CUMBERLAND TRACE

SECTION TWO

Drainage Study

Residential Development

Franklin, Johnson County, Indiana

NORTHPOINTE ENGINEERING & SURVEYING, Inc.

WBE/DBE Certified

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Section Two

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Professional Certification

Cumberland Trace

Section Two

The following report and accompanying computations have been developed by me or under my direct supervision.

Venus Thorne
Professional Engineer
Registration Number: 11200278

NORTHPOINTE ENGINEERING & SURVEYING, Inc.
WBE/DBE Certified

Preliminary Drainage Summary

Cumberland Trace
Section Two

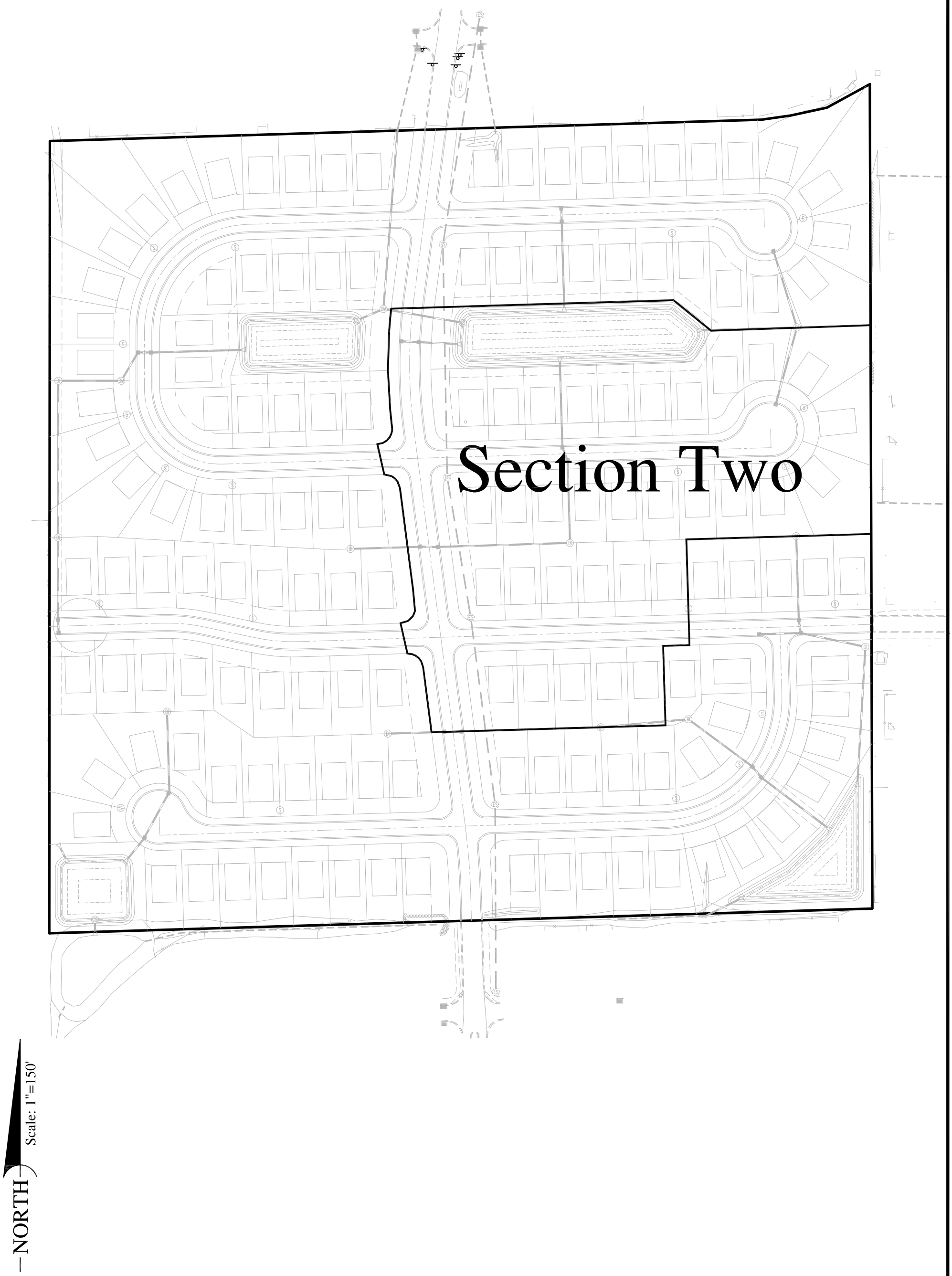
Cumberland Trace is a proposed residential development located in the City of Franklin in Johnson County. The project site for the proposed development consists of 40.08 acres. The development will contain 147 lots with lot sizes averaging approximately 0.18 acres.

Section Two Summary:
The site was designed per Section 6.19 General Drainage Standards of the City of Franklin Subdivision Control Ordnance. This report covers Section Two of the proposed development. Section Two contains 9.68 acres and 32 lots. The proposed site will be designed per the approved Preliminary Drainage Report. The approved report is included within this report.

Section Two is within Basin 2 of the attached report. Pond 2 will be constructed as part of this development.

Calculations for the proposed storm sewers in this section are also attached to this report.

Section Two Map



CUMBERLAND TRACE

Preliminary Drainage Study

Residential Development

Franklin, Johnson County, Indiana

NORTHPOINTE ENGINEERING & SURVEYING, Inc.

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Table of Contents

Cumberland Trace

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Professional Certification

Cumberland Trace

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Preliminary Drainage Summary

Cumberland Trace

Cumberland Trace is a proposed residential development located in the City of Franklin in Johnson County. The project site for the proposed development consists of 40.08 acres. The development will contain 147 lots with lot sizes averaging approximately 0.18 acres.

Analytical Methodology:

The site was designed per Section 6.19 General Drainage Standards of the City of Franklin Subdivision Control Ordnance.

Runoff Estimates - Runoff for the project were determined using the modified the huff rainfall distribution and corresponding quartile. The detention has been routed using Hydraflow hydrographs and the Huff 1st, 2nd and 3rd quartiles. The input criteria for the huff method includes determining the time-of-concentration, curve number and drainage area.

Times-of-Concentration – The existing and proposed times-of-concentration were determined using the TR-55 methodology. The flow paths are delineated on the enclosed existing and proposed site maps.

Curve Number –The curve numbers were determined using soil conditions and surface descriptions. Calculations for the existing and proposed runoff curve numbers are included within this report.

Allowable Release Rates – Per the ordinance, the storm water ponds have been designed to outlet storm water at a 2-year pre-development rainfall event rate for a 10-year post development storm and at a 10-year pre-development rainfall event rate for a 100-year post-development storm per the Ordinance.

Existing Site Conditions:

The existing site contains a vacant farm field. Residential developments are located to the north, south and east of the site, while the area to the east is a farm field. The site is split into four watersheds as shown on the enclosed maps.

Basin 1 - Basin 1 consist of 4.83 acres and outlets to the west of the site.

Basin 2 - Basin 2 consist of 16.55 acres and outlets to the north of the site.

Basin 3 - Basin 3 consist of 4.81 acres and outlets to the southwest corner of the site.

Basin 4 - Basin 4 consist of 13.89 acres and outlets to the southeast corner of the site.

Calculations for the 2 and 10-year storm events for the existing drainage basins in order to establish the allowable release rates for the developed site.

Proposed Site Conditions:

The runoff for the proposed site is being collected by the proposed storm sewer system. The proposed storm will outlet into four detention areas. The detention areas are labeled as Ponds 1 – 4 on the enclosed map. The proposed ponds are collecting runoff from all of the hard surfaces for the development. Calculations for the ponds and contributing drainage areas are shown within the report.

Pond 1 – Pond 1 collects runoff from the northwest quadrant of the site. This pond then outlets to the north of the site.

Pond 2 – Pond 2 collects runoff from the northwest quadrant of the site. This pond then outlets to the north of the site. The Pond 2 area also has a portion of grass area that will bypass the detention. Pond 1, Pond 2 and the bypass area outlet to the Existing Basin 2 watershed area. Therefore the runoff from these areas has been combined and compared the existing release rates from Basin 2 in order to establish the allowable release rates for this area. A summary of the allowable and proposed rates are as follows:

	Runoff Rates (cfs)		
	2YR	10YR	100YR
Basin 2 Existing	1.51	5.52	
Pond 1 + Pond 2 + Bypass		1.50	3.04

Pond 3 – Pond 3 collects runoff from the southwest quadrant of the site. The release rates for this pond are controlled by the existing runoff rates from Basin 3 in the existing conditions. A summary of the allowable and proposed rates are as follows:

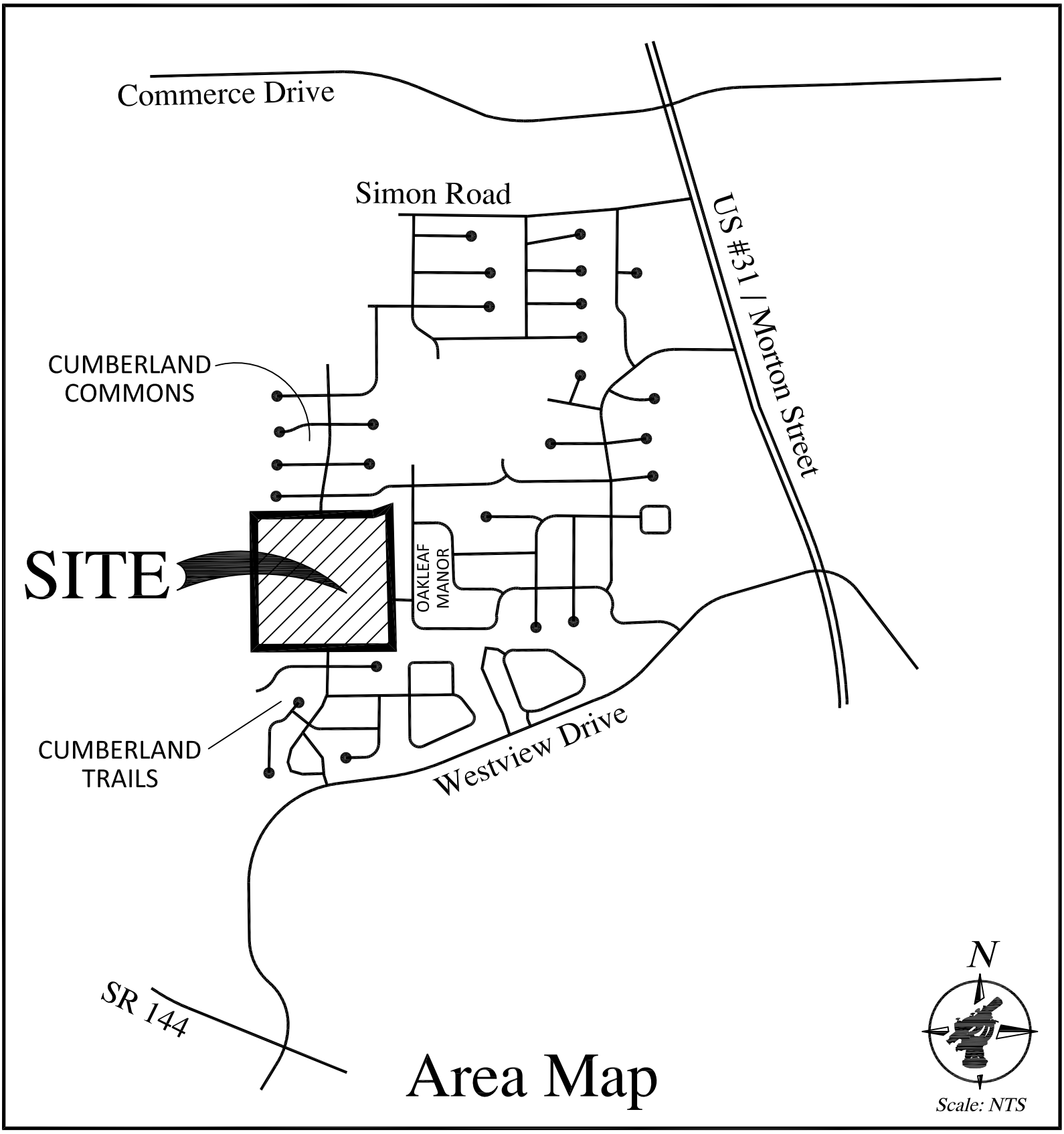
	Runoff Rates (cfs)		
	2YR	10YR	100YR
Basin 3 Existing	0.46	1.67	
Pond 3		0.45	0.74

Pond 4 – Pond 4 collects runoff from the southeast quadrant of the site. The release rates for this pond are controlled by the existing runoff rates from Basin 4 in the existing conditions. A summary of the allowable and proposed rates are as follows:

	Runoff Rates (cfs)		
	2YR	10YR	100YR
Basin 4	1.08	3.80	
Pond 4		1.73	3.59

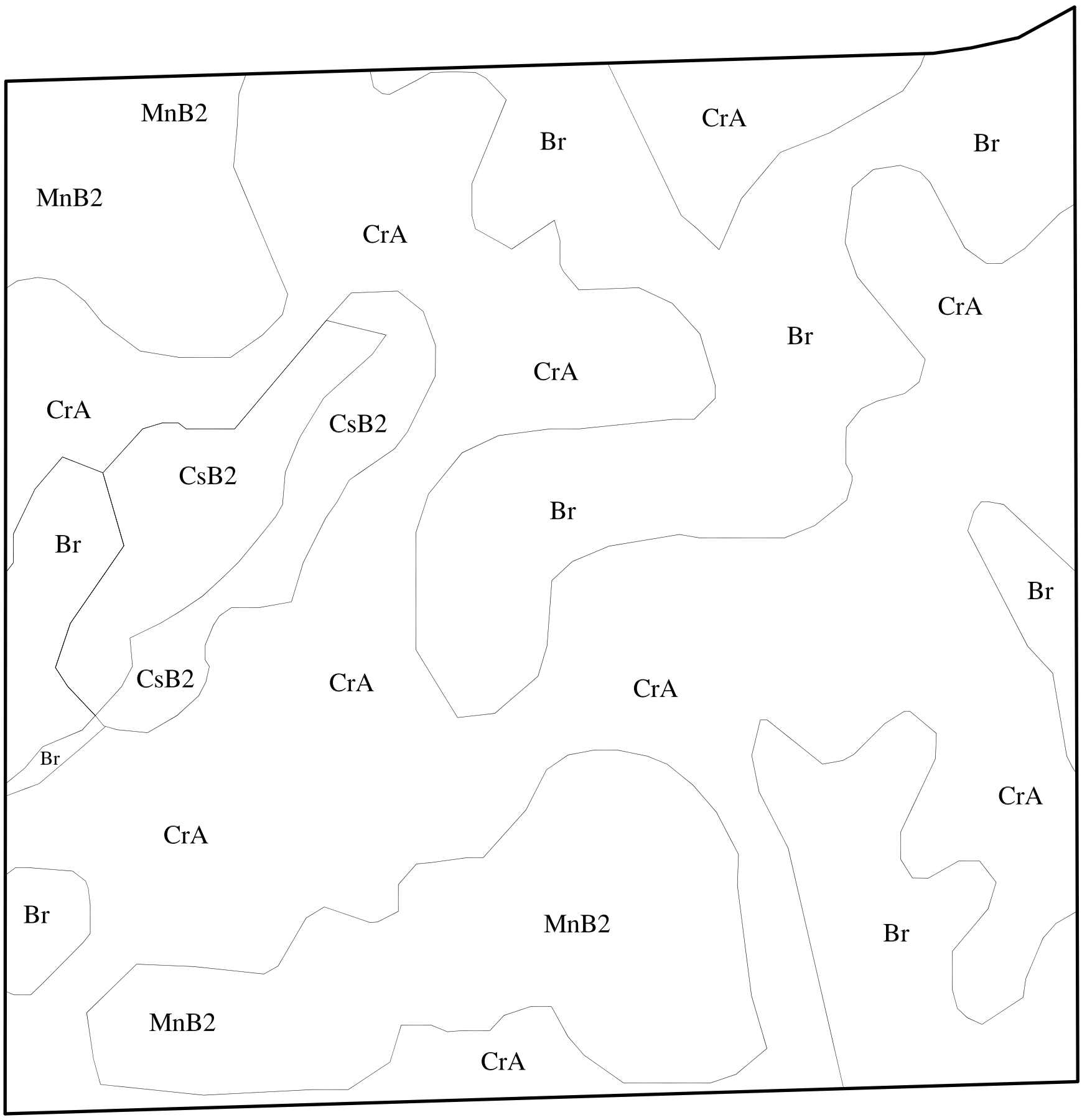
Water Quality:

The proposed ponds have been designed to address water quality for the site. A 2” orifice is proposed for the pond control structures for water quality purposes.


Commerce Drive
Simon Road
US #31 / Morton Street
CUMBERLAND COMMONS
SITE
OAKLEAF MANOR
CUMBERLAND TRAILS
Westview Drive
SR 144
N
Scale: NTS

Area Map

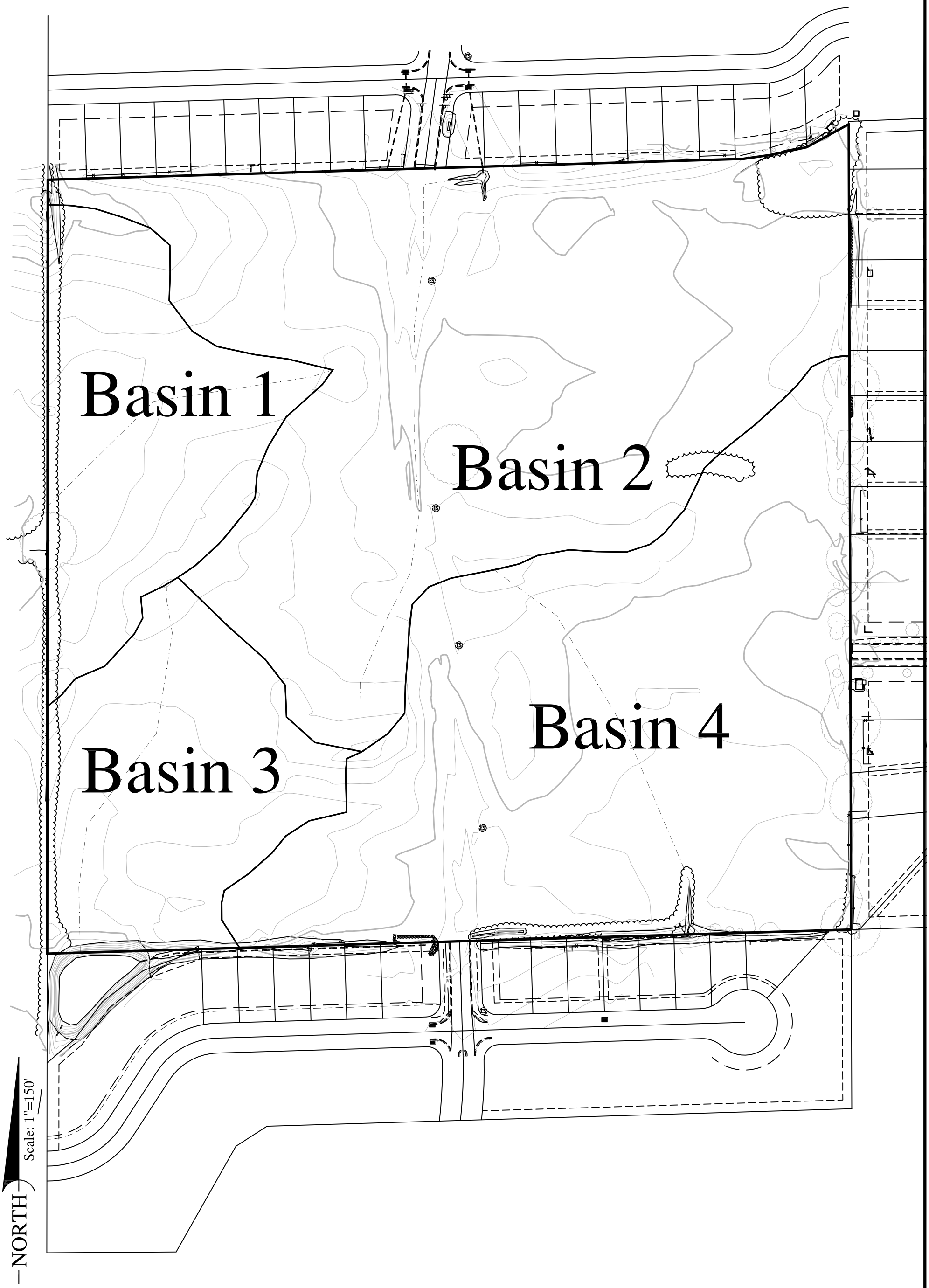
Soils Map



NORTH

Scale: 1"=50'

Existing Basins Map



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	0.161	2	68	370	------	------	------	Basin 1 1HR
2	SCS Runoff	0.243	2	108	1,187	------	------	------	Basin 1 2HR
3	SCS Runoff	0.268	2	98	1,860	------	------	------	Basin 1 3HR
4	SCS Runoff	0.265	2	170	3,449	------	------	------	Basin 1 6HR
5	SCS Runoff	0.370	2	364	6,290	------	------	------	Basin 1 12HR
6	SCS Runoff	0.391	2	942	8,187	------	------	------	Basin 1 24HR
7	SCS Runoff	0.860	2	60	1,794	------	------	------	Basin 2 1HR
8	SCS Runoff	1.089	2	64	5,007	------	------	------	Basin 2 2HR
9	SCS Runoff	1.163	2	88	7,551	------	------	------	Basin 2 3HR
10	SCS Runoff	1.047	2	164	13,435	------	------	------	Basin 2 6HR
11	SCS Runoff	1.508	2	330	23,748	------	------	------	Basin 2 12HR
12	SCS Runoff	1.504	2	938	30,559	------	------	------	Basin 2 24HR
13	SCS Runoff	0.283	2	62	653	------	------	------	Basin 3 1HR
14	SCS Runoff	0.351	2	68	1,673	------	------	------	Basin 3 2HR
15	SCS Runoff	0.372	2	90	2,461	------	------	------	Basin 3 3HR
16	SCS Runoff	0.331	2	132	4,258	------	------	------	Basin 3 6HR
17	SCS Runoff	0.464	2	334	7,365	------	------	------	Basin 3 12HR
18	SCS Runoff	0.454	2	938	9,400	------	------	------	Basin 3 24HR
19	SCS Runoff	0.461	2	64	914	------	------	------	Basin 4 1HR
20	SCS Runoff	0.670	2	106	3,089	------	------	------	Basin 4 2HR
21	SCS Runoff	0.730	2	94	4,901	------	------	------	Basin 4 3HR
22	SCS Runoff	0.720	2	168	9,218	------	------	------	Basin 4 6HR
23	SCS Runoff	1.008	2	336	16,984	------	------	------	Basin 4 12HR
24	SCS Runoff	1.081	2	940	22,191	------	------	------	Basin 4 24HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	1.126	2	56	3,328	------	------	------	Basin 1 1HR
2	SCS Runoff	1.332	2	66	6,288	------	------	------	Basin 1 2HR
3	SCS Runoff	1.259	2	78	8,187	------	------	------	Basin 1 3HR
4	SCS Runoff	1.078	2	108	12,479	------	------	------	Basin 1 6HR
5	SCS Runoff	1.126	2	334	17,328	------	------	------	Basin 1 12HR
6	SCS Runoff	1.034	2	940	22,628	------	------	------	Basin 1 24HR
7	SCS Runoff	5.097	2	38	12,990	------	------	------	Basin 2 1HR
8	SCS Runoff	5.516	2	48	23,748	------	------	------	Basin 2 2HR
9	SCS Runoff	5.051	2	60	30,559	------	------	------	Basin 2 3HR
10	SCS Runoff	4.182	2	96	45,831	------	------	------	Basin 2 6HR
11	SCS Runoff	4.279	2	326	62,949	------	------	------	Basin 2 12HR
12	SCS Runoff	3.773	2	936	81,547	------	------	------	Basin 2 24HR
13	SCS Runoff	1.481	2	44	4,114	------	------	------	Basin 3 1HR
14	SCS Runoff	1.672	2	56	7,359	------	------	------	Basin 3 2HR
15	SCS Runoff	1.532	2	66	9,394	------	------	------	Basin 3 3HR
16	SCS Runoff	1.259	2	100	13,934	------	------	------	Basin 3 6HR
17	SCS Runoff	1.267	2	330	18,987	------	------	------	Basin 3 12HR
18	SCS Runoff	1.112	2	938	24,452	------	------	------	Basin 3 24HR
19	SCS Runoff	3.185	2	48	8,876	------	------	------	Basin 4 1HR
20	SCS Runoff	3.788	2	58	16,984	------	------	------	Basin 4 2HR
21	SCS Runoff	3.511	2	68	22,188	------	------	------	Basin 4 3HR
22	SCS Runoff	2.983	2	102	33,996	------	------	------	Basin 4 6HR
23	SCS Runoff	3.140	2	330	47,376	------	------	------	Basin 4 12HR
24	SCS Runoff	2.876	2	938	62,025	------	------	------	Basin 4 24HR

Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

X	Present		Developed

Basin 1

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61	0.81	49.41
MnB2	B	Pasture - Good	61	1.3	79.3
CsB2	C	Pasture - Good	74	1.47	108.78
CrA	C	Pasture - Good	74	1.25	92.5
			Totals =	4.83	329.99

CN = 68.3

TR55 Tc Worksheet

Hyd. No. 1

Basin 1 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 0.36		0.00		0.00		
Travel Time (min)	**= 23.67**	**+**	**0.00**	**+**	**0.00**	**=**	**23.67**
Shallow Concentrated Flow							
Flow length (ft)	= 455.00		0.00		0.00		
Watercourse slope (%)	= 0.36		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.97		0.00		0.00		
Travel Time (min)	**= 7.83**	**+**	**0.00**	**+**	**0.00**	**=**	**7.83**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

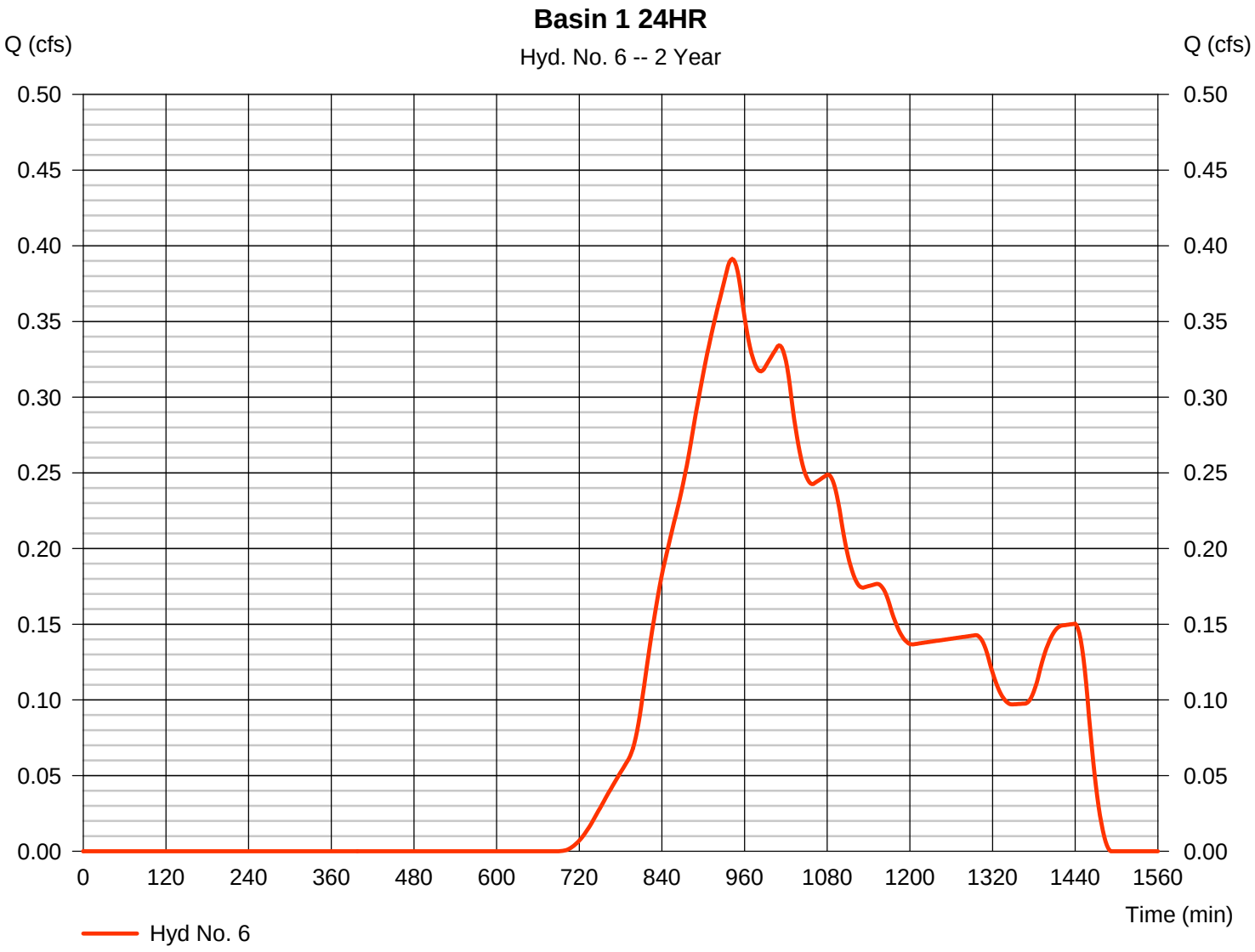
Total Travel Time, Tc ..... 31.51 min

Hydrograph Report

Hyd. No. 6

Basin 1 24HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.391 cfs
Storm frequency	= 2 yrs	Time to peak	= 942 min
Time interval	= 2 min	Hyd. volume	= 8,187 cuft
Drainage area	= 4.830 ac	Curve number	= 68.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 2.64 in	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484

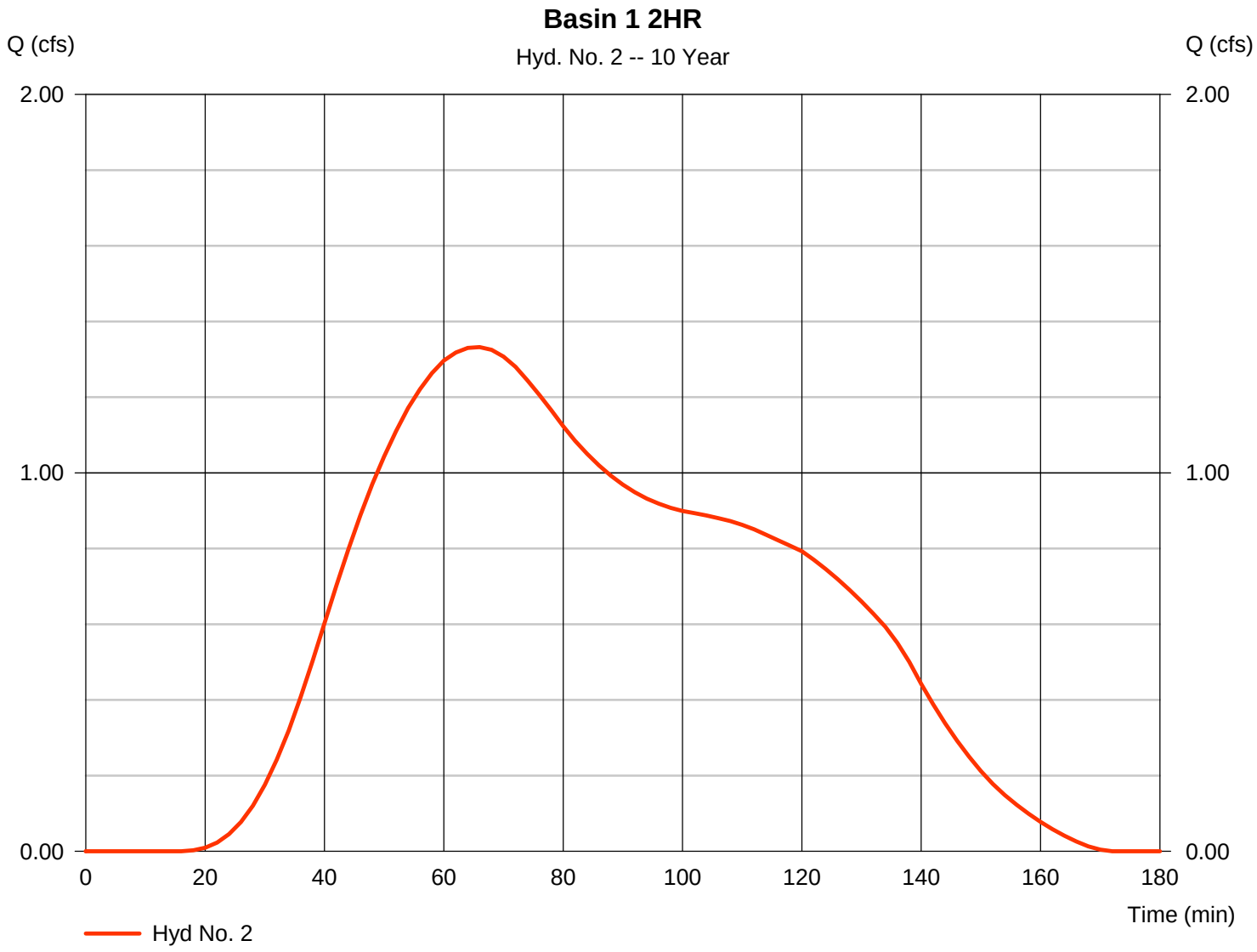


Hydrograph Report

Hyd. No. 2

Basin 1 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 1.332 cfs
Storm frequency	= 10 yrs	Time to peak	= 66 min
Time interval	= 2 min	Hyd. volume	= 6,288 cuft
Drainage area	= 4.830 ac	Curve number	= 68.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.50 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

X	Present		Developed

Basin 2

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61	5.55	338.55
CsB2	C	Pasture - Good	74	0.9	66.6
CrA	C	Pasture - Good	74	10.1	747.4
			Totals =	16.55	1152.55

CN = 69.6

TR55 Tc Worksheet

Hyd. No. 7

Basin 2 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.92**	**+**	**0.00**	**+**	**0.00**	**=**	**11.92**
Shallow Concentrated Flow							
Flow length (ft)	= 455.00		0.00		0.00		
Watercourse slope (%)	= 0.72		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.37		0.00		0.00		
Travel Time (min)	**= 5.54**	**+**	**0.00**	**+**	**0.00**	**=**	**5.54**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

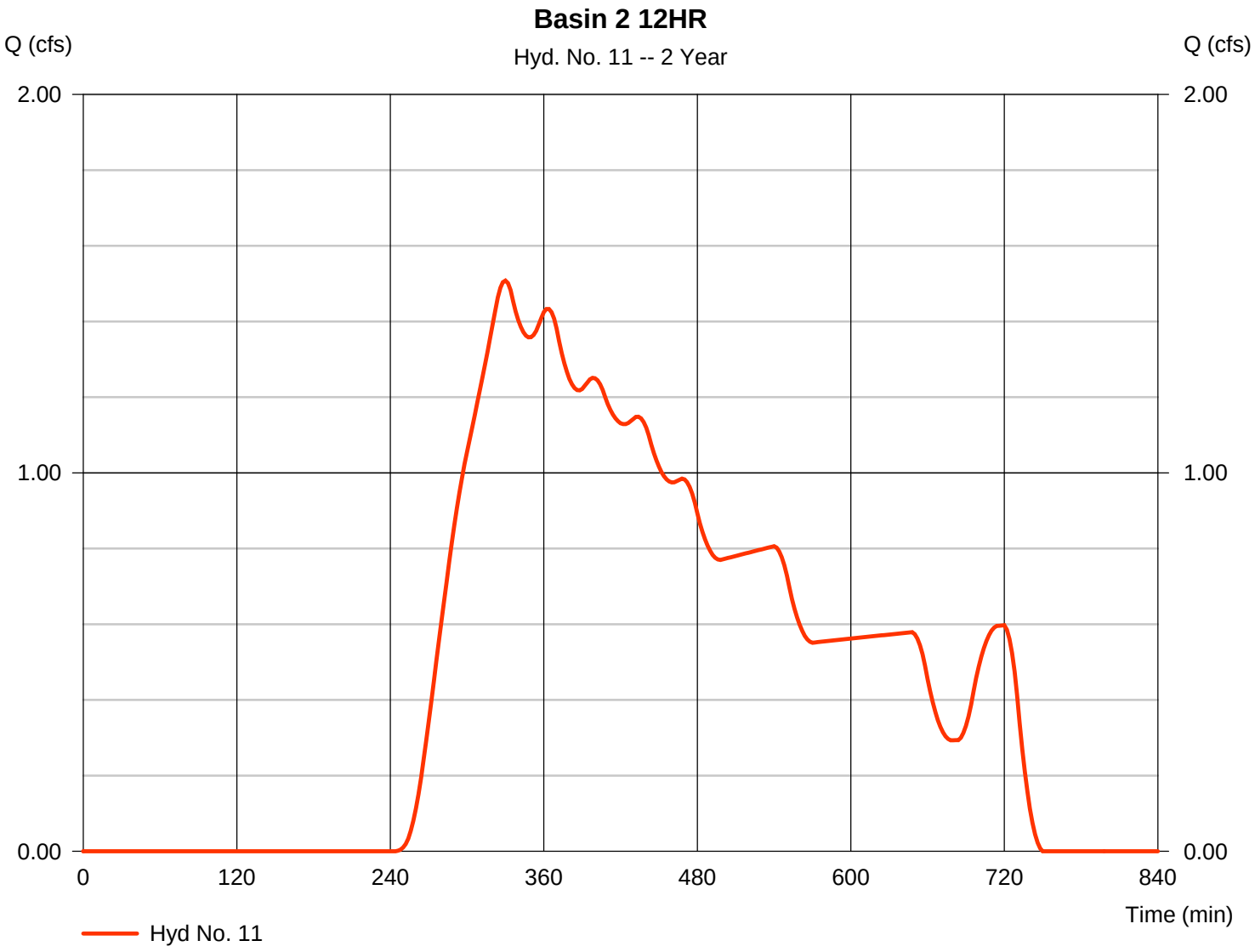
Total Travel Time, Tc ..... 17.46 min

Hydrograph Report

Hyd. No. 11

Basin 2 12HR

Hydrograph type	= SCS Runoff	Peak discharge	= 1.508 cfs
Storm frequency	= 2 yrs	Time to peak	= 330 min
Time interval	= 2 min	Hyd. volume	= 23,748 cuft
Drainage area	= 16.550 ac	Curve number	= 69.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.50 min
Total precip.	= 2.40 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484

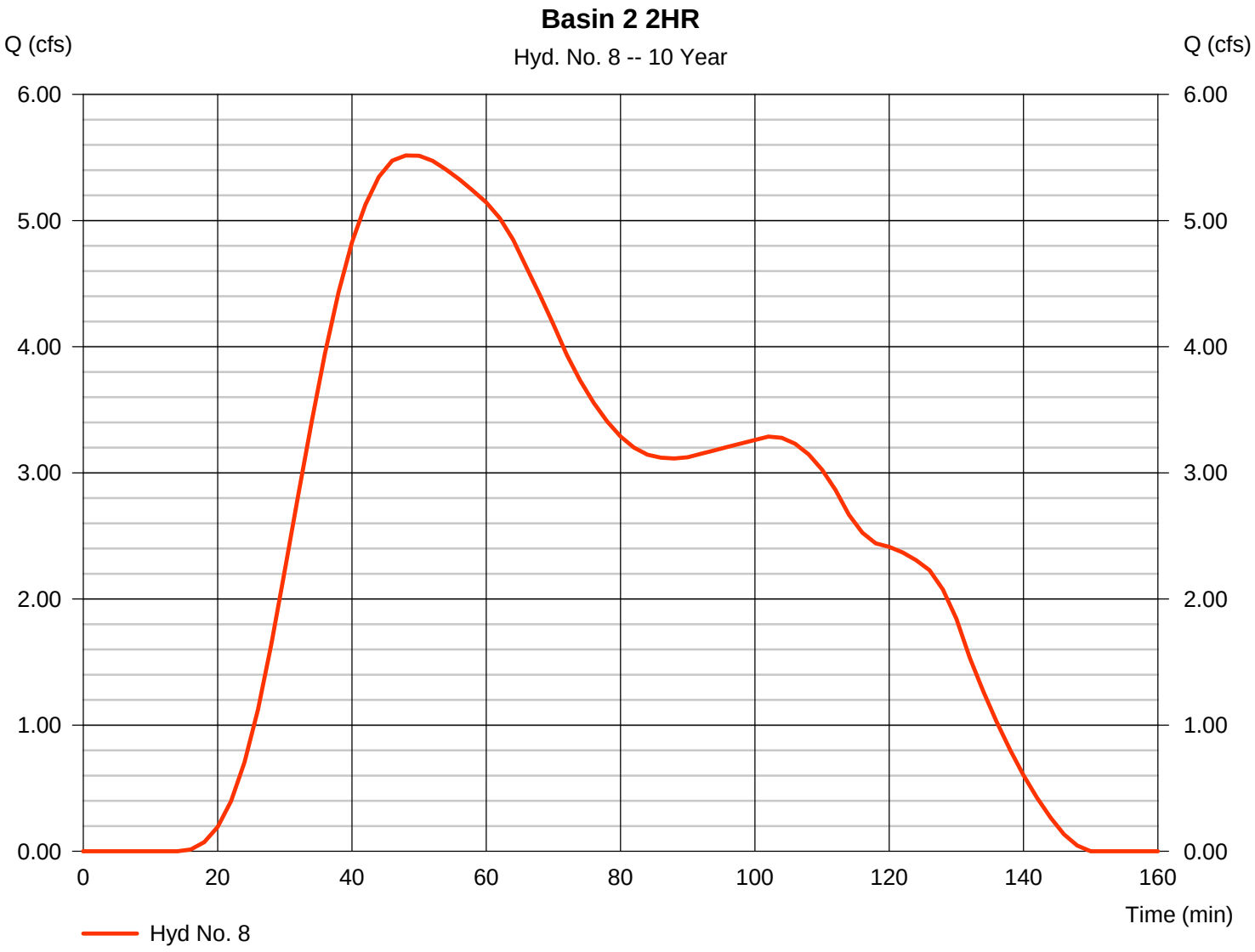


Hydrograph Report

Hyd. No. 8

Basin 2 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 5.516 cfs
Storm frequency	= 10 yrs	Time to peak	= 48 min
Time interval	= 2 min	Hyd. volume	= 23,748 cuft
Drainage area	= 16.550 ac	Curve number	= 69.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.50 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

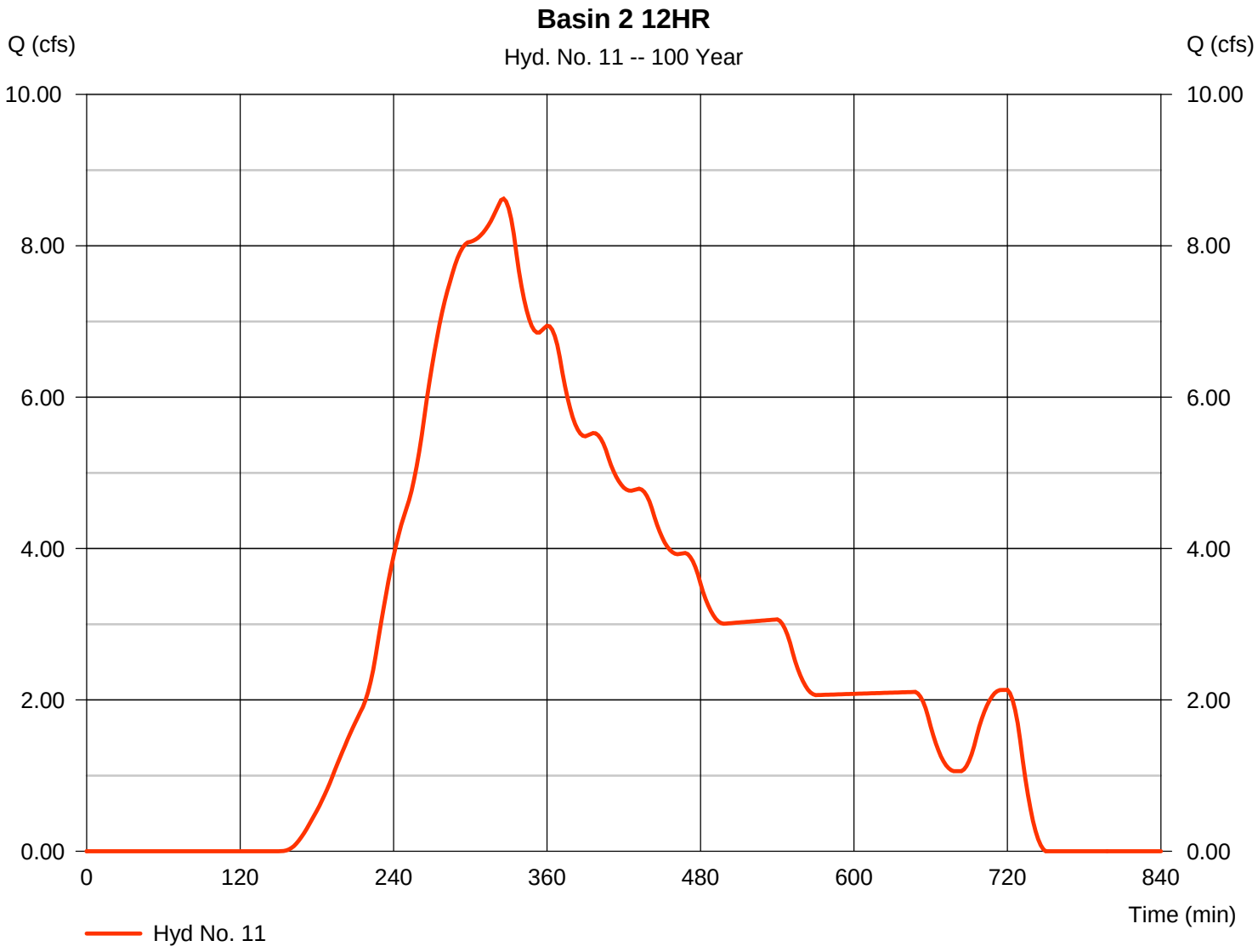


Hydrograph Report

Hyd. No. 11

Basin 2 12HR

Hydrograph type	= SCS Runoff	Peak discharge	= 8.622 cfs
Storm frequency	= 100 yrs	Time to peak	= 326 min
Time interval	= 2 min	Hyd. volume	= 127,546 cuft
Drainage area	= 16.550 ac	Curve number	= 69.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.50 min
Total precip.	= 5.16 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

X	Present		Developed

Basin 3

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61	0.39	23.79
MnB2	B	Pasture - Good	61	0.85	51.85
CsB2	C	Pasture - Good	74	0.29	21.46
CrA	C	Pasture - Good	74	3.28	242.72
			Totals =	4.81	339.82

CN = 70.6

TR55 Tc Worksheet

Hyd. No. 13

Basin 3 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 0.61		0.00		0.00		
Travel Time (min)	**= 19.17**	**+**	**0.00**	**+**	**0.00**	**=**	**19.17**
Shallow Concentrated Flow							
Flow length (ft)	= 455.00		0.00		0.00		
Watercourse slope (%)	= 0.61		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.26		0.00		0.00		
Travel Time (min)	**= 6.02**	**+**	**0.00**	**+**	**0.00**	**=**	**6.02**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 25.19 min

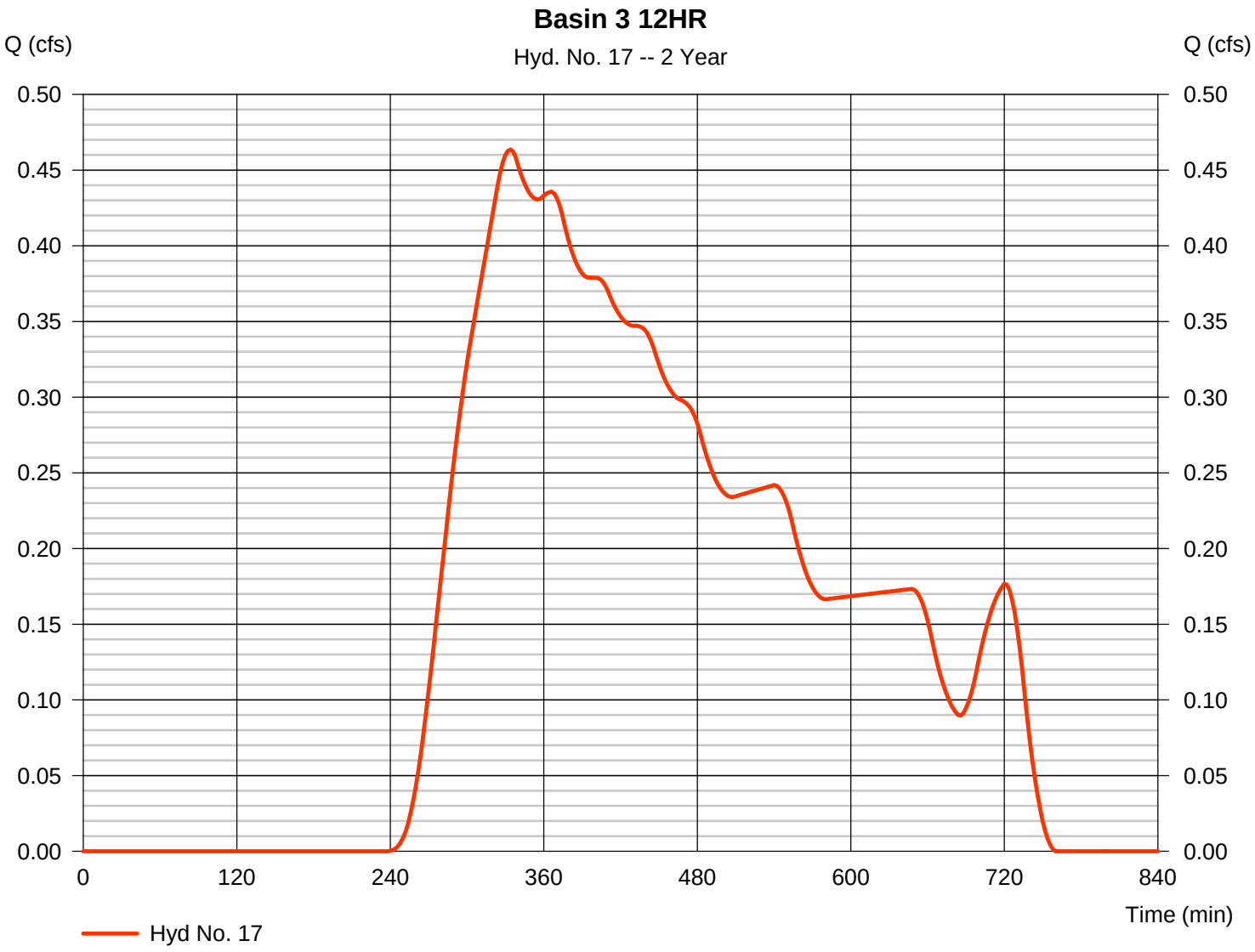
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 17

Basin 3 12HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.464 cfs
Storm frequency	= 2 yrs	Time to peak	= 334 min
Time interval	= 2 min	Hyd. volume	= 7,365 cuft
Drainage area	= 4.810 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.20 min
Total precip.	= 2.40 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484

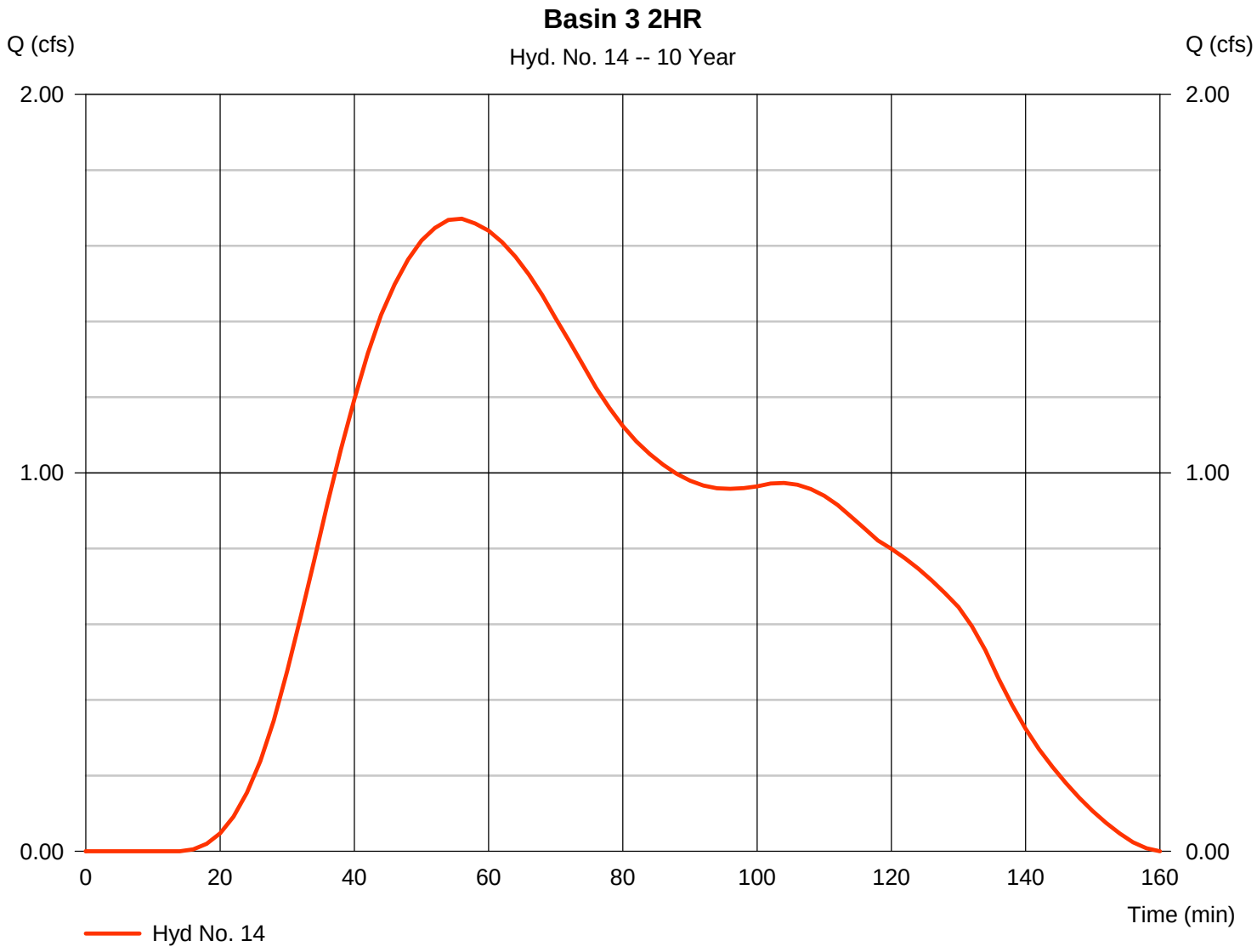


Hydrograph Report

Hyd. No. 14

Basin 3 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 1.672 cfs
Storm frequency	= 10 yrs	Time to peak	= 56 min
Time interval	= 2 min	Hyd. volume	= 7,359 cuft
Drainage area	= 4.810 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.20 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

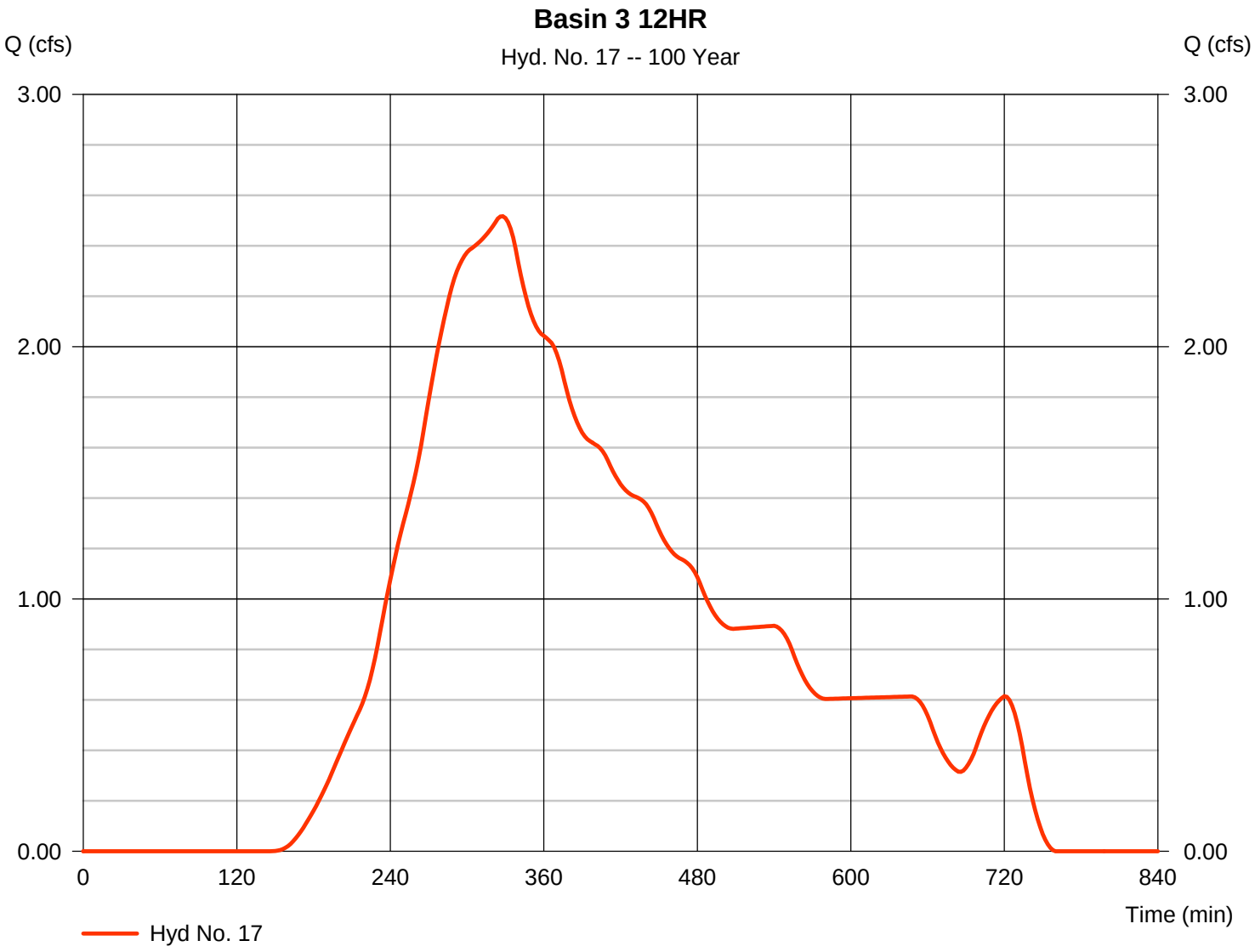


Hydrograph Report

Hyd. No. 17

Basin 3 12HR

Hydrograph type	= SCS Runoff	Peak discharge	= 2.517 cfs
Storm frequency	= 100 yrs	Time to peak	= 328 min
Time interval	= 2 min	Hyd. volume	= 37,899 cuft
Drainage area	= 4.810 ac	Curve number	= 70.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 25.20 min
Total precip.	= 5.16 in	Distribution	= Huff-2nd
Storm duration	= 12.00 hrs	Shape factor	= 484



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

X	Present		Developed

Basin 4

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Pasture - Good	61	2.75	167.75
MnB2	B	Pasture - Good	61	3.74	228.14
CrA	C	Pasture - Good	74	7.4	547.6
			Totals =	13.89	943.49

CN = 67.9

TR55 Tc Worksheet

Hyd. No. 19

Basin 4 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 0.64		0.00		0.00		
Travel Time (min)	**= 18.81**	**+**	**0.00**	**+**	**0.00**	**=**	**18.81**
Shallow Concentrated Flow							
Flow length (ft)	= 455.00		0.00		0.00		
Watercourse slope (%)	= 0.64		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.29		0.00		0.00		
Travel Time (min)	**= 5.88**	**+**	**0.00**	**+**	**0.00**	**=**	**5.88**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

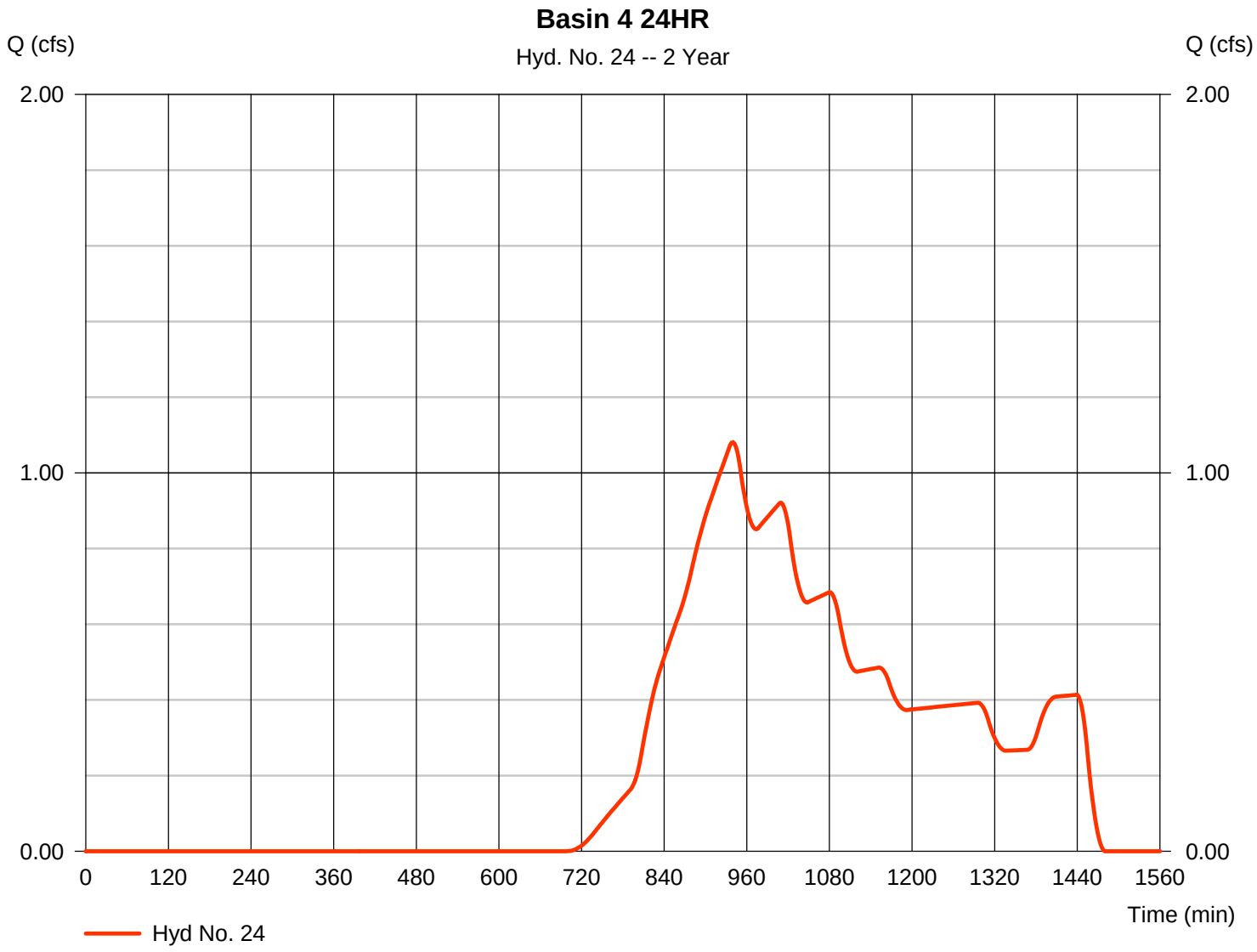
Total Travel Time, Tc ..... 24.68 min

Hydrograph Report

Hyd. No. 24

Basin 4 24HR

Hydrograph type	= SCS Runoff	Peak discharge	= 1.081 cfs
Storm frequency	= 2 yrs	Time to peak	= 940 min
Time interval	= 2 min	Hyd. volume	= 22,191 cuft
Drainage area	= 13.890 ac	Curve number	= 67.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 2.64 in	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484

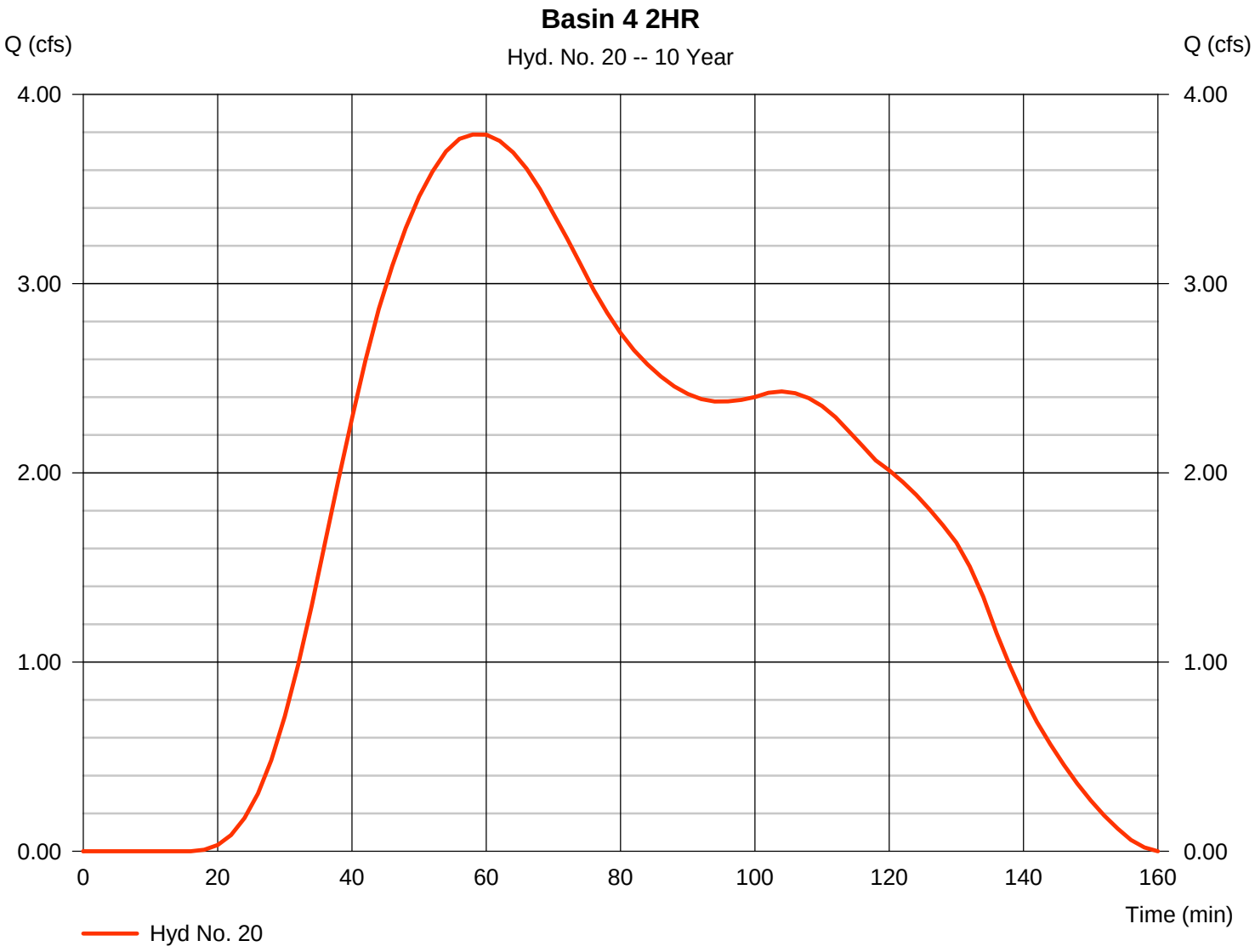


Hydrograph Report

Hyd. No. 20

Basin 4 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 3.788 cfs
Storm frequency	= 10 yrs	Time to peak	= 58 min
Time interval	= 2 min	Hyd. volume	= 16,984 cuft
Drainage area	= 13.890 ac	Curve number	= 67.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

