

APPENDIX B-3B

RFP # 2025-12

**BEACON ISLAND PHASE 3
Packaged Wastewater Treatment Plant
and
Fire Pump House and Marine Inlet**

REFERENCE DOCUMENTS (2 of 5)

Reference Documents

Beacon Island Phase 3 Program

- NYSDEC Article 11 and 15 Permits. Dated 11/10/22 - Page 1
- State Pollutant Discharge Elimination System (SPDES) Permit. Dated 10/1/23 - Page 21
- Stormwater Pollution Protection Plan (SWPPP). Dated 6/20/22 - Page 59
- Soil Management Plan. Dated 10/23/22 - Page 564
- Landfill Closure Certification Report. Dated 10/21/24 - Page 634
- Geotechnical Engineering Report. Dated 2/2/2023 - Page 659
- Army Corps of Engineers Permit. Date 4/10/23 - Page 779
- Community Air Monitoring Plan (CAMP). Dated 10/23/22 – Page 806

18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 31

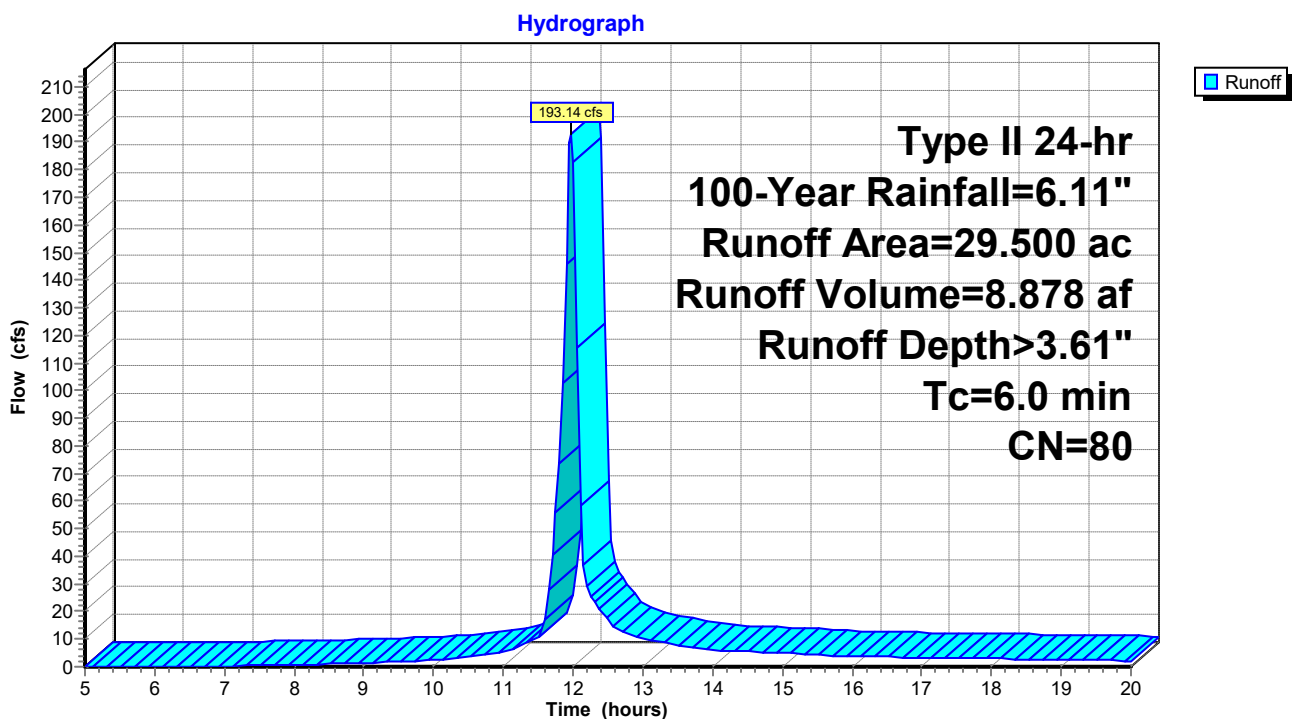
Summary for Subcatchment DR-C: Depression

Runoff = 193.14 cfs @ 11.97 hrs, Volume= 8.878 af, Depth> 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
3.970	77	Brush, Fair, HSG D
2.500	96	Gravel surface, HSG D
23.030	79	Woods, Fair, HSG D
29.500	80	Weighted Average
29.500		100.00% Pervious Area

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

Subcatchment DR-C: Depression

18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 32

Summary for Subcatchment DR-D: Overland

Runoff = 14.49 cfs @ 12.90 hrs, Volume= 2.563 af, Depth> 3.42"

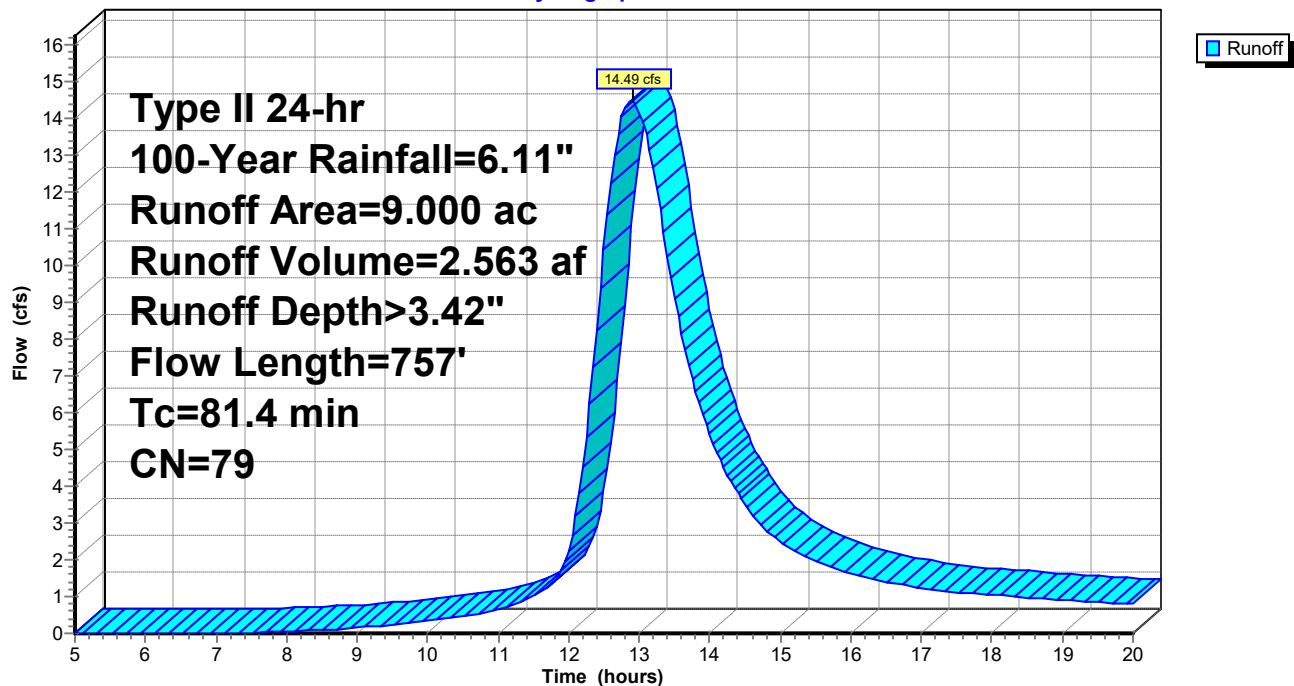
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
9.000	79	Woods, Fair, HSG D
9.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
56.6	150	0.0050	0.04		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 2.67"
23.9	507	0.0050	0.35		Shallow Concentrated Flow, Shallow Concentrated
					Woodland Kv= 5.0 fps
0.9	100	0.1300	1.80		Shallow Concentrated Flow, Shallow Concentrated
					Woodland Kv= 5.0 fps
81.4	757	Total			

Subcatchment DR-D: Overland

Hydrograph



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 33

Summary for Subcatchment DR-E: Overland

Runoff = 40.67 cfs @ 12.34 hrs, Volume= 4.227 af, Depth> 3.47"

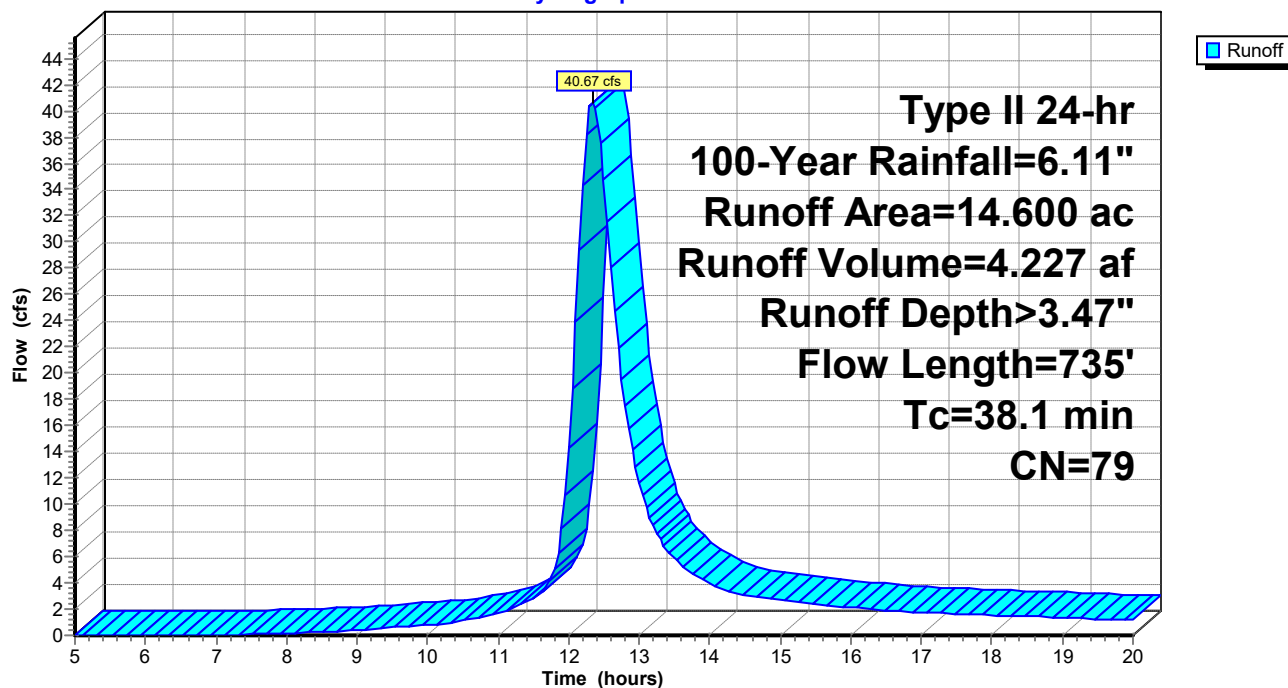
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
14.600	79	Woods, Fair, HSG D
14.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	150	0.0300	0.09		Sheet Flow, Sheet Flow Woods: Light underbrush n= 0.400 P2= 2.67"
9.8	510	0.0300	0.87		Shallow Concentrated Flow, Shallow Concentrated Woodland Kv= 5.0 fps
0.7	75	0.1200	1.73		Shallow Concentrated Flow, Shallow Concentrated Woodland Kv= 5.0 fps
38.1	735	Total			

Subcatchment DR-E: Overland

Hydrograph



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 34

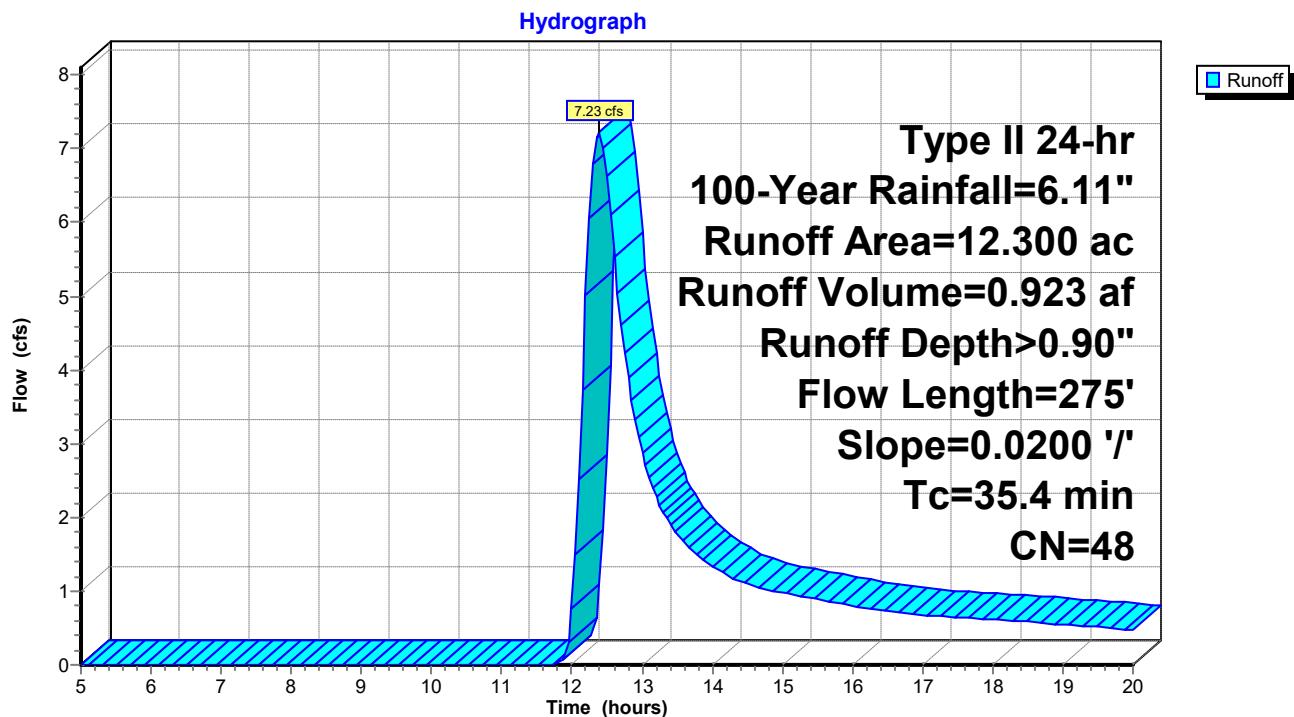
Summary for Subcatchment DR-F: Overland

Runoff = 7.23 cfs @ 12.39 hrs, Volume= 0.923 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 1.100	98	Pavement
11.200	43	Woods/grass comb., Fair, HSG A
12.300	48	Weighted Average
11.200		91.06% Pervious Area
1.100		8.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
32.5	150	0.0200	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.67"
2.9	125	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
35.4	275	Total			

Subcatchment DR-F: Overland

18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 35

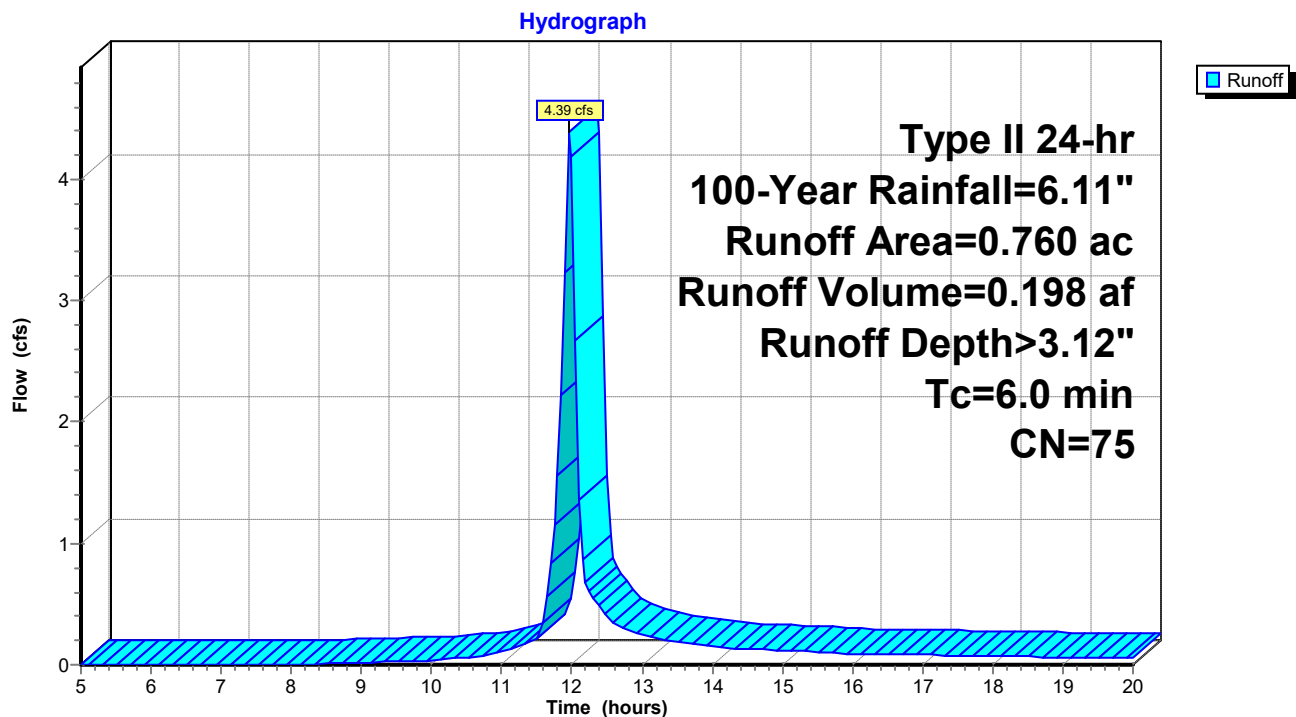
Summary for Subcatchment DR-G: Roadway

Runoff = 4.39 cfs @ 11.97 hrs, Volume= 0.198 af, Depth> 3.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 0.460	98	Roadway
0.300	39	>75% Grass cover, Good, HSG A
0.760	75	Weighted Average
0.300		39.47% Pervious Area
0.460		60.53% Impervious Area

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

Subcatchment DR-G: Roadway

18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 36

Summary for Reach 1W: Wetland #1 / Analysis Point 1A

Inflow Area = 39.800 ac, 2.76% Impervious, Inflow Depth > 3.59" for 100-Year event
Inflow = 163.60 cfs @ 12.14 hrs, Volume= 11.919 af
Outflow = 41.52 cfs @ 14.21 hrs, Volume= 9.967 af, Atten= 75%, Lag= 123.8 min

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

Max. Velocity= 0.17 fps, Min. Travel Time= 98.2 min

Avg. Velocity= 0.08 fps, Avg. Travel Time= 203.6 min

Peak Storage= 244,871 cf @ 12.57 hrs

Average Depth at Peak Storage= 1.21', Surface Width= 207.26'

Bank-Full Depth= 0.50' Flow Area= 100.8 sf, Capacity= 12.36 cfs

200.00' x 0.50' deep channel, n= 0.240 Sheet flow over Dense Grass

Side Slope Z-value= 3.0 '/' Top Width= 203.00'

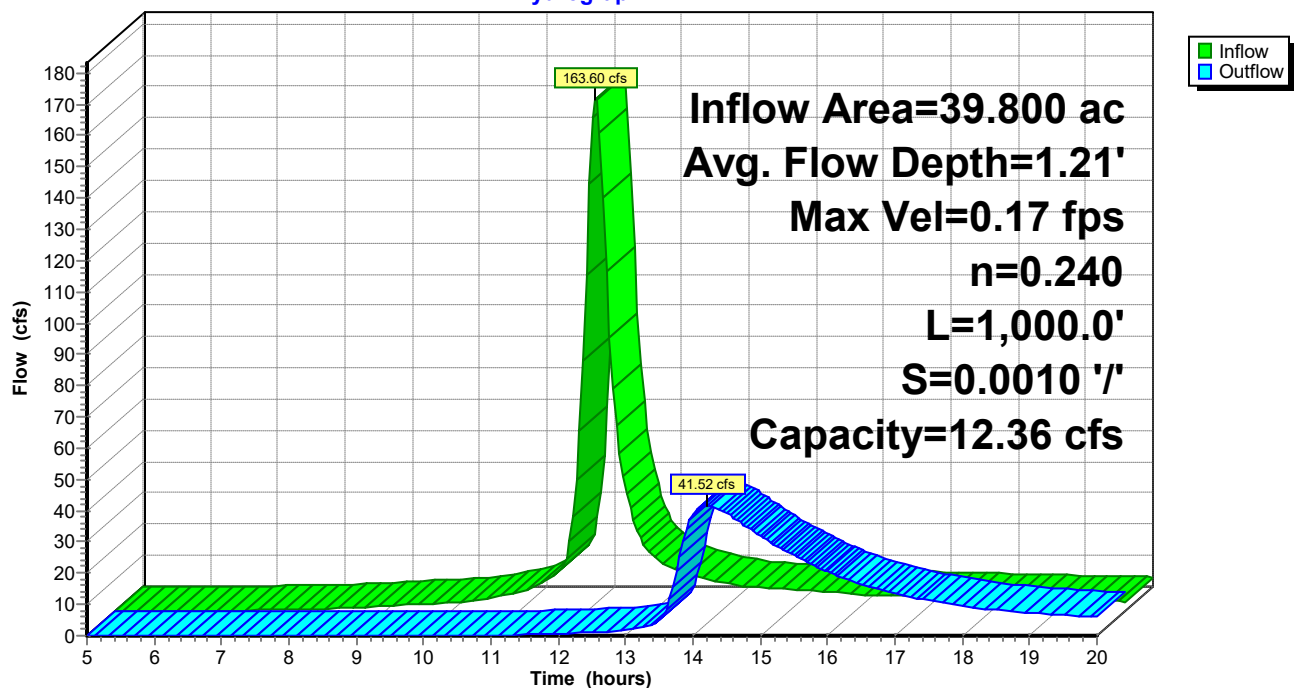
Length= 1,000.0' Slope= 0.0010 '/'

Inlet Invert= 6.00', Outlet Invert= 5.00'



Reach 1W: Wetland #1 / Analysis Point 1A

Hydrograph



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 37

Summary for Reach 2R: Outlet Pipe

Inflow Area = 39.800 ac, 2.76% Impervious, Inflow Depth > 3.01" for 100-Year event
Inflow = 41.52 cfs @ 14.21 hrs, Volume= 9.967 af
Outflow = 41.52 cfs @ 14.21 hrs, Volume= 9.964 af, Atten= 0%, Lag= 0.3 min

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

Max. Velocity= 8.44 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 4.38 fps, Avg. Travel Time= 0.3 min

Peak Storage= 345 cf @ 14.21 hrs

Average Depth at Peak Storage= 1.83' , Surface Width= 3.32'

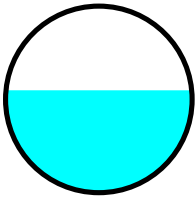
Bank-Full Depth= 3.33' Flow Area= 8.7 sf, Capacity= 70.83 cfs

40.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

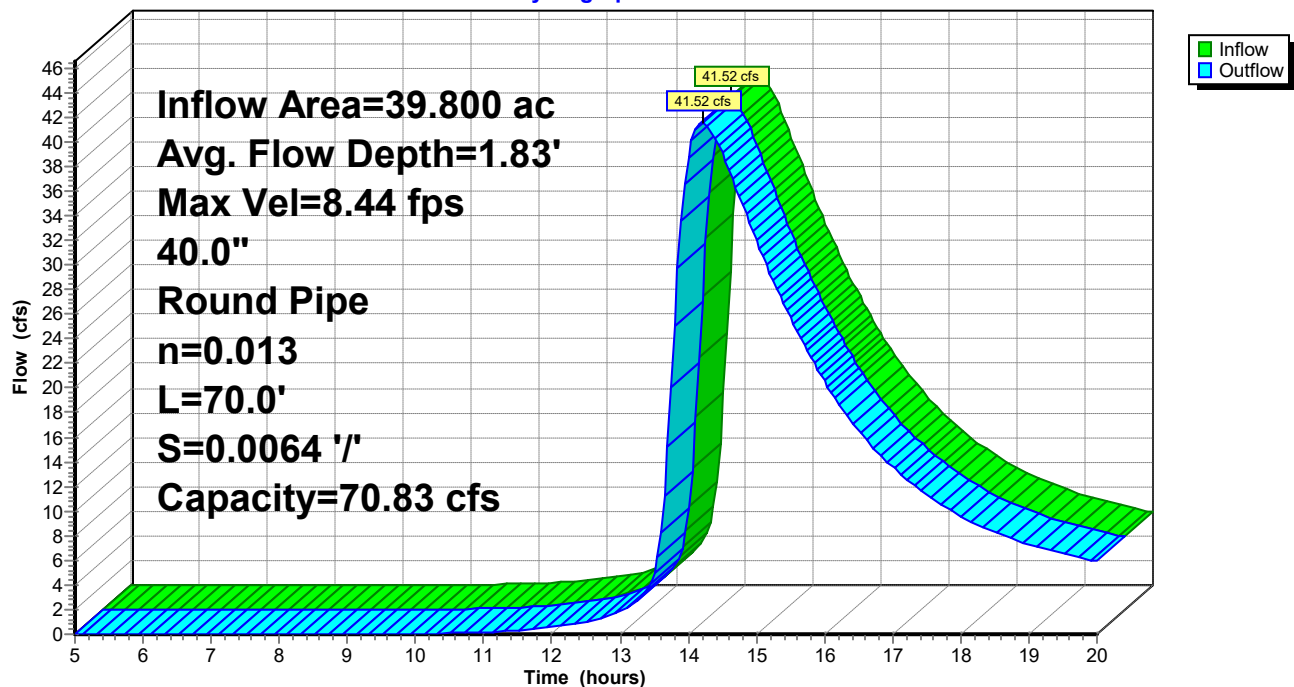
Length= 70.0' Slope= 0.0064 '/'

Inlet Invert= 4.25', Outlet Invert= 3.80'



Reach 2R: Outlet Pipe

Hydrograph



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

Page 38

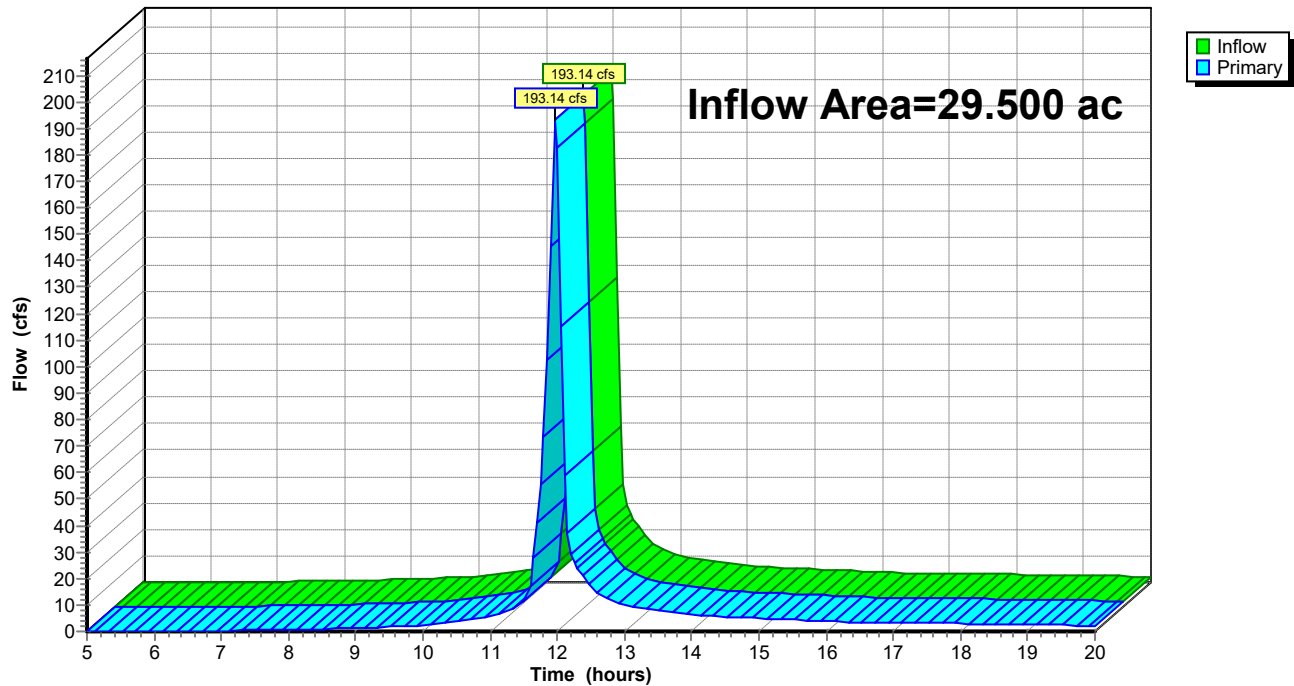
Summary for Pond 1P: Infiltration

Inflow Area = 29.500 ac, 0.00% Impervious, Inflow Depth > 3.61" for 100-Year event
Inflow = 193.14 cfs @ 11.97 hrs, Volume= 8.878 af
Primary = 193.14 cfs @ 11.97 hrs, Volume= 8.878 af, Atten= 0%, Lag= 0.0 min

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

Pond 1P: Infiltration

Hydrograph



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

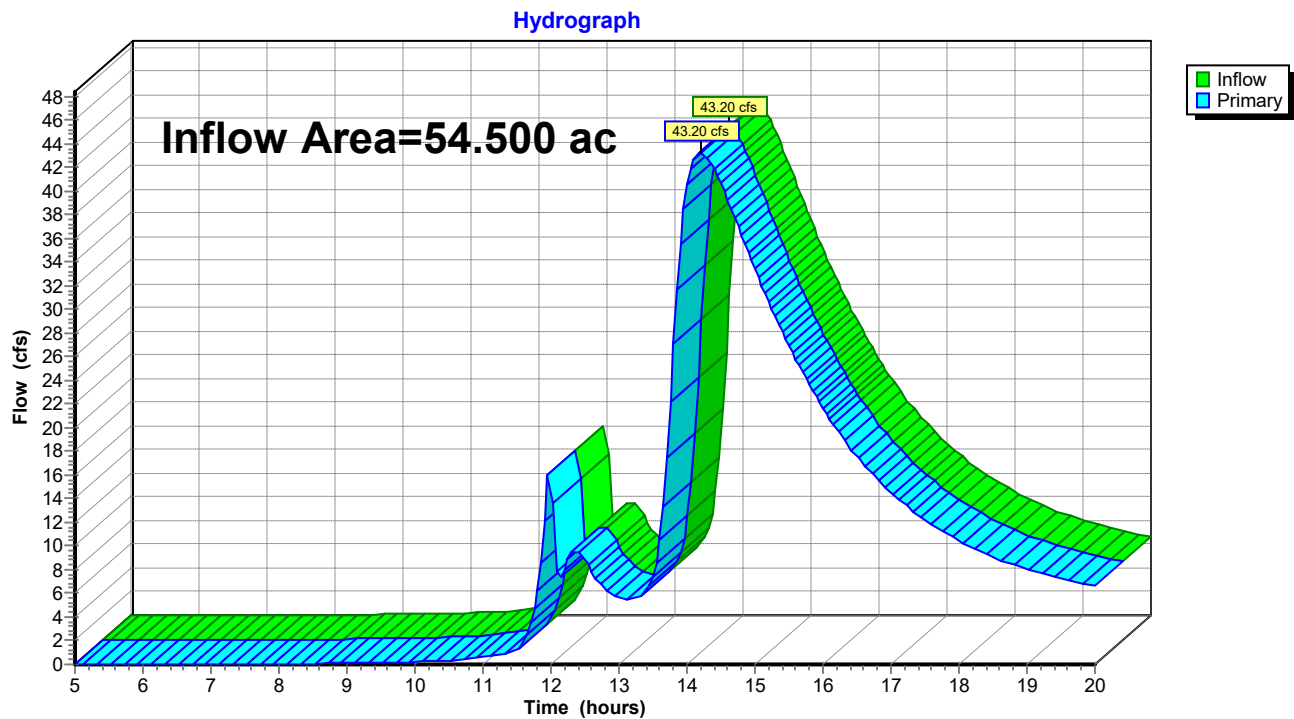
Page 39

Summary for Pond AP-1: Analysis Point #1

Inflow Area = 54.500 ac, 4.04% Impervious, Inflow Depth > 2.55" for 100-Year event
Inflow = 43.20 cfs @ 14.20 hrs, Volume= 11.589 af
Primary = 43.20 cfs @ 14.20 hrs, Volume= 11.589 af, Atten= 0%, Lag= 0.0 min

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

Pond AP-1: Analysis Point #1



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

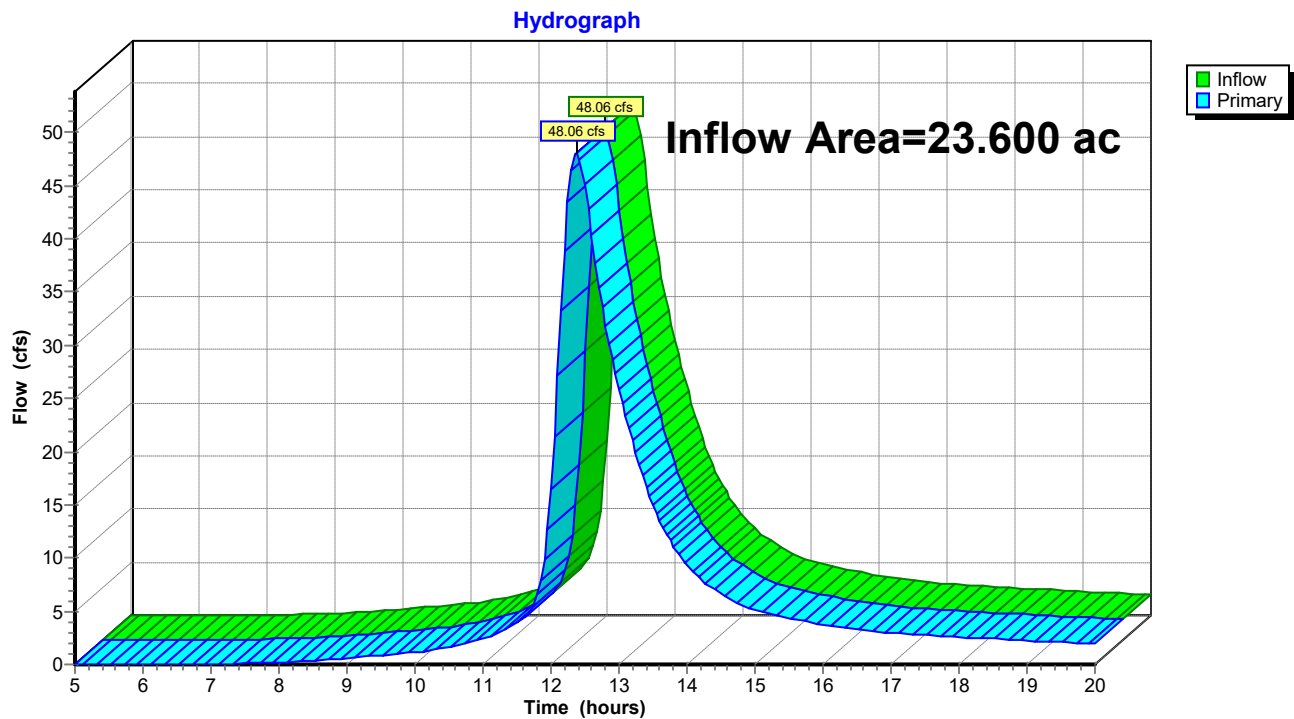
Page 40

Summary for Pond AP-2: Analysis Point #2

Inflow Area = 23.600 ac, 0.00% Impervious, Inflow Depth > 3.45" for 100-Year event
Inflow = 48.06 cfs @ 12.38 hrs, Volume= 6.789 af
Primary = 48.06 cfs @ 12.38 hrs, Volume= 6.789 af, Atten= 0%, Lag= 0.0 min

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

Pond AP-2: Analysis Point #2



18641.00-Existing Condition

Prepared by McFarland Johnson

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Type II 24-hr 100-Year Rainfall=6.11"

Printed 5/6/2022

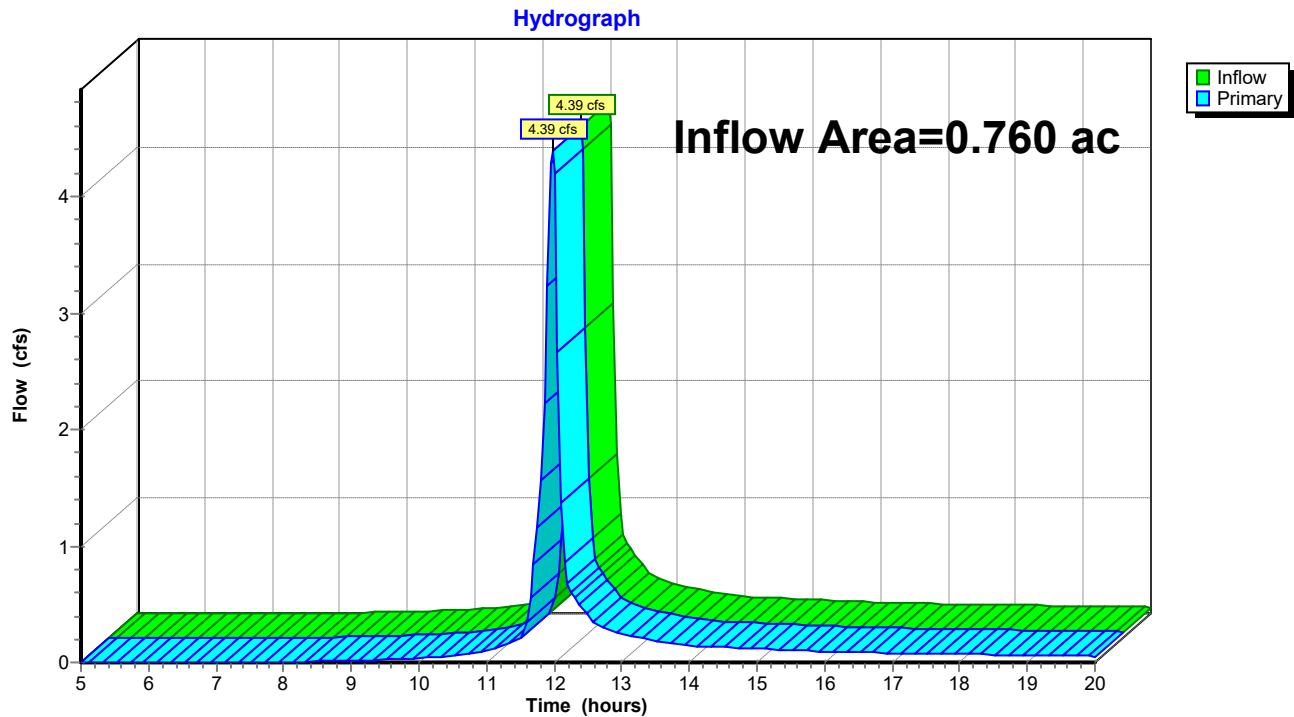
Page 41

Summary for Pond AP-3: Analysis Point #3

Inflow Area = 0.760 ac, 60.53% Impervious, Inflow Depth > 3.12" for 100-Year event
Inflow = 4.39 cfs @ 11.97 hrs, Volume= 0.198 af
Primary = 4.39 cfs @ 11.97 hrs, Volume= 0.198 af, Atten= 0%, Lag= 0.0 min

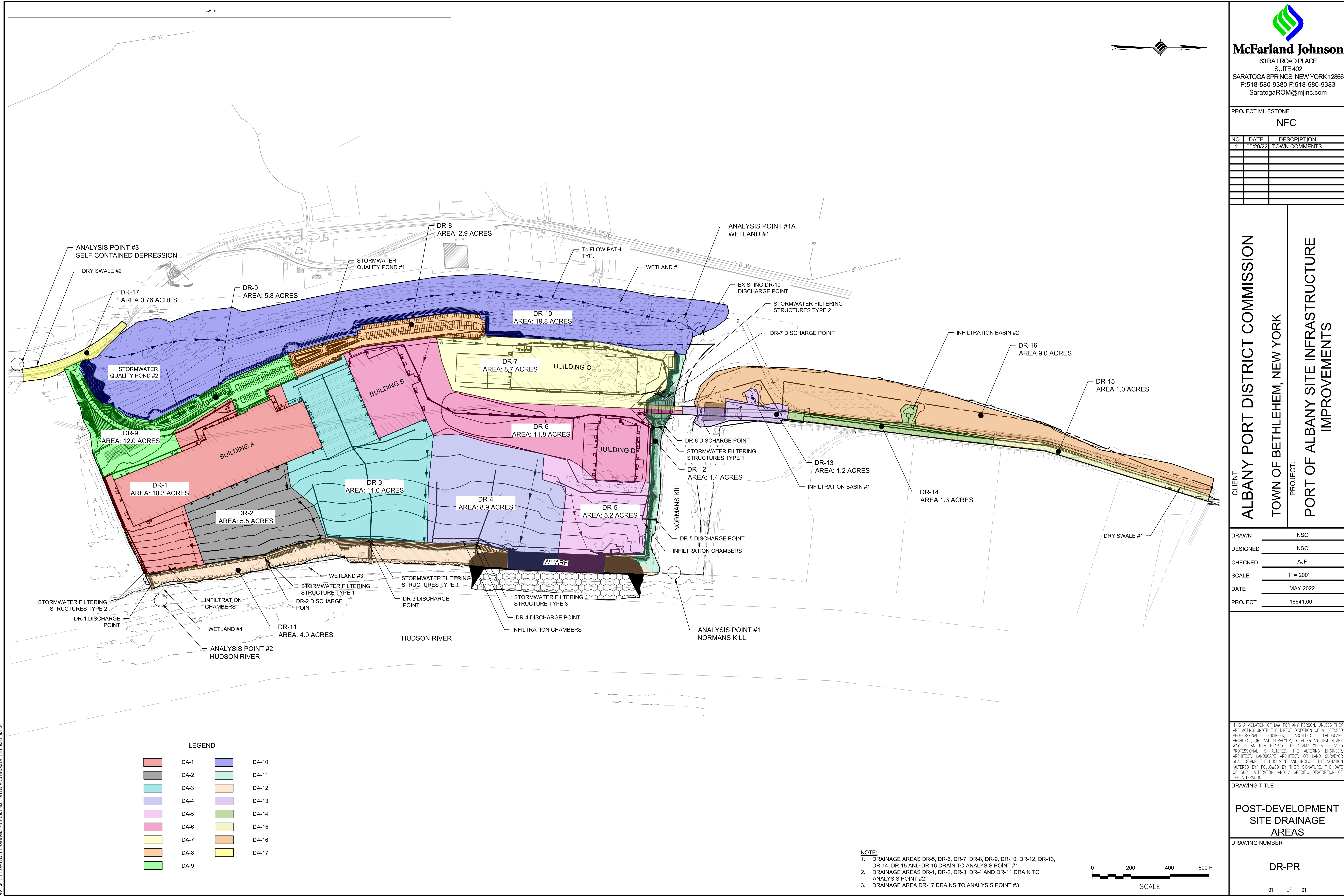
Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Pond AP-3: Analysis Point #3



Appendix B

Proposed Conditions Drainage Map and HydroCAD Report



PROJECT MILESTONE		
NFC		
NO.	DATE	DESCRIPTION
1	05/20/22	TOWN COMMENTS

CLIENT:
ALBANY PORT DISTRICT COMMISSION

TOWN OF BETHLEHEM, NEW YORK

PROJECT:
PORT OF ALBANY SITE INFRASTRUCTURE IMPROVEMENTS

DRAWN	NSO
DESIGNED	NSO
CHECKED	AJF
SCALE	1" = 200'
DATE	MAY 2022
PROJECT	18641.00

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECT DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR, TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT, OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

DRAWING TITLE

**POST-DEVELOPMENT
SITE DRAINAGE
AREAS**

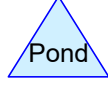
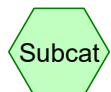
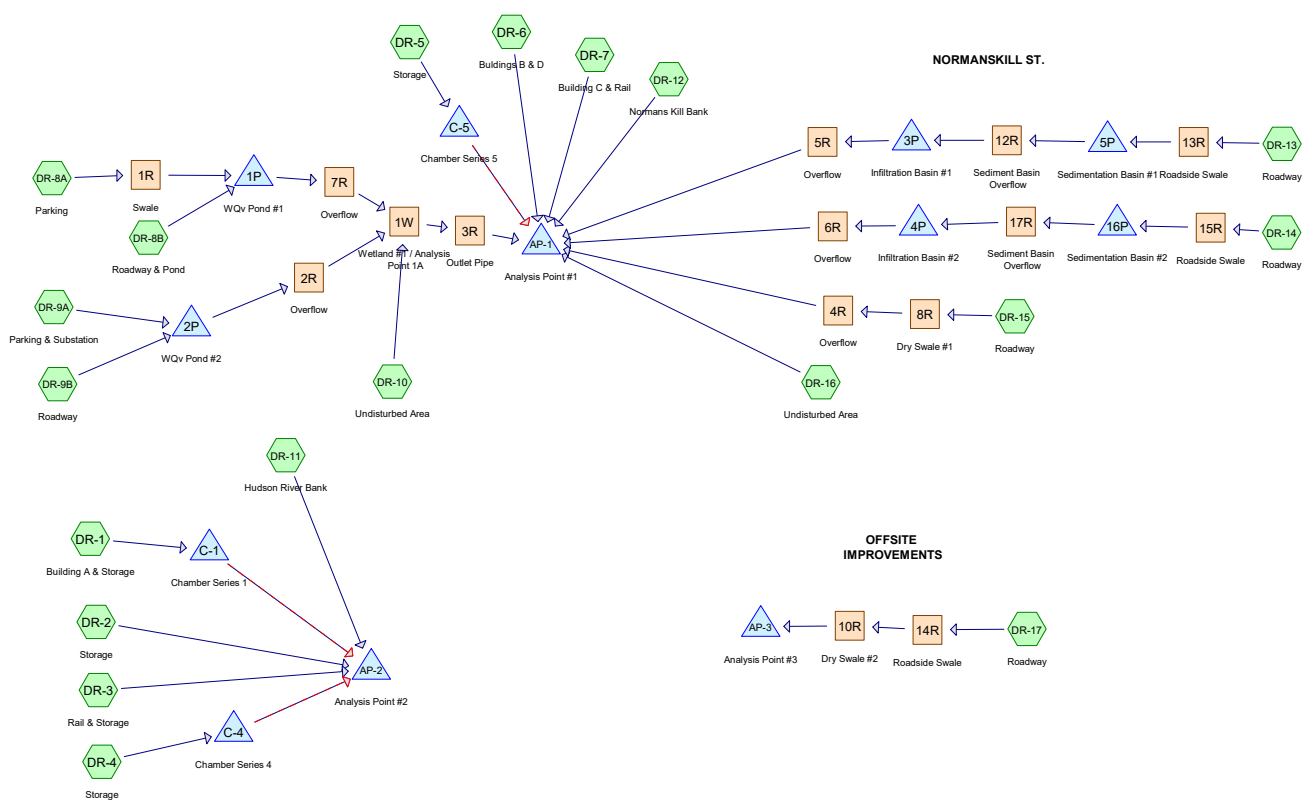
DRAWING NUMBER

DR-PR

N:\18641\05 ALBANY PORT DISTRICT COMMISSION\PORT OF ALBANY SITE INFRASTRUCTURE IMPROVEMENTS\DWG\18641-00-POST-DEVELOPMENT SITE DRAINAGE AREAS.DWG

EXPANSION SITE

NORMANSKILL ST.



Routing Diagram for 18641.00-Proposed Condition Chambers_CULVERTS_AJF
 Prepared by McFarland Johnson, Printed 6/8/2022
 HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

18641.00-Proposed Condition_Chambers_CULVERTS_AJF

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 2

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type II 24-hr		Default	24.00	1	2.20	2
2	10-Year	Type II 24-hr		Default	24.00	1	3.63	2
3	100-Year	Type II 24-hr		Default	24.00	1	6.11	2

18641.00-Proposed Condition_Chambers_CULVERTS_AJF

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 3

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.510	39	>75% Grass cover, Good, HSG A (DR-13, DR-14, DR-15, DR-17)
5.500	80	>75% Grass cover, Good, HSG D (DR-1, DR-2, DR-3, DR-4, DR-5, DR-6, DR-7, DR-8A, DR-8B, DR-9A, DR-9B)
6.870	98	Building A (DR-1)
2.549	98	Building B (DR-6)
3.030	98	Building C (DR-7)
1.413	98	Building D (DR-6)
16.900	95	Compacted Gravel (DR-3, DR-4)
0.200	92	Compacted Gravel (DR-9A)
26.618	95	Dense Graded Aggregate (DR-1, DR-2, DR-5, DR-6, DR-7, DR-9B)
0.970	96	Gravel surface, HSG D (DR-12)
1.100	98	Mill & Fill of Old Pavement (DR-14, DR-15)
0.600	98	New Pavement (DR-14, DR-15)
1.600	98	Parking (DR-8A)
1.200	98	Parking and Road (DR-9A)
0.450	98	Pavement (DR-13)
3.270	98	Rail (DR-3, DR-7)
0.140	98	Road Widening (DR-17)
1.240	98	Roadway (DR-17, DR-8B, DR-9B)
0.170	98	Substation (DR-9A)
24.230	79	Woods, Fair, HSG D (DR-10, DR-11, DR-12)
9.000	43	Woods/grass comb., Fair, HSG A (DR-16)
108.560	86	TOTAL AREA

Summary for Subcatchment DR-1: Building A & Storage

Runoff = 29.34 cfs @ 11.98 hrs, Volume= 1.592 af, Depth> 1.85"

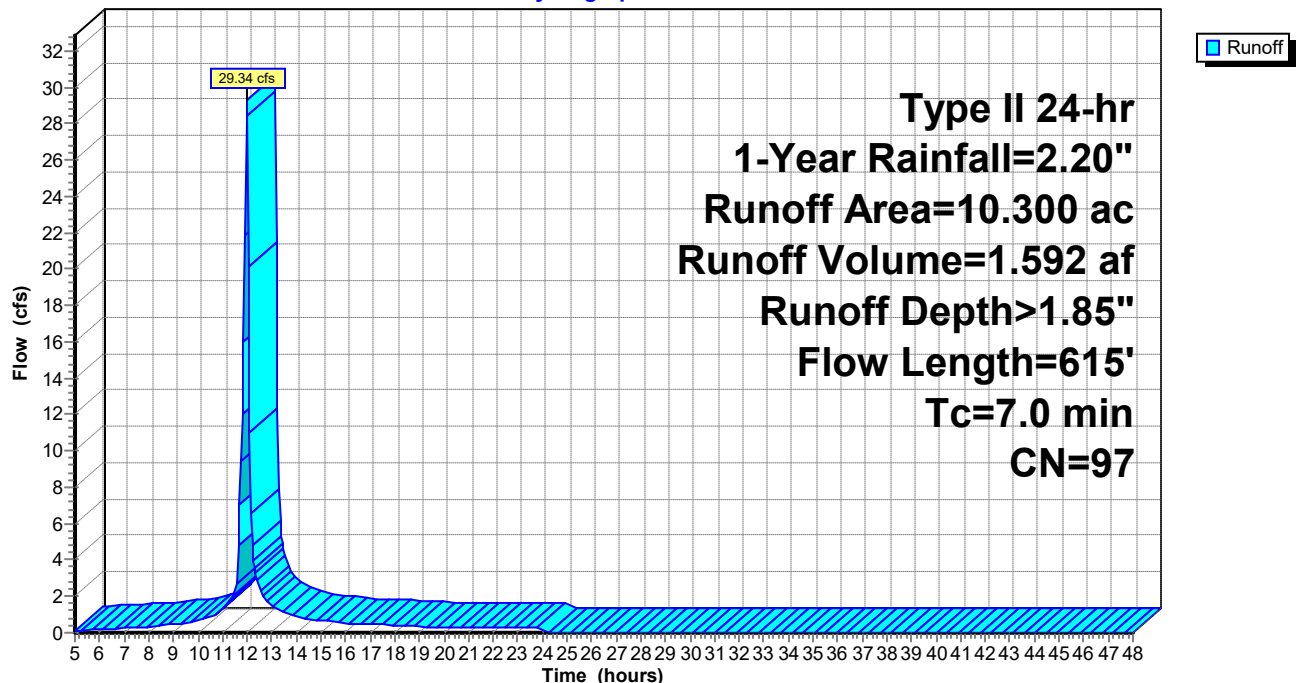
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 6.870	98	Building A
0.100	80	>75% Grass cover, Good, HSG D
* 3.330	95	Dense Graded Aggregate
10.300	97	Weighted Average
3.430		33.30% Pervious Area
6.870		66.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.1	300	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	215	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.0	615	Total			

Subcatchment DR-1: Building A & Storage

Hydrograph



Summary for Subcatchment DR-10: Undisturbed Area

Runoff = 4.00 cfs @ 13.29 hrs, Volume= 1.061 af, Depth= 0.64"

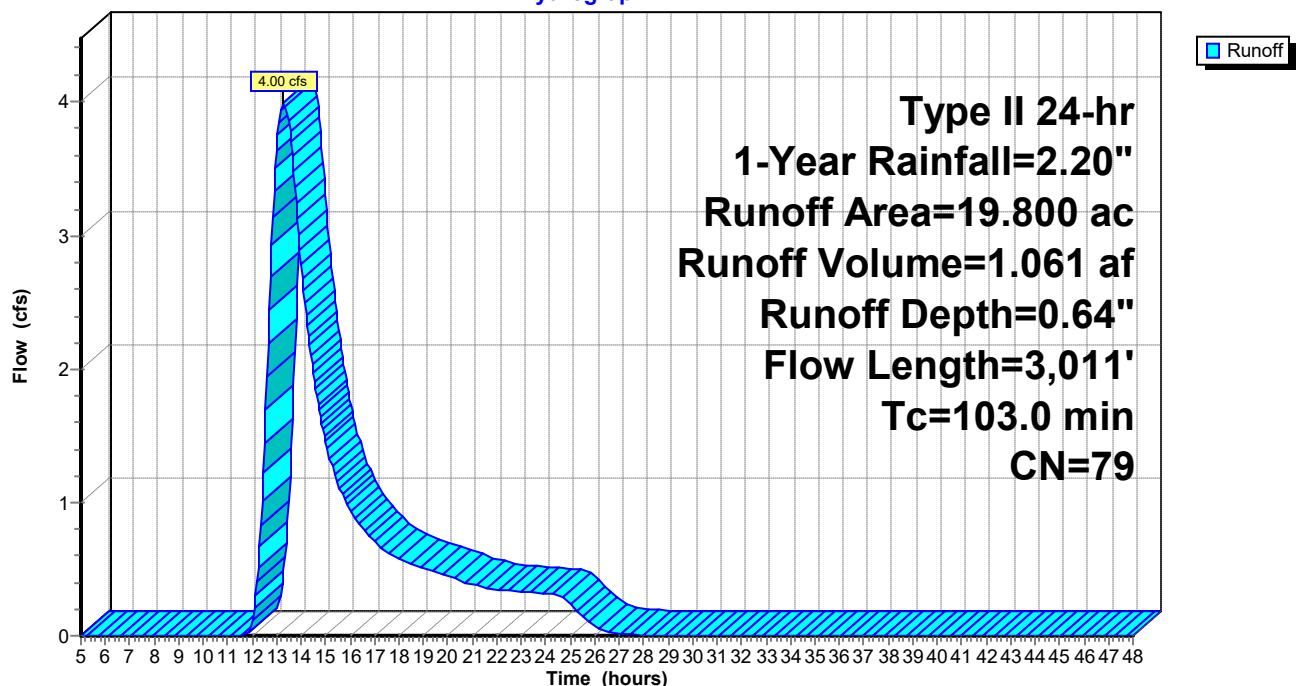
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
19.800	79	Woods, Fair, HSG D
19.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	150	0.0800	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"
3.0	200	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.6	250	0.2600	2.55		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
78.7	2,361	0.0100	0.50		Shallow Concentrated Flow, Wetland Flow Woodland Kv= 5.0 fps
0.0	50	0.0500	22.86	161.57	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
103.0	3,011	Total			

Subcatchment DR-10: Undisturbed Area

Hydrograph



Summary for Subcatchment DR-11: Hudson River Bank

Runoff = 3.01 cfs @ 12.10 hrs, Volume= 0.214 af, Depth= 0.64"

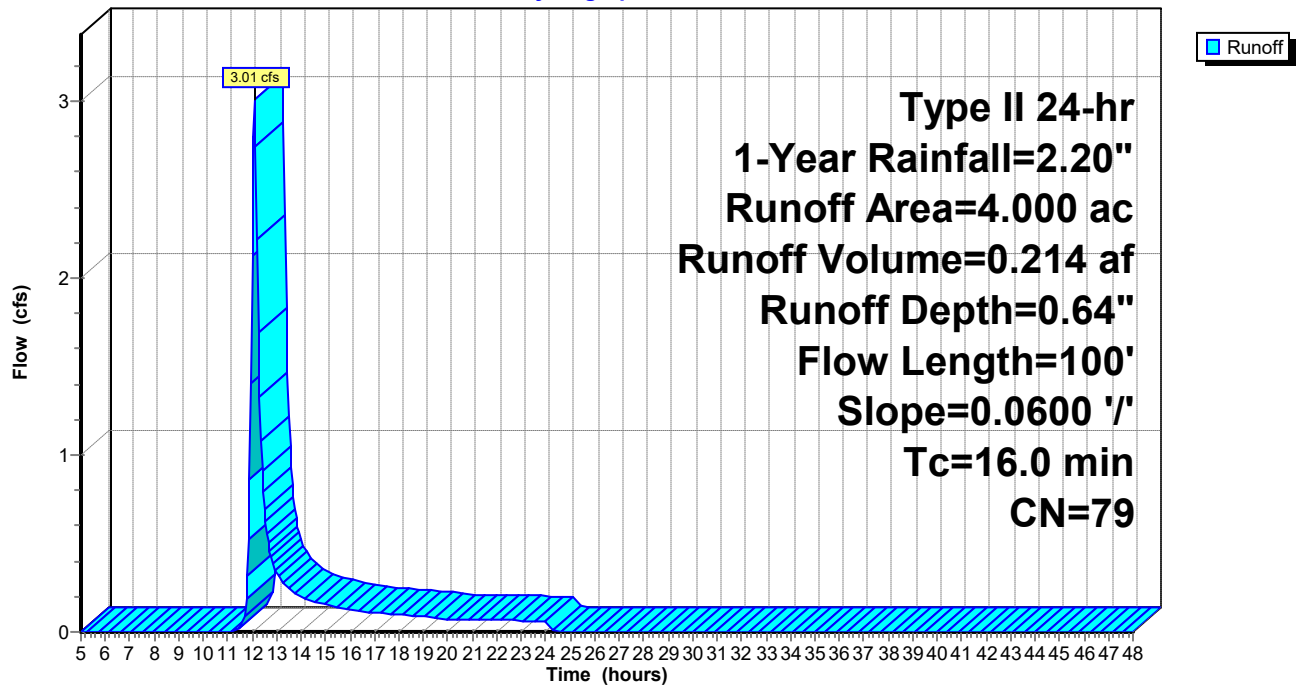
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
4.000	79	Woods, Fair, HSG D
4.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-11: Hudson River Bank

Hydrograph



Summary for Subcatchment DR-12: Normans Kill Bank

Runoff = 3.18 cfs @ 11.97 hrs, Volume= 0.156 af, Depth= 1.34"

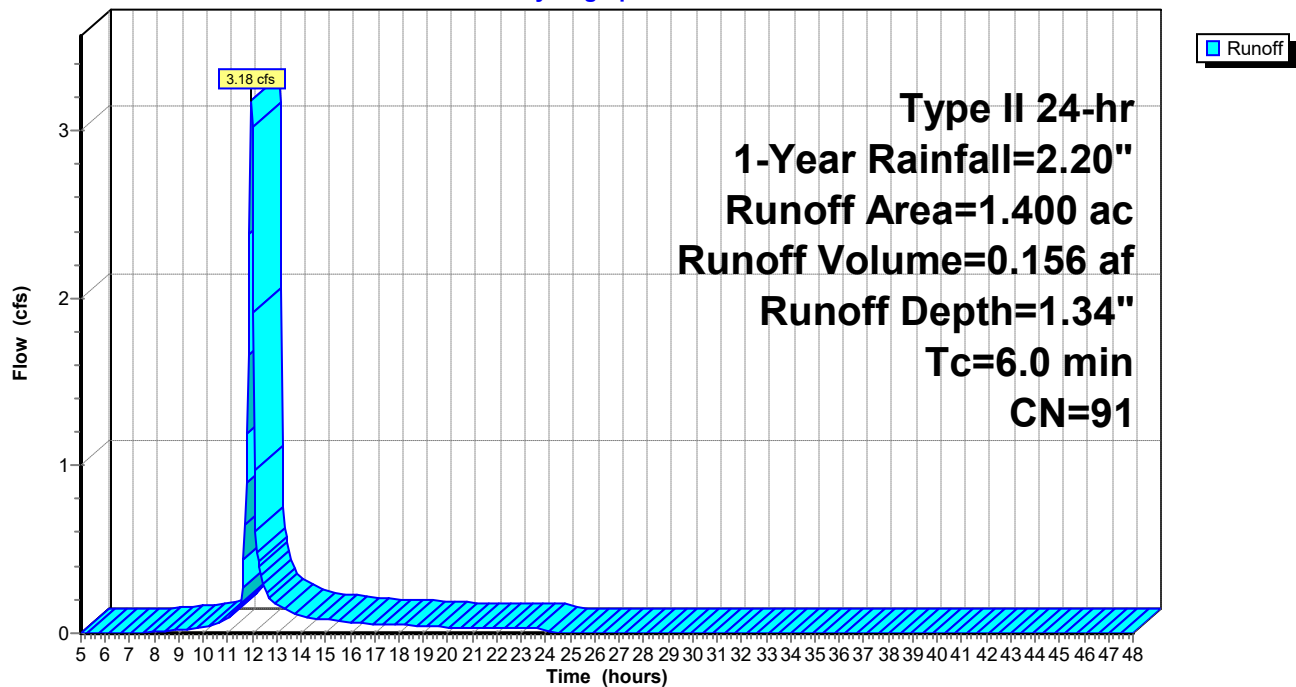
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
0.430	79	Woods, Fair, HSG D
0.970	96	Gravel surface, HSG D
1.400	91	Weighted Average
1.400		100.00% Pervious Area

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

Subcatchment DR-12: Normans Kill Bank

Hydrograph



Summary for Subcatchment DR-13: Roadway

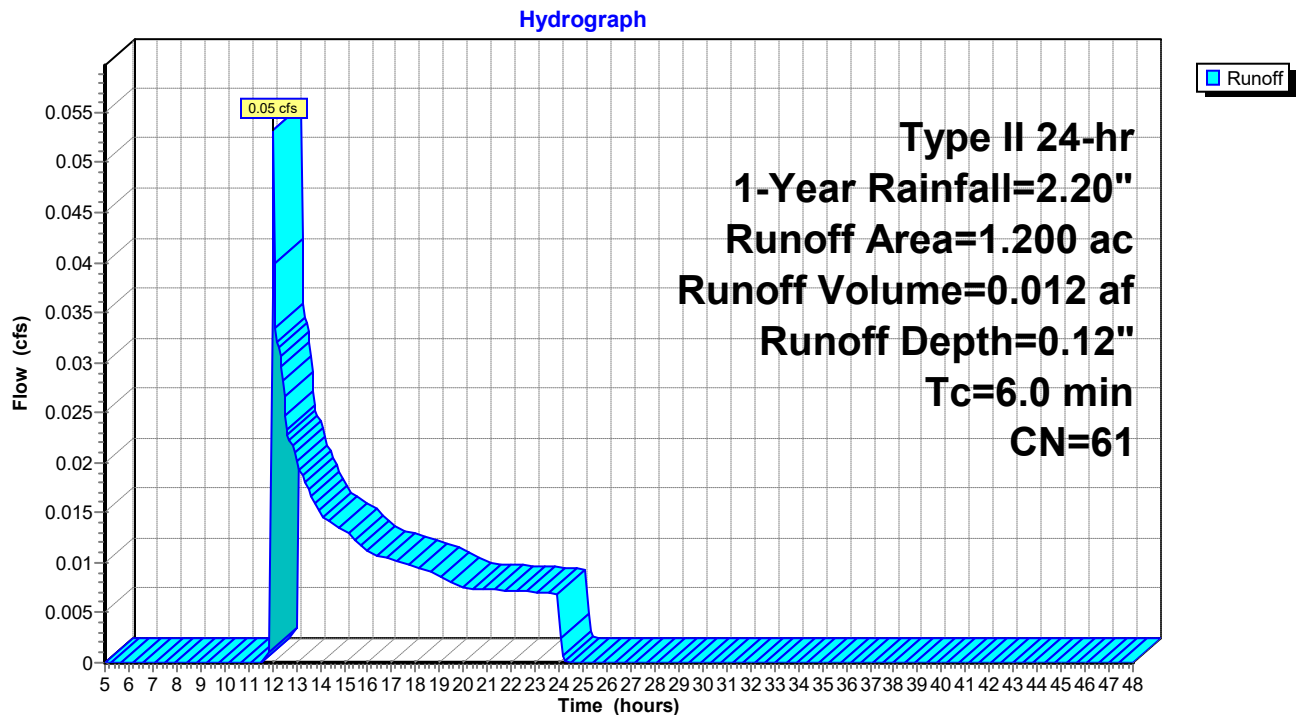
Runoff = 0.05 cfs @ 12.05 hrs, Volume= 0.012 af, Depth= 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 0.450	98	Pavement
0.750	39	>75% Grass cover, Good, HSG A
1.200	61	Weighted Average
0.750		62.50% Pervious Area
0.450		37.50% Impervious Area

