

DRAINAGE REPORT
FOR
Extra Space Storage

**650 Oldham Parkway
Lee's Summit, Missouri**

Prepared By:



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E&A #2018.037.006

January 17, 2019

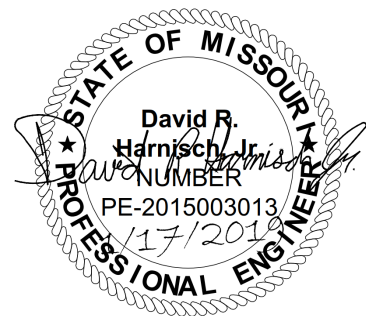


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EXECUTIVE SUMMARY

This report documents the drainage calculations including post construction stormwater requirements and BMP recommendations for a project proposed for 650 Oldham Parkway in Lee's Summit, Missouri. This lot comprises an area of approximately 2.88 acres. The lot is located in the SE $\frac{1}{4}$ of Section 8, Township 47 N, Range 31 W. This lot is intended for commercial purposes. See the vicinity area map for more information on the site's location.

The site currently is partially covered in unpaved green space and impervious paved areas. The site is mapped as a zone "X" flood hazard layer. This indicates a zone of greater than a 0.2% flood event. The site does not contain any wetland areas.

Existing Drainage Patterns

On-site generated stormwater runoff splits into four basins. The two to the north flow away from the western edge of the site and flow towards the north and east of the site. The two to the south flow away from the western edge of the site towards the south and east of the site. After leaving the site all runoff eventually flows into Big Creek to the south of the site.

Storm Water Detention / Water Quality

The Regional Stormwater Planning requirements for this development includes detaining 90% of the mean annual storm, 1.37" (this is modeled in the Hydraflow hydrographs as the "1yr event"). The site must also discharge less than 0.5 cfs/ac for the 50% event, 2.0 cfs/ac for the 10% event, and 3.0 cfs/ac for the 1% event. The proposed hydrology for the site is modeled as two different detention basins. Under proposed land use conditions, the center of the site flows and are collected into a proposed dry-detention system before being discharged from the site. The small areas to the north and south are un-captured and are predominately grassy areas and flow off site into the existing storm drain system as they do now.

The hydrographs of the lot were generated and the total volume and peak runoff rates were calculated and compared to the allowable peak runoff rates. All developed land use condition peak flows from the lot are less than the undeveloped land use condition peak flows. As well as meeting the minimum 40 hr detention time and required flow requirements for the various frequency events.



LATITUDE: 38.901590°N
LONGITUDE: 94.361065°W



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Engineering Answers

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Job No.: 2018.037.006

Date: 4/28/2018

Drawn by: DAS

Scale: No Scale

Sht: 1 of 1

EXTRA SPACE STORAGE
VICINITY AREA MAP
LEE'S SUMMIT, MISSOURI

Hydrologic Methodologies and Assumptions

The Hydraflow Hydrographs hydrologic modeling software was used to assist in calculating peak runoff, total runoff volumes and required detention volumes. The model uses the distributed precipitation of the TR-55 hydrologic method in the calculation of the peak runoff and volume calculations. 24-hour cumulative precipitation depths and design storm distributions are as described in the current Rainfall Intensities for the Kansas City Metropolitan Area.

Table 1, Lee Summit Regional Stormwater Design Parameters

Storm Event (Return Period)	Cumulative Precipitation (inches)
90% of the Mean Annual	1.37
2-year	3.60
10-year	5.52
100-year	7.92

Pre-developed land use conditions are based on the existing soils and existing slopes currently found on the Lot. The site is modeled as four basins EX-1,2,3, and 4. The corresponding Curve Numbers for the basins are summarized in table 2. The time of concentration for the lot under existing conditions is assumed to be 5 minutes for all basins. The pre-developed land use condition is based on curve numbers of moderately draining green spaces.

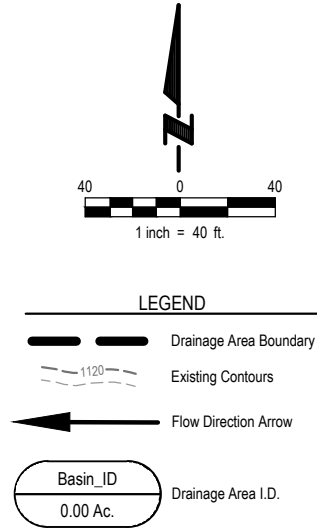
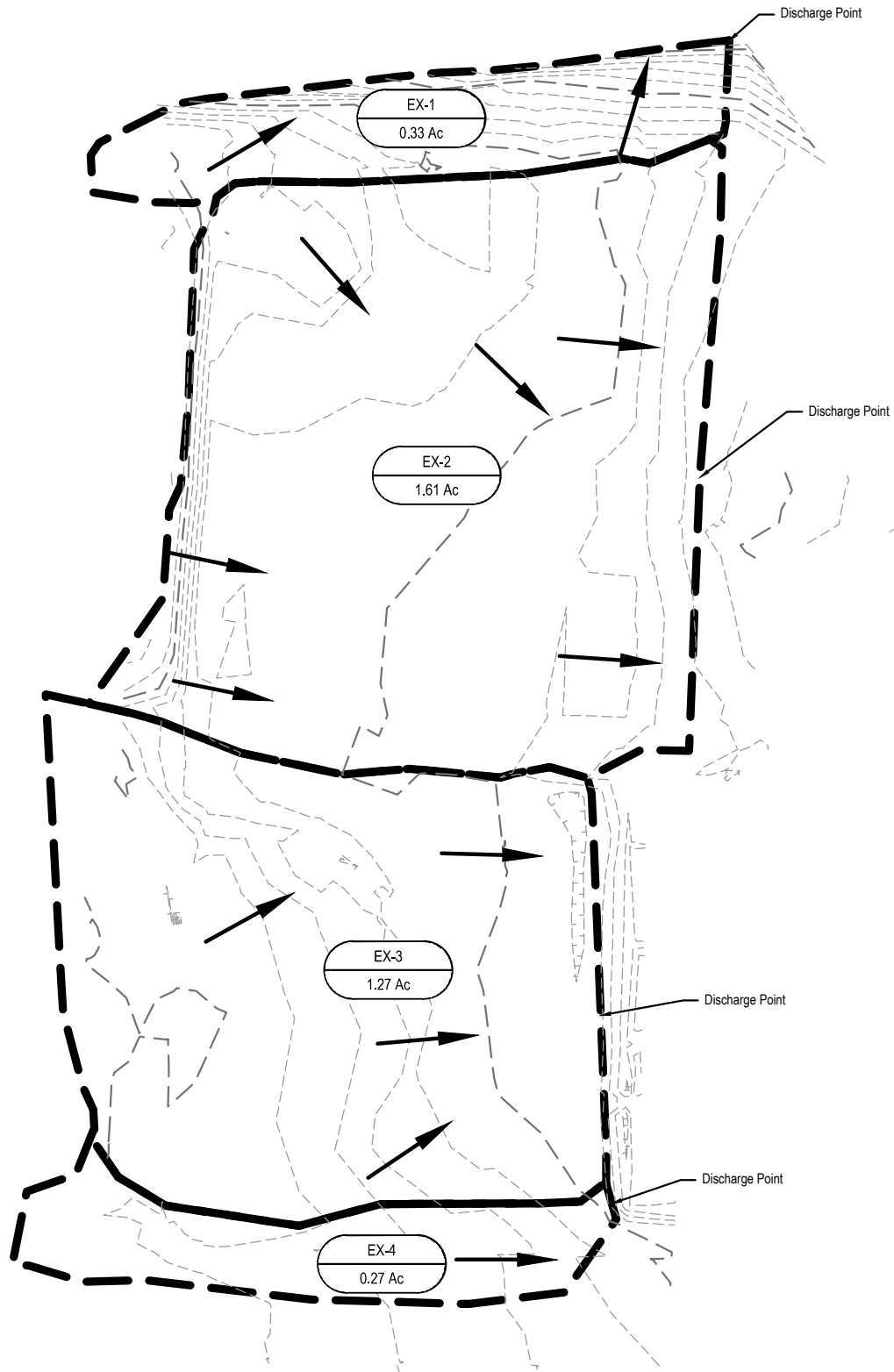
Table 2, Existing basin Curve Numbers and Time of Concentrations

Basin ID	Aggregate Curve Number	Computed Time of Concentration
EX-1	75	5.0
EX-2	79	5.0
EX-3	78	5.0
EX-4	88	5.0

Soil Classifications

Soil maps published on the NRCD Wed Soil Survey, categorize soils located on the lot as:

Symbol	Name	Slopes	HSG
10082	Arisburg-Urban land complex	1-5%	100%



Proj No:	2013.037.005
Date:	9/17/2018
Designed By:	DAS
Drawn By:	DAS
Scale:	AS NOTED
Sheet:	1 of 2

Revisions	
Δ	Description

EXISTING
DRAINAGE MAP

EXTRA SPACE STORAGE
650 OLDHAM PARKWAY
LEES SUMMIT, MISSOURI



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PRE-DEVELOPED BASIN SUMMARY AND DRAINAGE MAP

The following summarizes the pre-developed storm runoff for the pre-developed lot and the anticipated peak flow rates for the 2-, 10- and 100-year storm event.

DRAINAGE AREA – EX-1,

- Drainage Area: 0.33 ac (including off site contributions from the north)
- Drainage Pattern: Runoff flows from the south western edge of the basin and flows into a roadway drainage swale.
- NRCS CN: 75
- Land Use: 0.32 Ac grassed pervious area and 0.01 Ac of impervious area
- Time of Concentration: 5.0 minutes

Table 3, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.040
2-year	0.771
10-year	1.598
100-year	2.721

DRAINAGE AREA – EX-2,

- Drainage Area: 1.62 ac (including off site contributions from west)
- Drainage Pattern: EX-2 incorporates the majority of the northern half of the lot. Flows begin on the western edge and flow east across the site.
- NRCS CN: 79
- Land Use: 1.29 Ac grassed pervious area and 0.33 Ac of impervious area
- Time of Concentration: 5.0 minutes

Table 4, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.468
2-year	4.501
10-year	8.805
100-year	14.40

DRAINAGE AREA – EX-3,

- Drainage Area: 1.26 ac (including off site contributions from west)
- Drainage Pattern: EX-3 incorporates the majority of the southern half of the lot. Flows begin on the western edge and flows east across the site.
- NRCS CN: 78
- Land Use: 1.07 Ac grassed pervious area and 0.19 Ac of impervious area
- Time of Concentration: 5.0 minutes

Table 5, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.305
2-year	3.360
10-year	6.664
100-year	11.00

DRAINAGE AREA – EX-4,

- Drainage Area: 0.28 ac (including off site contributions from south)
- Drainage Pattern: Runoff flows from the western edge of the basin and flows into a roadway drainage swale along the southern edge of the site.
- NRCS CN: 88
- Land Use: 0.12 Ac grassed pervious area and 0.16 Ac of impervious area
- Time of Concentration: 5.0 minutes

Table 6, Peak Discharge Summary

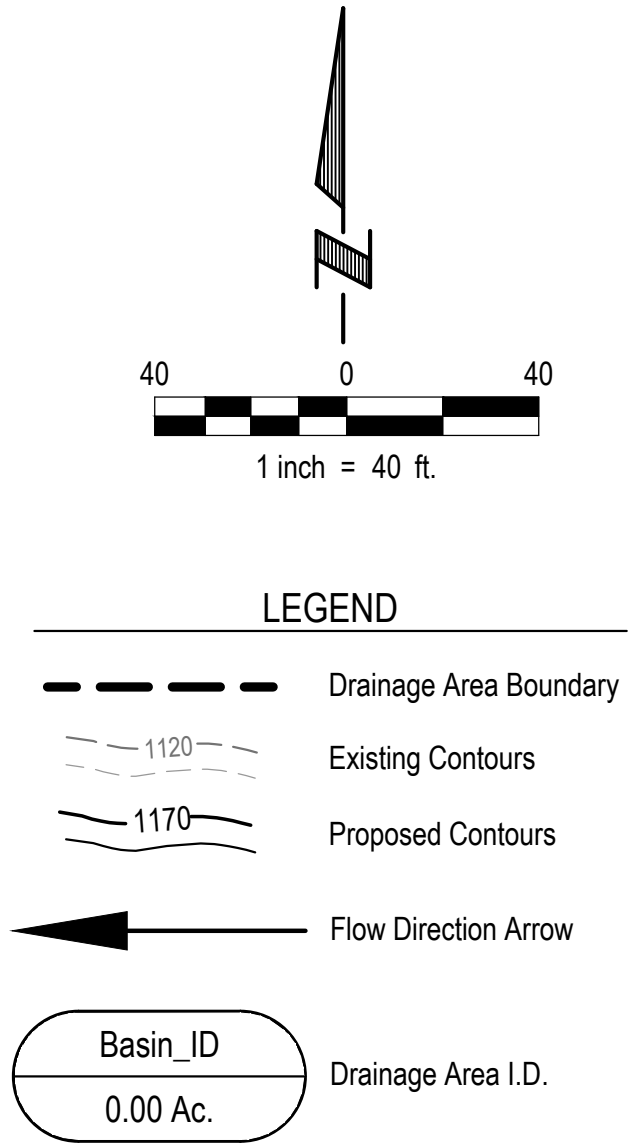
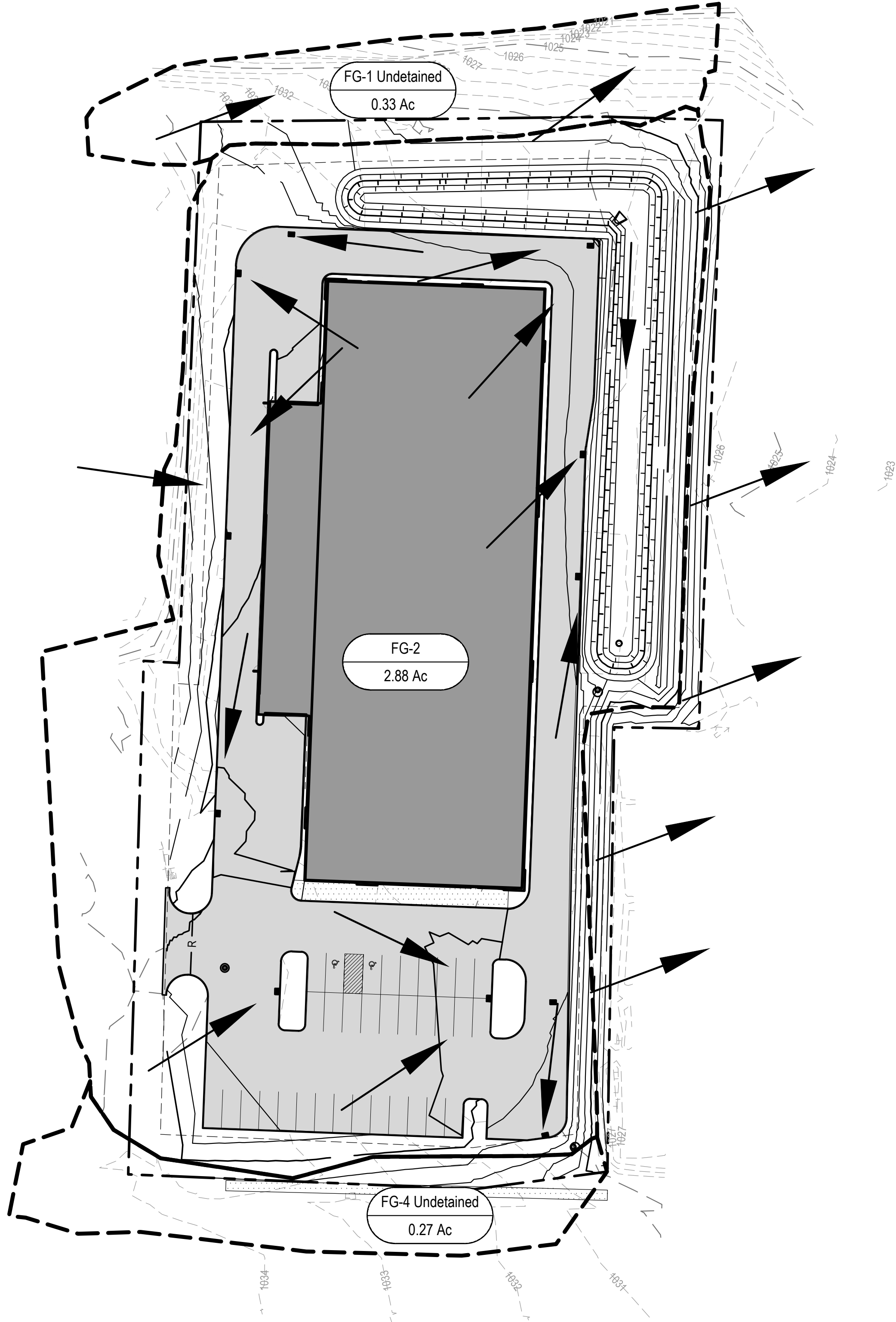
Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.233
2-year	1.089
10-year	1.865
100-year	2.825

TOTAL EXISTING FLOWS LEAVING SITE

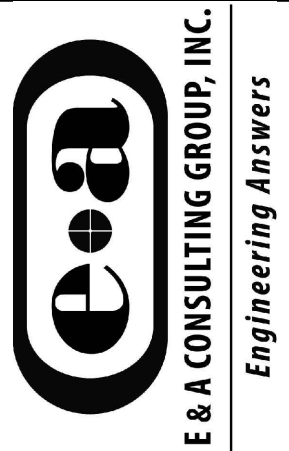
The total flows for this project are the flows affected by the disturbance of this project. These are captured in basins EX-2 and EX-3. These flows are combined to form the total flows summarized in the table below.

Table 7, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.773
2-year	7.861
10-year	15.47
100-year	25.40



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EXTRA SPACE STORAGE
650 OLDHAM PARKWAY
LEES SUMMIT, MISSOURI

DEVELOPED
DRAINAGE MAP

Revisions	
Δ	Description
1	
2	

Proj No:	P2018.037.008
Date:	11/17/2019
Designed By:	DAS
Drawn By:	DAS
Scale:	SEE PLANS
Sheet:	2 of 2

DEVELOPED LAND USE CONDITIONS BASIN SUMMARY AND DRAINAGE MAP

The following summary show the effects of routing the storm runoff for the developed basin and the anticipated peak volume for the 2-, 10- and 100-year storm event.

DRAINAGE AREA FG-1 UNDETAINED:

- Drainage Area: 0.33 ac
- Drainage Pattern: Runoff flows from the south western edge of the basin and flows into a roadway drainage swale as it did under existing conditions.
- NRCS CN: 75
 - Land Use: 0.32 Ac grassed pervious area and 0.01 Ac of impervious area
 - Time of Concentration: 5.0 minutes

Table 8, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.040
2-year	0.771
10-year	1.598
100-year	2.721

CAPTURED DRAINAGE AREA FG-2:

- Drainage Area: 2.88 ac
- Drainage Pattern: Runoff away from the center of the site across to various storm drains located around the site. These collect the water and drain it into a proposed bio-retention basin on the eastern edge of the site. From there the water discharges into an existing storm drain system.
- NRCS CN: 88
 - Land Use: 1.16 Ac grassed pervious area and 1.72 Ac of impervious area
 - Time of Concentration: 5.0 minutes

Table 9, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	2.398
2-year	11.21
10-year	19.18
100-year	29.06

DRAINAGE AREA FG-3 UNDETAINED:

- Drainage Area: 0.28 ac
- Drainage Pattern: Runoff flows from the western edge of the basin and flows into a roadway drainage swale along the southern edge of the site as it did under existing conditions.
- NRCS CN: 88
- Land Use: 0.12 Ac grassed pervious area and 0.16 Ac of impervious area
- Time of Concentration: 5.0 minutes

Table 10, Peak Discharge Summary

Storm Event (Return Period)	Peak Flow Rate (CFS)
90% of the Mean Annual	0.233
2-year	1.089
10-year	1.865
100-year	2.825

STORMWATER DETENTION BASIN

Proposed Dry Detention Basin:

Inflow Hydrograph #3: "FG-2" (Hydraflow Hydrographs File,
ESS_Storm_Bio.000.gpw)

Basin Invert Elevation: 1028.0
Top of Basin Elevation: 1032.0

Outflow Structure Characteristics:

4" Dia. Underdrain
Flow Line 1027.0

12" Dia. Riser
Crest Elevation 1030.0

Max 1% Water Surface Elevation 1031.89

90% of the Mean Annual Detention Time 20.53hrs

Max Detention Volume 29,903 CF

Table 11, BMP 1, Peak Inflow, Stage and Discharge Summary

Storm Event (Return Period)	Peak Inflow Rate (CFS)	Detained Volume (Cubic Feet)	Discharge Flow Rate (CFS)
90% of the Mean Annual	2.398	2,086	0.185
2-year	11.21	11,599	1.028
10-year	19.18	19,072	4.338
100-year	29.06	29,014	6.806

COMPARISON OF PRE-DEVELOPED AND POST-DEVELOPED STORMWATER RUNOFF

Table 12, Peak Flow Summary

Storm Event (Return Period)	Allowable Discharge Rate (CFS)	Total Flows Leaving Site (CFS) FG2 (Hydrograph #12)	Detained Runoff Peak Flow Rate <u>Less Than or Equal to</u> Allowable Discharge Flow Rate
2-year	0.5*2.88=1.44	1.028	YES
10-year	2.0*2.88=5.76	4.338	YES
100-year	3.0*2.88=8.64	6.806	YES

*See Hydrograph 12, Combined Total Post for Total Flows leaving the site. The post-developed, detained stormwater runoff peak flow rates are less than allowable discharge rates for the 2-year, 10-year and 100-year evaluated storm events. The 90% of the mean annual detention time has been raised to as long as possible while still meeting the required 4" minimum outlet size.

CONCLUSION

Table 13, Existing Discharge Rates Summary

	EX-1 Undetailed	EX-2	EX-3	EX-4 Undetailed	EX-Total
2-year	0.77	4.50	3.36	1.09	9.70
10-year	1.60	8.81	6.66	1.87	18.93
100-year	2.72	14.40	11.00	2.83	30.95

Table 14, Finished Grade Discharge Rates Summary

	FG-1 Undetailed	FG-2	FG-3 Undetailed	FG-Total
2-year	0.77	1.03	1.09	2.40
10-year	1.60	4.34	1.87	6.74
100-year	2.72	6.81	2.83	11.07

EX-1 was essentially untouched by this development. This is reflected in FG-1 identical flow rate values. FG-3 will have some grading work done but the overall imperviousness will remain the same as EX-4. This is also reflected in their identical flow values. Ex-2 and EX-3 is where the change is seen. This basin is far more impervious and is shown as FG-2. FG-2 is detained within the bio-retention basin. This basin is what has to meet the allowable discharge rates. As shown in table 12 this basin meets required levels wherever possible.

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650 Oldham Parkway

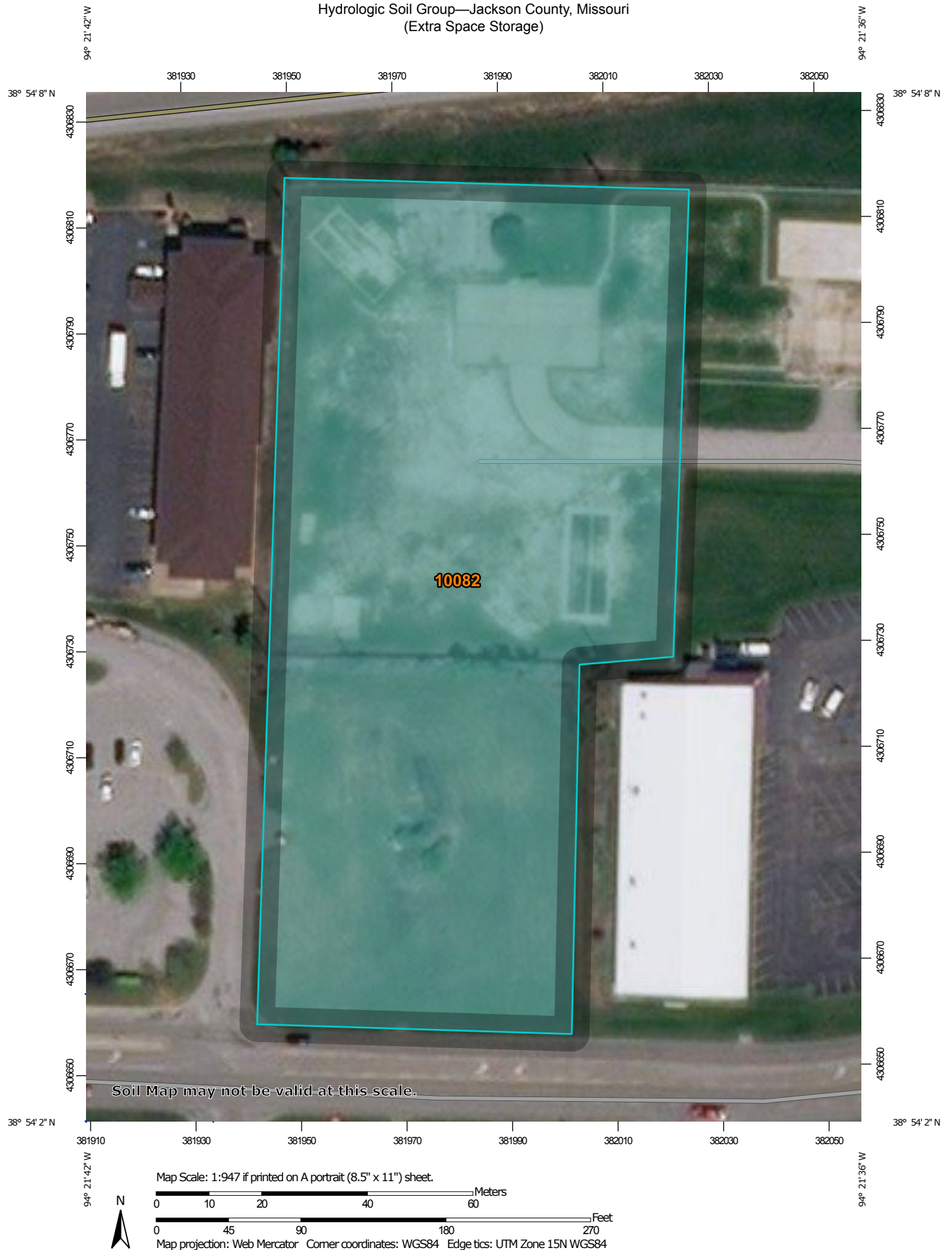
APPENDIX:

SOILS MAP

PCSMP MAP

HYDRAFLOW HYDROGRAPHS REPORT

Hydrologic Soil Group—Jackson County, Missouri (Extra Space Storage)




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: Jackson County, Missouri
Survey Area Data: Version 18, Sep 16, 2017

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

Date(s) aerial images were photographed: Oct 14, 2014—Oct 10, 2016

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
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	2.7	100.0%
Totals for Area of Interest			2.7	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.