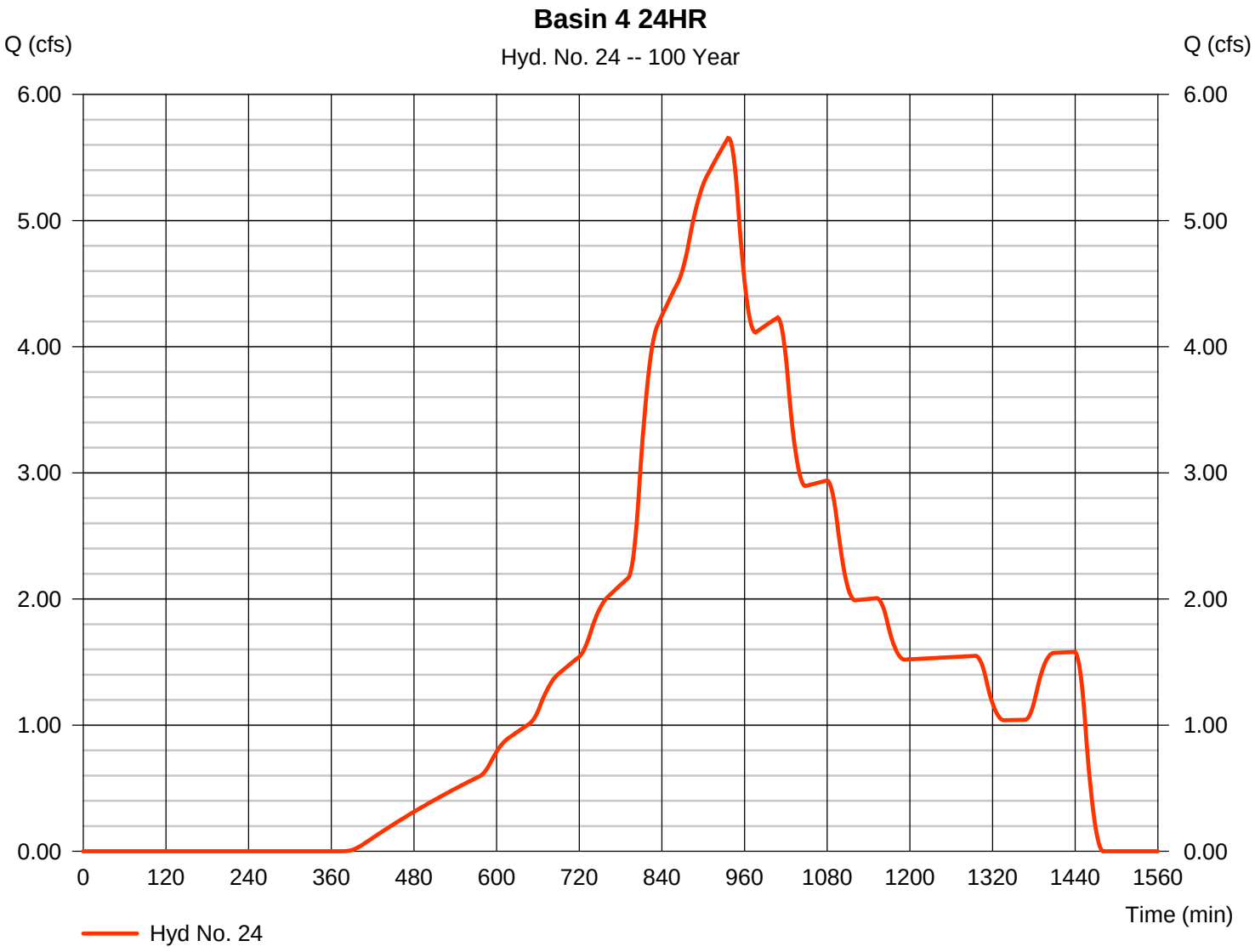


Hydrograph Report

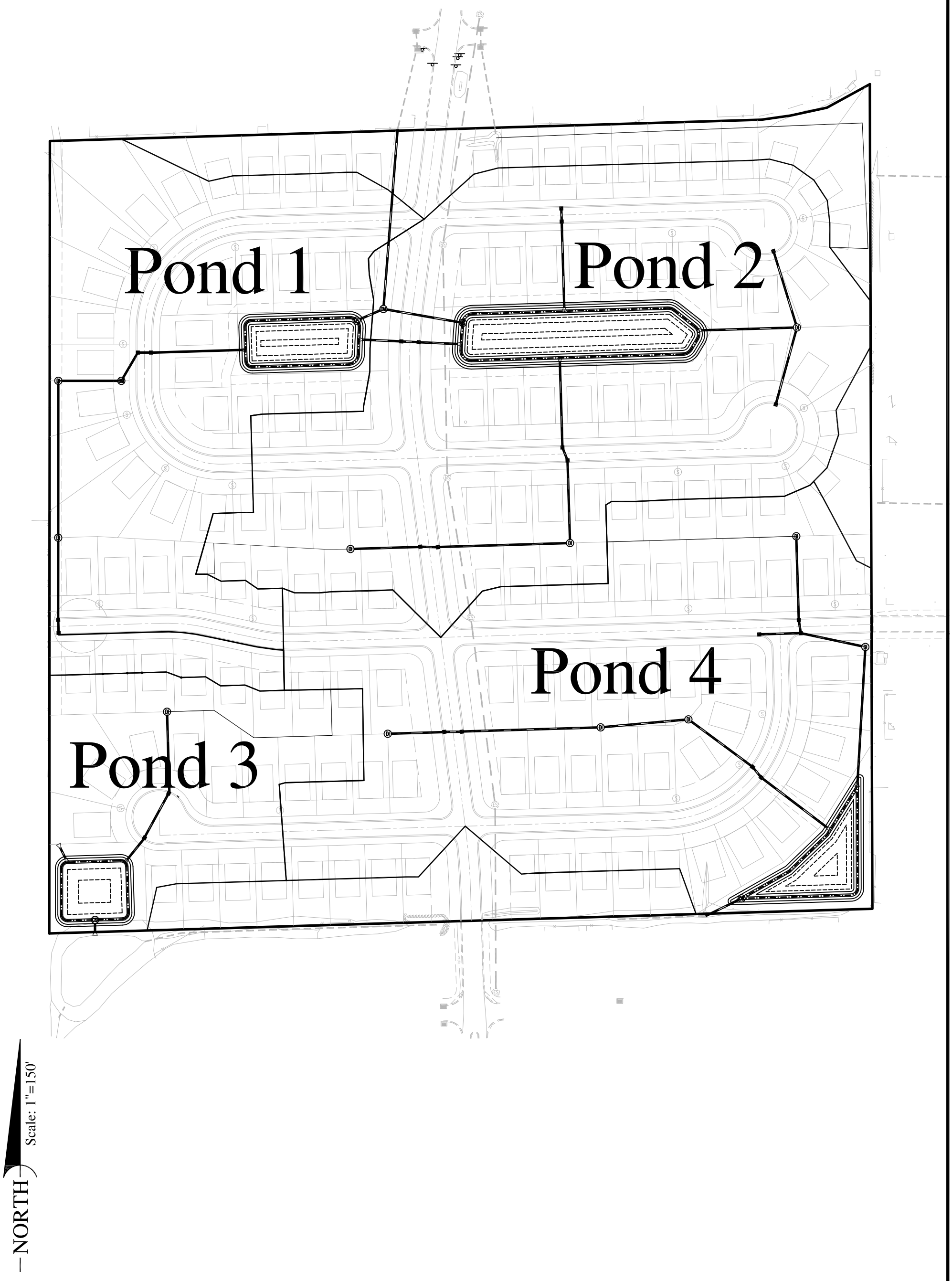
Hyd. No. 24

Basin 4 24HR

Hydrograph type	= SCS Runoff	Peak discharge	= 5.654 cfs
Storm frequency	= 100 yrs	Time to peak	= 936 min
Time interval	= 2 min	Hyd. volume	= 129,627 cuft
Drainage area	= 13.890 ac	Curve number	= 67.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 24.70 min
Total precip.	= 6.00 in	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484



Proposed Basins Map



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	6.846	2	28	15,207	------	------	------	Pond 1 1HR
2	SCS Runoff	6.203	2	38	23,483	------	------	------	Pond 1 2HR
3	SCS Runoff	5.239	2	48	28,301	------	------	------	Pond 1 3HR
4	SCS Runoff	3.696	2	90	38,623	------	------	------	Pond 1 6HR
5	SCS Runoff	3.345	2	324	49,584	------	------	------	Pond 1 12HR
6	SCS Runoff	2.594	2	936	61,045	------	------	------	Pond 1 24HR
7	Reservoir	0.096	2	82	14,425	1	750.98	14,917	1HR
8	Reservoir	0.118	2	140	22,209	2	751.42	22,822	2HR
9	Reservoir	0.128	2	200	26,477	3	751.66	27,250	3HR
10	Reservoir	0.147	2	378	34,284	4	752.14	36,240	6HR
11	Reservoir	0.163	2	736	40,302	5	752.59	45,502	12HR
12	Reservoir	0.180	2	1454	43,358	6	753.01	54,111	24HR
13	SCS Runoff	9.547	2	32	22,708	------	------	------	Pond 2 1HR
14	SCS Runoff	9.022	2	40	35,129	------	------	------	Pond 2 2HR
15	SCS Runoff	7.704	2	52	42,354	------	------	------	Pond 2 3HR
16	SCS Runoff	5.525	2	90	57,852	------	------	------	Pond 2 6HR
17	SCS Runoff	4.974	2	326	74,318	------	------	------	Pond 2 12HR
18	SCS Runoff	3.881	2	936	91,536	------	------	------	Pond 2 24HR
19	Reservoir	0.232	2	86	19,255	13	750.74	22,236	1HR
20	Reservoir	0.615	2	140	31,106	14	751.07	32,802	2HR
21	Reservoir	0.733	2	198	38,075	15	751.21	37,908	3HR
22	Reservoir	0.882	2	374	53,044	16	751.43	45,790	6HR
23	Reservoir	0.990	2	658	68,663	17	751.62	52,332	12HR
24	Reservoir	1.061	2	1172	84,145	18	751.75	57,114	24HR
25	SCS Runoff	0.525	2	46	1,436	------	------	------	Bypass 1HR
26	SCS Runoff	0.630	2	58	2,803	------	------	------	Bypass 2HR
27	SCS Runoff	0.584	2	66	3,688	------	------	------	Bypass 3HR
28	SCS Runoff	0.500	2	100	5,705	------	------	------	Bypass 6HR
29	SCS Runoff	0.533	2	330	7,999	------	------	------	Bypass 12HR
30	SCS Runoff	0.492	2	938	10,520	------	------	------	Bypass 24HR
31	Combine	0.686	2	60	35,116	7, 19, 25,	------	------	Combined 1 HR
32	Combine	1.042	2	110	56,117	8, 20, 26,	------	------	Combined 2 HR
33	Combine	1.131	2	158	68,240	9, 21, 27,	------	------	Combined 3 HR
34	Combine	1.240	2	308	93,032	10, 22, 28,	------	------	Combined 6 HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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
35	Combine	1.349	2	542	116,964	11, 23, 29,	------	------	Combined 12 HR
36	Combine	1.498	2	1012	138,024	12, 24, 30,	------	------	Combined 24 HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	15.56	2	26	33,252	------	------	------	Pond 1 1HR
2	SCS Runoff	13.13	2	32	47,234	------	------	------	Pond 1 2HR
3	SCS Runoff	10.63	2	44	55,963	------	------	------	Pond 1 3HR
4	SCS Runoff	7.468	2	44	71,382	------	------	------	Pond 1 6HR
5	SCS Runoff	5.763	2	324	88,146	------	------	------	Pond 1 12HR
6	SCS Runoff	4.390	2	936	110,110	------	------	------	Pond 1 24HR
7	Reservoir	0.140	2	82	30,566	1	751.97	32,788	1HR
8	Reservoir	0.164	2	142	40,111	2	752.63	46,250	2HR
9	Reservoir	0.185	2	200	45,110	3	753.03	54,422	3HR
10	Reservoir	0.676	2	374	56,671	4	753.52	65,661	6HR
11	Reservoir	0.891	2	728	70,503	5	753.80	71,972	12HR
12	Reservoir	1.052	2	1300	87,069	6	754.07	78,289	24HR
13	SCS Runoff	21.62	2	28	49,802	------	------	------	Pond 2 1HR
14	SCS Runoff	19.18	2	36	70,791	------	------	------	Pond 2 2HR
15	SCS Runoff	15.84	2	44	83,904	------	------	------	Pond 2 3HR
16	SCS Runoff	10.64	2	46	107,067	------	------	------	Pond 2 6HR
17	SCS Runoff	8.601	2	324	132,269	------	------	------	Pond 2 12HR
18	SCS Runoff	6.584	2	936	165,292	------	------	------	Pond 2 24HR
19	Reservoir	0.910	2	82	45,411	13	751.48	47,389	1HR
20	Reservoir	1.167	2	140	65,858	14	751.97	64,815	2HR
21	Reservoir	1.274	2	198	78,643	15	752.21	74,085	3HR
22	Reservoir	1.389	2	374	101,191	16	752.49	85,059	6HR
23	Reservoir	1.491	2	660	125,345	17	752.75	95,575	12HR
24	Reservoir	1.582	2	1302	156,222	18	753.01	105,653	24HR
25	SCS Runoff	1.776	2	38	4,657	------	------	------	Bypass 1HR
26	SCS Runoff	1.785	2	48	7,500	------	------	------	Bypass 2HR
27	SCS Runoff	1.618	2	56	9,392	------	------	------	Bypass 3HR
28	SCS Runoff	1.206	2	94	12,883	------	------	------	Bypass 6HR
29	SCS Runoff	1.132	2	328	16,838	------	------	------	Bypass 12HR
30	SCS Runoff	0.977	2	936	22,219	------	------	------	Bypass 24HR
31	Combine	2.382	2	42	80,634	7, 19, 25,	------	------	Combined 1 HR
32	Combine	2.516	2	54	113,469	8, 20, 26,	------	------	Combined 2 HR
33	Combine	2.395	2	66	133,145	9, 21, 27,	------	------	Combined 3 HR
34	Combine	2.445	2	366	170,744	10, 22, 28,	------	------	Combined 6 HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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
35	Combine	2.683	2	544	212,686	11, 23, 29,	------	------	Combined 12 HR
36	Combine	3.042	2	1084	265,510	12, 24, 30,	------	------	Combined 24 HR

Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

	Present	X	Developed

Pond 1

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Residential 1/4 Acre Lots	75	1.4	105
MnB2	B	Residential 1/4 Acre Lots	75	2.24	168
CsB2	C	Residential 1/4 Acre Lots	83	2.54	210.82
CrA	C	Residential 1/4 Acre Lots	83	2.16	179.28
			Totals =	8.34	663.1

CN = 79.5

TR55 Tc Worksheet

Hyd. No. 1

Pond 1 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 68.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 10.46**	**+**	**0.00**	**+**	**0.00**	**=**	**10.46**
Shallow Concentrated Flow							
Flow length (ft)	= 369.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=2.03		0.00		0.00		
Travel Time (min)	**= 3.03**	**+**	**0.00**	**+**	**0.00**	**=**	**3.03**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	=4.56						
			0.00				
					0.00		
Flow length (ft)	({0})750.0		0.0		0.0		
Travel Time (min)	**= 2.74**	**+**	**0.00**	**+**	**0.00**	**=**	**2.74**

Total Travel Time, Tc ..... 16.22 min

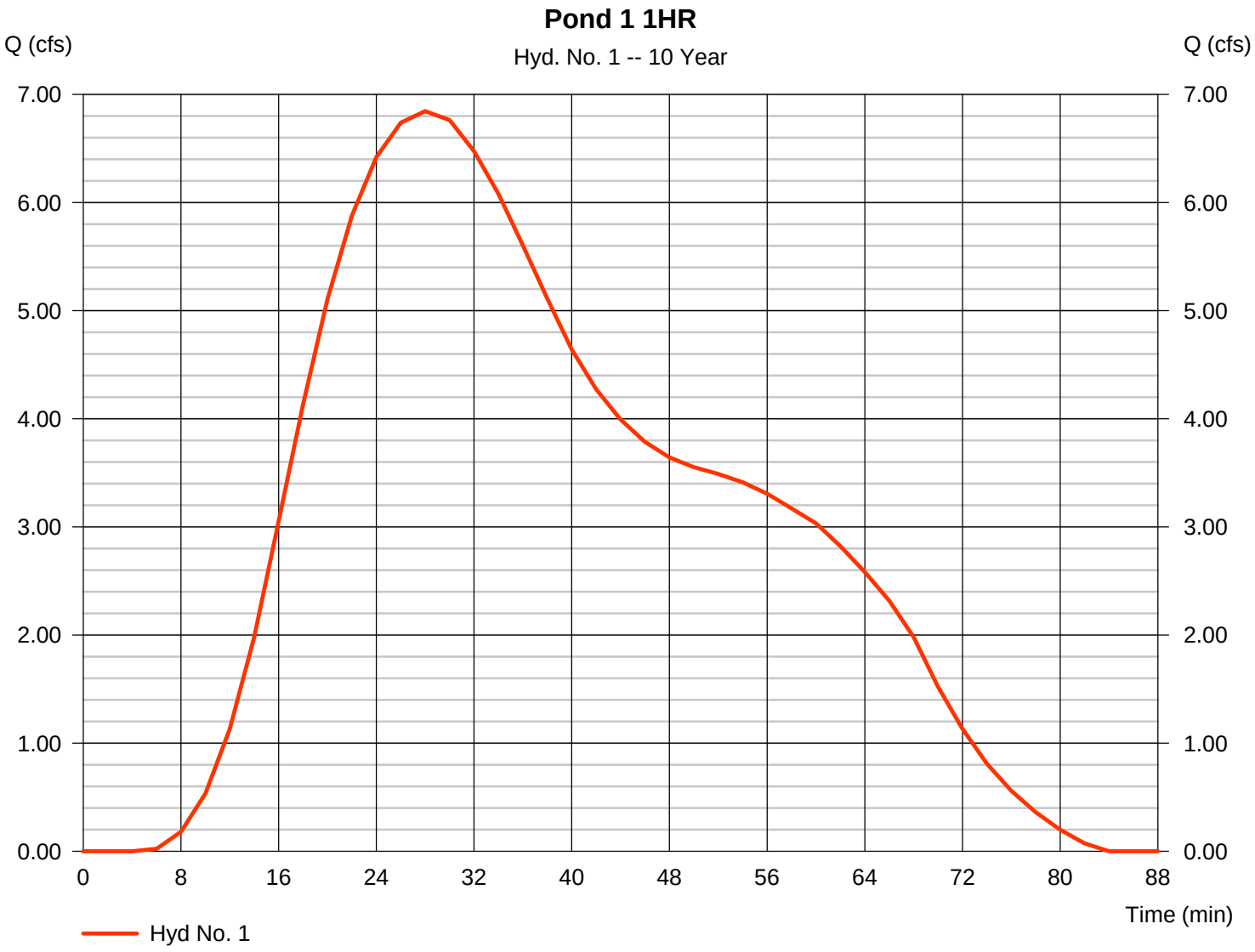
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 1

Pond 1 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 6.846 cfs
Storm frequency	= 10 yrs	Time to peak	= 28 min
Time interval	= 2 min	Hyd. volume	= 15,207 cuft
Drainage area	= 8.340 ac	Curve number	= 79.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.20 min
Total precip.	= 1.96 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



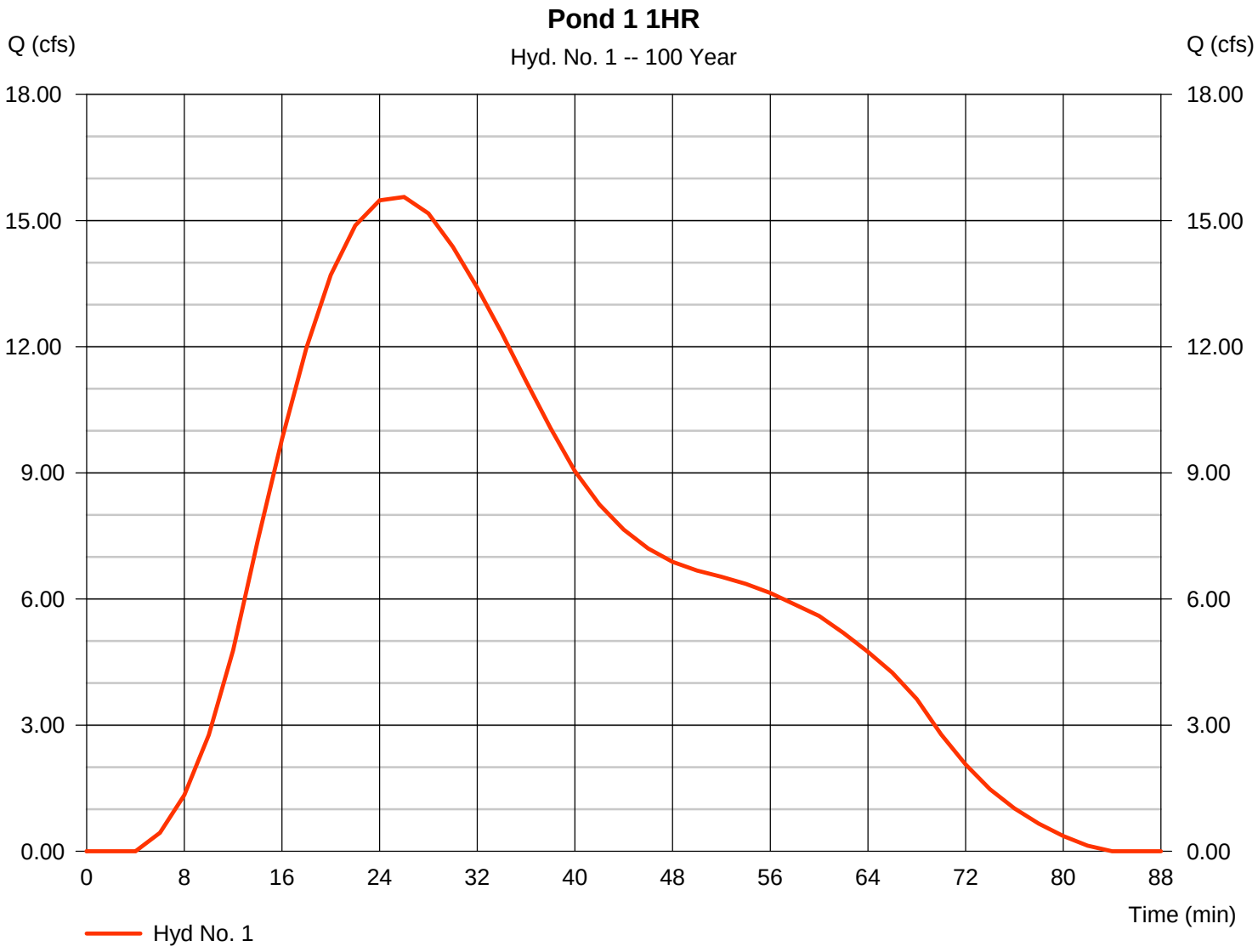
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 1

Pond 1 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 15.56 cfs
Storm frequency	= 100 yrs	Time to peak	= 26 min
Time interval	= 2 min	Hyd. volume	= 33,252 cuft
Drainage area	= 8.340 ac	Curve number	= 79.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.20 min
Total precip.	= 2.88 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Report

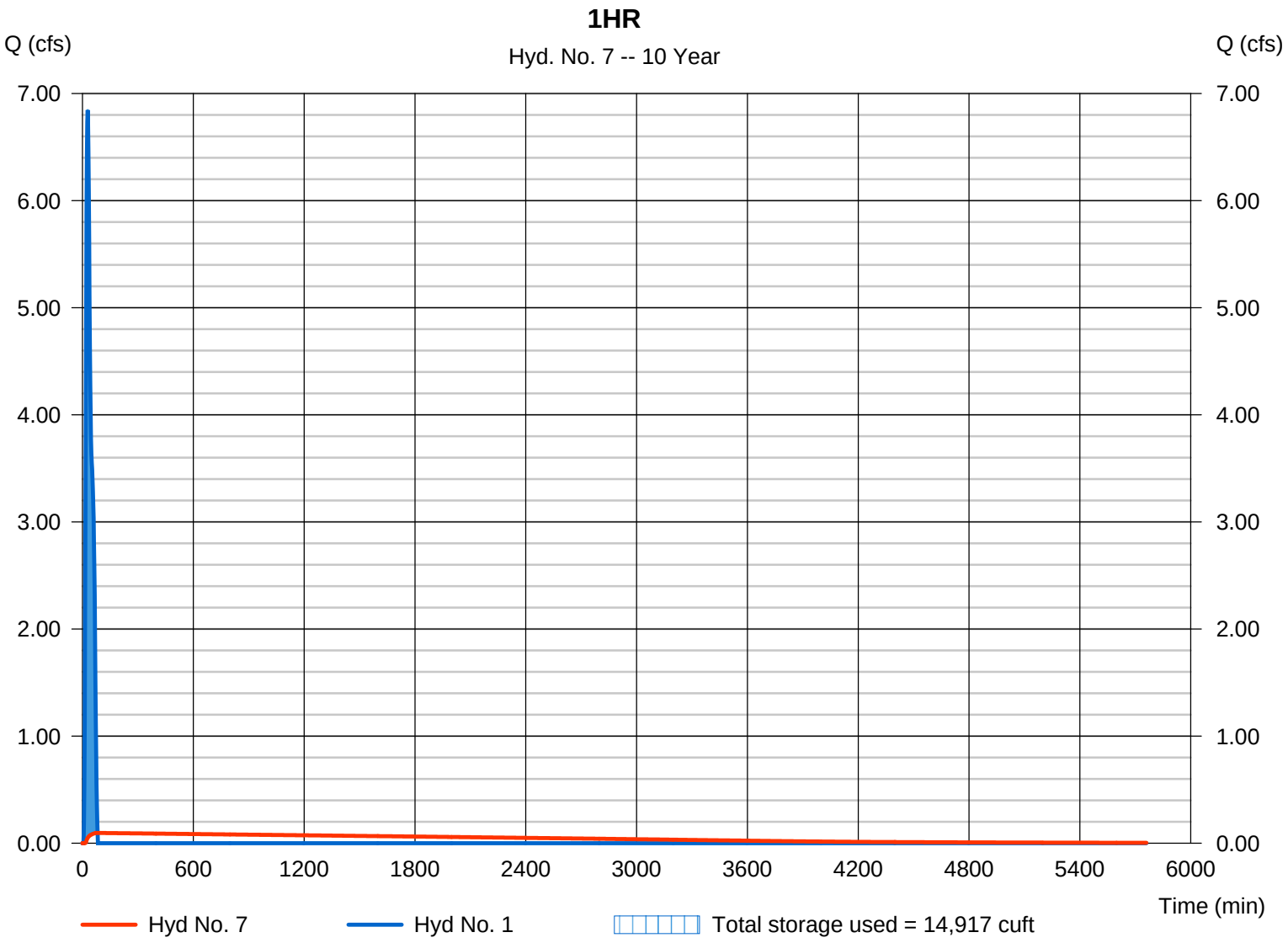
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.096 cfs
Storm frequency	= 10 yrs	Time to peak	= 82 min
Time interval	= 2 min	Hyd. volume	= 14,425 cuft
Inflow hyd. No.	= 1 - Pond 1 1HR	Max. Elevation	= 750.98 ft
Reservoir name	= Pond 1	Max. Storage	= 14,917 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

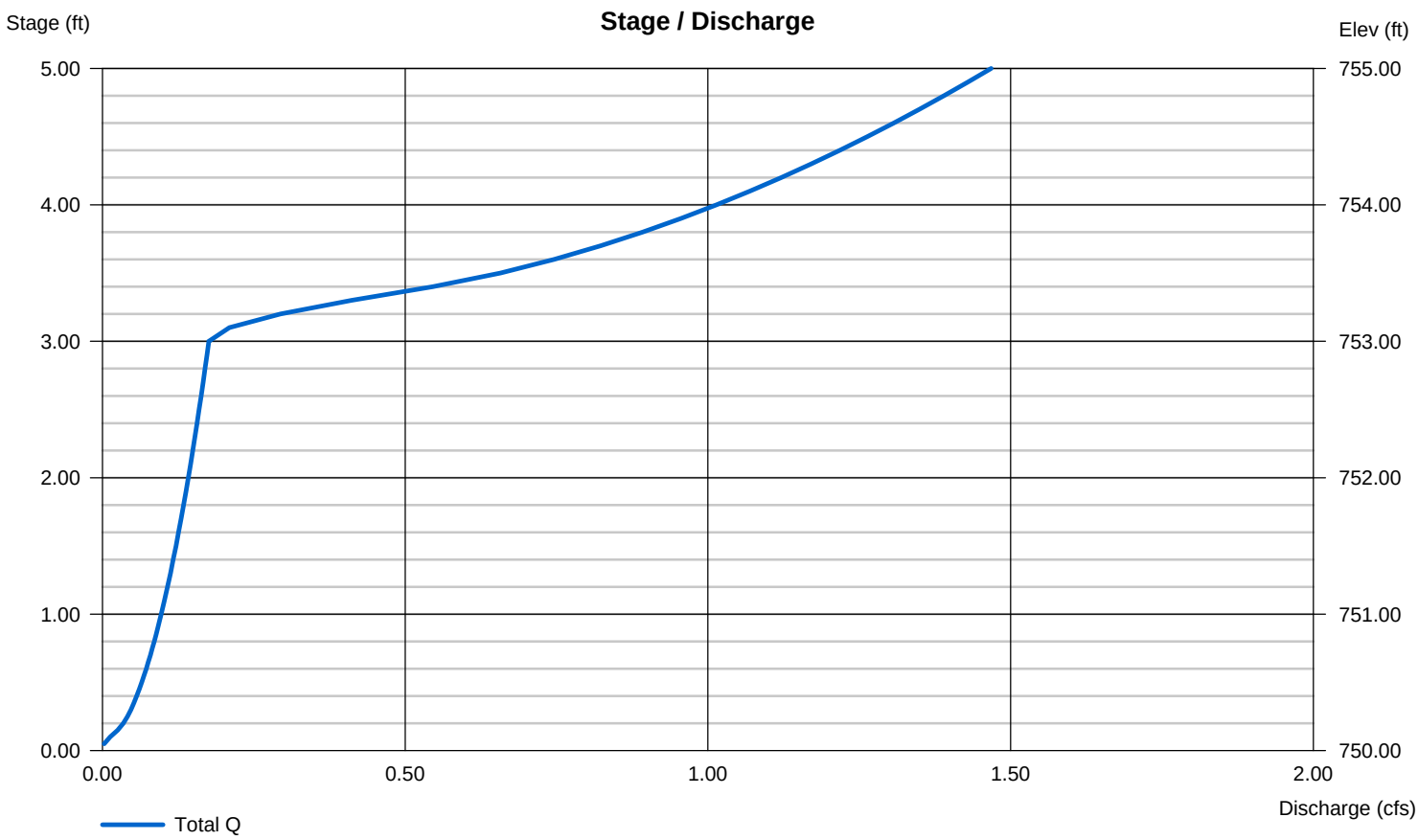
Weir Structures

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

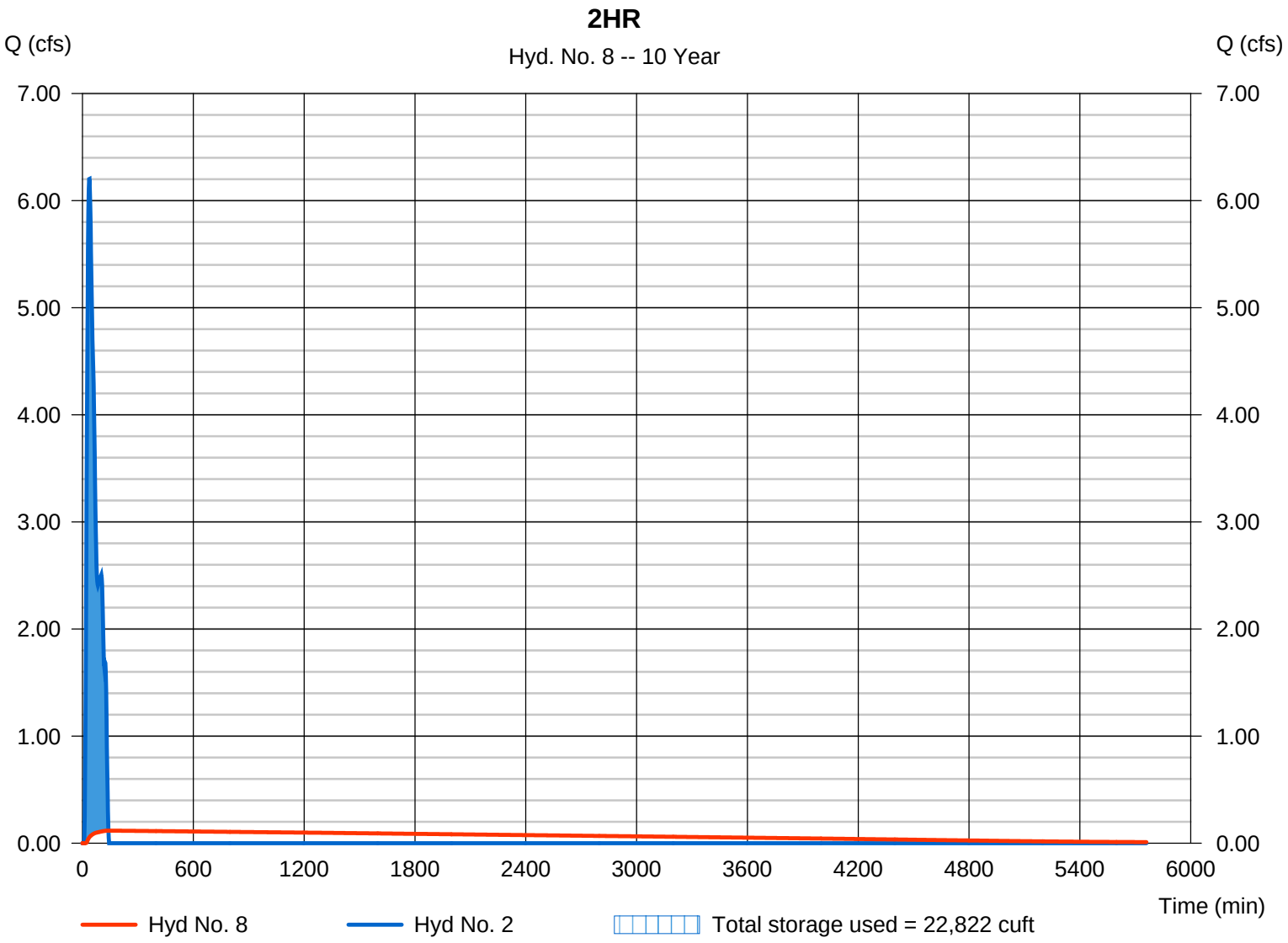
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.118 cfs
Storm frequency	= 10 yrs	Time to peak	= 140 min
Time interval	= 2 min	Hyd. volume	= 22,209 cuft
Inflow hyd. No.	= 2 - Pond 1 2HR	Max. Elevation	= 751.42 ft
Reservoir name	= Pond 1	Max. Storage	= 22,822 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

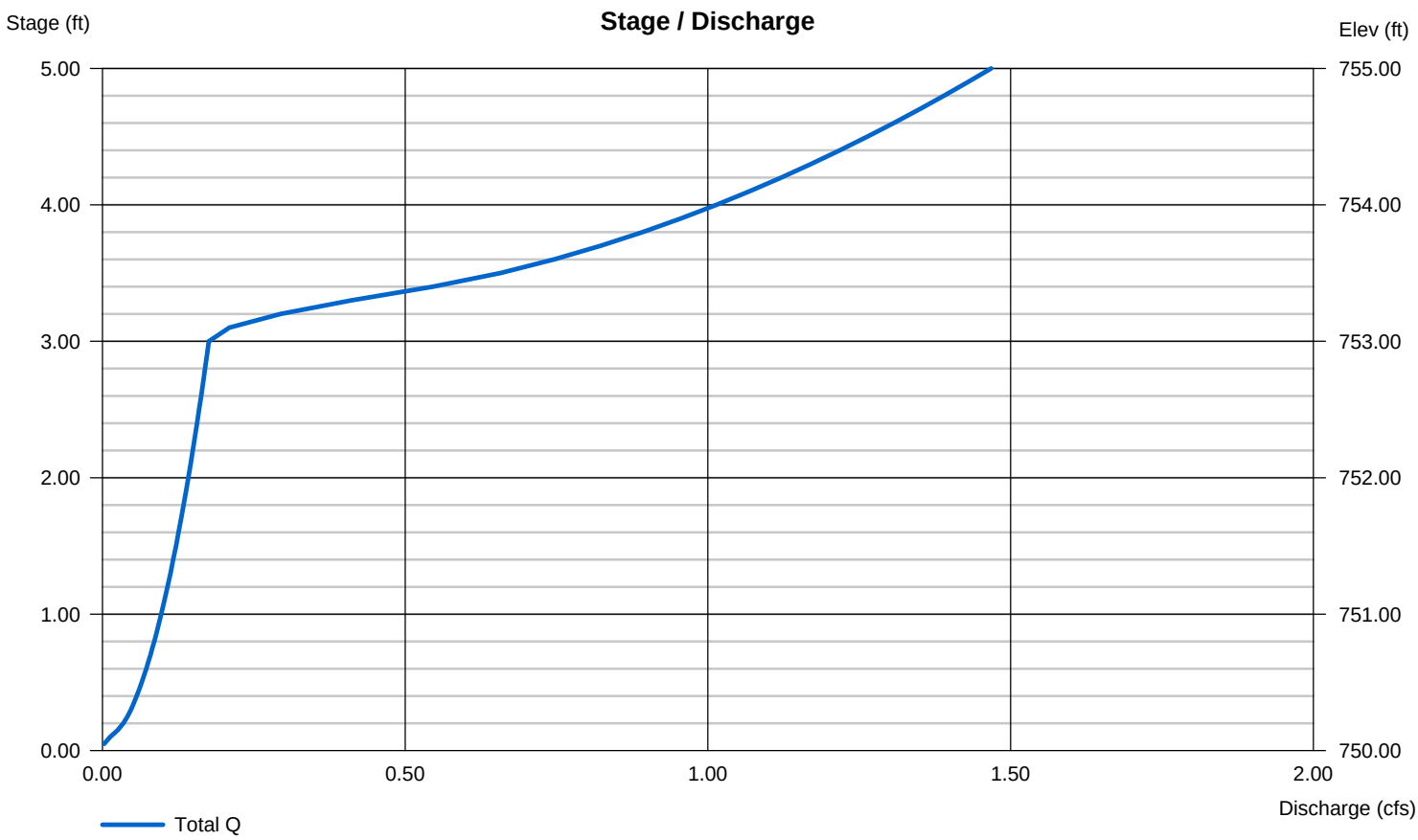
Weir Structures

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

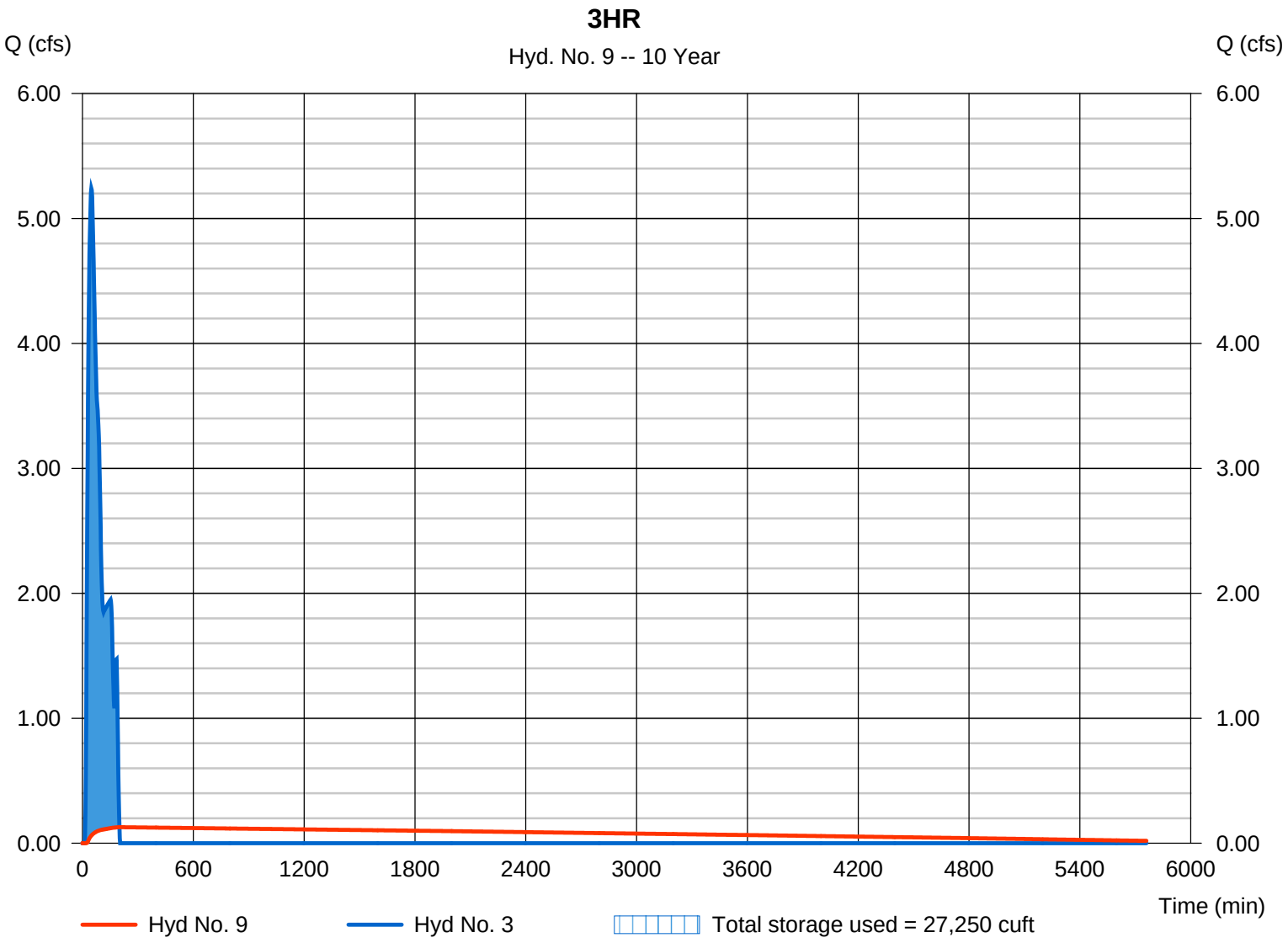
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.128 cfs
Storm frequency	= 10 yrs	Time to peak	= 200 min
Time interval	= 2 min	Hyd. volume	= 26,477 cuft
Inflow hyd. No.	= 3 - Pond 1 3HR	Max. Elevation	= 751.66 ft
Reservoir name	= Pond 1	Max. Storage	= 27,250 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

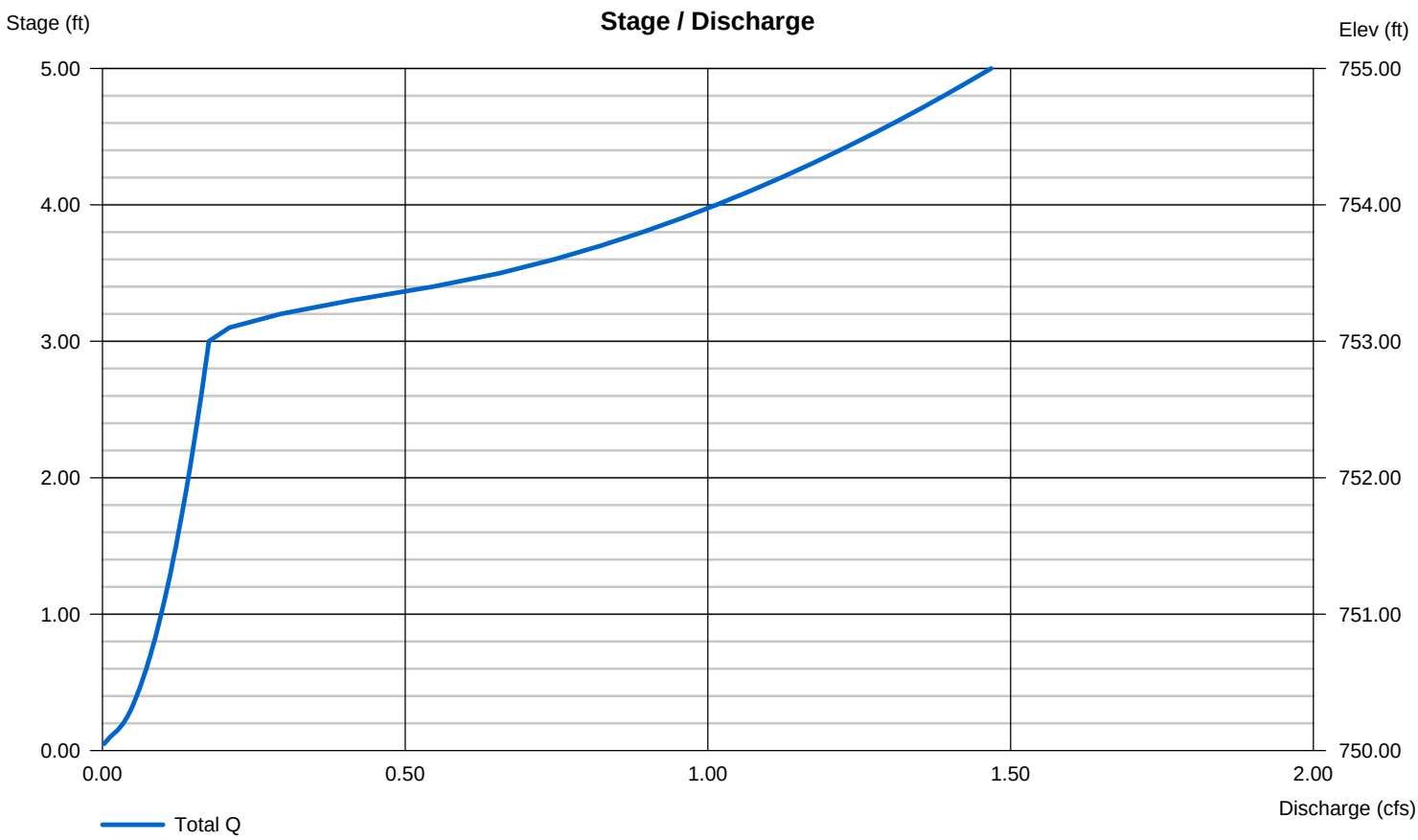
Weir Structures

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

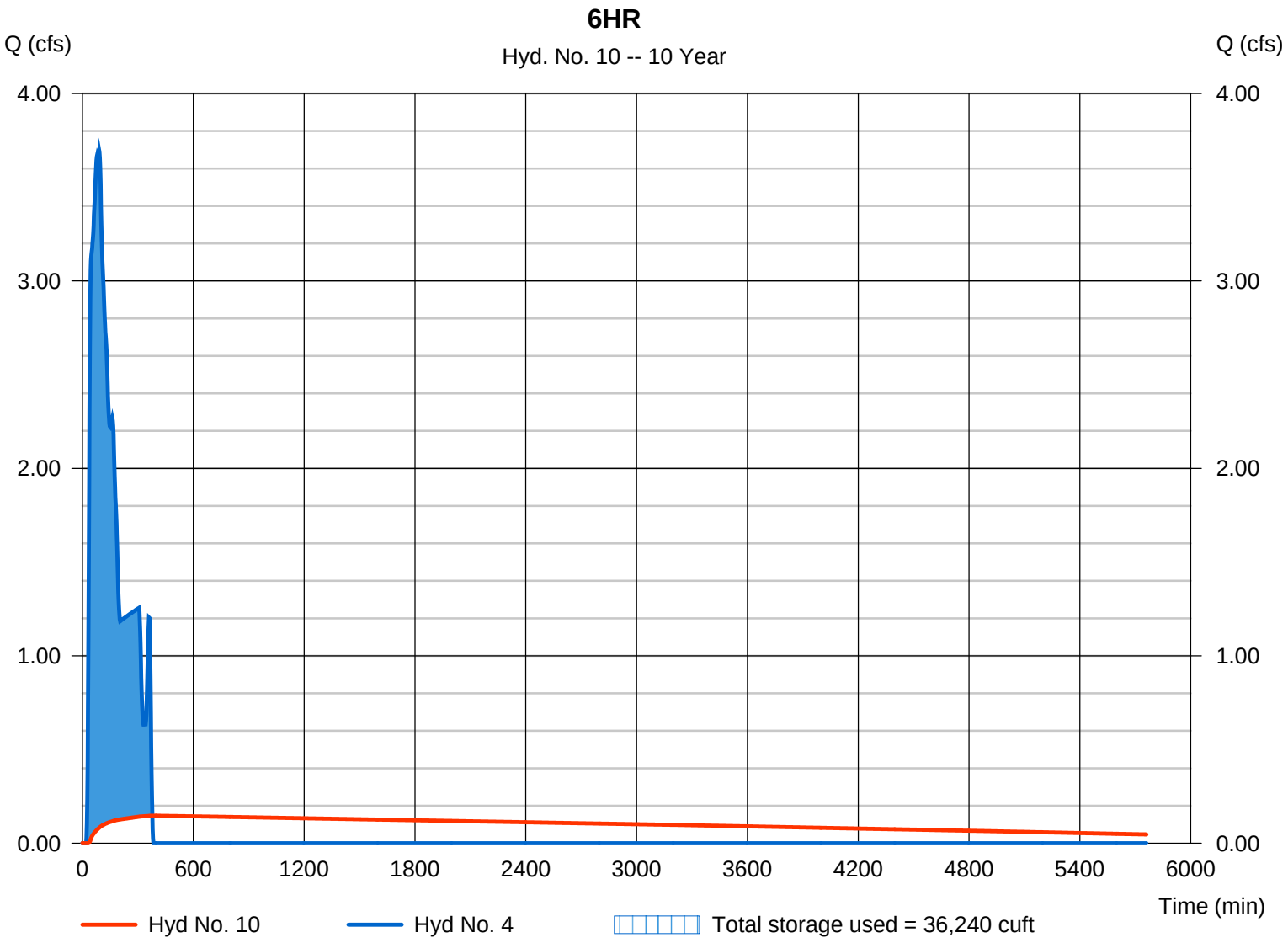
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.147 cfs
Storm frequency	= 10 yrs	Time to peak	= 378 min
Time interval	= 2 min	Hyd. volume	= 34,284 cuft
Inflow hyd. No.	= 4 - Pond 1 6HR	Max. Elevation	= 752.14 ft
Reservoir name	= Pond 1	Max. Storage	= 36,240 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

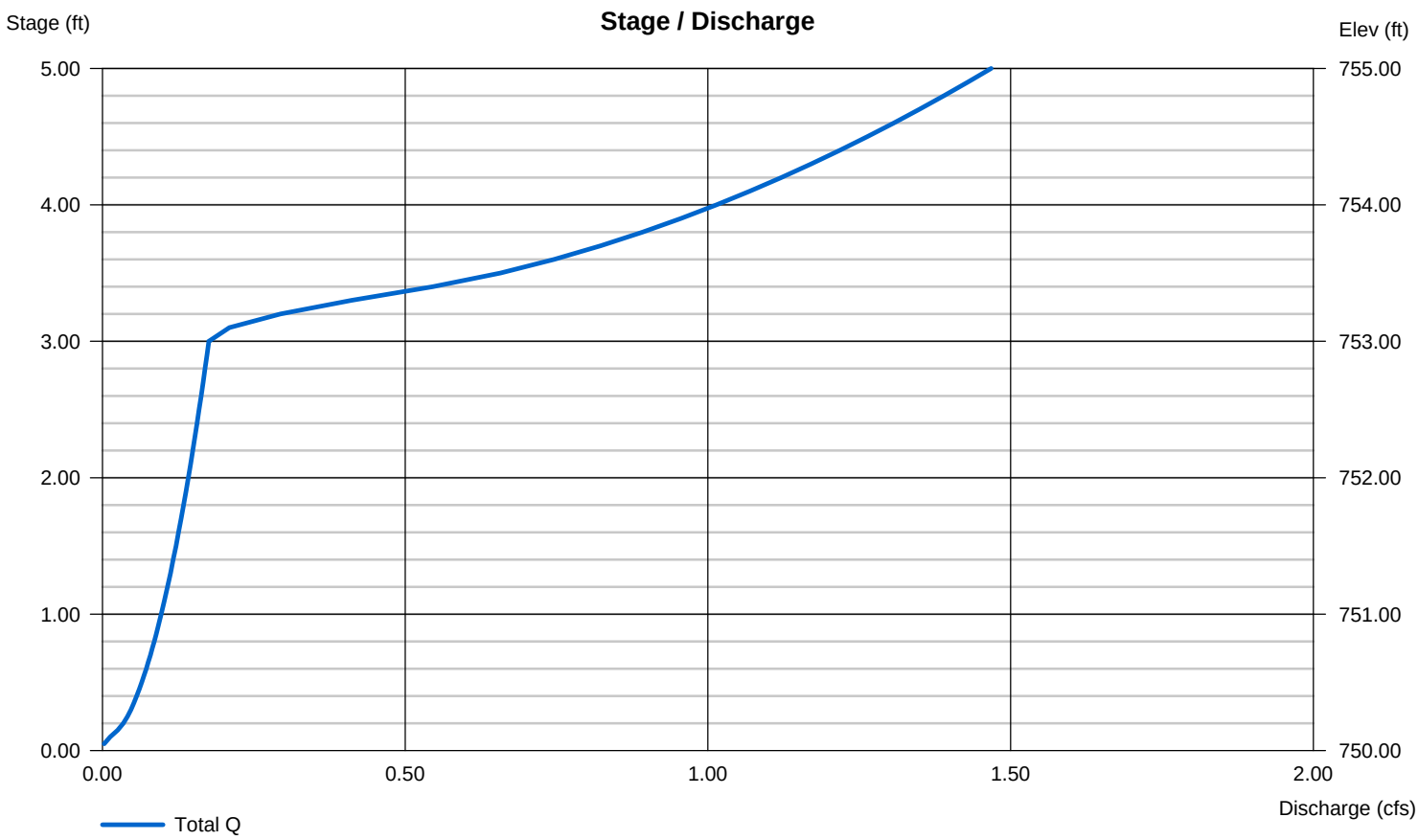
Weir Structures

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

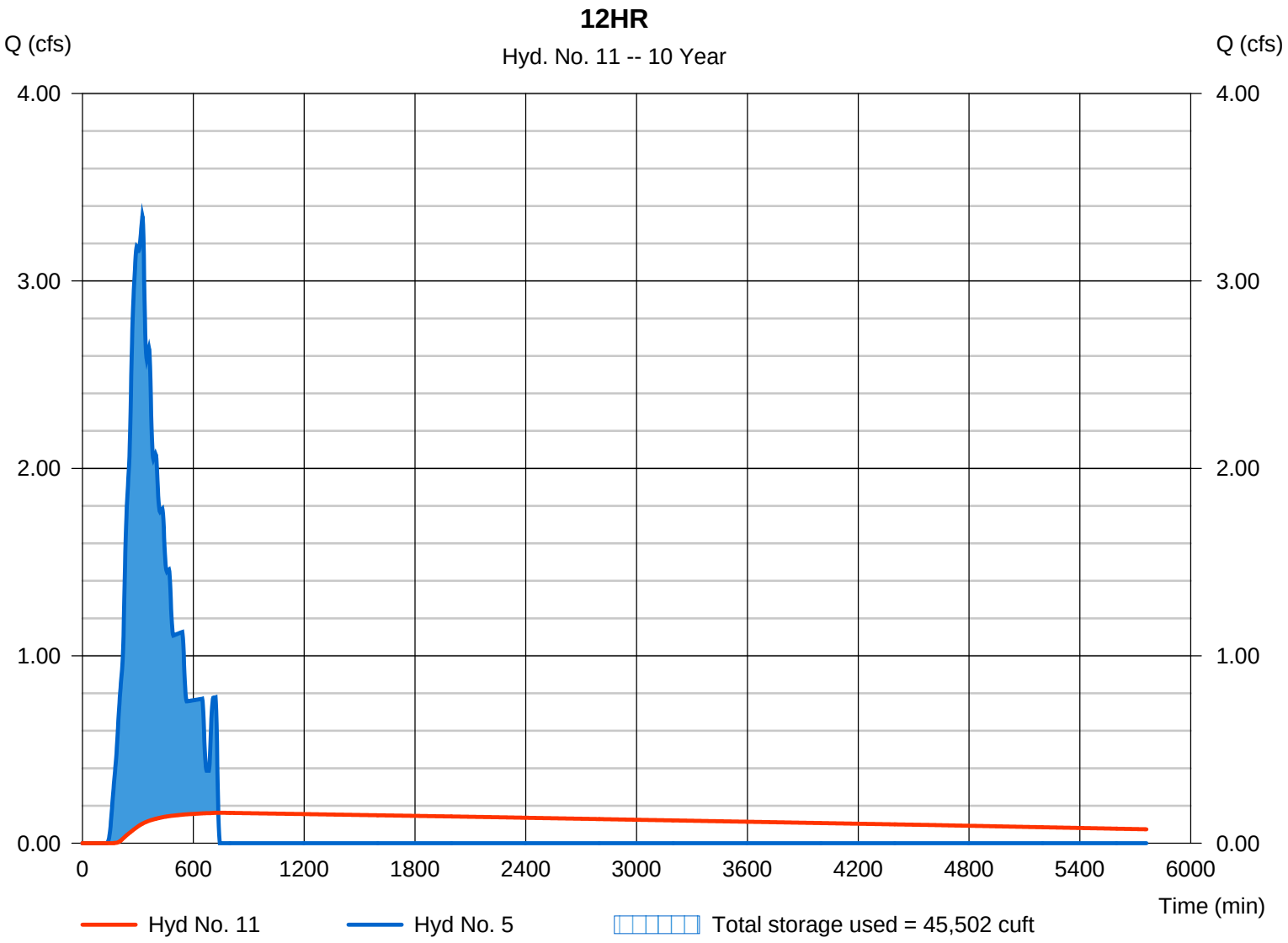
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.163 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 40,302 cuft
Inflow hyd. No.	= 5 - Pond 1 12HR	Max. Elevation	= 752.59 ft
Reservoir name	= Pond 1	Max. Storage	= 45,502 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

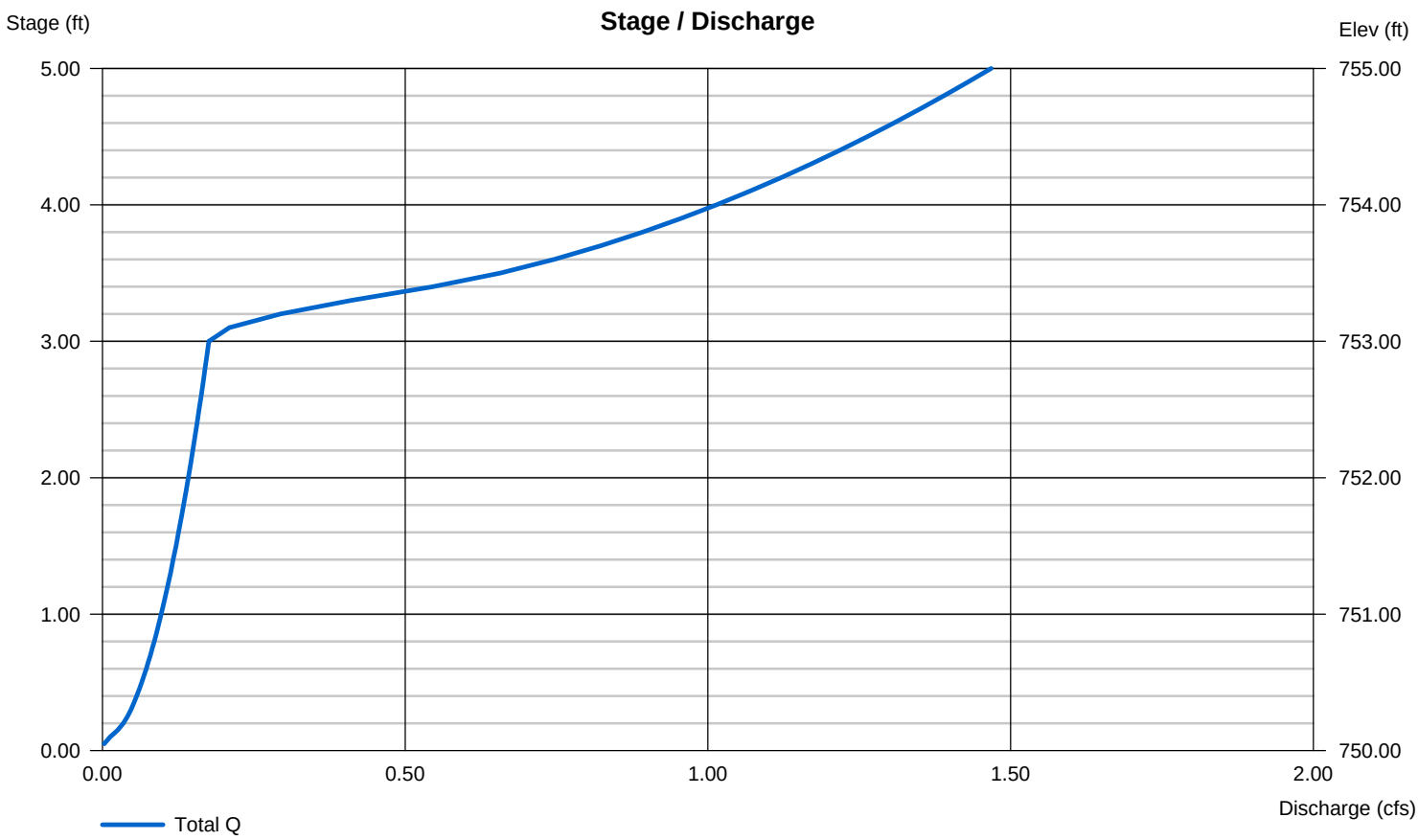
Weir Structures

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

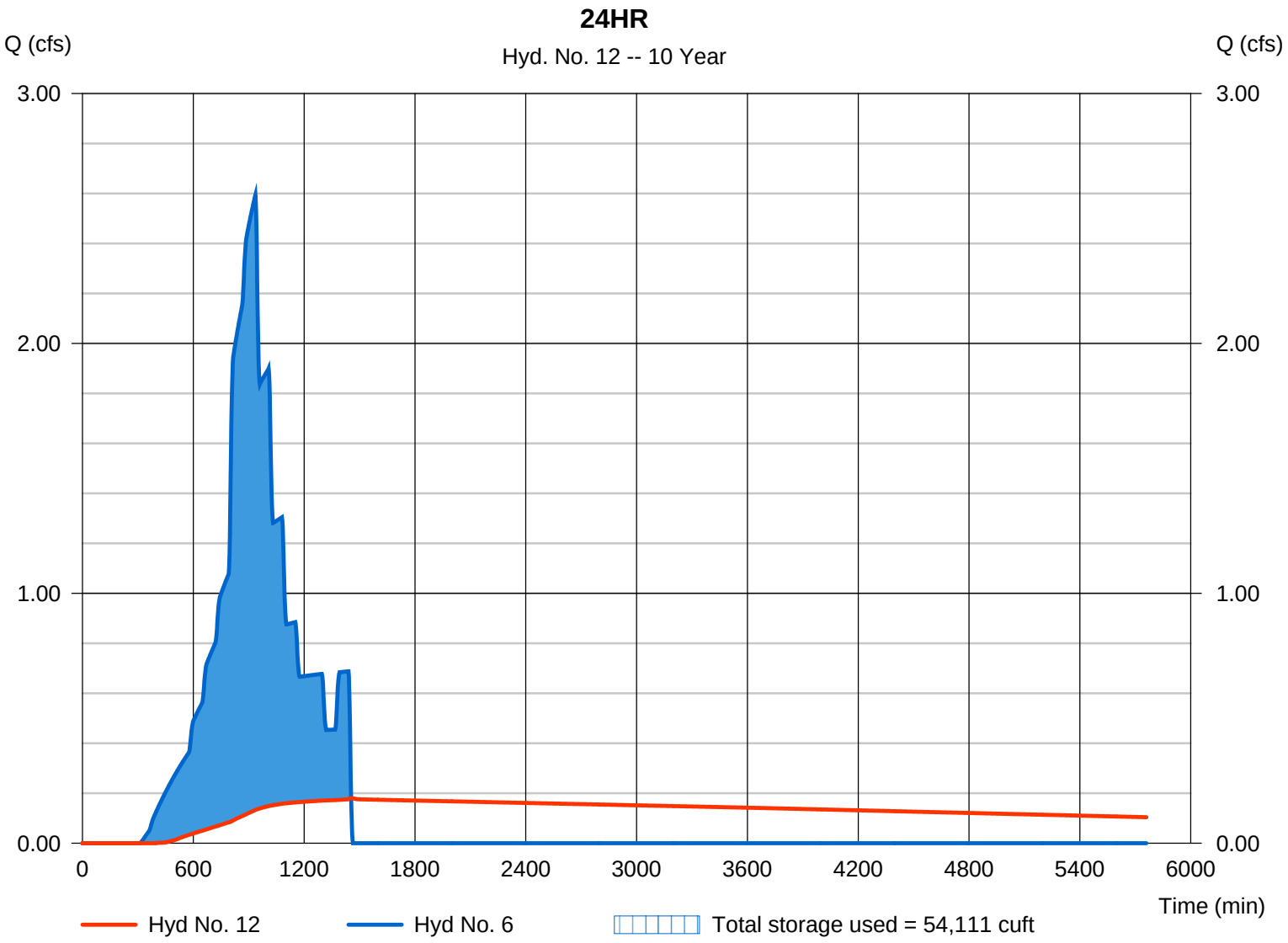
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.180 cfs
Storm frequency	= 10 yrs	Time to peak	= 1454 min
Time interval	= 2 min	Hyd. volume	= 43,358 cuft
Inflow hyd. No.	= 6 - Pond 1 24HR	Max. Elevation	= 753.01 ft
Reservoir name	= Pond 1	Max. Storage	= 54,111 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	13,949	0	0
0.50	750.50	14,963	7,226	7,226
1.00	751.00	17,067	8,001	15,227
2.00	752.00	19,271	18,156	33,383
3.00	753.00	21,576	20,411	53,793
4.00	754.00	23,981	22,766	76,559
5.00	755.00	26,487	25,221	101,780

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	753.00	0.00
Length (ft)	= 48.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

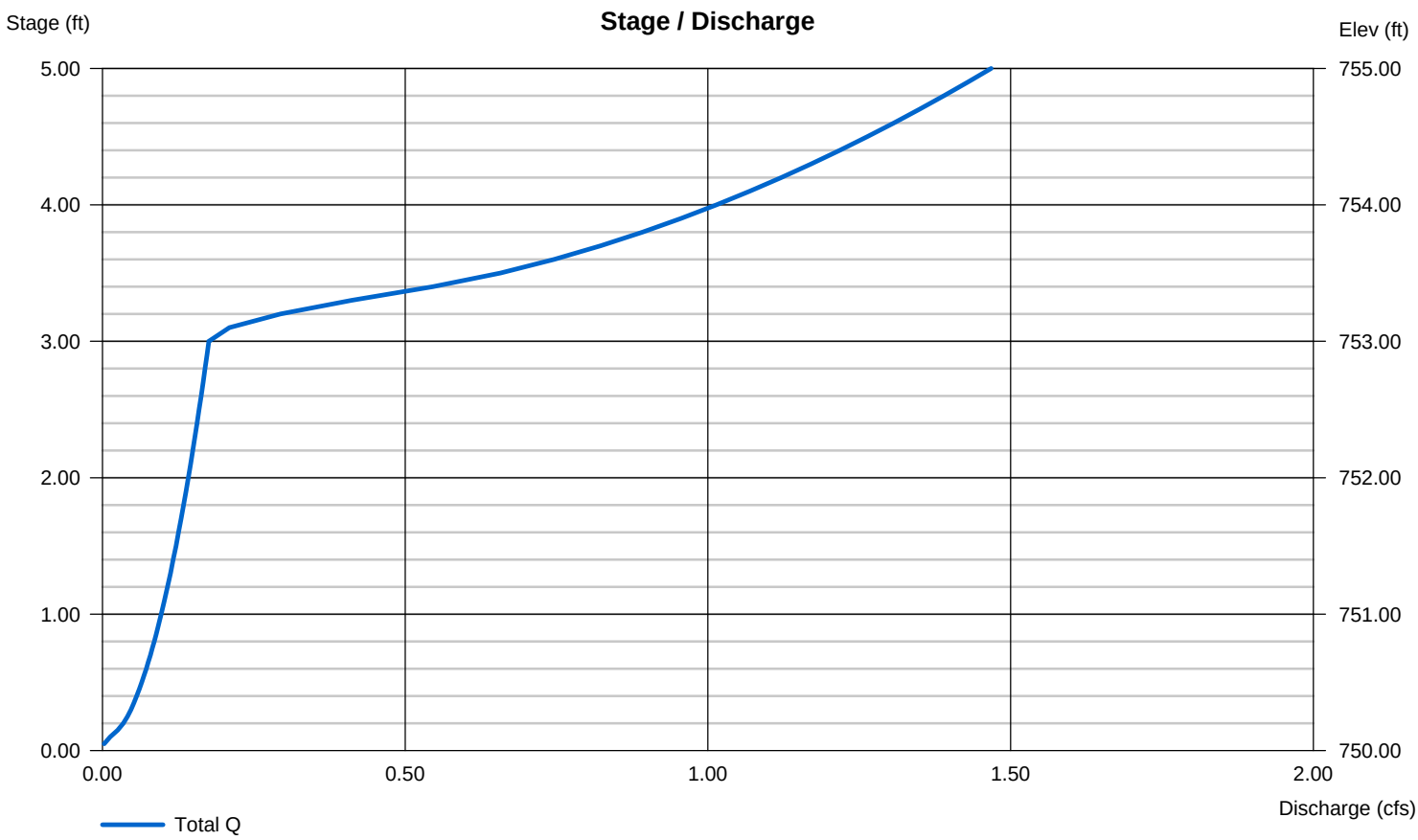
Weir Structures

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

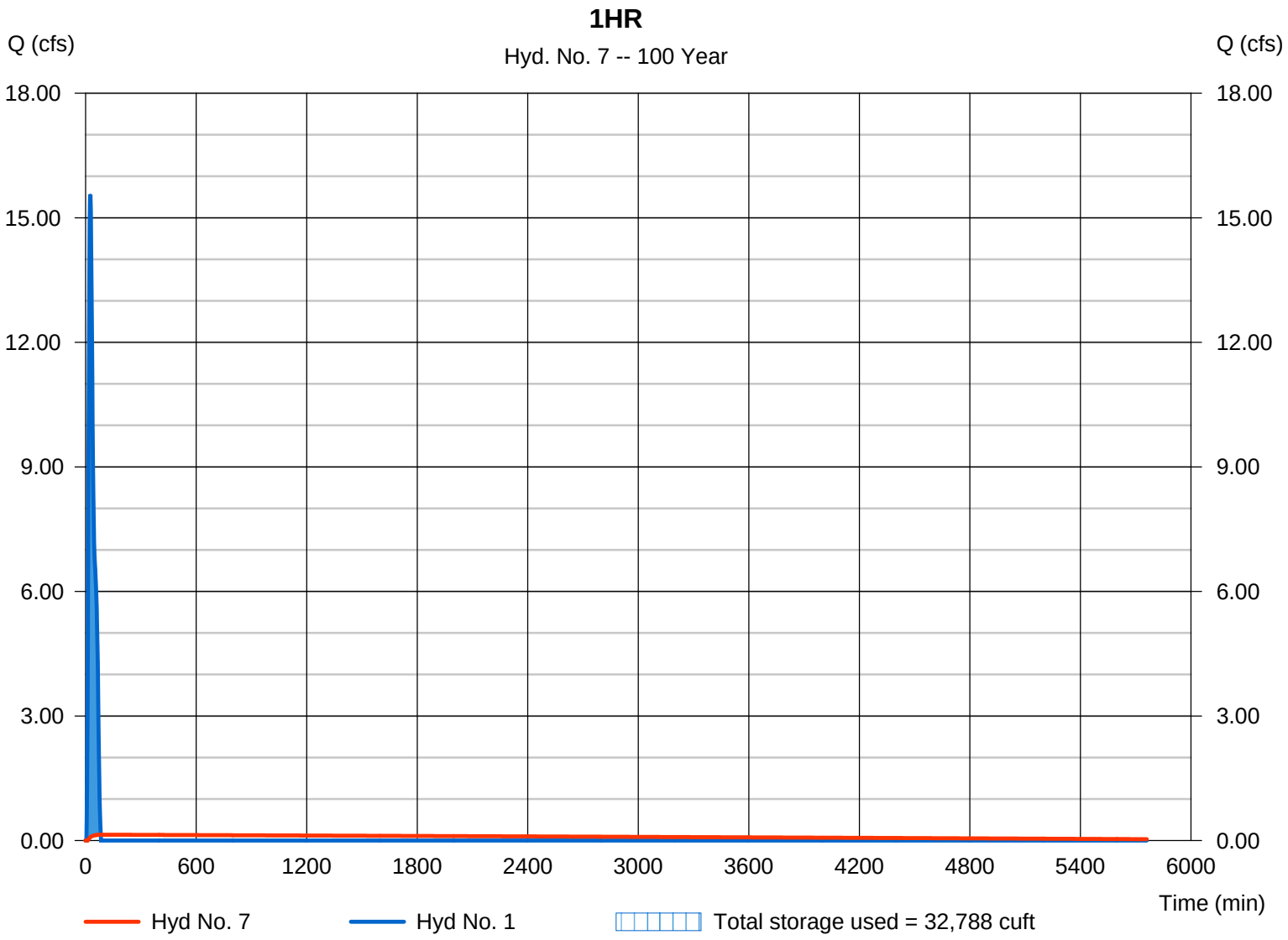
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.140 cfs
Storm frequency	= 100 yrs	Time to peak	= 82 min
Time interval	= 2 min	Hyd. volume	= 30,566 cuft
Inflow hyd. No.	= 1 - Pond 1 1HR	Max. Elevation	= 751.97 ft
Reservoir name	= Pond 1	Max. Storage	= 32,788 cuft

Storage Indication method used.



