

Stormwater Design Report

Ashville Concourse

State Route 752, Village of Ashville, Ohio
September 22, 2023

Prepared by:

**Craig E. Stevenson PE, PS
Harral and Stevenson
Civil Engineering and Surveying**

Executive Summary

The proposed project consists of the development of 3-stoarge buildings on a 4.42-acre parcel of land that is currently a grass field. Construction activities will include construction of said storage buildings, parking lot, and a detention pond and associated utilities.

The design of the detention basin is based on the proposed layout as well as future impervious area, as shown in the Post Developed Tributary Map. The future additions are assumed to be majority impervious, so the design of the basin has accounted for all future area.

Existing Site

Pre-Developed area consists of 9.58 with 7.45 acres of that being grass that drains from the east side of the property to the west side of the property where runoff sheet drains across the site and then enters an existing storm sewer on the west side of the property. The dry-detention basin then outlets into an existing ditch that runs north and south. The basin was built from a previous project, and it has been considered in the final design.

The existing soils on the site are class C hydrologic group. Additionally, 100.00% of the soil is Crosby Silt Loam (CrA). All curve numbers were assigned using the class C hydrologic soil group.

Quantity Control Design Approach

The proposed grading scheme is designed to direct the Stormwater to the proposed detention pond located at the west corner of the site. This area is labeled as Post-Developed A on the Post-Developed tributary map. Post-Developed B is a direct discharge of a fringe area that is unable to be detained in the detention pond.

Based on the discussion above, our design proposes to add two storm sewer runs, one along the north side and one along the south side of the property. Both will run east to west. After the Stormwater makes its way through the pipes it will be discharged into a detention basin. From there the Stormwater will outlet into an existing catch basin in the northwest corner of the property.

Our design also accounts for all onsite future additions. A chart has been added on the Post-Developed tributary map to show the difference in impervious and pervious areas over the existing, proposed, and future stages.

By comparing the 1 year predeveloped vs. post developed runoff volumes we determined there to be a 49.1% increase which indicates a 5 year critical storm event.

Critical Storm Combined		1 Year Volume C.F.
Predeveloped		29402
Postdeveloped		43845
	% increase	49.1%
	Critical Storm	5 Year

The outlet structure is designed to detain runoff from the improved area such that the total release rate from the site in each postdeveloped event up to and including the 5 year storm would be less than the peak rate from the 1 year predeveloped storm. Also designed to detain runoff in each post developed event up to the 100 year storm would be less than the peak rate from the 10 year predeveloped storm. The outlet control structure will consist of a PVC pipe extended into the basin from the adjacent catch basin and protected by a gravel filter with the orifice inside the structure to control the Water Quality Volume. This will consist of a 2.1" Orifice cast into the outlet control structure wall with a trash rack to prevent clogging from debris. The second stage or the Detention window will consist of an 18"x22" window at the Secondary outlet invert elevation. The top of the catch basin will act as the third stage and the water will spill over the top. The emergency overflow weir will direct flow from the basin to the existing ditch along the west side of the property if the system becomes temporarily restricted for some reason. Please note that the "Actual Release Rate" shown in the chart below includes the direct discharge from the small fringe areas of the site that sheet drain off rather than going into the basin. This ensures that the total runoff from the site is effectively controlled.

Detention Chart

	Pre-Developed	Post Developed A	Post Developed B	Post Developed Combined	Basin	Total Allowable Release	Actual Release	Ponding Elevation	Storage Volume
Year	CFS	CFS	CFS	CFS	CFS	CFS	CFS	Feet	CFS
1	6.551	10.93	0.087	10.940	0.345	6.551	0.347	707.52	37245
2	9.244	14.21	0.126	14.230	1.239	6.551	1.245	707.56	37800
5	13.300	18.94	0.186	18.960	5.900	6.551	5.913	707.85	41652
10	16.770	22.83	0.237	22.870	8.799	16.770	8.818	708.21	46831
25	21.780	28.30	0.313	28.340	11.90	16.770	11.920	708.75	55236
50	26.000	32.81	0.378	32.870	13.97	16.770	14.000	709.20	62784
100	30.470	37.55	0.447	37.610	16.58	16.770	16.620	709.65	70938

Water Quality and Forebays

The project will disturb well over 1 acre warranting coverage under the statewide general permit for construction stormwater. In accordance with the permit, the design proposes an extended detention basin as the post construction BMP. The WQv will be detained by the orifice in the outlet structure for ease of maintenance. A micropool and forebay are proposed with each contributing an additional 10% of the WQv for sediment storage. The WQv design was developed using the OEPA Compliance Worksheet which is included on the following pages.

The proposed detention pond will have two forebays to help collect sediment for ease of removal. Per the Ohio EPA, a dry detention basin is required to have 10% volume in the Forebay. The area provided for both forebays is 1,875 C.F., which is a little more than 10% of the Normal pool area of the Proposed Detention Pond (17,400 C.F.). The north forebay is 722 C.F. and the south forebay is 1,153 C.F. The south has a larger forebay because the trib area flowing into that area is larger than the north forebay. Details of the Forebays can be found in the Plot Grade and Utility Plans.

Storm Sewer

The internal storm sewer is designed using a 2 year flow and 5 year hydraulic grade line check. As previously discussed, the vast majority of the site is graded to be tributary to one of the catch basins or other inlets. The storm sewer network is directed to discharge to one of two forebays within detention pond through one of two headwalls with rock channel protection to dissipate flow and reduce erosion. The storm sewer design calculations are shown on the computation sheet which is included herein. The 5 year Hydraulic Grade Line elevations are below the top of castings except for structures 6 and 11.

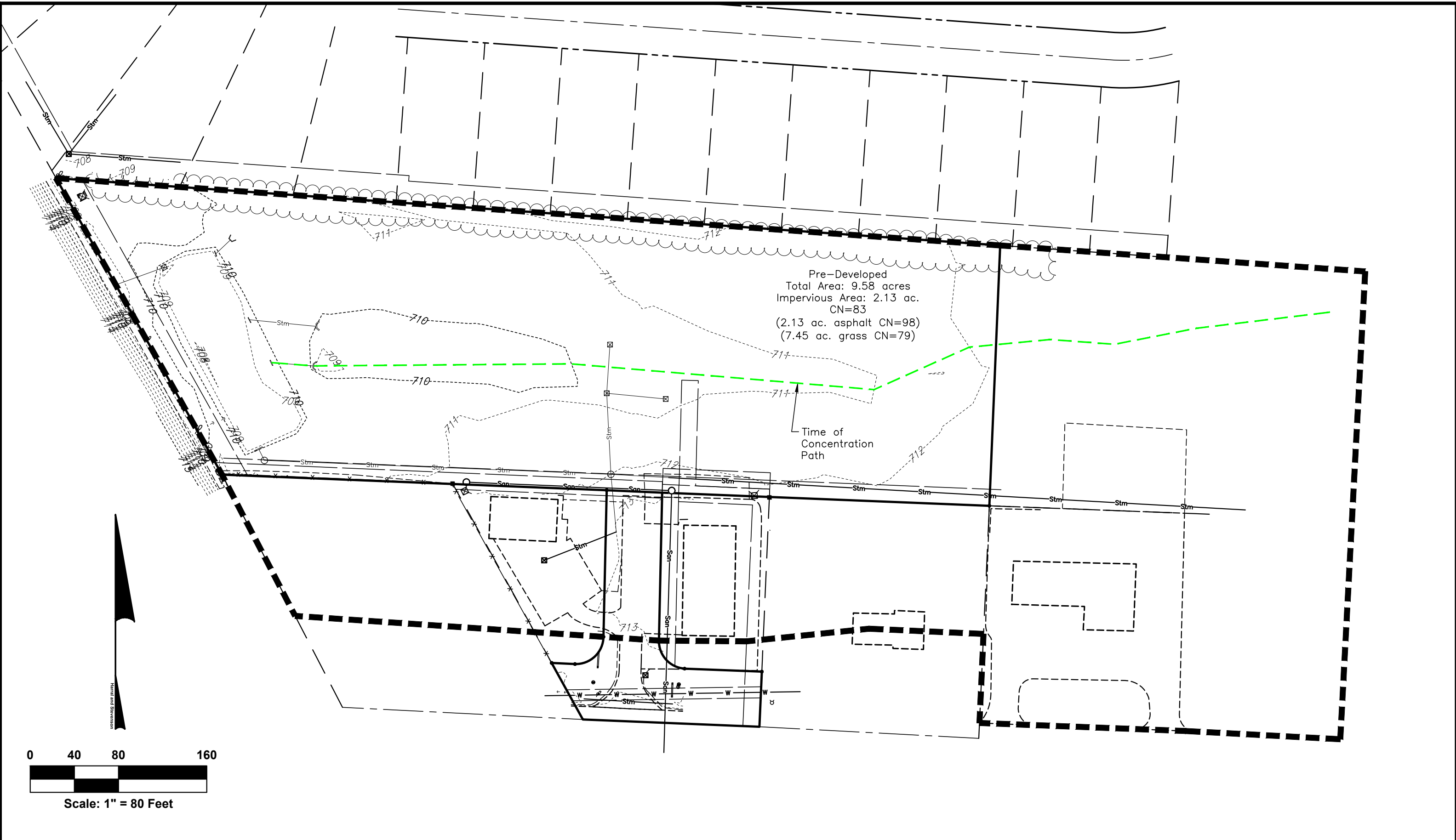
The reason for a lower top of casting is because we have to capture the water flowing from the east with a ditch that flows to both catch basin. In the future when expansion happens to the east, structure 6 and 11 will have to be raised to meet future edge of pavement elevations. In doing so this will increase the top of casting which will then be below the 5 year Hydraulic Grade Line.

Temporary Sediment Basin

The proposed detention pond will be used as a temporary sediment basin during the construction phase of this project. The sediment basin was developed using the OEPA Sediment Basin Sizing and Dewatering Compliance Tool which is included on the following pages. Per the OEPA Sediment Basin Sizing and Dewatering Compliance Tool, below is a screenshot of the Faircloth Skimmer sizing results.

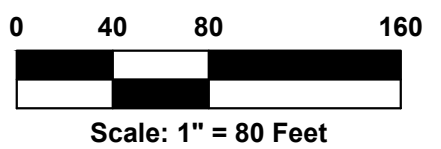
CALCULATE FAIRCLOTH SKIMMER® SIZE

Required Basin volume in cubic feet	Days to Drain	
<input type="text" value="19720"/>	<input type="text" value="2"/>	
<p>The required basin volume is the actual volume you intend to drain, not the provided or total volume which is often larger. If a pool of water is to be maintained between storms, do not include that volume.</p>	<p>Number of Days to drain is usually determined by local or state regulations. Where there is no requirement 3 days is recommended. Keep in mind the quicker the basin is to drain the larger the skimmer required. In NC, assume 3 days to drain.</p>	
SKIMMER SIZE 4.0 inches	ORIFICE RADIUS 1.4 inches	ORIFICE DIAMETER 2.8 inches



Pre-Developed
 Total Area: 9.58 acres
 Impervious Area: 2.13 ac.
 CN=83
 (2.13 ac. asphalt CN=98)
 (7.45 ac. grass CN=79)

Time of
 Concentration
 Path

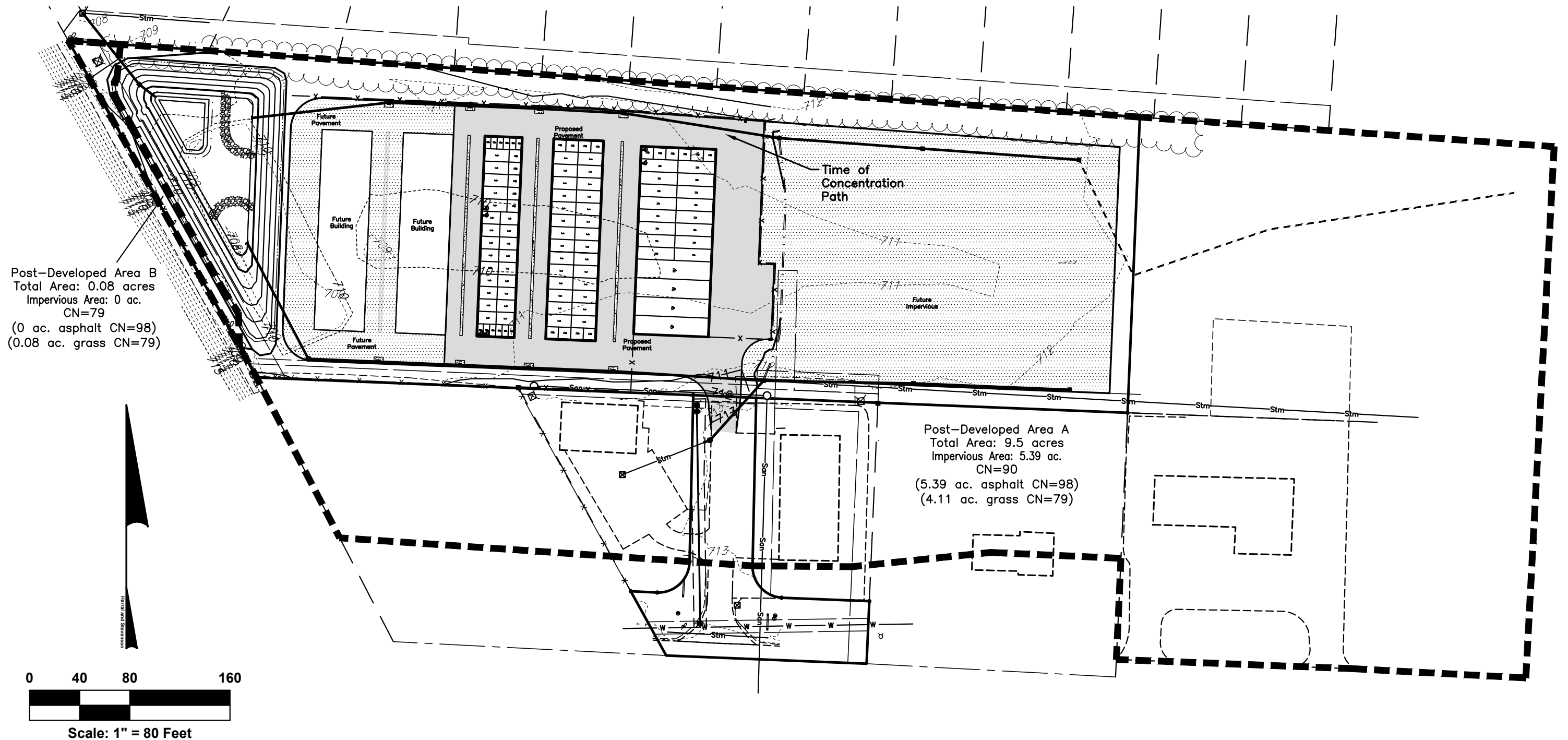


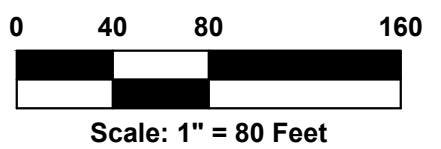
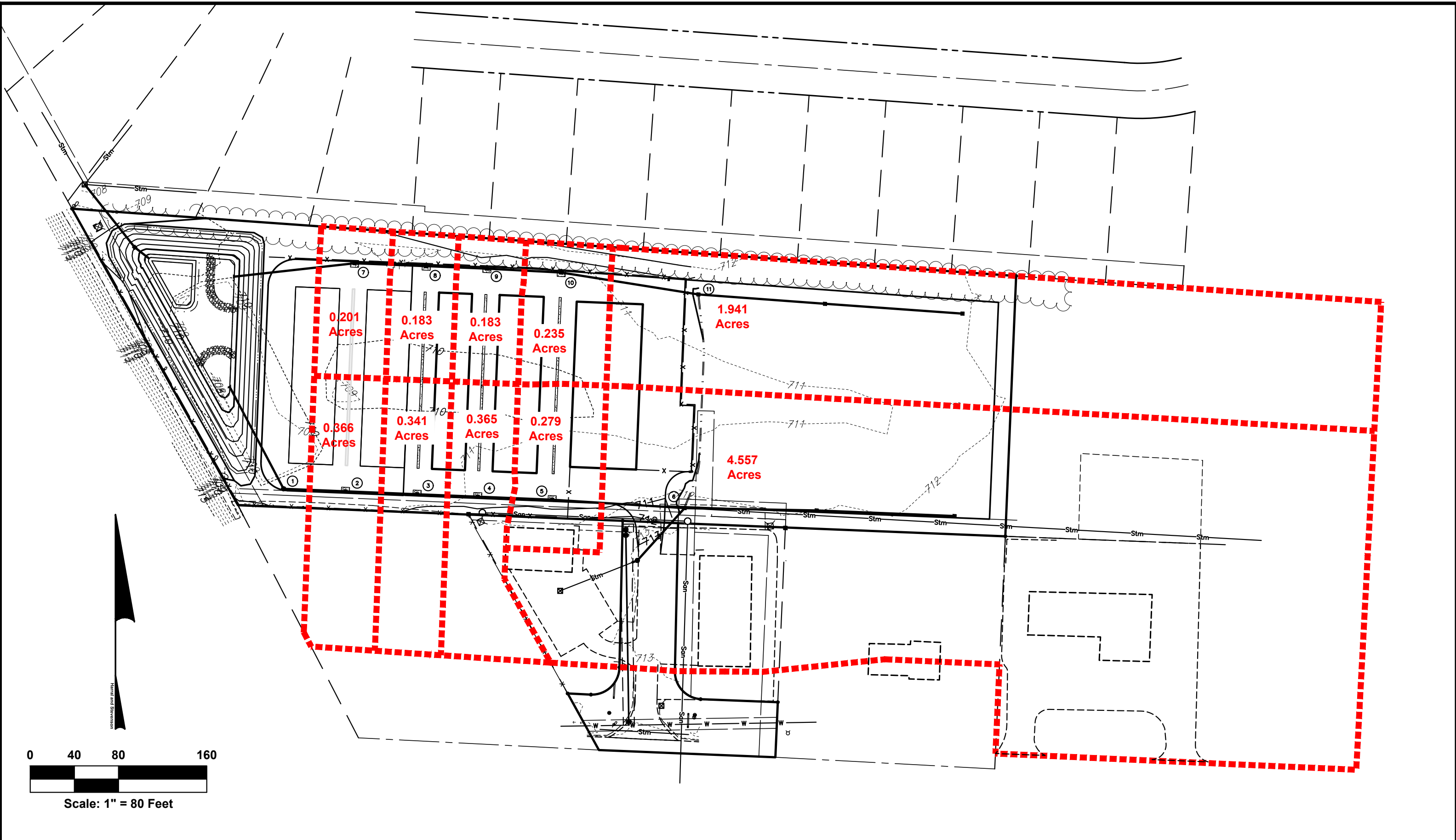
HS **Harral and Stevenson**
 Civil Engineering and Surveying
 2869 North Court Street
 Circleville, Ohio 43113
 Ph: 740.497.4432
 www.harralstevenson.com

Date: 09/20/23
 Scale: 1"=80'
 Drawn By: NSC
 Project: E231032
 Client:

VILLAGE OF ASHVILLE, PICKAWAY COUNTY, OHIO
 ASHVILLE CONCOURSE
PRE-DEVELOPED
 TRIBUTARY AREA MAP

Tributary Area Table		
	Impervious Area (Acres)	Pervious Area (Acres)
Existing	2.13	7.45
Proposed	3.35	6.23
Future	5.39	4.19





HS **Harral and Stevenson**
 Civil Engineering and Surveying
 2869 North Court Street
 Circleville, Ohio 43113
 Ph: 740.497.4432
 www.harralstevenson.com

Date: 09/20/23
 Scale: 1"=80'
 Drawn By: NSC
 Project: E231032
 Client:

VILLAGE OF ASHVILLE, PICKAWAY COUNTY, OHIO
 ASHVILLE CONCOURSE
STORM SEWER
 TRIBUTARY AREA MAP

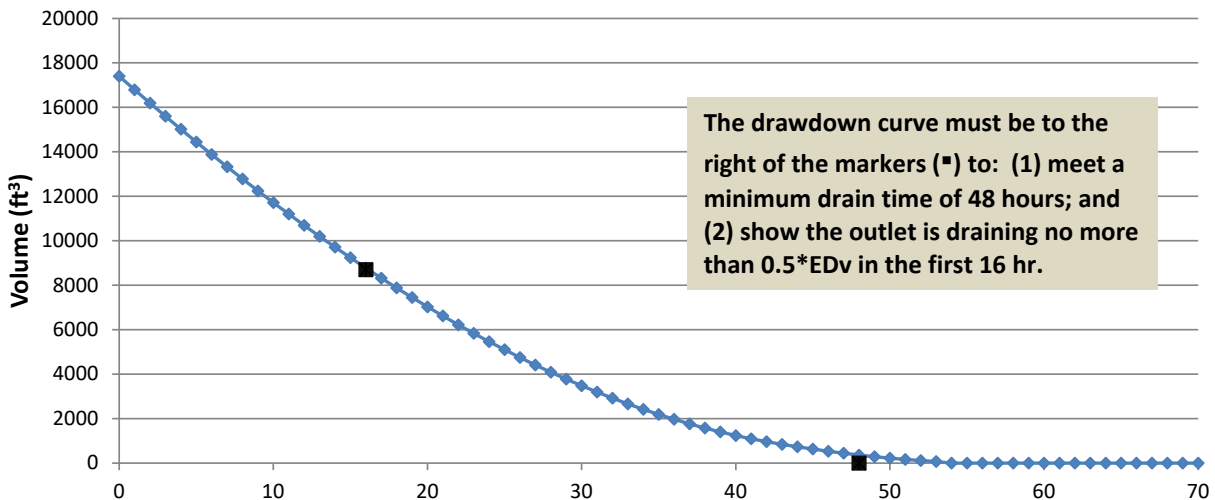
Step 4 - Outlet Elevations and Storage Volumes

WQ Orifice Invert Elevation =	703.90	
Elevation of Top of EDv =	706.16	
Secondary Outlet Invert Elevation =	706.20	OKAY
WQ Treatment Volume Provided, $V_{\text{treatment}}$ =	17,838 ft ³	
Treatment Vol Provided Relative to EDv, $V_{\text{treatment}}/EDv$ =	1.03	= 103% OKAY
Permanent Pool Volume Provided, PPv =	3,957 ft ³	
Forebay Volume Provided, V_{forebay} =	1,875 ft ³	= 1.08
Is forebay volume below WQ outlet? (Yes or No)	Yes	= 108% OKAY
Permanent Micropool Volume Provided, $V_{\text{micropool}}$ =	2,082 ft ³	
Ratio $V_{\text{micropool}}$ Provided to $V_{\text{micropool}}$ Required =	1.20	= 120% OKAY
Sediment Storage Volume Provided, V_{sediment} =	3,957 ft ³	
Ratio V_{sediment} Provided to V_{sediment} Required =	1.14	= 114% OKAY

Step 5 - Outlet (Orifice) Sizing

Maximum Hydraulic Head, H_{max} =	2.26 ft	
Orifice Coefficient, C =	0.6	
Target (Minimum) Draw-down Time, T_d =	48 hr	
Target Average Discharge, Q_{avg} =	0.10 cfs	
Average Hydraulic Head, H_{avg} =	1.13 ft	
Estimated Orifice Area, A_{orifice} =	2.83 in ²	= 0.020 ft ²
Estimated Orifice Diameter, D_{orifice} =	1.90 in	= 0.16 ft
Design Orifice Diameter, D_{orifice} =	2.10 in	= 0.18 ft
Design Orifice Area, A_{orifice} =	3.44 in ²	= 0.024 ft ²
Time to Completely Drain EDv, T_d =	54 hr	must be ≥ 48 hr OKAY
Volume Drained in First 16 hr =	8,625 ft ³	
% of EDv =	49.6%	must be $\leq 50\%$ OKAY

Dry Basin - EDv Drawdown vs Time



Sediment Basin Sizing and Dewatering Compliance Tool

version 1.2 2022-08-30

Project Summary	
Project Name:	Ashville Concourse
Project Location:	State Route 752 Ashville, Ohio
Subwatershed ID/Label:	Post-Developed A
Project Latitude:	
Project Longitude:	
NPDES Permit Applicant:	4GC09443*AG
Submitted by:	Craig Stevenson
Date:	9/21/2023
Watershed: Statewide ▼	
Subwatershed Total Drainage Area, A_{total} =	9.50 acres = 413,820 ft ²
Subwatershed Disturbed Drainage Area, A_{dist} =	2.62 acres = 114,127 ft ²

Street address (or street name and nearest intersection), City, state, zip code

Enter latitude at entrance to site in decimal degrees (format: 40.947544)

Enter longitude at entrance to site in decimal degrees (format: -81.465240)

Name of design engineer
mm/dd/yyyy

Select from dropdown which watershed the project is located in, select "Statewide" if not in the Big Darby Creek Watershed

Report to the nearest 0.01 acre; include any drainage from off-site

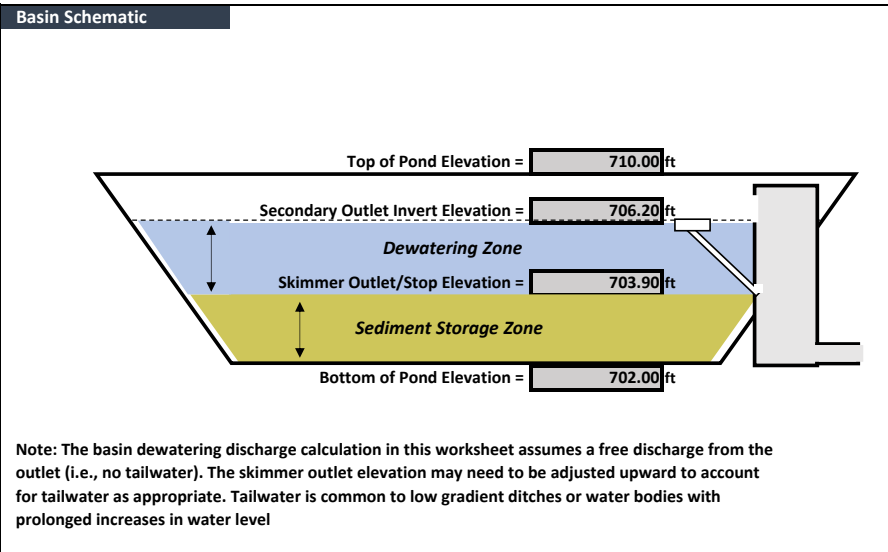
All Basin dewatering discharge calculations in these worksheets assume free discharge from the outlet (i.e., no tailwater)

Step 1 - Sediment Basin Volume Requirements					
<u>For Statewide Watersheds</u>					
Minimum Sediment Storage Volume, $V_{sediment}$ =	2620 ft ³	=	97 yd ³	=	0.060 acre-ft
Minimum Dewatering Zone Volume, $V_{dewatering}$ =	17100 ft ³	=	633 yd ³	=	0.393 acre-ft

Requirement: Minimum Sediment Volume = 1000 ft³/acre of disturbed drainage area

Requirement: Minimum Dewatering Volume = 1800 ft³/acre of total drainage area

Step 2 - Basin Stage-Storage Relationship				
	Elevation	Area	Incremental Volume	Cumulative Volume
	ft	ft ²	ft ³	ft ³
Bottom of Sediment Storage (Pond) =	702.00	945		
	703.00	1,379	1,155	1,155
	703.90	1,890	1,465	2,620
<i>IMPORTANT: Must include the exact Skimmer Outlet/Skimmer Stop Elevation and the Secondary Outlet Invert Elevation in the Stage-Storage Table</i>	704.00	5,852	369	2,989
	705.00	7,627	6,720	9,709
	706.00	9,609	8,599	18,308
	706.20	10,037	1,964	20,272
	707.00	11,818	8,732	29,005
	708.00	14,255	13,017	42,022
	709.00	16,919	15,568	57,590
	710.00	19,732	18,307	75,898



Step 3 - Outlet Elevations and Storage Volumes

Skimmer Outlet Invert/Skimmer Stop Elevation =	703.90 ft	OKAY
Secondary Outlet Invert Elevation =	706.20 ft	OKAY
Provided Sediment Storage Volume =	2,620 ft ³	OKAY
Provided Dewatering Volume =	17,652 ft ³	OKAY

- ┌ The invert of the Skimmer Outlet/Skimmer Stop (e.g. stone pad) corresponds to the top of the sediment storage zone/permanent pool and the bottom of the Dewatering Volume. It cannot be below the bottom of the pond.
- └ The invert elevation for the next (usually peak discharge or flood control) outlet. This elevation must exceed that of the Skimmer Outlet Invert Elevation and be below the top of the pond. *Check - The difference between the skimmer outlet invert/skimmer stop elevation and the secondary outlet invert elevation (dewatering zone depth) must not exceed 5ft.

