432 Cony Road
P.O. Box 4687
Augusta, ME 04330

ENGINEERING
E.S. COFFIN
SURVEYING
E.S. COFFIN ENGINEERING & SURVEYING, INC.

(207) 623-9475
Fax (207) 623-0016
1-800-244-9475

July 14, 2015

City of Augusta
Mr. Lionel Cayer, City Engineer
One City Center
Augusta, Maine 04330

Subject: Stormwater Report
Rocky's Stove Shoppe
Route 3

Dear Lionel,

E.S. Coffin Engineering & Surveying has completed the hydrologic calculations for Rocky's Stove Shop for their project located on Route 3 in Augusta. The 60.5 acre parcel of land is identified as Lot 38E on Tax Map 7 in the City of Augusta tax maps. The applicant is proposing to develop the parcel into the new home of Rocky's Stove Shoppe with associated parking.

The project results in 41,680 sf of new impervious area and therefore does not meet the threshold for a Department of Environmental Protection (DEP) Stormwater Permit Application. However the project must comply with the City of Augusta's Land Use Ordinance stating that the amount of flow (stormwater) in the post-development condition must be equal to or less then the flow in the pre-development condition for the 2-, 10- and 25-year peak storm events.

Modeling assumptions: The "Hydro-Cad" computer program was used to determine the peak storm water runoff for the pre- and post-development conditions. Hydro-Cad is a storm water modeling system, which utilizes the TR-20 method developed by the Soil Conservation Service (SCS).

The design assumptions used for this project are:

Design storm: 24 hour, Type III rainfall distribution.

Rainfall: 24-hour precipitation values from U.S. Weather Bureau Technical Release No. 40:

2-year storm = 3.0 inches
10-year storm = 4.4 inches
25-year storm = 5.1 inches

Site specific parameters for the project are listed below:

Soils: Soils information to determine the hydrologic soil group for the site is derived from the Soil Survey of Kennebec County by the United States Department of Agriculture Soil Conservation Service. The soils and hydrologic group are listed below:

Soil Classification	Hydrologic Group
Buxton (BuB2)	"C"

Ground Cover:

Pre-Development: The existing watershed ground cover is modeled as meadow and woods.

Post-Development: The proposed watershed ground cover is impervious, lawn, meadow and woods.

Cover Description	Curve Number:
Impervious	98
Lawn "C"	74
Woods "C"	70
Meadow "C"	71

Results:

The project will result in an increase of 41,680 sf of impervious area. These results are shown on the Hydro Cad output sheets enclosed at the end of the report. All of the runoff from the site ends up in the unnamed stream flowing along Civic Center Drive and therefore one study point is evaluated. A detention pond is utilized to reduce peak flows exiting the site.

Pre-development:

The hydrologic study evaluates a portion of the parcel that includes meadow (2.087 acres) and is broken down into four drainage areas (see plan entitled "PRE"). The peak flows for the 2-, 10- and 25-year events (see node labeled "SP") in the pre-development condition are 1.43 cfs (cubic feet per second), 3.46 cfs and 4.65 cfs.

Post Development:

The proposed site (see plan entitled "C-1") will be comprised of impervious area (41,680 sf) and lawn (49,230 sf). The post-development is broken down into seven drainage areas and is shown on the plan entitled "POST". Summary tables showing the input values and resulting peak flows for Sub Areas and reaches are also included at the end of the report. In the post development condition, the 2-, 10- and 25-year peak storm events for the study point "SP" yield 0.82 cfs, 1.31 cfs and 1.55 cfs. See the table on the next page for results.

PRE- & POST-DEVELOPMENT HYDROLOGIC RESULTS (SP)			
Event	**Pre-Develop.**	**Post-Develop.**	**Difference**
2 year	1.43 cfs	0.82 cfs	- 0.61 cfs
10 year	3.46 cfs	1.31 cfs	- 2.15 cfs
25 year	4.65 cfs	1.55 cfs	- 3.10 cfs

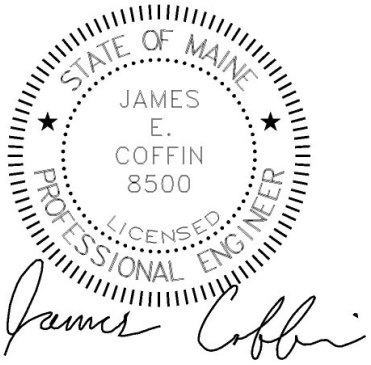
Conclusion:

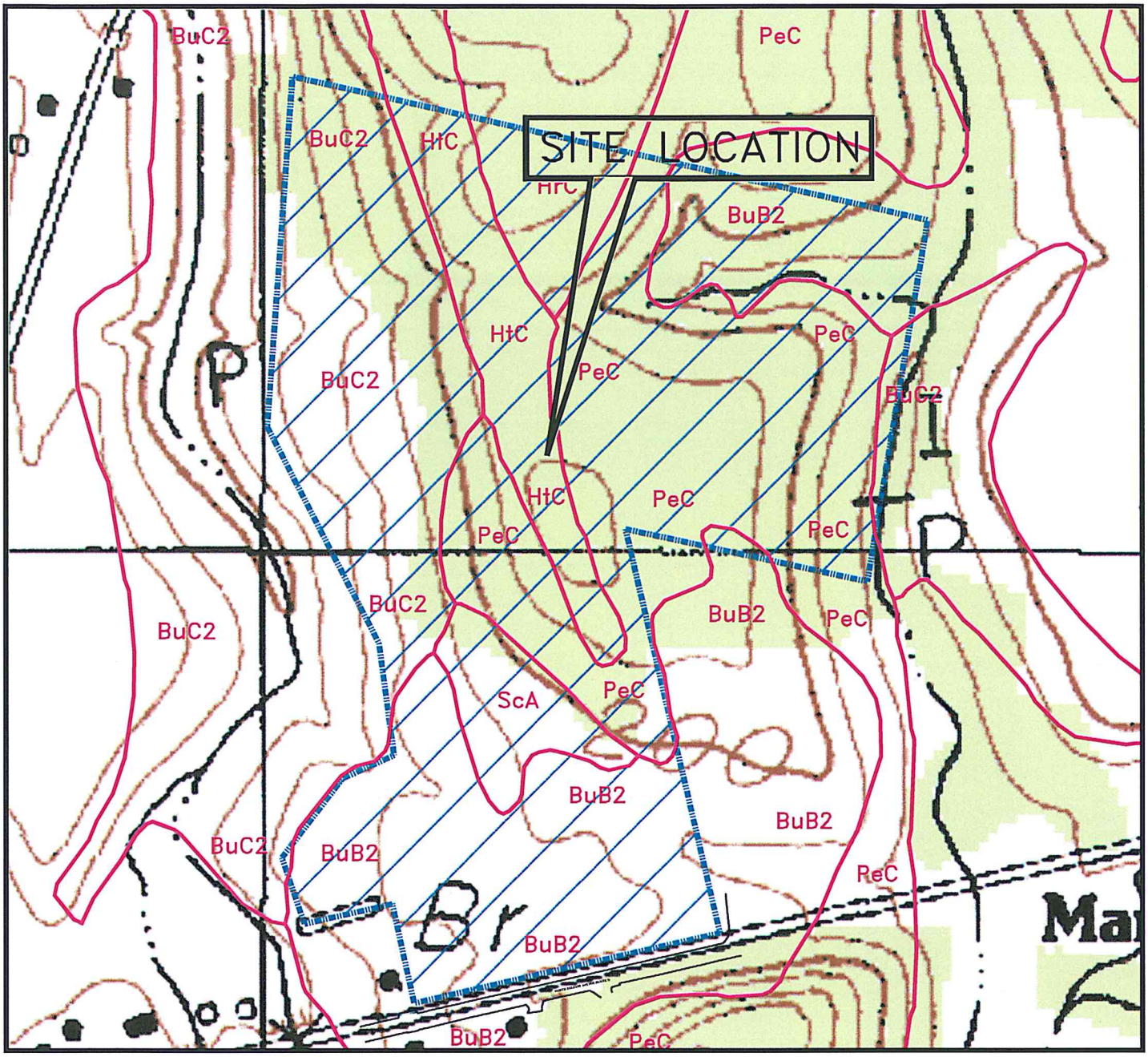
By comparing the node labeled "SP" in the post-development condition and in the pre-development condition, the results show that there will not be an increase in flow for any of the three peak storm events.

If you should have any questions or concerns, please do not hesitate to contact me at 623-9475.

Respectfully submitted,

James E. Coffin, PE





SOILS FOUND ON-SITE

CLASSIFICATION	NAME / DESCRIPTION
BuB2 (C)	BUXTON SILT LOAM, 3% TO 8% SLOPES, ERODED
BuC2 (C)	BUXTON SILT LOAM, 8% TO 15% SLOPES, ERODED
HrC (C/D)	HOLLIS FINE SANDY LOAM, 8% TO 15% SLOPES
HtC (C/D)	HOLLIS-ROCK OUTCROP COMPLEX, 8% TO 15% SLOPES
PeC (C)	PAXTON-CHARLTON VERY STONY FINE SANDY LOAMS, 8% TO 15% SLOPES
ScA (D)	SCANTIC SILT LOAM

INFORMATION REFERENCED FROM U.S. DEPT. OF AGRICULTURE S.C.S.
"SOIL SURVEY OF KENNEBEC COUNTY OF MAINE" MAP 53.

SOILS MAP

SCALE: 1"=400'

SOILS

CLIENT/PROJECT: ROCKY'S STOVE SHOPPE

LOCATION: NORTH BELFAST AVENUE

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

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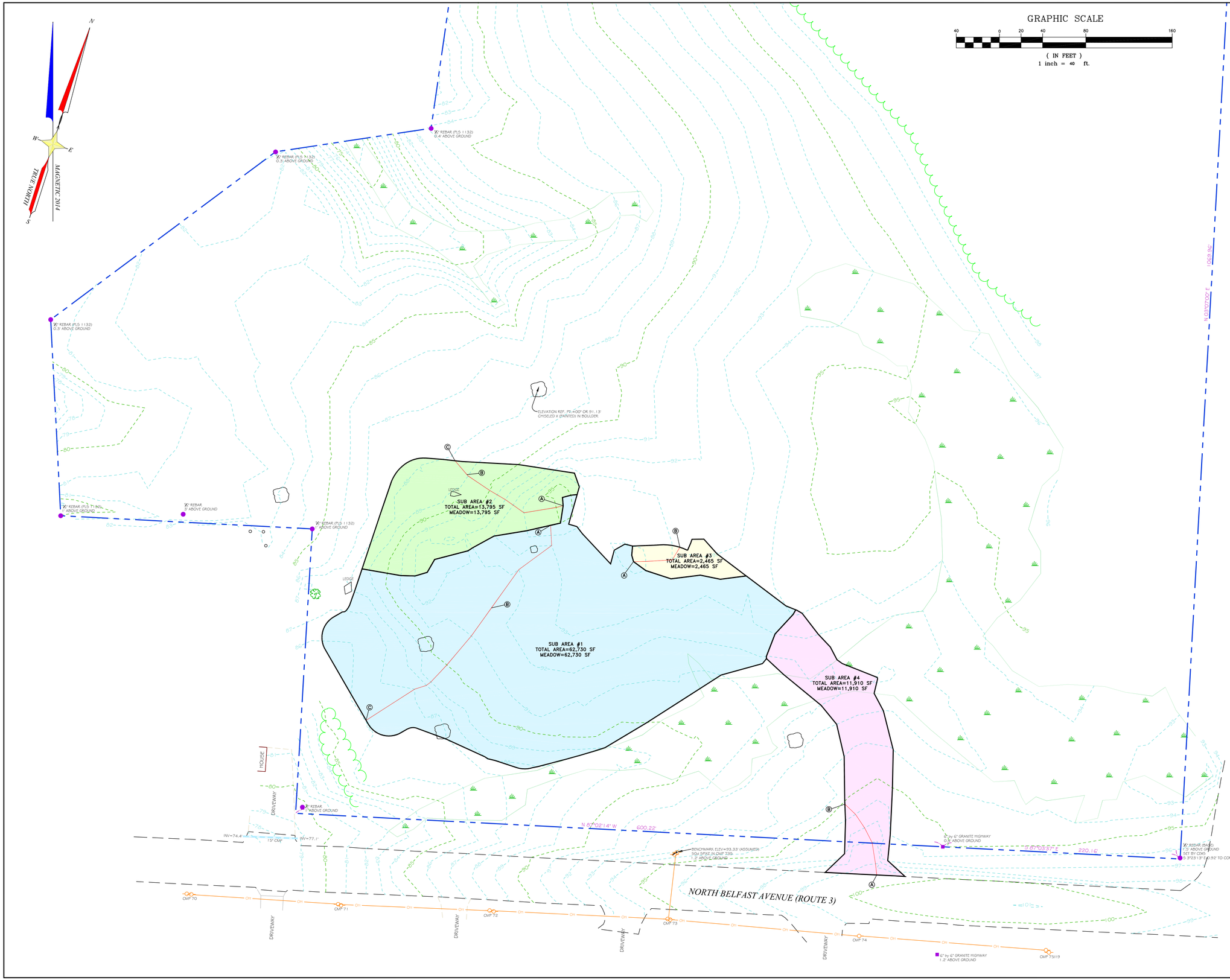
SHEET TITLE: SOILS MAP

SCALE: 1" = 400'

DATE: JUNLY 14, 2015

PROJ. NO. 2015-052



LEGEND

- IRON ROD FOUND
- IRON PIPE FOUND
- GRANITE MONUMENT FOUND
- 5/8" REBAR PROPOSED
- UTILITY POLE
- GUY ANCHOR
- OH — OVERHEAD UTILITY LINE
- HYDRANT
- W — WELL
- W — UNDERGROUND WATER LINE
- SIGN
- 123 — EXISTING CONTOUR
- SURVEYED LINE
- WIRE FENCE
- GUARDRAIL
- STONE WALL
- OR — CATCH BASIN
- SW — STORM PIPE
- SETBACK
- BOULDER OR BEDROCK
- TP — TEST PIT
- CONIFEROUS TREE
- DECIDUOUS TREE
- VEGETATION
- APPROXIMATE WETLANDS

STATE OF MAINE
JAMES E. COFFIN
8500
LICENSED
PROFESSIONAL ENGINEER

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NO.	REVISIONS	DATE

SHEET TITLE: **PRE-DEVELOPMENT PLAN**

SCALE: 1 INCH=40 FEET

DATE: JULY 13, 2015

DRAWN BY: TGH

CHECKED BY: JEC

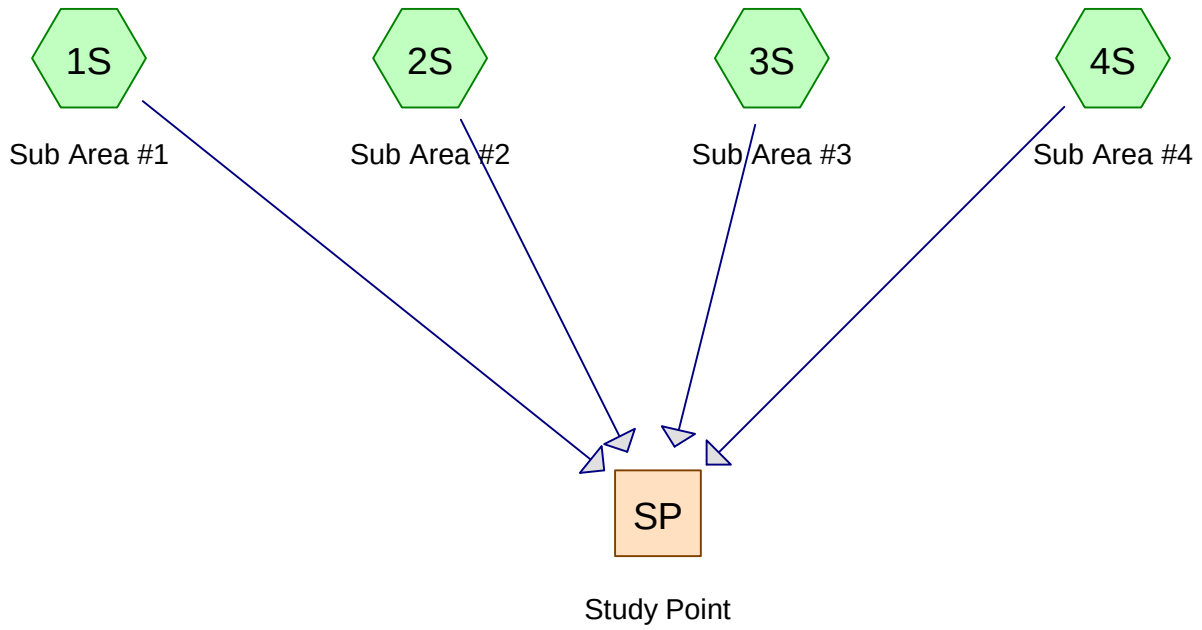
CLIENT/PROJECT: **PROPOSED BUILDING ROCKY'S STOVE SHOPPE**

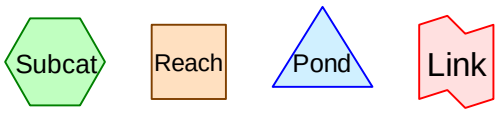
LOCATION: NORTH BELFAST AVENUE

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

PROJ. NO. 2015-052

PRE





Routing Diagram for Rocky's Pre-Development
Prepared by Microsoft, Printed 7/16/2015
HydroCAD® 10.00-12 s/n 00434 © 2014 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.087	71	Meadow, non-grazed, HSG C (1S, 2S, 3S, 4S)
2.087	**71**	**TOTAL AREA**

Summary for Subcatchment 1S: Sub Area #1

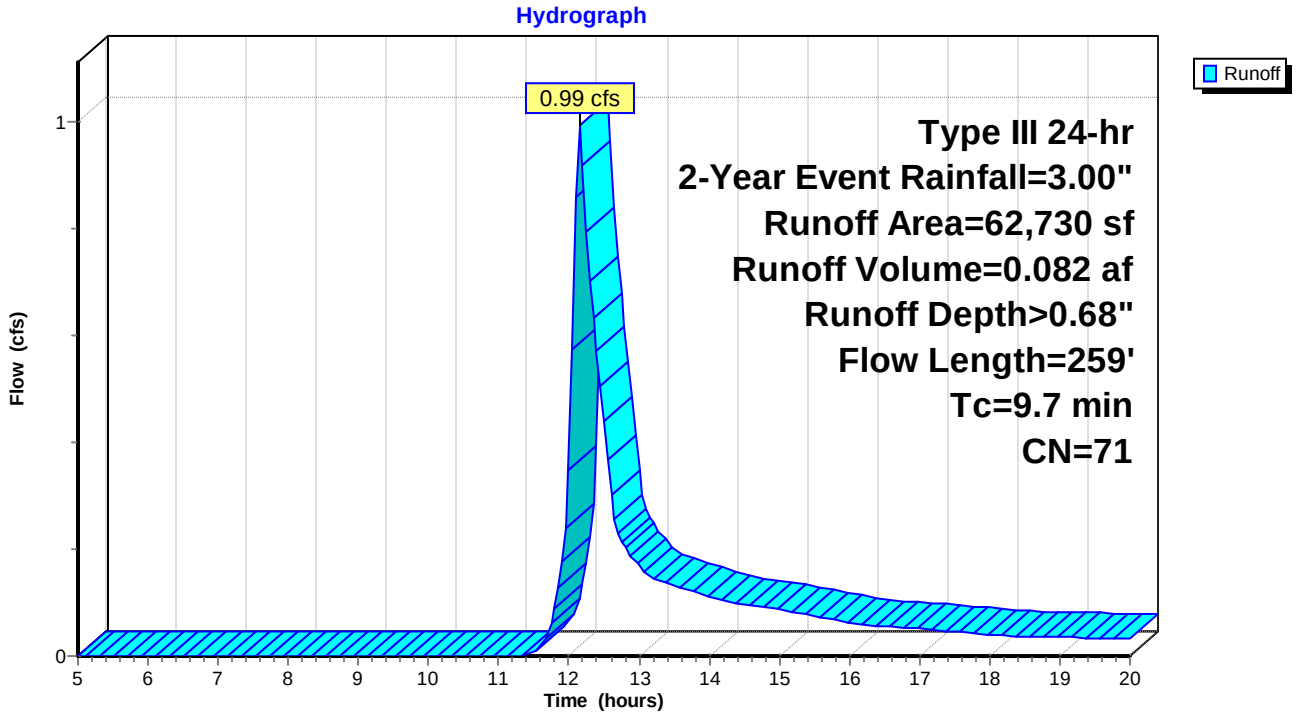
Runoff = 0.99 cfs @ 12.16 hrs, Volume= 0.082 af, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
62,730	71	Meadow, non-grazed, HSG C
62,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0300	0.22		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
2.0	159	0.0346	1.30		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
9.7	259	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

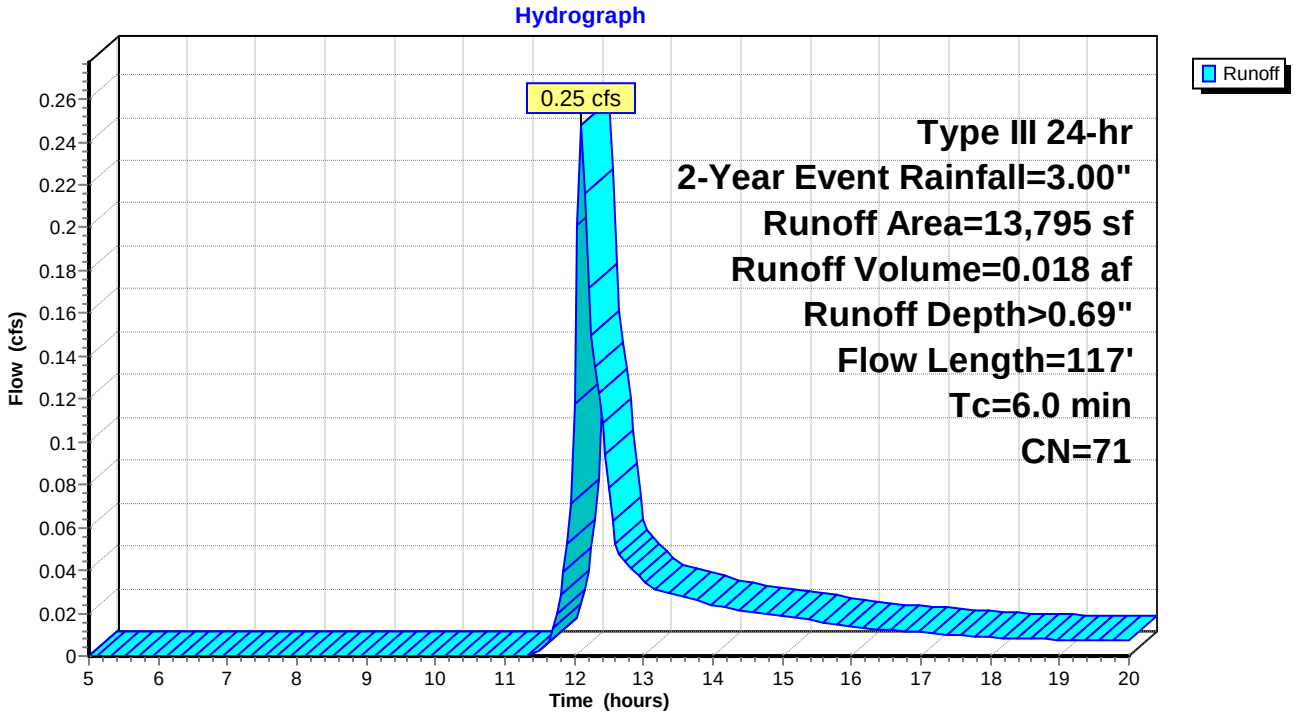
Runoff = 0.25 cfs @ 12.10 hrs, Volume= 0.018 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
13,795	71	Meadow, non-grazed, HSG C
13,795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0600	0.29		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
0.2	17	0.0471	1.52		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
6.0	117	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