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

Subcatchment DR-13: Roadway



Summary for Subcatchment DR-14: Roadway

Runoff = 0.84 cfs @ 11.99 hrs, Volume= 0.045 af, Depth= 0.41"

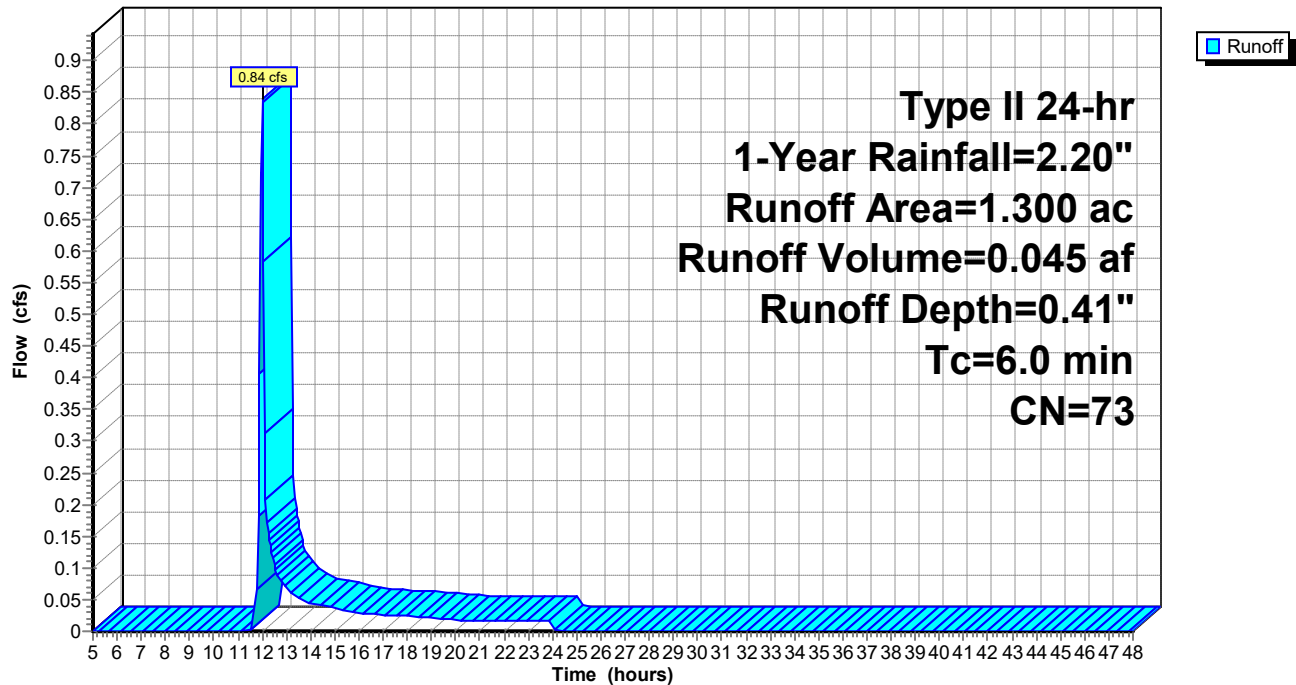
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

	Area (ac)	CN	Description
*	0.550	98	New Pavement
	0.550	39	>75% Grass cover, Good, HSG A
*	0.200	98	Mill & Fill of Old Pavement
	1.300	73	Weighted Average
	0.550		42.31% Pervious Area
	0.750		57.69% Impervious Area

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

Subcatchment DR-14: Roadway

Hydrograph



Summary for Subcatchment DR-15: Roadway

Runoff = 2.72 cfs @ 11.96 hrs, Volume= 0.139 af, Depth> 1.67"

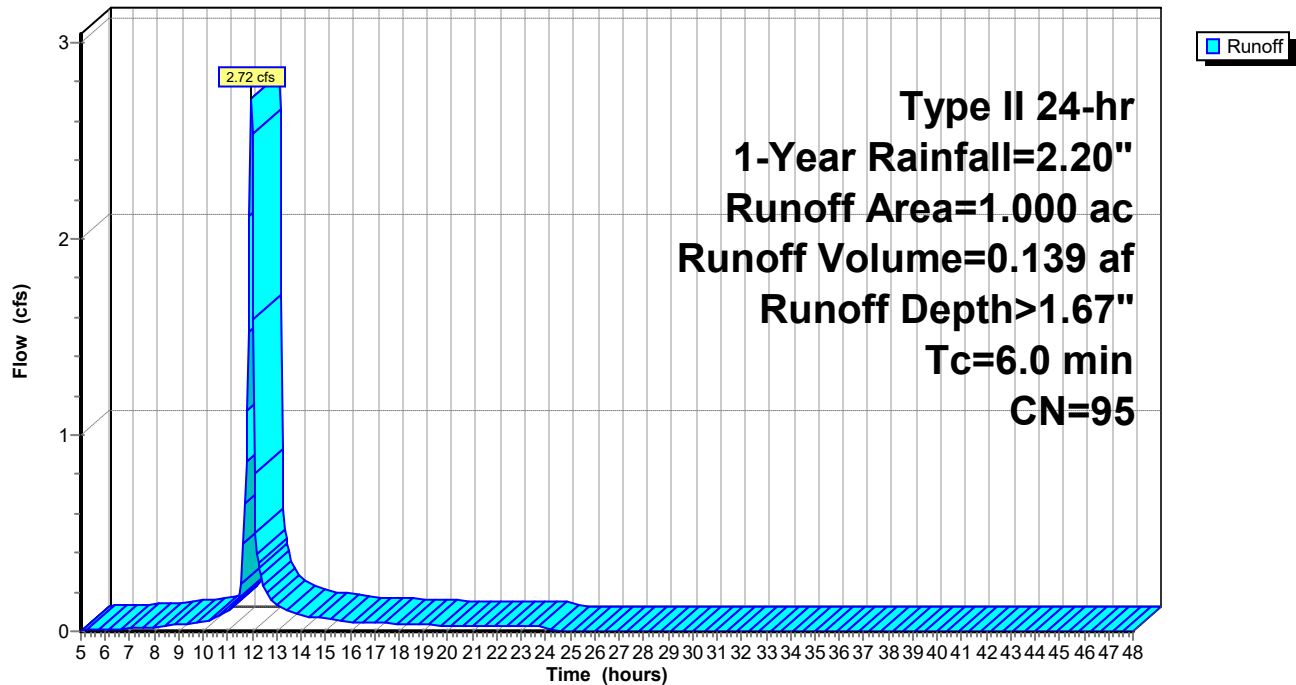
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 0.050	98	New Pavement
0.050	39	>75% Grass cover, Good, HSG A
* 0.900	98	Mill & Fill of Old Pavement
1.000	95	Weighted Average
0.050		5.00% Pervious Area
0.950		95.00% Impervious Area

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

Subcatchment DR-15: Roadway

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 11

Summary for Subcatchment DR-16: Undisturbed Area

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

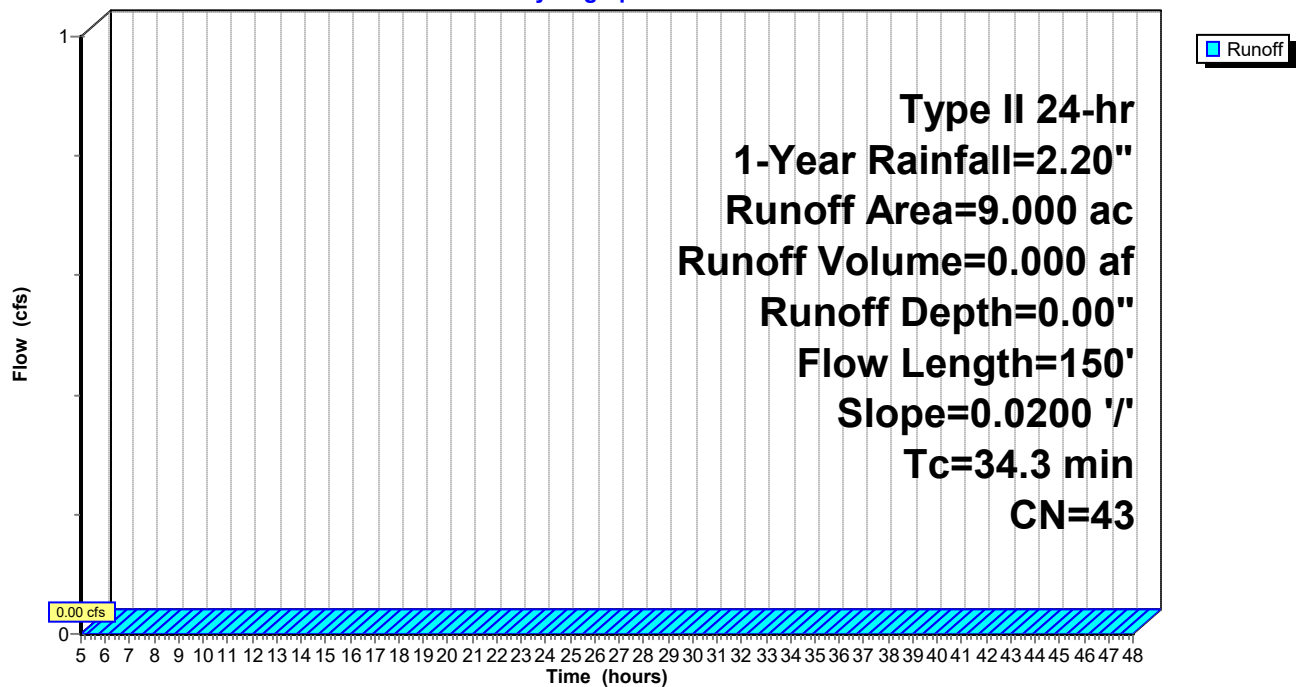
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
9.000	43	Woods/grass comb., Fair, HSG A
9.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.3	150	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-16: Undisturbed Area

Hydrograph



Summary for Subcatchment DR-17: Roadway

Runoff = 1.32 cfs @ 11.97 hrs, Volume= 0.064 af, Depth= 1.00"

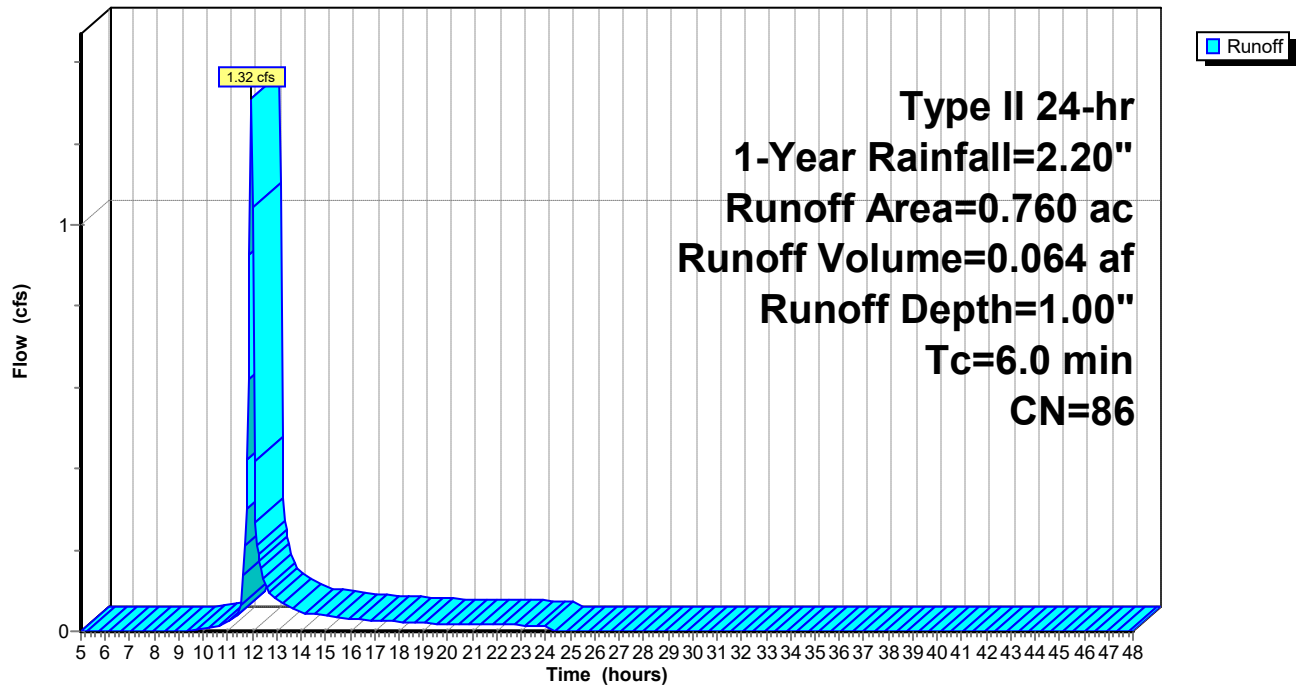
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 0.140	98	Road Widening
* 0.460	98	Roadway
0.160	39	>75% Grass cover, Good, HSG A
0.760	86	Weighted Average
0.160		21.05% Pervious Area
0.600		78.95% Impervious Area

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

Subcatchment DR-17: Roadway

Hydrograph



Summary for Subcatchment DR-2: Storage

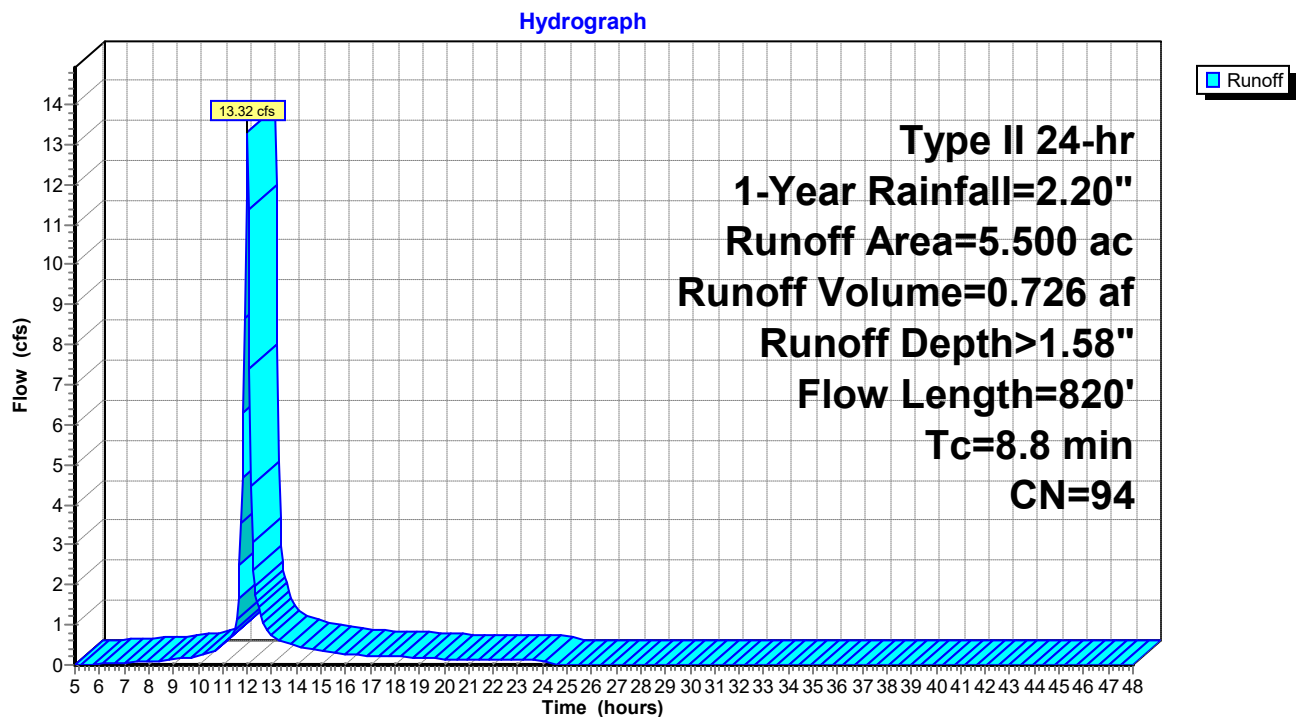
Runoff = 13.32 cfs @ 12.00 hrs, Volume= 0.726 af, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 5.300	95	Dense Graded Aggregate
0.200	80	>75% Grass cover, Good, HSG D
5.500	94	Weighted Average
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.9	470	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	250	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
8.8	820	Total			

Subcatchment DR-2: Storage



Summary for Subcatchment DR-3: Rail & Storage

Runoff = 27.00 cfs @ 12.01 hrs, Volume= 1.533 af, Depth> 1.67"

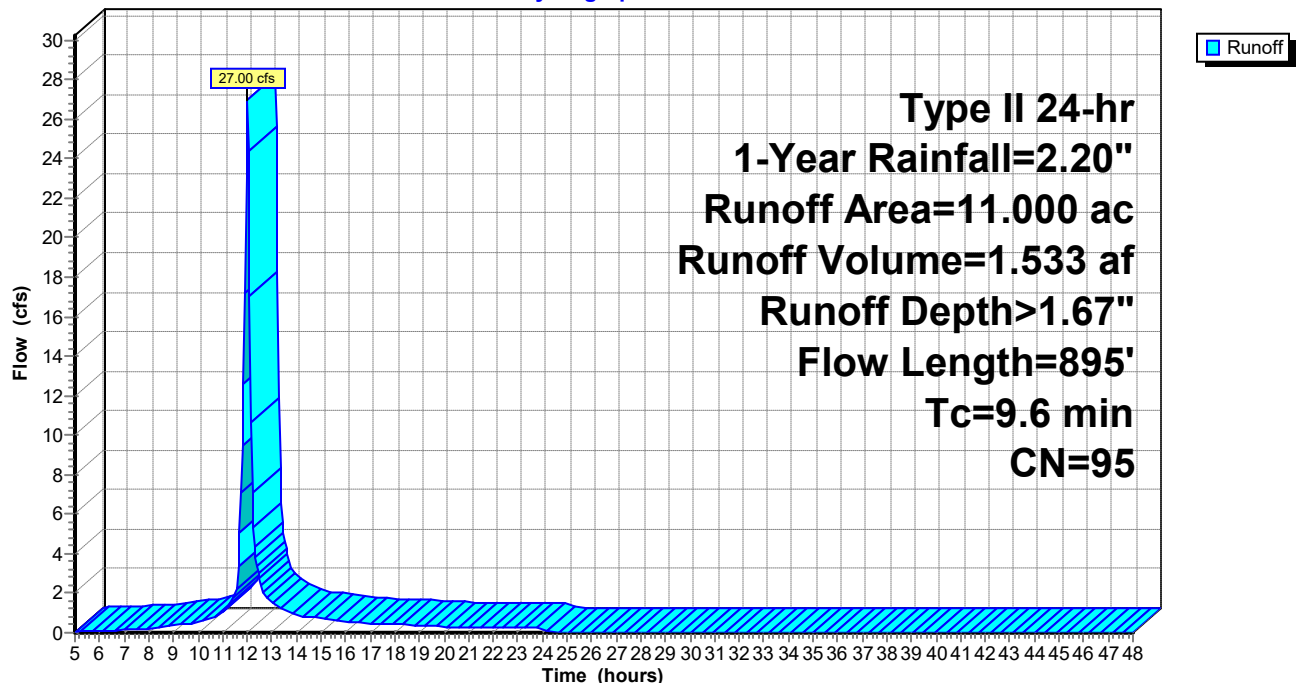
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 8.300	95	Compacted Gravel
0.400	80	>75% Grass cover, Good, HSG D
* 2.300	98	Rail
11.000	95	Weighted Average
8.700		79.09% Pervious Area
2.300		20.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
5.4	525	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.9	270	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	895	Total			

Subcatchment DR-3: Rail & Storage

Hydrograph



Summary for Subcatchment DR-4: Storage

Runoff = 22.13 cfs @ 11.99 hrs, Volume= 1.175 af, Depth> 1.58"

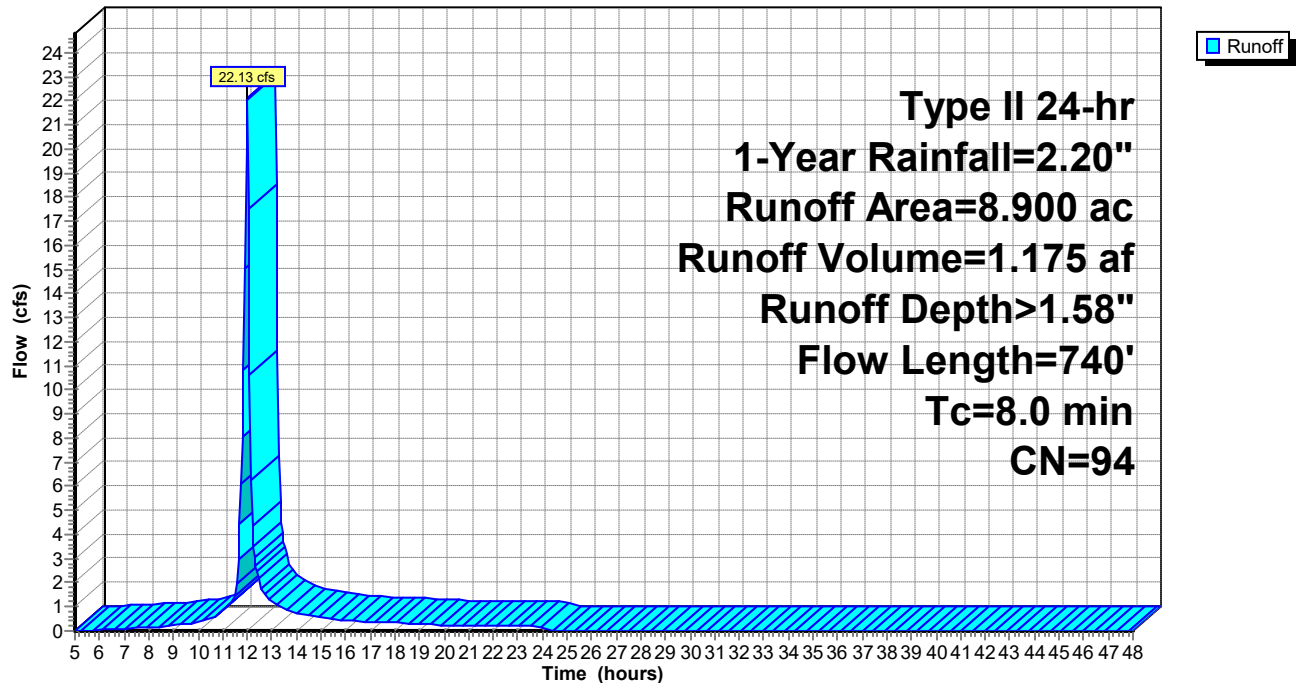
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 8.600	95	Compacted Gravel
0.300	80	>75% Grass cover, Good, HSG D
8.900	94	Weighted Average
8.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.1	400	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	240	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Corrugated PE, smooth interior
8.0	740	Total			

Subcatchment DR-4: Storage

Hydrograph



Summary for Subcatchment DR-5: Storage

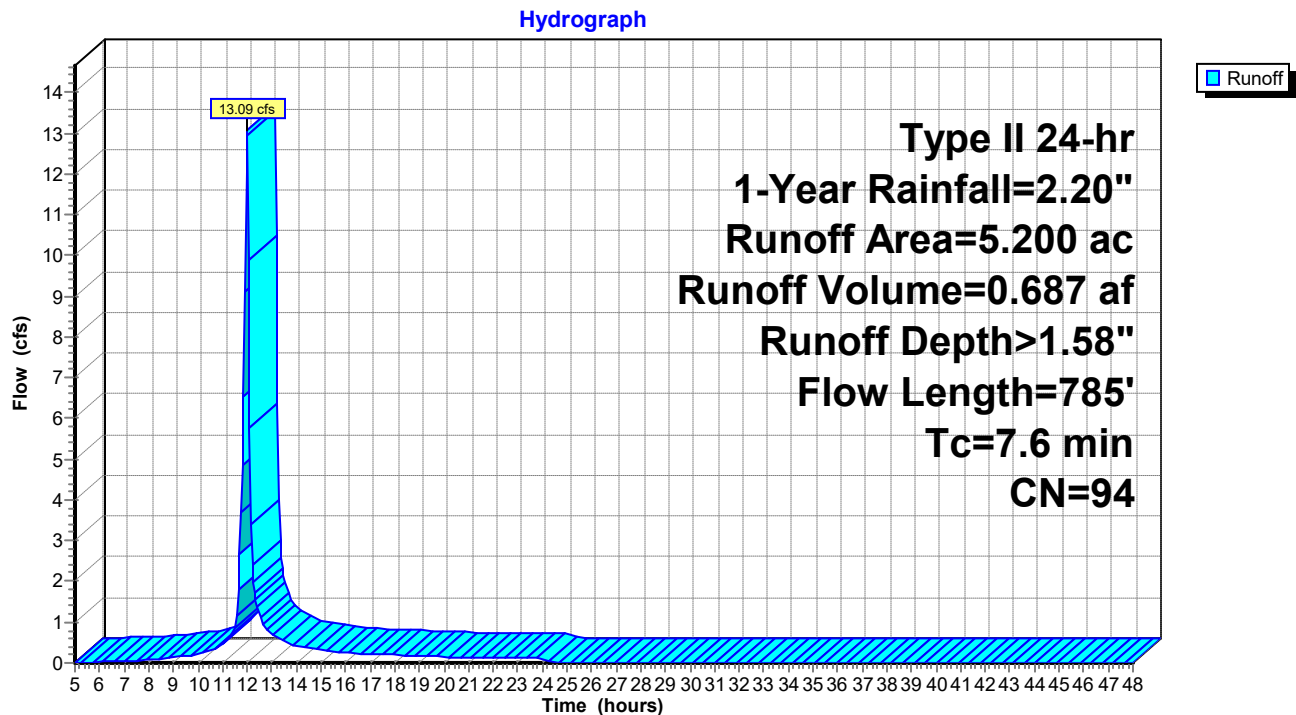
Runoff = 13.09 cfs @ 11.99 hrs, Volume= 0.687 af, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 4.900	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
5.200	94	Weighted Average
5.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.0	285	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.3	400	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
7.6	785	Total			

Subcatchment DR-5: Storage



Summary for Subcatchment DR-6: Buldings B & D

Runoff = 30.91 cfs @ 12.00 hrs, Volume= 1.734 af, Depth> 1.76"

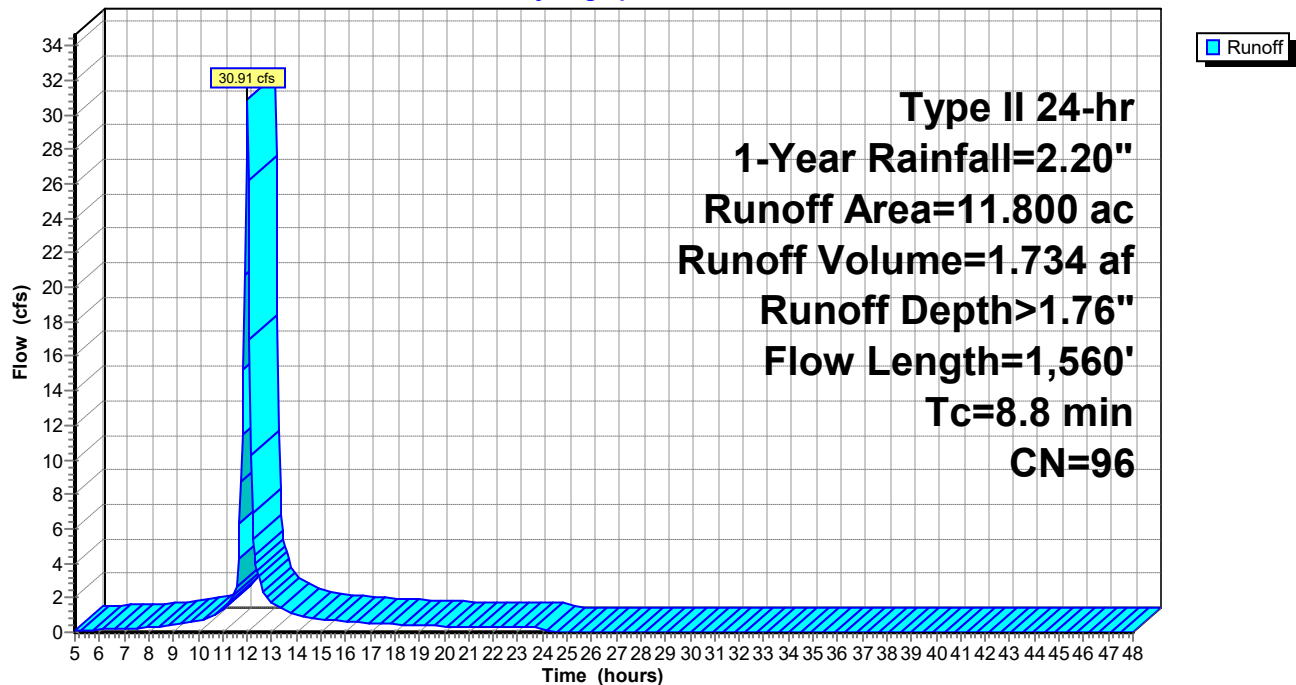
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 2.549	98	Building B
* 1.413	98	Building D
0.200	80	>75% Grass cover, Good, HSG D
* 7.638	95	Dense Graded Aggregate
11.800	96	Weighted Average
7.838		66.42% Pervious Area
3.962		33.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
4.5	1,360	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.8	1,560	Total			

Subcatchment DR-6: Buldings B & D

Hydrograph



Summary for Subcatchment DR-7: Building C & Rail

Runoff = 22.09 cfs @ 12.01 hrs, Volume= 1.278 af, Depth> 1.76"

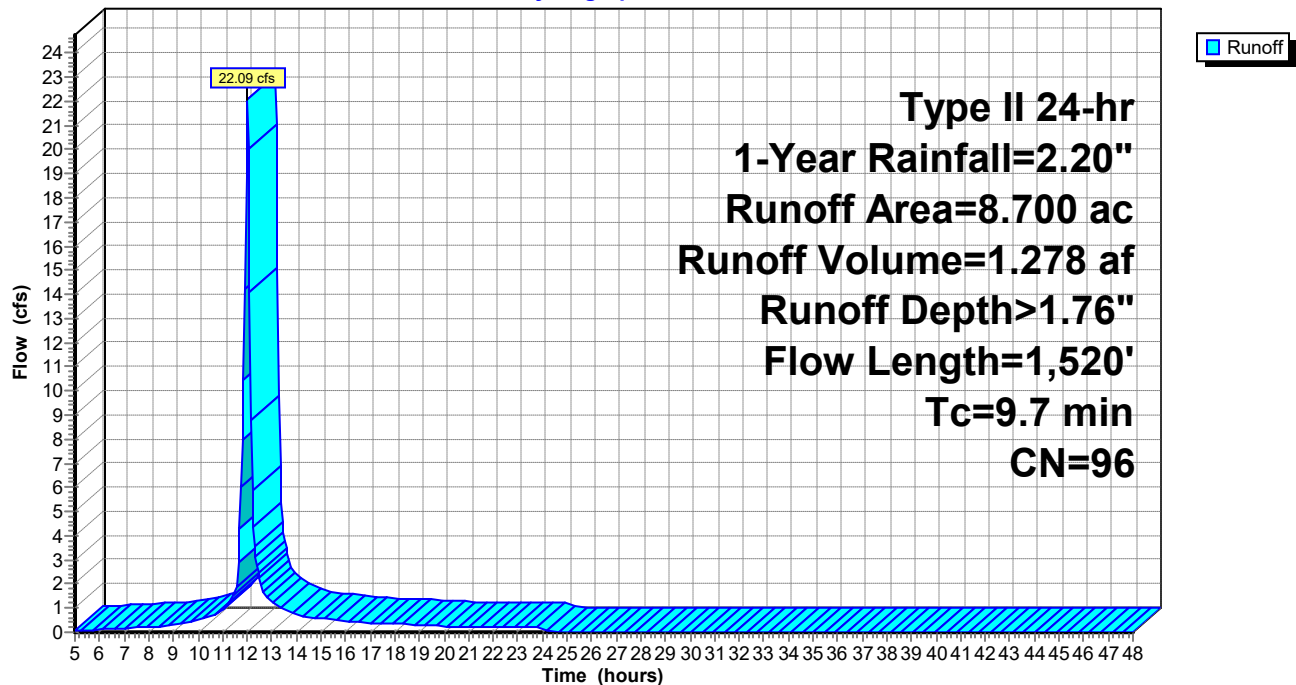
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 3.030	98	Building C
* 0.970	98	Rail
* 4.400	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
8.700	96	Weighted Average
4.700		54.02% Pervious Area
4.000		45.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
2.6	250	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
3.8	1,170	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.7	1,520	Total			

Subcatchment DR-7: Building C & Rail

Hydrograph



Summary for Subcatchment DR-8A: Parking

Runoff = 5.17 cfs @ 11.96 hrs, Volume= 0.265 af, Depth> 1.67"

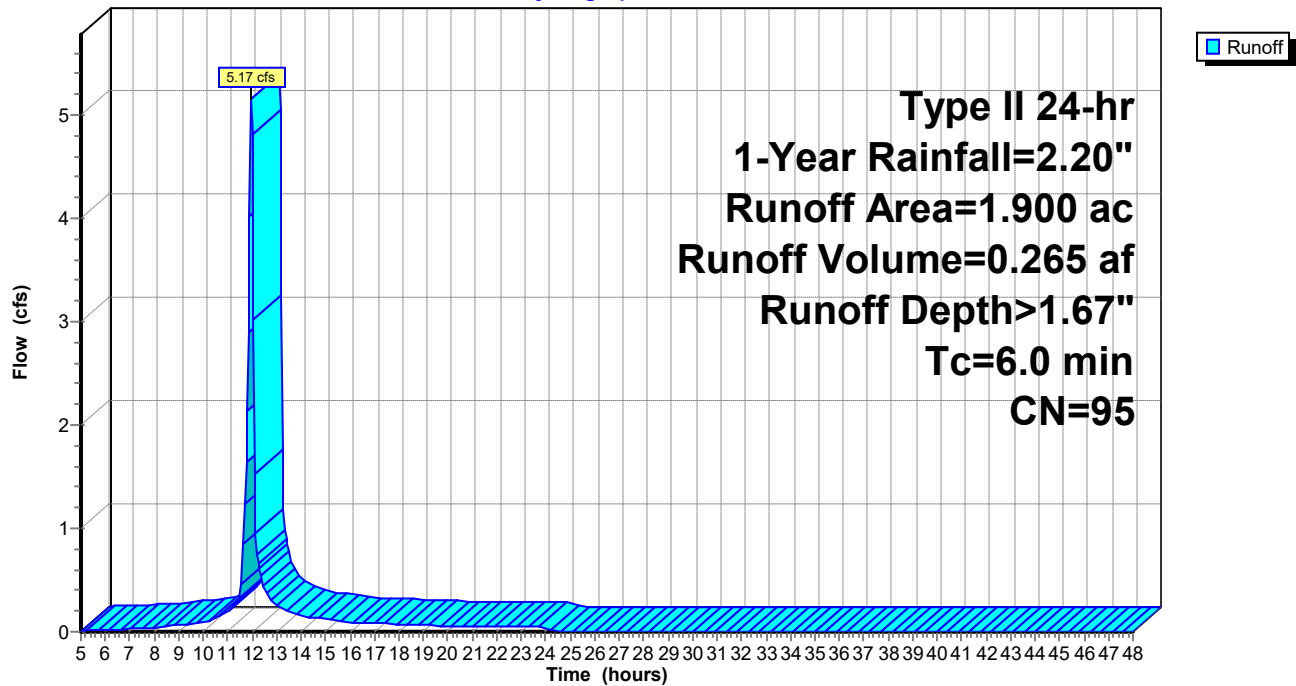
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 1.600	98	Parking
0.300	80	>75% Grass cover, Good, HSG D
1.900	95	Weighted Average
0.300		15.79% Pervious Area
1.600		84.21% Impervious Area

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

Subcatchment DR-8A: Parking

Hydrograph



Summary for Subcatchment DR-8B: Roadway & Pond

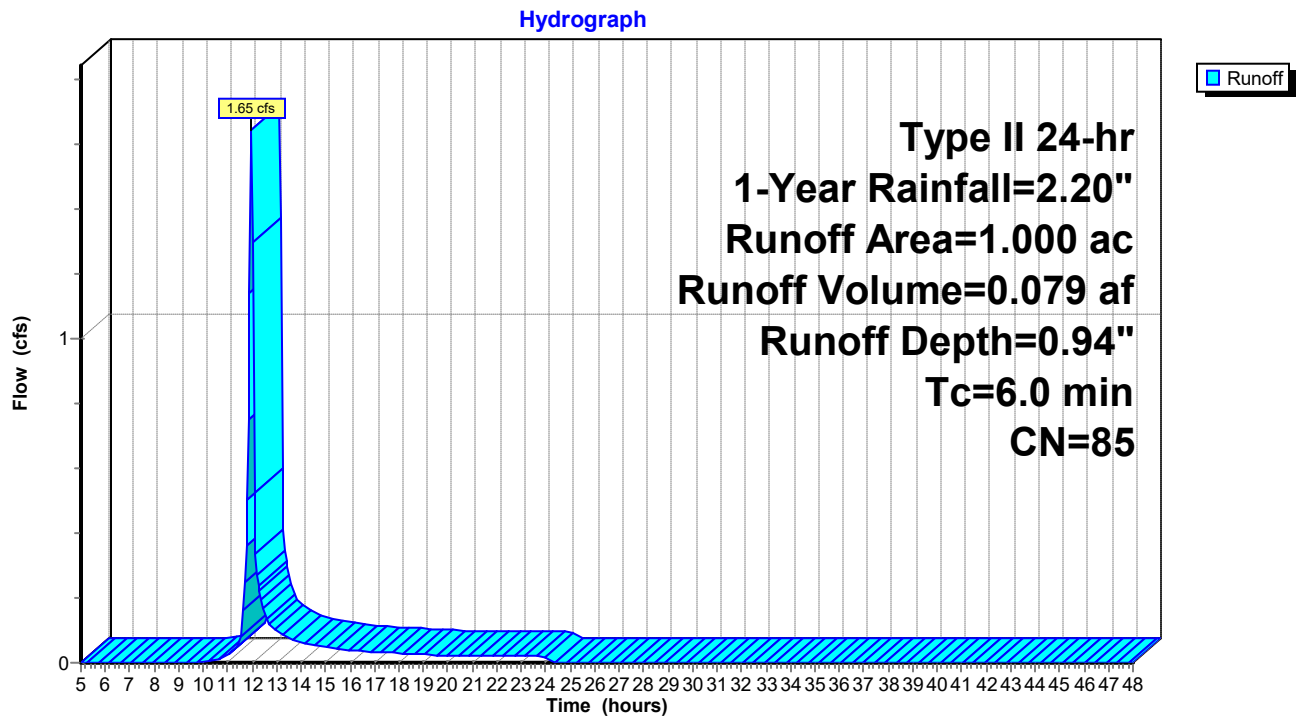
Runoff = 1.65 cfs @ 11.98 hrs, Volume= 0.079 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 0.300	98	Roadway
0.700	80	>75% Grass cover, Good, HSG D
1.000	85	Weighted Average
0.700		70.00% Pervious Area
0.300		30.00% Impervious Area

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

Subcatchment DR-8B: Roadway & Pond



Summary for Subcatchment DR-9A: Parking & Substation

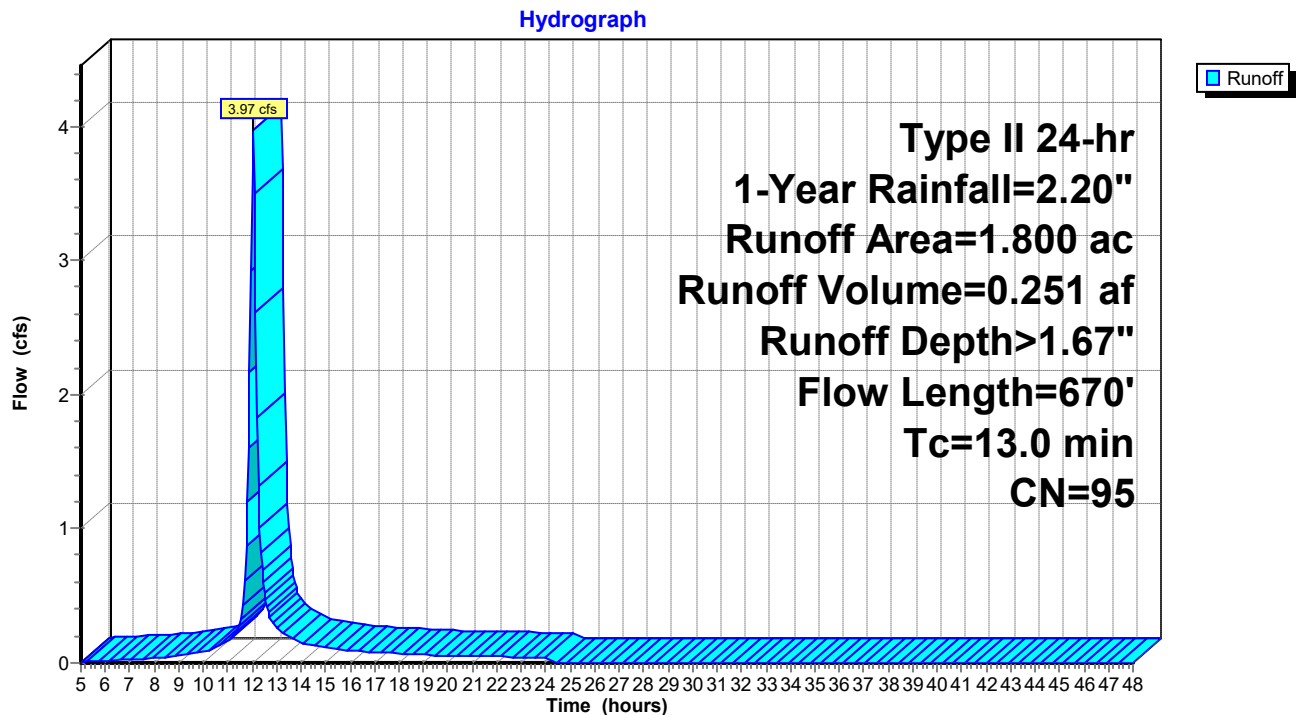
Runoff = 3.97 cfs @ 12.04 hrs, Volume= 0.251 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
0.230	80	>75% Grass cover, Good, HSG D
* 0.200	92	Compacted Gravel
* 1.200	98	Parking and Road
* 0.170	98	Substation
1.800	95	Weighted Average
0.430		23.89% Pervious Area
1.370		76.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	100	0.0200	1.19		Sheet Flow, Parking Lot Runoff
					Smooth surfaces n= 0.011 P2= 2.40"
11.6	570	0.0030	0.82		Shallow Concentrated Flow, Grass Lined Ditch to Pond
					Grassed Waterway Kv= 15.0 fps
13.0	670	Total			

Subcatchment DR-9A: Parking & Substation



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 22

Summary for Subcatchment DR-9B: Roadway

Runoff = 7.13 cfs @ 11.96 hrs, Volume= 0.334 af, Depth= 1.00"

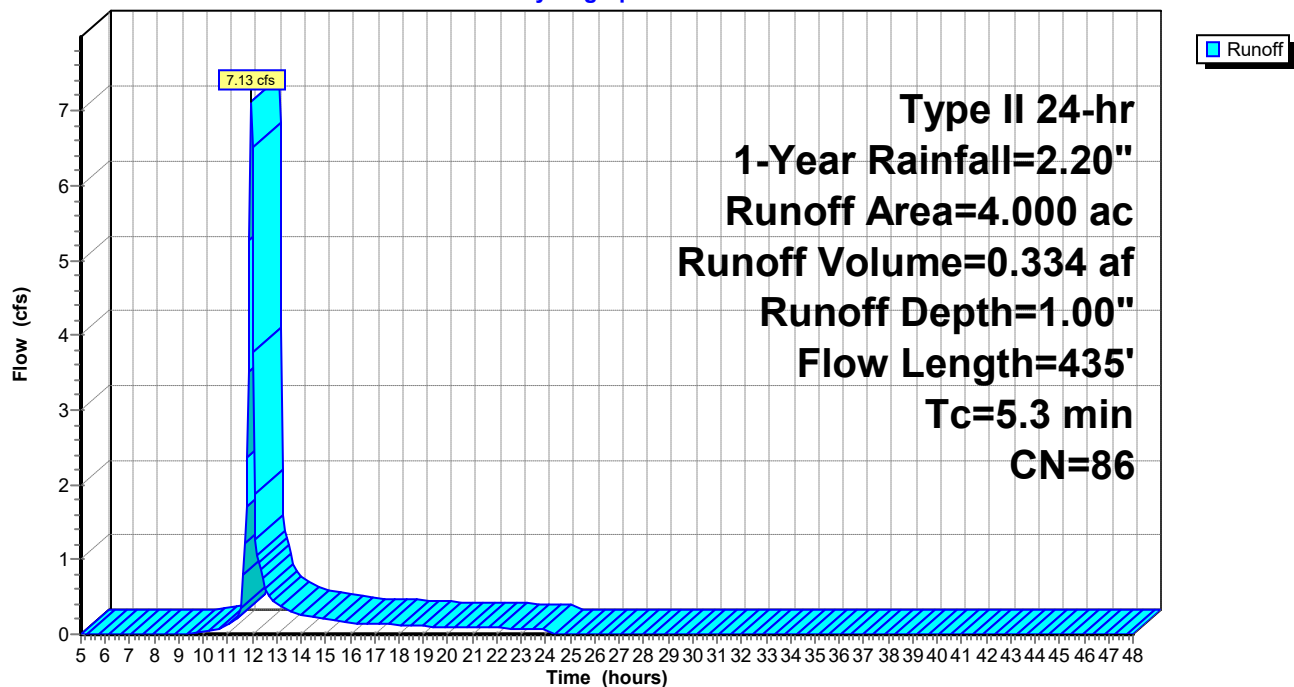
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-Year Rainfall=2.20"

Area (ac)	CN	Description
* 1.050	95	Dense Graded Aggregate
* 0.480	98	Roadway
2.470	80	>75% Grass cover, Good, HSG D
4.000	86	Weighted Average
3.520		88.00% Pervious Area
0.480		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	100	0.0250	0.46		Sheet Flow, Dense Graded Aggregate Yard n= 0.040 P2= 2.40"
1.3	230	0.0100	3.07	9.20	Channel Flow, Grass lined ditch Area= 3.0 sf Perim= 4.0' r= 0.75' n= 0.040 Earth, cobble bottom, clean sides
0.4	105	0.0050	4.20	7.43	Pipe Channel, driveway culvert 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.3	435	Total			

Subcatchment DR-9B: Roadway

Hydrograph



Summary for Reach 1R: Swale

Inflow Area = 1.900 ac, 84.21% Impervious, Inflow Depth > 1.67" for 1-Year event
 Inflow = 5.17 cfs @ 11.96 hrs, Volume= 0.265 af
 Outflow = 4.10 cfs @ 12.13 hrs, Volume= 0.265 af, Atten= 21%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.75 fps, Min. Travel Time= 6.6 min

Avg. Velocity = 0.50 fps, Avg. Travel Time= 22.9 min

Peak Storage= 1,638 cf @ 12.02 hrs

Average Depth at Peak Storage= 0.74' , Surface Width= 5.43'

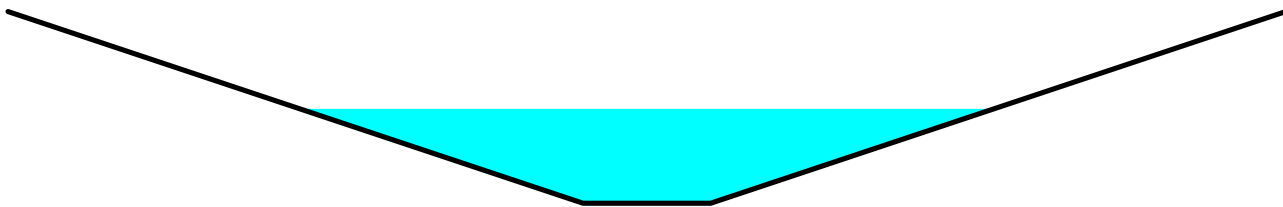
Bank-Full Depth= 1.50' Flow Area= 8.3 sf, Capacity= 22.13 cfs

1.00' x 1.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 10.00'

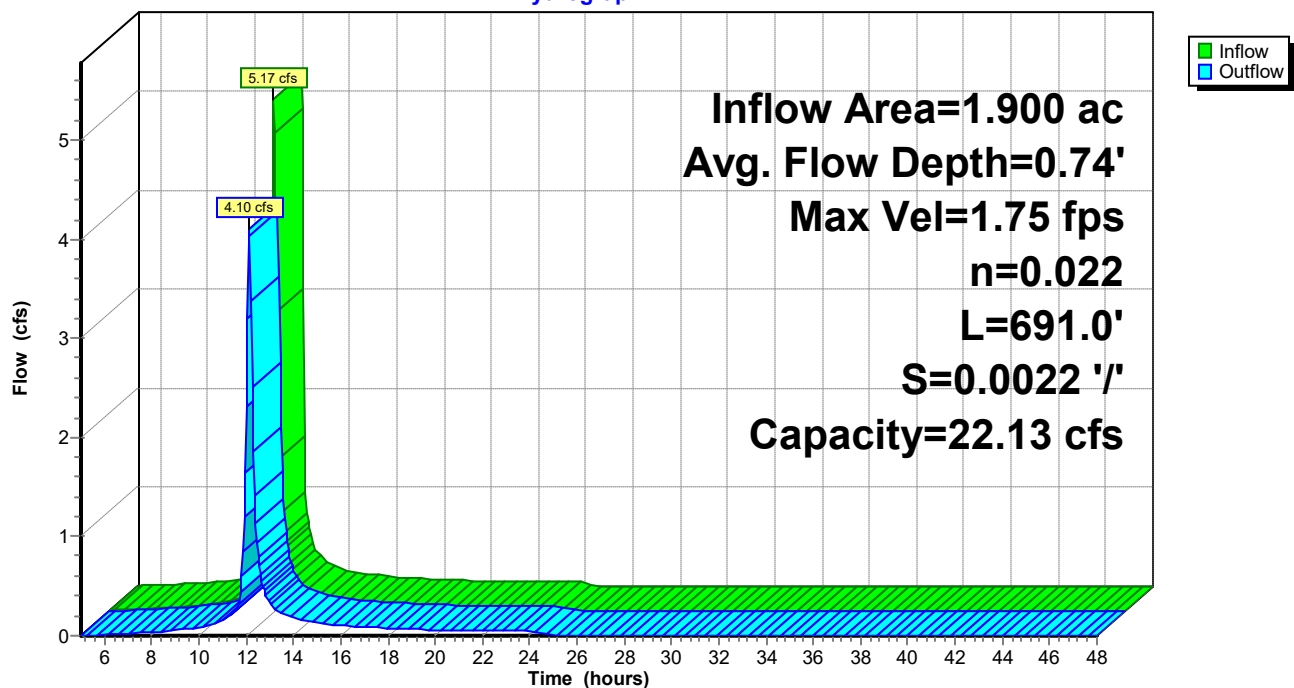
Length= 691.0' Slope= 0.0022 '/'

Inlet Invert= 15.50', Outlet Invert= 14.00'



Reach 1R: Swale

Hydrograph



Summary for Reach 1W: Wetland #1 / Analysis Point 1A

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 0.83" for 1-Year event
 Inflow = 4.77 cfs @ 13.30 hrs, Volume= 1.982 af
 Outflow = 1.61 cfs @ 21.37 hrs, Volume= 1.851 af, Atten= 66%, Lag= 484.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Max. Velocity= 0.05 fps, Min. Travel Time= 305.5 min
 Avg. Velocity= 0.03 fps, Avg. Travel Time= 568.8 min

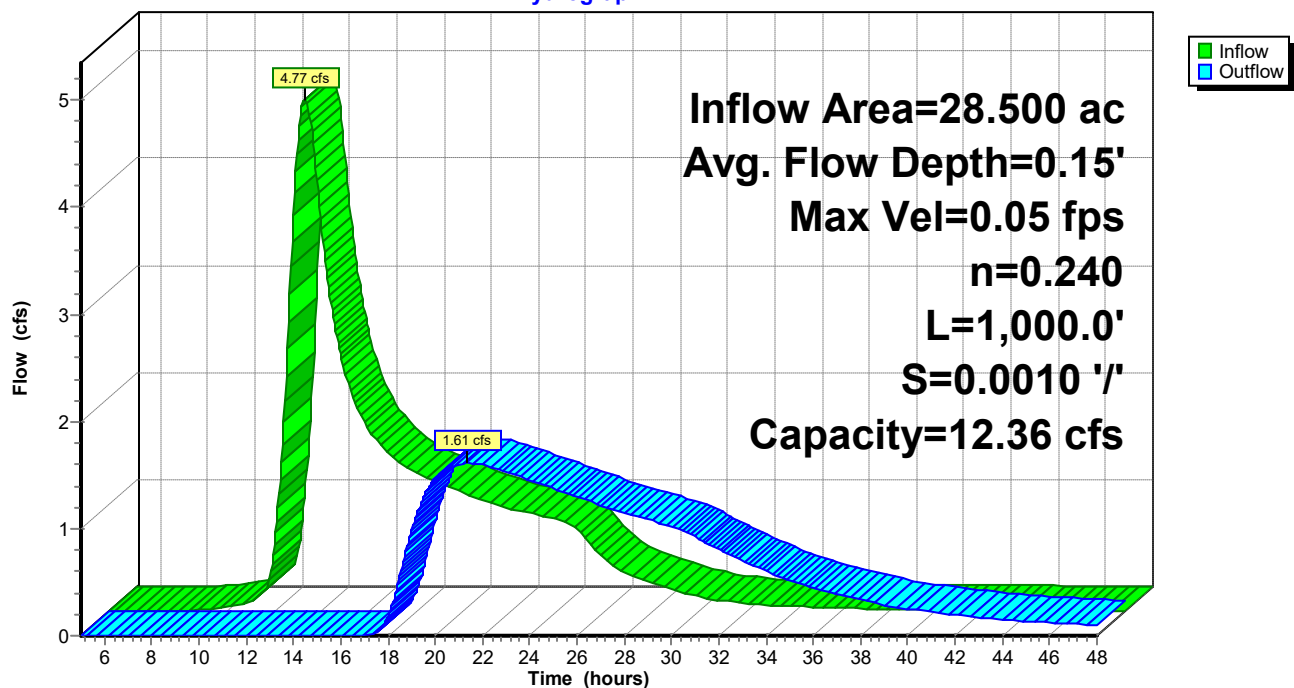
Peak Storage= 29,542 cf @ 16.28 hrs
 Average Depth at Peak Storage= 0.15', Surface Width= 200.88'
 Bank-Full Depth= 0.50' Flow Area= 100.8 sf, Capacity= 12.36 cfs

200.00' x 0.50' deep channel, n= 0.240
 Side Slope Z-value= 3.0 '/' Top Width= 203.00'
 Length= 1,000.0' Slope= 0.0010 '/'
 Inlet Invert= 6.00', Outlet Invert= 5.00'



Reach 1W: Wetland #1 / Analysis Point 1A

Hydrograph



Summary for Reach 2R: Overflow

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 1.20" for 1-Year event
 Inflow = 0.48 cfs @ 13.64 hrs, Volume= 0.581 af
 Outflow = 0.48 cfs @ 13.65 hrs, Volume= 0.581 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.78 fps, Min. Travel Time= 0.5 min

Avg. Velocity= 1.38 fps, Avg. Travel Time= 0.6 min

Peak Storage= 13 cf @ 13.64 hrs

Average Depth at Peak Storage= 0.03' , Surface Width= 8.20'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 569.91 cfs

8.00' x 2.00' deep channel, n= 0.020 Corrugated PE, corrugated interior

Side Slope Z-value= 3.0 ' / ' Top Width= 20.00'

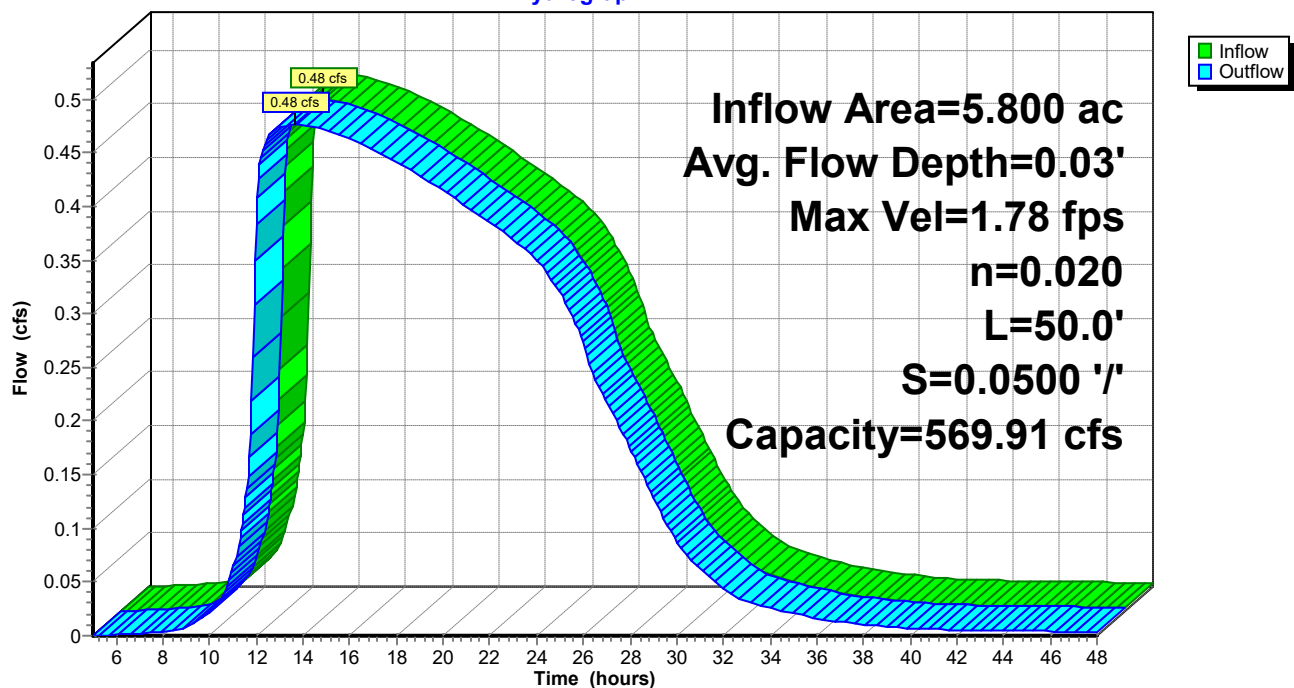
Length= 50.0' Slope= 0.0500 ' / '

Inlet Invert= 16.50', Outlet Invert= 14.00'



Reach 2R: Overflow

Hydrograph



Summary for Reach 3R: Outlet Pipe

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 0.78" for 1-Year event
 Inflow = 1.61 cfs @ 21.37 hrs, Volume= 1.851 af
 Outflow = 1.61 cfs @ 21.38 hrs, Volume= 1.851 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.34 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 2.22 fps, Avg. Travel Time= 0.5 min

Peak Storage= 34 cf @ 21.38 hrs

Average Depth at Peak Storage= 0.35', Surface Width= 2.04'

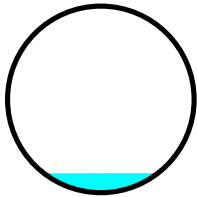
Bank-Full Depth= 3.33' Flow Area= 8.7 sf, Capacity= 70.83 cfs

40.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

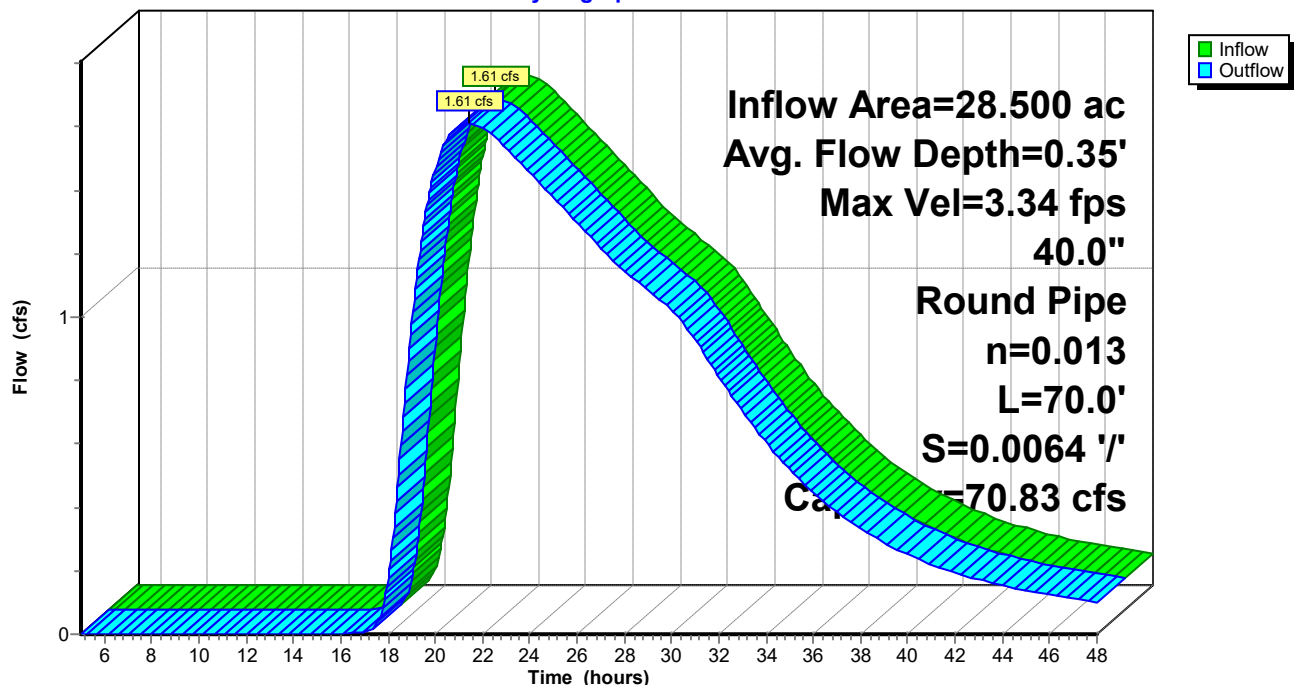
Length= 70.0' Slope= 0.0064 '/'

Inlet Invert= 4.25', Outlet Invert= 3.80'



Reach 3R: Outlet Pipe

Hydrograph



Summary for Reach 4R: Overflow

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 1.67" for 1-Year event
 Inflow = 2.65 cfs @ 11.99 hrs, Volume= 0.139 af
 Outflow = 2.56 cfs @ 12.00 hrs, Volume= 0.139 af, Atten= 3%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Max. Velocity= 2.29 fps, Min. Travel Time= 0.7 min
 Avg. Velocity= 0.58 fps, Avg. Travel Time= 2.9 min