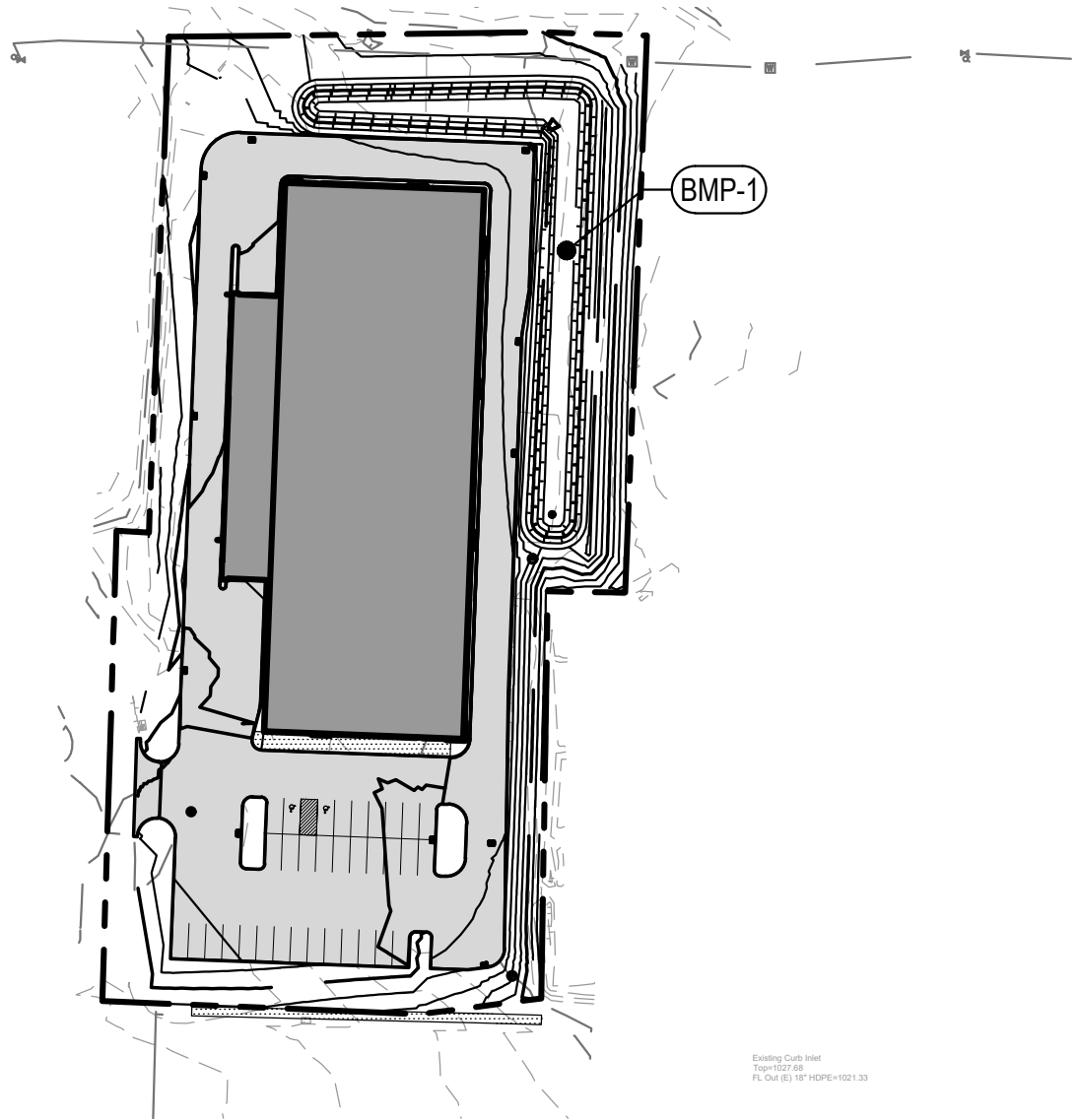
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

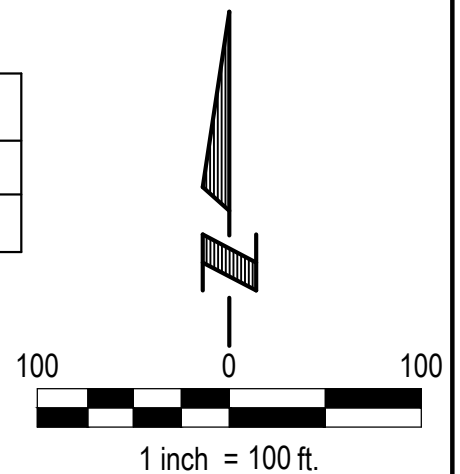
Component Percent Cutoff: None Specified

Tie-break Rule: Higher



X	BMP TABLE	
BMP ID	DESCRIPTION	LOCATION
BMP-1	DRY DETENTION BASIN	38.902013°N, 94.360642°W

PHYSICAL ADDRESS:
650 Oldham Parkway



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Date: 1/17/2019

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Scale: 1"=100'

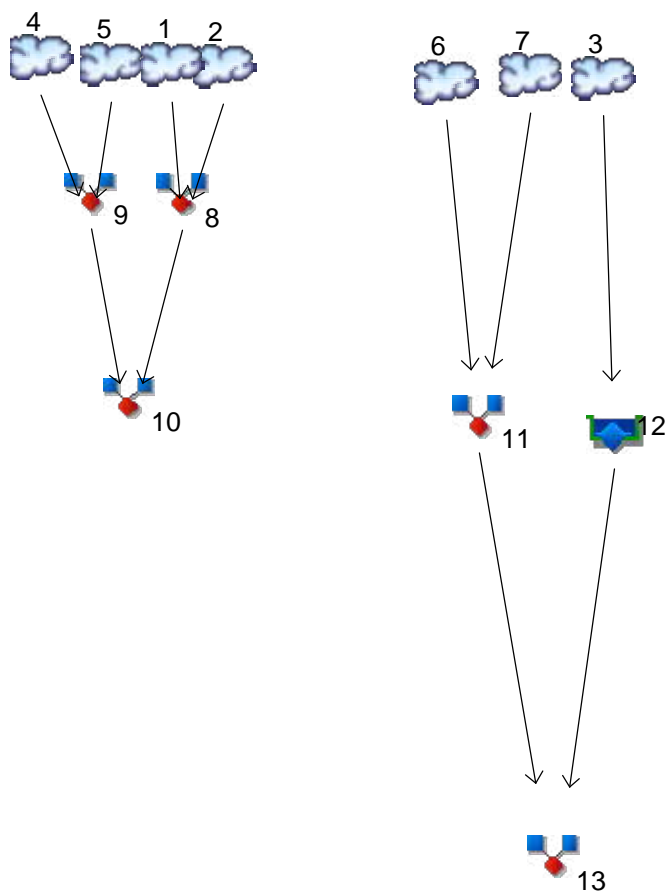
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EXTRA SPACE STORAGE BMP MAP

LEE'S SUMMIT, MISSOURI

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX-2
2	SCS Runoff	EX-3
3	SCS Runoff	FG-2
4	SCS Runoff	EX-1
5	SCS Runoff	EX-4
6	SCS Runoff	FG-1
7	SCS Runoff	FG-3
8	Combine	EX Full 2.88 Acres
9	Combine	<no description>
10	Combine	Total Existing
11	Combine	<no description>
12	Reservoir	<no description>
13	Combine	<no description>

Hydrograph Return Period Recap

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	-----	0.468	4.501	-----	-----	8.805	-----	-----	14.40	EX-2
2	SCS Runoff	-----	0.305	3.360	-----	-----	6.664	-----	-----	11.00	EX-3
3	SCS Runoff	-----	2.398	11.21	-----	-----	19.18	-----	-----	29.06	FG-2
4	SCS Runoff	-----	0.040	0.771	-----	-----	1.598	-----	-----	2.721	EX-1
5	SCS Runoff	-----	0.233	1.089	-----	-----	1.865	-----	-----	2.825	EX-4
6	SCS Runoff	-----	0.040	0.771	-----	-----	1.598	-----	-----	2.721	FG-1
7	SCS Runoff	-----	0.233	1.089	-----	-----	1.865	-----	-----	2.825	FG-3
8	Combine	1, 2,	0.773	7.861	-----	-----	15.47	-----	-----	25.40	EX Full 2.88 Acres
9	Combine	4, 5,	0.270	1.847	-----	-----	3.463	-----	-----	5.546	<no description>
10	Combine	8, 9	1.043	9.696	-----	-----	18.93	-----	-----	30.95	Total Existing
11	Combine	6, 7,	0.270	1.847	-----	-----	3.463	-----	-----	5.546	<no description>
12	Reservoir	3	0.185	1.028	-----	-----	4.338	-----	-----	6.806	<no description>
13	Combine	11, 12	0.388	2.398	-----	-----	6.741	-----	-----	11.07	<no description>
Proj. file: ESS_Storm_Bio.000.gpw										Monday, 09 / 17 / 2018	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	0.468	2	718	1,108	-----	-----	-----	EX-2
2	SCS Runoff	0.305	2	718	768	-----	-----	-----	EX-3
3	SCS Runoff	2.398	2	718	4,795	-----	-----	-----	FG-2
4	SCS Runoff	0.040	2	720	137	-----	-----	-----	EX-1
5	SCS Runoff	0.233	2	718	466	-----	-----	-----	EX-4
6	SCS Runoff	0.040	2	720	137	-----	-----	-----	FG-1
7	SCS Runoff	0.233	2	718	466	-----	-----	-----	FG-3
8	Combine	0.773	2	718	1,875	1, 2,	-----	-----	EX Full 2.88 Acres
9	Combine	0.270	2	718	604	4, 5,	-----	-----	<no description>
10	Combine	1.043	2	718	2,479	8, 9	-----	-----	Total Existing
11	Combine	0.270	2	718	604	6, 7,	-----	-----	<no description>
12	Reservoir	0.185	2	756	4,784	3	1028.28	2,086	<no description>
13	Combine	0.388	2	718	5,388	11, 12	-----	-----	<no description>
ESS_Storm_Bio.000.gpw					Return Period: 1 Year			Monday, 09 / 17 / 2018	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

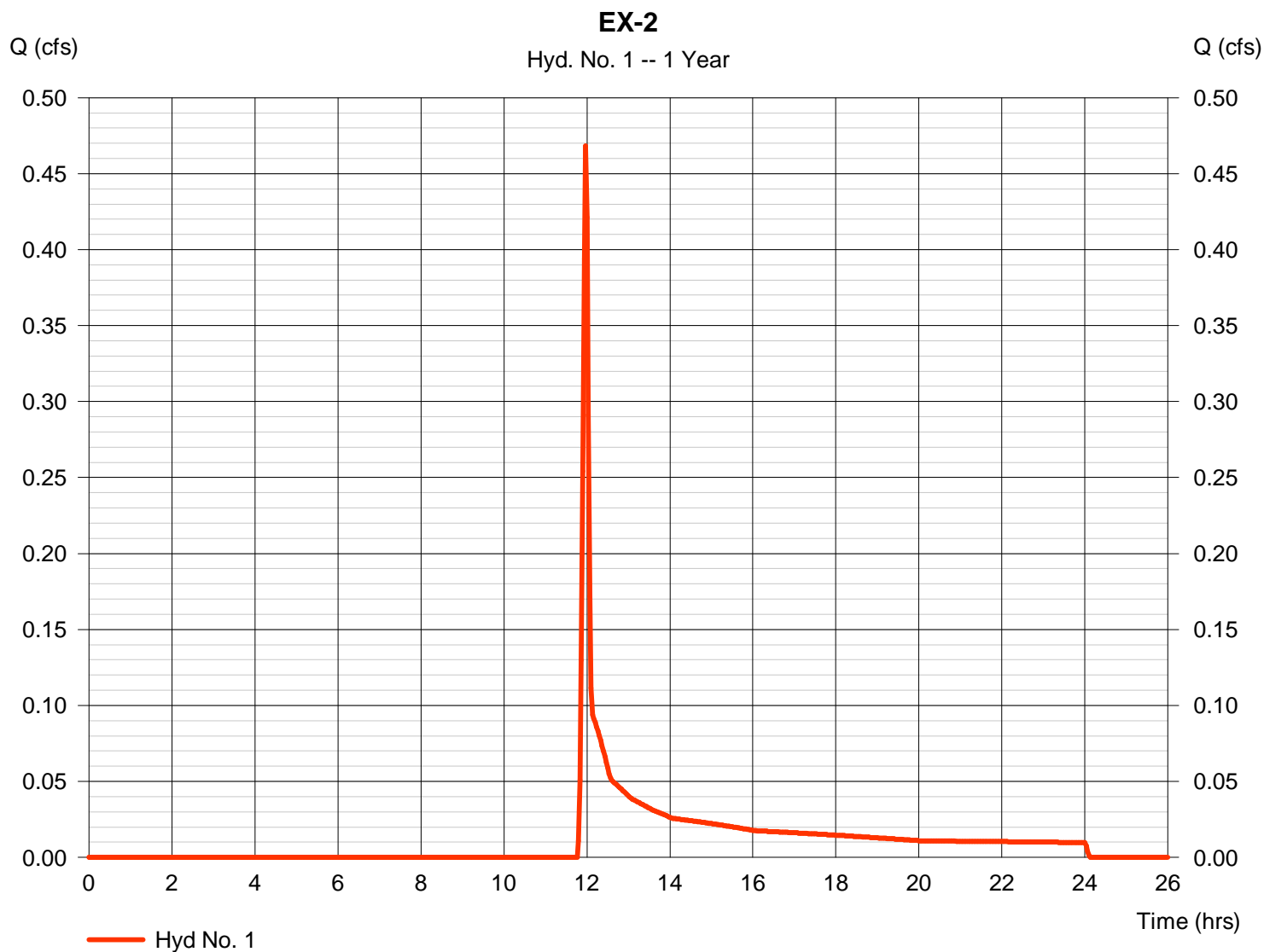
Monday, 09 / 17 / 2018

Hyd. No. 1

EX-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.468 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 1,108 cuft
Drainage area	= 1.620 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.330 \times 98) + (1.320 \times 74)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 2

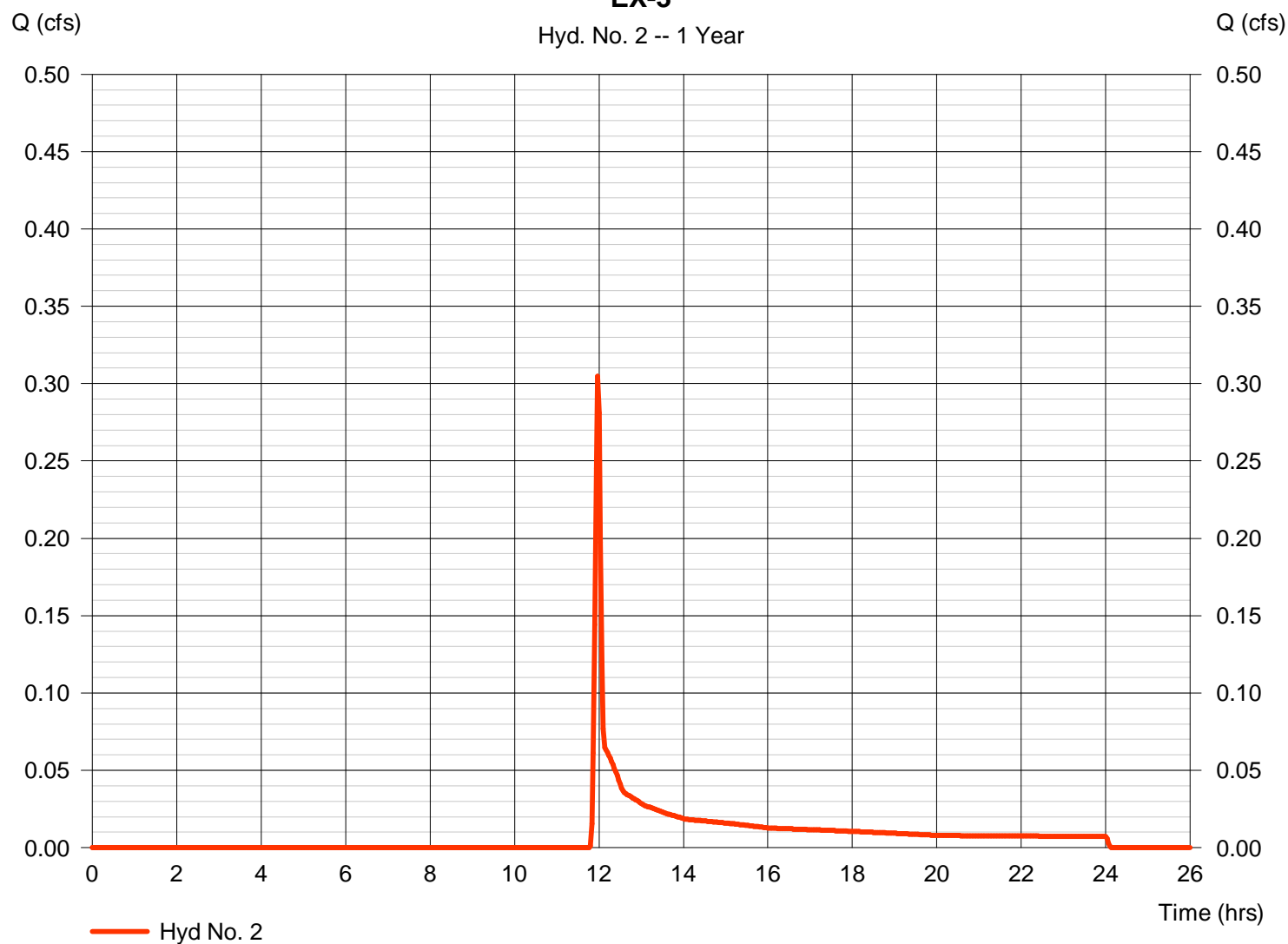
EX-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.305 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 768 cuft
Drainage area	= 1.260 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.190 \times 98) + (1.080 \times 74)] / 1.260$

EX-3

Hyd. No. 2 -- 1 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 3

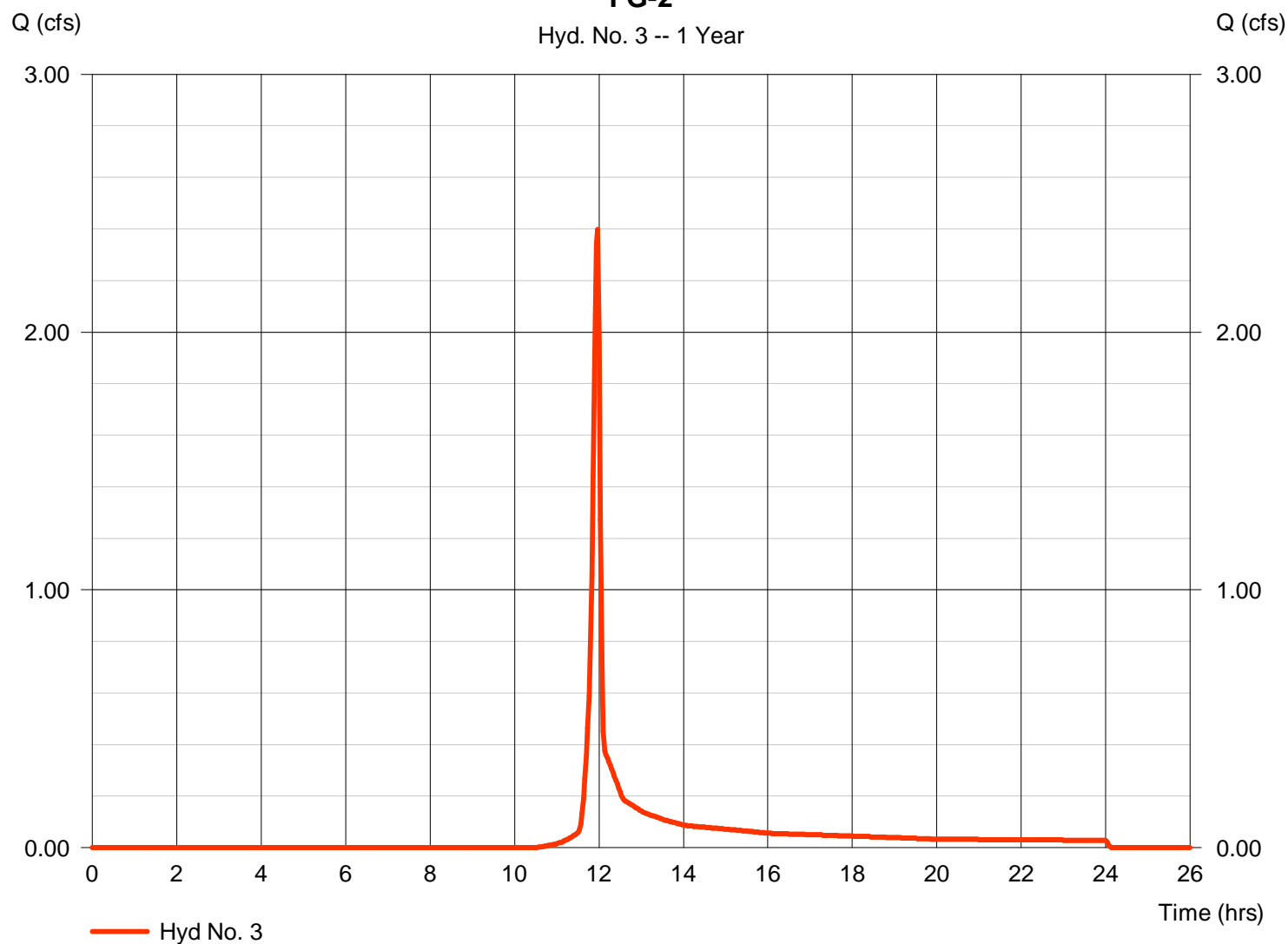
FG-2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.398 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 4,795 cuft
Drainage area	= 2.880 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.720 \times 98) + (1.160 \times 74)] / 2.880$

FG-2

Hyd. No. 3 -- 1 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

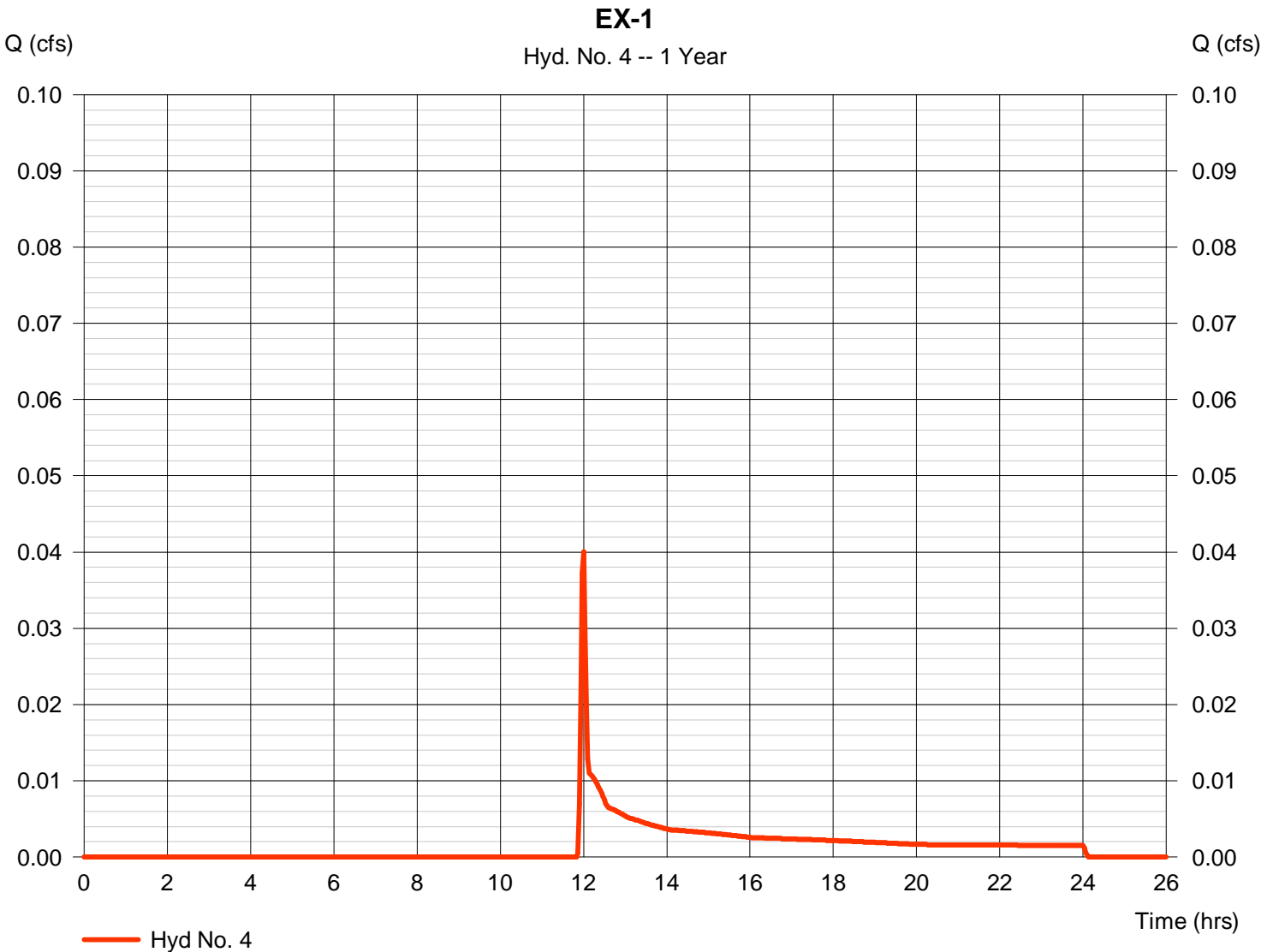
Monday, 09 / 17 / 2018

Hyd. No. 4

EX-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.040 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	137 cuft
Drainage area	=	0.330 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	1.37 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.320 x 74) + (0.010 x 98)] / 0.330



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

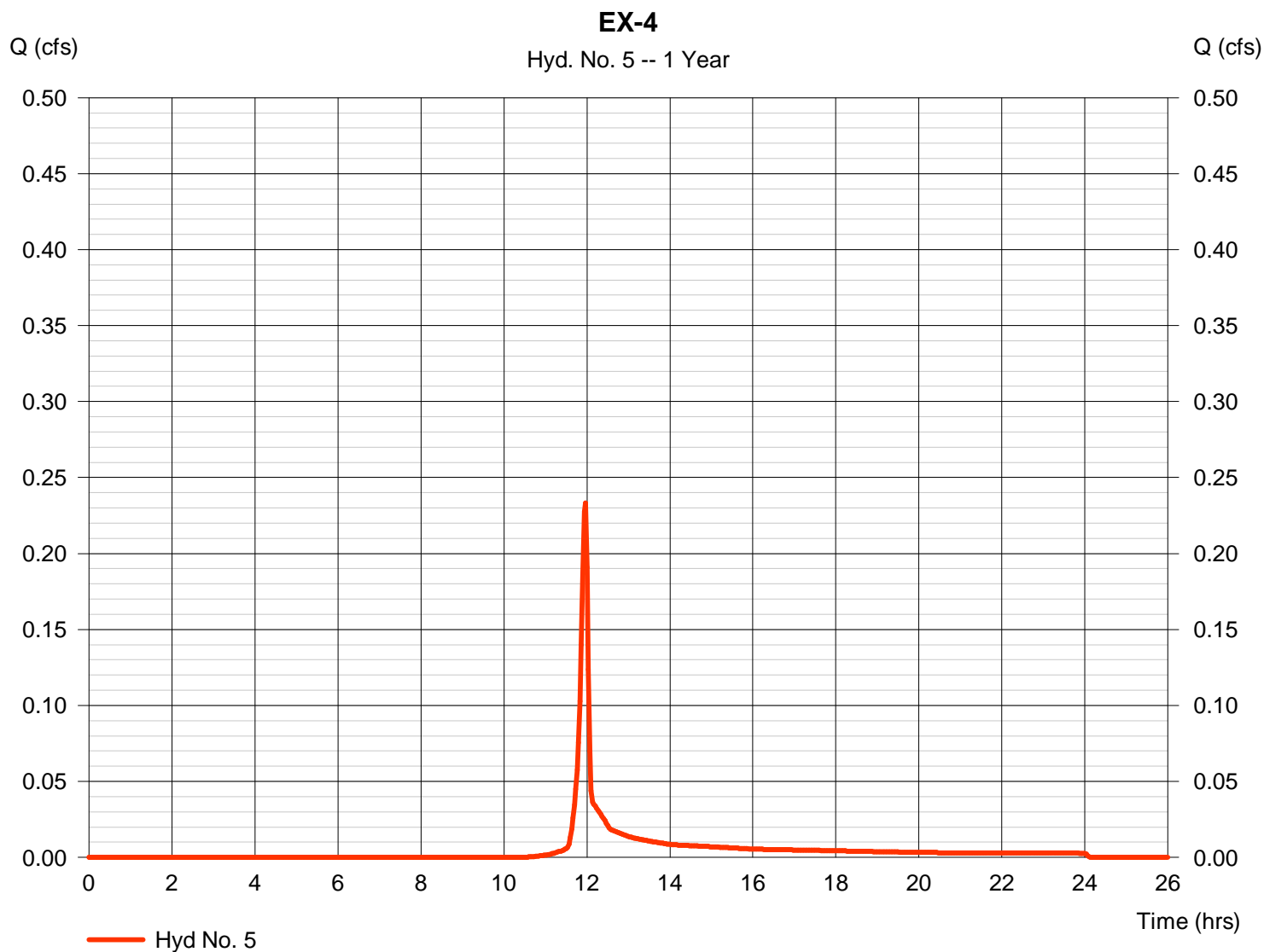
Monday, 09 / 17 / 2018

Hyd. No. 5

EX-4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.233 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 466 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$

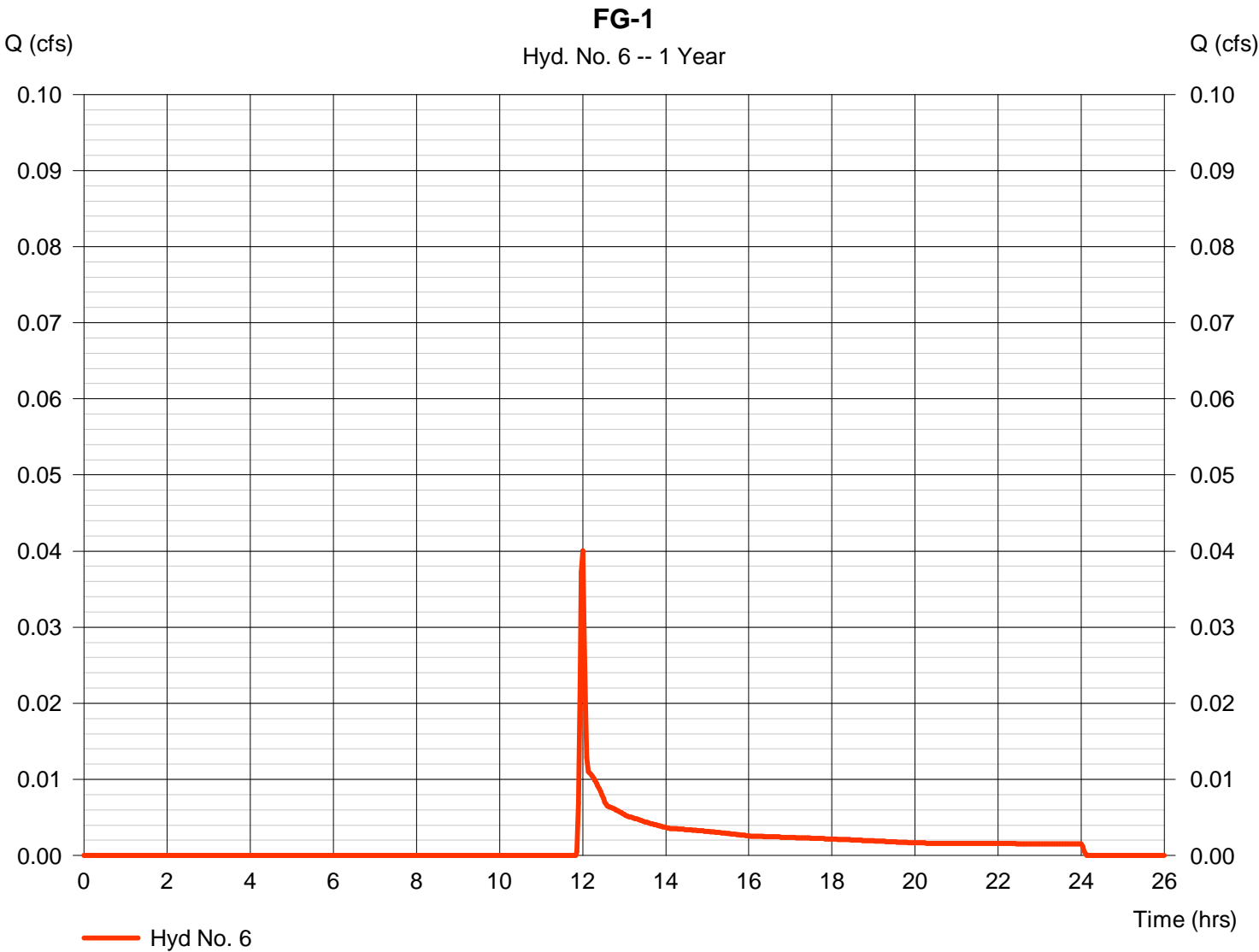


Hydrograph Report

Hyd. No. 6

FG-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.040 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 137 cuft
Drainage area	= 0.330 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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Hyd. No. 7

