

PRELIMINARY STORM WATER MANAGEMENT REPORT

The Fields at Liberty Way
Hyatt House

Prepared: 01/04/18
Revised: 04/18/18

SUMMARY OF DATA

Method of Hydrograph Development: TR-55

Software: Autodesk Storm and Sanitary Stand Alone

Design Criteria: Control the post development storms of a frequency between one year and the critical storm so as to be equal to or less than the pre-development peak runoff rate for a 24 hour-one year frequency storm. Control post development storms less frequent than the critical storm so as to be equal to or less than the pre-development peak runoff rate for the next most frequent storm event.

Drainage Area Descriptions	Drainage Area (Acres)	CN	Tc (Mins)	Q1 (cfs)	Q1 (ft^3)	Q25 (cfs)	Q50 (cfs)	Q100 (cfs)
Pre Developed Areas				See 58		See 74	See 81	See 89
HIX Site	2.03	73.6	14.85	0.93	3,115	5.64	6.36	7.36
				See 65		See 79	See 86	See 94
Access Drive	0.34	72.8	19.11	0.13	502	0.84	0.95	1.10
				See 9		See 11	See 12	See 13
Hyatt Site	3.46	65.0	16.50	0.38	2,369	6.49	7.54	8.99
Post Developed Areas				See 59		See 75	See 82	See 90
HIX Site Crit=25yr	2.03	92.0	12.00	4.12	10,773	10.93	11.82	13.01
				See 66	246%	See 80	See 87	See 95
Access Drive Crit = 50yr	0.34	98.0	12.00	0.88	2,511	1.97	2.12	2.31
				See 14	400%	See 16	See 17	See 18
Hyatt Site Crit = 100yr	3.46	92.4	12.00	7.16	18,777	6.49	7.54	8.99
					693%			
Offsite Areas				See 24		See 26	See 27	See 28
Lot 1 Offsite	7.00	73.0	23.25	2.40		15.96	18.08	20.99
				See 60		See 76	See 83	See 91
HIX ODOT RW	0.11	65.0	12.00	0.01		0.24	0.28	0.33
				See 19		See 21	See 22	See 23
Hyatt ODOT RW	0.28	65.0	12.00	0.04		0.61	0.71	0.84
				See 33		See 41	See 45	See 49
Liberty Way Pavement	2.23	96.0	12.00	5.41		12.72	13.68	14.96

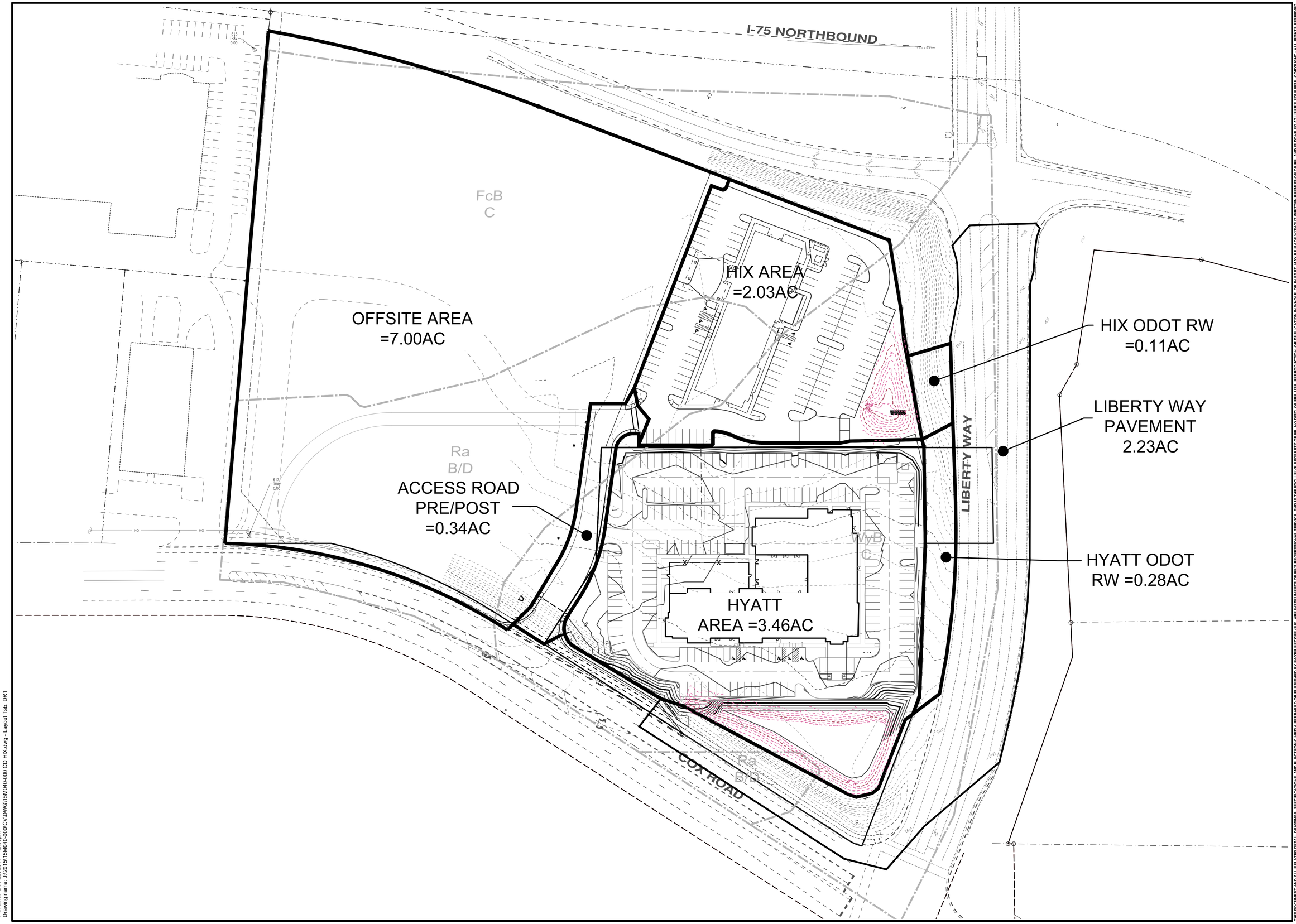
Hyatt Critical Storm = 100 yr.

Hyatt Allowable Release Rate=

Q1 HYATT Site Pre Developed (0.38) + Q100 HIX ODOT RW (0.33) + Q100 HYATT ODOT RW (0.84)+ Q50 HIX PRE-DEVELOPED (6.36) + Q50 ACCESS DRIVE PRE-DEVELOPED (0.95) + Q50 LOT 1 OFFISTE (18.08)= 26.94 CFS

100YR Routed Flow to Culvert Under Cox Road = 27.87 CFS See 50

Capacity of Culvet Under Cox Road = 39 CFS See 52



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Basis of Bearing:
State Plane NAD83 (2011)

0 50 75

SCALE: 1" = 50'

Item	Revision Description	Date	Drwn:	Chk:
1				
2				
3				
4				
5				
6				
7				
8				
9				

THE FIELDS AT LIBERTY WAY
PRELIMINARY DEVELOPMENT PLAN

COX ROAD & LIBERTY WAY
WEST CHESTER TOWNSHIP
BUTLER COUNTY, OH
SECTION 12, 18, TOWN 3, RANGE 2

DRAINAGE PLAN

bayer becker
www.bayerbecker.com
6925 Hillside Road, Suite A
Mason, OH 45040 - 513.336.6600

Drawing: 15M040-000 CD HIX
Drawn by: MJL
Checked By:
Issue Date: 12-21-17
Sheet: DR1

Plot time: Dec 22, 2017 - 12:35pm
Drawing name: J:\2015\15M040-000\CV\DWG\15M040-000 CD HIX.dwg - Layout Tab: DR1

SUMMARY OF DATA

Method of Hydrograph Development: TR-55

Software: Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2011

Design Criteria: Control the post development storms of a frequency between one year and the critical storm so as to be equal to or less than the pre-development peak runoff rate for a 24 hour one year frequency storm.

Hyatt Basin 100YR=886.74 T/Dike=888.90		**Outlet: 24" Pipe @ 1.09%** **2.5" WQ Orifice Inv=881.96, 15" Orifice Inv=883.50** **16"X36" @ 885.50, T/Grate @ 886.86, Spillway = 887.00**			
Frequency	**Inflow**	**Outflow**	**Storage**		**Elevation**
(yr)	(cfs)	(cfs)	(ft^3)	(ac-ft)	(ft)
1	See 31 10.36	3.64	43,010	0.99	884.51 See 32
5	23.09	7.46	44,118	1.01	885.60
10	See 35 28.56	11.11	49,590	1.14	885.96 See 36
25	See 39 35.74	16.04	55,932	1.28	886.35 See 40
50	See 43 39.40	18.62	59,072	1.36	886.53 See 44
100	See 47 44.38	22.11	63,166	1.45	886.78 See 48

Release Rate - Basin

Critical Storm = 100 yr

Storm Frequency	Pre-Developed Release Rate	Offsite Flow Rate	Allowable Release	Post-Developed Release Rate
(yr)	(cfs)	(cfs)	(cfs)	(cfs)
1	1.44	2.45	3.89	3.64
5	1.44	9.33	10.77	7.46
10	1.44	12.52	13.96	11.11
25	1.44	16.81	18.24	16.04
	HIX Pre 25yr + Access Pre 1yr + Hyatt Pre 1yr = 6.14	Lot 1 25yr + ODOT 50yr	Pre-Dev + Offsite	
50	6.14	16.94	23.08	18.62
	HIX Pre 50yr + Access Pre 50yr + Hyatt Pre 1yr = 7.69	Lot 1 50yr + ODOT 100yr	Pre-Dev + Offsite	
100	7.69	19.25	26.94	22.11

Spillway		$Q_{100}=CLH^{3/2}$	
Q_{100}=44.38	C=3.0	L=40	H=0.52
Spillway Invert		887.00	
100 Year Weir Flow		887.52	
Top of Dike Elevation		888.90	
Freeboard		1.38	
Spillway Side Slope		3:1	
Velocity		2.13	

Note: Storage Volumes are from Normal Pool, all storages are routed from 883.50

Note: See HIX Calculations for HIX and Access Road Critical Storm

Note: Spillway is designed for 100yr inflow into the basin

bayer becker

Water Quality Volume

Project:	The Fields of Liberty	Designed By:	MJL	Date:	10/9/17
Job No.:	15M040-000	Checked By:		Date:	
Basin ID:	Access Drive Pond	Revised By:	MJL	Date:	4/18/18

Required Water Quality Volume

$WQ_v = P\ C\ A/12$

Site Drainage Area (A) = 5.83 acres (To Basin)

Rainfall Depth (P) = 0.9 in.

Runoff Coefficient (C) = 0.82

C = 0.05 + 0.9i (85% impervious)

WQ_v = 0.359 acre-ft.

Wet Pond Allowance = 1

Wet Pond Allowance = 0.36 Ac-ft

Total WQ_v = 0.359 Ac-ft

= 15,618 cu.ft.

Water Quality Release Rate

Q_{wqv} = Total WQ_v/RT

Required Retention Time (RT) = 24 hours

Q_{wqv} = 0.181 cfs

Provided Retention Time (PT) = 36.22 hours

Water Quality Outlet Orifice

Contour Areas

	Elevation ft	Area ft^2	Volume ft^3	Cum. Vol. ft^3	Elevation at V	Storage at Elev
Basin Inv. =	875.00	0	0.00	0.00		
Contour 1 =	876.00	2,128	1064.00	1064.00		
Contour 2 =	877.00	2,789	2458.50	3522.50		
Contour 3 =	878.00	3,537	3163.00	6685.50		
Contour 4 =	879.00	4,364	3950.50	10636.00		
Contour 5 =	880.00	5,258	4811.00	15447.00		
Contour 6 =	881.00	6,213	5735.50	21182.50	880.03	
Contour 7 =	882.00	9,261	7737.00	0.00		
Contour 8 =	883.00	10,824	10042.50	10042.50		
Contour 9 =	884.00	12,395	11609.50	21652.00	883.48	15618.22
Contour 10 =	885.00	14,111	13253.00	34905.00		
Contour 11 =	886.00	15,993	15052.00	49957.00		
Contour 12 =	887.00	17,223	16608.00	66565.00		
Contour 13 =						
Contour 14 =						

$Q = N\ C_d\ A_o\ (2\ g\ \Delta h)^{1/2}$

C_d = 0.61

A_o = 0.03 $\pi\ D^2/4$ for circular orifices; = h * w for rectangular orifices

g = 32.20 ft/sec^2

Q = 0.133 cfs

Orifice h = 2.500 inch Orifice w = 0.00 inch (= 0 for circular orifice)

Number of orifices = N = 1

Δh_{avg} = (Elev at V - Basin Inv)/2 - 1/2 h = 0.64 ft

Project: **The Fields at Liberty Way**

Drainage Area Description:

Hyatt Hotel; Pre Developed

Job #: 15M040.000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 3.46 Acres

Soil Types:

100 %	Type 'B'	*3.5 acres*
0 %	Type 'C'	*0.0 acres*

Land Use: Woods - Grass 3.5 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Woods - Grass	**B**	65	100	100.0	65.00
Woods - Grass	**C**	76	0	100.0	0.00

Composite CN = 65.0

Time of Concentration:

Sheet Flow: **Tc**

Length = 100 Slope(ft/ft) = 0.0350 Manning's, n = 0.24 **0.201** *hr*

Shallow Concentrated Flow:

Length = 400 Slope(ft/ft) = 0.035 Velocity (fps) = 1.5 **0.074** *hr*

Channel Flow:

Tc = 0.28 ***hr***
17 min

Project: **The Fields at Liberty Way**

Drainage Area Description:

; Developed

Job #: 15M040-000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 3.46 Acres

Soil Types:

100 %	Type 'B'	*3.5 acres*
0 %	Type 'C'	*0.0 acres*

Land Use:

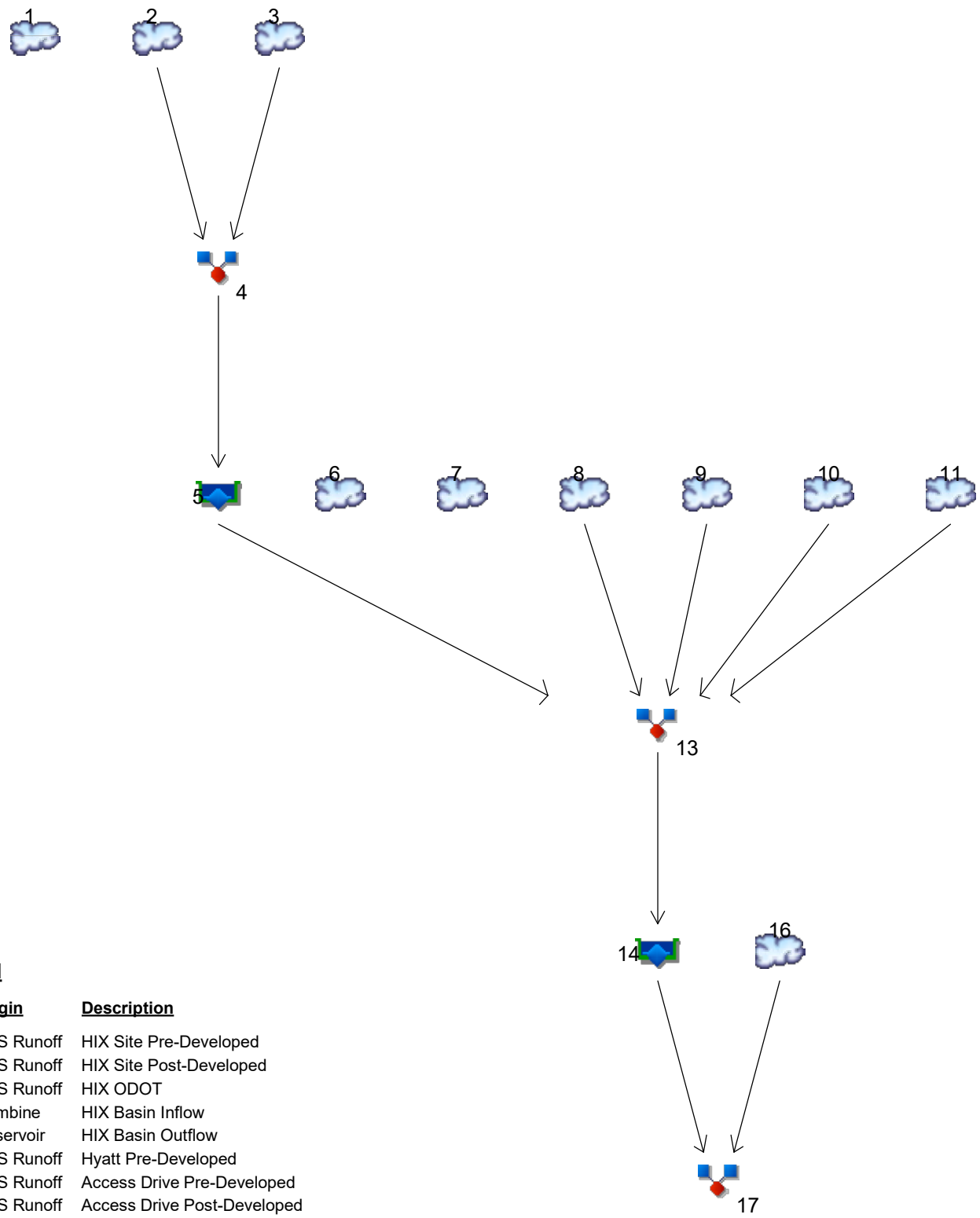
Open Space	0.5 Acres
Impervious	2.9 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Open Space	**B**	61	100	15.0	9.17
Open Space	**C**	74	0	15.0	0.00
Impervious	**B**	98	100	85.0	83.27
Impervious	**C**	98	0	85.0	0.00

Composite CN = 92.4

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	HIX Site Pre-Developed
2	SCS Runoff	HIX Site Post-Developed
3	SCS Runoff	HIX ODOT
4	Combine	HIX Basin Inflow
5	Reservoir	HIX Basin Outflow
6	SCS Runoff	Hyatt Pre-Developed
7	SCS Runoff	Access Drive Pre-Developed
8	SCS Runoff	Access Drive Post-Developed
9	SCS Runoff	Hyatt Post-Developed
10	SCS Runoff	Lot 1 Offsite
11	SCS Runoff	Hyatt ODOT R/W
13	Combine	Hyatt Basin Inflow
14	Reservoir	Hyatt Basin Outflow
16	SCS Runoff	Liberty Way Pavement
17	Combine	Elliptical Pipe Flow

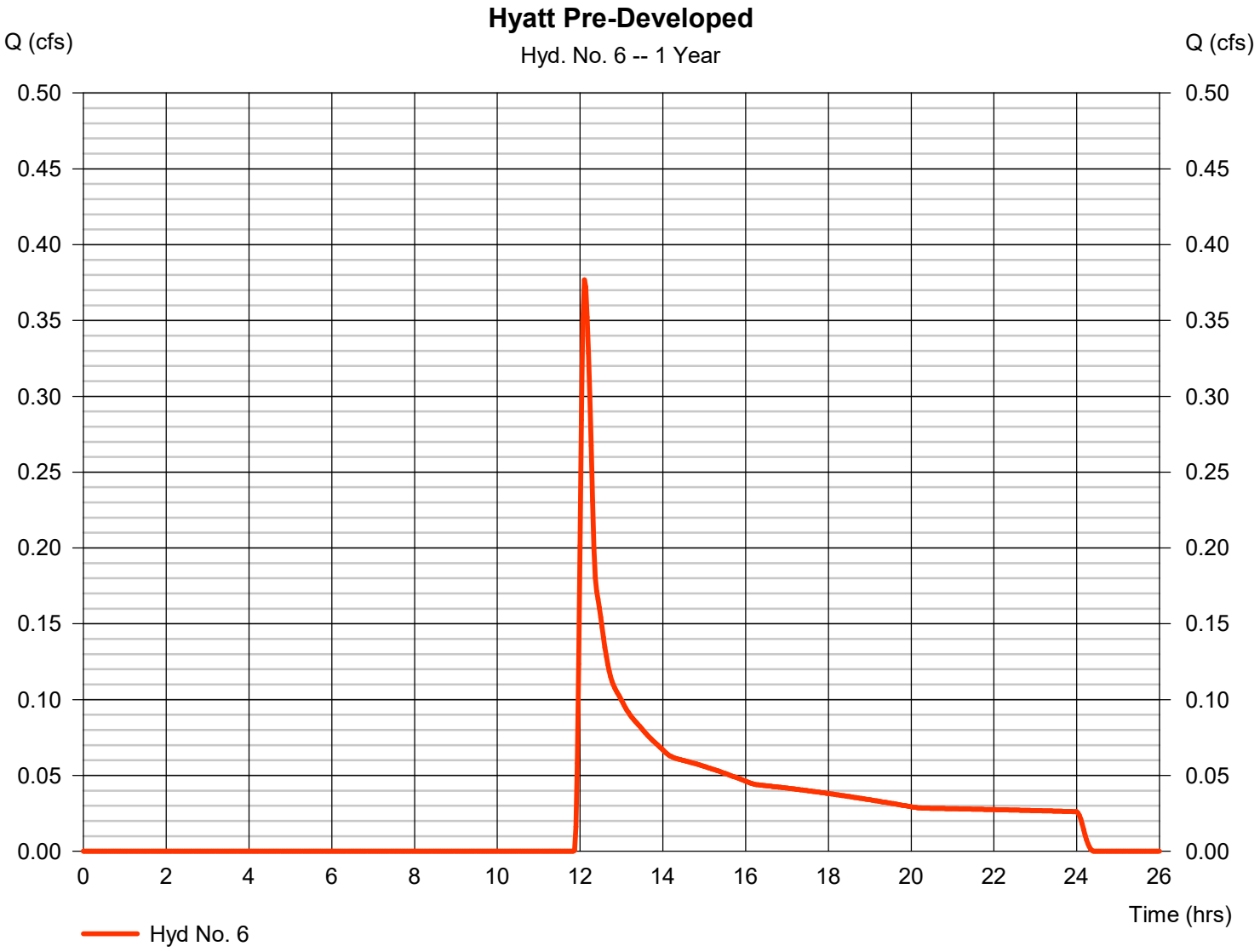
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 6

Hyatt Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.377 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 2,369 cuft
Drainage area	= 3.460 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.50 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



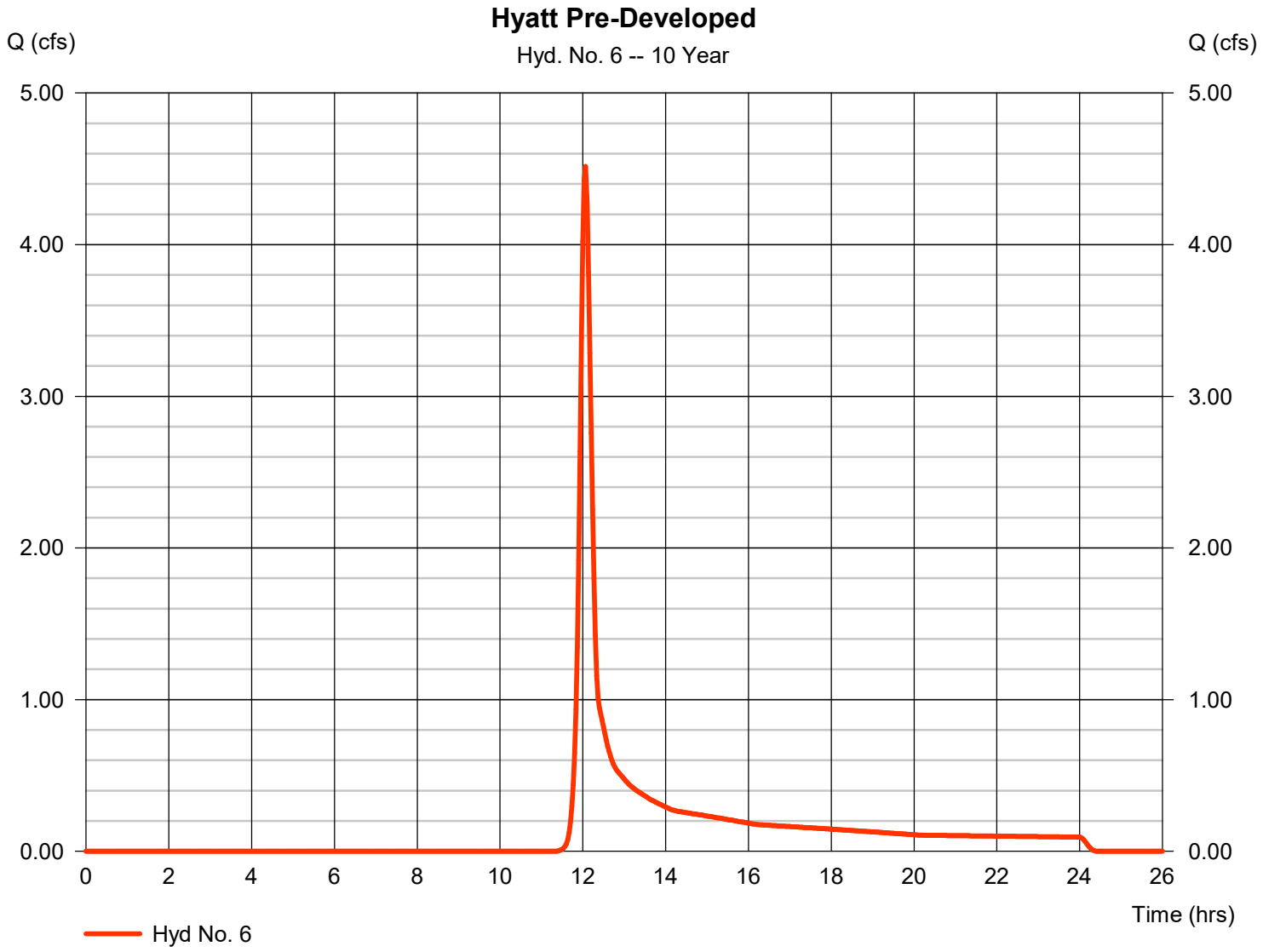
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Hyd. No. 6

Hyatt Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 4.517 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 13,674 cuft
Drainage area	= 3.460 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.50 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



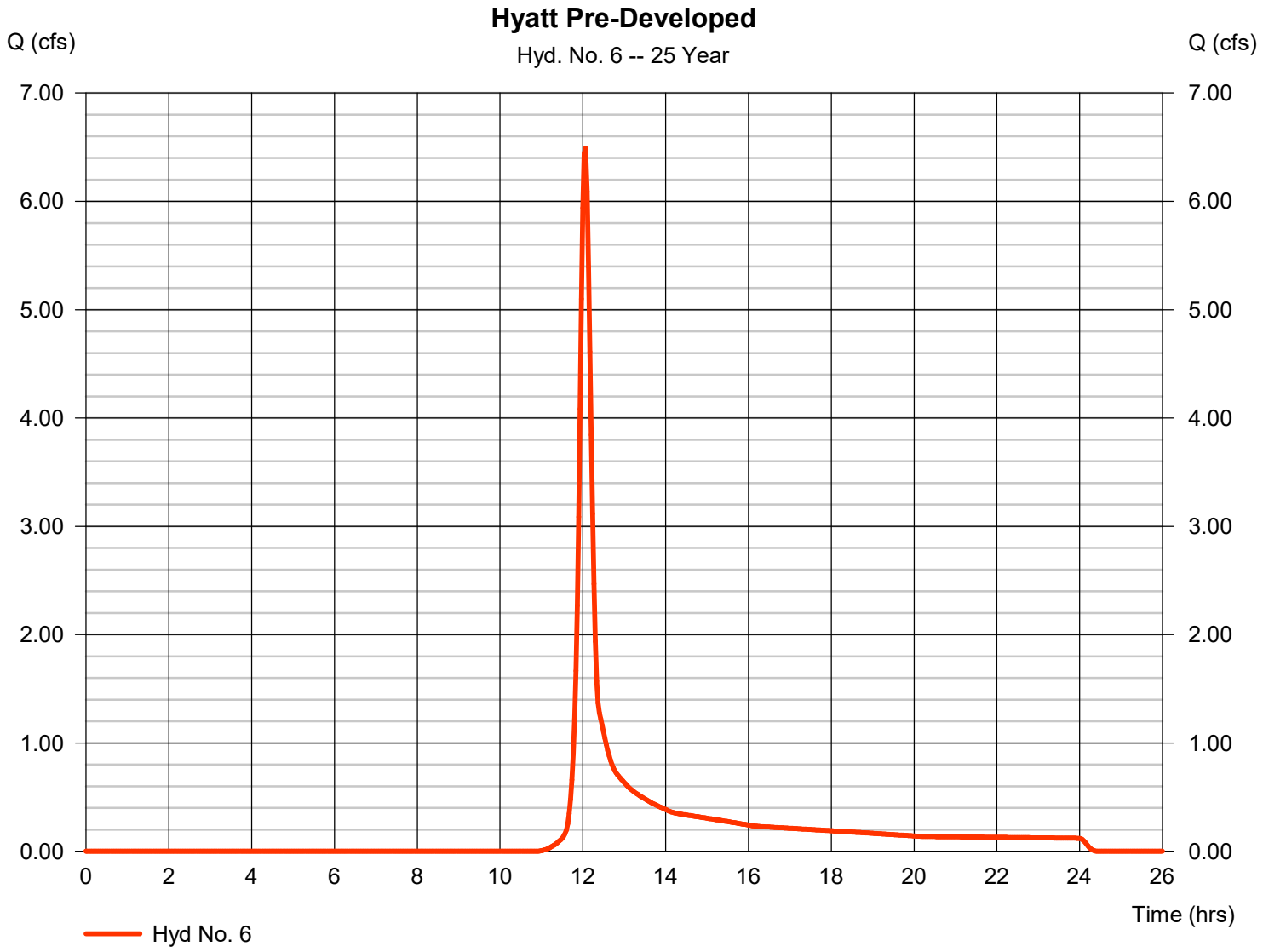
Hydrograph Report

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Hyd. No. 6

Hyatt Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.492 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	19,037 cuft
Drainage area	=	3.460 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.50 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



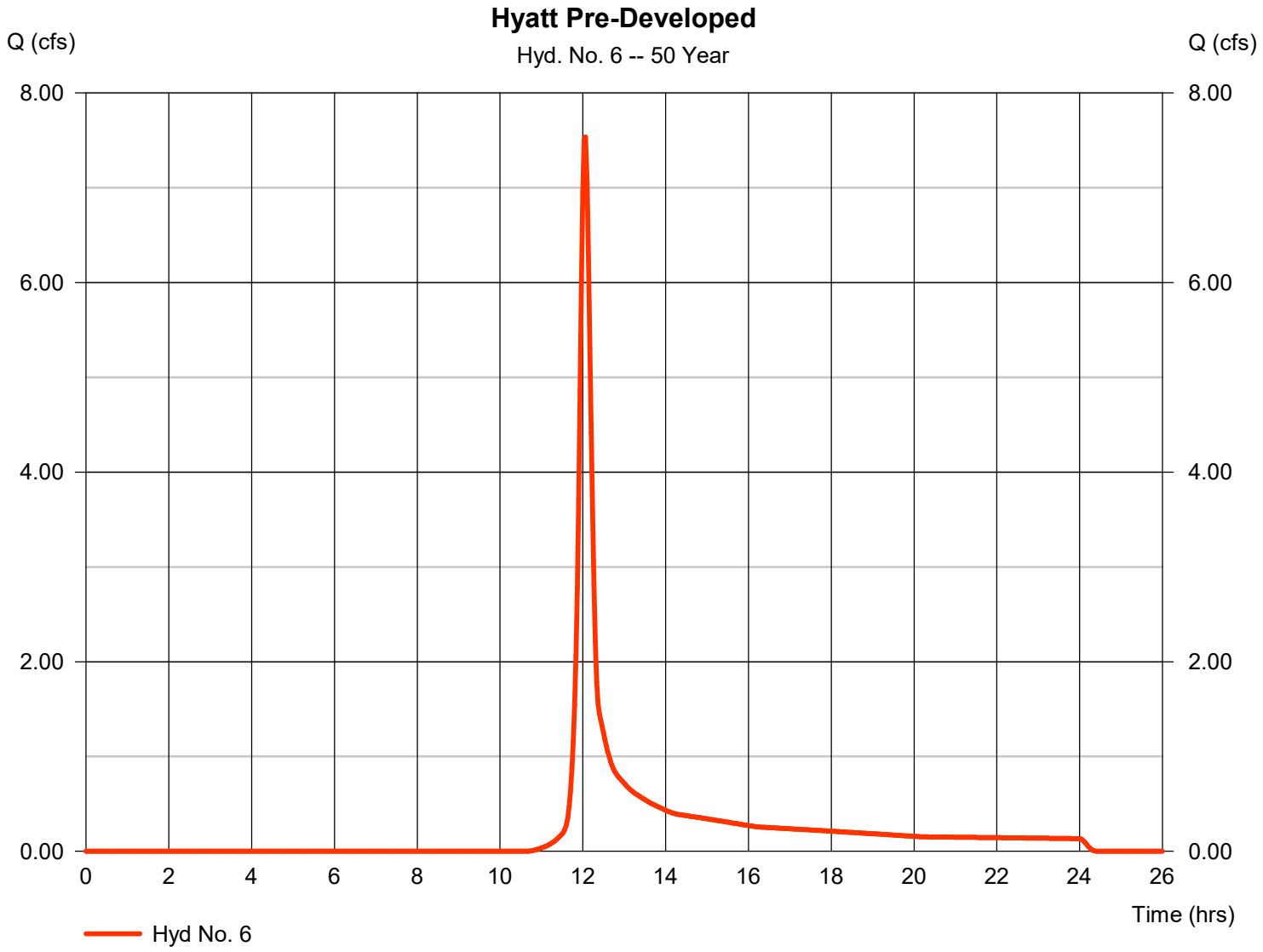
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Hyd. No. 6

Hyatt Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.535 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	21,896 cuft
Drainage area	=	3.460 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.50 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



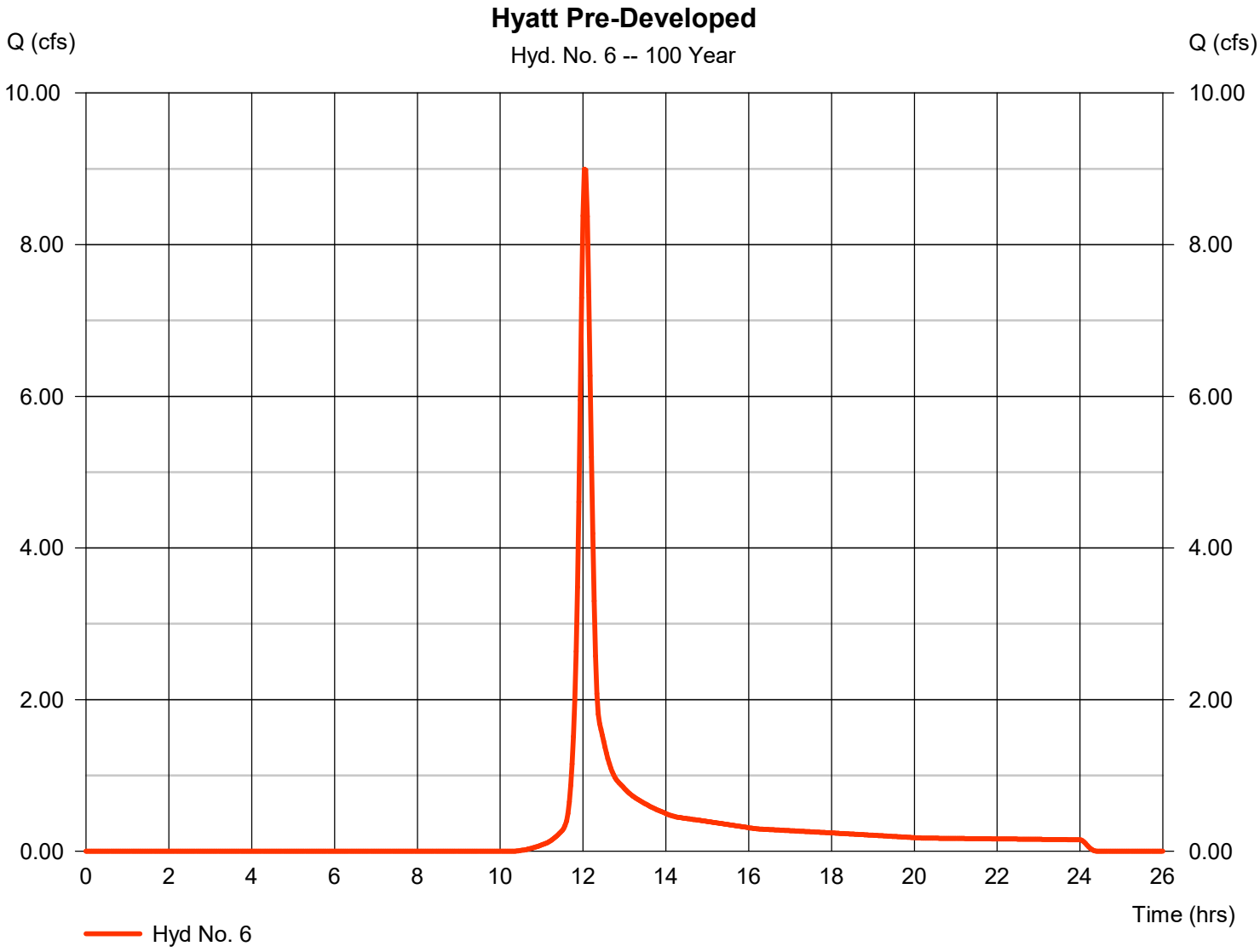
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Hyd. No. 6

Hyatt Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.994 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	25,892 cuft
Drainage area	=	3.460 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.50 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



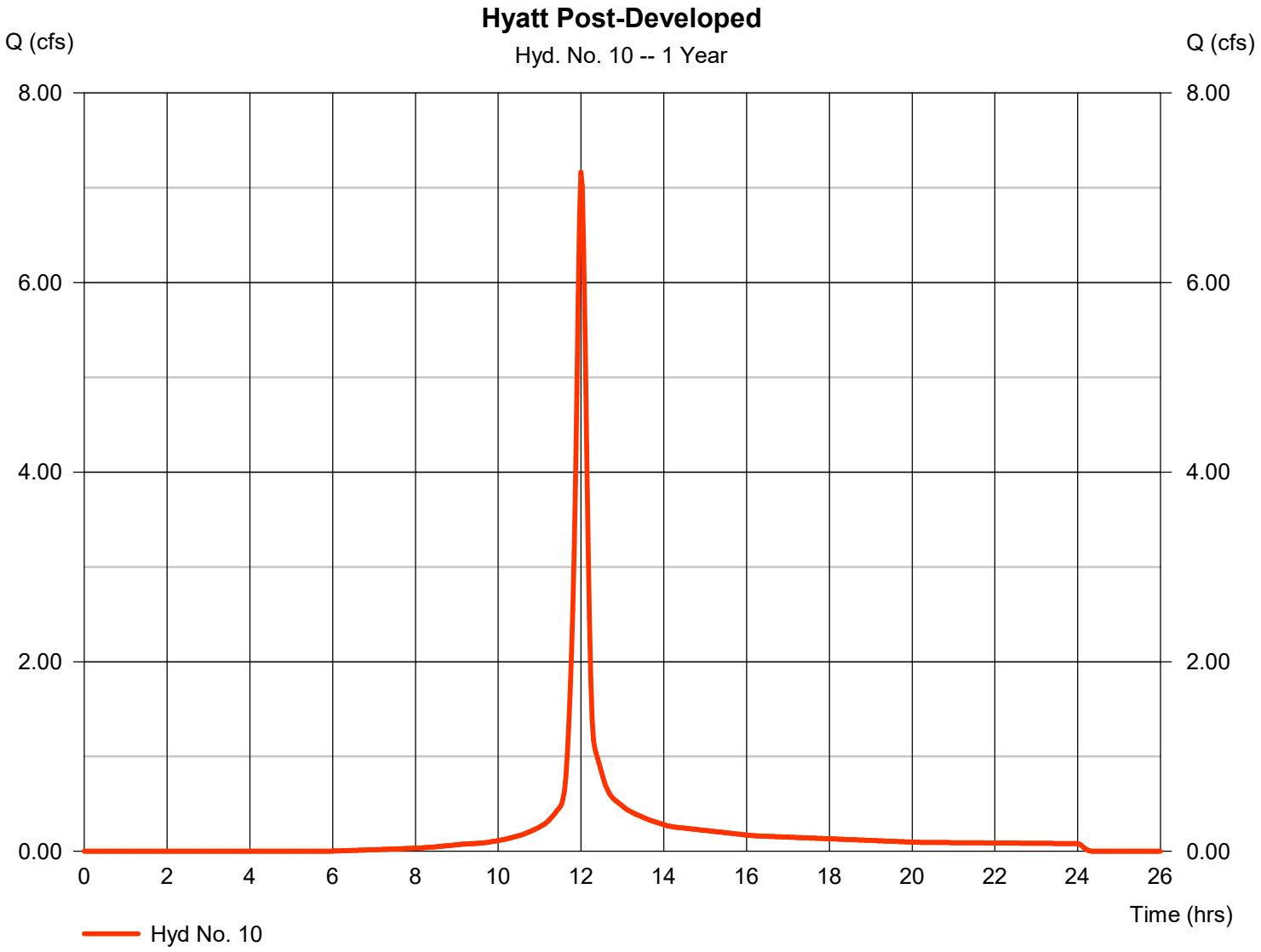
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Hyd. No. 10

Hyatt Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 7.163 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 18,777 cuft
Drainage area	= 3.460 ac	Curve number	= 92.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



