CUMBERLAND TRACE

SECTION ONE

Drainage Study

Residential Development

Franklin, Johnson County, Indiana

NORTHPOINTE ENGINEERING & SURVEYING, Inc.

WBE/DBE Certified

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Cumberland Trace
Section One

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Professional Certification

Cumberland Trace

Section One

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

Drainage Summary

Cumberland Trace Section One

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. This report analyzes Section One of the proposed development. Section One consists of 11.95 acres and 43 lots.

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. Section One contains Basins 3 and 4.

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 11.58 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. Ponds 3 and 4 are located within Section One. The

proposed calculations for these two ponds are shown within this report. A summary of the two ponds is shown below.

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		0.37	0.69

100 Year Elevation = 750.70

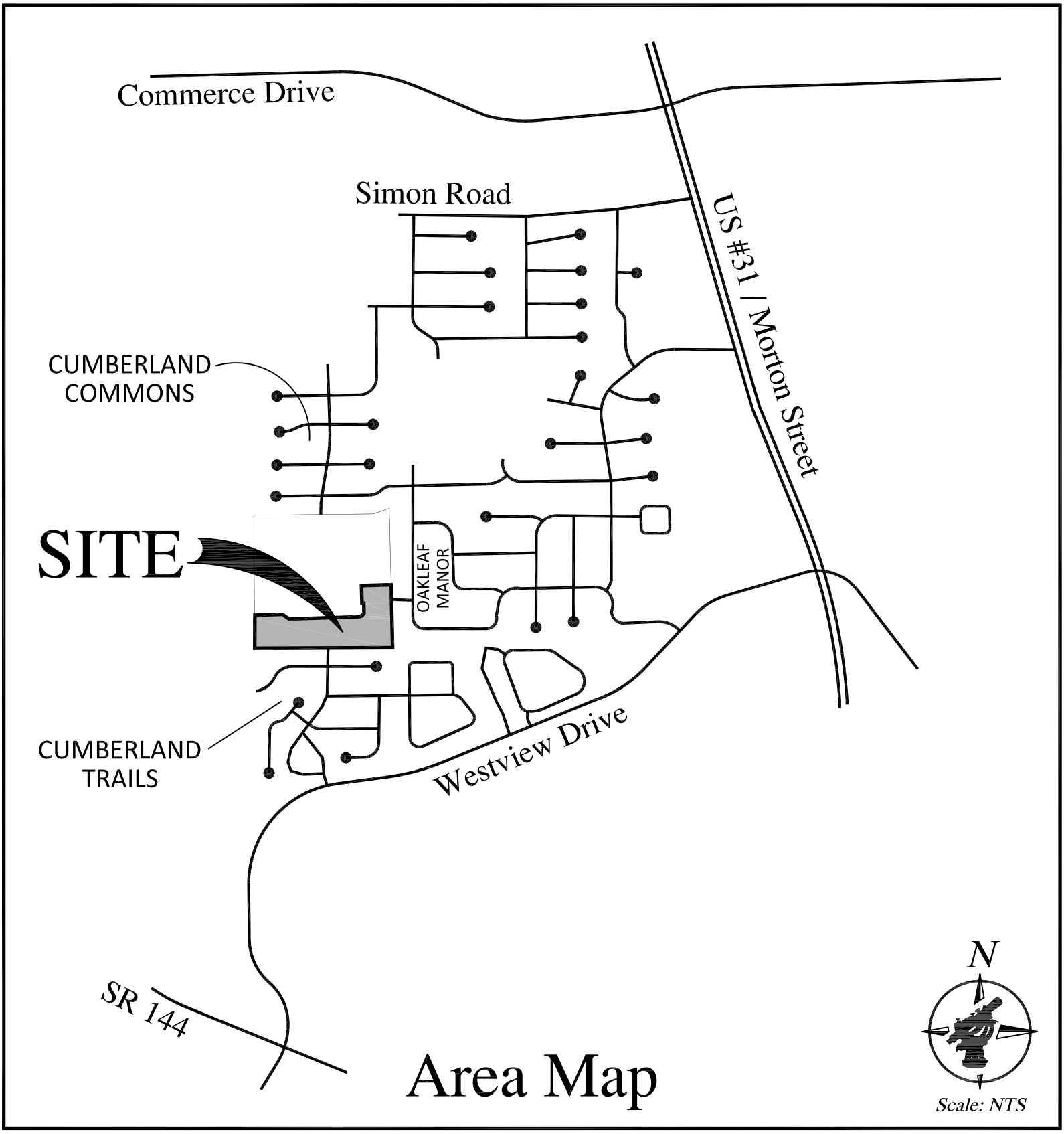
Pond 4 – Pond 4 collects runoff from the southeast quadrant of the site. The release rates for this pond are controlled by the existing runoff rates from Basin 4 in the existing conditions. A summary of the allowable and proposed rates are as follows:

	Runoff Rates (cfs)		
	2YR	10YR	100YR
Basin 4 Existing	1.08	3.80	
Pond 4		1.07	2.39

100 Year Elevation = 752.53

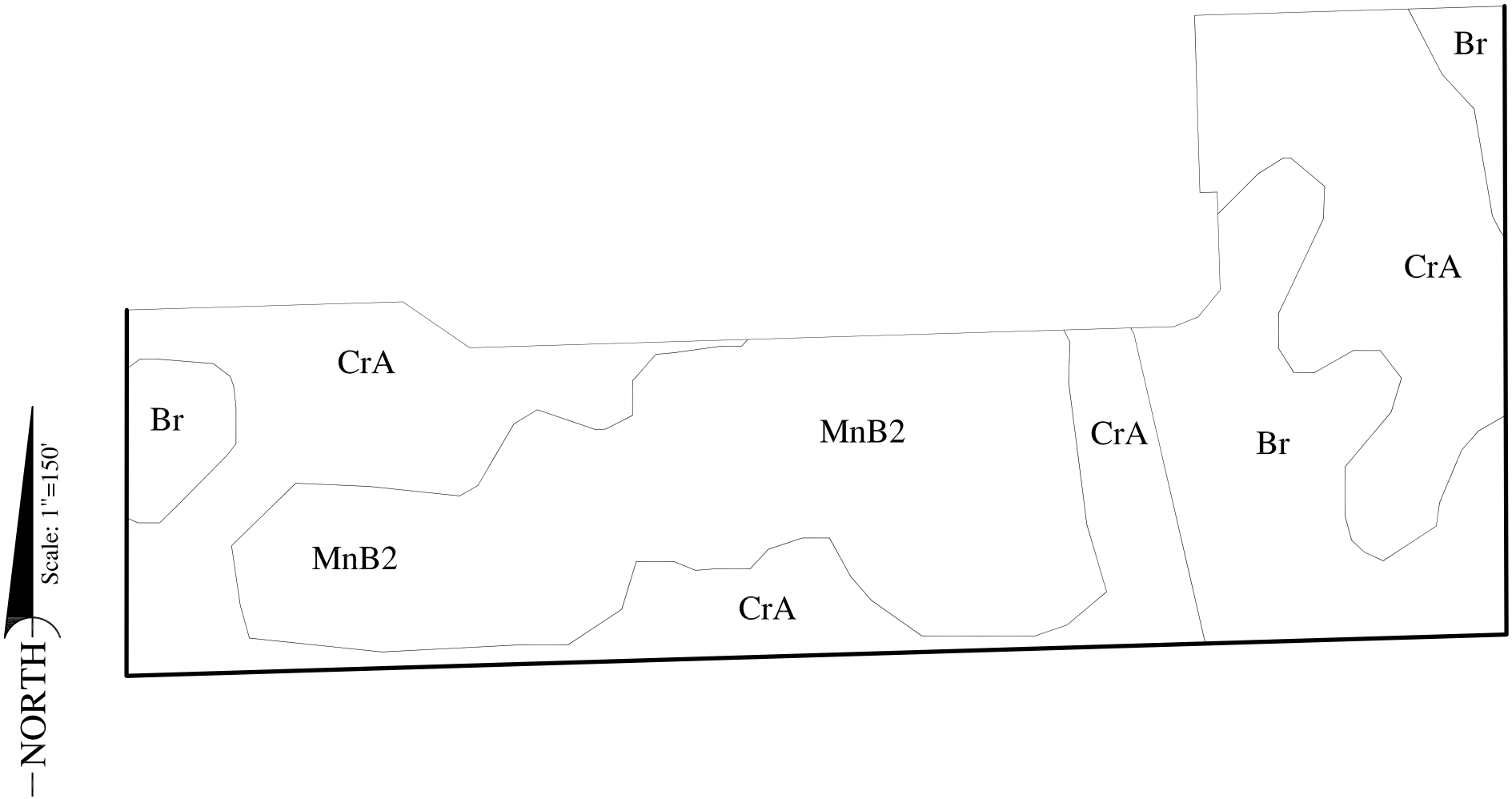
Water Quality:

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.

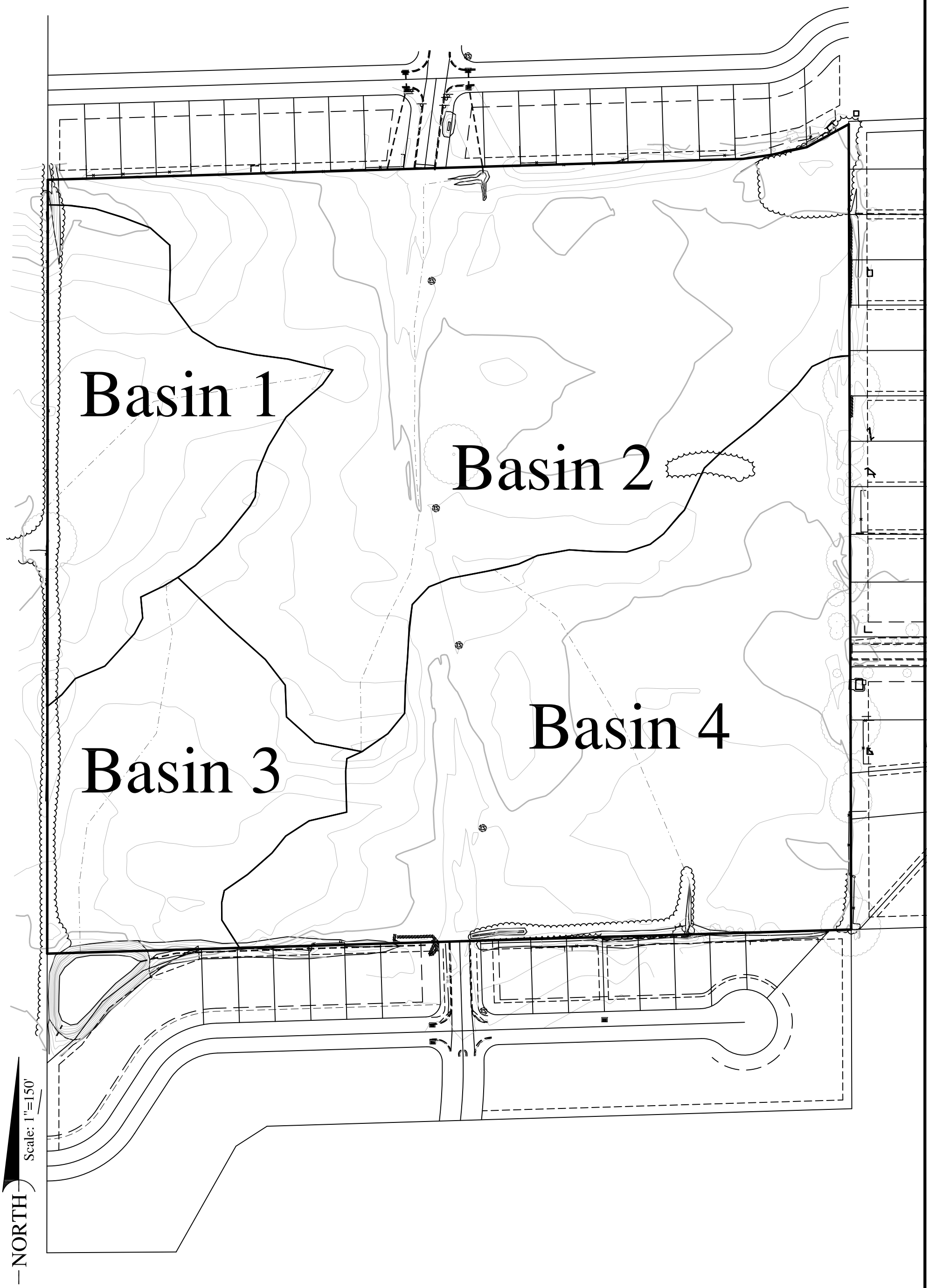

Commerce Drive
Simon Road
US #31 / Morton Street
CUMBERLAND COMMONS
SITE
OAKLEAF MANOR
CUMBERLAND TRAILS
Westview Drive
SR 144
N
Scale: NTS