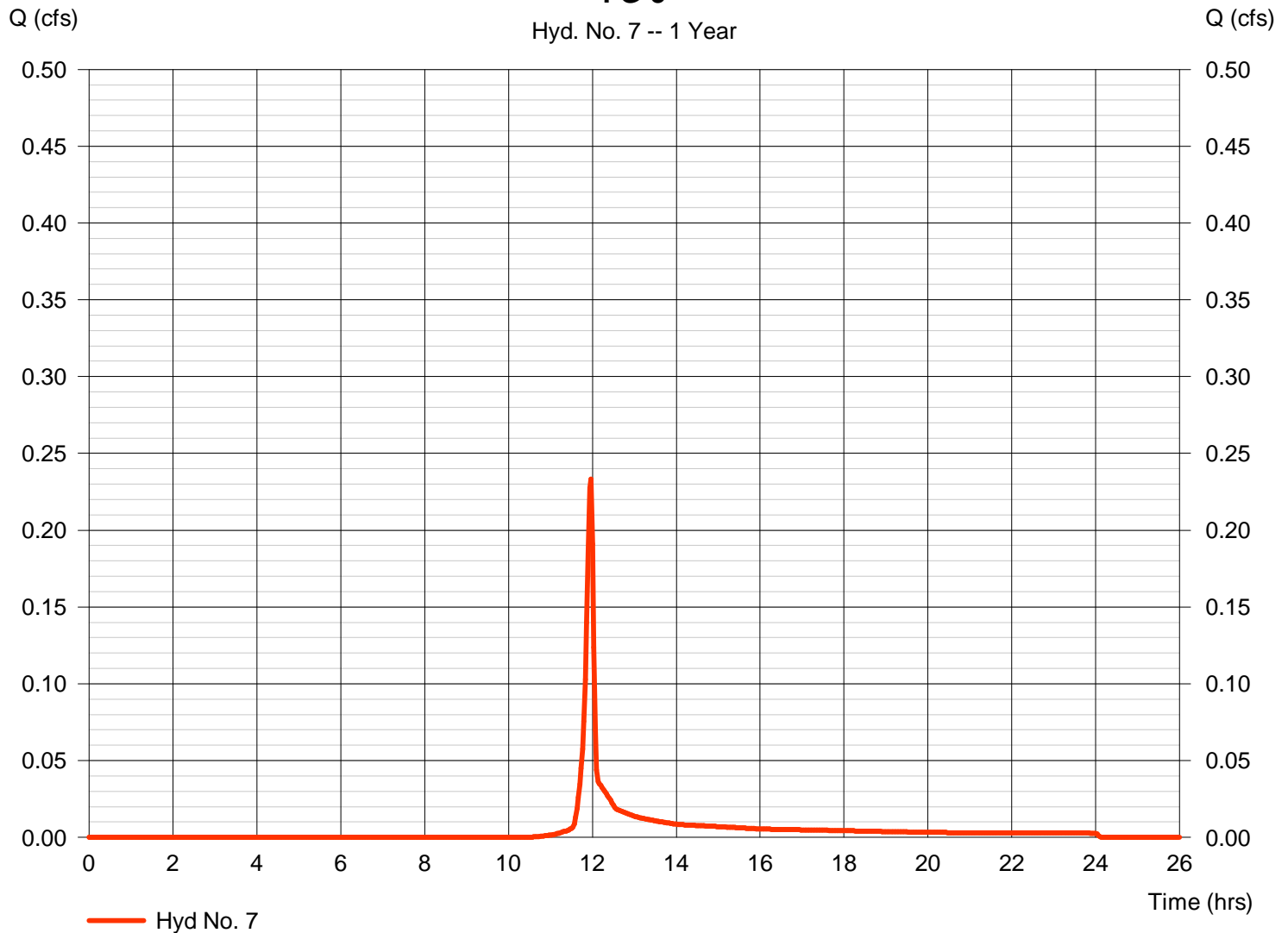
FG-3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.233 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 466 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.37 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$

FG-3

Hyd. No. 7 -- 1 Year



Hydrograph Report

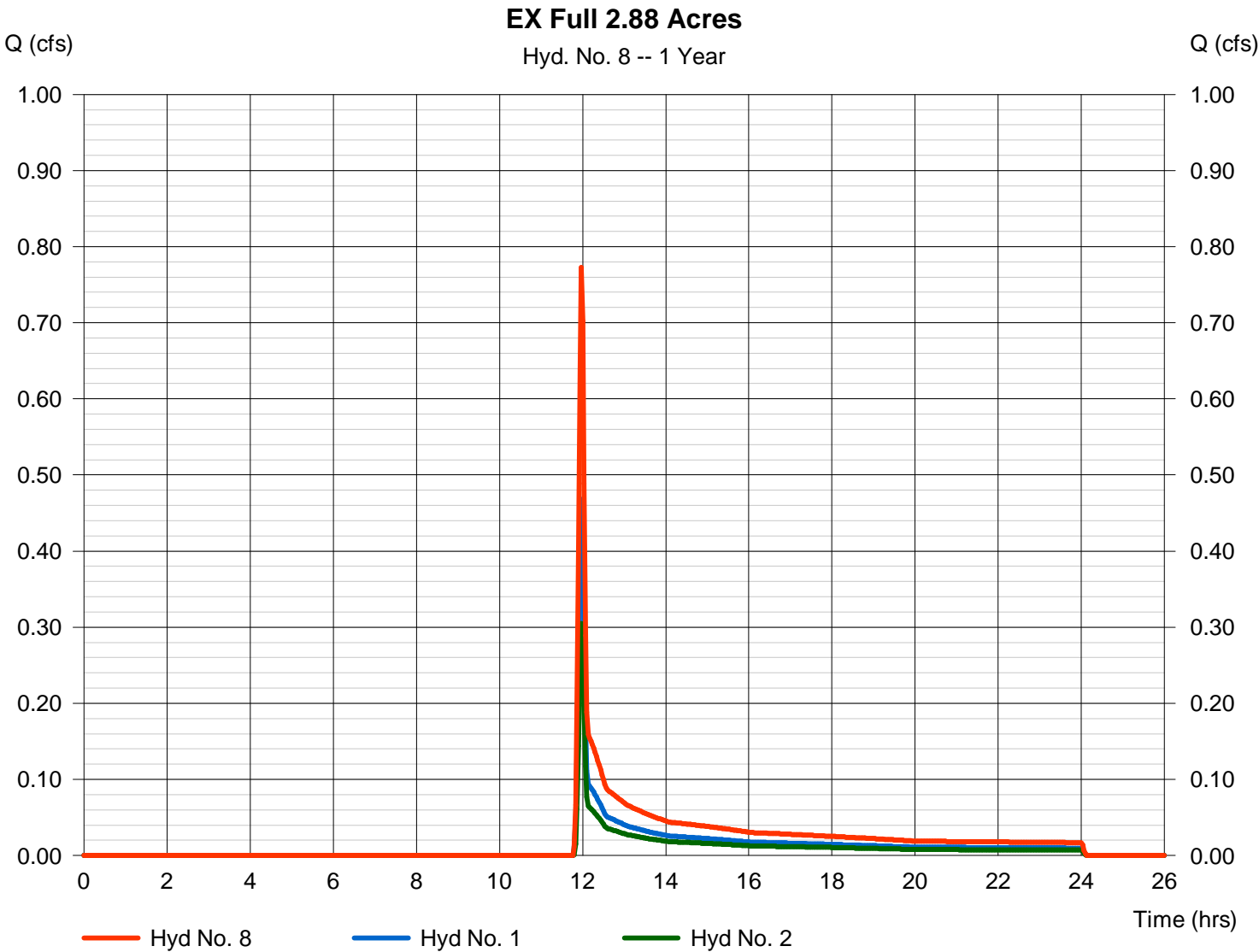
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 8

EX Full 2.88 Acres

Hydrograph type	= Combine	Peak discharge	= 0.773 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 1,875 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 2.880 ac



Hydrograph Report

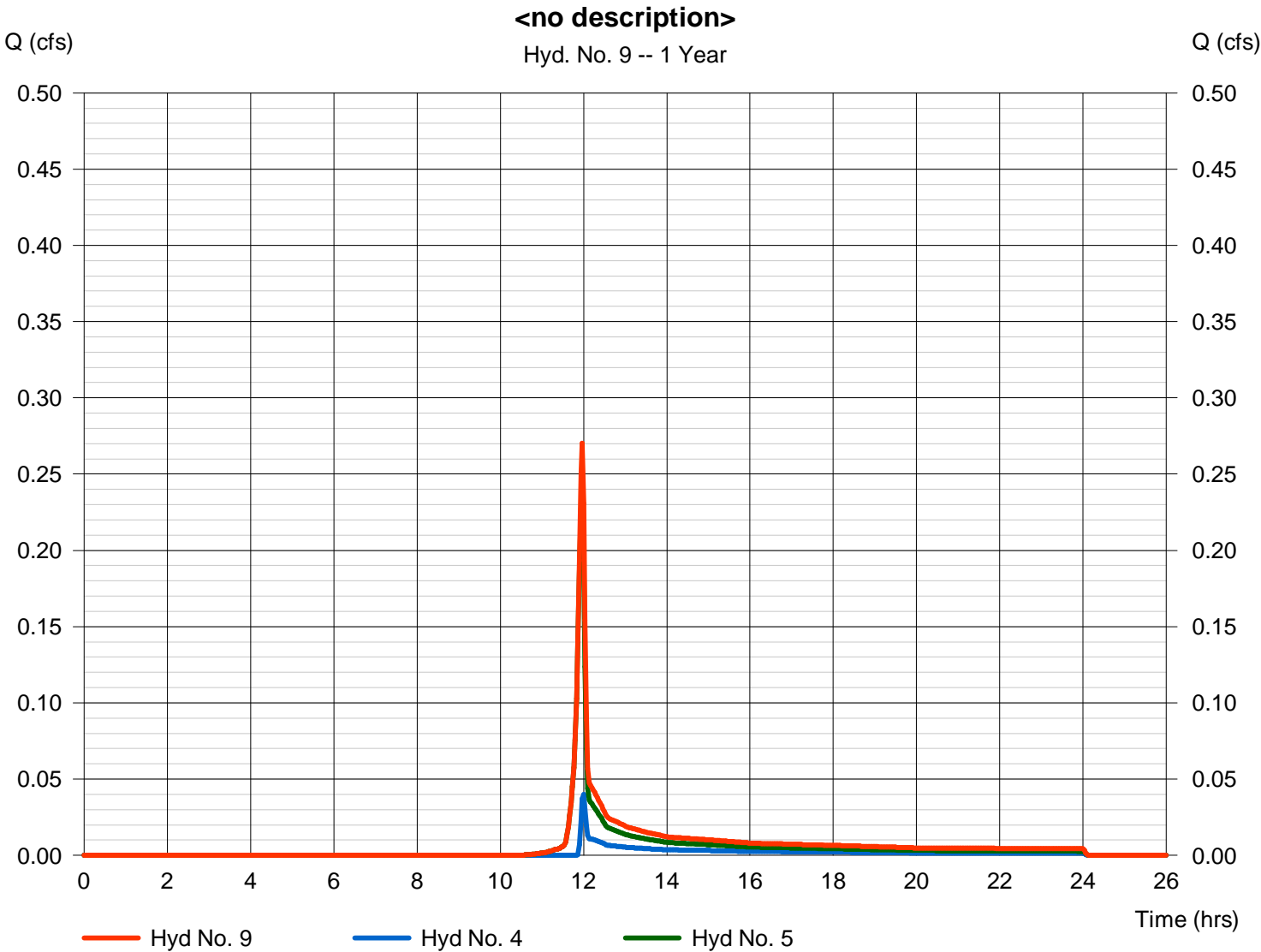
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 9

<no description>

Hydrograph type	= Combine	Peak discharge	= 0.270 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 604 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 0.610 ac



Hydrograph Report

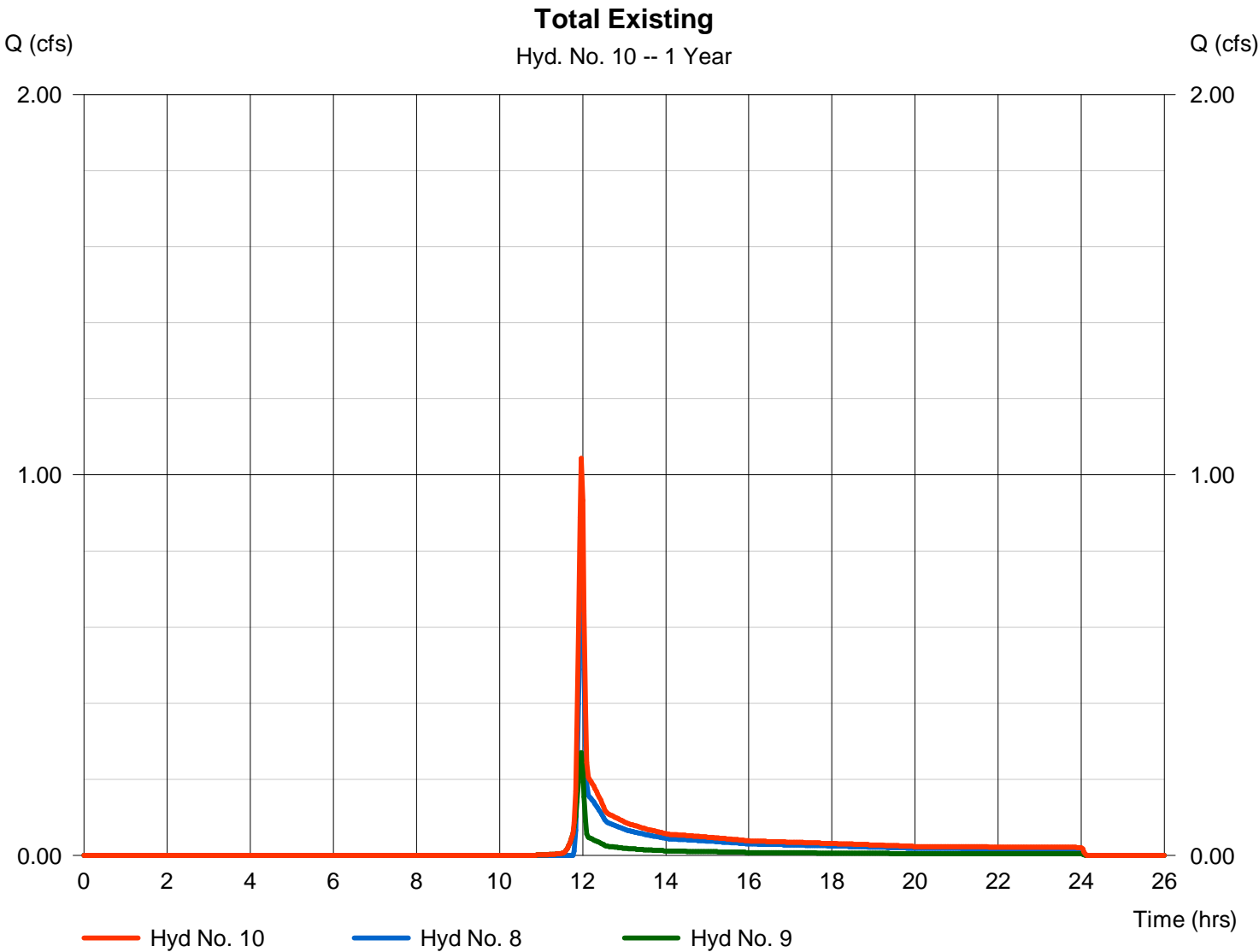
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 10

Total Existing

Hydrograph type	= Combine	Peak discharge	= 1.043 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 2,479 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 0.000 ac



Hydrograph Report

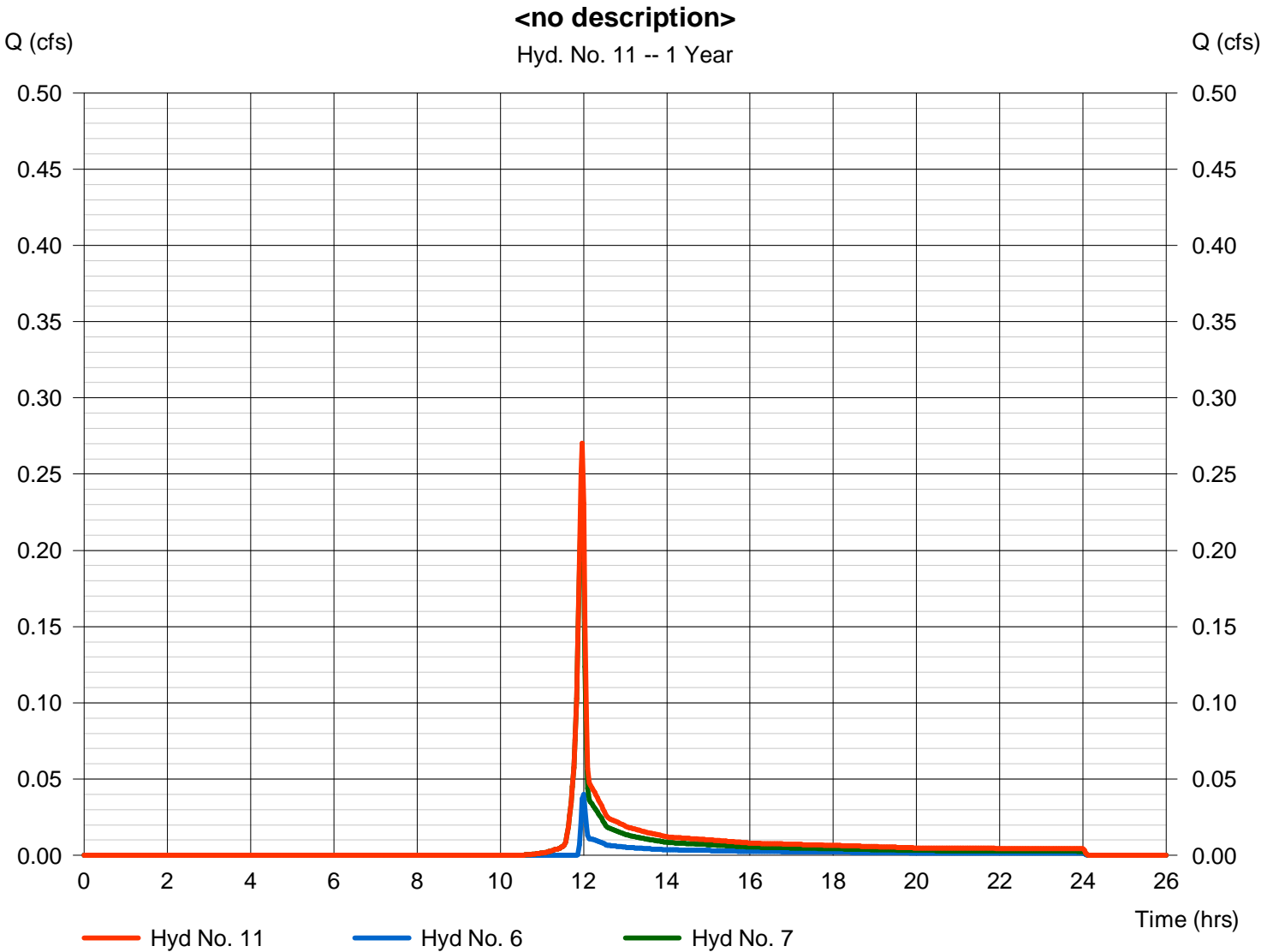
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 11

<no description>

Hydrograph type	= Combine	Peak discharge	= 0.270 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 604 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

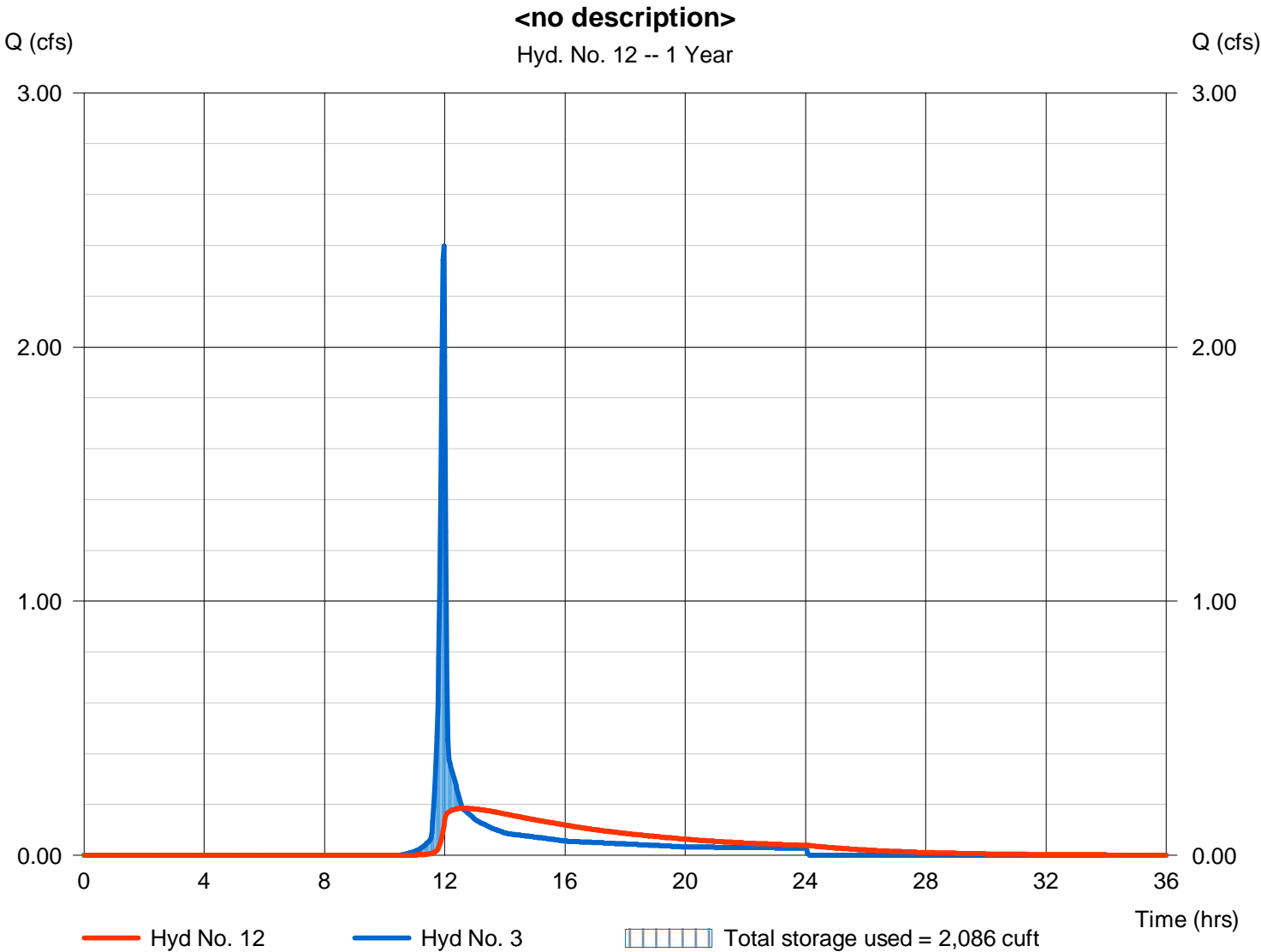
Monday, 09 / 17 / 2018

Hyd. No. 12

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 0.185 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.60 hrs
Time interval	= 2 min	Hyd. volume	= 4,784 cuft
Inflow hyd. No.	= 3 - FG-2	Max. Elevation	= 1028.28 ft
Reservoir name	= Bio-Retention Pond	Max. Storage	= 2,086 cuft

Storage Indication method used.



Pond No. 1 - Bio-Retention Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1028.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1028.00	3,543	0	0
4.00	1032.00	12,288	29,903	29,903

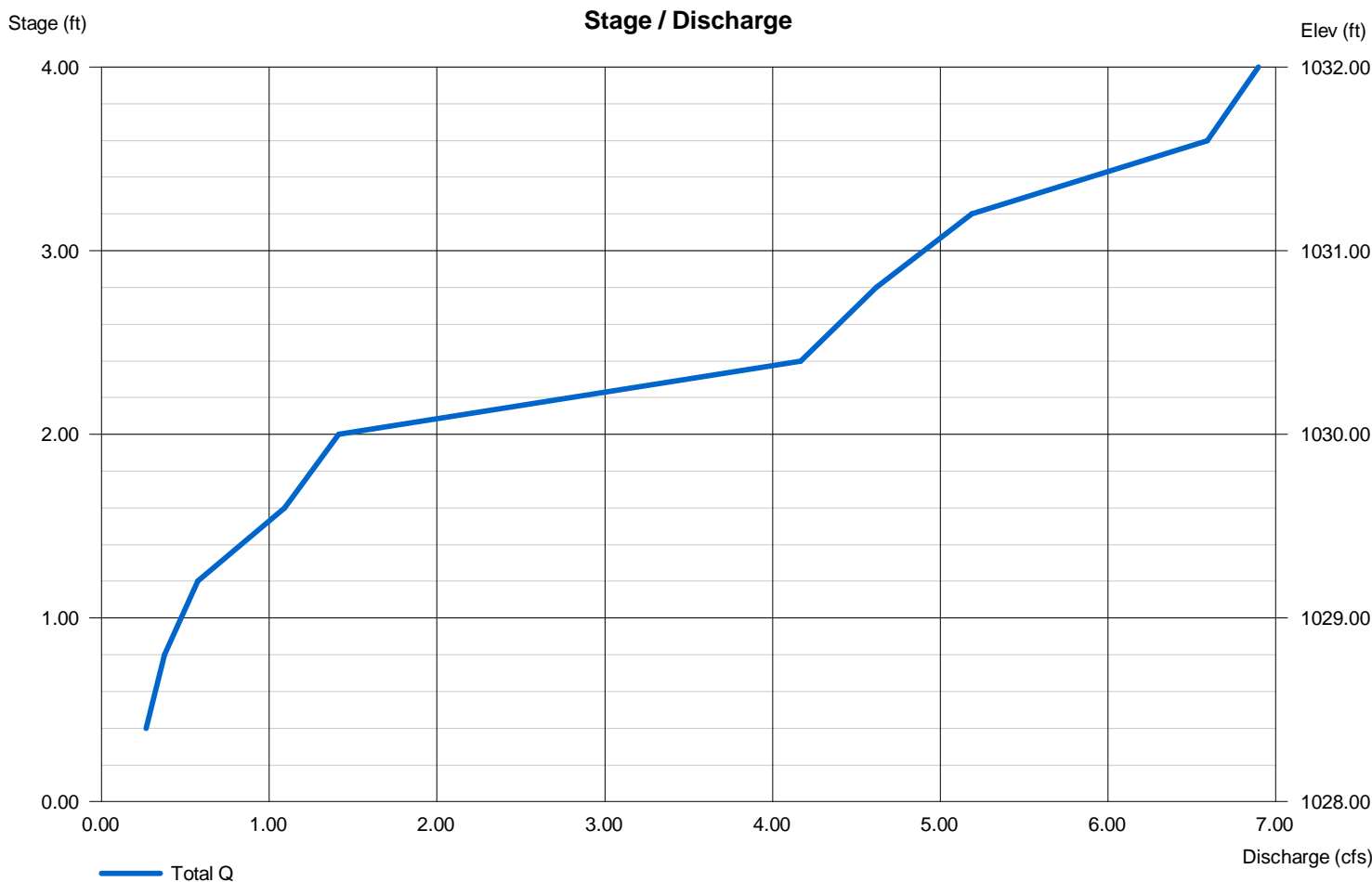
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	4.00	6.00	0.00
Span (in)	= 12.00	4.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 1027.00	1027.00	1029.00	0.00
Length (ft)	= 80.00	0.00	0.00	0.00
Slope (%)	= 1.00	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)	= 3.14	Inactive	0.00	0.00
Crest El. (ft)	= 1030.00	1031.89	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
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® 2019 by Autodesk, Inc. v2020

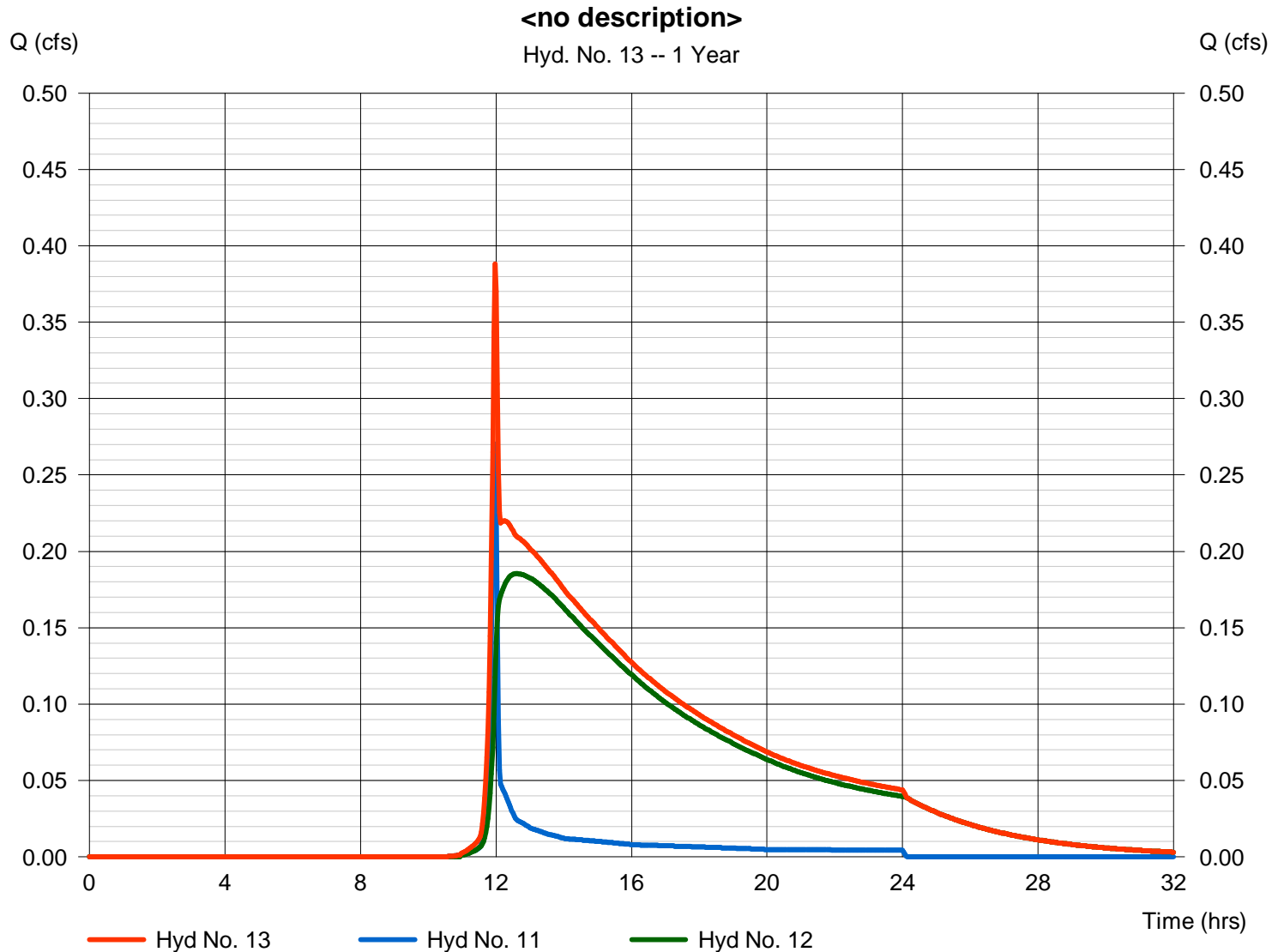
Monday, 09 / 17 / 2018

Hyd. No. 13

<no description>

Hydrograph type = Combine
 Storm frequency = 1 yrs
 Time interval = 2 min
 Inflow hyds. = 11, 12

Peak discharge = 0.388 cfs
 Time to peak = 11.97 hrs
 Hyd. volume = 5,388 cuft
 Contrib. drain. area = 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	4.501	2	718	9,064	-----	-----	-----	EX-2
2	SCS Runoff	3.360	2	718	6,748	-----	-----	-----	EX-3
3	SCS Runoff	11.21	2	716	23,131	-----	-----	-----	FG-2
4	SCS Runoff	0.771	2	718	1,542	-----	-----	-----	EX-1
5	SCS Runoff	1.089	2	716	2,249	-----	-----	-----	EX-4
6	SCS Runoff	0.771	2	718	1,542	-----	-----	-----	FG-1
7	SCS Runoff	1.089	2	716	2,249	-----	-----	-----	FG-3
8	Combine	7.861	2	718	15,812	1, 2,	-----	-----	EX Full 2.88 Acres
9	Combine	1.847	2	716	3,791	4, 5,	-----	-----	<no description>
10	Combine	9.696	2	718	19,603	8, 9	-----	-----	Total Existing
11	Combine	1.847	2	716	3,791	6, 7,	-----	-----	<no description>
12	Reservoir	1.028	2	744	23,120	3	1029.55	11,599	<no description>
13	Combine	2.398	2	718	26,910	11, 12	-----	-----	<no description>
ESS_Storm_Bio.000.gpw					Return Period: 2 Year			Monday, 09 / 17 / 2018	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