Hydrograph Report

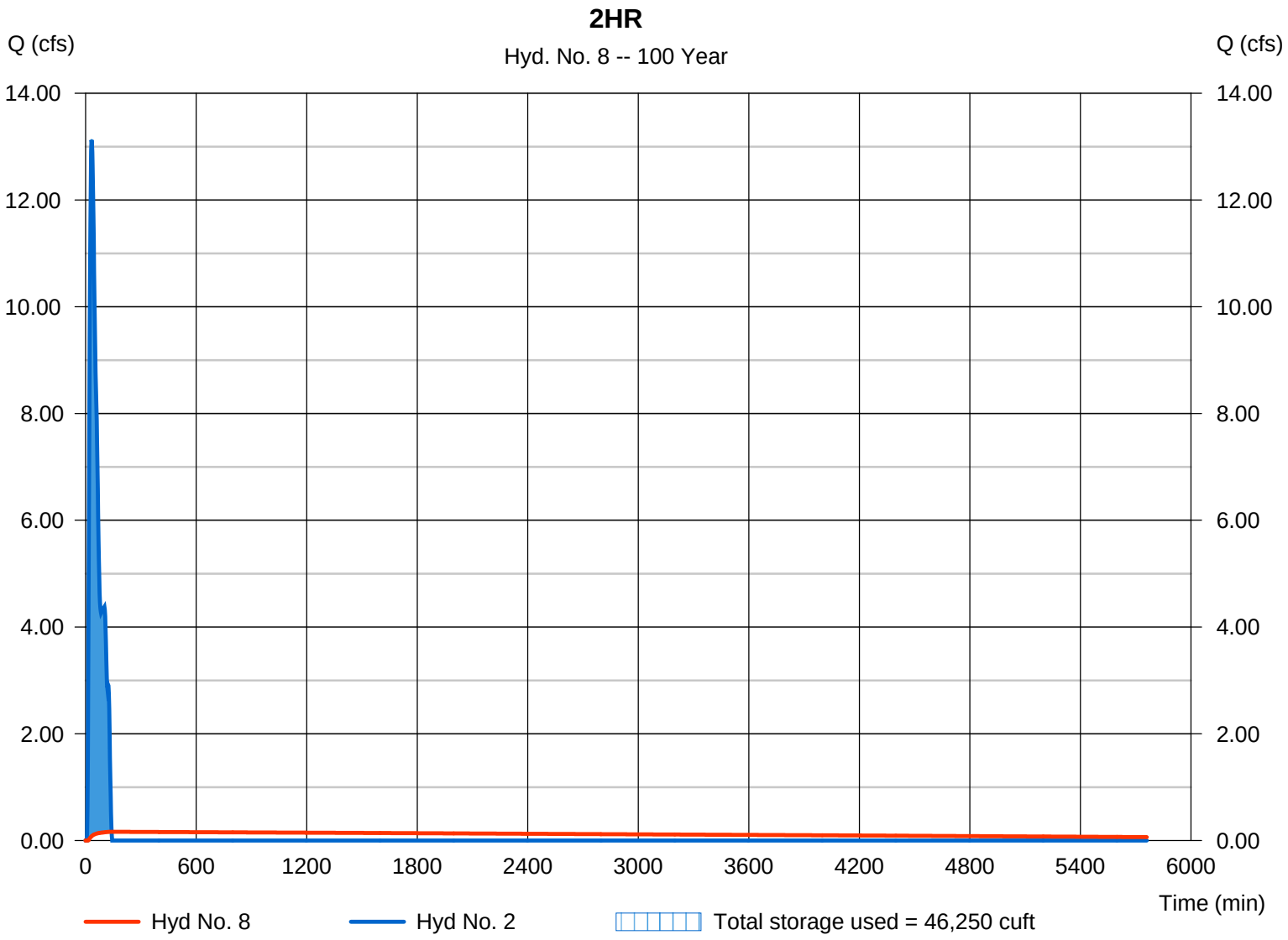
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.164 cfs
Storm frequency	= 100 yrs	Time to peak	= 142 min
Time interval	= 2 min	Hyd. volume	= 40,111 cuft
Inflow hyd. No.	= 2 - Pond 1 2HR	Max. Elevation	= 752.63 ft
Reservoir name	= Pond 1	Max. Storage	= 46,250 cuft

Storage Indication method used.



Hydrograph Report

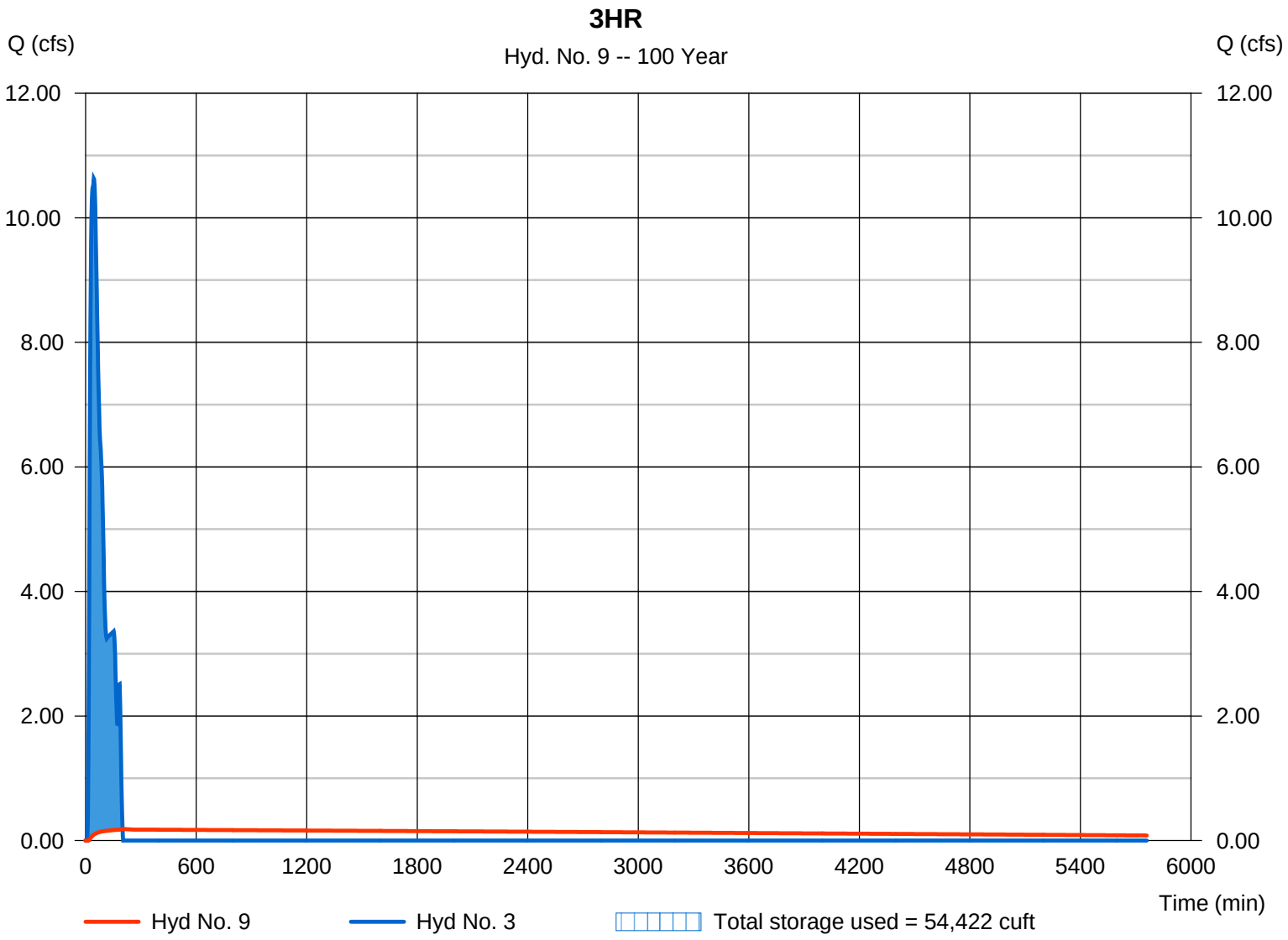
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.185 cfs
Storm frequency	= 100 yrs	Time to peak	= 200 min
Time interval	= 2 min	Hyd. volume	= 45,110 cuft
Inflow hyd. No.	= 3 - Pond 1 3HR	Max. Elevation	= 753.03 ft
Reservoir name	= Pond 1	Max. Storage	= 54,422 cuft

Storage Indication method used.



Hydrograph Report

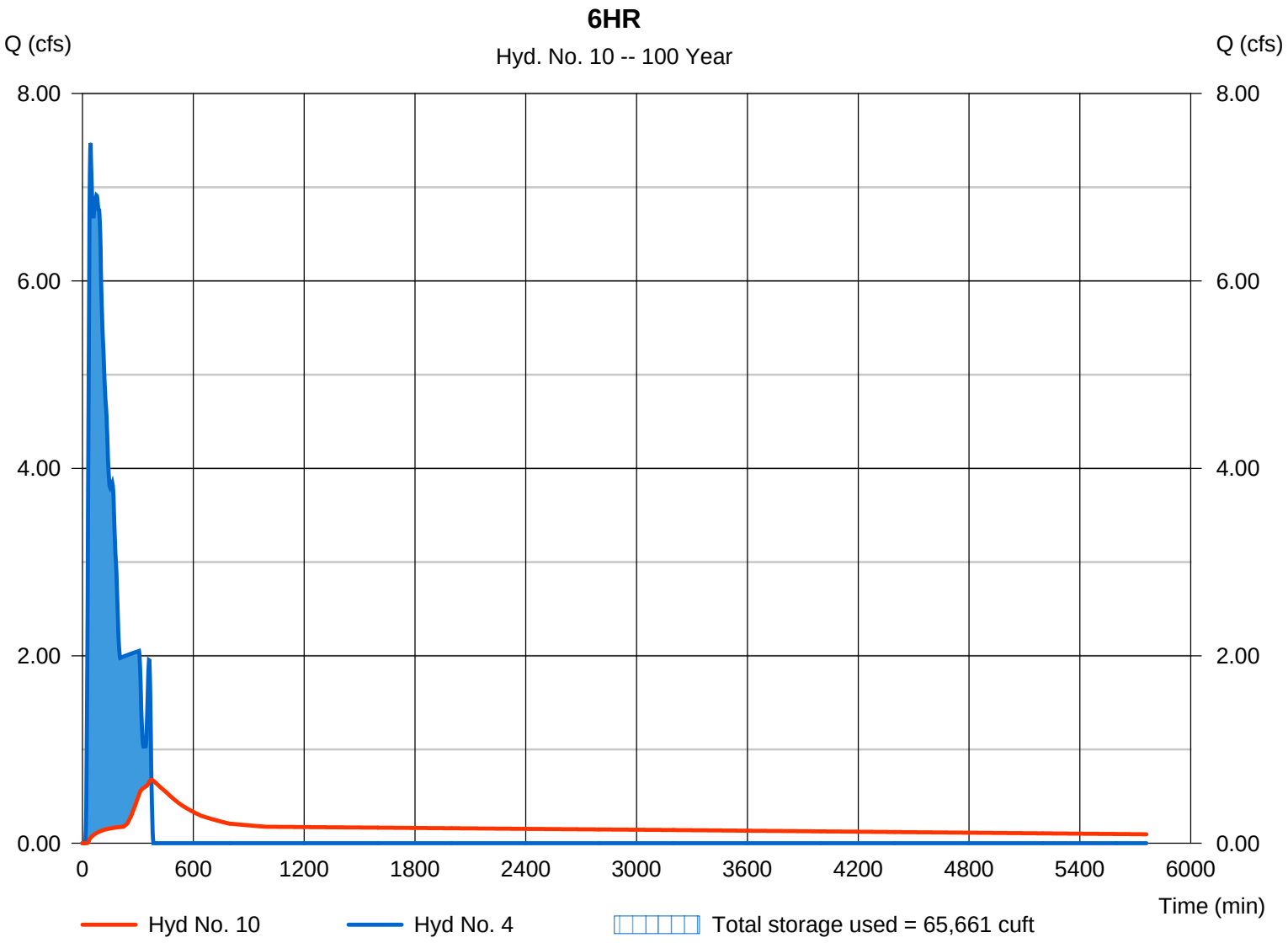
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.676 cfs
Storm frequency	= 100 yrs	Time to peak	= 374 min
Time interval	= 2 min	Hyd. volume	= 56,671 cuft
Inflow hyd. No.	= 4 - Pond 1 6HR	Max. Elevation	= 753.52 ft
Reservoir name	= Pond 1	Max. Storage	= 65,661 cuft

Storage Indication method used.



Hydrograph Report

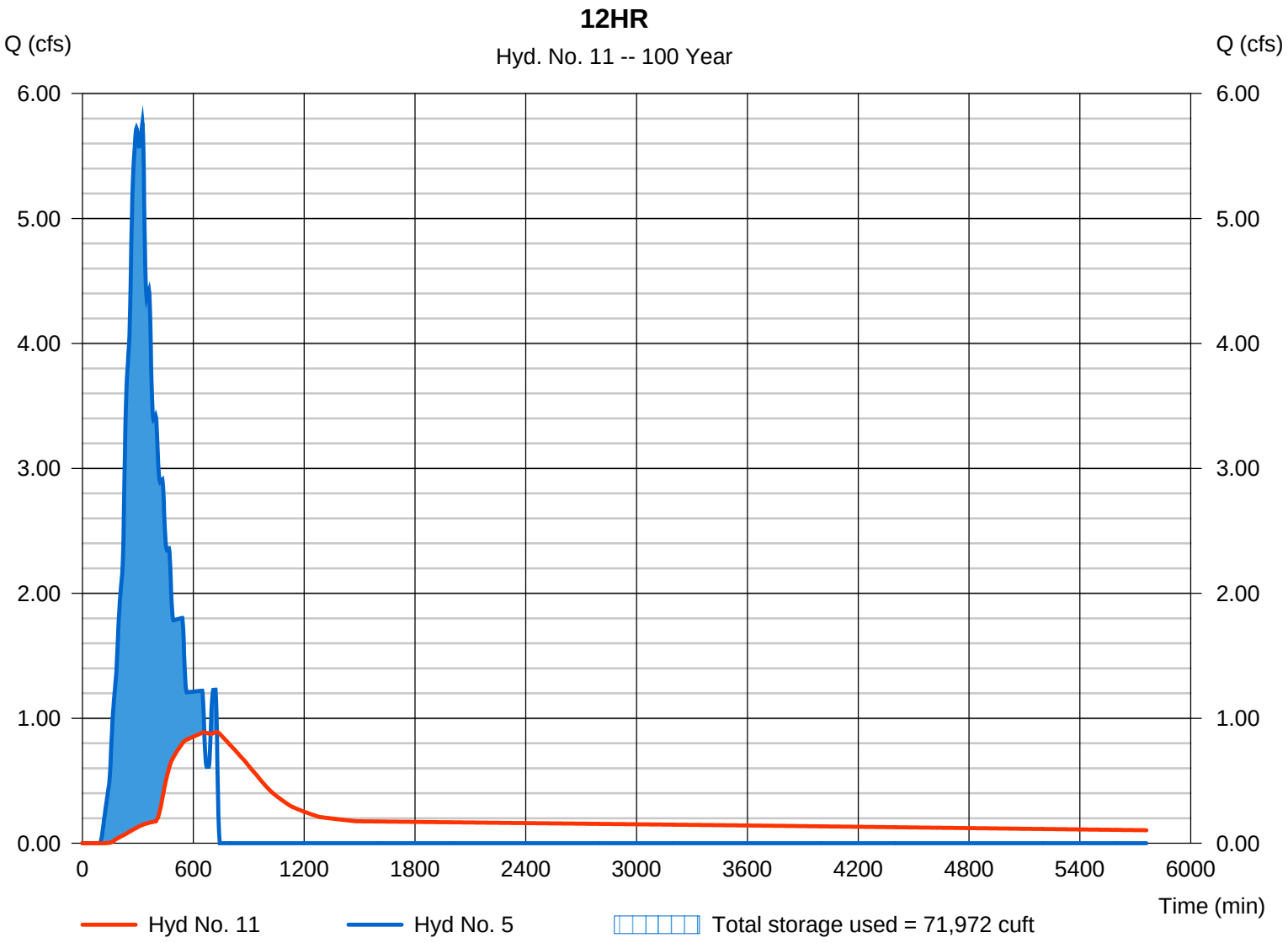
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.891 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 70,503 cuft
Inflow hyd. No.	= 5 - Pond 1 12HR	Max. Elevation	= 753.80 ft
Reservoir name	= Pond 1	Max. Storage	= 71,972 cuft

Storage Indication method used.



Hydrograph Report

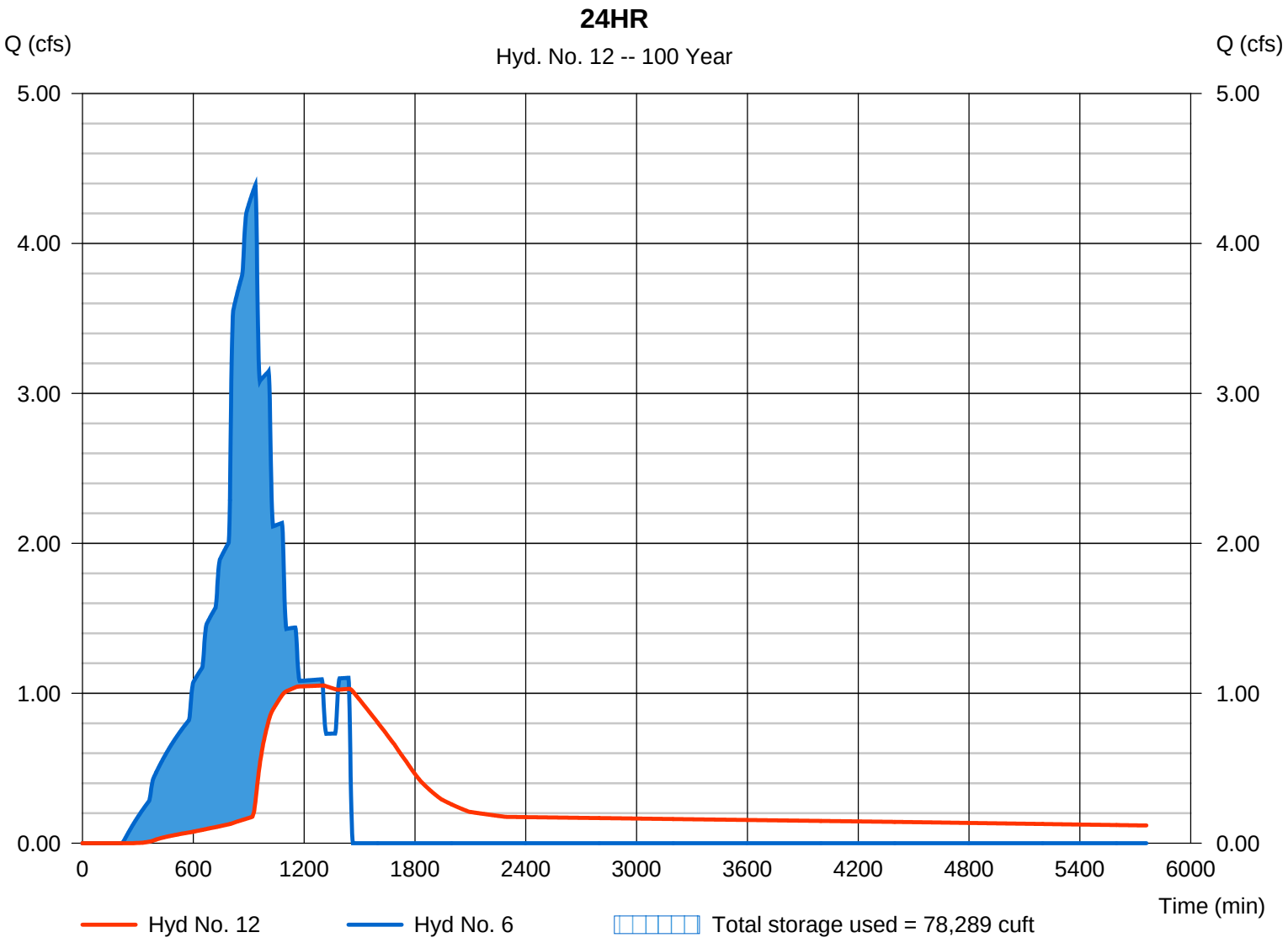
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 1.052 cfs
Storm frequency	= 100 yrs	Time to peak	= 1300 min
Time interval	= 2 min	Hyd. volume	= 87,069 cuft
Inflow hyd. No.	= 6 - Pond 1 24HR	Max. Elevation	= 754.07 ft
Reservoir name	= Pond 1	Max. Storage	= 78,289 cuft

Storage Indication method used.



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

	Present	X	Developed

Pond 2

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Residential 1/4 Acre Lots	75	5.49	411.75
CsB2	C	Residential 1/4 Acre Lots	83	0.67	55.61
CrA	C	Residential 1/4 Acre Lots	83	6.08	504.64
			Totals =	12.24	972

CN = 79.4

TR55 Tc Worksheet

Hyd. No. 13

Pond 2 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 14.23**	**+**	**0.00**	**+**	**0.00**	**=**	**14.23**
Shallow Concentrated Flow							
Flow length (ft)	= 205.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 2.12**	**+**	**0.00**	**+**	**0.00**	**=**	**2.12**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	=4.56						
			0.00				
					0.00		
Flow length (ft)	({0})664.0		0.0		0.0		
Travel Time (min)	**= 2.43**	**+**	**0.00**	**+**	**0.00**	**=**	**2.43**

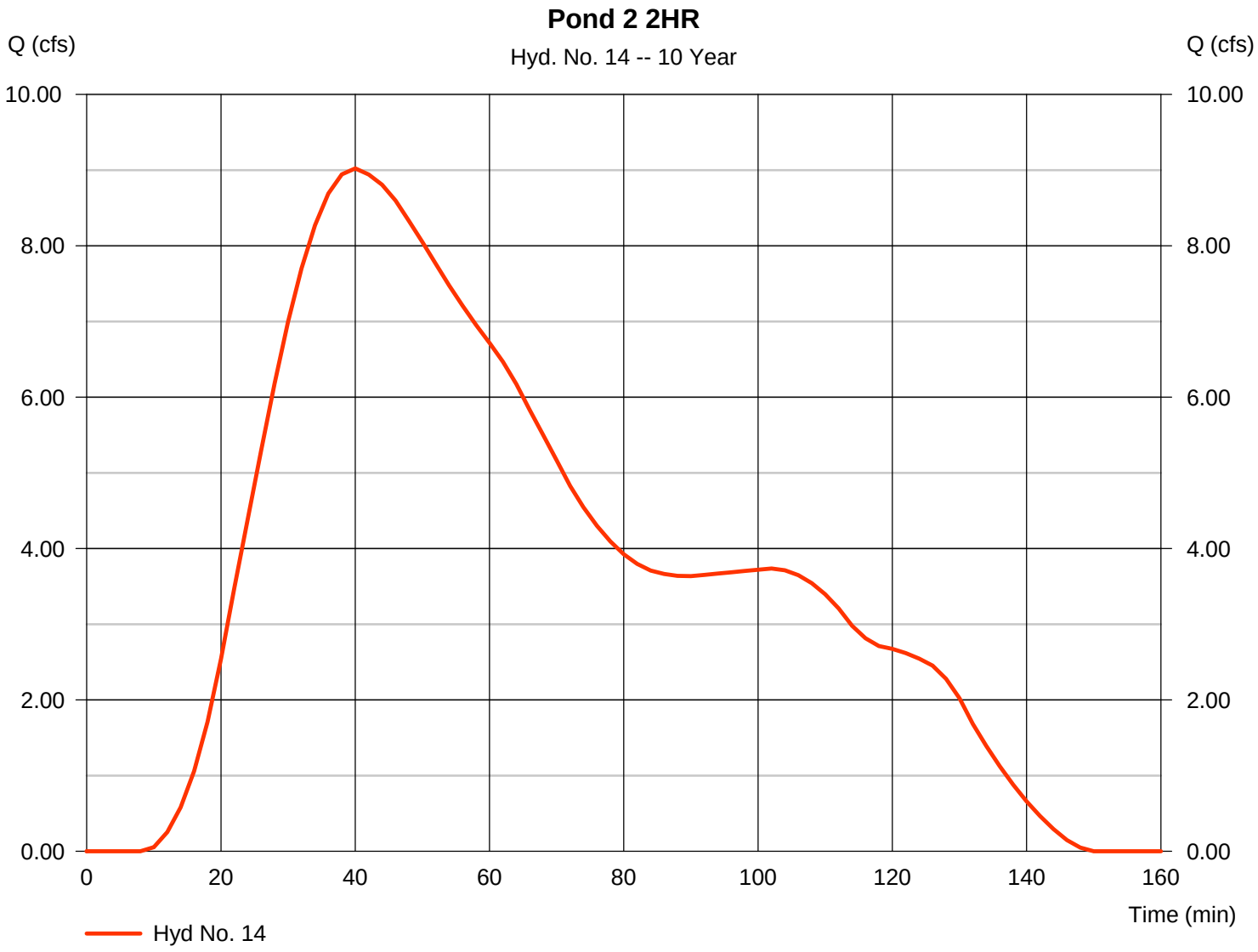
Total Travel Time, Tc ..... 18.78 min

Hydrograph Report

Hyd. No. 14

Pond 2 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 9.022 cfs
Storm frequency	= 10 yrs	Time to peak	= 40 min
Time interval	= 2 min	Hyd. volume	= 35,129 cuft
Drainage area	= 12.240 ac	Curve number	= 79.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.80 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484



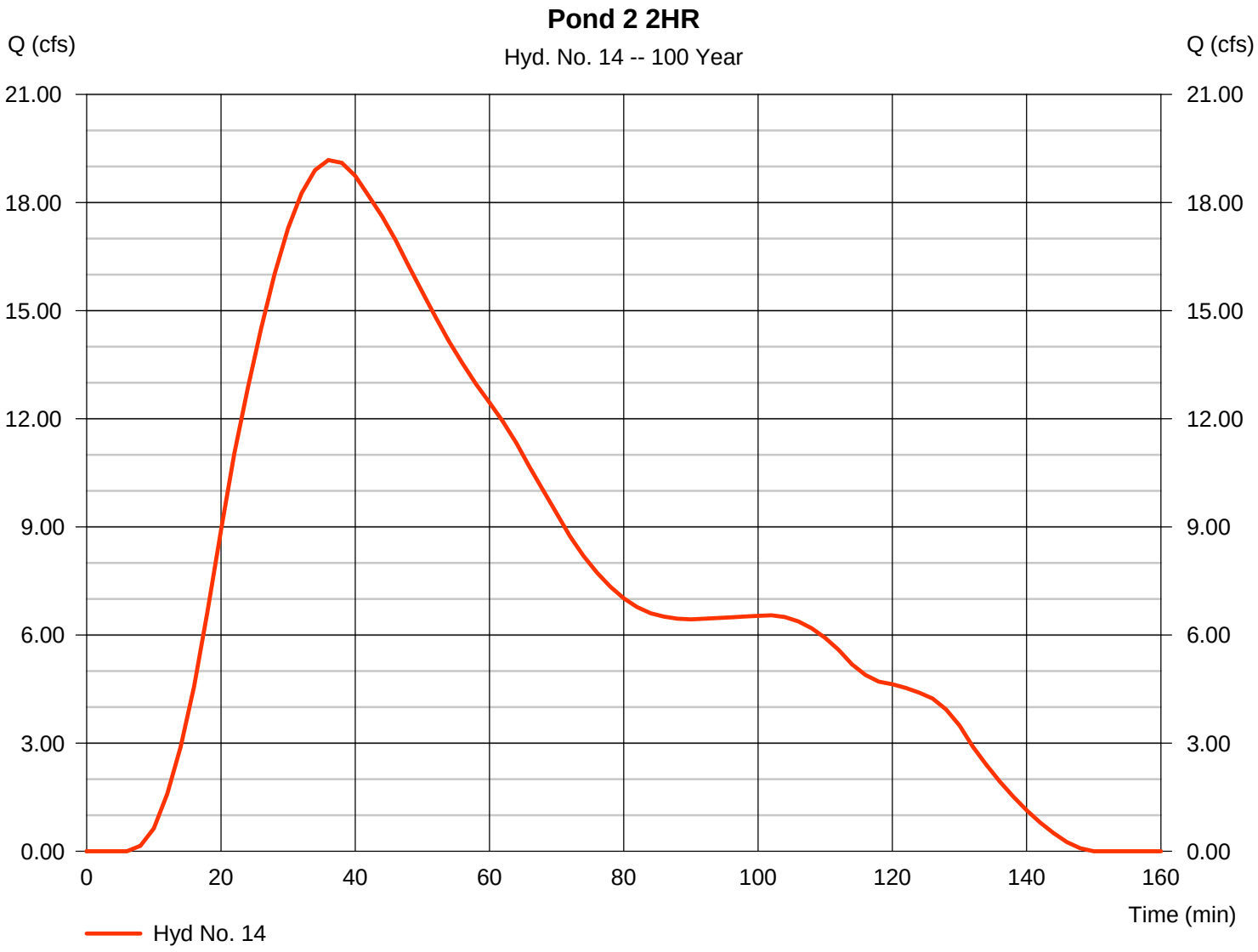
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 14

Pond 2 2HR

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.18 cfs
Storm frequency	=	100 yrs	Time to peak	=	36 min
Time interval	=	2 min	Hyd. volume	=	70,791 cuft
Drainage area	=	12.240 ac	Curve number	=	79.4
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	18.80 min
Total precip.	=	3.50 in	Distribution	=	Huff-1st
Storm duration	=	2.00 hrs	Shape factor	=	484



Hydrograph Report

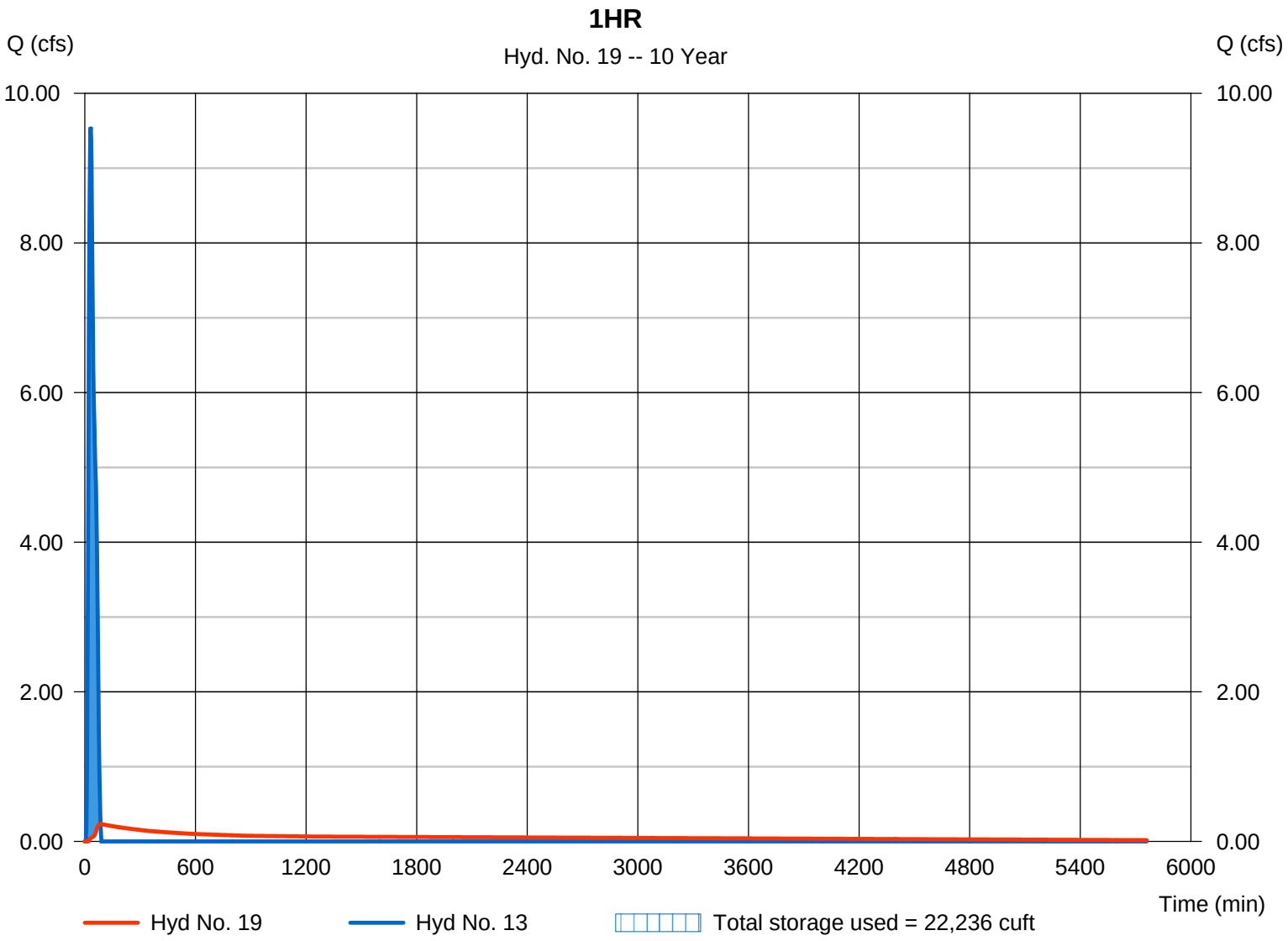
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 19

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.232 cfs
Storm frequency	= 10 yrs	Time to peak	= 86 min
Time interval	= 2 min	Hyd. volume	= 19,255 cuft
Inflow hyd. No.	= 13 - Pond 2 1HR	Max. Elevation	= 750.74 ft
Reservoir name	= Pond 2	Max. Storage	= 22,236 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

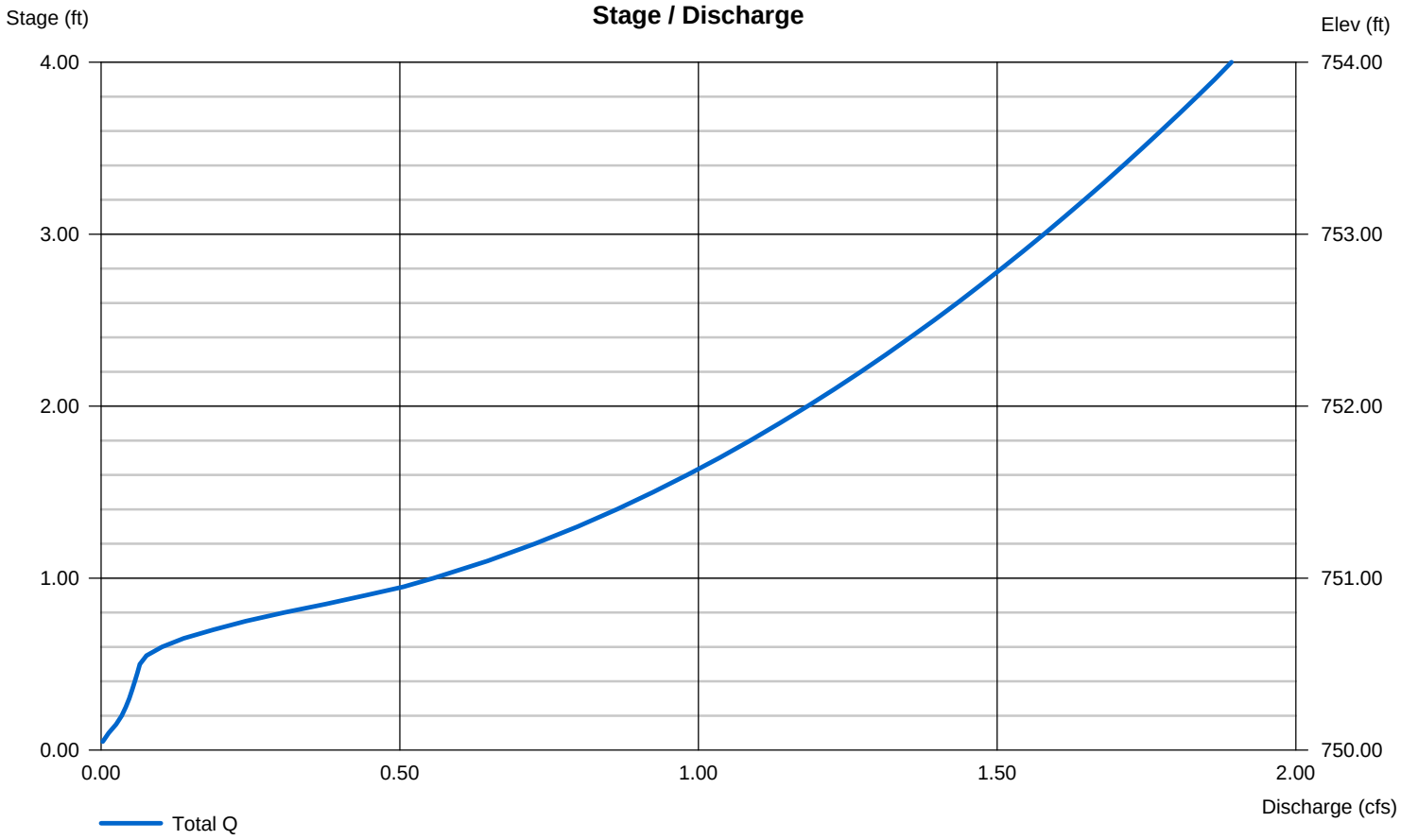
Weir Structures

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

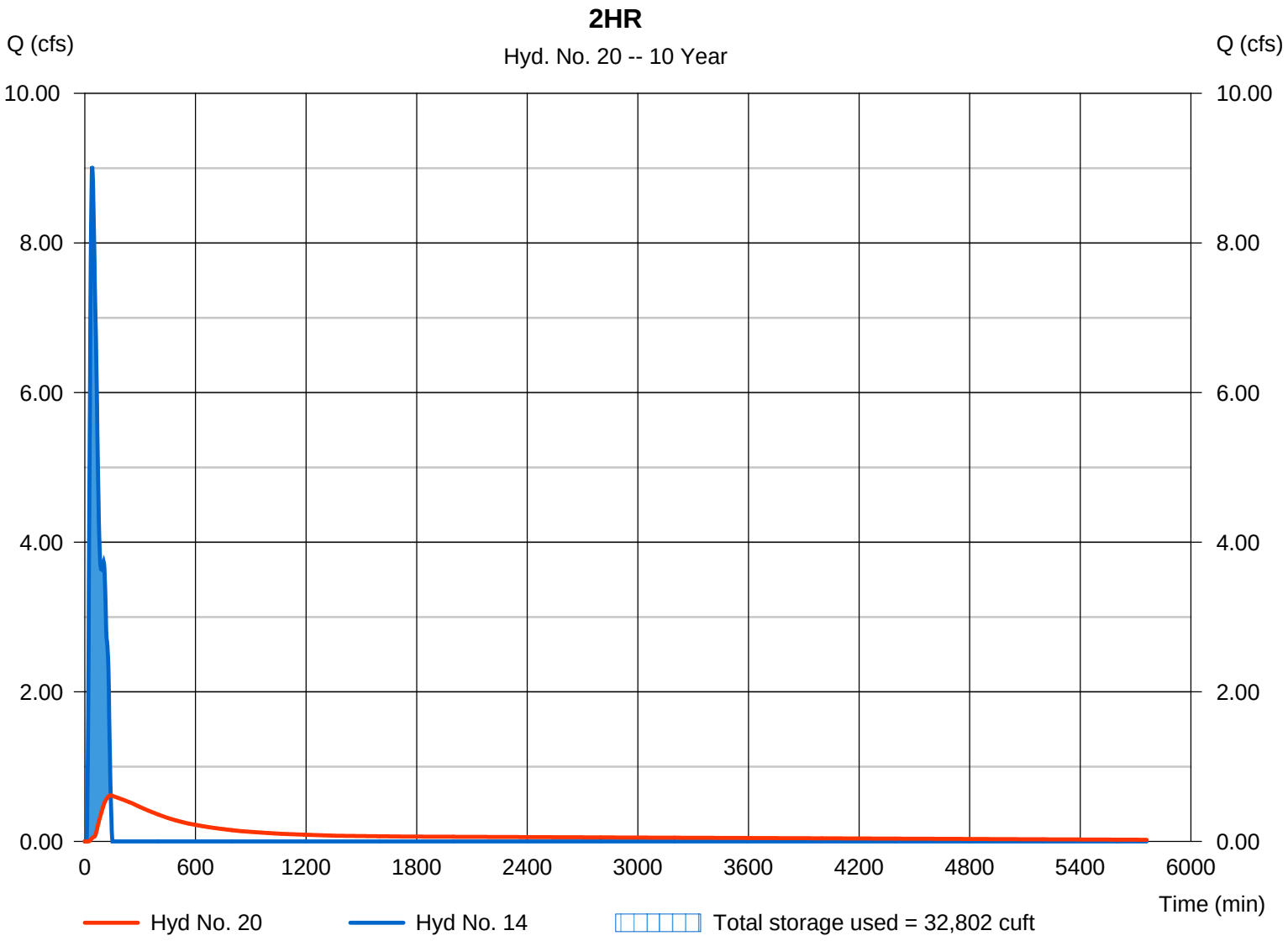
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 20

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.615 cfs
Storm frequency	= 10 yrs	Time to peak	= 140 min
Time interval	= 2 min	Hyd. volume	= 31,106 cuft
Inflow hyd. No.	= 14 - Pond 2 2HR	Max. Elevation	= 751.07 ft
Reservoir name	= Pond 2	Max. Storage	= 32,802 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

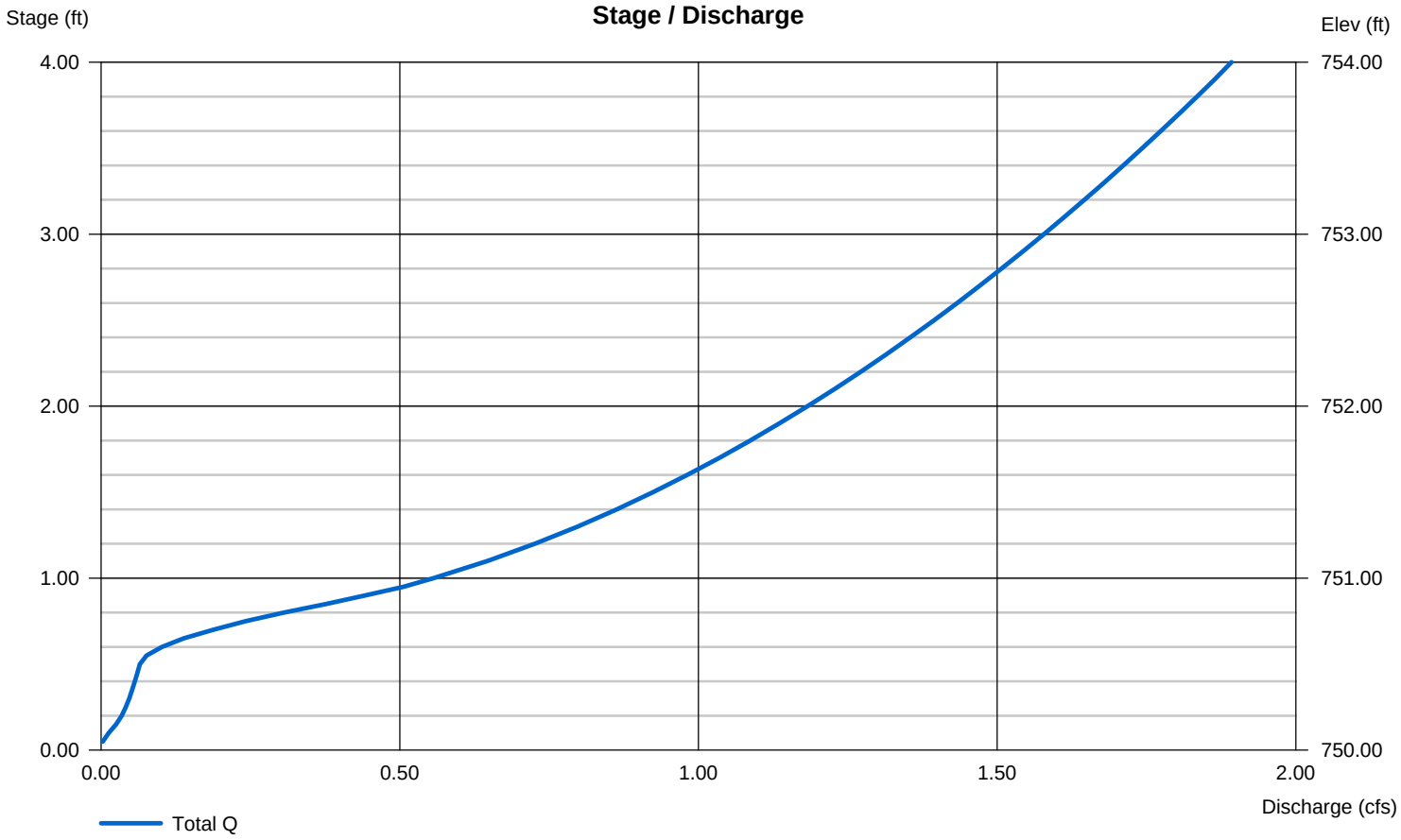
Weir Structures

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

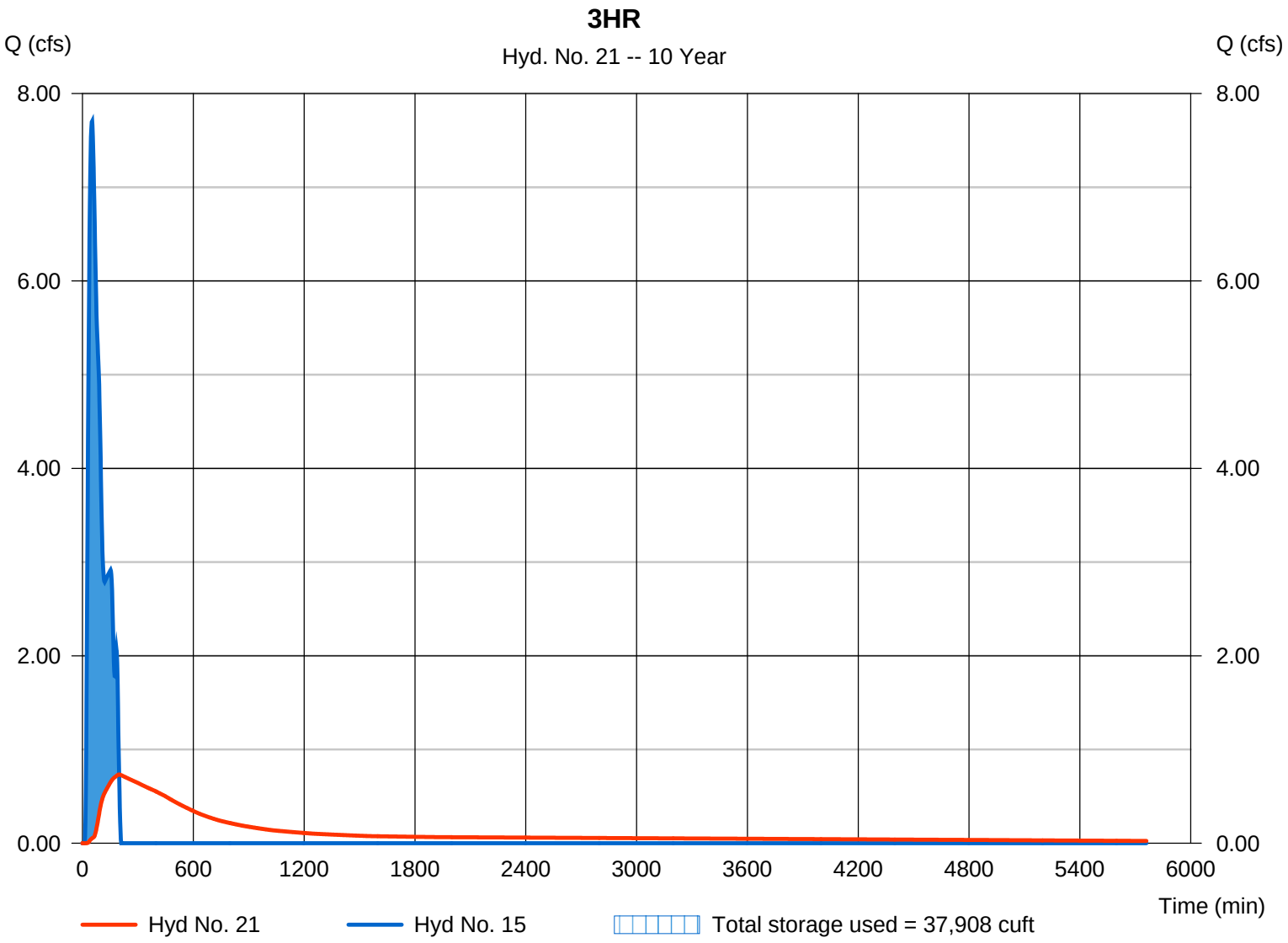
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 21

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.733 cfs
Storm frequency	= 10 yrs	Time to peak	= 198 min
Time interval	= 2 min	Hyd. volume	= 38,075 cuft
Inflow hyd. No.	= 15 - Pond 2 3HR	Max. Elevation	= 751.21 ft
Reservoir name	= Pond 2	Max. Storage	= 37,908 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

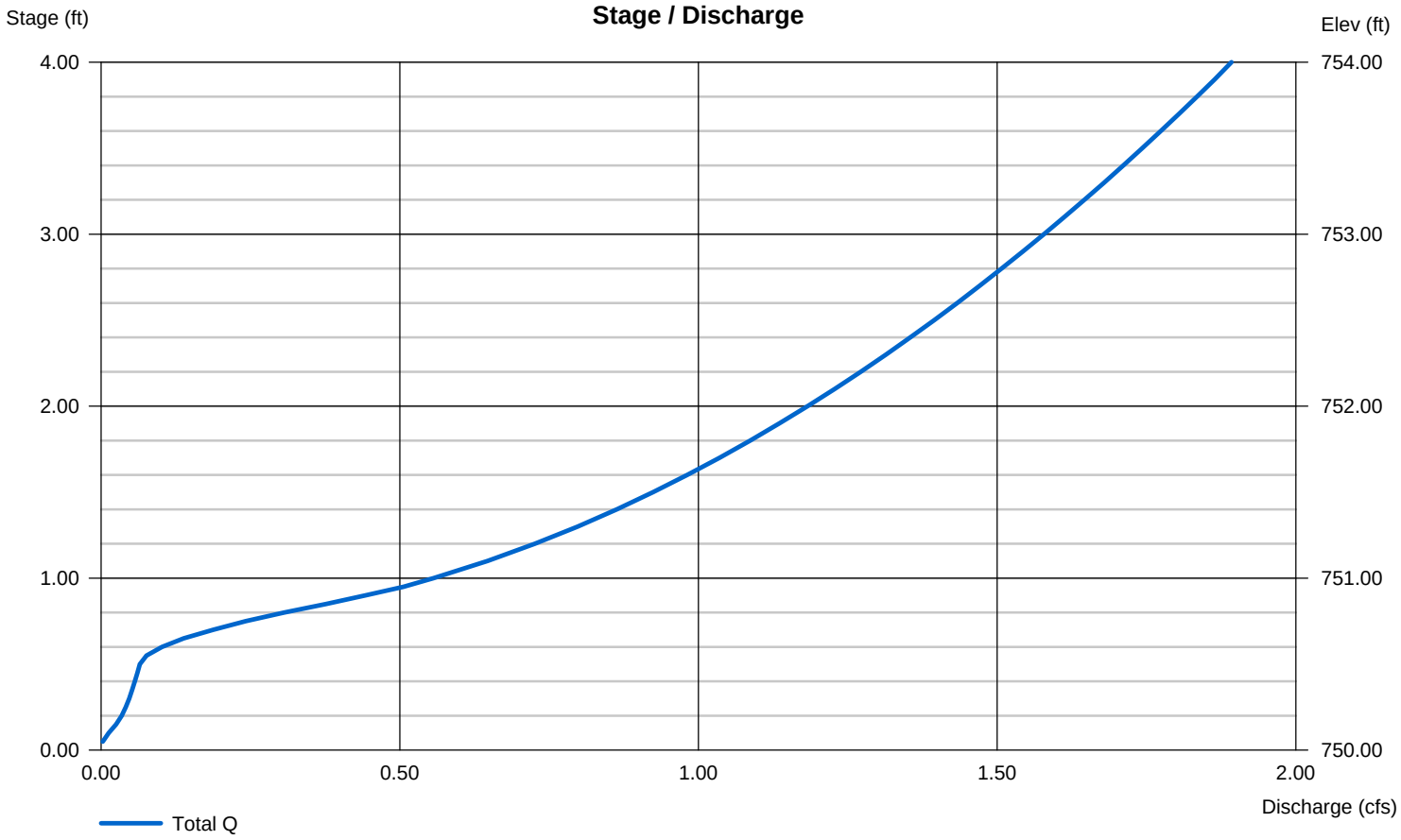
Weir Structures

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

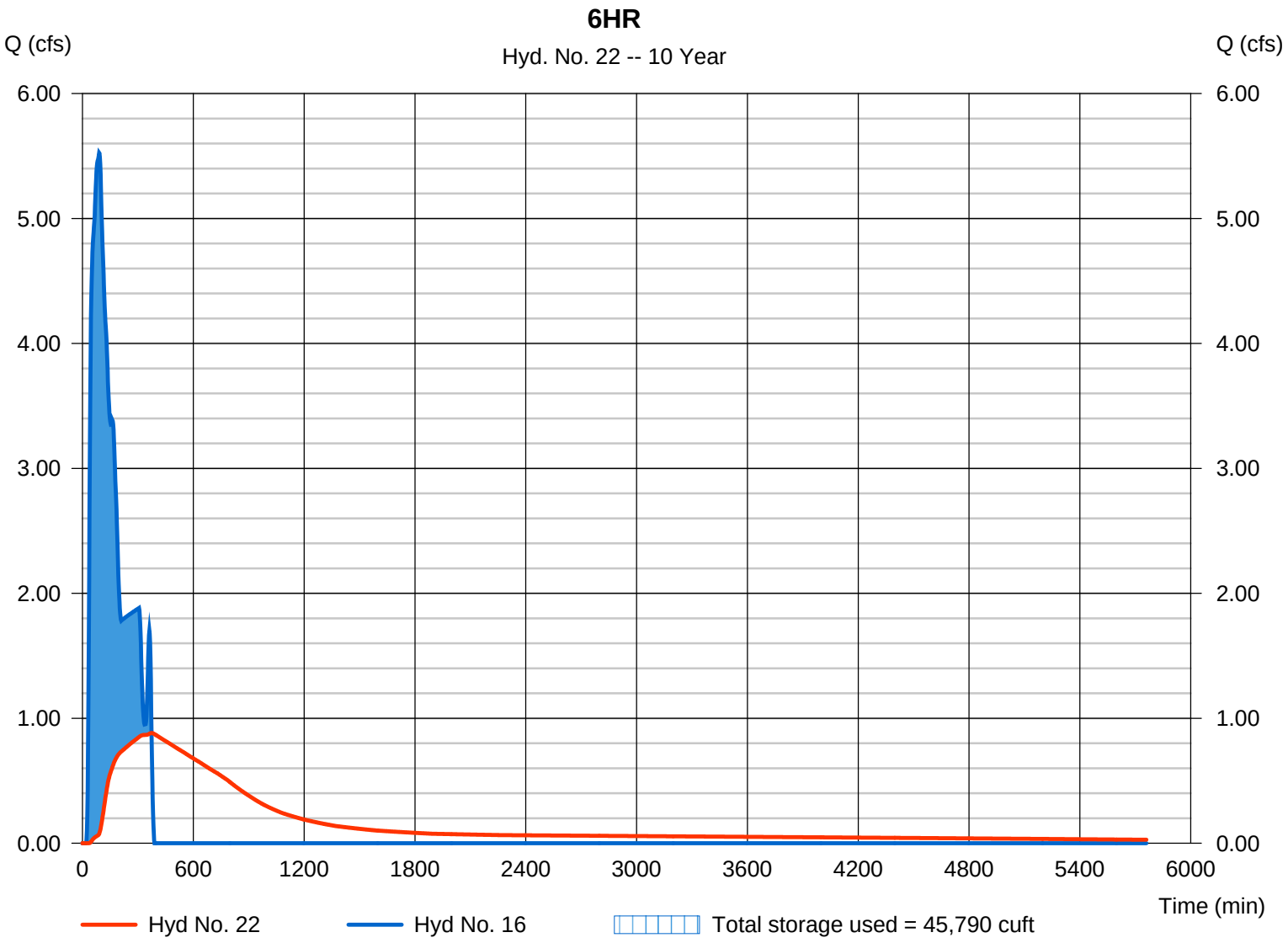
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 22

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.882 cfs
Storm frequency	= 10 yrs	Time to peak	= 374 min
Time interval	= 2 min	Hyd. volume	= 53,044 cuft
Inflow hyd. No.	= 16 - Pond 2 6HR	Max. Elevation	= 751.43 ft
Reservoir name	= Pond 2	Max. Storage	= 45,790 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

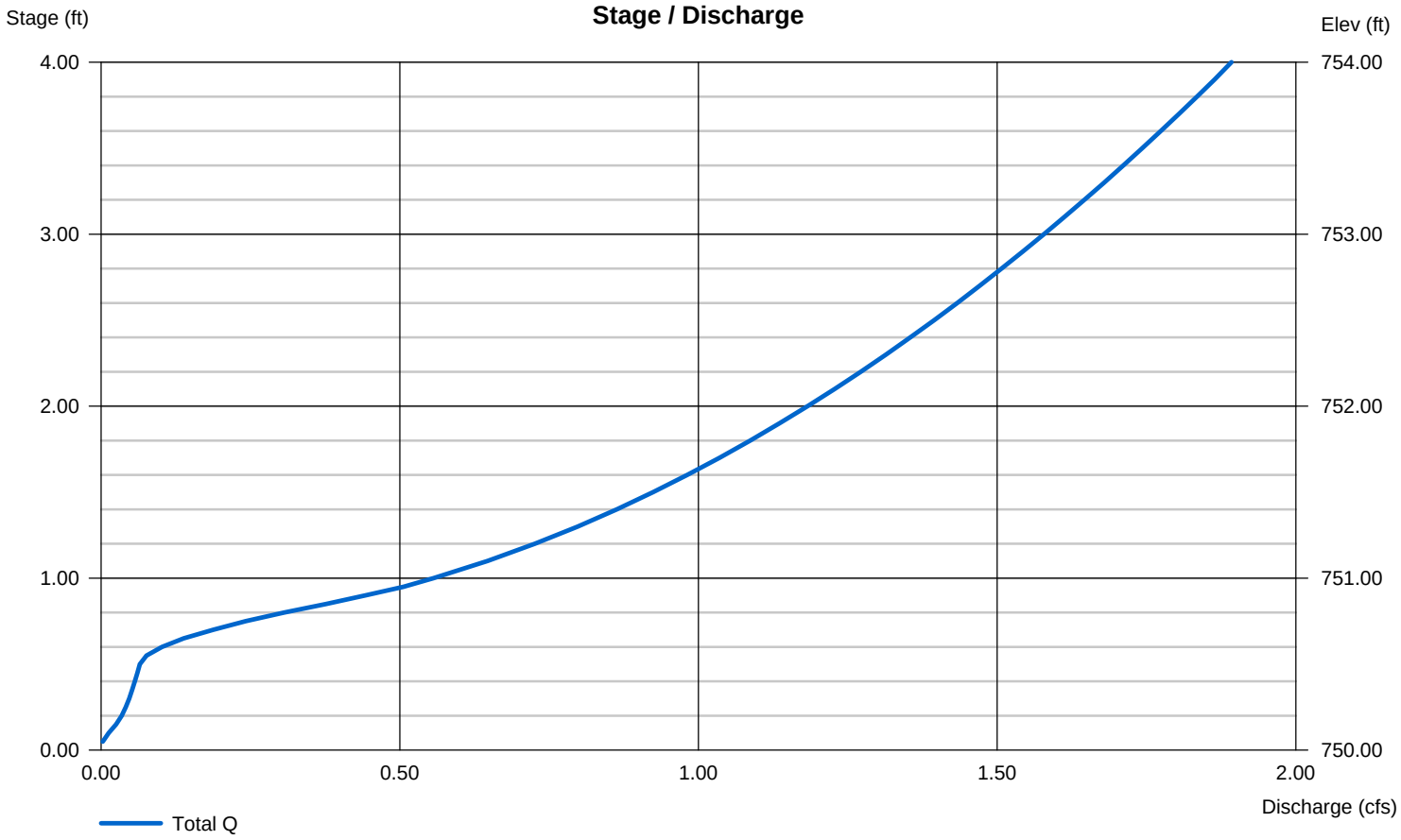
Weir Structures

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

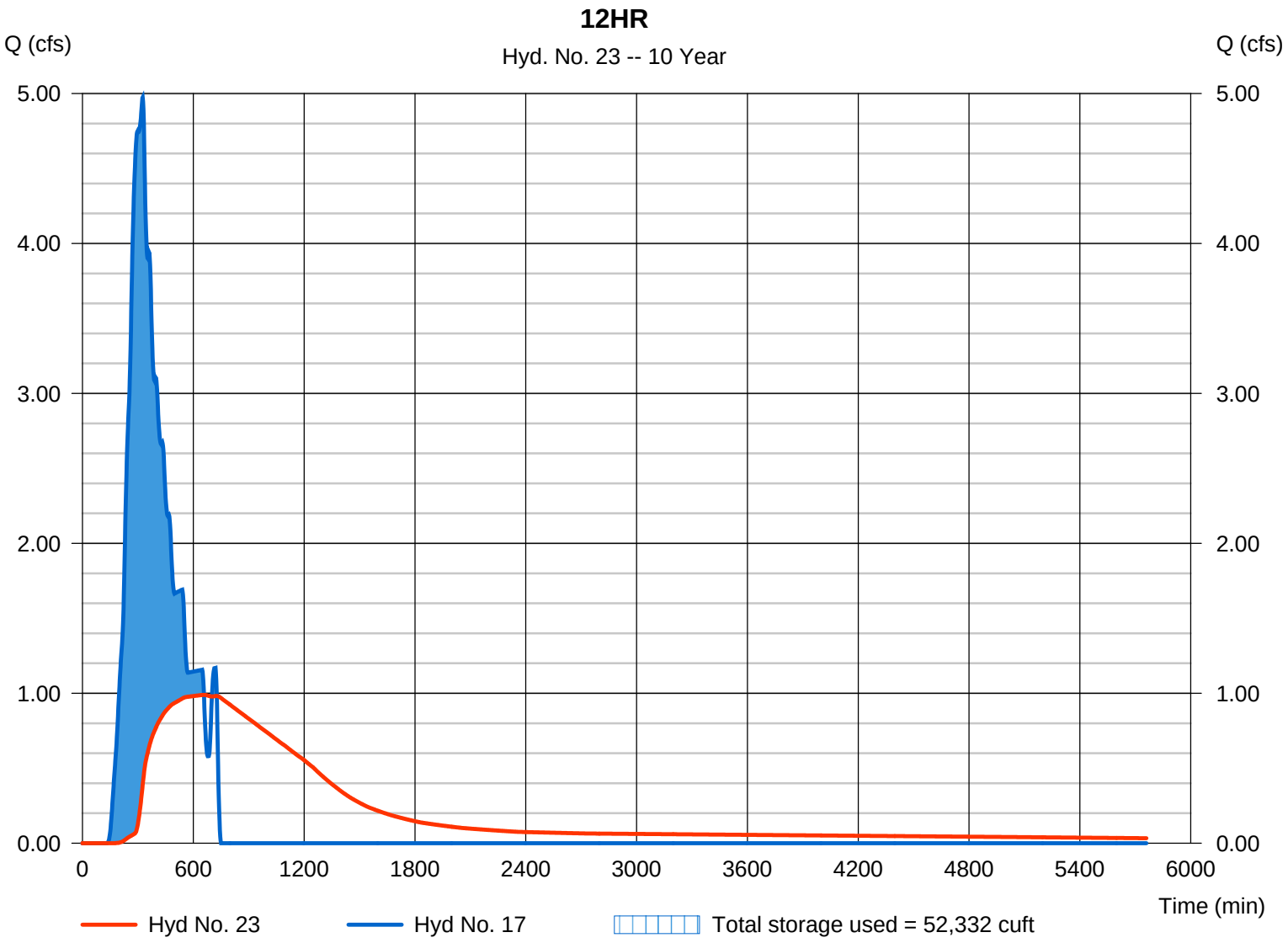
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 23