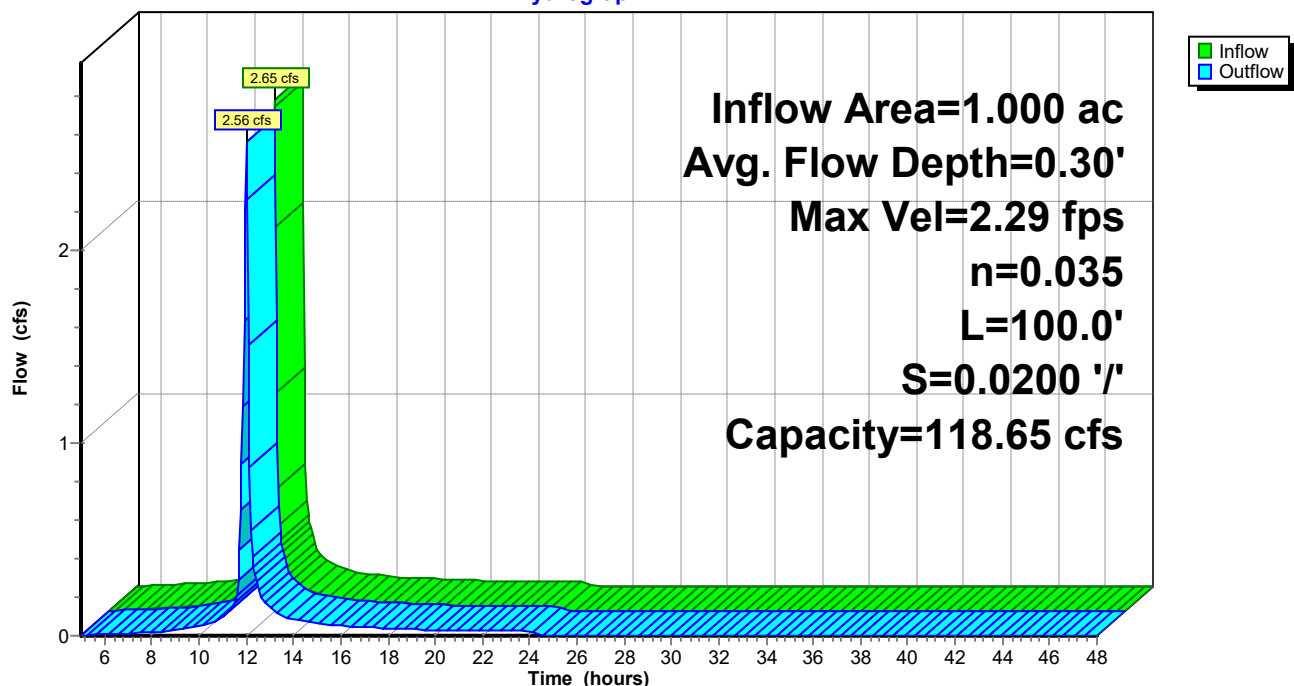
Peak Storage= 115 cf @ 11.99 hrs
 Average Depth at Peak Storage= 0.30' , Surface Width= 4.77'
 Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 118.65 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch
 Side Slope Z-value= 3.0 '/' Top Width= 15.00'
 Length= 100.0' Slope= 0.0200 '/'
 Inlet Invert= 12.00', Outlet Invert= 10.00'



Reach 4R: Overflow

Hydrograph



Summary for Reach 5R: Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.00" for 1-Year event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 90.48 cfs

3.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

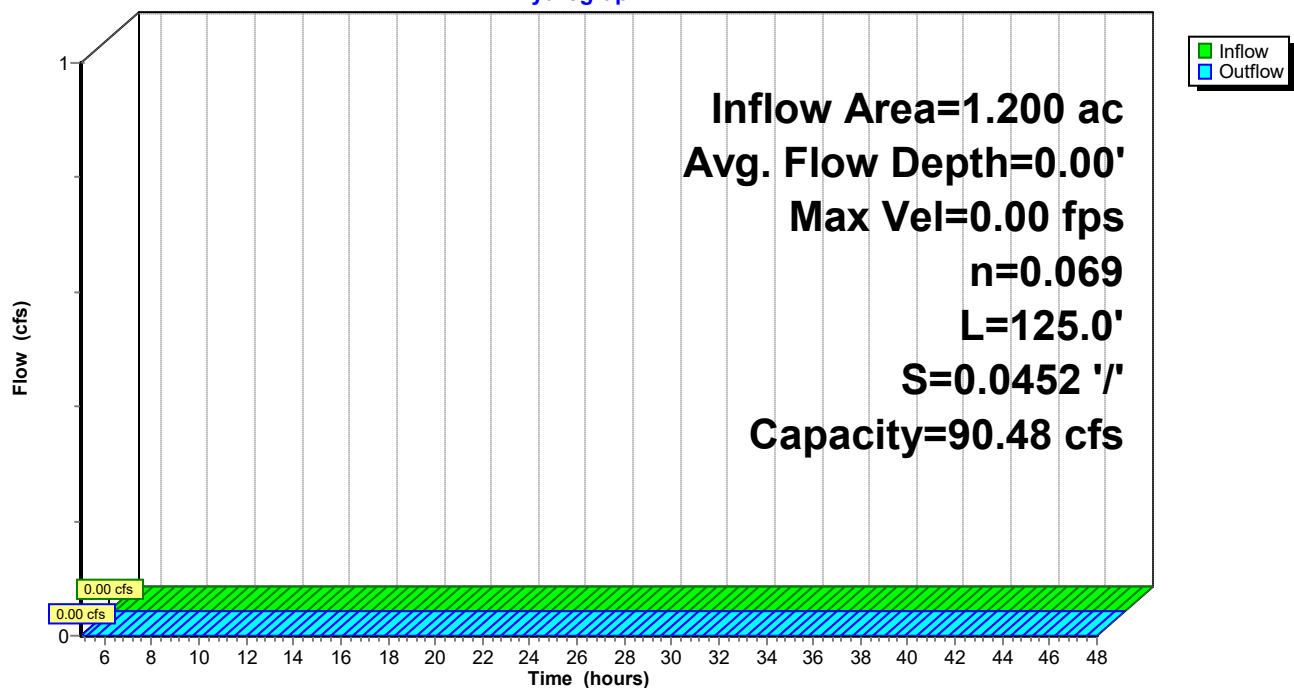
Length= 125.0' Slope= 0.0452 '/'

Inlet Invert= 11.65', Outlet Invert= 6.00'



Reach 5R: Overflow

Hydrograph



Summary for Reach 6R: Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.00" for 1-Year event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 116.91 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

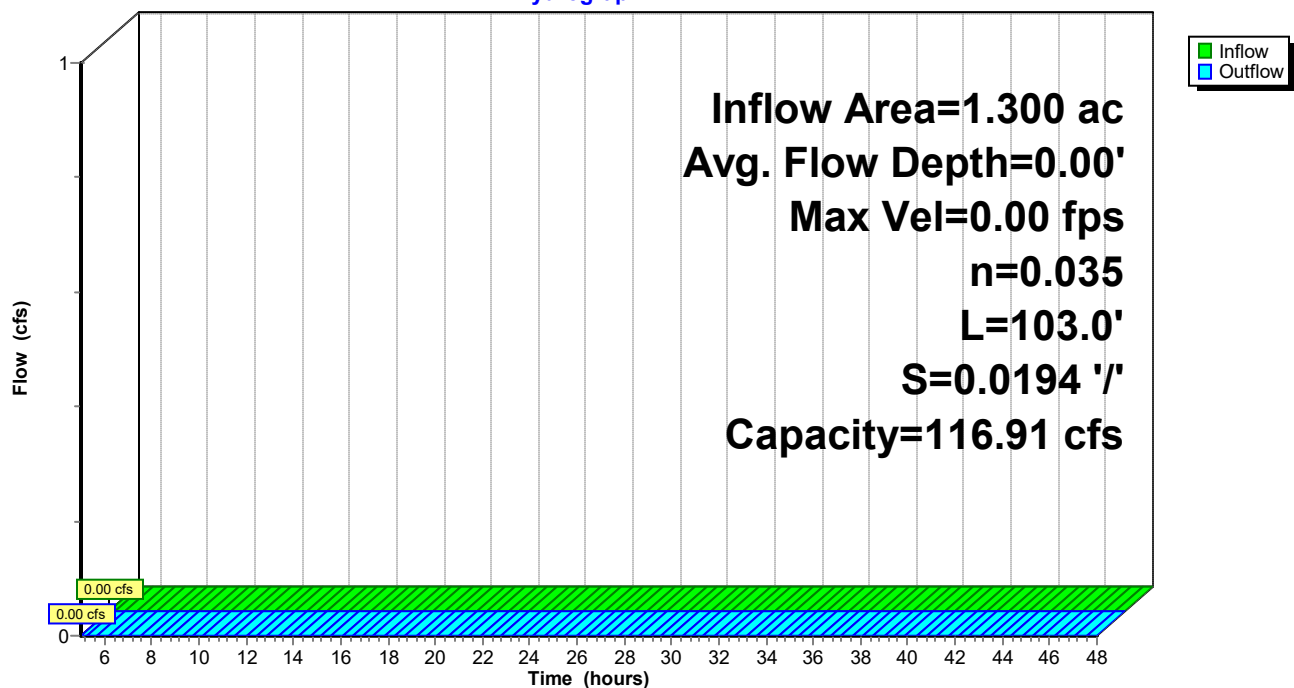
Length= 103.0' Slope= 0.0194 '/'

Inlet Invert= 8.50', Outlet Invert= 6.50'



Reach 6R: Overflow

Hydrograph



Summary for Reach 7R: Overflow

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth > 1.40" for 1-Year event
 Inflow = 0.30 cfs @ 13.53 hrs, Volume= 0.339 af
 Outflow = 0.30 cfs @ 13.61 hrs, Volume= 0.339 af, Atten= 0%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.55 fps, Min. Travel Time= 3.0 min

Avg. Velocity= 0.34 fps, Avg. Travel Time= 4.8 min

Peak Storage= 54 cf @ 13.56 hrs

Average Depth at Peak Storage= 0.07' , Surface Width= 8.40'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 116.81 cfs

8.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 ' / ' Top Width= 20.00'

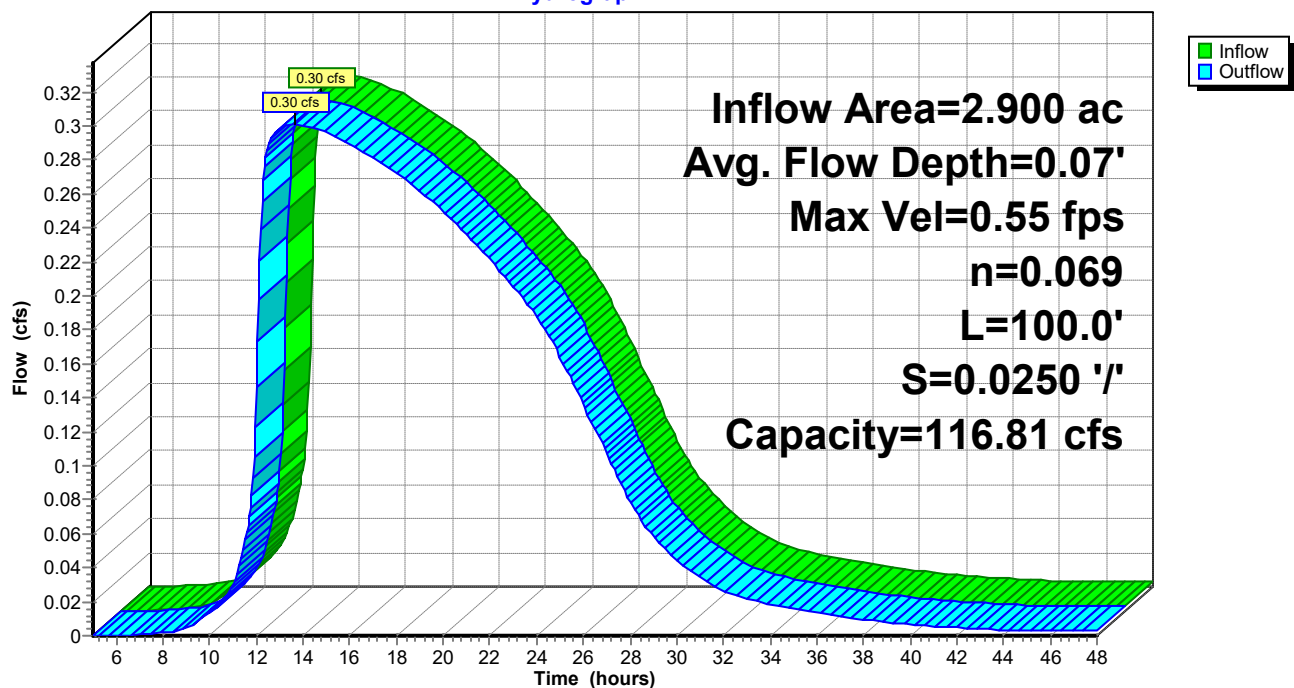
Length= 100.0' Slope= 0.0250 ' / '

Inlet Invert= 14.50', Outlet Invert= 12.00'



Reach 7R: Overflow

Hydrograph



Summary for Reach 8R: Dry Swale #1

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 1.67" for 1-Year event
 Inflow = 2.72 cfs @ 11.96 hrs, Volume= 0.139 af
 Outflow = 2.65 cfs @ 11.99 hrs, Volume= 0.139 af, Atten= 3%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.47 fps, Min. Travel Time= 0.7 min

Avg. Velocity = 0.61 fps, Avg. Travel Time= 2.9 min

Peak Storage= 114 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.39' , Surface Width= 3.57'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 16.53 cfs

2.00' x 1.00' deep channel, n= 0.018 Earth, clean & straight

Side Slope Z-value= 2.0 ' / ' Top Width= 6.00'

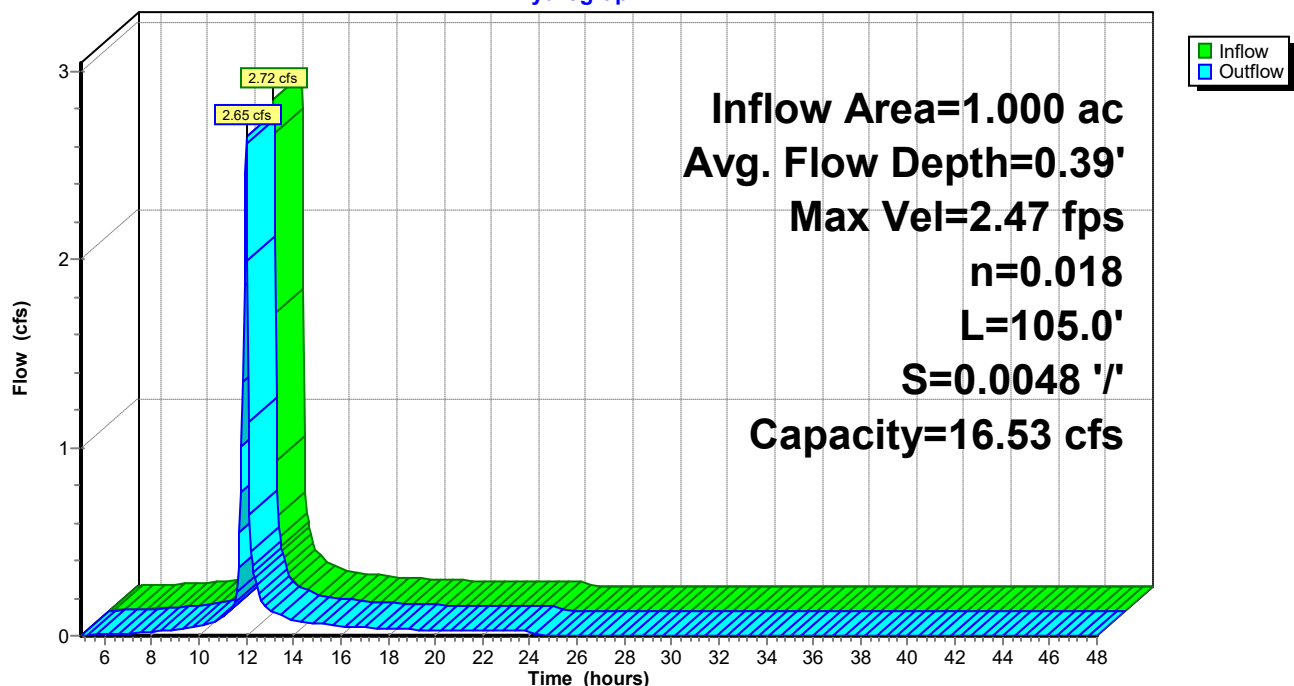
Length= 105.0' Slope= 0.0048 ' / '

Inlet Invert= 10.00', Outlet Invert= 9.50'



Reach 8R: Dry Swale #1

Hydrograph



Summary for Reach 10R: Dry Swale #2

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 1.00" for 1-Year event
Inflow = 1.22 cfs @ 12.03 hrs, Volume= 0.064 af
Outflow = 1.20 cfs @ 12.04 hrs, Volume= 0.064 af, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.19 fps, Min. Travel Time= 0.6 min

Avg. Velocity= 1.01 fps, Avg. Travel Time= 1.9 min

Peak Storage= 44 cf @ 12.03 hrs

Average Depth at Peak Storage= 0.15' , Surface Width= 2.93'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 213.76 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 14.00'

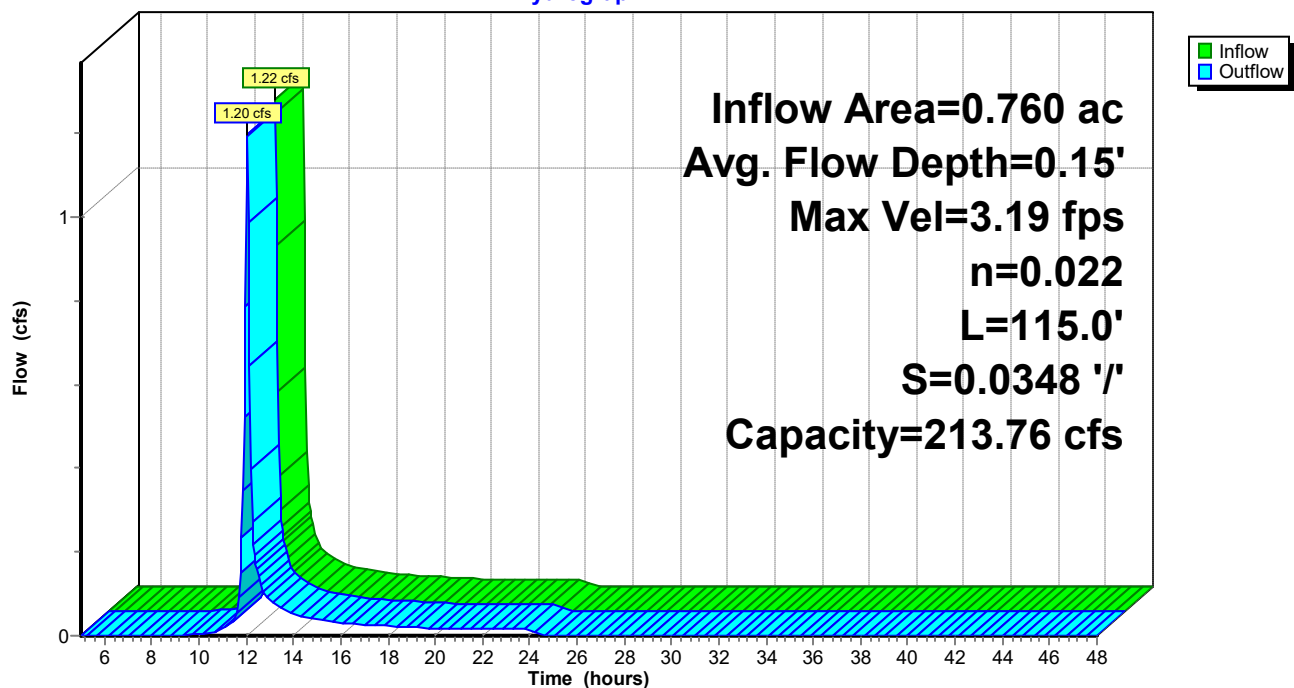
Length= 115.0' Slope= 0.0348 '/'

Inlet Invert= 37.00', Outlet Invert= 33.00'



Reach 10R: Dry Swale #2

Hydrograph



Summary for Reach 12R: Sediment Basin Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.00" for 1-Year event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 0.50' Flow Area= 6.0 sf, Capacity= 9.43 cfs

10.00' x 0.50' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 '/' Top Width= 14.00'

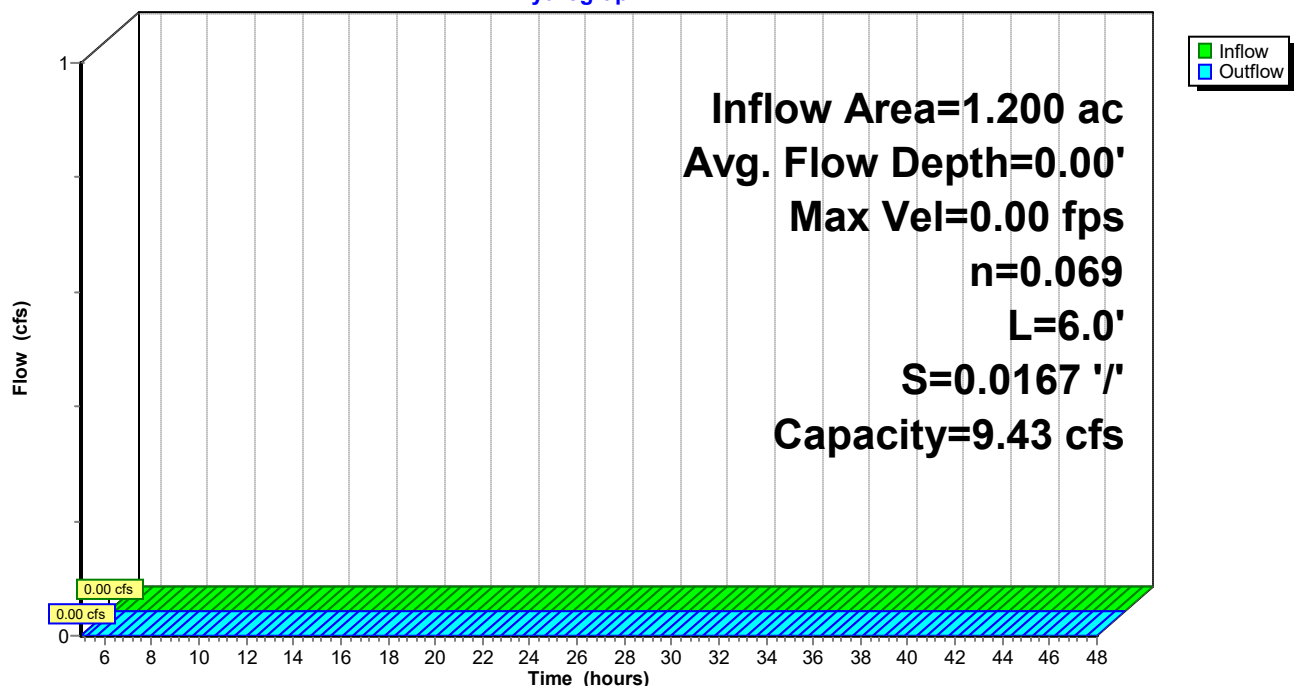
Length= 6.0' Slope= 0.0167 '/'

Inlet Invert= 12.00', Outlet Invert= 11.90'



Reach 12R: Sediment Basin Overflow

Hydrograph



Summary for Reach 13R: Roadside Swale

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.12" for 1-Year event
Inflow = 0.05 cfs @ 12.05 hrs, Volume= 0.012 af
Outflow = 0.04 cfs @ 12.26 hrs, Volume= 0.012 af, Atten= 34%, Lag= 12.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.76 fps, Min. Travel Time= 6.4 min

Avg. Velocity = 0.48 fps, Avg. Travel Time= 10.0 min

Peak Storage= 13 cf @ 12.15 hrs

Average Depth at Peak Storage= 0.04' , Surface Width= 1.25'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 18.36 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 7.00'

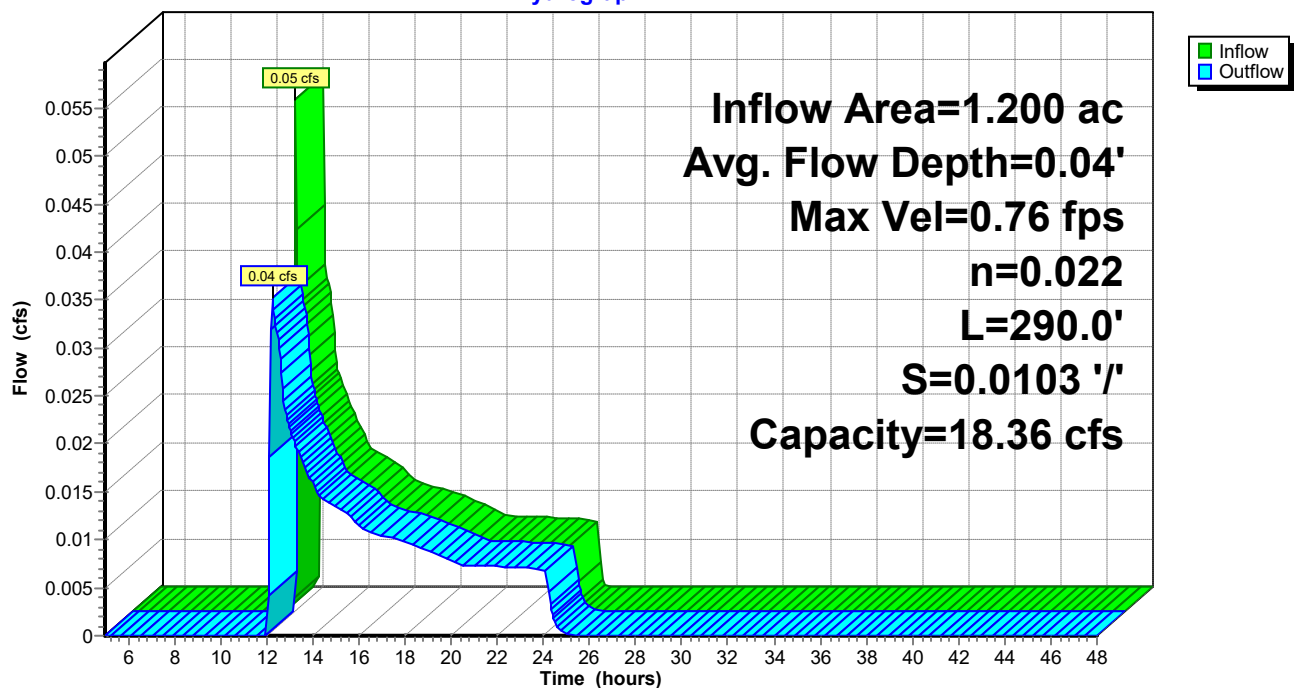
Length= 290.0' Slope= 0.0103 '/'

Inlet Invert= 15.00', Outlet Invert= 12.00'



Reach 13R: Roadside Swale

Hydrograph



Summary for Reach 14R: Roadside Swale

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 1.00" for 1-Year event
 Inflow = 1.32 cfs @ 11.97 hrs, Volume= 0.064 af
 Outflow = 1.22 cfs @ 12.03 hrs, Volume= 0.064 af, Atten= 7%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.99 fps, Min. Travel Time= 1.9 min

Avg. Velocity = 1.33 fps, Avg. Travel Time= 5.7 min

Peak Storage= 146 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.13' , Surface Width= 2.80'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 289.37 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 ' ' Top Width= 14.00'

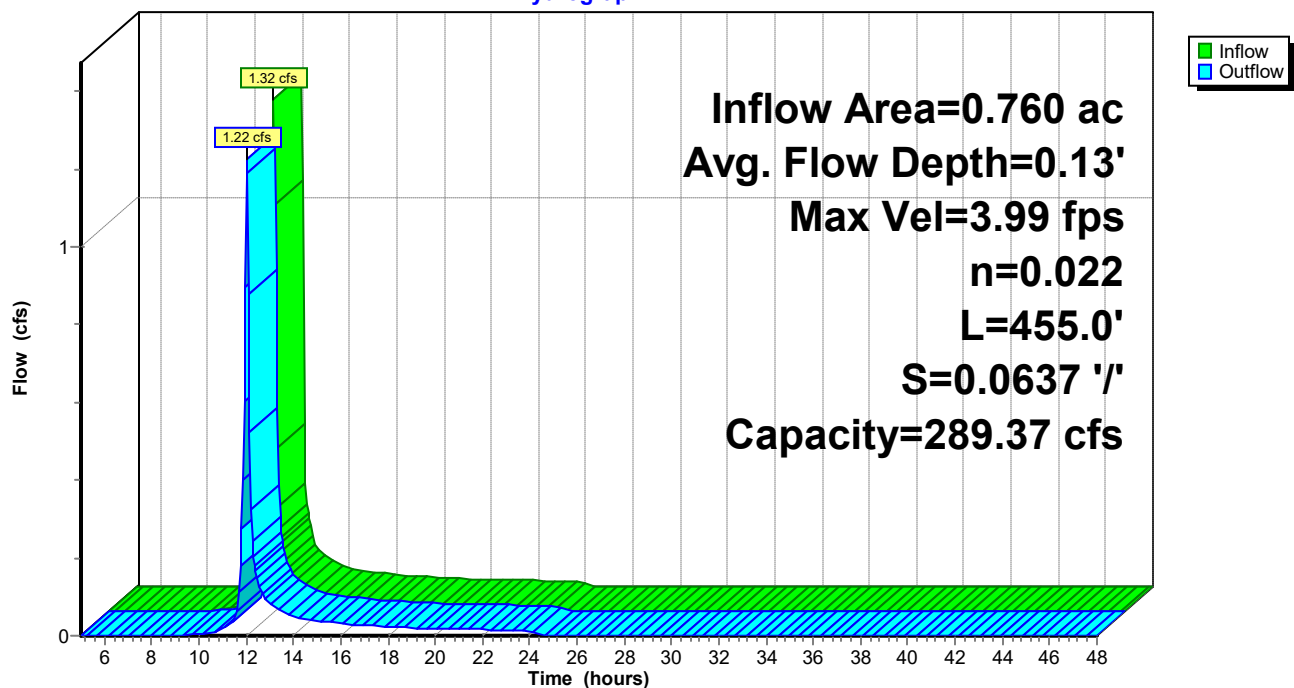
Length= 455.0' Slope= 0.0637 ' '

Inlet Invert= 66.00', Outlet Invert= 37.00'



Reach 14R: Roadside Swale

Hydrograph



Summary for Reach 15R: Roadside Swale

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.41" for 1-Year event
Inflow = 0.84 cfs @ 11.99 hrs, Volume= 0.045 af
Outflow = 0.46 cfs @ 12.27 hrs, Volume= 0.045 af, Atten= 46%, Lag= 16.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.64 fps, Min. Travel Time= 11.2 min

Avg. Velocity= 0.21 fps, Avg. Travel Time= 34.0 min

Peak Storage= 310 cf @ 12.07 hrs

Average Depth at Peak Storage= 0.35', Surface Width= 3.11'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 4.69 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 7.00'

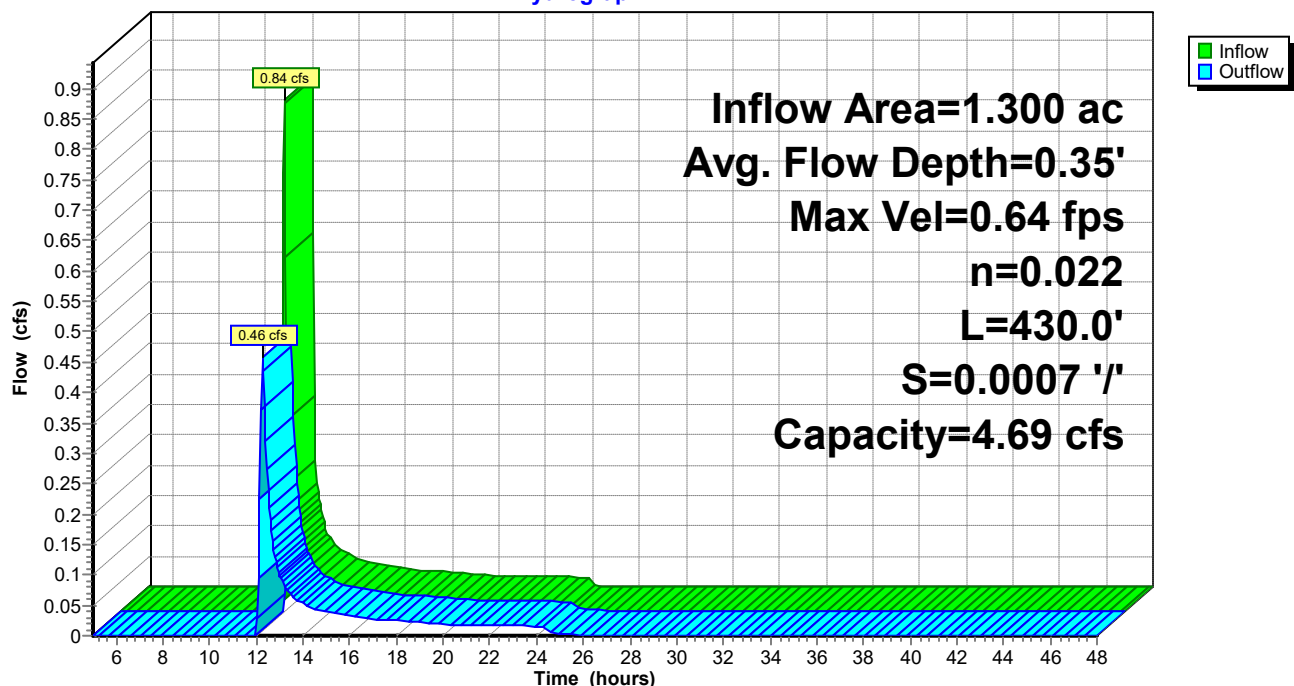
Length= 430.0' Slope= 0.0007 '/'

Inlet Invert= 10.00', Outlet Invert= 9.71'



Reach 15R: Roadside Swale

Hydrograph



Summary for Reach 17R: Sediment Basin Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.05" for 1-Year event
 Inflow = 0.02 cfs @ 20.86 hrs, Volume= 0.006 af
 Outflow = 0.02 cfs @ 20.88 hrs, Volume= 0.006 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.13 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 0.11 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1 cf @ 20.86 hrs

Average Depth at Peak Storage= 0.01', Surface Width= 15.07'

Bank-Full Depth= 0.70' Flow Area= 12.5 sf, Capacity= 24.64 cfs

15.00' x 0.70' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 '/' Top Width= 20.60'

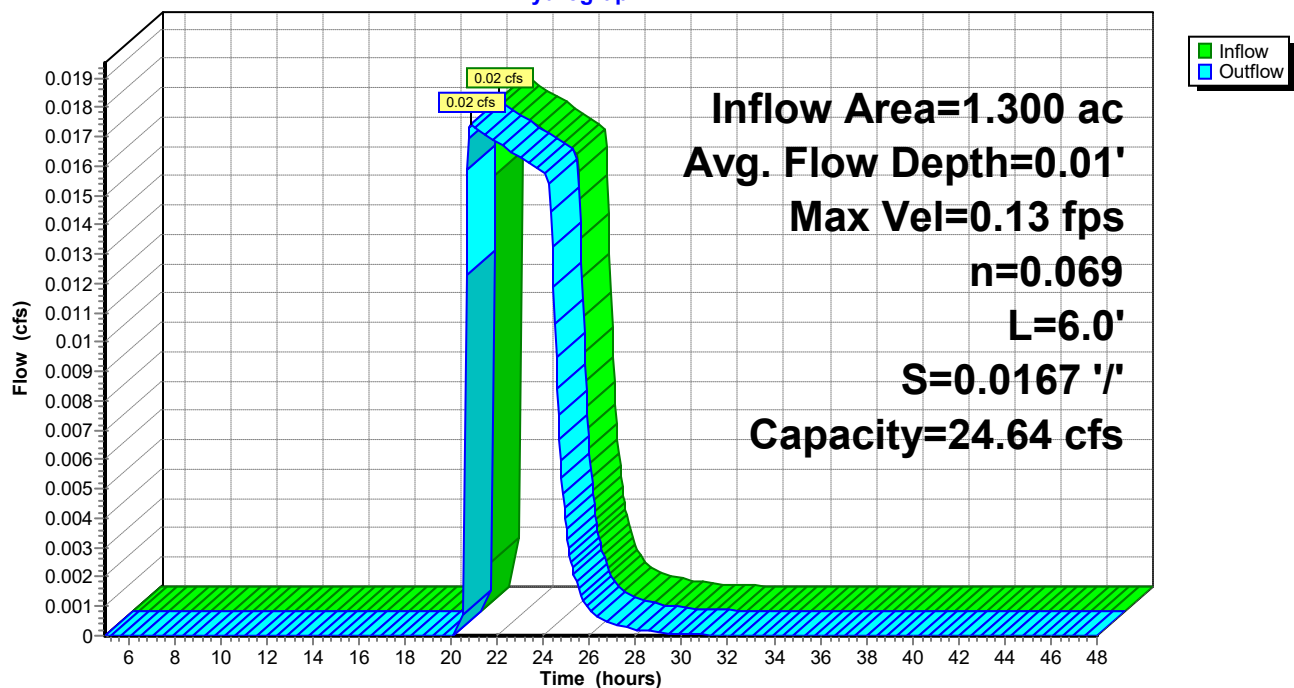
Length= 6.0' Slope= 0.0167 '/'

Inlet Invert= 9.00', Outlet Invert= 8.90'



Reach 17R: Sediment Basin Overflow

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 38

Summary for Pond 1P: WQv Pond #1

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth = 1.42" for 1-Year event
 Inflow = 4.50 cfs @ 12.11 hrs, Volume= 0.344 af
 Outflow = 0.30 cfs @ 13.53 hrs, Volume= 0.339 af, Atten= 93%, Lag= 85.1 min
 Primary = 0.30 cfs @ 13.53 hrs, Volume= 0.339 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 14.00' Surf.Area= 9,229 sf Storage= 19,003 cf

Peak Elev= 14.99' @ 13.53 hrs Surf.Area= 17,494 sf Storage= 27,569 cf (8,566 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= 363.1 min (1,180.3 - 817.1)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,795 cf	Forebay (Prismatic) Listed below (Recalc)
#2	9.00'	57,882 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		62,677 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	232	0	0
11.00	569	401	401
12.00	1,018	794	1,194
13.00	1,467	1,243	2,437
14.00	3,249	2,358	4,795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.00	1,145	0	0
10.00	1,751	1,448	1,448
11.00	2,339	2,045	3,493
12.00	2,959	2,649	6,142
13.00	3,597	3,278	9,420
14.00	5,980	4,789	14,209
14.50	7,240	3,305	17,514
15.00	14,392	5,408	22,922
16.00	17,455	15,924	38,845
17.00	20,619	19,037	57,882

Device	Routing	Invert	Outlet Devices
#1	Primary	13.50'	12.0" Round Culvert L= 50.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 13.50' / 13.23' S= 0.0054 ' S= 0.0054 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.00'	24.0" x 24.0" Horiz. Outlet Structure Top Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 1	14.00'	4.0" Round Reverse Slope Pipe L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.00' / 14.00' S= -0.1250 ' S= -0.1250 ' Cc= 0.900

18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 39

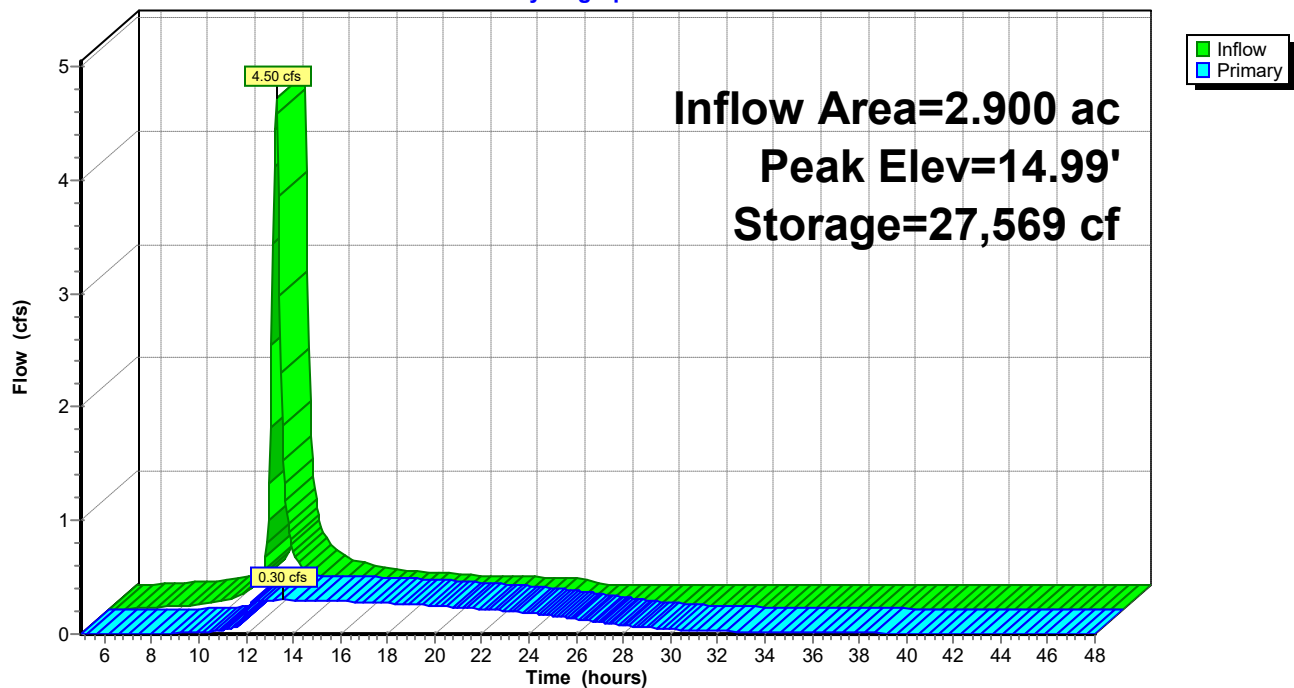
#4 Primary 16.25' n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
6.0' long x 1.0' breadth Broad-Crested Rectangular Weir
 Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
 2.50 3.00
 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
 3.30 3.31 3.32

Primary OutFlow Max=0.30 cfs @ 13.53 hrs HW=14.99' (Free Discharge)

- 1=Culvert (Passes 0.30 cfs of 3.14 cfs potential flow)
- 2=Outlet Structure Top Grate (Controls 0.00 cfs)
- 3=Reverse Slope Pipe (Inlet Controls 0.30 cfs @ 3.45 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: WQv Pond #1

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 40

Summary for Pond 2P: WQv Pond #2

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 1.21" for 1-Year event
 Inflow = 10.43 cfs @ 11.98 hrs, Volume= 0.585 af
 Outflow = 0.48 cfs @ 13.64 hrs, Volume= 0.581 af, Atten= 95%, Lag= 99.4 min
 Primary = 0.48 cfs @ 13.64 hrs, Volume= 0.581 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 14.00' Surf.Area= 5,917 sf Storage= 9,000 cf

Peak Elev= 15.45' @ 13.64 hrs Surf.Area= 20,156 sf Storage= 23,392 cf (14,393 cf above start)

Plug-Flow detention time= 671.8 min calculated for 0.374 af (64% of inflow)

Center-of-Mass det. time= 373.8 min (1,193.1 - 819.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,020 cf	Forebay #1 (Prismatic) Listed below (Recalc)
#2	10.00'	2,575 cf	Forebay #2 (Prismatic) Listed below (Recalc)
#3	10.00'	58,093 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		64,688 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	141	0	0
11.00	330	236	236
12.00	562	446	682
13.00	866	714	1,396
14.00	2,023	1,445	2,840
14.50	2,696	1,180	4,020

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	82	0	0
11.00	202	142	142
12.00	351	277	419
13.00	535	443	862
14.00	1,323	929	1,791
14.50	1,815	785	2,575

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	375	0	0
11.00	653	514	514
12.00	957	805	1,319
13.00	1,286	1,122	2,441
14.00	2,571	1,929	4,369
14.50	3,307	1,470	5,839
15.00	13,814	4,280	10,119
16.00	17,852	15,833	25,952
17.00	22,659	20,256	46,207
17.50	24,884	11,886	58,093

18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 41

Device	Routing	Invert	Outlet Devices
#1	Device 3	16.50'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#2	Device 3	14.00'	4.0" Vert. Reverse Slope Pipe C= 0.600 Limited to weir flow at low heads
#3	Primary	14.00'	12.0" Round Outlet Structure Discard Pipe L= 46.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.77' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Primary	16.60'	10.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.48 cfs @ 13.64 hrs HW=15.45' (Free Discharge)

3=Outlet Structure Discard Pipe (Passes 0.48 cfs of 3.04 cfs potential flow)

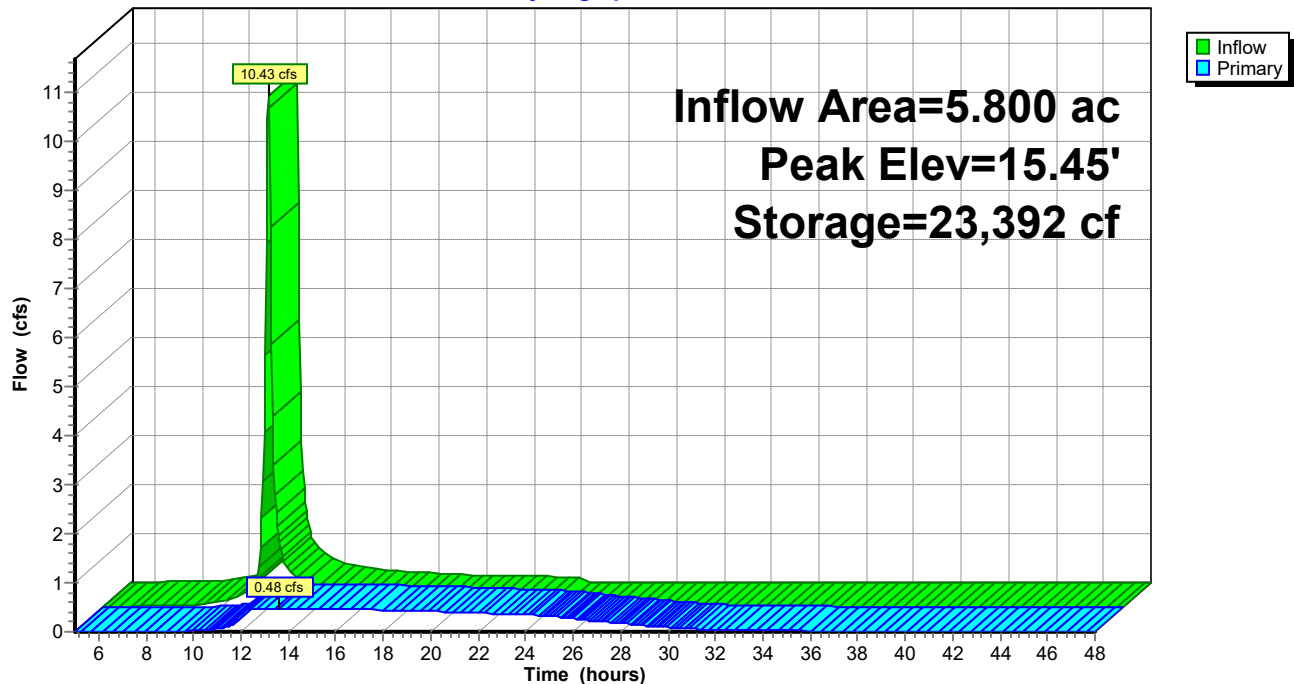
1=Orifice/Grate (Controls 0.00 cfs)

2=Reverse Slope Pipe (Orifice Controls 0.48 cfs @ 5.46 fps)

4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: WQv Pond #2

Hydrograph



Summary for Pond 3P: Infiltration Basin #1

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.00" for 1-Year event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 8.10' @ 5.00 hrs Surf.Area= 109 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	8.10'	2,492 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.10	109	56.0	0	0	109
12.00	1,415	149.0	2,492	2,492	1,678

Device	Routing	Invert	Outlet Devices
#1	Primary	11.65'	Channel/Reach using Reach 5R: Overflow
#2	Discarded	8.10'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 4.00'

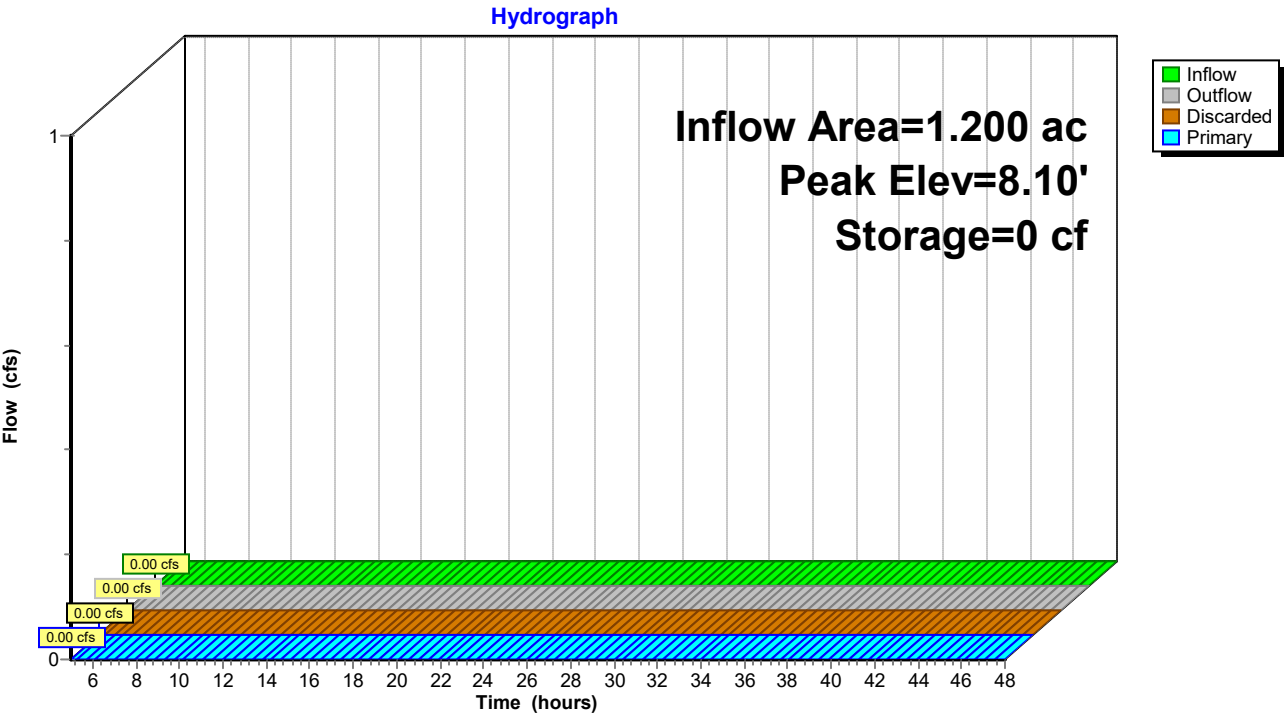
Discarded OutFlow Max=0.00 cfs @ 5.00 hrs HW=8.10' (Free Discharge)

↑ **2=Exfiltration** (Passes 0.00 cfs of 0.00 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=8.10' (Free Discharge)

↑ **1=Channel/Reach** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin #1



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 44

Summary for Pond 4P: Infiltration Basin #2

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.05" for 1-Year event
 Inflow = 0.02 cfs @ 20.88 hrs, Volume= 0.006 af
 Outflow = 0.02 cfs @ 20.97 hrs, Volume= 0.006 af, Atten= 0%, Lag= 5.4 min
 Discarded = 0.02 cfs @ 20.97 hrs, Volume= 0.006 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 5.82' @ 20.97 hrs Surf.Area= 114 sf Storage= 3 cf

Plug-Flow detention time= 2.7 min calculated for 0.006 af (100% of inflow)

Center-of-Mass det. time= 2.7 min (1,369.3 - 1,366.6)

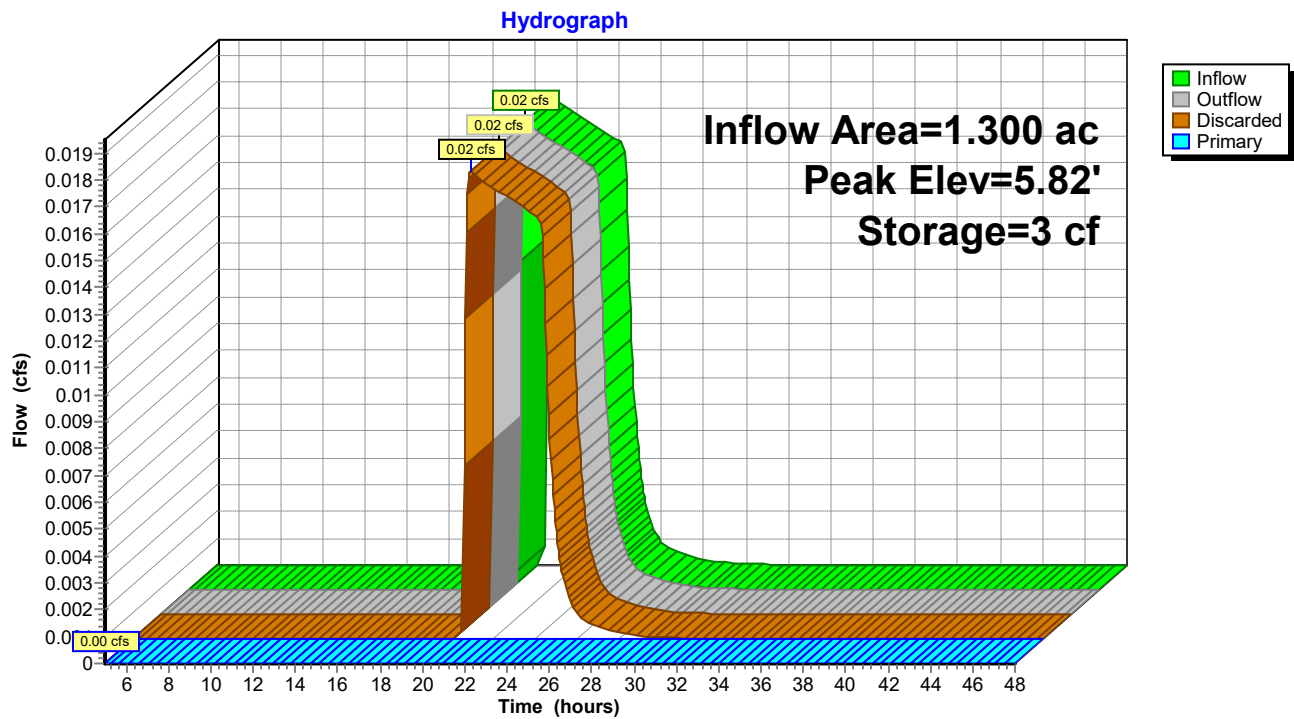
Volume	Invert	Avail.Storage	Storage Description
#1	5.80'	2,495 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	110	56.0	0	0	110
9.70	1,415	150.0	2,495	2,495	1,702

Device	Routing	Invert	Outlet Devices
#1	Primary	8.50'	Channel/Reach using Reach 6R: Overflow
#2	Discarded	5.80'	12.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 3.00'

Discarded OutFlow Max=0.03 cfs @ 20.97 hrs HW=5.82' (Free Discharge)↑ **2=Exfiltration** (Controls 0.03 cfs)**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=5.80' (Free Discharge)↑ **1=Channel/Reach** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin #2



Summary for Pond 5P: Sedimentation Basin #1

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.12" for 1-Year event
 Inflow = 0.04 cfs @ 12.26 hrs, Volume= 0.012 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.50' @ 31.80 hrs Surf.Area= 427 sf Storage= 505 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no outflow)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	1,058 cf	Custom Stage Data (Irregular) Listed below (Recalc)

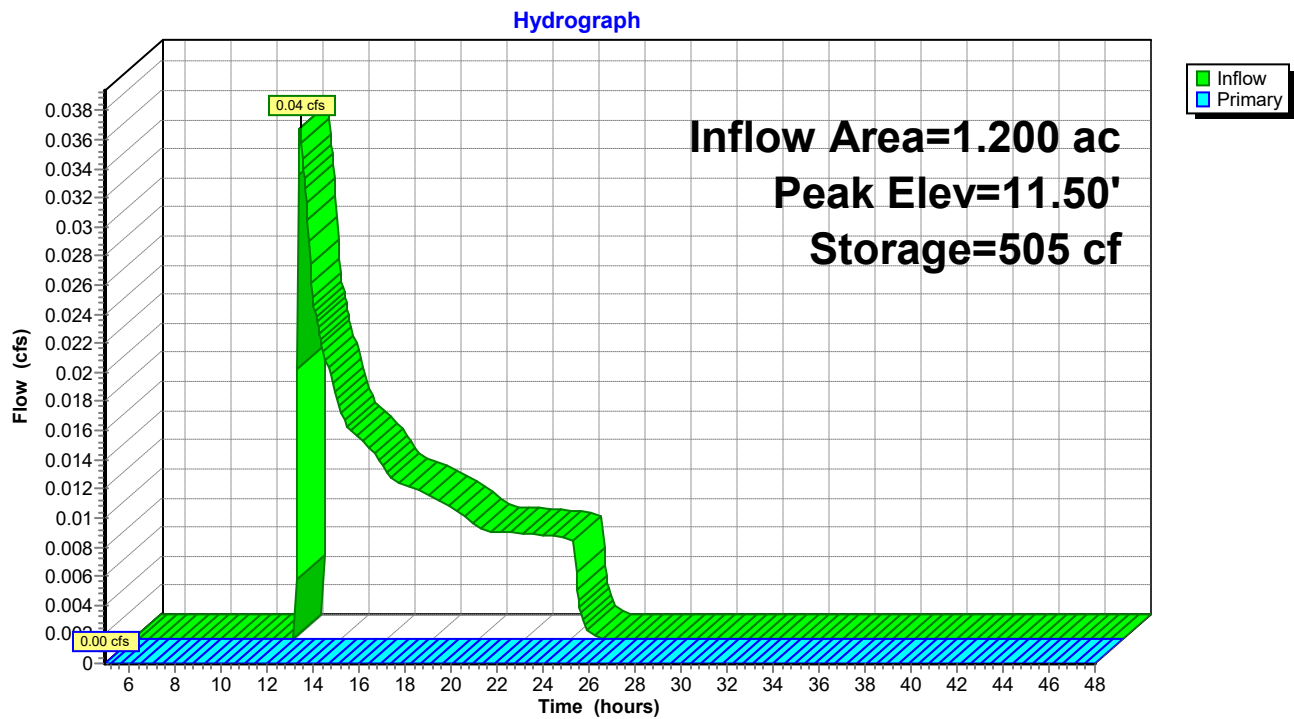
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	41	25.8	0	0	41
10.00	150	46.7	90	90	167
11.00	320	66.6	230	320	355
12.00	550	86.4	430	749	608
12.50	687	96.2	309	1,058	758

Device	Routing	Invert	Outlet Devices
#1	Primary	12.00'	Channel/Reach using Reach 12R: Sediment Basin Overflow

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=9.00' (Free Discharge)

↑1=Channel/Reach (Controls 0.00 cfs)

Pond 5P: Sedimentation Basin #1



Summary for Pond 16P: Sedimentation Basin #2

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.41" for 1-Year event
 Inflow = 0.46 cfs @ 12.27 hrs, Volume= 0.045 af
 Outflow = 0.02 cfs @ 20.86 hrs, Volume= 0.006 af, Atten= 96%, Lag= 515.7 min
 Primary = 0.02 cfs @ 20.86 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.00' @ 20.86 hrs Surf.Area= 893 sf Storage= 1,703 cf

Plug-Flow detention time= 632.6 min calculated for 0.006 af (13% of inflow)
 Center-of-Mass det. time= 440.5 min (1,365.0 - 924.5)

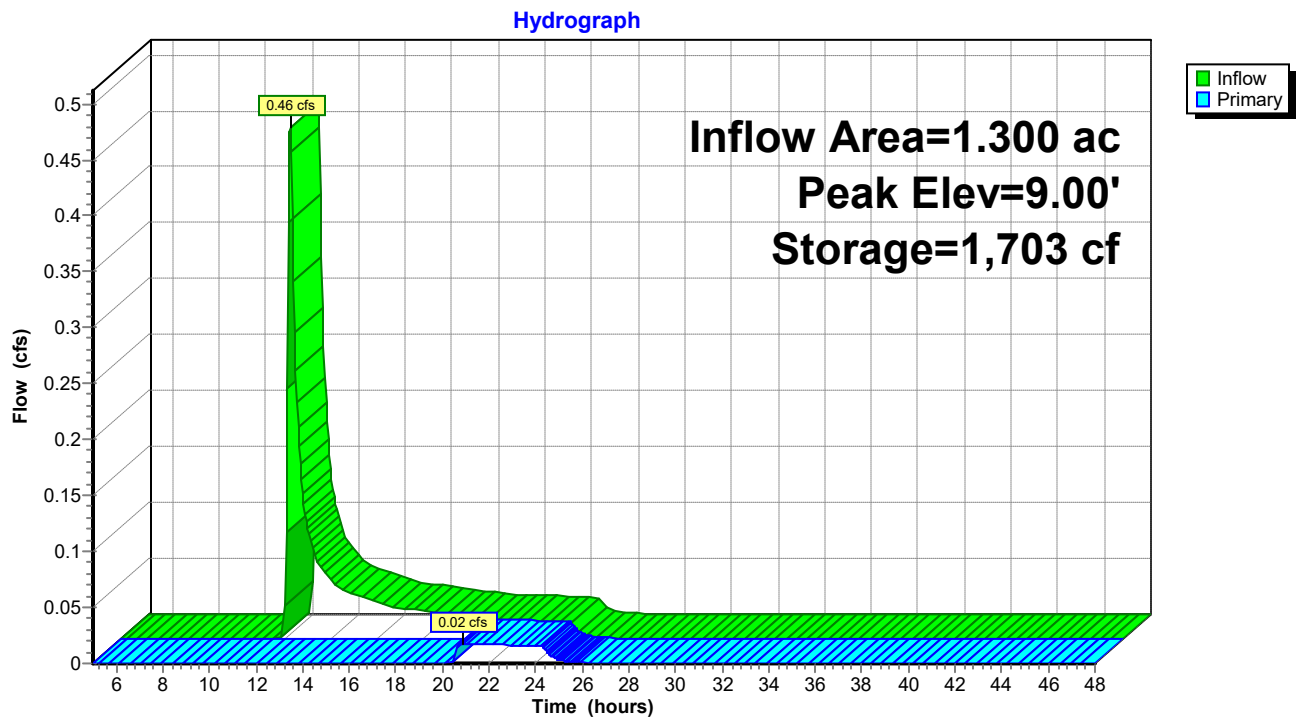
Volume	Invert	Avail.Storage	Storage Description		
#1	5.80'	2,389 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	224	80.0	0	0	224
6.00	257	83.0	48	48	266
7.00	438	98.0	344	392	500
8.00	650	113.0	541	932	773
9.00	892	128.0	768	1,700	1,085
9.70	1,079	139.0	689	2,389	1,337

Device	Routing	Invert	Outlet Devices
#1	Primary	9.00'	Channel/Reach using Reach 17R: Sediment Basin Overflow

Primary OutFlow Max=0.00 cfs @ 20.86 hrs HW=9.00' (Free Discharge)

↑ **1=Channel/Reach** (Channel Controls 0.00 cfs @ 0.07 fps)

Pond 16P: Sedimentation Basin #2

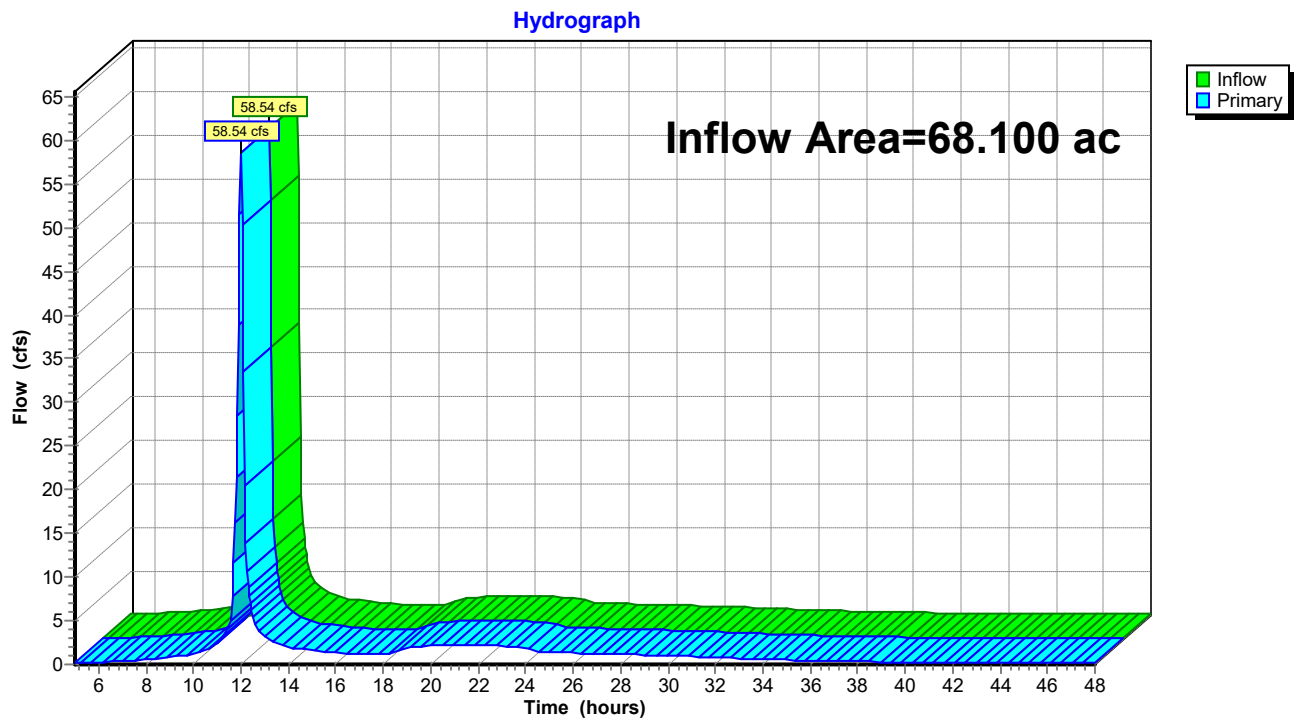


Summary for Pond AP-1: Analysis Point #1

Inflow Area = 68.100 ac, 20.36% Impervious, Inflow Depth > 0.92" for 1-Year event
Inflow = 58.54 cfs @ 12.00 hrs, Volume= 5.220 af
Primary = 58.54 cfs @ 12.00 hrs, Volume= 5.220 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Analysis Point #1

