

AS-BUILT STORMWATER CALCULATIONS FOR THE PRINCETON SENIOR LIVING COMMUNITY

APPLICATION NO. PL2019218

SE Oldham Parkway

Lee Summit, Missouri

South Prairie Lee Watershed

Prepared for:

Lee's Summit Senior Community, LLC

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March 2022

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Missouri Engineering Certificate of Authority #001592

Olsson Project No. 018-1450



TABLE OF CONTENTS

1. AS-BUILT SUMMARY.....	1
2. NORTHWEST BIORETENTION	4

LIST OF FIGURES

Figure 1. EXISITING CONDITION DRAINAGE AREA MAP.....	5
Figure 2. PROPOSED CONDITION DRAINAGE AREA MAP	6

LIST OF TABLES

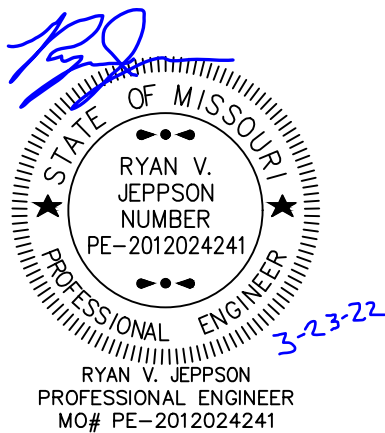
Table 1.1. DESIGN DETENTION STAGE STORAGE.....	2
Table 1.2. AS-BUILT DETENTION STAGE STORAGE	2
Table 2.1. DRY DETENTION FACILITY DESIGN SUMMARY.....	3
Table 2.1. DRY DETENTION FACILITY AS-BUILT SUMMARY	3
Table 3.1. POINT OF INTEREST #1 AS-BUILT SUMMARY.....	3
Table 4.1. AS-BUILT NORTHWEST BIORETENTION STAGE STORAGE.....	4

APPENDICES

APPENDIX A As-Built Hydrology & Detention Calculations

1. AS-BUILT SUMMARY

The following information presents the as-built calculations for The Princeton Senior Living Community located at 1701 S.E. Oldham Parkway in Lee's Summit, Missouri. Design information is followed by the as-built data collected by the Olsson survey department on March 7, 2022. Volume and hydrology calculation using the as-built information, indicate that the northwest Detention Basin and Bioretention facility will function as intended by design.



Ryan Jeppson, P.E.
Senior Engineer
Olsson General Civil Team

TABLE 1.1 DESIGN DETENTION STAGE STORAGE

Row	Stage	Elevation	Contour Area	Incremental Storage	Total Storage
	(ft)	(ft)	(sqft)	(cuft)	(cuft)
0	0.00	1013.00	0	0.000	0.000
1	1.00	1014.00	4,594	1,531	1,531
2	2.00	1015.00	11,600	7,831	9,362
3	3.00	1016.00	14,749	13,142	22,504
4	4.00	1017.00	17,255	15,984	38,488
5	5.00	1018.00	19,894	18,557	57,045
6	6.00	1019.00	22,676	21,268	78,312
7	7.00	1020.00	31,071	26,761	105,073
8	8.00	1021.00	36,435	33,714	138,787
9	9.00	1022.00	41,749	39,058	177,845

TABLE 1.2 AS-BUILT DETENTION STAGE STORAGE

Row	Stage	Elevation	Contour Area	Incremental Storage	Total Storage
	(ft)	(ft)	(sqft)	(cuft)	(cuft)
0	0.00	1013.19	0	0.000	0.000
1	0.81	1014.00	3,719	1,004	1,004
2	1.81	1015.00	10,687	6,903	7,907
3	2.81	1016.00	14,128	12,366	20,273
4	3.81	1017.00	16,167	15,135	35,408
5	4.81	1018.00	18,732	17,432	52,840
6	5.81	1019.00	25,153	21,862	74,701
7	6.81	1020.00	30,617	27,838	102,539
8	7.81	1021.00	36,188	33,360	135,899
9	8.81	1022.00	43,812	39,935	175,835

TABLE 2.1 DRY DETENTION FACILITY DESIGN SUMMARY

Return Frequency	Developed Q_{DEV} (cfs)	Detention Volume (cf)	WSE (ft)
2	1.69	51,638	1017.71
10	4.58	85,021	1019.25
100	10.44	149,104	1021.26

TABLE 2.2 DRY DETENTION FACILITY AS-BUILT SUMMARY

Return Frequency	Developed Q_{DEV} (cfs)	Detention Volume (cf)	WSE (ft)
2	2.10	49,812	1017.83
10	5.05	83,631	1019.32
100	11.61	145,635	1021.24

TABLE 3.1. POINT OF INTEREST #1 AS-BUILT SUMMARY

Return Frequency	Existing $Q_{ALLOWABLE}$ (cfs)	Developed Q_{DEV} (cfs)
2	15.96	13.22
10	34.50	29.25
100	72.08	61.91

2. NORTHWEST BIORETENTION

Design Water Quality Volume WQv= 9,547 CF

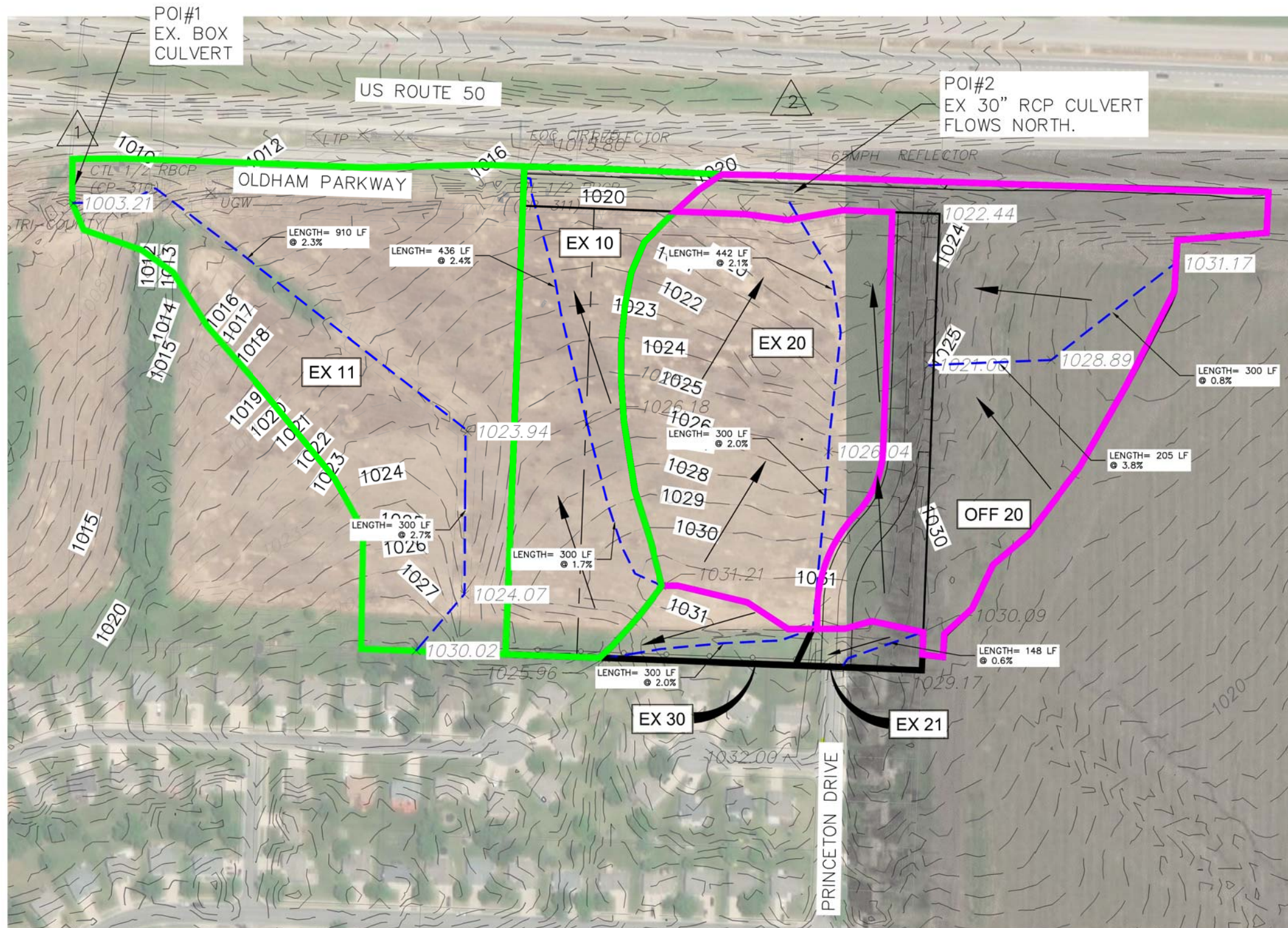
As-Built Water Quality Volume WQV= 12,364 CF

TABLE 4.1 AS-BUILT NORTHWEST BIORETENTION STAGE STORAGE

Row	Stage	Elevation	Contour Area	Incremental Storage	Total Storage
	(ft)	(ft)	(sqft)	(cuft)	(cuft)
0	0.00	1018.00	570	0.000	0.000
1	0.25	1018.25	1,967	300	300
2	0.50	1018.50	2,559	564	864
3	0.75	1018.75	3,322	733	1,597
4	1.00	1019.00	4,636	990	2,587
5	1.25	1019.25	5,346	1,247	3,833
6	1.50	1019.50	5,947	1,411	5,244
7	1.75	1019.75	6,538	1,560	6,804
8	2.00	1020.00	7,119	1,706	8,510
9	2.25	1020.25	7,702	1,852	10,362
10	2.50	1020.50	8,319	2,002	12,364

Overflow weir elevation 1020.66

DWG: F:\2018\1001-1500\018-1450\40-Design\AutoCAD\Preliminary Plans\C_XHYDR_81450.dwg
DATE: Aug 13, 2019 10:05am XREFS: C_PBASE_81450 V_XBOU_81450 V_TOPO_81450
USER: rjeppson



LEGEND

- POI#1 DRAINAGE AREA BOUNDARY
- POI#2 DRAINAGE AREA BOUNDARY
- TC ROUTE
- FLOW DIRECTION
- POINT OF INTEREST

SUMMARY TABLE

SUBBASIN	AREA (AC)	CN	TC (MIN.)
EX 10	3.98	74	26.30
EX 11	8.27	74	25.10
EX 20	6.02	74	25.60
EX 21	0.31	74	18.81
EX30	0.69	74	19.75
OFF 20	7.37	74	28.90

EXISTING CONDITIONS DRAINAGE AREA MAP

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DRAWN BY: TDD
DATE: 08/13/2019

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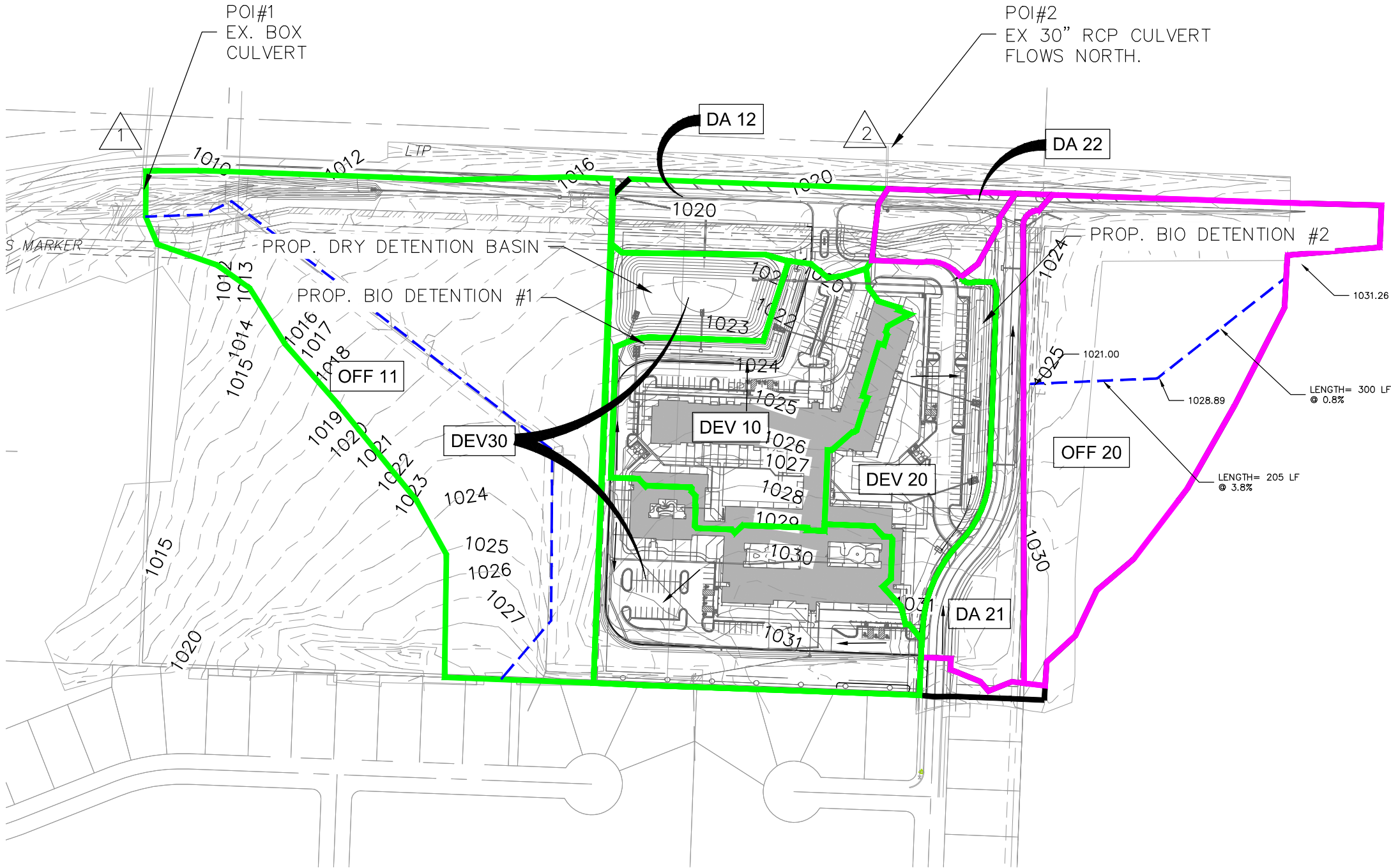
550 St. Louis Street
Springfield, MO 65806
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FIGURE
F-1

LEGEND

- POI#1 DRAINAGE AREA BOUNDARY
- POI#2 DRAINAGE AREA BOUNDARY
- TC ROUTE
- FLOW DIRECTION
- POINT OF INTEREST

SUMMARY TABLE			
SUBBASIN	AREA (AC)	CN	TC (MIN.)
DEV 10	2.94	92	5.00
DA 12	1.21	87	5.00
DEV 30	4.08	89	5.00
DEV 20	2.40	89	5.00
DA 21	1.50	88	5.00
DA 22	0.54	85	5.00
EX 11	8.28	74	25.60
OFF 20	5.39	74	32.70



PROJECT: 018-1450
DRAWN BY: TDD
DATE: 08/13/2019

DEVELOPED CONDITIONS DRAINAGE AREA MAP

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APPENDIX A

As-Built Hydrology & Detention Calculations

Hydraflow Table of Contents

C:\Users\1001151001\OneDrive\Design\Calcs\GNCV\Stormwater\HYDRAFLOW\81450_24-HR ANALYSIS_AS-BUILT.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Watershed Model Schematic..... 1

2 - Year

Summary Report.....	2
Hydrograph Reports.....	3
Hydrograph No. 1, SCS Runoff, EX 10.....	3
TR-55 Tc Worksheet.....	4
Hydrograph No. 2, SCS Runoff, EX 11.....	5
TR-55 Tc Worksheet.....	6
Hydrograph No. 3, Combine, EX POI #1.....	7
Hydrograph No. 4, SCS Runoff, DEV 10.....	8
Hydrograph No. 5, SCS Runoff, DEV 30.....	9
Hydrograph No. 6, SCS Runoff, DEV 20.....	10
Hydrograph No. 7, Combine, COMBINE AT DETENTION.....	11
Hydrograph No. 8, Reservoir, DETENTION ASBUILT.....	12
Pond Report - AS-BUILT DRY DETENTION 1.....	13
Hydrograph No. 9, SCS Runoff, DA 12.....	14
Hydrograph No. 10, Combine, POI #1.....	15

10 - Year

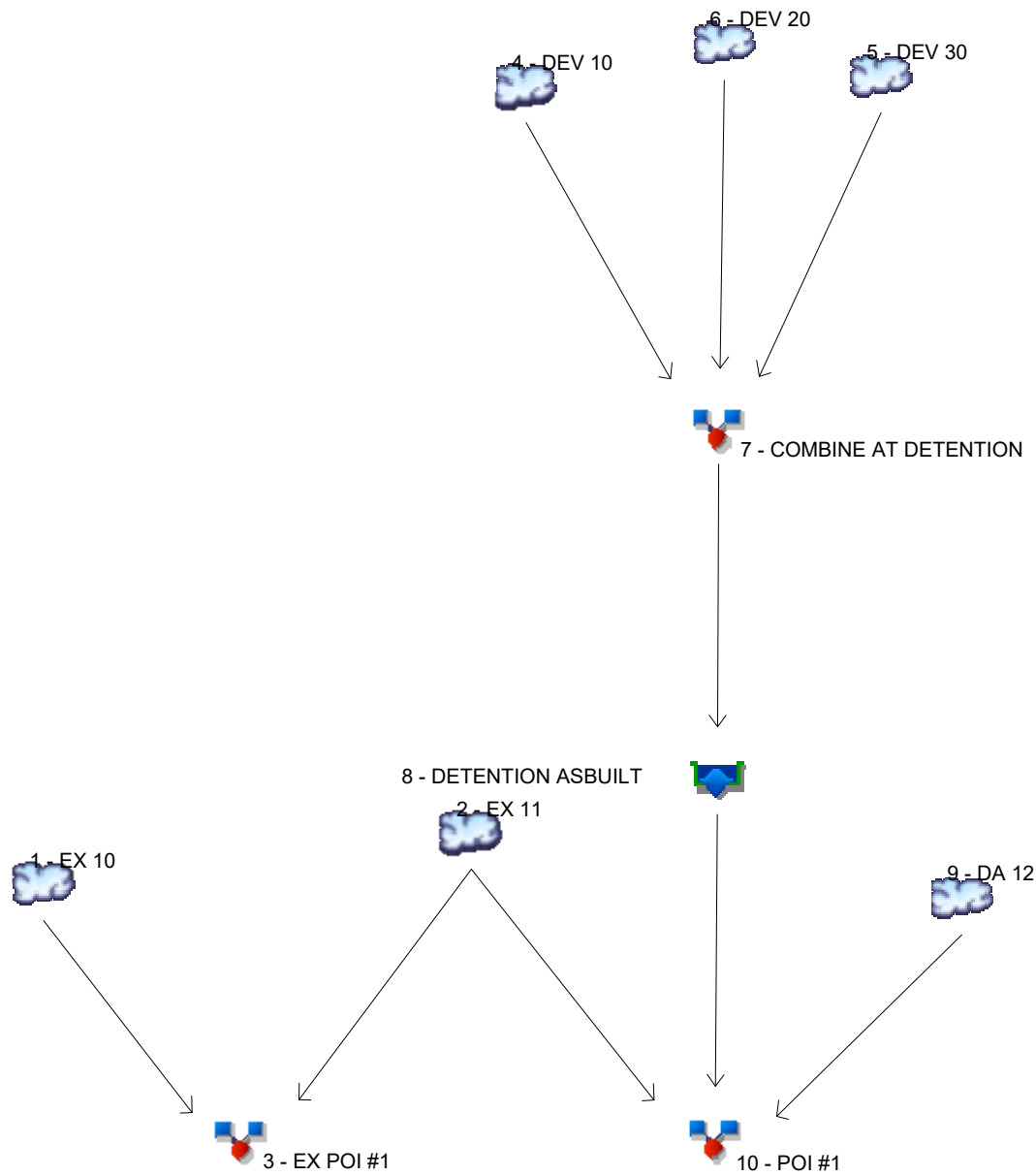
Summary Report.....	16
Hydrograph Reports.....	17
Hydrograph No. 1, SCS Runoff, EX 10.....	17
Hydrograph No. 2, SCS Runoff, EX 11.....	18
Hydrograph No. 3, Combine, EX POI #1.....	19
Hydrograph No. 4, SCS Runoff, DEV 10.....	20
Hydrograph No. 5, SCS Runoff, DEV 30.....	21
Hydrograph No. 6, SCS Runoff, DEV 20.....	22
Hydrograph No. 7, Combine, COMBINE AT DETENTION.....	23
Hydrograph No. 8, Reservoir, DETENTION ASBUILT.....	24
Hydrograph No. 9, SCS Runoff, DA 12.....	25
Hydrograph No. 10, Combine, POI #1.....	26

