Stormwater Management Facilities Report

Hospice Center
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O'Fallon, Missouri

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Section 1

Detention Calculations

DETENTION CALCULATIONS
FOR BMP #1
FOR
HOSPICE CENTER
O'FALLON, MISSOURI
MARCH 15, 2023
PROJECT NO. M22-8489

The following detention calculations have been performed for final design for the Hospice Center in O'Fallon, Missouri. Said calculations were performed in accordance with the City of O'Fallon Standards. All calculations and design were performed with the aid of AutoCAD Civil 3D Software. Existing, proposed, and routed hydrographs for the 2-year, 15-year, 25-year, 100-year storms are attached.

BMP #1 CALCULATIONS SUMMARY:
A summary of the detention calculations is shown below. All detention calculations, including release rates and volumes, are included in this report. Drainage area maps are also included at the end of this report.

Year of Storm Frequency	Existing Peak Runoff (cfs) [A]	Proposed Peak Runoff (cfs) [B]	**Required Detention (cfs) [B] – [A]**	Tributary/Runoff to Basin (cfs) [C]	Basin Peak Release Rate (cfs) [D]	**Actual Detention (cfs) [C] – [D]**
2	3.12	9.15	**6.03**	8.50	**0.015**	**8.485**
15	4.99	15.39	**10.40**	14.31	**0.020**	**14.290**
25	5.26	16.21	**10.95**	15.07	**0.020**	**15.050**
100	5.94	17.23	**11.29**	16.02	**0.021**	**15.999**

The 100-year storm, with low flow blocked reaches a peak elevation of 578.36 in the basin; the basin berm elevation is 580.00 providing 1.64' freeboard.

Storm Water Handling for the Hospice Center will be provided in BMP #1 at the northern portion of the property. The detention basin was designed so that the existing flow of the site would not be exceeded by the proposed flow of the site. Due to programming of the AutoCAD Civil 3D Software, the heading and title for the 15-year event is listed as the 3-year event on all hydrograph sheets. All necessary calculations are attached.

Water quality for the site is accomplished by utilizing extended detention for BMP #1. The 24-hour lag time for the 1-year storm was calculated to be 26.27 hours.

2-YEAR STORM

Existing Onsite Runoff (2-year storm**)**

Total Development = 2.00 acres
Existing Runoff (cfs) = 3.12 cfs

Proposed On-Site Runoff (2-year storm)

Total Development = 2.00 acres
Proposed Runoff (cfs) = 9.15 cfs

Tributary Runoff to Basin (2-year storm)

Total On-Site Development = 1.65 acres
Proposed "C" Factor= Tributary area is made of subareas which each have separate runoff coefficients, see subarea hydrograph for specific runoff coefficient.
Proposed ToC = Tributary area is made of subareas which each have separate time of concentrations, see subarea hydrograph for specific time of concentrations.
Proposed Runoff (cfs) = 8.50 cfs

Required Detention (2-year storm)

Required Detained Runoff = Developed Runoff – Undeveloped Runoff
Required Detained Runoff = **6.03 cfs**

Actual Detained Run-off = Tributary run-off to basin – Peak detention basin release rate
Actual Detained Run-off = 8.504 cfs – 0.015 cfs = 8.489 cfs
Actual High Water Elevation = 575.32 ft

Total Stored Volume = 509 ft^3

Detention Basin Volume = 20,153 ft^3 (To elevation 580.00, not including 1 ft of freeboard)

15-YEAR STORM

Existing Onsite Runoff (15-year storm**)**

Total Development = 2.00 acres
Existing Runoff (cfs) = 4.99 cfs

Proposed On-Site Runoff (15-year storm)

Total Development = 2.00 acres
Proposed Runoff (cfs) = 15.39 cfs

Tributary Runoff to Basin (15-year storm)

Total On-Site Development = 1.65 acres
Proposed "C" Factor= Tributary area is made of subareas which each have separate runoff coefficients, see subarea hydrograph for specific runoff coefficient.
Proposed ToC = Tributary area is made of subareas which each have separate time of concentrations, see subarea hydrograph for specific time of concentrations.
Proposed Runoff (cfs) = 14.31 cfs

Required Detention (15-year storm)

Required Detained Runoff = Developed Runoff – Undeveloped Runoff
Required Detained Runoff = **10.40 cfs**

Actual Detained Run-off = Tributary run-off to basin – Peak detention basin release rate
Actual Detained Run-off = 14.310 cfs – 0.020 cfs = 14.290 cfs
Actual High Water Elevation = 575.53 ft

Total Stored Volume = 857 ft^3

Detention Basin Volume = 20,153 ft^3 (To elevation 580.00, not including 1 ft of freeboard)

25-YEAR STORM

Existing Onsite Runoff (25-year storm**)**

Total Development = 2.00 acres
Existing Runoff (cfs) = 5.26 cfs

Proposed Runoff (25-year storm)

Total Development = 2.00 acres
Proposed Runoff (cfs) = 16.21 cfs

Tributary Runoff to Basin (25-year storm)

Total On-Site Development = 1.65 acres
Proposed "C" Factor= Tributary area is made of subareas which each have separate runoff coefficients, see subarea hydrograph for specific runoff coefficient.
Proposed ToC = Tributary area is made of subareas which each have separate time of concentrations, see subarea hydrograph for specific time of concentrations.
Proposed Runoff (cfs) = 15.07 cfs

Required Detention (25-year storm)

Required Detained Runoff = Developed Runoff – Undeveloped Runoff
Required Detained Runoff = **10.95 cfs**

Actual Detained Run-off = Tributary run-off to basin – Peak detention basin release rate
Actual Detained Run-off = 15.070 – 0.020 cfs = 15.050 cfs
Actual High Water Elevation = 575.56 ft

Total Stored Volume = 903 ft^3

Detention Basin Volume = 20,153 ft^3 (To elevation 580.00, not including 1 ft of freeboard)

100-YEAR STORM

Existing Onsite Runoff (100-year storm**)**

Total Development = 2.00 acres
Existing Runoff (cfs) = 5.94 cfs

Proposed Runoff (100-year storm)

Total Development = 2.00 acres
Proposed Runoff (cfs) = 17.23 cfs

Tributary Runoff to Basin (100-year storm)

Total On-Site Development = 1.65 acres
Proposed "C" Factor= Tributary area is made of subareas which each have separate runoff coefficients, see subarea hydrograph for specific runoff coefficient.
Proposed ToC = Tributary area is made of subareas which each have separate time of concentrations, see subarea hydrograph for specific time of concentrations.
Proposed Runoff (cfs) = 16.02 cfs

Required Detention (100-year storm)

Required Detained Runoff = Developed Runoff – Undeveloped Runoff
Required Detained Runoff = **20.99 cfs**

Actual Detained Run-off = Tributary run-off to basin – Peak detention basin release rate
Actual Detained Run-off = 16.020 cfs – 0.021 cfs = 15.999 cfs
Actual High Water Elevation = 575.60 ft

Total Stored Volume = 960 ft^3

Detention Basin Volume = 20,153 ft^3 (To elevation 580.00, not including 1 ft of freeboard)

Section 2

Calculations – BMP #1

Low Flow Orifice Open

Low Flow Orifice Blocked

Extended Detention

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	------	-------	0.483	0.813	-------	0.609	0.856	-------	0.910	EX_TRIB#1
2	Rational	------	-------	1.263	2.018	-------	1.633	2.129	-------	2.402	EX_TRIB#2
3	Rational	------	-------	0.830	1.326	-------	1.073	1.399	-------	1.578	EX_TRIB#3
4	Rational	------	-------	1.028	1.643	-------	1.329	1.734	-------	1.956	EX_TRIB#4
6	Rational	------	-------	8.504	14.31	-------	10.73	15.07	-------	16.02	P_TRIB#1
7	Rational	------	-------	0.460	0.774	-------	0.580	0.815	-------	0.866	P_TRIB#2
8	Rational	------	-------	0.184	0.310	-------	0.232	0.326	-------	0.347	P_TRIB#3
10	Reservoir	6	-------	0.015	0.020	-------	0.017	0.020	-------	0.021	ROUTED THRU BASIN
12	Combine	1, 2, 3, 4,	-------	3.120	4.986	-------	4.035	5.262	-------	5.936	EX_TOTAL
13	Combine	6, 7, 8,	-------	9.148	15.39	-------	11.54	16.21	-------	17.23	P_TOTAL
14	Combine	7, 8, 10,	-------	0.654	1.097	-------	0.823	1.155	-------	1.227	P_TOTAL W/ DETENTION

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

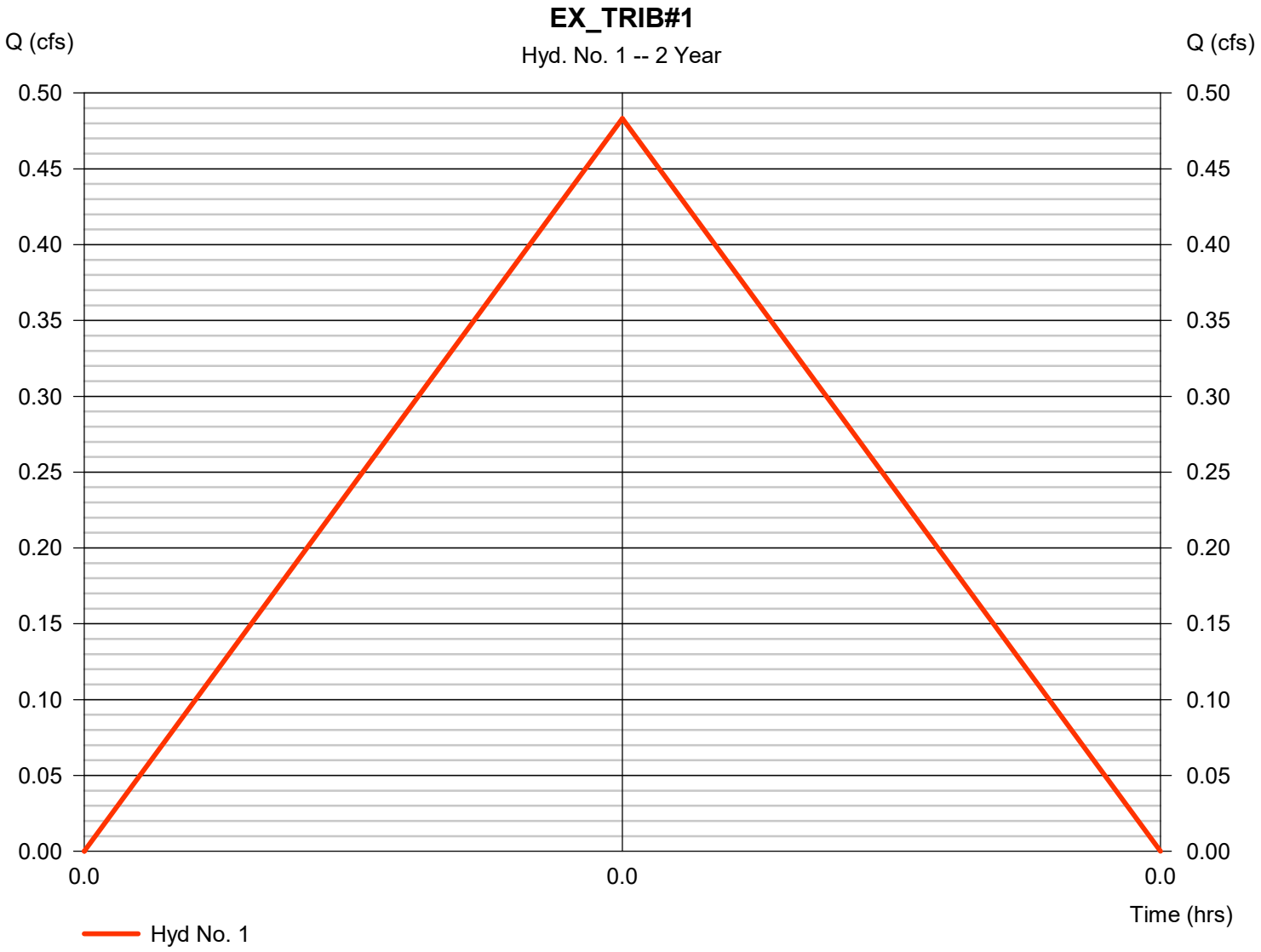
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.483	1	1	29	------	------	------	EX_TRIB#1
2	Rational	1.263	1	2	152	------	------	------	EX_TRIB#2
3	Rational	0.830	1	2	100	------	------	------	EX_TRIB#3
4	Rational	1.028	1	2	123	------	------	------	EX_TRIB#4
6	Rational	8.504	1	1	510	------	------	------	P_TRIB#1
7	Rational	0.460	1	1	28	------	------	------	P_TRIB#2
8	Rational	0.184	1	1	11	------	------	------	P_TRIB#3
10	Reservoir	0.015	1	2	488	6	575.36	509	ROUTED THRU BASIN
12	Combine	3.120	1	2	403	1, 2, 3, 4,	------	------	EX_TOTAL
13	Combine	9.148	1	1	549	6, 7, 8,	------	------	P_TOTAL
14	Combine	0.654	1	1	526	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.483 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	29 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	7.550 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

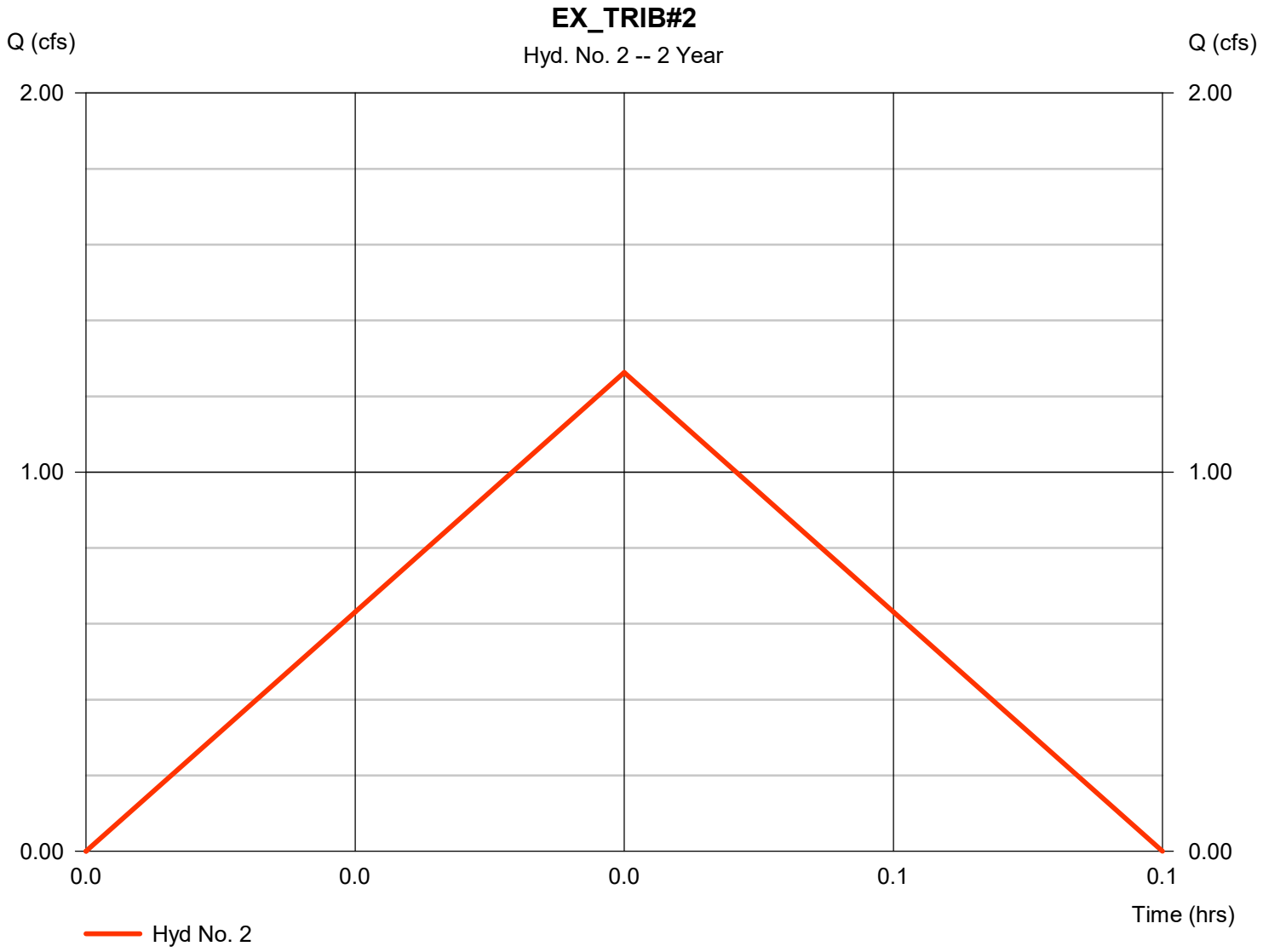


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	1.263 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	152 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	6.937 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

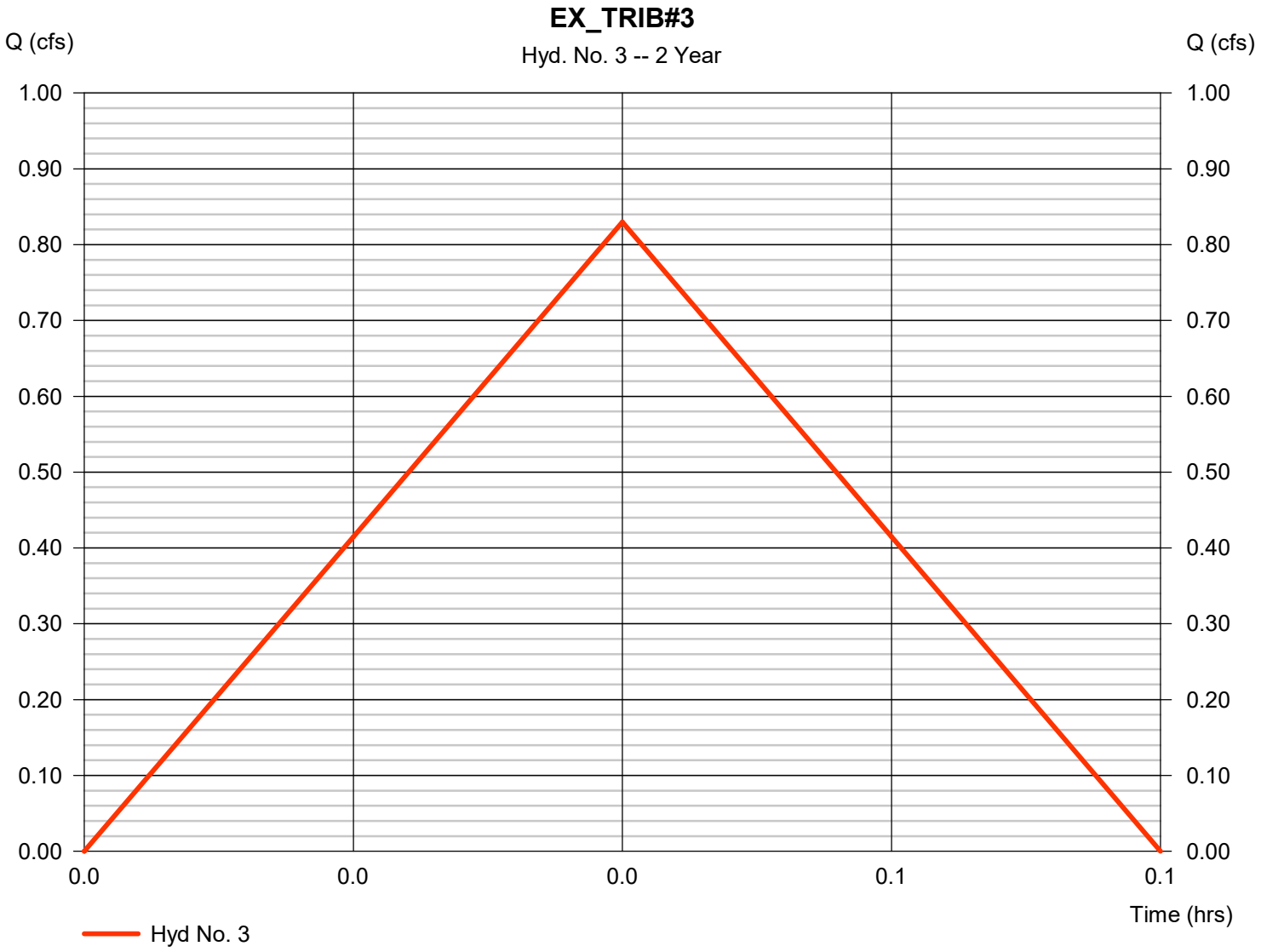


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.830 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	100 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	6.937 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

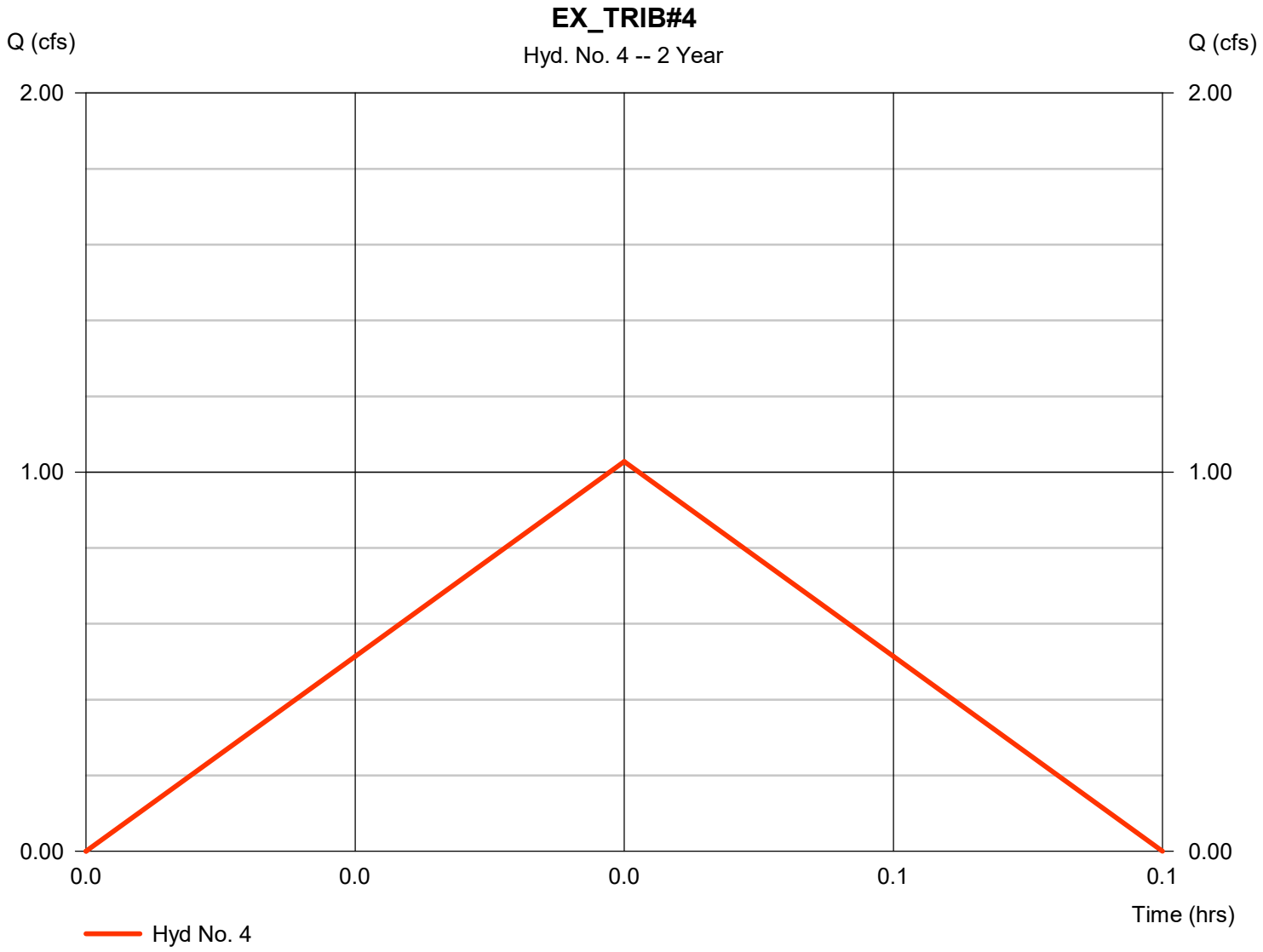


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.028 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	123 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	6.937 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

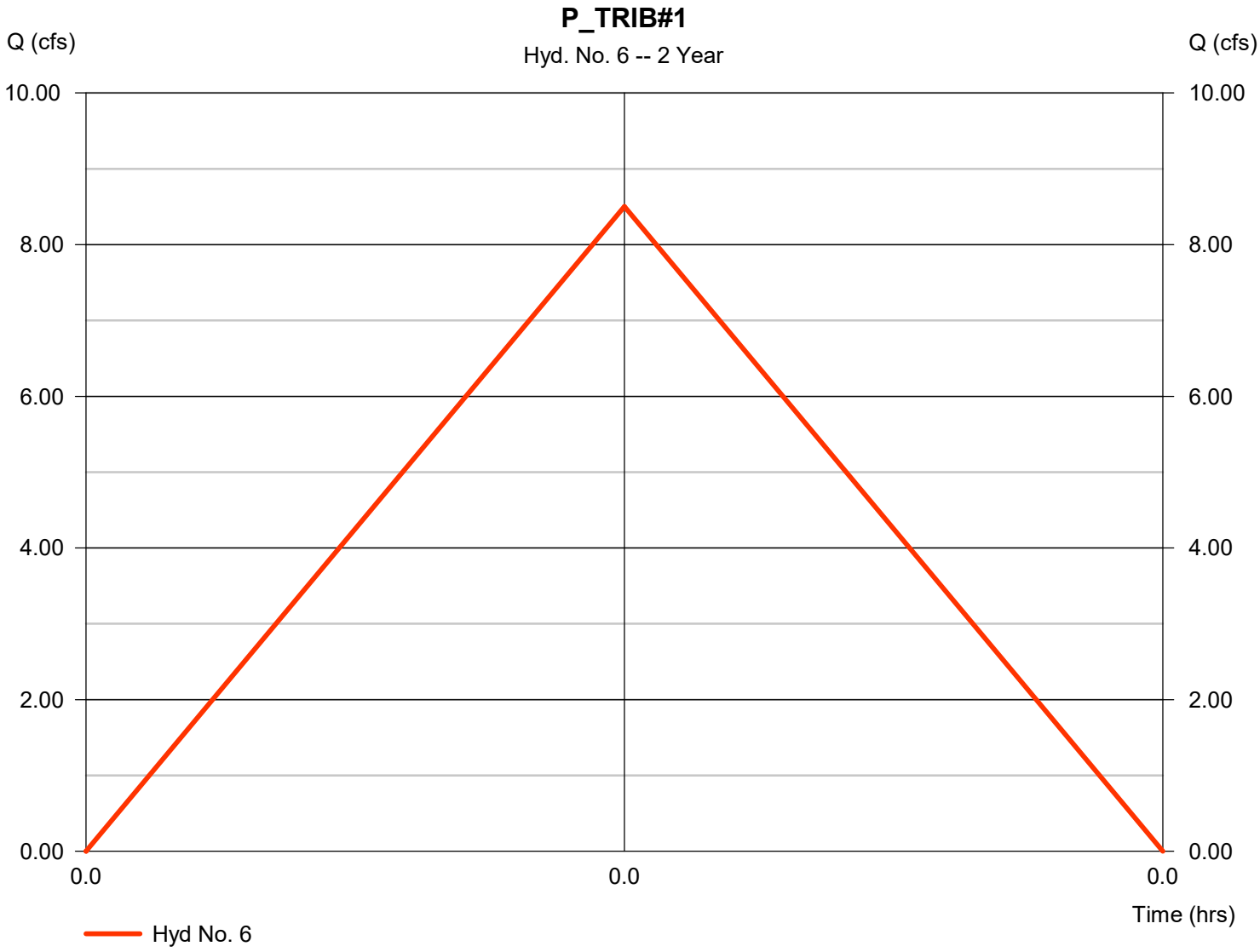


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	8.504 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	510 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	7.550 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

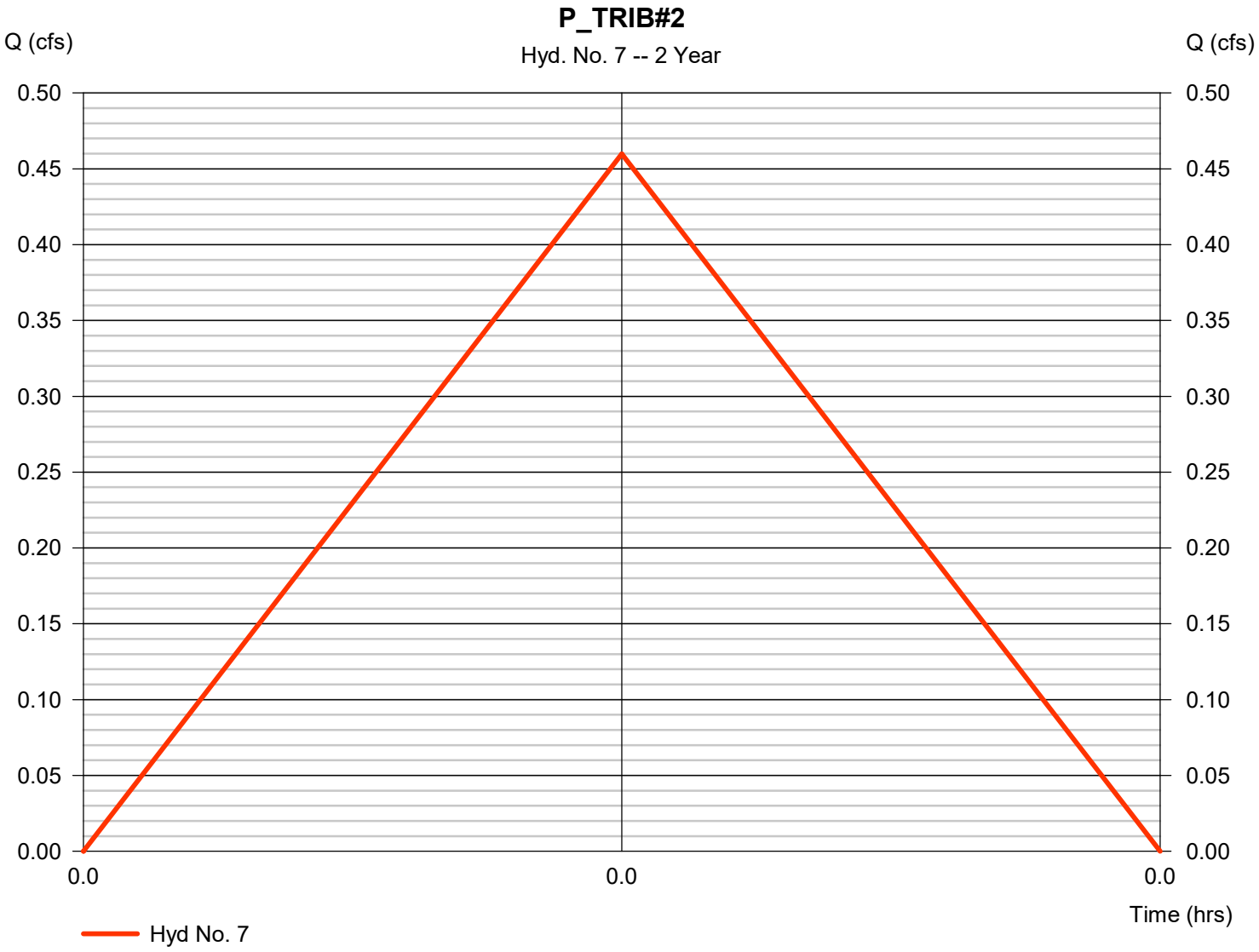


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.460 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	28 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	7.550 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

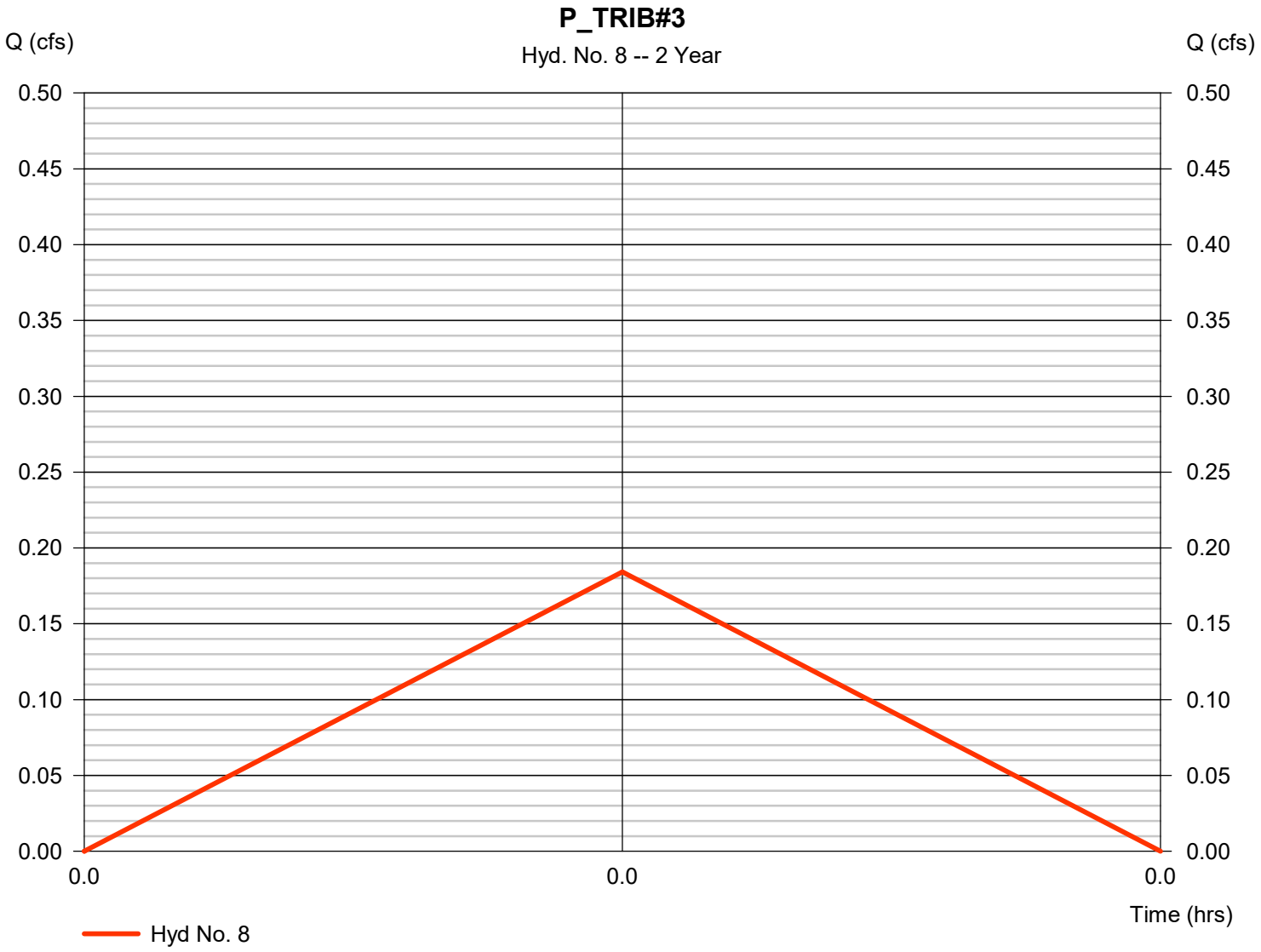


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.184 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	11 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	7.550 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



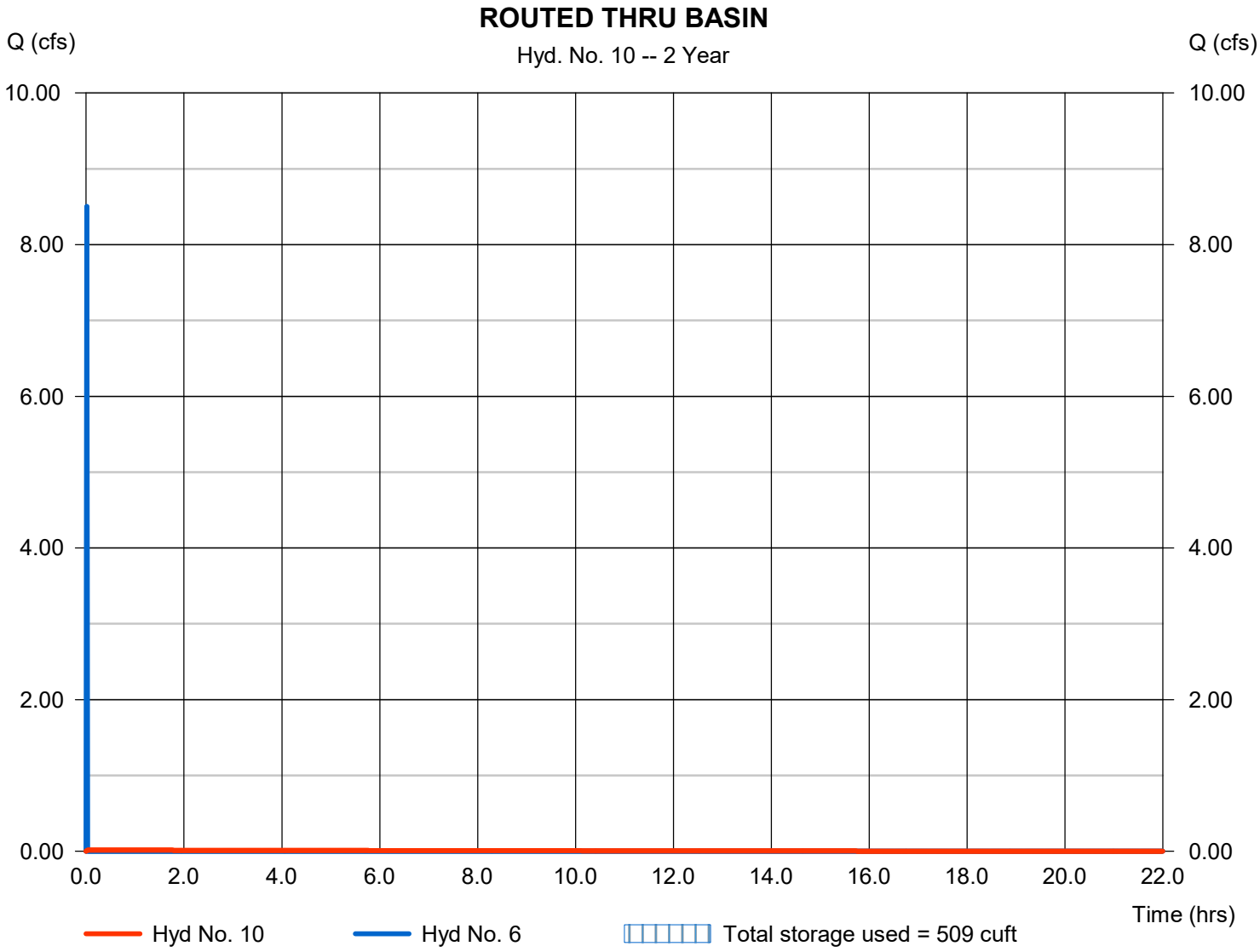
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	0.015 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	488 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	575.36 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	509 cuft

Storage Indication method used.



Pond No. 1 - DETENTION POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 575.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	575.00	700	0	0
1.00	576.00	2,303	1,424	1,424
2.00	577.00	3,500	2,880	4,304
3.00	578.00	4,720	4,094	8,399
4.00	579.00	5,863	5,281	13,680
5.00	580.00	7,106	6,474	20,153

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.00	6.00	0.00
Span (in)	= 12.00	1.00	24.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 572.50	575.00	577.75	0.00
Length (ft)	= 91.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 578.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	575.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.10	142	575.10	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.006
0.20	285	575.20	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.010
0.30	427	575.30	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.013
0.40	570	575.40	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.016
0.50	712	575.50	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.018
0.60	854	575.60	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.020
0.70	997	575.70	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.021
0.80	1,139	575.80	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.023
0.90	1,282	575.90	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.024
1.00	1,424	576.00	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.026
1.10	1,712	576.10	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.027
1.20	2,000	576.20	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.028
1.30	2,288	576.30	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.029
1.40	2,576	576.40	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.031
1.50	2,864	576.50	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.032
1.60	3,152	576.60	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.033
1.70	3,440	576.70	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.034
1.80	3,728	576.80	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.035
1.90	4,016	576.90	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.036
2.00	4,304	577.00	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.037
2.10	4,714	577.10	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.038
2.20	5,123	577.20	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.039
2.30	5,533	577.30	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.039
2.40	5,942	577.40	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.040
2.50	6,352	577.50	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.041
2.60	6,761	577.60	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.042
2.70	7,171	577.70	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.043
2.80	7,580	577.80	5.35 ic	0.04 ic	0.08 ic	---	0.00	---	---	---	---	---	0.119
2.90	7,989	577.90	5.35 ic	0.04 ic	0.39 ic	---	0.00	---	---	---	---	---	0.439
3.00	8,399	578.00	5.35 ic	0.05 ic	0.85 ic	---	0.00	---	---	---	---	---	0.896
3.10	8,927	578.10	5.35 ic	0.05 ic	1.41 ic	---	0.00	---	---	---	---	---	1.456
3.20	9,455	578.20	5.35 ic	0.05 ic	2.06 ic	---	0.00	---	---	---	---	---	2.102
3.30	9,983	578.30	5.35 ic	0.05 ic	2.64 ic	---	0.59	---	---	---	---	---	3.279
3.40	10,511	578.40	6.18 ic	0.04 ic	3.04 ic	---	3.09	---	---	---	---	---	6.181
3.50	11,039	578.50	8.33 oc	0.01 ic	2.05 ic	---	6.27 s	---	---	---	---	---	8.330
3.60	11,567	578.60	8.44 oc	0.01 ic	1.35 ic	---	7.09 s	---	---	---	---	---	8.442

Continues on next page...