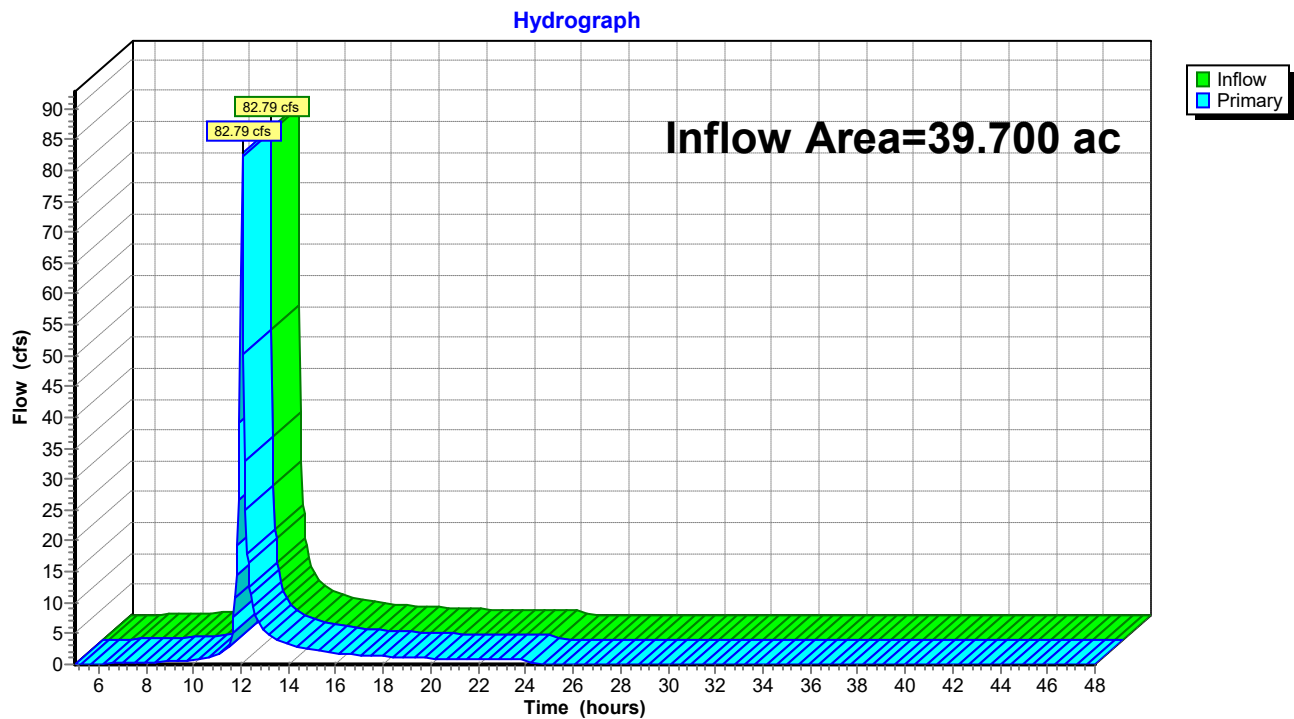


Summary for Pond AP-2: Analysis Point #2

Inflow Area = 39.700 ac, 23.10% Impervious, Inflow Depth > 1.20" for 1-Year event
Inflow = 82.79 cfs @ 12.04 hrs, Volume= 3.954 af
Primary = 82.79 cfs @ 12.04 hrs, Volume= 3.954 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-2: Analysis Point #2

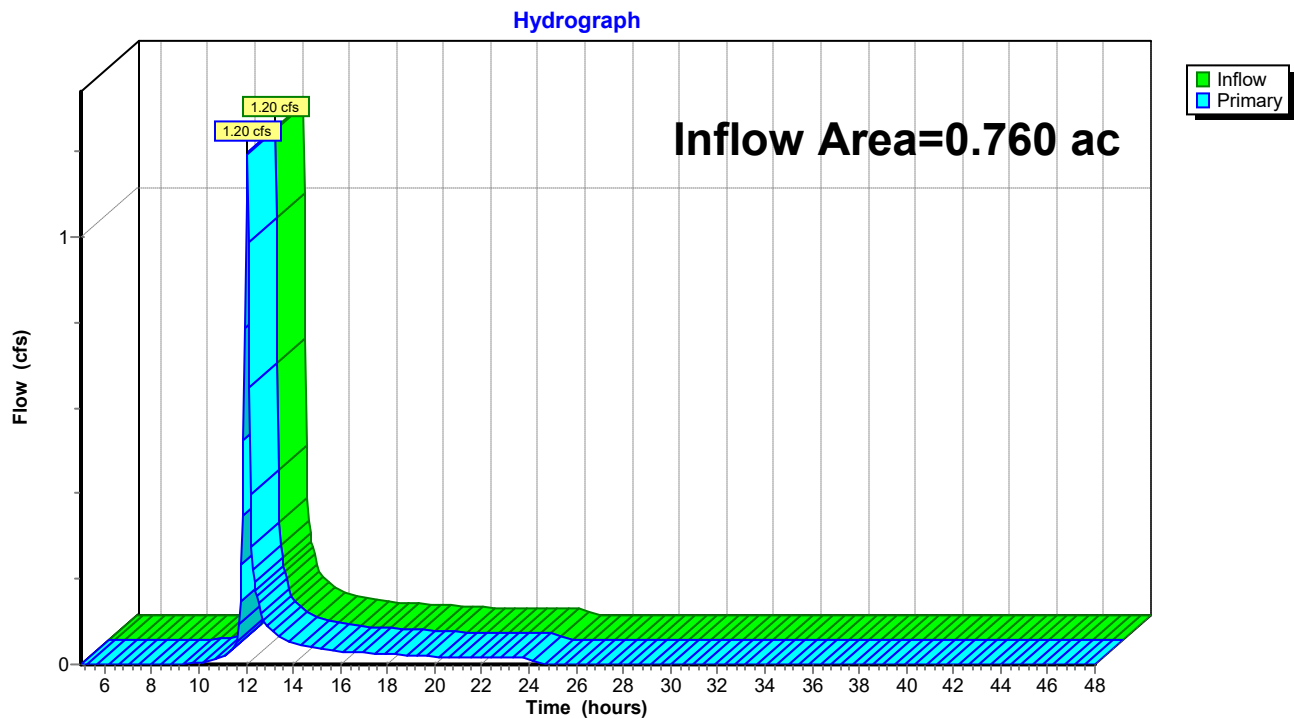


Summary for Pond AP-3: Analysis Point #3

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 1.00" for 1-Year event
 Inflow = 1.20 cfs @ 12.04 hrs, Volume= 0.064 af
 Primary = 1.20 cfs @ 12.04 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-3: Analysis Point #3



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 53

Summary for Pond C-1: Chamber Series 1

Inflow Area = 10.300 ac, 66.70% Impervious, Inflow Depth > 1.85" for 1-Year event
 Inflow = 29.34 cfs @ 11.98 hrs, Volume= 1.592 af
 Outflow = 27.91 cfs @ 12.04 hrs, Volume= 1.233 af, Atten= 5%, Lag= 3.7 min
 Discarded = 0.10 cfs @ 5.80 hrs, Volume= 0.345 af
 Primary = 27.81 cfs @ 12.04 hrs, Volume= 0.888 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.19' @ 12.04 hrs Surf.Area= 8,454 sf Storage= 28,913 cf

Plug-Flow detention time= 361.5 min calculated for 1.232 af (77% of inflow)
 Center-of-Mass det. time= 279.3 min (1,056.9 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	11,722 cf	37.08'W x 227.97'L x 5.50'H Field B 46,496 cf Overall - 17,192 cf Embedded = 29,305 cf x 40.0% Voids
#2B	6.75'	17,192 cf	ADS_StormTech MC-3500 d +Cap x 155 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 155 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#3	13.25'	6,100 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		35,013 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.25	600	0	0
13.75	4,900	1,375	1,375
14.00	8,200	1,638	3,013
14.25	16,500	3,088	6,100

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	10.00'	36.0" Round Culvert L= 55.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.00' / 7.59' S= 0.0431 ' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Secondary	14.24'	50.0' long x 0.7' breadth Concrete Curb Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.10 cfs @ 5.80 hrs HW=6.08' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.10 cfs)

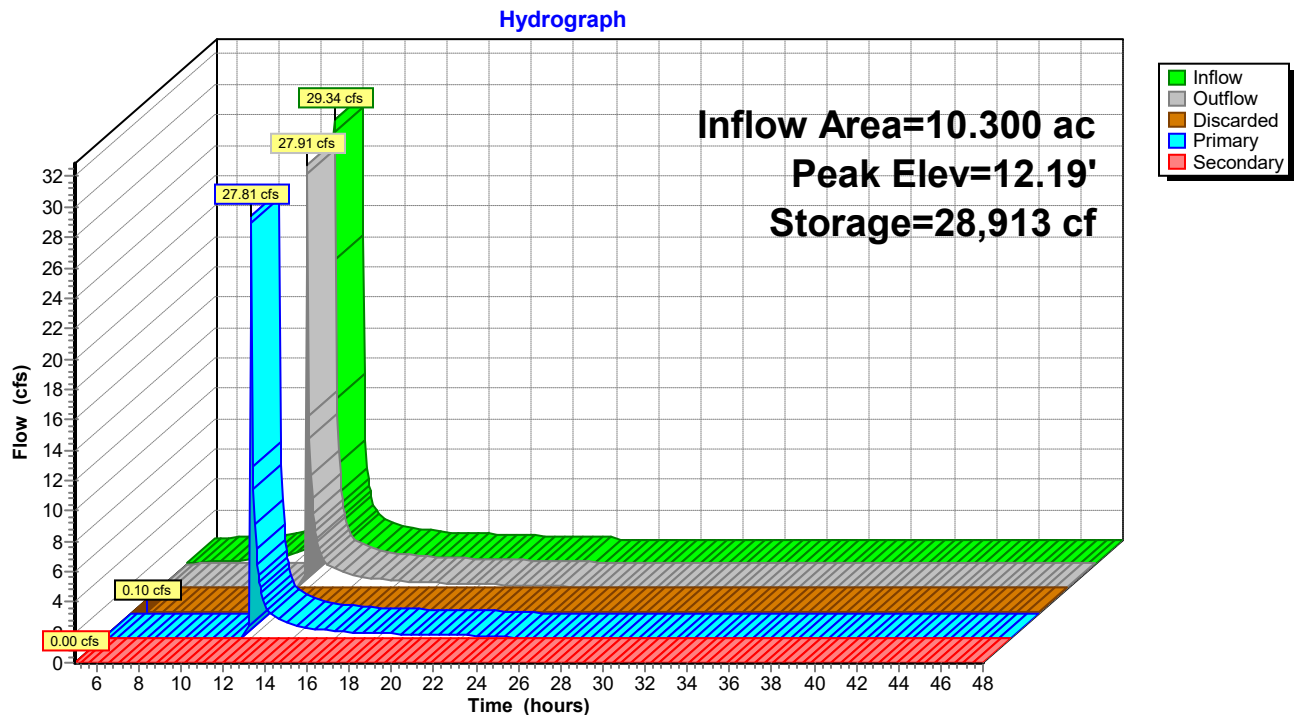
Primary OutFlow Max=25.90 cfs @ 12.04 hrs HW=12.09' (Free Discharge)

↑ **2=Culvert** (Inlet Controls 25.90 cfs @ 4.92 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.00' (Free Discharge)

↑ **3=Concrete Curb** (Controls 0.00 cfs)

Pond C-1: Chamber Series 1



Summary for Pond C-4: Chamber Series 4

Inflow Area = 8.900 ac, 0.00% Impervious, Inflow Depth > 1.58" for 1-Year event
 Inflow = 22.13 cfs @ 11.99 hrs, Volume= 1.175 af
 Outflow = 17.34 cfs @ 12.06 hrs, Volume= 0.845 af, Atten= 22%, Lag= 4.4 min
 Discarded = 0.07 cfs @ 7.60 hrs, Volume= 0.254 af
 Primary = 17.27 cfs @ 12.06 hrs, Volume= 0.592 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.75' @ 12.07 hrs Surf.Area= 6,391 sf Storage= 21,785 cf

Plug-Flow detention time= 397.3 min calculated for 0.844 af (72% of inflow)
 Center-of-Mass det. time= 304.6 min (1,103.4 - 798.9)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	8,911 cf	29.92'W x 213.63'L x 5.50'H Field B 35,151 cf Overall - 12,874 cf Embedded = 22,277 cf x 40.0% Voids
#2B	6.75'	12,874 cf	ADS_StormTech MC-3500 d +Cap x 116 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 116 Chambers in 4 Rows Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf
#3	14.10'	8,015 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		29,800 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.10	400	0	0
14.60	2,400	700	700
14.80	6,300	870	1,570
15.10	10,000	2,445	4,015
15.50	10,000	4,000	8,015

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	11.00'	36.0" Round Culvert L= 24.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 11.00' / 9.42' S= 0.0650 ' / S= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Secondary	15.50'	100.0' long x 0.5' breadth Wharf Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.07 cfs @ 7.60 hrs HW=6.10' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.07 cfs)

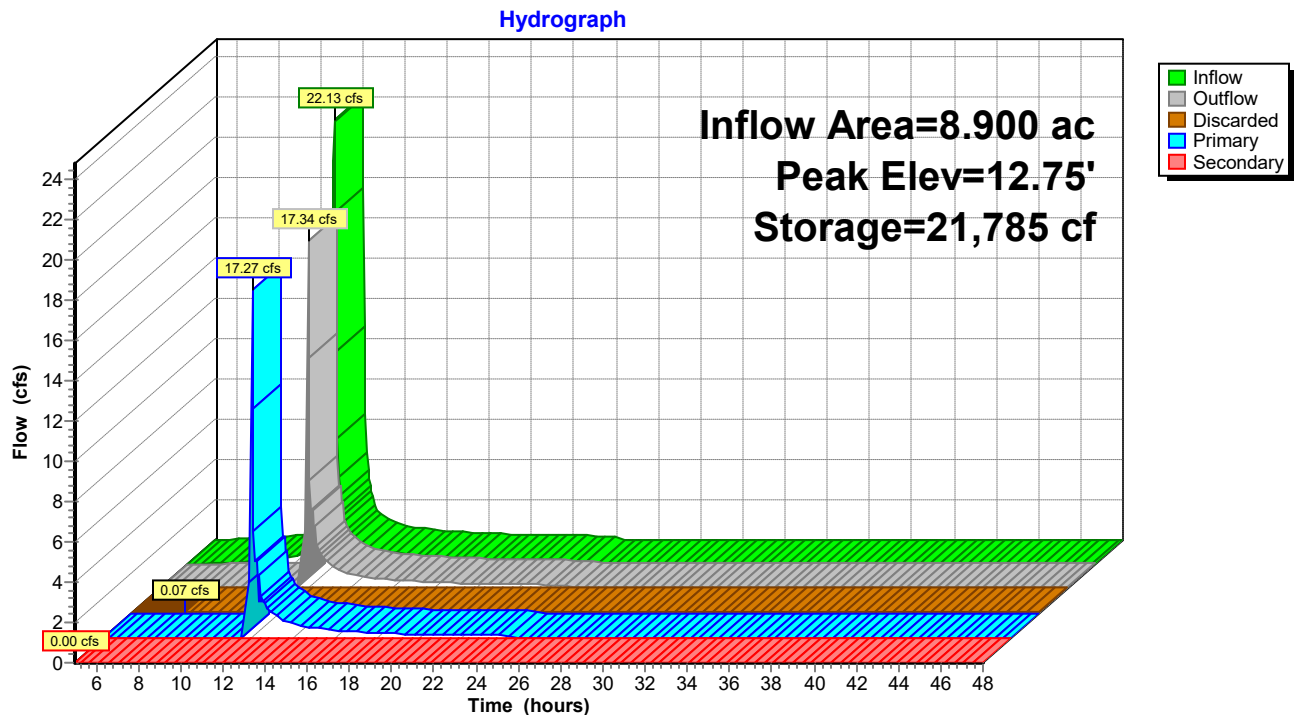
Primary OutFlow Max=15.10 cfs @ 12.06 hrs HW=12.52' (Free Discharge)

↑**2=Culvert** (Inlet Controls 15.10 cfs @ 4.20 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.00' (Free Discharge)

↑**3=Wharf** (Controls 0.00 cfs)

Pond C-4: Chamber Series 4



18641.00-Proposed Condition_Chambers_CULVERTS_ Type II 24-hr 1-Year Rainfall=2.20"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 57

Summary for Pond C-5: Chamber Series 5

Inflow Area = 5.200 ac, 0.00% Impervious, Inflow Depth > 1.58" for 1-Year event
 Inflow = 13.09 cfs @ 11.99 hrs, Volume= 0.687 af
 Outflow = 0.43 cfs @ 14.80 hrs, Volume= 0.434 af, Atten= 97%, Lag= 168.8 min
 Discarded = 0.11 cfs @ 9.00 hrs, Volume= 0.373 af
 Primary = 0.32 cfs @ 14.80 hrs, Volume= 0.062 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.84' @ 14.80 hrs Surf.Area= 4,801 sf Storage= 20,773 cf

Plug-Flow detention time= 879.5 min calculated for 0.434 af (63% of inflow)
 Center-of-Mass det. time= 777.3 min (1,575.8 - 798.5)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	7,757 cf	28.50'W x 168.47'L x 6.75'H Field B 32,409 cf Overall - 13,016 cf Embedded = 19,393 cf x 40.0% Voids
#2B	6.75'	13,016 cf	ADS_StormTech MC-4500 b +Cap x 120 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 120 Chambers in 3 Rows Cap Storage= +39.5 cf x 2 x 3 rows = 237.0 cf
#3	14.60'	7,420 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		28,193 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.60	200	0	0
14.80	1,000	120	120
15.00	10,000	1,100	1,220
15.50	14,800	6,200	7,420

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	1.000 in/hr Exfiltration over Surface area
#2	Primary	12.60'	36.0" Round Culvert L= 62.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.60' / 12.29' S= 0.0049 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 7.07 sf
#3	Secondary	15.50'	100.0' long x 0.5' breadth Wharf Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.11 cfs @ 9.00 hrs HW=6.10' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.31 cfs @ 14.80 hrs HW=12.84' (Free Discharge)

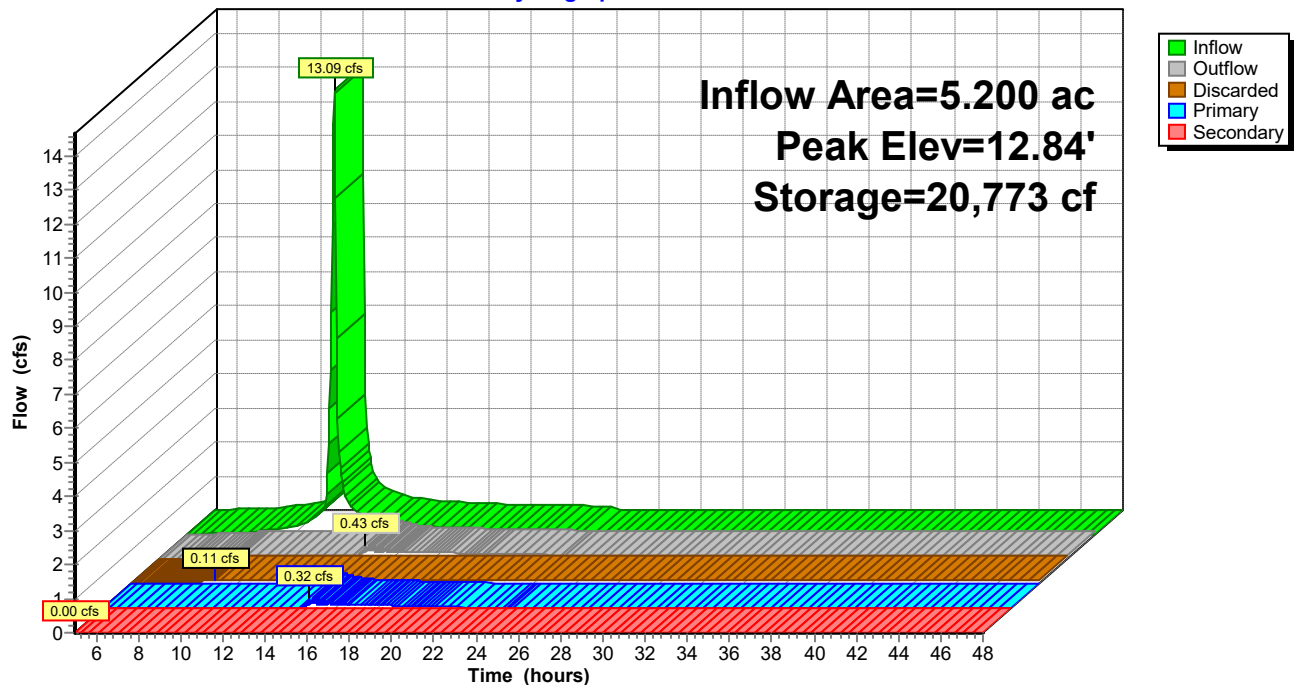
↑**2=Culvert** (Barrel Controls 0.31 cfs @ 1.84 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.00' (Free Discharge)

↑**3=Wharf** (Controls 0.00 cfs)

Pond C-5: Chamber Series 5

Hydrograph



Summary for Subcatchment DR-1: Building A & Storage

Runoff = 49.84 cfs @ 11.98 hrs, Volume= 2.772 af, Depth> 3.23"

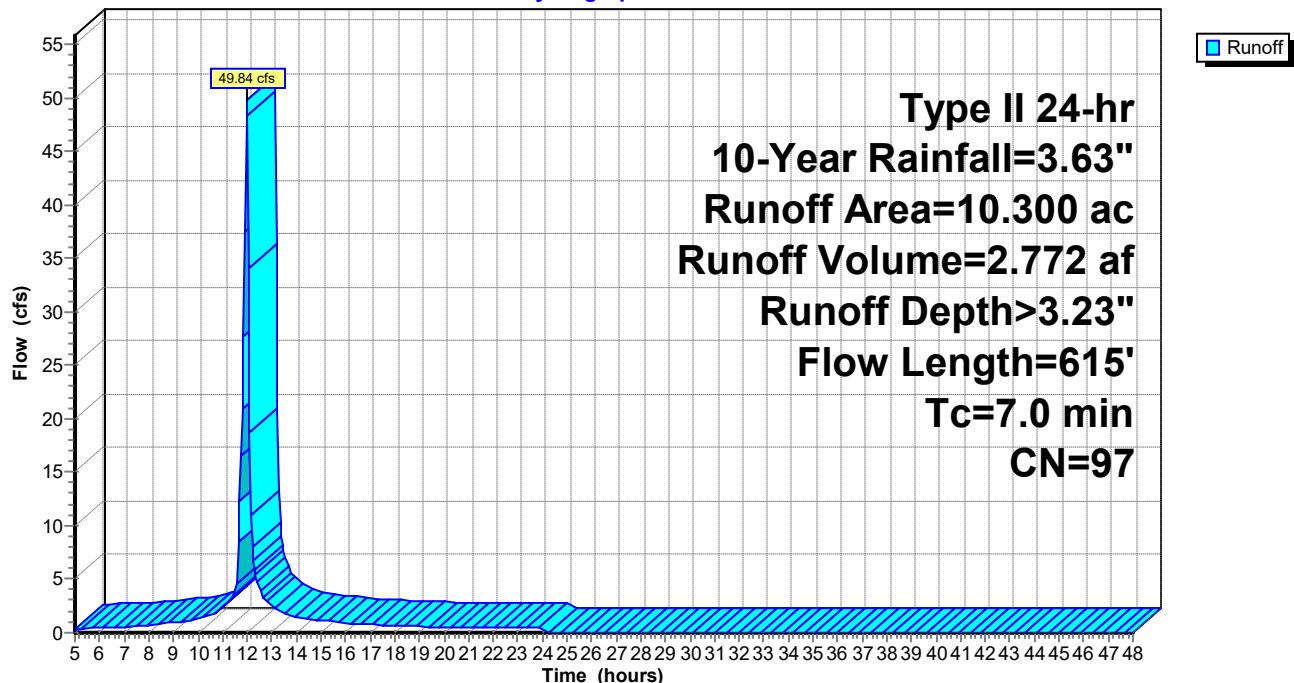
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 6.870	98	Building A
0.100	80	>75% Grass cover, Good, HSG D
* 3.330	95	Dense Graded Aggregate
10.300	97	Weighted Average
3.430		33.30% Pervious Area
6.870		66.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.1	300	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	215	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.0	615	Total			

Subcatchment DR-1: Building A & Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 60

Summary for Subcatchment DR-10: Undisturbed Area

Runoff = 11.44 cfs @ 13.19 hrs, Volume= 2.752 af, Depth= 1.67"

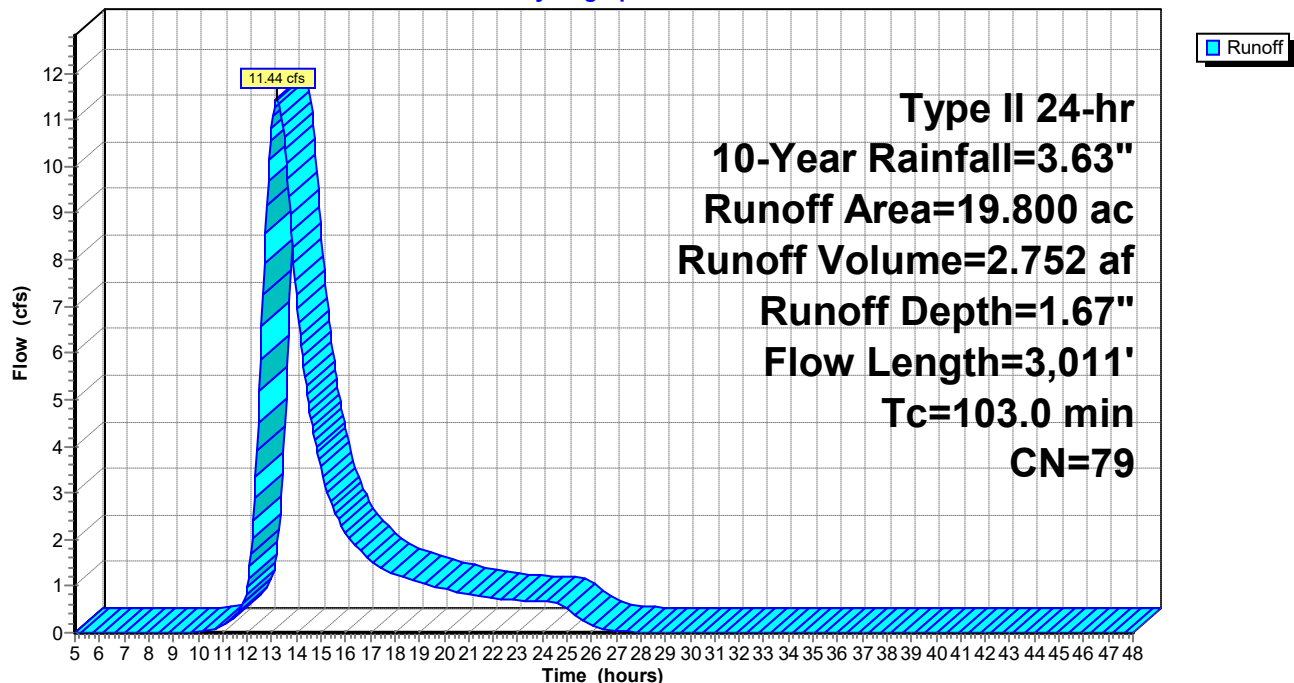
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
19.800	79	Woods, Fair, HSG D
19.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	150	0.0800	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"
3.0	200	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.6	250	0.2600	2.55		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
78.7	2,361	0.0100	0.50		Shallow Concentrated Flow, Wetland Flow Woodland Kv= 5.0 fps
0.0	50	0.0500	22.86	161.57	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
103.0	3,011	Total			

Subcatchment DR-10: Undisturbed Area

Hydrograph



Summary for Subcatchment DR-11: Hudson River Bank

Runoff = 8.27 cfs @ 12.09 hrs, Volume= 0.556 af, Depth= 1.67"

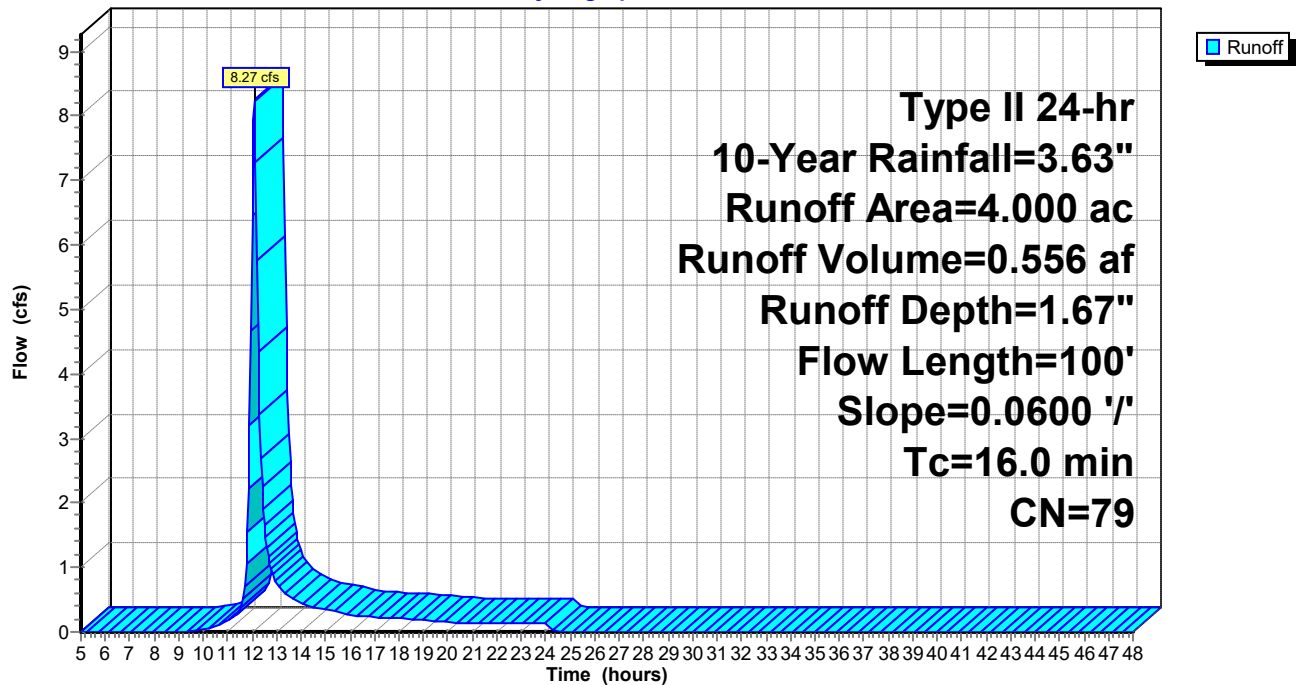
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
4.000	79	Woods, Fair, HSG D
4.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-11: Hudson River Bank

Hydrograph



Summary for Subcatchment DR-12: Normans Kill Bank

Runoff = 6.12 cfs @ 11.97 hrs, Volume= 0.311 af, Depth> 2.66"

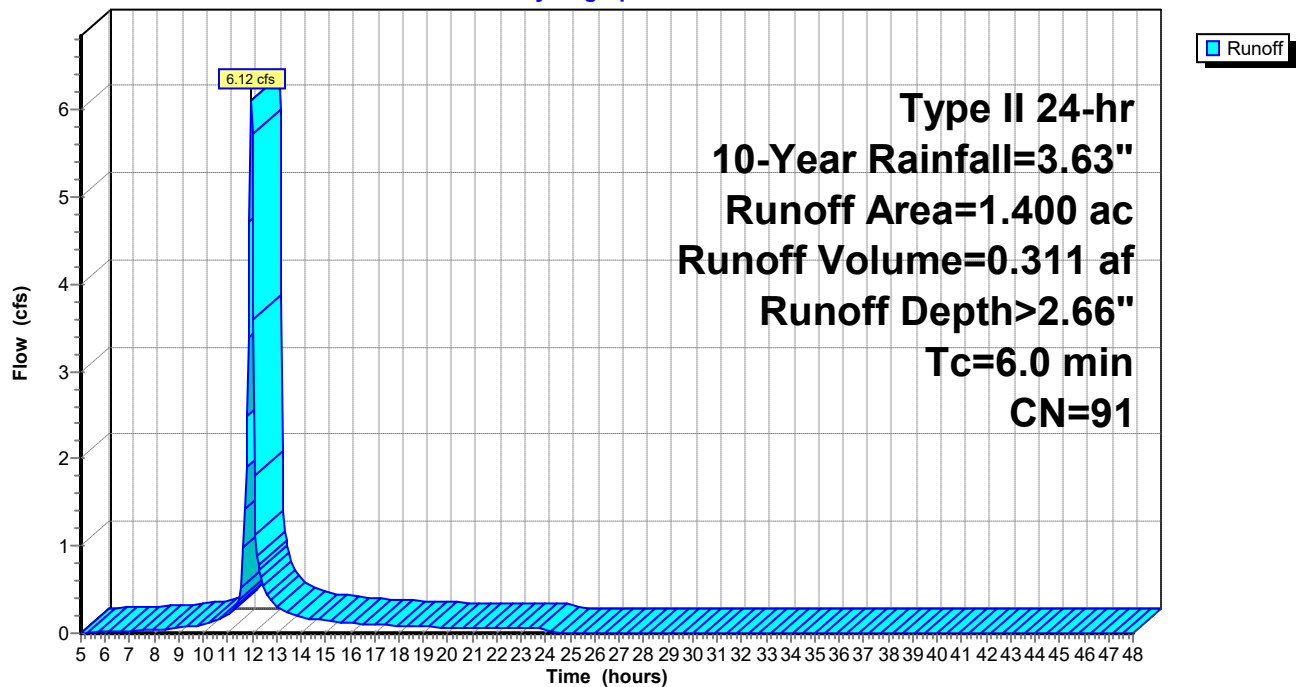
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
0.430	79	Woods, Fair, HSG D
0.970	96	Gravel surface, HSG D
1.400	91	Weighted Average
1.400		100.00% Pervious Area

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

Subcatchment DR-12: Normans Kill Bank

Hydrograph



Summary for Subcatchment DR-13: Roadway

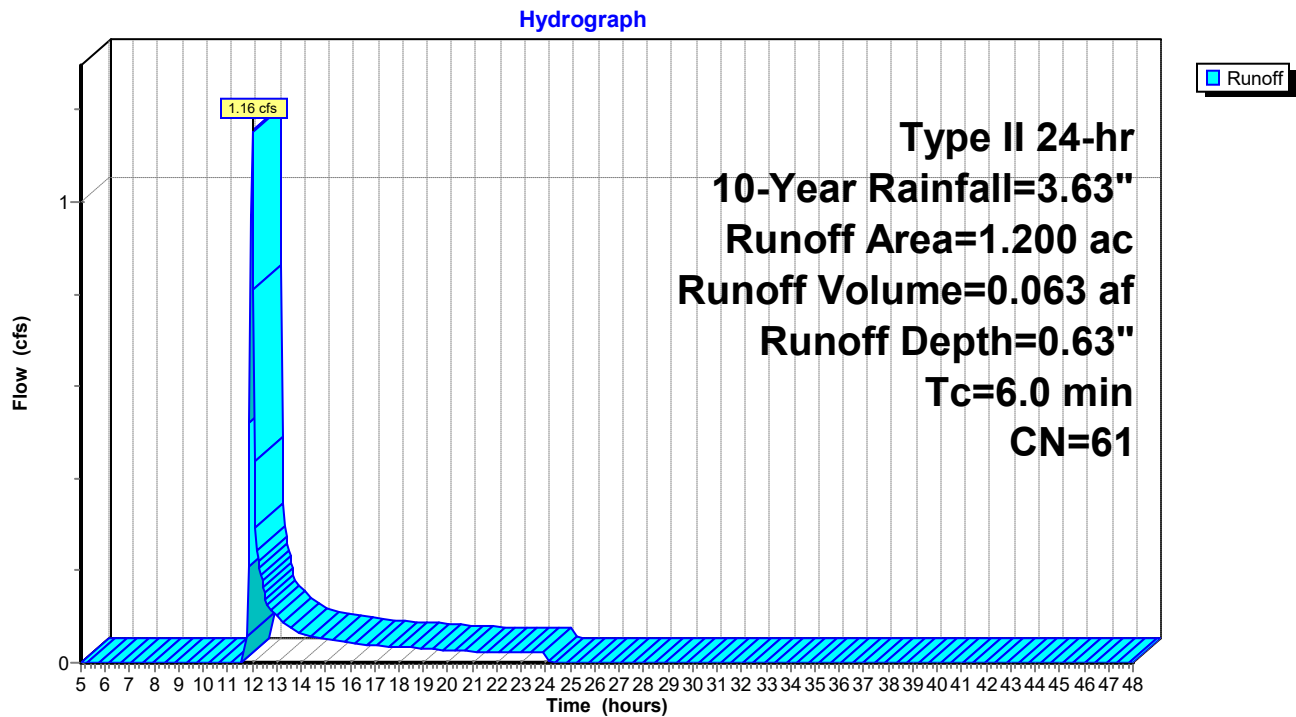
Runoff = 1.16 cfs @ 11.99 hrs, Volume= 0.063 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 0.450	98	Pavement
0.750	39	>75% Grass cover, Good, HSG A
1.200	61	Weighted Average
0.750		62.50% Pervious Area
0.450		37.50% Impervious Area

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

Subcatchment DR-13: Roadway



Summary for Subcatchment DR-14: Roadway

Runoff = 2.86 cfs @ 11.98 hrs, Volume= 0.137 af, Depth= 1.27"

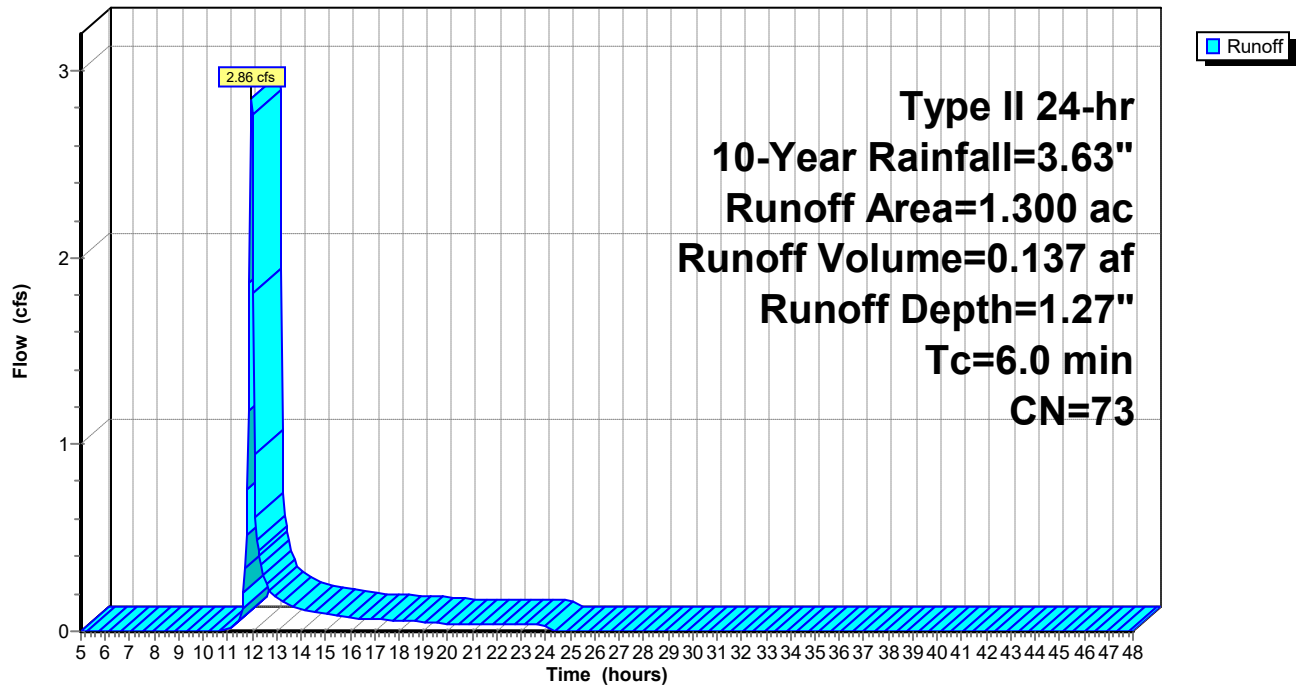
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 0.550	98	New Pavement
0.550	39	>75% Grass cover, Good, HSG A
* 0.200	98	Mill & Fill of Old Pavement
1.300	73	Weighted Average
0.550		42.31% Pervious Area
0.750		57.69% Impervious Area

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

Subcatchment DR-14: Roadway

Hydrograph



Summary for Subcatchment DR-15: Roadway

Runoff = 4.79 cfs @ 11.96 hrs, Volume= 0.254 af, Depth> 3.05"

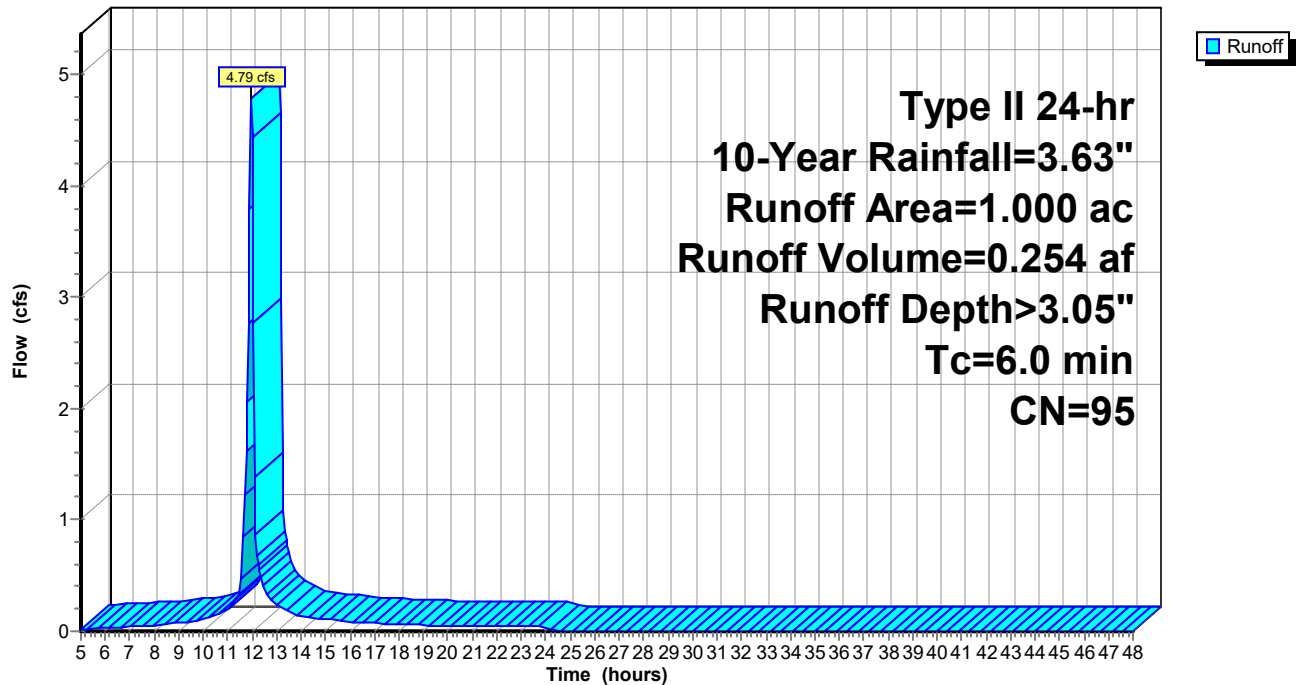
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 0.050	98	New Pavement
0.050	39	>75% Grass cover, Good, HSG A
* 0.900	98	Mill & Fill of Old Pavement
1.000	95	Weighted Average
0.050		5.00% Pervious Area
0.950		95.00% Impervious Area

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

Subcatchment DR-15: Roadway

Hydrograph



Summary for Subcatchment DR-16: Undisturbed Area

Runoff = 0.06 cfs @ 15.50 hrs, Volume= 0.050 af, Depth= 0.07"

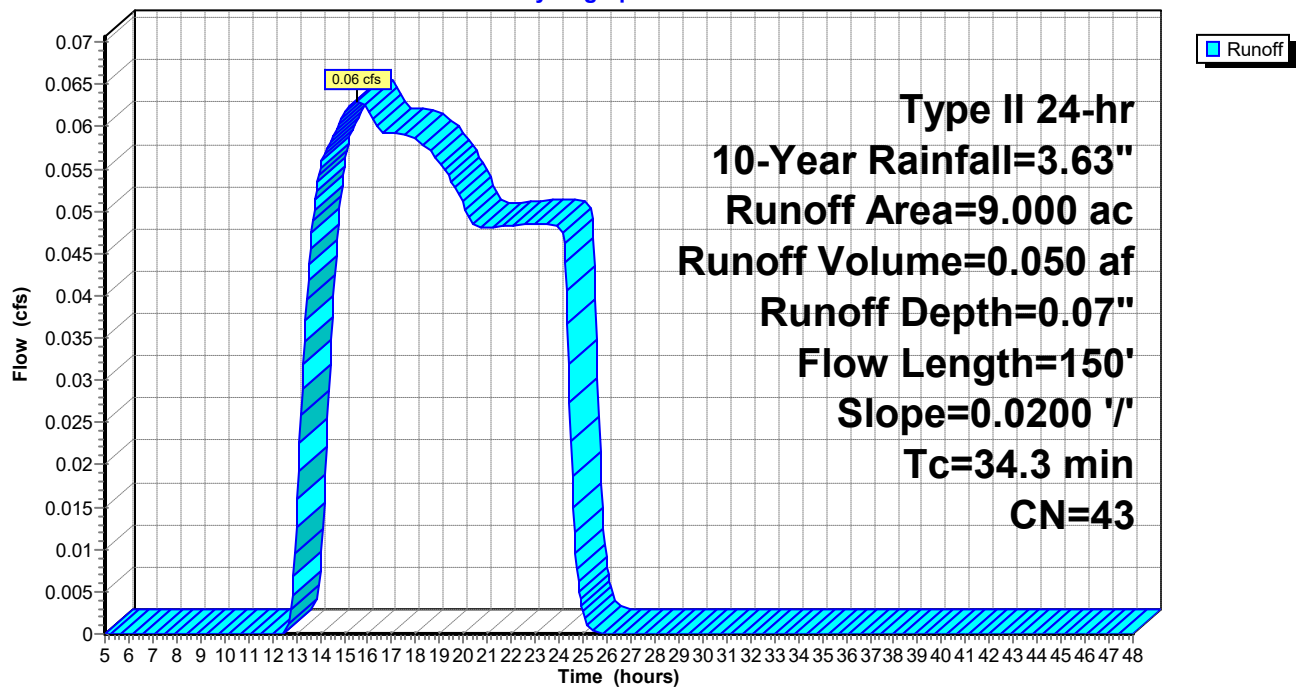
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
9.000	43	Woods/grass comb., Fair, HSG A
9.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.3	150	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-16: Undisturbed Area

Hydrograph



Summary for Subcatchment DR-17: Roadway

Runoff = 2.85 cfs @ 11.97 hrs, Volume= 0.140 af, Depth= 2.21"

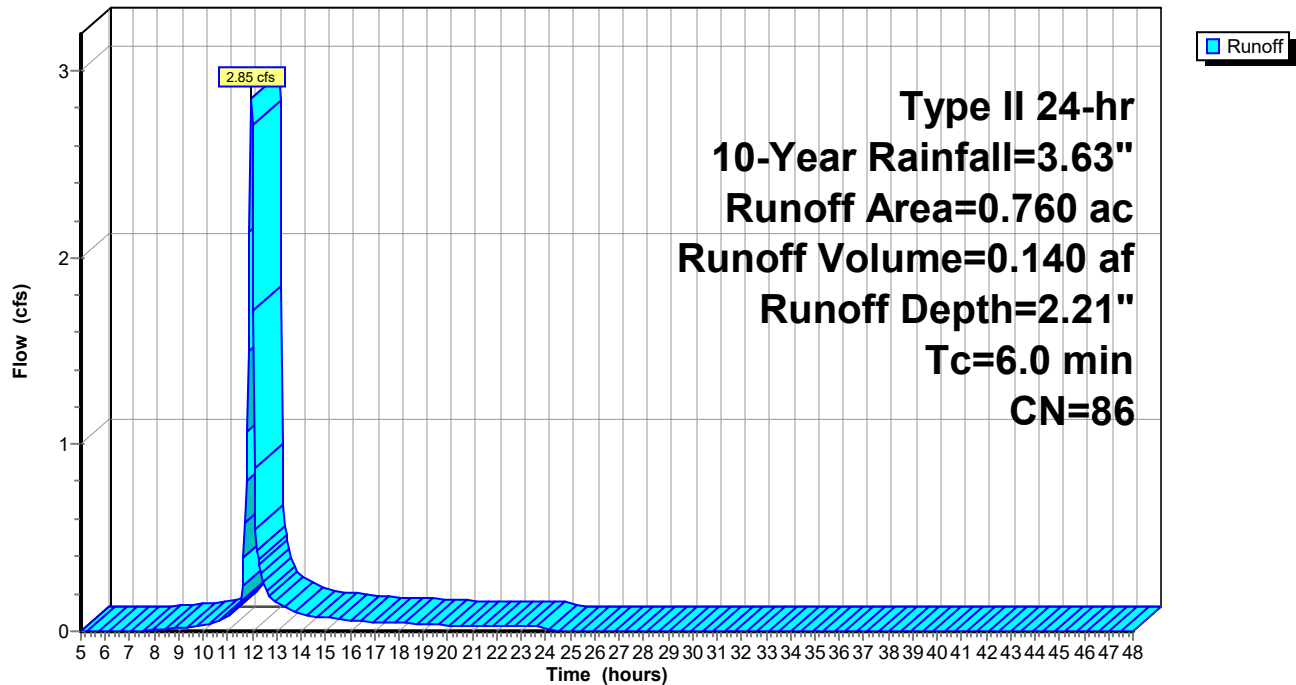
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 0.140	98	Road Widening
* 0.460	98	Roadway
0.160	39	>75% Grass cover, Good, HSG A
0.760	86	Weighted Average
0.160		21.05% Pervious Area
0.600		78.95% Impervious Area

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

Subcatchment DR-17: Roadway

Hydrograph



Summary for Subcatchment DR-2: Storage

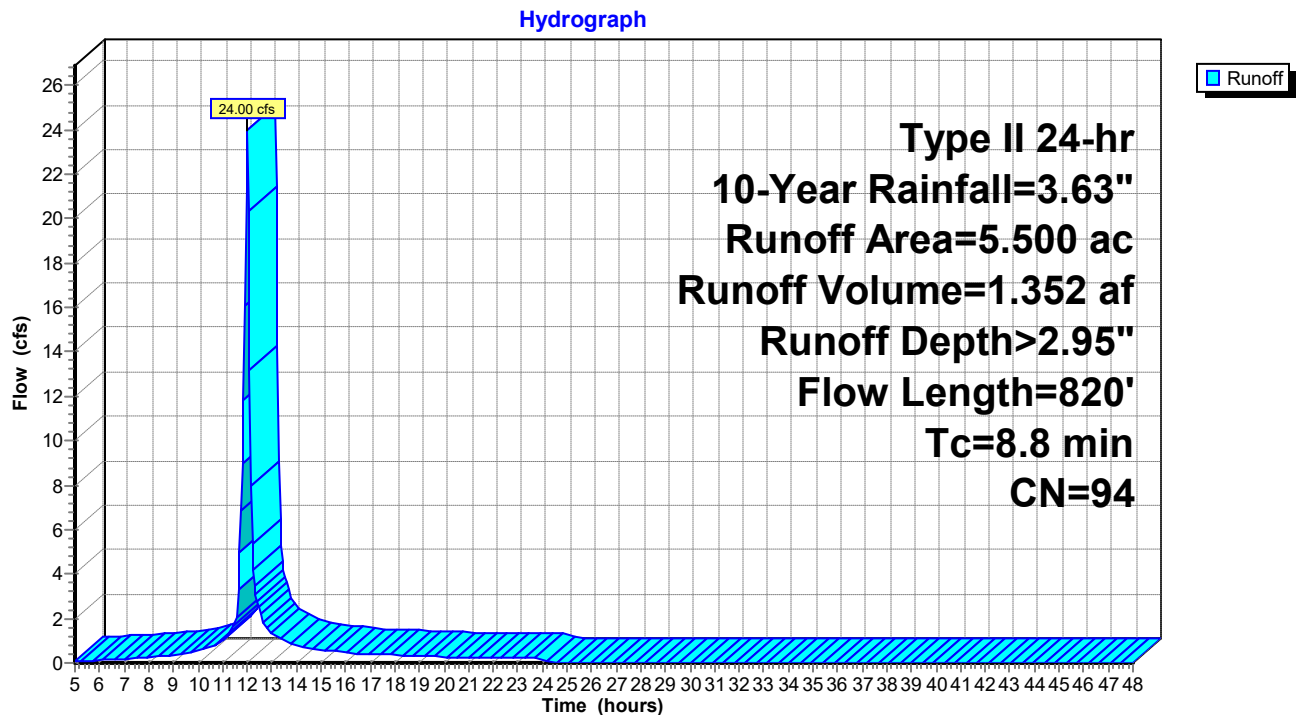
Runoff = 24.00 cfs @ 12.00 hrs, Volume= 1.352 af, Depth> 2.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 5.300	95	Dense Graded Aggregate
0.200	80	>75% Grass cover, Good, HSG D
5.500	94	Weighted Average
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.9	470	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	250	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
8.8	820	Total			

Subcatchment DR-2: Storage



Summary for Subcatchment DR-3: Rail & Storage

Runoff = 47.69 cfs @ 12.00 hrs, Volume= 2.793 af, Depth> 3.05"

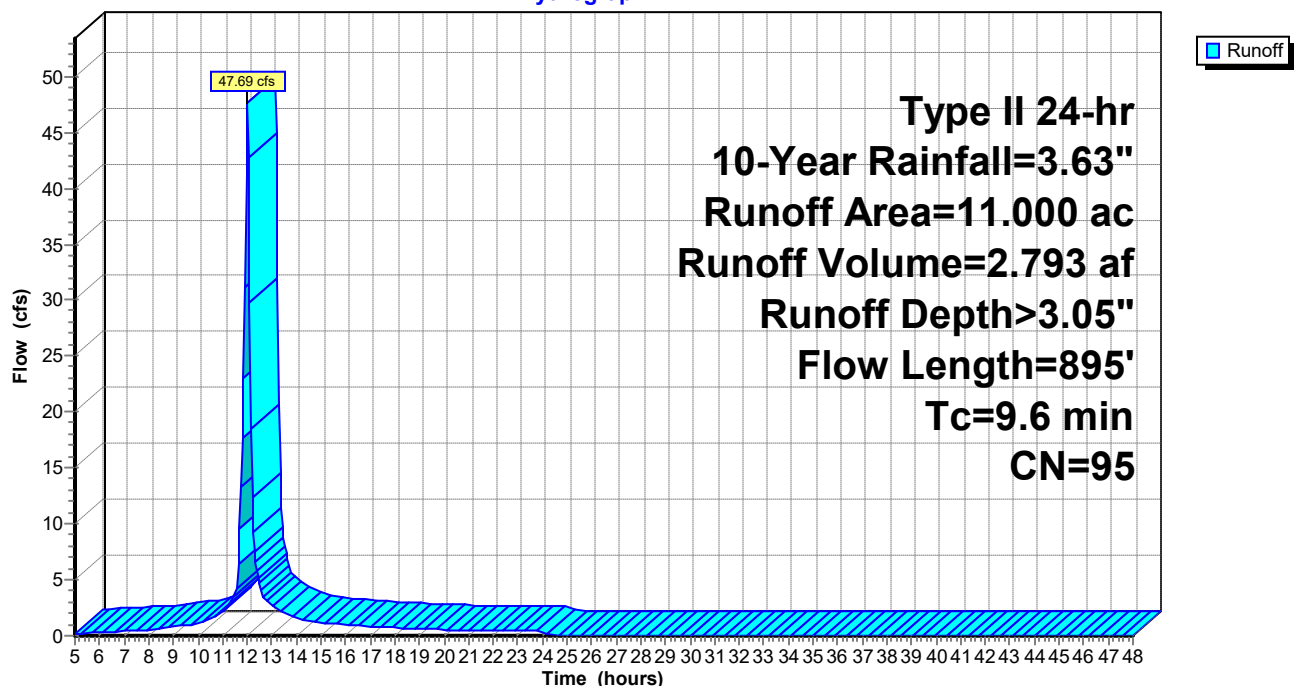
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 8.300	95	Compacted Gravel
0.400	80	>75% Grass cover, Good, HSG D
* 2.300	98	Rail
11.000	95	Weighted Average
8.700		79.09% Pervious Area
2.300		20.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
5.4	525	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.9	270	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	895	Total			

Subcatchment DR-3: Rail & Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 70

Summary for Subcatchment DR-4: Storage

Runoff = 39.82 cfs @ 11.99 hrs, Volume= 2.188 af, Depth> 2.95"

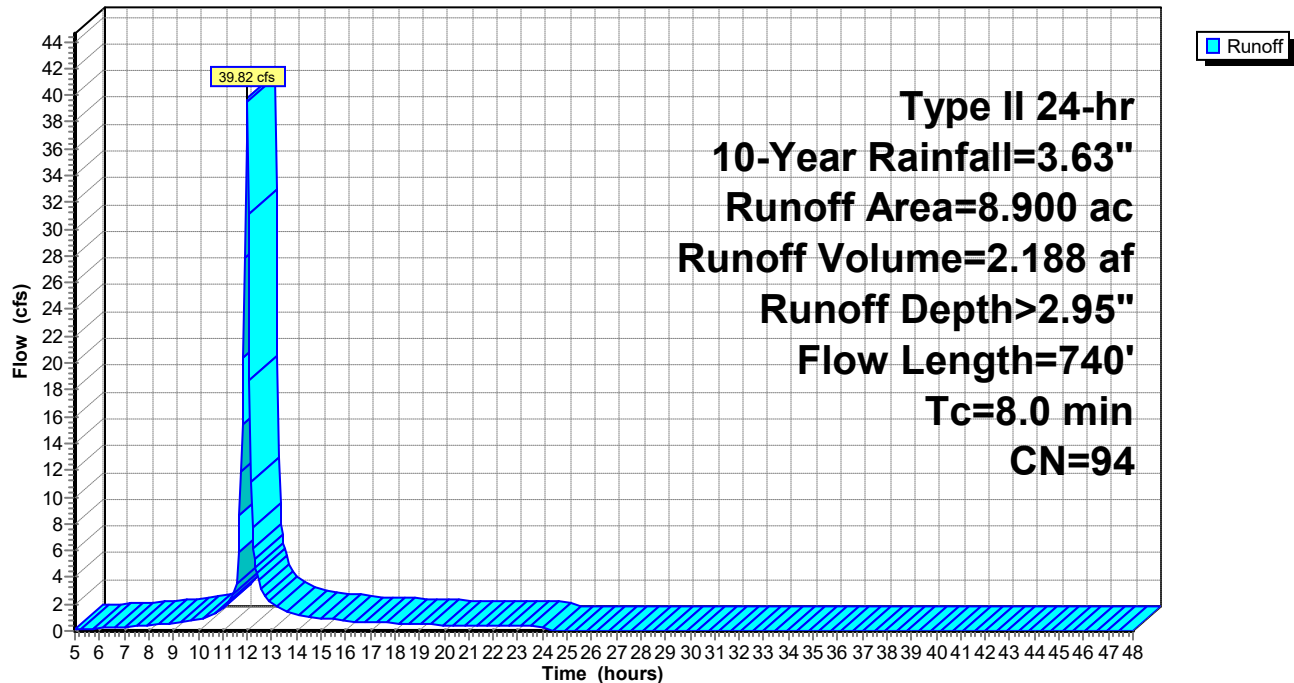
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 8.600	95	Compacted Gravel
0.300	80	>75% Grass cover, Good, HSG D
8.900	94	Weighted Average
8.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.1	400	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	240	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Corrugated PE, smooth interior
8.0	740	Total			

Subcatchment DR-4: Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 71

Summary for Subcatchment DR-5: Storage

Runoff = 23.53 cfs @ 11.98 hrs, Volume= 1.279 af, Depth> 2.95"

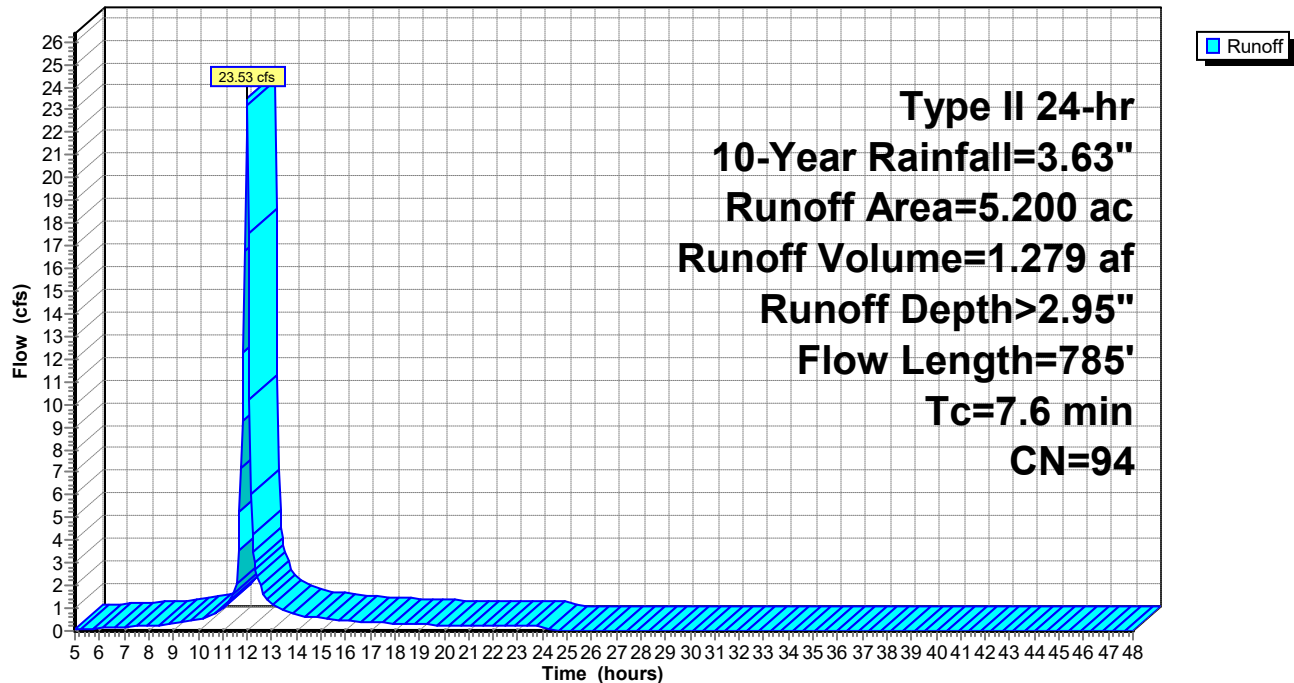
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 4.900	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
5.200	94	Weighted Average
5.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.0	285	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.3	400	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
7.6	785	Total			

Subcatchment DR-5: Storage

Hydrograph



Summary for Subcatchment DR-6: Buldings B & D

Runoff = 53.49 cfs @ 12.00 hrs, Volume= 3.088 af, Depth> 3.14"

