Poor House Run Hydrologic Assessment and Watershed Action Plan

April 1, 2022

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Appendix D: Hydrologic Study

HY-8 Culvert Analysis Report

Project Data

Project Title: Poor house run - Legion Road, Northern Culvert Analysis

Designer: William Ryall

Project Date: Friday, February 25, 2022

Project Notes: Existing analysis is based off existing pipe, landuse and tailwater conditions. Proposed analysis is based off multiple pipes, proposed landuse and tailwater conditions that may occur post stream restoration (stream bed is lifted).

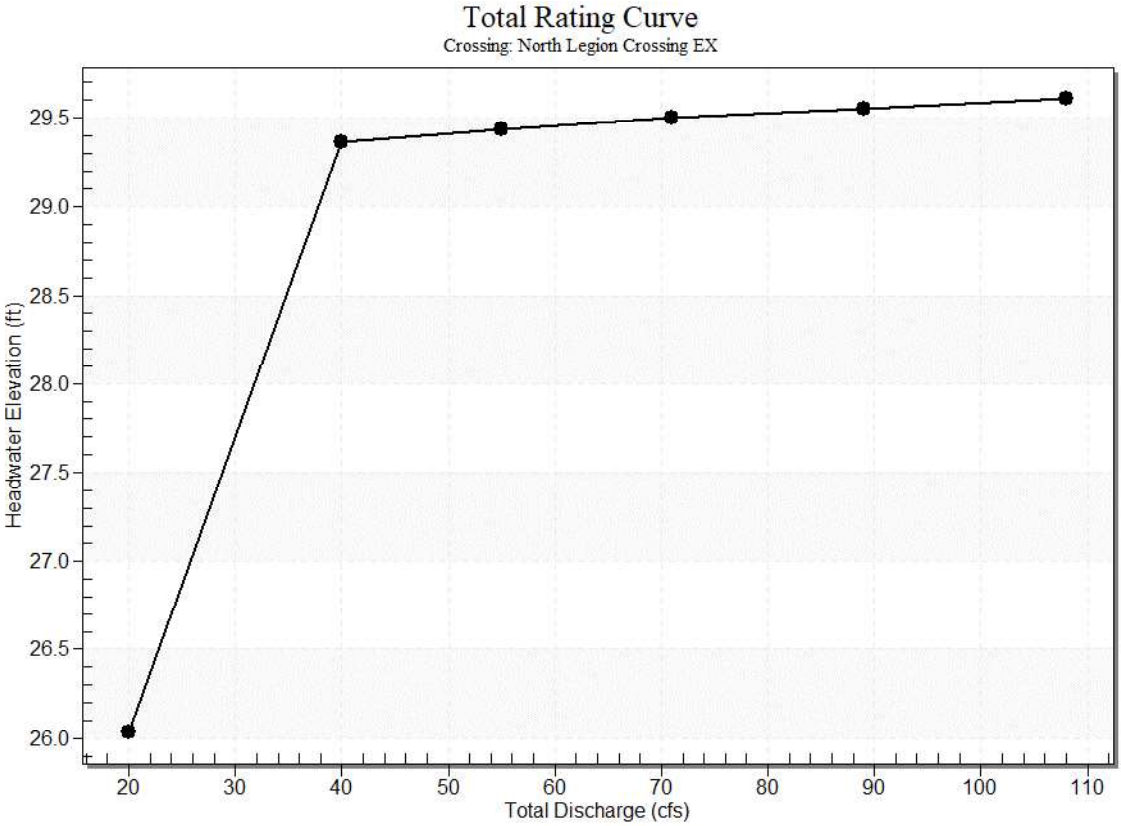
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: North Legion Crossing EX

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	ex damaged culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
26.04	2 year	20.00	20.00	0.00	1
29.36	5 year	40.00	27.61	12.25	14
29.44	10 year	55.00	27.75	27.04	5
29.50	25 year	71.00	27.87	42.91	4
29.55	50 year	89.00	27.99	60.93	4
29.61	100 year	108.00	28.10	79.73	3
29.20	Overtopping	27.27	27.27	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing EX



Culvert Data: ex damaged culvert

Table 2 - Culvert Summary Table: ex damaged culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	20.00 cfs	20.00 cfs	26.04	3.45	5.184	7-M2c	2.00	1.61	1.61	0.53	7.40	3.47
5 year	40.00 cfs	27.61 cfs	29.36	5.45	8.509	7-M2c	2.00	1.82	1.82	0.81	9.20	4.43
10 year	55.00 cfs	27.75 cfs	29.44	5.49	8.585	7-M2c	2.00	1.82	1.82	0.97	9.23	4.94

25 year	71.00 cfs	27.87 cfs	29.50	5.53	8.646	7-M 2c	2.00	1.83	1.83	1.13	9.27	5.39
50 year	89.00 cfs	27.99 cfs	29.55	5.57	8.702	7-M 2c	2.00	1.83	1.83	1.29	9.30	5.80
100 year	108.00 cfs	28.10 cfs	29.61	5.60	8.755	7-M 2c	2.00	1.83	1.83	1.44	9.33	6.18

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

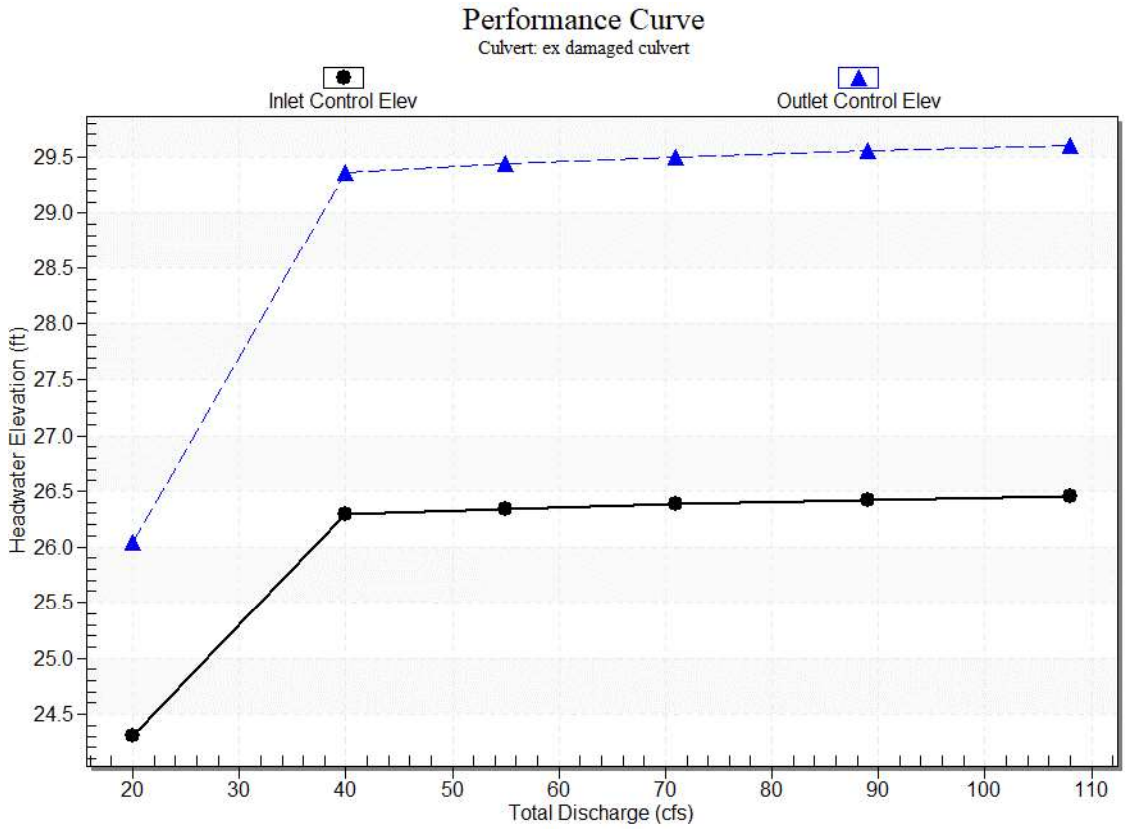
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

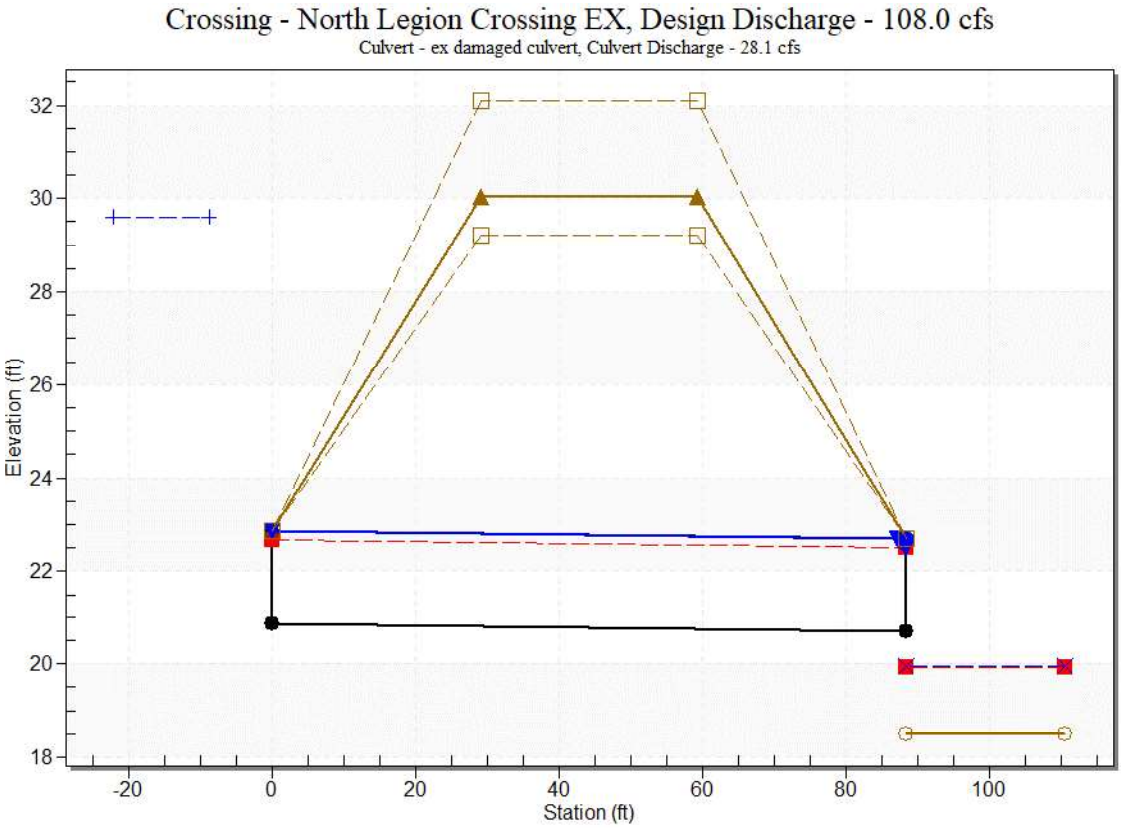
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: ex damaged culvert



Water Surface Profile Plot for Culvert: ex damaged culvert



Site Data - ex damaged culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - ex damaged culvert

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting (Ke=0.9)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing EX

Table 3 - Downstream Channel Rating Curve (Crossing: North Legion Crossing EX)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
20.00	19.03	0.53	3.47	0.97	0.87
40.00	19.31	0.81	4.43	1.46	0.92
55.00	19.47	0.97	4.94	1.76	0.94
71.00	19.63	1.13	5.39	2.04	0.96
89.00	19.79	1.29	5.80	2.33	0.97
108.00	19.94	1.44	6.18	2.60	0.99

Tailwater Channel Data - North Legion Crossing EX

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 18.50 ft

Roadway Data for Crossing: North Legion Crossing EX

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

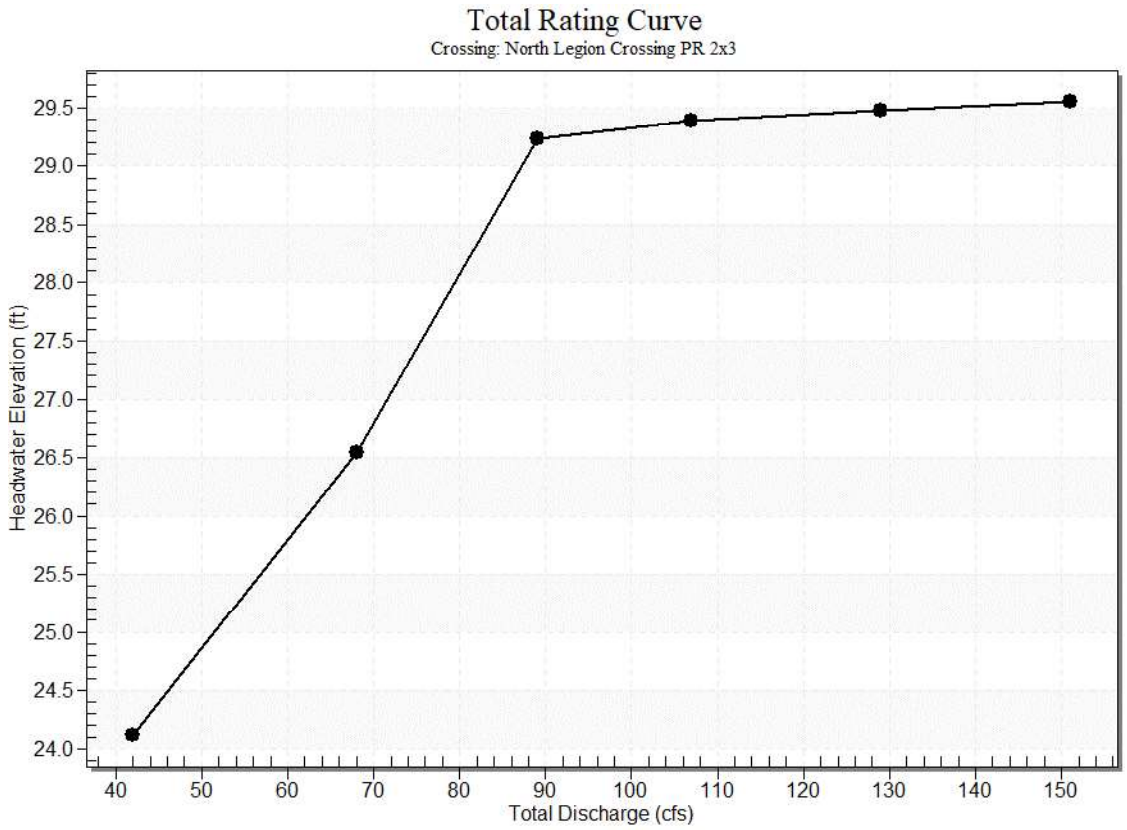
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 4 - Summary of Culvert Flows at Crossing: North Legion Crossing PR 2x3

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	2ft x 3ft concrete box culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
24.12	2 year	42.00	42.00	0.00	1
26.54	5 year	68.00	68.00	0.00	1
29.23	10 year	89.00	88.64	0.19	53
29.39	25 year	107.00	89.70	17.07	8
29.48	50 year	129.00	90.32	38.37	5
29.55	100 year	151.00	90.79	59.88	4
29.20	Overtopping	88.44	88.44	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing PR 2x3



Culvert Data: 2ft x 3ft concrete box culvert

Table 5 - Culvert Summary Table: 2ft x 3ft concrete box culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	42.00 cfs	24.12	2.96	3.267	7-M2c	2.00	1.83	1.83	0.83	7.67	4.51
5 year	68.00 cfs	68.00 cfs	26.54	4.96	5.687	6-FFc	2.00	2.00	2.00	1.10	11.33	5.31
10 year	89.00 cfs	88.64 cfs	29.23	7.44	8.379	6-FFc	2.00	2.00	2.00	1.29	14.77	5.80
25 year	107.00 cfs	89.70 cfs	29.39	7.59	8.536	6-FFc	2.00	2.00	2.00	1.43	14.95	6.16
50 year	129.00 cfs	90.32 cfs	29.48	7.68	8.629	6-FFc	2.00	2.00	2.00	1.59	15.05	6.54
100 year	151.00 cfs	90.79 cfs	29.55	7.75	8.700	6-FFc	2.00	2.00	2.00	1.74	15.13	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

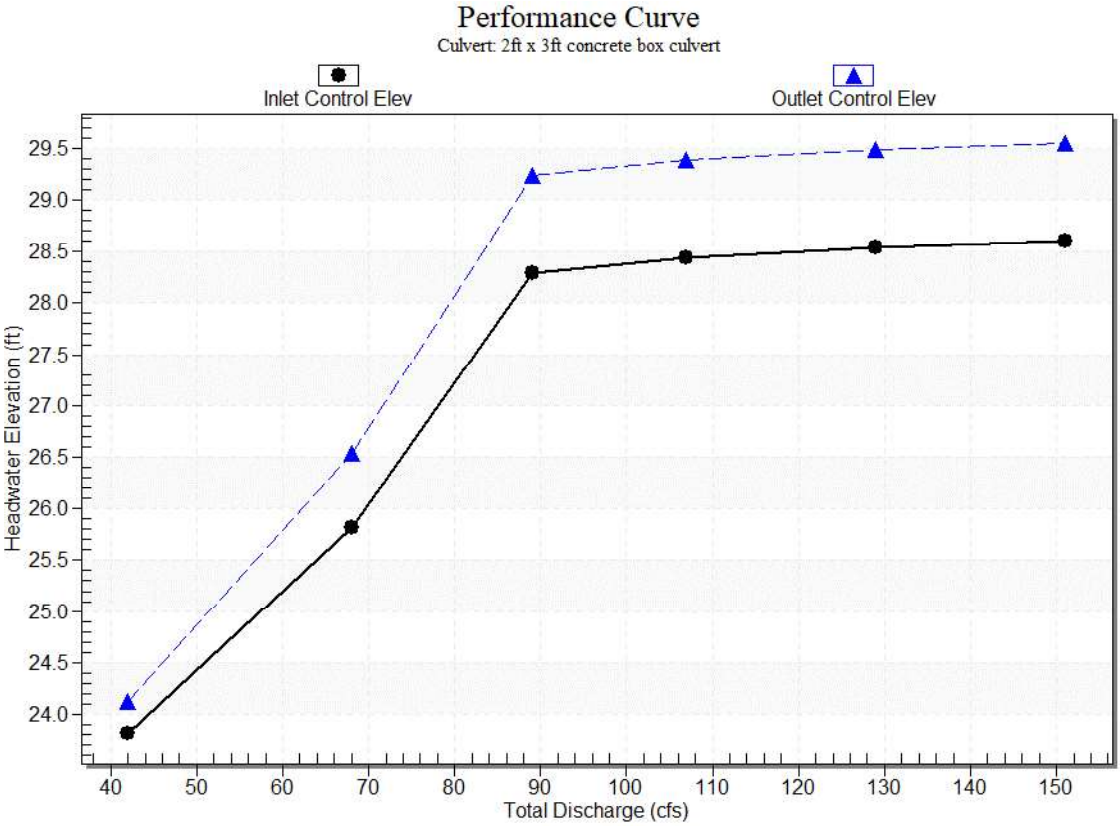
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

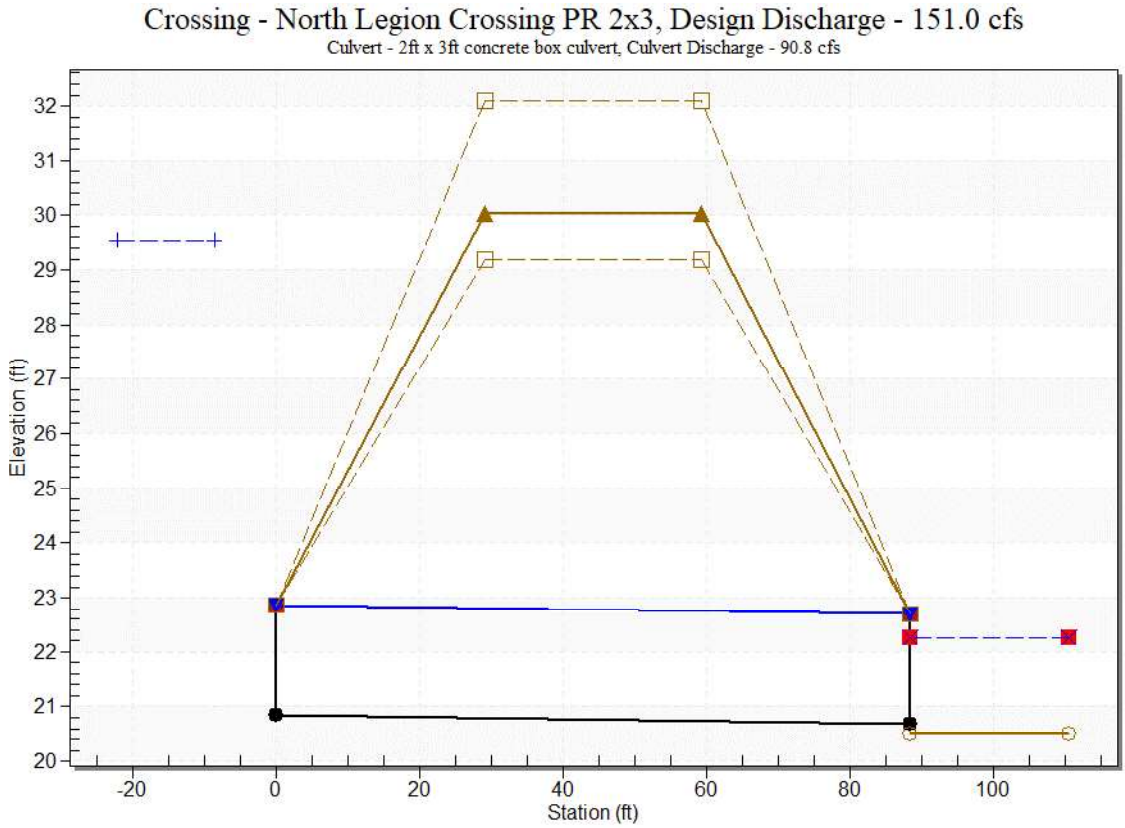
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2ft x 3ft concrete box culvert



Water Surface Profile Plot for Culvert: 2ft x 3ft concrete box culvert



Site Data - 2ft x 3ft concrete box culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2ft x 3ft concrete box culvert

Barrel Shape: Concrete Box

Barrel Span: 3.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1.5:1 Bevel (90º) Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing PR 2x3

Table 6 - Downstream Channel Rating Curve (Crossing: North Legion Crossing PR 2x3)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	21.33	0.83	4.51	1.50	0.92
68.00	21.60	1.10	5.31	1.99	0.95
89.00	21.79	1.29	5.80	2.33	0.97
107.00	21.93	1.43	6.16	2.59	0.98
129.00	22.09	1.59	6.54	2.88	1.00
151.00	22.24	1.74	6.87	3.15	1.01

Tailwater Channel Data - North Legion Crossing PR 2x3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 20.50 ft

Roadway Data for Crossing: North Legion Crossing PR 2x3

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

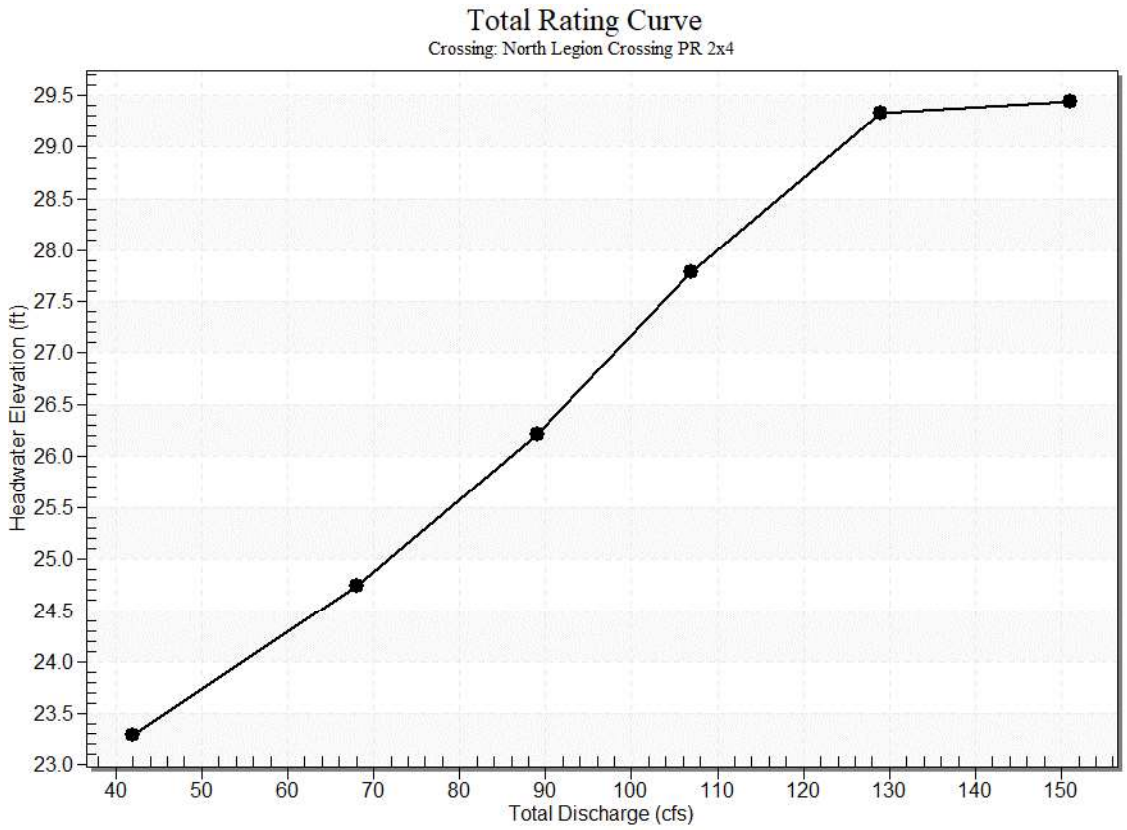
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 7 - Summary of Culvert Flows at Crossing: North Legion Crossing PR 2x4

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	2ft x 4ft concrete box culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.29	2 year	42.00	42.00	0.00	1
24.75	5 year	68.00	68.00	0.00	1
26.21	10 year	89.00	89.00	0.00	1
27.79	25 year	107.00	107.00	0.00	1
29.32	50 year	129.00	122.09	6.64	20
29.44	100 year	151.00	123.14	27.59	6
29.20	Overtopping	120.94	120.94	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing PR 2x4



Culvert Data: 2ft x 4ft concrete box culvert

Table 8 - Culvert Summary Table: 2ft x 4ft concrete box culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	42.00 cfs	23.29	2.36	2.439	7-M2c	2.00	1.51	1.51	0.83	6.97	4.51
5 year	68.00 cfs	68.00 cfs	24.75	3.55	3.895	6-FFc	2.00	2.00	2.00	1.10	8.50	5.31
10 year	89.00 cfs	89.00 cfs	26.21	4.85	5.363	6-FFc	2.00	2.00	2.00	1.29	11.12	5.80
25 year	107.00 cfs	107.00 cfs	27.79	6.28	6.933	6-FFc	2.00	2.00	2.00	1.43	13.38	6.16
50 year	129.00 cfs	122.09 cfs	29.32	7.87	8.472	6-FFc	2.00	2.00	2.00	1.59	15.26	6.54
100 year	151.00 cfs	123.14 cfs	29.44	7.99	8.586	6-FFc	2.00	2.00	2.00	1.74	15.39	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

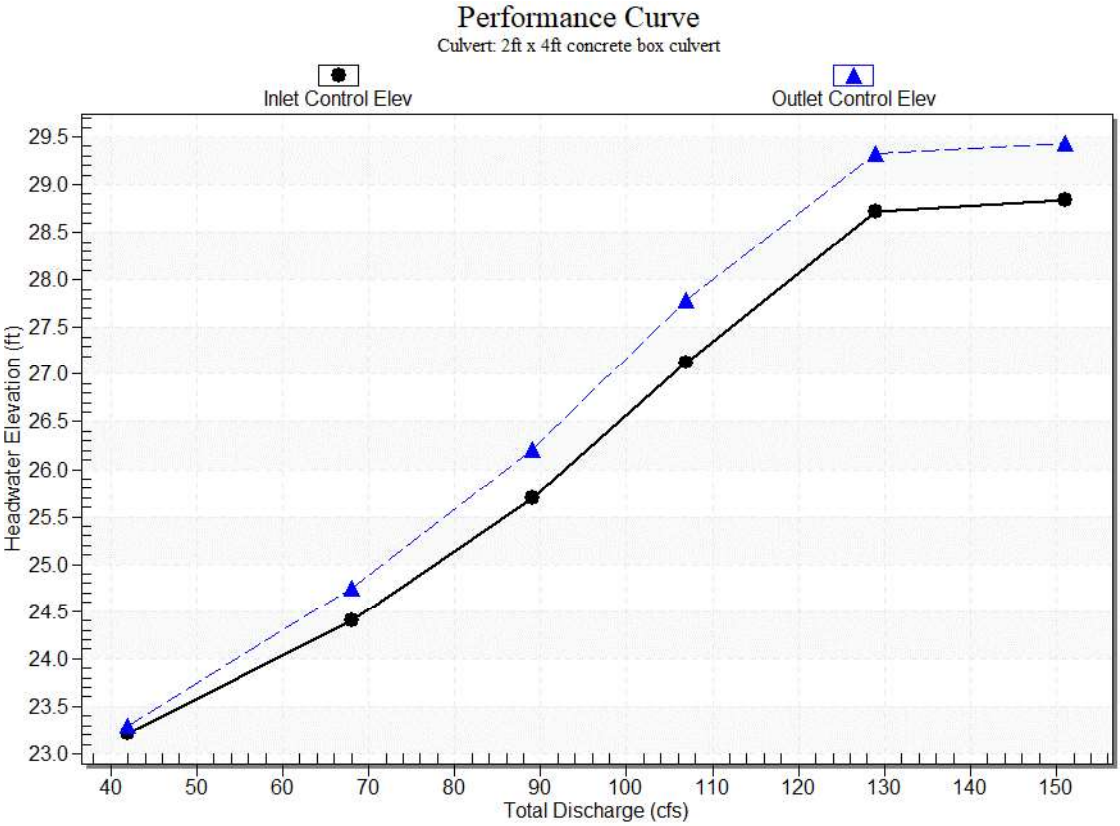
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

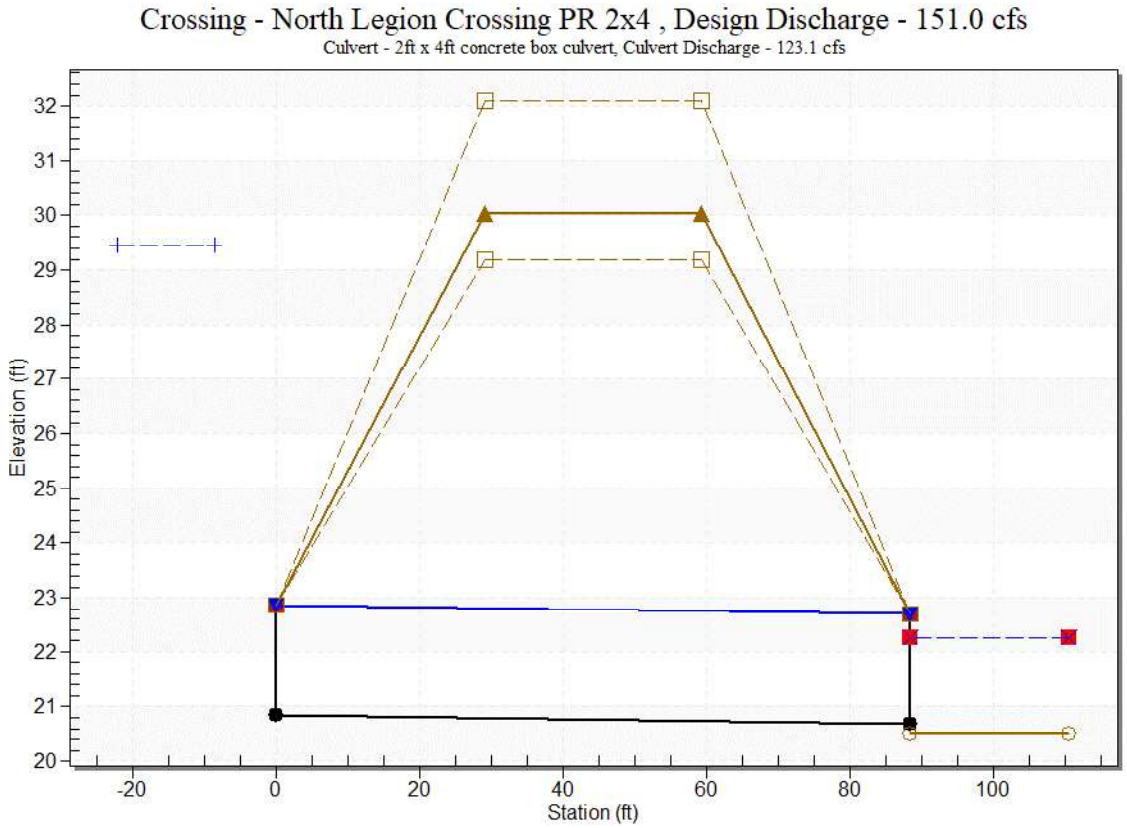
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2ft x 4ft concrete box culvert



Water Surface Profile Plot for Culvert: 2ft x 4ft concrete box culvert



Site Data - 2ft x 4ft concrete box culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2ft x 4ft concrete box culvert

Barrel Shape: Concrete Box

Barrel Span: 4.00 ft

Barrel Rise: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: 1.5:1 Bevel (90º) Headwall (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing PR 2x4

Table 9 - Downstream Channel Rating Curve (Crossing: North Legion Crossing PR 2x4)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	21.33	0.83	4.51	1.50	0.92
68.00	21.60	1.10	5.31	1.99	0.95
89.00	21.79	1.29	5.80	2.33	0.97
107.00	21.93	1.43	6.16	2.59	0.98
129.00	22.09	1.59	6.54	2.88	1.00
151.00	22.24	1.74	6.87	3.15	1.01

Tailwater Channel Data - North Legion Crossing PR 2x4

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 20.50 ft

Roadway Data for Crossing: North Legion Crossing PR 2x4

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

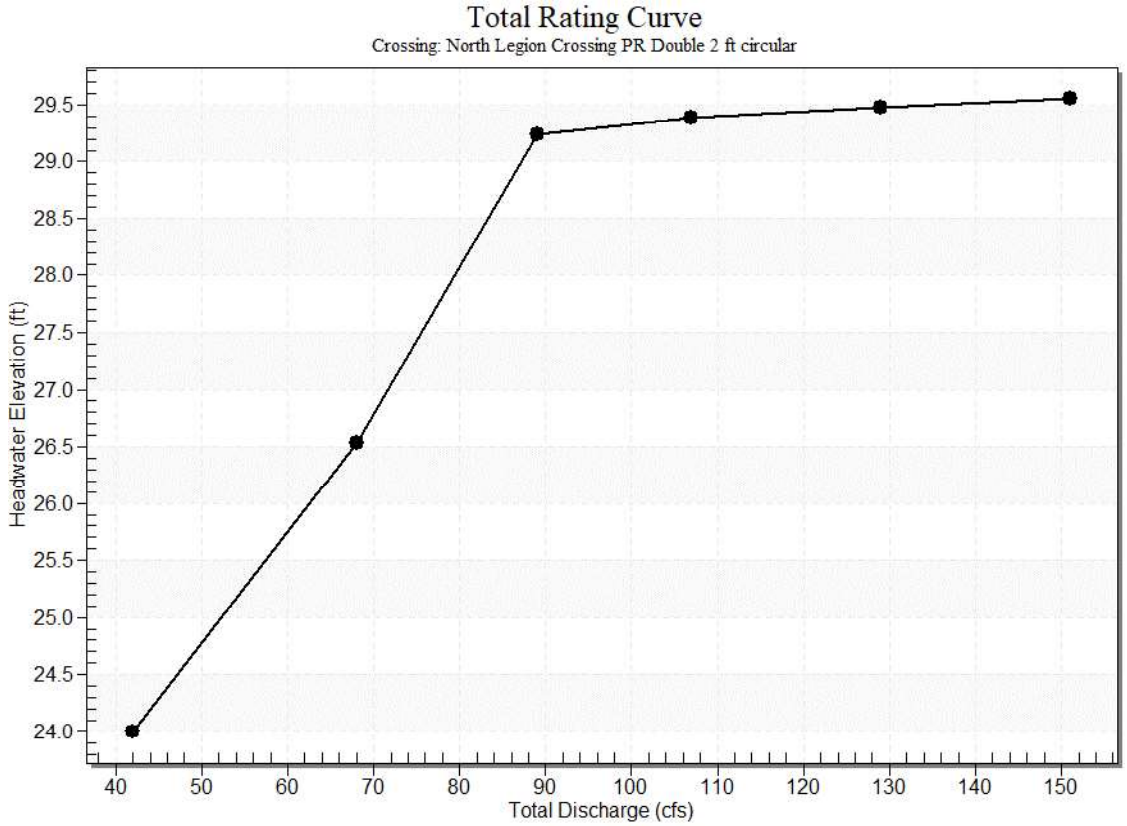
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 10 - Summary of Culvert Flows at Crossing: North Legion Crossing PR Double 2 ft circular

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	2ft conc circ pipe Discharge (cfs)	2ft conc circ pipe2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
24.00	2 year	42.00	21.00	21.00	0.00	5
26.53	5 year	68.00	34.00	34.00	0.00	6
29.24	10 year	89.00	44.21	44.21	0.42	45
29.39	25 year	107.00	44.70	44.70	17.39	8
29.48	50 year	129.00	45.01	45.01	38.67	5
29.55	100 year	151.00	45.24	45.24	60.19	4
29.20	Overtopping	88.13	44.06	44.06	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing PR Double 2 ft circular



Culvert Data: 2ft conc circ pipe

Table 11 - Culvert Summary Table: 2ft conc circ pipe

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	21.00 cfs	24.00	2.79	3.147	7-M2c	2.00	1.64	1.64	0.83	7.61	4.51
5 year	68.00 cfs	34.00 cfs	26.53	5.11	5.681	7-M2c	2.00	1.91	1.91	1.10	11.00	5.31
10 year	89.00 cfs	44.21 cfs	29.24	7.83	8.390	6-FFc	2.00	2.00	2.00	1.29	14.07	5.80
25 year	107.00 cfs	44.70 cfs	29.39	7.99	8.538	6-FFc	2.00	2.00	2.00	1.43	14.23	6.16
50 year	129.00 cfs	45.01 cfs	29.48	8.08	8.630	6-FFc	2.00	2.00	2.00	1.59	14.33	6.54
100 year	151.00 cfs	45.24 cfs	29.55	8.16	8.700	6-FFc	2.00	2.00	2.00	1.74	14.40	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

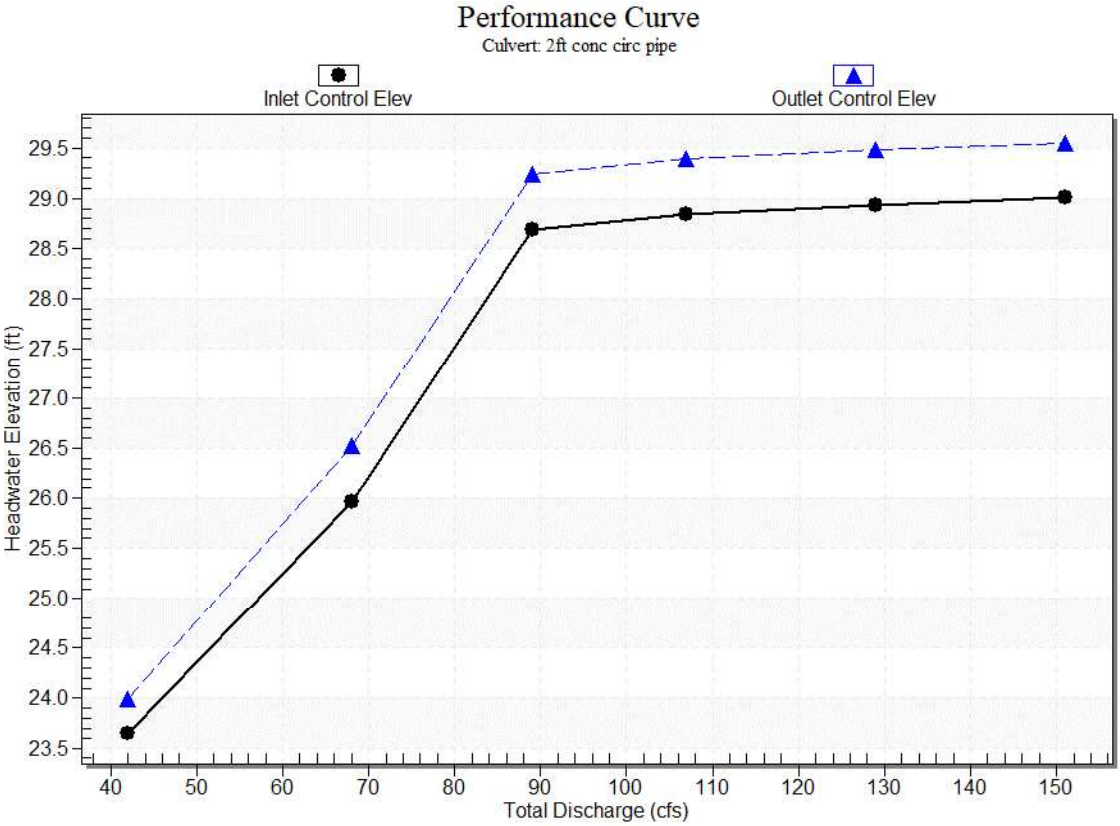
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

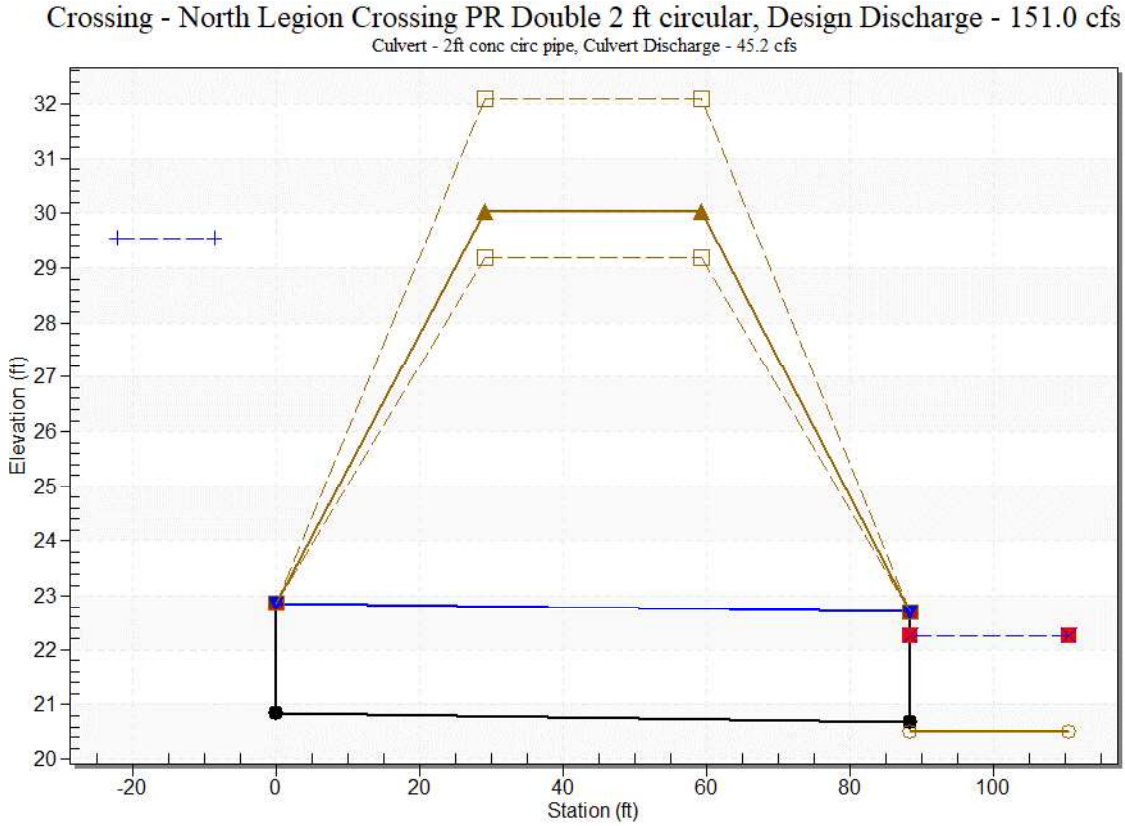
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2ft conc circ pipe



Water Surface Profile Plot for Culvert: 2ft conc circ pipe



Site Data - 2ft conc circ pipe

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2ft conc circ pipe

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Culvert Data: 2ft conc circ pipe2

Table 12 - Culvert Summary Table: 2ft conc circ pipe2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	21.00 cfs	24.00	2.79	3.147	7-M2c	2.00	1.64	1.64	0.83	7.61	4.51
5 year	68.00 cfs	34.00 cfs	26.53	5.11	5.681	7-M2c	2.00	1.91	1.91	1.10	11.00	5.31
10 year	89.00 cfs	44.21 cfs	29.24	7.83	8.390	6-FFc	2.00	2.00	2.00	1.29	14.07	5.80
25 year	107.00 cfs	44.70 cfs	29.39	7.99	8.538	6-FFc	2.00	2.00	2.00	1.43	14.23	6.16
50 year	129.00 cfs	45.01 cfs	29.48	8.08	8.630	6-FFc	2.00	2.00	2.00	1.59	14.33	6.54
100 year	151.00 cfs	45.24 cfs	29.55	8.16	8.700	6-FFc	2.00	2.00	2.00	1.74	14.40	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

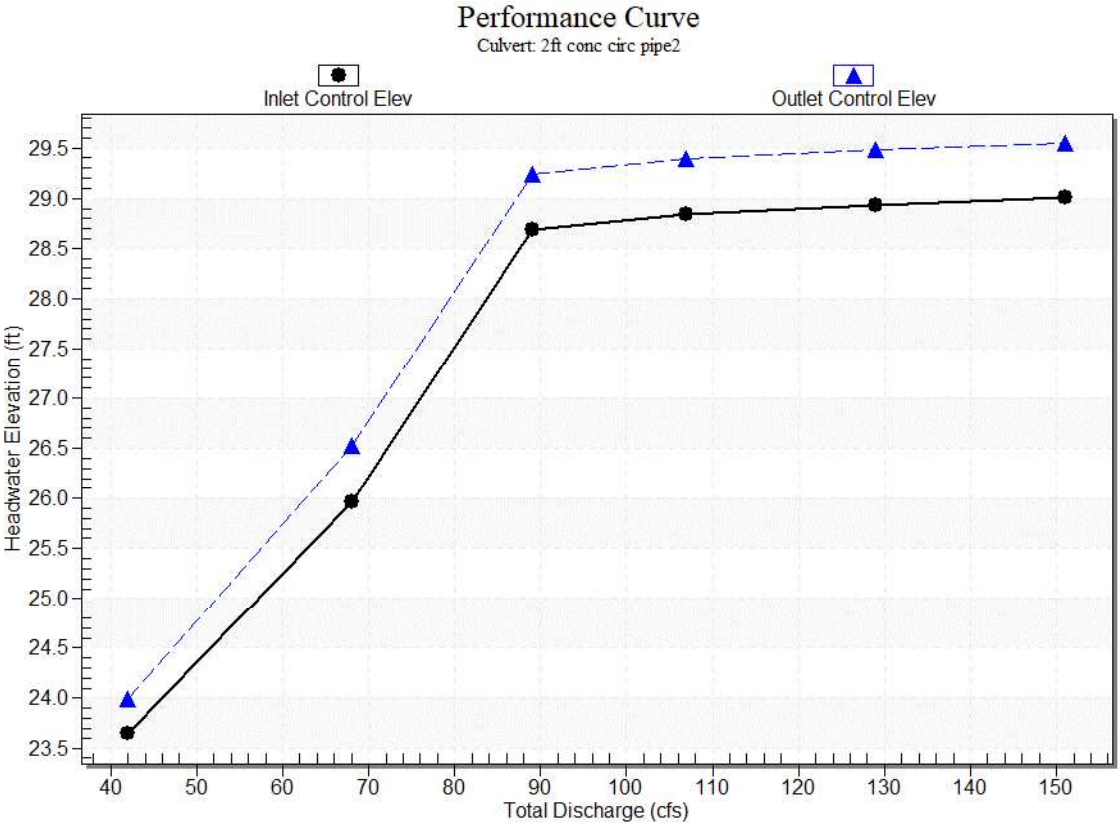
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

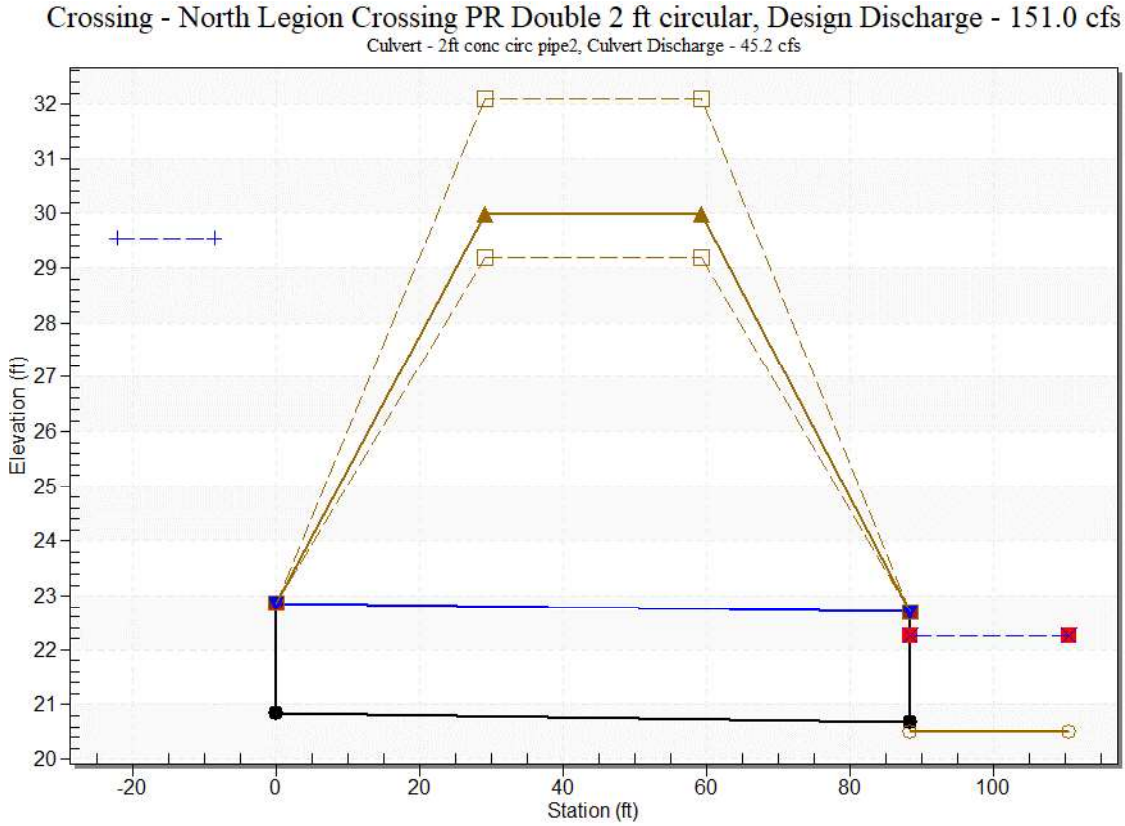
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2ft conc circ pipe2



Water Surface Profile Plot for Culvert: 2ft conc circ pipe2



Site Data - 2ft conc circ pipe2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2ft conc circ pipe2

Barrel Shape: Circular

Barrel Diameter: 2.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing PR Double 2 ft circular

Table 13 - Downstream Channel Rating Curve (Crossing: North Legion Crossing PR Double 2 ft circular)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	21.33	0.83	4.51	1.50	0.92
68.00	21.60	1.10	5.31	1.99	0.95
89.00	21.79	1.29	5.80	2.33	0.97
107.00	21.93	1.43	6.16	2.59	0.98
129.00	22.09	1.59	6.54	2.88	1.00
151.00	22.24	1.74	6.87	3.15	1.01

Tailwater Channel Data - North Legion Crossing PR Double 2 ft circular

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 20.50 ft

Roadway Data for Crossing: North Legion Crossing PR Double 2 ft circular

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

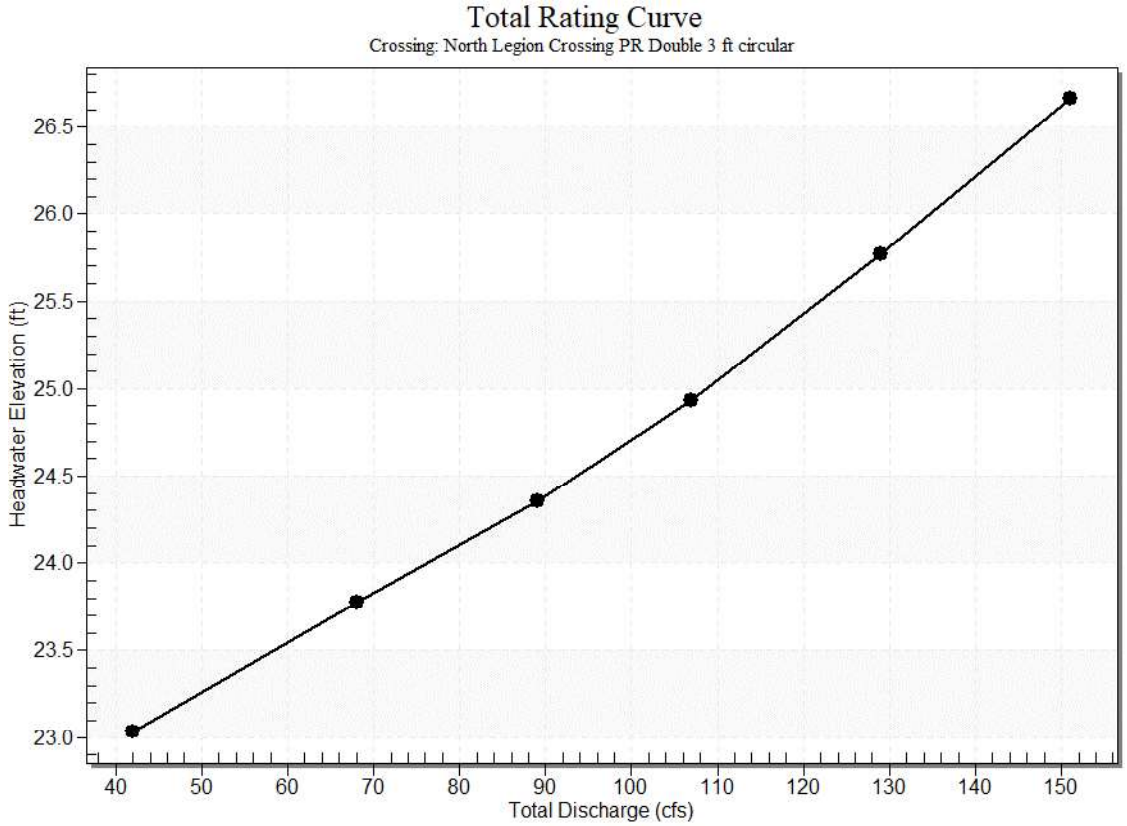
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 14 - Summary of Culvert Flows at Crossing: North Legion Crossing PR Double 3 ft circular