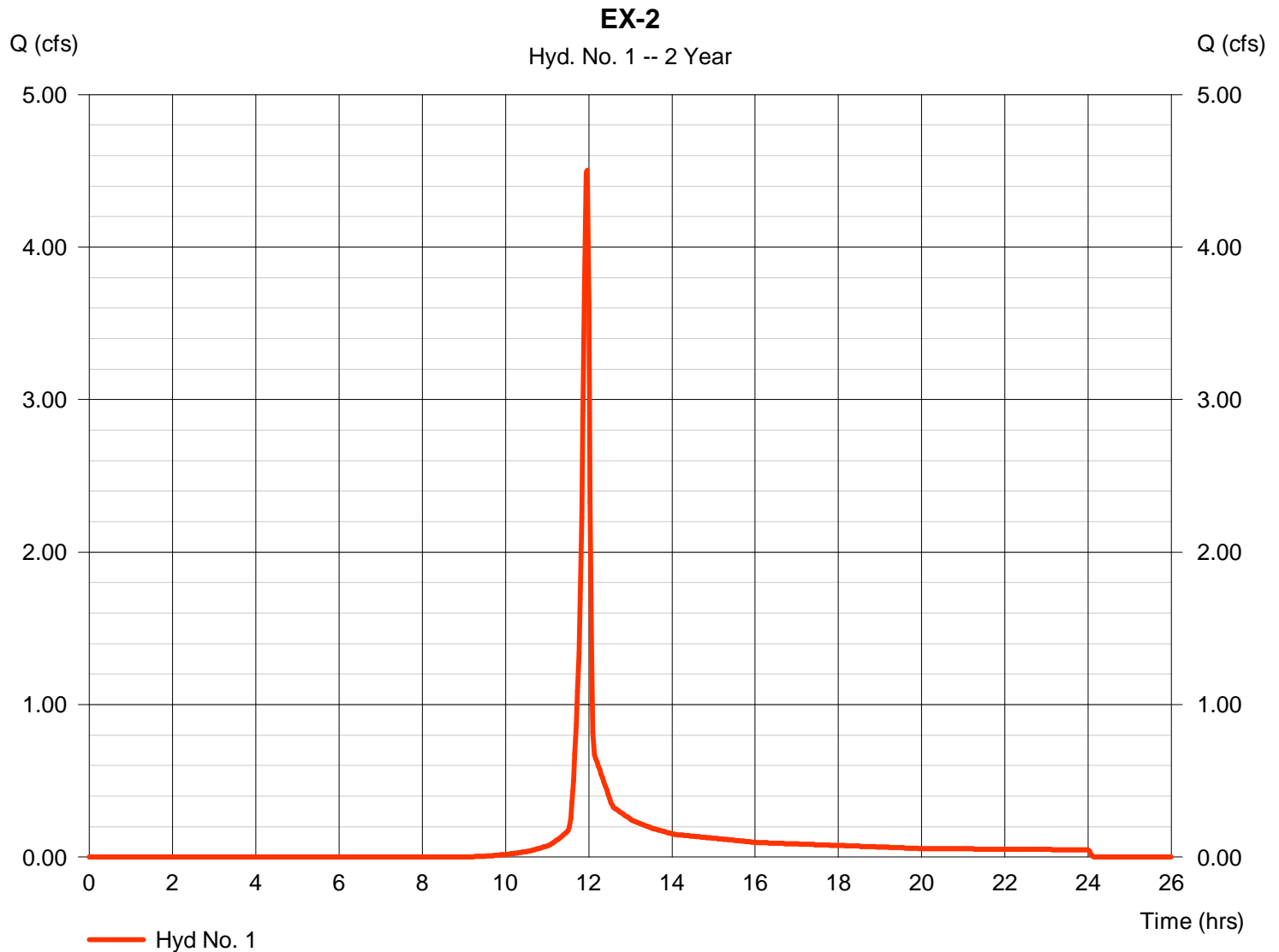
Monday, 09 / 17 / 2018

Hyd. No. 1

EX-2

Hydrograph type	= SCS Runoff	Peak discharge	= 4.501 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 9,064 cuft
Drainage area	= 1.620 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.330 \times 98) + (1.320 \times 74)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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Hyd. No. 2

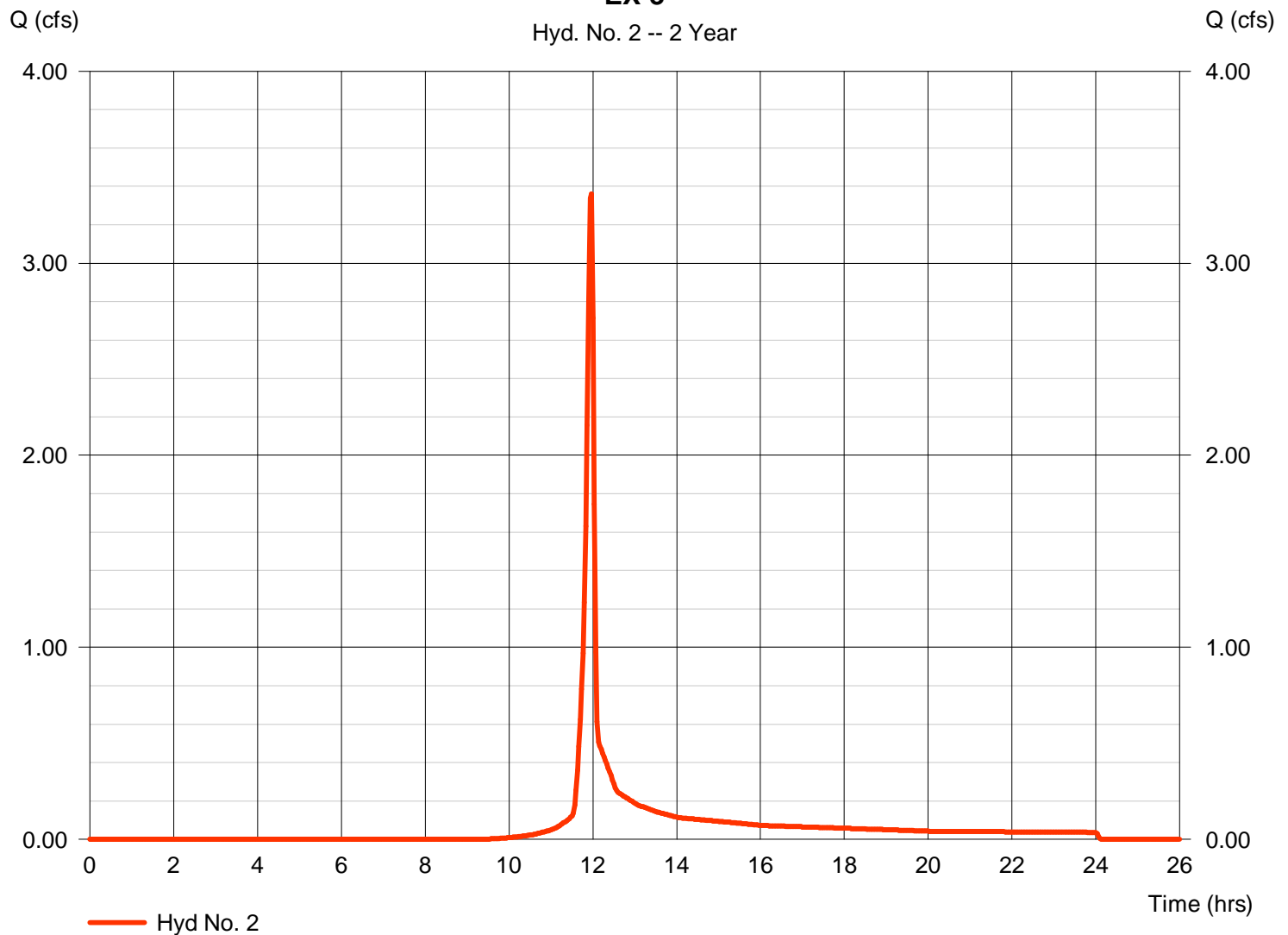
EX-3

Hydrograph type	= SCS Runoff	Peak discharge	= 3.360 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 6,748 cuft
Drainage area	= 1.260 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.190 \times 98) + (1.080 \times 74)] / 1.260$

EX-3

Hyd. No. 2 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

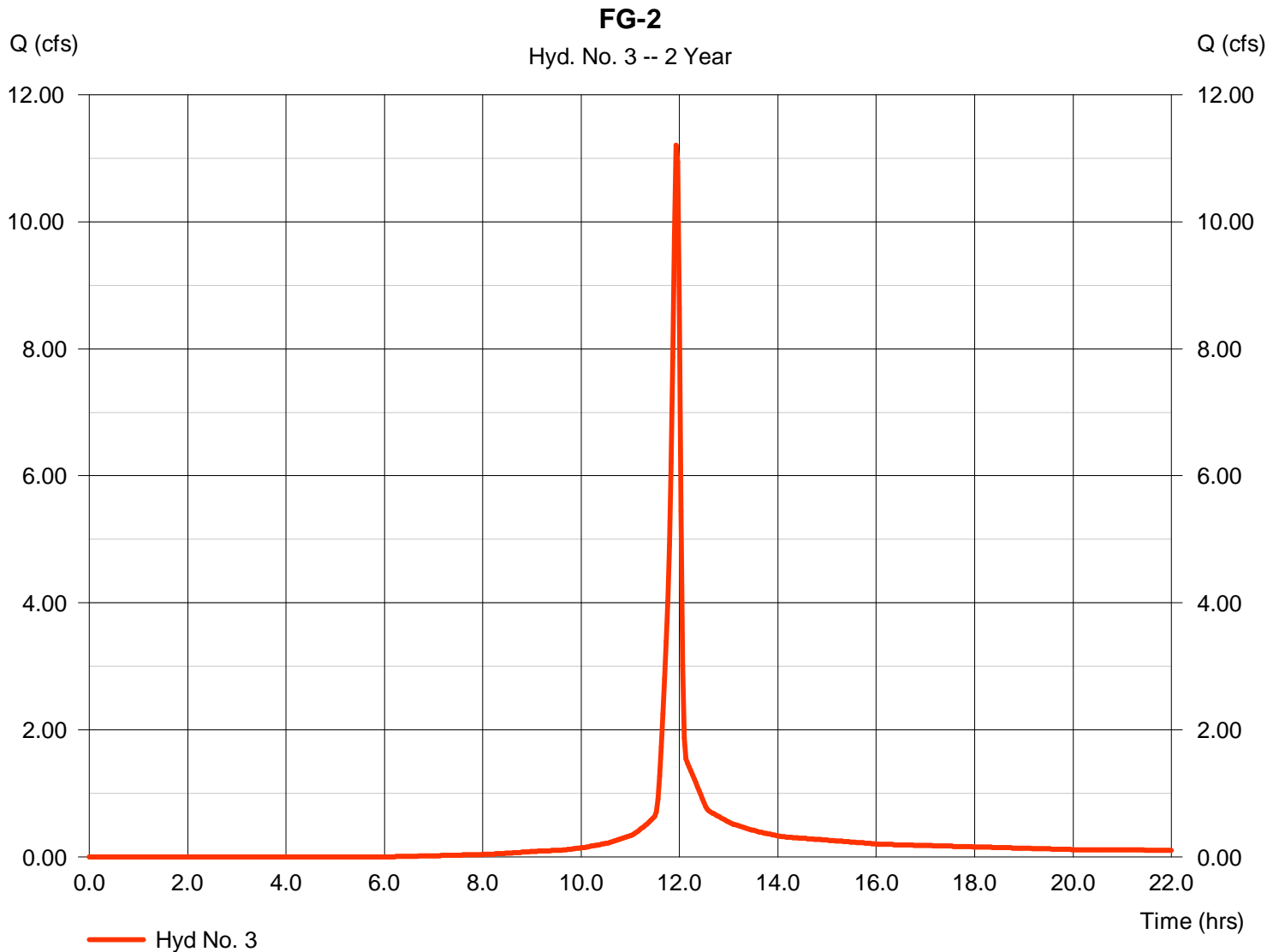
Monday, 09 / 17 / 2018

Hyd. No. 3

FG-2

Hydrograph type	= SCS Runoff	Peak discharge	= 11.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 23,131 cuft
Drainage area	= 2.880 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.720 \times 98) + (1.160 \times 74)] / 2.880$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

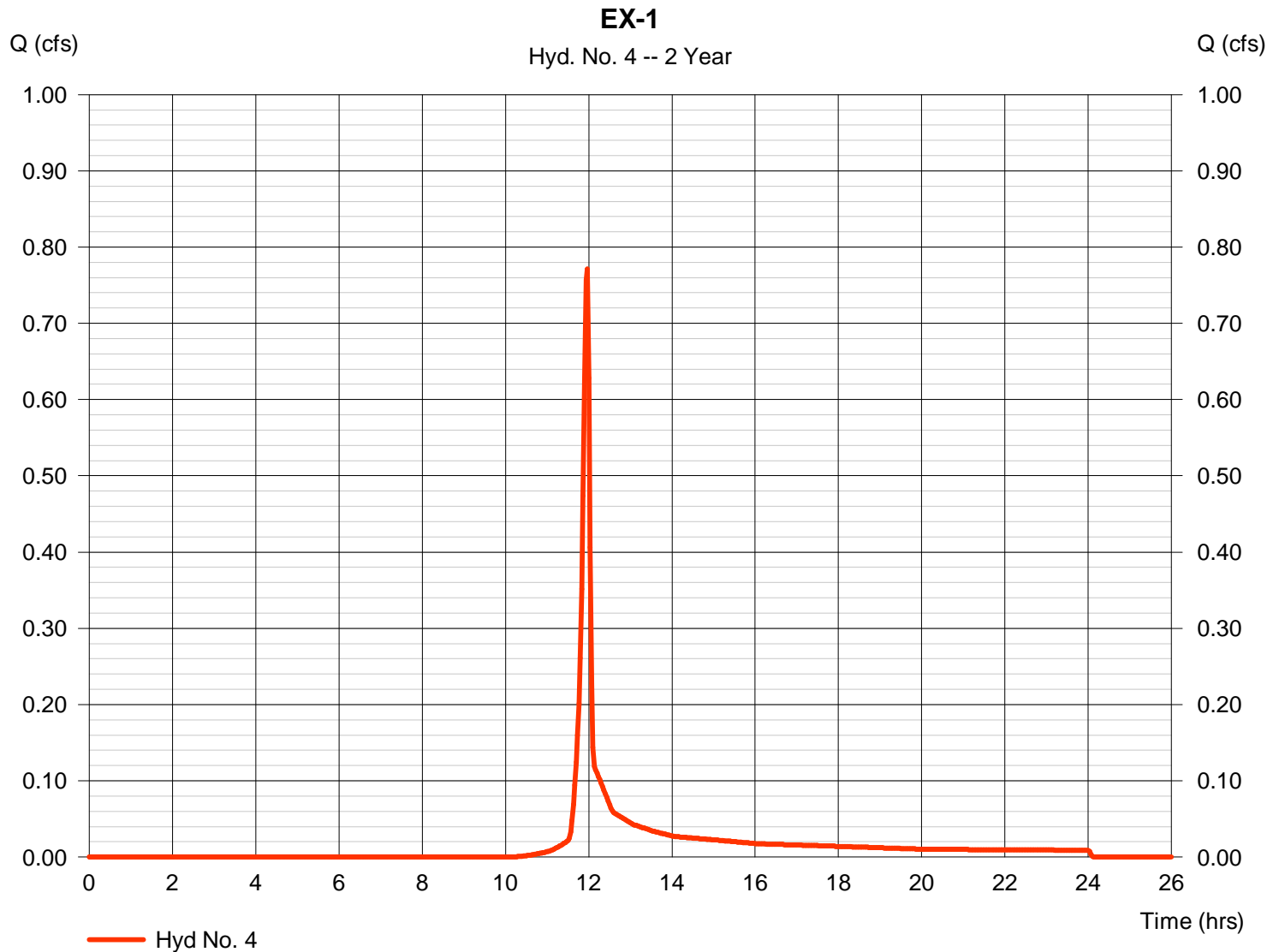
Monday, 09 / 17 / 2018

Hyd. No. 4

EX-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.771 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 1,542 cuft
Drainage area	= 0.330 ac	Curve number	= 75*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.320 \times 74) + (0.010 \times 98)] / 0.330$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 5

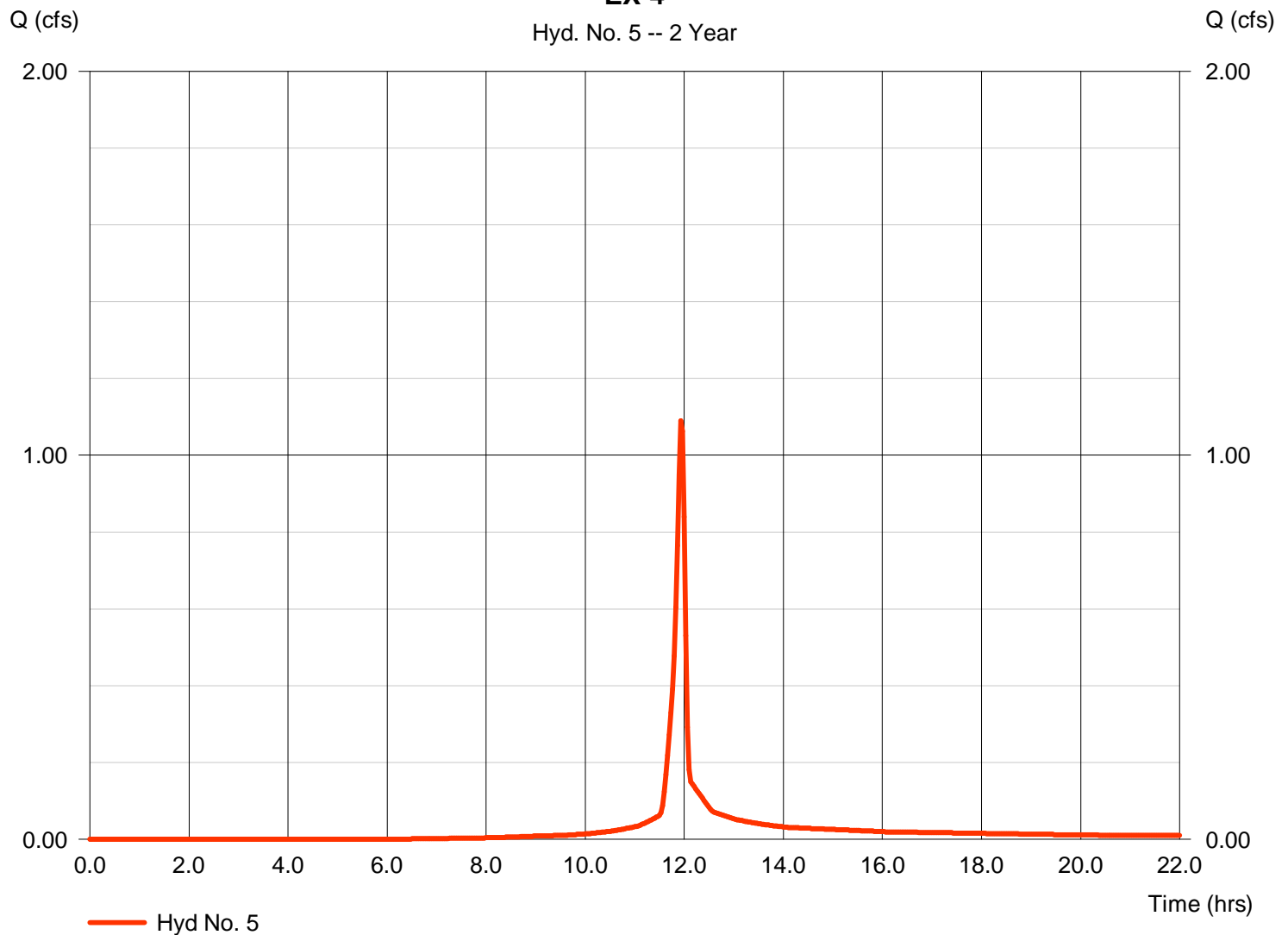
EX-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.089 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 2,249 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$

EX-4

Hyd. No. 5 -- 2 Year



Hydrograph Report

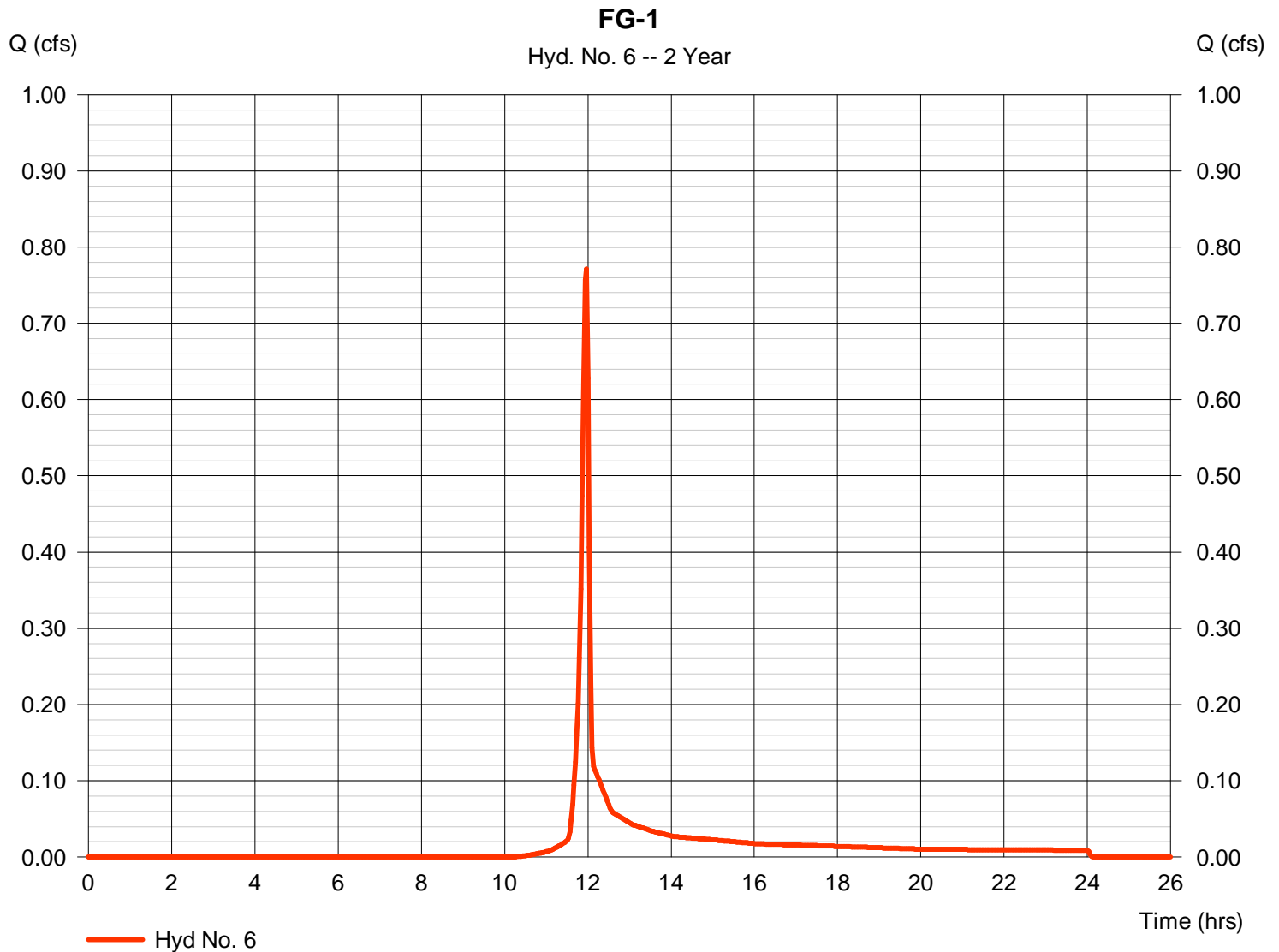
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 6

FG-1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.771 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 1,542 cuft
Drainage area	= 0.330 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 7

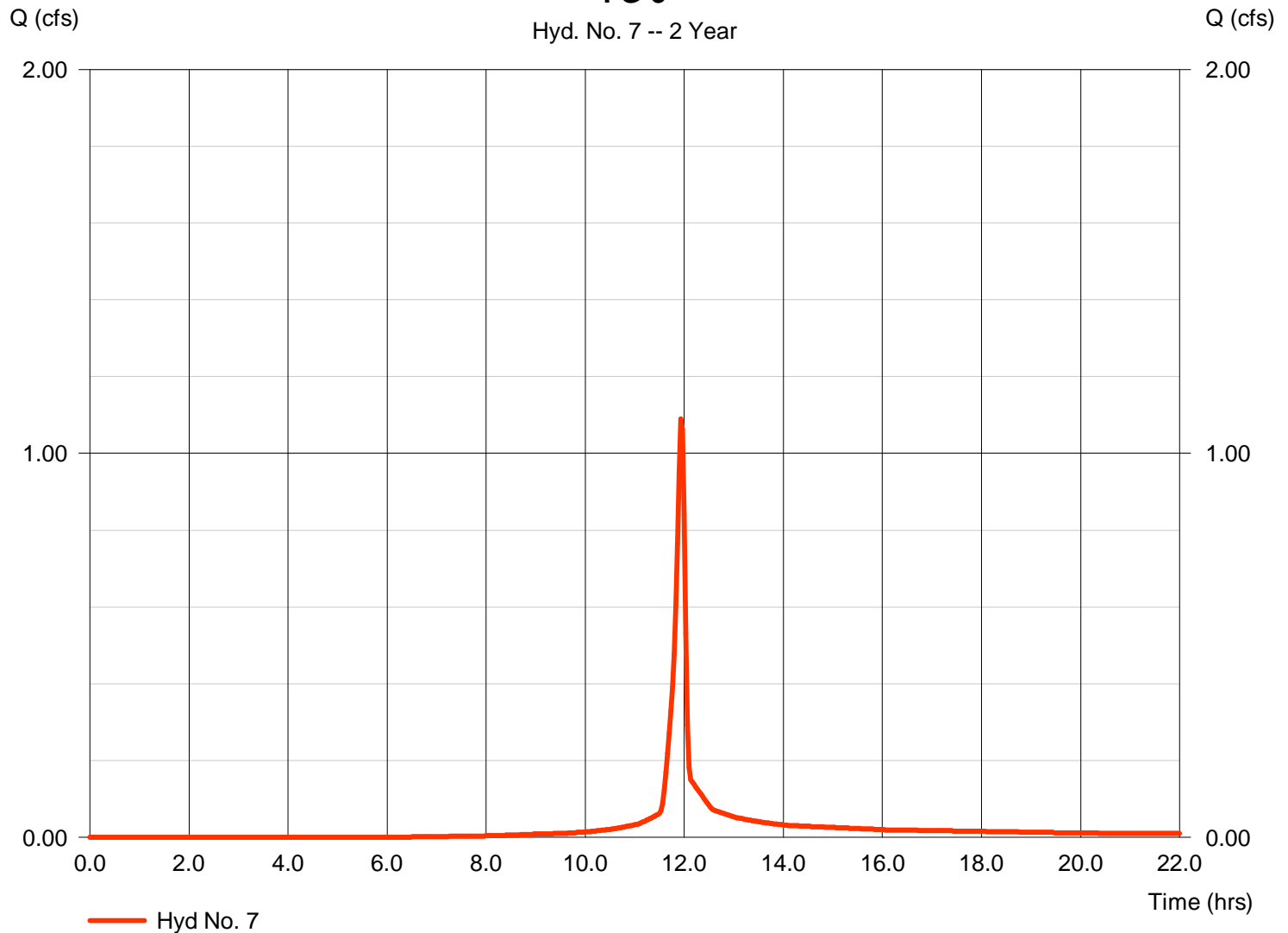
FG-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.089 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 2,249 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.60 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$

FG-3

Hyd. No. 7 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

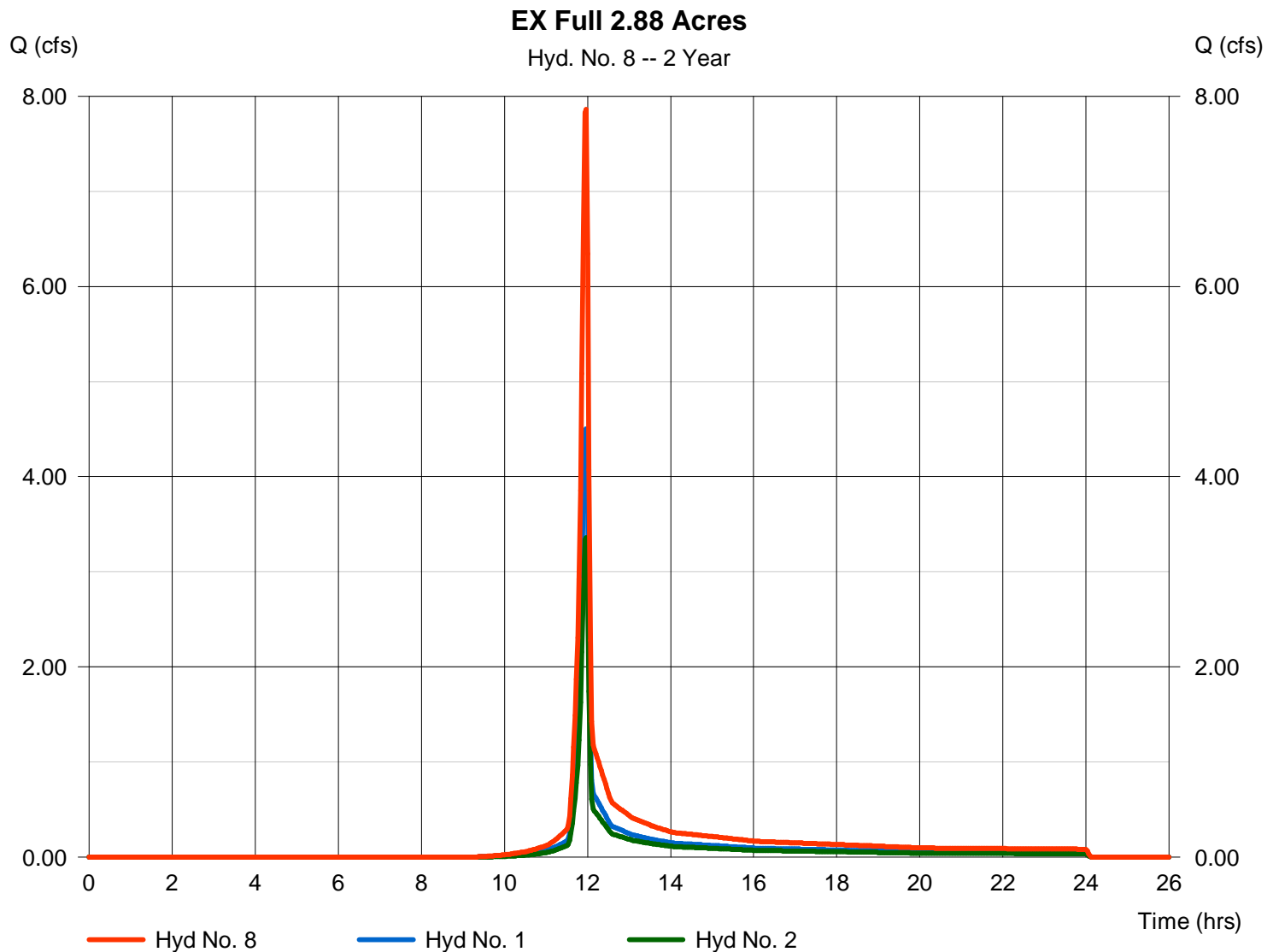
Monday, 09 / 17 / 2018

Hyd. No. 8

EX Full 2.88 Acres

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyds. = 1, 2

Peak discharge = 7.861 cfs
Time to peak = 11.97 hrs
Hyd. volume = 15,812 cuft
Contrib. drain. area = 2.880 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