DETENTION POND

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.70	12,095	578.70	8.52 oc	0.01 ic	0.99 ic	---	7.52 s	---	---	---	---	---	8.515
3.80	12,623	578.80	8.58 oc	0.00 ic	0.77 ic	---	7.79 s	---	---	---	---	---	8.568
3.90	13,152	578.90	8.64 oc	0.00 ic	0.63 ic	---	8.00 s	---	---	---	---	---	8.630
4.00	13,680	579.00	8.69 oc	0.00 ic	0.52 ic	---	8.15 s	---	---	---	---	---	8.677
4.10	14,327	579.10	8.75 oc	0.00 ic	0.44 ic	---	8.26 s	---	---	---	---	---	8.709
4.20	14,974	579.20	8.80 oc	0.00 ic	0.39 ic	---	8.41 s	---	---	---	---	---	8.795
4.30	15,622	579.30	8.85 oc	0.00 ic	0.34 ic	---	8.50 s	---	---	---	---	---	8.839
4.40	16,269	579.40	8.91 oc	0.00 ic	0.30 ic	---	8.56 s	---	---	---	---	---	8.856
4.50	16,917	579.50	8.96 oc	0.00 ic	0.27 ic	---	8.61 s	---	---	---	---	---	8.879
4.60	17,564	579.60	9.01 oc	0.00 ic	0.24 ic	---	8.71 s	---	---	---	---	---	8.955
4.70	18,211	579.70	9.06 oc	0.00 ic	0.22 ic	---	8.77 s	---	---	---	---	---	8.992
4.80	18,859	579.80	9.11 oc	0.00 ic	0.20 ic	---	8.90 s	---	---	---	---	---	9.108
4.90	19,506	579.90	9.16 oc	0.00 ic	0.19 ic	---	8.90 s	---	---	---	---	---	9.084
5.00	20,153	580.00	9.21 oc	0.00 ic	0.17 ic	---	8.90 s	---	---	---	---	---	9.076

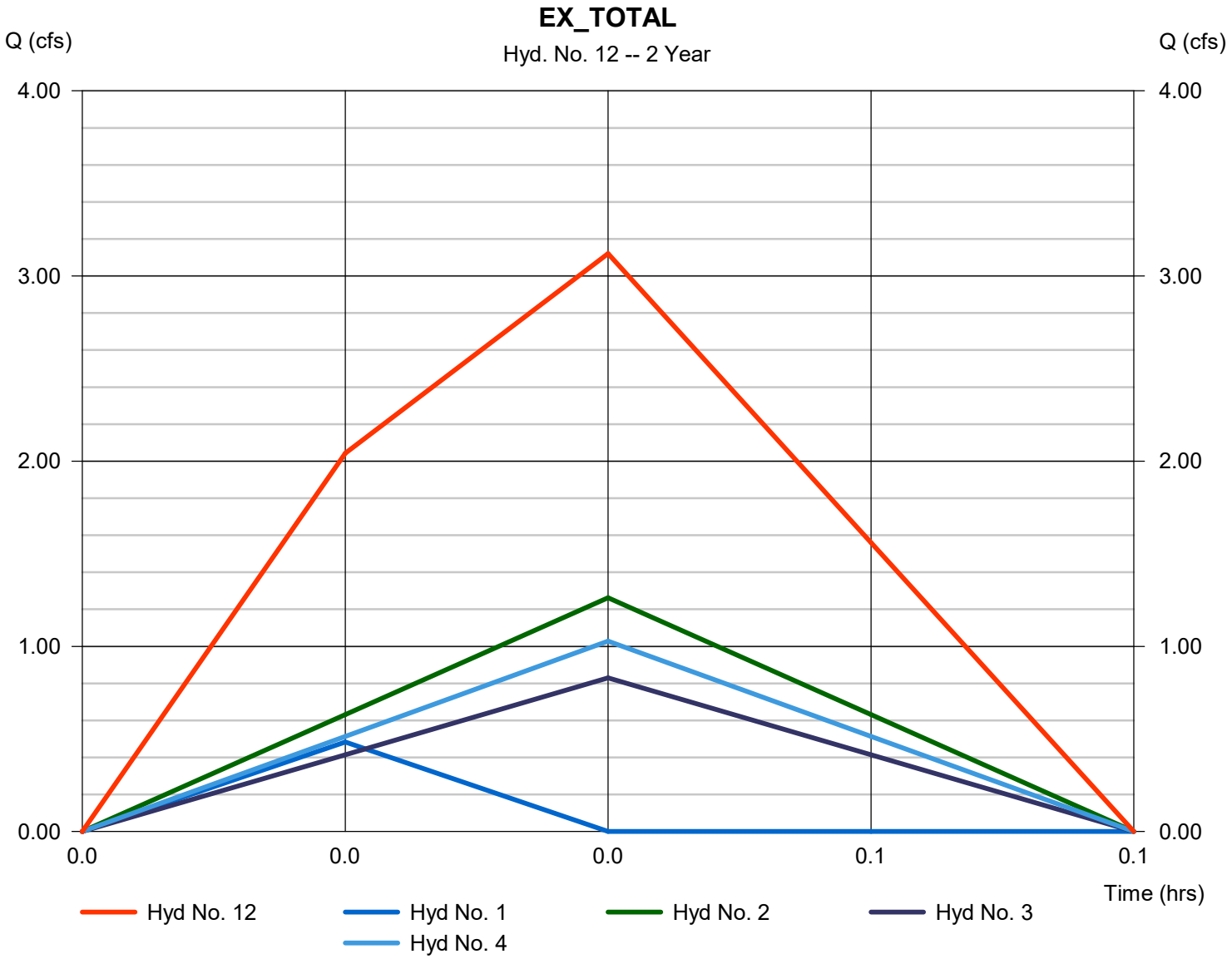
...End

Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	3.120 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	403 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

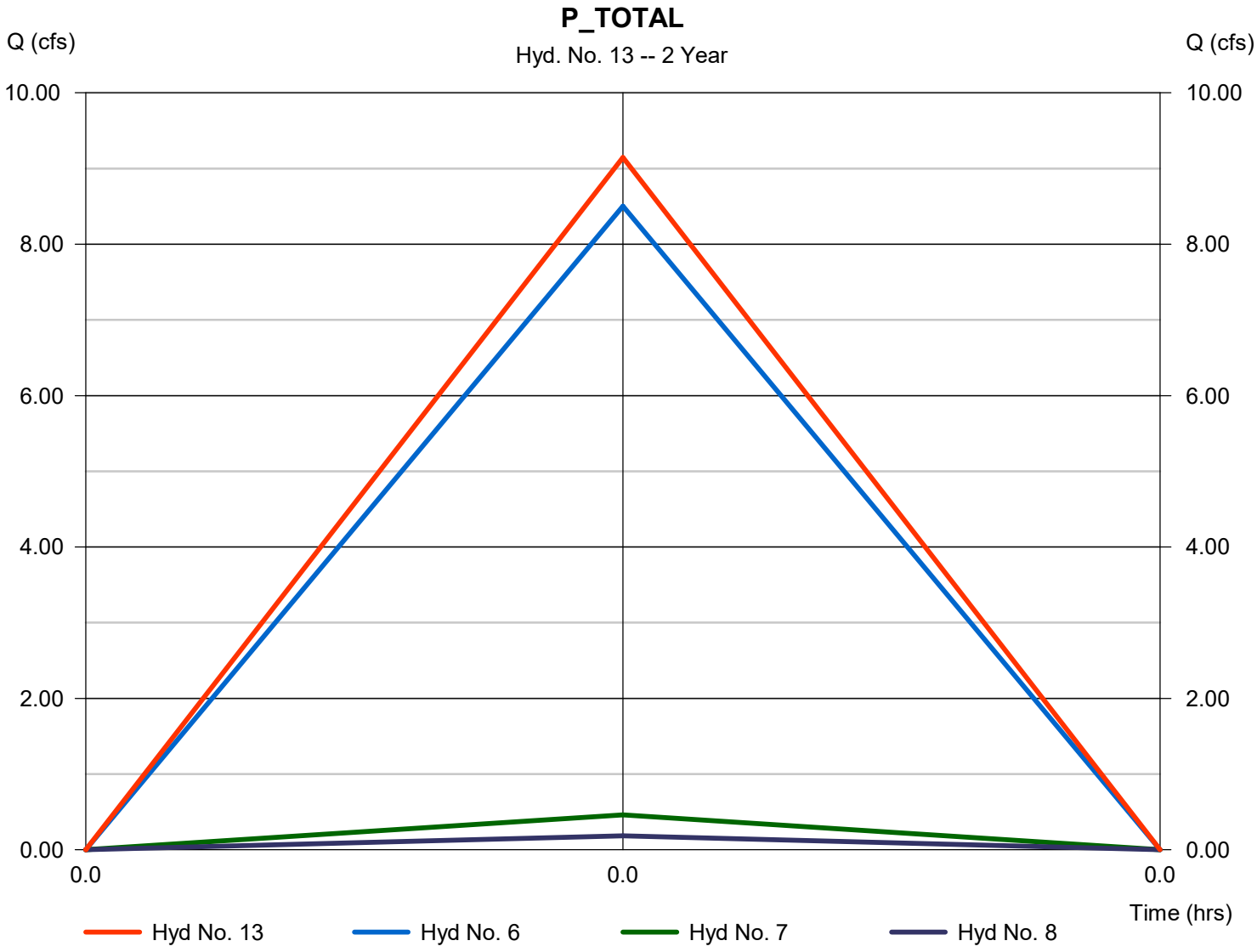


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	9.148 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	549 cuft
Inflow hyds.	=	6, 7, 8	Contrib. drain. area	=	2.010 ac

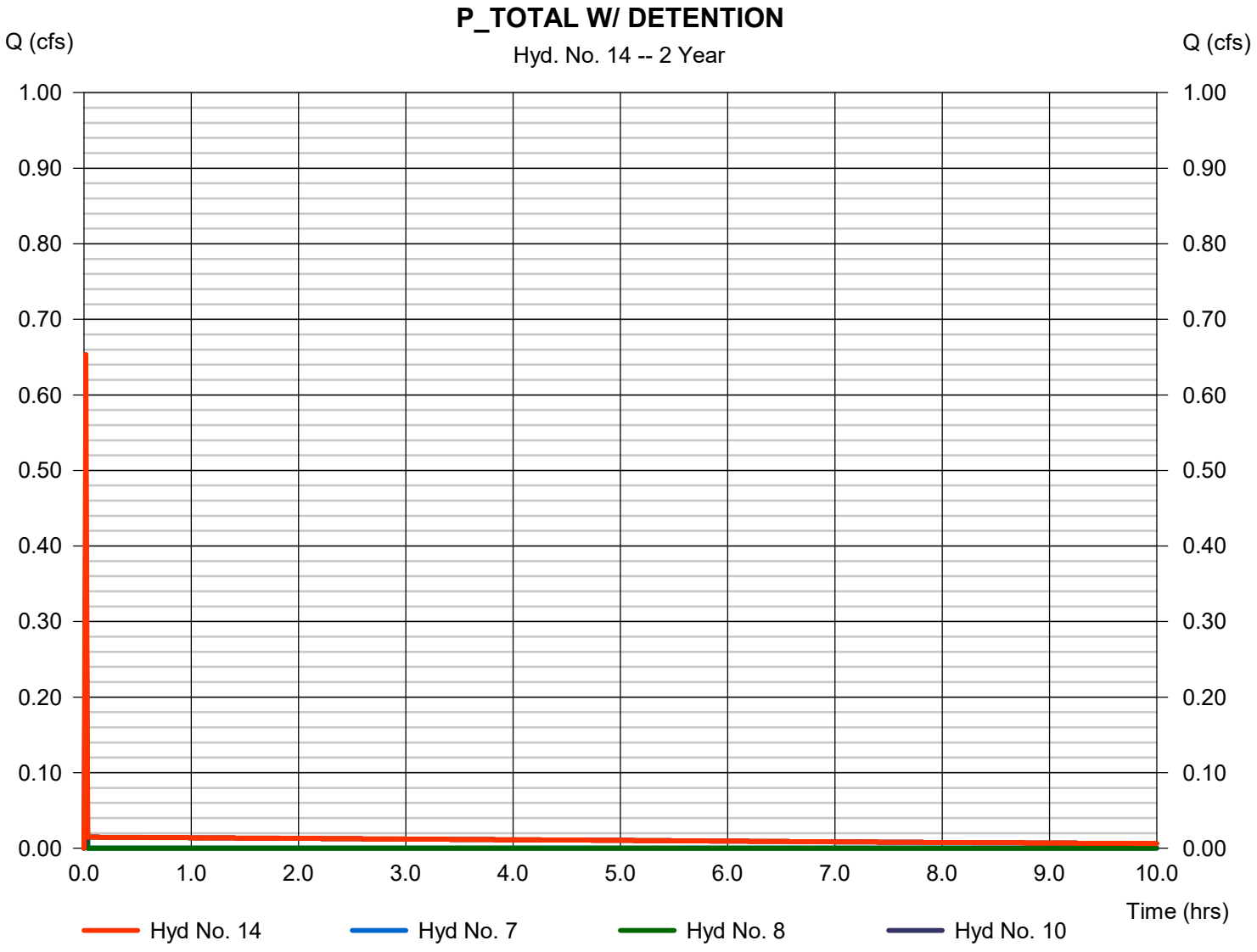


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	=	Combine	Peak discharge	=	0.654 cfs
Storm frequency	=	2 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	526 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	0.380 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

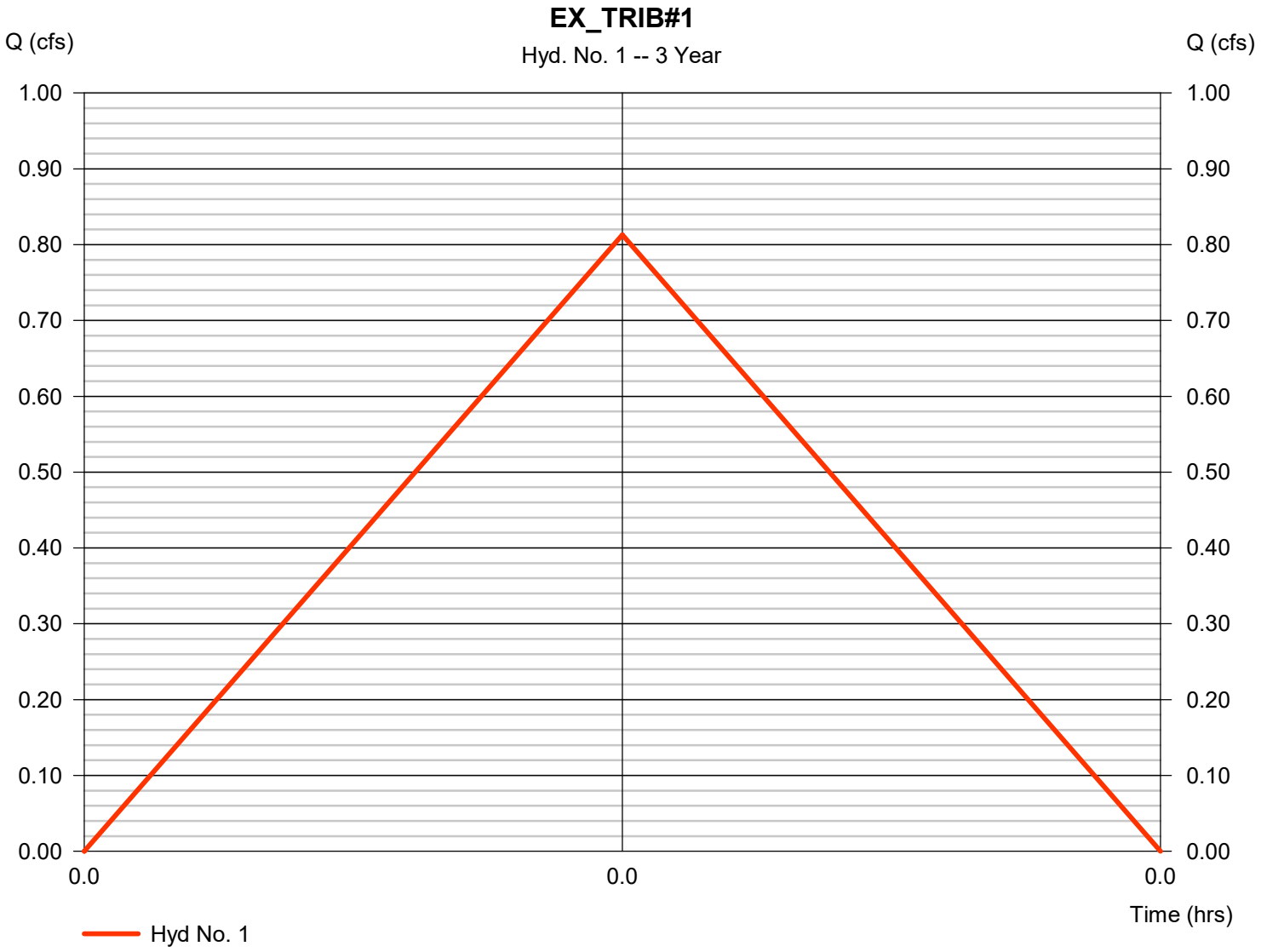
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.813	1	1	49	------	------	------	EX_TRIB#1
2	Rational	2.018	1	2	242	------	------	------	EX_TRIB#2
3	Rational	1.326	1	2	159	------	------	------	EX_TRIB#3
4	Rational	1.643	1	2	197	------	------	------	EX_TRIB#4
6	Rational	14.31	1	1	858	------	------	------	P_TRIB#1
7	Rational	0.774	1	1	46	------	------	------	P_TRIB#2
8	Rational	0.310	1	1	19	------	------	------	P_TRIB#3
10	Reservoir	0.020	1	2	836	6	575.60	857	ROUTED THRU BASIN
12	Combine	4.986	1	2	647	1, 2, 3, 4,	------	------	EX_TOTAL
13	Combine	15.39	1	1	923	6, 7, 8,	------	------	P_TOTAL
14	Combine	1.097	1	1	901	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.813 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	49 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	12.701 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

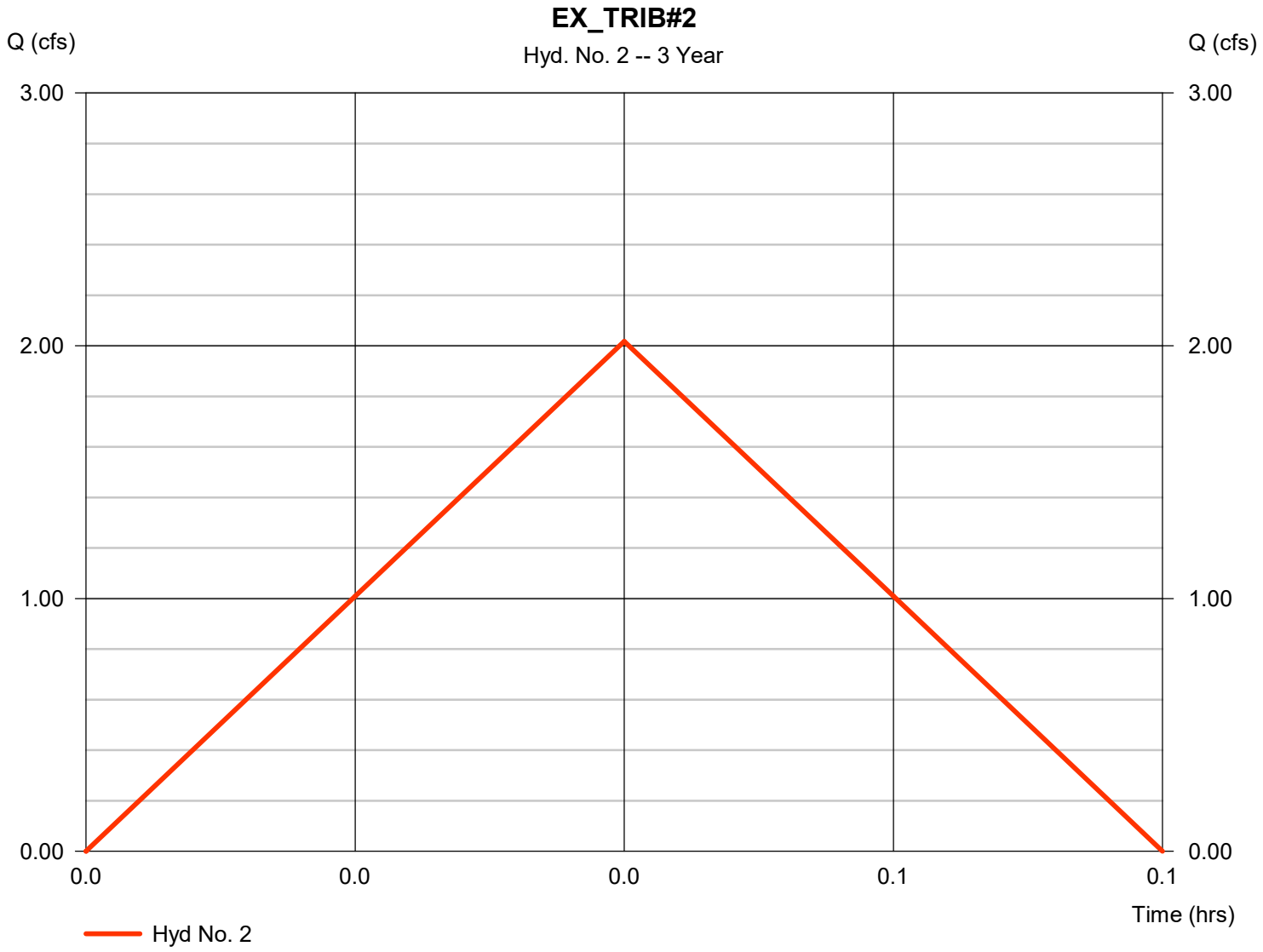


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	2.018 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	242 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	11.085 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

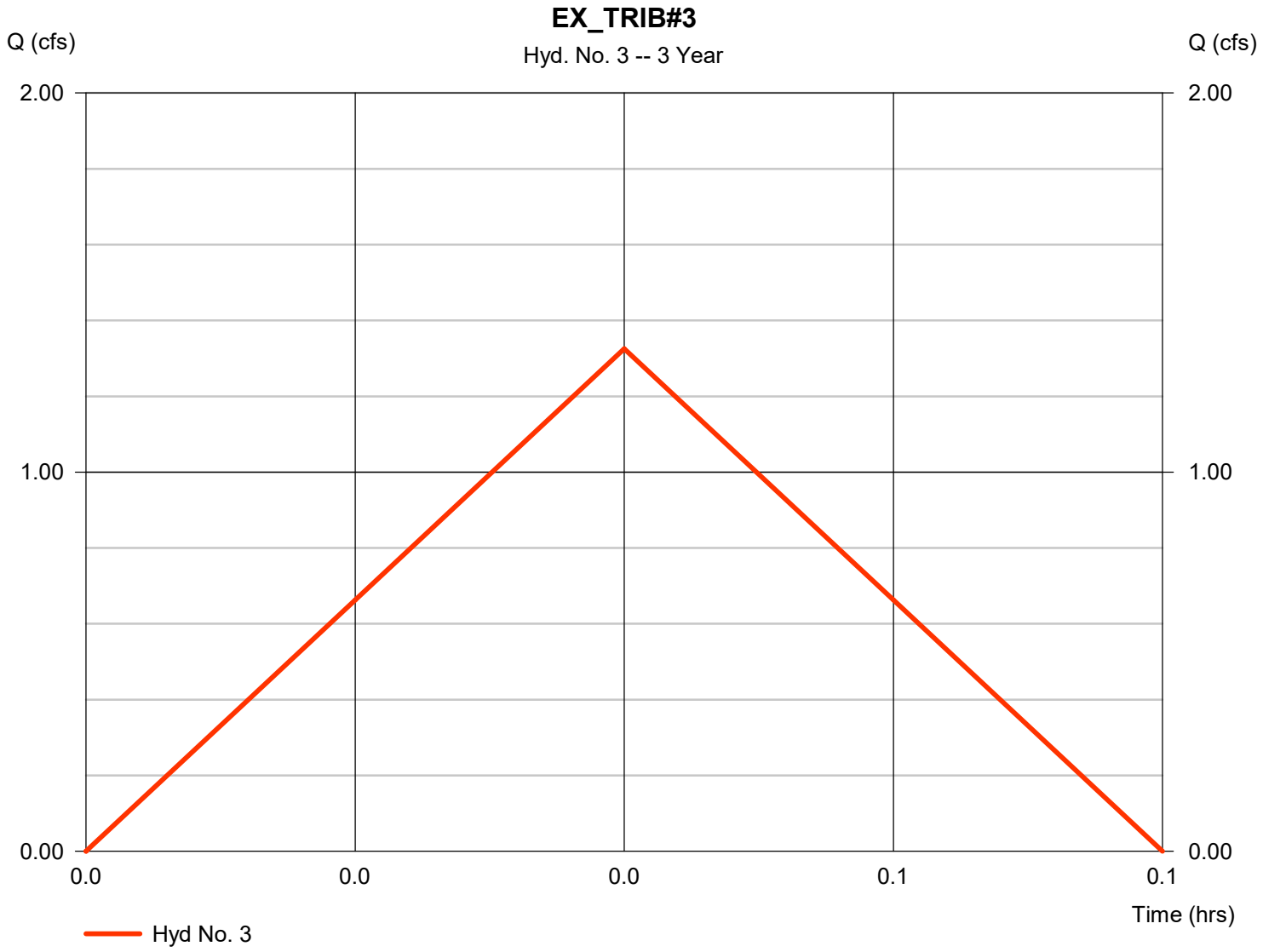


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	1.326 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	159 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	11.085 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

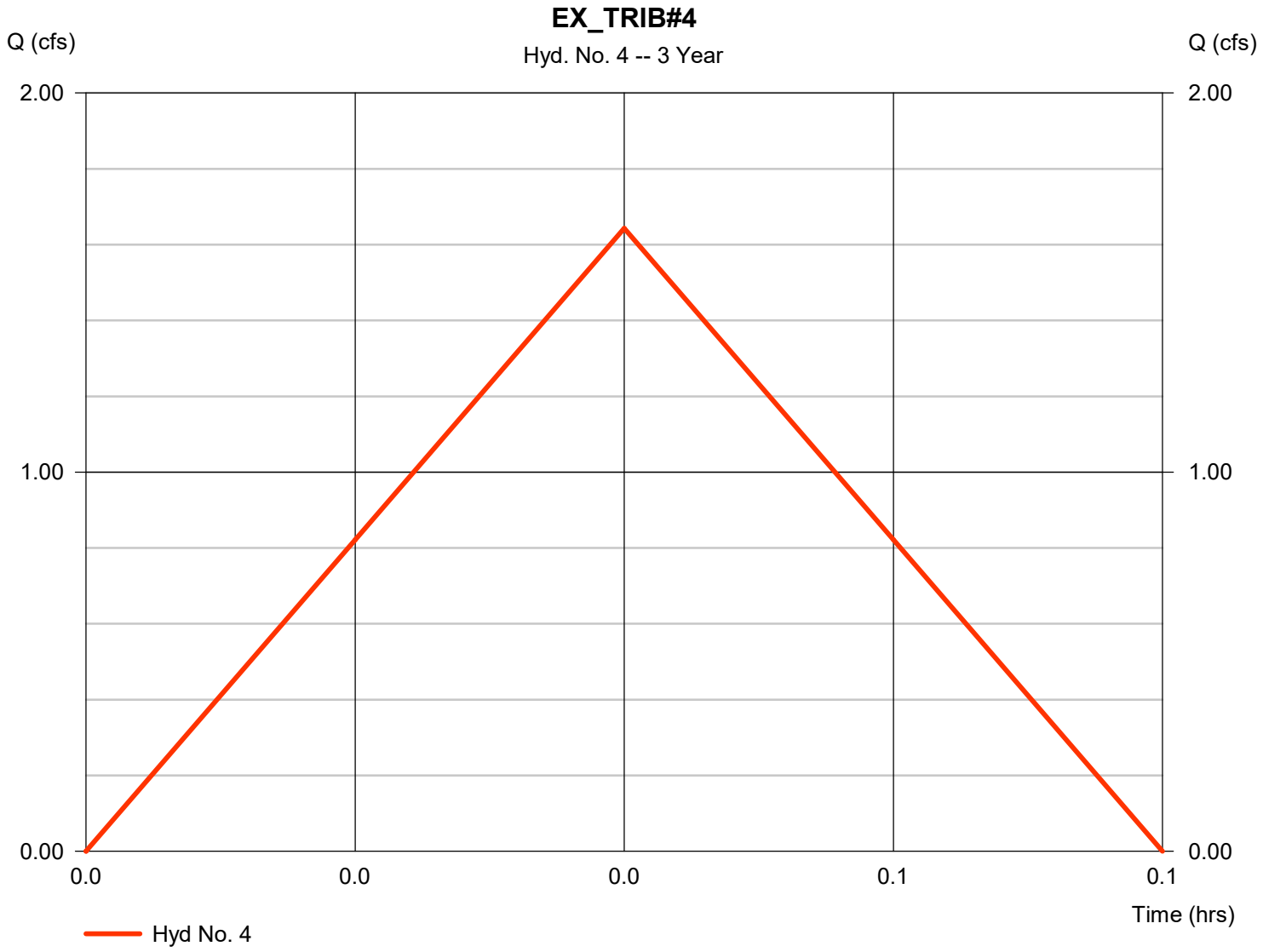


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.643 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	197 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	11.085 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

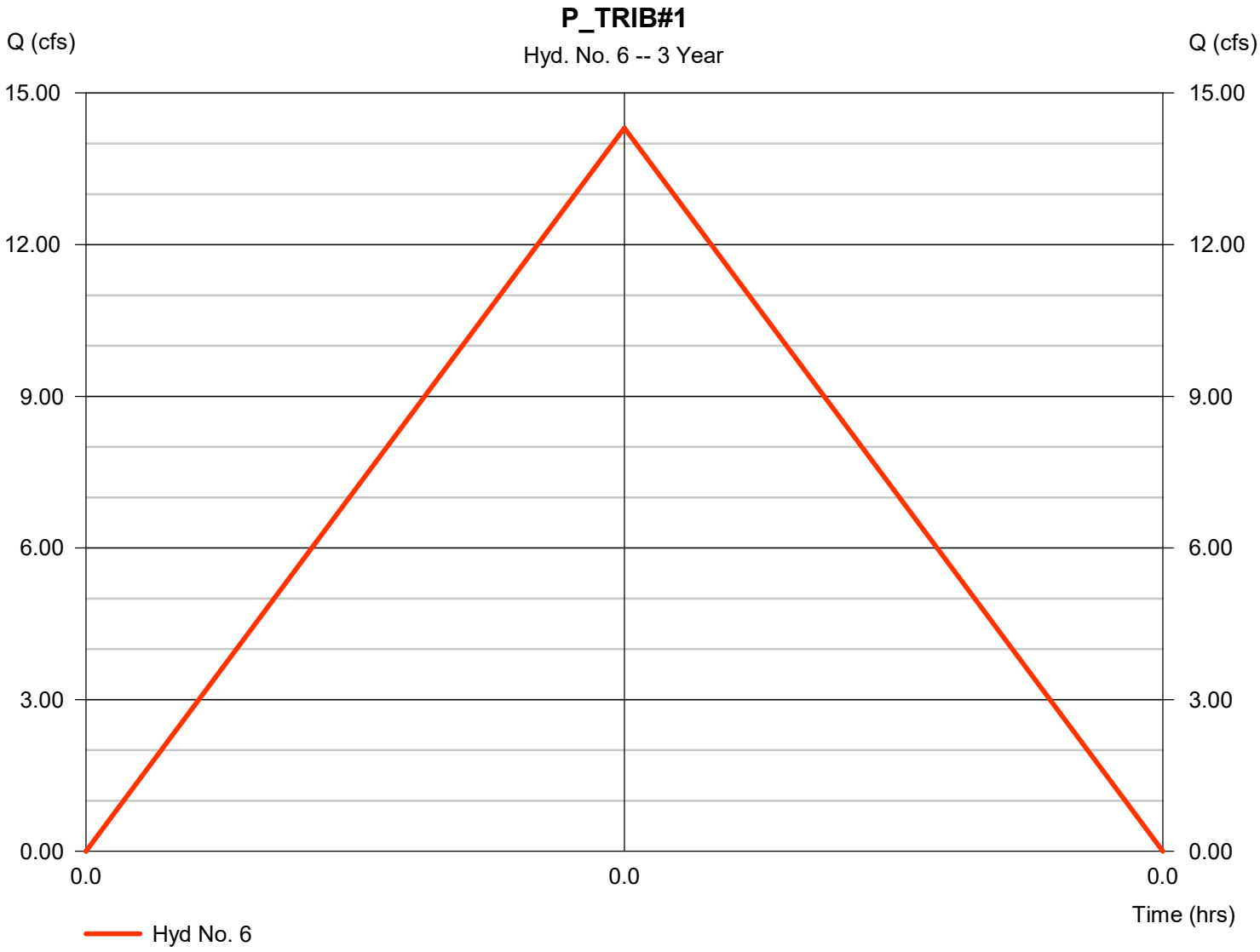


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	14.31 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	858 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	12.701 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

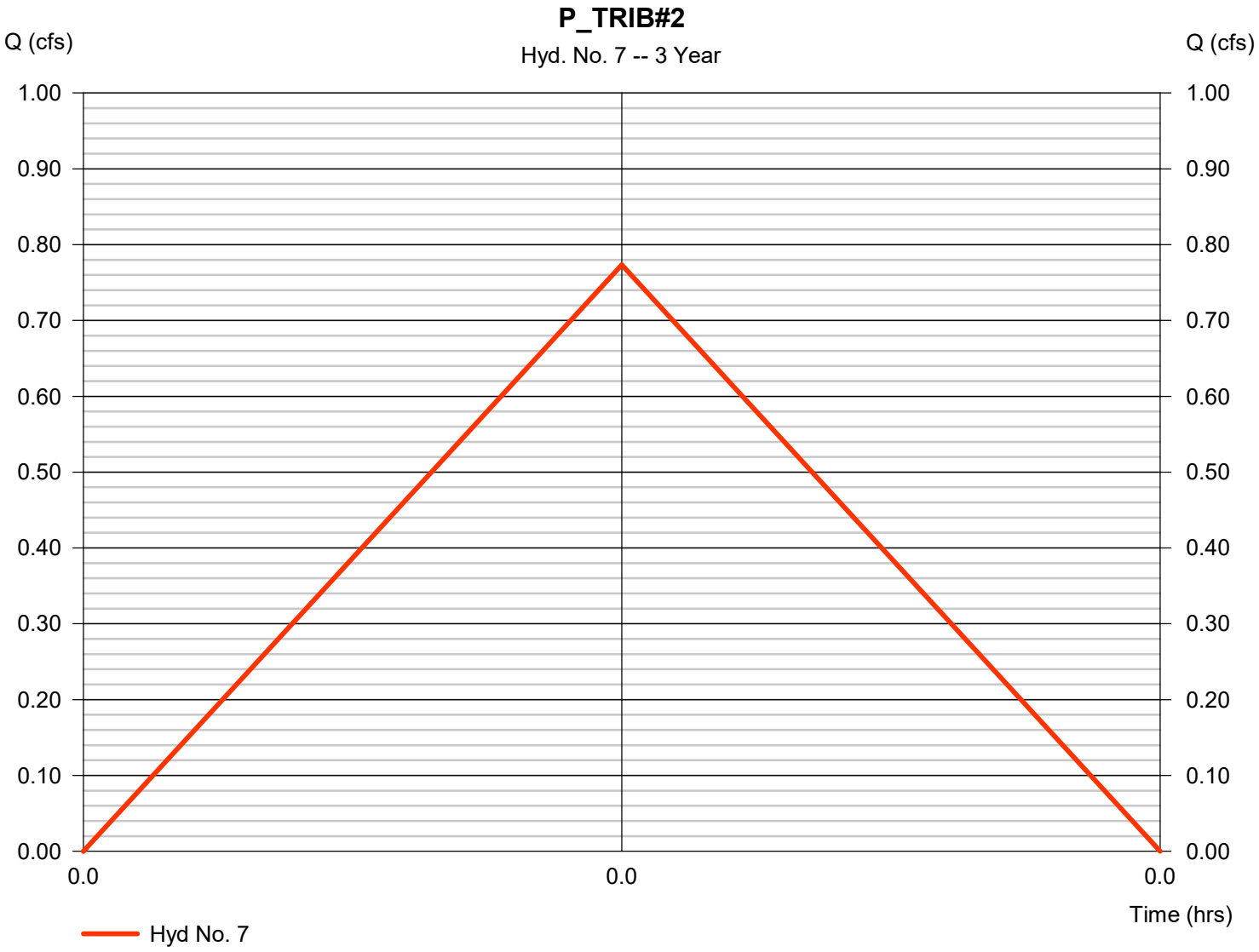


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.774 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	46 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	12.701 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

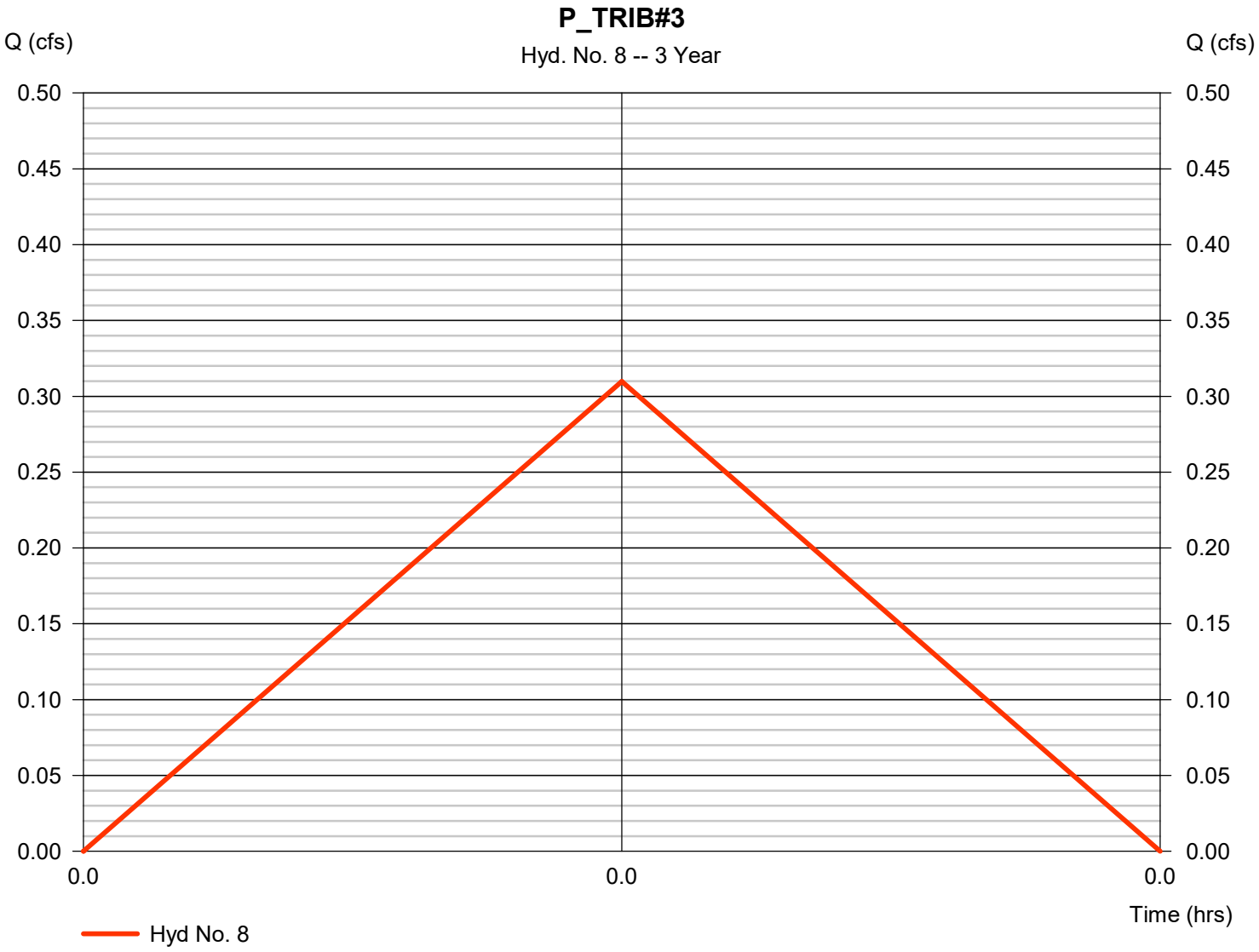


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.310 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	19 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	12.701 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



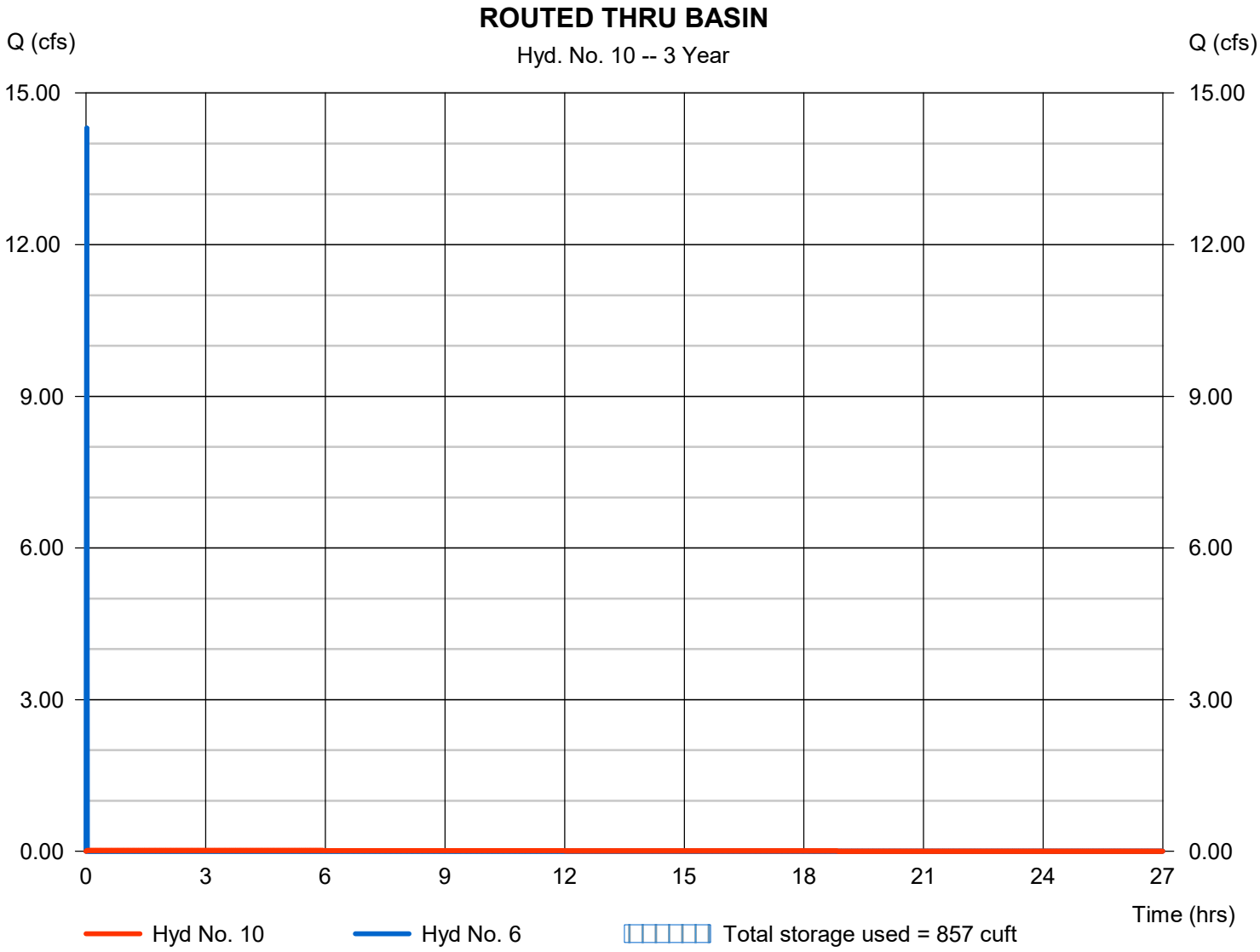
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	0.020 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	836 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	575.60 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	857 cuft

Storage Indication method used.

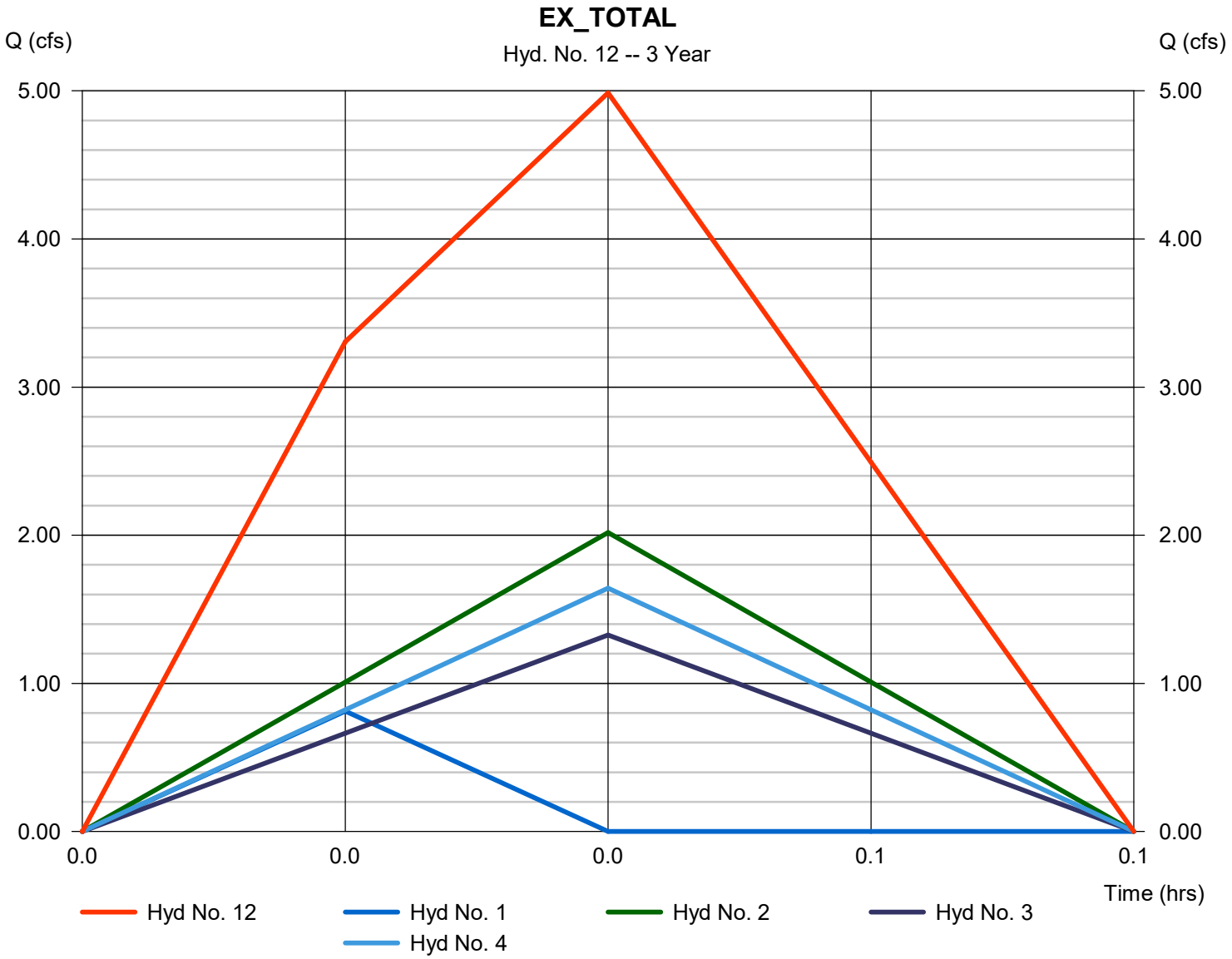


Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	4.986 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	647 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

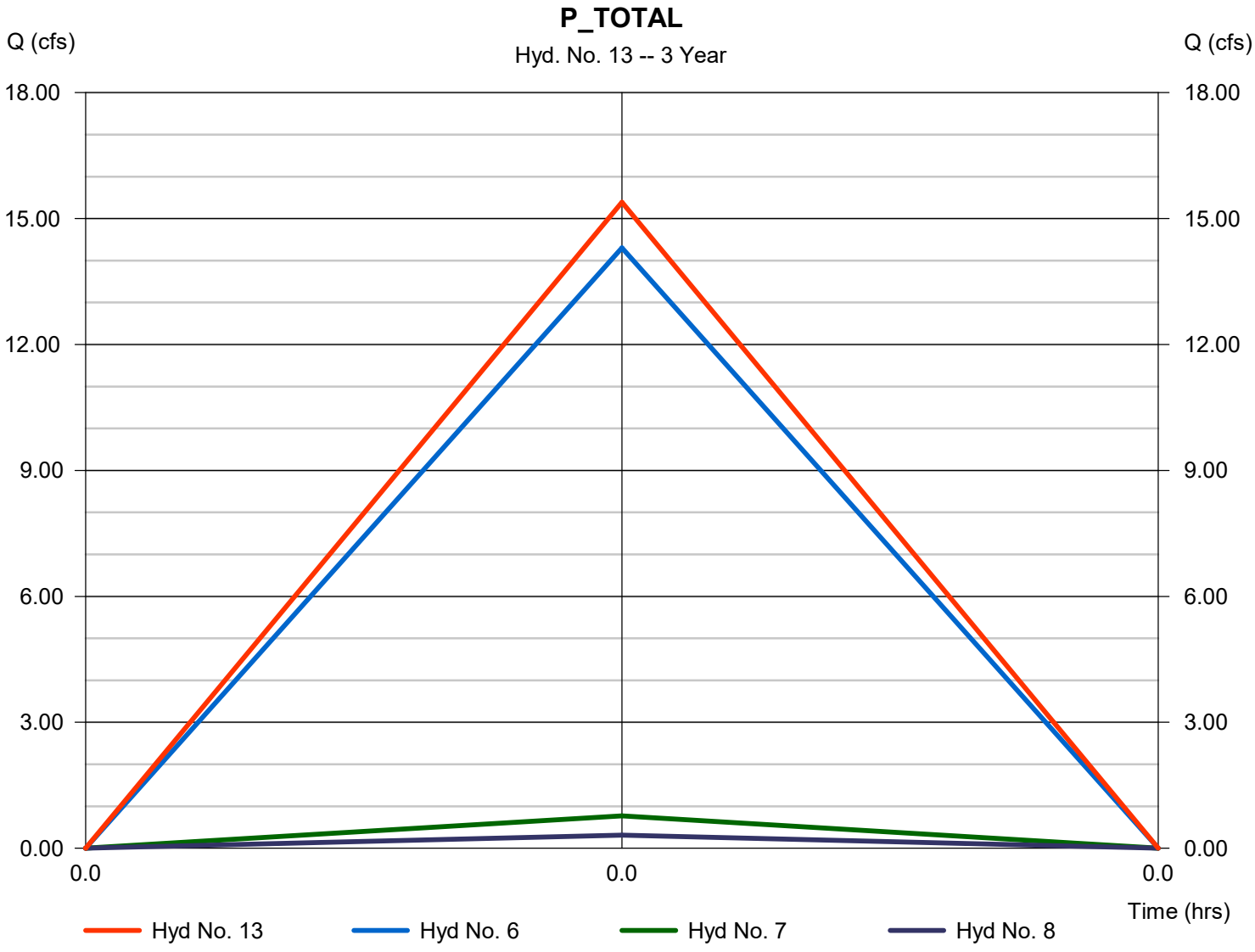


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	15.39 cfs
Storm frequency	=	3 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	923 cuft
Inflow hyds.	=	6, 7, 8	Contrib. drain. area	=	2.010 ac