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.990 cfs
Storm frequency	= 10 yrs	Time to peak	= 658 min
Time interval	= 2 min	Hyd. volume	= 68,663 cuft
Inflow hyd. No.	= 17 - Pond 2 12HR	Max. Elevation	= 751.62 ft
Reservoir name	= Pond 2	Max. Storage	= 52,332 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

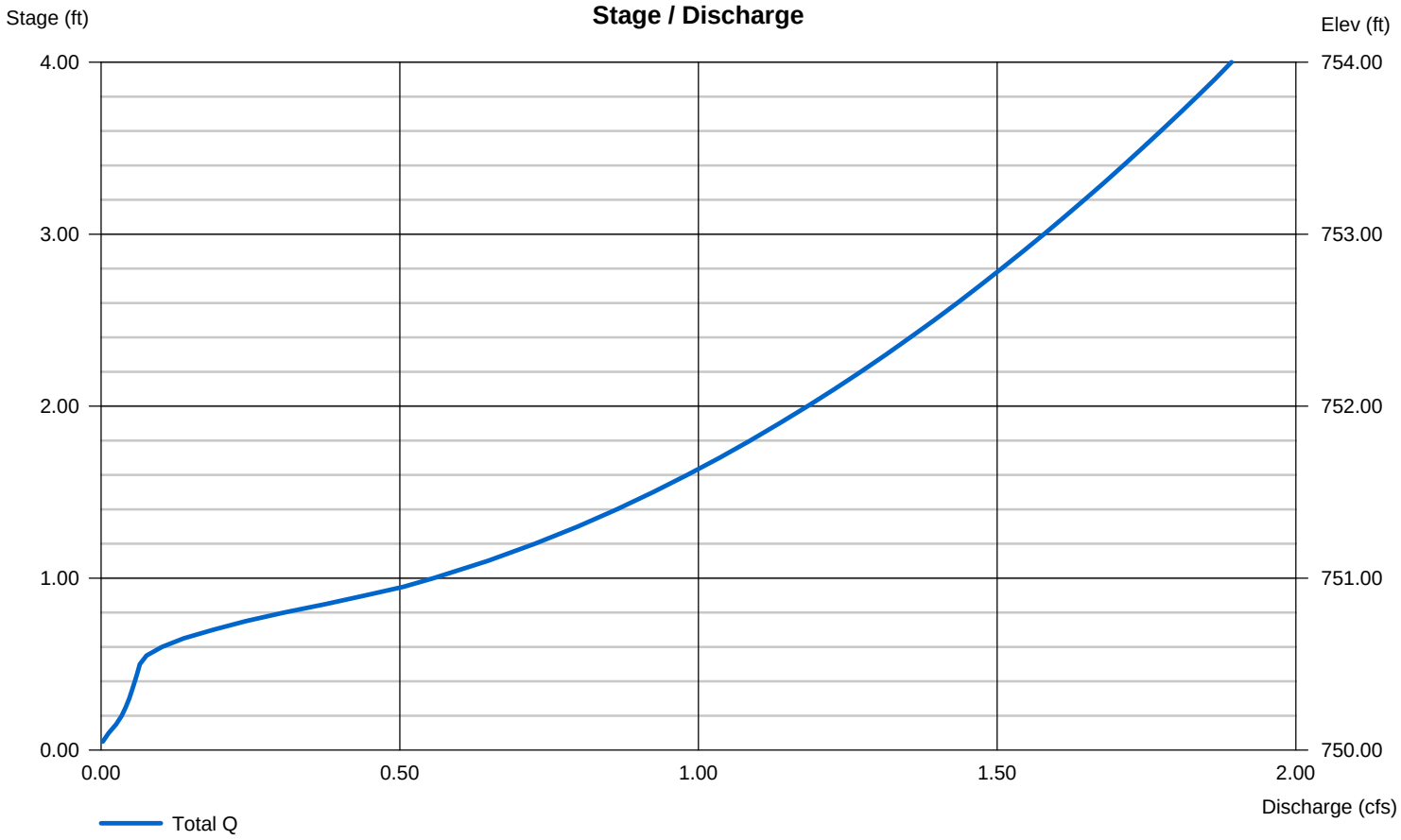
Weir Structures

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

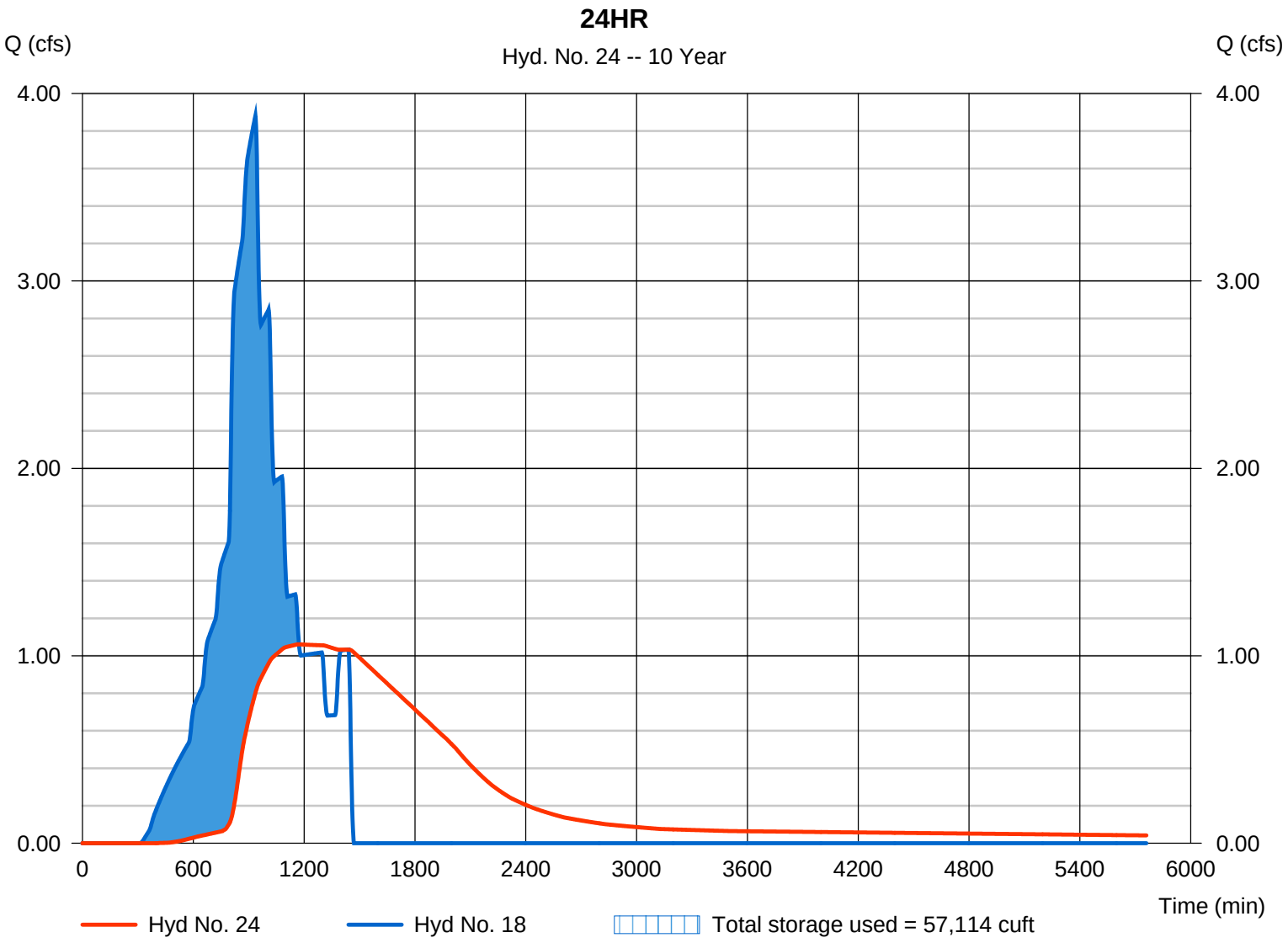
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 24

24HR

Hydrograph type	= Reservoir	Peak discharge	= 1.061 cfs
Storm frequency	= 10 yrs	Time to peak	= 1172 min
Time interval	= 2 min	Hyd. volume	= 84,145 cuft
Inflow hyd. No.	= 18 - Pond 2 24HR	Max. Elevation	= 751.75 ft
Reservoir name	= Pond 2	Max. Storage	= 57,114 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 2 - Pond 2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	28,286	0	0
0.50	750.50	30,048	14,580	14,580
1.00	751.00	33,647	15,914	30,494
2.00	752.00	37,347	35,477	65,971
3.00	753.00	41,148	39,228	105,199
4.00	754.00	45,048	43,079	148,278

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	6.00	0.00
Span (in)	= 12.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	750.50	0.00
Length (ft)	= 131.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

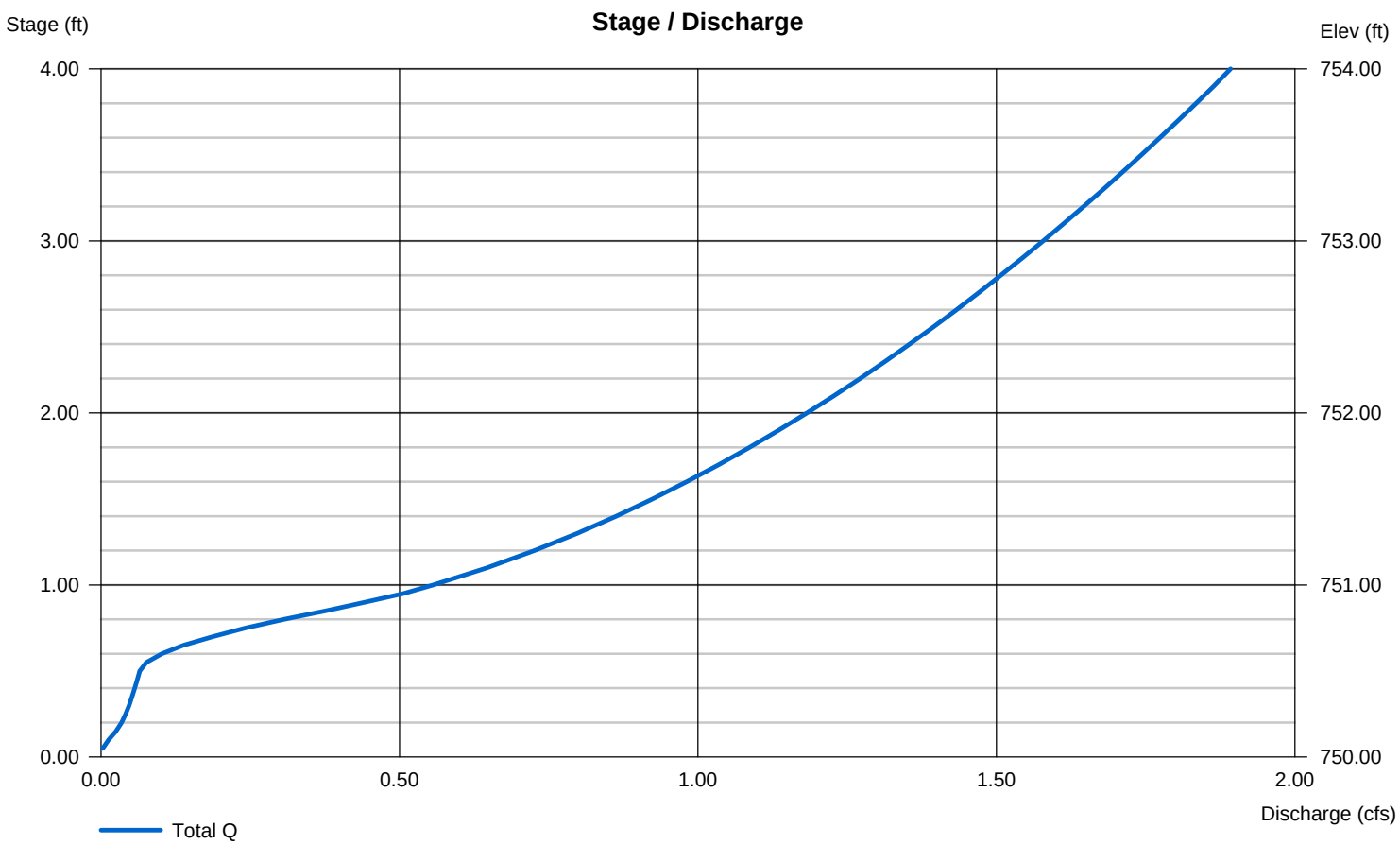
Weir Structures

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

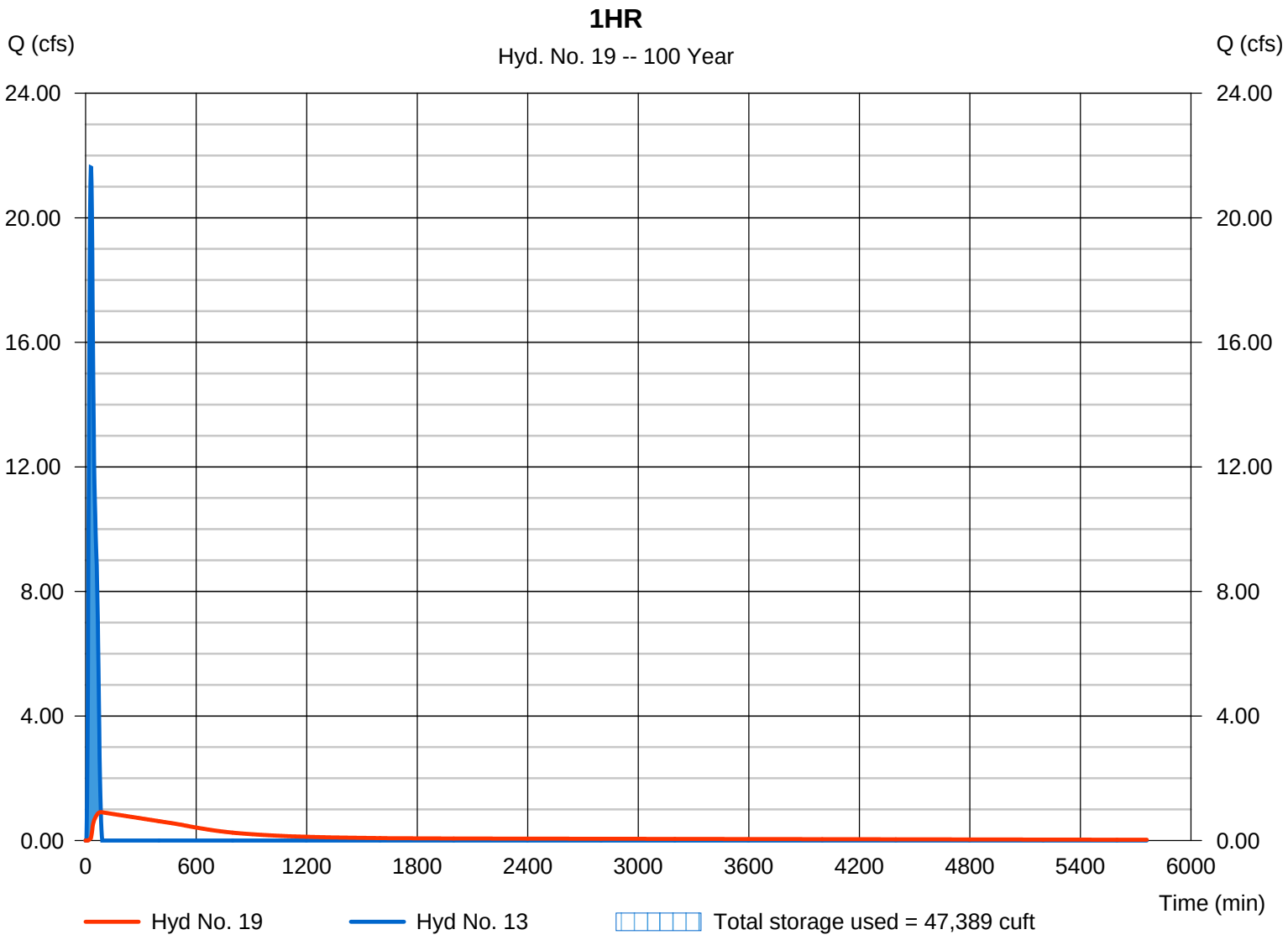
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 19

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.910 cfs
Storm frequency	= 100 yrs	Time to peak	= 82 min
Time interval	= 2 min	Hyd. volume	= 45,411 cuft
Inflow hyd. No.	= 13 - Pond 2 1HR	Max. Elevation	= 751.48 ft
Reservoir name	= Pond 2	Max. Storage	= 47,389 cuft

Storage Indication method used.



Hydrograph Report

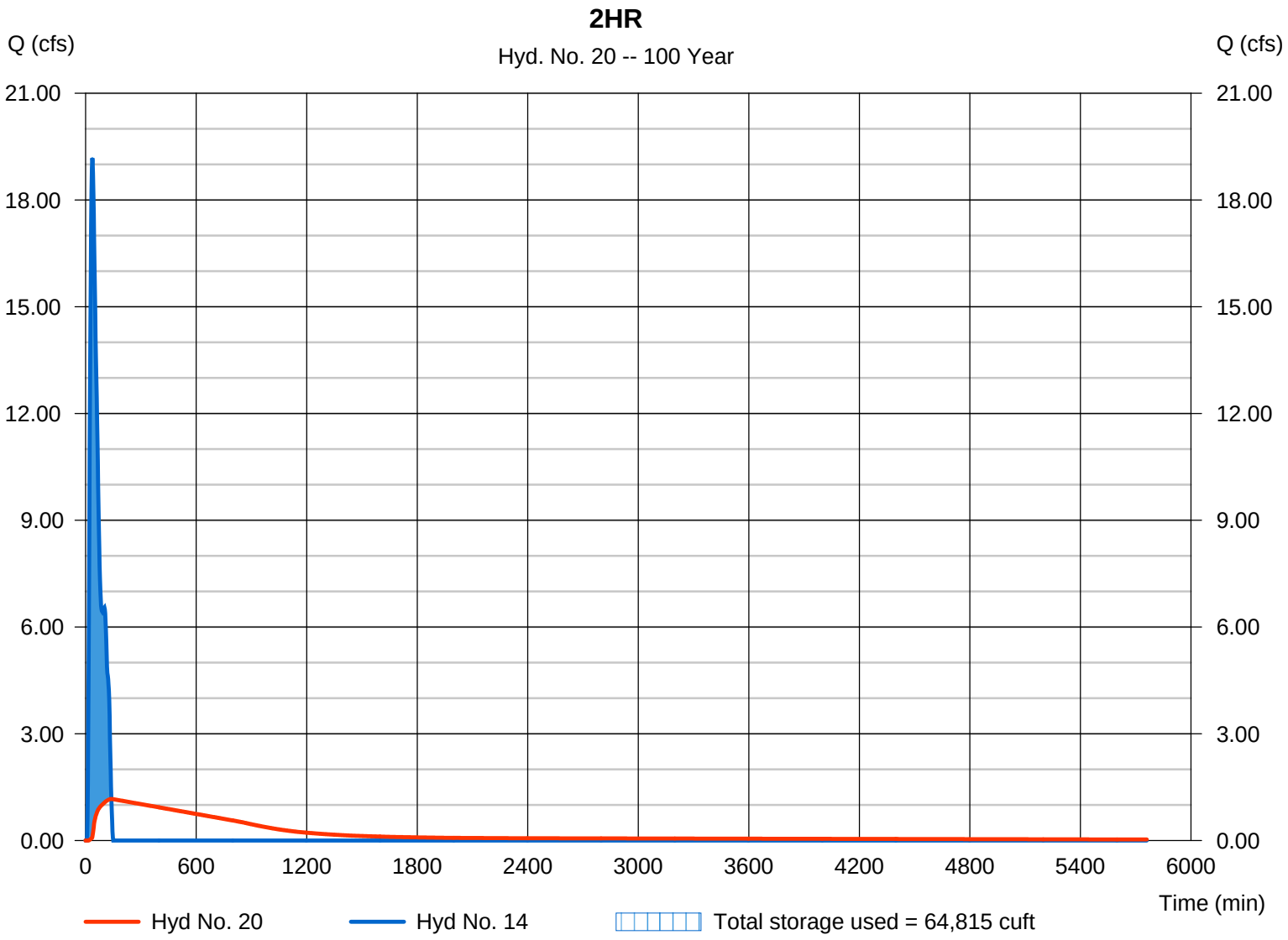
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 20

2HR

Hydrograph type	= Reservoir	Peak discharge	= 1.167 cfs
Storm frequency	= 100 yrs	Time to peak	= 140 min
Time interval	= 2 min	Hyd. volume	= 65,858 cuft
Inflow hyd. No.	= 14 - Pond 2 2HR	Max. Elevation	= 751.97 ft
Reservoir name	= Pond 2	Max. Storage	= 64,815 cuft

Storage Indication method used.



Hydrograph Report

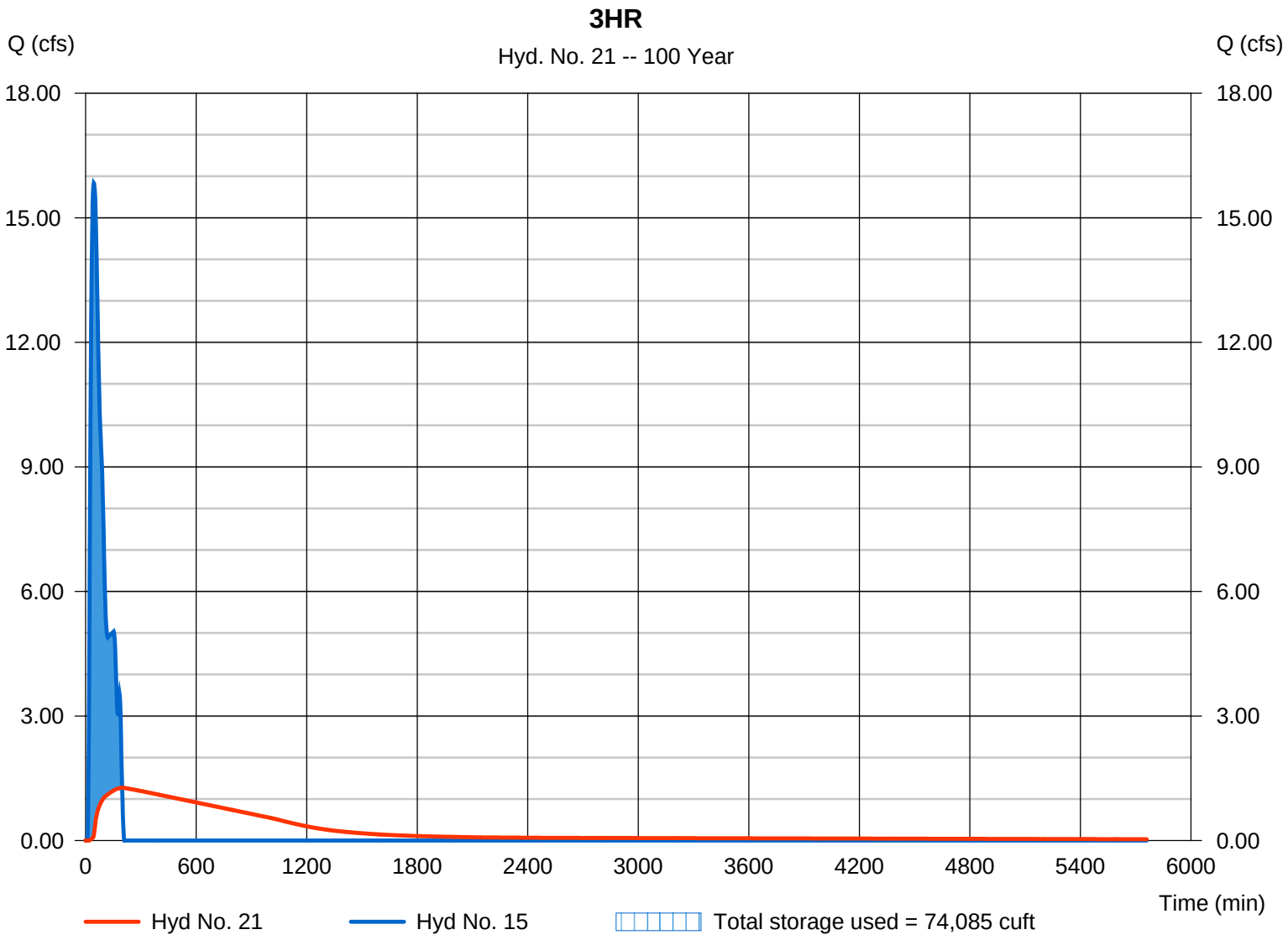
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 21

3HR

Hydrograph type	= Reservoir	Peak discharge	= 1.274 cfs
Storm frequency	= 100 yrs	Time to peak	= 198 min
Time interval	= 2 min	Hyd. volume	= 78,643 cuft
Inflow hyd. No.	= 15 - Pond 2 3HR	Max. Elevation	= 752.21 ft
Reservoir name	= Pond 2	Max. Storage	= 74,085 cuft

Storage Indication method used.



Hydrograph Report

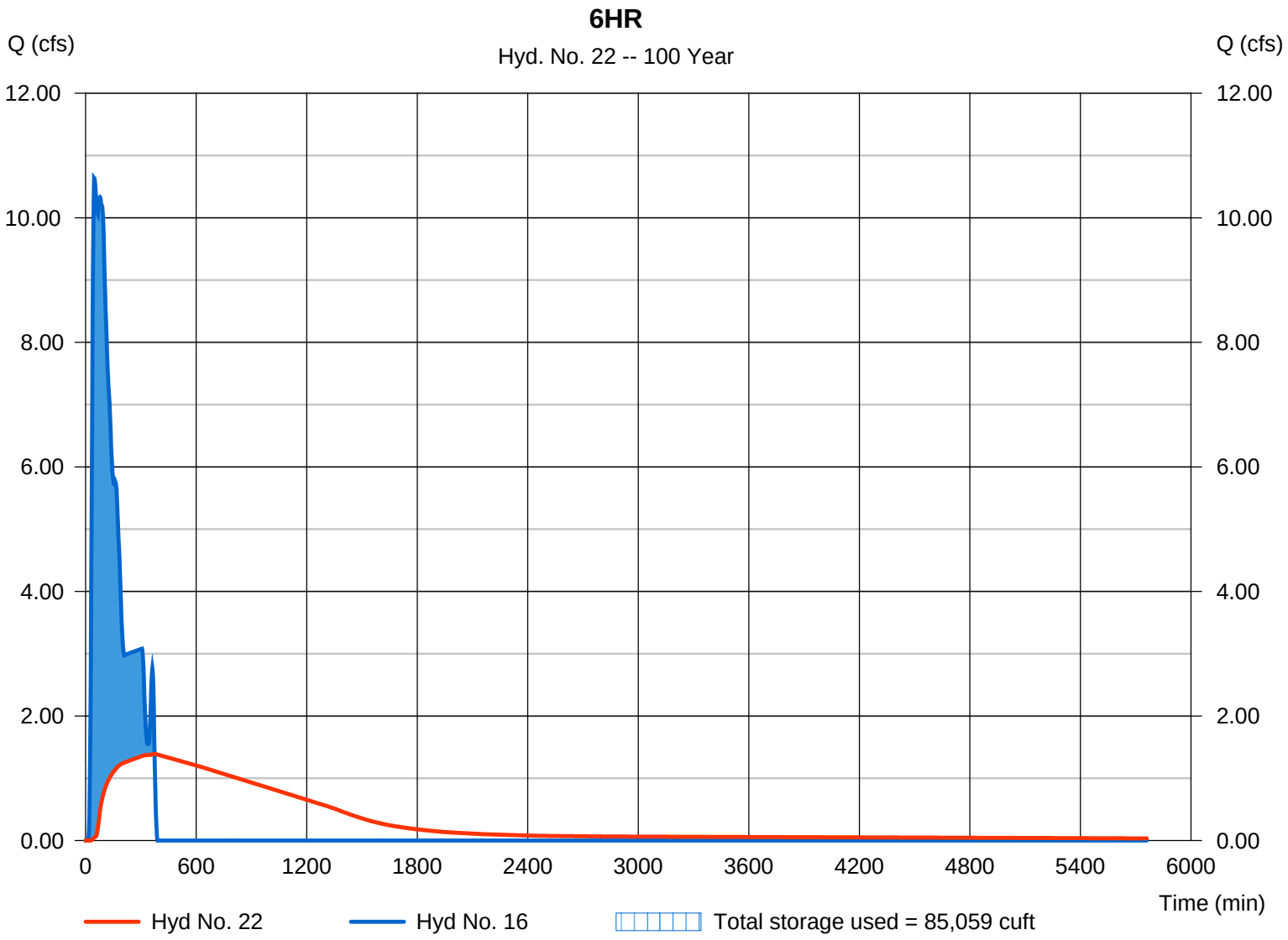
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 22

6HR

Hydrograph type	= Reservoir	Peak discharge	= 1.389 cfs
Storm frequency	= 100 yrs	Time to peak	= 374 min
Time interval	= 2 min	Hyd. volume	= 101,191 cuft
Inflow hyd. No.	= 16 - Pond 2 6HR	Max. Elevation	= 752.49 ft
Reservoir name	= Pond 2	Max. Storage	= 85,059 cuft

Storage Indication method used.



Hydrograph Report

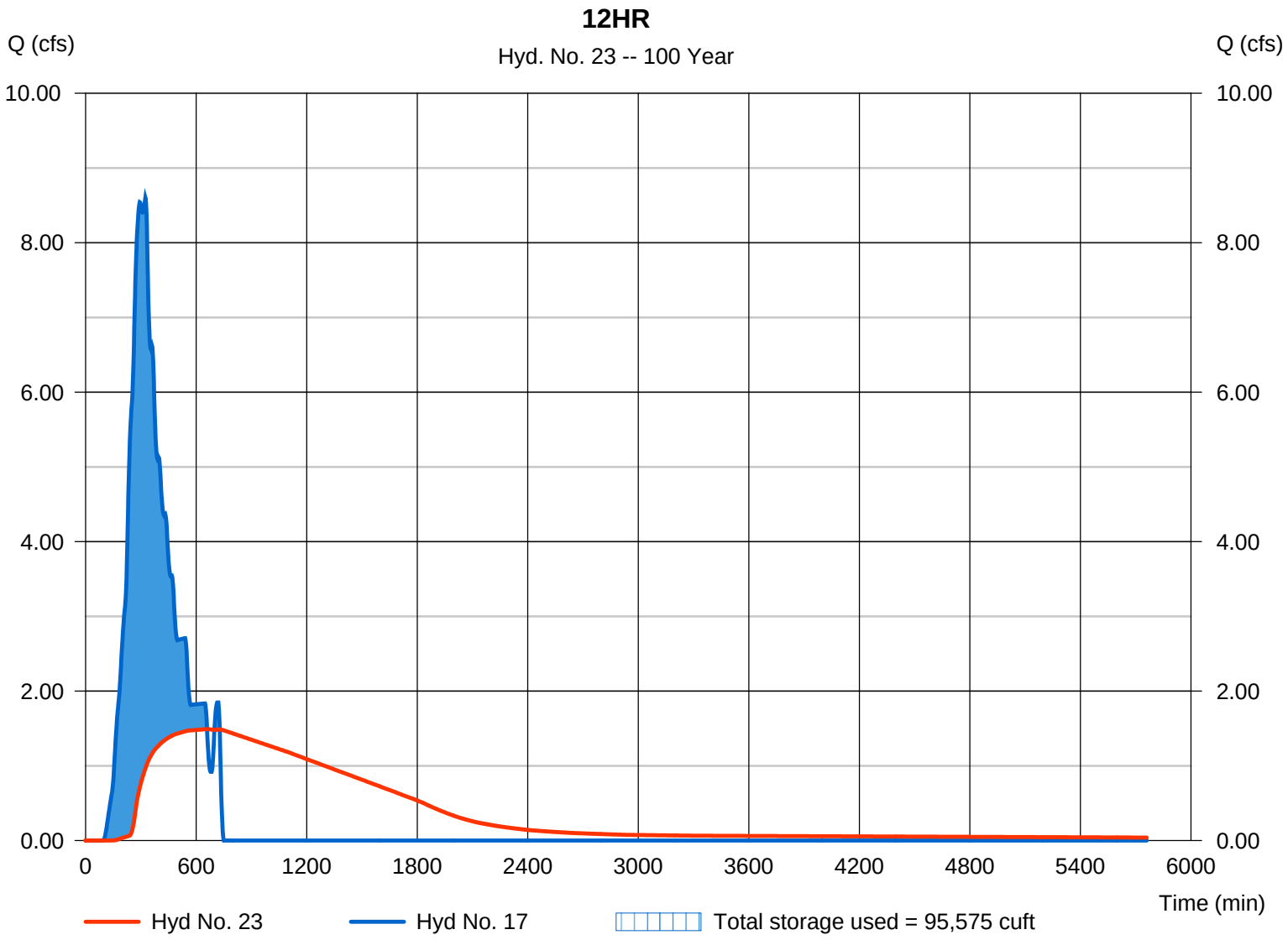
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 23

12HR

Hydrograph type	= Reservoir	Peak discharge	= 1.491 cfs
Storm frequency	= 100 yrs	Time to peak	= 660 min
Time interval	= 2 min	Hyd. volume	= 125,345 cuft
Inflow hyd. No.	= 17 - Pond 2 12HR	Max. Elevation	= 752.75 ft
Reservoir name	= Pond 2	Max. Storage	= 95,575 cuft

Storage Indication method used.



Hydrograph Report

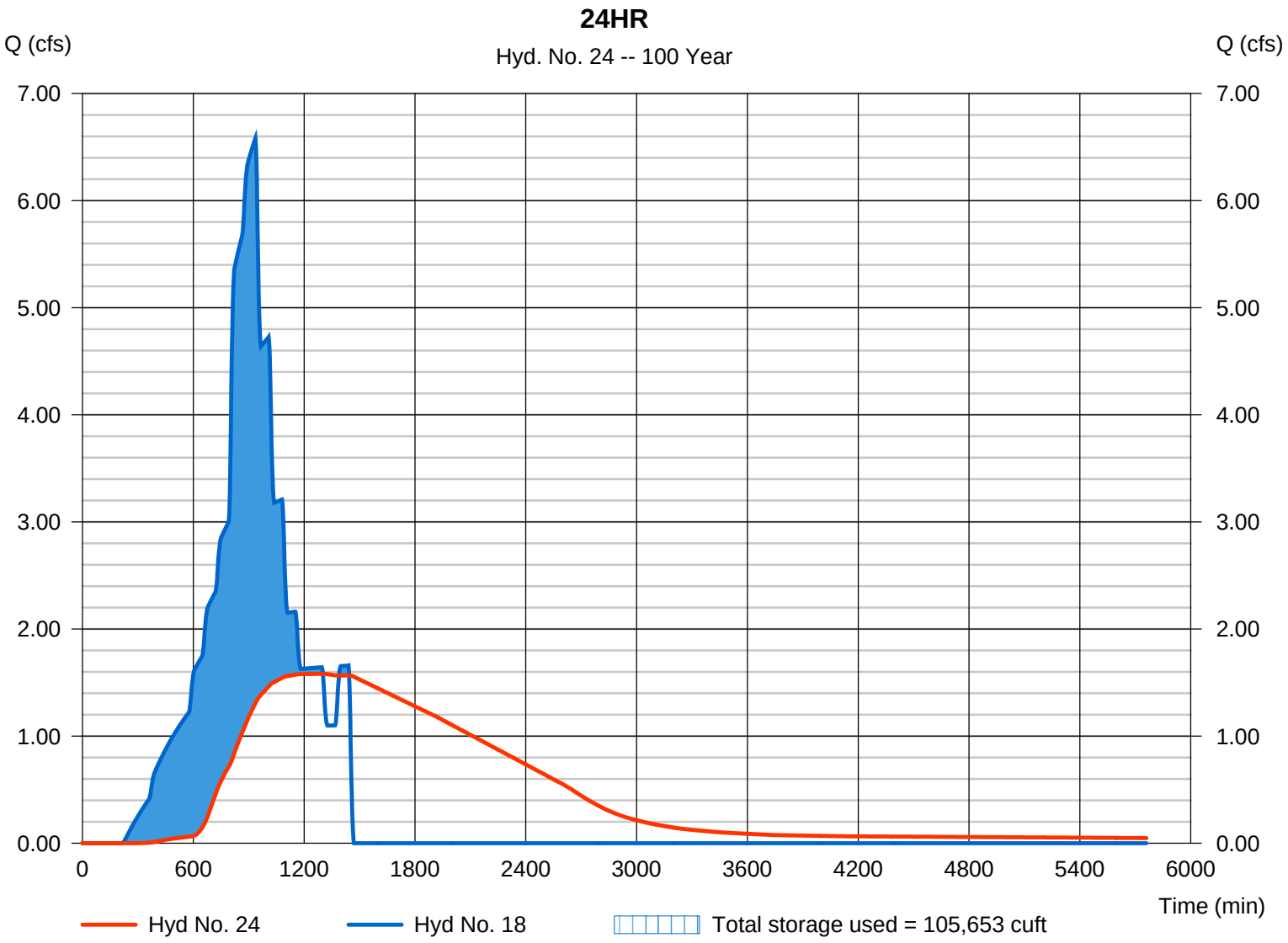
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 24

24HR

Hydrograph type	= Reservoir	Peak discharge	= 1.582 cfs
Storm frequency	= 100 yrs	Time to peak	= 1302 min
Time interval	= 2 min	Hyd. volume	= 156,222 cuft
Inflow hyd. No.	= 18 - Pond 2 24HR	Max. Elevation	= 753.01 ft
Reservoir name	= Pond 2	Max. Storage	= 105,653 cuft

Storage Indication method used.



TR55 Tc Worksheet

Hyd. No. 25

Bypass 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 14.23**	**+**	**0.00**	**+**	**0.00**	**=**	**14.23**
Shallow Concentrated Flow							
Flow length (ft)	= 767.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 7.92**	**+**	**0.00**	**+**	**0.00**	**=**	**7.92**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 22.16 min

Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

	Present	X	Developed

Bypass 2

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Good Condition Grass Cover	61	1.05	64.05
MnB2	B	Good Condition Grass Cover	61	0.18	10.98
CrA	C	Good Condition Grass Cover	74	1.13	83.62
			Totals =	2.36	158.65

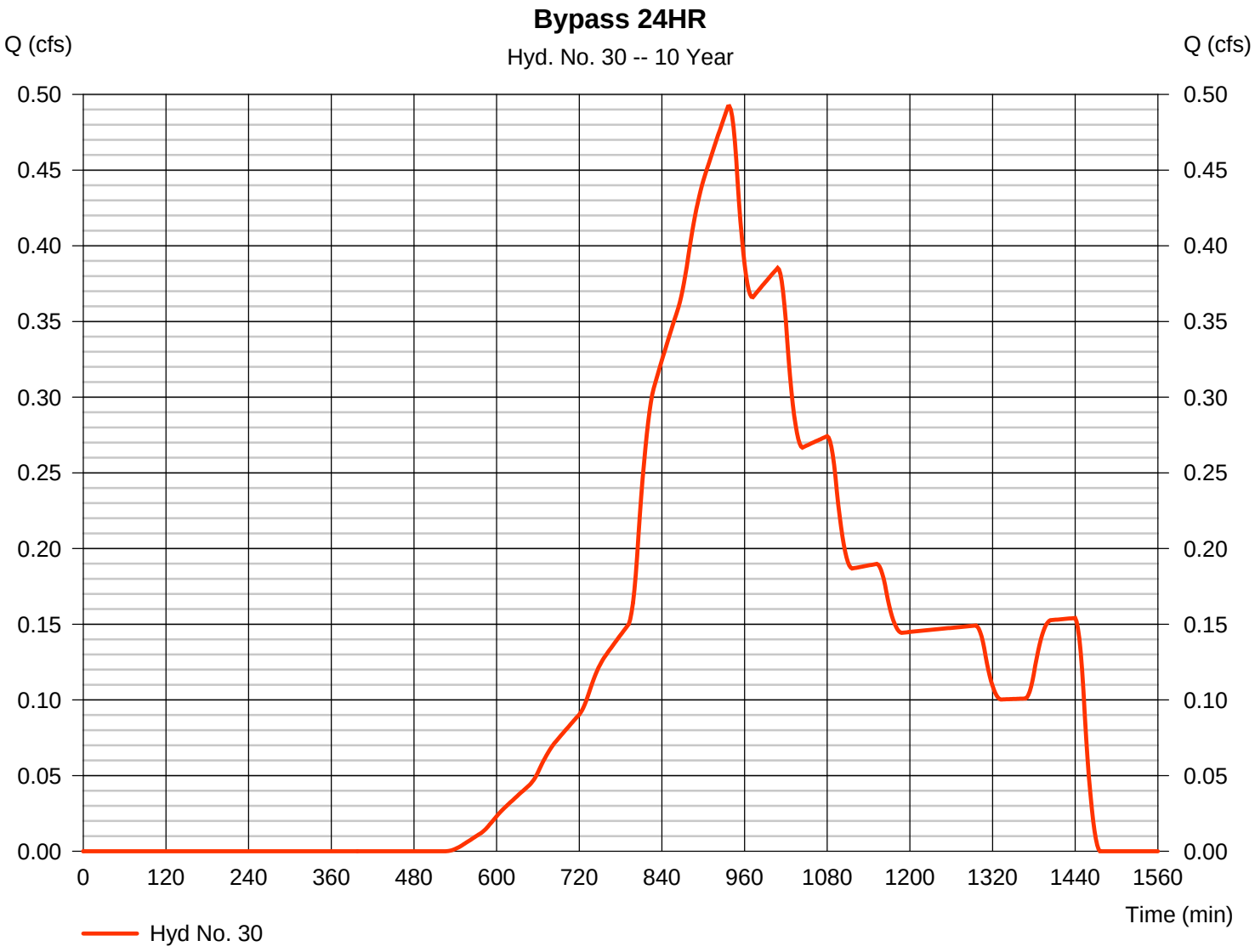
CN = 67.2

Hydrograph Report

Hyd. No. 30

Bypass 24HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.492 cfs
Storm frequency	= 10 yrs	Time to peak	= 938 min
Time interval	= 2 min	Hyd. volume	= 10,520 cuft
Drainage area	= 2.360 ac	Curve number	= 67.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 4.08 in	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484

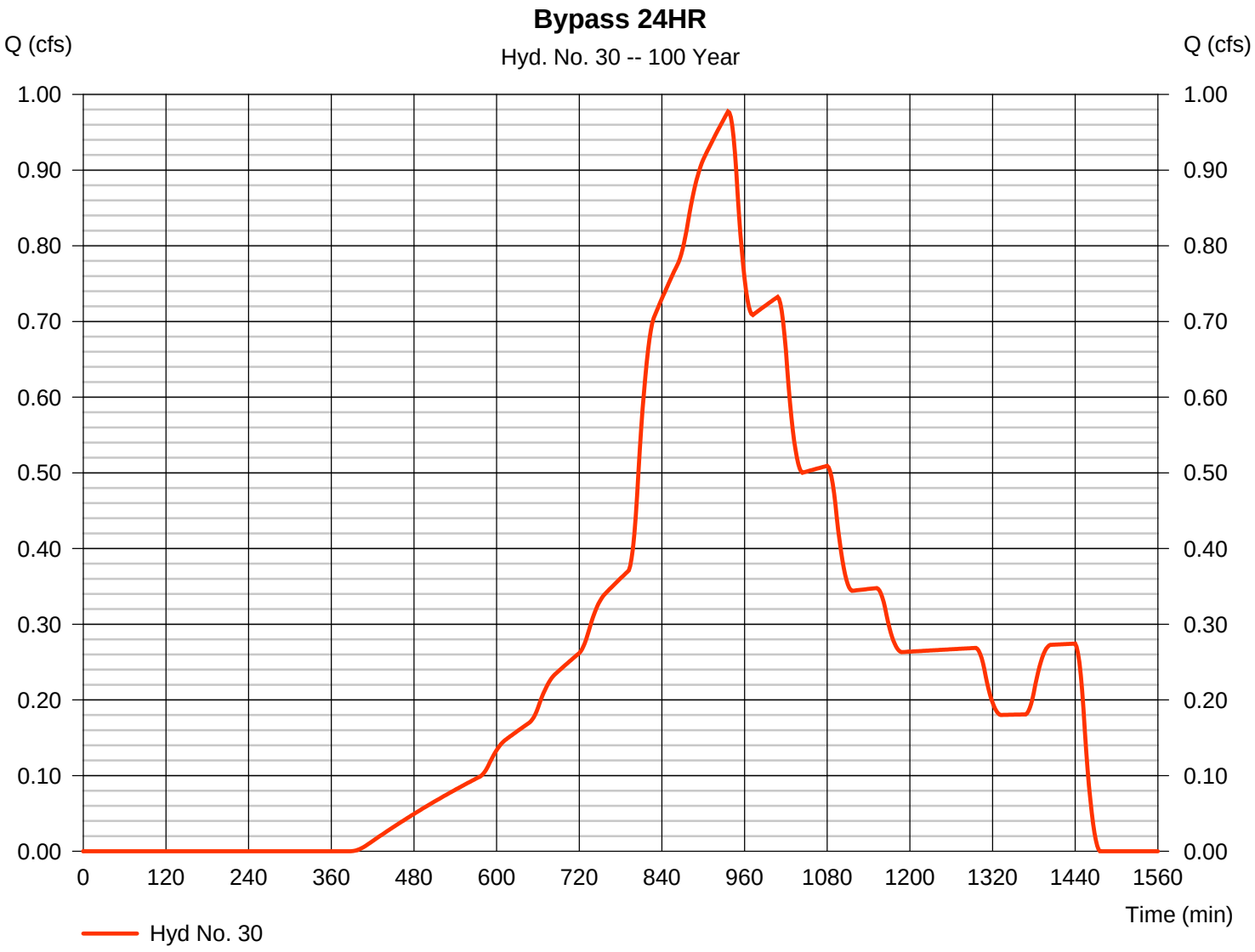


Hydrograph Report

Hyd. No. 30

Bypass 24HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.977 cfs
Storm frequency	= 100 yrs	Time to peak	= 936 min
Time interval	= 2 min	Hyd. volume	= 22,219 cuft
Drainage area	= 2.360 ac	Curve number	= 67.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 22.20 min
Total precip.	= 6.00 in	Distribution	= Huff-3rd
Storm duration	= 24.00 hrs	Shape factor	= 484

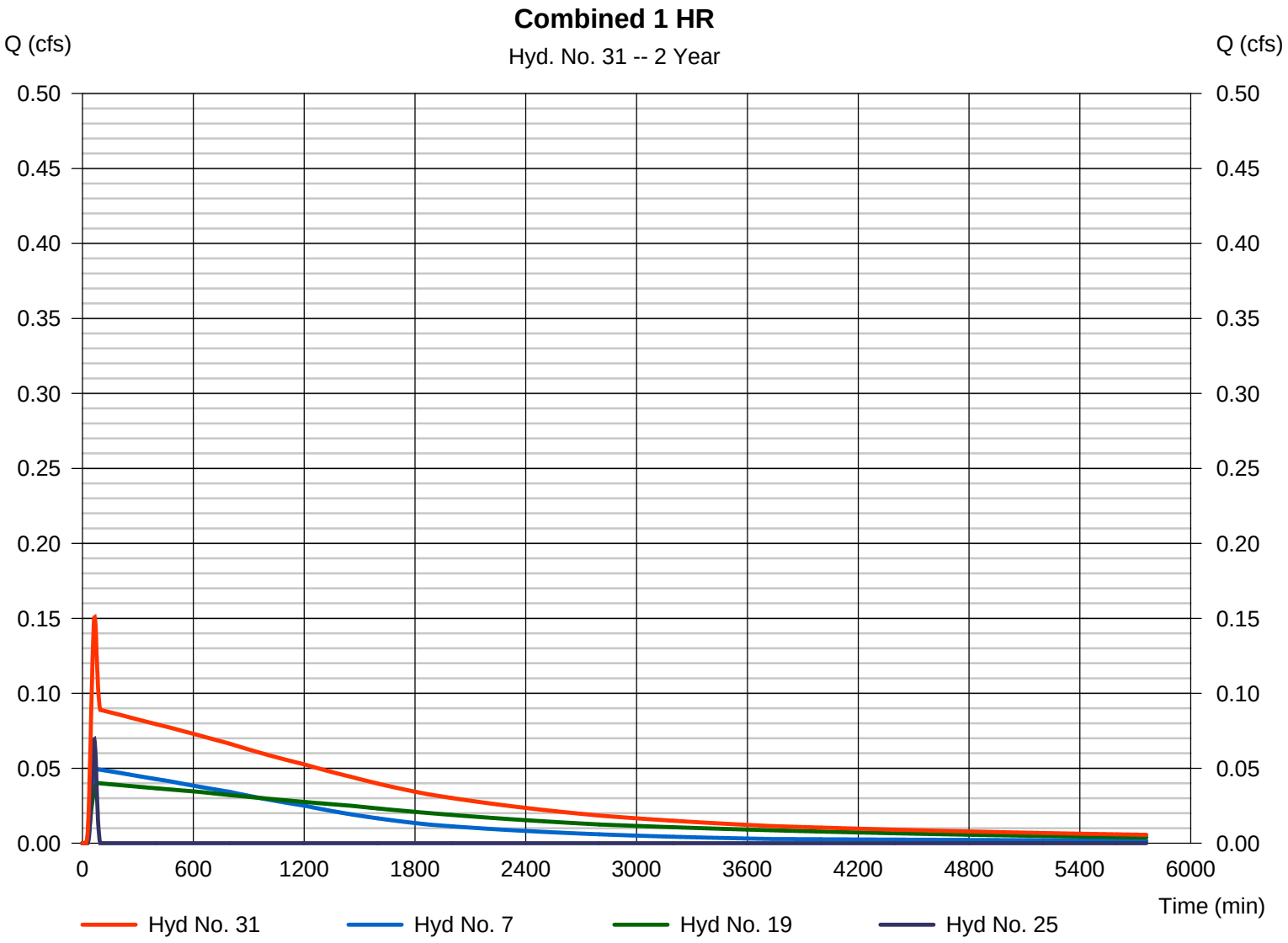


Hydrograph Report

Hyd. No. 31

Combined 1 HR

Hydrograph type	= Combine	Peak discharge	= 0.151 cfs
Storm frequency	= 2 yrs	Time to peak	= 66 min
Time interval	= 2 min	Hyd. volume	= 9,997 cuft
Inflow hyds.	= 7, 19, 25	Contrib. drain. area	= 2.360 ac

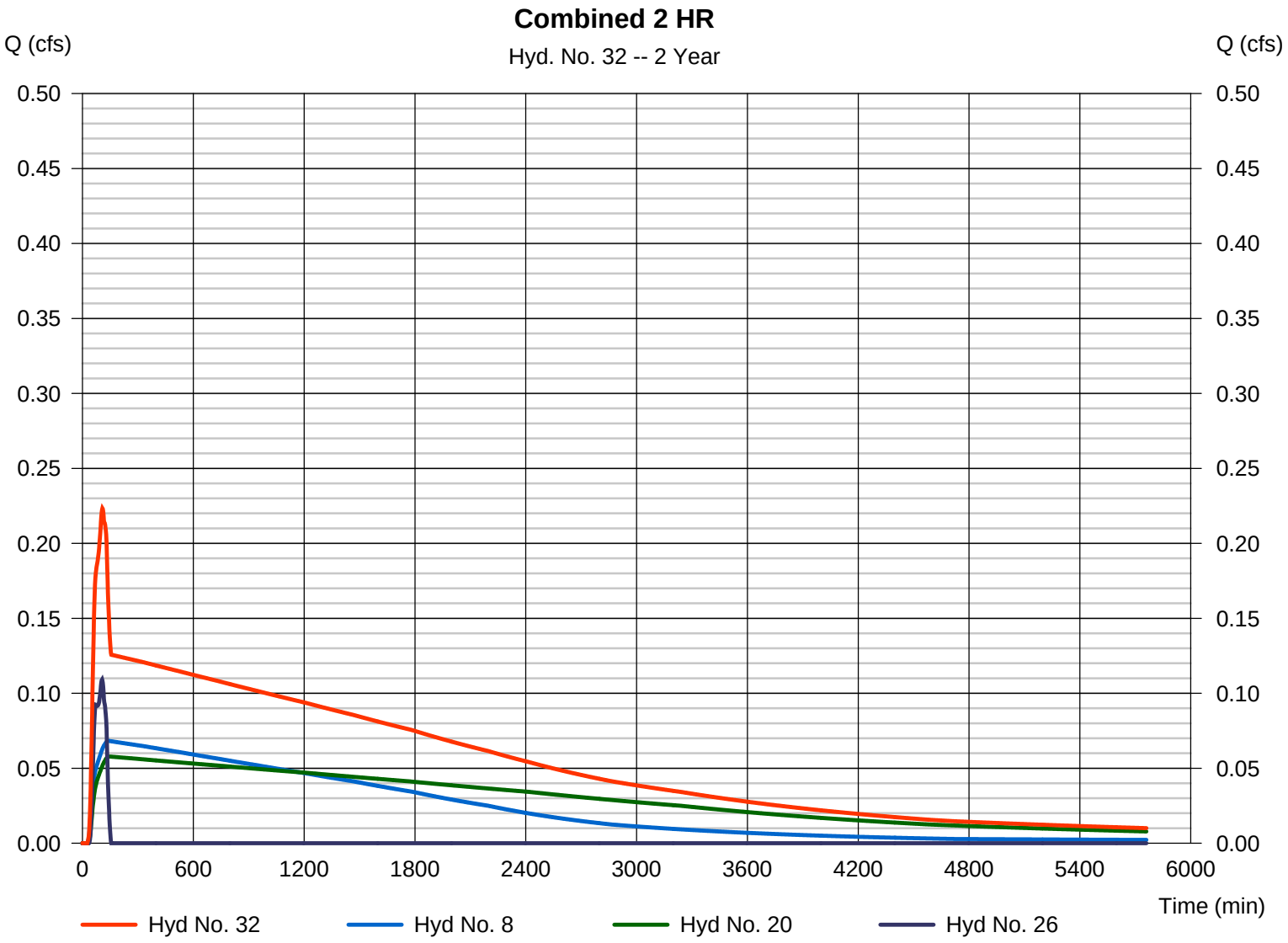


Hydrograph Report

Hyd. No. 32

Combined 2 HR

Hydrograph type	= Combine	Peak discharge	= 0.223 cfs
Storm frequency	= 2 yrs	Time to peak	= 108 min
Time interval	= 2 min	Hyd. volume	= 18,381 cuft
Inflow hyds.	= 8, 20, 26	Contrib. drain. area	= 2.360 ac

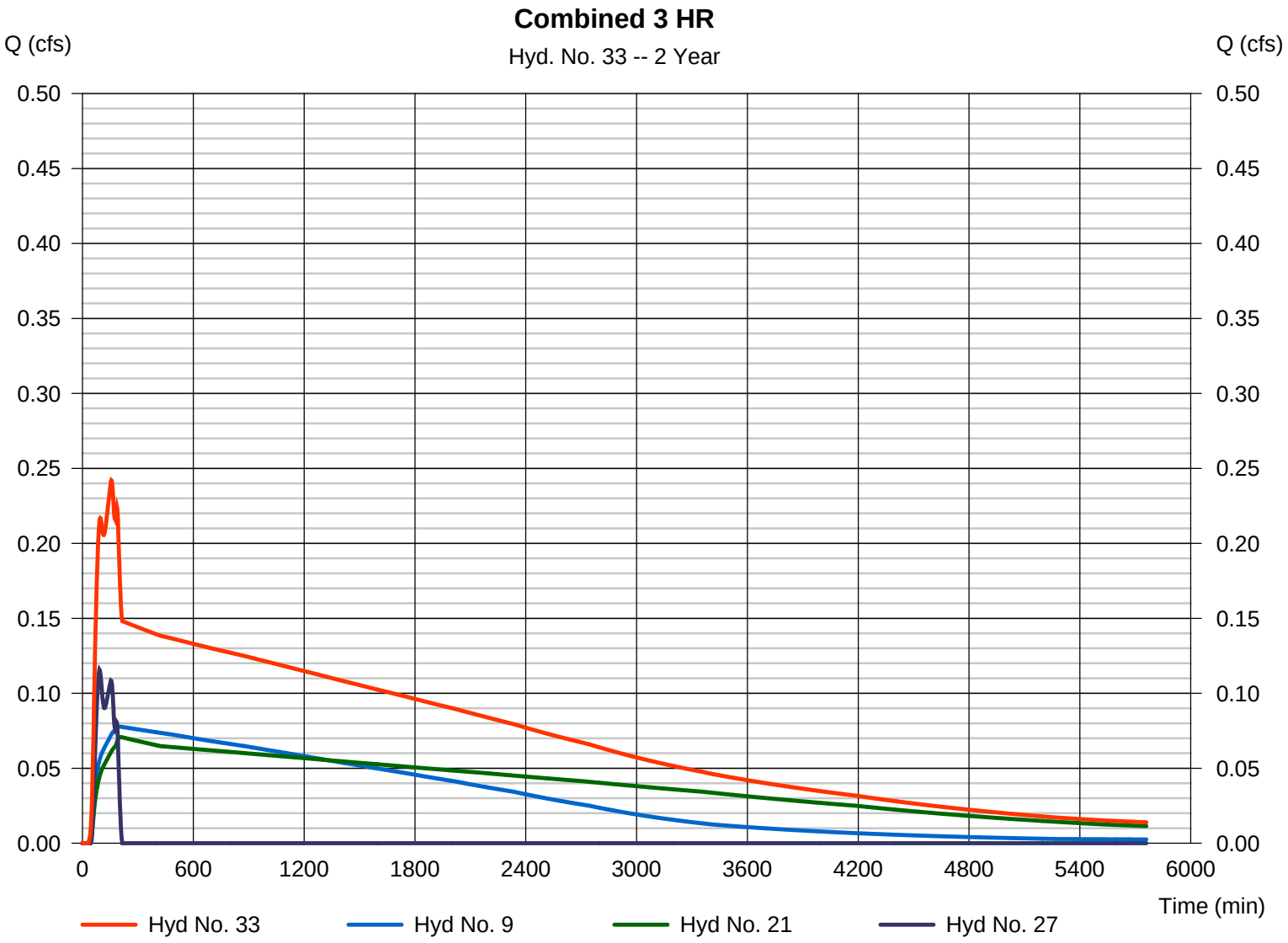


Hydrograph Report

Hyd. No. 33

Combined 3 HR

Hydrograph type	= Combine	Peak discharge	= 0.242 cfs
Storm frequency	= 2 yrs	Time to peak	= 156 min
Time interval	= 2 min	Hyd. volume	= 23,993 cuft
Inflow hyds.	= 9, 21, 27	Contrib. drain. area	= 2.360 ac



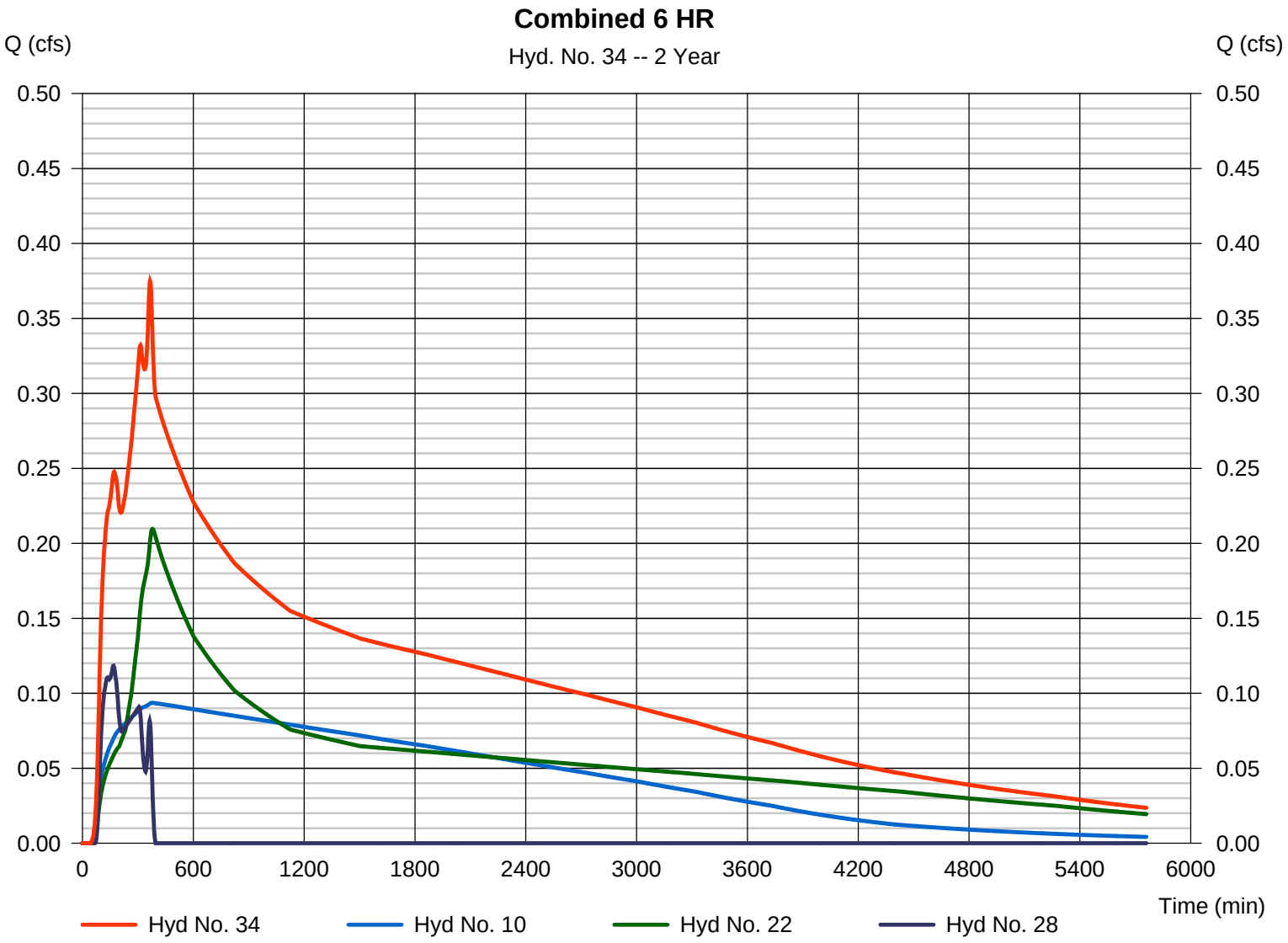
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 34

Combined 6 HR

Hydrograph type	=	Combine	Peak discharge	=	0.375 cfs
Storm frequency	=	2 yrs	Time to peak	=	366 min
Time interval	=	2 min	Hyd. volume	=	35,983 cuft
Inflow hyds.	=	10, 22, 28	Contrib. drain. area	=	2.360 ac

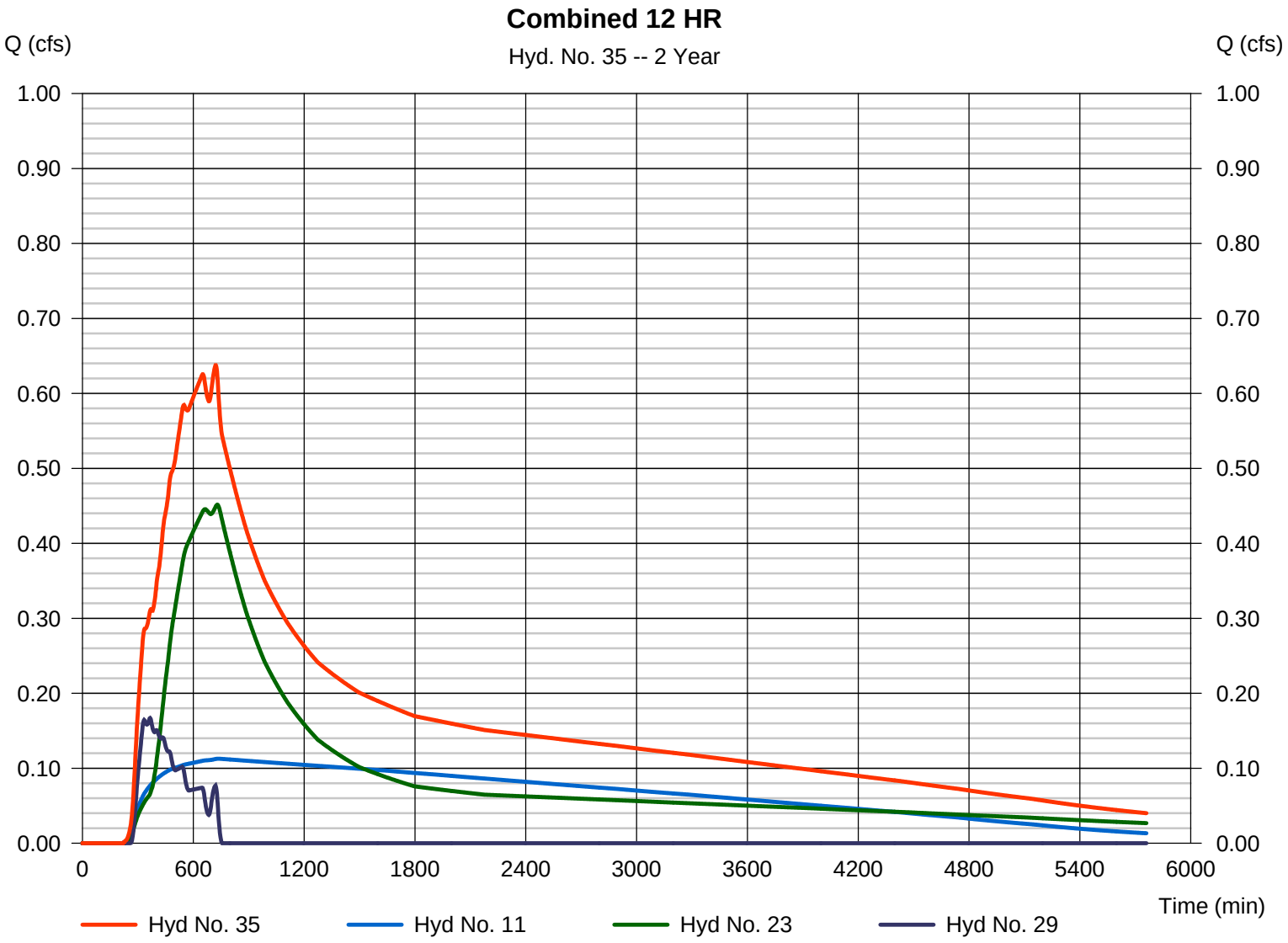


Hydrograph Report

Hyd. No. 35

Combined 12 HR

Hydrograph type	=	Combine	Peak discharge	=	0.638 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	55,270 cuft
Inflow hyds.	=	11, 23, 29	Contrib. drain. area	=	2.360 ac