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	3ft conc circ pipe Discharge (cfs)	3ft conc circ pipe2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.04	2 year	42.00	20.99	20.99	0.00	4
23.77	5 year	68.00	34.00	34.00	0.00	3
24.36	10 year	89.00	44.51	44.51	0.00	3
24.93	25 year	107.00	53.49	53.49	0.00	5
25.77	50 year	129.00	64.51	64.51	0.00	3
26.66	100 year	151.00	75.50	75.50	0.00	4
29.20	Overtopping	198.42	99.21	99.21	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing PR Double 3 ft circular



Culvert Data: 3ft conc circ pipe

Table 15 - Culvert Summary Table: 3ft conc circ pipe

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	20.99 cfs	23.04	2.10	2.184	2-M2c	1.81	1.47	1.47	0.83	6.08	4.51
5 year	68.00 cfs	34.00 cfs	23.77	2.78	2.919	2-M2c	3.00	1.89	1.89	1.10	7.23	5.31
10 year	89.00 cfs	44.51 cfs	24.36	3.33	3.503	7-M2c	3.00	2.17	2.17	1.29	8.12	5.80
25 year	107.00 cfs	53.49 cfs	24.93	3.88	4.081	7-M2c	3.00	2.38	2.38	1.43	8.91	6.16
50 year	129.00 cfs	64.51 cfs	25.77	4.70	4.917	7-M2c	3.00	2.58	2.58	1.59	9.98	6.54
100 year	151.00 cfs	75.50 cfs	26.66	5.68	5.809	7-M2c	3.00	2.72	2.72	1.74	11.20	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

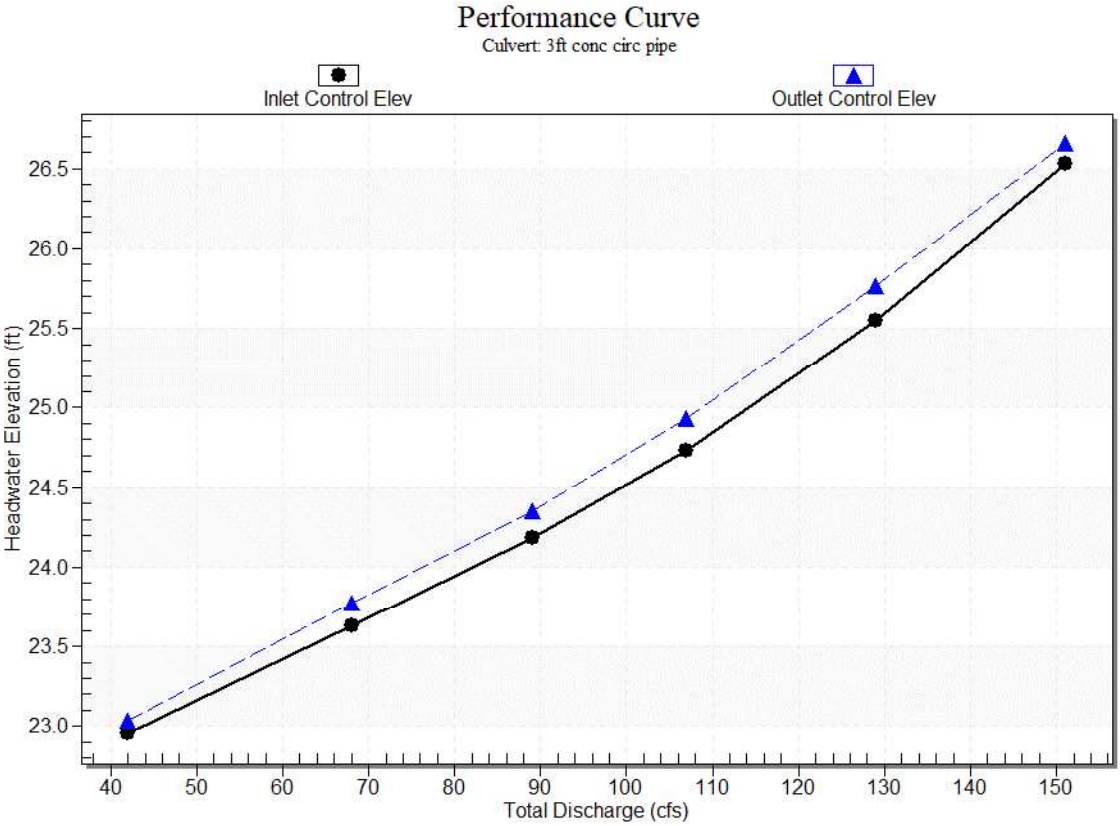
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

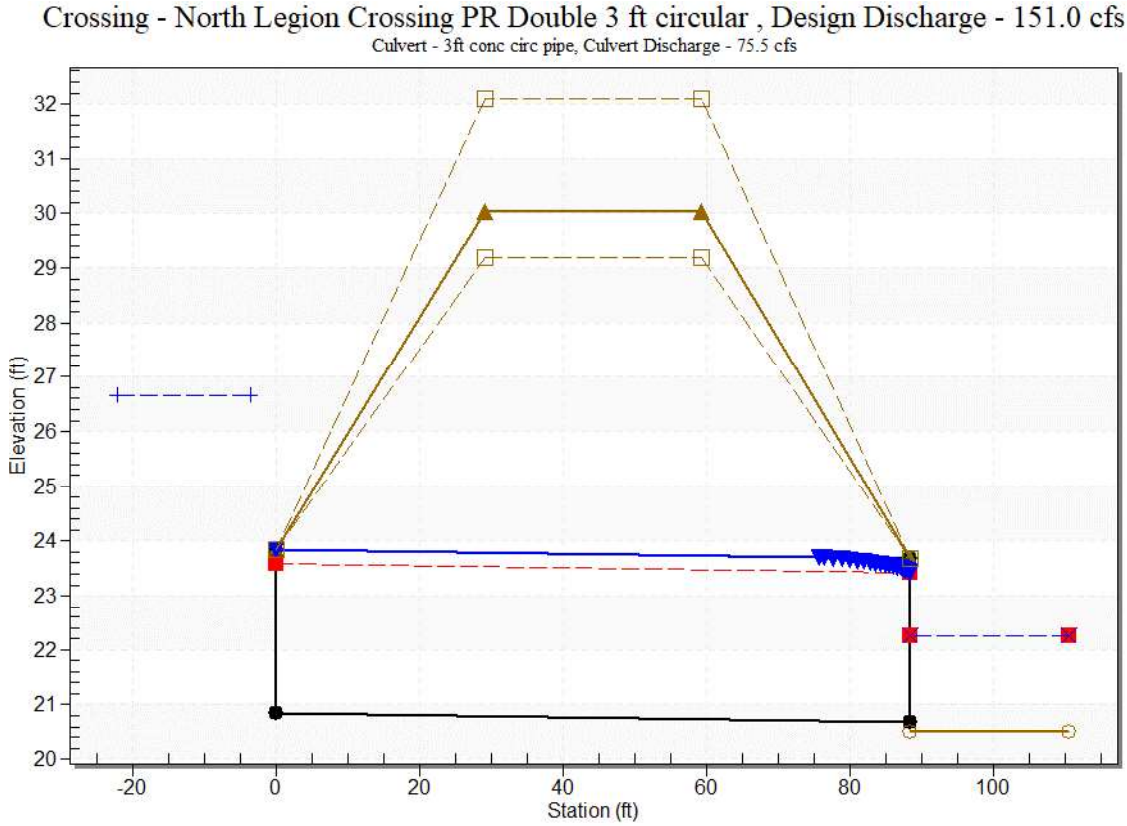
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 3ft conc circ pipe



Water Surface Profile Plot for Culvert: 3ft conc circ pipe



Site Data - 3ft conc circ pipe

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 3ft conc circ pipe

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Culvert Data: 3ft conc circ pipe2

Table 16 - Culvert Summary Table: 3ft conc circ pipe2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	20.99 cfs	23.04	2.10	2.184	2-M2c	1.81	1.47	1.47	0.83	6.08	4.51
5 year	68.00 cfs	34.00 cfs	23.77	2.78	2.919	2-M2c	3.00	1.89	1.89	1.10	7.23	5.31
10 year	89.00 cfs	44.51 cfs	24.36	3.33	3.503	7-M2c	3.00	2.17	2.17	1.29	8.12	5.80
25 year	107.00 cfs	53.49 cfs	24.93	3.88	4.081	7-M2c	3.00	2.38	2.38	1.43	8.91	6.16
50 year	129.00 cfs	64.51 cfs	25.77	4.70	4.917	7-M2c	3.00	2.58	2.58	1.59	9.98	6.54
100 year	151.00 cfs	75.50 cfs	26.66	5.68	5.809	7-M2c	3.00	2.72	2.72	1.74	11.20	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

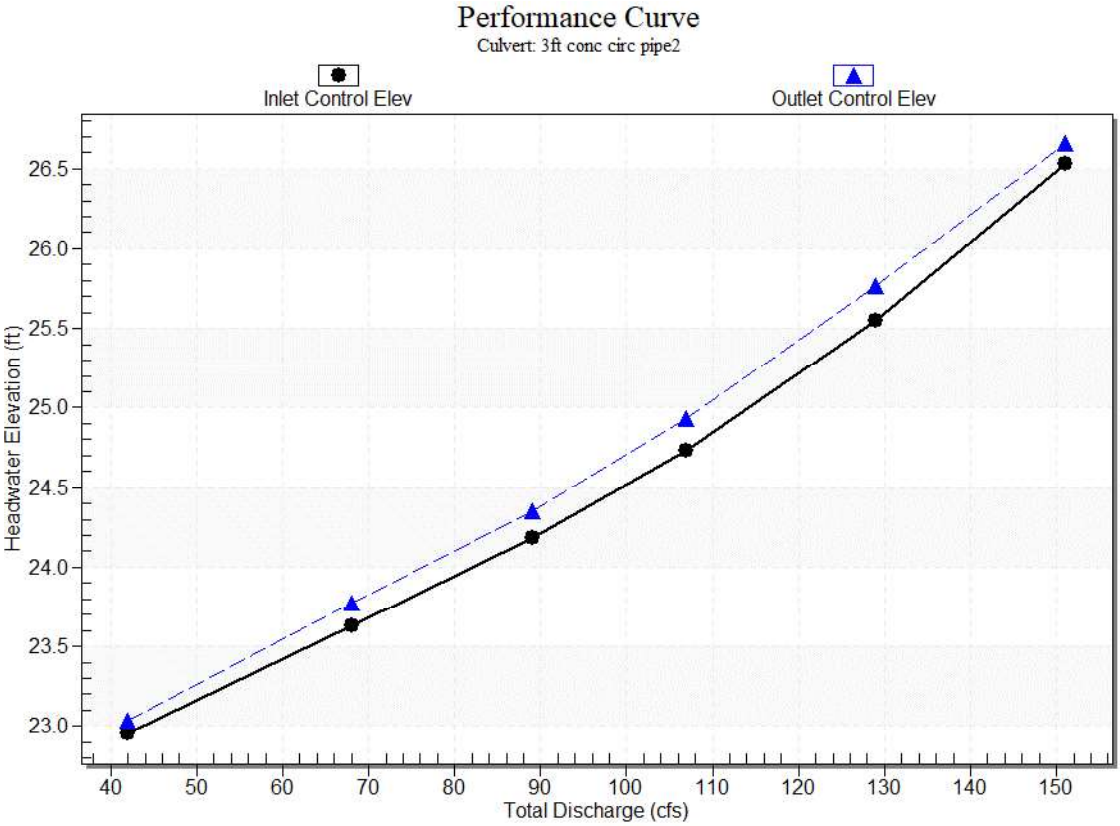
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

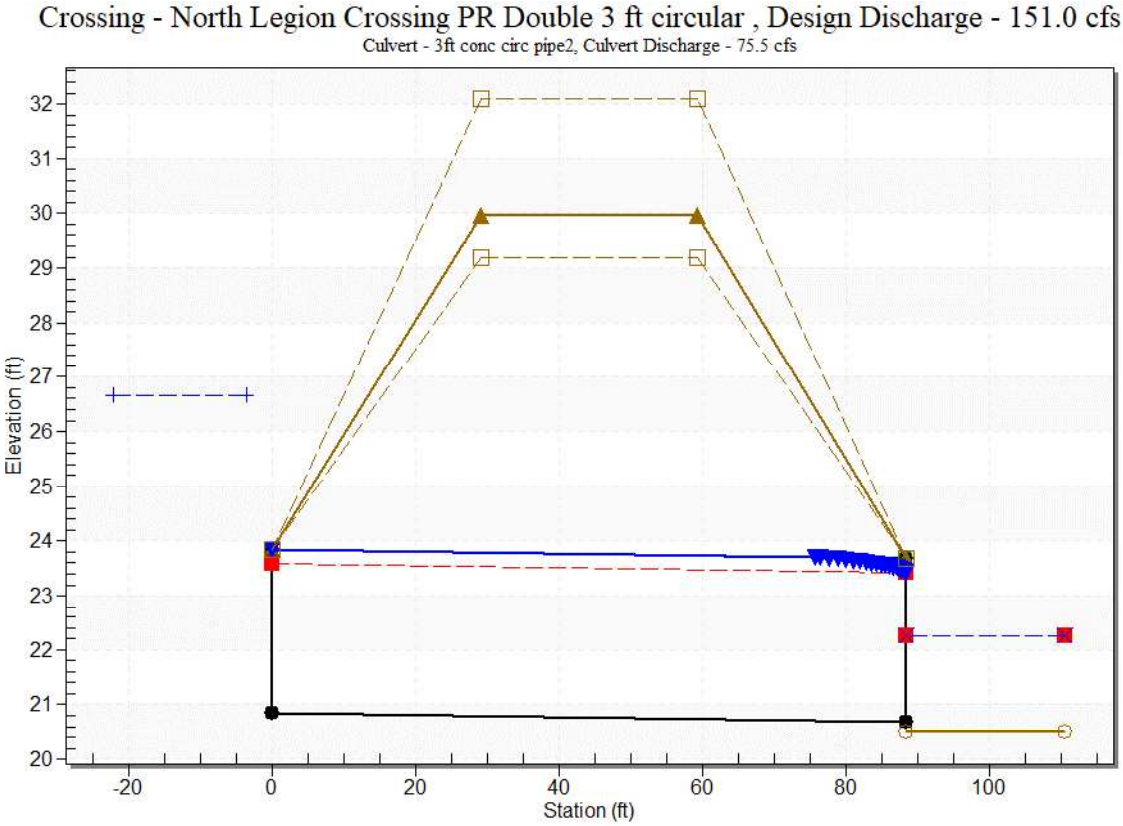
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 3ft conc circ pipe2



Water Surface Profile Plot for Culvert: 3ft conc circ pipe2



Site Data - 3ft conc circ pipe2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 3ft conc circ pipe2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing PR Double 3 ft circular

Table 17 - Downstream Channel Rating Curve (Crossing: North Legion Crossing PR Double 3 ft circular)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	21.33	0.83	4.51	1.50	0.92
68.00	21.60	1.10	5.31	1.99	0.95
89.00	21.79	1.29	5.80	2.33	0.97
107.00	21.93	1.43	6.16	2.59	0.98
129.00	22.09	1.59	6.54	2.88	1.00
151.00	22.24	1.74	6.87	3.15	1.01

Tailwater Channel Data - North Legion Crossing PR Double 3 ft circular

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 20.50 ft

Roadway Data for Crossing: North Legion Crossing PR Double 3 ft circular

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

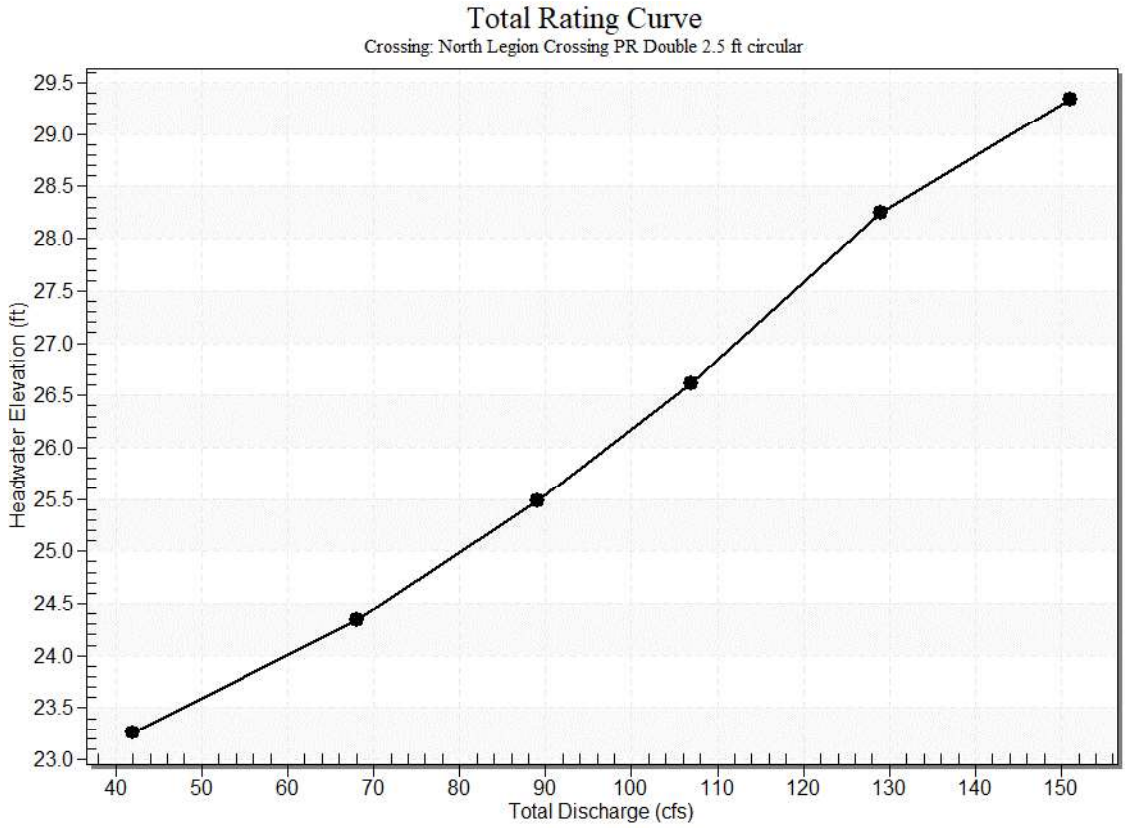
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 18 - Summary of Culvert Flows at Crossing: North Legion Crossing PR Double 2.5 ft circular

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	2.5ft conc circ pipe Discharge (cfs)	2.5ft conc circ pipe2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.26	2 year	42.00	21.00	21.00	0.00	4
24.34	5 year	68.00	34.00	34.00	0.00	5
25.48	10 year	89.00	44.49	44.49	0.00	5
26.62	25 year	107.00	53.49	53.49	0.00	6
28.25	50 year	129.00	64.41	64.41	0.00	8
29.34	100 year	151.00	71.02	71.02	8.62	9
29.20	Overtopping	140.44	70.22	70.22	0.00	Overtopping

Rating Curve Plot for Crossing: North Legion Crossing PR Double 2.5 ft circular



Culvert Data: 2.5ft conc circ pipe

Table 19 - Culvert Summary Table: 2.5ft conc circ pipe

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	21.00 cfs	23.26	2.28	2.410	2-M2c	2.50	1.56	1.56	0.83	6.53	4.51
5 year	68.00 cfs	34.00 cfs	24.34	3.24	3.493	7-M2c	2.50	1.98	1.98	1.10	8.15	5.31
10 year	89.00 cfs	44.49 cfs	25.48	4.32	4.628	7-M2c	2.50	2.22	2.22	1.29	9.67	5.80
25 year	107.00 cfs	53.49 cfs	26.62	5.50	5.766	7-M2c	2.50	2.34	2.34	1.43	11.20	6.16
50 year	129.00 cfs	64.41 cfs	28.25	7.21	7.395	7-M2c	2.50	2.30	2.30	1.59	13.65	6.54
100 year	151.00 cfs	71.02 cfs	29.34	8.47	8.486	6-FFc	2.50	2.50	2.50	1.74	14.47	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

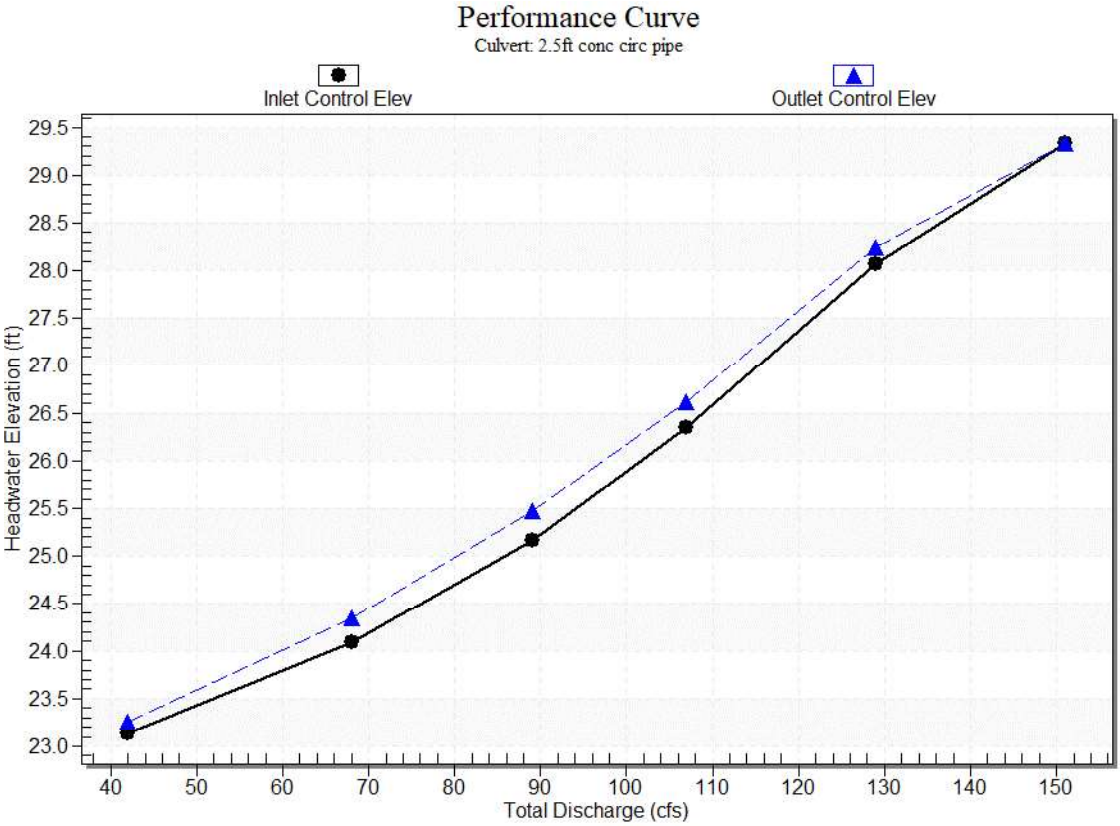
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

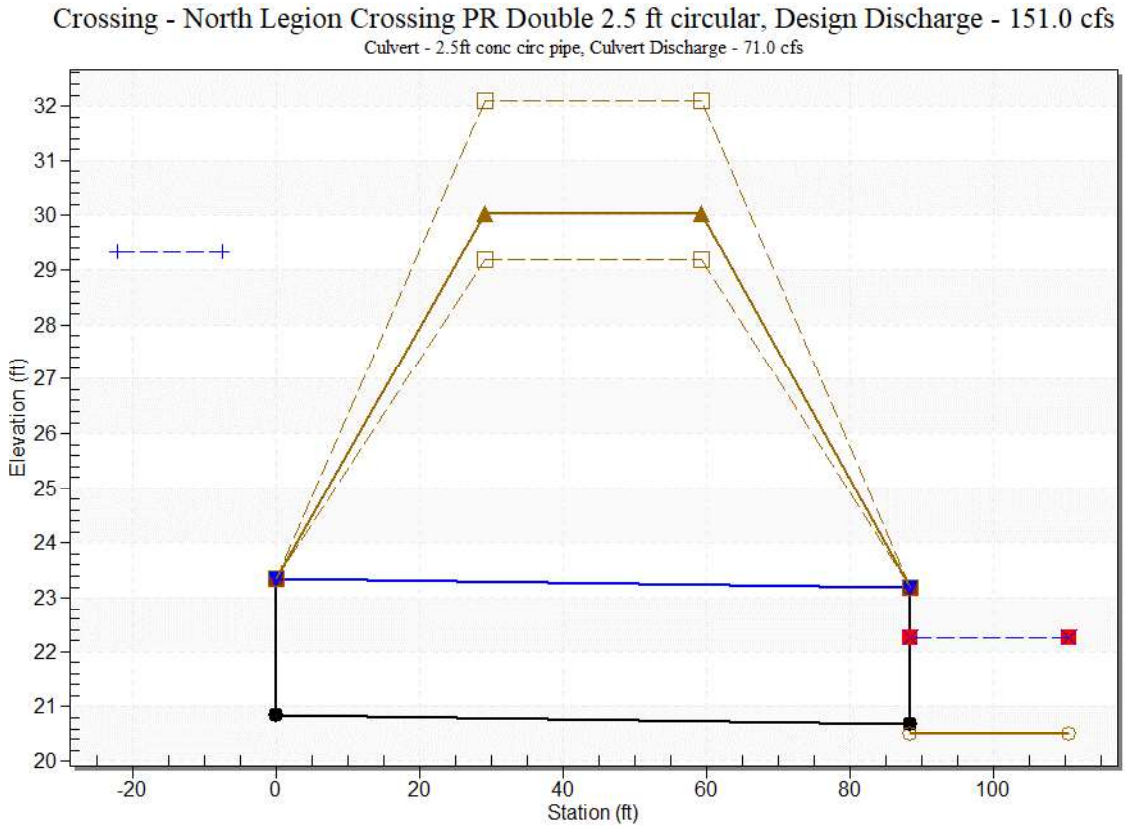
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2.5ft conc circ pipe



Water Surface Profile Plot for Culvert: 2.5ft conc circ pipe



Site Data - 2.5ft conc circ pipe

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2.5ft conc circ pipe

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Culvert Data: 2.5ft conc circ pipe2

Table 20 - Culvert Summary Table: 2.5ft conc circ pipe2

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	21.00 cfs	23.26	2.28	2.410	2-M2c	2.50	1.56	1.56	0.83	6.53	4.51
5 year	68.00 cfs	34.00 cfs	24.34	3.24	3.493	7-M2c	2.50	1.98	1.98	1.10	8.15	5.31
10 year	89.00 cfs	44.49 cfs	25.48	4.32	4.628	7-M2c	2.50	2.22	2.22	1.29	9.67	5.80
25 year	107.00 cfs	53.49 cfs	26.62	5.50	5.766	7-M2c	2.50	2.34	2.34	1.43	11.20	6.16
50 year	129.00 cfs	64.41 cfs	28.25	7.21	7.395	7-M2c	2.50	2.30	2.30	1.59	13.65	6.54
100 year	151.00 cfs	71.02 cfs	29.34	8.47	8.486	6-FFc	2.50	2.50	2.50	1.74	14.47	6.87

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

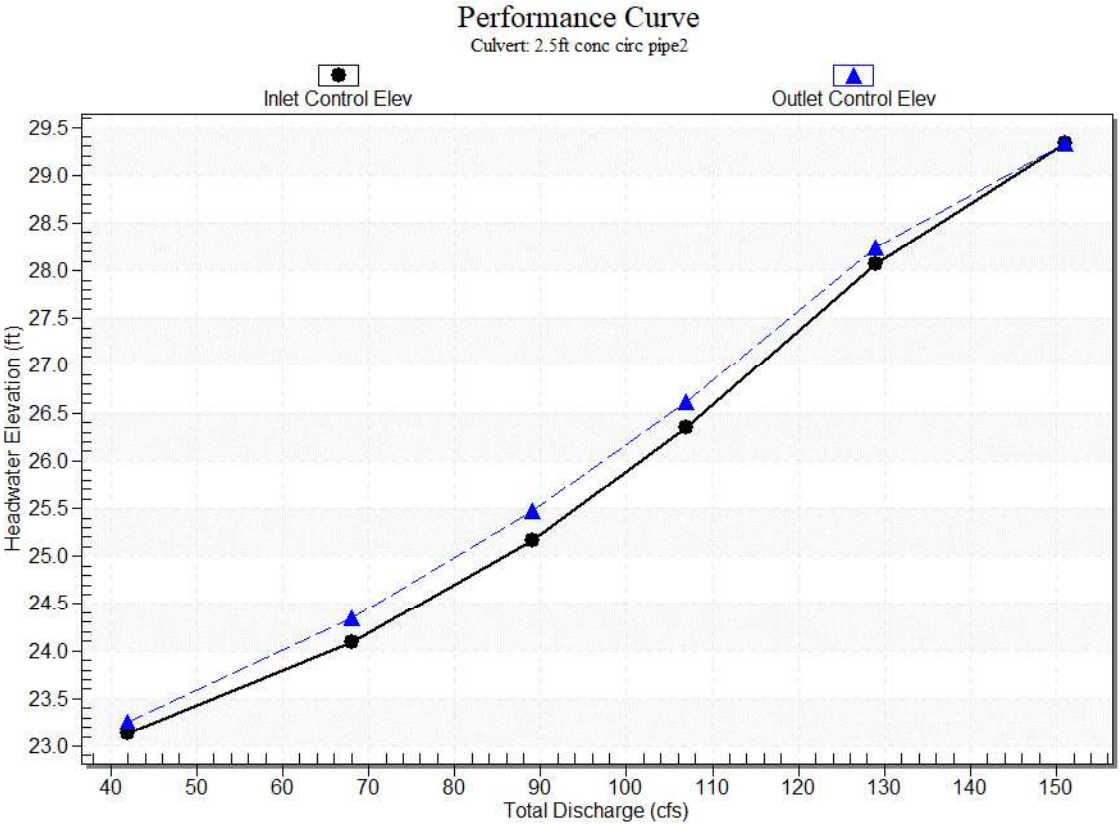
Inlet Elevation (invert): 20.85 ft,

Outlet Elevation (invert): 20.69 ft

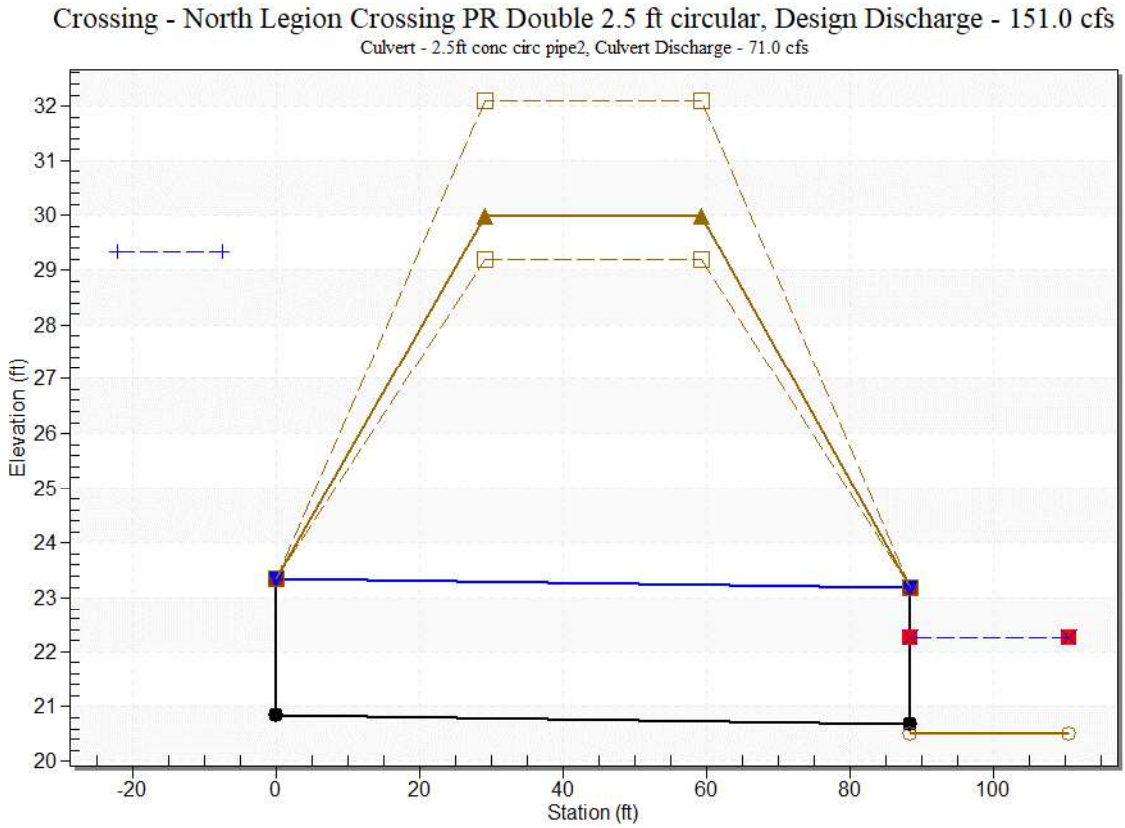
Culvert Length: 88.50 ft,

Culvert Slope: 0.0018

Culvert Performance Curve Plot: 2.5ft conc circ pipe2



Water Surface Profile Plot for Culvert: 2.5ft conc circ pipe2



Site Data - 2.5ft conc circ pipe2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.85 ft

Outlet Station: 88.50 ft

Outlet Elevation: 20.69 ft

Number of Barrels: 1

Culvert Data Summary - 2.5ft conc circ pipe2

Barrel Shape: Circular

Barrel Diameter: 2.50 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting (Ke=0.2)

Inlet Depression: None

Tailwater Data for Crossing: North Legion Crossing PR Double 2.5 ft circular

Table 21 - Downstream Channel Rating Curve (Crossing: North Legion Crossing PR Double 2.5 ft circular)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	21.33	0.83	4.51	1.50	0.92
68.00	21.60	1.10	5.31	1.99	0.95
89.00	21.79	1.29	5.80	2.33	0.97
107.00	21.93	1.43	6.16	2.59	0.98
129.00	22.09	1.59	6.54	2.88	1.00
151.00	22.24	1.74	6.87	3.15	1.01

Tailwater Channel Data - North Legion Crossing PR Double 2.5 ft circular

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0290

Channel Manning's n: 0.0450

Channel Invert Elevation: 20.50 ft

Roadway Data for Crossing: North Legion Crossing PR Double 2.5 ft circular

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report

Project Data

Project Title:

Designer:

Project Date:Friday, February 25, 2022

Project Notes:

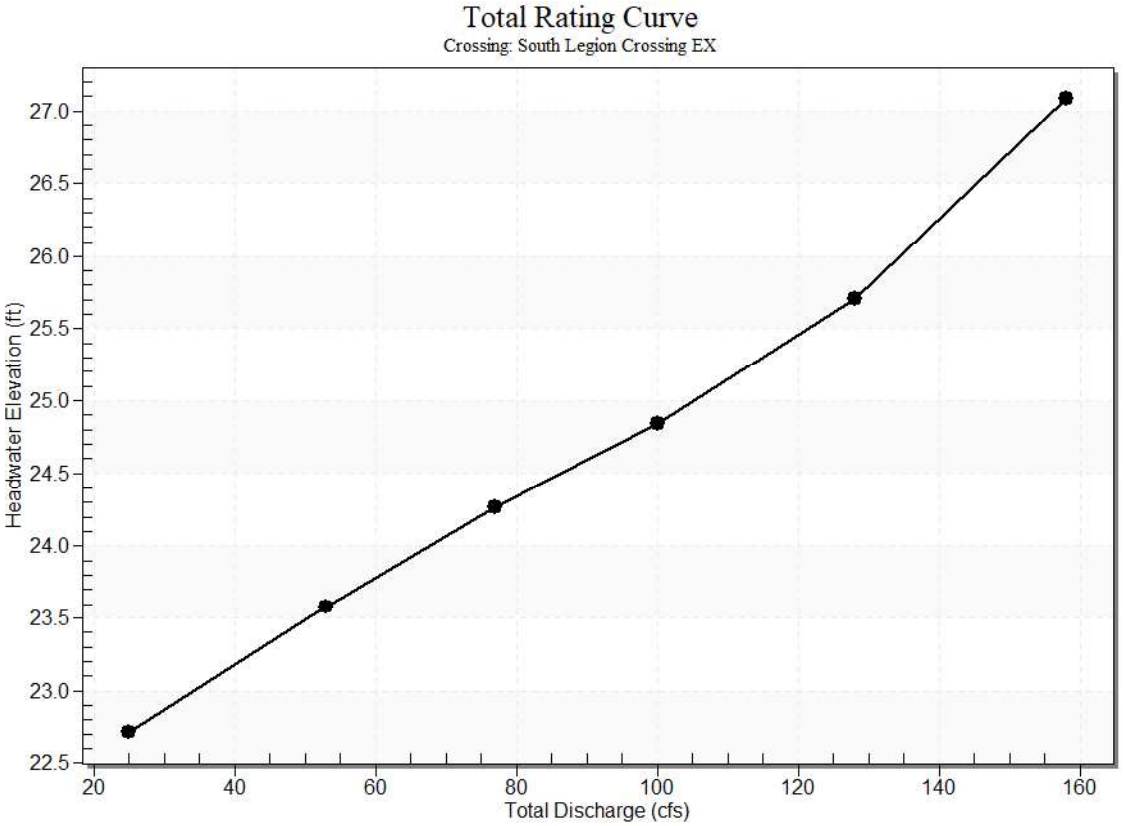
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: South Legion Crossing EX

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	northern culvert Discharge (cfs)	southern culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
22.72	2 year	25.00	13.89	11.11	0.00	4
23.58	5 year	53.00	28.08	24.92	0.00	3
24.27	10 year	77.00	40.33	36.67	0.00	3
24.84	25 year	100.00	52.15	47.83	0.00	3
25.71	50 year	128.00	66.67	61.34	0.00	5
27.08	100 year	158.00	81.12	76.89	0.00	4
29.20	Overtopping	195.24	99.35	95.89	0.00	Overtopping

Rating Curve Plot for Crossing: South Legion Crossing EX



Culvert Data: northern culvert

Table 2 - Culvert Summary Table: northern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	25.00 cfs	13.89 cfs	22.72	1.66	1.886	7-A2c	-1.00	1.19	1.19	0.90	5.34	3.42
5 year	53.00 cfs	28.08 cfs	23.58	2.48	2.751	7-A2c	-1.00	1.71	1.71	1.39	6.73	4.35
10 year	77.00 cfs	40.33 cfs	24.27	3.11	3.435	7-A2c	-1.00	2.07	2.07	1.72	7.76	4.88
25 year	100.00 cfs	52.15 cfs	24.84	3.80	4.015	7-A2c	-1.00	2.35	2.35	2.00	8.79	5.27

50 year	128.00 cfs	66.67 cfs	25.71	4.88	4.659	7-JA 2c	-1.00	2.61	2.61	2.29	10.21	5.66
100 year	158.00 cfs	81.12 cfs	27.08	6.25	5.456	7-JA 2c	-1.00	2.78	2.78	2.57	11.87	6.01

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

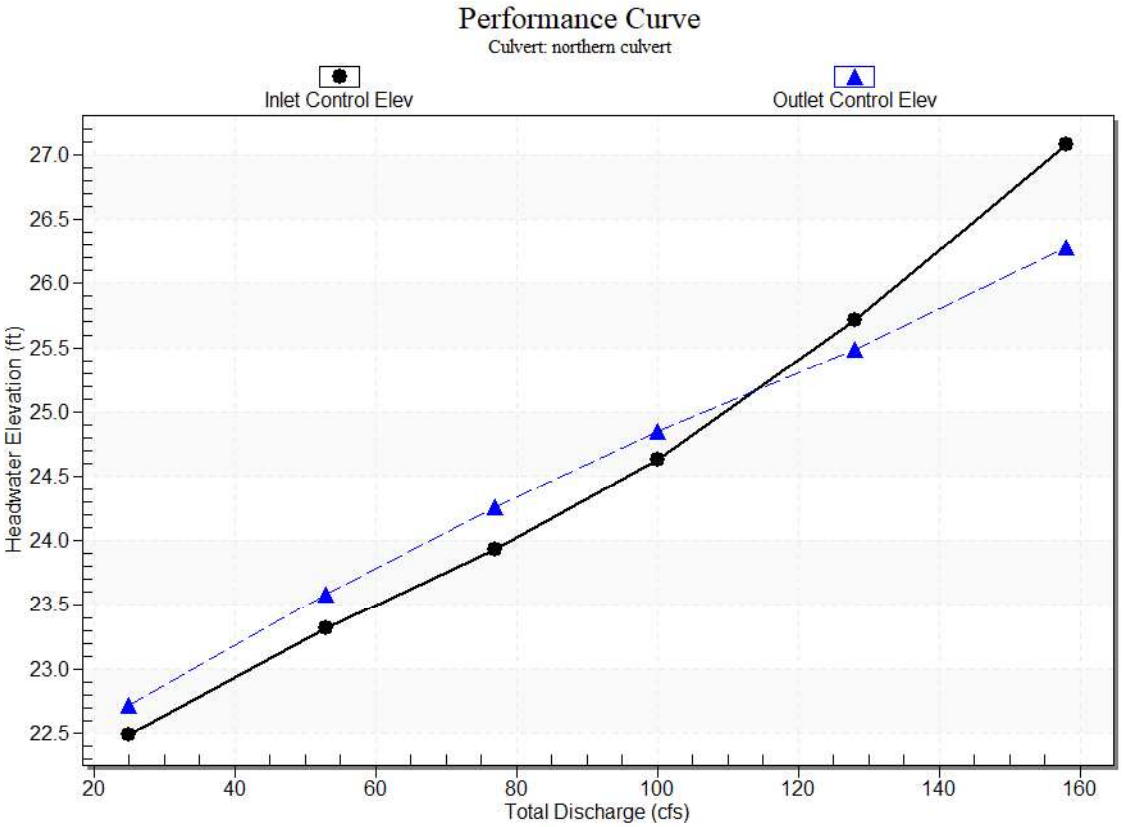
Inlet Elevation (invert): 20.83 ft,

Outlet Elevation (invert): 20.94 ft

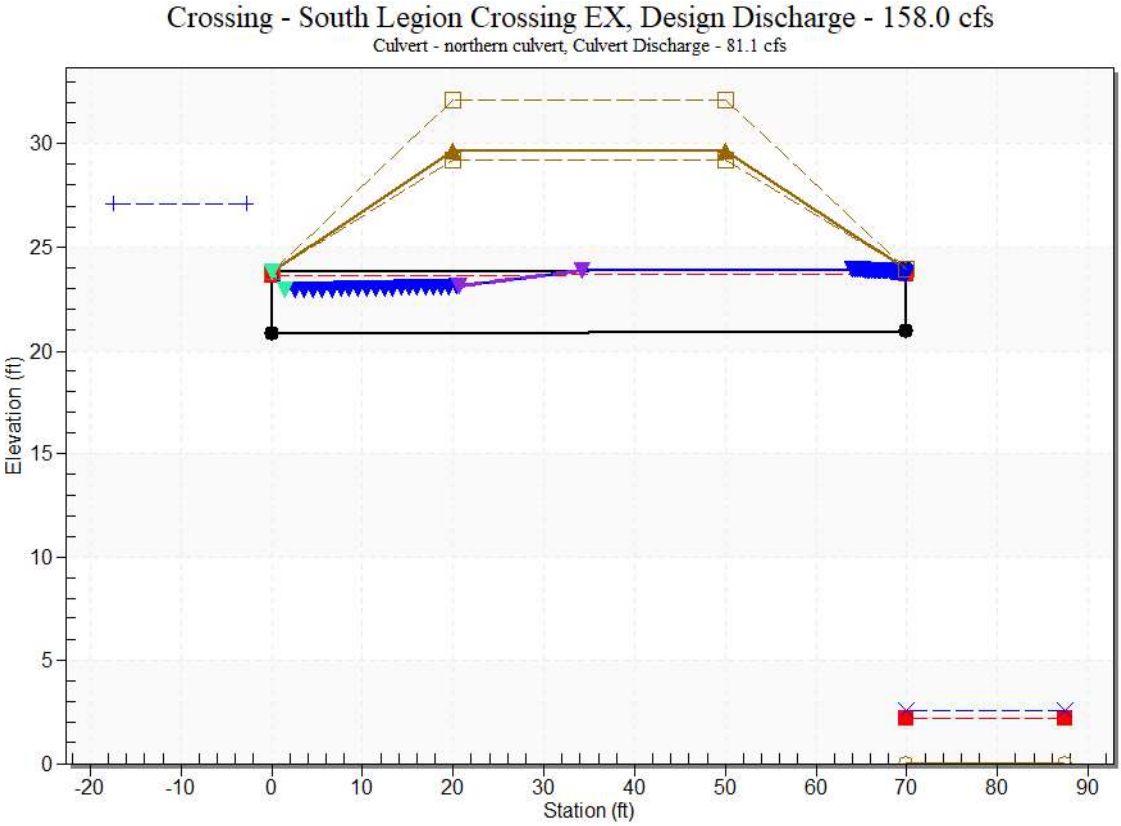
Culvert Length: 70.00 ft,

Culvert Slope: -0.0016

Culvert Performance Curve Plot: northern culvert



Water Surface Profile Plot for Culvert: northern culvert



Site Data - northern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.83 ft

Outlet Station: 70.00 ft

Outlet Elevation: 20.94 ft

Number of Barrels: 1

Culvert Data Summary - northern culvert

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Culvert Data: southern culvert

Table 3 - Culvert Summary Table: southern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	25.00 cfs	11.11 cfs	22.72	1.45	0.847	1-S2n	1.01	1.06	1.01	0.90	5.29	3.42
5 year	53.00 cfs	24.92 cfs	23.58	2.31	1.652	1-S2n	1.59	1.61	1.59	1.39	6.54	4.35
10 year	77.00 cfs	36.67 cfs	24.27	2.91	2.997	2-M2c	2.05	1.97	1.97	1.72	7.46	4.88
25 year	100.00 cfs	47.83 cfs	24.84	3.52	3.574	7-M2c	2.67	2.25	2.25	2.00	8.40	5.27
50 year	128.00 cfs	61.34 cfs	25.71	4.44	4.383	7-M2c	3.00	2.52	2.52	2.29	9.66	5.66
100 year	158.00 cfs	76.89 cfs	27.08	5.81	5.610	7-M2c	3.00	2.74	2.74	2.57	11.36	6.01

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

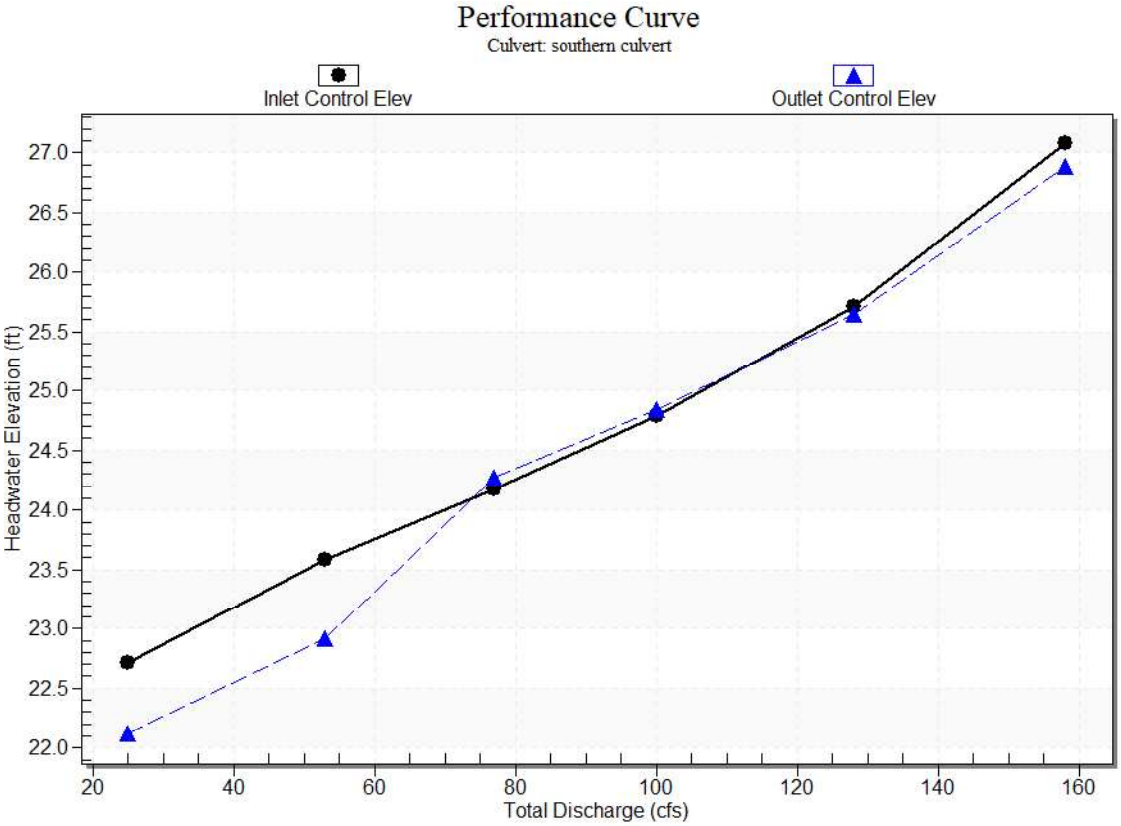
Inlet Elevation (invert): 21.27 ft,

Outlet Elevation (invert): 21.00 ft

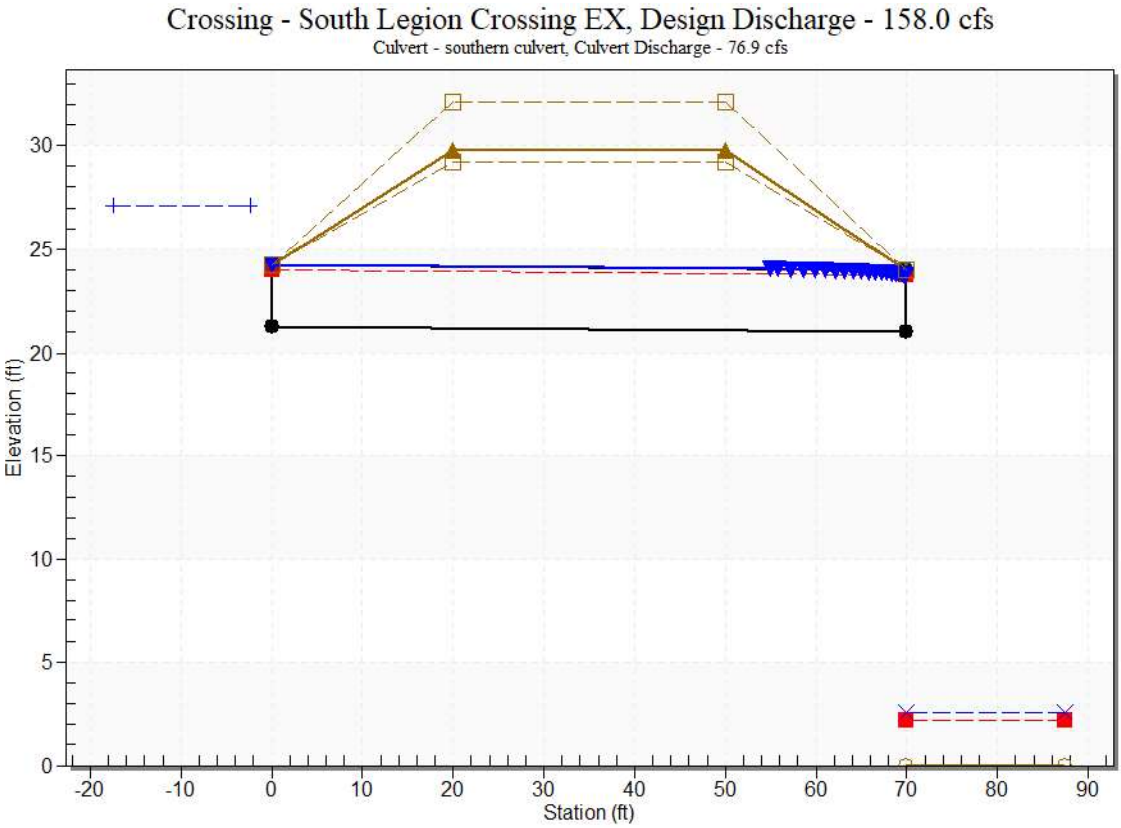
Culvert Length: 70.00 ft,

Culvert Slope: 0.0039

Culvert Performance Curve Plot: southern culvert



Water Surface Profile Plot for Culvert: southern culvert



Site Data - southern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 21.27 ft

Outlet Station: 70.00 ft

Outlet Elevation: 21.00 ft

Number of Barrels: 1

Culvert Data Summary - southern culvert

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Tailwater Data for Crossing: South Legion Crossing EX

Table 4 - Downstream Channel Rating Curve (Crossing: South Legion Crossing EX)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
25.00	0.90	0.90	3.42	0.90	0.68
53.00	1.39	1.39	4.35	1.39	0.71
77.00	1.72	1.72	4.88	1.72	0.73
100.00	2.00	2.00	5.27	2.00	0.74
128.00	2.29	2.29	5.66	2.29	0.75
158.00	2.57	2.57	6.01	2.57	0.76

Tailwater Channel Data - South Legion Crossing EX

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 7.00 ft

Side Slope (H:V): 1.25 (_:1)