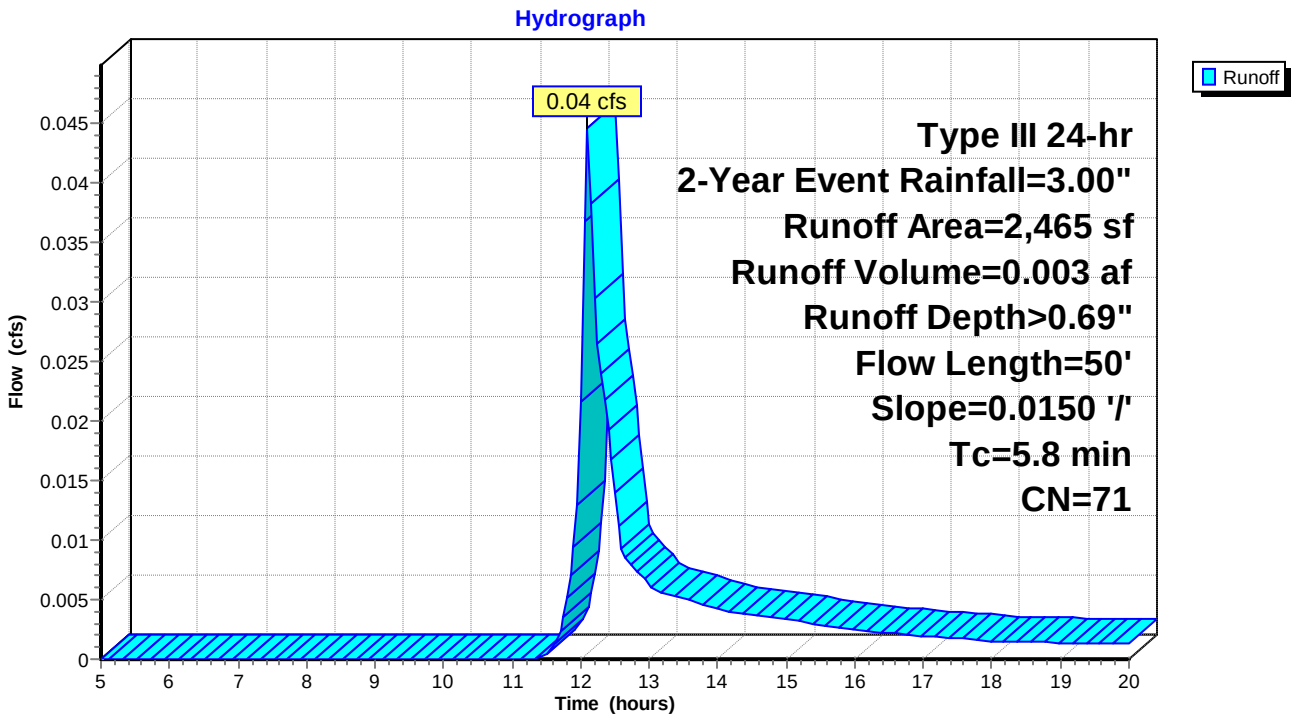
Runoff = 0.04 cfs @ 12.10 hrs, Volume= 0.003 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
2,465	71	Meadow, non-grazed, HSG C
2,465		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0150	0.14		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

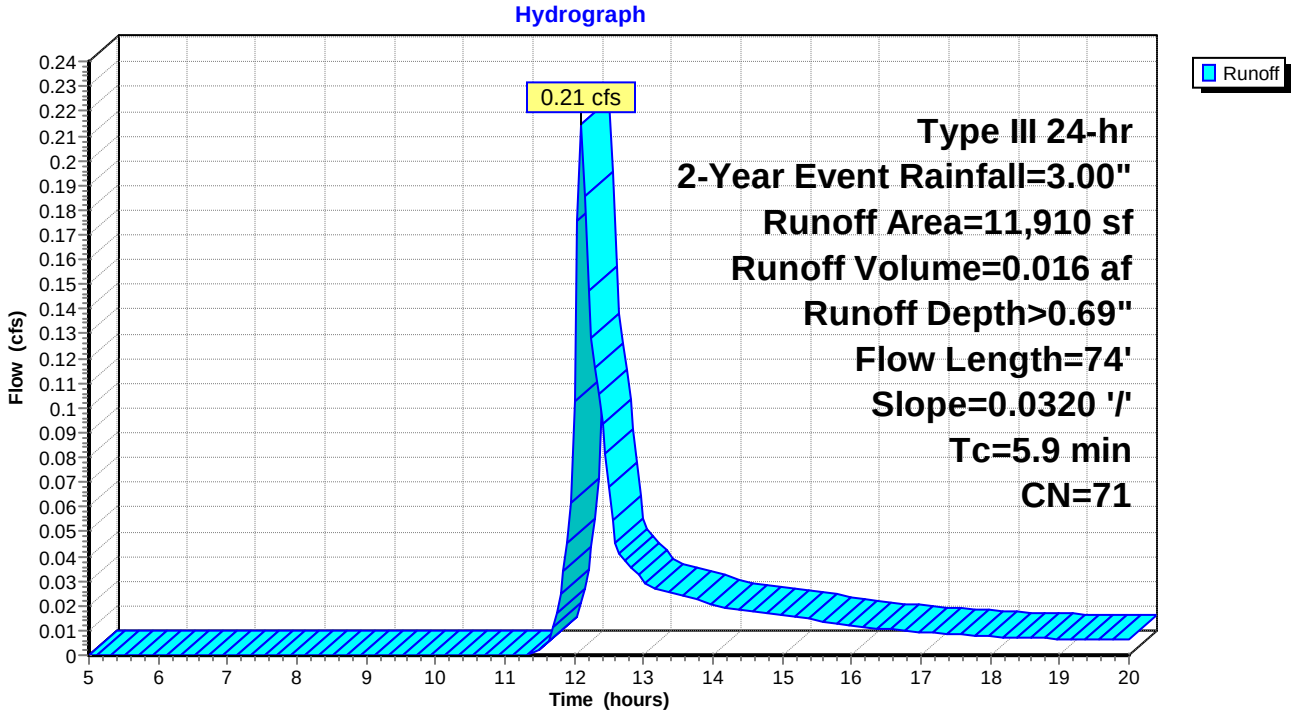
Runoff = 0.21 cfs @ 12.10 hrs, Volume= 0.016 af, Depth> 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
11,910	71	Meadow, non-grazed, HSG C
11,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	74	0.0320	0.21		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 4S: Sub Area #4

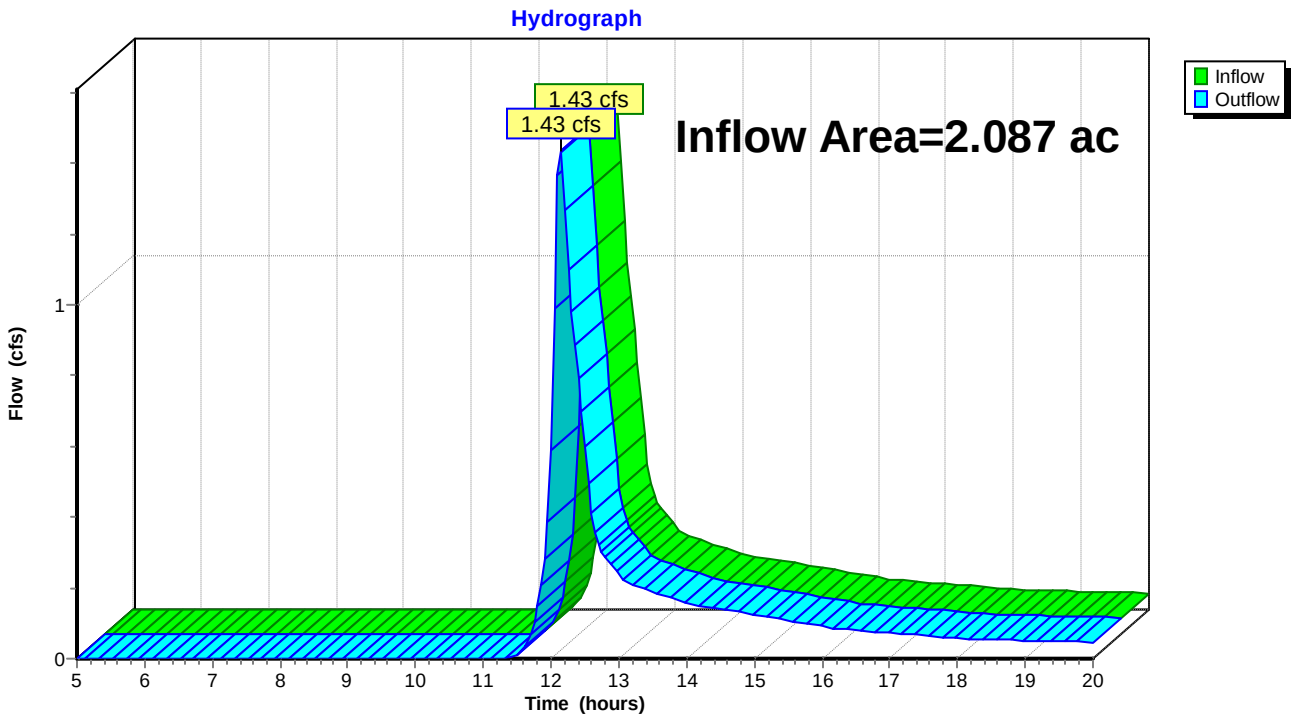


Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 0.00% Impervious, Inflow Depth > 0.68" for 2-Year Event event
Inflow = 1.43 cfs @ 12.14 hrs, Volume= 0.119 af
Outflow = 1.43 cfs @ 12.14 hrs, Volume= 0.119 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point



Summary for Subcatchment 1S: Sub Area #1

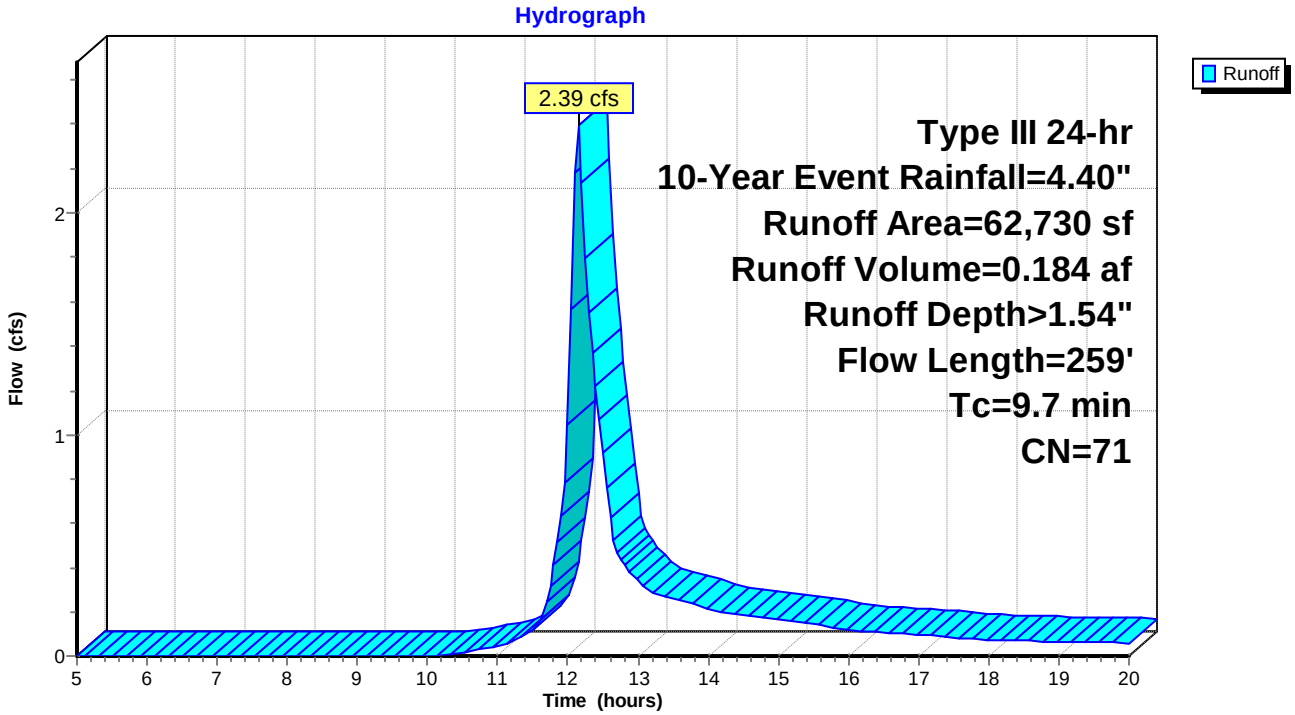
Runoff = 2.39 cfs @ 12.15 hrs, Volume= 0.184 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
62,730	71	Meadow, non-grazed, HSG C
62,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0300	0.22		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
2.0	159	0.0346	1.30		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
9.7	259	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

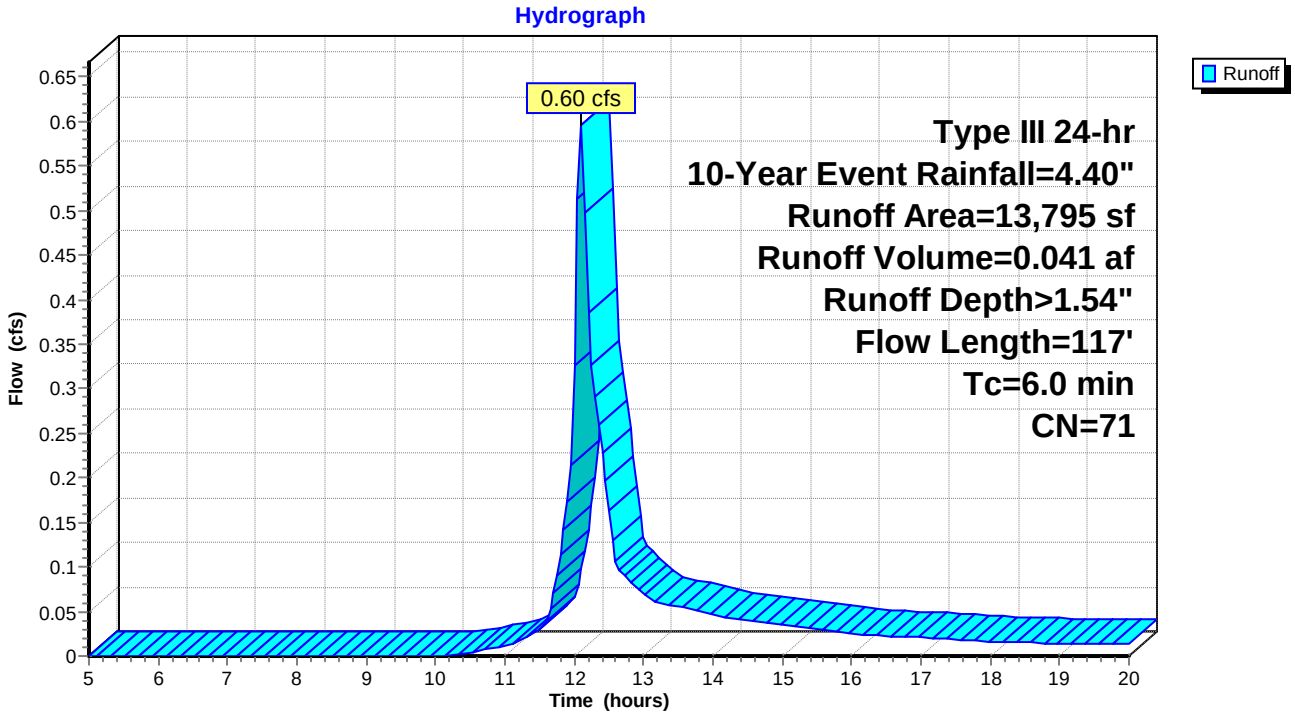
Runoff = 0.60 cfs @ 12.10 hrs, Volume= 0.041 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
13,795	71	Meadow, non-grazed, HSG C
13,795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0600	0.29		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
0.2	17	0.0471	1.52		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
6.0	117	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

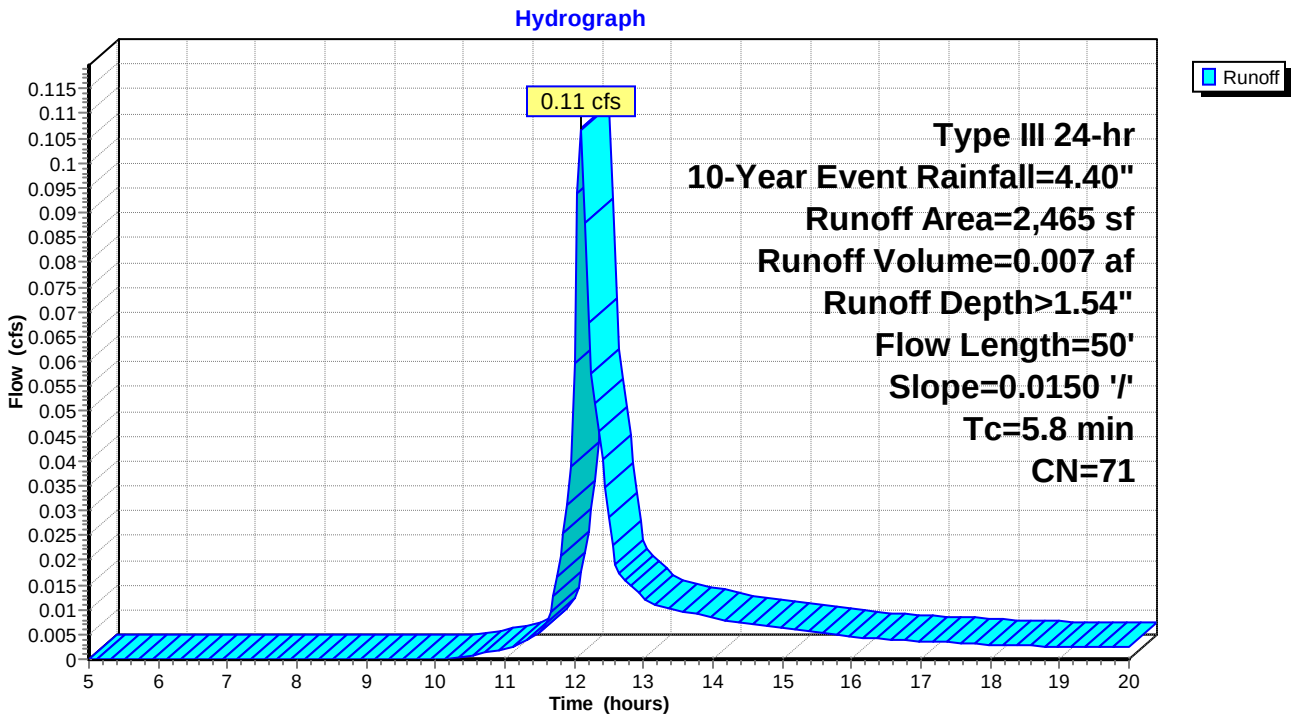
Runoff = 0.11 cfs @ 12.10 hrs, Volume= 0.007 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
2,465	71	Meadow, non-grazed, HSG C
2,465		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0150	0.14		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

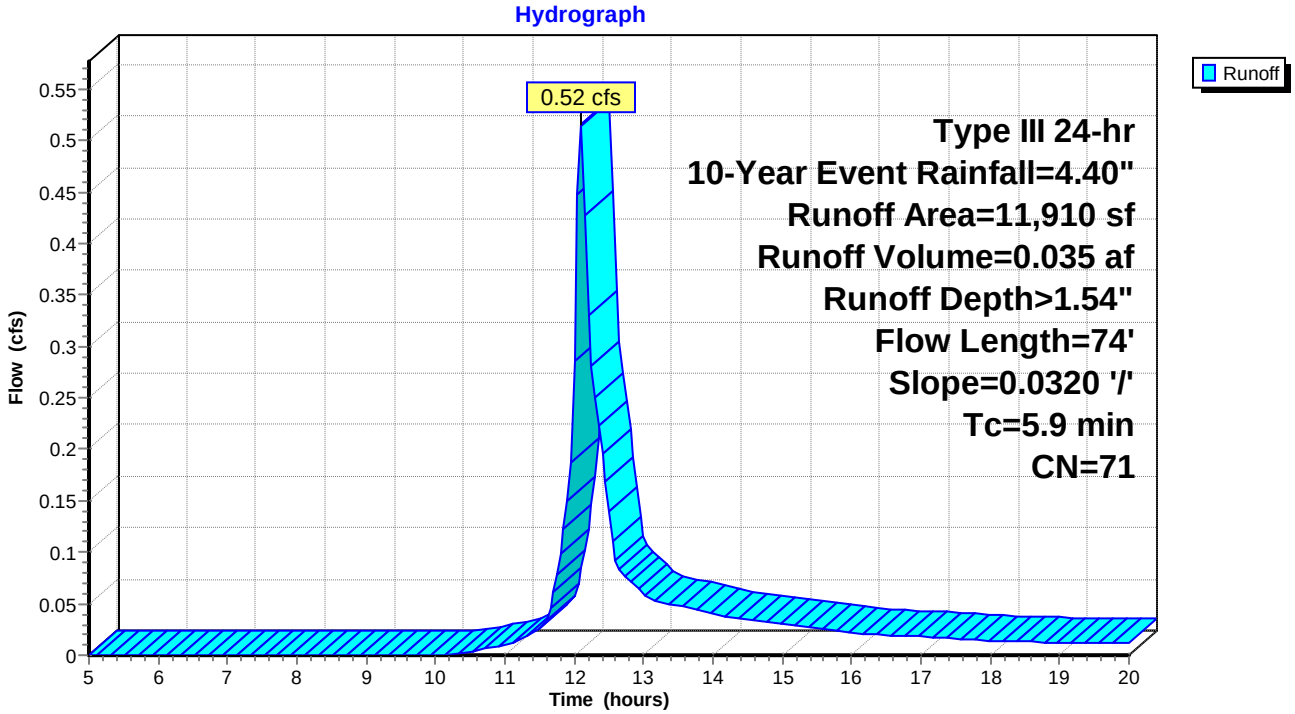
Runoff = 0.52 cfs @ 12.10 hrs, Volume= 0.035 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
11,910	71	Meadow, non-grazed, HSG C
11,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	74	0.0320	0.21		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 4S: Sub Area #4

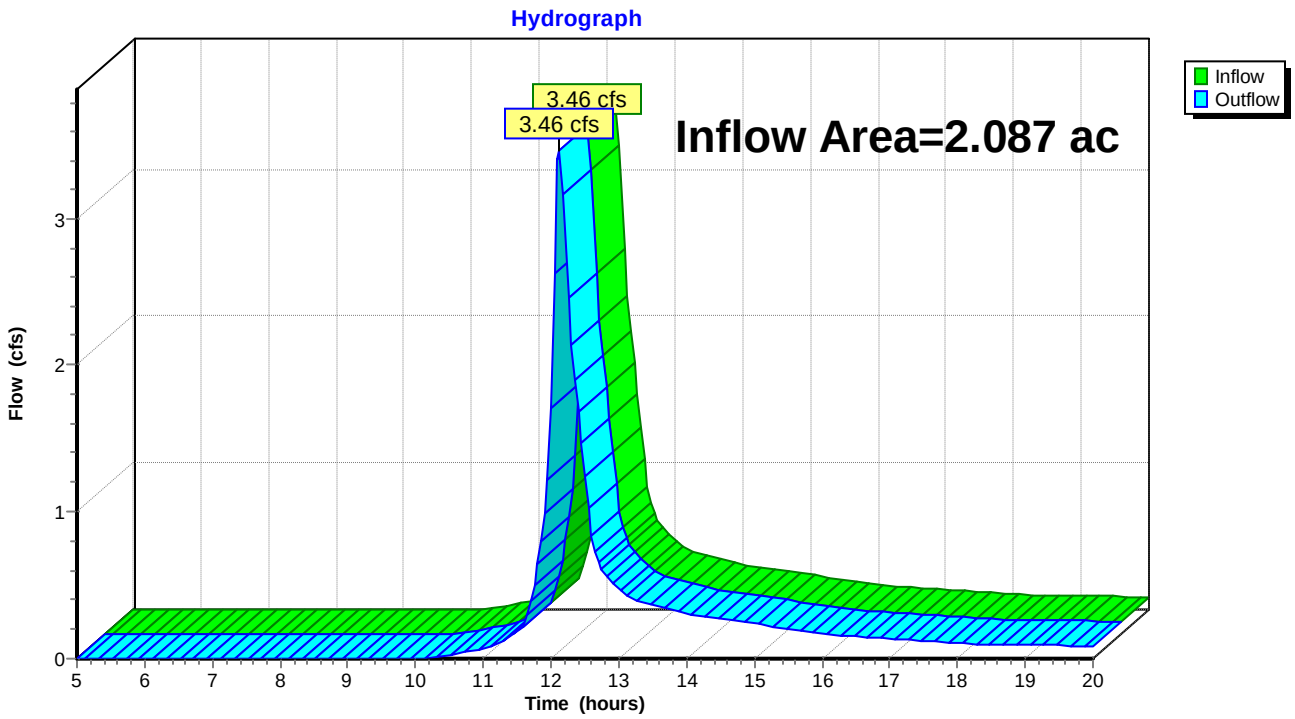


Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 0.00% Impervious, Inflow Depth > 1.54" for 10-Year Event event
Inflow = 3.46 cfs @ 12.13 hrs, Volume= 0.267 af
Outflow = 3.46 cfs @ 12.13 hrs, Volume= 0.267 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point