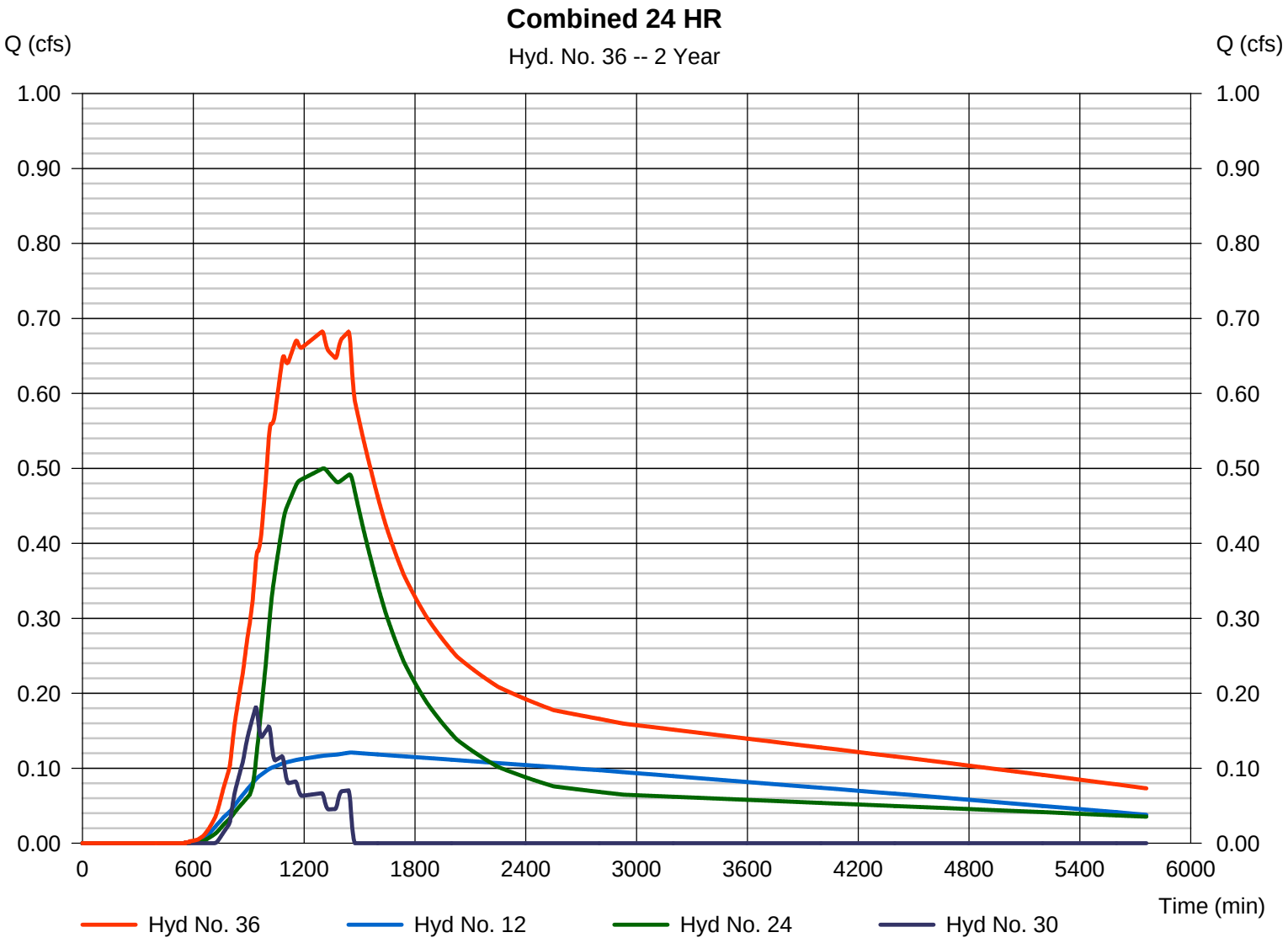


Hydrograph Report

Hyd. No. 36

Combined 24 HR

Hydrograph type	=	Combine	Peak discharge	=	0.682 cfs
Storm frequency	=	2 yrs	Time to peak	=	1298 min
Time interval	=	2 min	Hyd. volume	=	65,095 cuft
Inflow hyds.	=	12, 24, 30	Contrib. drain. area	=	2.360 ac

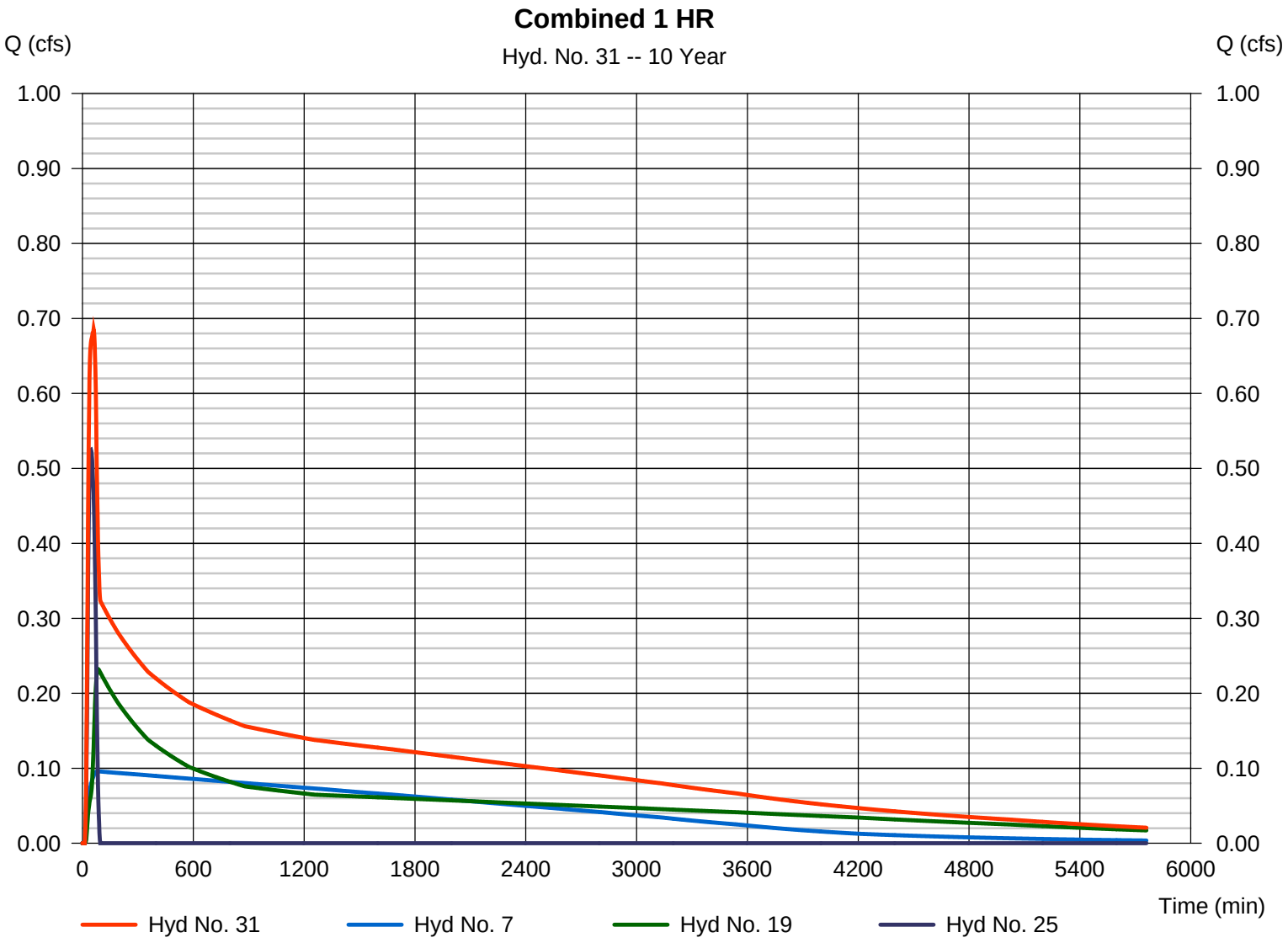


Hydrograph Report

Hyd. No. 31

Combined 1 HR

Hydrograph type	= Combine	Peak discharge	= 0.686 cfs
Storm frequency	= 10 yrs	Time to peak	= 60 min
Time interval	= 2 min	Hyd. volume	= 35,116 cuft
Inflow hyds.	= 7, 19, 25	Contrib. drain. area	= 2.360 ac

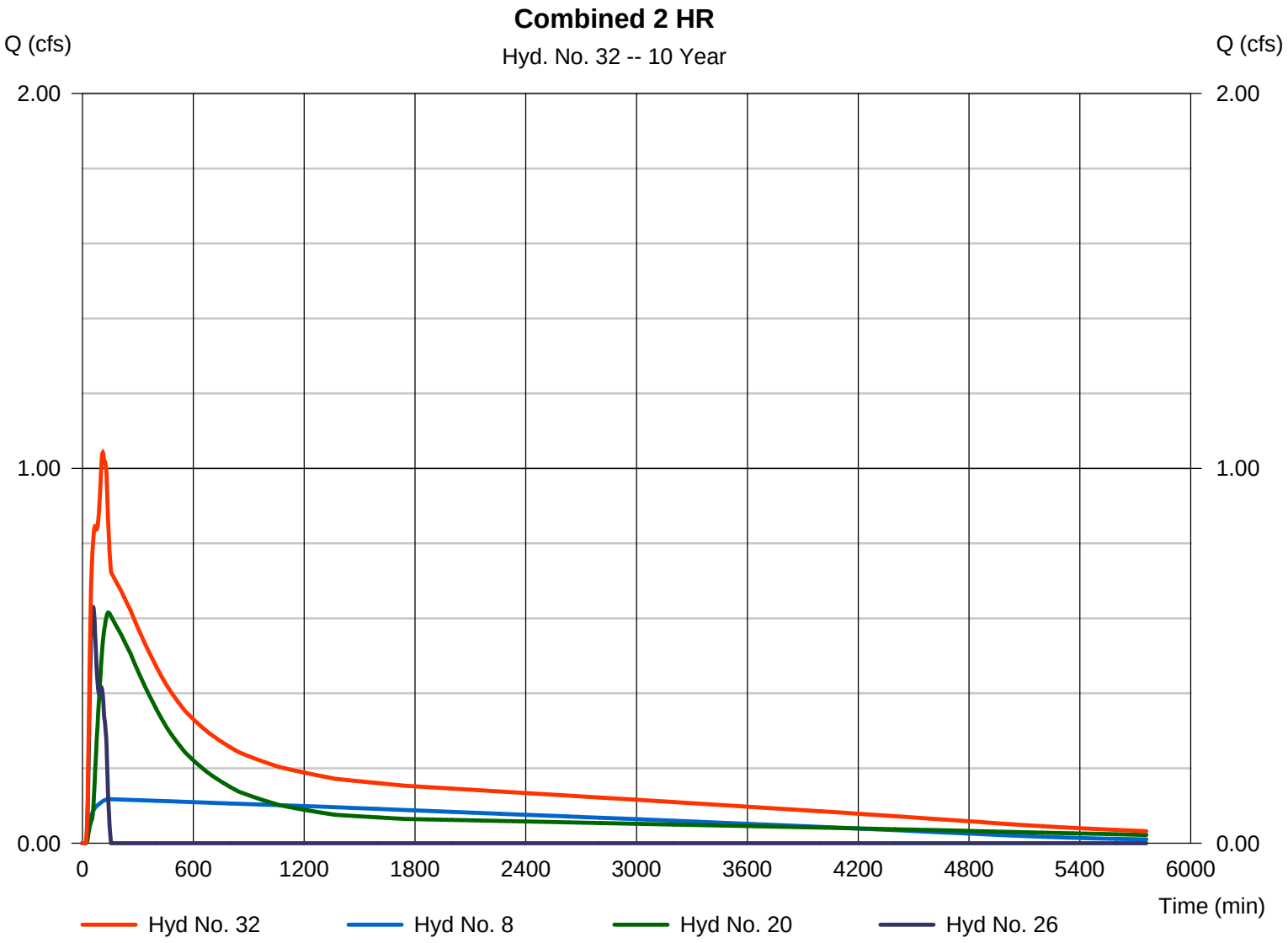


Hydrograph Report

Hyd. No. 32

Combined 2 HR

Hydrograph type	= Combine	Peak discharge	= 1.042 cfs
Storm frequency	= 10 yrs	Time to peak	= 110 min
Time interval	= 2 min	Hyd. volume	= 56,117 cuft
Inflow hyds.	= 8, 20, 26	Contrib. drain. area	= 2.360 ac

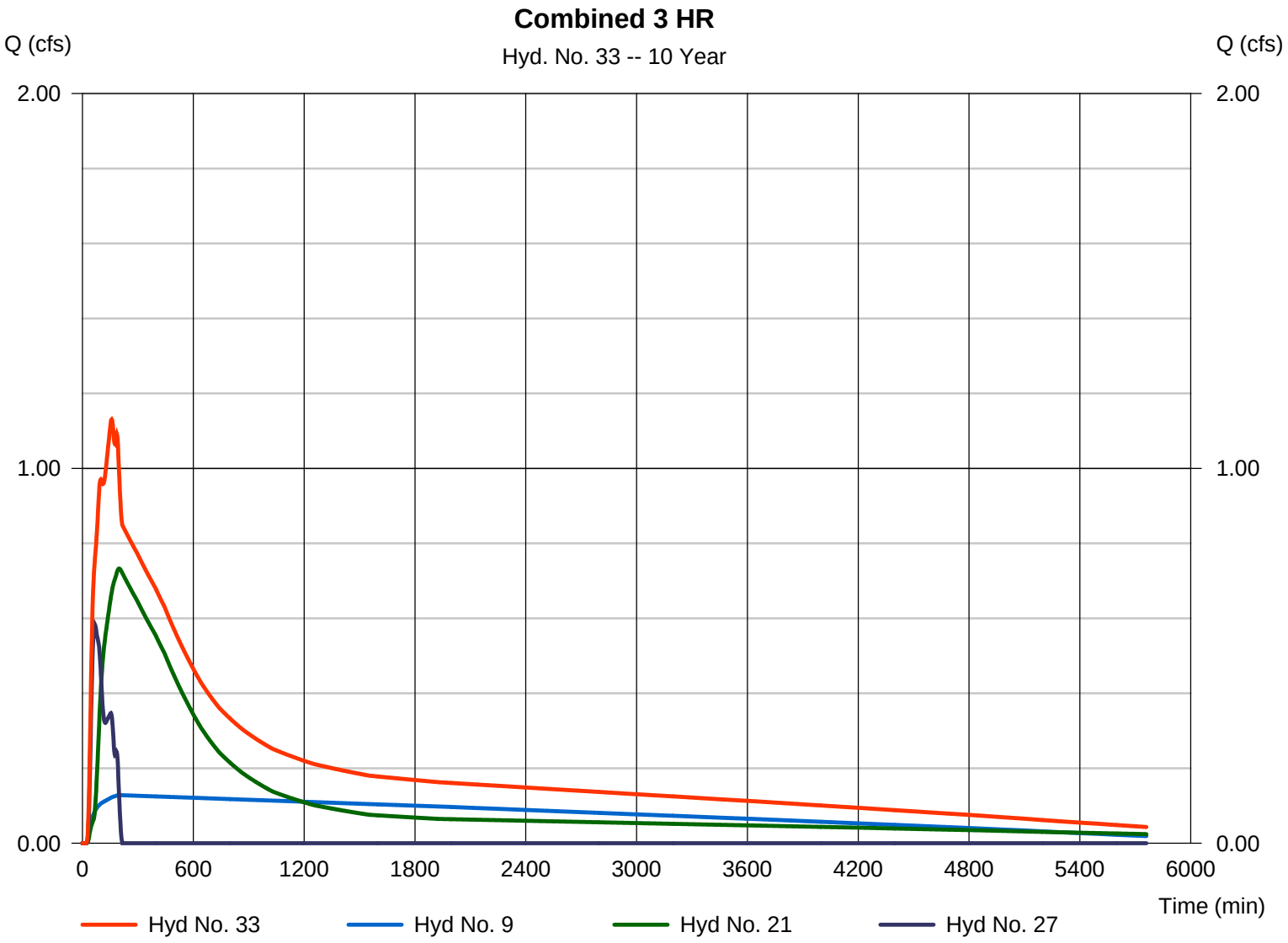


Hydrograph Report

Hyd. No. 33

Combined 3 HR

Hydrograph type	= Combine	Peak discharge	= 1.131 cfs
Storm frequency	= 10 yrs	Time to peak	= 158 min
Time interval	= 2 min	Hyd. volume	= 68,240 cuft
Inflow hyds.	= 9, 21, 27	Contrib. drain. area	= 2.360 ac

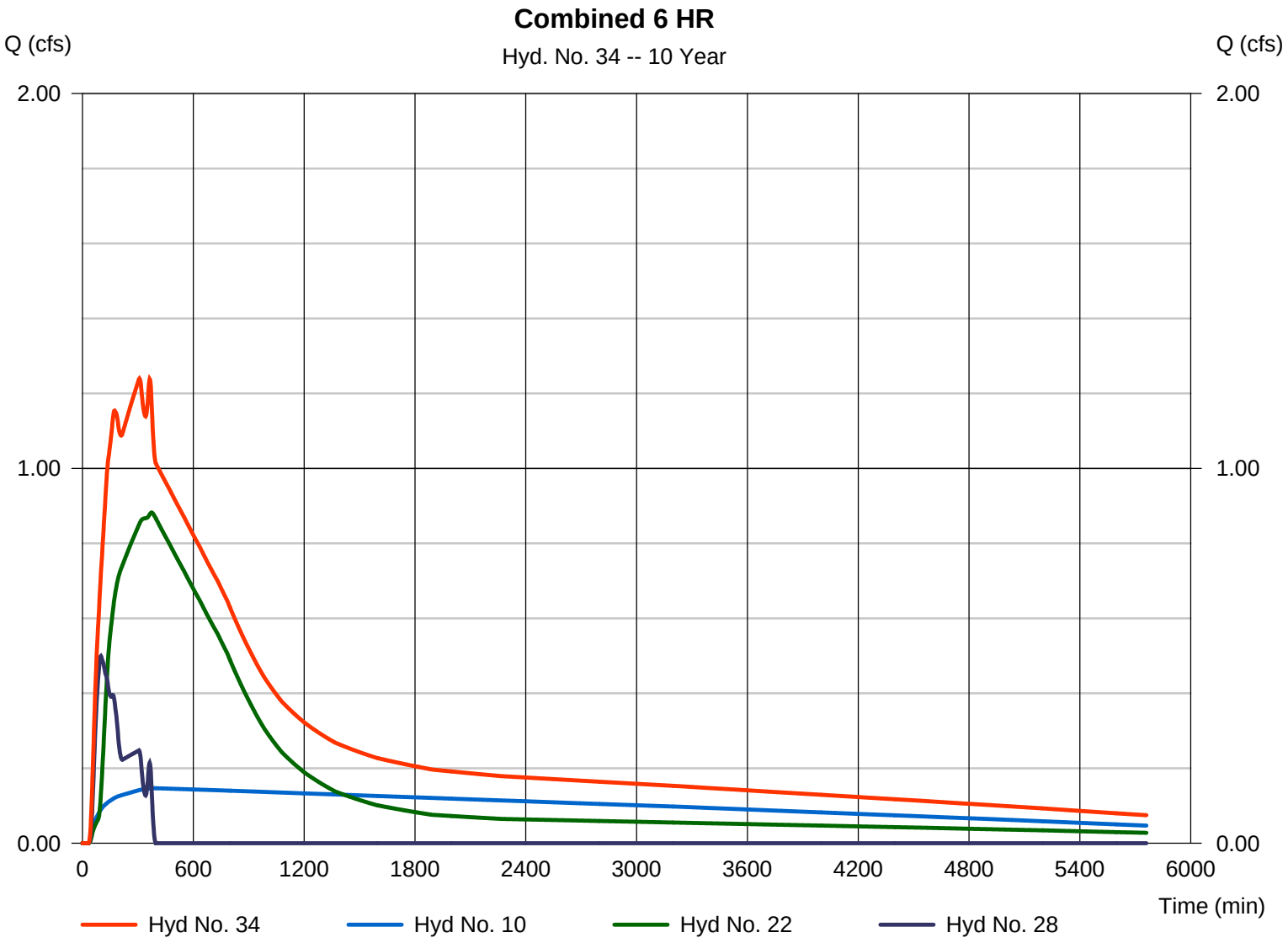


Hydrograph Report

Hyd. No. 34

Combined 6 HR

Hydrograph type	= Combine	Peak discharge	= 1.240 cfs
Storm frequency	= 10 yrs	Time to peak	= 308 min
Time interval	= 2 min	Hyd. volume	= 93,032 cuft
Inflow hyds.	= 10, 22, 28	Contrib. drain. area	= 2.360 ac

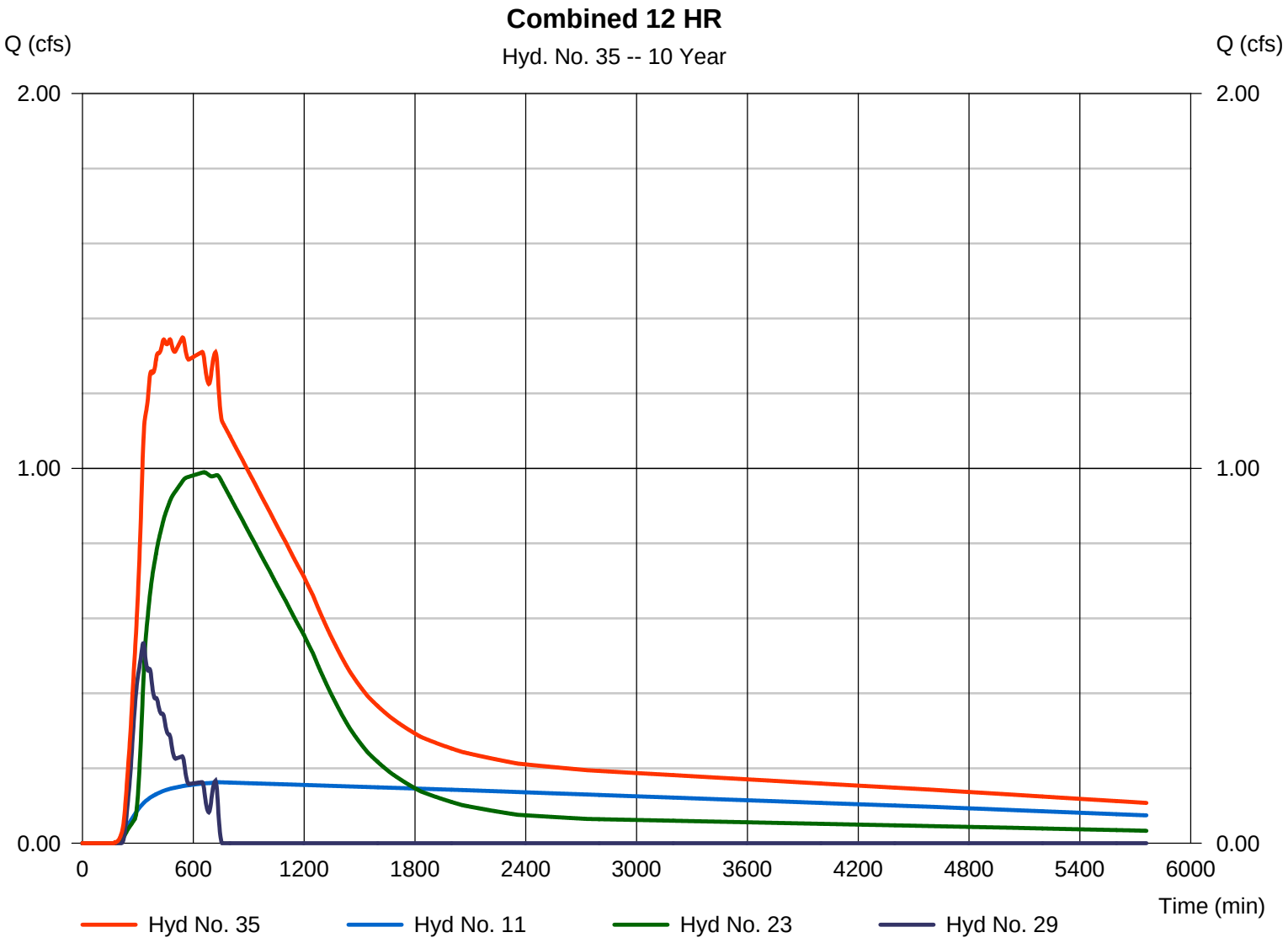


Hydrograph Report

Hyd. No. 35

Combined 12 HR

Hydrograph type	=	Combine	Peak discharge	=	1.349 cfs
Storm frequency	=	10 yrs	Time to peak	=	542 min
Time interval	=	2 min	Hyd. volume	=	116,964 cuft
Inflow hyds.	=	11, 23, 29	Contrib. drain. area	=	2.360 ac

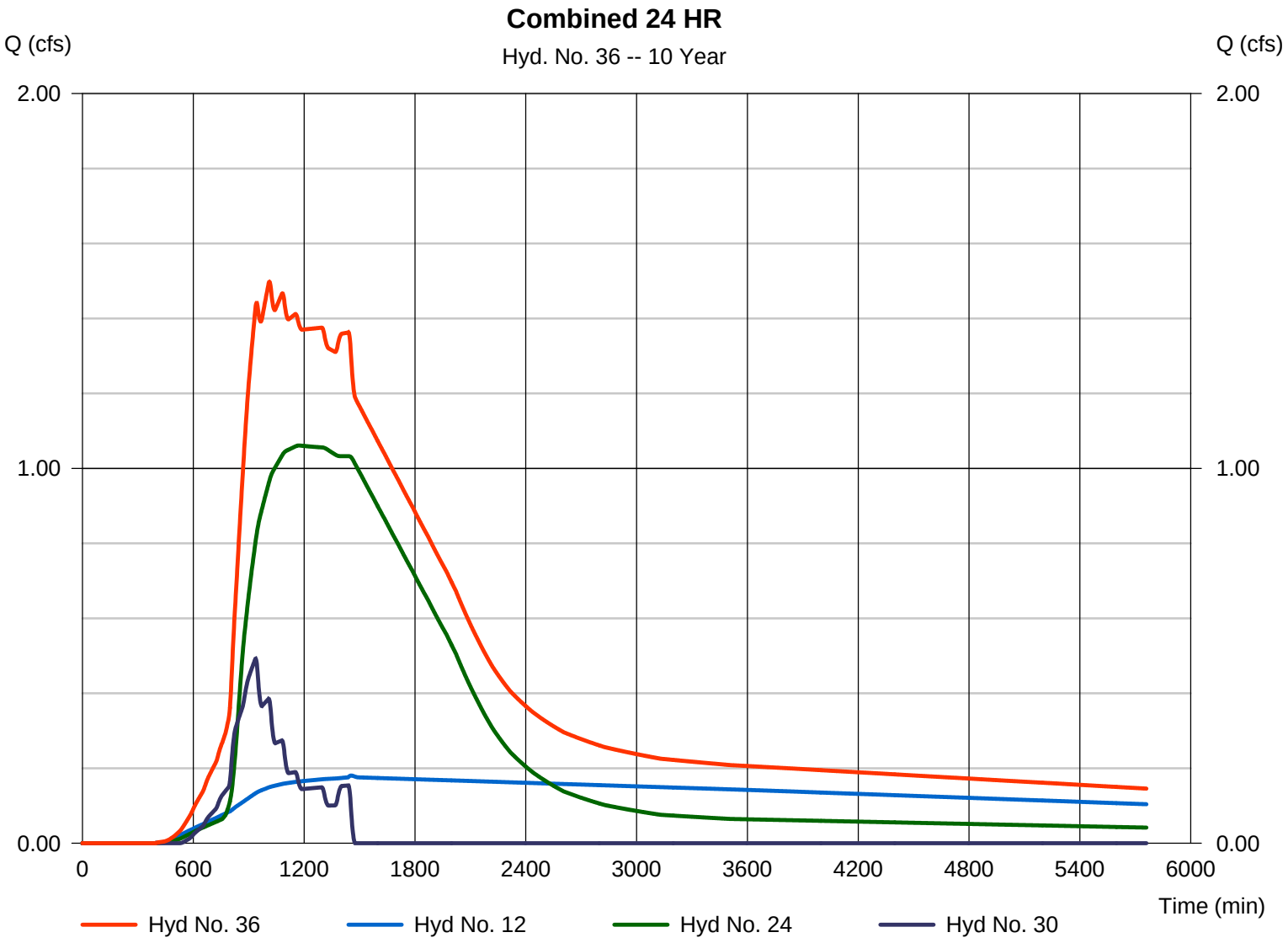


Hydrograph Report

Hyd. No. 36

Combined 24 HR

Hydrograph type	=	Combine	Peak discharge	=	1.498 cfs
Storm frequency	=	10 yrs	Time to peak	=	1012 min
Time interval	=	2 min	Hyd. volume	=	138,024 cuft
Inflow hyds.	=	12, 24, 30	Contrib. drain. area	=	2.360 ac

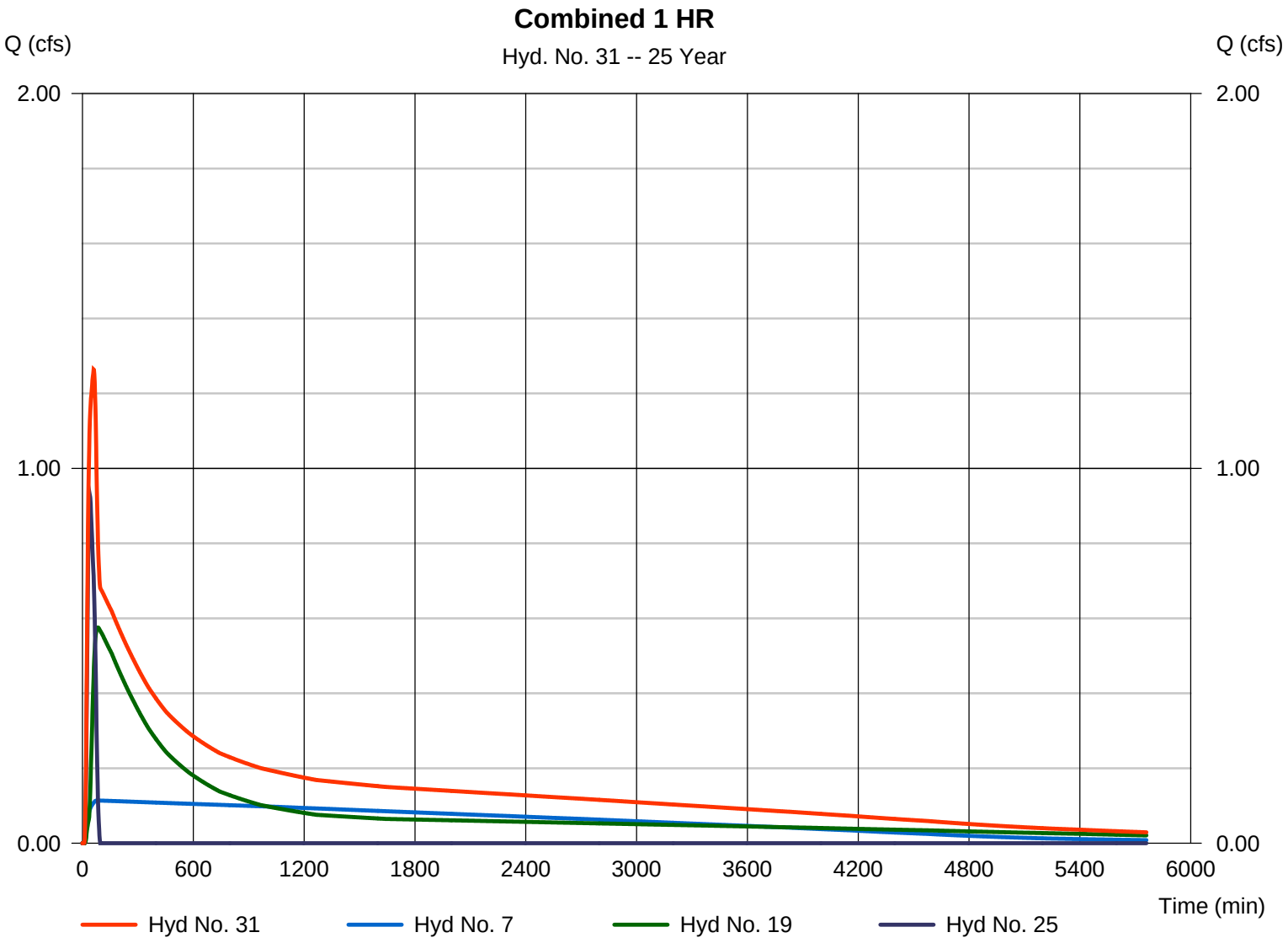


Hydrograph Report

Hyd. No. 31

Combined 1 HR

Hydrograph type	= Combine	Peak discharge	= 1.263 cfs
Storm frequency	= 25 yrs	Time to peak	= 60 min
Time interval	= 2 min	Hyd. volume	= 51,695 cuft
Inflow hyds.	= 7, 19, 25	Contrib. drain. area	= 2.360 ac

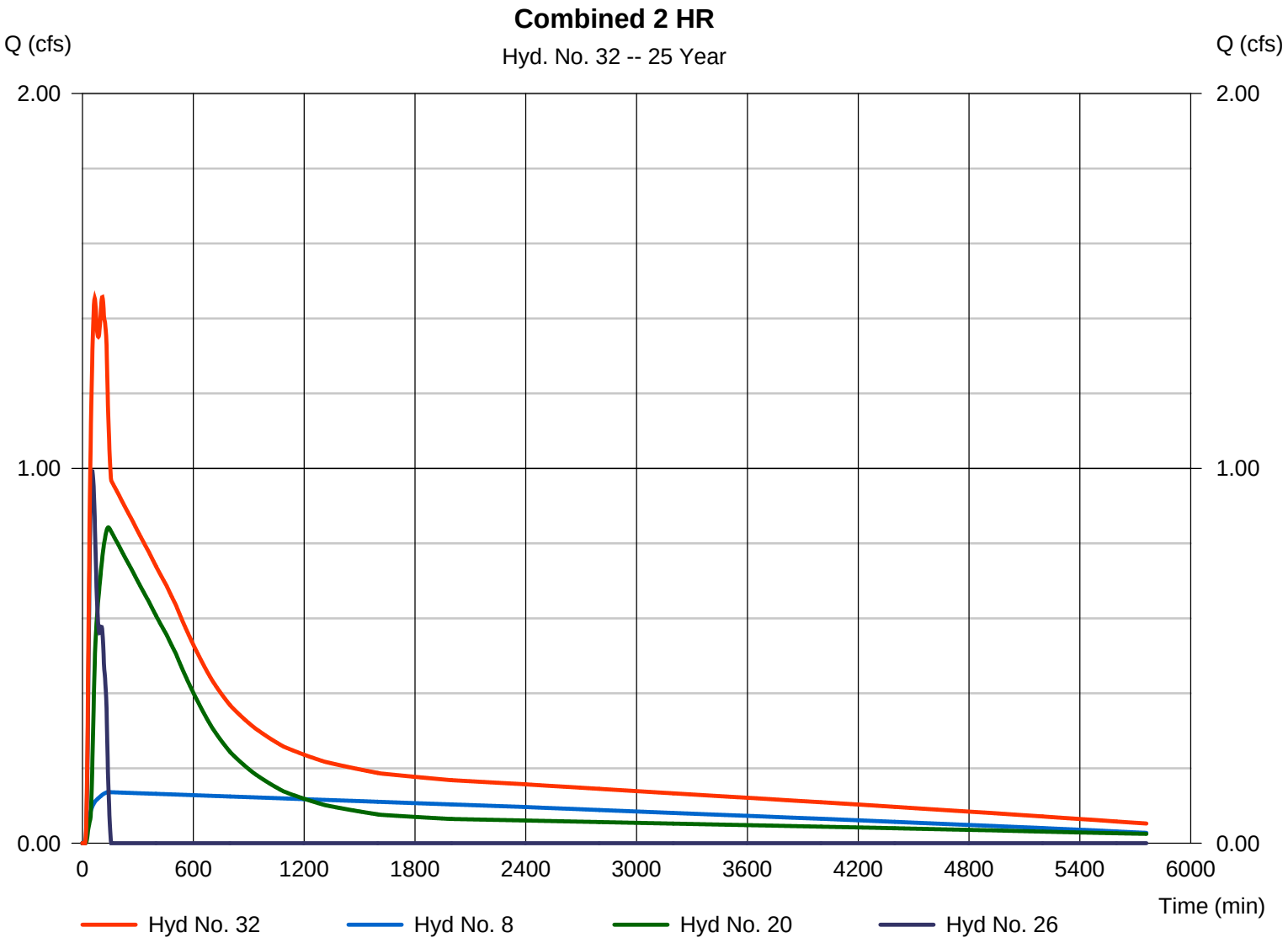


Hydrograph Report

Hyd. No. 32

Combined 2 HR

Hydrograph type	= Combine	Peak discharge	= 1.457 cfs
Storm frequency	= 25 yrs	Time to peak	= 108 min
Time interval	= 2 min	Hyd. volume	= 76,531 cuft
Inflow hyds.	= 8, 20, 26	Contrib. drain. area	= 2.360 ac

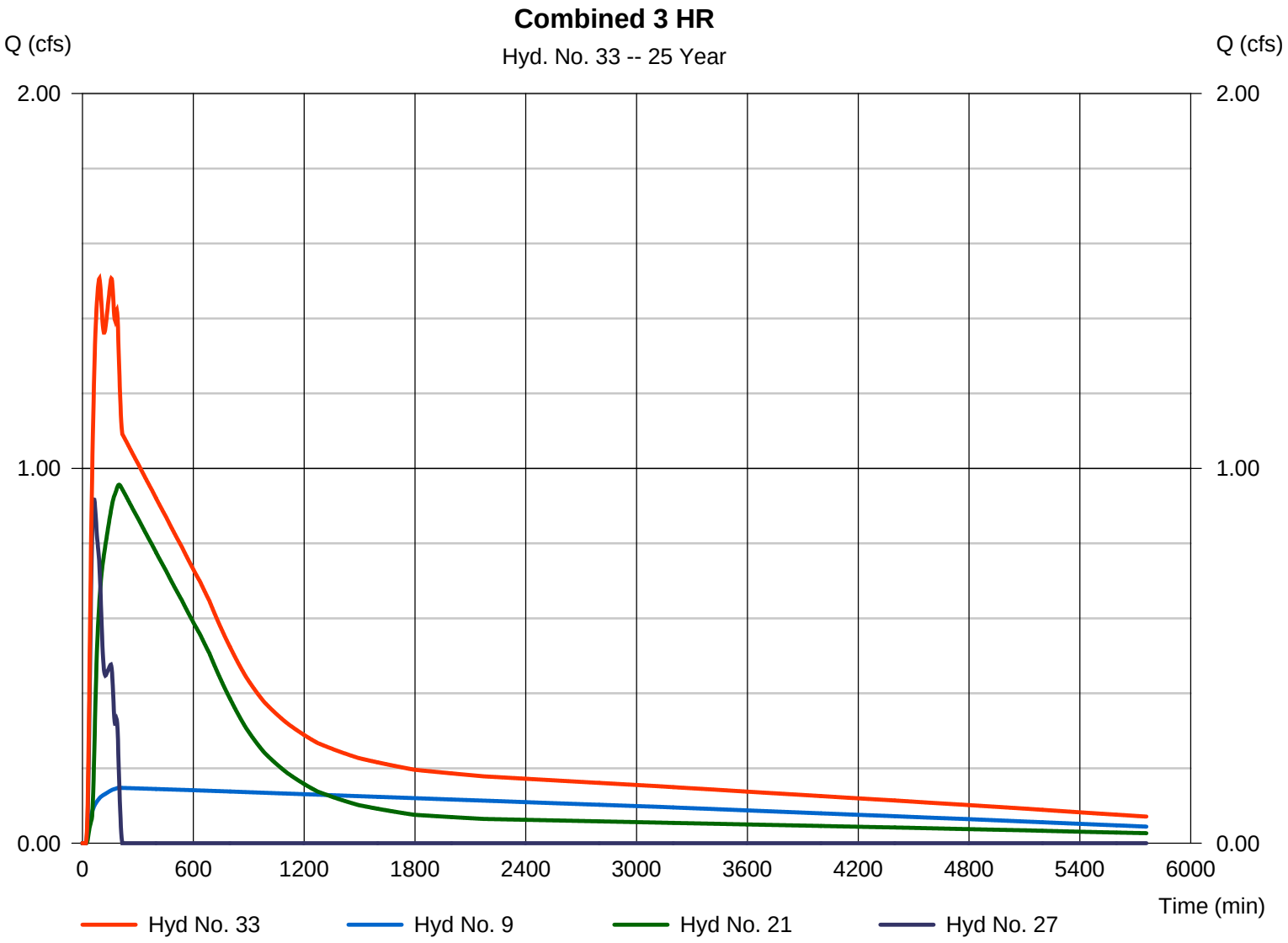


Hydrograph Report

Hyd. No. 33

Combined 3 HR

Hydrograph type	=	Combine	Peak discharge	=	1.507 cfs
Storm frequency	=	25 yrs	Time to peak	=	156 min
Time interval	=	2 min	Hyd. volume	=	91,710 cuft
Inflow hyds.	=	9, 21, 27	Contrib. drain. area	=	2.360 ac

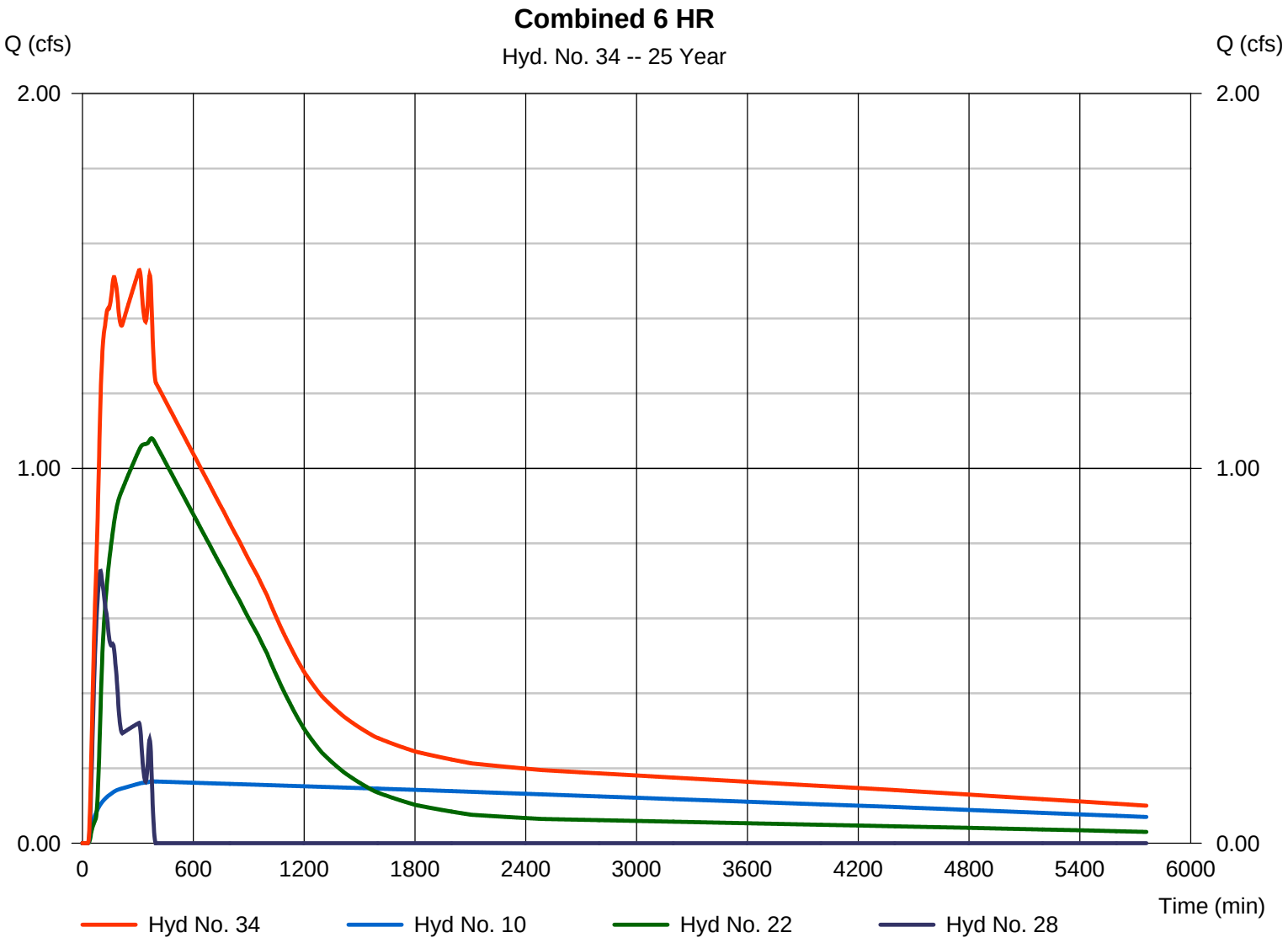


Hydrograph Report

Hyd. No. 34

Combined 6 HR

Hydrograph type	=	Combine	Peak discharge	=	1.529 cfs
Storm frequency	=	25 yrs	Time to peak	=	308 min
Time interval	=	2 min	Hyd. volume	=	118,393 cuft
Inflow hyds.	=	10, 22, 28	Contrib. drain. area	=	2.360 ac

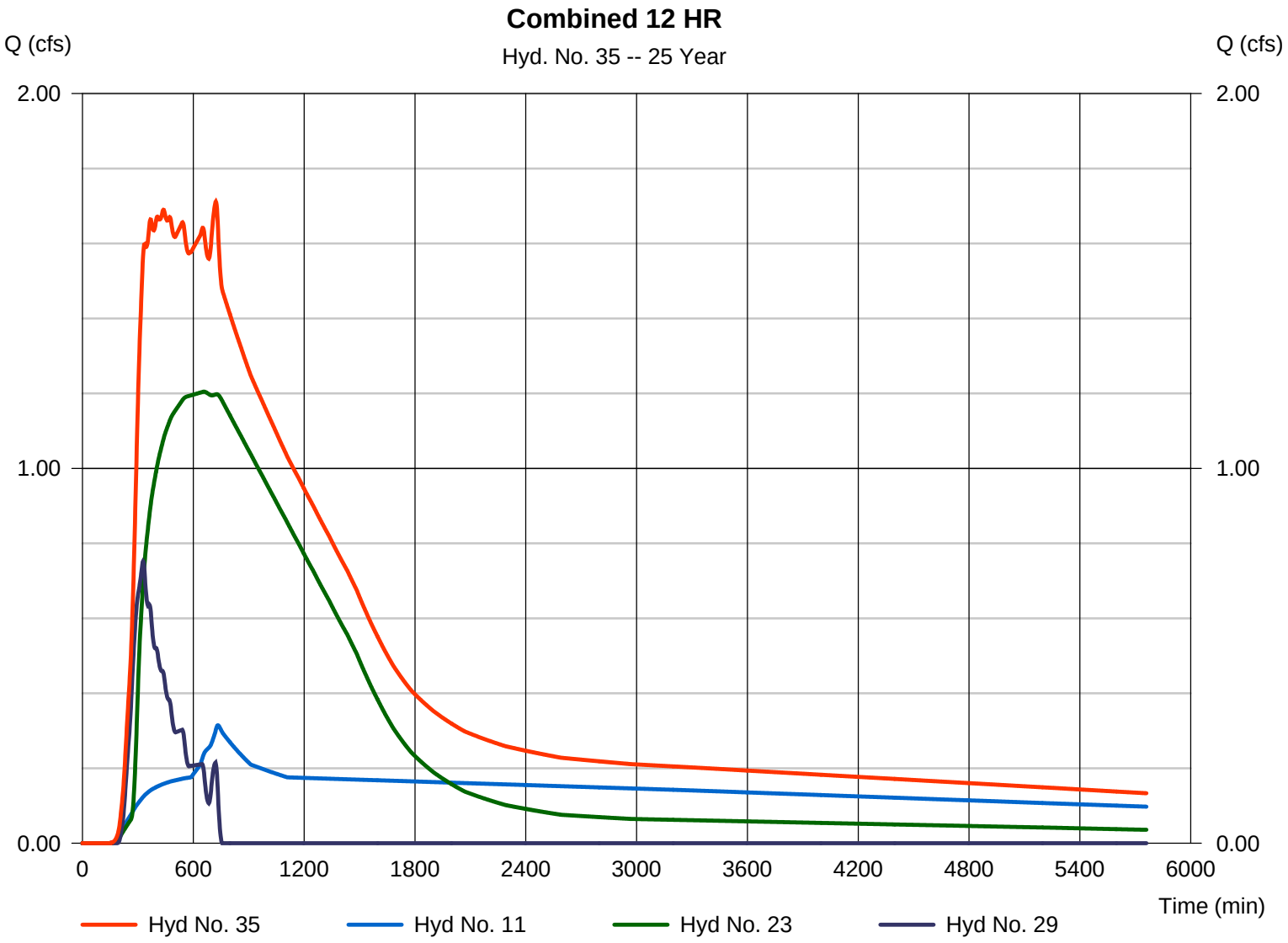


Hydrograph Report

Hyd. No. 35

Combined 12 HR

Hydrograph type	= Combine	Peak discharge	= 1.712 cfs
Storm frequency	= 25 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 149,556 cuft
Inflow hyds.	= 11, 23, 29	Contrib. drain. area	= 2.360 ac

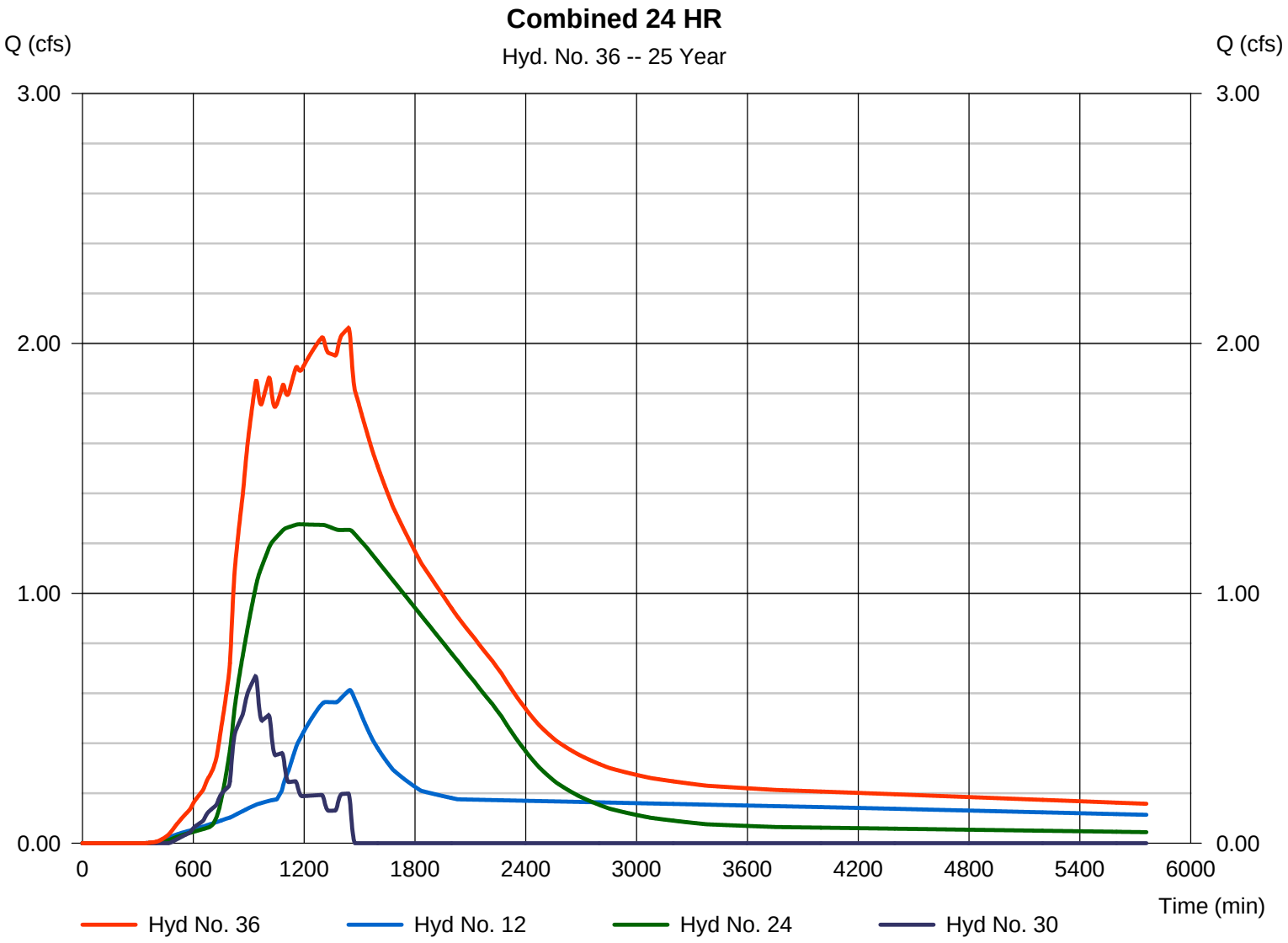


Hydrograph Report

Hyd. No. 36

Combined 24 HR

Hydrograph type	=	Combine	Peak discharge	=	2.062 cfs
Storm frequency	=	25 yrs	Time to peak	=	1440 min
Time interval	=	2 min	Hyd. volume	=	182,768 cuft
Inflow hyds.	=	12, 24, 30	Contrib. drain. area	=	2.360 ac

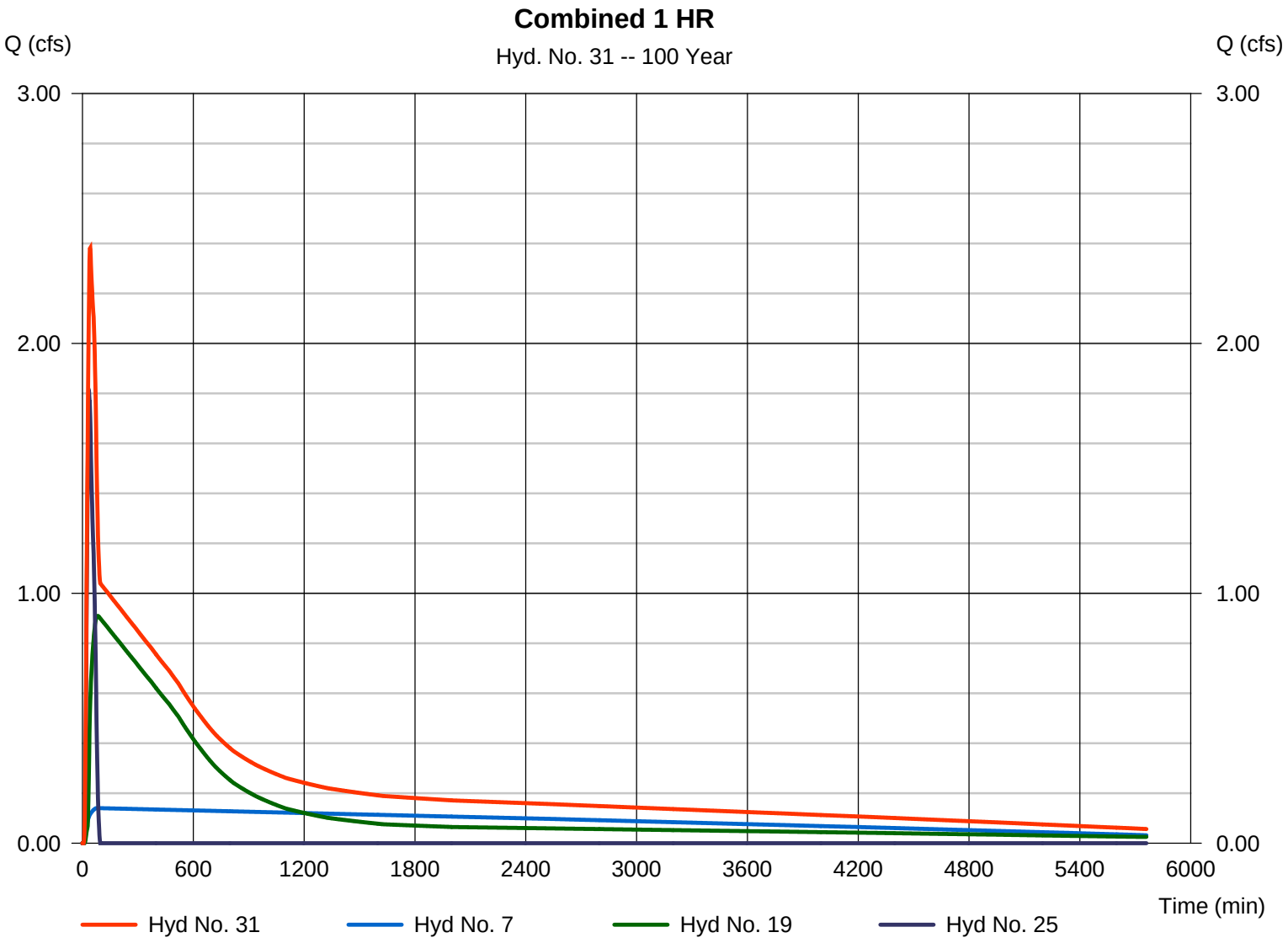


Hydrograph Report

Hyd. No. 31

Combined 1 HR

Hydrograph type	=	Combine	Peak discharge	=	2.382 cfs
Storm frequency	=	100 yrs	Time to peak	=	42 min
Time interval	=	2 min	Hyd. volume	=	80,634 cuft
Inflow hyds.	=	7, 19, 25	Contrib. drain. area	=	2.360 ac

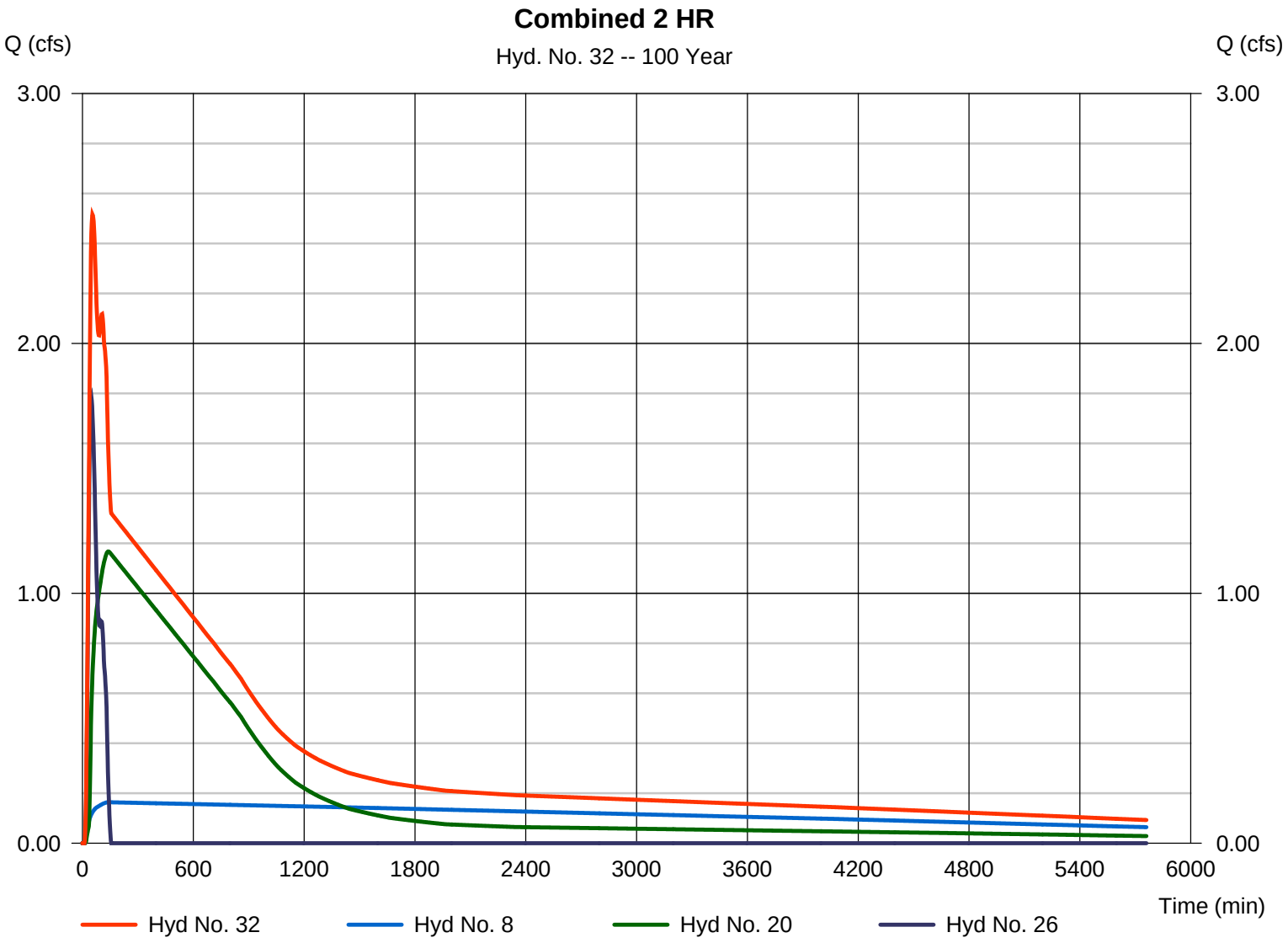


Hydrograph Report

Hyd. No. 32

Combined 2 HR

Hydrograph type	=	Combine	Peak discharge	=	2.516 cfs
Storm frequency	=	100 yrs	Time to peak	=	54 min
Time interval	=	2 min	Hyd. volume	=	113,469 cuft
Inflow hyds.	=	8, 20, 26	Contrib. drain. area	=	2.360 ac



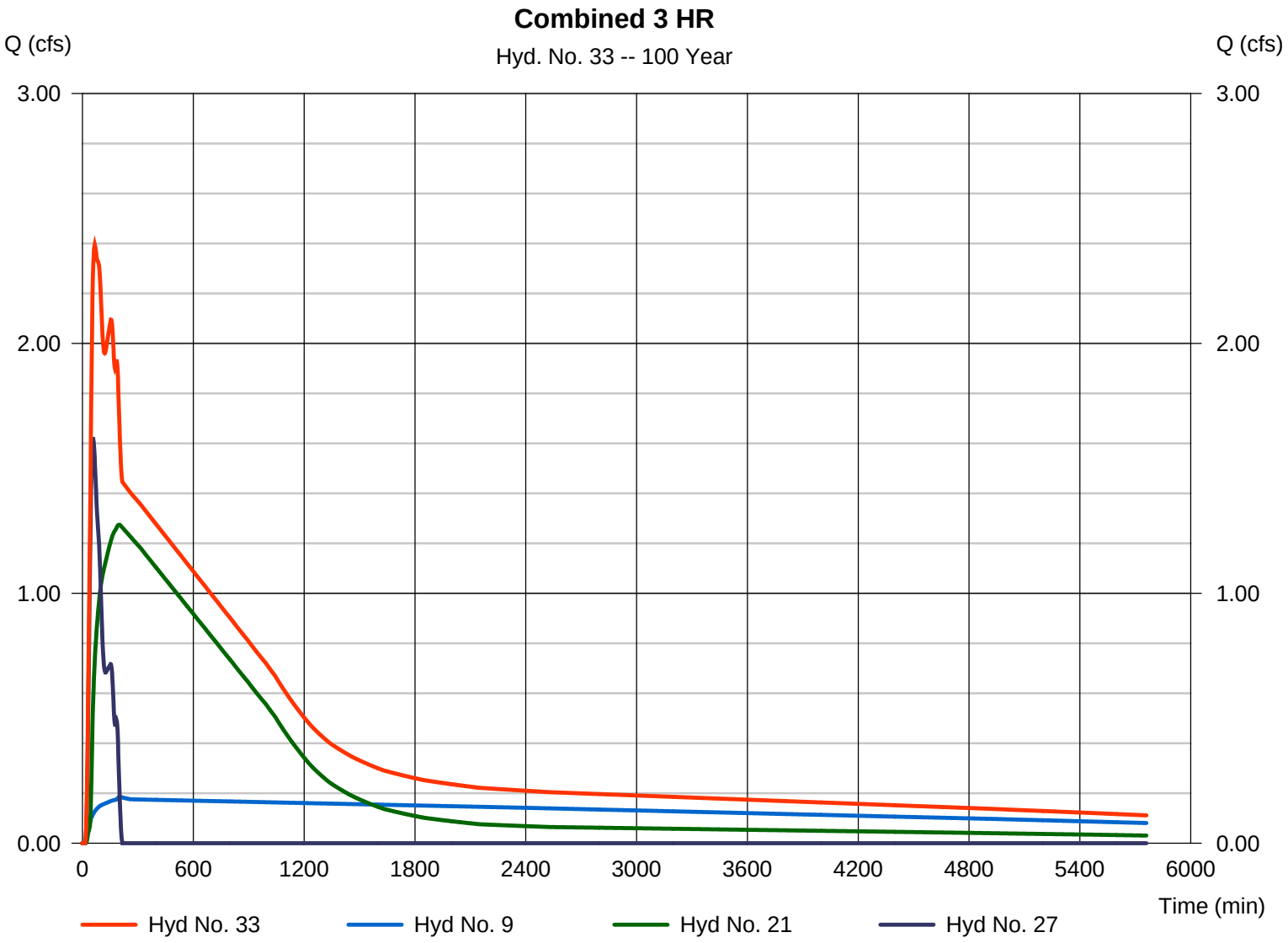
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 33

Combined 3 HR

Hydrograph type	= Combine	Peak discharge	= 2.395 cfs
Storm frequency	= 100 yrs	Time to peak	= 66 min
Time interval	= 2 min	Hyd. volume	= 133,145 cuft
Inflow hyds.	= 9, 21, 27	Contrib. drain. area	= 2.360 ac