Channel Slope: 0.0160

Channel Manning's n: 0.0450

Channel Invert Elevation: 0.00 ft

Roadway Data for Crossing: South Legion Crossing EX

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

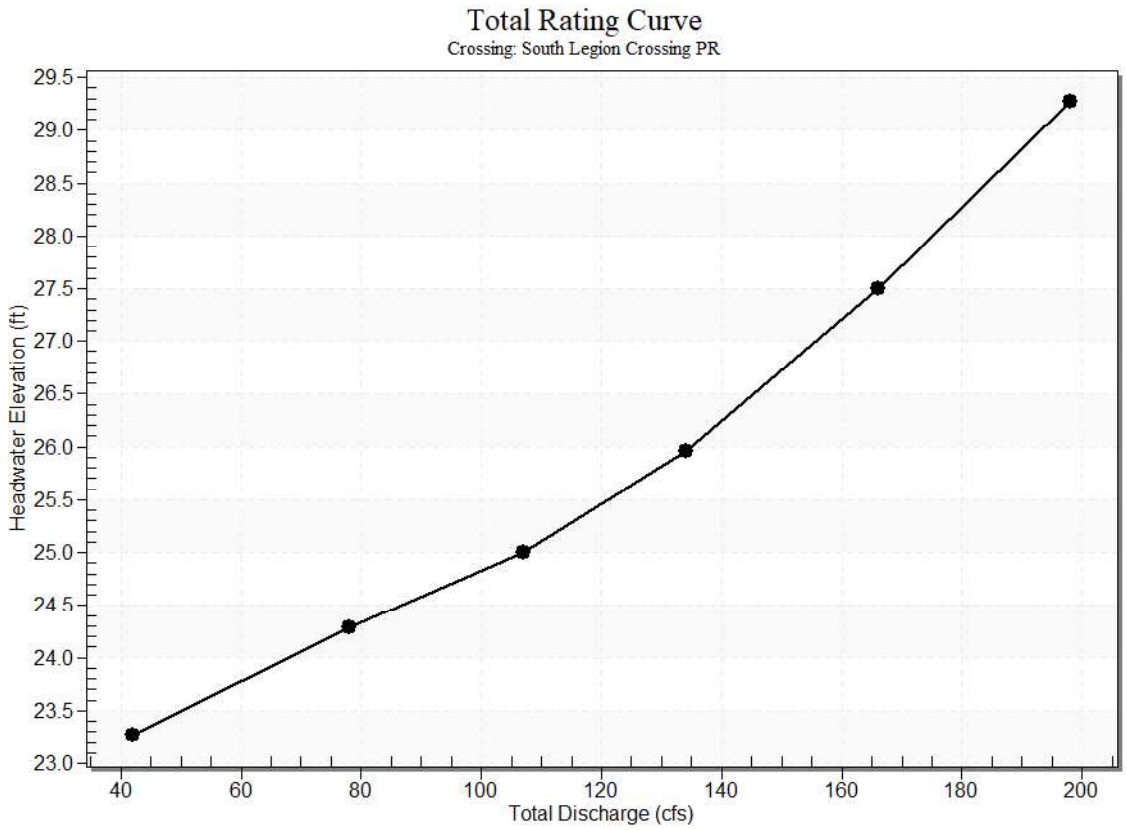
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 5 - Summary of Culvert Flows at Crossing: South Legion Crossing PR

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	northern culvert Discharge (cfs)	southern culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
23.27	2 year	42.00	22.67	19.33	0.00	5
24.29	5 year	78.00	40.80	37.16	0.00	3
25.01	10 year	107.00	56.15	50.81	0.00	3
25.96	25 year	134.00	69.54	64.47	0.00	4
27.50	50 year	166.00	85.02	80.99	0.00	4
29.27	100 year	198.00	99.89	96.45	1.48	20
29.20	Overtopping	195.24	99.35	95.89	0.00	Overtopping

Rating Curve Plot for Crossing: South Legion Crossing PR



Culvert Data: northern culvert

Table 6 - Culvert Summary Table: northern culvert

Disc	Total	Culv	Head	Inle	Out	Fl	Nor	Crit	Ou	Tail	Outl	Tail

harge Names	Discharge (cfs)	ert Discharge (cfs)	water Elevation (ft)	t Control Depth (ft)	let Control Depth (ft)	ow Type	mal Depth (ft)	ical Depth (ft)	tle t Depth (ft)	water Depth (ft)	et Velocity (ft/s)	water Velocity (ft/s)
2 year	42.00 cfs	22.67 cfs	23.27	2.20	2.440	7-A2c	-1.00	1.53	1.53	1.22	6.24	4.04
5 year	78.00 cfs	40.80 cfs	24.29	3.13	3.462	7-A2c	-1.00	2.08	2.08	1.74	7.80	4.89
10 year	107.00 cfs	56.15 cfs	25.01	4.07	4.177	7-A2c	-1.00	2.43	2.43	2.08	9.16	5.37
25 year	134.00 cfs	69.54 cfs	25.96	5.13	4.805	7-JA2t	-1.00	2.65	2.65	2.35	10.38	5.73
50 year	166.00 cfs	85.02 cfs	27.50	6.67	5.698	7-JA2t	-1.00	2.81	2.81	2.64	12.32	6.09
100 year	198.00 cfs	99.89 cfs	29.27	8.44	0.000	7-A2t	-1.00	2.66	2.66	2.91	14.49	6.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

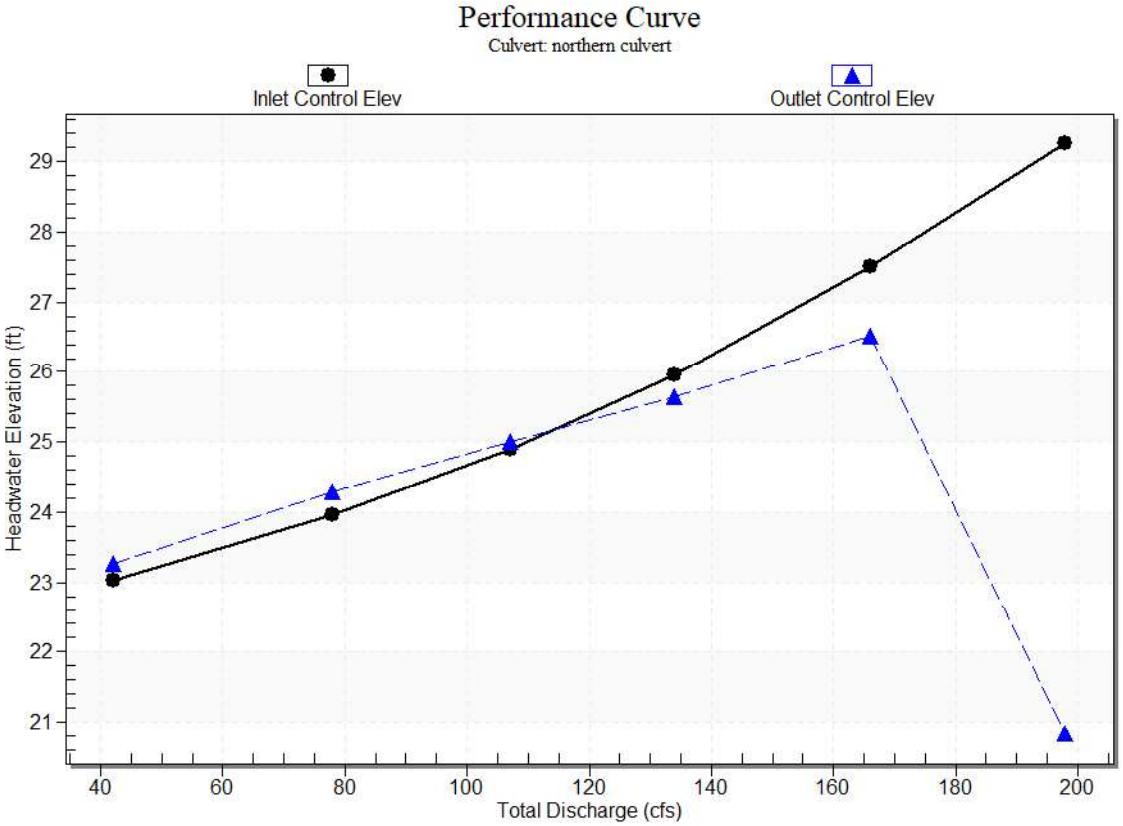
Inlet Elevation (invert): 20.83 ft,

Outlet Elevation (invert): 20.94 ft

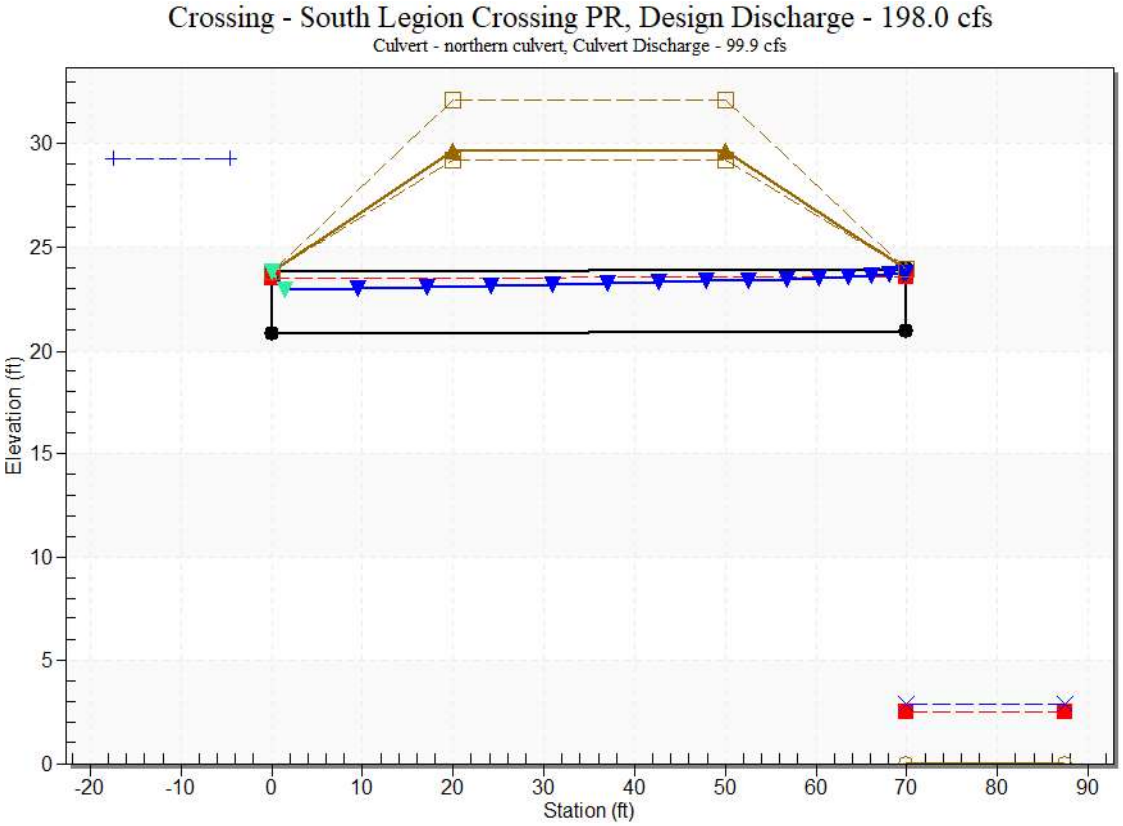
Culvert Length: 70.00 ft,

Culvert Slope: -0.0016

Culvert Performance Curve Plot: northern culvert



Water Surface Profile Plot for Culvert: northern culvert



Site Data - northern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 20.83 ft

Outlet Station: 70.00 ft

Outlet Elevation: 20.94 ft

Number of Barrels: 1

Culvert Data Summary - northern culvert

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Culvert Data: southern culvert

Table 7 - Culvert Summary Table: southern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	42.00 cfs	19.33 cfs	23.27	2.00	1.327	1-S2n	1.37	1.41	1.37	1.22	6.13	4.04
5 year	78.00 cfs	37.16 cfs	24.29	2.93	3.022	7-M2c	2.07	1.98	1.98	1.74	7.50	4.89
10 year	107.00 cfs	50.81 cfs	25.01	3.70	3.737	7-M2c	3.00	2.32	2.32	2.08	8.67	5.37
25 year	134.00 cfs	64.47 cfs	25.96	4.69	4.642	7-M2c	3.00	2.58	2.58	2.35	9.98	5.73
50 year	166.00 cfs	80.99 cfs	27.50	6.23	5.958	7-M2c	3.00	2.78	2.78	2.64	11.85	6.09
100 year	198.00 cfs	96.45 cfs	29.27	8.00	7.422	7-M2c	3.00	2.77	2.77	2.91	14.15	6.40

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

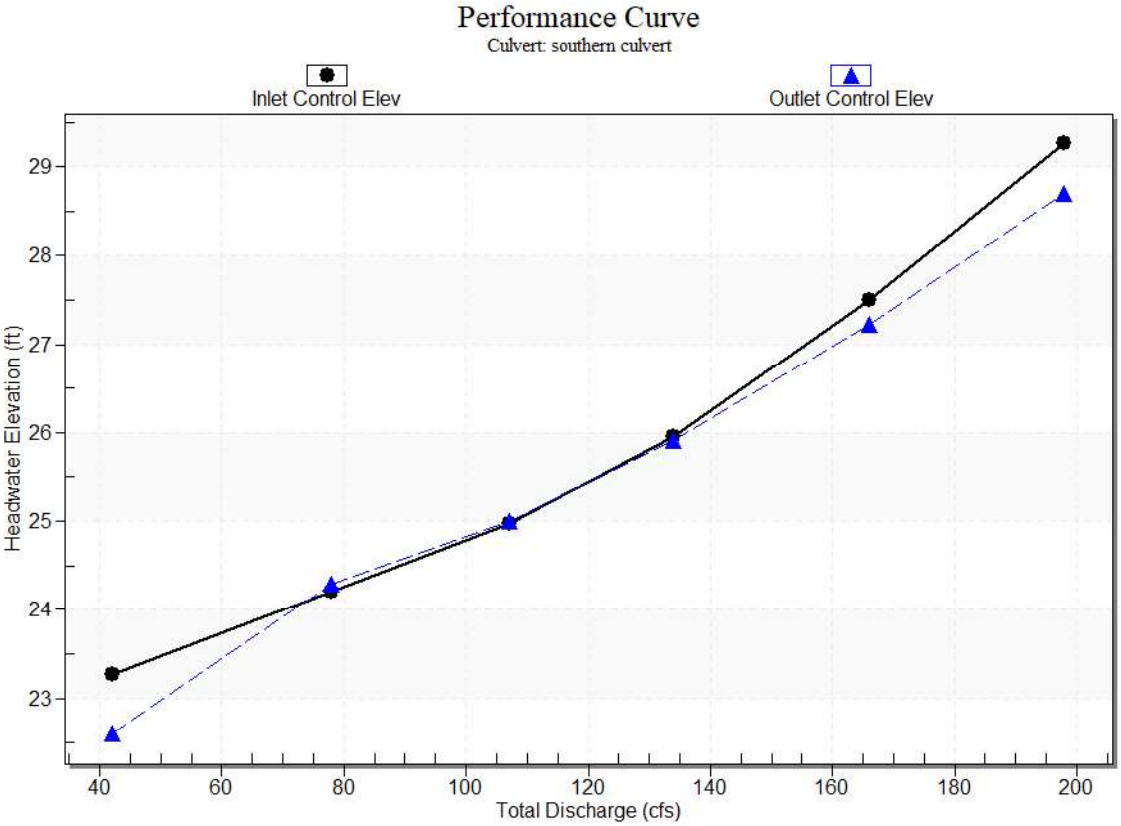
Inlet Elevation (invert): 21.27 ft,

Outlet Elevation (invert): 21.00 ft

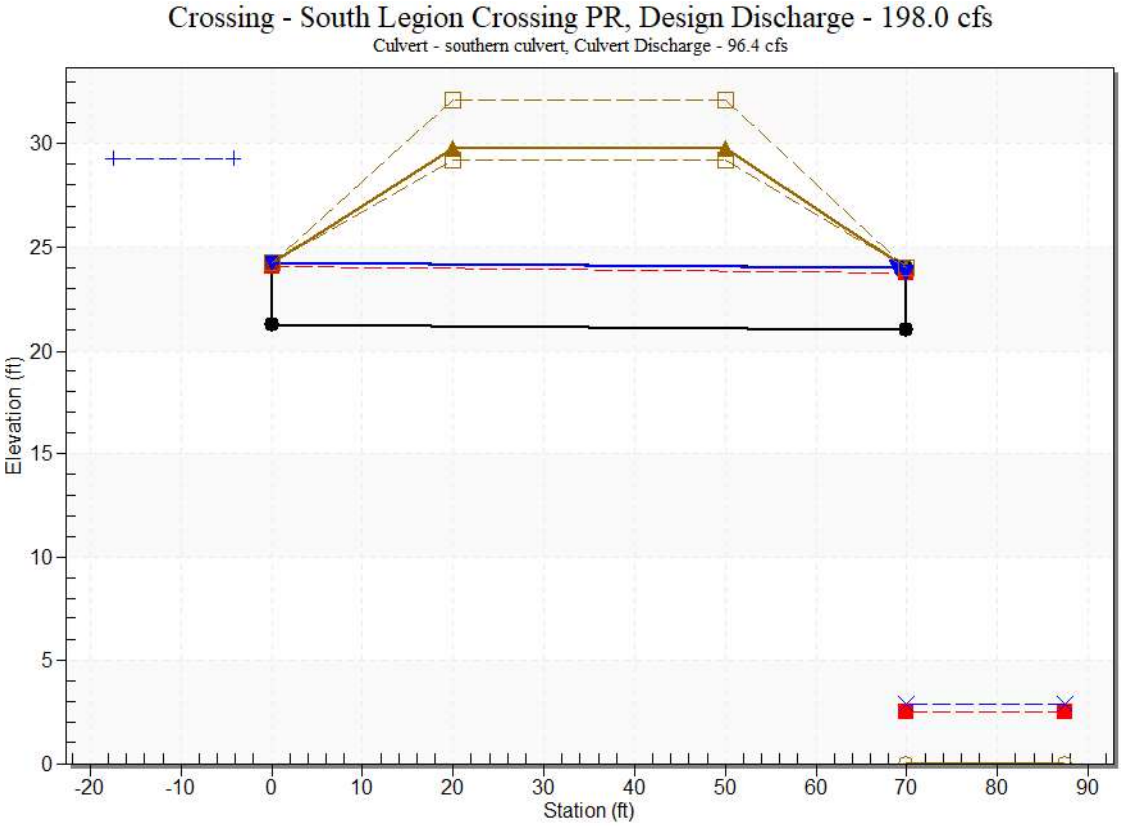
Culvert Length: 70.00 ft,

Culvert Slope: 0.0039

Culvert Performance Curve Plot: southern culvert



Water Surface Profile Plot for Culvert: southern culvert



Site Data - southern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 21.27 ft

Outlet Station: 70.00 ft

Outlet Elevation: 21.00 ft

Number of Barrels: 1

Culvert Data Summary - southern culvert

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Concrete

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Grooved End Projecting

Inlet Depression: None

Tailwater Data for Crossing: South Legion Crossing PR

Table 8 - Downstream Channel Rating Curve (Crossing: South Legion Crossing PR)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
42.00	1.22	1.22	4.04	1.22	0.70
78.00	1.74	1.74	4.89	1.73	0.73
107.00	2.08	2.08	5.37	2.07	0.74
134.00	2.35	2.35	5.73	2.35	0.75
166.00	2.64	2.64	6.09	2.64	0.76
198.00	2.91	2.91	6.40	2.90	0.77

Tailwater Channel Data - South Legion Crossing PR

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 7.00 ft

Side Slope (H:V): 1.25 (_:1)

Channel Slope: 0.0160

Channel Manning's n: 0.0450

Channel Invert Elevation: 0.00 ft

Roadway Data for Crossing: South Legion Crossing PR

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	32.09
1	42.90	31.26
2	111.84	29.99
3	174.20	29.29
4	266.00	29.20
5	322.00	29.63
6	353.80	30.30

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report

Project Data

Project Title: Poor house run – 2nd Street Culvert Analysis

Designer: William Ryall

Project Date:Friday, February 25, 2022

Project Notes: Comparison of existing and proposed runoff flow with existing culverts.

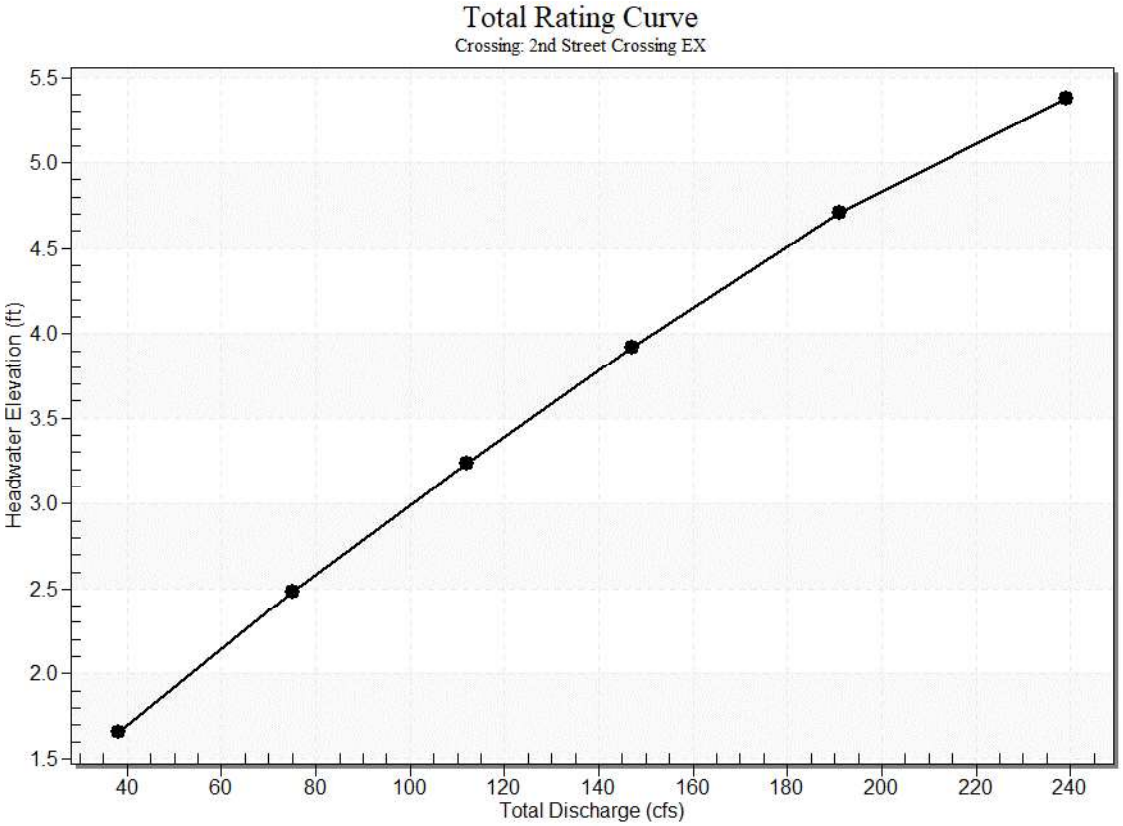
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 1 - Summary of Culvert Flows at Crossing: 2nd Street Crossing EX

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	northern culvert Discharge (cfs)	southern culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
1.66	2 year	38.00	18.99	19.08	0.00	8
2.48	5 year	75.00	37.48	37.51	0.00	3
3.23	10 year	112.00	56.09	55.91	0.00	3
3.92	25 year	147.00	73.74	73.27	0.00	3
4.71	50 year	191.00	93.48	97.58	0.00	3
5.38	100 year	239.00	115.50	123.50	0.00	3
11.90	Overtopping	428.20	212.98	215.22	0.00	Overtopping

Rating Curve Plot for Crossing: 2nd Street Crossing EX



Culvert Data: northern culvert

Table 2 - Culvert Summary Table: northern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	38.00 cfs	18.99 cfs	1.66	1.84	2.341	7-A2t	-1.00	1.24	1.68	0.59	3.52	3.86
5 year	75.00 cfs	37.48 cfs	2.48	2.67	3.166	7-A2t	-1.00	1.76	1.96	0.88	5.62	4.89
10 year	112.00 cfs	56.09 cfs	3.23	3.39	3.915	7-A2t	-1.00	2.17	2.19	1.11	7.29	5.60
25 year	147.00 cfs	73.74 cfs	3.92	4.05	4.598	7-A2c	-1.00	2.51	2.51	1.29	8.10	6.12

50 year	191.00 cfs	93.48 cfs	4.71	4.82	5.388	7-A2c	-1.00	2.84	2.84	1.50	8.85	6.66
100 year	239.00 cfs	115.50 cfs	5.38	5.78	6.057	7-A2c	-1.00	3.16	3.16	1.70	9.67	7.14

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

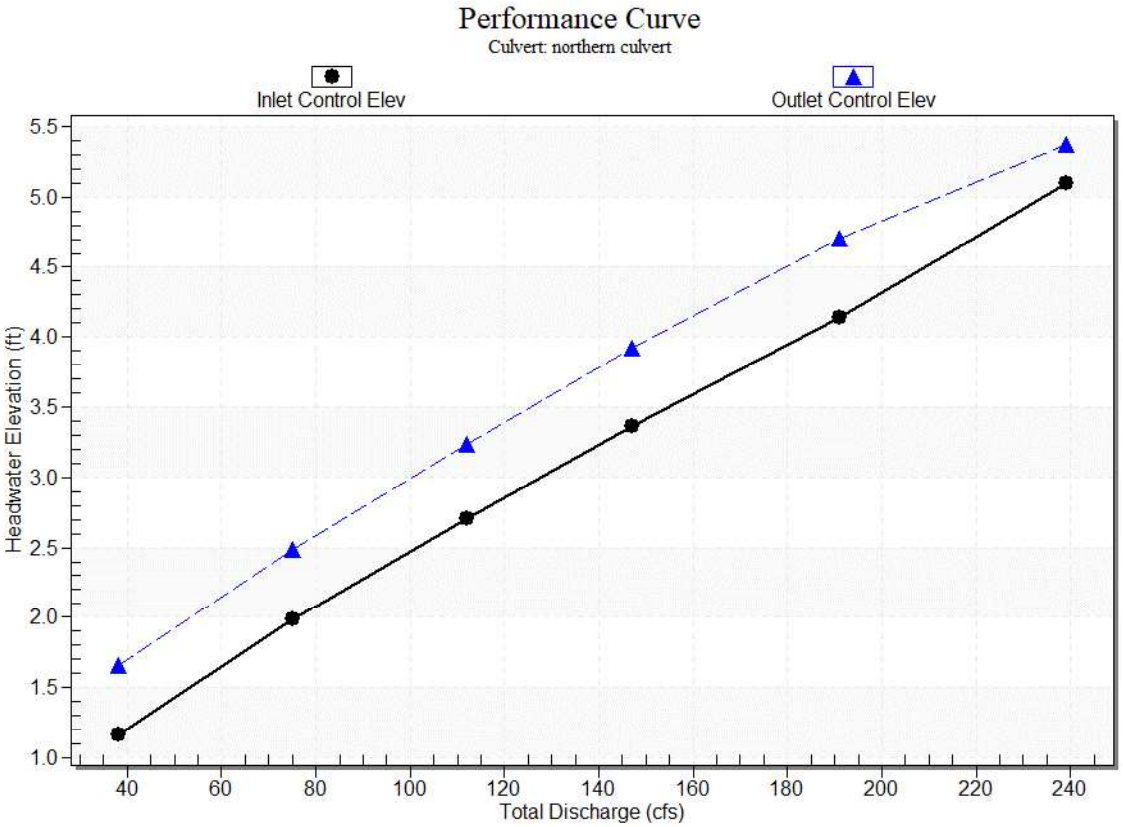
Inlet Elevation (invert): -0.68 ft,

Outlet Elevation (invert): -0.48 ft

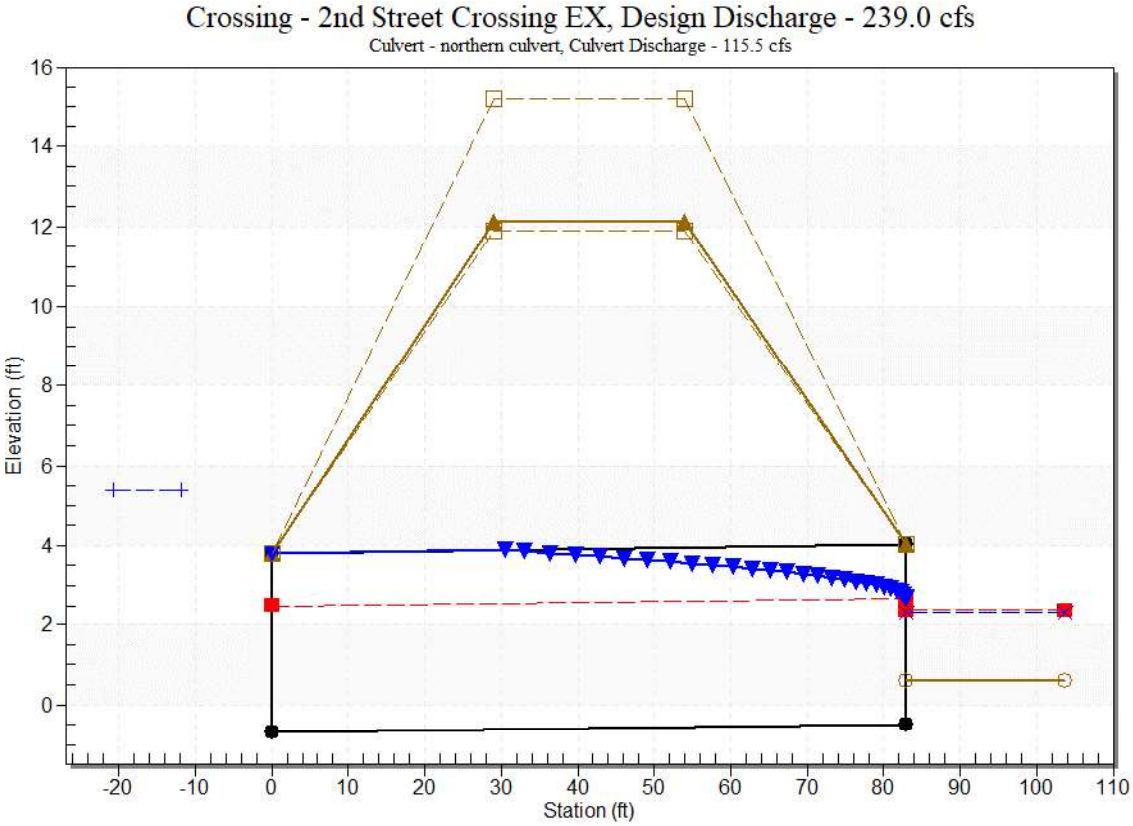
Culvert Length: 83.00 ft,

Culvert Slope: -0.0024

Culvert Performance Curve Plot: northern culvert



Water Surface Profile Plot for Culvert: northern culvert



Site Data - northern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: -0.68 ft

Outlet Station: 83.00 ft

Outlet Elevation: -0.48 ft

Number of Barrels: 1

Culvert Data Summary - northern culvert

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting (Ke=0.9)

Inlet Depression: None

Culvert Data: southern culvert

Table 3 - Culvert Summary Table: southern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	38.00 cfs	19.08 cfs	1.66	1.85	2.564	7-A2t	-1.00	1.24	1.57	0.59	3.87	3.86
5 year	75.00 cfs	37.51 cfs	2.48	2.68	3.388	7-A2t	-1.00	1.76	1.86	0.88	6.06	4.89
10 year	112.00 cfs	55.91 cfs	3.23	3.39	4.138	7-A2c	-1.00	2.17	2.17	1.11	7.37	5.60
25 year	147.00 cfs	73.27 cfs	3.92	4.04	4.821	7-A2c	-1.00	2.50	2.50	1.29	8.08	6.12
50 year	191.00 cfs	97.58 cfs	4.71	5.00	5.612	7-A2c	-1.00	2.90	2.90	1.50	9.00	6.66
100 year	239.00 cfs	123.50 cfs	5.38	6.18	6.280	7-A2c	-1.00	3.27	3.27	1.70	9.97	7.14

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

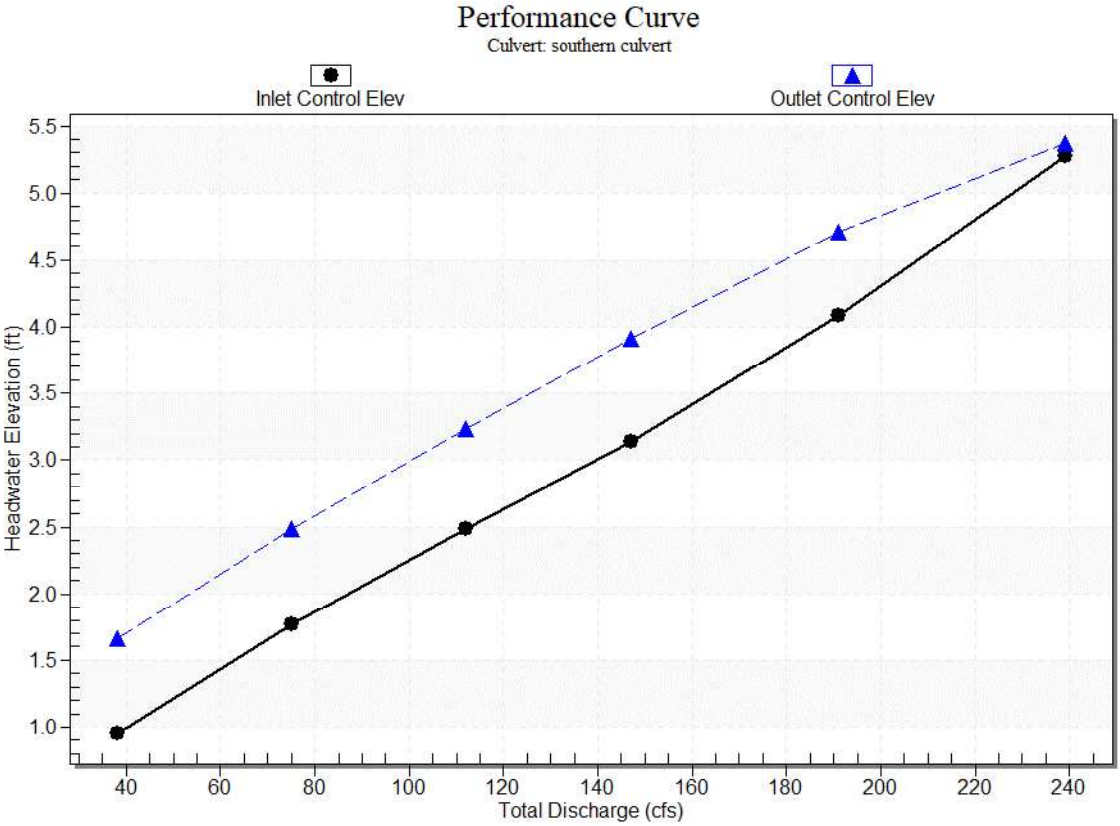
Inlet Elevation (invert): -0.91 ft,

Outlet Elevation (invert): -0.38 ft

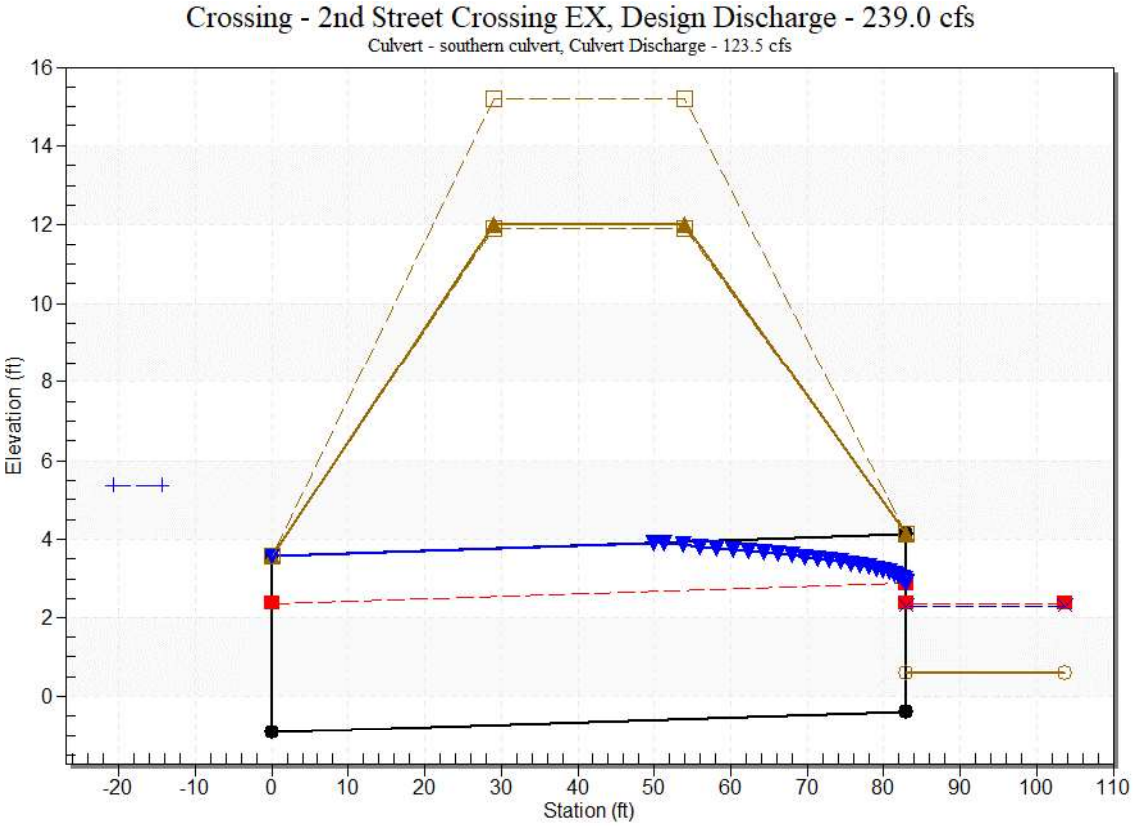
Culvert Length: 83.00 ft,

Culvert Slope: -0.0064

Culvert Performance Curve Plot: southern culvert



Water Surface Profile Plot for Culvert: southern culvert



Site Data - southern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: -0.91 ft

Outlet Station: 83.00 ft

Outlet Elevation: -0.38 ft

Number of Barrels: 1

Culvert Data Summary - southern culvert

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Data for Crossing: 2nd Street Crossing EX

Table 4 - Downstream Channel Rating Curve (Crossing: 2nd Street Crossing EX)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
38.00	1.19	0.59	3.86	0.92	0.93
75.00	1.48	0.88	4.89	1.37	0.98
112.00	1.71	1.11	5.60	1.73	1.01
147.00	1.89	1.29	6.12	2.02	1.04
191.00	2.10	1.50	6.66	2.34	1.06
239.00	2.30	1.70	7.14	2.65	1.07

Tailwater Channel Data - 2nd Street Crossing EX

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

Side Slope (H:V): 2.75 (_:1)

Channel Slope: 0.0250

Channel Manning's n: 0.0400

Channel Invert Elevation: 0.60 ft

Roadway Data for Crossing: 2nd Street Crossing EX

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	15.19
1	32.19	13.63
2	61.79	12.64
3	110.28	11.90
4	150.76	12.00
5	187.33	12.35
6	222.15	13.18

Roadway Surface: Paved

Roadway Top Width: 25.00 ft

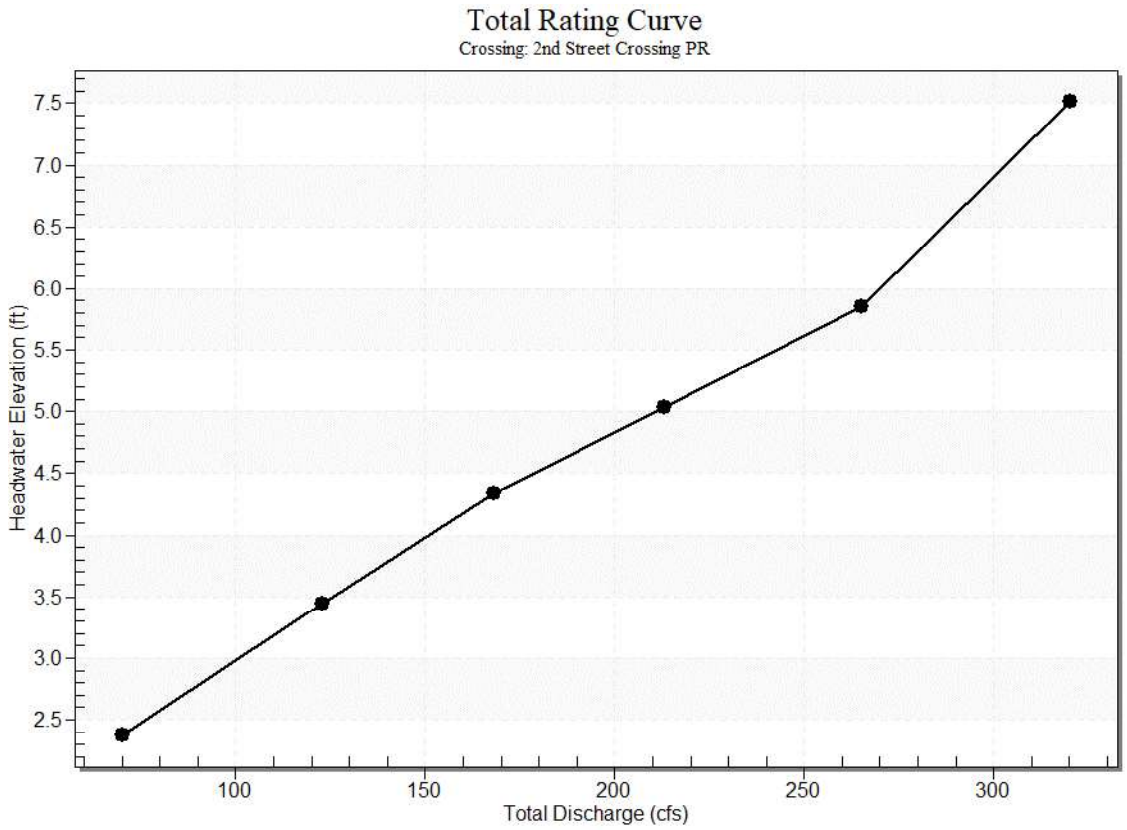
Crossing Discharge Data

Discharge Selection Method: Recurrence

Table 5 - Summary of Culvert Flows at Crossing: 2nd Street Crossing PR

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	northern culvert Discharge (cfs)	southern culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
2.38	2 year	70.00	34.99	35.05	0.00	6
3.45	5 year	123.00	61.64	61.40	0.00	3
4.34	10 year	168.00	84.49	83.52	0.00	3
5.03	25 year	213.00	102.03	110.98	0.00	4
5.86	50 year	265.00	130.53	134.50	0.00	7
7.51	100 year	320.00	158.41	161.61	0.00	4
11.90	Overtopping	428.20	212.98	215.22	0.00	Overtopping

Rating Curve Plot for Crossing: 2nd Street Crossing PR



Culvert Data: northern culvert

Table 6 - Culvert Summary Table: northern culvert

Disc	Total	Culv	Head	Inle	Out	Fl	Nor	Crit	Ou	Tail	Outl	Tail

harge Names	Discharge (cfs)	ert Discharge (cfs)	water Elevation (ft)	t Control Depth (ft)	let Control Depth (ft)	ow Type	mal Depth (ft)	ical Depth (ft)	tlet Depth (ft)	water Depth (ft)	et Velocity (ft/s)	water Velocity (ft/s)
2 year	70.00 cfs	34.99 cfs	2.38	2.56	3.061	7-A2t	-1.00	1.70	1.93	0.85	5.37	4.78
5 year	123.00 cfs	61.64 cfs	3.45	3.59	4.131	7-A2c	-1.00	2.28	2.28	1.17	7.61	5.78
10 year	168.00 cfs	84.49 cfs	4.34	4.46	5.019	7-A2c	-1.00	2.69	2.69	1.40	8.51	6.39
25 year	213.00 cfs	102.03 cfs	5.03	5.18	5.715	7-A2c	-1.00	2.97	2.97	1.59	9.17	6.89
50 year	265.00 cfs	130.53 cfs	5.86	6.54	6.489	7-JA2c	-1.00	3.36	3.36	1.80	10.24	7.38
100 year	320.00 cfs	158.41 cfs	7.51	8.19	7.429	7-JA2t	-1.00	3.68	3.68	2.00	11.37	7.81

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

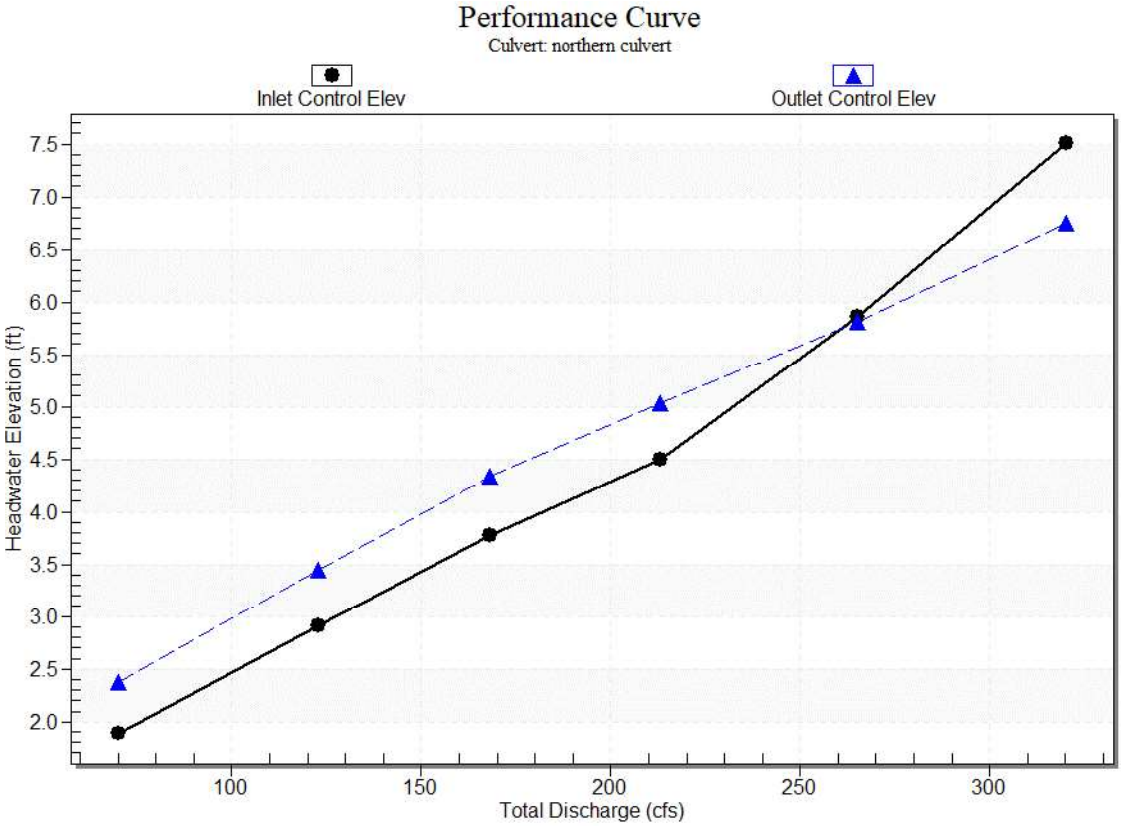
Inlet Elevation (invert): -0.68 ft,

Outlet Elevation (invert): -0.48 ft

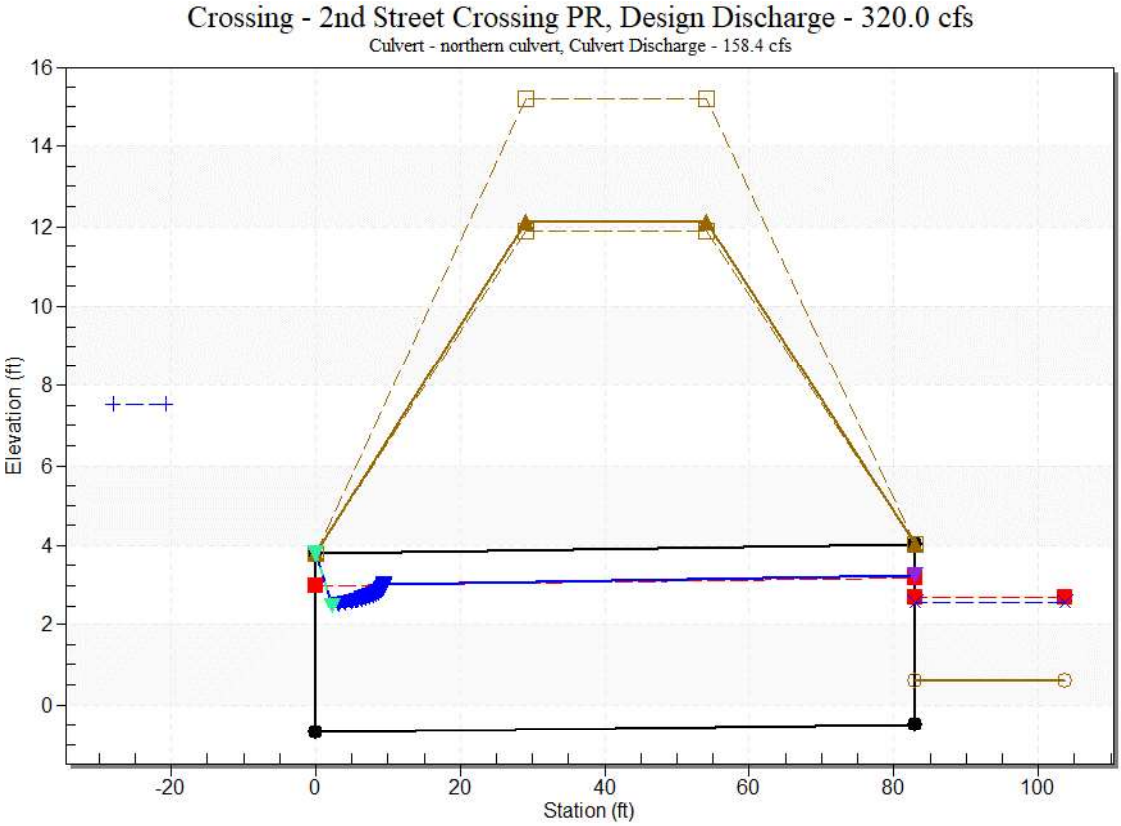
Culvert Length: 83.00 ft,

Culvert Slope: -0.0024

Culvert Performance Curve Plot: northern culvert



Water Surface Profile Plot for Culvert: northern culvert



Site Data - northern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: -0.68 ft

Outlet Station: 83.00 ft

Outlet Elevation: -0.48 ft

Number of Barrels: 1

Culvert Data Summary - northern culvert

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting (Ke=0.9)

Inlet Depression: None

Culvert Data: southern culvert

Table 7 - Culvert Summary Table: southern culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
2 year	70.00 cfs	35.05 cfs	2.38	2.58	3.284	7-A2t	-1.00	1.70	1.82	0.85	5.80	4.78
5 year	123.00 cfs	61.40 cfs	3.45	3.60	4.354	7-A2c	-1.00	2.28	2.28	1.17	7.60	5.78
10 year	168.00 cfs	83.52 cfs	4.34	4.43	5.242	7-A2c	-1.00	2.68	2.68	1.40	8.47	6.39
25 year	213.00 cfs	110.98 cfs	5.03	5.58	5.938	7-A2c	-1.00	3.10	3.10	1.59	9.50	6.89
50 year	265.00 cfs	134.50 cfs	5.86	6.76	6.612	7-JA2c	-1.00	3.41	3.41	1.80	10.40	7.38
100 year	320.00 cfs	161.61 cfs	7.51	8.42	7.549	7-JA2c	-1.00	3.72	3.72	2.00	11.51	7.81

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

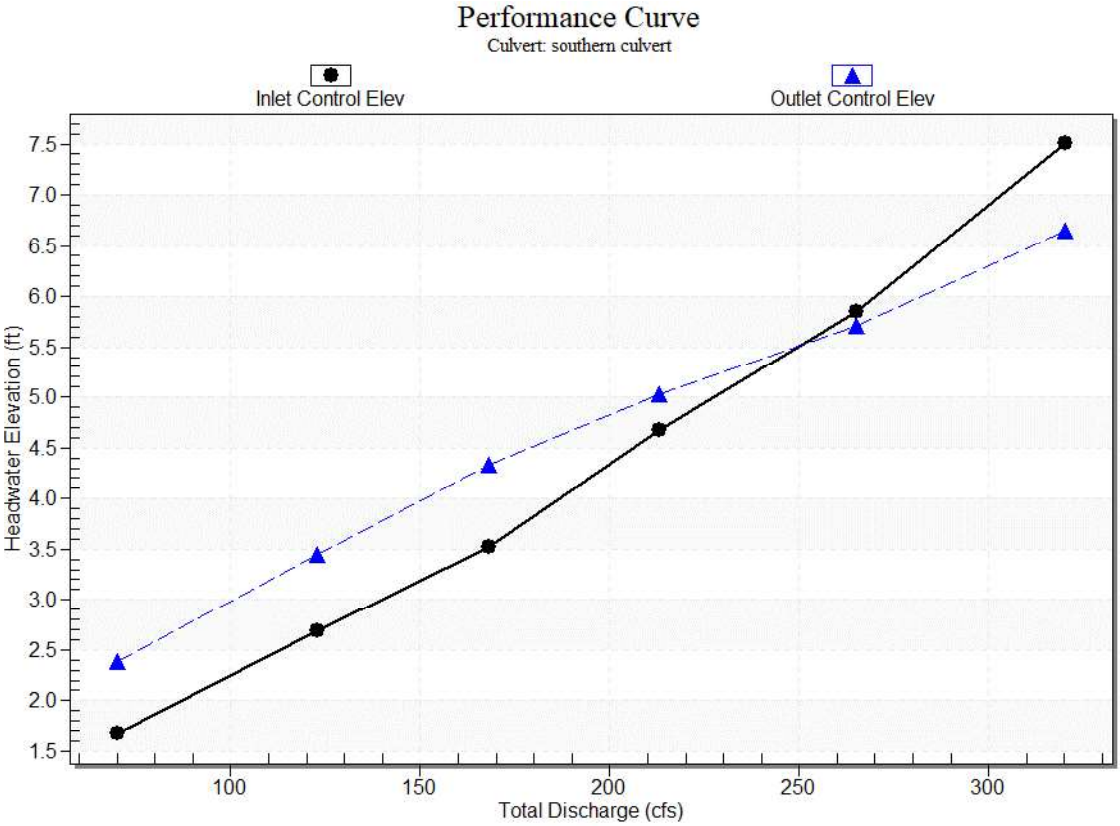
Inlet Elevation (invert): -0.91 ft,

Outlet Elevation (invert): -0.38 ft

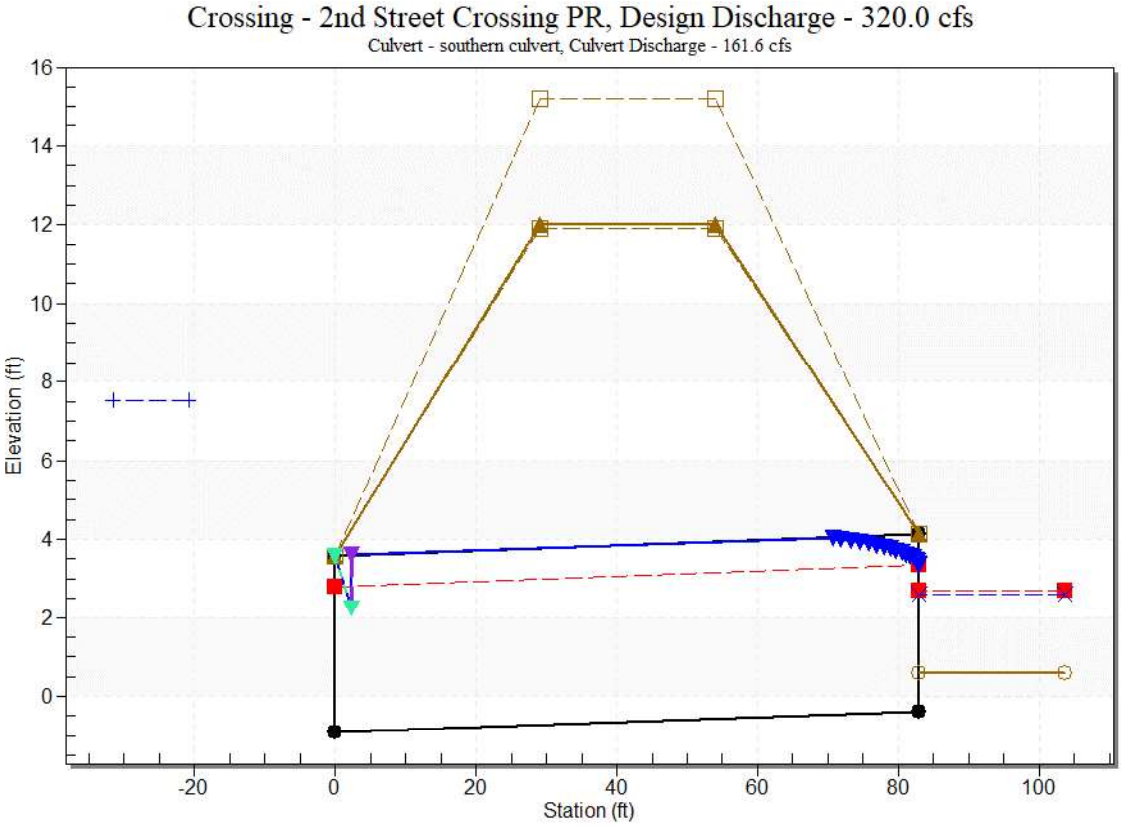
Culvert Length: 83.00 ft,

Culvert Slope: -0.0064

Culvert Performance Curve Plot: southern culvert



Water Surface Profile Plot for Culvert: southern culvert



Site Data - southern culvert

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: -0.91 ft

Outlet Station: 83.00 ft

Outlet Elevation: -0.38 ft

Number of Barrels: 1

Culvert Data Summary - southern culvert

Barrel Shape: Circular

Barrel Diameter: 4.50 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Tailwater Data for Crossing: 2nd Street Crossing PR