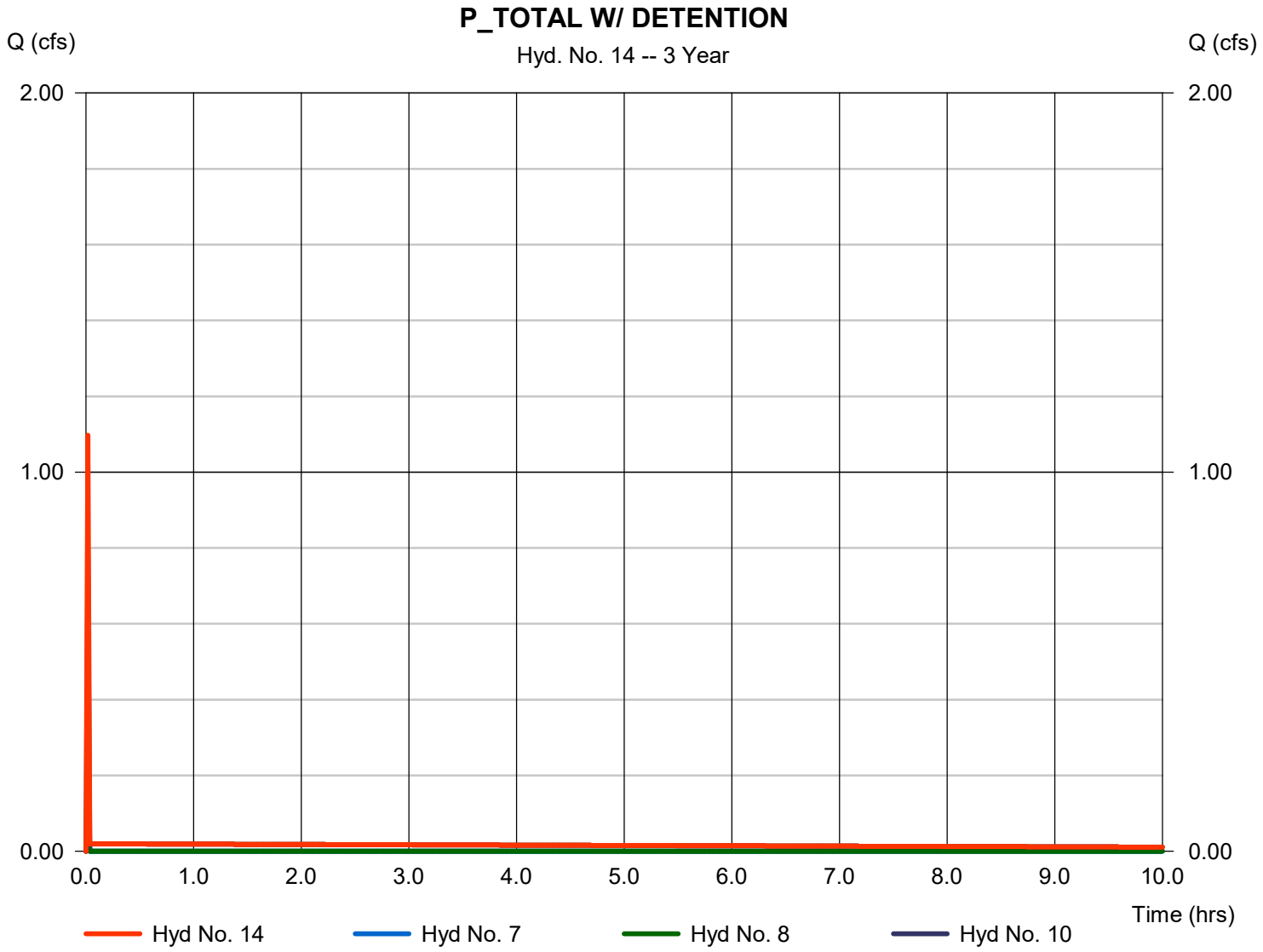


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	= Combine	Peak discharge	= 1.097 cfs
Storm frequency	= 3 yrs	Time to peak	= 0.02 hrs
Time interval	= 1 min	Hyd. volume	= 901 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 0.380 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

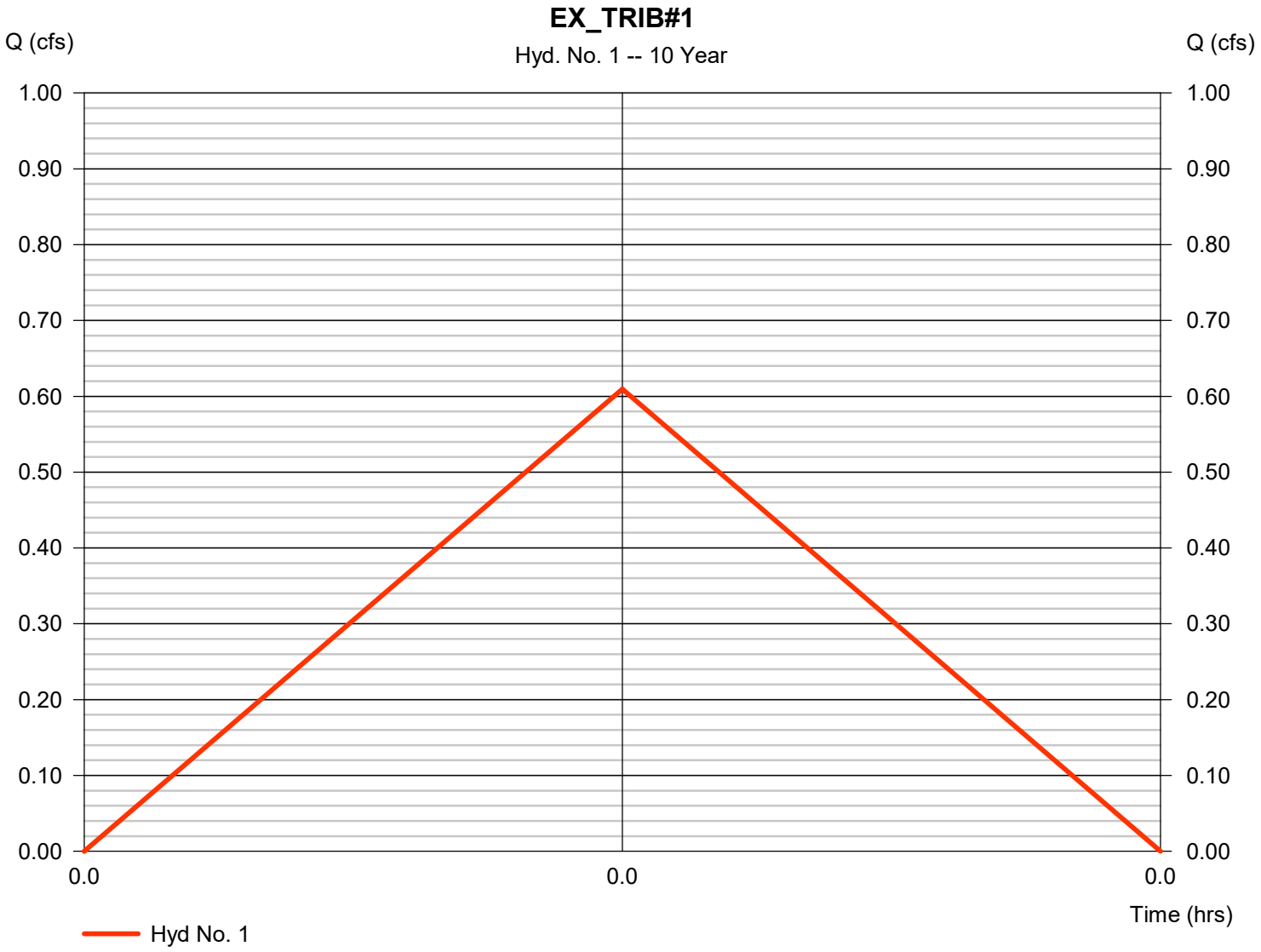
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.609	1	1	37	------	------	------	EX_TRIB#1
2	Rational	1.633	1	2	196	------	------	------	EX_TRIB#2
3	Rational	1.073	1	2	129	------	------	------	EX_TRIB#3
4	Rational	1.329	1	2	160	------	------	------	EX_TRIB#4
6	Rational	10.73	1	1	644	------	------	------	P_TRIB#1
7	Rational	0.580	1	1	35	------	------	------	P_TRIB#2
8	Rational	0.232	1	1	14	------	------	------	P_TRIB#3
10	Reservoir	0.017	1	2	621	6	575.45	642	ROUTED THRU BASIN
12	Combine	4.035	1	2	521	1, 2, 3, 4,	------	------	EX_TOTAL
13	Combine	11.54	1	1	692	6, 7, 8,	------	------	P_TOTAL
14	Combine	0.823	1	1	670	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.609 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	37 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	9.522 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

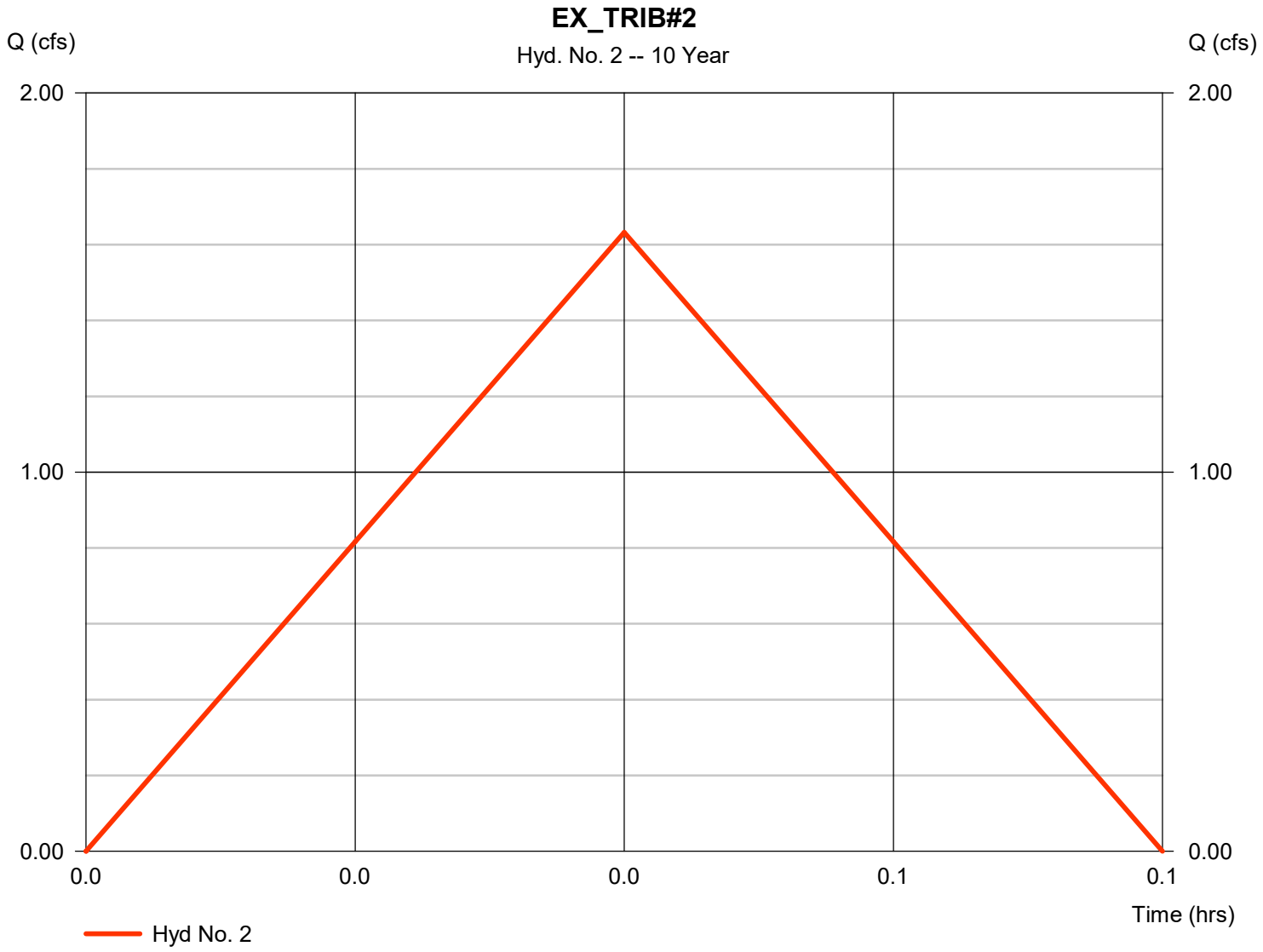


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	1.633 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	196 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	8.971 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

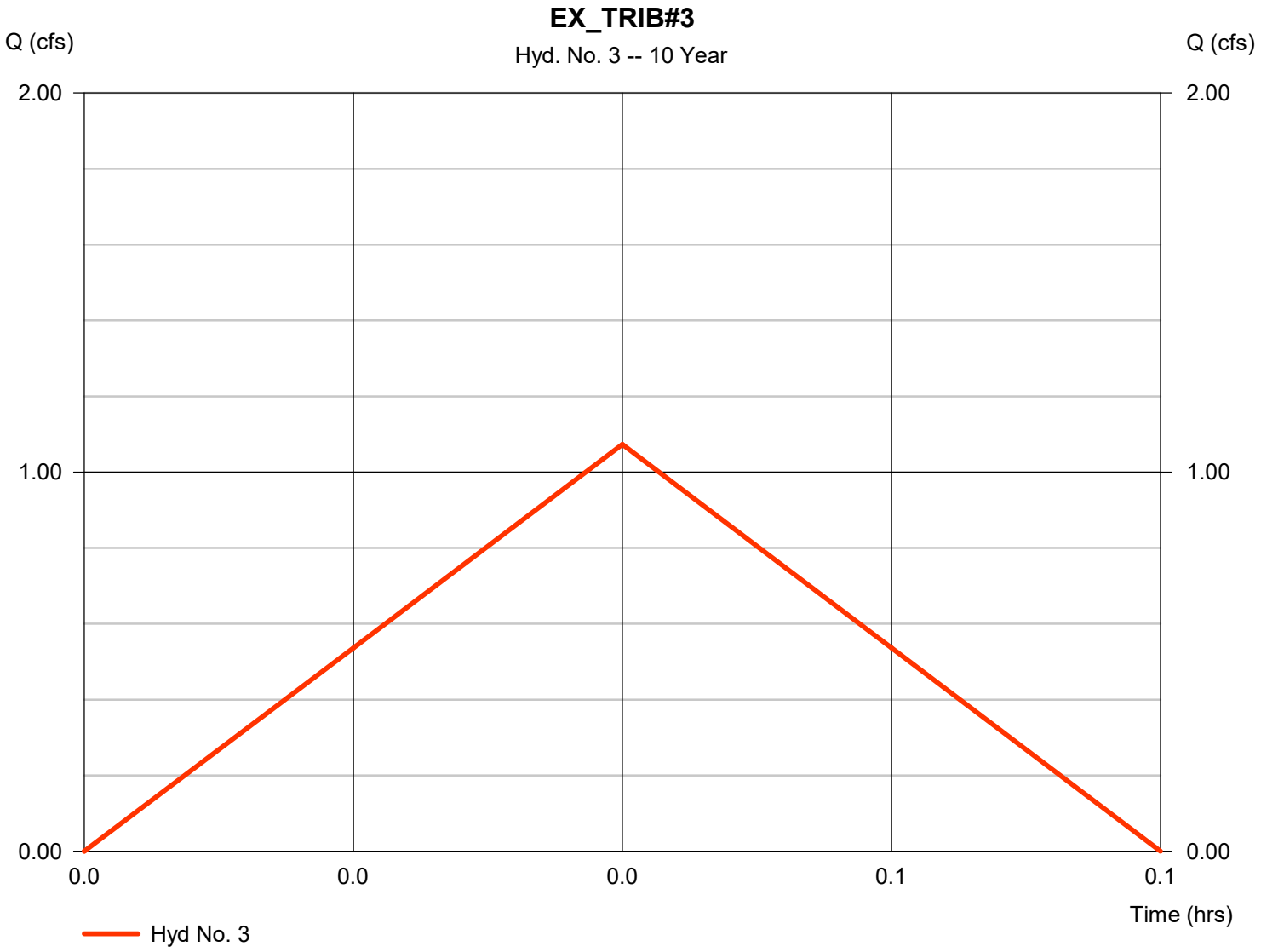


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	1.073 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	129 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	8.971 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

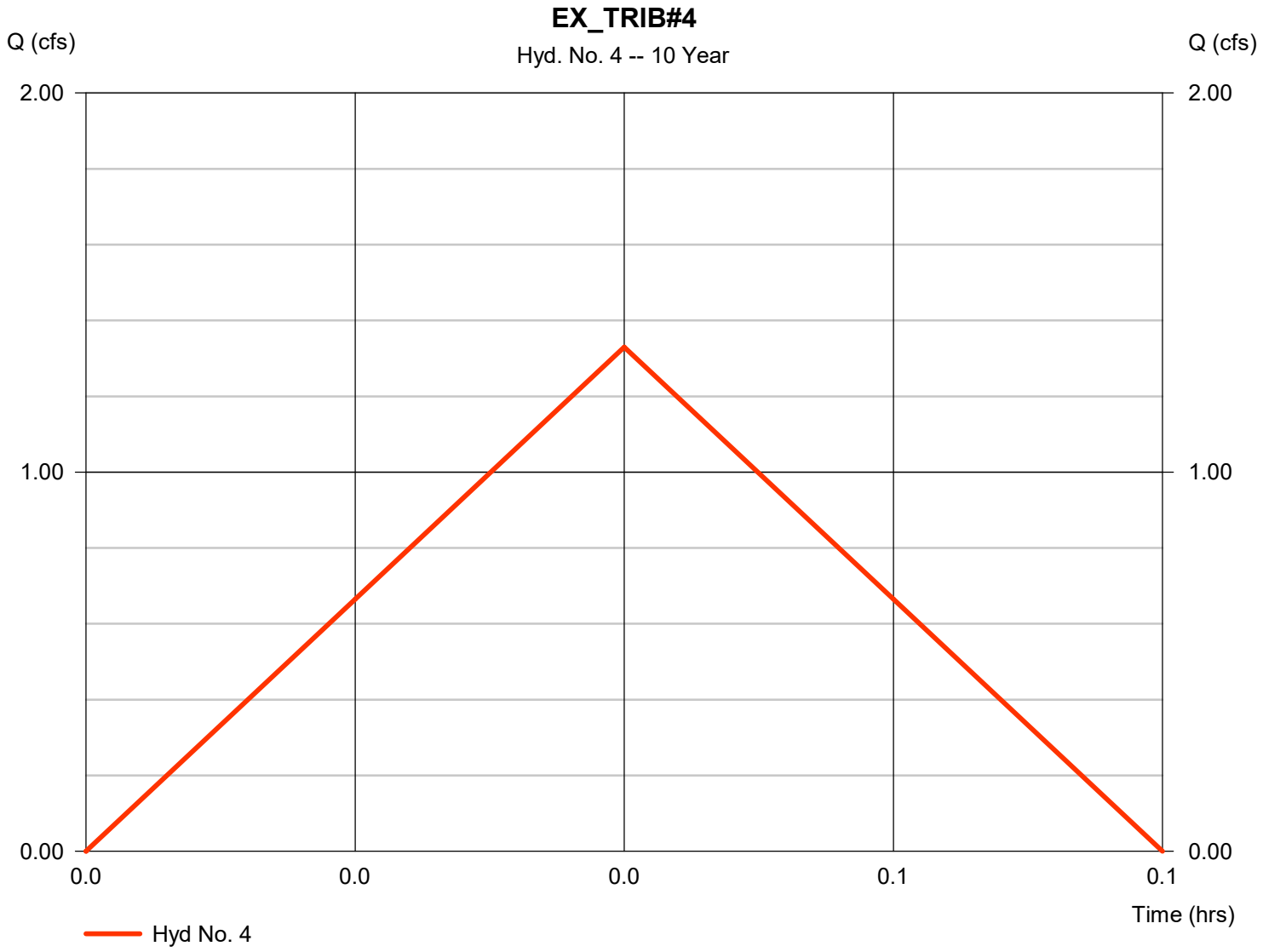


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.329 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	160 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	8.971 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

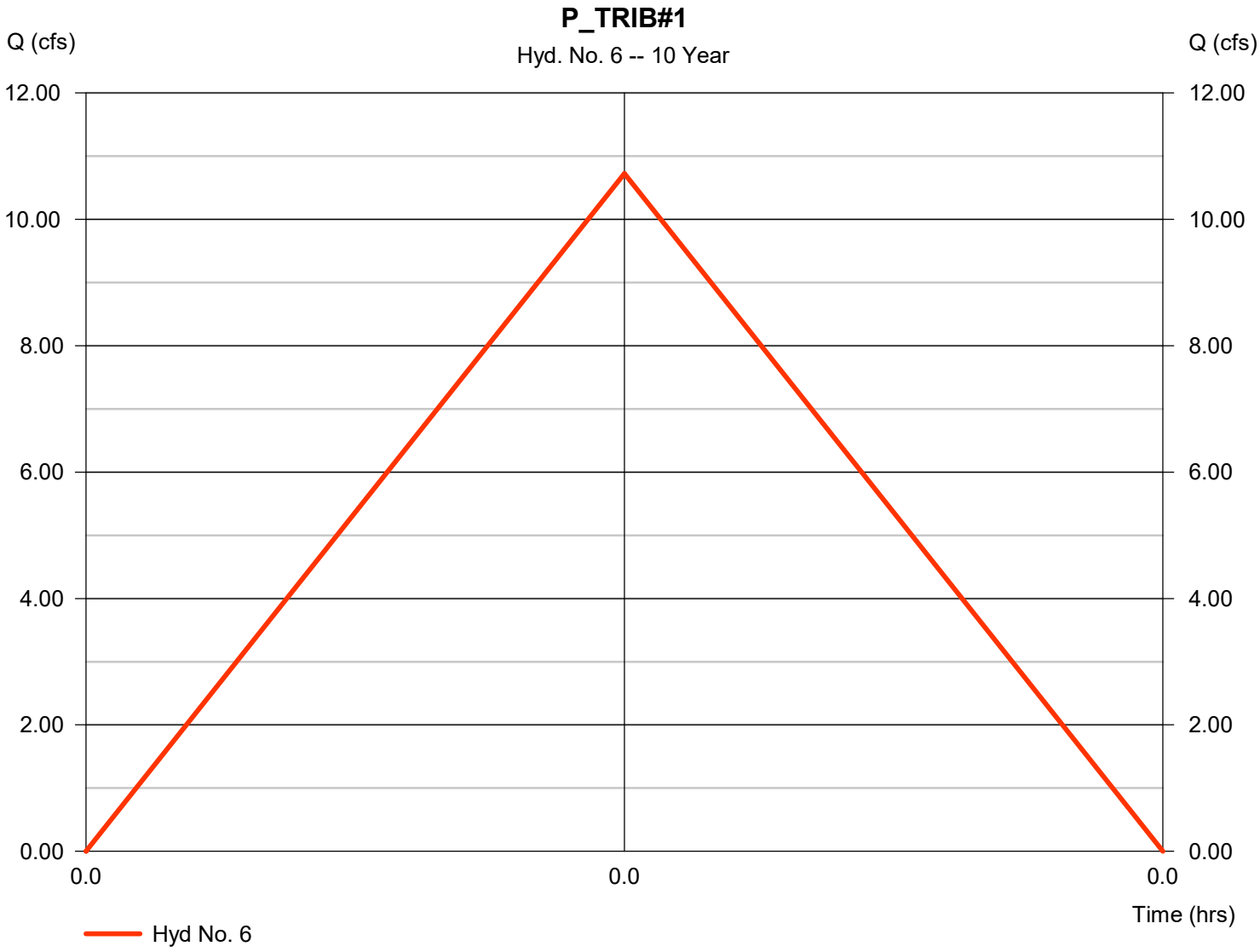


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	10.73 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	644 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	9.522 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

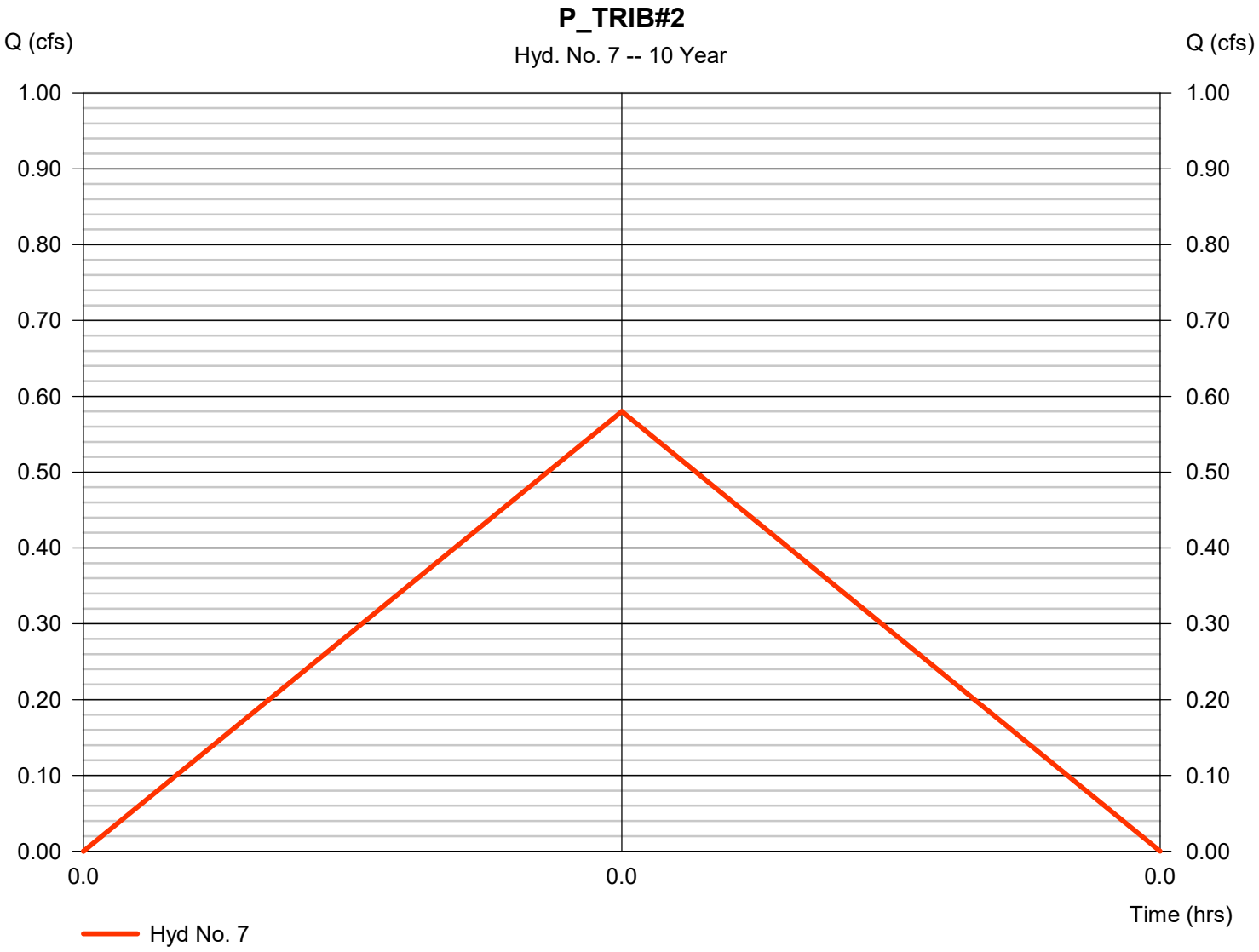


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.580 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	35 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	9.522 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

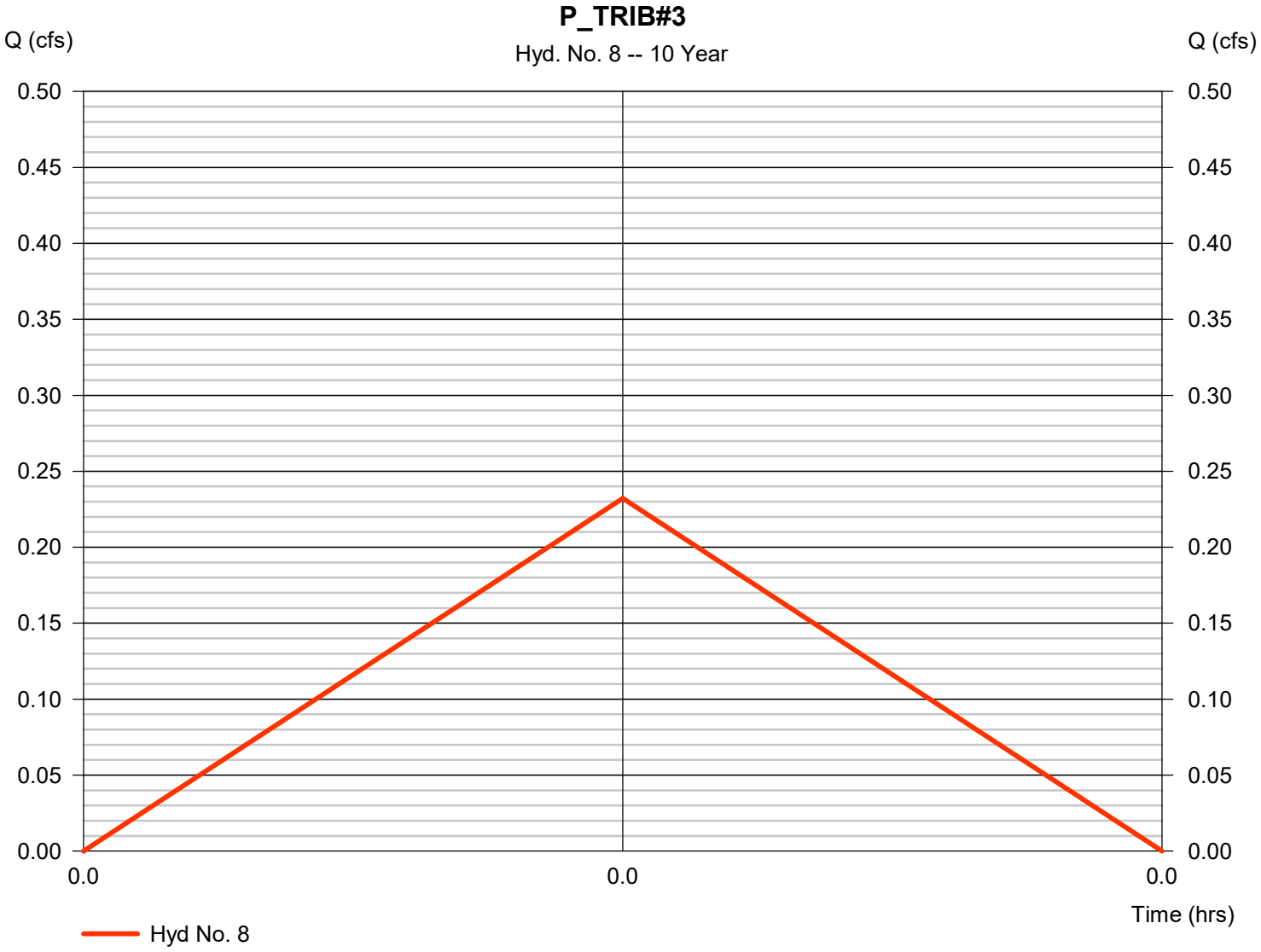


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.232 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	14 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	9.522 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



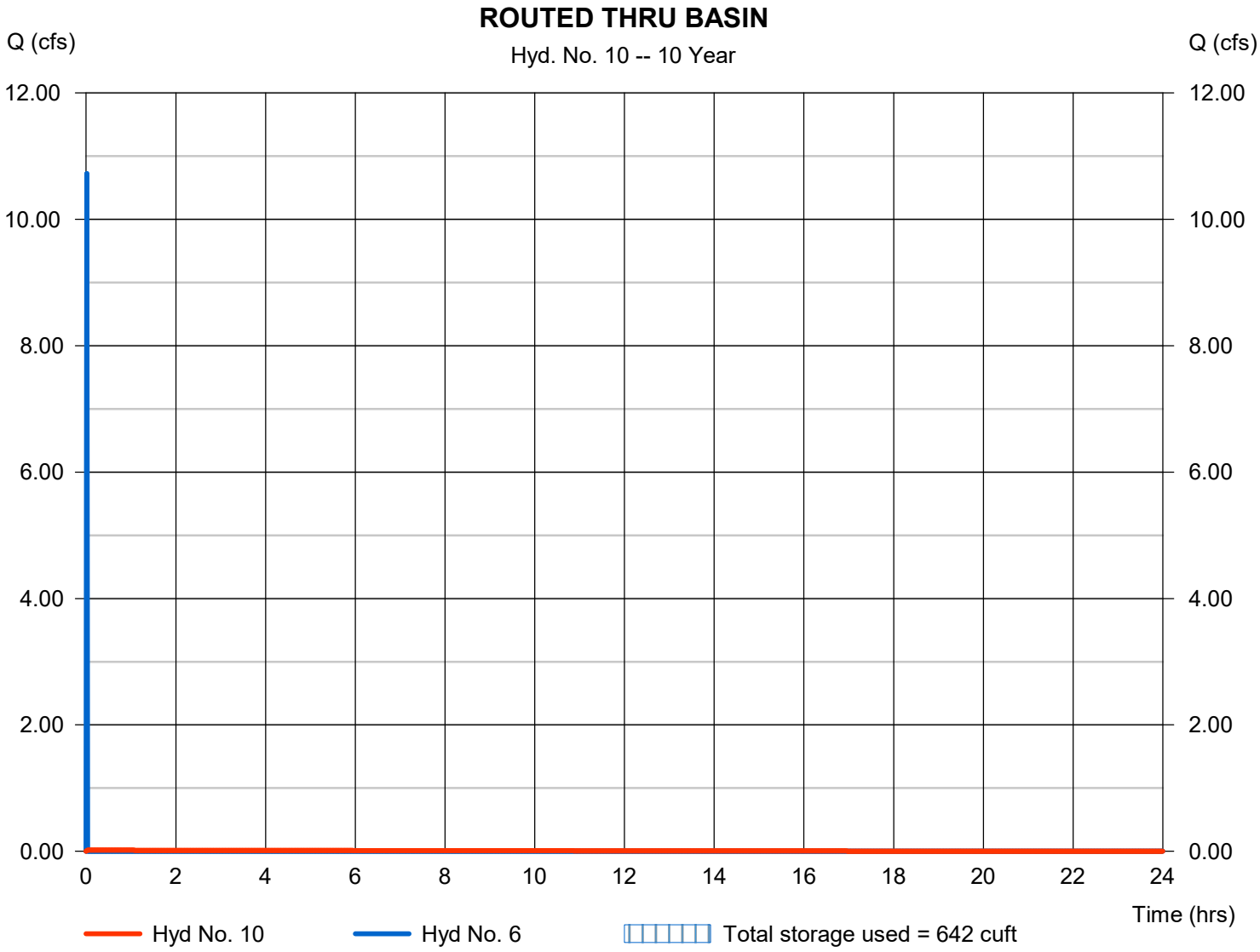
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	0.017 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	621 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	575.45 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	642 cuft

Storage Indication method used.

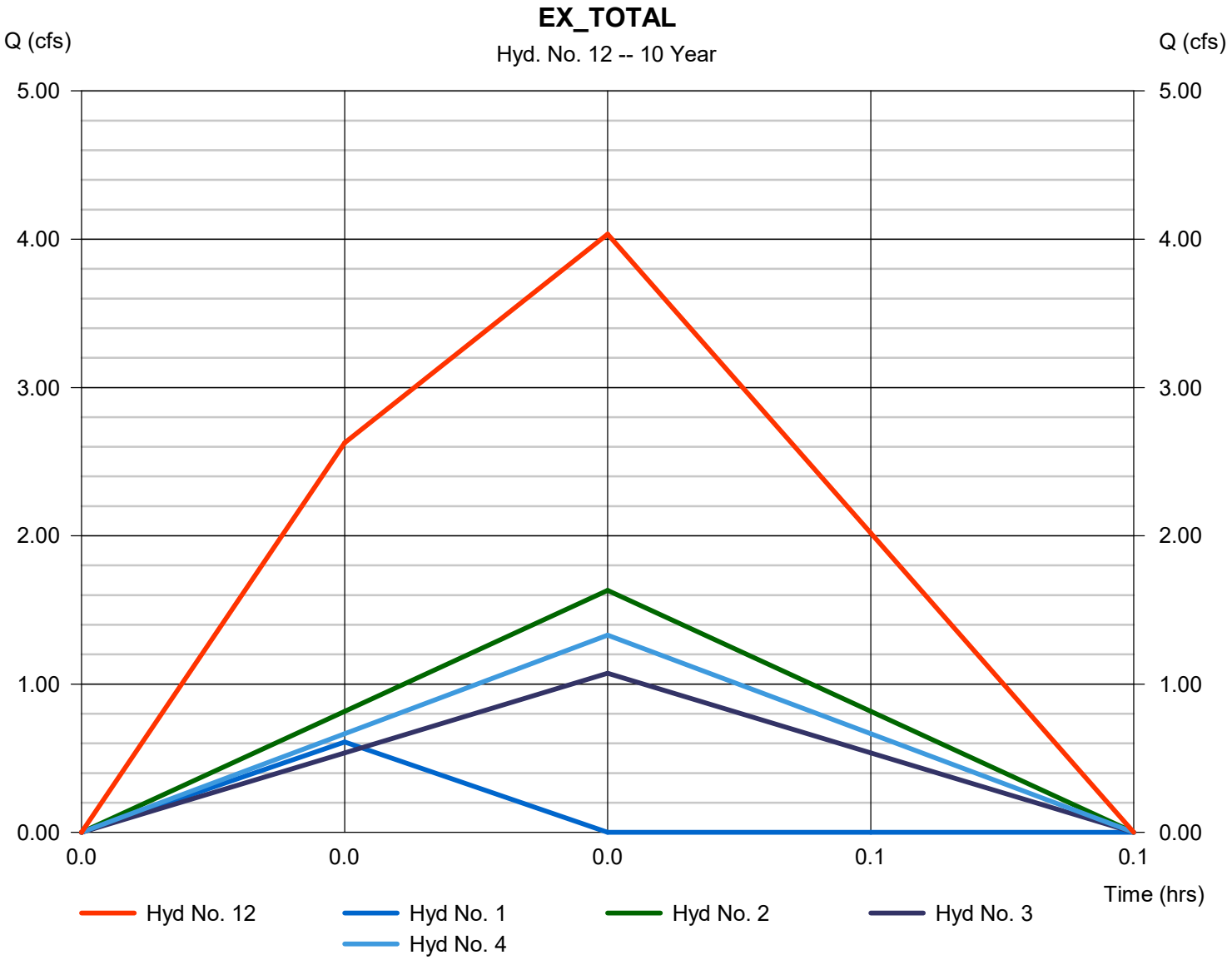


Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	4.035 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	521 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

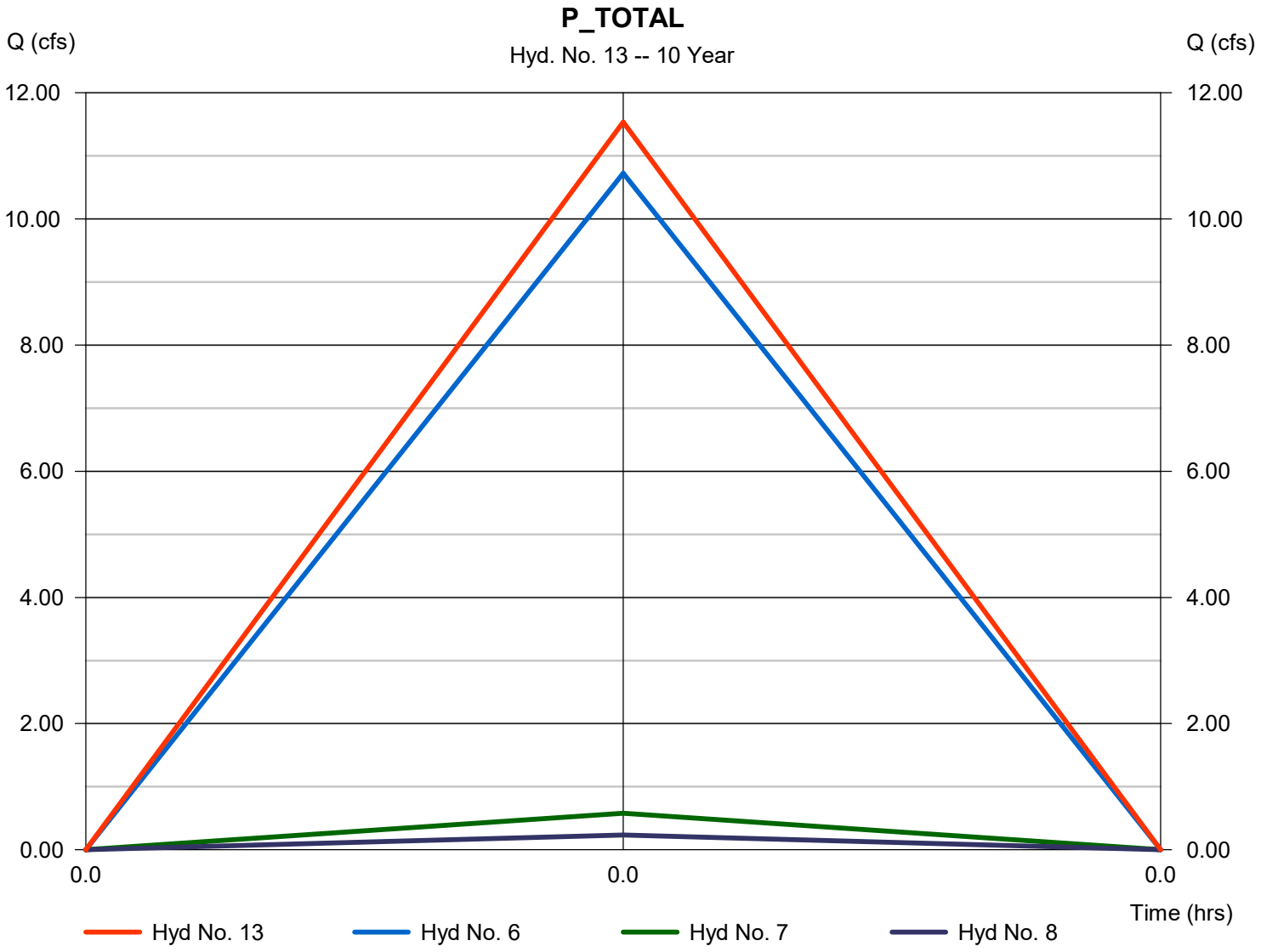


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	11.54 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	692 cuft
Inflow hyds.	=	6, 7, 8	Contrib. drain. area	=	2.010 ac

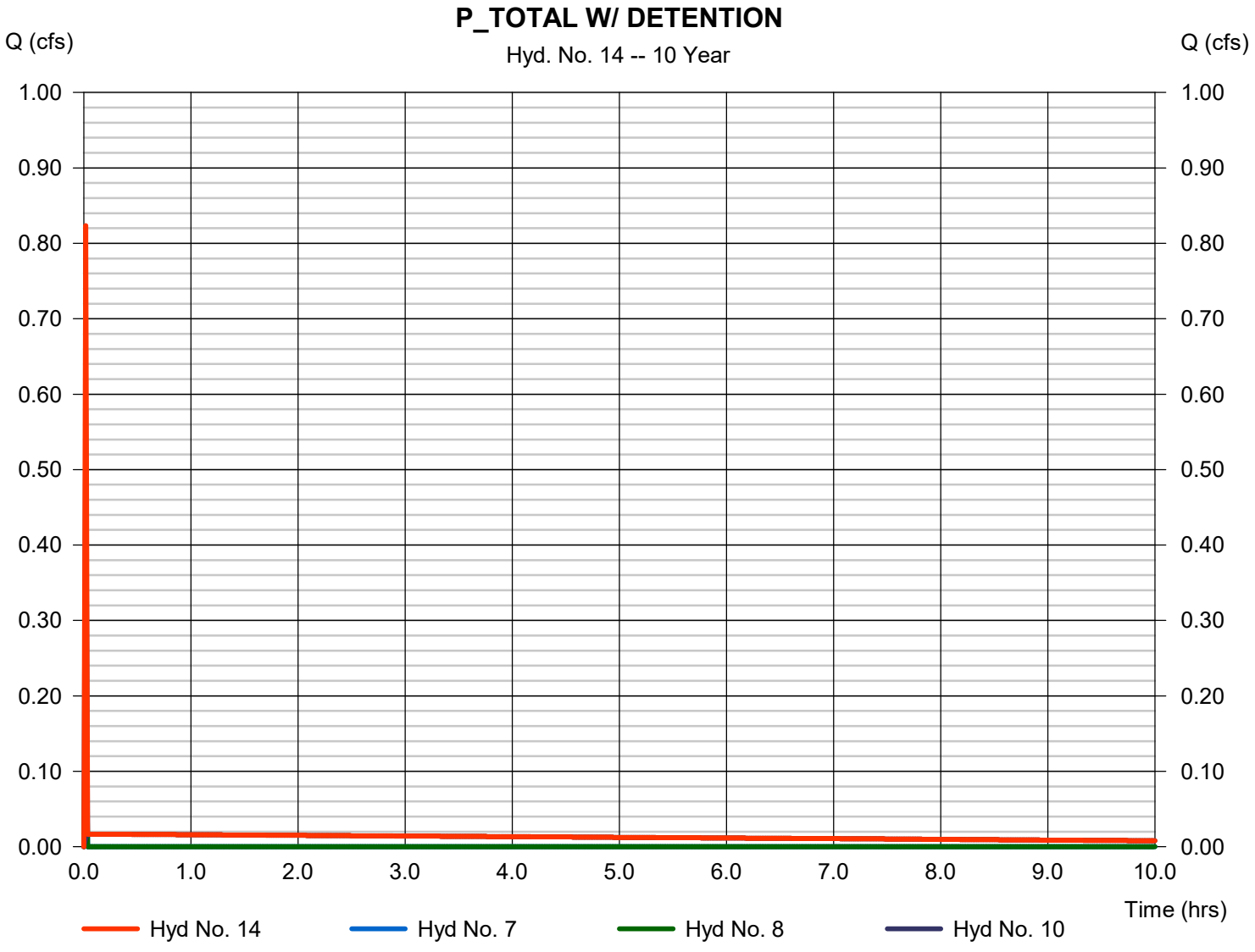


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	=	Combine	Peak discharge	=	0.823 cfs
Storm frequency	=	10 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	670 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	0.380 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