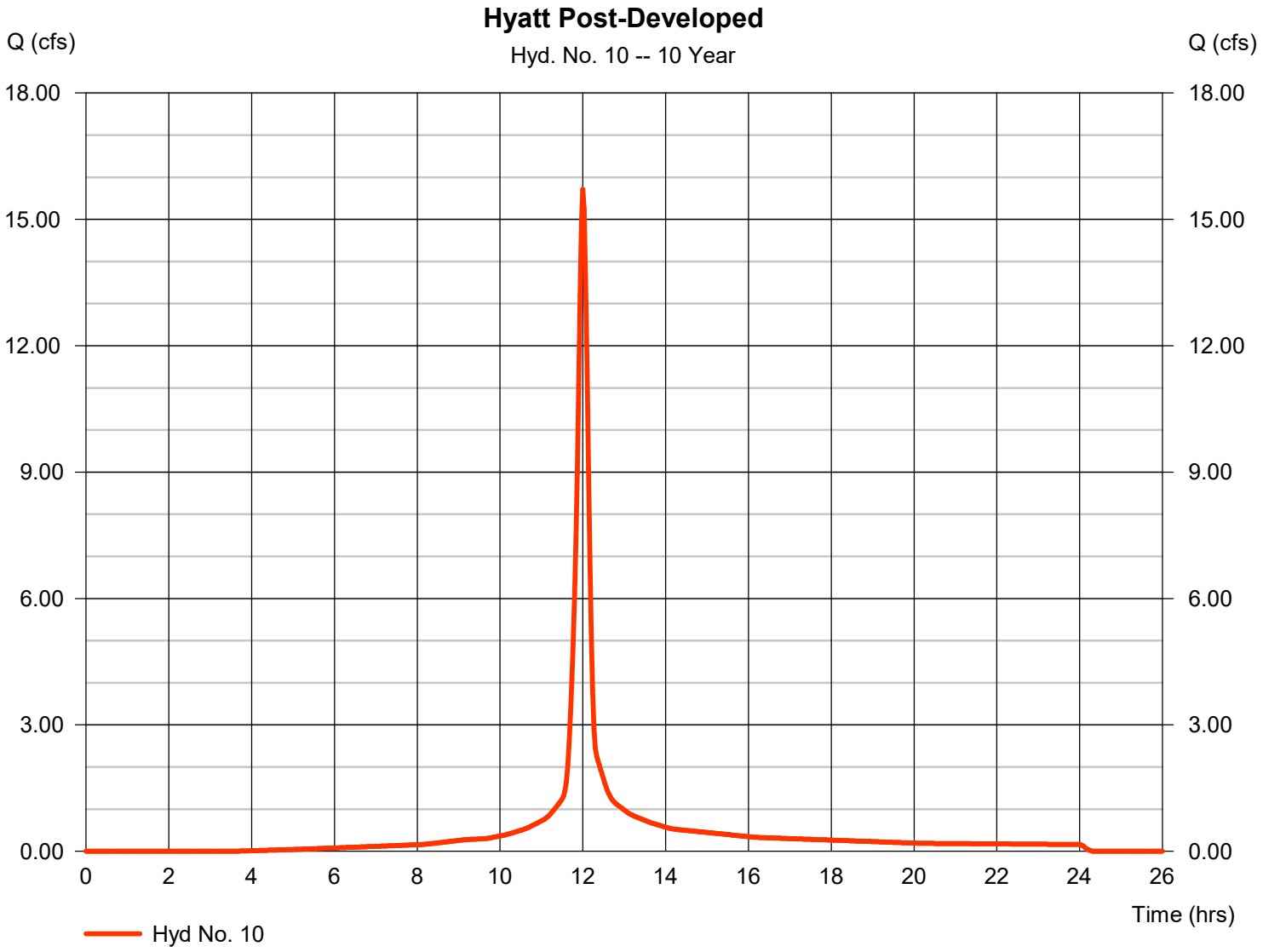
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Hyd. No. 10

Hyatt Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.71 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	42,790 cuft
Drainage area	=	3.460 ac	Curve number	=	92.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.15 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



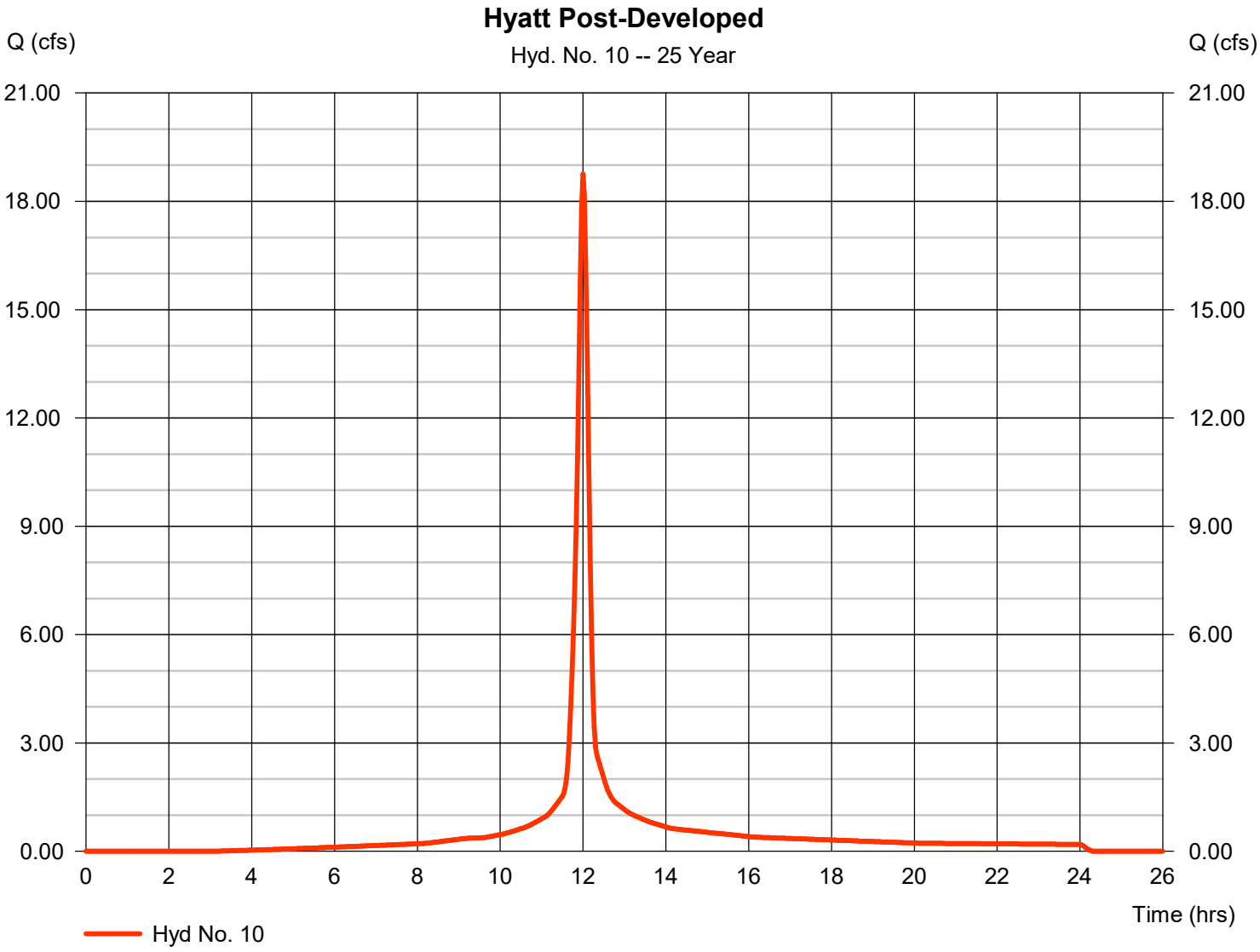
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Hyd. No. 10

Hyatt Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.76 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	51,625 cuft
Drainage area	=	3.460 ac	Curve number	=	92.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



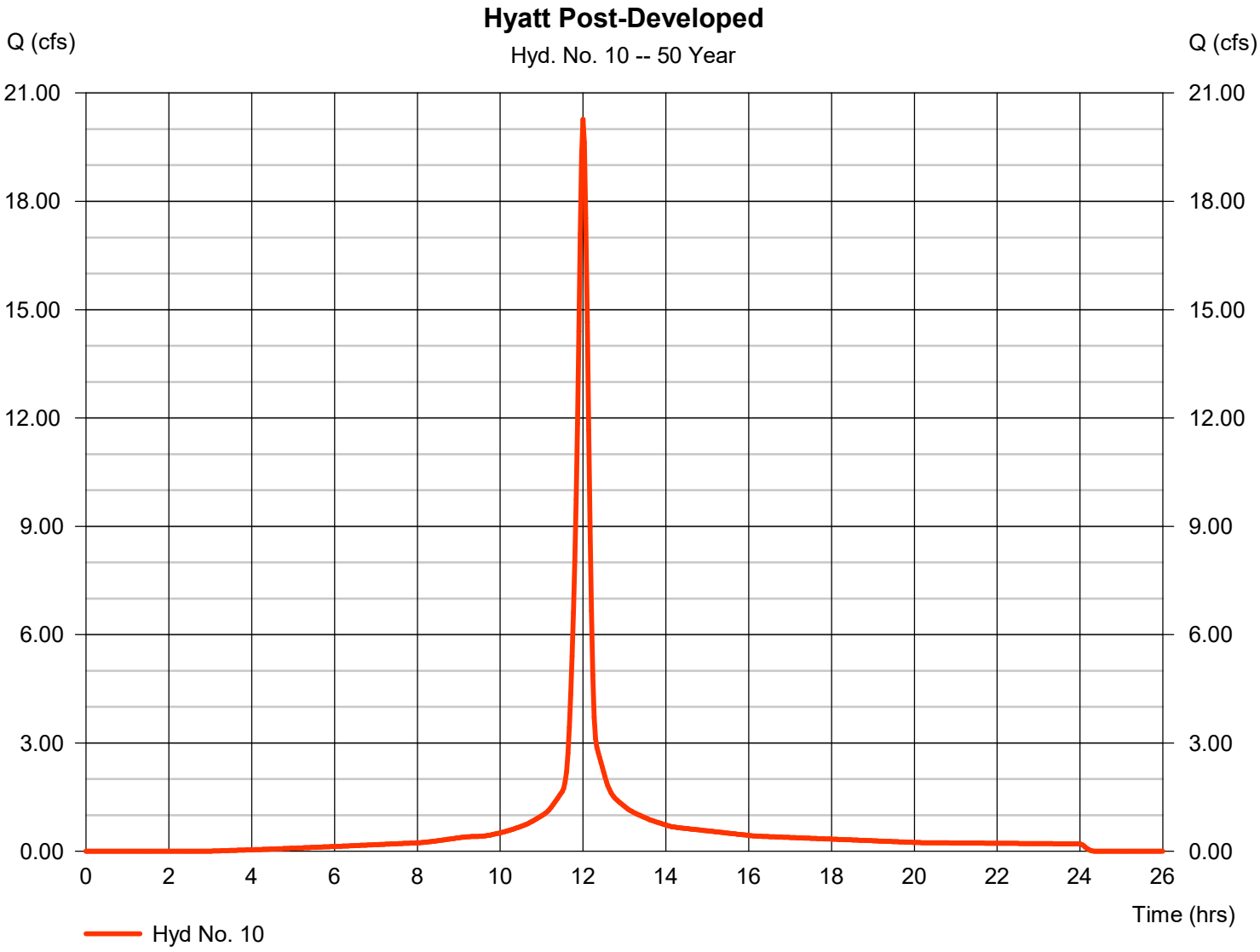
Hydrograph Report

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Hyd. No. 10

Hyatt Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.27 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	56,064 cuft
Drainage area	=	3.460 ac	Curve number	=	92.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

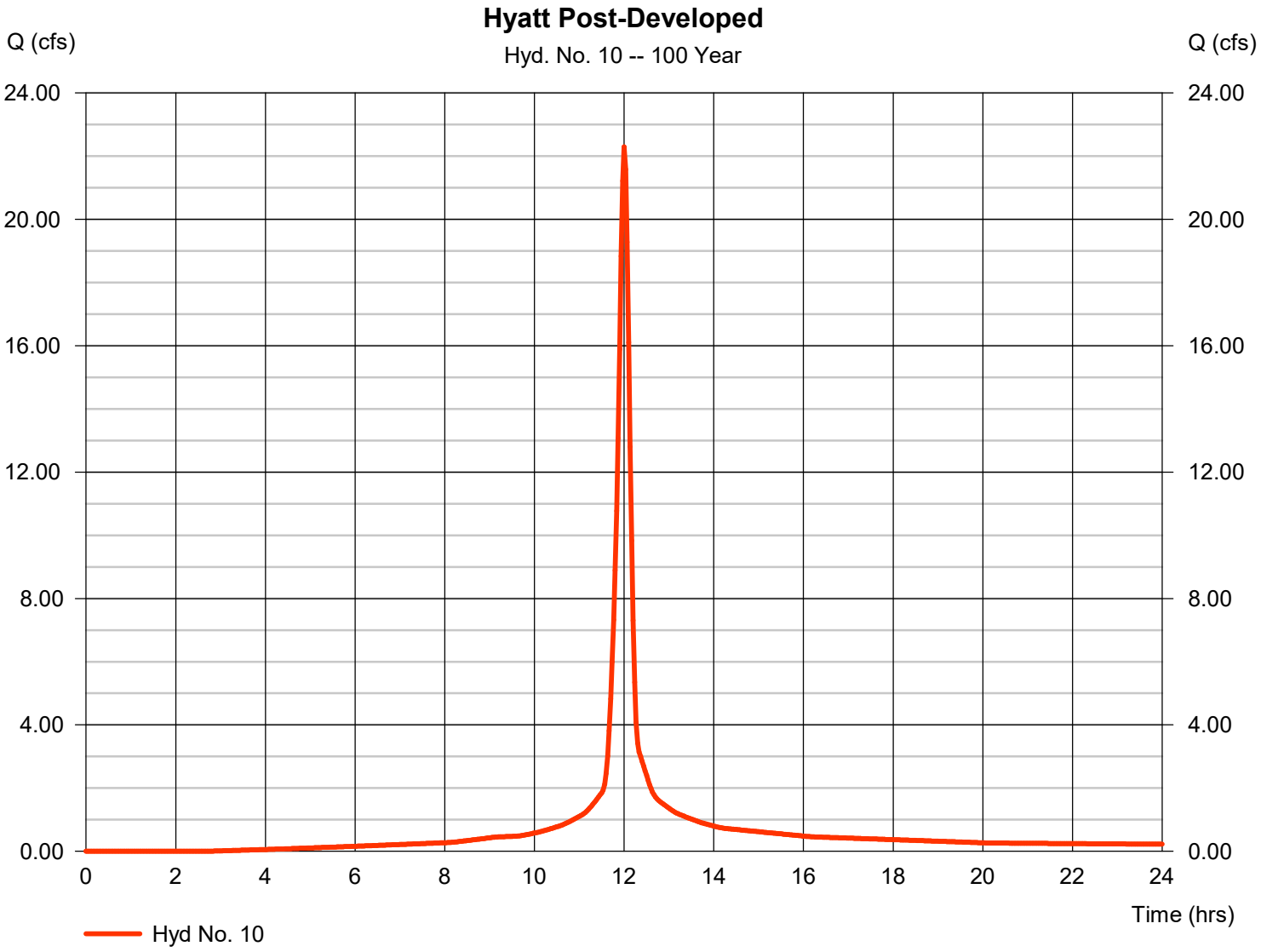


Hydrograph Report

Hyd. No. 10

Hyatt Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.30 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	62,040 cuft
Drainage area	=	3.460 ac	Curve number	=	92.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



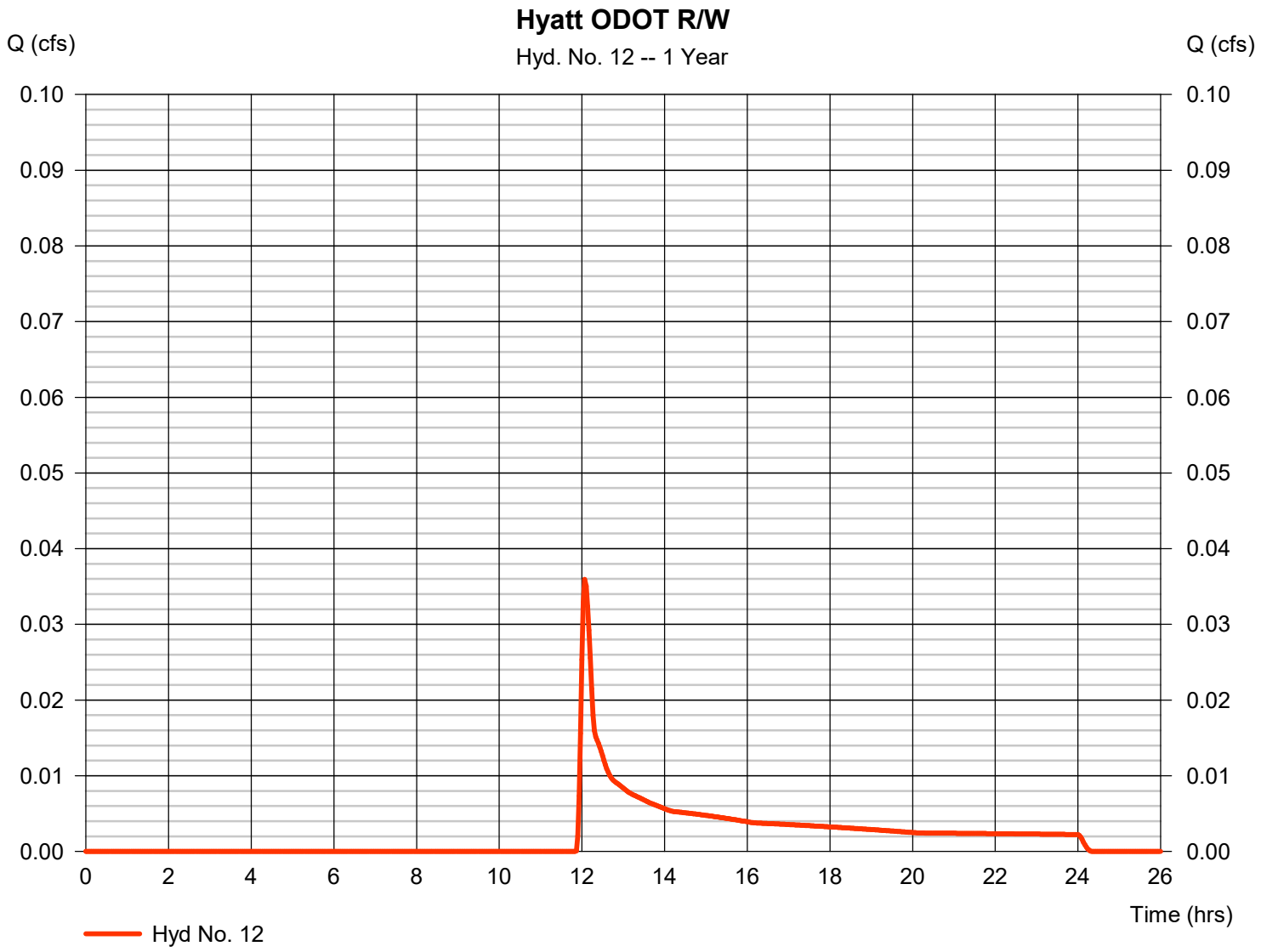
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Hyd. No. 12

Hyatt ODOT R/W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.036 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 203 cuft
Drainage area	= 0.280 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



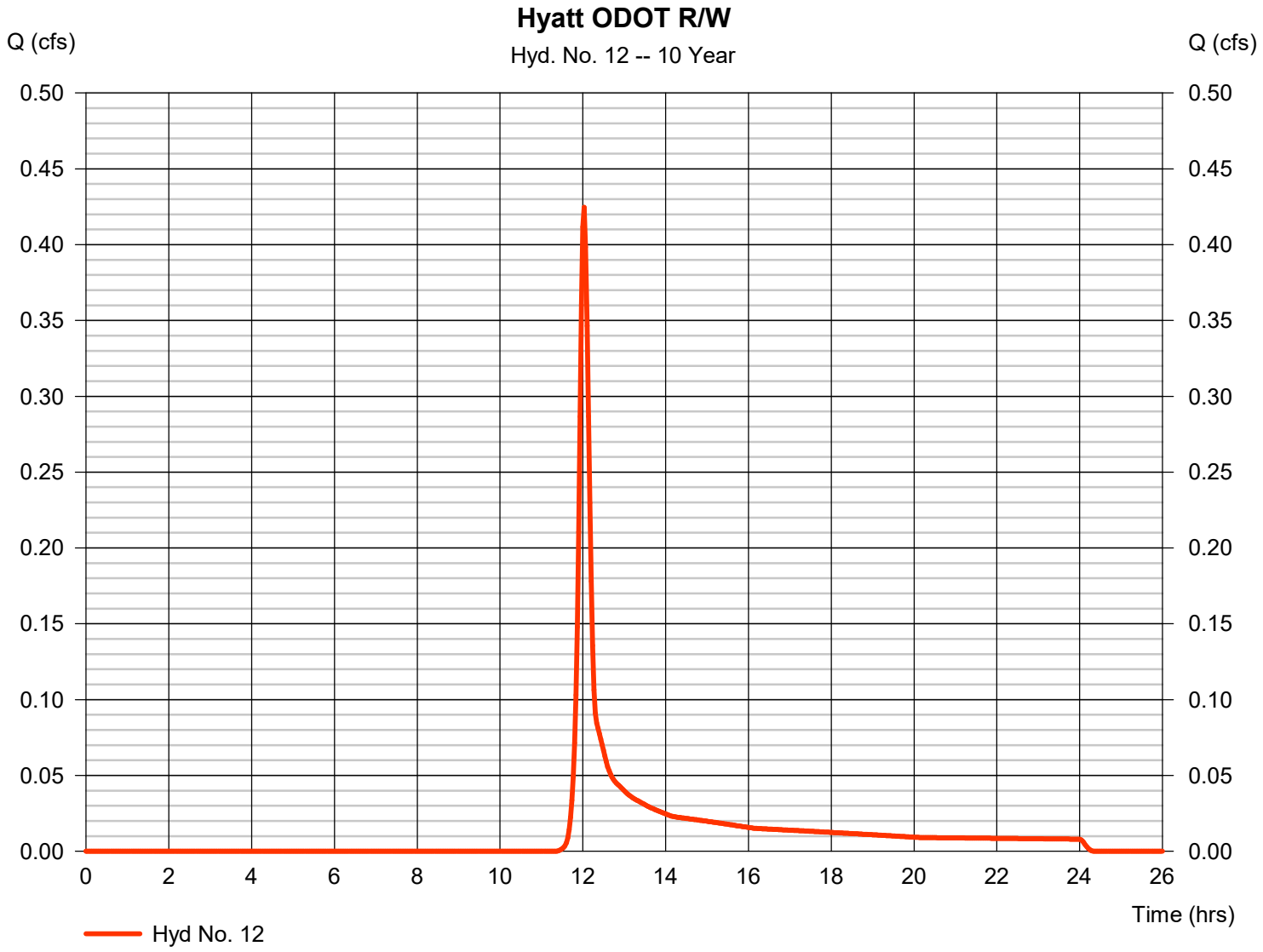
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Hyd. No. 12

Hyatt ODOT R/W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.425 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,170 cuft
Drainage area	= 0.280 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



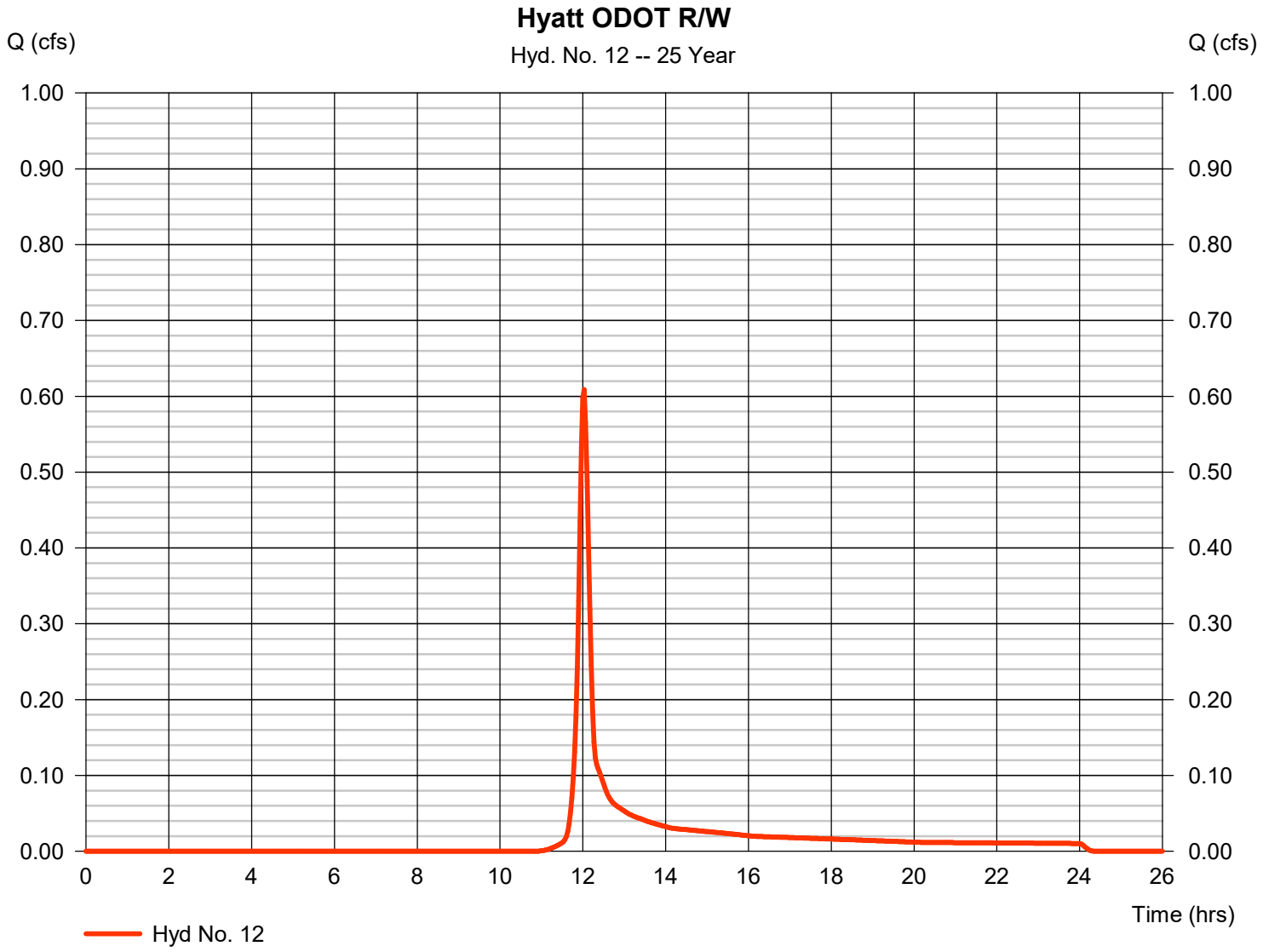
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 12

Hyatt ODOT R/W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.609 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,629 cuft
Drainage area	= 0.280 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



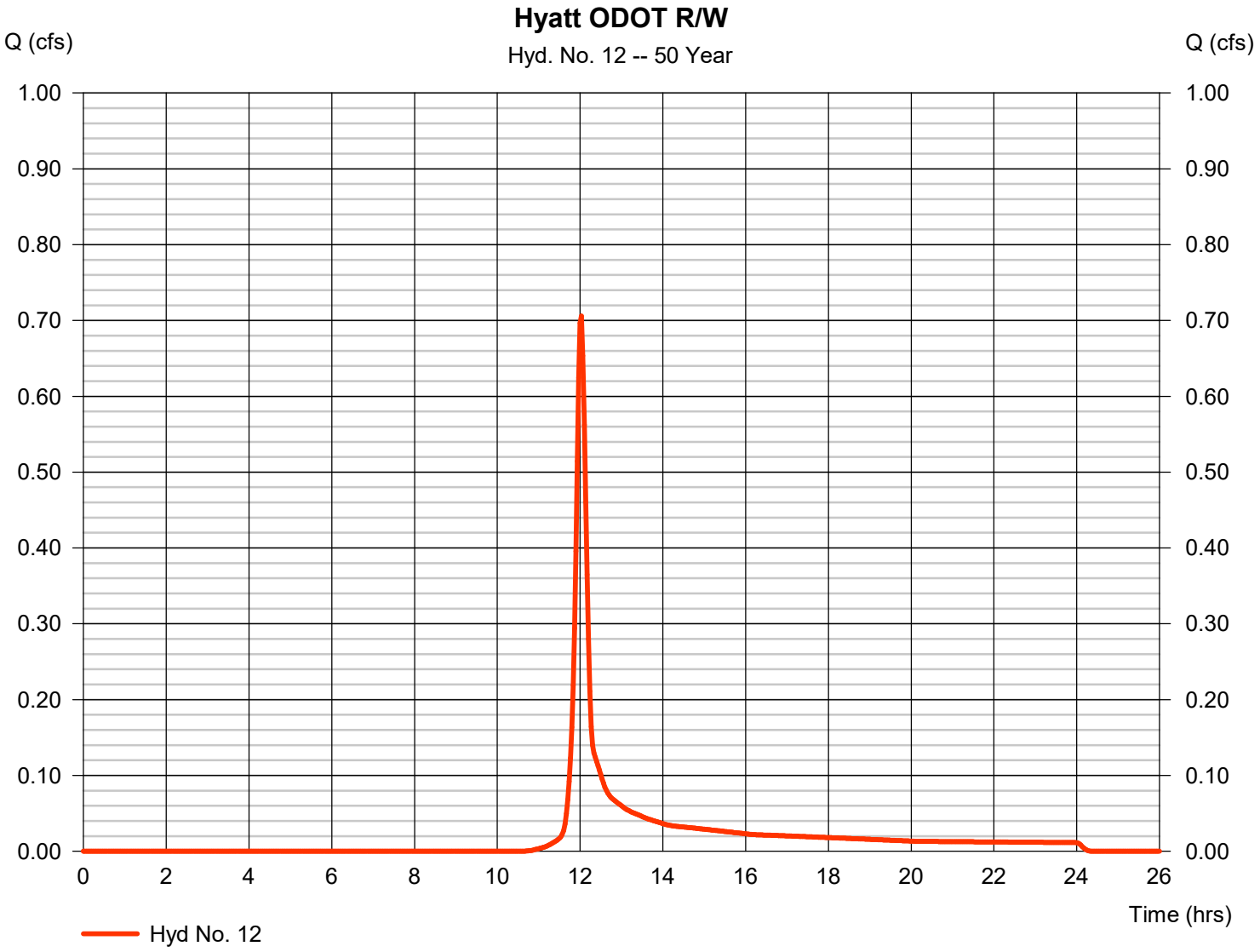
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 12

Hyatt ODOT R/W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.706 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,874 cuft
Drainage area	= 0.280 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



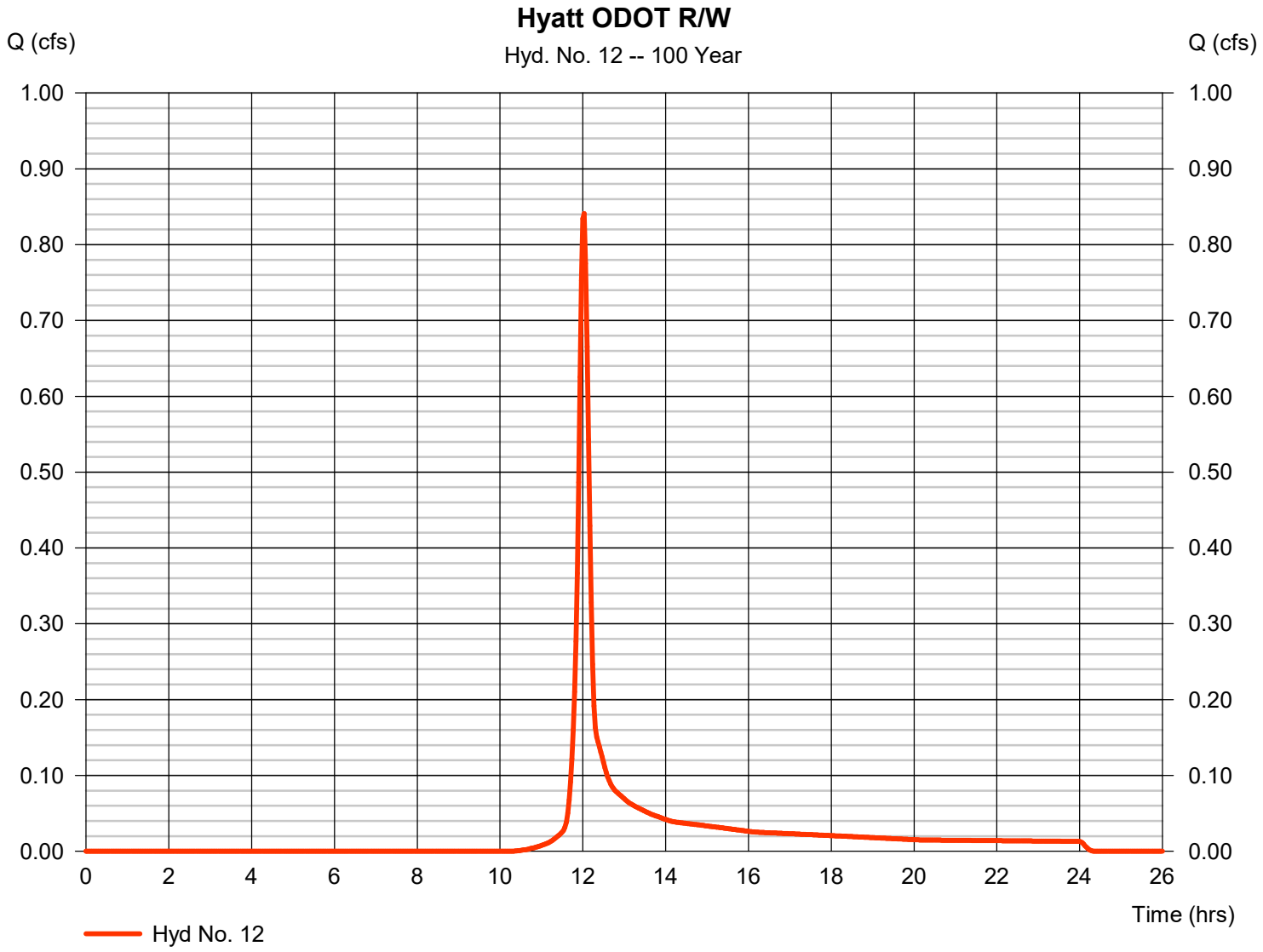
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 12

Hyatt ODOT R/W

Hydrograph type	= SCS Runoff	Peak discharge	= 0.841 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 2,216 cuft
Drainage area	= 0.280 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



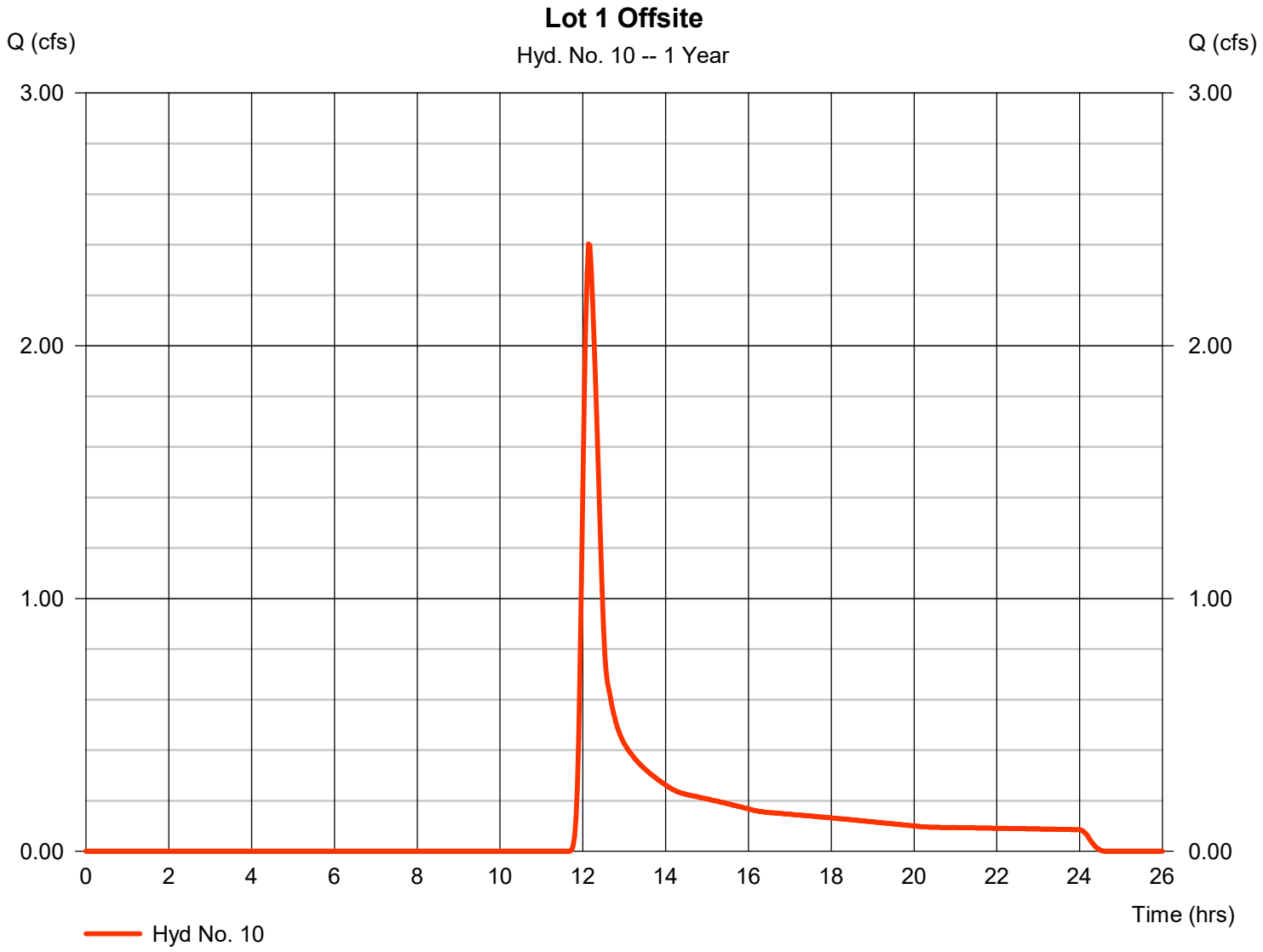
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Thursday, 12 / 21 / 2017

Hyd. No. 10

Lot 1 Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 2.402 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 10,691 cuft
Drainage area	= 7.000 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

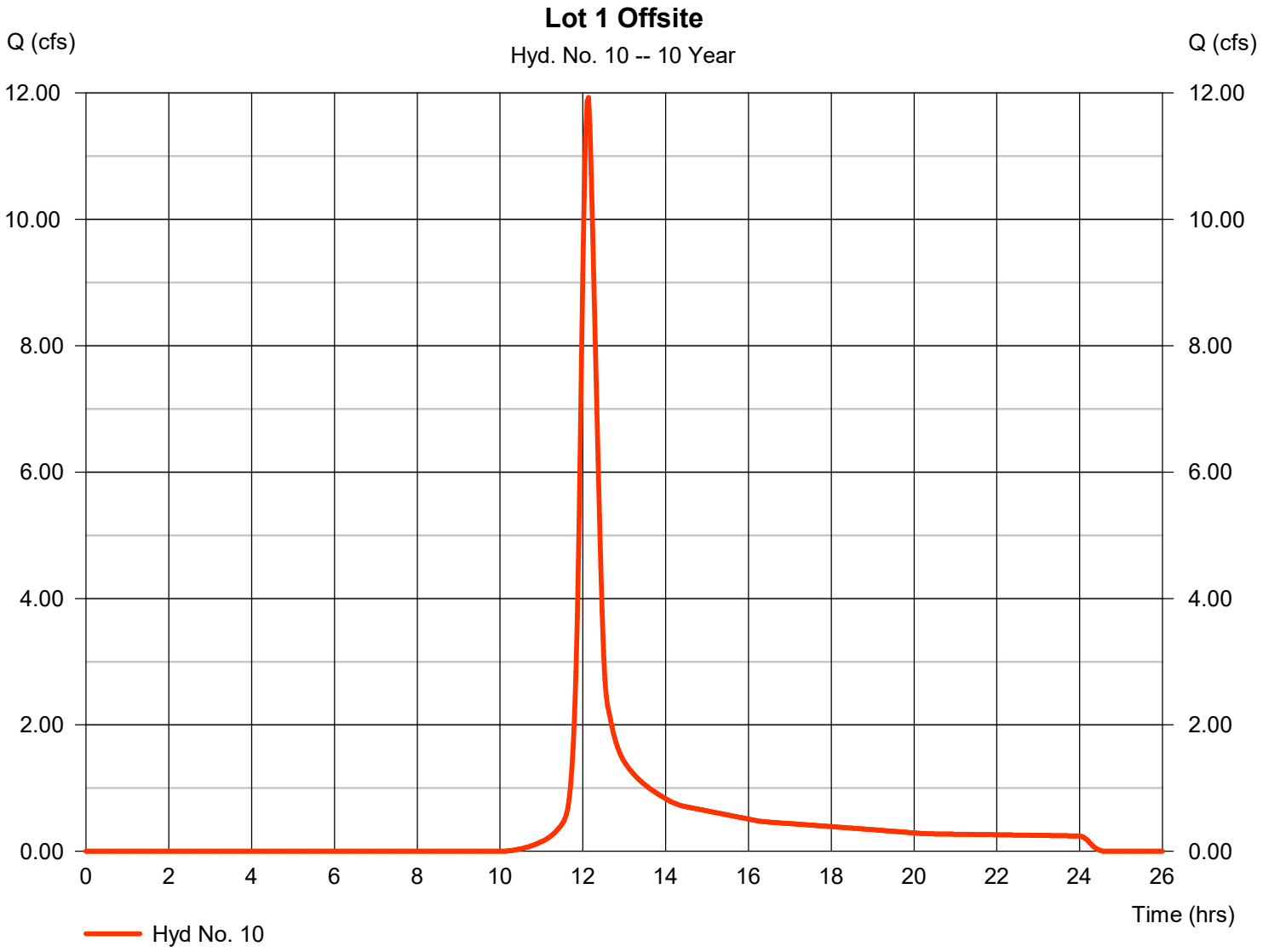


Hydrograph Report

Hyd. No. 10

Lot 1 Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 11.93 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 42,312 cuft
Drainage area	= 7.000 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