100 - Year

Summary Report.....	27
Hydrograph Reports.....	28
Hydrograph No. 1, SCS Runoff, EX 10.....	28
Hydrograph No. 2, SCS Runoff, EX 11.....	29
Hydrograph No. 3, Combine, EX POI #1.....	30
Hydrograph No. 4, SCS Runoff, DEV 10.....	31
Hydrograph No. 5, SCS Runoff, DEV 30.....	32
Hydrograph No. 6, SCS Runoff, DEV 20.....	33
Hydrograph No. 7, Combine, COMBINE AT DETENTION.....	34
Hydrograph No. 8, Reservoir, DETENTION ASBUILT.....	35
Hydrograph No. 9, SCS Runoff, DA 12.....	36
Hydrograph No. 10, Combine, POI #1.....	37

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX 10
2	SCS Runoff	EX 11
3	Combine	EX POI #1
4	SCS Runoff	DEV 10
5	SCS Runoff	DEV 30
6	SCS Runoff	DEV 20
7	Combine	COMBINE AT DETENTION
8	Reservoir	DETENTION ASBUILT
9	SCS Runoff	DA 12
10	Combine	POI #1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	5.183	2	730	19,724	-----	-----	-----	EX 10
2	SCS Runoff	10.78	2	730	41,034	-----	-----	-----	EX 11
3	Combine	15.96	2	730	60,759	1, 2	-----	-----	EX POI #1
4	SCS Runoff	13.29	2	716	28,396	-----	-----	-----	DEV 10
5	SCS Runoff	17.02	2	716	35,433	-----	-----	-----	DEV 30
6	SCS Runoff	10.01	2	716	20,843	-----	-----	-----	DEV 20
7	Combine	40.33	2	716	84,673	4, 5, 6	-----	-----	COMBINE AT DETENTION
8	Reservoir	2.096	2	774	84,663	7	1017.83	49,812	DETENTION ASBUILT
9	SCS Runoff	4.750	2	716	9,768	-----	-----	-----	DA 12
10	Combine	13.22	2	730	135,465	2, 8, 9	-----	-----	POI #1
F:\2018\1001-1500\018-1450\40-Design\Calcs\Runoff\Stormwater\HYDRAFLOW\W1450_24\H3\ASBUILT\ASBUILT					F:\2018\1001-1500\018-1450\40-Design\Calcs\Runoff\Stormwater\HYDRAFLOW\W1450_24\H3\ASBUILT\ASBUILT.gpw				

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 1

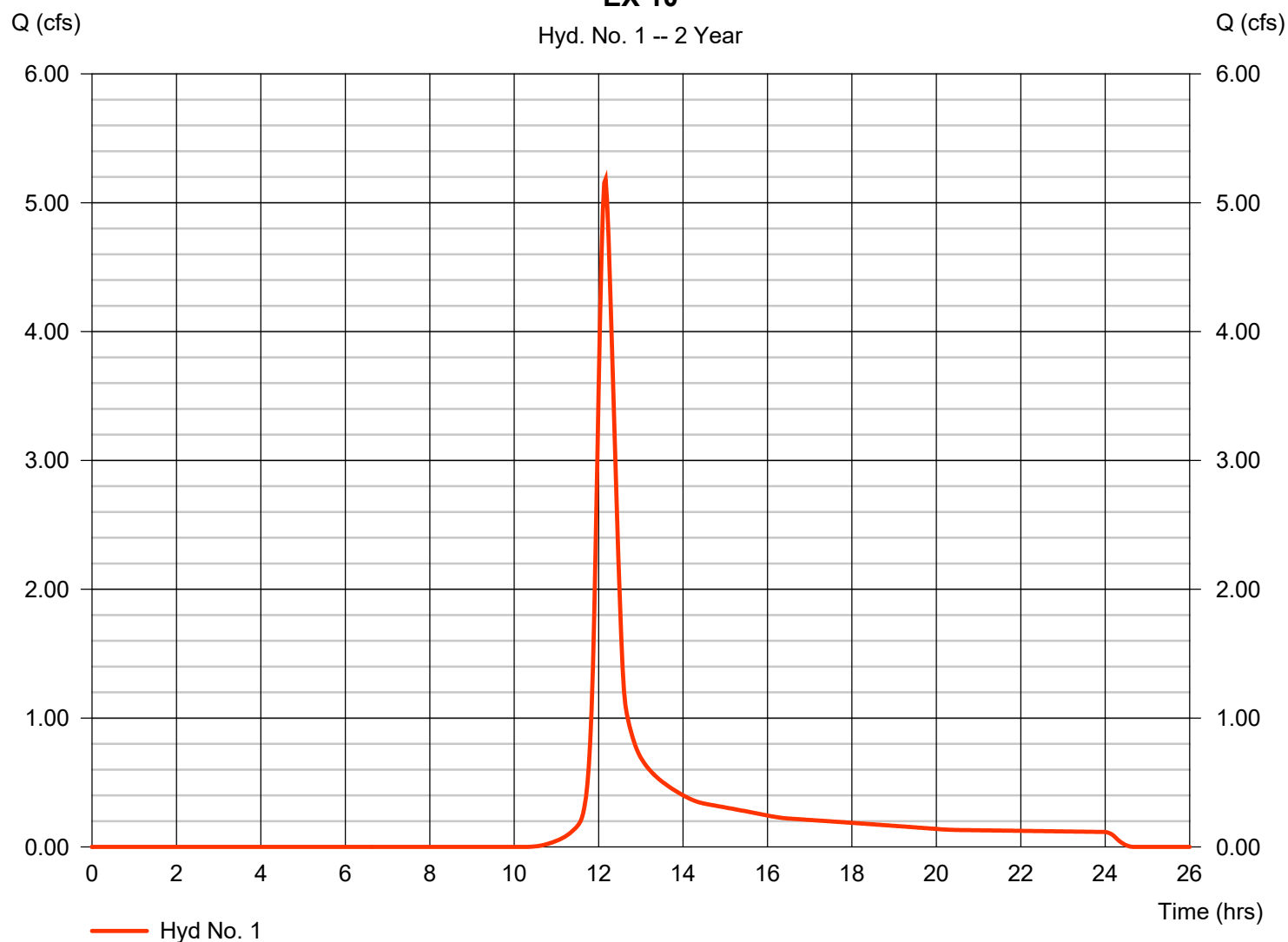
EX 10

Hydrograph type	= SCS Runoff	Peak discharge	= 5.183 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 19,724 cuft
Drainage area	= 3.980 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.30 min
Total precip.	= 3.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.090 \times 98) + (3.890 \times 74)] / 3.980$

EX 10

Hyd. No. 1 -- 2 Year



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 1

EX 10

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.150	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.71	0.00	0.00	
Land slope (%)	= 1.70	0.00	0.00	
Travel Time (min)	= 23.39	+	0.00	+
			0.00	= 23.39
Shallow Concentrated Flow				
Flow length (ft)	= 435.00	0.00	0.00	
Watercourse slope (%)	= 2.40	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.50	0.00	0.00	
Travel Time (min)	= 2.90	+	0.00	+
			0.00	= 2.90
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	(0)0.0	0.0	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				26.30 min

Hydrograph Report

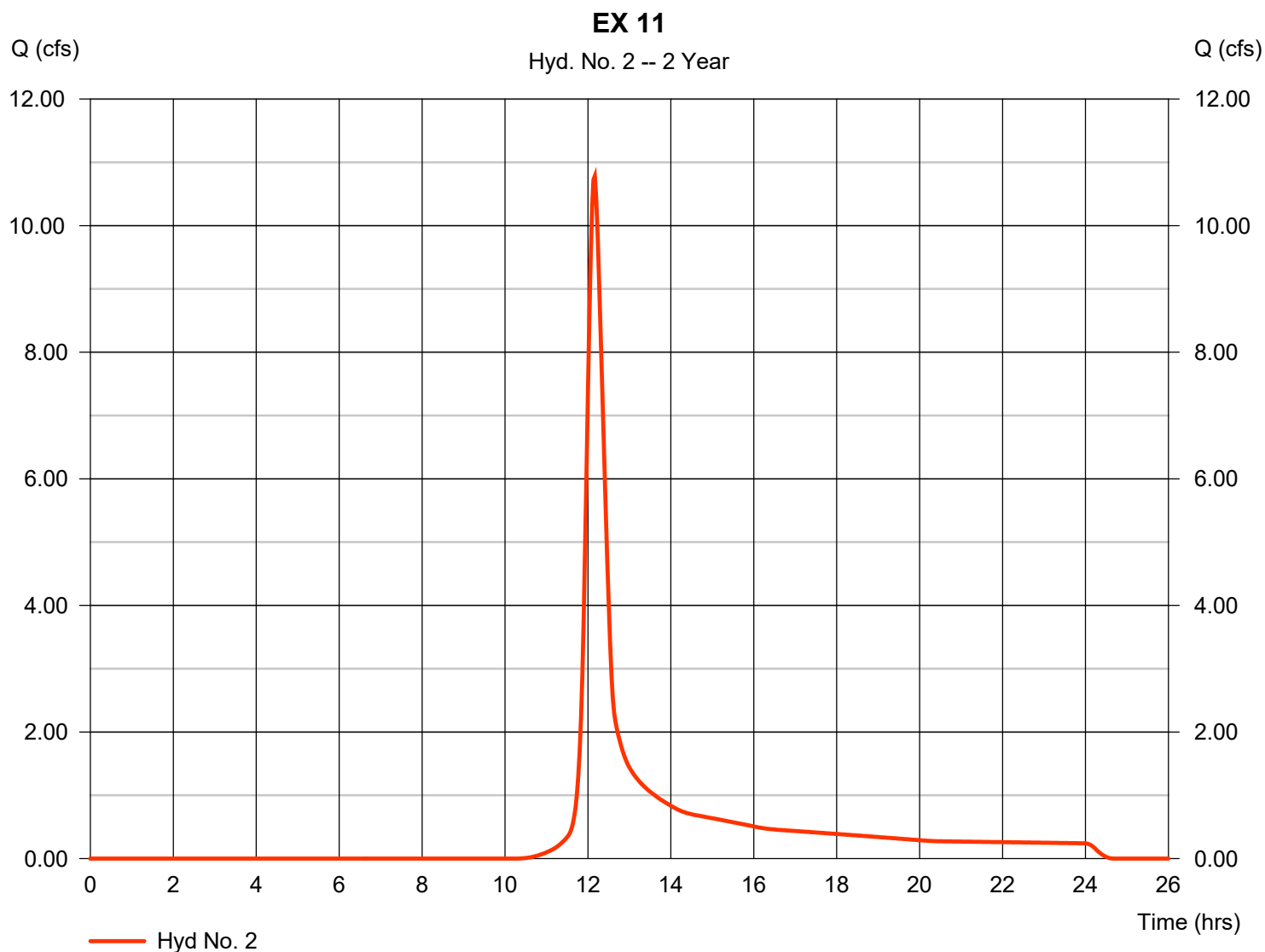
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 2

EX 11

Hydrograph type	= SCS Runoff	Peak discharge	= 10.78 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 41,034 cuft
Drainage area	= 8.280 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.60 min
Total precip.	= 3.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 2

EX 11

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.150	0.011	0.011	
Flow length (ft)	= 300.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.71	0.00	0.00	
Land slope (%)	= 2.70	0.00	0.00	
Travel Time (min)	= 19.44	+	0.00	+
			0.00	= 19.44
Shallow Concentrated Flow				
Flow length (ft)	= 910.00	0.00	0.00	
Watercourse slope (%)	= 2.30	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.45	0.00	0.00	
Travel Time (min)	= 6.20	+	0.00	+
			0.00	= 6.20
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	(0)0.0	0.0	0.0	
Travel Time (min)	= 0.00	+	0.00	+
			0.00	= 0.00
Total Travel Time, Tc				25.60 min

Hydrograph Report

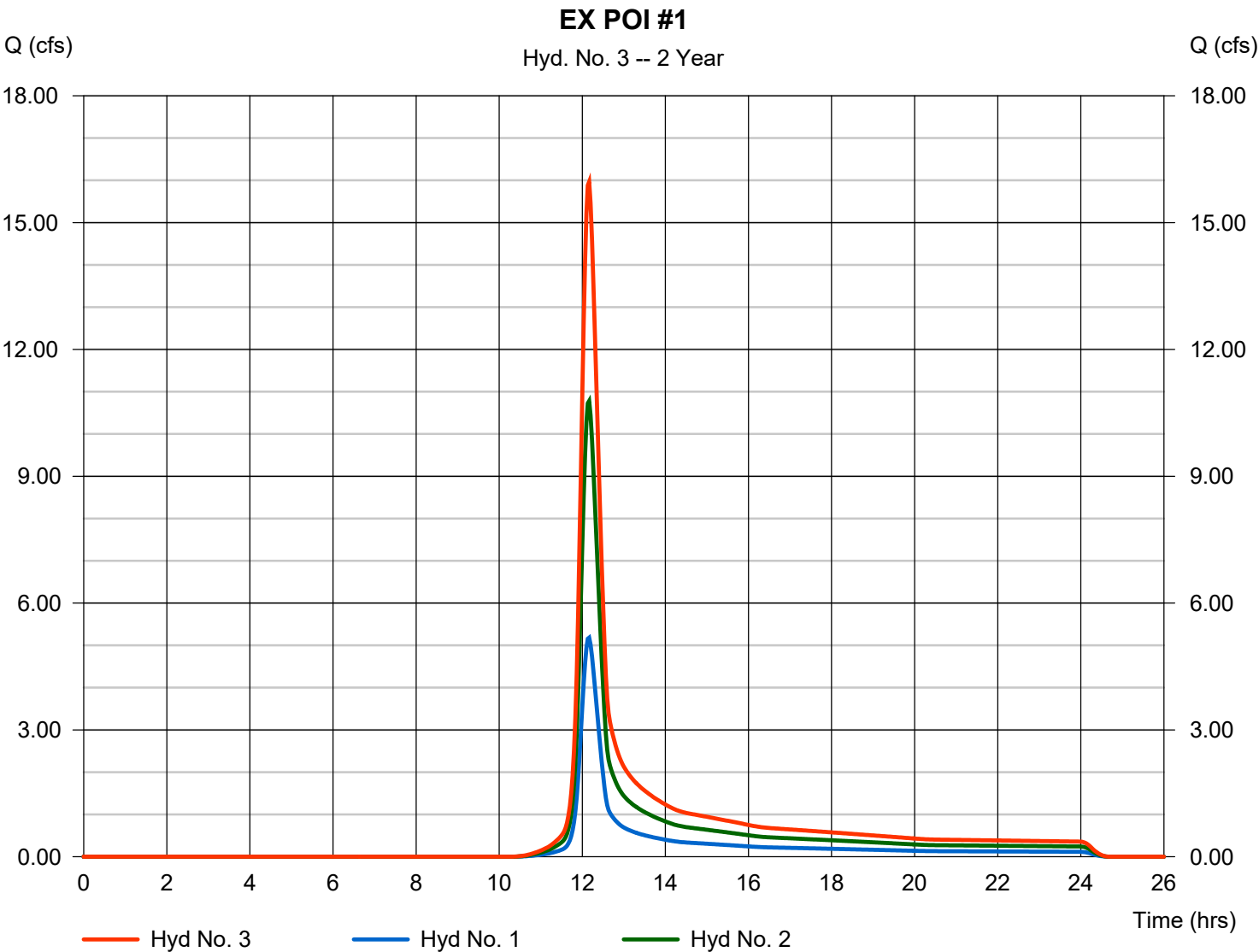
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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Hyd. No. 3

EX POI #1

Hydrograph type	= Combine	Peak discharge	= 15.96 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 60,759 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 12.260 ac



