DRAINAGE REPORT

Prepared for:

Gregory Sancoff

27 Durham Point Road

Durham, NH

Tax Map 11 Lot 34-1

Prepared on:

July 19, 2017

Revised on:

September 14, 2017

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1. Project Background / Purpose

Gregory Sancoff purchased a 20-acre parcel in Durham NH and is proposing to construct a single-family home on the parcel. The parcel is part of a three-lot subdivision from the estate of Isabelle Sawyer, subdivided in about 2002. Access to the parcel is from Durham Point Road, and is provided by a shared driveway with three other lots. The lot is within the shoreland protection district and the prime building location is at the northern most point of the parcel adjacent to the Oyster River. To provide access to the building site, the owner will be required to construct a 1400'+/- driveway, in addition to the grading for the structures and septic system.

The owner obtained a timber permit in the spring of 2017 and proceeded to construct a temporary access road from Durham Point Road to access the lot for timber harvesting. Once the roadway was in place he continued to construct the driveway for additional clearing and preparation for access to the building areas. Therefore, the majority of the driveway is already in place and this is an after the fact permit application.

The total disturbance on the parcel is 137,900 SF. The total disturbance within the shoreland protection district is 60,500 SF. The driveway is being constructed 14' wide and as close as possible to grade to minimize soil disturbance. Runoff will be collected in conveyance swales and treatment swales prior to release.

2. Methodology

The watershed areas have been determined via inspection by our office and a topographical survey. This analysis utilizes HydroCAD modeling software which models the runoff based on the SCS TR-20 method and the time of concentration based on the SCS TR-55 method. This analysis compares the runoff rates for the 2, 10, and 50-year USDA/SCS Type III 24-hour extreme storm events. The rainfall data used in the model is referenced from the Cornell extreme precipitation rainfall table found in Appendix C of this report.

3. Soils

The soils located within the proposed disturbed areas have been identified in accordance with the Society of Soil Scientists of Northern New England (SSSNNE) Special Publication No. 3, Site Specific Soil Mapping Standards for New Hampshire and Vermont. The soils on site consist mostly of sandy loam over silty clay and silty clay loam with Hydrologic Soil Groups determined to be C and D. Refer to the Site Specific Soil Report and Plans. The offsite areas have been identified in accordance with the NRCS Web Soil Survey.

On-Site Soil Types

Label	Description	HSG:
238	Elmridge Series	D
935	Boxford Series	D
33	Scitico Series	D
184	Hollis/Chatfield complex	D
140	Chatfield/Hollis/Canton complex	B

Off-Site or Undisturbed Soil Types

Label	Description	HSG:
BzA,BzB	Buxton Silt Loam	C/D
HcB,	Hollis-Charlton Fine Sandy Loam	D
HdC,	Hollis-Charlton Very Rocky Fine Sandy Loam	D

4. Pre-Development Conditions

The Pre-Development Plan depicts the contributing runoff areas that are generated from this property. Pre-Development Drainage conditions have been analyzed based on the runoff characteristics of one point of analysis (POA), the Oyster River. The area has been modeled as one subcatchment. POA-1 is set at the edge of the tidal river which surrounds the northerly point of the property. The on-site and off-site area consists of mostly grass, wooded areas, gravel drives, a small amount of paved driveways, and residential roofs. The land slopes generally to the north and northwest into the Oyster River. The tidal river surrounds the northern point of the property and stretches back approximately 700 - 800' along the east and west side of the property. The southerly portion of the property slopes steeply at approximately 10-20% and the northerly portion of the property slopes at approximately 5-10% toward the Oyster River.

The hydrologic analysis of the existing runoff conditions is provided in Appendix A.

5. Post-Development Conditions

The proposed site development is depicted on the Post Development Drainage Plan.

Subcatchments 1A is being collected in conveyance swales and treated in a portion of the designed stormwater system. This part of the stormwater system includes a sediment forebay and treatment swale before release to a stream that drains to the Oyster River. The existing farm pond has a dam and culvert and discharges into a forested wetland which empties into the Oyster River. Subcatchment area 1B is largely undisturbed with the exception of a half of the house and the barn. Therefore, the runoff from this area is released without treatment. Subcatchment areas 1D, 1E & 1F are collected in conveyance swales and treated in a treatment swale prior to release to the wetland complex and ultimately to the tidal Oyster River. The majority of the impervious surfaces have been collected and treated.

The stormwater management design includes conveyance swales, sediment forebays, treatment swales, and outlet protection. The predominance of silty clay soils on site precludes the use of infiltration best management practices.

The hydrologic analysis of the proposed runoff conditions is provided in Appendix B. The analysis to size the two road cross culverts is included in Appendix C.

6. Comparison of Pre- and Post-Development Conditions

The following table quantifies the peak rate of discharge leaving the parcel at POA 1 as shown on the Pre- and Post-Development Drainage Plans. POA-1 is set at the edge of the tidal river which surrounds the northerly point of the property. The analysis has been modeled using the extreme rainfall quantities.

Table 1: Peak Rate of Runoff at POA 1 Summary Table

Storm	Pre-Development (cfs)	Post-Development (cfs)	Difference
2-Year	9.82	11.13	+1.31
10-Year	23.04	25.17	+2.13
50-Year	46.09	48.91	+2.82

There is an increase in the peak rate of runoff during all the design storm events leaving the site at POA 1. This will allow treated runoff to leave the site early in a storm event so as not to negatively impact the peak flow of the Oyster River. A waiver is requested from the peak runoff control requirements.

Channel Protection Requirements (Env-Wq 1507.05)

A waiver is requested from these requirements to prevent a negative impact to the Oyster River.

7. Stormwater Treatment and Pretreatment Practices

Stormwater pre-treatment will be provided by the 2 sediment forebays. Stormwater treatment will be provided by 2 treatment swales (TS 1&2).

8. WQV, WQF & GRV Calculations

The WQV and WQF requirements have been met. Refer to the applicable BMP worksheets. The BMP Design Criteria Worksheets have been completed for the treatment swales. The flow depth in the treatment swales is less than 4 inches deep at the Water Quality Flow (WQF) and the hydraulic residence time exceeds 10 minutes. The disturbed areas are located mostly on HSG D soils and therefore no infiltration is provided.

9. Erosion & Sediment Control

Temporary and permanent practices are used to prevent and minimize erosion and sedimentation on site. The installation of Silt Soxx™ at the perimeter of construction

areas will provide sediment retention during the construction phase of the development. Erosion Control blankets are proposed on slopes steeper than 3:1 to prevent erosion prior to the establishment of permanent vegetation. Stone check dams shall be installed in swales. Haybales will be installed at culverts for inlet protection. Rip rap is provided for outlet protection.

10. Conclusion

The enclosed comparative hydrologic model provides sufficient evidence that the stormwater design will minimize the typical increase in peak rate of stormwater discharge resulting from the proposed development of the site by not detaining runoff on site. Stormwater treatment practices will provide treatment of runoff from impervious surfaces. The use of erosion and sediment controls and proper construction practices will minimize the impact of this project to downstream surface waters.

APPENDIX A

Summary for Subcatchment 1: Subcatchment 1

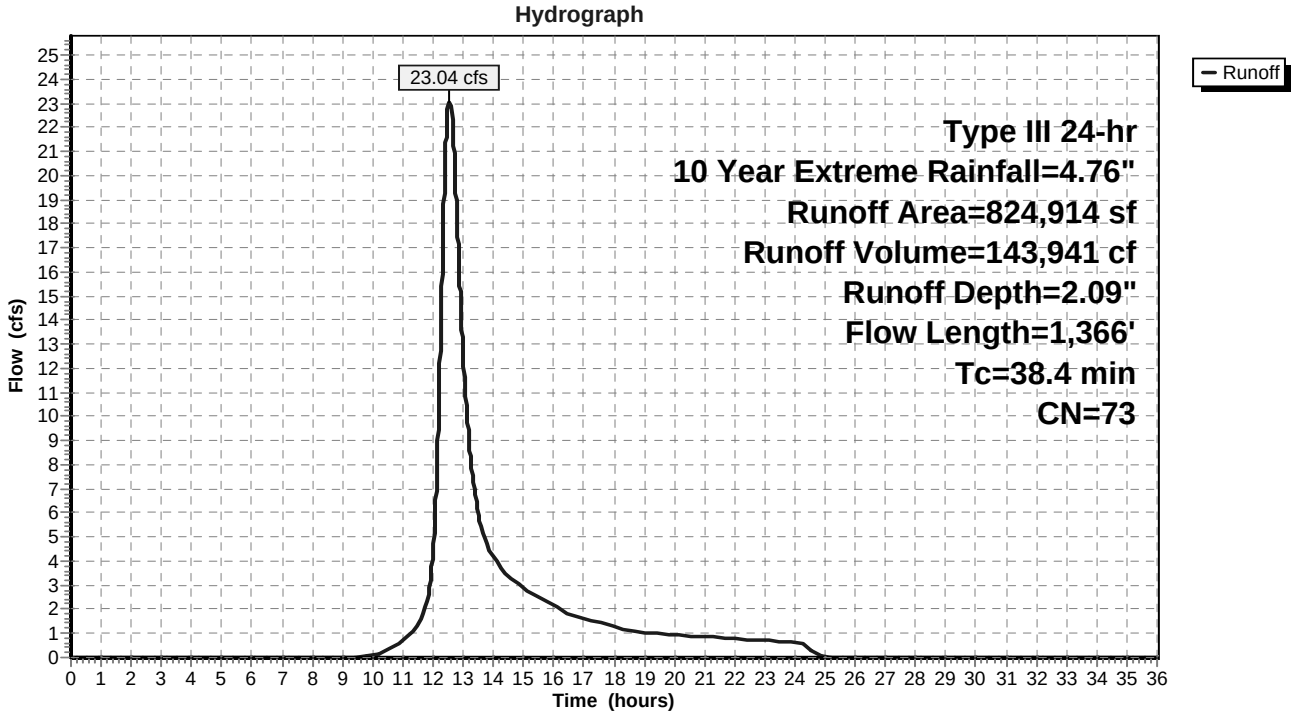
Runoff = 23.04 cfs @ 12.55 hrs, Volume= 143,941 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
9	61	>75% Grass cover, Good, HSG B
7,095	80	>75% Grass cover, Good, HSG D
46	98	Paved parking & roofs, HSG B
4,043	98	Paved parking & roofs, HSG D
41,312	55	Woods, Good, HSG B
339,142	70	Woods, Good, HSG C
433,267	77	Woods, Good, HSG D
824,914	73	Weighted Average
820,825		99.50% Pervious Area
4,089		0.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	100	0.0750	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.13"
16.1	1,266	0.0690	1.31		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
38.4	1,366	Total			