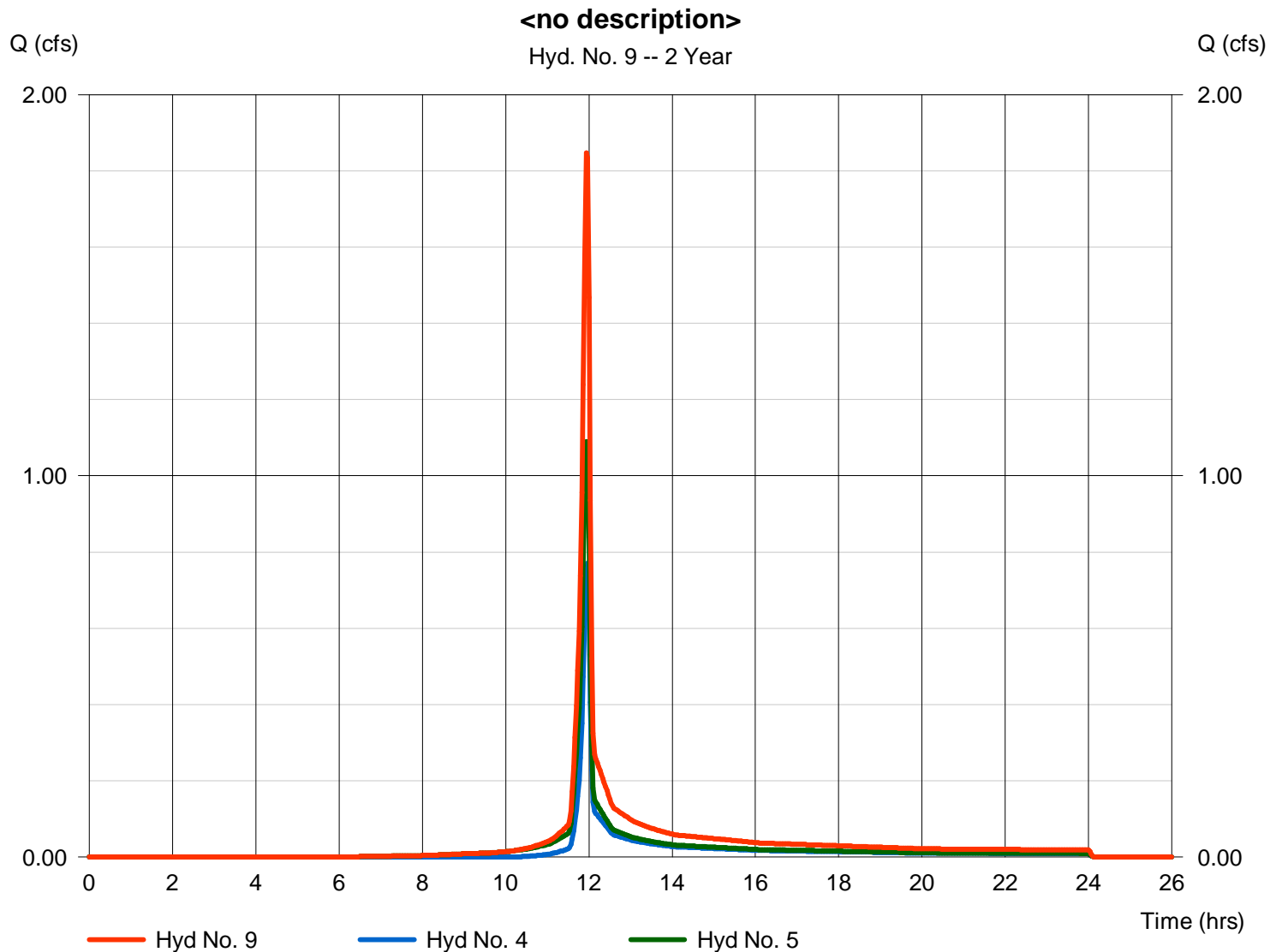
Monday, 09 / 17 / 2018

Hyd. No. 9

<no description>

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

Peak discharge = 1.847 cfs
Time to peak = 11.93 hrs
Hyd. volume = 3,791 cuft
Contrib. drain. area = 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

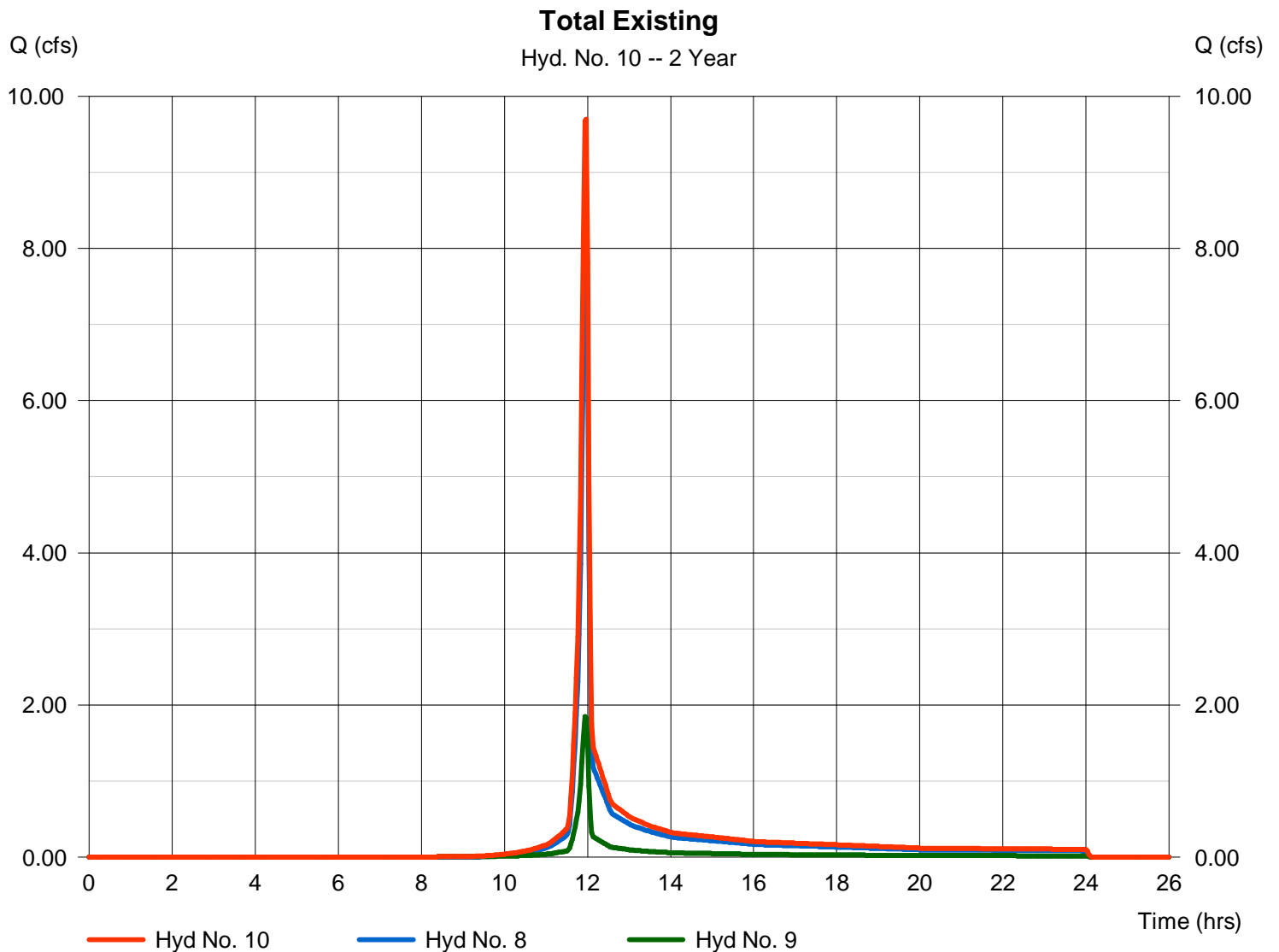
Monday, 09 / 17 / 2018

Hyd. No. 10

Total Existing

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

Peak discharge = 9.696 cfs
Time to peak = 11.97 hrs
Hyd. volume = 19,603 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

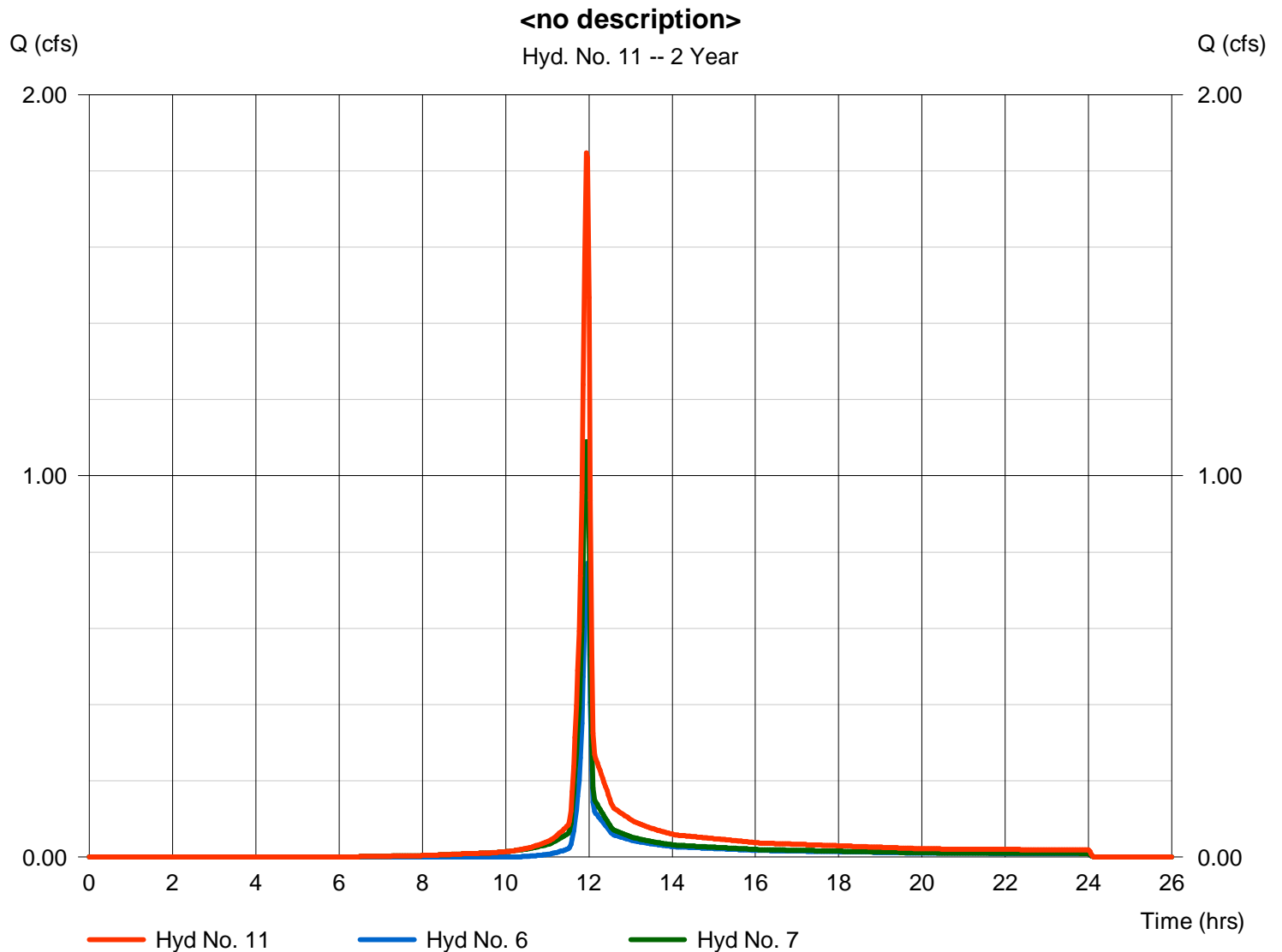
Monday, 09 / 17 / 2018

Hyd. No. 11

<no description>

Hydrograph type = Combine
 Storm frequency = 2 yrs
 Time interval = 2 min
 Inflow hyds. = 6, 7

Peak discharge = 1.847 cfs
 Time to peak = 11.93 hrs
 Hyd. volume = 3,791 cuft
 Contrib. drain. area = 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

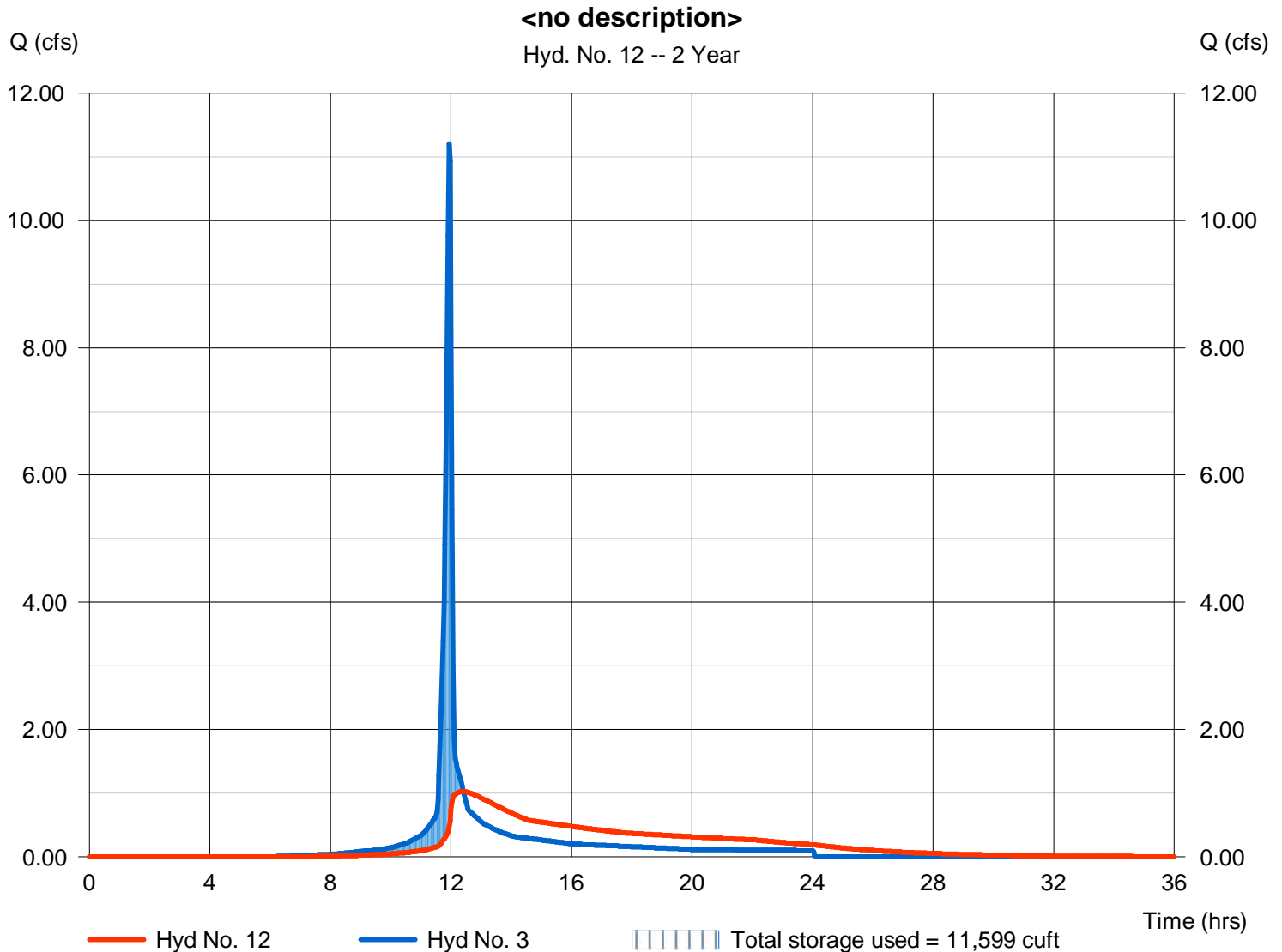
Monday, 09 / 17 / 2018

Hyd. No. 12

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 1.028 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.40 hrs
Time interval	= 2 min	Hyd. volume	= 23,120 cuft
Inflow hyd. No.	= 3 - FG-2	Max. Elevation	= 1029.55 ft
Reservoir name	= Bio-Retention Pond	Max. Storage	= 11,599 cuft

Storage Indication method used.



Hydrograph Report

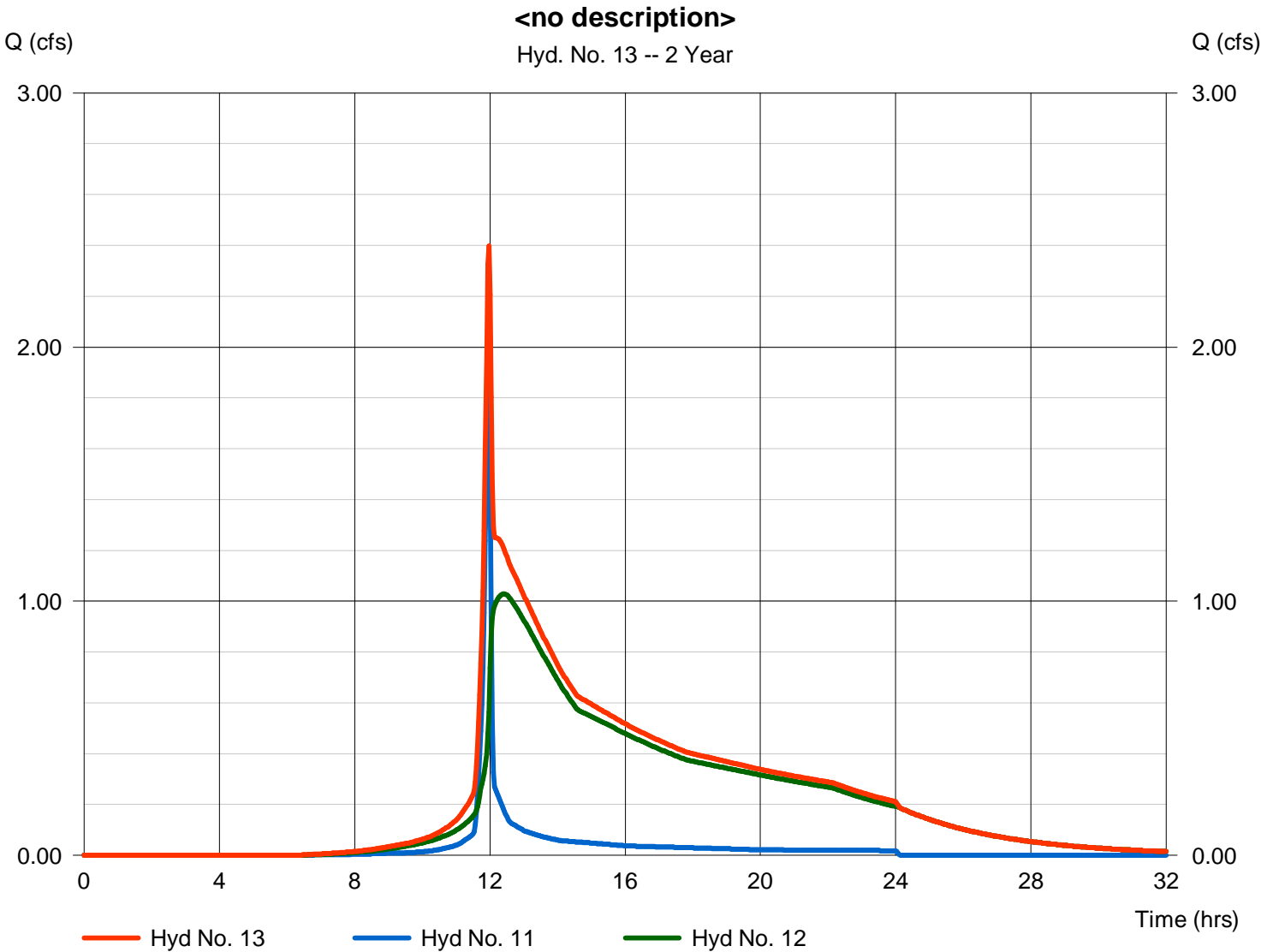
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 13

<no description>

Hydrograph type	= Combine	Peak discharge	= 2.398 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 26,910 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	8.805	2	716	17,941	-----	-----	-----	EX-2
2	SCS Runoff	6.664	2	716	13,543	-----	-----	-----	EX-3
3	SCS Runoff	19.18	2	716	40,820	-----	-----	-----	FG-2
4	SCS Runoff	1.598	2	716	3,231	-----	-----	-----	EX-1
5	SCS Runoff	1.865	2	716	3,969	-----	-----	-----	EX-4
6	SCS Runoff	1.598	2	716	3,231	-----	-----	-----	FG-1
7	SCS Runoff	1.865	2	716	3,969	-----	-----	-----	FG-3
8	Combine	15.47	2	716	31,484	1, 2,	-----	-----	EX Full 2.88 Acres
9	Combine	3.463	2	716	7,200	4, 5,	-----	-----	<no description>
10	Combine	18.93	2	716	38,684	8, 9	-----	-----	Total Existing
11	Combine	3.463	2	716	7,200	6, 7,	-----	-----	<no description>
12	Reservoir	4.338	2	724	40,809	3	1030.56	19,072	<no description>
13	Combine	6.741	2	720	48,009	11, 12	-----	-----	<no description>
ESS_Storm_Bio.000.gpw					Return Period: 10 Year			Monday, 09 / 17 / 2018	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

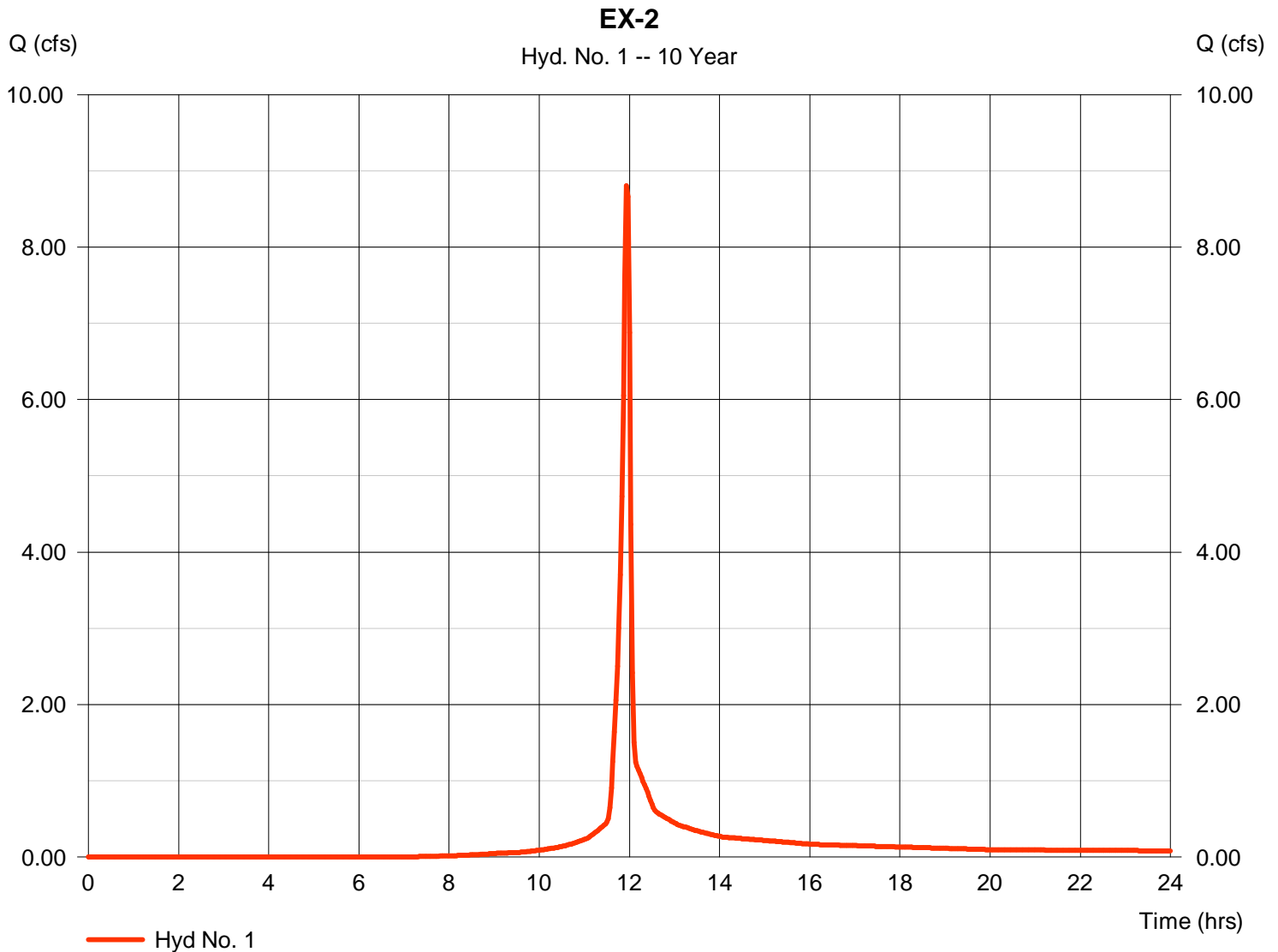
Monday, 09 / 17 / 2018

Hyd. No. 1

EX-2

Hydrograph type	= SCS Runoff	Peak discharge	= 8.805 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 17,941 cuft
Drainage area	= 1.620 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.330 \times 98) + (1.320 \times 74)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 2

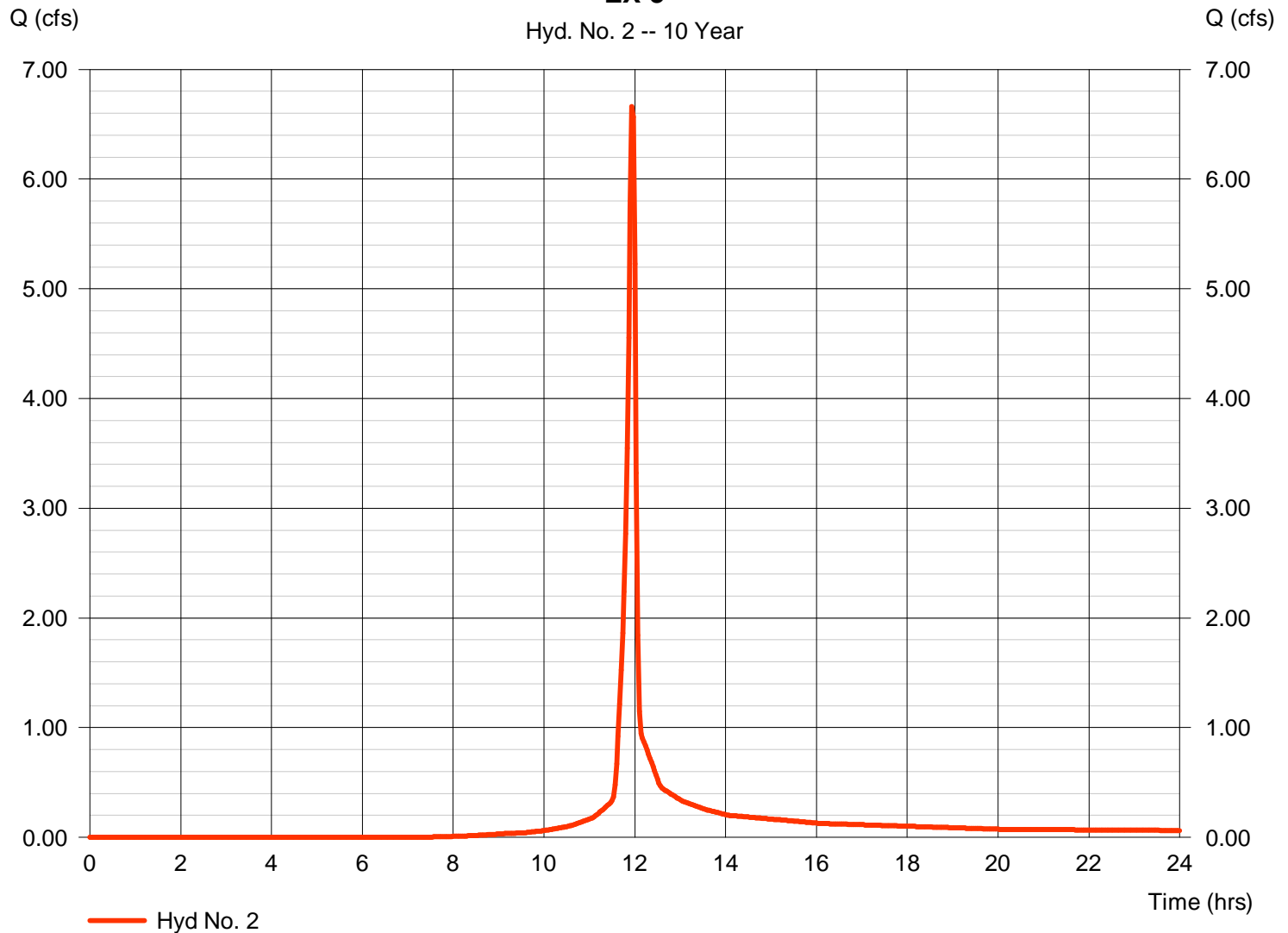
EX-3

Hydrograph type	= SCS Runoff	Peak discharge	= 6.664 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 13,543 cuft
Drainage area	= 1.260 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.190 \times 98) + (1.080 \times 74)] / 1.260$