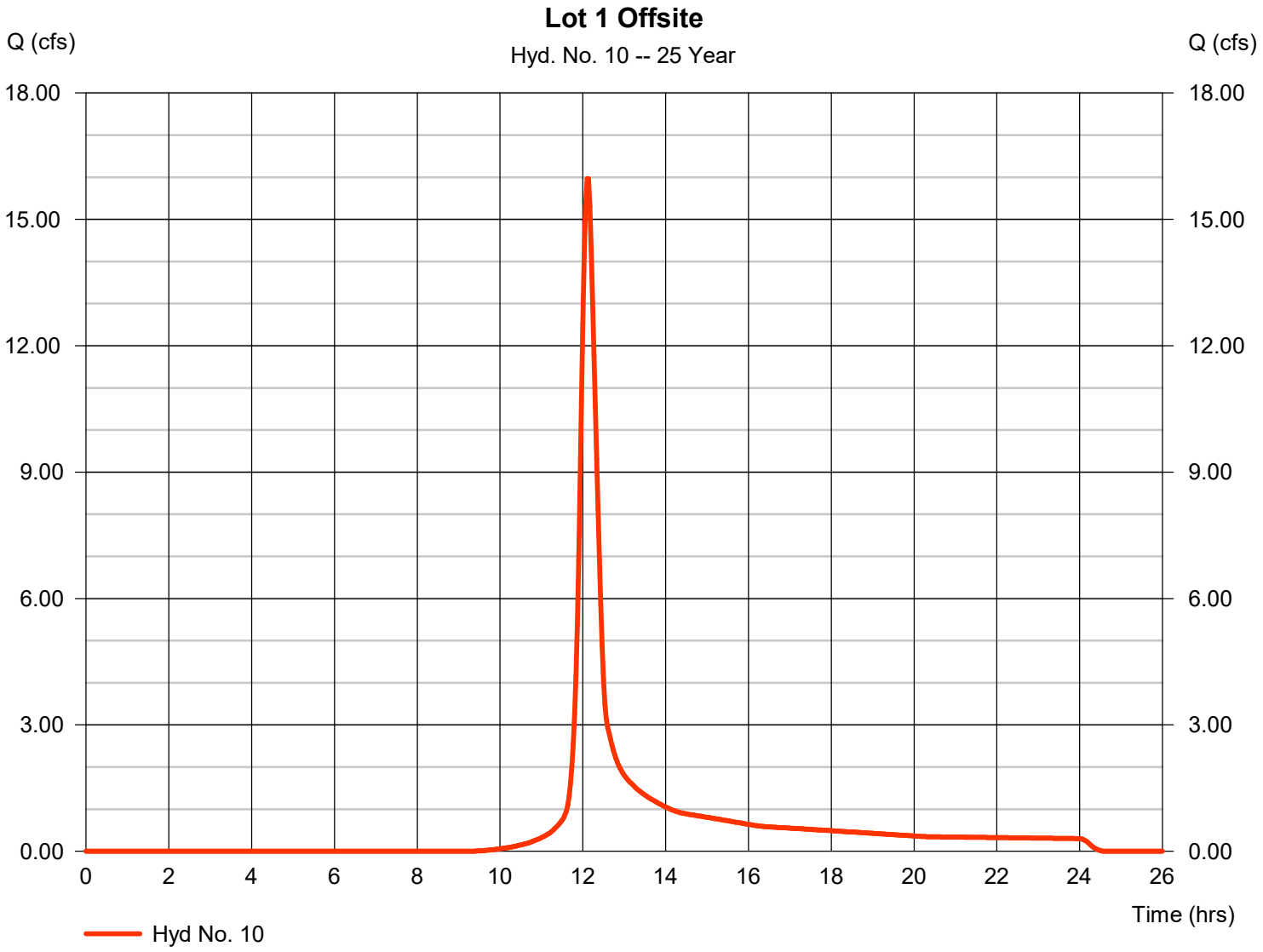
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Thursday, 12 / 21 / 2017

Hyd. No. 10

Lot 1 Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 15.96 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 55,956 cuft
Drainage area	= 7.000 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



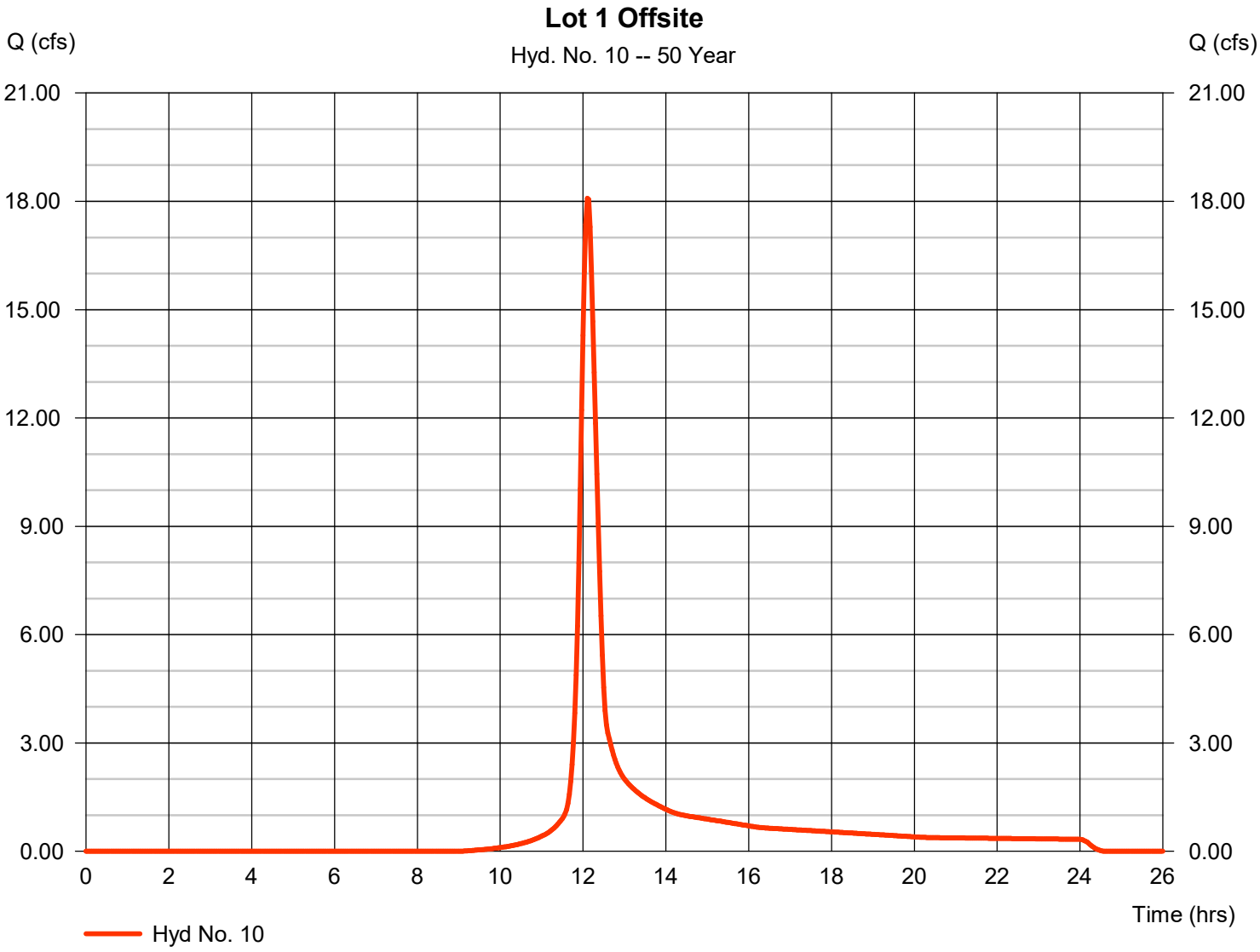
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Thursday, 12 / 21 / 2017

Hyd. No. 10

Lot 1 Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 18.08 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 63,064 cuft
Drainage area	= 7.000 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

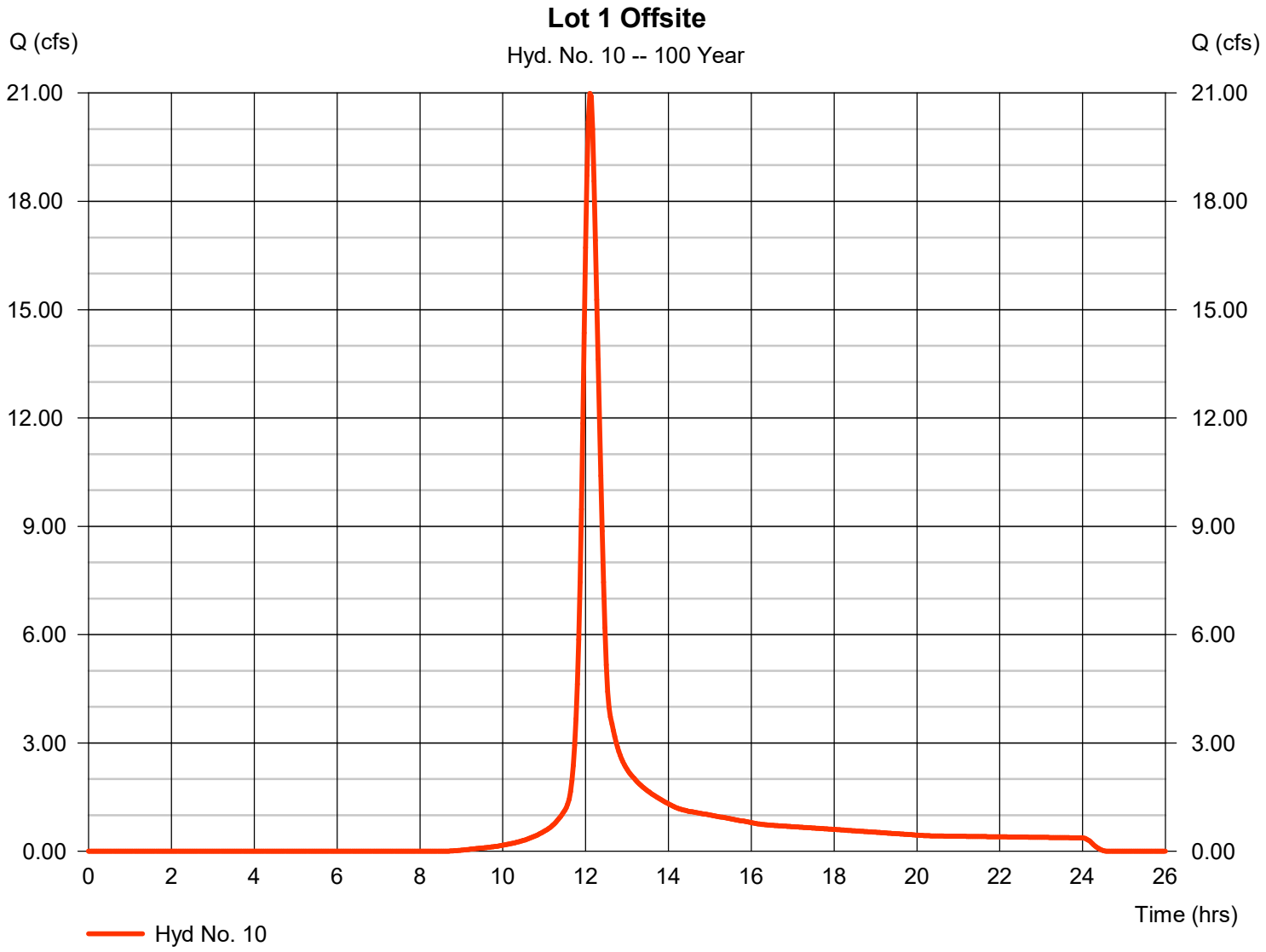


Hydrograph Report

Hyd. No. 10

Lot 1 Offsite

Hydrograph type	= SCS Runoff	Peak discharge	= 20.99 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 72,858 cuft
Drainage area	= 7.000 ac	Curve number	= 73
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 23.30 min
Total precip.	= 5.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Pond Report

Pond No. 1 - Hyatt House Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 881.96 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	881.96	5,931	0	0
0.04	882.00	9,261	301	301
1.04	883.00	10,824	10,031	10,333
2.04	884.00	12,395	11,599	21,932
3.04	885.00	14,111	13,242	35,175
4.04	886.00	15,993	15,041	50,215
5.04	887.00	17,223	16,603	66,818
6.04	888.00	17,223	17,221	84,039

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	Inactive	15.00	0.00
Span (in)	= 24.00	2.50	15.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 881.96	881.96	883.50	0.00
Length (ft)	= 32.00	0.00	0.00	0.00
Slope (%)	= 1.09	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)	= 8.00	40.00	3.00	0.00
Crest El. (ft)	= 886.86	887.00	885.50	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	Rect	---
Multi-Stage	= Yes	No	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	881.96	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.00	30	881.96	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.01	60	881.97	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.01	90	881.97	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.02	121	881.98	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.02	151	881.98	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.02	181	881.98	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.03	211	881.99	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.03	241	881.99	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.04	271	882.00	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.04	301	882.00	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.14	1,304	882.10	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.24	2,308	882.20	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.34	3,311	882.30	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.44	4,314	882.40	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.54	5,317	882.50	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.64	6,320	882.60	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.74	7,323	882.70	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.84	8,326	882.80	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
0.94	9,330	882.90	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.04	10,333	883.00	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.14	11,493	883.10	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.24	12,653	883.20	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.34	13,813	883.30	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.44	14,972	883.40	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.54	16,132	883.50	0.00	0.00	0.00	---	0.00	0.00	0.00	---	---	---	0.000
1.64	17,292	883.60	0.06 ic	0.00	0.05 ic	---	0.00	0.00	0.00	---	---	---	0.051
1.74	18,452	883.70	0.20 ic	0.00	0.20 ic	---	0.00	0.00	0.00	---	---	---	0.199
1.84	19,612	883.80	0.44 ic	0.00	0.44 ic	---	0.00	0.00	0.00	---	---	---	0.436
1.94	20,772	883.90	0.74 ic	0.00	0.74 ic	---	0.00	0.00	0.00	---	---	---	0.739
2.04	21,932	884.00	1.13 ic	0.00	1.13 ic	---	0.00	0.00	0.00	---	---	---	1.127
2.14	23,256	884.10	1.56 ic	0.00	1.55 ic	---	0.00	0.00	0.00	---	---	---	1.553
2.24	24,581	884.20	2.08 ic	0.00	2.03 ic	---	0.00	0.00	0.00	---	---	---	2.026
2.34	25,905	884.30	2.59 ic	0.00	2.56 ic	---	0.00	0.00	0.00	---	---	---	2.558
2.44	27,229	884.40	3.06 ic	0.00	3.05 ic	---	0.00	0.00	0.00	---	---	---	3.055

Continues on next page...

Hyatt House Pond

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.54	28,553	884.50	3.64 ic	0.00	3.58 ic	---	0.00	0.00	0.00	---	---	---	3.584
2.64	29,878	884.60	4.17 ic	0.00	4.08 ic	---	0.00	0.00	0.00	---	---	---	4.085
2.74	31,202	884.70	4.58 ic	0.00	4.52 ic	---	0.00	0.00	0.00	---	---	---	4.520
2.84	32,526	884.80	4.87 ic	0.00	4.85 ic	---	0.00	0.00	0.00	---	---	---	4.853
2.94	33,850	884.90	5.31 ic	0.00	5.20 ic	---	0.00	0.00	0.00	---	---	---	5.200
3.04	35,175	885.00	5.61 ic	0.00	5.53 ic	---	0.00	0.00	0.00	---	---	---	5.527
3.14	36,679	885.10	5.87 oc	0.00	5.83 ic	---	0.00	0.00	0.00	---	---	---	5.834
3.24	38,183	885.20	6.22 oc	0.00	6.13 ic	---	0.00	0.00	0.00	---	---	---	6.126
3.34	39,687	885.30	6.44 oc	0.00	6.40 ic	---	0.00	0.00	0.00	---	---	---	6.404
3.44	41,191	885.40	6.78 oc	0.00	6.67 ic	---	0.00	0.00	0.00	---	---	---	6.671
3.54	42,695	885.50	7.00 oc	0.00	6.93 ic	---	0.00	0.00	0.00	---	---	---	6.928
3.64	44,199	885.60	7.54 oc	0.00	7.18 ic	---	0.00	0.00	0.32	---	---	---	7.491
3.74	45,703	885.70	8.34 oc	0.00	7.41 ic	---	0.00	0.00	0.89	---	---	---	8.307
3.84	47,207	885.80	9.29 oc	0.00	7.65 ic	---	0.00	0.00	1.64	---	---	---	9.286
3.94	48,711	885.90	10.41 oc	0.00	7.87 ic	---	0.00	0.00	2.53	---	---	---	10.40
4.04	50,215	886.00	11.62 oc	0.00	8.09 ic	---	0.00	0.00	3.53	---	---	---	11.62
4.14	51,876	886.10	12.95 oc	0.00	8.30 ic	---	0.00	0.00	4.64	---	---	---	12.95
4.24	53,536	886.20	14.18 oc	0.00	8.33 ic	---	0.00	0.00	5.85	---	---	---	14.18
4.34	55,196	886.30	15.45 oc	0.00	8.31 ic	---	0.00	0.00	7.15	---	---	---	15.45
4.44	56,856	886.40	16.78 oc	0.00	8.25 ic	---	0.00	0.00	8.53	---	---	---	16.78
4.54	58,517	886.50	18.15 oc	0.00	8.16 ic	---	0.00	0.00	9.99	---	---	---	18.15
4.64	60,177	886.60	19.56 oc	0.00	8.03 ic	---	0.00	0.00	11.52	---	---	---	19.56
4.74	61,837	886.70	21.00 oc	0.00	7.87 ic	---	0.00	0.00	13.13	---	---	---	21.00
4.84	63,497	886.80	22.39 ic	0.00	7.59 ic	---	0.00	0.00	14.80	---	---	---	22.39
4.94	65,158	886.90	23.87 ic	0.00	7.11 ic	---	0.21	0.00	16.54	---	---	---	23.87
5.04	66,818	887.00	25.52 ic	0.00	6.45 ic	---	1.40	0.00	17.68 s	---	---	---	25.52
5.14	68,540	887.10	26.98 ic	0.00	5.78 ic	---	3.13	3.29	18.06 s	---	---	---	30.26
5.24	70,262	887.20	28.29 ic	0.00	5.09 ic	---	5.28	9.30	17.92 s	---	---	---	37.59
5.34	71,984	887.30	29.45 ic	0.00	4.38 ic	---	7.77	17.08	17.29 s	---	---	---	46.53
5.44	73,706	887.40	30.37 ic	0.00	3.77 ic	---	10.06 s	26.30	16.54 s	---	---	---	56.67
5.54	75,428	887.50	31.06 ic	0.00	3.36 ic	---	11.57 s	36.76	16.12 s	---	---	---	67.81
5.64	77,151	887.60	31.64 ic	0.00	3.03 ic	---	12.82 s	48.32	15.78 s	---	---	---	79.96
5.74	78,873	887.70	32.16 ic	0.00	2.76 ic	---	13.89 s	60.89	15.51 s	---	---	---	93.05
5.84	80,595	887.80	32.64 ic	0.00	2.53 ic	---	14.83 s	74.39	15.27 s	---	---	---	107.02
5.94	82,317	887.90	33.08 ic	0.00	2.33 ic	---	15.67 s	88.76	15.07 s	---	---	---	121.84
6.04	84,039	888.00	33.50 ic	0.00	2.16 ic	---	16.44 s	104.00	14.89 s	---	---	---	137.49

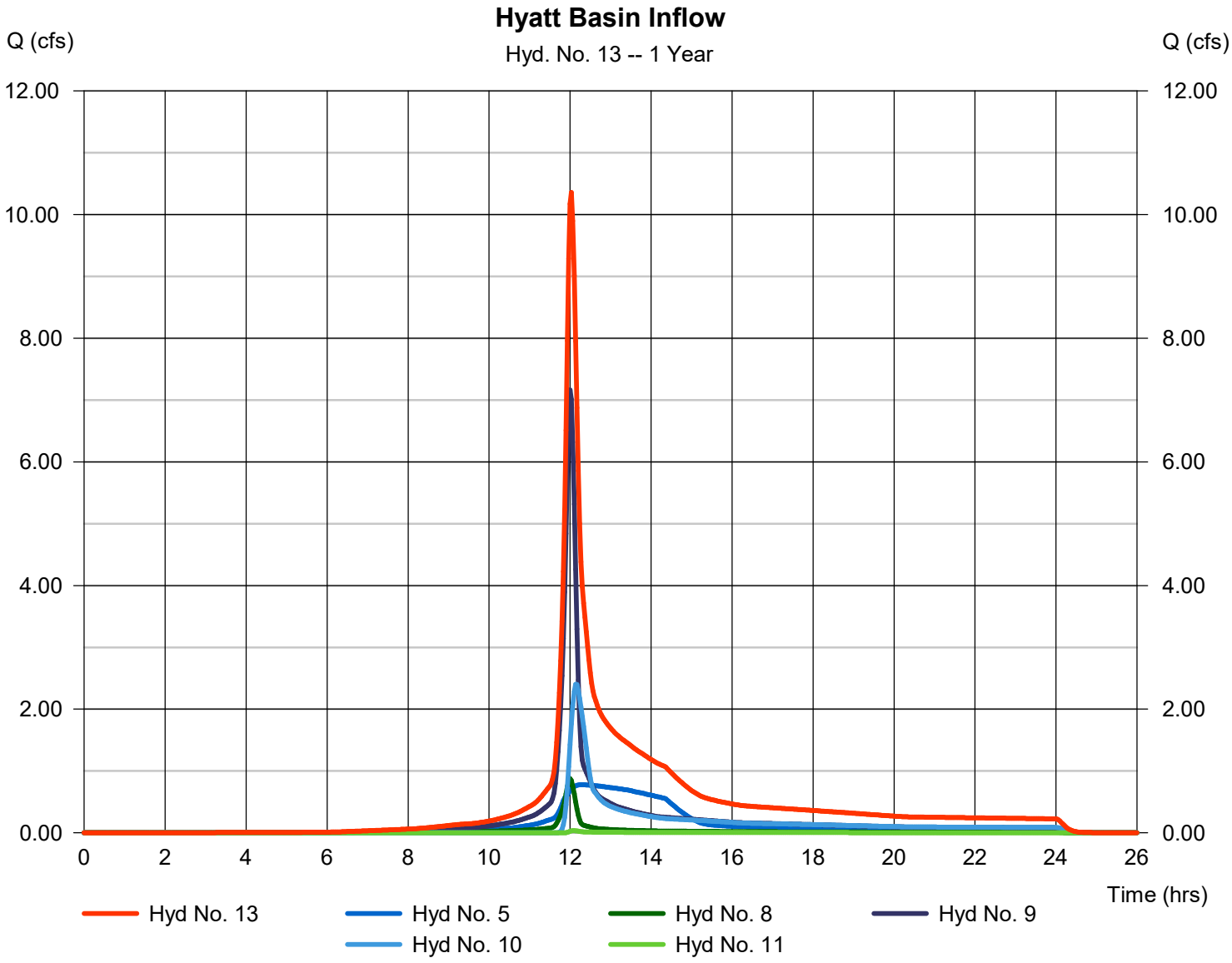
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Hydrograph Report

Hyd. No. 13

Hyatt Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 10.36 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 43,033 cuft
Inflow hyds.	= 5, 8, 9, 10, 11	Contrib. drain. area	= 11.080 ac



Hydrograph Report

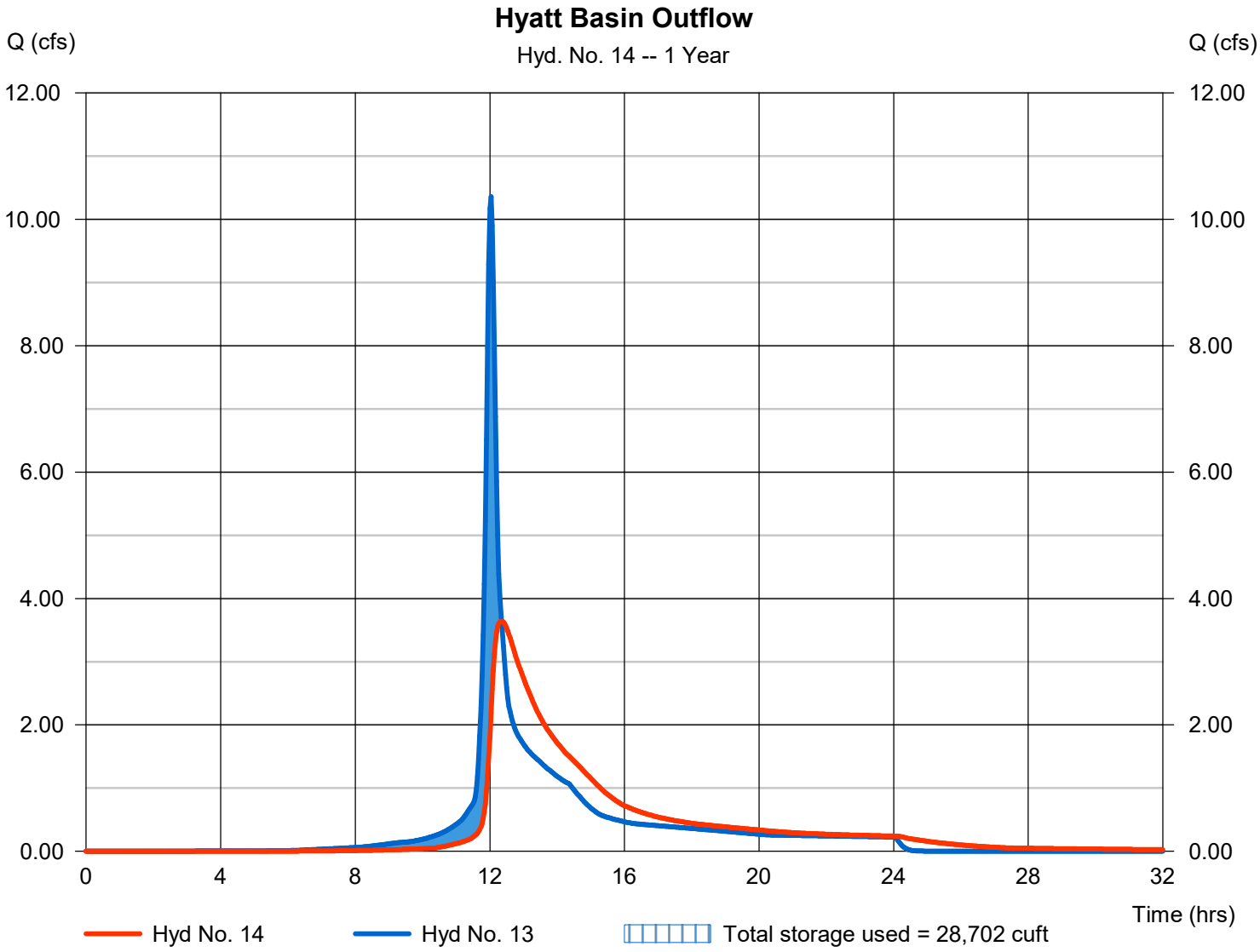
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Wednesday, 04 / 18 / 2018

Hyd. No. 14

Hyatt Basin Outflow

Hydrograph type	= Reservoir	Peak discharge	= 3.640 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 43,010 cuft
Inflow hyd. No.	= 13 - Hyatt Basin Inflow	Max. Elevation	= 884.51 ft
Reservoir name	= Hyatt House Pond	Max. Storage	= 28,702 cuft

Storage Indication method used. Wet pond routing start elevation = 883.50 ft.



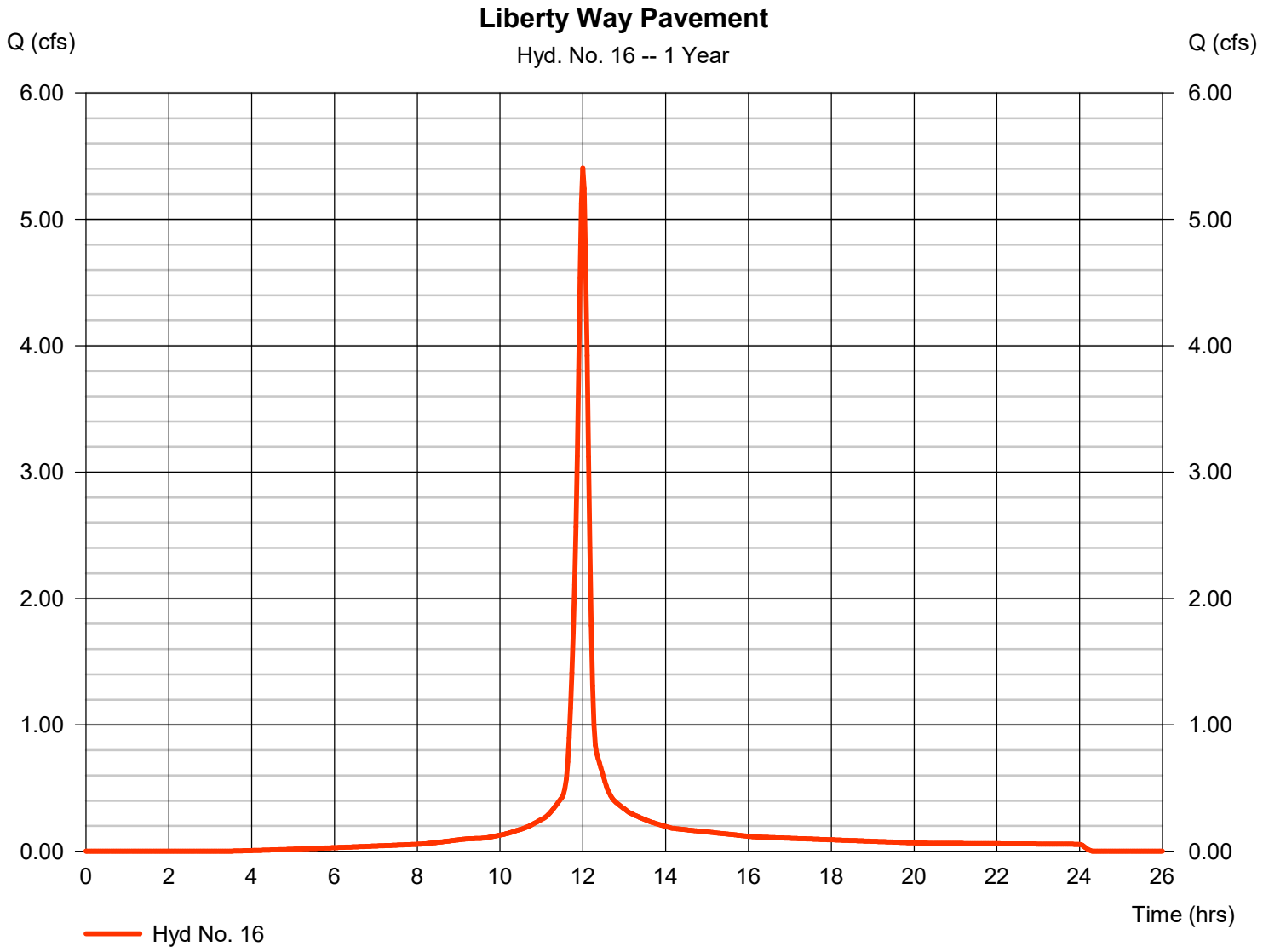
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 12 / 22 / 2017

Hyd. No. 16

Liberty Way Pavement

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.405 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	14,763 cuft
Drainage area	=	2.230 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	2.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

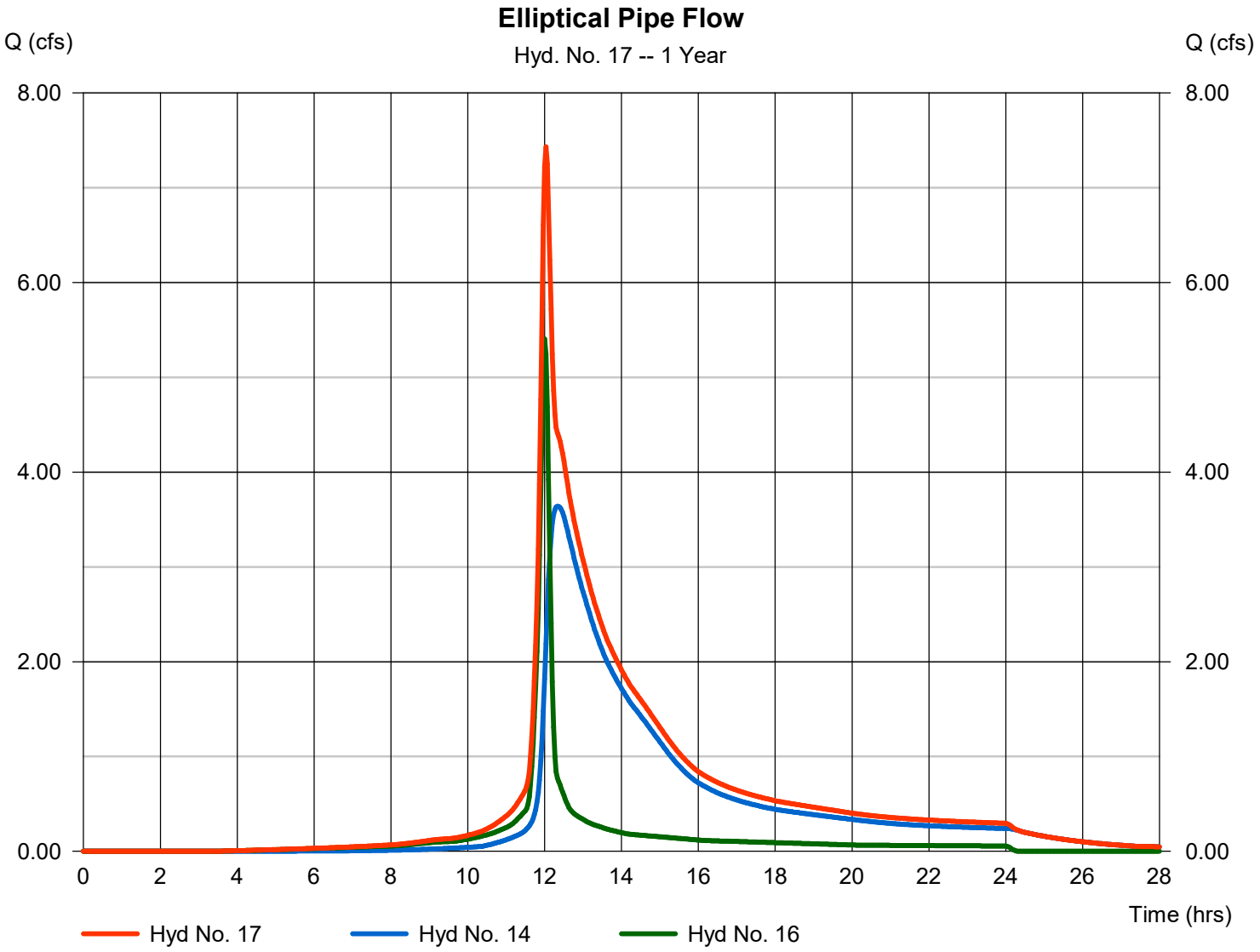


Hydrograph Report

Hyd. No. 17

Elliptical Pipe Flow

Hydrograph type	= Combine	Peak discharge	= 7.431 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 57,774 cuft
Inflow hyds.	= 14, 16	Contrib. drain. area	= 2.230 ac

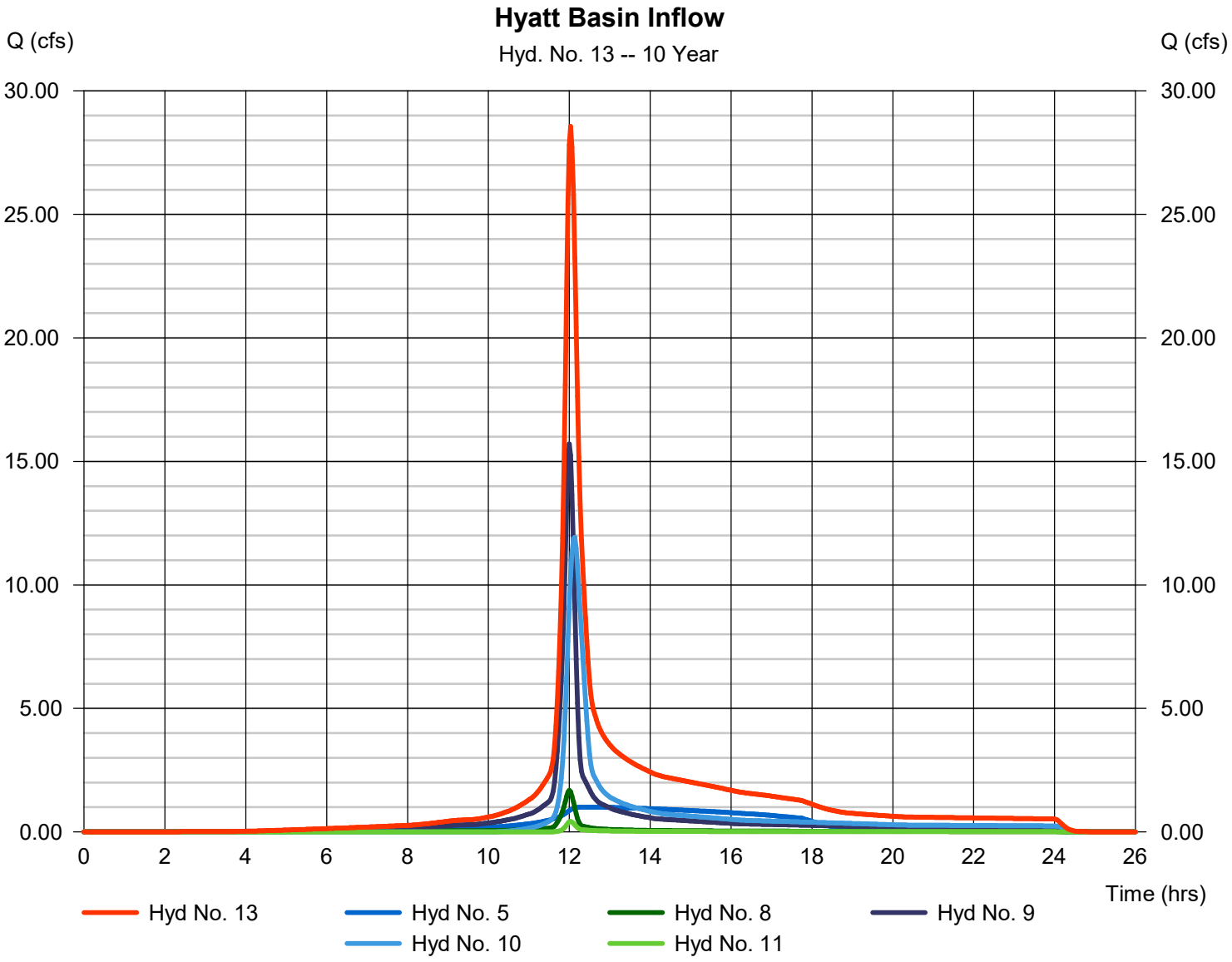


Hydrograph Report

Hyd. No. 13

Hyatt Basin Inflow

Hydrograph type	=	Combine	Peak discharge	=	28.56 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	116,507 cuft
Inflow hyds.	=	5, 8, 9, 10, 11	Contrib. drain. area	=	11.080 ac



Hydrograph Report

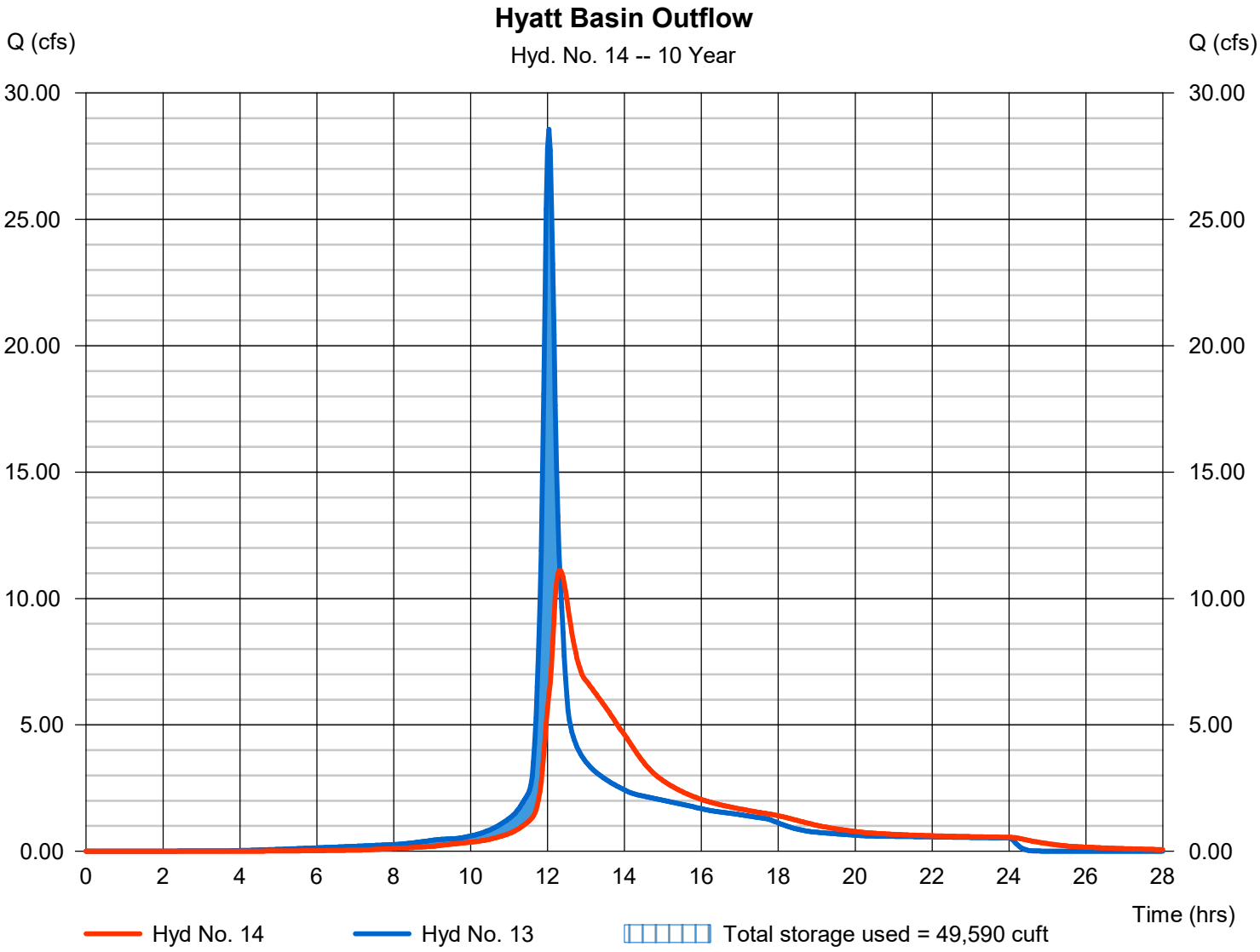
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Wednesday, 04 / 18 / 2018

Hyd. No. 14

Hyatt Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	11.11 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.33 hrs
Time interval	=	2 min	Hyd. volume	=	116,485 cuft
Inflow hyd. No.	=	13 - Hyatt Basin Inflow	Max. Elevation	=	885.96 ft
Reservoir name	=	Hyatt House Pond	Max. Storage	=	49,590 cuft

Storage Indication method used. Wet pond routing start elevation = 883.50 ft.