Subcatchment 1: Subcatchment 1



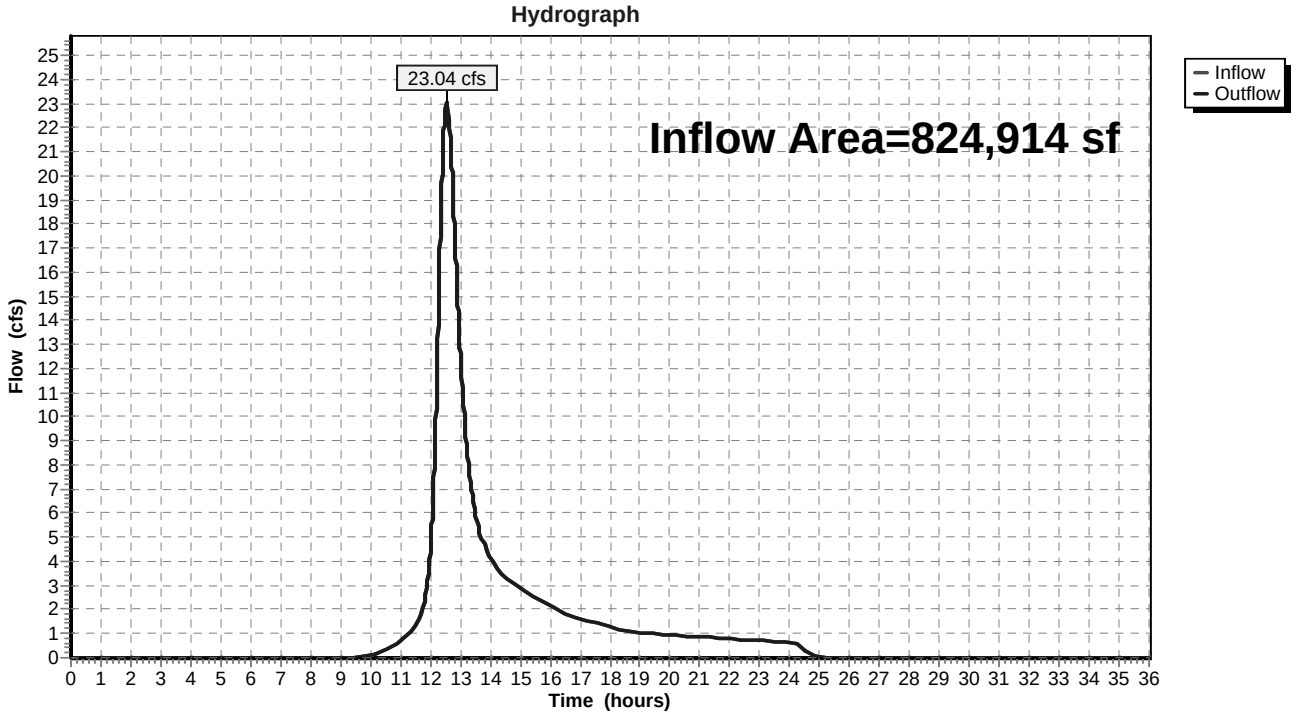
Summary for Reach POA1: POA #1

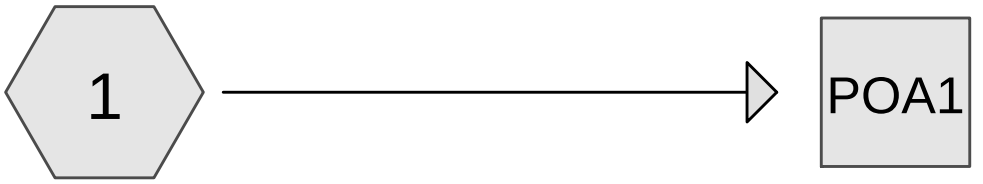
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 824,914 sf, 0.50% Impervious, Inflow Depth = 2.09" for 10 Year Extreme event
Inflow = 23.04 cfs @ 12.55 hrs, Volume= 143,941 cf
Outflow = 23.04 cfs @ 12.55 hrs, Volume= 143,941 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach POA1: POA #1





Subcatchment 1

POA #1

Subcat Reach Pond Link

Routing Diagram for 16075Pre-AoT
Prepared by MJS Engineering, PC, Printed 7/21/2017

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
9	61	>75% Grass cover, Good, HSG B (1)
7,095	80	>75% Grass cover, Good, HSG D (1)
46	98	Paved parking & roofs, HSG B (1)
4,043	98	Paved parking & roofs, HSG D (1)
41,312	55	Woods, Good, HSG B (1)
339,142	70	Woods, Good, HSG C (1)
433,267	77	Woods, Good, HSG D (1)
824,914	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
41,367	HSG B	1
339,142	HSG C	1
444,405	HSG D	1
0	Other	
824,914		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1: Subcatchment1 Runoff Area=824,914 sf 0.50% Impervious Runoff Depth=0.94"
Flow Length=1,366' Tc=38.4 min CN=73 Runoff=9.82 cfs 64,938 cf

Reach POA1: POA #1 Inflow=9.82 cfs 64,938 cf
Outflow=9.82 cfs 64,938 cf

Total Runoff Area = 824,914 sf Runoff Volume = 64,938 cf Average Runoff Depth = 0.94"
99.50% Pervious = 820,825 sf 0.50% Impervious = 4,089 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1: Subcatchment1 Runoff Area=824,914 sf 0.50% Impervious Runoff Depth=2.09"
Flow Length=1,366' Tc=38.4 min CN=73 Runoff=23.04 cfs 143,941 cf

Reach POA1: POA #1 Inflow=23.04 cfs 143,941 cf
Outflow=23.04 cfs 143,941 cf

Total Runoff Area = 824,914 sf Runoff Volume = 143,941 cf Average Runoff Depth = 2.09"
99.50% Pervious = 820,825 sf 0.50% Impervious = 4,089 sf

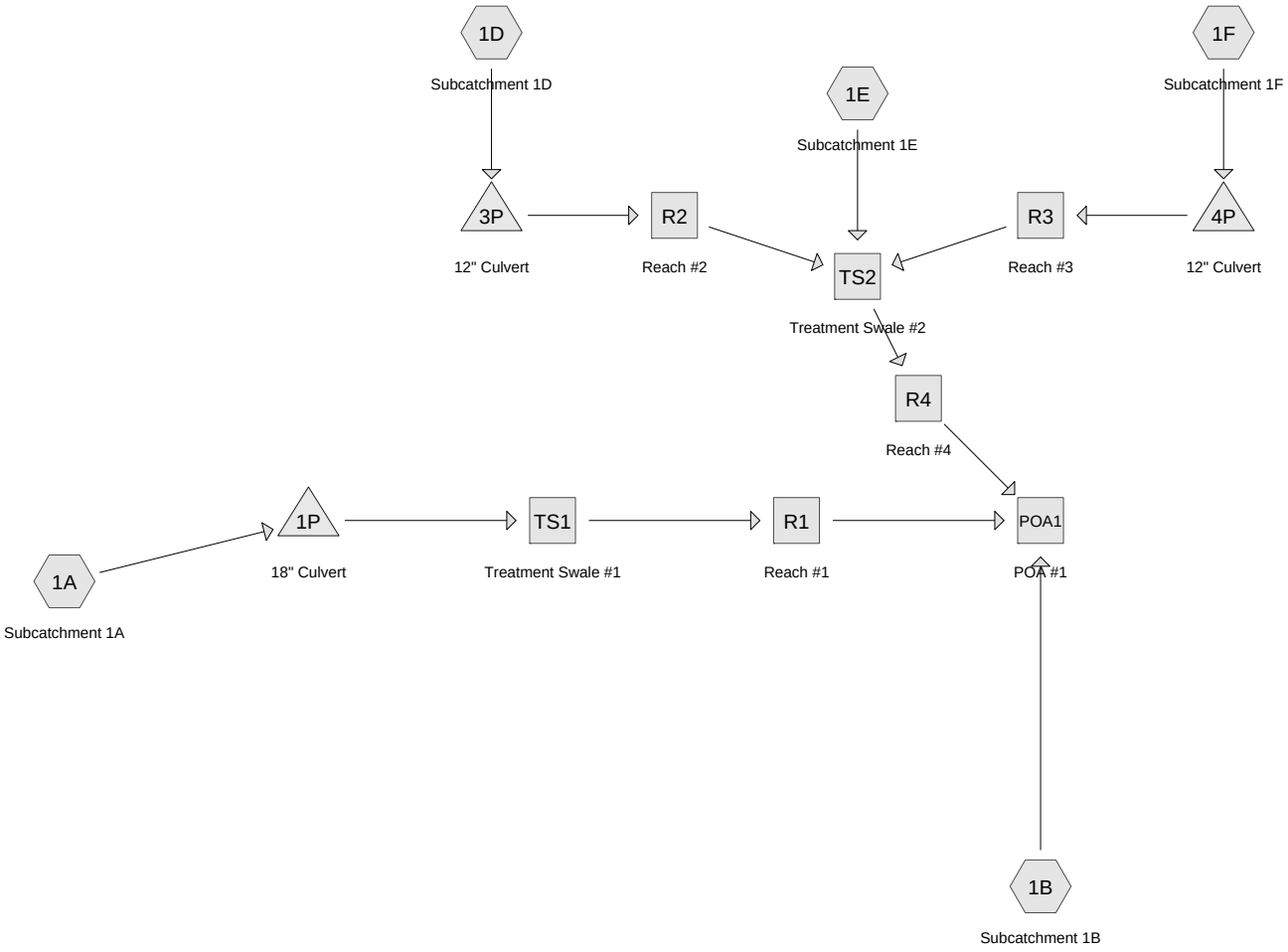
Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment1: Subcatchment1 Runoff Area=824,914 sf 0.50% Impervious Runoff Depth=4.13"
Flow Length=1,366' Tc=38.4 min CN=73 Runoff=46.09 cfs 284,201 cf

Reach POA1: POA #1 Inflow=46.09 cfs 284,201 cf
Outflow=46.09 cfs 284,201 cf

Total Runoff Area = 824,914 sf Runoff Volume = 284,201 cf Average Runoff Depth = 4.13"
99.50% Pervious = 820,825 sf 0.50% Impervious = 4,089 sf

APPENDIX B



Subcat Reach Pond Link

Routing Diagram for 16075Post-Aot1
Prepared by MJS Engineering, PC, Printed 9/14/2017

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
5,063	61	>75% Grass cover, Good, HSG B (1A, 1B)
5,289	74	>75% Grass cover, Good, HSG C (1A, 1B, 1E, 1F)
79,079	80	>75% Grass cover, Good, HSG D (1A, 1B, 1D, 1E, 1F)
5,530	98	Paved parking & roofs, HSG B (1A, 1B)
1,589	98	Paved parking & roofs, HSG C (1B, 1F)
42,578	98	Paved parking & roofs, HSG D (1A, 1B, 1D, 1E, 1F)
30,774	55	Woods, Good, HSG B (1A, 1B)
332,264	70	Woods, Good, HSG C (1A, 1B)
322,748	77	Woods, Good, HSG D (1A, 1B, 1D, 1E, 1F)
824,914	**75**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
41,367	HSG B	1A, 1B
339,142	HSG C	1A, 1B, 1E, 1F
444,405	HSG D	1A, 1B, 1D, 1E, 1F
0	Other	
824,914		**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1A Runoff Area=164,193 sf 11.95% Impervious Runoff Depth=1.17"
Flow Length=605' Tc=32.7 min CN=77 Runoff=2.72 cfs 15,997 cf

Subcatchment 1B: Subcatchment 1B Runoff Area=600,593 sf 1.40% Impervious Runoff Depth=0.94"
Flow Length=1,153' Tc=33.9 min CN=73 Runoff=7.59 cfs 47,279 cf

Subcatchment 1D: Subcatchment 1D Runoff Area=18,850 sf 41.78% Impervious Runoff Depth=1.78"
Tc=6.0 min CN=86 Runoff=0.91 cfs 2,801 cf

Subcatchment 1E: Subcatchment 1E Runoff Area=22,867 sf 23.59% Impervious Runoff Depth=1.56"
Tc=6.0 min CN=83 Runoff=0.96 cfs 2,973 cf

Subcatchment 1F: Subcatchment 1F Runoff Area=18,411 sf 45.47% Impervious Runoff Depth=1.94"
Tc=6.0 min CN=88 Runoff=0.96 cfs 2,981 cf

Reach POA1: POA #1 Inflow=11.13 cfs 72,031 cf
Outflow=11.13 cfs 72,031 cf

Reach R1: Reach #1 Avg. Flow Depth=0.07' Max Vel=2.43 fps Inflow=2.69 cfs 15,997 cf
n=0.022 L=650.0' S=0.0431 '/' Capacity=778.06 cfs Outflow=2.66 cfs 15,997 cf

Reach R2: Reach #2 Avg. Flow Depth=0.25' Max Vel=2.04 fps Inflow=0.90 cfs 2,801 cf
n=0.022 L=100.0' S=0.0098 '/' Capacity=17.87 cfs Outflow=0.89 cfs 2,801 cf

Reach R3: Reach #3 Avg. Flow Depth=0.26' Max Vel=2.08 fps Inflow=0.96 cfs 2,981 cf
n=0.022 L=175.0' S=0.0099 '/' Capacity=17.95 cfs Outflow=0.94 cfs 2,981 cf