Hydrograph Report

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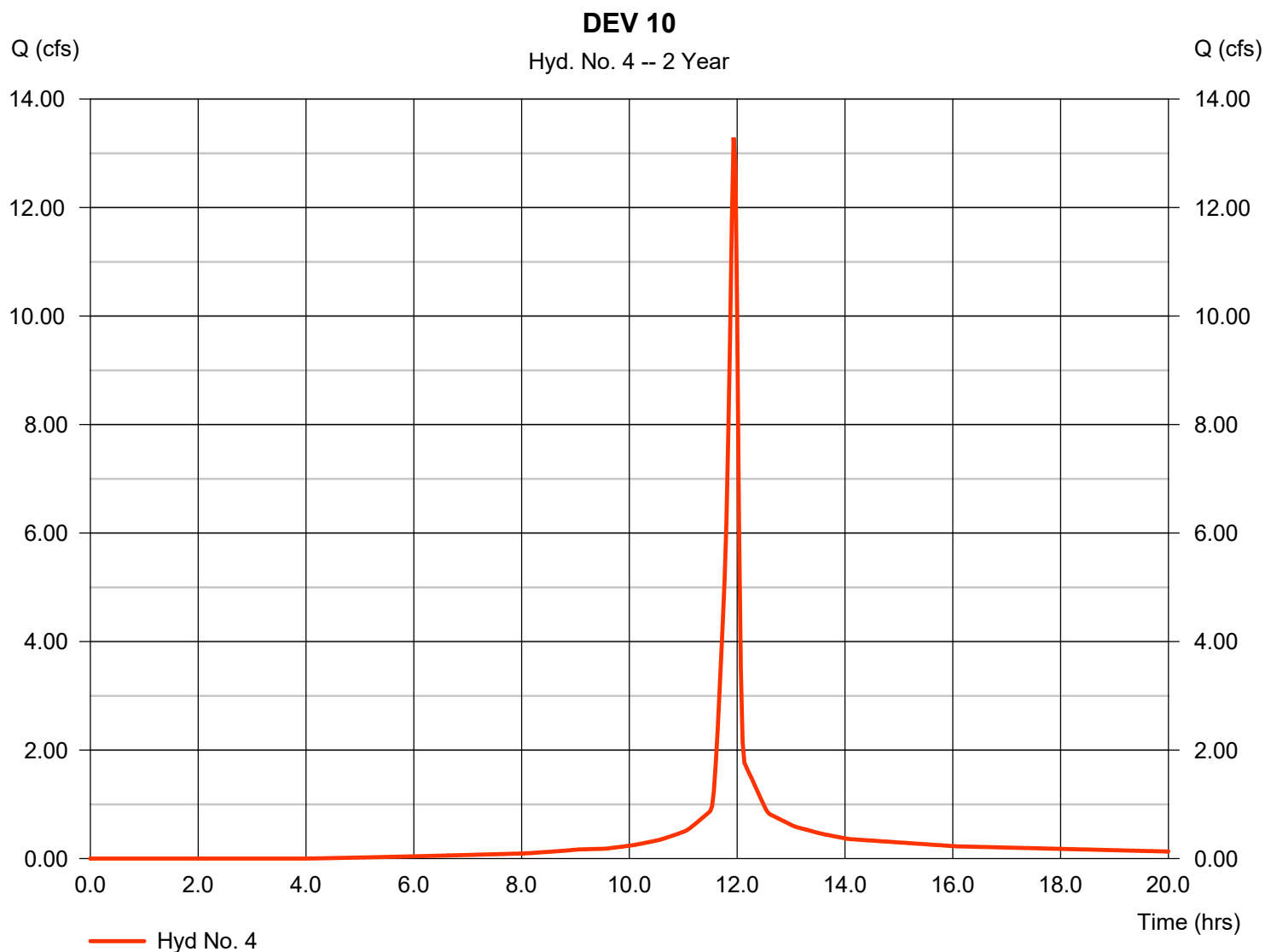
Wednesday, 03 / 23 / 2022

Hyd. No. 4

DEV 10

Hydrograph type	= SCS Runoff	Peak discharge	= 13.29 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 28,396 cuft
Drainage area	= 2.940 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.970 \times 98) + (0.970 \times 80)] / 2.940$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

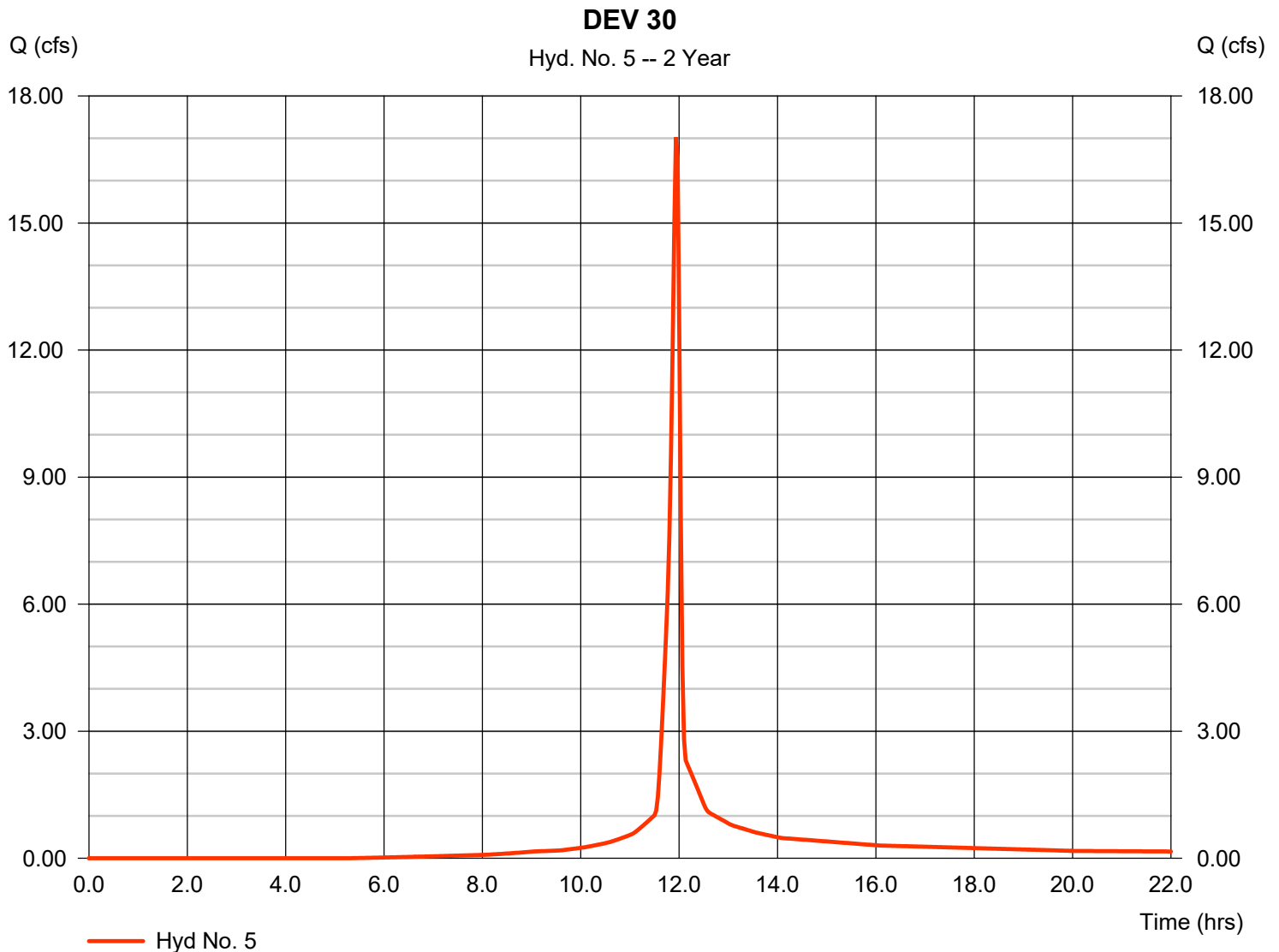
Wednesday, 03 / 23 / 2022

Hyd. No. 5

DEV 30

Hydrograph type	= SCS Runoff	Peak discharge	= 17.02 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 35,433 cuft
Drainage area	= 4.080 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.71 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(2.040 \times 98) + (2.040 \times 80)] / 4.080$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

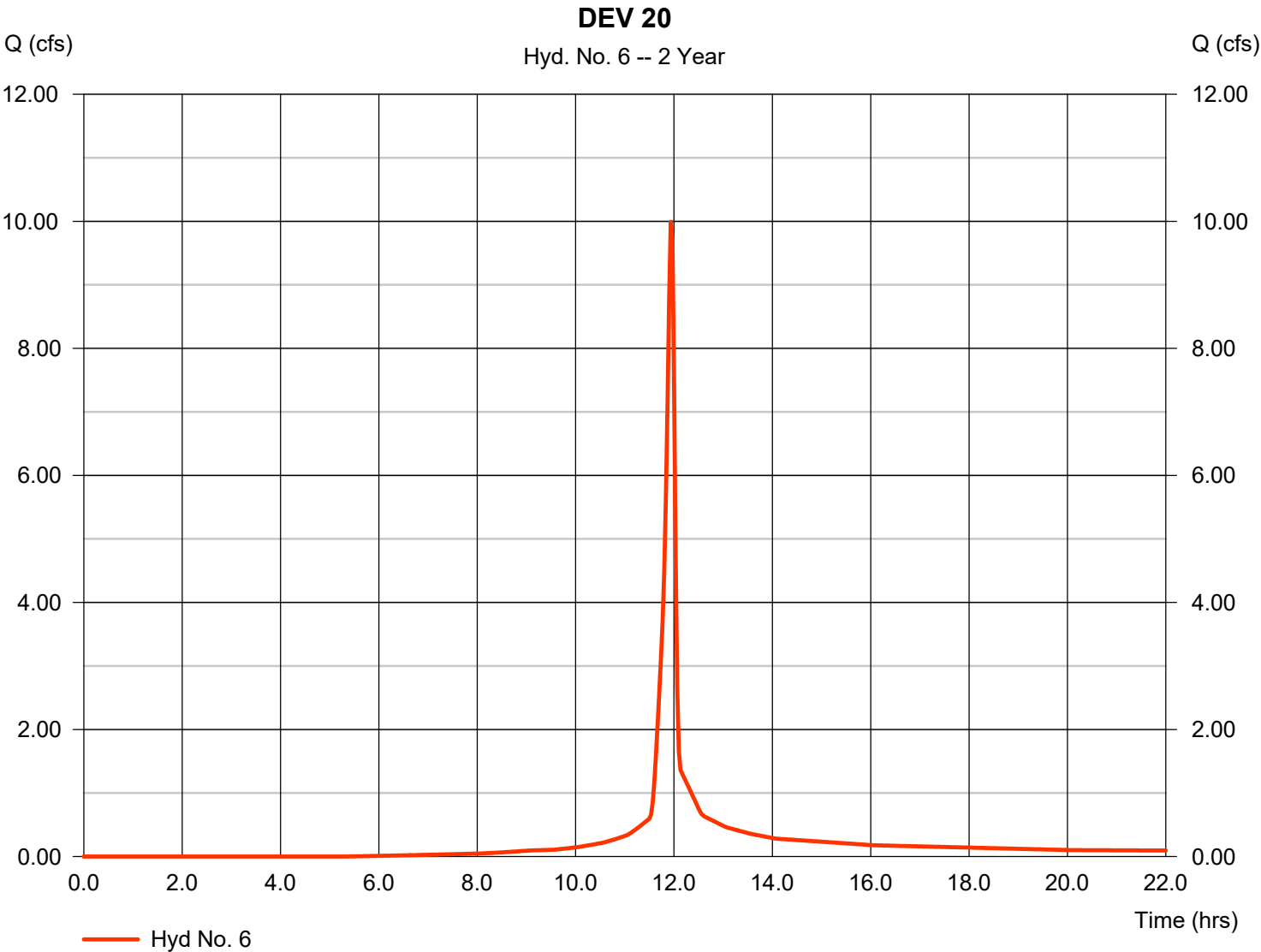
Wednesday, 03 / 23 / 2022

Hyd. No. 6

DEV 20

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.01 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	20,843 cuft
Drainage area	=	2.400 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 98) + (1.250 x 80)] / 2.400

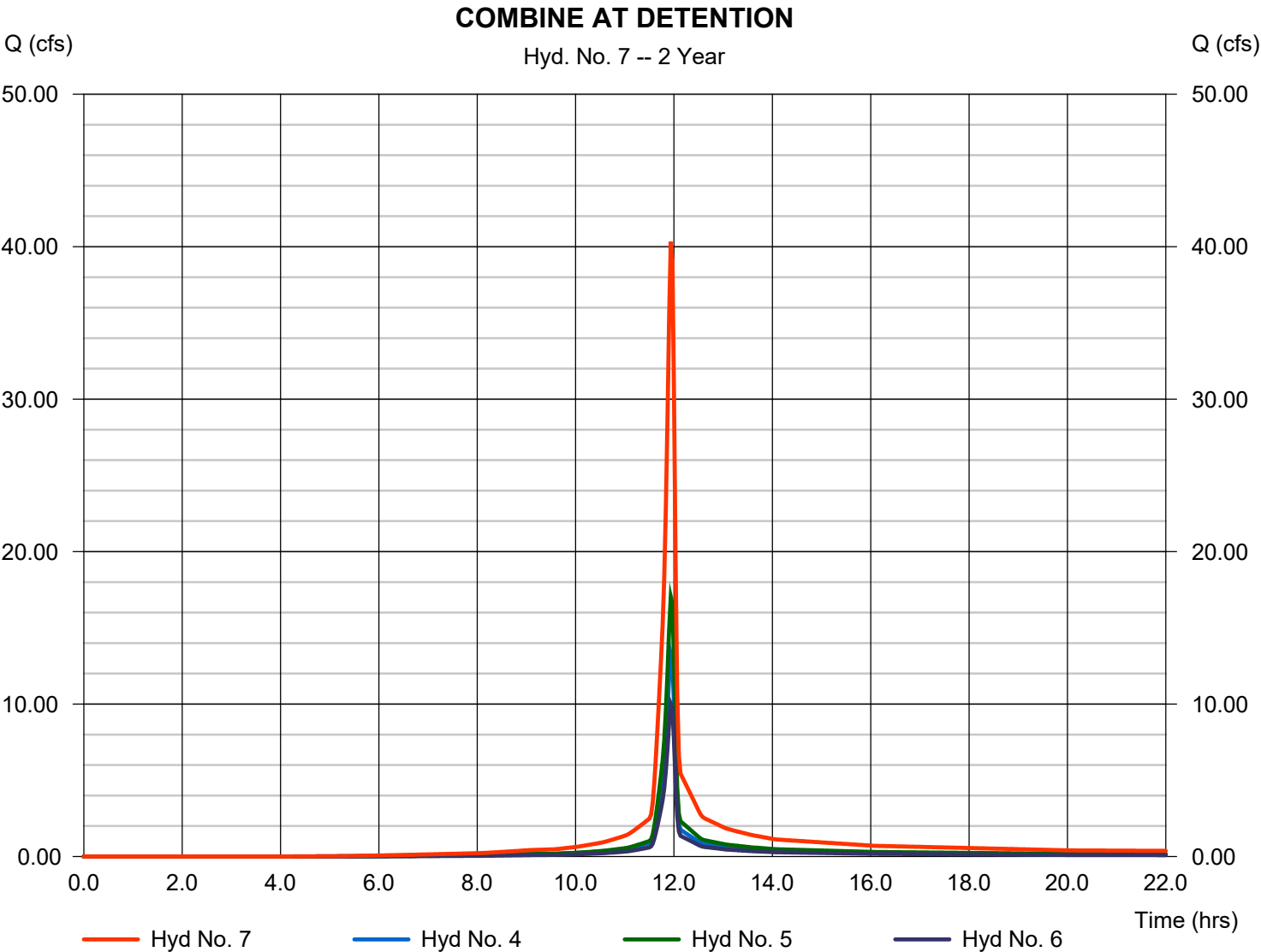


Hydrograph Report

Hyd. No. 7

COMBINE AT DETENTION

Hydrograph type	= Combine	Peak discharge	= 40.33 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 84,673 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 9.420 ac



Hydrograph Report

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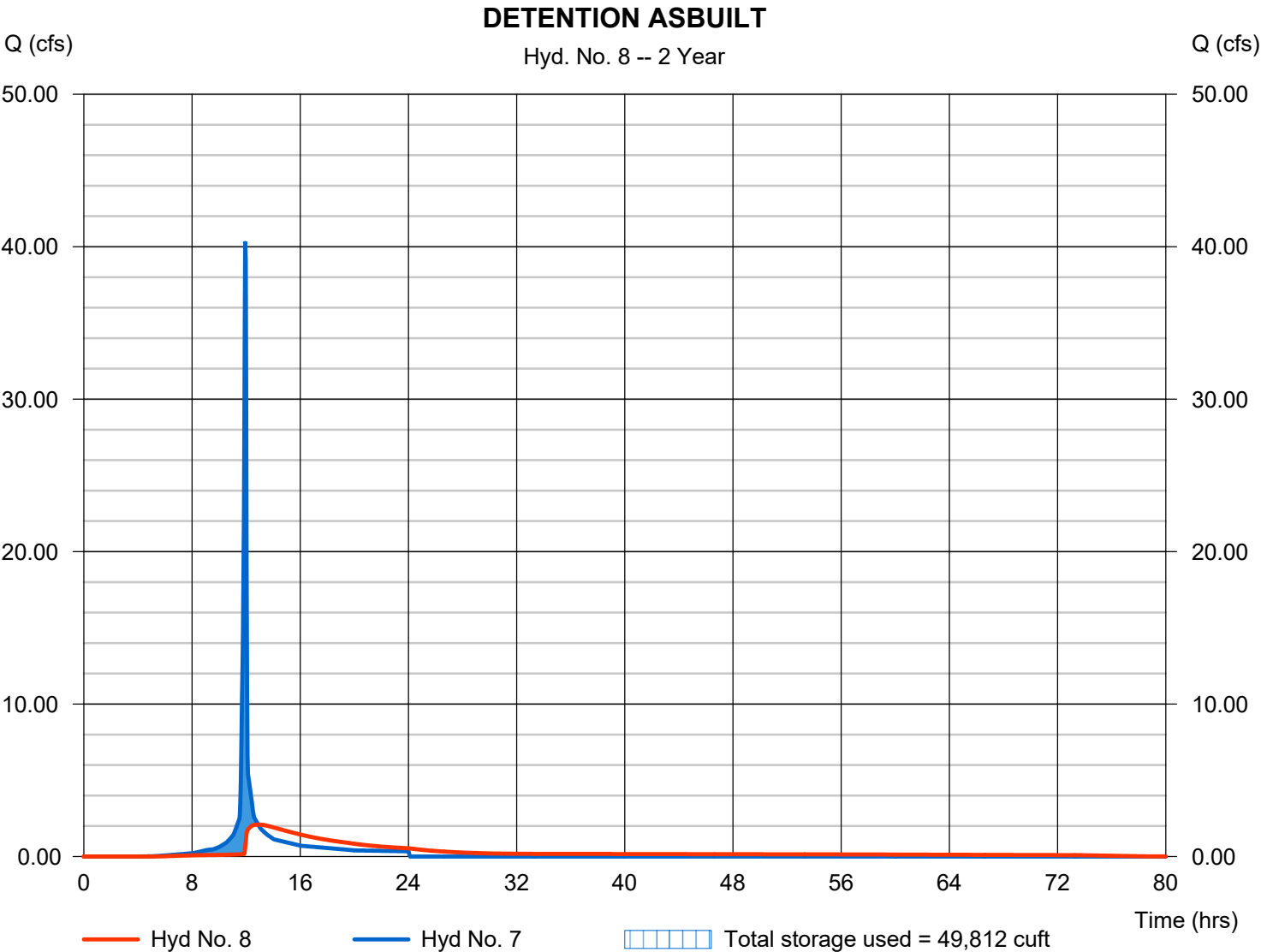
Wednesday, 03 / 23 / 2022

Hyd. No. 8

DETENTION ASBUILT

Hydrograph type	= Reservoir	Peak discharge	= 2.096 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.90 hrs
Time interval	= 2 min	Hyd. volume	= 84,663 cuft
Inflow hyd. No.	= 7 - COMBINE AT DETENTION	Max. Elevation	= 1017.83 ft
Reservoir name	= AS-BUILT DRY DETENTION	Max. Storage	= 49,812 cuft

Storage Indication method used.