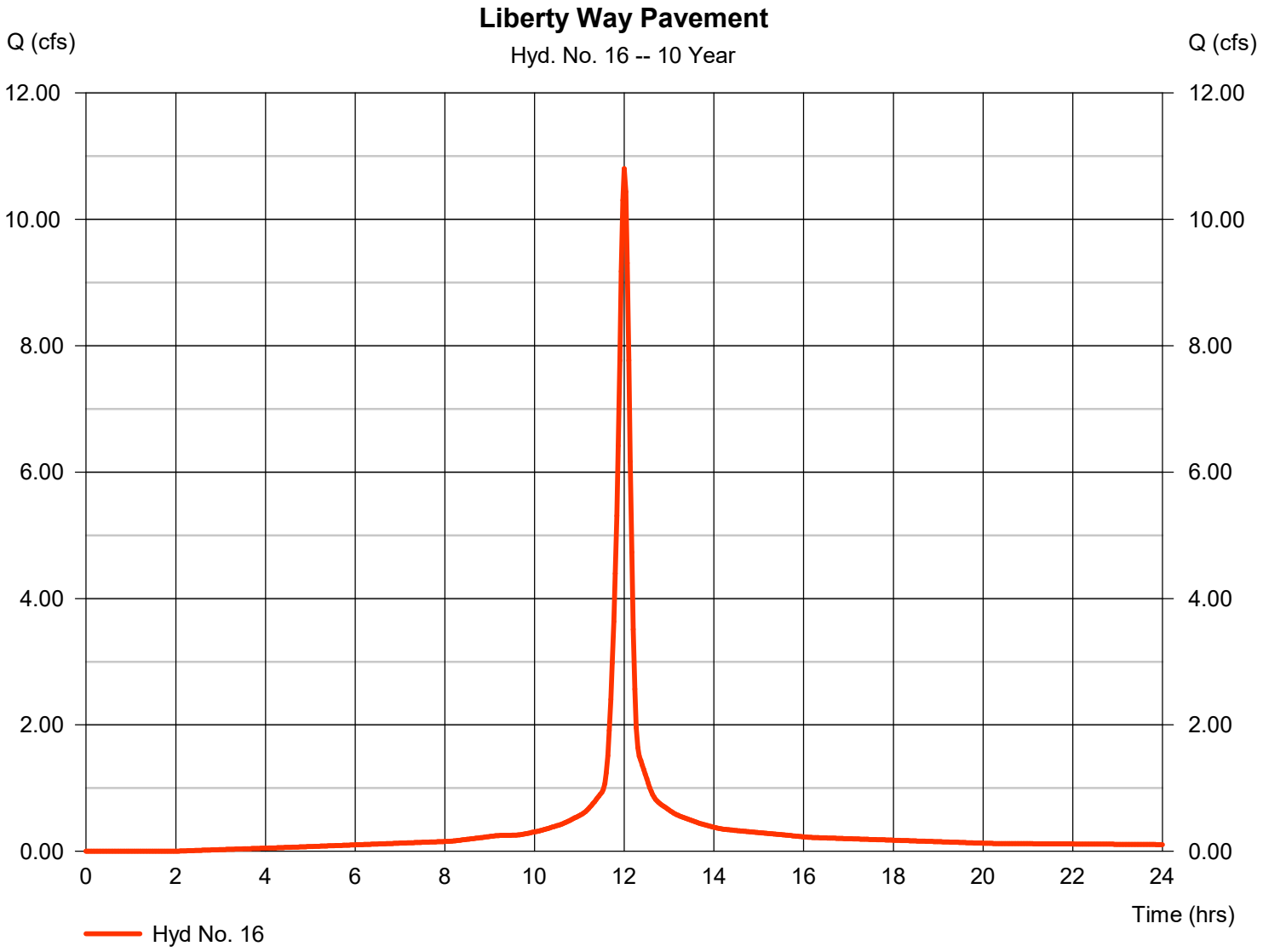


Hydrograph Report

Hyd. No. 16

Liberty Way Pavement

Hydrograph type	= SCS Runoff	Peak discharge	= 10.80 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 30,793 cuft
Drainage area	= 2.230 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

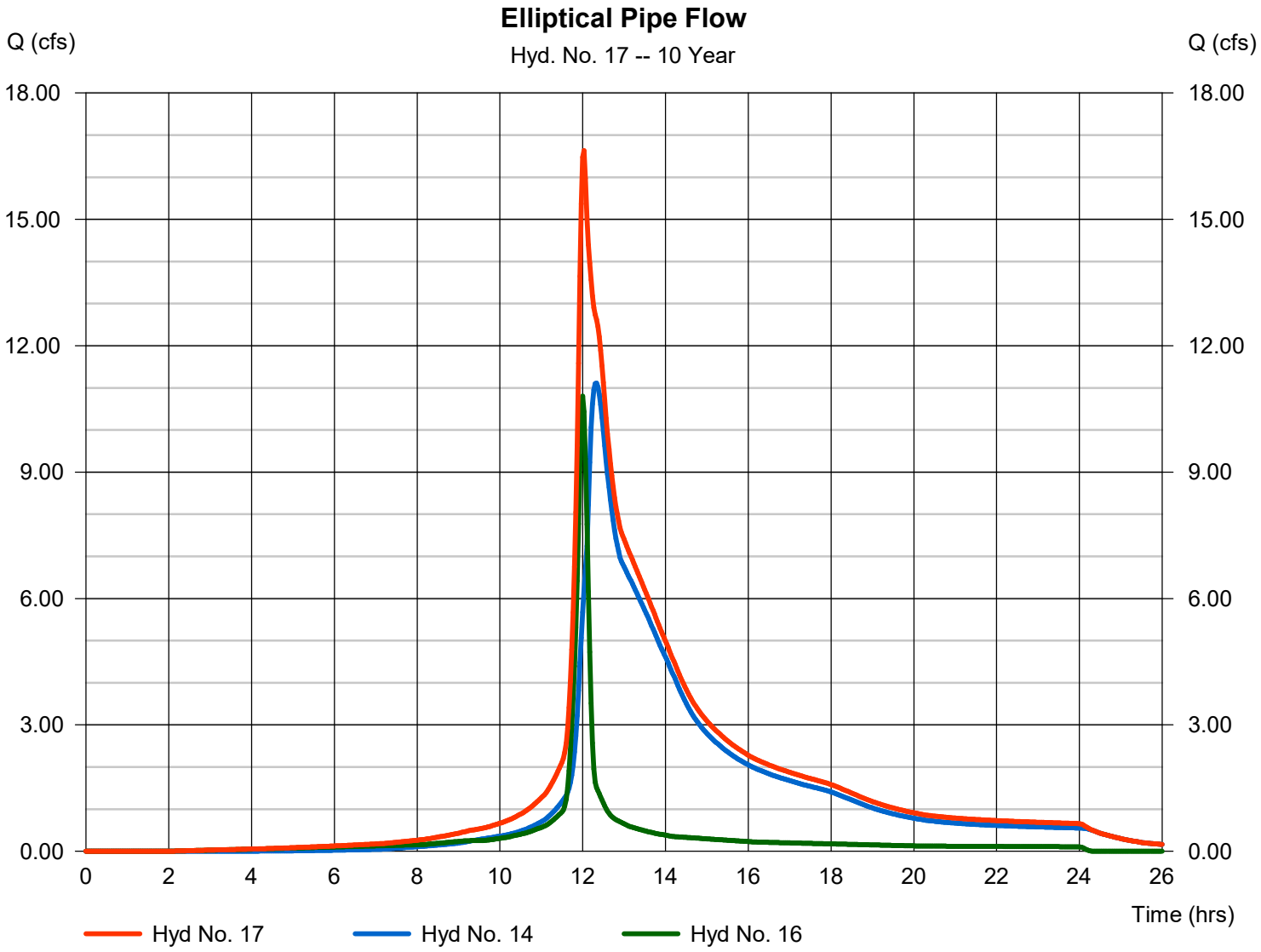


Hydrograph Report

Hyd. No. 17

Elliptical Pipe Flow

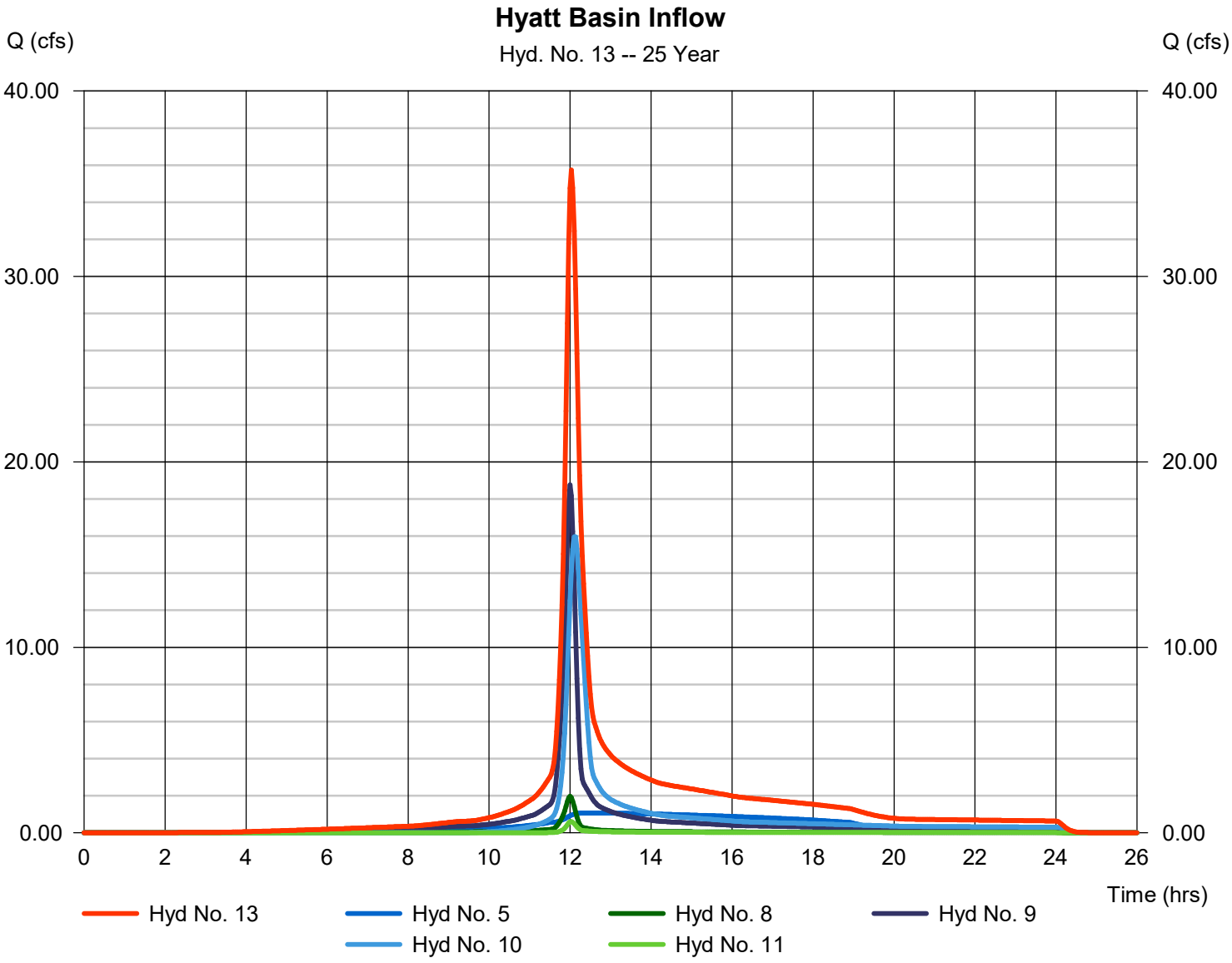
Hydrograph type	=	Combine	Peak discharge	=	16.63 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	147,278 cuft
Inflow hyds.	=	14, 16	Contrib. drain. area	=	2.230 ac



Hyd. No. 13

Hyatt Basin Inflow

Hydrograph type	=	Combine	Peak discharge	=	35.74 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	145,684 cuft
Inflow hyds.	=	5, 8, 9, 10, 11	Contrib. drain. area	=	11.080 ac



Hydrograph Report

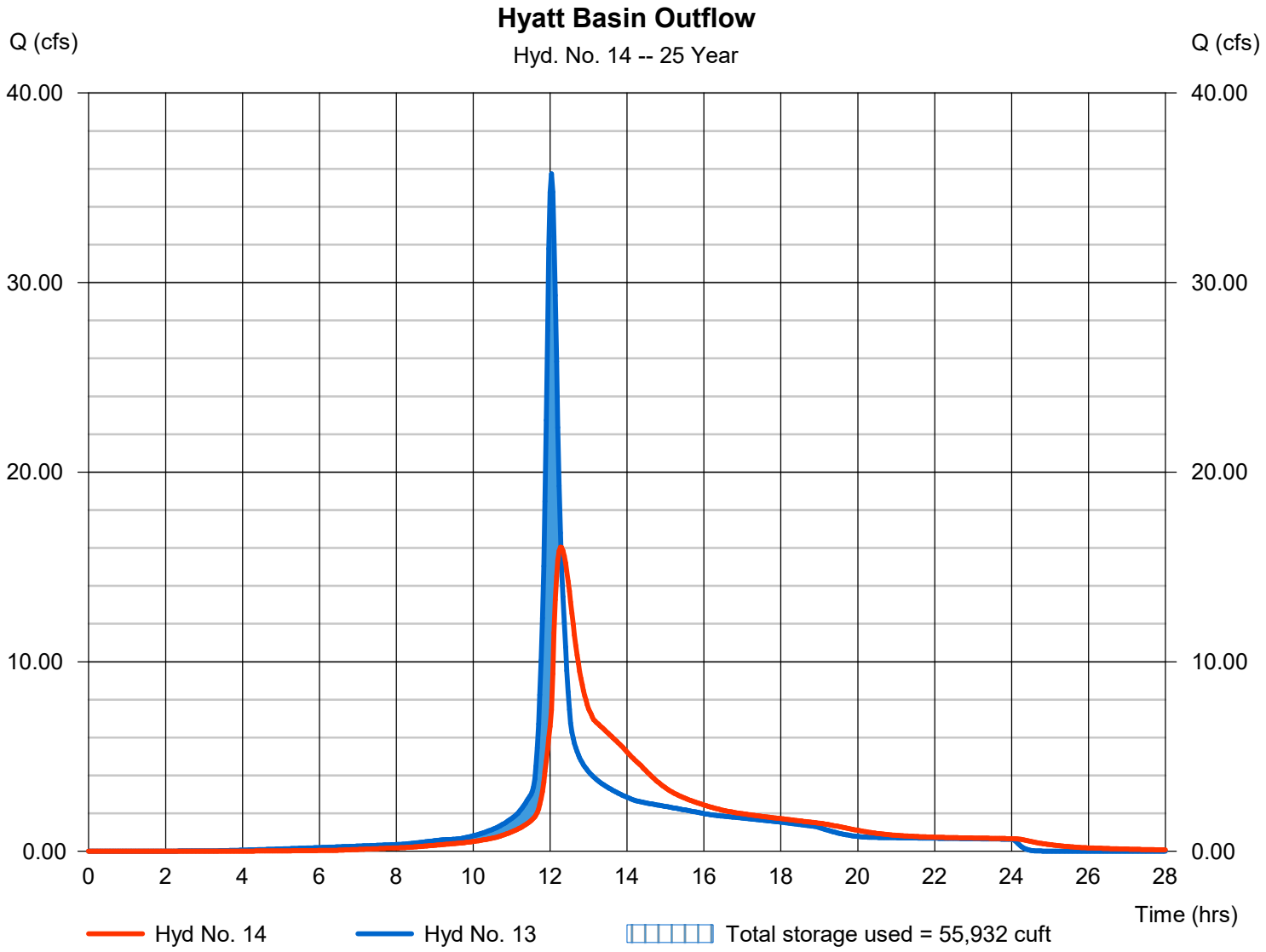
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Wednesday, 04 / 18 / 2018

Hyd. No. 14

Hyatt Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	16.04 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.27 hrs
Time interval	=	2 min	Hyd. volume	=	145,661 cuft
Inflow hyd. No.	=	13 - Hyatt Basin Inflow	Max. Elevation	=	886.35 ft
Reservoir name	=	Hyatt House Pond	Max. Storage	=	55,932 cuft

Storage Indication method used. Wet pond routing start elevation = 883.50 ft.

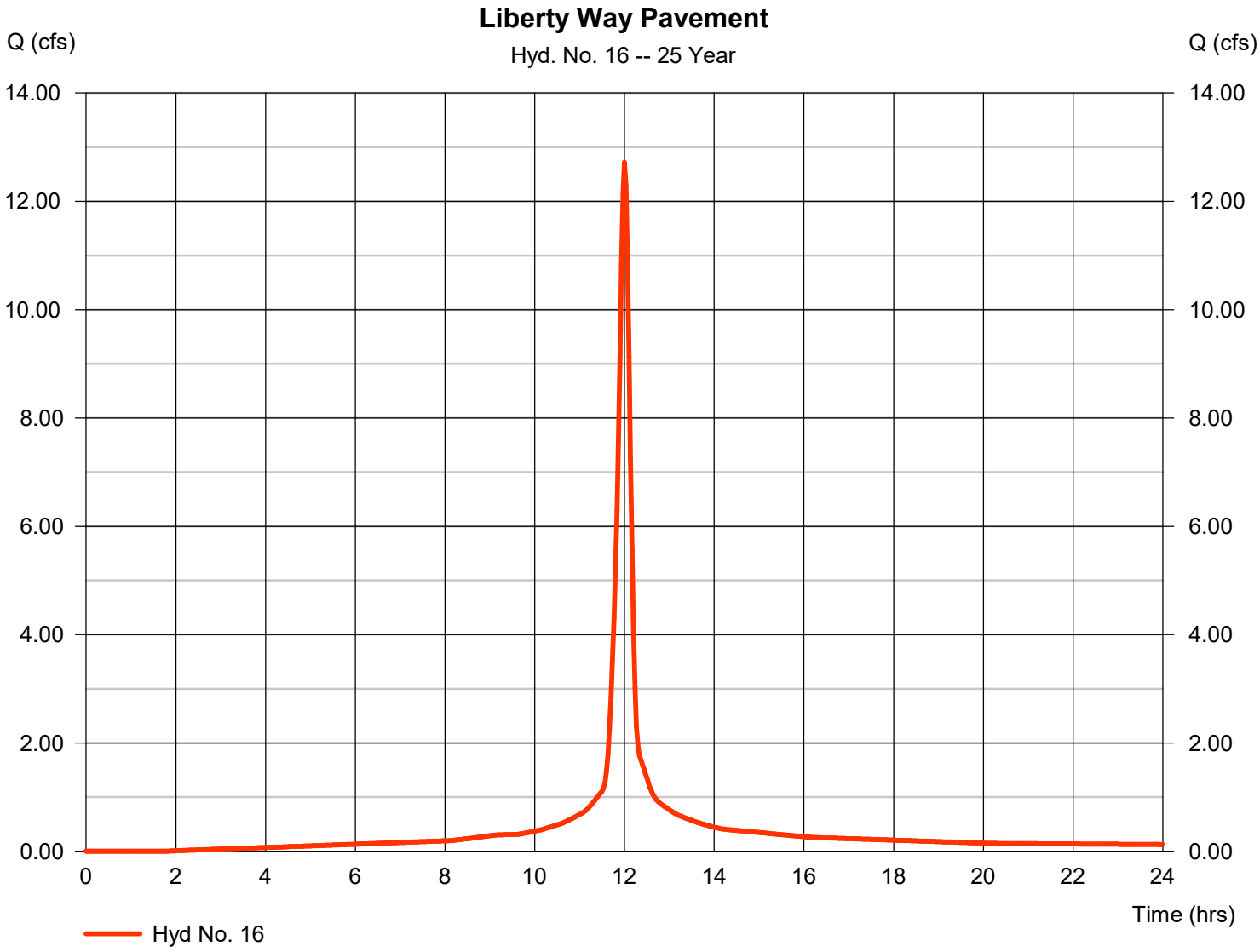


Hydrograph Report

Hyd. No. 16

Liberty Way Pavement

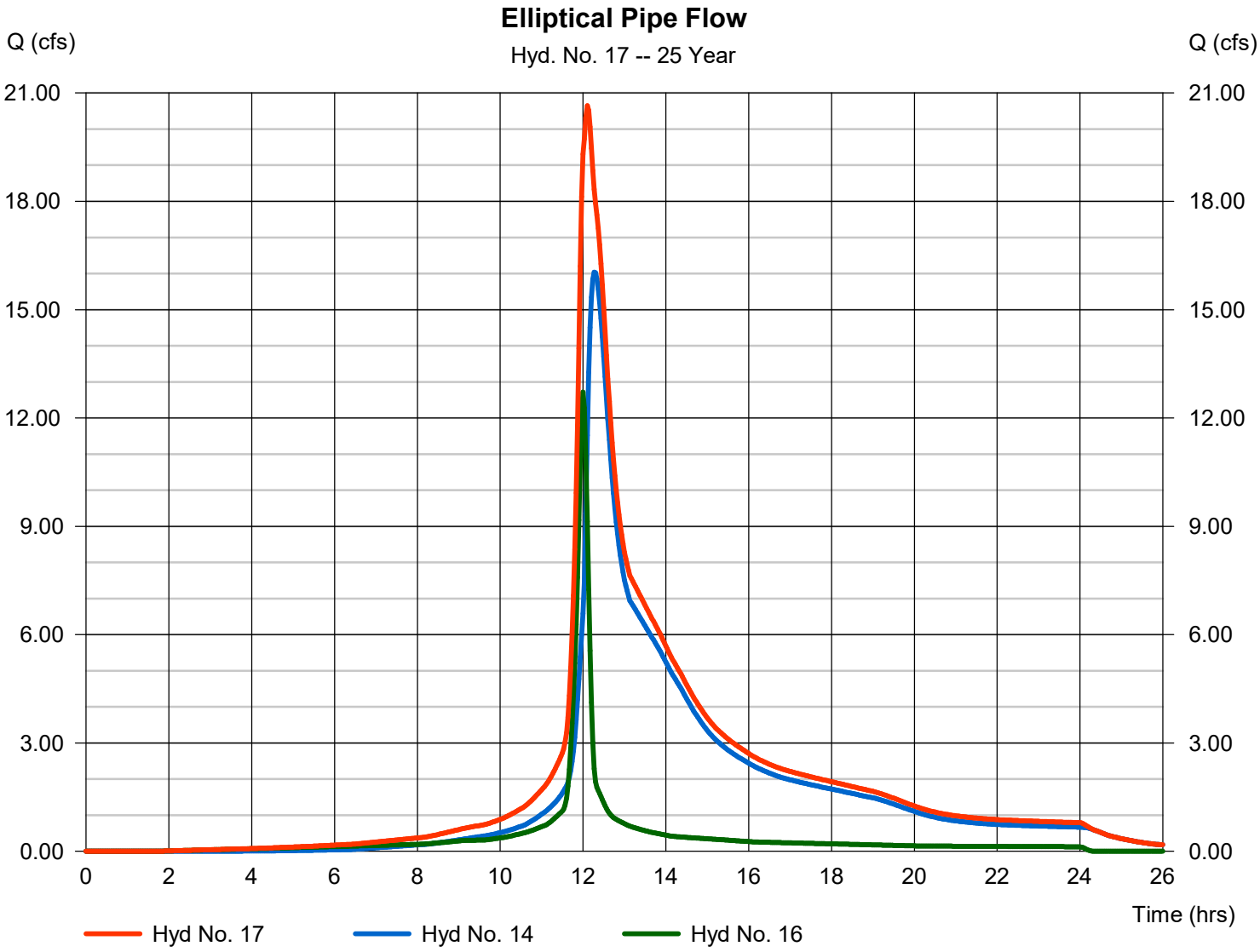
Hydrograph type	=	SCS Runoff	Peak discharge	=	12.72 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	36,593 cuft
Drainage area	=	2.230 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Hyd. No. 17

Elliptical Pipe Flow

Hydrograph type	=	Combine	Peak discharge	=	20.65 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	182,254 cuft
Inflow hyds.	=	14, 16	Contrib. drain. area	=	2.230 ac



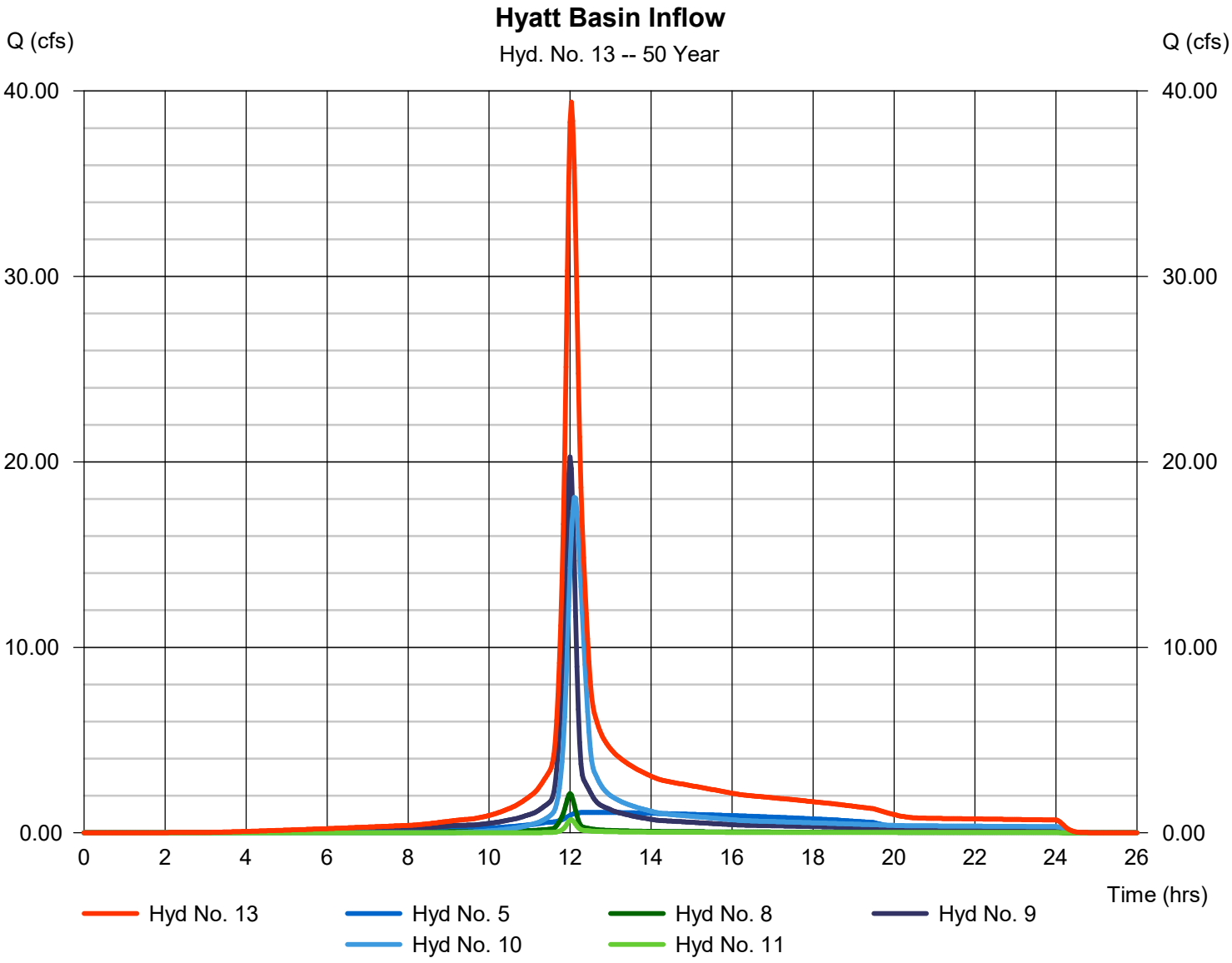
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Friday, 12 / 22 / 2017

Hyd. No. 13

Hyatt Basin Inflow

Hydrograph type	=	Combine	Peak discharge	=	39.40 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	160,615 cuft
Inflow hyds.	=	5, 8, 9, 10, 11	Contrib. drain. area	=	11.080 ac



Hydrograph Report

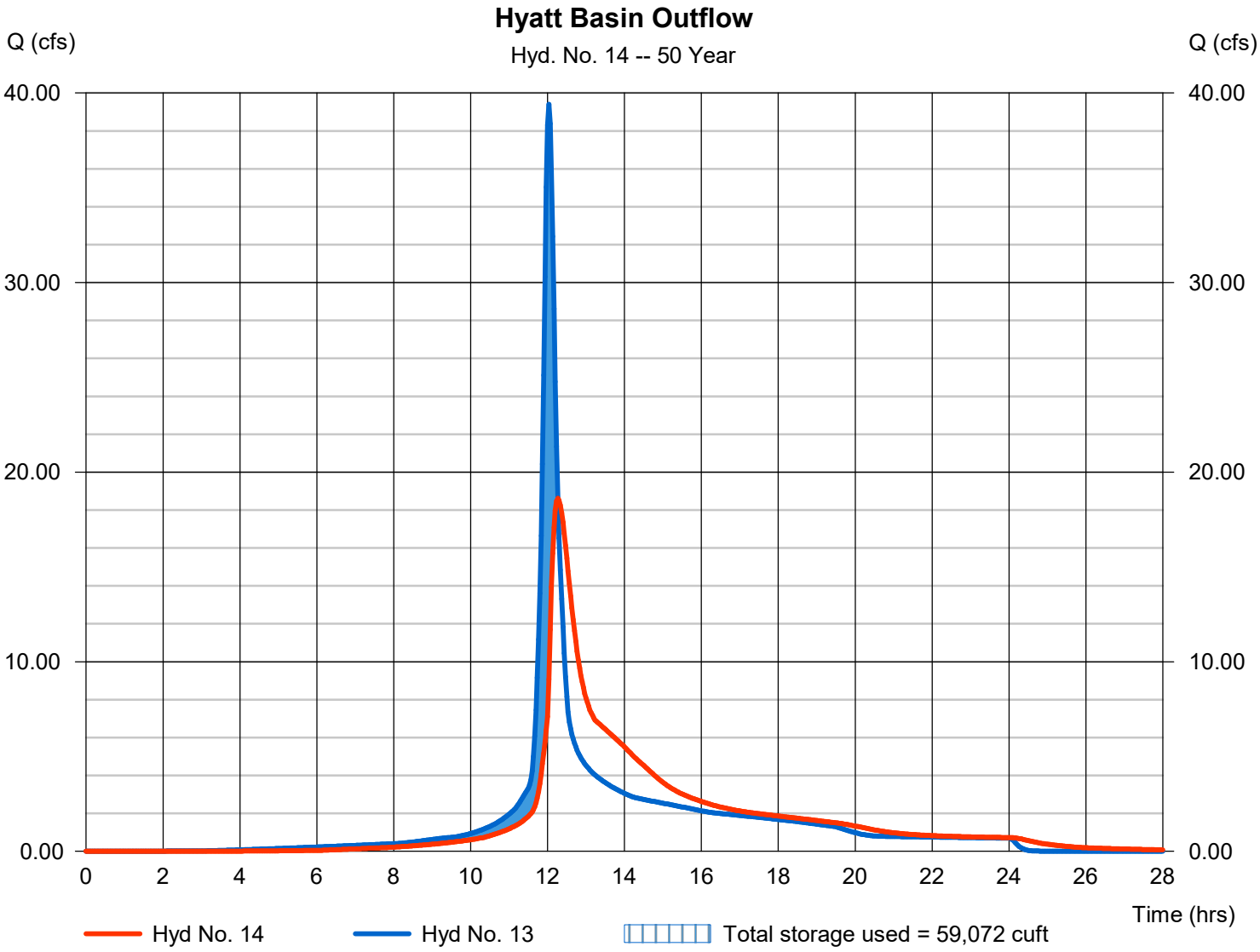
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Wednesday, 04 / 18 / 2018

Hyd. No. 14

Hyatt Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	18.62 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.27 hrs
Time interval	=	2 min	Hyd. volume	=	160,592 cuft
Inflow hyd. No.	=	13 - Hyatt Basin Inflow	Max. Elevation	=	886.53 ft
Reservoir name	=	Hyatt House Pond	Max. Storage	=	59,072 cuft

Storage Indication method used. Wet pond routing start elevation = 883.50 ft.

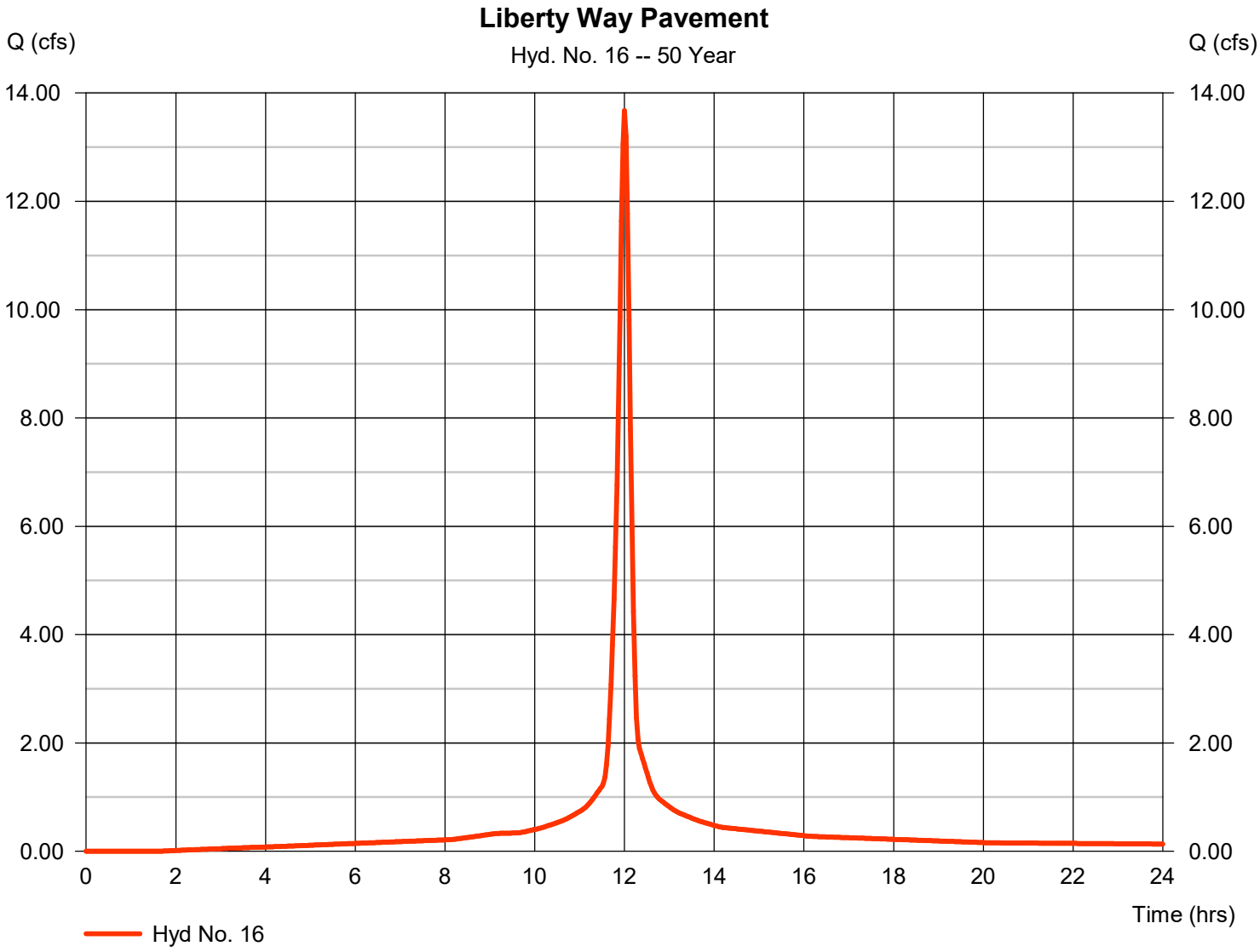


Hydrograph Report

Hyd. No. 16

Liberty Way Pavement

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.68 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	39,497 cuft
Drainage area	=	2.230 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

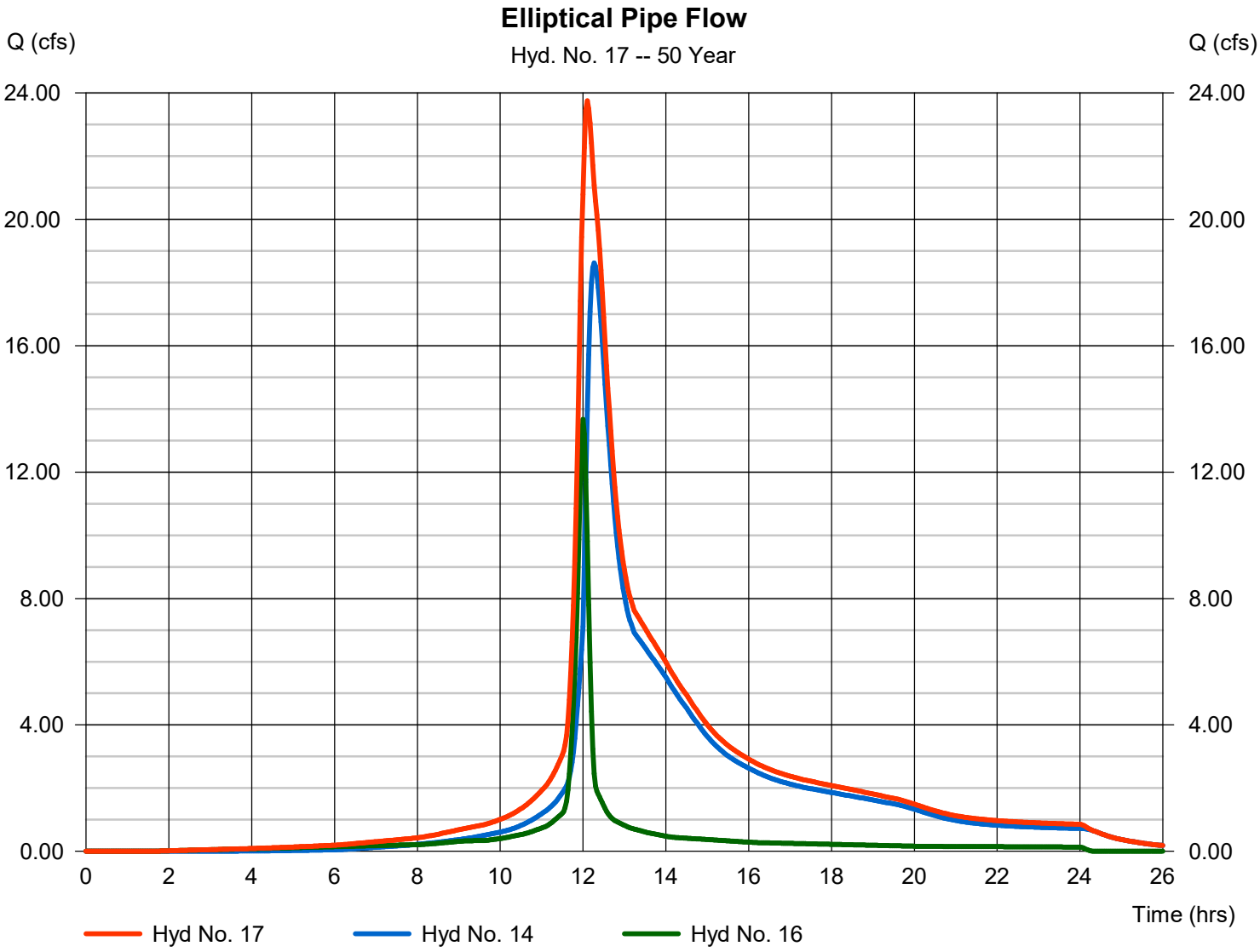


Hydrograph Report

Hyd. No. 17

Elliptical Pipe Flow

Hydrograph type	= Combine	Peak discharge	= 23.75 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 200,089 cuft
Inflow hyds.	= 14, 16	Contrib. drain. area	= 2.230 ac

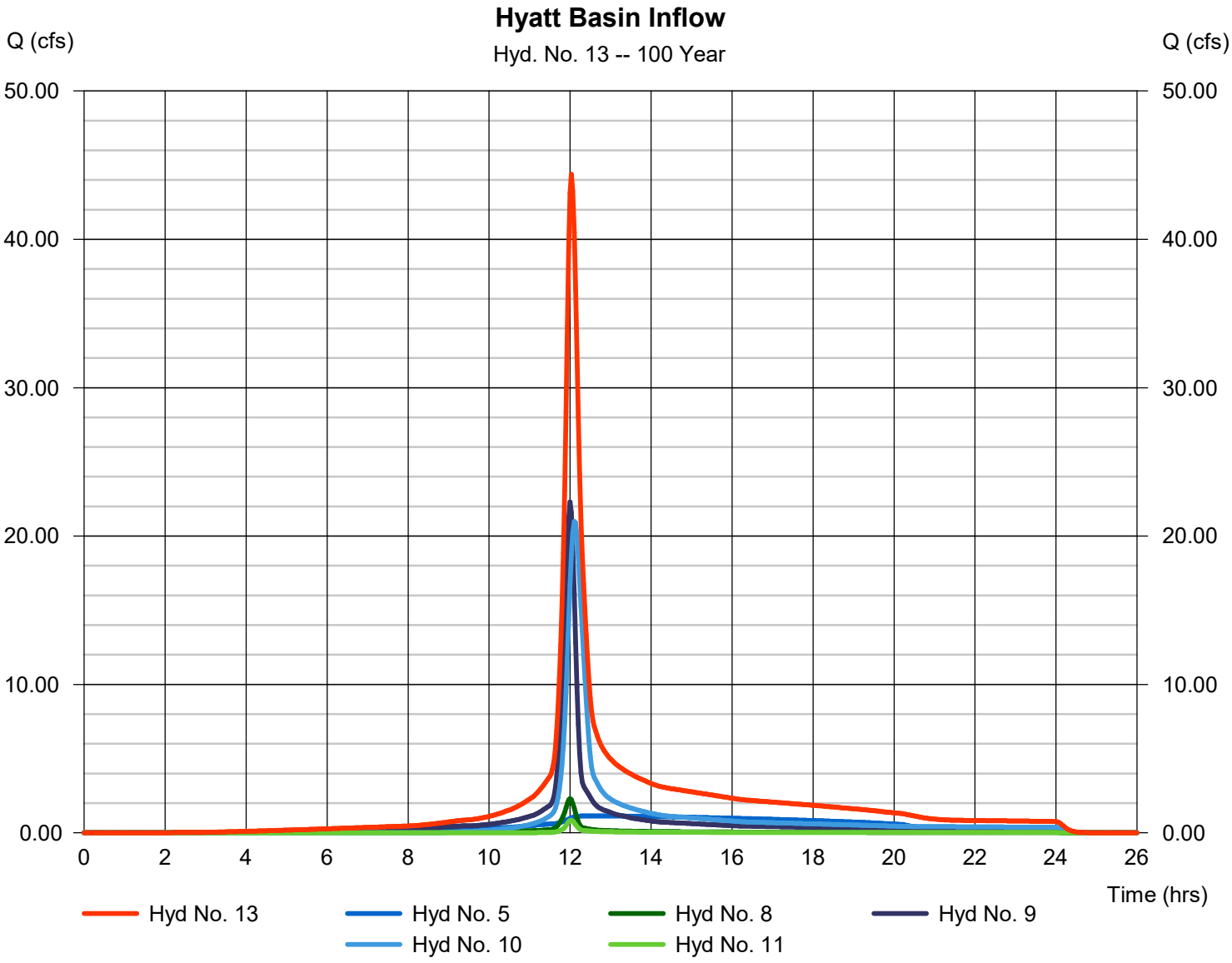


Hydrograph Report

Hyd. No. 13

Hyatt Basin Inflow

Hydrograph type	=	Combine	Peak discharge	=	44.38 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	180,959 cuft
Inflow hyds.	=	5, 8, 9, 10, 11	Contrib. drain. area	=	11.080 ac



Hydrograph Report

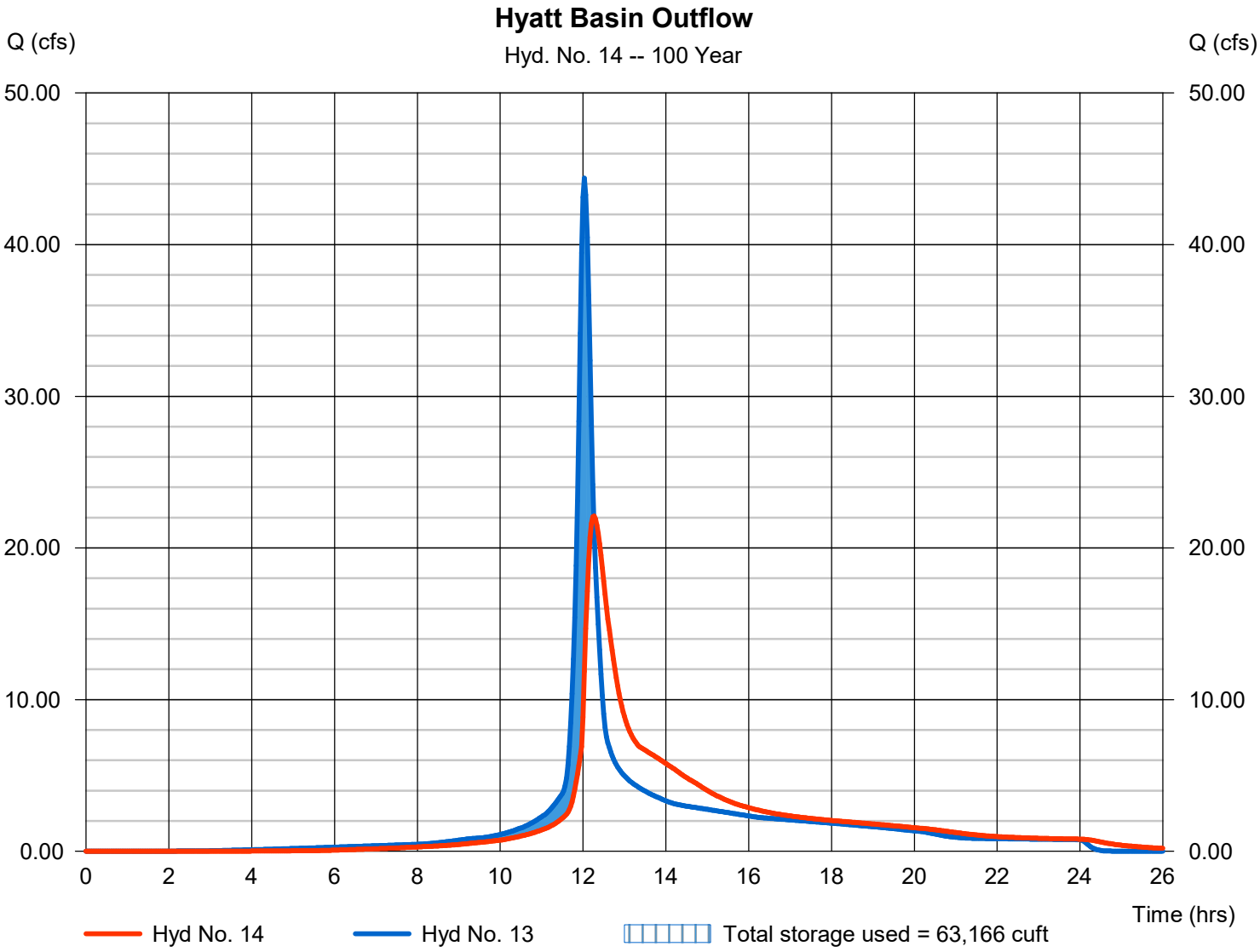
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Wednesday, 04 / 18 / 2018

Hyd. No. 14

Hyatt Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	22.11 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.27 hrs
Time interval	=	2 min	Hyd. volume	=	180,936 cuft
Inflow hyd. No.	=	13 - Hyatt Basin Inflow	Max. Elevation	=	886.78 ft
Reservoir name	=	Hyatt House Pond	Max. Storage	=	63,166 cuft

Storage Indication method used. Wet pond routing start elevation = 883.50 ft.