Reach R4: Reach #4 Avg. Flow Depth=0.09' Max Vel=2.25 fps Inflow=2.41 cfs 8,755 cf
n=0.022 L=264.0' S=0.0292 '/' Capacity=189.55 cfs Outflow=2.36 cfs 8,755 cf

Reach TS1: Treatment Swale #1 Avg. Flow Depth=0.64' Max Vel=0.71 fps Inflow=2.72 cfs 15,997 cf
n=0.090 L=135.0' S=0.0050 '/' Capacity=9.82 cfs Outflow=2.69 cfs 15,997 cf

Reach TS2: Treatment Swale #2 Avg. Flow Depth=0.58' Max Vel=0.62 fps Inflow=2.77 cfs 8,755 cf
n=0.100 L=180.0' S=0.0050 '/' Capacity=14.81 cfs Outflow=2.41 cfs 8,755 cf

Pond 1P: 18" Culvert Peak Elev=36.81' Storage=48 cf Inflow=2.72 cfs 15,997 cf
18.0" Round Culvert n=0.013 L=41.0' S=0.0098 '/' Outflow=2.72 cfs 15,997 cf

Pond 3P: 12" Culvert Peak Elev=17.94' Storage=26 cf Inflow=0.91 cfs 2,801 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0099 '/' Outflow=0.90 cfs 2,801 cf

Pond 4P: 12" Culvert Peak Elev=18.71' Storage=15 cf Inflow=0.96 cfs 2,981 cf
12.0" Round Culvert n=0.013 L=35.0' S=0.0100 '/' Outflow=0.96 cfs 2,981 cf

Total Runoff Area = 824,914 sf Runoff Volume = 72,031 cf Average Runoff Depth = 1.05"
93.98% Pervious = 775,217 sf 6.02% Impervious = 49,697 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1A Runoff Area=164,193 sf 11.95% Impervious Runoff Depth=4.57"
Flow Length=605' Tc=32.7 min CN=77 Runoff=10.97 cfs 62,572 cf

Subcatchment 1B: Subcatchment 1B Runoff Area=600,593 sf 1.40% Impervious Runoff Depth=4.13"
Flow Length=1,153' Tc=33.9 min CN=73 Runoff=35.78 cfs 206,918 cf

Subcatchment 1D: Subcatchment 1D Runoff Area=18,850 sf 41.78% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=86 Runoff=2.74 cfs 8,776 cf

Subcatchment 1E: Subcatchment 1E Runoff Area=22,867 sf 23.59% Impervious Runoff Depth=5.25"
Tc=6.0 min CN=83 Runoff=3.16 cfs 9,995 cf

Subcatchment 1F: Subcatchment 1F Runoff Area=18,411 sf 45.47% Impervious Runoff Depth=5.82"
Tc=6.0 min CN=88 Runoff=2.75 cfs 8,925 cf

Reach POA1: POA #1 Inflow=48.91 cfs 297,187 cf
Outflow=48.91 cfs 297,187 cf

Reach R1: Reach #1 Avg. Flow Depth=0.17' Max Vel=4.16 fps Inflow=10.78 cfs 62,572 cf
n=0.022 L=650.0' S=0.0431 '/' Capacity=778.06 cfs Outflow=10.74 cfs 62,572 cf

Reach R2: Reach #2 Avg. Flow Depth=0.42' Max Vel=2.73 fps Inflow=2.63 cfs 8,776 cf
n=0.022 L=100.0' S=0.0098 '/' Capacity=17.87 cfs Outflow=2.61 cfs 8,776 cf

Reach R3: Reach #3 Avg. Flow Depth=0.43' Max Vel=2.76 fps Inflow=2.71 cfs 8,925 cf
n=0.022 L=175.0' S=0.0099 '/' Capacity=17.95 cfs Outflow=2.68 cfs 8,925 cf

Reach R4: Reach #4 Avg. Flow Depth=0.19' Max Vel=3.39 fps Inflow=7.99 cfs 27,696 cf
n=0.022 L=264.0' S=0.0292 '/' Capacity=189.55 cfs Outflow=7.90 cfs 27,696 cf

Reach TS1: Treatment Swale #1 Avg. Flow Depth=0.87' Max Vel=1.87 fps Inflow=10.79 cfs 62,572 cf
n=0.040 L=135.0' S=0.0050 '/' Capacity=22.10 cfs Outflow=10.78 cfs 62,572 cf

Reach TS2: Treatment Swale #2 Avg. Flow Depth=0.84' Max Vel=1.26 fps Inflow=8.34 cfs 27,696 cf
n=0.060 L=180.0' S=0.0050 '/' Capacity=24.68 cfs Outflow=7.99 cfs 27,696 cf

Pond 1P: 18" Culvert Peak Elev=38.40' Storage=739 cf Inflow=10.97 cfs 62,572 cf
18.0" Round Culvert n=0.013 L=41.0' S=0.0098 '/' Outflow=10.79 cfs 62,572 cf

Pond 3P: 12" Culvert Peak Elev=18.45' Storage=151 cf Inflow=2.74 cfs 8,776 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0099 '/' Outflow=2.63 cfs 8,776 cf

Pond 4P: 12" Culvert Peak Elev=19.23' Storage=77 cf Inflow=2.75 cfs 8,925 cf
12.0" Round Culvert n=0.013 L=35.0' S=0.0100 '/' Outflow=2.71 cfs 8,925 cf

Total Runoff Area = 824,914 sf Runoff Volume = 297,187 cf Average Runoff Depth = 4.32"
93.98% Pervious = 775,217 sf 6.02% Impervious = 49,697 sf

Summary for Subcatchment 1A: Subcatchment 1A

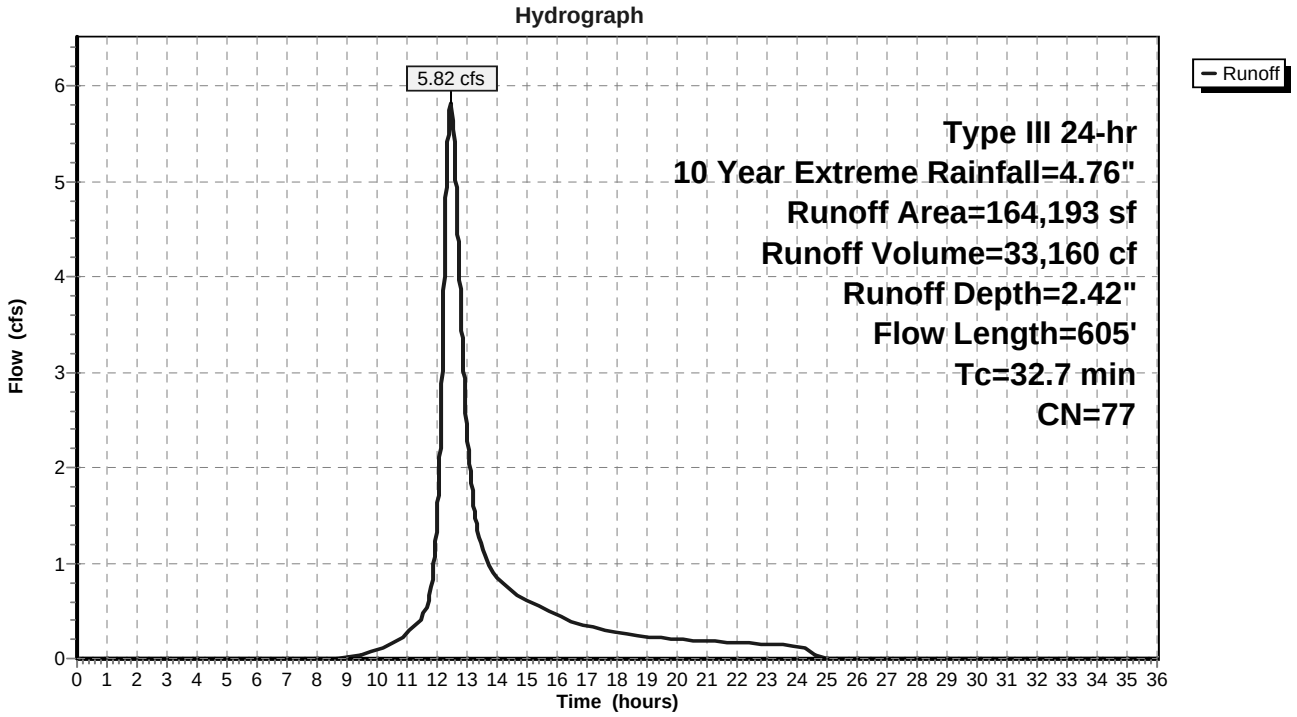
Runoff = 5.82 cfs @ 12.46 hrs, Volume= 33,160 cf, Depth= 2.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
2,332	61	>75% Grass cover, Good, HSG B
7	74	>75% Grass cover, Good, HSG C
17,383	80	>75% Grass cover, Good, HSG D
5,479	98	Paved parking & roofs, HSG B
14,148	98	Paved parking & roofs, HSG D
19,134	55	Woods, Good, HSG B
343	70	Woods, Good, HSG C
105,367	77	Woods, Good, HSG D
164,193	77	Weighted Average
144,566		88.05% Pervious Area
19,627		11.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.8	25	0.0920	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.13"
16.2	75	0.0930	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.13"
14.6	446	0.0103	0.51		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	59	0.0420	14.08	197.11	**Trap/Vee/Rect Channel Flow,** Bot.W=1.00' D=2.00' Z= 3.0 '/' Top.W=13.00' n= 0.022 Earth, clean & straight
32.7	605	Total			

Subcatchment 1A: Subcatchment 1A



Summary for Subcatchment 1B: Subcatchment 1B

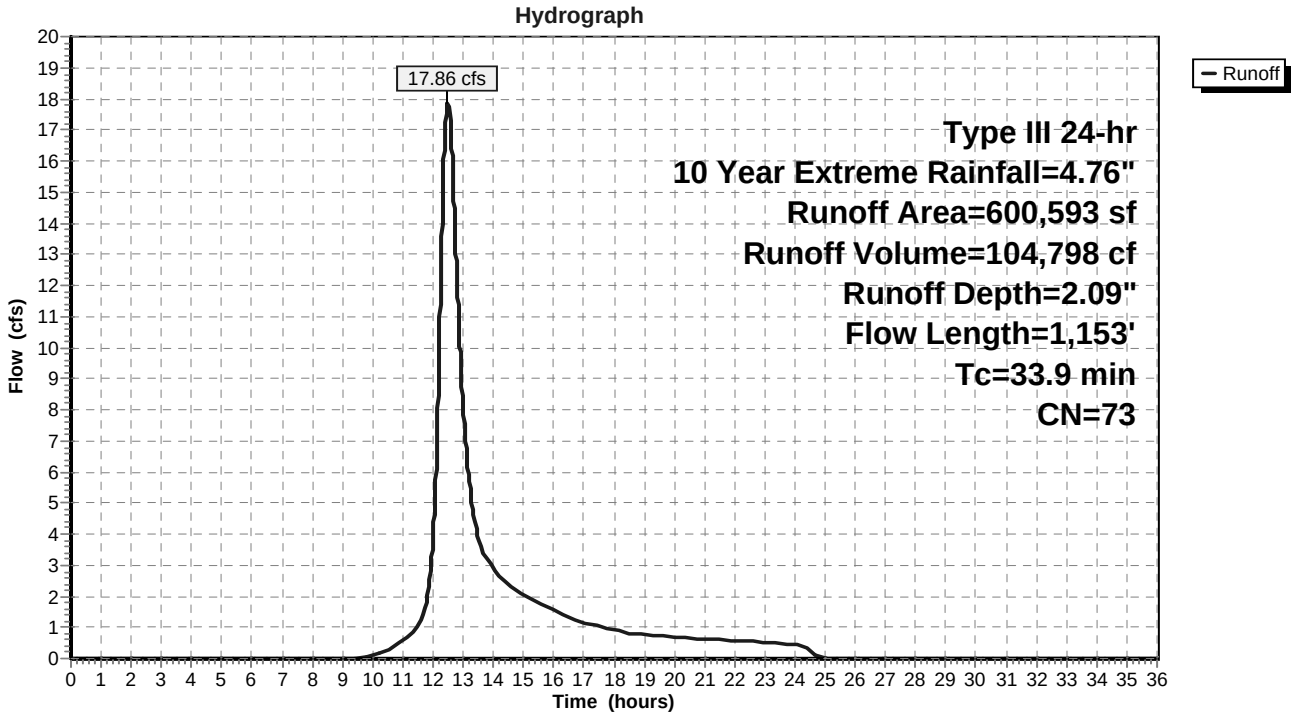
Runoff = 17.86 cfs @ 12.47 hrs, Volume= 104,798 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
2,731	61	>75% Grass cover, Good, HSG B
4,099	74	>75% Grass cover, Good, HSG C
37,884	80	>75% Grass cover, Good, HSG D
51	98	Paved parking & roofs, HSG B
1,216	98	Paved parking & roofs, HSG C
7,162	98	Paved parking & roofs, HSG D
11,640	55	Woods, Good, HSG B
331,921	70	Woods, Good, HSG C
203,889	77	Woods, Good, HSG D
600,593	73	Weighted Average
592,164		98.60% Pervious Area
8,429		1.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	100	0.0960	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.13"
13.7	1,053	0.0660	1.28		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
33.9	1,153	Total			