Table 8 - Downstream Channel Rating Curve (Crossing: 2nd Street Crossing PR)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
70.00	1.45	0.85	4.78	1.32	0.98
123.00	1.77	1.17	5.78	1.82	1.02
168.00	2.00	1.40	6.39	2.18	1.05
213.00	2.19	1.59	6.89	2.49	1.06
265.00	2.40	1.80	7.38	2.81	1.08
320.00	2.60	2.00	7.81	3.12	1.10

Tailwater Channel Data - 2nd Street Crossing PR

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 15.00 ft

Side Slope (H:V): 2.75 (_:1)

Channel Slope: 0.0250

Channel Manning's n: 0.0400

Channel Invert Elevation: 0.60 ft

Roadway Data for Crossing: 2nd Street Crossing PR

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

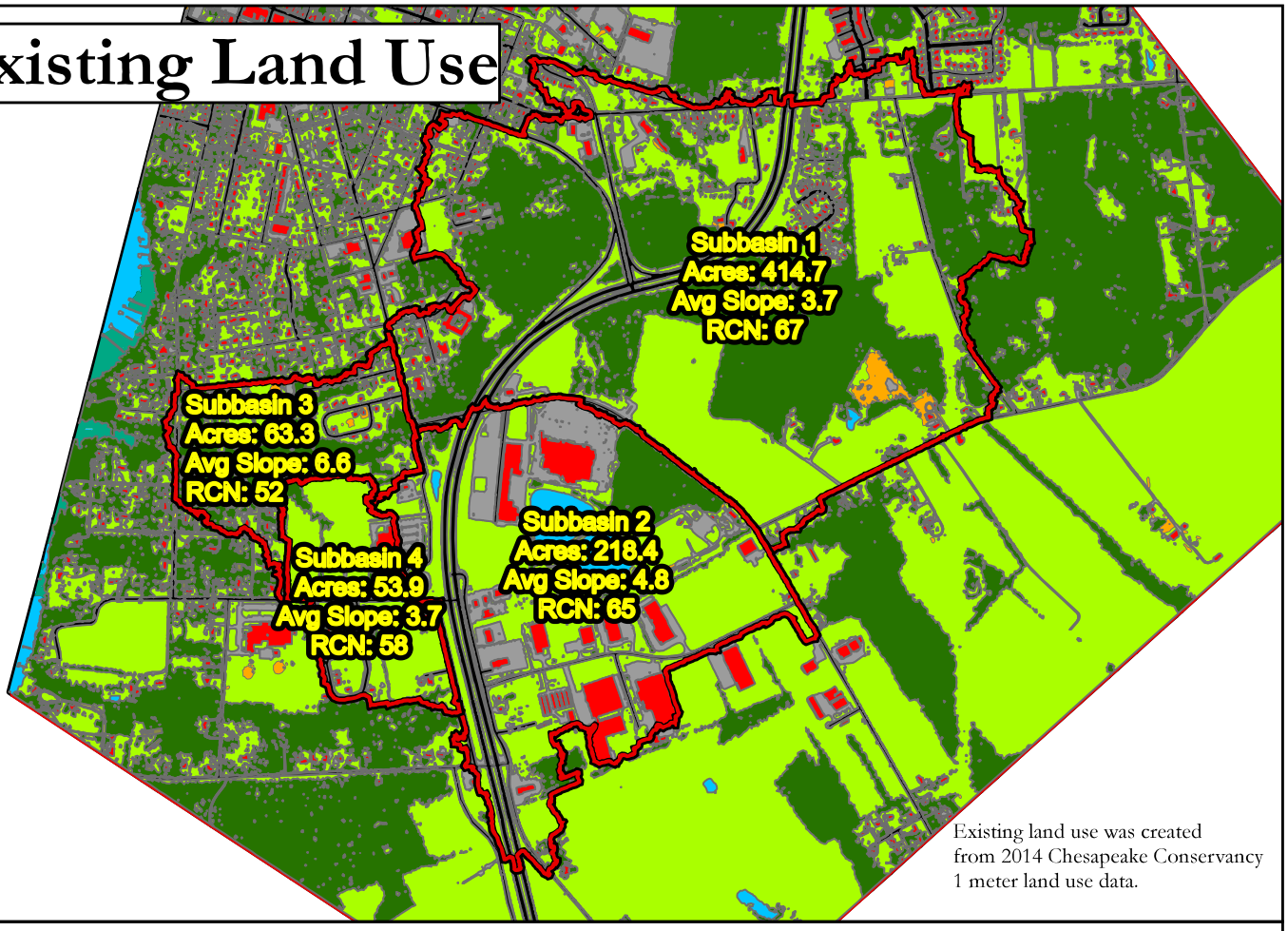
Irregular Roadway Cross-Section

Coord No.	Station (ft)	Elevation (ft)
0	0.00	15.19
1	32.19	13.63
2	61.79	12.64
3	110.28	11.90
4	150.76	12.00
5	187.33	12.35
6	222.15	13.18

Roadway Surface: Paved

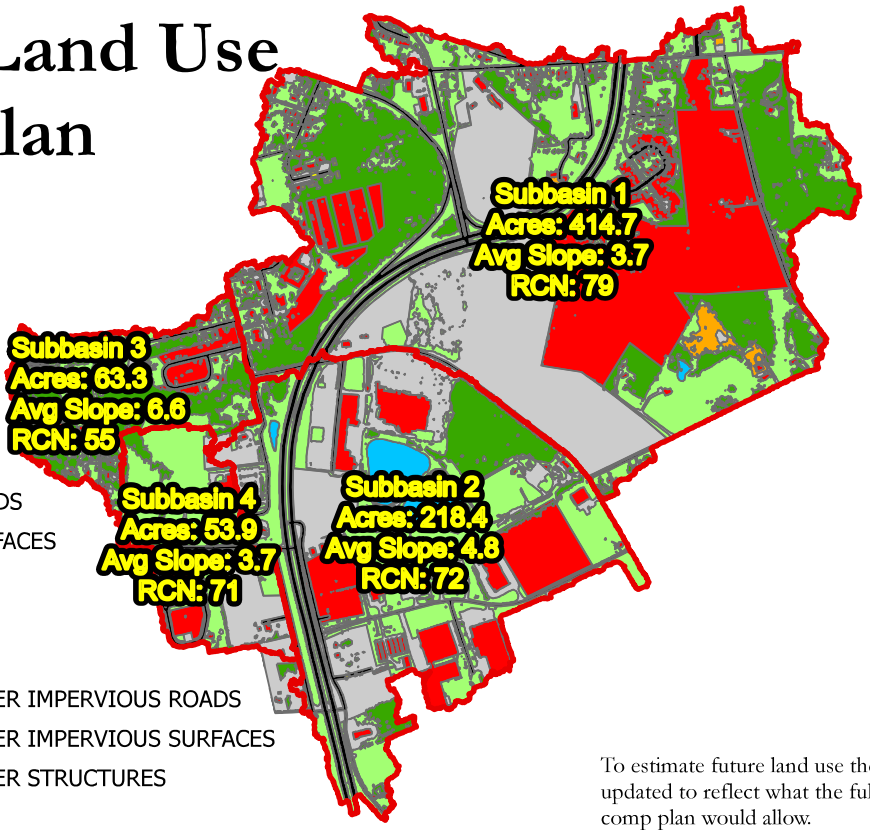
Roadway Top Width: 25.00 ft

Existing Land Use



Existing land use was created from 2014 Chesapeake Conservancy 1 meter land use data.

Future Land Use Comp Plan



LANDUSE

- BARREN
- IMPERVIOUS ROADS
- IMPERVIOUS SURFACES
- LOW VEGETATION
- STRUCTURES
- TREE CANOPY
- TREE CANOPY OVER IMPERVIOUS ROADS
- TREE CANOPY OVER IMPERVIOUS SURFACES
- TREE CANOPY OVER STRUCTURES
- WATER

To estimate future land use the existing land use data was updated to reflect what the full build out of the comp plan would allow.

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	3.40	0.70	156.21	24.70	0 01:54:31
2	2	63.25	284.00	52.00	3.40	0.22	14.17	1.91	0 01:04:05
3	3	52.87	284.00	58.00	3.40	0.41	21.89	2.98	0 01:46:50
4	4	414.75	284.00	67.00	3.40	0.79	329.31	20.42	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	36.61	8.74	0.00	11.28	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	2.98	13.27	0.00	12.62	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	20.42	23.46	0.00	4.15	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	24.69	22.32	0.00	3.96	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	34.44	18.86	0.00	7.76	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					37.83	3.97					

EX-2 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	36.54	7775.14	0.00	1.89	1.72	0.13	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	2.98	15547.20	0.00	5.78	0.38	0.03	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	20.42	374.12	0.05	3.75	0.85	0.17	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	24.69	326.72	0.08	3.66	1.04	0.21	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	34.44	6323.30	0.01	2.37	0.75	0.09	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	65
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

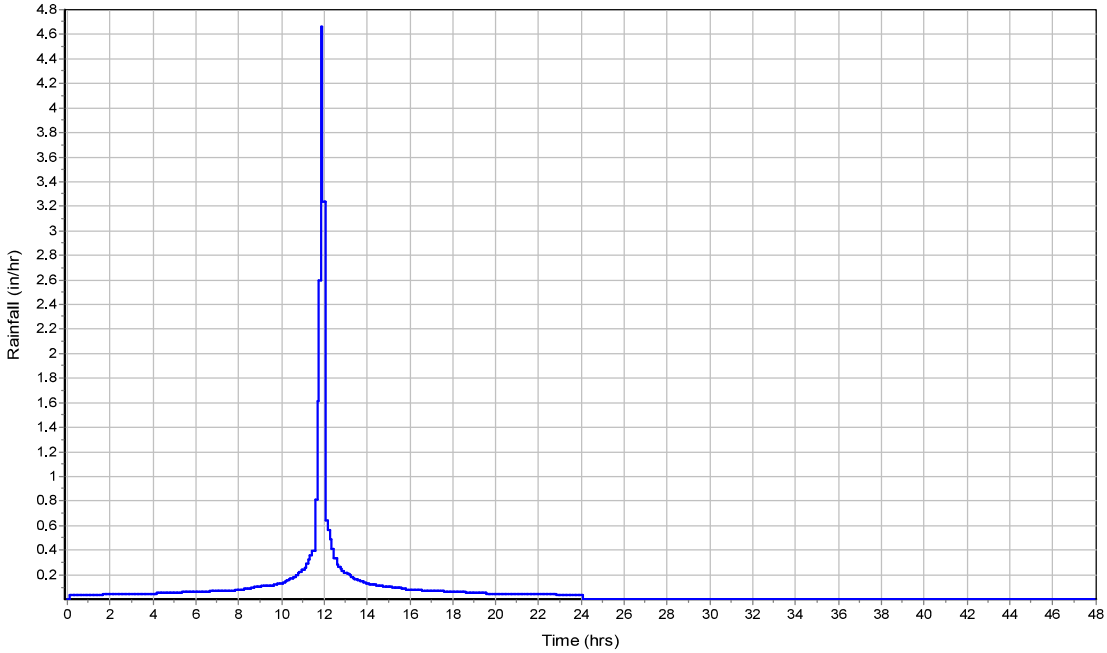
Total TOC (min) 114.53

Subbasin Runoff Results

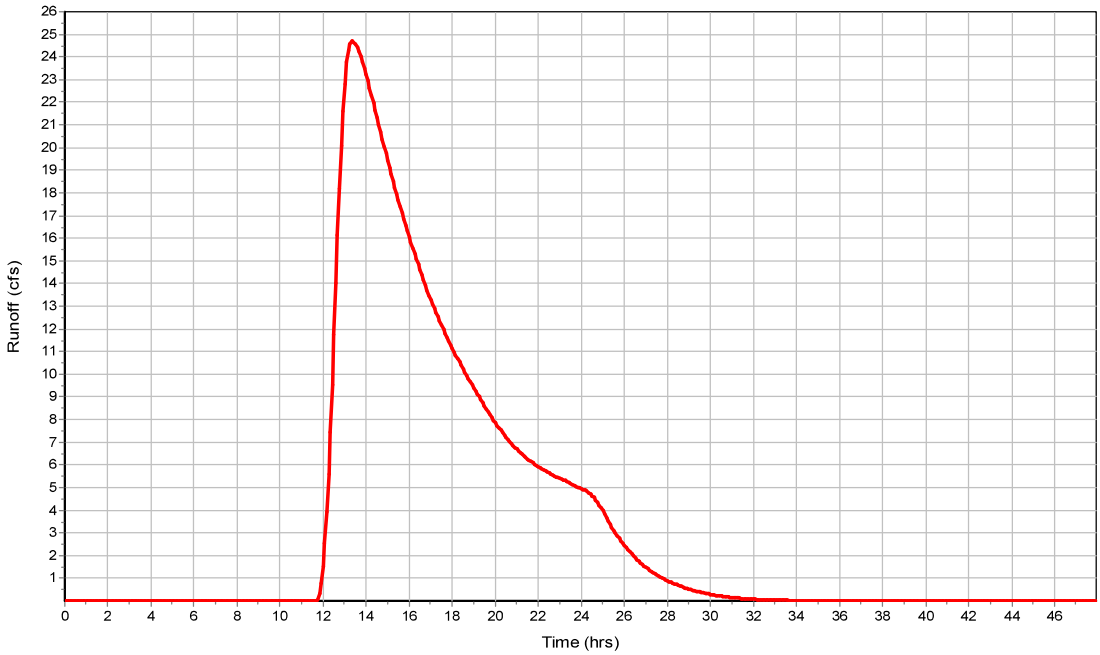
Total Rainfall (in)	3.4
Total Runoff (in)	0.7
Peak Runoff (cfs)	24.7
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 52
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

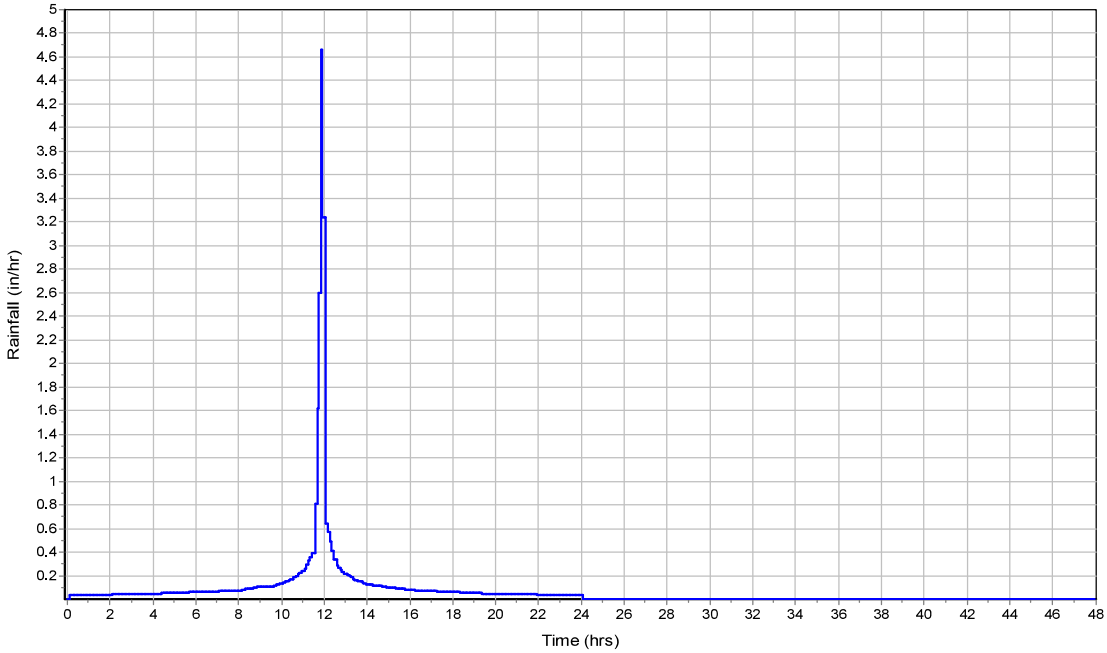
Total TOC (min) 64.09

Subbasin Runoff Results

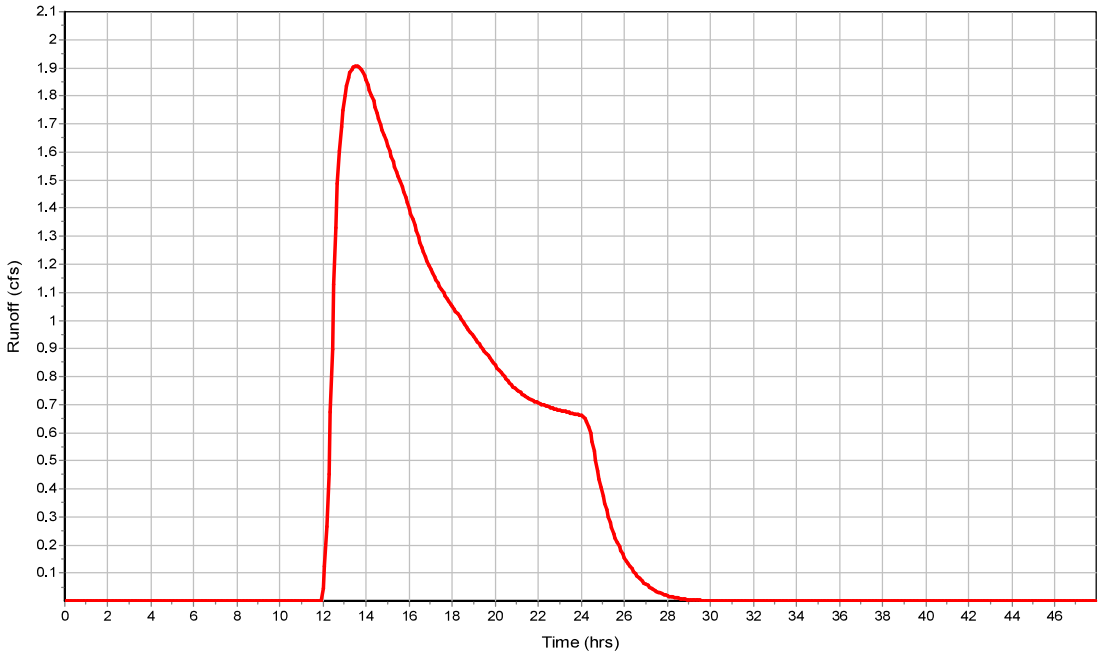
Total Rainfall (in) 3.4
Total Runoff (in) 0.22
Peak Runoff (cfs) 1.91
Weighted Curve Number 52
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 58
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

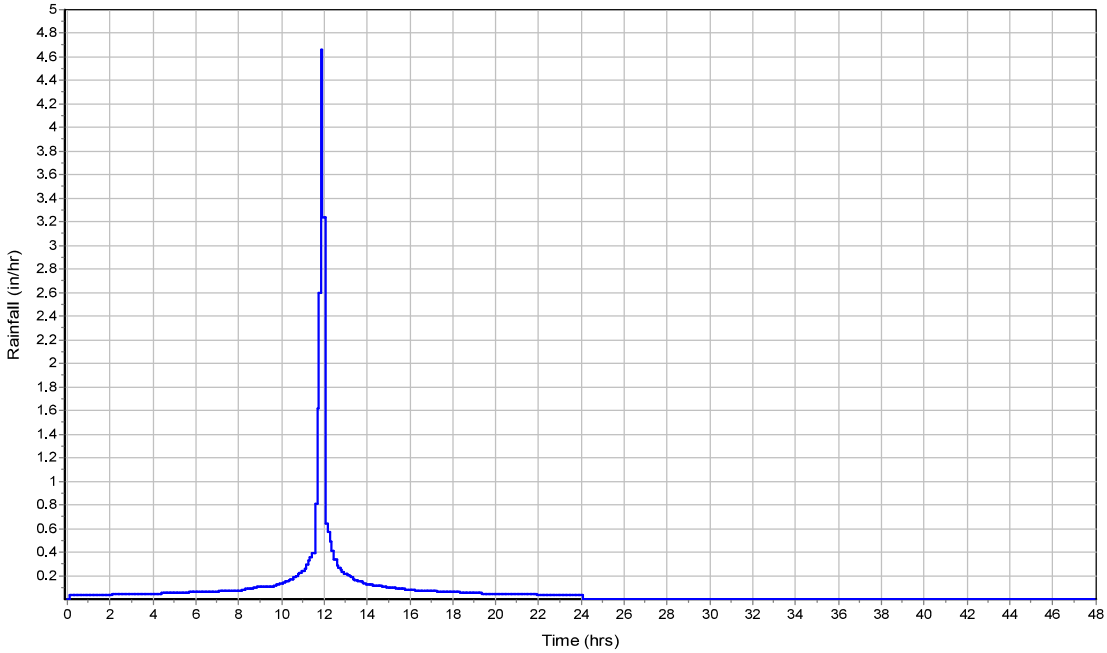
Total TOC (min) 106.84

Subbasin Runoff Results

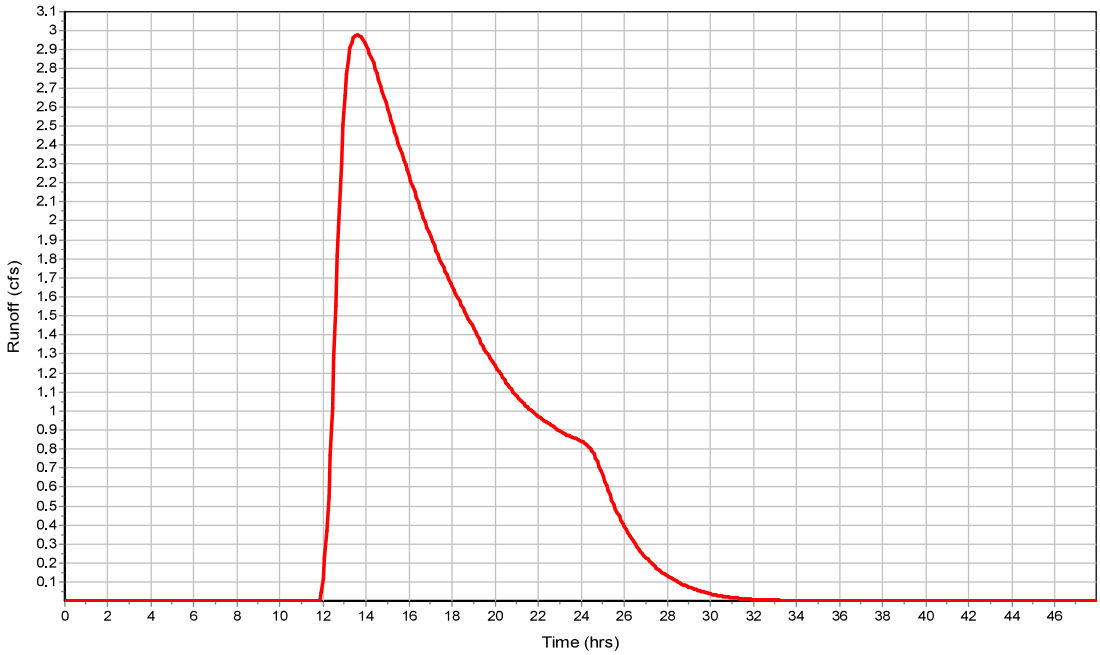
Total Rainfall (in) 3.4
Total Runoff (in) 0.41
Peak Runoff (cfs) 2.98
Weighted Curve Number 58
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

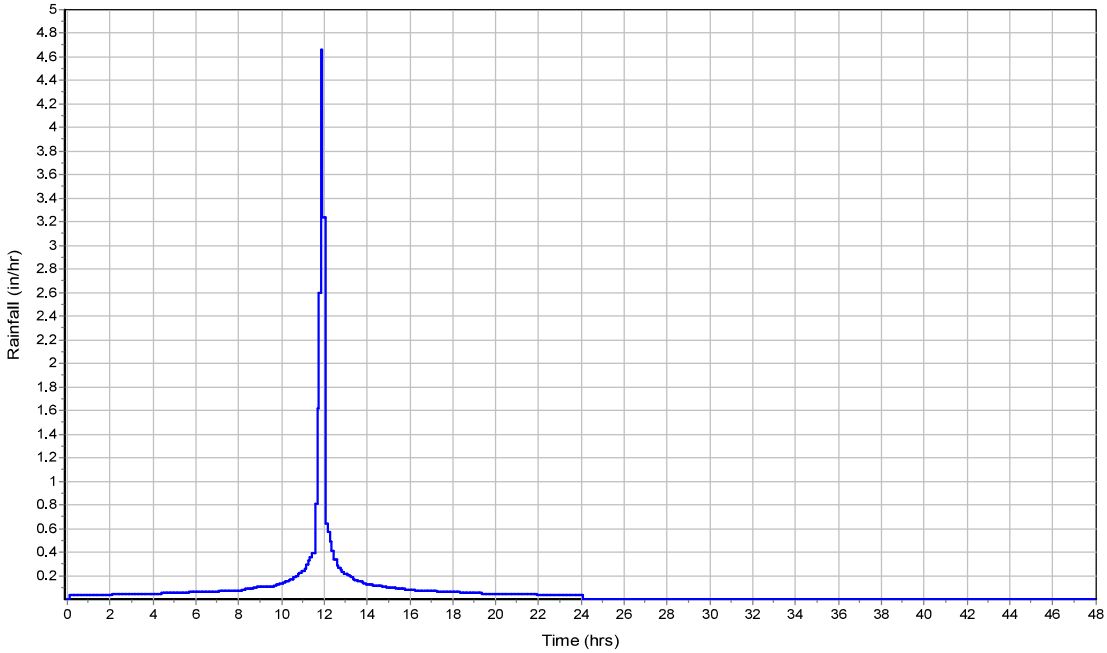
Total TOC (min) 436.75

Subbasin Runoff Results

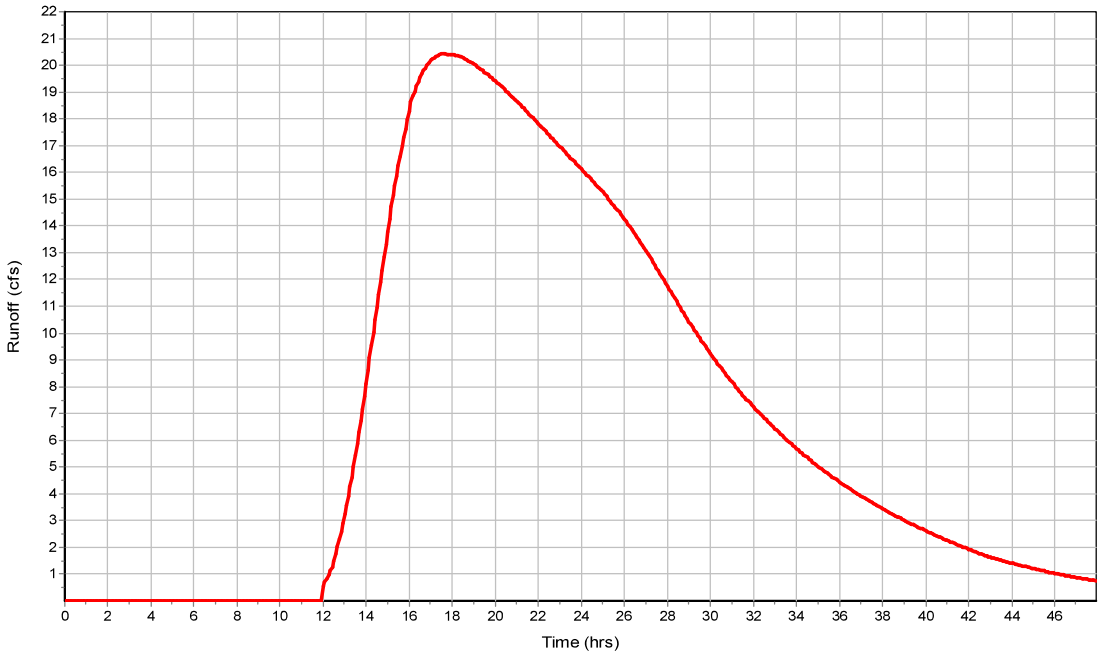
Total Rainfall (in) 3.4
Total Runoff (in) 0.79
Peak Runoff (cfs) 20.42
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	36.61	0.00	8.74	8.74	0.00	11.28	7.73	7.73	0 16:17	0 00:00	0.00	0.00
2	FIELD	2.98	2.98	13.27	13.27	0.00	12.62	12.98	12.98	0 13:40	0 00:00	0.00	0.00
3	N-LEGION	20.42	20.42	23.46	23.46	0.00	4.15	22.97	22.97	0 17:35	0 00:00	0.00	0.00
4	S-LEGION	24.69	24.69	22.32	22.32	0.00	3.96	21.48	21.48	0 13:25	0 00:00	0.00	0.00
5	UPSTREAM	34.44	0.00	18.86	18.86	0.00	7.76	18.21	18.21	0 13:26	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	36.54	0 16:35	7775.14	0.00	1.89	18.08	1.72	0.13	0.00		
2	FIELDS	2.98	0 13:41	15547.20	0.00	5.78	0.63	0.38	0.03	0.00		
3	NLEGION	20.42	0 17:37	374.12	0.05	3.75	1.27	0.85	0.17	0.00		
4	SLEGION	24.69	0 13:26	326.72	0.08	3.66	1.23	1.04	0.21	0.00		
5	UPSTREAM	34.44	0 16:18	6323.30	0.01	2.37	9.77	0.75	0.09	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	3.40	1.06	235.65	42.33	0 01:54:31
2	2	63.25	284.00	55.00	3.40	0.31	19.80	3.19	0 01:04:05
3	3	52.87	284.00	71.00	3.40	1.00	52.92	9.88	0 01:46:50
4	4	414.75	284.00	79.00	3.40	1.49	617.56	41.75	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	68.70	9.16	0.00	10.85	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	9.88	13.52	0.00	12.37	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	41.73	23.93	0.00	3.68	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	42.30	22.74	0.00	3.55	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	63.64	19.27	0.00	7.35	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					70.49	4.40					

FUT-2 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	68.77	7775.14	0.01	1.91	2.15	0.17	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	9.88	15547.20	0.00	5.75	0.63	0.05	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	41.73	374.12	0.11	4.75	1.32	0.26	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	42.29	326.72	0.13	4.35	1.45	0.29	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	63.61	6323.30	0.01	3.00	1.04	0.12	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac) 223.15
Peak Rate Factor 284
Weighted Curve Number 72
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

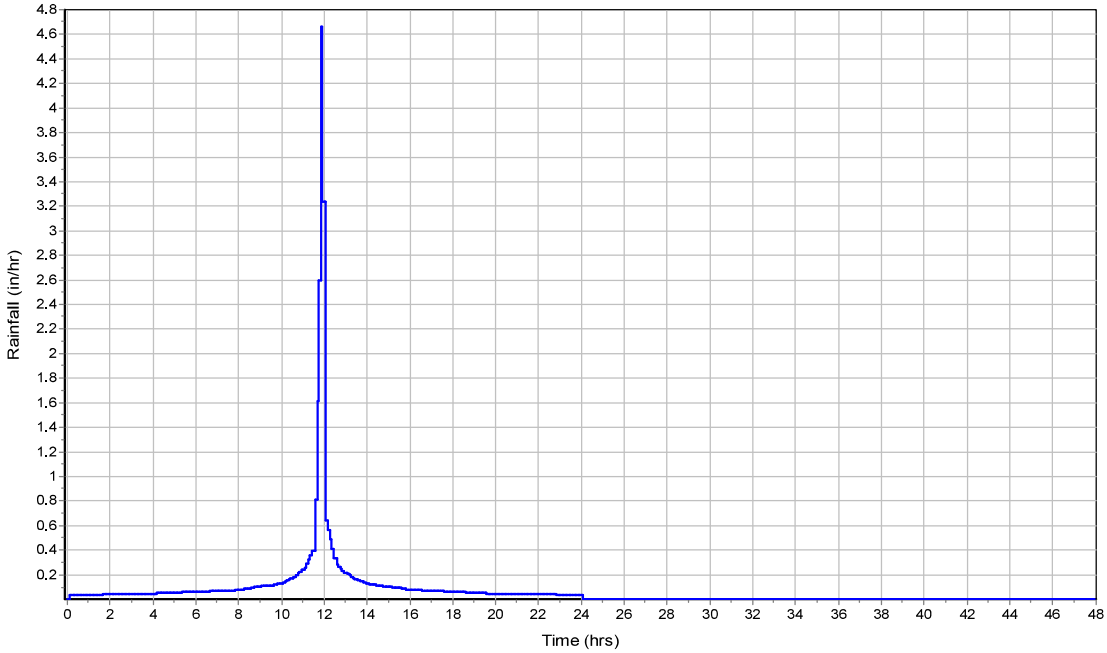
Total TOC (min) 114.53

Subbasin Runoff Results

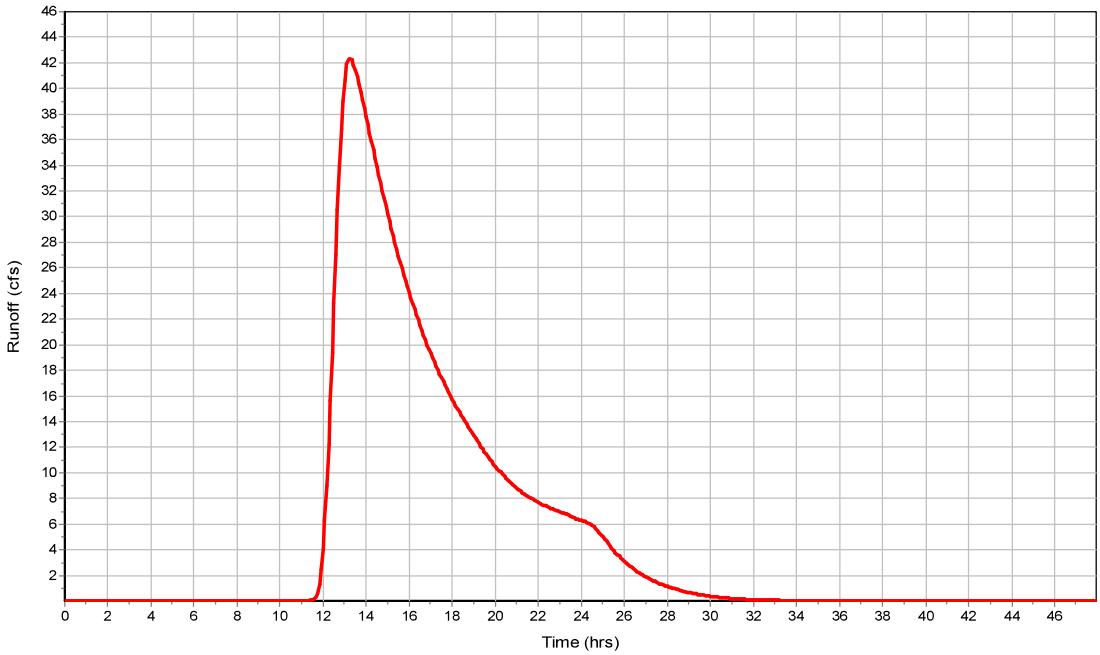
Total Rainfall (in)	3.4
Total Runoff (in)	1.06
Peak Runoff (cfs)	42.33
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

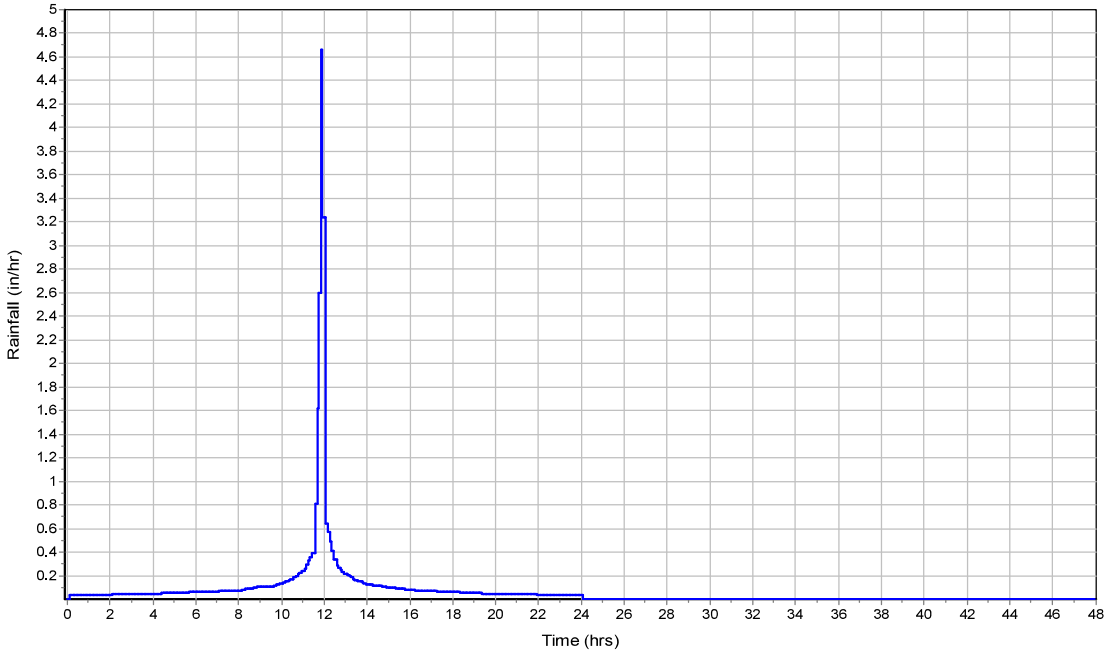
Total TOC (min) 64.09

Subbasin Runoff Results

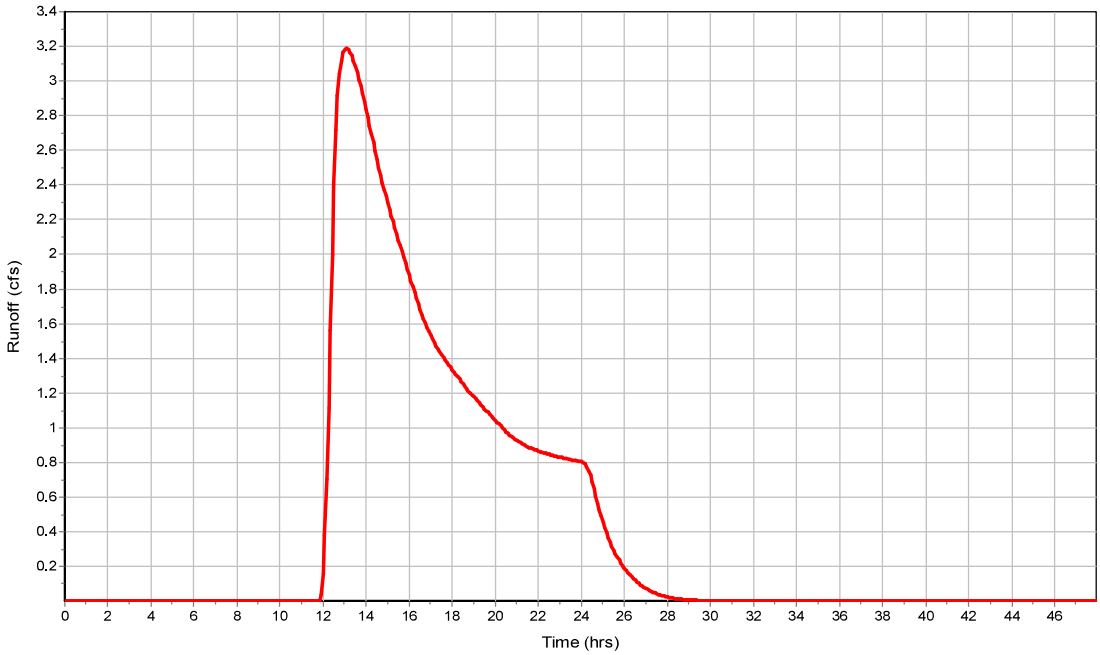
Total Rainfall (in) 3.4
Total Runoff (in) 0.31
Peak Runoff (cfs) 3.19
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

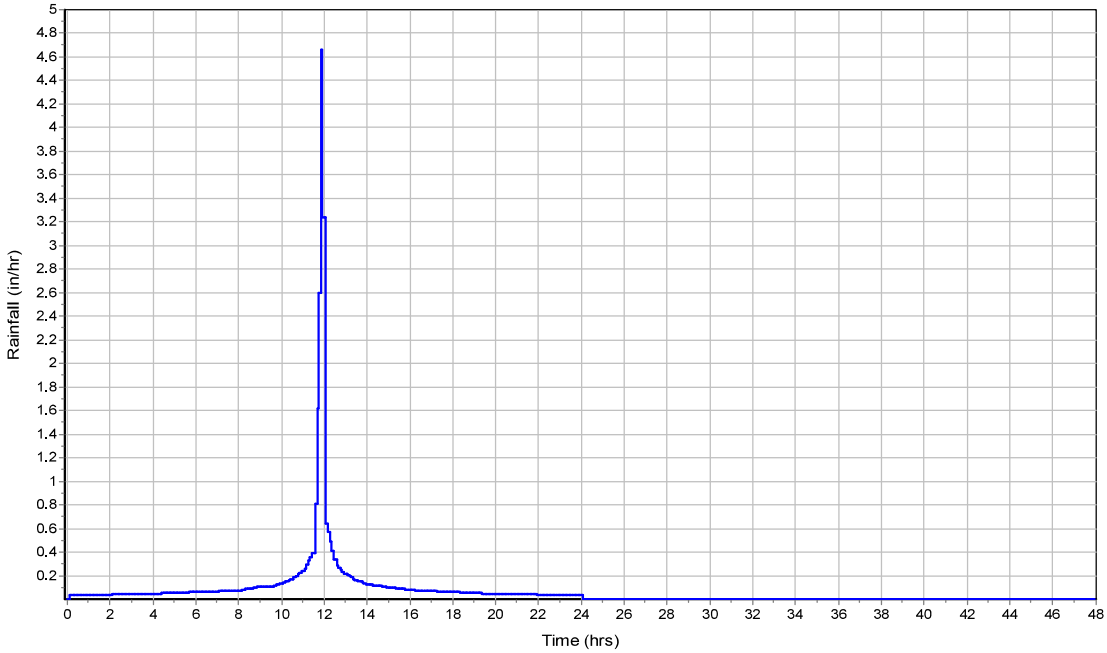
Total TOC (min) 106.84

Subbasin Runoff Results

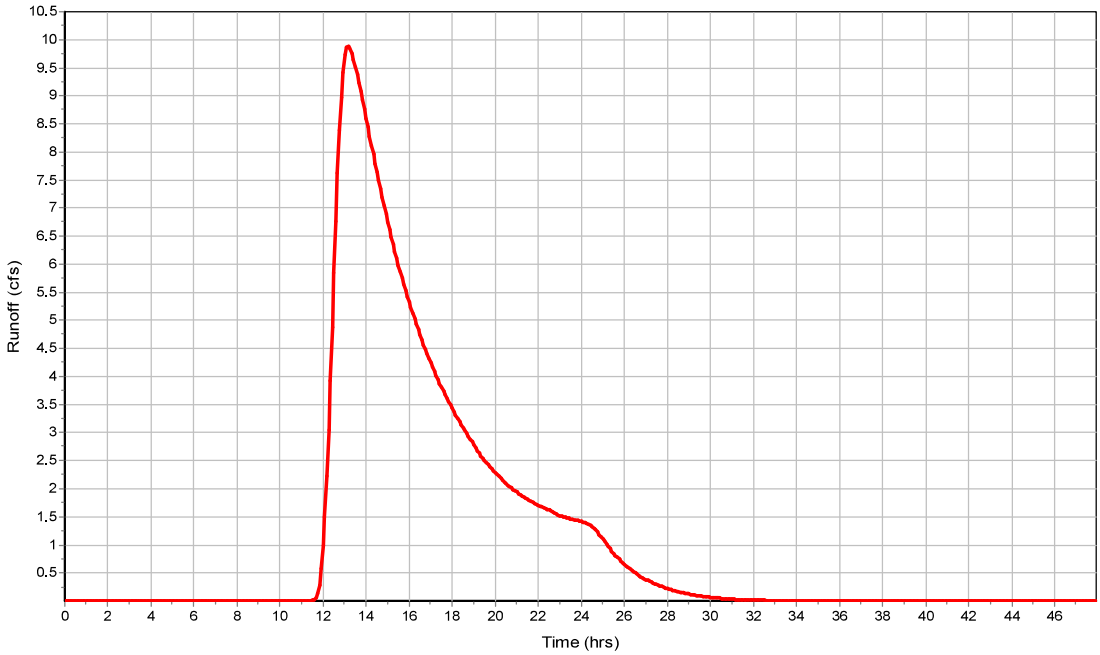
Total Rainfall (in) 3.4
Total Runoff (in) 1
Peak Runoff (cfs) 9.88
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

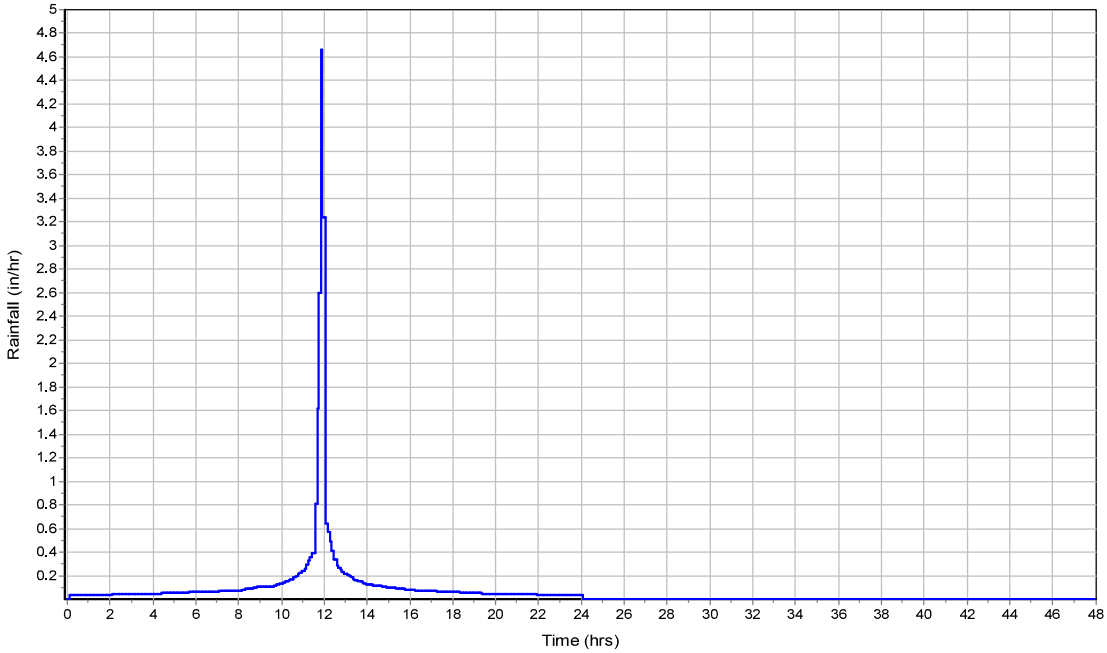
Total TOC (min) 436.75

Subbasin Runoff Results

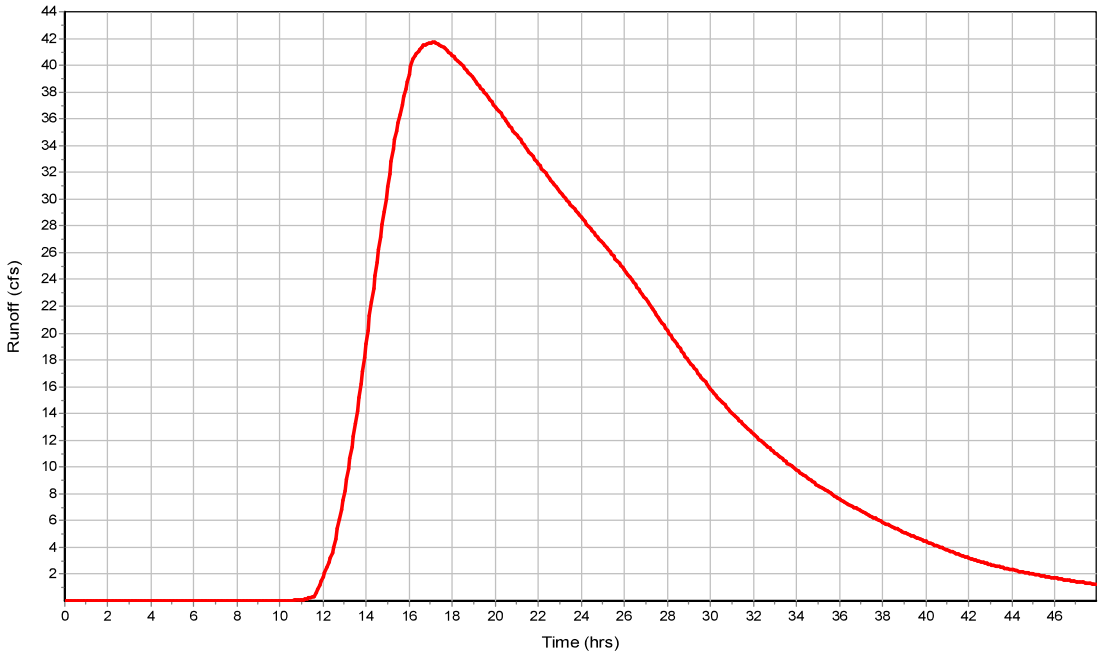
Total Rainfall (in) 3.4
Total Runoff (in) 1.49
Peak Runoff (cfs) 41.75
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	68.70	0.00	9.16	9.16	0.00	10.85	7.93	7.93	0 16:17	0 00:00	0.00	0.00
2	FIELD	9.88	9.88	13.52	13.52	0.00	12.37	13.02	13.02	0 13:15	0 00:00	0.00	0.00
3	N-LEGION	41.73	41.73	23.93	23.93	0.00	3.68	23.13	23.13	0 17:10	0 00:00	0.00	0.00
4	S-LEGION	42.30	42.30	22.74	22.74	0.00	3.55	21.53	21.53	0 13:20	0 00:00	0.00	0.00
5	UPSTREAM	63.64	0.00	19.27	19.27	0.00	7.35	18.38	18.38	0 13:20	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	68.77	0 16:31	7775.14	0.01	1.91	17.89	2.15	0.17	0.00		
2	FIELDS	9.88	0 13:15	15547.20	0.00	5.75	0.64	0.63	0.05	0.00		
3	NLEGION	41.73	0 17:10	374.12	0.11	4.75	1.00	1.32	0.26	0.00		
4	SLEGION	42.29	0 13:20	326.72	0.13	4.35	1.04	1.45	0.29	0.00		
5	UPSTREAM	63.61	0 16:18	6323.30	0.01	3.00	7.71	1.04	0.12	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########## SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########## NO

Analysis Options

Start Analysis On 00:00:00 00:00:00
End Analysis On 00:00:00 00:00:00
Start Reporting On 00:00:00 00:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss
Routing Time Step ..... 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	4
Nodes	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	4.50	1.33	296.79	52.63	0 01:54:31
2	2	63.25	284.00	52.00	4.50	0.59	37.51	7.34	0 01:04:05
3	3	52.87	284.00	58.00	4.50	0.91	47.85	7.89	0 01:46:50
4	4	414.75	284.00	67.00	4.50	1.46	607.19	39.60	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	71.81	9.20	0.00	10.82	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	7.89	13.46	0.00	12.43	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	39.59	23.89	0.00	3.72	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	52.60	22.94	0.00	3.34	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	66.62	19.48	0.00	7.14	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					75.49	4.43					

EX-5 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	71.66	7775.14	0.01	1.91	2.18	0.17	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	7.89	15547.20	0.00	5.80	0.57	0.04	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	39.59	374.12	0.11	4.67	1.28	0.26	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	52.59	326.72	0.16	4.65	1.66	0.33	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	66.62	6323.30	0.01	3.05	1.07	0.12	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	65
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

