DRAINAGE REPORT

Lisbon Fire Station
25 Newent Road

Prepared For:

Town of Lisbon
Thomas Sparkman: First Selectman
1 Newent Road
Lisbon, CT 06351

April 27, 2022

Prepared By:
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Robert DeLuca, P.E.

Narrative:

The site is located at 25 Newent Road. The location of the site in reference to the USGS Quad Map is attached as Figure 1. The existing site is roughly 7.3 acres of both undeveloped and disturbed land from a previous residential development. The site location in reference to the 2019 Connecticut Aerial photography is included as Figure 2.

Land cover for the calculations is based on the current development of the property. A summary of the curve numbers used for the calculations is included in Table 1. Existing ground elevations on the site range from approximately 339 to 267 feet.

Existing Watershed

In general, the current stormwater drainage pattern is from northeast to southwest, towards an existing wetlands complex located at the west portion of the site (Watershed 1). The existing wetland complex to the west bi-sects the site and a small area continues to drain west away from the wetland (Watershed 2). At the extreme northeast of the site, a rock outcrop forms a peak where another small portion of the site drains to the east (Watershed 3).

An existing conditions watershed map and stormwater flow path is included as Figure 3. Hydrographs for the pre-existing conditions are included in this report. A summary of the peak stormwater flow rates from the site are included in Table 2.

Proposed Watershed

The proposed development includes the multi-phased construction of a new fire station building with associated parking, site improvements, and utility relocations. The first phase of the project involves clearing the site of vegetation, rock and overburden soils to prepare the site for a separate construction phase.

The site plans depict the proposed site grading, proposed drainage system, and proposed site improvements. The proposed site grading and drainage system have designed to match the existing drainage patterns as closely as possible. The majority of the stormwater from the site will discharge to a new stormwater quality basin located at the southwest portion of the site. A summary of the curve numbers used for the calculations is included in Table 1. A post development watershed map with stormwater flow paths is included as Figure 4.

The peak stormwater flow rate from the post developed site will be mitigated by intercepting run-off from parking areas using vegetated drainage swales. The front landscaped area of the fire

station and a large portion of the easterly driveway will sheet flow into a wide, vegetated drainage swale. A catch basin will be installed above the swale bottom to allow for temporary ponding and will convey higher stormwater flows to the drainage system before discharging into another vegetated drainage swale of the west side of the site, before finally discharging to a stormwater treatment basin. Almost all of the parking area and roof runoff will be captured and pre-treated within vegetated drainage swales before discharging to the stormwater treatment basin. For the purposes of the calculations infiltration into the surrounding soil was not deducted.

The stormwater treatment basin will be constructed and receive run-off from the entire area of the developed site. This basin will be constructed with a flat bottom and a long level spreader will be installed to relieve the basin during larger storm events. Utilizing these measures, the peak stormwater runoff rates from the post development site have been reduced. Hydrographs for the post development conditions are included in this report. A summary of the peak stormwater flow rates from the site are included in Table 2.

The proposed closed catch basin and culvert drainage system within the parking lot was analyzed to ensure that it would adequately convey the 10-year storm without surcharge. A summary of the findings and the storm sewers calculations are included with this report.

Proposed water quality improvement measures include the installation of perimeter vegetated drainage swales and the construction of a stormwater treatment basin. The post development stormwater management is consistent with the 2004 Connecticut Stormwater Quality Manual and will remove 80% of total suspended solids. The water quality measures along with the drainage system are to be installed as part of the Site Preparation Contract. The proposed stormwater treatment basin has been sized provide the required water quality volume as shown in the following calculations.

Analysis Method:

The overall site analysis was performed for the 2-year, 10-year, 25-year, and 100-year frequency storms using the SCS TR-55 method utilizing the Hydraflow Hydrographs Extension for AutoCAD. The drainage system hydraulic analysis was performed using the rational method for the 10-year frequency storm utilizing the Hydraflow Storm Sewers Extension for AutoCAD. Precipitation data, rainfall intensities, and distribution were acquired from NOAA Atlas 14, Volume 10, Version 2 for the site, and are included in Appendix A. Water quality volume and flow rate calculations were performed as outlined in the 2004 Connecticut Stormwater Quality Manual (Section 7.4.1 and Section 7.4.2 respectively).

Table 1 – Curve Numbers:

Runoff curve numbers for the existing and proposed conditions were compiled from Table 2-2 of TR-55. The following curve numbers were used for the calculations using Hydrologic Soil Group D:

Existing Conditions	
Impervious (rock)	98
Open Space (lawns, etc.) – Good Condition:	80
Woods – Good:	77
Proposed Conditions	
Impervious Areas (roofs, pavement, rock, etc.)	98
Open Space (lawns, etc.) – Good Condition:	80
Woods – Good:	77

Table 2 – Peak Flow Summary:

	Peak Flow (cfs)			
	2-Yr	10-Yr	25-Yr	100-Yr
Pre-Existing Conditions - To Wetlands :	8.31	17.62	20.42	29.61
Post Development - To Wetlands :	7.37	17.65	20.20	28.48

Stormwater Treatment Basin - Water Quality Volume Calculation:

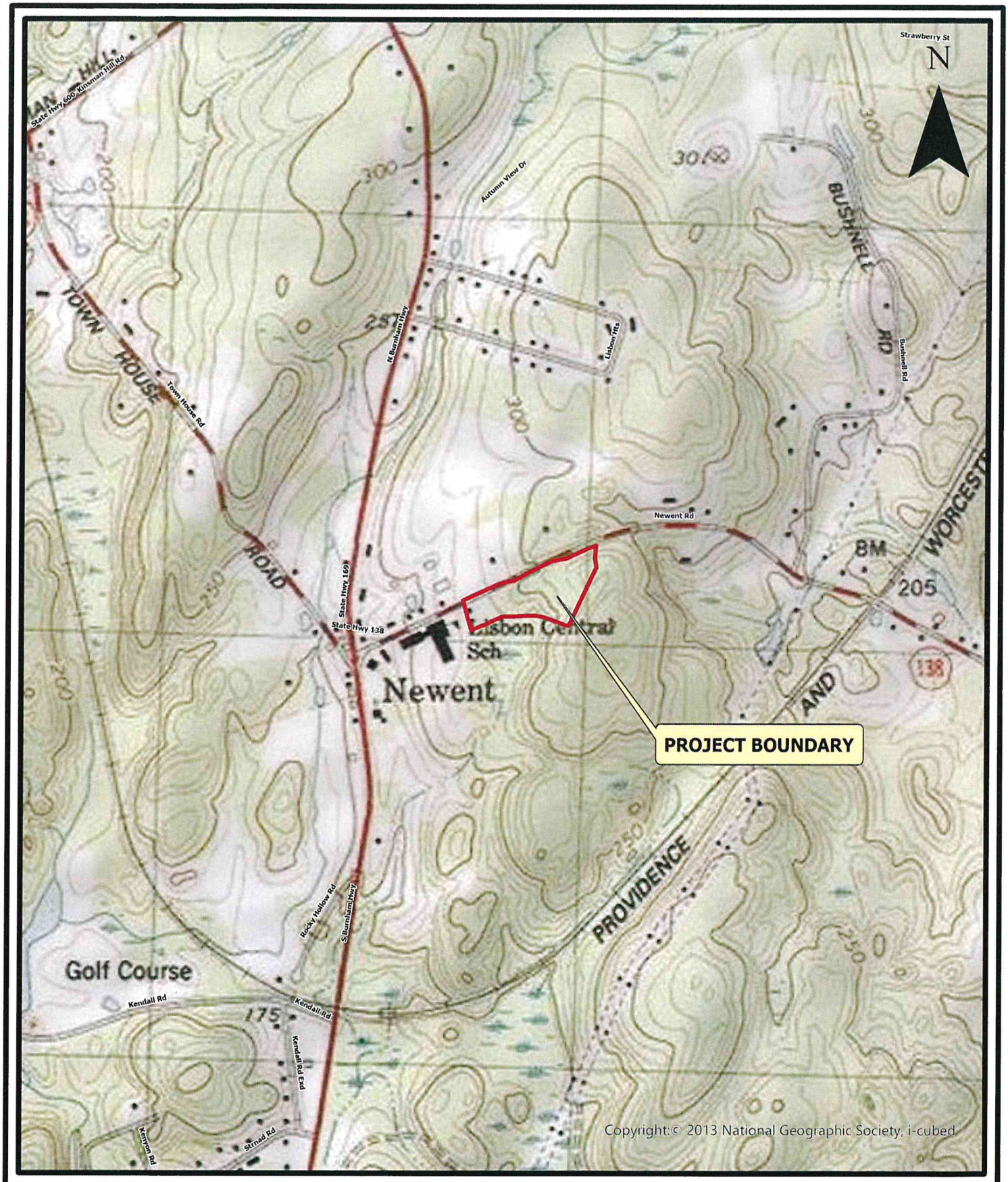
The majority of Stormwater from the site will discharge to a stormwater treatment basin located to the southwest of the site. The treatment basin volume has been sized to store the water quality volume (WQV) in accordance with the 2004 Connecticut Stormwater Quality Manual. The minimum volume is as follows:

Calculate water quality volume
Per Chapter 7.4 of the DEP 2004 Storm Water Quality Manual:
Water Quality Volume (WQV) = (1")(R)(A) / 12
R = 0.05 + 0.009(I)
I = percent of impervious cover
A = site area

A (total):	10.96 ac.
A (impervious):	1.22 ac (Pavement only. Roof and rock considered clean).

I = 10.96 ac. / 1.22 ac. = 11.2%
R = 0.05 + 0.009(11.2%) = 0.15
WQV = (1")(0.15)(1.22 ac.) / 12 = 0.1375 ac.-ft = 5,987 CF Required
21,671 CF Provided

FIGURES



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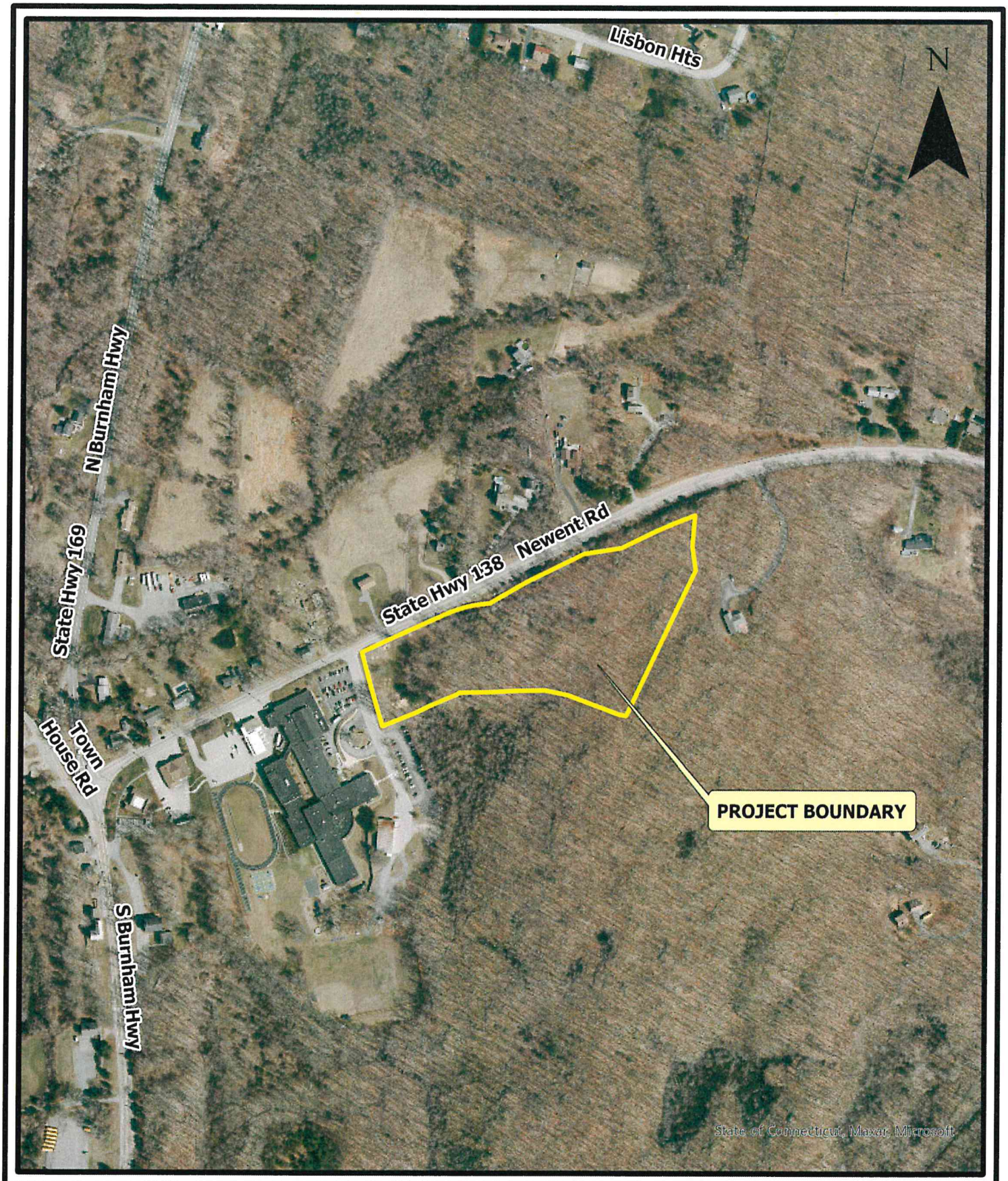
TOWN OF LISBON

PROPOSED FIRE STATION
25 NEWENT ROAD (Rte 138)
LISBON, CT

DATE: 4/22/2022

SCALE: 1"=1,000'

FIGURE
1



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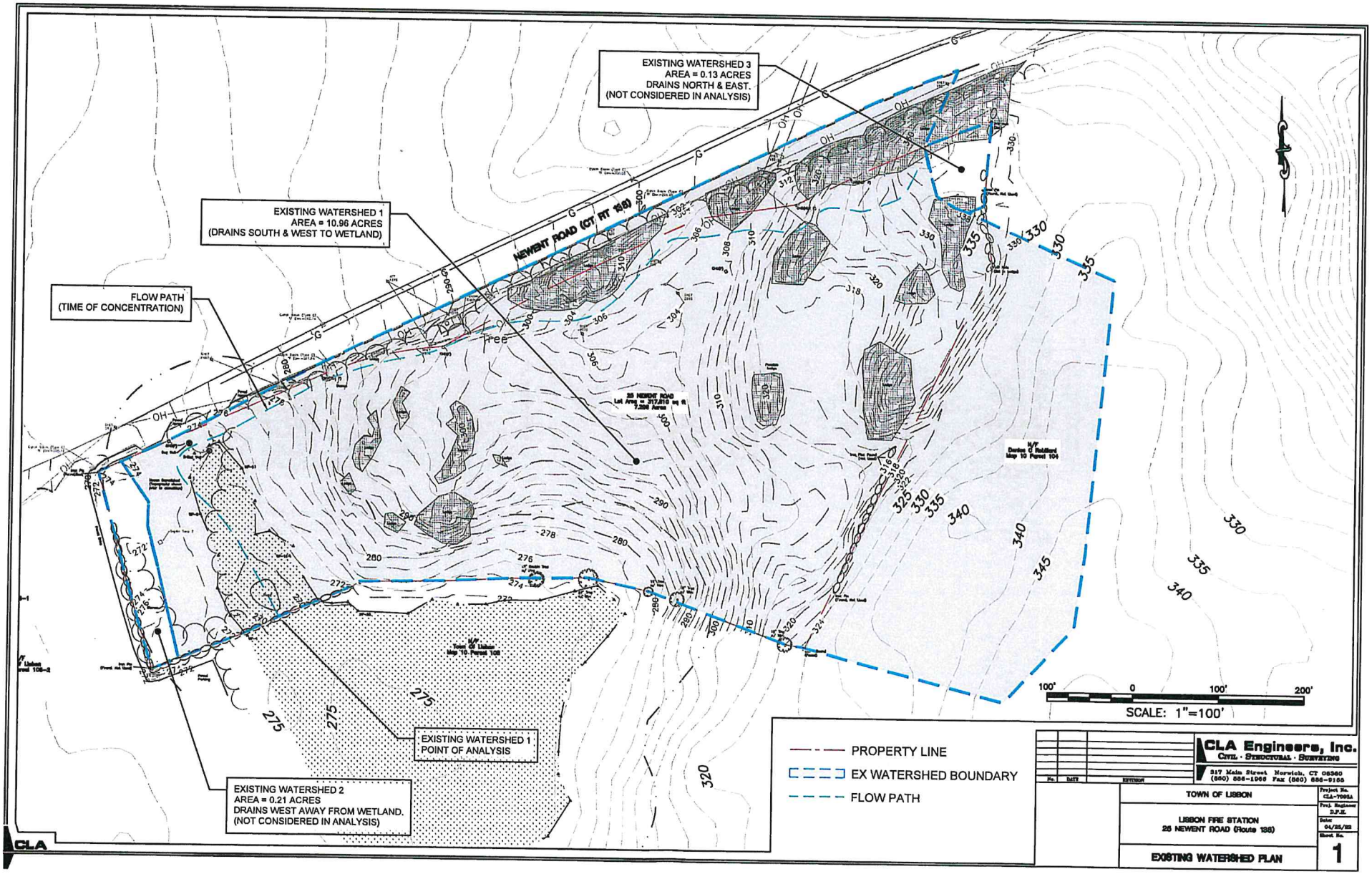
TOWN OF LISBON

PROPOSED FIRE STATION
25 NEWENT ROAD (Rte 138)
LISBON, CT

DATE: 4/22/2022

SCALE: 1"=400'

FIGURE
2



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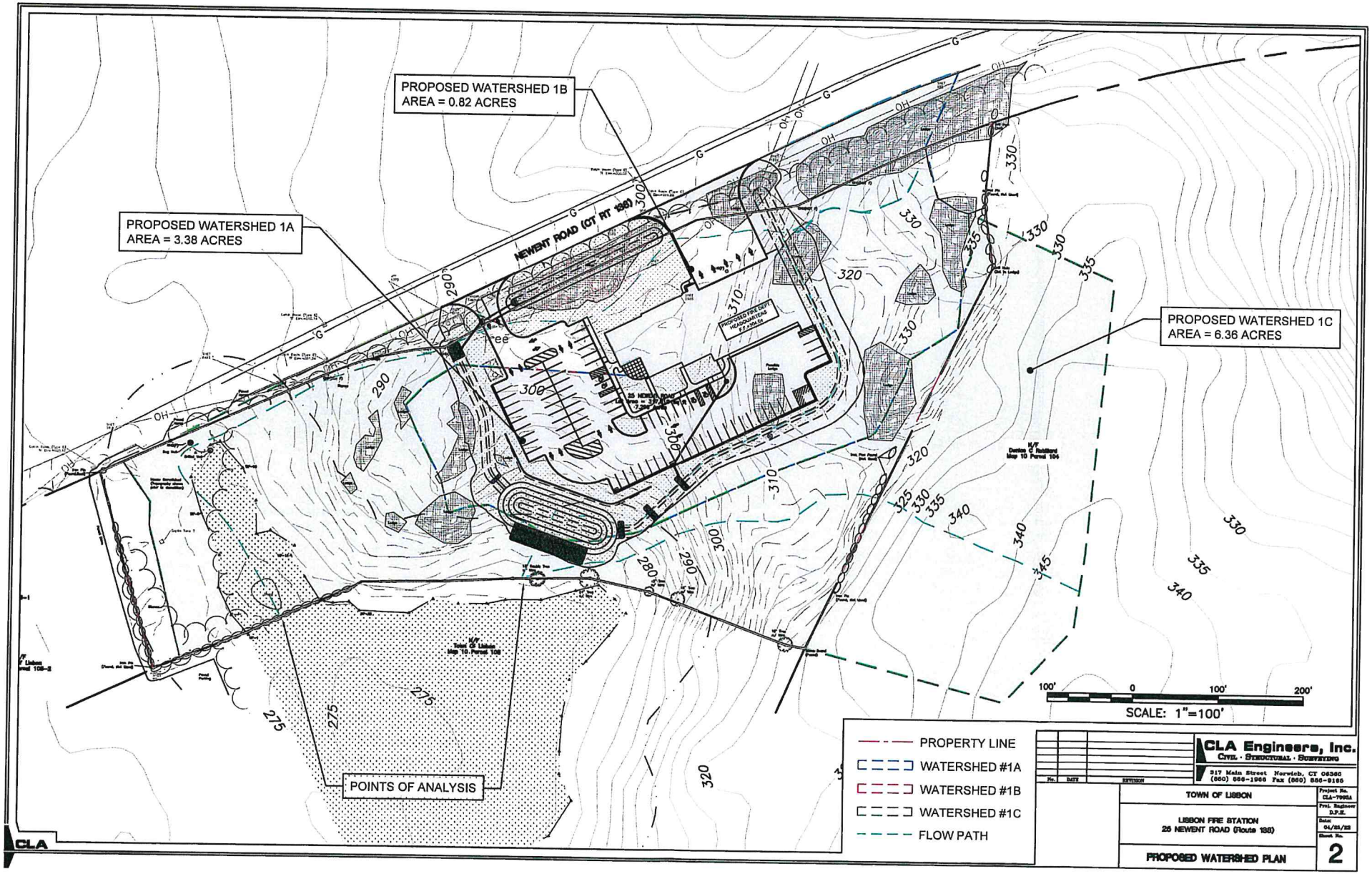
No.	DATE	REVISION