Area Map

Soils Map



Existing Basins Map



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**

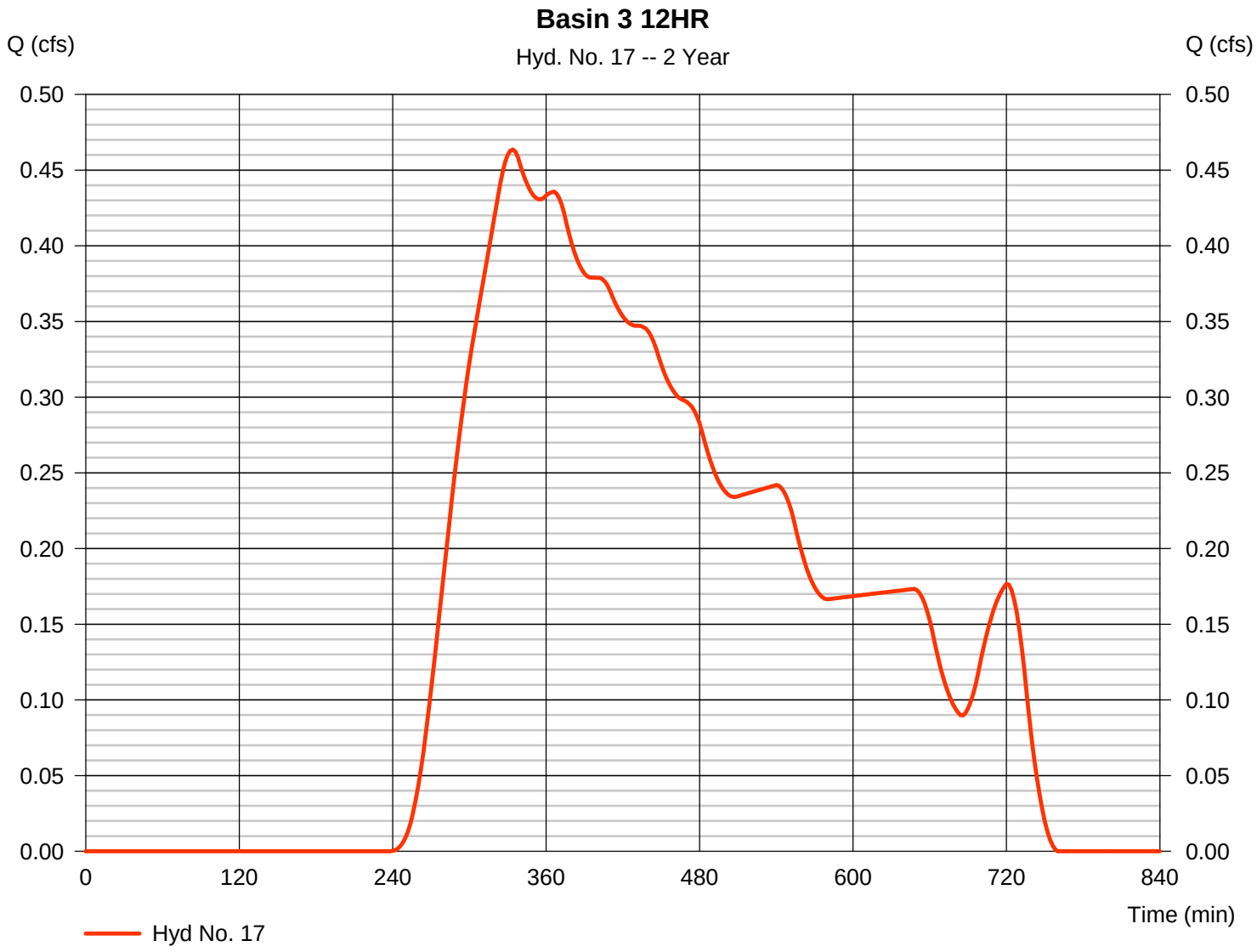
Total Travel Time, Tc ..... 25.19 min

Hydrograph Report

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

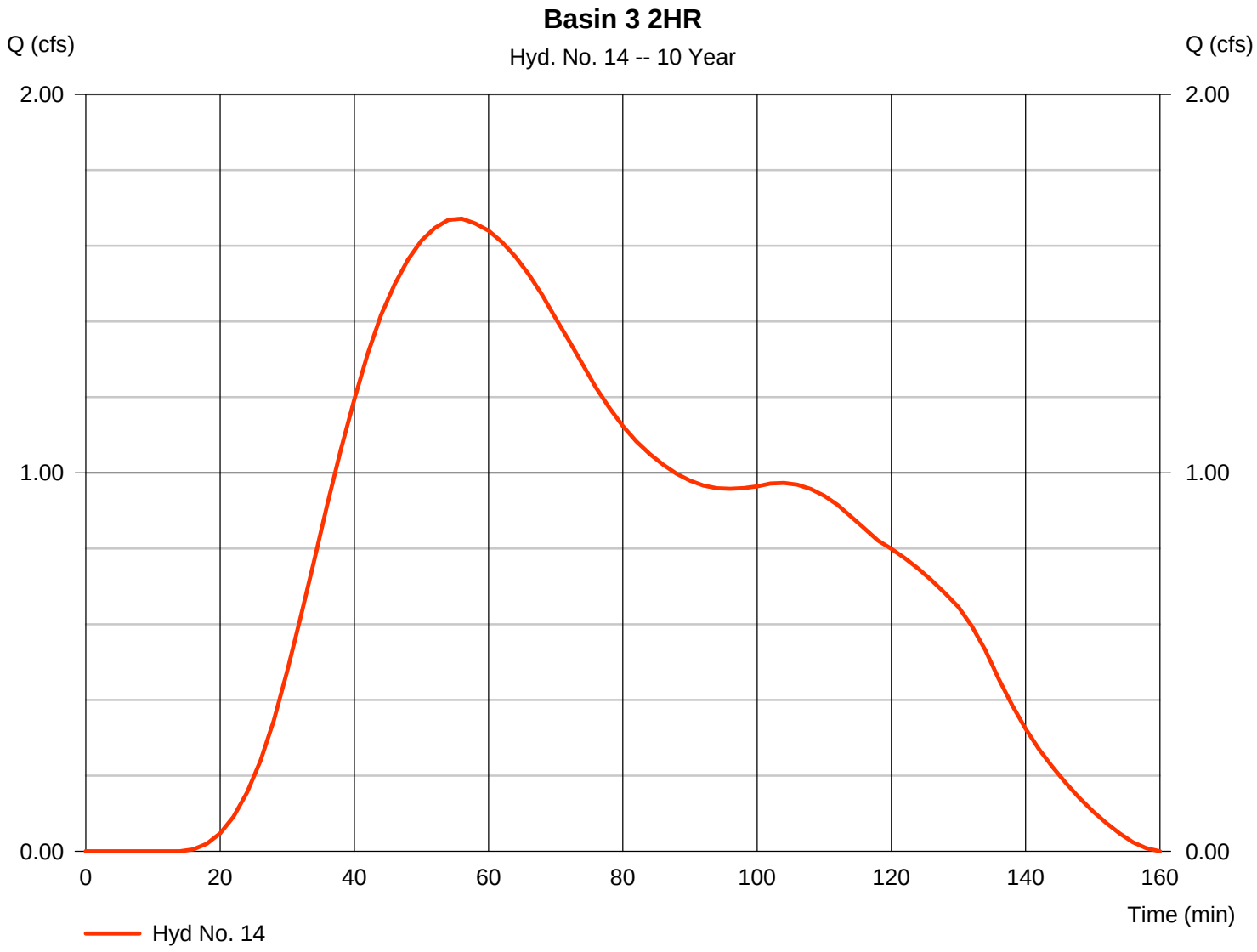


Hydrograph Report

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

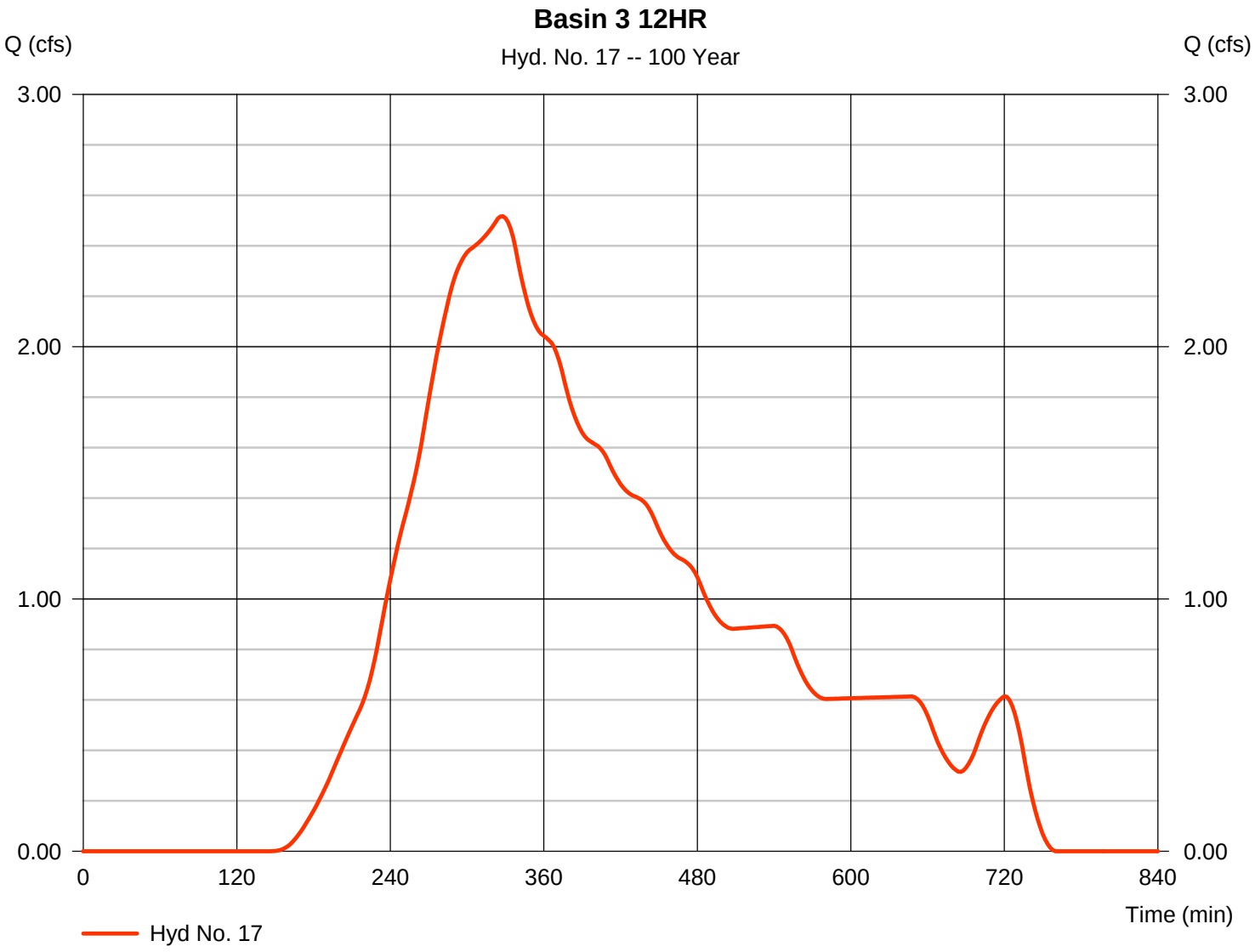


Hydrograph Report

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**

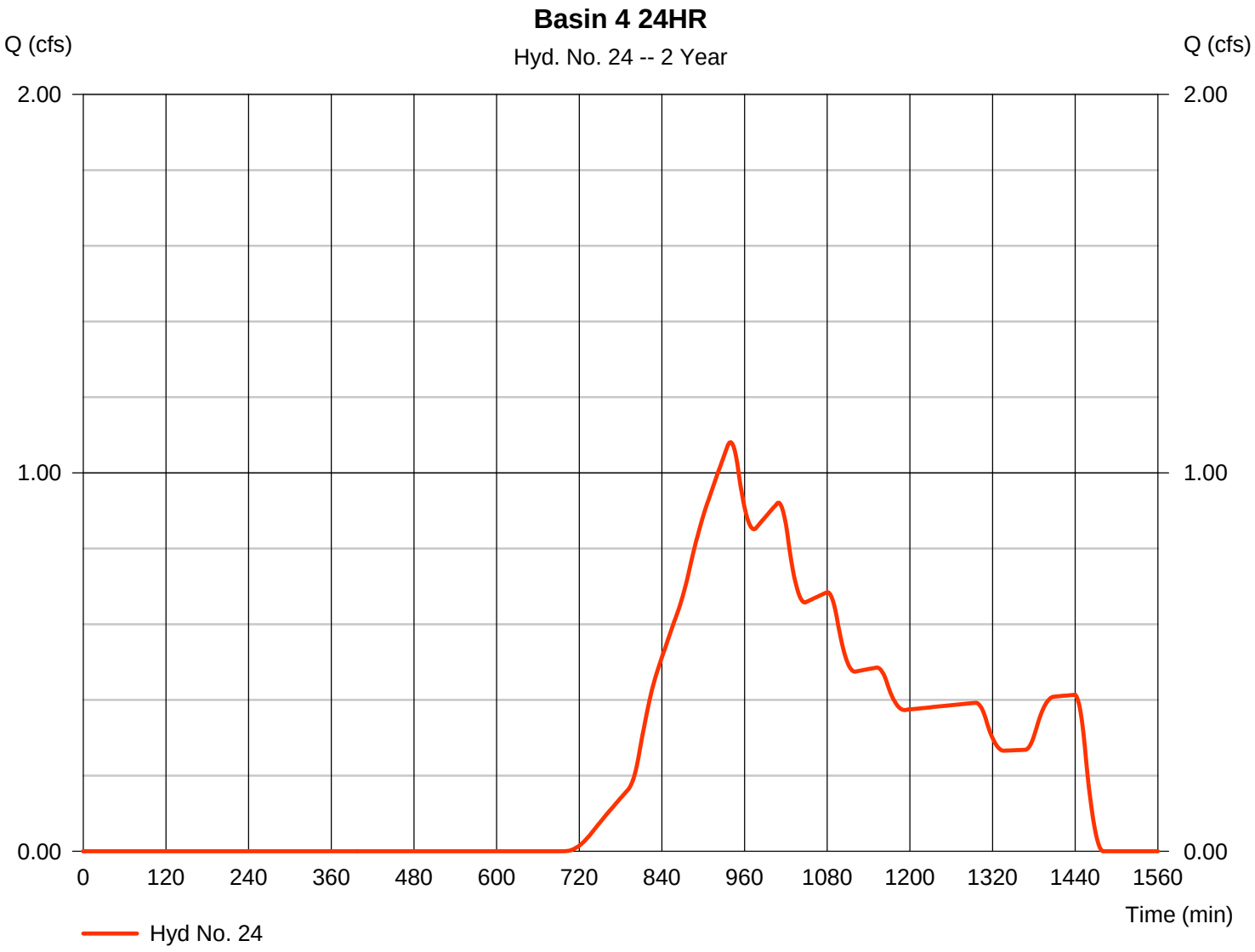
Total Travel Time, Tc ..... 24.68 min

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

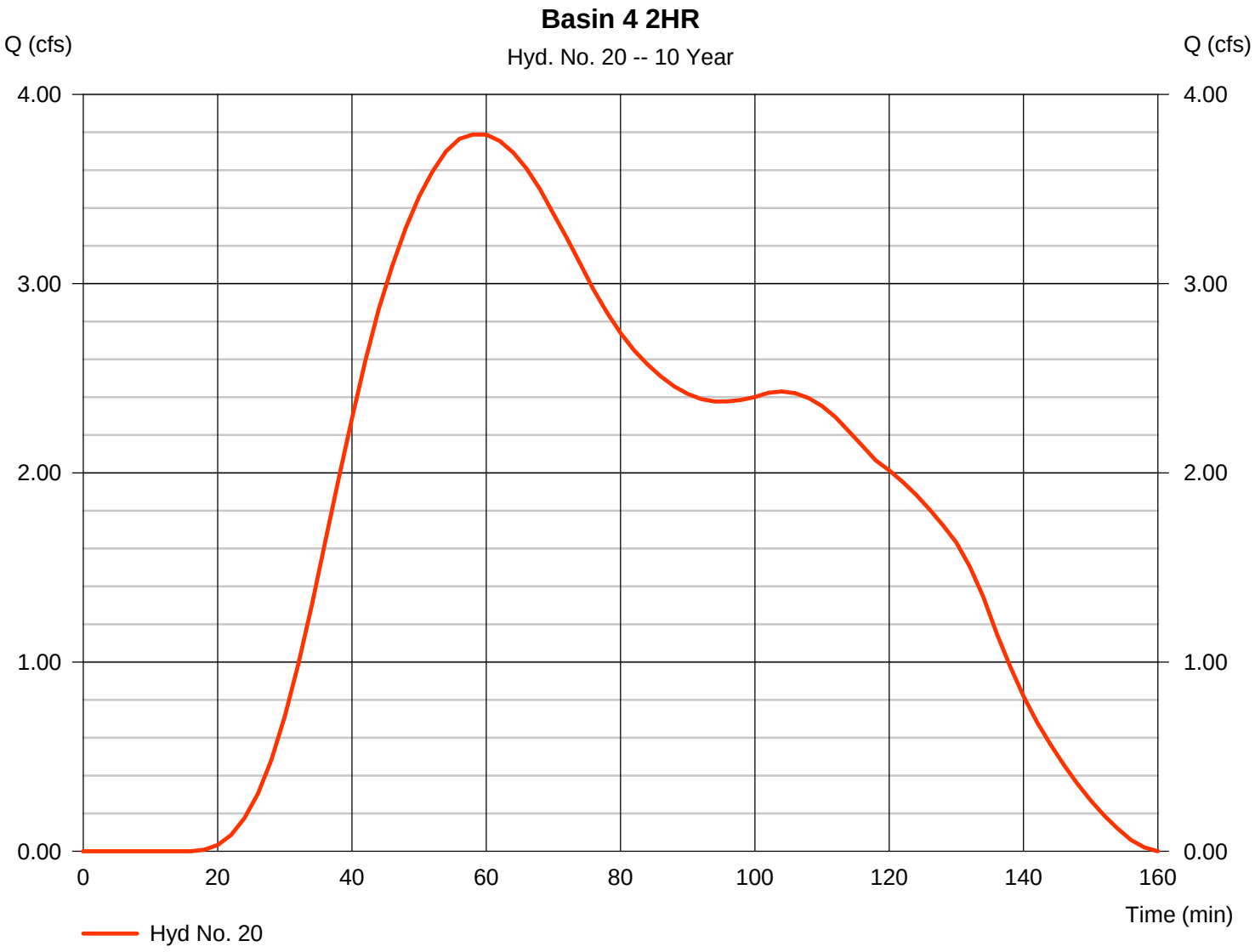


Hydrograph Report

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

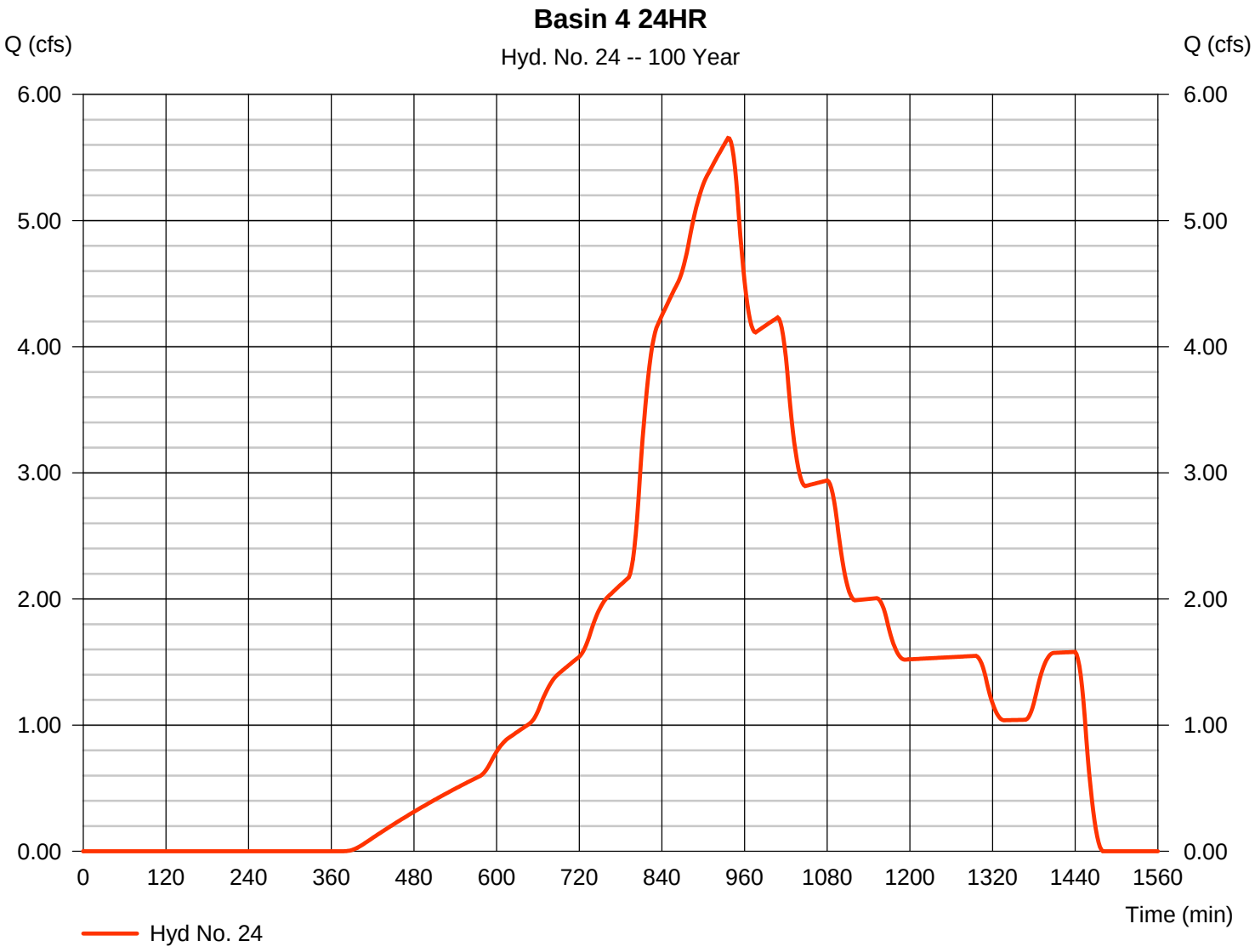


Hydrograph Report

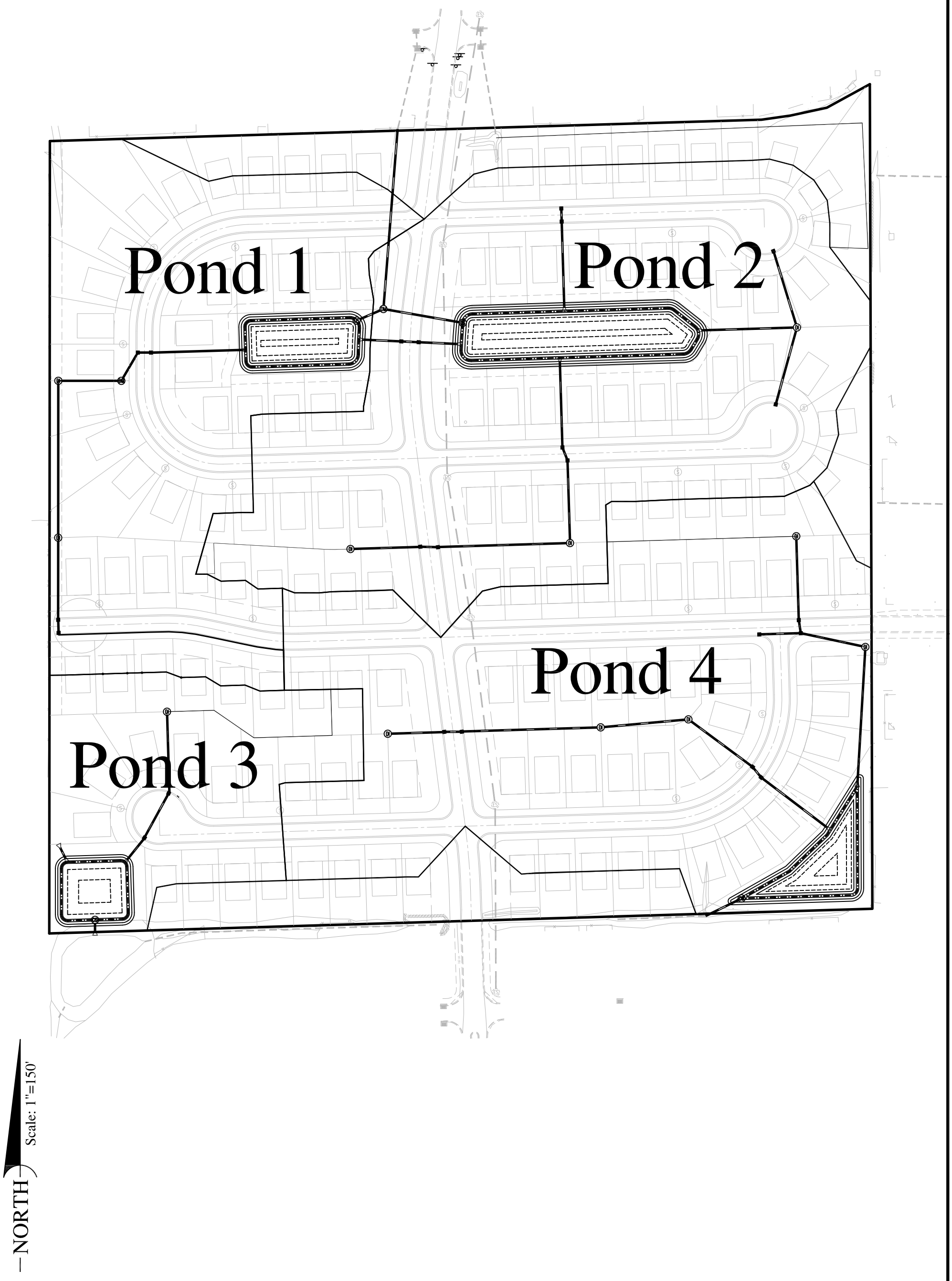
Hyd. No. 24

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



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	1/25/2016
Location	Johnson County Franklin Township	Checked	DJS	Date	1/25/2016

	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	2.01	166.83
			Totals =	3.07	246.33

CN = 80.2

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 Summary Report

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

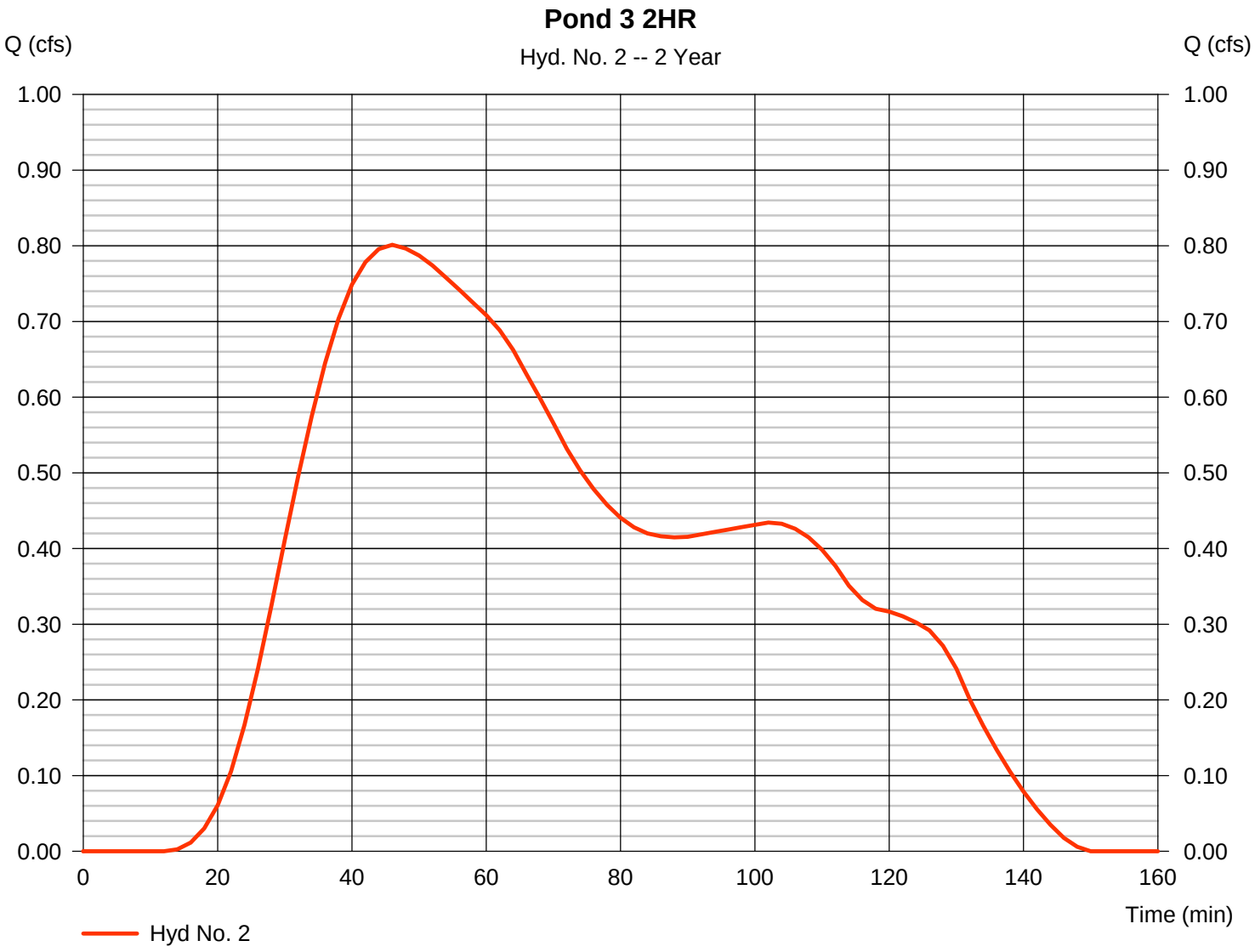
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.791	2	36	1,976	------	------	------	Pond 3 1HR
2	SCS Runoff	0.801	2	46	3,358	------	------	------	Pond 3 2HR
3	SCS Runoff	0.731	2	56	4,290	------	------	------	Pond 3 3HR
4	SCS Runoff	0.579	2	94	6,224	------	------	------	Pond 3 6HR
5	SCS Runoff	0.630	2	326	9,256	------	------	------	Pond 3 12HR
6	SCS Runoff	0.503	2	936	11,123	------	------	------	Pond 3 24HR
7	Reservoir	0.053	2	82	1,936	1	748.36	1,838	1HR
8	Reservoir	0.072	2	140	3,317	2	748.59	3,001	2HR
9	Reservoir	0.081	2	200	4,250	3	748.73	3,691	3HR
10	Reservoir	0.094	2	376	6,183	4	748.95	4,801	6HR
11	Reservoir	0.106	2	730	9,215	5	749.17	6,645	12HR
12	Reservoir	0.108	2	1448	11,082	6	749.21	7,076	24HR

Hydrograph Report

Hyd. No. 2

Pond 3 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 0.801 cfs
Storm frequency	= 2 yrs	Time to peak	= 46 min
Time interval	= 2 min	Hyd. volume	= 3,358 cuft
Drainage area	= 3.070 ac	Curve number	= 80.2
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.90 min
Total precip.	= 1.52 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484



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	2.554	2	32	6,066	------	------	------	Pond 3 1HR
2	SCS Runoff	2.394	2	40	9,253	------	------	------	Pond 3 2HR
3	SCS Runoff	2.031	2	50	11,121	------	------	------	Pond 3 3HR
4	SCS Runoff	1.442	2	90	15,085	------	------	------	Pond 3 6HR
5	SCS Runoff	1.286	2	326	19,287	------	------	------	Pond 3 12HR
6	SCS Runoff	0.995	2	936	23,670	------	------	------	Pond 3 24HR
7	Reservoir	0.101	2	84	6,026	1	749.07	5,744	1HR
8	Reservoir	0.115	2	142	9,212	2	749.37	8,567	2HR
9	Reservoir	0.128	2	200	11,080	3	749.52	10,056	3HR
10	Reservoir	0.255	2	372	15,045	4	749.74	12,125	6HR
11	Reservoir	0.329	2	558	19,246	5	749.83	12,995	12HR
12	Reservoir	0.371	2	1100	23,630	6	749.89	13,563	24HR

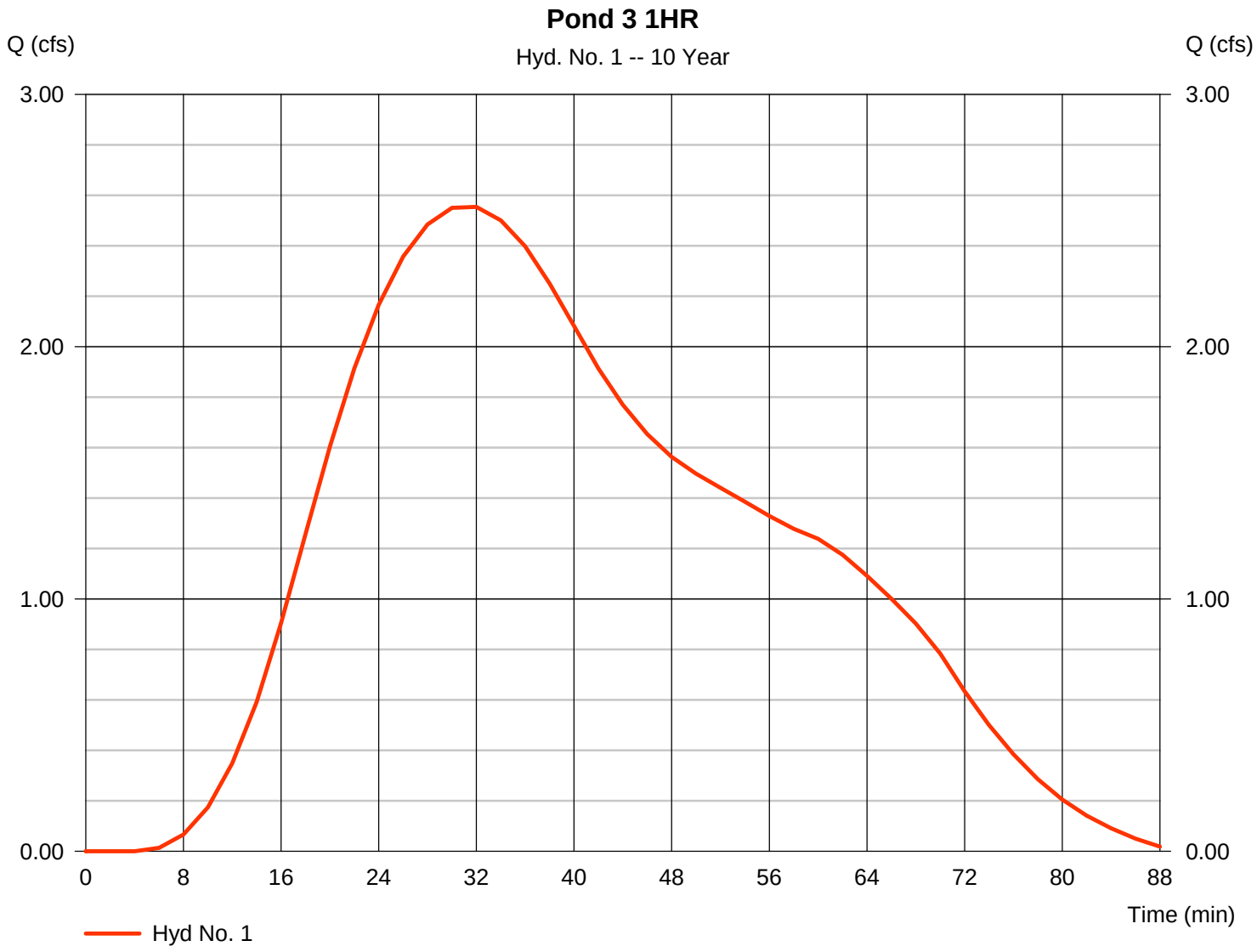
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 1

Pond 3 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 2.554 cfs
Storm frequency	= 10 yrs	Time to peak	= 32 min
Time interval	= 2 min	Hyd. volume	= 6,066 cuft
Drainage area	= 3.070 ac	Curve number	= 80.2
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 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	5.676	2	28	12,997	------	------	------	Pond 3 1HR
2	SCS Runoff	5.017	2	36	18,376	------	------	------	Pond 3 2HR
3	SCS Runoff	4.126	2	44	21,719	------	------	------	Pond 3 3HR
4	SCS Runoff	2.822	2	46	27,622	------	------	------	Pond 3 6HR
5	SCS Runoff	2.202	2	324	34,008	------	------	------	Pond 3 12HR
6	SCS Runoff	1.674	2	936	42,366	------	------	------	Pond 3 24HR
7	Reservoir	0.276	2	82	12,957	1	749.77	12,361	1HR
8	Reservoir	0.501	2	136	18,335	2	750.15	16,215	2HR
9	Reservoir	0.562	2	194	21,678	3	750.31	17,870	3HR
10	Reservoir	0.594	2	318	27,582	4	750.40	18,826	6HR
11	Reservoir	0.646	2	548	33,967	5	750.55	20,505	12HR
12	Reservoir	0.694	2	1092	42,325	6	750.71	22,203	24HR

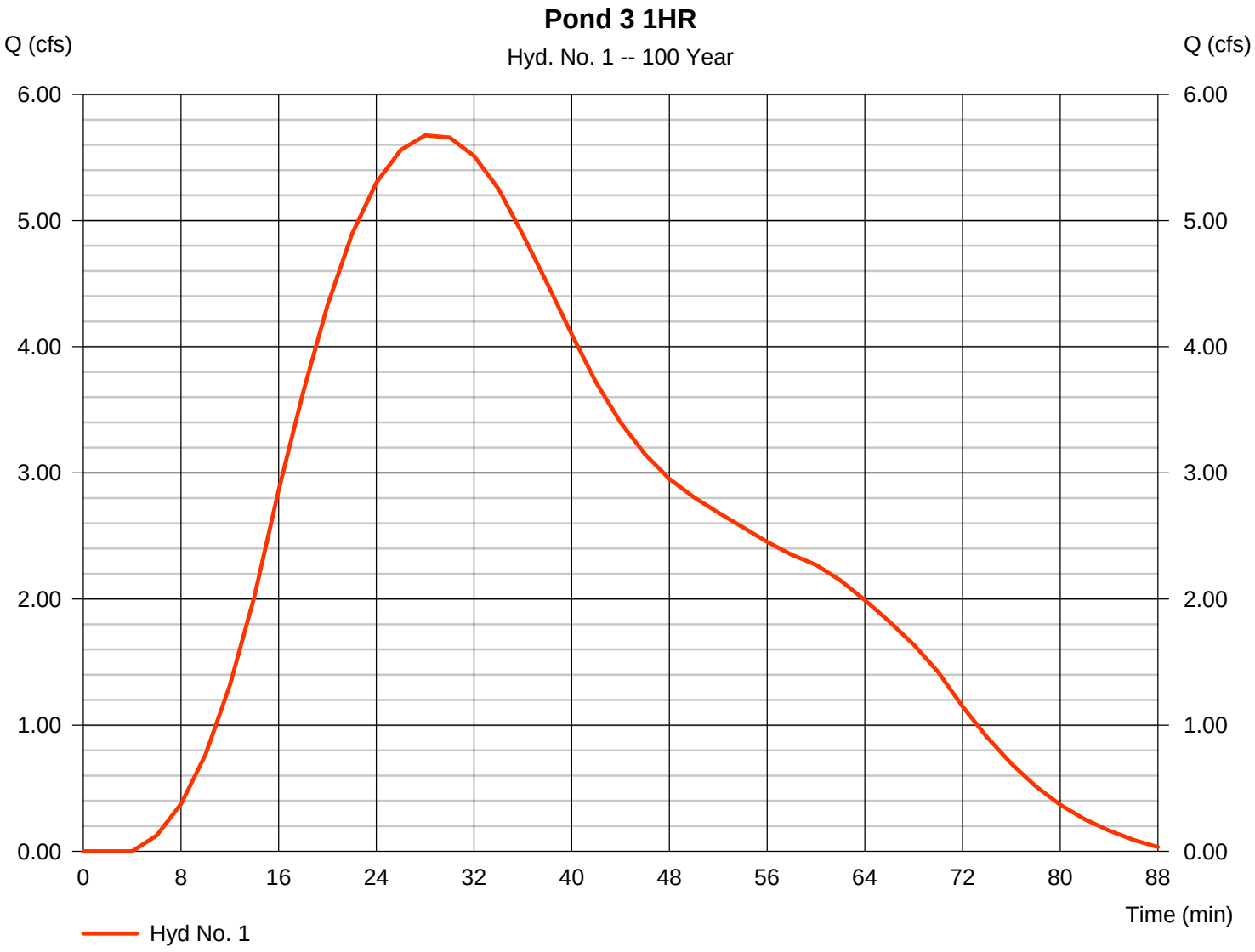
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 1

Pond 3 1HR

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.676 cfs
Storm frequency	=	100 yrs	Time to peak	=	28 min
Time interval	=	2 min	Hyd. volume	=	12,997 cuft
Drainage area	=	3.070 ac	Curve number	=	80.2
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 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	2.554	2	32	6,066	------	------	------	Pond 3 1HR
2	SCS Runoff	2.394	2	40	9,253	------	------	------	Pond 3 2HR
3	SCS Runoff	2.031	2	50	11,121	------	------	------	Pond 3 3HR
4	SCS Runoff	1.442	2	90	15,085	------	------	------	Pond 3 6HR
5	SCS Runoff	1.286	2	326	19,287	------	------	------	Pond 3 12HR
6	SCS Runoff	0.995	2	936	23,670	------	------	------	Pond 3 24HR
7	Reservoir	0.101	2	84	6,026	1	749.07	5,744	1HR
8	Reservoir	0.115	2	142	9,212	2	749.37	8,567	2HR
9	Reservoir	0.128	2	200	11,080	3	749.52	10,056	3HR
10	Reservoir	0.255	2	372	15,045	4	749.74	12,125	6HR
11	Reservoir	0.329	2	558	19,246	5	749.83	12,995	12HR
12	Reservoir	0.371	2	1100	23,630	6	749.89	13,563	24HR

Hydrograph Report

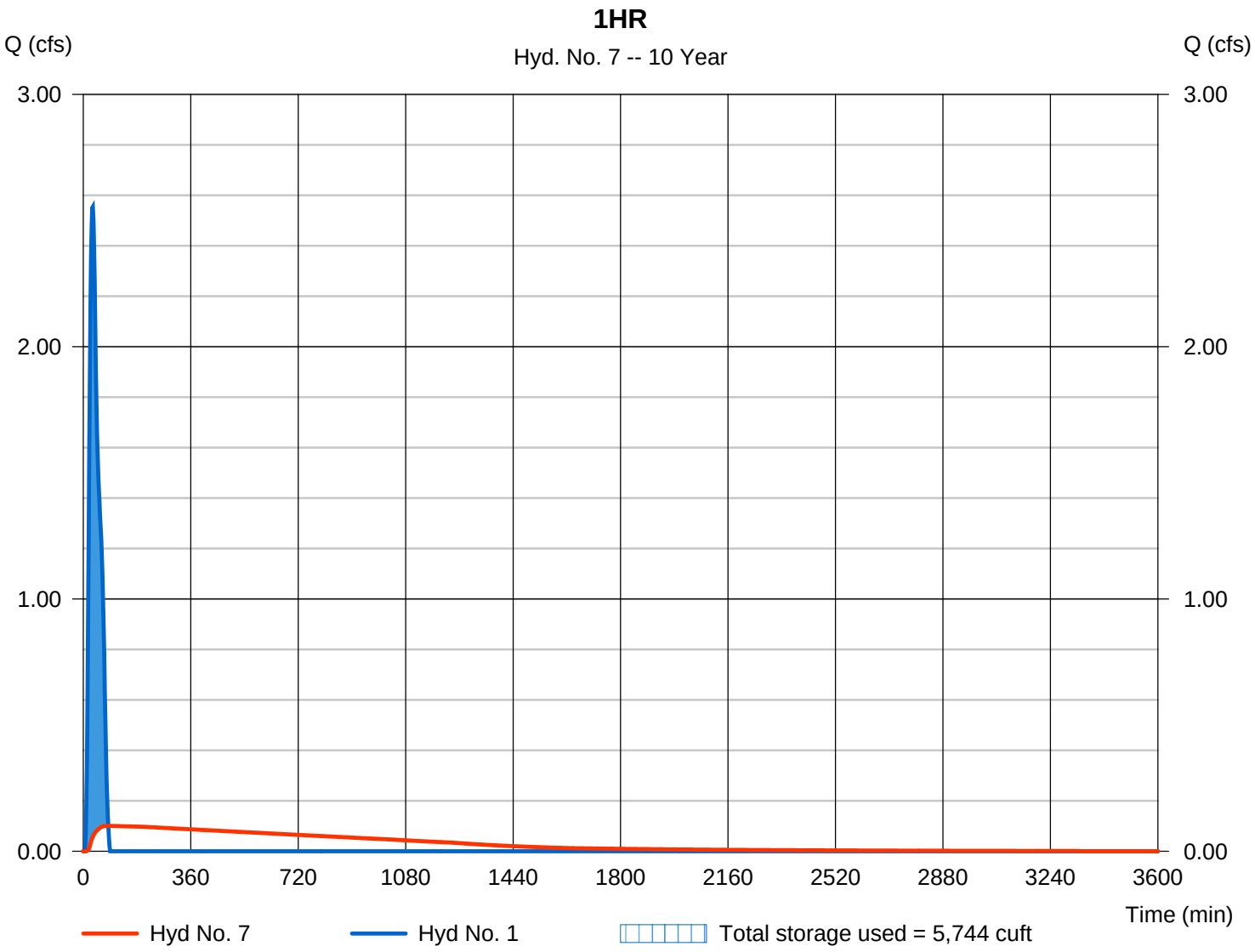
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.101 cfs
Storm frequency	= 10 yrs	Time to peak	= 84 min
Time interval	= 2 min	Hyd. volume	= 6,026 cuft
Inflow hyd. No.	= 1 - Pond 3 1HR	Max. Elevation	= 749.07 ft
Reservoir name	= Pond 3	Max. Storage	= 5,744 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

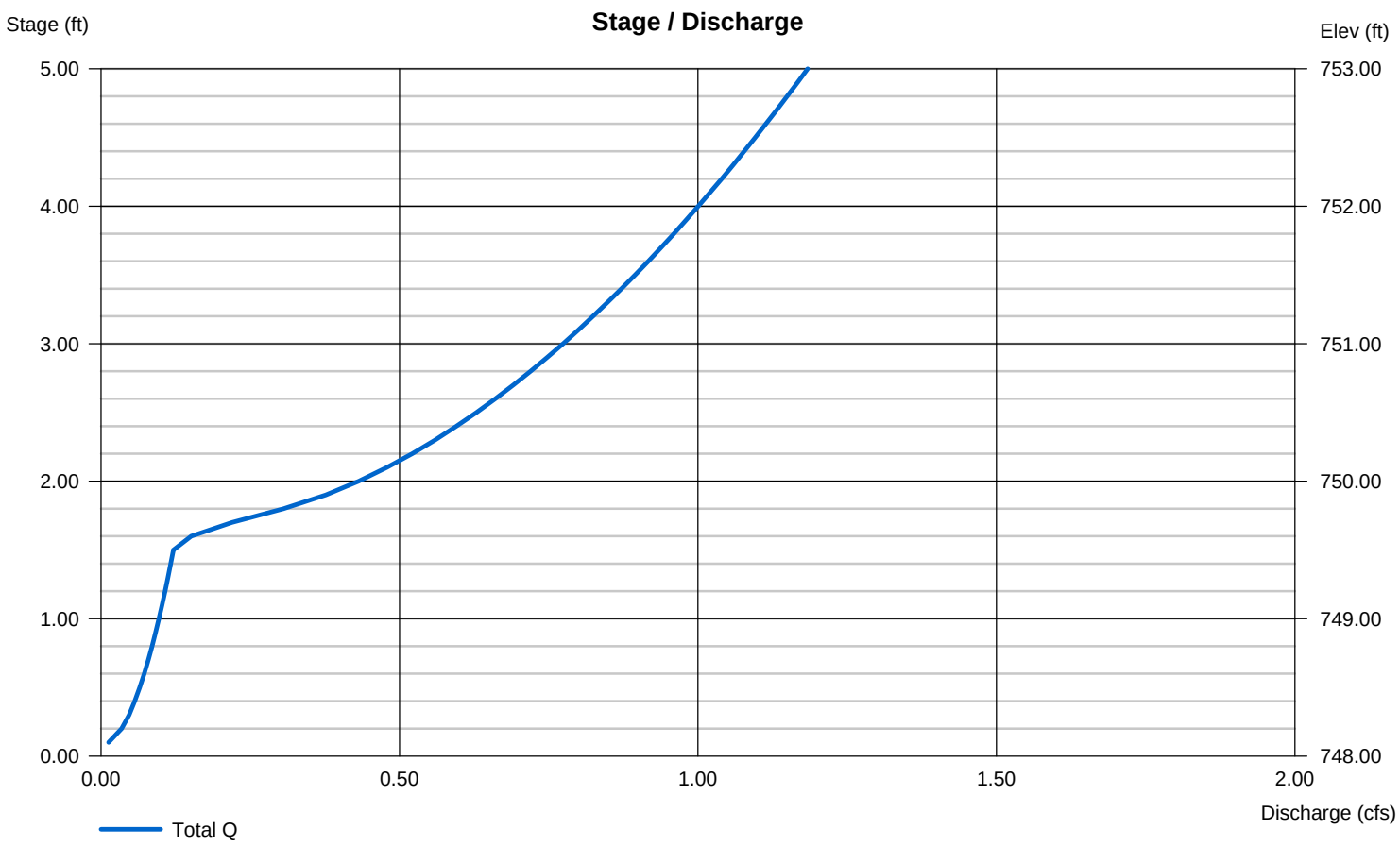
Weir Structures

	[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

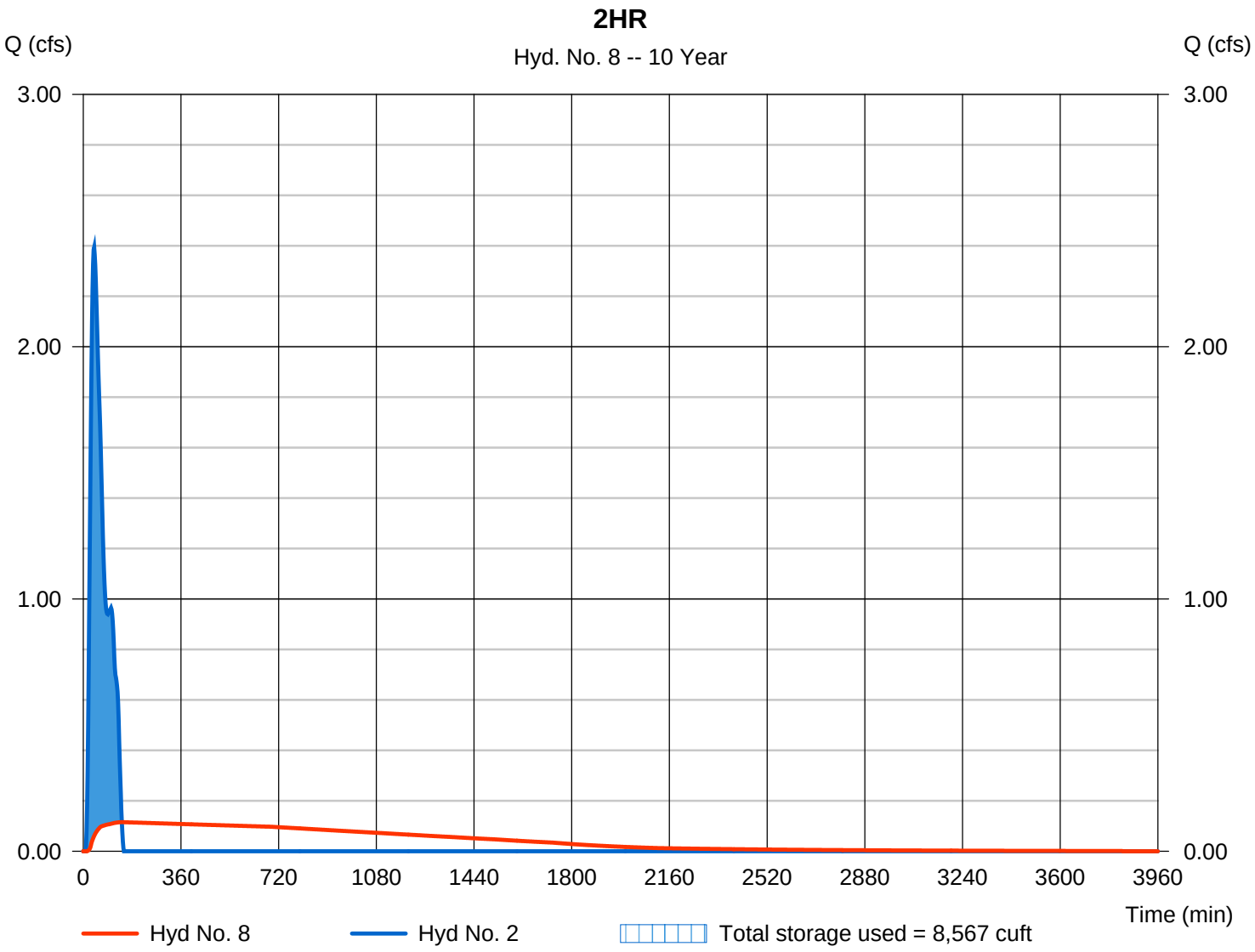
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.115 cfs
Storm frequency	= 10 yrs	Time to peak	= 142 min
Time interval	= 2 min	Hyd. volume	= 9,212 cuft
Inflow hyd. No.	= 2 - Pond 3 2HR	Max. Elevation	= 749.37 ft
Reservoir name	= Pond 3	Max. Storage	= 8,567 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