Summary for Subcatchment 1S: Sub Area #1

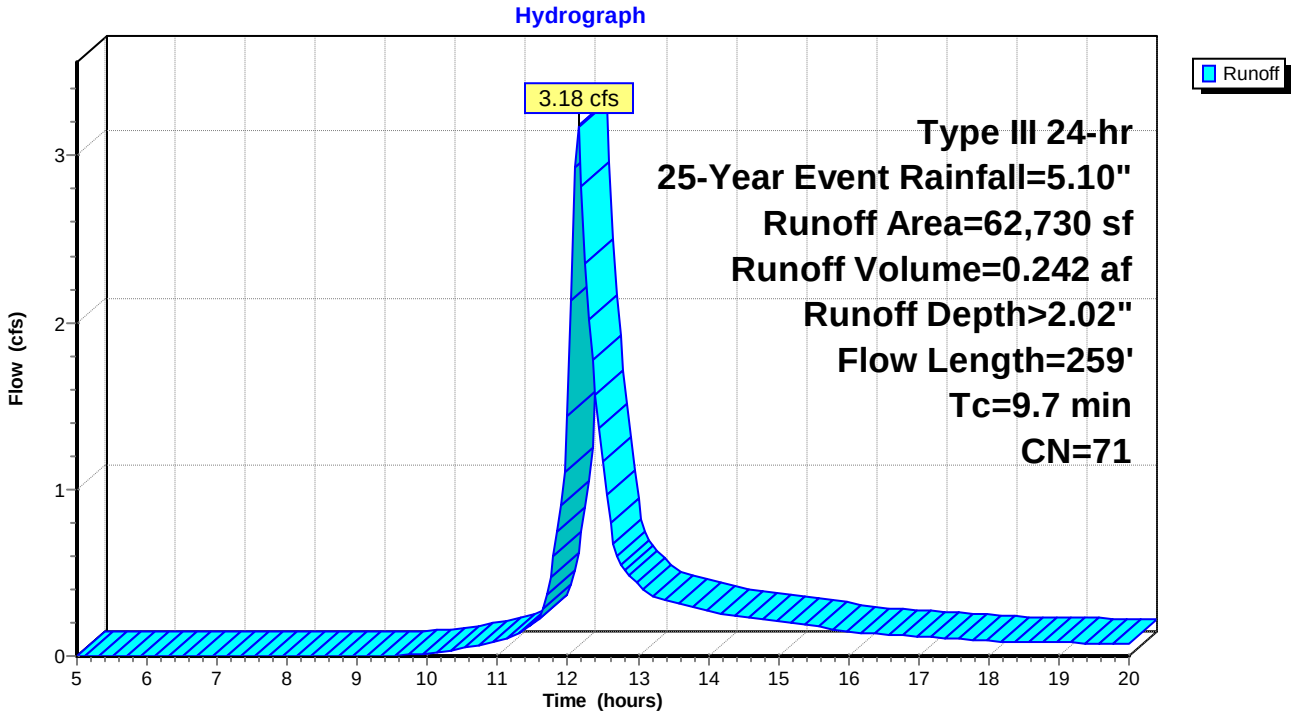
Runoff = 3.18 cfs @ 12.15 hrs, Volume= 0.242 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
62,730	71	Meadow, non-grazed, HSG C
62,730		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0300	0.22		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
2.0	159	0.0346	1.30		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
9.7	259	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

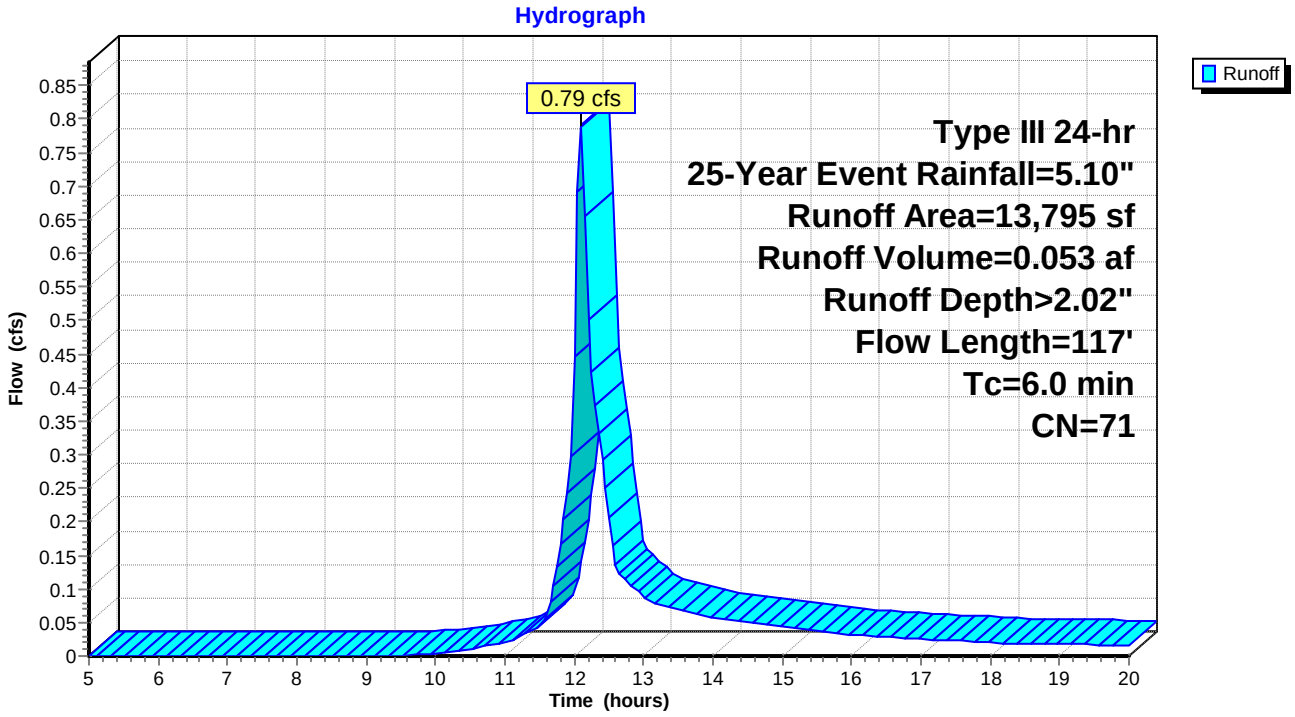
Runoff = 0.79 cfs @ 12.10 hrs, Volume= 0.053 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
13,795	71	Meadow, non-grazed, HSG C
13,795		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	100	0.0600	0.29		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"
0.2	17	0.0471	1.52		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
6.0	117	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

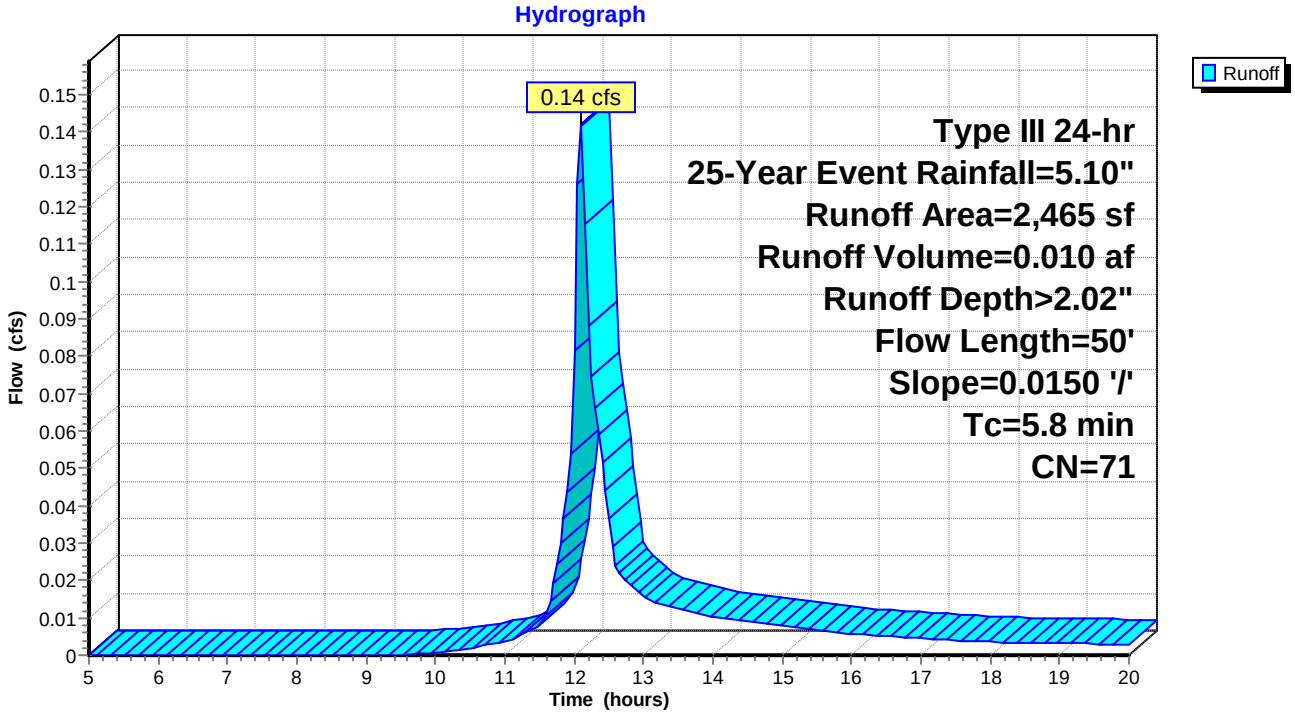
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 0.010 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
2,465	71	Meadow, non-grazed, HSG C
2,465		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.0150	0.14		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

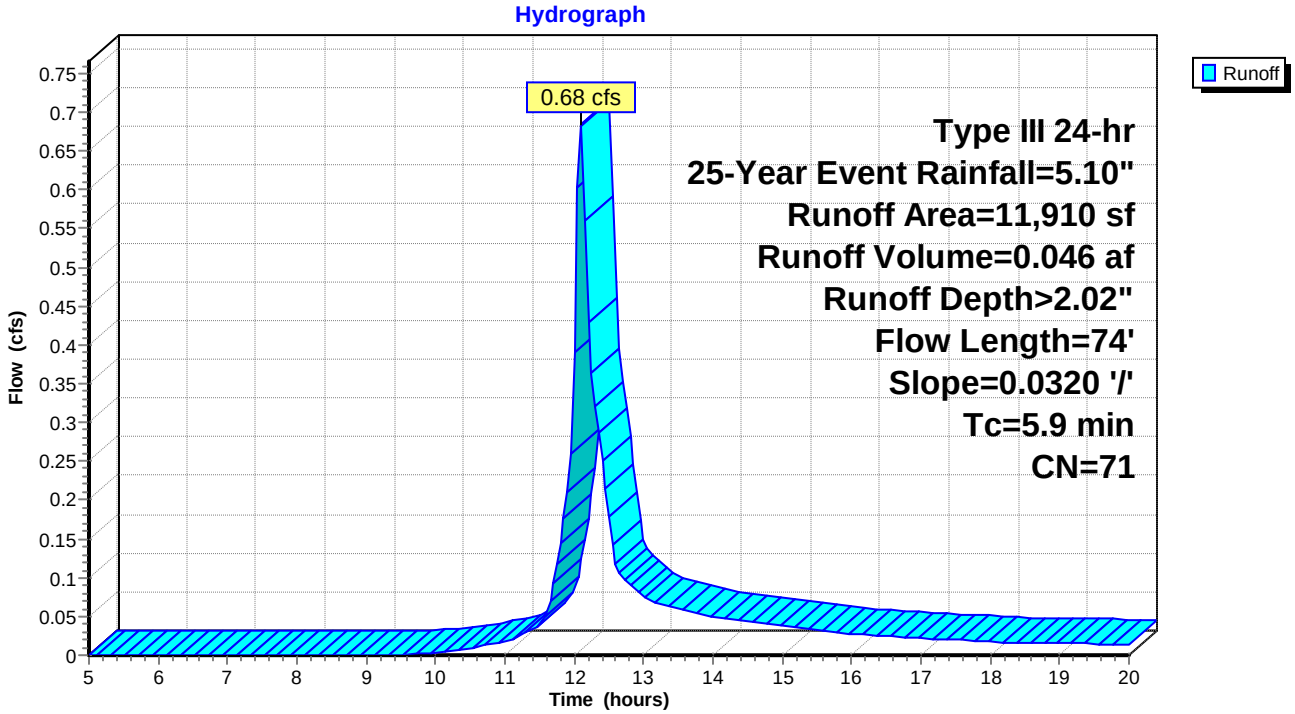
Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.046 af, Depth> 2.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
11,910	71	Meadow, non-grazed, HSG C
11,910		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	74	0.0320	0.21		**Sheet Flow, AB** Range n= 0.130 P2= 3.00"

Subcatchment 4S: Sub Area #4

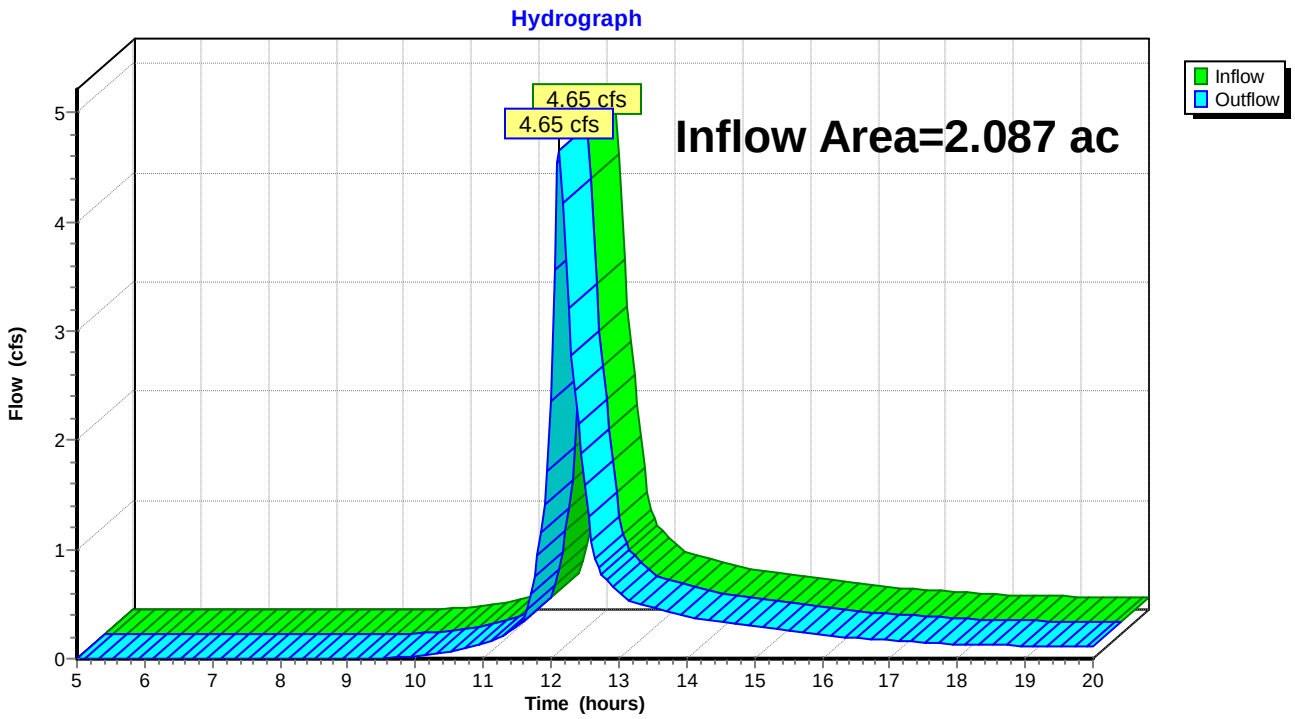


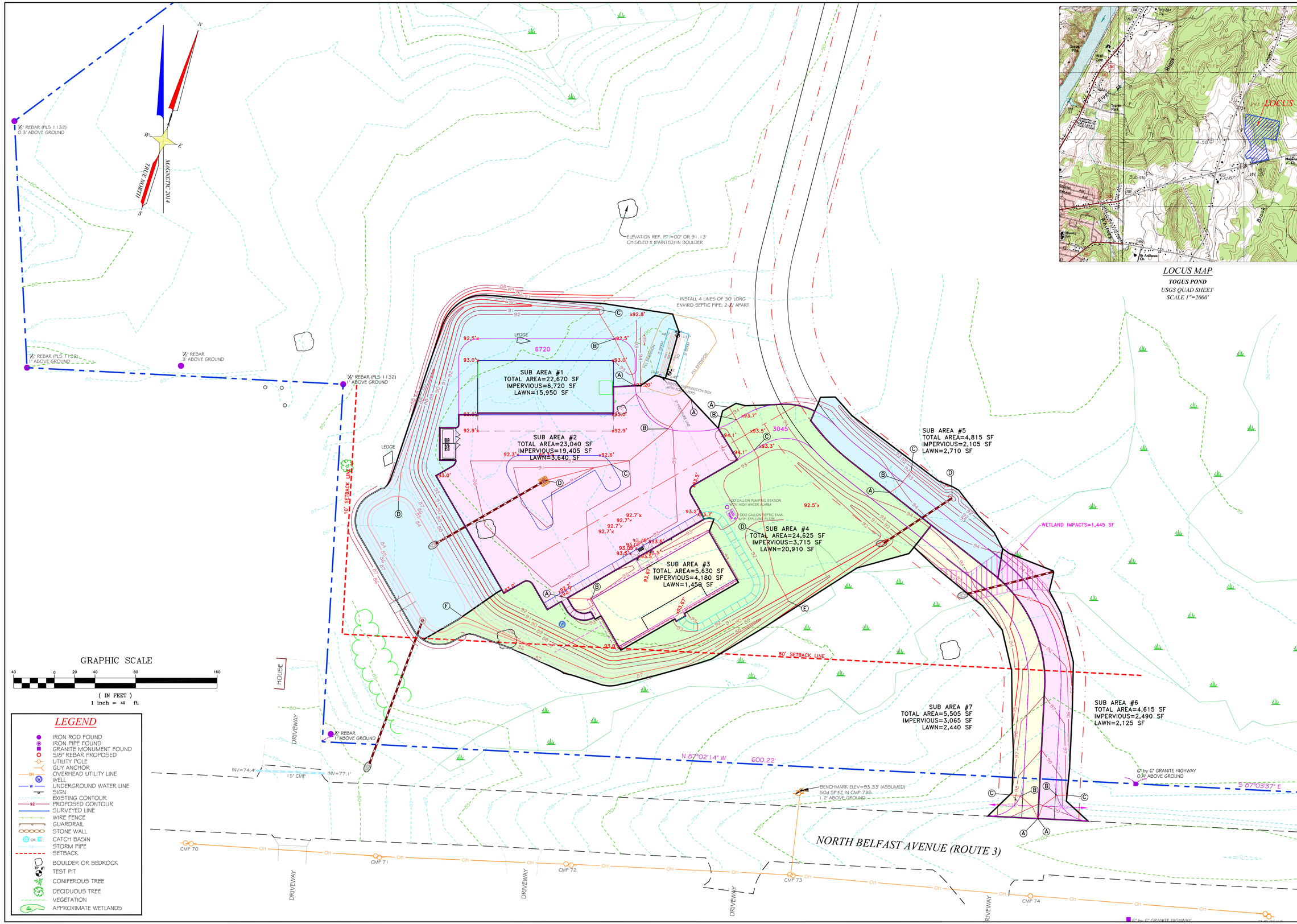
Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 0.00% Impervious, Inflow Depth > 2.02" for 25-Year Event event
Inflow = 4.65 cfs @ 12.12 hrs, Volume= 0.352 af
Outflow = 4.65 cfs @ 12.12 hrs, Volume= 0.352 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point





LOCUS MAP
TOGUS POND
USGS QUAD SHEET
SCALE 1"=2000'

STATE OF MAINE
JAMES E. COFFIN 8500
LICENSED PROFESSIONAL ENGINEER

E.S. COFFIN ENGINEERING & SURVEYING, INC.
ENGINEERING SURVEYING
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NO.	REVISIONS	DATE

SHEET TITLE: POST0DEVELOPMENT PLAN

SCALE: 1 INCH=30 FEET

DRAWN BY: TGH
CHECKED BY: JEC

DATE: JULY 10, 2015

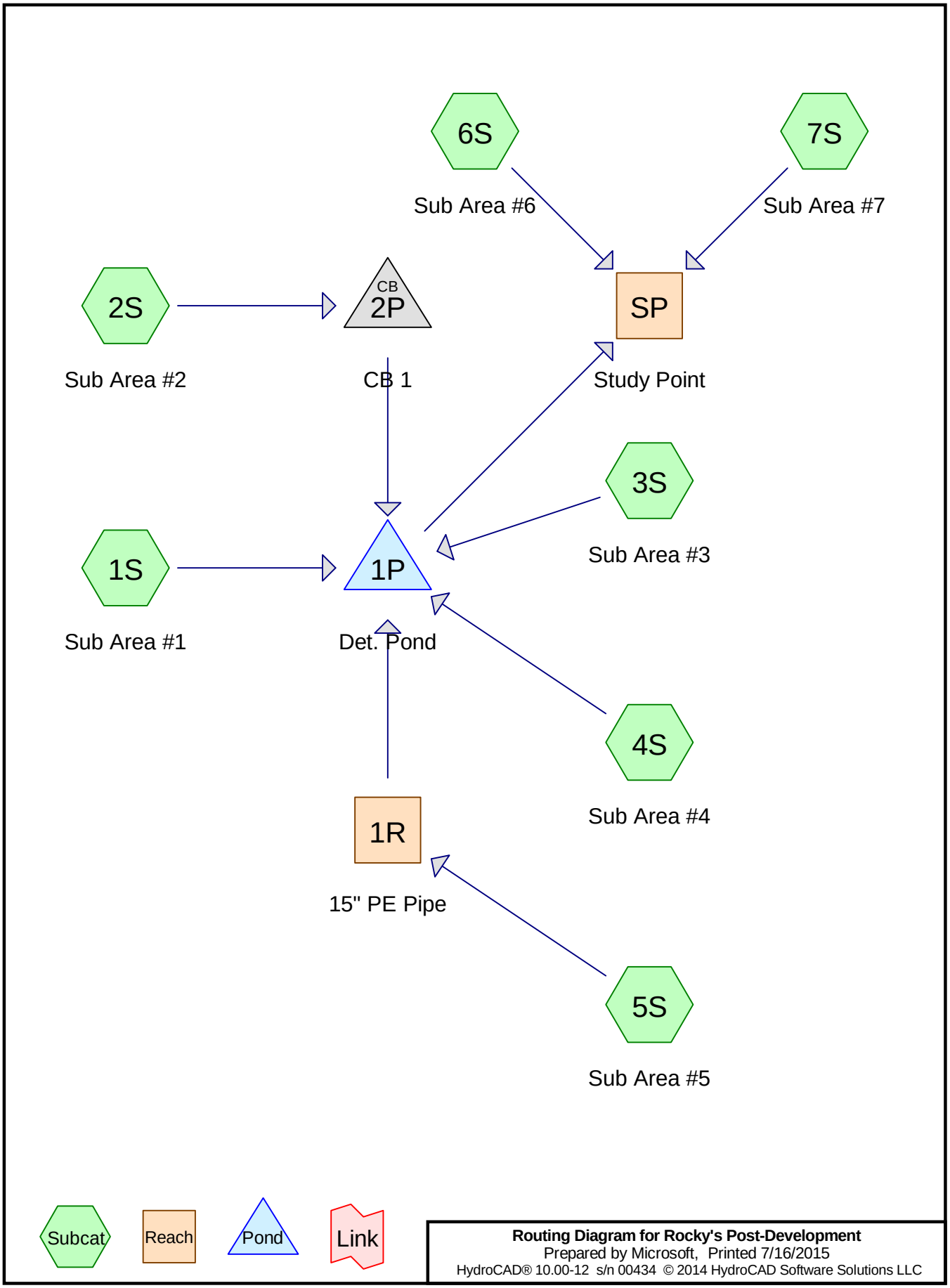
CLIENT/PROJECT: PROPOSED BUILDING ROCKY'S STOVE SHOPPE