The Sediment Storage Volume must exceed the requirement listed above in Step 1

The Dewatering Volume must exceed the requirement listed above in Step 1

ERROR Check - The Step 2 Stage Storage Table above must include the exact Skimmer Outlet/Skimmer Stop Elevation and the Secondary Outlet Invert Elevation provided in Step 3

Step 4 - Skimmer-Type Outlet Sizing

Select Skimmer Type or Manufacturer: Faircloth Skimmer

Faircloth Skimmer Sizing Calculator: [Click Here For Link to Online Calculator](#)

Orifice Size Selected: 2.8 in
Dewatering Drawdown Time: 48 hrs

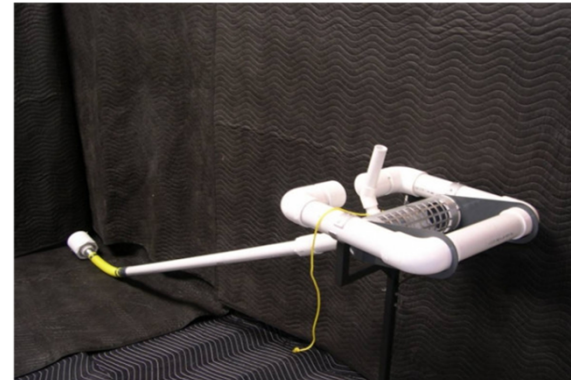
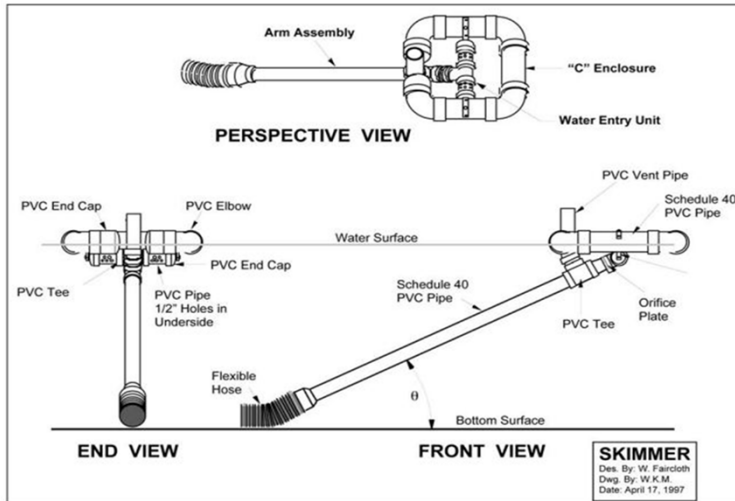
Follow directions on webpage to calculate exact skimmer size and model, include screenshot of results in SWP3. *Note* Input require

Check to ensure that orifice sizing calculation is done using required, NOT provided dewatering volume
Check that dewatering drawdown time is greater than 2 days and less than 7 days

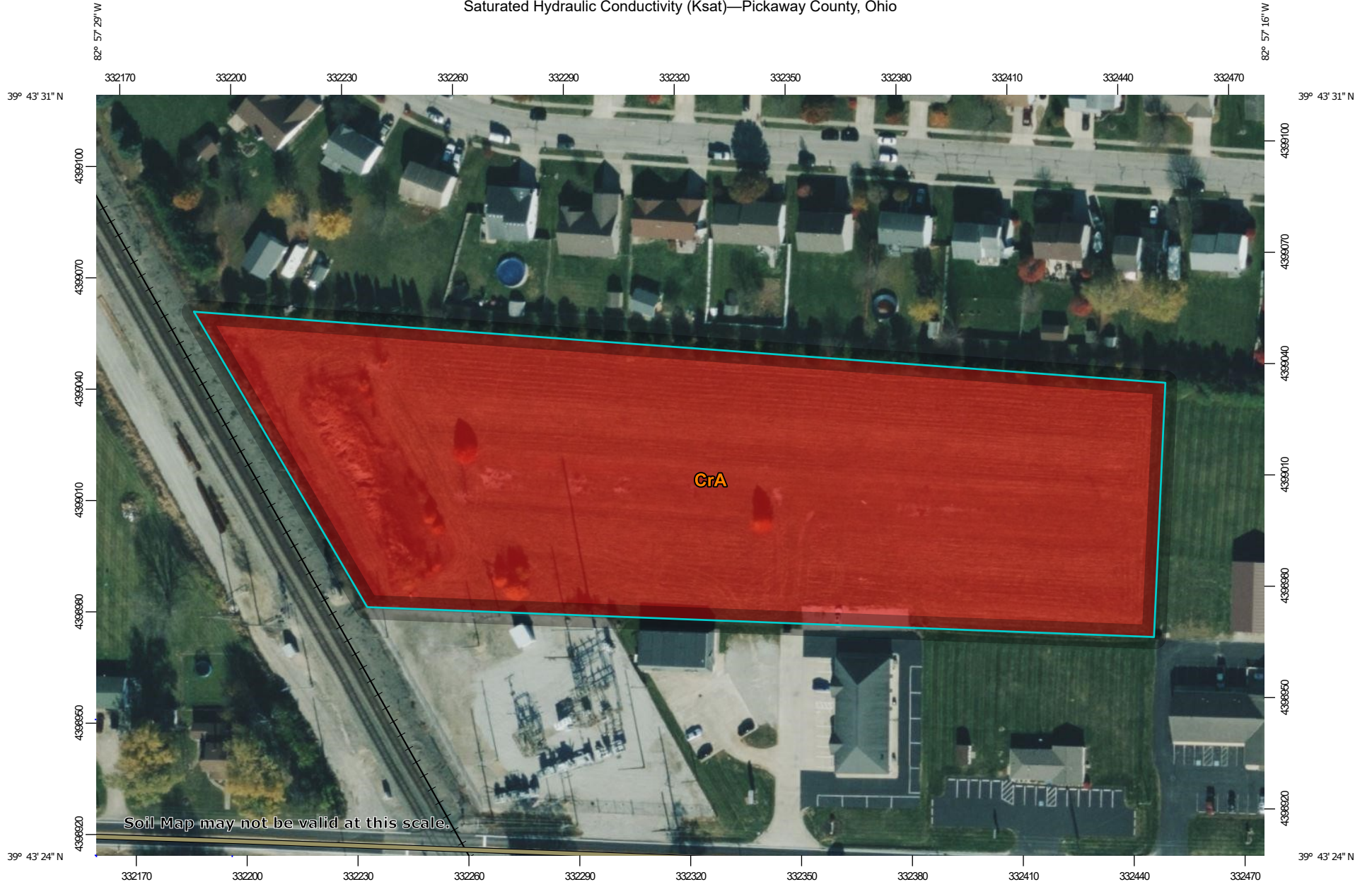
Example Faircloth Float Spec Sheet

Faircloth Float Photo

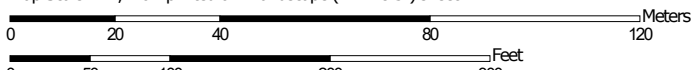
Please note the drawing and image shown below are provided solely to assist with identification of the skimmer type and its associated components. The drawing and photo below does not necessarily depict an installation that complies with the General Permit or Rainwater & Land Development specification, especially where the sediment storage zone is omitted.



Saturated Hydraulic Conductivity (Ksat)—Pickaway County, Ohio




Map Scale: 1:1,440 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84


MAP LEGEND


Area of Interest (AOI)

 Area of Interest (AOI)


Soils


Soil Rating Polygons

 = 3.9788


 Not rated or not available


Soil Rating Lines

 = 3.9788

 Not rated or not available

Soil Rating Points

 = 3.9788


 Not rated or not available

Water Features

 Streams and Canals


Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pickaway County, Ohio

Survey Area Data: Version 23, Sep 9, 2022

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

Date(s) aerial images were photographed: Oct 8, 2020—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, Southern Ohio Till Plain, 0 to 2 percent slopes	3.9788	4.3	100.0%
Totals for Area of Interest			4.3	100.0%

Description

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Rating Options

Units of Measure: micrometers per second

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Fastest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 6

Bottom Depth: 60

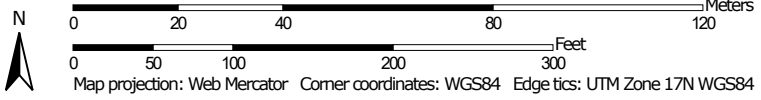
Units of Measure: Inches

Hydrologic Soil Group—Pickaway County, Ohio



Soil Map may not be valid at this scale.

Map Scale: 1:1,440 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pickaway County, Ohio
 Survey Area Data: Version 23, Sep 9, 2022

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

Date(s) aerial images were photographed: Oct 8, 2020—Nov 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Crosby silt loam, Southern Ohio Till Plain, 0 to 2 percent slopes	C/D	4.3	100.0%
Totals for Area of Interest			4.3	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

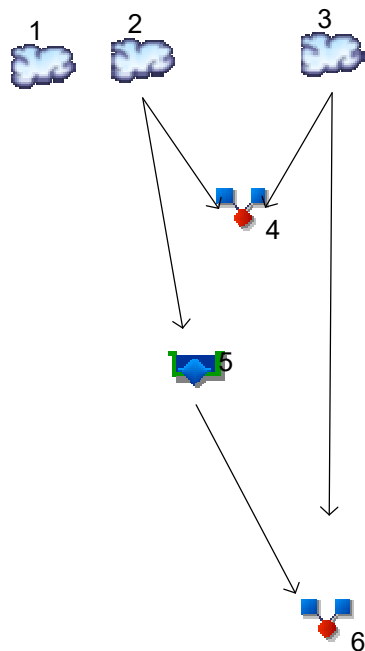
Tie-break Rule: Higher

Watershed Model Schematic.....	1
Hydrograph Return Period Recap.....	2
1 - Year	
Summary Report.....	3
Hydrograph Reports.....	4
Hydrograph No. 1, SCS Runoff, Predeveloped.....	4
TR-55 Tc Worksheet.....	5
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	6
TR-55 Tc Worksheet.....	7
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	8
Hydrograph No. 4, Combine, Post A and B Combined.....	9
Hydrograph No. 5, Reservoir, Post A Routed.....	10
Pond Report - Detention Basin.....	11
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	12
2 - Year	
Summary Report.....	13
Hydrograph Reports.....	14
Hydrograph No. 1, SCS Runoff, Predeveloped.....	14
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	15
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	16
Hydrograph No. 4, Combine, Post A and B Combined.....	17
Hydrograph No. 5, Reservoir, Post A Routed.....	18
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	19
5 - Year	
Summary Report.....	20
Hydrograph Reports.....	21
Hydrograph No. 1, SCS Runoff, Predeveloped.....	21
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	22
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	23
Hydrograph No. 4, Combine, Post A and B Combined.....	24
Hydrograph No. 5, Reservoir, Post A Routed.....	25
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	26
10 - Year	
Summary Report.....	27
Hydrograph Reports.....	28
Hydrograph No. 1, SCS Runoff, Predeveloped.....	28
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	29
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	30
Hydrograph No. 4, Combine, Post A and B Combined.....	31
Hydrograph No. 5, Reservoir, Post A Routed.....	32
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	33
25 - Year	

Summary Report.....	34
Hydrograph Reports.....	35
Hydrograph No. 1, SCS Runoff, Predeveloped.....	35
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	36
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	37
Hydrograph No. 4, Combine, Post A and B Combined.....	38
Hydrograph No. 5, Reservoir, Post A Routed.....	39
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	40
50 - Year	
Summary Report.....	41
Hydrograph Reports.....	42
Hydrograph No. 1, SCS Runoff, Predeveloped.....	42
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	43
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	44
Hydrograph No. 4, Combine, Post A and B Combined.....	45
Hydrograph No. 5, Reservoir, Post A Routed.....	46
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	47
100 - Year	
Summary Report.....	48
Hydrograph Reports.....	49
Hydrograph No. 1, SCS Runoff, Predeveloped.....	49
Hydrograph No. 2, SCS Runoff, Postdeveloped A.....	50
Hydrograph No. 3, SCS Runoff, Postdeveloped B.....	51
Hydrograph No. 4, Combine, Post A and B Combined.....	52
Hydrograph No. 5, Reservoir, Post A Routed.....	53
Hydrograph No. 6, Combine, Post A Routed and Post B Combined.....	54
IDF Report.....	55

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Legend

Hyd. Origin	Description
1	SCS Runoff Predeveloped
2	SCS Runoff Postdeveloped A
3	SCS Runoff Postdeveloped B
4	Combine Post A and B Combined
5	Reservoir Post A Routed
6	Combine Post A Routed and Post B Combined

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	-----	6.551	9.244	-----	13.30	16.77	21.78	26.00	30.47	Predeveloped
2	SCS Runoff	-----	10.93	14.21	-----	18.94	22.83	28.30	32.81	37.55	Postdeveloped A
3	SCS Runoff	-----	0.087	0.126	-----	0.186	0.237	0.313	0.378	0.447	Postdeveloped B
4	Combine	2, 3	10.94	14.23	-----	18.96	22.87	28.34	32.87	37.61	Post A and B Combined
5	Reservoir	2	0.345	1.239	-----	5.900	8.799	11.90	13.97	16.58	Post A Routed
6	Combine	3, 5	0.347	1.245	-----	5.913	8.818	11.92	14.00	16.62	Post A Routed and Post B Combined

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	SCS Runoff	6.551	2	734	29,402	-----	-----	-----	Predeveloped	
2	SCS Runoff	10.93	2	730	43,670	-----	-----	-----	Postdeveloped A	
3	SCS Runoff	0.087	2	718	175	-----	-----	-----	Postdeveloped B	
4	Combine	10.94	2	730	43,845	2, 3	-----	-----	Post A and B Combined	
5	Reservoir	0.345	2	1072	6,639	2	707.52	37,245	Post A Routed	
6	Combine	0.347	2	1072	6,814	3, 5	-----	-----	Post A Routed and Post B Combined	
E231032 Hydro.gpw					Return Period: 1 Year			Wednesday, 09 / 20 / 2023		

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

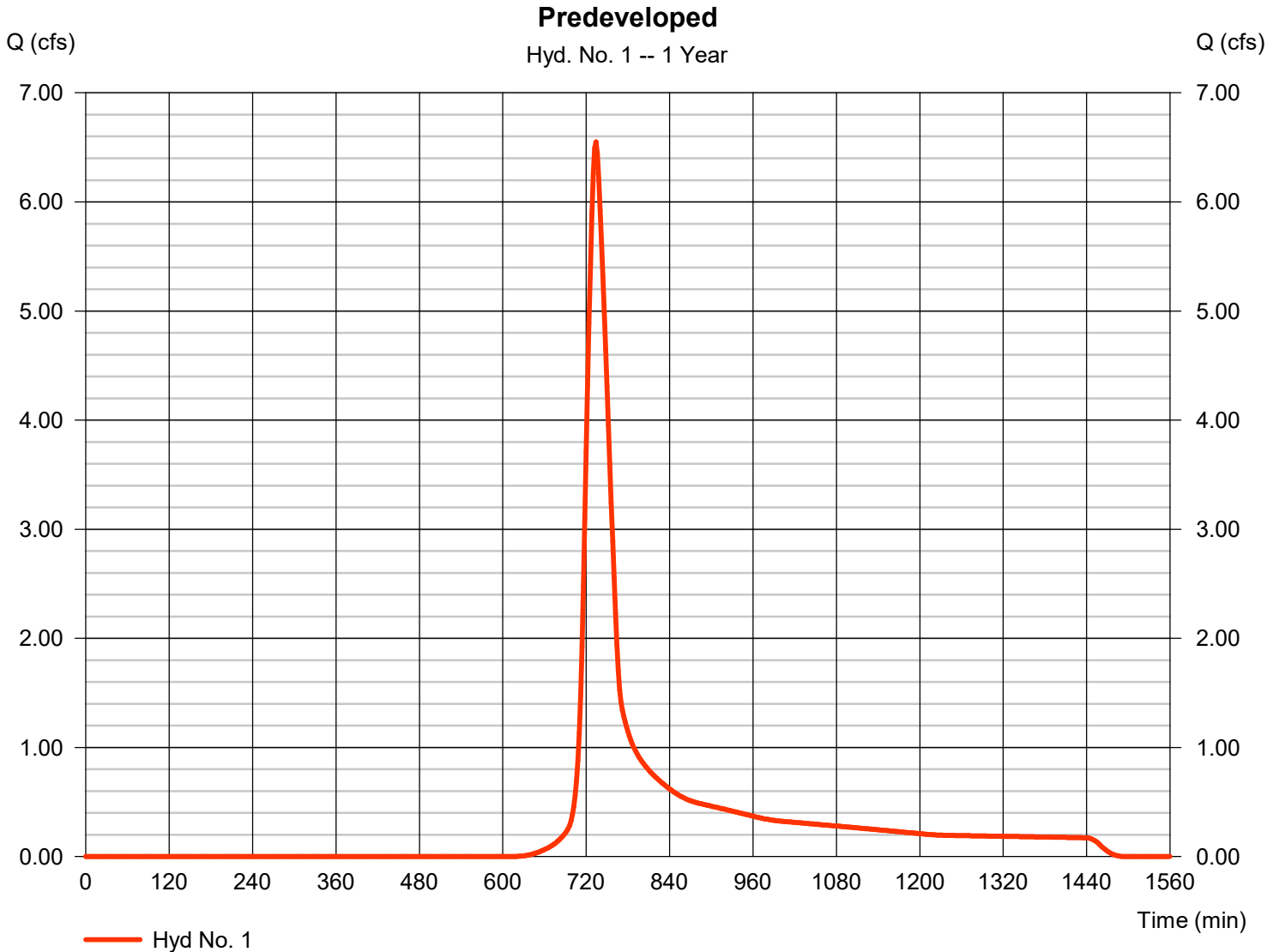
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 6.551 cfs
Storm frequency	= 1 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 29,402 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 1

Predeveloped

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
Sheet Flow							
Manning's n-value	= 0.200		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.63		0.00		0.00		
Land slope (%)	= 1.33		0.00		0.00		
Travel Time (min)	= 22.15	+	0.00	+	0.00	=	22.15
Shallow Concentrated Flow							
Flow length (ft)	= 783.00		0.00		0.00		
Watercourse slope (%)	= 0.76		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.41		0.00		0.00		
Travel Time (min)	= 9.28	+	0.00	+	0.00	=	9.28
Channel Flow							
X sectional flow area (sqft)	= 0.79		0.00		0.00		
Wetted perimeter (ft)	= 3.14		0.00		0.00		
Channel slope (%)	= 0.09		0.00		0.00		
Manning's n-value	= 0.023		0.015		0.015		
Velocity (ft/s)	=0.79		0.00		0.00		
Flow length (ft)	{{0}}38.0		0.0		0.0		
Travel Time (min)	= 0.80	+	0.00	+	0.00	=	0.80
Total Travel Time, Tc							32.20 min

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

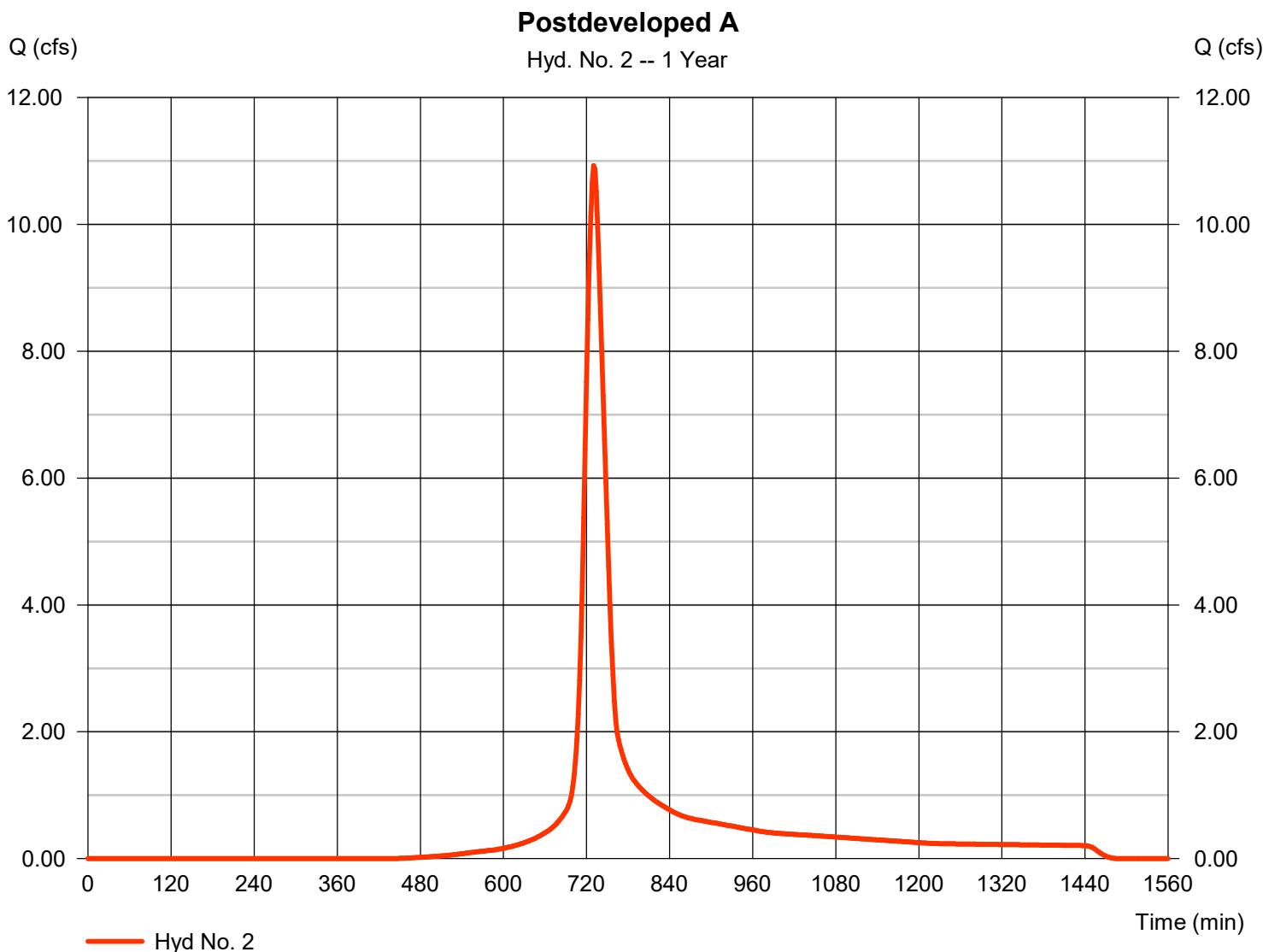
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 10.93 cfs
Storm frequency	= 1 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 43,670 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 2

Postdeveloped A

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.200	0.011	0.011	
Flow length (ft)	= 150.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.63	0.00	0.00	
Land slope (%)	= 1.67	0.00	0.00	
Travel Time (min)	= 20.24	+ 0.00	+ 0.00	= 20.24
Shallow Concentrated Flow				
Flow length (ft)	= 264.00	0.00	0.00	
Watercourse slope (%)	= 0.76	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=1.41	0.00	0.00	
Travel Time (min)	= 3.13	+ 0.00	+ 0.00	= 3.13
Channel Flow				
X sectional flow area (sqft)	= 0.79	0.00	0.00	
Wetted perimeter (ft)	= 3.14	0.00	0.00	
Channel slope (%)	= 0.45	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=2.63	0.00	0.00	
Flow length (ft)	{{0}}663.0	0.0	0.0	
Travel Time (min)	= 4.20	+ 0.00	+ 0.00	= 4.20
Total Travel Time, Tc				27.60 min

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

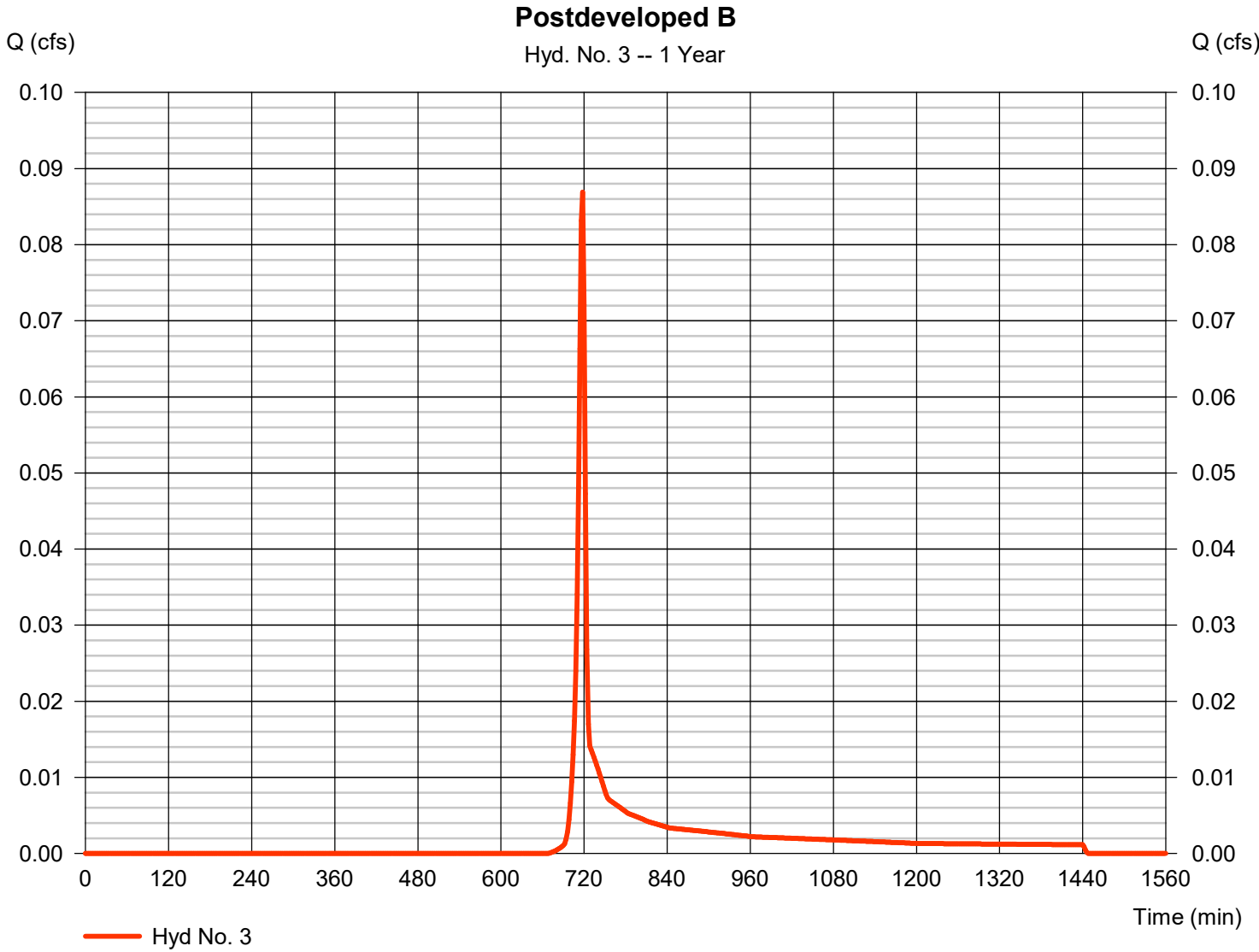
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.087 cfs
Storm frequency	= 1 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 175 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