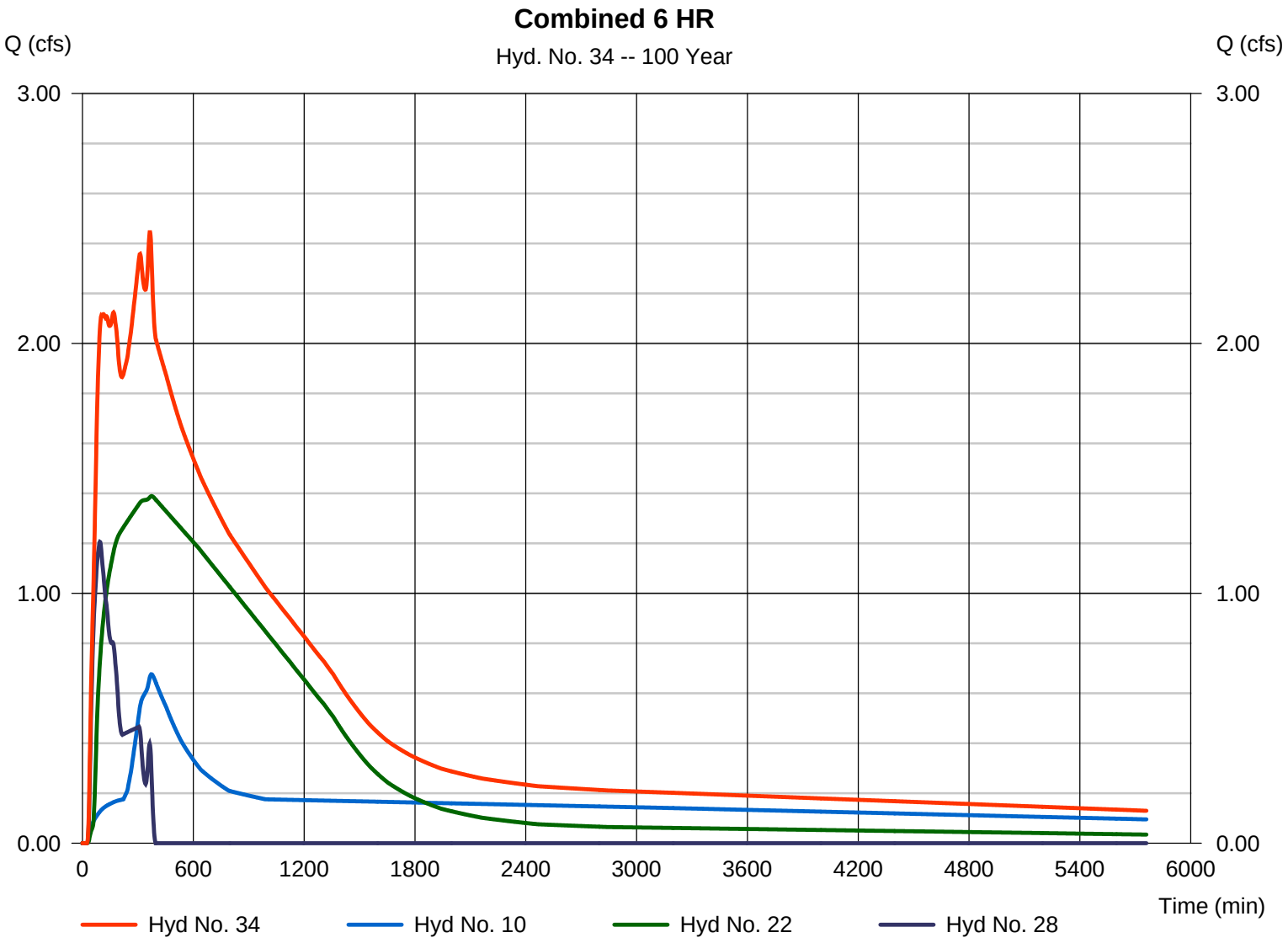


Hydrograph Report

Hyd. No. 34

Combined 6 HR

Hydrograph type	=	Combine	Peak discharge	=	2.445 cfs
Storm frequency	=	100 yrs	Time to peak	=	366 min
Time interval	=	2 min	Hyd. volume	=	170,744 cuft
Inflow hyds.	=	10, 22, 28	Contrib. drain. area	=	2.360 ac

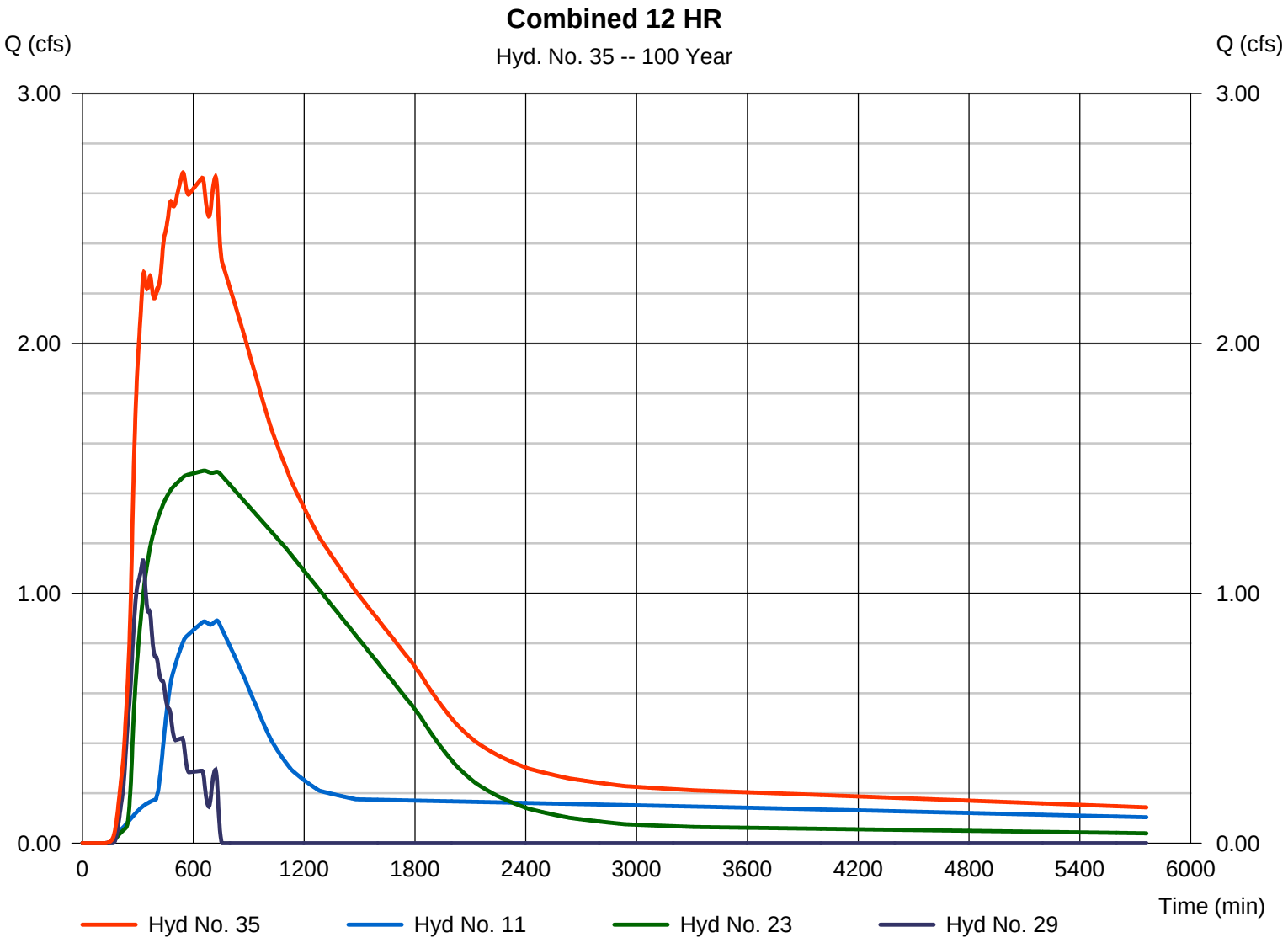


Hydrograph Report

Hyd. No. 35

Combined 12 HR

Hydrograph type	=	Combine	Peak discharge	=	2.683 cfs
Storm frequency	=	100 yrs	Time to peak	=	544 min
Time interval	=	2 min	Hyd. volume	=	212,686 cuft
Inflow hyds.	=	11, 23, 29	Contrib. drain. area	=	2.360 ac

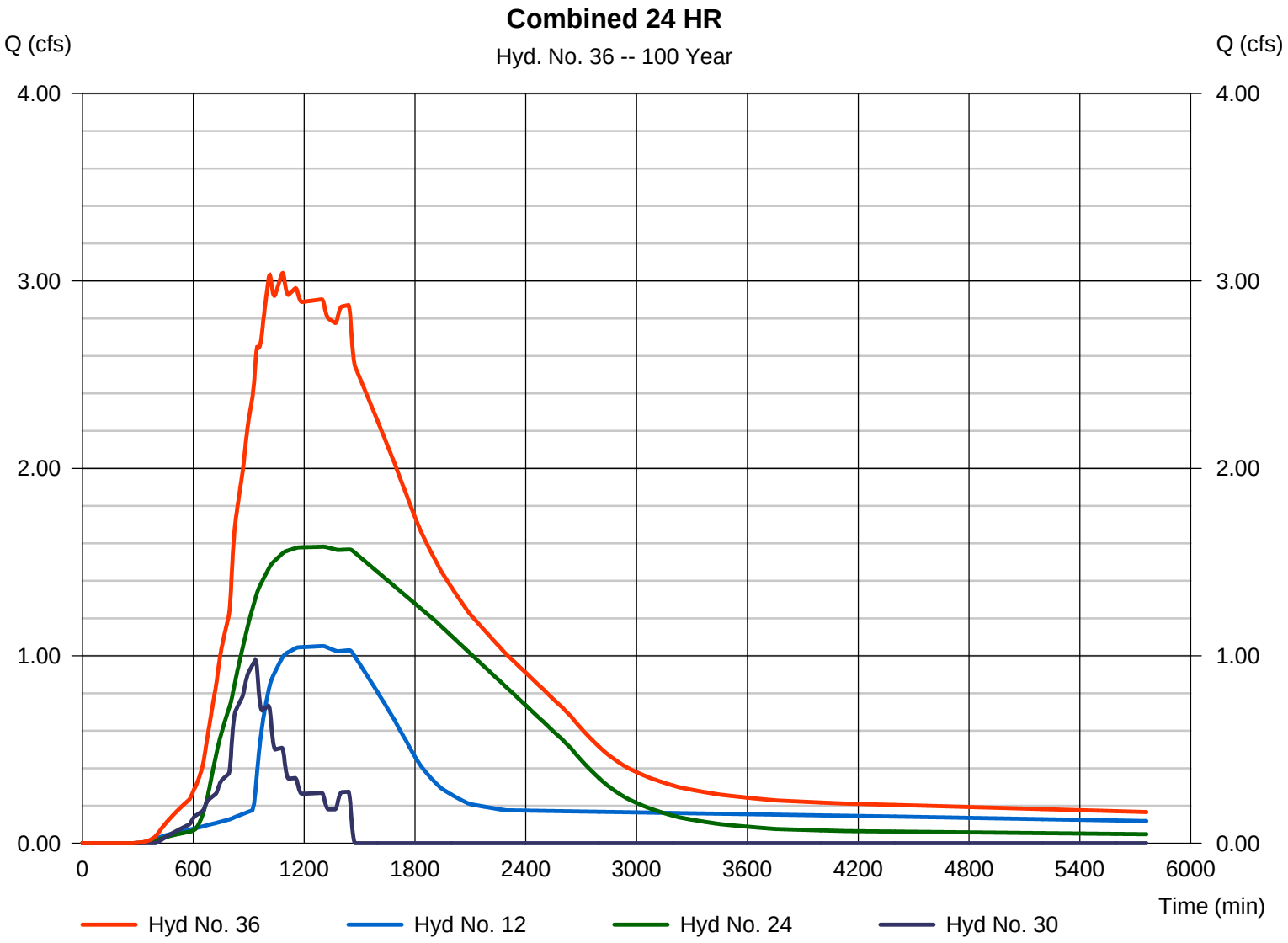


Hydrograph Report

Hyd. No. 36

Combined 24 HR

Hydrograph type	=	Combine	Peak discharge	=	3.042 cfs
Storm frequency	=	100 yrs	Time to peak	=	1084 min
Time interval	=	2 min	Hyd. volume	=	265,510 cuft
Inflow hyds.	=	12, 24, 30	Contrib. drain. area	=	2.360 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	3.207	2	30	7,596	------	------	------	Pond 3 1HR
2	SCS Runoff	2.986	2	40	11,490	------	------	------	Pond 3 2HR
3	SCS Runoff	2.526	2	50	13,784	------	------	------	Pond 3 3HR
4	SCS Runoff	1.780	2	90	18,619	------	------	------	Pond 3 6HR
5	SCS Runoff	1.579	2	326	23,740	------	------	------	Pond 3 12HR
6	SCS Runoff	1.216	2	936	29,071	------	------	------	Pond 3 24HR
7	Reservoir	0.077	2	86	7,312	1	749.67	7,354	1HR
8	Reservoir	0.160	2	142	11,138	2	749.97	10,851	2HR
9	Reservoir	0.261	2	198	13,411	3	750.09	12,432	3HR
10	Reservoir	0.355	2	372	18,212	4	750.22	14,220	6HR
11	Reservoir	0.410	2	556	23,280	5	750.32	15,611	12HR
12	Reservoir	0.449	2	1100	28,490	6	750.40	16,699	24HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	7.035	2	28	16,050	------	------	------	Pond 3 1HR
2	SCS Runoff	6.205	2	36	22,618	------	------	------	Pond 3 2HR
3	SCS Runoff	5.090	2	44	26,691	------	------	------	Pond 3 3HR
4	SCS Runoff	3.518	2	46	33,872	------	------	------	Pond 3 6HR
5	SCS Runoff	2.688	2	294	41,619	------	------	------	Pond 3 12HR
6	SCS Runoff	2.035	2	936	51,748	------	------	------	Pond 3 24HR
7	Reservoir	0.393	2	80	15,675	1	750.29	15,147	1HR
8	Reservoir	0.548	2	136	22,214	2	750.65	20,045	2HR
9	Reservoir	0.606	2	194	26,271	3	750.82	22,307	3HR
10	Reservoir	0.644	2	322	33,422	4	750.93	23,906	6HR
11	Reservoir	0.693	2	554	41,111	5	751.10	26,327	12HR
12	Reservoir	0.736	2	1098	51,082	6	751.25	28,689	24HR

Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

	Present	X	Developed

Pond 3

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Residential 1/4 Acre Lots	75	0.36	27
MnB2	B	Residential 1/4 Acre Lots	75	0.7	52.5
CrA	C	Residential 1/4 Acre Lots	83	2.64	219.12
			Totals =	3.7	298.62

CN = 80.7

TR55 Tc Worksheet

Hyd. No. 1

Pond 3 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 14.23**	**+**	**0.00**	**+**	**0.00**	**=**	**14.23**
Shallow Concentrated Flow							
Flow length (ft)	= 260.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 2.69**	**+**	**0.00**	**+**	**0.00**	**=**	**2.69**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	=4.56						
			0.00				
					0.00		
Flow length (ft)	({0})268.0		0.0		0.0		
Travel Time (min)	**= 0.98**	**+**	**0.00**	**+**	**0.00**	**=**	**0.98**

Total Travel Time, Tc ..... 17.90 min

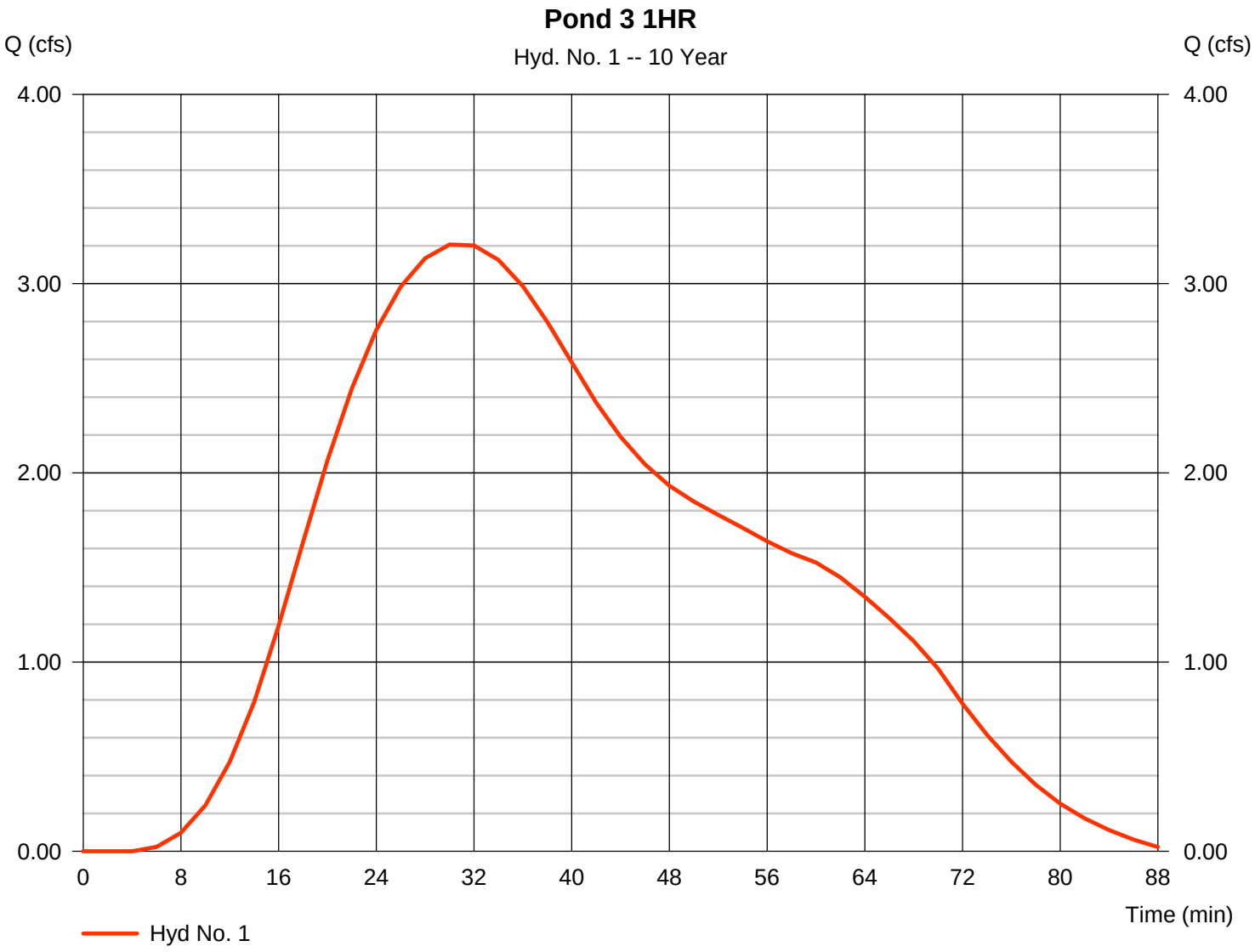
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Friday, 12 / 4 / 2015

Hyd. No. 1

Pond 3 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 3.207 cfs
Storm frequency	= 10 yrs	Time to peak	= 30 min
Time interval	= 2 min	Hyd. volume	= 7,596 cuft
Drainage area	= 3.700 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.90 min
Total precip.	= 1.96 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484

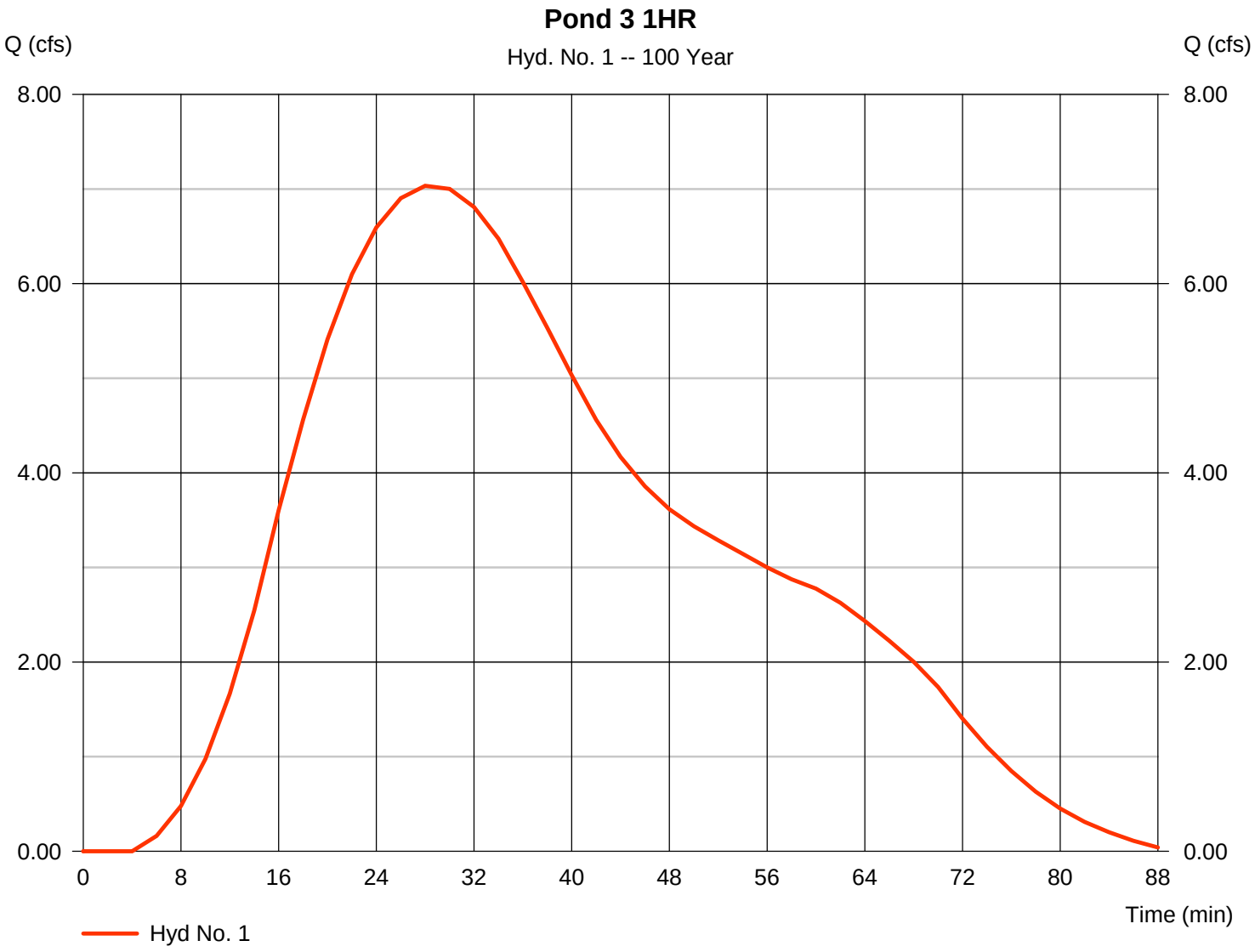


Hydrograph Report

Hyd. No. 1

Pond 3 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 7.035 cfs
Storm frequency	= 100 yrs	Time to peak	= 28 min
Time interval	= 2 min	Hyd. volume	= 16,050 cuft
Drainage area	= 3.700 ac	Curve number	= 80.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.90 min
Total precip.	= 2.88 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Report

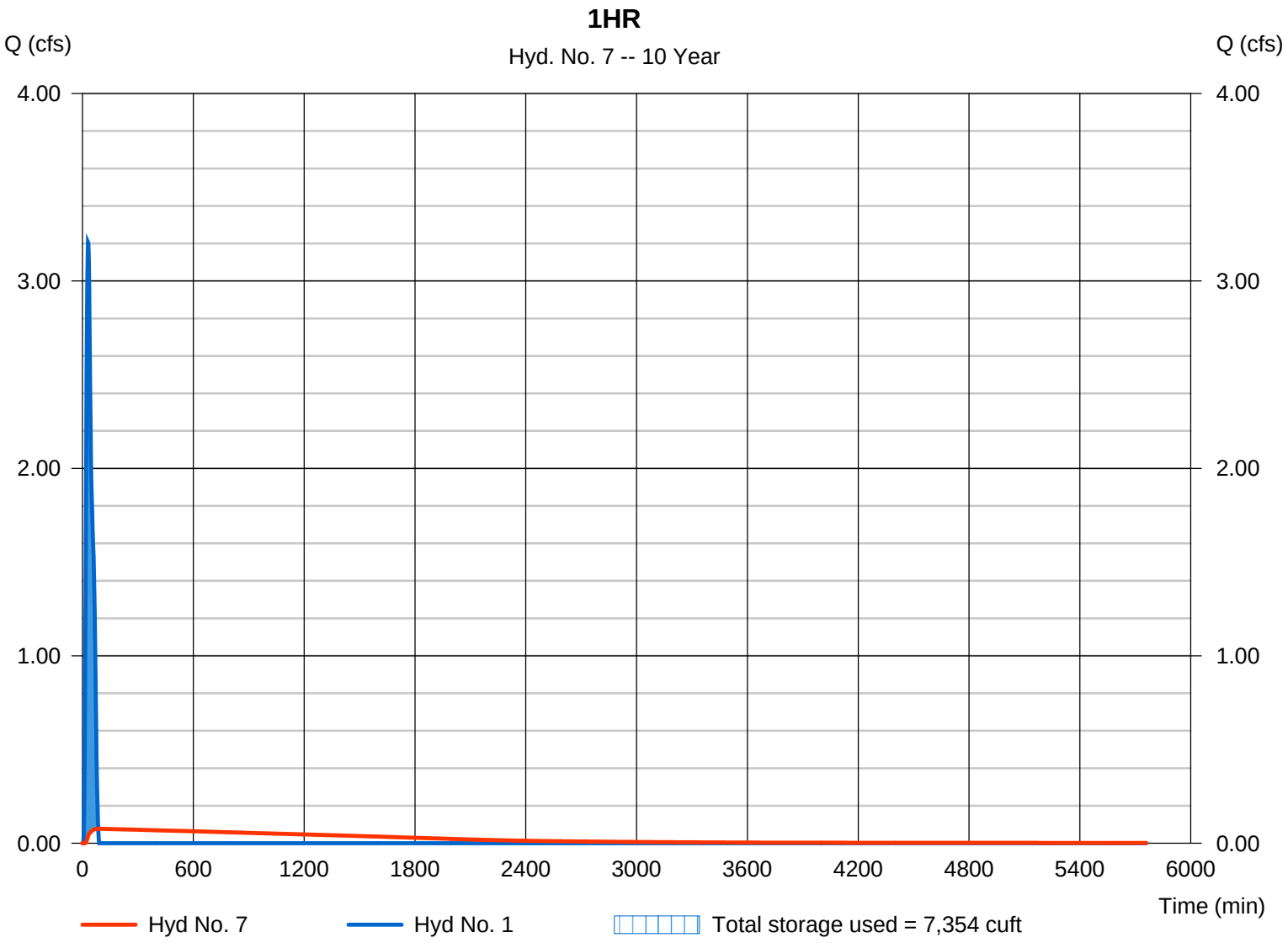
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.077 cfs
Storm frequency	= 10 yrs	Time to peak	= 86 min
Time interval	= 2 min	Hyd. volume	= 7,312 cuft
Inflow hyd. No.	= 1 - Pond 3 1HR	Max. Elevation	= 749.67 ft
Reservoir name	= Pond 3	Max. Storage	= 7,354 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

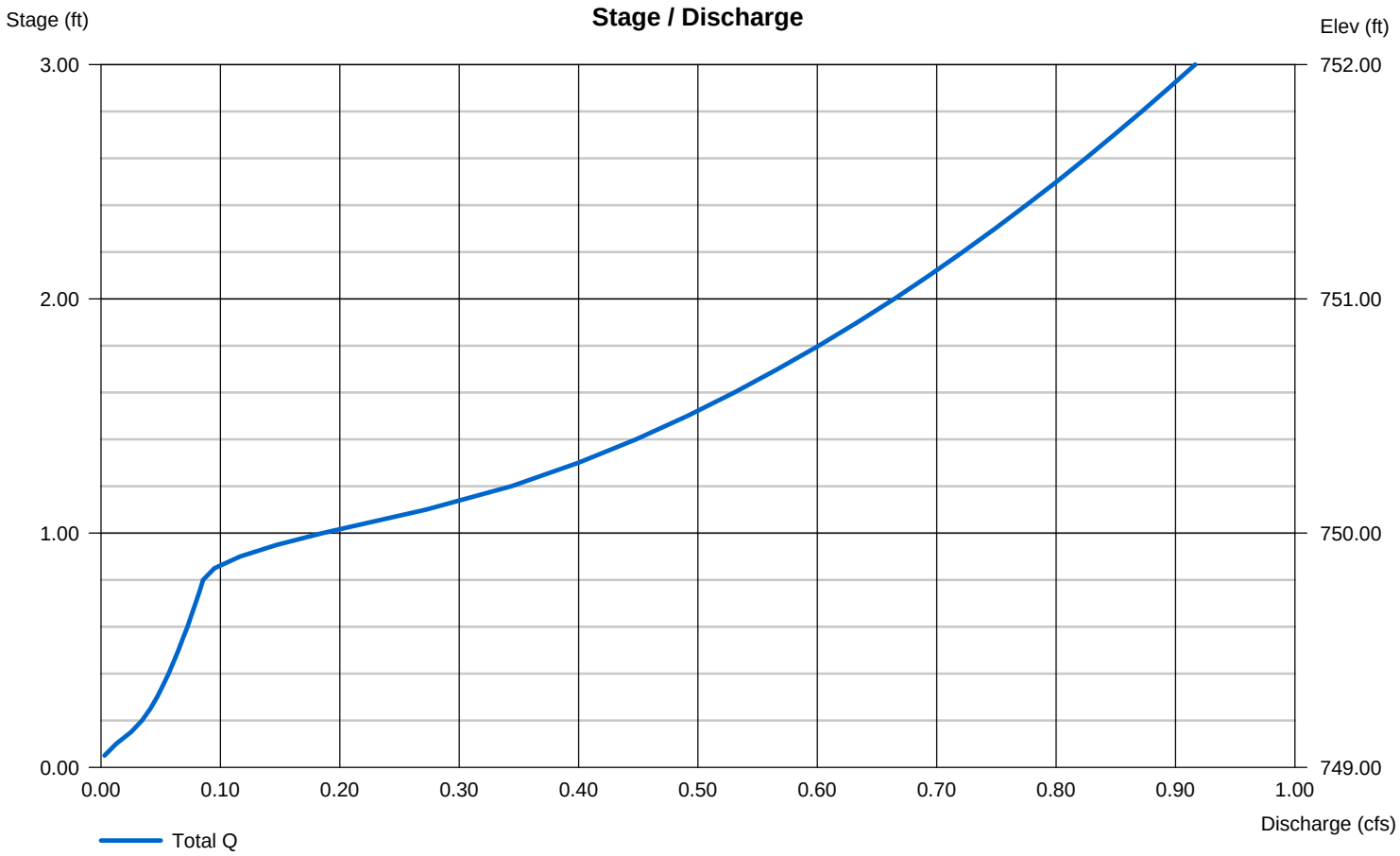
Weir Structures

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

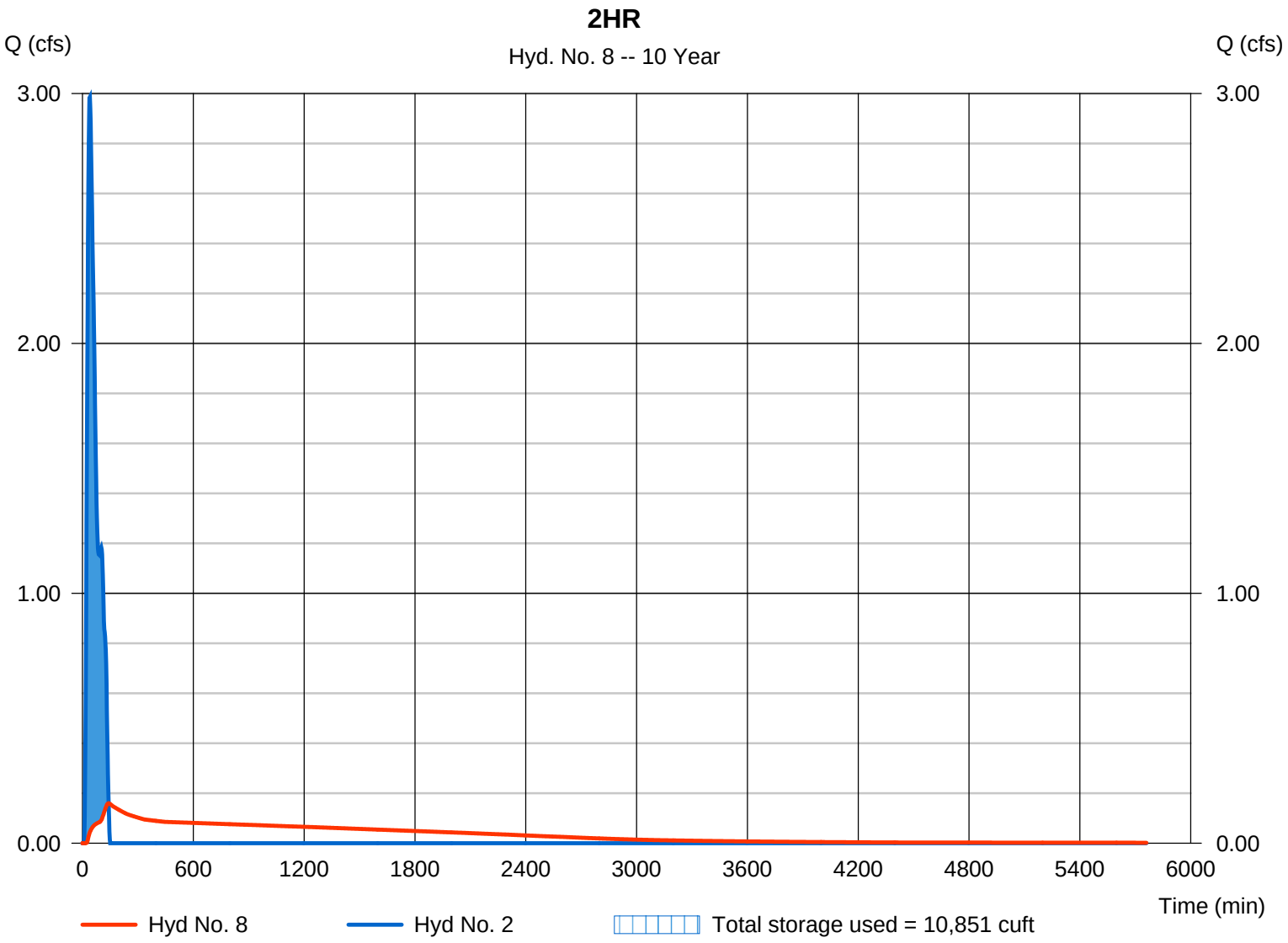
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.160 cfs
Storm frequency	= 10 yrs	Time to peak	= 142 min
Time interval	= 2 min	Hyd. volume	= 11,138 cuft
Inflow hyd. No.	= 2 - Pond 3 2HR	Max. Elevation	= 749.97 ft
Reservoir name	= Pond 3	Max. Storage	= 10,851 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

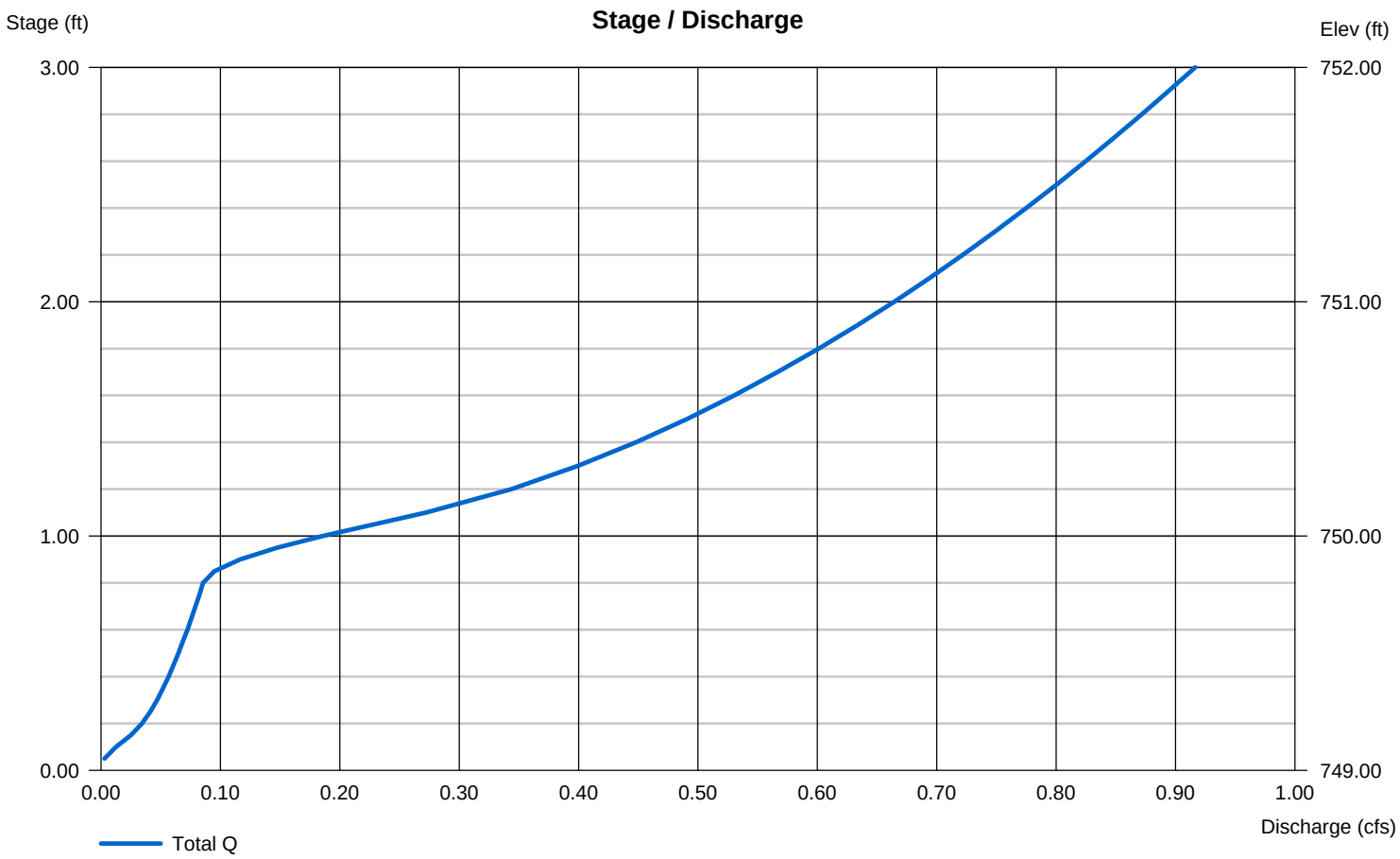
Weir Structures

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

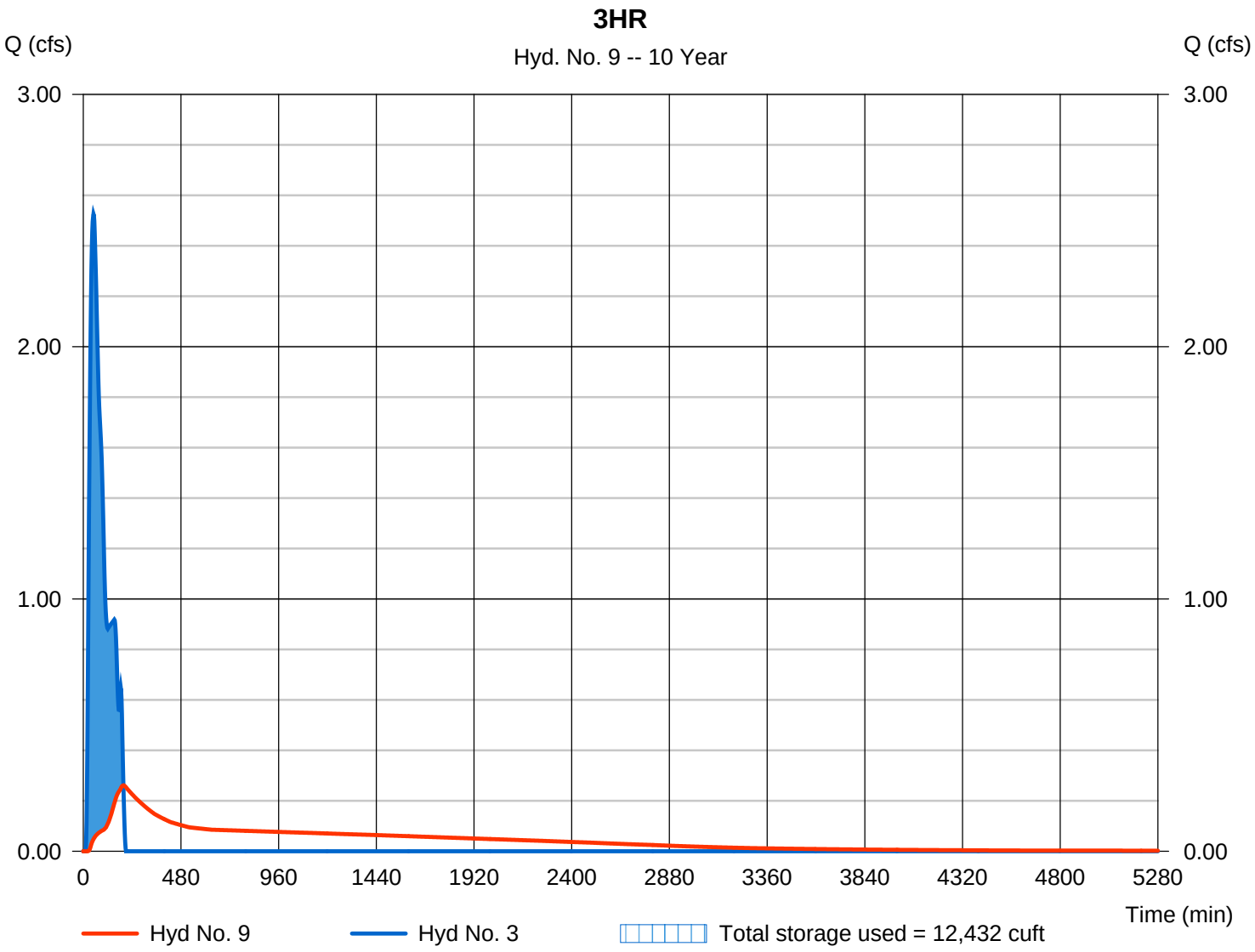
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.261 cfs
Storm frequency	= 10 yrs	Time to peak	= 198 min
Time interval	= 2 min	Hyd. volume	= 13,411 cuft
Inflow hyd. No.	= 3 - Pond 3 3HR	Max. Elevation	= 750.09 ft
Reservoir name	= Pond 3	Max. Storage	= 12,432 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

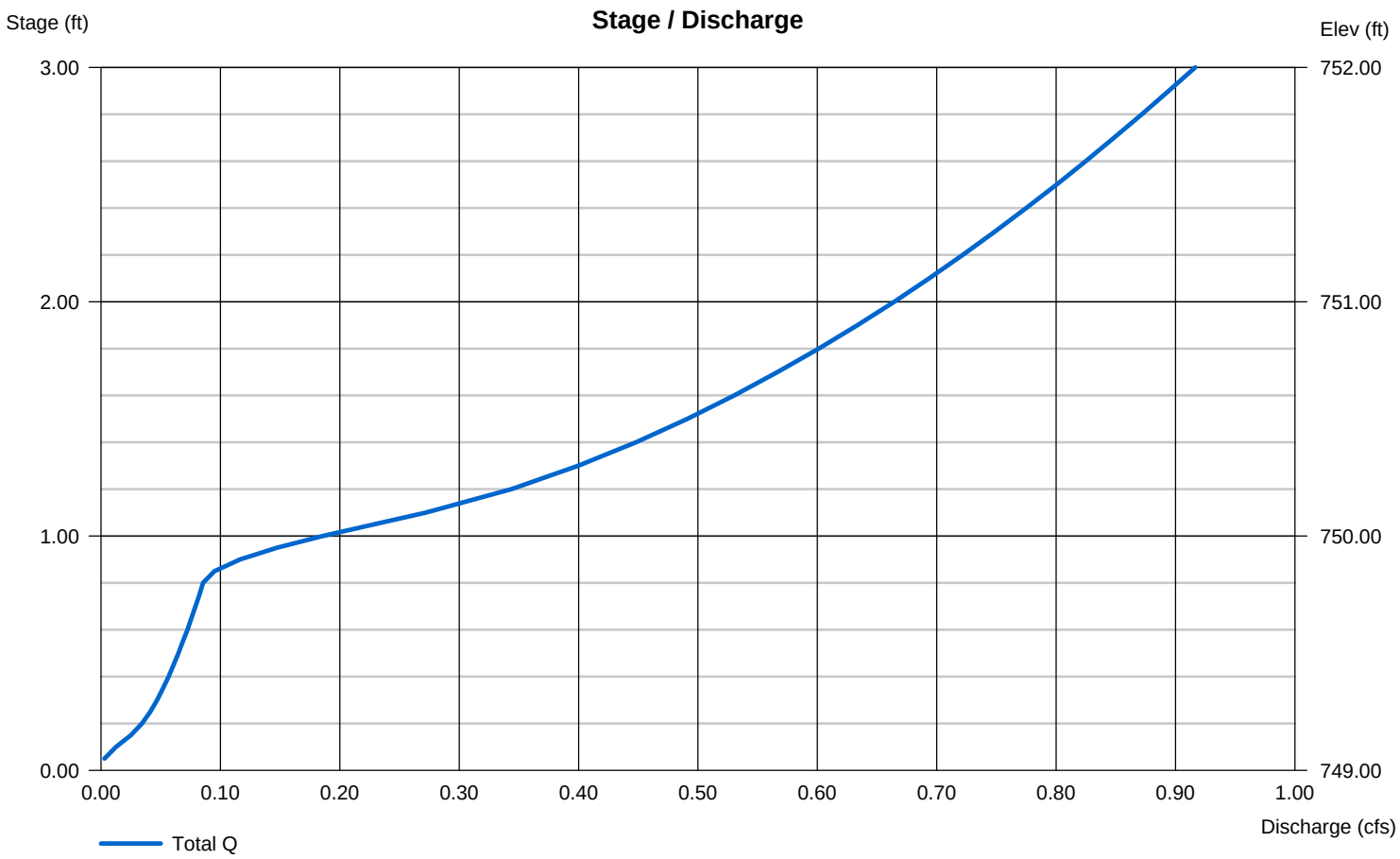
Weir Structures

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

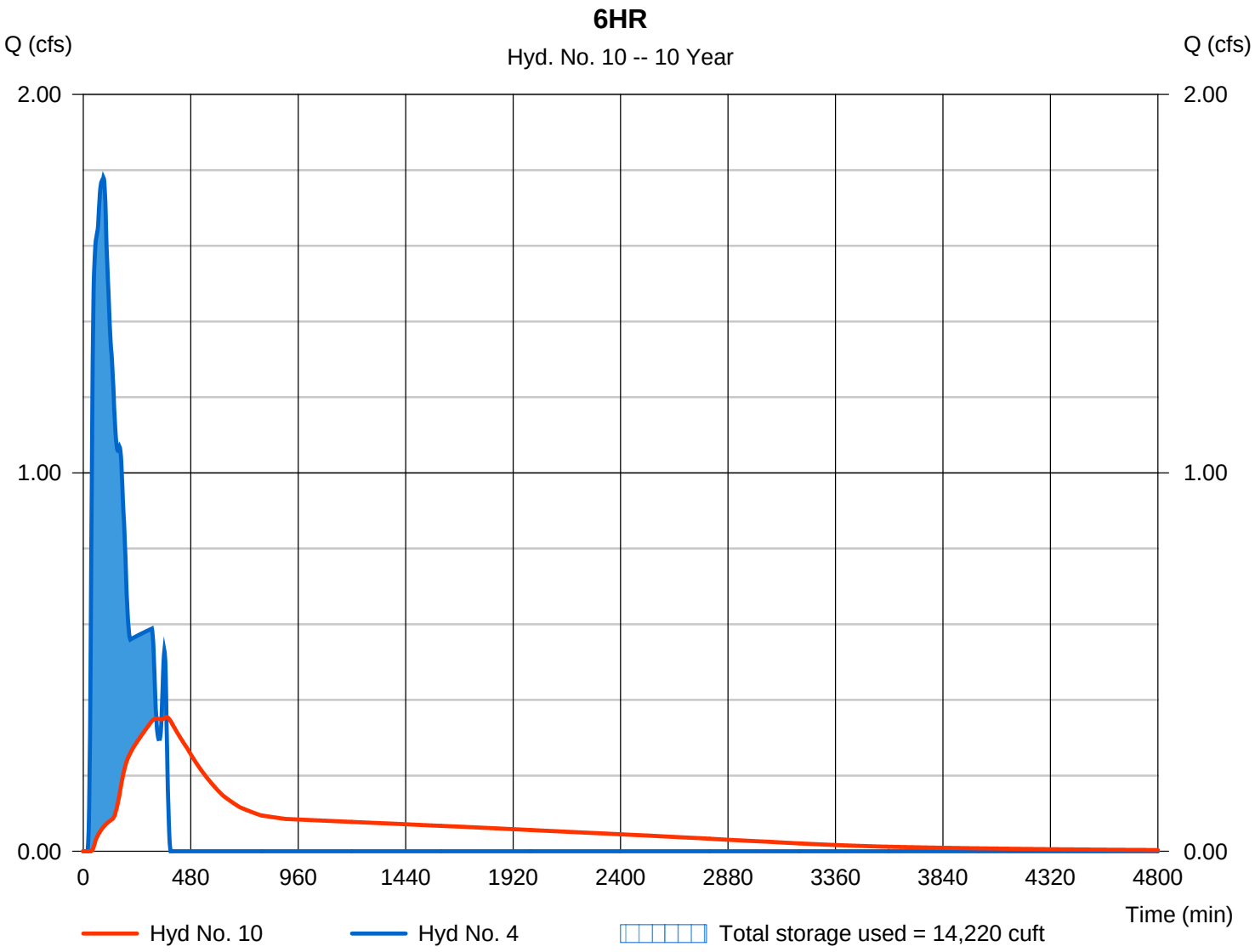
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.355 cfs
Storm frequency	= 10 yrs	Time to peak	= 372 min
Time interval	= 2 min	Hyd. volume	= 18,212 cuft
Inflow hyd. No.	= 4 - Pond 3 6HR	Max. Elevation	= 750.22 ft
Reservoir name	= Pond 3	Max. Storage	= 14,220 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

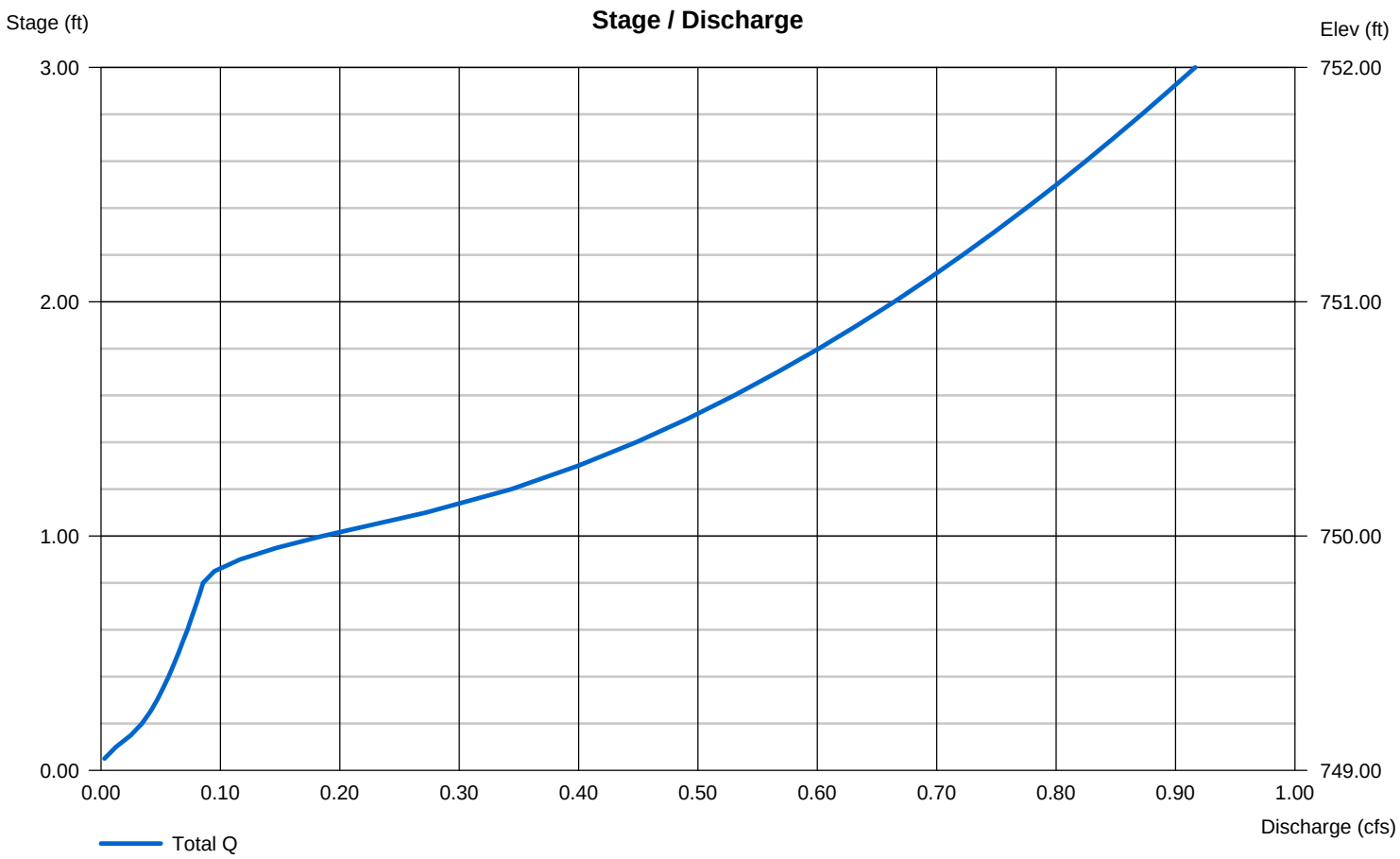
Weir Structures

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

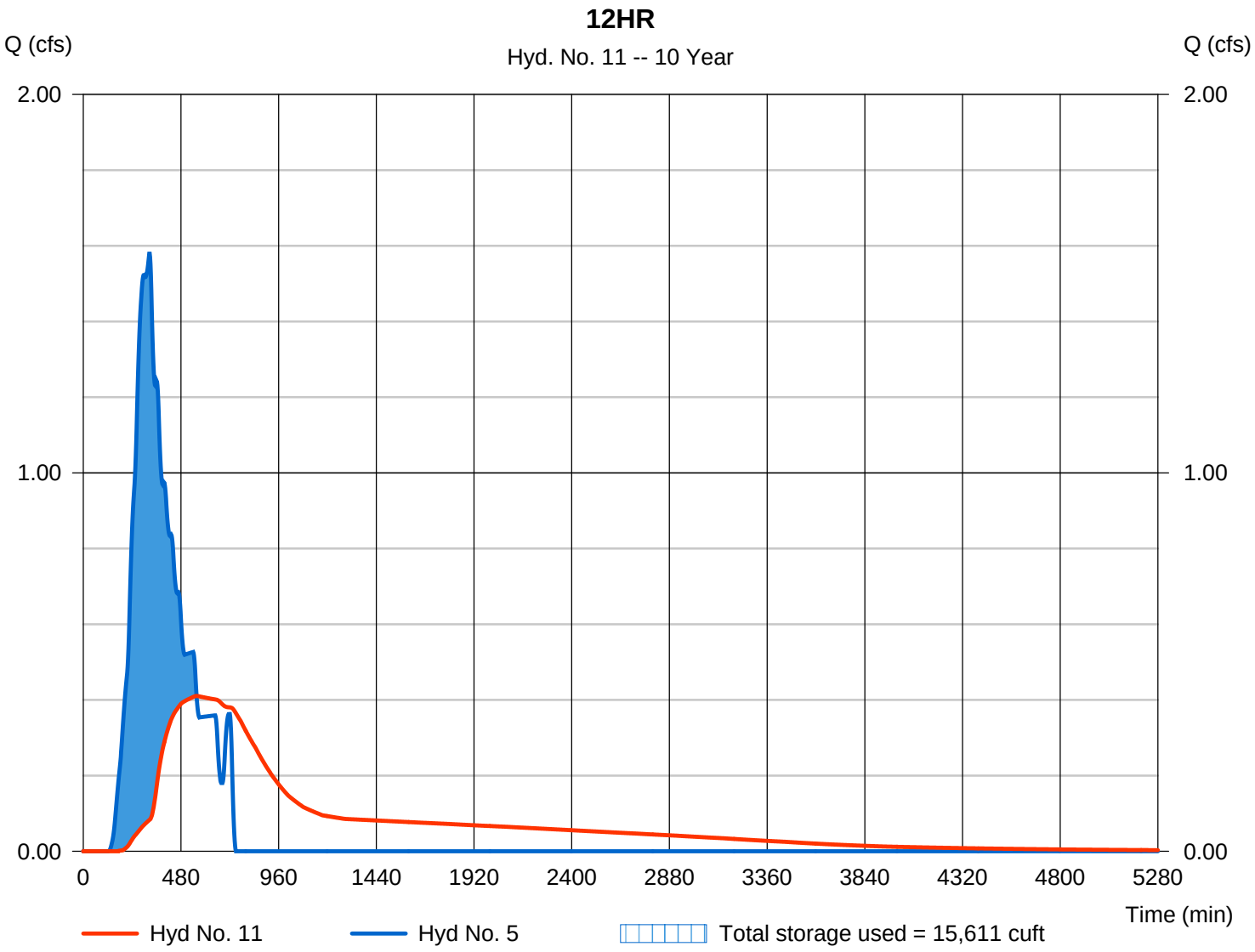
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.410 cfs
Storm frequency	= 10 yrs	Time to peak	= 556 min
Time interval	= 2 min	Hyd. volume	= 23,280 cuft
Inflow hyd. No.	= 5 - Pond 3 12HR	Max. Elevation	= 750.32 ft
Reservoir name	= Pond 3	Max. Storage	= 15,611 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

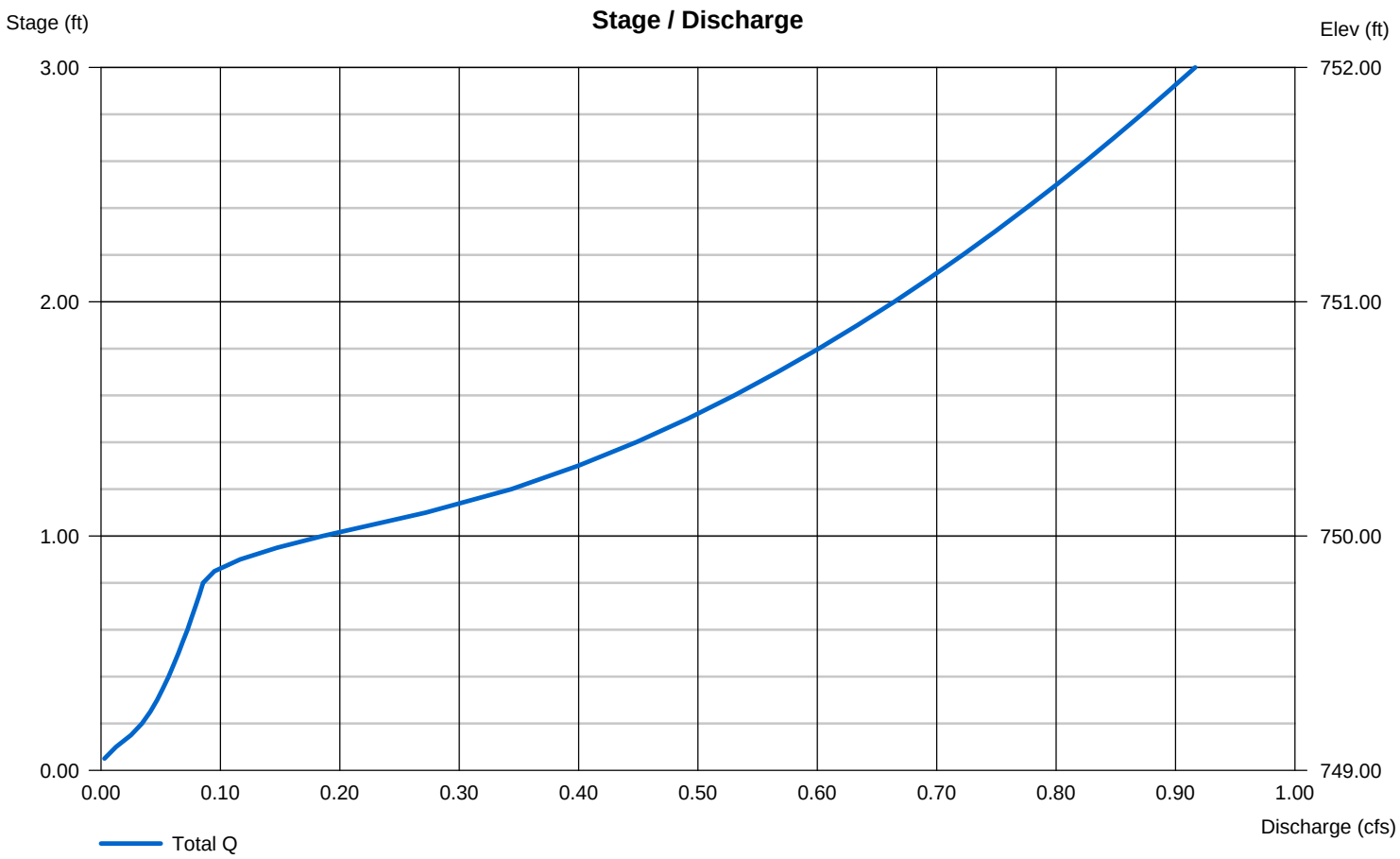
Weir Structures

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

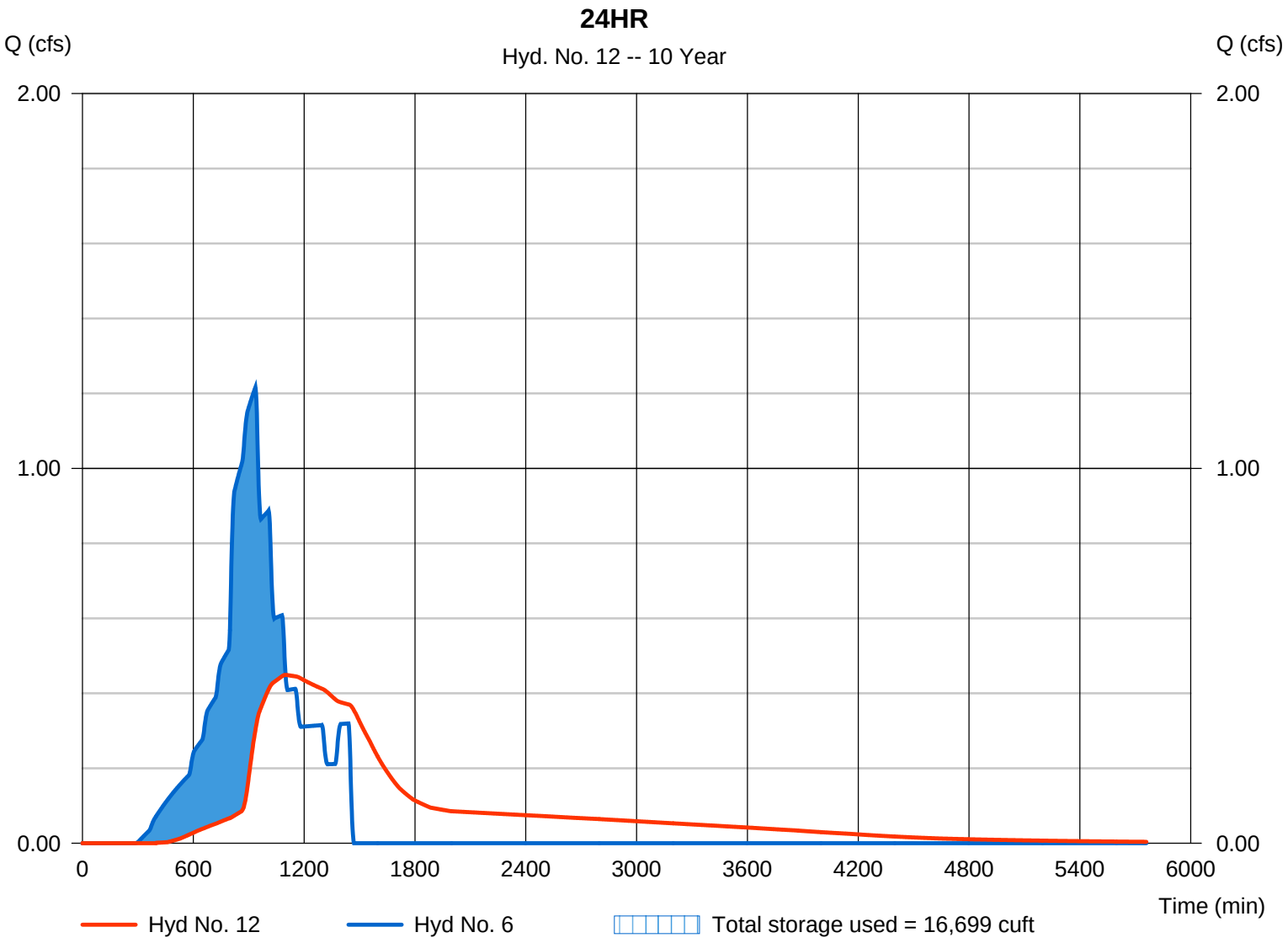
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.449 cfs
Storm frequency	= 10 yrs	Time to peak	= 1100 min
Time interval	= 2 min	Hyd. volume	= 28,490 cuft
Inflow hyd. No.	= 6 - Pond 3 24HR	Max. Elevation	= 750.40 ft
Reservoir name	= Pond 3	Max. Storage	= 16,699 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 749.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	749.00	10,244	0	0
0.50	749.50	11,037	5,318	5,318
1.00	750.00	12,698	5,928	11,247
2.00	751.00	14,460	13,568	24,815
3.00	752.00	16,322	15,380	40,195

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	4.50	0.00
Span (in)	= 12.00	2.00	4.50	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 749.00	749.01	749.80	0.00
Length (ft)	= 20.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

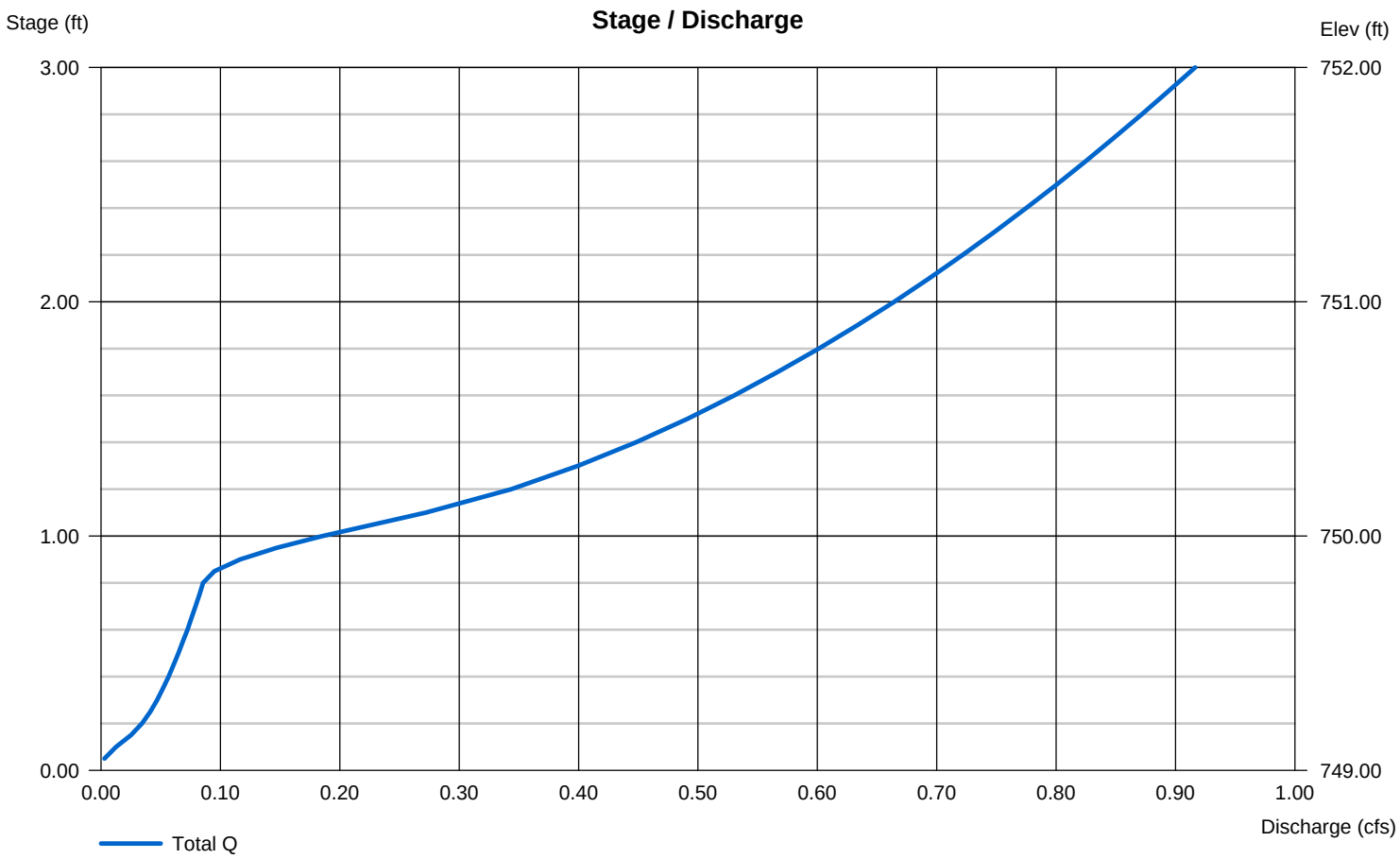
Weir Structures

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

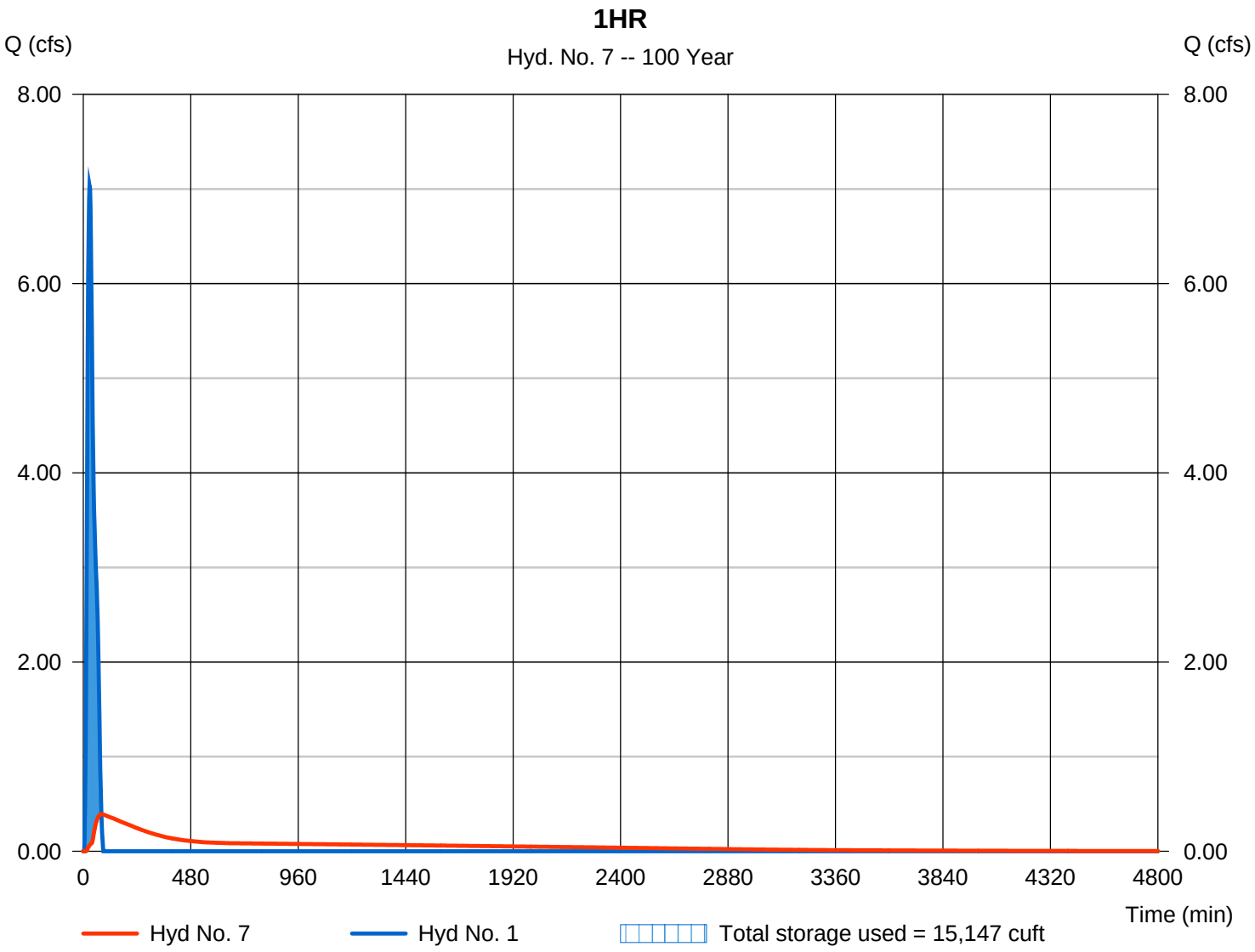
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.393 cfs
Storm frequency	= 100 yrs	Time to peak	= 80 min
Time interval	= 2 min	Hyd. volume	= 15,675 cuft
Inflow hyd. No.	= 1 - Pond 3 1HR	Max. Elevation	= 750.29 ft
Reservoir name	= Pond 3	Max. Storage	= 15,147 cuft

Storage Indication method used.