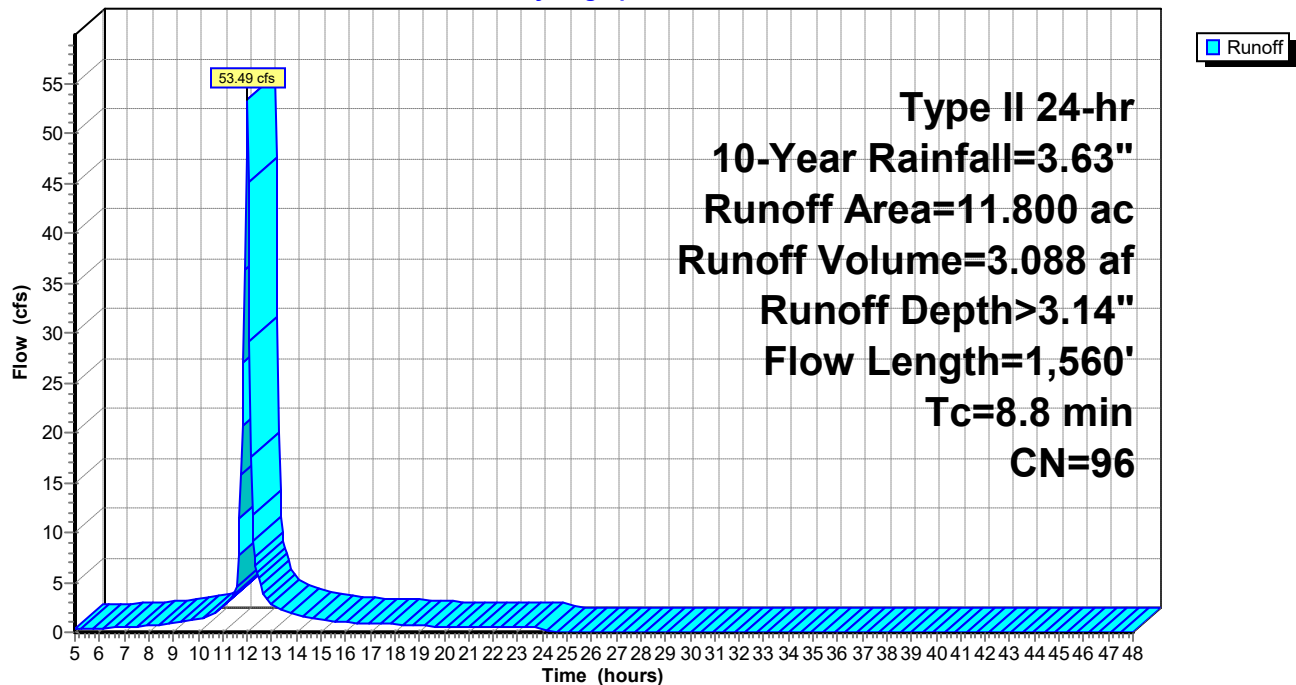
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 2.549	98	Building B
* 1.413	98	Building D
0.200	80	>75% Grass cover, Good, HSG D
* 7.638	95	Dense Graded Aggregate
11.800	96	Weighted Average
7.838		66.42% Pervious Area
3.962		33.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
4.5	1,360	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.8	1,560	Total			

Subcatchment DR-6: Buldings B & D

Hydrograph



Summary for Subcatchment DR-7: Building C & Rail

Runoff = 38.26 cfs @ 12.00 hrs, Volume= 2.277 af, Depth> 3.14"

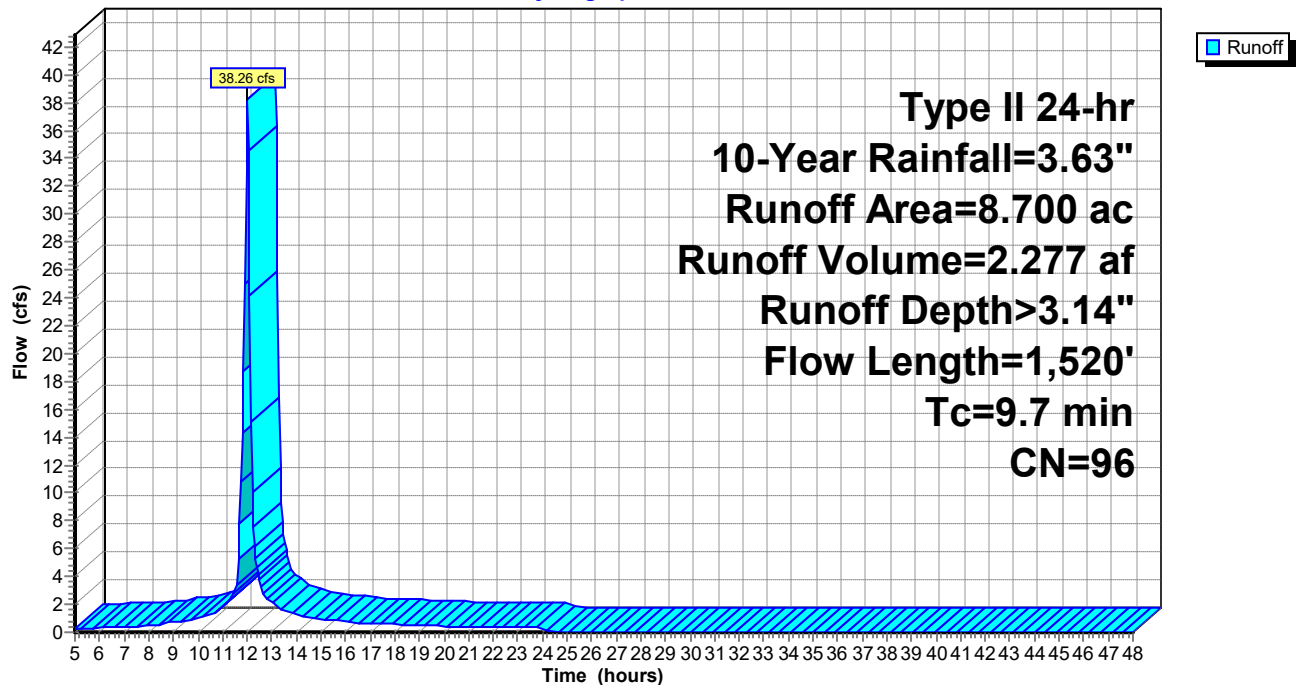
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 3.030	98	Building C
* 0.970	98	Rail
* 4.400	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
8.700	96	Weighted Average
4.700		54.02% Pervious Area
4.000		45.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
2.6	250	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
3.8	1,170	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.7	1,520	Total			

Subcatchment DR-7: Building C & Rail

Hydrograph



Summary for Subcatchment DR-8A: Parking

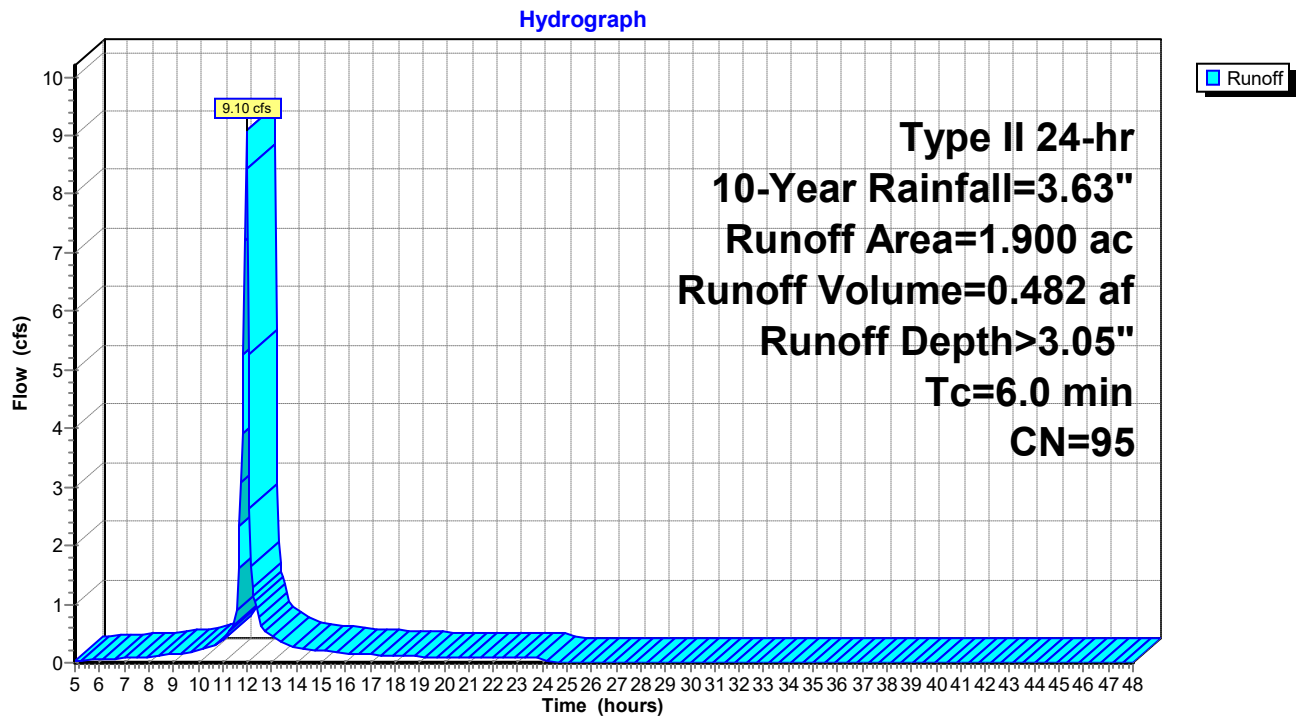
Runoff = 9.10 cfs @ 11.96 hrs, Volume= 0.482 af, Depth> 3.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 1.600	98	Parking
0.300	80	>75% Grass cover, Good, HSG D
1.900	95	Weighted Average
0.300		15.79% Pervious Area
1.600		84.21% Impervious Area

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

Subcatchment DR-8A: Parking



Summary for Subcatchment DR-8B: Roadway & Pond

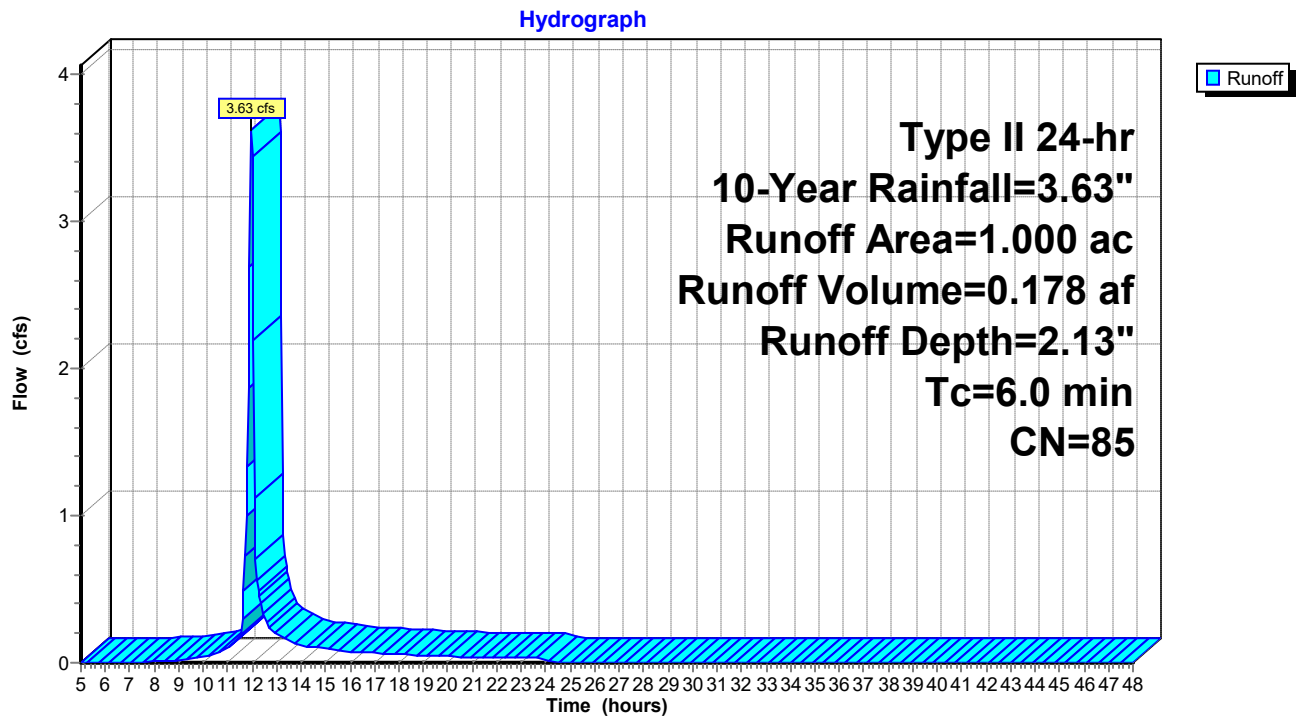
Runoff = 3.63 cfs @ 11.97 hrs, Volume= 0.178 af, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 0.300	98	Roadway
0.700	80	>75% Grass cover, Good, HSG D
1.000	85	Weighted Average
0.700		70.00% Pervious Area
0.300		30.00% Impervious Area

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

Subcatchment DR-8B: Roadway & Pond



Summary for Subcatchment DR-9A: Parking & Substation

Runoff = 7.03 cfs @ 12.04 hrs, Volume= 0.457 af, Depth> 3.05"

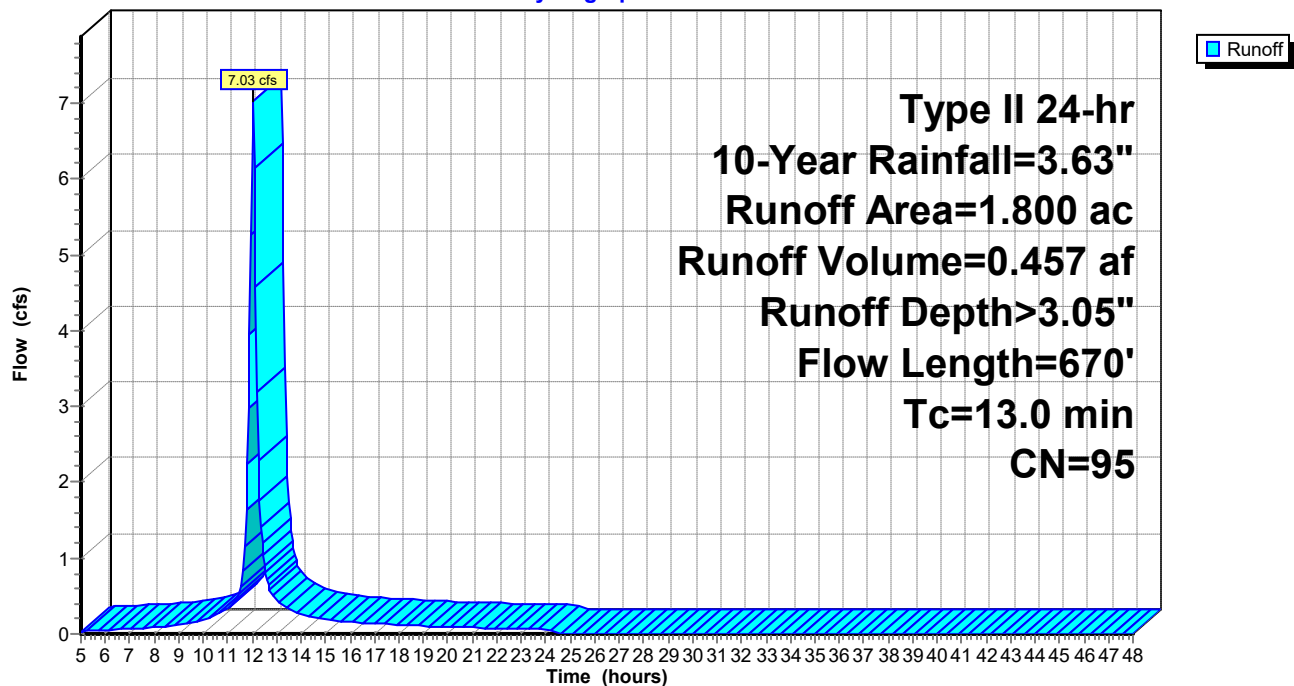
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
0.230	80	>75% Grass cover, Good, HSG D
* 0.200	92	Compacted Gravel
* 1.200	98	Parking and Road
* 0.170	98	Substation
1.800	95	Weighted Average
0.430		23.89% Pervious Area
1.370		76.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	100	0.0200	1.19		Sheet Flow, Parking Lot Runoff
					Smooth surfaces n= 0.011 P2= 2.40"
11.6	570	0.0030	0.82		Shallow Concentrated Flow, Grass Lined Ditch to Pond
					Grassed Waterway Kv= 15.0 fps
13.0	670	Total			

Subcatchment DR-9A: Parking & Substation

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 77

Summary for Subcatchment DR-9B: Roadway

Runoff = 15.47 cfs @ 11.96 hrs, Volume= 0.738 af, Depth= 2.21"

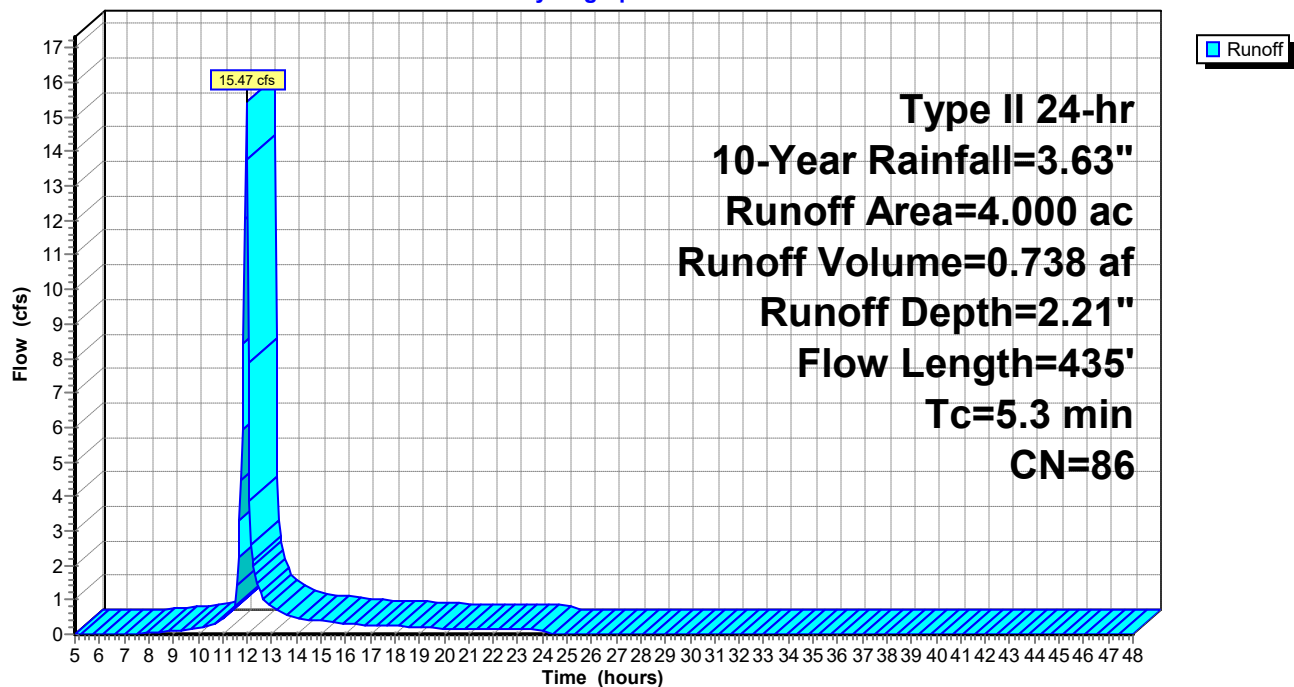
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-Year Rainfall=3.63"

Area (ac)	CN	Description
* 1.050	95	Dense Graded Aggregate
* 0.480	98	Roadway
2.470	80	>75% Grass cover, Good, HSG D
4.000	86	Weighted Average
3.520		88.00% Pervious Area
0.480		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	100	0.0250	0.46		Sheet Flow, Dense Graded Aggregate Yard n= 0.040 P2= 2.40"
1.3	230	0.0100	3.07	9.20	Channel Flow, Grass lined ditch Area= 3.0 sf Perim= 4.0' r= 0.75' n= 0.040 Earth, cobble bottom, clean sides
0.4	105	0.0050	4.20	7.43	Pipe Channel, driveway culvert 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.3	435	Total			

Subcatchment DR-9B: Roadway

Hydrograph



Summary for Reach 1R: Swale

Inflow Area = 1.900 ac, 84.21% Impervious, Inflow Depth > 3.05" for 10-Year event
Inflow = 9.10 cfs @ 11.96 hrs, Volume= 0.482 af
Outflow = 7.58 cfs @ 12.11 hrs, Volume= 0.482 af, Atten= 17%, Lag= 8.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.05 fps, Min. Travel Time= 5.6 min

Avg. Velocity= 0.60 fps, Avg. Travel Time= 19.1 min

Peak Storage= 2,580 cf @ 12.01 hrs

Average Depth at Peak Storage= 0.96' , Surface Width= 6.77'

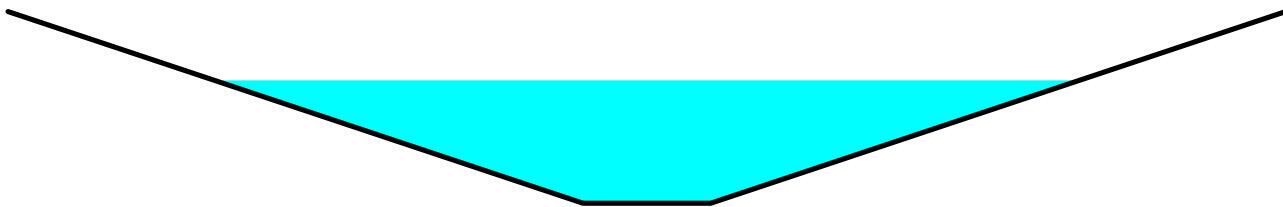
Bank-Full Depth= 1.50' Flow Area= 8.3 sf, Capacity= 22.13 cfs

1.00' x 1.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 10.00'

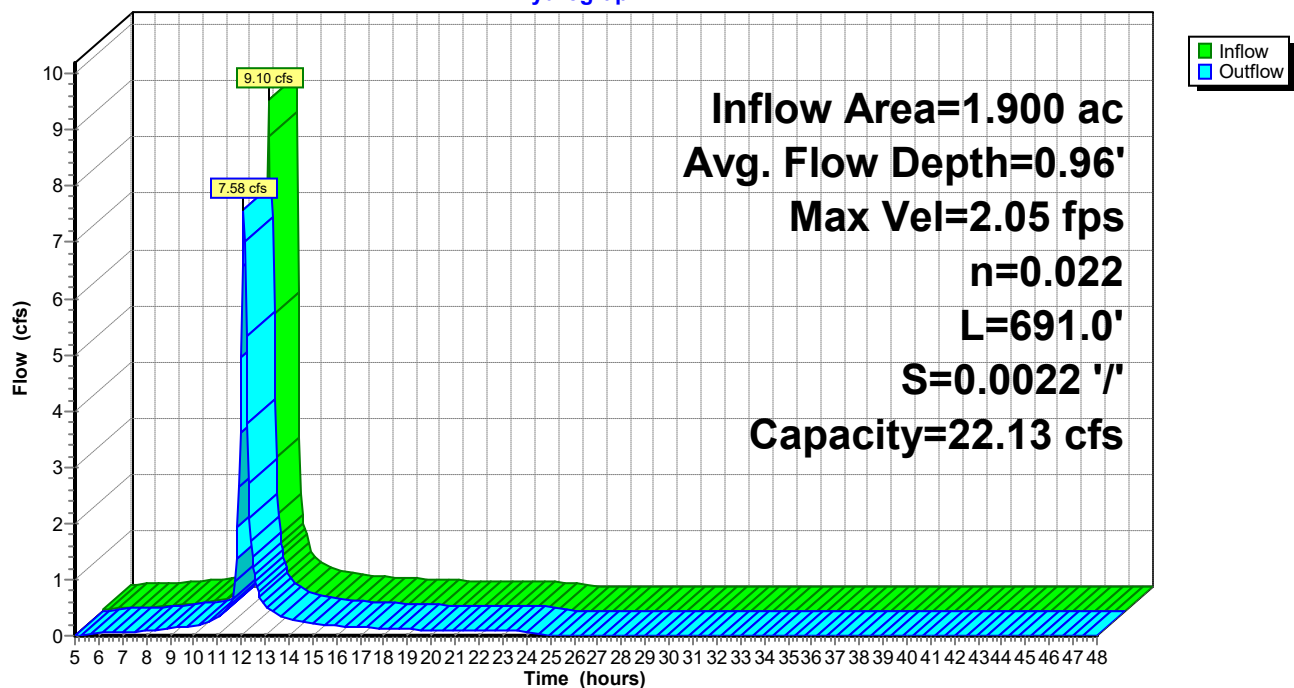
Length= 691.0' Slope= 0.0022 '/'

Inlet Invert= 15.50', Outlet Invert= 14.00'



Reach 1R: Swale

Hydrograph



Summary for Reach 1W: Wetland #1 / Analysis Point 1A

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 1.93" for 10-Year event
 Inflow = 12.46 cfs @ 13.19 hrs, Volume= 4.590 af
 Outflow = 5.17 cfs @ 17.95 hrs, Volume= 4.381 af, Atten= 58%, Lag= 285.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.09 fps, Min. Travel Time= 192.0 min

Avg. Velocity= 0.04 fps, Avg. Travel Time= 405.5 min

Peak Storage= 59,576 cf @ 14.75 hrs

Average Depth at Peak Storage= 0.30' , Surface Width= 201.78'

Bank-Full Depth= 0.50' Flow Area= 100.8 sf, Capacity= 12.36 cfs

200.00' x 0.50' deep channel, n= 0.240

Side Slope Z-value= 3.0 ' / ' Top Width= 203.00'

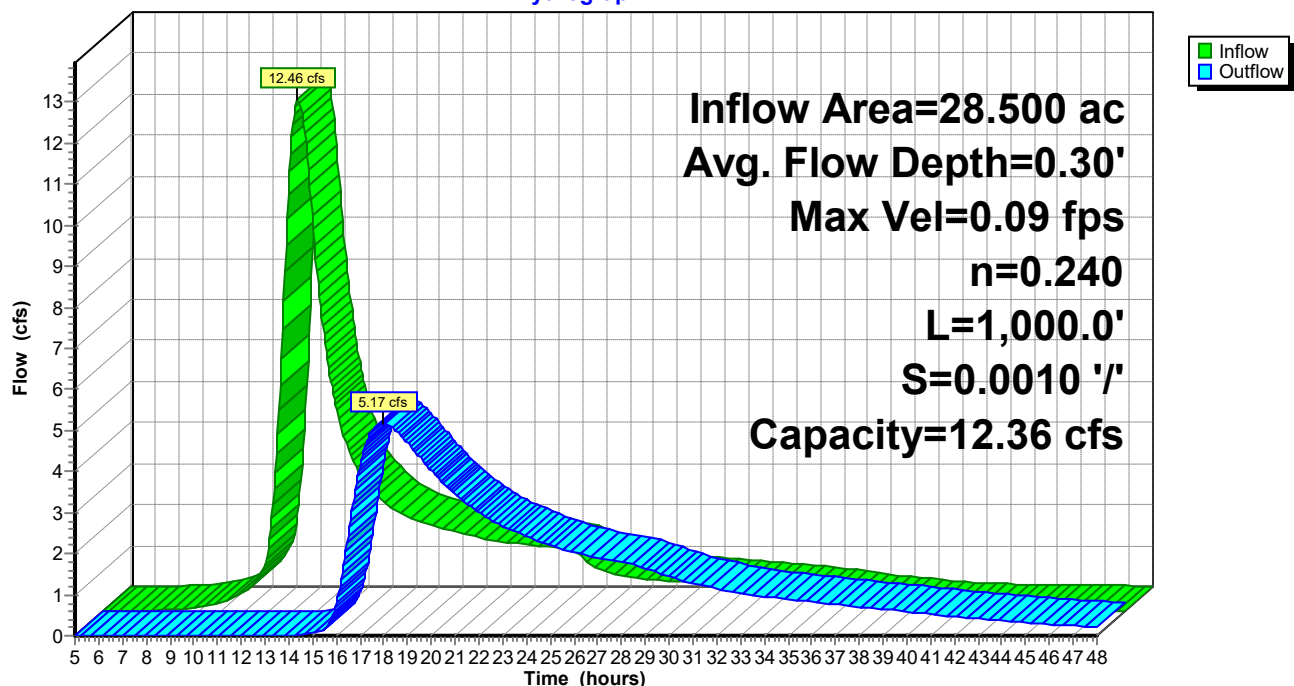
Length= 1,000.0' Slope= 0.0010 ' / '

Inlet Invert= 6.00', Outlet Invert= 5.00'



Reach 1W: Wetland #1 / Analysis Point 1A

Hydrograph



Summary for Reach 2R: Overflow

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 2.45" for 10-Year event
 Inflow = 0.64 cfs @ 14.62 hrs, Volume= 1.187 af
 Outflow = 0.64 cfs @ 14.63 hrs, Volume= 1.186 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.94 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.56 fps, Avg. Travel Time= 0.5 min

Peak Storage= 16 cf @ 14.62 hrs

Average Depth at Peak Storage= 0.04' , Surface Width= 8.24'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 569.91 cfs

8.00' x 2.00' deep channel, n= 0.020 Corrugated PE, corrugated interior

Side Slope Z-value= 3.0 '/' Top Width= 20.00'

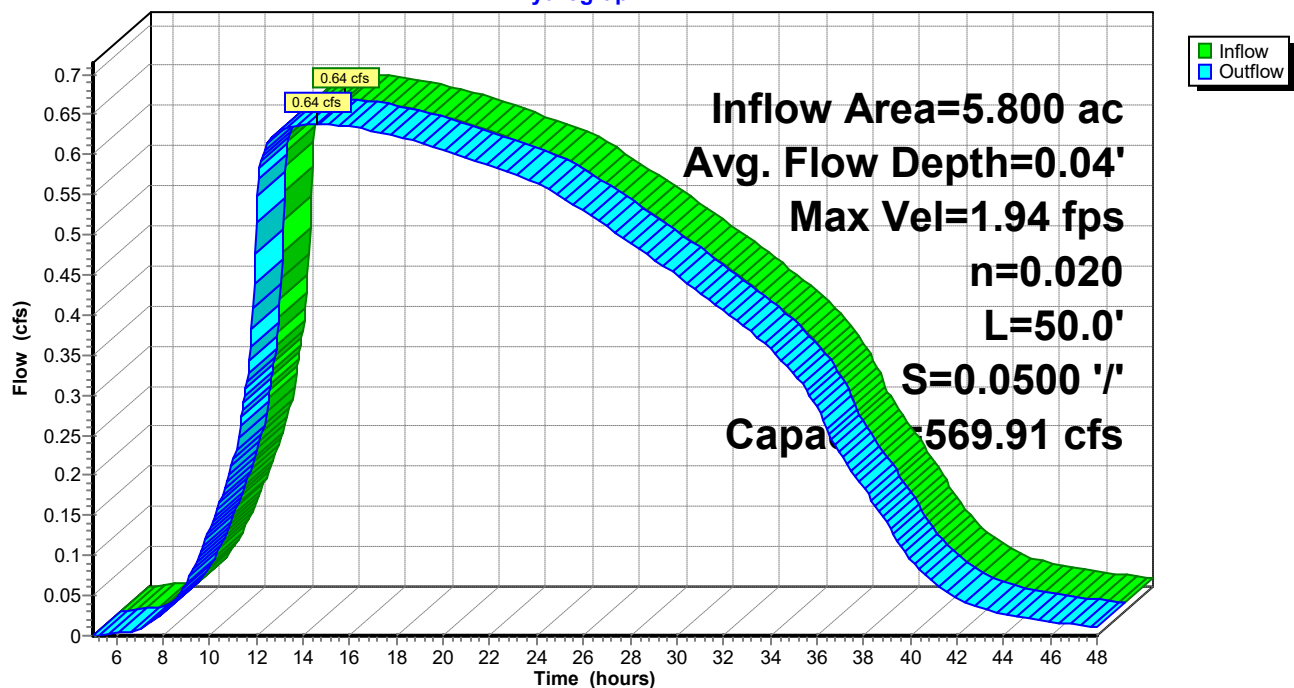
Length= 50.0' Slope= 0.0500 '/'

Inlet Invert= 16.50', Outlet Invert= 14.00'



Reach 2R: Overflow

Hydrograph



Summary for Reach 3R: Outlet Pipe

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 1.84" for 10-Year event
 Inflow = 5.17 cfs @ 17.95 hrs, Volume= 4.381 af
 Outflow = 5.17 cfs @ 17.95 hrs, Volume= 4.381 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.73 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 2.76 fps, Avg. Travel Time= 0.4 min

Peak Storage= 76 cf @ 17.95 hrs

Average Depth at Peak Storage= 0.61', Surface Width= 2.58'

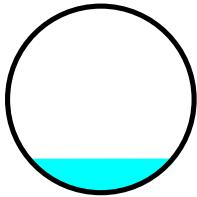
Bank-Full Depth= 3.33' Flow Area= 8.7 sf, Capacity= 70.83 cfs

40.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

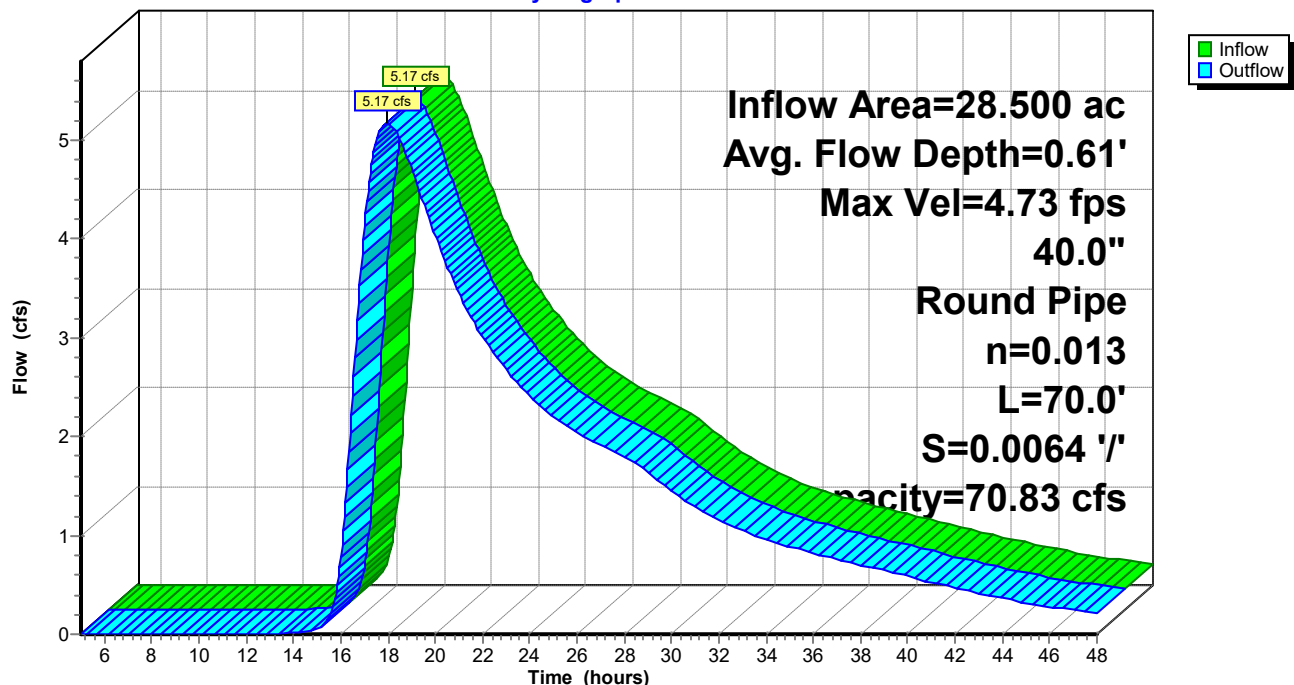
Length= 70.0' Slope= 0.0064 '/'

Inlet Invert= 4.25', Outlet Invert= 3.80'



Reach 3R: Outlet Pipe

Hydrograph



Summary for Reach 4R: Overflow

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 3.05" for 10-Year event
 Inflow = 4.69 cfs @ 11.98 hrs, Volume= 0.254 af
 Outflow = 4.56 cfs @ 12.00 hrs, Volume= 0.254 af, Atten= 3%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.73 fps, Min. Travel Time= 0.6 min

Avg. Velocity= 0.70 fps, Avg. Travel Time= 2.4 min

Peak Storage= 171 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.41', Surface Width= 5.43'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 118.65 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

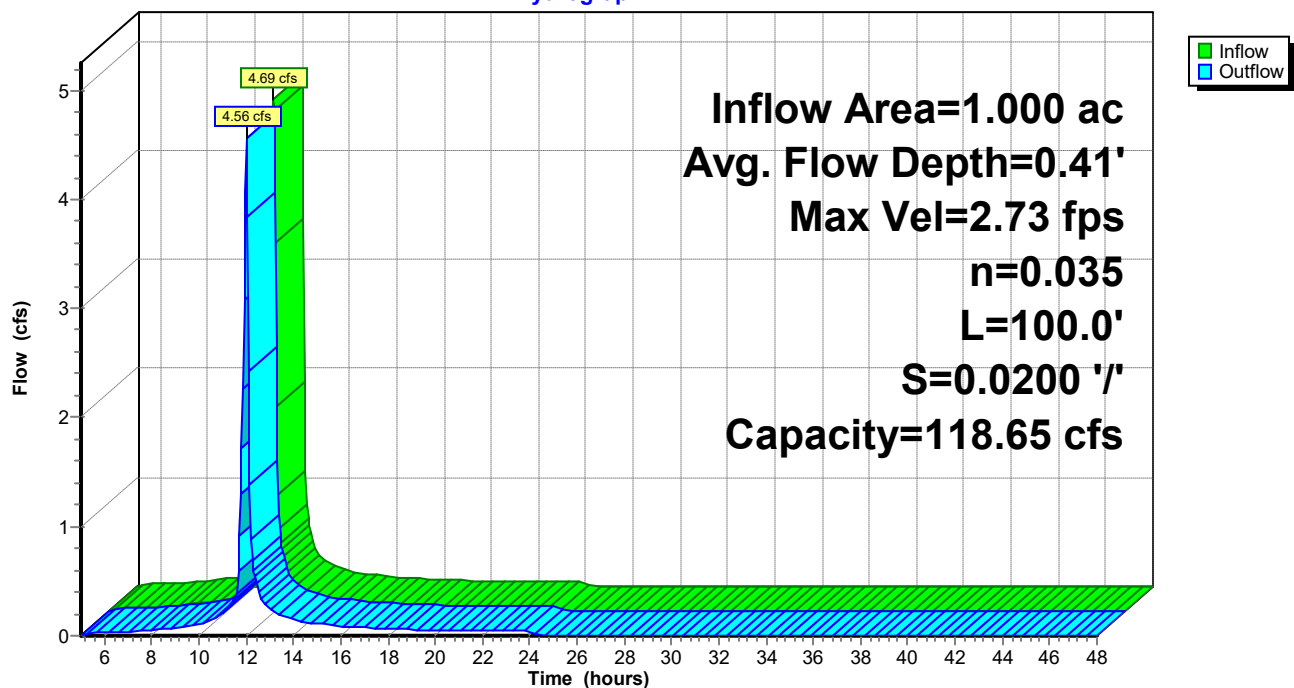
Length= 100.0' Slope= 0.0200 '/'

Inlet Invert= 12.00', Outlet Invert= 10.00'



Reach 4R: Overflow

Hydrograph



Summary for Reach 5R: Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.00" for 10-Year event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 90.48 cfs

3.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

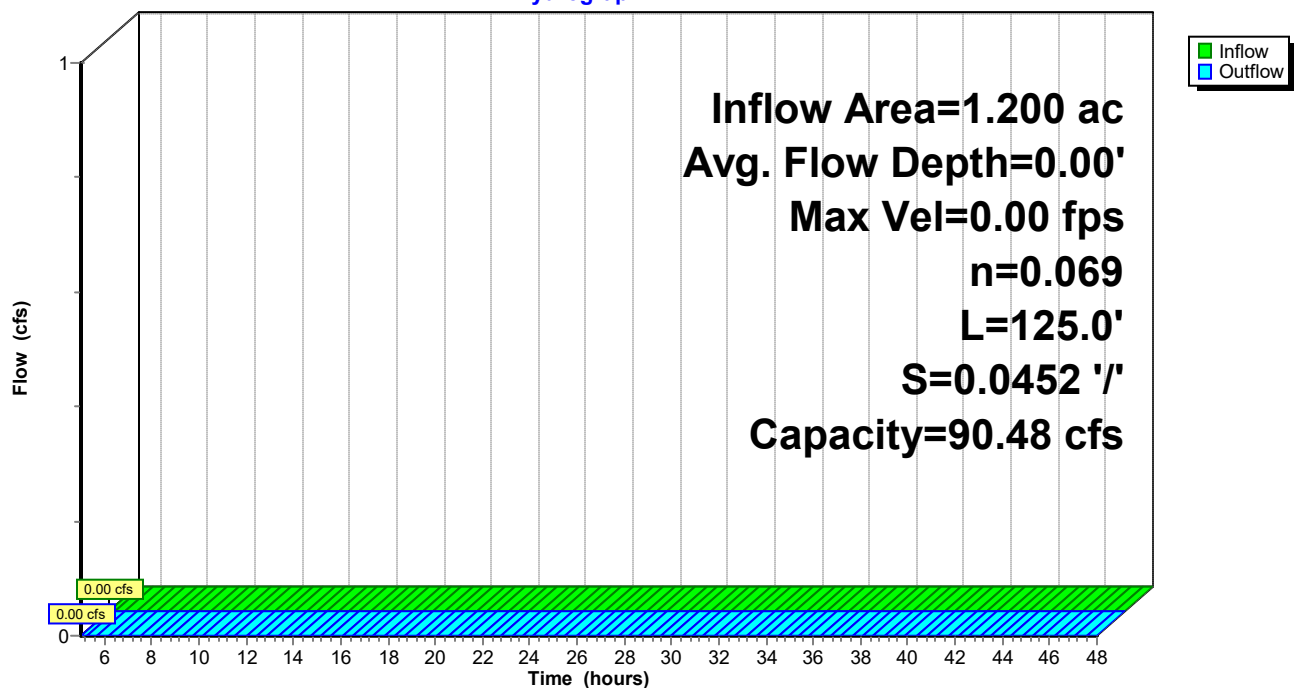
Length= 125.0' Slope= 0.0452 '/'

Inlet Invert= 11.65', Outlet Invert= 6.00'



Reach 5R: Overflow

Hydrograph



Summary for Reach 6R: Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.00" for 10-Year event
 Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity= 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs

Average Depth at Peak Storage= 0.00'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 116.91 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

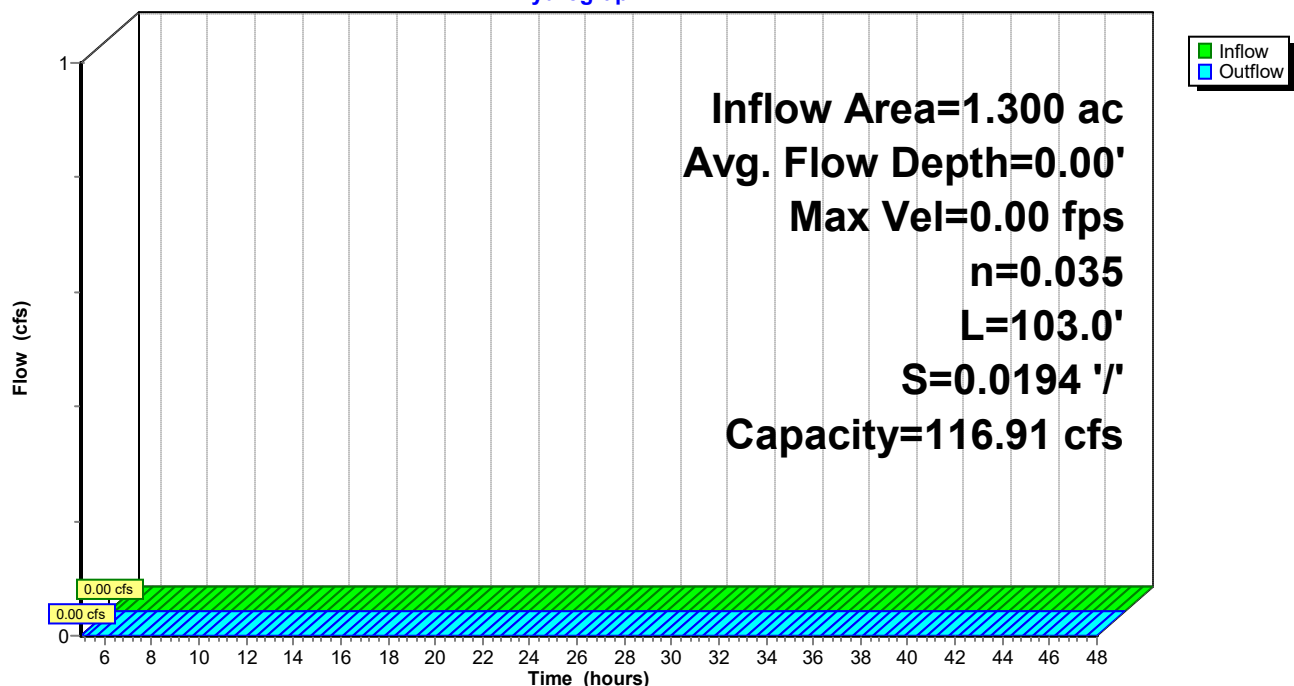
Length= 103.0' Slope= 0.0194 '/'

Inlet Invert= 8.50', Outlet Invert= 6.50'



Reach 6R: Overflow

Hydrograph



Summary for Reach 7R: Overflow

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth > 2.70" for 10-Year event
 Inflow = 0.39 cfs @ 14.15 hrs, Volume= 0.652 af
 Outflow = 0.39 cfs @ 14.22 hrs, Volume= 0.652 af, Atten= 0%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.61 fps, Min. Travel Time= 2.7 min

Avg. Velocity= 0.43 fps, Avg. Travel Time= 3.9 min

Peak Storage= 64 cf @ 14.18 hrs

Average Depth at Peak Storage= 0.08' , Surface Width= 8.47'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 116.81 cfs

8.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 20.00'

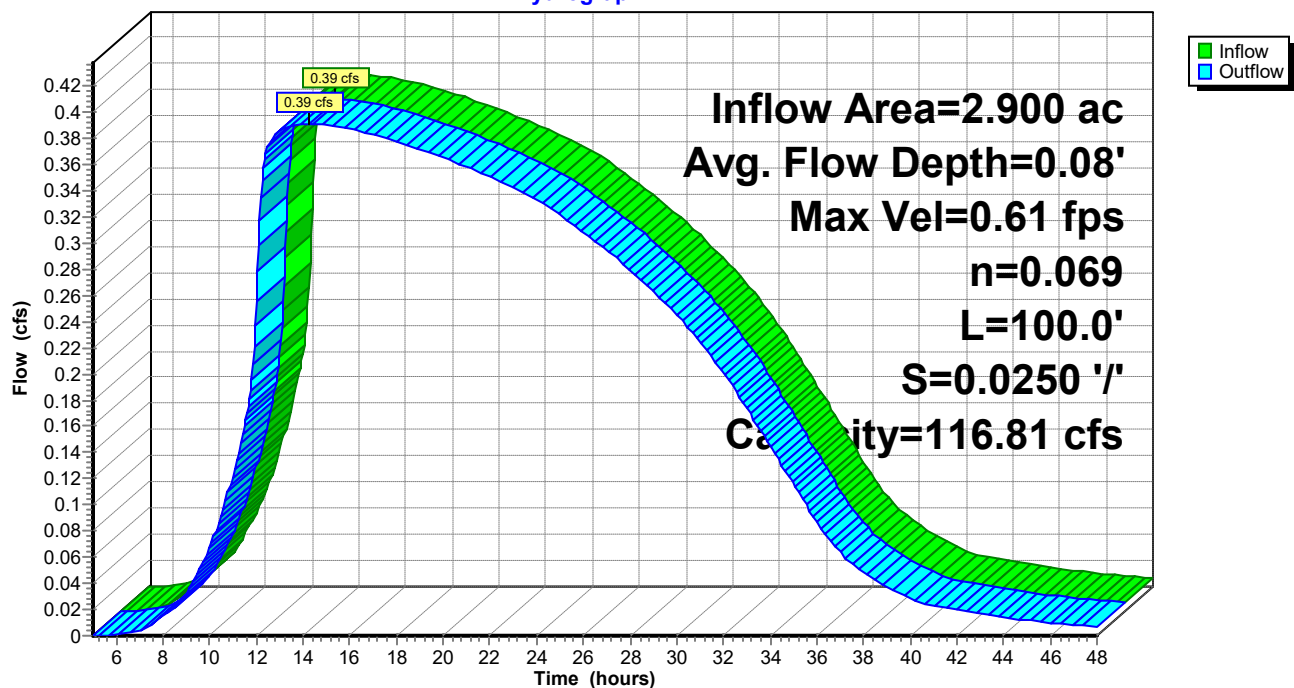
Length= 100.0' Slope= 0.0250 '/'

Inlet Invert= 14.50', Outlet Invert= 12.00'



Reach 7R: Overflow

Hydrograph



Summary for Reach 8R: Dry Swale #1

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 3.05" for 10-Year event
 Inflow = 4.79 cfs @ 11.96 hrs, Volume= 0.254 af
 Outflow = 4.69 cfs @ 11.98 hrs, Volume= 0.254 af, Atten= 2%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.92 fps, Min. Travel Time= 0.6 min

Avg. Velocity = 0.77 fps, Avg. Travel Time= 2.3 min

Peak Storage= 169 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.53' , Surface Width= 4.11'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 16.53 cfs

2.00' x 1.00' deep channel, n= 0.018 Earth, clean & straight

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

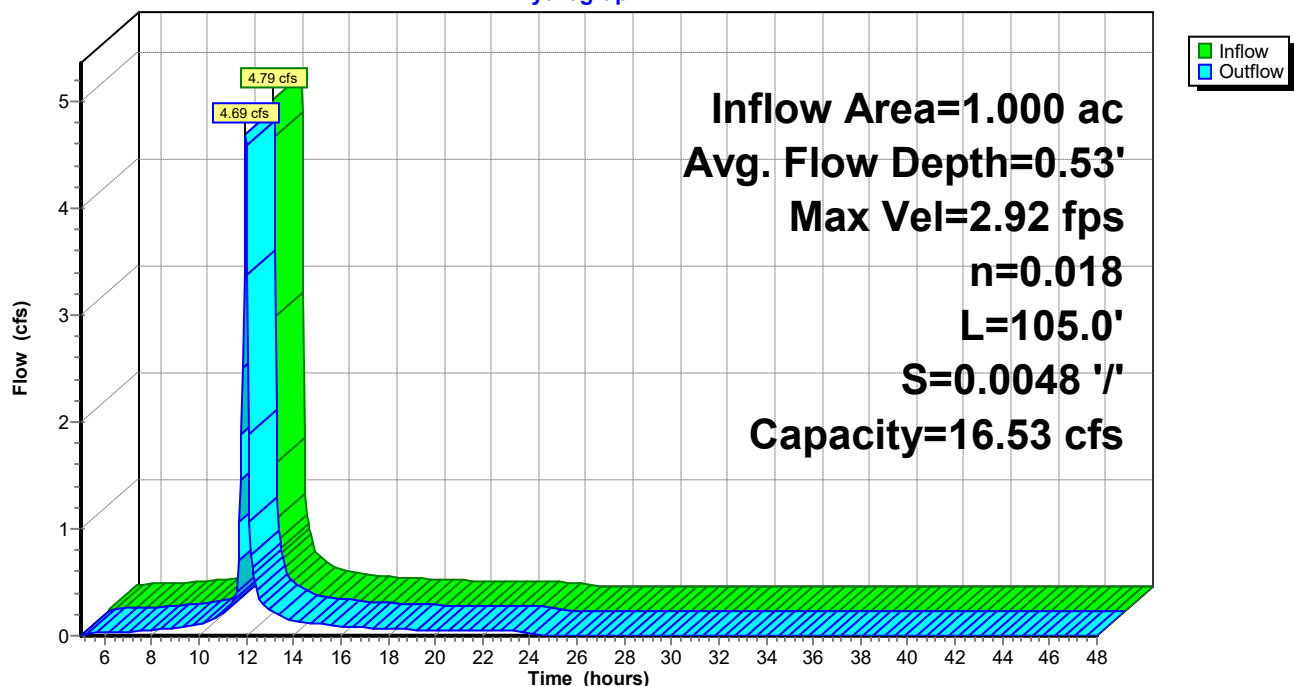
Length= 105.0' Slope= 0.0048 '/'

Inlet Invert= 10.00', Outlet Invert= 9.50'



Reach 8R: Dry Swale #1

Hydrograph



Summary for Reach 10R: Dry Swale #2

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 2.69 cfs @ 12.01 hrs, Volume= 0.140 af
Outflow = 2.62 cfs @ 12.02 hrs, Volume= 0.140 af, Atten= 3%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.08 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 1.13 fps, Avg. Travel Time= 1.7 min

Peak Storage= 75 cf @ 12.01 hrs

Average Depth at Peak Storage= 0.24' , Surface Width= 3.44'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 213.76 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 14.00'

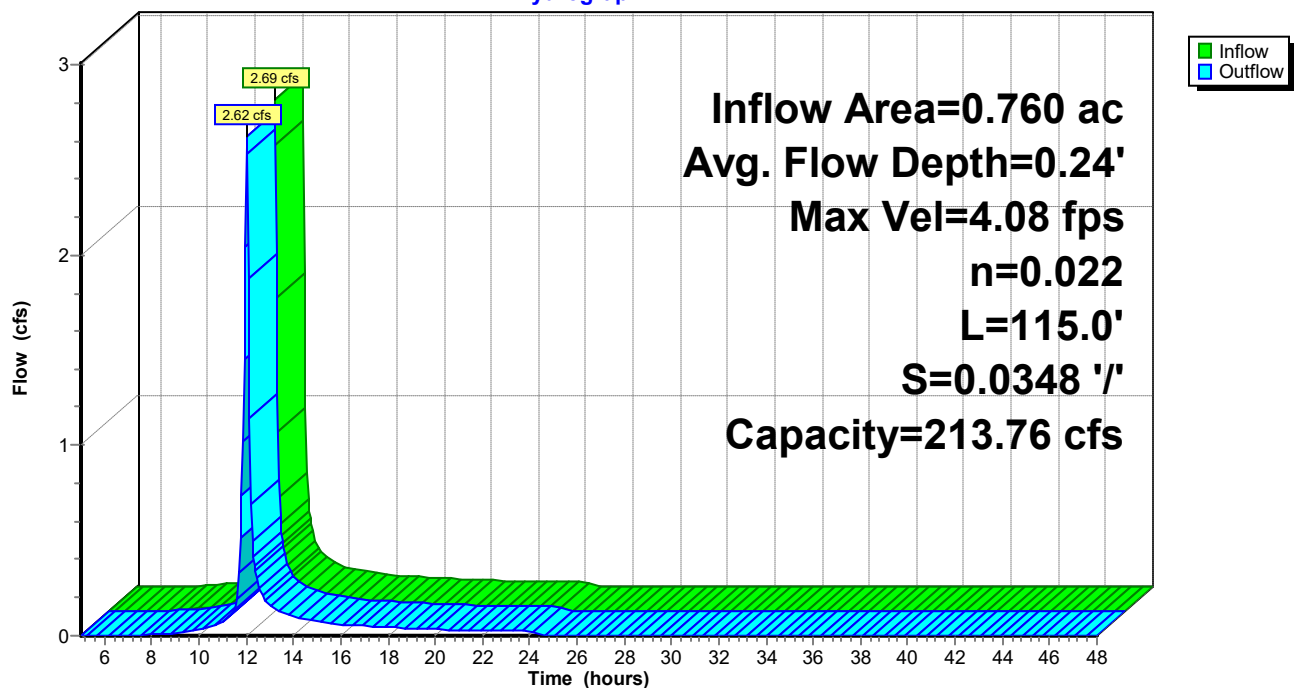
Length= 115.0' Slope= 0.0348 '/'

Inlet Invert= 37.00', Outlet Invert= 33.00'



Reach 10R: Dry Swale #2

Hydrograph



Summary for Reach 12R: Sediment Basin Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.46" for 10-Year event
Inflow = 0.26 cfs @ 12.31 hrs, Volume= 0.046 af
Outflow = 0.26 cfs @ 12.32 hrs, Volume= 0.046 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.42 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 0.19 fps, Avg. Travel Time= 0.5 min

Peak Storage= 4 cf @ 12.32 hrs

Average Depth at Peak Storage= 0.06' , Surface Width= 10.50'

Bank-Full Depth= 0.50' Flow Area= 6.0 sf, Capacity= 9.43 cfs

10.00' x 0.50' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 ' / ' Top Width= 14.00'

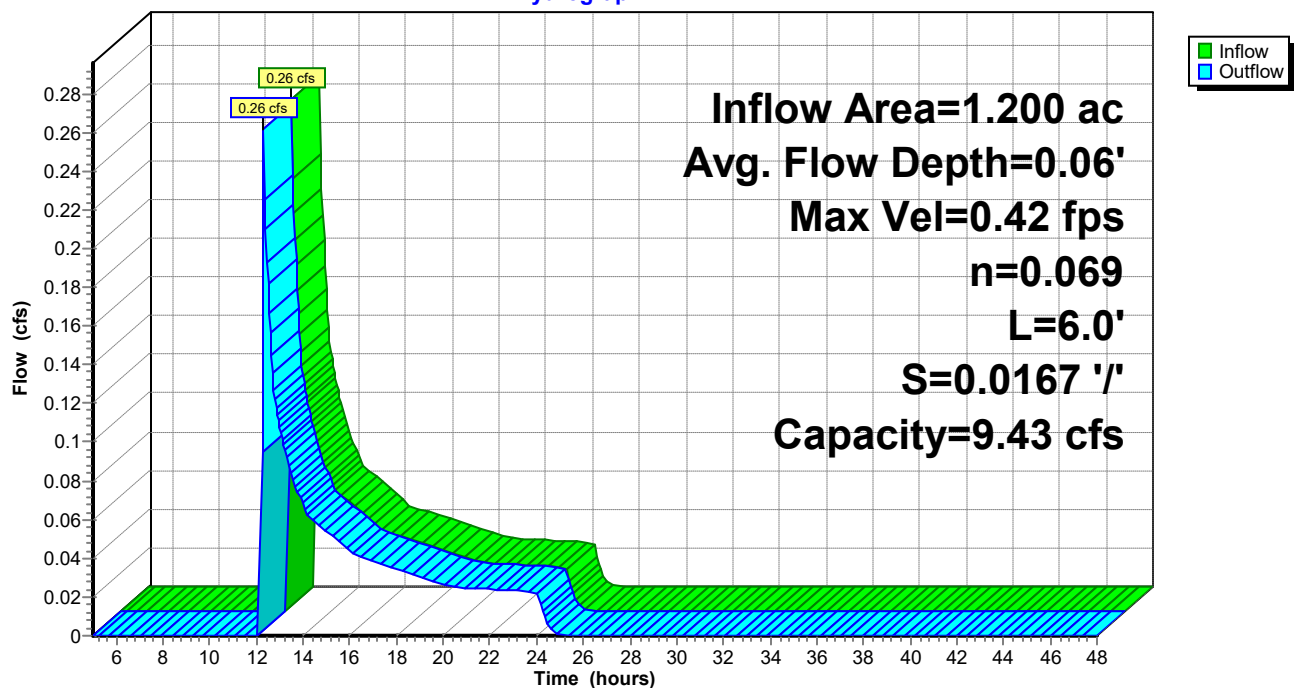
Length= 6.0' Slope= 0.0167 ' / '

Inlet Invert= 12.00', Outlet Invert= 11.90'



Reach 12R: Sediment Basin Overflow

Hydrograph



Summary for Reach 13R: Roadside Swale

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.63" for 10-Year event
Inflow = 1.16 cfs @ 11.99 hrs, Volume= 0.063 af
Outflow = 1.03 cfs @ 12.06 hrs, Volume= 0.063 af, Atten= 11%, Lag= 3.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.18 fps, Min. Travel Time= 2.2 min

Avg. Velocity = 0.77 fps, Avg. Travel Time= 6.3 min

Peak Storage= 141 cf @ 12.02 hrs

Average Depth at Peak Storage= 0.27' , Surface Width= 2.62'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 18.36 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 7.00'

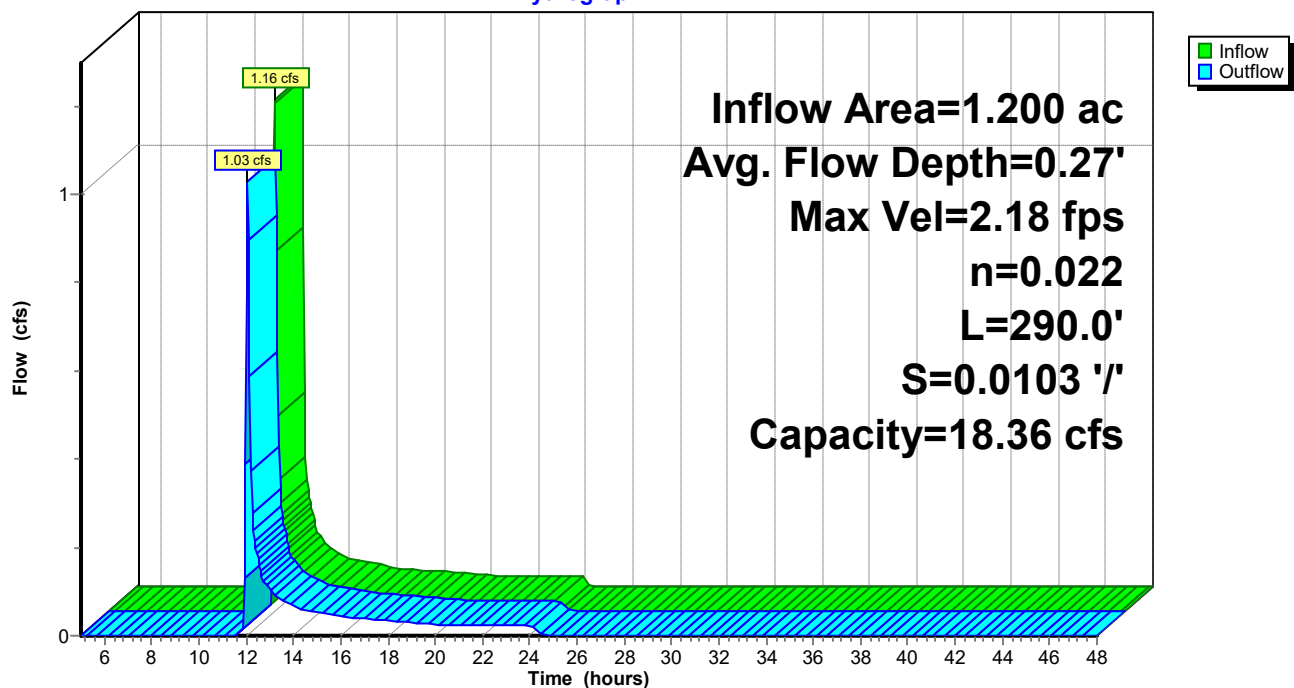
Length= 290.0' Slope= 0.0103 '/'

Inlet Invert= 15.00', Outlet Invert= 12.00'



Reach 13R: Roadside Swale

Hydrograph



Summary for Reach 14R: Roadside Swale

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 2.85 cfs @ 11.97 hrs, Volume= 0.140 af
Outflow = 2.69 cfs @ 12.01 hrs, Volume= 0.140 af, Atten= 6%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.12 fps, Min. Travel Time= 1.5 min

Avg. Velocity = 1.44 fps, Avg. Travel Time= 5.3 min

Peak Storage= 250 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.21' , Surface Width= 3.25'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 289.37 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 ' ' Top Width= 14.00'

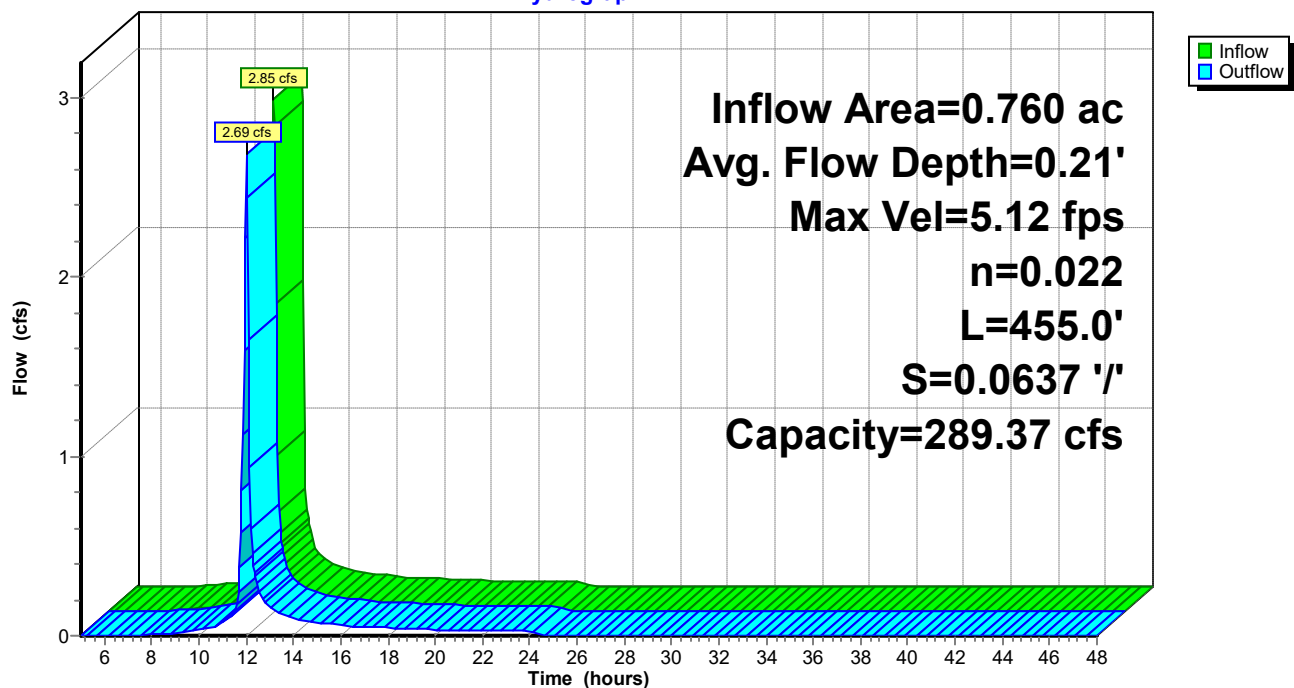
Length= 455.0' Slope= 0.0637 ' '