EX-3

Hyd. No. 2 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

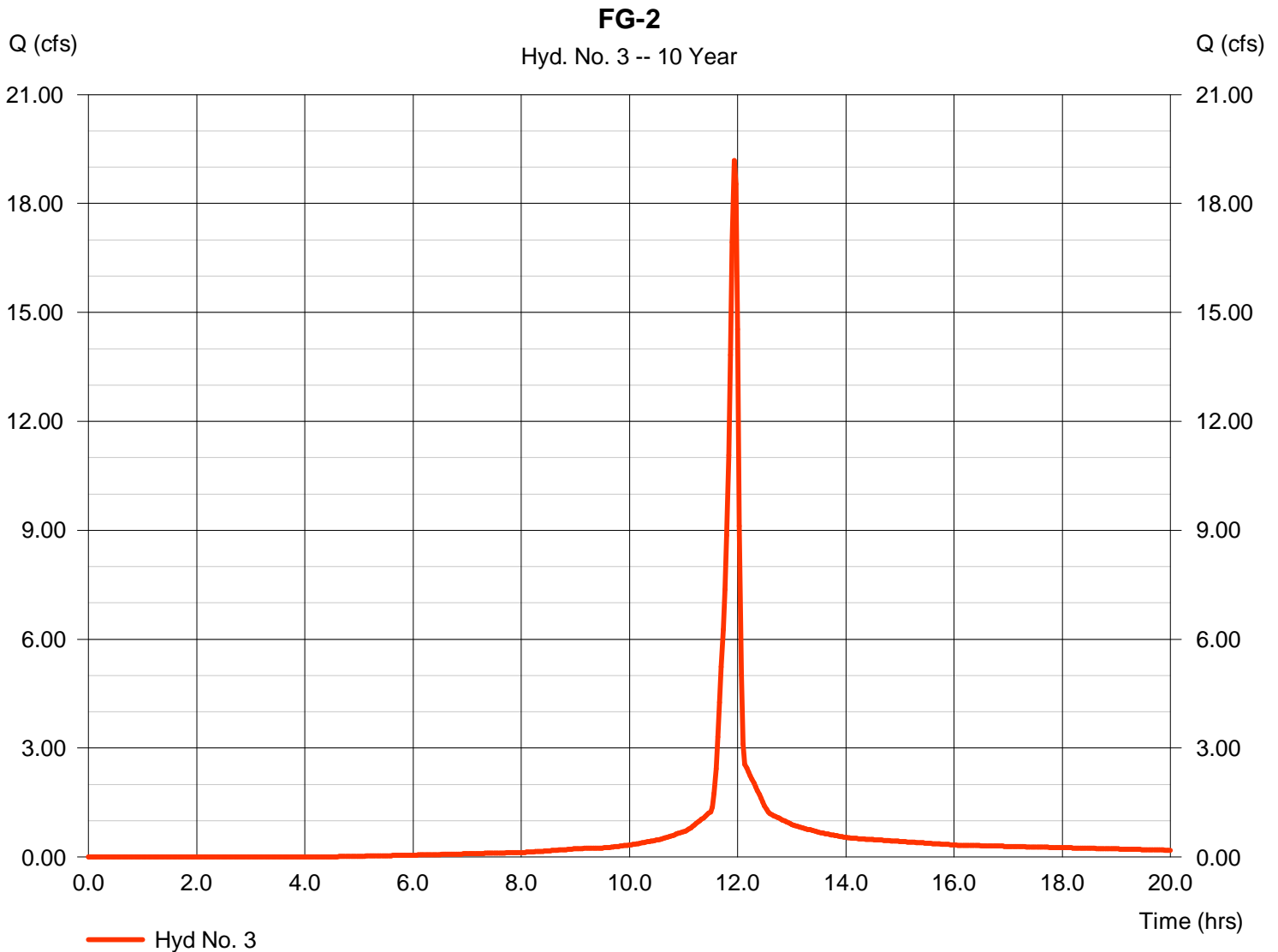
Monday, 09 / 17 / 2018

Hyd. No. 3

FG-2

Hydrograph type	= SCS Runoff	Peak discharge	= 19.18 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 40,820 cuft
Drainage area	= 2.880 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.720 \times 98) + (1.160 \times 74)] / 2.880$



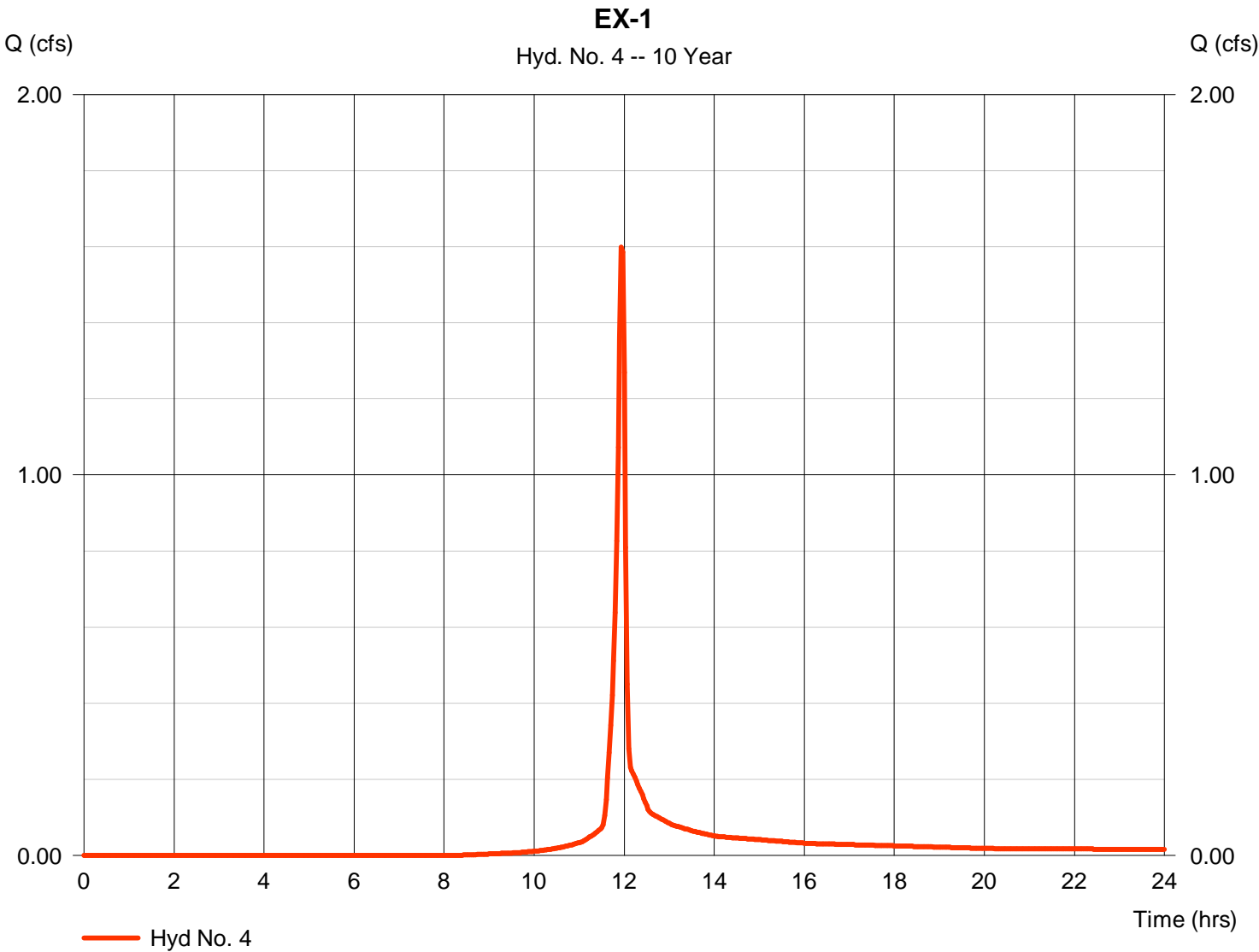
Hydrograph Report

Hyd. No. 4

EX-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.598 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,231 cuft
Drainage area	= 0.330 ac	Curve number	= 75*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.320 x 74) + (0.010 x 98)] / 0.330



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

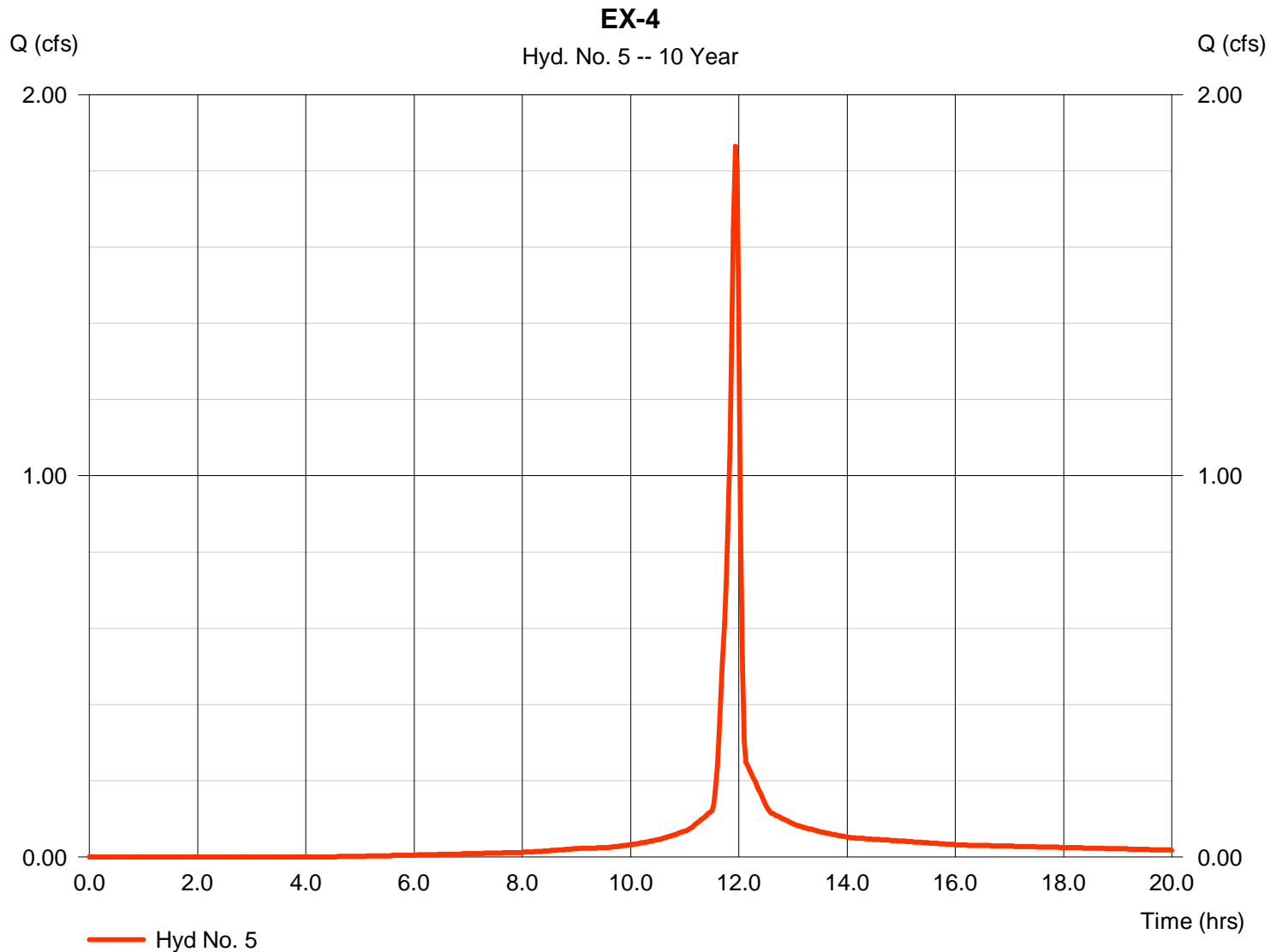
Monday, 09 / 17 / 2018

Hyd. No. 5

EX-4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.865 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,969 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$



Hydrograph Report

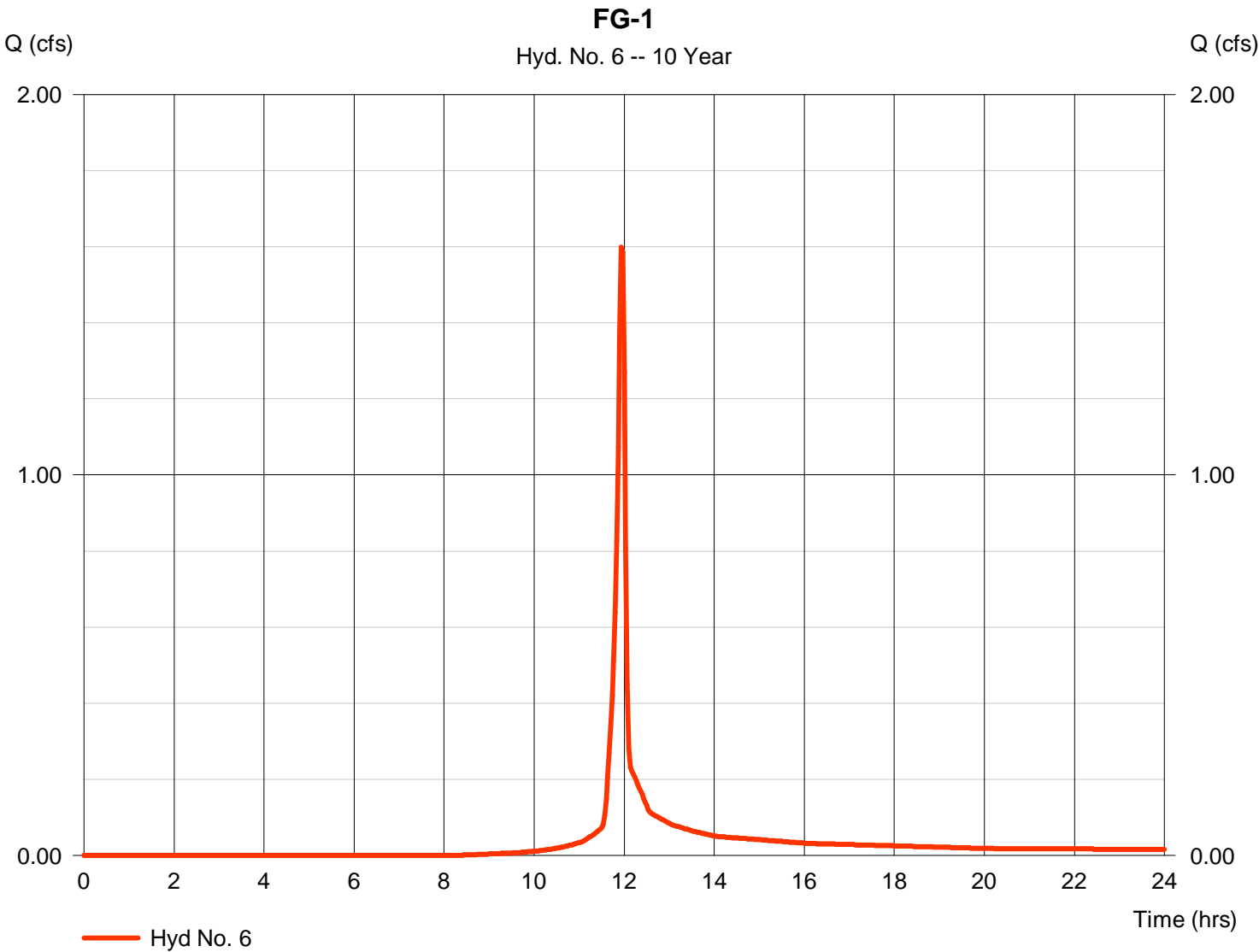
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 6

FG-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.598 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,231 cuft
Drainage area	= 0.330 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

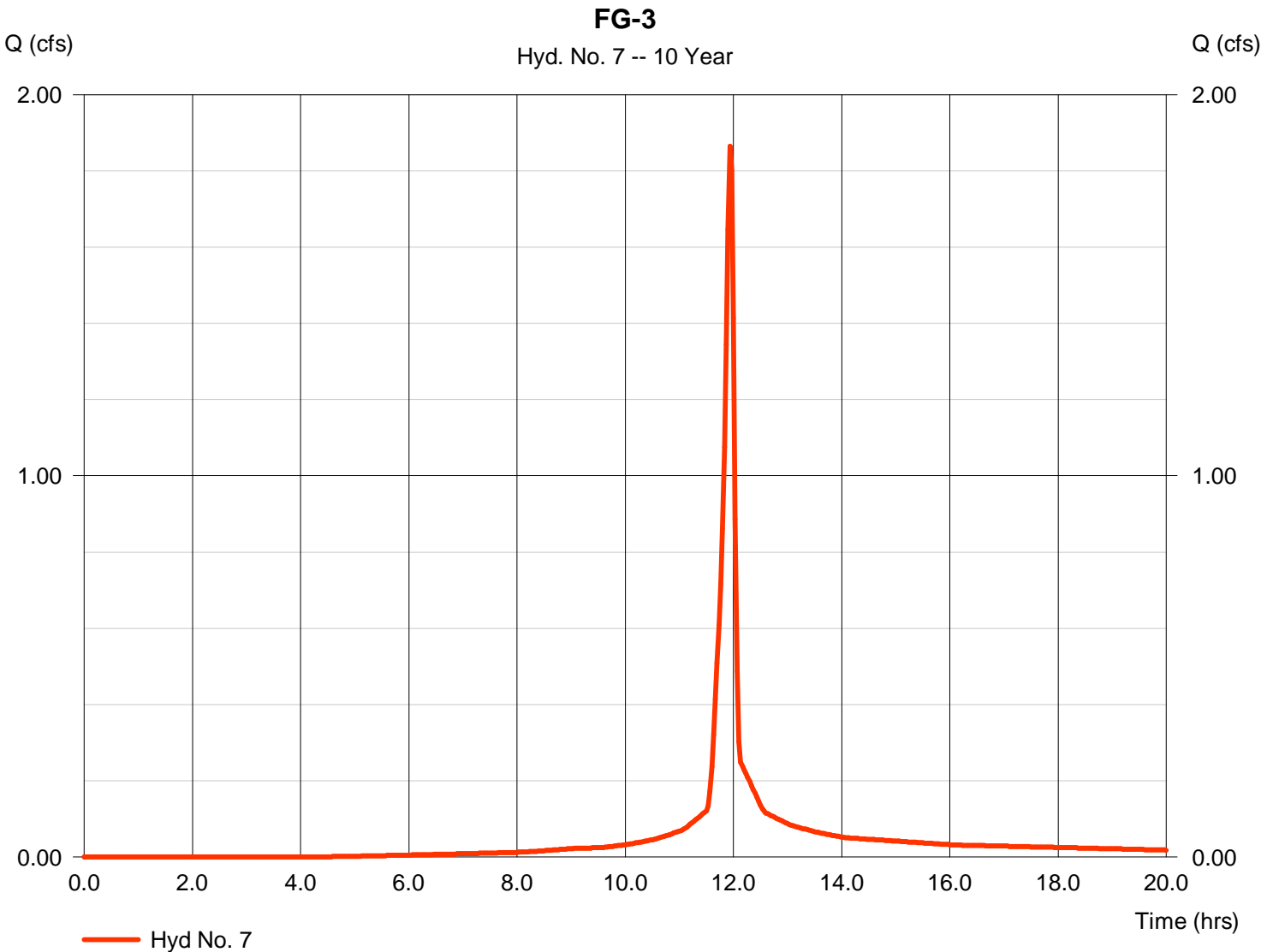
Monday, 09 / 17 / 2018

Hyd. No. 7

FG-3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.865 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 3,969 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.52 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.160 x 98) + (0.120 x 74)] / 0.280



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

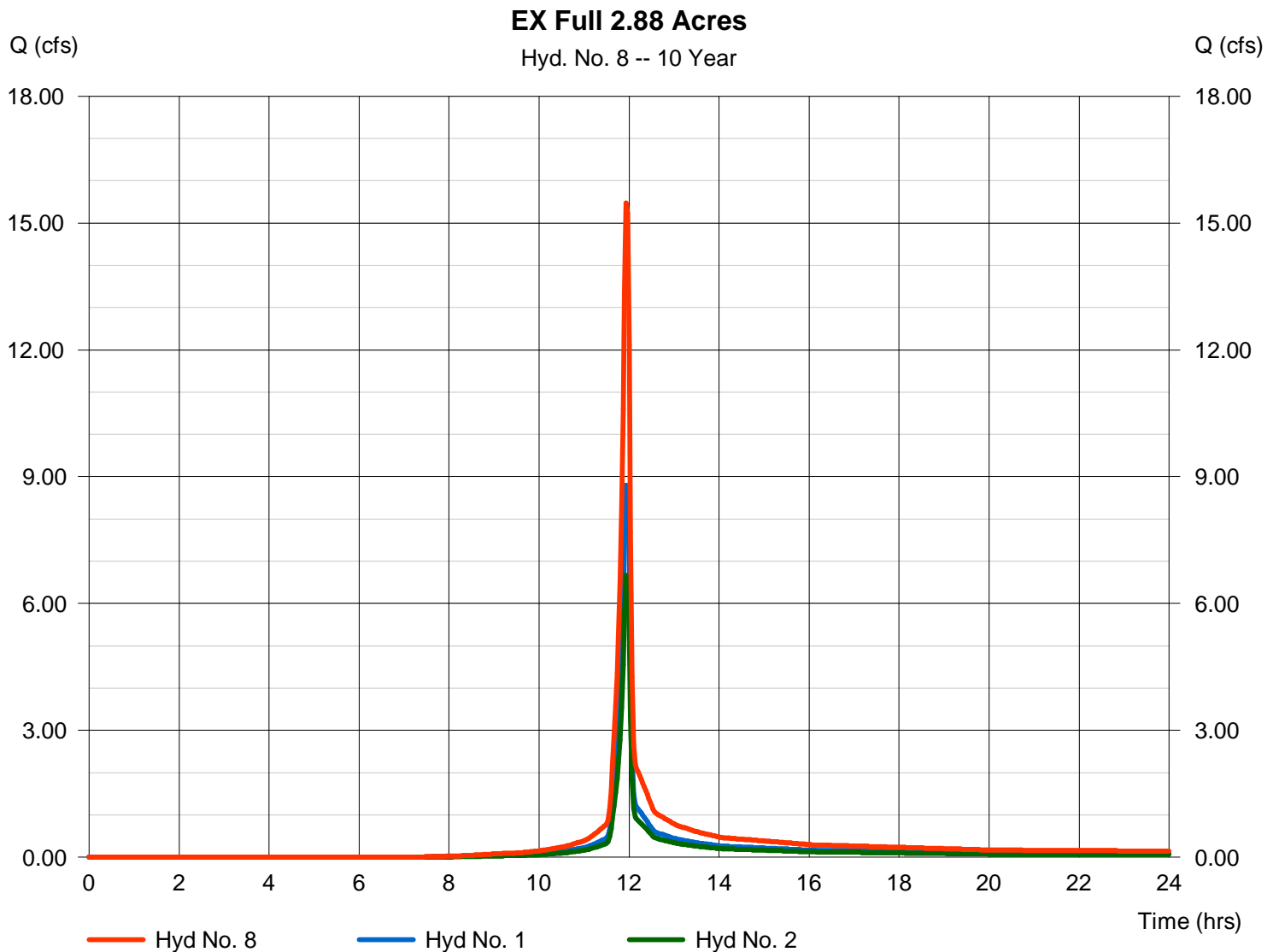
Monday, 09 / 17 / 2018

Hyd. No. 8

EX Full 2.88 Acres

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 1, 2

Peak discharge = 15.47 cfs
Time to peak = 11.93 hrs
Hyd. volume = 31,484 cuft
Contrib. drain. area = 2.880 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

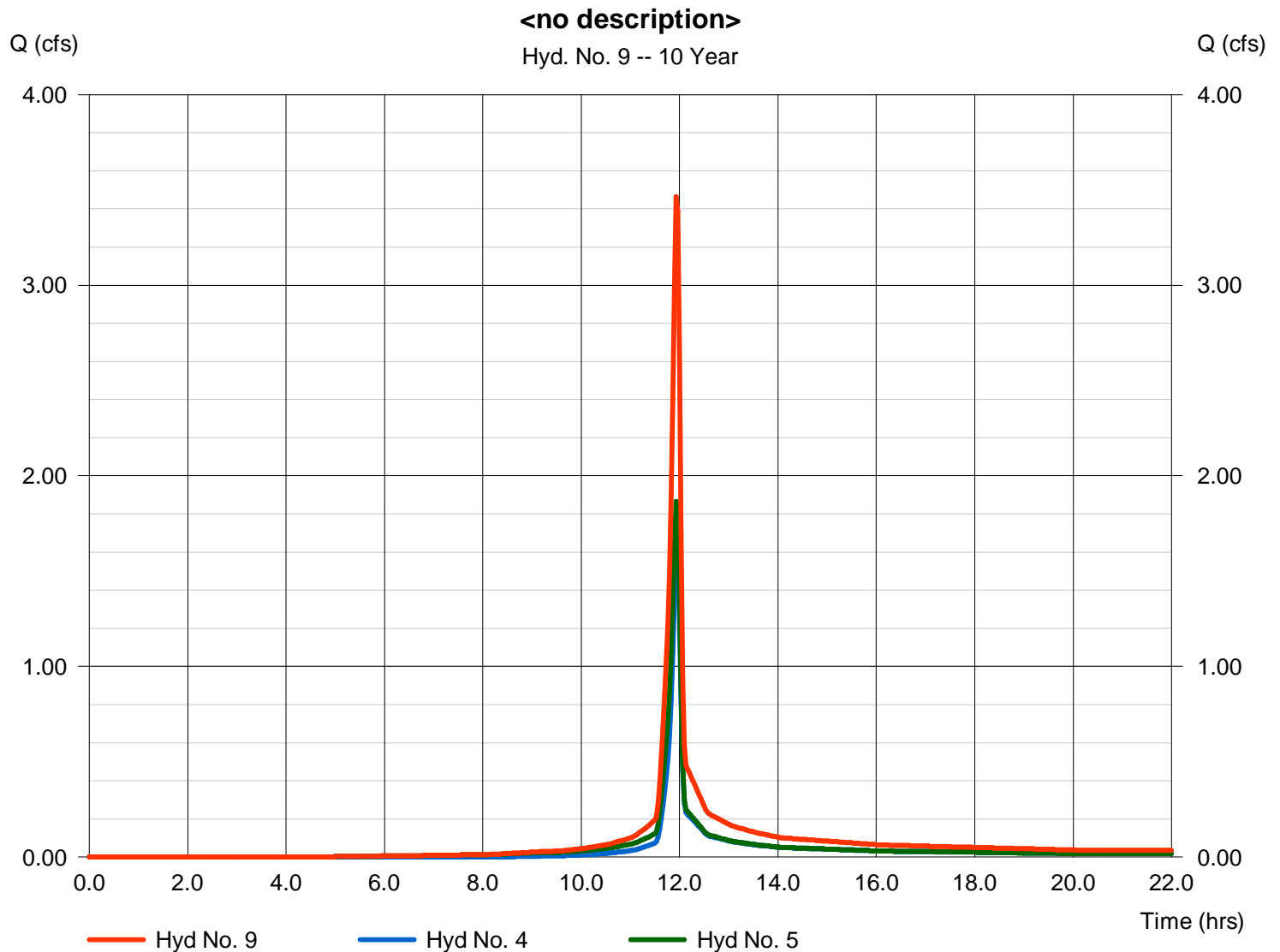
Monday, 09 / 17 / 2018

Hyd. No. 9

<no description>

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

Peak discharge = 3.463 cfs
Time to peak = 11.93 hrs
Hyd. volume = 7,200 cuft
Contrib. drain. area = 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

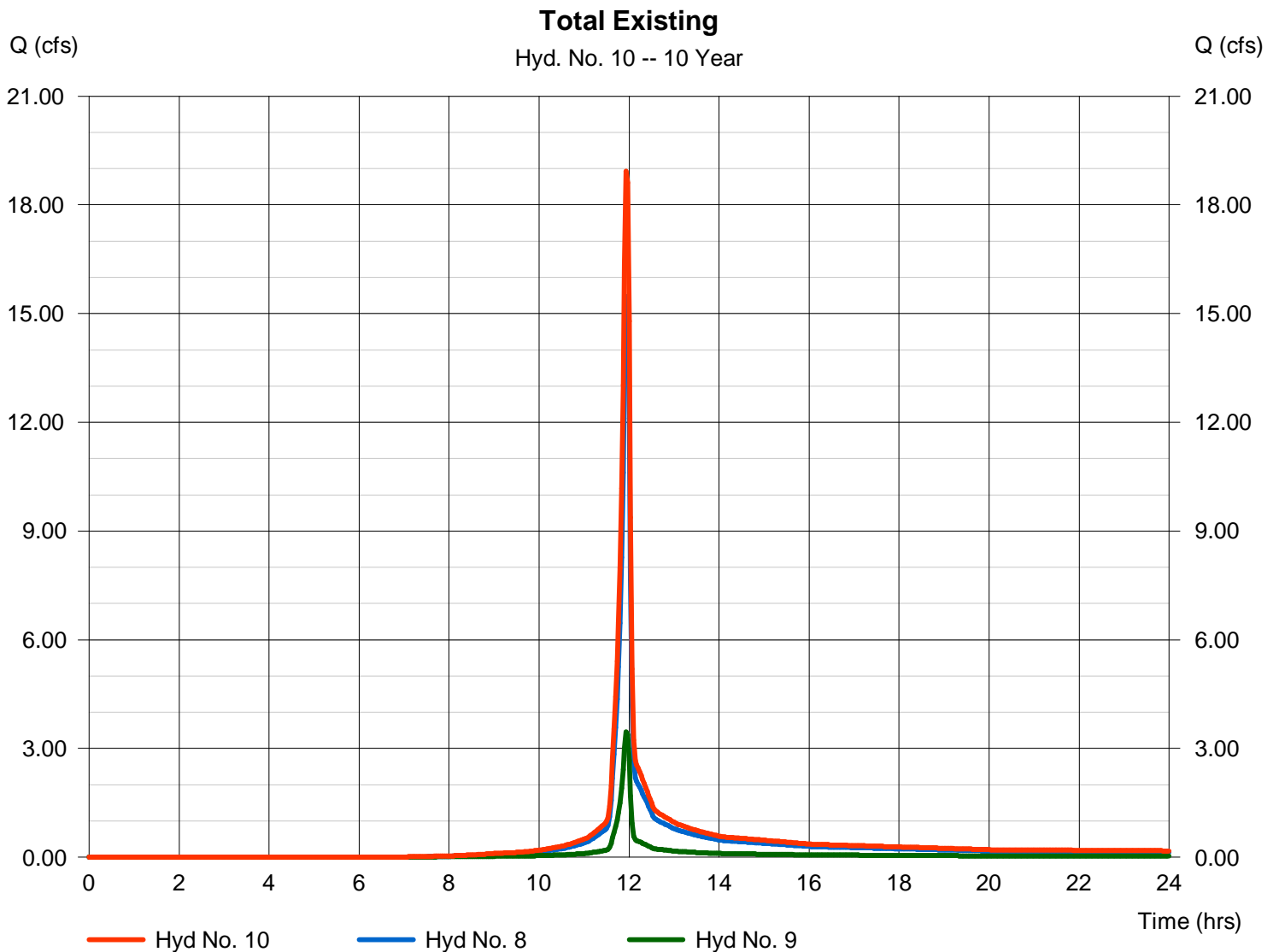
Monday, 09 / 17 / 2018

Hyd. No. 10

Total Existing

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 8, 9

Peak discharge = 18.93 cfs
Time to peak = 11.93 hrs
Hyd. volume = 38,684 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