Subcatchment 1B: Subcatchment 1B



Summary for Subcatchment 1D: Subcatchment 1D

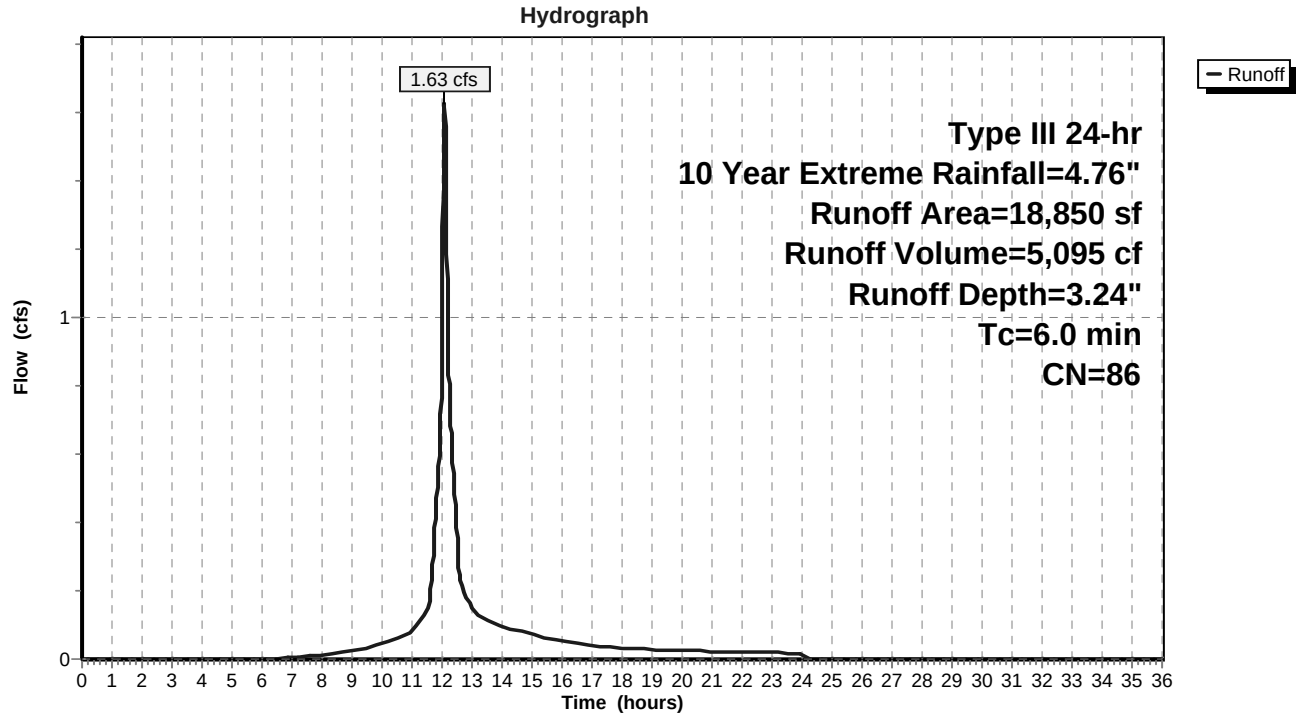
Runoff = 1.63 cfs @ 12.09 hrs, Volume= 5,095 cf, Depth= 3.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
3,967	80	>75% Grass cover, Good, HSG D
7,875	98	Paved parking & roofs, HSG D
7,008	77	Woods, Good, HSG D
18,850	86	Weighted Average
10,975		58.22% Pervious Area
7,875		41.78% Impervious Area

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

Subcatchment 1D: Subcatchment 1D



Summary for Subcatchment 1E: Subcatchment 1E

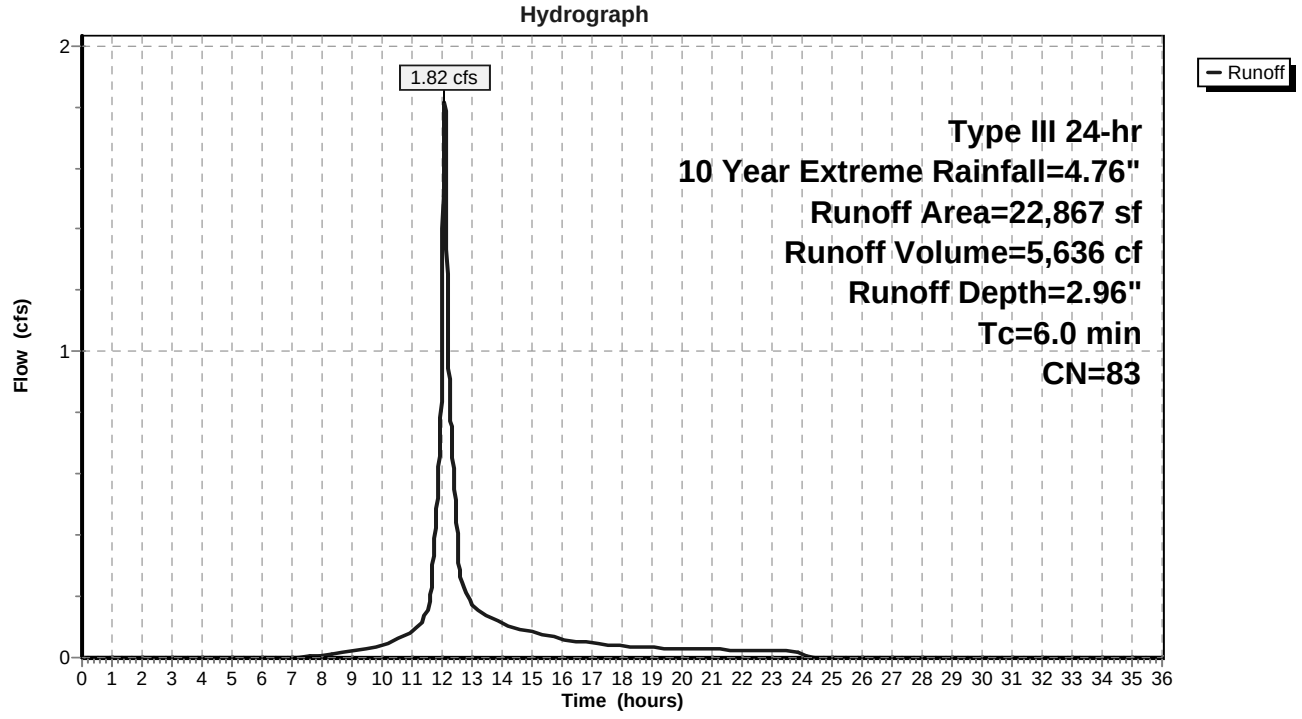
Runoff = 1.82 cfs @ 12.09 hrs, Volume= 5,636 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
939	74	>75% Grass cover, Good, HSG C
10,051	80	>75% Grass cover, Good, HSG D
5,395	98	Paved parking & roofs, HSG D
6,482	77	Woods, Good, HSG D
22,867	83	Weighted Average
17,472		76.41% Pervious Area
5,395		23.59% Impervious Area

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

Subcatchment 1E: Subcatchment 1E



Summary for Subcatchment 1F: Subcatchment 1F

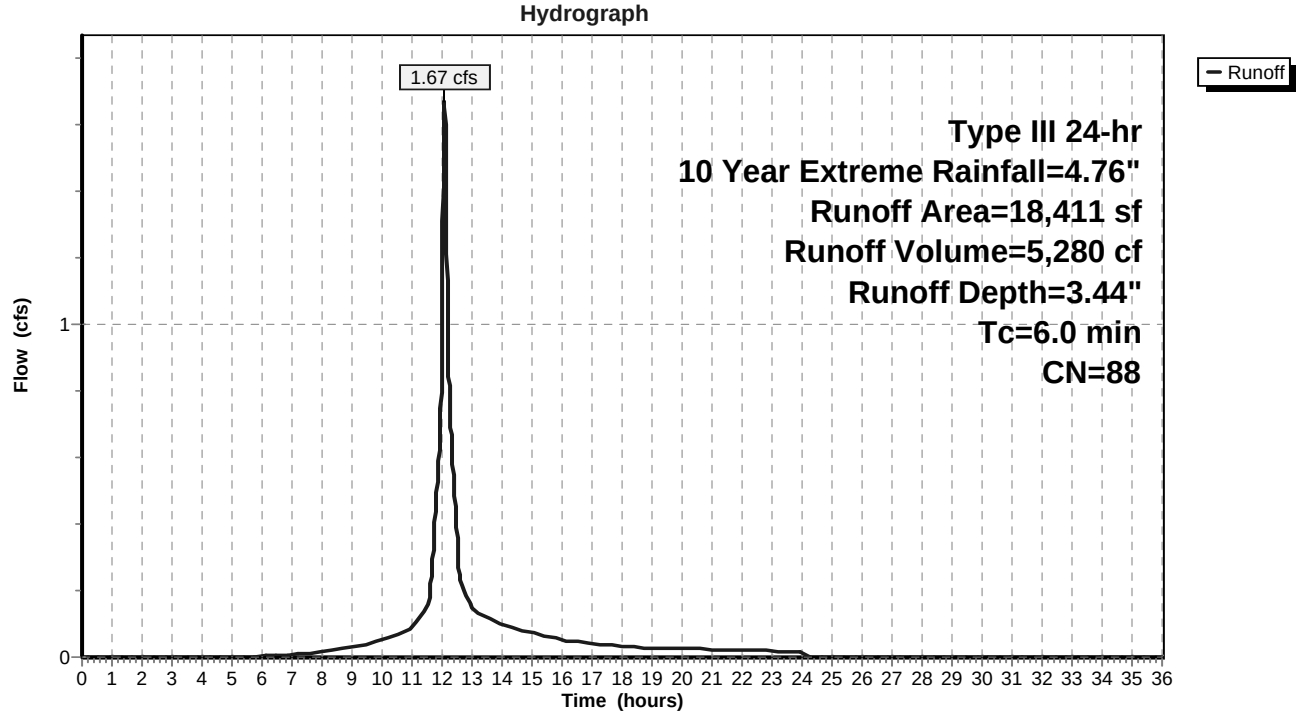
Runoff = 1.67 cfs @ 12.09 hrs, Volume= 5,280 cf, Depth= 3.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Extreme Rainfall=4.76"

Area (sf)	CN	Description
244	74	>75% Grass cover, Good, HSG C
9,794	80	>75% Grass cover, Good, HSG D
373	98	Paved parking & roofs, HSG C
7,998	98	Paved parking & roofs, HSG D
2	77	Woods, Good, HSG D
18,411	88	Weighted Average
10,040		54.53% Pervious Area
8,371		45.47% Impervious Area