Inlet Invert= 66.00', Outlet Invert= 37.00'



Reach 14R: Roadside Swale

Hydrograph



Summary for Reach 15R: Roadside Swale

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 1.27" for 10-Year event
Inflow = 2.86 cfs @ 11.98 hrs, Volume= 0.137 af
Outflow = 2.02 cfs @ 12.17 hrs, Volume= 0.137 af, Atten= 29%, Lag= 11.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.95 fps, Min. Travel Time= 7.5 min

Avg. Velocity = 0.27 fps, Avg. Travel Time= 26.8 min

Peak Storage= 939 cf @ 12.04 hrs

Average Depth at Peak Storage= 0.70' , Surface Width= 5.22'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 4.69 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 ' / ' Top Width= 7.00'

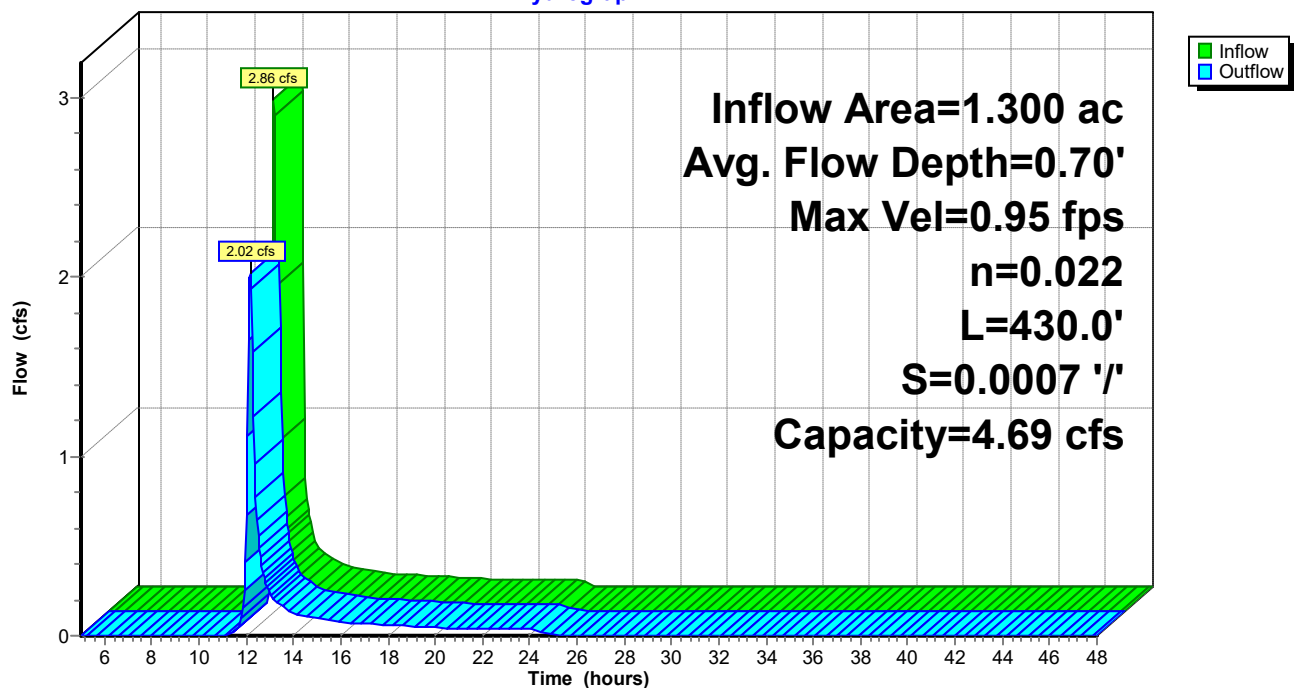
Length= 430.0' Slope= 0.0007 ' / '

Inlet Invert= 10.00', Outlet Invert= 9.71'



Reach 15R: Roadside Swale

Hydrograph



Summary for Reach 17R: Sediment Basin Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.91" for 10-Year event
 Inflow = 1.45 cfs @ 12.31 hrs, Volume= 0.098 af
 Outflow = 1.33 cfs @ 12.32 hrs, Volume= 0.098 af, Atten= 9%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 0.67 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 0.17 fps, Avg. Travel Time= 0.6 min

Peak Storage= 12 cf @ 12.32 hrs

Average Depth at Peak Storage= 0.13' , Surface Width= 16.07'

Bank-Full Depth= 0.70' Flow Area= 12.5 sf, Capacity= 24.64 cfs

15.00' x 0.70' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 ' / ' Top Width= 20.60'

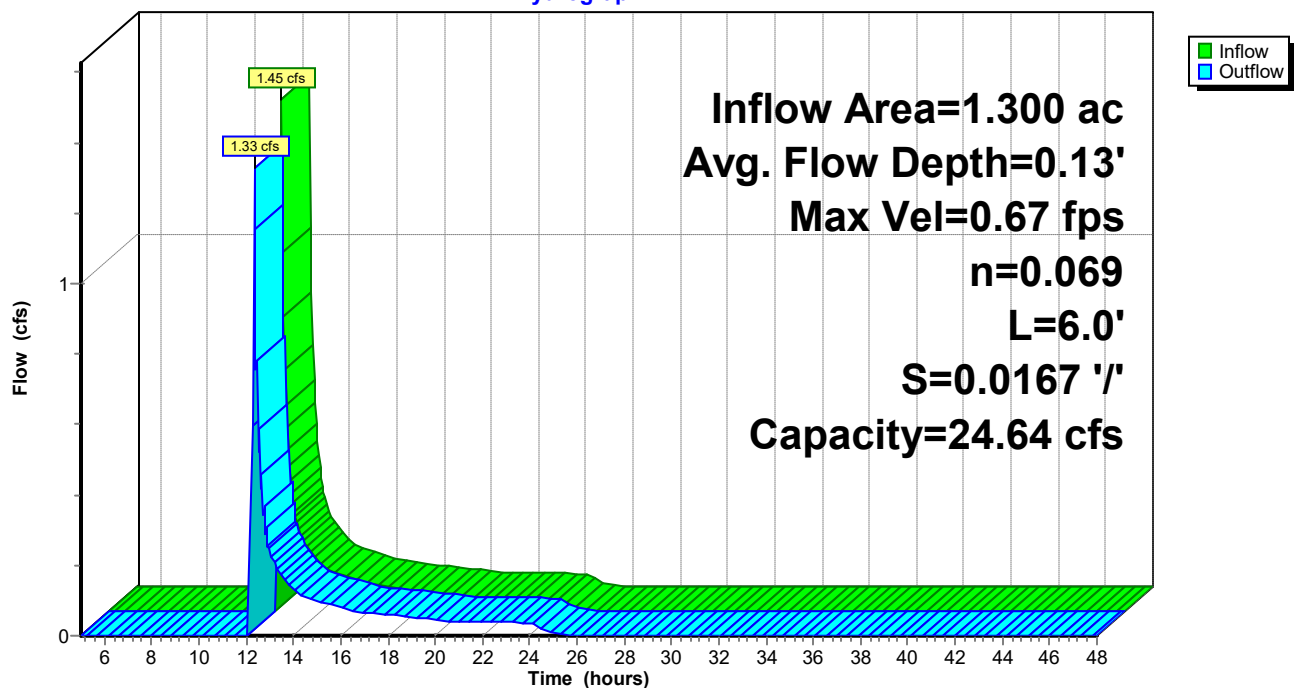
Length= 6.0' Slope= 0.0167 ' / '

Inlet Invert= 9.00', Outlet Invert= 8.90'



Reach 17R: Sediment Basin Overflow

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 93

Summary for Pond 1P: WQv Pond #1

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth = 2.73" for 10-Year event
 Inflow = 8.78 cfs @ 12.07 hrs, Volume= 0.660 af
 Outflow = 0.39 cfs @ 14.15 hrs, Volume= 0.652 af, Atten= 96%, Lag= 125.0 min
 Primary = 0.39 cfs @ 14.15 hrs, Volume= 0.652 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 14.00' Surf.Area= 9,229 sf Storage= 19,003 cf
 Peak Elev= 15.59' @ 14.15 hrs Surf.Area= 19,456 sf Storage= 36,781 cf (17,778 cf above start)

Plug-Flow detention time= 1,195.5 min calculated for 0.216 af (33% of inflow)
 Center-of-Mass det. time= 536.4 min (1,336.8 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,795 cf	Forebay (Prismatic) Listed below (Recalc)
#2	9.00'	57,882 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		62,677 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	232	0	0
11.00	569	401	401
12.00	1,018	794	1,194
13.00	1,467	1,243	2,437
14.00	3,249	2,358	4,795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.00	1,145	0	0
10.00	1,751	1,448	1,448
11.00	2,339	2,045	3,493
12.00	2,959	2,649	6,142
13.00	3,597	3,278	9,420
14.00	5,980	4,789	14,209
14.50	7,240	3,305	17,514
15.00	14,392	5,408	22,922
16.00	17,455	15,924	38,845
17.00	20,619	19,037	57,882

Device	Routing	Invert	Outlet Devices
#1	Primary	13.50'	12.0" Round Culvert L= 50.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 13.50' / 13.23' S= 0.0054 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.00'	24.0" x 24.0" Horiz. Outlet Structure Top Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 1	14.00'	4.0" Round Reverse Slope Pipe L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.00' / 14.00' S= -0.1250 ' / Cc= 0.900

18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 94

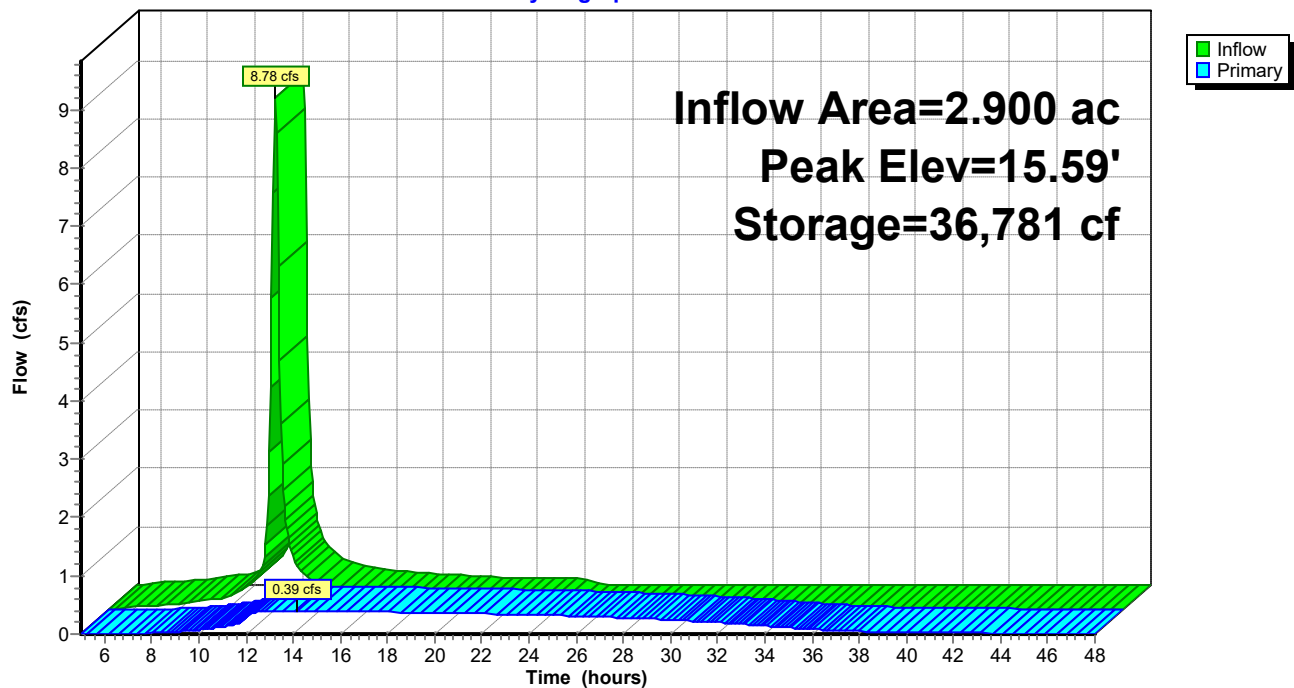
#4 Primary 16.25' n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
6.0' long x 1.0' breadth Broad-Crested Rectangular Weir
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
2.50 3.00
Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
3.30 3.31 3.32

Primary OutFlow Max=0.39 cfs @ 14.15 hrs HW=15.59' (Free Discharge)

- 1=Culvert (Passes 0.39 cfs of 4.20 cfs potential flow)
- 2=Outlet Structure Top Grate (Controls 0.00 cfs)
- 3=Reverse Slope Pipe (Outlet Controls 0.39 cfs @ 4.48 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: WQv Pond #1

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 95

Summary for Pond 2P: WQv Pond #2

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 2.47" for 10-Year event
 Inflow = 21.14 cfs @ 11.97 hrs, Volume= 1.195 af
 Outflow = 0.64 cfs @ 14.62 hrs, Volume= 1.187 af, Atten= 97%, Lag= 158.7 min
 Primary = 0.64 cfs @ 14.62 hrs, Volume= 1.187 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Starting Elev= 14.00' Surf.Area= 5,917 sf Storage= 9,000 cf

Peak Elev= 16.47' @ 14.62 hrs Surf.Area= 24,629 sf Storage= 41,496 cf (32,496 cf above start)

Plug-Flow detention time= 808.8 min calculated for 0.980 af (82% of inflow)

Center-of-Mass det. time= 597.8 min (1,399.8 - 802.0)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,020 cf	Forebay #1 (Prismatic) Listed below (Recalc)
#2	10.00'	2,575 cf	Forebay #2 (Prismatic) Listed below (Recalc)
#3	10.00'	58,093 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		64,688 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	141	0	0
11.00	330	236	236
12.00	562	446	682
13.00	866	714	1,396
14.00	2,023	1,445	2,840
14.50	2,696	1,180	4,020

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	82	0	0
11.00	202	142	142
12.00	351	277	419
13.00	535	443	862
14.00	1,323	929	1,791
14.50	1,815	785	2,575

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	375	0	0
11.00	653	514	514
12.00	957	805	1,319
13.00	1,286	1,122	2,441
14.00	2,571	1,929	4,369
14.50	3,307	1,470	5,839
15.00	13,814	4,280	10,119
16.00	17,852	15,833	25,952
17.00	22,659	20,256	46,207
17.50	24,884	11,886	58,093

18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 96

Device	Routing	Invert	Outlet Devices
#1	Device 3	16.50'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#2	Device 3	14.00'	4.0" Vert. Reverse Slope Pipe C= 0.600 Limited to weir flow at low heads
#3	Primary	14.00'	12.0" Round Outlet Structure Discard Pipe L= 46.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.77' S= 0.0050 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Primary	16.60'	10.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

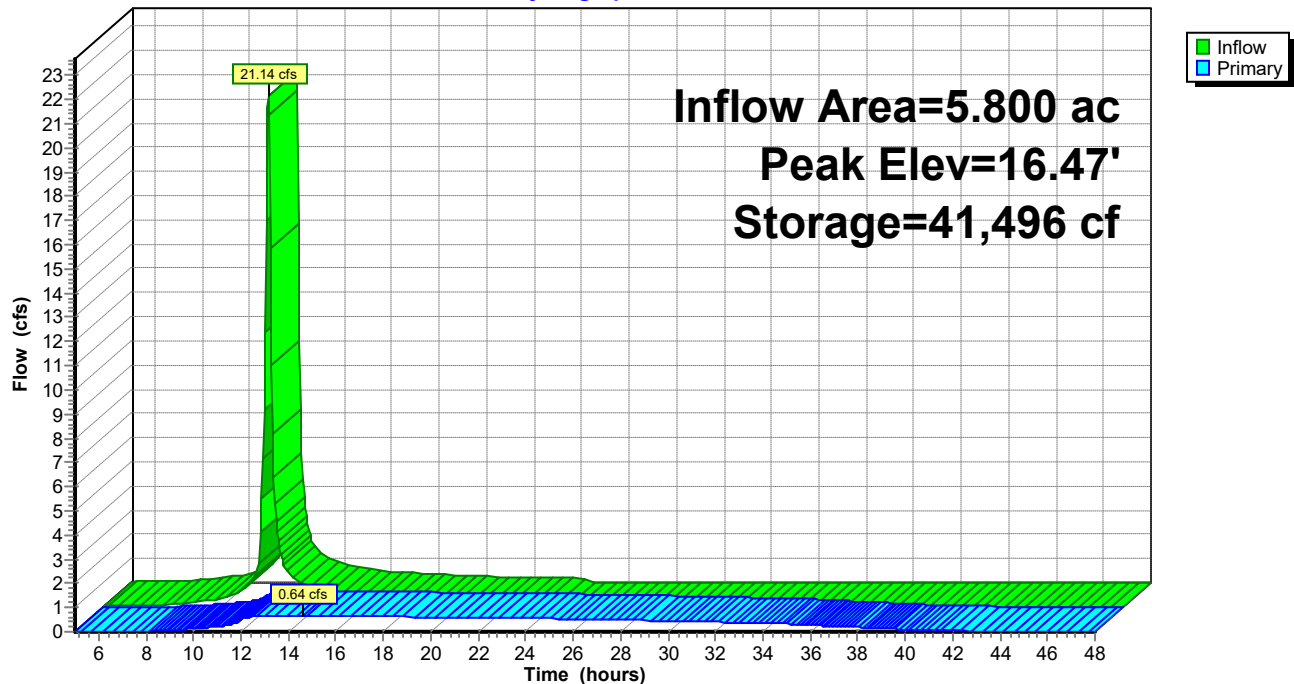
Primary OutFlow Max=0.64 cfs @ 14.62 hrs HW=16.47' (Free Discharge)

3=Outlet Structure Discard Pipe (Passes 0.64 cfs of 4.79 cfs potential flow)

1=Orifice/Grate (Controls 0.00 cfs)

2=Reverse Slope Pipe (Orifice Controls 0.64 cfs @ 7.31 fps)

4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: WQv Pond #2**Hydrograph**

18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 97

Summary for Pond 3P: Infiltration Basin #1

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.46" for 10-Year event
 Inflow = 0.26 cfs @ 12.32 hrs, Volume= 0.046 af
 Outflow = 0.02 cfs @ 24.21 hrs, Volume= 0.034 af, Atten= 94%, Lag= 713.8 min
 Discarded = 0.02 cfs @ 24.21 hrs, Volume= 0.034 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.15' @ 24.21 hrs Surf.Area= 1,004 sf Storage= 1,468 cf

Plug-Flow detention time= 879.4 min calculated for 0.034 af (73% of inflow)
 Center-of-Mass det. time= 771.6 min (1,748.3 - 976.8)

Volume	Invert	Avail.Storage	Storage Description
#1	8.10'	2,492 cf	Custom Stage Data (Irregular) Listed below (Recalc)

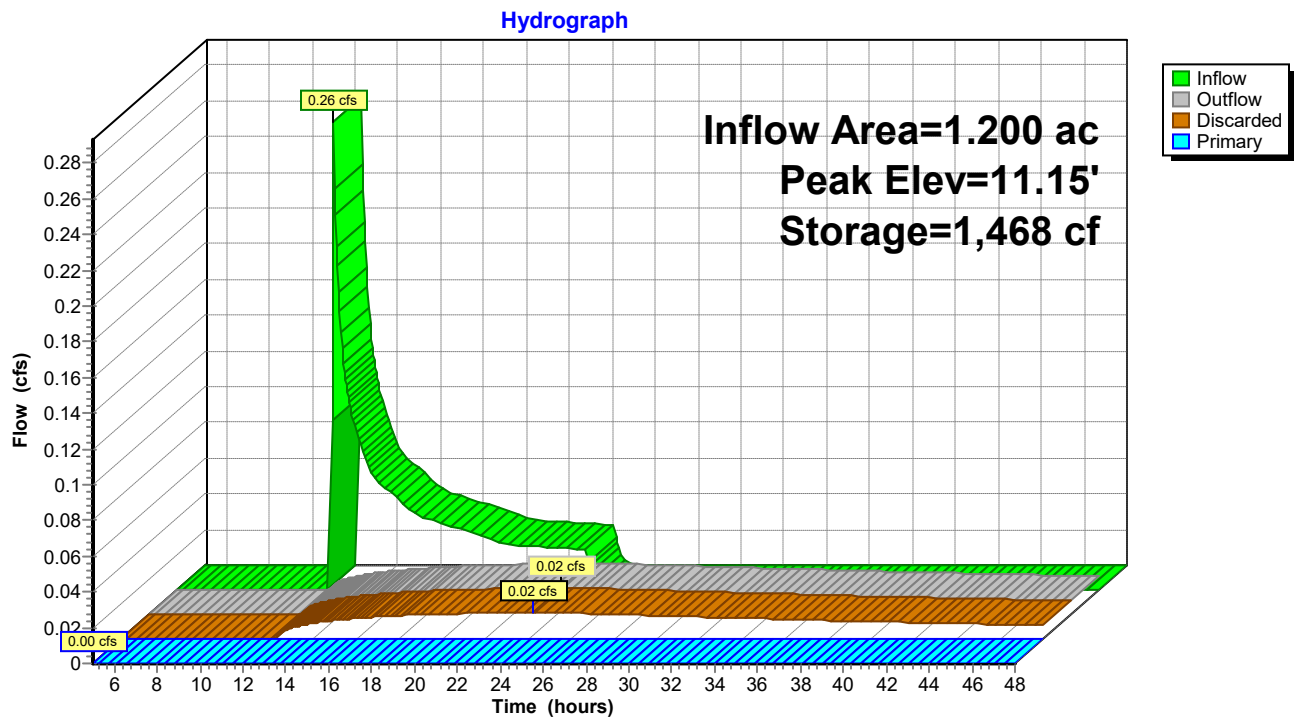
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.10	109	56.0	0	0	109
12.00	1,415	149.0	2,492	2,492	1,678

Device	Routing	Invert	Outlet Devices
#1	Primary	11.65'	Channel/Reach using Reach 5R: Overflow
#2	Discarded	8.10'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 4.00'

Discarded OutFlow Max=0.02 cfs @ 24.21 hrs HW=11.15' (Free Discharge)
 ↑ **2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=8.10' (Free Discharge)
 ↑ **1=Channel/Reach** (Controls 0.00 cfs)

Pond 3P: Infiltration Basin #1



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 99

Summary for Pond 4P: Infiltration Basin #2

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 0.91" for 10-Year event
 Inflow = 1.33 cfs @ 12.32 hrs, Volume= 0.098 af
 Outflow = 0.26 cfs @ 12.92 hrs, Volume= 0.098 af, Atten= 80%, Lag= 35.5 min
 Discarded = 0.26 cfs @ 12.92 hrs, Volume= 0.098 af
 Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 8.10' @ 12.92 hrs Surf.Area= 701 sf Storage= 834 cf

Plug-Flow detention time= 35.0 min calculated for 0.098 af (100% of inflow)

Center-of-Mass det. time= 35.0 min (973.5 - 938.5)

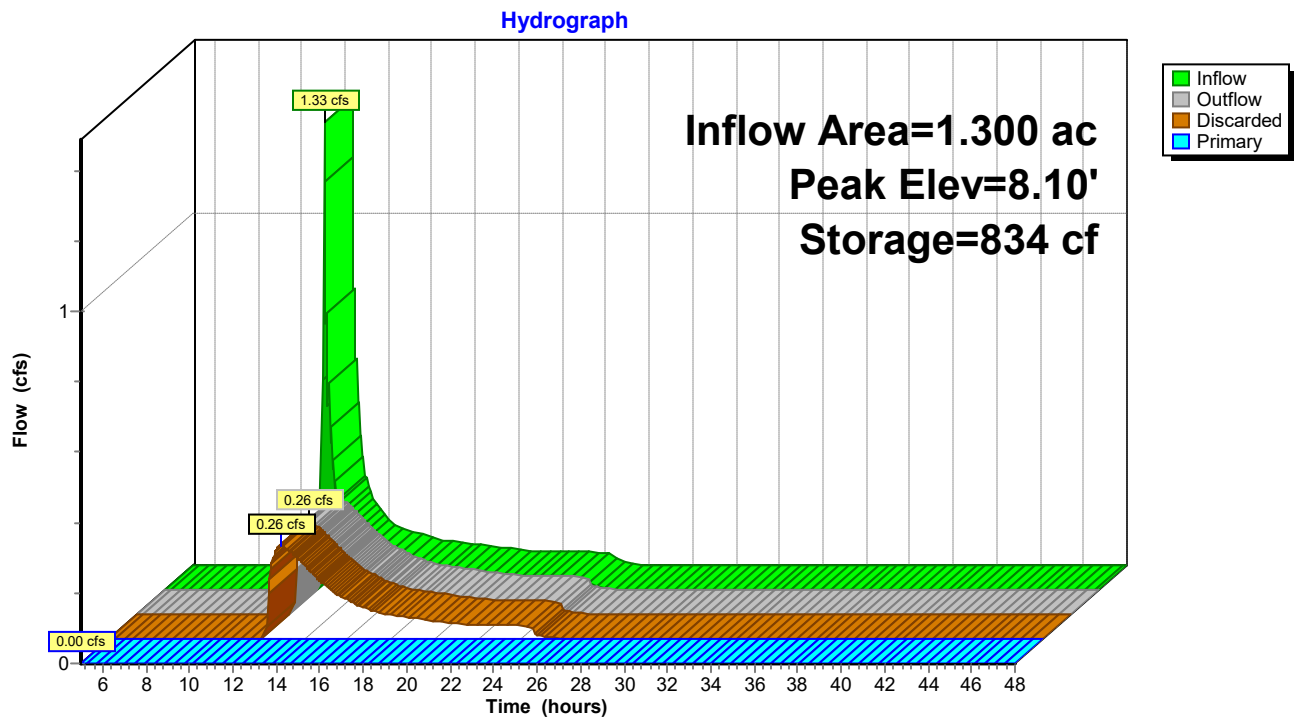
Volume	Invert	Avail.Storage	Storage Description
#1	5.80'	2,495 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	110	56.0	0	0	110
9.70	1,415	150.0	2,495	2,495	1,702

Device	Routing	Invert	Outlet Devices
#1	Primary	8.50'	Channel/Reach using Reach 6R: Overflow
#2	Discarded	5.80'	12.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 3.00'

Discarded OutFlow Max=0.26 cfs @ 12.92 hrs HW=8.10' (Free Discharge)↑ **2=Exfiltration** (Controls 0.26 cfs)**Primary OutFlow** Max=0.00 cfs @ 5.00 hrs HW=5.80' (Free Discharge)↑ **1=Channel/Reach** (Controls 0.00 cfs)

Pond 4P: Infiltration Basin #2



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 101

Summary for Pond 5P: Sedimentation Basin #1

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 0.63" for 10-Year event
 Inflow = 1.03 cfs @ 12.06 hrs, Volume= 0.063 af
 Outflow = 0.26 cfs @ 12.31 hrs, Volume= 0.046 af, Atten= 74%, Lag= 15.4 min
 Primary = 0.26 cfs @ 12.31 hrs, Volume= 0.046 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 12.06' @ 12.32 hrs Surf.Area= 566 sf Storage= 783 cf

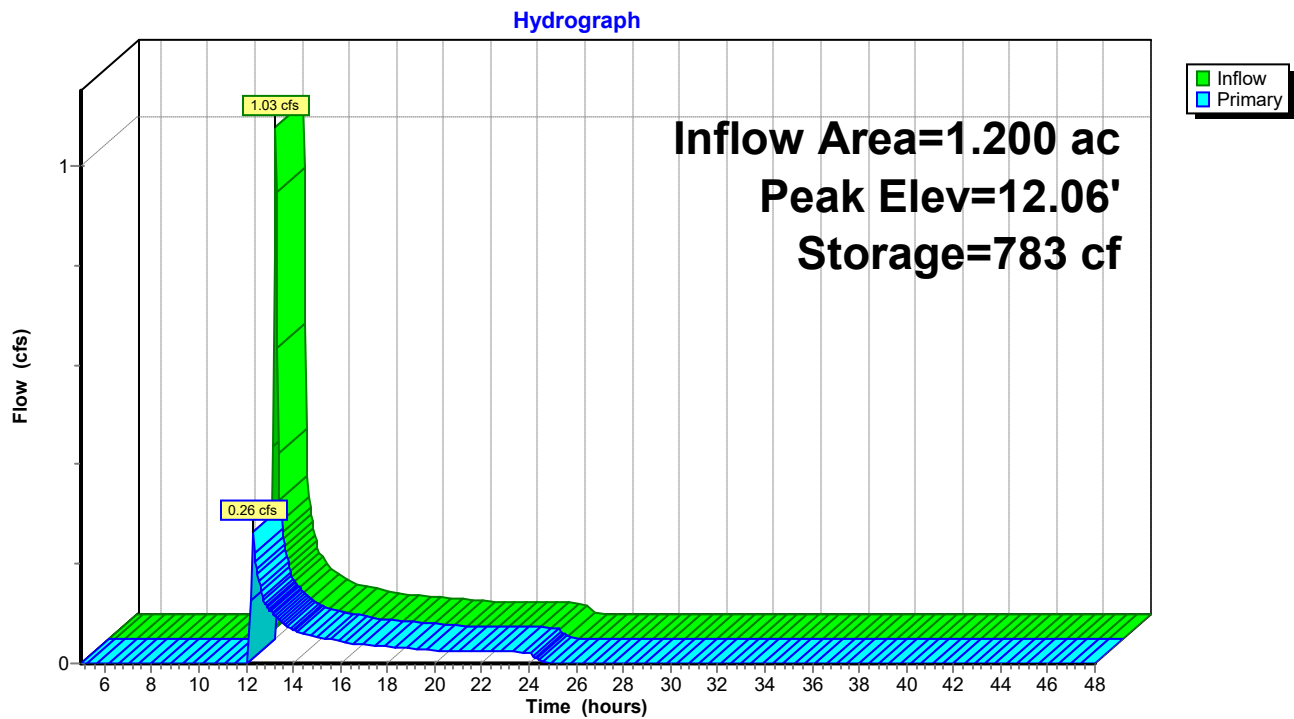
Plug-Flow detention time= 185.4 min calculated for 0.046 af (73% of inflow)
 Center-of-Mass det. time= 71.3 min (976.1 - 904.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	9.00'	1,058 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	41	25.8	0	0	41
10.00	150	46.7	90	90	167
11.00	320	66.6	230	320	355
12.00	550	86.4	430	749	608
12.50	687	96.2	309	1,058	758

Device	Routing	Invert	Outlet Devices
#1	Primary	12.00'	Channel/Reach using Reach 12R: Sediment Basin Overflow

Primary OutFlow Max=0.24 cfs @ 12.31 hrs HW=12.06' (Free Discharge)
 ↑1=Channel/Reach (Channel Controls 0.24 cfs @ 0.41 fps)

Pond 5P: Sedimentation Basin #1



Summary for Pond 16P: Sedimentation Basin #2

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 1.27" for 10-Year event
 Inflow = 2.02 cfs @ 12.17 hrs, Volume= 0.137 af
 Outflow = 1.45 cfs @ 12.31 hrs, Volume= 0.098 af, Atten= 28%, Lag= 8.9 min
 Primary = 1.45 cfs @ 12.31 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 9.14' @ 12.32 hrs Surf.Area= 928 sf Storage= 1,826 cf

Plug-Flow detention time= 174.4 min calculated for 0.098 af (72% of inflow)
 Center-of-Mass det. time= 62.3 min (938.0 - 875.7)

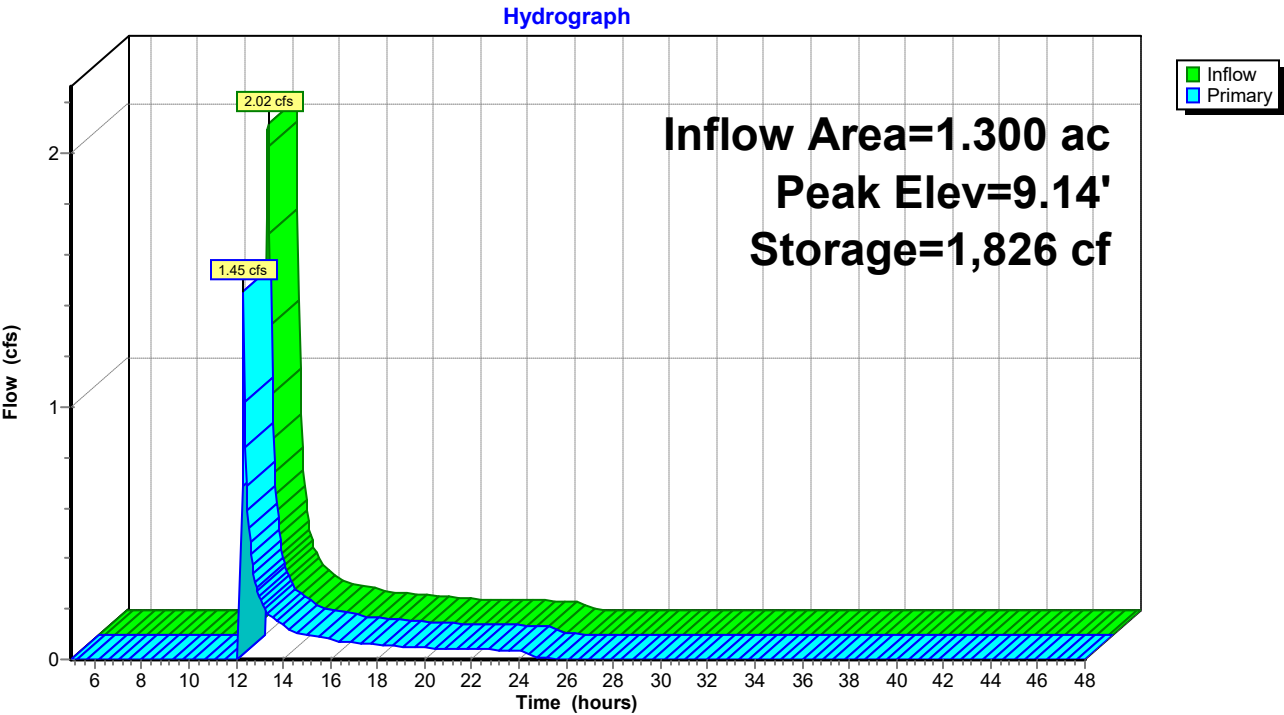
Volume	Invert	Avail.Storage	Storage Description		
#1	5.80'	2,389 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	224	80.0	0	0	224
6.00	257	83.0	48	48	266
7.00	438	98.0	344	392	500
8.00	650	113.0	541	932	773
9.00	892	128.0	768	1,700	1,085
9.70	1,079	139.0	689	2,389	1,337

Device	Routing	Invert	Outlet Devices
#1	Primary	9.00'	Channel/Reach using Reach 17R: Sediment Basin Overflow

Primary OutFlow Max=1.25 cfs @ 12.31 hrs HW=9.12' (Free Discharge)

↑ **1=Channel/Reach** (Channel Controls 1.25 cfs @ 0.67 fps)

Pond 16P: Sedimentation Basin #2

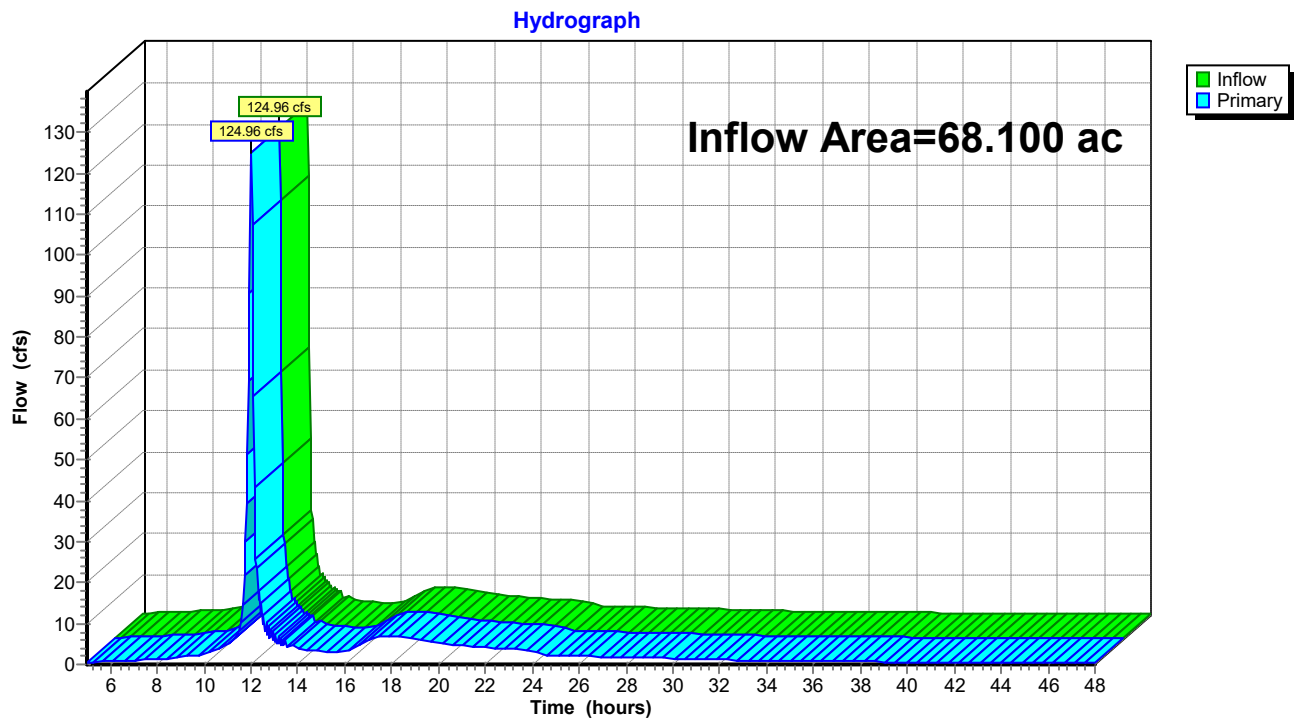


Summary for Pond AP-1: Analysis Point #1

Inflow Area = 68.100 ac, 20.36% Impervious, Inflow Depth > 1.94" for 10-Year event
 Inflow = 124.96 cfs @ 12.01 hrs, Volume= 10.994 af
 Primary = 124.96 cfs @ 12.01 hrs, Volume= 10.994 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-1: Analysis Point #1



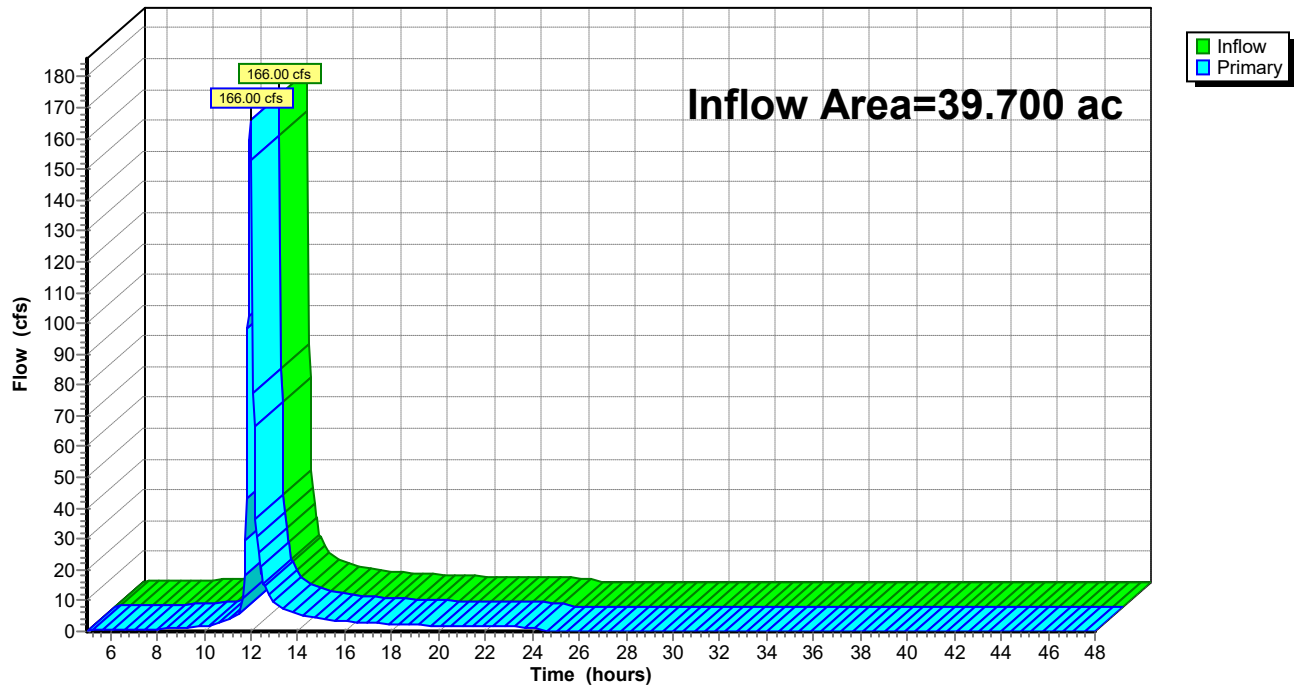
Summary for Pond AP-2: Analysis Point #2

Inflow Area = 39.700 ac, 23.10% Impervious, Inflow Depth > 2.53" for 10-Year event
Inflow = 166.00 cfs @ 11.97 hrs, Volume= 8.362 af
Primary = 166.00 cfs @ 11.97 hrs, Volume= 8.362 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-2: Analysis Point #2

Hydrograph

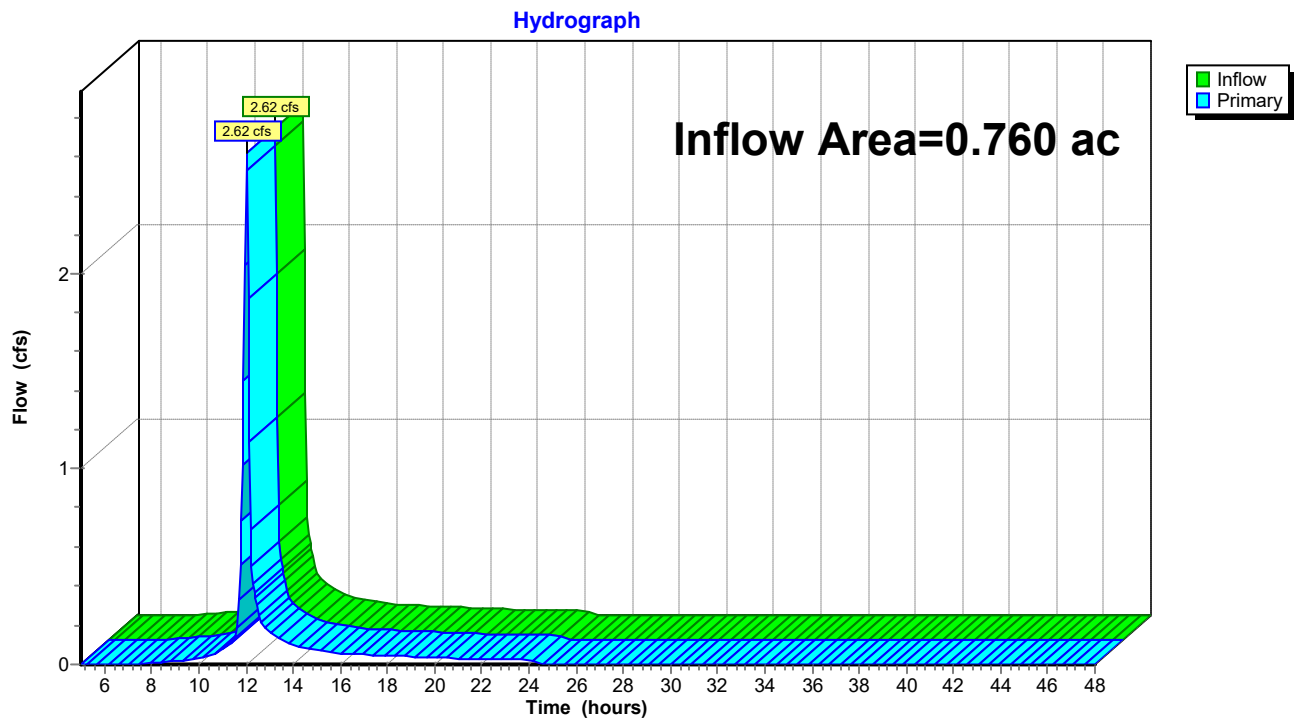


Summary for Pond AP-3: Analysis Point #3

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth = 2.21" for 10-Year event
Inflow = 2.62 cfs @ 12.02 hrs, Volume= 0.140 af
Primary = 2.62 cfs @ 12.02 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Pond AP-3: Analysis Point #3



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 108

Summary for Pond C-1: Chamber Series 1

Inflow Area = 10.300 ac, 66.70% Impervious, Inflow Depth > 3.23" for 10-Year event
 Inflow = 49.84 cfs @ 11.98 hrs, Volume= 2.772 af
 Outflow = 50.37 cfs @ 11.97 hrs, Volume= 2.412 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.13 cfs @ 11.97 hrs, Volume= 0.347 af
 Primary = 50.24 cfs @ 11.97 hrs, Volume= 2.065 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 13.64' @ 11.97 hrs Surf.Area= 12,440 sf Storage= 29,816 cf

Plug-Flow detention time= 222.6 min calculated for 2.411 af (87% of inflow)
 Center-of-Mass det. time= 160.8 min (929.8 - 769.0)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	11,722 cf	37.08'W x 227.97'L x 5.50'H Field B 46,496 cf Overall - 17,192 cf Embedded = 29,305 cf x 40.0% Voids
#2B	6.75'	17,192 cf	ADS_StormTech MC-3500 d +Cap x 155 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 155 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#3	13.25'	6,100 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		35,013 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
13.25	600	0	0
13.75	4,900	1,375	1,375
14.00	8,200	1,638	3,013
14.25	16,500	3,088	6,100

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	10.00'	36.0" Round Culvert L= 55.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 10.00' / 7.59' S= 0.0431 ' S= 0.0431 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Secondary	14.24'	50.0' long x 0.7' breadth Concrete Curb Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.13 cfs @ 11.97 hrs HW=13.50' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=48.14 cfs @ 11.97 hrs HW=13.50' (Free Discharge)

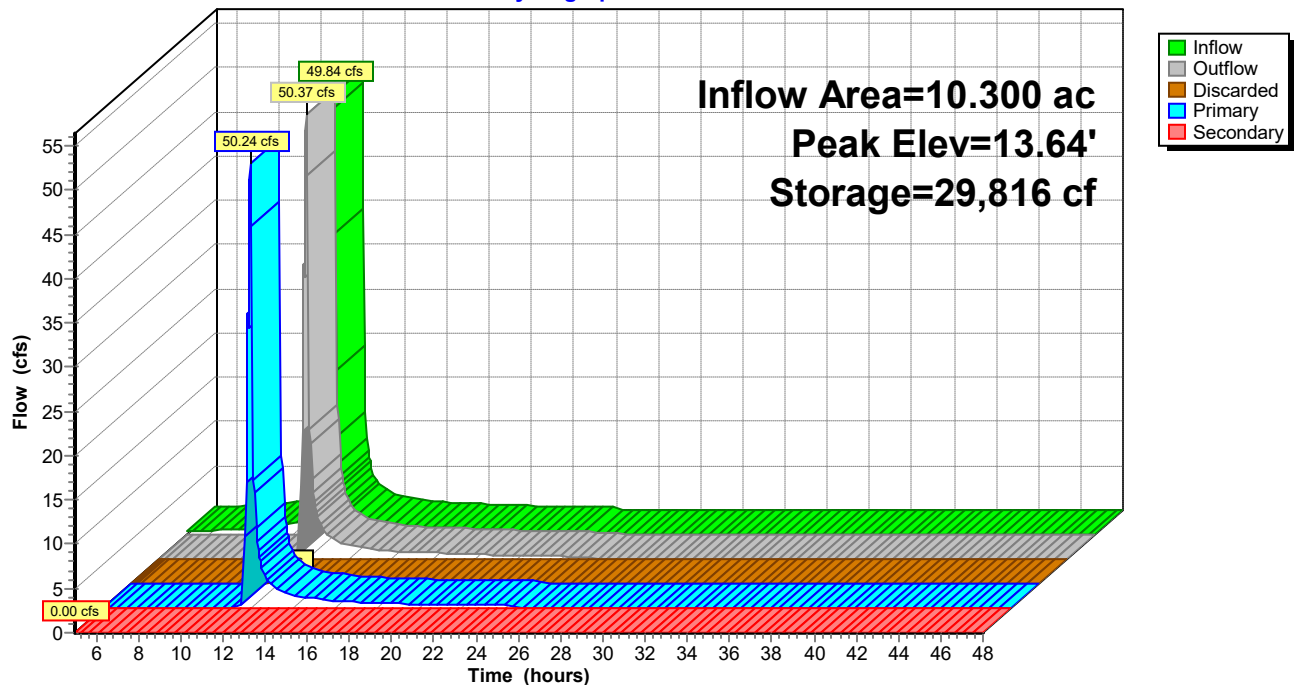
↑ **2=Culvert** (Inlet Controls 48.14 cfs @ 6.81 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.01' (Free Discharge)

↑ **3=Concrete Curb** (Controls 0.00 cfs)

Pond C-1: Chamber Series 1

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 110

Summary for Pond C-4: Chamber Series 4

Inflow Area = 8.900 ac, 0.00% Impervious, Inflow Depth > 2.95" for 10-Year event
 Inflow = 39.82 cfs @ 11.99 hrs, Volume= 2.188 af
 Outflow = 44.40 cfs @ 11.96 hrs, Volume= 1.858 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.08 cfs @ 11.95 hrs, Volume= 0.261 af
 Primary = 44.32 cfs @ 11.96 hrs, Volume= 1.597 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Peak Elev= 14.18' @ 11.96 hrs Surf.Area= 7,104 sf Storage= 21,828 cf

Plug-Flow detention time= 221.0 min calculated for 1.858 af (85% of inflow)

Center-of-Mass det. time= 153.0 min (936.6 - 783.6)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	8,911 cf	29.92'W x 213.63'L x 5.50'H Field B 35,151 cf Overall - 12,874 cf Embedded = 22,277 cf x 40.0% Voids
#2B	6.75'	12,874 cf	ADS_StormTech MC-3500 d +Cap x 116 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 116 Chambers in 4 Rows Cap Storage= +14.9 cf x 2 x 4 rows = 119.2 cf
#3	14.10'	8,015 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		29,800 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.10	400	0	0
14.60	2,400	700	700
14.80	6,300	870	1,570
15.10	10,000	2,445	4,015
15.50	10,000	4,000	8,015

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	11.00'	36.0" Round Culvert L= 24.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 11.00' / 9.42' S= 0.0650 ' /' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 7.07 sf
#3	Secondary	15.50'	100.0' long x 0.5' breadth Wharf Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

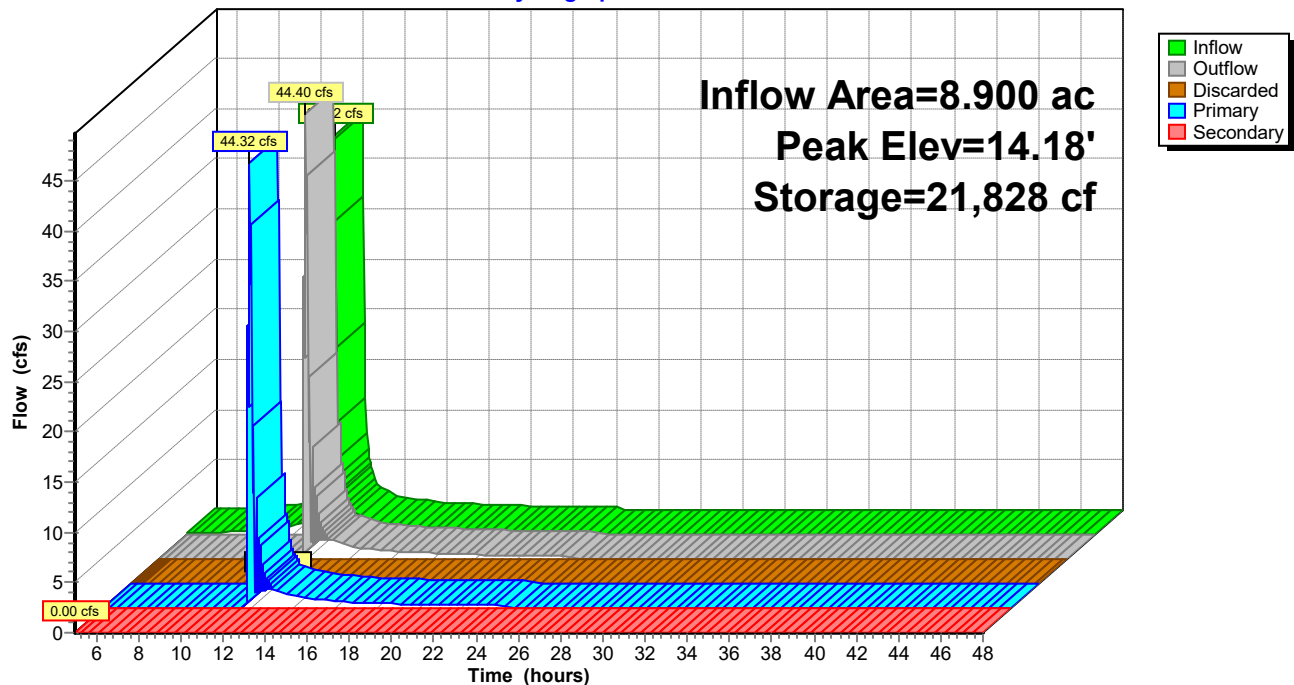
Discarded OutFlow Max=0.08 cfs @ 11.95 hrs HW=14.15' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=42.04 cfs @ 11.96 hrs HW=14.03' (Free Discharge)
 ↑2=Culvert (Inlet Controls 42.04 cfs @ 5.95 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.00' (Free Discharge)
 ↑3=Wharf (Controls 0.00 cfs)

Pond C-4: Chamber Series 4

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 10-Year Rainfall=3.63"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 112

Summary for Pond C-5: Chamber Series 5

Inflow Area = 5.200 ac, 0.00% Impervious, Inflow Depth > 2.95" for 10-Year event
 Inflow = 23.53 cfs @ 11.98 hrs, Volume= 1.279 af
 Outflow = 24.69 cfs @ 12.02 hrs, Volume= 1.023 af, Atten= 0%, Lag= 2.2 min
 Discarded = 0.19 cfs @ 12.00 hrs, Volume= 0.391 af
 Primary = 24.51 cfs @ 12.02 hrs, Volume= 0.633 af
 Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 15.19' @ 12.02 hrs Surf.Area= 16,669 sf Storage= 24,121 cf

Plug-Flow detention time= 425.0 min calculated for 1.022 af (80% of inflow)
 Center-of-Mass det. time= 347.1 min (1,130.4 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1B	6.00'	7,757 cf	28.50'W x 168.47'L x 6.75'H Field B 32,409 cf Overall - 13,016 cf Embedded = 19,393 cf x 40.0% Voids
#2B	6.75'	13,016 cf	ADS_StormTech MC-4500 b +Cap x 120 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 120 Chambers in 3 Rows Cap Storage= +39.5 cf x 2 x 3 rows = 237.0 cf
#3	14.60'	7,420 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
		28,193 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
14.60	200	0	0
14.80	1,000	120	120
15.00	10,000	1,100	1,220
15.50	14,800	6,200	7,420

Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	1.000 in/hr Exfiltration over Surface area
#2	Primary	12.60'	36.0" Round Culvert L= 62.8' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 12.60' / 12.29' S= 0.0049 ' / ' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 7.07 sf
#3	Secondary	15.50'	100.0' long x 0.5' breadth Wharf Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.19 cfs @ 12.00 hrs HW=14.85' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=21.56 cfs @ 12.02 hrs HW=14.81' (Free Discharge)

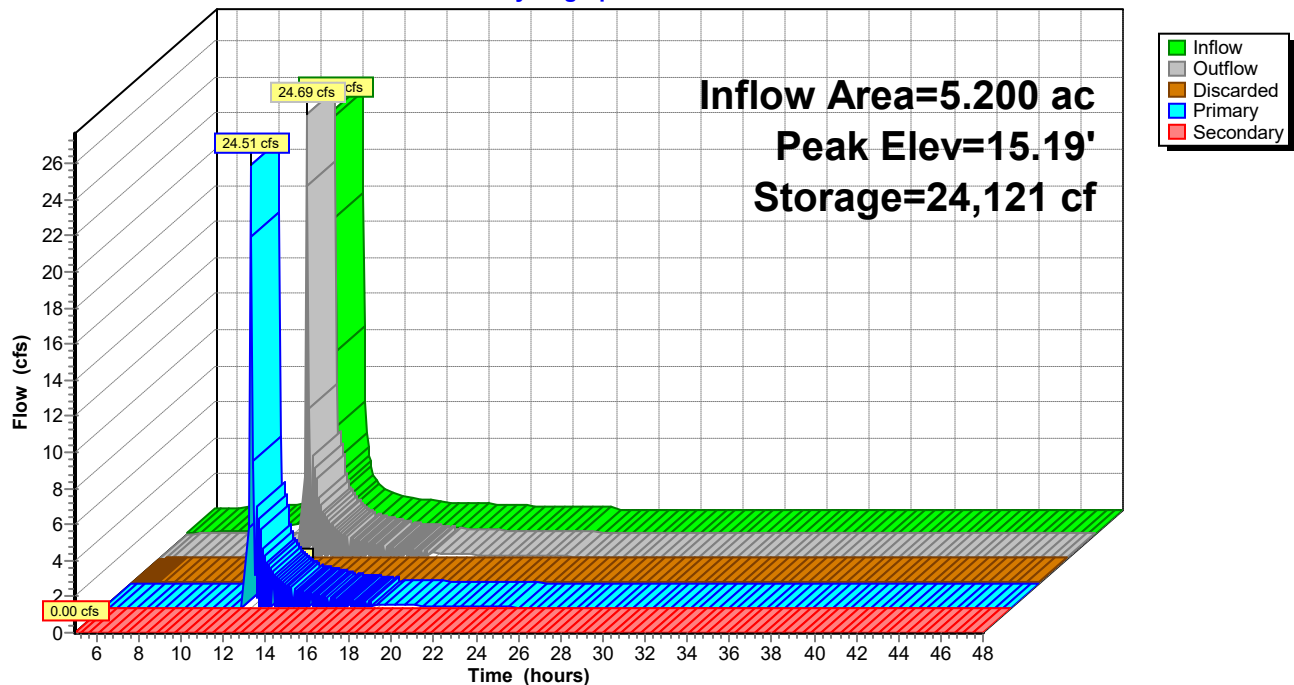
↑**2=Culvert** (Barrel Controls 21.56 cfs @ 5.38 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=6.00' (Free Discharge)

↑**3=Wharf** (Controls 0.00 cfs)

Pond C-5: Chamber Series 5

Hydrograph



Summary for Subcatchment DR-1: Building A & Storage

Runoff = 84.97 cfs @ 11.98 hrs, Volume= 4.805 af, Depth> 5.60"

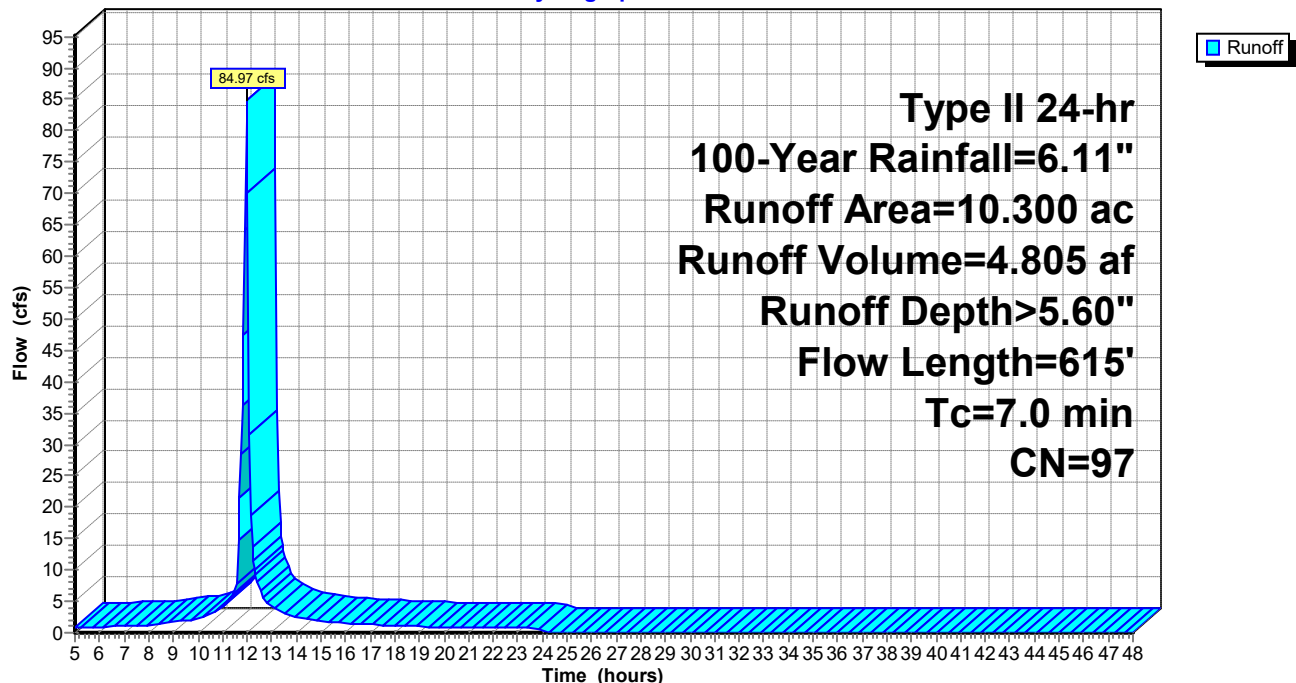
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 6.870	98	Building A
0.100	80	>75% Grass cover, Good, HSG D
* 3.330	95	Dense Graded Aggregate
10.300	97	Weighted Average
3.430		33.30% Pervious Area
6.870		66.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.1	300	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	215	0.0050	5.91	29.00	Pipe Channel, 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.013
7.0	615	Total			

Subcatchment DR-1: Building A & Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 115

Summary for Subcatchment DR-10: Undisturbed Area

Runoff = 26.67 cfs @ 13.16 hrs, Volume= 6.234 af, Depth= 3.78"

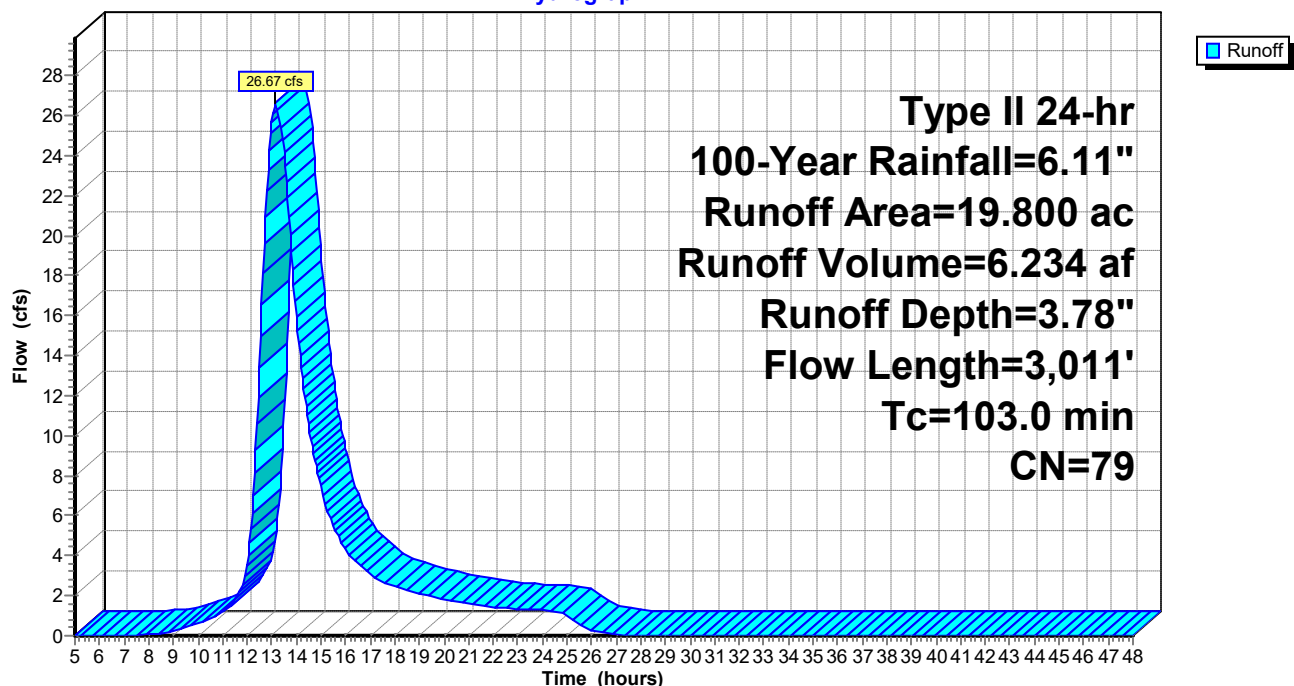
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
19.800	79	Woods, Fair, HSG D
19.800		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.7	150	0.0800	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"
3.0	200	0.0500	1.12		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.6	250	0.2600	2.55		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
78.7	2,361	0.0100	0.50		Shallow Concentrated Flow, Wetland Flow Woodland Kv= 5.0 fps
0.0	50	0.0500	22.86	161.57	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012 Corrugated PP, smooth interior
103.0	3,011	Total			