TOWN OF LISBON

LISBON FIRE STATION
25 NEWENT ROAD (Route 163)

EXISTING WATERSHED PLAN

Project No. CLA-79951
Proj. Engineer D.P.S.
Date 04/25/22
Sheet No. 1



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No.	DATE	REVISION

TOWN OF LISBON

LISBON FIRE STATION
25 NEWENT ROAD (Route 138)

PROPOSED WATERSHED PLAN

Project No. CLA-79901A
Proj. Engineer D.P.K.
Date: 04/22/22
Sheet No. 2

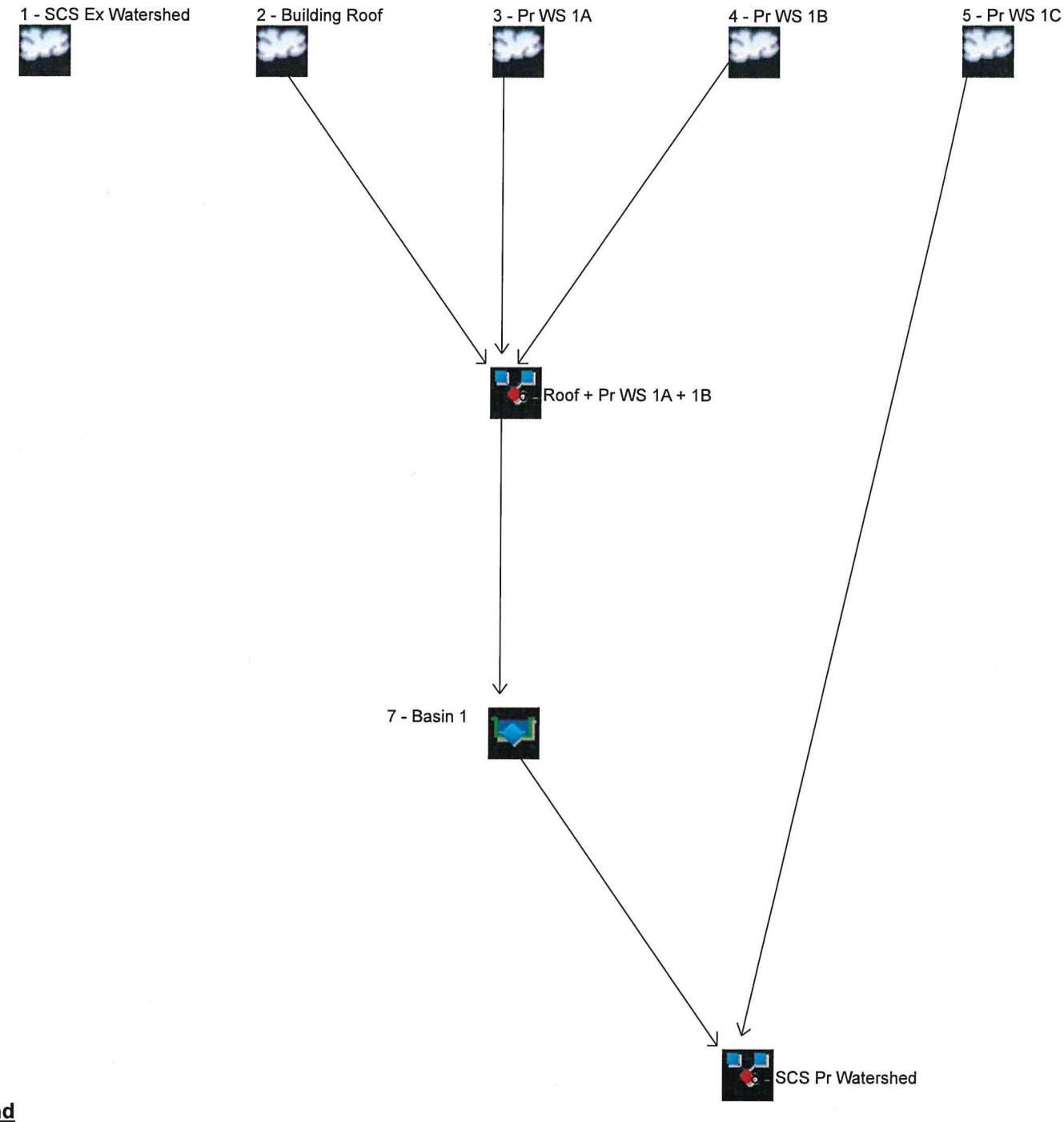
CLA

CALCULATIONS:

Hydrograph Reports – 2, 10, 25 & 100-Year Frequencies

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066



Legend

Hyd.	Origin	Description
1	SCS Runoff	SCS Ex Watershed
2	SCS Runoff	Building Roof
3	SCS Runoff	Pr WS 1A
4	SCS Runoff	Pr WS 1B
5	SCS Runoff	Pr WS 1C
6	Combine	Roof + Pr WS 1A + 1B
7	Reservoir	Basin 1
8	Combine	SCS Pr Watershed

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	-------	8.313	-------	13.50	17.62	20.42	26.72	29.61	SCS Ex Watershed
2	SCS Runoff	------	-------	1.306	-------	1.717	2.024	2.229	2.679	2.883	Building Roof
3	SCS Runoff	------	-------	4.318	-------	6.349	7.893	8.926	11.20	12.23	Pr WS 1A
4	SCS Runoff	------	-------	1.946	-------	2.817	3.478	3.920	4.888	5.327	Pr WS 1B
5	SCS Runoff	------	-------	4.347	-------	7.066	9.224	10.70	14.00	15.52	Pr WS 1C
6	Combine	2, 3, 4,	-------	5.593	-------	8.103	10.01	11.29	14.10	15.38	Roof + Pr WS 1A + 1B
7	Reservoir	6	-------	0.963	-------	6.679	9.793	11.07	14.02	15.30	Basin 1
8	Combine	5, 7	-------	4.347	-------	13.60	17.65	20.20	25.88	28.48	SCS Pr Watershed

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	8.313	1	750	52,383	------	------	------	SCS Ex Watershed
2	SCS Runoff	1.306	1	724	4,518	------	------	------	Building Roof
3	SCS Runoff	4.318	1	742	23,202	------	------	------	Pr WS 1A
4	SCS Runoff	1.946	1	725	6,014	------	------	------	Pr WS 1B
5	SCS Runoff	4.347	1	756	30,246	------	------	------	Pr WS 1C
6	Combine	5.593	1	726	33,734	2, 3, 4,	------	------	Roof + Pr WS 1A + 1B
7	Reservoir	0.963	1	801	12,063	6	279.01	21,757	Basin 1
8	Combine	4.347	1	756	42,309	5, 7	------	------	SCS Pr Watershed

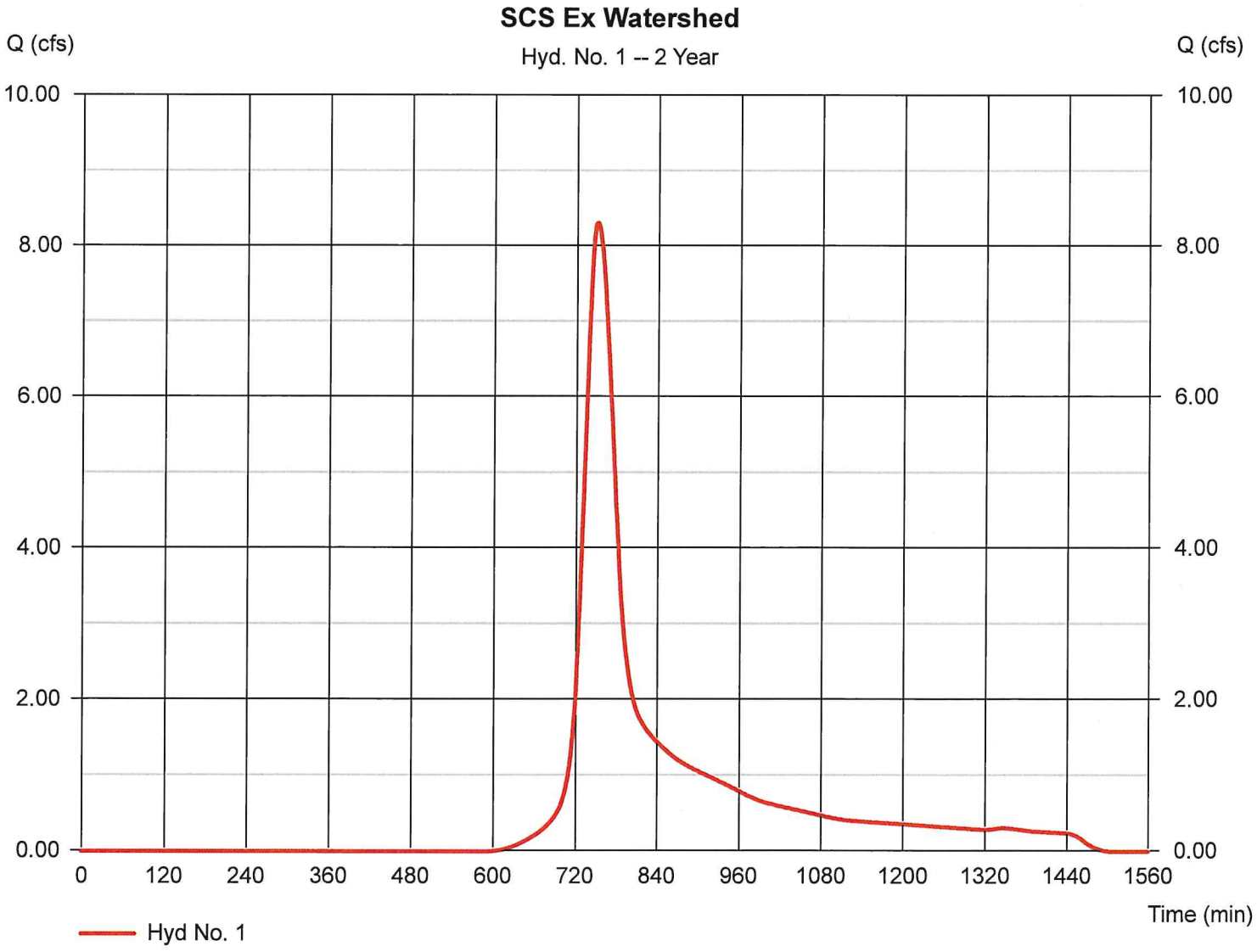
Hydrograph Report

Hyd. No. 1

SCS Ex Watershed

Hydrograph type	= SCS Runoff	Peak discharge	= 8.313 cfs
Storm frequency	= 2 yrs	Time to peak	= 750 min
Time interval	= 1 min	Hyd. volume	= 52,383 cuft
Drainage area	= 10.960 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 41.80 min
Total precip.	= 3.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(10.230 x 77) + (0.360 x 98) + (0.370 x 80)] / 10.960



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No. 1

SCS Ex Watershed

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 175.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.25	0.00	0.00	
Land slope (%)	= 6.50	0.00	0.00	
Travel Time (min)	**= 36.23**	**+ 0.00**	**+ 0.00**	**= 36.23**
Shallow Concentrated Flow				
Flow length (ft)	= 745.00	270.00	0.00	
Watercourse slope (%)	= 6.90	1.10	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 4.24	1.69	0.00	
Travel Time (min)	**= 2.93**	**+ 2.66**	**+ 0.00**	**= 5.59**
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	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 41.80 min

Hydrograph Report

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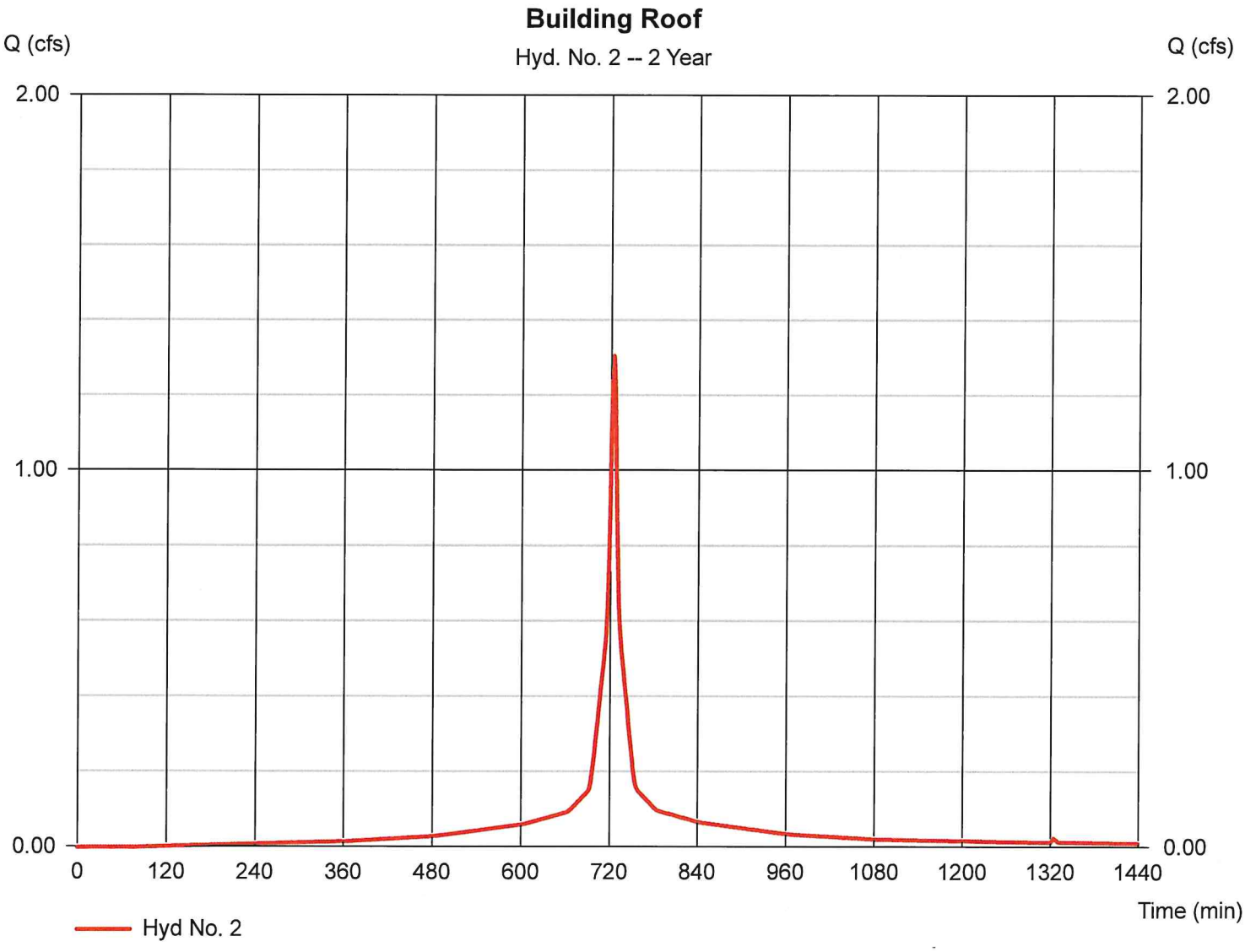
Hyd. No. 2

Building Roof

Hydrograph type	= SCS Runoff	Peak discharge	= 1.306 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 4,518 cuft
Drainage area	= 0.400 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

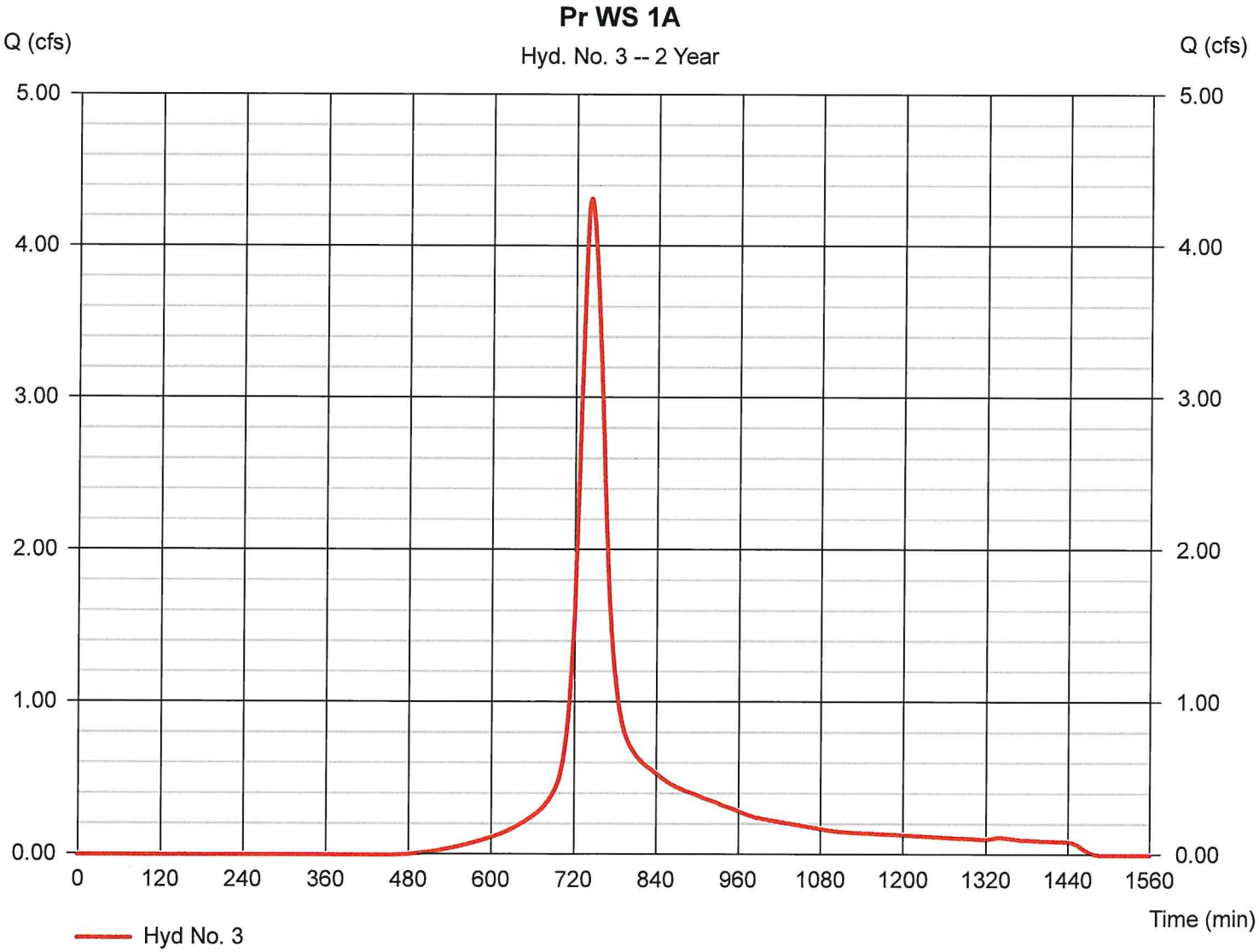
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 3

Pr WS 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 4.318 cfs
Storm frequency	= 2 yrs	Time to peak	= 742 min
Time interval	= 1 min	Hyd. volume	= 23,202 cuft
Drainage area	= 3.380 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.80 min
Total precip.	= 3.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.900 x 77) + (0.120 x 80) + (0.800 x 98) + (0.560 x 98)] / 3.380



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No. 3

Pr WS 1A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.800		0.011		0.011		
Flow length (ft)	= 166.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.25		0.00		0.00		
Land slope (%)	= 9.00		0.00		0.00		
Travel Time (min)	**= 30.49**	**+**	**0.00**	**+**	**0.00**	**=**	**30.49**
Shallow Concentrated Flow							
Flow length (ft)	= 20.00		0.00		0.00		
Watercourse slope (%)	= 100.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 20.33		0.00		0.00		
Travel Time (min)	**= 0.02**	**+**	**0.00**	**+**	**0.00**	**=**	**0.02**
Channel Flow							
X sectional flow area (sqft)	= 4.80		4.80		0.00		
Wetted perimeter (ft)	= 6.00		6.00		0.00		
Channel slope (%)	= 1.10		13.80		0.00		
Manning's n-value	= 0.026		0.015		0.015		
Velocity (ft/s)	= 5.18		31.78		0.00		
Flow length (ft)	= 366.0		156.0		0.0		
Travel Time (min)	**= 1.18**	**+**	**0.08**	**+**	**0.00**	**=**	**1.26**