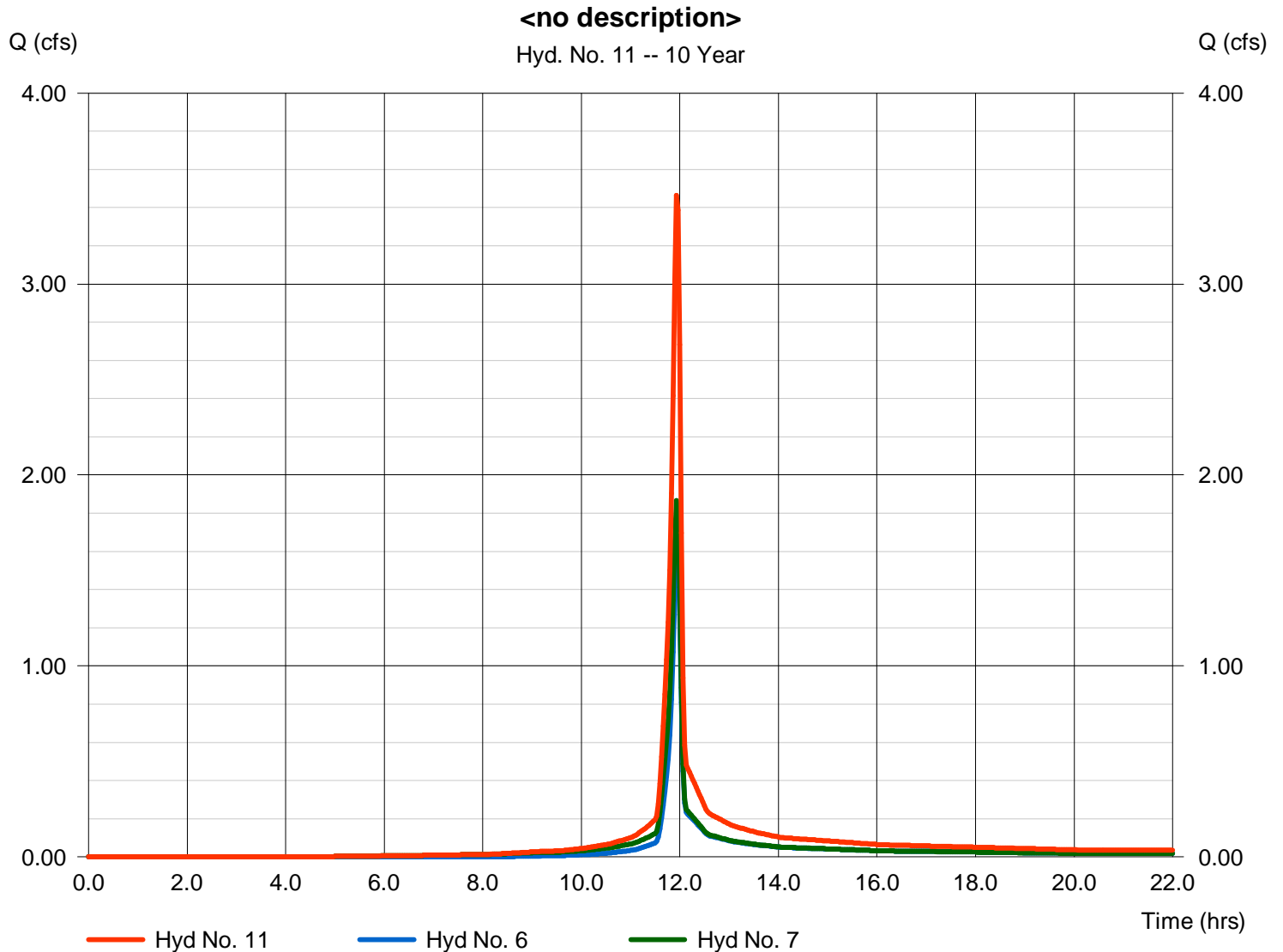
Monday, 09 / 17 / 2018

Hyd. No. 11

<no description>

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 6, 7

Peak discharge = 3.463 cfs
Time to peak = 11.93 hrs
Hyd. volume = 7,200 cuft
Contrib. drain. area = 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

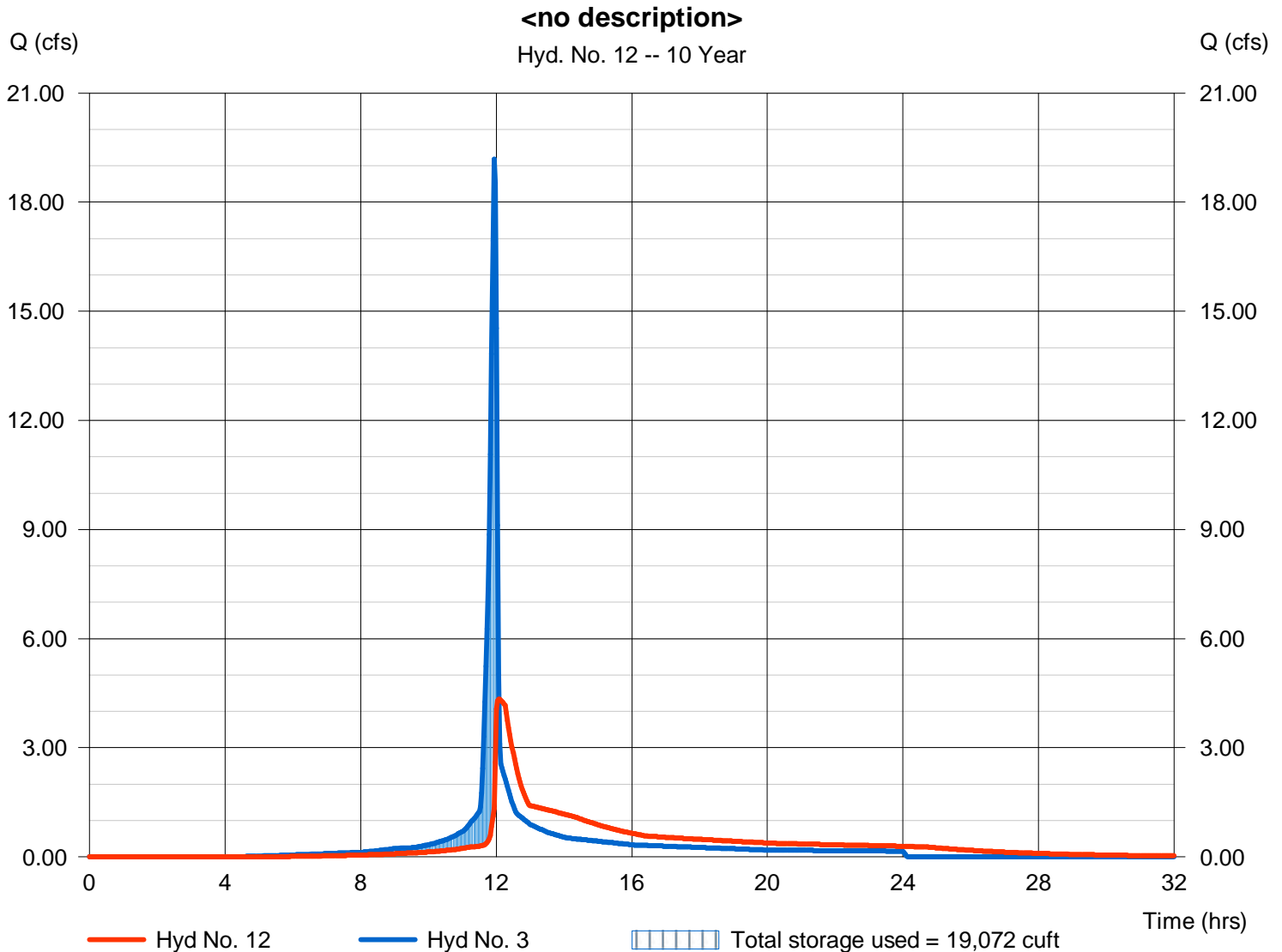
Monday, 09 / 17 / 2018

Hyd. No. 12

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 4.338 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 40,809 cuft
Inflow hyd. No.	= 3 - FG-2	Max. Elevation	= 1030.56 ft
Reservoir name	= Bio-Retention Pond	Max. Storage	= 19,072 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

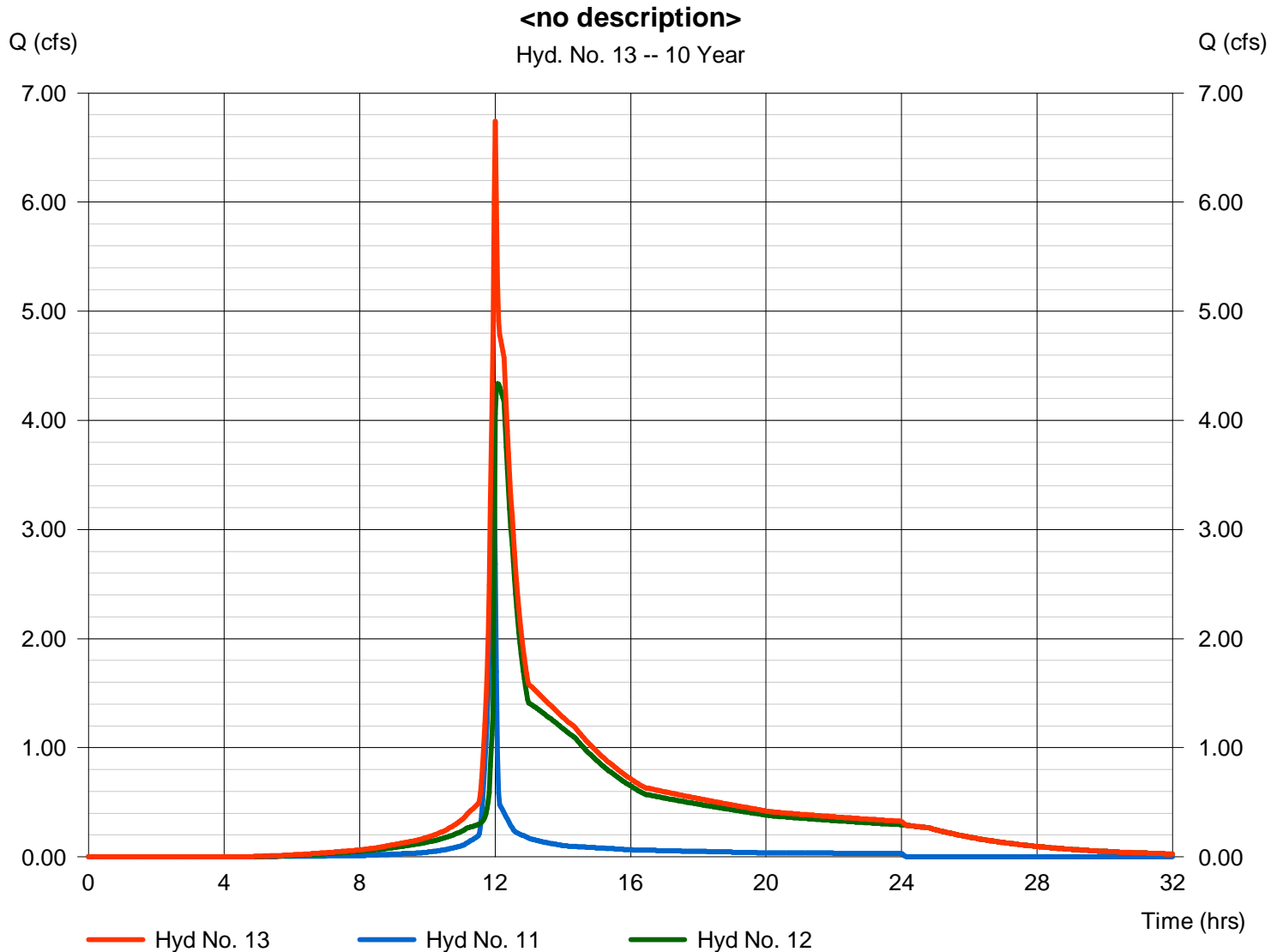
Monday, 09 / 17 / 2018

Hyd. No. 13

<no description>

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 11, 12

Peak discharge = 6.741 cfs
Time to peak = 12.00 hrs
Hyd. volume = 48,009 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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	14.40	2	716	29,955	-----	-----	-----	EX-2
2	SCS Runoff	11.00	2	716	22,799	-----	-----	-----	EX-3
3	SCS Runoff	29.06	2	716	63,608	-----	-----	-----	FG-2
4	SCS Runoff	2.721	2	716	5,581	-----	-----	-----	EX-1
5	SCS Runoff	2.825	2	716	6,184	-----	-----	-----	EX-4
6	SCS Runoff	2.721	2	716	5,581	-----	-----	-----	FG-1
7	SCS Runoff	2.825	2	716	6,184	-----	-----	-----	FG-3
8	Combine	25.40	2	716	52,755	1, 2,	-----	-----	EX Full 2.88 Acres
9	Combine	5.546	2	716	11,765	4, 5,	-----	-----	<no description>
10	Combine	30.95	2	716	64,520	8, 9	-----	-----	Total Existing
11	Combine	5.546	2	716	11,765	6, 7,	-----	-----	<no description>
12	Reservoir	6.806	2	724	63,597	3	1031.89	29,014	<no description>
13	Combine	11.07	2	718	75,362	11, 12	-----	-----	<no description>
ESS_Storm_Bio.000.gpw					Return Period: 100 Year			Monday, 09 / 17 / 2018	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

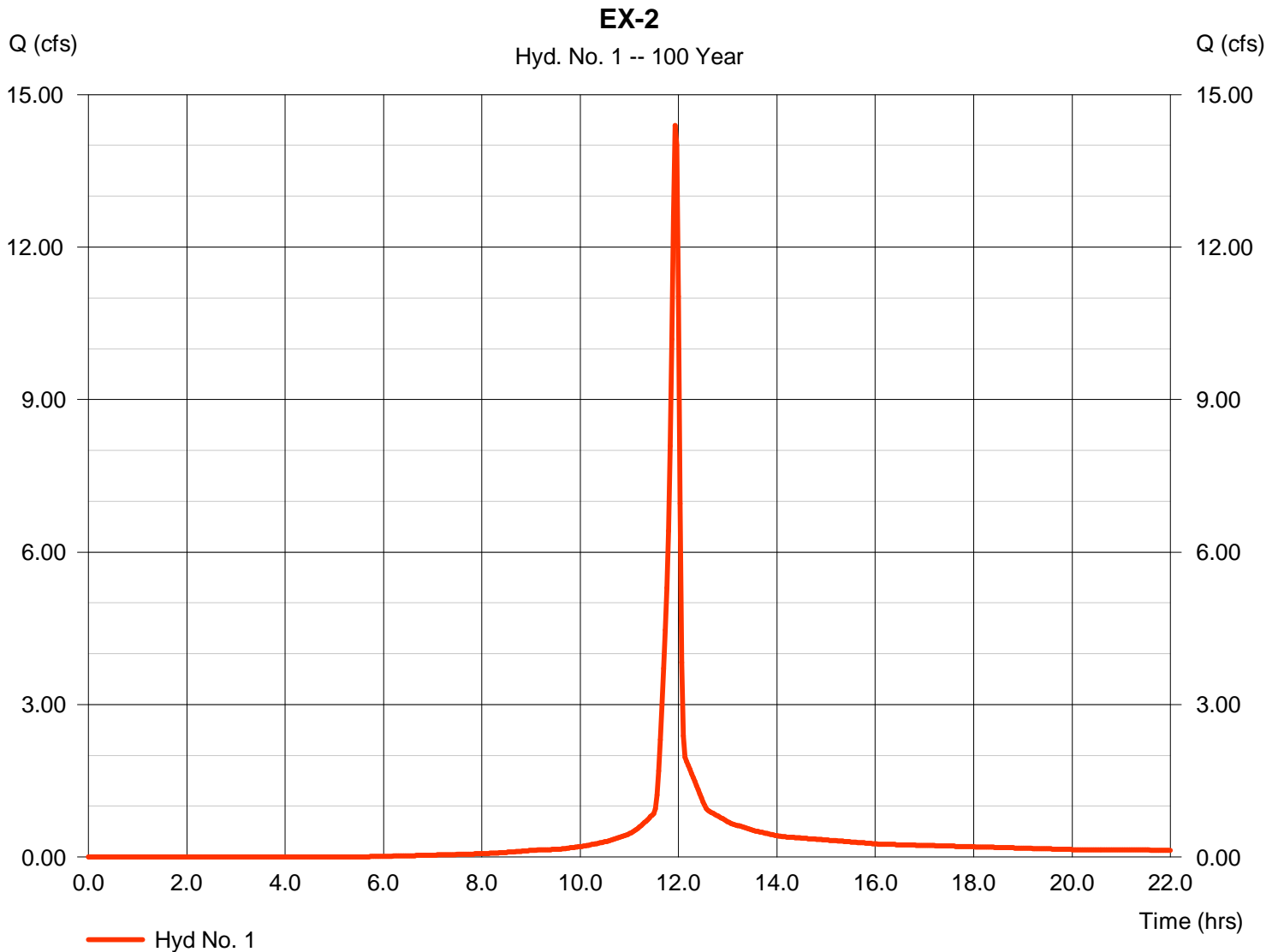
Monday, 09 / 17 / 2018

Hyd. No. 1

EX-2

Hydrograph type	= SCS Runoff	Peak discharge	= 14.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 29,955 cuft
Drainage area	= 1.620 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.330 \times 98) + (1.320 \times 74)] / 1.620$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

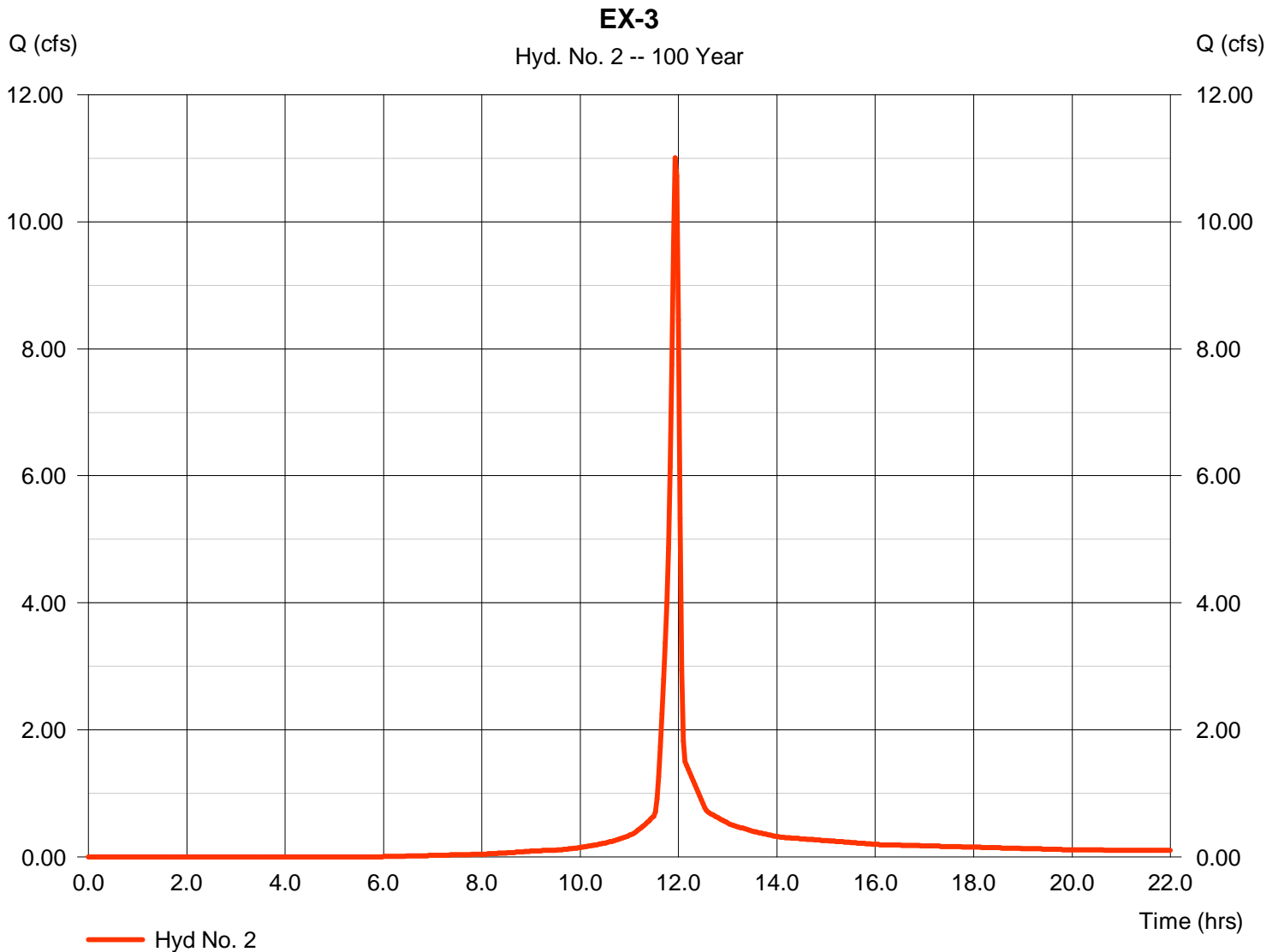
Monday, 09 / 17 / 2018

Hyd. No. 2

EX-3

Hydrograph type	= SCS Runoff	Peak discharge	= 11.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 22,799 cuft
Drainage area	= 1.260 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.190 \times 98) + (1.080 \times 74)] / 1.260$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

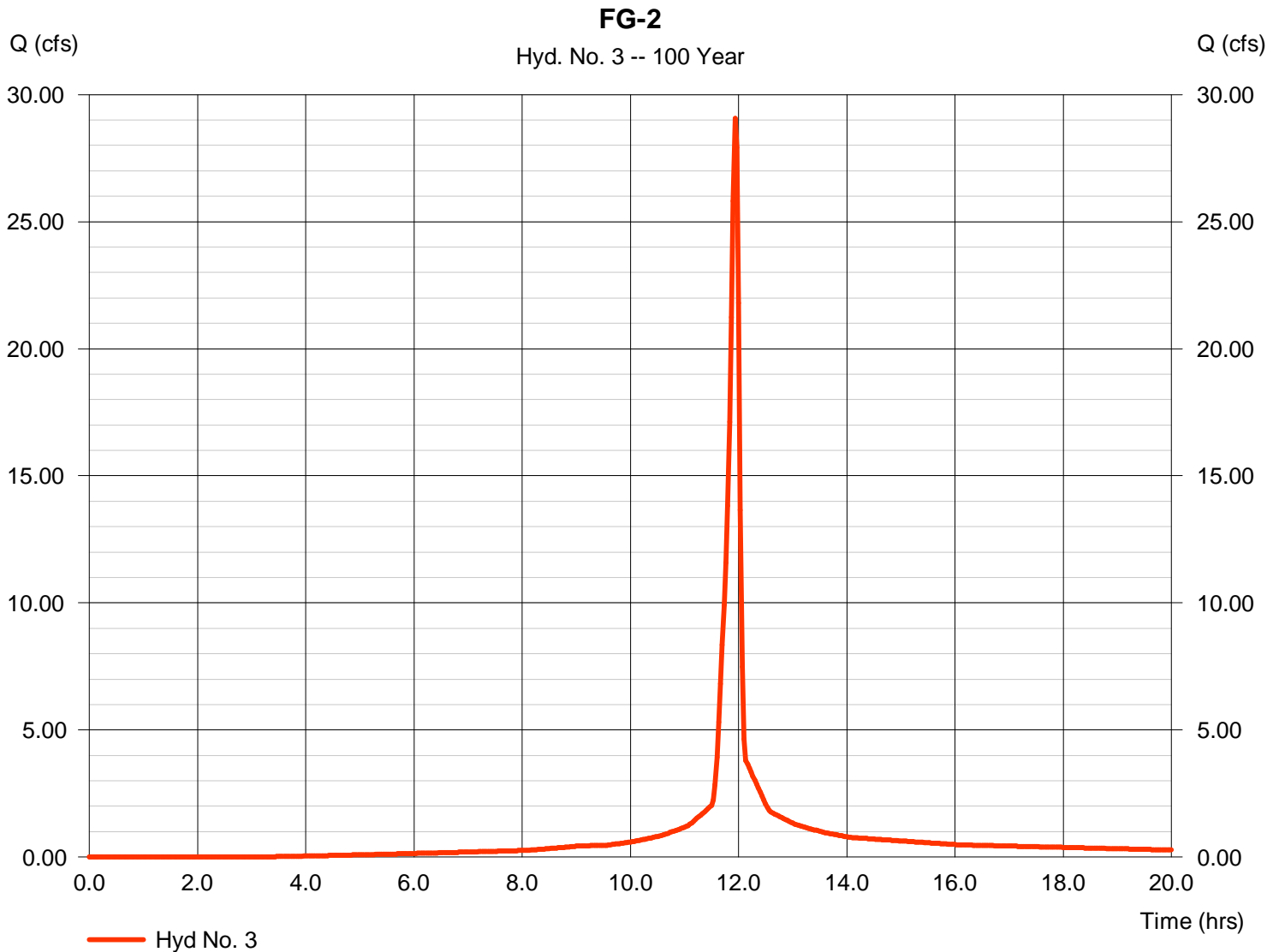
Monday, 09 / 17 / 2018

Hyd. No. 3

FG-2

Hydrograph type	= SCS Runoff	Peak discharge	= 29.06 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 63,608 cuft
Drainage area	= 2.880 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.720 \times 98) + (1.160 \times 74)] / 2.880$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

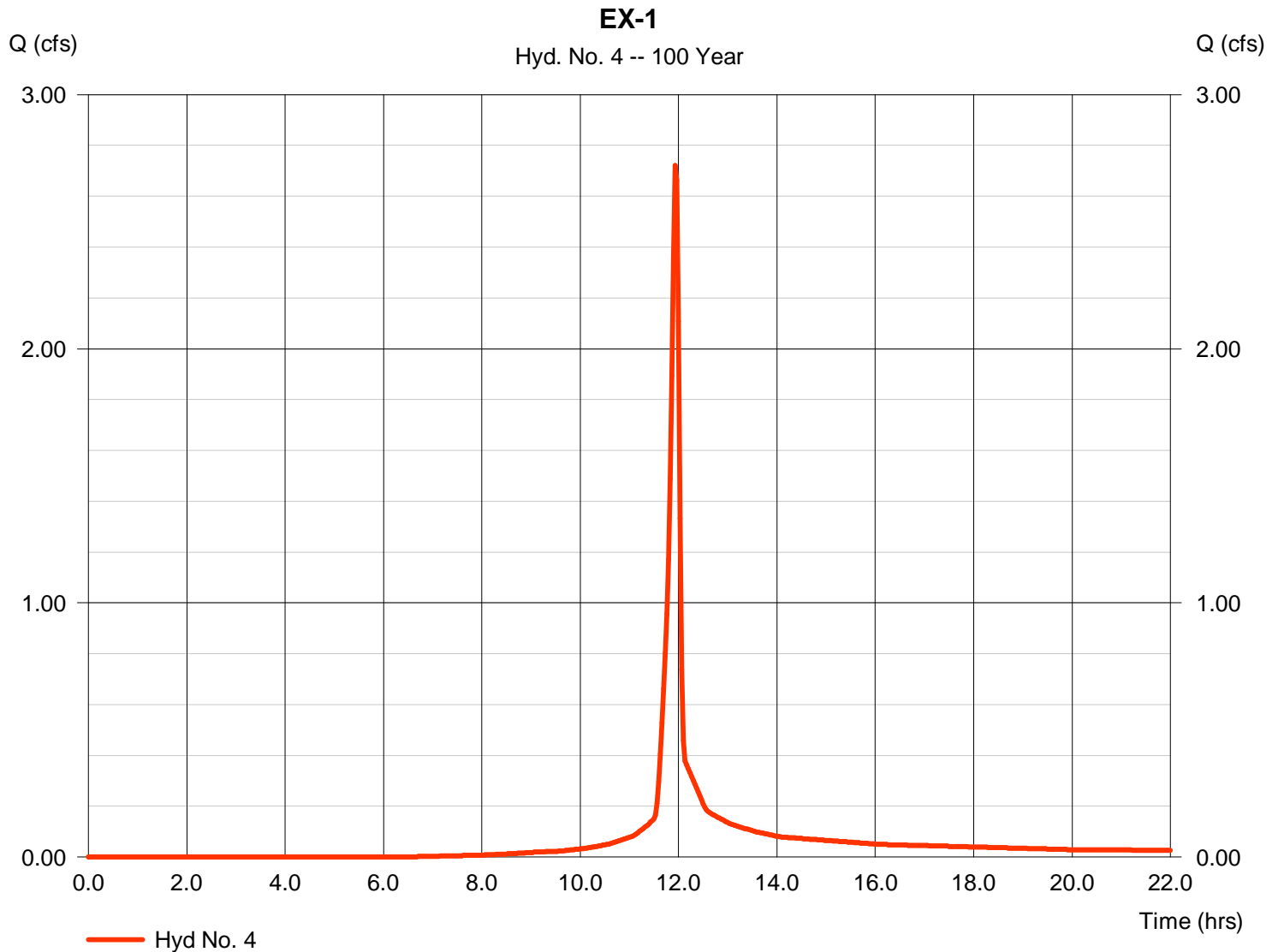
Monday, 09 / 17 / 2018

Hyd. No. 4

EX-1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.721 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,581 cuft
Drainage area	= 0.330 ac	Curve number	= 75*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.320 \times 74) + (0.010 \times 98)] / 0.330$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