LOCATION: NORTH BELFAST AVENUE

TOWN: AUGUSTA COUNTY: KENNEBEC STATE: MAINE

PROJ. NO. 2015-052

POST



Routing Diagram for Rocky's Post-Development
Prepared by Microsoft, Printed 7/16/2015
HydroCAD® 10.00-12 s/n 00434 © 2014 HydroCAD Software Solutions LLC

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	1R	90.30	89.70	60.0	0.0100	0.013	15.0	0.0	0.0
2	1P	81.50	80.40	110.0	0.0100	0.013	12.0	0.0	0.0
3	2P	85.90	85.00	90.0	0.0100	0.013	15.0	0.0	0.0

Summary for Subcatchment 1S: Sub Area #1

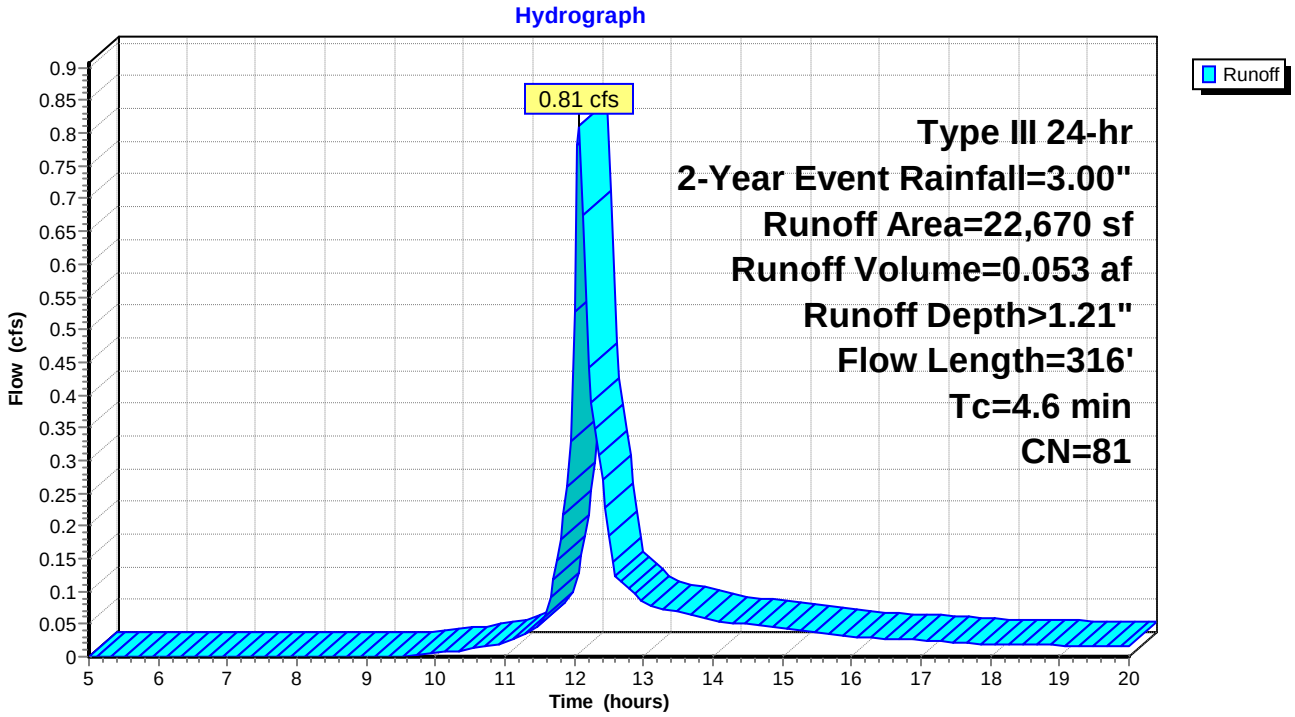
Runoff = 0.81 cfs @ 12.07 hrs, Volume= 0.053 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
6,720	98	Water Surface, HSG C
15,950	74	>75% Grass cover, Good, HSG C
22,670	81	Weighted Average
15,950		70.36% Pervious Area
6,720		29.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	38	0.0184	1.06		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
3.3	25	0.0200	0.12		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.7	253	0.0277	5.88	29.40	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
4.6	316	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

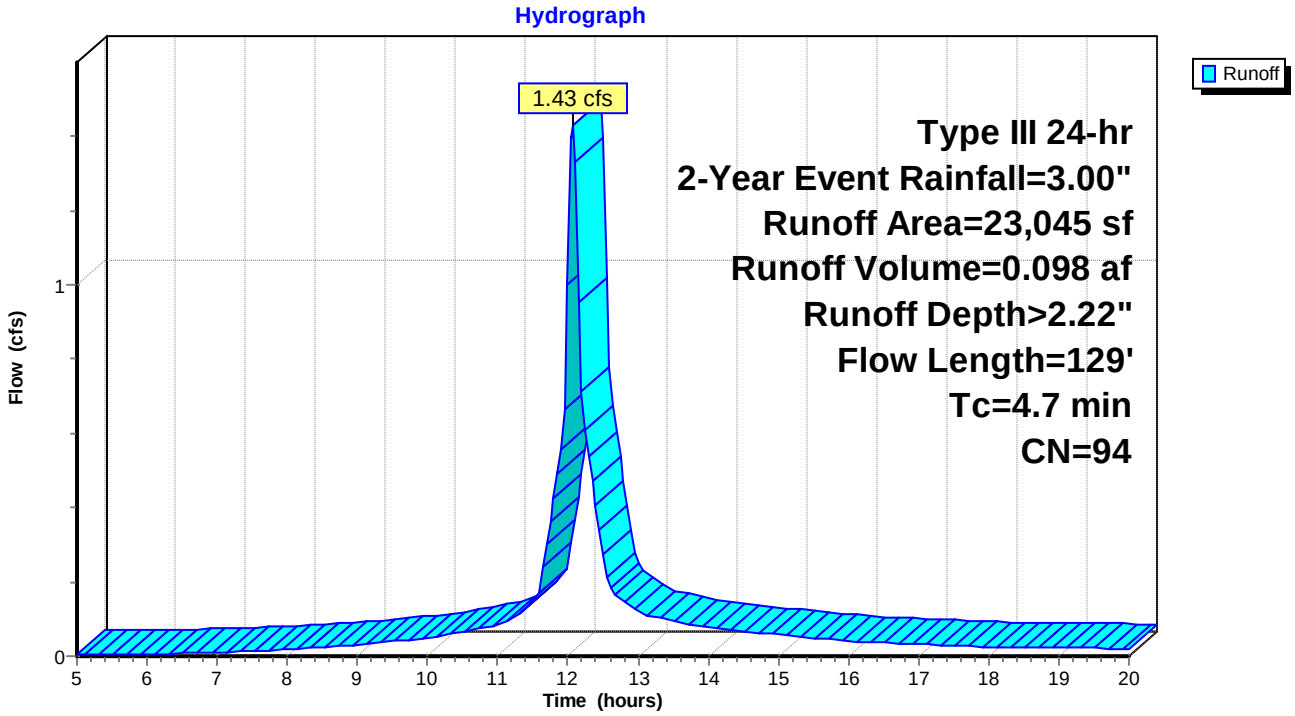
Runoff = 1.43 cfs @ 12.07 hrs, Volume= 0.098 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
19,405	98	Water Surface, HSG C
3,640	74	>75% Grass cover, Good, HSG C
23,045	94	Weighted Average
3,640		15.80% Pervious Area
19,405		84.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	28	0.0200	0.13		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.6	51	0.0275	1.32		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.4	50	0.0200	2.12		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
4.7	129	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

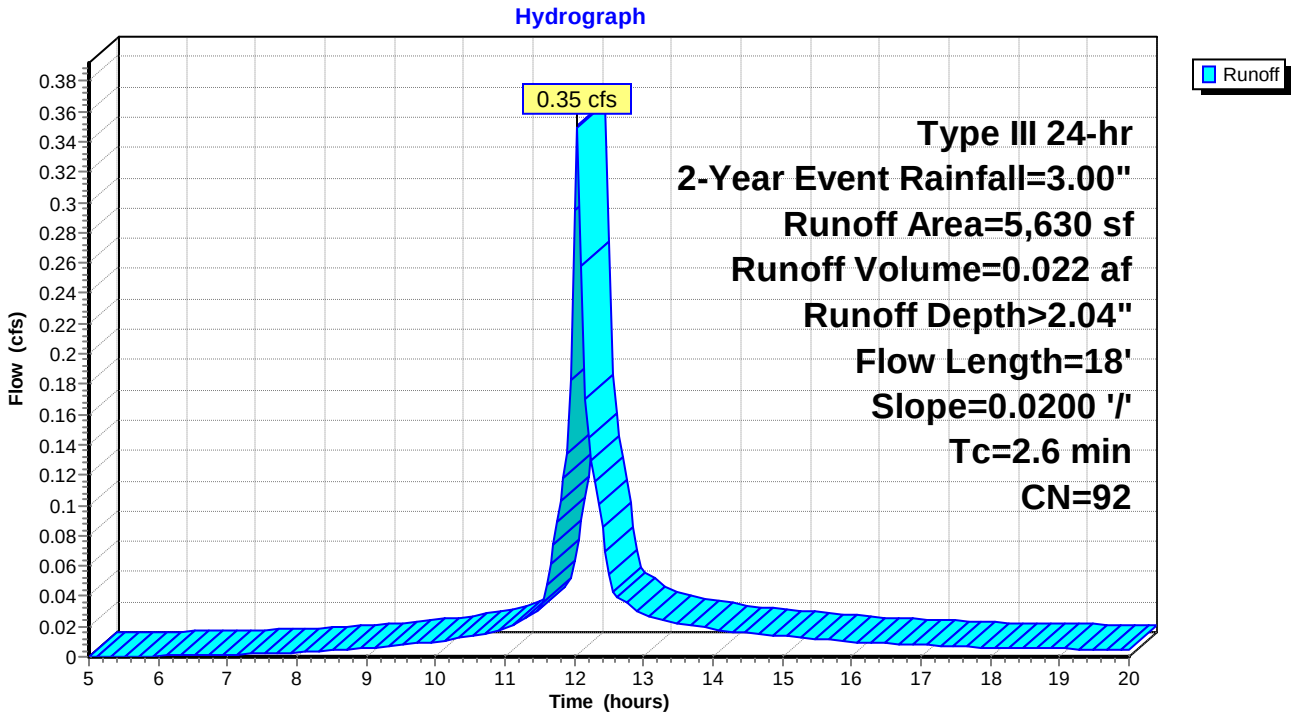
Runoff = 0.35 cfs @ 12.04 hrs, Volume= 0.022 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
4,180	98	Water Surface, HSG C
1,450	74	>75% Grass cover, Good, HSG C
5,630	92	Weighted Average
1,450		25.75% Pervious Area
4,180		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	18	0.0200	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

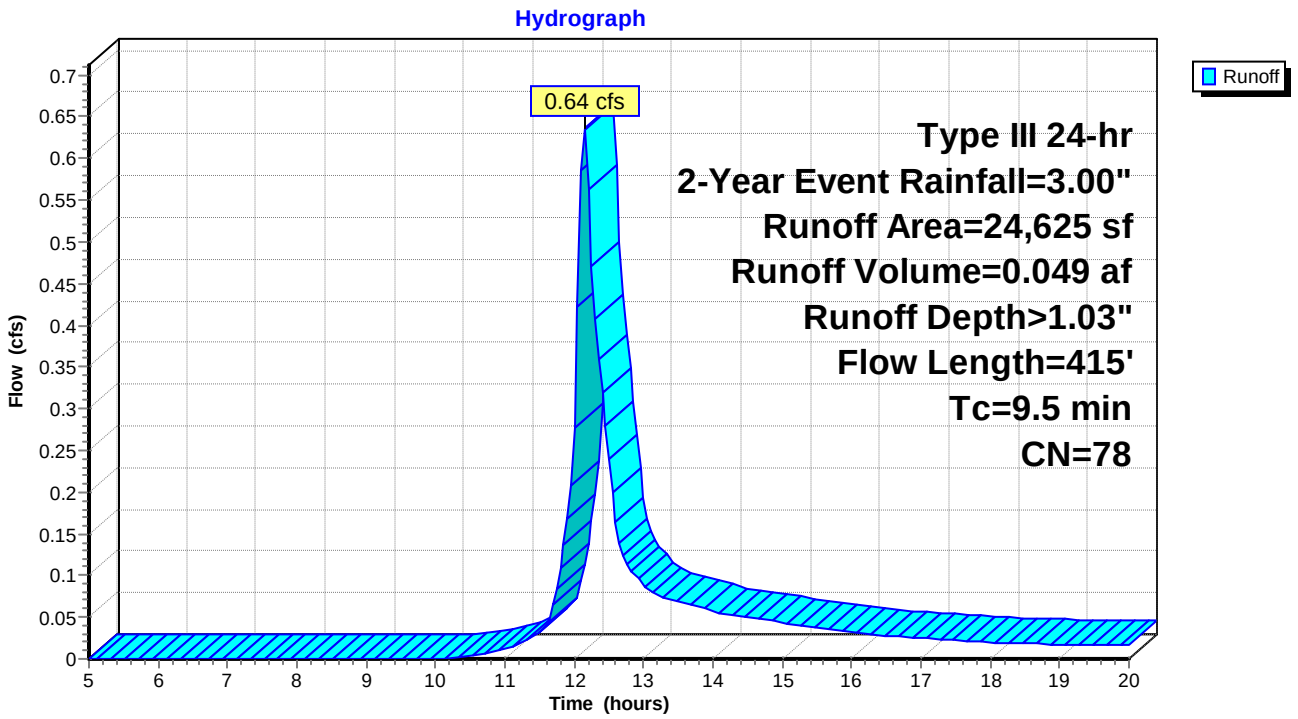
Runoff = 0.64 cfs @ 12.15 hrs, Volume= 0.049 af, Depth> 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
3,715	98	Water Surface, HSG C
20,910	74	>75% Grass cover, Good, HSG C
24,625	78	Weighted Average
20,910		84.91% Pervious Area
3,715		15.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	11	0.0300	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.4	26	0.0288	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
6.4	63	0.0254	0.17		**Sheet Flow, CD** Grass: Short n= 0.150 P2= 3.00"
0.2	51	0.0529	3.45		**Shallow Concentrated Flow, DE** Grassed Waterway Kv= 15.0 fps
1.0	264	0.0170	4.61	23.03	**Channel Flow, EF** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
9.5	415	Total			

Subcatchment 4S: Sub Area #4



Summary for Subcatchment 5S: Sub Area #5

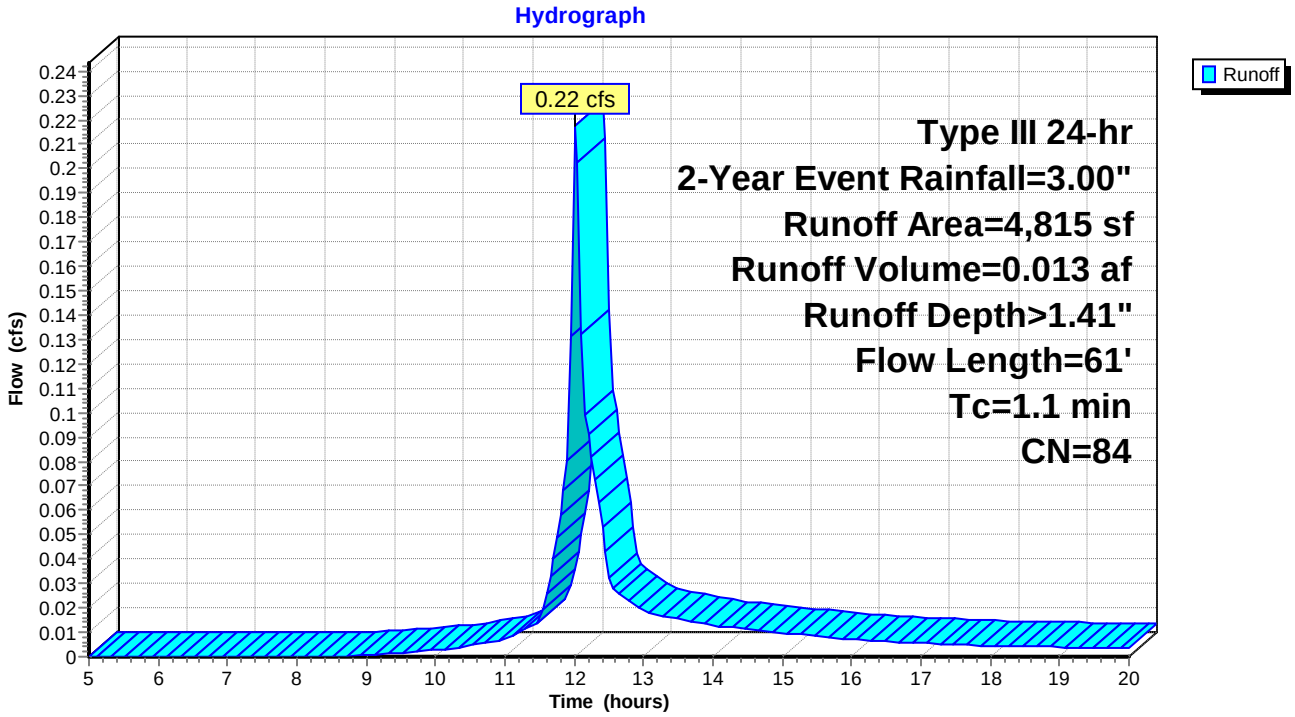
Runoff = 0.22 cfs @ 12.02 hrs, Volume= 0.013 af, Depth> 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
2,105	98	Water Surface, HSG C
2,710	74	>75% Grass cover, Good, HSG C
4,815	84	Weighted Average
2,710		56.28% Pervious Area
2,105		43.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0200	0.89		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	11	0.1364	0.23		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.1	37	0.0324	6.36	31.80	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
1.1	61	Total			

Subcatchment 5S: Sub Area #5



Summary for Subcatchment 6S: Sub Area #6

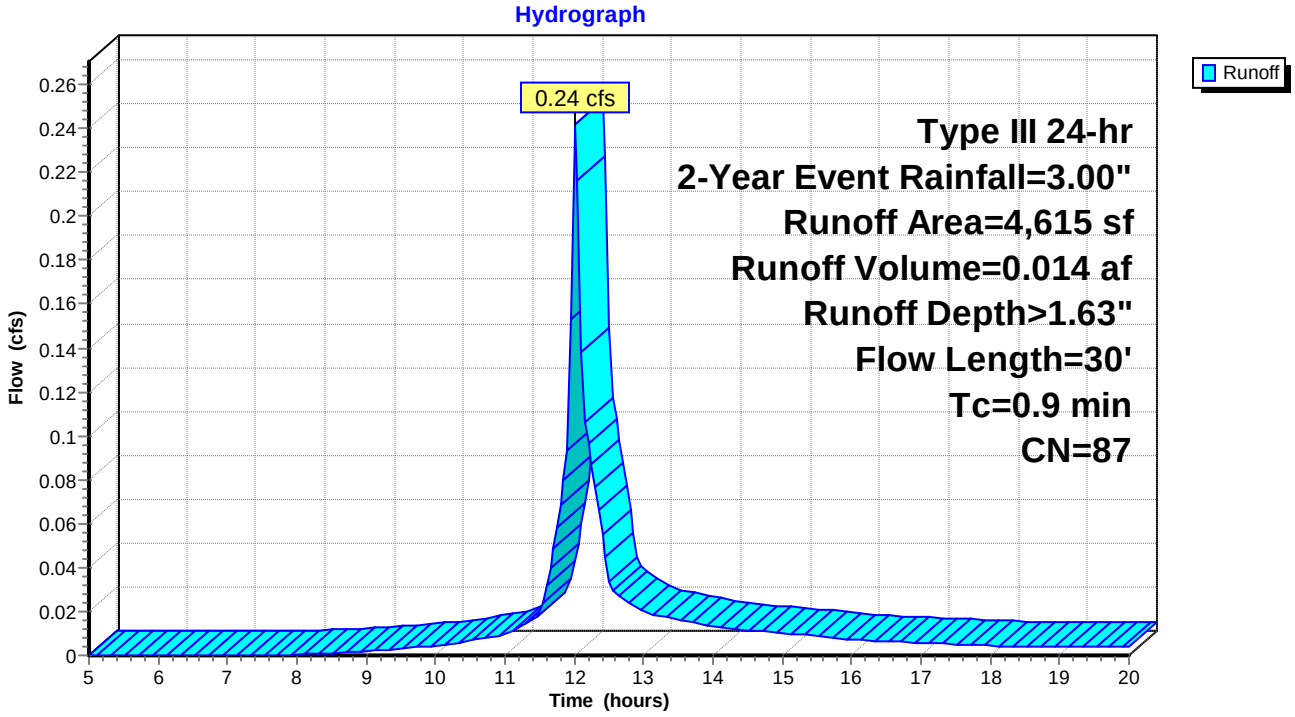
Runoff = 0.24 cfs @ 12.02 hrs, Volume= 0.014 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
2,490	98	Water Surface, HSG C
2,125	74	>75% Grass cover, Good, HSG C
4,615	87	Weighted Average
2,125		46.05% Pervious Area
2,490		53.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	23	0.0200	0.99		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.5	7	0.2143	0.25		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.9	30	Total			