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

Subcatchment 1F: Subcatchment 1F



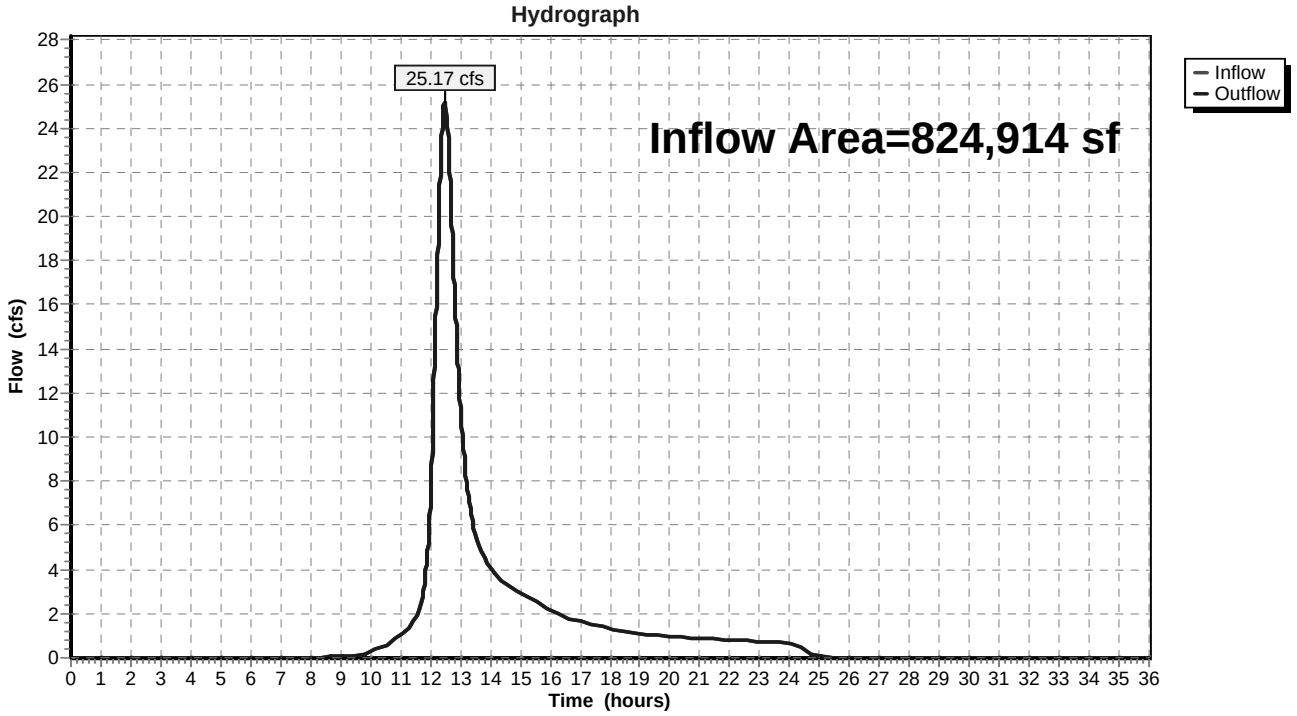
Summary for Reach POA1: POA #1

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 824,914 sf, 6.02% Impervious, Inflow Depth = 2.24" for 10 Year Extreme event
Inflow = 25.17 cfs @ 12.47 hrs, Volume= 153,970 cf
Outflow = 25.17 cfs @ 12.47 hrs, Volume= 153,970 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach POA1: POA #1



Summary for Reach R1: Reach #1

Inflow Area = 164,193 sf, 11.95% Impervious, Inflow Depth = 2.42" for 10 Year Extreme event
Inflow = 5.78 cfs @ 12.50 hrs, Volume= 33,160 cf
Outflow = 5.74 cfs @ 12.53 hrs, Volume= 33,160 cf, Atten= 1%, Lag= 2.2 min

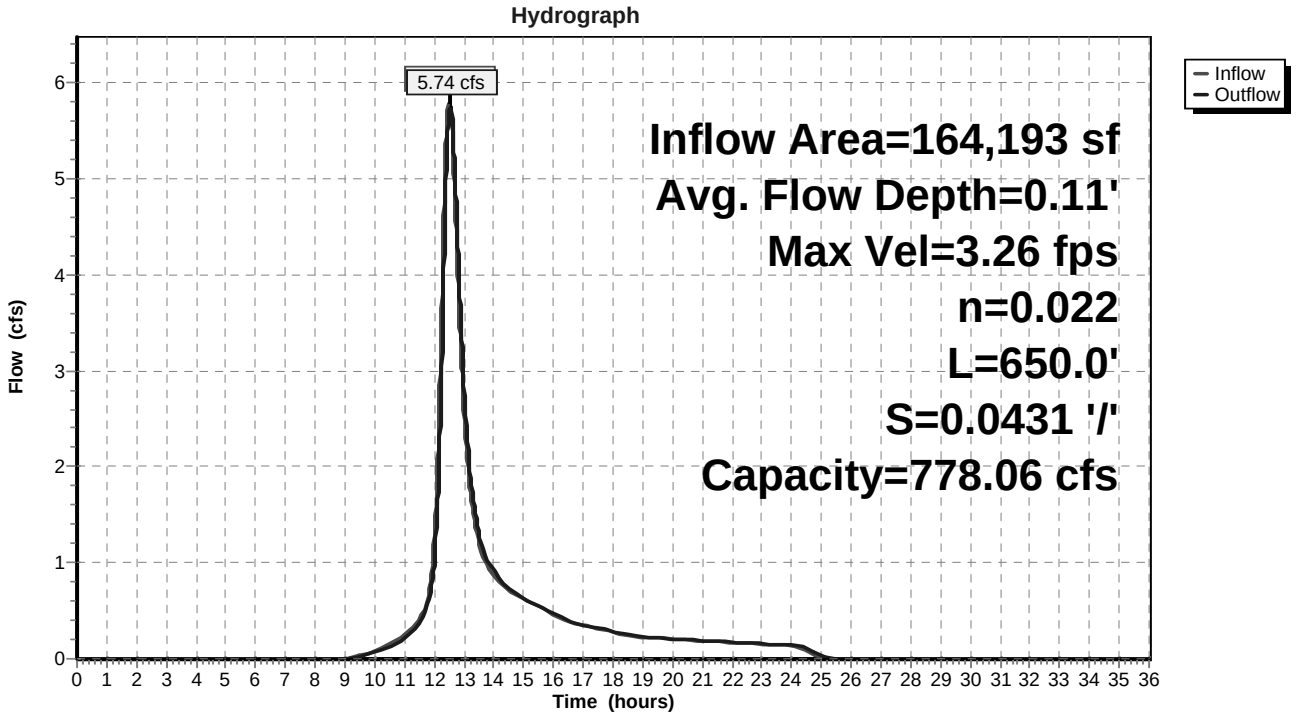
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.26 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 8.8 min

Peak Storage= 1,143 cf @ 12.53 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 2.00' Flow Area= 42.0 sf, Capacity= 778.06 cfs

15.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 27.00'
Length= 650.0' Slope= 0.0431 '/'
Inlet Invert= 34.00', Outlet Invert= 6.00'

‡

Reach R1: Reach #1



Summary for Reach R2: Reach #2

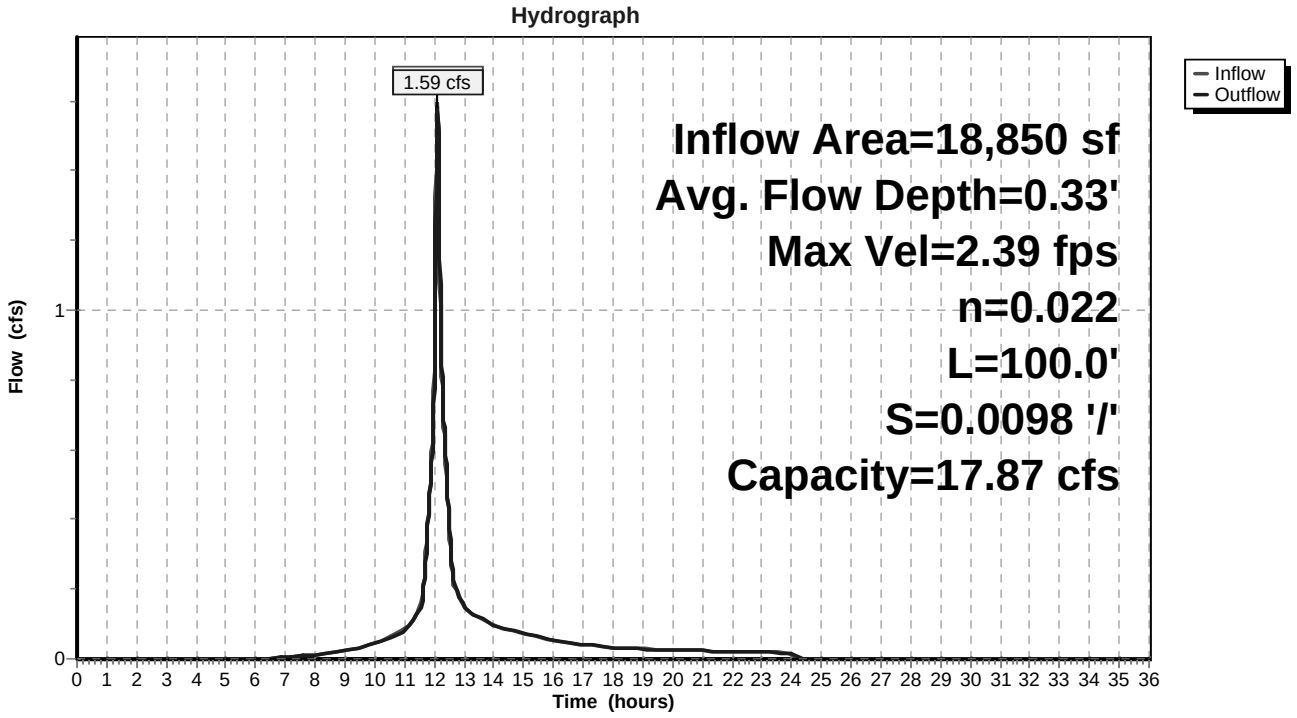
Inflow Area = 18,850 sf, 41.78% Impervious, Inflow Depth = 3.24" for 10 Year Extreme event
Inflow = 1.59 cfs @ 12.10 hrs, Volume= 5,095 cf
Outflow = 1.59 cfs @ 12.11 hrs, Volume= 5,095 cf, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.39 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 2.1 min

Peak Storage= 66 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 17.87 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= 100.0' Slope= 0.0098 '/'
Inlet Invert= 17.08', Outlet Invert= 16.10'