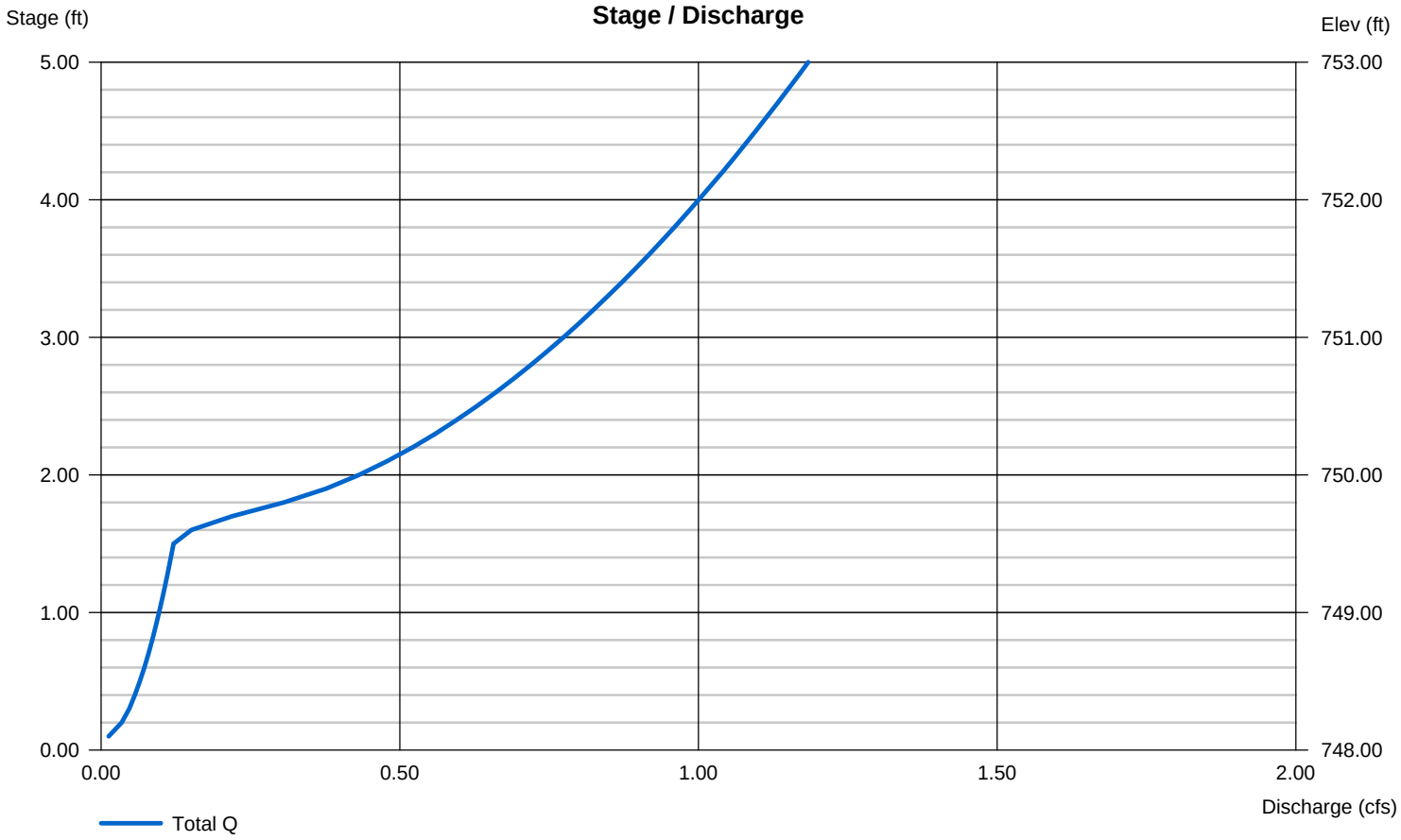
Weir Structures

	[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

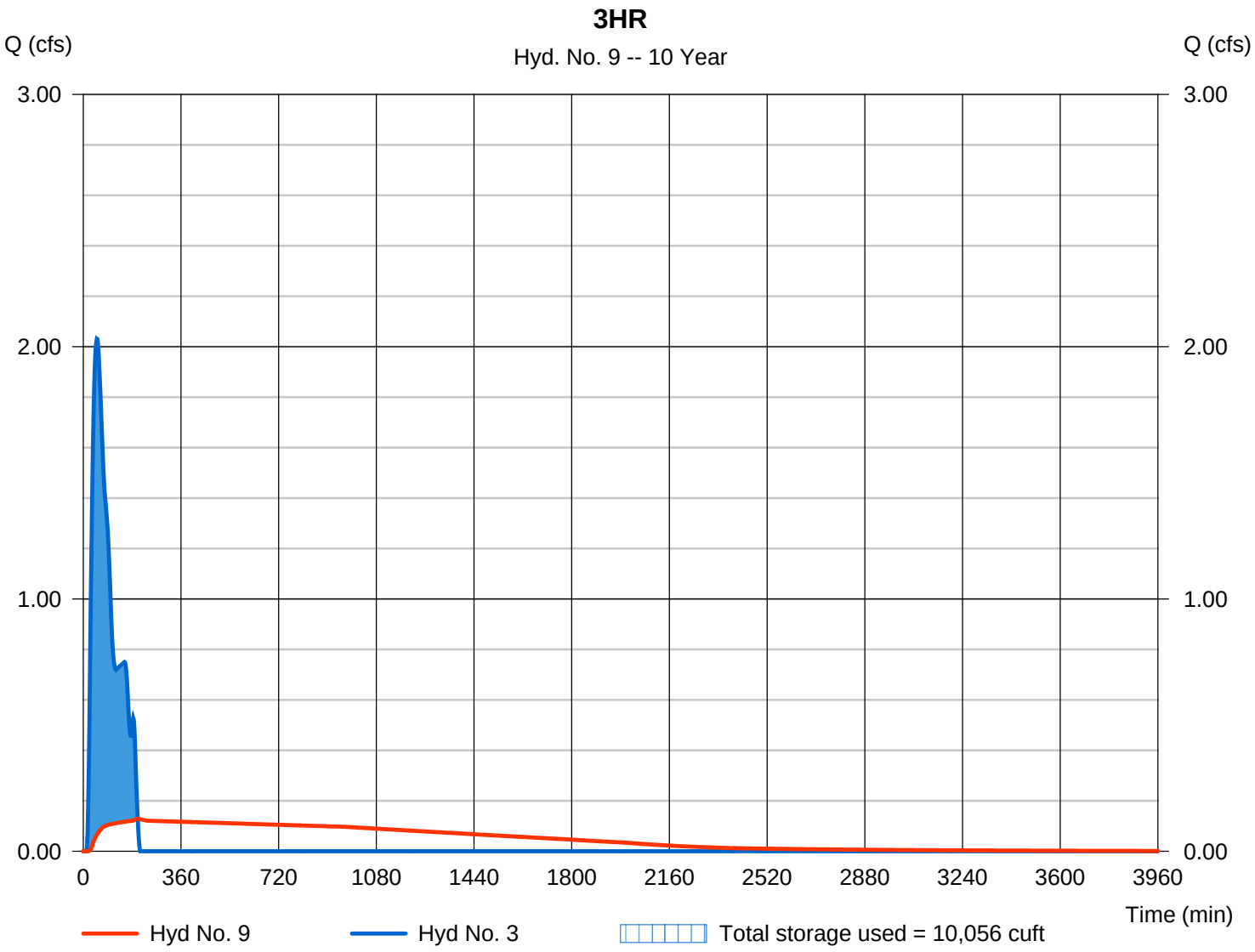
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

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	= 11,080 cuft
Inflow hyd. No.	= 3 - Pond 3 3HR	Max. Elevation	= 749.52 ft
Reservoir name	= Pond 3	Max. Storage	= 10,056 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

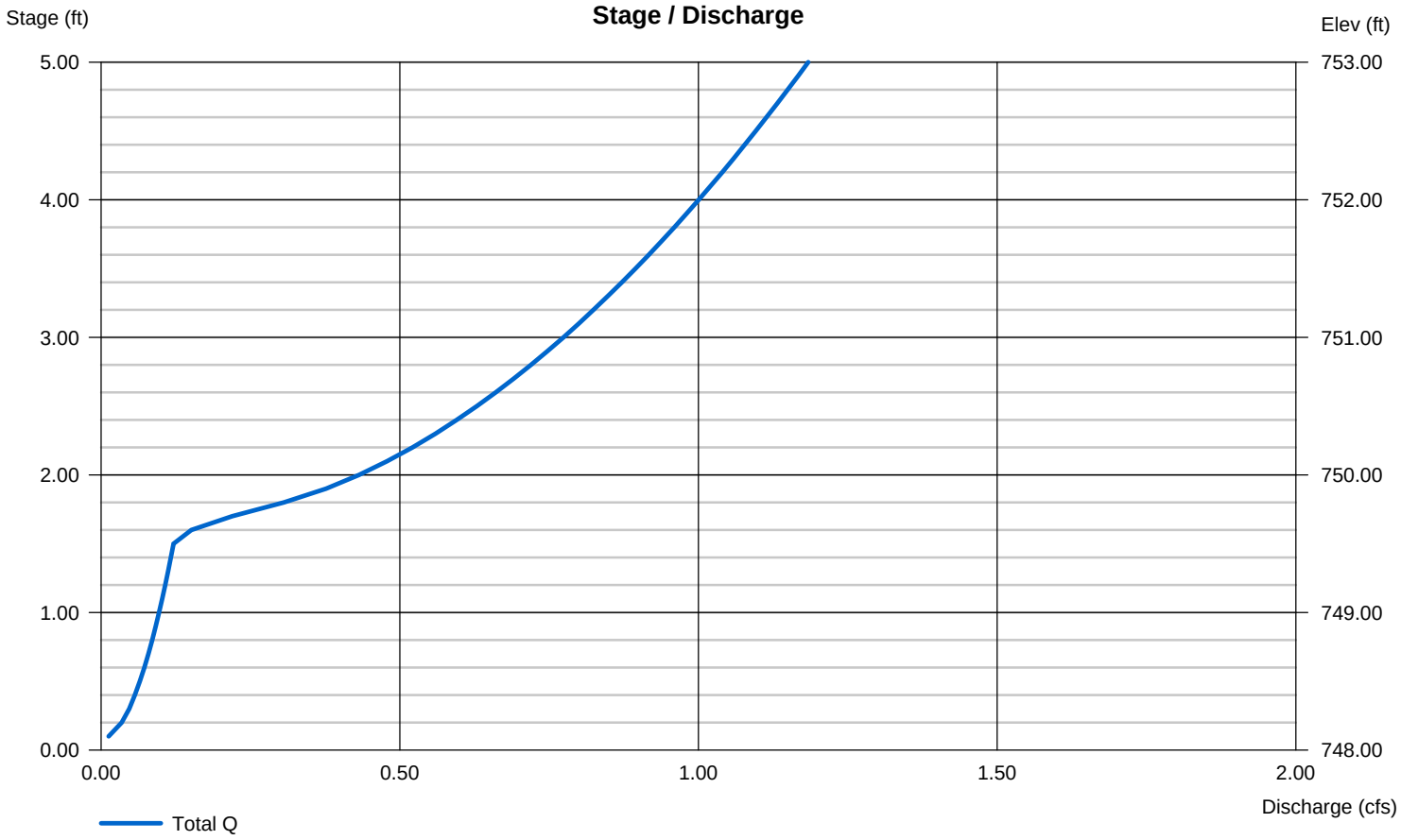
Weir Structures

	[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

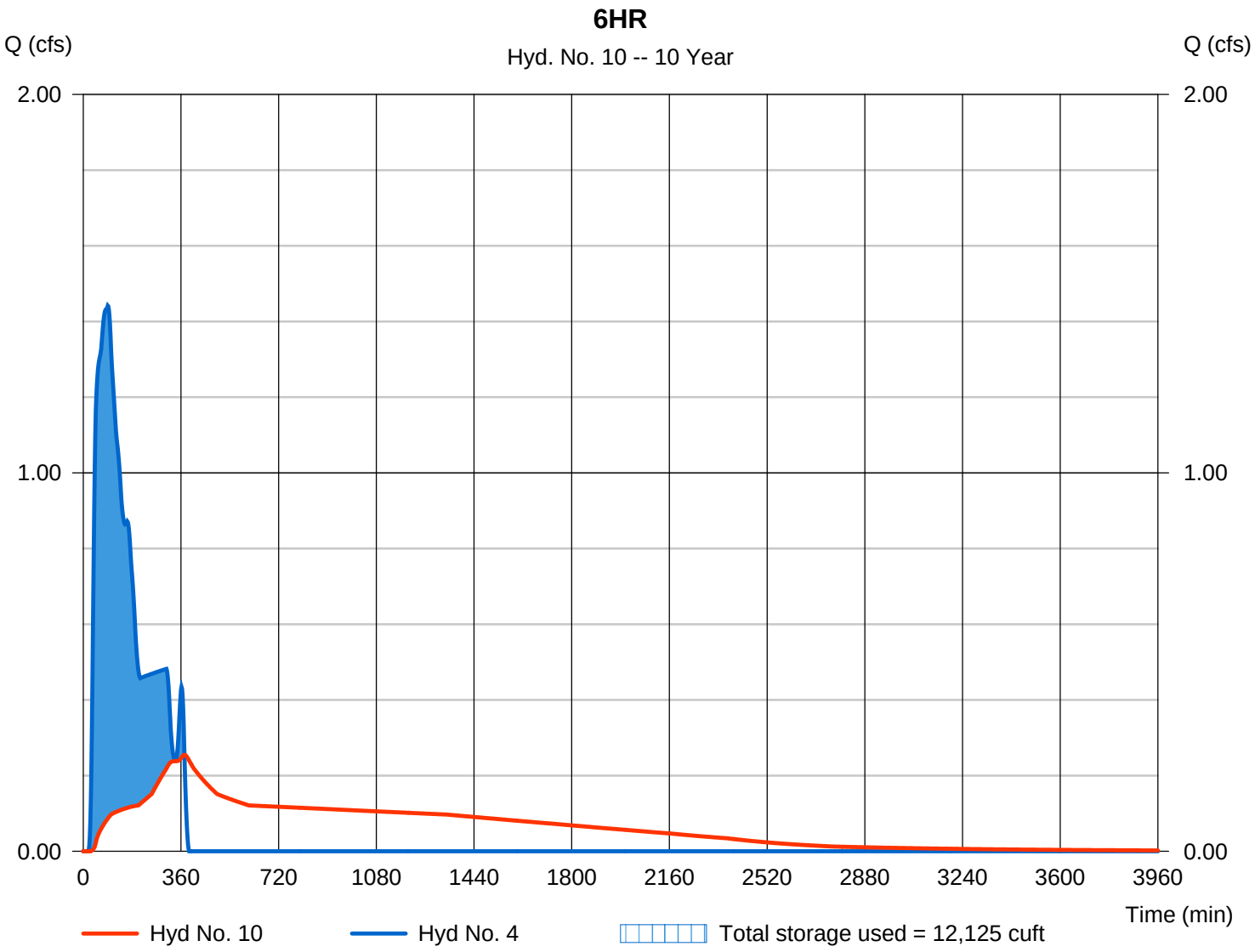
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.255 cfs
Storm frequency	= 10 yrs	Time to peak	= 372 min
Time interval	= 2 min	Hyd. volume	= 15,045 cuft
Inflow hyd. No.	= 4 - Pond 3 6HR	Max. Elevation	= 749.74 ft
Reservoir name	= Pond 3	Max. Storage	= 12,125 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

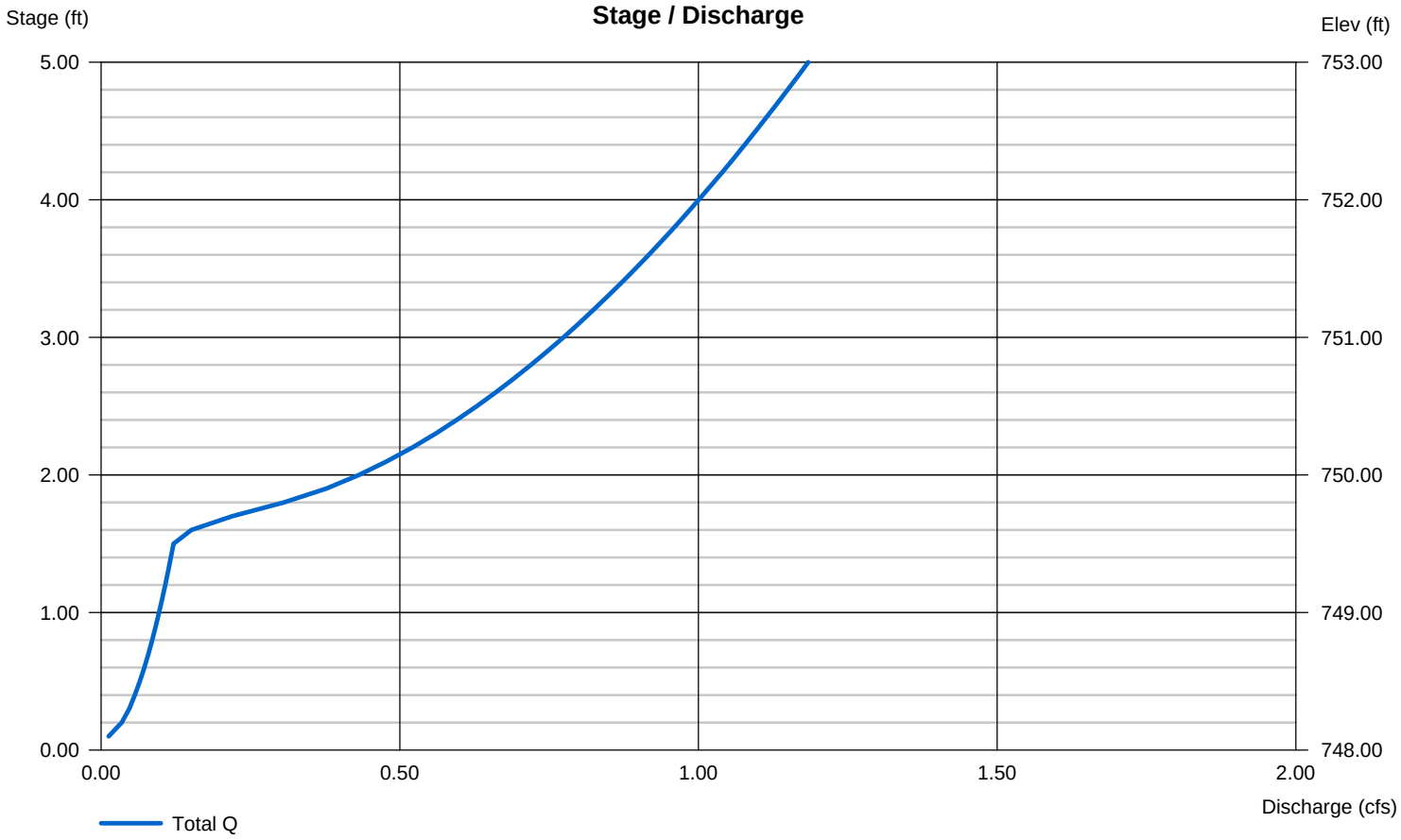
Weir Structures

	[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

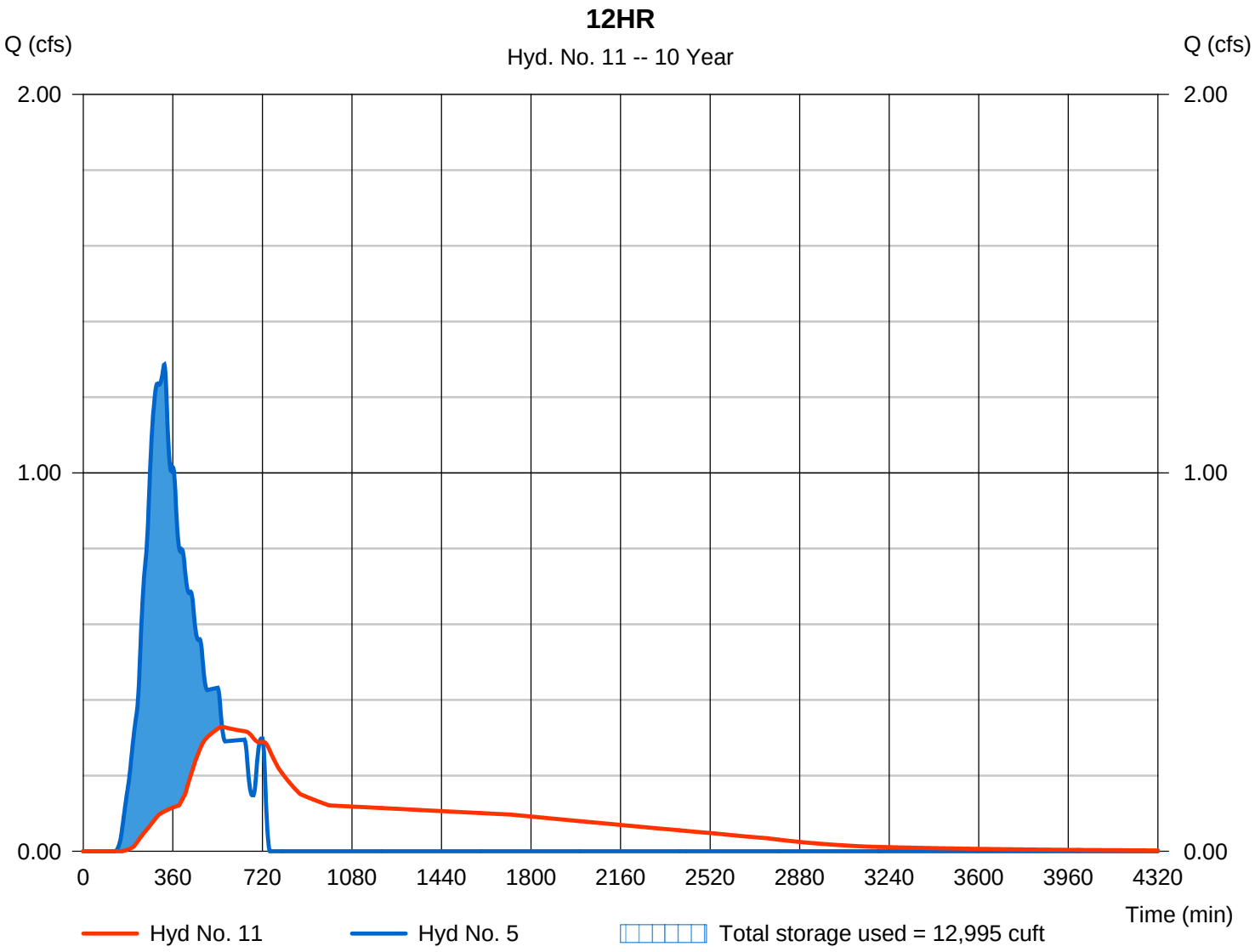
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.329 cfs
Storm frequency	= 10 yrs	Time to peak	= 558 min
Time interval	= 2 min	Hyd. volume	= 19,246 cuft
Inflow hyd. No.	= 5 - Pond 3 12HR	Max. Elevation	= 749.83 ft
Reservoir name	= Pond 3	Max. Storage	= 12,995 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

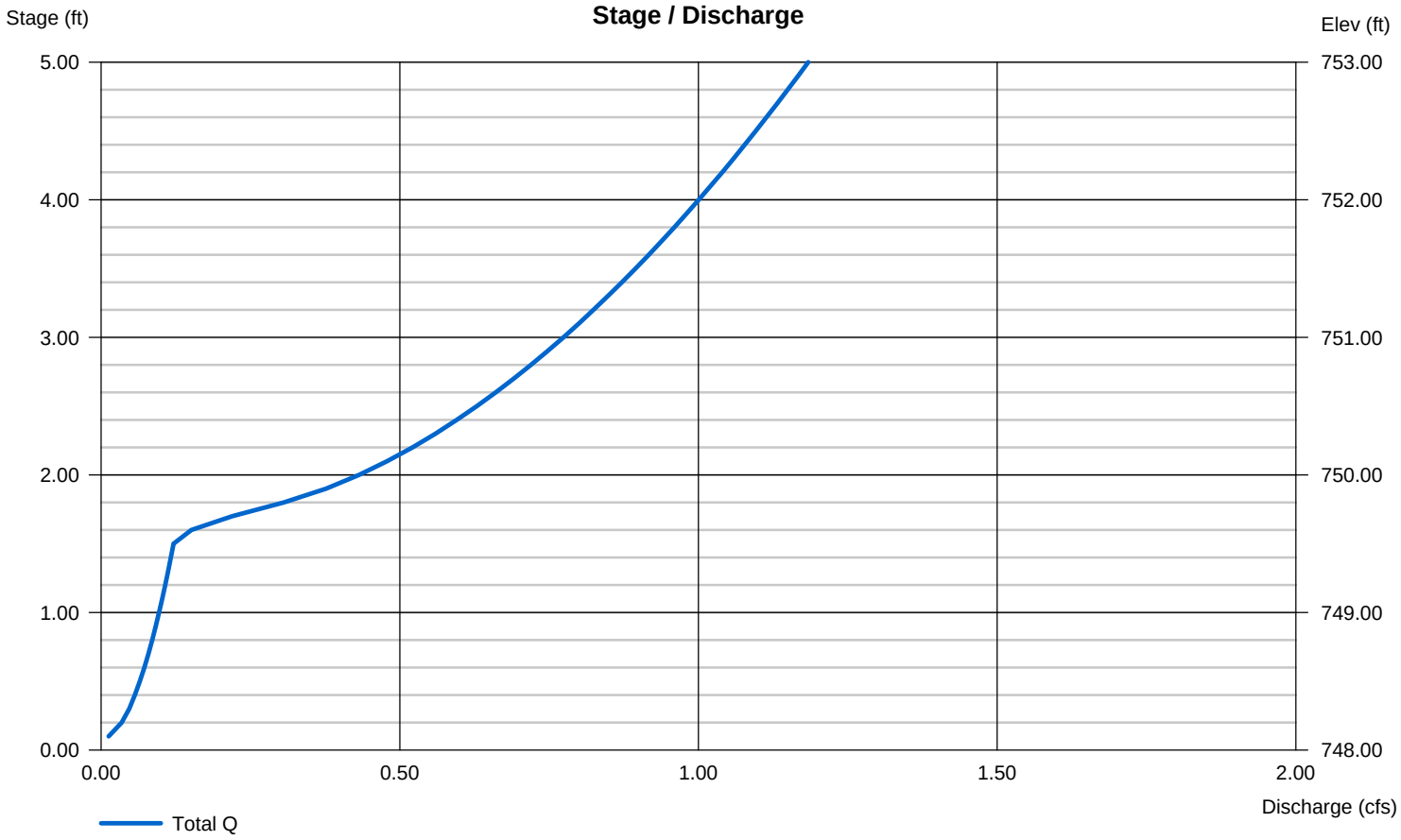
Weir Structures

	[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

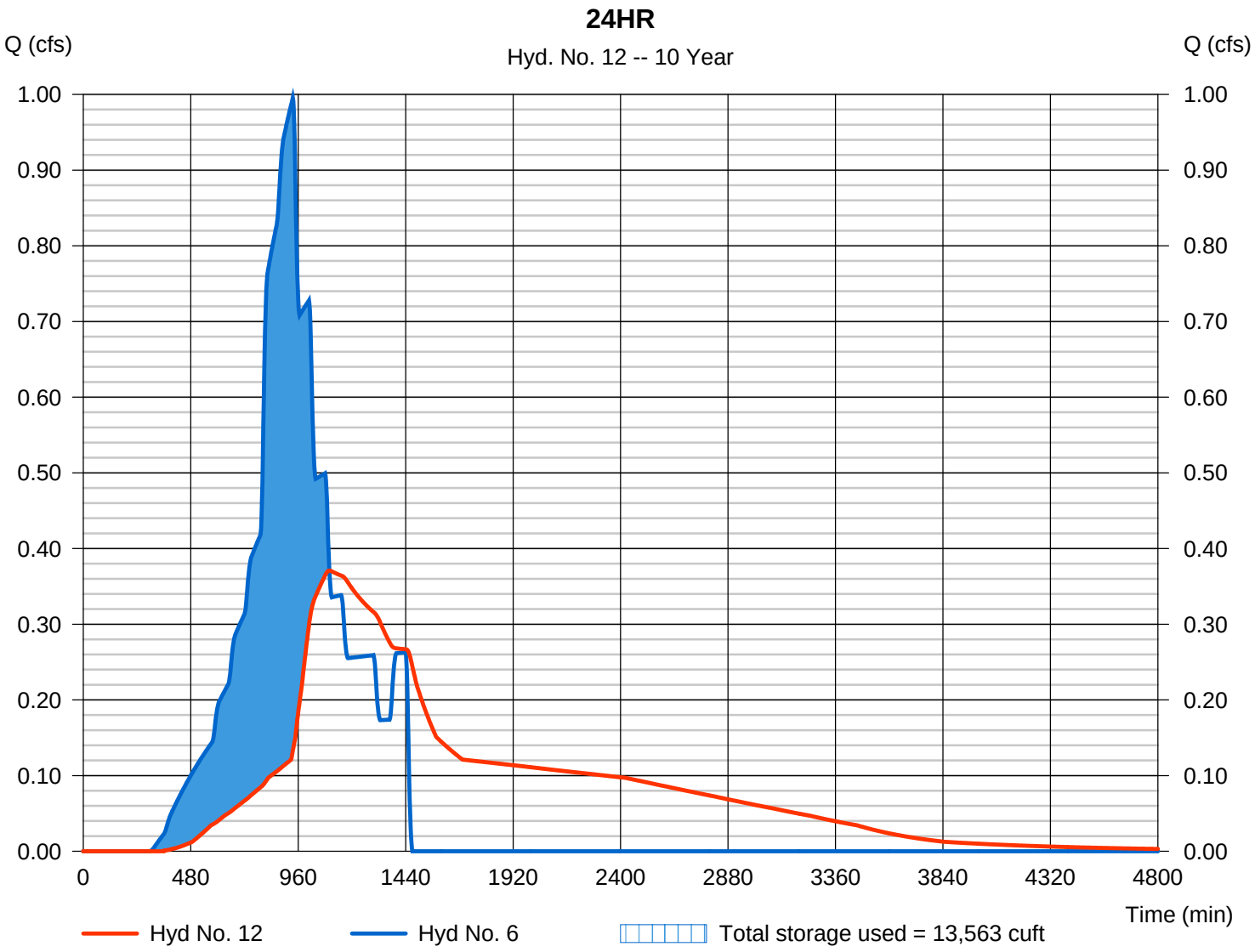
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.371 cfs
Storm frequency	= 10 yrs	Time to peak	= 1100 min
Time interval	= 2 min	Hyd. volume	= 23,630 cuft
Inflow hyd. No.	= 6 - Pond 3 24HR	Max. Elevation	= 749.89 ft
Reservoir name	= Pond 3	Max. Storage	= 13,563 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 748.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	748.00	2,000	0	0
1.00	749.00	8,964	5,066	5,066
2.00	750.00	10,103	9,527	14,592
3.00	751.00	11,299	10,694	25,287
4.00	752.00	12,551	11,918	37,205
5.00	753.00	13,860	13,199	50,404

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)	= 748.00	748.01	749.50	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