Subcatchment 6S: Sub Area #6



Summary for Subcatchment 7S: Sub Area #7

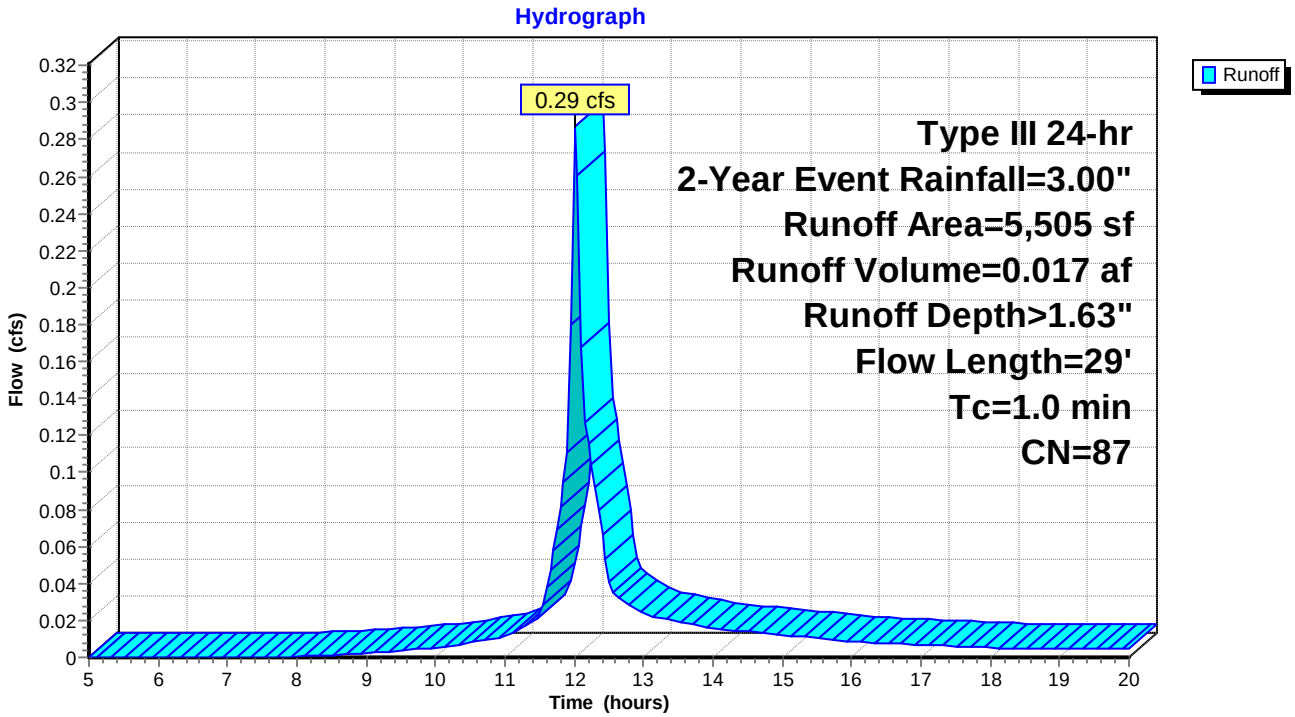
Runoff = 0.29 cfs @ 12.02 hrs, Volume= 0.017 af, Depth> 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Event Rainfall=3.00"

Area (sf)	CN	Description
3,065	98	Water Surface, HSG C
2,440	74	>75% Grass cover, Good, HSG C
5,505	87	Weighted Average
2,440		44.32% Pervious Area
3,065		55.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0200	0.97		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.6	8	0.1280	0.21		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
1.0	29	Total			

Subcatchment 7S: Sub Area #7



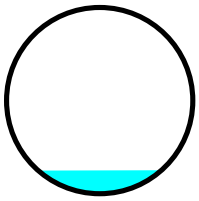
Summary for Reach 1R: 15" PE Pipe

Inflow Area = 0.111 ac, 43.72% Impervious, Inflow Depth > 1.41" for 2-Year Event event
Inflow = 0.22 cfs @ 12.02 hrs, Volume= 0.013 af
Outflow = 0.21 cfs @ 12.04 hrs, Volume= 0.013 af, Atten= 3%, Lag= 0.9 min

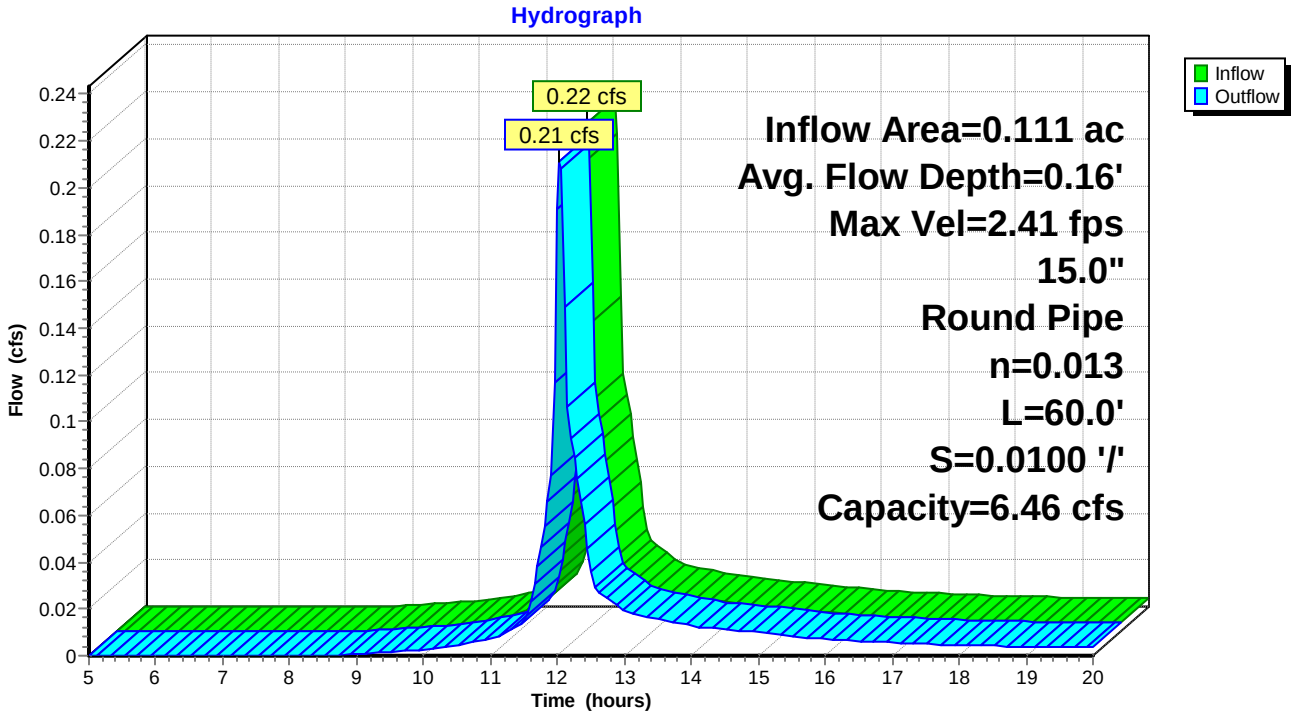
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.41 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 1.1 min

Peak Storage= 5 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.46 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 90.30', Outlet Invert= 89.70'



Reach 1R: 15" PE Pipe

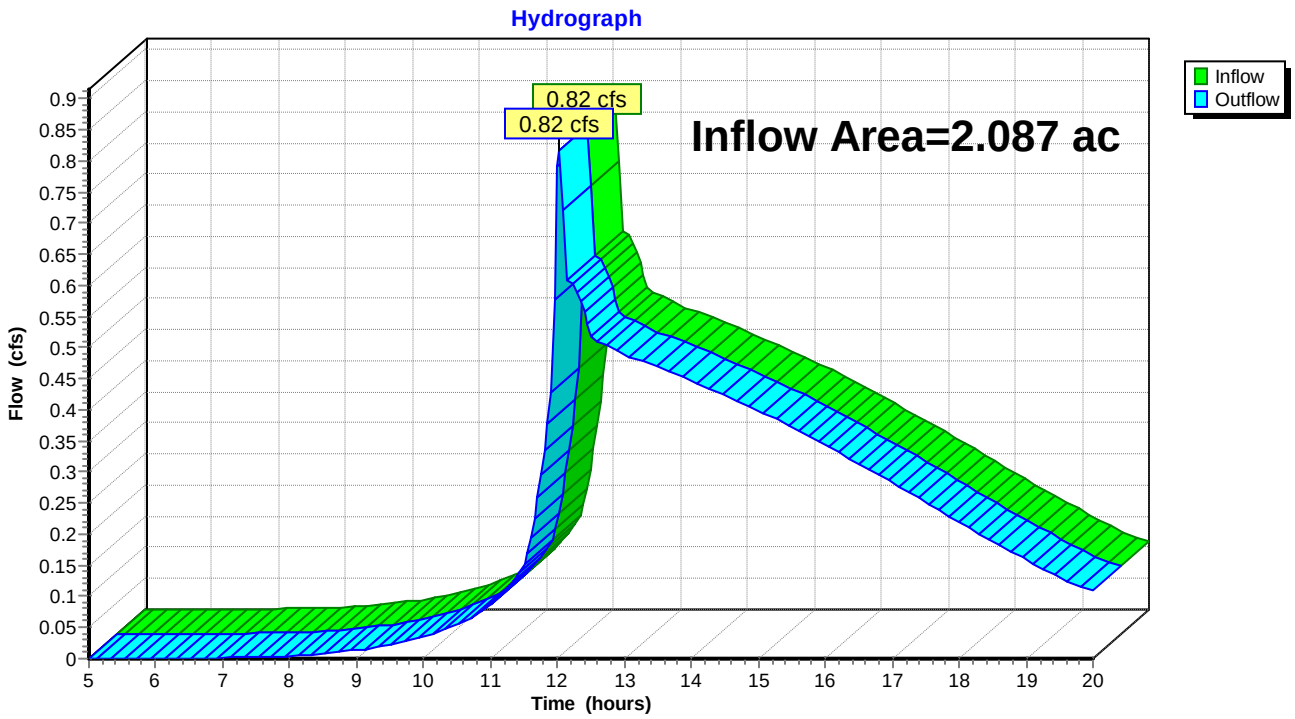


Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 45.85% Impervious, Inflow Depth > 1.44" for 2-Year Event event
Inflow = 0.82 cfs @ 12.02 hrs, Volume= 0.250 af
Outflow = 0.82 cfs @ 12.02 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point



Summary for Pond 1P: Det. Pond

Inflow Area = 1.855 ac, 44.72% Impervious, Inflow Depth > 1.52" for 2-Year Event event
Inflow = 3.25 cfs @ 12.07 hrs, Volume= 0.234 af
Outflow = 0.45 cfs @ 12.72 hrs, Volume= 0.219 af, Atten= 86%, Lag= 39.1 min
Primary = 0.45 cfs @ 12.72 hrs, Volume= 0.219 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 85.31' @ 12.72 hrs Surf.Area= 4,333 sf Storage= 4,664 cf

Plug-Flow detention time= 134.9 min calculated for 0.218 af (93% of inflow)
Center-of-Mass det. time= 111.4 min (894.0 - 782.6)

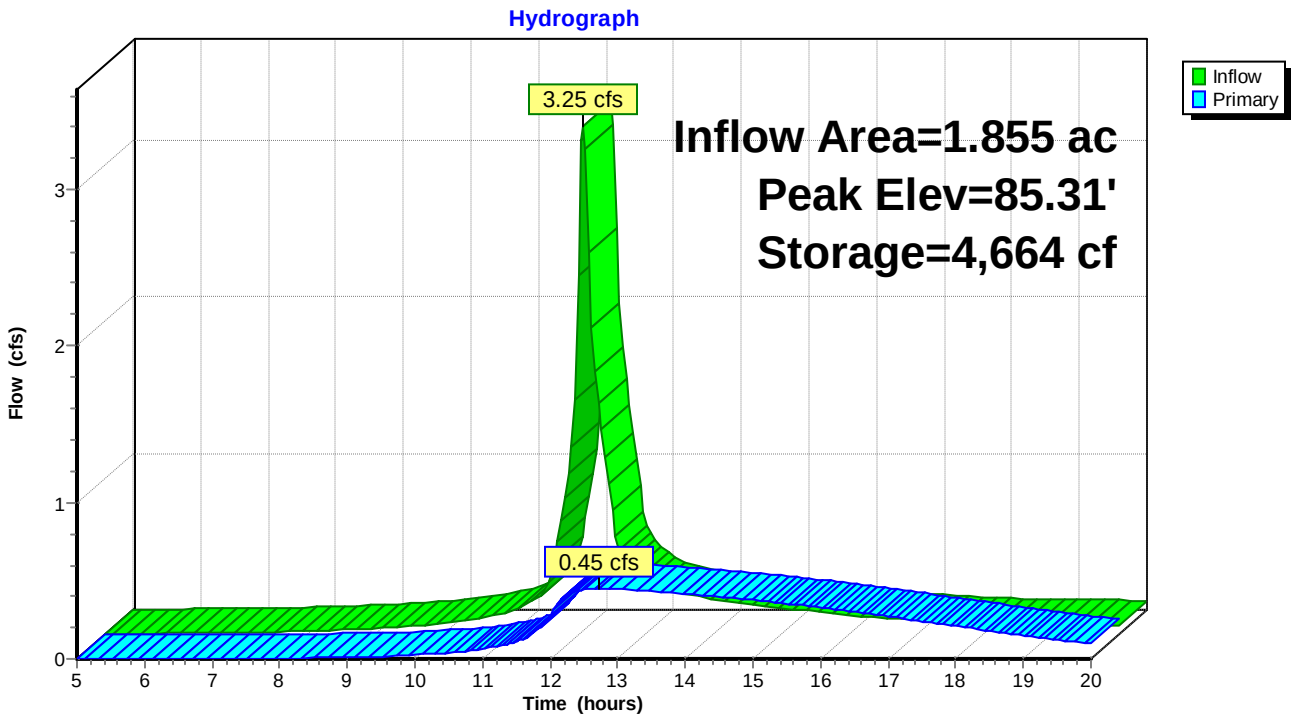
Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	18,189 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
84.00	2,915	0	0	2,915
85.00	3,920	3,405	3,405	3,941
86.00	5,350	4,617	8,022	5,391
87.00	7,180	6,243	14,264	7,242
87.50	8,540	3,925	18,189	8,611

Device	Routing	Invert	Outlet Devices
#1	Primary	81.50'	**12.0" Round Culvert** L= 110.0' Ke= 0.900 Inlet / Outlet Invert= 81.50' / 80.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	84.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.45 cfs @ 12.72 hrs HW=85.31' (Free Discharge)
└─**1=Culvert** (Passes 0.45 cfs of 5.38 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 5.14 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Det. Pond



Summary for Pond 2P: CB 1

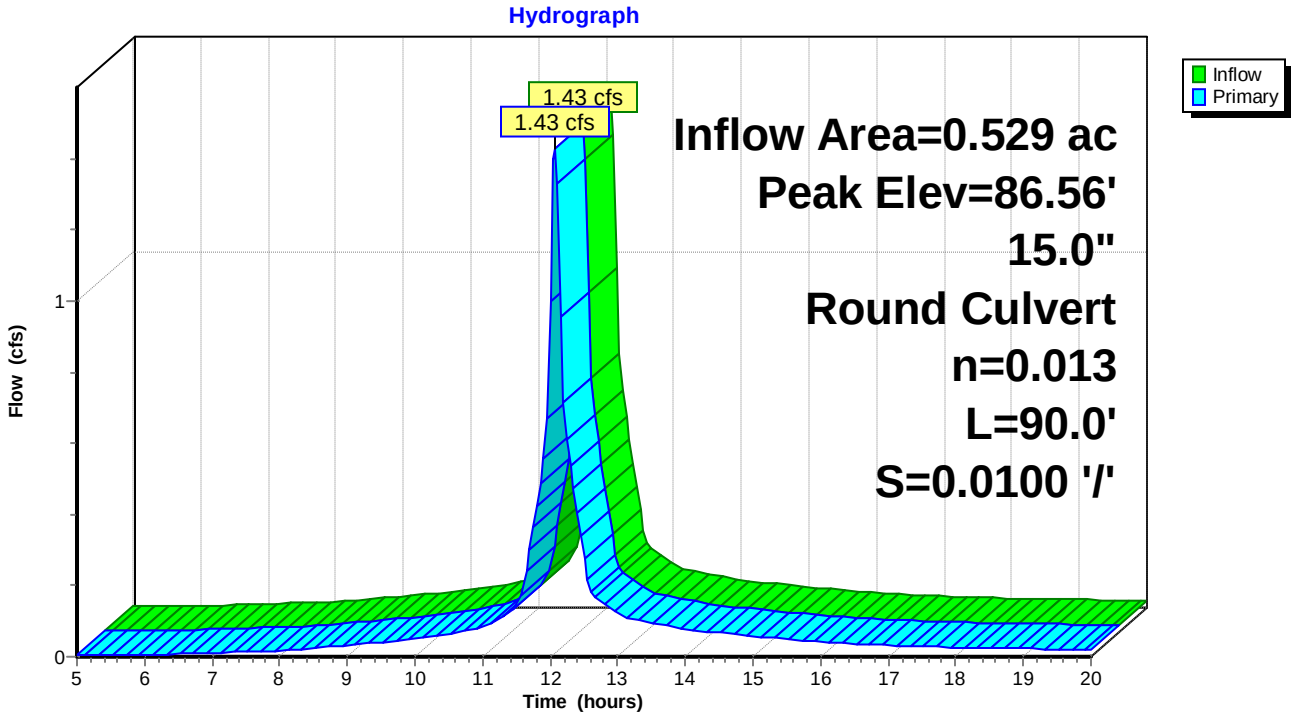
Inflow Area = 0.529 ac, 84.20% Impervious, Inflow Depth > 2.22" for 2-Year Event event
Inflow = 1.43 cfs @ 12.07 hrs, Volume= 0.098 af
Outflow = 1.43 cfs @ 12.07 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min
Primary = 1.43 cfs @ 12.07 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.56' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.90'	**15.0" Round Culvert** L= 90.0' Ke= 0.900 Inlet / Outlet Invert= 85.90' / 85.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.38 cfs @ 12.07 hrs HW=86.54' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.38 cfs @ 2.16 fps)

Pond 2P: CB 1



Summary for Subcatchment 1S: Sub Area #1

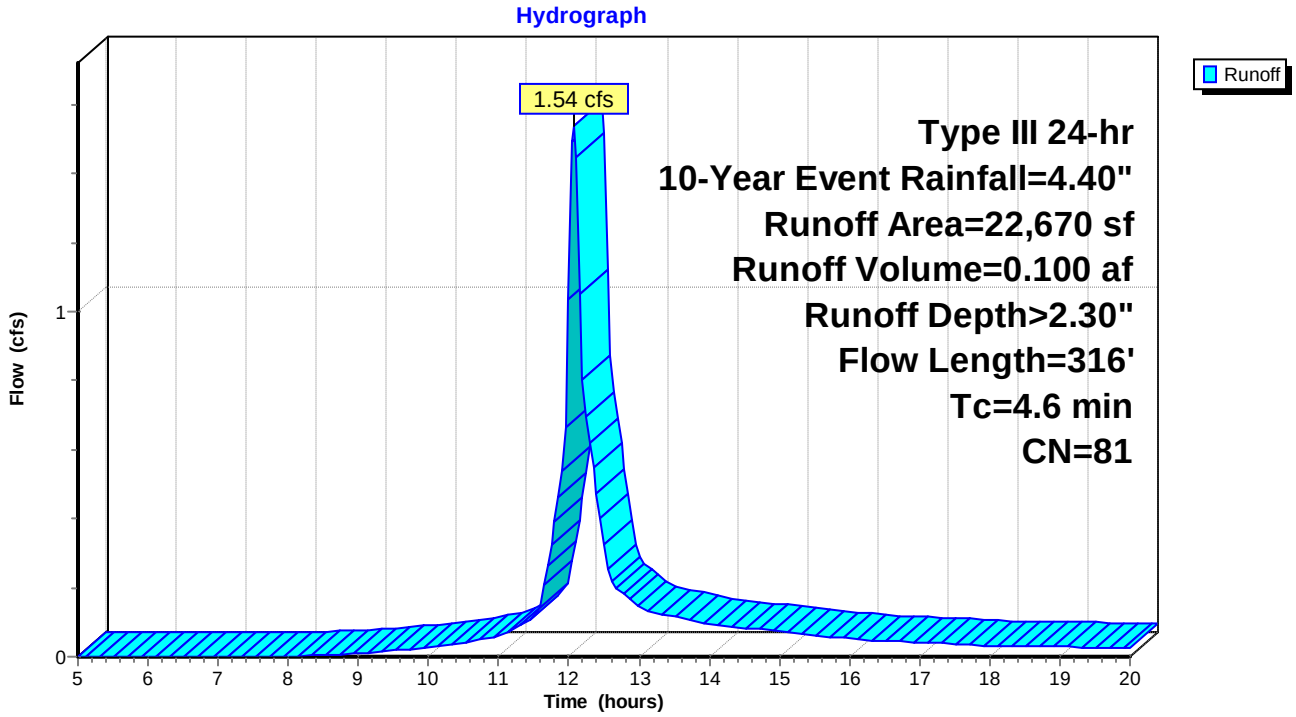
Runoff = 1.54 cfs @ 12.07 hrs, Volume= 0.100 af, Depth> 2.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
6,720	98	Water Surface, HSG C
15,950	74	>75% Grass cover, Good, HSG C
22,670	81	Weighted Average
15,950		70.36% Pervious Area
6,720		29.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	38	0.0184	1.06		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
3.3	25	0.0200	0.12		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.7	253	0.0277	5.88	29.40	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
4.6	316	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

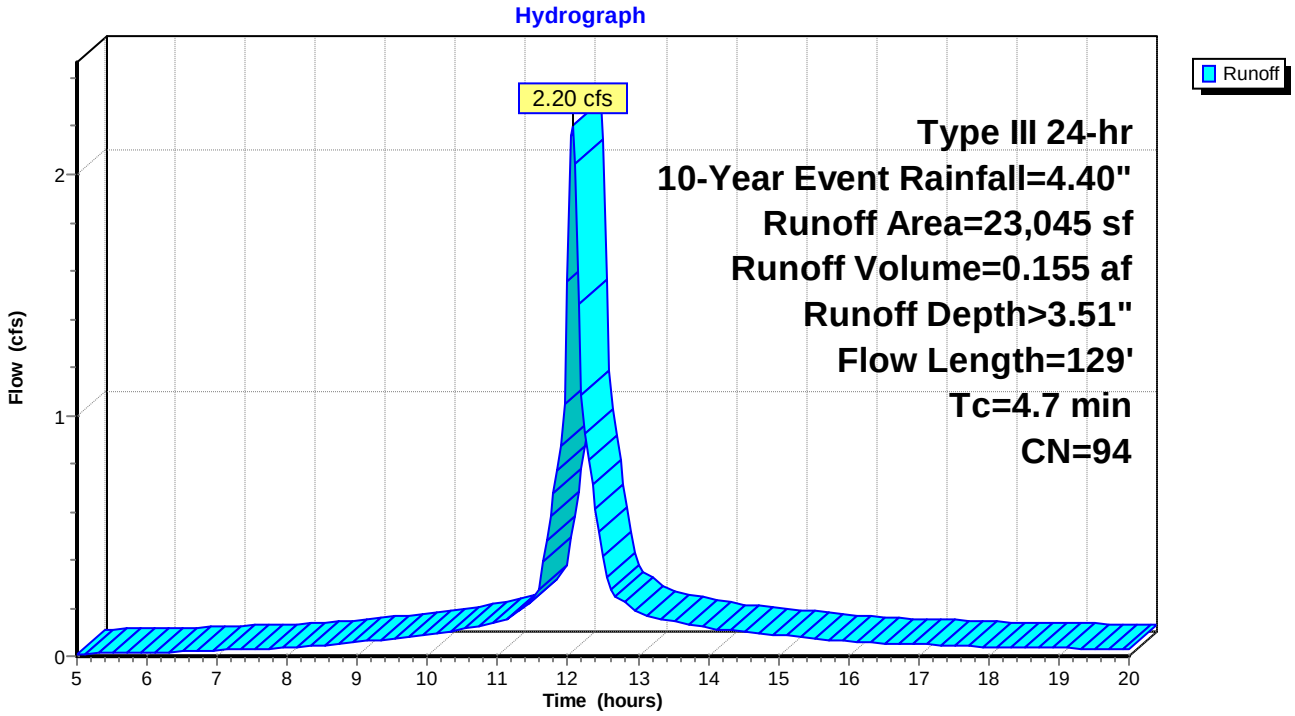
Runoff = 2.20 cfs @ 12.07 hrs, Volume= 0.155 af, Depth> 3.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
19,405	98	Water Surface, HSG C
3,640	74	>75% Grass cover, Good, HSG C
23,045	94	Weighted Average
3,640		15.80% Pervious Area
19,405		84.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	28	0.0200	0.13		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.6	51	0.0275	1.32		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.4	50	0.0200	2.12		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
4.7	129	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