Total Travel Time, Tc ..... 31.80 min

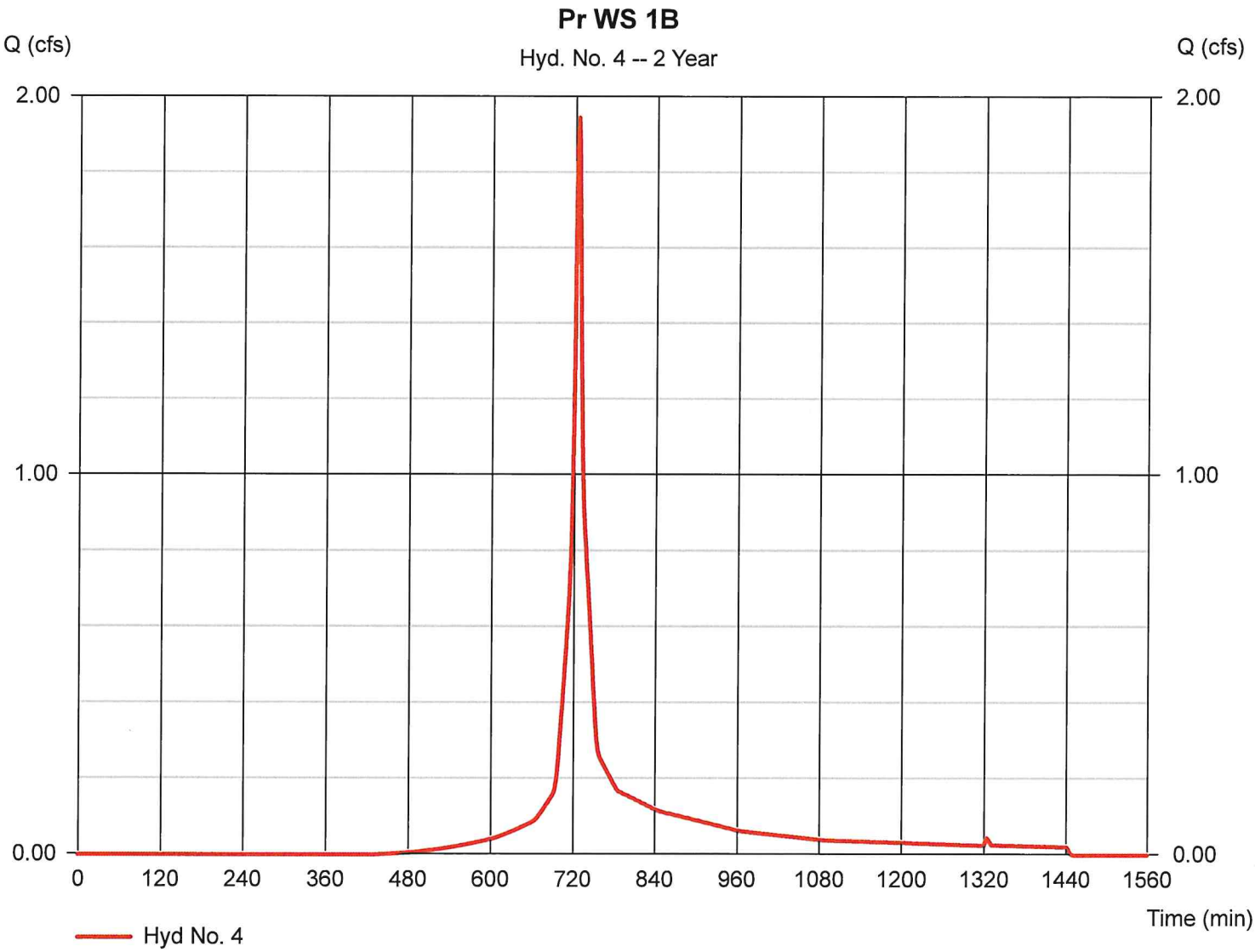
Hydrograph Report

Hyd. No. 4

Pr WS 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 1.946 cfs
Storm frequency	= 2 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 6,014 cuft
Drainage area	= 0.820 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.490 x 80) + (0.330 x 98)] / 0.820



Hydrograph Report

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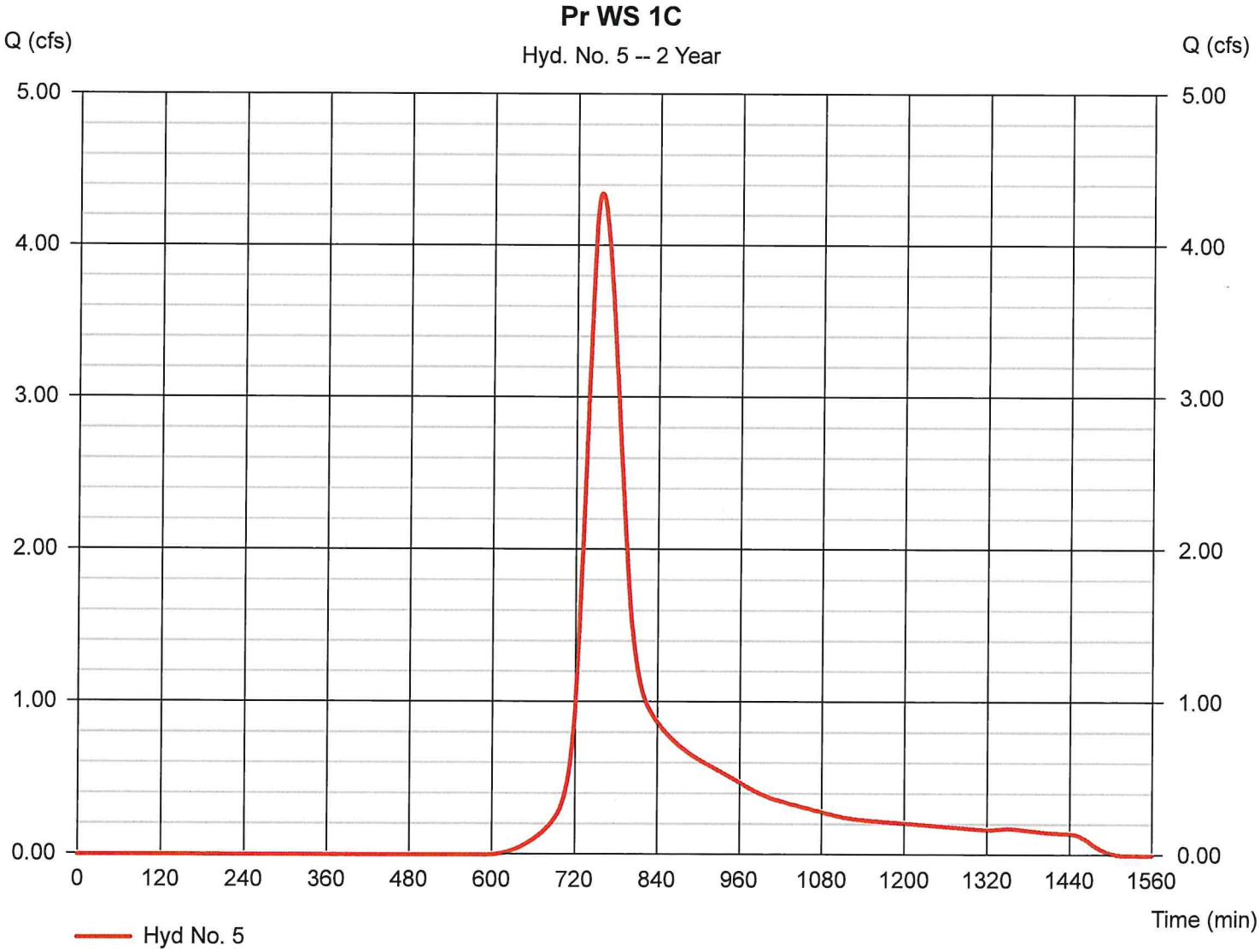
Hyd. No. 5

Pr WS 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 4.347 cfs
Storm frequency	= 2 yrs	Time to peak	= 756 min
Time interval	= 1 min	Hyd. volume	= 30,246 cuft
Drainage area	= 6.360 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.10 min
Total precip.	= 3.25 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.120 x 77) + (0.090 x 98) + (0.150 x 98)] / 6.360



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No. 5

Pr WS 1C

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.800	0.011	0.011	
Flow length (ft)	= 171.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.25	0.00	0.00	
Land slope (%)	= 3.00	0.00	0.00	
Travel Time (min)	**= 48.45**	**+ 0.00**	**+ 0.00**	**= 48.45**
Shallow Concentrated Flow				
Flow length (ft)	= 400.00	125.00	0.00	
Watercourse slope (%)	= 15.00	4.30	0.00	
Surface description	= Unpaved	Unpaved	Paved	
Average velocity (ft/s)	= 6.25	3.35	0.00	
Travel Time (min)	**= 1.07**	**+ 0.62**	**+ 0.00**	**= 1.69**
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	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... 50.10 min

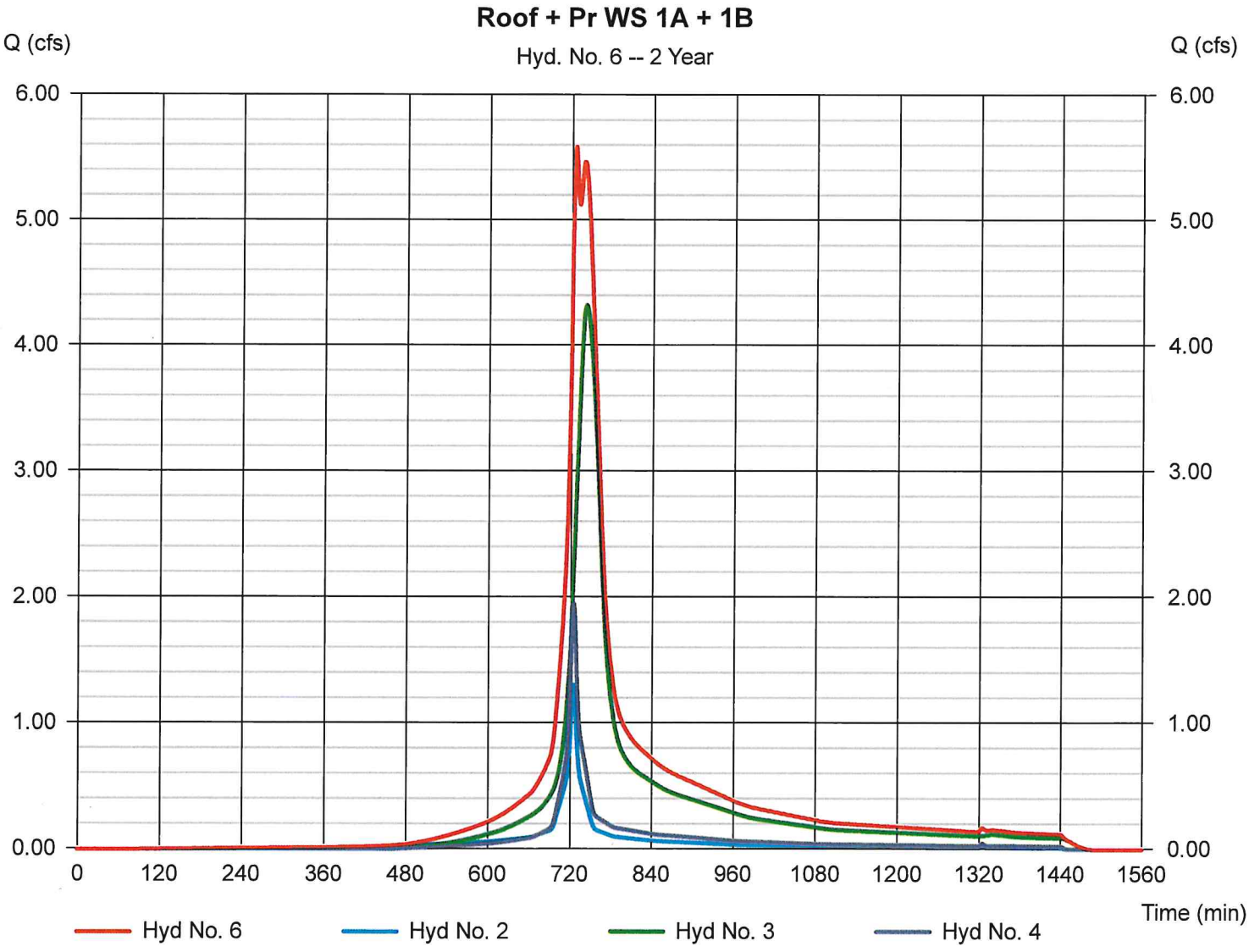
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 6

Roof + Pr WS 1A + 1B

Hydrograph type	= Combine	Peak discharge	= 5.593 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 33,734 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 4.600 ac



Hydrograph Report

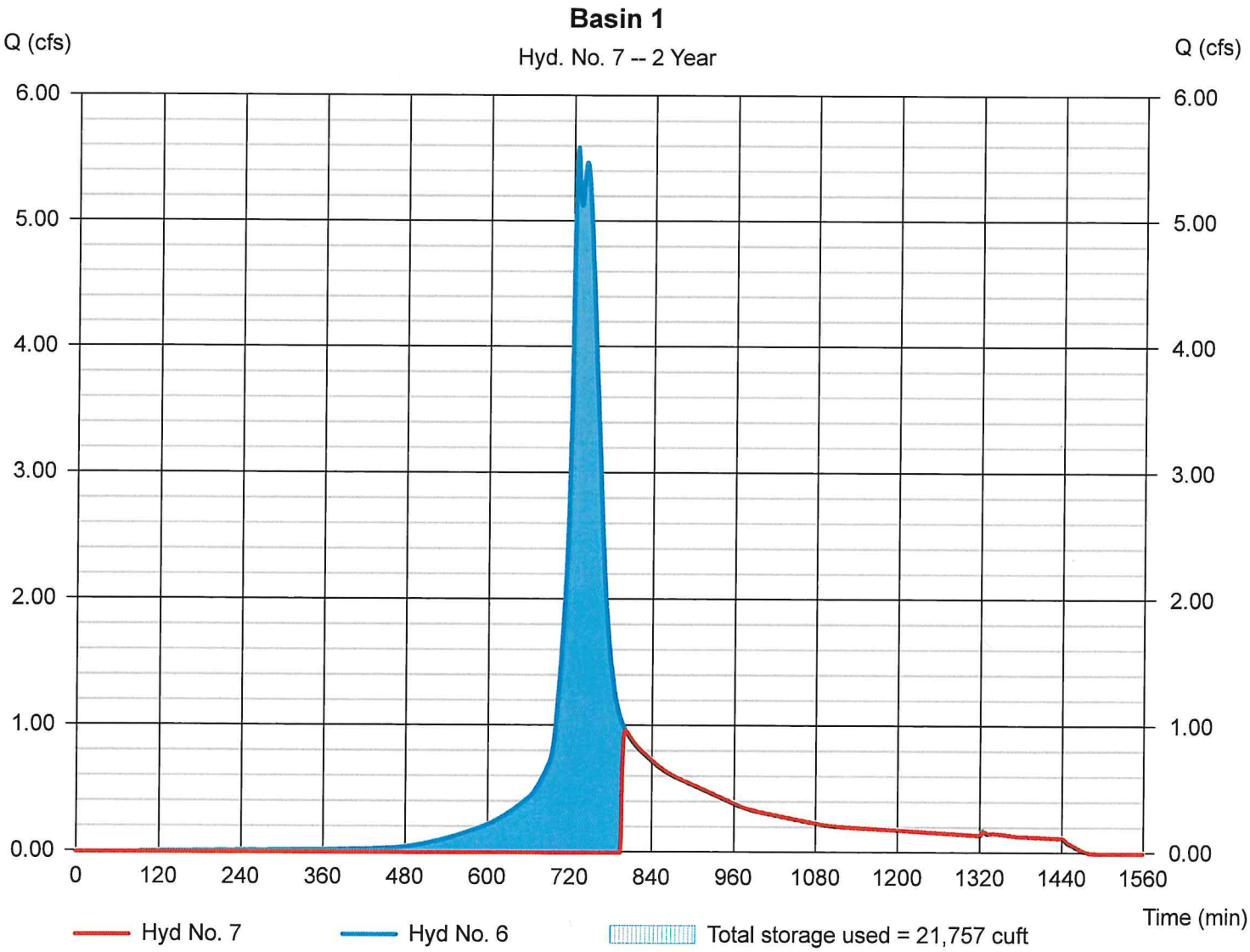
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 7

Basin 1

Hydrograph type	= Reservoir	Peak discharge	= 0.963 cfs
Storm frequency	= 2 yrs	Time to peak	= 801 min
Time interval	= 1 min	Hyd. volume	= 12,063 cuft
Inflow hyd. No.	= 6 - Roof + Pr WS 1A + 1B	Max. Elevation	= 279.01 ft
Reservoir name	= Basin 1	Max. Storage	= 21,757 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Monday, Apr 25, 2022

Pond No. 1 - Basin 1

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 272.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	272.00	568	0	0
2.00	274.00	1,874	2,316	2,316
4.00	276.00	3,407	5,205	7,520
6.00	278.00	5,165	8,510	16,031
7.00	279.00	6,130	5,640	21,671
8.00	280.00	7,150	6,633	28,304

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

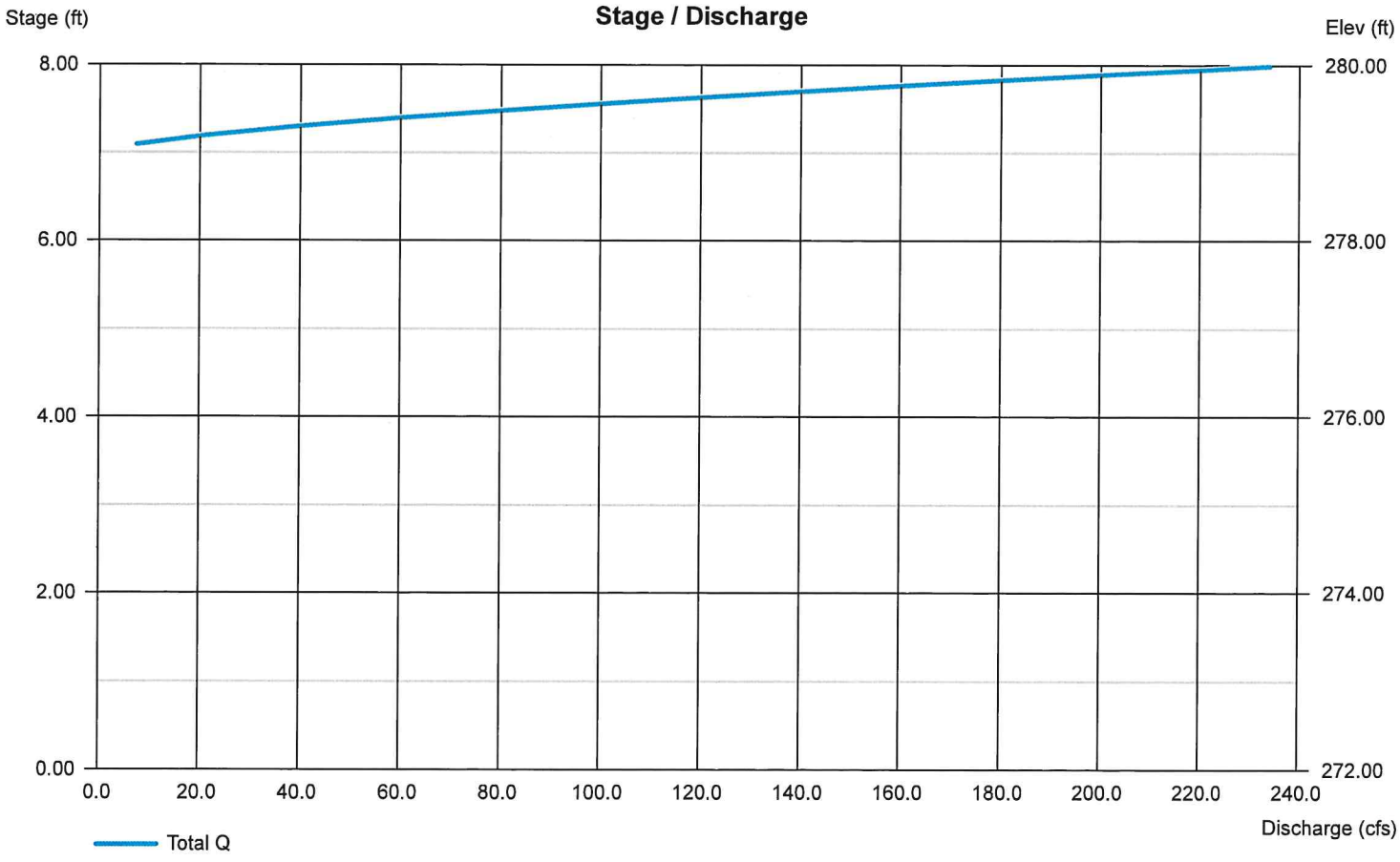
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 90.00	0.00	0.00	0.00
Crest El. (ft)	= 279.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
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).