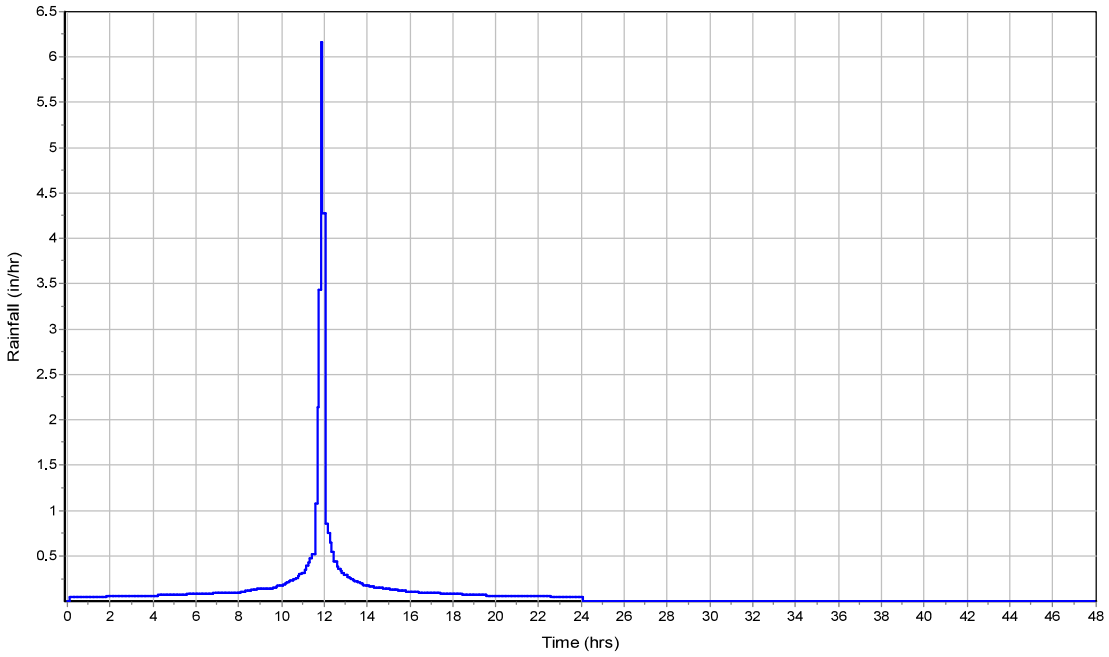
Total TOC (min) 114.53

Subbasin Runoff Results

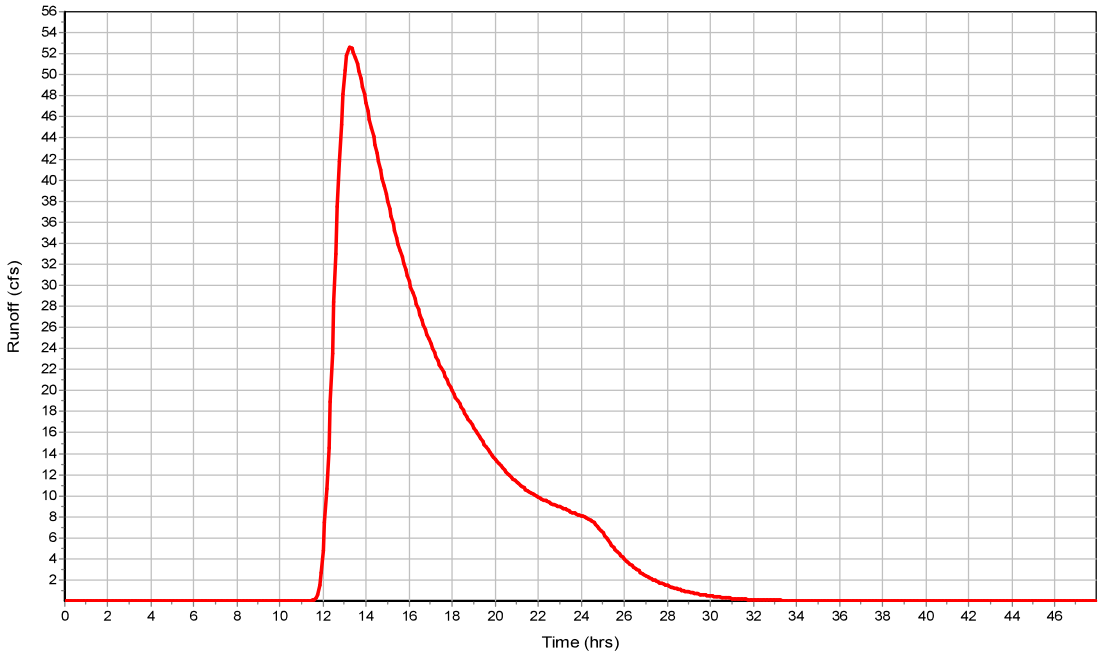
Total Rainfall (in)	4.5
Total Runoff (in)	1.33
Peak Runoff (cfs)	52.63
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 52
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

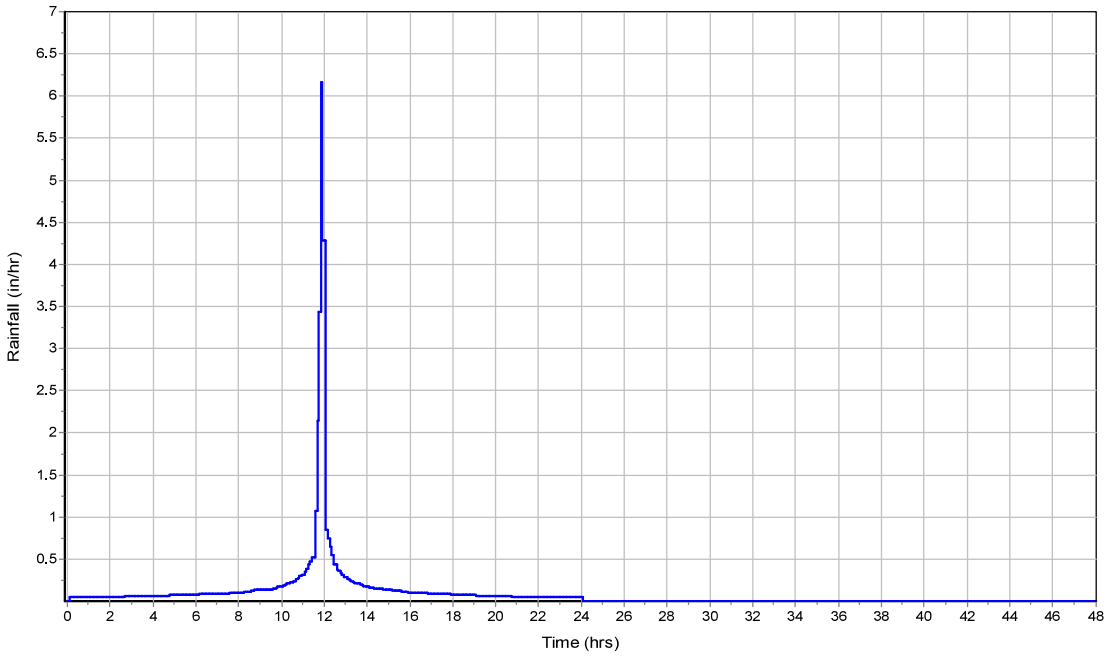
Total TOC (min) 64.09

Subbasin Runoff Results

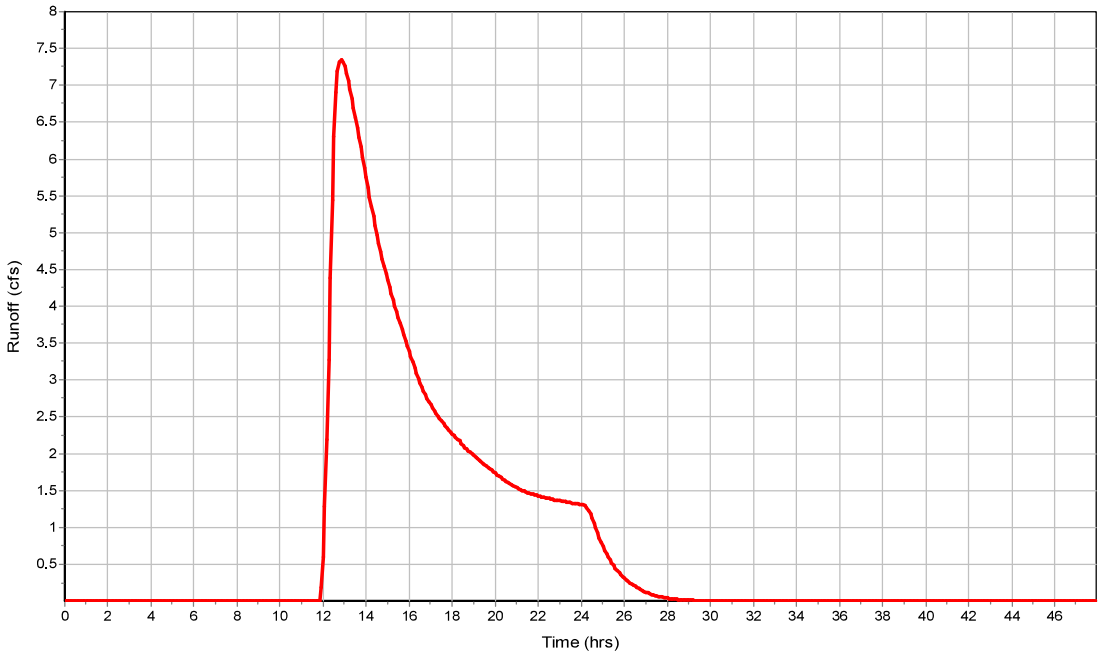
Total Rainfall (in) 4.5
Total Runoff (in) 0.59
Peak Runoff (cfs) 7.34
Weighted Curve Number 52
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 58
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

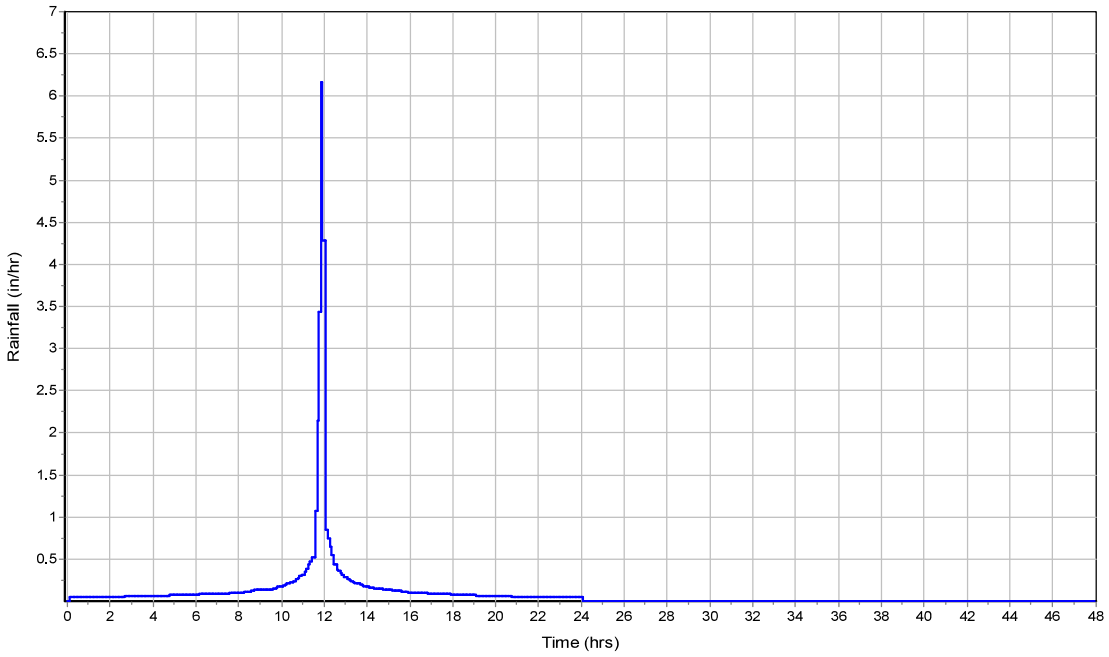
Total TOC (min) 106.84

Subbasin Runoff Results

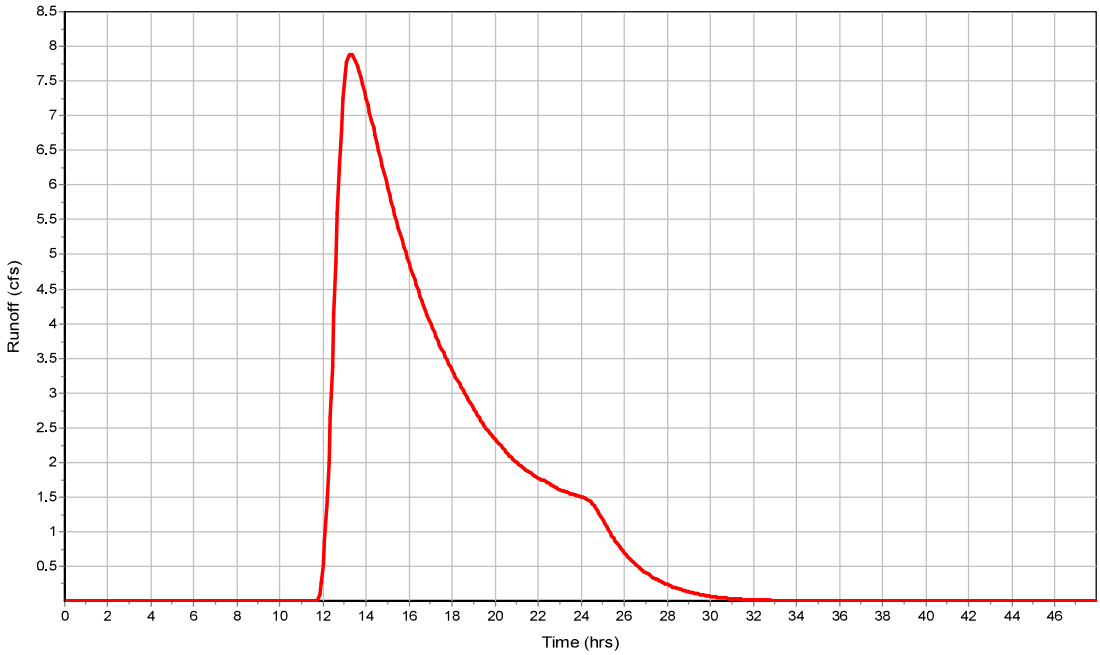
Total Rainfall (in) 4.5
Total Runoff (in) 0.91
Peak Runoff (cfs) 7.89
Weighted Curve Number 58
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

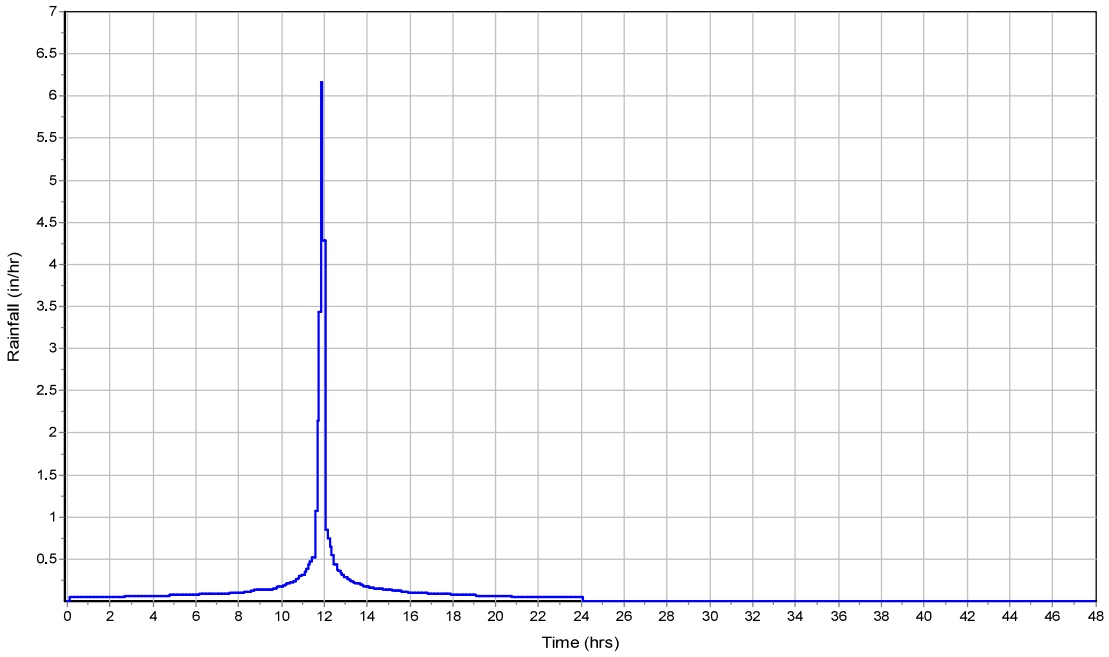
Total TOC (min) 436.75

Subbasin Runoff Results

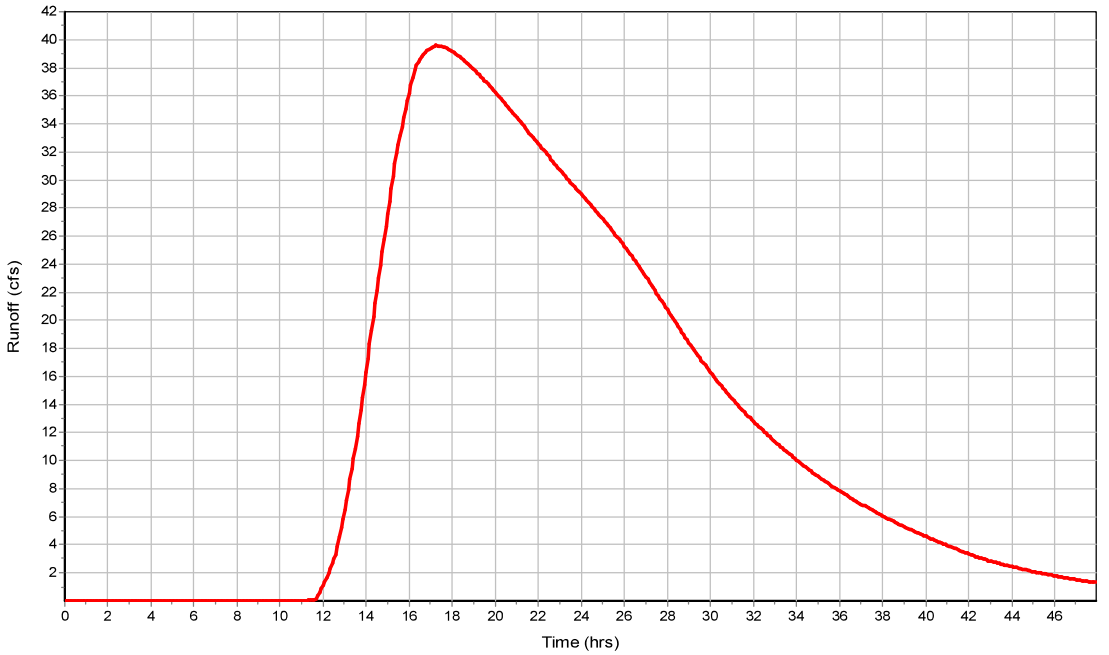
Total Rainfall (in) 4.5
Total Runoff (in) 1.46
Peak Runoff (cfs) 39.6
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	71.81	0.00	9.20	9.20	0.00	10.82	7.95	7.95	0 15:32	0 00:00	0.00	0.00
2	FIELD	7.89	7.89	13.46	13.46	0.00	12.43	13.02	13.02	0 13:20	0 00:00	0.00	0.00
3	N-LEGION	39.59	39.59	23.89	23.89	0.00	3.72	23.13	23.13	0 17:20	0 00:00	0.00	0.00
4	S-LEGION	52.60	52.60	22.94	22.94	0.00	3.34	21.57	21.57	0 13:20	0 00:00	0.00	0.00
5	UPSTREAM	66.62	0.00	19.48	19.48	0.00	7.14	18.39	18.39	0 13:20	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	71.66	0 15:54	7775.14	0.01	1.91	17.89	2.18	0.17	0.00		
2	FIELDS	7.89	0 13:21	15547.20	0.00	5.80	0.63	0.57	0.04	0.00		
3	NLEGION	39.59	0 17:20	374.12	0.11	4.67	1.02	1.28	0.26	0.00		
4	SLEGION	52.59	0 13:20	326.72	0.16	4.65	0.97	1.66	0.33	0.00		
5	UPSTREAM	66.62	0 16:22	6323.30	0.01	3.05	7.59	1.07	0.12	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	4.50	1.82	406.13	78.18	0 01:54:31
2	2	63.25	284.00	55.00	4.50	0.74	46.93	10.30	0 01:04:05
3	3	52.87	284.00	71.00	4.50	1.75	92.31	18.59	0 01:46:50
4	4	414.75	284.00	79.00	4.50	2.38	985.45	68.04	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	116.68	9.49	0.00	10.53	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	18.58	13.72	0.00	12.17	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	68.03	24.40	0.00	3.21	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	78.18	23.40	0.00	2.89	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	106.10	19.93	0.00	6.69	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					122.55	4.72					

FUT-5 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	116.58	7775.14	0.01	1.91	2.47	0.19	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	18.57	15547.20	0.00	5.82	0.83	0.06	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	68.03	374.12	0.18	5.53	1.79	0.36	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	78.15	326.72	0.24	5.24	2.11	0.42	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	106.10	6323.30	0.02	3.50	1.38	0.16	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	72
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

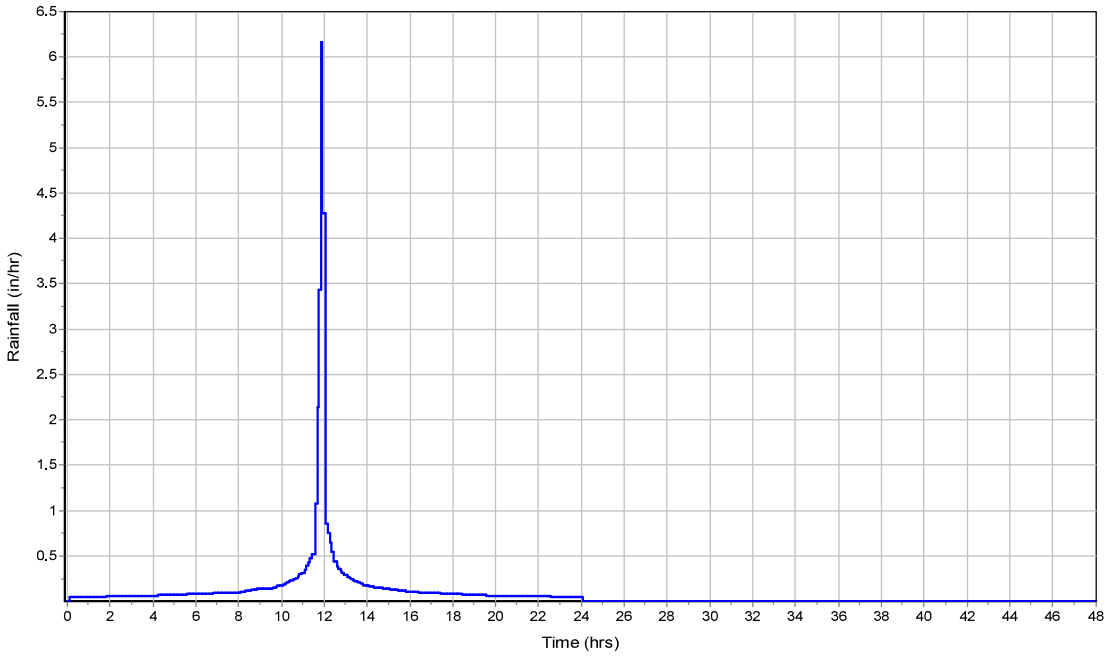
Total TOC (min) 114.53

Subbasin Runoff Results

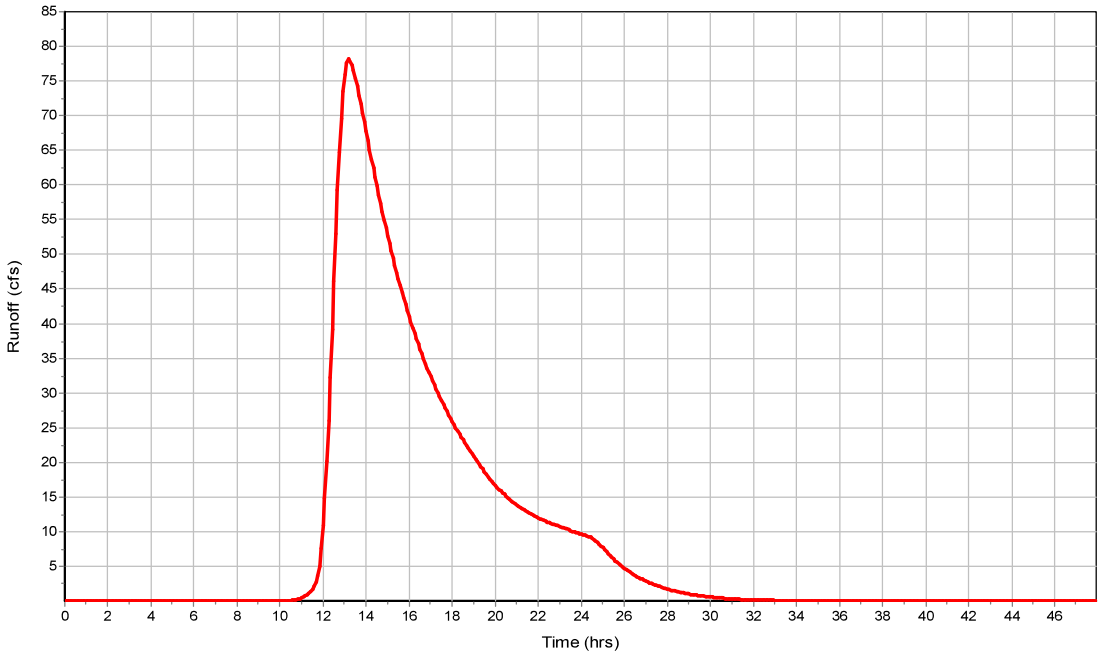
Total Rainfall (in)	4.5
Total Runoff (in)	1.82
Peak Runoff (cfs)	78.18
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

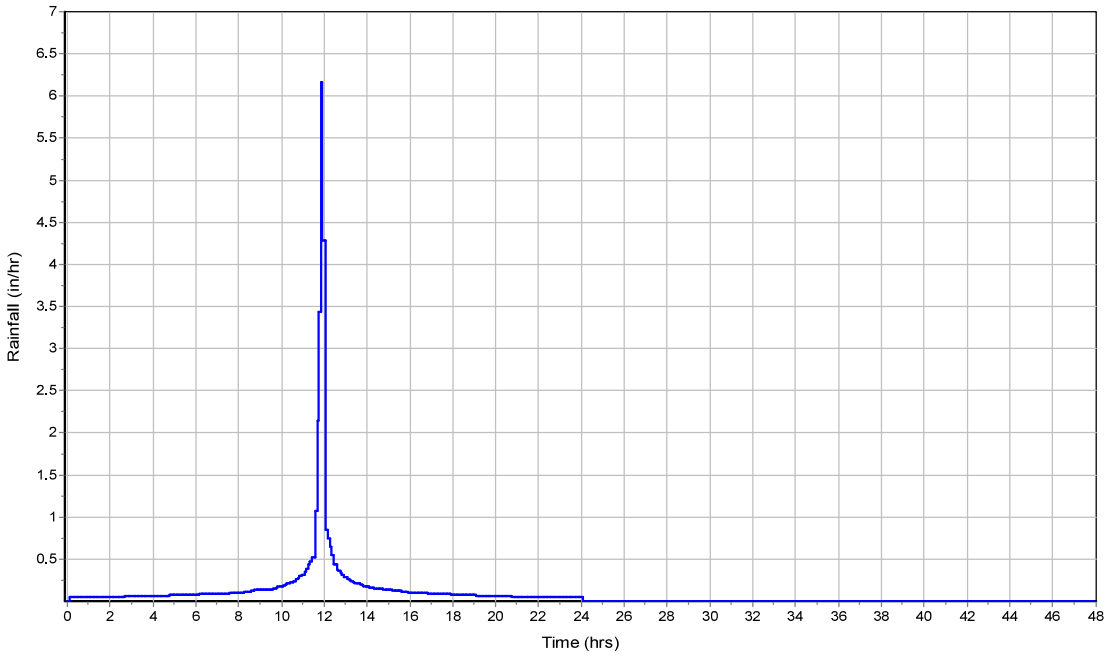
Total TOC (min) 64.09

Subbasin Runoff Results

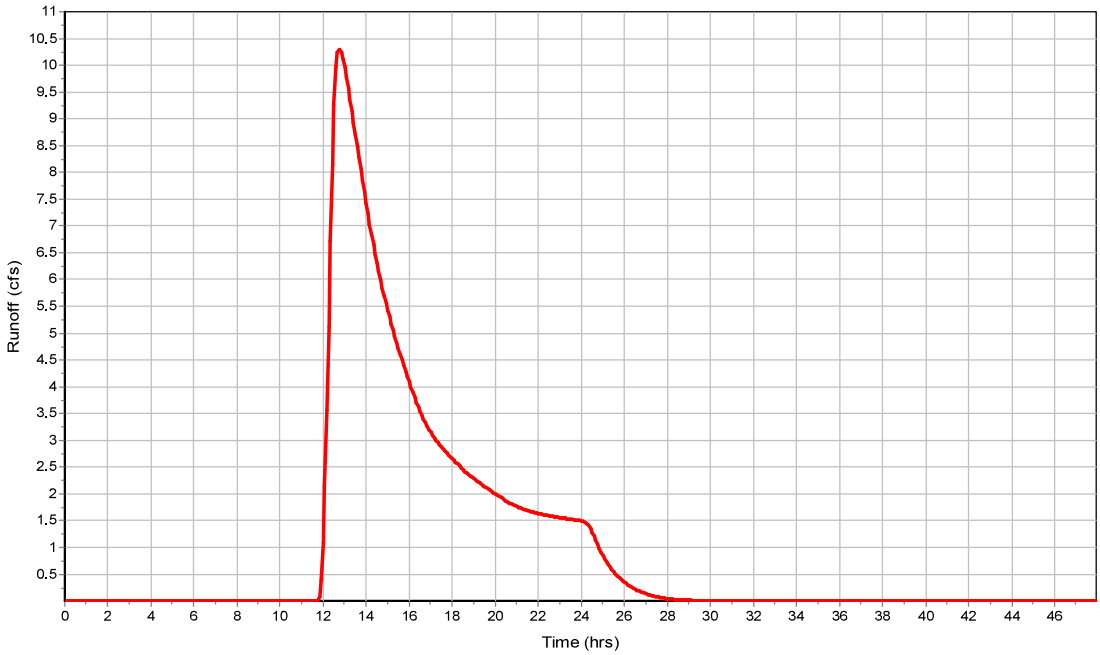
Total Rainfall (in) 4.5
Total Runoff (in) 0.74
Peak Runoff (cfs) 10.3
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

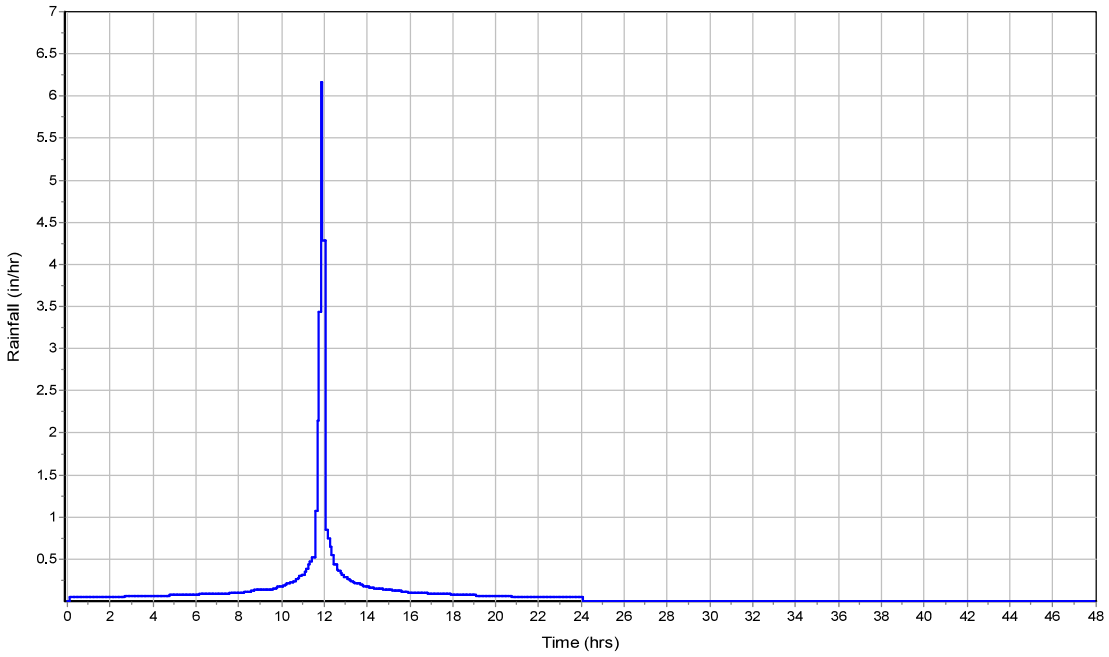
Total TOC (min) 106.84

Subbasin Runoff Results

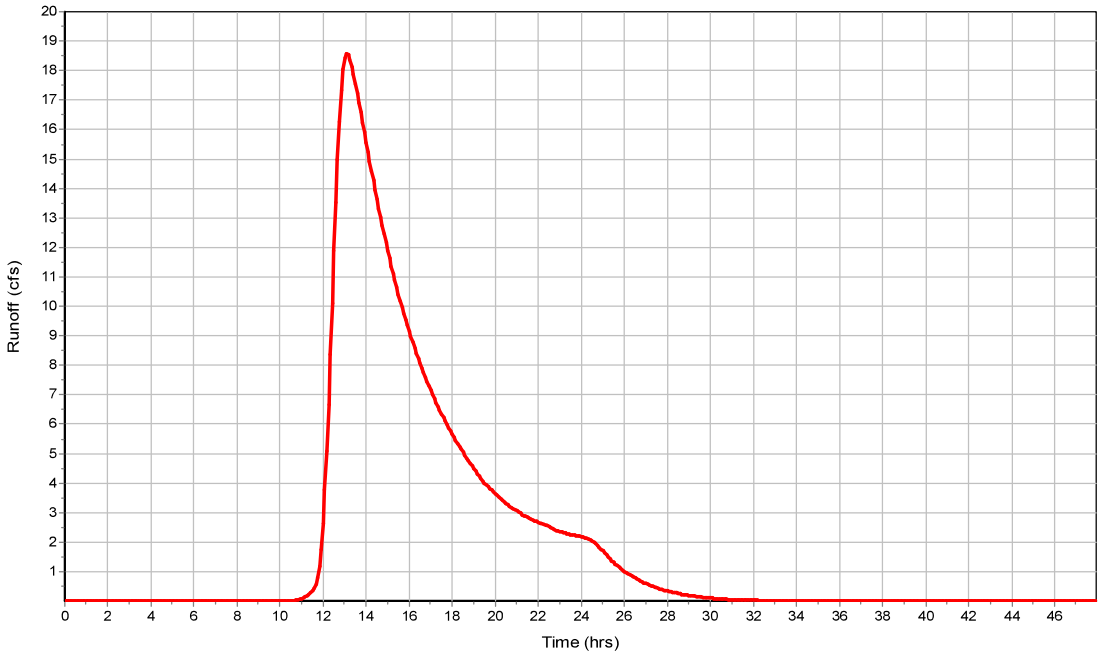
Total Rainfall (in) 4.5
Total Runoff (in) 1.75
Peak Runoff (cfs) 18.59
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

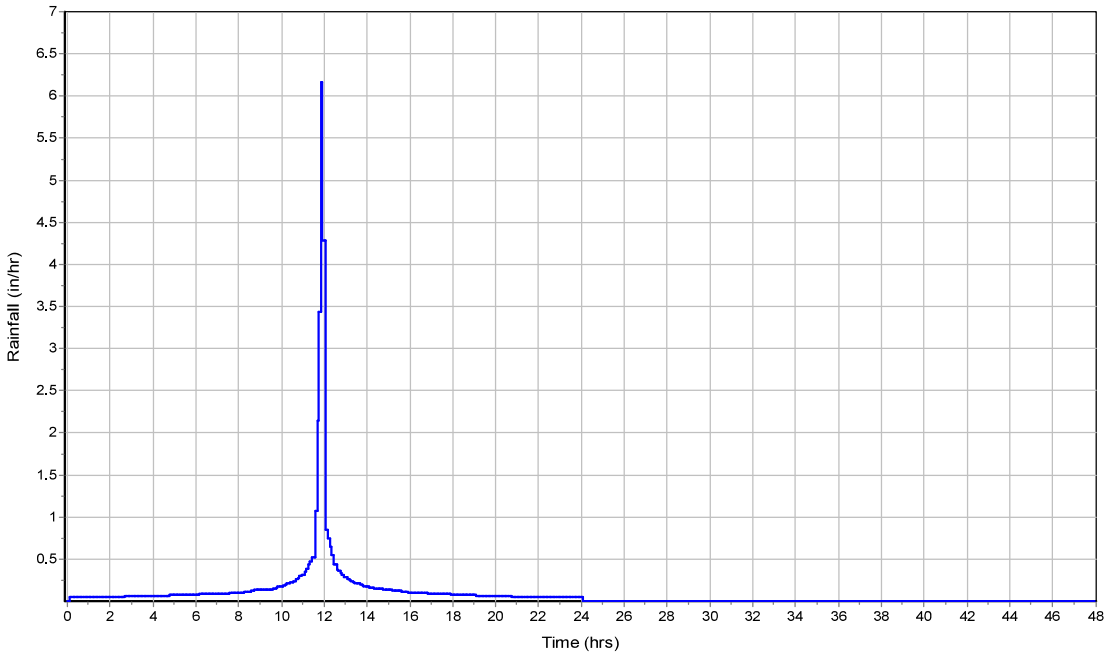
Total TOC (min) 436.75

Subbasin Runoff Results

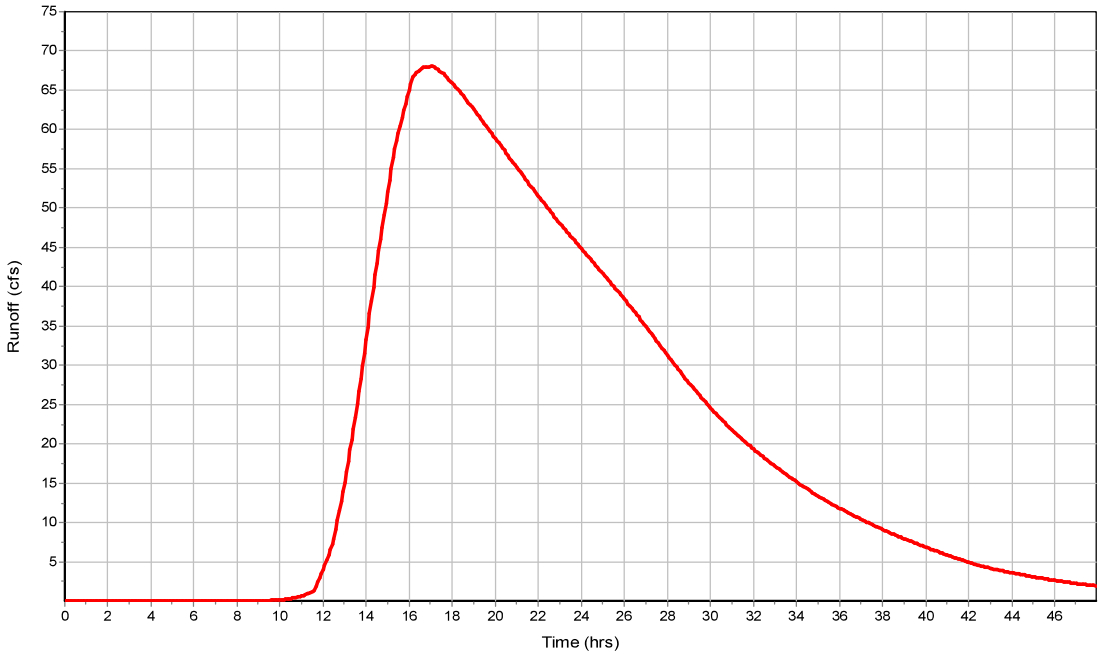
Total Rainfall (in) 4.5
Total Runoff (in) 2.38
Peak Runoff (cfs) 68.04
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	116.68	0.00	9.49	9.49	0.00	10.53	8.13	8.13	0 15:24	0 00:00	0.00	0.00
2	FIELD	18.58	18.58	13.72	13.72	0.00	12.17	13.05	13.05	0 13:10	0 00:00	0.00	0.00
3	N-LEGION	68.03	68.03	24.40	24.40	0.00	3.21	23.31	23.31	0 17:10	0 00:00	0.00	0.00
4	S-LEGION	78.18	78.18	23.40	23.40	0.00	2.89	21.63	21.63	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	106.10	0.00	19.93	19.93	0.00	6.69	18.58	18.58	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	116.58	0 15:38	7775.14	0.01	1.91	17.89	2.47	0.19	0.00		
2	FIELDS	18.57	0 13:11	15547.20	0.00	5.82	0.63	0.83	0.06	0.00		
3	NLEGION	68.03	0 17:10	374.12	0.18	5.53	0.86	1.79	0.36	0.00		
4	SLEGION	78.15	0 13:15	326.72	0.24	5.24	0.86	2.11	0.42	0.00		
5	UPSTREAM	106.10	0 16:17	6323.30	0.02	3.50	6.61	1.38	0.16	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########## SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########## NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	5.30	1.86	414.17	76.96	0 01:54:31
2	2	63.25	284.00	52.00	5.30	0.94	59.46	13.49	0 01:04:05
3	3	52.87	284.00	58.00	5.30	1.34	70.69	12.60	0 01:46:50
4	4	414.75	284.00	67.00	5.30	2.02	835.72	55.39	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	103.81	9.41	0.00	10.61	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	12.58	13.59	0.00	12.30	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	55.37	24.18	0.00	3.43	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	76.96	23.38	0.00	2.91	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	94.22	19.91	0.00	6.71	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					112.07	4.64					

EX-10 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	103.32	7775.14	0.01	1.91	2.39	0.19	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	12.58	15547.20	0.00	5.75	0.70	0.05	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	55.37	374.12	0.15	5.19	1.57	0.31	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	76.95	326.72	0.24	5.21	2.09	0.42	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	94.20	6323.30	0.01	3.42	1.30	0.15	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	65
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

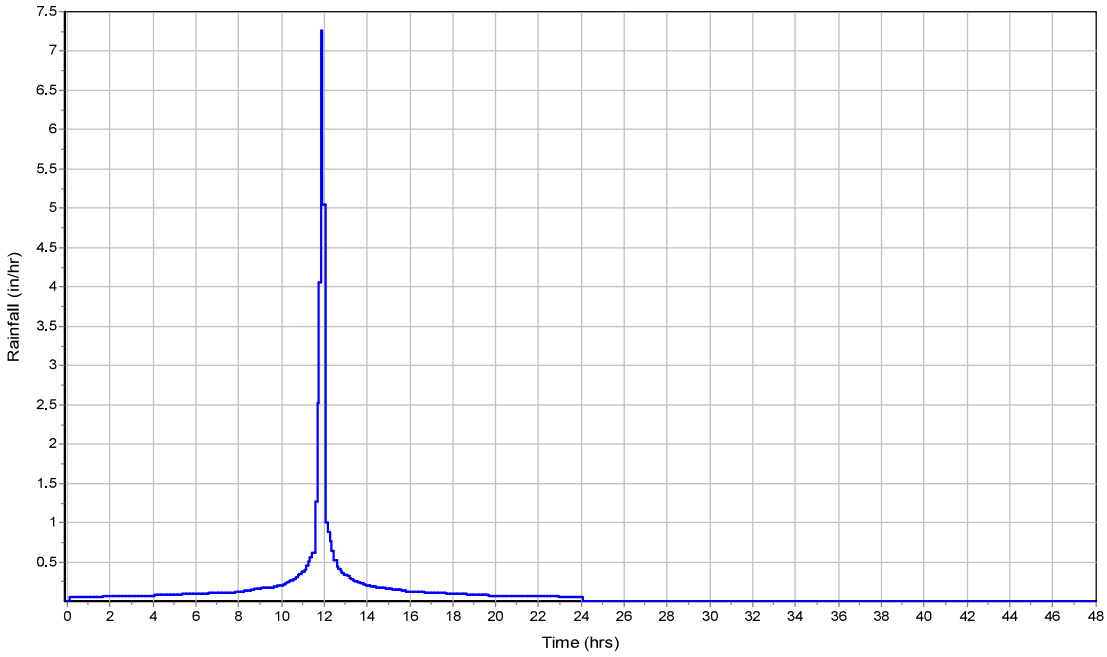
Total TOC (min) 114.53

Subbasin Runoff Results

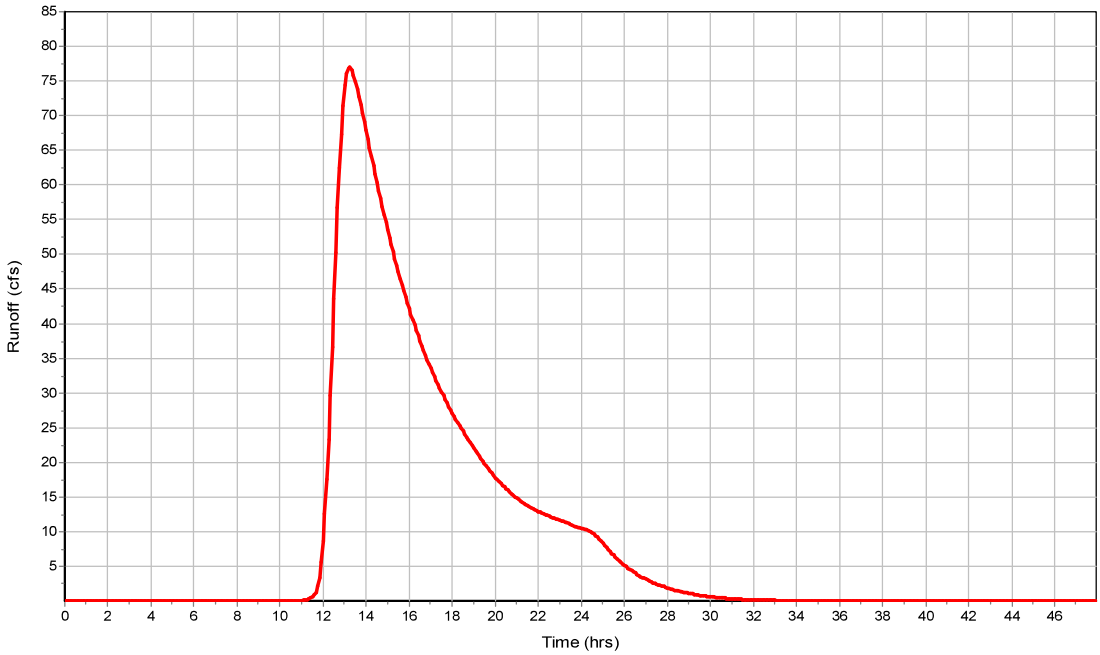
Total Rainfall (in)	5.3
Total Runoff (in)	1.86
Peak Runoff (cfs)	76.96
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 52
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

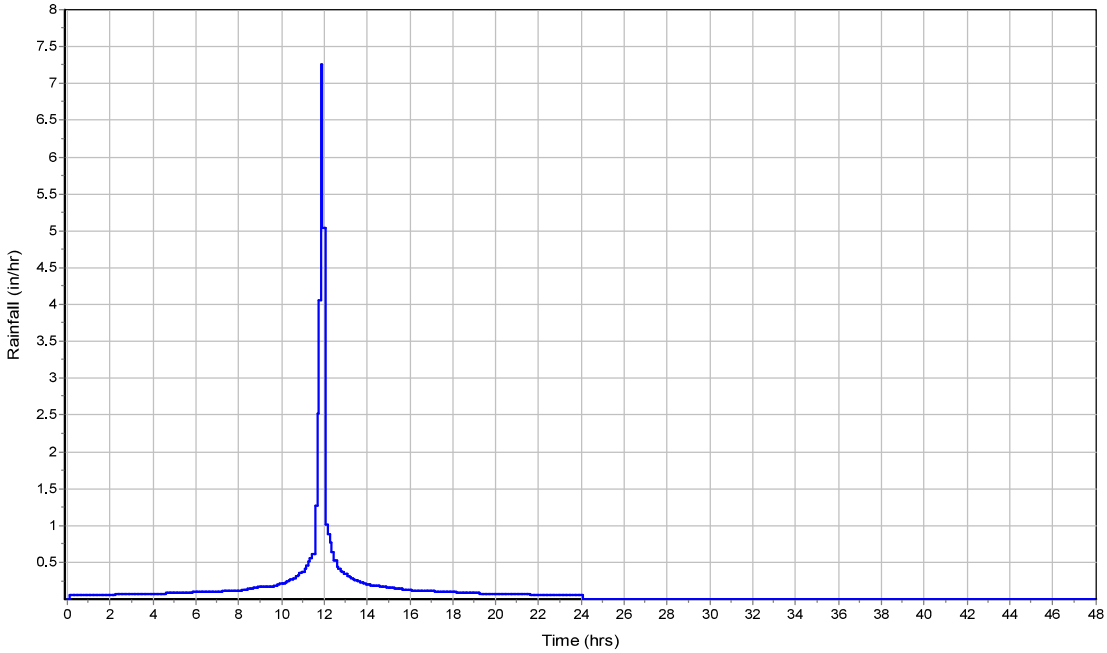
Total TOC (min) 64.09

Subbasin Runoff Results

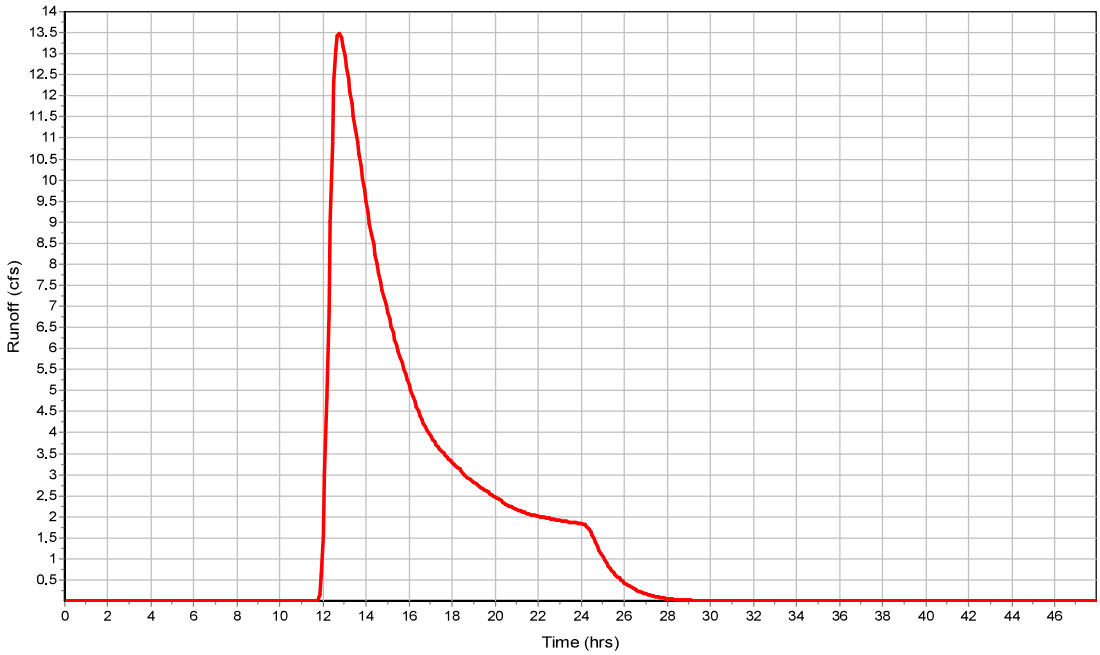
Total Rainfall (in) 5.3
Total Runoff (in) 0.94
Peak Runoff (cfs) 13.49
Weighted Curve Number 52
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac)	52.87
Peak Rate Factor	284
Weighted Curve Number	58
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

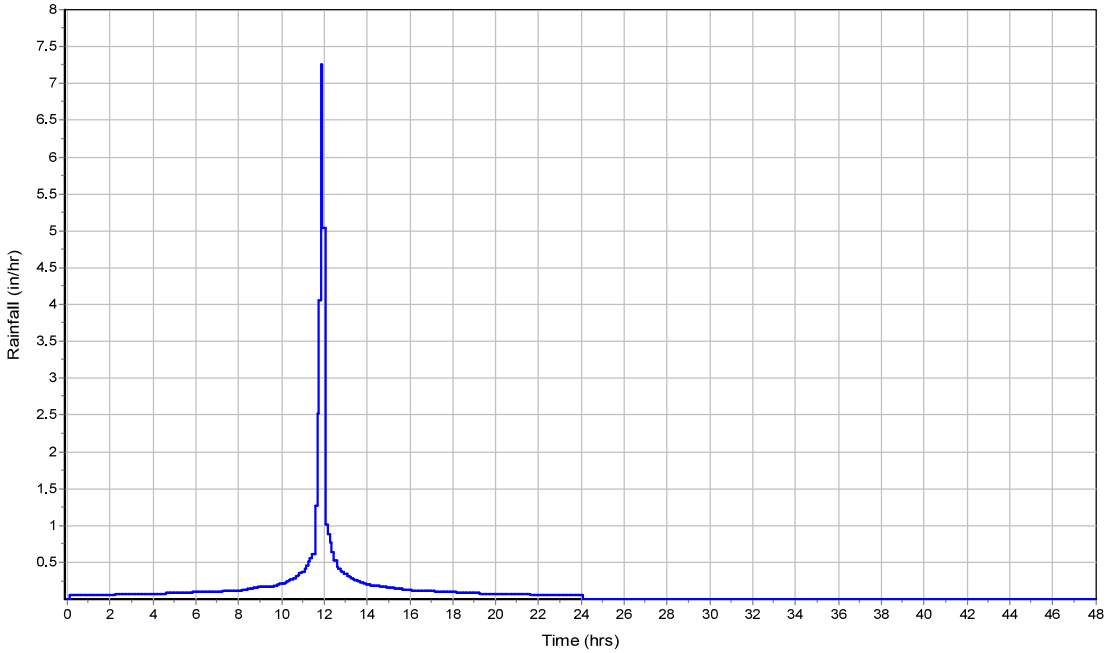
Total TOC (min) 106.84

Subbasin Runoff Results

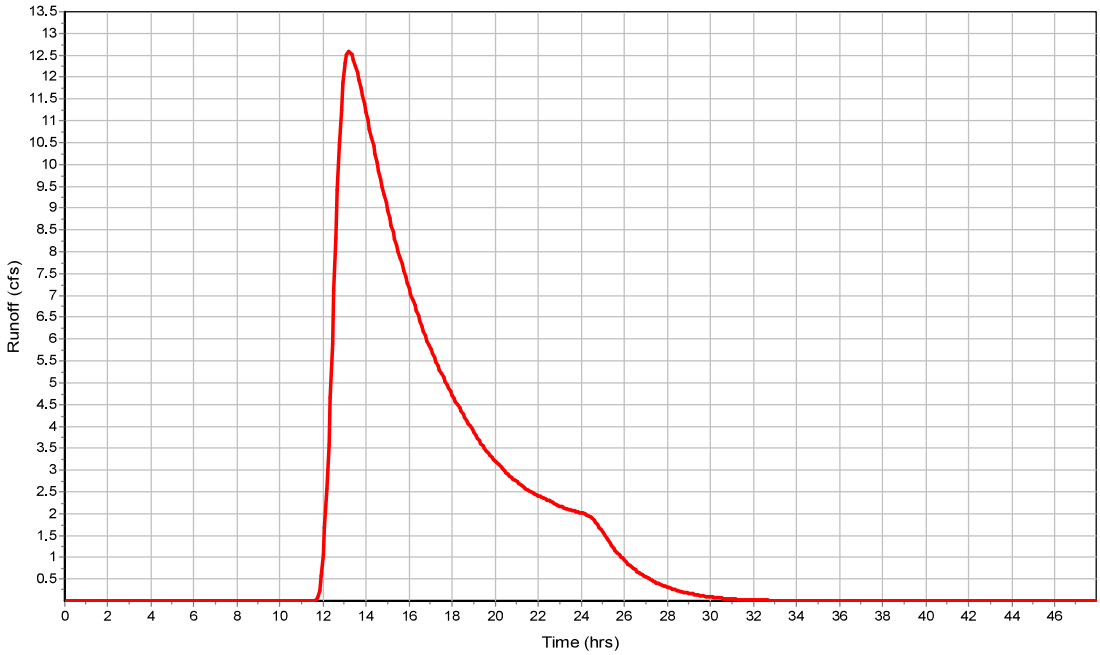
Total Rainfall (in)	5.3
Total Runoff (in)	1.34
Peak Runoff (cfs)	12.6
Weighted Curve Number	58
Time of Concentration (days hh:mm:ss)	0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