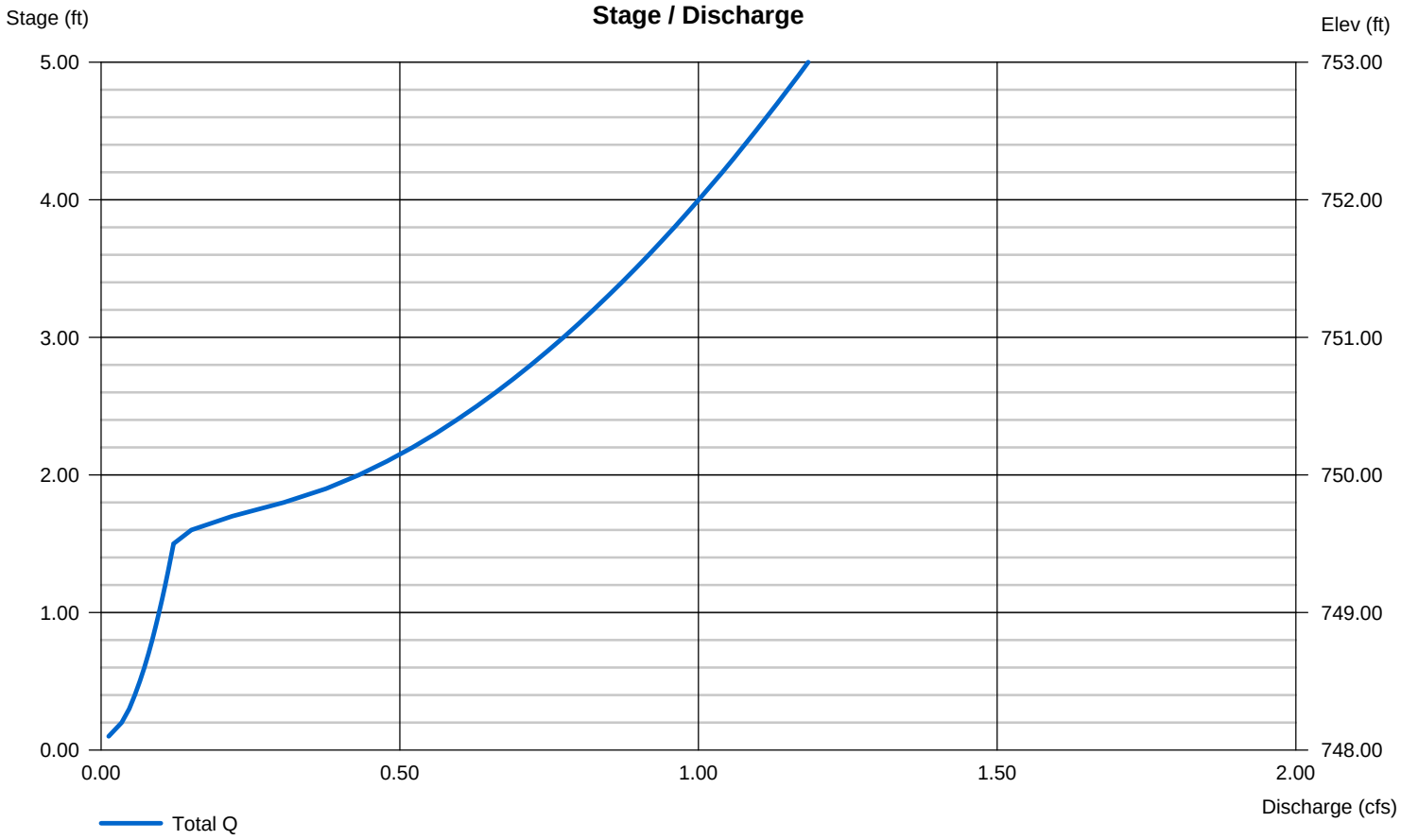
Weir Structures

	[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 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	5.676	2	28	12,997	------	------	------	Pond 3 1HR
2	SCS Runoff	5.017	2	36	18,376	------	------	------	Pond 3 2HR
3	SCS Runoff	4.126	2	44	21,719	------	------	------	Pond 3 3HR
4	SCS Runoff	2.822	2	46	27,622	------	------	------	Pond 3 6HR
5	SCS Runoff	2.202	2	324	34,008	------	------	------	Pond 3 12HR
6	SCS Runoff	1.674	2	936	42,366	------	------	------	Pond 3 24HR
7	Reservoir	0.276	2	82	12,957	1	749.77	12,361	1HR
8	Reservoir	0.501	2	136	18,335	2	750.15	16,215	2HR
9	Reservoir	0.562	2	194	21,678	3	750.31	17,870	3HR
10	Reservoir	0.594	2	318	27,582	4	750.40	18,826	6HR
11	Reservoir	0.646	2	548	33,967	5	750.55	20,505	12HR
12	Reservoir	0.694	2	1092	42,325	6	750.71	22,203	24HR

Hydrograph Report

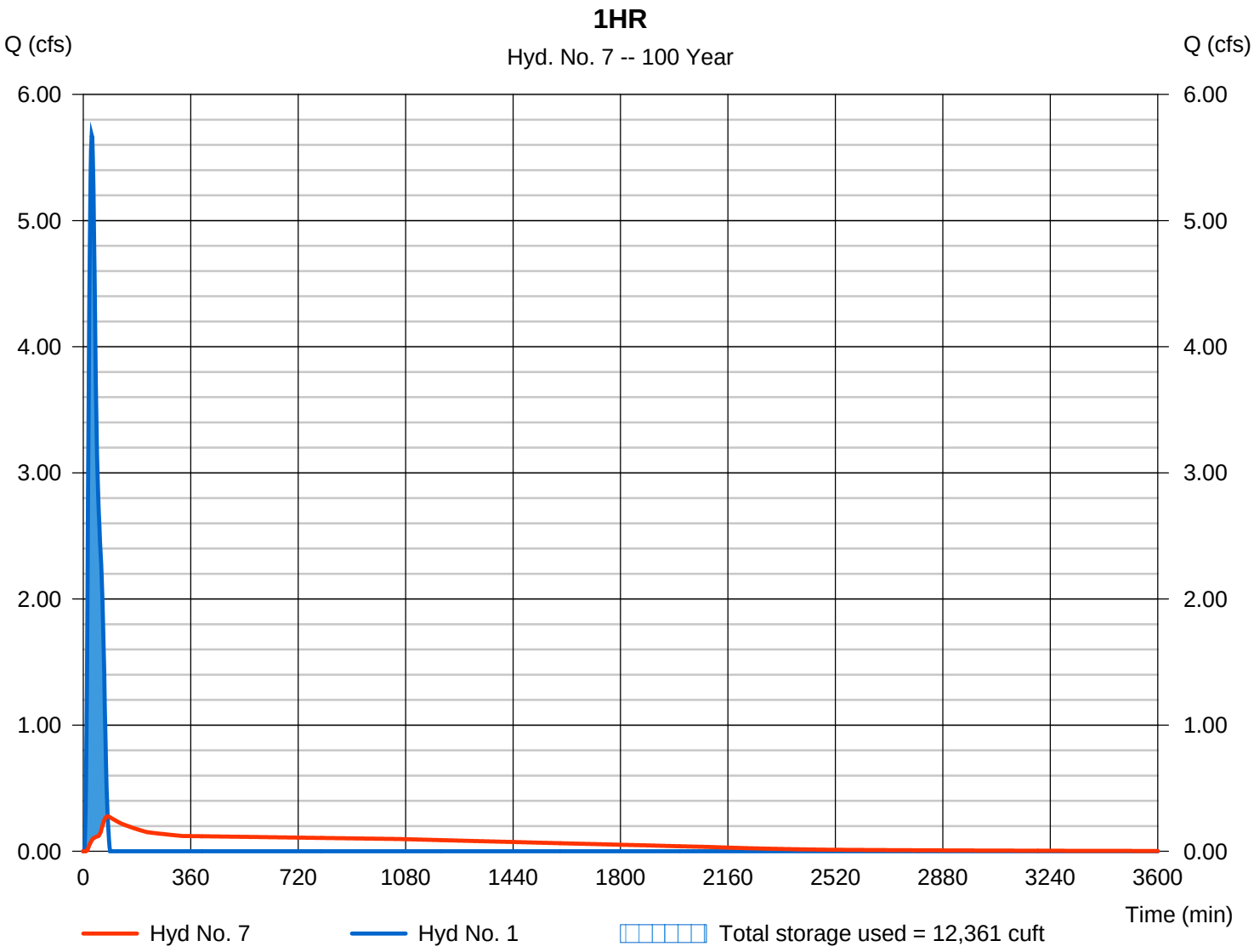
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.276 cfs
Storm frequency	= 100 yrs	Time to peak	= 82 min
Time interval	= 2 min	Hyd. volume	= 12,957 cuft
Inflow hyd. No.	= 1 - Pond 3 1HR	Max. Elevation	= 749.77 ft
Reservoir name	= Pond 3	Max. Storage	= 12,361 cuft

Storage Indication method used.



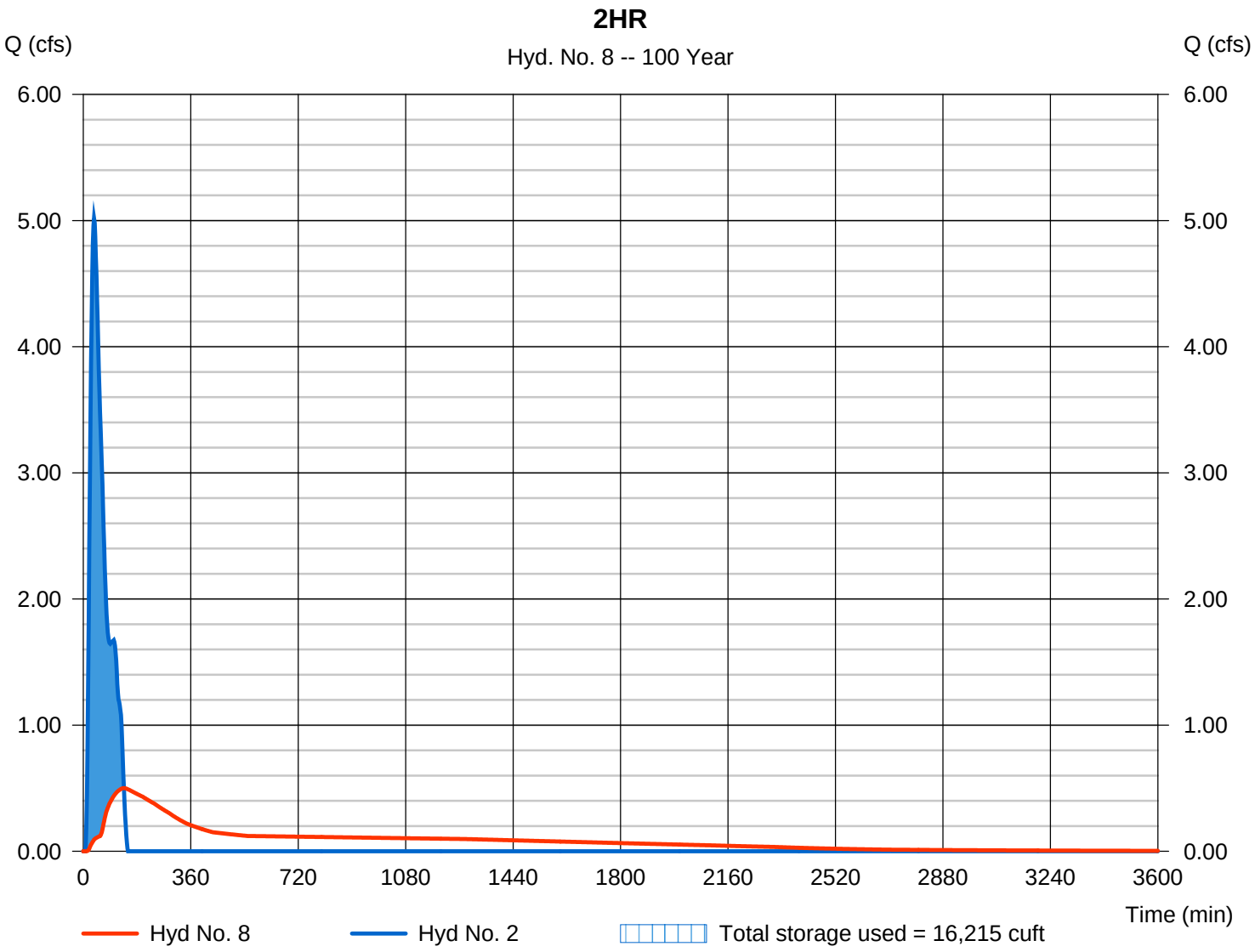
Hydrograph Report

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.501 cfs
Storm frequency	= 100 yrs	Time to peak	= 136 min
Time interval	= 2 min	Hyd. volume	= 18,335 cuft
Inflow hyd. No.	= 2 - Pond 3 2HR	Max. Elevation	= 750.15 ft
Reservoir name	= Pond 3	Max. Storage	= 16,215 cuft

Storage Indication method used.



Hydrograph Report

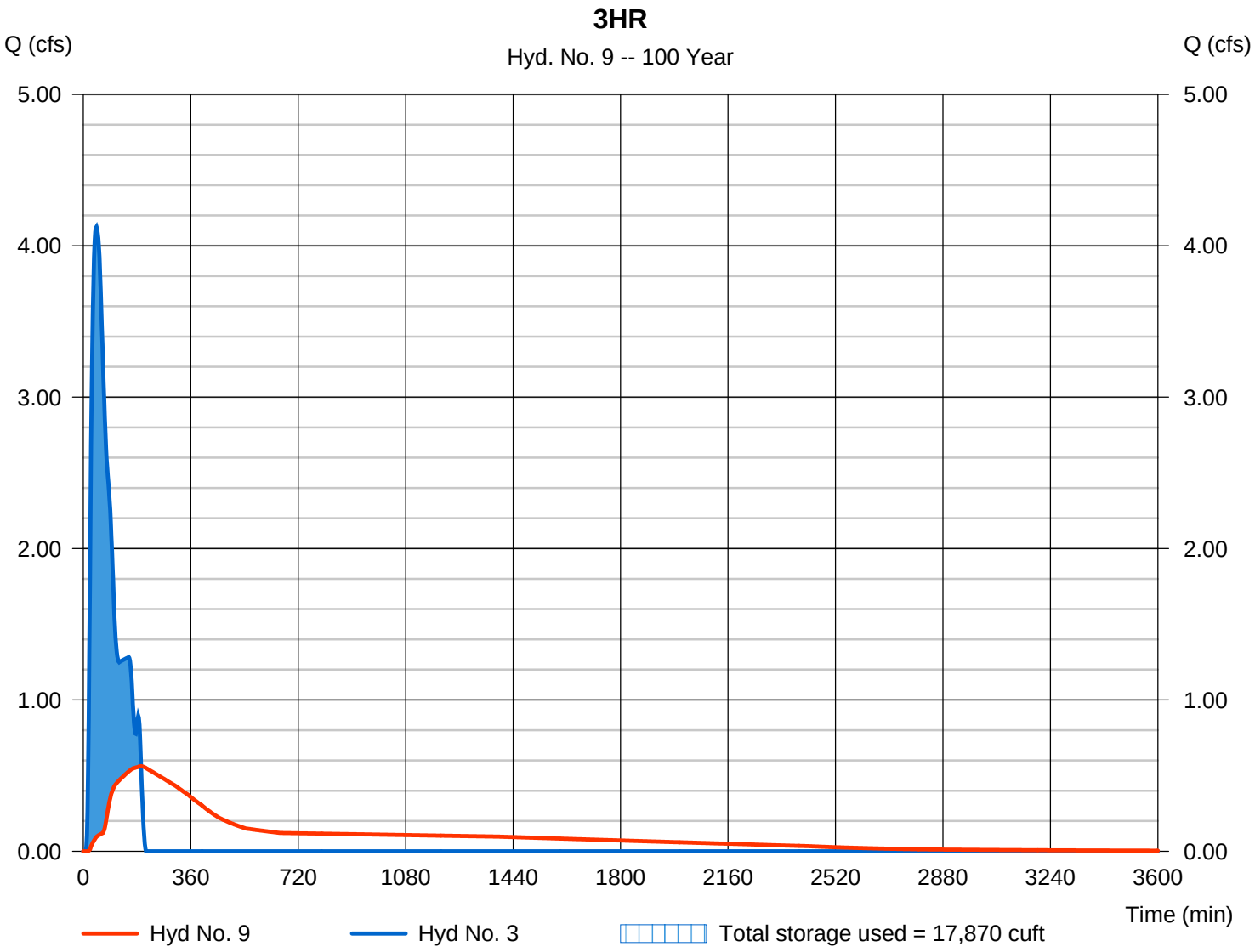
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.562 cfs
Storm frequency	= 100 yrs	Time to peak	= 194 min
Time interval	= 2 min	Hyd. volume	= 21,678 cuft
Inflow hyd. No.	= 3 - Pond 3 3HR	Max. Elevation	= 750.31 ft
Reservoir name	= Pond 3	Max. Storage	= 17,870 cuft

Storage Indication method used.



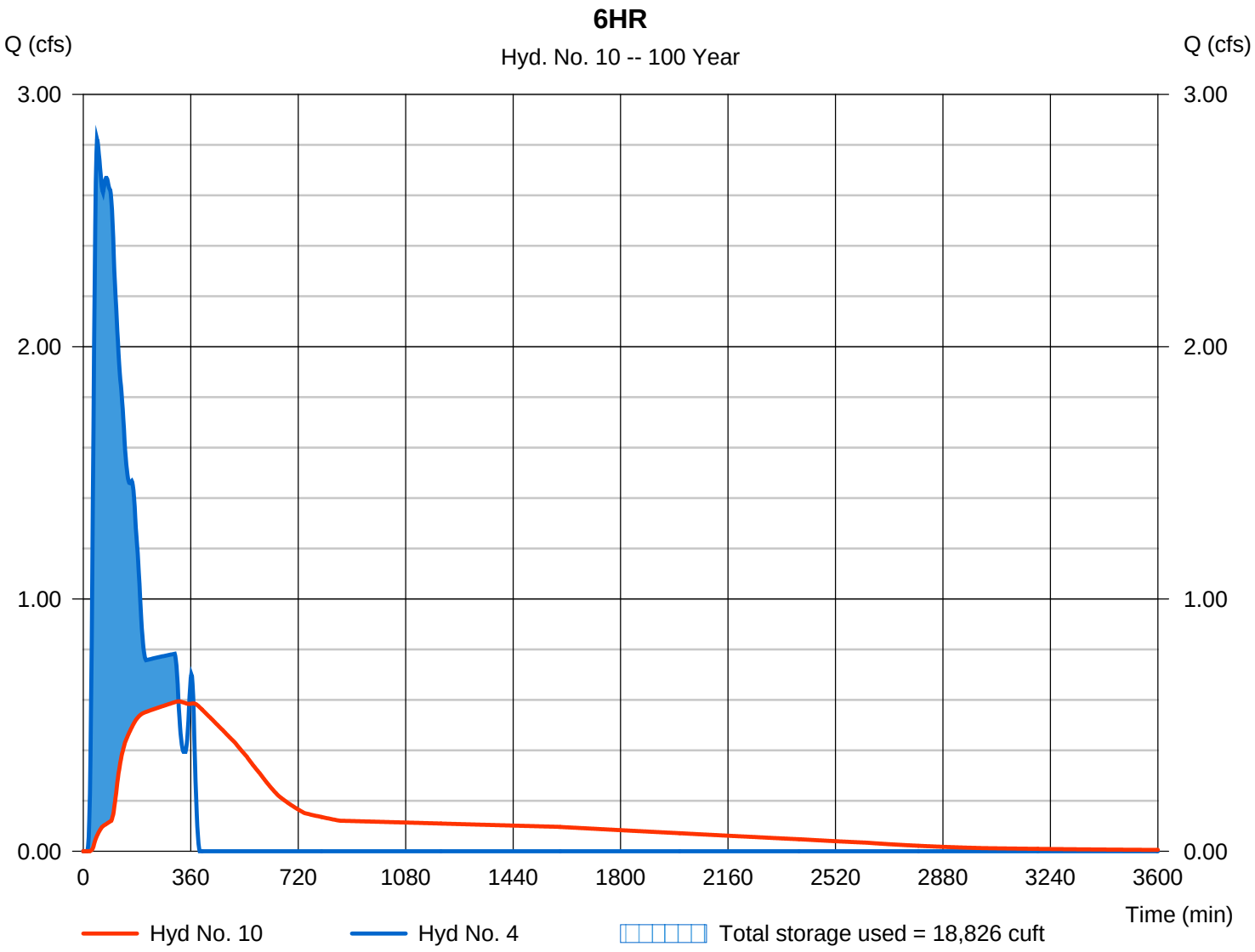
Hydrograph Report

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.594 cfs
Storm frequency	= 100 yrs	Time to peak	= 318 min
Time interval	= 2 min	Hyd. volume	= 27,582 cuft
Inflow hyd. No.	= 4 - Pond 3 6HR	Max. Elevation	= 750.40 ft
Reservoir name	= Pond 3	Max. Storage	= 18,826 cuft

Storage Indication method used.



Hydrograph Report

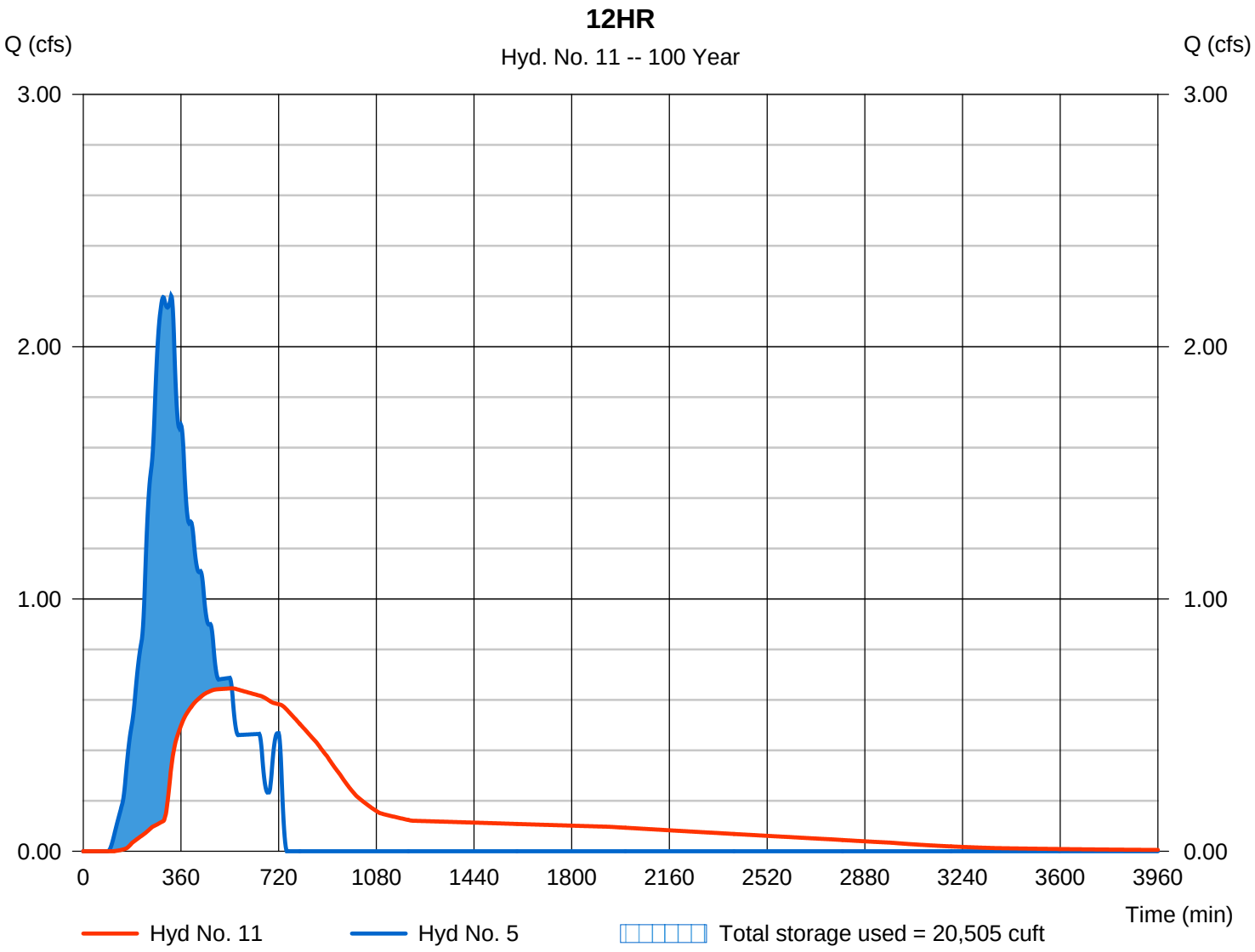
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.646 cfs
Storm frequency	= 100 yrs	Time to peak	= 548 min
Time interval	= 2 min	Hyd. volume	= 33,967 cuft
Inflow hyd. No.	= 5 - Pond 3 12HR	Max. Elevation	= 750.55 ft
Reservoir name	= Pond 3	Max. Storage	= 20,505 cuft

Storage Indication method used.



Hydrograph Report

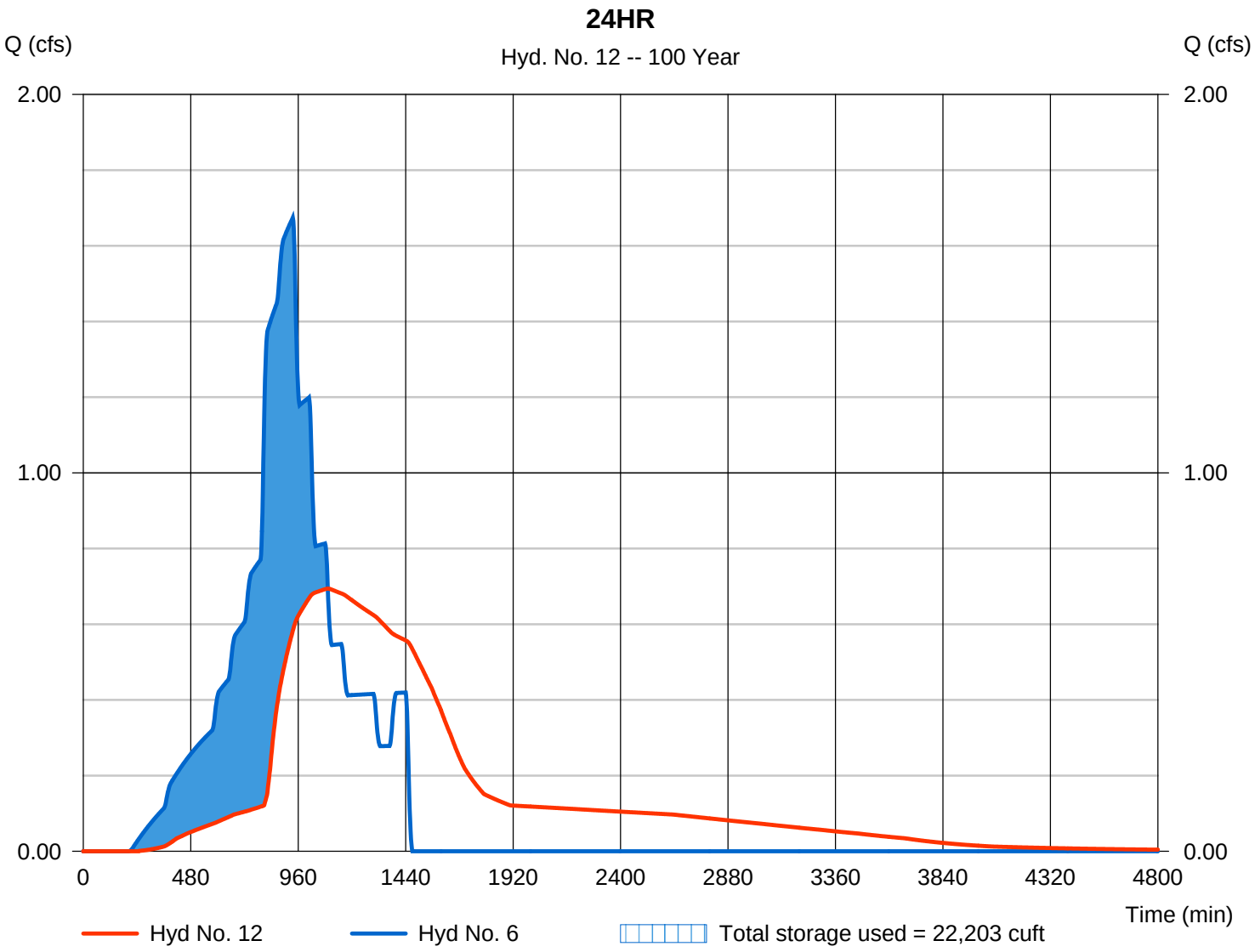
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.694 cfs
Storm frequency	= 100 yrs	Time to peak	= 1092 min
Time interval	= 2 min	Hyd. volume	= 42,325 cuft
Inflow hyd. No.	= 6 - Pond 3 24HR	Max. Elevation	= 750.71 ft
Reservoir name	= Pond 3	Max. Storage	= 22,203 cuft

Storage Indication method used.