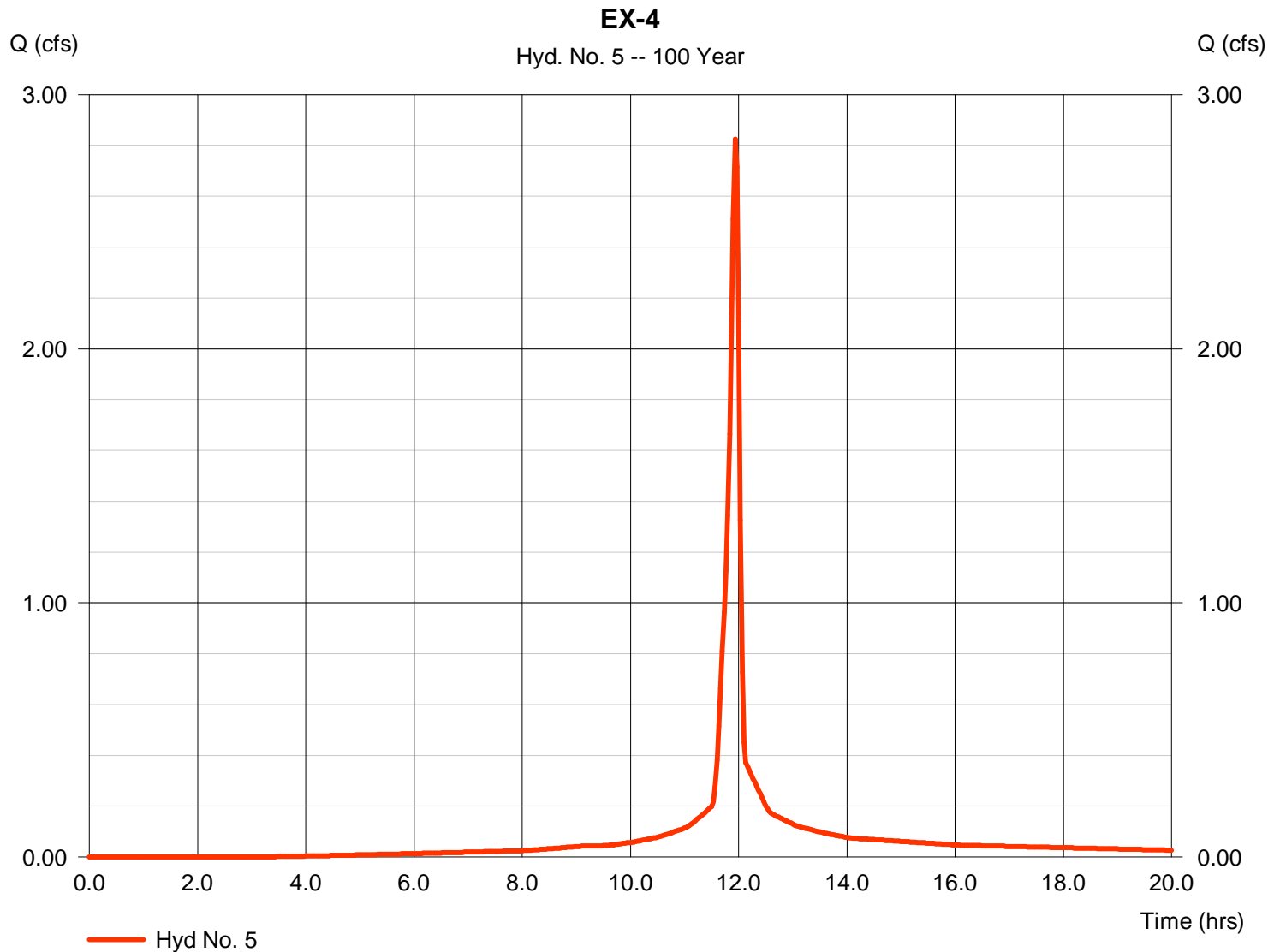
Monday, 09 / 17 / 2018

Hyd. No. 5

EX-4

Hydrograph type	= SCS Runoff	Peak discharge	= 2.825 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 6,184 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

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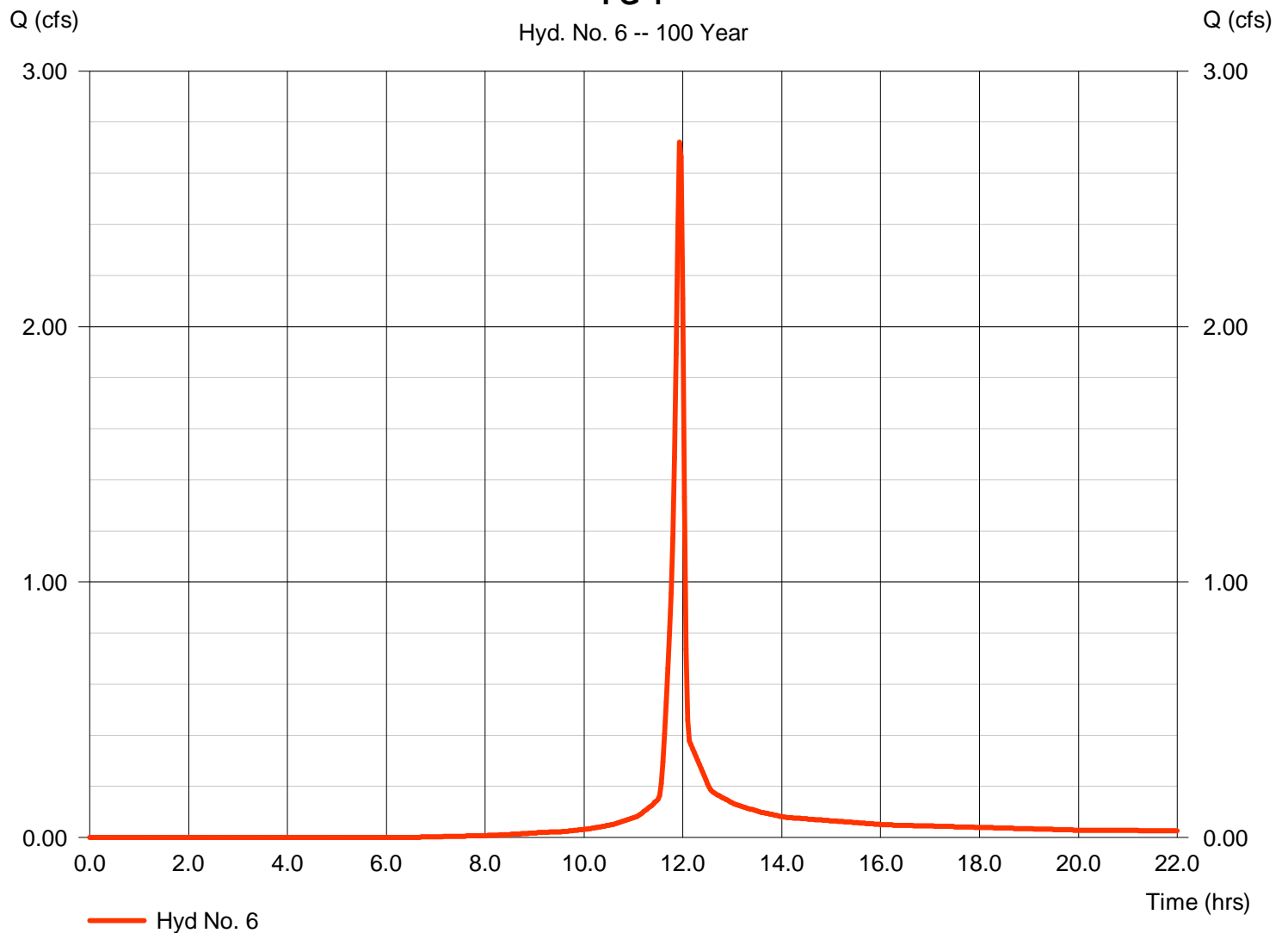
Hyd. No. 6

FG-1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.721 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 5,581 cuft
Drainage area	= 0.330 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

FG-1

Hyd. No. 6 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

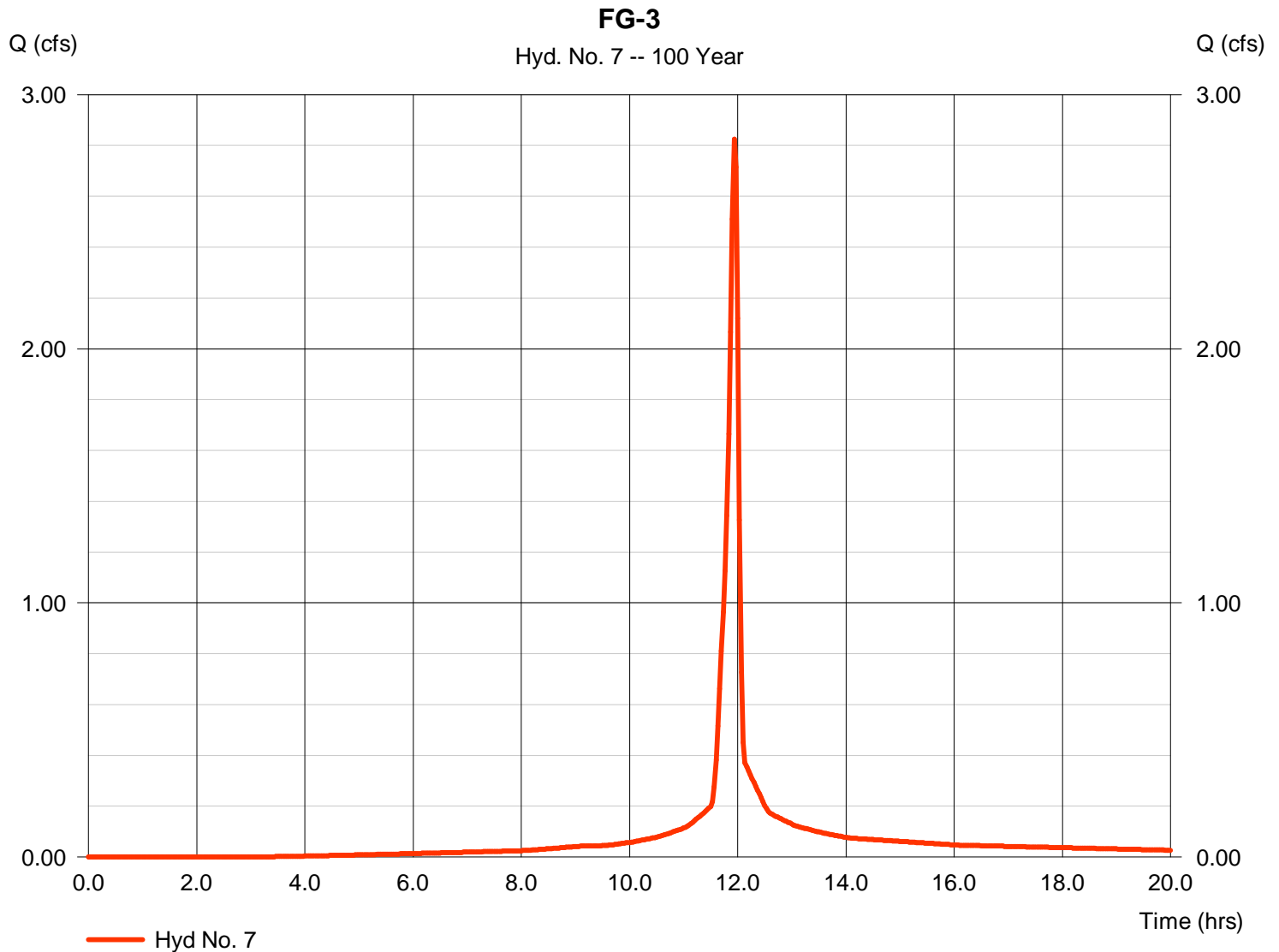
Monday, 09 / 17 / 2018

Hyd. No. 7

FG-3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.825 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 6,184 cuft
Drainage area	= 0.280 ac	Curve number	= 88*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(0.160 \times 98) + (0.120 \times 74)] / 0.280$



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

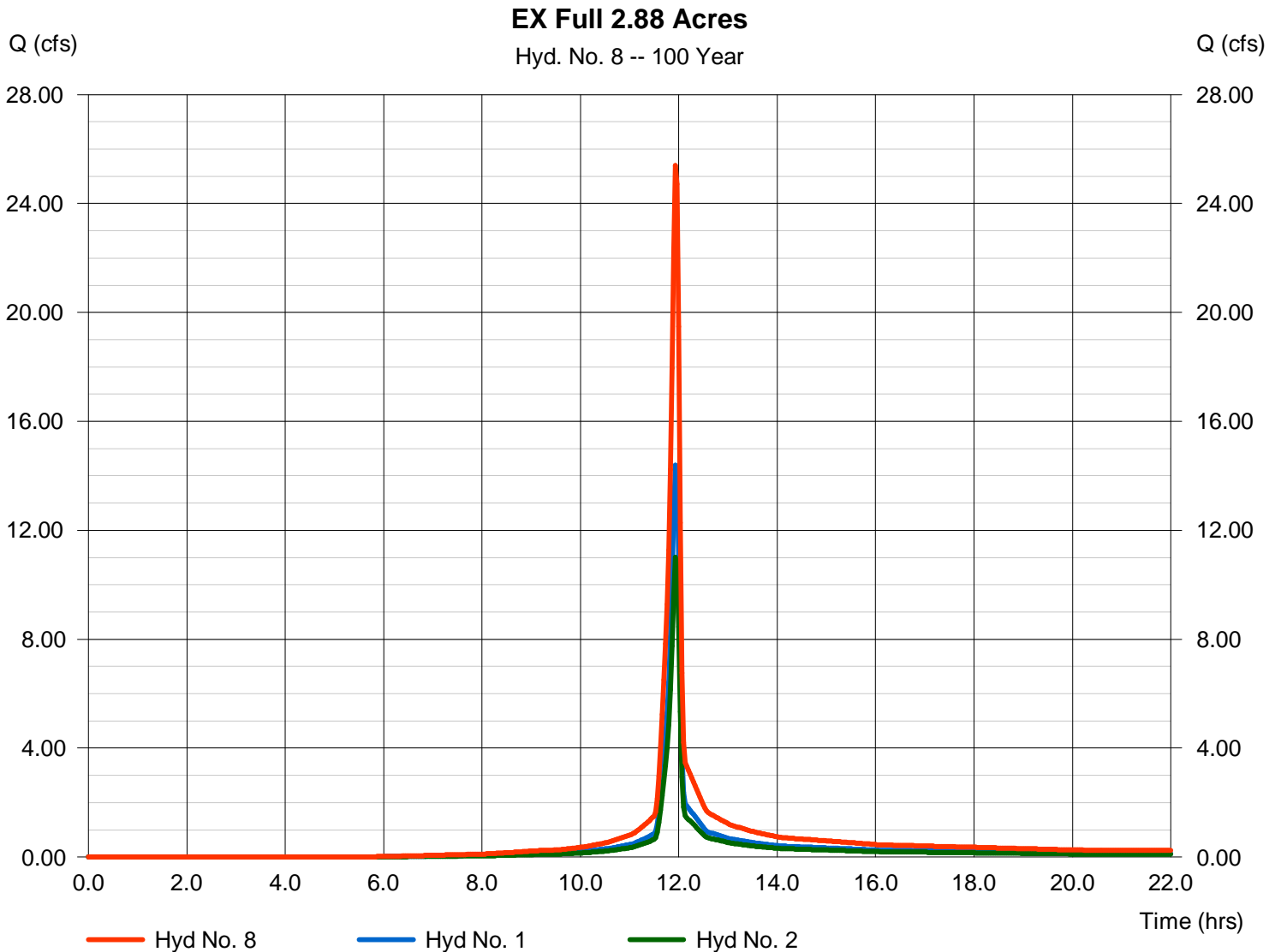
Monday, 09 / 17 / 2018

Hyd. No. 8

EX Full 2.88 Acres

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 2 min
 Inflow hyds. = 1, 2

Peak discharge = 25.40 cfs
 Time to peak = 11.93 hrs
 Hyd. volume = 52,755 cuft
 Contrib. drain. area = 2.880 ac



Hydrograph Report

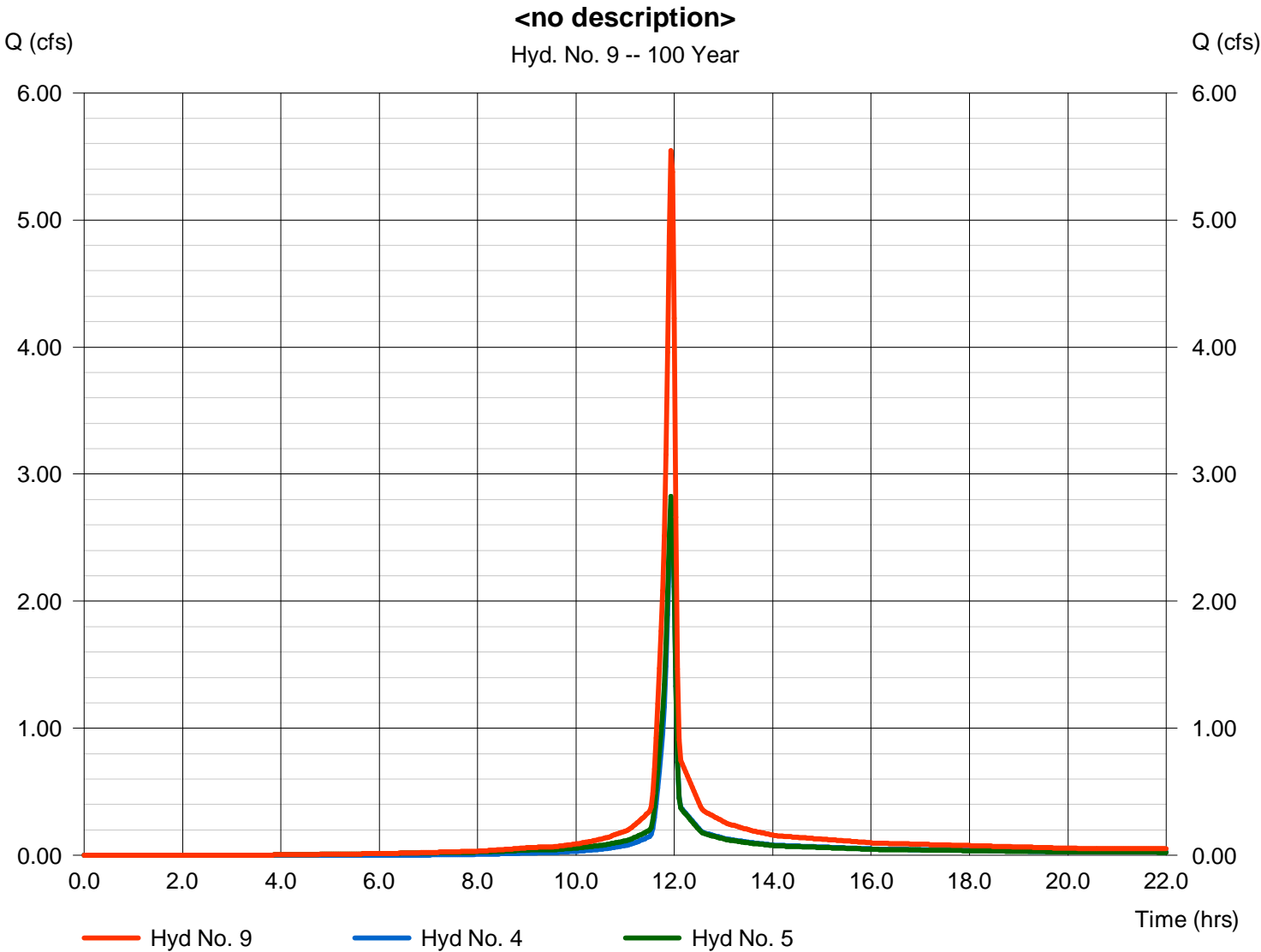
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 9

<no description>

Hydrograph type	= Combine	Peak discharge	= 5.546 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 11,765 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

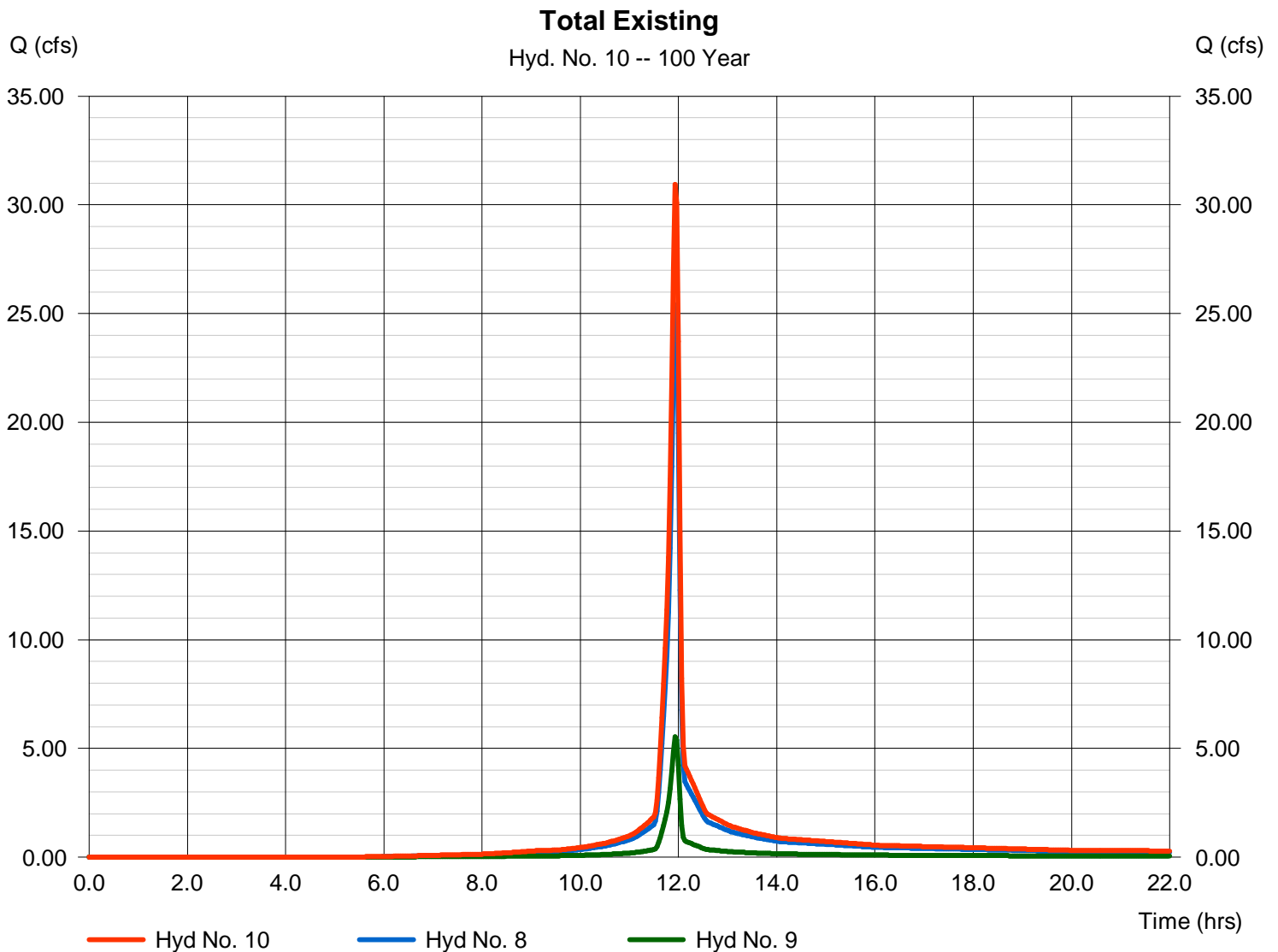
Monday, 09 / 17 / 2018

Hyd. No. 10

Total Existing

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

Peak discharge = 30.95 cfs
Time to peak = 11.93 hrs
Hyd. volume = 64,520 cuft
Contrib. drain. area = 0.000 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

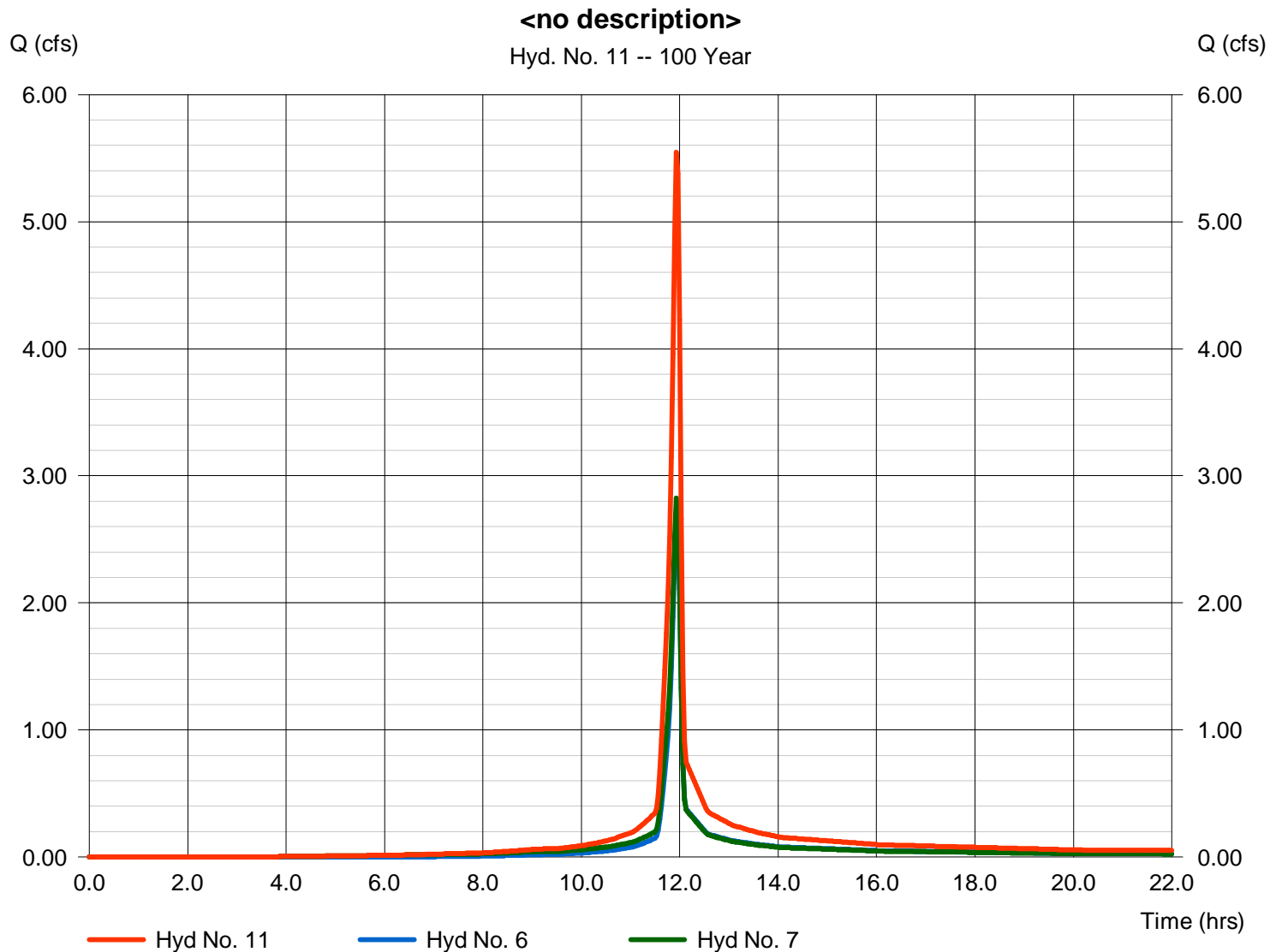
Monday, 09 / 17 / 2018

Hyd. No. 11

<no description>

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 6, 7

Peak discharge = 5.546 cfs
Time to peak = 11.93 hrs
Hyd. volume = 11,765 cuft
Contrib. drain. area = 0.610 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

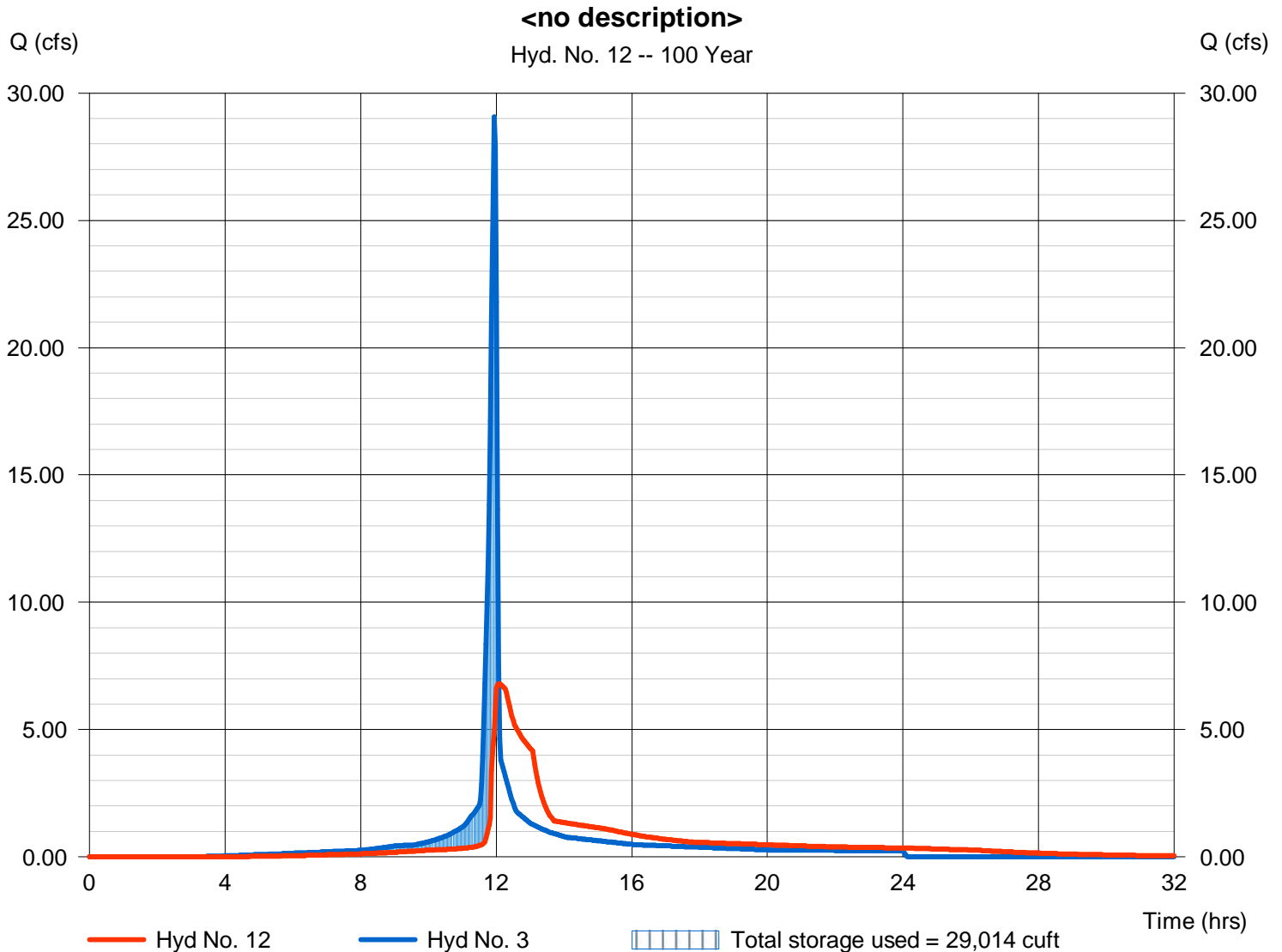
Monday, 09 / 17 / 2018

Hyd. No. 12

<no description>

Hydrograph type	= Reservoir	Peak discharge	= 6.806 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 63,597 cuft
Inflow hyd. No.	= 3 - FG-2	Max. Elevation	= 1031.89 ft
Reservoir name	= Bio-Retention Pond	Max. Storage	= 29,014 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Monday, 09 / 17 / 2018

Hyd. No. 13

<no description>

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 11, 12

Peak discharge = 11.07 cfs
Time to peak = 11.97 hrs
Hyd. volume = 75,362 cuft
Contrib. drain. area = 0.000 ac