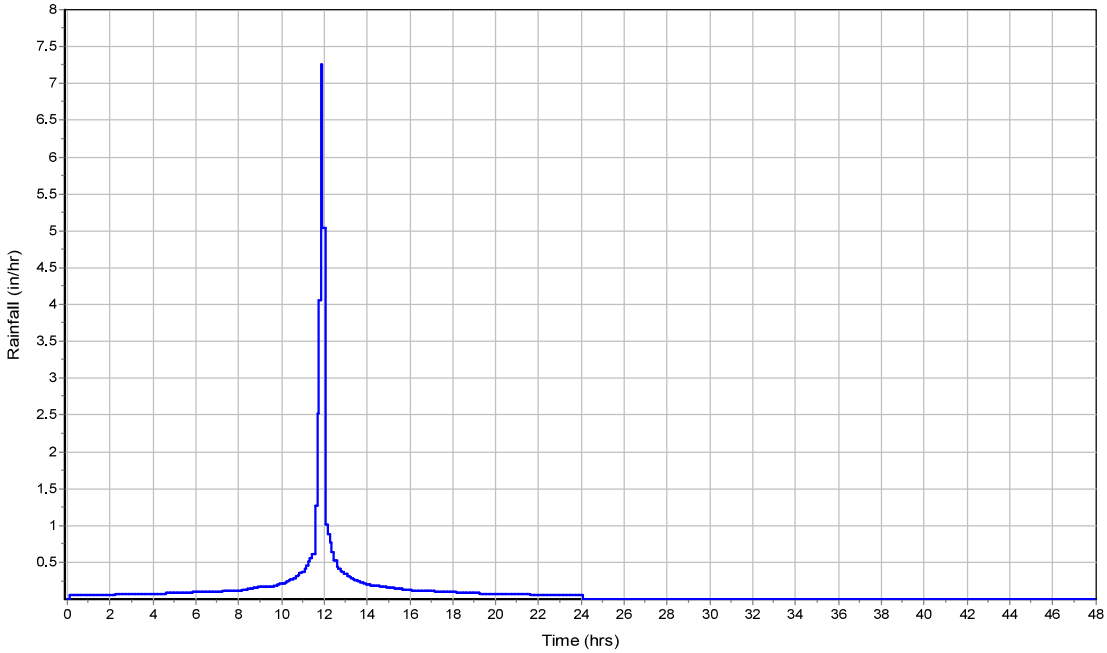
Total TOC (min) 436.75

Subbasin Runoff Results

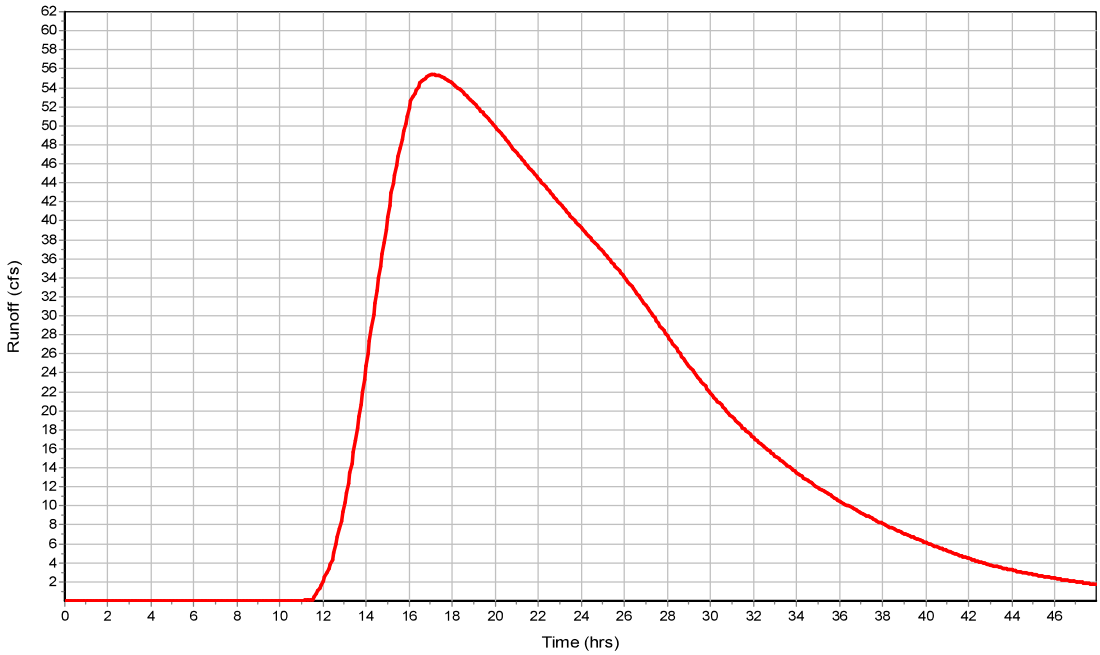
Total Rainfall (in) 5.3
Total Runoff (in) 2.02
Peak Runoff (cfs) 55.39
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	103.81	0.00	9.41	9.41	0.00	10.61	8.08	8.08	0 13:46	0 00:00	0.00	0.00
2	FIELD	12.58	12.58	13.59	13.59	0.00	12.30	13.04	13.04	0 13:15	0 00:00	0.00	0.00
3	N-LEGION	55.37	55.37	24.18	24.18	0.00	3.43	23.24	23.24	0 17:05	0 00:00	0.00	0.00
4	S-LEGION	76.96	76.96	23.38	23.38	0.00	2.91	21.63	21.63	0 13:20	0 00:00	0.00	0.00
5	UPSTREAM	94.22	0.00	19.91	19.91	0.00	6.71	18.52	18.52	0 13:20	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	103.32	0 14:31	7775.14	0.01	1.91	17.89	2.39	0.19	0.00		
2	FIELDS	12.58	0 13:16	15547.20	0.00	5.75	0.64	0.70	0.05	0.00		
3	NLEGION	55.37	0 17:06	374.12	0.15	5.19	0.92	1.57	0.31	0.00		
4	SLEGION	76.95	0 13:20	326.72	0.24	5.21	0.87	2.09	0.42	0.00		
5	UPSTREAM	94.20	0 15:47	6323.30	0.01	3.42	6.77	1.30	0.15	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########## SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########## NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	5.30	2.43	542.48	107.07	0 01:54:31
2	2	63.25	284.00	55.00	5.30	1.13	71.66	17.64	0 01:04:05
3	3	52.87	284.00	71.00	5.30	2.35	124.03	25.73	0 01:46:50
4	4	414.75	284.00	79.00	5.30	3.06	1269.96	88.62	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	160.31	9.73	0.00	10.29	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	25.68	13.78	0.00	12.11	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	88.61	24.71	0.00	2.90	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	106.94	23.85	0.00	2.44	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	139.87	20.38	0.00	6.24	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					168.13	4.94					

FUT-10 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	156.73	7775.14	0.02	1.90	2.69	0.21	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	25.68	15547.20	0.00	5.76	0.89	0.07	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	88.60	374.12	0.24	5.98	2.10	0.42	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	106.94	326.72	0.33	5.73	2.56	0.51	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	139.75	6323.30	0.02	3.55	1.65	0.19	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	72
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

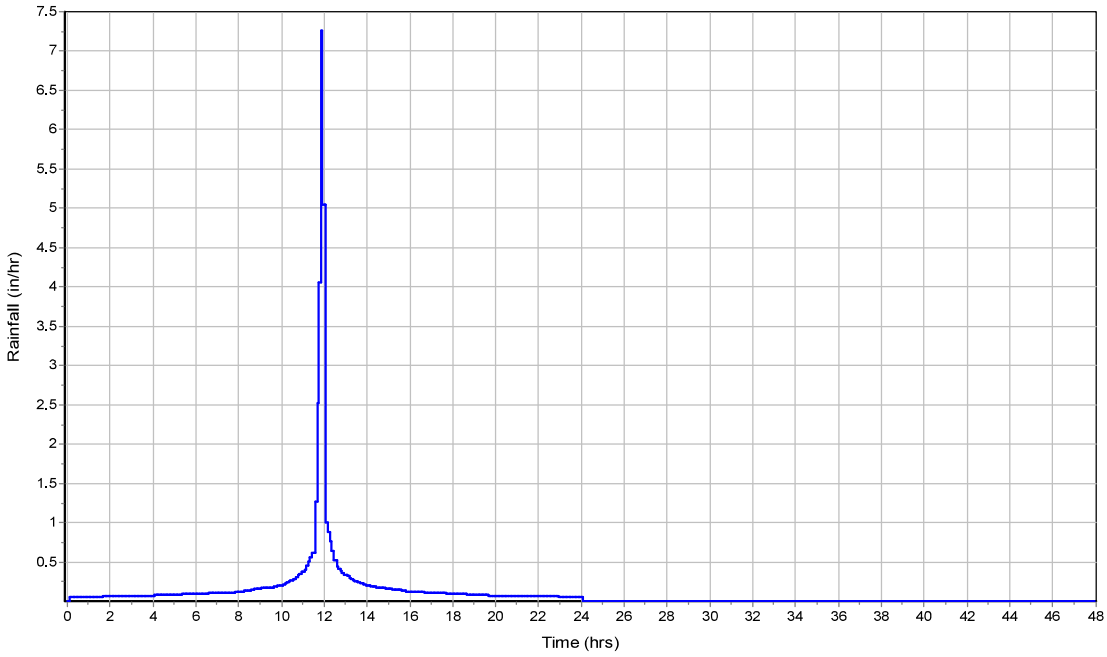
Total TOC (min) 114.53

Subbasin Runoff Results

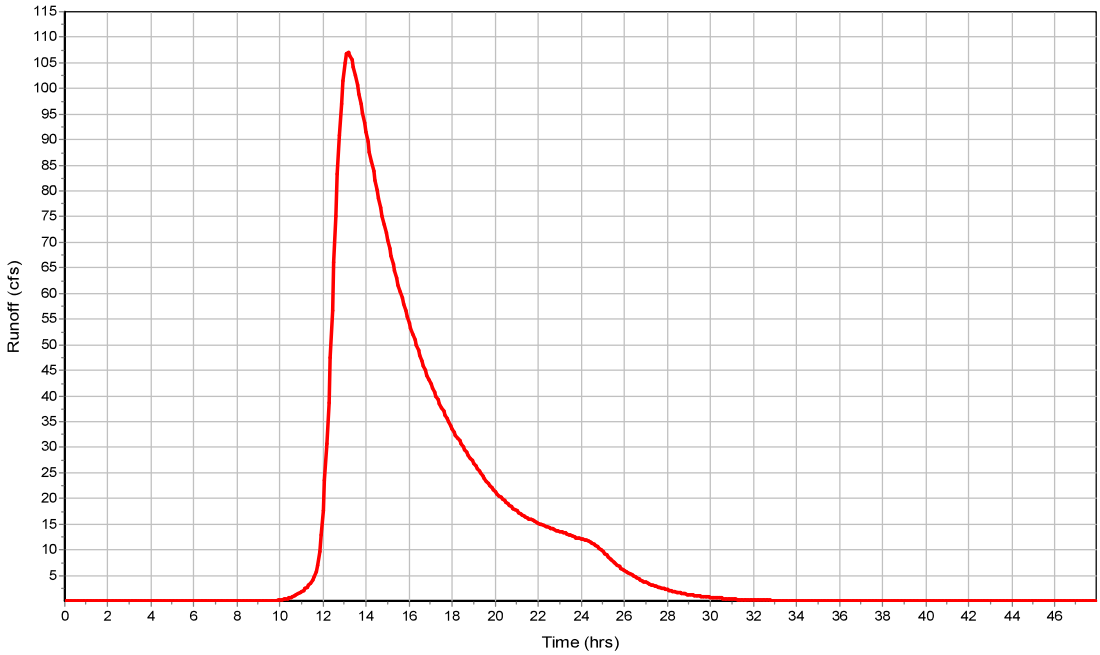
Total Rainfall (in)	5.3
Total Runoff (in)	2.43
Peak Runoff (cfs)	107.07
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

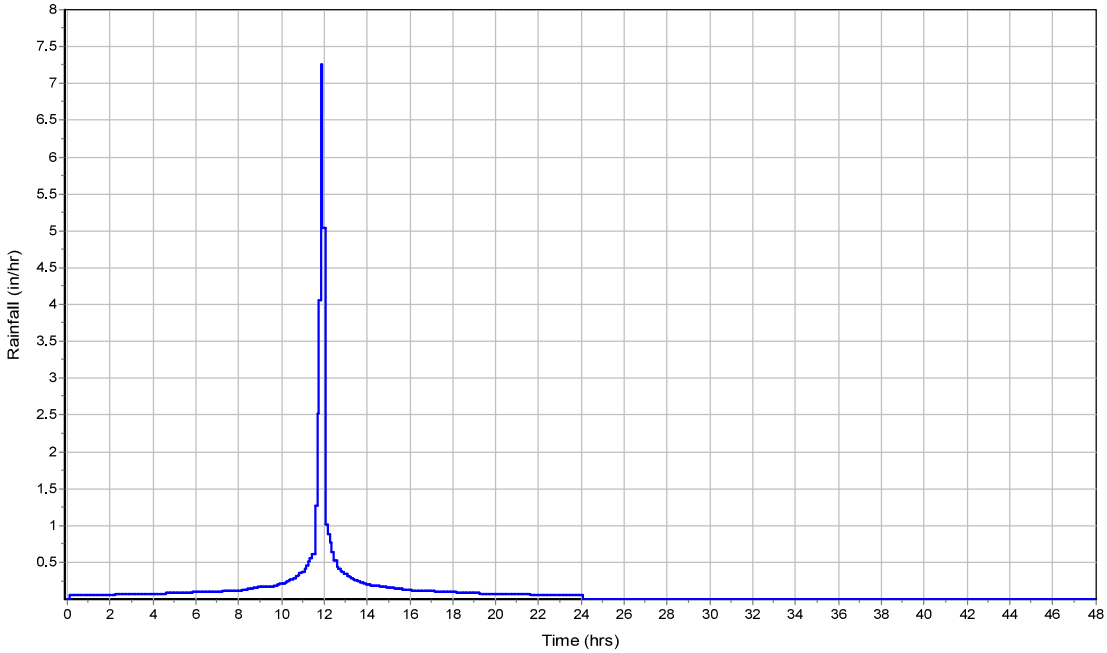
Total TOC (min) 64.09

Subbasin Runoff Results

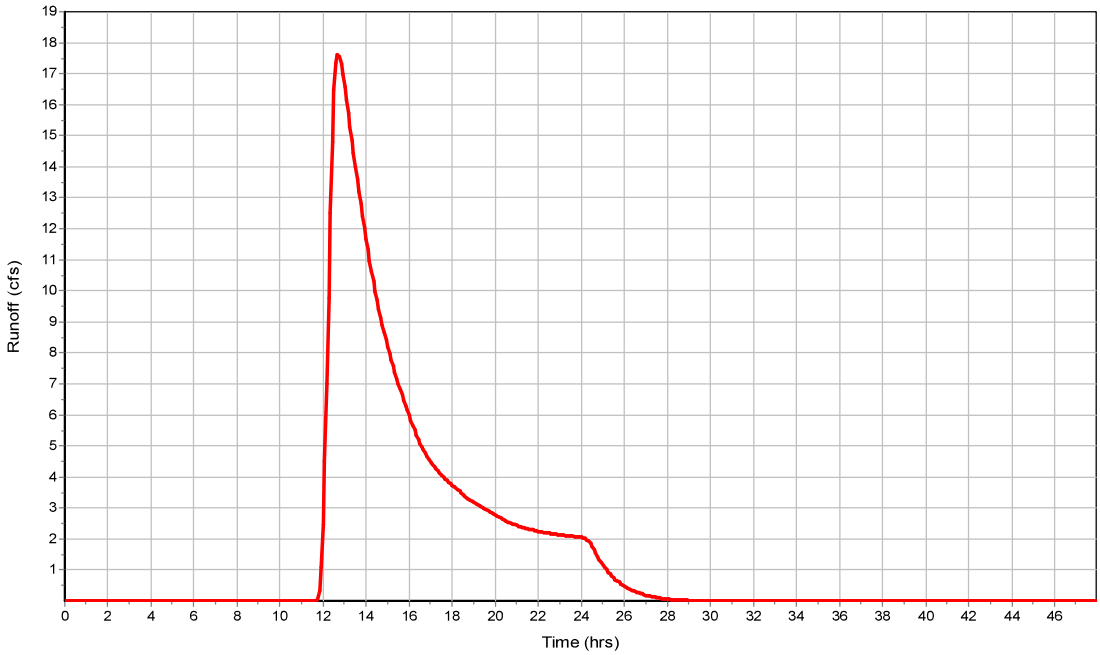
Total Rainfall (in) 5.3
Total Runoff (in) 1.13
Peak Runoff (cfs) 17.64
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

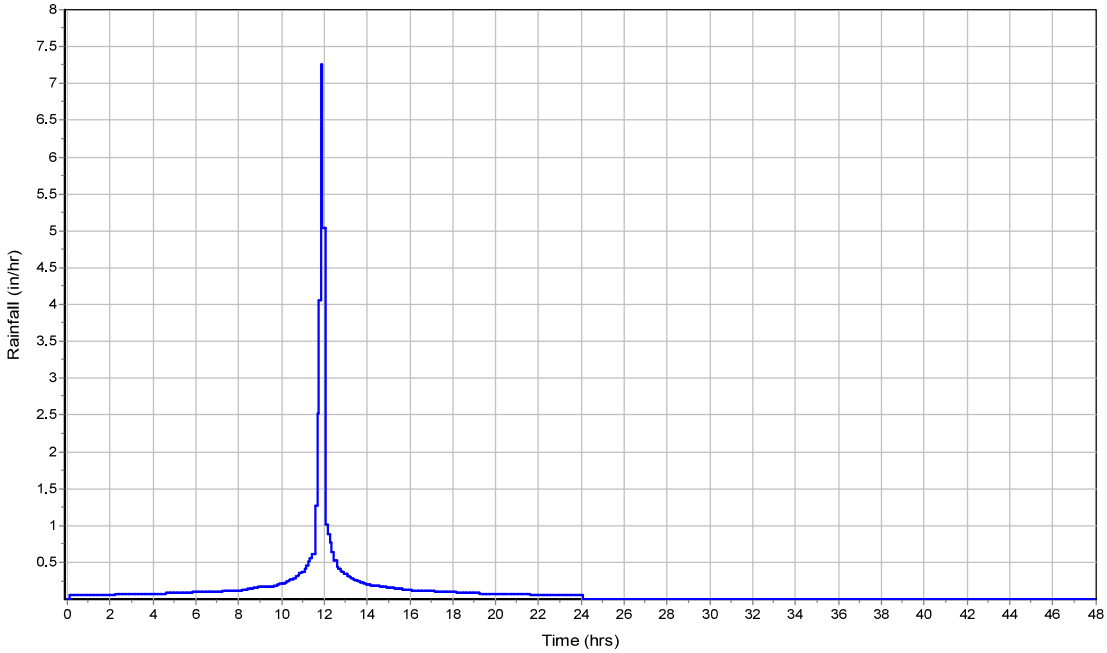
Total TOC (min) 106.84

Subbasin Runoff Results

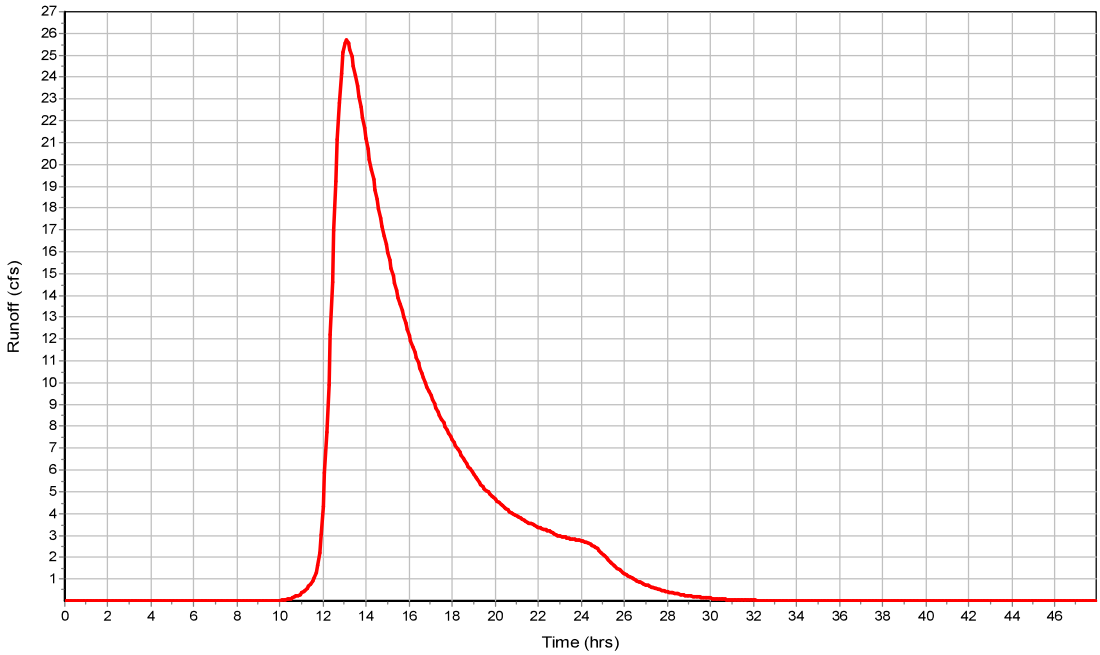
Total Rainfall (in) 5.3
Total Runoff (in) 2.35
Peak Runoff (cfs) 25.73
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

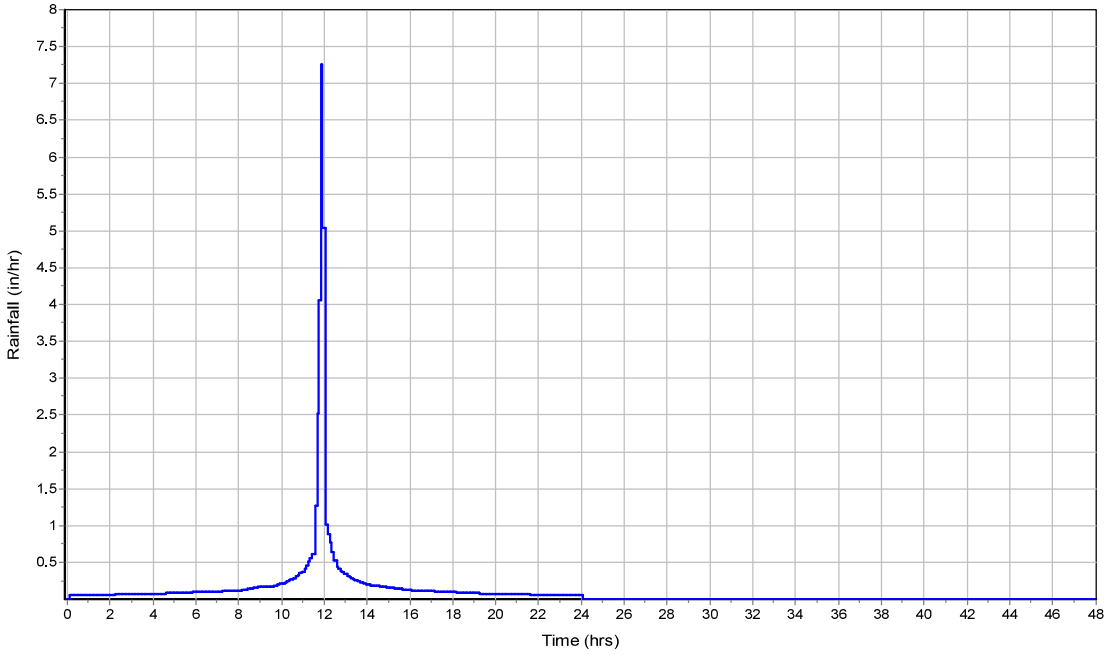
Total TOC (min) 436.75

Subbasin Runoff Results

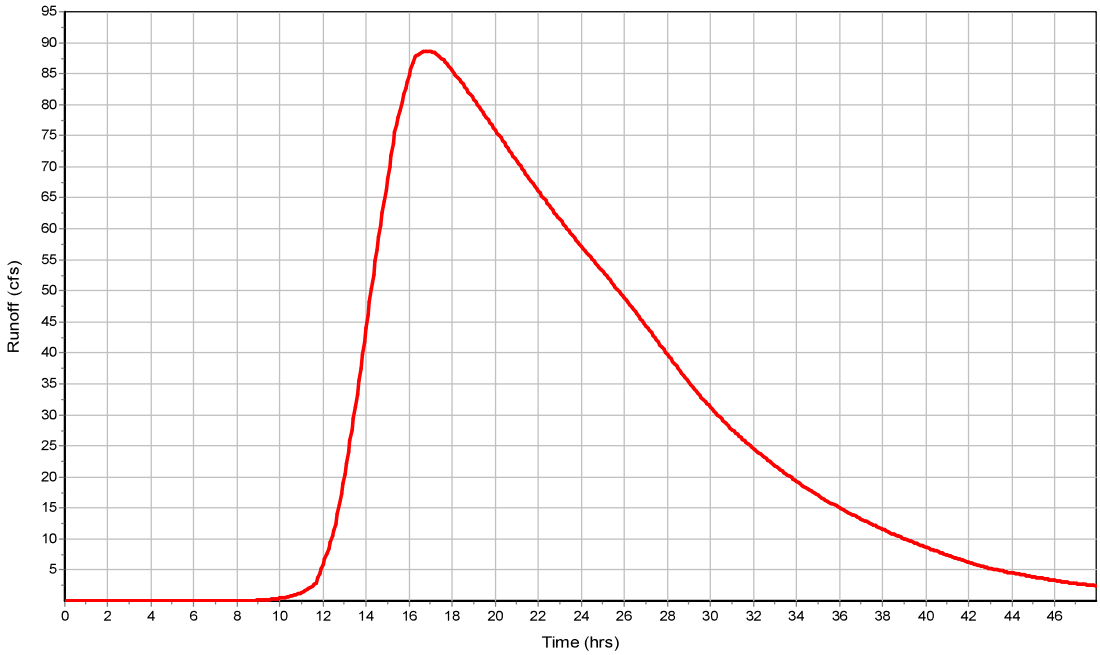
Total Rainfall (in) 5.3
Total Runoff (in) 3.06
Peak Runoff (cfs) 88.62
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	160.31	0.00	9.73	9.73	0.00	10.29	8.25	8.25	0 14:10	0 00:00	0.00	0.00
2	FIELD	25.68	25.68	13.78	13.78	0.00	12.11	13.07	13.07	0 14:01	0 00:00	0.00	0.00
3	N-LEGION	88.61	88.61	24.71	24.71	0.00	2.90	23.43	23.43	0 16:50	0 00:00	0.00	0.00
4	S-LEGION	106.94	106.94	23.85	23.85	0.00	2.44	21.69	21.69	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	139.87	0.00	20.38	20.38	0.00	6.24	18.71	18.71	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	156.73	0 14:11	7775.14	0.02	1.90	17.99	2.69	0.21	0.00		
2	FIELDS	25.68	0 13:10	15547.20	0.00	5.76	0.63	0.89	0.07	0.00		
3	NLEGION	88.60	0 16:50	374.12	0.24	5.98	0.80	2.10	0.42	0.00		
4	SLEGION	106.94	0 13:15	326.72	0.33	5.73	0.79	2.56	0.51	0.00		
5	UPSTREAM	139.75	0 15:33	6323.30	0.02	3.55	6.52	1.65	0.19	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	6.00	2.35	524.63	100.06	0 01:54:31
2	2	63.25	284.00	52.00	6.00	1.29	81.53	20.11	0 01:04:05
3	3	52.87	284.00	58.00	6.00	1.76	92.89	17.31	0 01:46:50
4	4	414.75	284.00	67.00	6.00	2.53	1049.32	70.66	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	134.50	9.60	0.00	10.42	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	17.30	13.70	0.00	12.19	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	70.66	24.44	0.00	3.17	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	100.00	23.75	0.00	2.54	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	119.86	20.28	0.00	6.34	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					146.52	4.82					

EX-25 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	133.35	7775.14	0.02	1.91	2.57	0.20	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	17.30	15547.20	0.00	5.83	0.81	0.06	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	70.66	374.12	0.19	5.59	1.83	0.37	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	99.98	326.72	0.31	5.62	2.46	0.49	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	119.80	6323.30	0.02	3.53	1.50	0.17	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	65
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

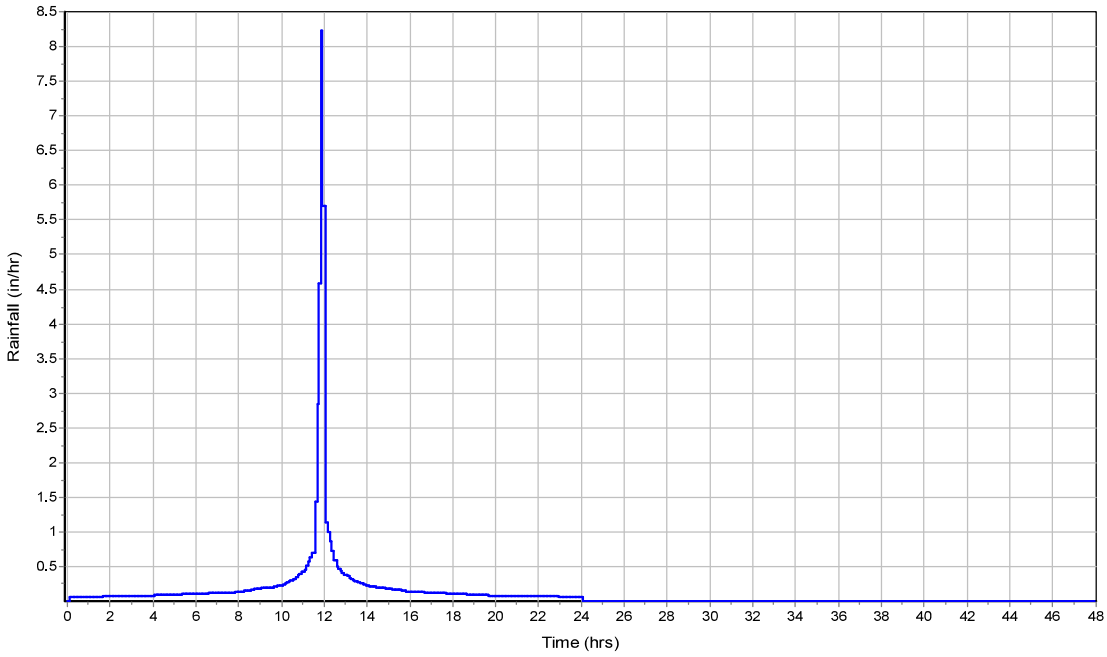
Total TOC (min) 114.53

Subbasin Runoff Results

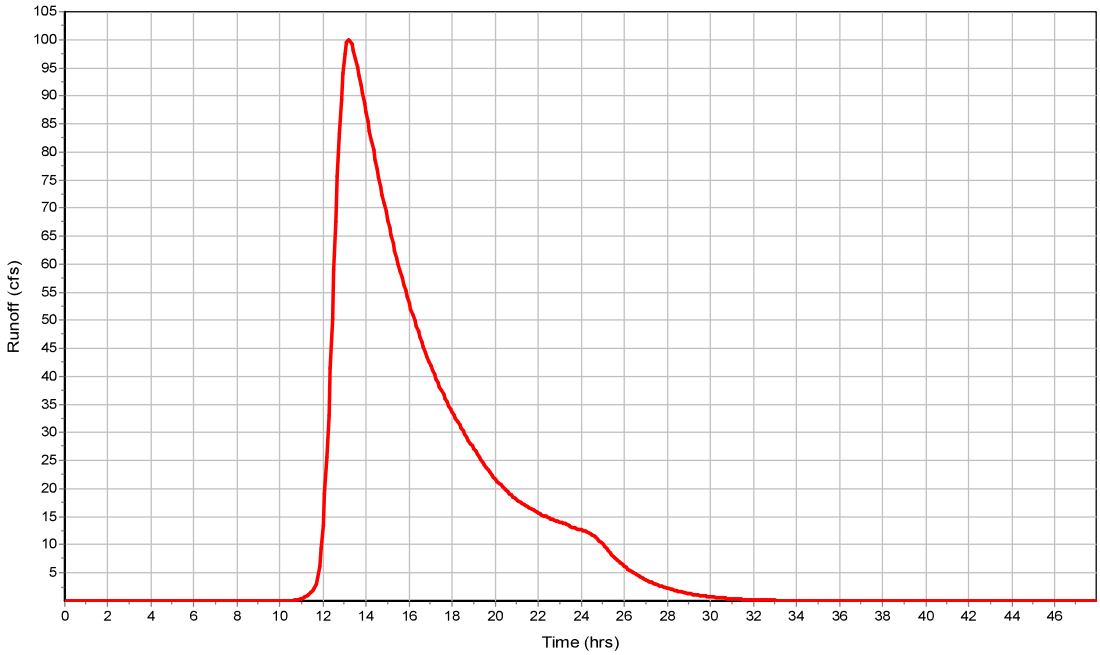
Total Rainfall (in)	6
Total Runoff (in)	2.35
Peak Runoff (cfs)	100.06
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 52
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

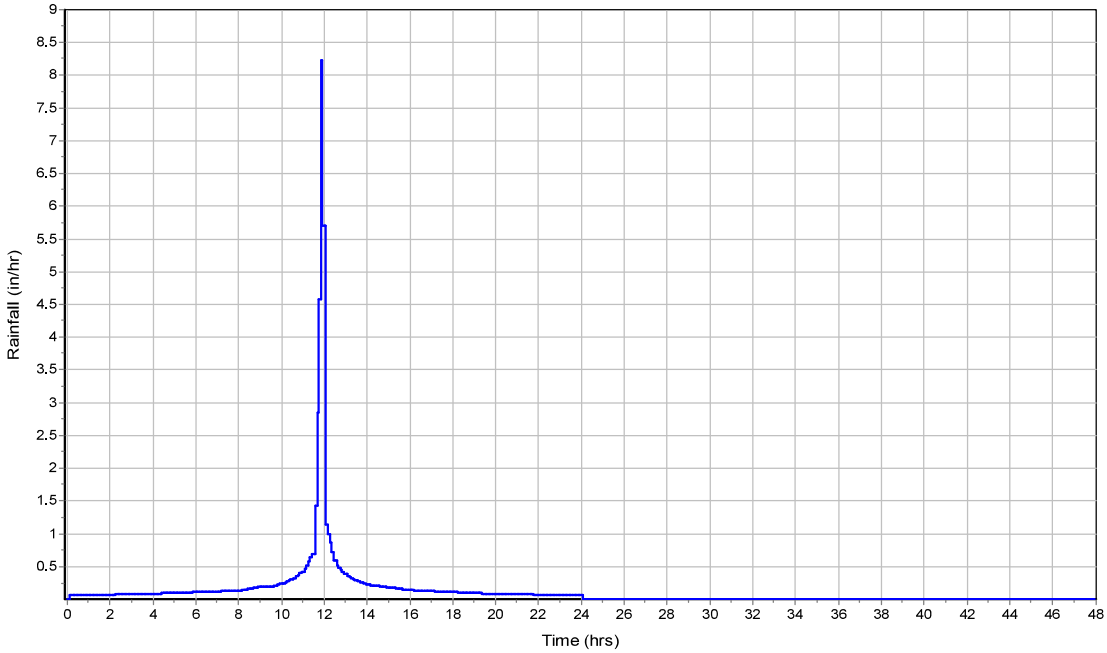
Total TOC (min) 64.09

Subbasin Runoff Results

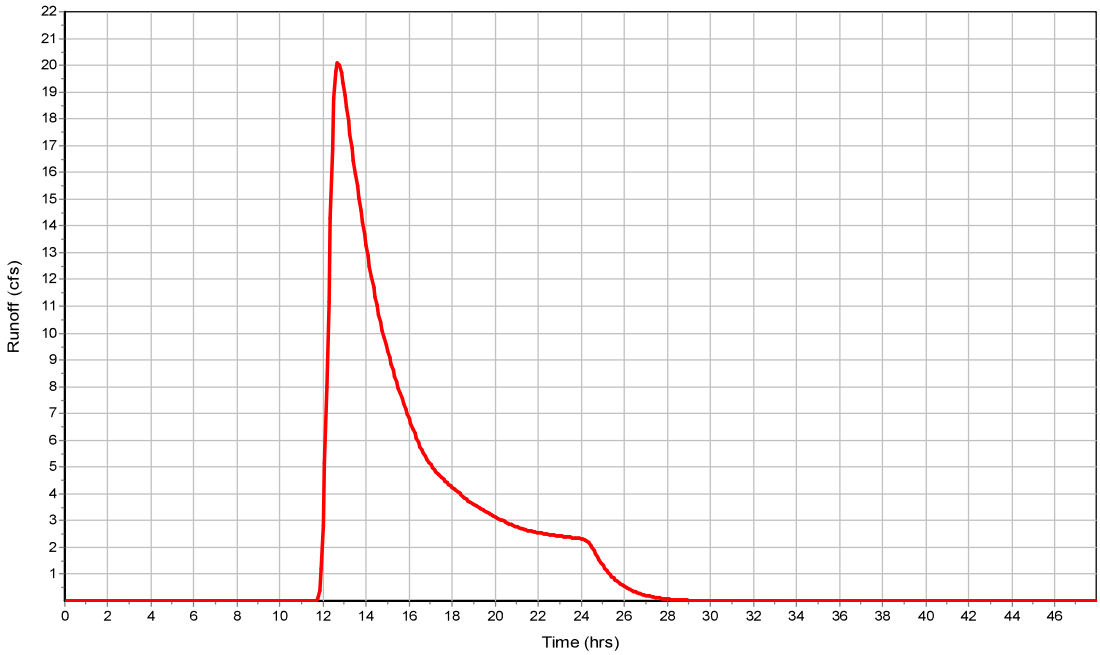
Total Rainfall (in) 6
Total Runoff (in) 1.29
Peak Runoff (cfs) 20.11
Weighted Curve Number 52
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 58
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

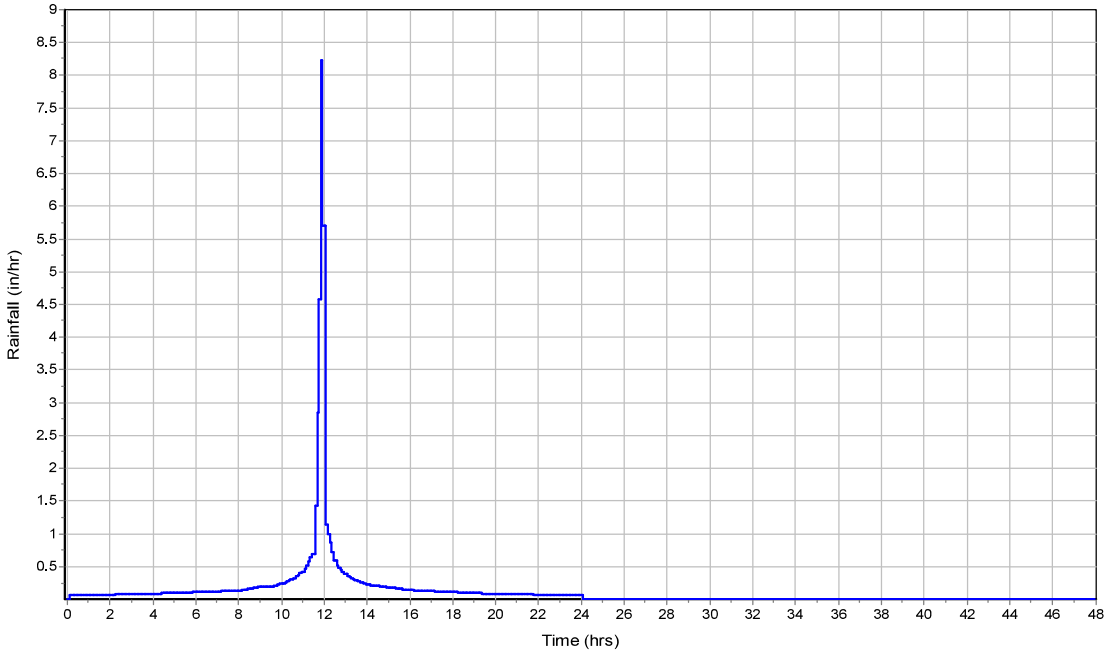
Total TOC (min) 106.84

Subbasin Runoff Results

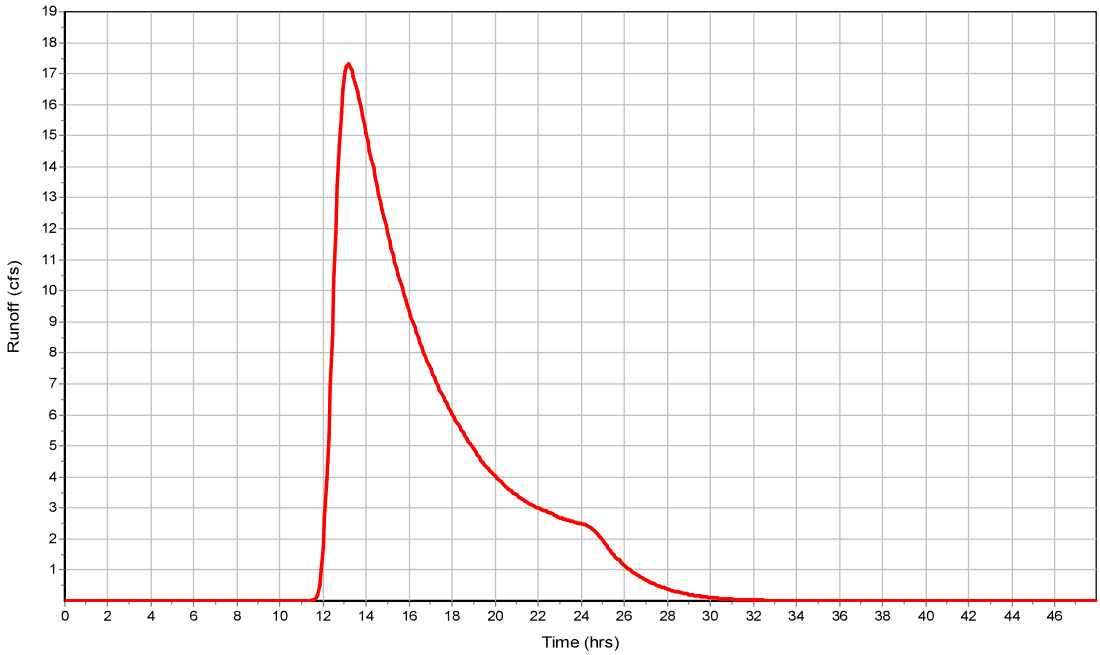
Total Rainfall (in) 6
Total Runoff (in) 1.76
Peak Runoff (cfs) 17.31
Weighted Curve Number 58
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

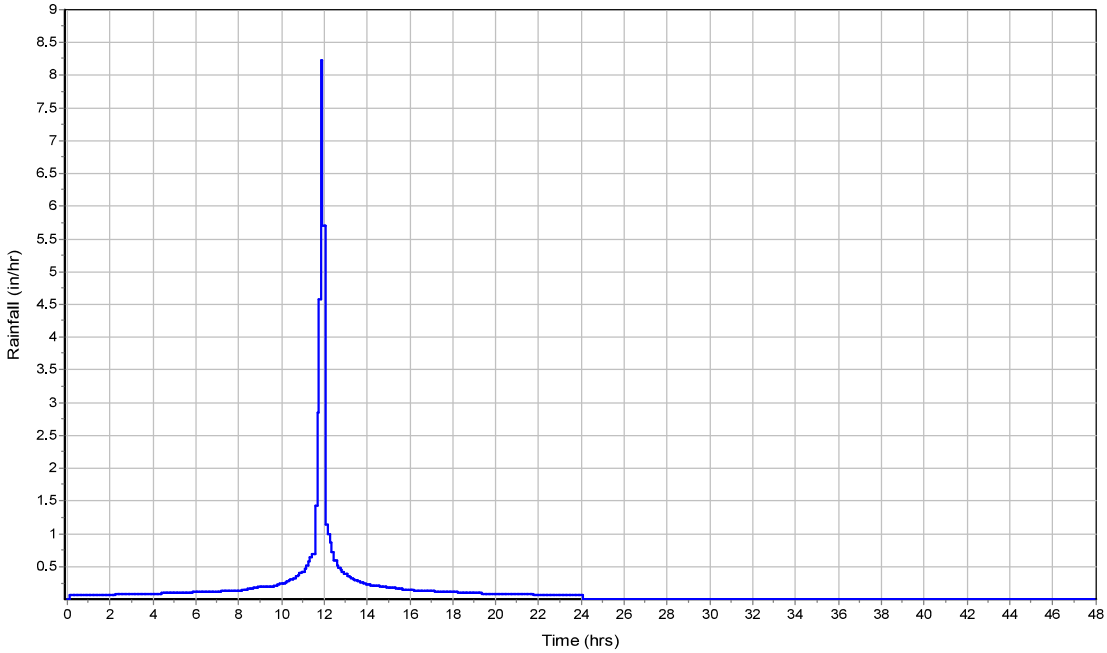
Total TOC (min) 436.75

Subbasin Runoff Results

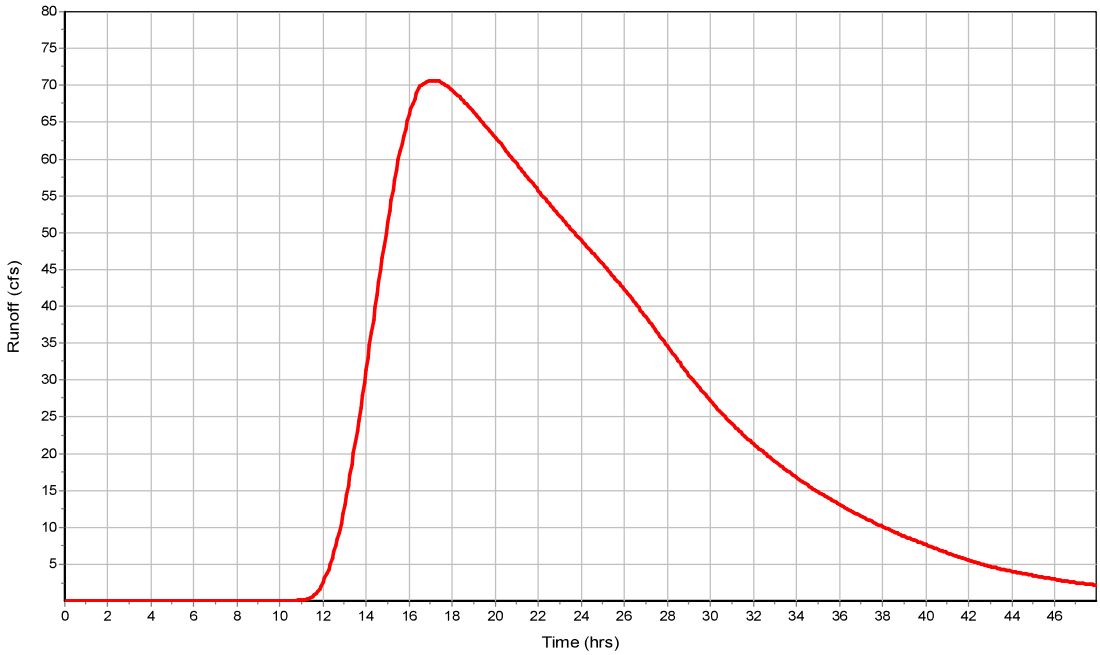
Total Rainfall (in) 6
Total Runoff (in) 2.53
Peak Runoff (cfs) 70.66
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	134.50	0.00	9.60	9.60	0.00	10.42	8.17	8.17	0 13:37	0 00:00	0.00	0.00
2	FIELD	17.30	17.30	13.70	13.70	0.00	12.19	13.05	13.05	0 13:15	0 00:00	0.00	0.00
3	N-LEGION	70.66	70.66	24.44	24.44	0.00	3.17	23.34	23.34	0 17:25	0 00:00	0.00	0.00
4	S-LEGION	100.00	100.00	23.75	23.75	0.00	2.54	21.68	21.68	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	119.86	0.00	20.28	20.28	0.00	6.34	18.63	18.63	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	133.35	0 14:13	7775.14	0.02	1.91	17.89	2.57	0.20	0.00		
2	FIELDS	17.30	0 13:15	15547.20	0.00	5.83	0.63	0.81	0.06	0.00		
3	NLEGION	70.66	0 17:25	374.12	0.19	5.59	0.85	1.83	0.37	0.00		
4	SLEGION	99.98	0 13:15	326.72	0.31	5.62	0.80	2.46	0.49	0.00		
5	UPSTREAM	119.80	0 15:41	6323.30	0.02	3.53	6.56	1.50	0.17	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########## SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########## NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	6.00	2.99	667.89	134.02	0 01:54:31
2	2	63.25	284.00	55.00	6.00	1.52	96.01	25.24	0 01:04:05
3	3	52.87	284.00	71.00	6.00	2.90	153.27	32.32	0 01:46:50
4	4	414.75	284.00	79.00	6.00	3.68	1526.28	106.77	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	197.31	9.90	0.00	10.11	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	32.23	13.80	0.00	12.09	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	106.77	24.97	0.00	2.64	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	133.69	24.23	0.00	2.06	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	171.54	20.76	0.00	5.86	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					213.09	5.13					

FUT-25 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	196.17	7775.14	0.03	1.90	2.88	0.23	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	32.23	15547.20	0.00	5.80	0.91	0.07	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	106.77	374.12	0.29	6.31	2.36	0.47	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	133.68	326.72	0.41	6.09	2.94	0.59	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	171.50	6323.30	0.03	3.56	1.77	0.20	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	72
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

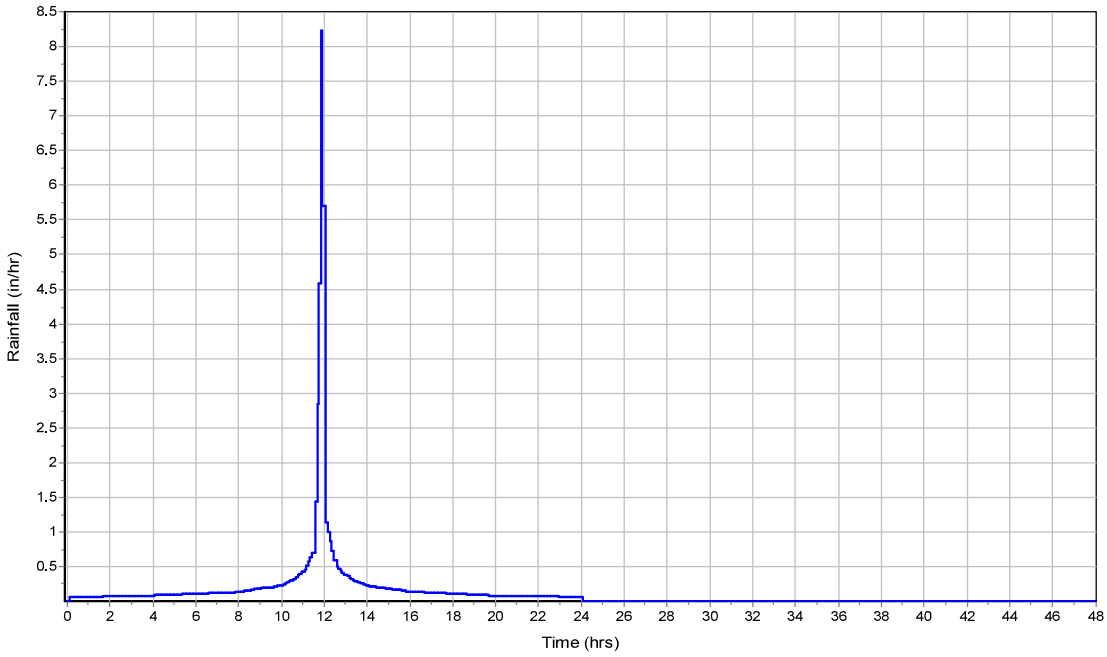
Total TOC (min) 114.53

Subbasin Runoff Results

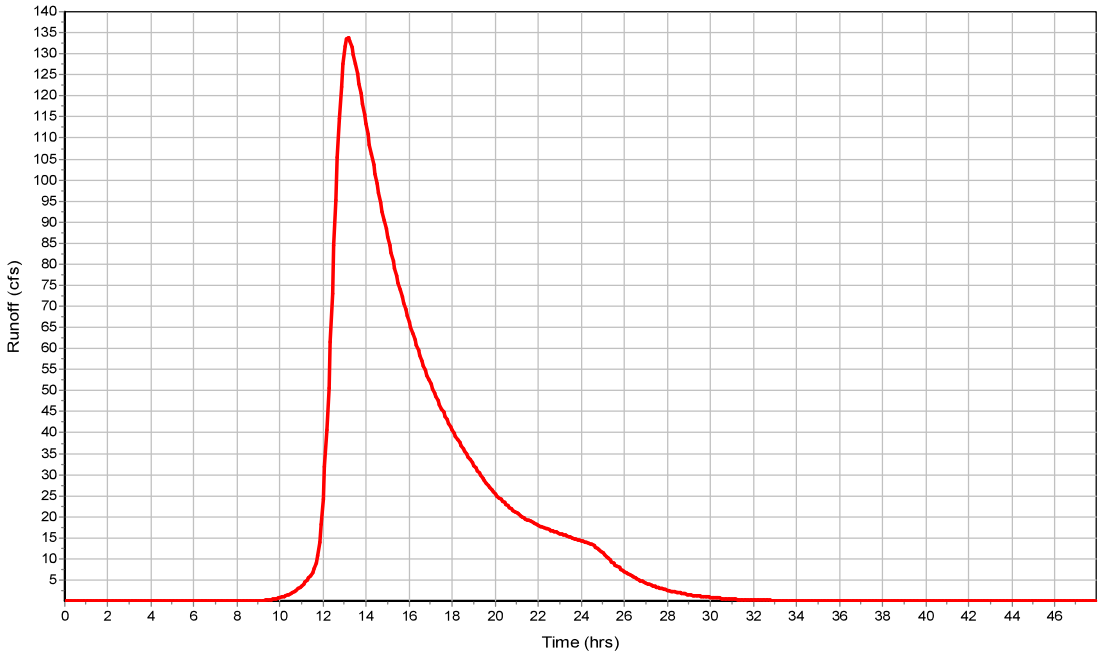
Total Rainfall (in)	6
Total Runoff (in)	2.99
Peak Runoff (cfs)	134.02
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