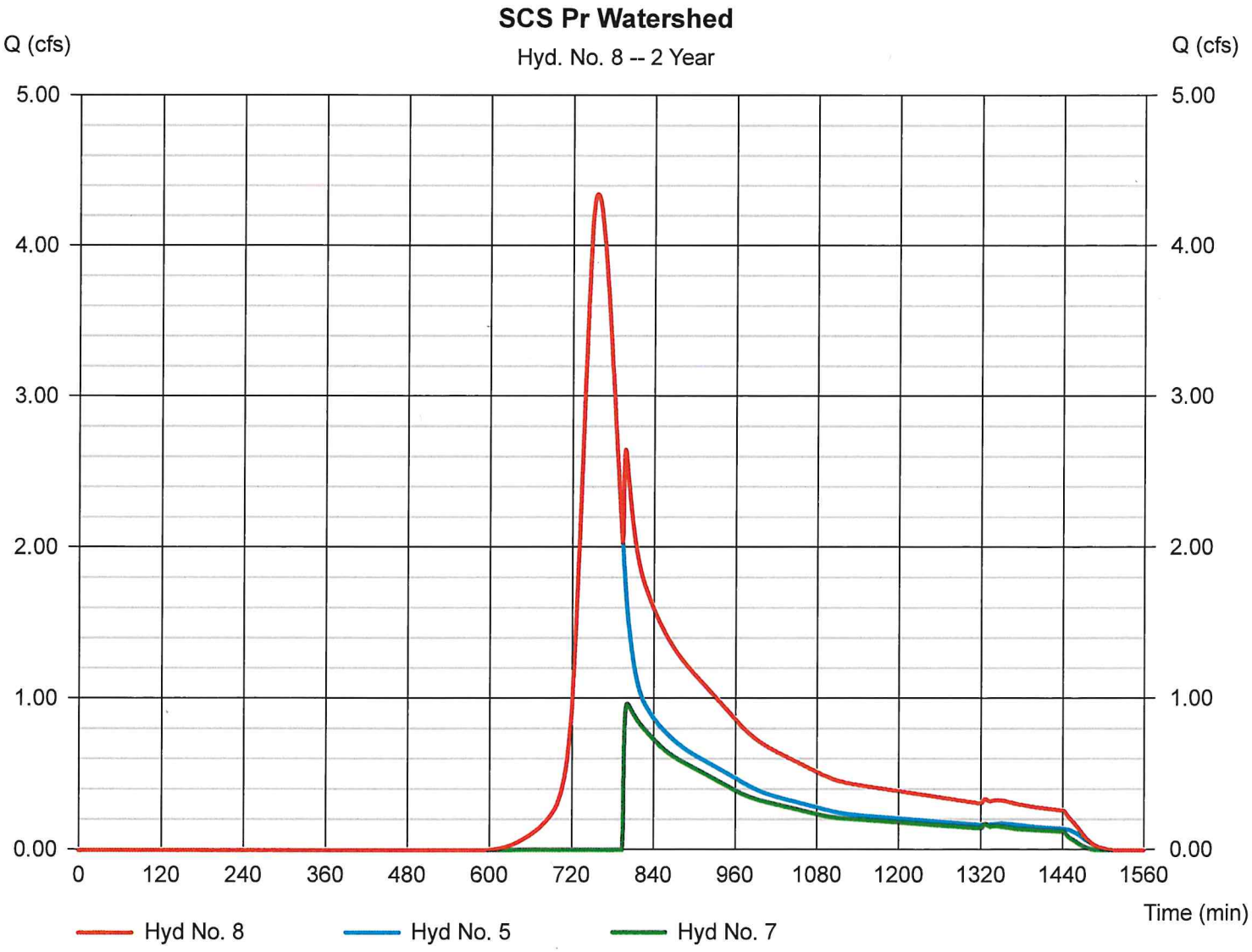


Hydrograph Report

Hyd. No. 8

SCS Pr Watershed

Hydrograph type	= Combine	Peak discharge	= 4.347 cfs
Storm frequency	= 2 yrs	Time to peak	= 756 min
Time interval	= 1 min	Hyd. volume	= 42,309 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 6.360 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	17.62	1	749	108,424	------	------	------	SCS Ex Watershed
2	SCS Runoff	2.024	1	724	7,132	------	------	------	Building Roof
3	SCS Runoff	7.893	1	741	42,818	------	------	------	Pr WS 1A
4	SCS Runoff	3.478	1	724	10,950	------	------	------	Pr WS 1B
5	SCS Runoff	9.224	1	754	62,604	------	------	------	Pr WS 1C
6	Combine	10.01	1	726	60,900	2, 3, 4,	------	------	Roof + Pr WS 1A + 1B
7	Reservoir	9.793	1	740	39,229	6	279.12	22,451	Basin 1
8	Combine	17.65	1	747	101,834	5, 7	------	------	SCS Pr Watershed

Hydrograph Report

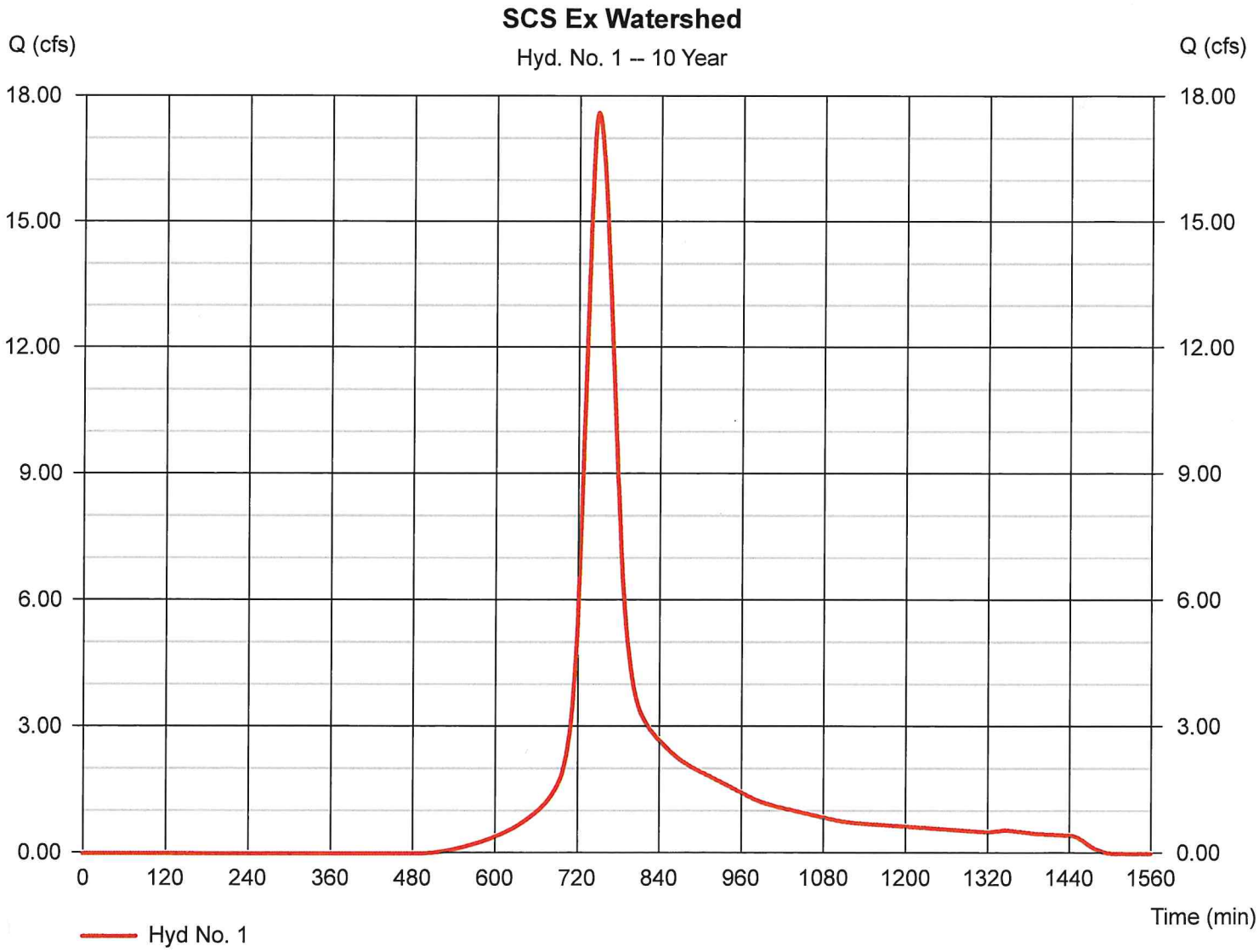
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 1

SCS Ex Watershed

Hydrograph type	= SCS Runoff	Peak discharge	= 17.62 cfs
Storm frequency	= 10 yrs	Time to peak	= 749 min
Time interval	= 1 min	Hyd. volume	= 108,424 cuft
Drainage area	= 10.960 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 41.80 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(10.230 x 77) + (0.360 x 98) + (0.370 x 80)] / 10.960



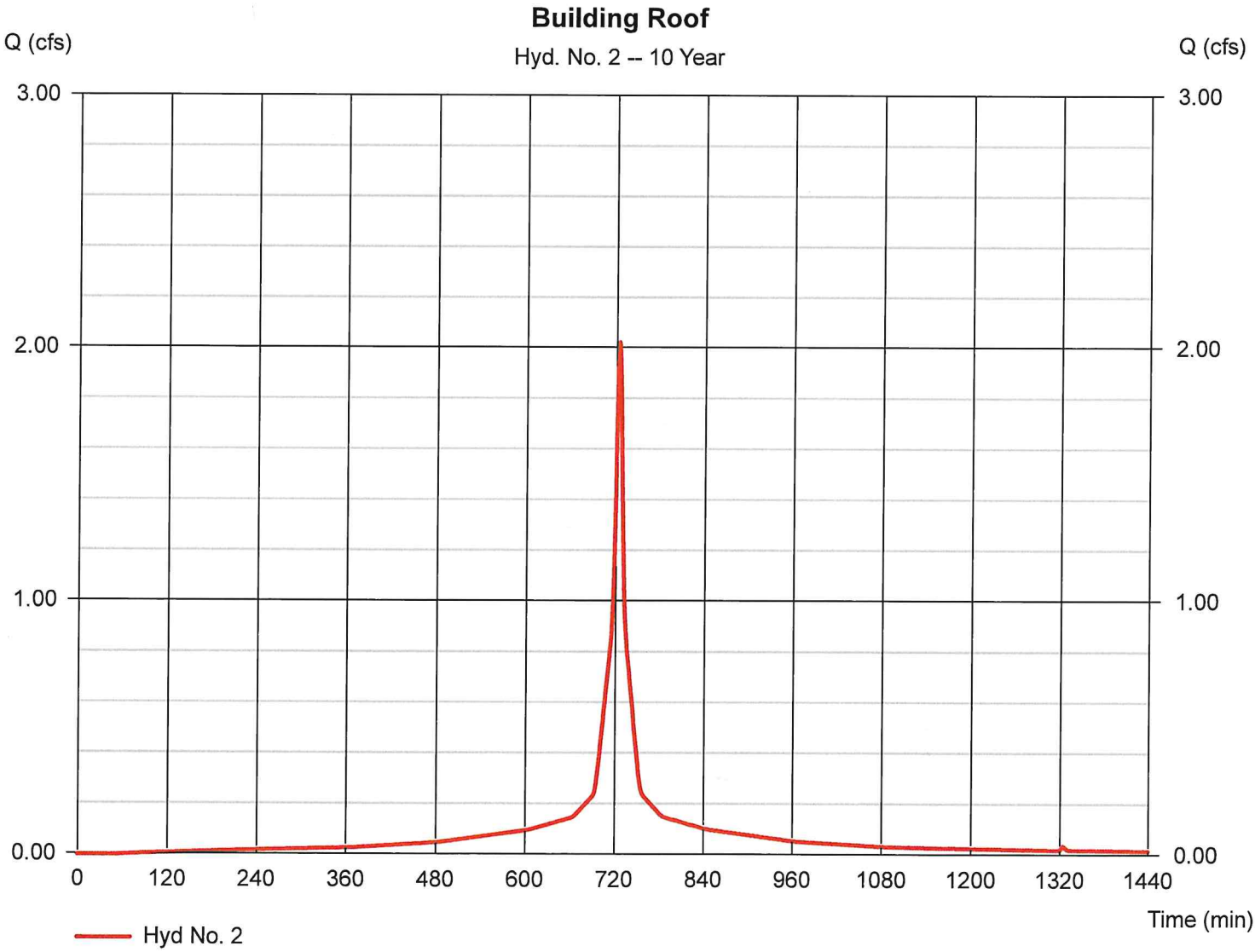
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 2

Building Roof

Hydrograph type	= SCS Runoff	Peak discharge	= 2.024 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 7,132 cuft
Drainage area	= 0.400 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



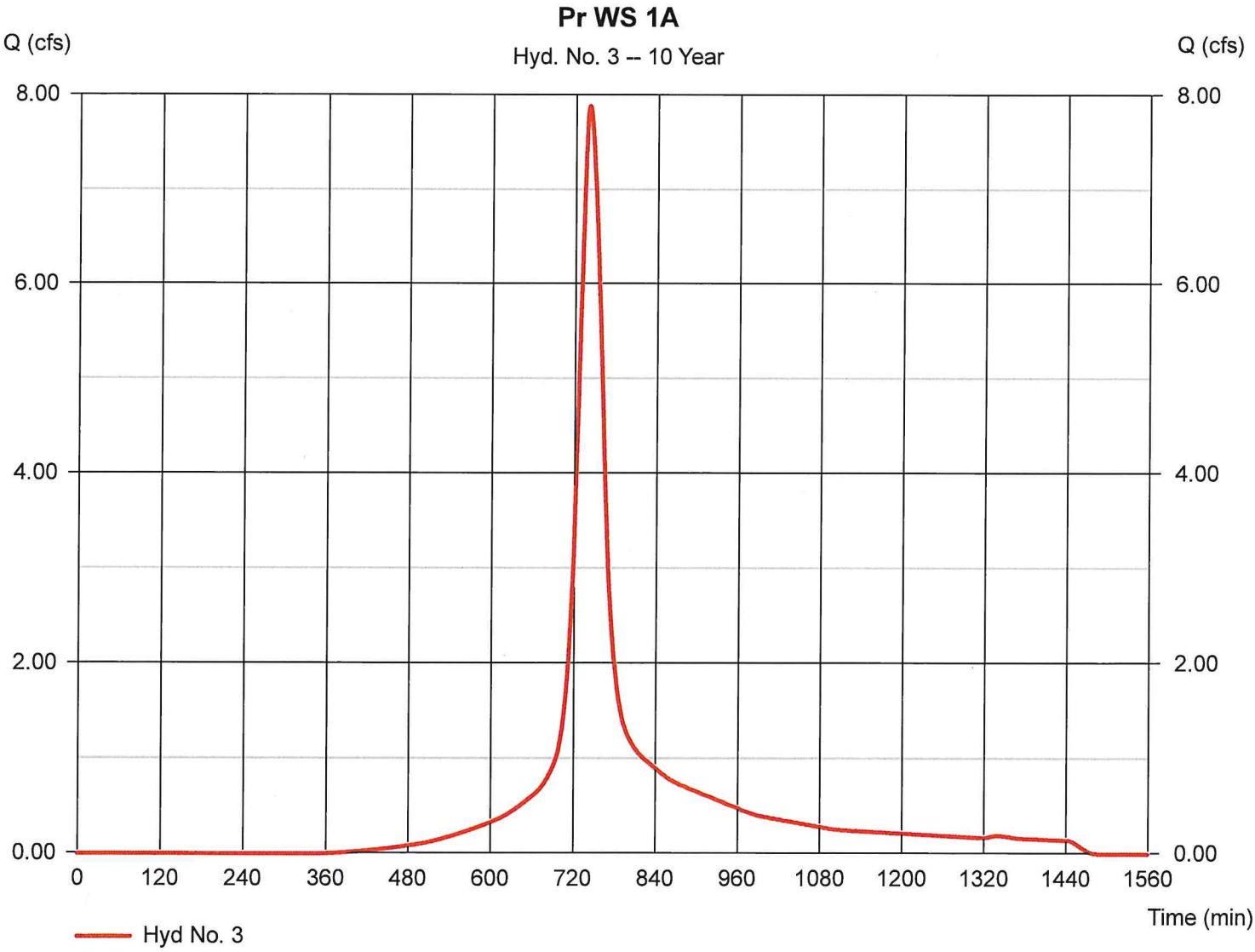
Hydrograph Report

Hyd. No. 3

Pr WS 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 7.893 cfs
Storm frequency	= 10 yrs	Time to peak	= 741 min
Time interval	= 1 min	Hyd. volume	= 42,818 cuft
Drainage area	= 3.380 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.80 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.900 x 77) + (0.120 x 80) + (0.800 x 98) + (0.560 x 98)] / 3.380



Hydrograph Report

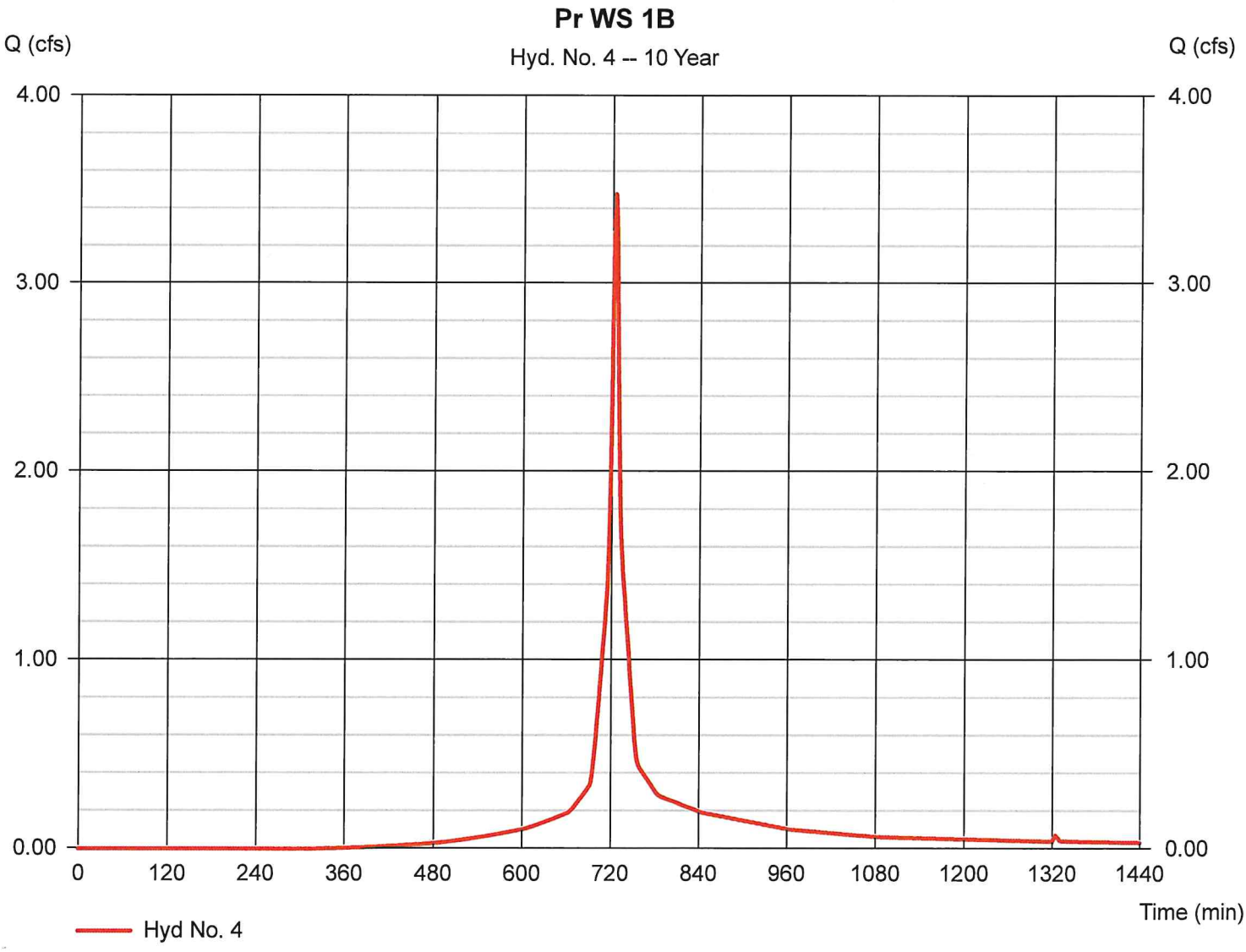
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 4

Pr WS 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 3.478 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 10,950 cuft
Drainage area	= 0.820 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.490 x 80) + (0.330 x 98)] / 0.820



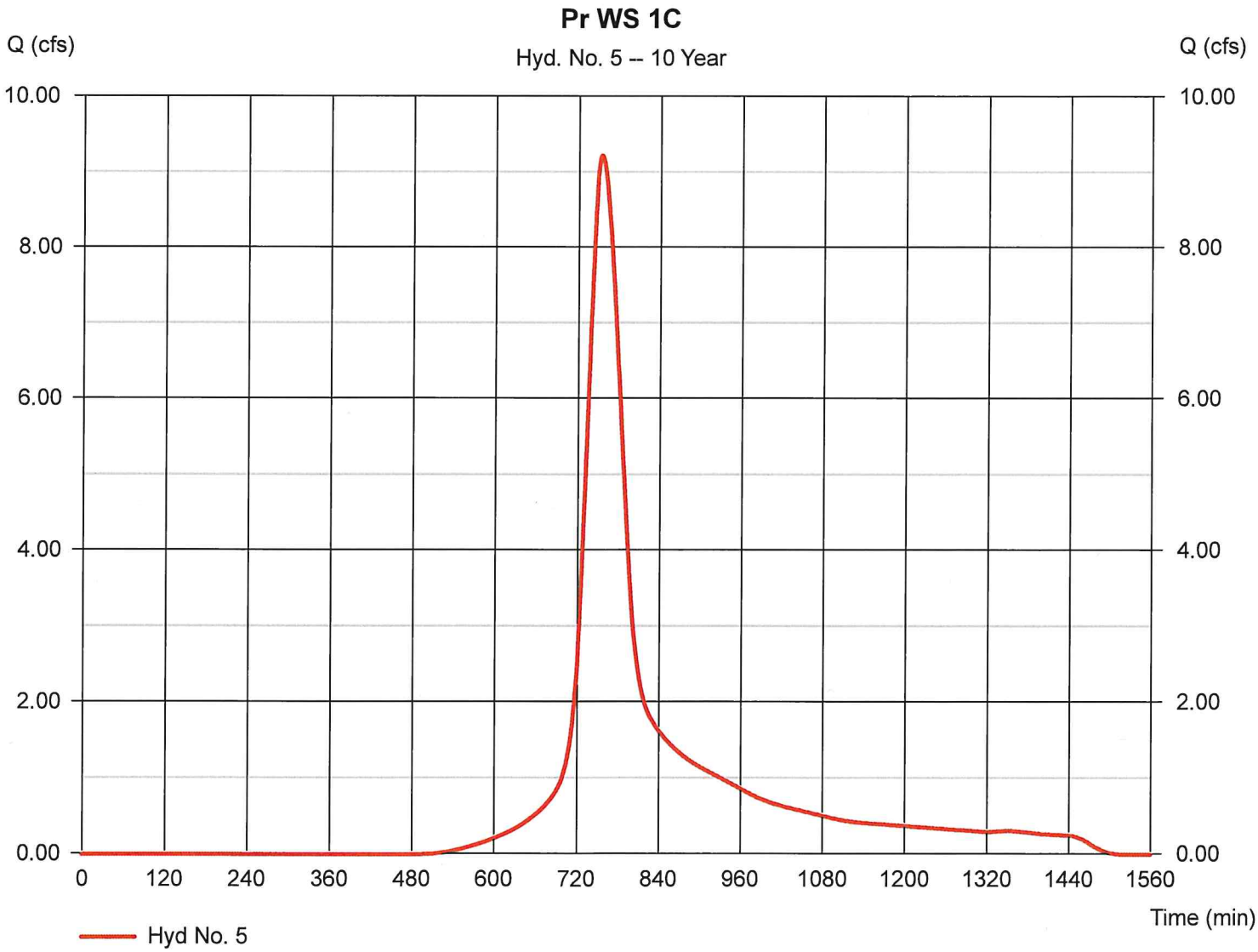
Hydrograph Report

Hyd. No. 5

Pr WS 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 9.224 cfs
Storm frequency	= 10 yrs	Time to peak	= 754 min
Time interval	= 1 min	Hyd. volume	= 62,604 cuft
Drainage area	= 6.360 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.10 min
Total precip.	= 5.00 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.120 x 77) + (0.090 x 98) + (0.150 x 98)] / 6.360