Pond No. 5 - AS-BUILT DRY DETENTION 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1013.19 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1013.19	00	0	0
0.81	1014.00	3,719	1,004	1,004
1.81	1015.00	10,687	6,903	7,907
2.81	1016.00	14,128	12,366	20,273
3.81	1017.00	16,167	15,135	35,408
4.81	1018.00	18,732	17,432	52,840
5.81	1019.00	25,153	21,862	74,701
6.81	1020.00	30,617	27,838	102,539
7.81	1021.00	36,188	33,360	135,899
8.81	1022.00	43,812	39,935	175,835
9.91	1023.00	47,108	49,990	225,825

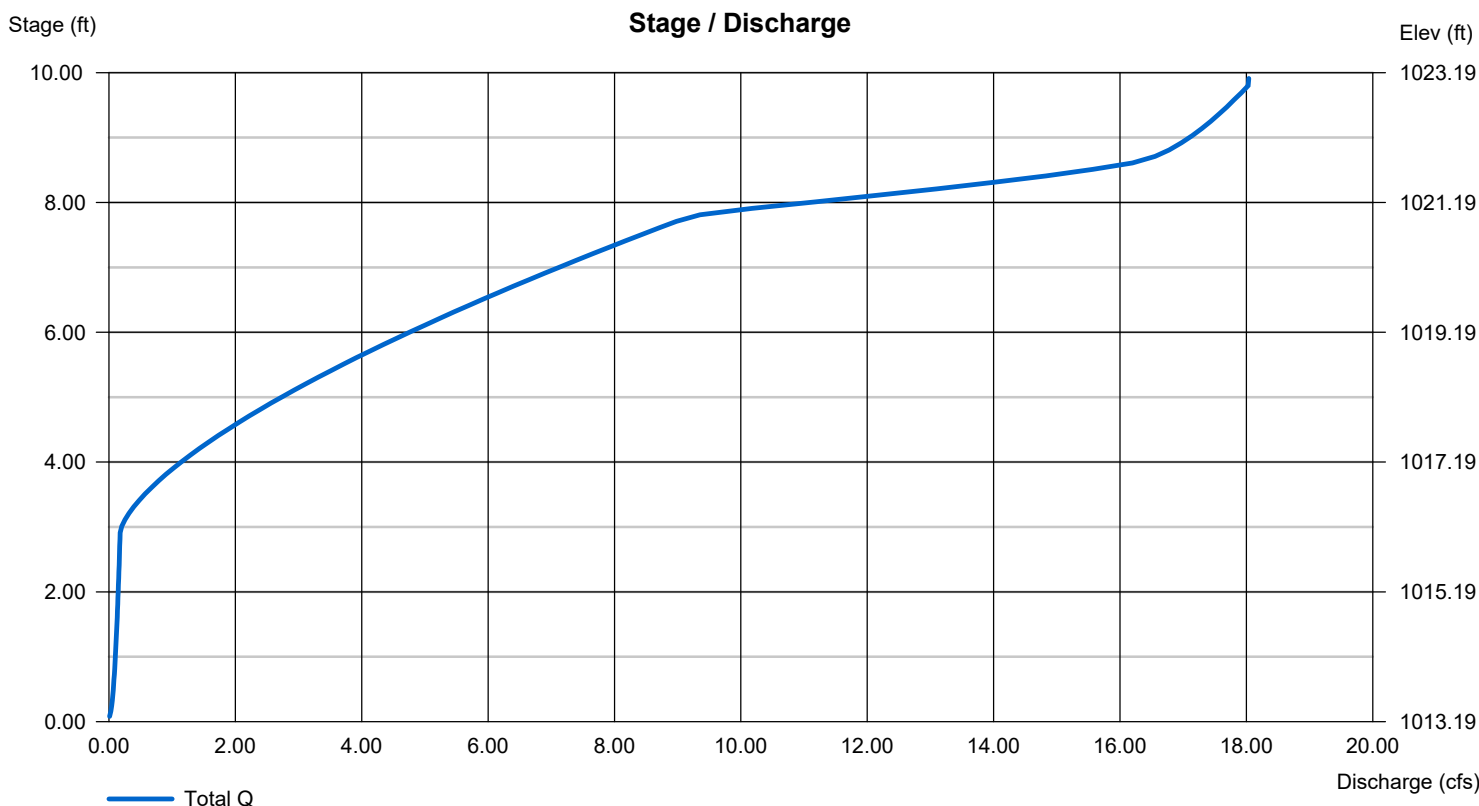
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	2.00	0.00	0.00
Span (in)	= 15.00	2.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1011.57	1013.19	0.00	0.00
Length (ft)	= 69.50	0.50	0.00	0.00
Slope (%)	= 0.50	0.50	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	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 3.75	0.25	0.00	0.00
Crest El. (ft)	= 1020.96	1016.11	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	Rect	---
Multi-Stage	= Yes	Yes	Yes	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 Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

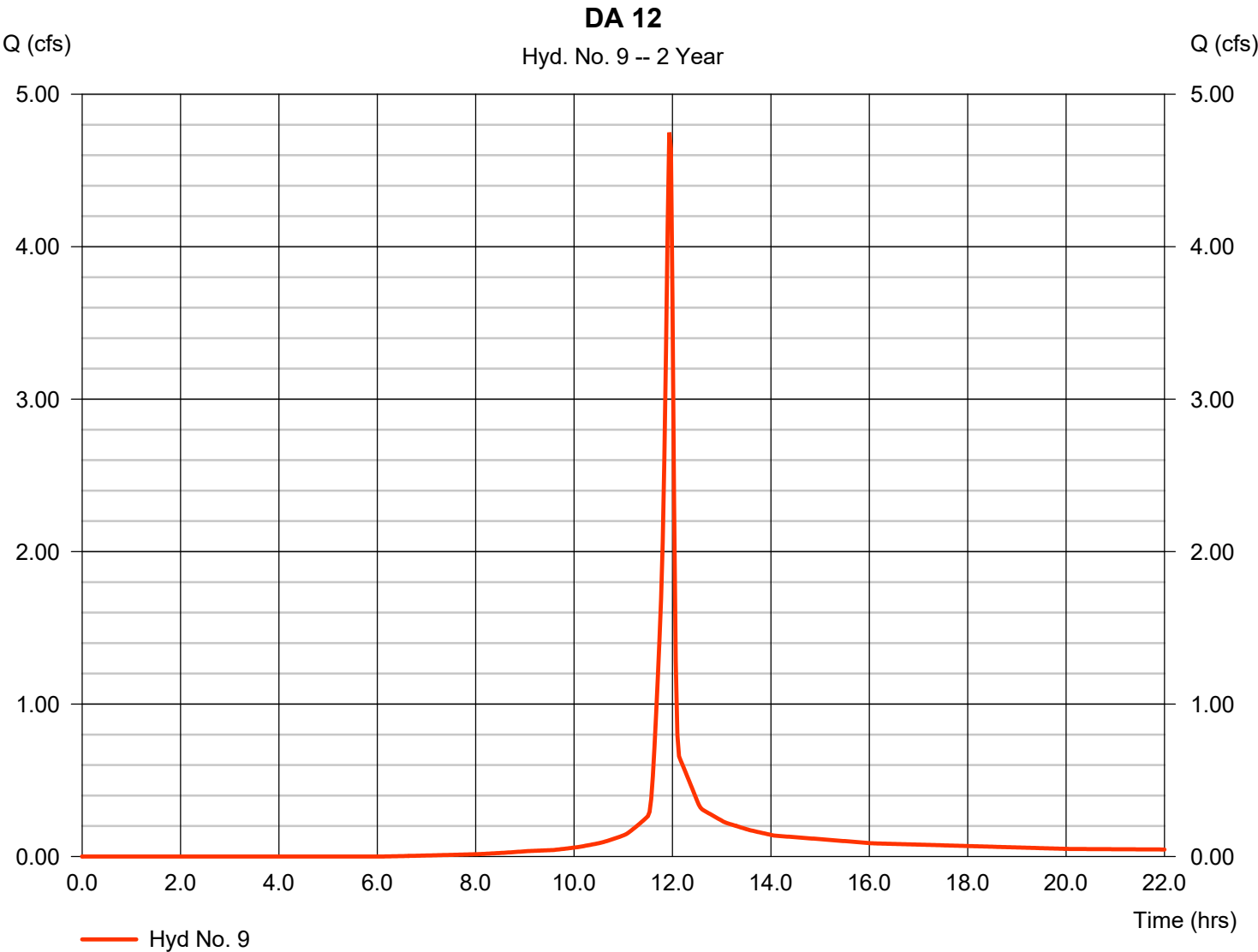
Wednesday, 03 / 23 / 2022

Hyd. No. 9

DA 12

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.750 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	9,768 cuft
Drainage area	=	1.210 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.71 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.460 x 98) + (0.750 x 80)] / 1.210



Hydrograph Report

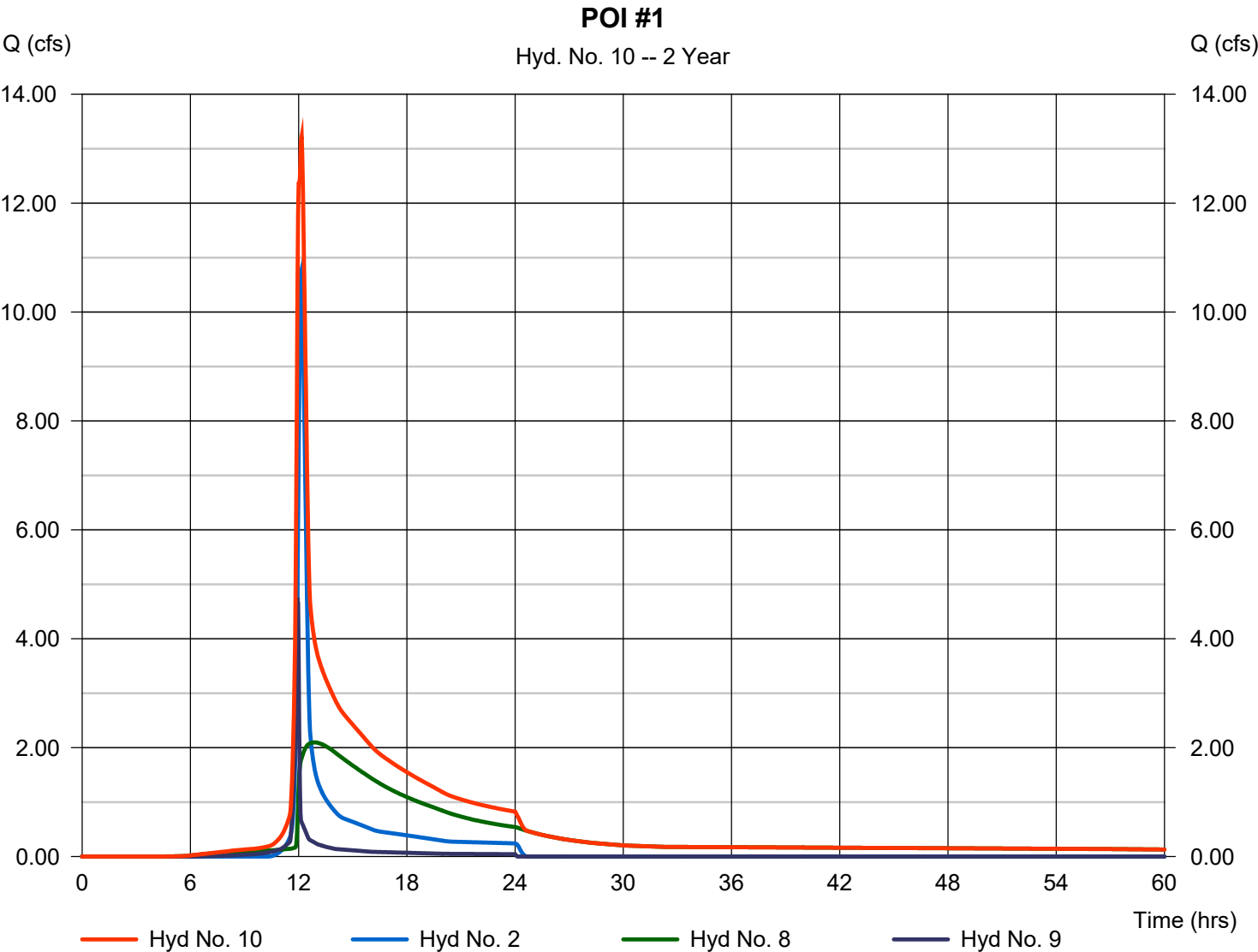
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 10

POI #1

Hydrograph type	= Combine	Peak discharge	= 13.22 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 135,465 cuft
Inflow hyds.	= 2, 8, 9	Contrib. drain. area	= 9.490 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	11.20	2	728	41,259	-----	-----	-----	EX 10
2	SCS Runoff	23.30	2	728	85,835	-----	-----	-----	EX 11
3	Combine	34.50	2	728	127,093	1, 2	-----	-----	EX POI #1
4	SCS Runoff	21.46	2	716	47,379	-----	-----	-----	DEV 10
5	SCS Runoff	28.48	2	716	61,185	-----	-----	-----	DEV 30
6	SCS Runoff	16.75	2	716	35,991	-----	-----	-----	DEV 20
7	Combine	66.69	2	716	144,555	4, 5, 6	-----	-----	COMBINE AT DETENTION
8	Reservoir	5.048	2	748	144,545	7	1019.32	83,631	DETENTION ASBUILT
9	SCS Runoff	8.155	2	716	17,264	-----	-----	-----	DA 12
10	Combine	29.25	2	728	247,644	2, 8, 9	-----	-----	POI #1
F:\2018\1001-1500\018-1450\40-Design\Calcs\Runoff\Standard\HYDRAFLOW\W1450_24\H3\ASBUILT\ASBUILT.gpw					F:\2018\1001-1500\018-1450\40-Design\Calcs\Runoff\Standard\HYDRAFLOW\W1450_24\H3\ASBUILT\ASBUILT.gpw				

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

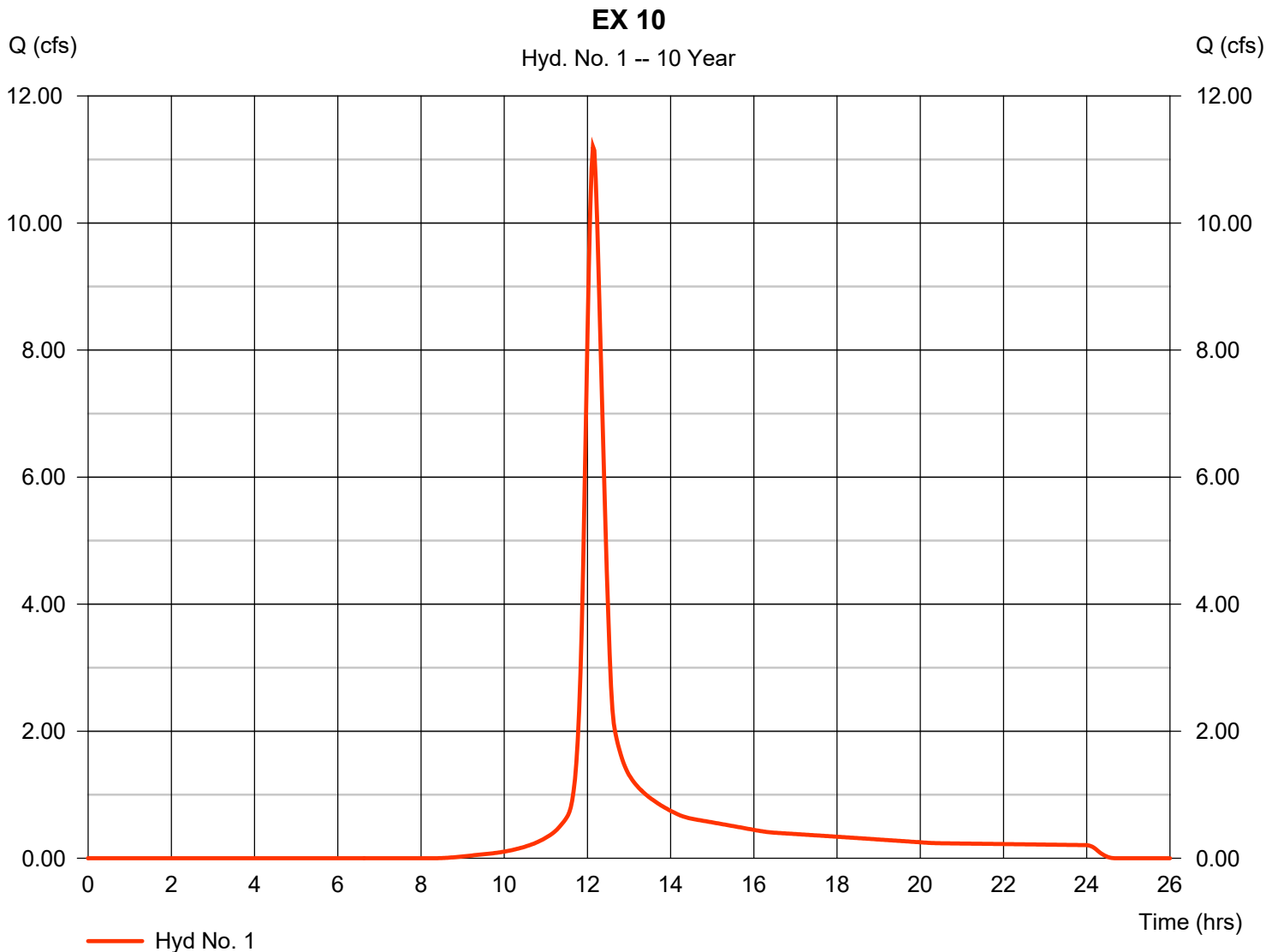
Wednesday, 03 / 23 / 2022

Hyd. No. 1

EX 10

Hydrograph type	= SCS Runoff	Peak discharge	= 11.20 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 41,259 cuft
Drainage area	= 3.980 ac	Curve number	= 74*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.30 min
Total precip.	= 5.66 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.090 \times 98) + (3.890 \times 74)] / 3.980$