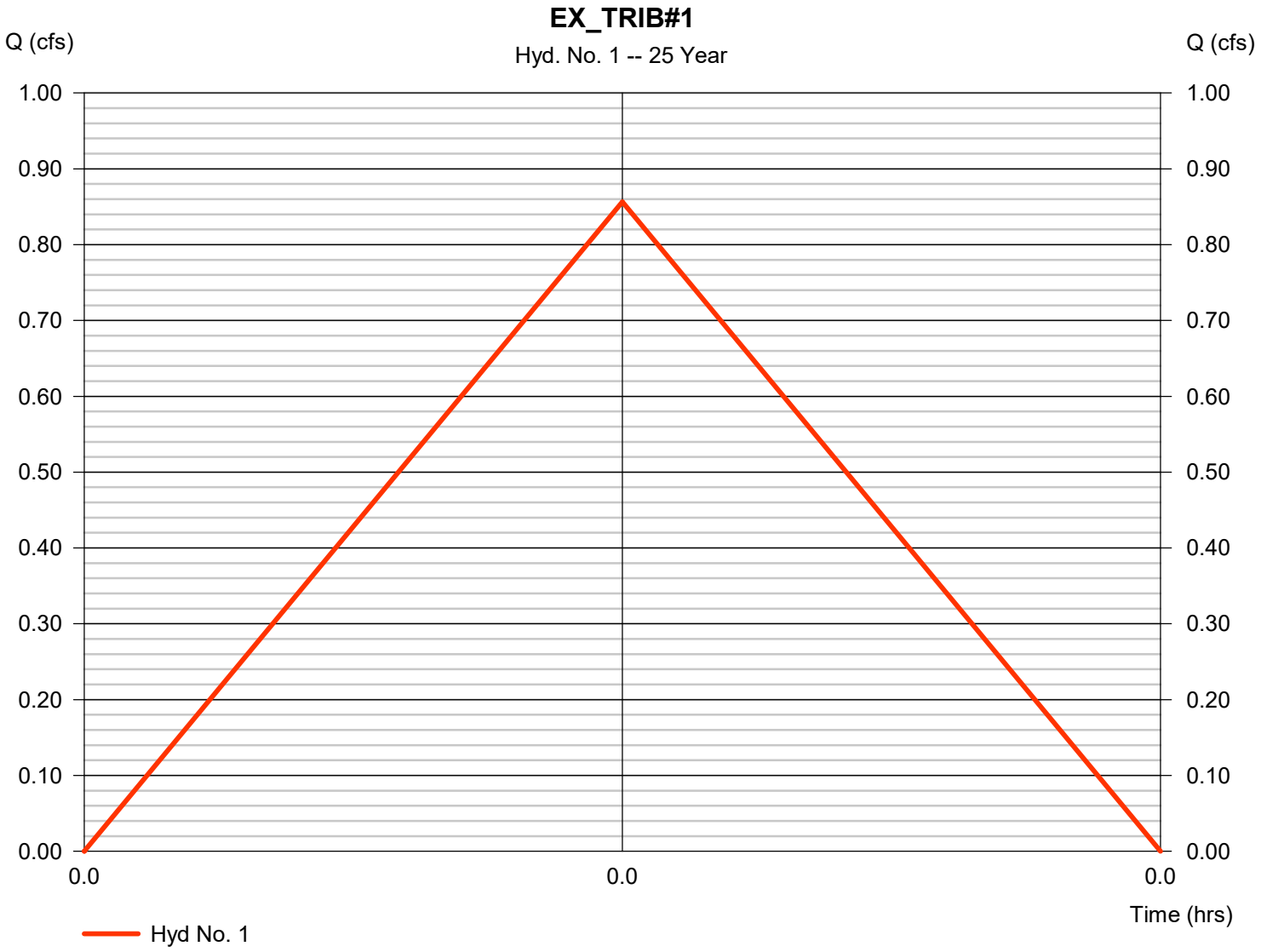
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.856	1	1	51	------	------	------	EX_TRIB#1
2	Rational	2.129	1	2	256	------	------	------	EX_TRIB#2
3	Rational	1.399	1	2	168	------	------	------	EX_TRIB#3
4	Rational	1.734	1	2	208	------	------	------	EX_TRIB#4
6	Rational	15.07	1	1	904	------	------	------	P_TRIB#1
7	Rational	0.815	1	1	49	------	------	------	P_TRIB#2
8	Rational	0.326	1	1	20	------	------	------	P_TRIB#3
10	Reservoir	0.020	1	2	882	6	575.63	903	ROUTED THRU BASIN
12	Combine	5.262	1	2	683	1, 2, 3, 4,	------	------	EX_TOTAL
13	Combine	16.21	1	1	973	6, 7, 8,	------	------	P_TOTAL
14	Combine	1.155	1	1	950	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.856 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	51 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	13.381 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

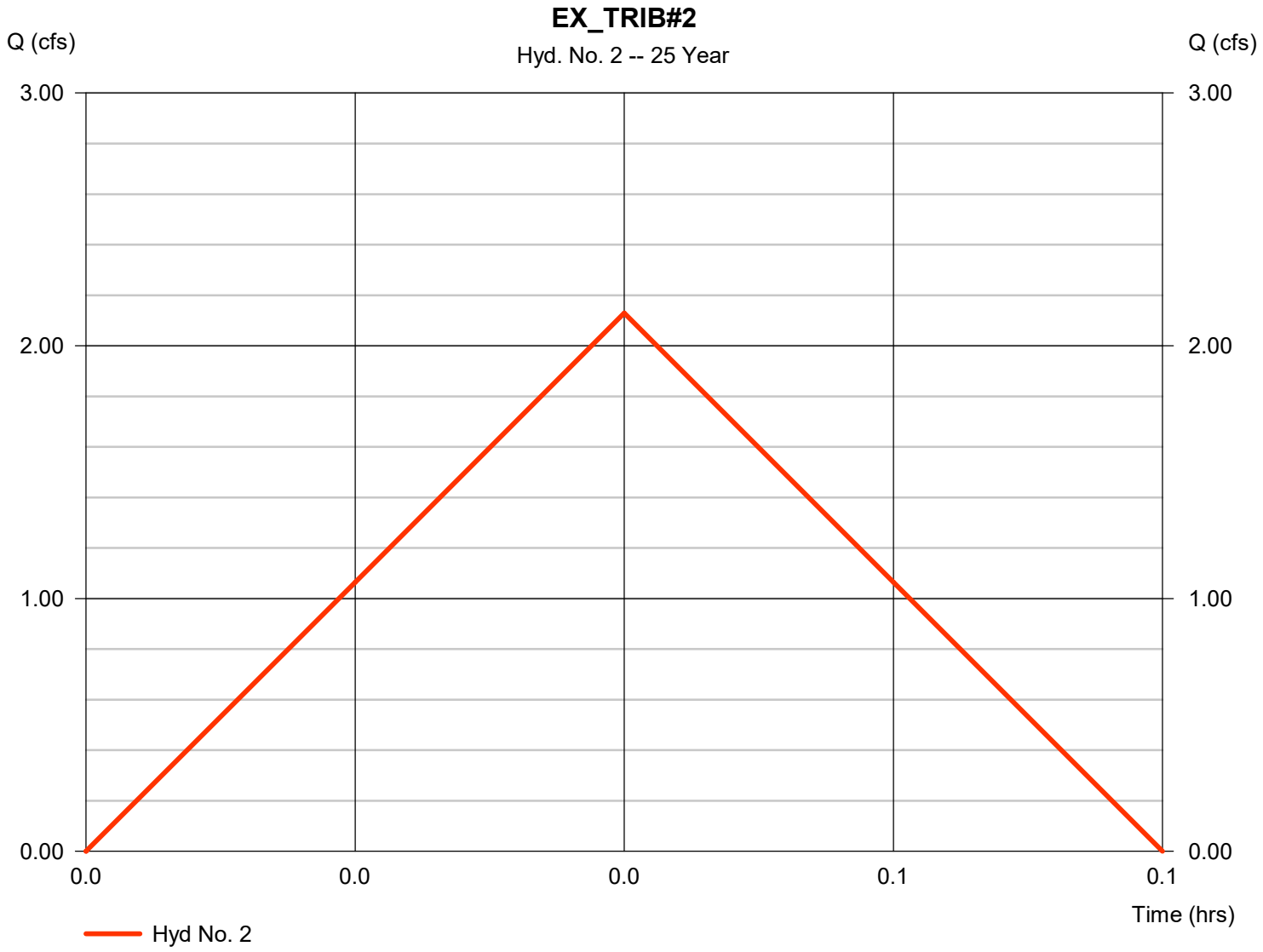


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	2.129 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	256 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	11.699 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

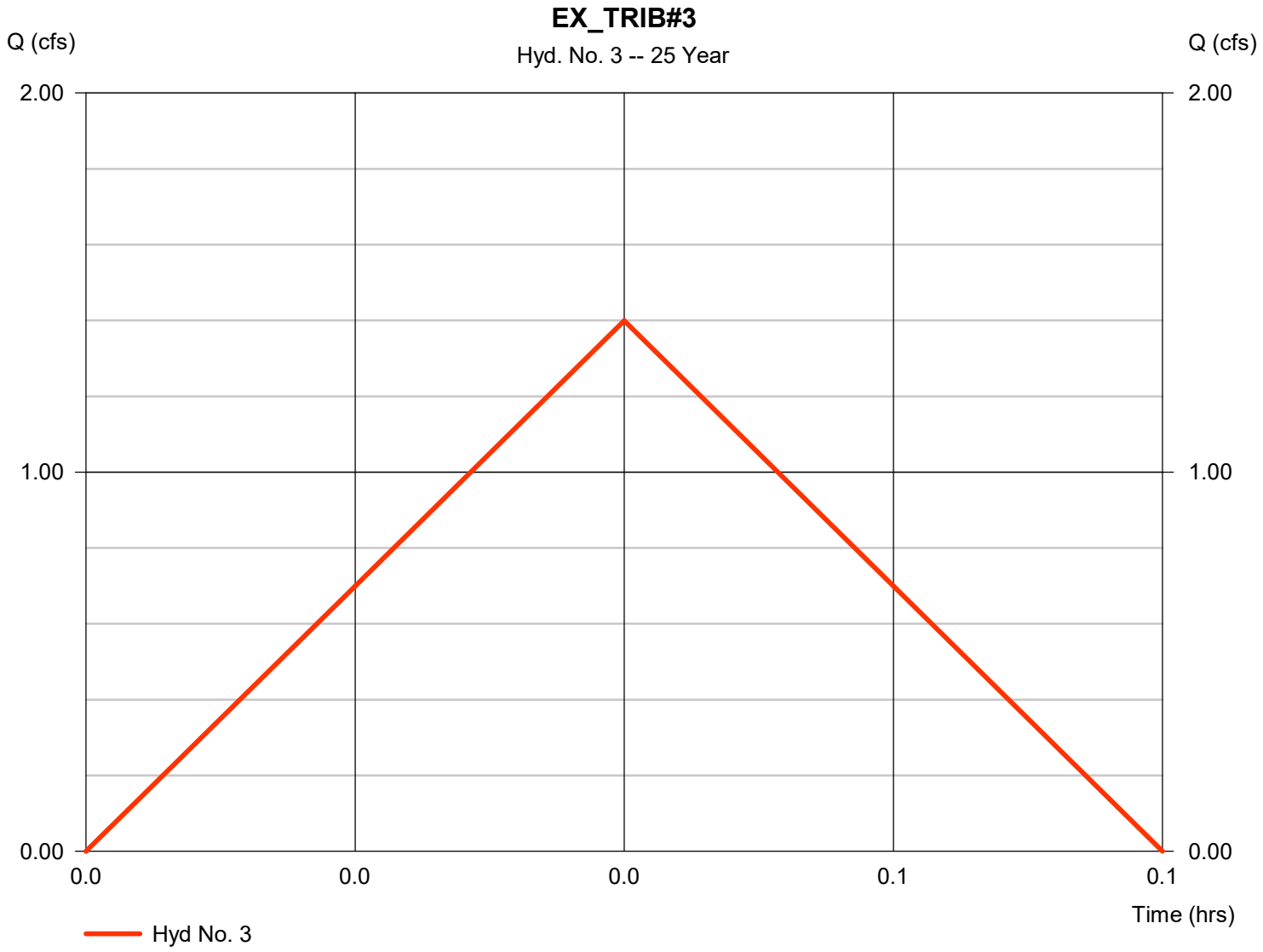


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	1.399 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	168 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	11.699 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

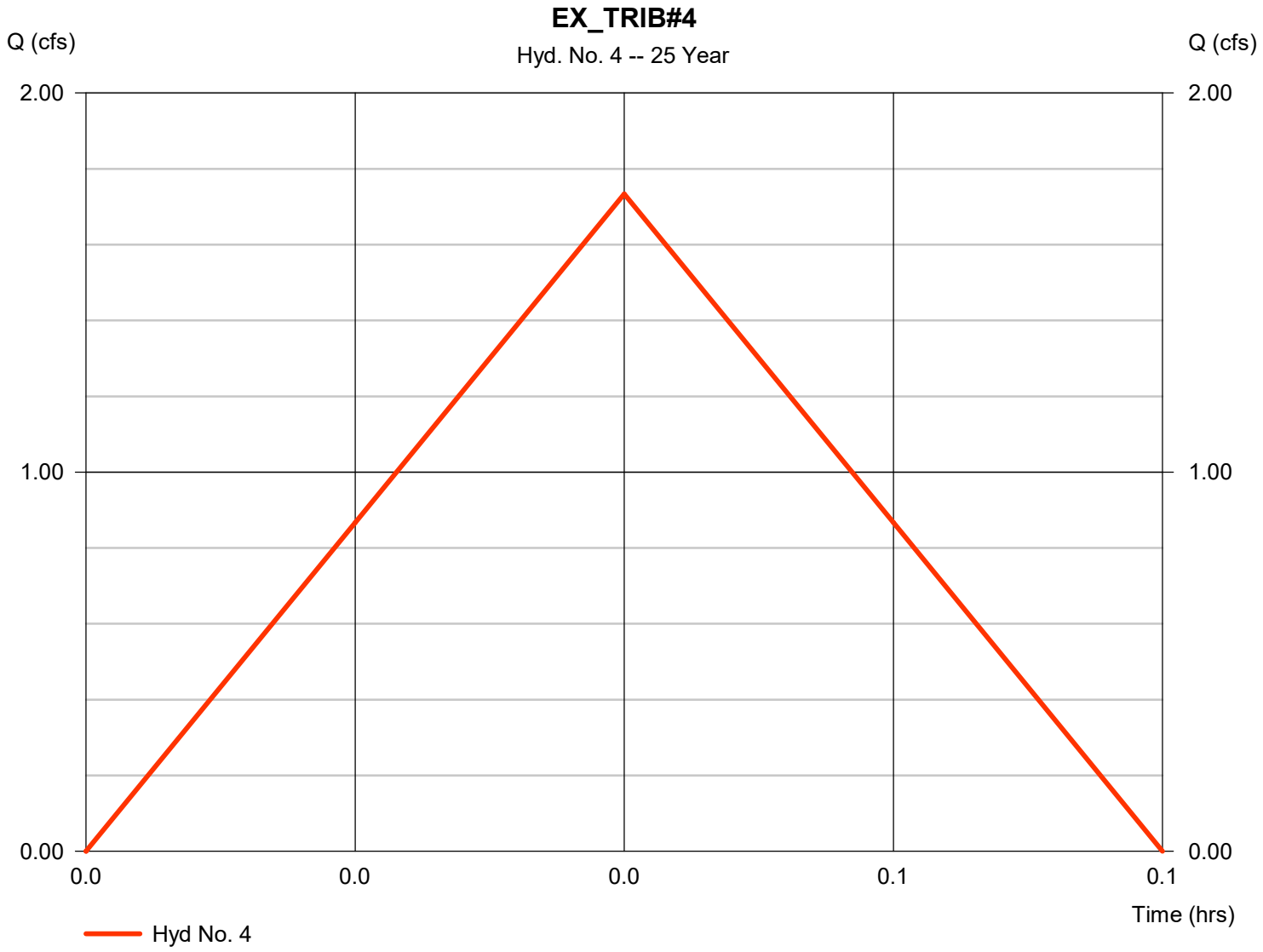


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.734 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	208 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	11.699 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

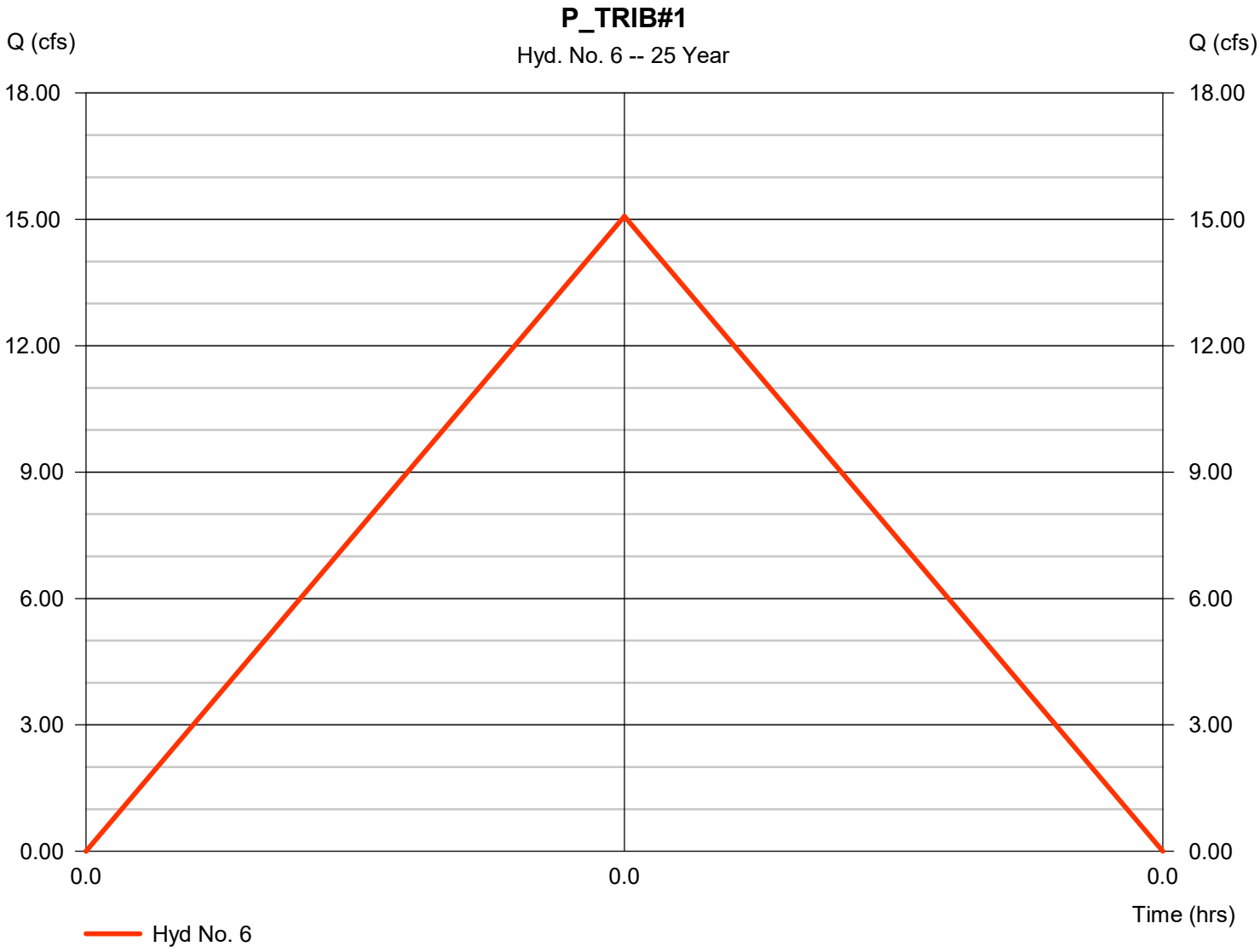


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	15.07 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	904 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	13.381 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

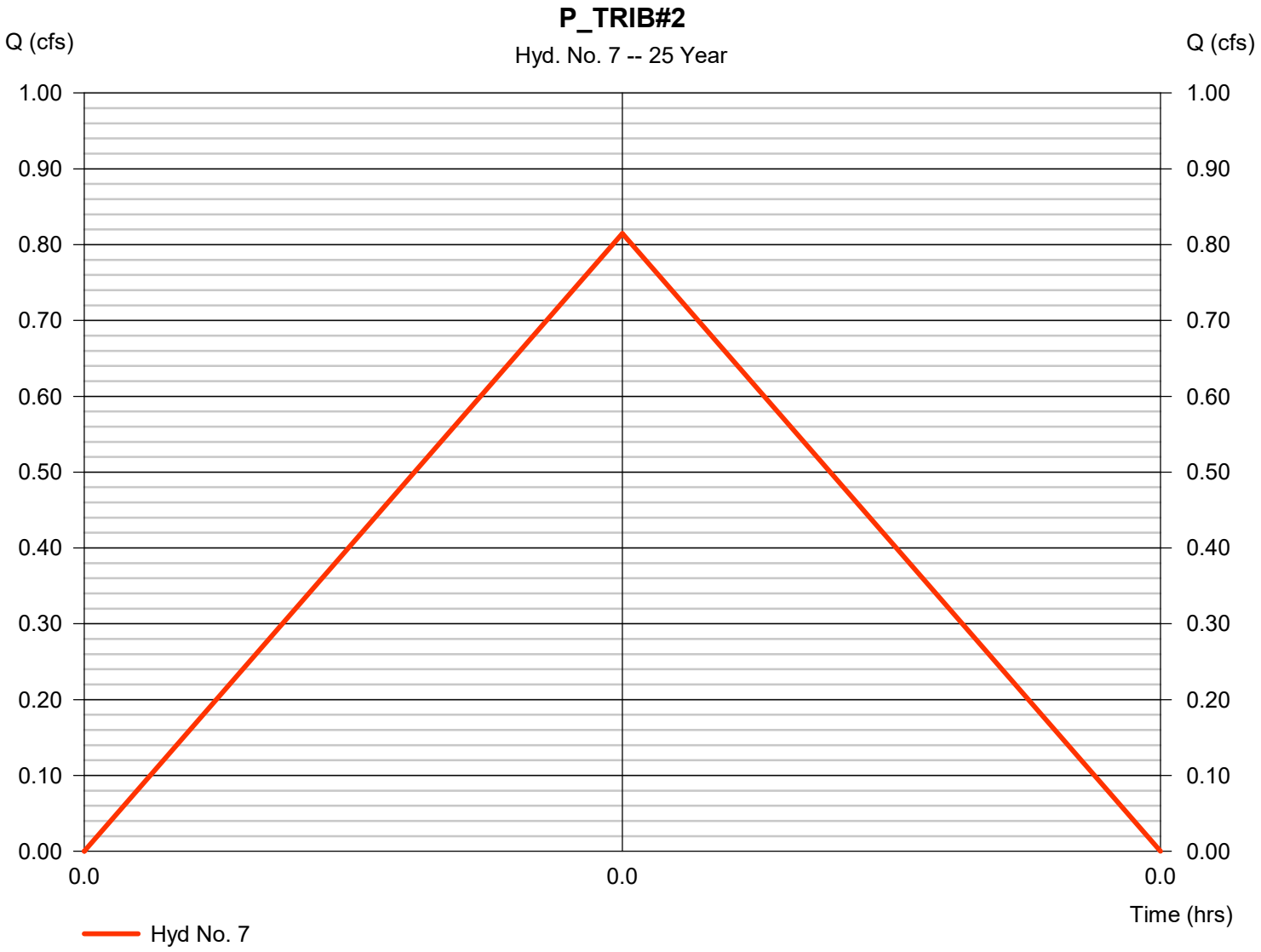


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.815 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	49 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	13.381 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

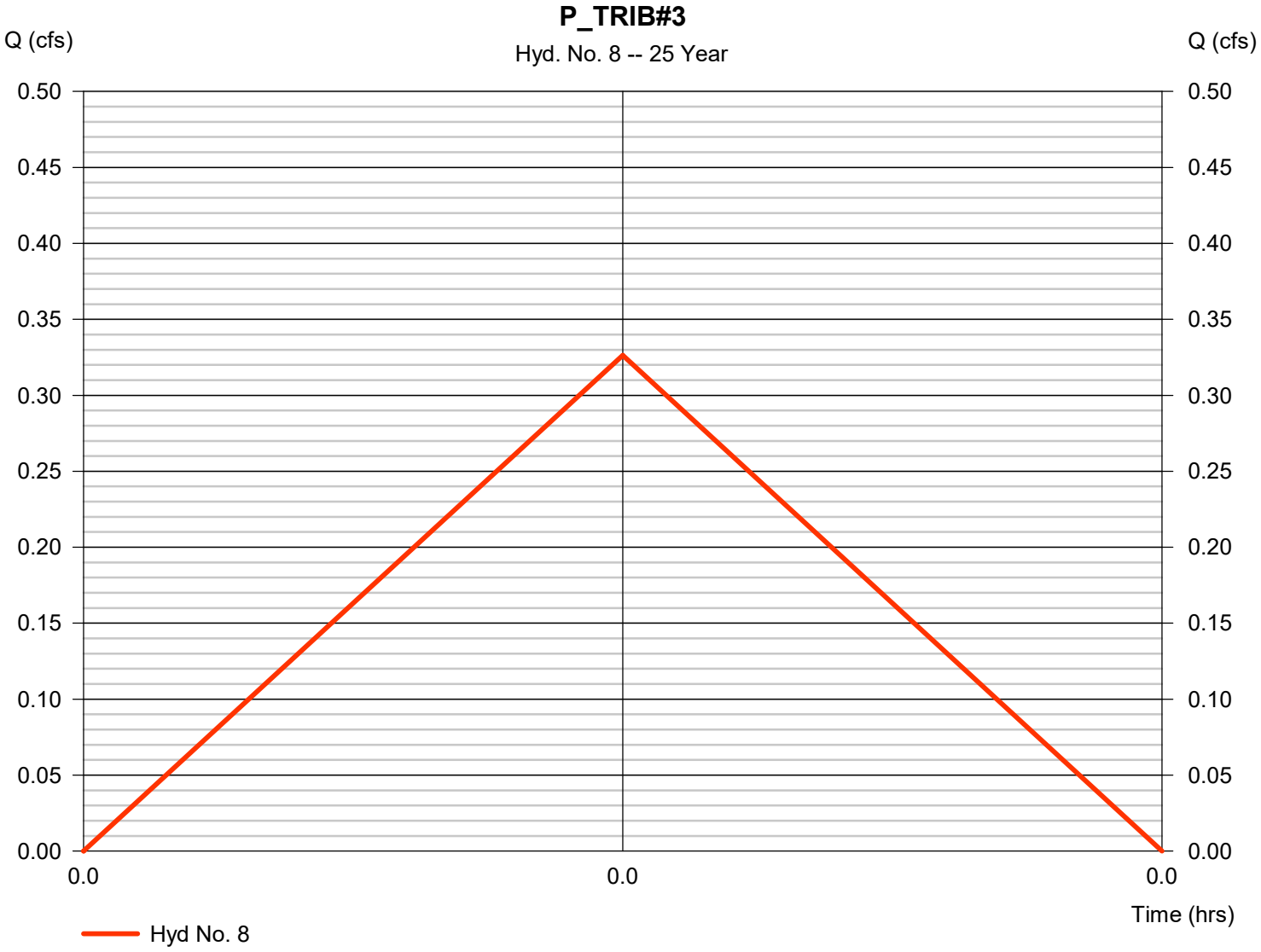


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.326 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	20 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	13.381 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



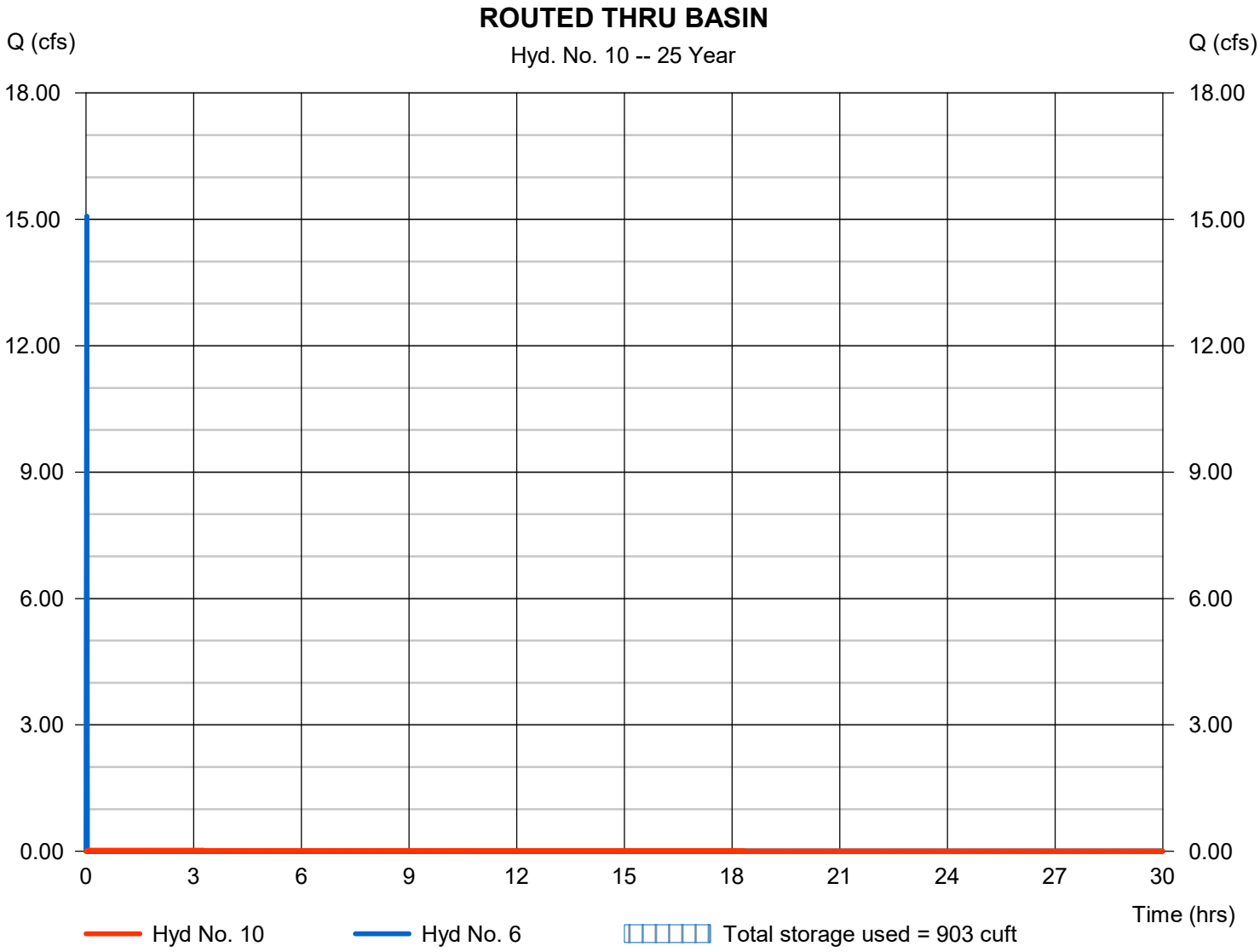
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	0.020 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	882 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	575.63 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	903 cuft

Storage Indication method used.

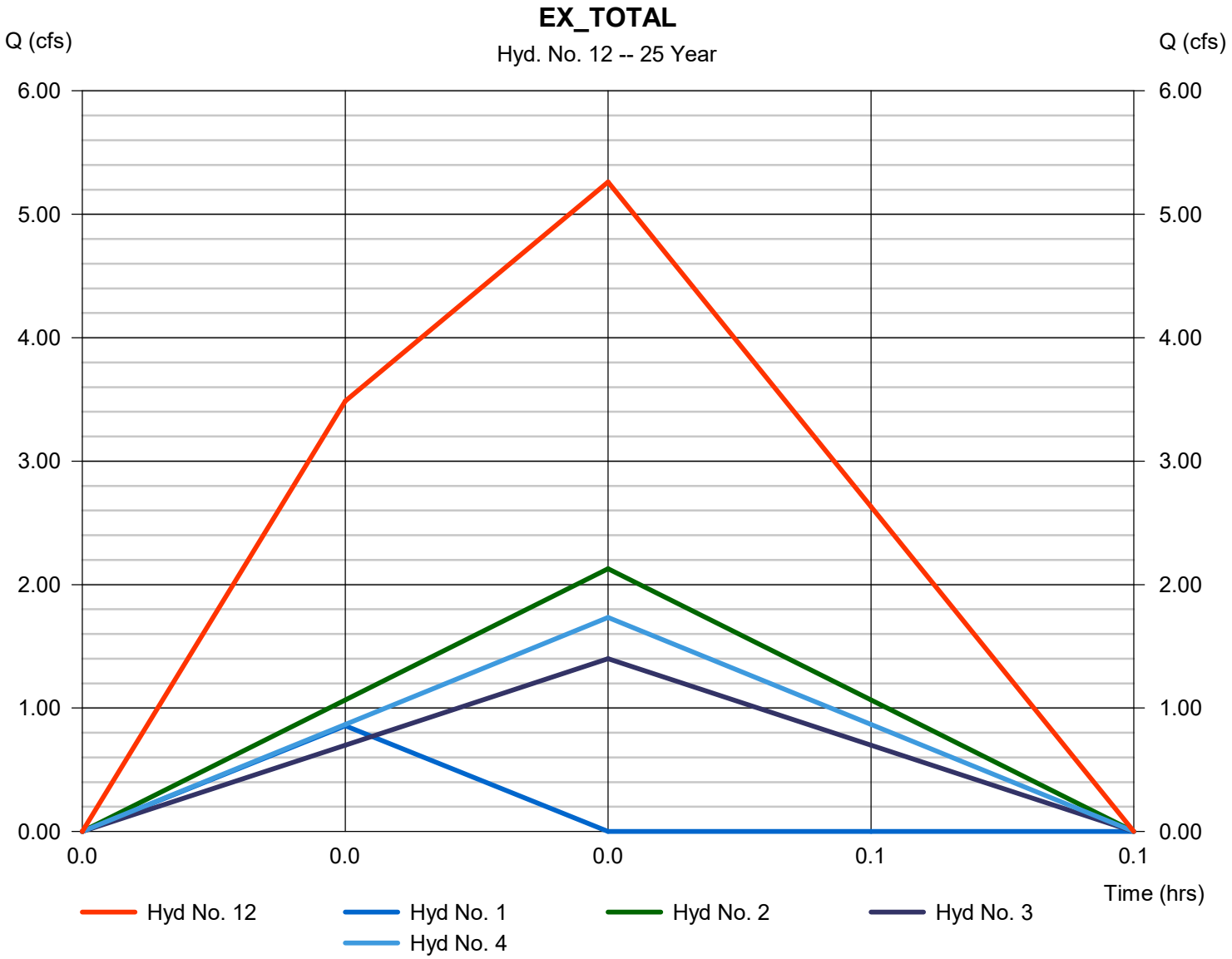


Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	5.262 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	683 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

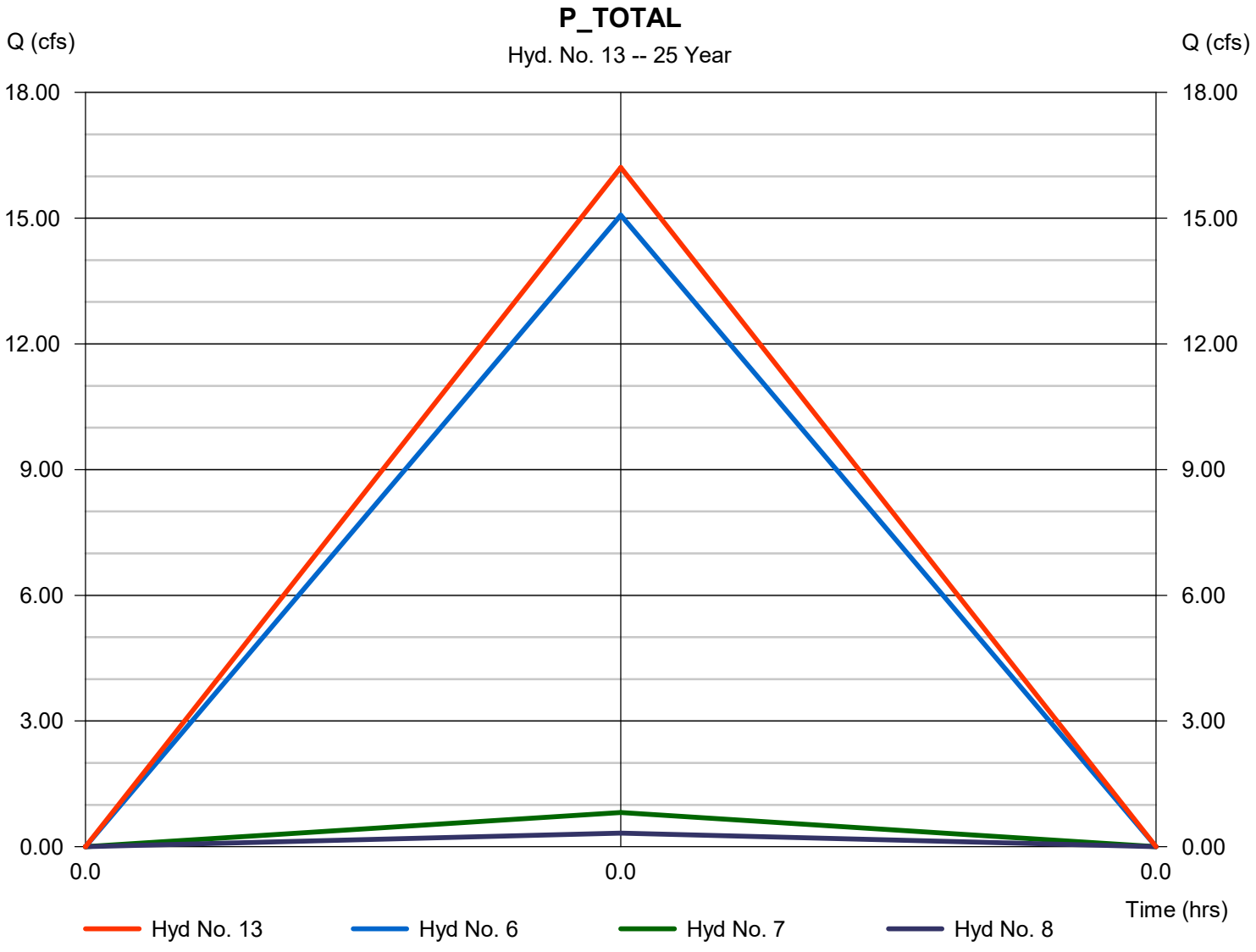


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	16.21 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	973 cuft
Inflow hyds.	=	6, 7, 8	Contrib. drain. area	=	2.010 ac

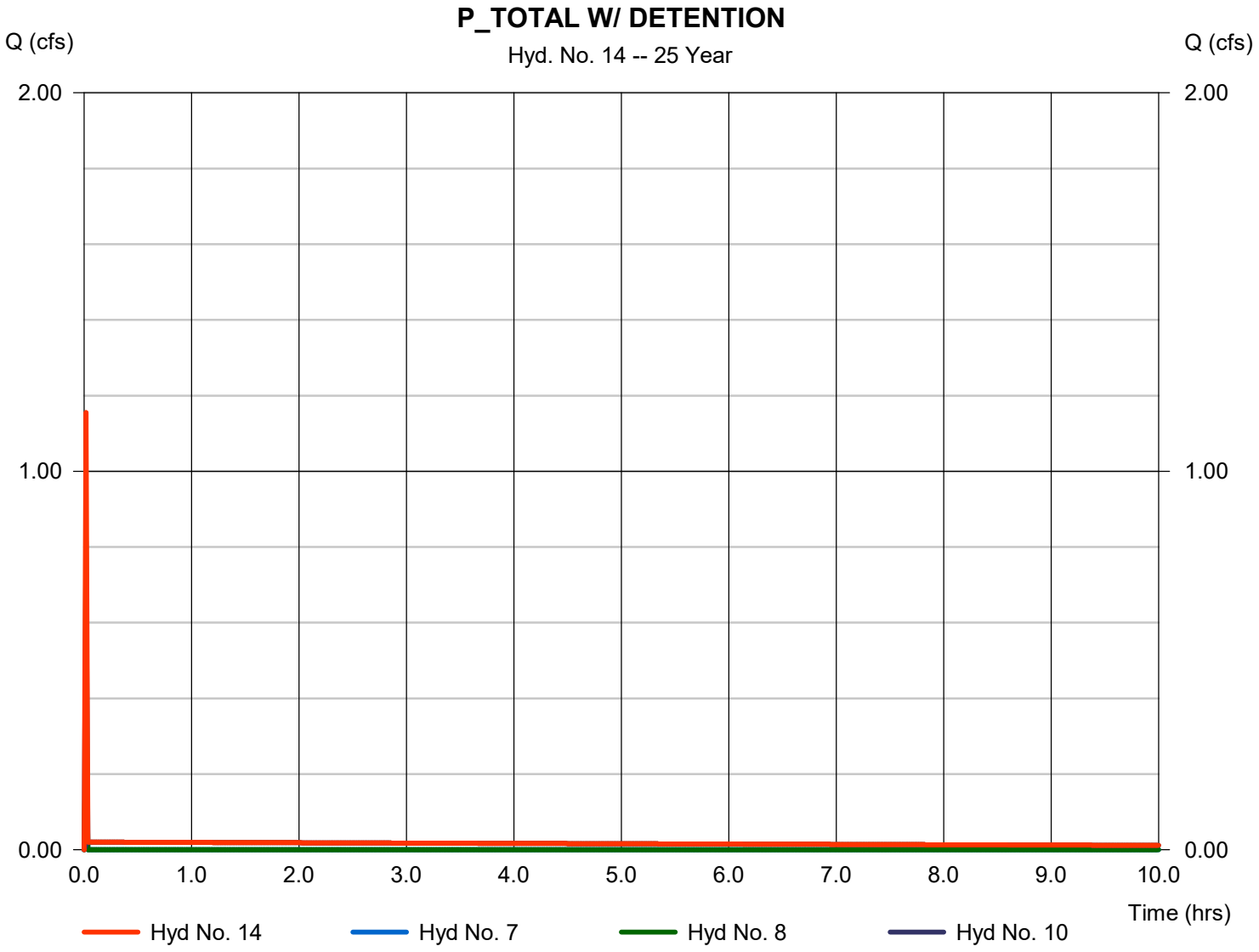


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	=	Combine	Peak discharge	=	1.155 cfs
Storm frequency	=	25 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	950 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	0.380 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

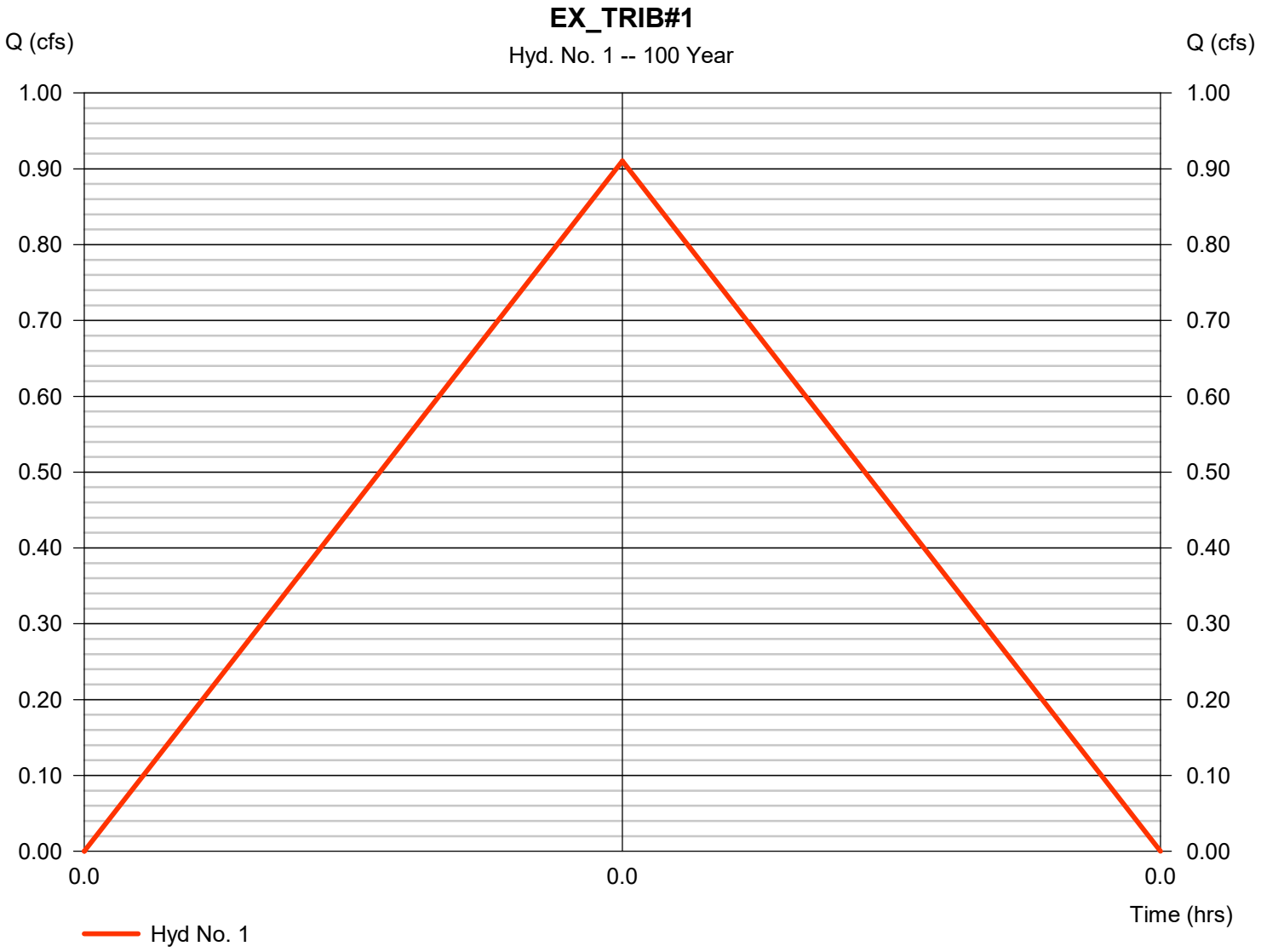
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.910	1	1	55	------	------	------	EX_TRIB#1
2	Rational	2.402	1	2	288	------	------	------	EX_TRIB#2
3	Rational	1.578	1	2	189	------	------	------	EX_TRIB#3
4	Rational	1.956	1	2	235	------	------	------	EX_TRIB#4
6	Rational	16.02	1	1	961	------	------	------	P_TRIB#1
7	Rational	0.866	1	1	52	------	------	------	P_TRIB#2
8	Rational	0.347	1	1	21	------	------	------	P_TRIB#3
10	Reservoir	0.021	1	2	939	6	575.67	960	ROUTED THRU BASIN
12	Combine	5.936	1	2	767	1, 2, 3, 4,	------	------	EX_TOTAL
13	Combine	17.23	1	1	1,034	6, 7, 8,	------	------	P_TOTAL
14	Combine	1.227	1	1	1,012	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.910 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	55 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