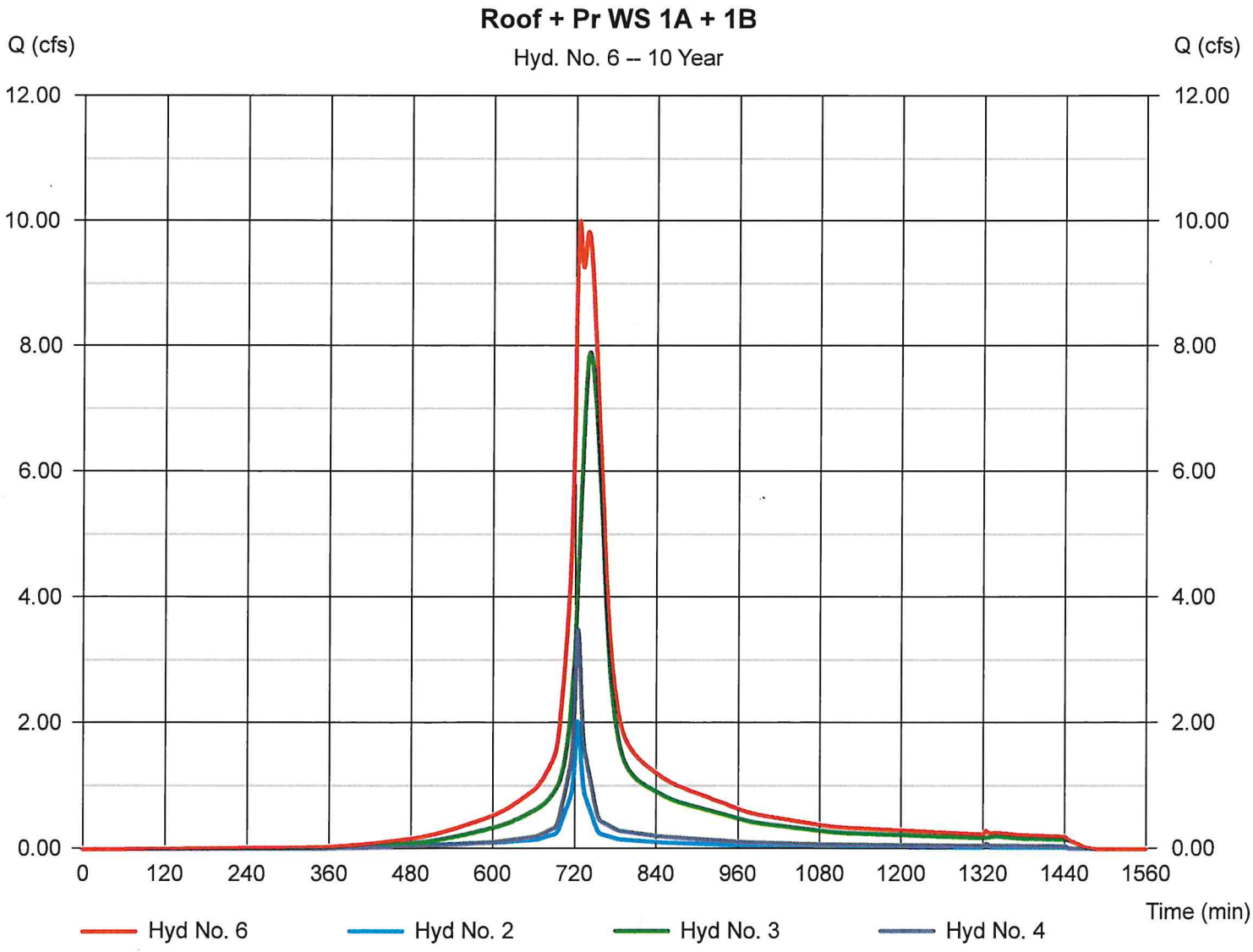


Hydrograph Report

Hyd. No. 6

Roof + Pr WS 1A + 1B

Hydrograph type	= Combine	Peak discharge	= 10.01 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 60,900 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 4.600 ac



Hydrograph Report

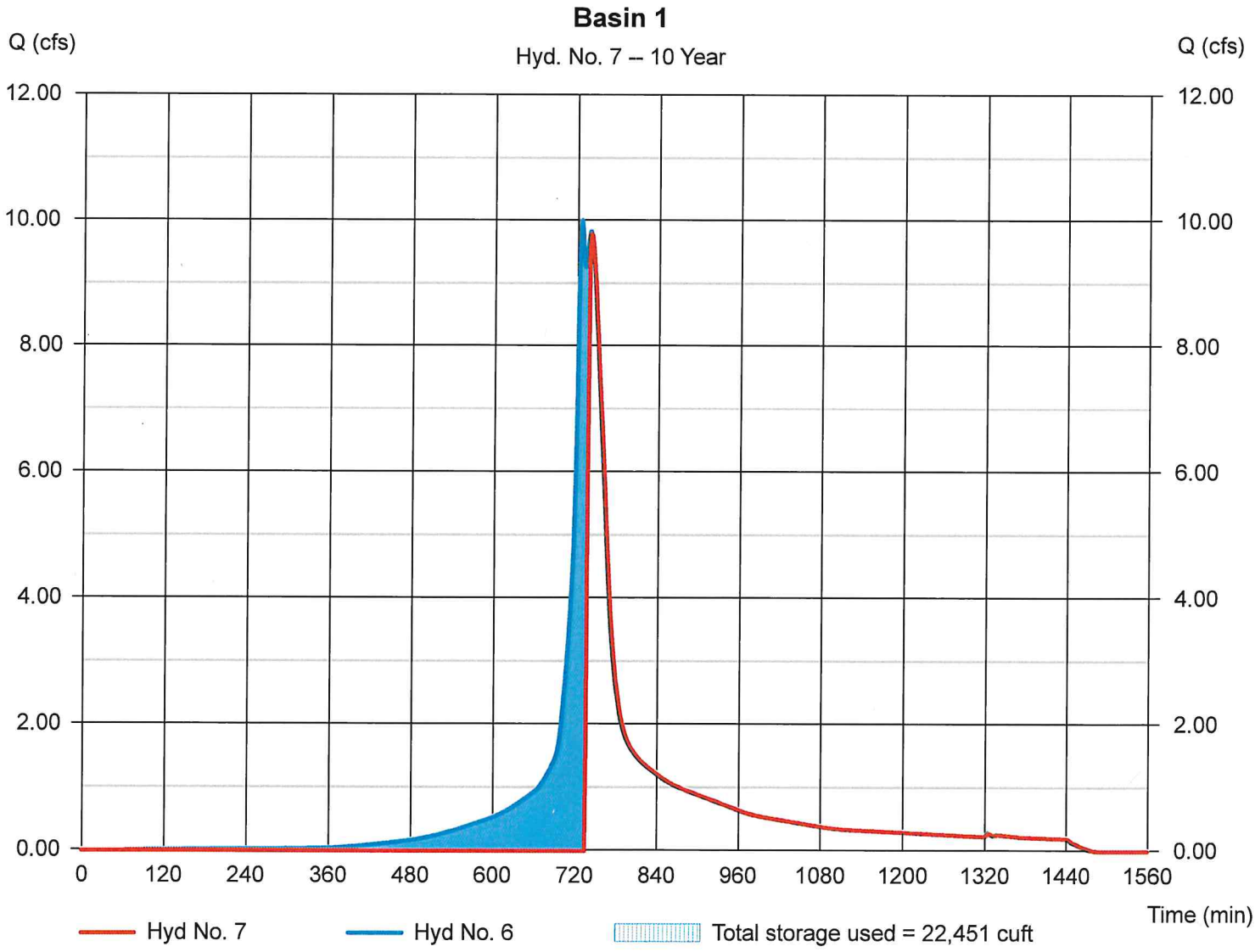
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 7

Basin 1

Hydrograph type	= Reservoir	Peak discharge	= 9.793 cfs
Storm frequency	= 10 yrs	Time to peak	= 740 min
Time interval	= 1 min	Hyd. volume	= 39,229 cuft
Inflow hyd. No.	= 6 - Roof + Pr WS 1A + 1B	Max. Elevation	= 279.12 ft
Reservoir name	= Basin 1	Max. Storage	= 22,451 cuft

Storage Indication method used.



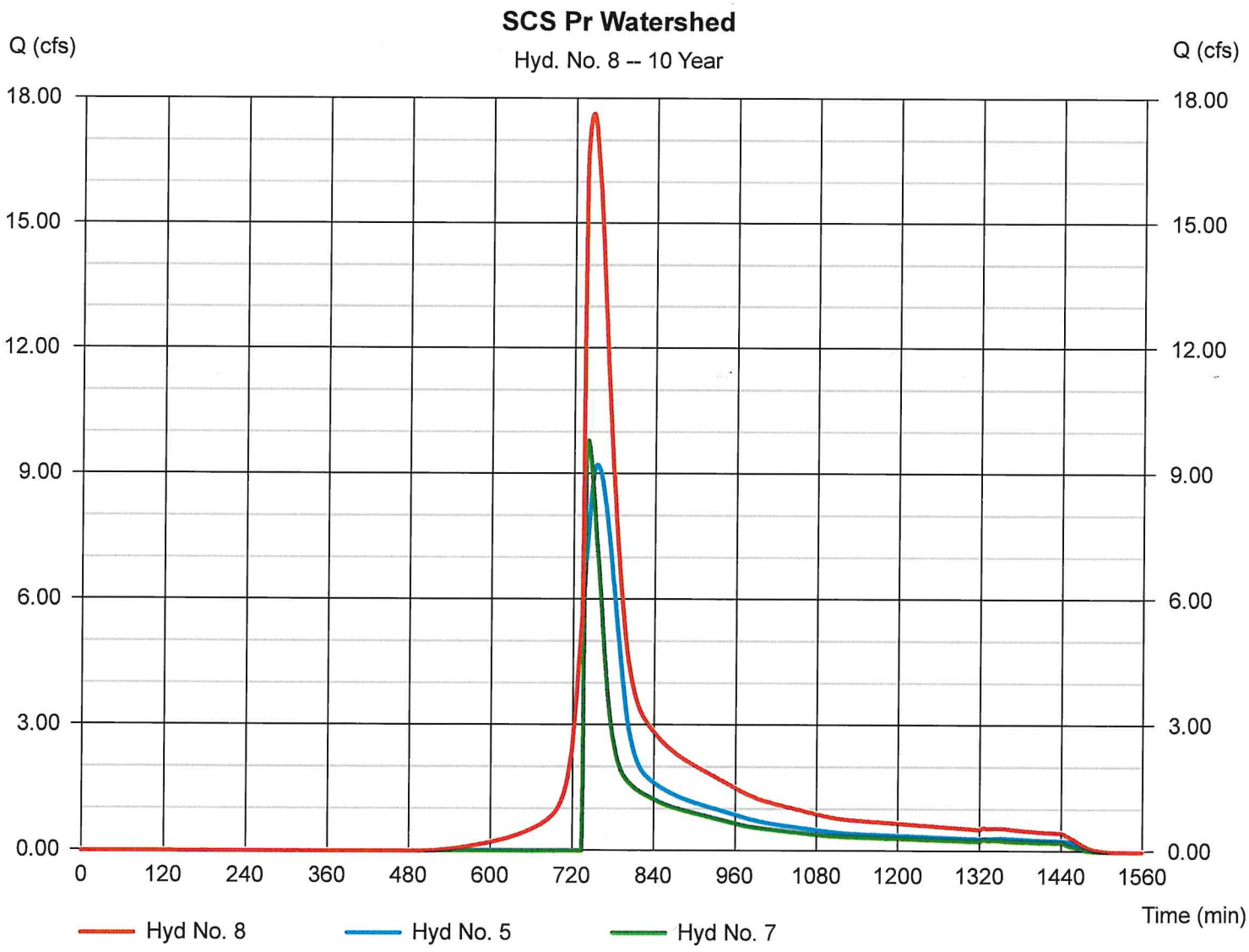
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 8

SCS Pr Watershed

Hydrograph type	= Combine	Peak discharge	= 17.65 cfs
Storm frequency	= 10 yrs	Time to peak	= 747 min
Time interval	= 1 min	Hyd. volume	= 101,834 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 6.360 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	20.42	1	749	125,590	------	------	------	SCS Ex Watershed
2	SCS Runoff	2.229	1	724	7,880	------	------	------	Building Roof
3	SCS Runoff	8.926	1	741	48,611	------	------	------	Pr WS 1A
4	SCS Runoff	3.920	1	724	12,402	------	------	------	Pr WS 1B
5	SCS Runoff	10.70	1	754	72,516	------	------	------	Pr WS 1C
6	Combine	11.29	1	726	68,894	2, 3, 4,	------	------	Roof + Pr WS 1A + 1B
7	Reservoir	11.07	1	740	47,223	6	279.13	22,514	Basin 1
8	Combine	20.20	1	747	119,739	5, 7	------	------	SCS Pr Watershed

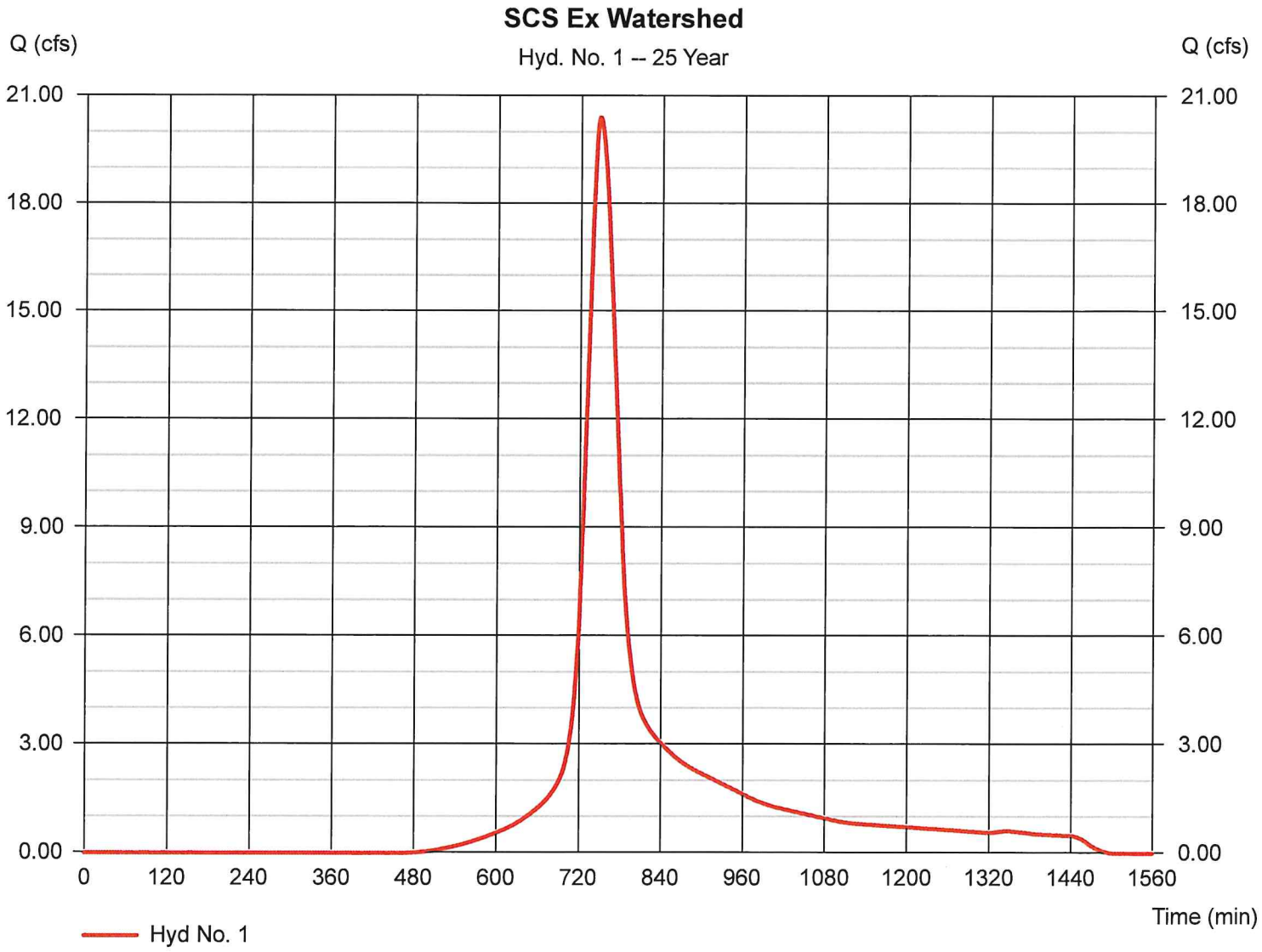
Hydrograph Report

Hyd. No. 1

SCS Ex Watershed

Hydrograph type	= SCS Runoff	Peak discharge	= 20.42 cfs
Storm frequency	= 25 yrs	Time to peak	= 749 min
Time interval	= 1 min	Hyd. volume	= 125,590 cuft
Drainage area	= 10.960 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 41.80 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(10.230 x 77) + (0.360 x 98) + (0.370 x 80)] / 10.960



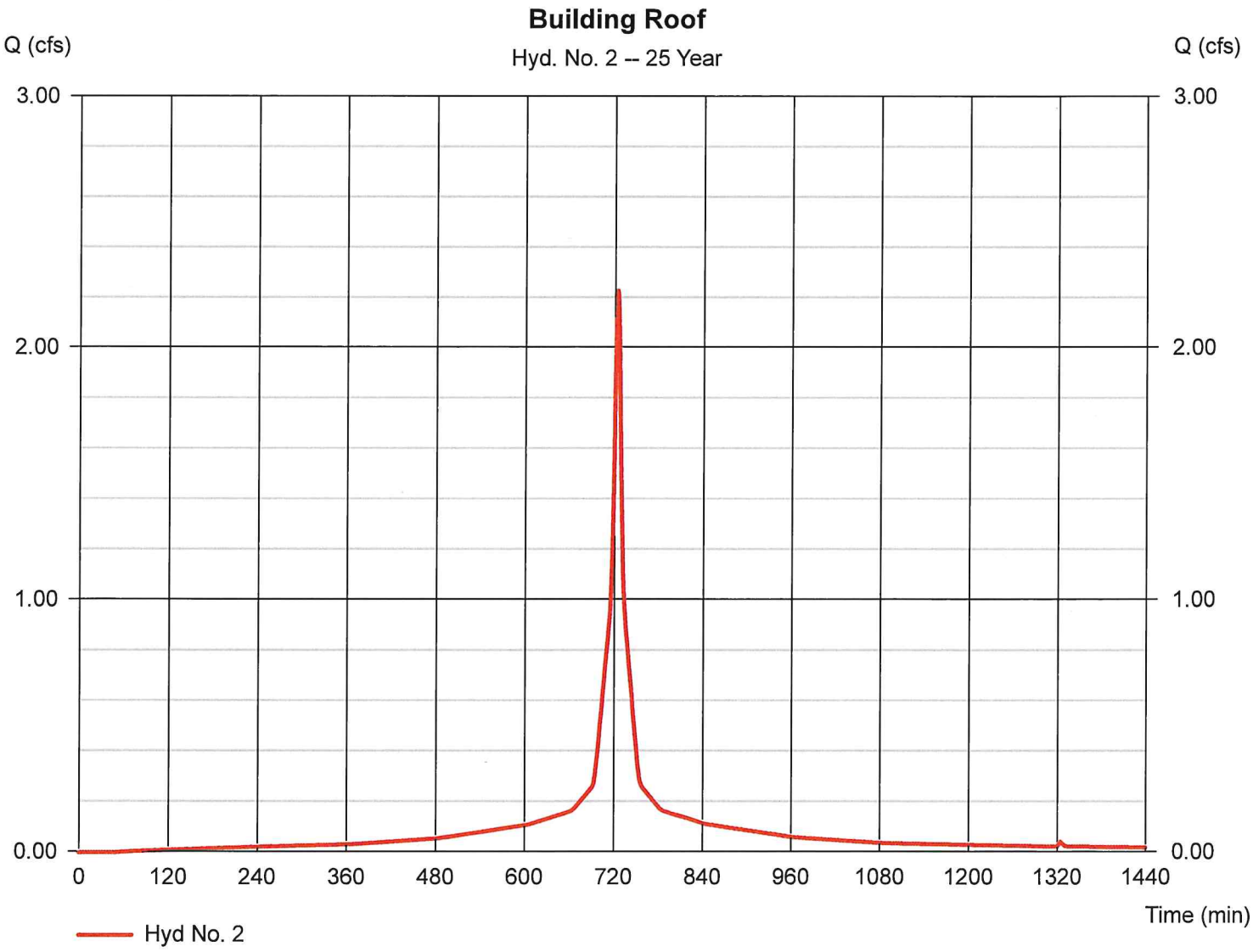
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 2