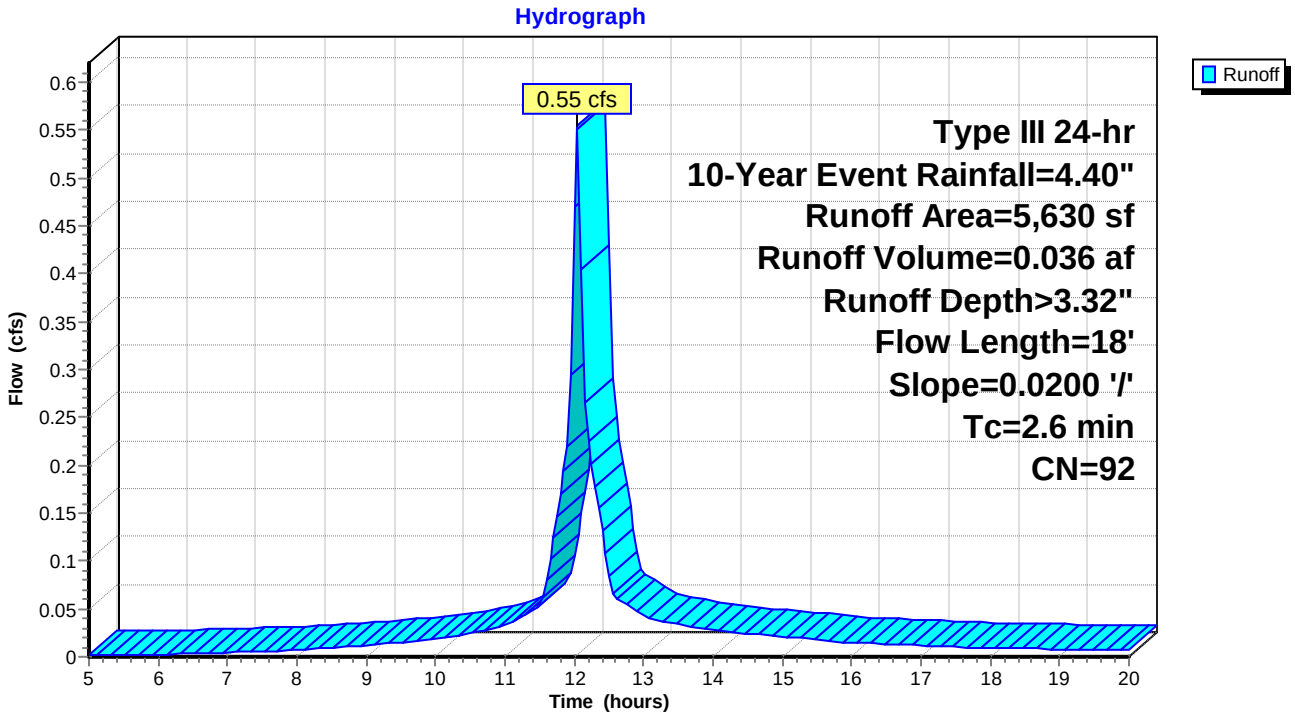
Runoff = 0.55 cfs @ 12.04 hrs, Volume= 0.036 af, Depth> 3.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
4,180	98	Water Surface, HSG C
1,450	74	>75% Grass cover, Good, HSG C
5,630	92	Weighted Average
1,450		25.75% Pervious Area
4,180		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	18	0.0200	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

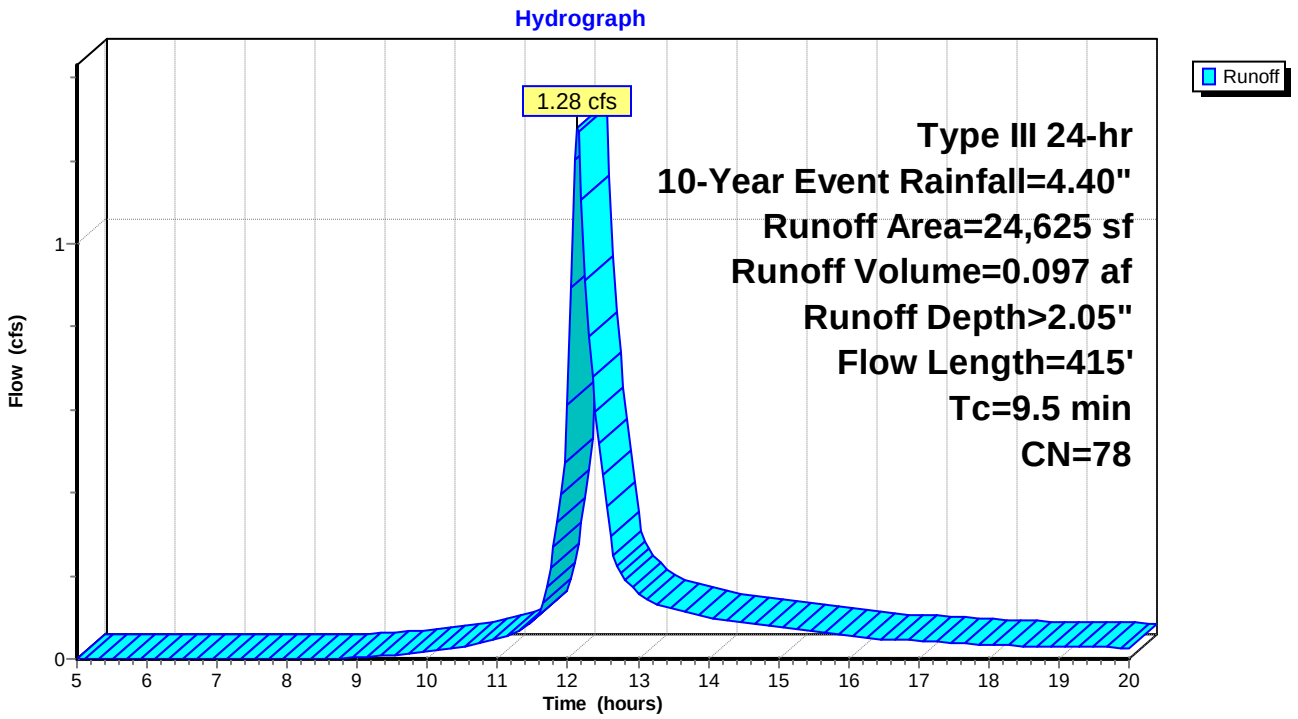
Runoff = 1.28 cfs @ 12.14 hrs, Volume= 0.097 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
3,715	98	Water Surface, HSG C
20,910	74	>75% Grass cover, Good, HSG C
24,625	78	Weighted Average
20,910		84.91% Pervious Area
3,715		15.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	11	0.0300	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.4	26	0.0288	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
6.4	63	0.0254	0.17		**Sheet Flow, CD** Grass: Short n= 0.150 P2= 3.00"
0.2	51	0.0529	3.45		**Shallow Concentrated Flow, DE** Grassed Waterway Kv= 15.0 fps
1.0	264	0.0170	4.61	23.03	**Channel Flow, EF** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
9.5	415	Total			

Subcatchment 4S: Sub Area #4



Summary for Subcatchment 5S: Sub Area #5

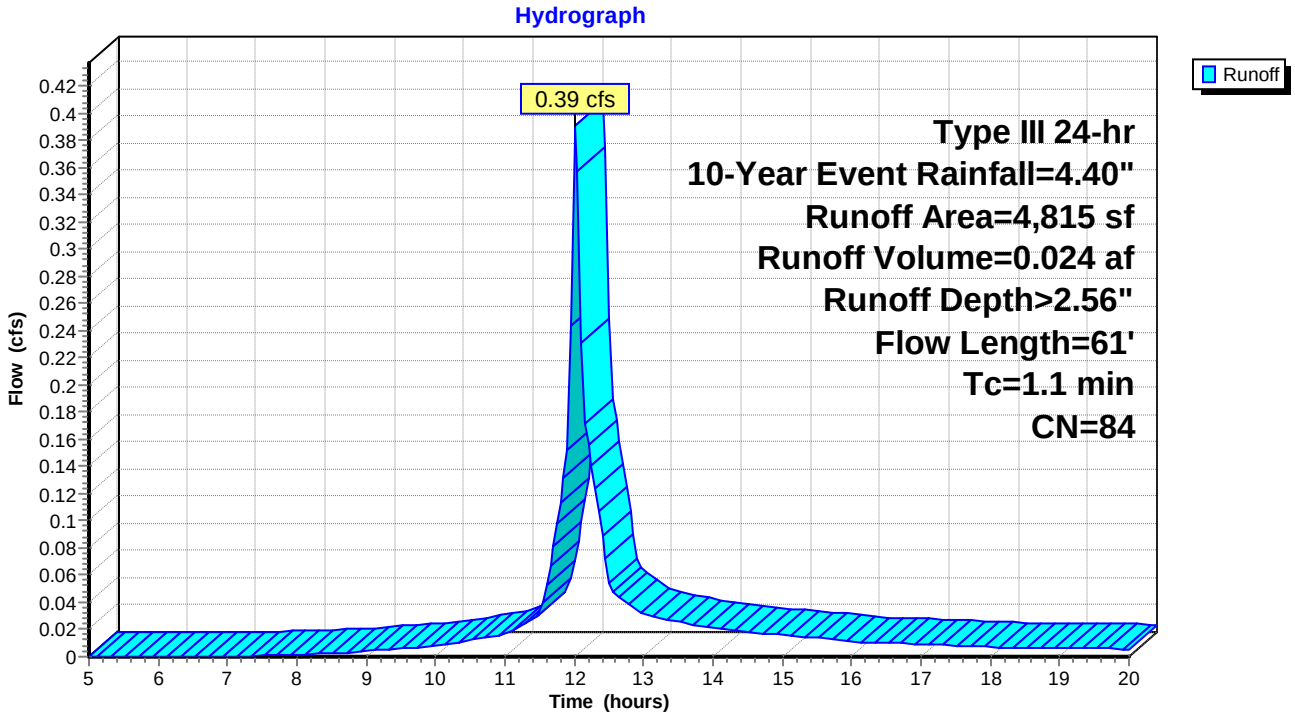
Runoff = 0.39 cfs @ 12.02 hrs, Volume= 0.024 af, Depth> 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
2,105	98	Water Surface, HSG C
2,710	74	>75% Grass cover, Good, HSG C
4,815	84	Weighted Average
2,710		56.28% Pervious Area
2,105		43.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0200	0.89		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	11	0.1364	0.23		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.1	37	0.0324	6.36	31.80	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
1.1	61	Total			

Subcatchment 5S: Sub Area #5



Summary for Subcatchment 6S: Sub Area #6

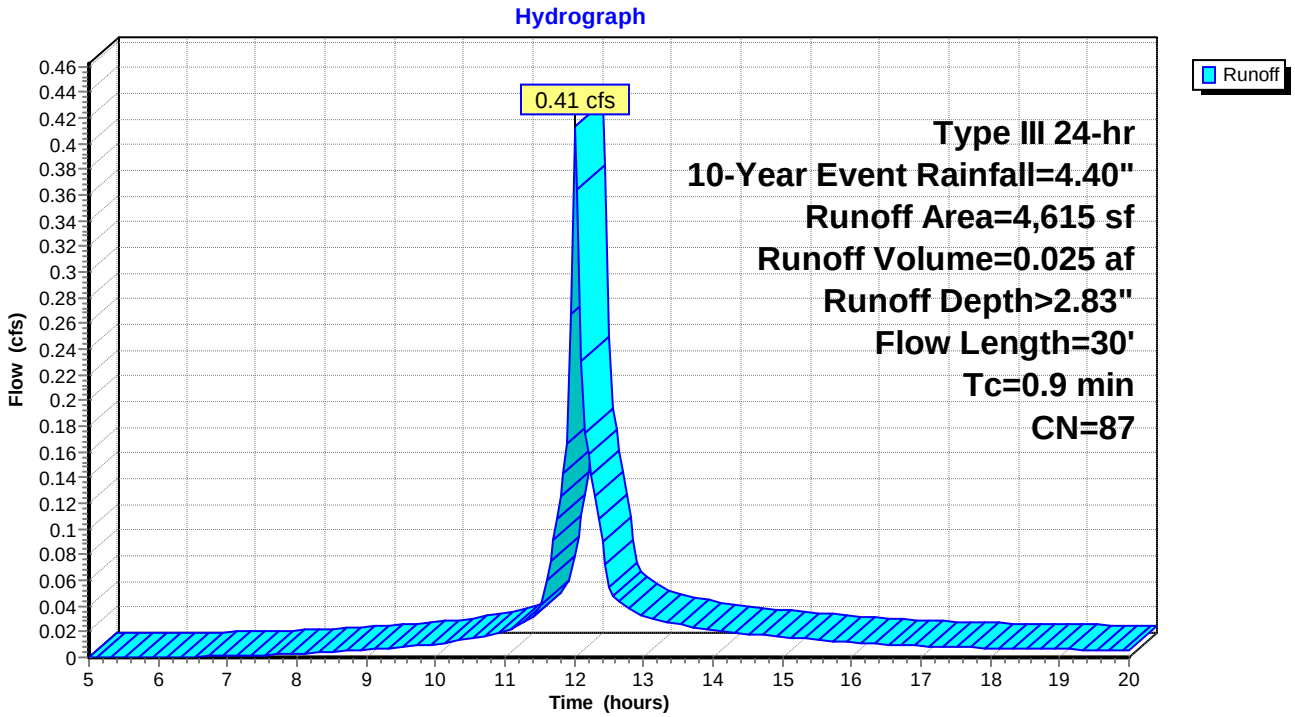
Runoff = 0.41 cfs @ 12.01 hrs, Volume= 0.025 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
2,490	98	Water Surface, HSG C
2,125	74	>75% Grass cover, Good, HSG C
4,615	87	Weighted Average
2,125		46.05% Pervious Area
2,490		53.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	23	0.0200	0.99		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.5	7	0.2143	0.25		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.9	30	Total			

Subcatchment 6S: Sub Area #6



Summary for Subcatchment 7S: Sub Area #7

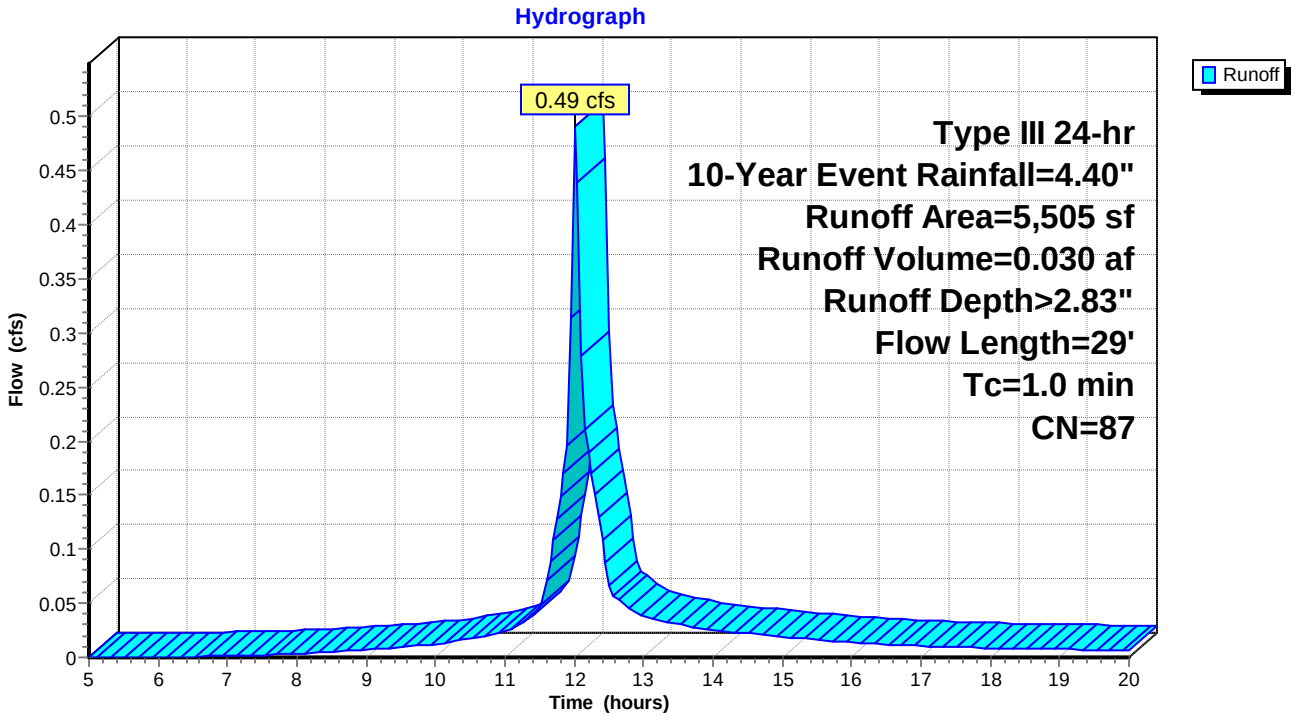
Runoff = 0.49 cfs @ 12.02 hrs, Volume= 0.030 af, Depth> 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Event Rainfall=4.40"

Area (sf)	CN	Description
3,065	98	Water Surface, HSG C
2,440	74	>75% Grass cover, Good, HSG C
5,505	87	Weighted Average
2,440		44.32% Pervious Area
3,065		55.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0200	0.97		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.6	8	0.1280	0.21		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
1.0	29	Total			

Subcatchment 7S: Sub Area #7



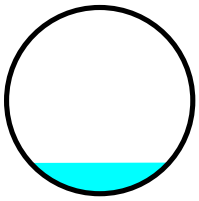
Summary for Reach 1R: 15" PE Pipe

Inflow Area = 0.111 ac, 43.72% Impervious, Inflow Depth > 2.56" for 10-Year Event event
Inflow = 0.39 cfs @ 12.02 hrs, Volume= 0.024 af
Outflow = 0.38 cfs @ 12.03 hrs, Volume= 0.024 af, Atten= 3%, Lag= 0.8 min

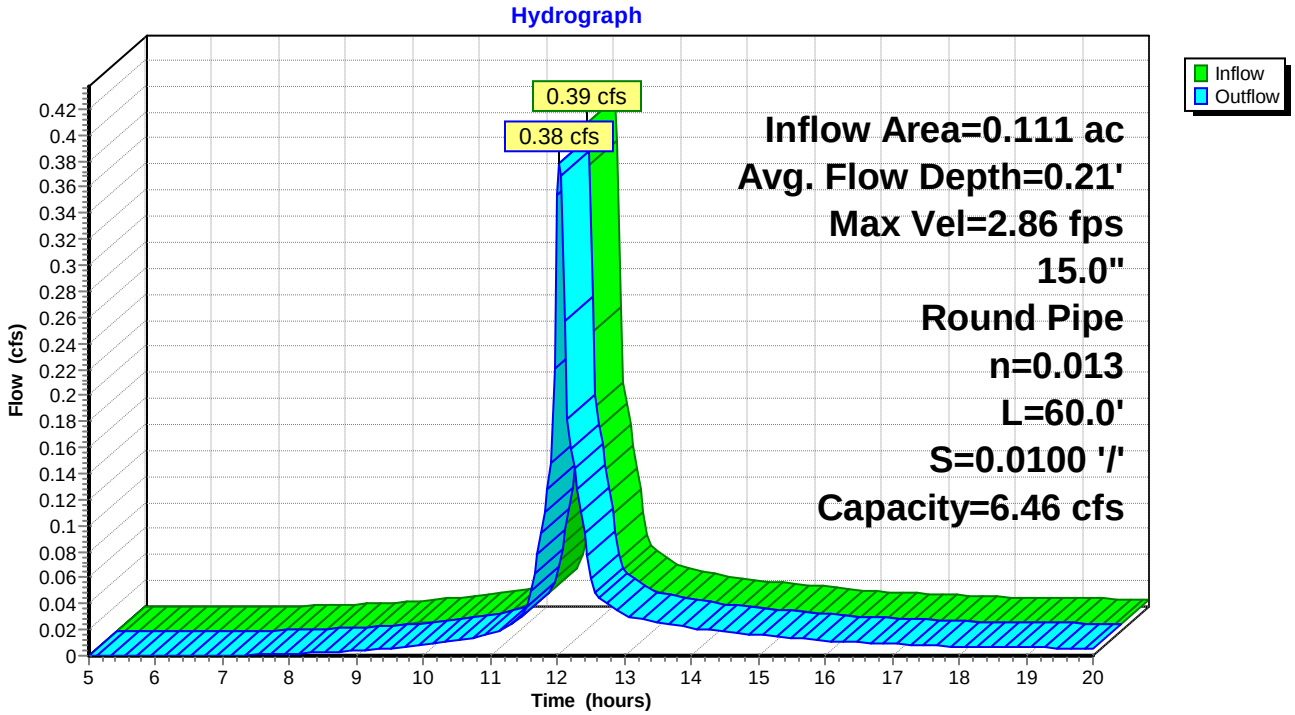
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.86 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 1.0 min

Peak Storage= 8 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.46 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 90.30', Outlet Invert= 89.70'



Reach 1R: 15" PE Pipe

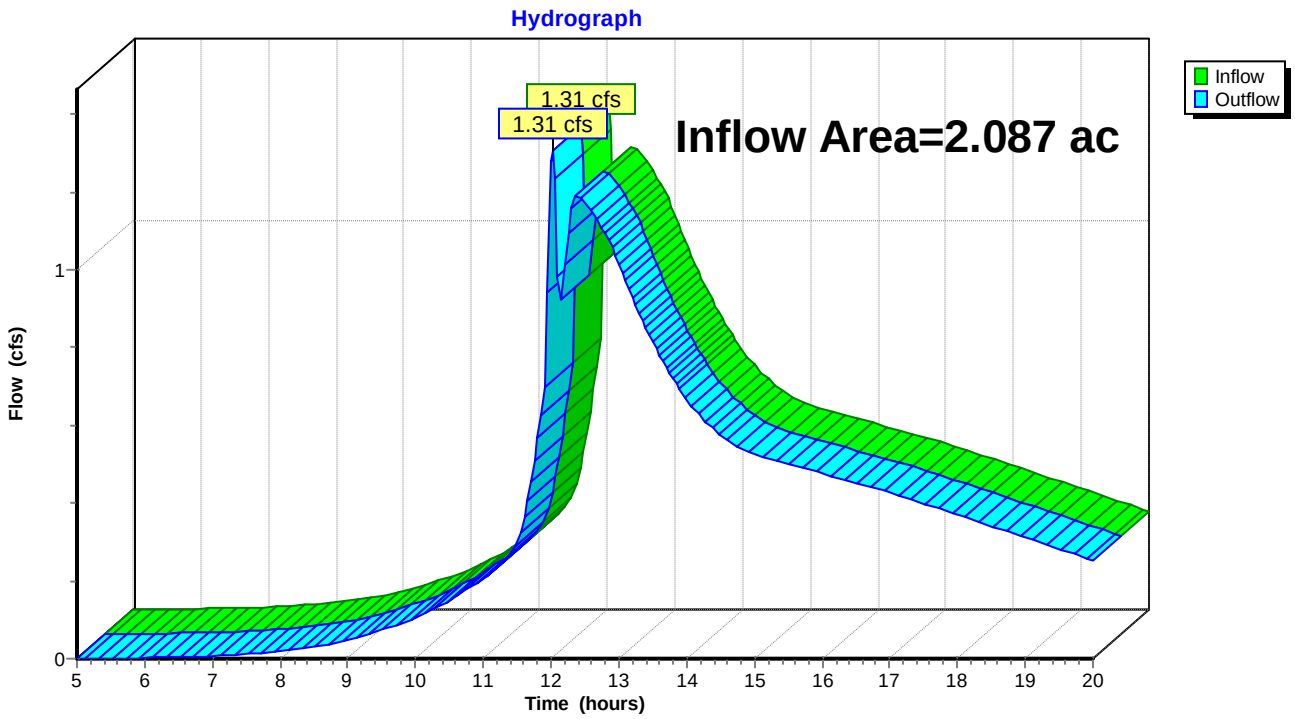


Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 45.85% Impervious, Inflow Depth > 2.47" for 10-Year Event event
Inflow = 1.31 cfs @ 12.02 hrs, Volume= 0.429 af
Outflow = 1.31 cfs @ 12.02 hrs, Volume= 0.429 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point