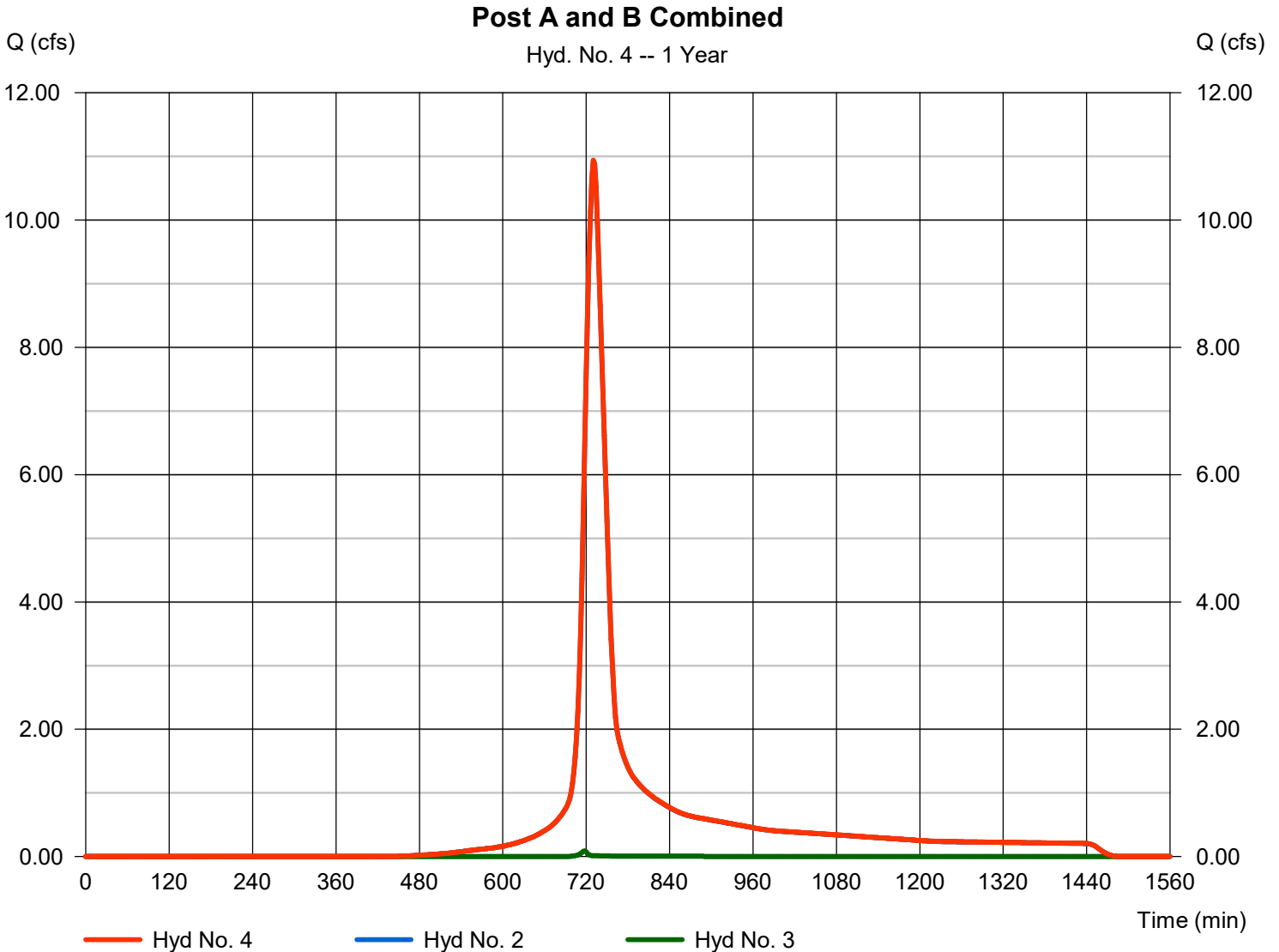
Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type = Combine
Storm frequency = 1 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 10.94 cfs
Time to peak = 730 min
Hyd. volume = 43,845 cuft
Contrib. drain. area = 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

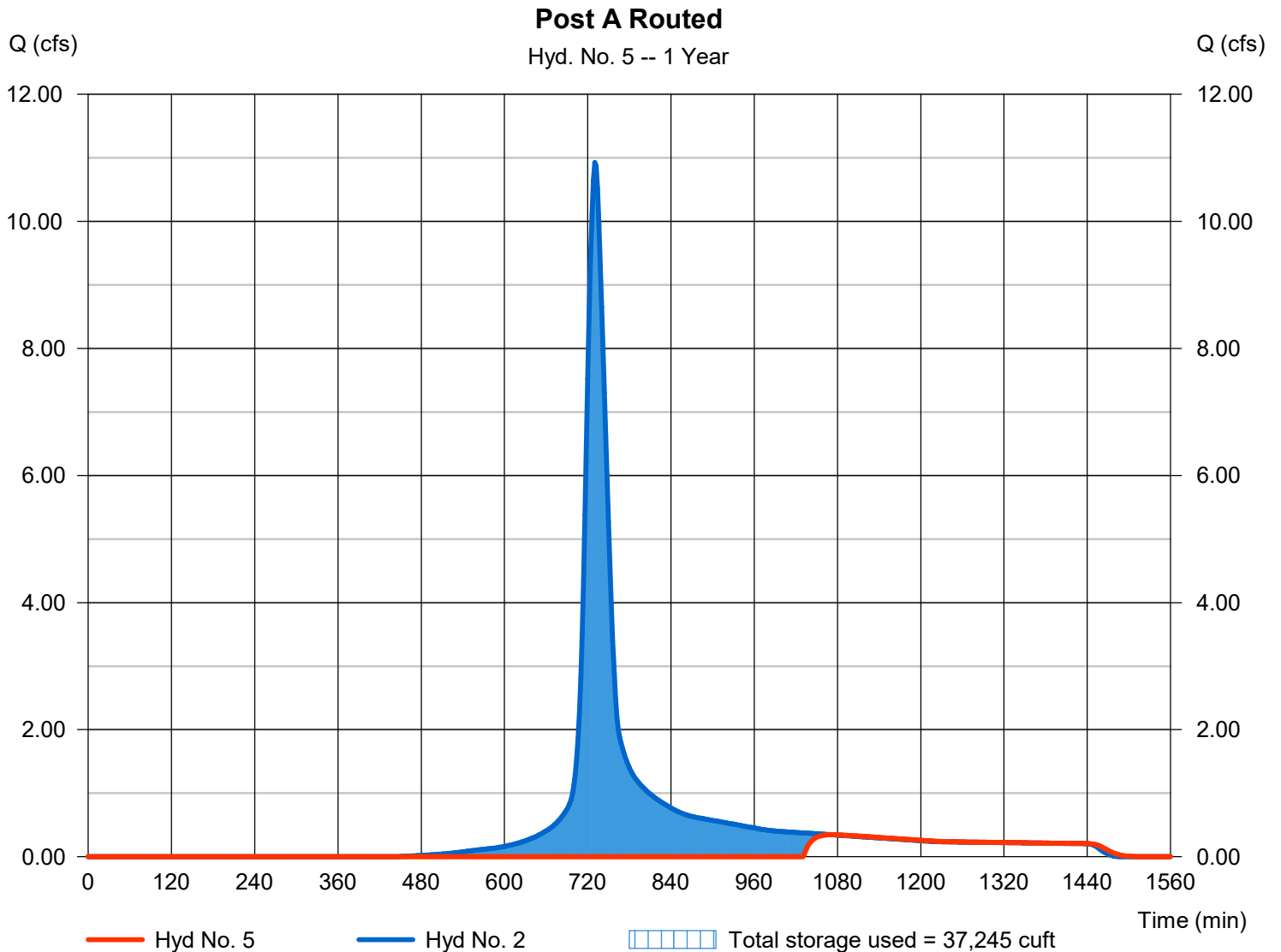
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 0.345 cfs
Storm frequency	= 1 yrs	Time to peak	= 1072 min
Time interval	= 2 min	Hyd. volume	= 6,639 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 707.52 ft
Reservoir name	= Detention Basin	Max. Storage	= 37,245 cuft

Storage Indication method used.



Pond No. 1 - Detention Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 702.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	702.00	945	0	0
1.00	703.00	1,379	1,155	1,155
2.00	704.00	5,852	3,357	4,512
3.00	705.00	7,627	6,719	11,231
4.00	706.00	9,609	8,598	19,829
5.00	707.00	11,818	10,693	30,523
6.00	708.00	14,255	13,016	43,539
7.00	709.00	16,919	15,566	59,105
8.00	710.00	19,732	18,306	77,411

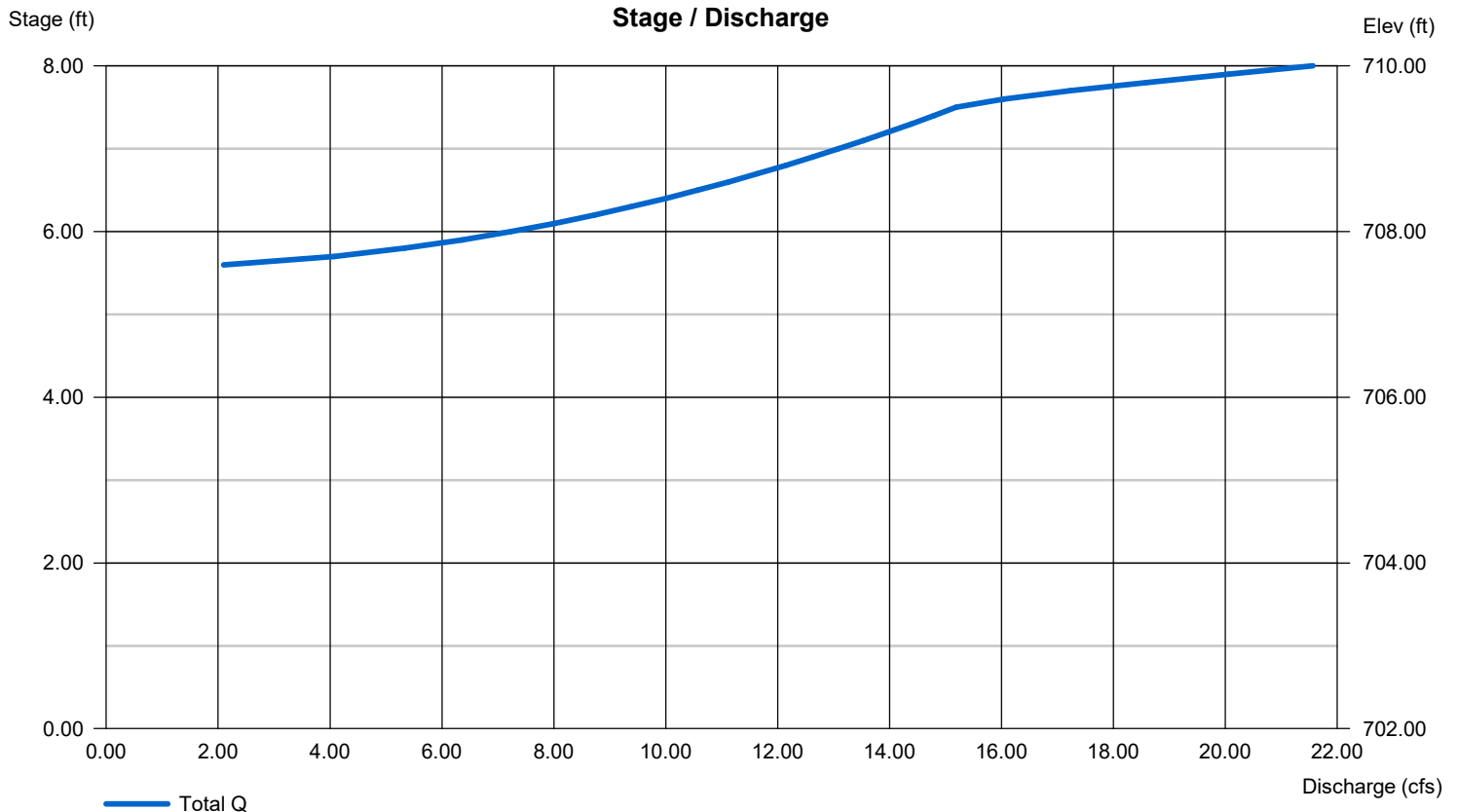
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.10	18.00	0.00
Span (in)	= 24.00	2.10	22.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 703.90	703.90	706.20	0.00
Length (ft)	= 73.00	0.00	0.00	0.00
Slope (%)	= 0.34	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.66	0.66	0.66	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 709.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Rect	Broad	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 707.56			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 6

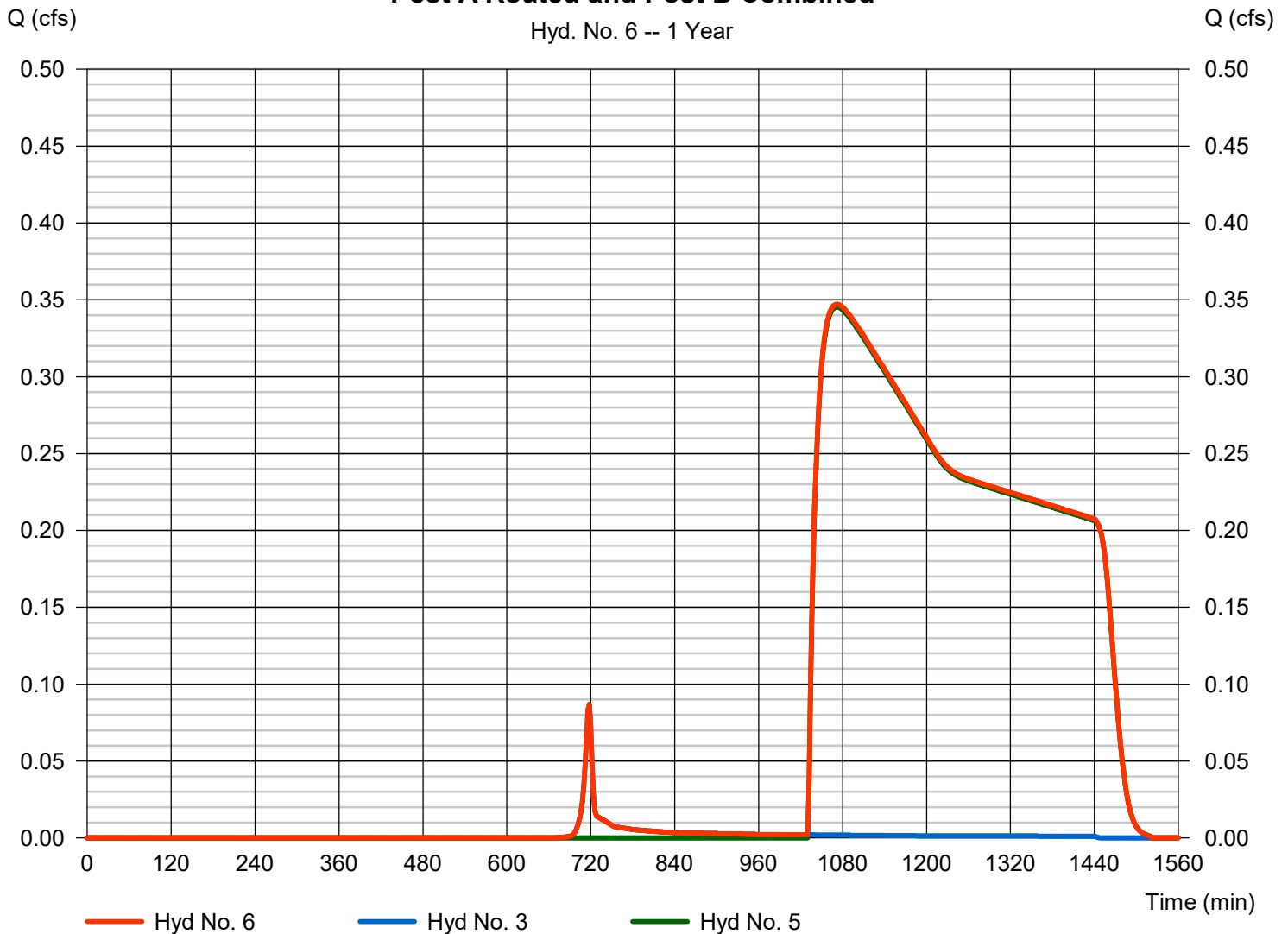
Post A Routed and Post B Combined

Hydrograph type = Combine
 Storm frequency = 1 yrs
 Time interval = 2 min
 Inflow hyds. = 3, 5

Peak discharge = 0.347 cfs
 Time to peak = 1072 min
 Hyd. volume = 6,814 cuft
 Contrib. drain. area = 0.080 ac

Post A Routed and Post B Combined

Hyd. No. 6 -- 1 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	9.244	2	734	40,666	-----	-----	-----	Predeveloped	
2	SCS Runoff	14.21	2	730	56,814	-----	-----	-----	Postdeveloped A	
3	SCS Runoff	0.126	2	718	252	-----	-----	-----	Postdeveloped B	
4	Combine	14.23	2	730	57,066	2, 3	-----	-----	Post A and B Combined	
5	Reservoir	1.239	2	810	19,783	2	707.56	37,800	Post A Routed	
6	Combine	1.245	2	810	20,035	3, 5	-----	-----	Post A Routed and Post B Combined	
E231032 Hydro.gpw					Return Period: 2 Year			Wednesday, 09 / 20 / 2023		

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

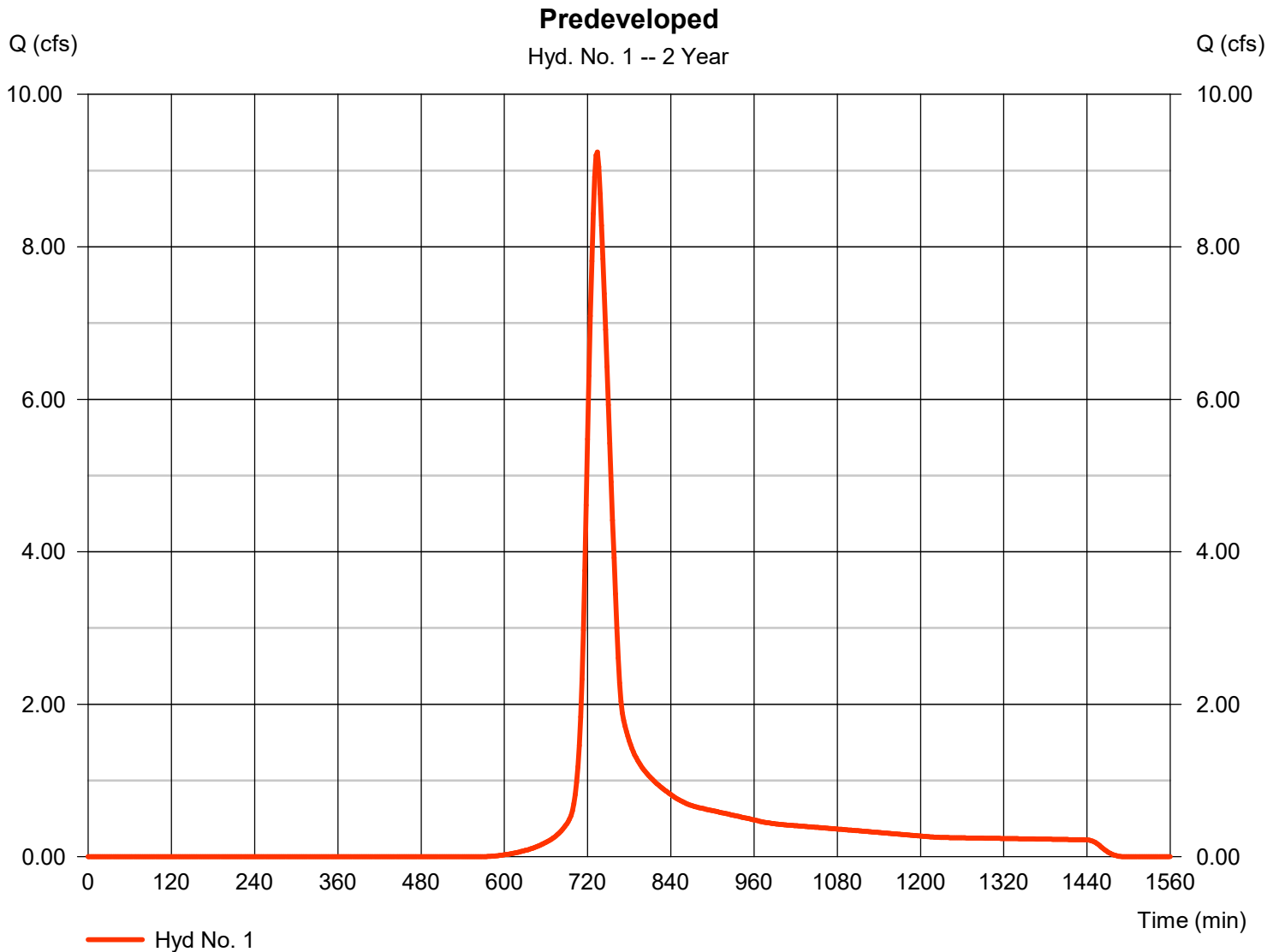
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 9.244 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 40,666 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

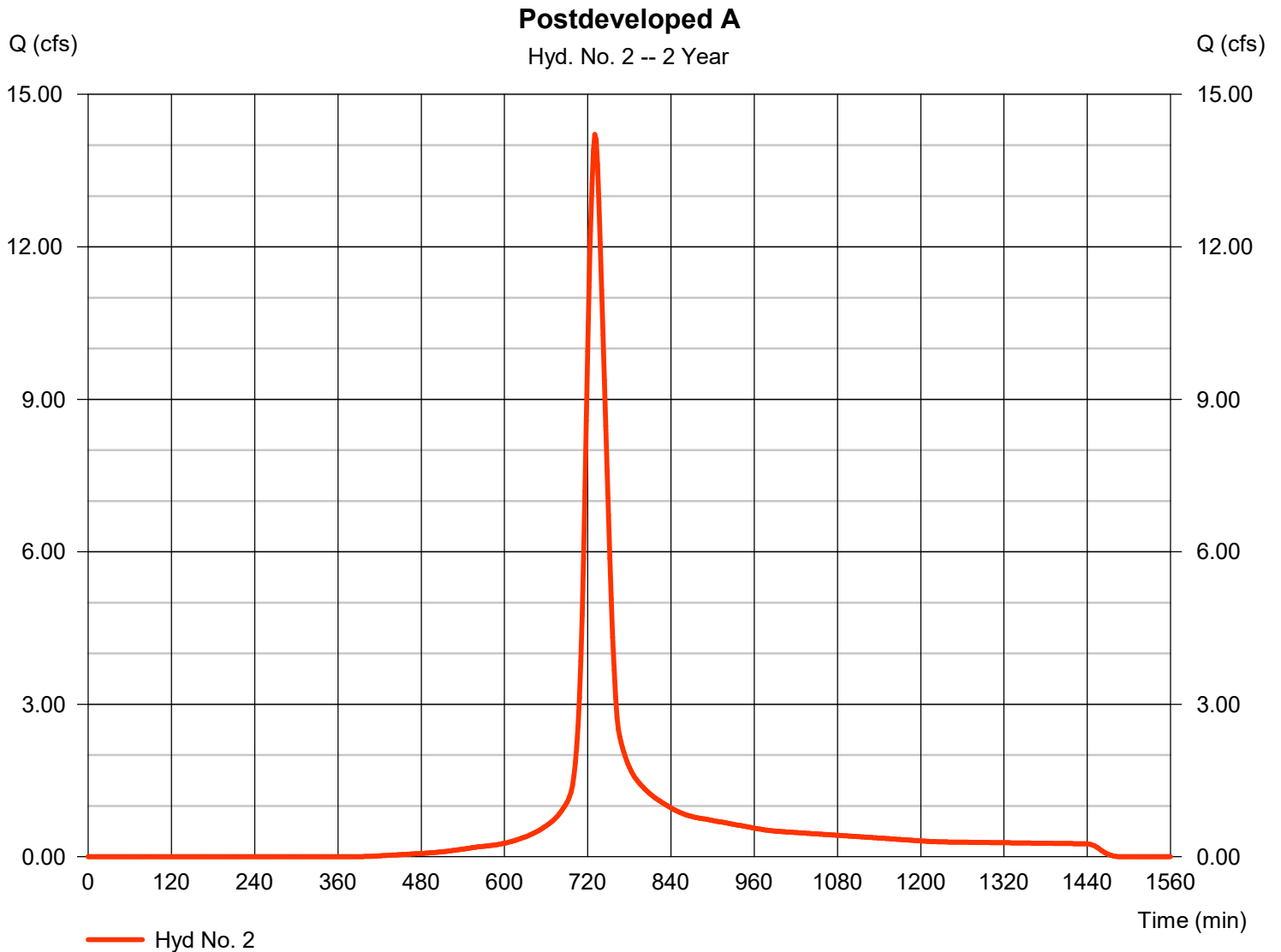
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 14.21 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 56,814 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