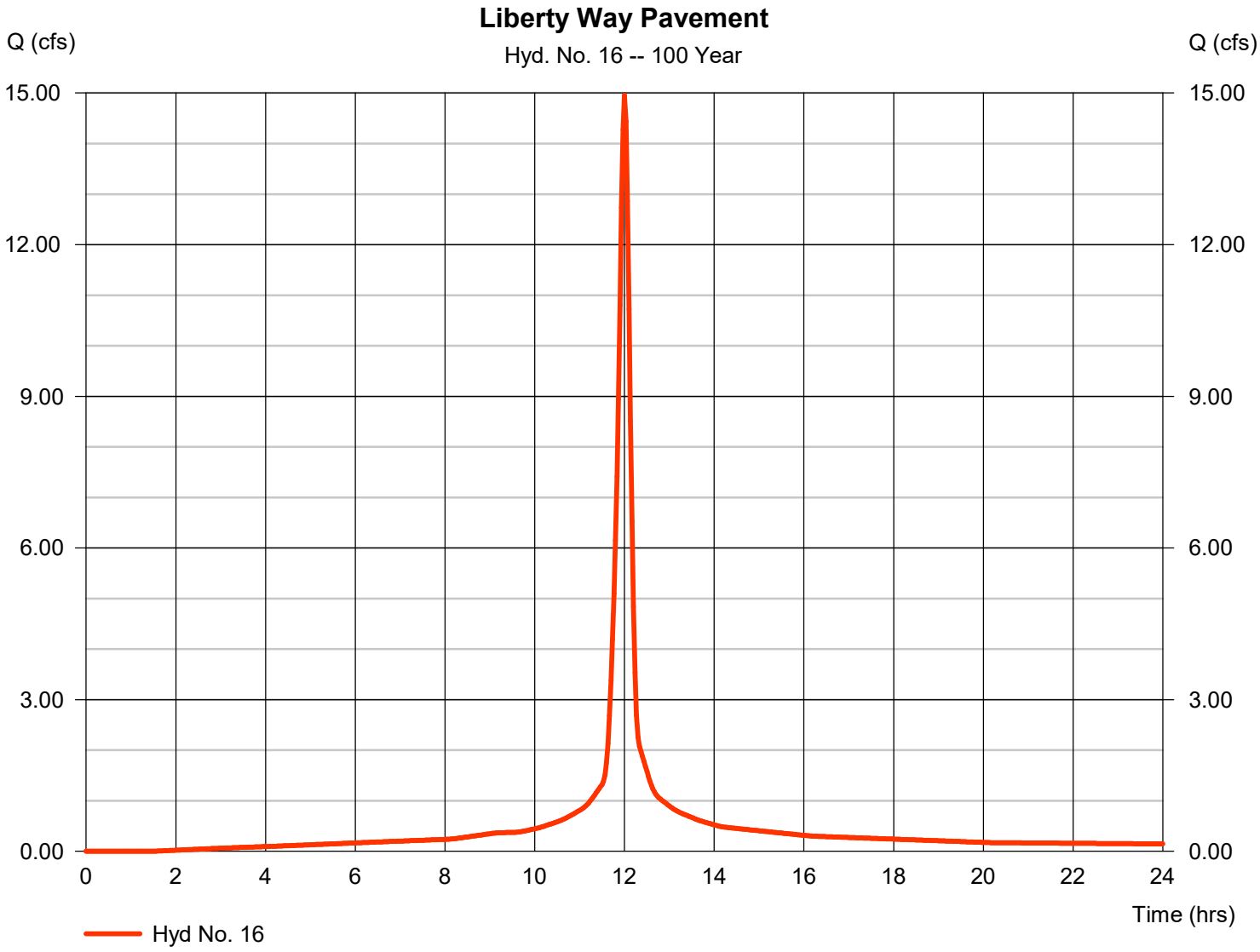


Hydrograph Report

Hyd. No. 16

Liberty Way Pavement

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.96 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	43,400 cuft
Drainage area	=	2.230 ac	Curve number	=	96
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

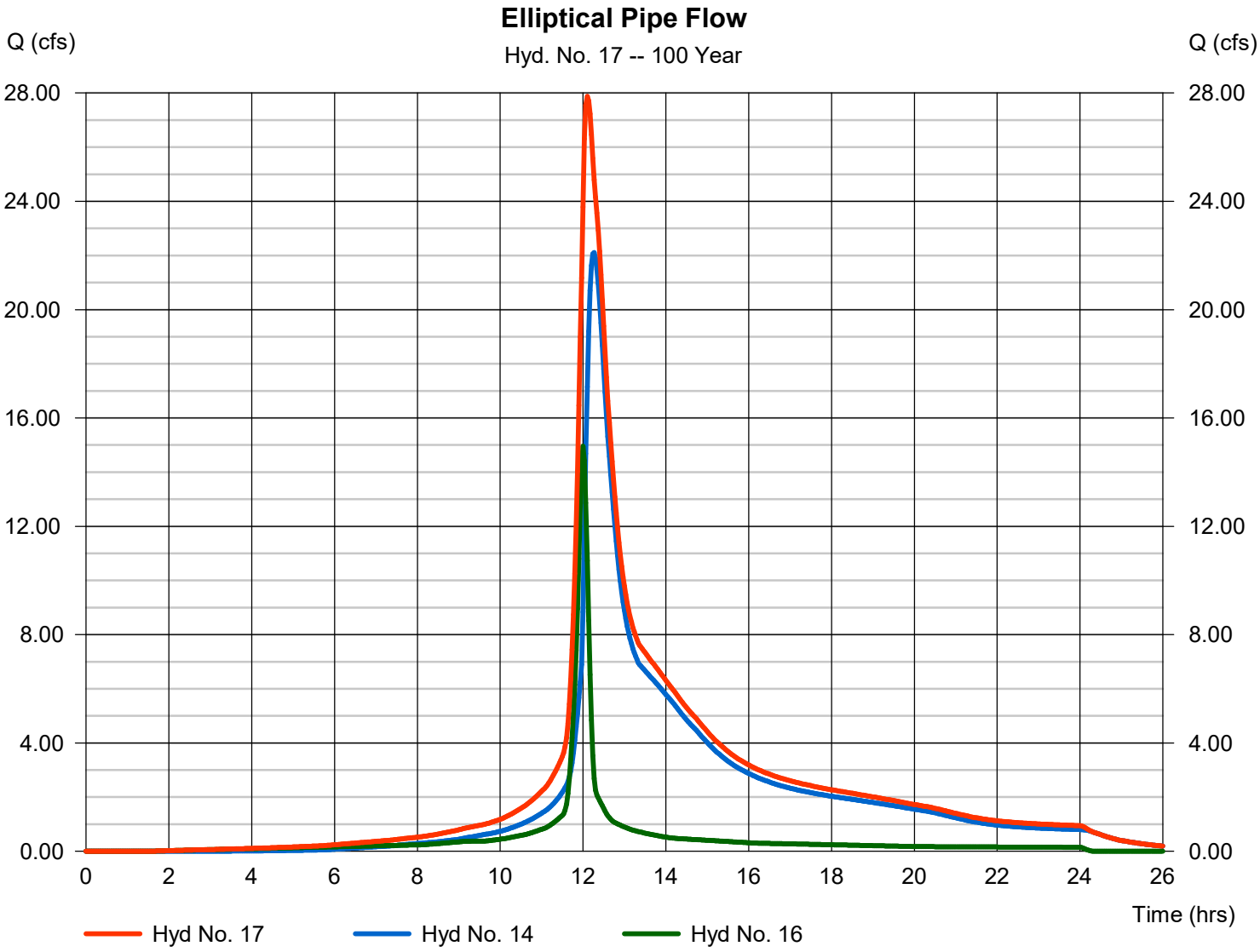


Hydrograph Report

Hyd. No. 17

Elliptical Pipe Flow

Hydrograph type	= Combine	Peak discharge	= 27.87 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 224,336 cuft
Inflow hyds.	= 14, 16	Contrib. drain. area	= 2.230 ac



Cox Road Elliptical

Invert Elev Dn (ft)	=	878.77
Pipe Length (ft)	=	117.00
Slope (%)	=	0.66
Invert Elev Up (ft)	=	879.54
Rise (in)	=	24.0
Shape	=	Elliptical
Span (in)	=	38.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

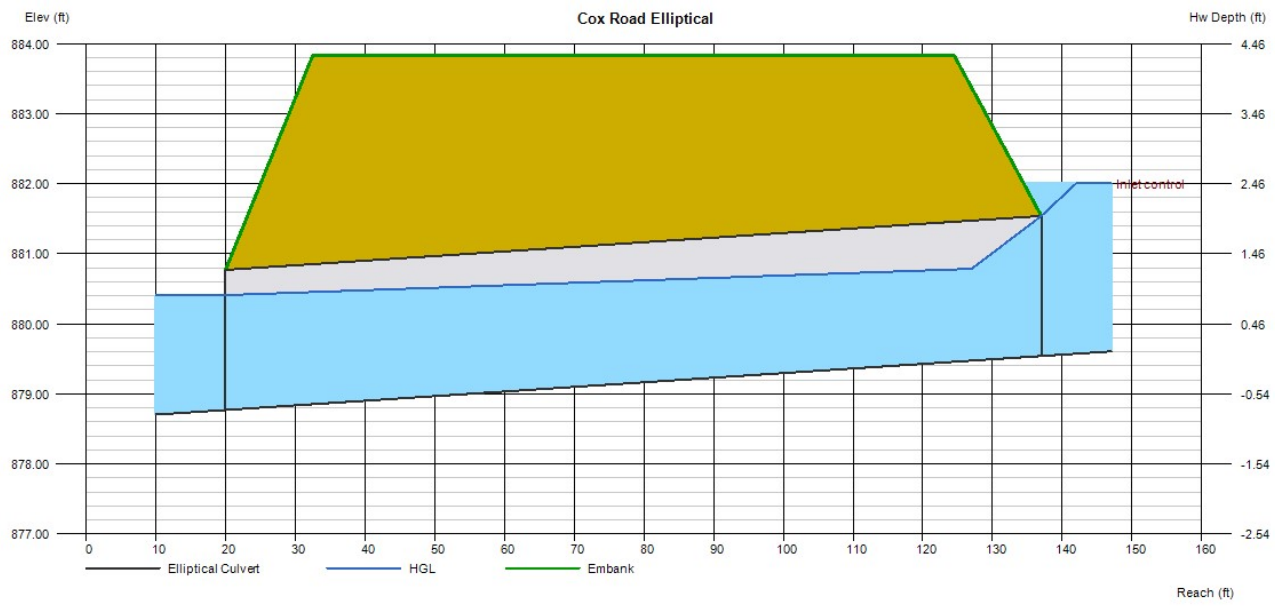
Top Elevation (ft)	=	883.83
Top Width (ft)	=	92.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	28.52
Qmax (cfs)	=	40.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	28.52
Qpipe (cfs)	=	28.52
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	6.34
Veloc Up (ft/s)	=	8.19
HGL Dn (ft)	=	880.41
HGL Up (ft)	=	880.82
Hw Elev (ft)	=	882.00
Hw/D (ft)	=	1.23
Flow Regime	=	Inlet Control



Cox Road Elliptical

Invert Elev Dn (ft)	=	878.77
Pipe Length (ft)	=	117.00
Slope (%)	=	0.66
Invert Elev Up (ft)	=	879.54
Rise (in)	=	24.0
Shape	=	Elliptical
Span (in)	=	38.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Horizontal Ellipse Concrete
Culvert Entrance	=	Groove end projecting (H)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

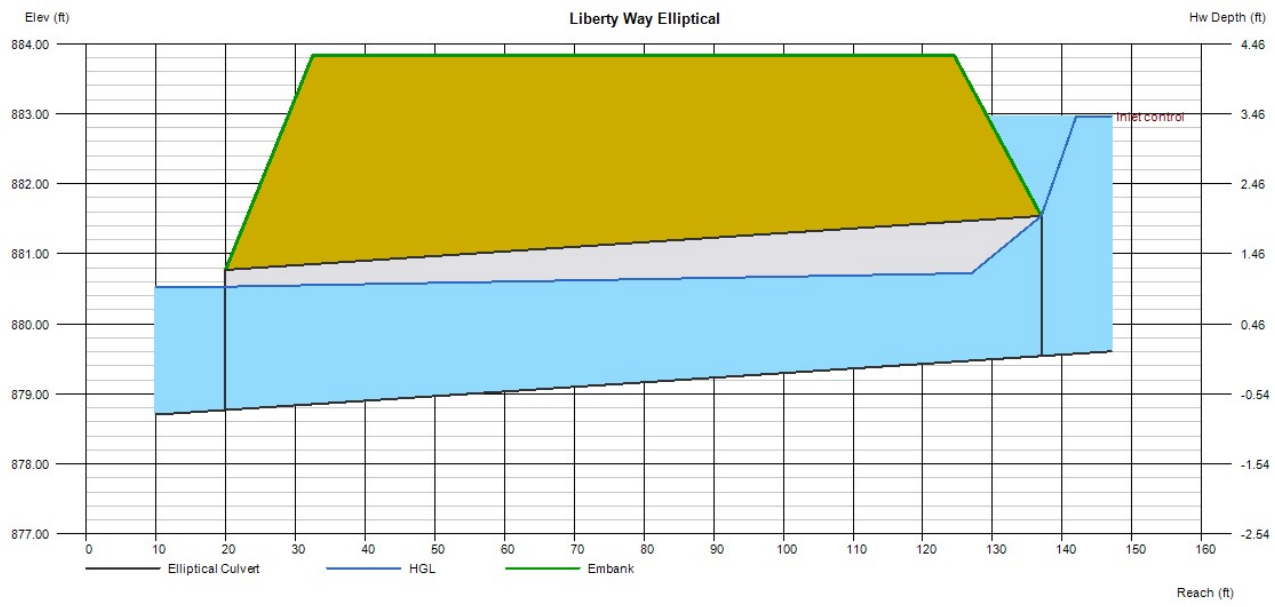
Top Elevation (ft)	=	883.83
Top Width (ft)	=	92.00
Crest Width (ft)	=	15.00

Calculations

Qmin (cfs)	=	20.00
Qmax (cfs)	=	40.00
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	40.00
Qpipe (cfs)	=	40.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	8.38
Veloc Up (ft/s)	=	12.47
HGL Dn (ft)	=	880.53
HGL Up (ft)	=	880.74
Hw Elev (ft)	=	882.96
Hw/D (ft)	=	1.71
Flow Regime	=	Inlet Control



SUMMARY OF DATA

Method of Hydrograph Development: TR-55

Software: Hydraflow Hydrographs Extension for AutoCAD Civil 3D 2011

Design Criteria: Control the post development storms of a frequency between one year and the critical storm so as to be equal to or less than the pre-development peak runoff rate for a 24 hour one year frequency storm.

HIX Basin 100YR=894.77 T/Dike=898.00		**Outlet: 24" Pipe @ 0.58%** **4" Orifice Inv=887.06** **T/Grate @ 895.06, Spillway = 896.82**			
Frequency	**Inflow**	**Outflow**	**Storage**		**Elevation**
(yr)	(cfs)	(cfs)	(ft^3)	(ac-ft)	(ft)
1	4.13	0.78	3,821	0.09	890.74
5	7.84	0.95	8,498	0.20	892.46
10	9.30	1.01	10,504	0.24	893.10
25	11.16	1.07	13,153	0.30	893.89
50	12.09	1.10	14,515	0.33	894.27
100	13.34	1.14	16,377	0.38	894.77

Release Rate - Basin		
Critical Storm = 25 yr		
Storm Frequency	**Pre-Developed Allowable Release Rate**	**Post-Developed Release Rate**
(yr)	(cfs)	(cfs)
1	1.17	0.78
5	1.17	0.95
10	1.17	1.01
25	1.17	1.07
50	5.92	1.10
100	6.69	1.14

Note: HIX Basin is Based on As-Built information

Spillway		$Q_{100}=CLH^{3/2}$	
Q_{100}=13.34	C=3.0	L=30	H=0.28
Spillway Invert		896.82	
100 Year Weir Flow		897.10	
Top of Dike Elevation		898.00	
Freeboard		0.90'	
Spillway Side Slope		3:1	
Velocity		1.58	

Project: **The Fields at Liberty Way**

Drainage Area Description:

HIX Site Pre-Developed

Job #: 15M040.000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 2.03 Acres

Soil Types:

22 %	Type 'B'	*0.5 acres*
78 %	Type 'C'	*1.6 acres*

Land Use: Woods - Grass 2.0 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Woods - Grass	**B**	65	22	100.0	14.41
Woods - Grass	**C**	76	78	100.0	59.15

Composite CN = 73.6

Time of Concentration:

Sheet Flow: **Tc**

Length = 72 Slope(ft/ft) = 0.0108 Manning's, n = 0.24 **0.248** *hr*

Tc = 0.25 ***hr***
15 min

Project: **The Fields at Liberty Way**

Drainage Area Description:

HIX Site Post-Developed

Job #: 15M040.000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 2.03 Acres

Soil Types:

22 %	Type 'B'	*0.5 acres*
78 %	Type 'C'	*1.6 acres*

Land Use:

Impervious	1.6 Acres
Open Space - Good	0.4 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Impervious	**B**	98	22	77.9	16.91
Impervious	**C**	98	78	77.9	59.39
Open Space - Good	**B**	61	22	22.1	2.99
Open Space - Good	**C**	74	78	22.1	12.75

Composite CN = 92.0

Time of Concentration:

Tc

Tc = 12.00 *min*
12 min

Project: **The Fields at Liberty Way**

Drainage Area Description:

Access Drive Pre-Developed

Job #: 15M040.000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 0.34 Acres

Soil Types:

29 %	Type 'B'	*0.1 acres*
71 %	Type 'C'	*0.2 acres*

Land Use: Woods - Grass 0.3 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Woods - Grass	**B**	65	29	100.0	19.12
Woods - Grass	**C**	76	71	100.0	53.65

Composite CN = 72.8

Time of Concentration:

Sheet Flow: **Tc**

Length = 100 Slope(ft/ft) = 0.0175 Manning's, n = 0.24 **0.265** *hr*

Shallow Concentrated Flow:

Length = 191 Slope(ft/ft) = 0.042 Velocity (fps) = 1 **0.053** *hr*

Channel Flow:

Tc = 0.32 ***hr***
19 min

Project: **The Fields at Liberty Way**

Drainage Area Description:

Access Drive Post-Devloped

Job #: 15M040.000
Initials: MJL
Date: 10/17/2017
Revised:

Drainage Area = 0.34 Acres

Soil Types:

29 %	Type 'B'	*0.1 acres*
71 %	Type 'C'	*0.2 acres*

Land Use: Impervious 0.3 Acres

Composite Runoff Curve Number:

Ground Cover	Soil Type	CN	Soil Type %	Land Use %	CN*Soil %*Land %
Impervious	**B**	98	29	100.0	28.82
Impervious	**C**	98	71	100.0	69.18

Composite CN = 98.0

Time of Concentration:

Tc

Tc = 12.00 *min*
12 min

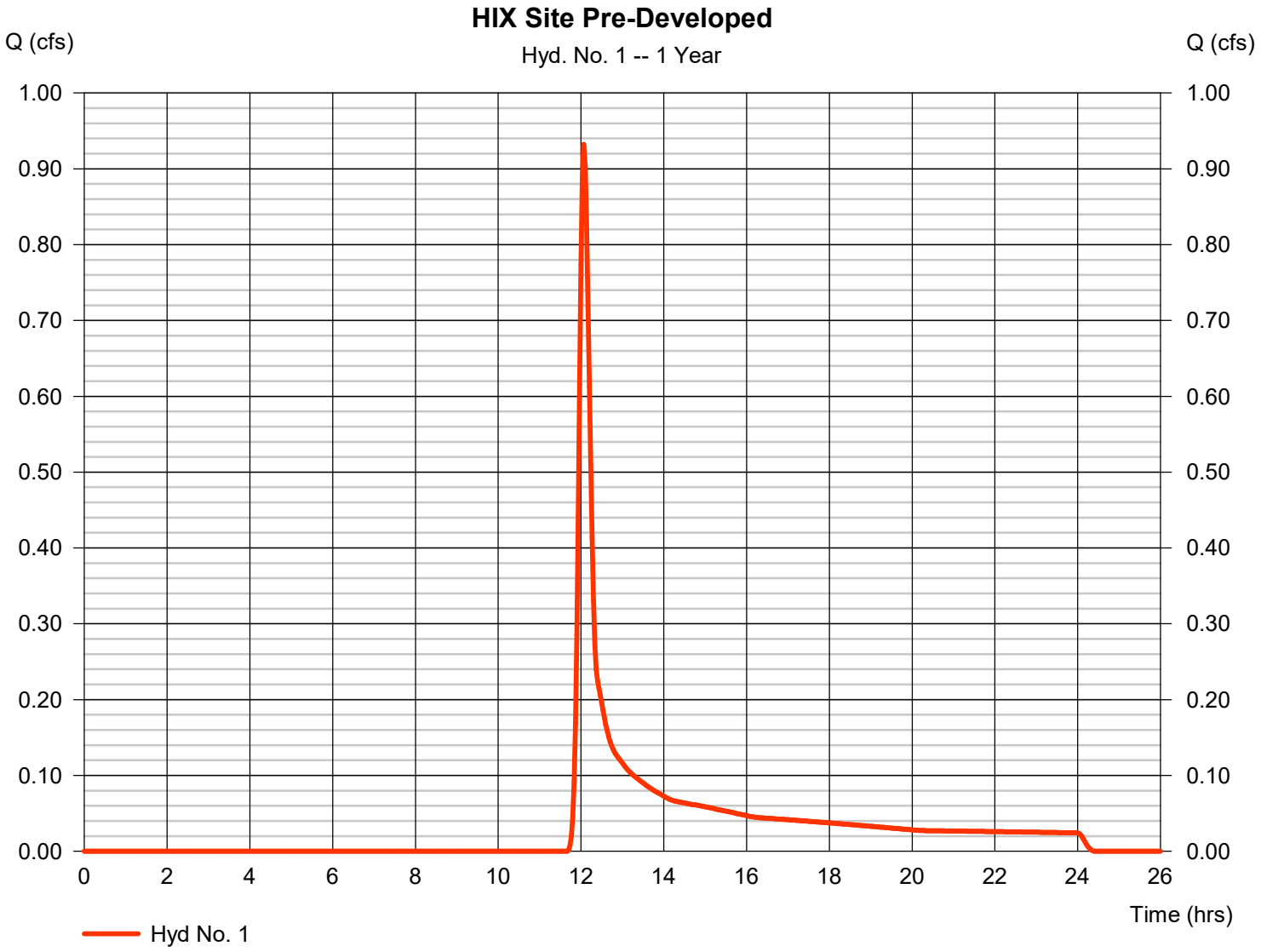
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 1

HIX Site Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.932 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,115 cuft
Drainage area	= 2.030 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



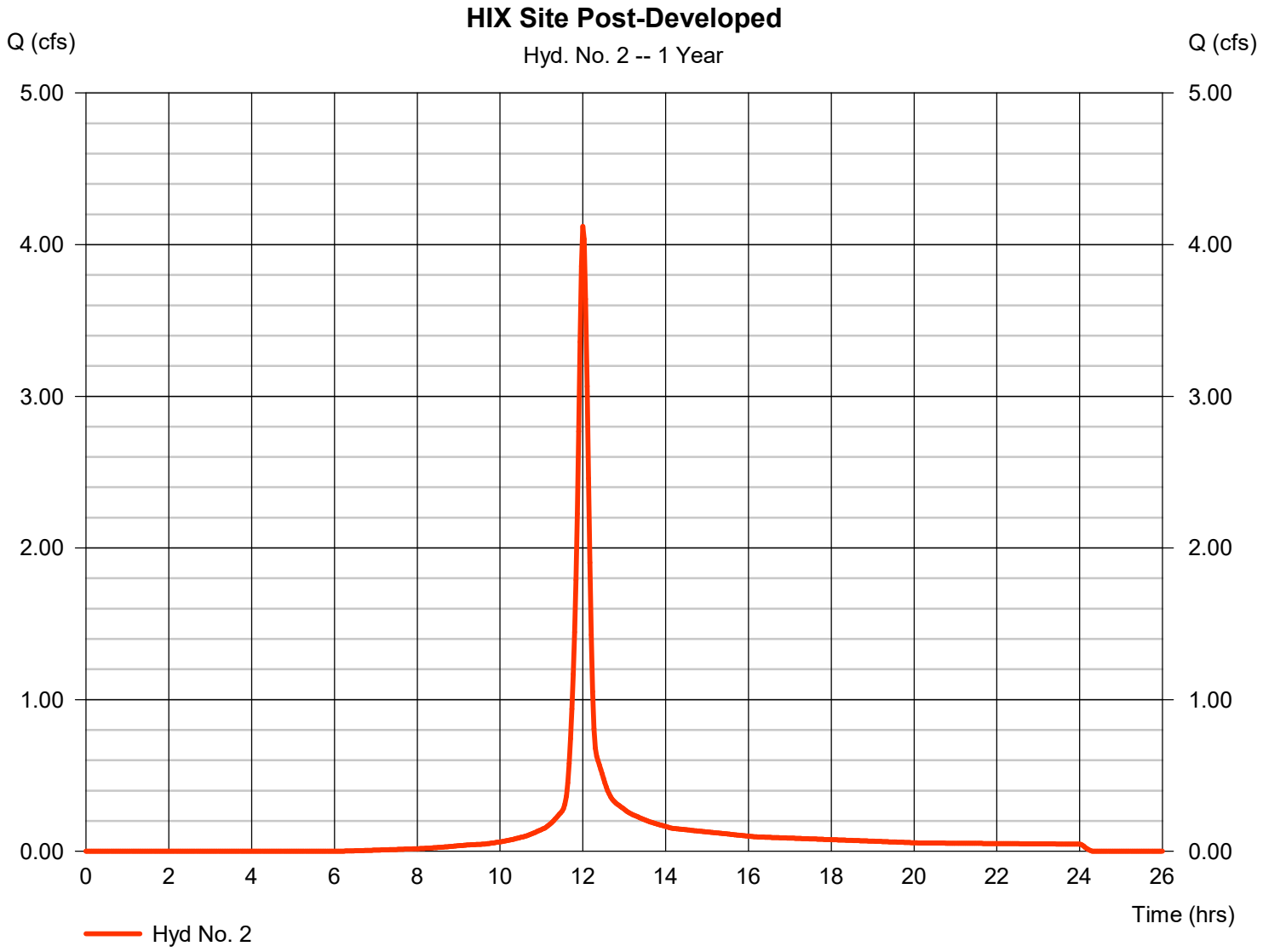
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 2

HIX Site Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 4.120 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 10,773 cuft
Drainage area	= 2.030 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



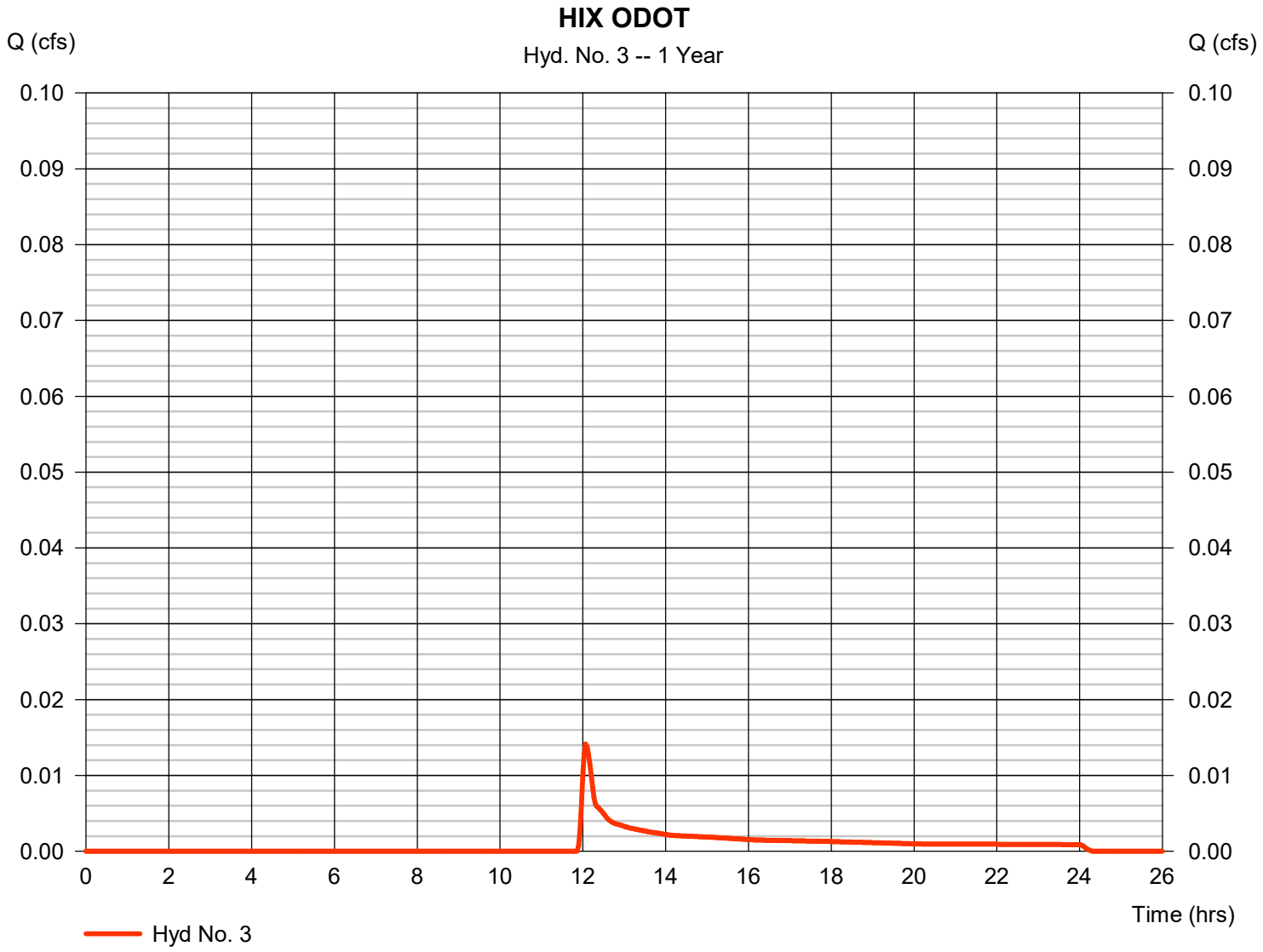
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 3

HIX ODOT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.014 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 80 cuft
Drainage area	= 0.110 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



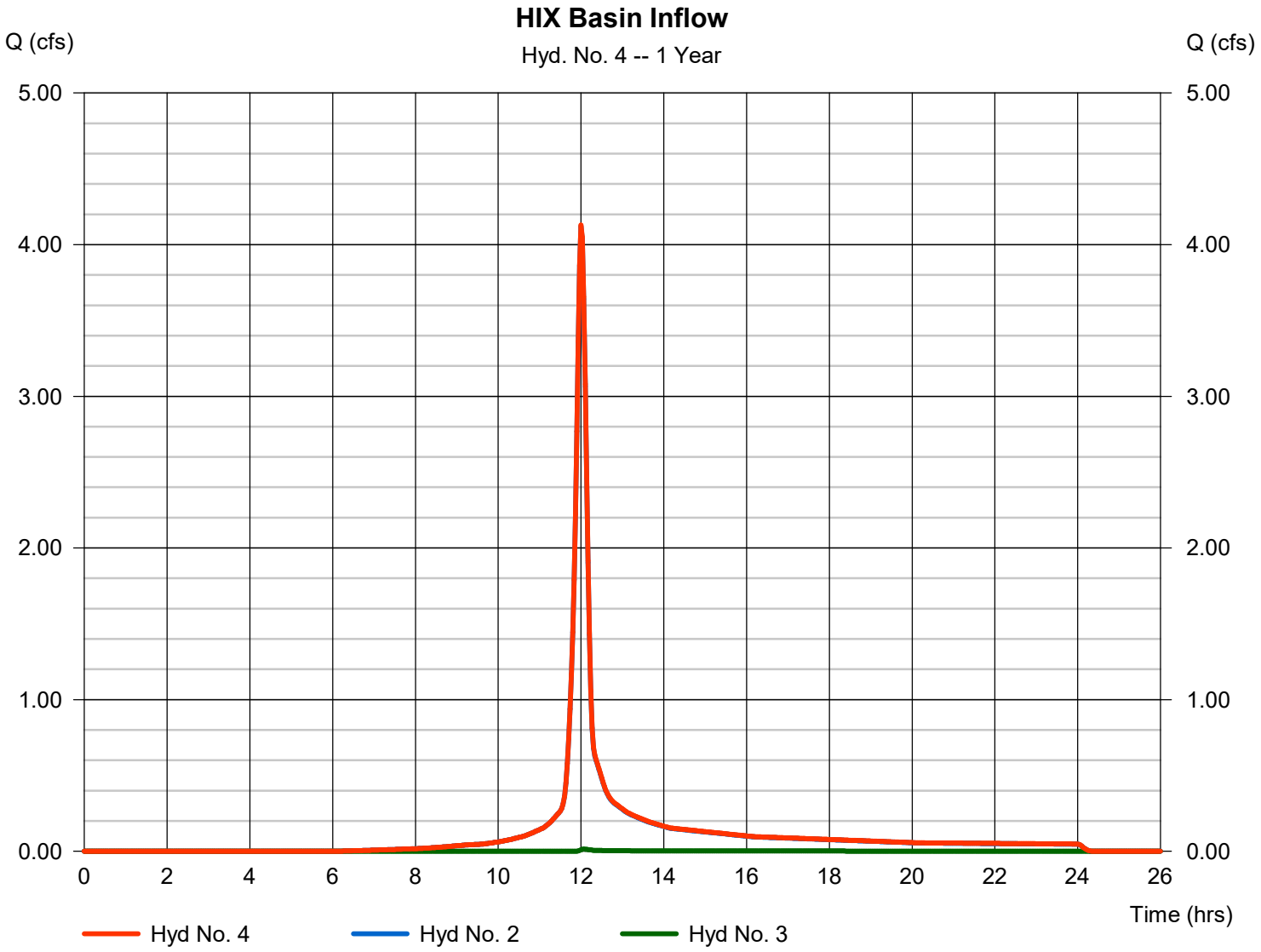
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 4

HIX Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 4.130 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 10,853 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.140 ac



Hydrograph Report

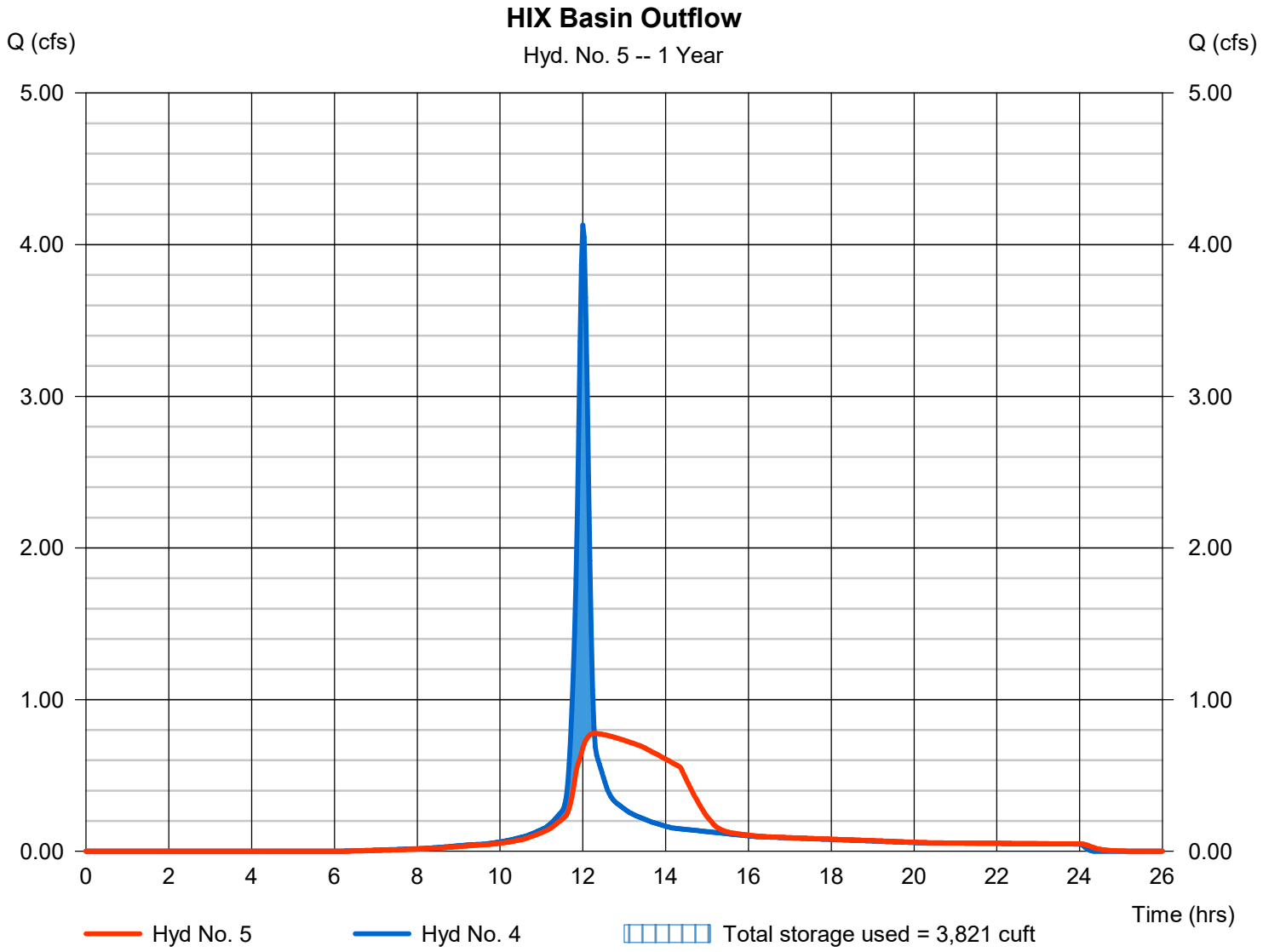
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 5

HIX Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	0.778 cfs
Storm frequency	=	1 yrs	Time to peak	=	12.27 hrs
Time interval	=	2 min	Hyd. volume	=	10,852 cuft
Inflow hyd. No.	=	4 - HIX Basin Inflow	Max. Elevation	=	890.74 ft
Reservoir name	=	HIX Pond	Max. Storage	=	3,821 cuft

Storage Indication method used.