Summary for Pond 1P: Det. Pond

Inflow Area = 1.855 ac, 44.72% Impervious, Inflow Depth > 2.65" for 10-Year Event event
Inflow = 5.61 cfs @ 12.07 hrs, Volume= 0.410 af
Outflow = 1.05 cfs @ 12.56 hrs, Volume= 0.375 af, Atten= 81%, Lag= 29.2 min
Primary = 1.05 cfs @ 12.56 hrs, Volume= 0.375 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.01' @ 12.56 hrs Surf.Area= 5,366 sf Storage= 8,073 cf

Plug-Flow detention time= 139.7 min calculated for 0.374 af (91% of inflow)
Center-of-Mass det. time= 109.9 min (882.7 - 772.7)

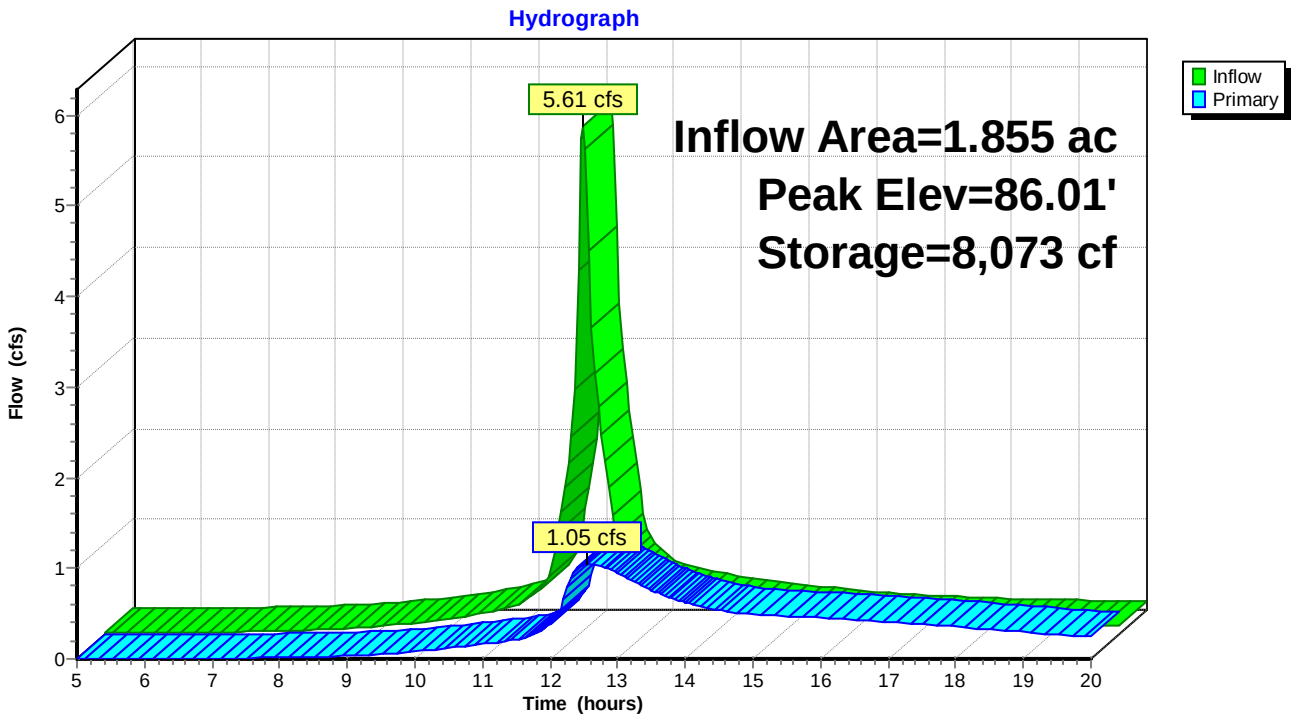
Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	18,189 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
84.00	2,915	0	0	2,915
85.00	3,920	3,405	3,405	3,941
86.00	5,350	4,617	8,022	5,391
87.00	7,180	6,243	14,264	7,242
87.50	8,540	3,925	18,189	8,611

Device	Routing	Invert	Outlet Devices
#1	Primary	81.50'	**12.0" Round Culvert** L= 110.0' Ke= 0.900 Inlet / Outlet Invert= 81.50' / 80.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	84.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.05 cfs @ 12.56 hrs HW=86.01' (Free Discharge)
└─**1=Culvert** (Passes 1.05 cfs of 5.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.57 cfs @ 6.54 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.48 cfs @ 2.45 fps)

Pond 1P: Det. Pond



Summary for Pond 2P: CB 1

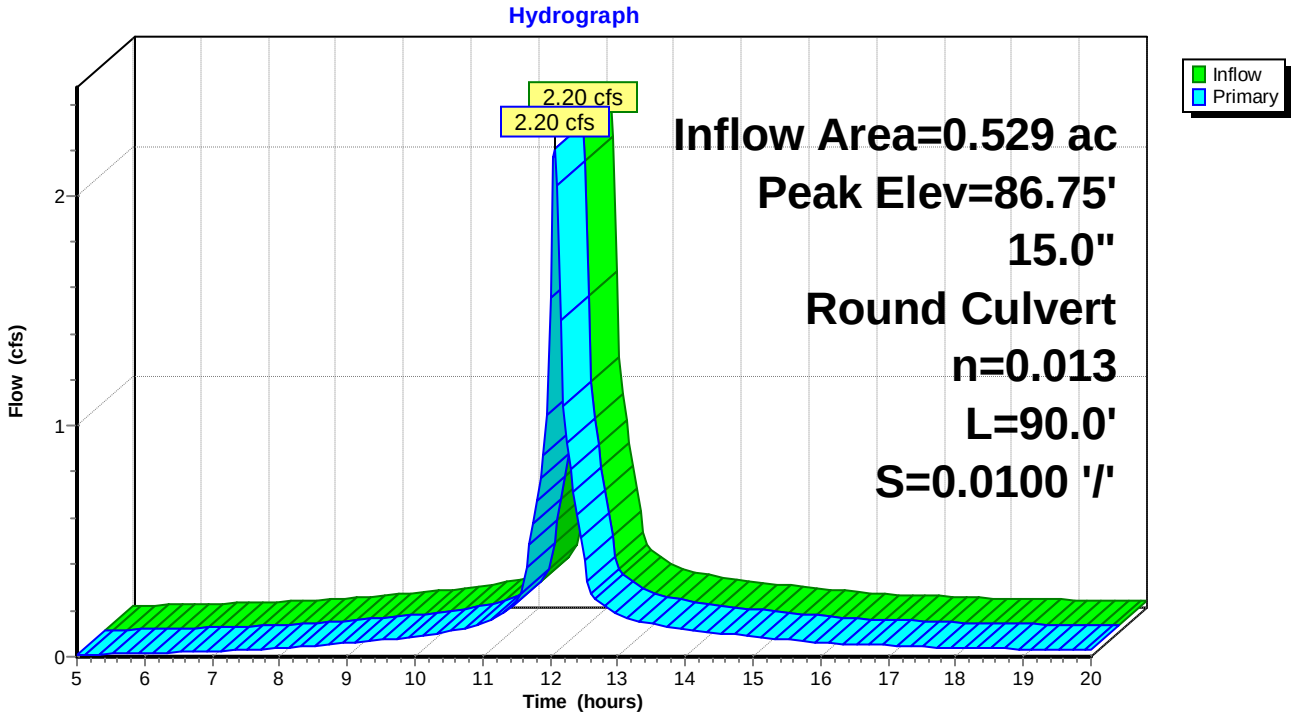
Inflow Area = 0.529 ac, 84.20% Impervious, Inflow Depth > 3.51" for 10-Year Event event
Inflow = 2.20 cfs @ 12.07 hrs, Volume= 0.155 af
Outflow = 2.20 cfs @ 12.07 hrs, Volume= 0.155 af, Atten= 0%, Lag= 0.0 min
Primary = 2.20 cfs @ 12.07 hrs, Volume= 0.155 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.75' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.90'	**15.0" Round Culvert** L= 90.0' Ke= 0.900 Inlet / Outlet Invert= 85.90' / 85.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.12 cfs @ 12.07 hrs HW=86.73' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.12 cfs @ 2.45 fps)

Pond 2P: CB 1



Summary for Subcatchment 1S: Sub Area #1

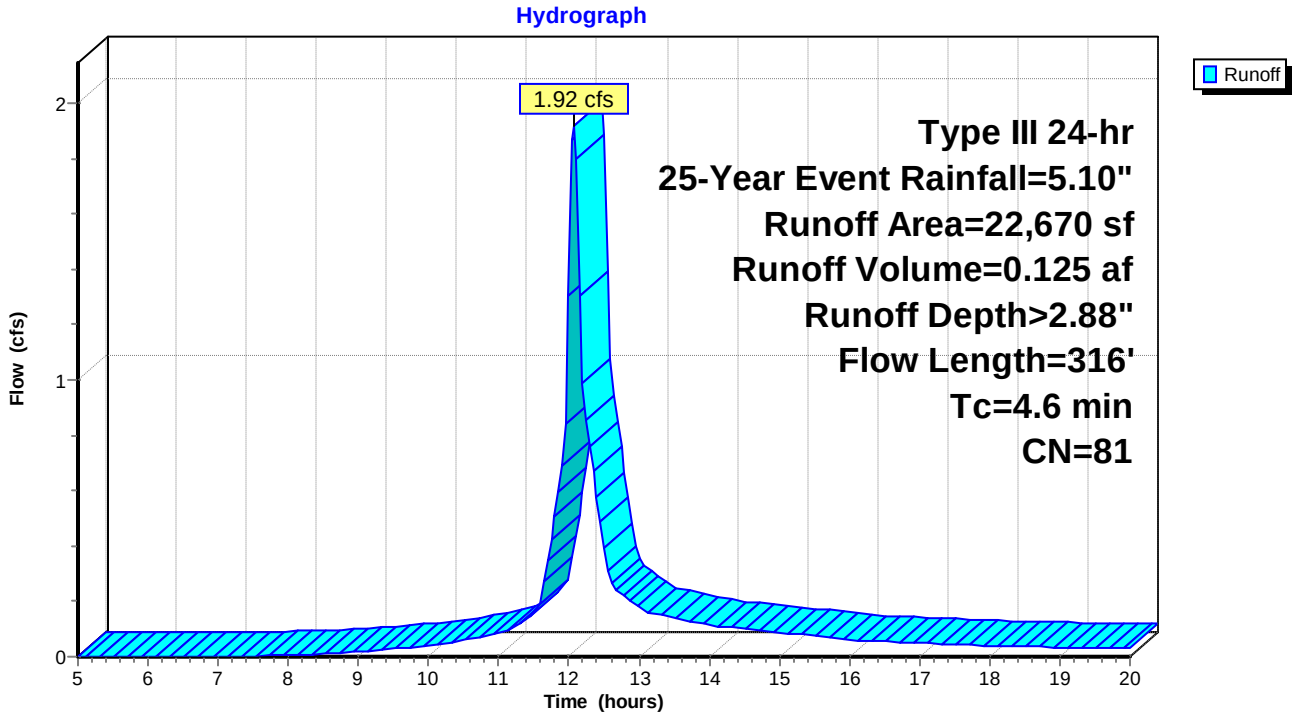
Runoff = 1.92 cfs @ 12.07 hrs, Volume= 0.125 af, Depth> 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
6,720	98	Water Surface, HSG C
15,950	74	>75% Grass cover, Good, HSG C
22,670	81	Weighted Average
15,950		70.36% Pervious Area
6,720		29.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	38	0.0184	1.06		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
3.3	25	0.0200	0.12		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.7	253	0.0277	5.88	29.40	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
4.6	316	Total			

Subcatchment 1S: Sub Area #1



Summary for Subcatchment 2S: Sub Area #2

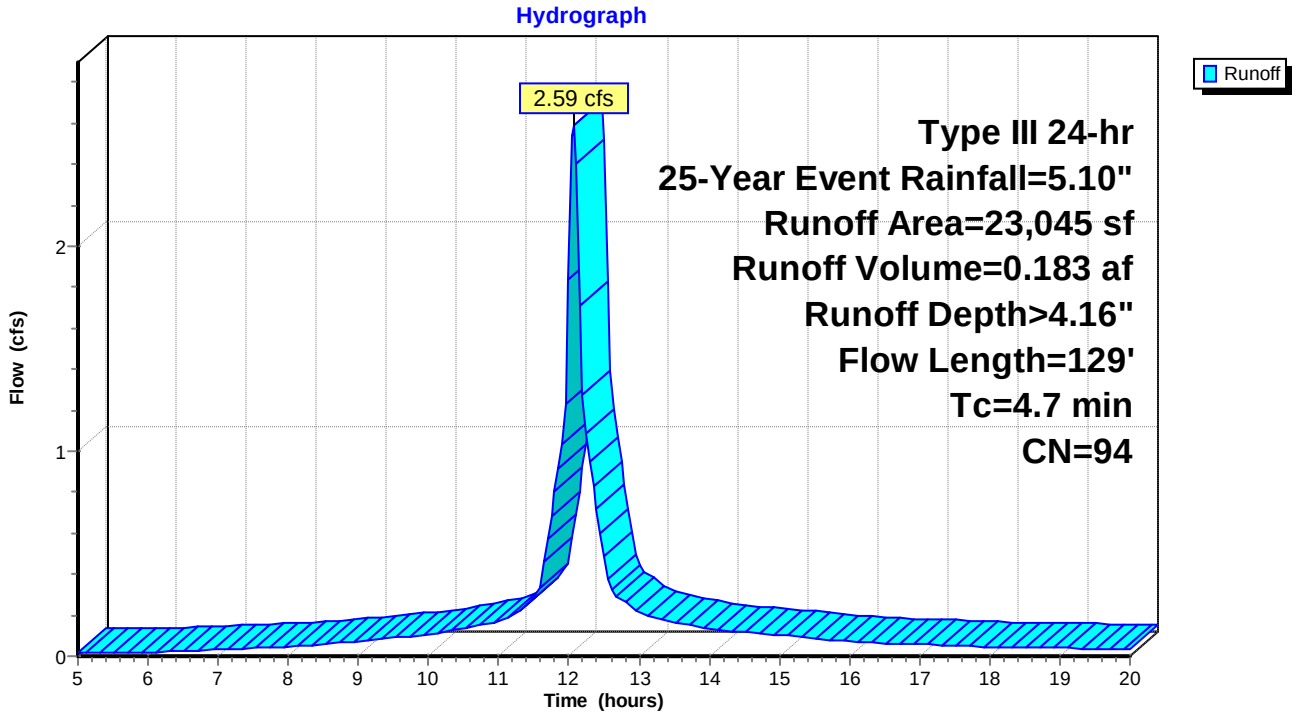
Runoff = 2.59 cfs @ 12.07 hrs, Volume= 0.183 af, Depth> 4.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
19,405	98	Water Surface, HSG C
3,640	74	>75% Grass cover, Good, HSG C
23,045	94	Weighted Average
3,640		15.80% Pervious Area
19,405		84.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	28	0.0200	0.13		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.6	51	0.0275	1.32		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
0.4	50	0.0200	2.12		**Shallow Concentrated Flow, CD** Grassed Waterway Kv= 15.0 fps
4.7	129	Total			

Subcatchment 2S: Sub Area #2



Summary for Subcatchment 3S: Sub Area #3

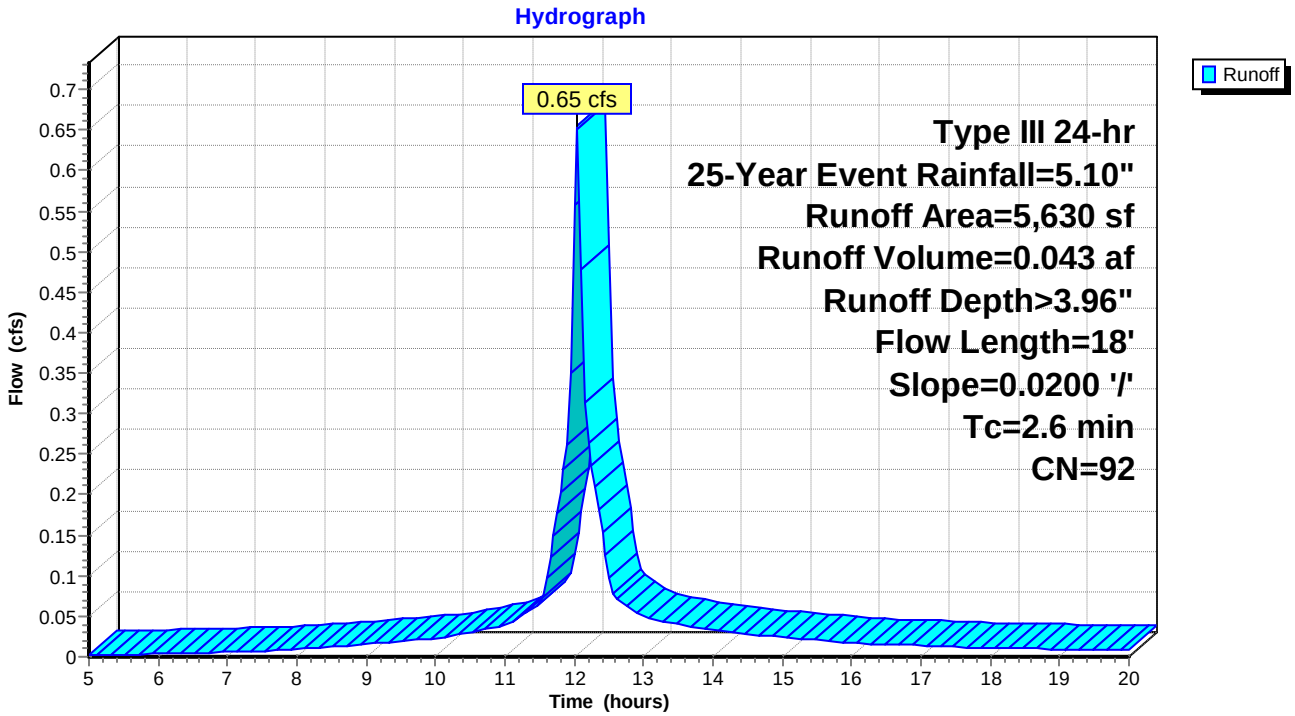
Runoff = 0.65 cfs @ 12.04 hrs, Volume= 0.043 af, Depth> 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
4,180	98	Water Surface, HSG C
1,450	74	>75% Grass cover, Good, HSG C
5,630	92	Weighted Average
1,450		25.75% Pervious Area
4,180		74.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.6	18	0.0200	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"

Subcatchment 3S: Sub Area #3



Summary for Subcatchment 4S: Sub Area #4

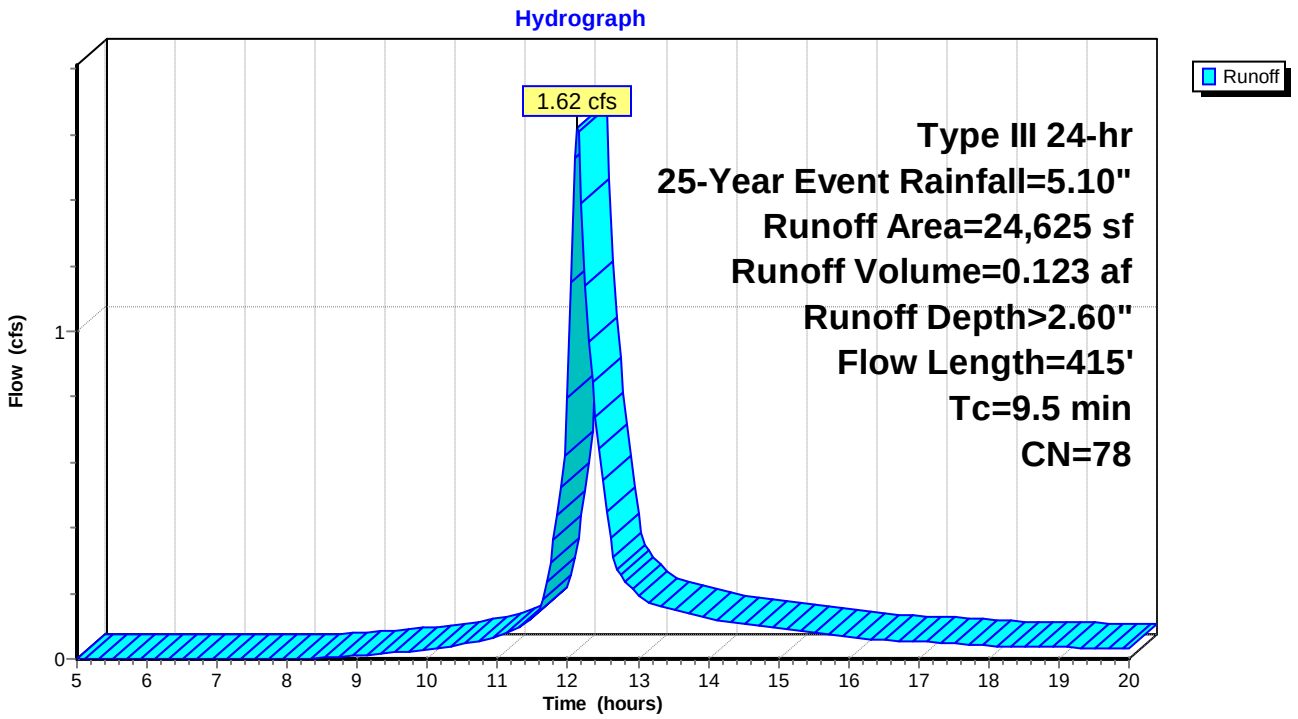
Runoff = 1.62 cfs @ 12.14 hrs, Volume= 0.123 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
3,715	98	Water Surface, HSG C
20,910	74	>75% Grass cover, Good, HSG C
24,625	78	Weighted Average
20,910		84.91% Pervious Area
3,715		15.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	11	0.0300	0.12		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.00"
0.4	26	0.0288	1.18		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.00"
6.4	63	0.0254	0.17		**Sheet Flow, CD** Grass: Short n= 0.150 P2= 3.00"
0.2	51	0.0529	3.45		**Shallow Concentrated Flow, DE** Grassed Waterway Kv= 15.0 fps
1.0	264	0.0170	4.61	23.03	**Channel Flow, EF** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
9.5	415	Total			

Subcatchment 4S: Sub Area #4



Summary for Subcatchment 5S: Sub Area #5

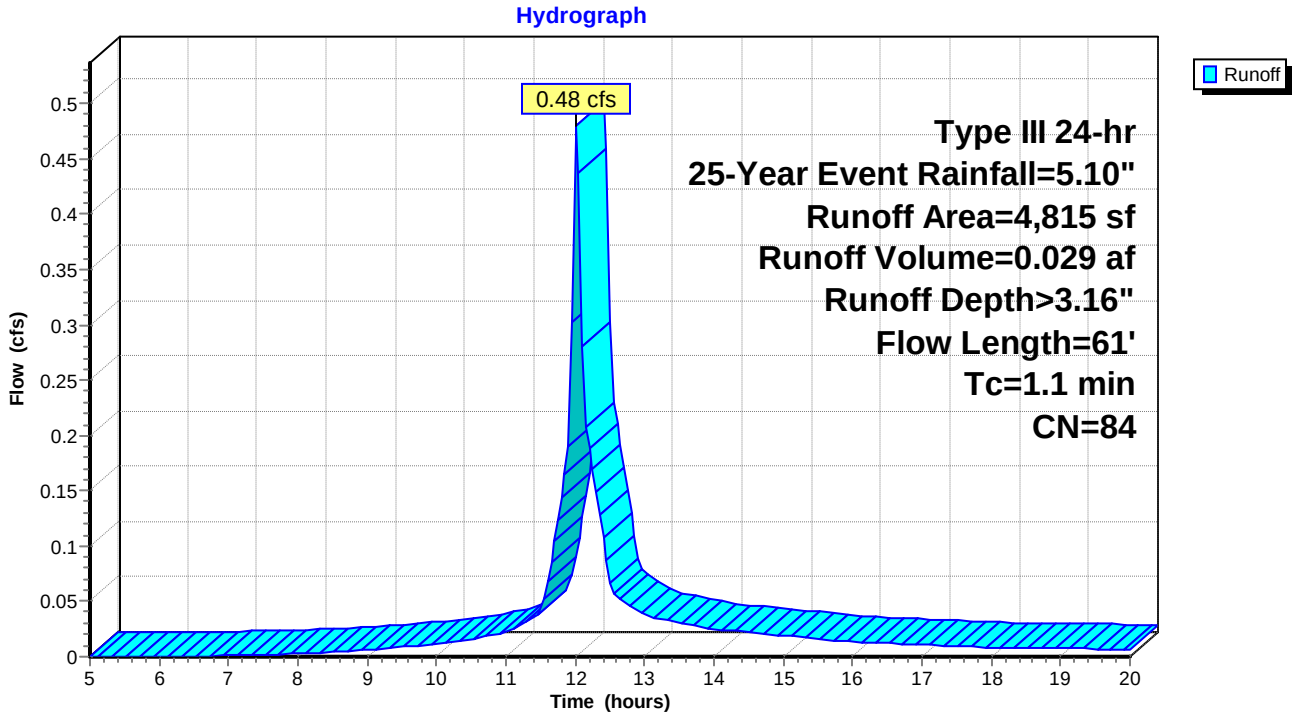
Runoff = 0.48 cfs @ 12.02 hrs, Volume= 0.029 af, Depth> 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
2,105	98	Water Surface, HSG C
2,710	74	>75% Grass cover, Good, HSG C
4,815	84	Weighted Average
2,710		56.28% Pervious Area
2,105		43.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	13	0.0200	0.89		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.8	11	0.1364	0.23		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.1	37	0.0324	6.36	31.80	**Channel Flow, CD** Area= 5.0 sf Perim= 8.3' r= 0.60' n= 0.030 Earth, grassed & winding
1.1	61	Total			