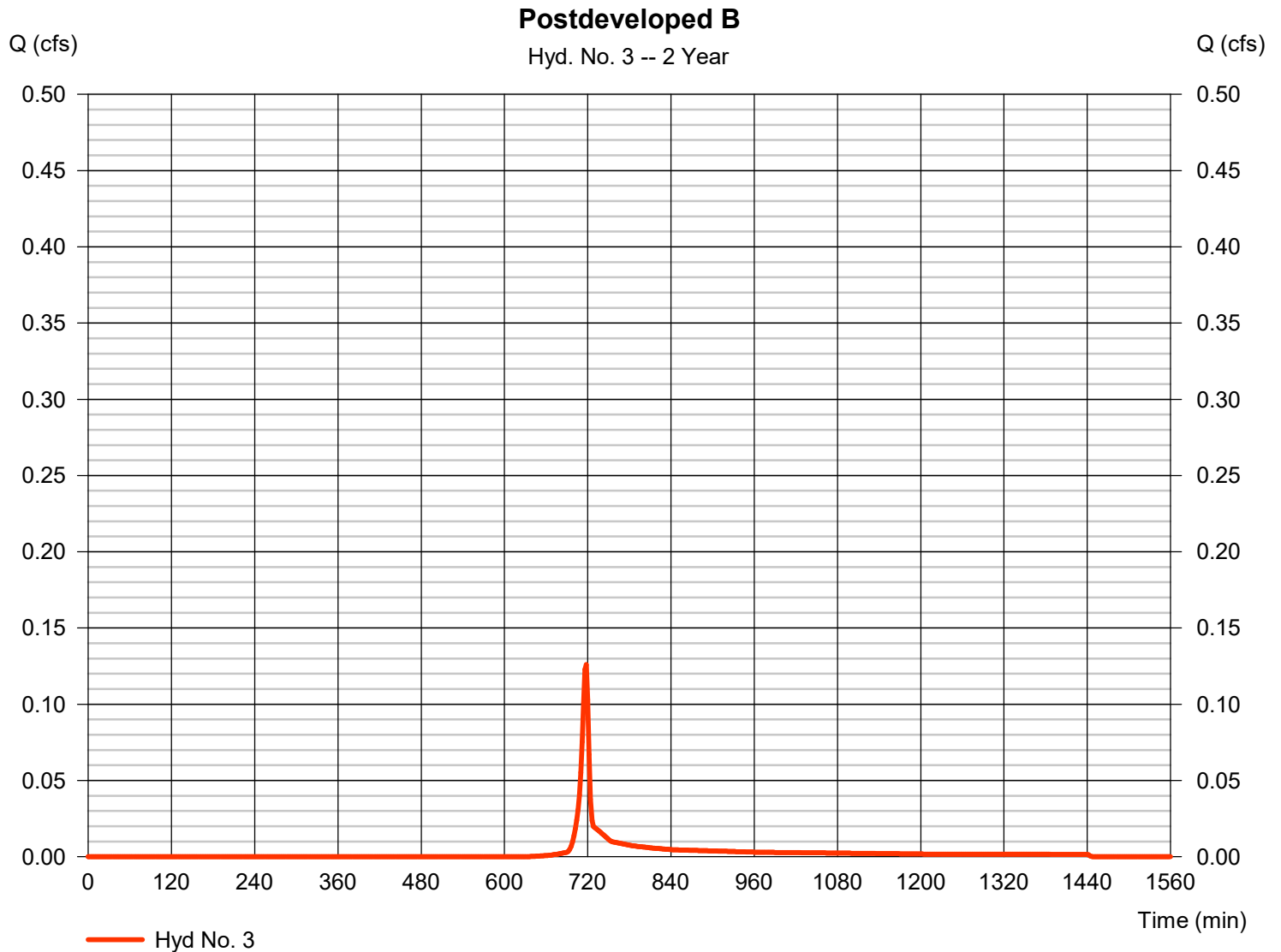
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.126 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 252 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

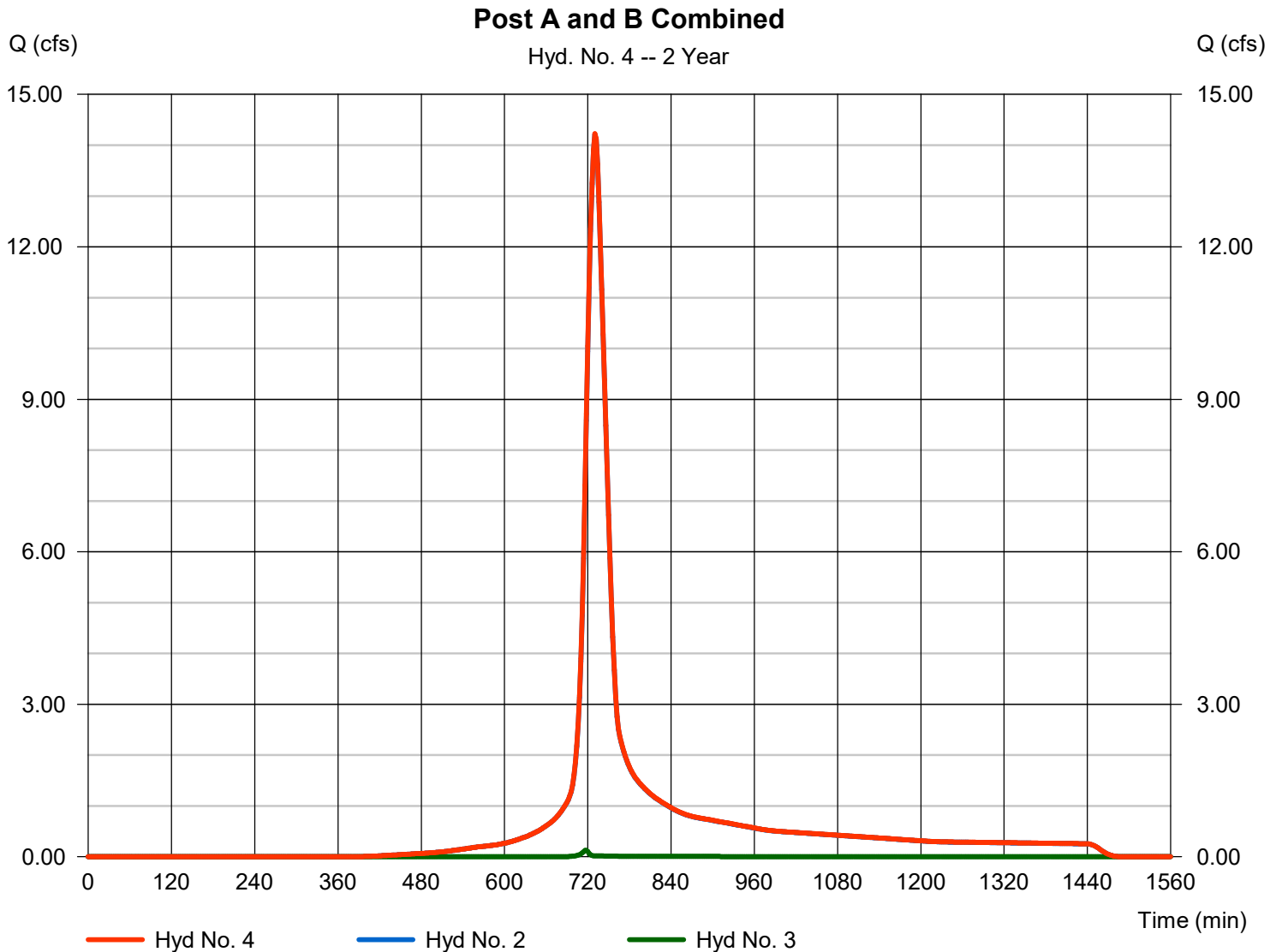
Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 14.23 cfs
Time to peak = 730 min
Hyd. volume = 57,066 cuft
Contrib. drain. area = 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

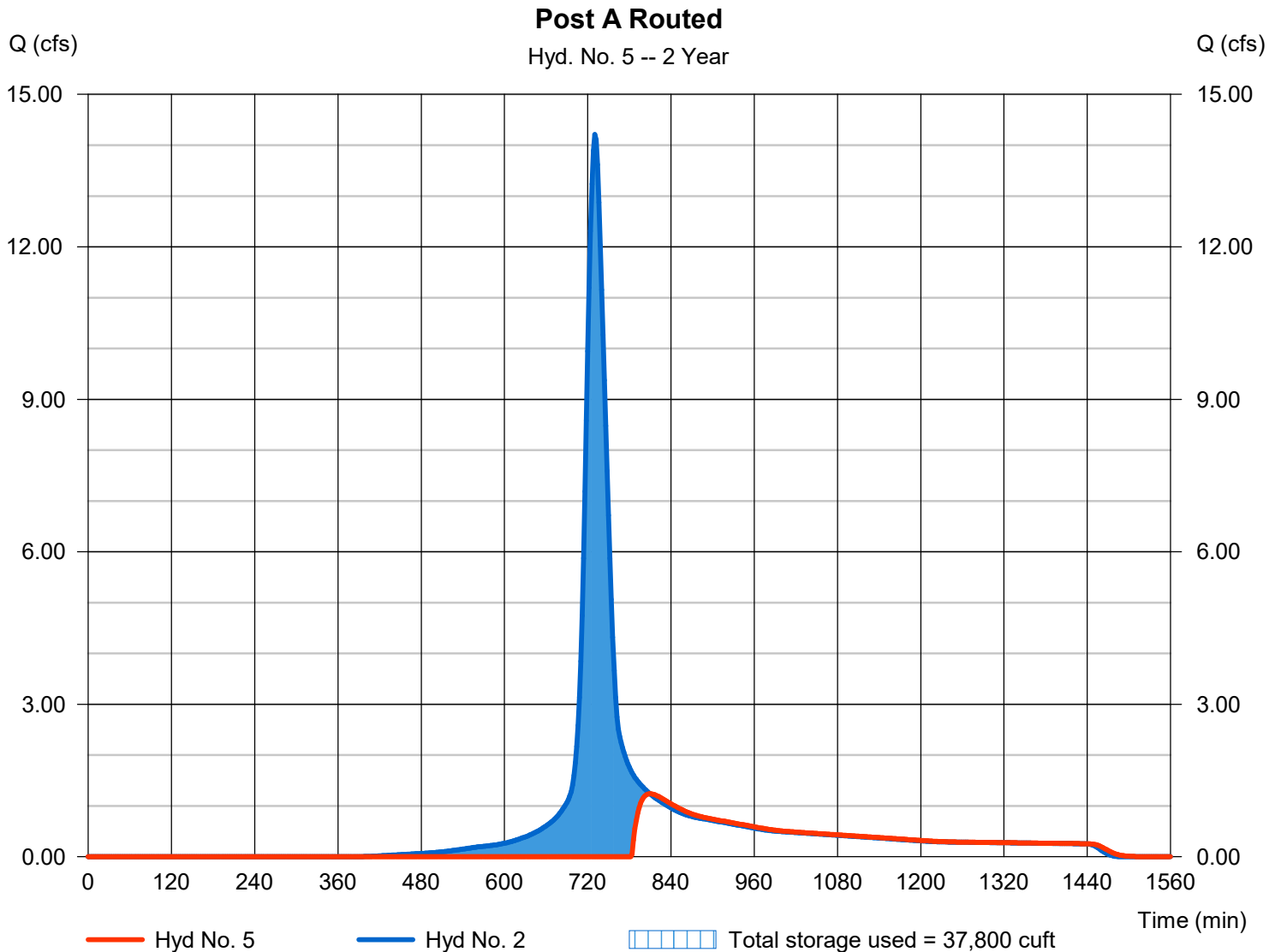
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 1.239 cfs
Storm frequency	= 2 yrs	Time to peak	= 810 min
Time interval	= 2 min	Hyd. volume	= 19,783 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 707.56 ft
Reservoir name	= Detention Basin	Max. Storage	= 37,800 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

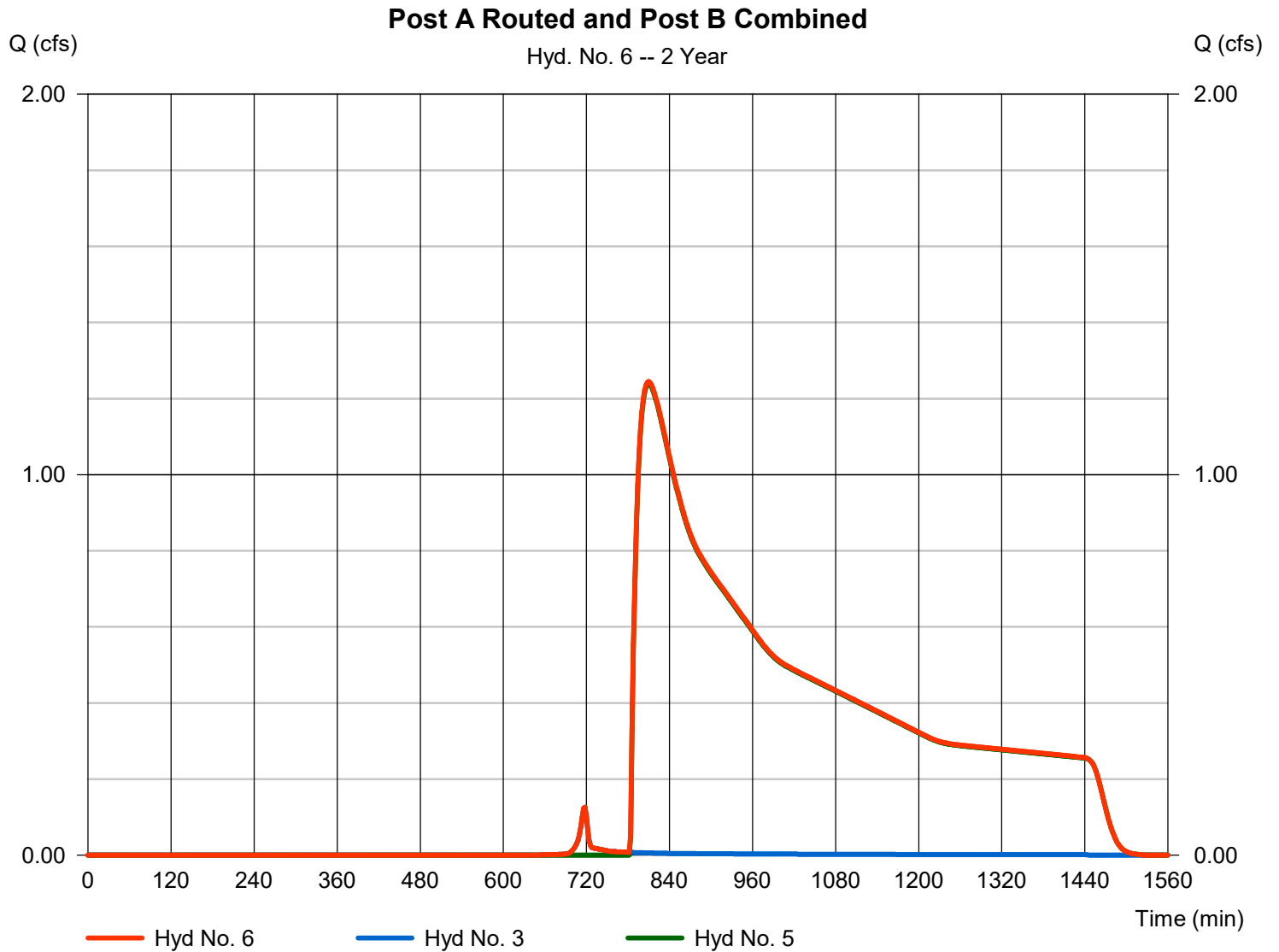
Wednesday, 09 / 20 / 2023

Hyd. No. 6

Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 2 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 1.245 cfs
Time to peak = 810 min
Hyd. volume = 20,035 cuft
Contrib. drain. area = 0.080 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	13.30	2	734	57,818	-----	-----	-----	Predeveloped	
2	SCS Runoff	18.94	2	730	76,063	-----	-----	-----	Postdeveloped A	
3	SCS Runoff	0.186	2	718	372	-----	-----	-----	Postdeveloped B	
4	Combine	18.96	2	730	76,435	2, 3	-----	-----	Post A and B Combined	
5	Reservoir	5.900	2	756	39,031	2	707.85	41,652	Post A Routed	
6	Combine	5.913	2	756	39,403	3, 5	-----	-----	Post A Routed and Post B Combined	
E231032 Hydro.gpw					Return Period: 5 Year			Wednesday, 09 / 20 / 2023		

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

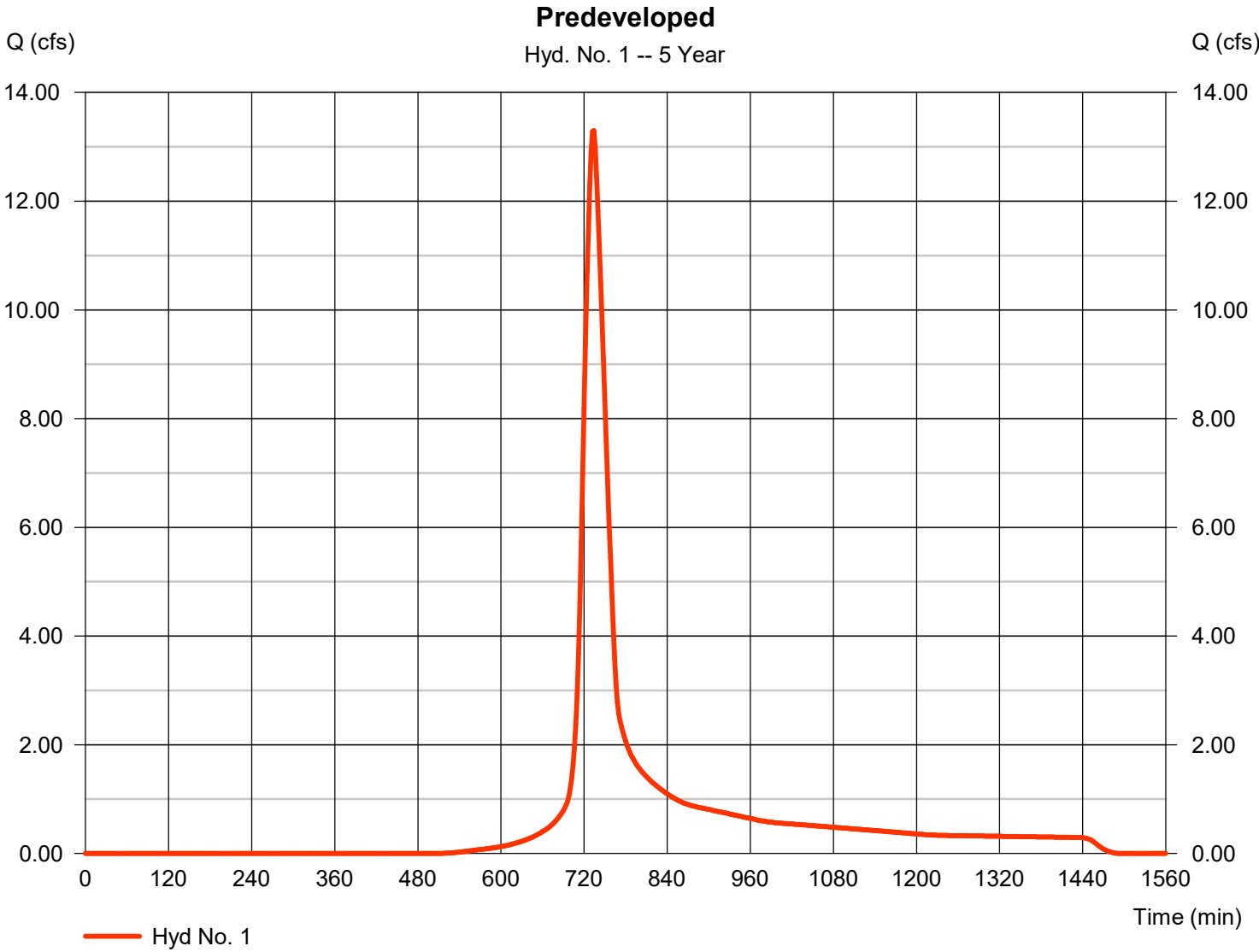
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 13.30 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 57,818 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

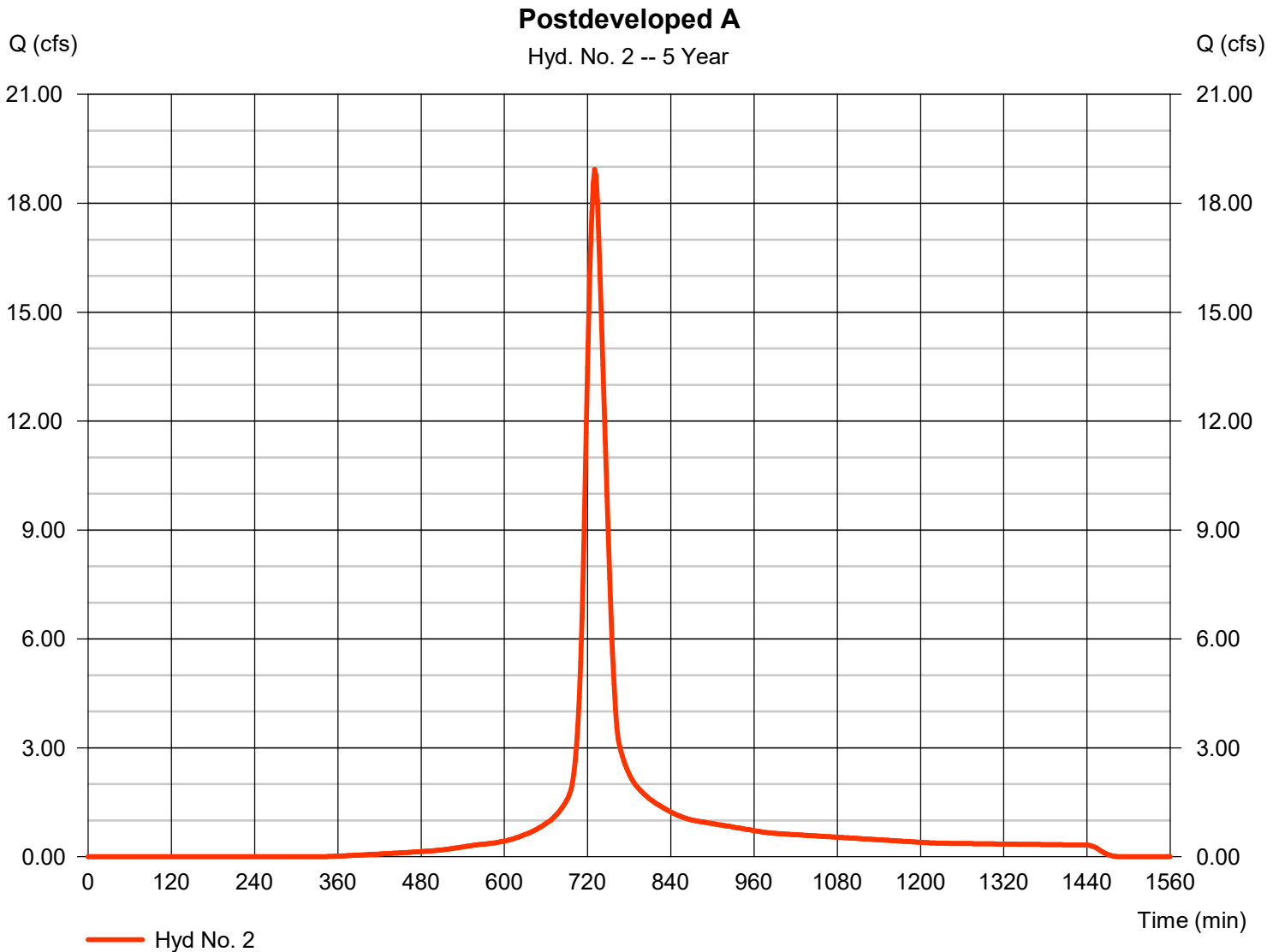
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 18.94 cfs
Storm frequency	= 5 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 76,063 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

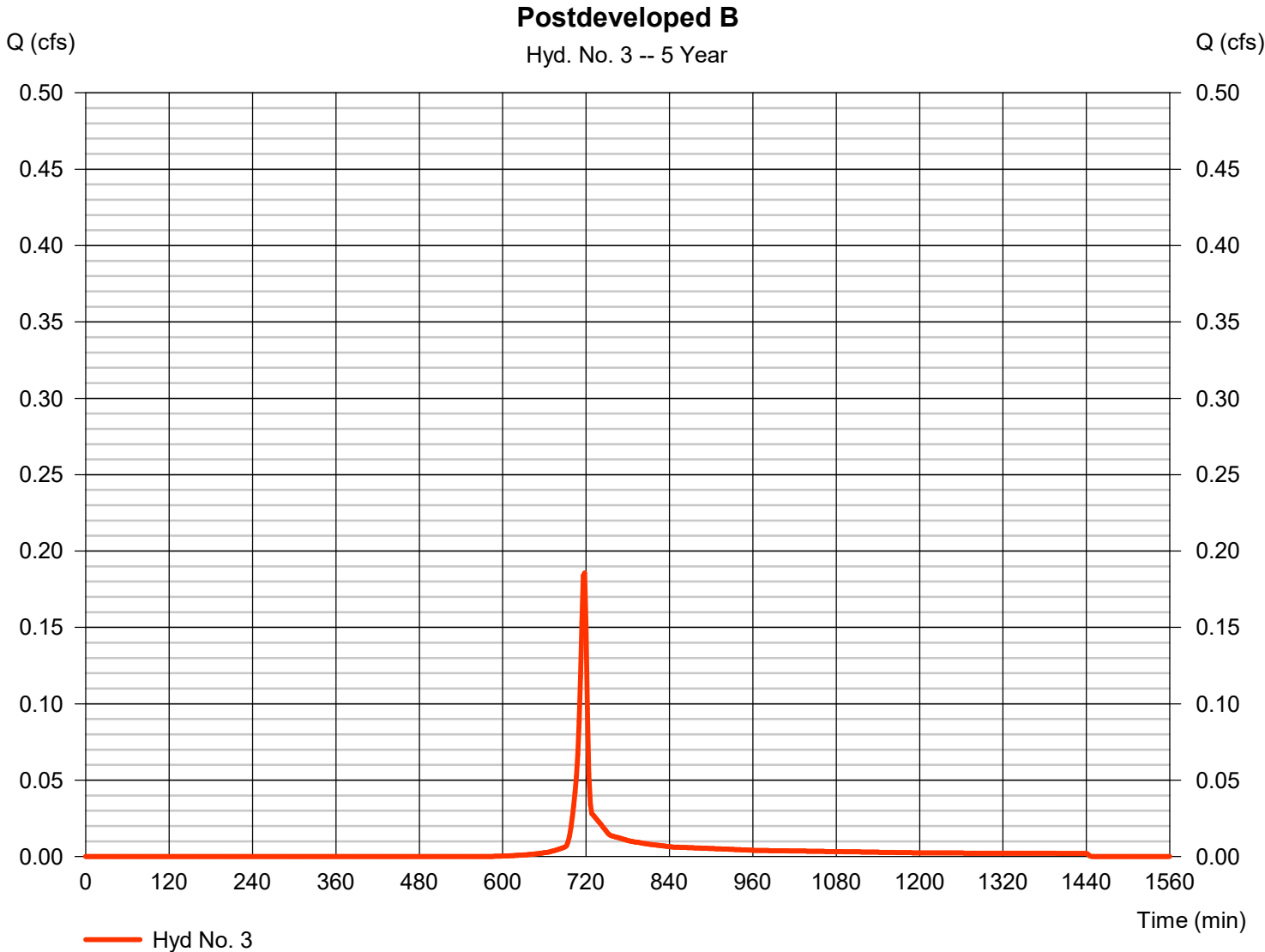
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.186 cfs
Storm frequency	= 5 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 372 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.24 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