Hydrograph Report

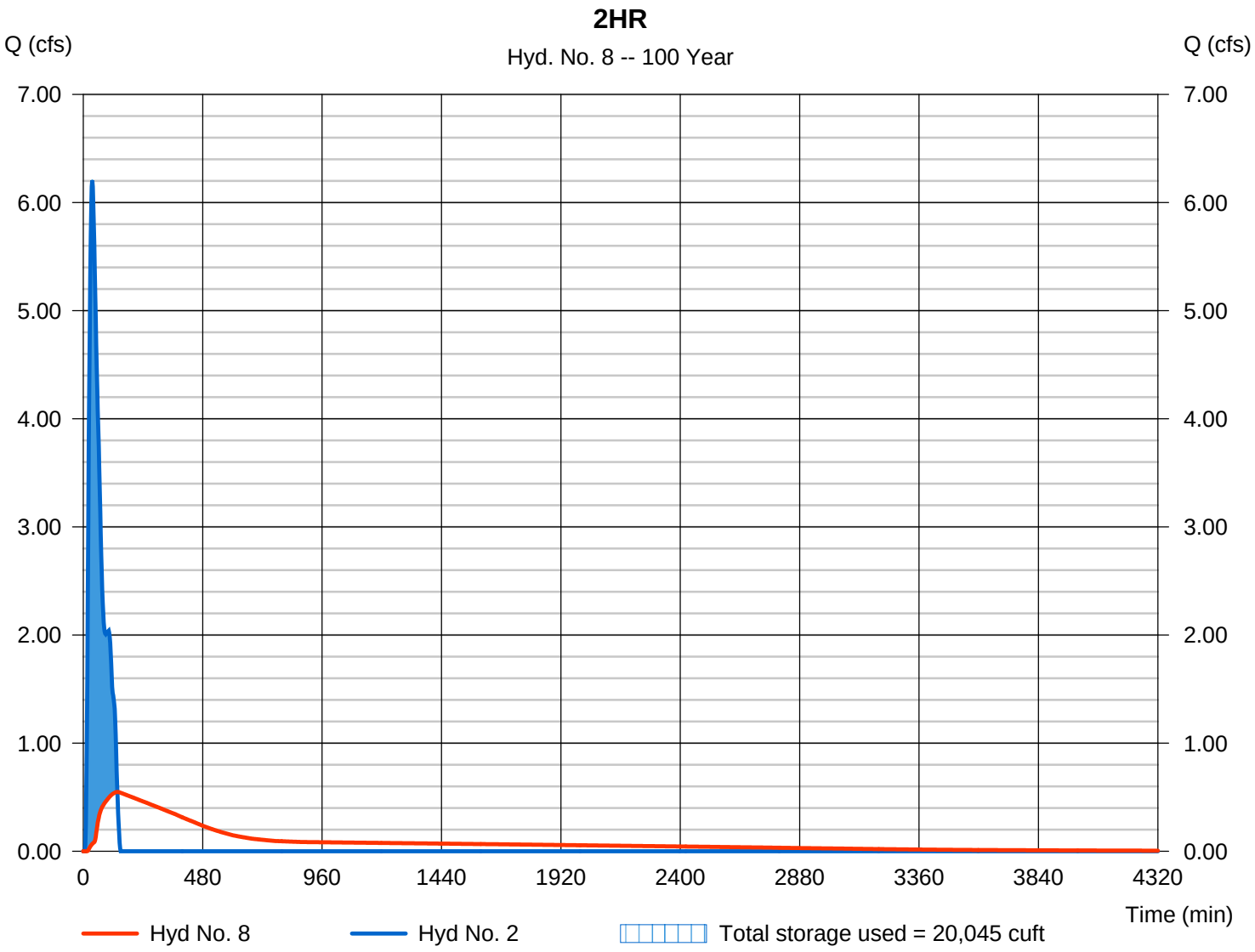
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.548 cfs
Storm frequency	= 100 yrs	Time to peak	= 136 min
Time interval	= 2 min	Hyd. volume	= 22,214 cuft
Inflow hyd. No.	= 2 - Pond 3 2HR	Max. Elevation	= 750.65 ft
Reservoir name	= Pond 3	Max. Storage	= 20,045 cuft

Storage Indication method used.



Hydrograph Report

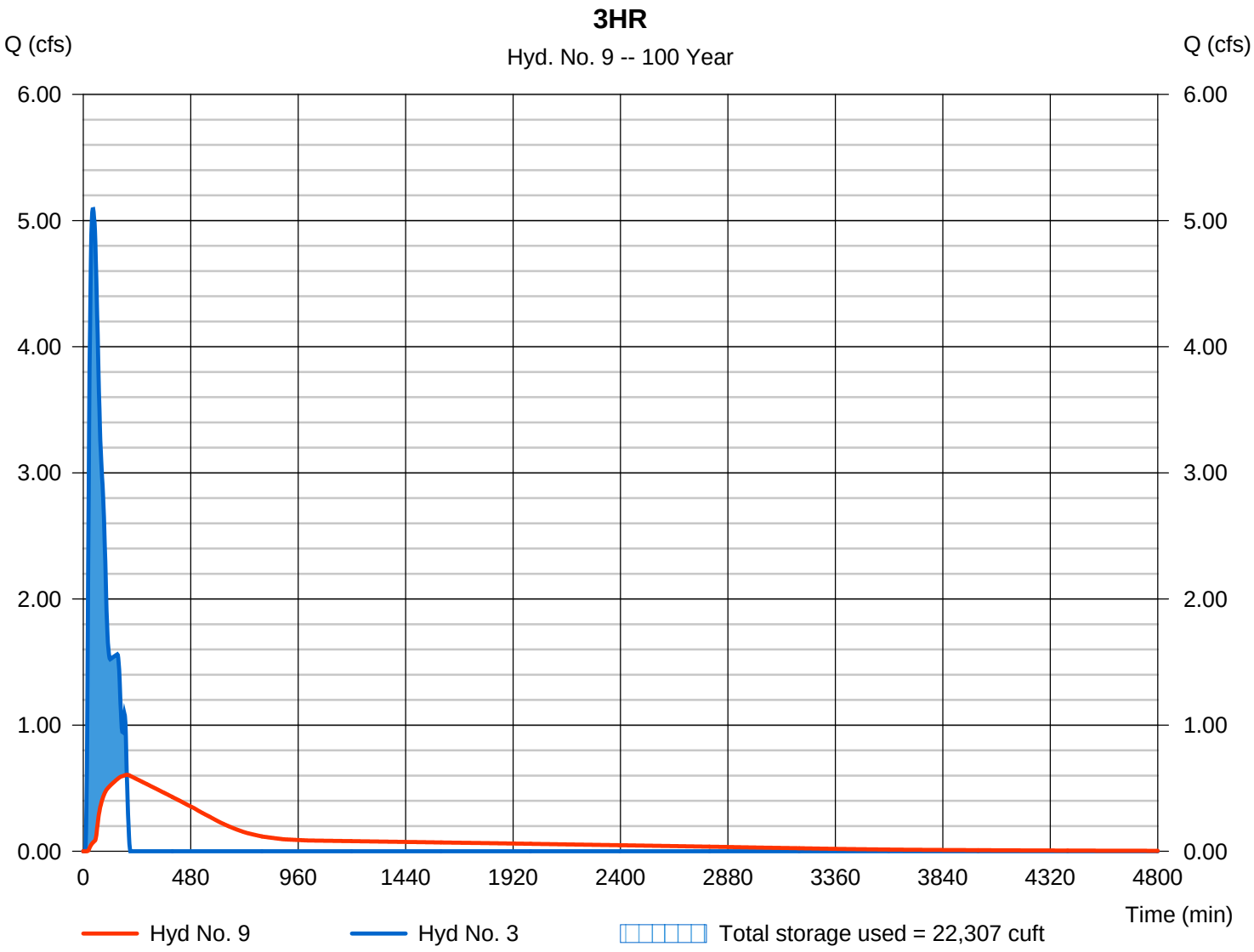
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.606 cfs
Storm frequency	= 100 yrs	Time to peak	= 194 min
Time interval	= 2 min	Hyd. volume	= 26,271 cuft
Inflow hyd. No.	= 3 - Pond 3 3HR	Max. Elevation	= 750.82 ft
Reservoir name	= Pond 3	Max. Storage	= 22,307 cuft

Storage Indication method used.



Hydrograph Report

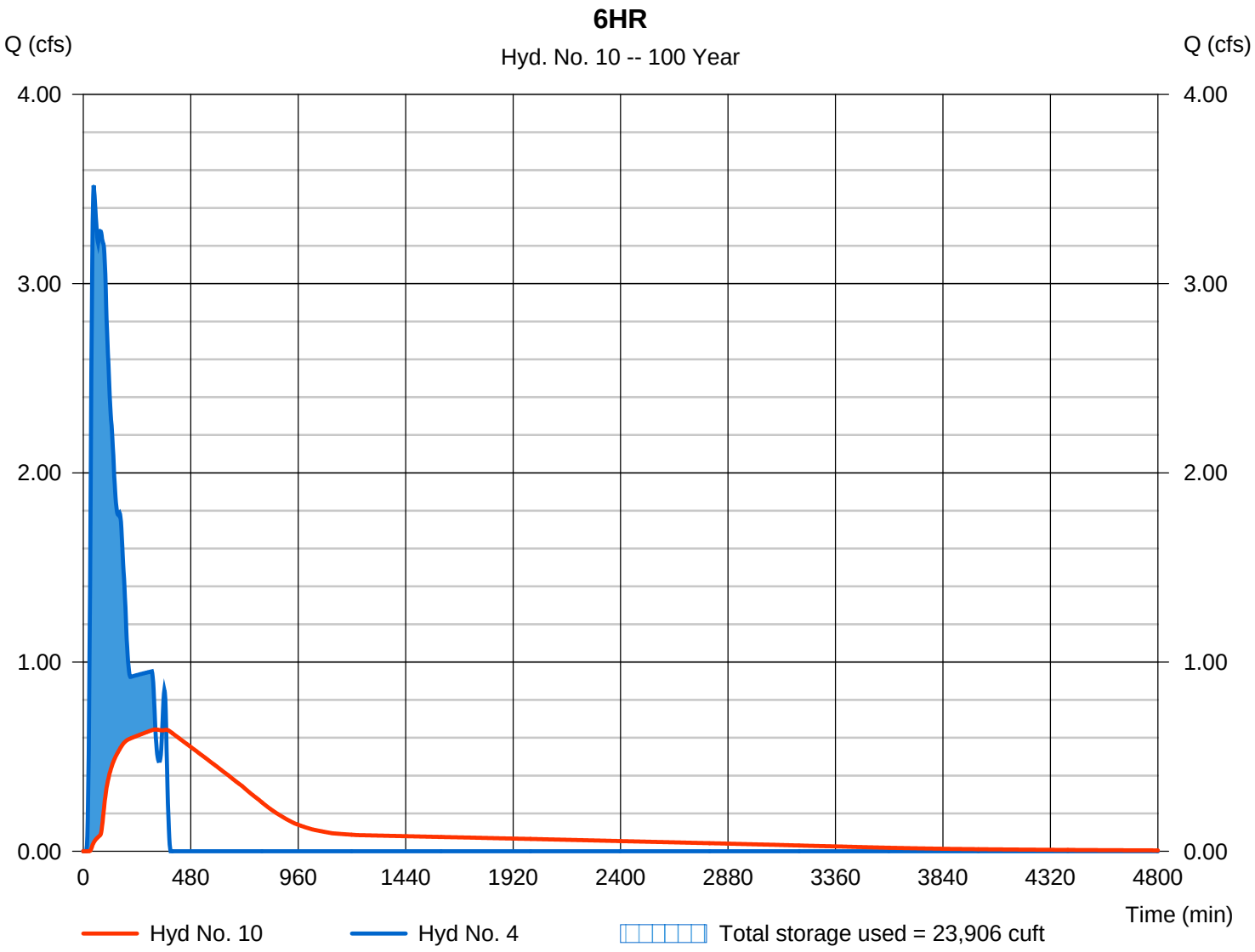
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.644 cfs
Storm frequency	= 100 yrs	Time to peak	= 322 min
Time interval	= 2 min	Hyd. volume	= 33,422 cuft
Inflow hyd. No.	= 4 - Pond 3 6HR	Max. Elevation	= 750.93 ft
Reservoir name	= Pond 3	Max. Storage	= 23,906 cuft

Storage Indication method used.



Hydrograph Report

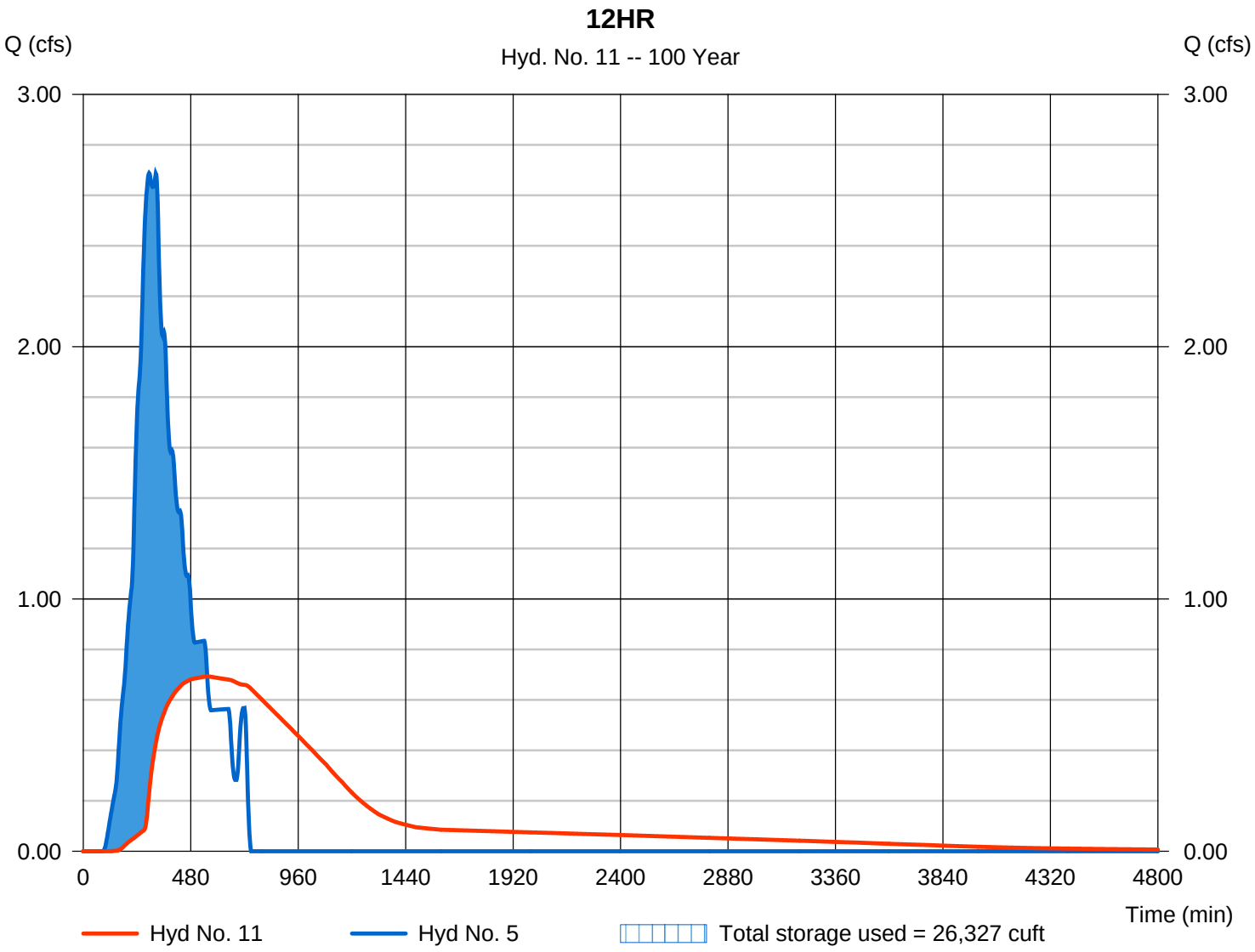
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.693 cfs
Storm frequency	= 100 yrs	Time to peak	= 554 min
Time interval	= 2 min	Hyd. volume	= 41,111 cuft
Inflow hyd. No.	= 5 - Pond 3 12HR	Max. Elevation	= 751.10 ft
Reservoir name	= Pond 3	Max. Storage	= 26,327 cuft

Storage Indication method used.



Hydrograph Report

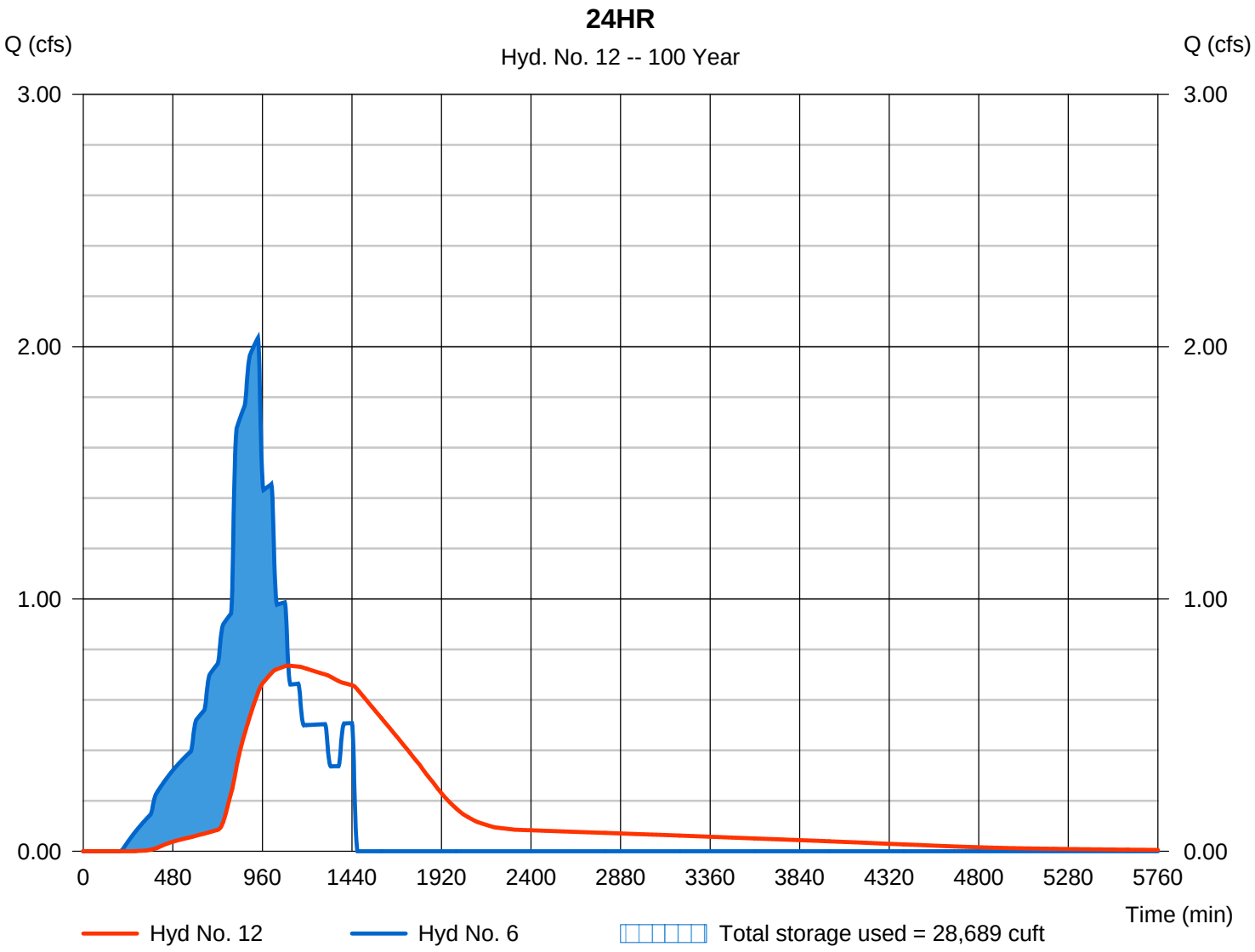
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.736 cfs
Storm frequency	= 100 yrs	Time to peak	= 1098 min
Time interval	= 2 min	Hyd. volume	= 51,082 cuft
Inflow hyd. No.	= 6 - Pond 3 24HR	Max. Elevation	= 751.25 ft
Reservoir name	= Pond 3	Max. Storage	= 28,689 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	8.795	2	32	20,924	------	------	------	Pond 4 1HR
2	SCS Runoff	8.321	2	40	32,430	------	------	------	Pond 4 2HR
3	SCS Runoff	7.112	2	52	39,116	------	------	------	Pond 4 3HR
4	SCS Runoff	5.106	2	90	53,476	------	------	------	Pond 4 6HR
5	SCS Runoff	4.603	2	326	68,739	------	------	------	Pond 4 12HR
6	SCS Runoff	3.595	2	936	84,703	------	------	------	Pond 4 24HR
7	Reservoir	0.114	2	88	19,988	1	751.33	20,548	1HR
8	Reservoir	0.139	2	146	30,170	2	751.93	31,614	2HR
9	Reservoir	0.336	2	202	35,581	3	752.21	37,545	3HR
10	Reservoir	1.084	2	372	48,959	4	752.51	44,030	6HR
11	Reservoir	1.422	2	550	63,079	5	752.62	46,300	12HR
12	Reservoir	1.734	2	1086	76,263	6	752.71	48,300	24HR

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

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	19.97	2	30	46,029	------	------	------	Pond 4 1HR
2	SCS Runoff	17.72	2	36	65,474	------	------	------	Pond 4 2HR
3	SCS Runoff	14.64	2	44	77,630	------	------	------	Pond 4 3HR
4	SCS Runoff	9.813	2	46	99,109	------	------	------	Pond 4 6HR
5	SCS Runoff	7.969	2	324	122,484	------	------	------	Pond 4 12HR
6	SCS Runoff	6.105	2	936	153,124	------	------	------	Pond 4 24HR
7	Reservoir	1.114	2	82	42,335	1	752.52	44,236	1HR
8	Reservoir	2.605	2	132	61,334	2	753.06	56,032	2HR
9	Reservoir	2.878	2	190	73,260	3	753.20	59,522	3HR
10	Reservoir	2.864	2	204	94,252	4	753.19	59,342	6HR
11	Reservoir	3.277	2	470	116,541	5	753.43	65,333	12HR
12	Reservoir	3.591	2	1022	144,393	6	753.64	70,446	24HR

Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	11/9/2015
Location	Johnson County Franklin Township	Checked	DJS	Date	11/9/2015

	Present	X	Developed

Pond 4

Soil Name	Soil Group	Cover Description	CN	Area (ac)	Product
Br	B	Residential 1/4 Acre Lots	75	2.25	168.75
MnB2	B	Residential 1/4 Acre Lots	75	3.06	229.5
CsB2	C	Residential 1/4 Acre Lots	83		0
CrA	C	Residential 1/4 Acre Lots	83	6.06	502.98
			Totals =	11.37	901.23

CN = 79.3

TR55 Tc Worksheet

Hyd. No. 1

Pond 4 1HR

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.64		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 14.23**	**+**	**0.00**	**+**	**0.00**	**=**	**14.23**
Shallow Concentrated Flow							
Flow length (ft)	= 270.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 2.79**	**+**	**0.00**	**+**	**0.00**	**=**	**2.79**
Channel Flow							
X sectional flow area (sqft)	= 1.77		0.00		0.00		
Wetted perimeter (ft)	= 4.71		0.00		0.00		
Channel slope (%)	= 0.50		0.00		0.00		
Manning's n-value	= 0.012		0.015		0.015		
Velocity (ft/s)	=4.56						
			0.00				
					0.00		
Flow length (ft)	({0})496.0		0.0		0.0		
Travel Time (min)	**= 1.81**	**+**	**0.00**	**+**	**0.00**	**=**	**1.81**

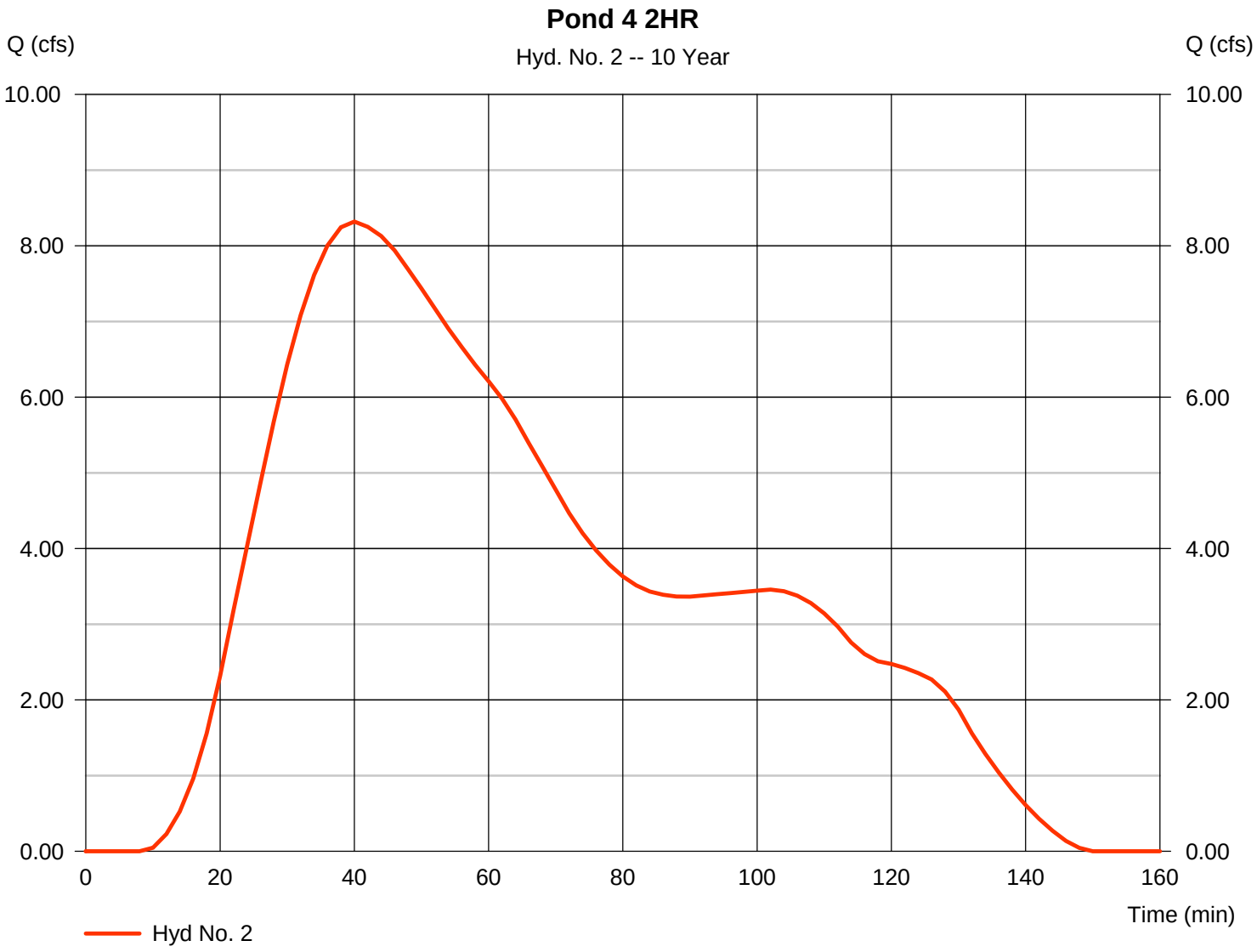
Total Travel Time, Tc ..... 18.84 min

Hydrograph Report

Hyd. No. 2

Pond 4 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 8.321 cfs
Storm frequency	= 10 yrs	Time to peak	= 40 min
Time interval	= 2 min	Hyd. volume	= 32,430 cuft
Drainage area	= 11.370 ac	Curve number	= 79.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.80 min
Total precip.	= 2.40 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484

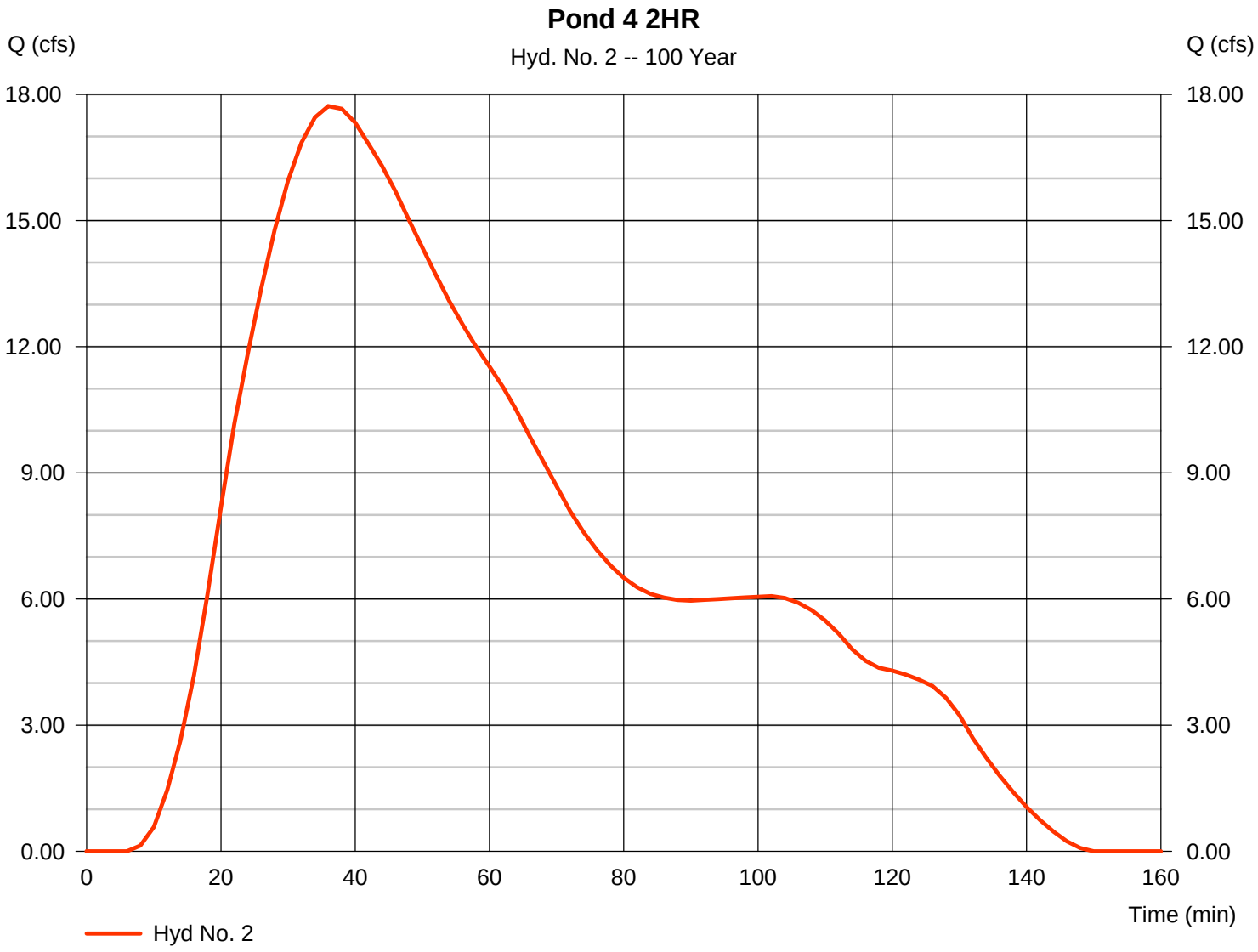


Hydrograph Report

Hyd. No. 2

Pond 4 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 17.72 cfs
Storm frequency	= 100 yrs	Time to peak	= 36 min
Time interval	= 2 min	Hyd. volume	= 65,474 cuft
Drainage area	= 11.370 ac	Curve number	= 79.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.80 min
Total precip.	= 3.50 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484



Hydrograph Report

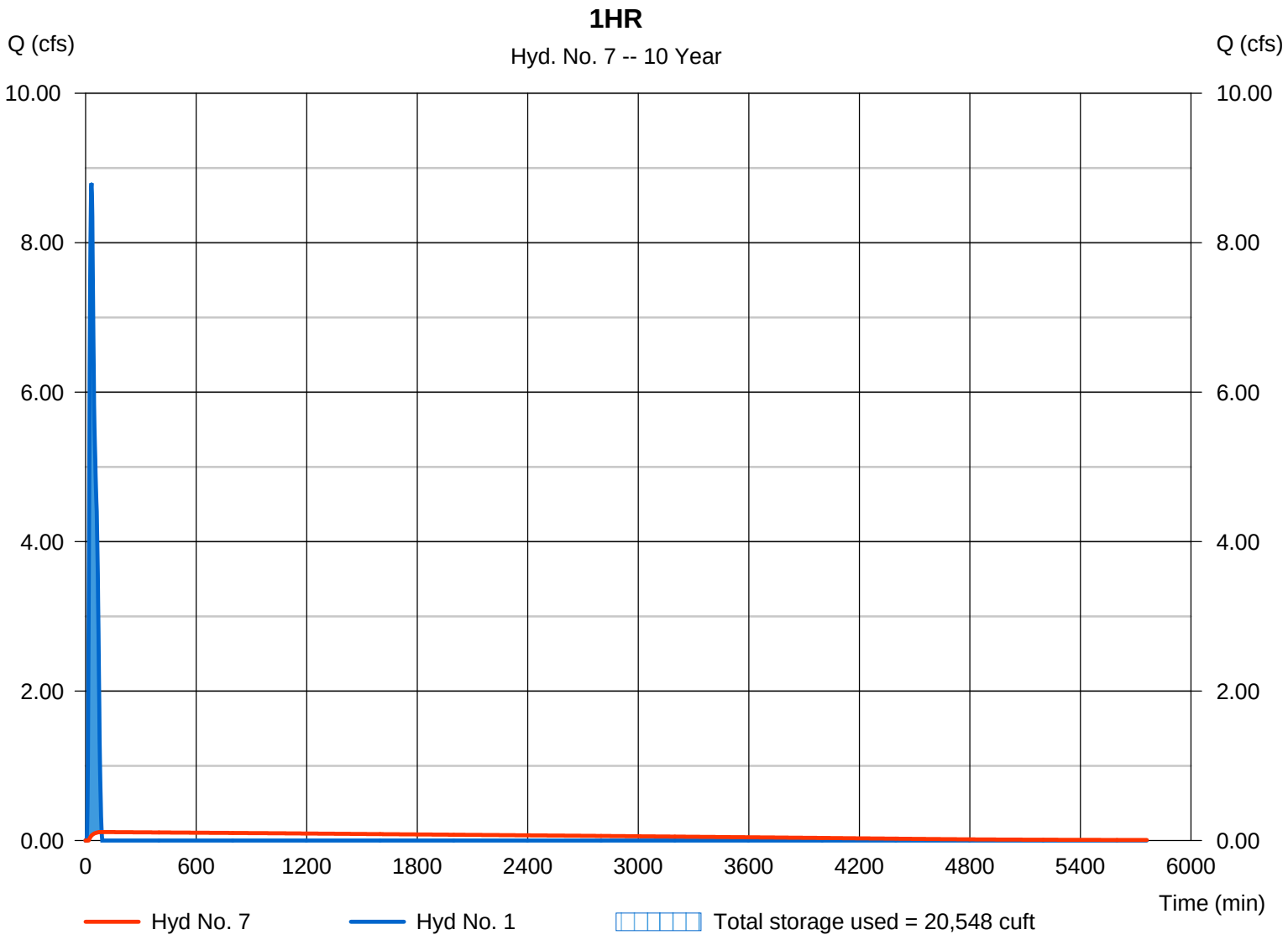
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.114 cfs
Storm frequency	= 10 yrs	Time to peak	= 88 min
Time interval	= 2 min	Hyd. volume	= 19,988 cuft
Inflow hyd. No.	= 1 - Pond 4 1HR	Max. Elevation	= 751.33 ft
Reservoir name	= Pond 4	Max. Storage	= 20,548 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

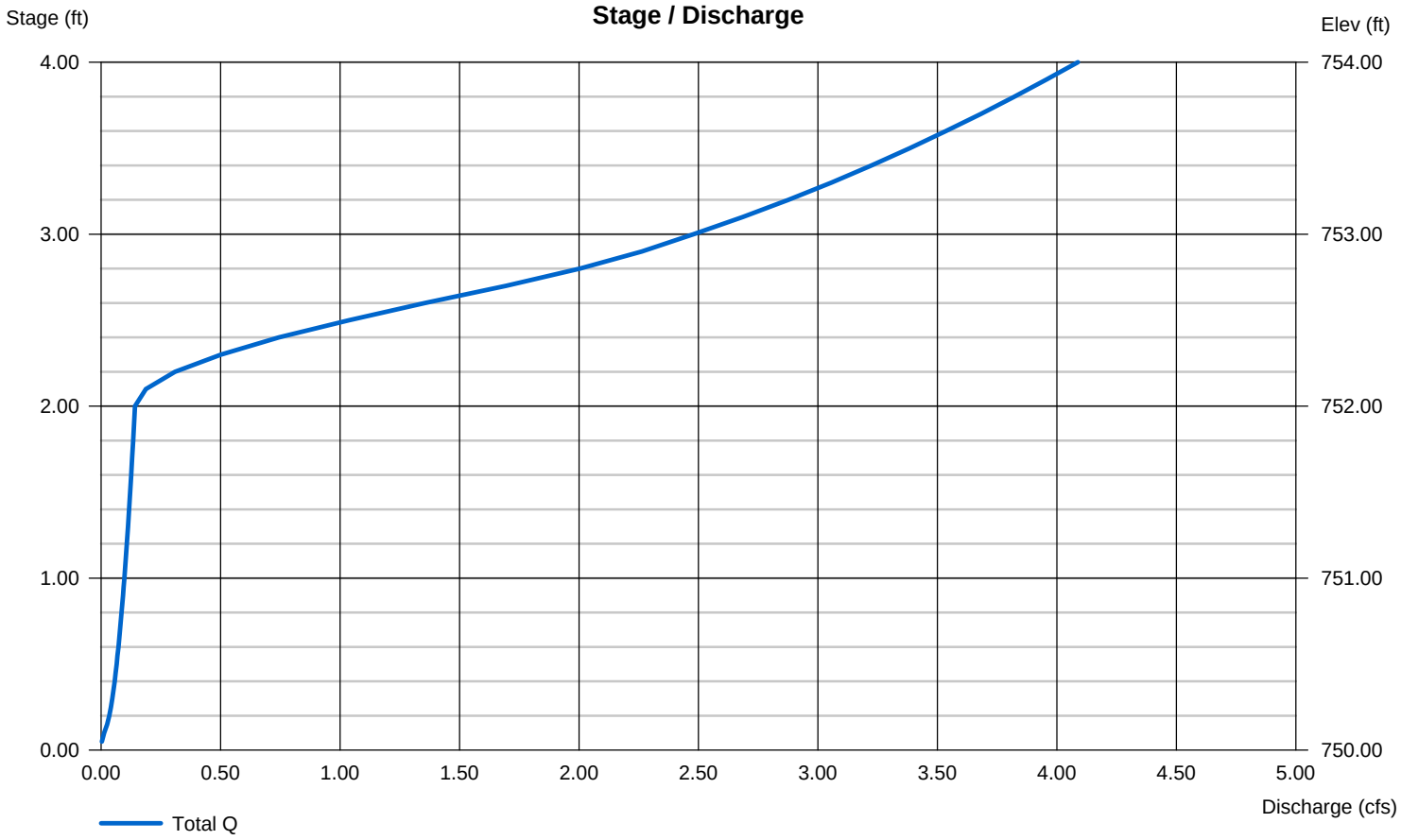
Weir Structures

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

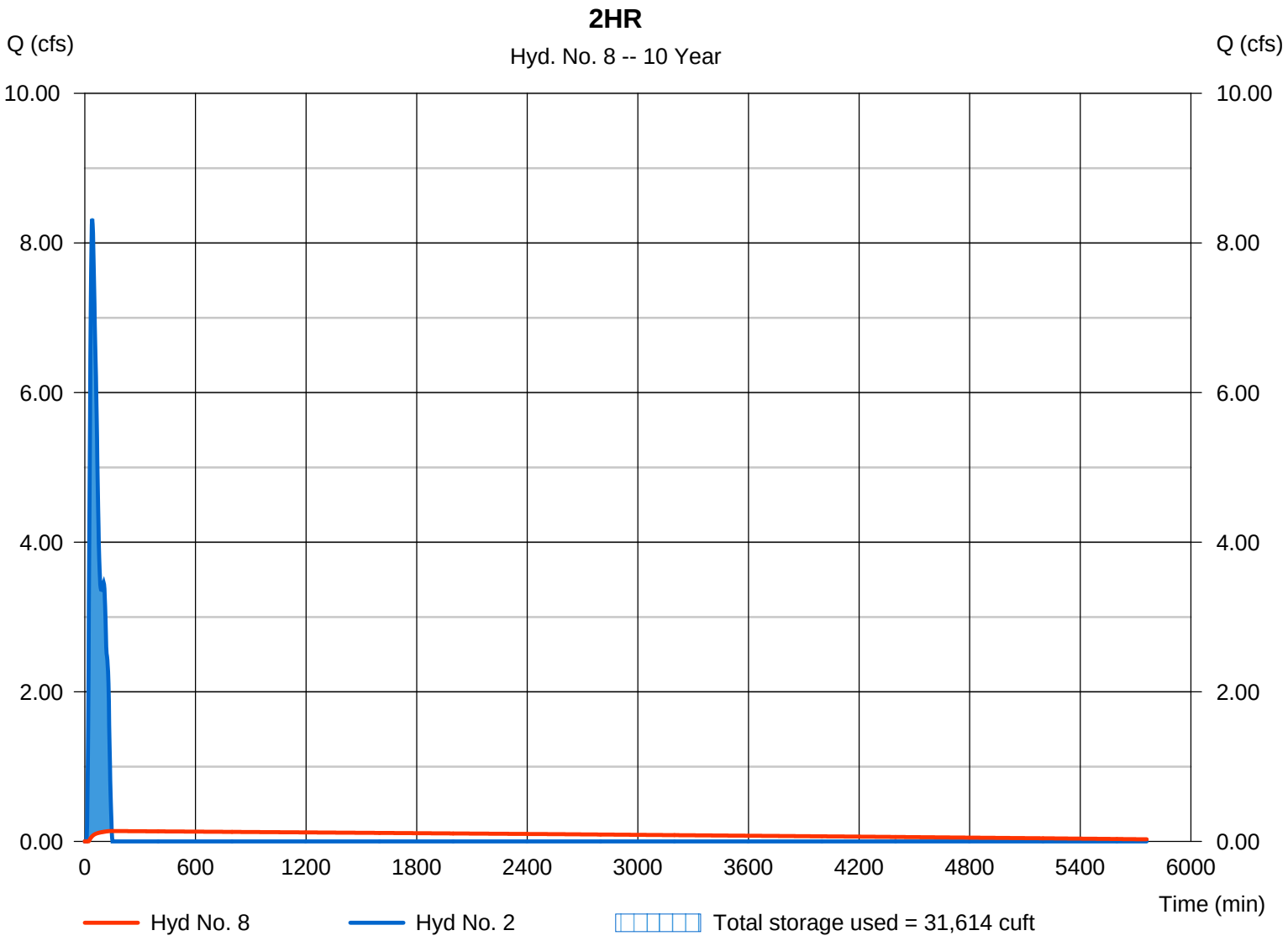
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.139 cfs
Storm frequency	= 10 yrs	Time to peak	= 146 min
Time interval	= 2 min	Hyd. volume	= 30,170 cuft
Inflow hyd. No.	= 2 - Pond 4 2HR	Max. Elevation	= 751.93 ft
Reservoir name	= Pond 4	Max. Storage	= 31,614 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

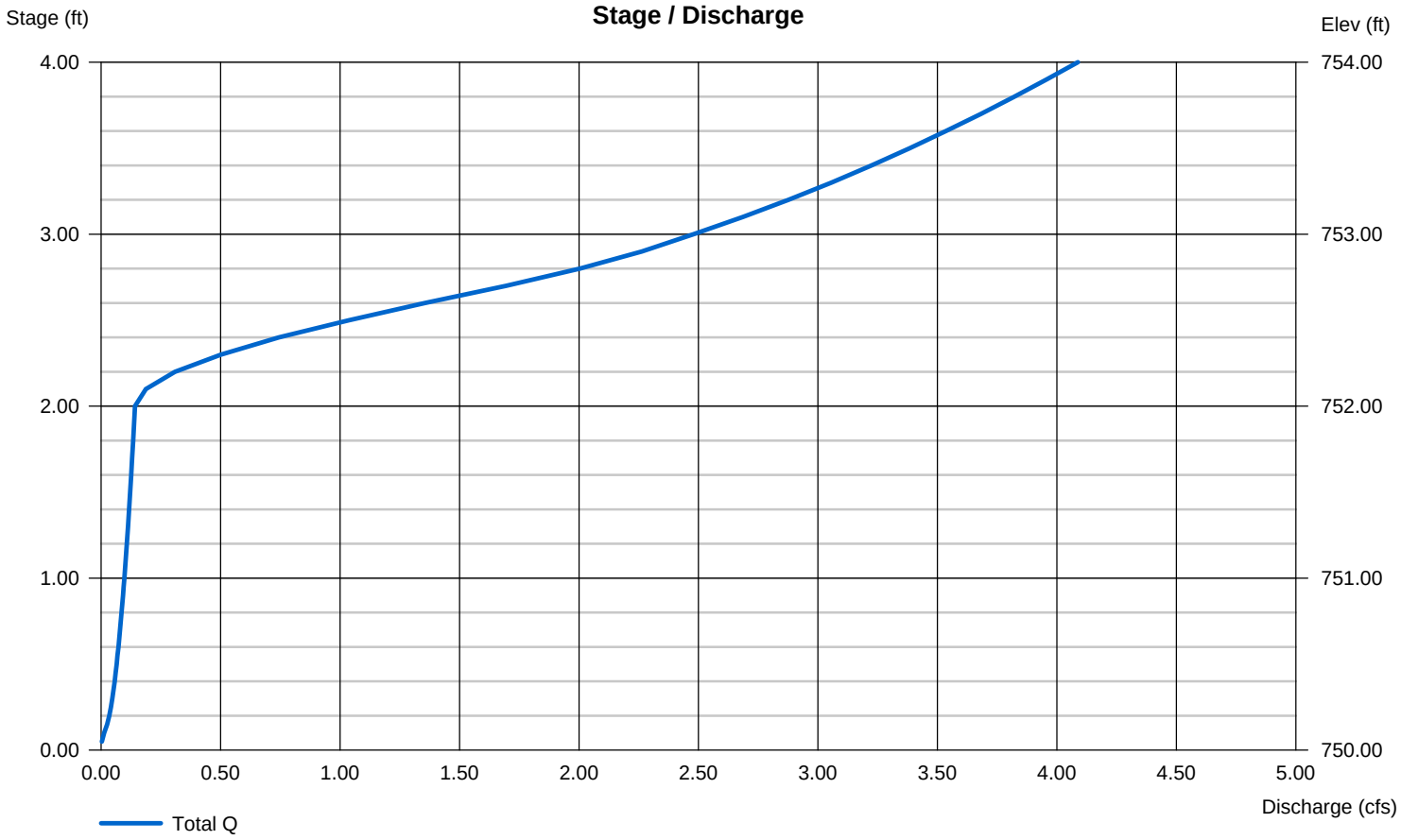
Weir Structures

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

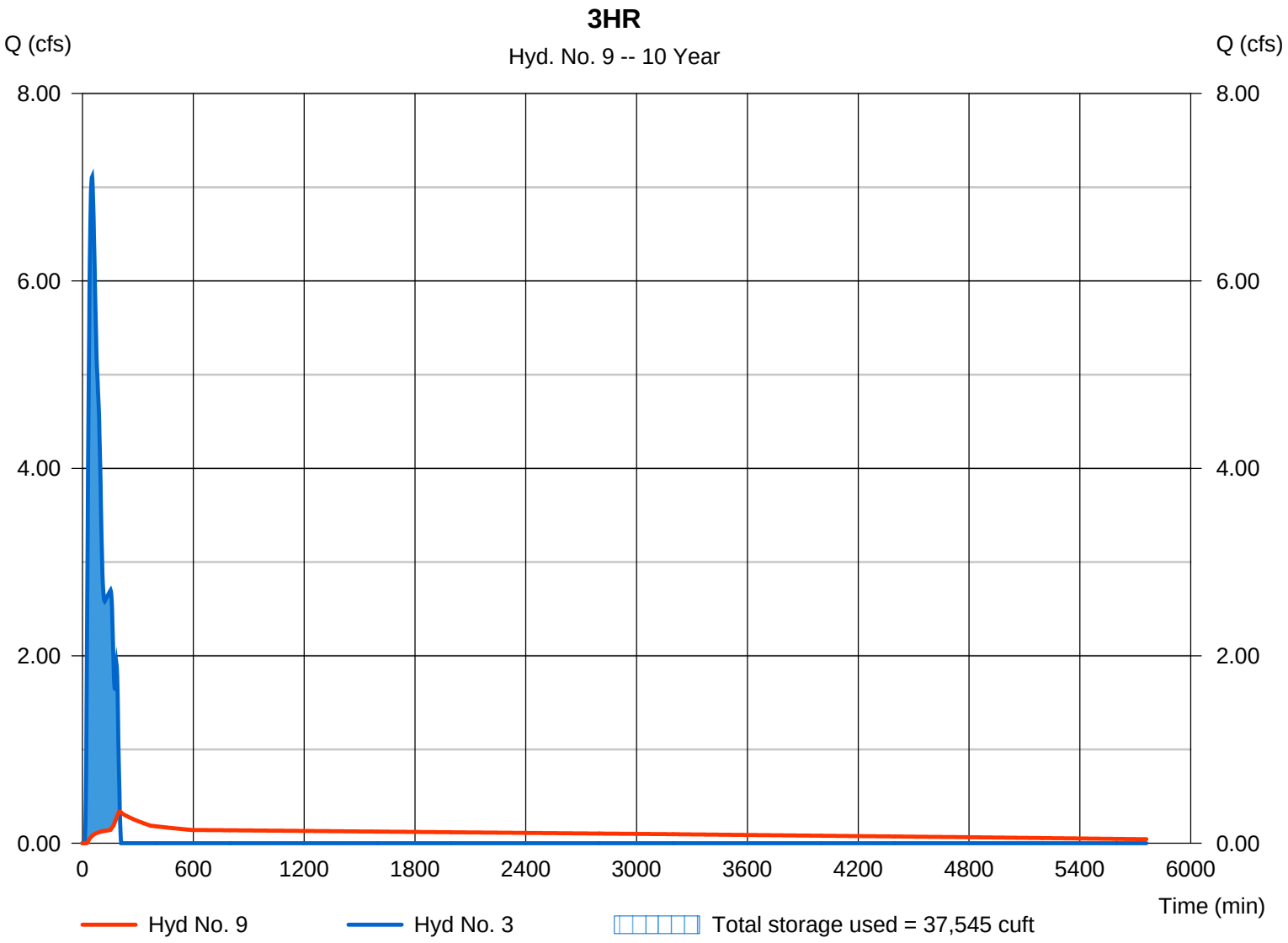
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.336 cfs
Storm frequency	= 10 yrs	Time to peak	= 202 min
Time interval	= 2 min	Hyd. volume	= 35,581 cuft
Inflow hyd. No.	= 3 - Pond 4 3HR	Max. Elevation	= 752.21 ft
Reservoir name	= Pond 4	Max. Storage	= 37,545 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

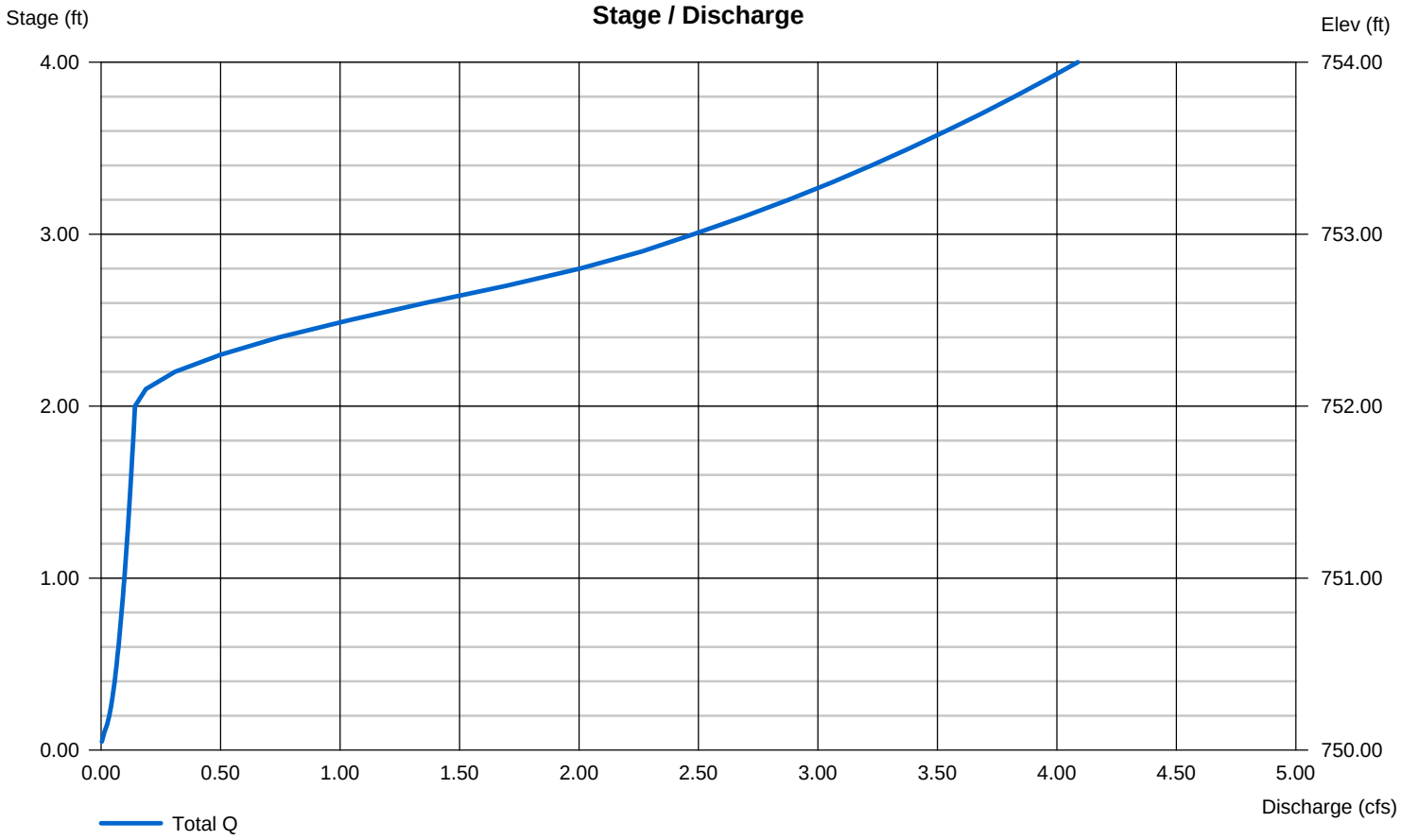
Weir Structures

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

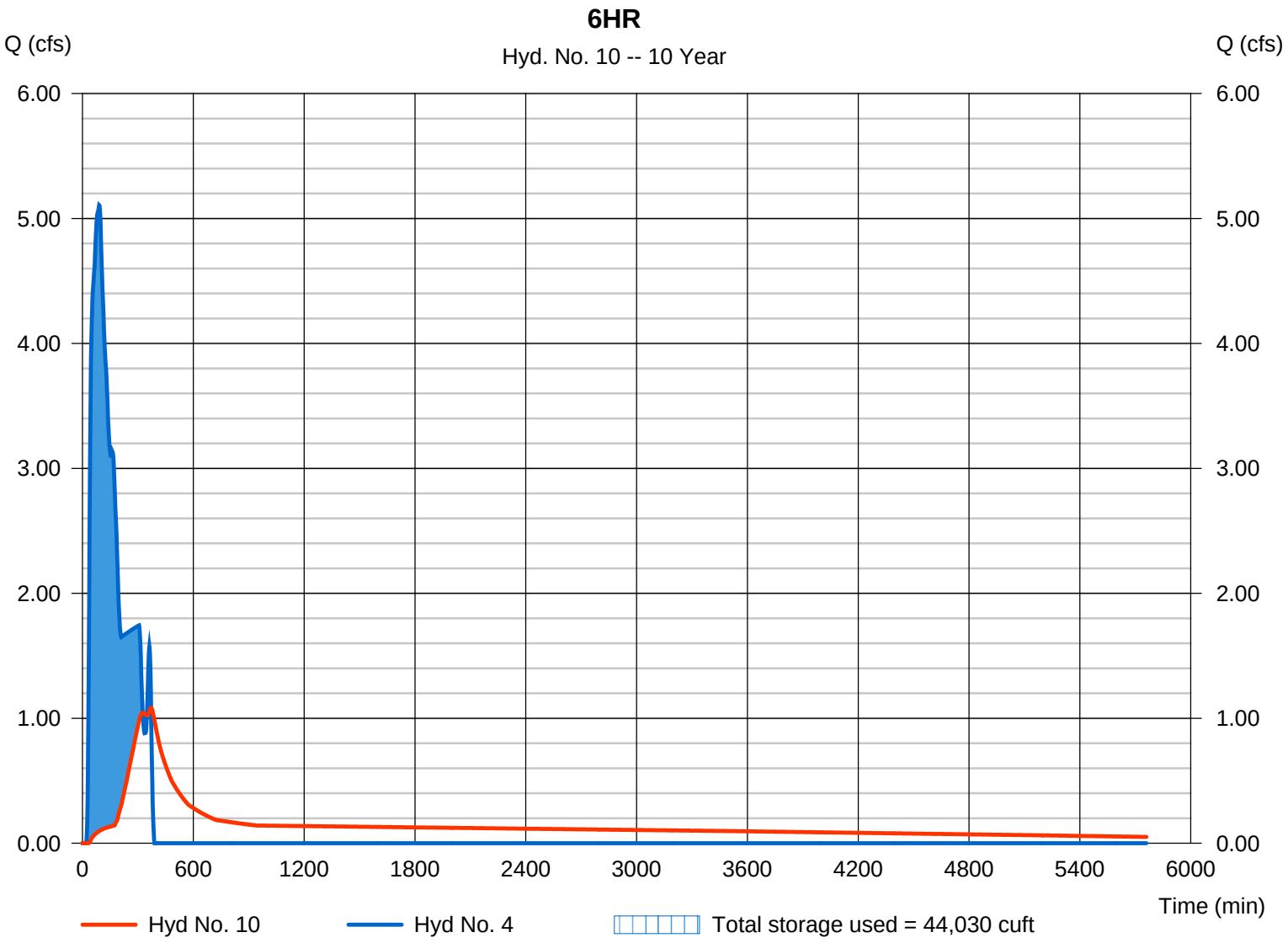
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 1.084 cfs
Storm frequency	= 10 yrs	Time to peak	= 372 min
Time interval	= 2 min	Hyd. volume	= 48,959 cuft
Inflow hyd. No.	= 4 - Pond 4 6HR	Max. Elevation	= 752.51 ft
Reservoir name	= Pond 4	Max. Storage	= 44,030 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