Reach R2: Reach #2



Summary for Reach R3: Reach #3

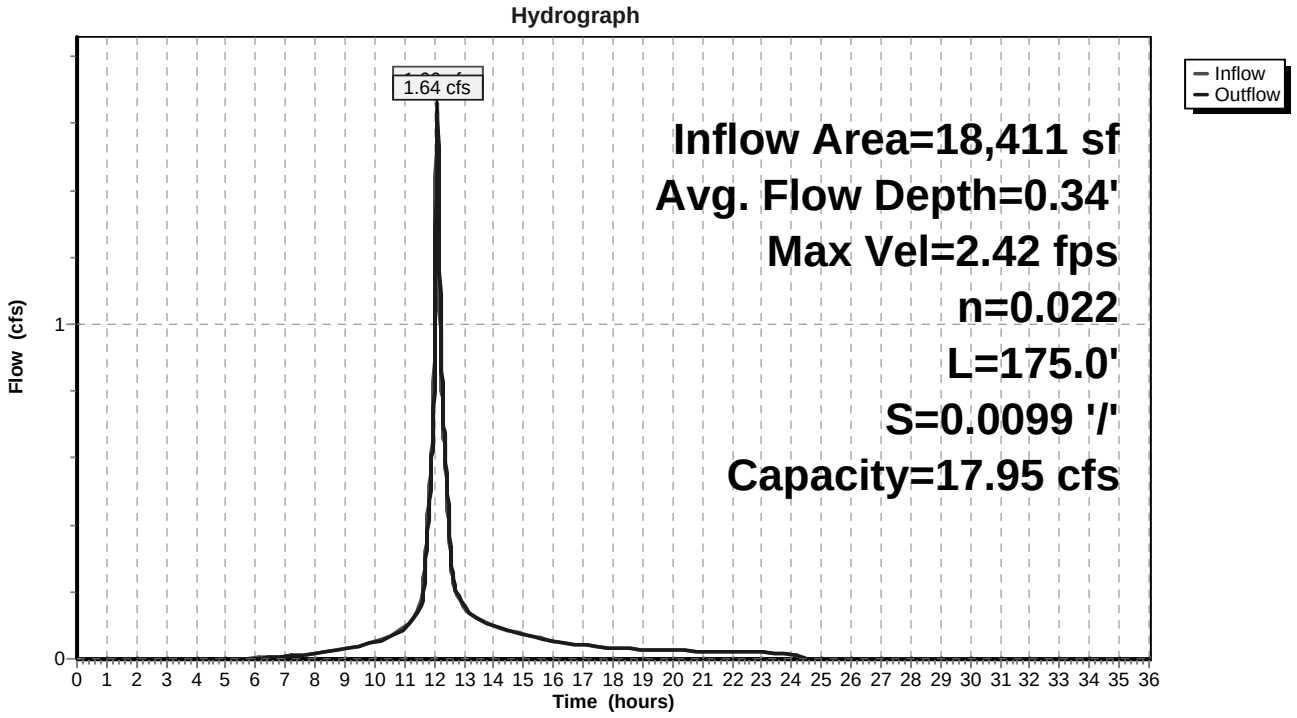
Inflow Area = 18,411 sf, 45.47% Impervious, Inflow Depth = 3.44" for 10 Year Extreme event
Inflow = 1.66 cfs @ 12.09 hrs, Volume= 5,280 cf
Outflow = 1.64 cfs @ 12.11 hrs, Volume= 5,280 cf, Atten= 2%, Lag= 0.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.42 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 3.8 min

Peak Storage= 118 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 17.95 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= 175.0' Slope= 0.0099 '/'
Inlet Invert= 17.83', Outlet Invert= 16.10'

Reach R3: Reach #3



Summary for Reach R4: Reach #4

Inflow Area = 60,128 sf, 35.99% Impervious, Inflow Depth = 3.20" for 10 Year Extreme event
Inflow = 4.66 cfs @ 12.14 hrs, Volume= 16,012 cf
Outflow = 4.58 cfs @ 12.15 hrs, Volume= 16,012 cf, Atten= 2%, Lag= 1.1 min

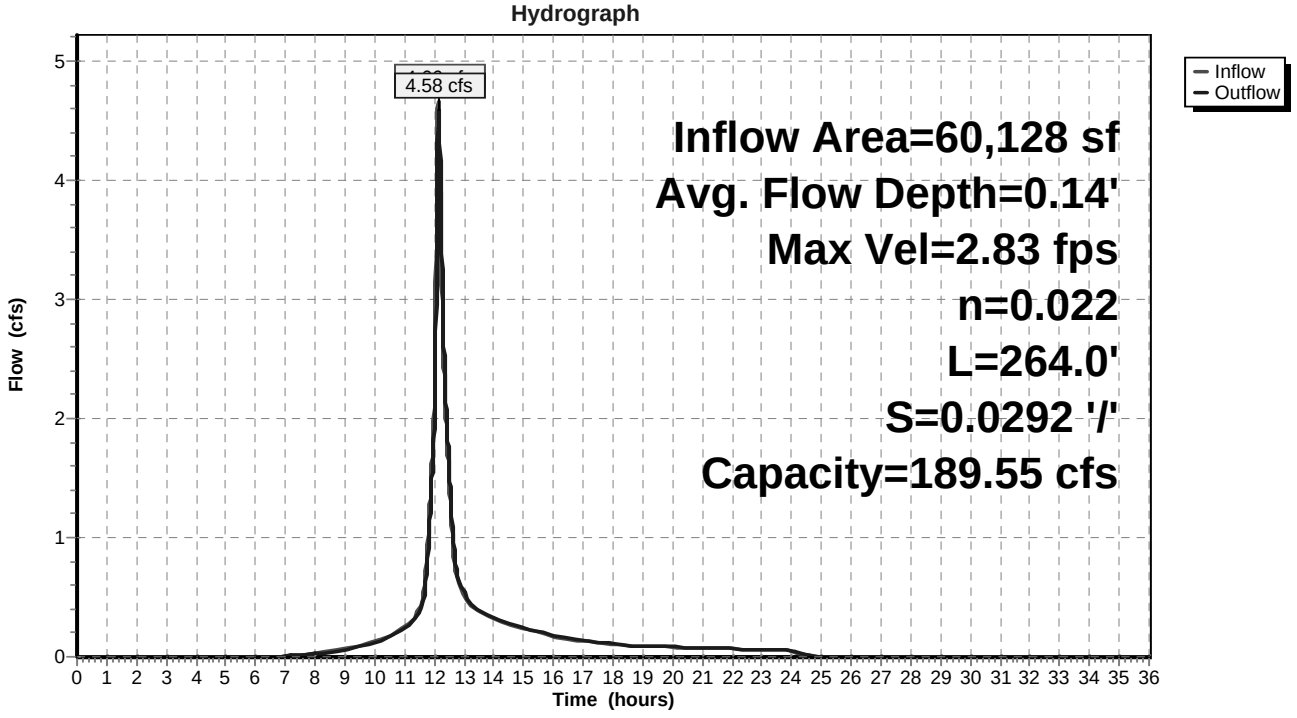
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 5.7 min

Peak Storage= 428 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 22.0 sf, Capacity= 189.55 cfs

10.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 12.0 '/' Top Width= 34.00'
Length= 264.0' Slope= 0.0292 '/'
Inlet Invert= 13.90', Outlet Invert= 6.20'

‡

Reach R4: Reach #4



Summary for Reach TS1: Treatment Swale #1

Inflow Area = 164,193 sf, 11.95% Impervious, Inflow Depth = 2.42" for 10 Year Extreme event
Inflow = 5.80 cfs @ 12.47 hrs, Volume= 33,160 cf
Outflow = 5.78 cfs @ 12.50 hrs, Volume= 33,160 cf, Atten= 0%, Lag= 1.4 min

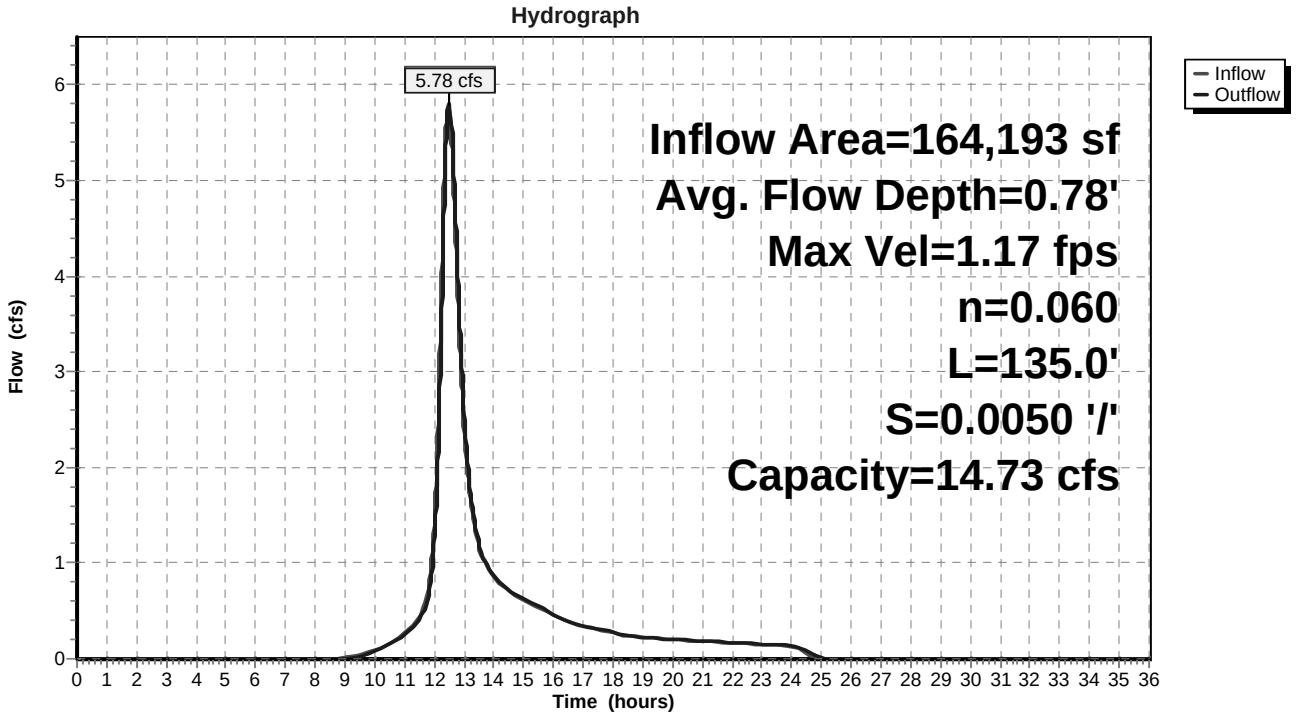
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.17 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 5.5 min

Peak Storage= 665 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 1.25' Flow Area= 9.7 sf, Capacity= 14.73 cfs

4.00' x 1.25' deep channel, n= 0.060
Side Slope Z-value= 3.0 '/' Top Width= 11.50'
Length= 135.0' Slope= 0.0050 '/'
Inlet Invert= 35.00', Outlet Invert= 34.33'

‡

Reach TS1: Treatment Swale #1



Summary for Reach TS2: Treatment Swale #2

Inflow Area = 60,128 sf, 35.99% Impervious, Inflow Depth = 3.20" for 10 Year Extreme event
Inflow = 4.99 cfs @ 12.10 hrs, Volume= 16,012 cf
Outflow = 4.66 cfs @ 12.14 hrs, Volume= 16,012 cf, Atten= 7%, Lag= 2.0 min

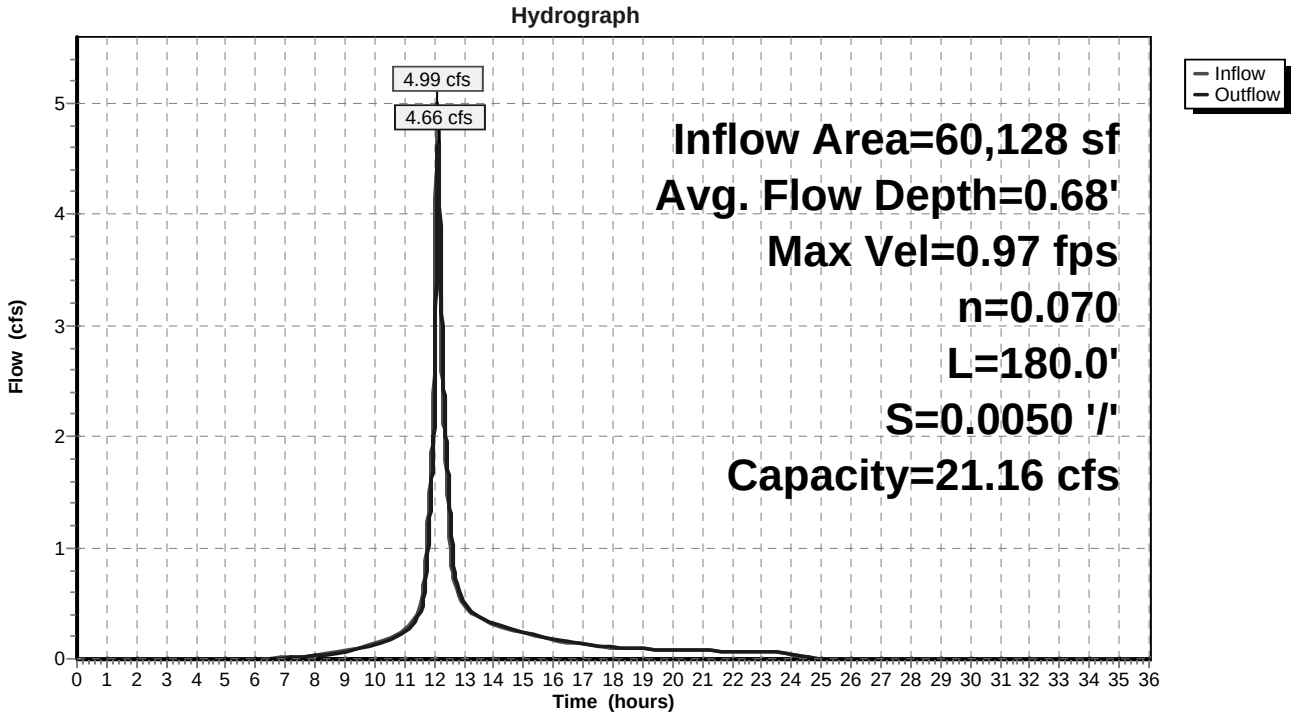
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.97 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.25 fps, Avg. Travel Time= 12.1 min