Subcatchment 5S: Sub Area #5



Summary for Subcatchment 6S: Sub Area #6

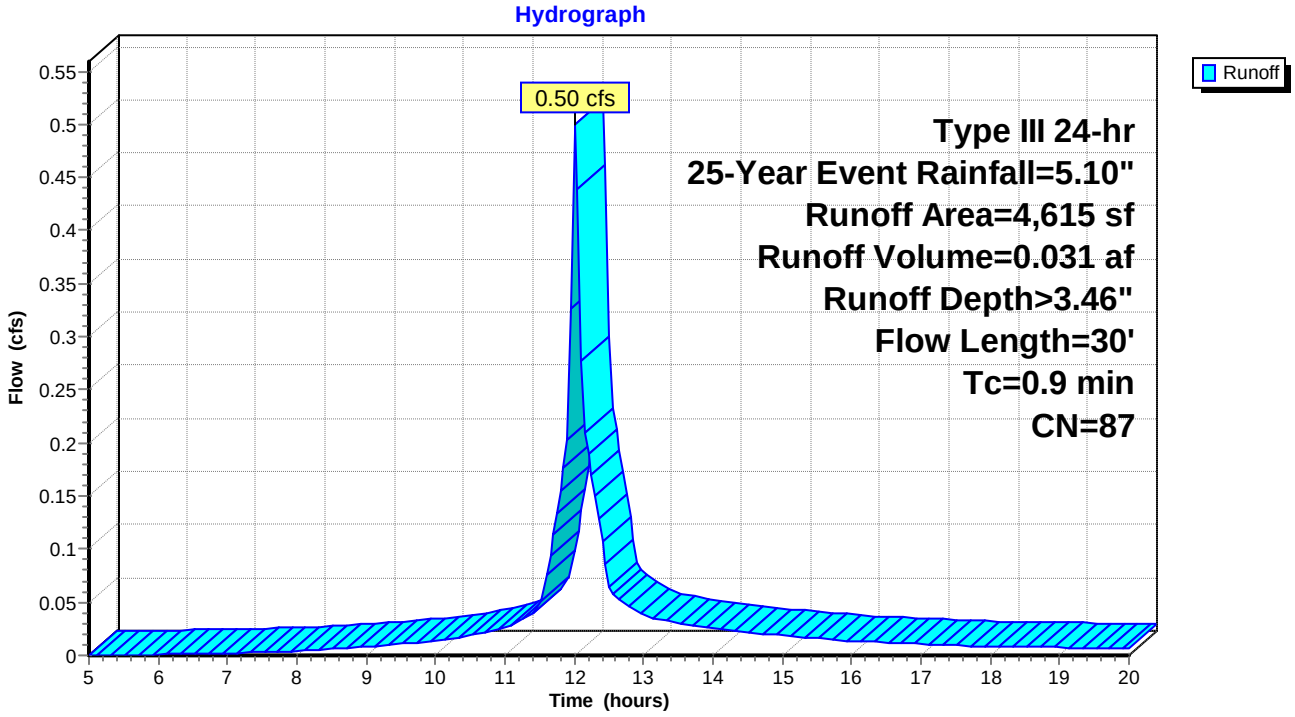
Runoff = 0.50 cfs @ 12.01 hrs, Volume= 0.031 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
2,490	98	Water Surface, HSG C
2,125	74	>75% Grass cover, Good, HSG C
4,615	87	Weighted Average
2,125		46.05% Pervious Area
2,490		53.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	23	0.0200	0.99		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.5	7	0.2143	0.25		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
0.9	30	Total			

Subcatchment 6S: Sub Area #6



Summary for Subcatchment 7S: Sub Area #7

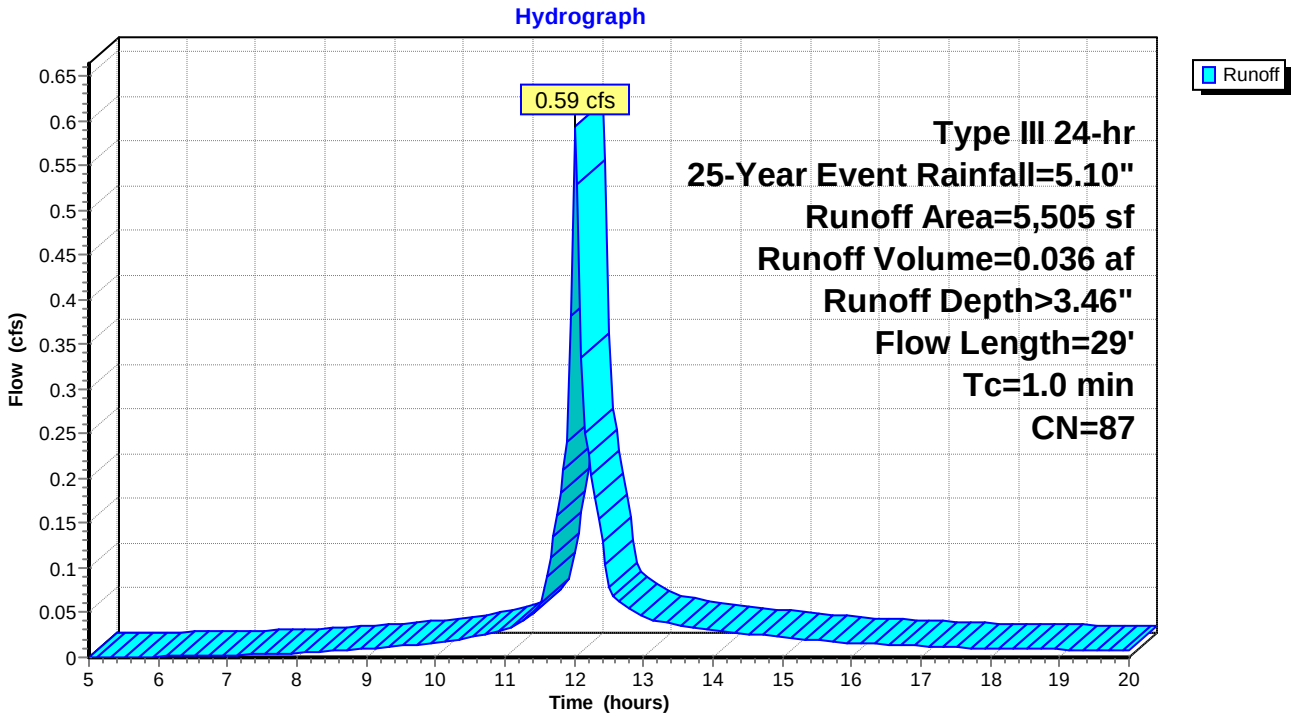
Runoff = 0.59 cfs @ 12.01 hrs, Volume= 0.036 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Event Rainfall=5.10"

Area (sf)	CN	Description
3,065	98	Water Surface, HSG C
2,440	74	>75% Grass cover, Good, HSG C
5,505	87	Weighted Average
2,440		44.32% Pervious Area
3,065		55.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0200	0.97		**Sheet Flow, AB** Smooth surfaces n= 0.011 P2= 3.00"
0.6	8	0.1280	0.21		**Sheet Flow, BC** Grass: Short n= 0.150 P2= 3.00"
1.0	29	Total			

Subcatchment 7S: Sub Area #7



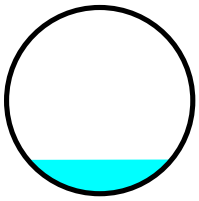
Summary for Reach 1R: 15" PE Pipe

Inflow Area = 0.111 ac, 43.72% Impervious, Inflow Depth > 3.16" for 25-Year Event event
Inflow = 0.48 cfs @ 12.02 hrs, Volume= 0.029 af
Outflow = 0.46 cfs @ 12.03 hrs, Volume= 0.029 af, Atten= 3%, Lag= 0.7 min

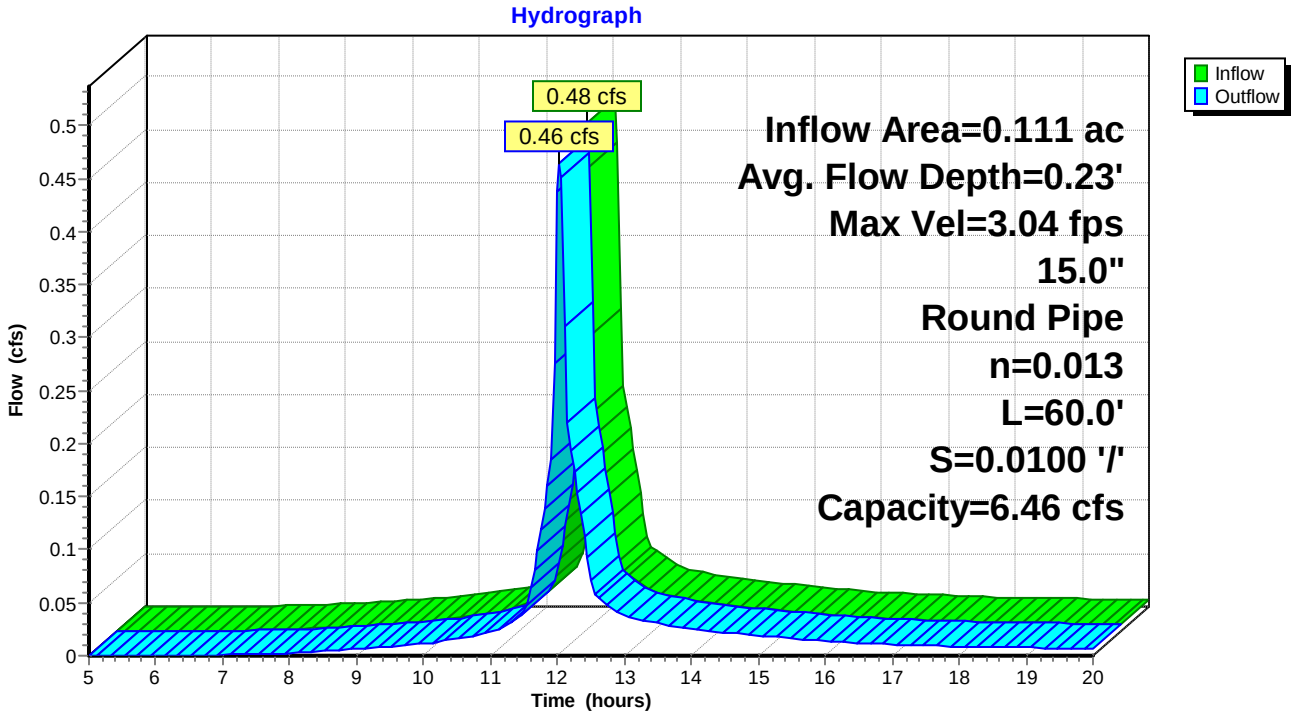
Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.04 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.08 fps, Avg. Travel Time= 0.9 min

Peak Storage= 9 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.25' Flow Area= 1.2 sf, Capacity= 6.46 cfs

15.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 60.0' Slope= 0.0100 '/'
Inlet Invert= 90.30', Outlet Invert= 89.70'



Reach 1R: 15" PE Pipe

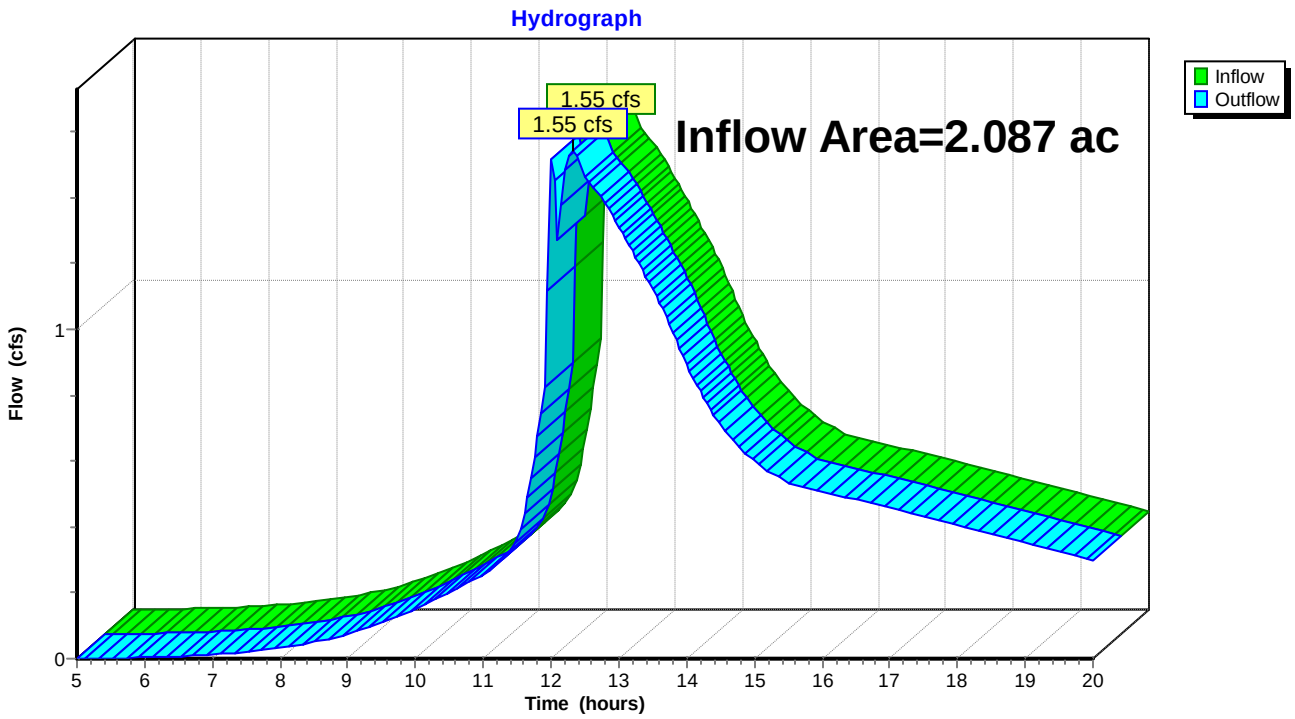


Summary for Reach SP: Study Point

Inflow Area = 2.087 ac, 45.85% Impervious, Inflow Depth > 3.01" for 25-Year Event event
Inflow = 1.55 cfs @ 12.32 hrs, Volume= 0.524 af
Outflow = 1.55 cfs @ 12.32 hrs, Volume= 0.524 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach SP: Study Point



Summary for Pond 1P: Det. Pond

Inflow Area = 1.855 ac, 44.72% Impervious, Inflow Depth > 3.25" for 25-Year Event event
Inflow = 6.83 cfs @ 12.07 hrs, Volume= 0.502 af
Outflow = 1.32 cfs @ 12.55 hrs, Volume= 0.457 af, Atten= 81%, Lag= 28.5 min
Primary = 1.32 cfs @ 12.55 hrs, Volume= 0.457 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.31' @ 12.55 hrs Surf.Area= 5,893 sf Storage= 9,778 cf

Plug-Flow detention time= 132.2 min calculated for 0.455 af (91% of inflow)
Center-of-Mass det. time= 101.7 min (870.8 - 769.1)

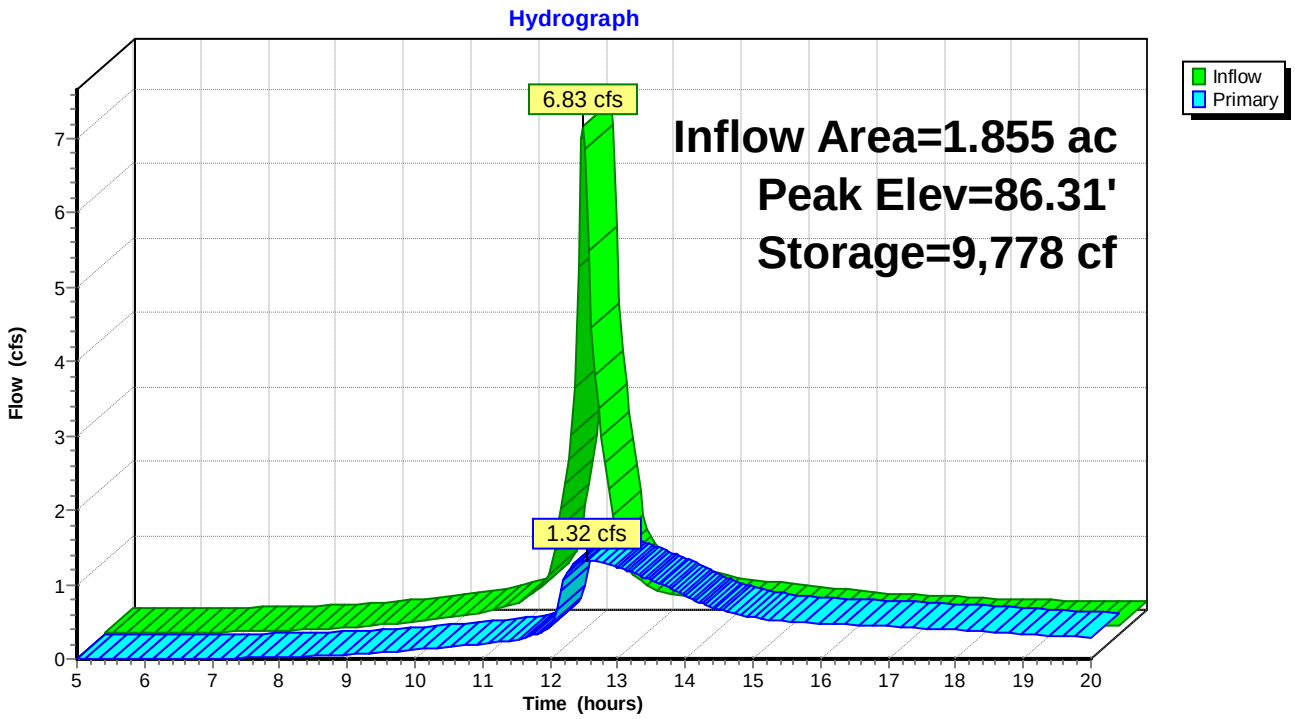
Volume	Invert	Avail.Storage	Storage Description
#1	84.00'	18,189 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
84.00	2,915	0	0	2,915
85.00	3,920	3,405	3,405	3,941
86.00	5,350	4,617	8,022	5,391
87.00	7,180	6,243	14,264	7,242
87.50	8,540	3,925	18,189	8,611

Device	Routing	Invert	Outlet Devices
#1	Primary	81.50'	**12.0" Round Culvert** L= 110.0' Ke= 0.900 Inlet / Outlet Invert= 81.50' / 80.40' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	84.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	85.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.32 cfs @ 12.55 hrs HW=86.31' (Free Discharge)
└─**1=Culvert** (Passes 1.32 cfs of 6.04 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.62 cfs @ 7.05 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.71 cfs @ 3.61 fps)

Pond 1P: Det. Pond

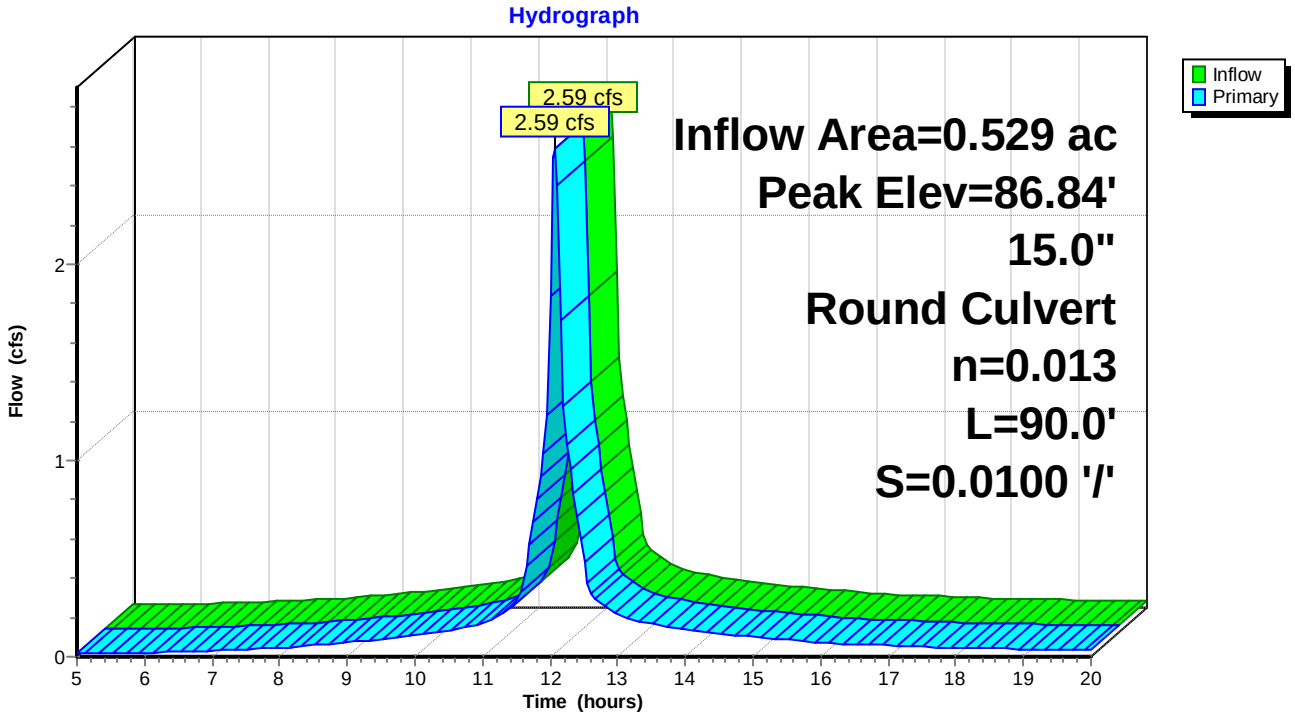


Summary for Pond 2P: CB 1

Inflow Area = 0.529 ac, 84.20% Impervious, Inflow Depth > 4.16" for 25-Year Event event
Inflow = 2.59 cfs @ 12.07 hrs, Volume= 0.183 af
Outflow = 2.59 cfs @ 12.07 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min
Primary = 2.59 cfs @ 12.07 hrs, Volume= 0.183 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 86.84' @ 12.07 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	85.90'	**15.0" Round Culvert** L= 90.0' Ke= 0.900 Inlet / Outlet Invert= 85.90' / 85.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.49 cfs @ 12.07 hrs HW=86.82' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.49 cfs @ 2.58 fps)

Pond 2P: CB 1