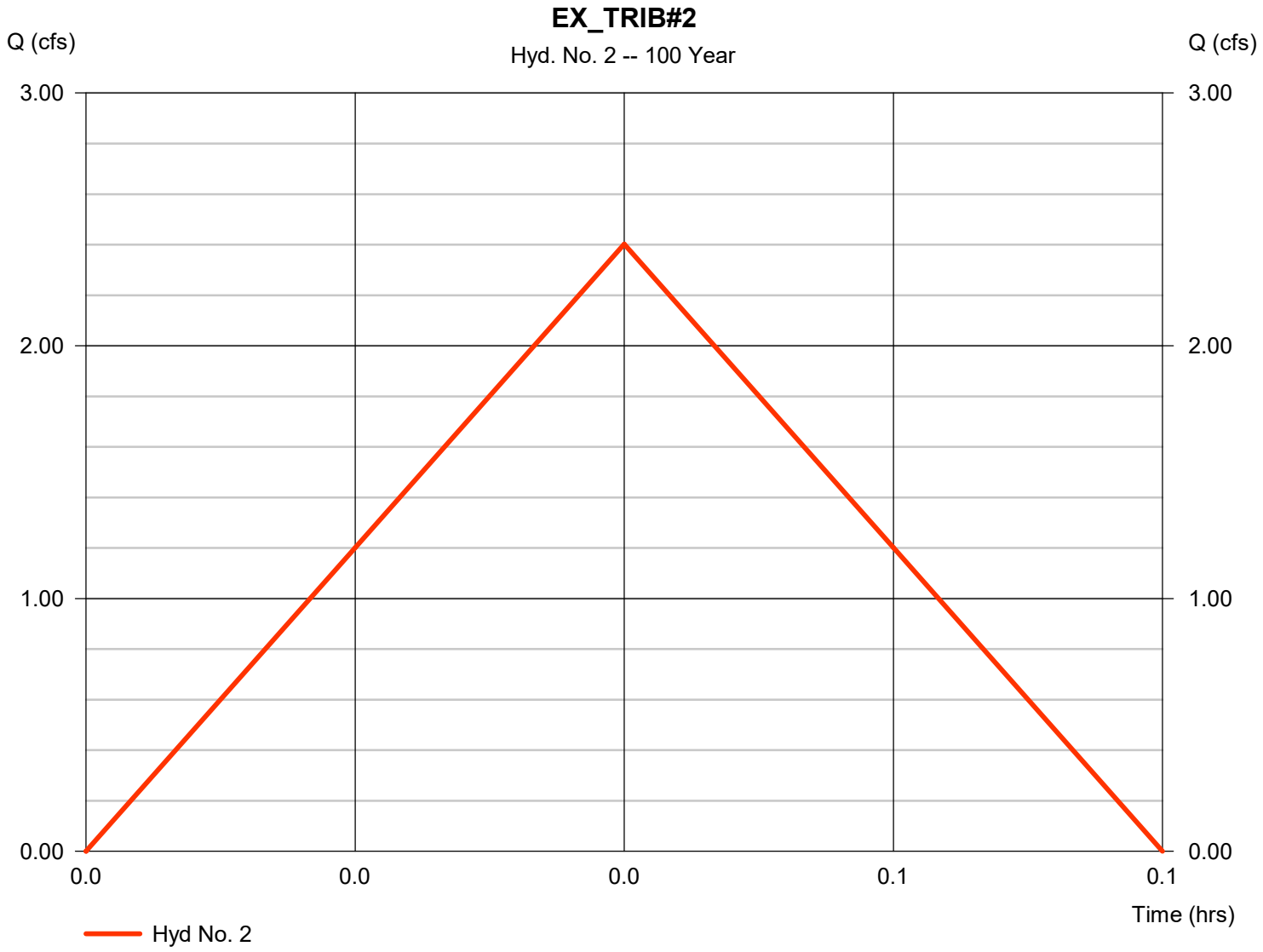


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	2.402 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	288 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

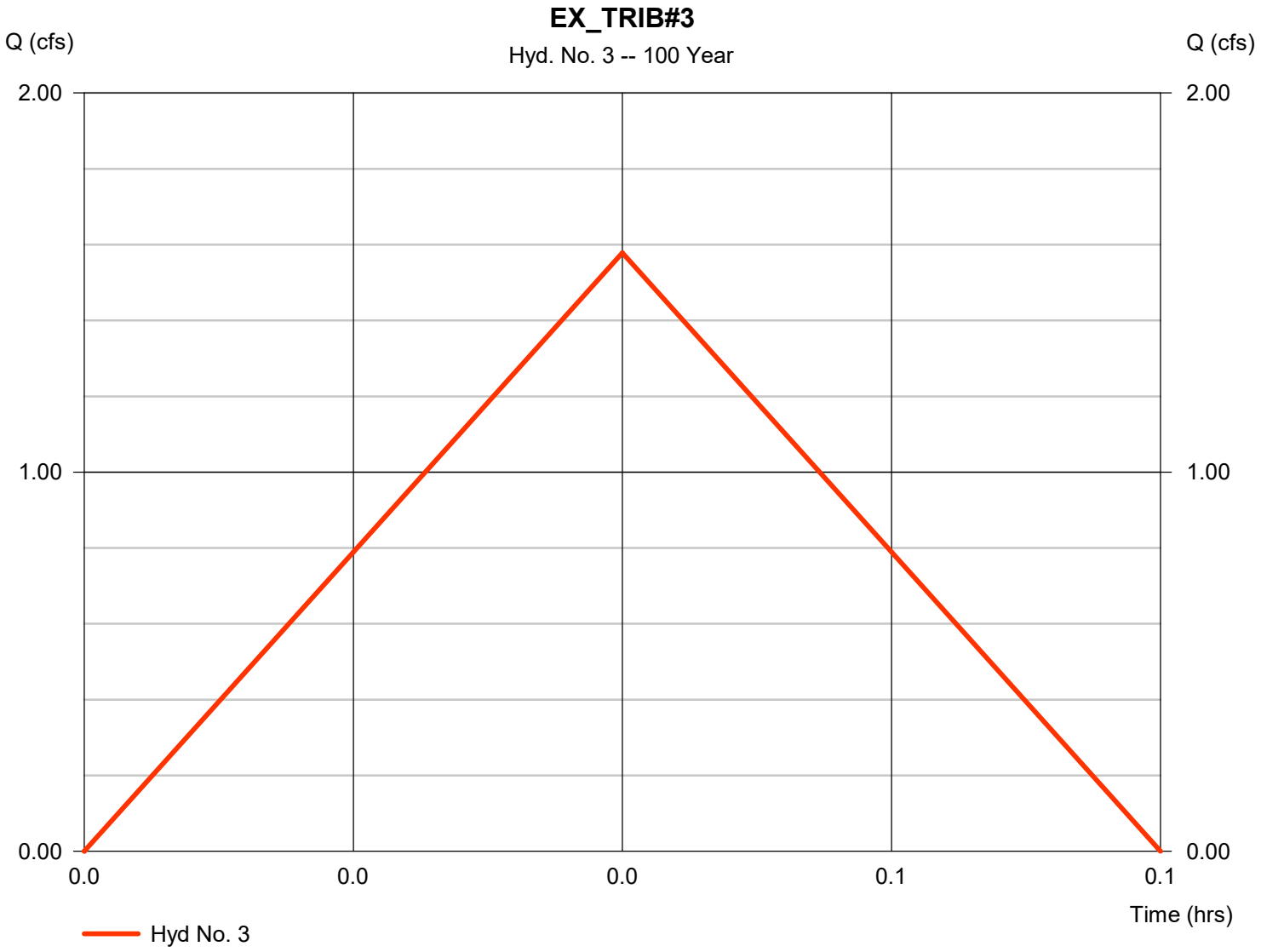


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	1.578 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	189 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

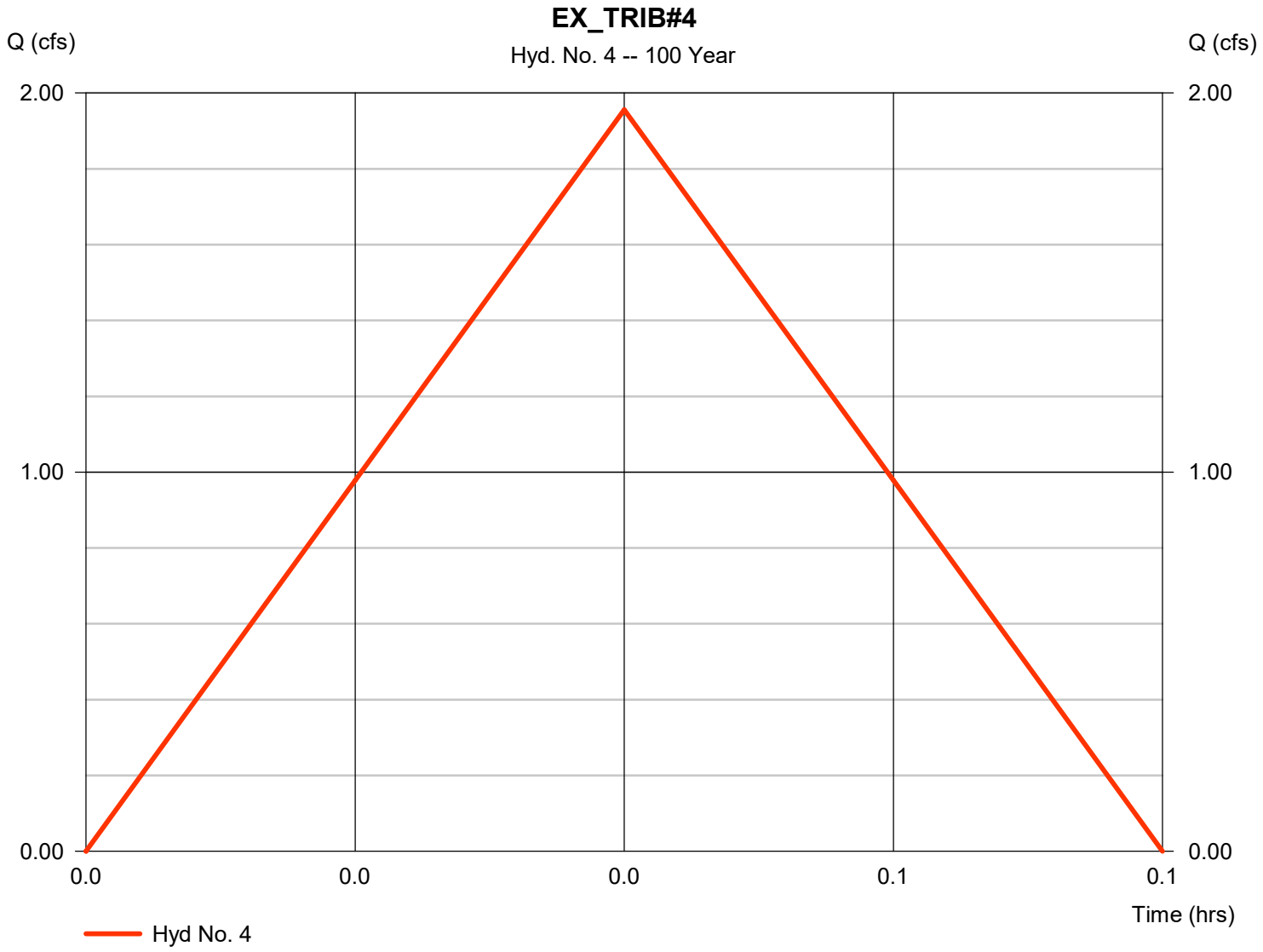


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.956 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	235 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

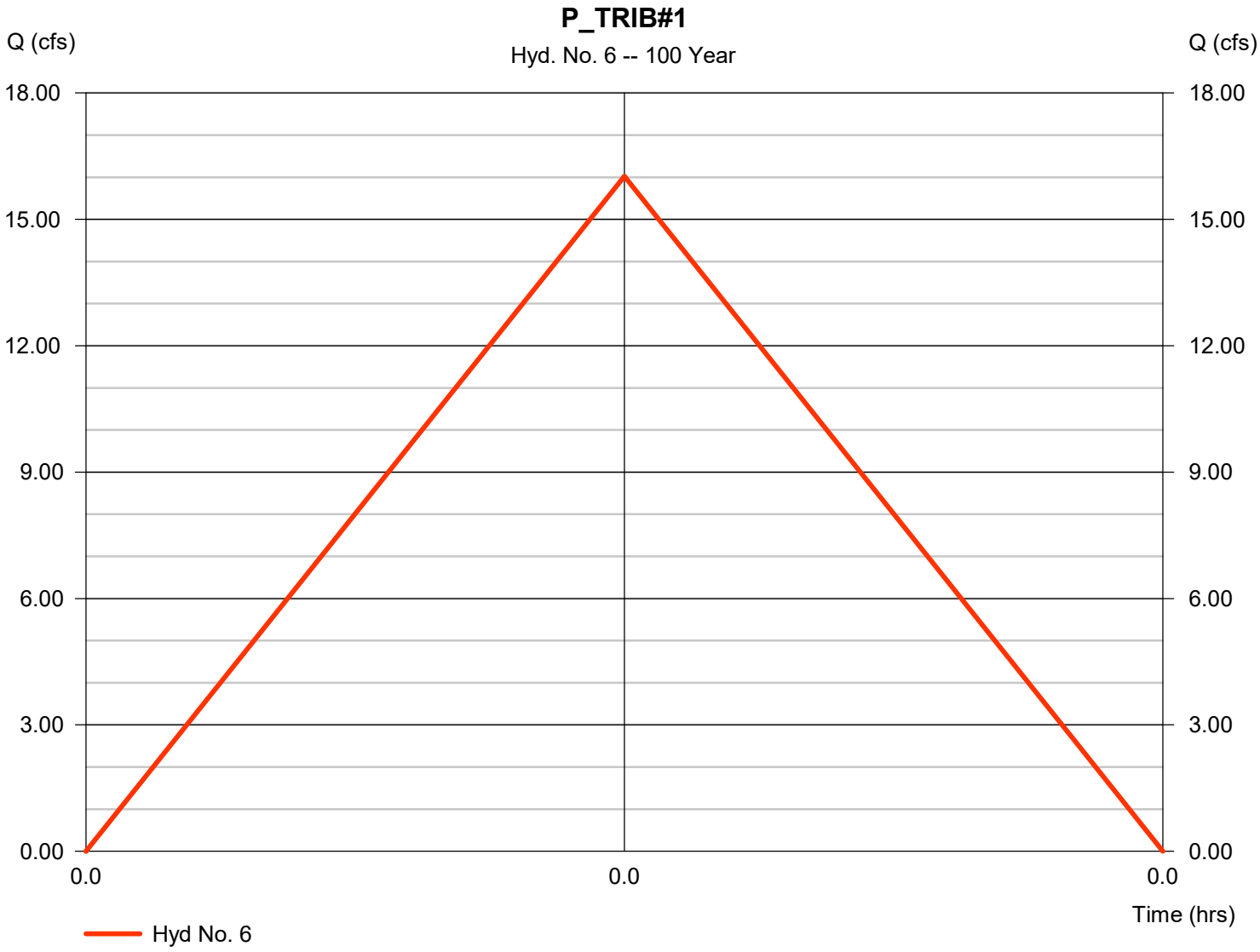


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	16.02 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	961 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

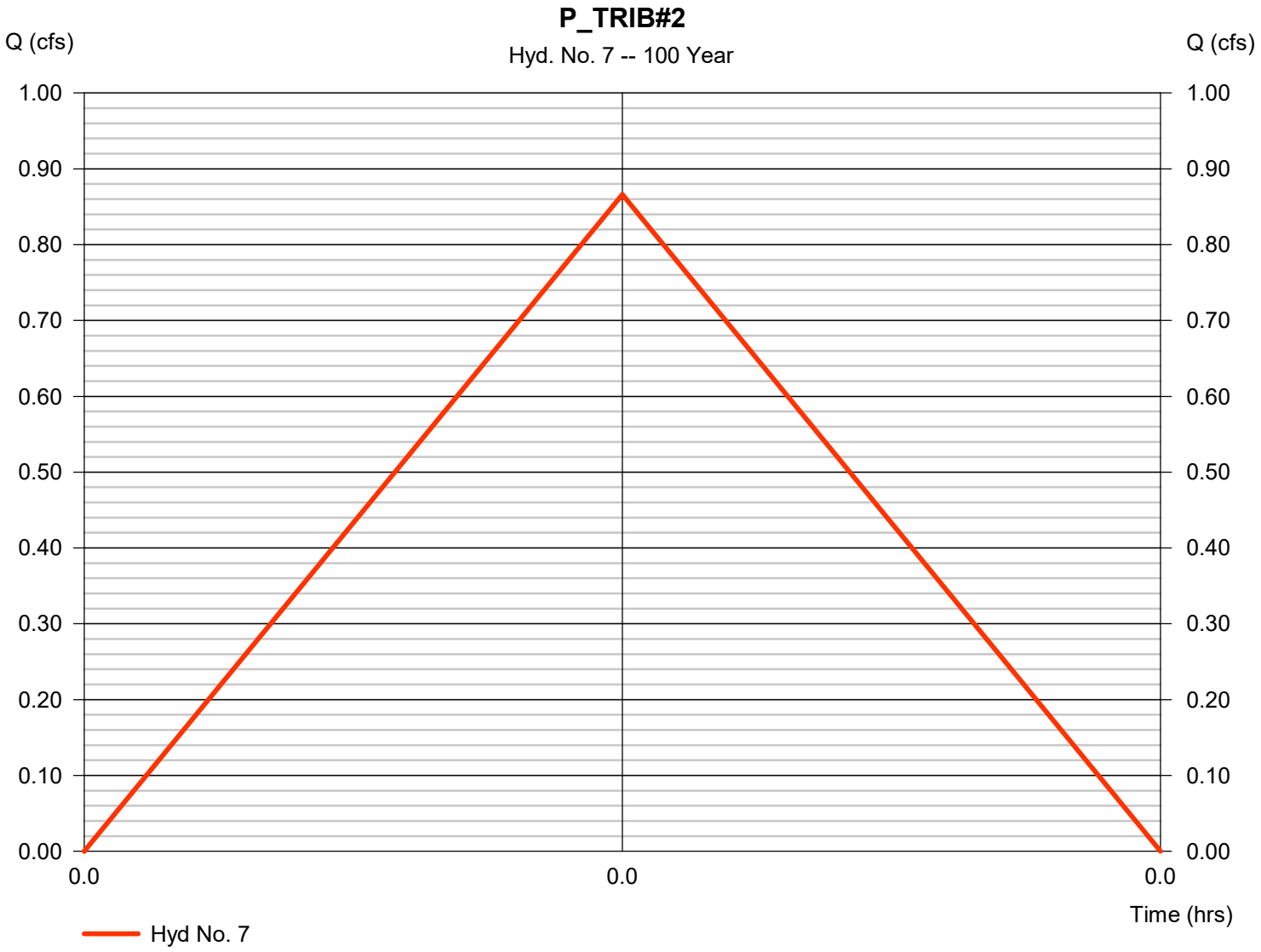


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.866 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	52 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

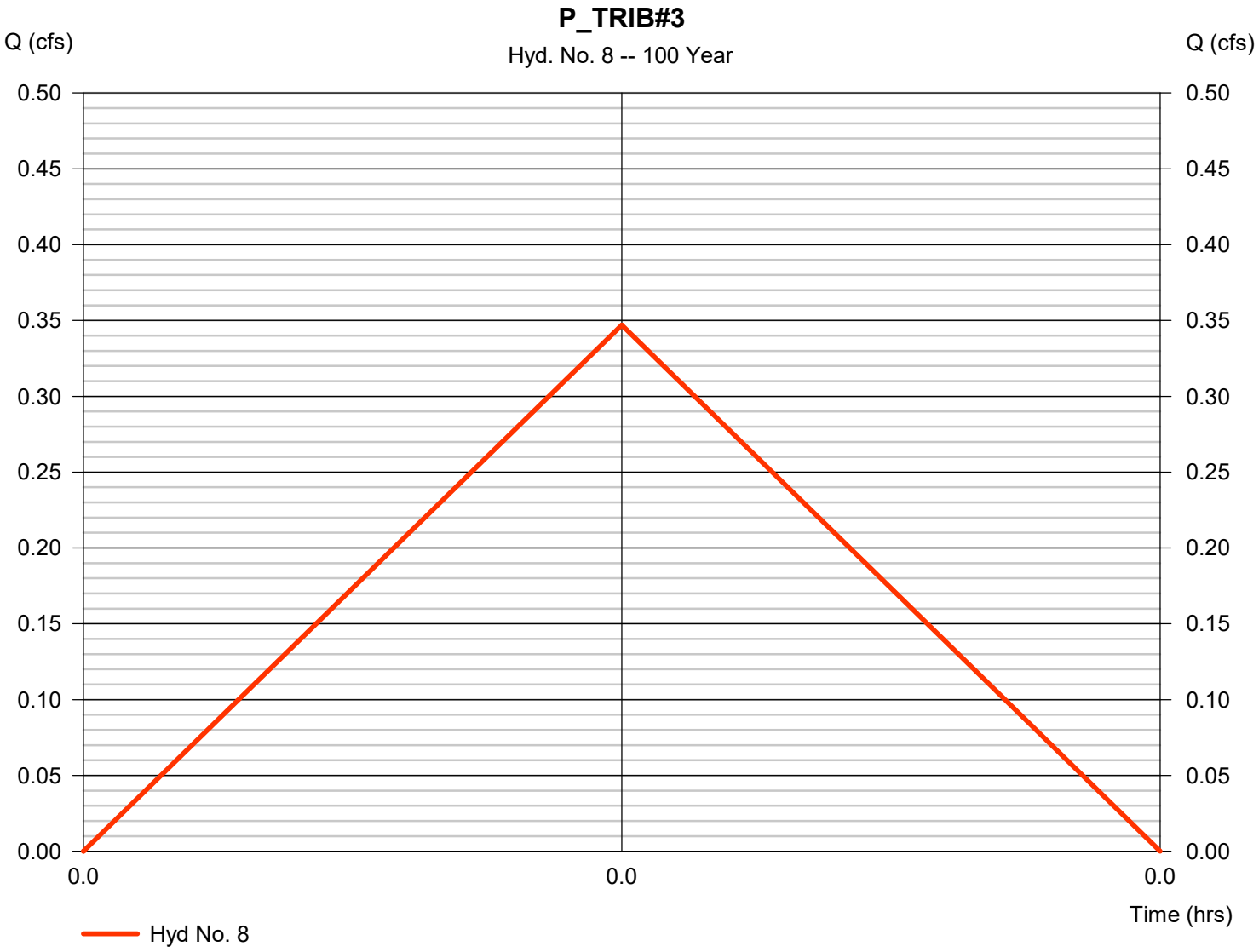


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.347 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	21 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



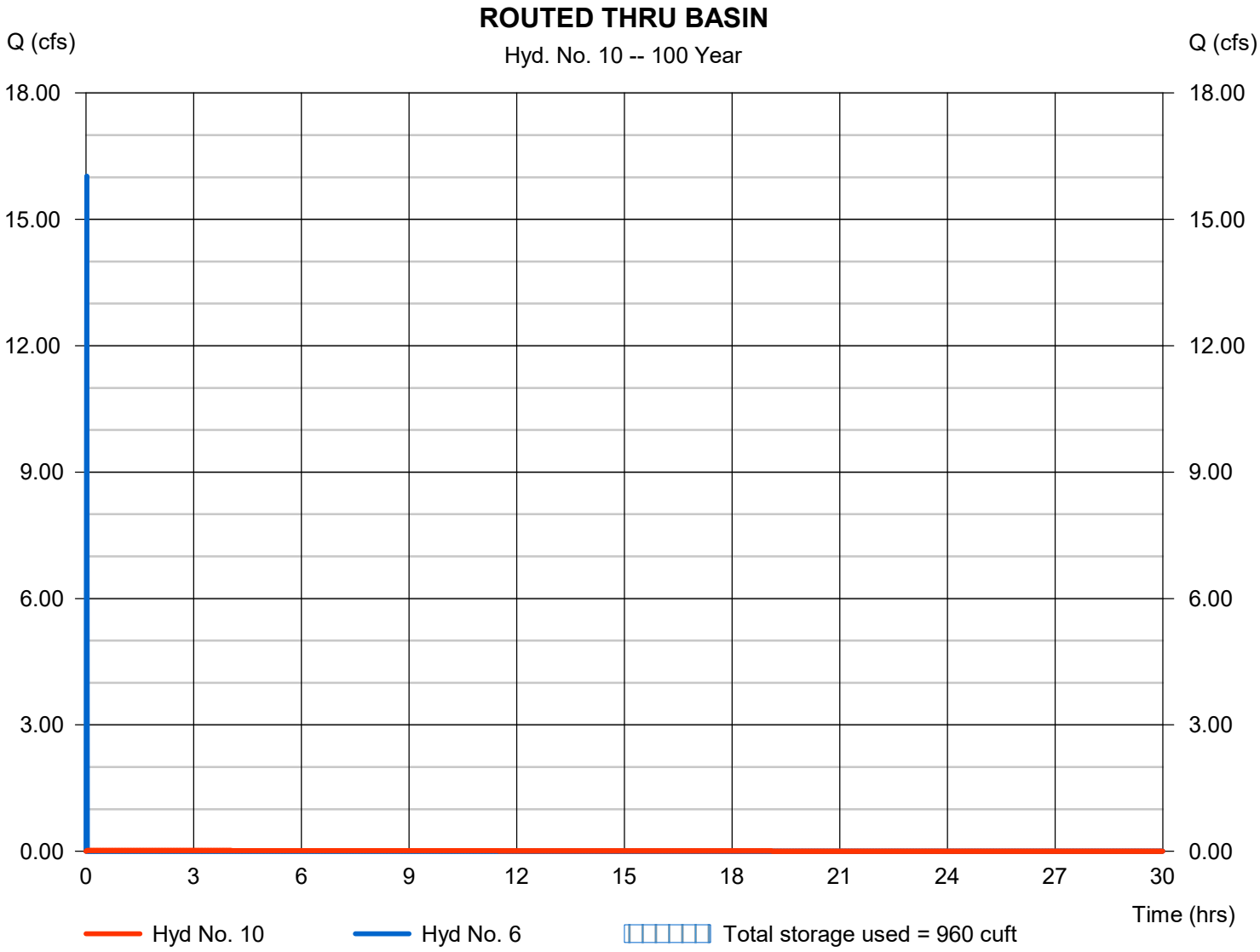
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	0.021 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	939 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	575.67 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	960 cuft

Storage Indication method used.

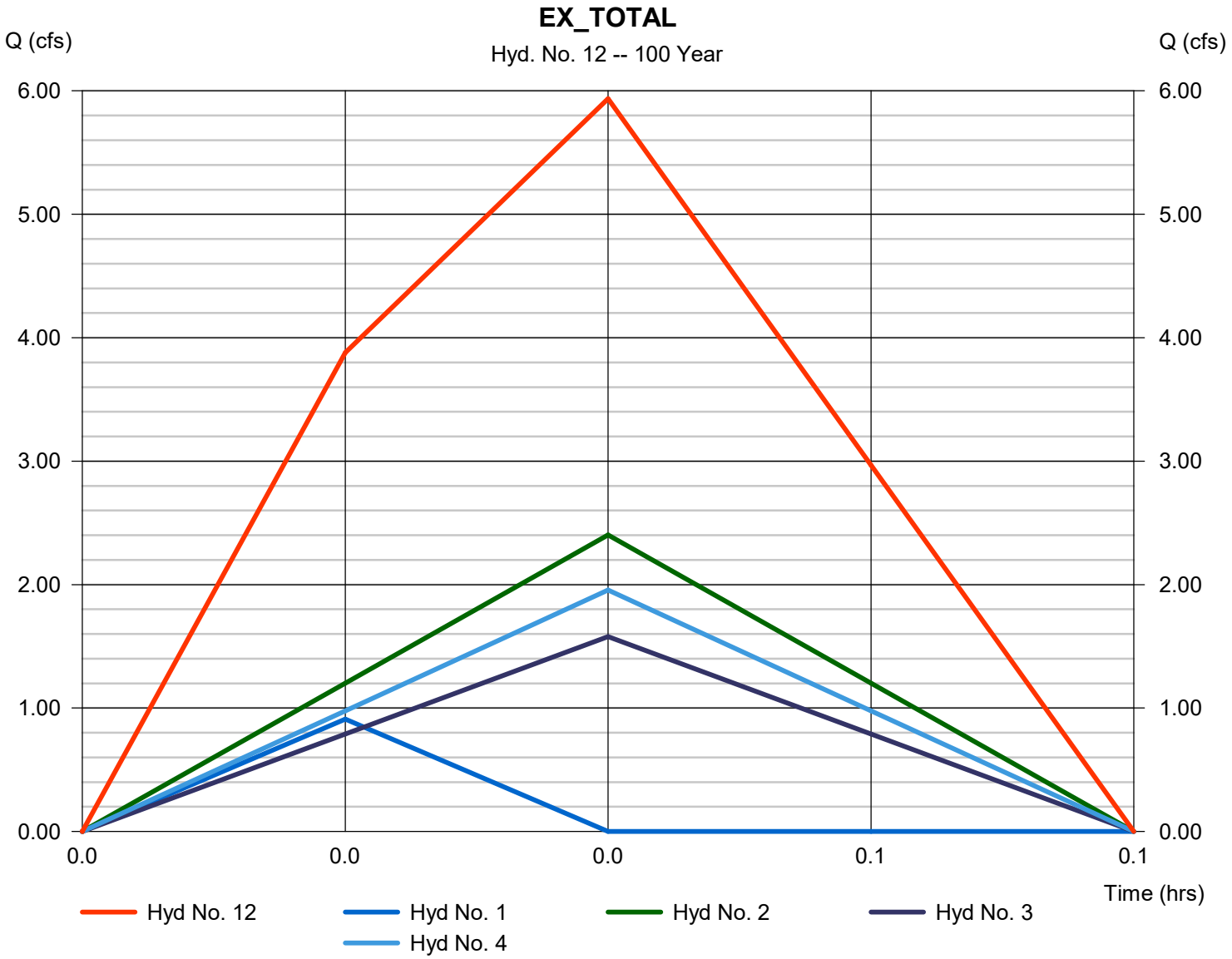


Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	5.936 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	767 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

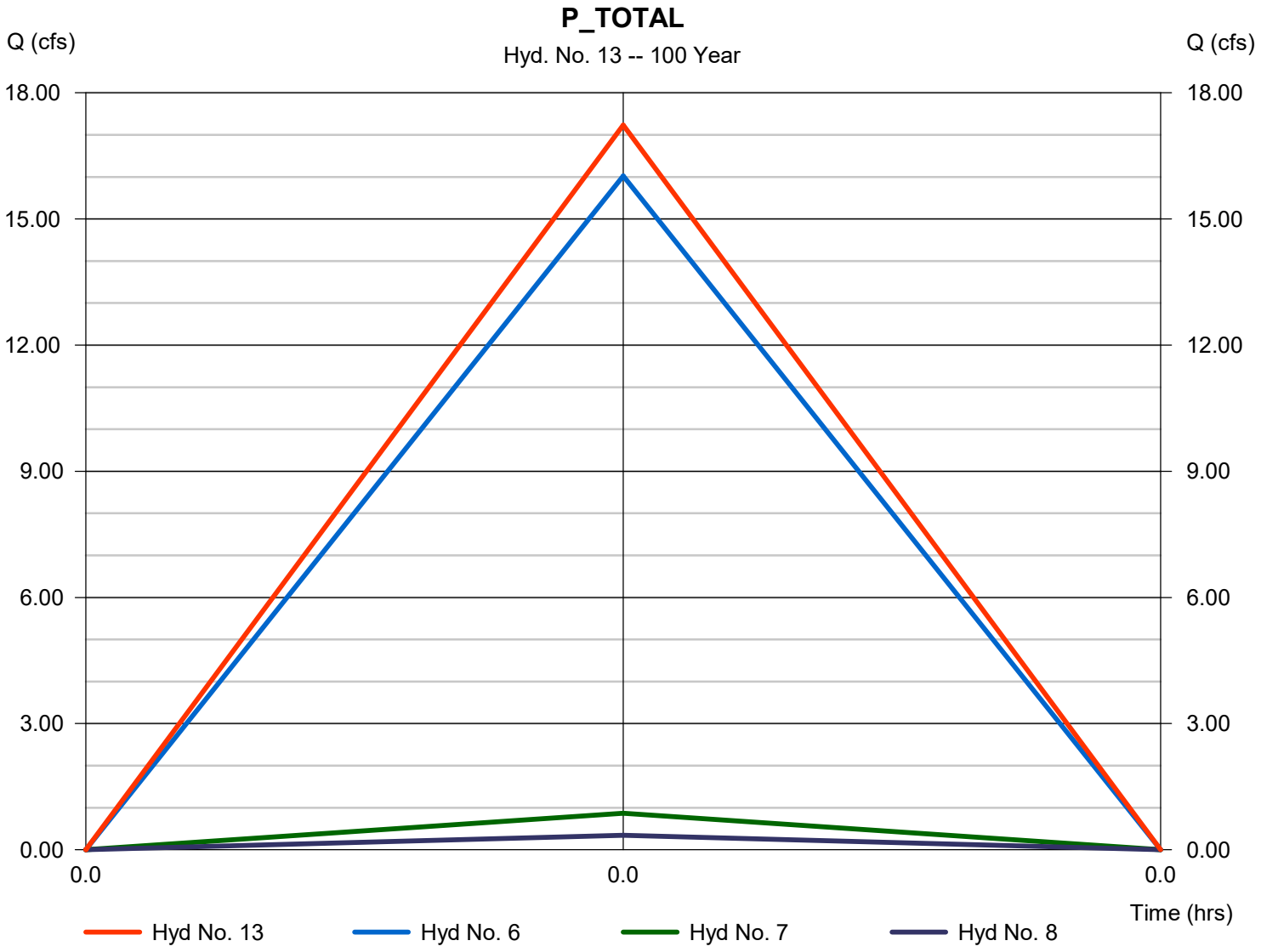


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	= Combine	Peak discharge	= 17.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.02 hrs
Time interval	= 1 min	Hyd. volume	= 1,034 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 2.010 ac

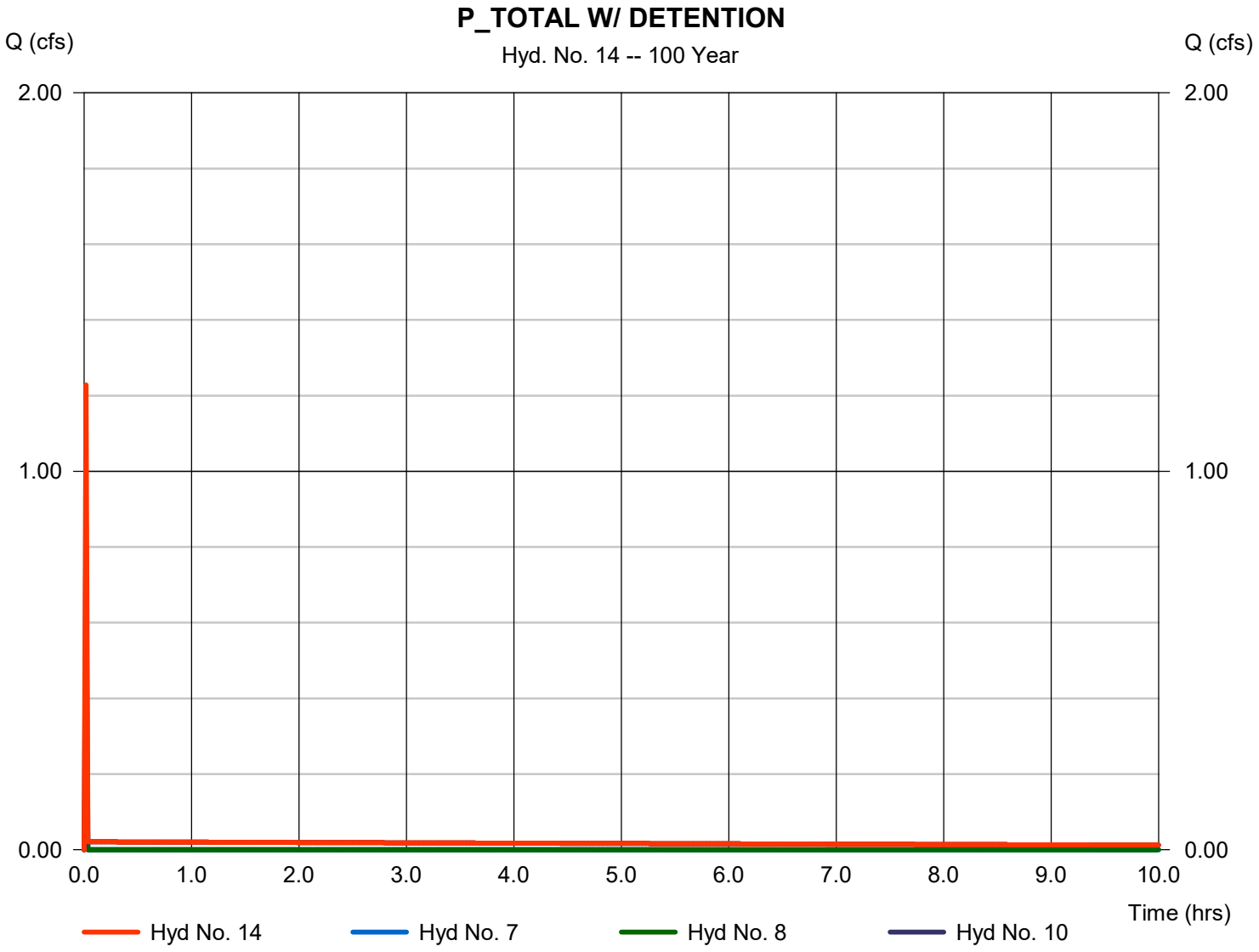


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	= Combine	Peak discharge	= 1.227 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.02 hrs
Time interval	= 1 min	Hyd. volume	= 1,012 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 0.380 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	38.4810	7.5000	0.7610	--------
3	29.0800	2.9500	0.6030	--------
5	0.0000	0.0000	0.0000	--------
10	78.3870	12.2000	0.8170	--------
25	30.8270	3.0000	0.6020	--------
50	0.0000	0.0000	0.0000	--------
100	76.6220	8.5000	0.7480	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.63	4.36	3.60	3.09	2.72	2.44	2.22	2.04	1.89	1.76	1.65	1.56
3	8.33	6.21	5.10	4.40	3.90	3.53	3.25	3.01	2.82	2.66	2.51	2.39
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.67	6.23	5.27	4.60	4.08	3.68	3.36	3.10	2.87	2.68	2.52	2.38
25	8.82	6.58	5.41	4.67	4.15	3.76	3.45	3.20	3.00	2.82	2.68	2.55
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	10.94	8.64	7.22	6.25	5.54	4.99	4.56	4.20	3.90	3.65	3.43	3.25

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Wednesday, 03 / 8 / 2023

Pond No. 1 - DETENTION POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 575.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	575.00	700	0	0
1.00	576.00	2,303	1,424	1,424
2.00	577.00	3,500	2,880	4,304
3.00	578.00	4,720	4,094	8,399
4.00	579.00	5,863	5,281	13,680
5.00	580.00	7,106	6,474	20,153

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.00	6.00	0.00
Span (in)	= 12.00	1.00	24.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 572.50	575.00	577.75	0.00
Length (ft)	= 91.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

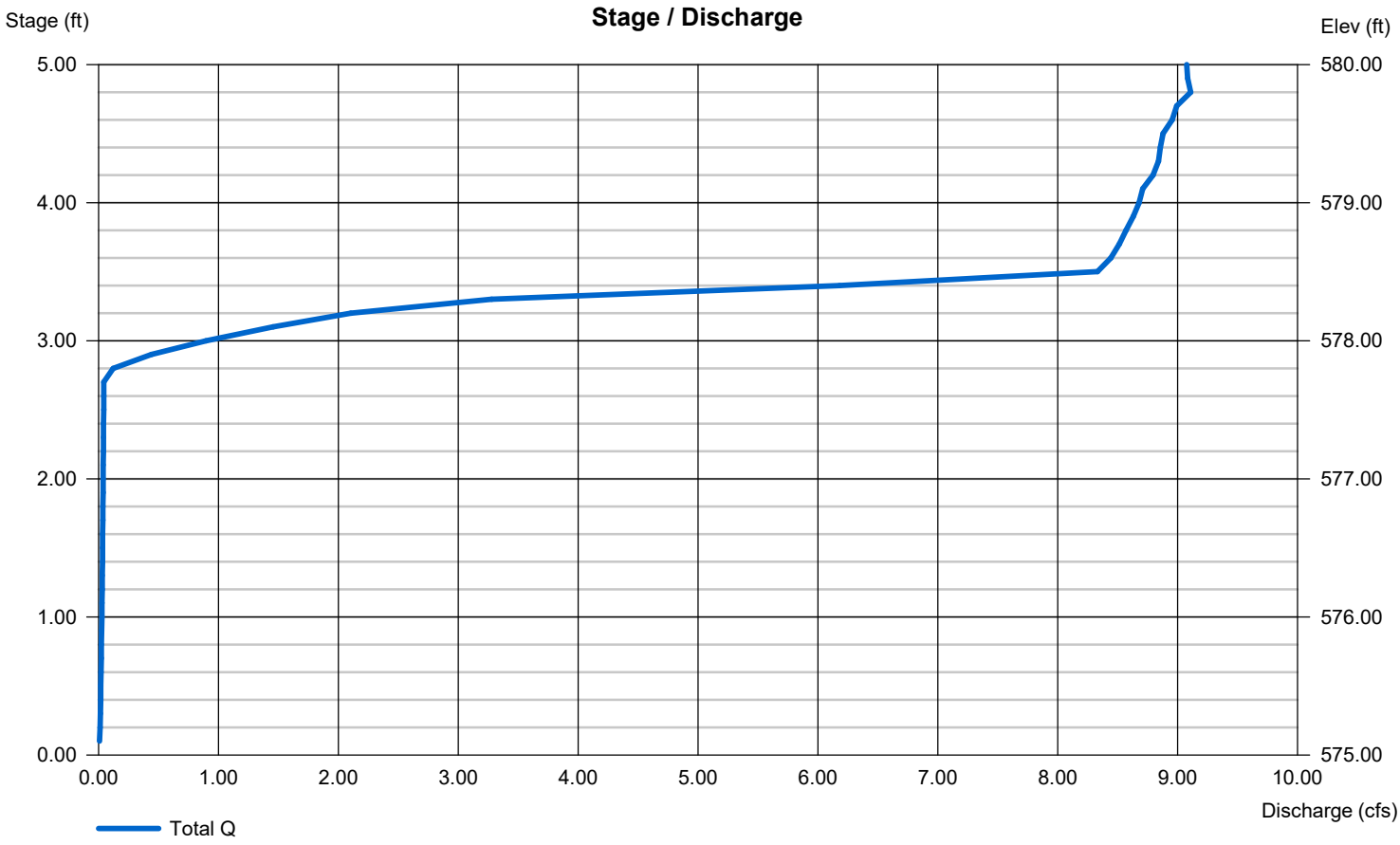
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 578.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Wednesday, 03 / 8 / 2023

Pond No. 1 - DETENTION POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 575.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	575.00	700	0	0
1.00	576.00	2,303	1,424	1,424
2.00	577.00	3,500	2,880	4,304
3.00	578.00	4,720	4,094	8,399
4.00	579.00	5,863	5,281	13,680
5.00	580.00	7,106	6,474	20,153

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.00	6.00	0.00
Span (in)	= 12.00	1.00	24.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 572.50	575.00	577.75	0.00
Length (ft)	= 91.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

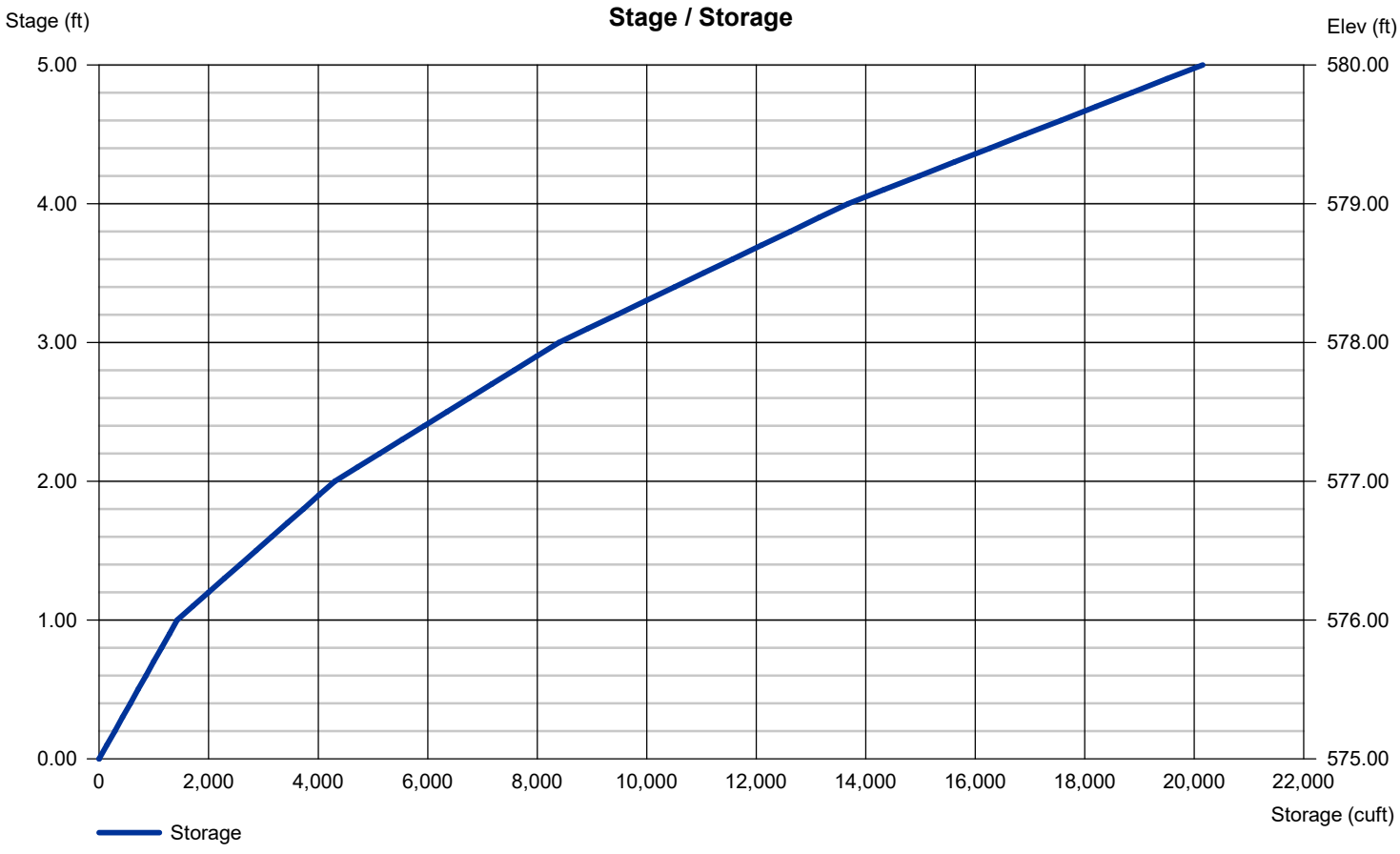
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 578.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	------	-------	-------	-------	-------	-------	-------	-------	0.910	EX_TRIB#1
2	Rational	------	-------	-------	-------	-------	-------	-------	-------	2.402	EX_TRIB#2
3	Rational	------	-------	-------	-------	-------	-------	-------	-------	1.578	EX_TRIB#3
4	Rational	------	-------	-------	-------	-------	-------	-------	-------	1.956	EX_TRIB#4
6	Rational	------	-------	-------	-------	-------	-------	-------	-------	16.02	P_TRIB#1
7	Rational	------	-------	-------	-------	-------	-------	-------	-------	0.866	P_TRIB#2
8	Rational	------	-------	-------	-------	-------	-------	-------	-------	0.347	P_TRIB#3
10	Reservoir	6	-------	-------	-------	-------	-------	-------	-------	2.185	ROUTED THRU BASIN
12	Combine	1, 2, 3, 4,	-------	-------	-------	-------	-------	-------	-------	5.936	EX_TOTAL
13	Combine	6, 7, 8,	-------	-------	-------	-------	-------	-------	-------	17.23	P_TOTAL
14	Combine	7, 8, 10,	-------	-------	-------	-------	-------	-------	-------	2.185	P_TOTAL W/ DETENTION