Peak Storage= 867 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.50' Flow Area= 14.3 sf, Capacity= 21.16 cfs

5.00' x 1.50' deep channel, n= 0.070
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 180.0' Slope= 0.0050 '/'
Inlet Invert= 15.00', Outlet Invert= 14.10'

‡

Reach TS2: Treatment Swale #2



Summary for Pond 1P: 18" Culvert

Inflow Area = 164,193 sf, 11.95% Impervious, Inflow Depth = 2.42" for 10 Year Extreme event
Inflow = 5.82 cfs @ 12.46 hrs, Volume= 33,160 cf
Outflow = 5.80 cfs @ 12.47 hrs, Volume= 33,160 cf, Atten= 0%, Lag= 0.7 min
Primary = 5.80 cfs @ 12.47 hrs, Volume= 33,160 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 37.32' @ 12.47 hrs Surf.Area= 289 sf Storage= 152 cf

Plug-Flow detention time= 0.4 min calculated for 33,160 cf (100% of inflow)
Center-of-Mass det. time= 0.3 min (857.1 - 856.8)

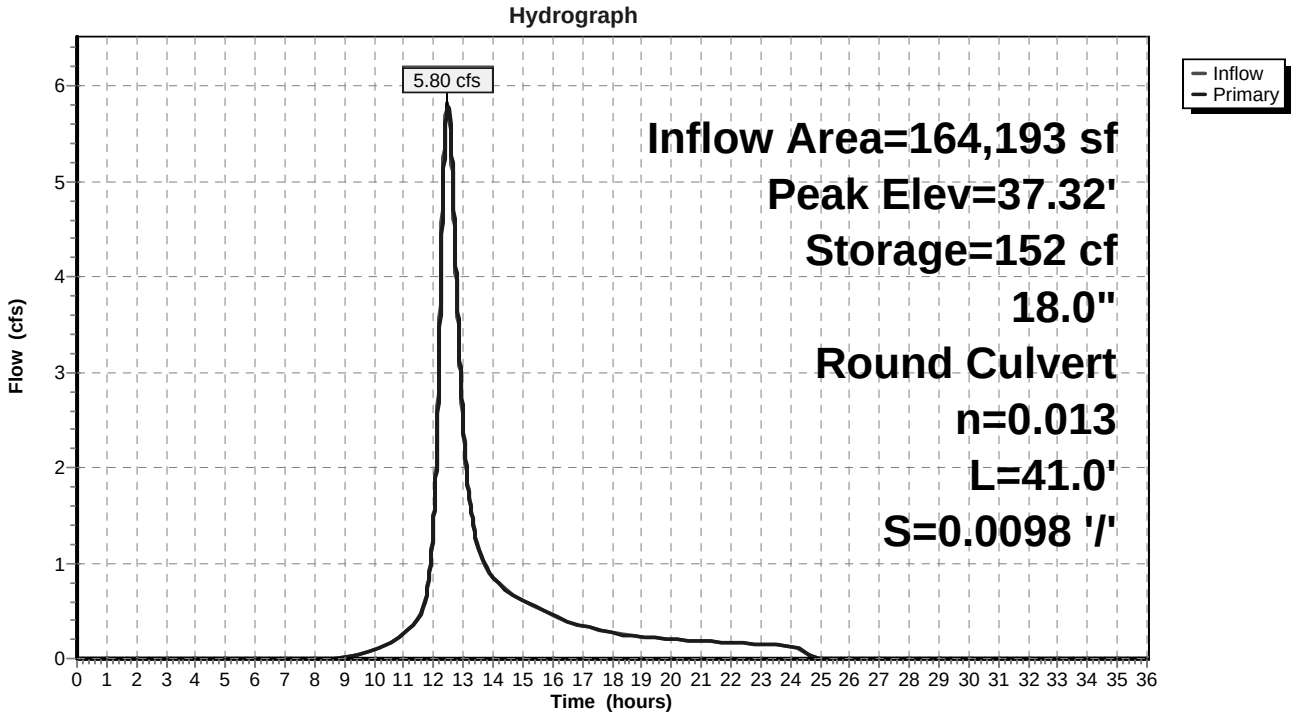
Volume	Invert	Avail.Storage	Storage Description
#1	36.00'	3,255 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
36.00	8	10.3	0	0	8
38.00	595	162.8	448	448	2,116
40.00	2,416	374.3	2,807	3,255	11,171

Device	Routing	Invert	Outlet Devices
#1	Primary	36.00'	**18.0" Round Culvert** L= 41.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 36.00' / 35.60' S= 0.0098 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.80 cfs @ 12.47 hrs HW=37.32' TW=35.78' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 5.80 cfs @ 4.71 fps)

Pond 1P: 18" Culvert



Summary for Pond 3P: 12" Culvert

Inflow Area = 18,850 sf, 41.78% Impervious, Inflow Depth = 3.24" for 10 Year Extreme event
Inflow = 1.63 cfs @ 12.09 hrs, Volume= 5,095 cf
Outflow = 1.59 cfs @ 12.10 hrs, Volume= 5,095 cf, Atten= 2%, Lag= 1.0 min
Primary = 1.59 cfs @ 12.10 hrs, Volume= 5,095 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 18.15' @ 12.10 hrs Surf.Area= 227 sf Storage= 63 cf

Plug-Flow detention time= 0.4 min calculated for 5,094 cf (100% of inflow)
Center-of-Mass det. time= 0.4 min (806.7 - 806.3)

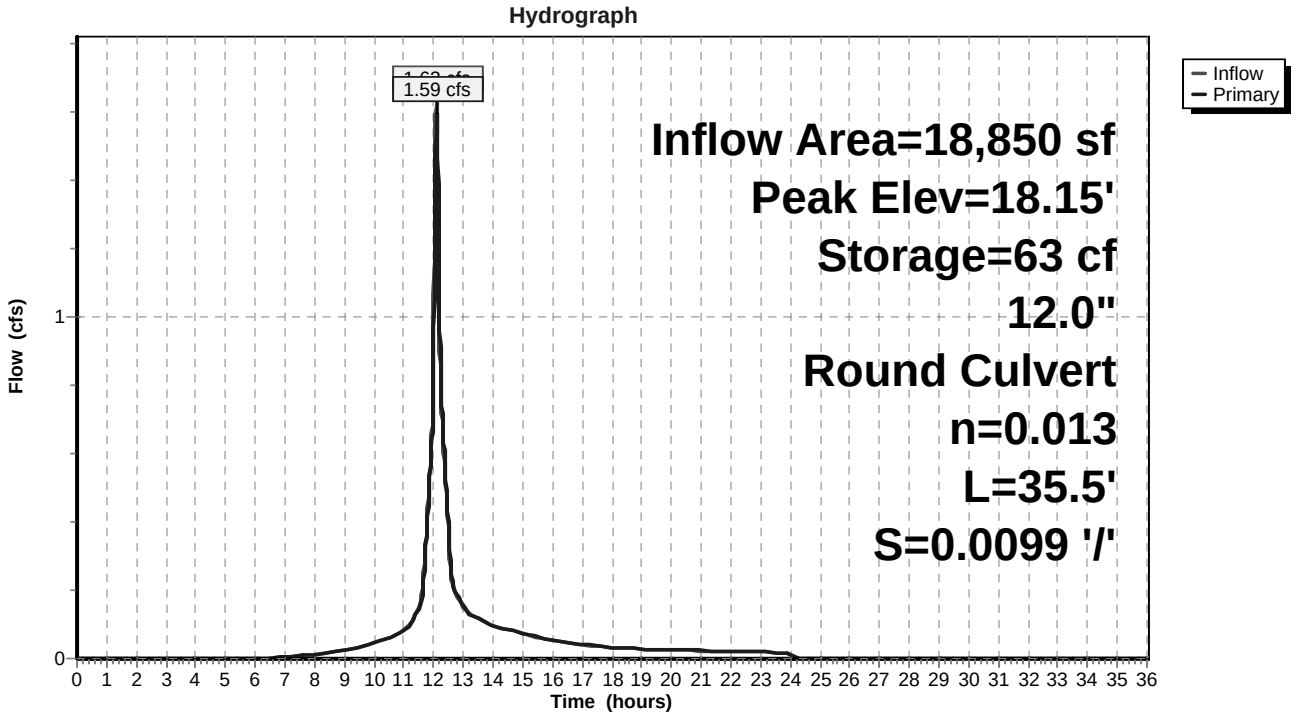
Volume	Invert	Avail.Storage	Storage Description
#1	17.43'	151 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
17.43	4	8.0	0	0	4
18.00	152	119.0	34	34	1,126
18.25	282	170.0	53	88	2,300
18.45	355	180.0	64	151	2,581

Device	Routing	Invert	Outlet Devices
#1	Primary	17.43'	**12.0" Round Culvert** L= 35.5' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 17.43' / 17.08' S= 0.0099 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.59 cfs @ 12.10 hrs HW=18.15' TW=17.41' (Dynamic Tailwater)
↑—**1=Culvert** (Barrel Controls 1.59 cfs @ 3.66 fps)

Pond 3P: 12" Culvert



Summary for Pond 4P: 12" Culvert

Inflow Area = 18,411 sf, 45.47% Impervious, Inflow Depth = 3.44" for 10 Year Extreme event
Inflow = 1.67 cfs @ 12.09 hrs, Volume= 5,280 cf
Outflow = 1.66 cfs @ 12.09 hrs, Volume= 5,280 cf, Atten= 1%, Lag= 0.5 min
Primary = 1.66 cfs @ 12.09 hrs, Volume= 5,280 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 18.92' @ 12.09 hrs Surf.Area= 106 sf Storage= 32 cf

Plug-Flow detention time= 0.4 min calculated for 5,280 cf (100% of inflow)
Center-of-Mass det. time= 0.3 min (799.9 - 799.7)