Building Roof

Hydrograph type	= SCS Runoff	Peak discharge	= 2.229 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 7,880 cuft
Drainage area	= 0.400 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



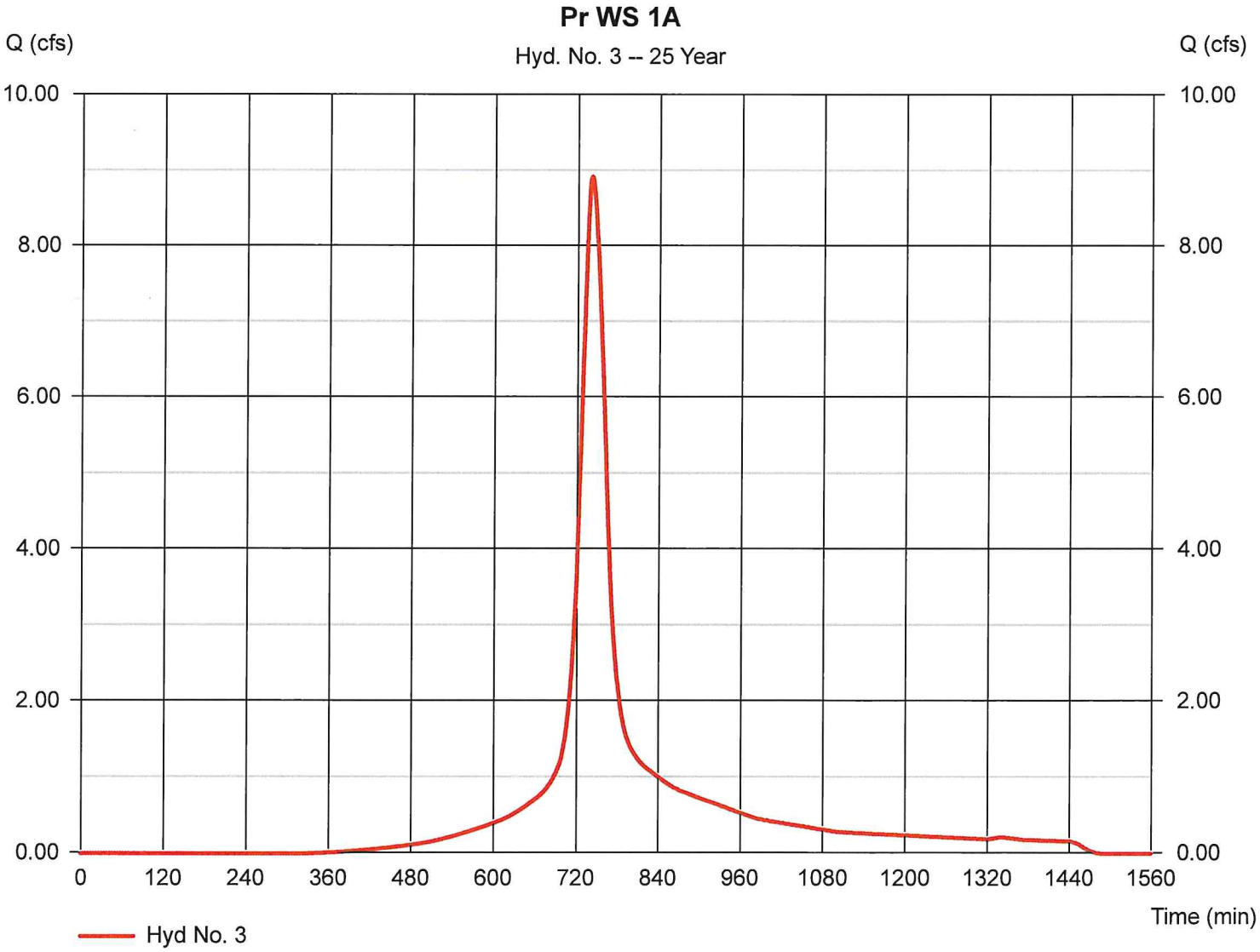
Hydrograph Report

Hyd. No. 3

Pr WS 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 8.926 cfs
Storm frequency	= 25 yrs	Time to peak	= 741 min
Time interval	= 1 min	Hyd. volume	= 48,611 cuft
Drainage area	= 3.380 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.80 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.900 x 77) + (0.120 x 80) + (0.800 x 98) + (0.560 x 98)] / 3.380



Hydrograph Report

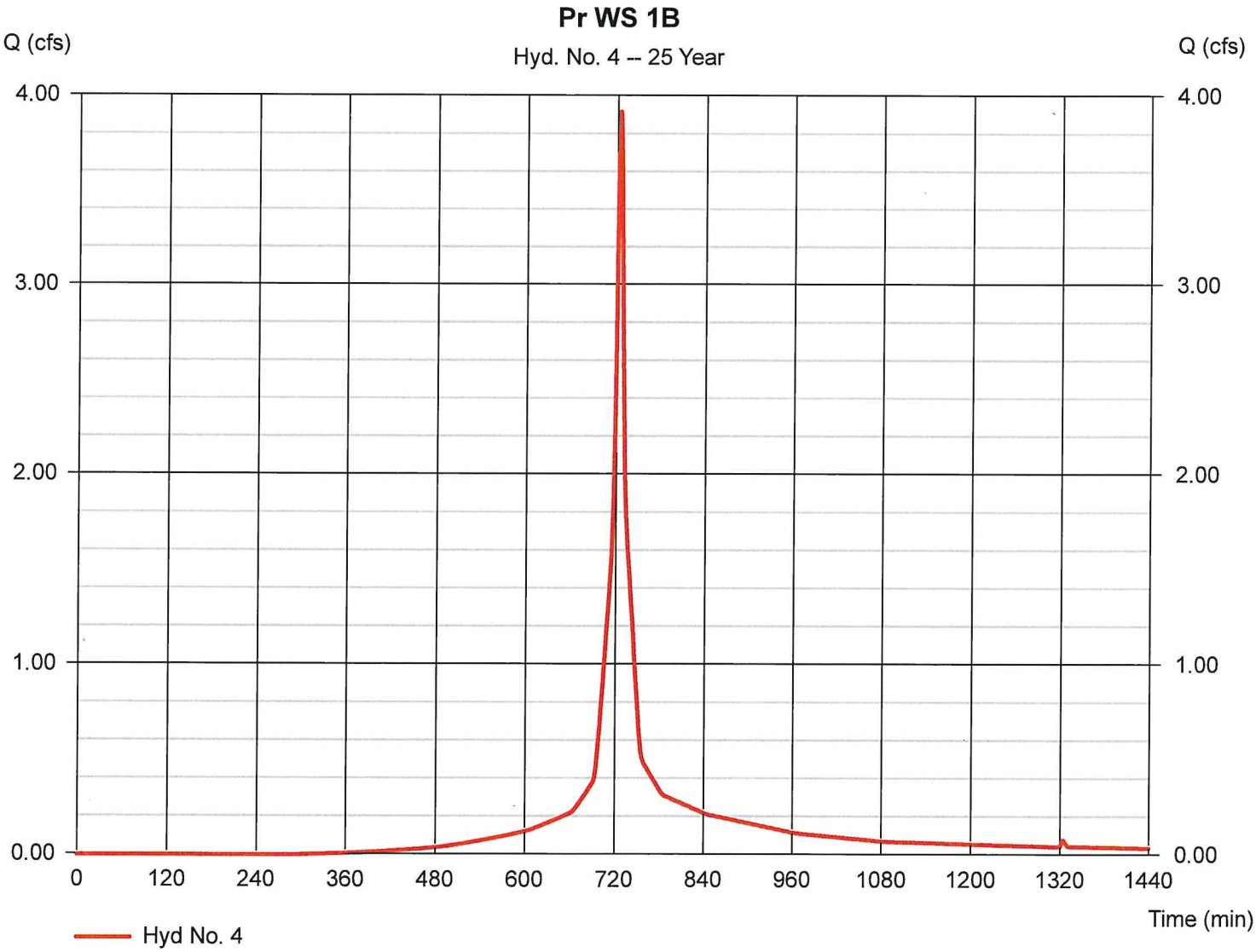
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 4

Pr WS 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 3.920 cfs
Storm frequency	= 25 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 12,402 cuft
Drainage area	= 0.820 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.490 x 80) + (0.330 x 98)] / 0.820



Hydrograph Report

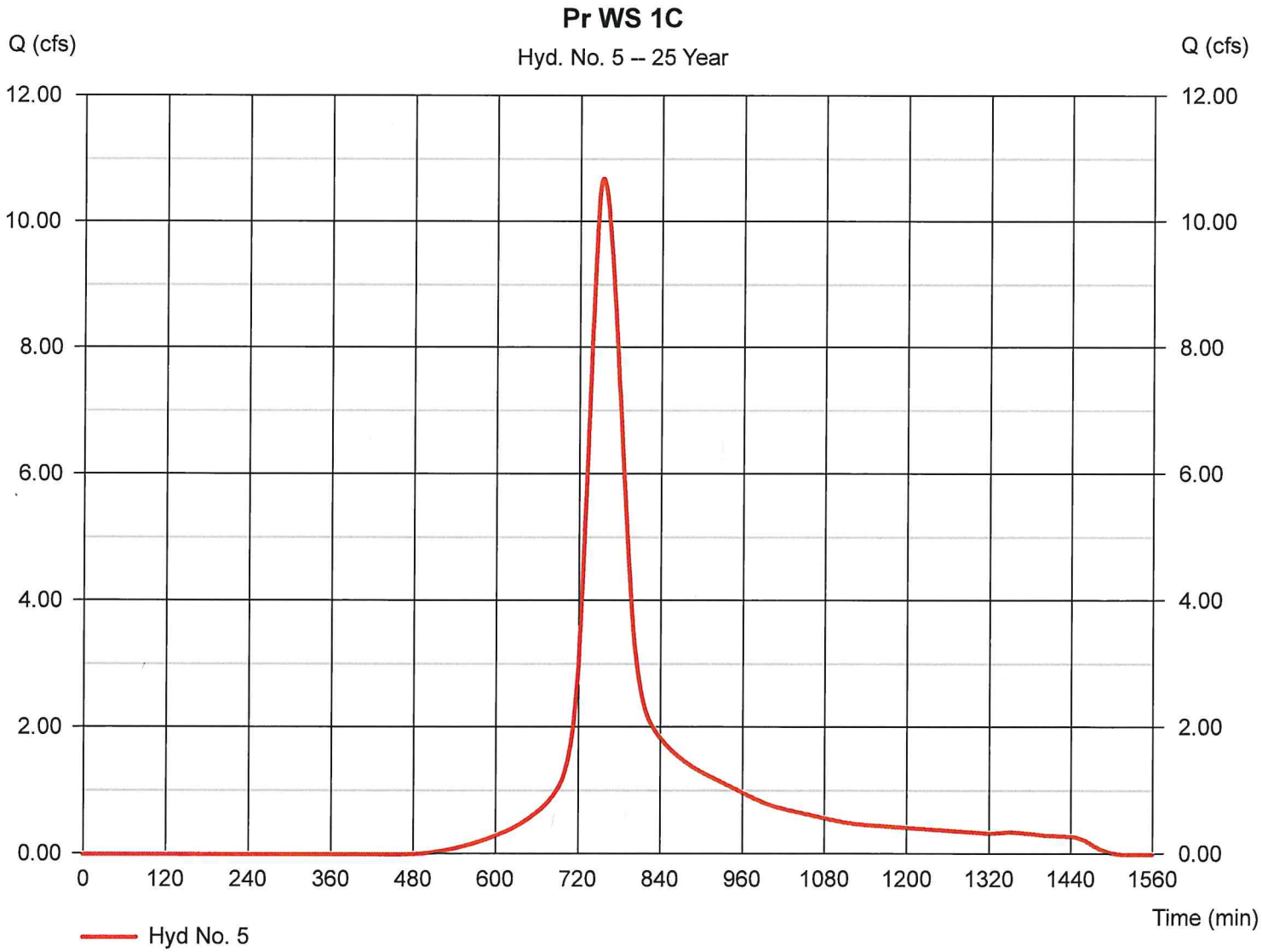
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 5

Pr WS 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 10.70 cfs
Storm frequency	= 25 yrs	Time to peak	= 754 min
Time interval	= 1 min	Hyd. volume	= 72,516 cuft
Drainage area	= 6.360 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.10 min
Total precip.	= 5.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.120 x 77) + (0.090 x 98) + (0.150 x 98)] / 6.360



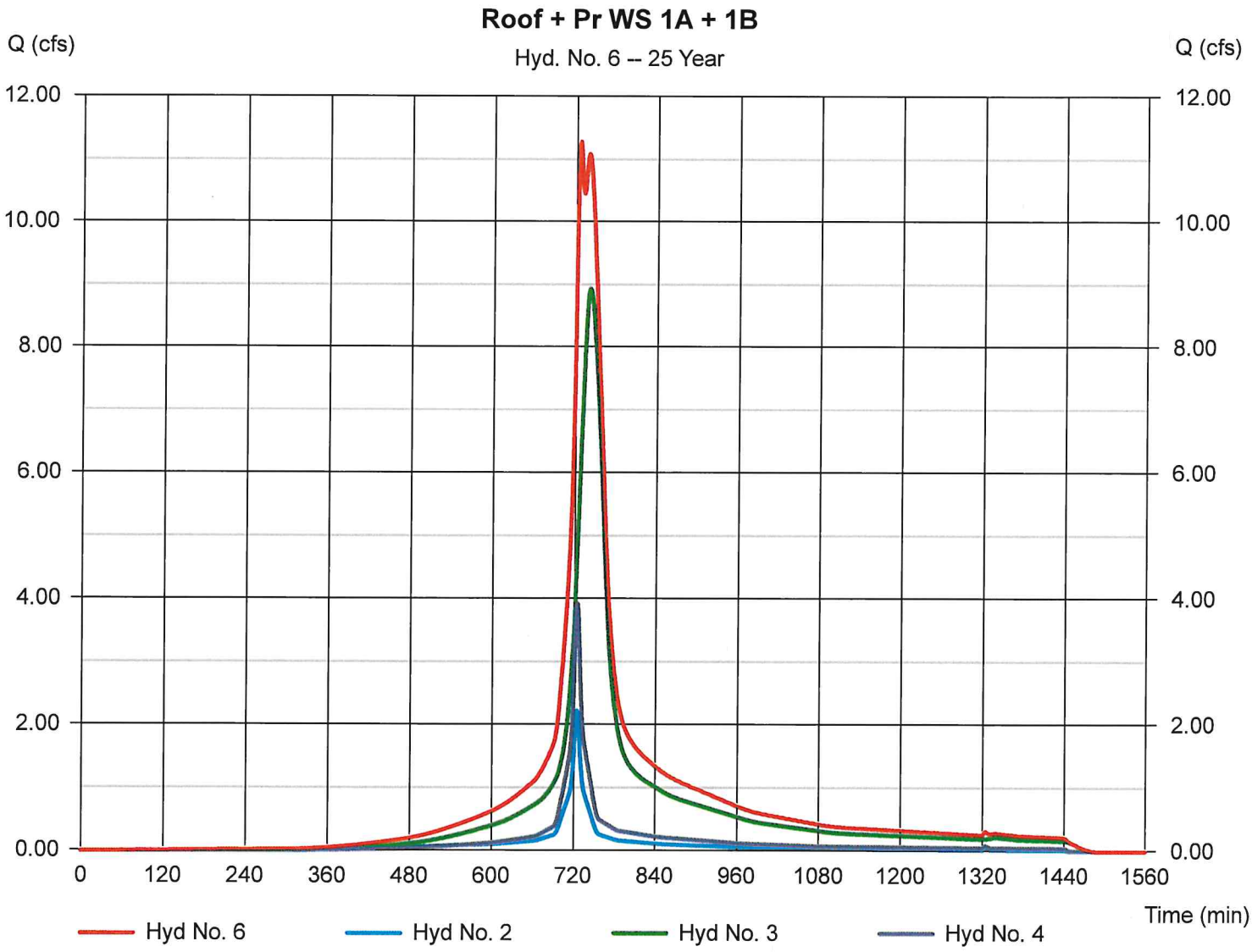
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 6

Roof + Pr WS 1A + 1B

Hydrograph type	= Combine	Peak discharge	= 11.29 cfs
Storm frequency	= 25 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 68,894 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 4.600 ac



Hydrograph Report

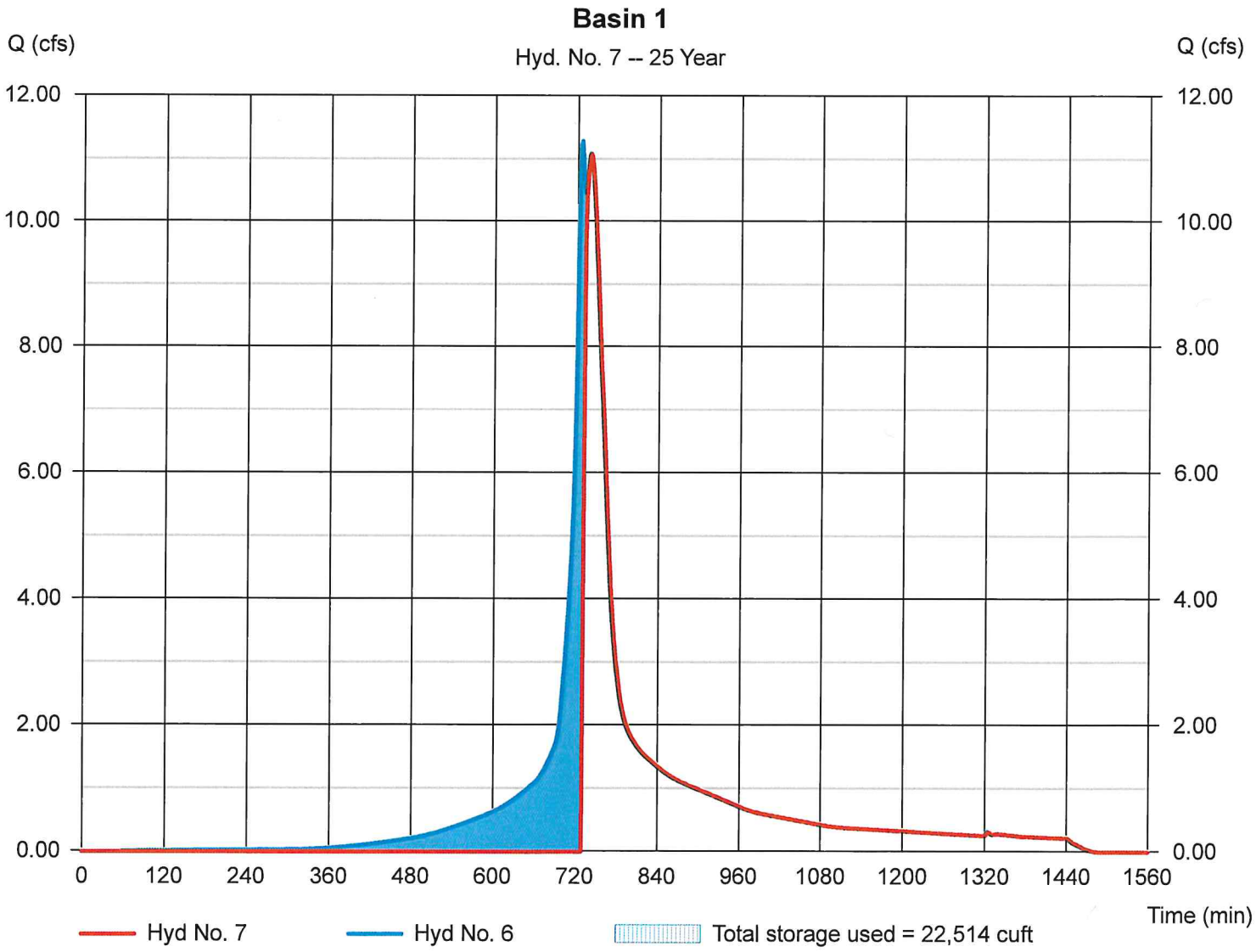
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 7

Basin 1

Hydrograph type	= Reservoir	Peak discharge	= 11.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 740 min
Time interval	= 1 min	Hyd. volume	= 47,223 cuft
Inflow hyd. No.	= 6 - Roof + Pr WS 1A + 1B	Max. Elevation	= 279.13 ft
Reservoir name	= Basin 1	Max. Storage	= 22,514 cuft

Storage Indication method used.