Runoff Curve Number

Project	Cumberland Trace	By	VT	Date	1/25/2016
Location	Johnson County Franklin Township	Checked	DJS	Date	1/25/2016

	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	6.27	520.41
			Totals =	11.58	918.66

CN = 79.3

Hydrograph Summary Report

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

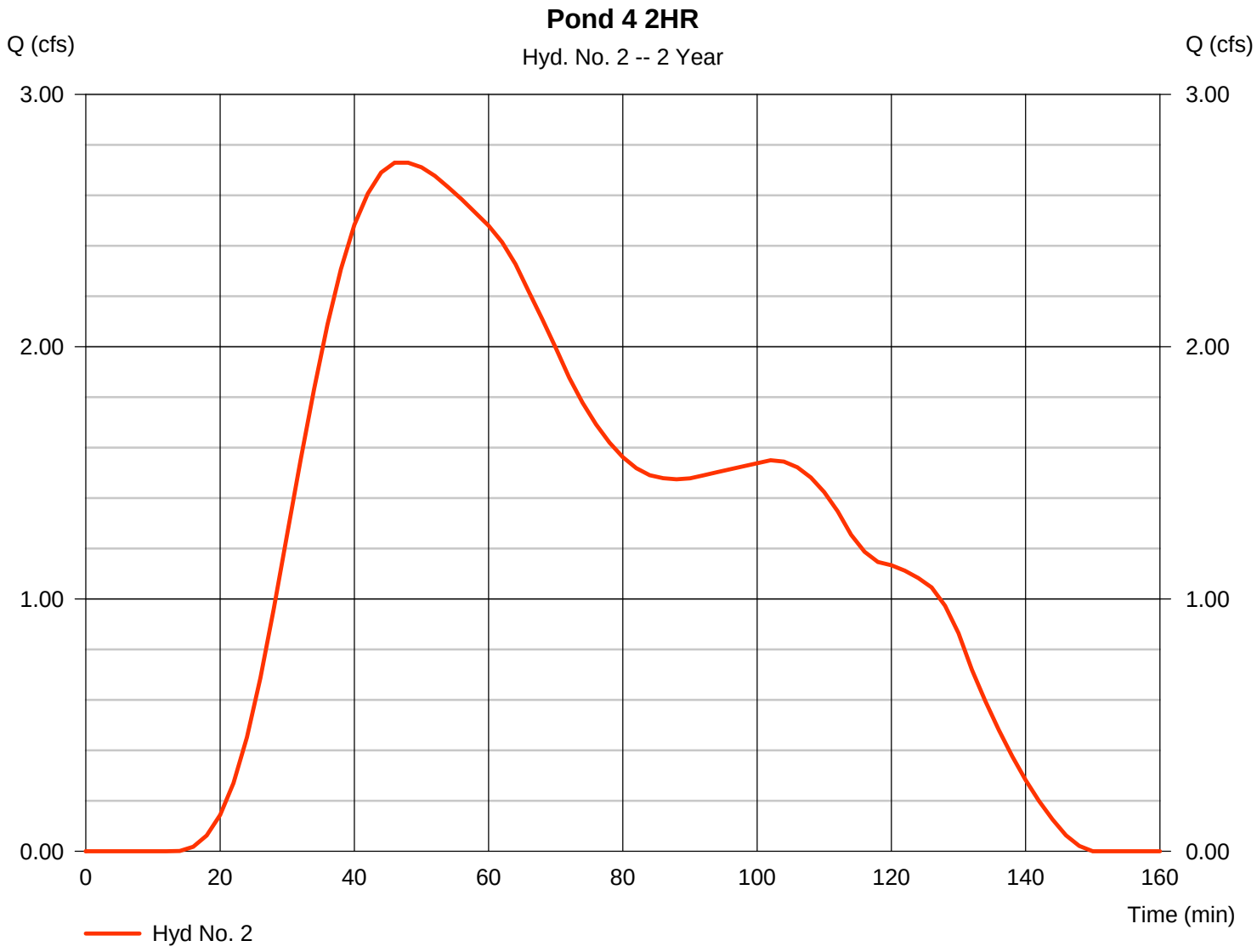
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.648	2	36	6,661	------	------	------	Pond 4 1HR
2	SCS Runoff	2.730	2	46	11,595	------	------	------	Pond 4 2HR
3	SCS Runoff	2.512	2	58	14,941	------	------	------	Pond 4 3HR
4	SCS Runoff	2.026	2	94	21,957	------	------	------	Pond 4 6HR
5	SCS Runoff	2.249	2	326	33,029	------	------	------	Pond 4 12HR
6	SCS Runoff	1.821	2	936	39,878	------	------	------	Pond 4 24HR
7	Reservoir	0.058	2	86	5,076	1	747.99	6,522	1HR
8	Reservoir	0.083	2	146	9,870	2	748.31	11,200	2HR
9	Reservoir	0.096	2	204	13,110	3	748.51	14,261	3HR
10	Reservoir	0.117	2	382	19,849	4	748.92	20,275	6HR
11	Reservoir	0.141	2	738	29,560	5	749.49	29,786	12HR
12	Reservoir	0.152	2	1458	32,963	6	749.78	34,715	24HR
13	SCS Runoff	1.028	2	936	21,470	------	------	------	Pond 4 WQ
14	Reservoir	0.108	2	1456	18,898	13	748.74	18,200	Pond 4 WQ

Hydrograph Report

Hyd. No. 2

Pond 4 2HR

Hydrograph type	= SCS Runoff	Peak discharge	= 2.730 cfs
Storm frequency	= 2 yrs	Time to peak	= 46 min
Time interval	= 2 min	Hyd. volume	= 11,595 cuft
Drainage area	= 11.580 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.	= 1.52 in	Distribution	= Huff-1st
Storm duration	= 2.00 hrs	Shape factor	= 484



Hydrograph Summary Report

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

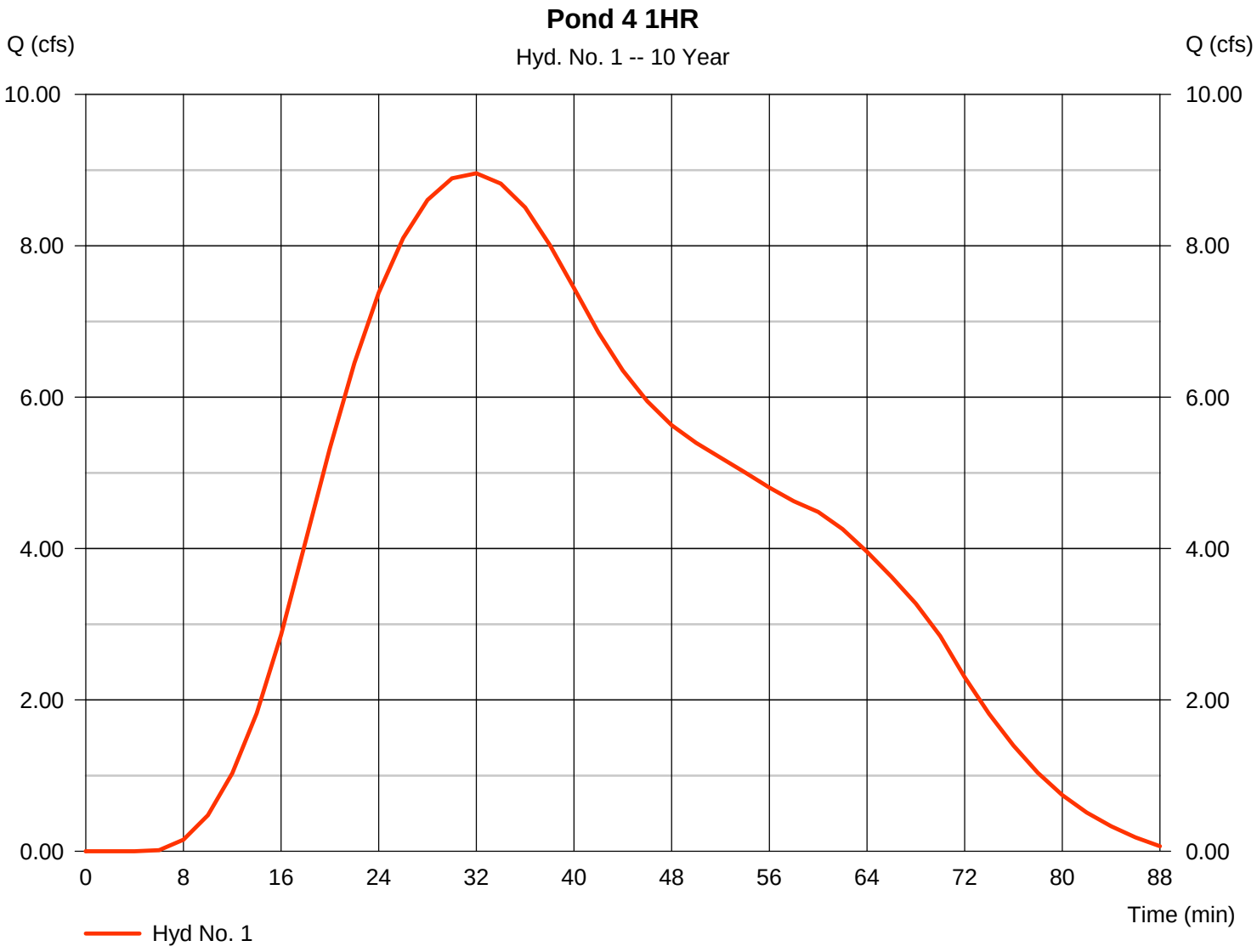
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.958	2	32	21,311	------	------	------	Pond 4 1HR
2	SCS Runoff	8.475	2	40	33,029	------	------	------	Pond 4 2HR
3	SCS Runoff	7.244	2	52	39,839	------	------	------	Pond 4 3HR
4	SCS Runoff	5.201	2	90	54,464	------	------	------	Pond 4 6HR
5	SCS Runoff	4.688	2	326	70,009	------	------	------	Pond 4 12HR
6	SCS Runoff	3.662	2	936	86,267	------	------	------	Pond 4 24HR
7	Reservoir	0.119	2	88	19,269	1	748.96	20,937	1HR
8	Reservoir	0.118	2	146	19,411	2	748.96	20,833	2HR
9	Reservoir	0.160	2	206	35,484	3	750.01	38,513	3HR
10	Reservoir	0.288	2	380	45,440	4	750.67	51,321	6HR
11	Reservoir	0.855	2	660	58,342	5	751.00	57,506	12HR
12	Reservoir	1.065	2	1168	70,516	6	751.10	59,813	24HR
13	SCS Runoff	3.662	2	936	86,267	------	------	------	Pond 4 WQ
14	Reservoir	1.928	2	1030	78,752	13	750.28	46,619	Pond 4 WQ

Hydrograph Report

Hyd. No. 1

Pond 4 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 8.958 cfs
Storm frequency	= 10 yrs	Time to peak	= 32 min
Time interval	= 2 min	Hyd. volume	= 21,311 cuft
Drainage area	= 11.580 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.	= 1.96 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



Hydrograph Summary Report

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

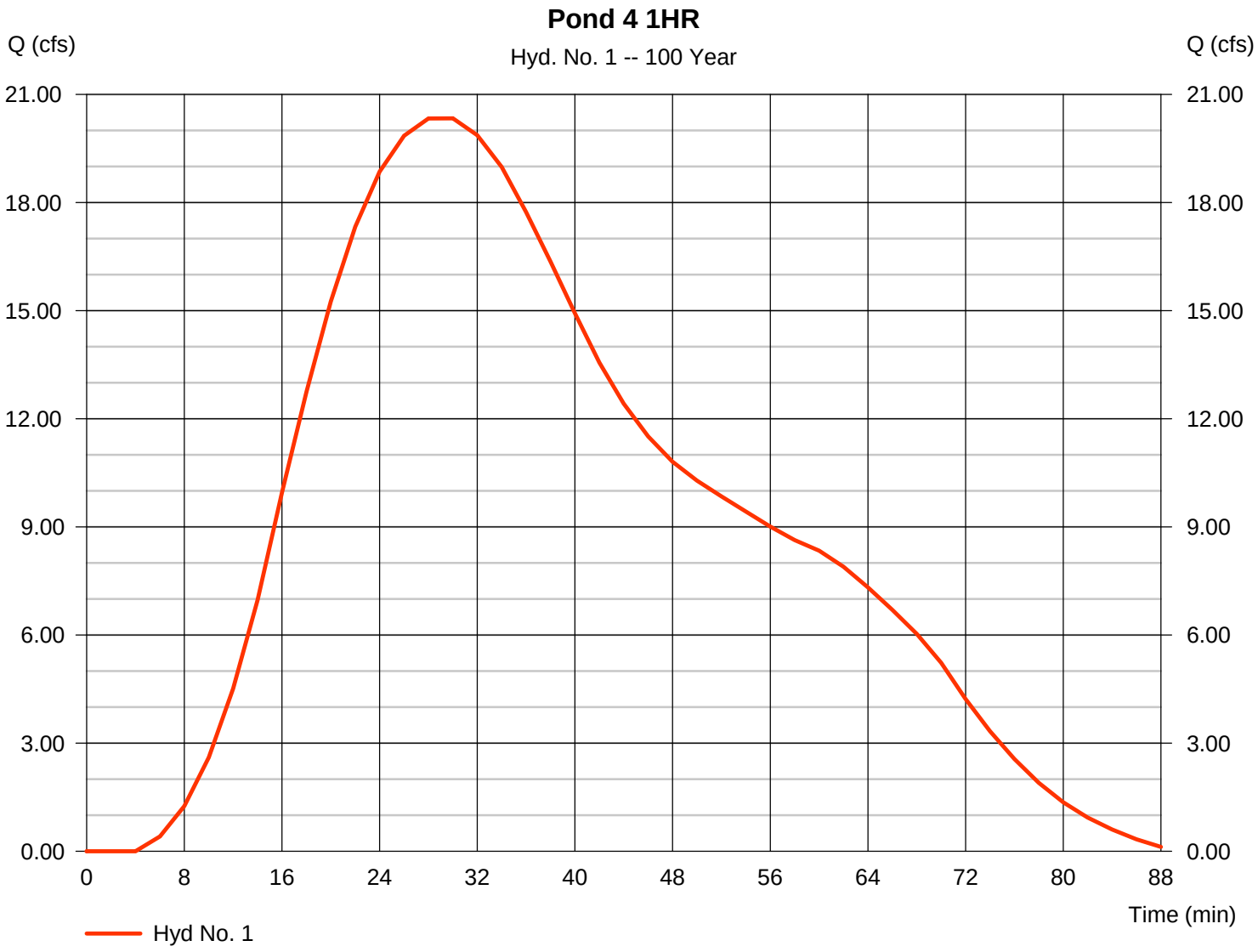
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	20.34	2	30	46,880	------	------	------	Pond 4 1HR
2	SCS Runoff	18.05	2	36	66,684	------	------	------	Pond 4 2HR
3	SCS Runoff	14.91	2	44	79,064	------	------	------	Pond 4 3HR
4	SCS Runoff	9.994	2	46	100,939	------	------	------	Pond 4 6HR
5	SCS Runoff	8.117	2	324	124,746	------	------	------	Pond 4 12HR
6	SCS Runoff	6.217	2	936	155,953	------	------	------	Pond 4 24HR
7	Reservoir	0.173	2	88	40,630	1	750.41	46,275	1HR
8	Reservoir	0.172	2	146	40,635	2	750.39	45,950	2HR
9	Reservoir	1.660	2	196	69,161	3	751.60	70,454	3HR
10	Reservoir	1.903	2	324	89,939	4	751.86	76,241	6HR
11	Reservoir	2.133	2	554	111,839	5	752.16	82,969	12HR
12	Reservoir	2.392	2	1096	138,793	6	752.53	91,821	24HR
13	SCS Runoff	6.217	2	936	155,953	------	------	------	Pond 4 WQ
14	Reservoir	3.764	2	1020	148,192	13	751.26	68,718	Pond 4 WQ

Hydrograph Report

Hyd. No. 1

Pond 4 1HR

Hydrograph type	= SCS Runoff	Peak discharge	= 20.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 30 min
Time interval	= 2 min	Hyd. volume	= 46,880 cuft
Drainage area	= 11.580 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.	= 2.88 in	Distribution	= Huff-1st
Storm duration	= 1.00 hrs	Shape factor	= 484



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	2.648	2	36	6,661	------	------	------	Pond 4 1HR
2	SCS Runoff	2.730	2	46	11,595	------	------	------	Pond 4 2HR
3	SCS Runoff	2.512	2	58	14,941	------	------	------	Pond 4 3HR
4	SCS Runoff	2.026	2	94	21,957	------	------	------	Pond 4 6HR
5	SCS Runoff	2.249	2	326	33,029	------	------	------	Pond 4 12HR
6	SCS Runoff	1.821	2	936	39,878	------	------	------	Pond 4 24HR
7	Reservoir	0.058	2	86	5,076	1	747.99	6,522	1HR
8	Reservoir	0.083	2	146	9,870	2	748.31	11,200	2HR
9	Reservoir	0.096	2	204	13,110	3	748.51	14,261	3HR
10	Reservoir	0.117	2	382	19,849	4	748.92	20,275	6HR
11	Reservoir	0.141	2	738	29,560	5	749.49	29,786	12HR
12	Reservoir	0.152	2	1458	32,963	6	749.78	34,715	24HR
13	SCS Runoff	1.028	2	936	21,470	------	------	------	Pond 4 WQ
14	Reservoir	0.108	2	1456	18,898	13	748.74	18,200	Pond 4 WQ

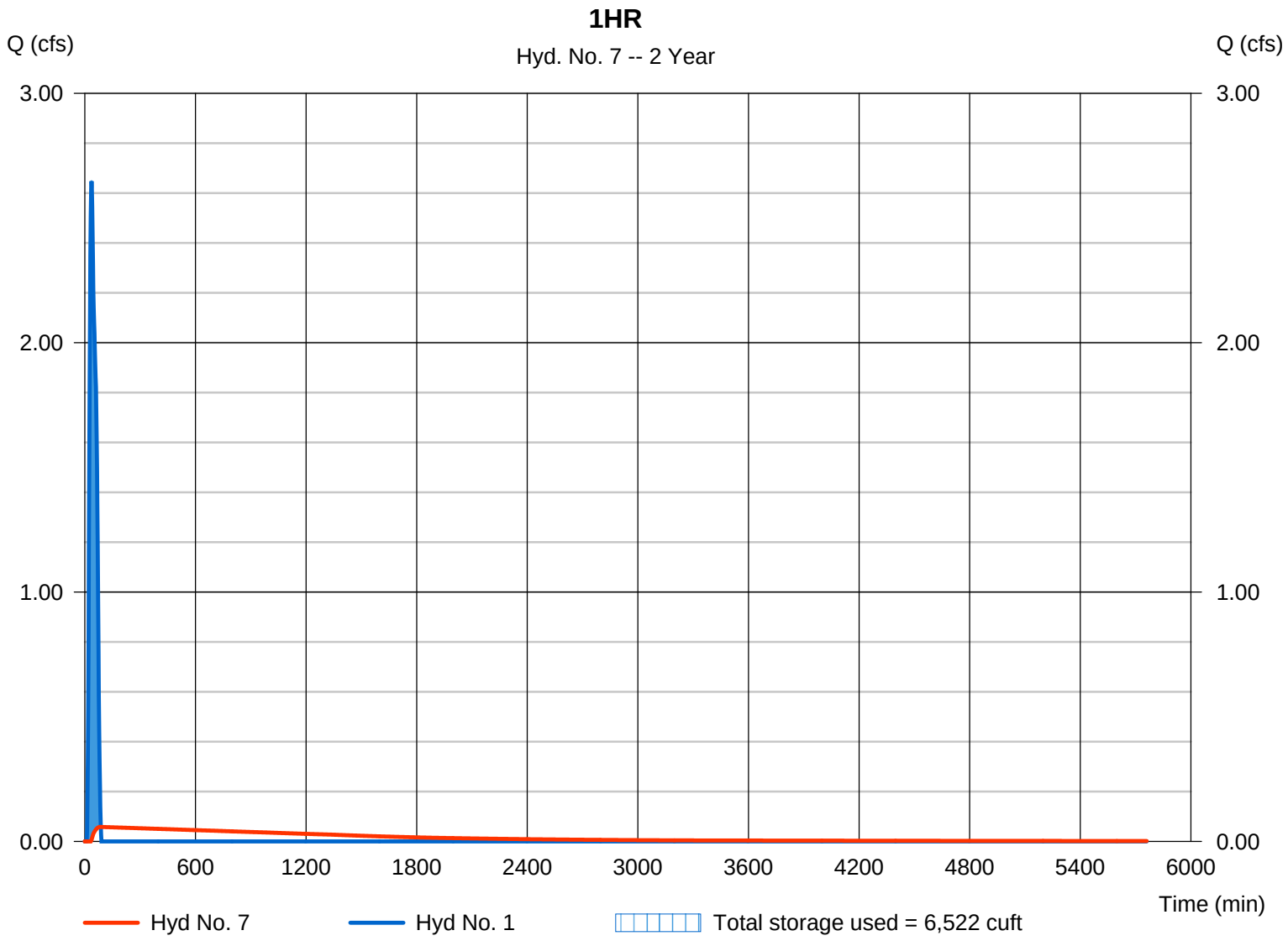
Hydrograph Report

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.058 cfs
Storm frequency	= 2 yrs	Time to peak	= 86 min
Time interval	= 2 min	Hyd. volume	= 5,076 cuft
Inflow hyd. No.	= 1 - Pond 4 1HR	Max. Elevation	= 747.99 ft
Reservoir name	= Pond 4	Max. Storage	= 6,522 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

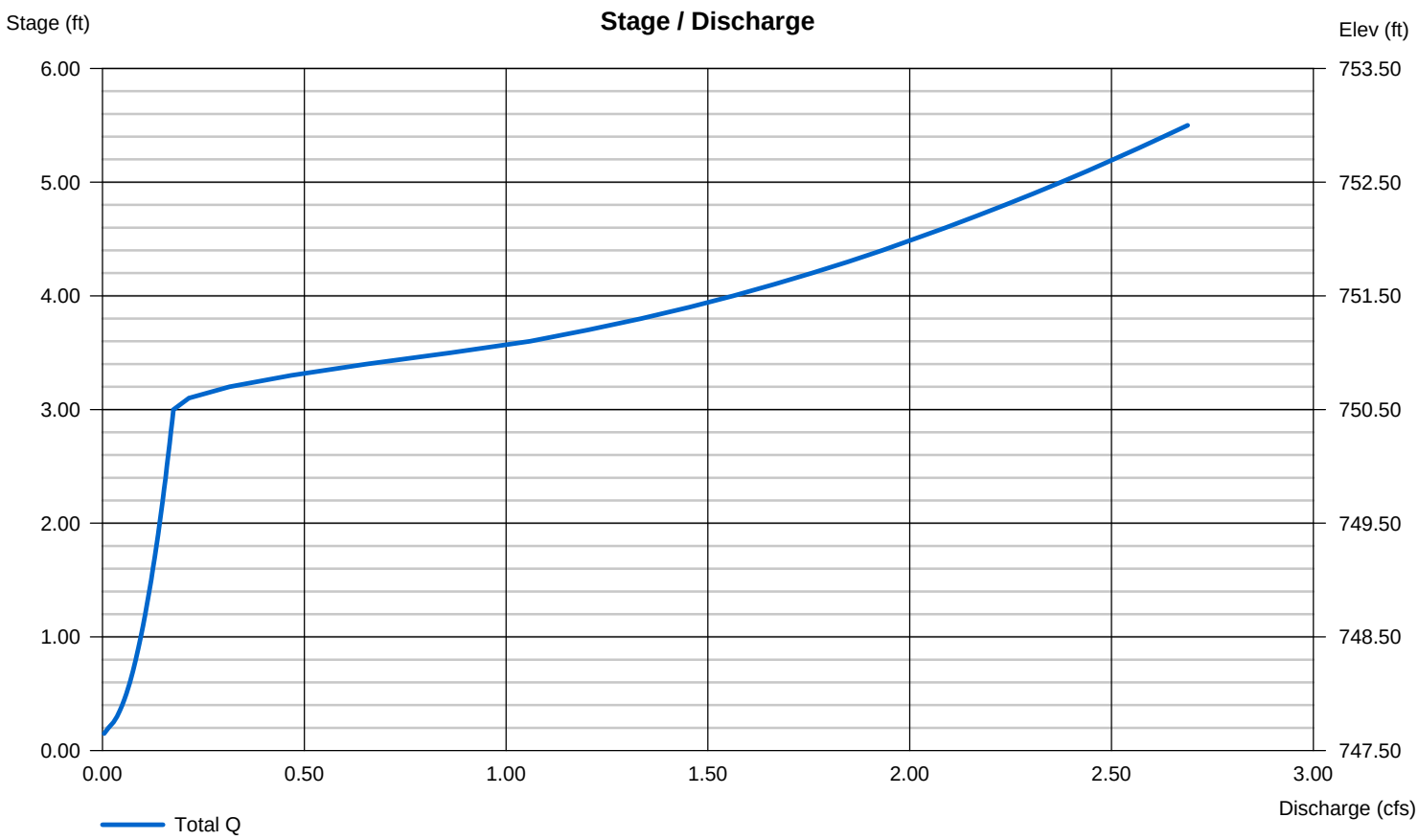
Weir Structures

	[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

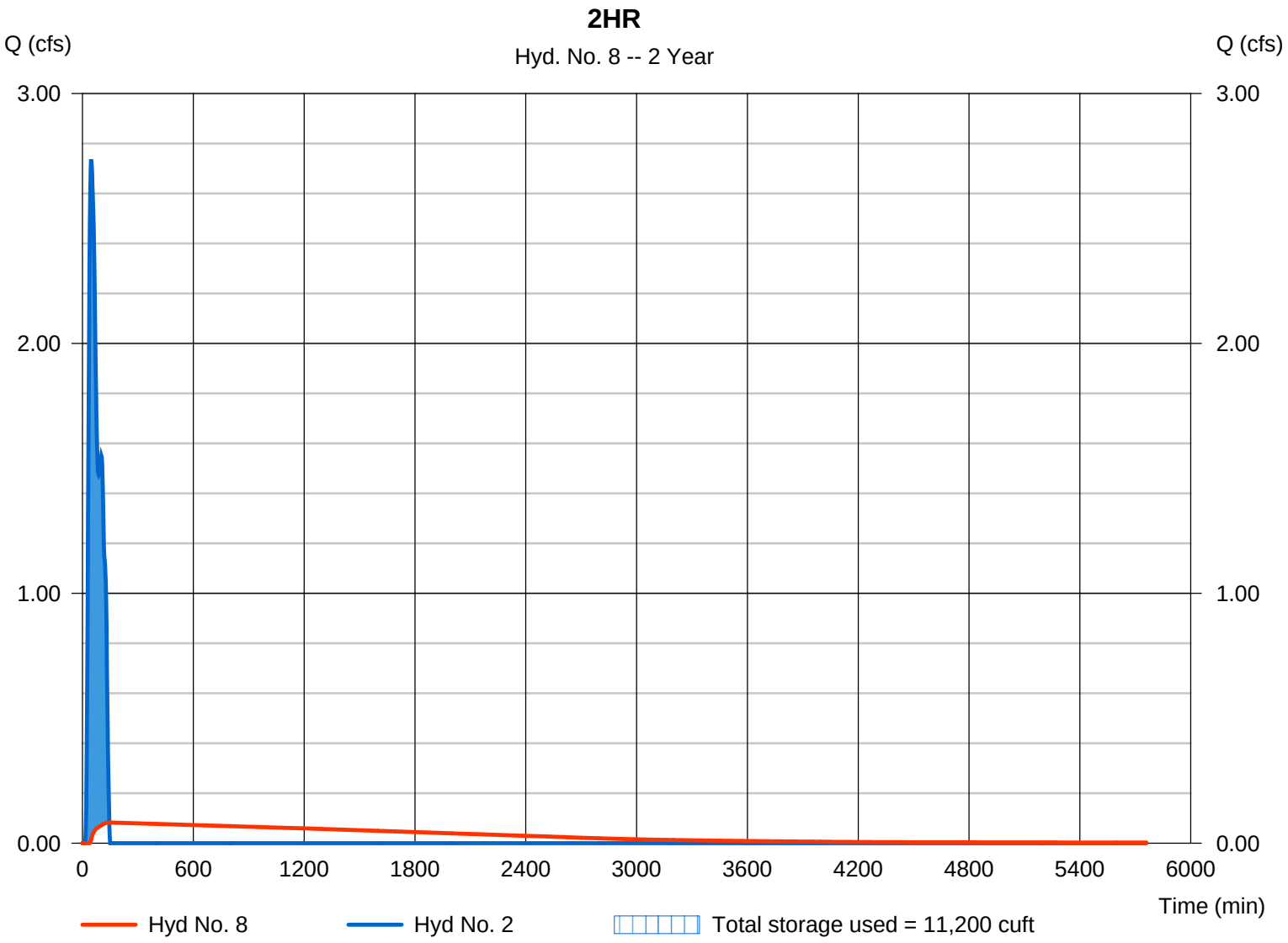
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.083 cfs
Storm frequency	= 2 yrs	Time to peak	= 146 min
Time interval	= 2 min	Hyd. volume	= 9,870 cuft
Inflow hyd. No.	= 2 - Pond 4 2HR	Max. Elevation	= 748.31 ft
Reservoir name	= Pond 4	Max. Storage	= 11,200 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

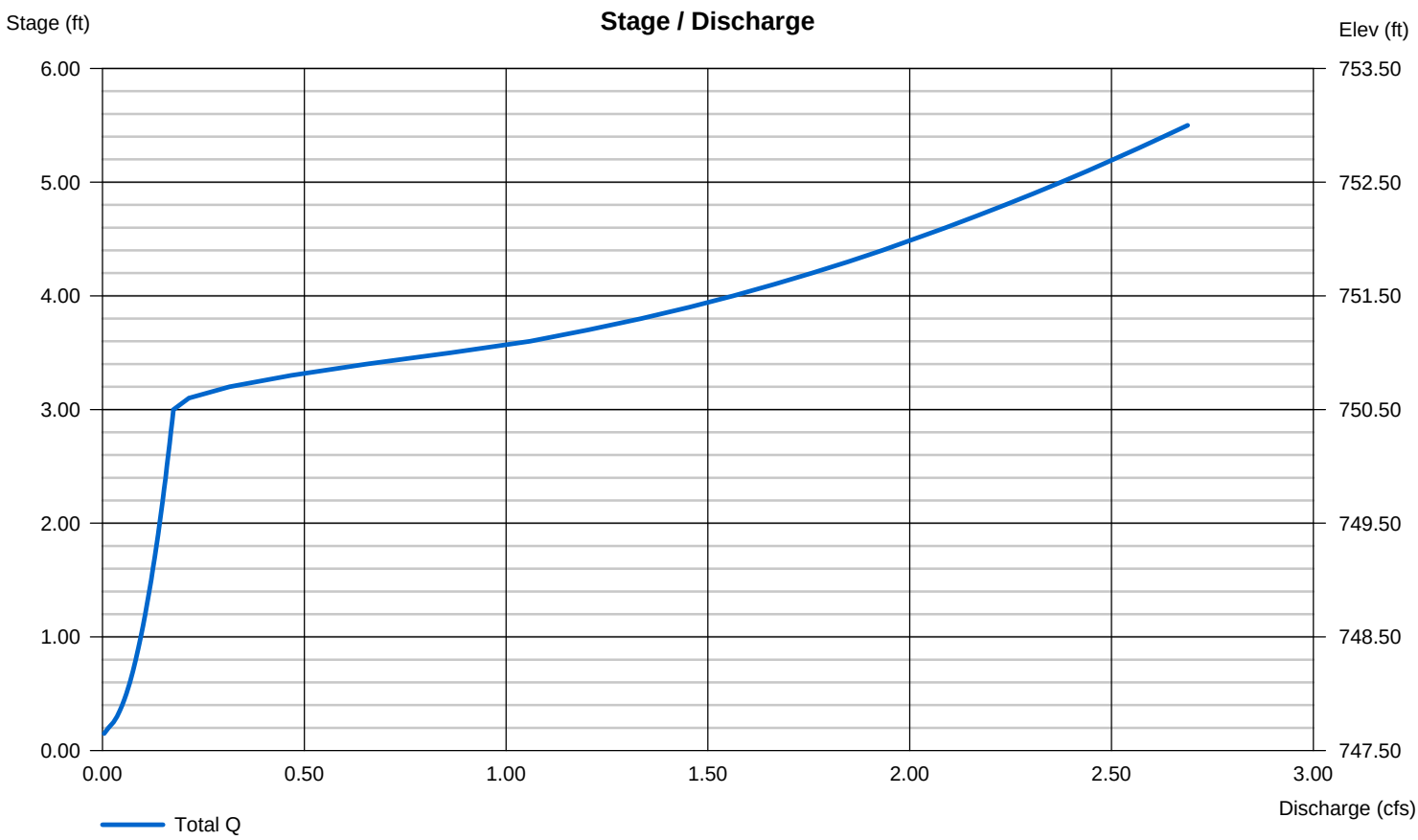
Weir Structures

	[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

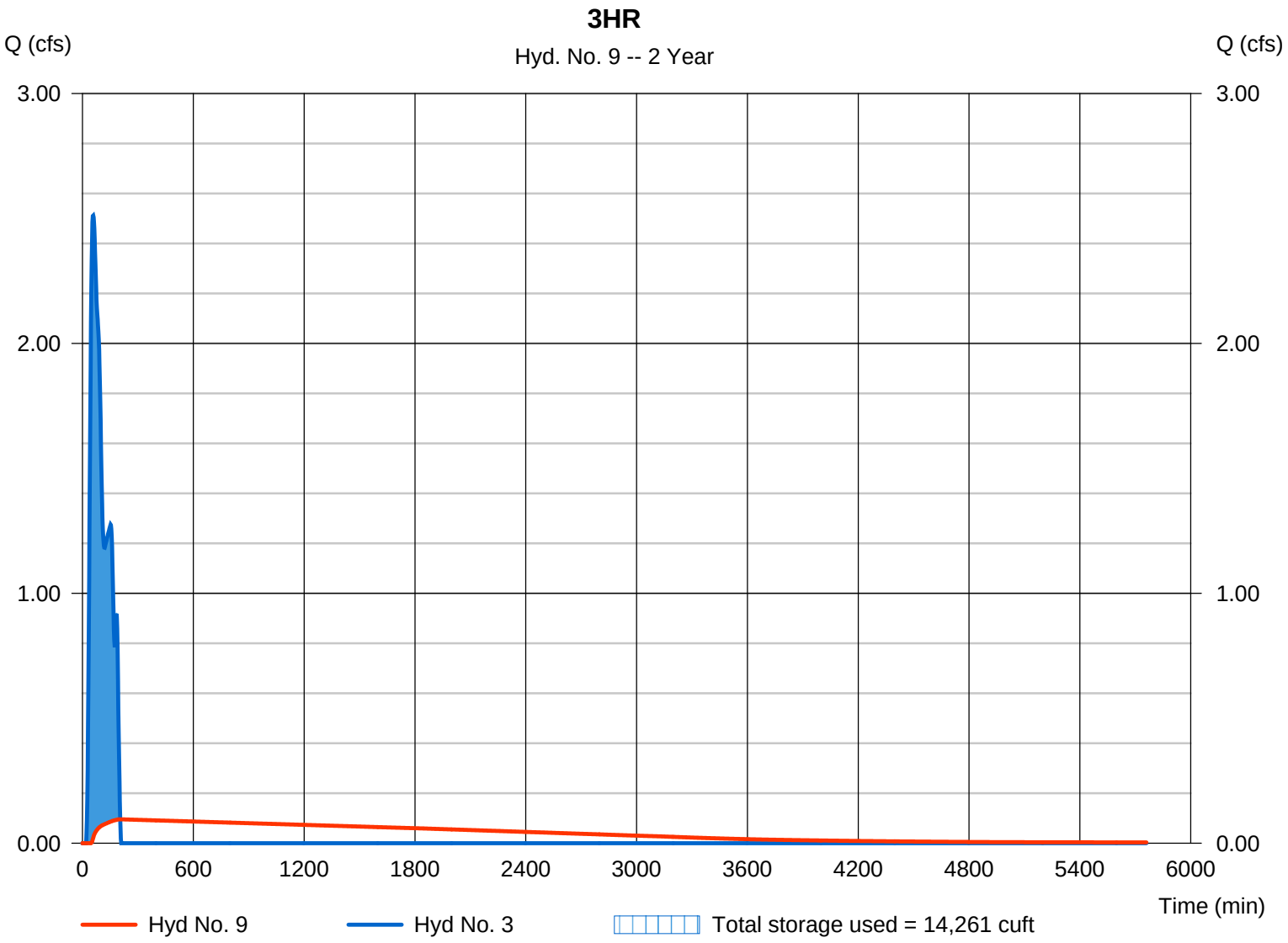
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.096 cfs
Storm frequency	= 2 yrs	Time to peak	= 204 min
Time interval	= 2 min	Hyd. volume	= 13,110 cuft
Inflow hyd. No.	= 3 - Pond 4 3HR	Max. Elevation	= 748.51 ft
Reservoir name	= Pond 4	Max. Storage	= 14,261 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