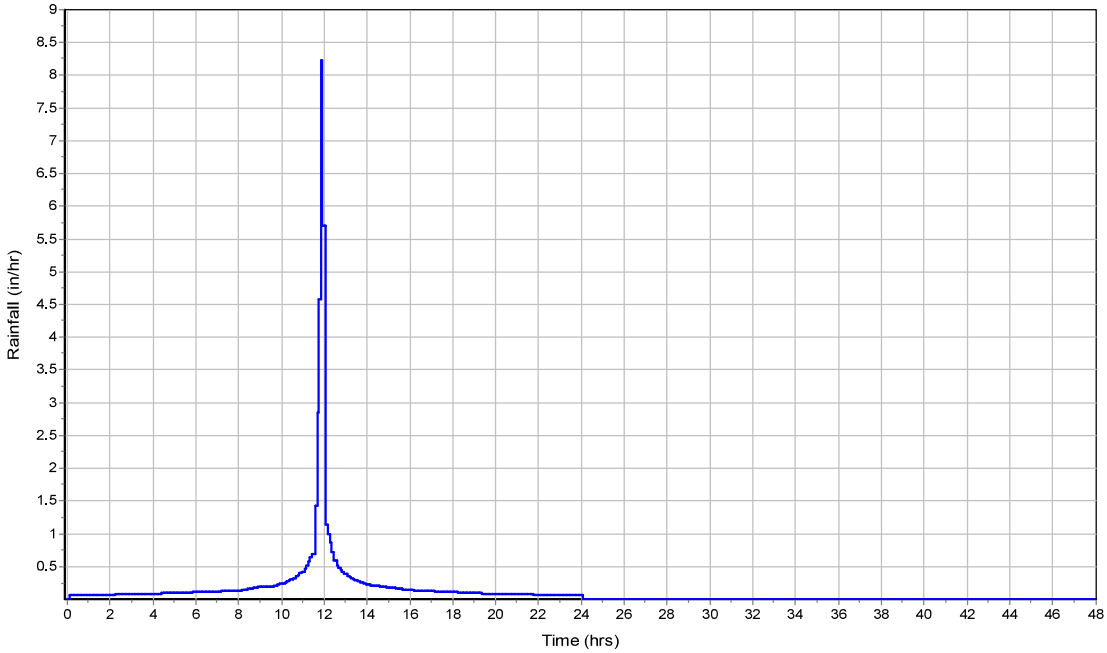
Total TOC (min) 64.09

Subbasin Runoff Results

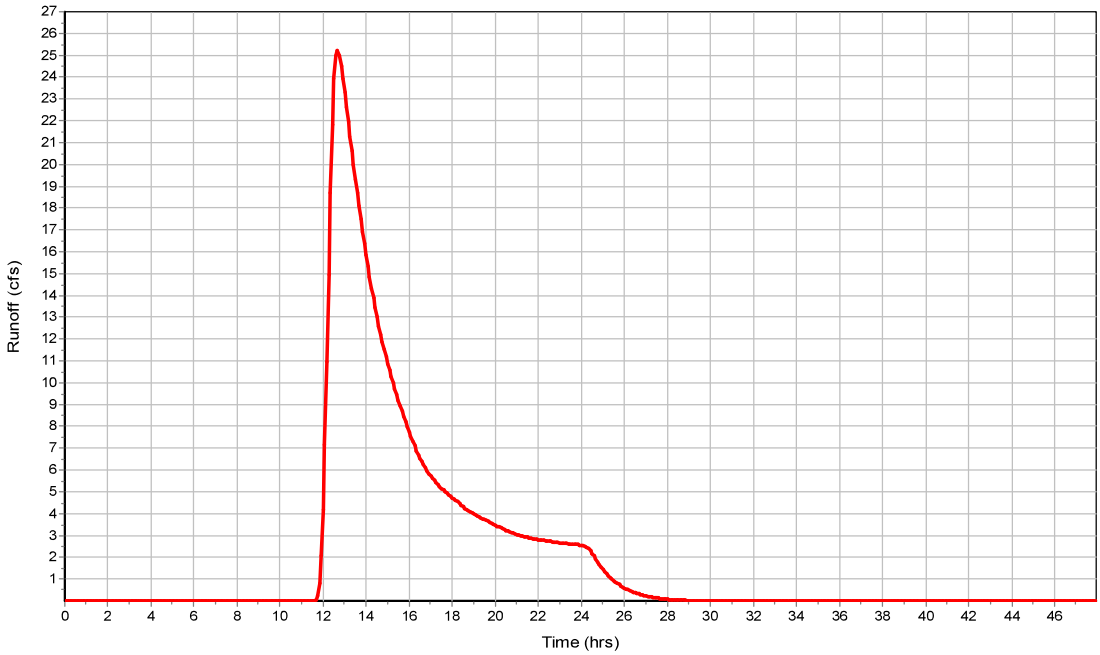
Total Rainfall (in) 6
Total Runoff (in) 1.52
Peak Runoff (cfs) 25.24
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

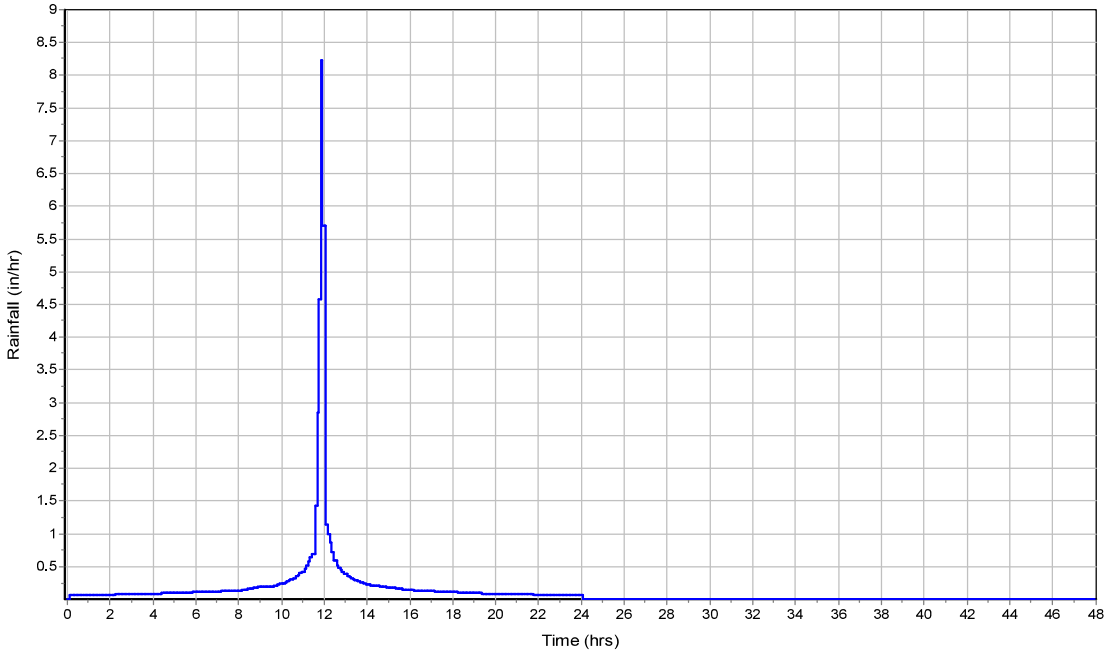
Total TOC (min) 106.84

Subbasin Runoff Results

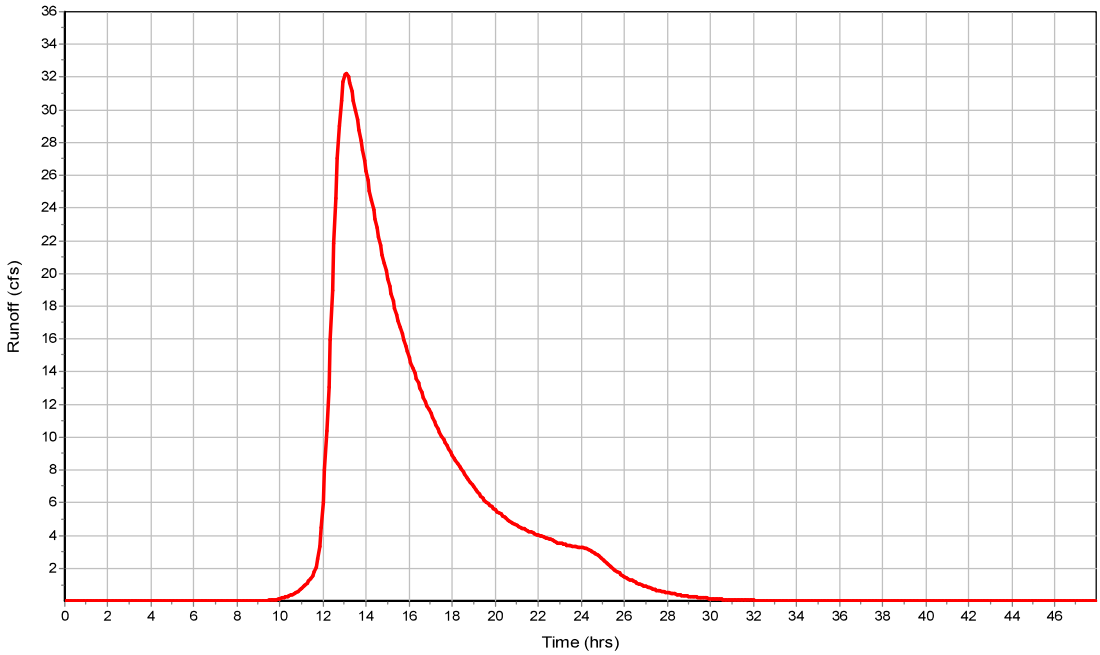
Total Rainfall (in) 6
Total Runoff (in) 2.9
Peak Runoff (cfs) 32.32
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

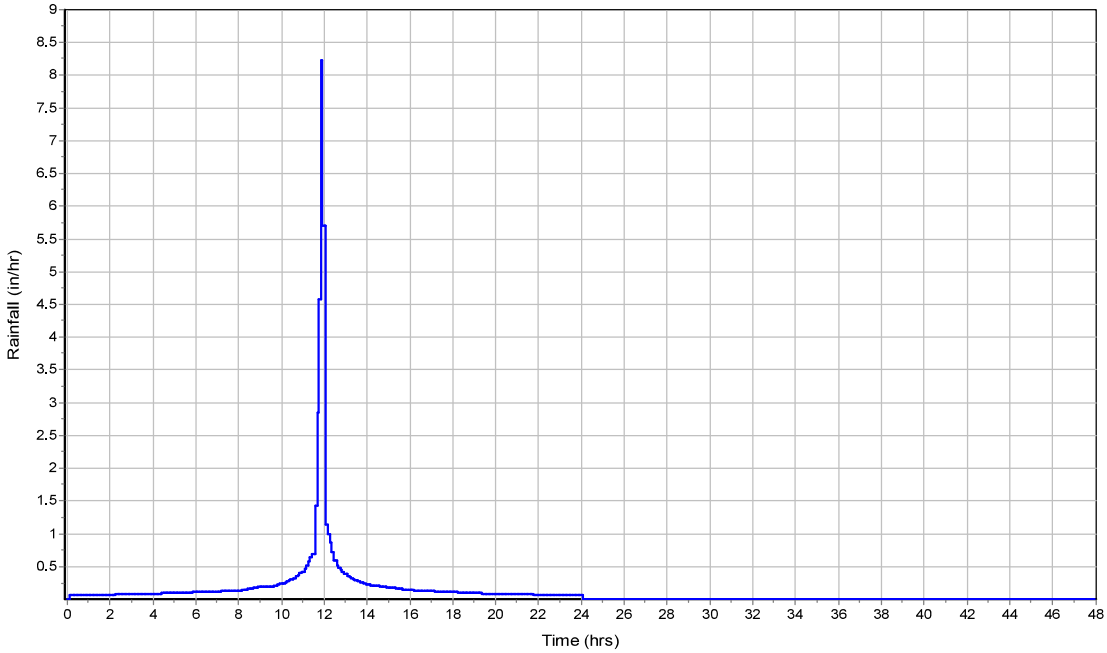
Total TOC (min) 436.75

Subbasin Runoff Results

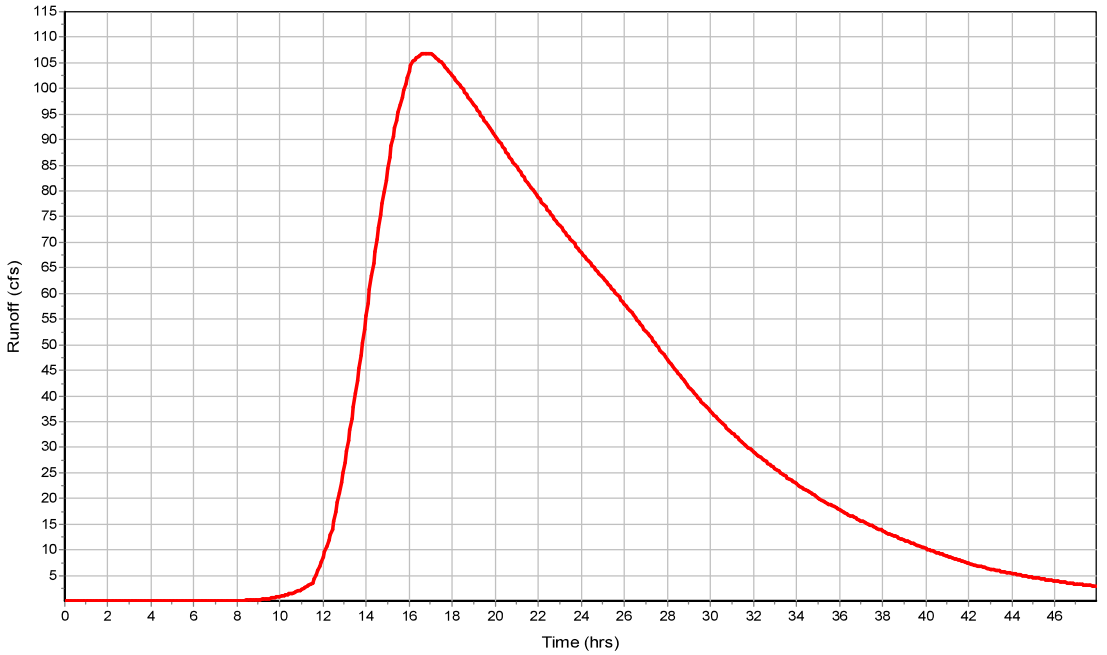
Total Rainfall (in) 6
Total Runoff (in) 3.68
Peak Runoff (cfs) 106.77
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	197.31	0.00	9.90	9.90	0.00	10.11	8.34	8.34	0 13:34	0 00:00	0.00	0.00
2	FIELD	32.23	32.23	13.80	13.80	0.00	12.09	13.09	13.09	0 13:10	0 00:00	0.00	0.00
3	N-LEGION	106.77	106.77	24.97	24.97	0.00	2.64	23.53	23.53	0 16:40	0 00:00	0.00	0.00
4	S-LEGION	133.69	133.69	24.23	24.23	0.00	2.06	21.75	21.75	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	171.54	0.00	20.76	20.76	0.00	5.86	18.83	18.83	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	196.17	0 13:59	7775.14	0.03	1.90	17.99	2.88	0.23	0.00		
2	FIELDS	32.23	0 13:10	15547.20	0.00	5.80	0.63	0.91	0.07	0.00		
3	NLEGION	106.77	0 16:41	374.12	0.29	6.31	0.75	2.36	0.47	0.00		
4	SLEGION	133.68	0 13:15	326.72	0.41	6.09	0.74	2.94	0.59	0.00		
5	UPSTREAM	171.50	0 15:24	6323.30	0.03	3.56	6.50	1.77	0.20	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	6.80	2.95	658.07	128.30	0 01:54:31
2	2	63.25	284.00	52.00	6.80	1.73	109.42	28.83	0 01:04:05
3	3	52.87	284.00	58.00	6.80	2.27	120.23	23.29	0 01:46:50
4	4	414.75	284.00	67.00	6.80	3.15	1305.63	89.04	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	175.02	9.80	0.00	10.22	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	23.24	13.78	0.00	12.11	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	89.01	24.72	0.00	2.89	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	128.25	24.15	0.00	2.14	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	151.60	20.68	0.00	5.94	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					190.87	5.02					

EX-50 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	171.84	7775.14	0.02	1.90	2.77	0.22	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	23.89	15547.20	0.00	5.82	0.89	0.07	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	89.01	374.12	0.24	5.99	2.11	0.42	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	128.24	326.72	0.39	6.02	2.86	0.57	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	151.55	6323.30	0.02	3.56	1.67	0.19	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac) 223.15
Peak Rate Factor 284
Weighted Curve Number 65
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

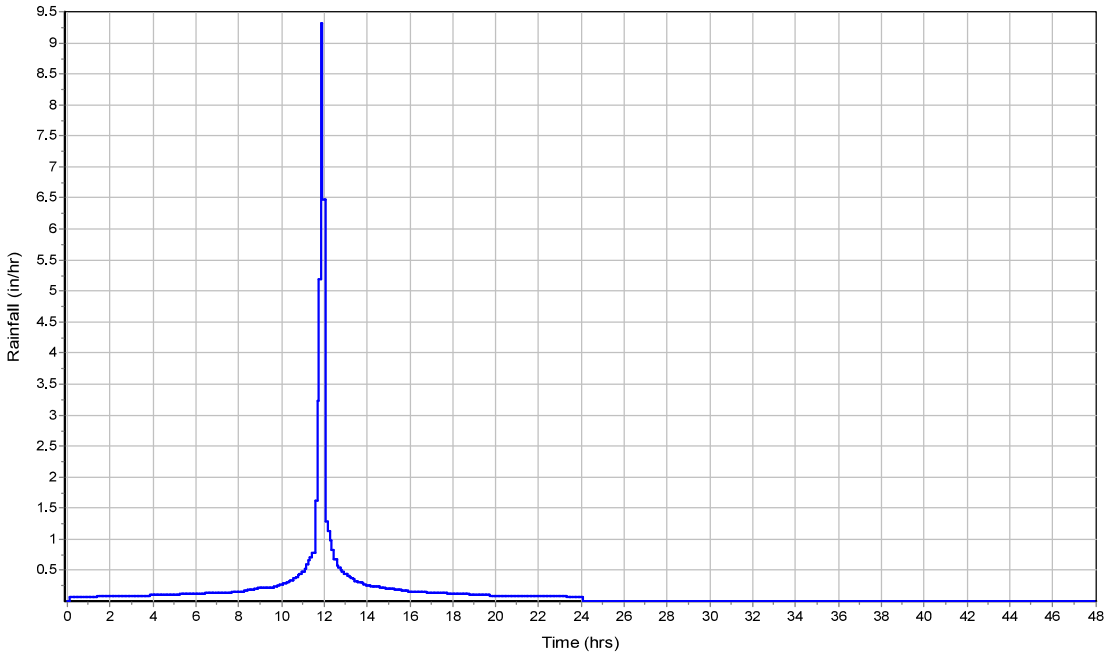
Total TOC (min) 114.53

Subbasin Runoff Results

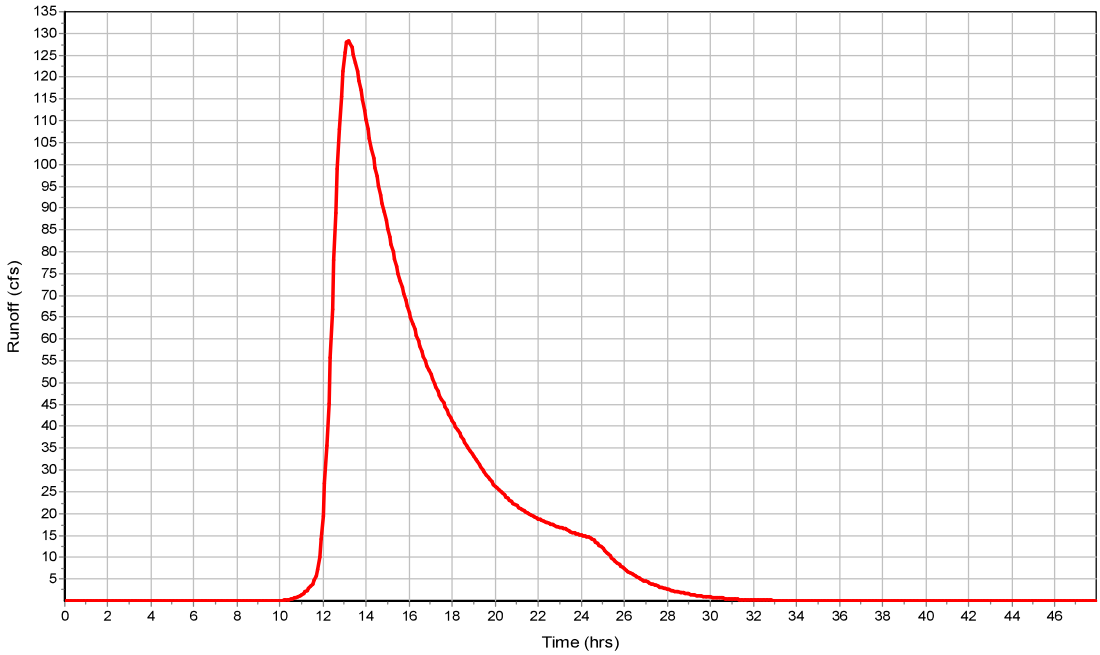
Total Rainfall (in)	6.8
Total Runoff (in)	2.95
Peak Runoff (cfs)	128.3
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac)	63.25
Peak Rate Factor	284
Weighted Curve Number	52
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

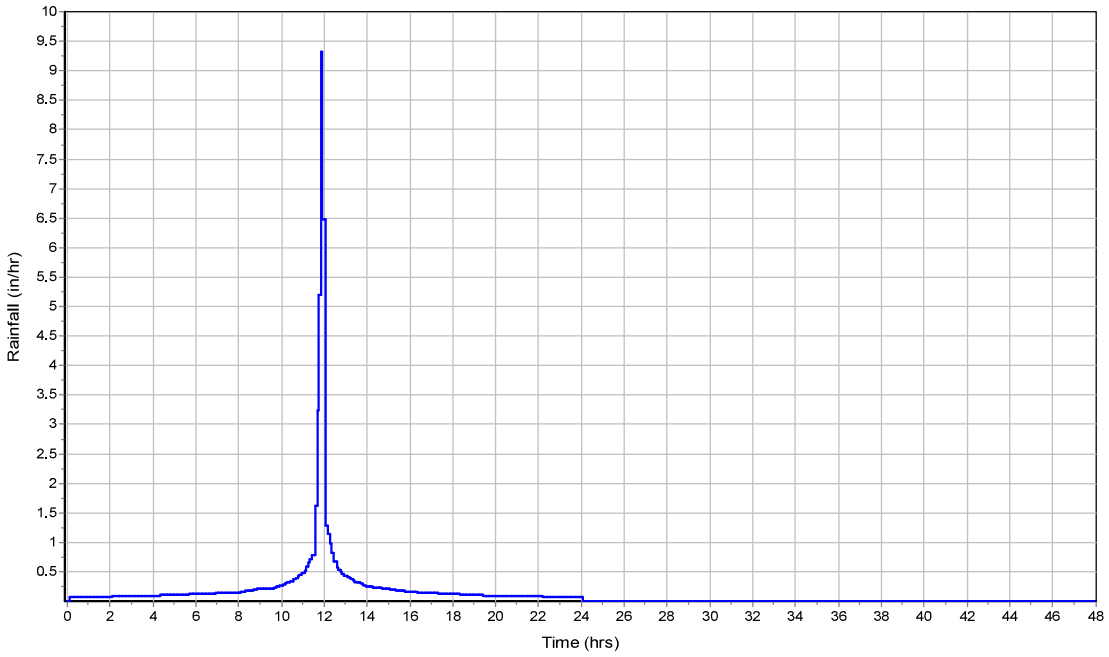
Total TOC (min) 64.09

Subbasin Runoff Results

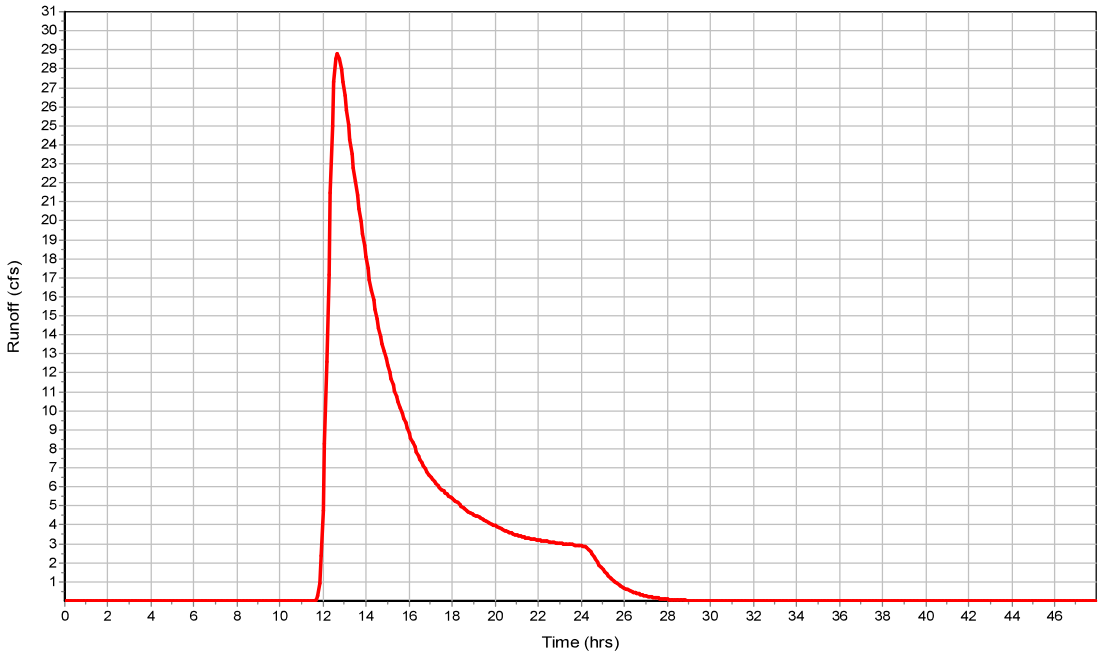
Total Rainfall (in)	6.8
Total Runoff (in)	1.73
Peak Runoff (cfs)	28.83
Weighted Curve Number	52
Time of Concentration (days hh:mm:ss)	0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 58
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

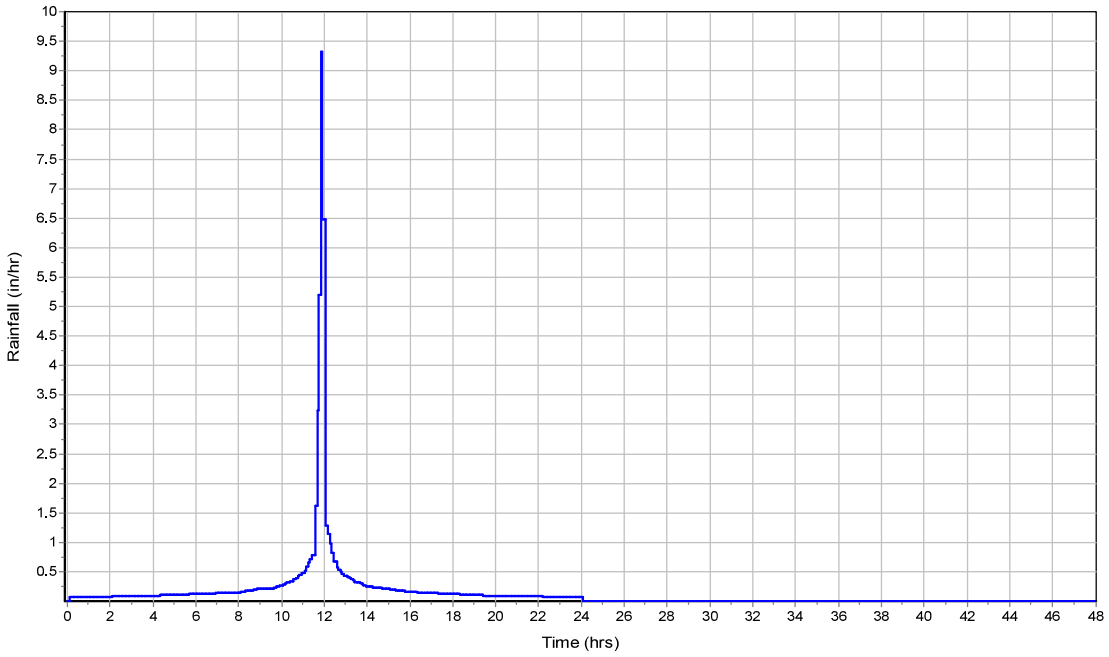
Total TOC (min) 106.84

Subbasin Runoff Results

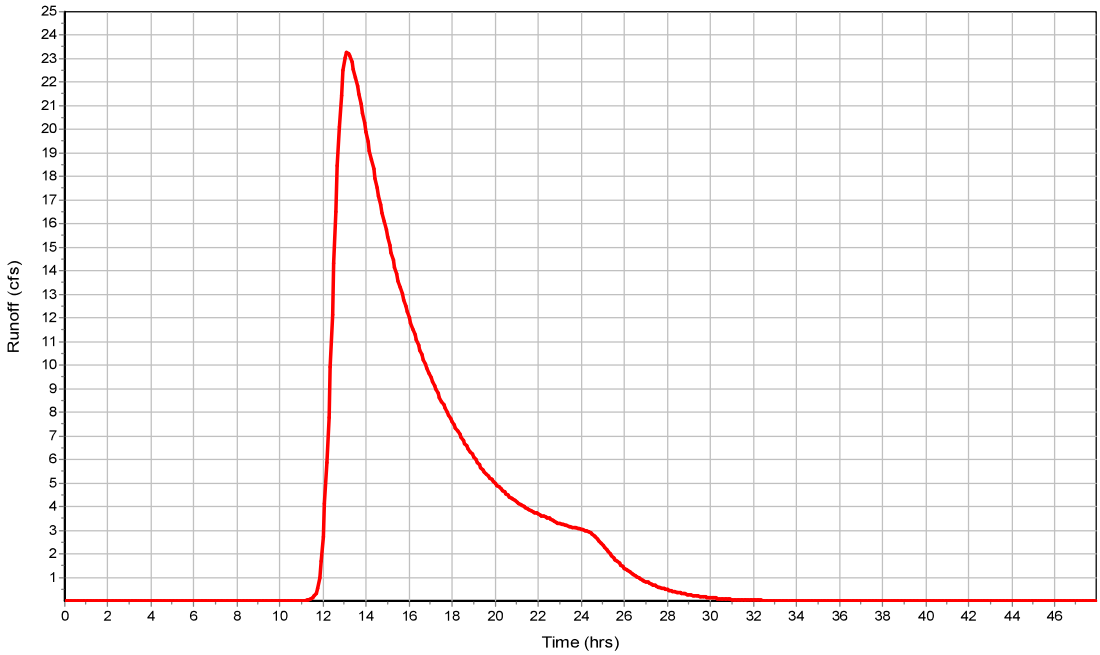
Total Rainfall (in) 6.8
Total Runoff (in) 2.27
Peak Runoff (cfs) 23.29
Weighted Curve Number 58
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

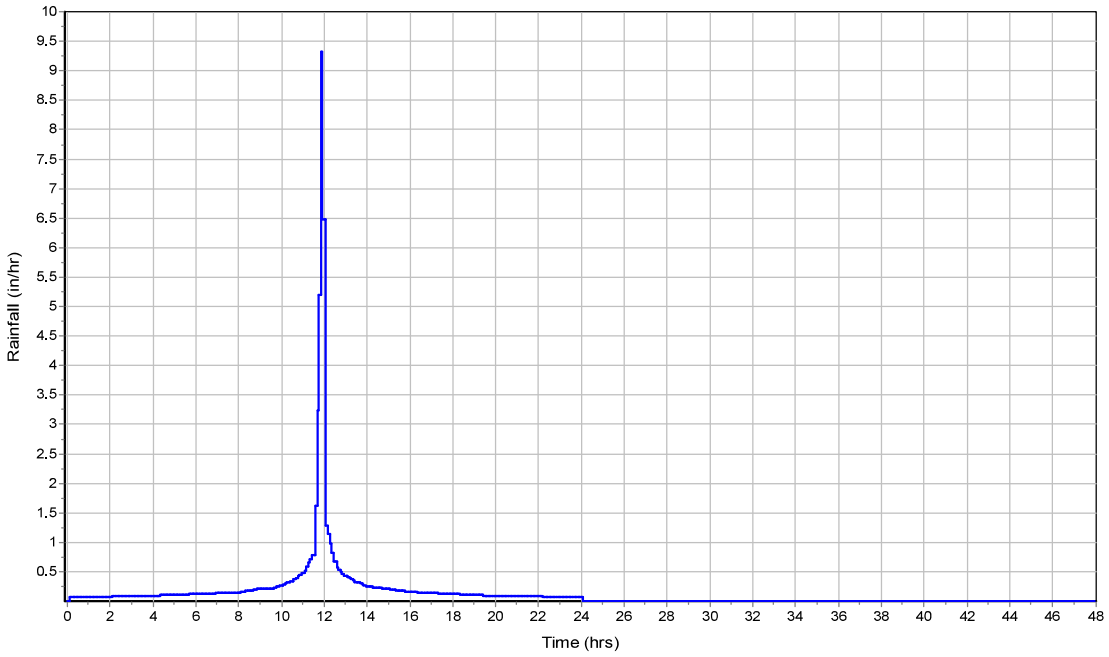
Total TOC (min) 436.75

Subbasin Runoff Results

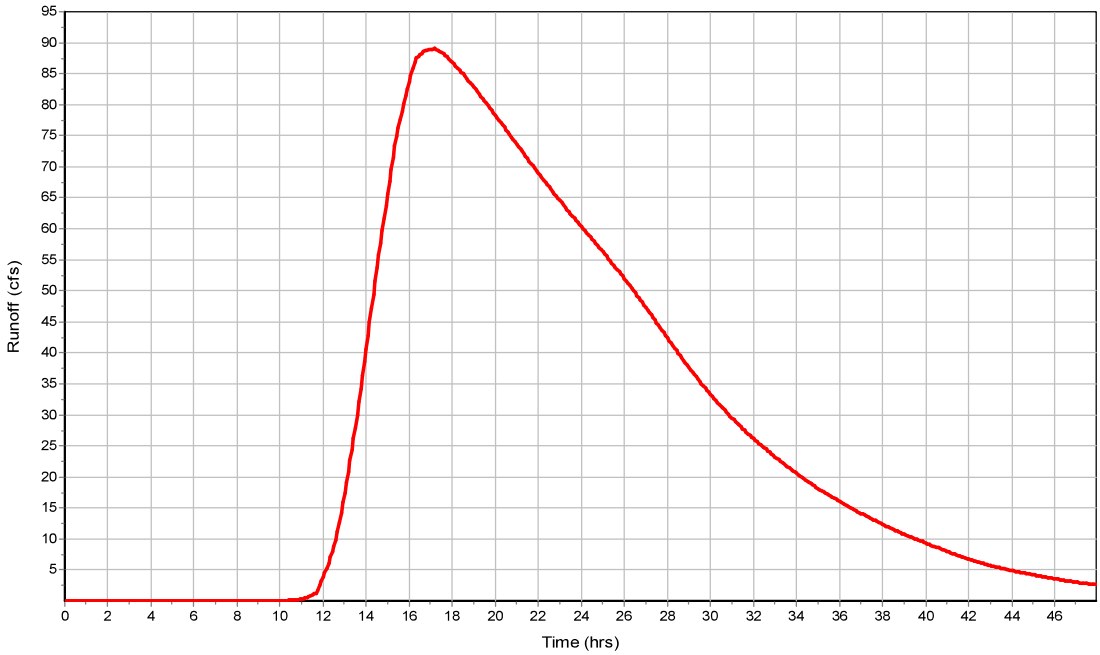
Total Rainfall (in) 6.8
Total Runoff (in) 3.15
Peak Runoff (cfs) 89.04
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	175.02	0.00	9.80	9.80	0.00	10.22	8.27	8.27	0 13:43	0 00:00	0.00	0.00
2	FIELD	23.24	23.24	13.78	13.78	0.00	12.11	13.07	13.07	0 13:43	0 00:00	0.00	0.00
3	N-LEGION	89.01	89.01	24.72	24.72	0.00	2.89	23.44	23.44	0 17:15	0 00:00	0.00	0.00
4	S-LEGION	128.25	128.25	24.15	24.15	0.00	2.14	21.74	21.74	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	151.60	0.00	20.68	20.68	0.00	5.94	18.75	18.75	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	171.84	0 14:02	7775.14	0.02	1.90	17.99	2.77	0.22	0.00		
2	FIELDS	23.89	0 13:43	15547.20	0.00	5.82	0.63	0.89	0.07	0.00		
3	NLEGION	89.01	0 17:15	374.12	0.24	5.99	0.79	2.11	0.42	0.00		
4	SLEGION	128.24	0 13:15	326.72	0.39	6.02	0.75	2.86	0.57	0.00		
5	UPSTREAM	151.55	0 15:33	6323.30	0.02	3.56	6.50	1.67	0.19	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########## SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########## NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	6.80	3.66	816.51	165.72	0 01:54:31
2	2	63.25	284.00	55.00	6.80	2.00	126.37	35.06	0 01:04:05
3	3	52.87	284.00	71.00	6.80	3.56	188.01	40.18	0 01:46:50
4	4	414.75	284.00	79.00	6.80	4.40	1825.73	128.57	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	243.40	10.10	0.00	9.92	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	40.12	13.88	0.00	12.01	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	128.57	25.25	0.00	2.36	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	165.72	24.63	0.00	1.65	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	207.38	21.16	0.00	5.46	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					265.33	5.33					

FUT-50 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	241.84	7775.14	0.03	1.90	3.08	0.24	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	40.11	15547.20	0.00	5.81	0.99	0.08	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	128.57	374.12	0.34	6.65	2.64	0.53	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	165.69	326.72	0.51	6.46	3.34	0.67	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	207.27	6323.30	0.03	3.56	1.94	0.22	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	72
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

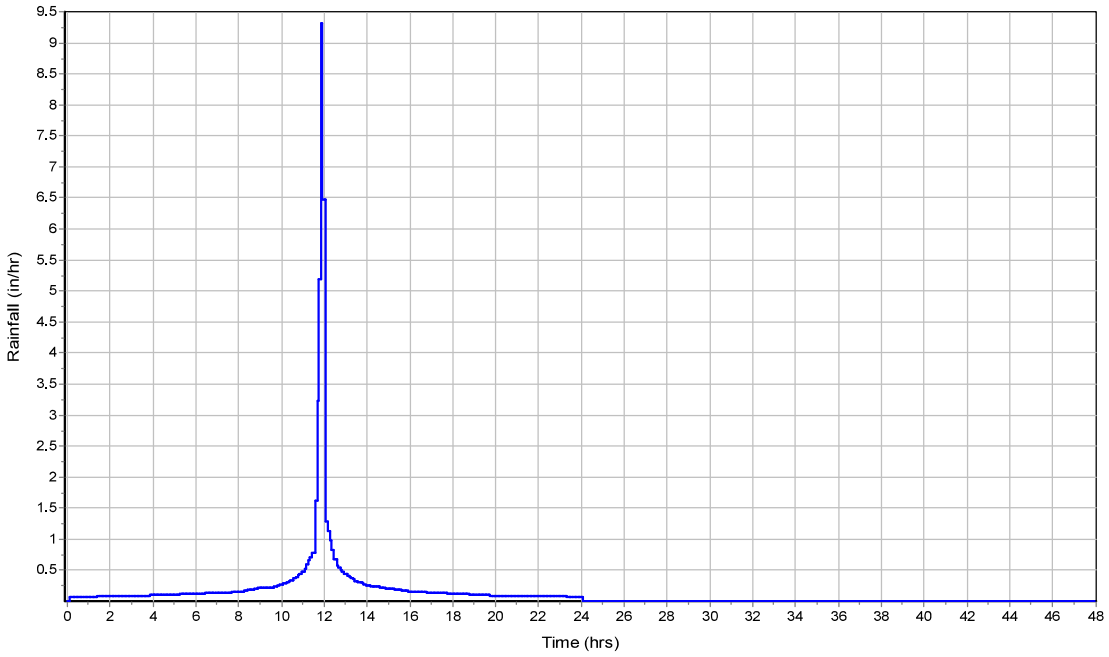
Total TOC (min) 114.53

Subbasin Runoff Results

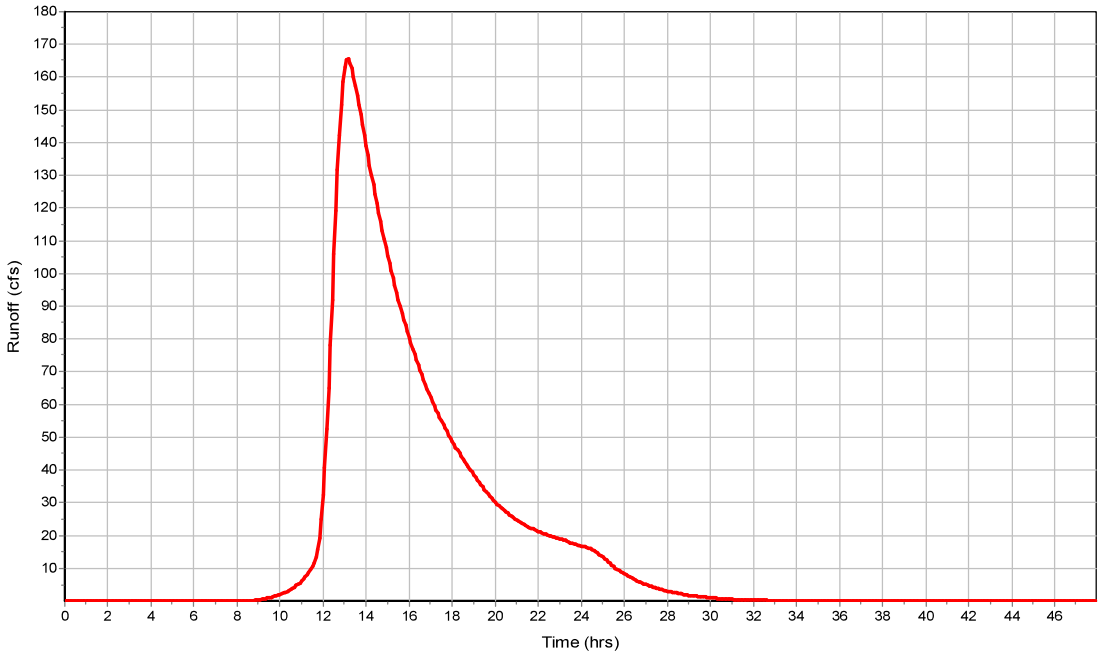
Total Rainfall (in)	6.8
Total Runoff (in)	3.66
Peak Runoff (cfs)	165.72
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

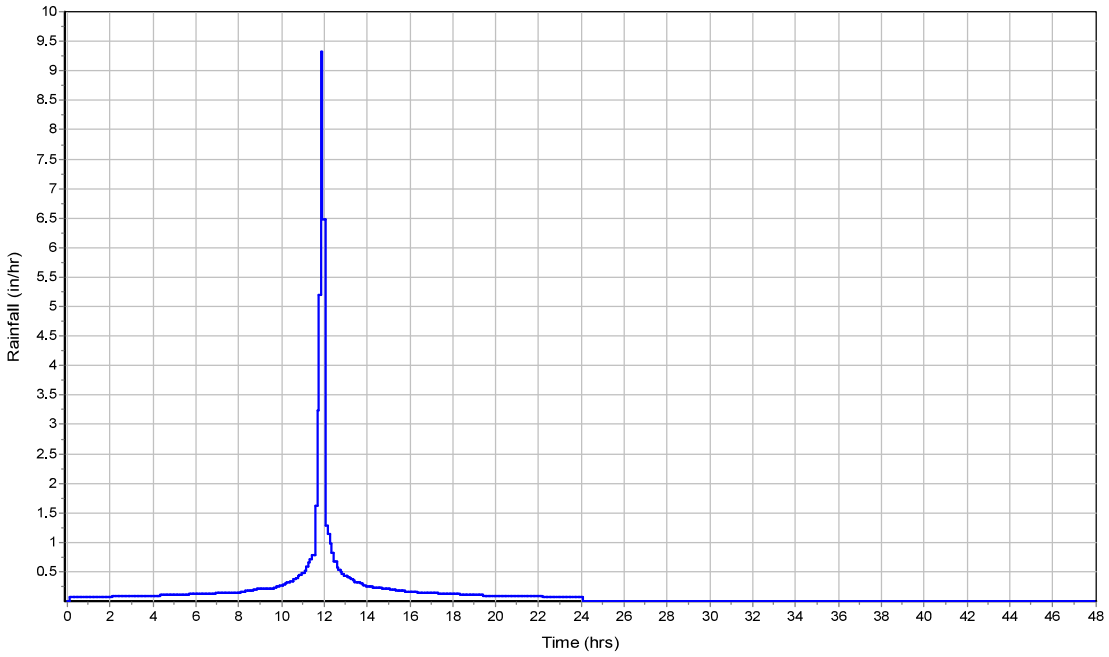
Total TOC (min) 64.09

Subbasin Runoff Results

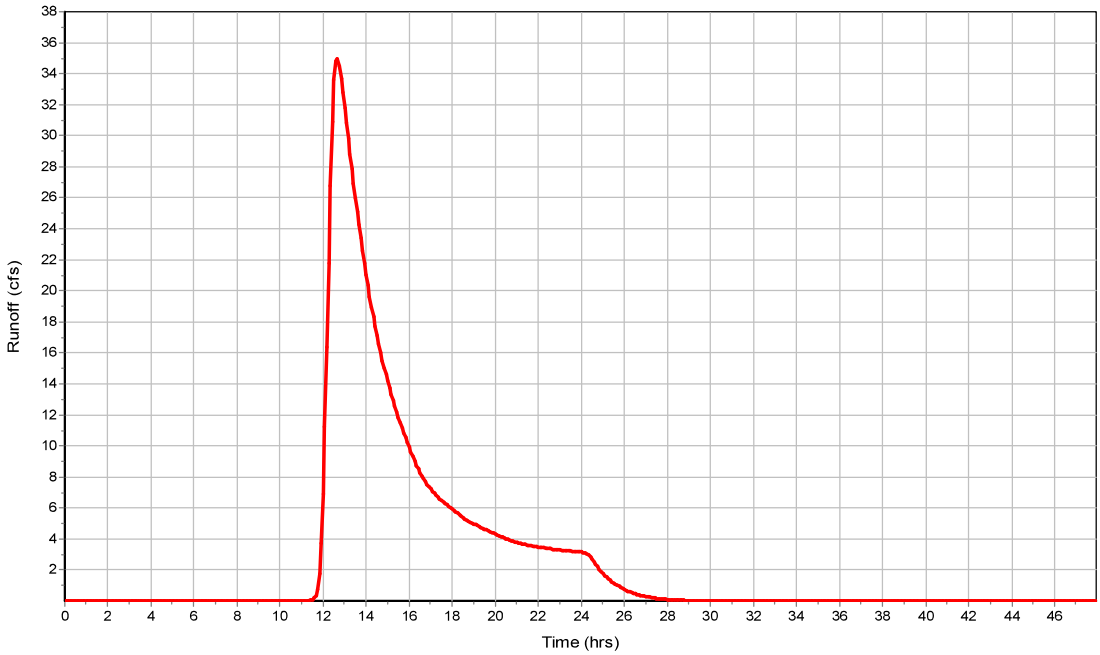
Total Rainfall (in) 6.8
Total Runoff (in) 2
Peak Runoff (cfs) 35.06
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

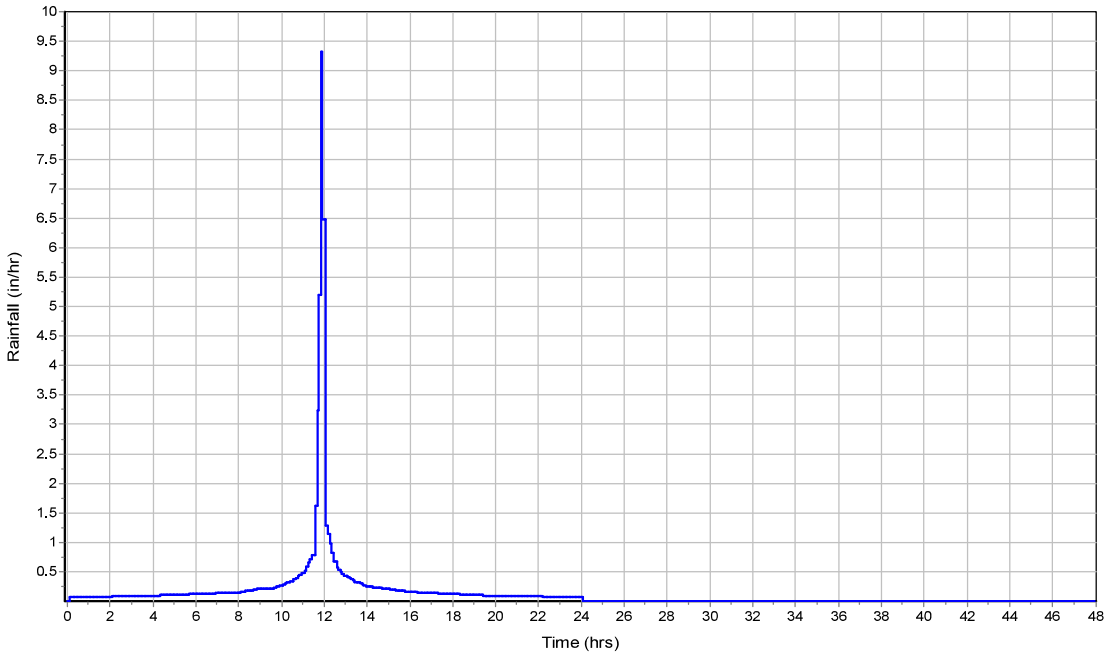
Total TOC (min) 106.84

Subbasin Runoff Results

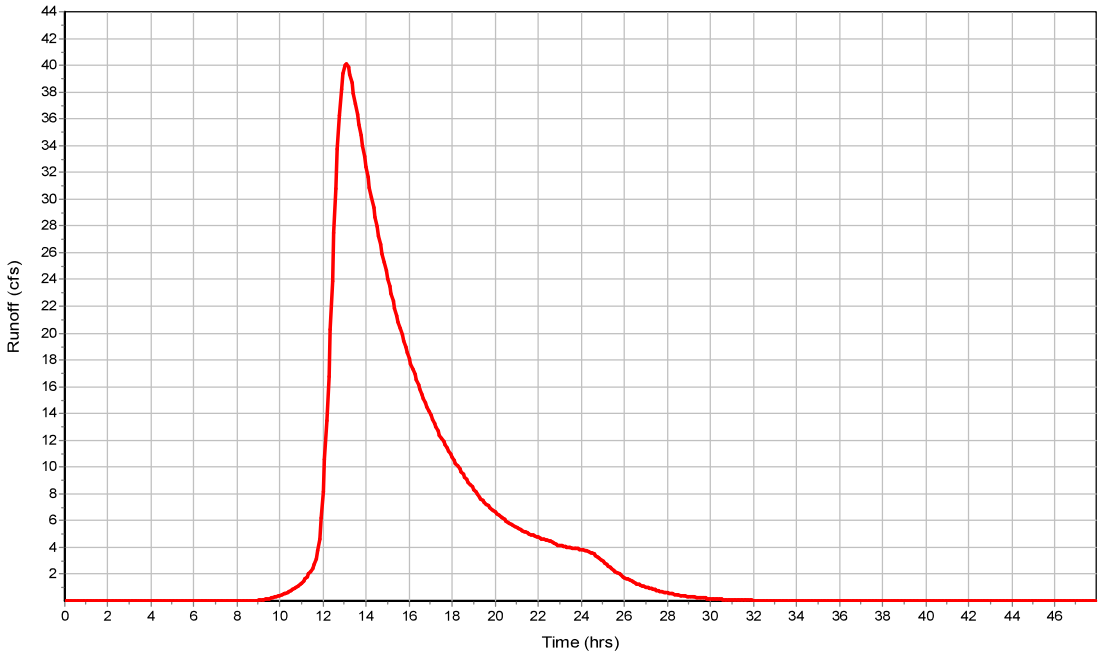
Total Rainfall (in) 6.8
Total Runoff (in) 3.56
Peak Runoff (cfs) 40.18
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