Pond No. 2 - HIX Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 887.06 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	887.06	00	0	0
1.94	889.00	1,148	742	742
2.94	890.00	1,873	1,496	2,238
3.94	891.00	2,440	2,150	4,388
4.94	892.00	2,904	2,668	7,056
5.94	893.00	3,314	3,106	10,163
6.94	894.00	3,412	3,363	13,525
7.94	895.00	4,004	3,704	17,229
8.94	896.00	5,677	4,816	22,045

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	4.00	0.00
Span (in)	= 24.00	0.00	4.00	0.00
No. Barrels	= 1	0	1	0
Invert El. (ft)	= 886.96	0.00	887.06	0.00
Length (ft)	= 92.00	0.00	0.00	0.00
Slope (%)	= 0.58	0.00	0.00	n/a
N-Value	= .013	.013	.015	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	30.00	0.00	0.00
Crest El. (ft)	= 895.06	896.82	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	887.06	0.00	---	0.00	---	0.00	0.00	---	---	---	---	0.000
0.19	74	887.25	0.08 ic	---	0.08 ic	---	0.00	0.00	---	---	---	---	0.080
0.39	148	887.45	0.20 ic	---	0.20 ic	---	0.00	0.00	---	---	---	---	0.198
0.58	223	887.64	0.27 ic	---	0.27 ic	---	0.00	0.00	---	---	---	---	0.271
0.78	297	887.84	0.35 ic	---	0.33 ic	---	0.00	0.00	---	---	---	---	0.328
0.97	371	888.03	0.38 ic	---	0.38 ic	---	0.00	0.00	---	---	---	---	0.377
1.16	445	888.22	0.44 ic	---	0.42 ic	---	0.00	0.00	---	---	---	---	0.420
1.36	520	888.42	0.48 ic	---	0.46 ic	---	0.00	0.00	---	---	---	---	0.458
1.55	594	888.61	0.52 ic	---	0.49 ic	---	0.00	0.00	---	---	---	---	0.492
1.75	668	888.81	0.52 ic	---	0.52 ic	---	0.00	0.00	---	---	---	---	0.524
1.94	742	889.00	0.56 ic	---	0.56 ic	---	0.00	0.00	---	---	---	---	0.555
2.04	892	889.10	0.60 ic	---	0.57 ic	---	0.00	0.00	---	---	---	---	0.569
2.14	1,041	889.20	0.60 ic	---	0.58 ic	---	0.00	0.00	---	---	---	---	0.585
2.24	1,191	889.30	0.60 ic	---	0.60 ic	---	0.00	0.00	---	---	---	---	0.599
2.34	1,341	889.40	0.64 ic	---	0.61 ic	---	0.00	0.00	---	---	---	---	0.612
2.44	1,490	889.50	0.64 ic	---	0.63 ic	---	0.00	0.00	---	---	---	---	0.627
2.54	1,640	889.60	0.64 ic	---	0.64 ic	---	0.00	0.00	---	---	---	---	0.640
2.64	1,789	889.70	0.69 ic	---	0.65 ic	---	0.00	0.00	---	---	---	---	0.653
2.74	1,939	889.80	0.69 ic	---	0.67 ic	---	0.00	0.00	---	---	---	---	0.666
2.84	2,088	889.90	0.69 ic	---	0.68 ic	---	0.00	0.00	---	---	---	---	0.679
2.94	2,238	890.00	0.69 ic	---	0.69 ic	---	0.00	0.00	---	---	---	---	0.691
3.04	2,453	890.10	0.73 ic	---	0.70 ic	---	0.00	0.00	---	---	---	---	0.703
3.14	2,668	890.20	0.73 ic	---	0.72 ic	---	0.00	0.00	---	---	---	---	0.716
3.24	2,883	890.30	0.73 ic	---	0.73 ic	---	0.00	0.00	---	---	---	---	0.728
3.34	3,098	890.40	0.74 ic	---	0.74 ic	---	0.00	0.00	---	---	---	---	0.739
3.44	3,313	890.50	0.78 ic	---	0.75 ic	---	0.00	0.00	---	---	---	---	0.750
3.54	3,528	890.60	0.78 ic	---	0.76 ic	---	0.00	0.00	---	---	---	---	0.762
3.64	3,743	890.70	0.78 ic	---	0.77 ic	---	0.00	0.00	---	---	---	---	0.773
3.74	3,958	890.80	0.78 ic	---	0.78 ic	---	0.00	0.00	---	---	---	---	0.785
3.84	4,173	890.90	0.79 ic	---	0.79 ic	---	0.00	0.00	---	---	---	---	0.795
3.94	4,388	891.00	0.84 ic	---	0.81 ic	---	0.00	0.00	---	---	---	---	0.806
4.04	4,655	891.10	0.84 ic	---	0.82 ic	---	0.00	0.00	---	---	---	---	0.817
4.14	4,922	891.20	0.84 ic	---	0.83 ic	---	0.00	0.00	---	---	---	---	0.827
4.24	5,188	891.30	0.84 ic	---	0.84 ic	---	0.00	0.00	---	---	---	---	0.838

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HIX Pond

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
4.34	5,455	891.40	0.85 ic	---	0.85 ic	---	0.00	0.00	---	---	---	---	0.847
4.44	5,722	891.50	0.89 ic	---	0.86 ic	---	0.00	0.00	---	---	---	---	0.857
4.54	5,989	891.60	0.89 ic	---	0.87 ic	---	0.00	0.00	---	---	---	---	0.868
4.64	6,256	891.70	0.89 ic	---	0.88 ic	---	0.00	0.00	---	---	---	---	0.878
4.74	6,523	891.80	0.89 ic	---	0.89 ic	---	0.00	0.00	---	---	---	---	0.888
4.84	6,790	891.90	0.90 ic	---	0.90 ic	---	0.00	0.00	---	---	---	---	0.897
4.94	7,056	892.00	0.95 ic	---	0.91 ic	---	0.00	0.00	---	---	---	---	0.906
5.04	7,367	892.10	0.95 ic	---	0.92 ic	---	0.00	0.00	---	---	---	---	0.916
5.14	7,678	892.20	0.95 ic	---	0.93 ic	---	0.00	0.00	---	---	---	---	0.926
5.24	7,988	892.30	0.95 ic	---	0.93 ic	---	0.00	0.00	---	---	---	---	0.935
5.34	8,299	892.40	0.95 ic	---	0.94 ic	---	0.00	0.00	---	---	---	---	0.944
5.44	8,610	892.50	0.95 ic	---	0.95 ic	---	0.00	0.00	---	---	---	---	0.953
5.54	8,920	892.60	1.00 ic	---	0.96 ic	---	0.00	0.00	---	---	---	---	0.962
5.64	9,231	892.70	1.00 ic	---	0.97 ic	---	0.00	0.00	---	---	---	---	0.971
5.74	9,541	892.80	1.00 ic	---	0.98 ic	---	0.00	0.00	---	---	---	---	0.980
5.84	9,852	892.90	1.00 ic	---	0.99 ic	---	0.00	0.00	---	---	---	---	0.989
5.94	10,163	893.00	1.00 ic	---	1.00 ic	---	0.00	0.00	---	---	---	---	0.998
6.04	10,499	893.10	1.01 ic	---	1.01 ic	---	0.00	0.00	---	---	---	---	1.006
6.14	10,835	893.20	1.01 ic	---	1.01 ic	---	0.00	0.00	---	---	---	---	1.015
6.24	11,172	893.30	1.07 ic	---	1.02 ic	---	0.00	0.00	---	---	---	---	1.023
6.34	11,508	893.40	1.07 ic	---	1.03 ic	---	0.00	0.00	---	---	---	---	1.031
6.44	11,844	893.50	1.07 ic	---	1.04 ic	---	0.00	0.00	---	---	---	---	1.040
6.54	12,180	893.60	1.07 ic	---	1.05 ic	---	0.00	0.00	---	---	---	---	1.048
6.64	12,517	893.70	1.07 ic	---	1.06 ic	---	0.00	0.00	---	---	---	---	1.057
6.74	12,853	893.80	1.07 ic	---	1.07 ic	---	0.00	0.00	---	---	---	---	1.065
6.84	13,189	893.90	1.07 ic	---	1.07 ic	---	0.00	0.00	---	---	---	---	1.073
6.94	13,525	894.00	1.08 ic	---	1.08 ic	---	0.00	0.00	---	---	---	---	1.081
7.04	13,896	894.10	1.13 ic	---	1.09 ic	---	0.00	0.00	---	---	---	---	1.089
7.14	14,266	894.20	1.13 ic	---	1.10 ic	---	0.00	0.00	---	---	---	---	1.097
7.24	14,636	894.30	1.13 ic	---	1.10 ic	---	0.00	0.00	---	---	---	---	1.105
7.34	15,007	894.40	1.13 ic	---	1.11 ic	---	0.00	0.00	---	---	---	---	1.113
7.44	15,377	894.50	1.13 ic	---	1.12 ic	---	0.00	0.00	---	---	---	---	1.121
7.54	15,748	894.60	1.13 ic	---	1.13 ic	---	0.00	0.00	---	---	---	---	1.129
7.64	16,118	894.70	1.14 ic	---	1.14 ic	---	0.00	0.00	---	---	---	---	1.136
7.74	16,488	894.80	1.14 ic	---	1.14 ic	---	0.00	0.00	---	---	---	---	1.143
7.84	16,859	894.90	1.20 ic	---	1.15 ic	---	0.00	0.00	---	---	---	---	1.151
7.94	17,229	895.00	1.20 ic	---	1.16 ic	---	0.00	0.00	---	---	---	---	1.158
8.04	17,711	895.10	1.41 ic	---	1.16 ic	---	0.21	0.00	---	---	---	---	1.376
8.14	18,192	895.20	2.59 ic	---	1.16 ic	---	1.40	0.00	---	---	---	---	2.552
8.24	18,674	895.30	4.30 ic	---	1.15 ic	---	3.13	0.00	---	---	---	---	4.279
8.34	19,155	895.40	6.42 ic	---	1.14 ic	---	5.28	0.00	---	---	---	---	6.417
8.44	19,637	895.50	8.97 oc	---	1.12 ic	---	7.77	0.00	---	---	---	---	8.895
8.54	20,118	895.60	11.65 oc	---	1.08 ic	---	10.57	0.00	---	---	---	---	11.65
8.64	20,600	895.70	14.70 oc	---	1.06 ic	---	13.63	0.00	---	---	---	---	14.70
8.74	21,082	895.80	17.98 oc	---	1.03 ic	---	16.95	0.00	---	---	---	---	17.98
8.84	21,563	895.90	21.49 oc	---	0.99 ic	---	20.50	0.00	---	---	---	---	21.49
8.94	22,045	896.00	25.21 oc	---	0.93 ic	---	24.28	0.00	---	---	---	---	25.21

...End

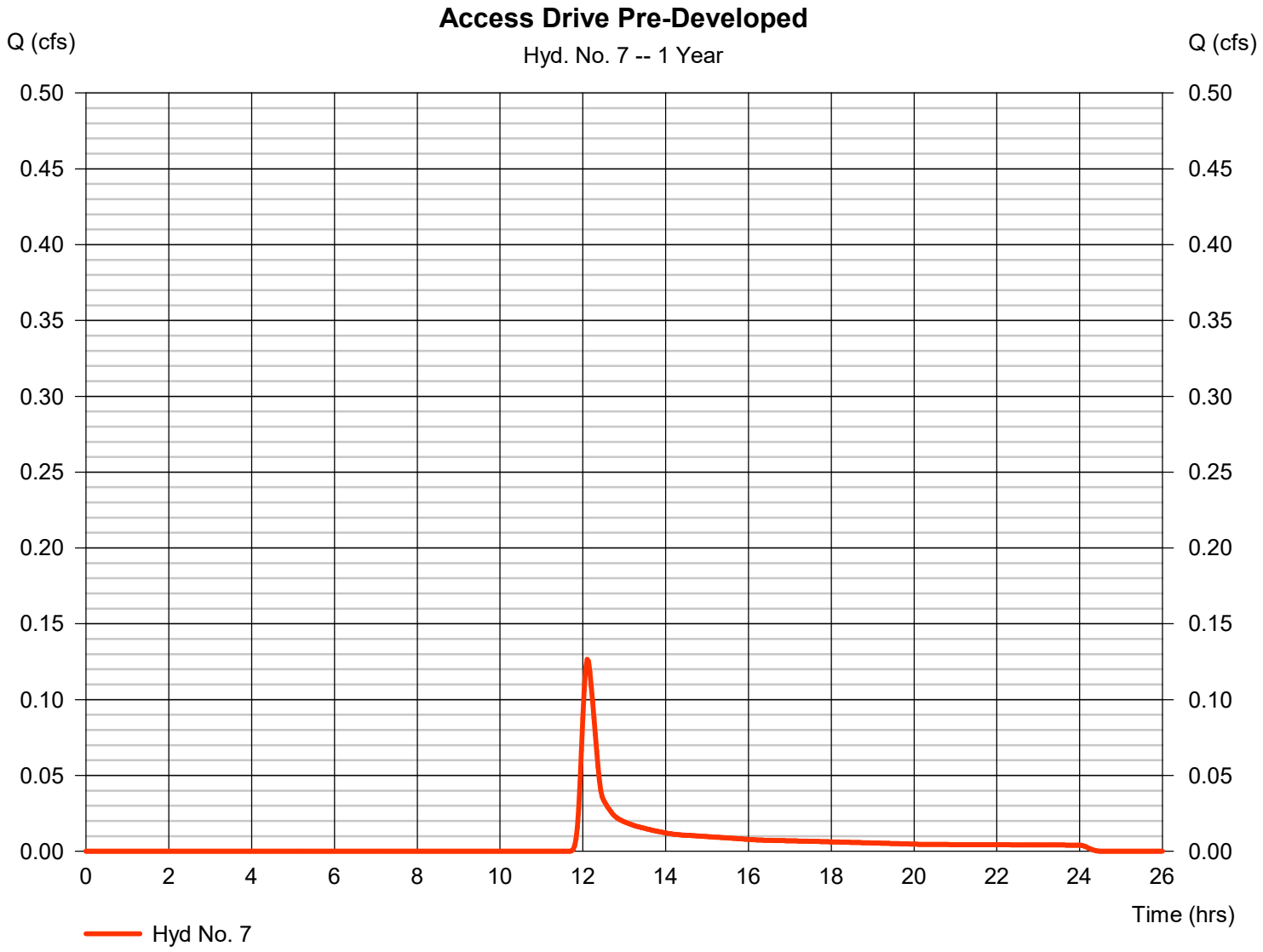
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 7

Access Drive Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.126 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 502 cuft
Drainage area	= 0.340 ac	Curve number	= 72.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



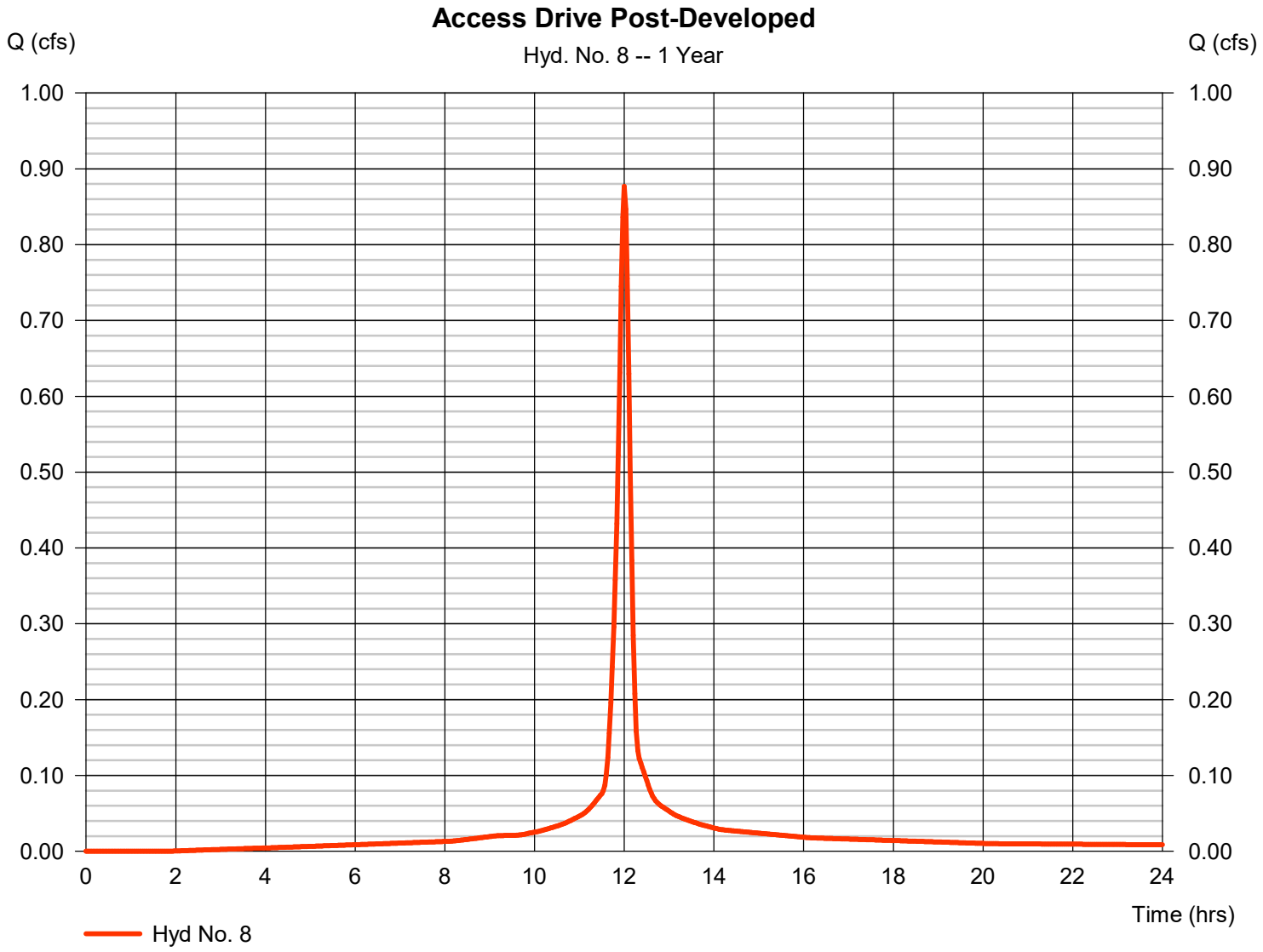
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 8

Access Drive Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.877 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 2,511 cuft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



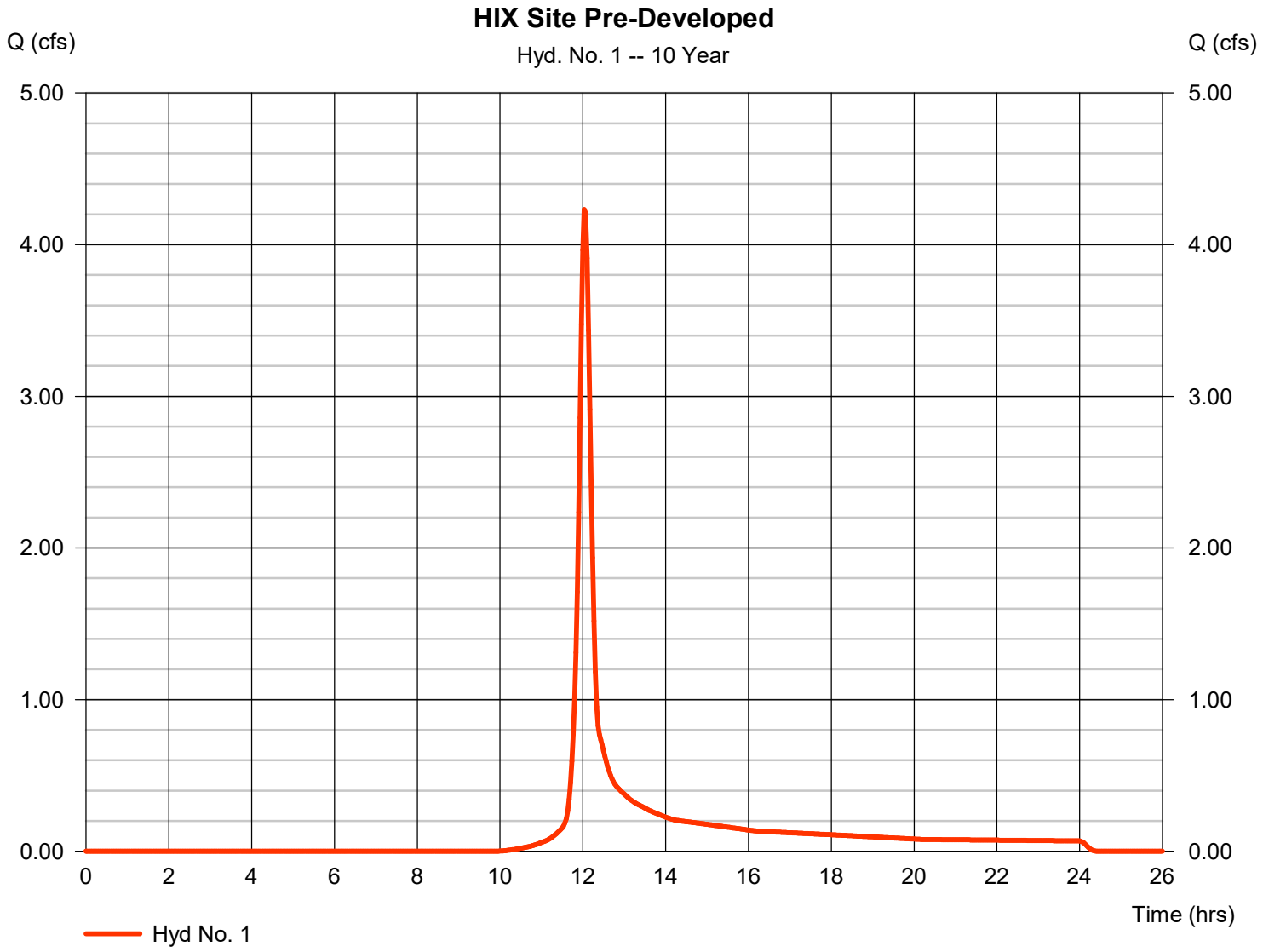
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 1

HIX Site Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 4.233 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 12,060 cuft
Drainage area	= 2.030 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



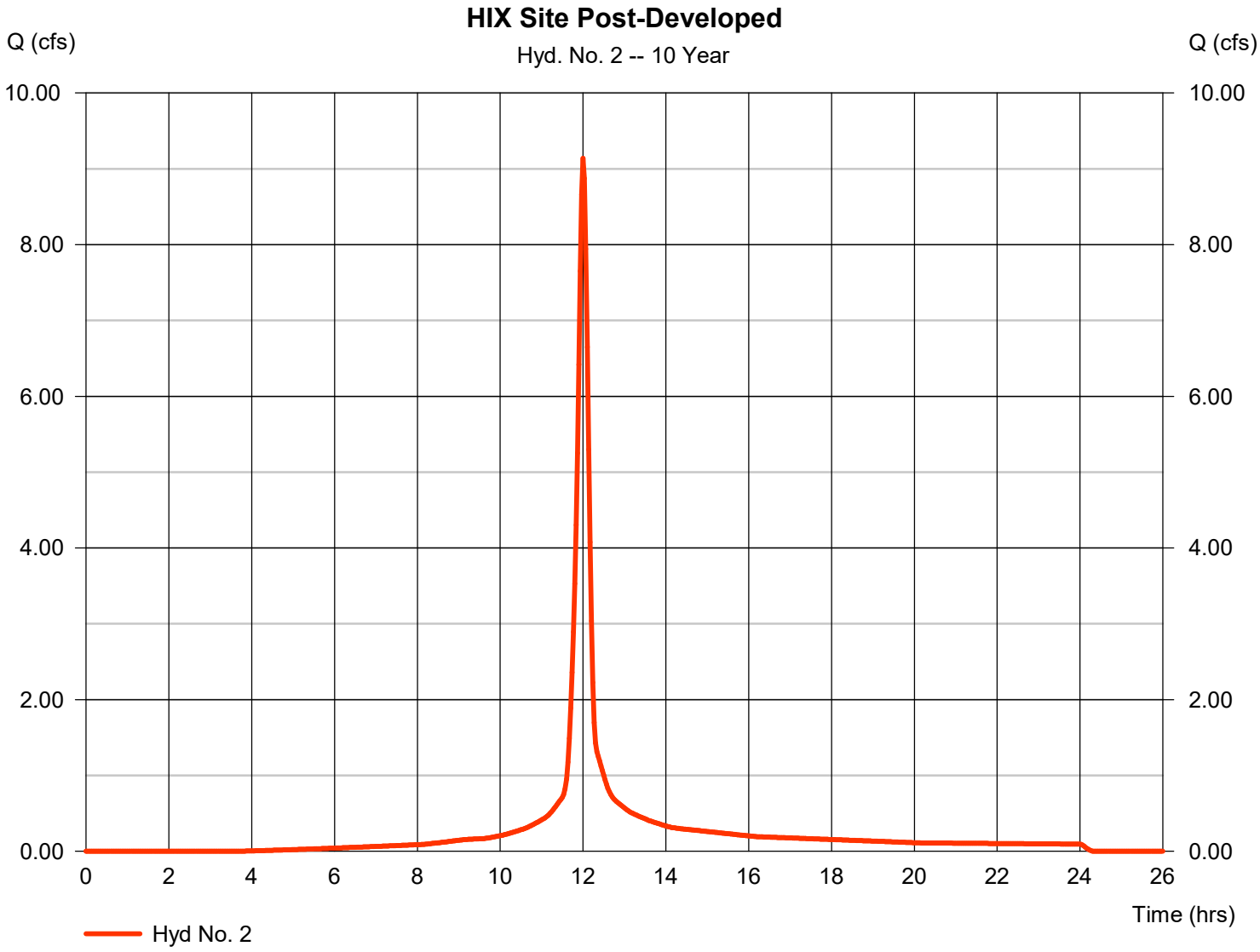
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 2

HIX Site Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 9.140 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 24,793 cuft
Drainage area	= 2.030 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

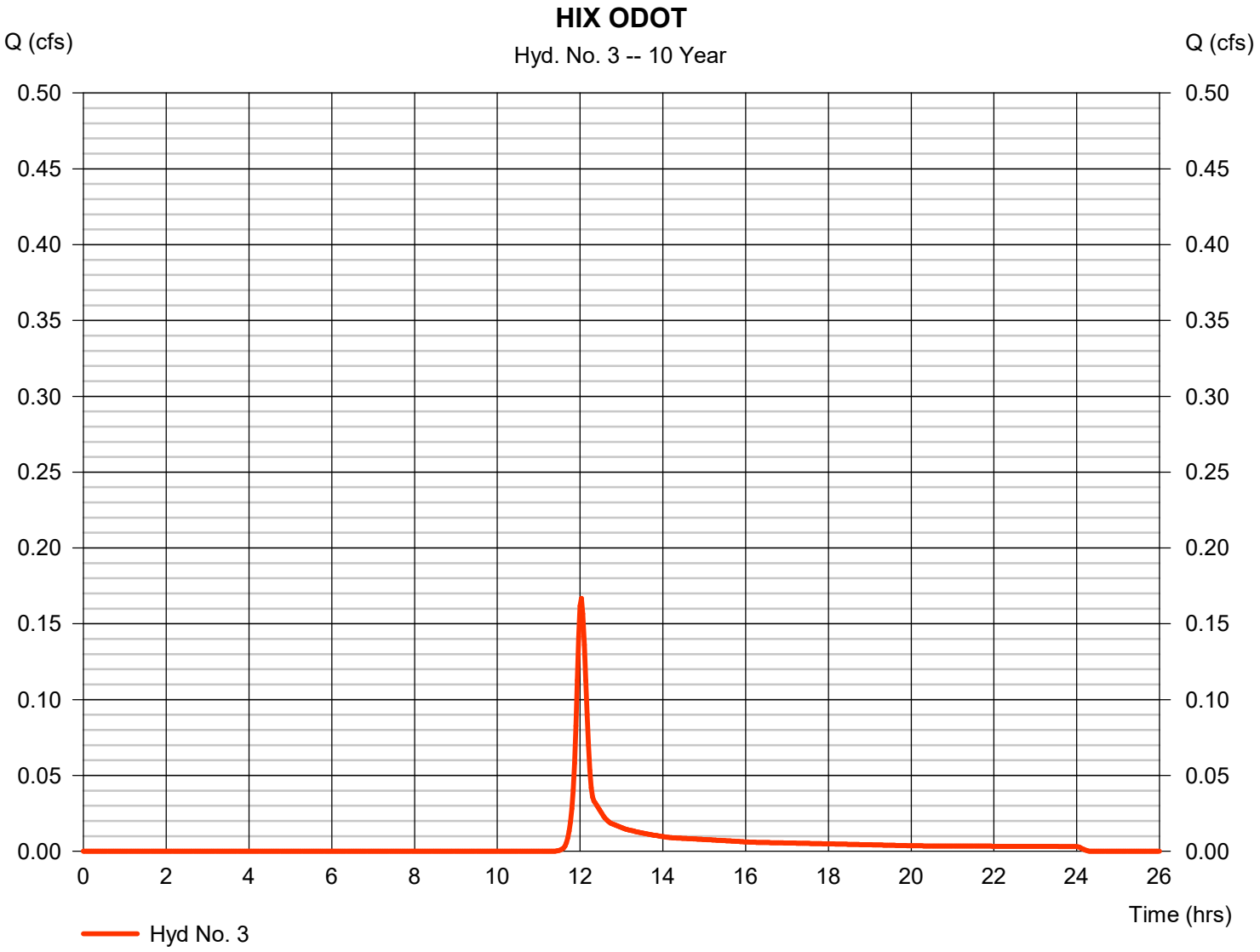


Hydrograph Report

Hyd. No. 3

HIX ODOT

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.167 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	460 cuft
Drainage area	=	0.110 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.15 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



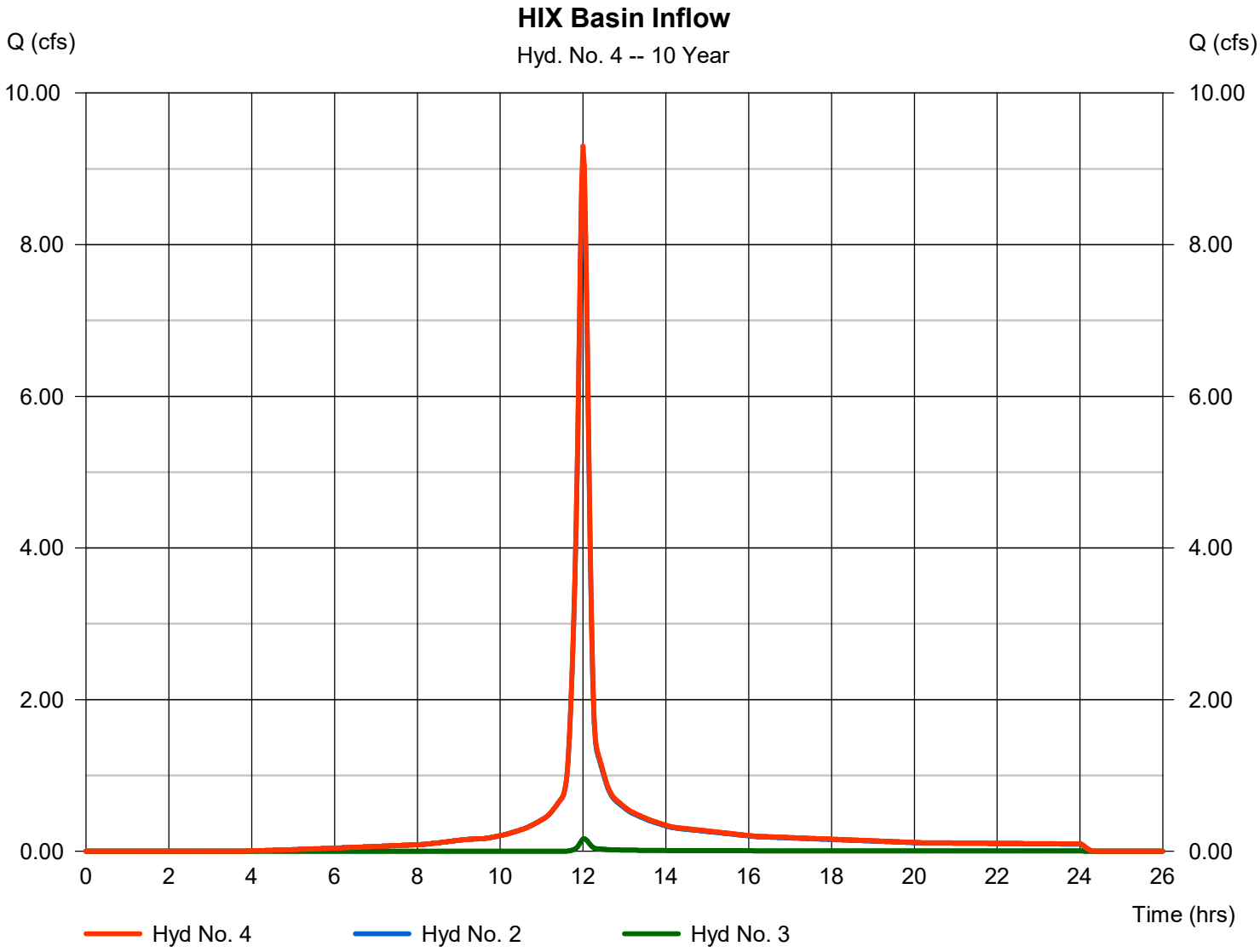
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 4

HIX Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 9.302 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 25,253 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.140 ac



Hydrograph Report

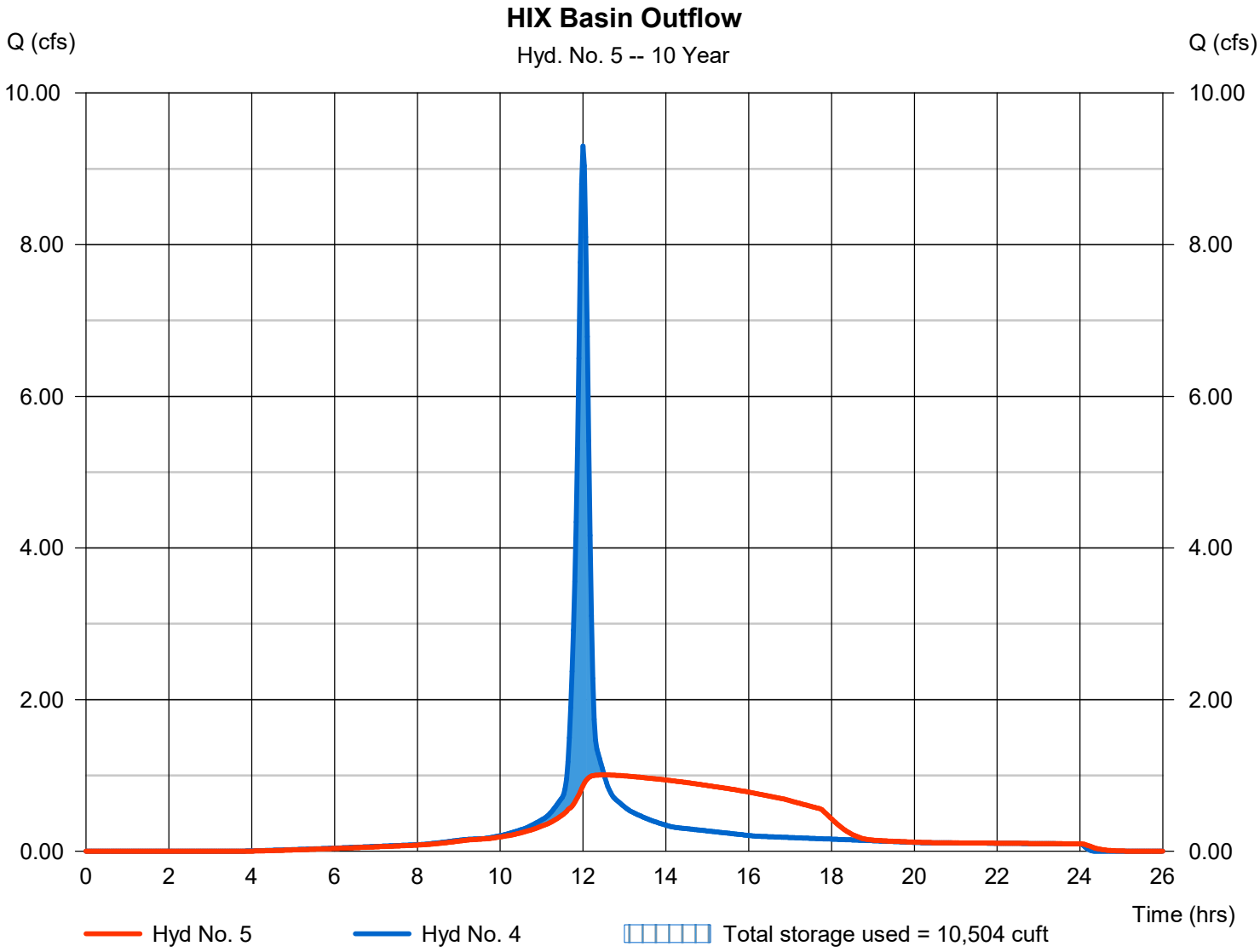
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 5

HIX Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	1.007 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	25,252 cuft
Inflow hyd. No.	=	4 - HIX Basin Inflow	Max. Elevation	=	893.10 ft
Reservoir name	=	HIX Pond	Max. Storage	=	10,504 cuft

Storage Indication method used.