Hydrograph Report

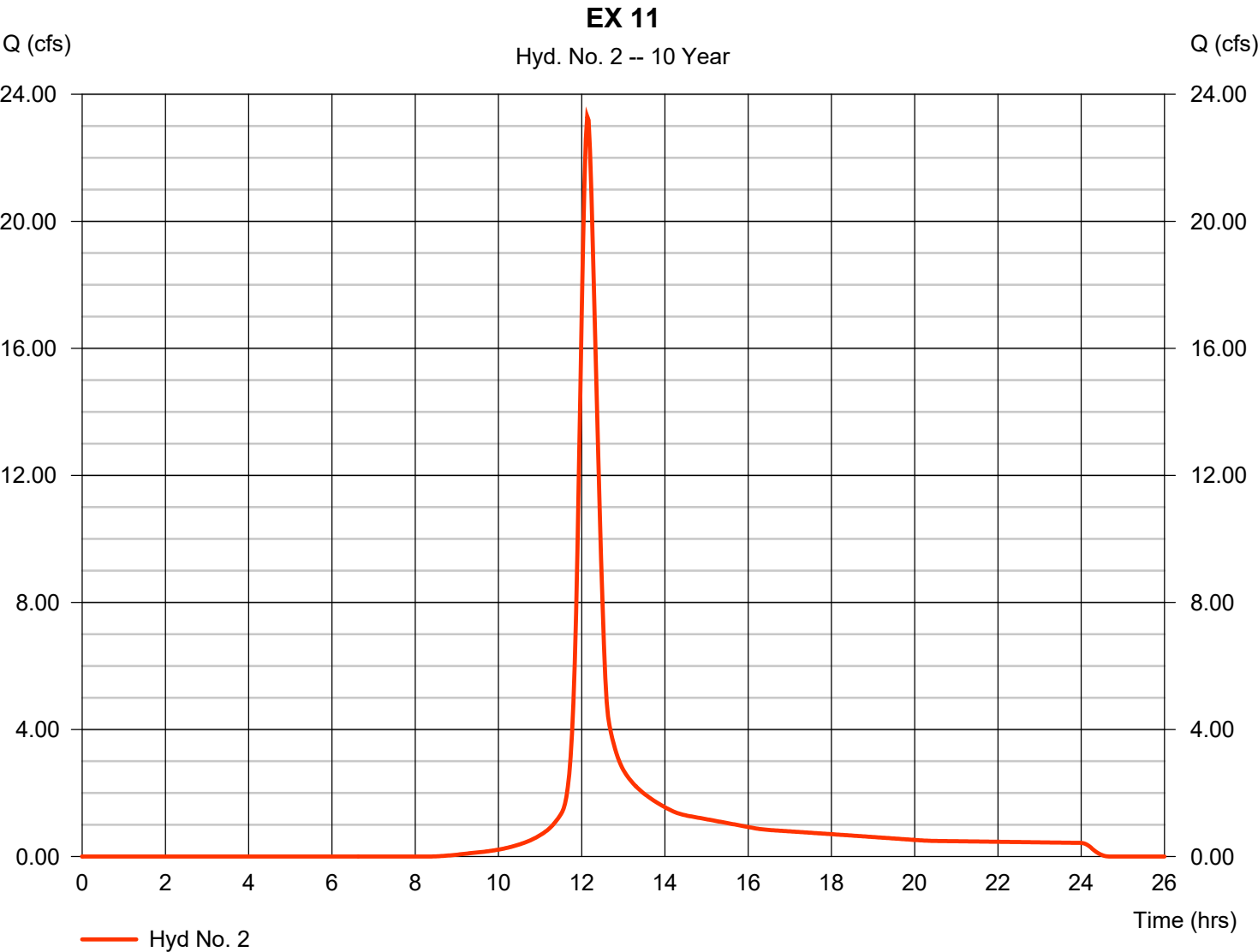
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 2

EX 11

Hydrograph type	= SCS Runoff	Peak discharge	= 23.30 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 85,835 cuft
Drainage area	= 8.280 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.60 min
Total precip.	= 5.66 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

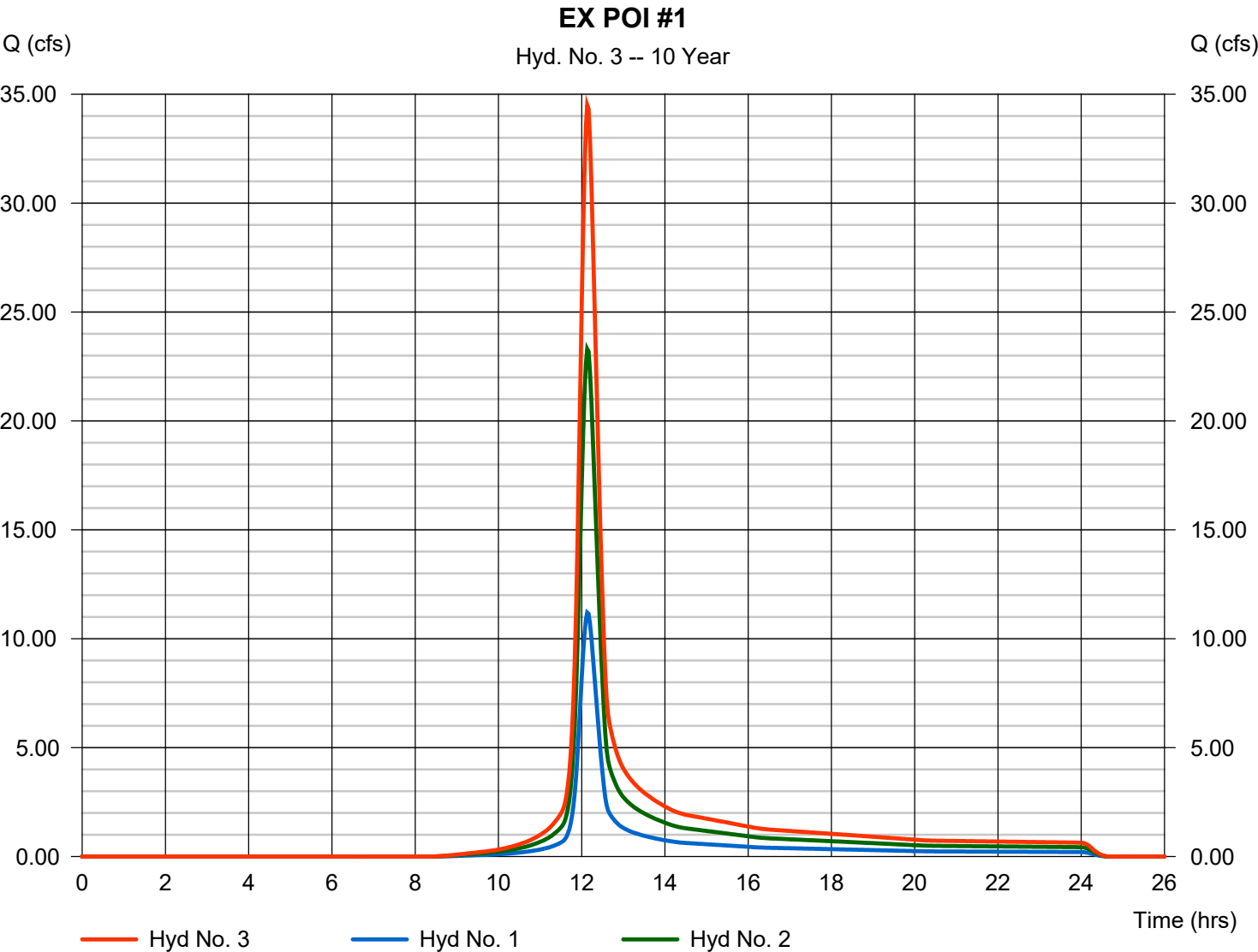
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 3

EX POI #1

Hydrograph type	= Combine	Peak discharge	= 34.50 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 127,093 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 12.260 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

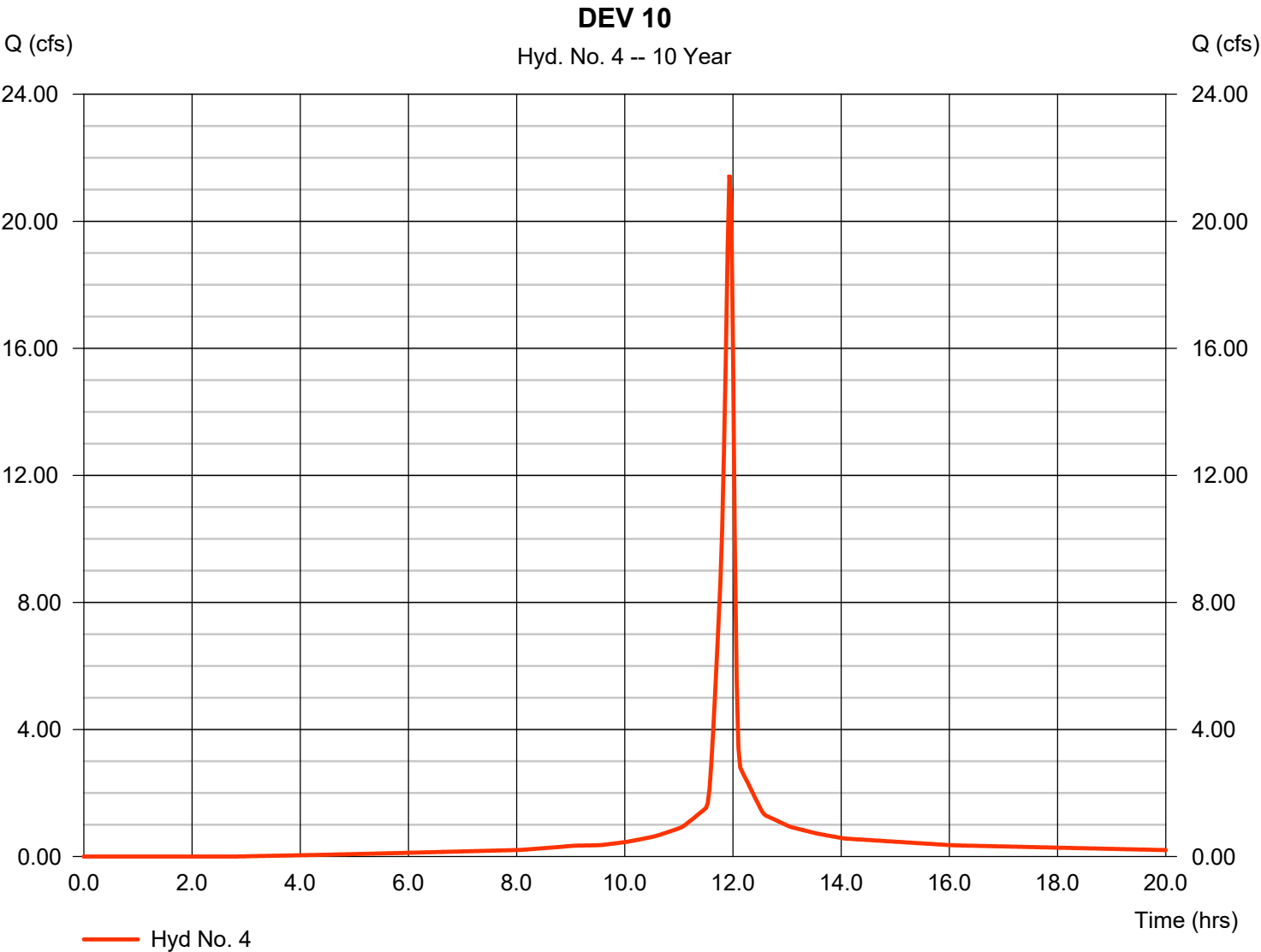
Wednesday, 03 / 23 / 2022

Hyd. No. 4

DEV 10

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.46 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	47,379 cuft
Drainage area	=	2.940 ac	Curve number	=	92*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.66 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.970 x 98) + (0.970 x 80)] / 2.940



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

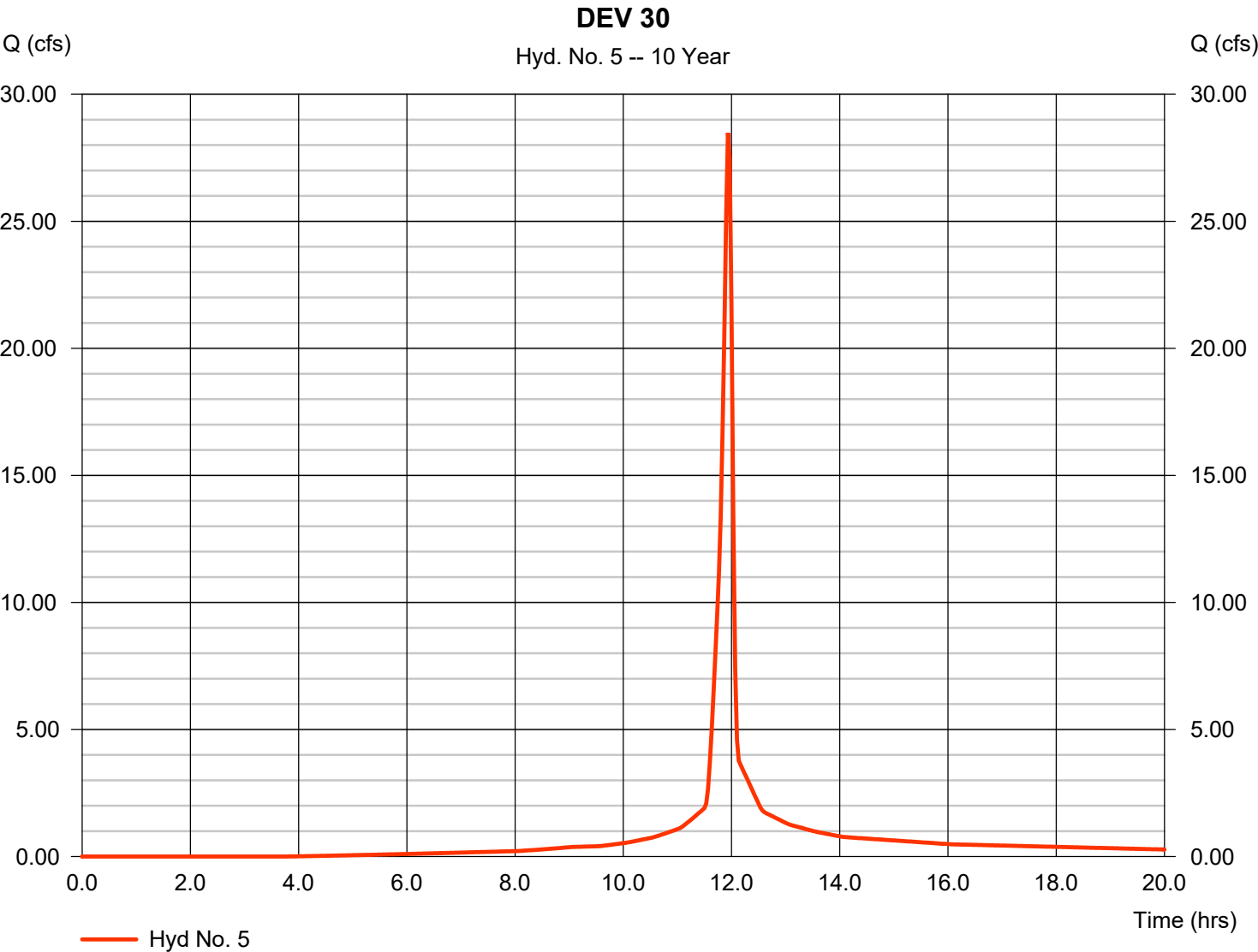
Wednesday, 03 / 23 / 2022

Hyd. No. 5

DEV 30

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.48 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	61,185 cuft
Drainage area	=	4.080 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.66 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.040 x 98) + (2.040 x 80)] / 4.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

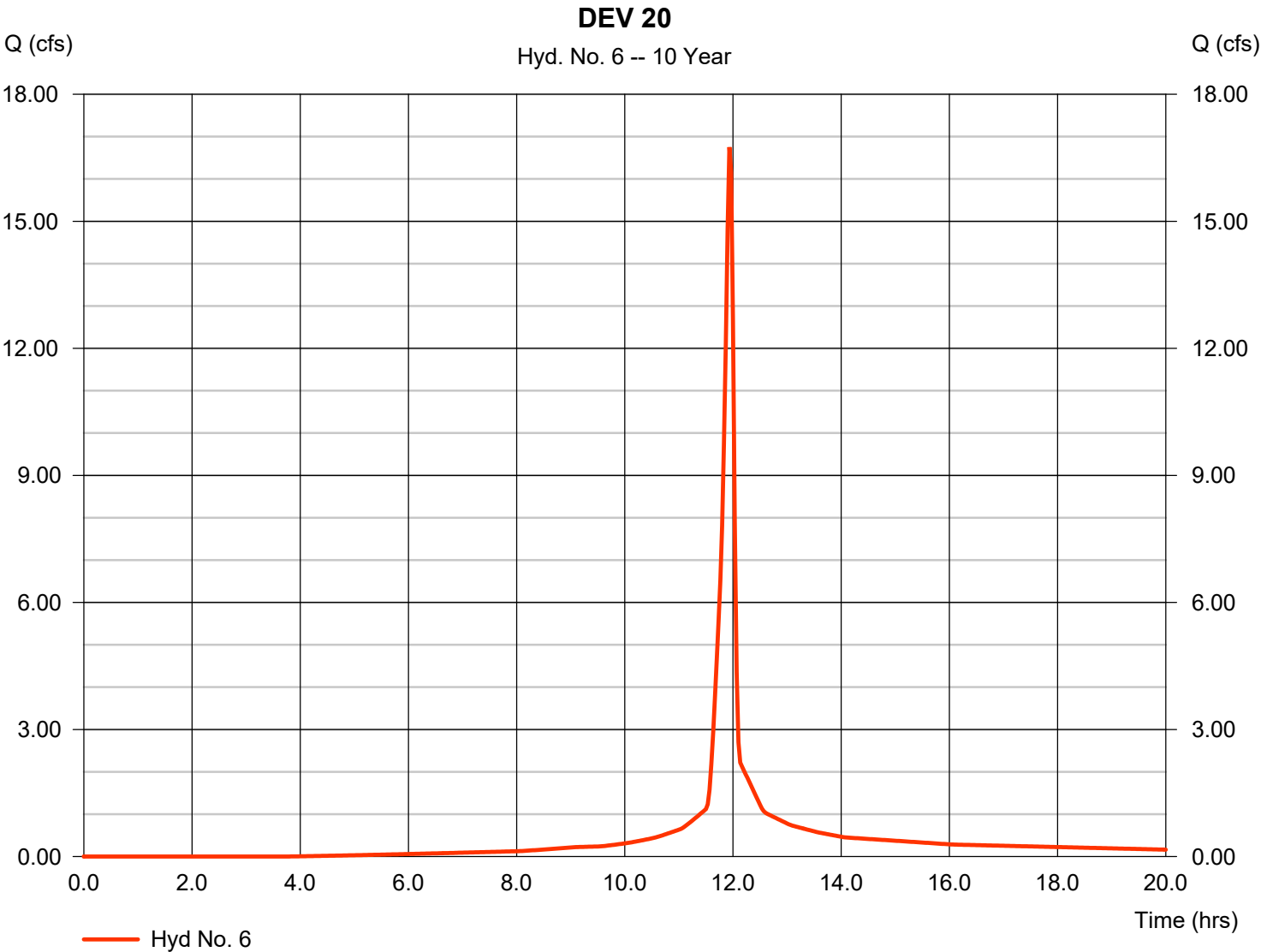
Wednesday, 03 / 23 / 2022

Hyd. No. 6

DEV 20

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.75 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	35,991 cuft
Drainage area	=	2.400 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.66 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 98) + (1.250 x 80)] / 2.400