Subcatchment DR-10: Undisturbed Area

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 116

Summary for Subcatchment DR-11: Hudson River Bank

Runoff = 18.71 cfs @ 12.08 hrs, Volume= 1.259 af, Depth= 3.78"

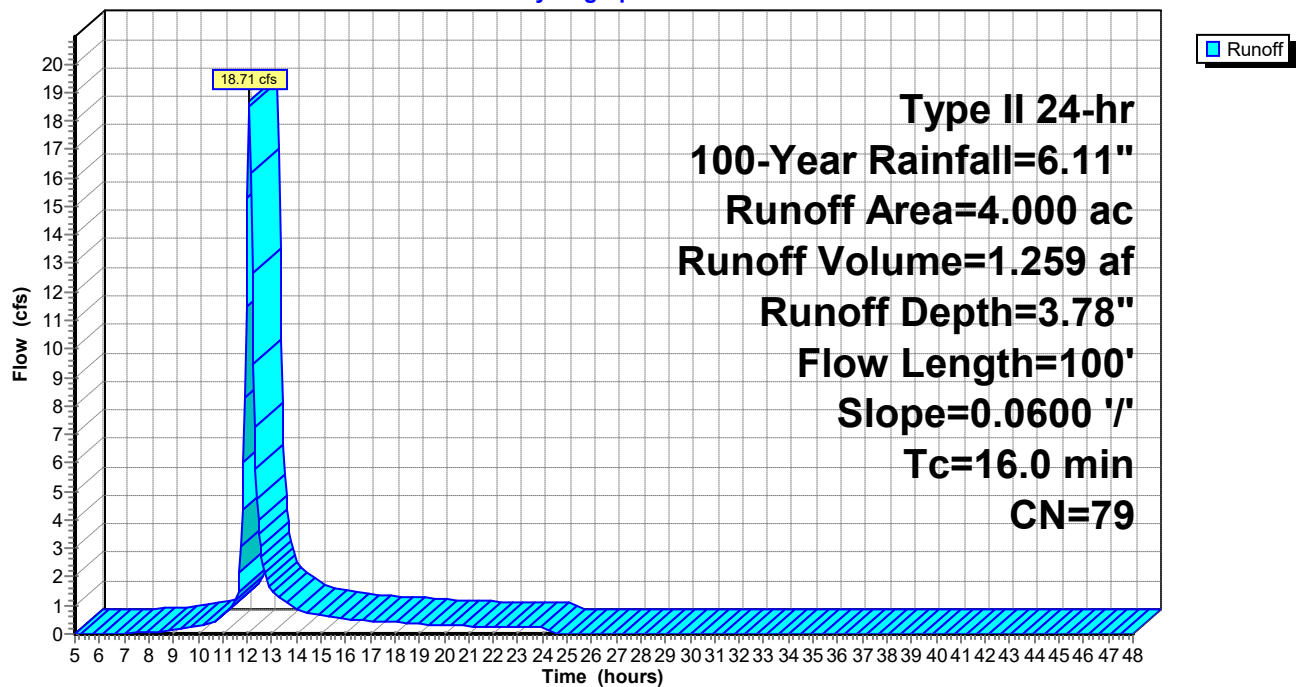
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
4.000	79	Woods, Fair, HSG D
4.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-11: Hudson River Bank

Hydrograph



Summary for Subcatchment DR-12: Normans Kill Bank

Runoff = 11.17 cfs @ 11.96 hrs, Volume= 0.588 af, Depth> 5.04"

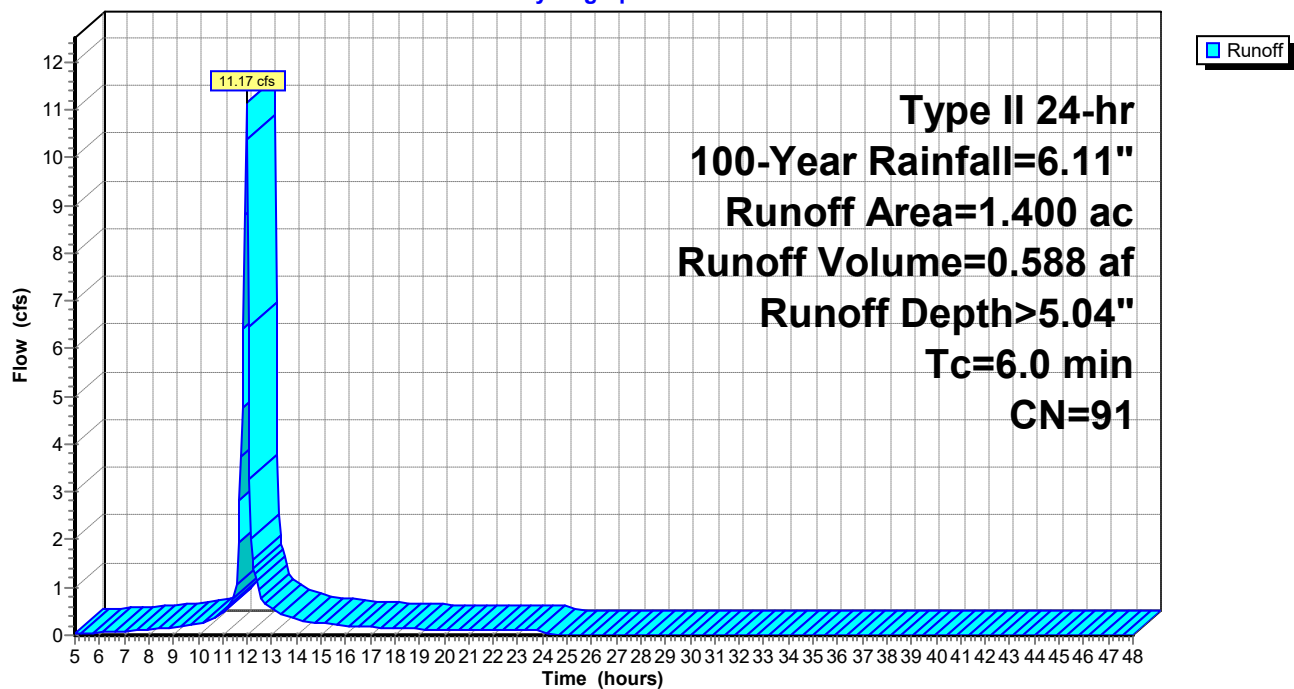
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
0.430	79	Woods, Fair, HSG D
0.970	96	Gravel surface, HSG D
1.400	91	Weighted Average
1.400		100.00% Pervious Area

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

Subcatchment DR-12: Normans Kill Bank

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 118

Summary for Subcatchment DR-13: Roadway

Runoff = 4.32 cfs @ 11.98 hrs, Volume= 0.208 af, Depth= 2.08"

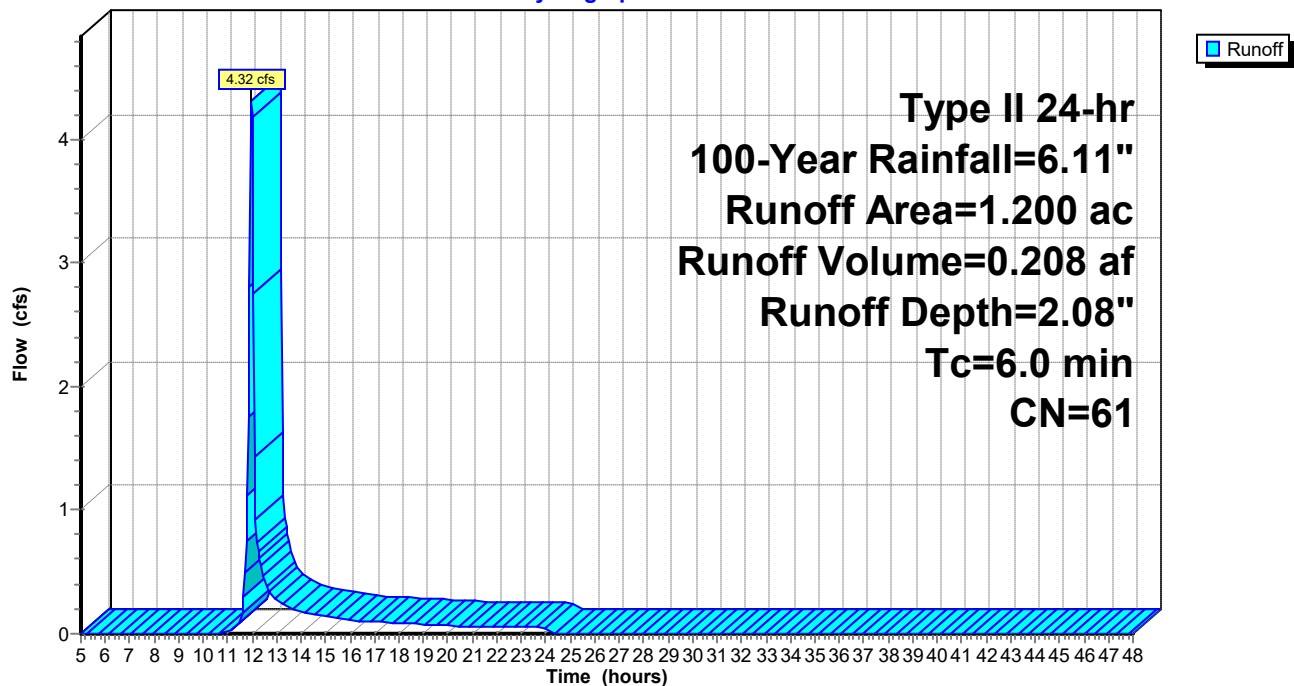
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 0.450	98	Pavement
0.750	39	>75% Grass cover, Good, HSG A
1.200	61	Weighted Average
0.750		62.50% Pervious Area
0.450		37.50% Impervious Area

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

Subcatchment DR-13: Roadway

Hydrograph



Summary for Subcatchment DR-14: Roadway

Runoff = 7.10 cfs @ 11.97 hrs, Volume= 0.345 af, Depth= 3.18"

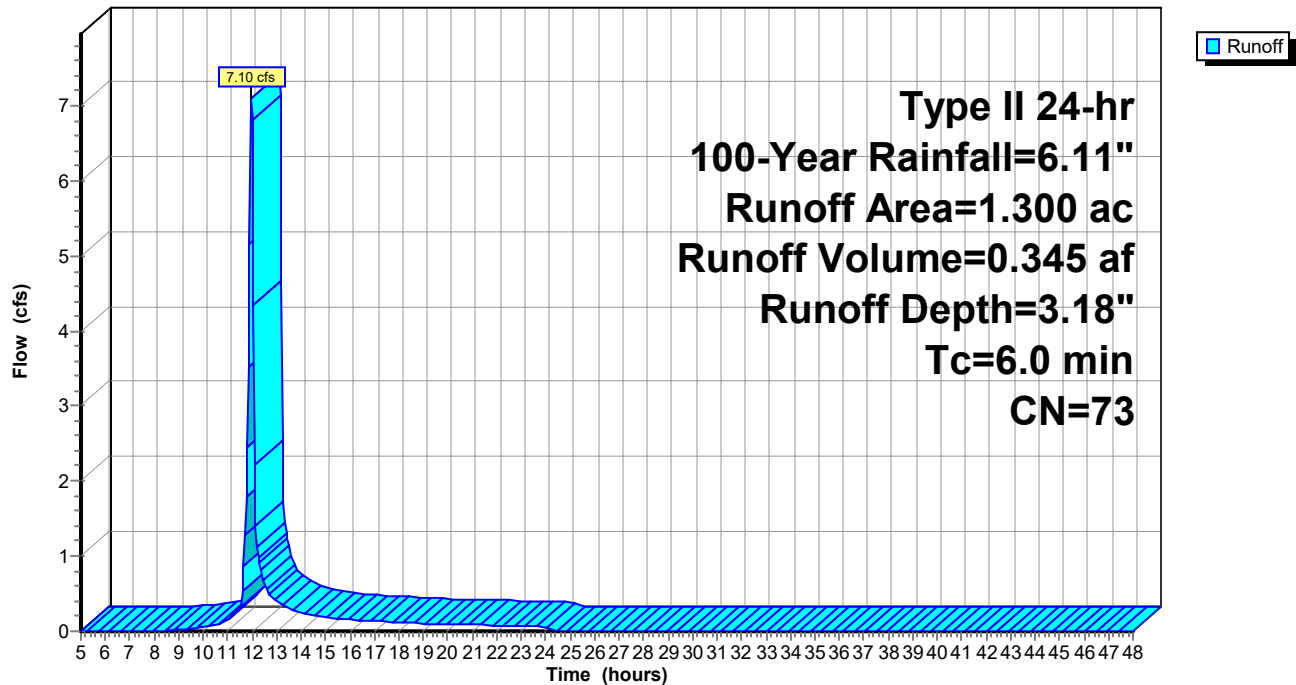
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 0.550	98	New Pavement
0.550	39	>75% Grass cover, Good, HSG A
* 0.200	98	Mill & Fill of Old Pavement
1.300	73	Weighted Average
0.550		42.31% Pervious Area
0.750		57.69% Impervious Area

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

Subcatchment DR-14: Roadway

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 120

Summary for Subcatchment DR-15: Roadway

Runoff = 8.32 cfs @ 11.96 hrs, Volume= 0.453 af, Depth> 5.43"

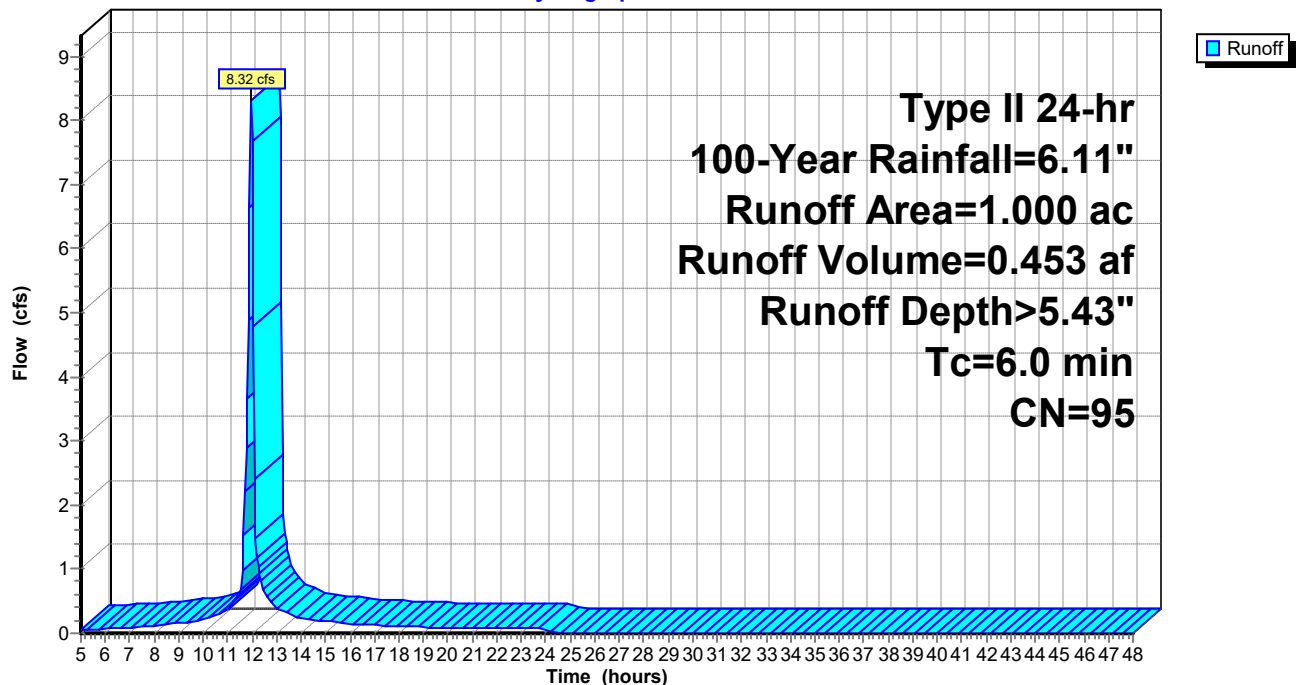
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

	Area (ac)	CN	Description
*	0.050	98	New Pavement
	0.050	39	>75% Grass cover, Good, HSG A
*	0.900	98	Mill & Fill of Old Pavement
	1.000	95	Weighted Average
	0.050		5.00% Pervious Area
	0.950		95.00% Impervious Area

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

Subcatchment DR-15: Roadway

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 121

Summary for Subcatchment DR-16: Undisturbed Area

Runoff = 2.86 cfs @ 12.41 hrs, Volume= 0.537 af, Depth= 0.72"

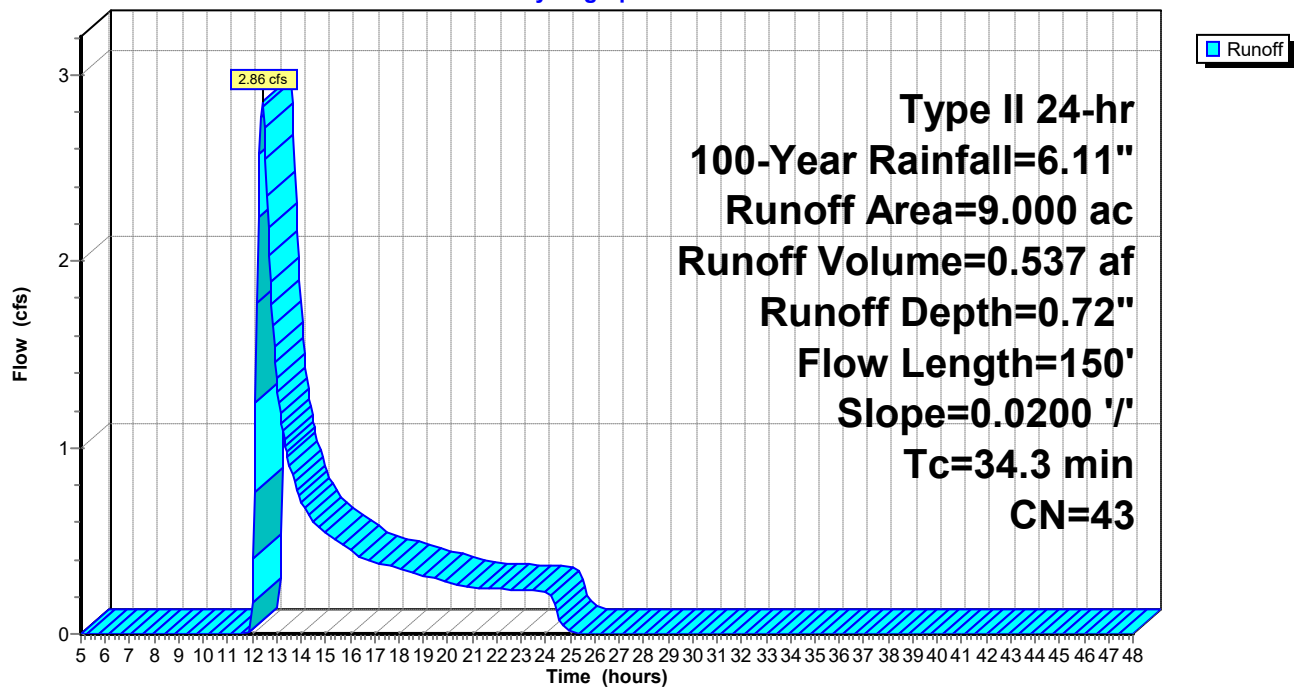
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
9.000	43	Woods/grass comb., Fair, HSG A
9.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
34.3	150	0.0200	0.07		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 2.40"

Subcatchment DR-16: Undisturbed Area

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 122

Summary for Subcatchment DR-17: Roadway

Runoff = 5.62 cfs @ 11.97 hrs, Volume= 0.286 af, Depth> 4.51"

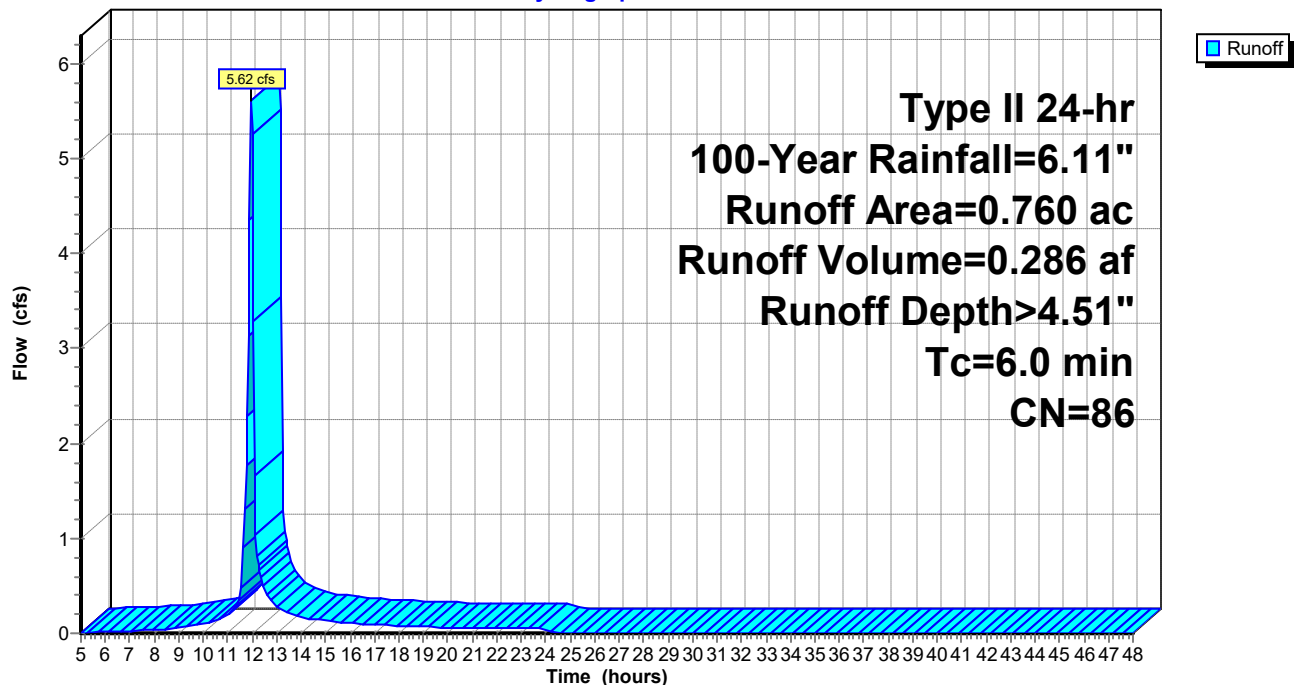
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

	Area (ac)	CN	Description
*	0.140	98	Road Widening
*	0.460	98	Roadway
	0.160	39	>75% Grass cover, Good, HSG A
	0.760	86	Weighted Average
	0.160		21.05% Pervious Area
	0.600		78.95% Impervious Area

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

Subcatchment DR-17: Roadway

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 123

Summary for Subcatchment DR-2: Storage

Runoff = 42.20 cfs @ 12.00 hrs, Volume= 2.447 af, Depth> 5.34"

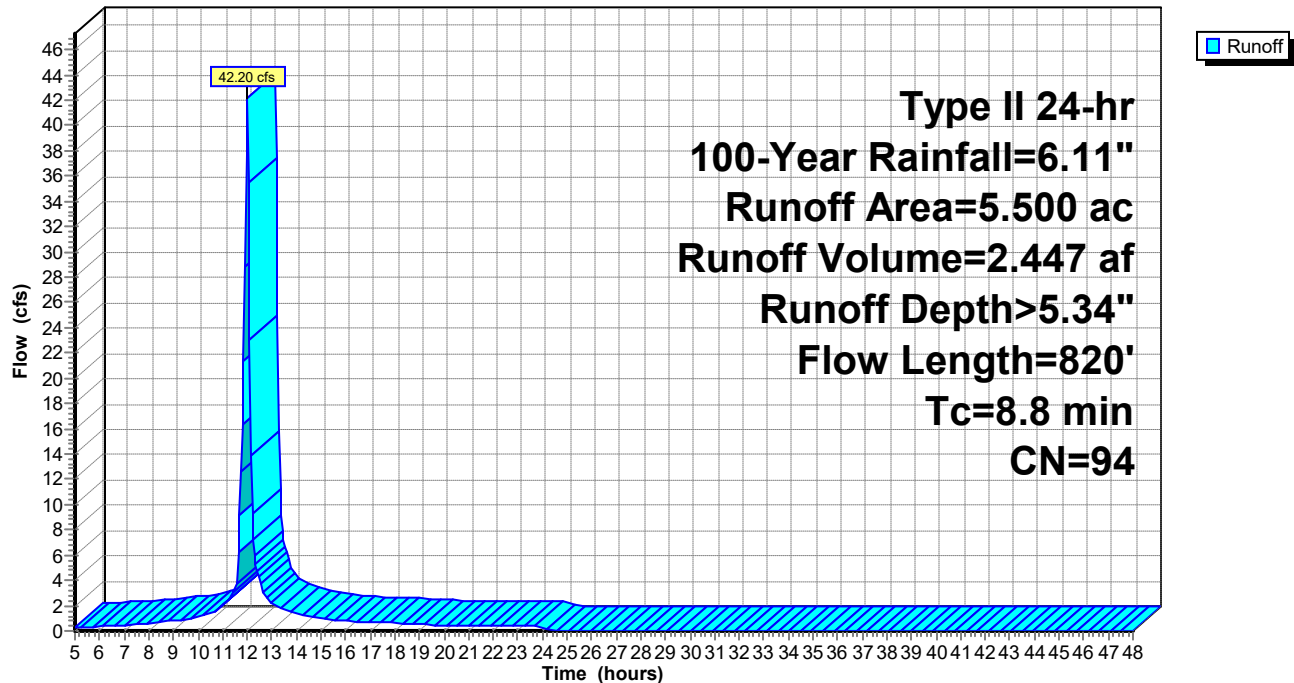
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 5.300	95	Dense Graded Aggregate
0.200	80	>75% Grass cover, Good, HSG D
5.500	94	Weighted Average
5.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.9	470	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	250	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
8.8	820	Total			

Subcatchment DR-2: Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 124

Summary for Subcatchment DR-3: Rail & Storage

Runoff = 82.94 cfs @ 12.00 hrs, Volume= 4.980 af, Depth> 5.43"

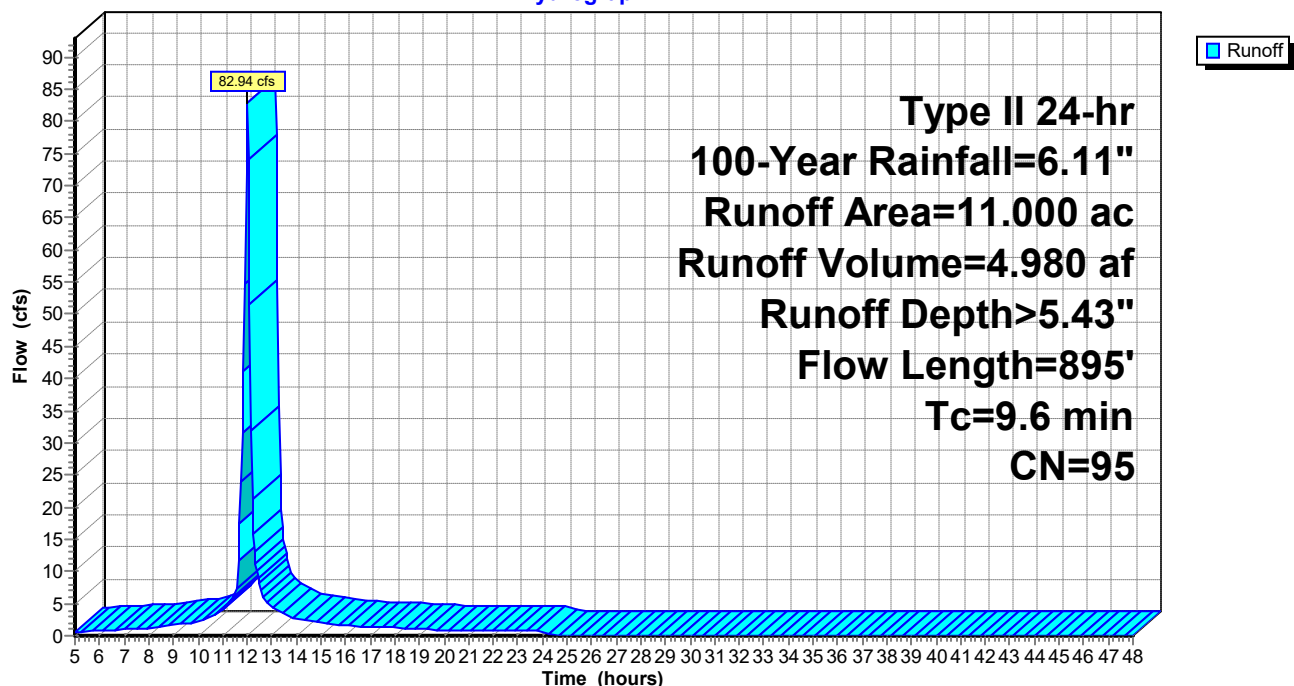
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 8.300	95	Compacted Gravel
0.400	80	>75% Grass cover, Good, HSG D
* 2.300	98	Rail
11.000	95	Weighted Average
8.700		79.09% Pervious Area
2.300		20.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
5.4	525	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.9	270	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.6	895	Total			

Subcatchment DR-3: Rail & Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 125

Summary for Subcatchment DR-4: Storage

Runoff = 69.96 cfs @ 11.99 hrs, Volume= 3.959 af, Depth> 5.34"

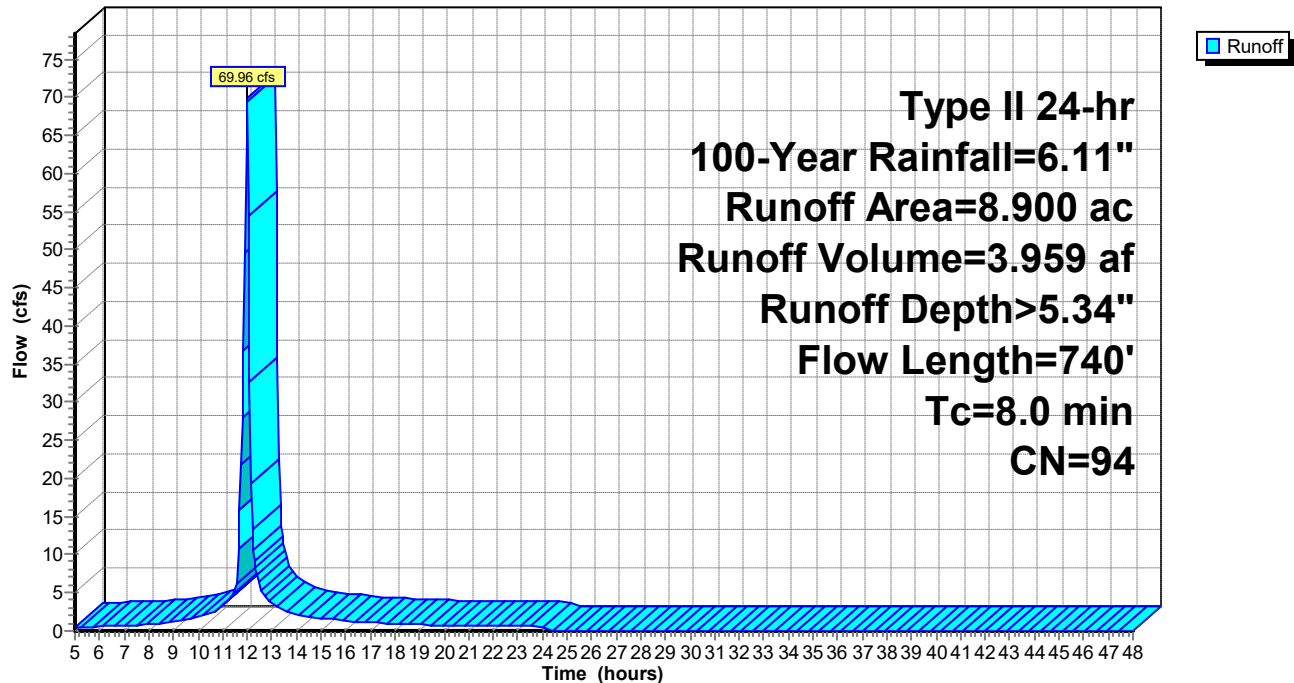
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 8.600	95	Compacted Gravel
0.300	80	>75% Grass cover, Good, HSG D
8.900	94	Weighted Average
8.900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
4.1	400	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
0.6	240	0.0050	6.67	47.16	Pipe Channel, 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013 Corrugated PE, smooth interior
8.0	740	Total			

Subcatchment DR-4: Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 126

Summary for Subcatchment DR-5: Storage

Runoff = 41.34 cfs @ 11.98 hrs, Volume= 2.313 af, Depth> 5.34"

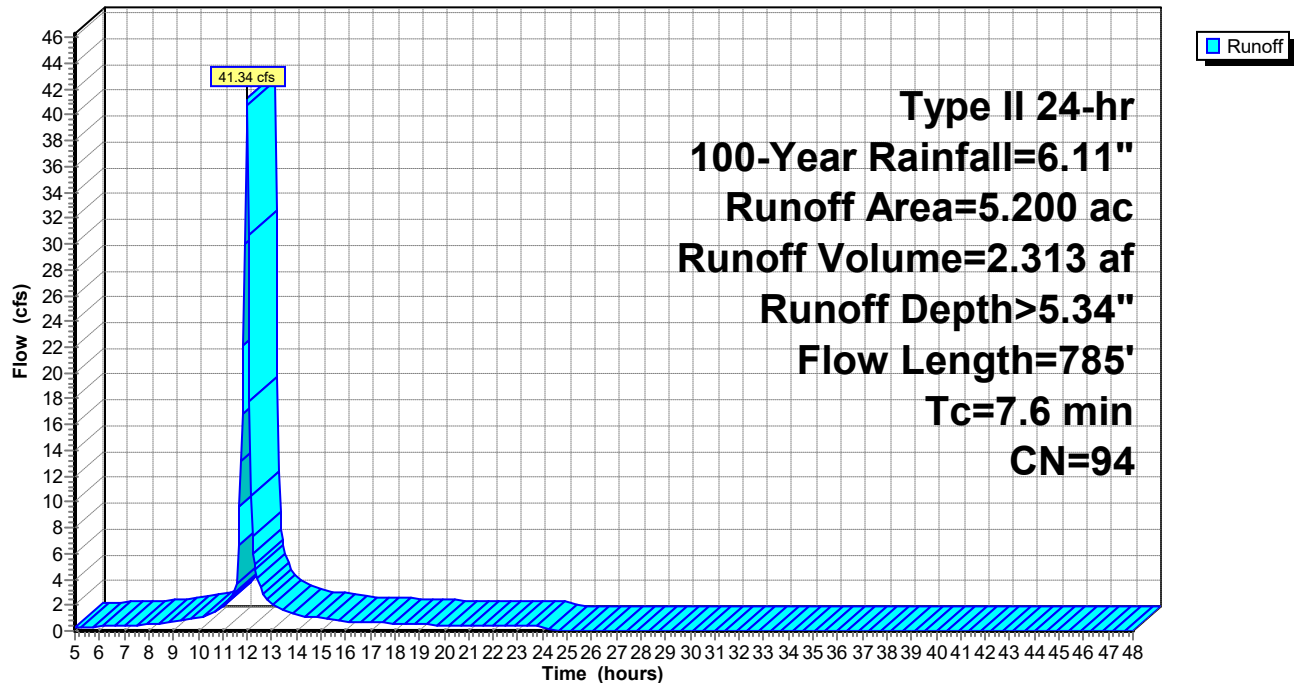
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 4.900	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
5.200	94	Weighted Average
5.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
3.0	285	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.3	400	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
7.6	785	Total			

Subcatchment DR-5: Storage

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 127

Summary for Subcatchment DR-6: Buldings B & D

Runoff = 92.04 cfs @ 11.99 hrs, Volume= 5.428 af, Depth> 5.52"

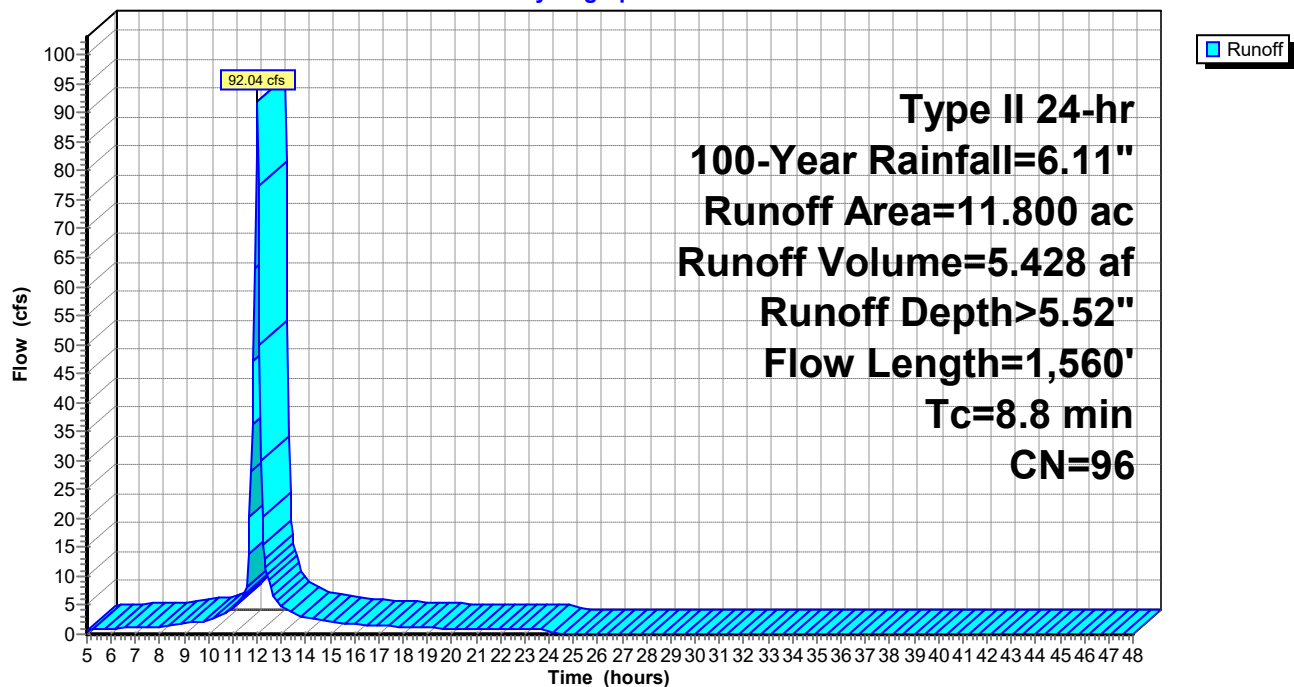
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 2.549	98	Building B
* 1.413	98	Building D
0.200	80	>75% Grass cover, Good, HSG D
* 7.638	95	Dense Graded Aggregate
11.800	96	Weighted Average
7.838		66.42% Pervious Area
3.962		33.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
1.0	100	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
4.5	1,360	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
8.8	1,560	Total			

Subcatchment DR-6: Buldings B & D

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 128

Summary for Subcatchment DR-7: Building C & Rail

Runoff = 65.86 cfs @ 12.00 hrs, Volume= 4.003 af, Depth> 5.52"

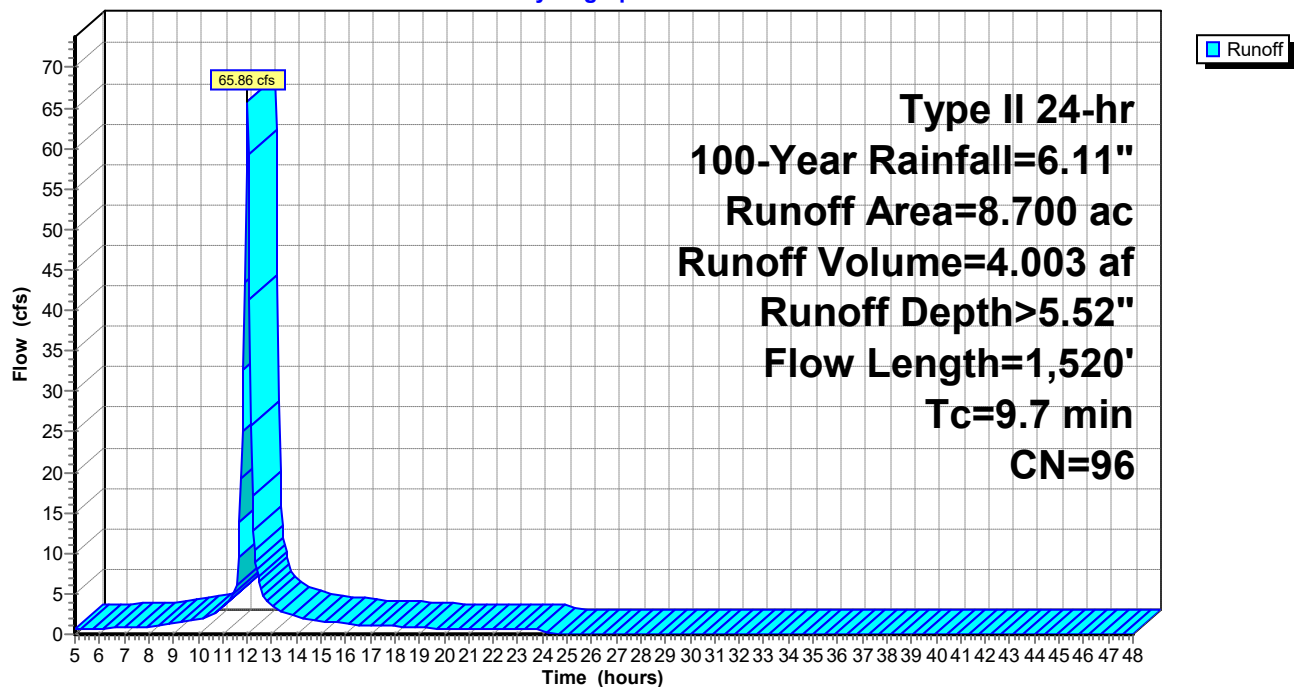
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 3.030	98	Building C
* 0.970	98	Rail
* 4.400	95	Dense Graded Aggregate
0.300	80	>75% Grass cover, Good, HSG D
8.700	96	Weighted Average
4.700		54.02% Pervious Area
4.000		45.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	100	0.0100	0.50		Sheet Flow, n= 0.023 P2= 2.40"
2.6	250	0.0100	1.61		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
3.8	1,170	0.0050	5.09	16.00	Pipe Channel, 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.013
9.7	1,520	Total			

Subcatchment DR-7: Building C & Rail

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 129

Summary for Subcatchment DR-8A: Parking

Runoff = 15.81 cfs @ 11.96 hrs, Volume= 0.860 af, Depth> 5.43"

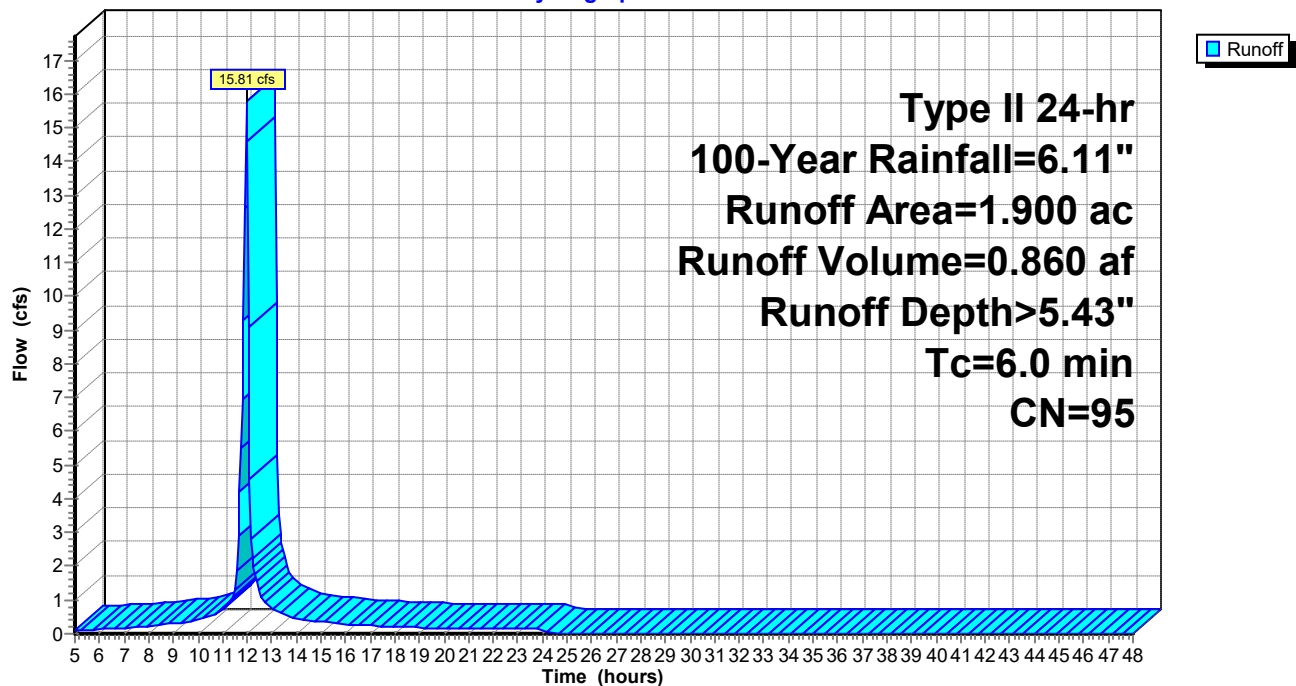
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 1.600	98	Parking
0.300	80	>75% Grass cover, Good, HSG D
1.900	95	Weighted Average
0.300		15.79% Pervious Area
1.600		84.21% Impervious Area

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

Subcatchment DR-8A: Parking

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 130

Summary for Subcatchment DR-8B: Roadway & Pond

Runoff = 7.26 cfs @ 11.97 hrs, Volume= 0.367 af, Depth> 4.41"

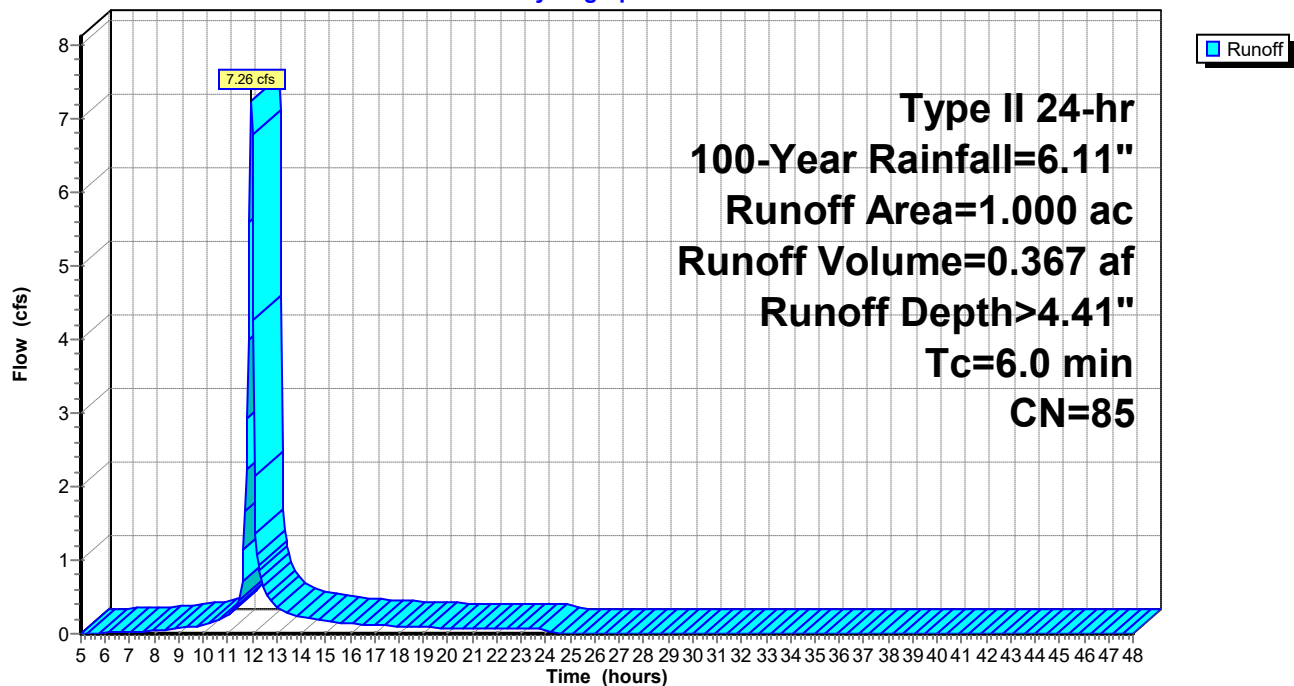
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 0.300	98	Roadway
0.700	80	>75% Grass cover, Good, HSG D
1.000	85	Weighted Average
0.700		70.00% Pervious Area
0.300		30.00% Impervious Area

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

Subcatchment DR-8B: Roadway & Pond

Hydrograph



Summary for Subcatchment DR-9A: Parking & Substation

Runoff = 12.25 cfs @ 12.04 hrs, Volume= 0.815 af, Depth> 5.44"

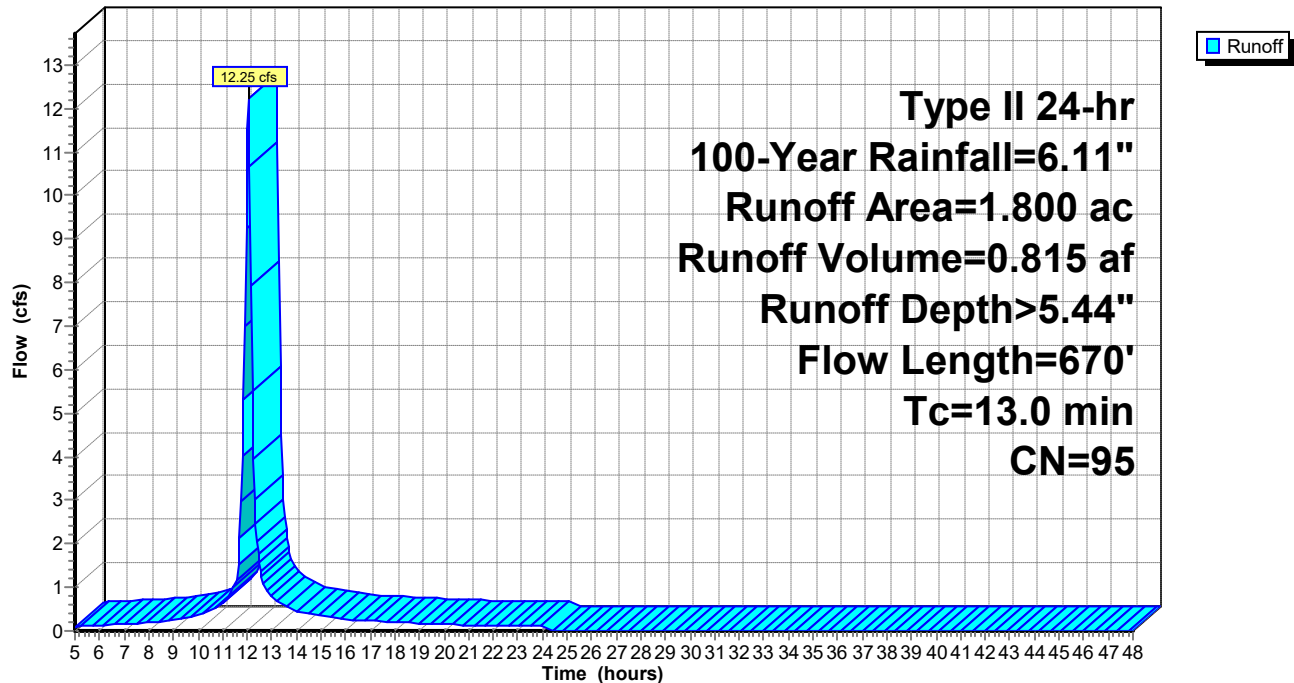
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
0.230	80	>75% Grass cover, Good, HSG D
* 0.200	92	Compacted Gravel
* 1.200	98	Parking and Road
* 0.170	98	Substation
1.800	95	Weighted Average
0.430		23.89% Pervious Area
1.370		76.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	100	0.0200	1.19		Sheet Flow, Parking Lot Runoff
					Smooth surfaces n= 0.011 P2= 2.40"
11.6	570	0.0030	0.82		Shallow Concentrated Flow, Grass Lined Ditch to Pond
					Grassed Waterway Kv= 15.0 fps
13.0	670	Total			

Subcatchment DR-9A: Parking & Substation

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 132

Summary for Subcatchment DR-9B: Roadway

Runoff = 30.42 cfs @ 11.96 hrs, Volume= 1.504 af, Depth> 4.51"

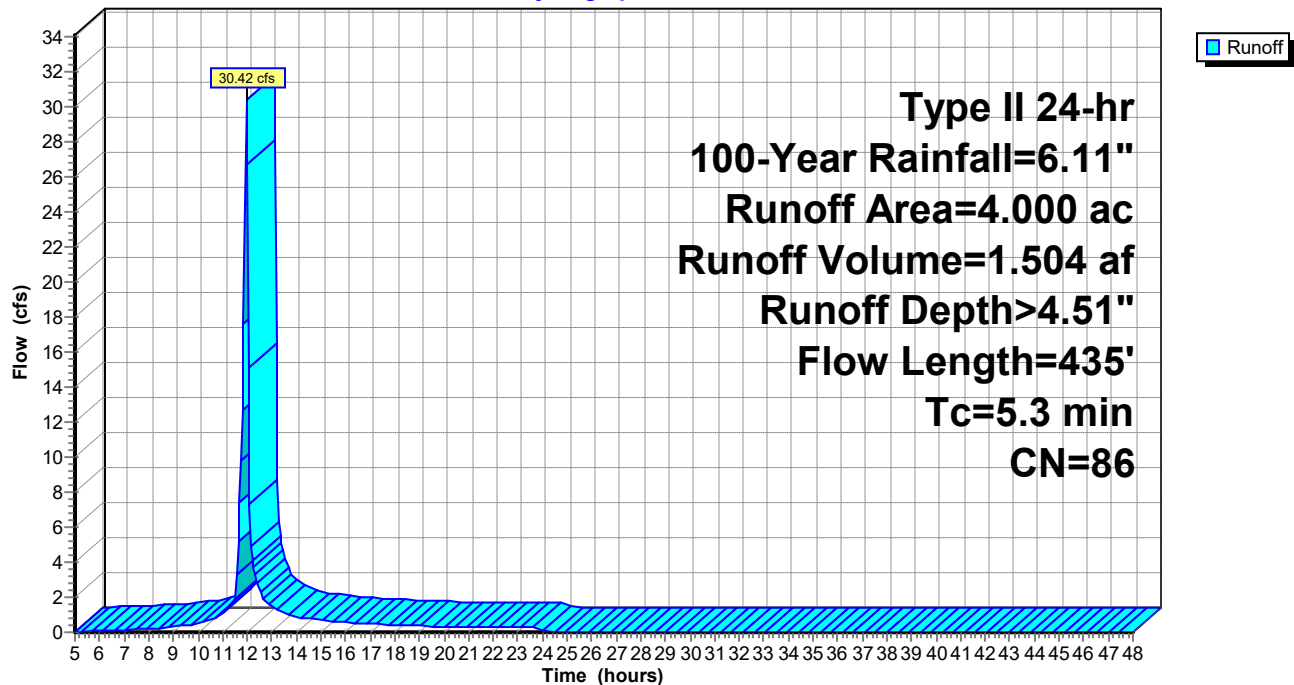
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-Year Rainfall=6.11"

Area (ac)	CN	Description
* 1.050	95	Dense Graded Aggregate
* 0.480	98	Roadway
2.470	80	>75% Grass cover, Good, HSG D
4.000	86	Weighted Average
3.520		88.00% Pervious Area
0.480		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	100	0.0250	0.46		Sheet Flow, Dense Graded Aggregate Yard n= 0.040 P2= 2.40"
1.3	230	0.0100	3.07	9.20	Channel Flow, Grass lined ditch Area= 3.0 sf Perim= 4.0' r= 0.75' n= 0.040 Earth, cobble bottom, clean sides
0.4	105	0.0050	4.20	7.43	Pipe Channel, driveway culvert 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Corrugated PE, smooth interior
5.3	435	Total			

Subcatchment DR-9B: Roadway

Hydrograph



Summary for Reach 1R: Swale

Inflow Area = 1.900 ac, 84.21% Impervious, Inflow Depth > 5.43" for 100-Year event
Inflow = 15.81 cfs @ 11.96 hrs, Volume= 0.860 af
Outflow = 13.37 cfs @ 12.09 hrs, Volume= 0.860 af, Atten= 15%, Lag= 7.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.38 fps, Min. Travel Time= 4.8 min

Avg. Velocity= 0.71 fps, Avg. Travel Time= 16.3 min

Peak Storage= 3,995 cf @ 12.01 hrs

Average Depth at Peak Storage= 1.23' , Surface Width= 8.39'

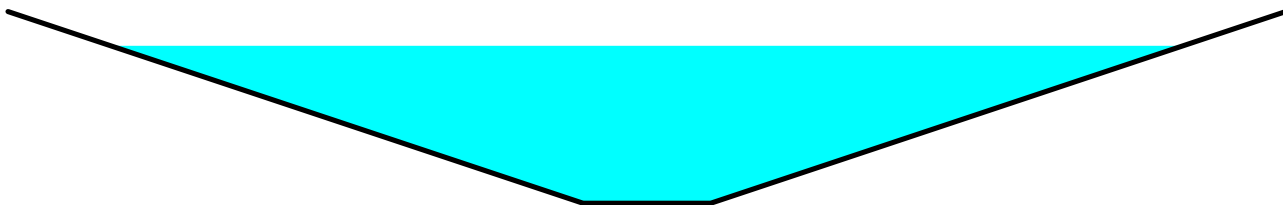
Bank-Full Depth= 1.50' Flow Area= 8.3 sf, Capacity= 22.13 cfs

1.00' x 1.50' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 10.00'

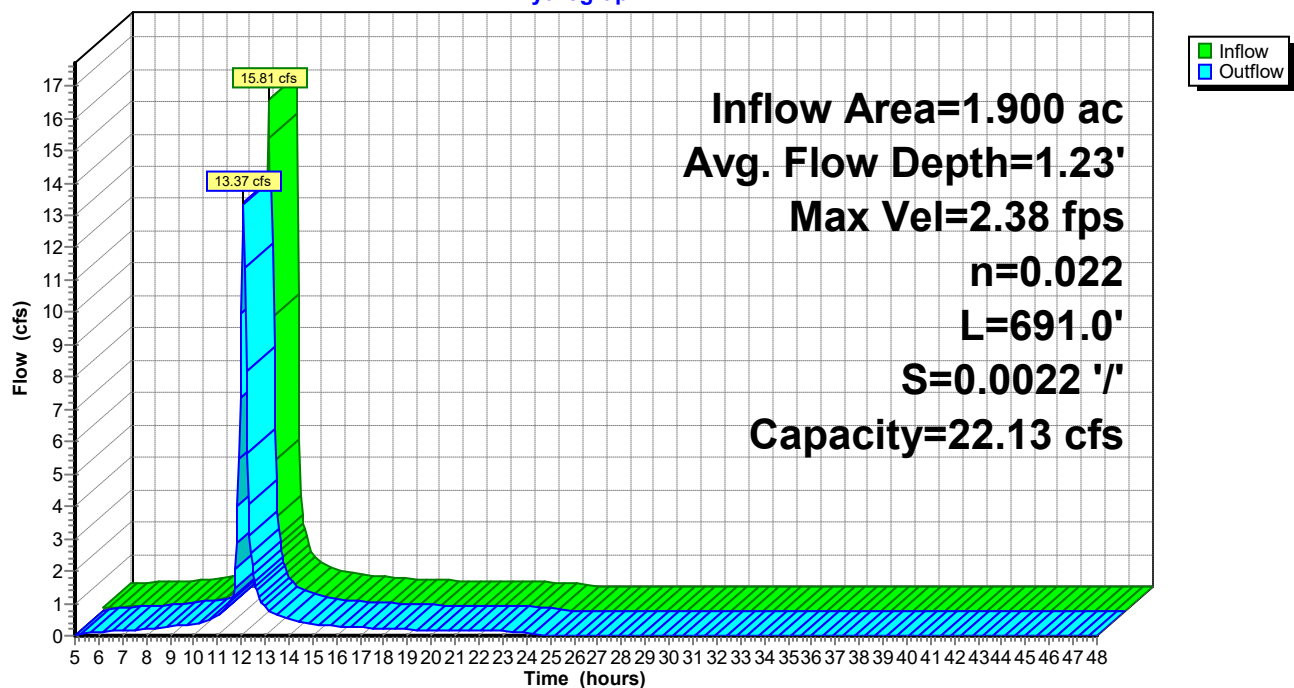
Length= 691.0' Slope= 0.0022 '/'

Inlet Invert= 15.50', Outlet Invert= 14.00'



Reach 1R: Swale

Hydrograph



Summary for Reach 1W: Wetland #1 / Analysis Point 1A

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 4.11" for 100-Year event
 Inflow = 30.97 cfs @ 13.14 hrs, Volume= 9.753 af
 Outflow = 18.15 cfs @ 16.00 hrs, Volume= 9.491 af, Atten= 41%, Lag= 172.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Max. Velocity= 0.14 fps, Min. Travel Time= 118.8 min
 Avg. Velocity= 0.05 fps, Avg. Travel Time= 314.3 min

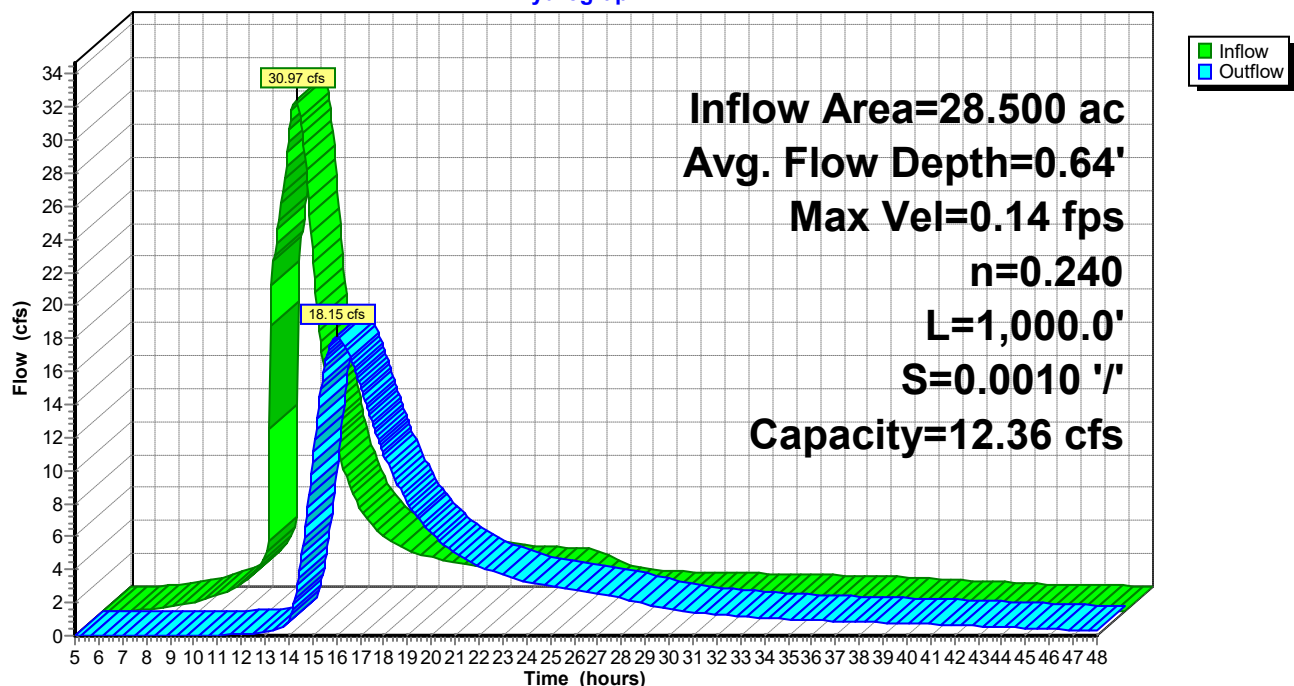
Peak Storage= 129,381 cf @ 14.02 hrs
 Average Depth at Peak Storage= 0.64', Surface Width= 203.85'
 Bank-Full Depth= 0.50' Flow Area= 100.8 sf, Capacity= 12.36 cfs