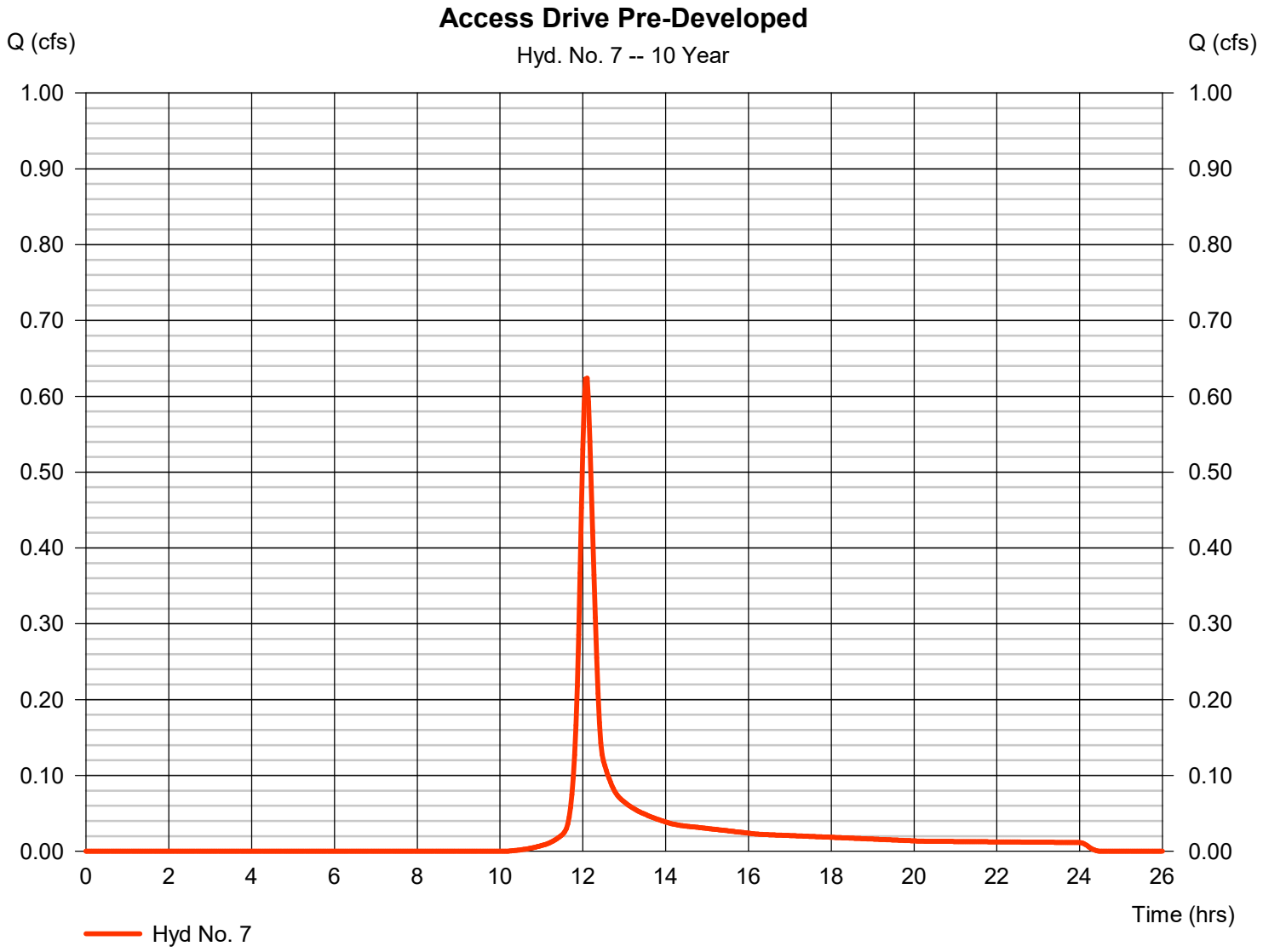
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 7

Access Drive Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.624 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 2,002 cuft
Drainage area	= 0.340 ac	Curve number	= 72.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



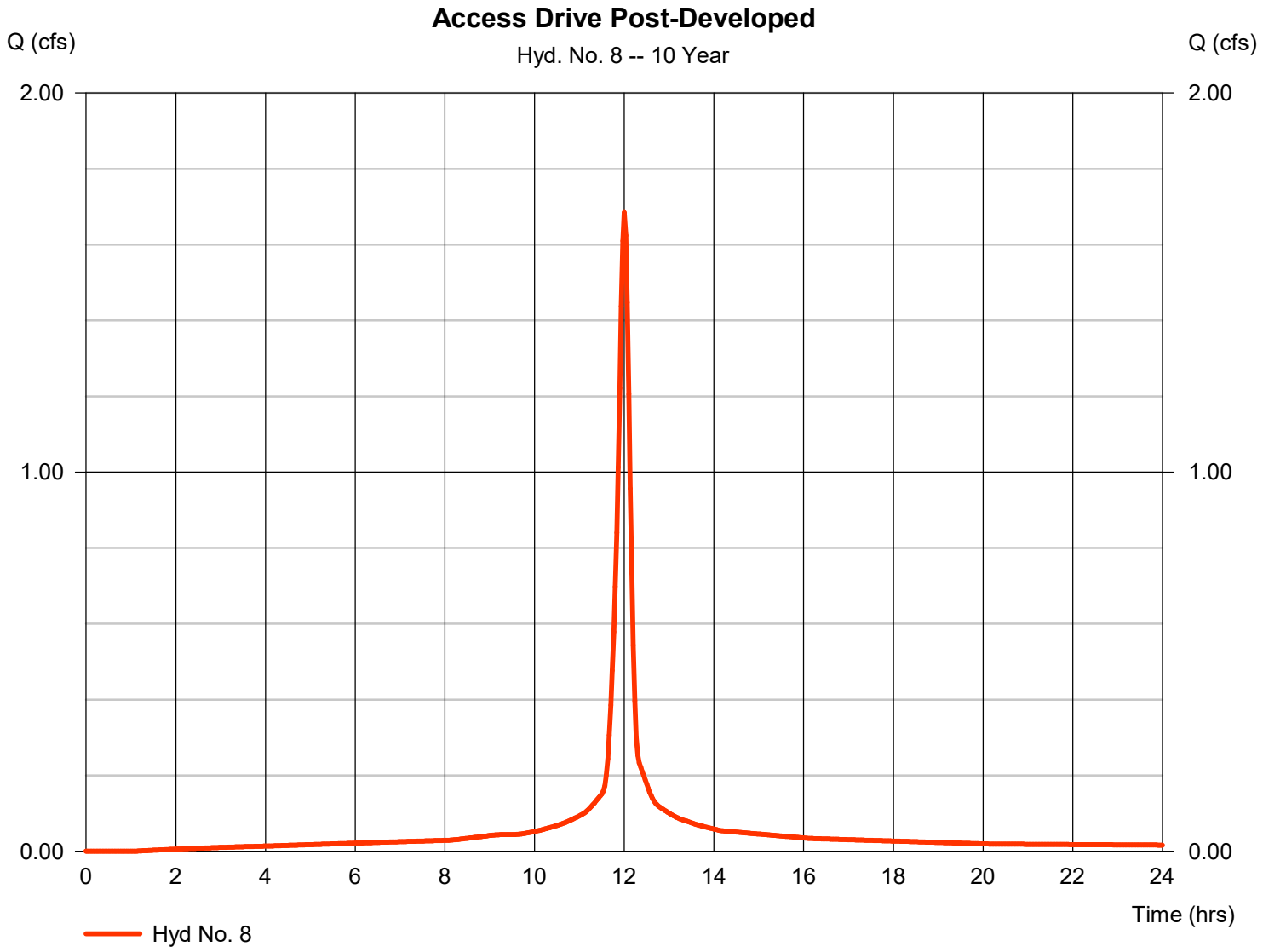
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 8

Access Drive Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 1.684 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,983 cuft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.15 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



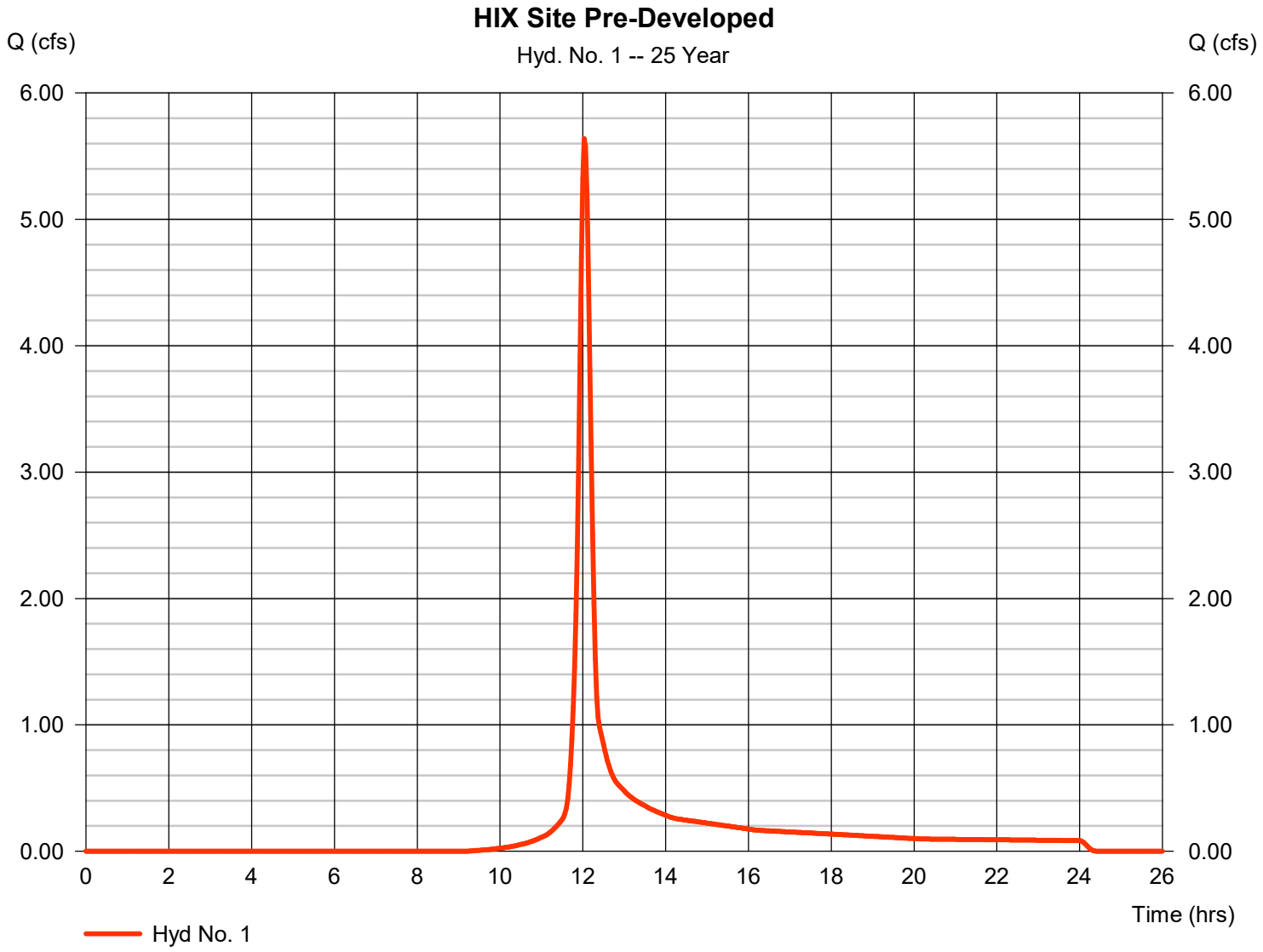
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 1

HIX Site Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 5.638 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 15,895 cuft
Drainage area	= 2.030 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



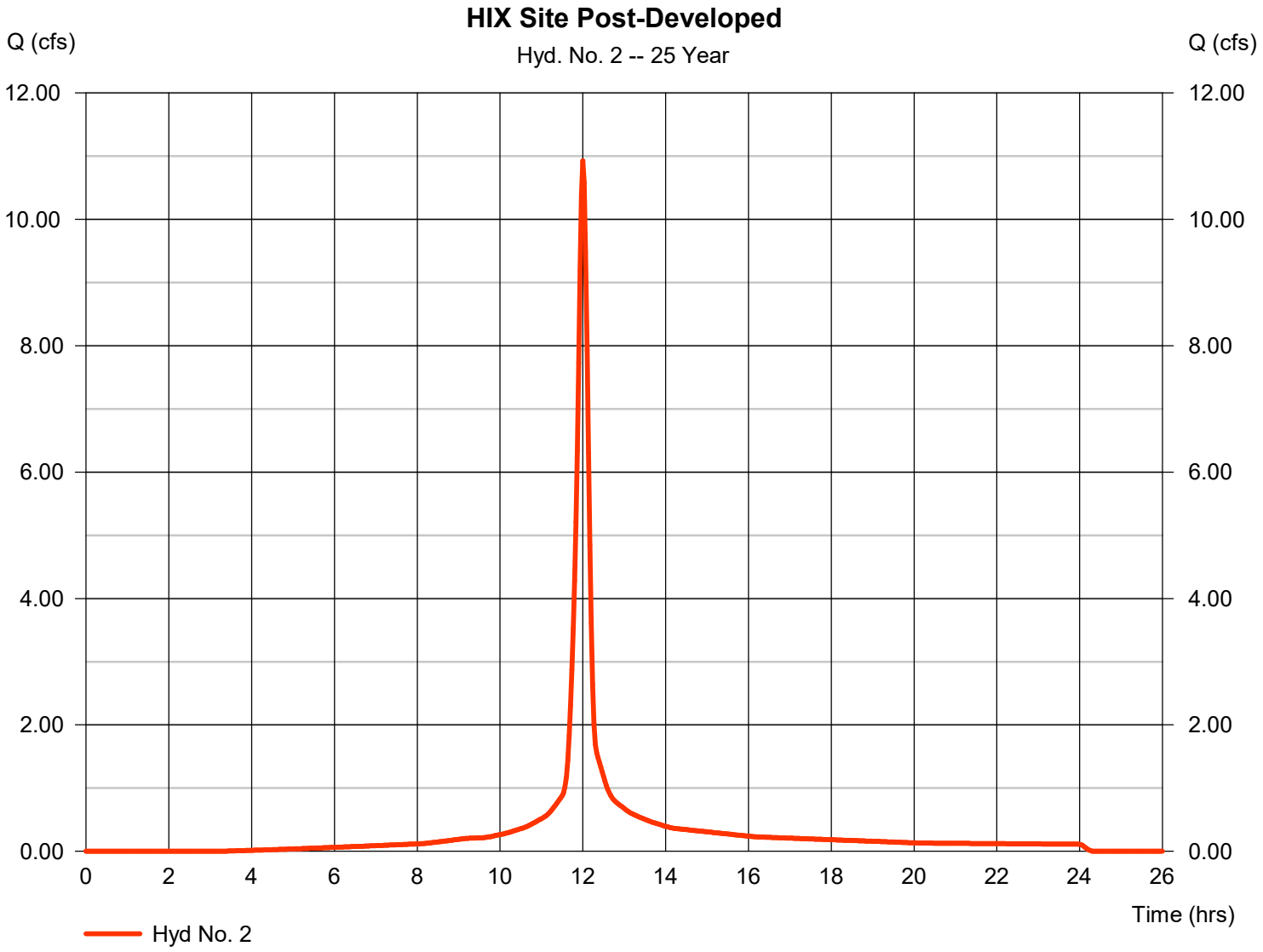
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 2

HIX Site Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 10.93 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 29,963 cuft
Drainage area	= 2.030 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



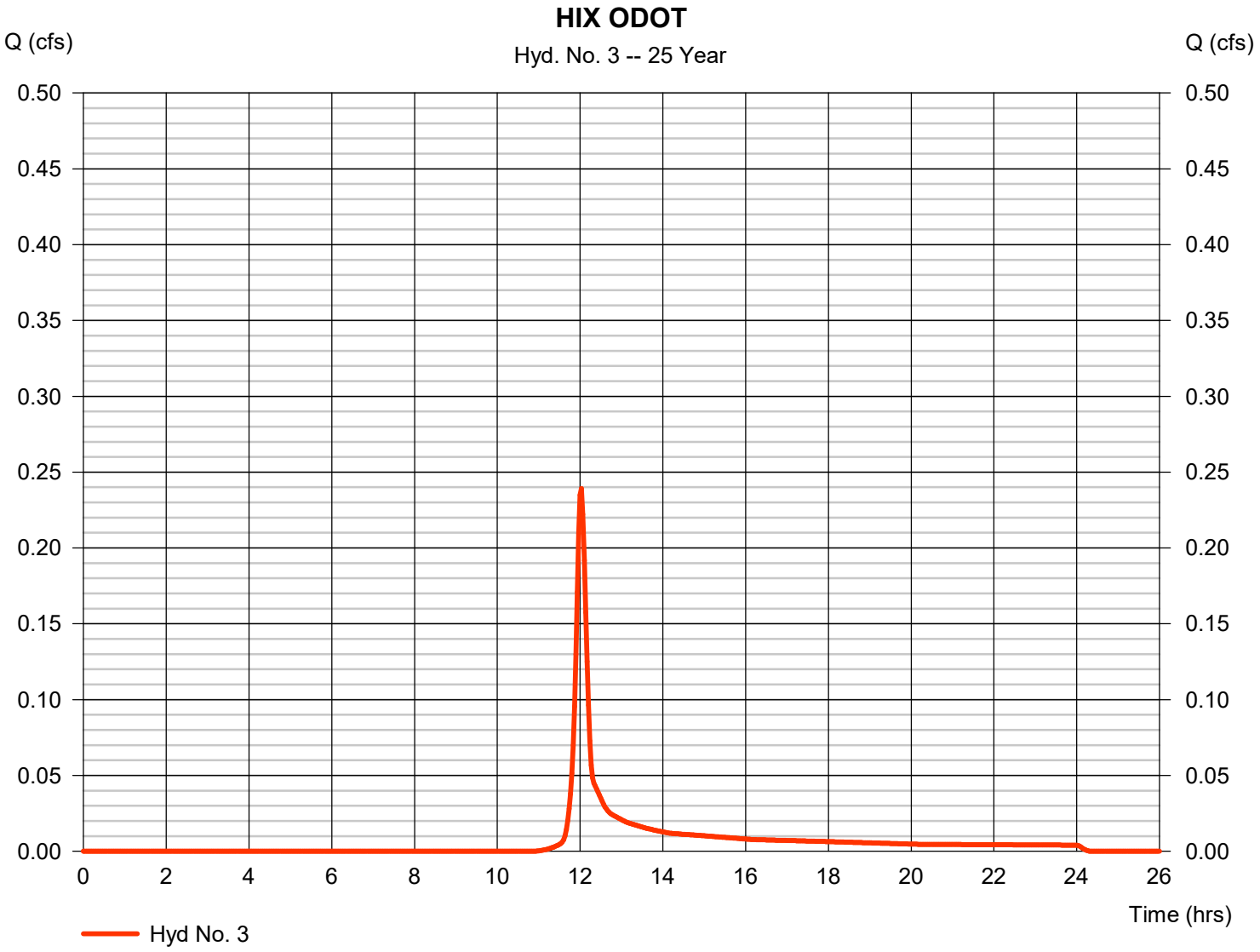
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 3

HIX ODOT

Hydrograph type	= SCS Runoff	Peak discharge	= 0.239 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 640 cuft
Drainage area	= 0.110 ac	Curve number	= 65
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



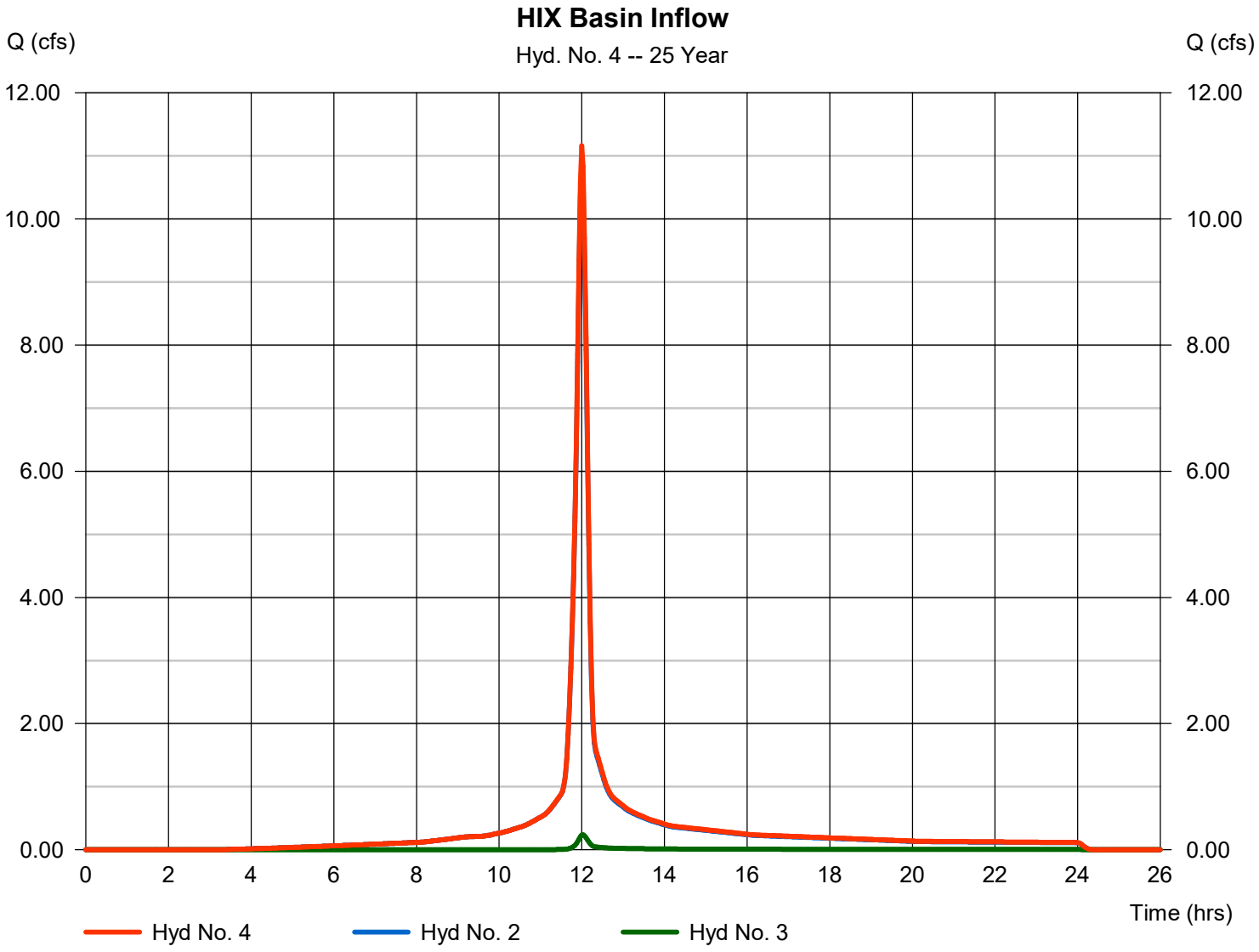
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 4

HIX Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 11.16 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 30,603 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.140 ac



Hydrograph Report

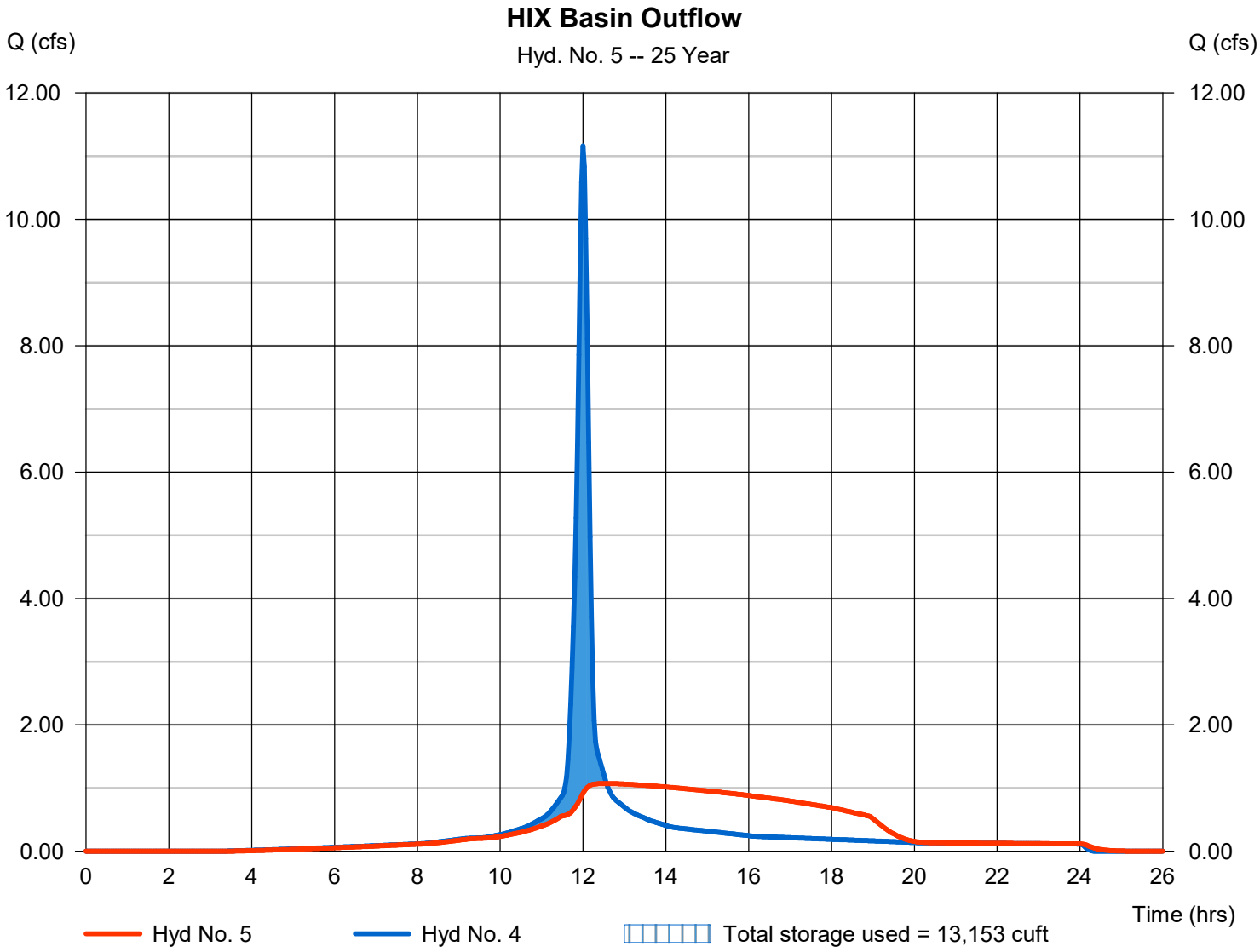
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 5

HIX Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	1.072 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.57 hrs
Time interval	=	2 min	Hyd. volume	=	30,602 cuft
Inflow hyd. No.	=	4 - HIX Basin Inflow	Max. Elevation	=	893.89 ft
Reservoir name	=	HIX Pond	Max. Storage	=	13,153 cuft

Storage Indication method used.



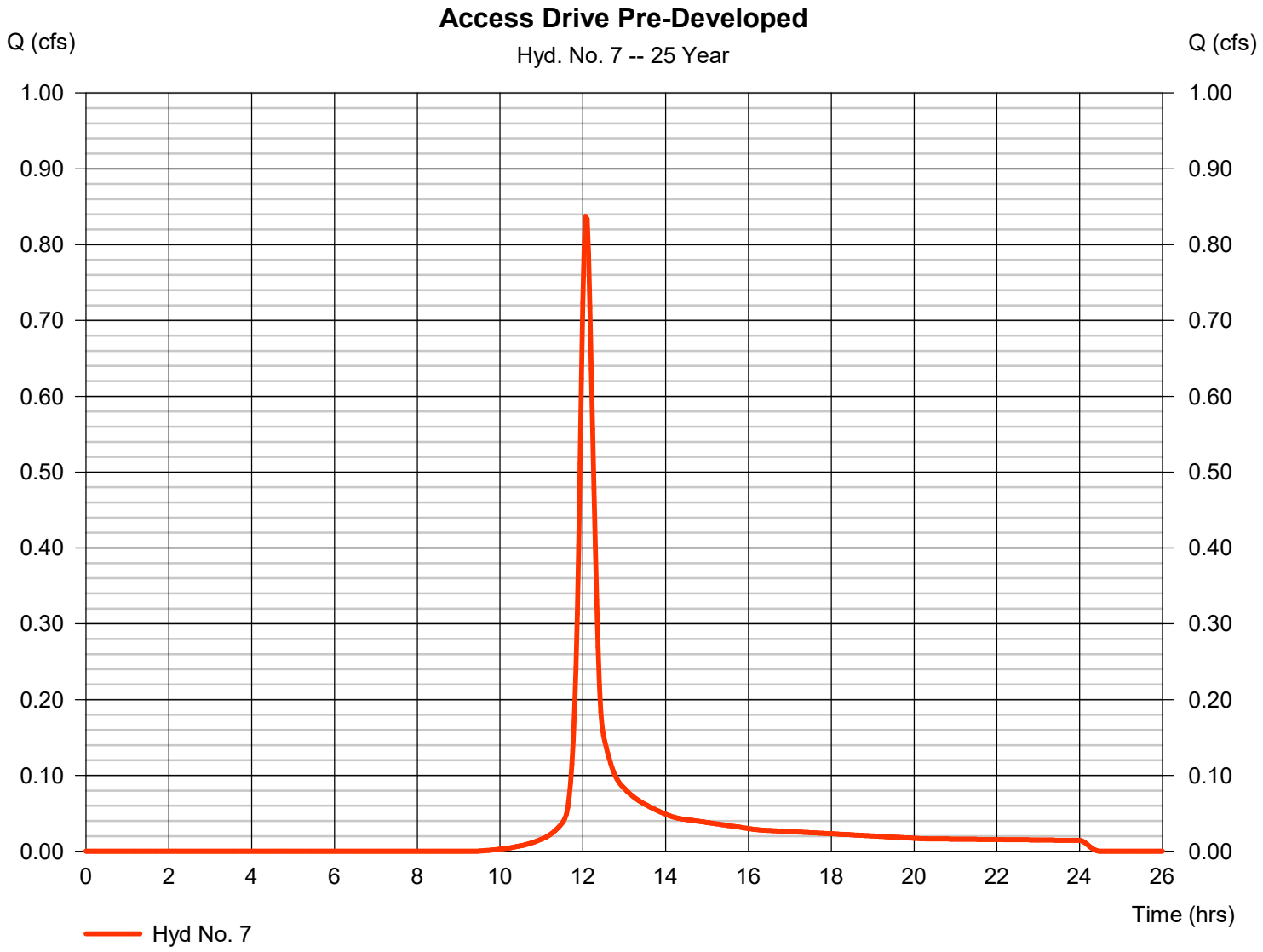
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 7

Access Drive Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.837 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 2,650 cuft
Drainage area	= 0.340 ac	Curve number	= 72.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 4.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



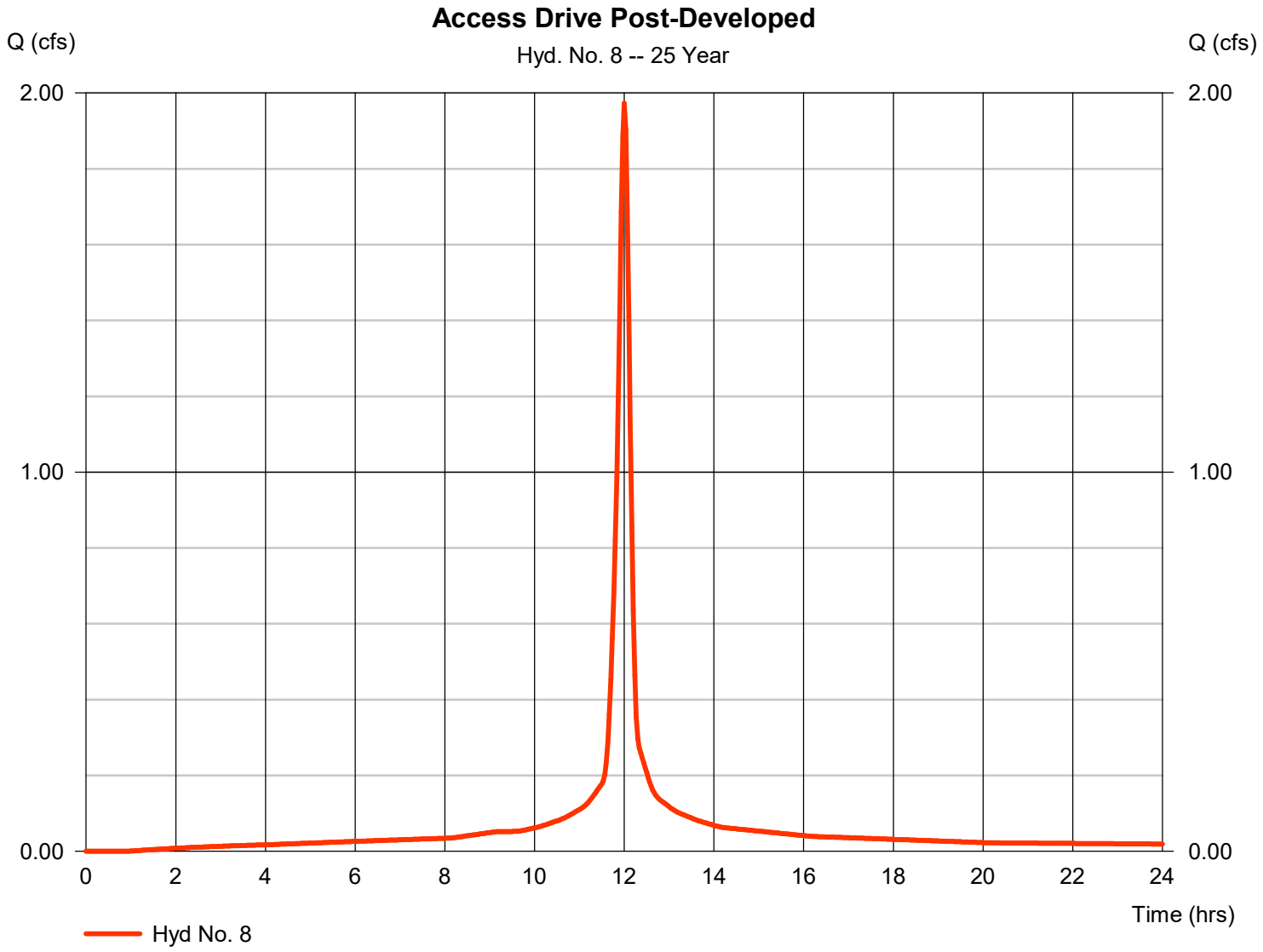
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 8

Access Drive Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.973 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	5,872 cuft
Drainage area	=	0.340 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	4.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



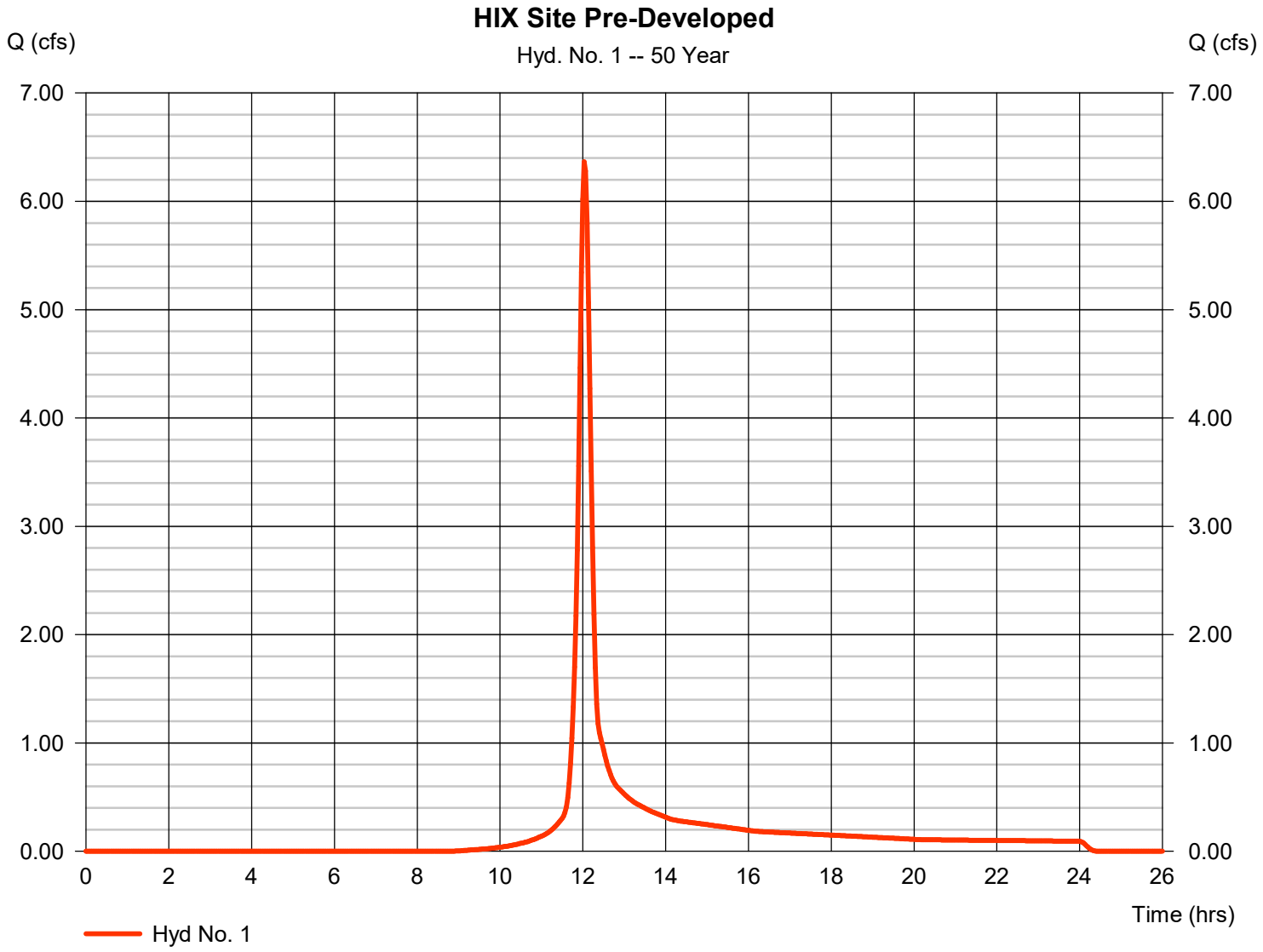
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 1

HIX Site Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 6.364 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 17,890 cuft
Drainage area	= 2.030 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



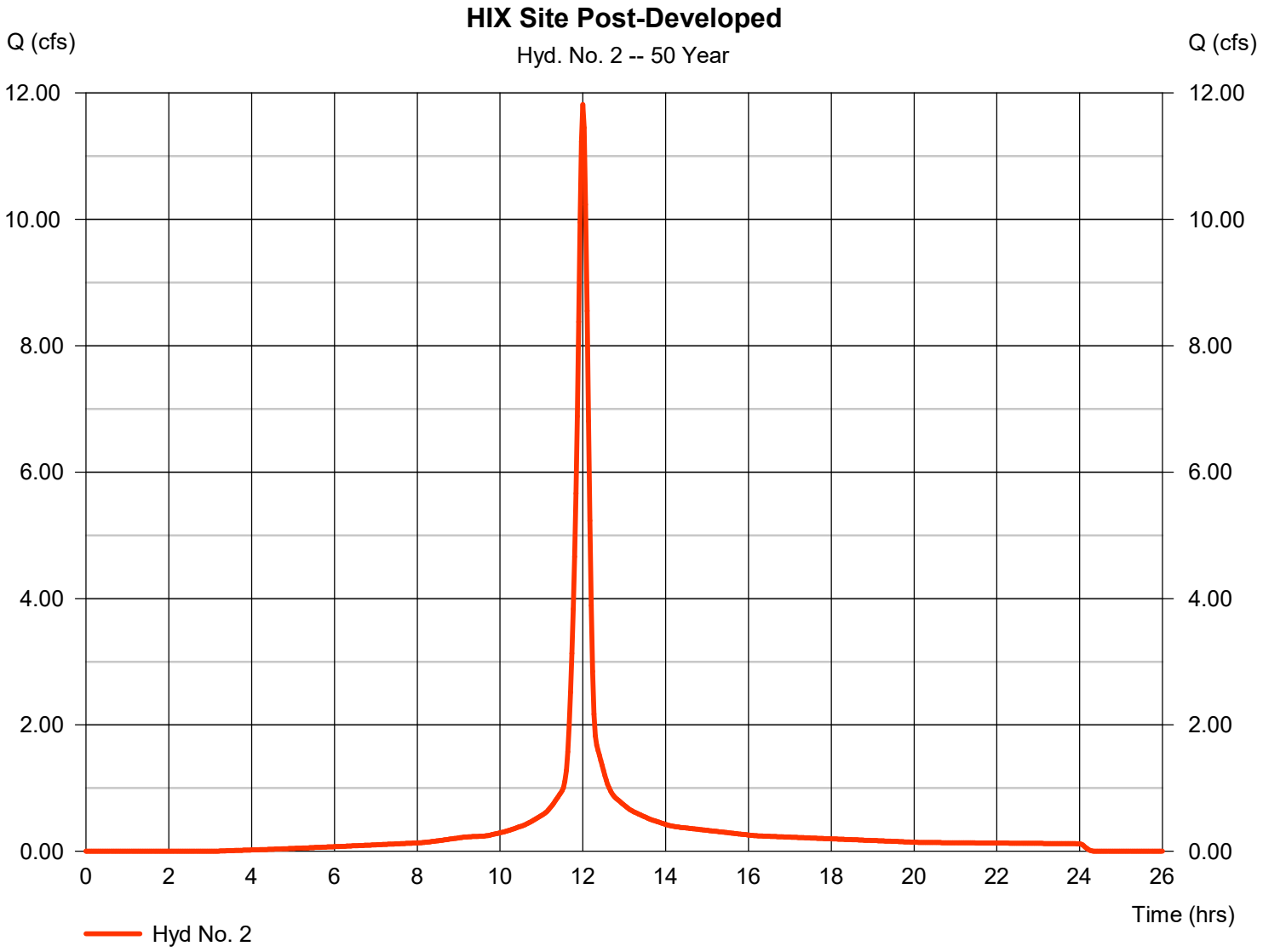
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 2

HIX Site Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 11.82 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 32,561 cuft
Drainage area	= 2.030 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



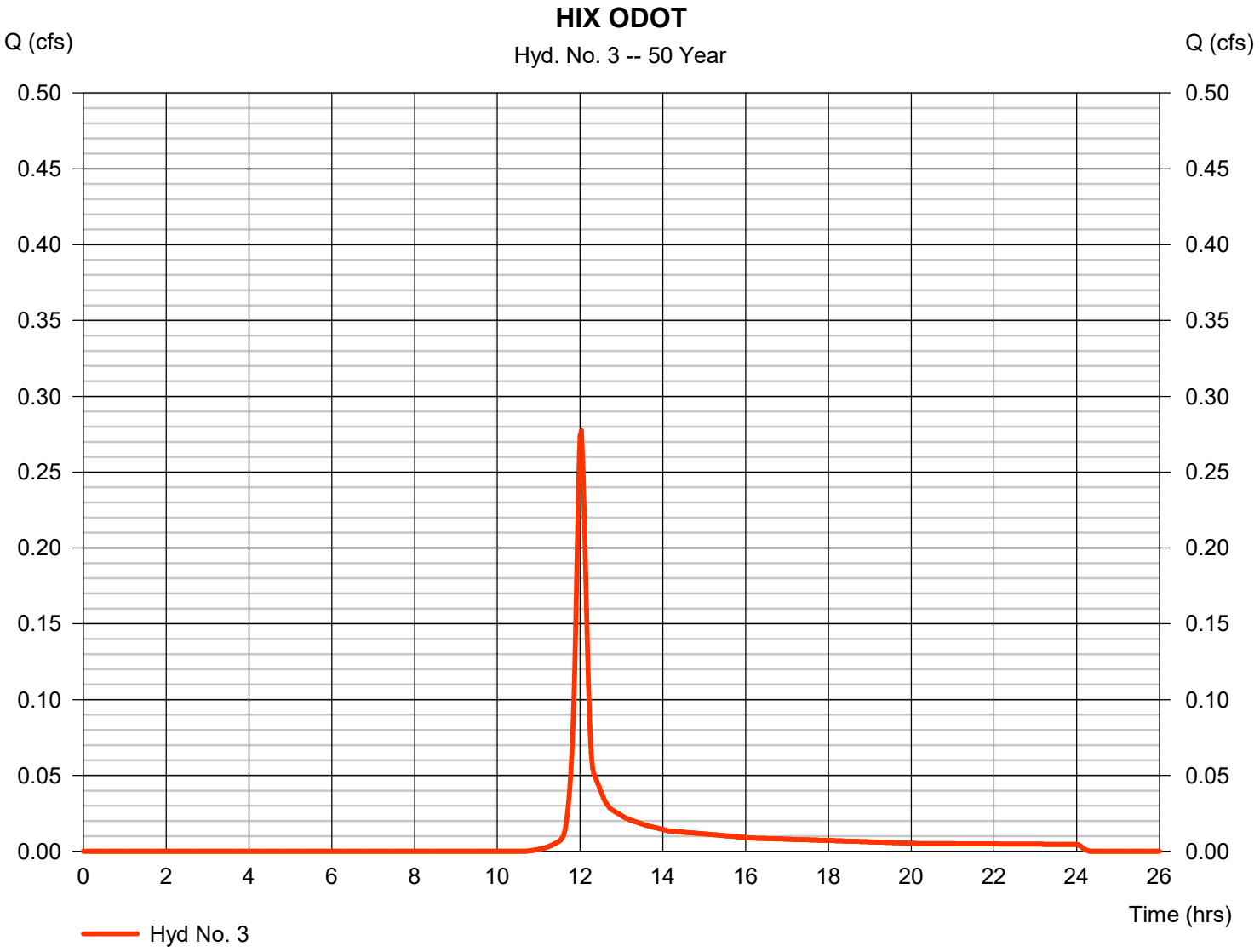
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 3

HIX ODOT

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.277 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	736 cuft
Drainage area	=	0.110 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