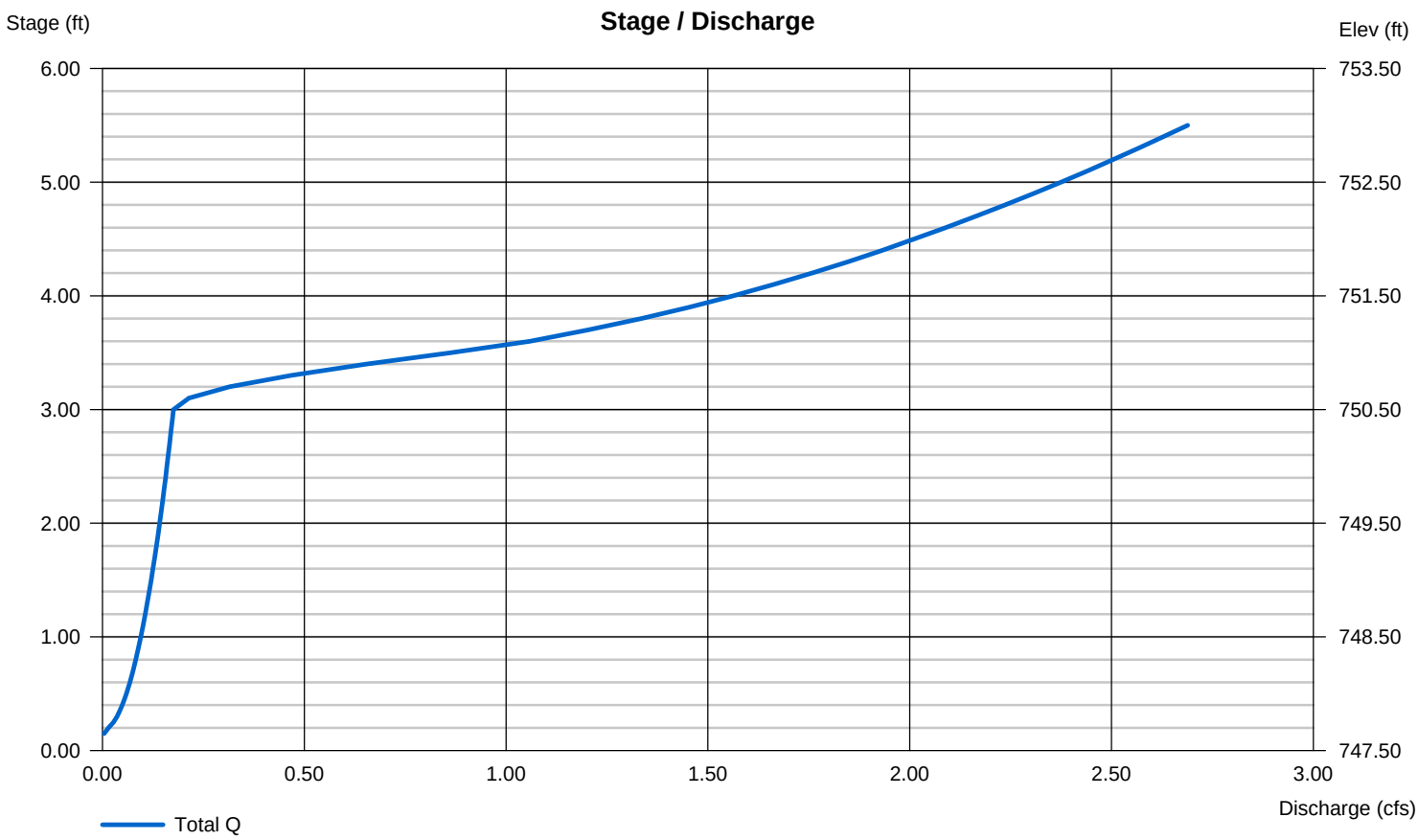
Weir Structures

	[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

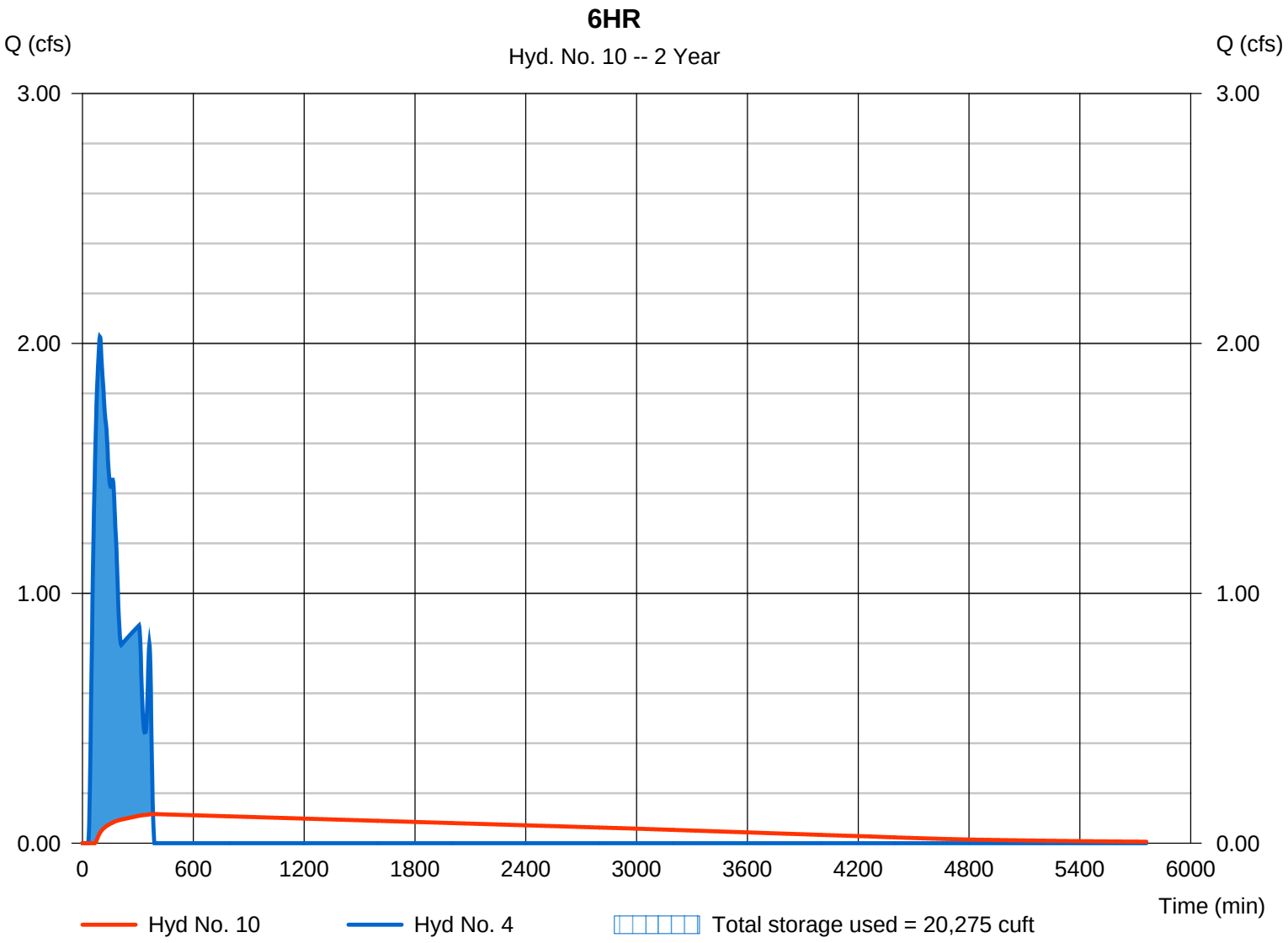
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.117 cfs
Storm frequency	= 2 yrs	Time to peak	= 382 min
Time interval	= 2 min	Hyd. volume	= 19,849 cuft
Inflow hyd. No.	= 4 - Pond 4 6HR	Max. Elevation	= 748.92 ft
Reservoir name	= Pond 4	Max. Storage	= 20,275 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

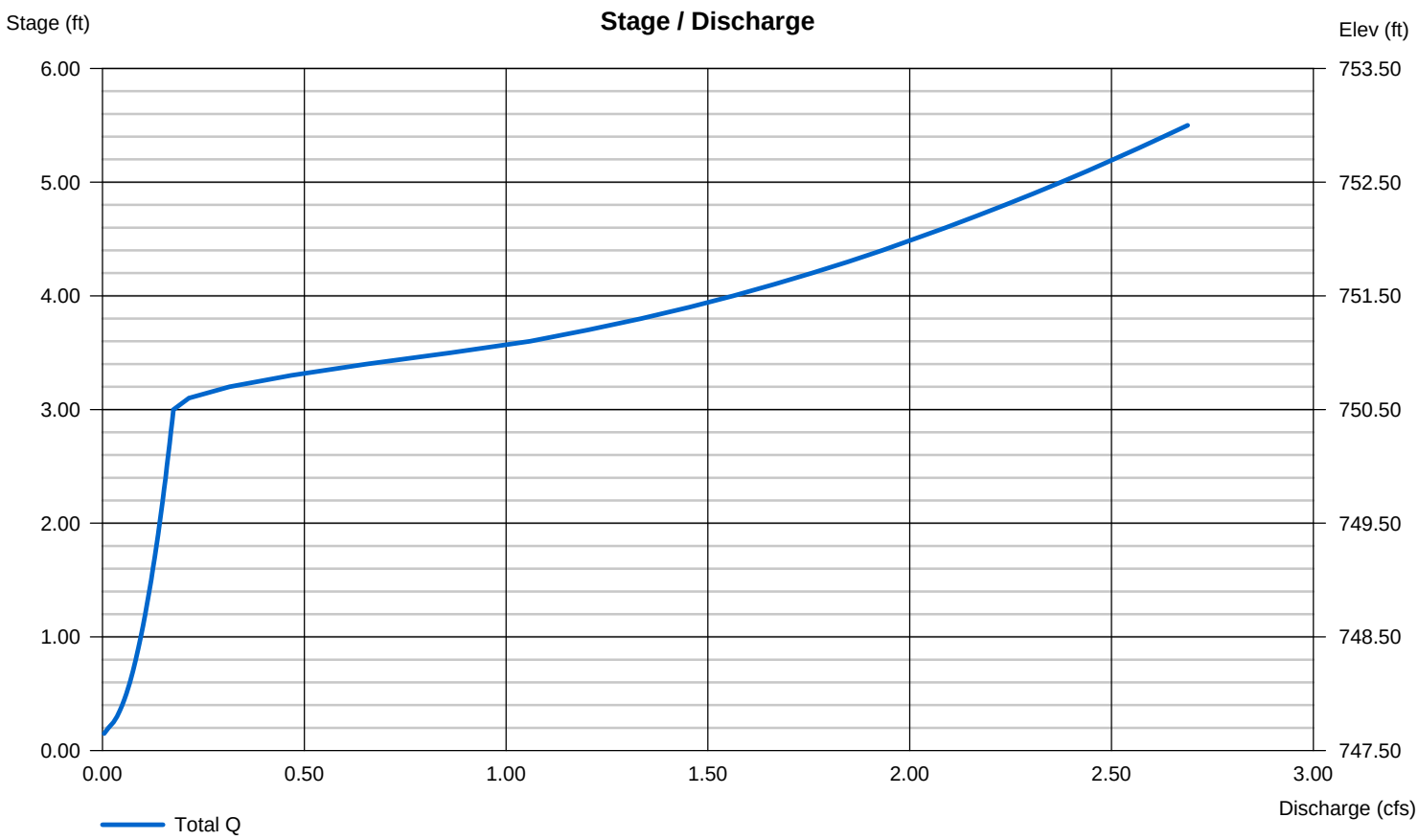
Weir Structures

	[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

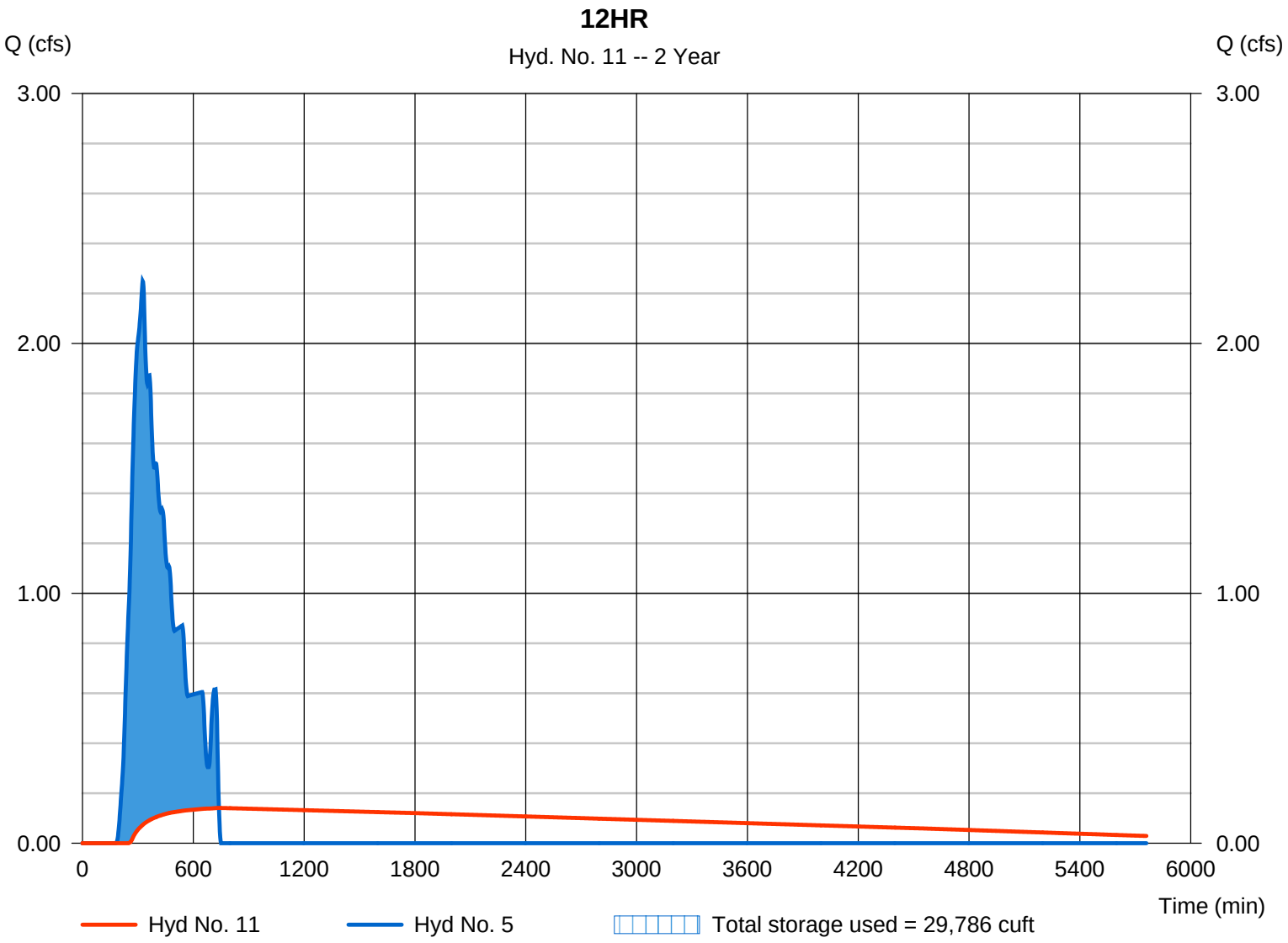
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.141 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 29,560 cuft
Inflow hyd. No.	= 5 - Pond 4 12HR	Max. Elevation	= 749.49 ft
Reservoir name	= Pond 4	Max. Storage	= 29,786 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

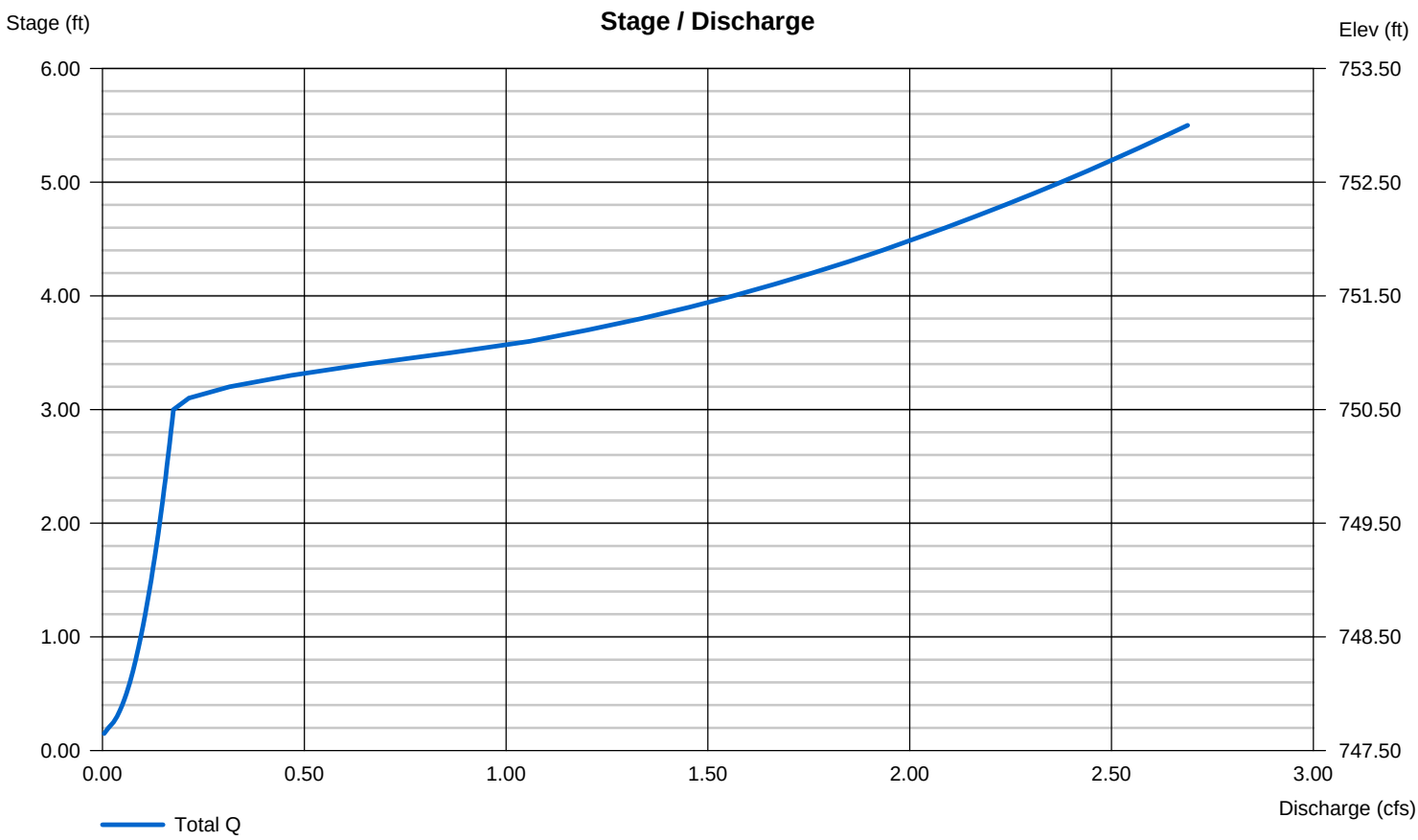
Weir Structures

	[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

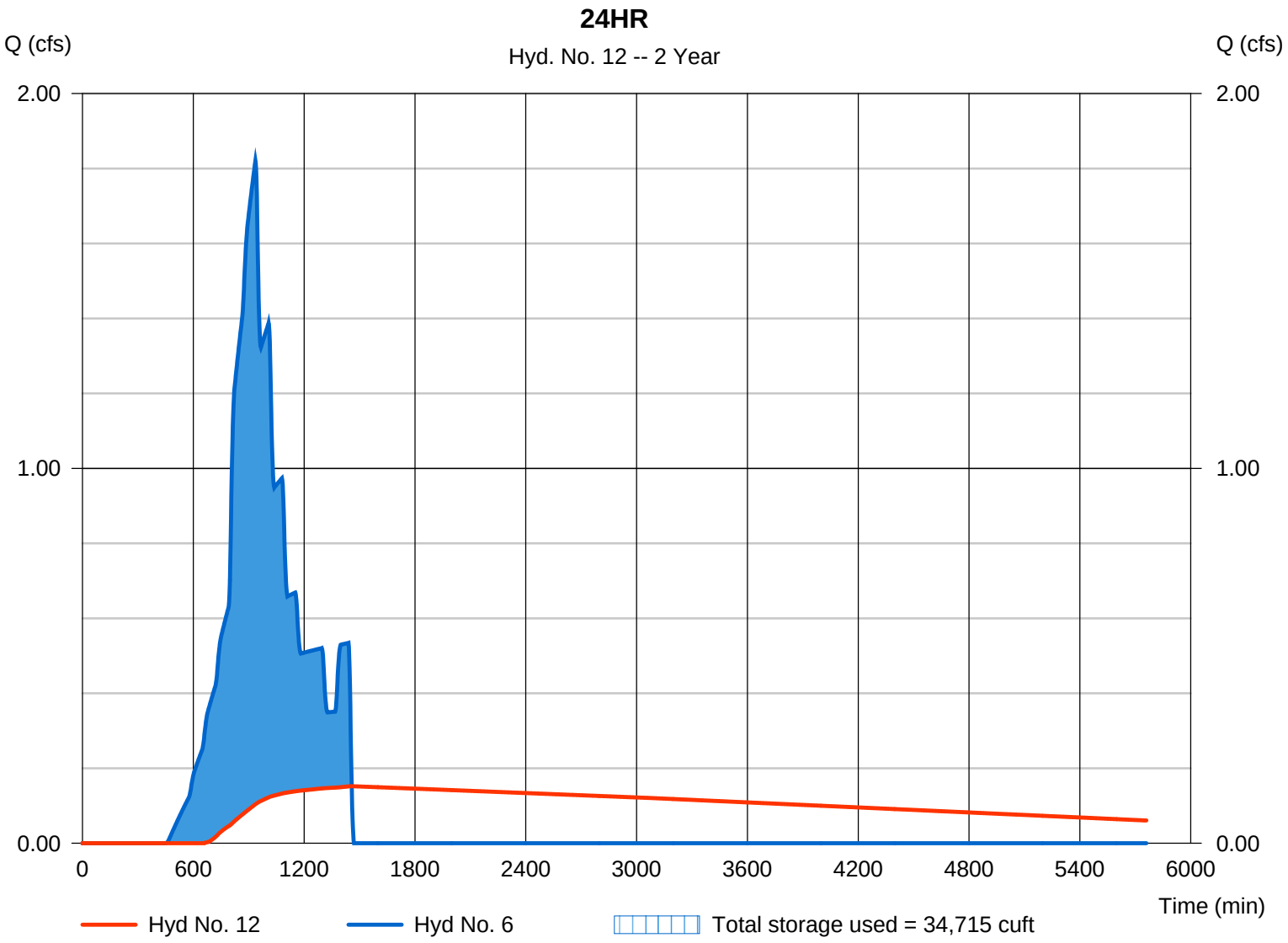
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 0.152 cfs
Storm frequency	= 2 yrs	Time to peak	= 1458 min
Time interval	= 2 min	Hyd. volume	= 32,963 cuft
Inflow hyd. No.	= 6 - Pond 4 24HR	Max. Elevation	= 749.78 ft
Reservoir name	= Pond 4	Max. Storage	= 34,715 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Pond No. 1 - Pond 4

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 747.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	747.50	12,850	0	0
0.50	748.00	13,808	6,662	6,662
1.50	749.00	15,846	14,814	21,476
2.50	750.00	18,028	16,924	38,400
3.50	751.00	20,355	19,178	57,578
4.50	752.00	22,826	21,577	79,154
5.50	753.00	25,443	24,120	103,274

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	8.00	0.00
Span (in)	= 12.00	2.00	8.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 747.50	747.60	750.50	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

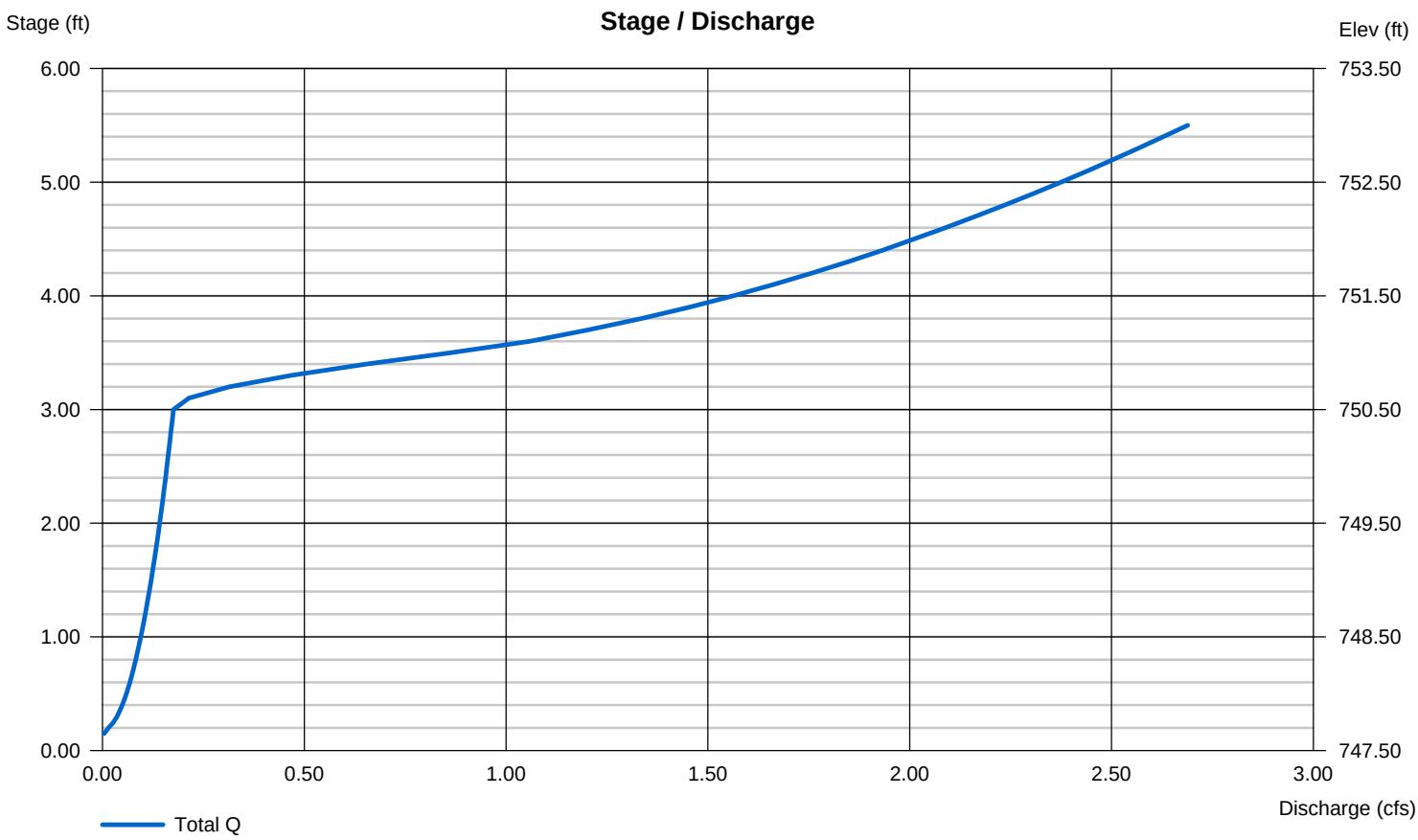
Weir Structures

	[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 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	8.958	2	32	21,311	------	------	------	Pond 4 1HR
2	SCS Runoff	8.475	2	40	33,029	------	------	------	Pond 4 2HR
3	SCS Runoff	7.244	2	52	39,839	------	------	------	Pond 4 3HR
4	SCS Runoff	5.201	2	90	54,464	------	------	------	Pond 4 6HR
5	SCS Runoff	4.688	2	326	70,009	------	------	------	Pond 4 12HR
6	SCS Runoff	3.662	2	936	86,267	------	------	------	Pond 4 24HR
7	Reservoir	0.119	2	88	19,269	1	748.96	20,937	1HR
8	Reservoir	0.118	2	146	19,411	2	748.96	20,833	2HR
9	Reservoir	0.160	2	206	35,484	3	750.01	38,513	3HR
10	Reservoir	0.288	2	380	45,440	4	750.67	51,321	6HR
11	Reservoir	0.855	2	660	58,342	5	751.00	57,506	12HR
12	Reservoir	1.065	2	1168	70,516	6	751.10	59,813	24HR
13	SCS Runoff	3.662	2	936	86,267	------	------	------	Pond 4 WQ
14	Reservoir	1.928	2	1030	78,752	13	750.28	46,619	Pond 4 WQ

Hydrograph Report

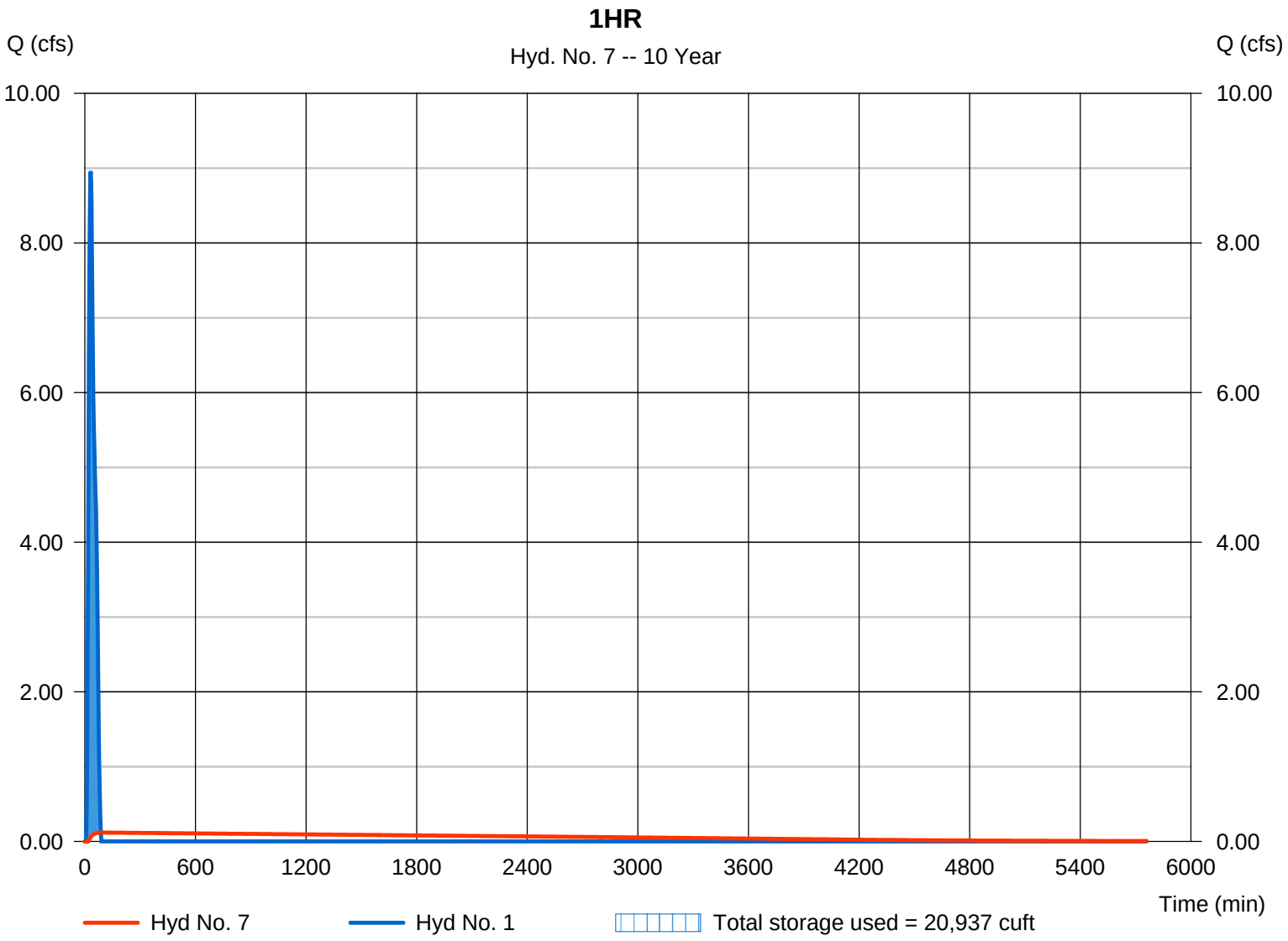
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.119 cfs
Storm frequency	= 10 yrs	Time to peak	= 88 min
Time interval	= 2 min	Hyd. volume	= 19,269 cuft
Inflow hyd. No.	= 1 - Pond 4 1HR	Max. Elevation	= 748.96 ft
Reservoir name	= Pond 4	Max. Storage	= 20,937 cuft

Storage Indication method used.