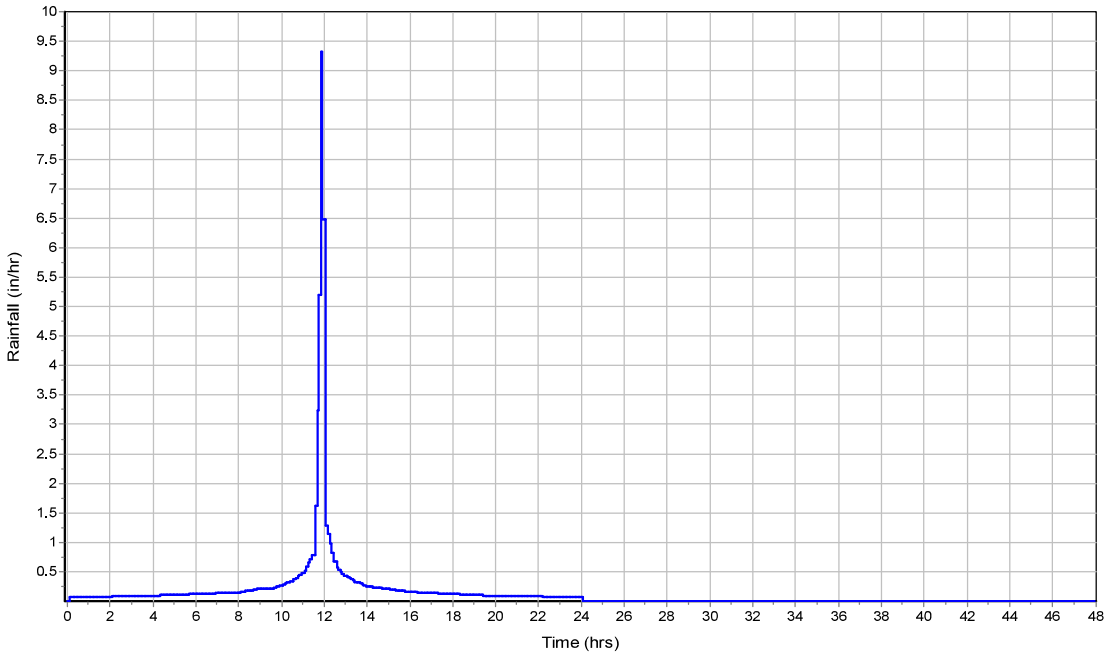
Total TOC (min) 436.75

Subbasin Runoff Results

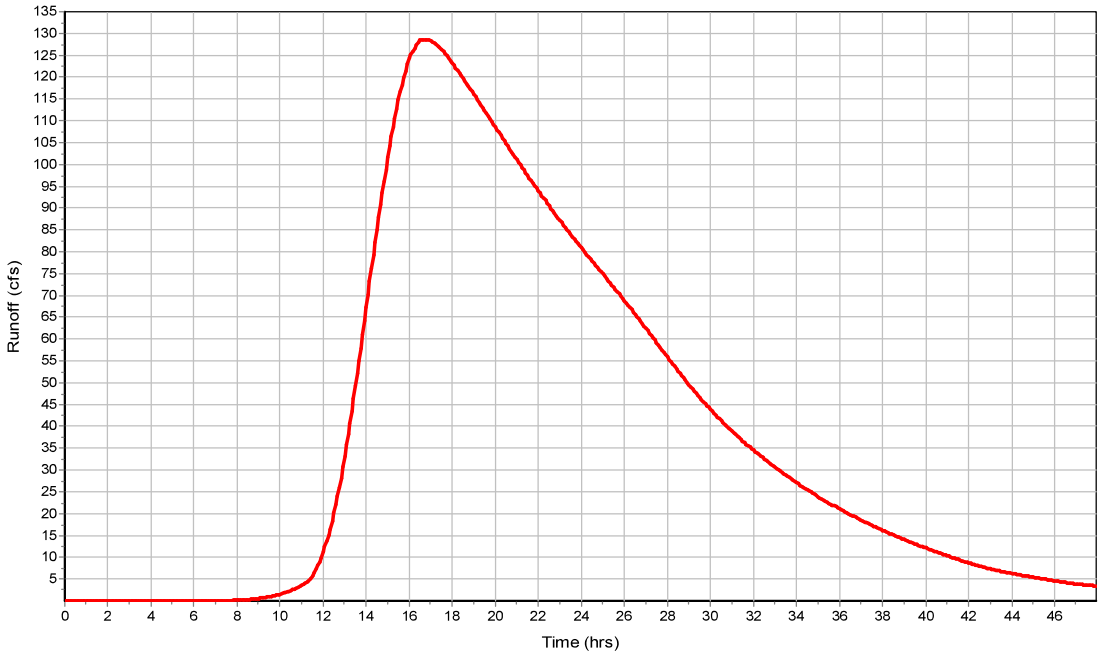
Total Rainfall (in) 6.8
Total Runoff (in) 4.4
Peak Runoff (cfs) 128.57
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	243.40	0.00	10.10	10.10	0.00	9.92	8.44	8.44	0 13:32	0 00:00	0.00	0.00
2	FIELD	40.12	40.12	13.88	13.88	0.00	12.01	13.11	13.11	0 13:10	0 00:00	0.00	0.00
3	N-LEGION	128.57	128.57	25.25	25.25	0.00	2.36	23.64	23.64	0 17:00	0 00:00	0.00	0.00
4	S-LEGION	165.72	165.72	24.63	24.63	0.00	1.65	21.81	21.81	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	207.38	0.00	21.16	21.16	0.00	5.46	18.95	18.95	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	241.84	0 14:01	7775.14	0.03	1.90	17.99	3.08	0.24	0.00		
2	FIELDS	40.11	0 13:10	15547.20	0.00	5.81	0.63	0.99	0.08	0.00		
3	NLEGION	128.57	0 17:00	374.12	0.34	6.65	0.72	2.64	0.53	0.00		
4	SLEGION	165.69	0 13:15	326.72	0.51	6.46	0.70	3.34	0.67	0.00		
5	UPSTREAM	207.27	0 15:17	6323.30	0.03	3.56	6.50	1.94	0.22	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_7MAR22_EXISTING.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
################################ SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
################################ NO

Analysis Options

Start Analysis On 00:00:00 00:00:00
End Analysis On 00:00:00 00:00:00
Start Reporting On 00:00:00 00:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss
Routing Time Step ..... 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins	4
Nodes	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	65.00	7.60	3.57	797.31	158.26	0 01:54:31
2	2	63.25	284.00	52.00	7.60	2.21	139.72	38.58	0 01:04:05
3	3	52.87	284.00	58.00	7.60	2.83	149.41	29.73	0 01:46:50
4	4	414.75	284.00	67.00	7.60	3.79	1572.73	107.97	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	215.30	9.98	0.00	10.03	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	29.72	13.78	0.00	12.11	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	107.94	24.98	0.00	2.63	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	158.21	24.54	0.00	1.75	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	187.21	21.07	0.00	5.55	0 00:00	0.00	0.00
6	OUTFALL	Outfall	0.00					239.20	5.21					

EX-100 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	OUTFALL	2050.57	7.02	2.25	0.2300	153.600	0.0320	213.71	7775.14	0.03	1.90	2.96	0.23	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	29.72	15547.20	0.00	5.87	0.89	0.07	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	107.93	374.12	0.29	6.33	2.37	0.47	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	158.19	326.72	0.48	6.38	3.25	0.65	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	187.08	6323.30	0.03	3.56	1.85	0.21	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac)	223.15
Peak Rate Factor	284
Weighted Curve Number	65
Rain Gage ID	Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	65
Composite Area & Weighted CN	223.15		65

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

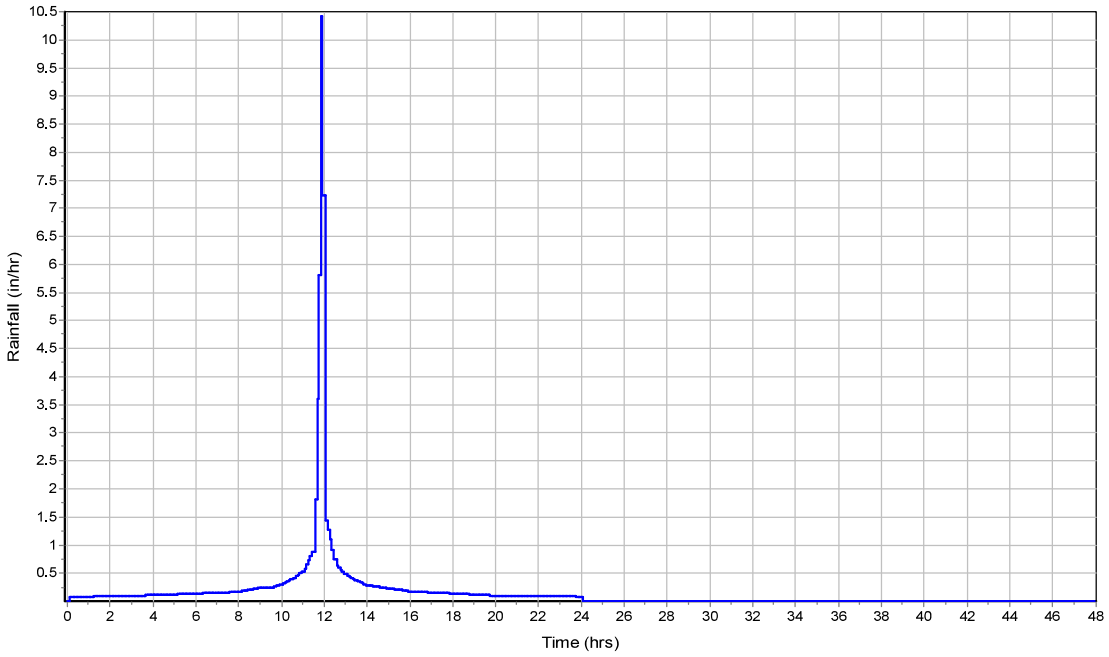
Total TOC (min) 114.53

Subbasin Runoff Results

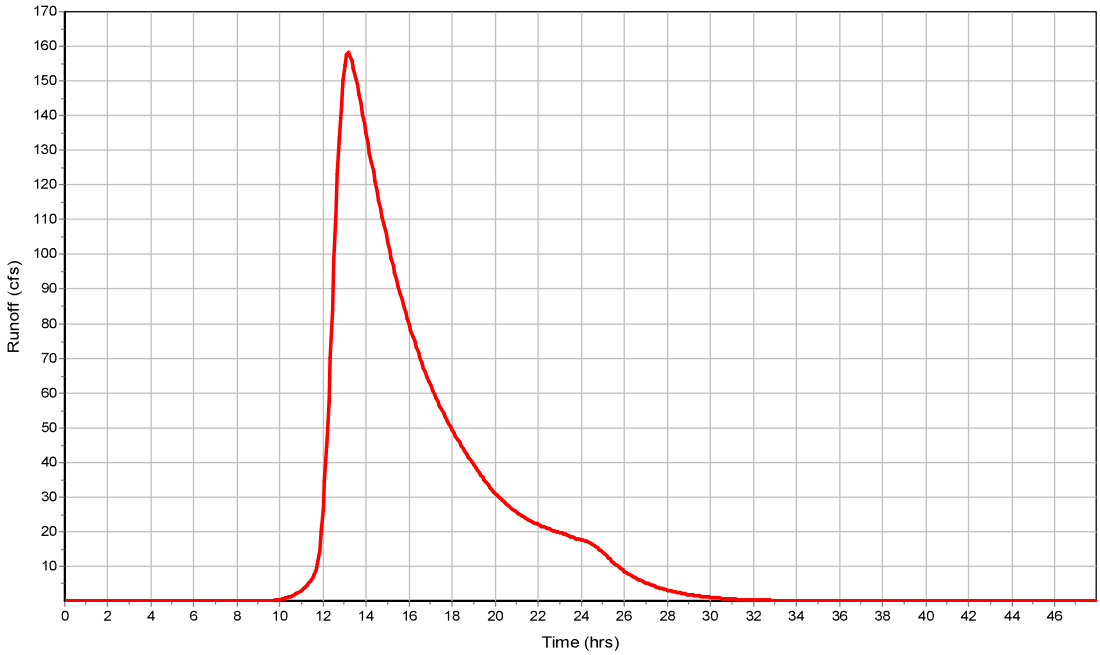
Total Rainfall (in)	7.6
Total Runoff (in)	3.57
Peak Runoff (cfs)	158.26
Weighted Curve Number	65
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 52
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	52
Composite Area & Weighted CN	63.25		52

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

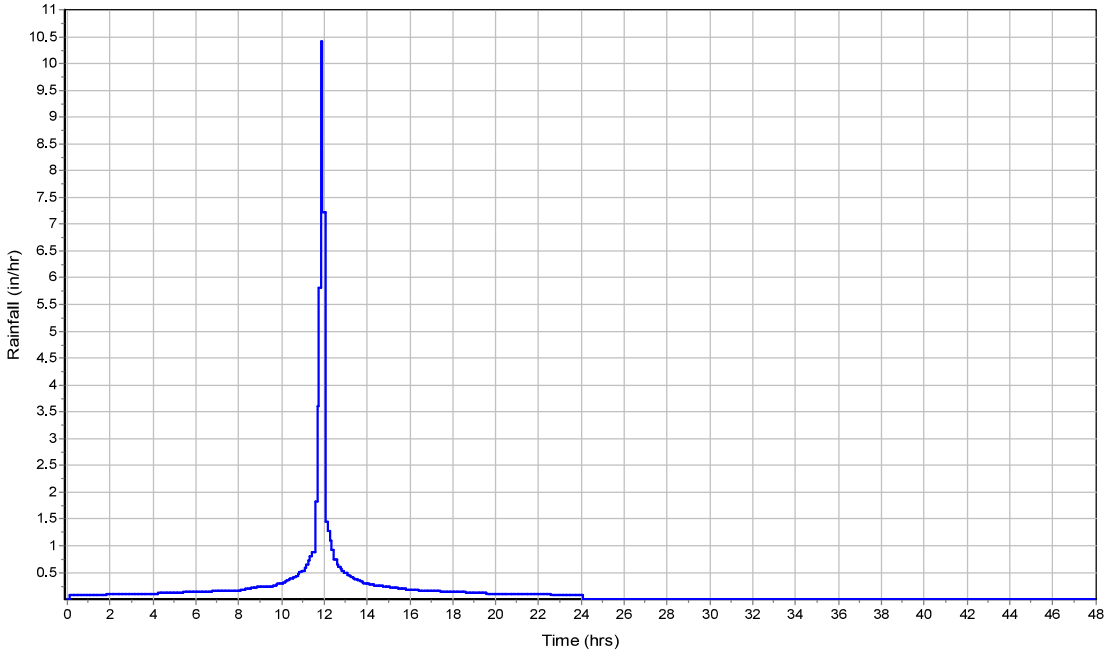
Total TOC (min) 64.09

Subbasin Runoff Results

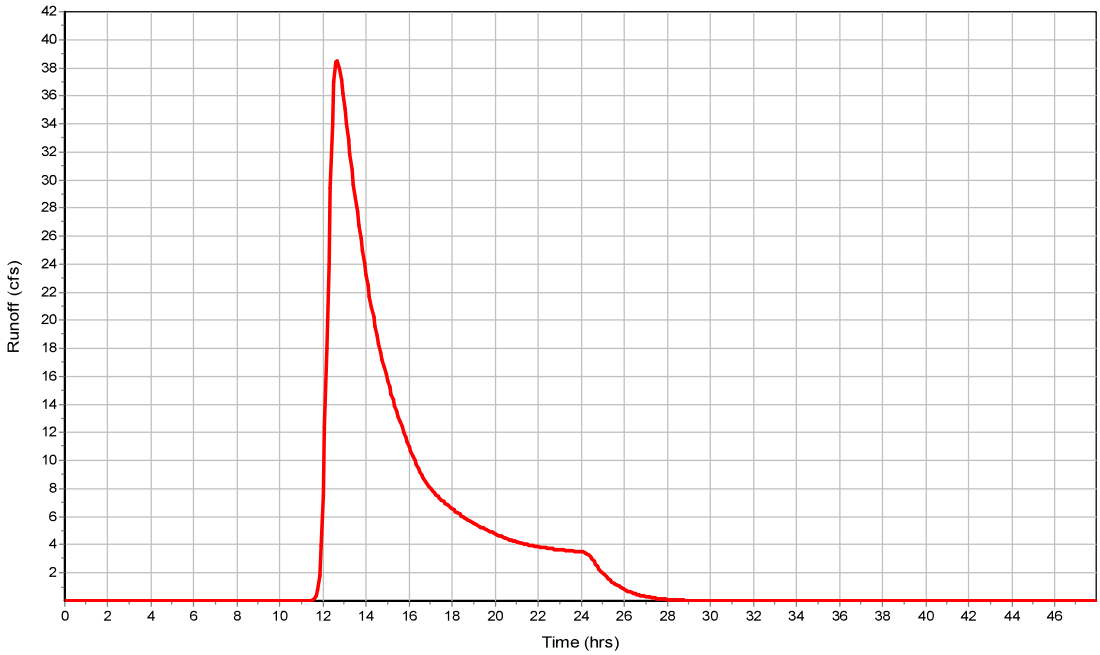
Total Rainfall (in) 7.6
Total Runoff (in) 2.21
Peak Runoff (cfs) 38.58
Weighted Curve Number 52
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 58
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	58
Composite Area & Weighted CN	52.87		58

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

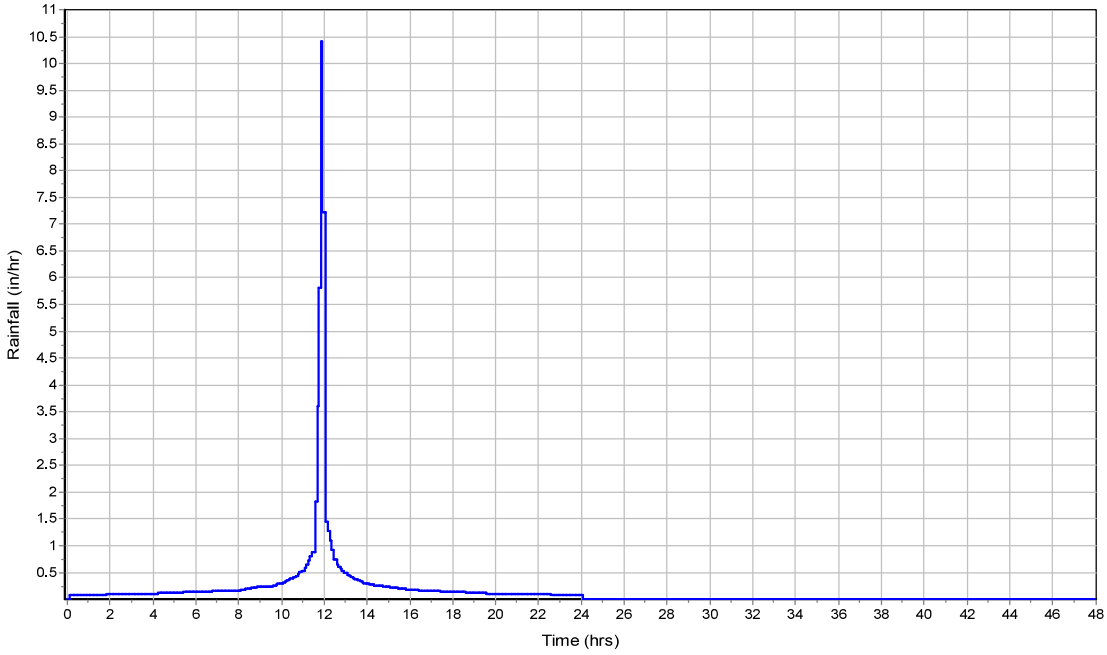
Total TOC (min) 106.84

Subbasin Runoff Results

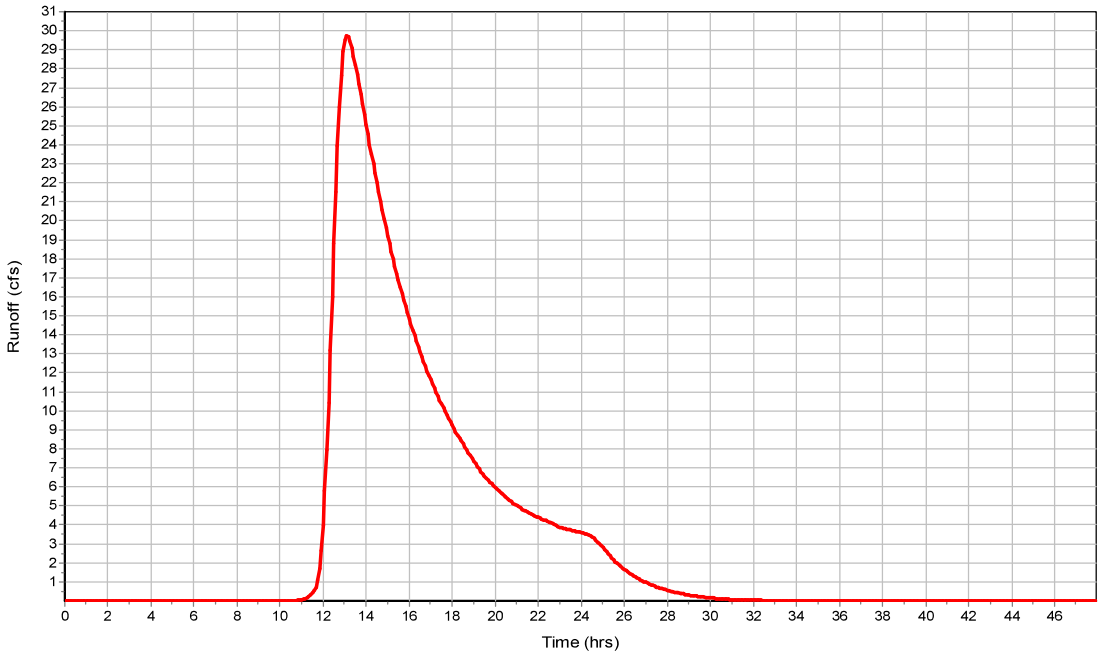
Total Rainfall (in) 7.6
Total Runoff (in) 2.83
Peak Runoff (cfs) 29.73
Weighted Curve Number 58
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 67
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	67
Composite Area & Weighted CN	414.75		67

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

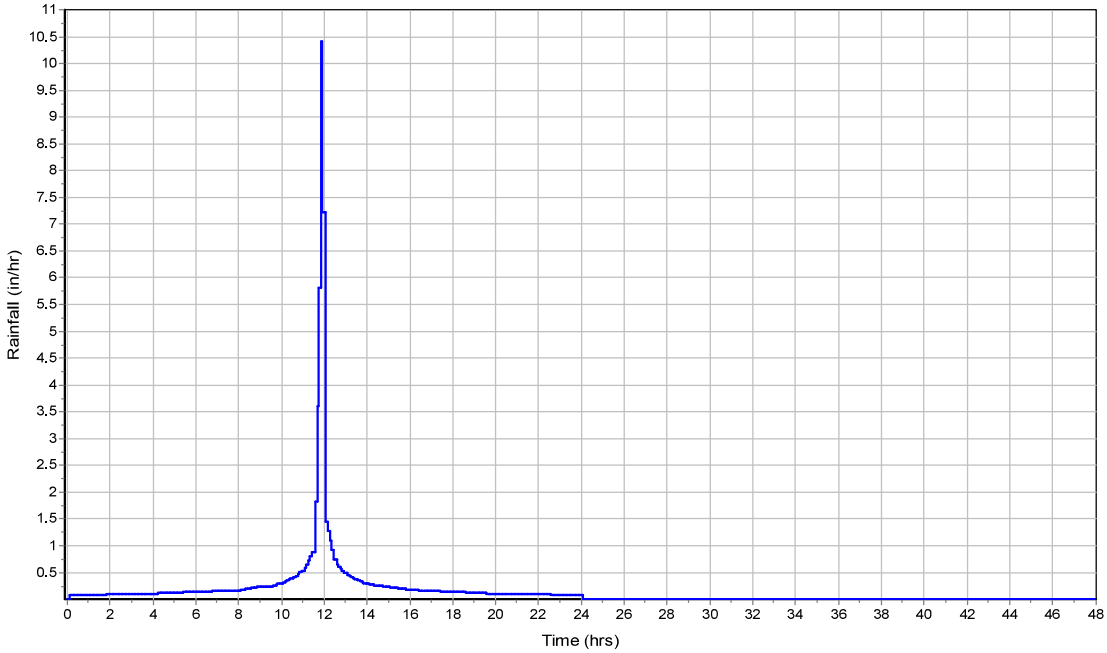
Total TOC (min) 436.75

Subbasin Runoff Results

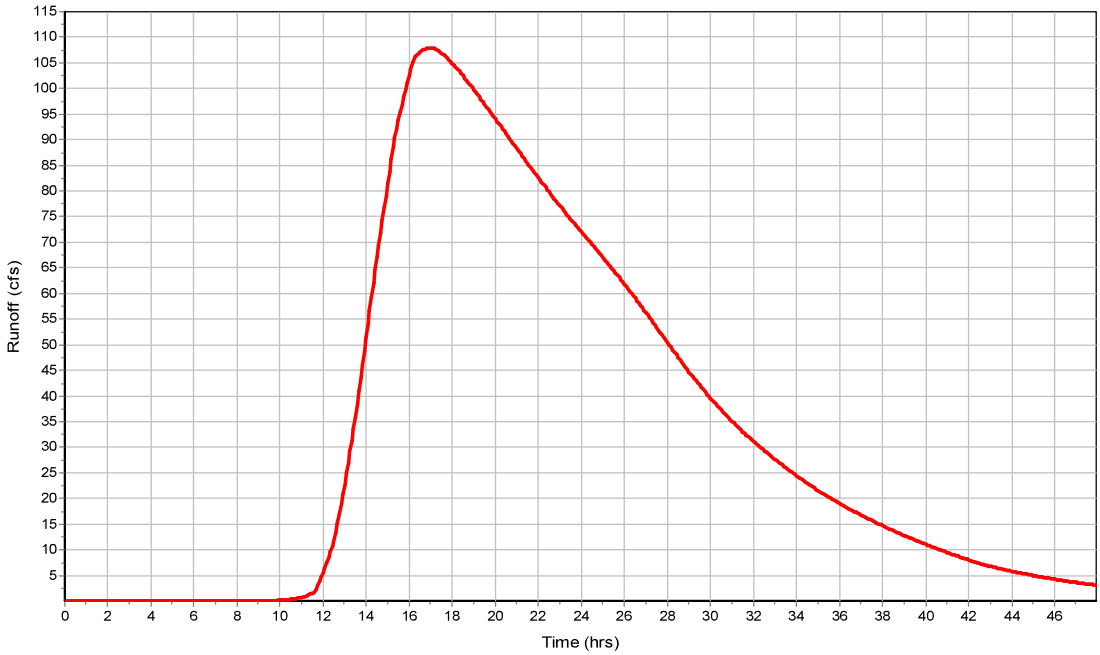
Total Rainfall (in) 7.6
Total Runoff (in) 3.79
Peak Runoff (cfs) 107.97
Weighted Curve Number 67
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	215.30	0.00	9.98	9.98	0.00	10.03	8.37	8.37	0 13:32	0 00:00	0.00	0.00
2	FIELD	29.72	29.72	13.78	13.78	0.00	12.11	13.09	13.09	0 14:39	0 00:00	0.00	0.00
3	N-LEGION	107.94	107.94	24.98	24.98	0.00	2.63	23.55	23.55	0 17:10	0 00:00	0.00	0.00
4	S-LEGION	158.21	158.21	24.54	24.54	0.00	1.75	21.80	21.80	0 13:15	0 00:00	0.00	0.00
5	UPSTREAM	187.21	0.00	21.07	21.07	0.00	5.55	18.87	18.87	0 13:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	DOWNSTREAM	213.71	0 13:57	7775.14	0.03	1.90	17.99	2.96	0.23	0.00		
2	FIELDS	29.72	0 13:11	15547.20	0.00	5.87	0.62	0.89	0.07	0.00		
3	NLEGION	107.93	0 17:10	374.12	0.29	6.33	0.75	2.37	0.47	0.00		
4	SLEGION	158.19	0 13:15	326.72	0.48	6.38	0.71	3.25	0.65	0.00		
5	UPSTREAM	187.08	0 13:43	6323.30	0.03	3.56	6.50	1.85	0.21	0.00		

Project Description

File Name ..... PHR_STORMSANITARY_10MAR22_FUTURE.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
########################### SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ... YES
########################### NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	00:00:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	4
Nodes.....	6
Junctions	5
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links.....	5
Channels	5
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	1	223.15	284.00	72.00	7.60	4.35	969.59	198.53	0 01:54:31
2	2	63.25	284.00	55.00	7.60	2.51	159.01	45.69	0 01:04:05
3	3	52.87	284.00	71.00	7.60	4.23	223.85	48.33	0 01:46:50
4	4	414.75	284.00	79.00	7.60	5.14	2130.57	150.68	0 07:16:45

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	291.10	10.28	0.00	9.74	0 00:00	0.00	0.00
2	FIELD	Junction	0.00	6.00	0.00	6.00	0.00	48.15	13.95	0.00	11.94	0 00:00	0.00	0.00
3	N-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	150.67	25.52	0.00	2.09	0 00:00	0.00	0.00
4	S-LEGION	Junction	0.00	6.00	0.00	6.00	0.00	198.48	25.02	0.00	1.27	0 00:00	0.00	0.00
5	UPSTREAM	Junction	0.00	6.00	0.00	6.00	0.00	246.44	21.55	0.00	5.07	0 00:00	0.00	0.00
6	Out-01	Outfall	0.00					319.99	5.50					

FUT-100 YEAR

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Average Slope	Diameter or Height	Manning's Roughness	Peak Flow	Design Flow Capacity	Peak Flow/ Design Flow Ratio	Peak Flow Velocity	Peak Flow Depth	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged	Reported Condition
					(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)		(ft/sec)	(ft)		(min)	
1	DOWNSTREAM	Channel	DOWNSTREAM	Out-01	2050.57	7.02	2.25	0.2300	153.600	0.0320	289.28	7775.14	0.04	1.90	3.25	0.25	0.00	
2	FIELDS	Channel	FIELD	DOWNSTREAM	219.18	12.89	7.02	2.6800	156.000	0.0320	48.15	15547.20	0.00	5.84	1.06	0.08	0.00	
3	NLEGION	Channel	N-LEGION	UPSTREAM	285.42	22.61	17.82	1.6800	60.000	0.0400	150.67	374.12	0.40	6.95	2.91	0.58	0.00	
4	SLEGION	Channel	S-LEGION	UPSTREAM	271.03	21.29	17.82	1.2800	60.000	0.0400	198.42	326.72	0.61	6.77	3.73	0.75	0.00	
5	UPSTREAM	Channel	UPSTREAM	DOWNSTREAM	1388.64	17.82	7.02	0.7800	105.600	0.0320	246.31	6323.30	0.04	3.55	2.12	0.24	0.00	

Subbasin Hydrology

Subbasin : 1

Input Data

Area (ac) 223.15
Peak Rate Factor 284
Weighted Curve Number 72
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	223.15	-	72
Composite Area & Weighted CN	223.15		72

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.2	0	0
Flow Length (ft) :	101.02	0	0
Slope (%) :	1.039	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.11	0	0
Computed Flow Time (min) :	15.68	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	395.53	1000.71	0
Slope (%) :	0.642	0.345	0
Surface Type :	Straight rows	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.72	0.88	0
Computed Flow Time (min) :	9.16	18.95	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.01	0.045
Flow Length (ft) :	2306.04	1298.95	420.94
Channel Slope (%) :	0.201	0.383	1.194
Cross Section Area (ft^2) :	3.043	4.104	7.31
Wetted Perimeter (ft) :	13.41	5.09	9.51
Velocity (ft/sec) :	0.58	7.99	3.04
Computed Flow Time (min) :	65.73	2.71	2.31

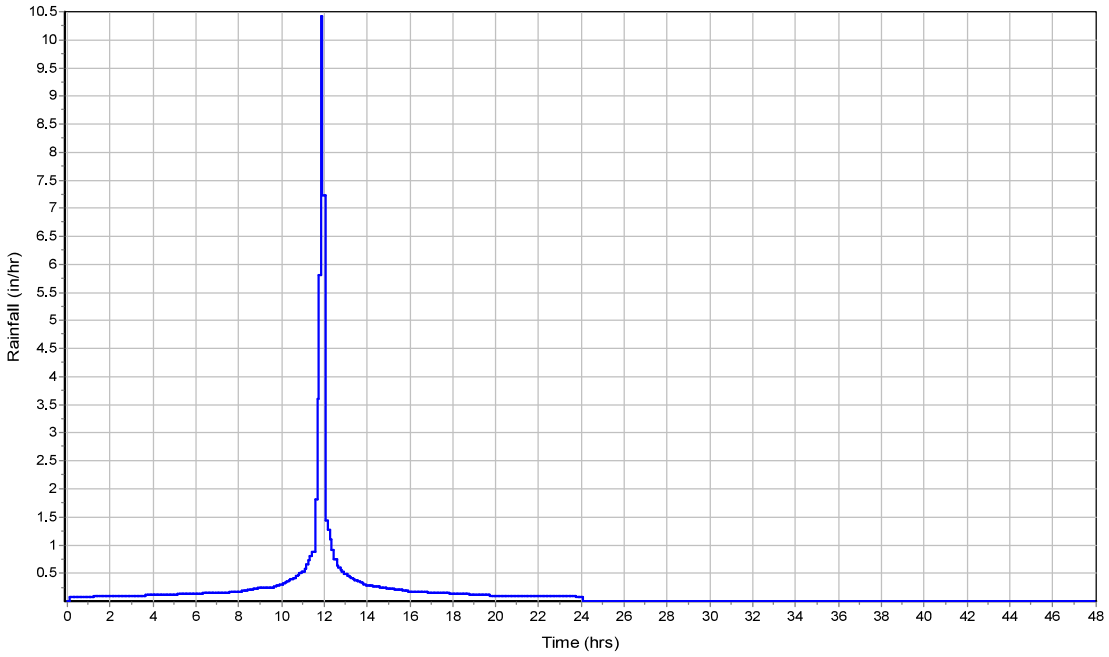
Total TOC (min) 114.53

Subbasin Runoff Results

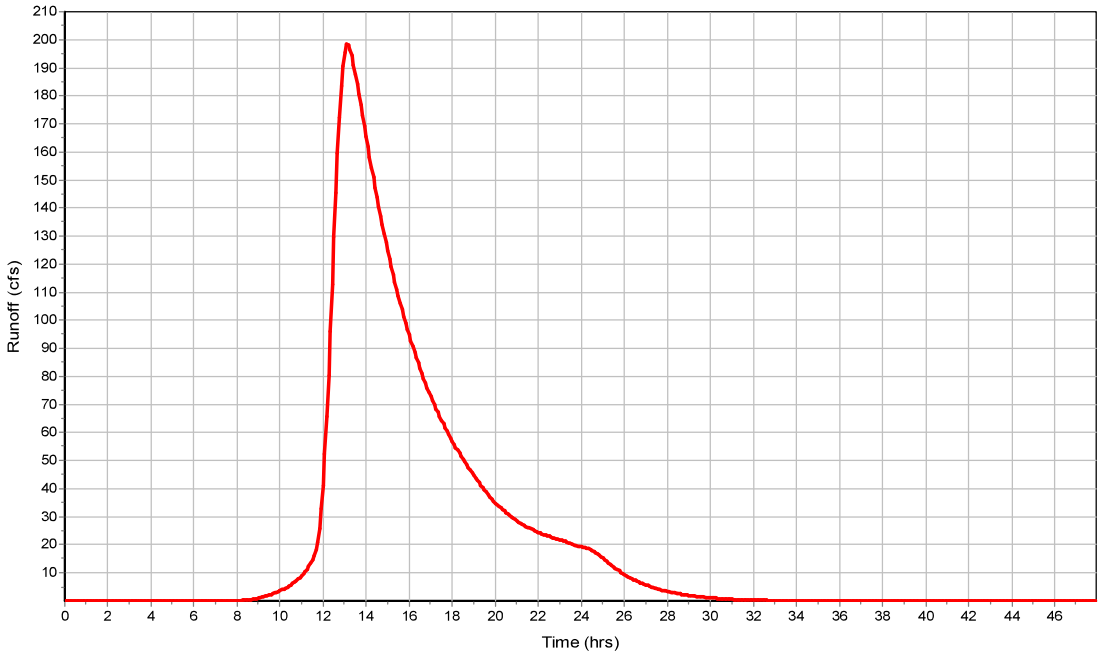
Total Rainfall (in)	7.6
Total Runoff (in)	4.35
Peak Runoff (cfs)	198.53
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 01:54:32

Subbasin : 1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 2

Input Data

Area (ac) 63.25
Peak Rate Factor 284
Weighted Curve Number 55
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	63.25	-	55
Composite Area & Weighted CN	63.25		55

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	100.2	0	0
Slope (%) :	1.956	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.65	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	158.63	466.19	142.02
Slope (%) :	1.809	2.091	12.21
Surface Type :	Woodland	Paved	Woodland
Velocity (ft/sec) :	0.67	2.94	1.75
Computed Flow Time (min) :	3.95	2.64	1.35

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.035	0	0
Flow Length (ft) :	1884.73	0	0
Channel Slope (%) :	0.335	0	0
Cross Section Area (ft^2) :	6.96	0	0
Wetted Perimeter (ft) :	13.16	0	0
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	19.49	0	0

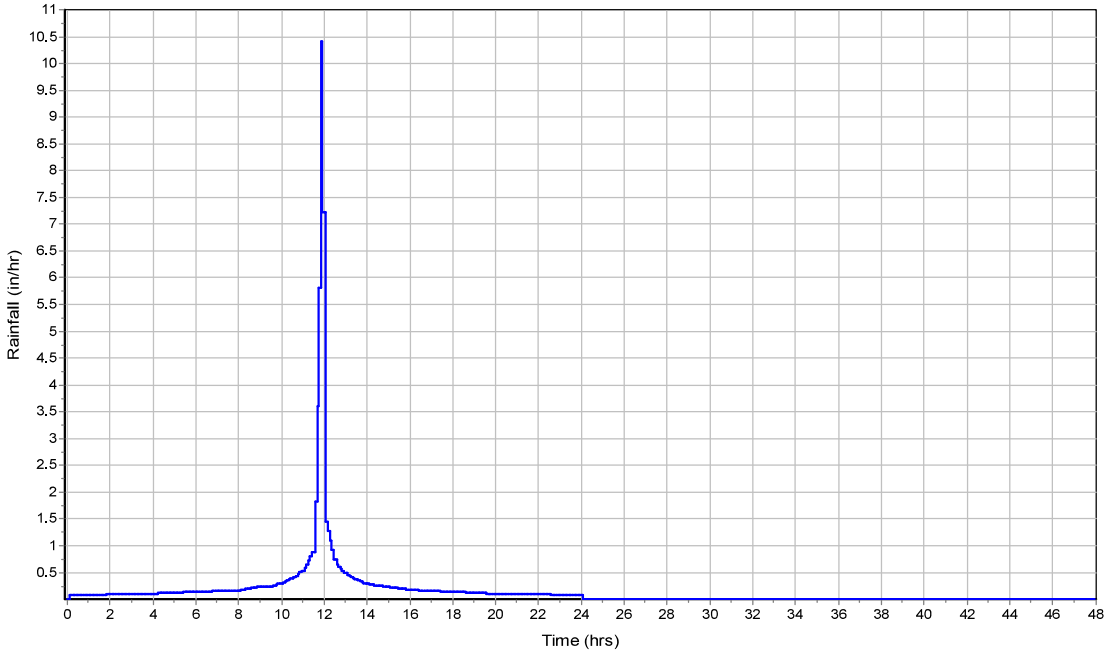
Total TOC (min) 64.09

Subbasin Runoff Results

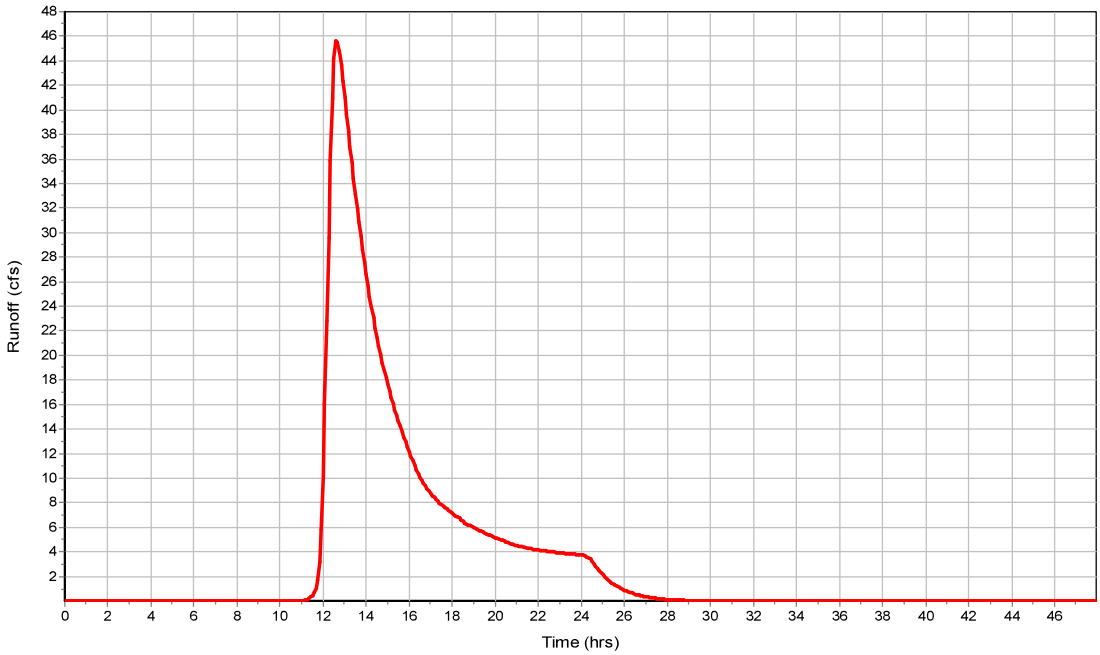
Total Rainfall (in) 7.6
Total Runoff (in) 2.51
Peak Runoff (cfs) 45.69
Weighted Curve Number 55
Time of Concentration (days hh:mm:ss) 0 01:04:05

Subbasin : 2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 3

Input Data

Area (ac) 52.87
Peak Rate Factor 284
Weighted Curve Number 71
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	52.87	-	71
Composite Area & Weighted CN	52.87		71

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.17	0	0
Flow Length (ft) :	99.67	0	0
Slope (%) :	0.25	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	24.07	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	725.9	0	0
Slope (%) :	0.195	0	0
Surface Type :	Bare & untilled	Unpaved	Unpaved
Velocity (ft/sec) :	0.44	0	0
Computed Flow Time (min) :	27.5	0	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.07	0.055	0.04
Flow Length (ft) :	1442.27	573.7	384.67
Channel Slope (%) :	0.321	0.945	3.122
Cross Section Area (ft^2) :	1.86	1.09	3.5
Wetted Perimeter (ft) :	5.88	5.8	5.24
Velocity (ft/sec) :	0.56	0.86	5.03
Computed Flow Time (min) :	42.93	11.07	1.27

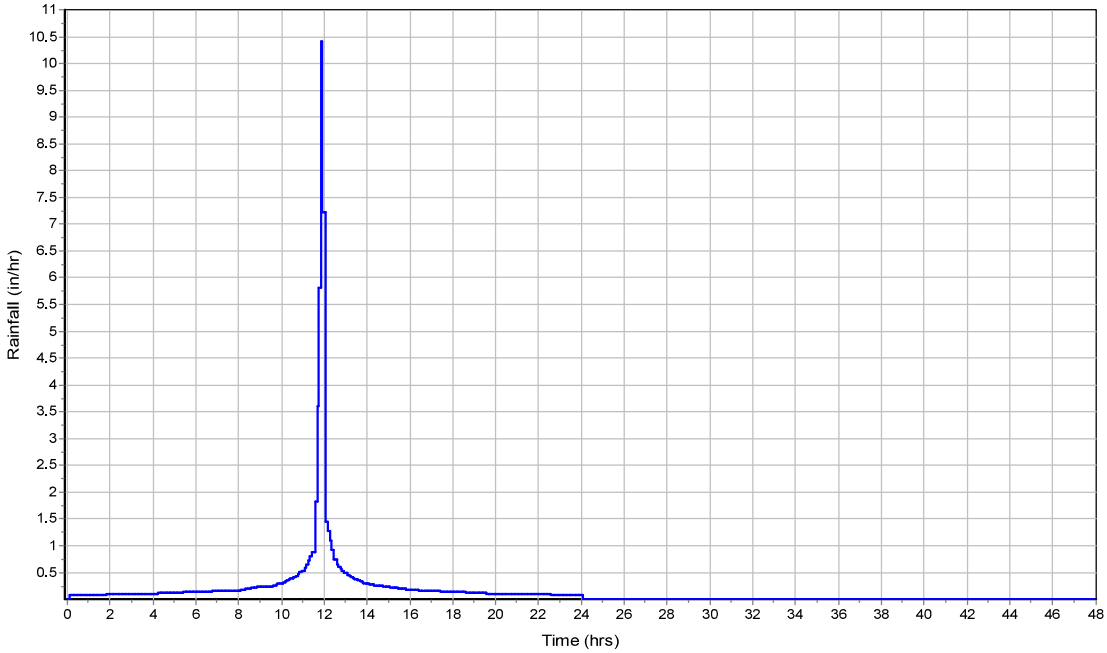
Total TOC (min) 106.84

Subbasin Runoff Results

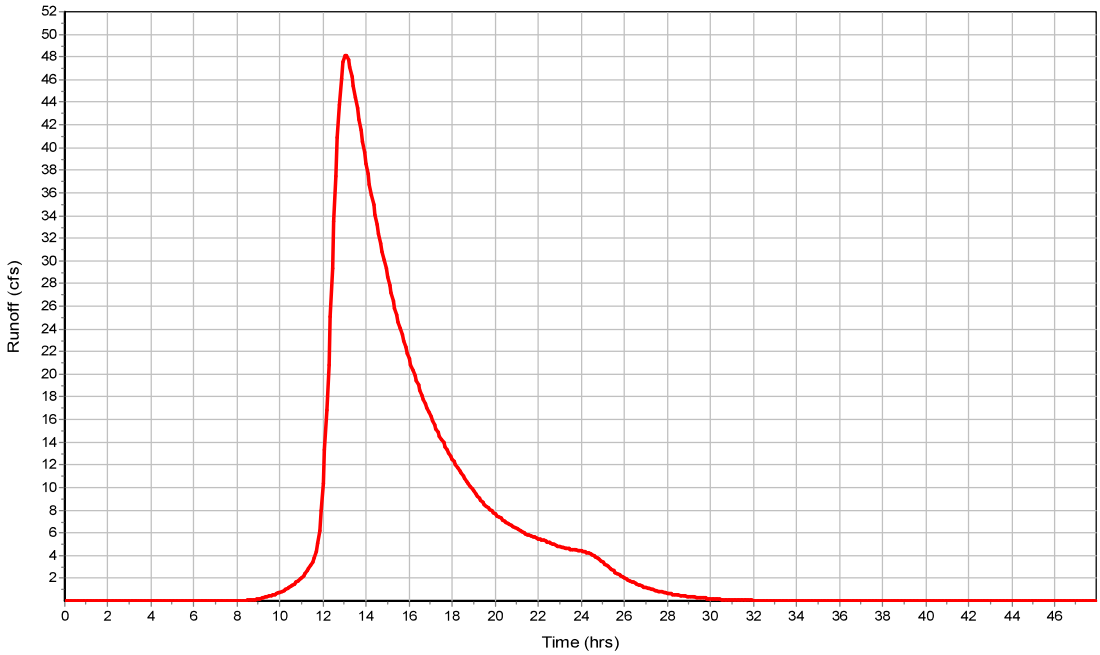
Total Rainfall (in) 7.6
Total Runoff (in) 4.23
Peak Runoff (cfs) 48.33
Weighted Curve Number 71
Time of Concentration (days hh:mm:ss) 0 01:46:50

Subbasin : 3

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : 4

Input Data

Area (ac) 414.75
Peak Rate Factor 284
Weighted Curve Number 79
Rain Gage ID ..... Rain Gage-01

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
-	414.75	-	79
Composite Area & Weighted CN	414.75		79

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.8	0	0
Flow Length (ft) :	99.49	0	0
Slope (%) :	1.96	0	0
2 yr, 24 hr Rainfall (in) :	3.4	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	36.42	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	800.62	675.42	0
Slope (%) :	0.049	0.009	0
Surface Type :	Forest	Grassed waterway	Unpaved
Velocity (ft/sec) :	0.06	0.14	0
Computed Flow Time (min) :	222.39	80.41	0

Channel Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.0425	0.04125	0.031
Flow Length (ft) :	3025.89	1214.38	2761.95
Channel Slope (%) :	0.199	0.323	0.564
Cross Section Area (ft^2) :	3.24	3.083	7.657
Wetted Perimeter (ft) :	7.42	6.77	20.83
Velocity (ft/sec) :	0.9	1.22	1.85
Computed Flow Time (min) :	56.03	16.66	24.85

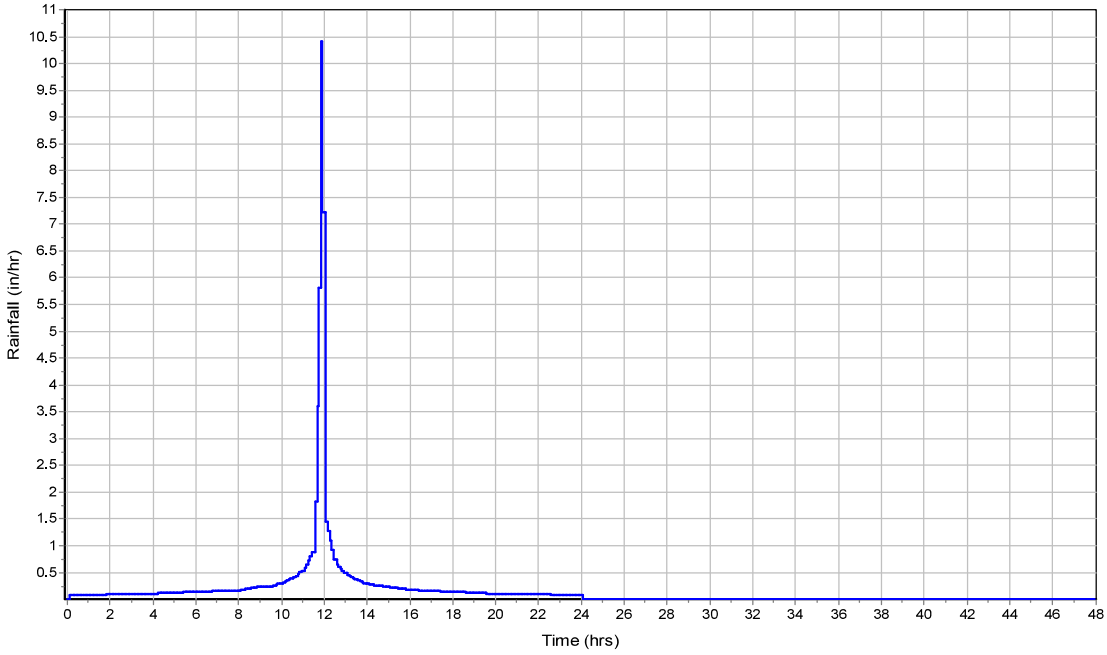
Total TOC (min) 436.75

Subbasin Runoff Results

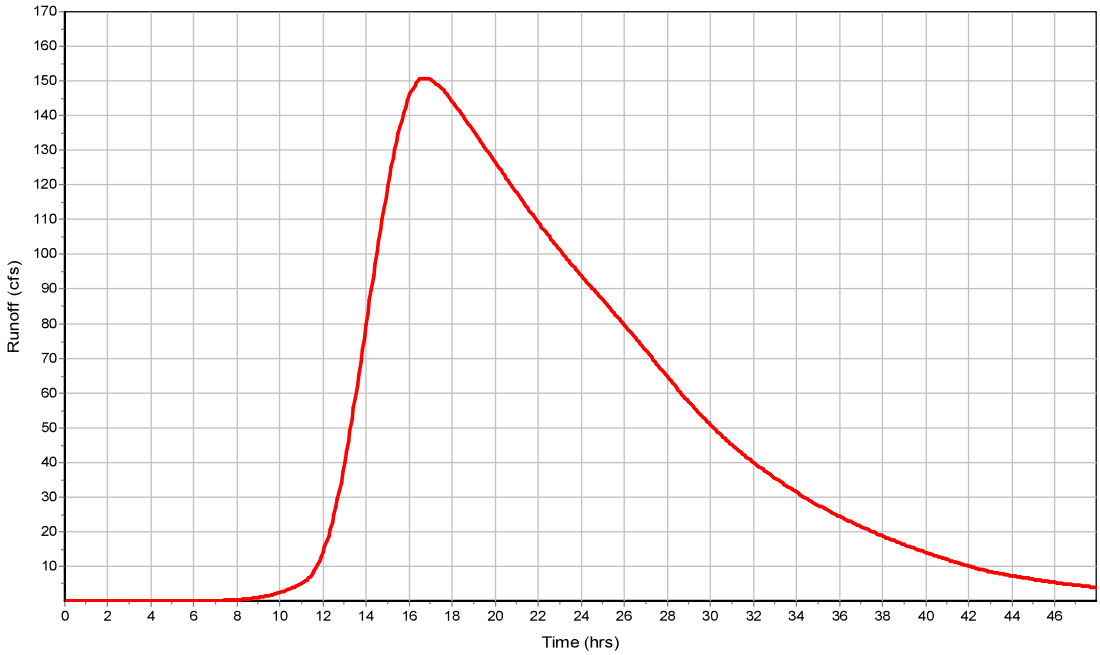
Total Rainfall (in) 7.6
Total Runoff (in) 5.14
Peak Runoff (cfs) 150.68
Weighted Curve Number 79
Time of Concentration (days hh:mm:ss) 0 07:16:45

Subbasin : 4

Rainfall Intensity Graph



Runoff Hydrograph



Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	DOWNSTREAM	291.10	0.00	10.28	10.28	0.00	9.74	8.53	8.53	0 13:30	0 00:00	0.00	0.00
2	FIELD	48.15	48.15	13.95	13.95	0.00	11.94	13.13	13.13	0 13:10	0 00:00	0.00	0.00
3	N-LEGION	150.67	150.67	25.52	25.52	0.00	2.09	23.75	23.75	0 16:35	0 00:00	0.00	0.00
4	S-LEGION	198.48	198.48	25.02	25.02	0.00	1.27	21.87	21.87	0 13:10	0 00:00	0.00	0.00
5	UPSTREAM	246.44	0.00	21.55	21.55	0.00	5.07	19.07	19.07	0 13:10	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	DOWNSTREAM	2050.57	7.02	7.02	2.25	2.25	4.77	0.2300	User-Defined	12.800	182.000	0.0320	0.5000	0.5000	0.0000	0.00	No
2	FIELDS	219.18	12.89	12.89	7.02	7.02	5.87	2.6800	User-Defined	13.000	89.000	0.0320	0.5000	0.5000	0.0000	0.00	No
3	NLEGION	285.42	22.61	22.61	17.82	17.82	4.79	1.6800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
4	SLEGION	271.03	21.29	21.29	17.82	17.82	3.47	1.2800	Trapezoidal	5.000	11.000	0.0400	0.5000	0.5000	0.0000	0.00	No
5	UPSTREAM	1388.64	17.82	17.82	7.02	7.02	10.80	0.7800	User-Defined	8.800	131.000	0.0320	0.5000	0.5000	0.0000	0.00	No