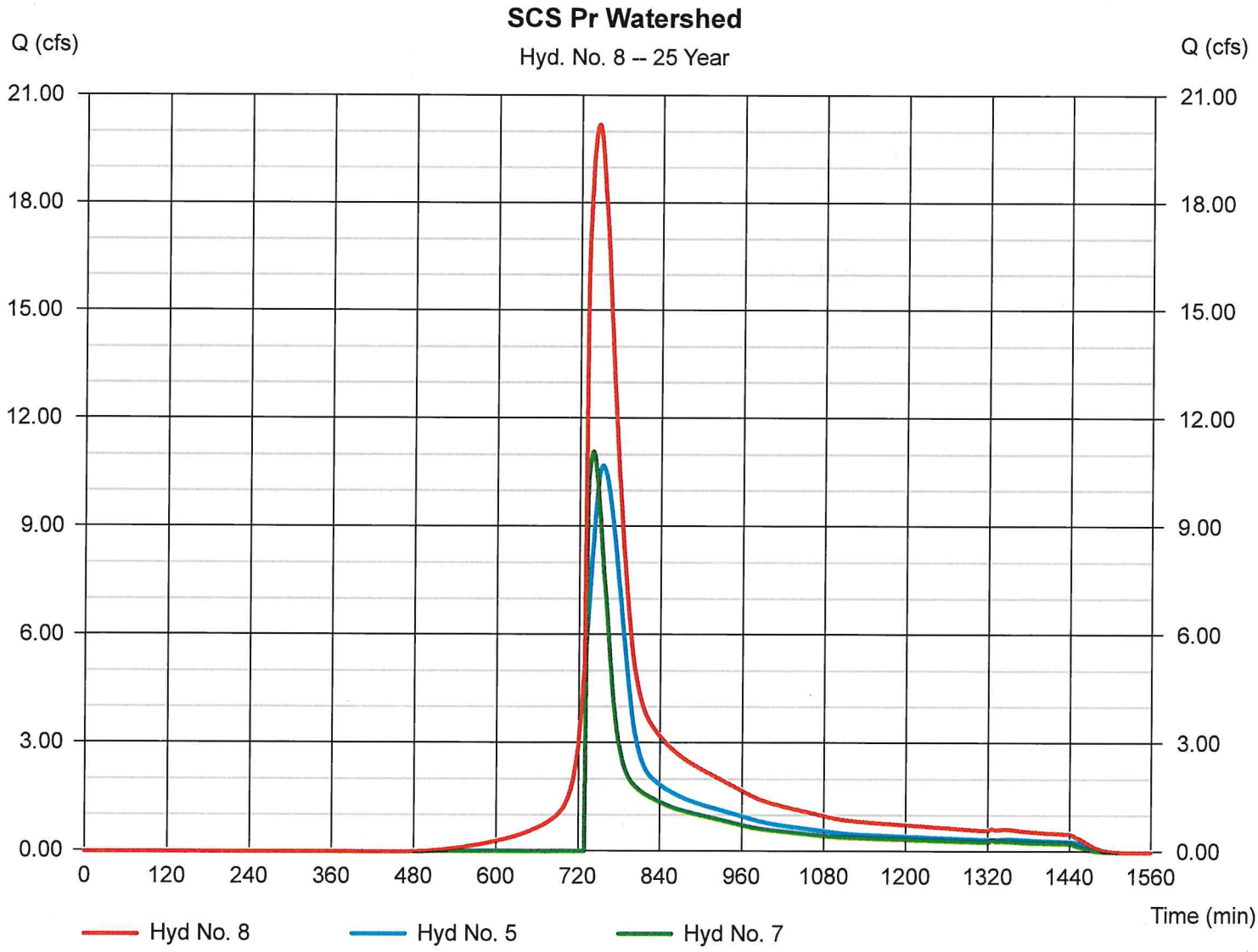
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 8

SCS Pr Watershed

Hydrograph type	= Combine	Peak discharge	= 20.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 747 min
Time interval	= 1 min	Hyd. volume	= 119,739 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 6.360 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	29.61	1	748	182,551	------	------	------	SCS Ex Watershed
2	SCS Runoff	2.883	1	724	10,273	------	------	------	Building Roof
3	SCS Runoff	12.23	1	741	67,455	------	------	------	Pr WS 1A
4	SCS Runoff	5.327	1	724	17,116	------	------	------	Pr WS 1B
5	SCS Runoff	15.52	1	753	105,406	------	------	------	Pr WS 1C
6	Combine	15.38	1	726	94,845	2, 3, 4,	------	------	Roof + Pr WS 1A + 1B
7	Reservoir	15.30	1	727	73,174	6	279.16	22,721	Basin 1
8	Combine	28.48	1	746	178,580	5, 7	------	------	SCS Pr Watershed

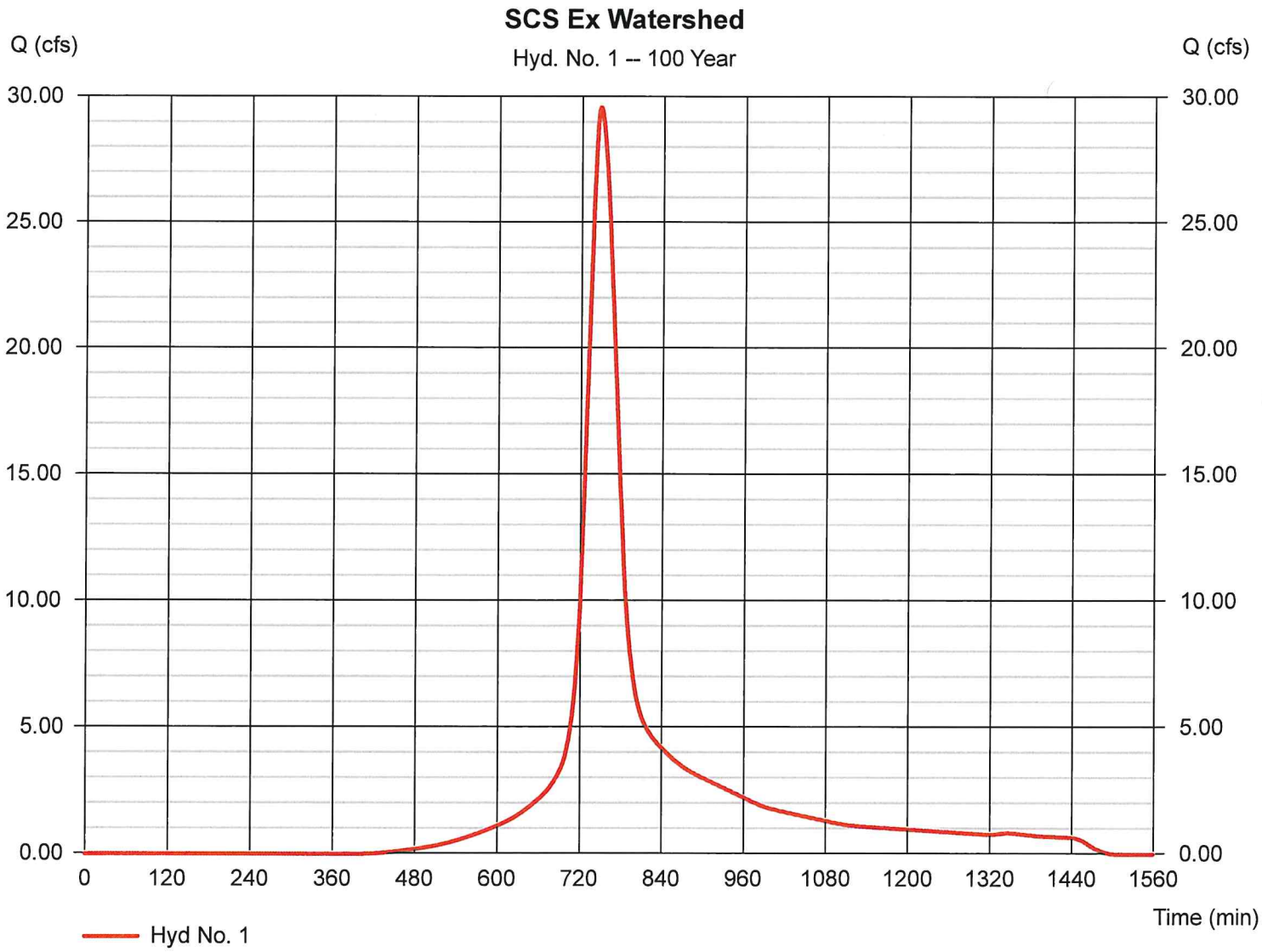
Hydrograph Report

Hyd. No. 1

SCS Ex Watershed

Hydrograph type	= SCS Runoff	Peak discharge	= 29.61 cfs
Storm frequency	= 100 yrs	Time to peak	= 748 min
Time interval	= 1 min	Hyd. volume	= 182,551 cuft
Drainage area	= 10.960 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 41.80 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(10.230 x 77) + (0.360 x 98) + (0.370 x 80)] / 10.960



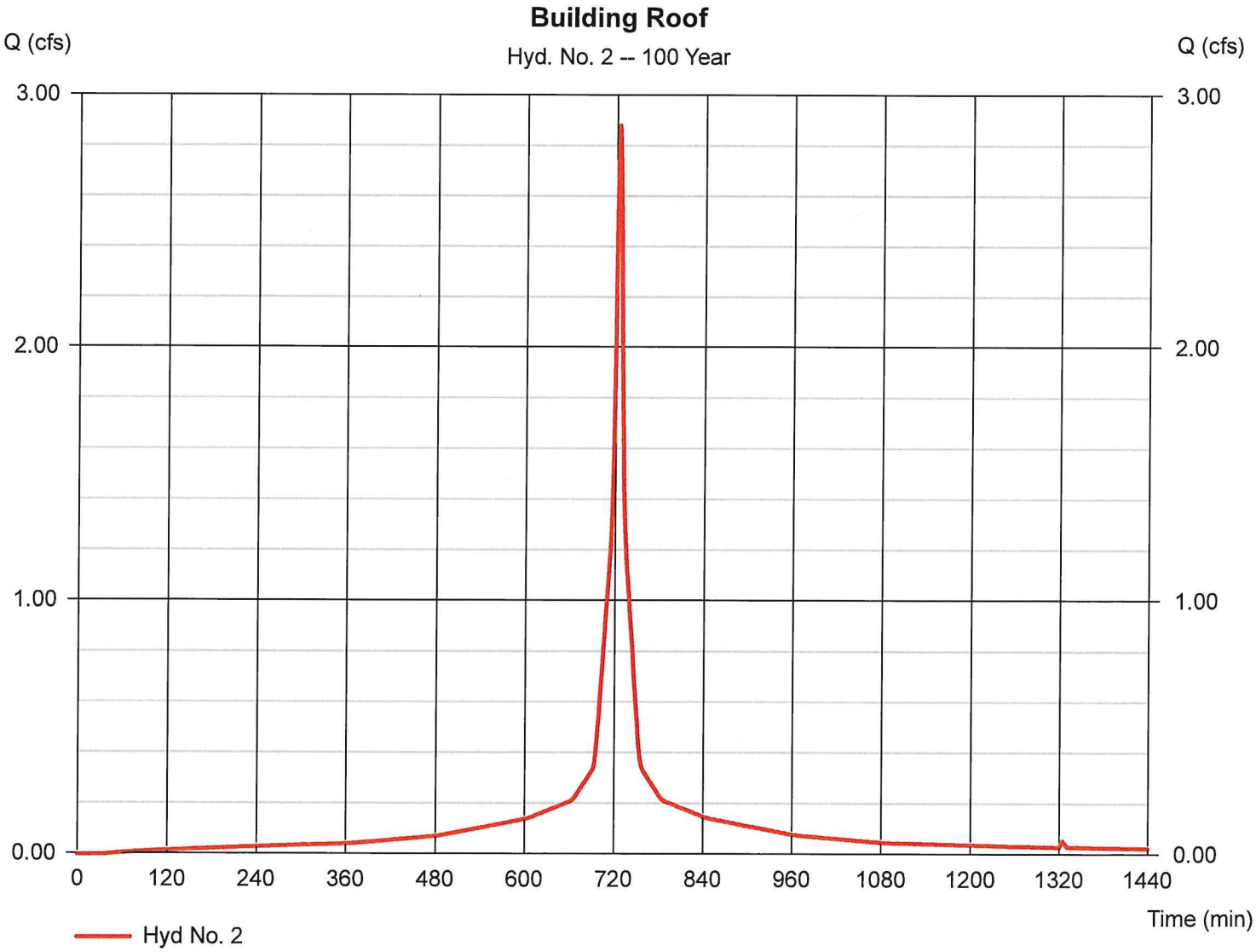
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 2

Building Roof

Hydrograph type	= SCS Runoff	Peak discharge	= 2.883 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 10,273 cuft
Drainage area	= 0.400 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484



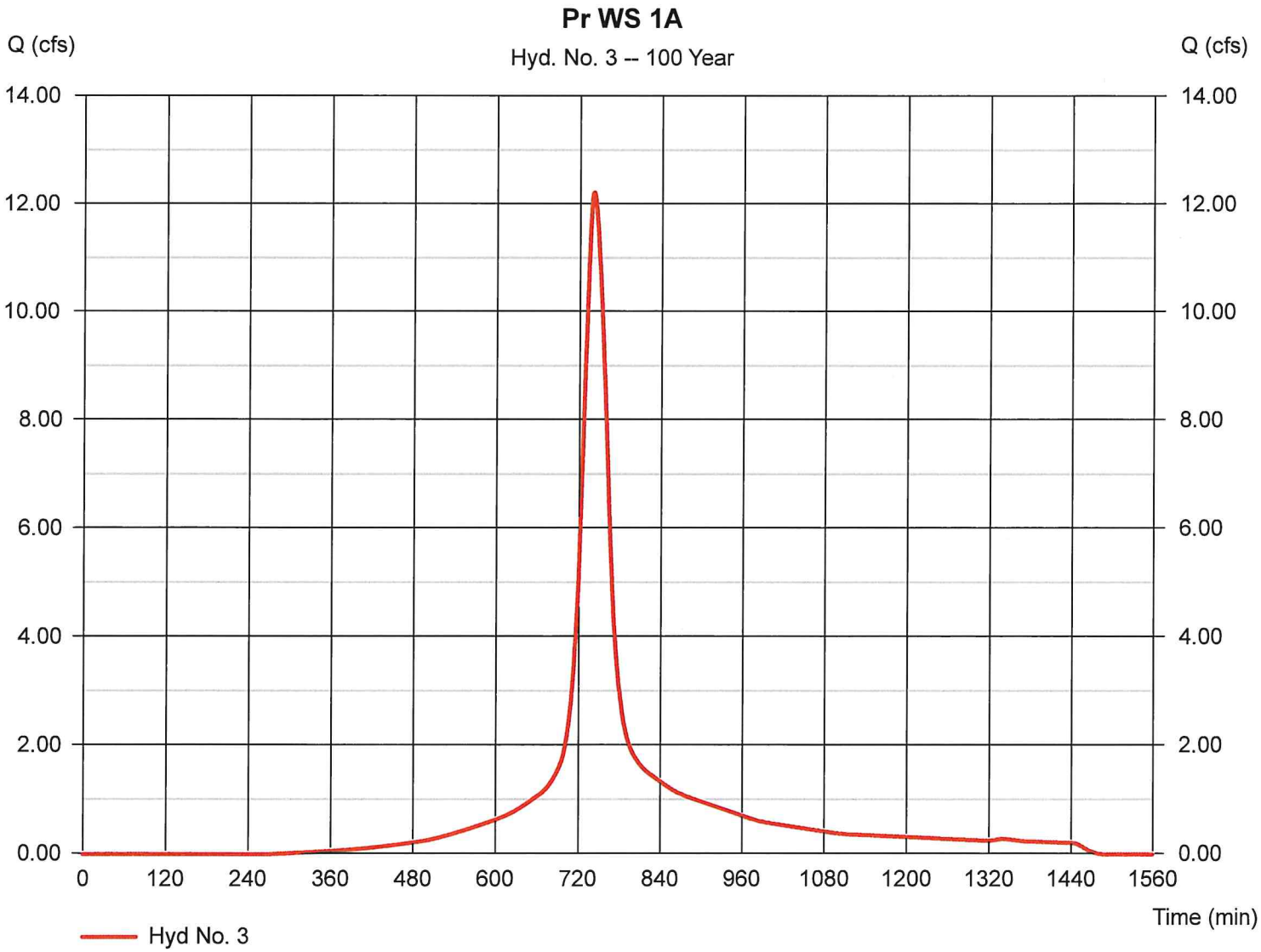
Hydrograph Report

Hyd. No. 3

Pr WS 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 12.23 cfs
Storm frequency	= 100 yrs	Time to peak	= 741 min
Time interval	= 1 min	Hyd. volume	= 67,455 cuft
Drainage area	= 3.380 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.80 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.900 x 77) + (0.120 x 80) + (0.800 x 98) + (0.560 x 98)] / 3.380



Hydrograph Report

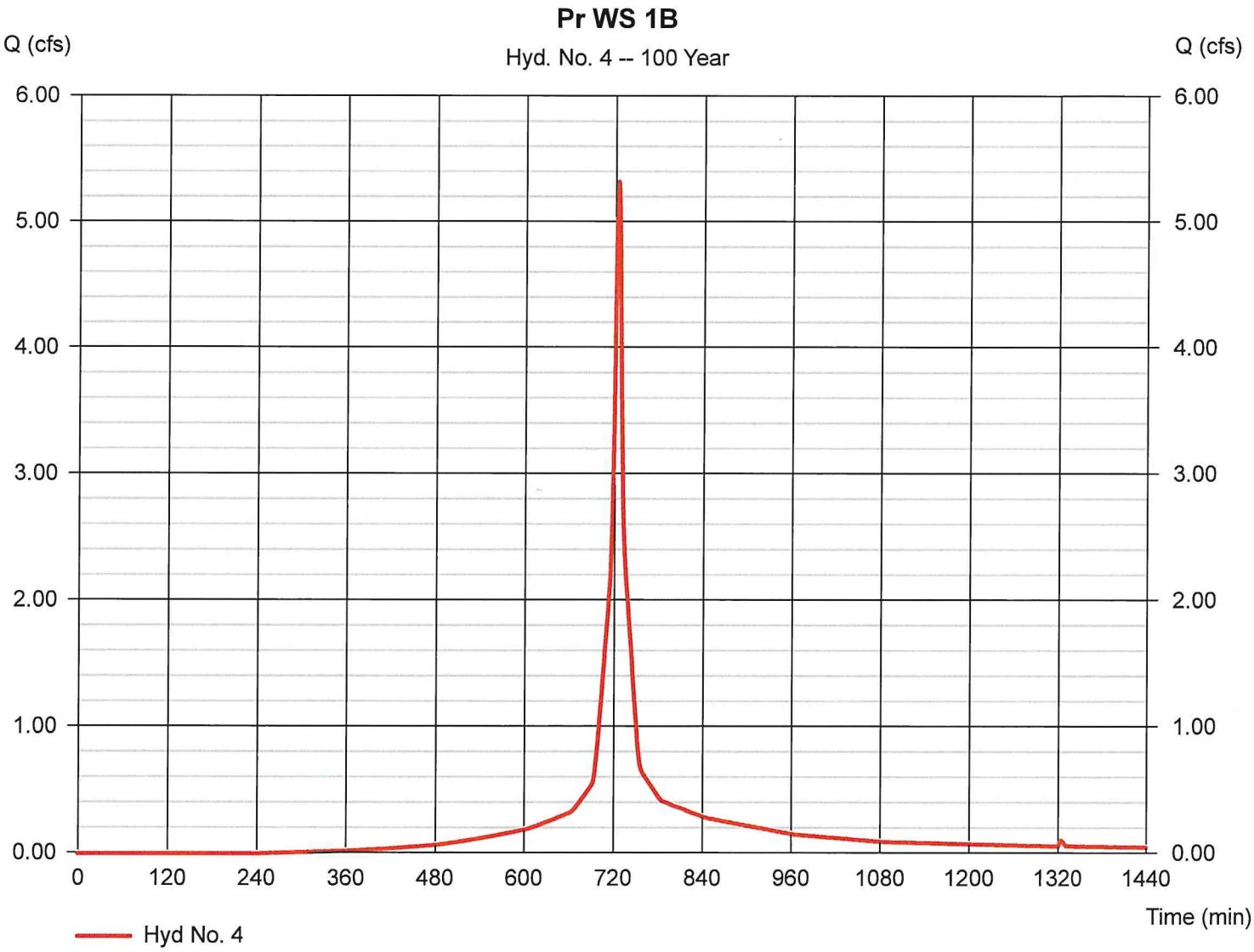
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 4

Pr WS 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 5.327 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 1 min	Hyd. volume	= 17,116 cuft
Drainage area	= 0.820 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.490 x 80) + (0.330 x 98)] / 0.820