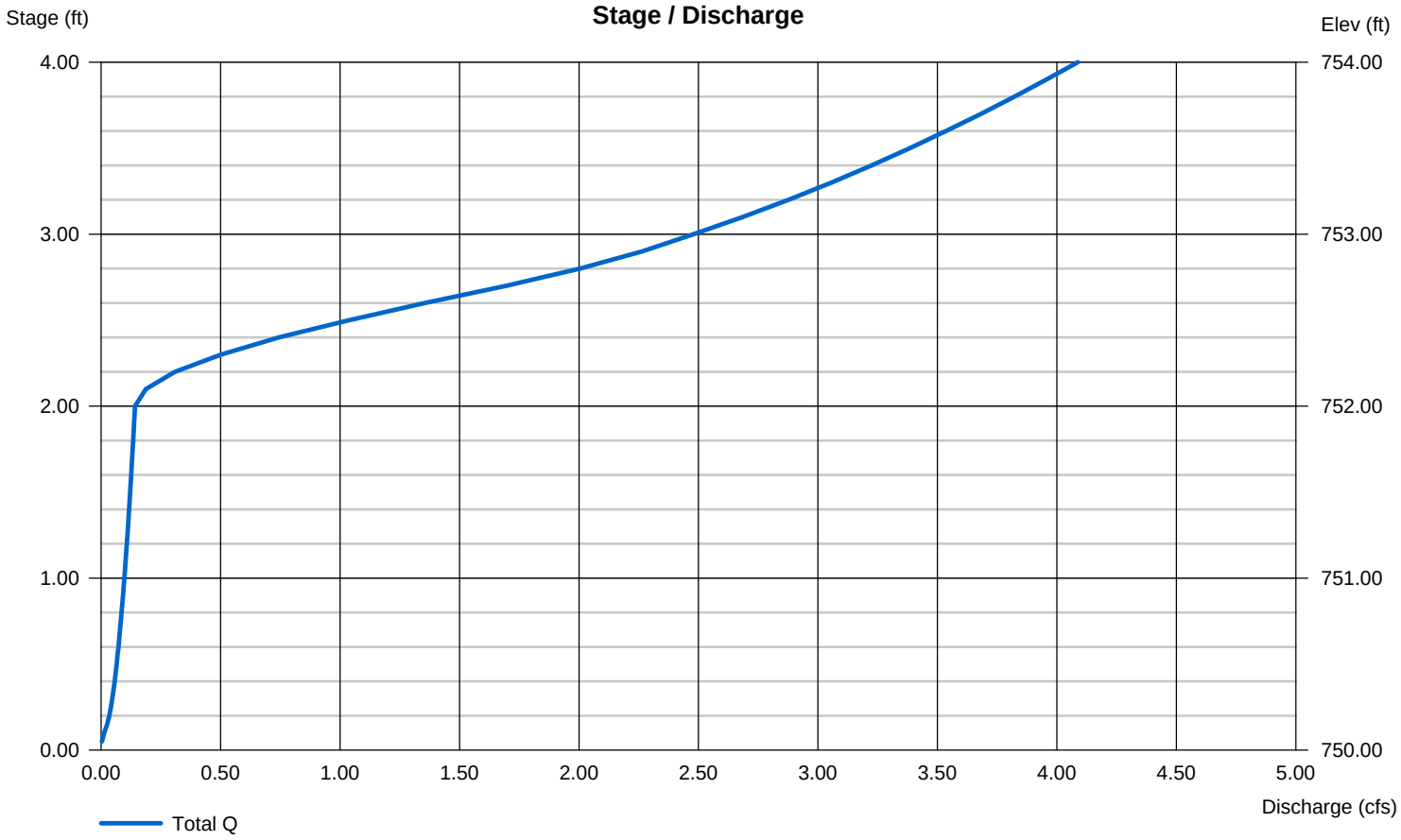
Weir Structures

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

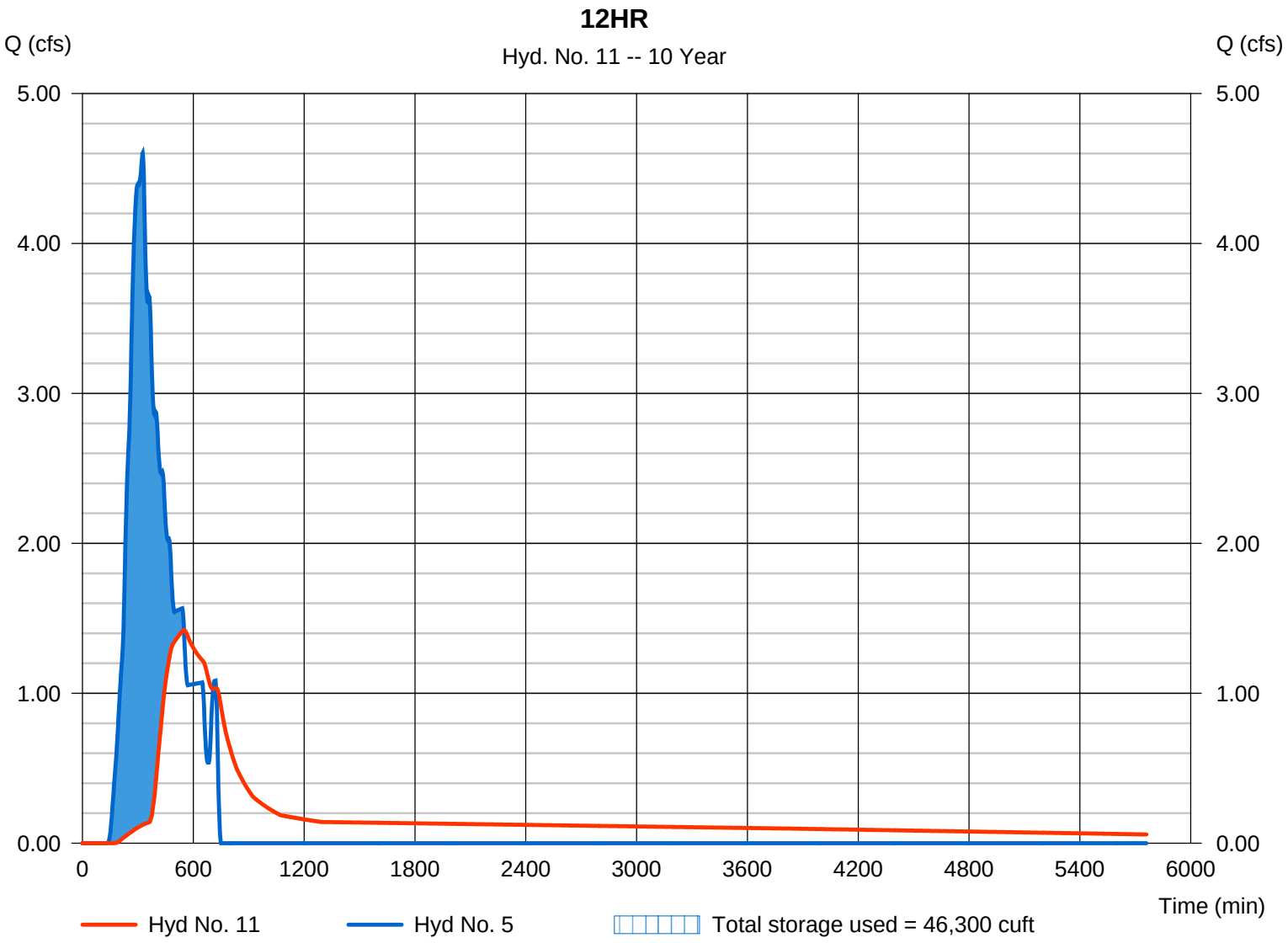
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 1.422 cfs
Storm frequency	= 10 yrs	Time to peak	= 550 min
Time interval	= 2 min	Hyd. volume	= 63,079 cuft
Inflow hyd. No.	= 5 - Pond 4 12HR	Max. Elevation	= 752.62 ft
Reservoir name	= Pond 4	Max. Storage	= 46,300 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

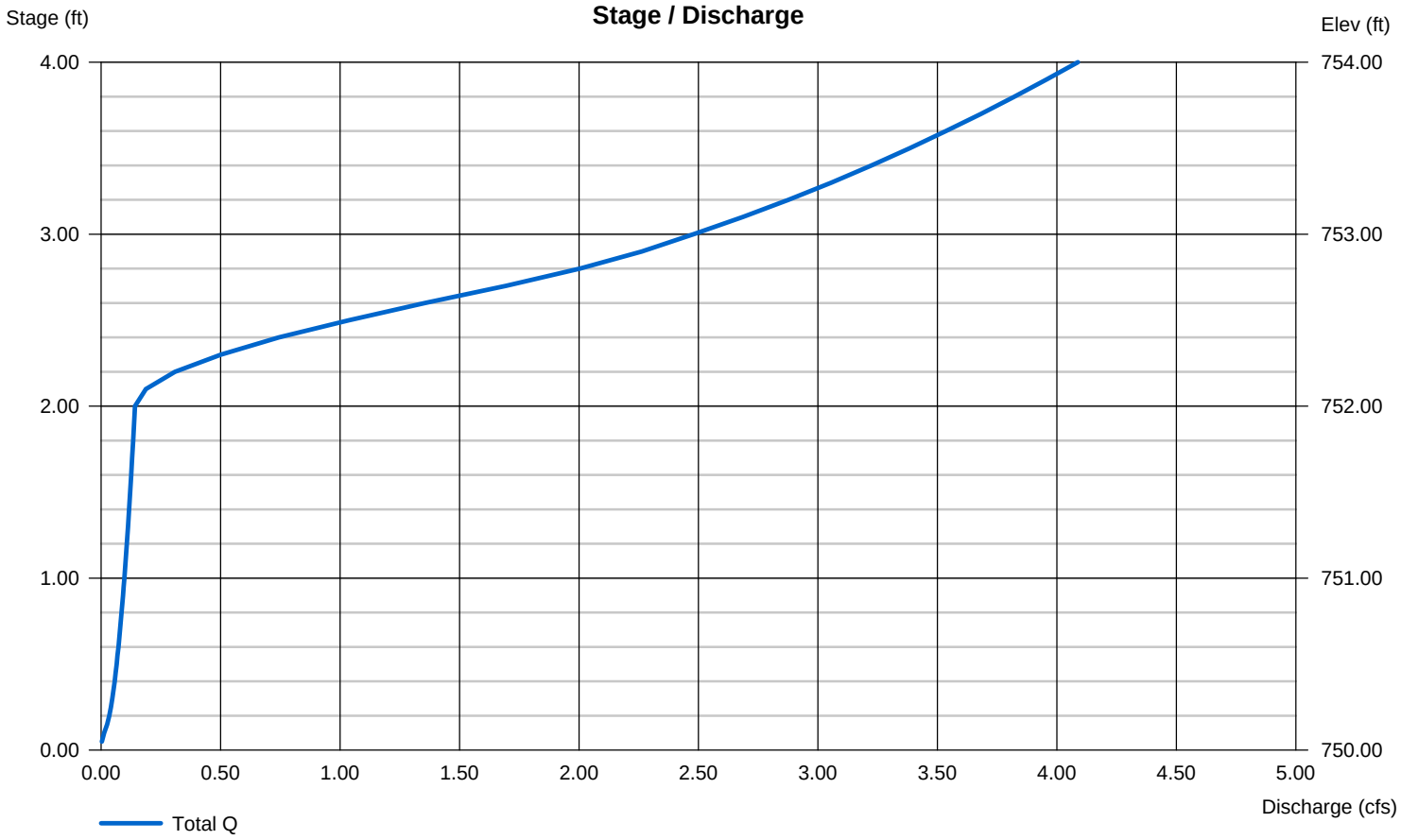
Weir Structures

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

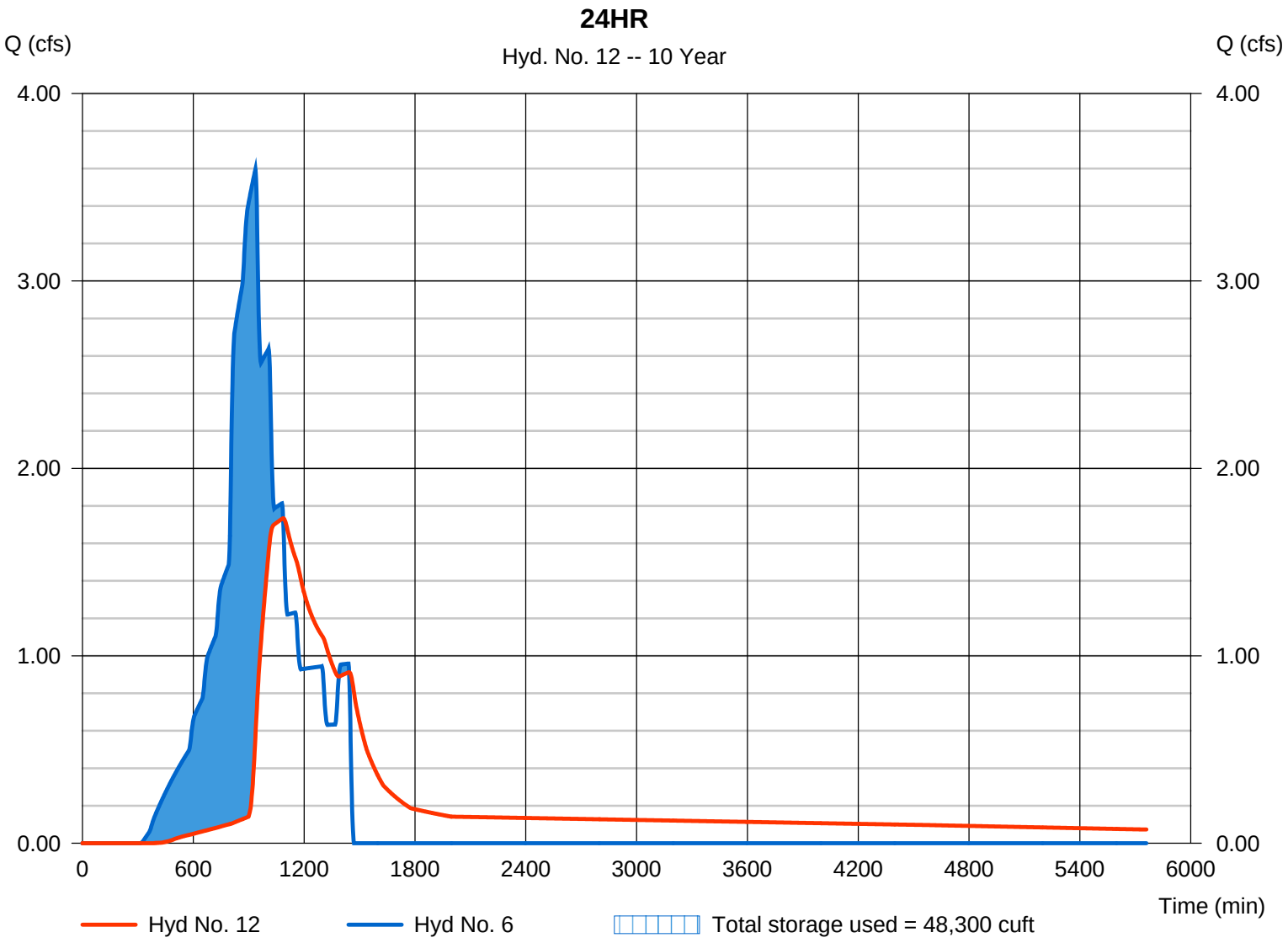
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 1.734 cfs
Storm frequency	= 10 yrs	Time to peak	= 1086 min
Time interval	= 2 min	Hyd. volume	= 76,263 cuft
Inflow hyd. No.	= 6 - Pond 4 24HR	Max. Elevation	= 752.71 ft
Reservoir name	= Pond 4	Max. Storage	= 48,300 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 750.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	750.00	12,850	0	0
0.50	750.50	14,143	6,745	6,745
1.00	751.00	16,924	7,756	14,501
2.00	752.00	19,960	18,419	32,920
3.00	753.00	23,254	21,584	54,504
4.00	754.00	26,804	25,005	79,509

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	11.00	0.00
Span (in)	= 12.00	2.00	11.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 750.00	750.01	752.00	0.00
Length (ft)	= 65.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.01	0.01	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

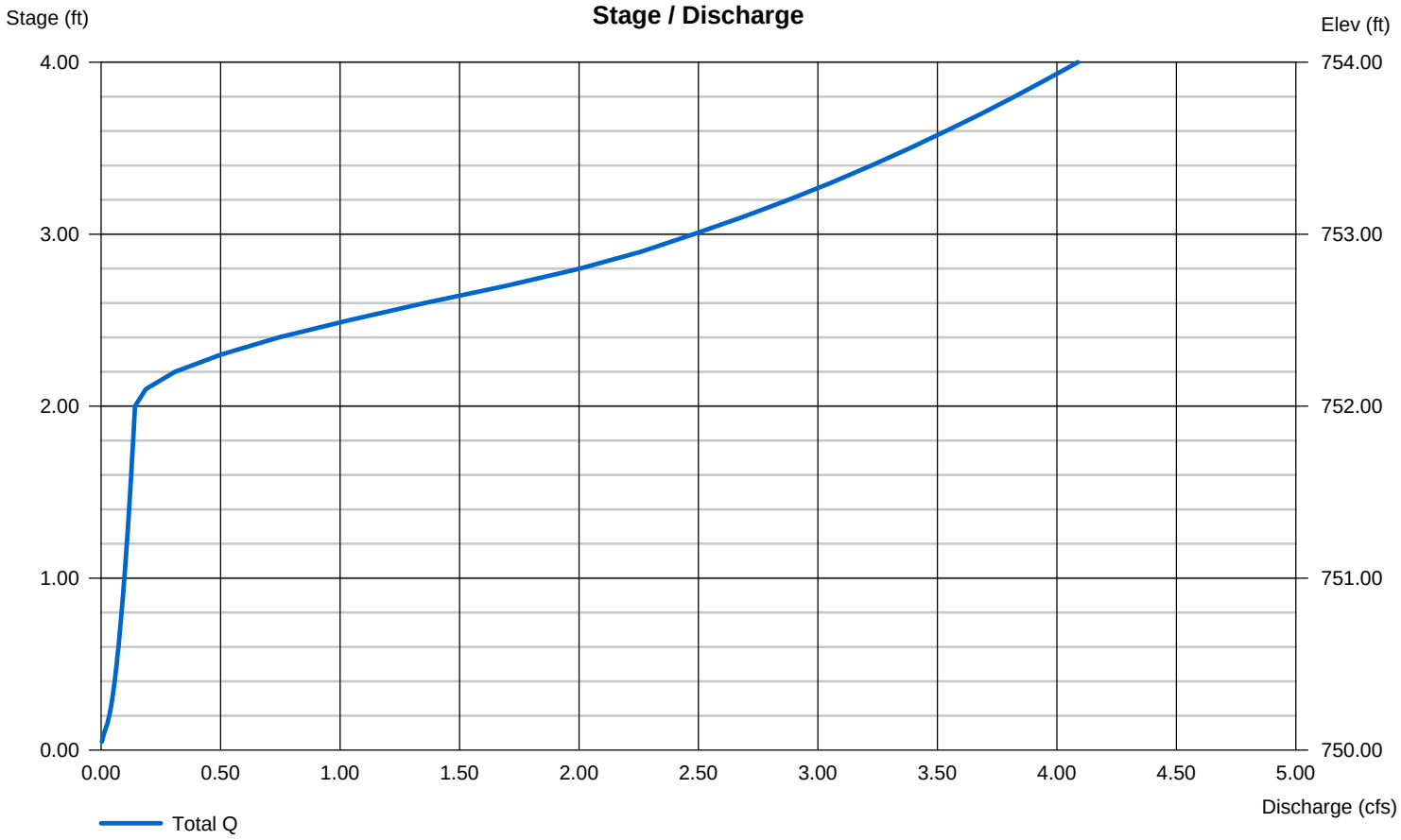
Weir Structures

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

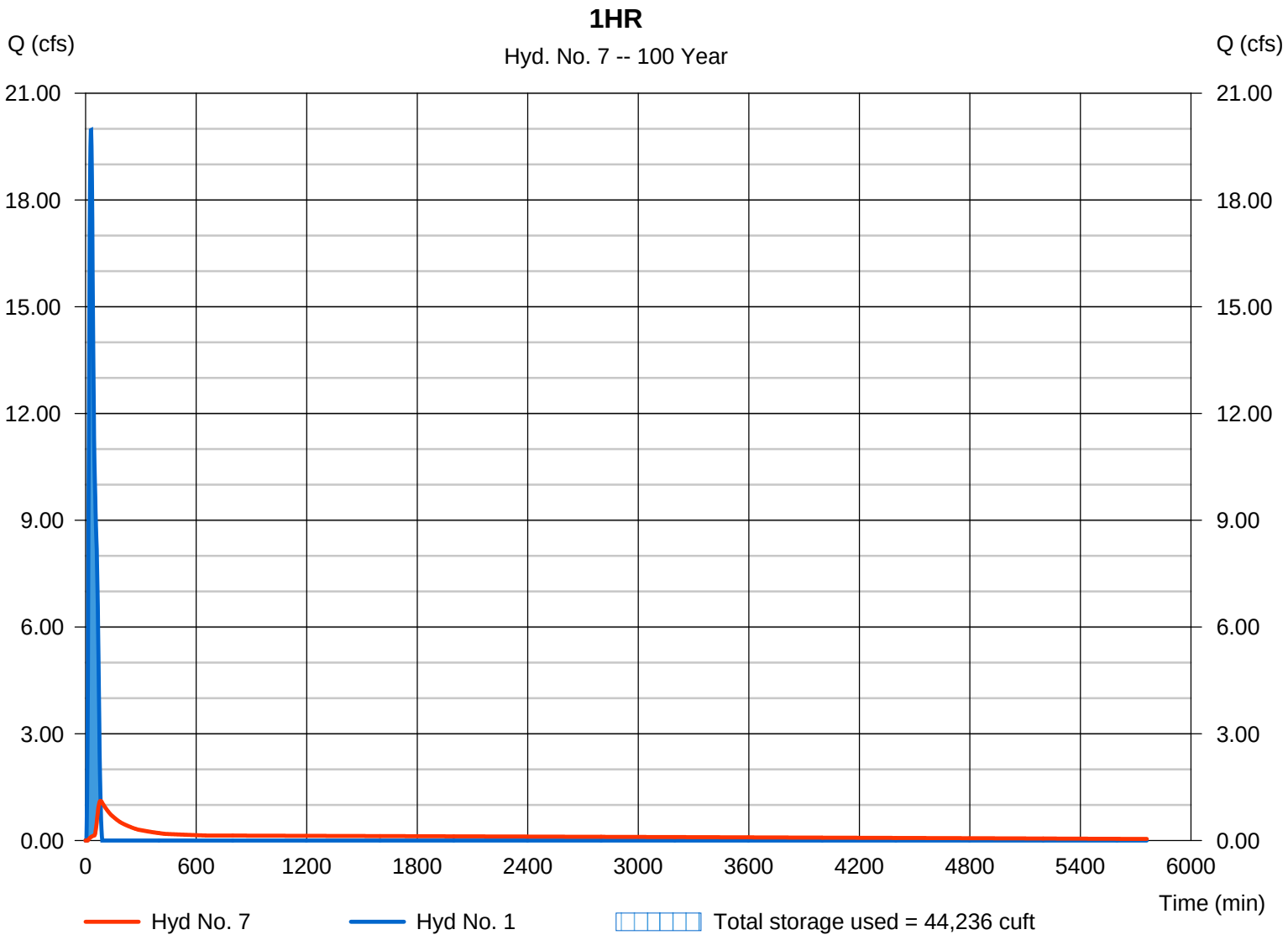
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 1.114 cfs
Storm frequency	= 100 yrs	Time to peak	= 82 min
Time interval	= 2 min	Hyd. volume	= 42,335 cuft
Inflow hyd. No.	= 1 - Pond 4 1HR	Max. Elevation	= 752.52 ft
Reservoir name	= Pond 4	Max. Storage	= 44,236 cuft

Storage Indication method used.



Hydrograph Report

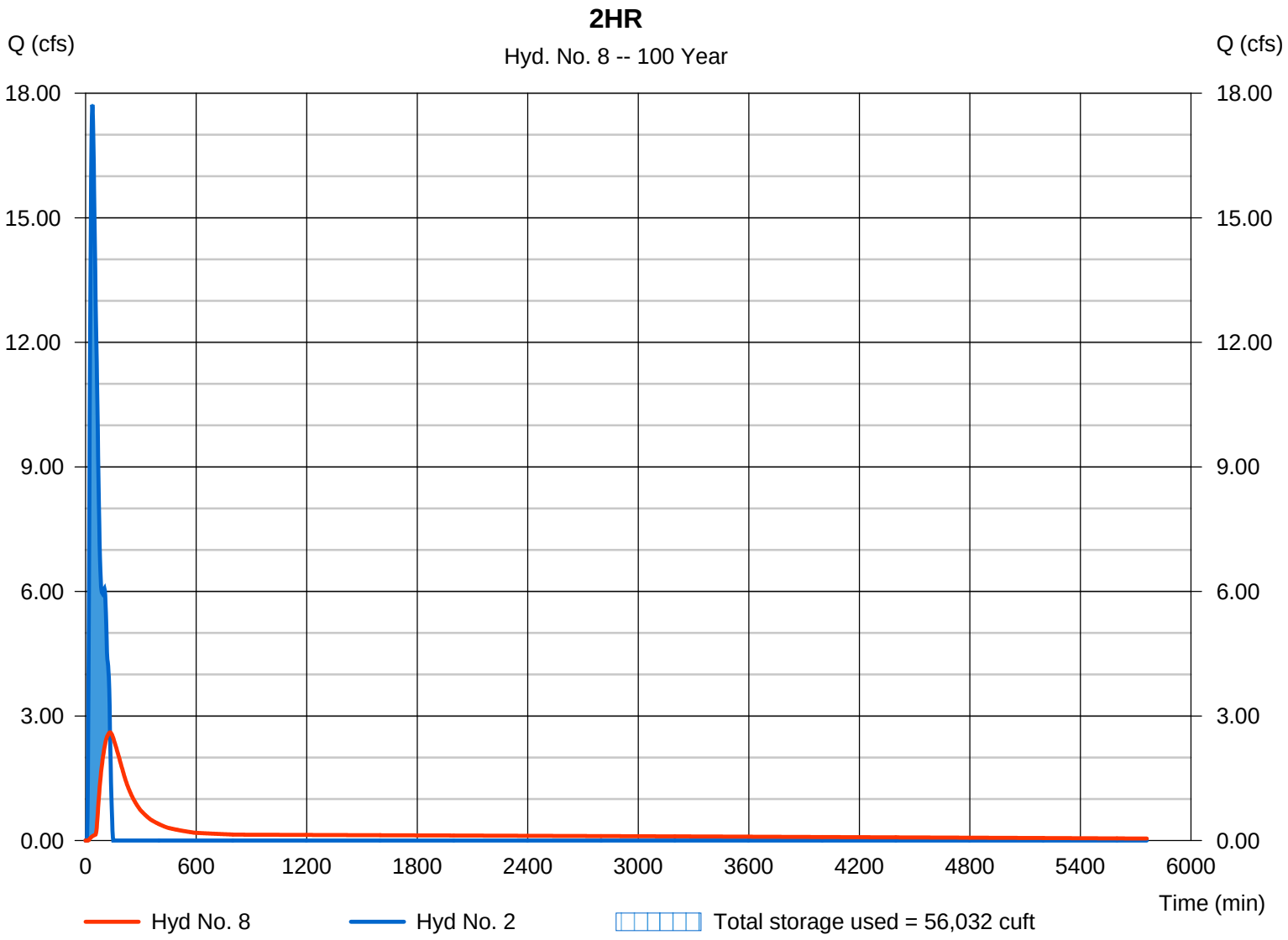
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 2.605 cfs
Storm frequency	= 100 yrs	Time to peak	= 132 min
Time interval	= 2 min	Hyd. volume	= 61,334 cuft
Inflow hyd. No.	= 2 - Pond 4 2HR	Max. Elevation	= 753.06 ft
Reservoir name	= Pond 4	Max. Storage	= 56,032 cuft

Storage Indication method used.



Hydrograph Report

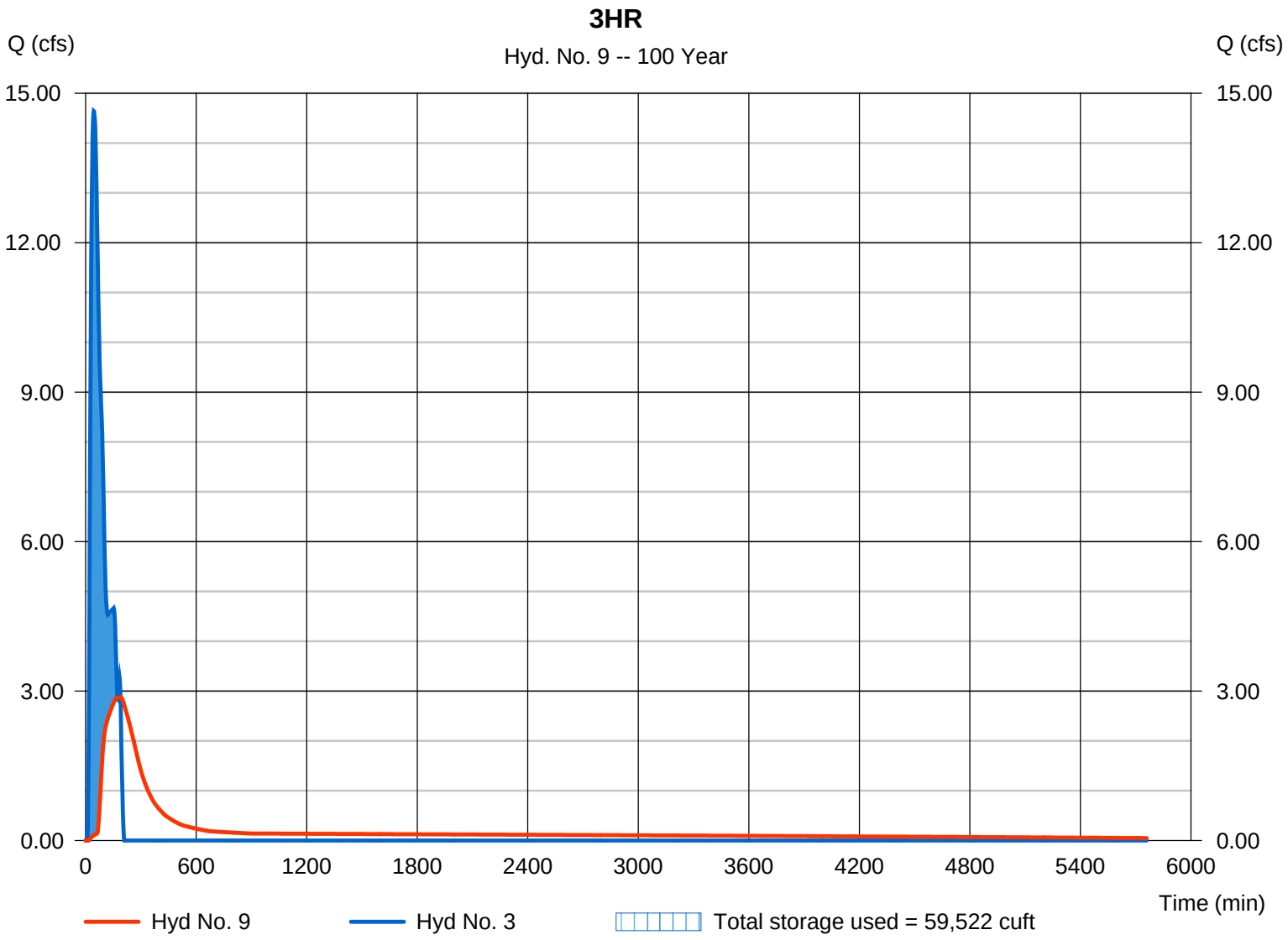
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 2.878 cfs
Storm frequency	= 100 yrs	Time to peak	= 190 min
Time interval	= 2 min	Hyd. volume	= 73,260 cuft
Inflow hyd. No.	= 3 - Pond 4 3HR	Max. Elevation	= 753.20 ft
Reservoir name	= Pond 4	Max. Storage	= 59,522 cuft

Storage Indication method used.



Hydrograph Report

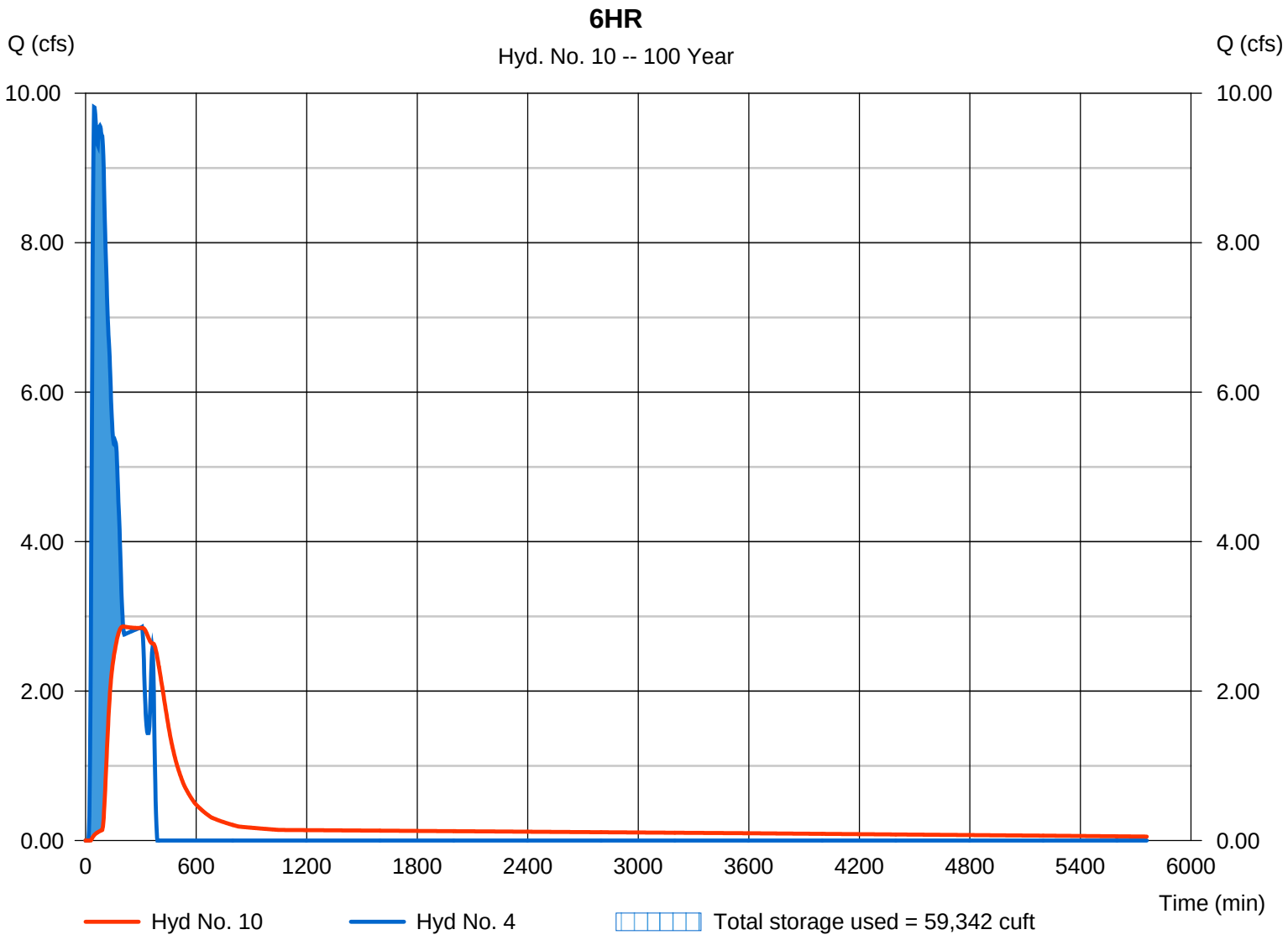
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 2.864 cfs
Storm frequency	= 100 yrs	Time to peak	= 204 min
Time interval	= 2 min	Hyd. volume	= 94,252 cuft
Inflow hyd. No.	= 4 - Pond 4 6HR	Max. Elevation	= 753.19 ft
Reservoir name	= Pond 4	Max. Storage	= 59,342 cuft

Storage Indication method used.



Hydrograph Report

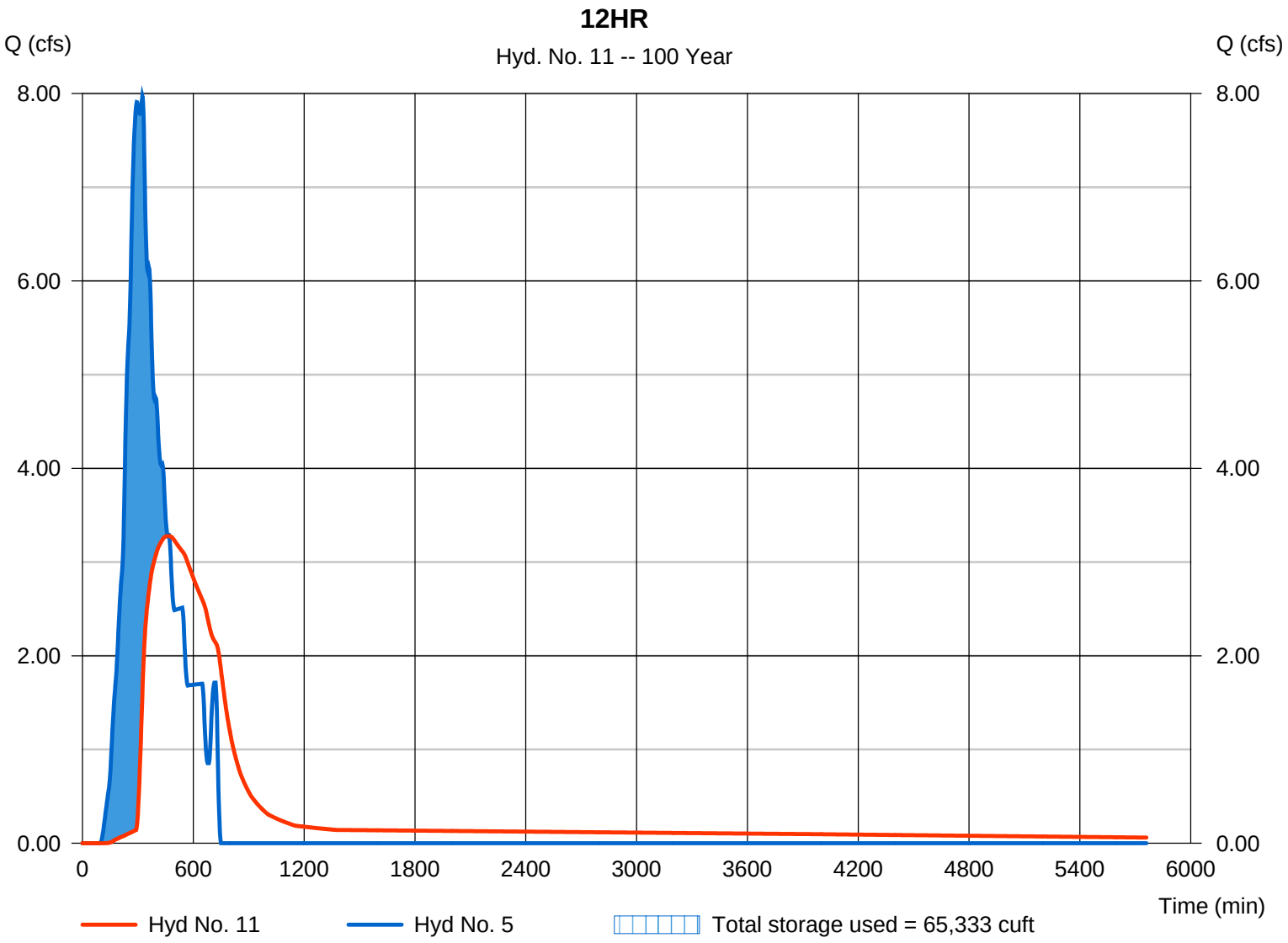
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 3.277 cfs
Storm frequency	= 100 yrs	Time to peak	= 470 min
Time interval	= 2 min	Hyd. volume	= 116,541 cuft
Inflow hyd. No.	= 5 - Pond 4 12HR	Max. Elevation	= 753.43 ft
Reservoir name	= Pond 4	Max. Storage	= 65,333 cuft

Storage Indication method used.



Hydrograph Report

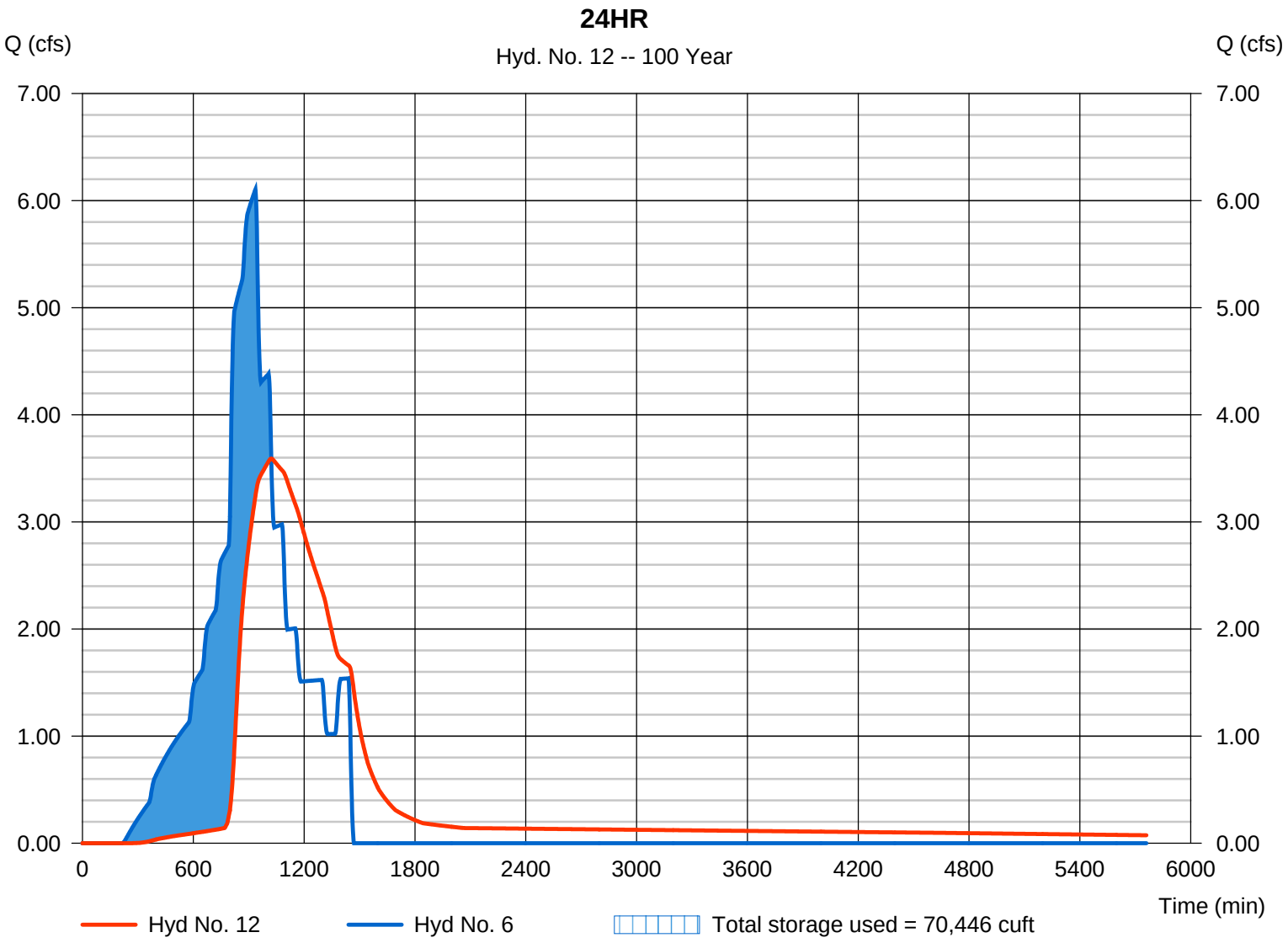
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Wednesday, 11 / 11 / 2015

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 3.591 cfs
Storm frequency	= 100 yrs	Time to peak	= 1022 min
Time interval	= 2 min	Hyd. volume	= 144,393 cuft
Inflow hyd. No.	= 6 - Pond 4 24HR	Max. Elevation	= 753.64 ft
Reservoir name	= Pond 4	Max. Storage	= 70,446 cuft

Storage Indication method used.



Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan

Project File: Storm 103_105.stm	Number of lines: 2	Date: 10/1/2016

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	103-104	1.77	12	Cir	69.000	750.00	750.28	0.406	750.56	751.01	0.07	751.07	End	DropGrate
2	104-105	0.94	12	Cir	28.000	750.28	750.39	0.393	751.07	751.09	0.04	751.13	1	DropGrate

Project File: Storm 103_105.stm | Number of lines: 2 | Run Date: 10/1/2016

NOTES: Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	69.000	0.38	0.81	0.45	0.17	0.36	13.1	13.5	4.8	1.77	2.27	3.39	12	0.41	750.00	750.28	750.56	751.01	0.00	754.45	103-104
2	1	28.000	0.43	0.43	0.45	0.19	0.19	13.1	13.1	4.9	0.94	2.23	1.51	12	0.39	750.28	750.39	751.07	751.09	754.45	754.45	104-105

Project File: Storm 103_105.stm | Number of lines: 2 | Run Date: 10/1/2016

NOTES:Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period =Yrs. 10 ; Total flows limited to inlet captured flows. ; c = cir e = ellip b = box

Inlet Report

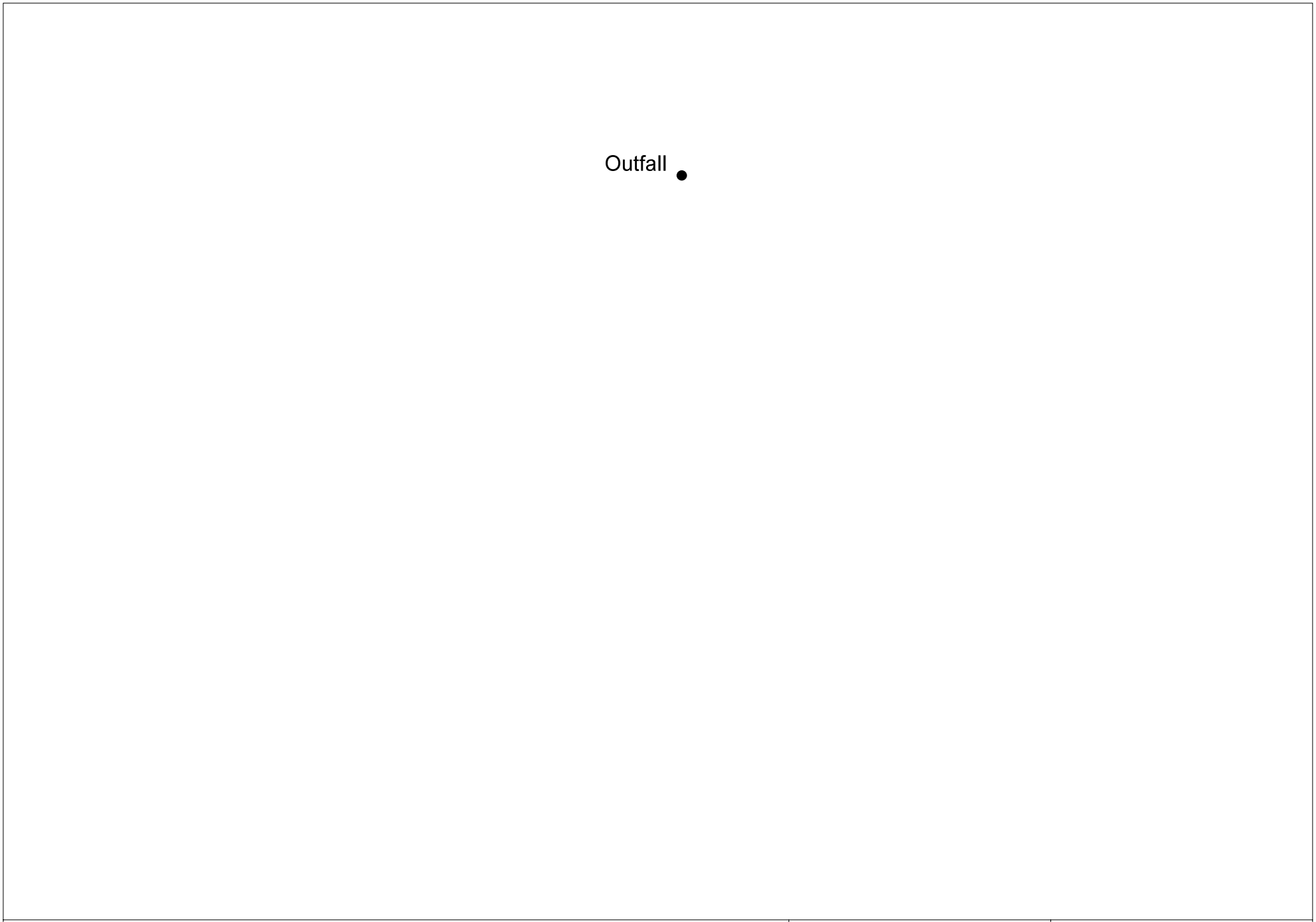
Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	160	0.83	0.00	0.83	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.11	12.61	0.11	12.61	0.0	Off
2	161	0.94	0.00	0.94	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	13.52	0.12	13.52	0.0	Off

Project File: Storm 103_105.stm | Number of lines: 2 | Run Date: 10/1/2016

NOTES: Inlet N-Values = 0.016; Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

1

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: Storm 106_112.stm	Number of lines: 6	Date: 10/1/2016

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	106-107	8.91	24	Cir	146.000	750.00	750.29	0.199	751.06	751.81	0.09	751.90	End	DropGrate
2	107-108	7.35	24	Cir	22.000	750.29	750.33	0.182	751.90	751.92	0.06	751.98	1	DropGrate
3	108-109	6.06	24	Cir	135.000	750.33	750.60	0.200	751.98	752.07	0.14	752.21	2	DropGrate
4	109-110	3.37	18	Cir	216.000	750.60	751.03	0.199	752.21	752.41	0.03	752.45	3	DropGrate
5	110-111	2.71	15	Cir	28.000	751.03	751.09	0.214	752.45*	752.49*	0.04	752.53	4	DropGrate
6	111-112	2.02	15	Cir	114.000	751.09	751.32	0.202	752.53*	752.64*	0.04	752.69	5	DropGrate

Project File: Storm 106_112.stm | Number of lines: 6 | Run Date: 10/1/2016

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	146.000	0.76	4.10	0.45	0.34	1.85	15.0	17.1	4.3	8.91	10.08	4.38	24	0.20	750.00	750.29	751.06	751.81	0.00	754.62	106-107
2	1	22.000	0.63	3.34	0.45	0.28	1.50	15.0	17.0	4.3	7.35	9.65	2.73	24	0.18	750.29	750.33	751.90	751.92	754.62	754.62	107-108
3	2	135.000	1.24	2.71	0.45	0.56	1.22	13.3	15.8	4.4	6.06	10.11	2.31	24	0.20	750.33	750.60	751.98	752.07	754.62	754.33	108-109
4	3	216.000	0.31	1.47	0.45	0.14	0.66	13.7	13.9	4.7	3.37	4.69	1.94	18	0.20	750.60	751.03	752.21	752.41	754.33	754.85	109-110
5	4	28.000	0.32	1.16	0.45	0.14	0.52	13.7	13.7	4.8	2.71	2.99	2.20	15	0.21	751.03	751.09	752.45	752.49	754.85	754.85	110-111
6	5	114.000	0.84	0.84	0.45	0.38	0.38	10.6	10.6	5.3	2.02	2.90	1.65	15	0.20	751.09	751.32	752.53	752.64	754.85	756.00	111-112

Project File: Storm 106_112.stm | Number of lines: 6 | Run Date: 10/1/2016

NOTES:Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period =Yrs. 10 ; Total flows limited to inlet captured flows. ; c = cir e = ellip b = box

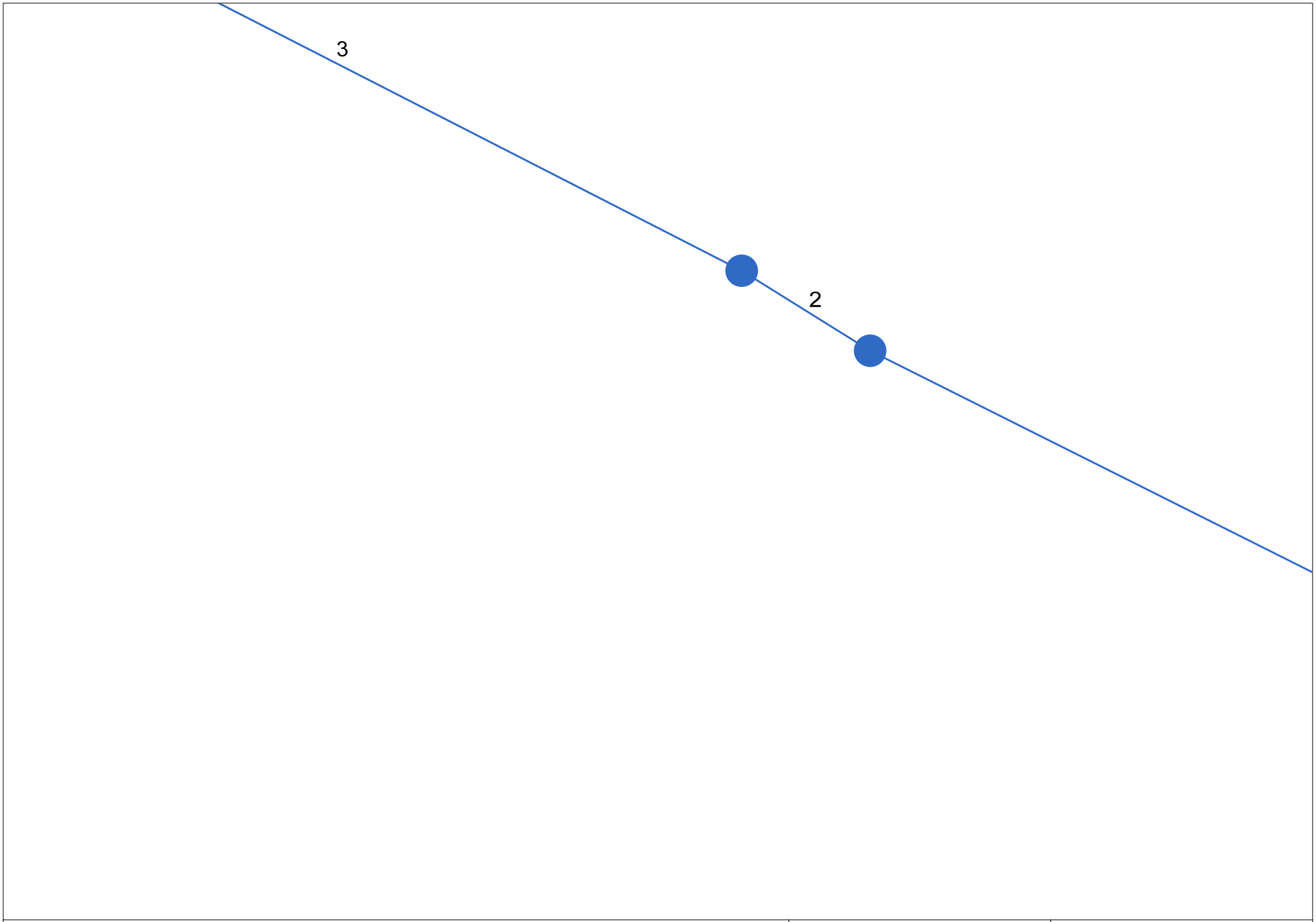
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	170	1.56	0.00	1.56	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.16	18.12	0.16	18.12	0.0	Off
2	171	1.29	0.00	1.29	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	16.23	0.14	16.23	0.0	Off
3	172	2.69	0.00	2.69	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.23	25.24	0.23	25.24	0.0	Off
4	173	0.66	0.00	0.66	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.09	11.13	0.09	11.13	0.0	Off
5	174	0.68	0.00	0.68	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.09	11.33	0.09	11.33	0.0	Off
6	175	2.02	0.00	2.02	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.19	21.19	0.19	21.19	0.0	Off

Project File: Storm 106_112.stm | Number of lines: 6 | Run Date: 10/1/2016

NOTES: Inlet N-Values = 0.016; Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: Storm 108_138.stm	Number of lines: 20	Date: 10/1/2016

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	108-109	19.33	30	Cir	144.000	747.50	747.93	0.299	748.97	749.81	0.18	750.00	End	DropGrate
2	109-110	18.07	30	Cir	22.000	747.93	748.00	0.318	750.00	750.03	0.14	750.17	1	DropGrate
3	110-111	17.25	30	Cir	130.000	748.00	748.39	0.300	750.17	750.36	0.27	750.62	2	DropGrate
4	111-112	15.87	30	Cir	97.000	748.39	748.68	0.299	750.62	750.73	0.21	750.94	3	Manhole
5	112-113	13.27	30	Cir	46.000	748.68	748.82	0.304	750.94	750.97	0.20	751.18	4	DropGrate
6	113-114	9.54	30	Cir	227.000	748.82	749.50	0.300	751.18	751.28	0.05	751.33	5	DropGrate
7	114-115	8.13	30	Cir	28.000	749.50	749.58	0.286	751.33	751.33	0.04	751.37	6	DropGrate
8	115-116	6.95	18	Cir	28.000	750.58	750.72	0.500	751.73	751.87	0.35	752.23	7	Manhole
9	116-117	1.88	12	Cir	64.000	751.22	751.48	0.406	752.23	752.38	0.05	752.43	8	DropGrate
10	117-118	1.02	12	Cir	207.000	751.48	752.31	0.401	752.43	752.80	0.11	752.91	9	DropGrate
11	112-119	2.60	12	Cir	141.000	750.18	751.03	0.603	750.95	751.80	0.12	751.93	4	DropGrate
12	119-F1	1.35	12	Cir	21.000	751.03	751.11	0.381	751.93	751.95	0.06	752.00	11	DropGrate
13	113-120	2.66	12	Cir	144.000	750.32	751.18	0.597	751.18	751.96	0.13	752.08	5	DropGrate
14	120-121	1.32	12	Cir	21.000	751.18	751.26	0.381	752.08	752.10	0.05	752.16	13	DropGrate
15	116-126	2.06	12	Cir	145.000	751.22	751.80	0.400	752.23	752.67	0.06	752.74	8	DropGrate
16	126-127	1.07	12	Cir	21.000	751.80	751.88	0.381	752.74	752.75	0.03	752.78	15	DropGrate
17	116-122	3.00	15	Cir	145.000	750.97	751.41	0.303	752.23	752.51	0.16	752.67	8	DropGrate
18	122-F2	1.03	12	Cir	83.000	751.66	751.91	0.301	752.67	752.73	0.05	752.78	17	DropGrate
19	F2-F3	0.61	12	Cir	22.000	751.91	751.98	0.318	752.78	752.79	0.01	752.80	18	DropGrate
20	122-F4	1.05	12	Cir	21.000	751.66	751.72	0.286	752.67	752.69	0.03	752.71	17	DropGrate

Project File: Storm 108_138.stm | Number of lines: 20 | Run Date: 10/1/2016

NOTES: Return period = 10 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	144.000	0.55	8.38	0.45	0.25	3.77	11.9	19.5	4.0	19.33	22.41	5.66	30	0.30	747.50	747.93	748.97	749.81	0.00	753.45	108-109
2	1	22.000	0.37	7.83	0.45	0.17	3.52	12.5	19.4	4.0	18.07	23.13	4.19	30	0.32	747.93	748.00	750.00	750.03	753.45	753.45	109-110
3	2	130.000	0.63	7.46	0.45	0.28	3.36	13.1	18.8	4.0	17.25	22.46	3.99	30	0.30	748.00	748.39	750.17	750.36	753.45	753.10	110-111
4	3	97.000	0.00	6.83	0.00	0.00	3.07	0.0	18.3	4.1	15.87	22.42	3.56	30	0.30	748.39	748.68	750.62	750.73	753.10	754.20	111-112
5	4	46.000	0.48	5.71	0.45	0.22	2.57	12.5	18.0	4.1	13.27	22.63	2.90	30	0.30	748.68	748.82	750.94	750.97	754.20	754.20	112-113
6	5	227.000	0.56	4.08	0.45	0.25	1.84	9.5	16.1	4.4	9.54	22.45	2.27	30	0.30	748.82	749.50	751.18	751.28	754.20	754.10	113-114
7	6	28.000	0.47	3.52	0.45	0.21	1.58	9.5	15.8	4.4	8.13	21.92	2.16	30	0.29	749.50	749.58	751.33	751.33	754.10	754.10	114-115
8	7	28.000	0.00	3.05	0.00	0.00	1.37	0.0	15.7	4.4	6.95	7.42	4.78	18	0.50	750.58	750.72	751.73	751.87	754.10	754.50	115-116
9	8	64.000	0.38	0.84	0.45	0.17	0.38	12.2	15.2	4.5	1.88	2.27	2.46	12	0.41	751.22	751.48	752.23	752.38	754.50	756.50	116-117
10	9	207.000	0.46	0.46	0.45	0.21	0.21	12.6	12.6	4.9	1.02	2.26	2.01	12	0.40	751.48	752.31	752.43	752.80	756.50	756.50	117-118
11	4	141.000	0.54	1.12	0.45	0.24	0.50	11.5	11.7	5.1	2.60	2.77	4.00	12	0.60	750.18	751.03	750.95	751.80	754.20	754.50	112-119
12	11	21.000	0.58	0.58	0.45	0.26	0.26	11.5	11.5	5.2	1.35	2.20	1.87	12	0.38	751.03	751.11	751.93	751.95	754.50	754.50	119-F1
13	5	144.000	0.58	1.15	0.45	0.26	0.52	11.6	11.8	5.1	2.66	2.75	3.89	12	0.60	750.32	751.18	751.18	751.96	754.20	753.64	113-120
14	13	21.000	0.57	0.57	0.45	0.26	0.26	11.6	11.6	5.1	1.32	2.20	1.81	12	0.38	751.18	751.26	752.08	752.10	753.64	753.64	120-121
15	8	145.000	0.44	0.91	0.45	0.20	0.41	12.1	12.4	5.0	2.06	2.25	2.73	12	0.40	751.22	751.80	752.23	752.67	754.50	755.00	116-126
16	15	21.000	0.47	0.47	0.45	0.21	0.21	12.1	12.1	5.0	1.07	2.20	1.43	12	0.38	751.80	751.88	752.74	752.75	755.00	755.00	126-127
17	8	145.000	0.40	1.30	0.45	0.18	0.59	11.9	12.7	4.9	3.00	3.56	2.53	15	0.30	750.97	751.41	752.23	752.51	754.50	754.95	116-122
18	17	83.000	0.18	0.44	0.45	0.08	0.20	11.2	11.7	5.1	1.03	1.95	1.41	12	0.30	751.66	751.91	752.67	752.73	754.95	754.95	122-F2
19	18	22.000	0.26	0.26	0.45	0.12	0.12	11.2	11.2	5.2	0.61	2.01	0.87	12	0.32	751.91	751.98	752.78	752.79	754.95	754.95	F2-F3
20	17	21.000	0.46	0.46	0.45	0.21	0.21	11.9	11.9	5.1	1.05	1.90	1.35	12	0.29	751.66	751.72	752.67	752.69	754.95	754.95	122-F4

Project File: Storm 108_138.stm | Number of lines: 20 | Run Date: 10/1/2016

NOTES:Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period =Yrs. 10 ; Total flows limited to inlet captured flows. ; c = cir e = ellip b = box

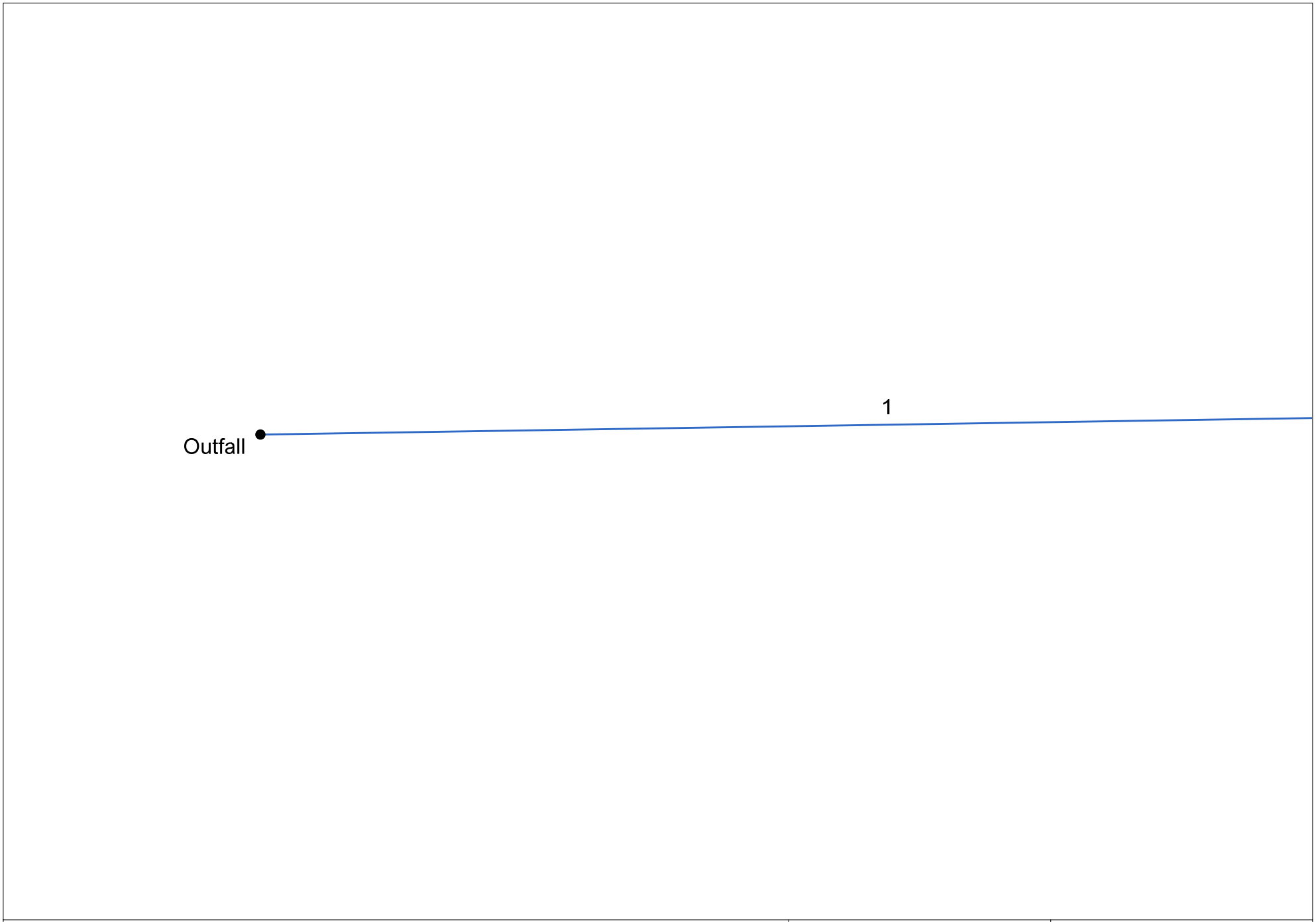
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	108	1.26	0.00	1.26	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	15.99	0.14	15.99	0.0	Off
2	109	0.83	0.00	0.83	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.11	12.58	0.11	12.58	0.0	Off
3	110	1.38	0.00	1.38	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.15	16.86	0.15	16.86	0.0	Off
4	111	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
5	112	1.07	0.00	1.07	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.13	14.58	0.13	14.58	0.0	Off
6	113	1.41	0.00	1.41	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.15	17.10	0.15	17.10	0.0	Off
7	114	1.18	0.00	1.18	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.13	15.43	0.13	15.43	0.0	Off
8	115	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
9	116	0.86	0.00	0.86	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.11	12.85	0.11	12.85	0.0	Off
10	117	1.02	0.00	1.02	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	14.20	0.12	14.20	0.0	Off
11	118	1.25	0.00	1.25	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	15.96	0.14	15.96	0.0	Off
12	F1	1.35	0.00	1.35	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.15	16.64	0.15	16.64	0.0	Off
13	120	1.34	0.00	1.34	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.15	16.60	0.15	16.60	0.0	Off
14	121	1.32	0.00	1.32	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.14	16.43	0.14	16.43	0.0	Off
15	126	1.00	0.00	1.00	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	13.99	0.12	13.99	0.0	Off
16	127	1.07	0.00	1.07	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.13	14.53	0.13	14.53	0.0	Off
17	122	0.91	0.00	0.91	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.11	13.31	0.11	13.31	0.0	Off
18	F2	0.42	0.00	0.42	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.07	8.76	0.07	8.76	0.0	Off
19	F3	0.61	0.00	0.61	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.09	10.64	0.09	10.64	0.0	Off
20	F4	1.05	0.00	1.05	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.12	14.41	0.12	14.41	0.0	Off

Project File: Storm 108_138.stm | Number of lines: 20 | Run Date: 10/1/2016

NOTES: Inlet N-Values = 0.016; Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: Storm 113_115.stm	Number of lines: 3	Date: 10/1/2016

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	113-114	6.99	18	Cir	162.000	750.00	750.81	0.500	751.01	752.09	0.44	752.53	End	DropGrate
2	114-115	2.52	18	Cir	130.000	750.81	751.01	0.154	752.53*	752.61*	0.03	752.64	1	DropGrate
3	F1-F2	2.80	18	Cir	130.000	750.81	750.94	0.100	752.53*	752.63*	0.04	752.66	1	DropGrate

Project File: Storm 113_115.stm | Number of lines: 3 | Run Date: 10/1/2016

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown).

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	162.000	0.71	3.03	0.45	0.32	1.36	11.2	13.3	4.8	6.99	7.43	4.93	18	0.50	750.00	750.81	751.01	752.09	0.00	754.50	113-114
2	1	130.000	1.10	1.10	0.45	0.50	0.50	11.8	11.8	5.1	2.52	4.12	1.43	18	0.15	750.81	751.01	752.53	752.61	754.50	755.00	114-115
3	1	130.000	1.22	1.22	0.45	0.55	0.55	11.8	11.8	5.1	2.80	3.32	1.58	18	0.10	750.81	750.94	752.53	752.63	754.50	754.40	F1-F2

Project File: Storm 113_115.stm | Number of lines: 3 | Run Date: 10/1/2016

NOTES:Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period =Yrs. 10 ; Total flows limited to inlet captured flows. ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	166	1.67	0.00	1.67	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.17	18.88	0.17	18.88	0.0	Off
2	167	2.52	0.00	2.52	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.22	24.26	0.22	24.26	0.0	Off
3	168	2.80	0.00	2.80	0.00	DrGrt	0.0	0.00	2.00	2.00	2.00	Sag	2.00	0.020	0.020	0.000	0.24	25.85	0.24	25.85	0.0	Off

Project File: Storm 113_115.stm | Number of lines: 3 | Run Date: 10/1/2016

NOTES: Inlet N-Values = 0.016; Intensity = 57.92 / (Inlet time + 9.10) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.