Hydrograph Report

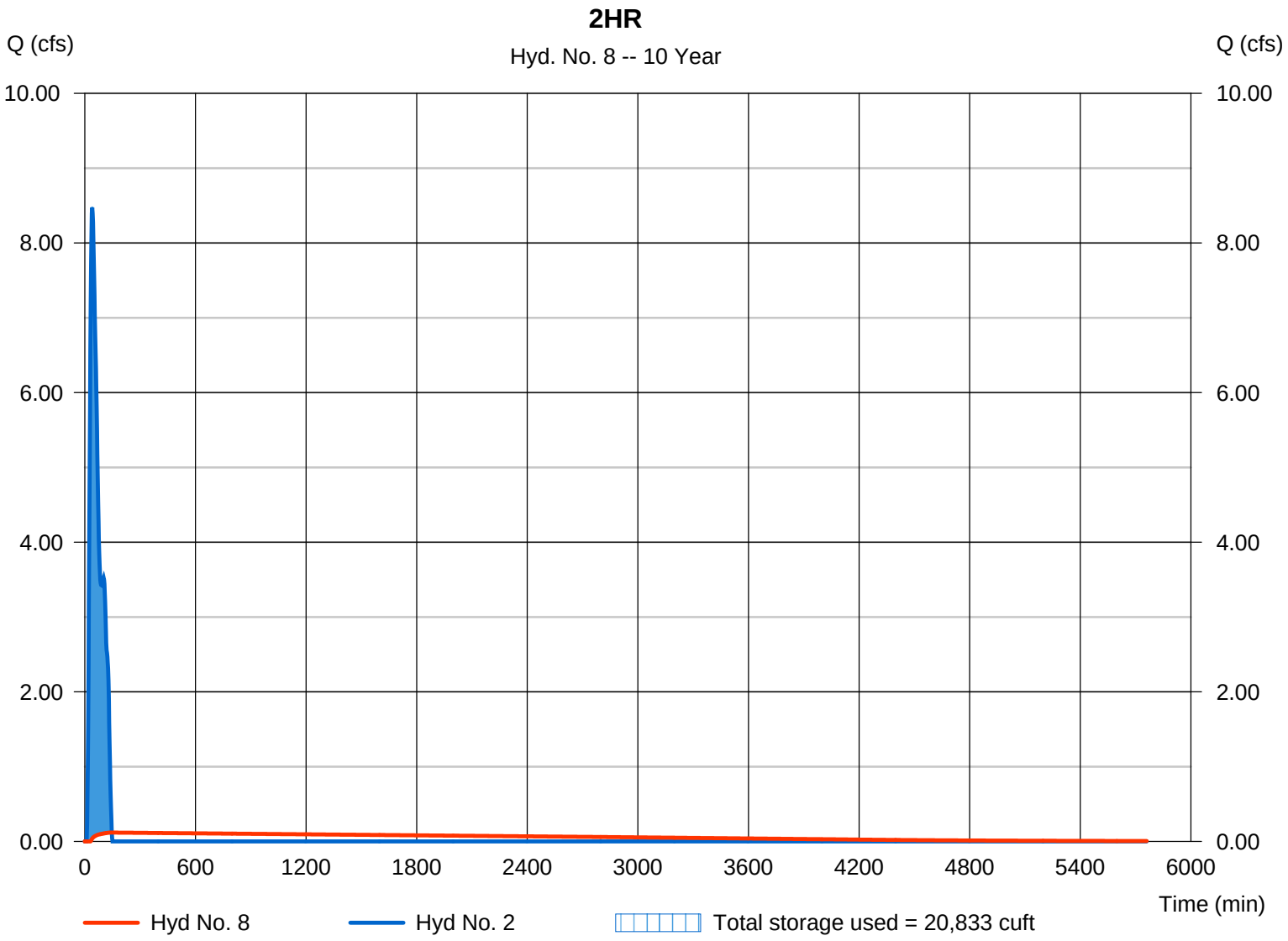
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.118 cfs
Storm frequency	= 10 yrs	Time to peak	= 146 min
Time interval	= 2 min	Hyd. volume	= 19,411 cuft
Inflow hyd. No.	= 2 - Pond 4 2HR	Max. Elevation	= 748.96 ft
Reservoir name	= Pond 4	Max. Storage	= 20,833 cuft

Storage Indication method used.



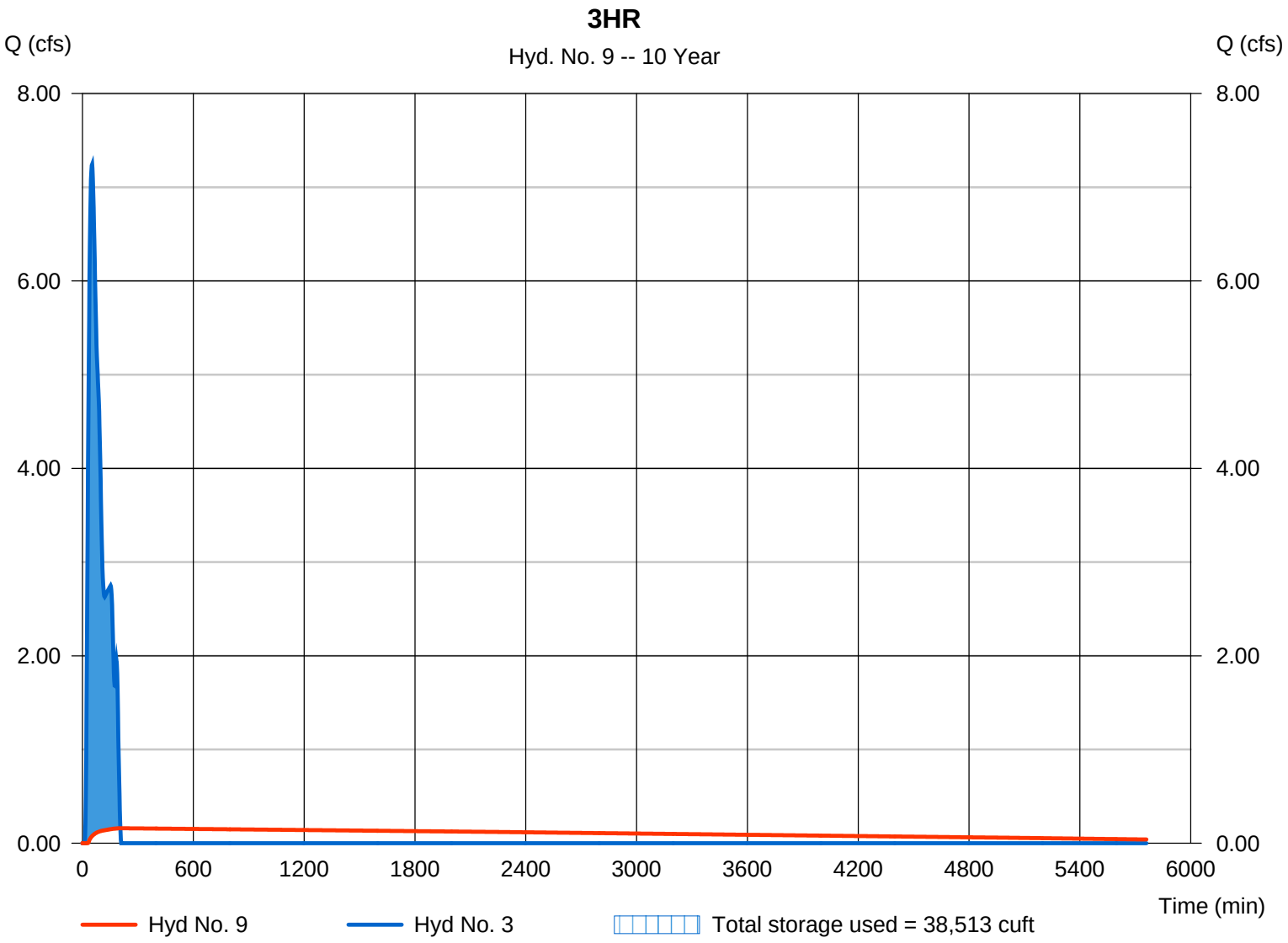
Hydrograph Report

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 0.160 cfs
Storm frequency	= 10 yrs	Time to peak	= 206 min
Time interval	= 2 min	Hyd. volume	= 35,484 cuft
Inflow hyd. No.	= 3 - Pond 4 3HR	Max. Elevation	= 750.01 ft
Reservoir name	= Pond 4	Max. Storage	= 38,513 cuft

Storage Indication method used.



Hydrograph Report

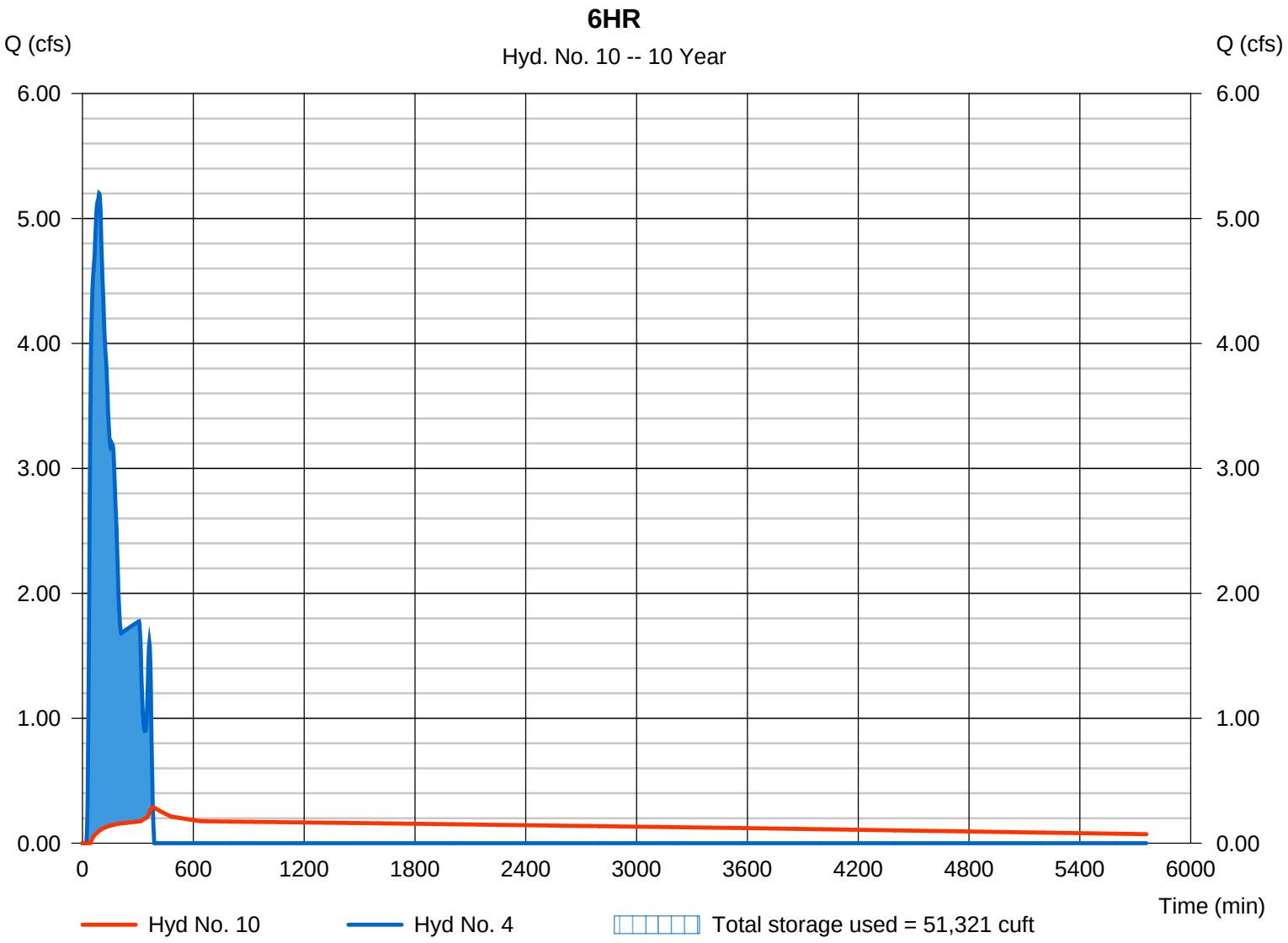
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 0.288 cfs
Storm frequency	= 10 yrs	Time to peak	= 380 min
Time interval	= 2 min	Hyd. volume	= 45,440 cuft
Inflow hyd. No.	= 4 - Pond 4 6HR	Max. Elevation	= 750.67 ft
Reservoir name	= Pond 4	Max. Storage	= 51,321 cuft

Storage Indication method used.



Hydrograph Report

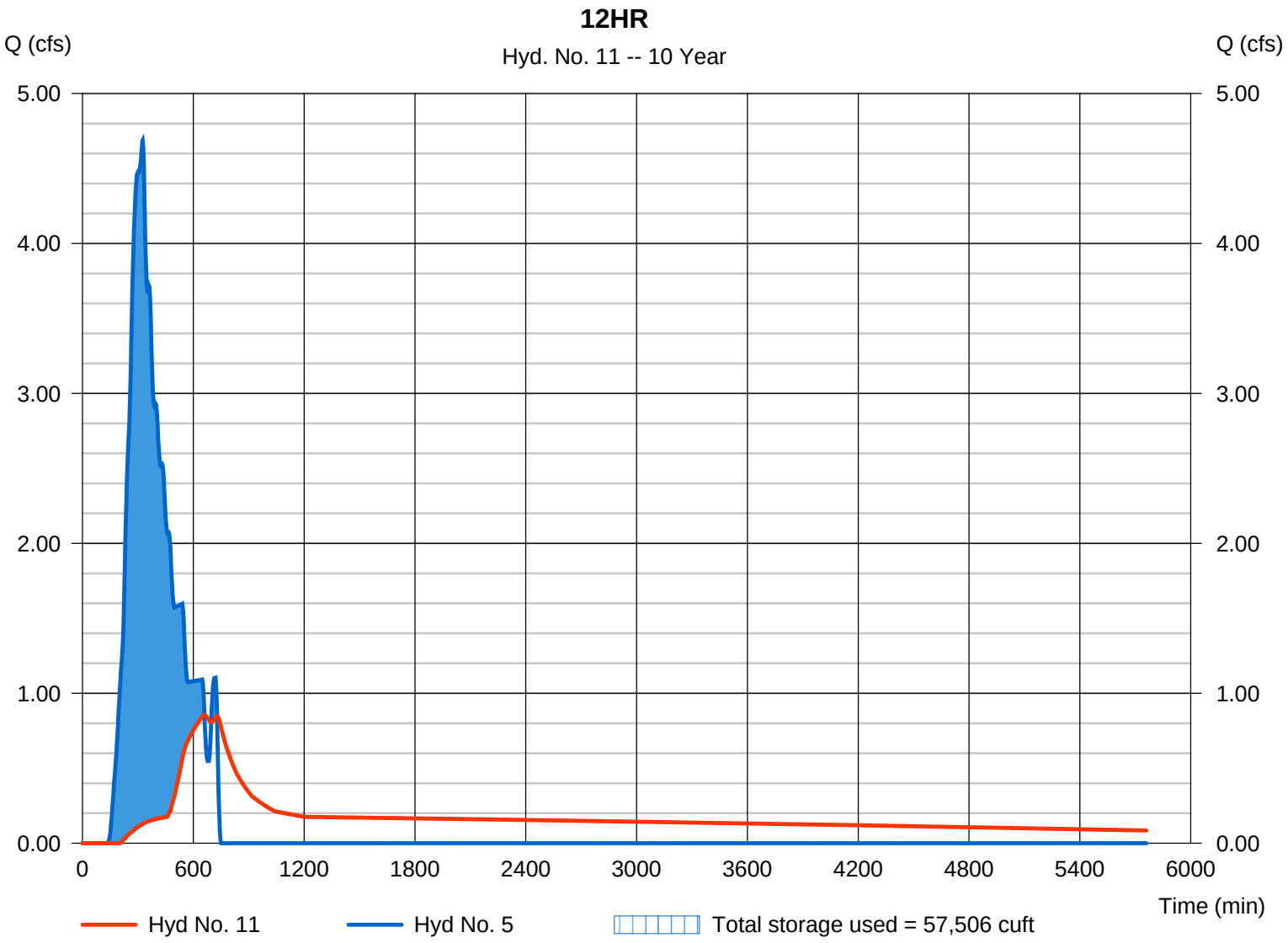
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 0.855 cfs
Storm frequency	= 10 yrs	Time to peak	= 660 min
Time interval	= 2 min	Hyd. volume	= 58,342 cuft
Inflow hyd. No.	= 5 - Pond 4 12HR	Max. Elevation	= 751.00 ft
Reservoir name	= Pond 4	Max. Storage	= 57,506 cuft

Storage Indication method used.



Hydrograph Report

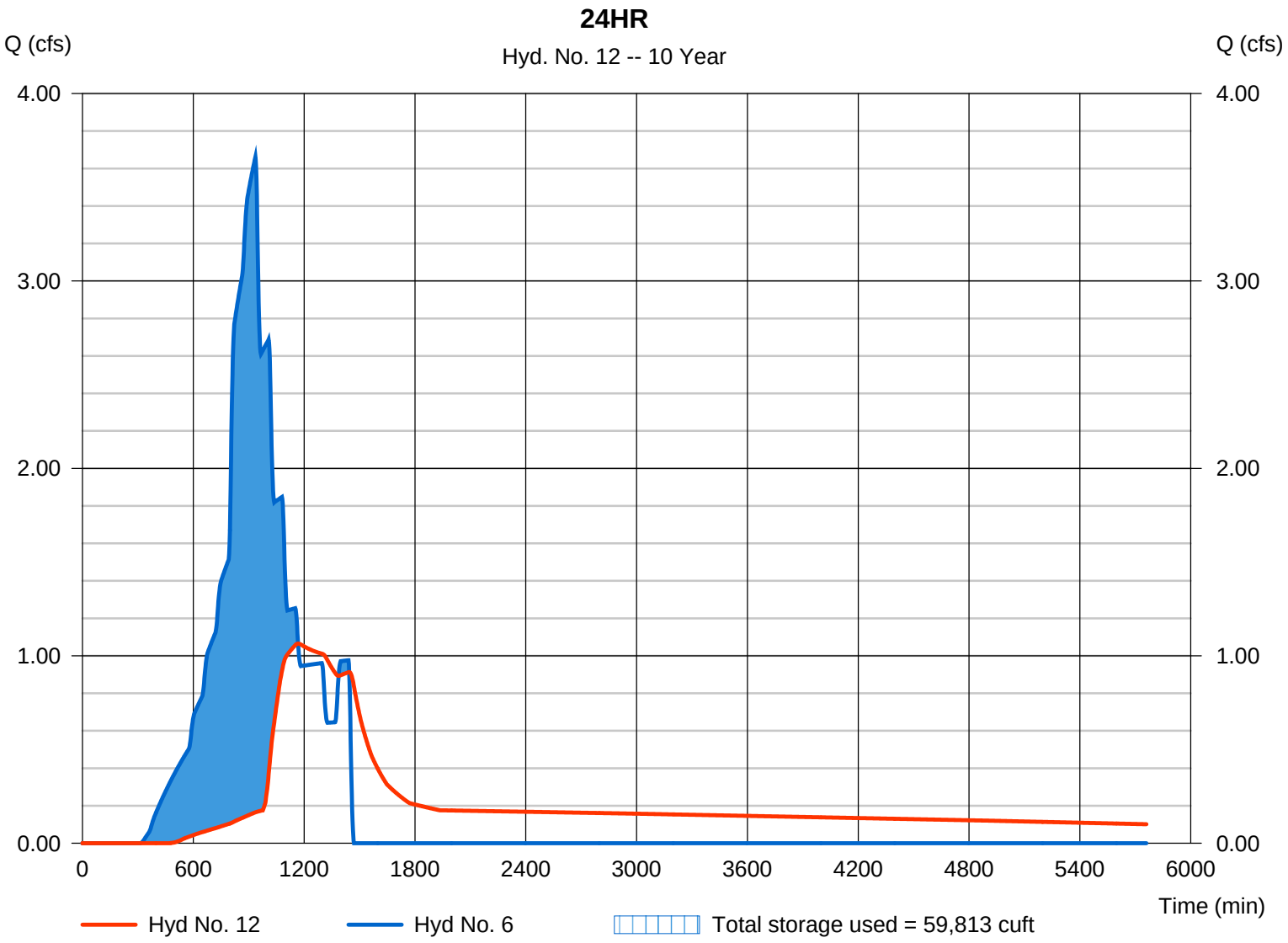
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 12

24HR

Hydrograph type	= Reservoir	Peak discharge	= 1.065 cfs
Storm frequency	= 10 yrs	Time to peak	= 1168 min
Time interval	= 2 min	Hyd. volume	= 70,516 cuft
Inflow hyd. No.	= 6 - Pond 4 24HR	Max. Elevation	= 751.10 ft
Reservoir name	= Pond 4	Max. Storage	= 59,813 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	20.34	2	30	46,880	------	------	------	Pond 4 1HR
2	SCS Runoff	18.05	2	36	66,684	------	------	------	Pond 4 2HR
3	SCS Runoff	14.91	2	44	79,064	------	------	------	Pond 4 3HR
4	SCS Runoff	9.994	2	46	100,939	------	------	------	Pond 4 6HR
5	SCS Runoff	8.117	2	324	124,746	------	------	------	Pond 4 12HR
6	SCS Runoff	6.217	2	936	155,953	------	------	------	Pond 4 24HR
7	Reservoir	0.173	2	88	40,630	1	750.41	46,275	1HR
8	Reservoir	0.172	2	146	40,635	2	750.39	45,950	2HR
9	Reservoir	1.660	2	196	69,161	3	751.60	70,454	3HR
10	Reservoir	1.903	2	324	89,939	4	751.86	76,241	6HR
11	Reservoir	2.133	2	554	111,839	5	752.16	82,969	12HR
12	Reservoir	2.392	2	1096	138,793	6	752.53	91,821	24HR
13	SCS Runoff	6.217	2	936	155,953	------	------	------	Pond 4 WQ
14	Reservoir	3.764	2	1020	148,192	13	751.26	68,718	Pond 4 WQ

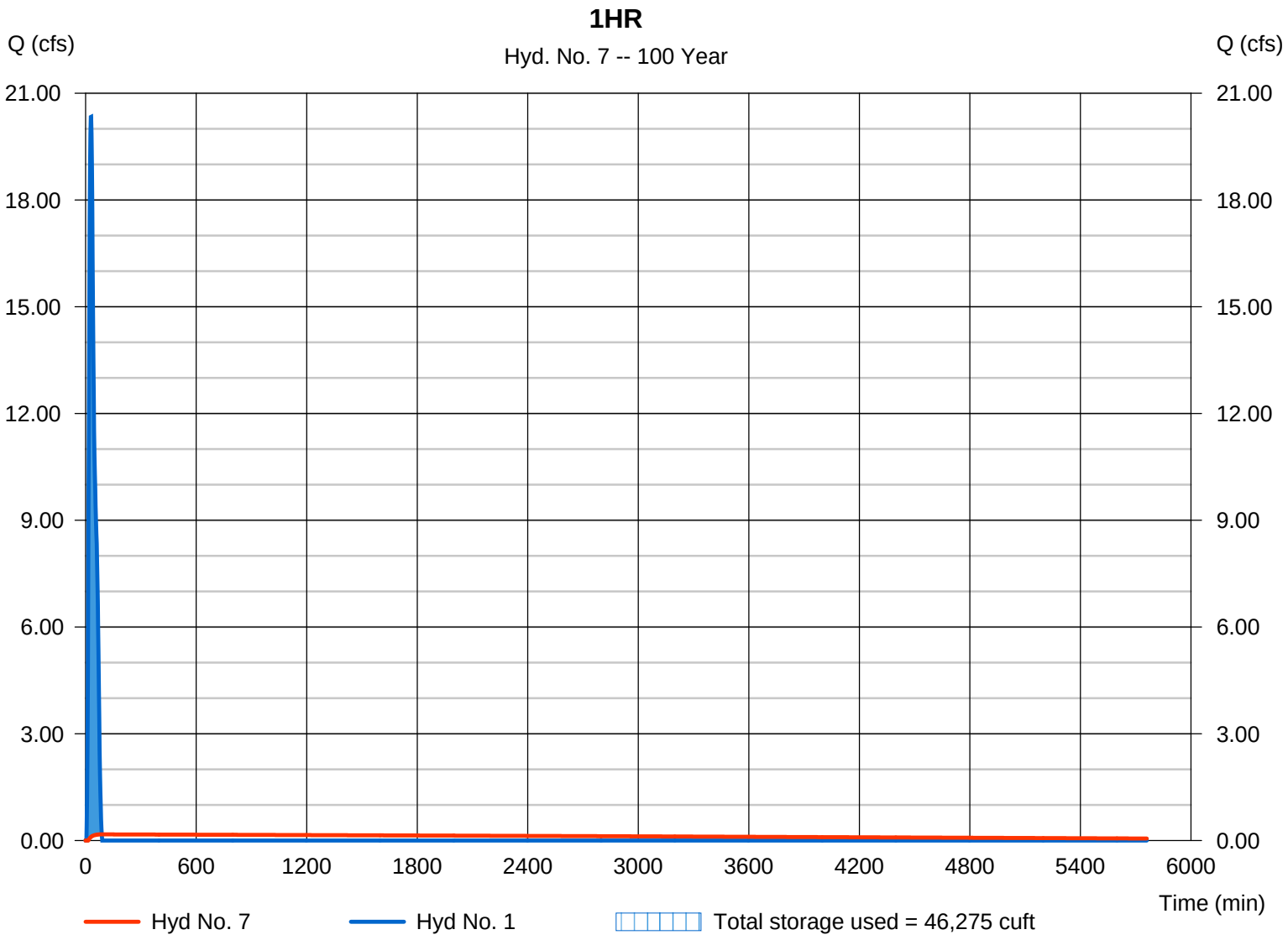
Hydrograph Report

Hyd. No. 7

1HR

Hydrograph type	= Reservoir	Peak discharge	= 0.173 cfs
Storm frequency	= 100 yrs	Time to peak	= 88 min
Time interval	= 2 min	Hyd. volume	= 40,630 cuft
Inflow hyd. No.	= 1 - Pond 4 1HR	Max. Elevation	= 750.41 ft
Reservoir name	= Pond 4	Max. Storage	= 46,275 cuft

Storage Indication method used.



Hydrograph Report

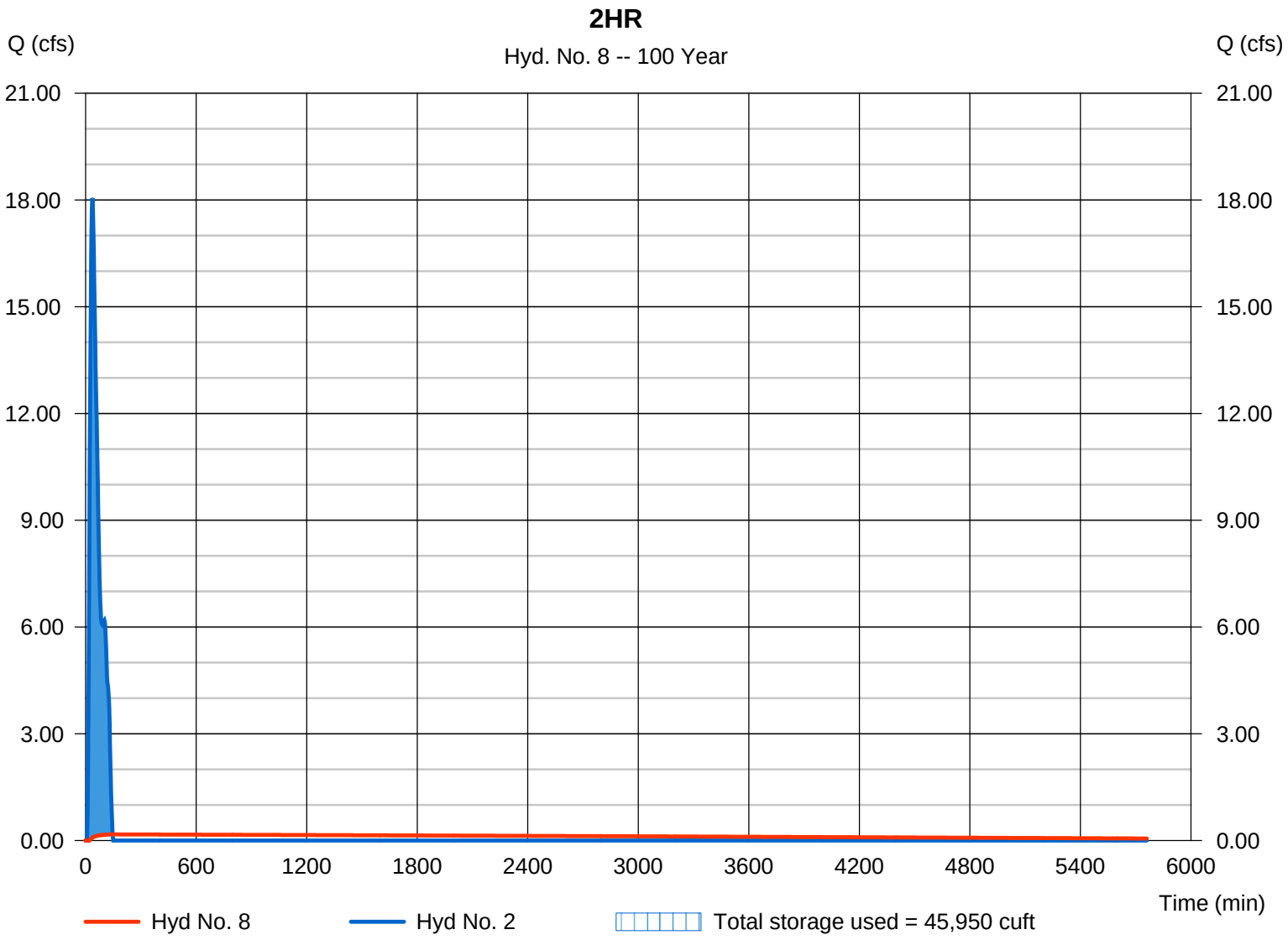
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 8

2HR

Hydrograph type	= Reservoir	Peak discharge	= 0.172 cfs
Storm frequency	= 100 yrs	Time to peak	= 146 min
Time interval	= 2 min	Hyd. volume	= 40,635 cuft
Inflow hyd. No.	= 2 - Pond 4 2HR	Max. Elevation	= 750.39 ft
Reservoir name	= Pond 4	Max. Storage	= 45,950 cuft

Storage Indication method used.