Hydrograph Report

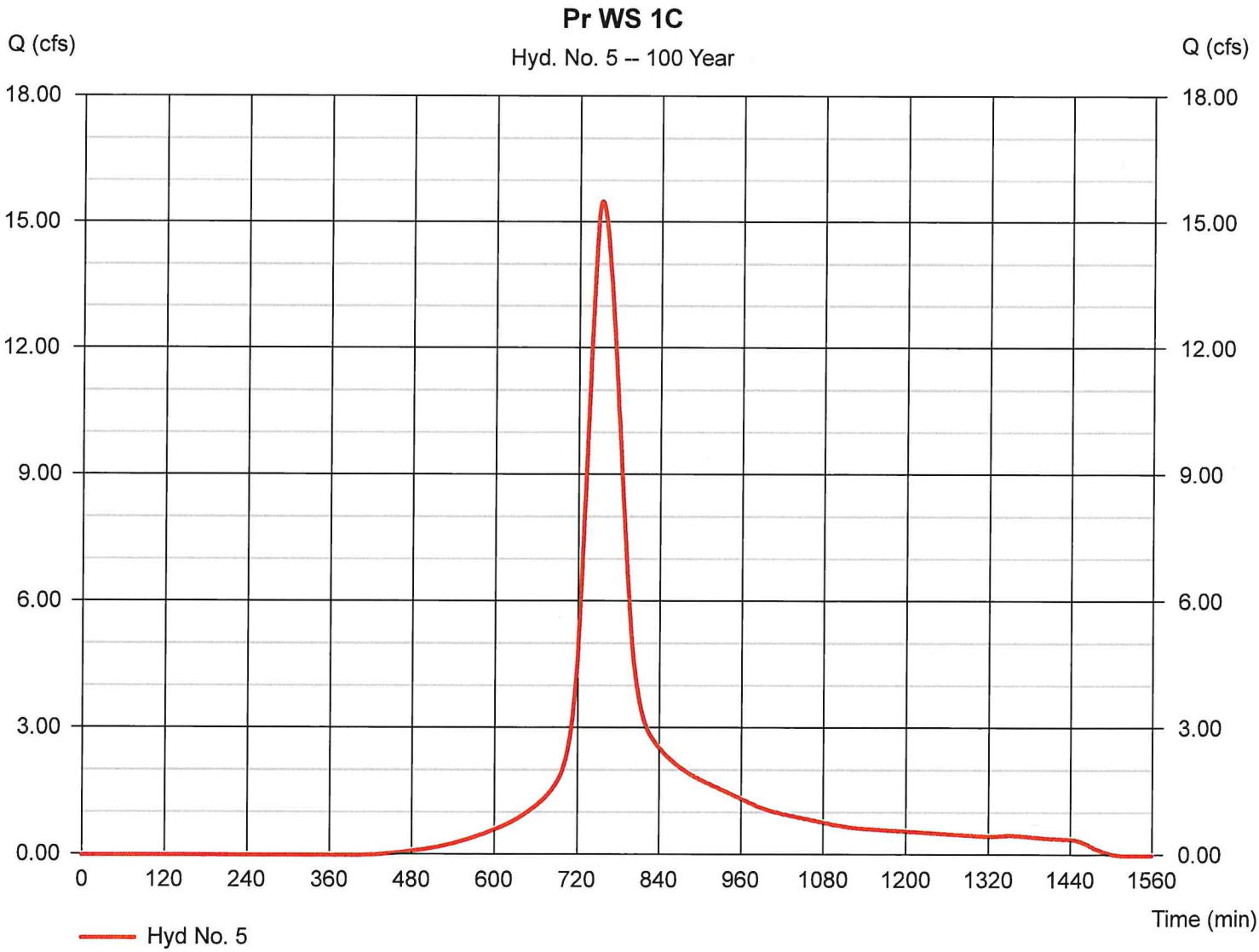
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 5

Pr WS 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 15.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 753 min
Time interval	= 1 min	Hyd. volume	= 105,406 cuft
Drainage area	= 6.360 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 50.10 min
Total precip.	= 7.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(6.120 x 77) + (0.090 x 98) + (0.150 x 98)] / 6.360

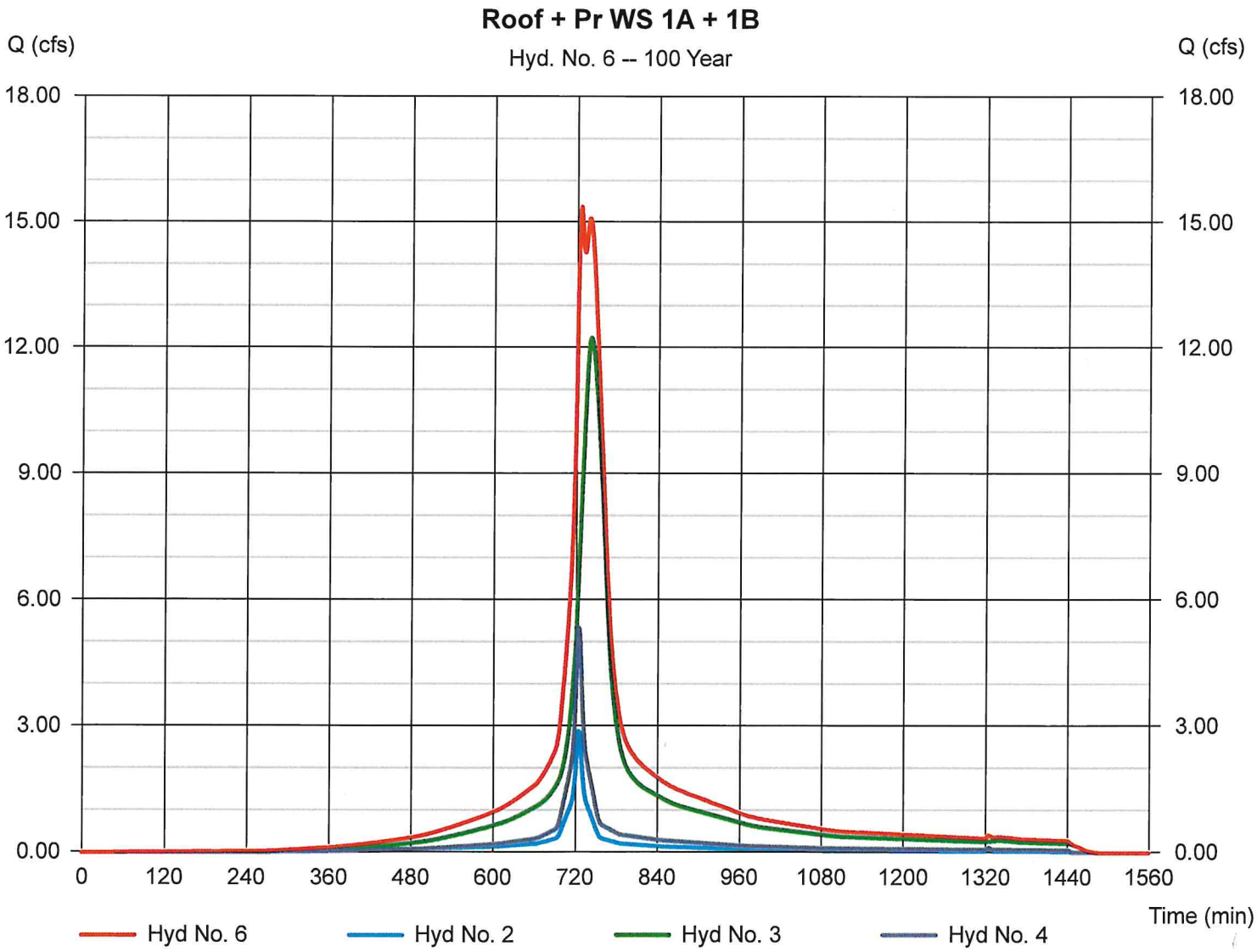


Hydrograph Report

Hyd. No. 6

Roof + Pr WS 1A + 1B

Hydrograph type	= Combine	Peak discharge	= 15.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 94,845 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 4.600 ac



Hydrograph Report

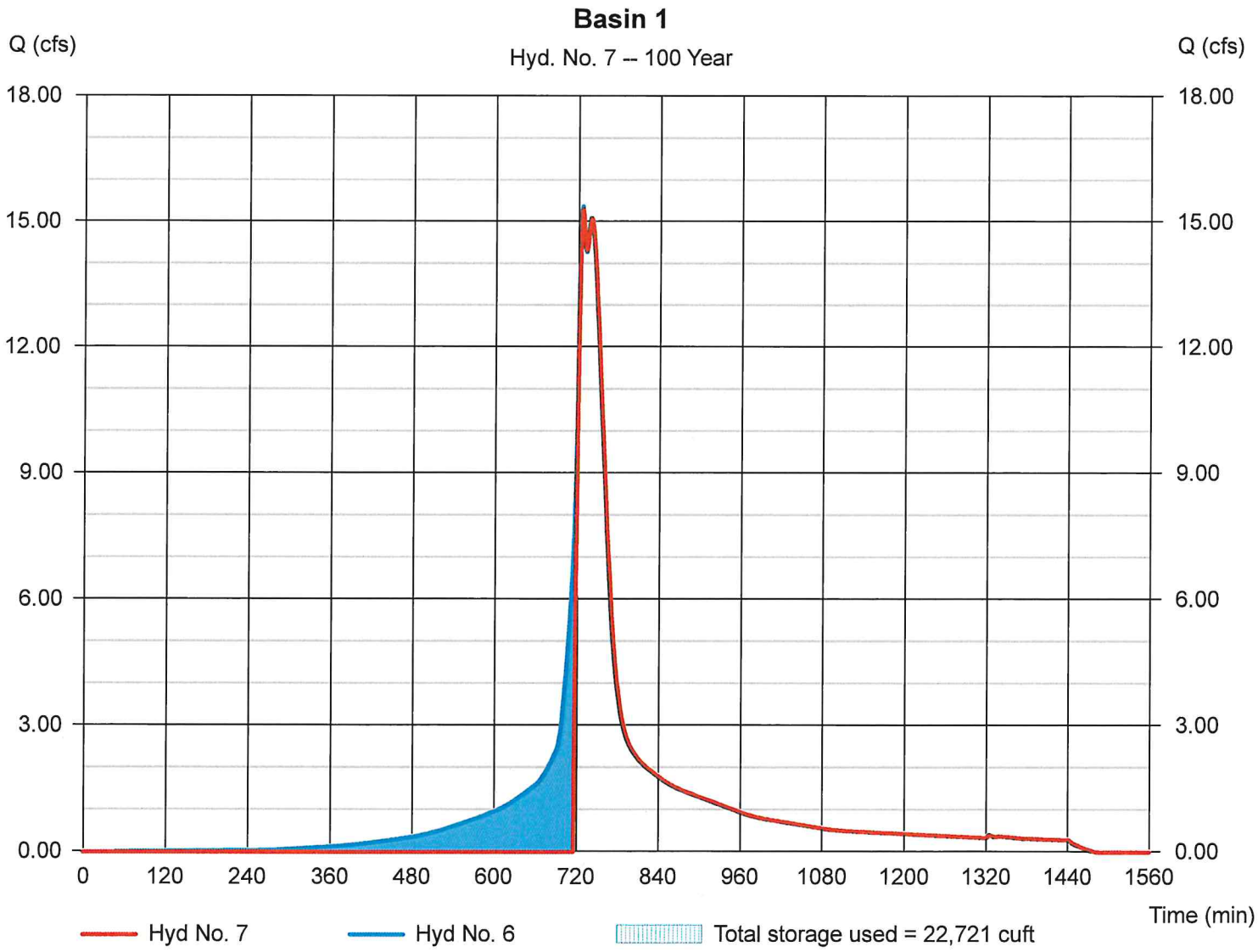
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Apr 25, 2022

Hyd. No. 7

Basin 1

Hydrograph type	= Reservoir	Peak discharge	= 15.30 cfs
Storm frequency	= 100 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 73,174 cuft
Inflow hyd. No.	= 6 - Roof + Pr WS 1A + 1B	Max. Elevation	= 279.16 ft
Reservoir name	= Basin 1	Max. Storage	= 22,721 cuft

Storage Indication method used.

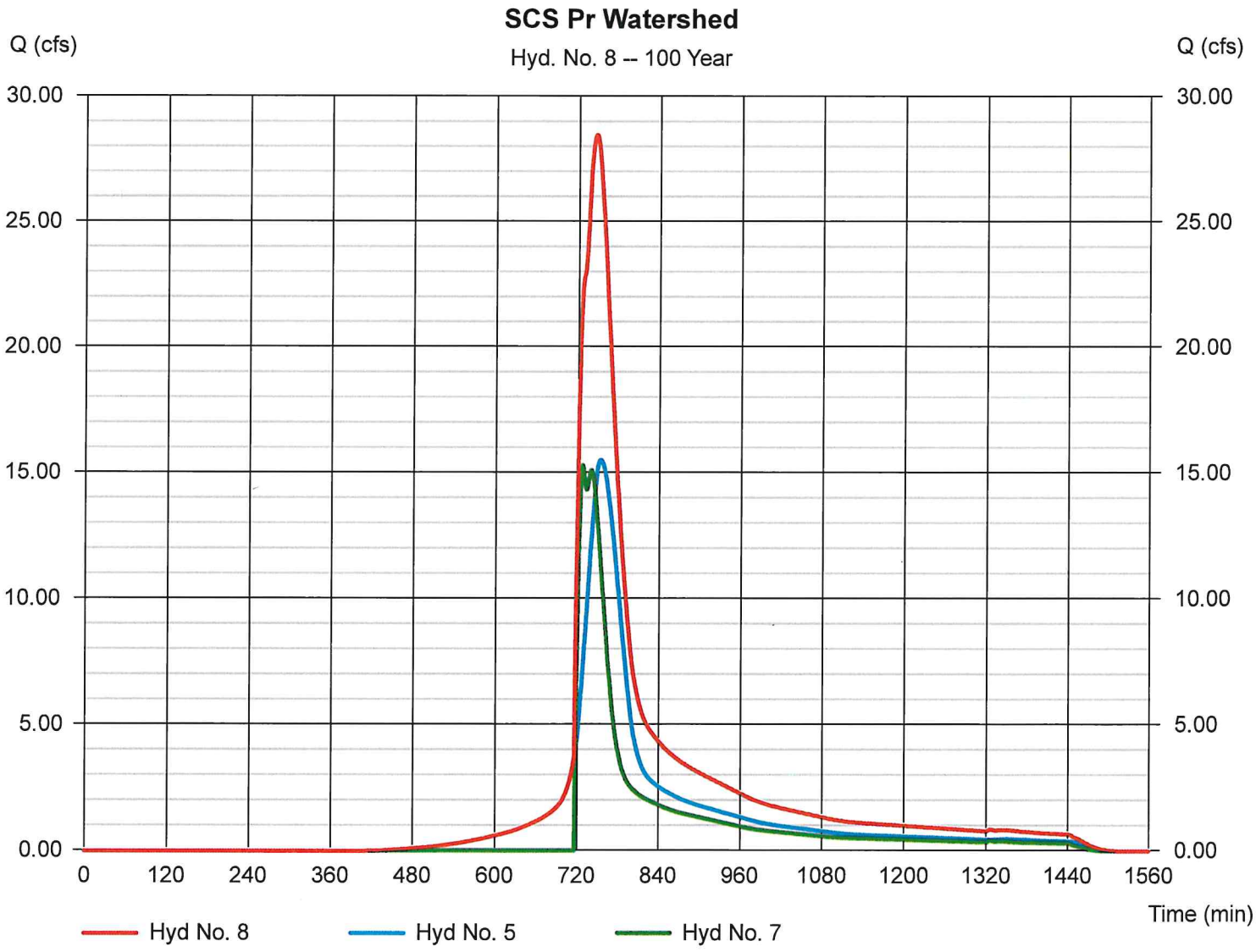


Hydrograph Report

Hyd. No. 8

SCS Pr Watershed

Hydrograph type	= Combine	Peak discharge	= 28.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 1 min	Hyd. volume	= 178,580 cuft
Inflow hyds.	= 5, 7	Contrib. drain. area	= 6.360 ac



Hydraflow Table of Contents

7093 Watershed Analysis.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Monday, Apr 25, 2022

CALCULATIONS:

Storm Sewer Report – 10-Year Frequency

APPENDIX A

Support Information

Point precipitation frequency estimates (inches)
NOAA Atlas 14 Volume 10 Version 3
Data type: Precipitation depth
Time series type: Partial duration
Project area: Northeastern States
Location name (ESRI Maps): Jewett City Connecticut USA
Station Name: -
Latitude: 41.6058°
Longitude: -72.0149°
Elevation (USGS): 273.2 ft

PRECIPITATION FREQUENCY ESTIMATES

by duration for ARI (years):	1	2	5	10	25	50	100	200	500	1000
5-min:	0.331	0.396	0.503	0.592	0.715	0.808	0.904	1.01	1.16	1.29
10-min:	0.469	0.562	0.714	0.84	1.01	1.14	1.28	1.43	1.65	1.82
15-min:	0.551	0.661	0.84	0.987	1.19	1.35	1.51	1.68	1.94	2.14
30-min:	0.765	0.917	1.17	1.37	1.66	1.87	2.09	2.34	2.69	2.98
60-min:	0.979	1.17	1.49	1.76	2.12	2.39	2.68	3	3.45	3.82
2-hr:	1.27	1.52	1.93	2.27	2.73	3.08	3.45	3.87	4.5	5.01
3-hr:	1.48	1.76	2.23	2.62	3.15	3.55	3.98	4.47	5.21	5.82
6-hr:	1.89	2.25	2.84	3.33	4	4.51	5.04	5.67	6.6	7.38
12-hr:	2.38	2.83	3.57	4.18	5.02	5.64	6.31	7.08	8.22	9.17
24-hr:	2.83	3.38	4.28	5.03	6.06	6.83	7.64	8.59	9.99	11.2
2-day:	3.18	3.84	4.91	5.8	7.02	7.93	8.91	10.1	11.8	13.3
3-day:	3.45	4.16	5.32	6.29	7.61	8.6	9.66	10.9	12.8	14.5
4-day:	3.7	4.45	5.67	6.69	8.09	9.13	10.2	11.6	13.6	15.4
7-day:	4.39	5.22	6.58	7.71	9.26	10.4	11.7	13.1	15.4	17.3
10-day:	5.07	5.95	7.39	8.58	10.2	11.4	12.7	14.3	16.5	18.4
20-day:	7.23	8.16	9.69	11	12.7	14	15.4	16.8	18.8	20.4
30-day:	9.04	10	11.6	12.9	14.7	16	17.4	18.8	20.5	21.8
45-day:	11.3	12.3	13.9	15.3	17.1	18.6	20	21.3	22.8	23.8
60-day:	13.1	14.2	15.9	17.3	19.2	20.8	22.2	23.4	24.8	25.7

Date/time (GMT): Thu Feb 10 20:03:56 2022
pyRunTime: 0.0105521678925

Point precipitation frequency estimates (inches/hour)
NOAA Atlas 14 Volume 10 Version 3
Data type: Precipitation intensity
Time series type: Partial duration
Project area: Northeastern States
Location name (ESRI Maps): Jewett City Connecticut USA
Station Name: -
Latitude: 41.6058°
Longitude: -72.0149°
Elevation (USGS): 273.2 ft

PRECIPITATION FREQUENCY ESTIMATES

by duration for ARI (years):	1	2	5	10	25	50	100	200	500	1000
5-min:	3.97	4.75	6.04	7.1	8.58	9.7	10.8	12.1	13.9	15.4
10-min:	2.81	3.37	4.28	5.04	6.08	6.86	7.68	8.59	9.88	10.9
15-min:	2.2	2.64	3.36	3.95	4.76	5.38	6.02	6.74	7.74	8.56
30-min:	1.53	1.83	2.33	2.74	3.31	3.74	4.19	4.68	5.39	5.96
60-min:	0.979	1.17	1.49	1.76	2.12	2.39	2.68	3	3.45	3.82
2-hr:	0.636	0.761	0.964	1.13	1.37	1.54	1.72	1.94	2.25	2.51
3-hr:	0.492	0.587	0.743	0.872	1.05	1.18	1.32	1.49	1.73	1.94
6-hr:	0.316	0.376	0.475	0.556	0.669	0.753	0.842	0.947	1.1	1.23
12-hr:	0.198	0.235	0.296	0.347	0.416	0.468	0.524	0.588	0.682	0.761
24-hr:	0.118	0.141	0.178	0.21	0.252	0.284	0.318	0.358	0.416	0.465
2-day:	0.066	0.08	0.102	0.121	0.146	0.165	0.186	0.21	0.246	0.277
3-day:	0.048	0.058	0.074	0.087	0.106	0.119	0.134	0.152	0.178	0.201
4-day:	0.038	0.046	0.059	0.07	0.084	0.095	0.107	0.121	0.142	0.16
7-day:	0.026	0.031	0.039	0.046	0.055	0.062	0.069	0.078	0.092	0.103
10-day:	0.021	0.025	0.031	0.036	0.043	0.048	0.053	0.059	0.069	0.077
20-day:	0.015	0.017	0.02	0.023	0.026	0.029	0.032	0.035	0.039	0.042
30-day:	0.013	0.014	0.016	0.018	0.02	0.022	0.024	0.026	0.028	0.03
45-day:	0.01	0.011	0.013	0.014	0.016	0.017	0.019	0.02	0.021	0.022
60-day:	0.009	0.01	0.011	0.012	0.013	0.014	0.015	0.016	0.017	0.018

Date/time (GMT): Thu Feb 10 20:05:19 2022
pyRunTime: 0.0106840133667