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

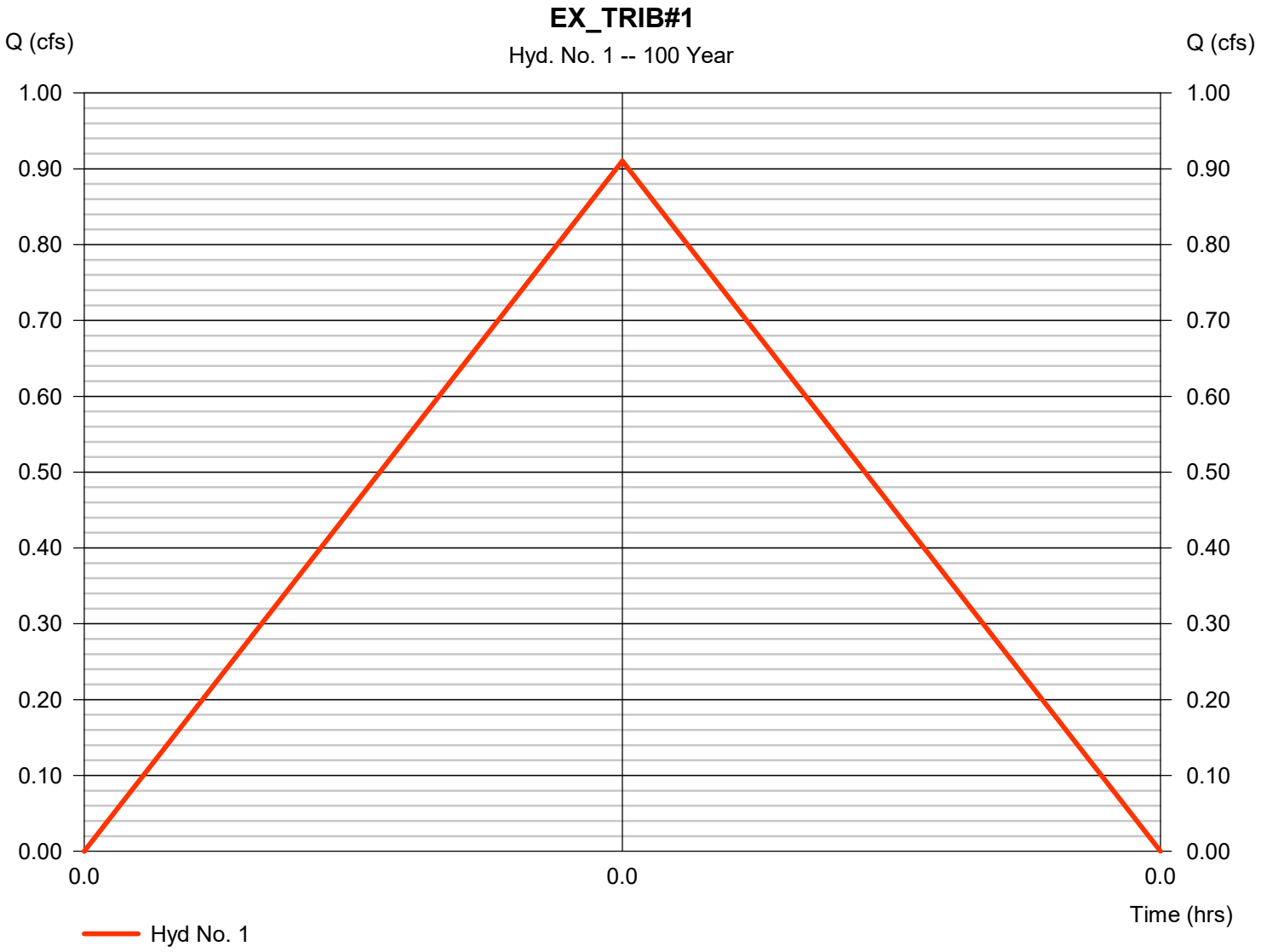
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.910	1	1	55	------	------	------	EX_TRIB#1
2	Rational	2.402	1	2	288	------	------	------	EX_TRIB#2
3	Rational	1.578	1	2	189	------	------	------	EX_TRIB#3
4	Rational	1.956	1	2	235	------	------	------	EX_TRIB#4
6	Rational	16.02	1	1	961	------	------	------	P_TRIB#1
7	Rational	0.866	1	1	52	------	------	------	P_TRIB#2
8	Rational	0.347	1	1	21	------	------	------	P_TRIB#3
10	Reservoir	2.185	1	2	960	6	578.36	10,319	ROUTED THRU BASIN
12	Combine	5.936	1	2	767	1, 2, 3,	------	------	EX_TOTAL
13	Combine	17.23	1	1	1,034	4, 6, 7, 8,	------	------	P_TOTAL
14	Combine	2.185	1	2	1,033	7, 8, 10,	------	------	P_TOTAL W/ DETENTION

Hydrograph Report

Hyd. No. 1

EX_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	0.910 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	55 cuft
Drainage area	=	0.320 ac	Runoff coeff.	=	0.2
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

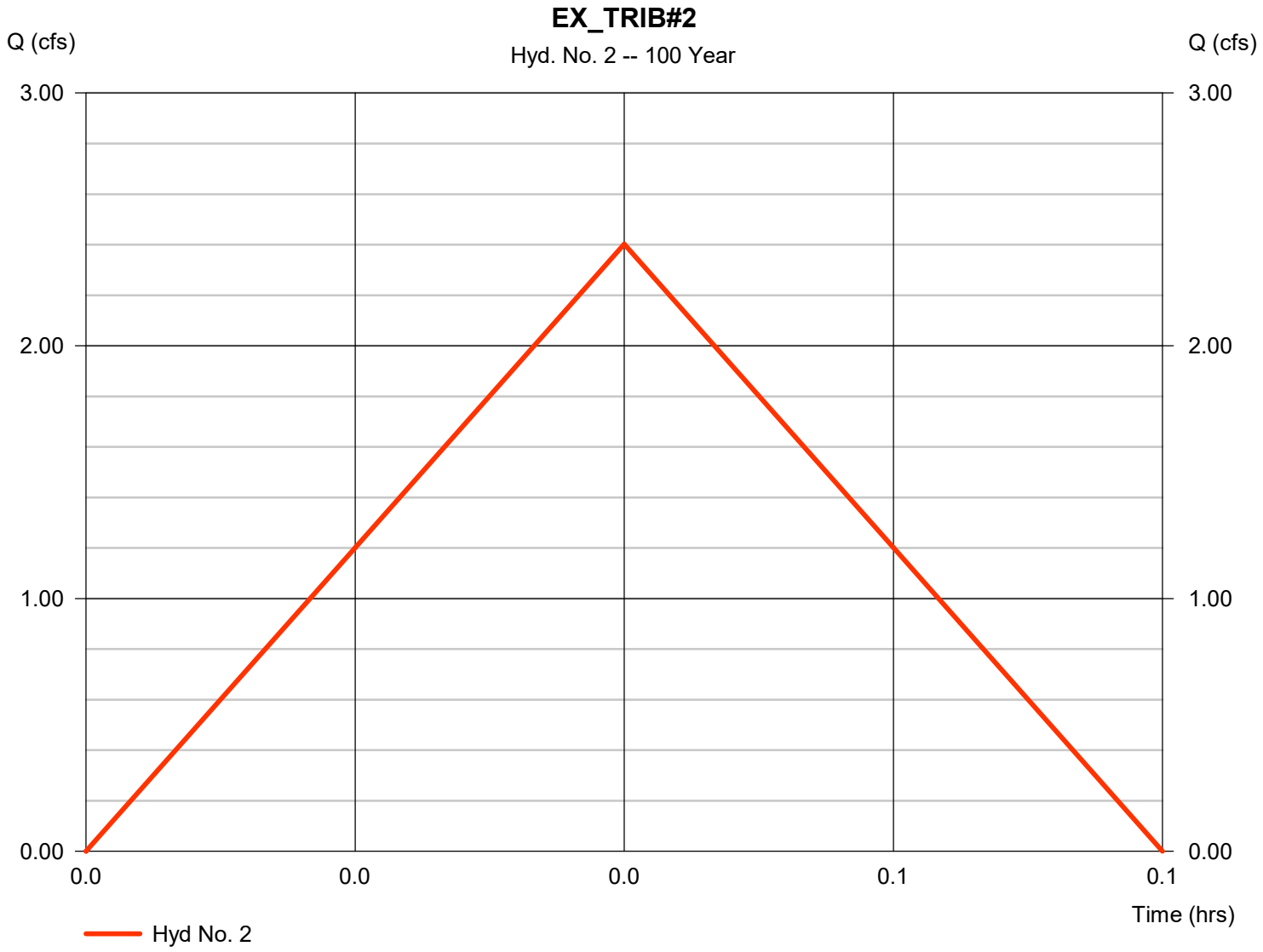


Hydrograph Report

Hyd. No. 2

EX_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	2.402 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	288 cuft
Drainage area	=	0.910 ac	Runoff coeff.	=	0.2
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

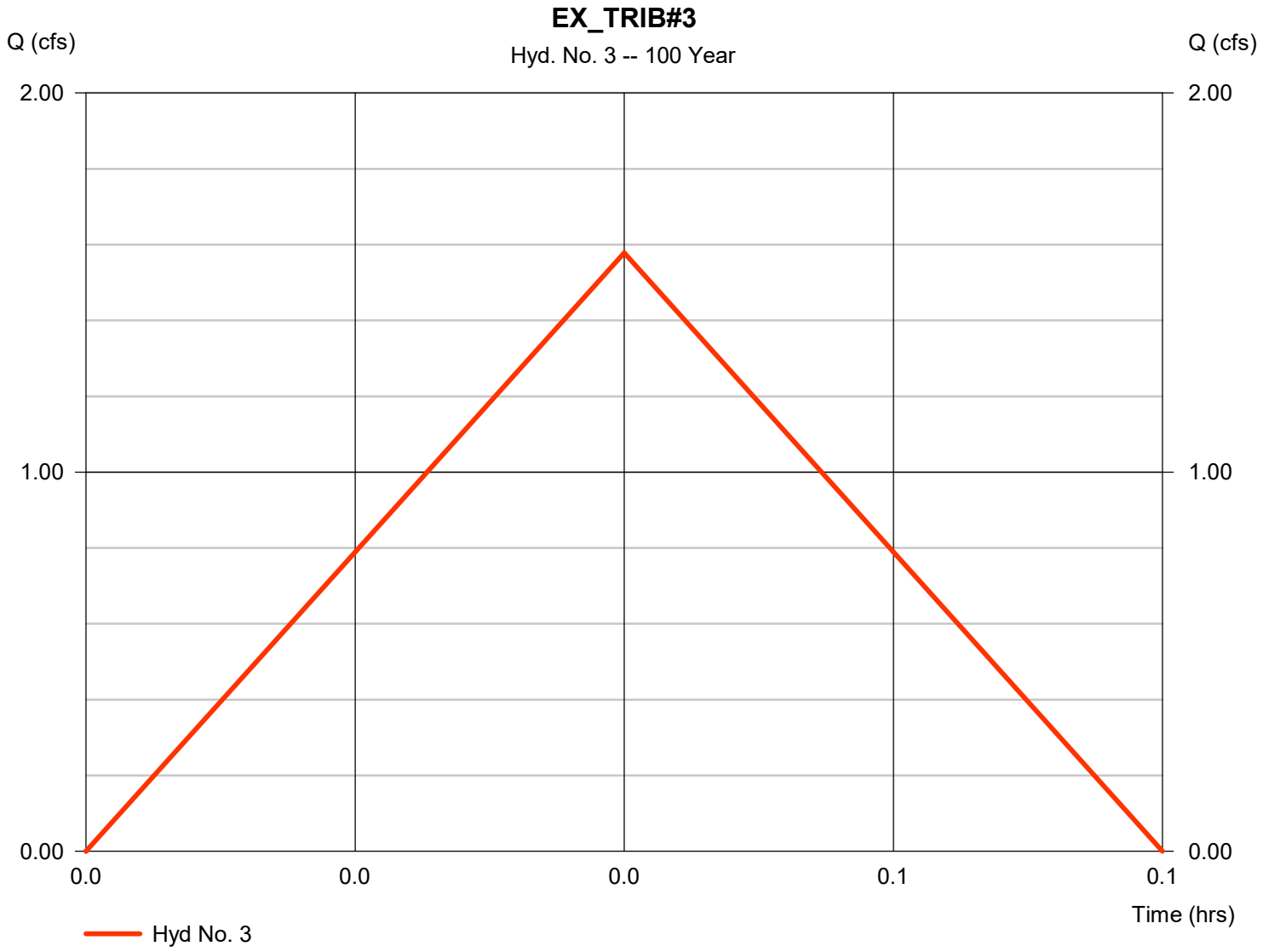


Hydrograph Report

Hyd. No. 3

EX_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	1.578 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	189 cuft
Drainage area	=	0.200 ac	Runoff coeff.	=	0.598
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

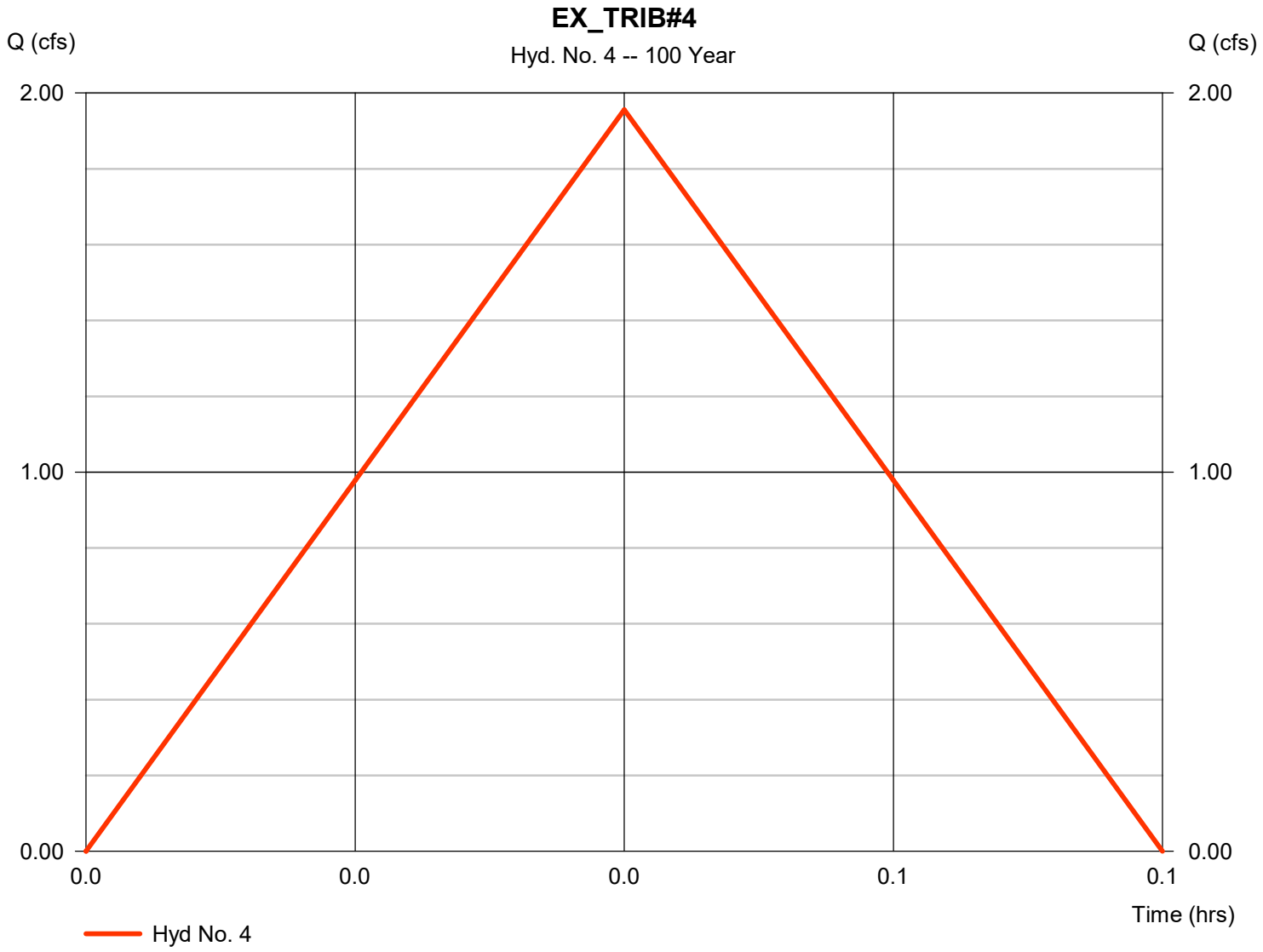


Hydrograph Report

Hyd. No. 4

EX_TRIB#4

Hydrograph type	=	Rational	Peak discharge	=	1.956 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	235 cuft
Drainage area	=	0.570 ac	Runoff coeff.	=	0.26
Intensity	=	13.198 in/hr	Tc by User	=	2.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

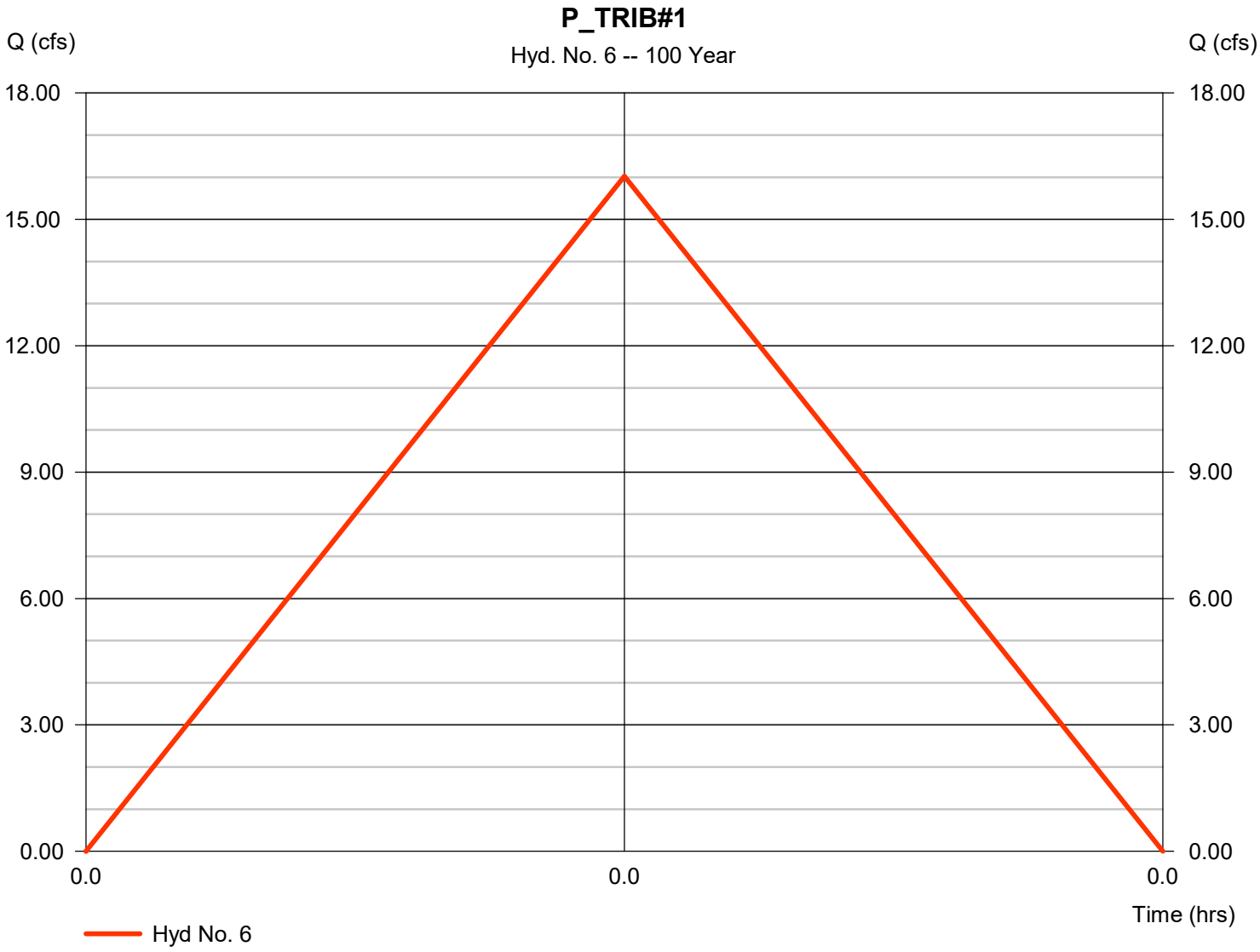


Hydrograph Report

Hyd. No. 6

P_TRIB#1

Hydrograph type	=	Rational	Peak discharge	=	16.02 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	961 cuft
Drainage area	=	1.630 ac	Runoff coeff.	=	0.691
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

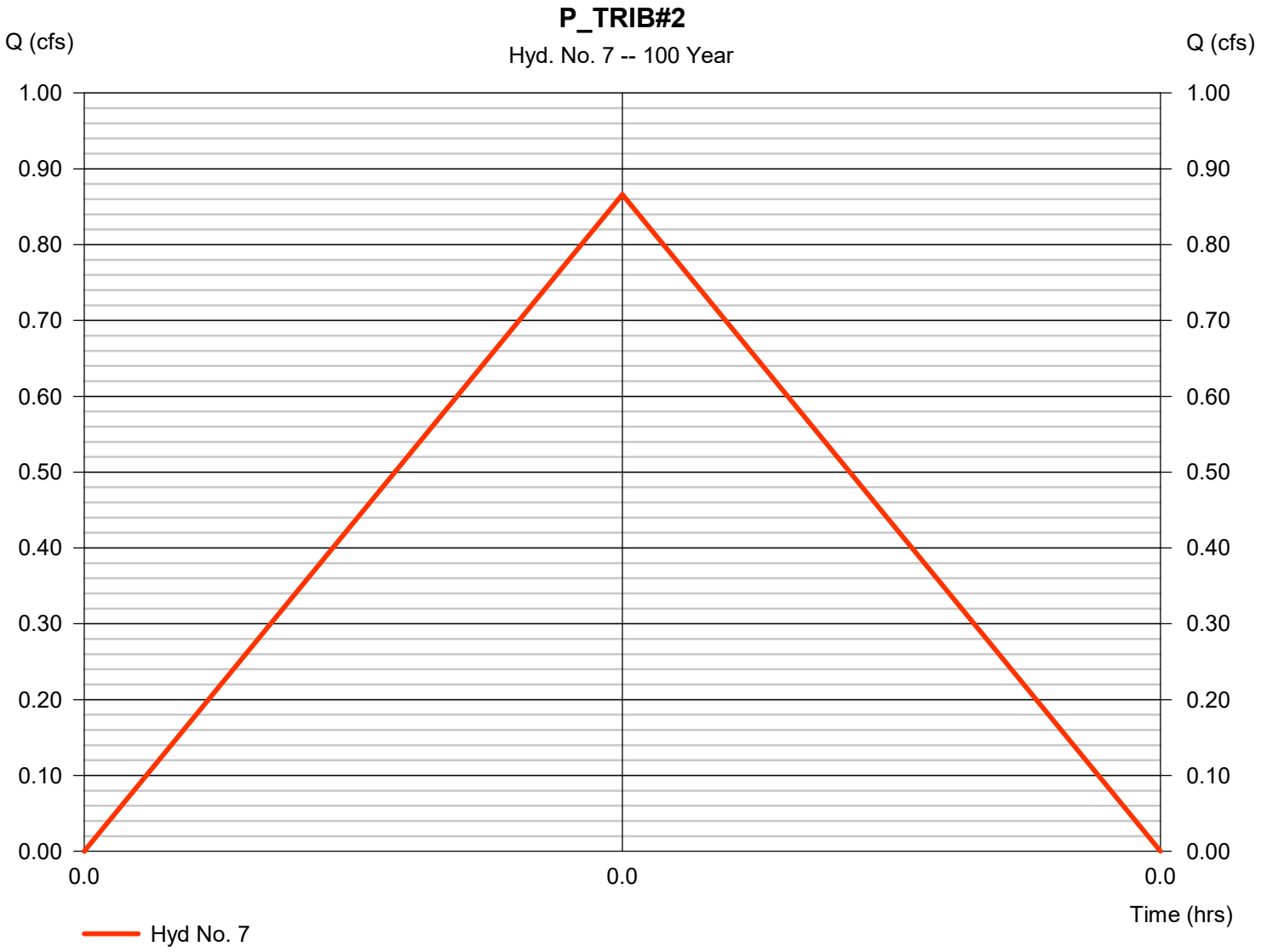


Hydrograph Report

Hyd. No. 7

P_TRIB#2

Hydrograph type	=	Rational	Peak discharge	=	0.866 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	52 cuft
Drainage area	=	0.290 ac	Runoff coeff.	=	0.21
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1

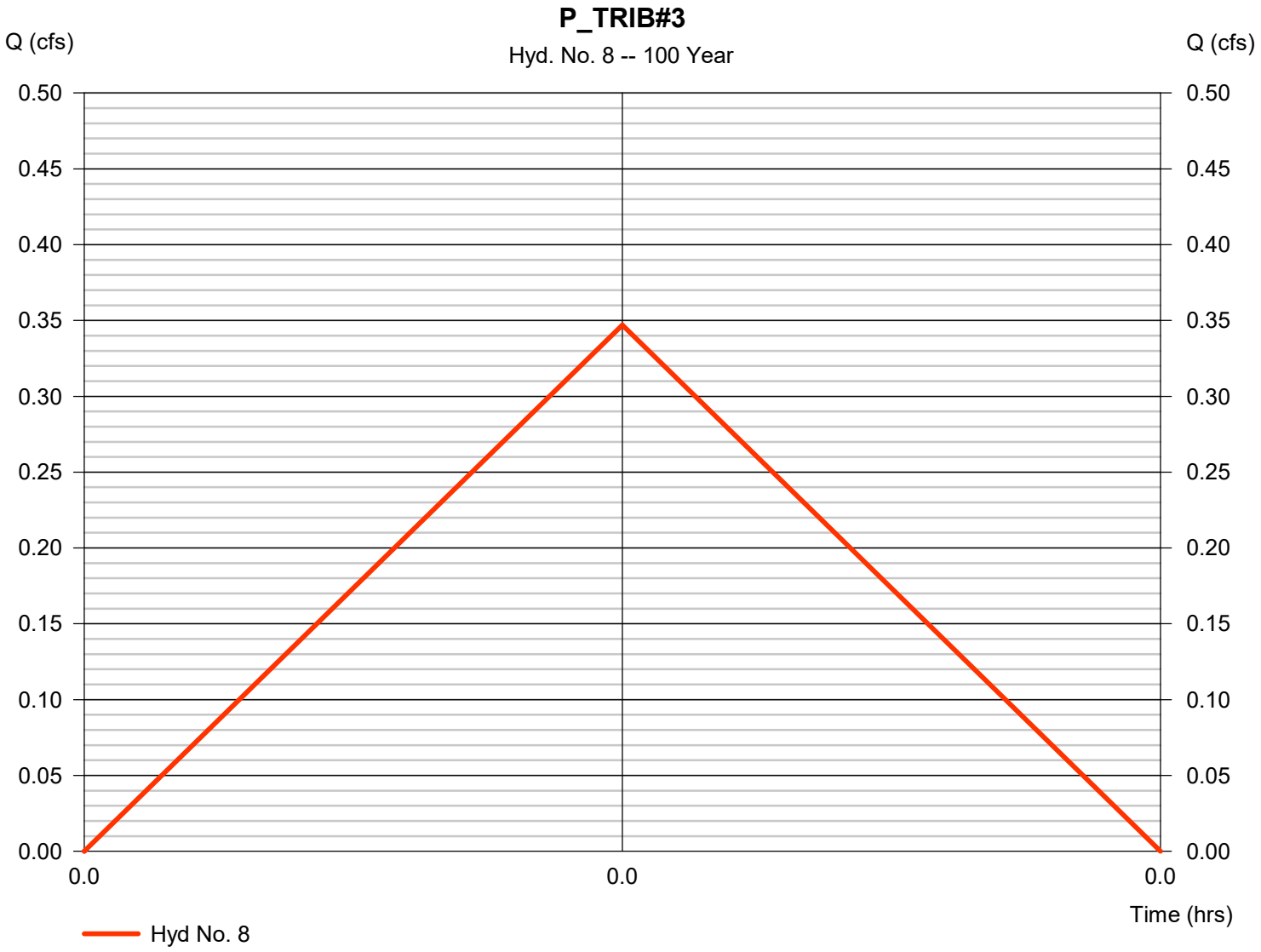


Hydrograph Report

Hyd. No. 8

P_TRIB#3

Hydrograph type	=	Rational	Peak discharge	=	0.347 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	21 cuft
Drainage area	=	0.090 ac	Runoff coeff.	=	0.271
Intensity	=	14.224 in/hr	Tc by User	=	1.00 min
IDF Curve	=	SampleFHA.idf	Asc/Rec limb fact	=	1/1



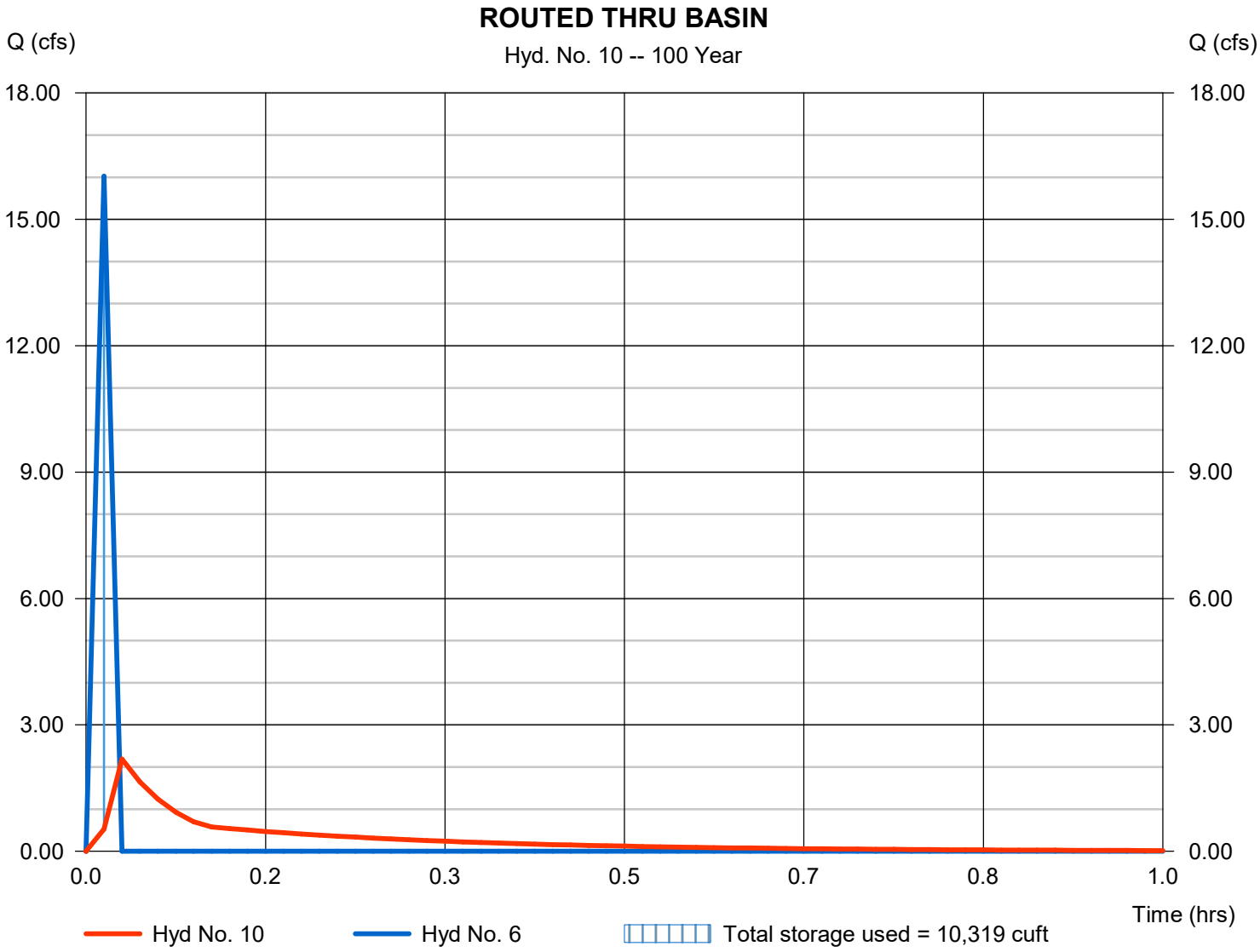
Hydrograph Report

Hyd. No. 10

ROUTED THRU BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	2.185 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	960 cuft
Inflow hyd. No.	=	6 - P_TRIB#1	Max. Elevation	=	578.36 ft
Reservoir name	=	DETENTION POND	Max. Storage	=	10,319 cuft

Storage Indication method used. Wet pond routing start elevation = 578.20 ft.



Pond No. 1 - DETENTION POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 575.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	575.00	700	0	0
1.00	576.00	2,303	1,424	1,424
2.00	577.00	3,500	2,880	4,304
3.00	578.00	4,720	4,094	8,399
4.00	579.00	5,863	5,281	13,680
5.00	580.00	7,106	6,474	20,153

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	Inactive	Inactive	0.00
Span (in)	= 12.00	1.00	24.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 572.50	575.00	577.75	0.00
Length (ft)	= 91.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 578.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	575.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.10	142	575.10	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.20	285	575.20	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.30	427	575.30	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.40	570	575.40	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.50	712	575.50	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.60	854	575.60	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.70	997	575.70	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.80	1,139	575.80	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.90	1,282	575.90	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.00	1,424	576.00	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.10	1,712	576.10	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.20	2,000	576.20	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.30	2,288	576.30	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.40	2,576	576.40	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.50	2,864	576.50	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.60	3,152	576.60	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.70	3,440	576.70	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.80	3,728	576.80	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
1.90	4,016	576.90	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.00	4,304	577.00	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.10	4,714	577.10	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.20	5,123	577.20	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.30	5,533	577.30	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.40	5,942	577.40	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.50	6,352	577.50	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.60	6,761	577.60	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.70	7,171	577.70	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.80	7,580	577.80	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
2.90	7,989	577.90	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
3.00	8,399	578.00	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
3.10	8,927	578.10	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
3.20	9,455	578.20	5.35 ic	0.00	0.00	---	0.00	---	---	---	---	---	0.000
3.30	9,983	578.30	5.35 ic	0.00	0.00	---	0.59	---	---	---	---	---	0.594
3.40	10,511	578.40	5.35 ic	0.00	0.00	---	3.09	---	---	---	---	---	3.092
3.50	11,039	578.50	6.66 ic	0.00	0.00	---	6.66	---	---	---	---	---	6.655
3.60	11,567	578.60	8.42 oc	0.00	0.00	---	8.41 s	---	---	---	---	---	8.413

Continues on next page...

DETENTION POND

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.70	12,095	578.70	8.51 oc	0.00	0.00	---	8.51 s	---	---	---	---	---	8.506
3.80	12,623	578.80	8.57 oc	0.00	0.00	---	8.57 s	---	---	---	---	---	8.567
3.90	13,152	578.90	8.63 oc	0.00	0.00	---	8.63 s	---	---	---	---	---	8.630
4.00	13,680	579.00	8.69 oc	0.00	0.00	---	8.68 s	---	---	---	---	---	8.681
4.10	14,327	579.10	8.75 oc	0.00	0.00	---	8.71 s	---	---	---	---	---	8.715
4.20	14,974	579.20	8.80 oc	0.00	0.00	---	8.78 s	---	---	---	---	---	8.776
4.30	15,622	579.30	8.85 oc	0.00	0.00	---	8.79 s	---	---	---	---	---	8.793
4.40	16,269	579.40	8.91 oc	0.00	0.00	---	8.85 s	---	---	---	---	---	8.851
4.50	16,917	579.50	8.96 oc	0.00	0.00	---	8.88 s	---	---	---	---	---	8.878
4.60	17,564	579.60	9.01 oc	0.00	0.00	---	8.94 s	---	---	---	---	---	8.942
4.70	18,211	579.70	9.06 oc	0.00	0.00	---	9.01 s	---	---	---	---	---	9.013
4.80	18,859	579.80	9.11 oc	0.00	0.00	---	9.05 s	---	---	---	---	---	9.049
4.90	19,506	579.90	9.16 oc	0.00	0.00	---	9.07 s	---	---	---	---	---	9.072
5.00	20,153	580.00	9.21 oc	0.00	0.00	---	9.05 s	---	---	---	---	---	9.050

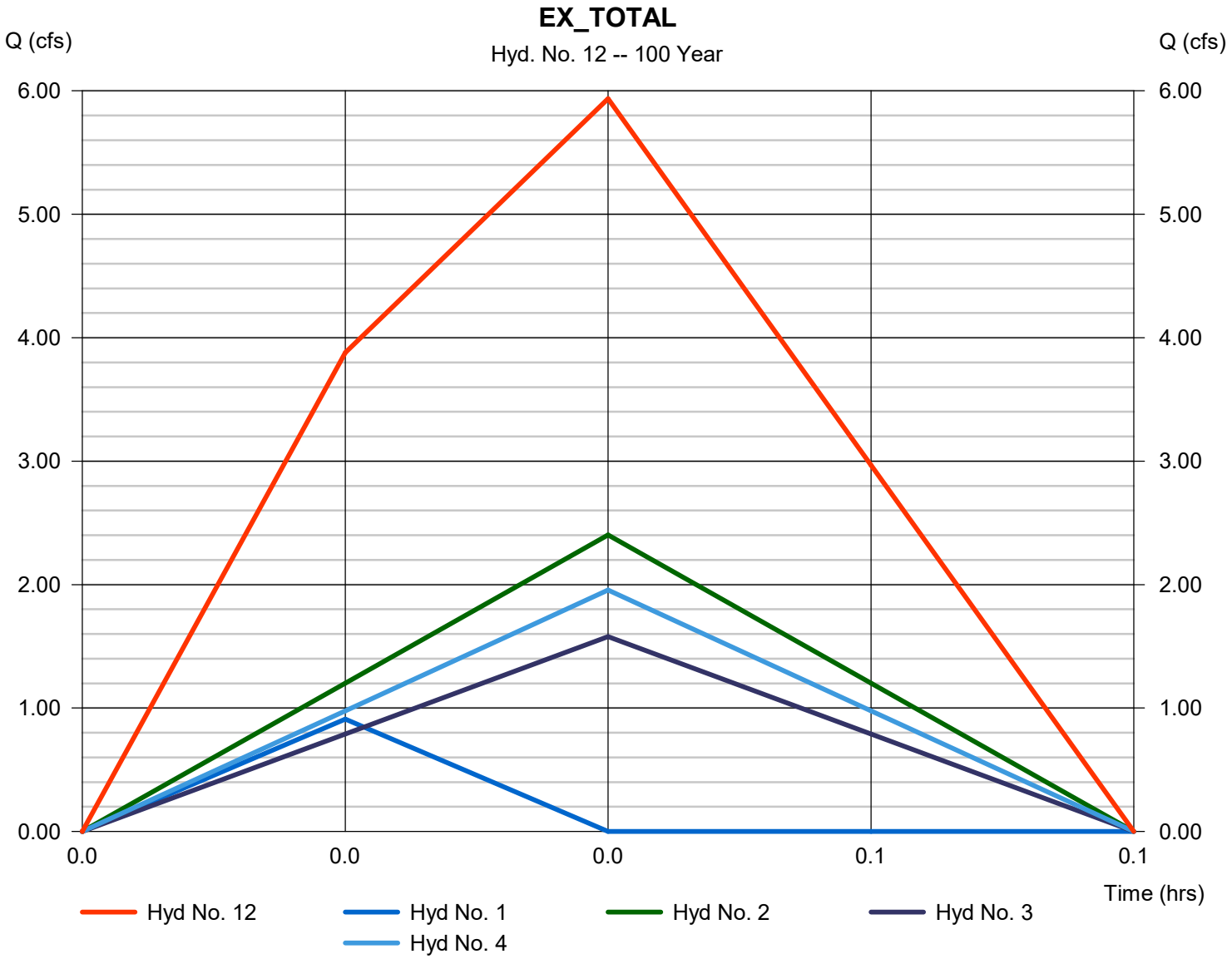
...End

Hydrograph Report

Hyd. No. 12

EX_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	5.936 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.03 hrs
Time interval	=	1 min	Hyd. volume	=	767 cuft
Inflow hyds.	=	1, 2, 3, 4	Contrib. drain. area	=	2.000 ac

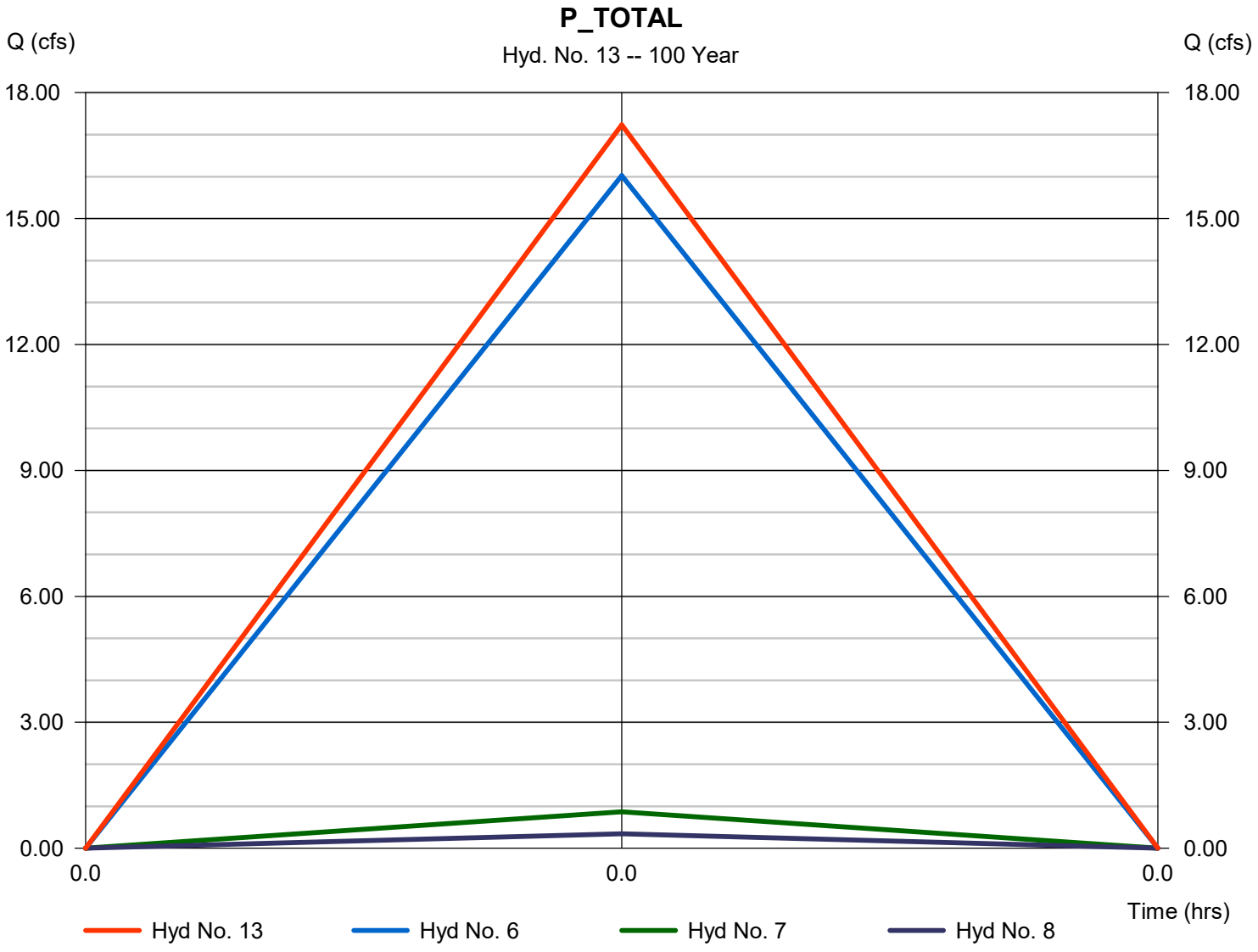


Hydrograph Report

Hyd. No. 13

P_TOTAL

Hydrograph type	=	Combine	Peak discharge	=	17.23 cfs
Storm frequency	=	100 yrs	Time to peak	=	0.02 hrs
Time interval	=	1 min	Hyd. volume	=	1,034 cuft
Inflow hyds.	=	6, 7, 8	Contrib. drain. area	=	2.010 ac

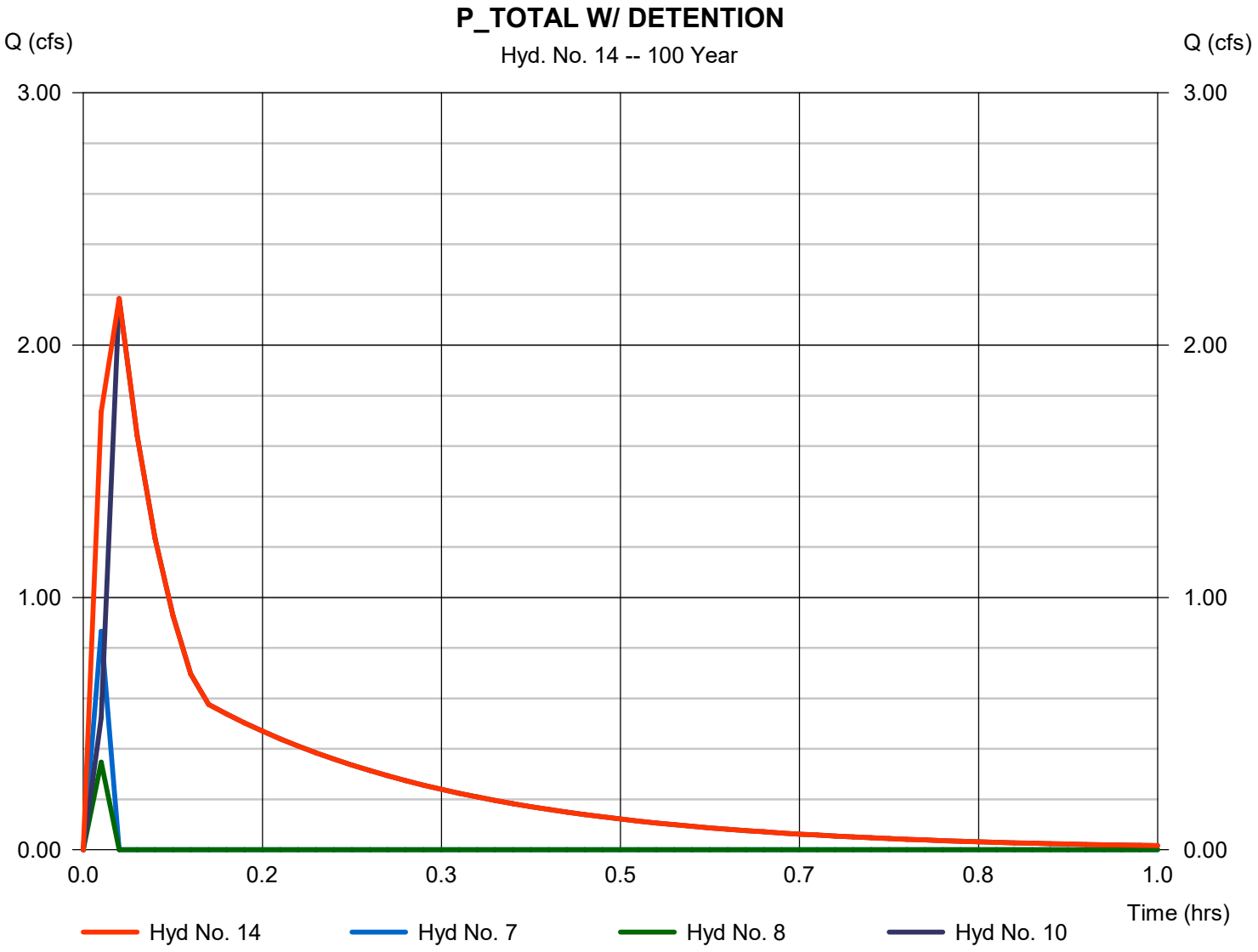


Hydrograph Report

Hyd. No. 14

P_TOTAL W/ DETENTION

Hydrograph type	= Combine	Peak discharge	= 2.185 cfs
Storm frequency	= 100 yrs	Time to peak	= 0.03 hrs
Time interval	= 1 min	Hyd. volume	= 1,033 cuft
Inflow hyds.	= 7, 8, 10	Contrib. drain. area	= 0.380 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	38.4810	7.5000	0.7610	--------
3	29.0800	2.9500	0.6030	--------
5	0.0000	0.0000	0.0000	--------
10	78.3870	12.2000	0.8170	--------
25	30.8270	3.0000	0.6020	--------
50	0.0000	0.0000	0.0000	--------
100	76.6220	8.5000	0.7480	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.63	4.36	3.60	3.09	2.72	2.44	2.22	2.04	1.89	1.76	1.65	1.56
3	8.33	6.21	5.10	4.40	3.90	3.53	3.25	3.01	2.82	2.66	2.51	2.39
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.67	6.23	5.27	4.60	4.08	3.68	3.36	3.10	2.87	2.68	2.52	2.38
25	8.82	6.58	5.41	4.67	4.15	3.76	3.45	3.20	3.00	2.82	2.68	2.55
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	10.94	8.64	7.22	6.25	5.54	4.99	4.56	4.20	3.90	3.65	3.43	3.25