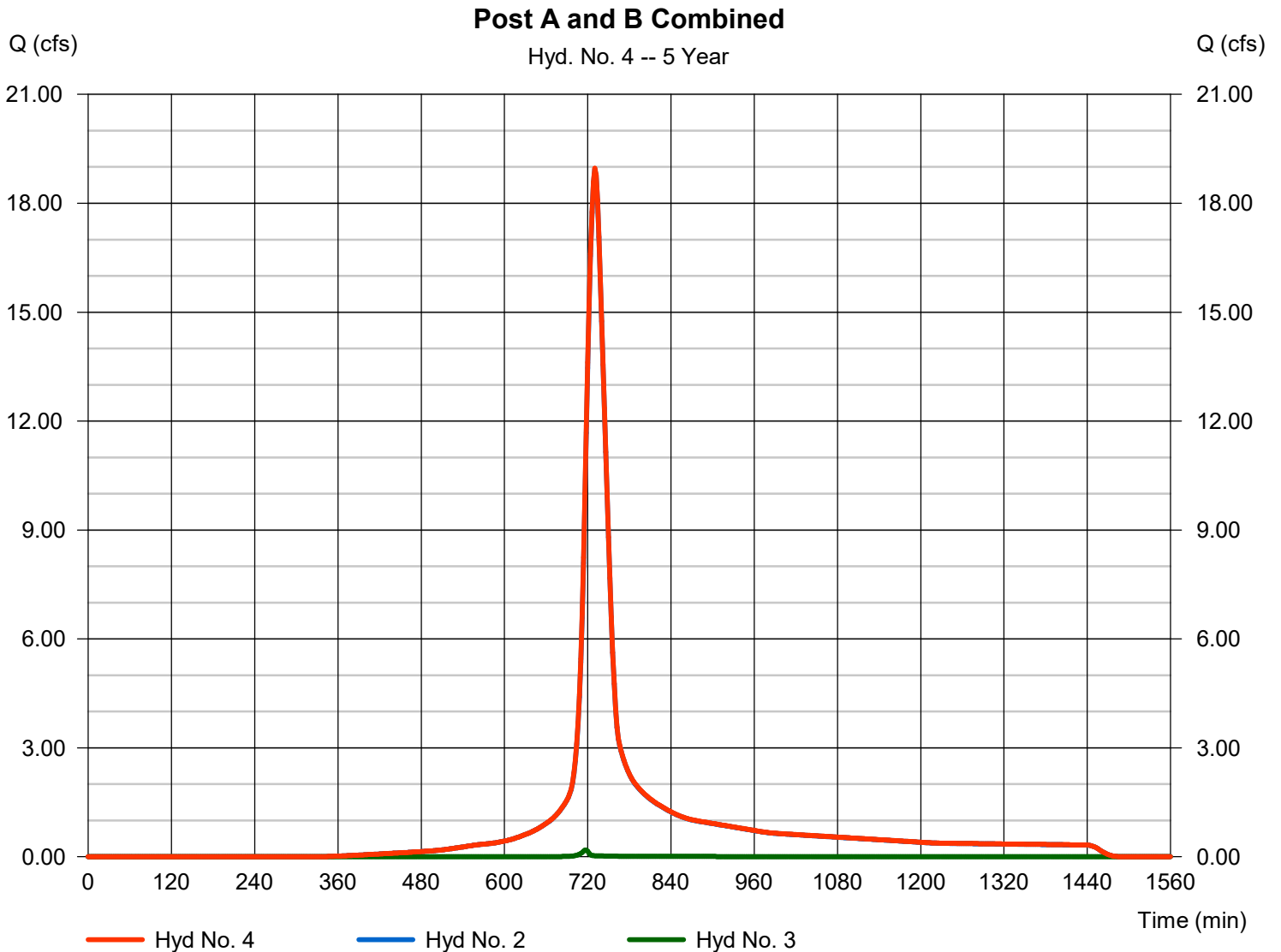
Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type = Combine
Storm frequency = 5 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 18.96 cfs
Time to peak = 730 min
Hyd. volume = 76,435 cuft
Contrib. drain. area = 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

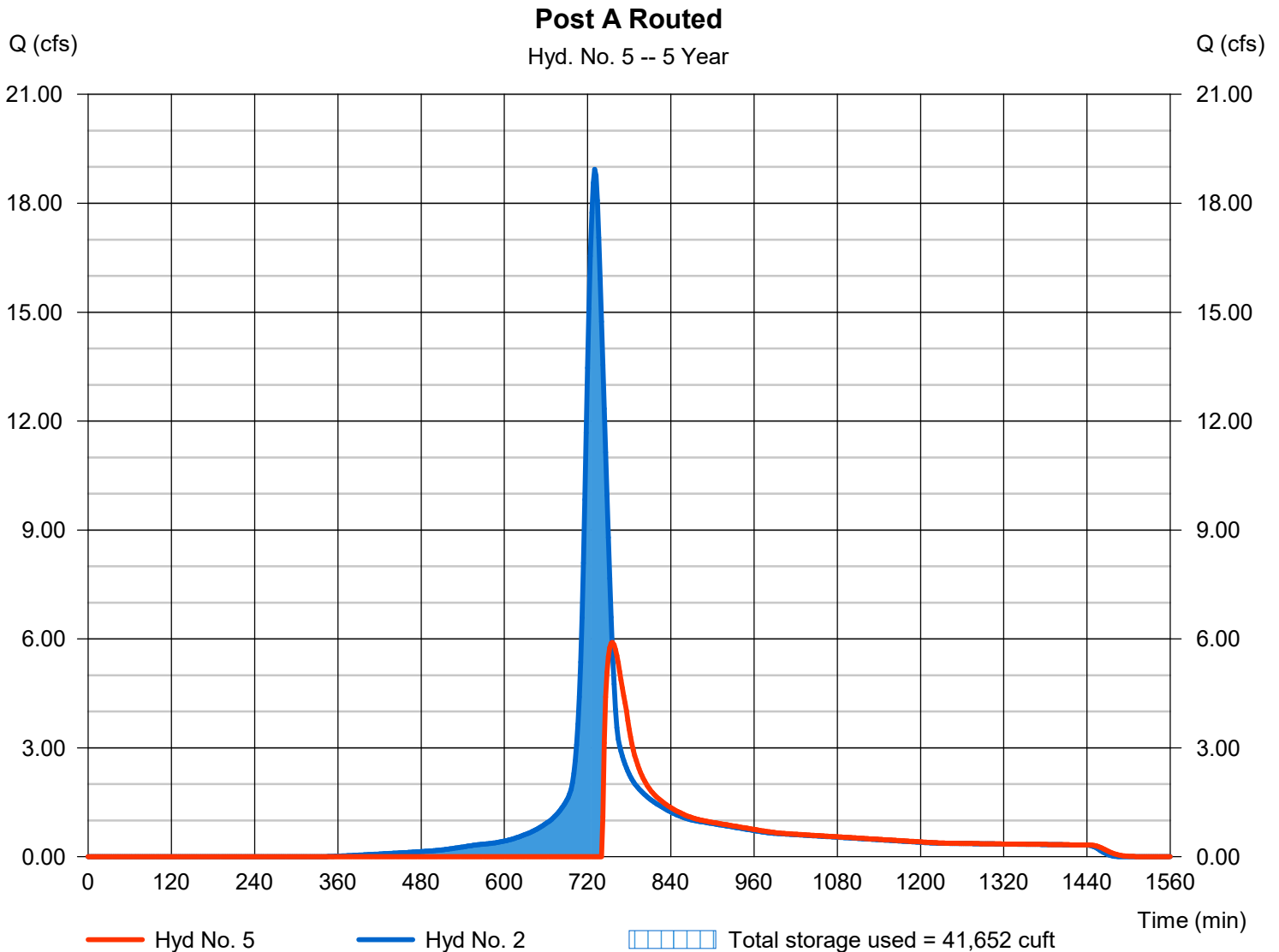
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 5.900 cfs
Storm frequency	= 5 yrs	Time to peak	= 756 min
Time interval	= 2 min	Hyd. volume	= 39,031 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 707.85 ft
Reservoir name	= Detention Basin	Max. Storage	= 41,652 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

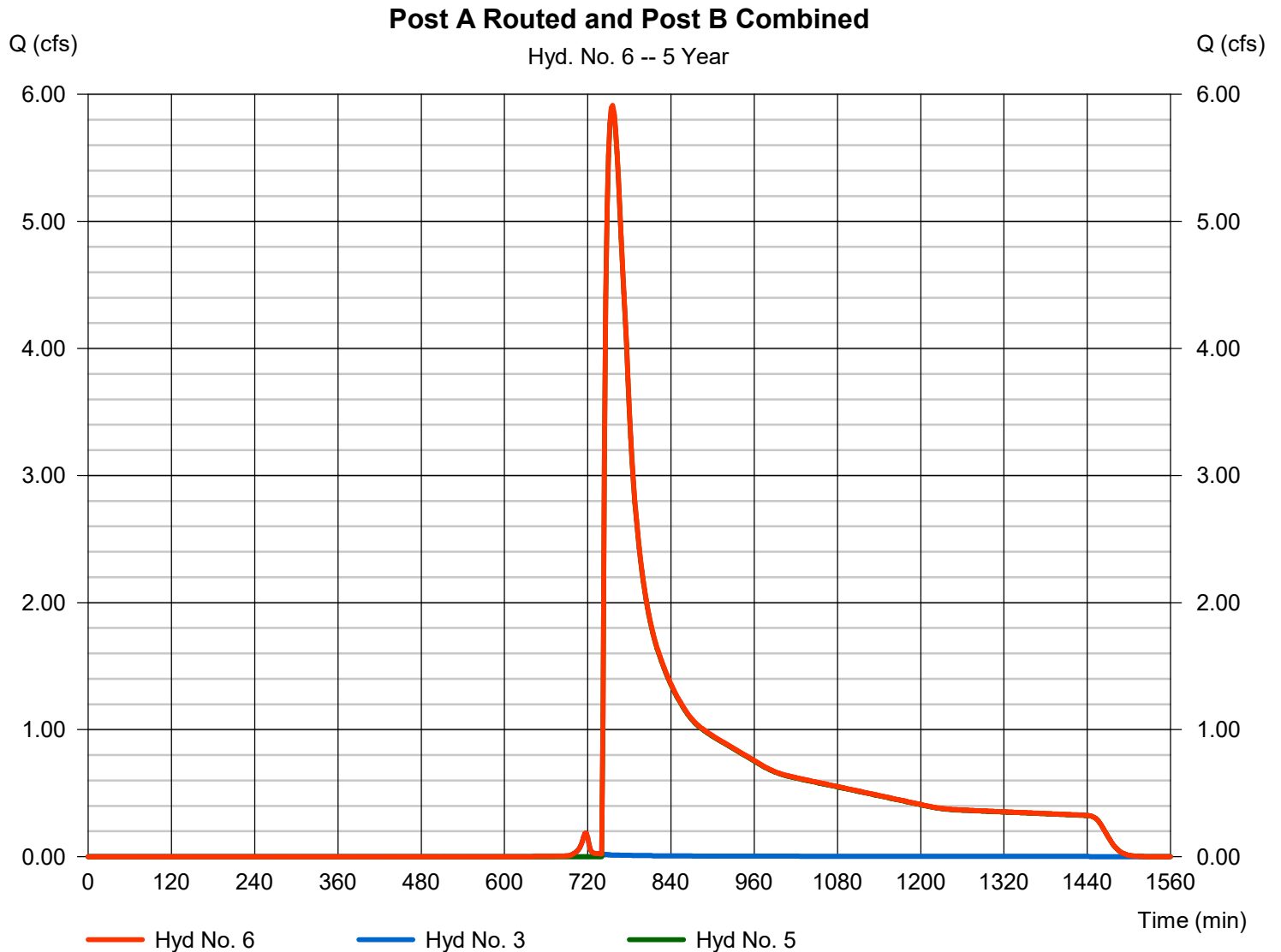
Wednesday, 09 / 20 / 2023

Hyd. No. 6

Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 5 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 5.913 cfs
Time to peak = 756 min
Hyd. volume = 39,403 cuft
Contrib. drain. area = 0.080 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	16.77	2	732	72,608	-----	-----	-----	Predeveloped
2	SCS Runoff	22.83	2	730	92,191	-----	-----	-----	Postdeveloped A
3	SCS Runoff	0.237	2	718	478	-----	-----	-----	Postdeveloped B
4	Combine	22.87	2	730	92,669	2, 3	-----	-----	Post A and B Combined
5	Reservoir	8.799	2	752	55,160	2	708.21	46,832	Post A Routed
6	Combine	8.818	2	752	55,638	3, 5	-----	-----	Post A Routed and Post B Combined
E231032 Hydro.gpw					Return Period: 10 Year			Wednesday, 09 / 20 / 2023	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

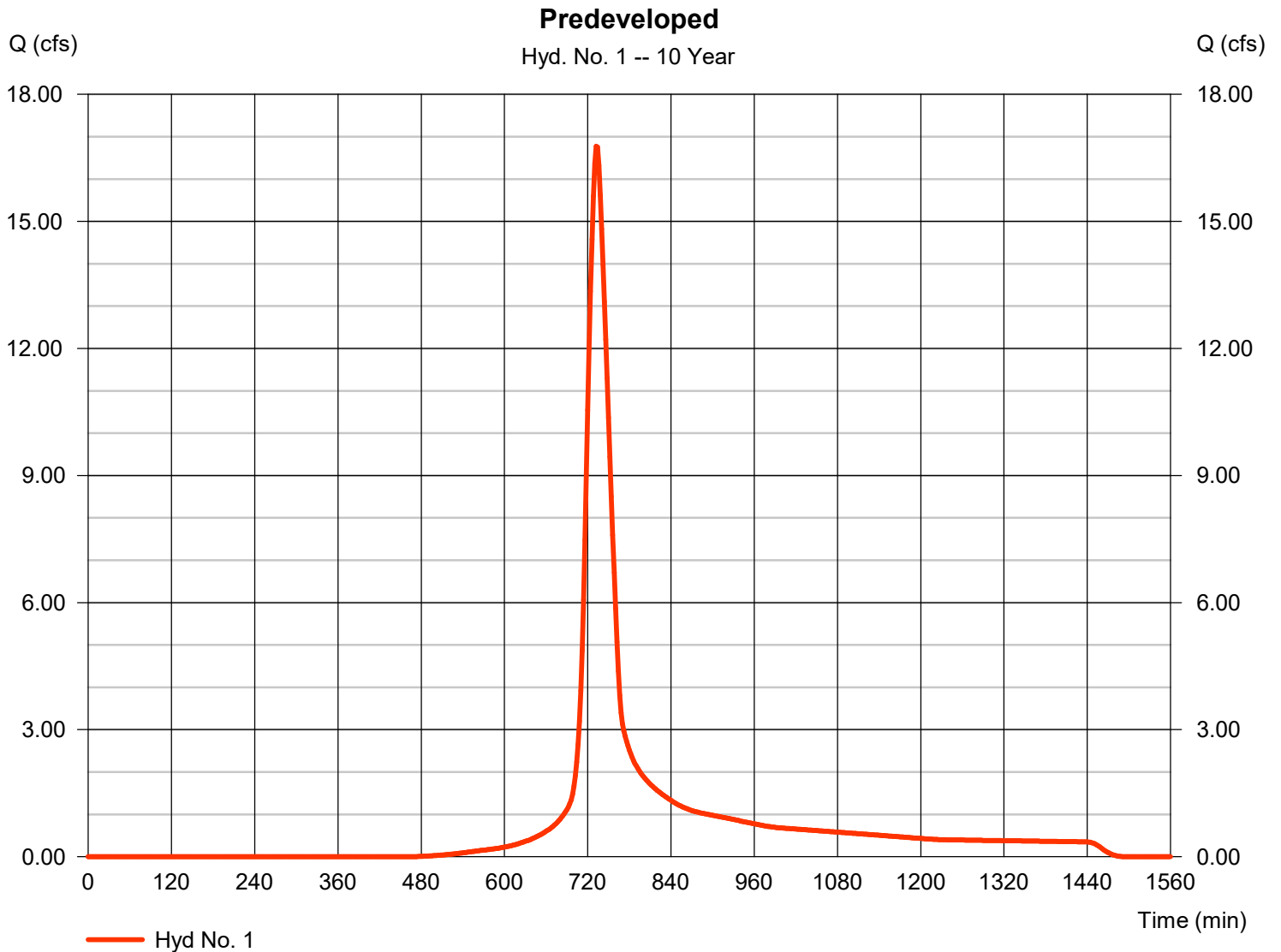
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 16.77 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 72,608 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 3.74 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

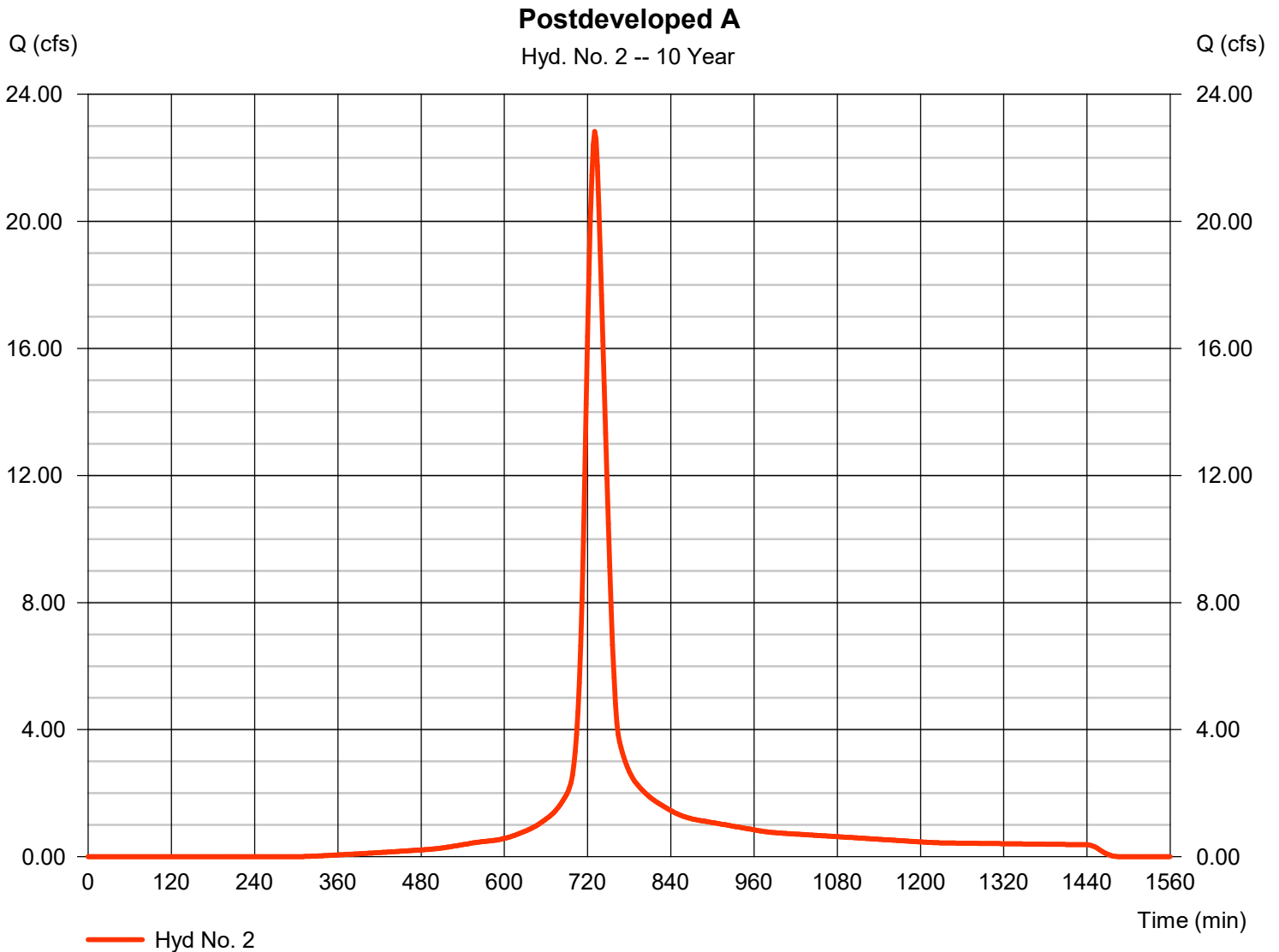
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 22.83 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 92,191 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 3.74 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

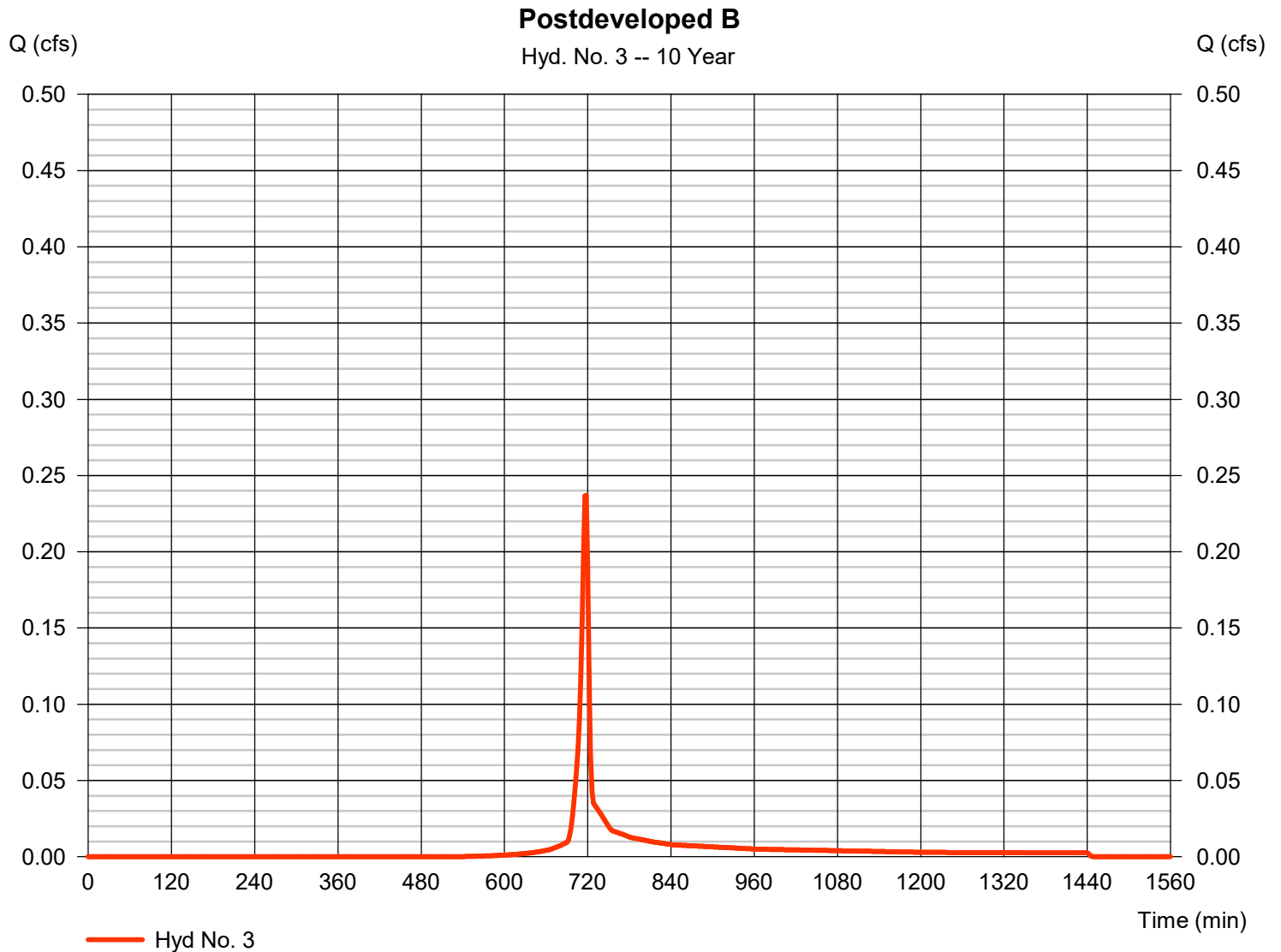
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.237 cfs
Storm frequency	= 10 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 478 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.74 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

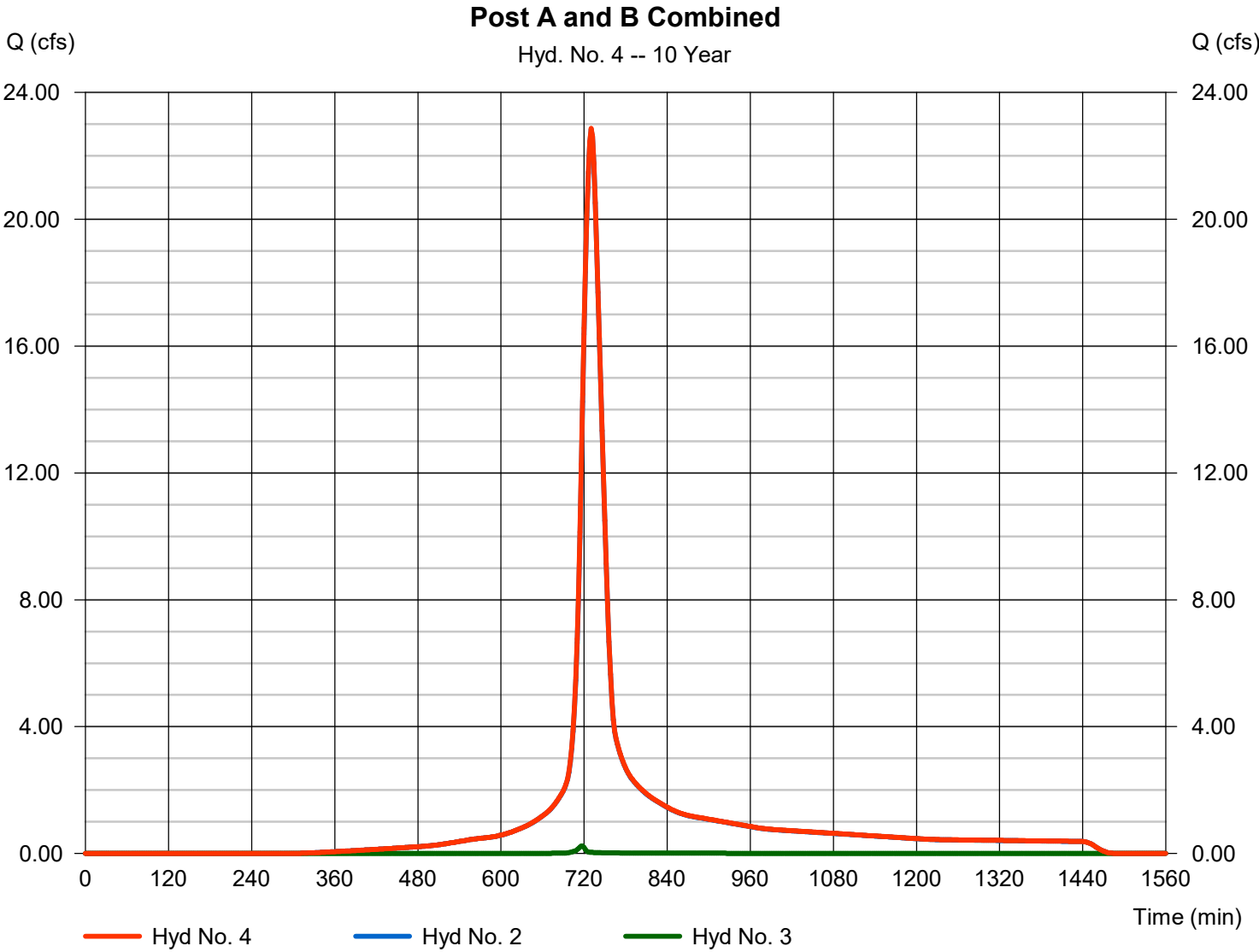
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type	= Combine	Peak discharge	= 22.87 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 92,669 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