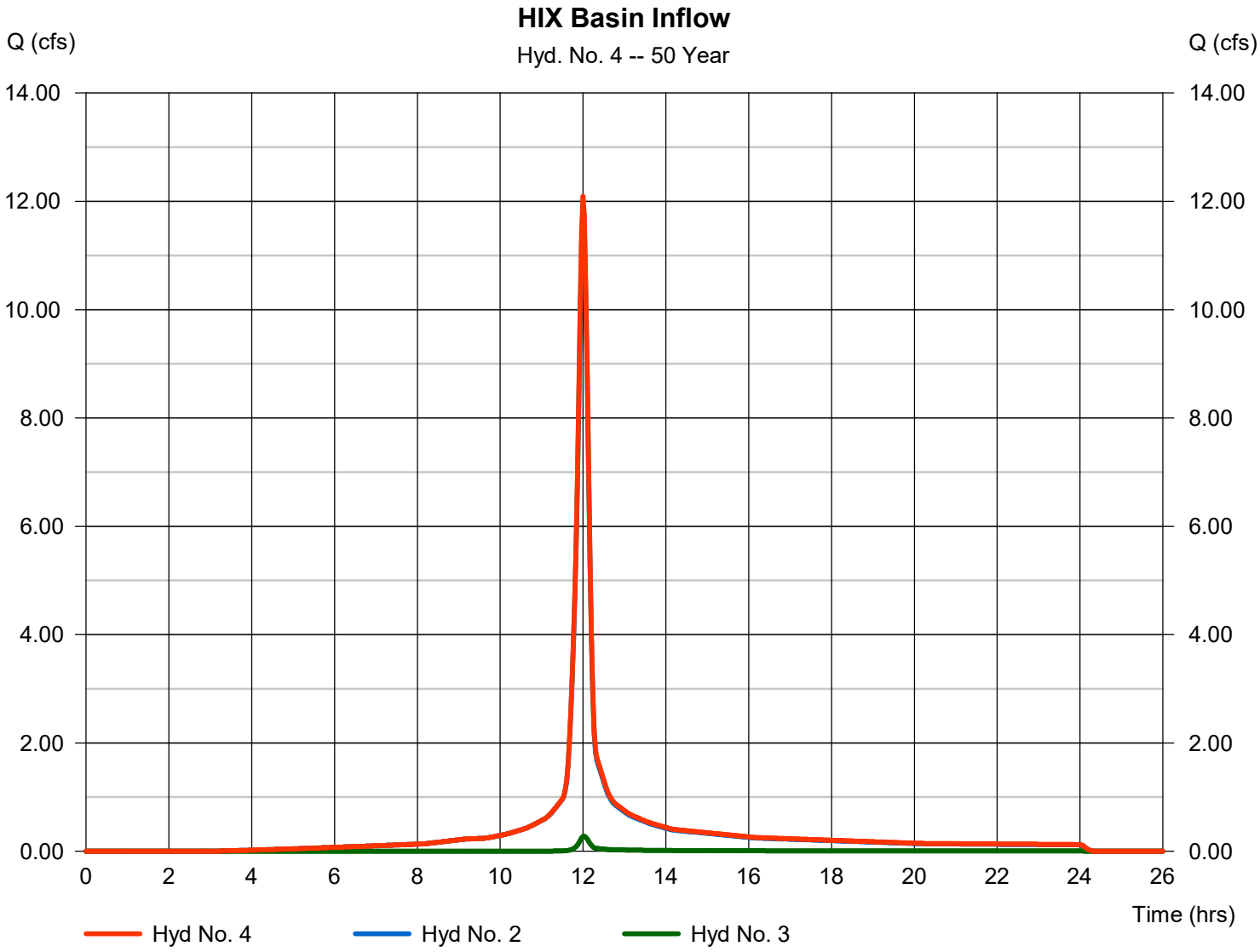
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 4

HIX Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 12.09 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 33,297 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.140 ac



Hydrograph Report

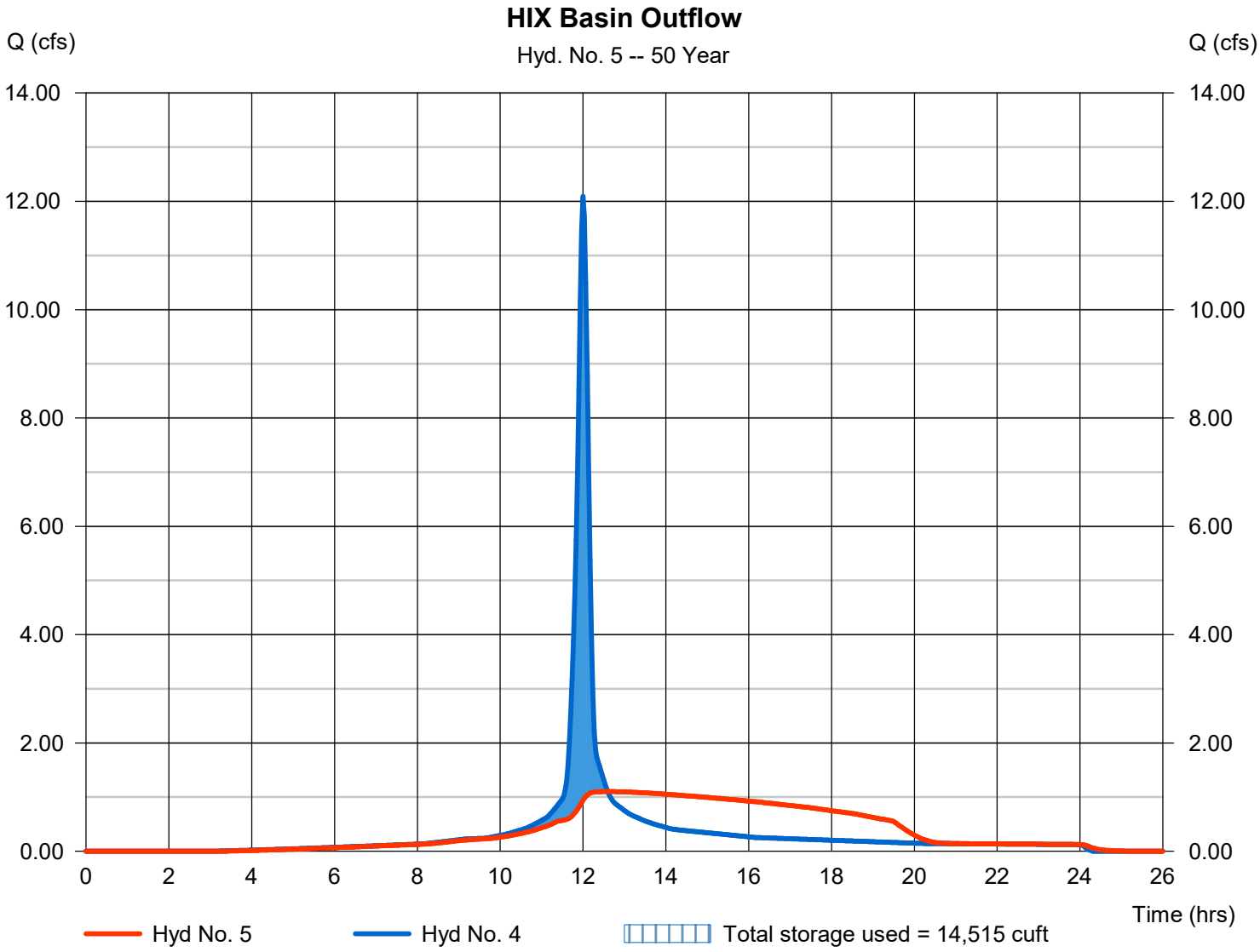
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 5

HIX Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	1.102 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.60 hrs
Time interval	=	2 min	Hyd. volume	=	33,296 cuft
Inflow hyd. No.	=	4 - HIX Basin Inflow	Max. Elevation	=	894.27 ft
Reservoir name	=	HIX Pond	Max. Storage	=	14,515 cuft

Storage Indication method used.



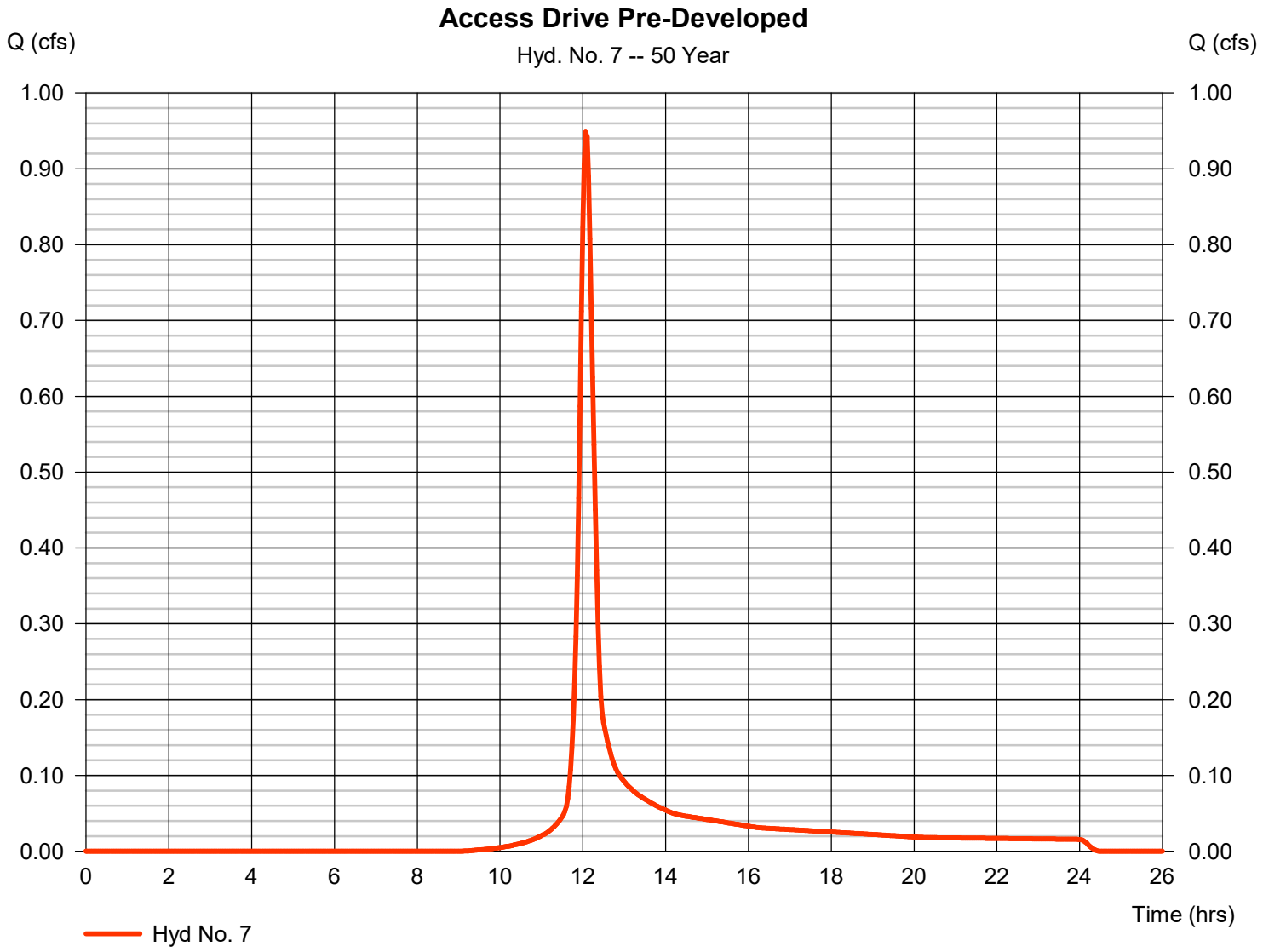
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 7

Access Drive Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.948 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 2,988 cuft
Drainage area	= 0.340 ac	Curve number	= 72.8
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



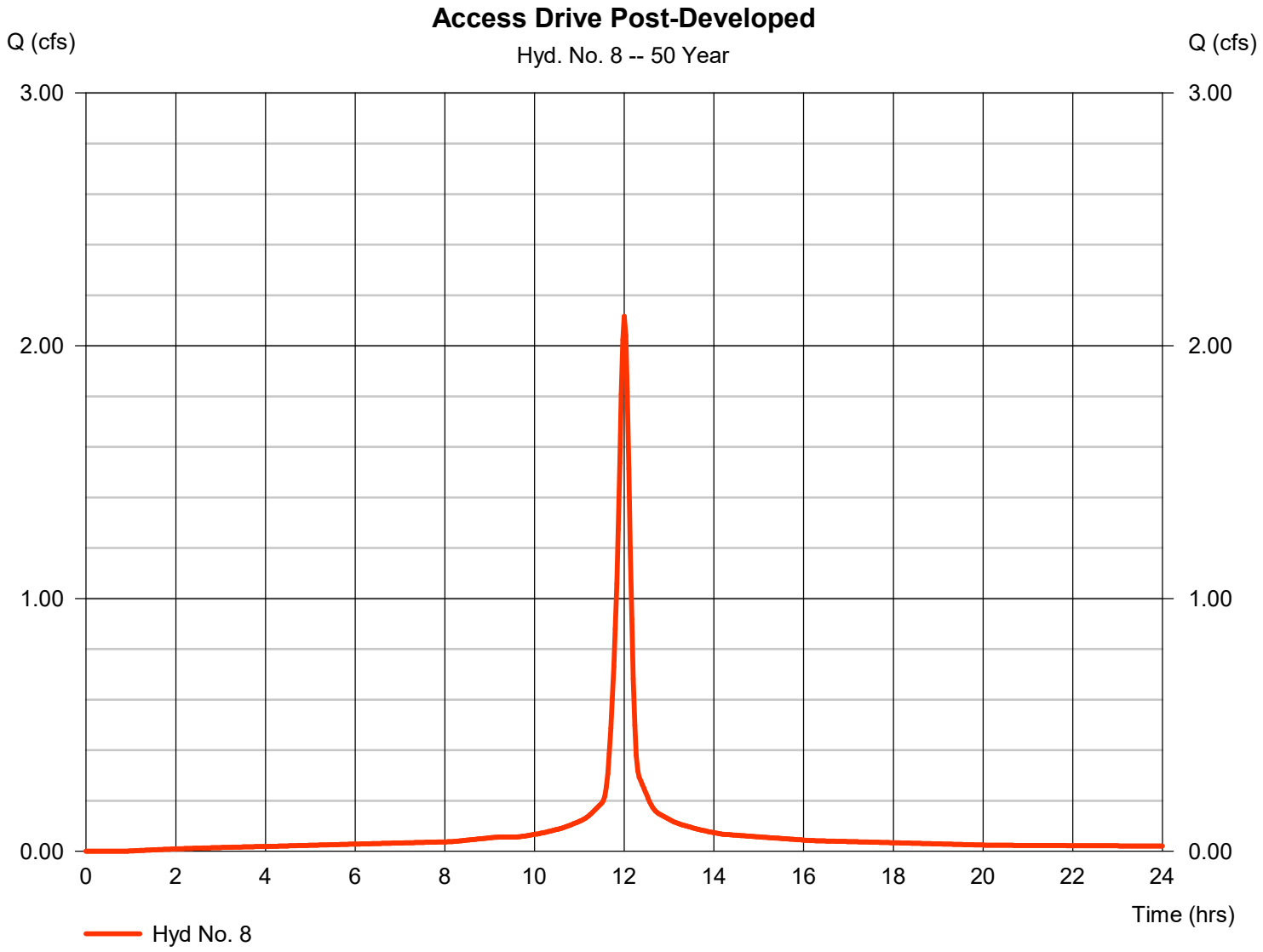
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 8

Access Drive Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 2.117 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 6,317 cuft
Drainage area	= 0.340 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



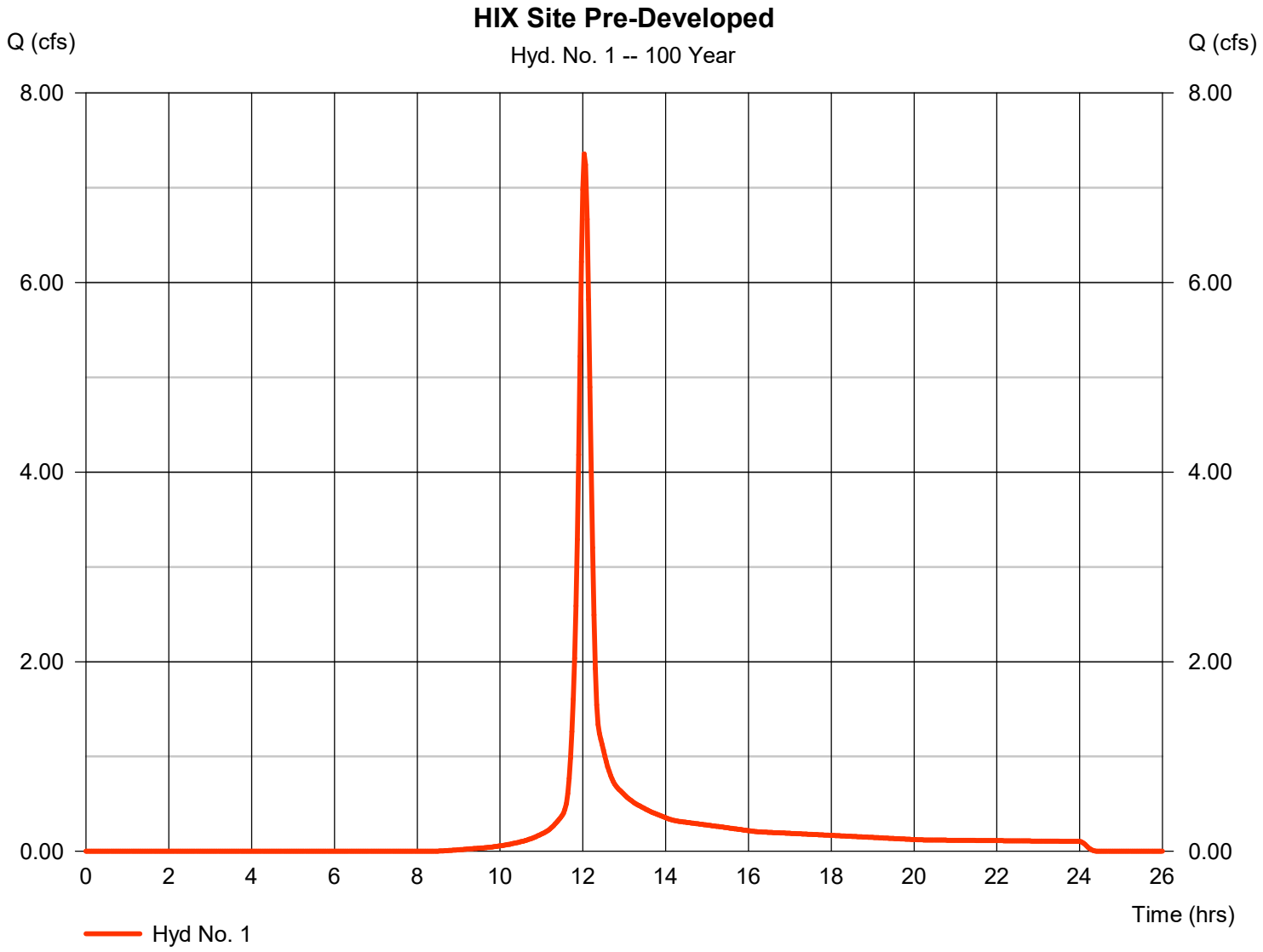
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 1

HIX Site Pre-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 7.356 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 20,637 cuft
Drainage area	= 2.030 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.67 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

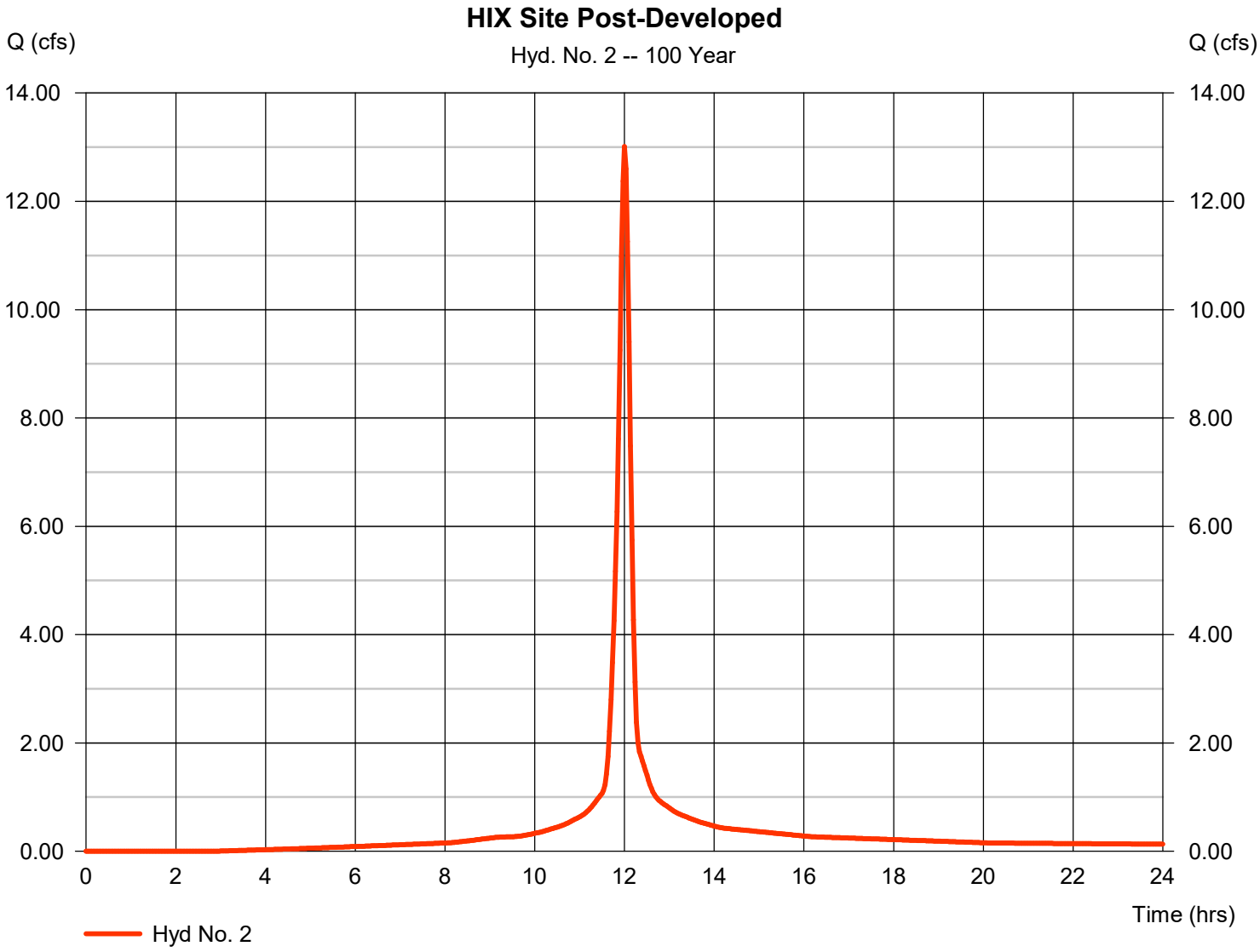


Hydrograph Report

Hyd. No. 2

HIX Site Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.01 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	36,060 cuft
Drainage area	=	2.030 ac	Curve number	=	92
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



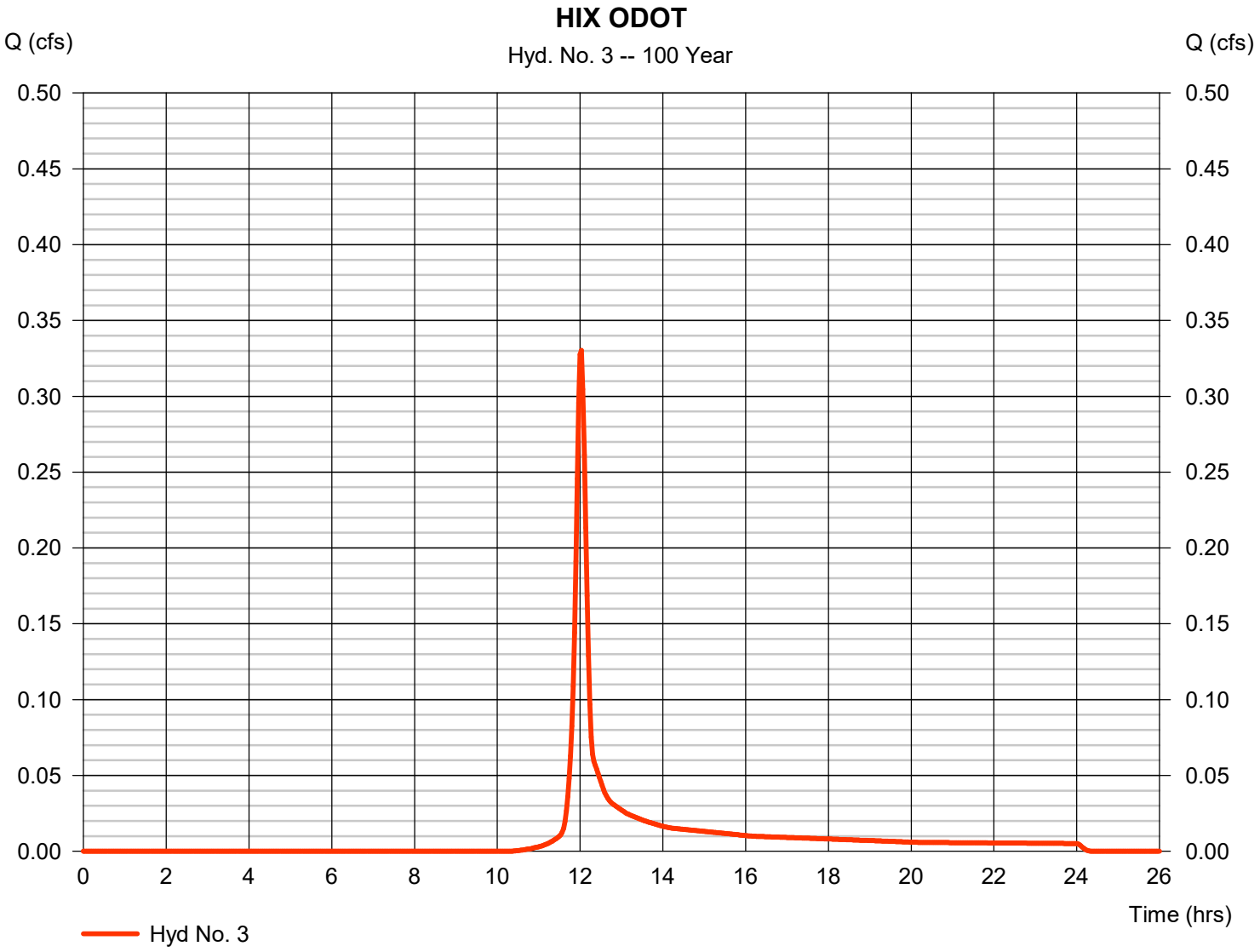
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 3

HIX ODOT

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.330 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	871 cuft
Drainage area	=	0.110 ac	Curve number	=	65
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



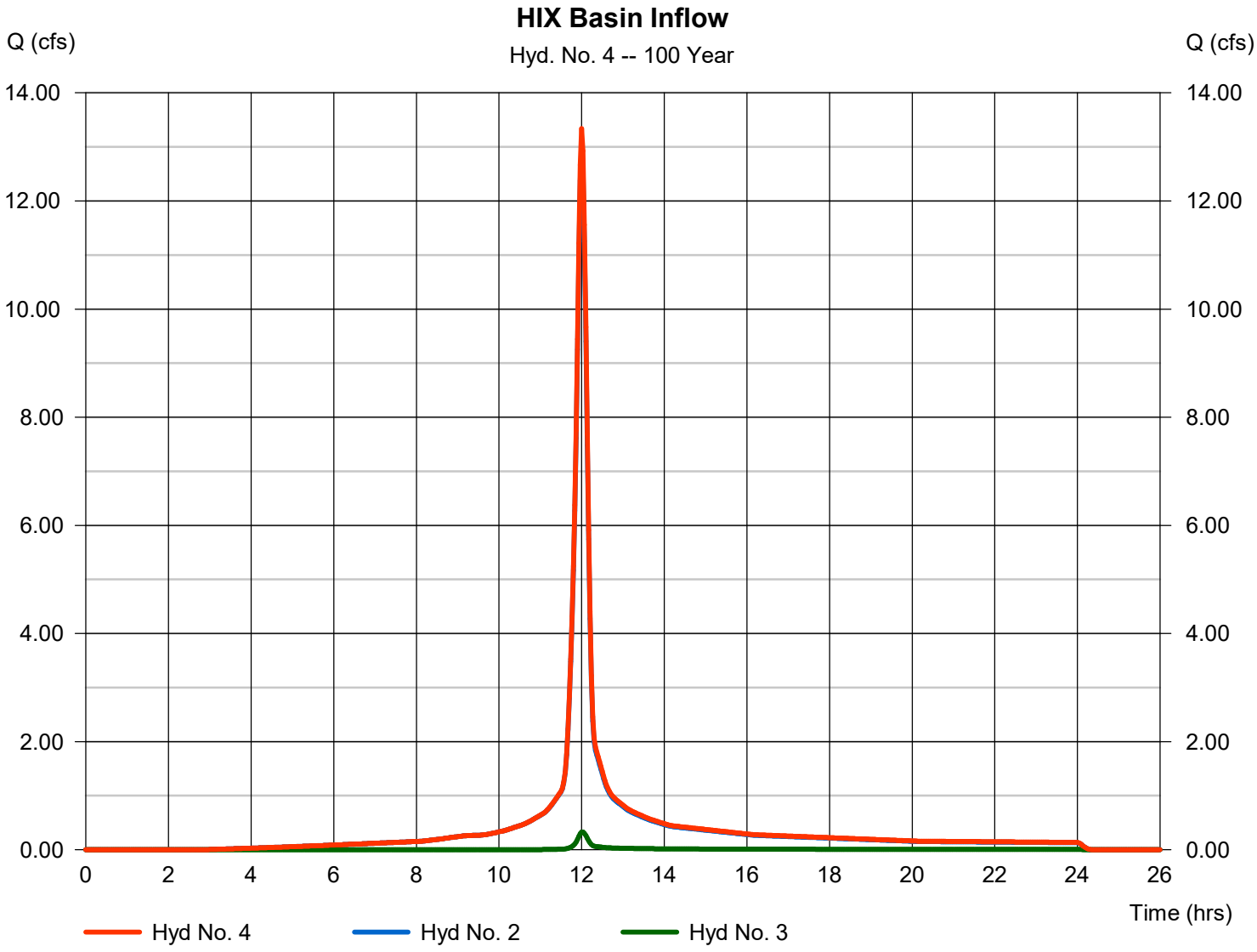
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 4

HIX Basin Inflow

Hydrograph type	= Combine	Peak discharge	= 13.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 36,931 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 2.140 ac



Hydrograph Report

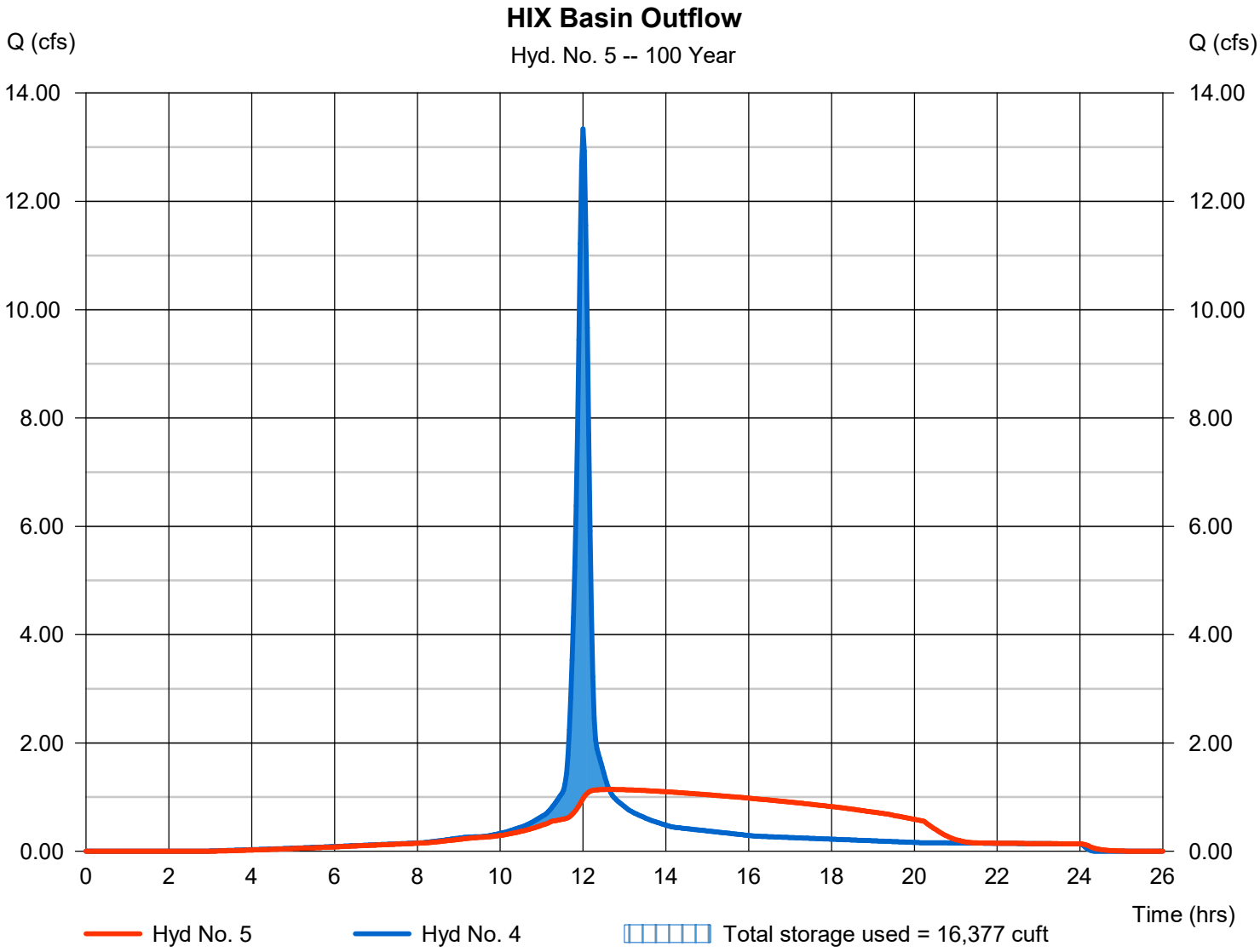
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 5

HIX Basin Outflow

Hydrograph type	=	Reservoir	Peak discharge	=	1.141 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.63 hrs
Time interval	=	2 min	Hyd. volume	=	36,930 cuft
Inflow hyd. No.	=	4 - HIX Basin Inflow	Max. Elevation	=	894.77 ft
Reservoir name	=	HIX Pond	Max. Storage	=	16,377 cuft

Storage Indication method used.



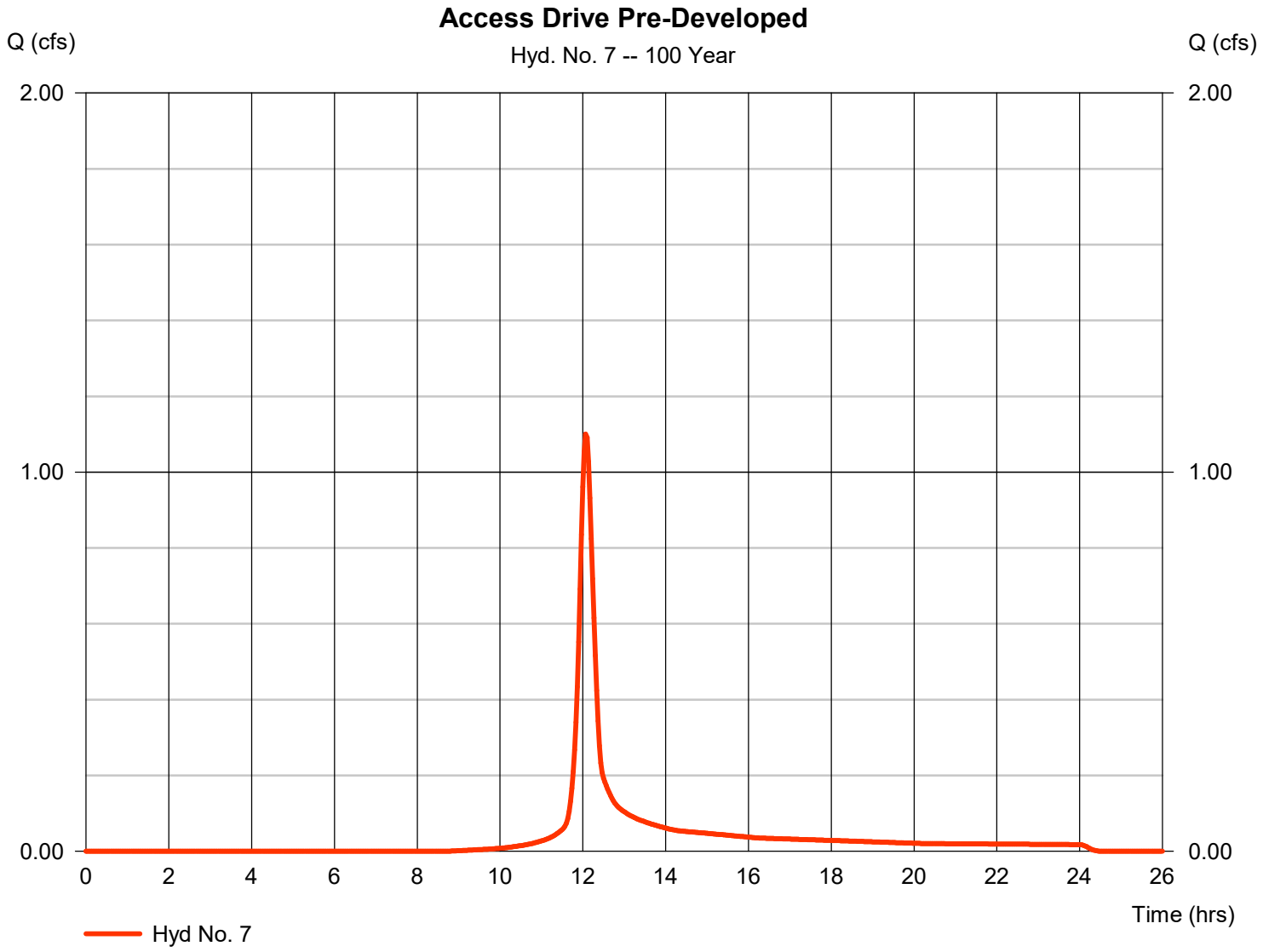
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 7

Access Drive Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.101 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	3,454 cuft
Drainage area	=	0.340 ac	Curve number	=	72.8
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	19.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



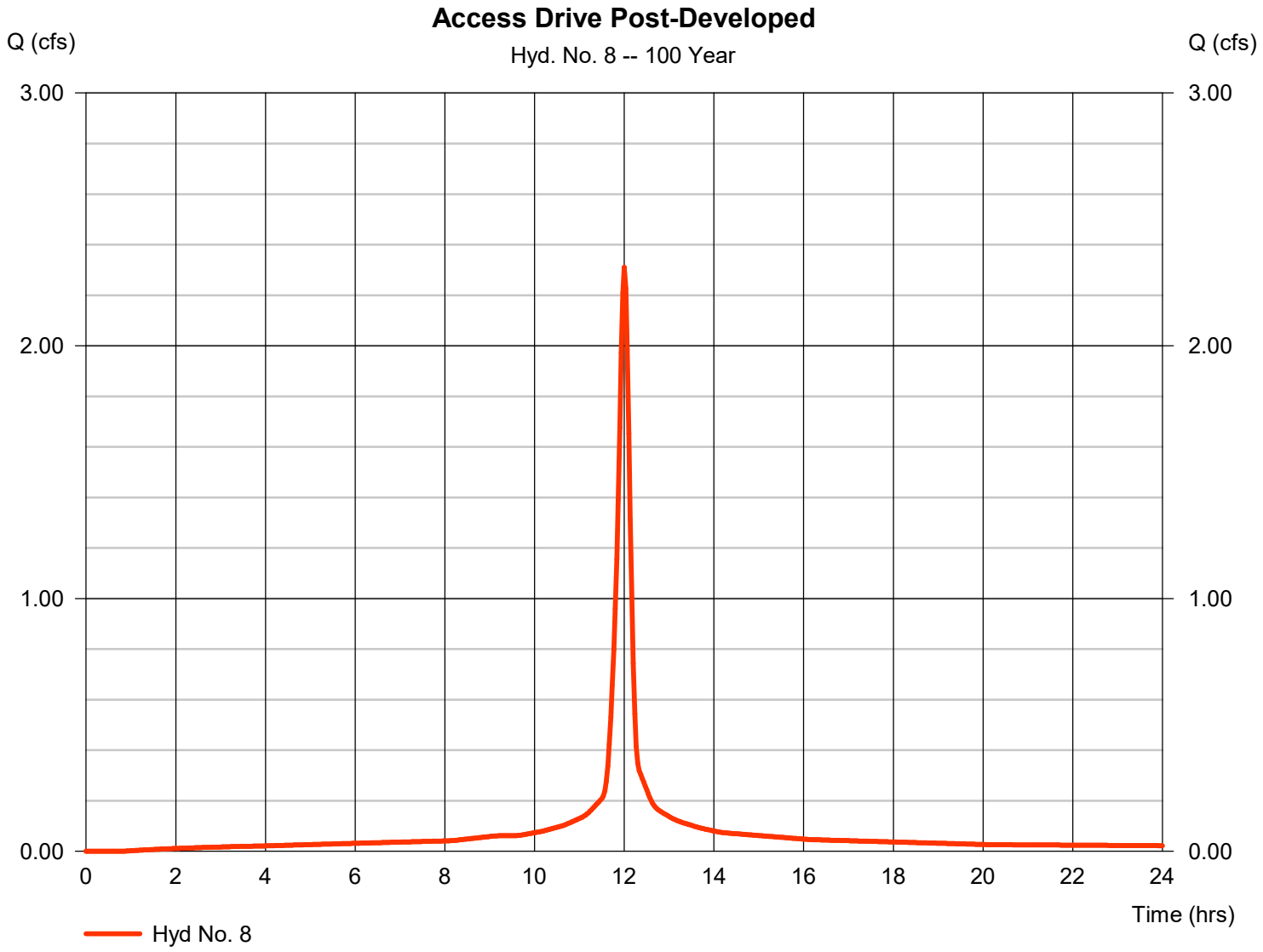
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514 Saturday, 10 / 14 / 2017

Hyd. No. 8

Access Drive Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.310 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	6,914 cuft
Drainage area	=	0.340 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: K:\~FF\SITE PLANS\Design Calcs\Butler.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.20	2.90	0.00	3.60	4.15	4.85	5.20	5.67
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10