200.00' x 0.50' deep channel, n= 0.240
 Side Slope Z-value= 3.0 '/' Top Width= 203.00'
 Length= 1,000.0' Slope= 0.0010 '/'
 Inlet Invert= 6.00', Outlet Invert= 5.00'



Reach 1W: Wetland #1 / Analysis Point 1A

Hydrograph



Summary for Reach 2R: Overflow

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 4.77" for 100-Year event
 Inflow = 15.27 cfs @ 12.13 hrs, Volume= 2.307 af
 Outflow = 15.48 cfs @ 12.14 hrs, Volume= 2.307 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.51 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.77 fps, Avg. Travel Time= 0.5 min

Peak Storage= 119 cf @ 12.14 hrs

Average Depth at Peak Storage= 0.27' , Surface Width= 9.62'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 569.91 cfs

8.00' x 2.00' deep channel, n= 0.020 Corrugated PE, corrugated interior

Side Slope Z-value= 3.0 '/' Top Width= 20.00'

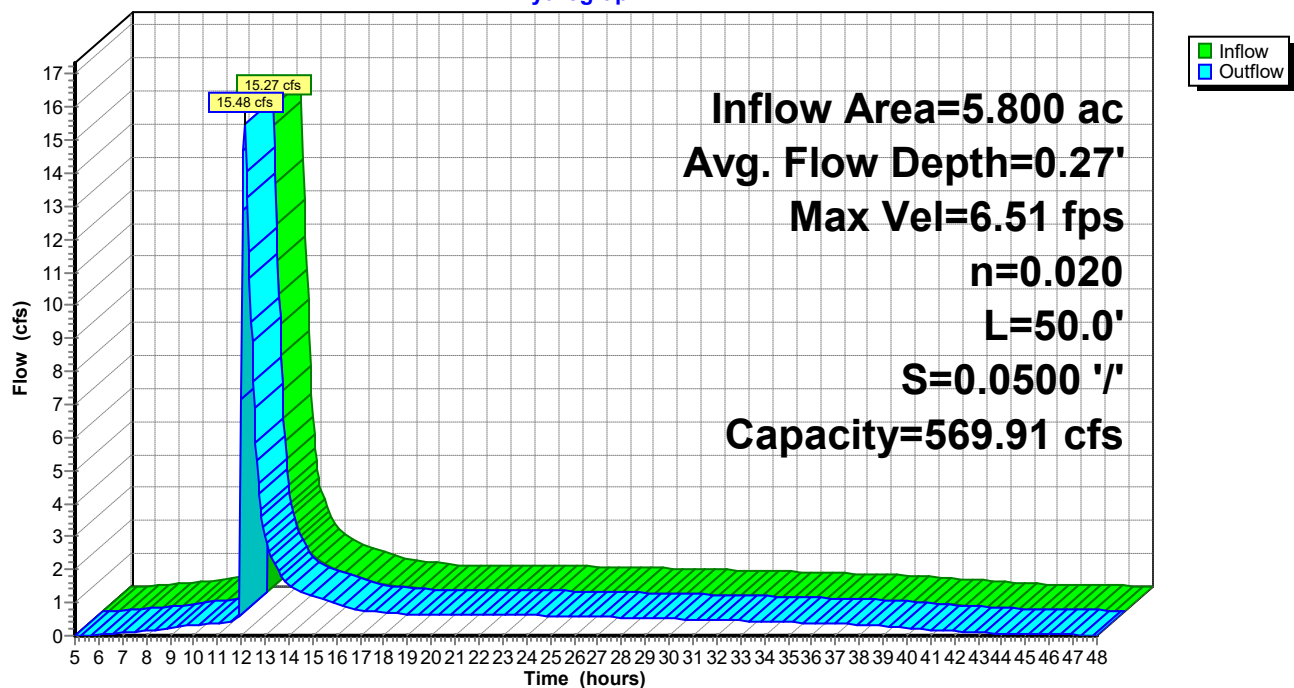
Length= 50.0' Slope= 0.0500 '/'

Inlet Invert= 16.50', Outlet Invert= 14.00'



Reach 2R: Overflow

Hydrograph



Summary for Reach 3R: Outlet Pipe

Inflow Area = 28.500 ac, 13.16% Impervious, Inflow Depth > 4.00" for 100-Year event
Inflow = 18.15 cfs @ 16.00 hrs, Volume= 9.491 af
Outflow = 18.15 cfs @ 16.01 hrs, Volume= 9.490 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.79 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 3.26 fps, Avg. Travel Time= 0.4 min

Peak Storage= 187 cf @ 16.00 hrs

Average Depth at Peak Storage= 1.15', Surface Width= 3.17'

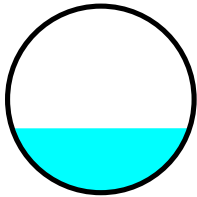
Bank-Full Depth= 3.33' Flow Area= 8.7 sf, Capacity= 70.83 cfs

40.0" Round Pipe

n= 0.013 Corrugated PE, smooth interior

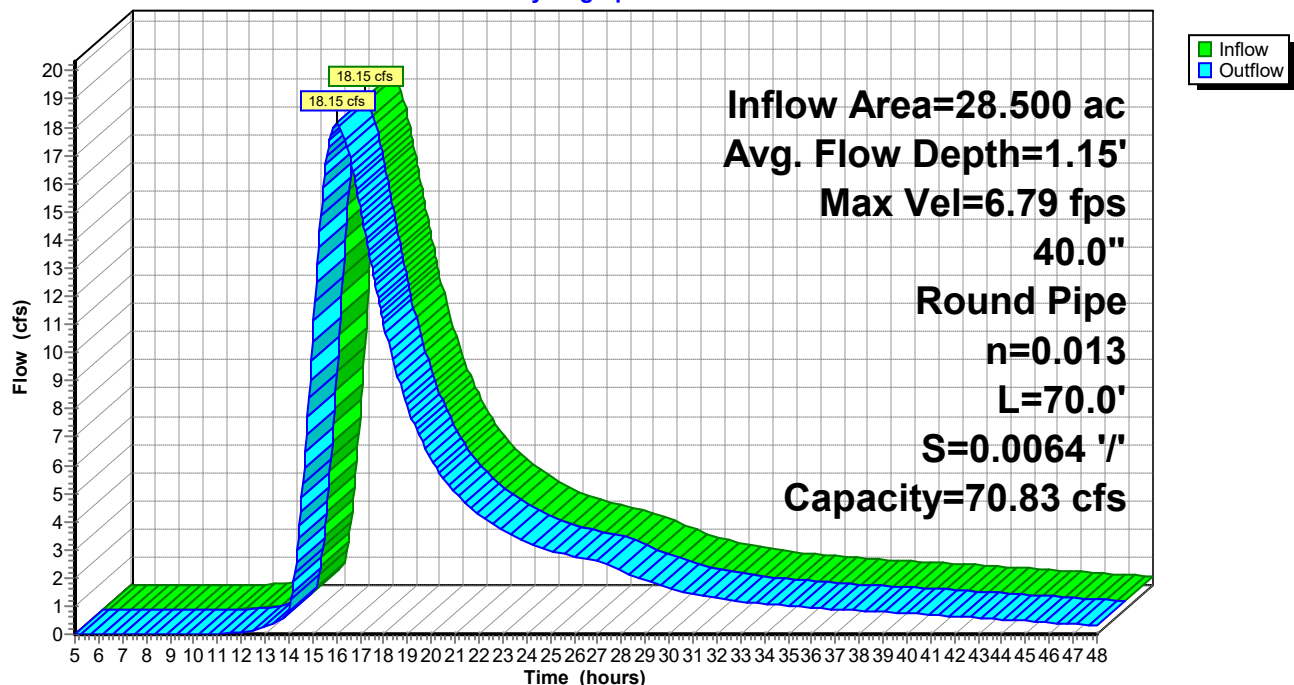
Length= 70.0' Slope= 0.0064 '/'

Inlet Invert= 4.25', Outlet Invert= 3.80'



Reach 3R: Outlet Pipe

Hydrograph



Summary for Reach 4R: Overflow

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 5.43" for 100-Year event
Inflow = 8.17 cfs @ 11.98 hrs, Volume= 0.452 af
Outflow = 8.00 cfs @ 11.99 hrs, Volume= 0.452 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.21 fps, Min. Travel Time= 0.5 min

Avg. Velocity= 0.87 fps, Avg. Travel Time= 1.9 min

Peak Storage= 253 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.55' , Surface Width= 6.28'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 118.65 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

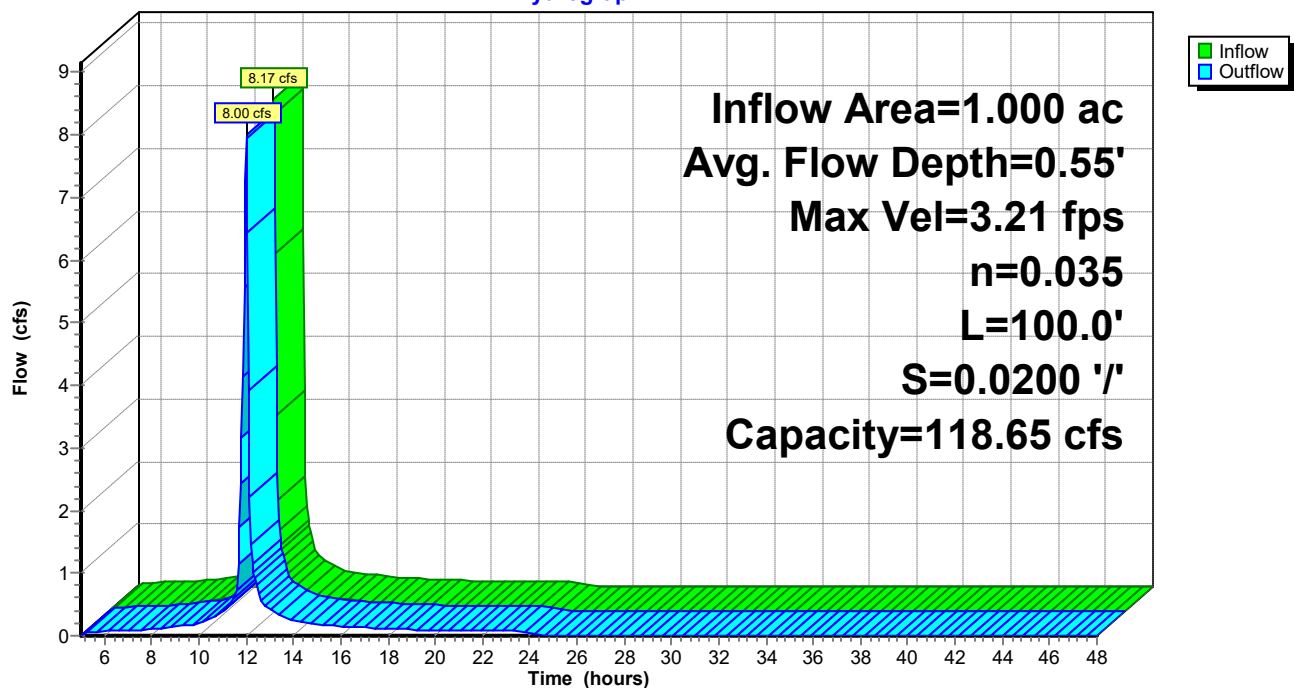
Length= 100.0' Slope= 0.0200 '/'

Inlet Invert= 12.00', Outlet Invert= 10.00'



Reach 4R: Overflow

Hydrograph



Summary for Reach 5R: Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 1.24" for 100-Year event
 Inflow = 1.86 cfs @ 12.17 hrs, Volume= 0.124 af
 Outflow = 1.56 cfs @ 12.22 hrs, Volume= 0.124 af, Atten= 16%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.68 fps, Min. Travel Time= 1.2 min

Avg. Velocity= 0.58 fps, Avg. Travel Time= 3.6 min

Peak Storage= 132 cf @ 12.20 hrs

Average Depth at Peak Storage= 0.28' , Surface Width= 4.65'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 90.48 cfs

3.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

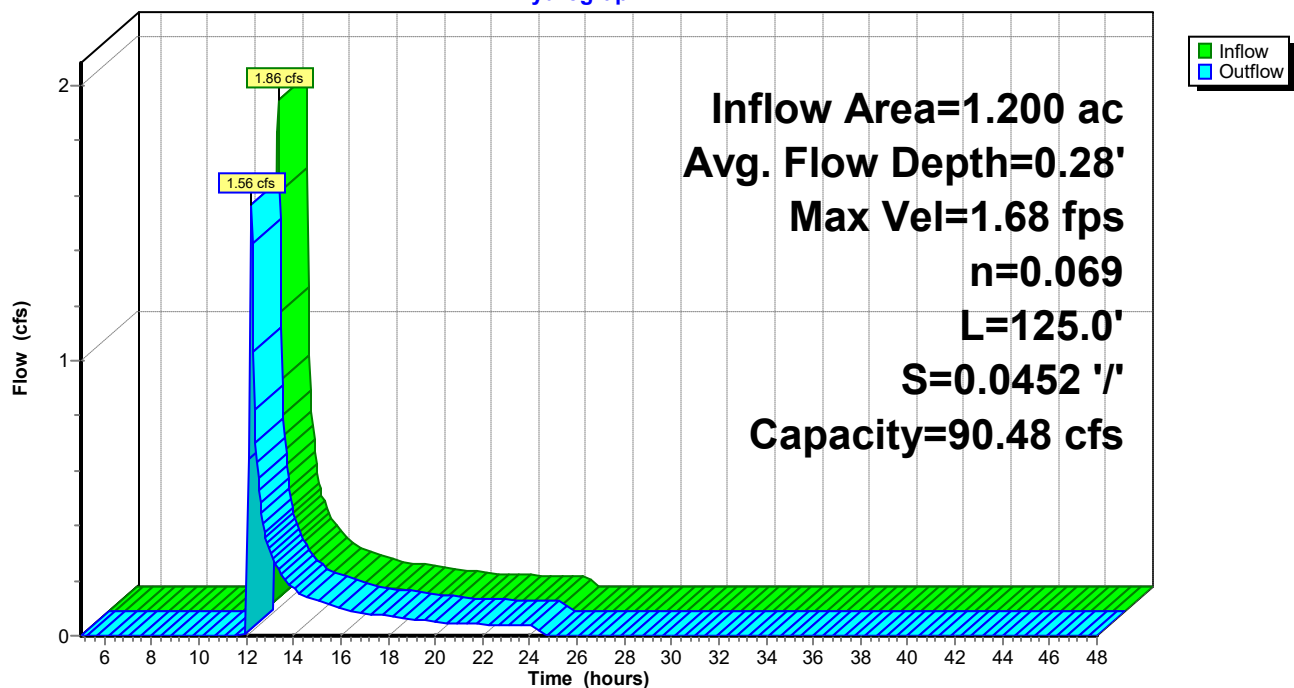
Length= 125.0' Slope= 0.0452 '/'

Inlet Invert= 11.65', Outlet Invert= 6.00'



Reach 5R: Overflow

Hydrograph



Summary for Reach 6R: Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 1.08" for 100-Year event
Inflow = 6.03 cfs @ 12.16 hrs, Volume= 0.117 af
Outflow = 5.16 cfs @ 12.19 hrs, Volume= 0.117 af, Atten= 14%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.82 fps, Min. Travel Time= 0.6 min

Avg. Velocity= 1.06 fps, Avg. Travel Time= 1.6 min

Peak Storage= 209 cf @ 12.17 hrs

Average Depth at Peak Storage= 0.47' , Surface Width= 5.80'

Bank-Full Depth= 2.00' Flow Area= 18.0 sf, Capacity= 116.91 cfs

3.00' x 2.00' deep channel, n= 0.035 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 15.00'

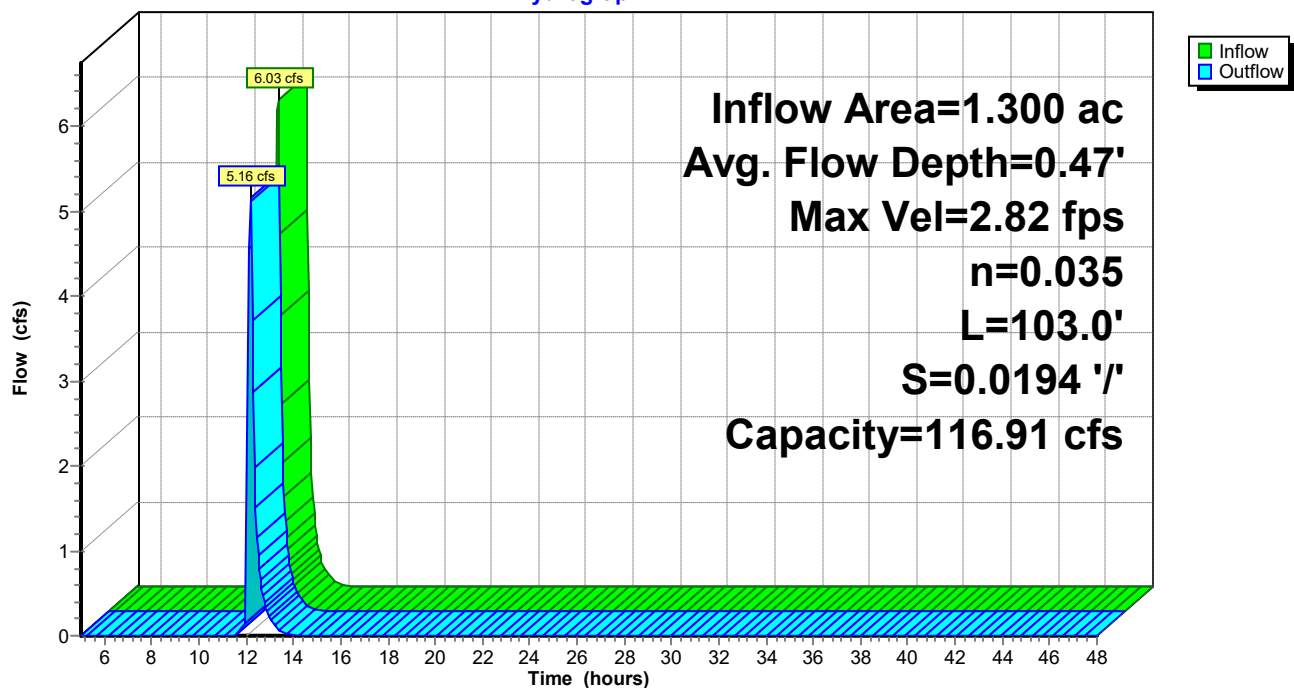
Length= 103.0' Slope= 0.0194 '/'

Inlet Invert= 8.50', Outlet Invert= 6.50'



Reach 6R: Overflow

Hydrograph



Summary for Reach 7R: Overflow

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth > 5.02" for 100-Year event
Inflow = 3.28 cfs @ 12.41 hrs, Volume= 1.212 af
Outflow = 3.26 cfs @ 12.44 hrs, Volume= 1.212 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.35 fps, Min. Travel Time= 1.2 min

Avg. Velocity= 0.53 fps, Avg. Travel Time= 3.2 min

Peak Storage= 243 cf @ 12.42 hrs

Average Depth at Peak Storage= 0.28' , Surface Width= 9.65'

Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 116.81 cfs

8.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 3.0 '/' Top Width= 20.00'

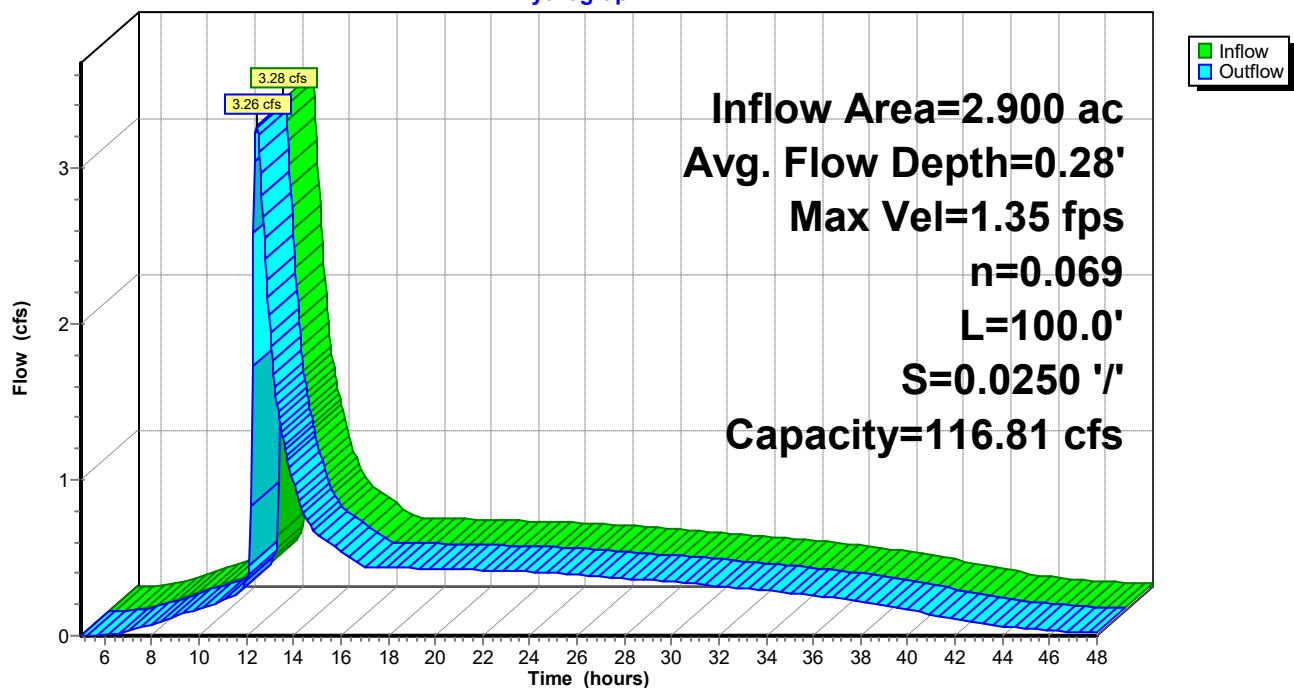
Length= 100.0' Slope= 0.0250 '/'

Inlet Invert= 14.50', Outlet Invert= 12.00'



Reach 7R: Overflow

Hydrograph



Summary for Reach 8R: Dry Swale #1

Inflow Area = 1.000 ac, 95.00% Impervious, Inflow Depth > 5.43" for 100-Year event
Inflow = 8.32 cfs @ 11.96 hrs, Volume= 0.453 af
Outflow = 8.17 cfs @ 11.98 hrs, Volume= 0.452 af, Atten= 2%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.41 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 0.96 fps, Avg. Travel Time= 1.8 min

Peak Storage= 252 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.71', Surface Width= 4.82'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 16.53 cfs

2.00' x 1.00' deep channel, n= 0.018 Earth, clean & straight

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

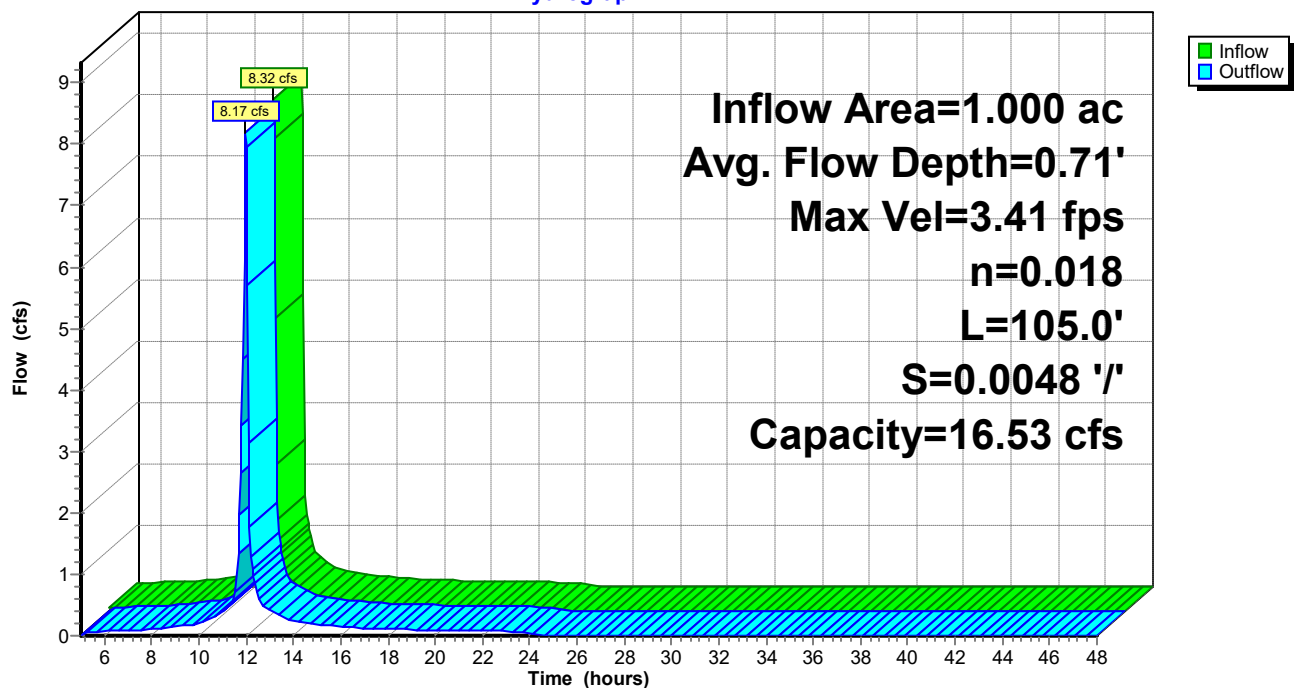
Length= 105.0' Slope= 0.0048 '/'

Inlet Invert= 10.00', Outlet Invert= 9.50'



Reach 8R: Dry Swale #1

Hydrograph



Summary for Reach 10R: Dry Swale #2

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth > 4.51" for 100-Year event
Inflow = 5.36 cfs @ 12.00 hrs, Volume= 0.286 af
Outflow = 5.25 cfs @ 12.01 hrs, Volume= 0.286 af, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.03 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 1.34 fps, Avg. Travel Time= 1.4 min

Peak Storage= 122 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.35' , Surface Width= 4.09'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 213.76 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 14.00'

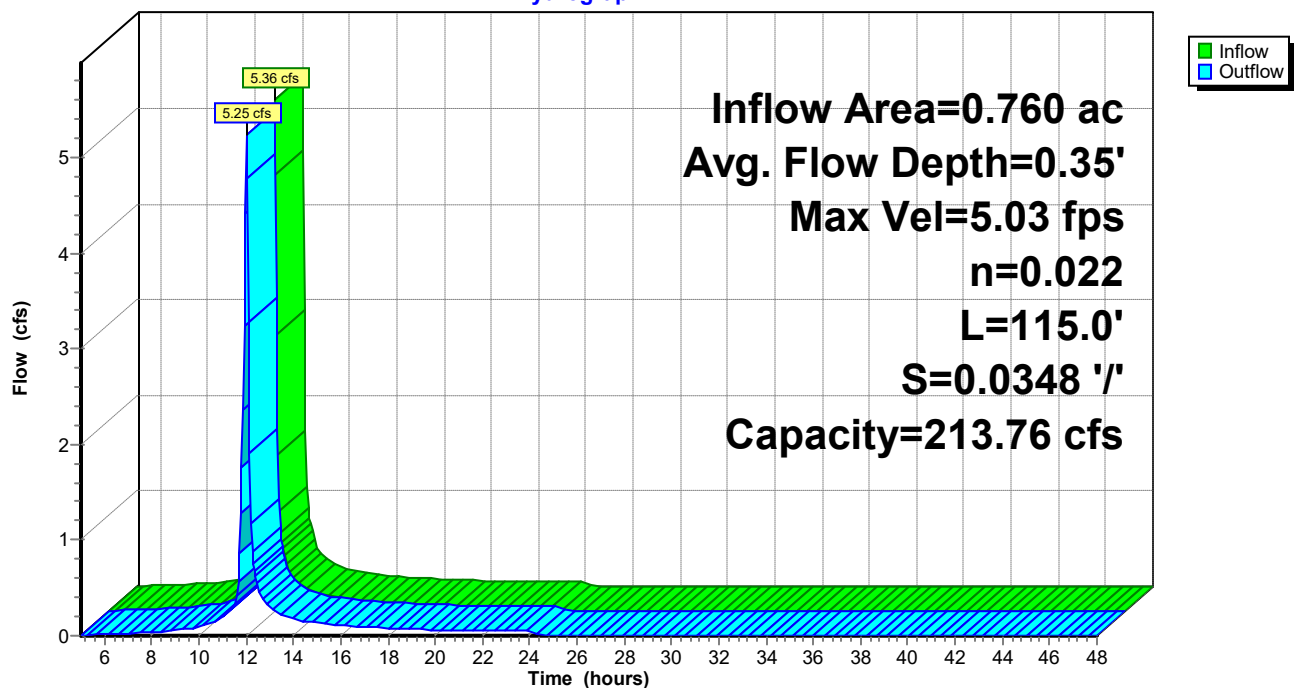
Length= 115.0' Slope= 0.0348 '/'

Inlet Invert= 37.00', Outlet Invert= 33.00'



Reach 10R: Dry Swale #2

Hydrograph



Summary for Reach 12R: Sediment Basin Overflow

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 1.91" for 100-Year event
Inflow = 4.02 cfs @ 12.04 hrs, Volume= 0.191 af
Outflow = 3.89 cfs @ 12.04 hrs, Volume= 0.191 af, Atten= 3%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.16 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 0.28 fps, Avg. Travel Time= 0.4 min

Peak Storage= 20 cf @ 12.04 hrs

Average Depth at Peak Storage= 0.30', Surface Width= 12.40'

Bank-Full Depth= 0.50' Flow Area= 6.0 sf, Capacity= 9.43 cfs

10.00' x 0.50' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 '/' Top Width= 14.00'

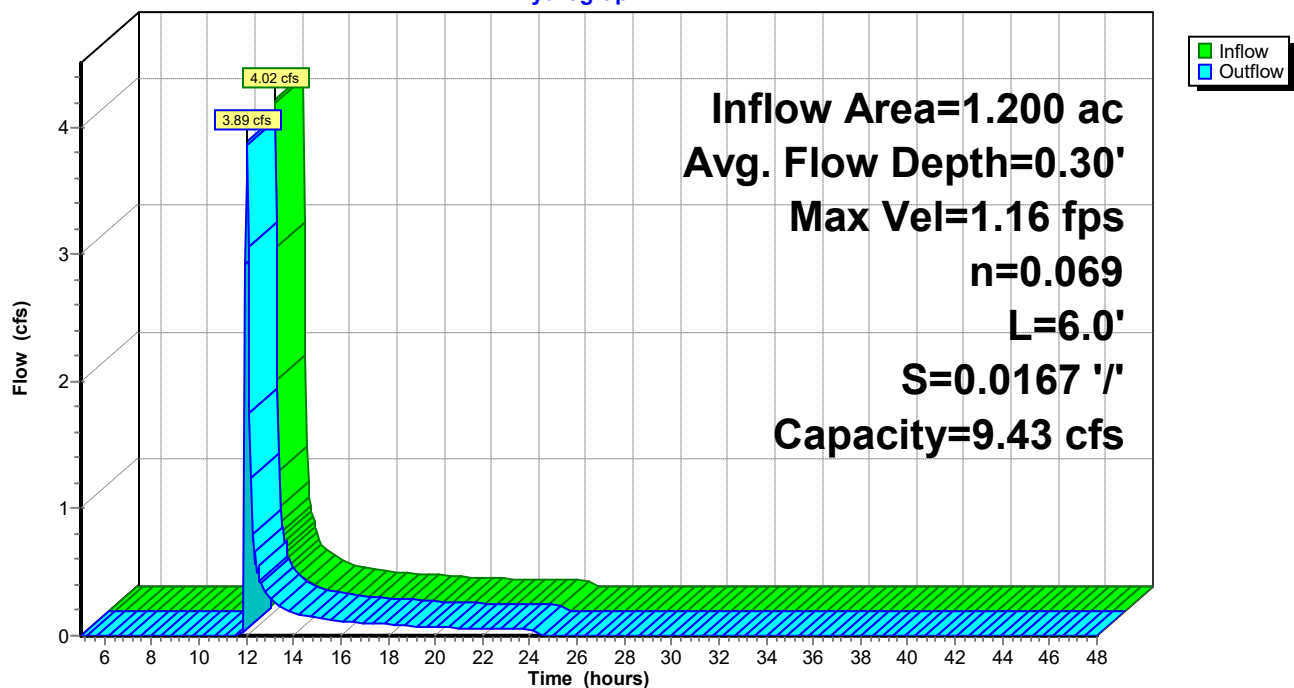
Length= 6.0' Slope= 0.0167 '/'

Inlet Invert= 12.00', Outlet Invert= 11.90'



Reach 12R: Sediment Basin Overflow

Hydrograph



Summary for Reach 13R: Roadside Swale

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 2.08" for 100-Year event
Inflow = 4.32 cfs @ 11.98 hrs, Volume= 0.208 af
Outflow = 3.95 cfs @ 12.02 hrs, Volume= 0.208 af, Atten= 9%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.15 fps, Min. Travel Time= 1.5 min

Avg. Velocity = 1.04 fps, Avg. Travel Time= 4.6 min

Peak Storage= 386 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.52' , Surface Width= 4.12'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 18.36 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 '/' Top Width= 7.00'

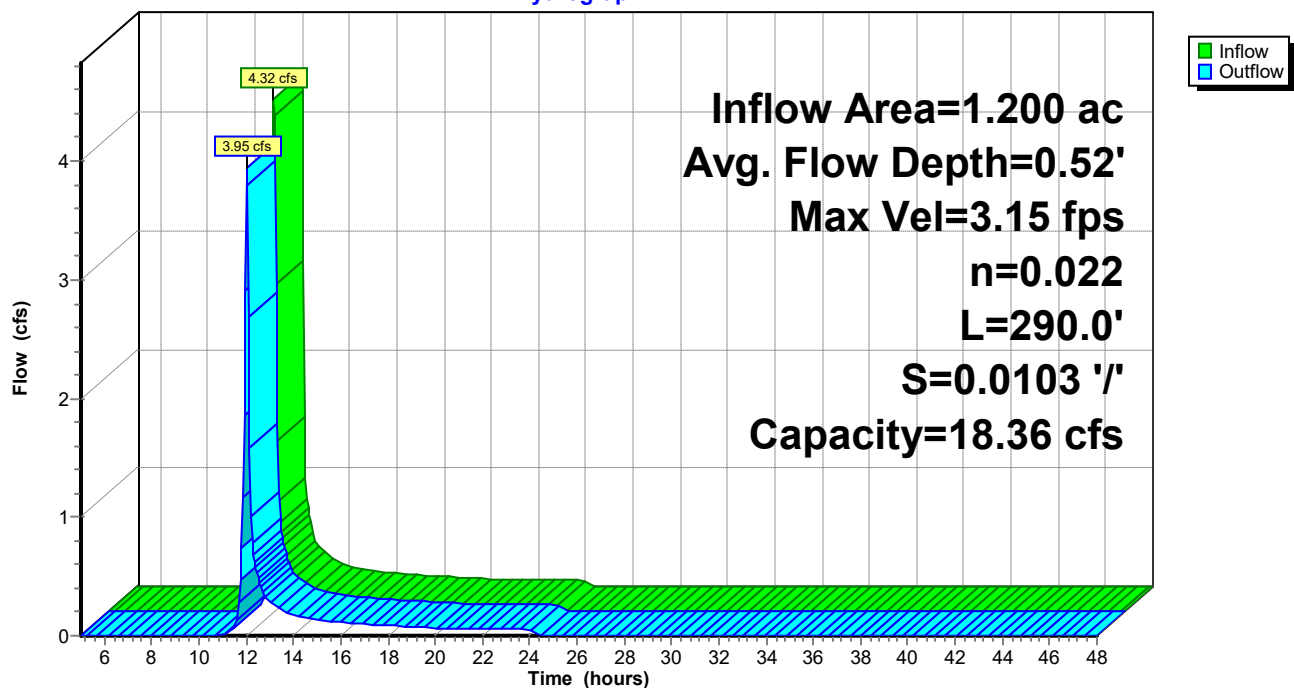
Length= 290.0' Slope= 0.0103 '/'

Inlet Invert= 15.00', Outlet Invert= 12.00'



Reach 13R: Roadside Swale

Hydrograph



Summary for Reach 14R: Roadside Swale

Inflow Area = 0.760 ac, 78.95% Impervious, Inflow Depth > 4.51" for 100-Year event
Inflow = 5.62 cfs @ 11.97 hrs, Volume= 0.286 af
Outflow = 5.36 cfs @ 12.00 hrs, Volume= 0.286 af, Atten= 5%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.27 fps, Min. Travel Time= 1.2 min

Avg. Velocity = 1.65 fps, Avg. Travel Time= 4.6 min

Peak Storage= 402 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.30' , Surface Width= 3.82'

Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 289.37 cfs

2.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 ' ' Top Width= 14.00'

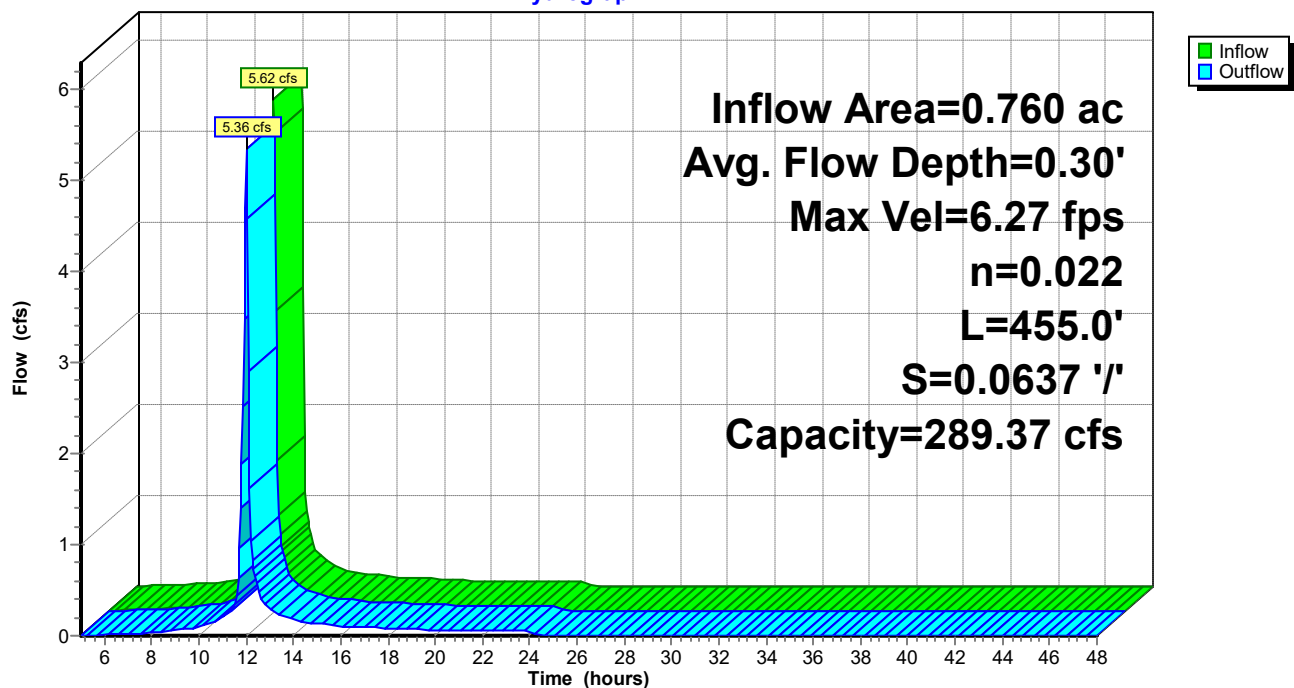
Length= 455.0' Slope= 0.0637 ' '

Inlet Invert= 66.00', Outlet Invert= 37.00'



Reach 14R: Roadside Swale

Hydrograph



Summary for Reach 15R: Roadside Swale

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 3.18" for 100-Year event
Inflow = 7.10 cfs @ 11.97 hrs, Volume= 0.345 af
Outflow = 5.76 cfs @ 12.12 hrs, Volume= 0.345 af, Atten= 19%, Lag= 9.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.22 fps, Min. Travel Time= 5.9 min

Avg. Velocity= 0.33 fps, Avg. Travel Time= 22.0 min

Peak Storage= 2,022 cf @ 12.02 hrs

Average Depth at Peak Storage= 1.10' , Surface Width= 7.60'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 4.69 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight

Side Slope Z-value= 3.0 ' ' Top Width= 7.00'

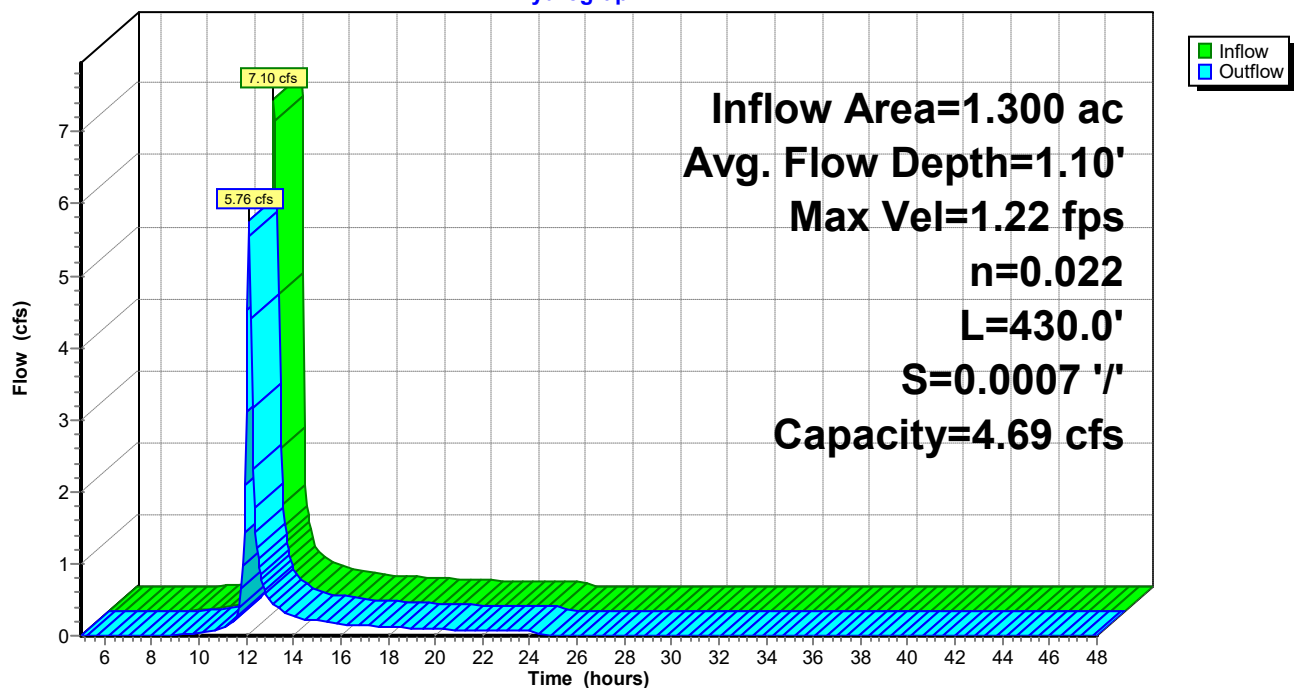
Length= 430.0' Slope= 0.0007 ' '

Inlet Invert= 10.00', Outlet Invert= 9.71'



Reach 15R: Roadside Swale

Hydrograph



Summary for Reach 17R: Sediment Basin Overflow

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 2.82" for 100-Year event
Inflow = 5.75 cfs @ 12.13 hrs, Volume= 0.305 af
Outflow = 5.82 cfs @ 12.14 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.19 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 0.23 fps, Avg. Travel Time= 0.4 min

Peak Storage= 29 cf @ 12.14 hrs

Average Depth at Peak Storage= 0.30' , Surface Width= 17.42'

Bank-Full Depth= 0.70' Flow Area= 12.5 sf, Capacity= 24.64 cfs

15.00' x 0.70' deep channel, n= 0.069 Riprap, 6-inch

Side Slope Z-value= 4.0 '/' Top Width= 20.60'

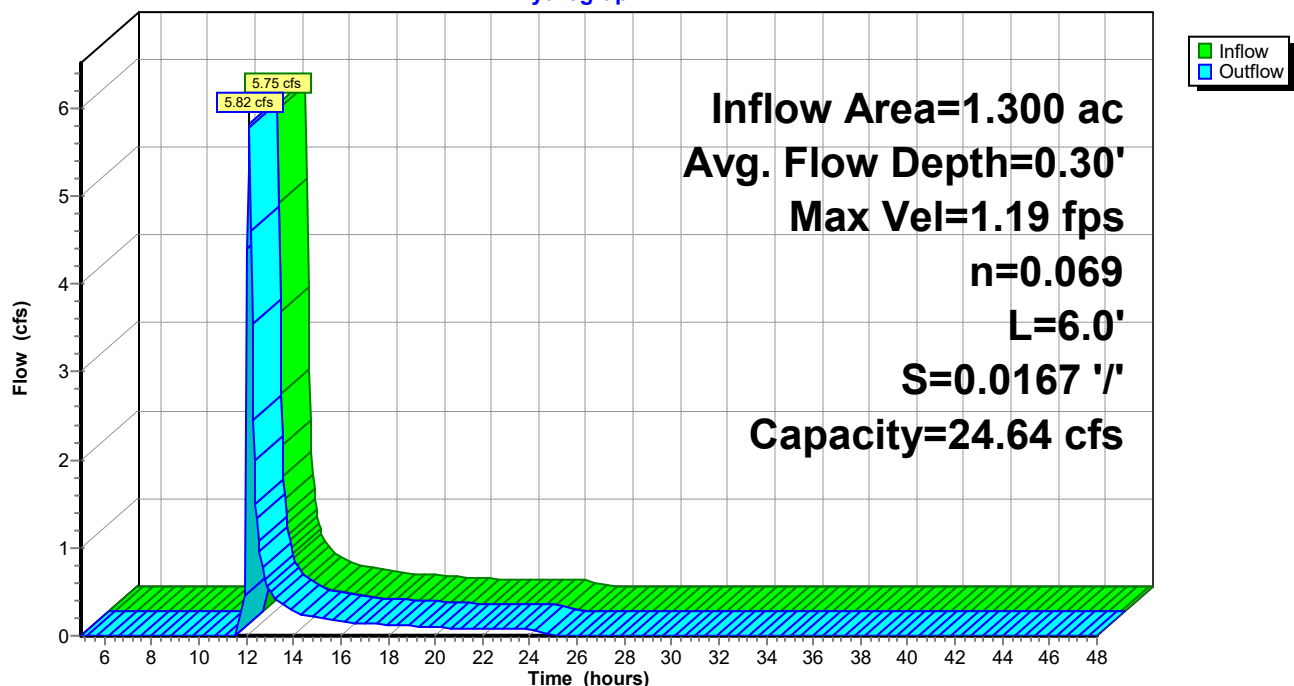
Length= 6.0' Slope= 0.0167 '/'

Inlet Invert= 9.00', Outlet Invert= 8.90'



Reach 17R: Sediment Basin Overflow

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 148

Summary for Pond 1P: WQv Pond #1

Inflow Area = 2.900 ac, 65.52% Impervious, Inflow Depth > 5.08" for 100-Year event
 Inflow = 16.96 cfs @ 12.03 hrs, Volume= 1.227 af
 Outflow = 3.28 cfs @ 12.41 hrs, Volume= 1.212 af, Atten= 81%, Lag= 22.8 min
 Primary = 3.28 cfs @ 12.41 hrs, Volume= 1.212 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 14.00' Surf.Area= 9,229 sf Storage= 19,003 cf
 Peak Elev= 16.23' @ 12.41 hrs Surf.Area= 21,418 sf Storage= 47,659 cf (28,656 cf above start)

Plug-Flow detention time= 930.0 min calculated for 0.775 af (63% of inflow)
 Center-of-Mass det. time= 522.7 min (1,309.6 - 786.9)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,795 cf	Forebay (Prismatic) Listed below (Recalc)
#2	9.00'	57,882 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		62,677 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	232	0	0
11.00	569	401	401
12.00	1,018	794	1,194
13.00	1,467	1,243	2,437
14.00	3,249	2,358	4,795

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
9.00	1,145	0	0
10.00	1,751	1,448	1,448
11.00	2,339	2,045	3,493
12.00	2,959	2,649	6,142
13.00	3,597	3,278	9,420
14.00	5,980	4,789	14,209
14.50	7,240	3,305	17,514
15.00	14,392	5,408	22,922
16.00	17,455	15,924	38,845
17.00	20,619	19,037	57,882

Device	Routing	Invert	Outlet Devices
#1	Primary	13.50'	12.0" Round Culvert L= 50.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 13.50' / 13.23' S= 0.0054 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	16.00'	24.0" x 24.0" Horiz. Outlet Structure Top Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#3	Device 1	14.00'	4.0" Round Reverse Slope Pipe L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.00' / 14.00' S= -0.1250 ' / Cc= 0.900

18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 149

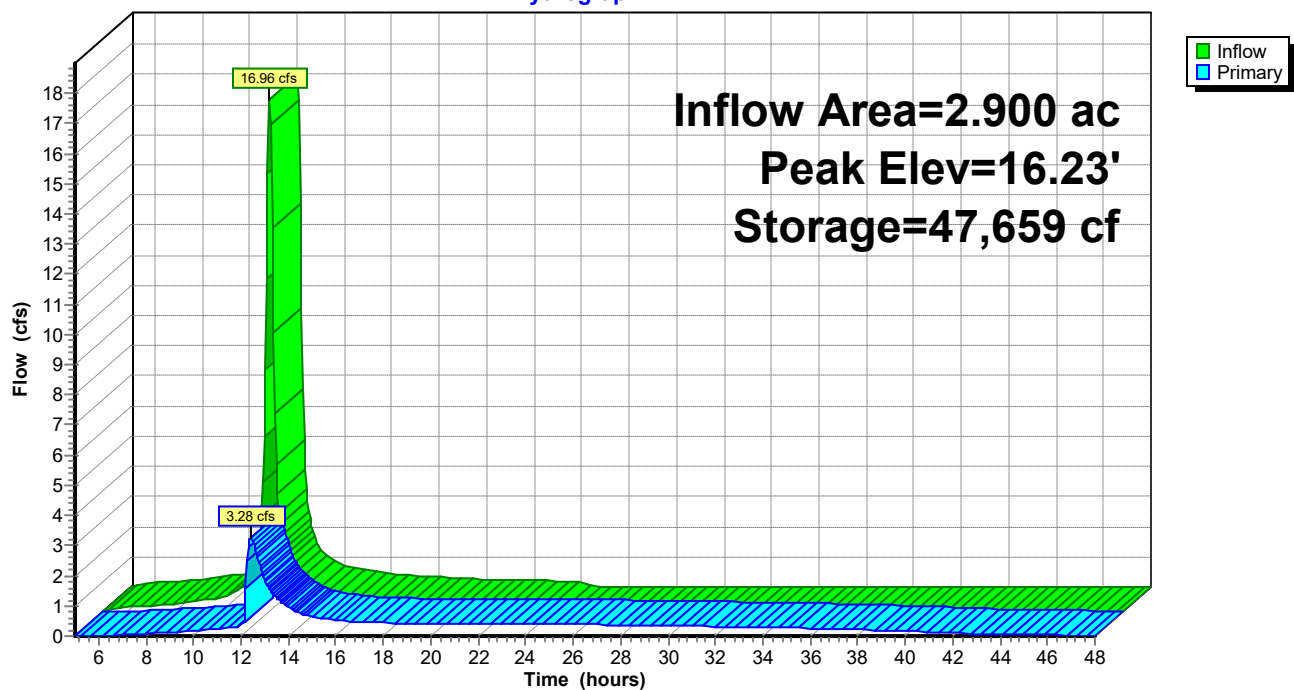
#4	Primary	16.25'	n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf
			6.0' long x 1.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00
			Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31
			3.30 3.31 3.32

Primary OutFlow Max=3.26 cfs @ 12.41 hrs HW=16.23' (Free Discharge)

- 1=Culvert (Passes 3.26 cfs of 5.08 cfs potential flow)
- 2=Outlet Structure Top Grate (Weir Controls 2.80 cfs @ 1.55 fps)
- 3=Reverse Slope Pipe (Outlet Controls 0.46 cfs @ 5.29 fps)
- 4=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 1P: WQv Pond #1

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 150

Summary for Pond 2P: WQv Pond #2

Inflow Area = 5.800 ac, 31.90% Impervious, Inflow Depth > 4.80" for 100-Year event
 Inflow = 40.22 cfs @ 11.97 hrs, Volume= 2.320 af
 Outflow = 15.27 cfs @ 12.13 hrs, Volume= 2.307 af, Atten= 62%, Lag= 9.6 min
 Primary = 15.27 cfs @ 12.13 hrs, Volume= 2.307 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Starting Elev= 14.00' Surf.Area= 5,917 sf Storage= 9,000 cf
 Peak Elev= 17.07' @ 12.13 hrs Surf.Area= 27,493 sf Storage= 54,456 cf (45,456 cf above start)

Plug-Flow detention time= 493.6 min calculated for 2.098 af (90% of inflow)
 Center-of-Mass det. time= 393.8 min (1,180.5 - 786.7)

Volume	Invert	Avail.Storage	Storage Description
#1	10.00'	4,020 cf	Forebay #1 (Prismatic) Listed below (Recalc)
#2	10.00'	2,575 cf	Forebay #2 (Prismatic) Listed below (Recalc)
#3	10.00'	58,093 cf	Permanent Pool (Prismatic) Listed below (Recalc)
		64,688 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	141	0	0
11.00	330	236	236
12.00	562	446	682
13.00	866	714	1,396
14.00	2,023	1,445	2,840
14.50	2,696	1,180	4,020

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	82	0	0
11.00	202	142	142
12.00	351	277	419
13.00	535	443	862
14.00	1,323	929	1,791
14.50	1,815	785	2,575

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
10.00	375	0	0
11.00	653	514	514
12.00	957	805	1,319
13.00	1,286	1,122	2,441
14.00	2,571	1,929	4,369
14.50	3,307	1,470	5,839
15.00	13,814	4,280	10,119
16.00	17,852	15,833	25,952
17.00	22,659	20,256	46,207
17.50	24,884	11,886	58,093

18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 151

Device	Routing	Invert	Outlet Devices
#1	Device 3	16.50'	24.0" x 24.0" Horiz. Orifice/Grate C= 0.600 in 24.0" x 24.0" Grate (100% open area) Limited to weir flow at low heads
#2	Device 3	14.00'	4.0" Vert. Reverse Slope Pipe C= 0.600 Limited to weir flow at low heads
#3	Primary	14.00'	12.0" Round Outlet Structure Discard Pipe L= 46.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 14.00' / 13.77' S= 0.0050 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#4	Primary	16.60'	10.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=15.12 cfs @ 12.13 hrs HW=17.07' (Free Discharge)

3=Outlet Structure Discard Pipe (Barrel Controls 5.57 cfs @ 7.09 fps)

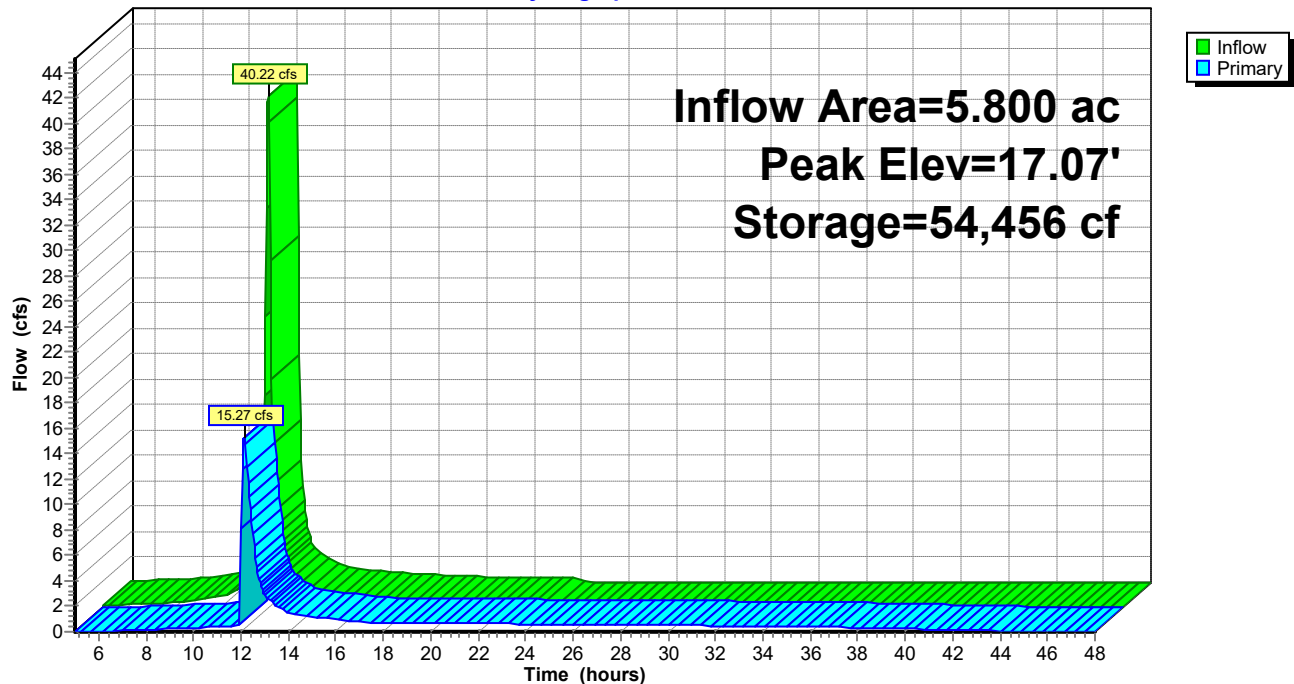
1=Orifice/Grate (Passes < 11.22 cfs potential flow)

2=Reverse Slope Pipe (Passes < 0.72 cfs potential flow)

4=Broad-Crested Rectangular Weir (Weir Controls 9.55 cfs @ 2.04 fps)

Pond 2P: WQv Pond #2

Hydrograph



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 152

Summary for Pond 3P: Infiltration Basin #1

Inflow Area = 1.200 ac, 37.50% Impervious, Inflow Depth = 1.91" for 100-Year event
 Inflow = 3.89 cfs @ 12.04 hrs, Volume= 0.191 af
 Outflow = 1.88 cfs @ 12.17 hrs, Volume= 0.172 af, Atten= 52%, Lag= 7.9 min
 Discarded = 0.02 cfs @ 12.17 hrs, Volume= 0.048 af
 Primary = 1.86 cfs @ 12.17 hrs, Volume= 0.124 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 11.94' @ 12.17 hrs Surf.Area= 1,383 sf Storage= 2,406 cf

Plug-Flow detention time= 296.0 min calculated for 0.172 af (90% of inflow)
 Center-of-Mass det. time= 245.1 min (1,121.7 - 876.7)

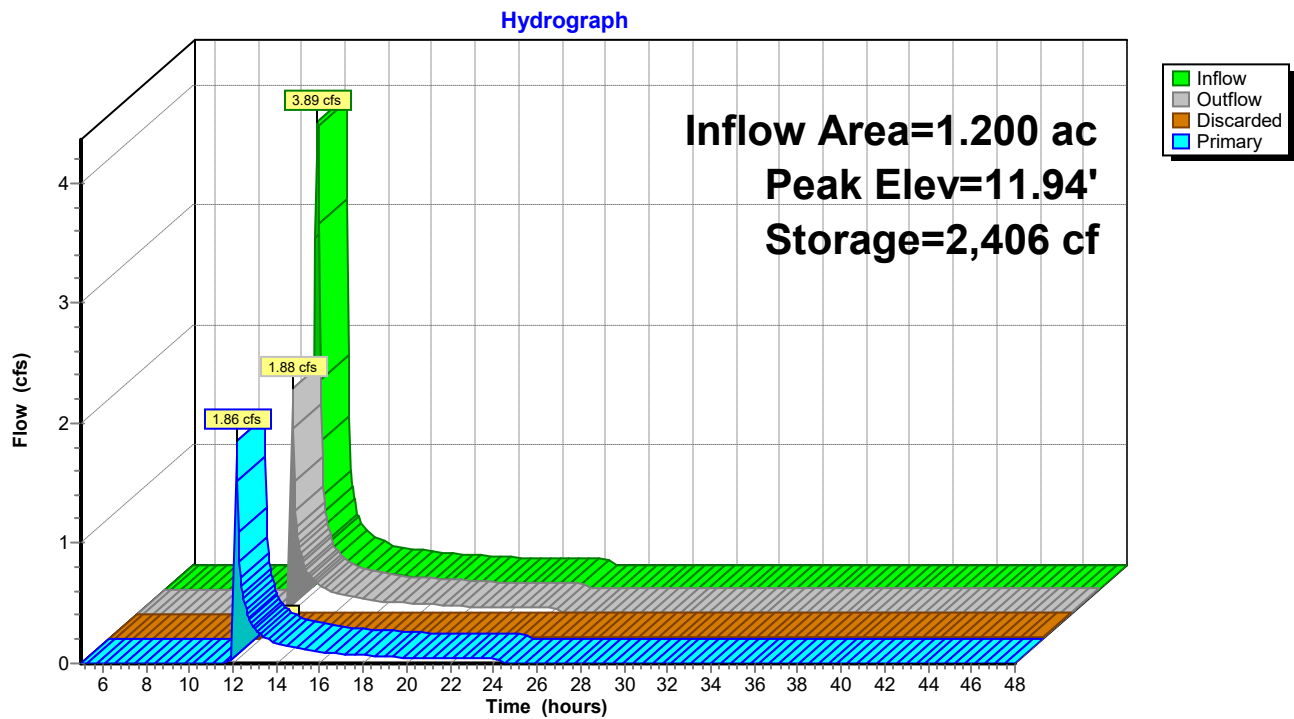
Volume	Invert	Avail.Storage	Storage Description		
#1	8.10'	2,492 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
8.10	109	56.0	0	0	109
12.00	1,415	149.0	2,492	2,492	1,678

Device	Routing	Invert	Outlet Devices
#1	Primary	11.65'	Channel/Reach using Reach 5R: Overflow
#2	Discarded	8.10'	0.500 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 4.00'

Discarded OutFlow Max=0.02 cfs @ 12.17 hrs HW=11.91' (Free Discharge)
 ↑ **2=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=1.65 cfs @ 12.17 hrs HW=11.91' (Free Discharge)
 ↑ **1=Channel/Reach** (Channel Controls 1.65 cfs @ 1.64 fps)

Pond 3P: Infiltration Basin #1



18641.00-Proposed Condition_Chambers_CULVERTS Type II 24-hr 100-Year Rainfall=6.11"

Prepared by McFarland Johnson

Printed 6/8/2022

HydroCAD® 10.10-5a s/n 02401 © 2020 HydroCAD Software Solutions LLC

Page 154

Summary for Pond 4P: Infiltration Basin #2

Inflow Area = 1.300 ac, 57.69% Impervious, Inflow Depth = 2.82" for 100-Year event
 Inflow = 5.82 cfs @ 12.14 hrs, Volume= 0.305 af
 Outflow = 6.44 cfs @ 12.16 hrs, Volume= 0.305 af, Atten= 0%, Lag= 1.3 min
 Discarded = 0.42 cfs @ 12.16 hrs, Volume= 0.189 af
 Primary = 6.03 cfs @ 12.16 hrs, Volume= 0.117 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
 Peak Elev= 8.97' @ 12.16 hrs Surf.Area= 1,059 sf Storage= 1,597 cf

Plug-Flow detention time= 29.1 min calculated for 0.305 af (100% of inflow)
 Center-of-Mass det. time= 29.1 min (895.2 - 866.1)

Volume	Invert	Avail.Storage	Storage Description
#1	5.80'	2,495 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
5.80	110	56.0	0	0	110
9.70	1,415	150.0	2,495	2,495	1,702

Device	Routing	Invert	Outlet Devices
#1	Primary	8.50'	Channel/Reach using Reach 6R: Overflow
#2	Discarded	5.80'	12.000 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 3.00'

Discarded OutFlow Max=0.41 cfs @ 12.16 hrs HW=8.95' (Free Discharge)
 ↑ **2=Exfiltration** (Controls 0.41 cfs)

Primary OutFlow Max=5.55 cfs @ 12.16 hrs HW=8.95' (Free Discharge)
 ↑ **1=Channel/Reach** (Channel Controls 5.55 cfs @ 2.85 fps)