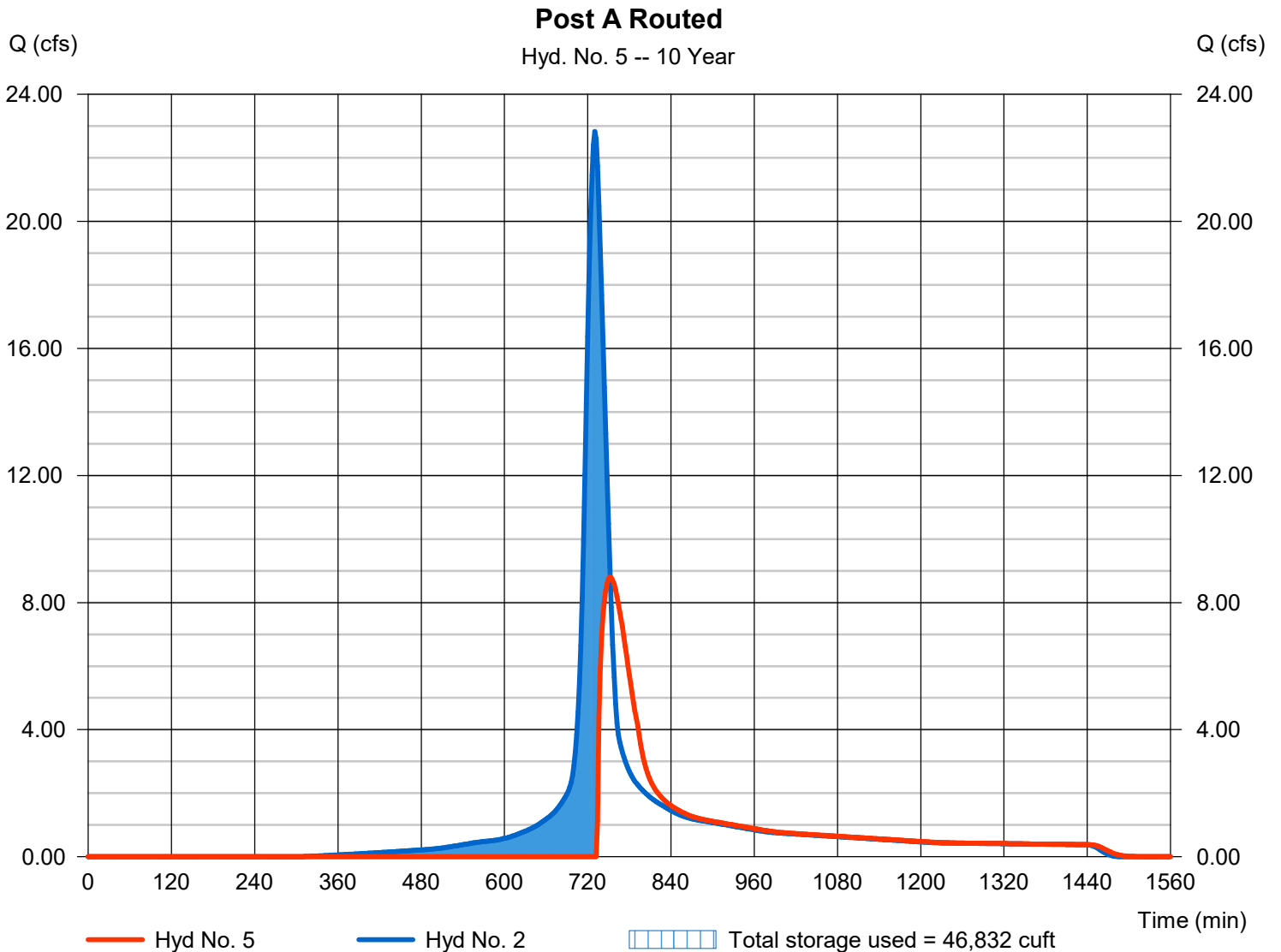
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 8.799 cfs
Storm frequency	= 10 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 55,160 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 708.21 ft
Reservoir name	= Detention Basin	Max. Storage	= 46,832 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 6

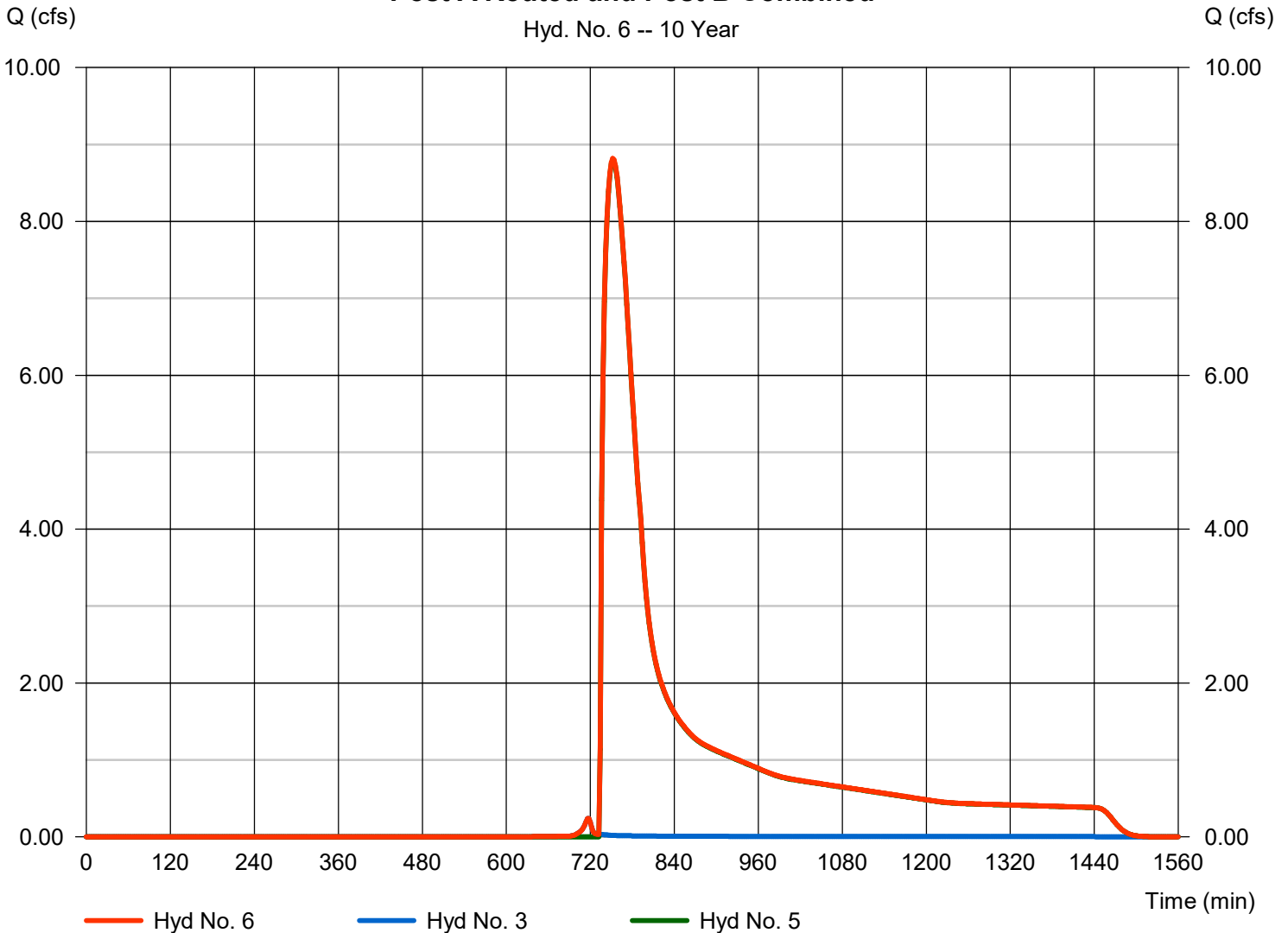
Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 10 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 8.818 cfs
Time to peak = 752 min
Hyd. volume = 55,638 cuft
Contrib. drain. area = 0.080 ac

Post A Routed and Post B Combined

Hyd. No. 6 -- 10 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	21.78	2	732	94,092	-----	-----	-----	Predeveloped
2	SCS Runoff	28.30	2	730	115,123	-----	-----	-----	Postdeveloped A
3	SCS Runoff	0.313	2	716	633	-----	-----	-----	Postdeveloped B
4	Combine	28.34	2	730	115,756	2, 3	-----	-----	Post A and B Combined
5	Reservoir	11.90	2	752	78,091	2	708.75	55,236	Post A Routed
6	Combine	11.92	2	752	78,725	3, 5	-----	-----	Post A Routed and Post B Combined
E231032 Hydro.gpw					Return Period: 25 Year			Wednesday, 09 / 20 / 2023	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

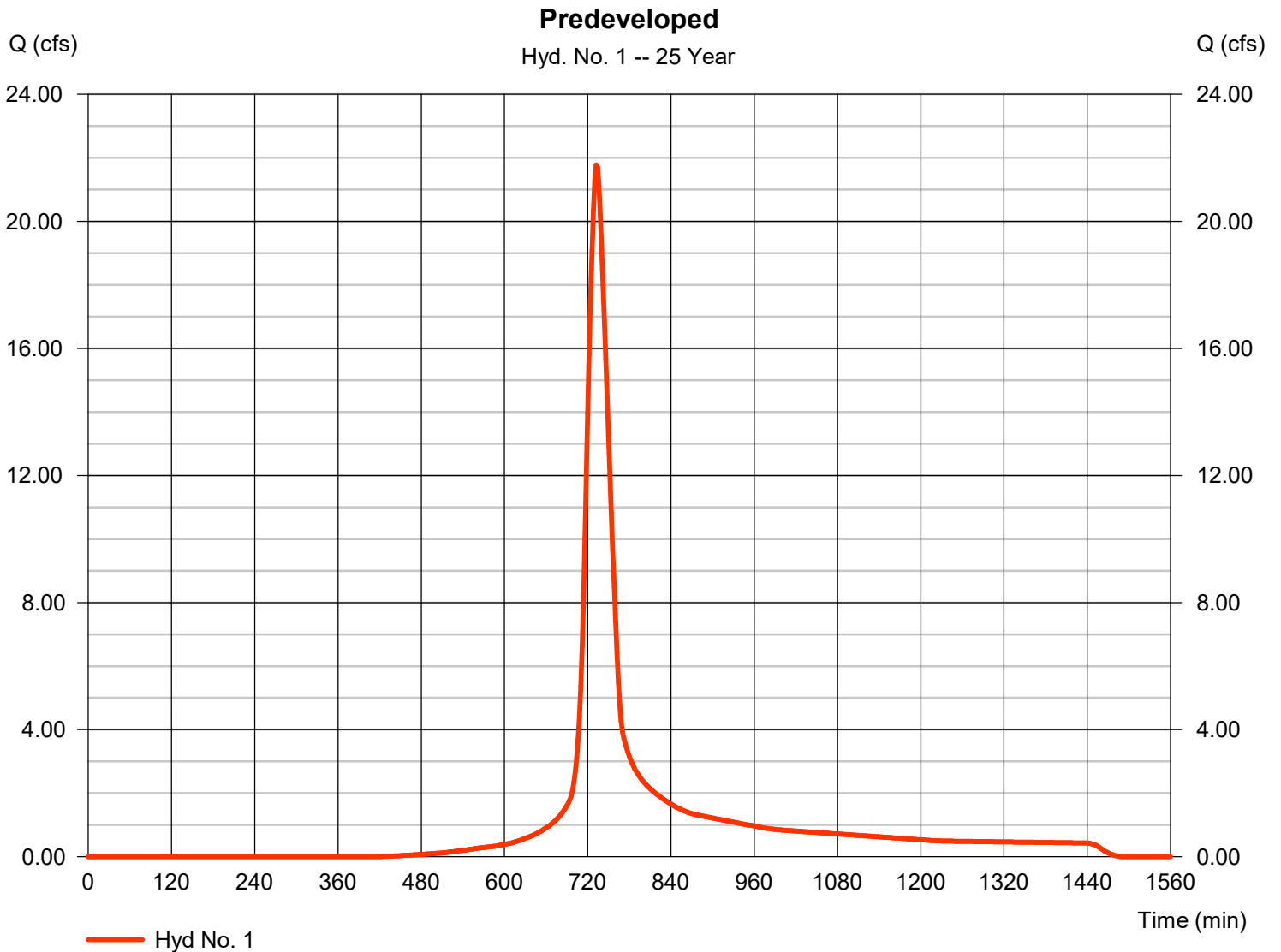
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 21.78 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 94,092 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 4.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

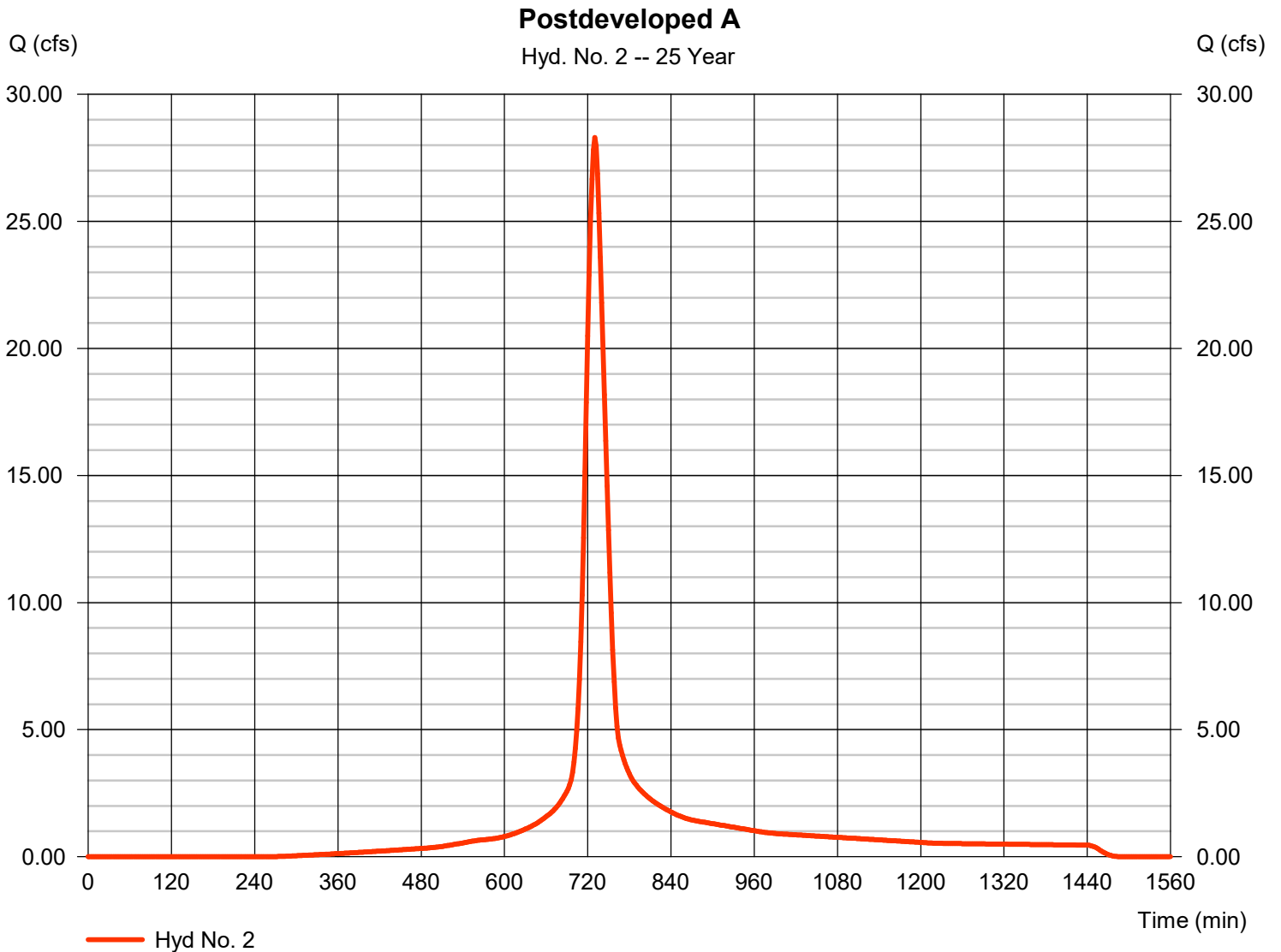
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 28.30 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 115,123 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 4.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

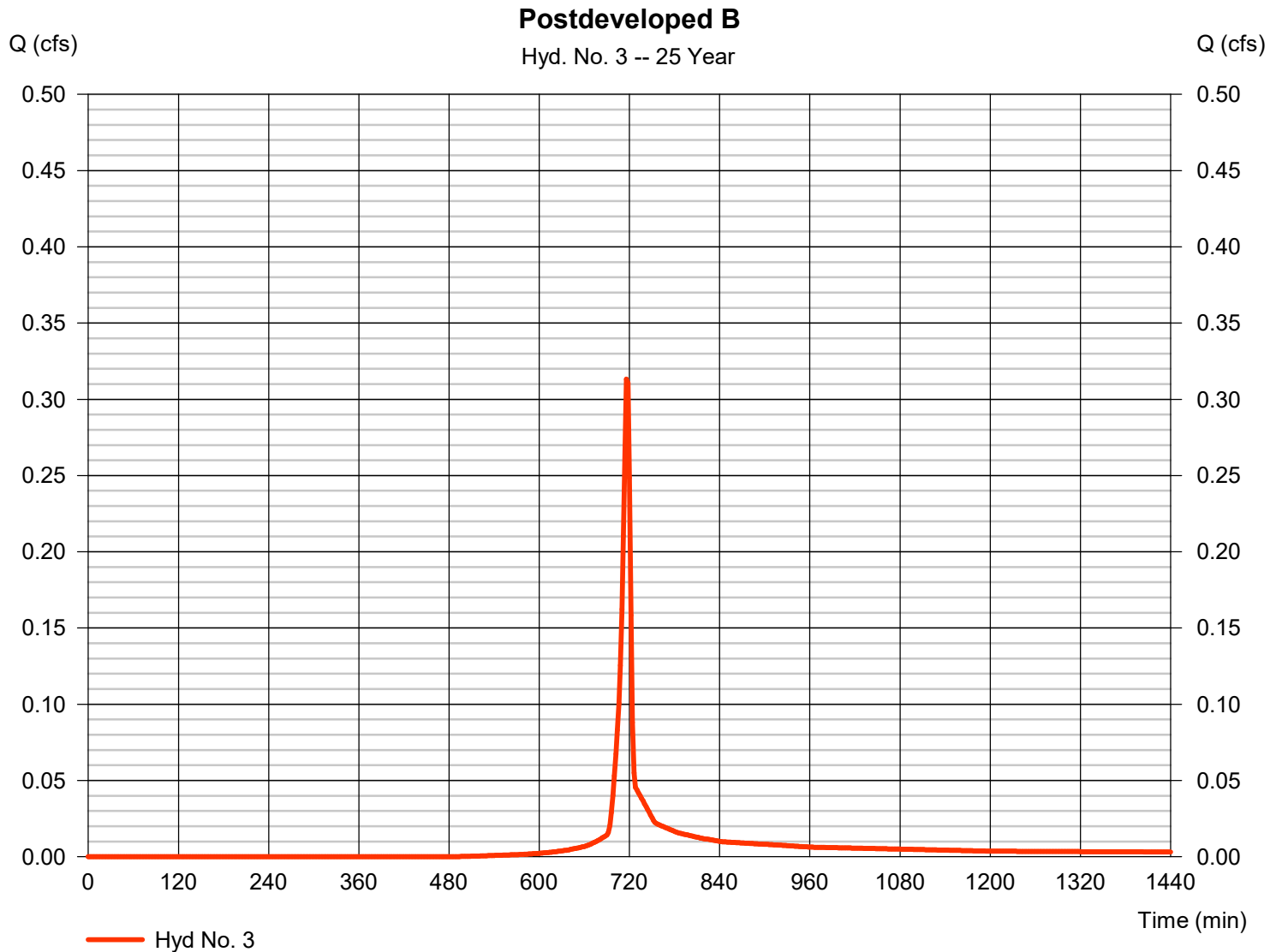
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.313 cfs
Storm frequency	= 25 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 633 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.44 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

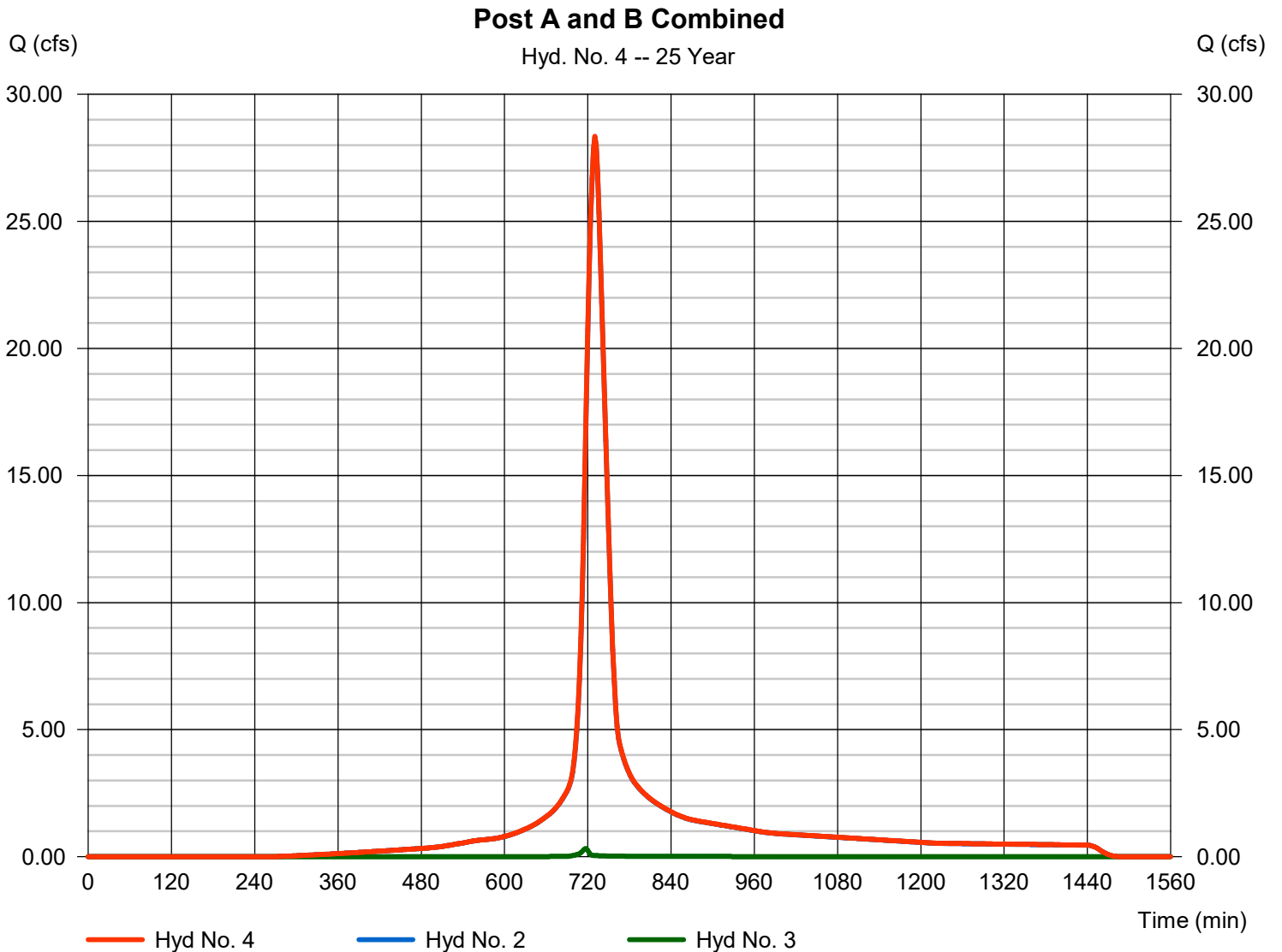
Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 2 min
Inflow hyds. = 2, 3

Peak discharge = 28.34 cfs
Time to peak = 730 min
Hyd. volume = 115,756 cuft
Contrib. drain. area = 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

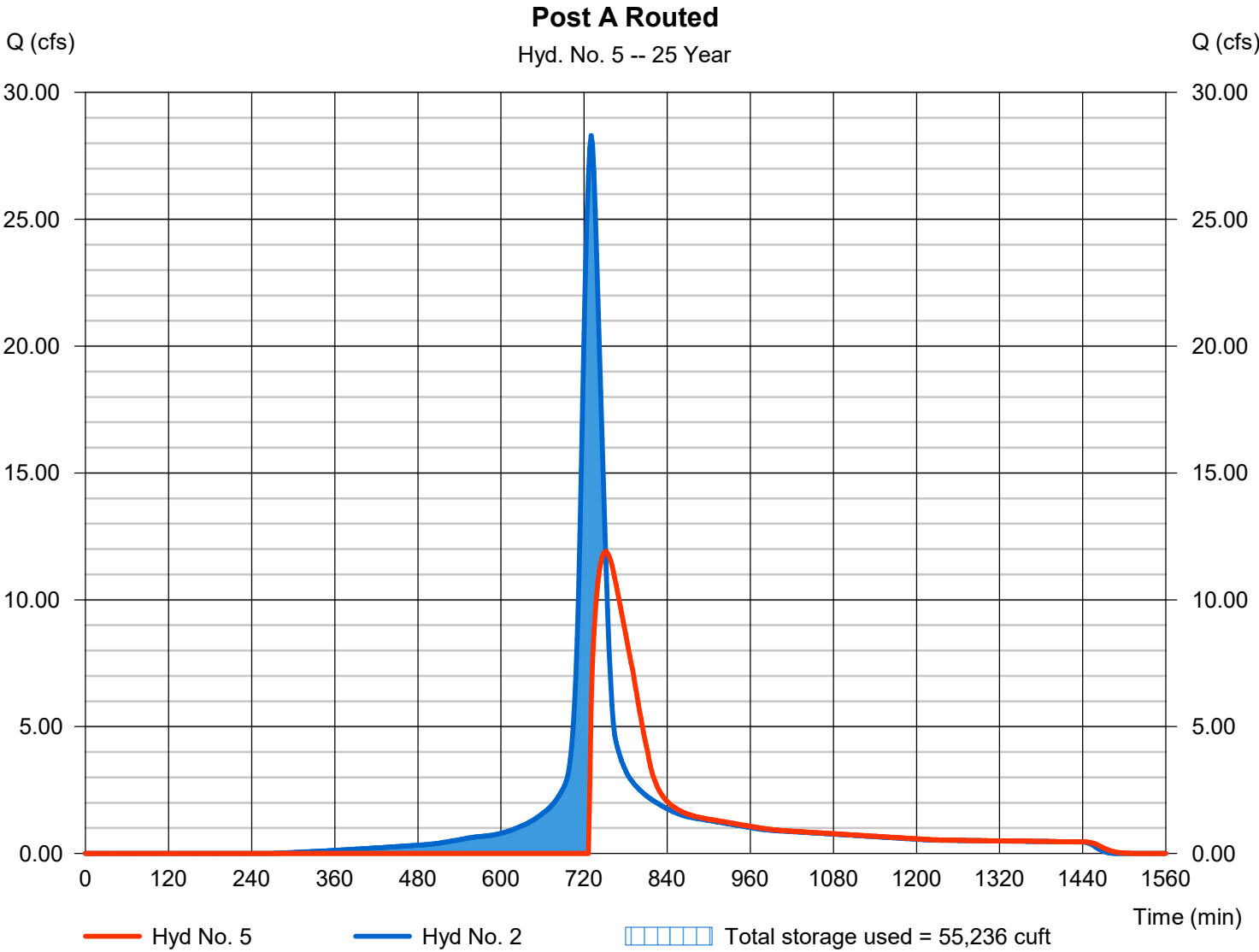
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 11.90 cfs
Storm frequency	= 25 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 78,091 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 708.75 ft
Reservoir name	= Detention Basin	Max. Storage	= 55,236 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 6