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

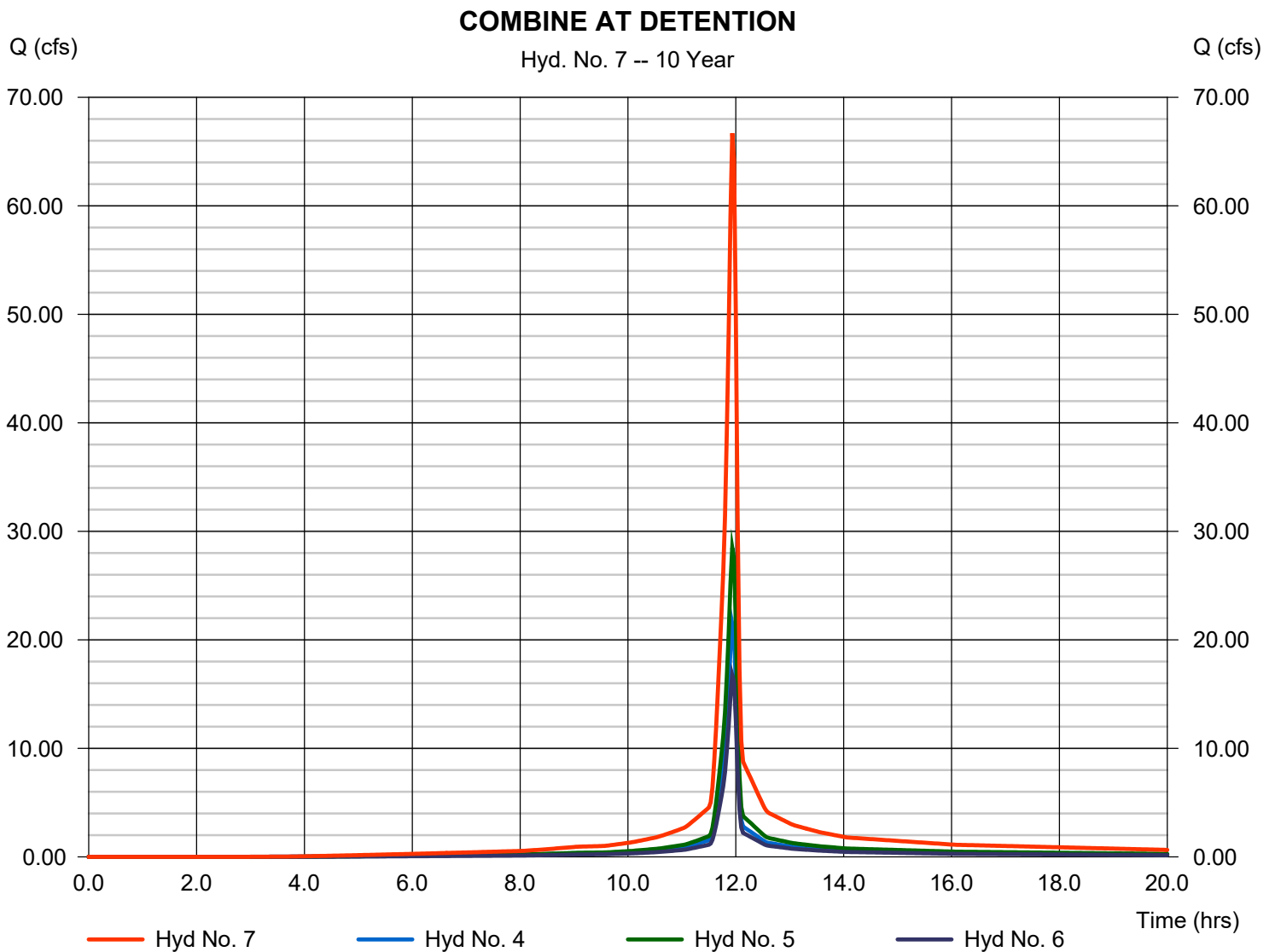
Wednesday, 03 / 23 / 2022

Hyd. No. 7

COMBINE AT DETENTION

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 4, 5, 6

Peak discharge = 66.69 cfs
Time to peak = 11.93 hrs
Hyd. volume = 144,555 cuft
Contrib. drain. area = 9.420 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

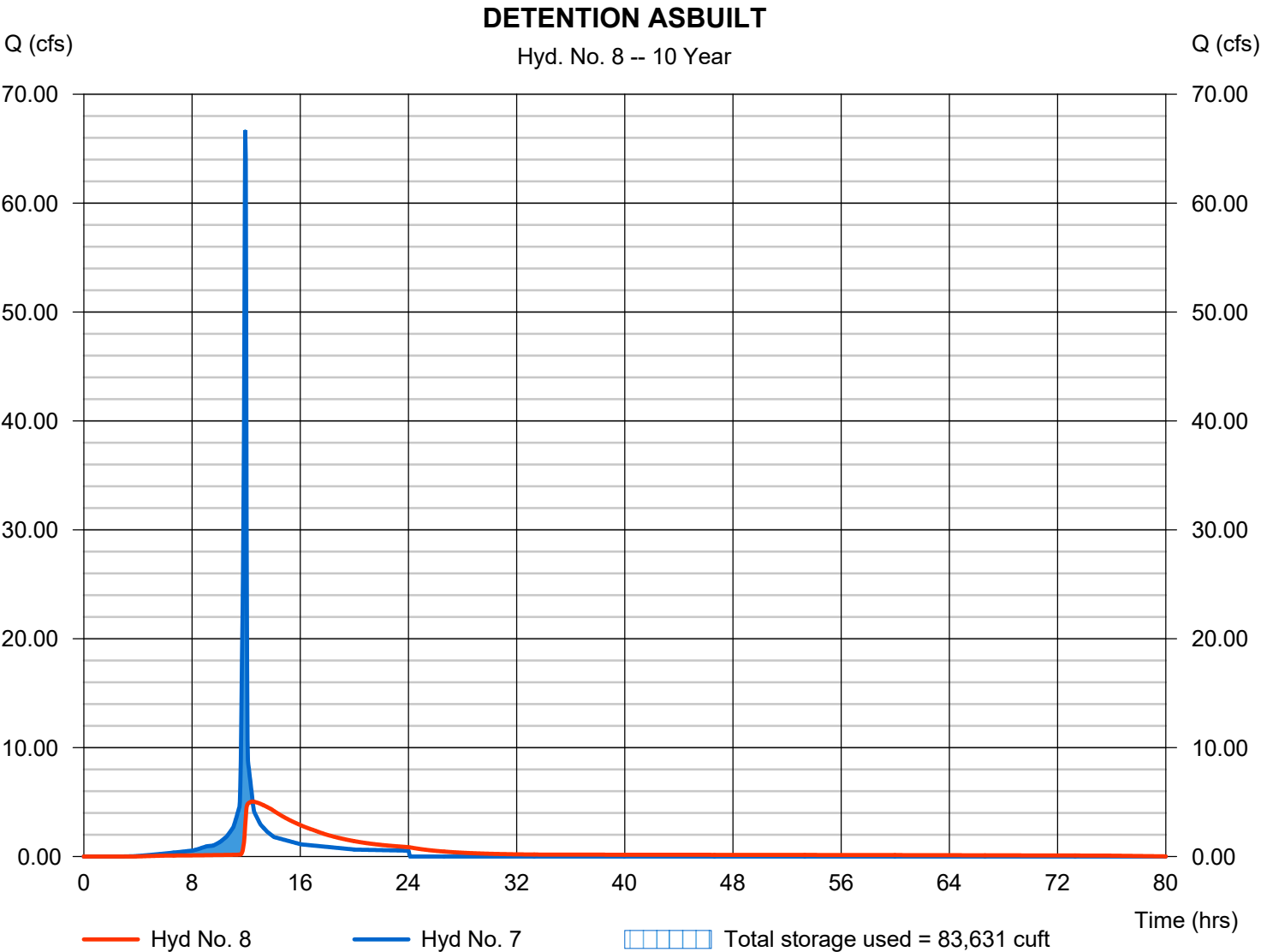
Wednesday, 03 / 23 / 2022

Hyd. No. 8

DETENTION ASBUILT

Hydrograph type	= Reservoir	Peak discharge	= 5.048 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 144,545 cuft
Inflow hyd. No.	= 7 - COMBINE AT DETENTION	Max. Elevation	= 1019.32 ft
Reservoir name	= AS-BUILT DRY DETENTION	Max. Storage	= 83,631 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

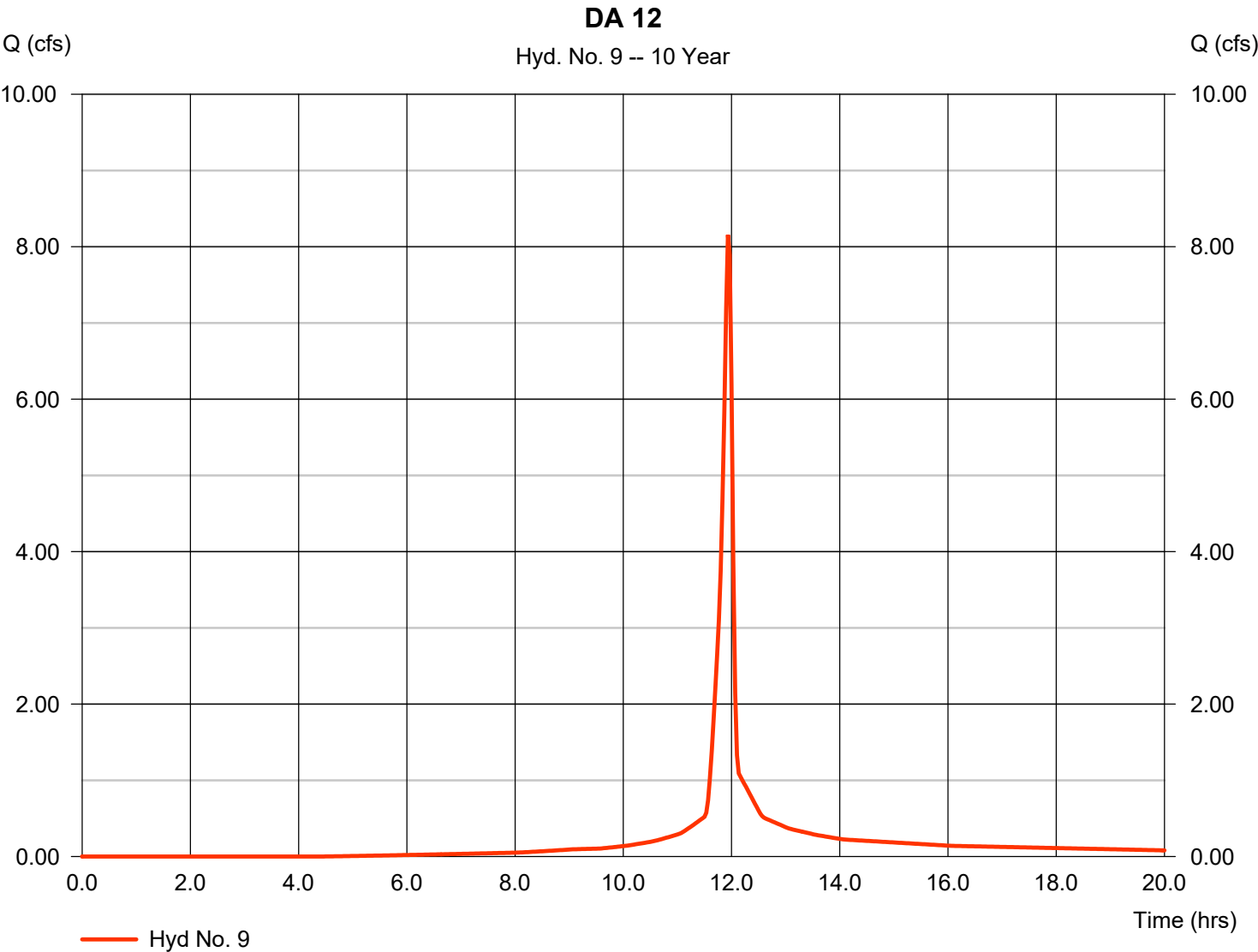
Wednesday, 03 / 23 / 2022

Hyd. No. 9

DA 12

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.155 cfs
Storm frequency	=	10 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	17,264 cuft
Drainage area	=	1.210 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.66 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.460 x 98) + (0.750 x 80)] / 1.210



Hydrograph Report

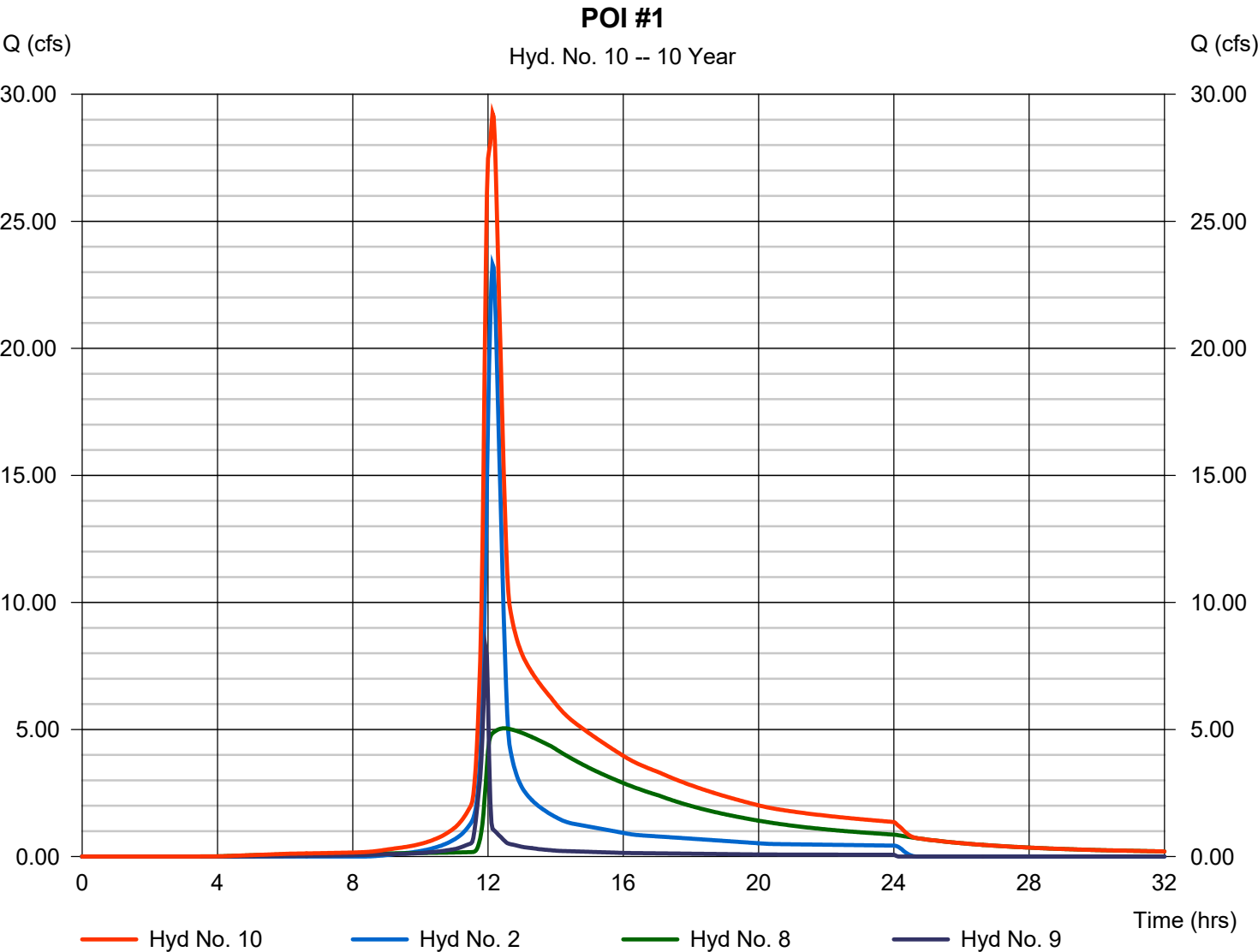
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 10

POI #1

Hydrograph type	= Combine	Peak discharge	= 29.25 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 247,644 cuft
Inflow hyds.	= 2, 8, 9	Contrib. drain. area	= 9.490 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

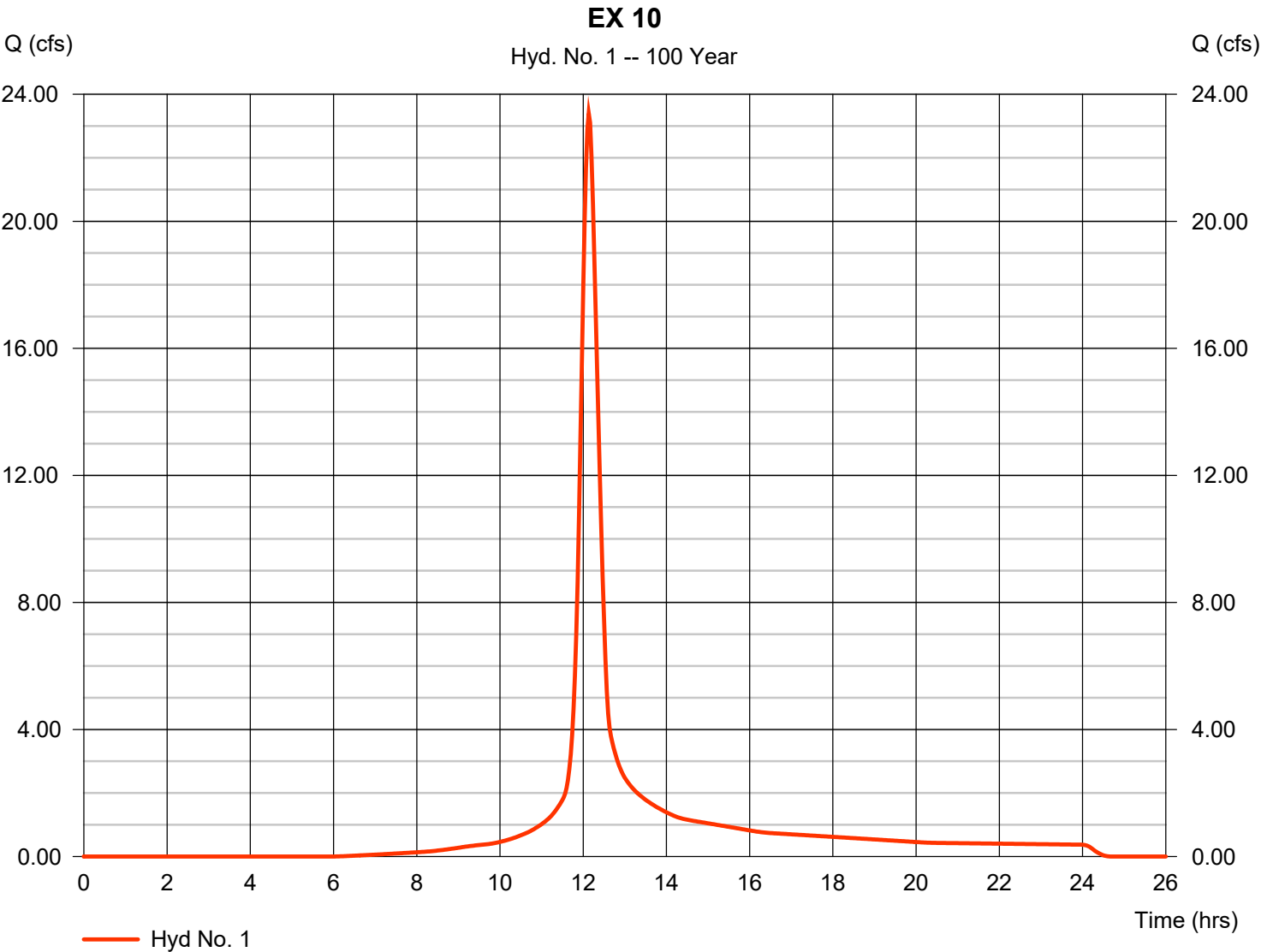
Wednesday, 03 / 23 / 2022

Hyd. No. 1

EX 10

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.40 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	86,145 cuft
Drainage area	=	3.980 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	26.30 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.090 x 98) + (3.890 x 74)] / 3.980