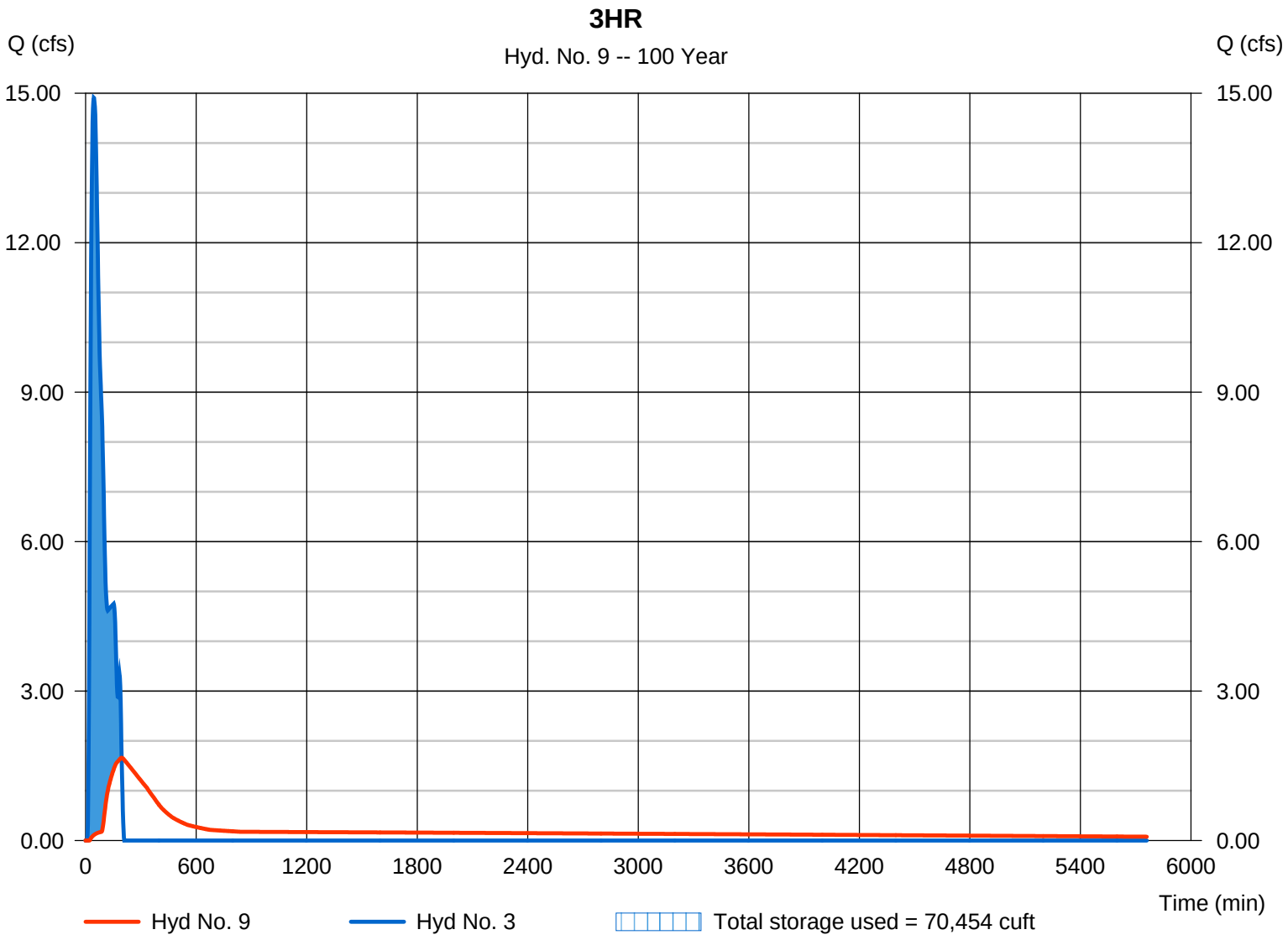
Hydrograph Report

Hyd. No. 9

3HR

Hydrograph type	= Reservoir	Peak discharge	= 1.660 cfs
Storm frequency	= 100 yrs	Time to peak	= 196 min
Time interval	= 2 min	Hyd. volume	= 69,161 cuft
Inflow hyd. No.	= 3 - Pond 4 3HR	Max. Elevation	= 751.60 ft
Reservoir name	= Pond 4	Max. Storage	= 70,454 cuft

Storage Indication method used.



Hydrograph Report

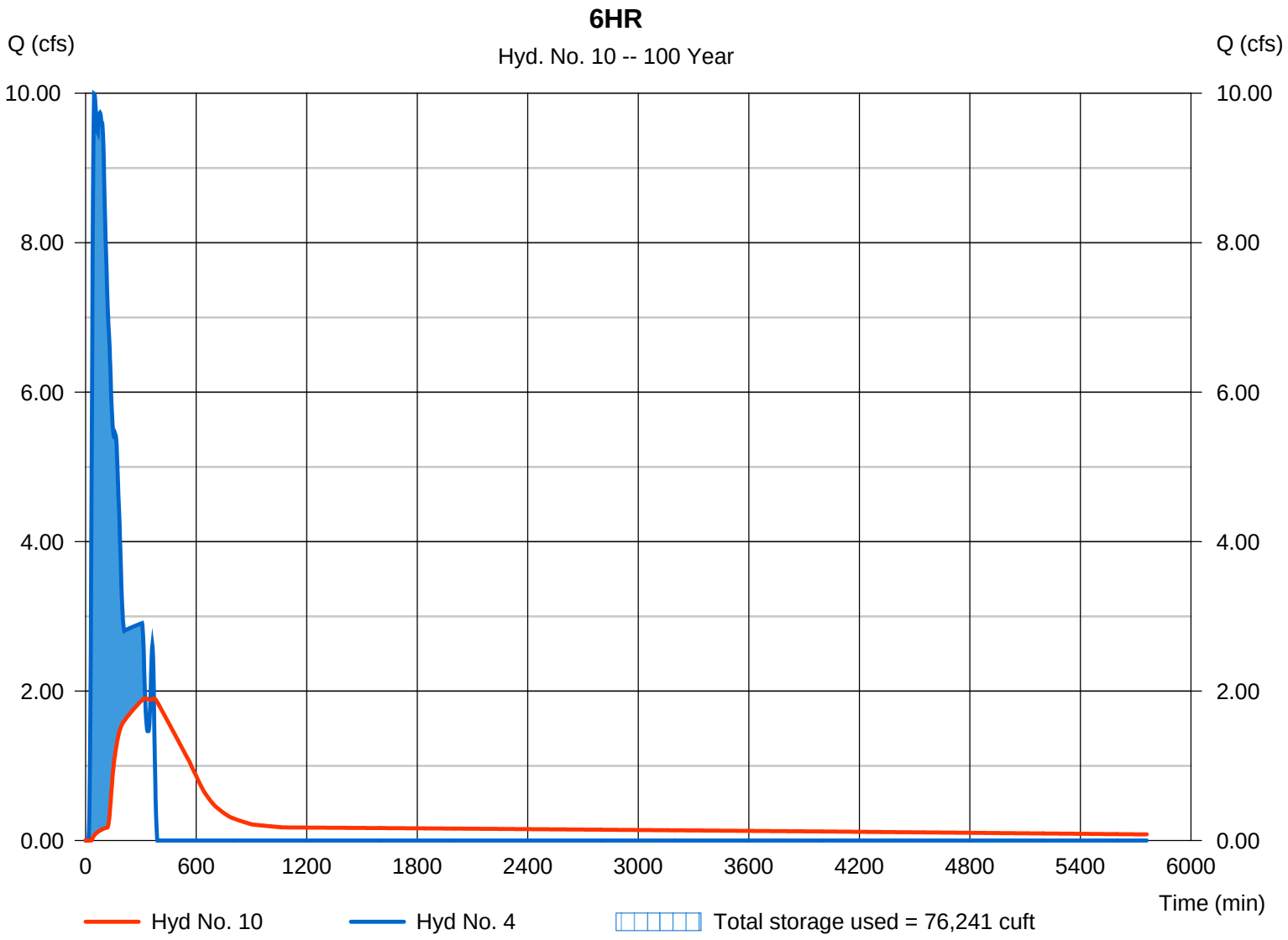
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 10

6HR

Hydrograph type	= Reservoir	Peak discharge	= 1.903 cfs
Storm frequency	= 100 yrs	Time to peak	= 324 min
Time interval	= 2 min	Hyd. volume	= 89,939 cuft
Inflow hyd. No.	= 4 - Pond 4 6HR	Max. Elevation	= 751.86 ft
Reservoir name	= Pond 4	Max. Storage	= 76,241 cuft

Storage Indication method used.



Hydrograph Report

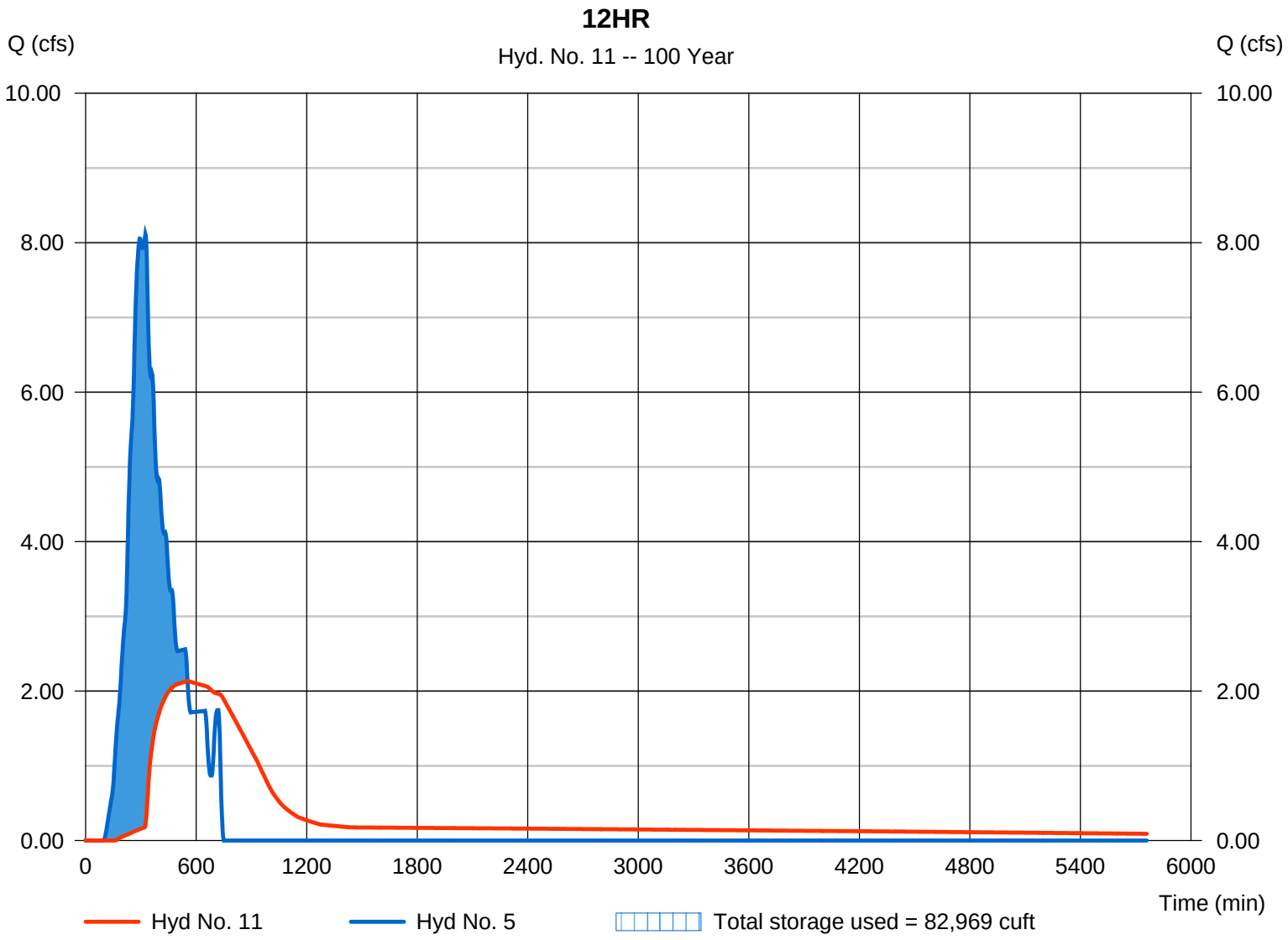
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 11

12HR

Hydrograph type	= Reservoir	Peak discharge	= 2.133 cfs
Storm frequency	= 100 yrs	Time to peak	= 554 min
Time interval	= 2 min	Hyd. volume	= 111,839 cuft
Inflow hyd. No.	= 5 - Pond 4 12HR	Max. Elevation	= 752.16 ft
Reservoir name	= Pond 4	Max. Storage	= 82,969 cuft

Storage Indication method used.



Hydrograph Report

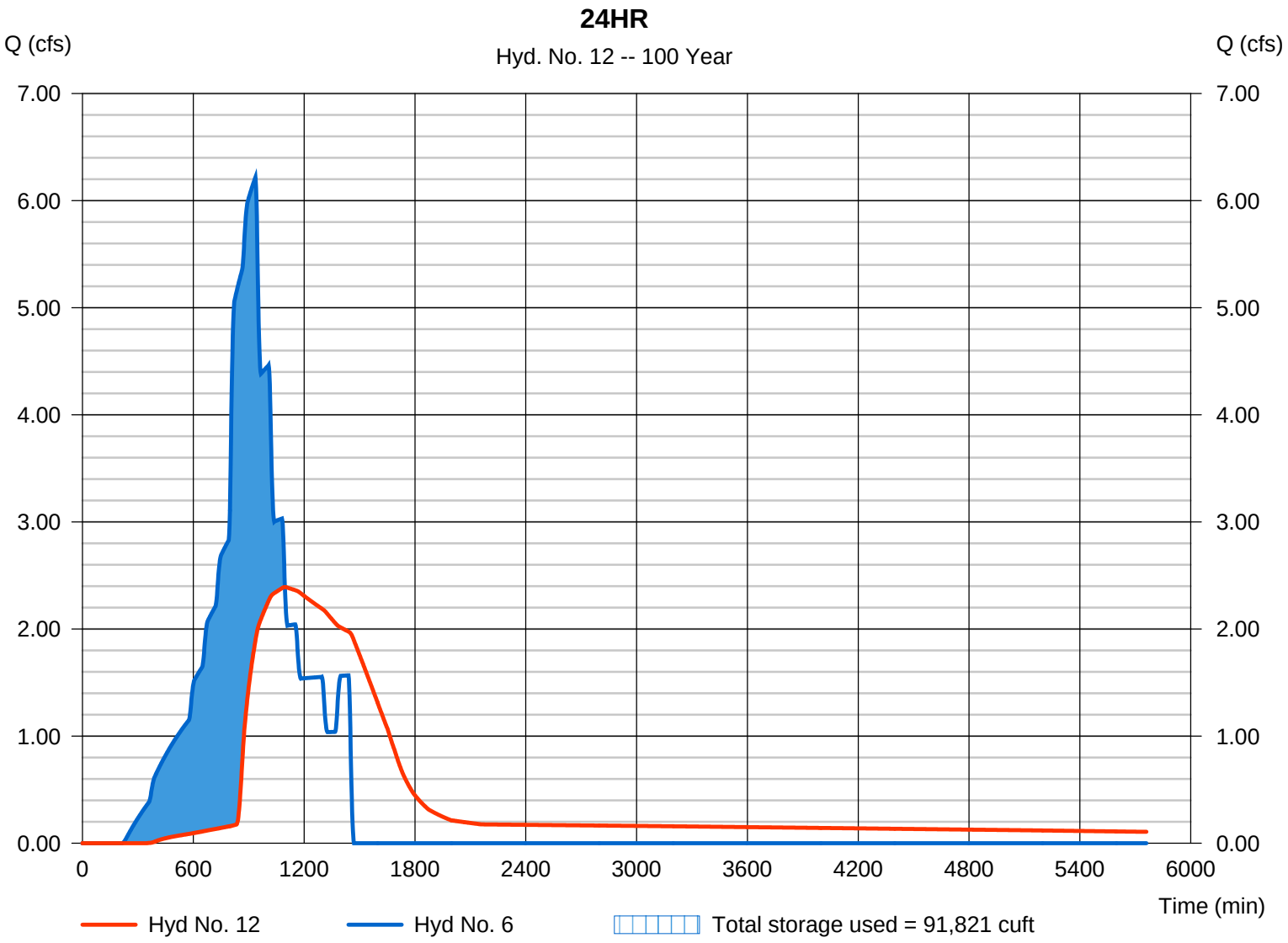
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Thursday, 04 / 7 / 2016

Hyd. No. 12

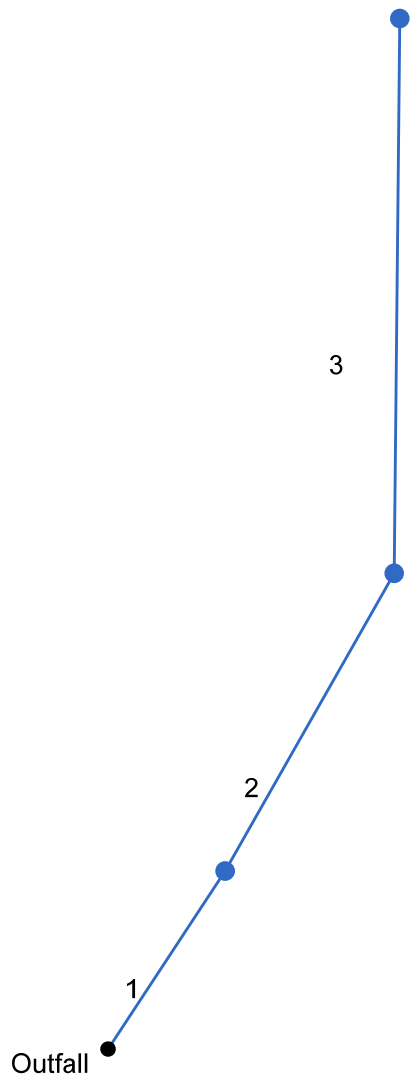
24HR

Hydrograph type	= Reservoir	Peak discharge	= 2.392 cfs
Storm frequency	= 100 yrs	Time to peak	= 1096 min
Time interval	= 2 min	Hyd. volume	= 138,793 cuft
Inflow hyd. No.	= 6 - Pond 4 24HR	Max. Elevation	= 752.53 ft
Reservoir name	= Pond 4	Max. Storage	= 91,821 cuft

Storage Indication method used.



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



Project File: Line 104-108.stm	Number of lines: 3	Date: 4/7/2016

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	105	DropGrate	755.00	Cir	4.00	4.00	18	Cir	749.45	15	Cir	749.45
2	106	DropGrate	755.00	Cir	4.00	4.00	15	Cir	749.78	12	Cir	750.03
3	107	DropGrate	755.30	Cir	4.00	4.00	12	Cir	750.63			

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	104-105	5.12	18	Cir	51.000	749.08	749.45	0.725	749.94	750.26	n/a	750.48	End	DropGrate
2	105-106	3.83	15	Cir	82.000	749.45	749.78	0.402	750.48	750.76	0.17	750.93	1	DropGrate
3	106-107	2.25	12	Cir	133.000	750.03	750.63	0.451	750.93	751.41	0.18	751.59	2	DropGrate

Project File: Line 104-108.stm | Number of lines: 3 | Run Date: 4/7/2016

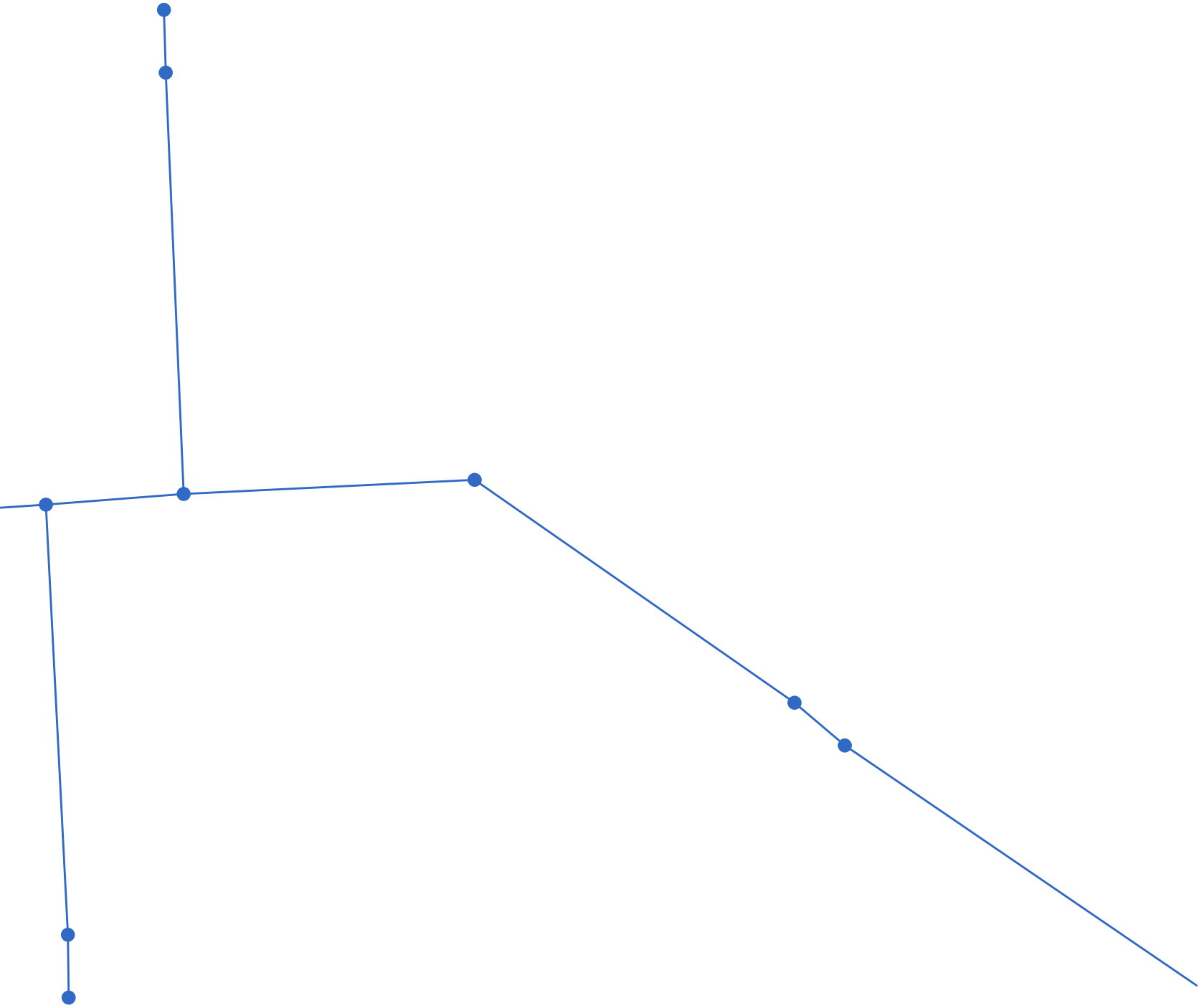
NOTES: Return period = 10 Yrs.

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	51.000	0.58	2.24	0.45	0.26	1.01	12.6	13.0	4.9	5.12	8.94	5.04	18	0.73	749.08	749.45	749.94	750.26	752.60	755.00	104-105
2	1	82.000	0.68	1.66	0.45	0.31	0.75	11.5	12.6	5.0	3.83	4.10	3.63	15	0.40	749.45	749.78	750.48	750.76	755.00	755.00	105-106
3	2	133.000	0.98	0.98	0.45	0.44	0.44	11.8	11.8	5.1	2.25	2.39	3.21	12	0.45	750.03	750.63	750.93	751.41	755.00	755.30	106-107

Project File: Line 104-108.stm | Number of lines: 3 | Run Date: 4/7/2016

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



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

Outfall

Project File: Line 111-131.stm	Number of lines: 20	Date: 4/7/2016

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	108	DropGrate	753.45	Cir	4.00	4.00	30	Cir	747.93	30	Cir	747.93
2	109	DropGrate	753.45	Cir	4.00	4.00	30	Cir	748.00	30	Cir	748.00
3	110	DropGrate	753.10	Cir	4.00	4.00	30	Cir	748.39	30	Cir	748.39
4	111	Manhole	754.20	Cir	4.00	4.00	30	Cir	748.68	30 12	Cir Cir	748.68 750.18
5	112	DropGrate	754.20	Cir	4.00	4.00	30	Cir	748.82	30 12	Cir Cir	748.82 750.32
6	113	DropGrate	754.10	Cir	4.00	4.00	30	Cir	749.50	30	Cir	749.50
7	114	DropGrate	754.10	Cir	4.00	4.00	30	Cir	749.58	18	Cir	750.58
8	115	Manhole	754.50	Cir	4.00	4.00	18	Cir	750.72	12 12 15	Cir Cir Cir	751.22 751.22 750.97
9	116	DropGrate	756.50	Cir	4.00	4.00	12	Cir	751.48	12	Cir	751.48
10	117	DropGrate	756.50	Cir	4.00	4.00	12	Cir	752.31			
11	118	DropGrate	754.50	Cir	4.00	4.00	12	Cir	751.03	12	Cir	751.03
12	F1	DropGrate	754.50	Cir	4.00	4.00	12	Cir	751.11			
13	120	DropGrate	753.64	Cir	4.00	4.00	12	Cir	751.18	12	Cir	751.18
14	121	DropGrate	753.64	Cir	4.00	4.00	12	Cir	751.26			
15	126	DropGrate	755.00	Cir	4.00	4.00	12	Cir	751.80	12	Cir	751.80
16	127	DropGrate	755.00	Cir	4.00	4.00	12	Cir	751.88			
17	122	DropGrate	754.95	Cir	4.00	4.00	15	Cir	751.41	12 12	Cir Cir	751.66 751.66
18	F2	DropGrate	754.95	Cir	4.00	4.00	12	Cir	751.99	12	Cir	751.99
19	F3	DropGrate	754.95	Cir	4.00	4.00	12	Cir	752.08			
20	F4	DropGrate	754.95	Cir	4.00	4.00	12	Cir	751.74			

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	142.000	747.50	747.93	0.303	748.97	749.80	0.19	749.99	End	DropGrate
2	109-110	18.07	30	Cir	22.000	747.93	748.00	0.318	749.99	750.02	0.14	750.16	1	DropGrate
3	110-111	17.25	30	Cir	130.000	748.00	748.39	0.300	750.16	750.35	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	751.99	0.398	752.67	752.73	0.06	752.79	17	DropGrate
19	F2-F3	0.61	12	Cir	22.000	751.99	752.08	0.409	752.79	752.80	0.02	752.81	18	DropGrate
20	122-F4	1.05	12	Cir	21.000	751.66	751.74	0.381	752.67	752.68	0.03	752.71	17	DropGrate

Project File: Line 111-131.stm | Number of lines: 20 | Run Date: 4/7/2016

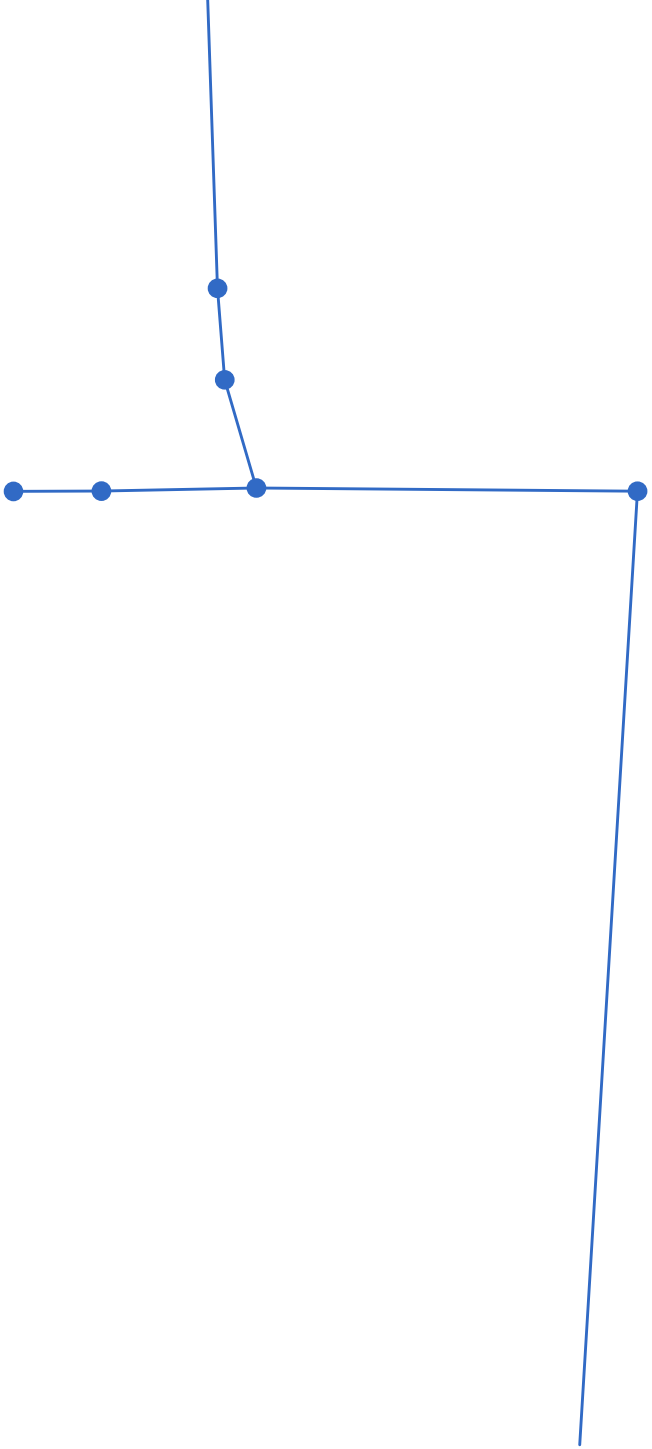
NOTES: Return period = 10 Yrs.

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	142.000	0.55	8.38	0.45	0.25	3.77	11.9	19.5	4.0	19.33	22.57	5.67	30	0.30	747.50	747.93	748.97	749.80	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	4.21	30	0.32	747.93	748.00	749.99	750.02	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	4.00	30	0.30	748.00	748.39	750.16	750.35	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	2.25	1.49	12	0.40	751.66	751.99	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	2.28	0.96	12	0.41	751.99	752.08	752.79	752.80	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	2.20	1.35	12	0.38	751.66	751.74	752.67	752.68	754.95	754.95	122-F4

Project File: Line 111-131.stm | Number of lines: 20 | Run Date: 4/7/2016

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



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

Outfall

Project File: Line 126-132.stm	Number of lines: 7	Date: 4/7/2016

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	126	Manhole	754.60	Cir	4.00	4.00	18	Cir	748.42	18	Cir	748.42
2	127	Manhole	754.60	Cir	4.00	4.00	18	Cir	748.78	15 12	Cir Cir	749.03 749.28
3	128	DropGrate	753.85	Cir	4.00	4.00	15	Cir	749.14	15	Cir	749.14
4	129	DropGrate	753.85	Cir	4.00	4.00	15	Cir	749.23	12	Cir	749.48
5	130	DropGrate	753.20	Cir	4.00	4.00	12	Cir	750.02			
6	131	DropGrate	753.85	Cir	4.00	4.00	12	Cir	749.43	12	Cir	749.43
7	132	DropGrate	753.85	Cir	4.00	4.00	12	Cir	749.51			

Project File: Line 126-132.stm | Number of Structures: 7 | Run Date: 4/7/2016

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	125-126	0.00	18	Cir	229.000	747.50	748.42	0.402	748.32	749.32	n/a	749.54	End	Manhole
2	126-127	0.00	18	Cir	91.000	748.42	748.78	0.396	749.54	749.70	n/a	749.91	1	Manhole
3	127-128	0.00	15	Cir	27.000	749.03	749.14	0.407	749.91	749.98	n/a	750.07	2	DropGrate
4	128-129	0.00	15	Cir	22.000	749.14	749.23	0.409	750.07	750.10	n/a	750.17	3	DropGrate
5	129-130	0.00	12	Cir	137.000	749.48	750.02	0.394	750.17	750.62	n/a	750.78	4	DropGrate
6	127-131	0.00	12	Cir	37.000	749.28	749.43	0.405	749.91	749.98	n/a	750.04	2	DropGrate
7	131-132	0.00	12	Cir	21.000	749.43	749.51	0.381	750.04	750.05	n/a	750.09	6	DropGrate

Project File: Line 126-132.stm | Number of lines: 7 | Run Date: 4/7/2016

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	229.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	4.01	18	0.40	747.50	748.42	748.32	749.32	0.00	754.60	125-126
2	1	91.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.00	0.00	3.32	18	0.40	748.42	748.78	749.54	749.70	754.60	754.60	126-127
3	2	27.000	0.14	0.00	0.45	0.06	0.00	10.3	0.0	0.0	0.00	0.00	3.33	15	0.41	749.03	749.14	749.91	749.98	754.60	753.85	127-128
4	3	22.000	0.46	0.00	0.45	0.21	0.00	10.9	0.0	0.0	0.00	0.00	2.80	15	0.41	749.14	749.23	750.07	750.10	753.85	753.85	128-129
5	4	137.000	0.67	0.00	0.45	0.30	0.00	11.4	0.0	0.0	0.00	0.00	2.96	12	0.39	749.48	750.02	750.17	750.62	753.85	753.20	129-130
6	2	37.000	0.22	0.00	0.45	0.10	0.00	11.1	0.0	0.0	0.00	0.00	2.52	12	0.41	749.28	749.43	749.91	749.98	754.60	753.85	127-131
7	6	21.000	0.29	0.00	0.45	0.13	0.00	11.1	0.0	0.0	0.00	0.00	1.49	12	0.38	749.43	749.51	750.04	750.05	753.85	753.85	131-132

Project File: Line 126-132.stm | Number of lines: 7 | Run Date: 4/7/2016

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