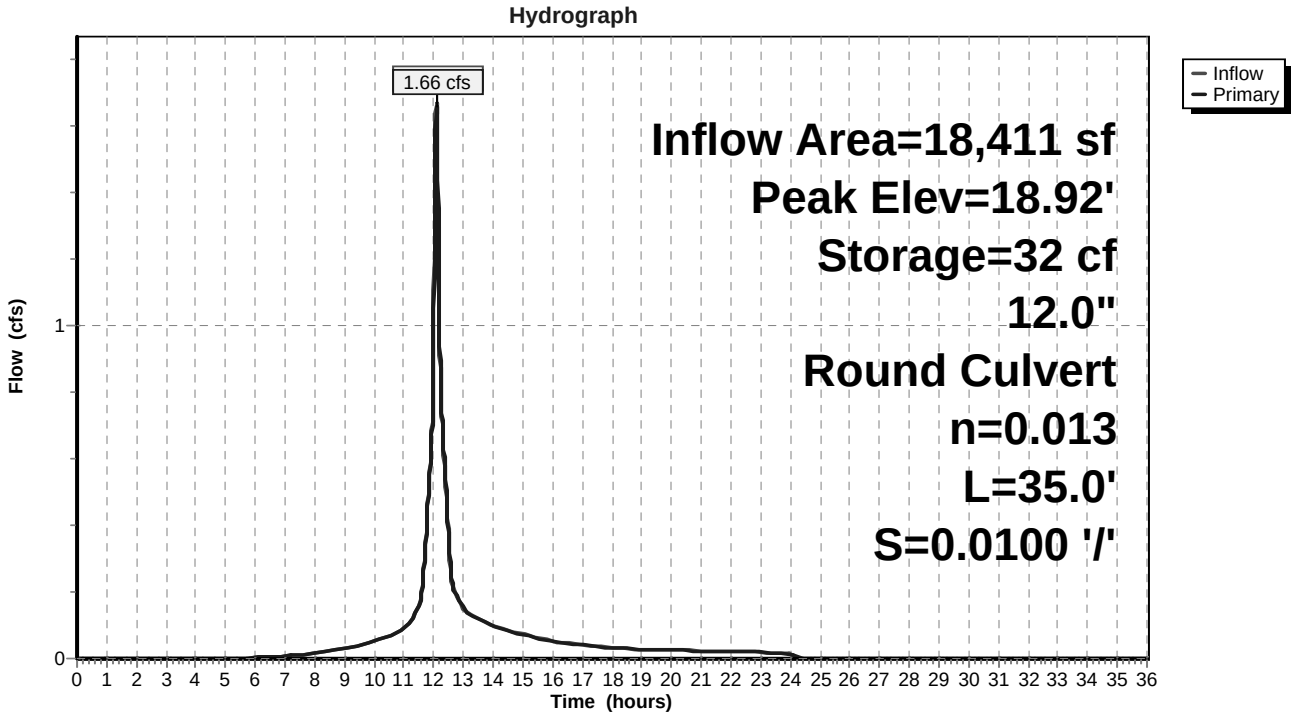
Volume	Invert	Avail.Storage	Storage Description
#1	18.18'	334 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
18.18	4	8.0	0	0	4
20.00	501	159.0	334	334	2,016

Device	Routing	Invert	Outlet Devices
#1	Primary	18.18'	**12.0" Round Culvert** L= 35.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 18.18' / 17.83' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.66 cfs @ 12.09 hrs HW=18.92' TW=18.16' (Dynamic Tailwater)
↑**1=Culvert** (Barrel Controls 1.66 cfs @ 3.71 fps)

Pond 4P: 12" Culvert



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: Subcatchment 1A Runoff Area=164,193 sf 11.95% Impervious Runoff Depth=2.42"
Flow Length=605' Tc=32.7 min CN=77 Runoff=5.82 cfs 33,160 cf

Subcatchment 1B: Subcatchment 1B Runoff Area=600,593 sf 1.40% Impervious Runoff Depth=2.09"
Flow Length=1,153' Tc=33.9 min CN=73 Runoff=17.86 cfs 104,798 cf

Subcatchment 1D: Subcatchment 1D Runoff Area=18,850 sf 41.78% Impervious Runoff Depth=3.24"
Tc=6.0 min CN=86 Runoff=1.63 cfs 5,095 cf

Subcatchment 1E: Subcatchment 1E Runoff Area=22,867 sf 23.59% Impervious Runoff Depth=2.96"
Tc=6.0 min CN=83 Runoff=1.82 cfs 5,636 cf

Subcatchment 1F: Subcatchment 1F Runoff Area=18,411 sf 45.47% Impervious Runoff Depth=3.44"
Tc=6.0 min CN=88 Runoff=1.67 cfs 5,280 cf

Reach POA1: POA #1 Inflow=25.17 cfs 153,970 cf
Outflow=25.17 cfs 153,970 cf

Reach R1: Reach #1 Avg. Flow Depth=0.11' Max Vel=3.26 fps Inflow=5.78 cfs 33,160 cf
n=0.022 L=650.0' S=0.0431 '/' Capacity=778.06 cfs Outflow=5.74 cfs 33,160 cf

Reach R2: Reach #2 Avg. Flow Depth=0.33' Max Vel=2.39 fps Inflow=1.59 cfs 5,095 cf
n=0.022 L=100.0' S=0.0098 '/' Capacity=17.87 cfs Outflow=1.59 cfs 5,095 cf

Reach R3: Reach #3 Avg. Flow Depth=0.34' Max Vel=2.42 fps Inflow=1.66 cfs 5,280 cf
n=0.022 L=175.0' S=0.0099 '/' Capacity=17.95 cfs Outflow=1.64 cfs 5,280 cf

Reach R4: Reach #4 Avg. Flow Depth=0.14' Max Vel=2.83 fps Inflow=4.66 cfs 16,012 cf
n=0.022 L=264.0' S=0.0292 '/' Capacity=189.55 cfs Outflow=4.58 cfs 16,012 cf

Reach TS1: Treatment Swale #1 Avg. Flow Depth=0.78' Max Vel=1.17 fps Inflow=5.80 cfs 33,160 cf
n=0.060 L=135.0' S=0.0050 '/' Capacity=14.73 cfs Outflow=5.78 cfs 33,160 cf

Reach TS2: Treatment Swale #2 Avg. Flow Depth=0.68' Max Vel=0.97 fps Inflow=4.99 cfs 16,012 cf
n=0.070 L=180.0' S=0.0050 '/' Capacity=21.16 cfs Outflow=4.66 cfs 16,012 cf

Pond 1P: 18" Culvert Peak Elev=37.32' Storage=152 cf Inflow=5.82 cfs 33,160 cf
18.0" Round Culvert n=0.013 L=41.0' S=0.0098 '/' Outflow=5.80 cfs 33,160 cf

Pond 3P: 12" Culvert Peak Elev=18.15' Storage=63 cf Inflow=1.63 cfs 5,095 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0099 '/' Outflow=1.59 cfs 5,095 cf

Pond 4P: 12" Culvert Peak Elev=18.92' Storage=32 cf Inflow=1.67 cfs 5,280 cf
12.0" Round Culvert n=0.013 L=35.0' S=0.0100 '/' Outflow=1.66 cfs 5,280 cf

Total Runoff Area = 824,914 sf Runoff Volume = 153,970 cf Average Runoff Depth = 2.24"
93.98% Pervious = 775,217 sf 6.02% Impervious = 49,697 sf

APPENDIX C

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.915 degrees West
Latitude	43.126 degrees North
Elevation	0 feet
Date/Time	Tue, 11 Jul 2017 13:45:48 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.03	**1yr**	0.70	0.98	1.20	1.55	2.00	2.61	2.85	**1yr**	2.31	2.74	3.14	3.86	4.44	**1yr**
2yr	0.32	0.49	0.61	0.81	1.01	1.29	**2yr**	0.88	1.17	1.50	1.91	2.45	3.14	3.48	**2yr**	2.78	3.35	3.85	4.58	5.21	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.58	**5yr**	1.06	1.44	1.85	2.38	3.08	3.98	4.47	**5yr**	3.52	4.29	4.91	5.80	6.56	**5yr**
10yr	0.40	0.63	0.80	1.09	1.42	1.85	**10yr**	1.22	1.69	2.18	2.83	3.67	4.76	5.39	**10yr**	4.21	5.19	5.90	6.93	7.81	**10yr**
25yr	0.46	0.74	0.94	1.29	1.72	2.27	**25yr**	1.48	2.09	2.70	3.53	4.62	6.04	6.92	**25yr**	5.34	6.66	7.54	8.79	9.84	**25yr**
50yr	0.51	0.83	1.06	1.48	2.00	2.66	**50yr**	1.72	2.46	3.18	4.19	5.51	7.23	8.37	**50yr**	6.39	8.05	9.08	10.52	11.73	**50yr**
100yr	0.58	0.93	1.20	1.70	2.32	3.12	**100yr**	2.00	2.89	3.74	4.97	6.57	8.65	10.12	**100yr**	7.66	9.73	10.93	12.59	13.98	**100yr**
200yr	0.64	1.04	1.35	1.95	2.69	3.67	**200yr**	2.32	3.40	4.43	5.91	7.84	10.37	12.24	**200yr**	9.17	11.77	13.17	15.09	16.68	**200yr**
500yr	0.75	1.24	1.61	2.34	3.29	4.53	**500yr**	2.84	4.22	5.50	7.40	9.90	13.17	15.75	**500yr**	11.66	15.14	16.84	19.17	21.07	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.90	**1yr**	0.64	0.88	0.91	1.27	1.57	2.04	2.51	**1yr**	1.80	2.42	2.92	3.26	4.00	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.18	**2yr**	0.86	1.16	1.36	1.83	2.36	3.04	3.39	**2yr**	2.69	3.26	3.74	4.46	5.05	**2yr**
5yr	0.35	0.54	0.67	0.92	1.16	1.40	**5yr**	1.01	1.37	1.62	2.15	2.78	3.73	4.14	**5yr**	3.30	3.98	4.60	5.44	6.15	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.82	2.45	3.13	4.30	4.82	**10yr**	3.81	4.63	5.34	6.31	7.08	**10yr**
25yr	0.44	0.67	0.83	1.18	1.56	1.91	**25yr**	1.34	1.87	2.11	2.85	3.66	5.00	5.87	**25yr**	4.43	5.64	6.54	7.68	8.56	**25yr**
50yr	0.48	0.73	0.91	1.31	1.77	2.19	**50yr**	1.53	2.14	2.36	3.20	4.11	5.73	6.80	**50yr**	5.07	6.54	7.63	8.91	9.87	**50yr**
100yr	0.54	0.81	1.02	1.47	2.02	2.50	**100yr**	1.74	2.45	2.64	3.58	4.59	6.55	7.88	**100yr**	5.80	7.58	8.90	10.34	11.35	**100yr**
200yr	0.60	0.90	1.14	1.65	2.31	2.86	**200yr**	1.99	2.80	2.94	4.01	5.13	7.49	9.13	**200yr**	6.62	8.78	10.39	12.01	13.08	**200yr**
500yr	0.70	1.04	1.34	1.95	2.77	3.44	**500yr**	2.39	3.36	3.42	4.64	5.96	8.89	11.09	**500yr**	7.87	10.67	12.76	14.65	15.73	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.88	1.08	**1yr**	0.76	1.05	1.24	1.75	2.22	2.85	3.04	**1yr**	2.52	2.92	3.39	4.19	4.80	**1yr**
2yr	0.33	0.51	0.62	0.85	1.04	1.25	**2yr**	0.90	1.22	1.48	1.96	2.50	3.27	3.58	**2yr**	2.89	3.45	3.96	4.71	5.41	**2yr**
5yr	0.39	0.60	0.75	1.03	1.31	1.58	**5yr**	1.13	1.55	1.85	2.50	3.20	4.23	4.78	**5yr**	3.75	4.60	5.23	6.17	6.94	**5yr**
10yr	0.46	0.70	0.87	1.21	1.57	1.92	**10yr**	1.35	1.88	2.23	3.05	3.85	5.22	5.96	**10yr**	4.62	5.73	6.50	7.57	8.46	**10yr**
25yr	0.55	0.84	1.05	1.50	1.97	2.48	**25yr**	1.70	2.42	2.88	3.97	4.95	7.10	7.97	**25yr**	6.28	7.67	8.63	9.96	11.04	**25yr**
50yr	0.64	0.97	1.21	1.74	2.34	3.00	**50yr**	2.02	2.93	3.49	4.84	6.00	8.79	9.96	**50yr**	7.78	9.58	10.70	12.24	13.49	**50yr**
100yr	0.74	1.12	1.41	2.03	2.79	3.62	**100yr**	2.41	3.54	4.23	5.92	7.29	10.89	12.45	**100yr**	9.63	11.97	13.26	15.06	16.51	**100yr**
200yr	0.86	1.30	1.64	2.38	3.32	4.39	**200yr**	2.86	4.29	5.15	7.25	8.85	13.53	15.57	**200yr**	11.97	14.97	16.44	18.52	20.24	**200yr**
500yr	1.05	1.56	2.01	2.92	4.16	5.64	**500yr**	3.59	5.51	6.64	9.50	11.45	18.07	20.92	**500yr**	15.99	20.11	21.84	24.37	26.49	**500yr**

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