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	4.146	-------	-------	-------	-------	-------	-------	-------	P_WQ#1
3	Reservoir	1	0.141	-------	-------	-------	-------	-------	-------	-------	ROUTED THRU BASIN

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

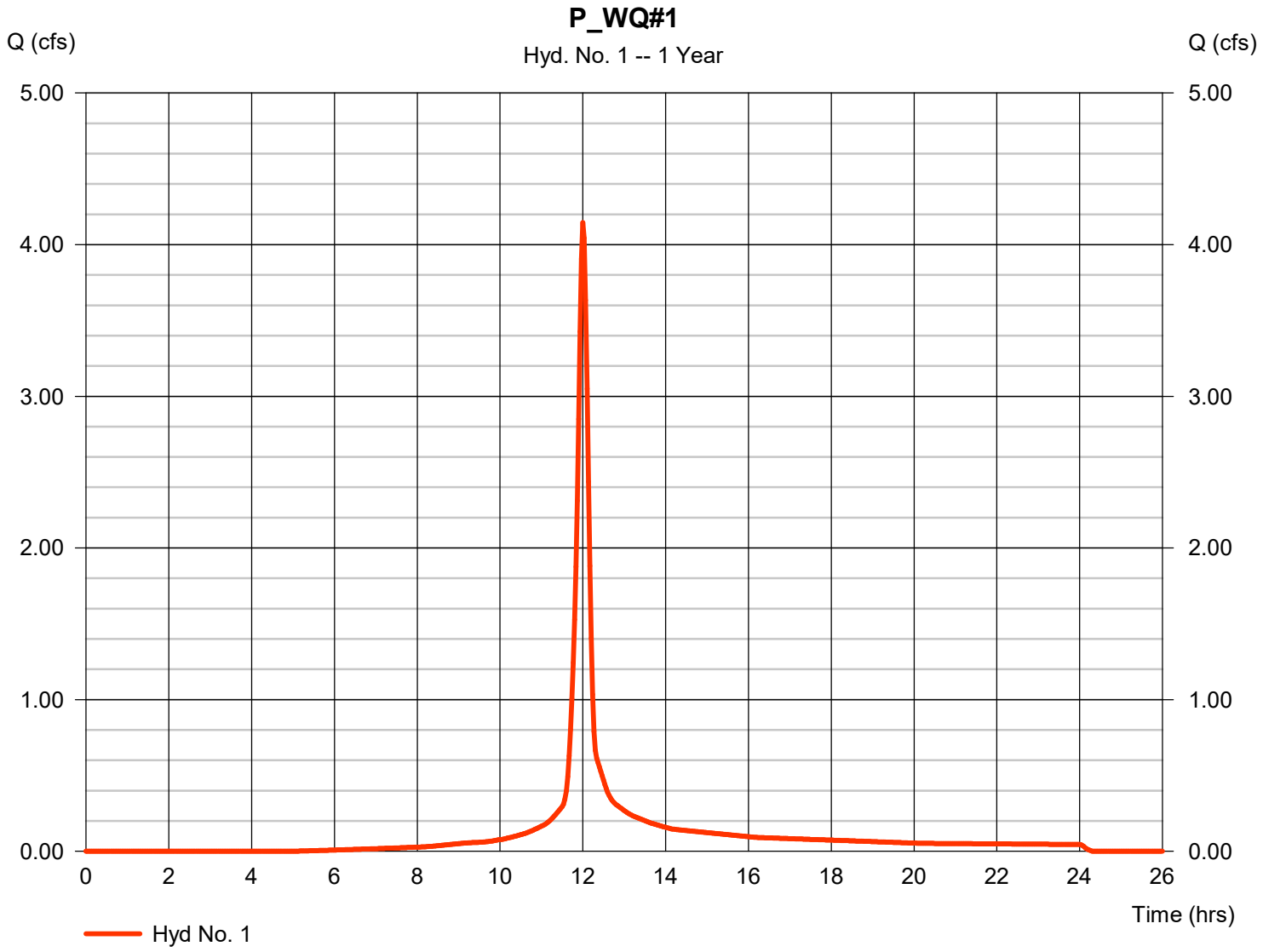
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.146	2	720	10,991	------	------	------	P_WQ#1
3	Reservoir	0.141	2	860	10,912	1	577.81	7,608	ROUTED THRU BASIN

Hydrograph Report

Hyd. No. 1

P_WQ#1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.146 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 10,991 cuft
Drainage area	= 1.650 ac	Curve number	= 93
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.80 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

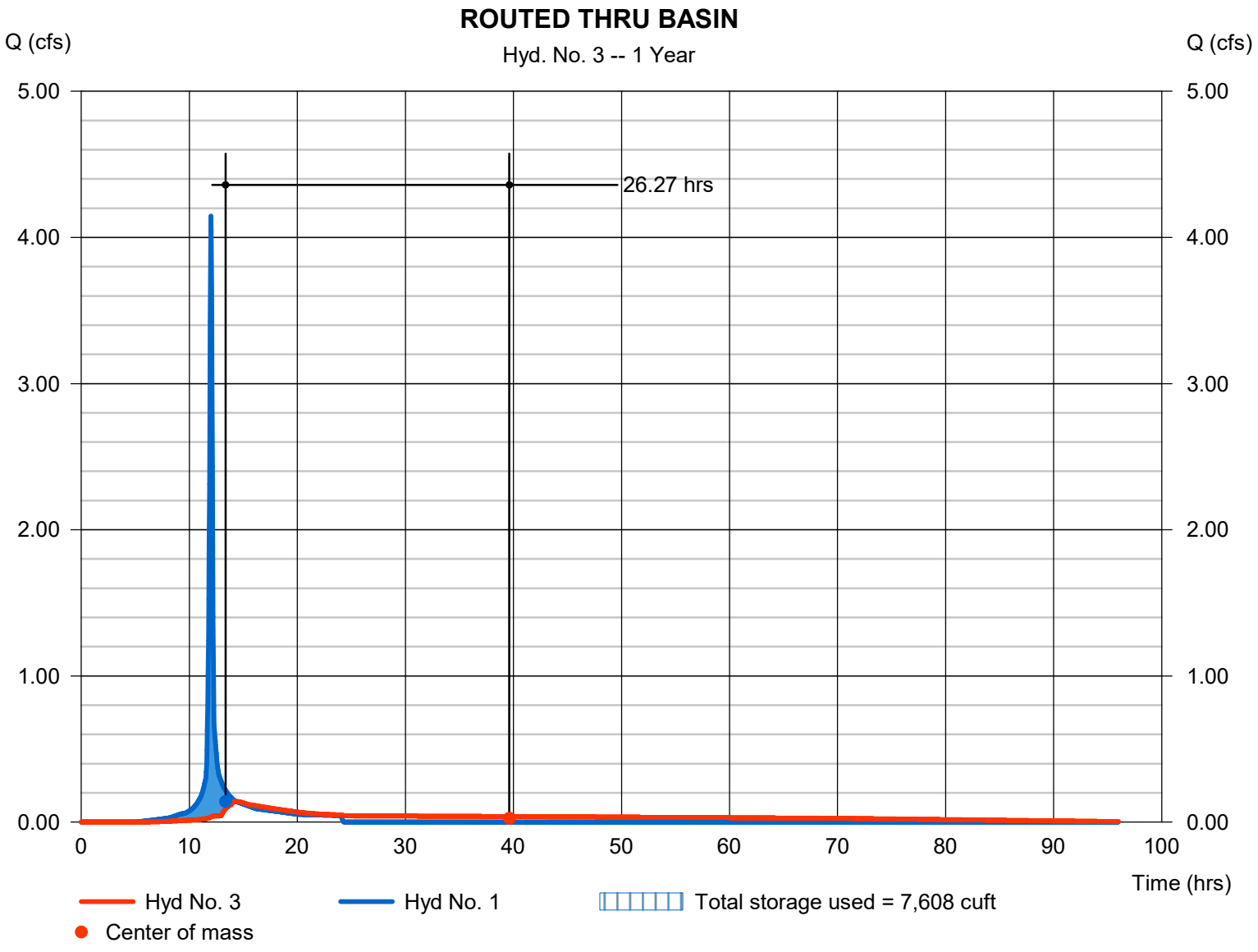
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Wednesday, 03 / 8 / 2023

Hyd. No. 3

ROUTED THRU BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.141 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.33 hrs
Time interval	= 2 min	Hyd. volume	= 10,912 cuft
Inflow hyd. No.	= 1 - P_WQ#1	Max. Elevation	= 577.81 ft
Reservoir name	= DETENTION POND	Max. Storage	= 7,608 cuft

Storage Indication method used.



Pond No. 1 - DETENTION POND

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 575.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	575.00	700	0	0
1.00	576.00	2,303	1,424	1,424
2.00	577.00	3,500	2,880	4,304
3.00	578.00	4,720	4,094	8,399
4.00	579.00	5,863	5,281	13,680
5.00	580.00	7,106	6,474	20,153

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	1.00	6.00	0.00
Span (in)	= 12.00	1.00	24.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 572.50	575.00	577.75	0.00
Length (ft)	= 91.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 578.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	575.00	0.00	0.00	0.00	---	0.00	---	---	---	---	---	0.000
0.10	142	575.10	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.006
0.20	285	575.20	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.010
0.30	427	575.30	5.35 ic	0.01 ic	0.00	---	0.00	---	---	---	---	---	0.013
0.40	570	575.40	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.016
0.50	712	575.50	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.018
0.60	854	575.60	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.020
0.70	997	575.70	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.021
0.80	1,139	575.80	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.023
0.90	1,282	575.90	5.35 ic	0.02 ic	0.00	---	0.00	---	---	---	---	---	0.024
1.00	1,424	576.00	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.026
1.10	1,712	576.10	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.027
1.20	2,000	576.20	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.028
1.30	2,288	576.30	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.029
1.40	2,576	576.40	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.031
1.50	2,864	576.50	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.032
1.60	3,152	576.60	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.033
1.70	3,440	576.70	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.034
1.80	3,728	576.80	5.35 ic	0.03 ic	0.00	---	0.00	---	---	---	---	---	0.035
1.90	4,016	576.90	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.036
2.00	4,304	577.00	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.037
2.10	4,714	577.10	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.038
2.20	5,123	577.20	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.039
2.30	5,533	577.30	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.039
2.40	5,942	577.40	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.040
2.50	6,352	577.50	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.041
2.60	6,761	577.60	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.042
2.70	7,171	577.70	5.35 ic	0.04 ic	0.00	---	0.00	---	---	---	---	---	0.043
2.80	7,580	577.80	5.35 ic	0.04 ic	0.08 ic	---	0.00	---	---	---	---	---	0.119
2.90	7,989	577.90	5.35 ic	0.04 ic	0.39 ic	---	0.00	---	---	---	---	---	0.439
3.00	8,399	578.00	5.35 ic	0.05 ic	0.85 ic	---	0.00	---	---	---	---	---	0.896
3.10	8,927	578.10	5.35 ic	0.05 ic	1.41 ic	---	0.00	---	---	---	---	---	1.456
3.20	9,455	578.20	5.35 ic	0.05 ic	2.06 ic	---	0.00	---	---	---	---	---	2.102
3.30	9,983	578.30	5.35 ic	0.05 ic	2.64 ic	---	0.59	---	---	---	---	---	3.279
3.40	10,511	578.40	6.18 ic	0.04 ic	3.04 ic	---	3.09	---	---	---	---	---	6.181
3.50	11,039	578.50	8.33 oc	0.01 ic	2.05 ic	---	6.27 s	---	---	---	---	---	8.330
3.60	11,567	578.60	8.44 oc	0.01 ic	1.35 ic	---	7.08 s	---	---	---	---	---	8.438

Continues on next page...

DETENTION POND

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.70	12,095	578.70	8.52 oc	0.01 ic	0.99 ic	---	7.52 s	---	---	---	---	---	8.515
3.80	12,623	578.80	8.58 oc	0.00 ic	0.77 ic	---	7.79 s	---	---	---	---	---	8.568
3.90	13,152	578.90	8.64 oc	0.00 ic	0.63 ic	---	8.00 s	---	---	---	---	---	8.630
4.00	13,680	579.00	8.69 oc	0.00 ic	0.52 ic	---	8.15 s	---	---	---	---	---	8.677
4.10	14,327	579.10	8.75 oc	0.00 ic	0.44 ic	---	8.26 s	---	---	---	---	---	8.709
4.20	14,974	579.20	8.80 oc	0.00 ic	0.38 ic	---	8.38 s	---	---	---	---	---	8.762
4.30	15,622	579.30	8.85 oc	0.00 ic	0.34 ic	---	8.50 s	---	---	---	---	---	8.839
4.40	16,269	579.40	8.91 oc	0.00 ic	0.30 ic	---	8.56 s	---	---	---	---	---	8.856
4.50	16,917	579.50	8.96 oc	0.00 ic	0.27 ic	---	8.61 s	---	---	---	---	---	8.879
4.60	17,564	579.60	9.01 oc	0.00 ic	0.24 ic	---	8.76 s	---	---	---	---	---	9.008
4.70	18,211	579.70	9.06 oc	0.00 ic	0.22 ic	---	8.77 s	---	---	---	---	---	8.992
4.80	18,859	579.80	9.11 oc	0.00 ic	0.20 ic	---	8.90 s	---	---	---	---	---	9.108
4.90	19,506	579.90	9.16 oc	0.00 ic	0.19 ic	---	8.90 s	---	---	---	---	---	9.084
5.00	20,153	580.00	9.21 oc	0.00 ic	0.17 ic	---	8.90 s	---	---	---	---	---	9.076

...End

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	38.4810	7.5000	0.7610	--------
3	29.0800	2.9500	0.6030	--------
5	0.0000	0.0000	0.0000	--------
10	78.3870	12.2000	0.8170	--------
25	30.8270	3.0000	0.6020	--------
50	0.0000	0.0000	0.0000	--------
100	76.6220	8.5000	0.7480	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.63	4.36	3.60	3.09	2.72	2.44	2.22	2.04	1.89	1.76	1.65	1.56
3	8.33	6.21	5.10	4.40	3.90	3.53	3.25	3.01	2.82	2.66	2.51	2.39
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	7.67	6.23	5.27	4.60	4.08	3.68	3.36	3.10	2.87	2.68	2.52	2.38
25	8.82	6.58	5.41	4.67	4.15	3.76	3.45	3.20	3.00	2.82	2.68	2.55
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	10.94	8.64	7.22	6.25	5.54	4.99	4.56	4.20	3.90	3.65	3.43	3.25

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.50	2.20	0.00	3.30	4.25	5.77	6.80	7.95
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydrograph Report

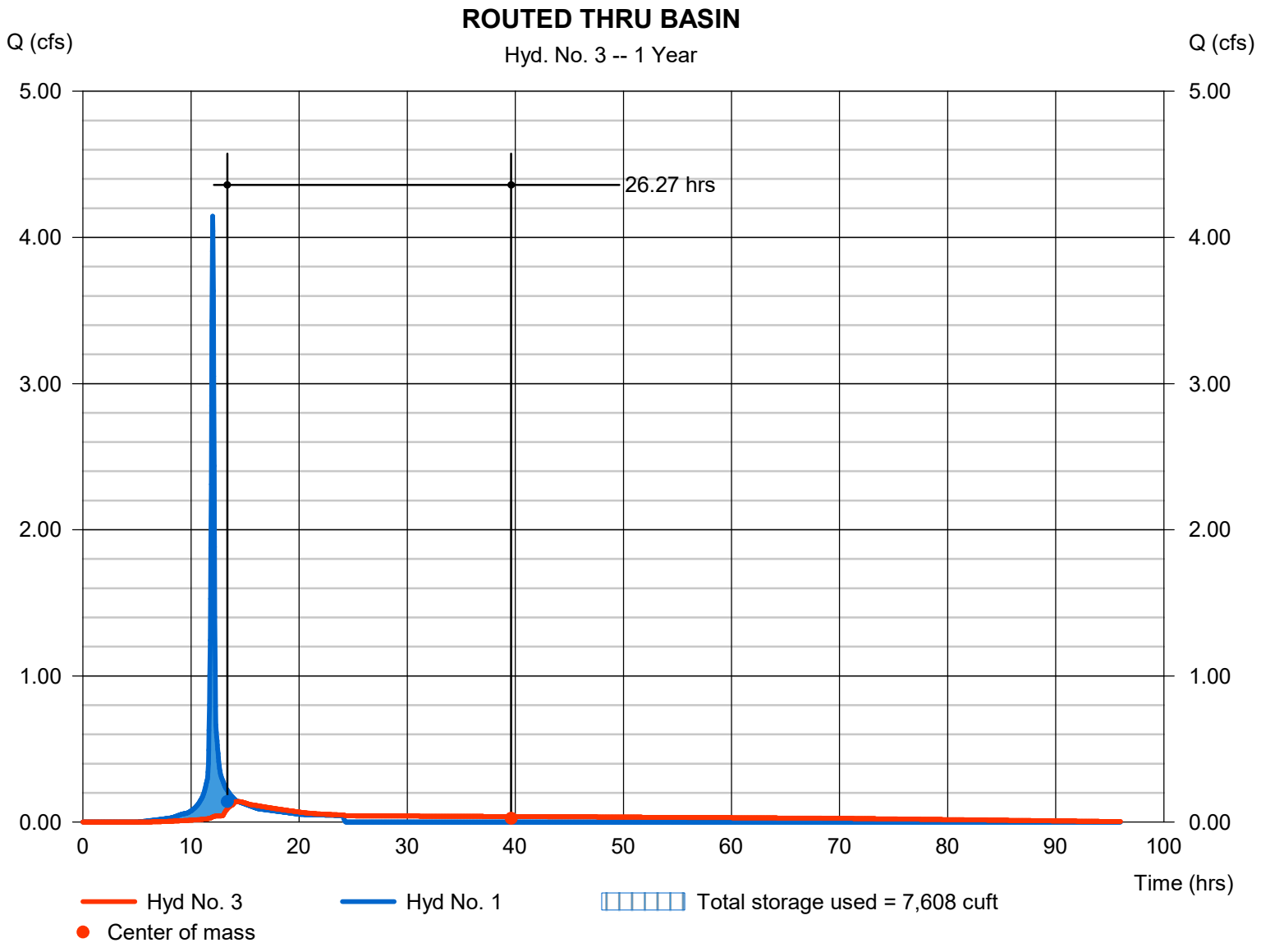
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Wednesday, 03 / 8 / 2023

Hyd. No. 3

ROUTED THRU BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.141 cfs
Storm frequency	= 1 yrs	Time to peak	= 14.33 hrs
Time interval	= 2 min	Hyd. volume	= 10,912 cuft
Inflow hyd. No.	= 1 - P_WQ#1	Max. Elevation	= 577.81 ft
Reservoir name	= DETENTION POND	Max. Storage	= 7,608 cuft

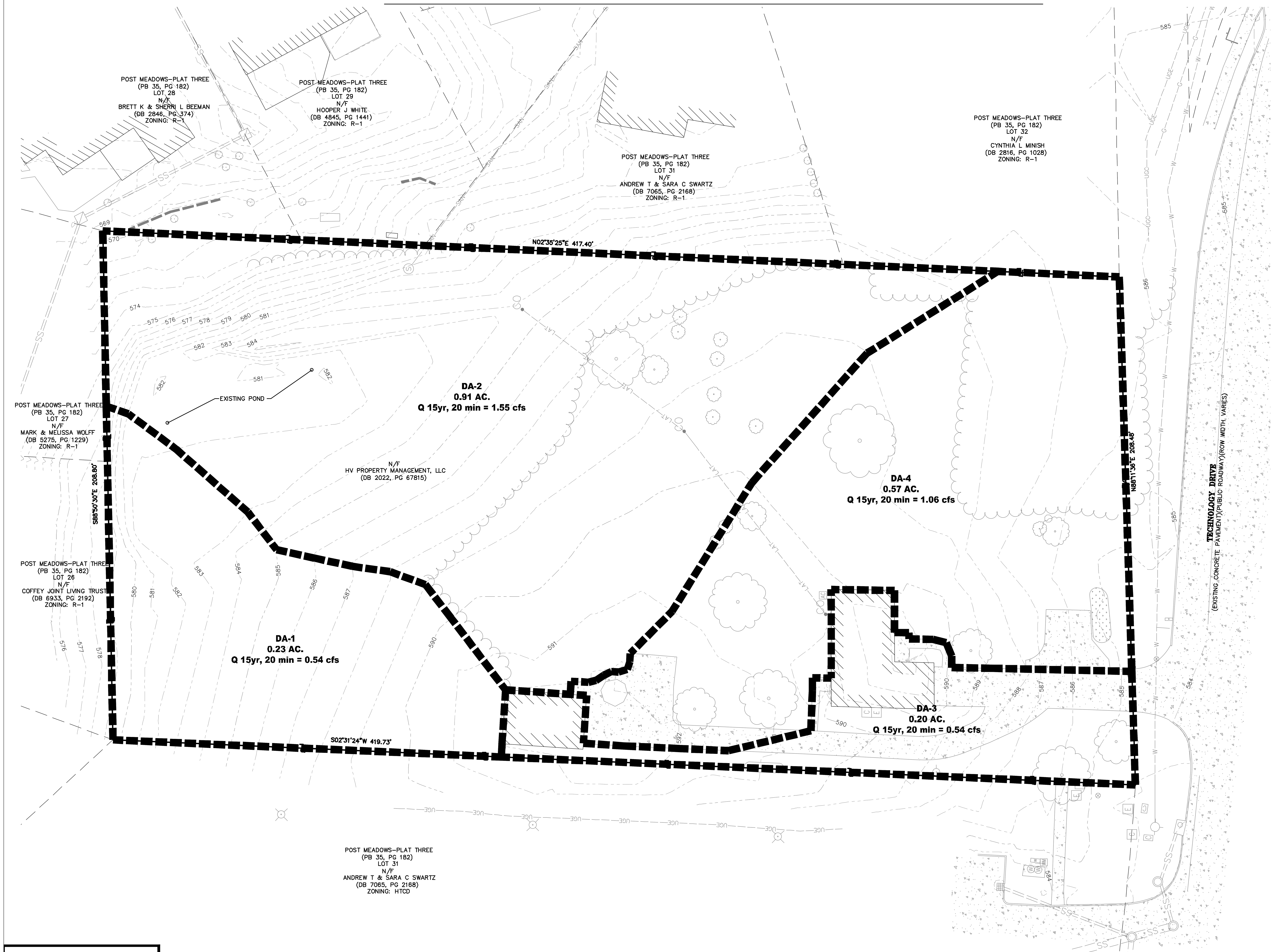
Storage Indication method used.



Section 3

Drainage Area Maps

EXISTING DRAINAGE AREA MAP



SCALE: 1"=20'
FEBRUARY, 2023

ALL AREAS
PI VALUE OPEN = 1.70
PI VALUE GRAVEL = 3.36
PI VALUE PAVEMENT/BUILDING = 3.54

DA–01
OPEN = 0.32 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.32}{0.32}1.70\right)+\left(\frac{0.00}{0.32}3.36\right)+\left(\frac{0.00}{0.32}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.32)(1.70) = 0.54

DA–02
OPEN = 0.91 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.91}{0.91}1.70\right)+\left(\frac{0.00}{0.91}3.36\right)+\left(\frac{0.00}{0.91}3.54\right)=1.55$$
Q(15YR, 20MIN) = API = (1.55)(1.70) = 1.55

DA–03
OPEN = 0.09 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.11 ACRES
$$PI = \left(\frac{0.09}{0.20}1.70\right)+\left(\frac{0.00}{0.20}3.36\right)+\left(\frac{0.11}{0.20}3.54\right)=2.71$$
Q(15YR, 20MIN) = API = (0.20)(2.71) = 0.54

DA–04
OPEN = 0.52 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.05 ACRES
$$PI = \left(\frac{0.52}{0.57}1.70\right)+\left(\frac{0.00}{0.57}3.36\right)+\left(\frac{0.05}{0.57}3.54\right)=1.86$$
Q(15YR, 20MIN) = API = (0.57)(1.86) = 1.06

TOTAL EXISTING DRAINAGE AREA = 3.69 cfs

OWNER/DEVELOPER:
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• Master Planning

Missouri State Certificate of Authority Number: 2010000046

Cochran Project No. M22–8498

STATE OF MISSOURI ERIC SCOTT KIRCHNER E-2001004618 REGISTERED PROFESSIONAL ENGINEER

DATE

Eric S. Kirchner No. E–2001004618
Registered Professional Engineer
State of Missouri
for Cochran Engineering & Surveying

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EXISTING DRAINAGE AREA MAP

P+Z No. 22-008964
Approval Date: NOV. 3, 2022

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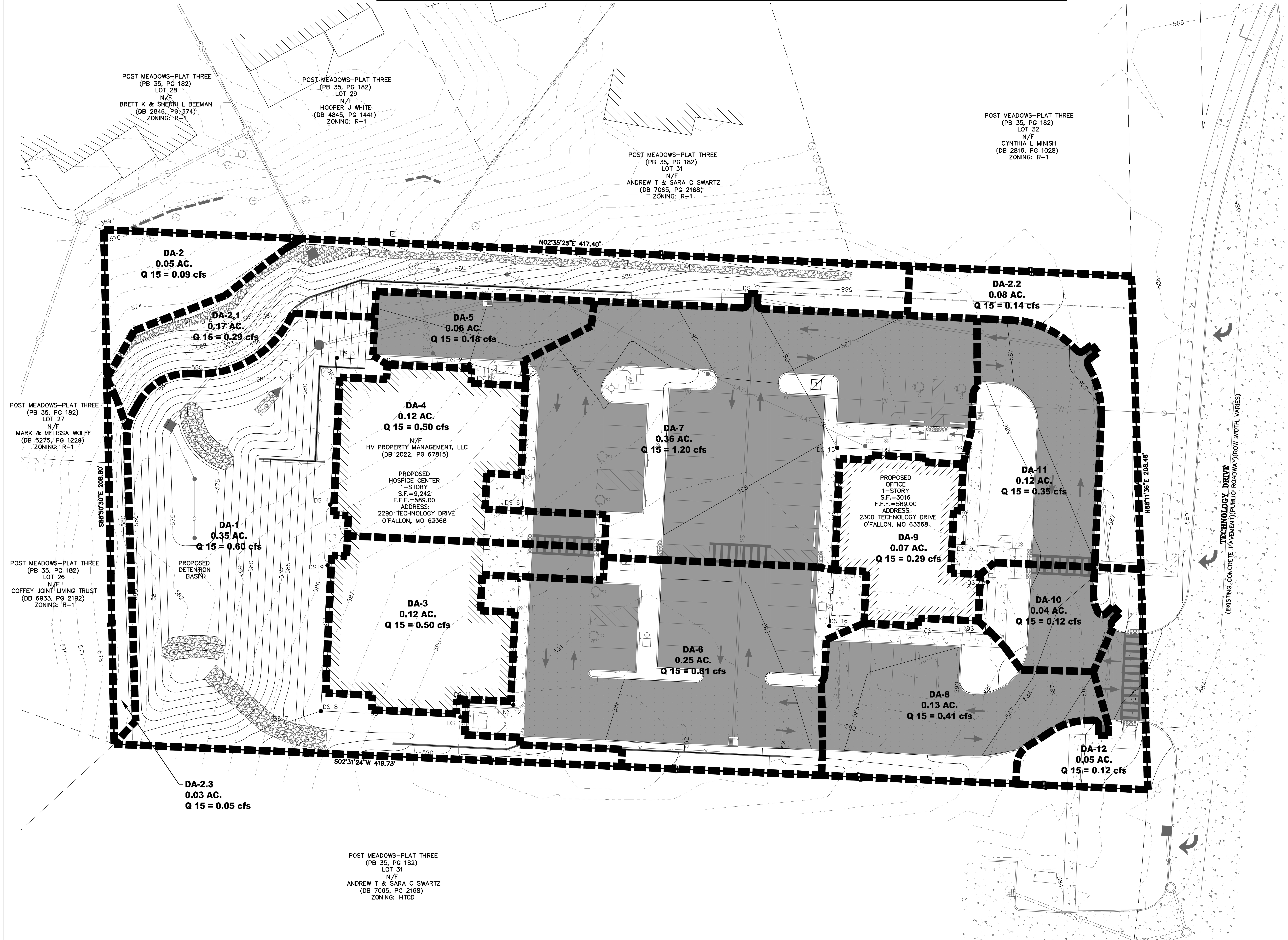
PROPOSED DRAINAGE AREA MAP



ALL AREAS
PI VALUE OPEN = 1.70
PI VALUE GRAVEL = 3.36
PI VALUE PAVEMENT = 3.54
PI VALUE BUILDING = 4.20

DA–01
OPEN = 0.35 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.35}{0.35}1.70\right)+\left(\frac{0.00}{0.35}3.36\right)+\left(\frac{0.00}{0.35}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.35)(1.70) = 0.60

DA–02
OPEN = 0.05 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.05}{0.05}1.70\right)+\left(\frac{0.00}{0.05}3.36\right)+\left(\frac{0.00}{0.05}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.05)(1.70) = 0.09

DA–02.1
OPEN = 0.17 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.17}{0.17}1.70\right)+\left(\frac{0.00}{0.17}3.36\right)+\left(\frac{0.00}{0.17}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.17)(1.70) = 0.29

DA–02.2
OPEN = 0.08 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.08}{0.08}1.70\right)+\left(\frac{0.00}{0.08}3.36\right)+\left(\frac{0.00}{0.08}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.08)(1.70) = 0.14

DA–02.3
OPEN = 0.03 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.00 ACRES
$$PI = \left(\frac{0.03}{0.03}1.70\right)+\left(\frac{0.00}{0.03}3.36\right)+\left(\frac{0.13}{0.03}3.54\right)=1.70$$
Q(15YR, 20MIN) = API = (0.03)(1.70) = 0.05

DA–03
OPEN = 0.00 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.12 ACRES
$$PI = \left(\frac{0.00}{0.12}1.70\right)+\left(\frac{0.00}{0.12}3.36\right)+\left(\frac{0.12}{0.12}4.20\right)=4.20$$
Q(15YR, 20MIN) = API = (0.12)(4.20) = 0.50

DA–04
OPEN = 0.00 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.12 ACRES
$$PI = \left(\frac{0.00}{0.12}1.70\right)+\left(\frac{0.00}{0.12}3.36\right)+\left(\frac{0.12}{0.12}4.20\right)=4.20$$
Q(15YR, 20MIN) = API = (0.12)(4.20) = 0.50

DA–05
OPEN = 0.00 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.05 ACRES
$$PI = \left(\frac{0.00}{0.05}1.70\right)+\left(\frac{0.00}{0.05}3.36\right)+\left(\frac{0.05}{0.05}3.54\right)=3.54$$
Q(15YR, 20MIN) = API = (0.05)(3.54) = 0.18

DA–06
OPEN = 0.04 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.21 ACRES
$$PI = \left(\frac{0.04}{0.25}1.70\right)+\left(\frac{0.00}{0.25}3.36\right)+\left(\frac{0.21}{0.25}3.54\right)=3.25$$
Q(15YR, 20MIN) = API = (0.25)(3.25) = 0.81

DA–07
OPEN = 0.04 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.32 ACRES
$$PI = \left(\frac{0.04}{0.36}1.70\right)+\left(\frac{0.00}{0.36}3.36\right)+\left(\frac{0.32}{0.36}3.54\right)=3.34$$
Q(15YR, 20MIN) = API = (0.36)(3.34) = 1.20

DA–08
OPEN = 0.03 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.10 ACRES
$$PI = \left(\frac{0.03}{0.13}1.70\right)+\left(\frac{0.00}{0.13}3.36\right)+\left(\frac{0.10}{0.13}3.54\right)=3.12$$
Q(15YR, 20MIN) = API = (0.13)(3.12) = 0.41

DA–09
OPEN = 0.00 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.07 ACRES
$$PI = \left(\frac{0.00}{0.07}1.70\right)+\left(\frac{0.00}{0.07}3.36\right)+\left(\frac{0.07}{0.07}4.20\right)=4.20$$
Q(15YR, 20MIN) = API = (0.07)(4.20) = 0.29

DA–10
OPEN = 0.01 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.03 ACRES
$$PI = \left(\frac{0.01}{0.04}1.70\right)+\left(\frac{0.00}{0.04}3.36\right)+\left(\frac{0.03}{0.04}3.54\right)=3.08$$
Q(15YR, 20MIN) = API = (0.04)(3.08) = 0.12

DA–11
OPEN = 0.04 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.08 ACRES
$$PI = \left(\frac{0.04}{0.12}1.70\right)+\left(\frac{0.00}{0.12}3.36\right)+\left(\frac{0.08}{0.12}3.54\right)=2.93$$
Q(15YR, 20MIN) = API = (0.12)(2.93) = 0.35

DA–12
OPEN = 0.03 ACRES
GRAVEL = 0.00 ACRES
PAVEMENT/BUILDING = 0.02 ACRES
$$PI = \left(\frac{0.03}{0.05}1.70\right)+\left(\frac{0.00}{0.05}3.36\right)+\left(\frac{0.02}{0.05}3.54\right)=2.44$$
Q(15YR, 20MIN) = API = (0.05)(2.44) = 0.12

TOTAL EXISTING DRAINAGE AREA = 5.65 cfs

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Missouri State Certificate of Authority Number: 2010000046

Cochran Project No. M22-8498

STATE OF MISSOURI ERIC SCOTT KIRCHNER E-2001004618

DATE

Eric S. Kirchner No. E-2001004618
Registered Professional Engineer
State of Missouri
for Cochran Engineering & Surveying

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PROPOSED DRAINAGE AREA MAP

P+Z No. 22-008964
Approval Date: NOV. 3, 2022

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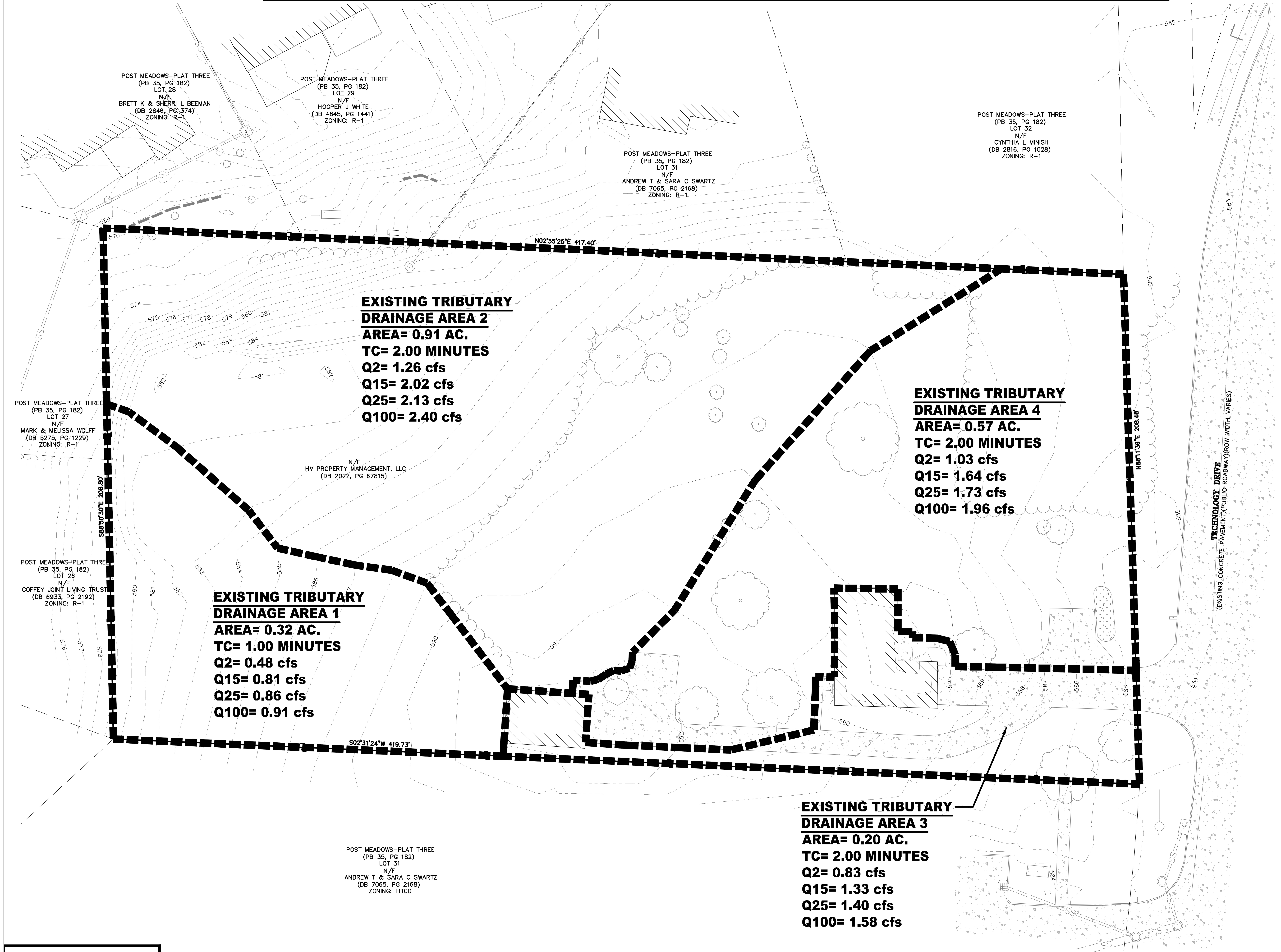
EXISTING TRIBUTARY DRAINAGE AREA MAP



20 0 10 20 40
SCALE: 1"=20'
FEBRUARY, 2023

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PROFESSIONAL ENGINEER

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EXISTING TRIBUTARY DRAINAGE AREA MAP

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Approval Date: NOV. 3, 2022
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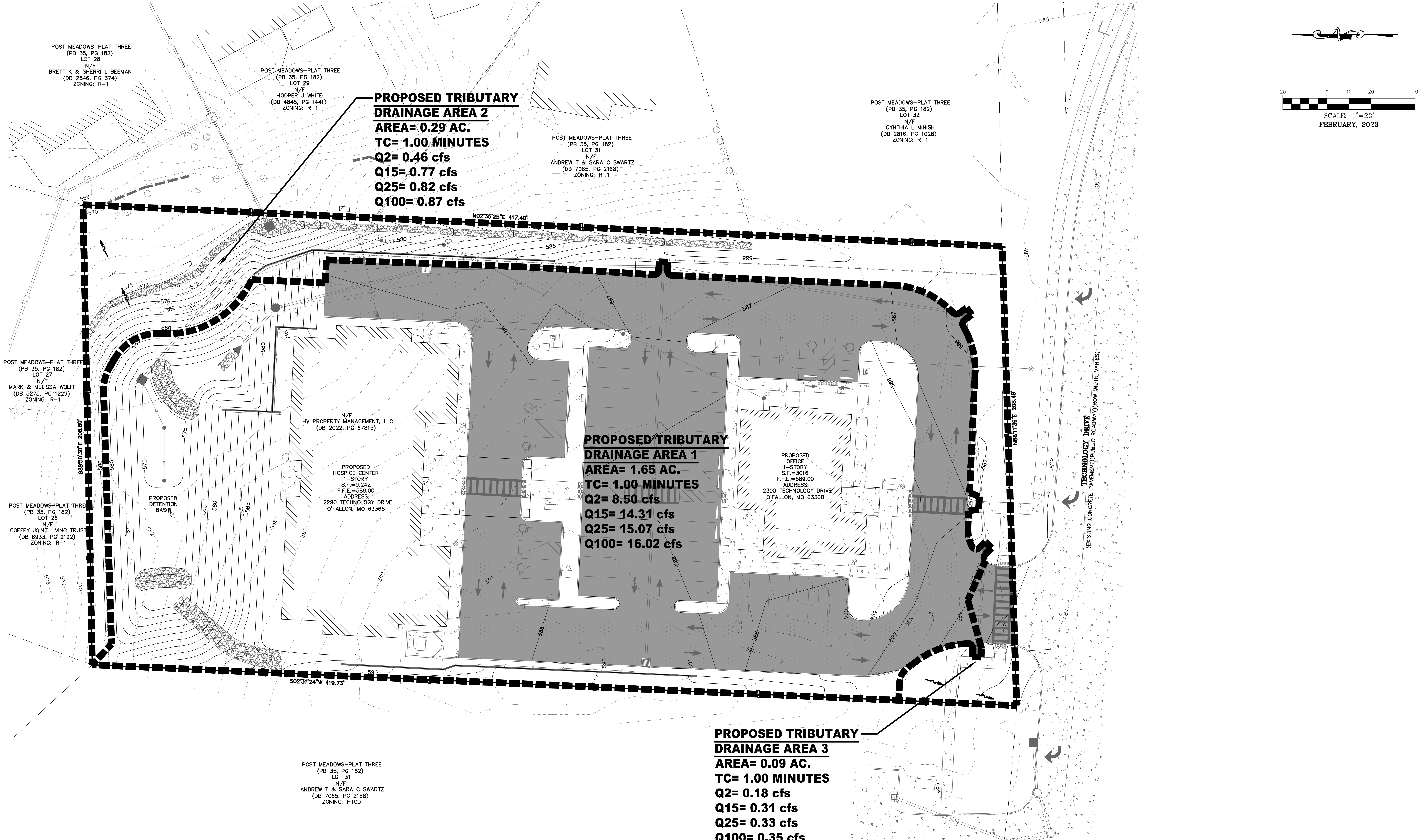
PROPOSED TRIBUTARY DRAINAGE AREA MAP



20 0 10 20 40
SCALE: 1"=20'
FEBRUARY, 2023

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City of O'Fallon Standard Notes and Details – June 2010

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Section 4

Storm Sewer Hydrology

Existing Rational Method 15yr, 20min						
Drainage Area #	Open Area (ac.)	Gravel Area (ac.)	Impervious Area (ac.)	A	PI	Q
1	0.32	-	-	0.32	1.70	0.54
2	0.91	-	-	0.91	1.70	1.55
3	0.09	-	0.11	0.20	2.71	0.54
4	0.52	-	0.05	0.57	1.86	1.06

Q = API

A = total drainage area (acres)
P = runoff factor based on runoff from pervious and impervious surfaces
I = average intensity of rainfall for a given period and a given frequency (inches/hour)

Proposed Rational Method 15yr, 20min						
Drainage Area #	Open Area (ac.)	Gravel Area (ac.)	Impervious Area (ac.)	A	PI	Q
1	0.35	-	-	0.35	1.70	0.60
2	0.05	-	-	0.05	1.70	0.09
2.1	0.17	-	-	0.17	1.70	0.29
2.2	0.08	-	-	0.08	1.70	0.14
2.3	0.03	-	-	0.03	1.70	0.05
3	-	-	0.12	0.12	4.20	0.50
4	-	-	0.12	0.12	4.20	0.50
5	-	-	0.05	0.05	3.54	0.18
6	0.04	-	0.21	0.25	3.25	0.81
7	0.04	-	0.32	0.36	3.34	1.20
8	0.03	-	0.10	0.13	3.12	0.41
9	-	-	0.07	0.07	4.20	0.29
10	0.01	-	0.03	0.04	3.08	0.12
11	0.04	-	0.08	0.12	2.93	0.35
12	0.03	-	0.02	0.05	2.44	0.12

Q = API

A = total drainage area (acres)

P = runoff factor based on runoff from pervious and impervious surfaces

I = average intensity of rainfall for a given period and a given frequency (inches/hour)

RESULTS

	Tc			
	2 YEAR	15 YEAR	25 YEAR	100 YEAR
EXISTING =	3.250	4.463	4.962	5.947
PROPOSED =	8.109	10.352	11.514	13.791
PROPOSED OFFSITE =	0.000	0.000	0.000	0.000
PROPOSED TOTAL =	8.109	10.352	11.514	13.791
DIFFERENCE =	4.859	5.889	6.552	7.844

	1-HOUR			
	2 YEAR	15 YEAR	25 YEAR	100 YEAR
EXISTING =	0.806	1.244	1.866	1.767
PROPOSED =	1.903	2.935	4.403	4.170
PROPOSED OFFSITE =	0.000	0.000	0.000	0.000
PROPOSED TOTAL =	1.903	2.935	4.403	4.170
DIFFERENCE =	1.096	1.692	2.537	2.403

	24-HOUR			
	2 YEAR	15 YEAR	25 YEAR	100 YEAR
EXISTING =	0.064	0.111	0.202	0.202
PROPOSED =	0.152	0.261	0.476	0.477
PROPOSED OFFSITE =	0.000	0.000	0.000	0.000
PROPOSED TOTAL =	0.152	0.261	0.476	0.477
DIFFERENCE =	0.088	0.150	0.274	0.275

WORST CASE FOR EACH STORM EVENT

	2 YEAR	15 YEAR	25 YEAR	100 YEAR
EXISTING =	3.250	4.463	4.962	5.947
PROPOSED =	8.109	10.352	11.514	13.791
PROPOSED OFFSITE =	0.000	0.000	0.000	0.000
PROPOSED TOTAL =	8.109	10.352	11.514	13.791
DIFFERENCE =	4.859	5.889	6.552	7.844