Hydrograph Report

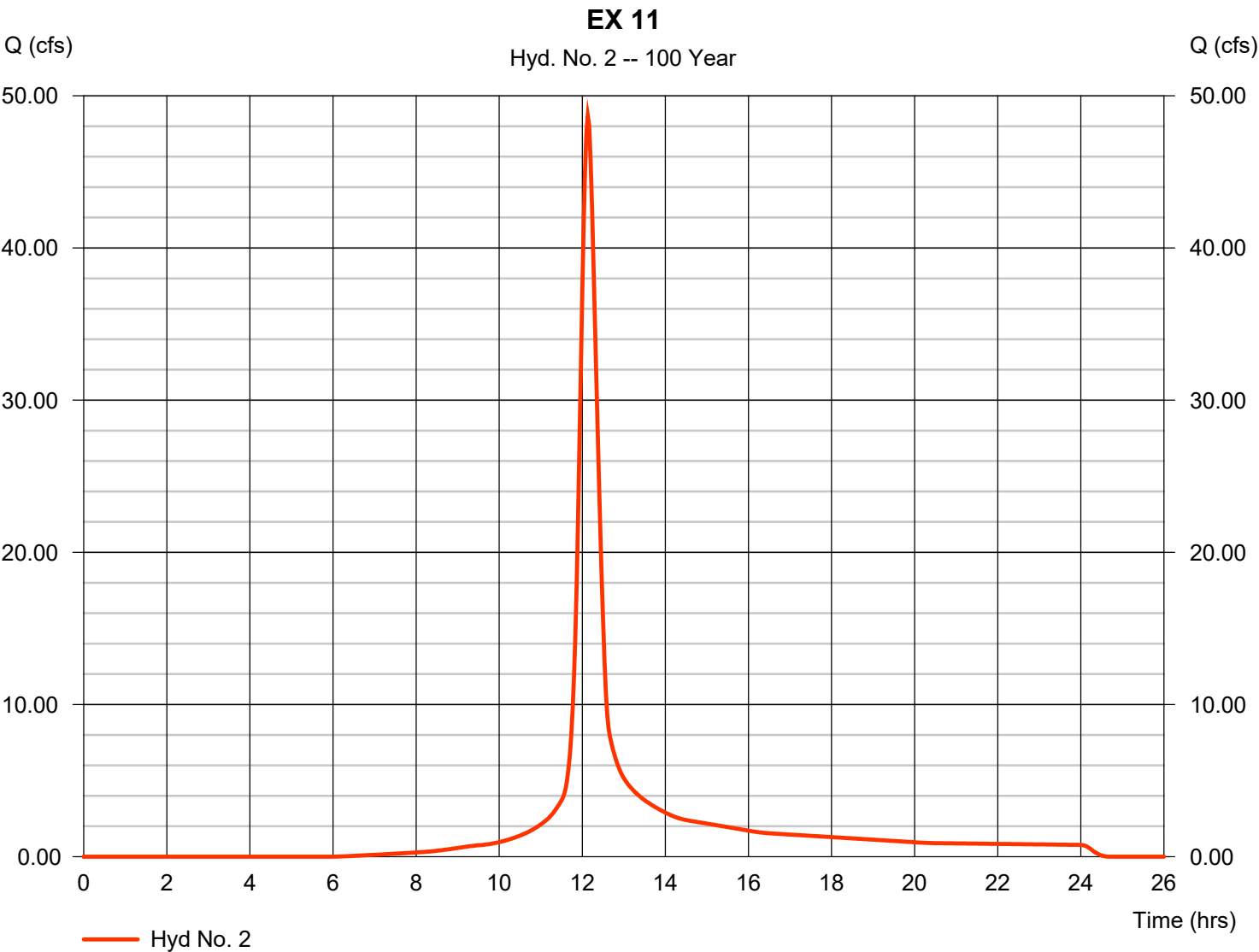
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 2

EX 11

Hydrograph type	= SCS Runoff	Peak discharge	= 48.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 179,217 cuft
Drainage area	= 8.280 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 25.60 min
Total precip.	= 9.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

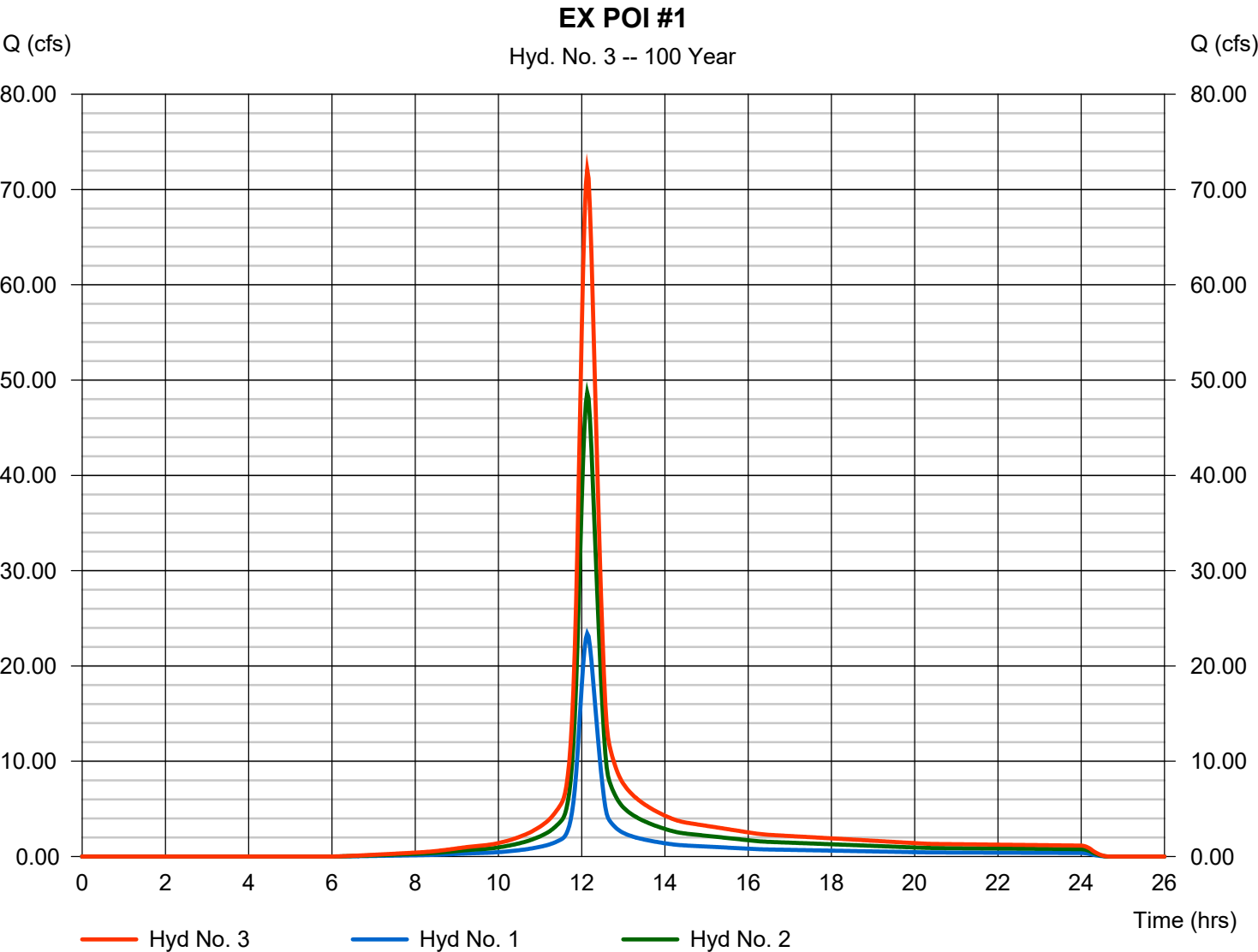
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 3

EX POI #1

Hydrograph type	= Combine	Peak discharge	= 72.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 265,362 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 12.260 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

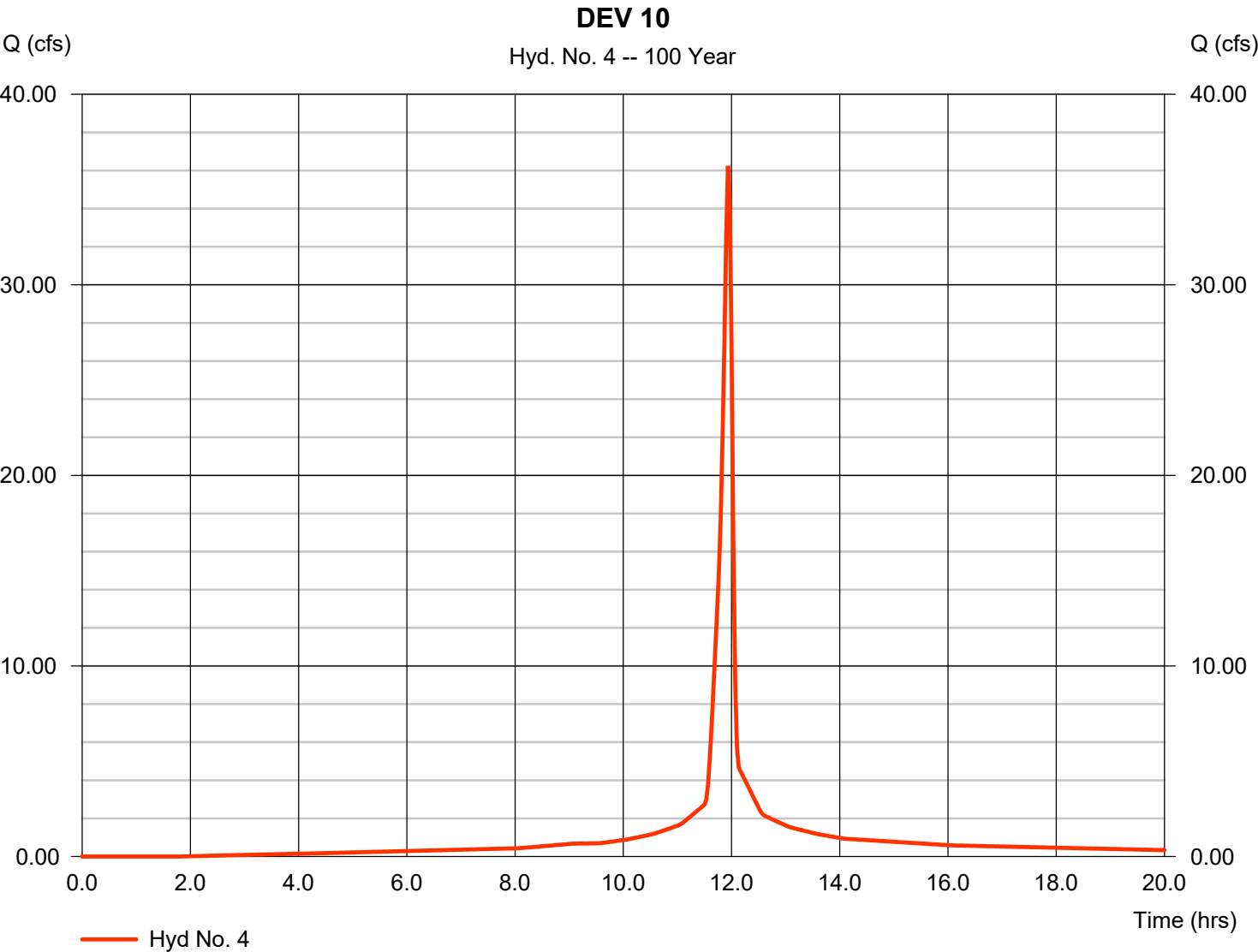
Wednesday, 03 / 23 / 2022

Hyd. No. 4

DEV 10

Hydrograph type	= SCS Runoff	Peak discharge	= 36.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 82,868 cuft
Drainage area	= 2.940 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 9.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.970 x 98) + (0.970 x 80)] / 2.940



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

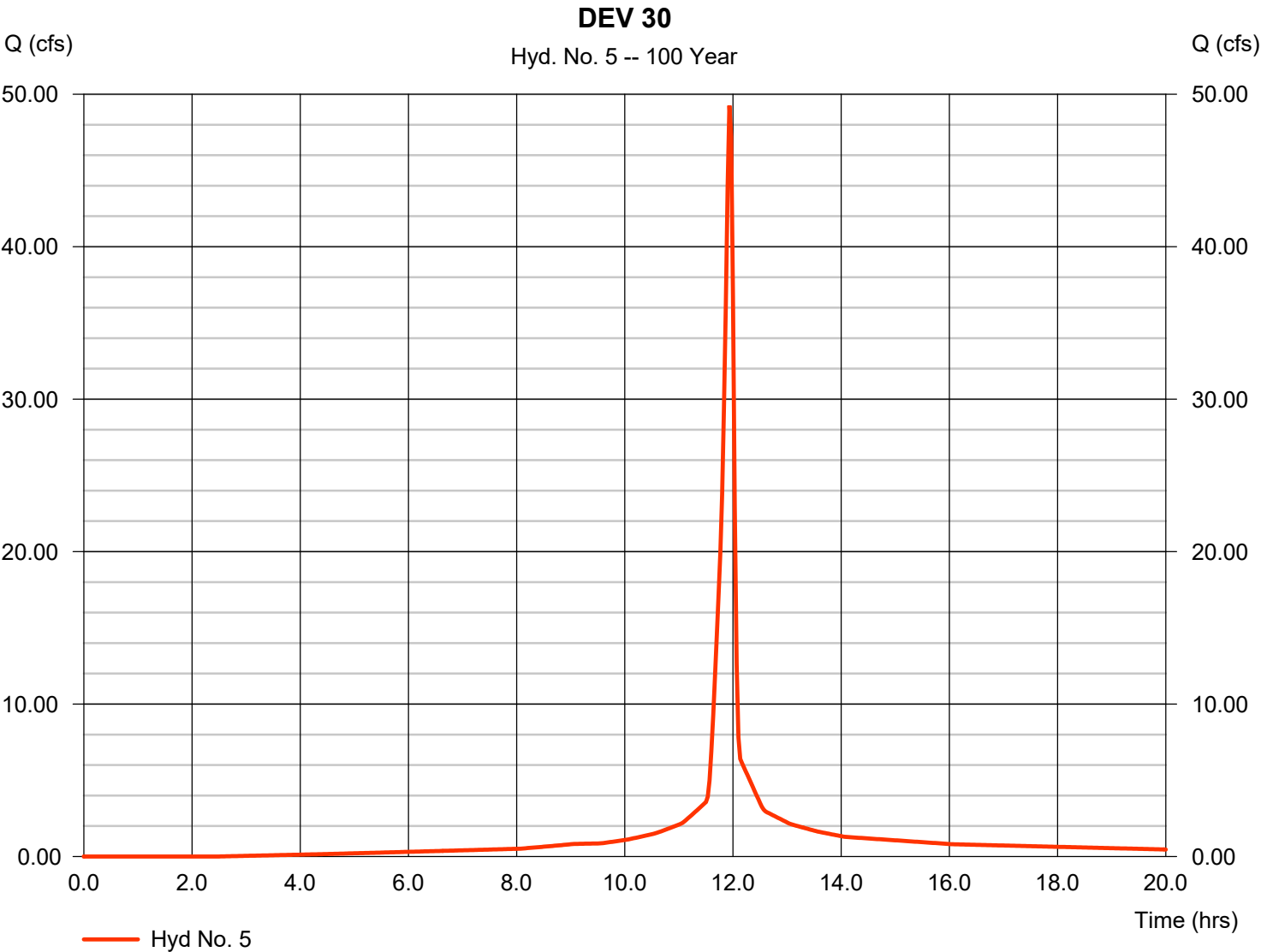
Wednesday, 03 / 23 / 2022

Hyd. No. 5

DEV 30

Hydrograph type	=	SCS Runoff	Peak discharge	=	49.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	109,912 cuft
Drainage area	=	4.080 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.040 x 98) + (2.040 x 80)] / 4.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