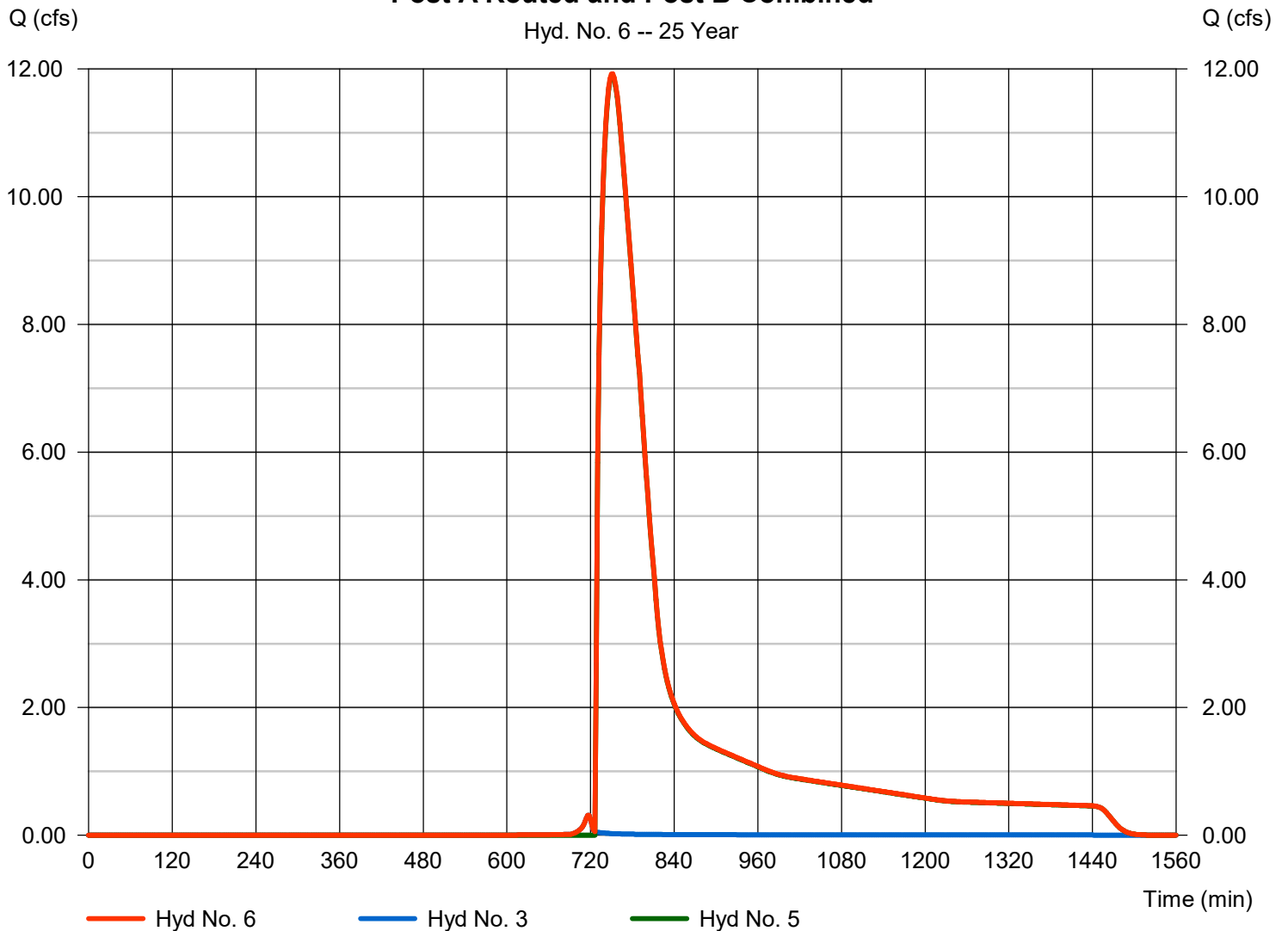
Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 25 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 11.92 cfs
Time to peak = 752 min
Hyd. volume = 78,725 cuft
Contrib. drain. area = 0.080 ac

Post A Routed and Post B Combined

Hyd. No. 6 -- 25 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	26.00	2	732	112,398	-----	-----	-----	Predeveloped	
2	SCS Runoff	32.81	2	730	134,340	-----	-----	-----	Postdeveloped A	
3	SCS Runoff	0.378	2	716	767	-----	-----	-----	Postdeveloped B	
4	Combine	32.87	2	730	135,107	2, 3	-----	-----	Post A and B Combined	
5	Reservoir	13.97	2	750	97,308	2	709.20	62,784	Post A Routed	
6	Combine	14.00	2	750	98,076	3, 5	-----	-----	Post A Routed and Post B Combined	
E231032 Hydro.gpw					Return Period: 50 Year			Wednesday, 09 / 20 / 2023		

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

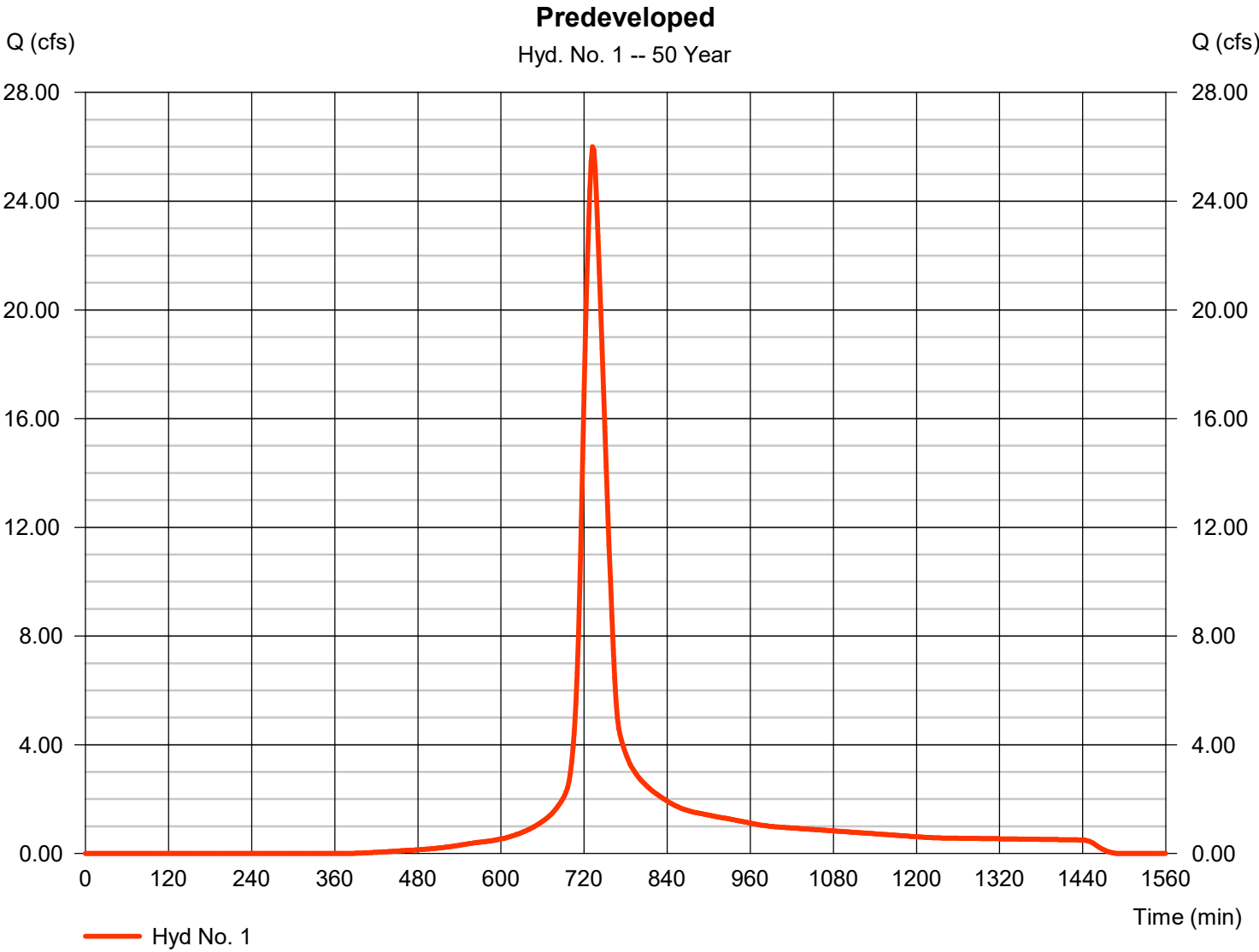
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 26.00 cfs
Storm frequency	= 50 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 112,398 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

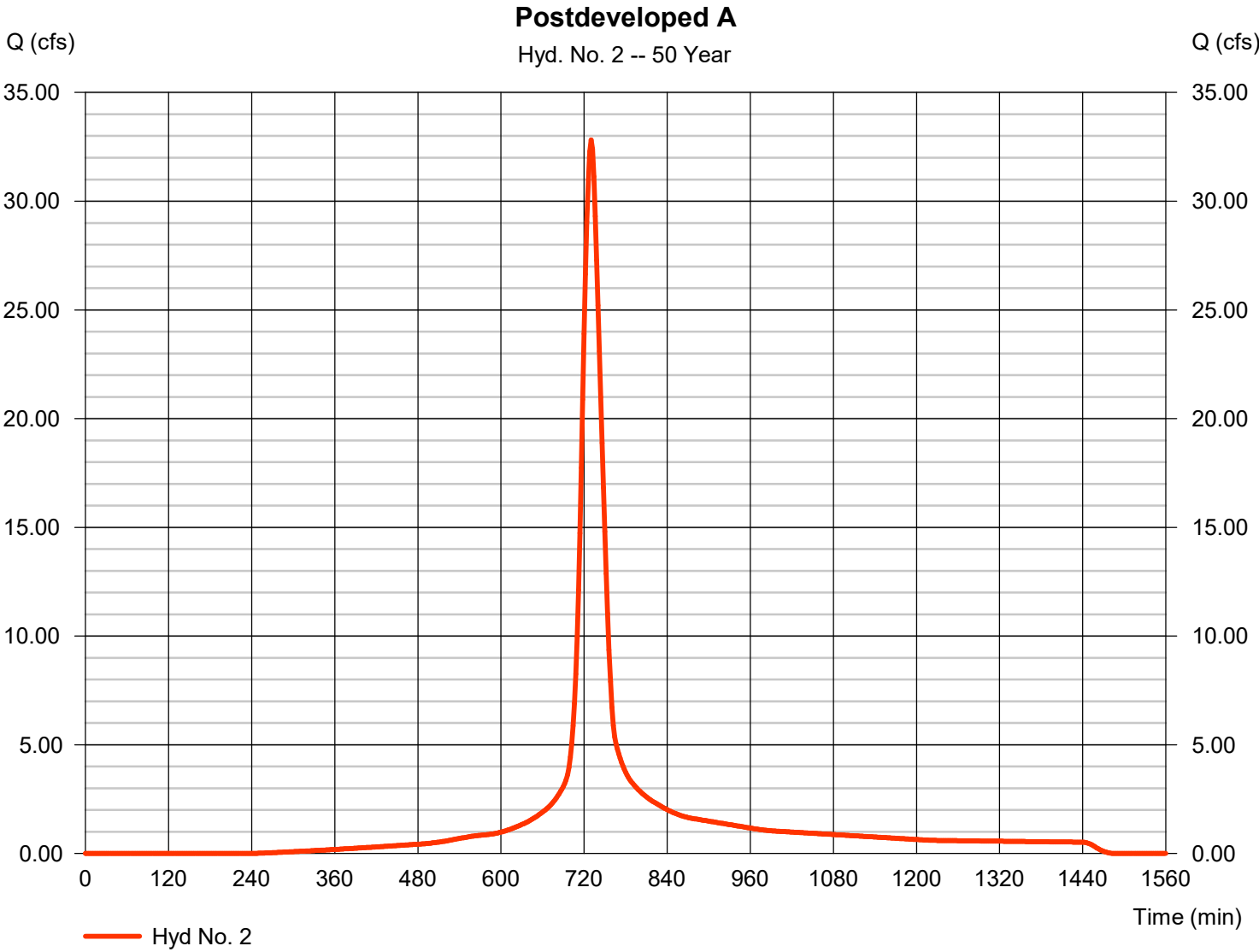
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 32.81 cfs
Storm frequency	= 50 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 134,340 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

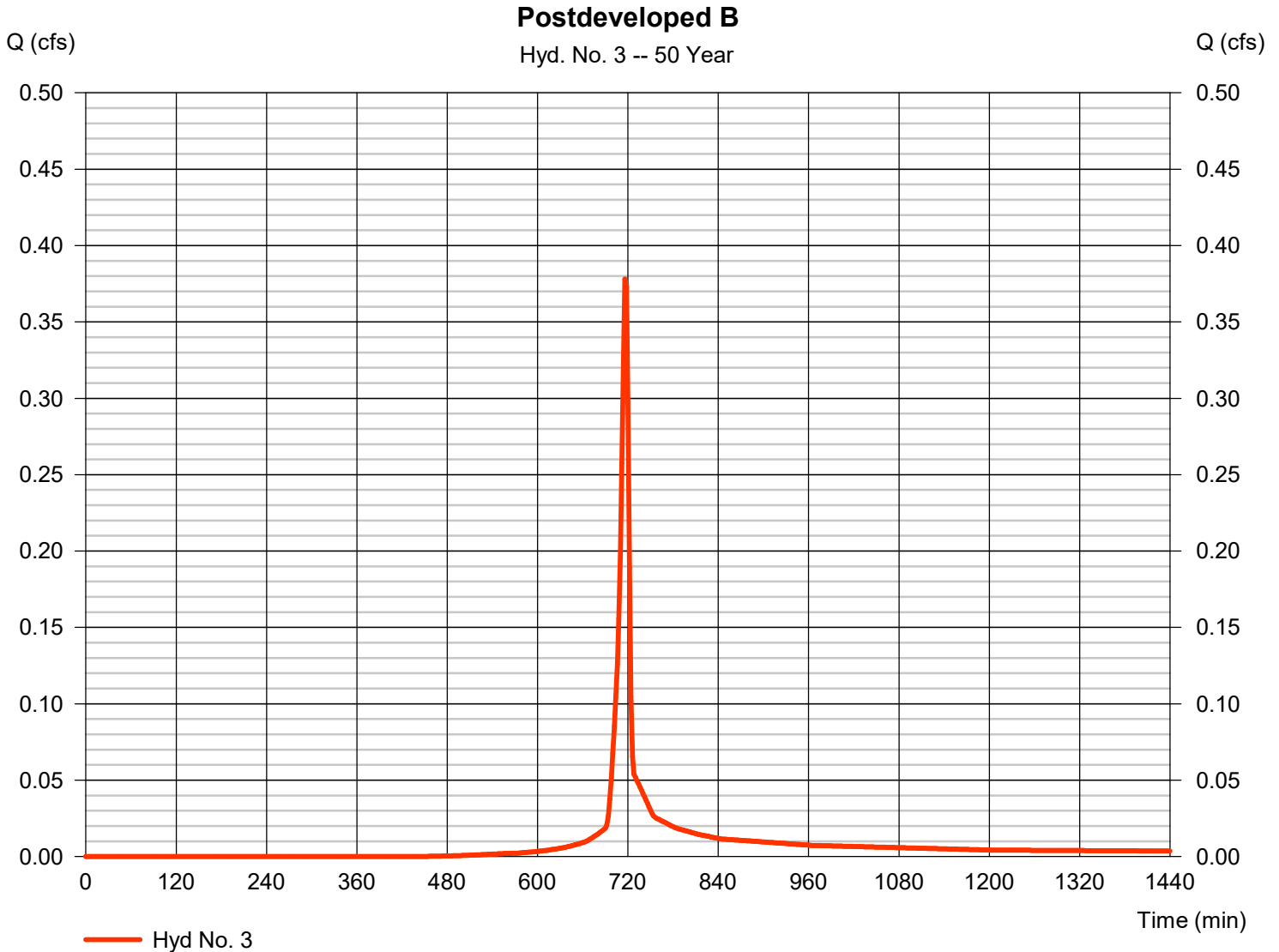
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.378 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 767 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.02 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

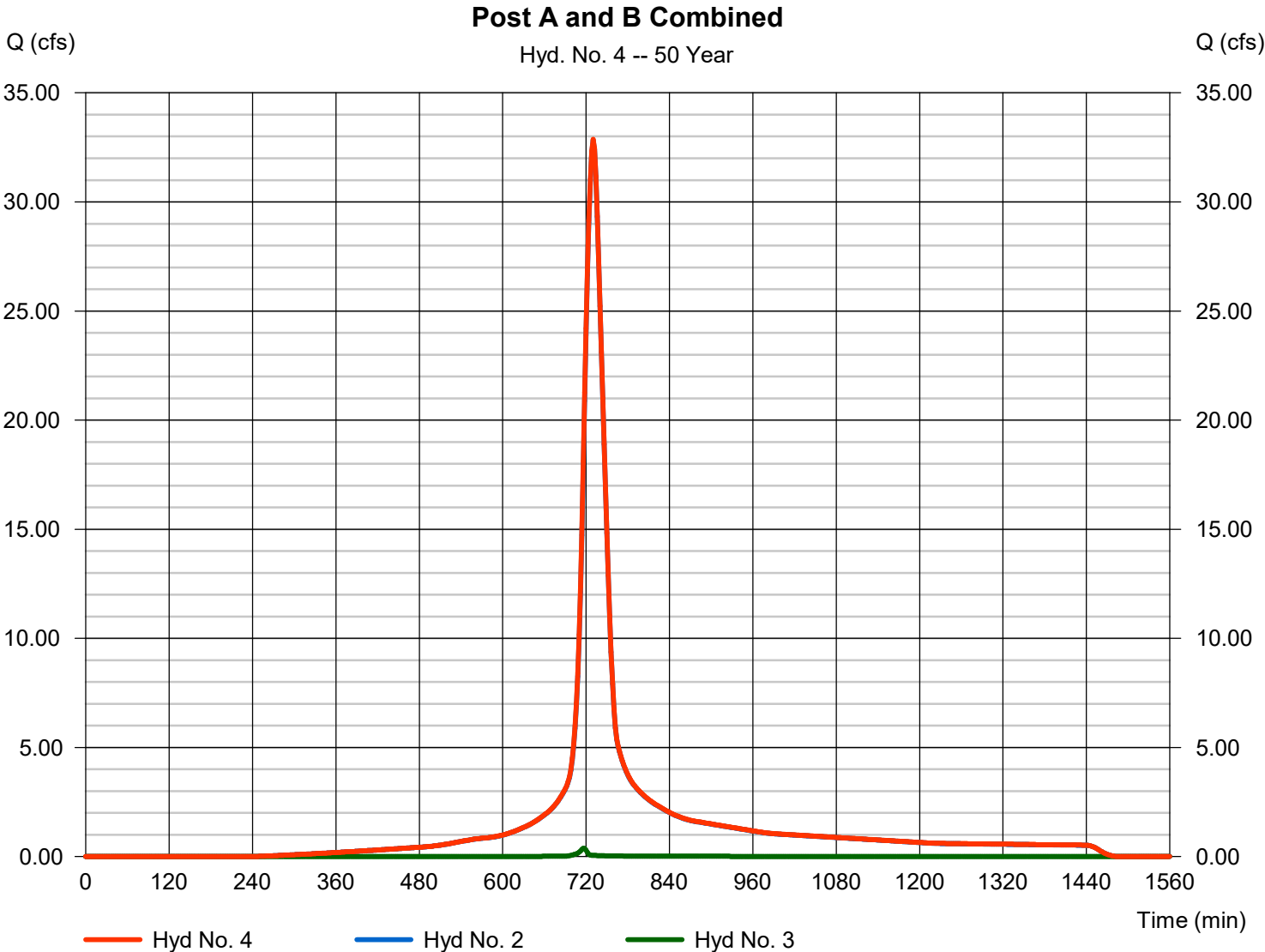
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type	= Combine	Peak discharge	= 32.87 cfs
Storm frequency	= 50 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 135,107 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

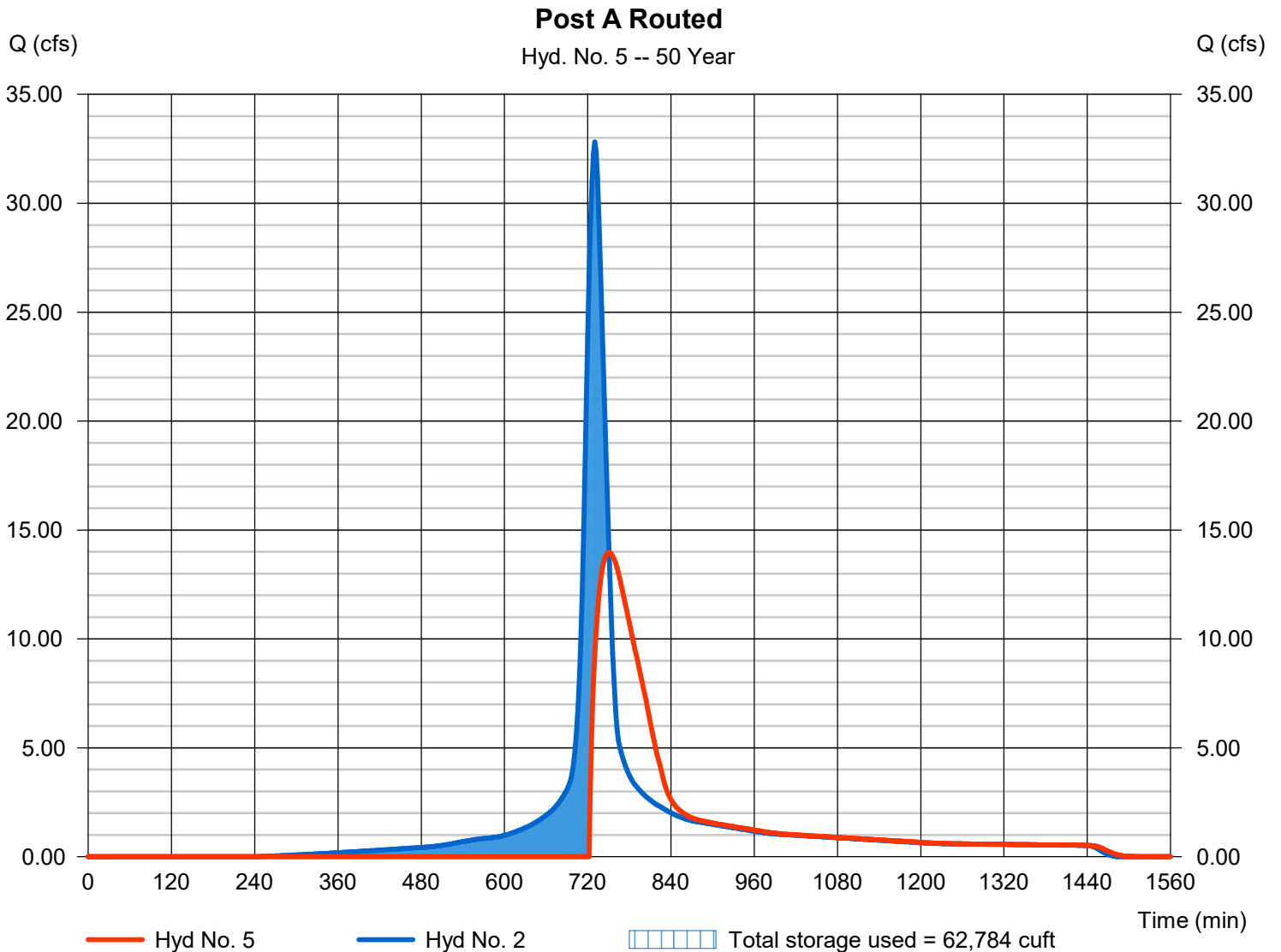
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 13.97 cfs
Storm frequency	= 50 yrs	Time to peak	= 750 min
Time interval	= 2 min	Hyd. volume	= 97,308 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 709.20 ft
Reservoir name	= Detention Basin	Max. Storage	= 62,784 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 6

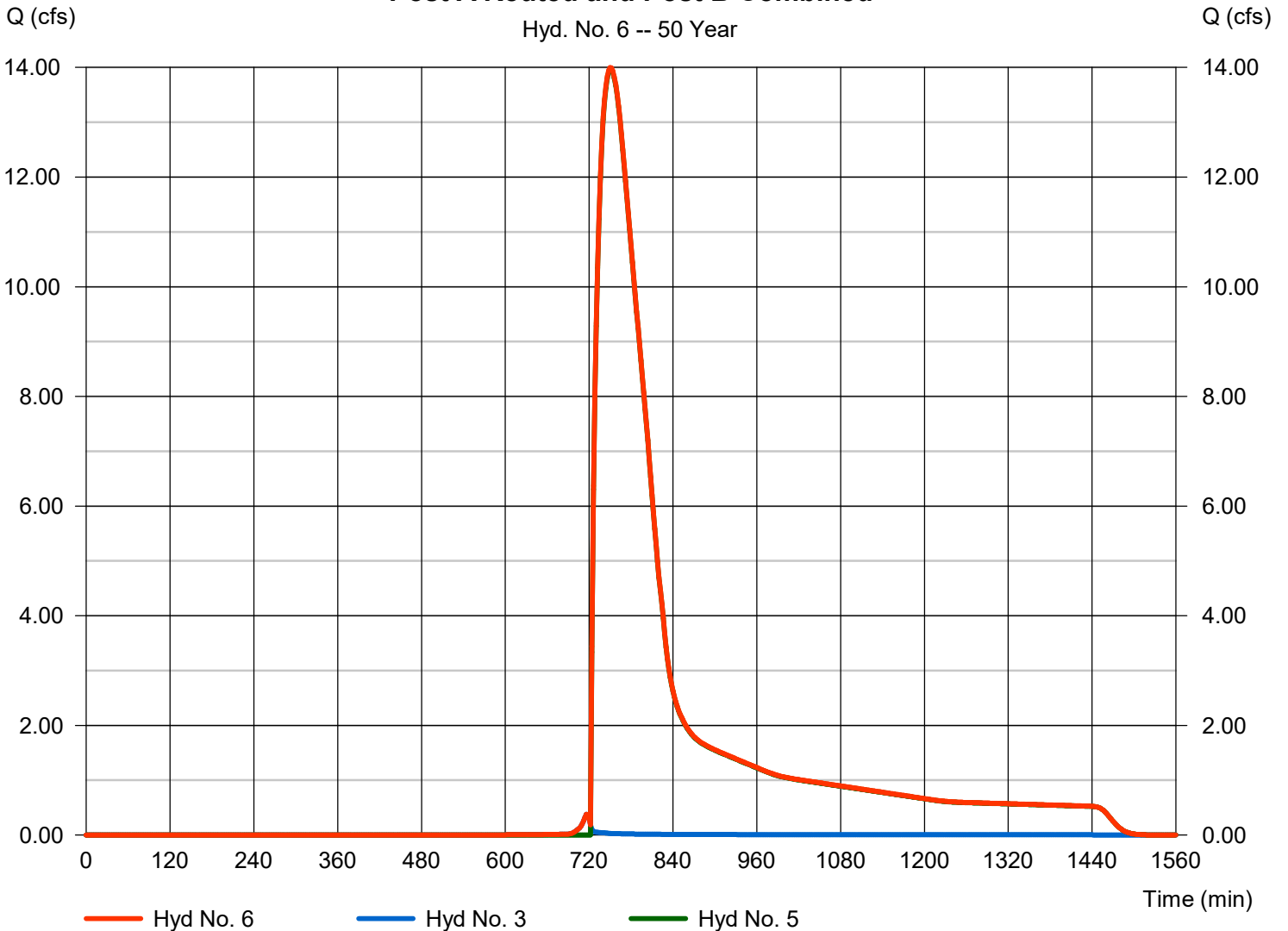
Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 50 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 14.00 cfs
Time to peak = 750 min
Hyd. volume = 98,076 cuft
Contrib. drain. area = 0.080 ac