2 YEAR, TC

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	6.625
Q =		0.424	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	6.388
Q =		1.162	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	6.273
Q =		0.747	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	6.185
Q =		0.917	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.093
Tc =	1.025	I =	6.675
Q =		7.529	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.170
Tc =	0.379	I =	6.970
Q =		0.419	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.054
Tc =	0.518	I =	6.905
Q =		0.161	

EXISTING =	3.250
PROPOSED =	8.109
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	8.109
DIFFERENCE =	4.859

RATIONAL DATA		
FREQUENC	2	YEARS
DURATION	TC	MIN.
I =	0.126	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

2 YEAR,1 HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	1.571
Q =		0.101	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	1.571
Q =		0.286	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	1.571
Q =		0.187	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	1.571
Q =		0.233	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.093
Tc =	1.025	I =	1.571
Q =		1.772	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.170
Tc =	0.379	I =	1.571
Q =		0.094	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.054
Tc =	0.518	I =	1.571
Q =		0.037	

EXISTING =	0.806
PROPOSED =	1.903
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	1.903
DIFFERENCE =	1.096

RATIONAL DATA		
FREQUENC	2	YEARS
DURATION	60	MIN.
I =	1.571	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

2 YEAR,24 HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	0.126
Q =		0.008	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	0.126
Q =		0.023	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	0.126
Q =		0.015	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	0.126
Q =		0.019	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.093
Tc =	1.025	I =	0.126
Q =		0.142	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.170
Tc =	0.379	I =	0.126
Q =		0.008	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.054
Tc =	0.518	I =	0.126
Q =		0.003	

EXISTING =	0.064
PROPOSED =	0.152
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	0.152
DIFFERENCE =	0.088

RATIONAL DATA		
FREQUENC	2	YEARS
DURATION	1440	MIN.
I =	0.126	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

15 YEAR, TC

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	9.043
Q =		0.579	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	8.761
Q =		1.593	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	8.624
Q =		1.027	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	8.518
Q =		1.263	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	8.500
Q =		9.588	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	9.178
Q =		0.552	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	9.090
Q =		0.212	

EXISTING =	4.463
PROPOSED =	10.352
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	10.352
DIFFERENCE =	5.889

RATIONAL DATA		
FREQUENC	15	YEARS
DURATION	TC	MIN.
I =	N/A	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

15 YEAR, 1-HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	2.423
Q =		0.155	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	2.423
Q =		0.441	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	2.423
Q =		0.289	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	2.423
Q =		0.359	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	2.423
Q =		2.733	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	2.423
Q =		0.146	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	2.423
Q =		0.057	

EXISTING =	1.244
PROPOSED =	2.935
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	2.935
DIFFERENCE =	1.692

RATIONAL DATA		
FREQUENC	15	YEARS
DURATION	60	MIN.
I =	2.423	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

15 YEAR, 24-HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	0.216
Q =		0.014	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	0.216
Q =		0.039	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	0.216
Q =		0.026	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	0.216
Q =		0.032	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	0.216
Q =		0.243	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	0.216
Q =		0.013	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	0.216
Q =		0.005	

EXISTING =	0.111
PROPOSED =	0.261
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	0.261
DIFFERENCE =	0.150

RATIONAL DATA		
FREQUENC	15	YEARS
DURATION	1440	MIN.
I =	0.215542	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

25 YEAR, TC

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	10.043
Q =		0.643	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	9.739
Q =		1.771	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	9.590
Q =		1.142	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	9.476
Q =		1.405	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	9.456
Q =		10.666	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	10.190
Q =		0.612	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	10.094
Q =		0.235	

EXISTING =	4.962
PROPOSED =	11.514
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	11.514
DIFFERENCE =	6.552

RATIONAL DATA		
FREQUENC	25	YEARS
DURATION	TC	MIN.
I =	N/A	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

25 YEAR, 1-HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	3.635
Q =		0.233	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	3.635
Q =		0.661	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	3.635
Q =		0.433	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	3.635
Q =		0.539	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	3.635
Q =		4.100	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	3.635
Q =		0.218	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	3.635
Q =		0.085	

EXISTING =	1.866
PROPOSED =	4.403
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	4.403
DIFFERENCE =	2.537

RATIONAL DATA		
FREQUENC	25	YEARS
DURATION	60	MIN.
I =	3.634686	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

25 YEAR, 24-HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	0.393
Q =		0.025	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	0.393
Q =		0.071	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	0.393
Q =		0.047	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	0.393
Q =		0.058	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	0.393
Q =		0.443	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	0.393
Q =		0.024	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	0.393
Q =		0.009	

EXISTING =	0.202
PROPOSED =	0.476
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	0.476
DIFFERENCE =	0.274

RATIONAL DATA		
FREQUENC	25	YEARS
DURATION	1440	MIN.
I =	0.392853	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

100 YEAR, TC

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	12.060
Q =		0.772	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	11.677
Q =		2.123	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	11.490
Q =		1.369	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	11.348
Q =		1.683	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	11.323
Q =		12.772	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	12.245
Q =		0.736	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	12.124
Q =		0.283	

EXISTING =	5.947
PROPOSED =	13.791
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	13.791
DIFFERENCE =	7.844

RATIONAL DATA		
FREQUENC	100	YEARS
DURATION	TC	MIN.
I =	N/A	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

100 YEAR, 1 HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	3.442
Q =		0.220	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	3.442
Q =		0.626	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	3.442
Q =		0.410	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	3.442
Q =		0.510	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	3.442
Q =		3.882	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	3.442
Q =		0.207	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	3.442
Q =		0.080	

EXISTING =	1.767
PROPOSED =	4.170
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	4.170
DIFFERENCE =	2.403

RATIONAL DATA		
FREQUENC	100	YEARS
DURATION	60	MIN.
I =	3.441978	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

100 YEAR, 24 HOUR

EX1			
OPEN	GRAVEL	PAVED	BUILDING
13950	0	0	0
13950	0	0	0
0.064	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	176	S =	0.074
Tc =	1.139	I =	0.393
Q =		0.025	

EX2			
OPEN	GRAVEL	PAVED	BUILDING
39603	0	0	0
39603	0	0	0
0.182	0.000	0.000	0.000
COMPOSITE C =		0.200	
L =	301	S =	0.075
Tc =	1.713	I =	0.393
Q =		0.072	

EX3			
OPEN	GRAVEL	PAVED	BUILDING
3743	0	4934	0
3743	0	4934	0
0.017	0.000	0.102	0.000
COMPOSITE C =		0.598	
L =	238	S =	0.031
Tc =	2.009	I =	0.393
Q =		0.047	

EX4			
OPEN	GRAVEL	PAVED	BUILDING
22762	0	2119	0
22762	0	2119	0
0.105	0.000	0.044	0.000
COMPOSITE C =		0.260	
L =	261	S =	0.028
Tc =	2.243	I =	0.393
Q =		0.058	

POST 1			
OPEN	GRAVEL	PAVED	BUILDING
21229	453	49449	0
21229	453	49449	0
0.097	0.009	1.022	0.000
COMPOSITE C =		0.691	
L =	172	S =	0.012
Tc =	2.284	I =	0.393
Q =		0.444	

POST 2			
OPEN	GRAVEL	PAVED	BUILDING
12277	191	0	0
12277	191	0	0
0.056	0.004	0.000	0.000
COMPOSITE C =		0.210	
L =	64	S =	0.019
Tc =	0.877	I =	0.393
Q =		0.024	

POST 3			
OPEN	GRAVEL	PAVED	BUILDING
3369	0	380	0
3369	0	380	0
0.015	0.000	0.008	0.000
COMPOSITE C =		0.271	
L =	54	S =	0.009
Tc =	1.047	I =	0.393
Q =		0.009	

EXISTING =	0.202
PROPOSED =	0.477
PROPOSED OFFSITE =	0.000
PROPOSED TOTAL =	0.477
DIFFERENCE =	0.275

RATIONAL DATA		
FREQUENC	25	YEARS
DURATION	1440	MIN.
I =	0.393422	
C, IMP =	0.9	
C, PERV =	0.2	
C, GRA. =	0.85	

Section 5

Storm Sewer Hydraulics

Downspout Collector Calculation

HGL CALCS

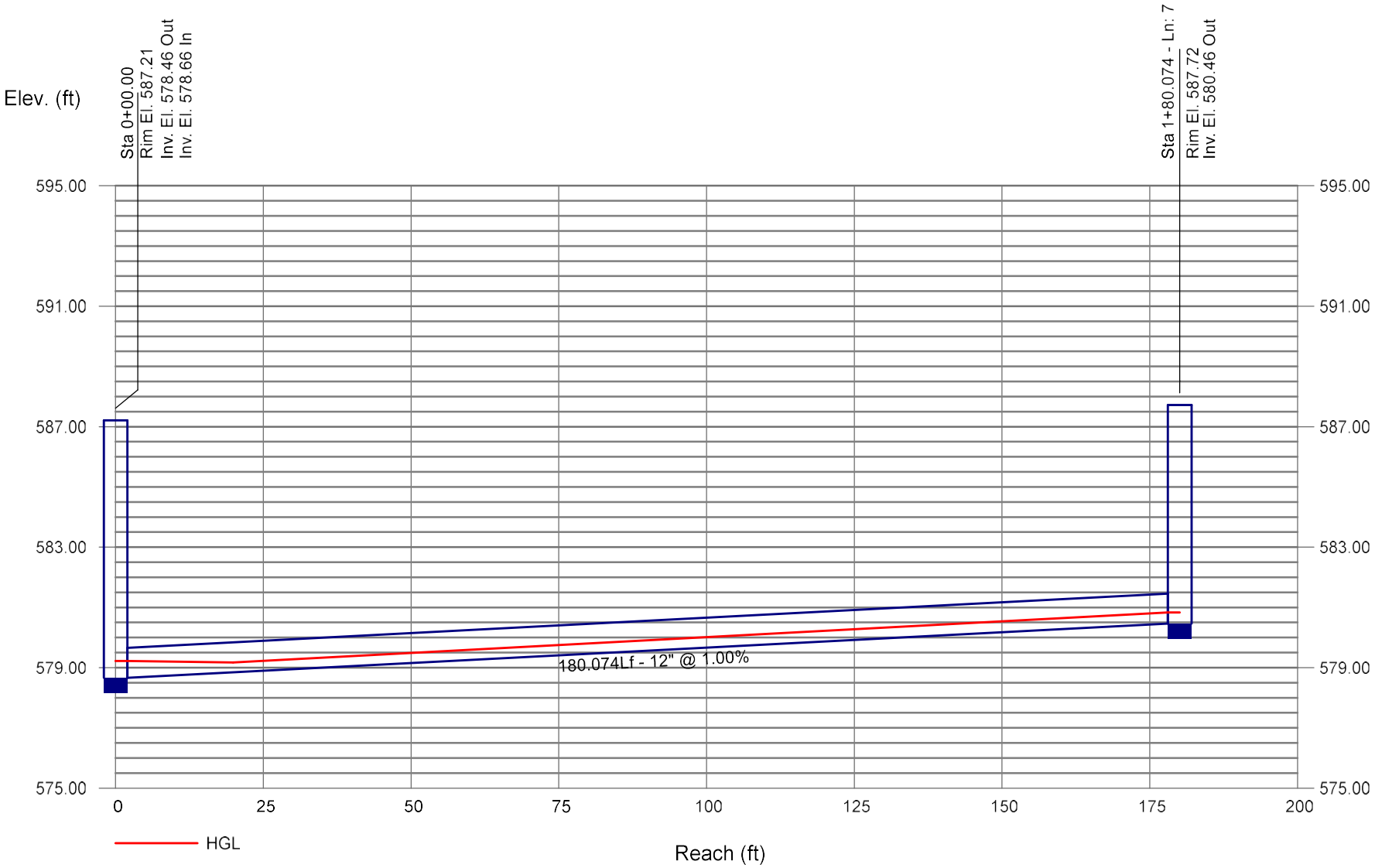
Line No.	Line ID	DnStm Ln No	Invert Dn (ft)	Invert Up (ft)	Line Length (ft)	Line Slope (%)	Line Size (in)	Capac Full (cfs)	Known Q (cfs)	Flow Rate (cfs)	Depth Dn (ft)	HGL Dn (ft)	HGL Up (ft)	Vel Ave (ft/s)	Vel Dn (ft/s)	Rim-Hw (ft)	
1	FES 3 - OS 4	Outfall	576.00	576.27	26.980	1.00	15	6.46	0.00	3.86	0.70	576.70	577.06	5.10	5.50	4.71	
2	MH 4 - GCI 5	1	576.47	577.18	70.687	1.00	15	6.47	0.68	3.86	0.70	577.17	577.97	5.10	5.50	9.78	
3	GCI 5 - CI 6	2	577.38	578.46	107.495	1.00	12	0.00	1.49	3.18	0.00	578.12	579.22	5.04	5.14	7.99	
4	CI 6 - CI 7	3	578.66	580.04	138.777	0.99	12	0.00	0.35	0.88	0.00	579.22	580.43	2.50	1.93	5.77	
5	CI 7 - CI 8	4	580.24	581.31	106.577	1.00	12	0.00	0.12	0.53	0.00	580.50	581.61	2.95	3.26	4.95	
6	CI 8 - CI 9	5	581.51	581.98	47.644	0.99	12	0.00	0.41	0.41	0.00	581.74	582.24	2.73	3.00	3.54	
7	CI 6 - GCI 10	3	578.66	580.46	180.074	1.00	12	0.00	0.81	0.81	0.00	579.22	580.84	2.39	1.78	6.88	
8	EX AI - AI 1	Outfall	560.14	569.58	55.817	16.91	12	0.00	0.29	5.25	0.00	560.53	570.48	11.50	16.64	4.05	
9	AI 1 - OS 2	8	569.78	572.50	90.563	3.00	12	0.00	4.96	4.96	0.00	570.48	573.38	6.82	7.57	5.87	

Project File: M22-8498_STORM NETWORK_2023-04-17.stm | Number of lines: 9 | Date: 4/17/2023

NOTES: ** Critical depth

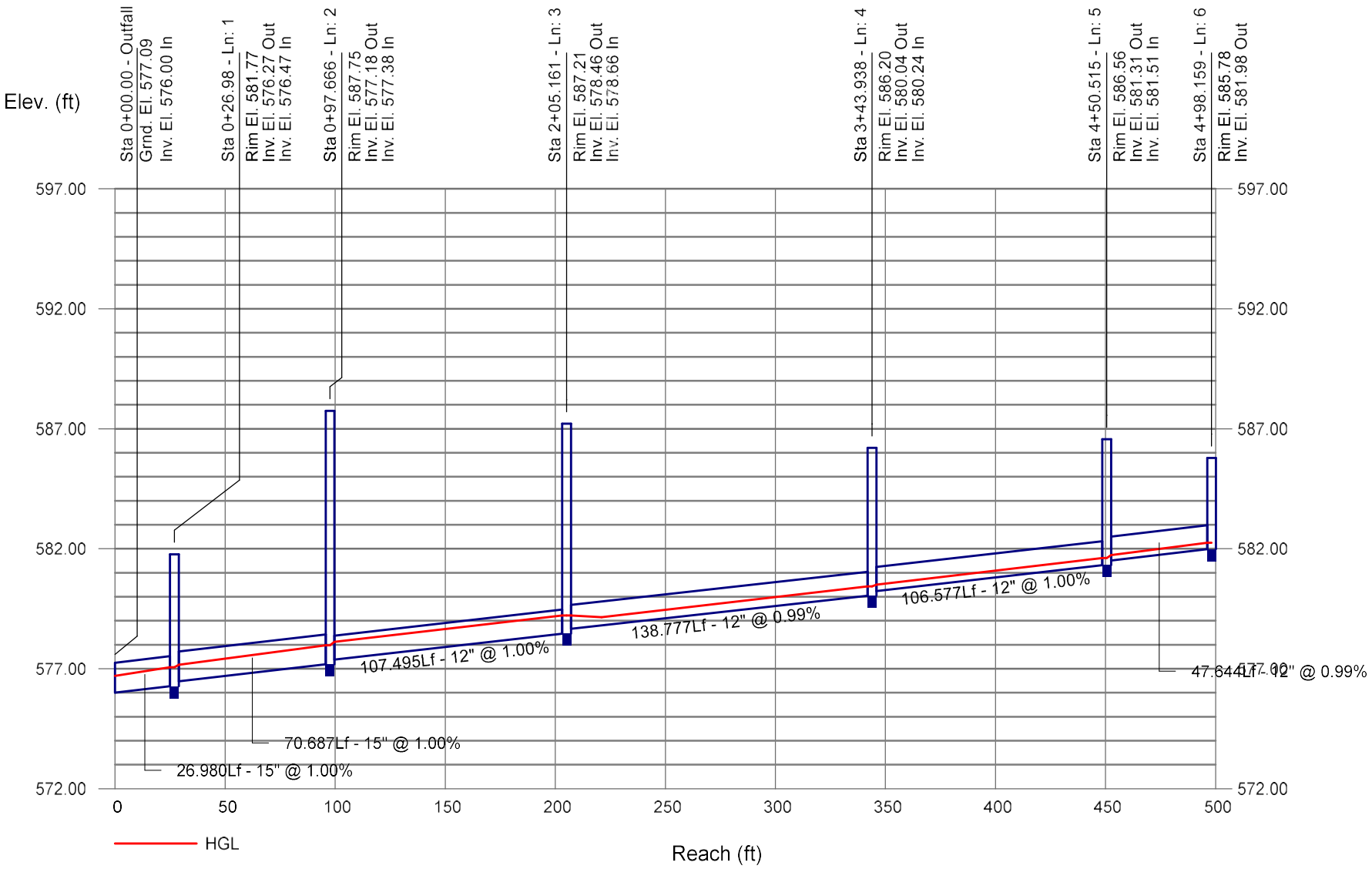
Storm Sewer Profile

Proj. file: M22-8498_STORM NETWORK_2023-04-05.stm



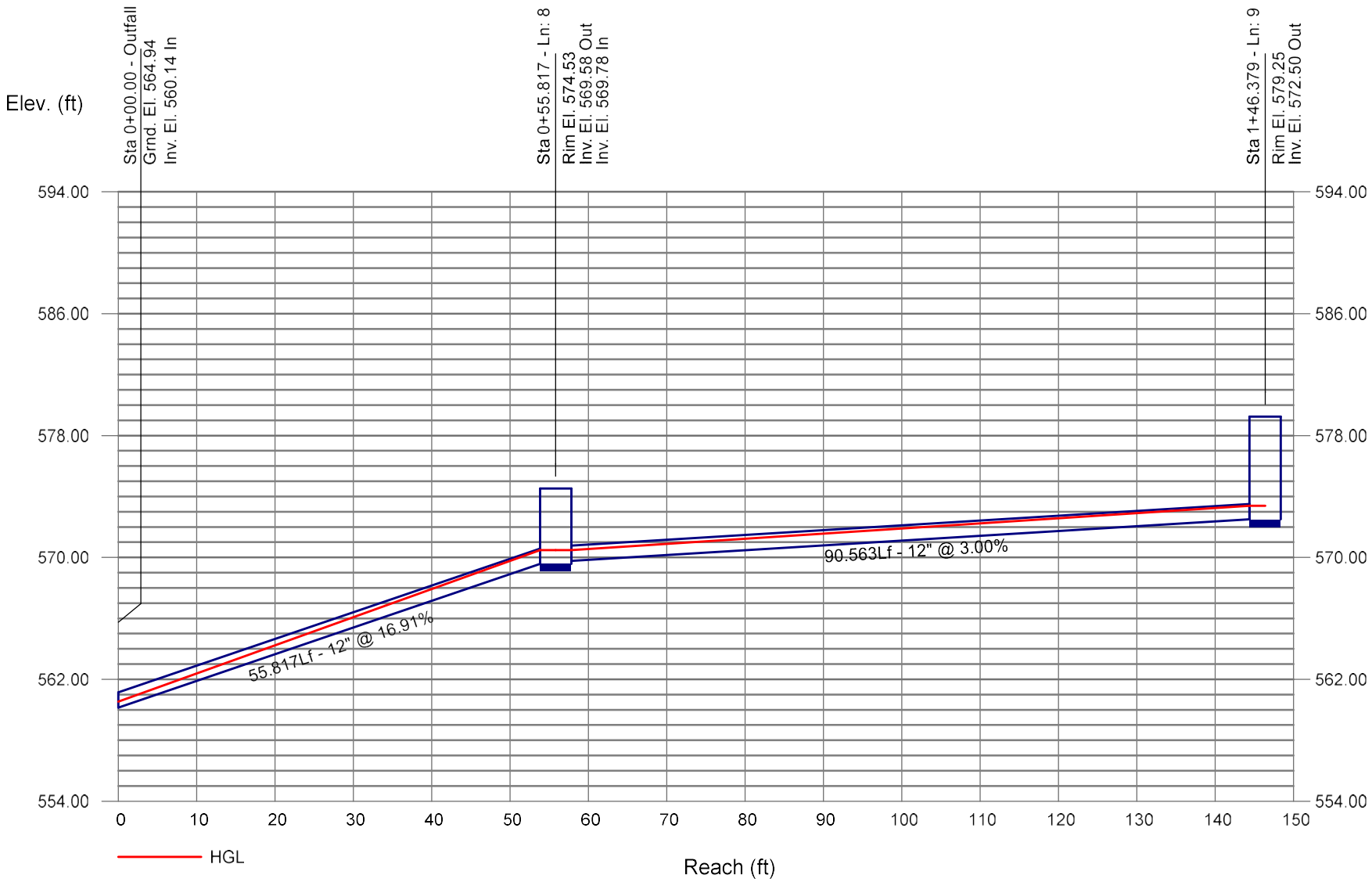
Storm Sewer Profile

Proj. file: M22-8498_STORM NETWORK_2023-04-05.stm



Storm Sewer Profile

Proj. file: M22-8498_STORM NETWORK_2023-04-17.stm



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 1 2023

DOWNSPOUT COLLECTOR 1

Circular

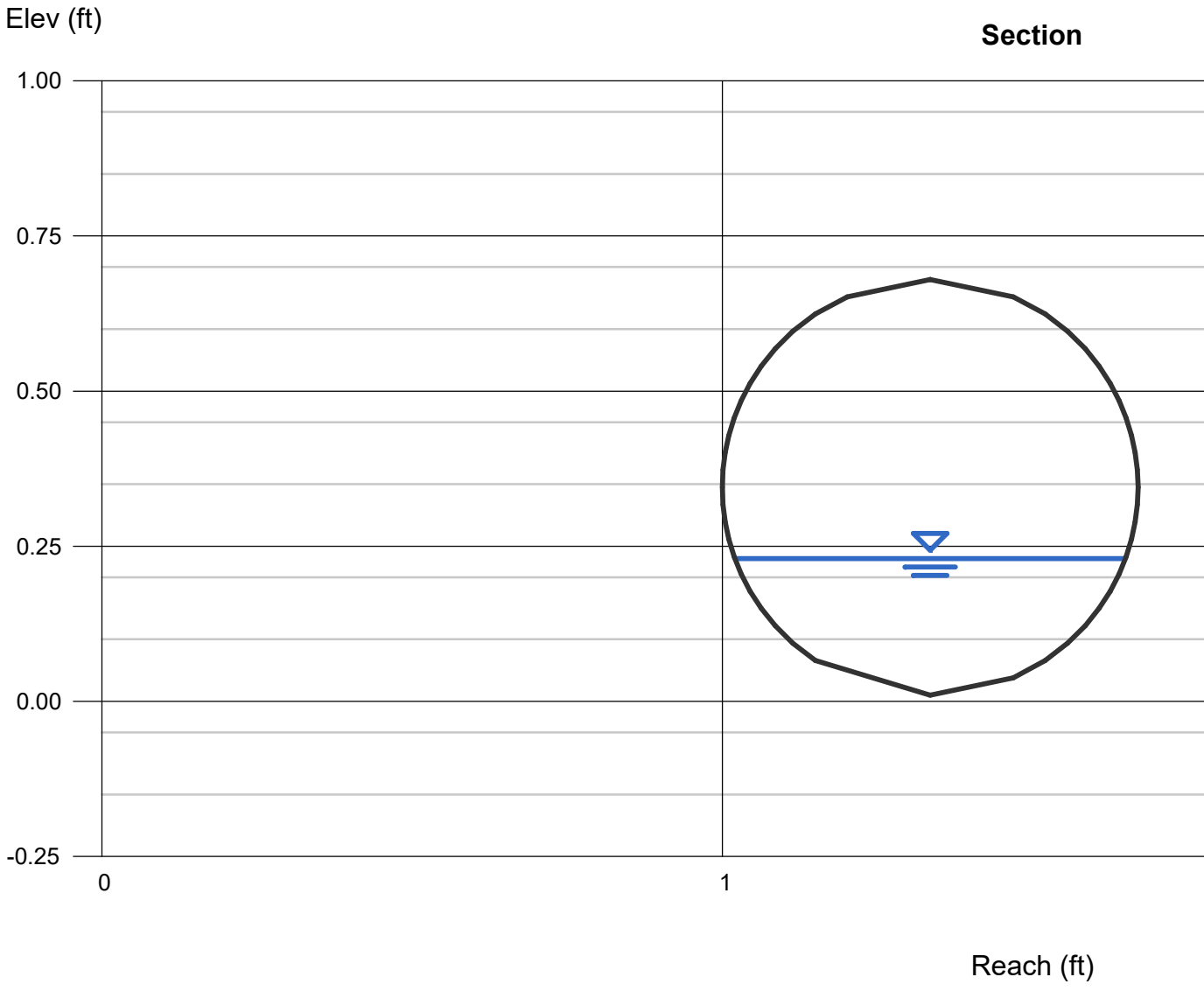
Diameter (ft)	= 0.67
Invert Elev (ft)	= 0.01
Slope (%)	= 2.00
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.46

Highlighted

Depth (ft)	= 0.22
Q (cfs)	= 0.460
Area (sqft)	= 0.10
Velocity (ft/s)	= 4.52
Wetted Perim (ft)	= 0.82
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 0.63
EGL (ft)	= 0.54



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 1 2023

DOWNSPOUT COLLECTOR 8

Circular

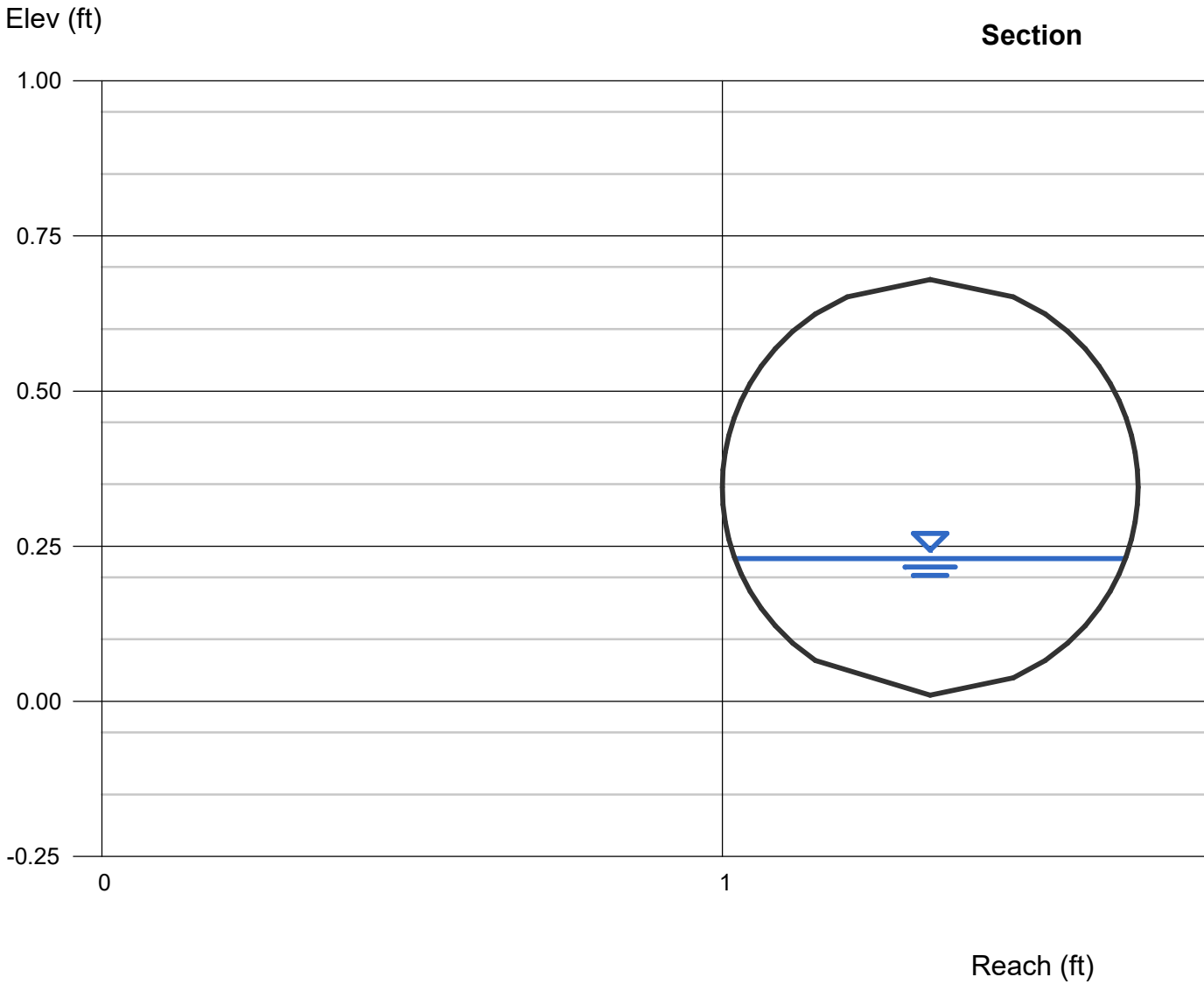
Diameter (ft)	= 0.67
Invert Elev (ft)	= 0.01
Slope (%)	= 2.00
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.46

Highlighted

Depth (ft)	= 0.22
Q (cfs)	= 0.460
Area (sqft)	= 0.10
Velocity (ft/s)	= 4.52
Wetted Perim (ft)	= 0.82
Crit Depth, Yc (ft)	= 0.32
Top Width (ft)	= 0.63
EGL (ft)	= 0.54



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Feb 1 2023

DOWNSPOUT COLLECTOR 13

Circular

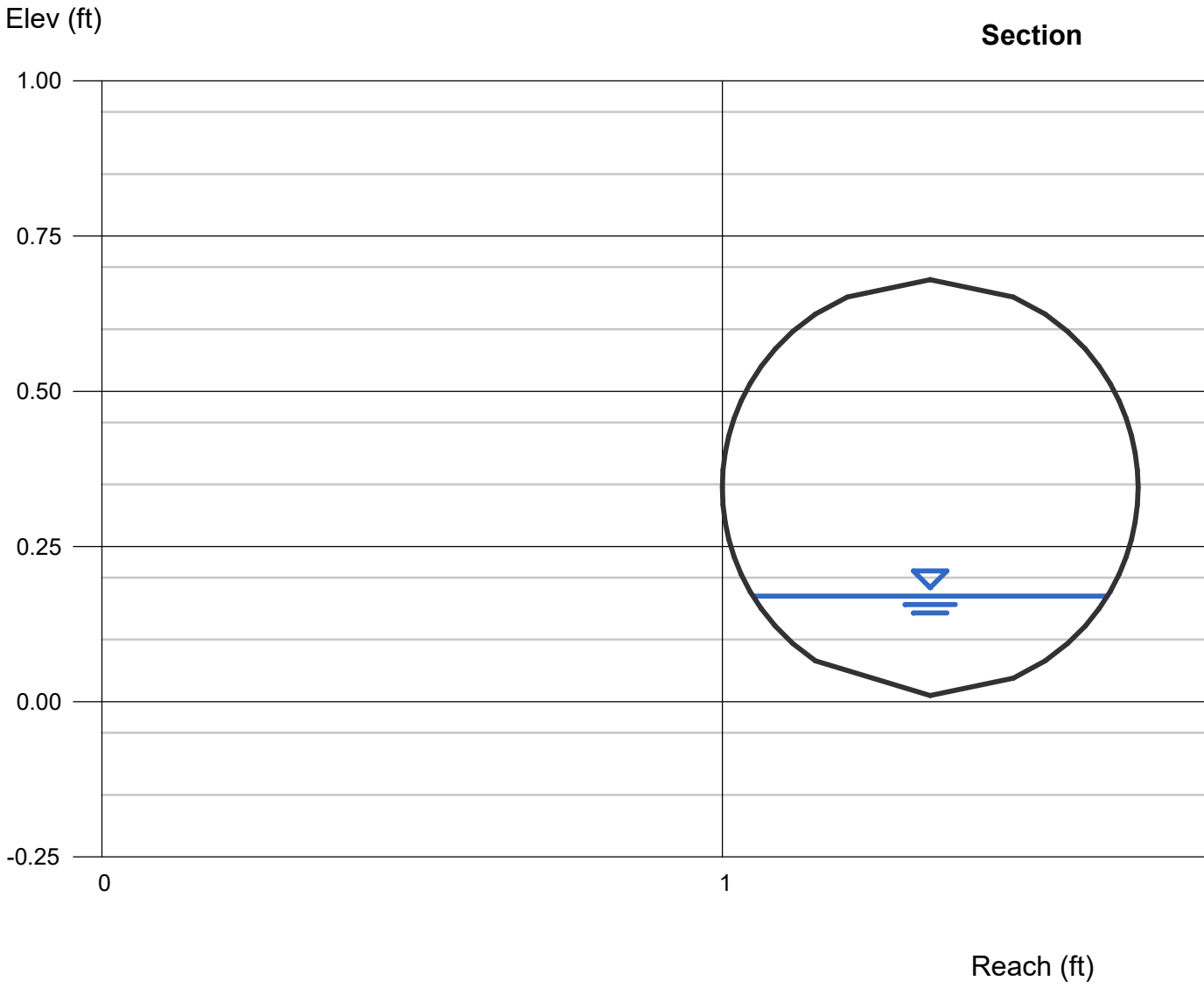
Diameter (ft)	= 0.67
Invert Elev (ft)	= 0.01
Slope (%)	= 2.00
N-Value	= 0.011

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

Depth (ft)	= 0.16
Q (cfs)	= 0.250
Area (sqft)	= 0.07
Velocity (ft/s)	= 3.83
Wetted Perim (ft)	= 0.69
Crit Depth, Yc (ft)	= 0.23
Top Width (ft)	= 0.57
EGL (ft)	= 0.39



Section 6

Swale Calculation

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 24 2023

SWALE

Trapezoidal

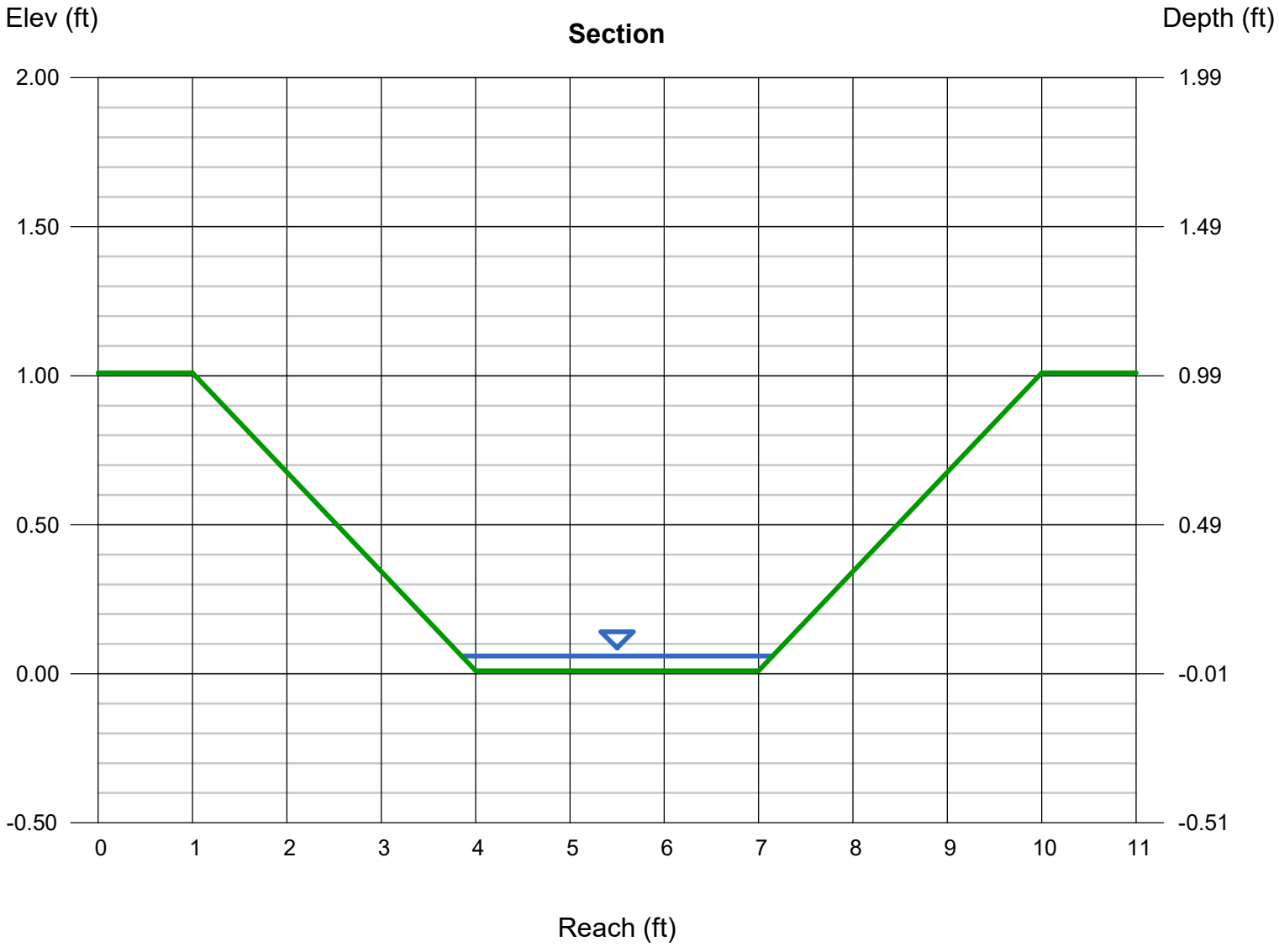
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 0.01
Slope (%)	= 6.89
N-Value	= 0.024

Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.29

Highlighted

Depth (ft)	= 0.05
Q (cfs)	= 0.290
Area (sqft)	= 0.16
Velocity (ft/s)	= 1.84
Wetted Perim (ft)	= 3.32
Crit Depth, Yc (ft)	= 0.07
Top Width (ft)	= 3.30
EGL (ft)	= 0.10



Section 7

WQv Calculation

WATER QUALITY CALCULATIONS
HOSPICE CENTER
O'FALLON, MISSOURI
PROJECT NO. M22-8498

Calculation for Hospice Center Water Quality Volume

Water Quality Volume for Proposed Tributary #1

WQv = [(P)(Rv)(A)(43,560 ft^2)]/12

P = Rainfall Depth = 1.14 inches
Rv = Volumetric Runoff Coefficient = 0.05 + 0.009(I) = 0.05 + 0.009(34) = 0.356
A = Area in Acres = Pavement/Buildings = 0.153 Ac.
Landscaping/Grass = 0.297 Ac.

WQv = [(1.14)(0.356)(0.45 Ac.*43,560 ft^2/Ac.)]/12
WQv = 667 ft^3

Water Quality Volume for Proposed Tributary #2

WQv = [(P)(Rv)(A)(43,560 ft^2)]/12

P = Rainfall Depth = 1.14 inches
Rv = Volumetric Runoff Coefficient = 0.05 + 0.009(I) = 0.05 + 0.009(85) = 0.813
A = Area in Acres = Pavement/Buildings = 0.995 Ac.
Landscaping/Grass = 0.175 Ac.

WQv = [(1.14)(0.813)(1.17 Ac.*43,560 ft^2/Ac.)]/12
WQv = 3,936 ft^3

Extended Detention Water Quality for Tributary #1

Extended Detention WQv = WQv(1/2)
Extended Detention WQv = 334 ft^3

Extended Detention Water Quality for Tributary #2

Extended Detention WQv = WQv(1/2)
Extended Detention WQv = 1,968 ft^3

Pretreatment Calculation for Proposed Tributary #1

V_p = 0.25WQv = 0.25*334 = **83.5 ft^3**

Forebay Volume = 260 ft^3 > 83.5 ft^3, Pretreatment has been accounted for

Pretreatment Calculation for Proposed Tributary #2

V_p = 0.25WQv = 0.25*1,968 = **492 ft^3**

Forebay Volume = 495 ft^3 > 492 ft^3, Pretreatment has been accounted for

Nested Surface Sand Filter Calculation

$A_{sf} = (0.066)(WQ_v)$
A_{sf} = (0.066)(1,547) = 102 ft^2, Forebay area = 516 ft^2

$$A_f = \frac{(WQ_v)(d_f)}{[(k)(h_f + d_f)(t_f)}$$

WQ_v = 1,547 ft^3 h_f = 2.5 ft.
d_f = 1.5 ft t_f = 1.67 days
k = 3.5 ft/day

A_f = ((1,547)(1.5))/((3.5)(2.5+1.5)(1.67)) = 100 ft^2

$$V = \frac{H}{3}\left(A_1 + A_2 + \sqrt{A_1 A_2}\right)$$

H = 1.0 ft.
A_1 = 700 ft^2
A_2 = 1,788 ft^2

V_{top} = 1/3(700+1788+(700*1788)^0.5 = 1,469 ft^3
$V_{filter\ media}$ = (0.4)(700)(1.5) = 420 ft^3
V_{total} = $V_{forebay}$ + V_{top} + $V_{filter\ media}$ + V_{ED} = 516 + 1,469 + 420 + 334 + 1968 = **4,707 ft^3**

V_{total} = 4,707 ft^3 > 4,603 ft^3 Therefore, all water quality volume is accounted for.

WORKSHEET 2

PROJECT:	M22-8498A								
LOCATION:	Hospice Center; Water Quality Drainage Area								
DESIGNED BY:	CJD		DATE:	1/11/2023			Area :	TRIB.-1	
CHECKED BY:	ESK		DATE:	1/11/2023		☐ Present		☑ Developed	

Soil name and hydrologic group (Appendix A)	Cover description (Cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN	Area Ac.	Area (Ac.)	Product of CN x Area
D	IMPERVIOUS PAVED PARKING, ROOFS, DRIVEWAYS, ETC.	98	1.15	1.150	112.70
D	OPEN SPACE-GOOD CONDITION (GRASS COVER > 75%)	80	0.49	0.490	39.20
D	STREETS/ROADS-GRAVEL	91	0.01	0.010	0.91
		0	0	0.000	0.00
		0	0	0.000	0.00
			Total =	1.650	152.81
				Weighted CN =	93

Frequency (YR.) =	1	2	25	100		S =	0.75
Rainfall, P (24-HOUR) (IN.) =	2.50	3.10	5.60	7.21		I =	0.15
Runoff, Q (IN.)=	1.78	2.35	4.79	6.38			

WORKSHEET 3

SHEET FLOW								☐ Present	☑ Developed
SEGMENT ID =	A-B								
SURFACE DESCRIPTION =	GRASS-DENSE GRASSES								
MANNING'S n VALUE =	0.24								
FLOW LENGTH (<100 FT.) =	100								
2 YEAR, 24 HOUR RAINFALL =	3.10								
LAND SLOPE =	0.043								
T_t =	0.18								0.18
CONCENTRATED FLOW									
SEGMENT ID =	B-C								
SURFACE DESCRIPTION =	UNPAVED								
FLOW LENGTH =	72								
WATERCOURSE SLOPE, s =	0.170								
AVERAGE VELOCITY, V =	6.65								
T_t =	0.00								0.00
CHANNEL FLOW									
SEGMENT ID =									
SEGMENT TYPE =									
PIPE DIAMETER, (FT) =									
SEGMENT DESCRIPTION =									
CROSS AREA, a (FT^2) =									
WETTED PERIMETER, P (FT) =									
HYDRAULIC RADIUS, r (FT) =									
CHANNEL SLOPE, s (FT/FT) =									
MANNING'S n VALUE =									
AVERAGE VELOCITY, V (FT/s) =									
FLOW LENGTH, L (FT) =									
T_t =									0.00
total T_C (hrs.) =									0.18

WORKSHEET 4

Drainage Area, A (mi^2) =	0.0026				Rainfall Distribution =		II
Runoff Curve Number, CN =	93				Ponds/Swamps Area =		0
Time of Concentration, T_c =	0.18					☐ Present	☑ Developed

Frequency (YR.) =	1	2	25	100		
Rainfall, P (24-HOUR) (IN.) =	2.50	3.10	5.60	7.21		
Initiall Abstraction, I_a =	0.151	0.151	0.151	0.151		
I_a/P =	0.06	0.05	0.03	0.02		
Unit Peak Discharge, q_u =	854	862	881	892		
Runoff , Q =	1.78	2.35	4.79	6.38		
Pond/Swamp Factor, F_p =	1	1	1	1		
Peak Discharge, q_p =	3.95	5.27	10.97	14.80		

Appendix – Supporting Documents

NRCS Hydrologic Soils Group Map

NRCS Saturated Hydraulic Conductivity

Map Scale: 1:1,790 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: St. Charles County, Missouri
Survey Area Data: Version 23, Sep 7, 2022

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

Date(s) aerial images were photographed: Sep 17, 2018—Oct 24, 2018

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
60124	Harvester-Urban land complex, 2 to 9 percent slopes	C	15.2	100.0%
Totals for Area of Interest			**15.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Map Scale: 1:1,790 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

= 3.0559

Not rated or not available

Soil Rating Lines

= 3.0559

Not rated or not available

Soil Rating Points

= 3.0559

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: St. Charles County, Missouri
Survey Area Data: Version 23, Sep 7, 2022

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

Date(s) aerial images were photographed: Sep 17, 2018—Oct 24, 2018

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

Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
60124	Harvester-Urban land complex, 2 to 9 percent slopes	3.0559	15.2	100.0%
Totals for Area of Interest			**15.2**	**100.0%**

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Component" returns the attribute value associated with the component with the highest percent composition in the map unit. If more than one component shares the highest percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher attribute value should be returned in the case of a percent composition tie. The result returned by this aggregation method may or may not represent the dominant condition throughout the map unit.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Fastest

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Interpret Nulls as Zero: No

This option indicates if a null value for a component should be converted to zero before aggregation occurs. This will be done only if a map unit has at least one component where this value is not null.

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

For an attribute of a soil horizon, a depth qualification must be specified. In most cases it is probably most appropriate to specify a fixed depth range, either in centimeters or inches. The Bottom Depth must be greater than the Top Depth, and the Top Depth can be greater than zero. The choice of "inches" or "centimeters" only applies to the depth of soil to be evaluated. It has no influence on the units of measure the data are presented in.

When "Surface Layer" is specified as the depth qualifier, only the surface layer or horizon is considered when deriving a value for a component, but keep in mind that the thickness of the surface layer varies from component to component.

When "All Layers" is specified as the depth qualifier, all layers recorded for a component are considered when deriving the value for that component.

Whenever more than one layer or horizon is considered when deriving a value for a component, and the attribute being aggregated is a numeric attribute, a weighted average value is returned, where the weighting factor is the layer or horizon thickness.

Top Depth: 0

Bottom Depth: 60

Units of Measure: Inches