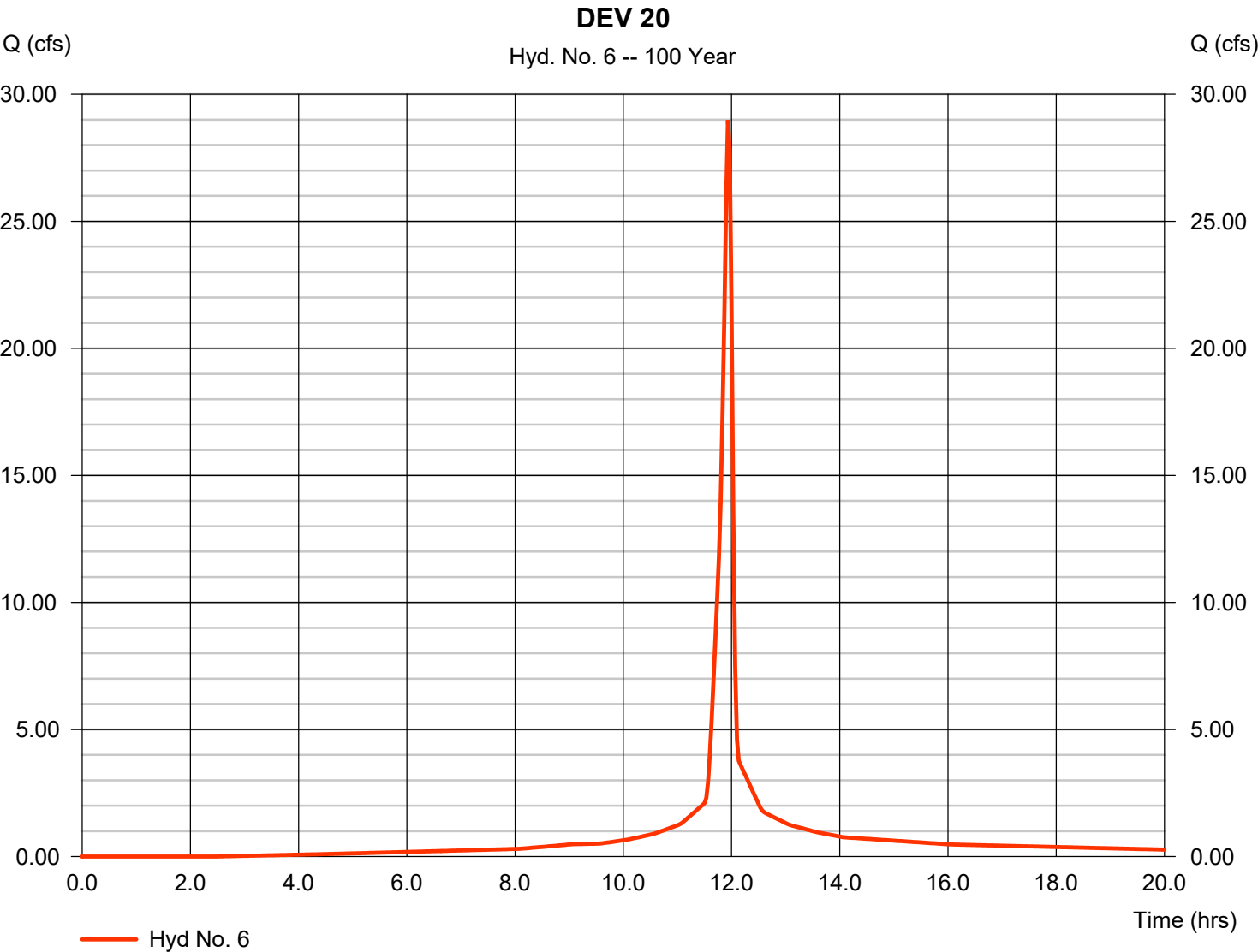
Wednesday, 03 / 23 / 2022

Hyd. No. 6

DEV 20

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.97 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	64,654 cuft
Drainage area	=	2.400 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.150 x 98) + (1.250 x 80)] / 2.400



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

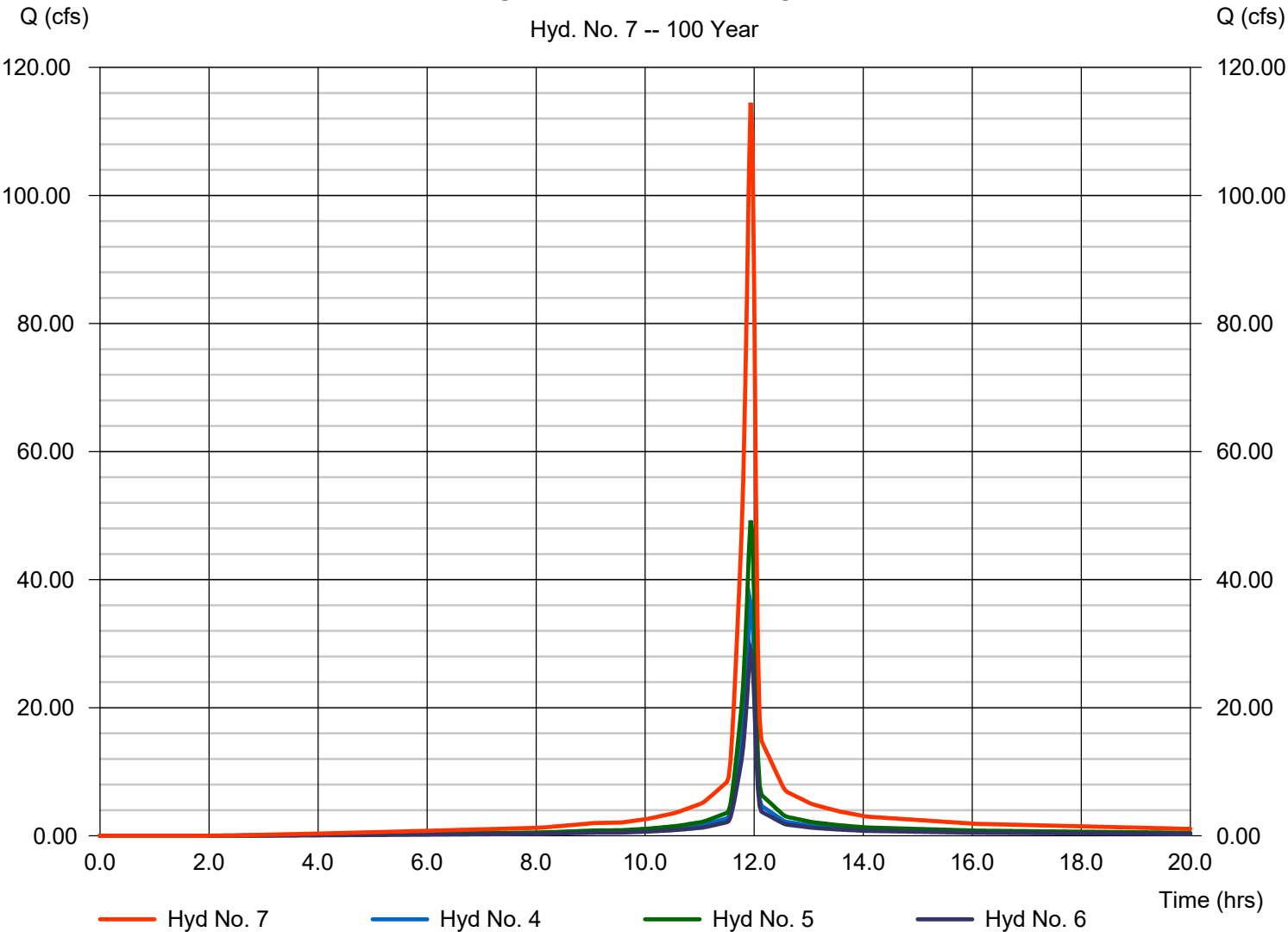
Wednesday, 03 / 23 / 2022

Hyd. No. 7

COMBINE AT DETENTION

Hydrograph type	= Combine	Peak discharge	= 114.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 257,435 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 9.420 ac

COMBINE AT DETENTION



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 03 / 23 / 2022

Hyd. No. 8

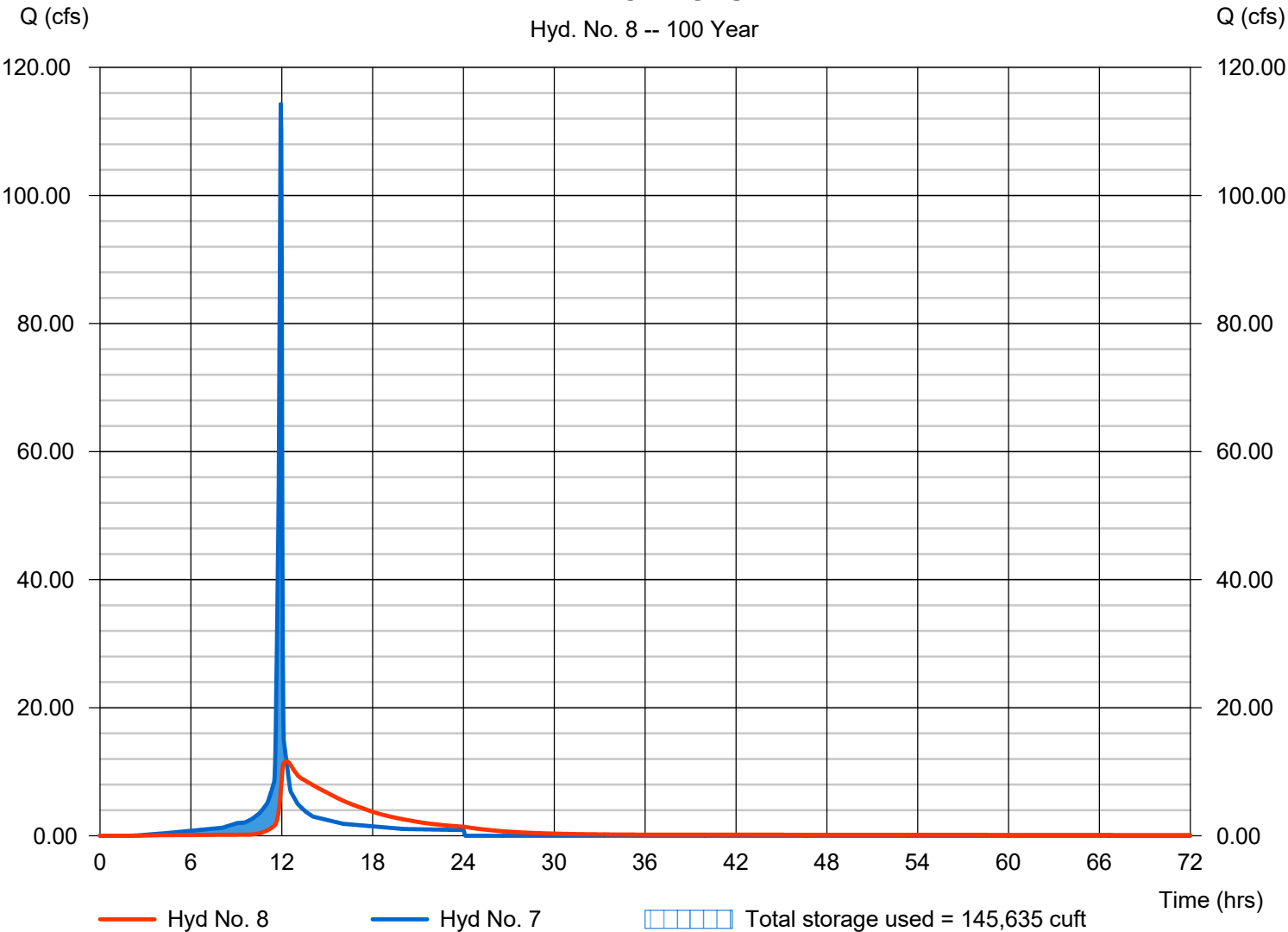
DETENTION ASBUILT

Hydrograph type	= Reservoir	Peak discharge	= 11.61 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.30 hrs
Time interval	= 2 min	Hyd. volume	= 257,425 cuft
Inflow hyd. No.	= 7 - COMBINE AT DETENTION	Max. Elevation	= 1021.24 ft
Reservoir name	= AS-BUILT DRY DETENTION	Max. Storage	= 145,635 cuft

Storage Indication method used.

DETENTION ASBUILT

Hyd. No. 8 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

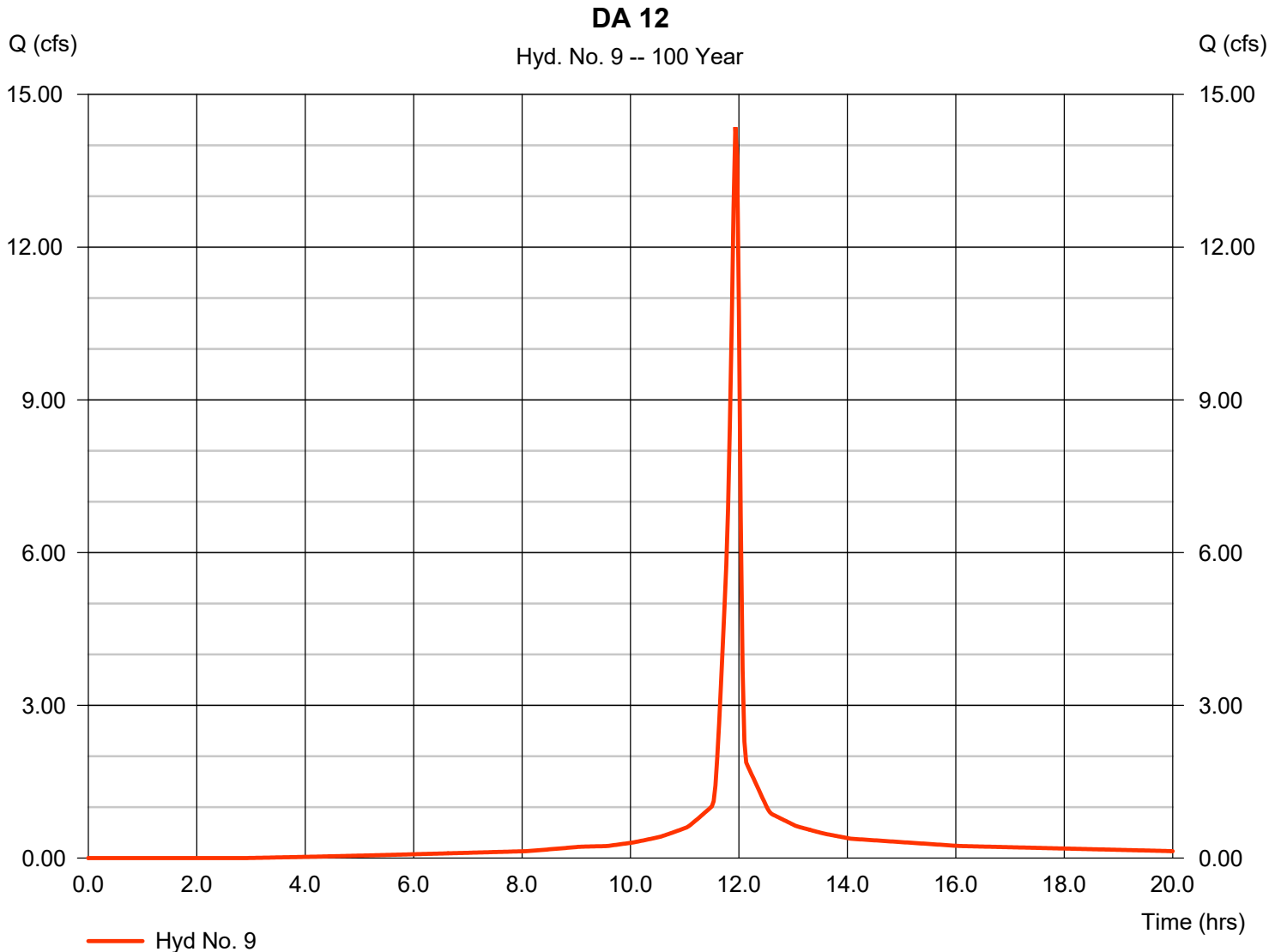
Wednesday, 03 / 23 / 2022

Hyd. No. 9

DA 12

Hydrograph type	= SCS Runoff	Peak discharge	= 14.36 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 31,586 cuft
Drainage area	= 1.210 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 9.25 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.460 \times 98) + (0.750 \times 80)] / 1.210$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

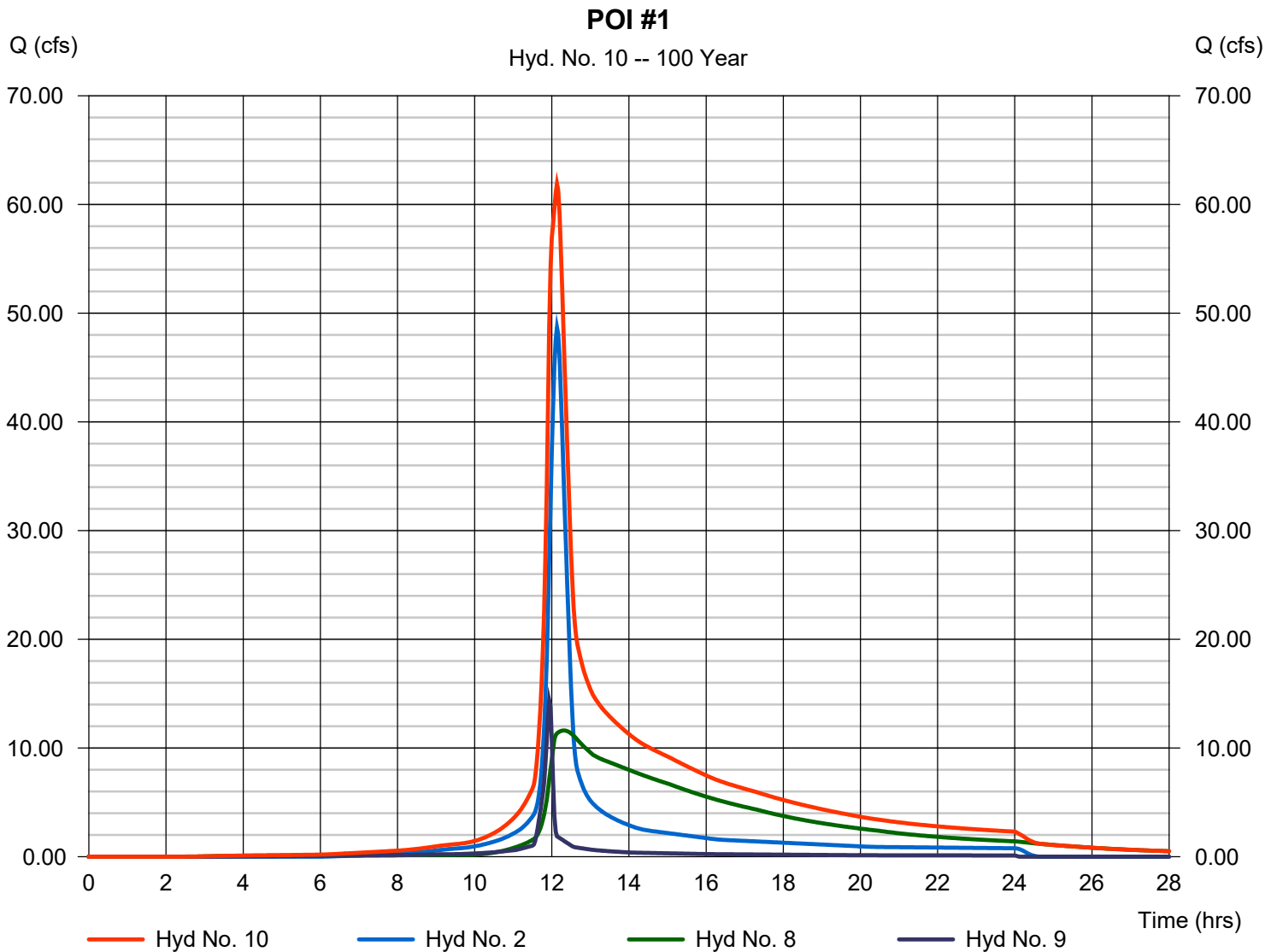
Wednesday, 03 / 23 / 2022

Hyd. No. 10

POI #1

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 2, 8, 9

Peak discharge = 61.91 cfs
Time to peak = 12.13 hrs
Hyd. volume = 468,228 cuft
Contrib. drain. area = 9.490 ac



THE PRINCETON SENIOR LIVING COMMUNITY

Lee's Summit, MO - 2019

March 2022

Olsson Project No. 018-1450