Post A Routed and Post B Combined

Hyd. No. 6 -- 50 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

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	30.47	2	732	132,014	-----	-----	-----	Predeveloped
2	SCS Runoff	37.55	2	730	154,702	-----	-----	-----	Postdeveloped A
3	SCS Runoff	0.447	2	716	912	-----	-----	-----	Postdeveloped B
4	Combine	37.61	2	730	155,614	2, 3	-----	-----	Post A and B Combined
5	Reservoir	16.58	2	750	117,670	2	709.65	70,938	Post A Routed
6	Combine	16.62	2	750	118,582	3, 5	-----	-----	Post A Routed and Post B Combined
E231032 Hydro.gpw					Return Period: 100 Year			Wednesday, 09 / 20 / 2023	

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

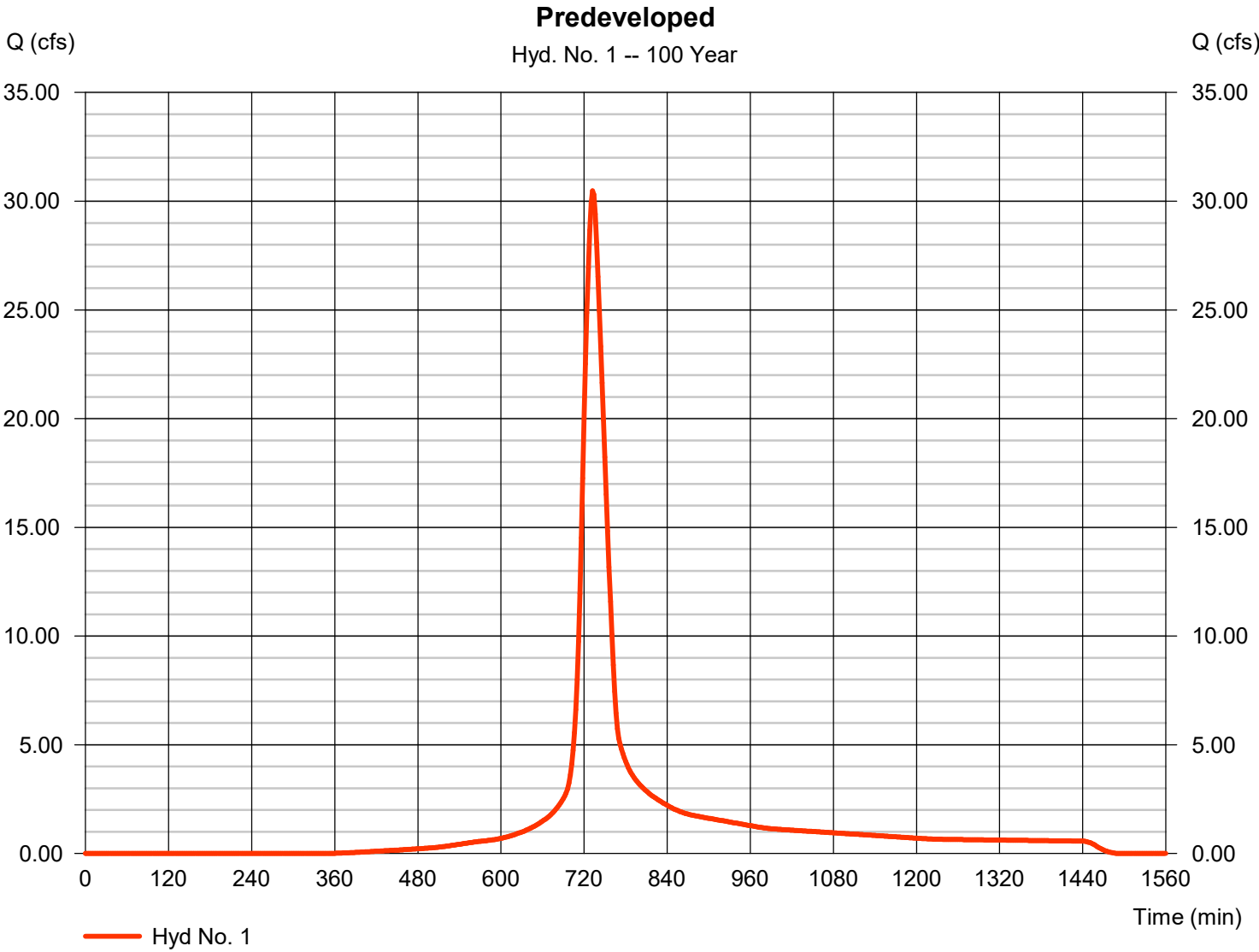
Wednesday, 09 / 20 / 2023

Hyd. No. 1

Predeveloped

Hydrograph type	= SCS Runoff	Peak discharge	= 30.47 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 132,014 cuft
Drainage area	= 9.580 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 32.20 min
Total precip.	= 5.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.130 x 98) + (7.450 x 79)] / 9.580



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

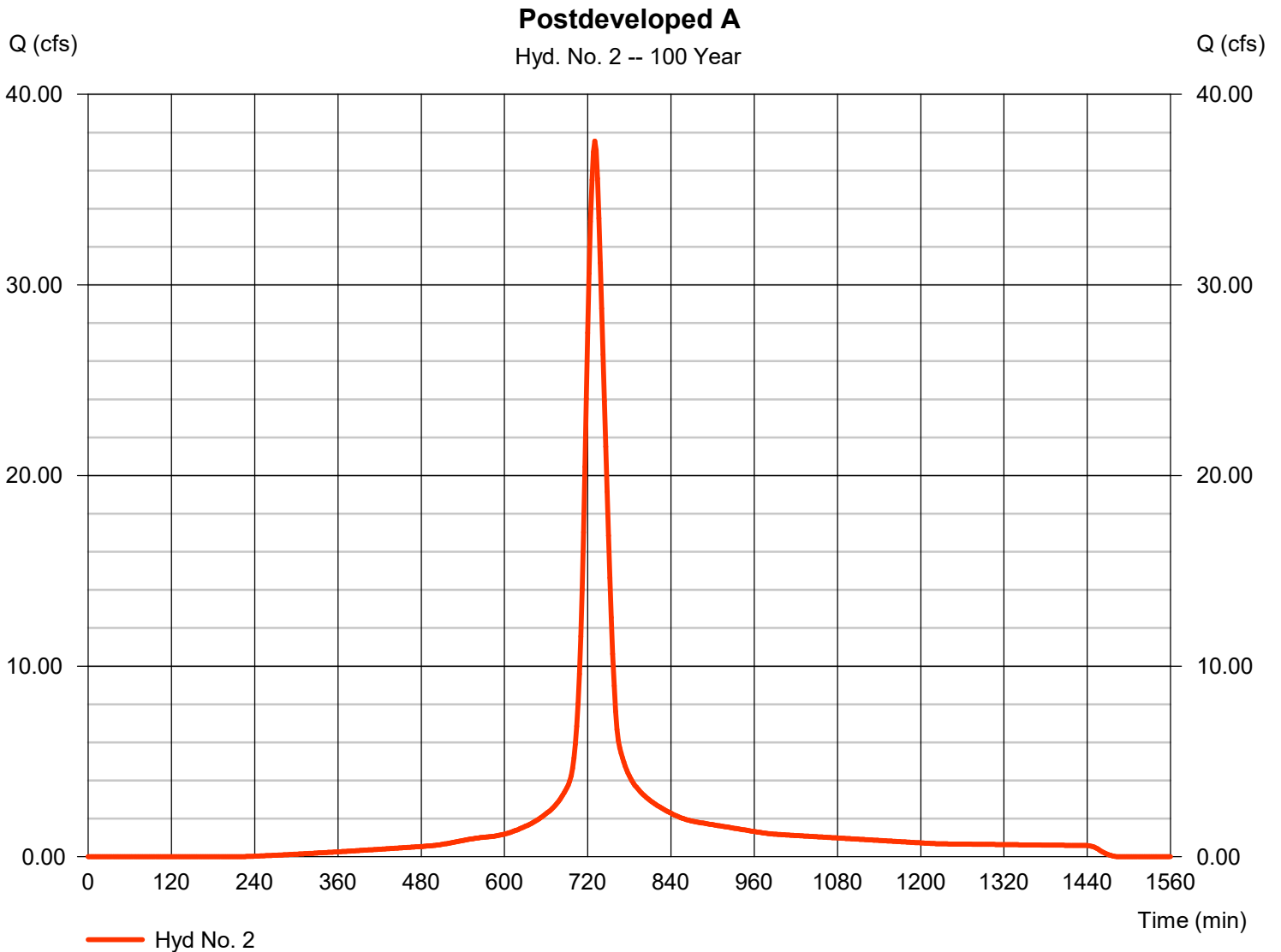
Wednesday, 09 / 20 / 2023

Hyd. No. 2

Postdeveloped A

Hydrograph type	= SCS Runoff	Peak discharge	= 37.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 2 min	Hyd. volume	= 154,702 cuft
Drainage area	= 9.500 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 27.60 min
Total precip.	= 5.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.390 x 98) + (4.110 x 79)] / 9.500



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

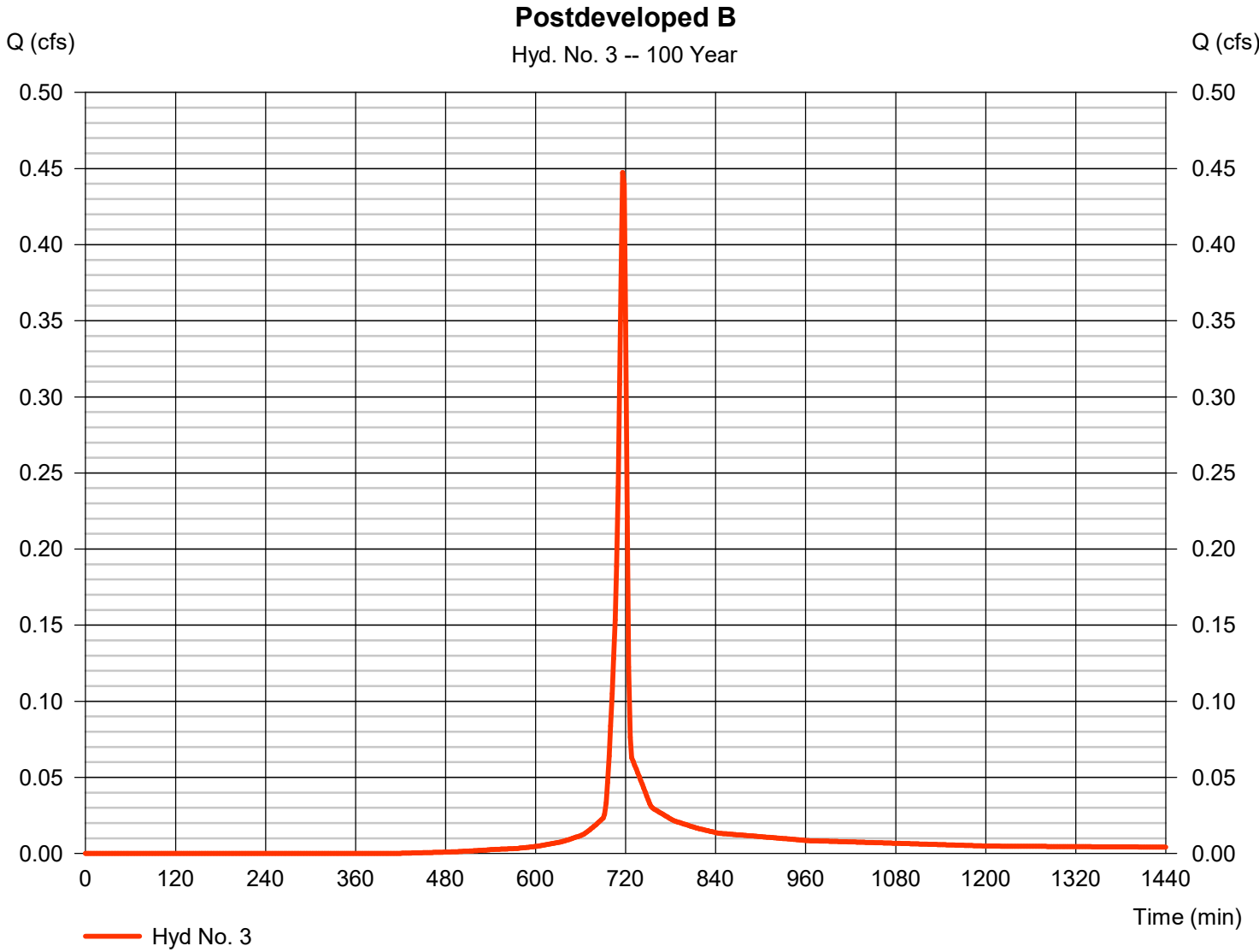
Wednesday, 09 / 20 / 2023

Hyd. No. 3

Postdeveloped B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.447 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 912 cuft
Drainage area	= 0.080 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.080 x 79) / 0.080



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

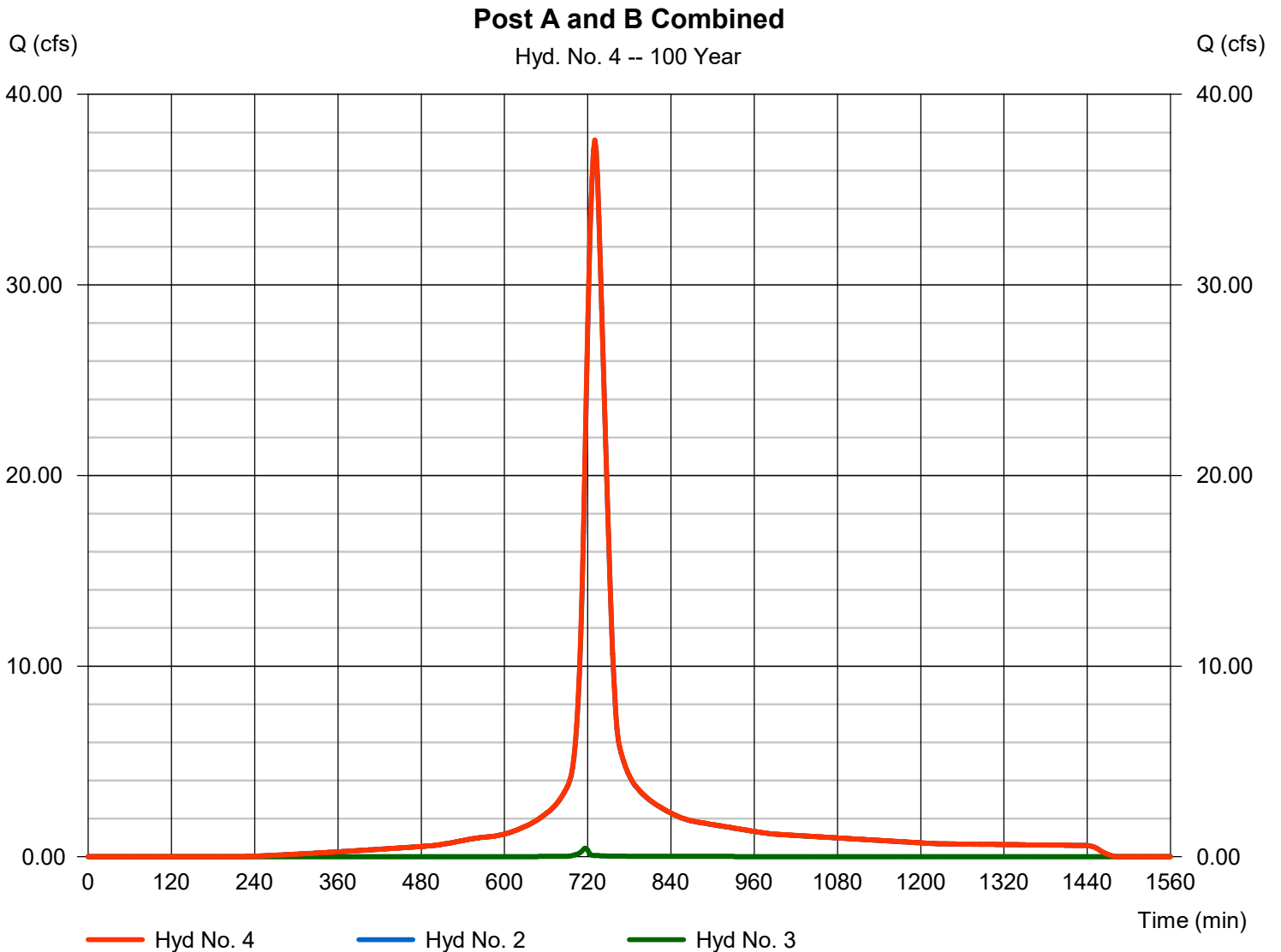
Wednesday, 09 / 20 / 2023

Hyd. No. 4

Post A and B Combined

Hydrograph type = Combine
 Storm frequency = 100 yrs
 Time interval = 2 min
 Inflow hyds. = 2, 3

Peak discharge = 37.61 cfs
 Time to peak = 730 min
 Hyd. volume = 155,614 cuft
 Contrib. drain. area = 9.580 ac



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

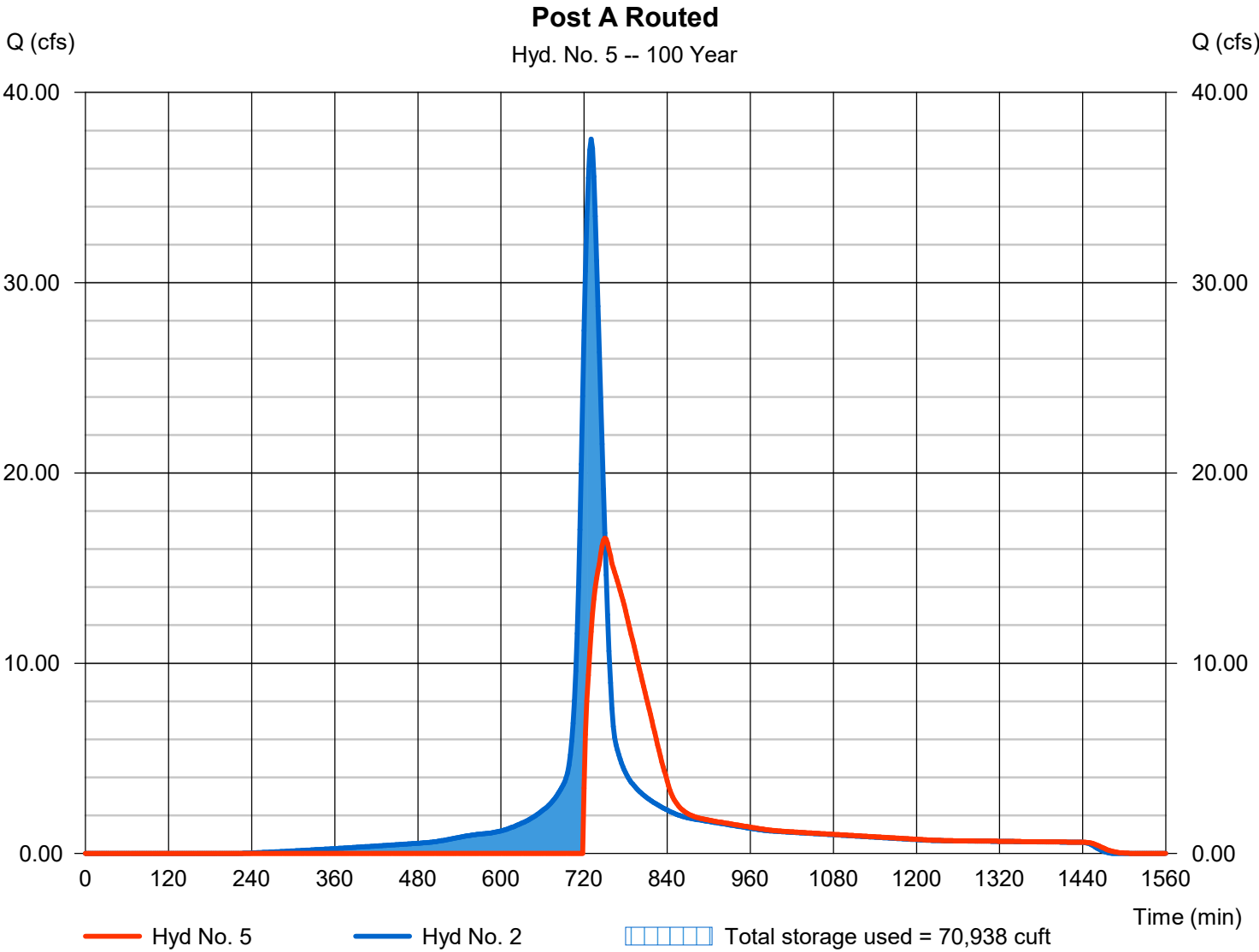
Wednesday, 09 / 20 / 2023

Hyd. No. 5

Post A Routed

Hydrograph type	= Reservoir	Peak discharge	= 16.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 750 min
Time interval	= 2 min	Hyd. volume	= 117,670 cuft
Inflow hyd. No.	= 2 - Postdeveloped A	Max. Elevation	= 709.65 ft
Reservoir name	= Detention Basin	Max. Storage	= 70,938 cuft

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Wednesday, 09 / 20 / 2023

Hyd. No. 6

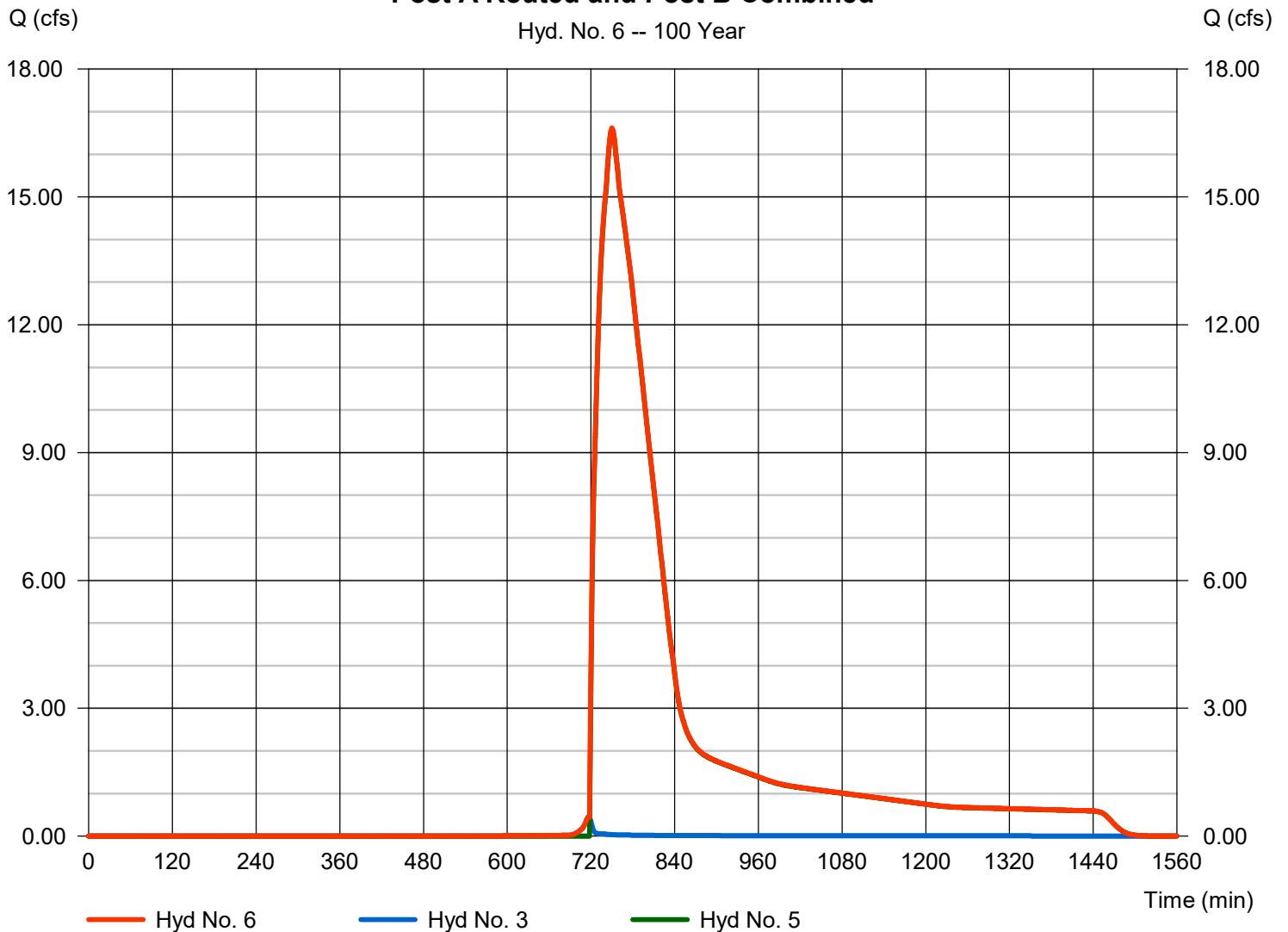
Post A Routed and Post B Combined

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 3, 5

Peak discharge = 16.62 cfs
Time to peak = 750 min
Hyd. volume = 118,582 cuft
Contrib. drain. area = 0.080 ac

Post A Routed and Post B Combined

Hyd. No. 6 -- 100 Year



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	40.9319	9.8000	0.8767	-----
2	45.5761	9.6000	0.8553	-----
3	0.0000	0.0000	0.0000	-----
5	51.8623	9.6000	0.8320	-----
10	48.5688	8.5000	0.7836	-----
25	45.2702	7.3000	0.7295	-----
50	43.8185	6.5000	0.6970	-----
100	41.7893	5.7000	0.6627	-----

File name: Pickaway Co.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.86	2.99	2.45	2.09	1.82	1.62	1.46	1.33	1.22	1.13	1.06	0.99
2	4.60	3.58	2.95	2.51	2.20	1.96	1.77	1.62	1.49	1.38	1.29	1.21
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.57	4.36	3.61	3.10	2.72	2.43	2.20	2.01	1.86	1.73	1.62	1.52
10	6.32	4.94	4.09	3.52	3.10	2.78	2.53	2.32	2.15	2.00	1.88	1.77
25	7.26	5.66	4.70	4.06	3.59	3.23	2.95	2.72	2.52	2.36	2.22	2.10
50	7.99	6.21	5.16	4.46	3.96	3.57	3.26	3.02	2.81	2.63	2.48	2.35
100	8.69	6.74	5.61	4.86	4.32	3.91	3.58	3.32	3.10	2.91	2.75	2.61

Tc = time in minutes. Values may exceed 60.

Precip. file name: O:\Support\Autocad\Drainage SCS Tables\Columbus.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.20	2.63	0.00	3.24	3.74	4.44	5.02	5.63
SCS 6-Hr	1.61	1.94	0.00	2.42	2.82	3.40	3.89	4.42
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10