PROPOSED COMMERCIAL

25300 I30 N

DRAINAGE REPORT

FOR
City of Bryant, Saline County, AR

November 2025



Vicinity Map

Owner & Developer: FINLEY & COMPANY

By:

HOPE CONSULTING
ENGINEERS - SURVEYORS

129 N. Main Street
Benton, Arkansas 72015
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Narrative & Summary

PROJECT TITLE

25300 I30 N COMMERCIAL

PROJECT PROPERTY OWNER

Stuart Finley

PROJECT LOCATION

Bryant, Saline County, AR

PROJECT DESCRIPTION

The proposed commercial development is at the city of Bryant, AR. Total development site area is 0.90 acres.

DRAINAGE ANALYSIS

On Site Drainage- Rational method was used to determine the existing and proposed flow from proposed site. There will be one detention pond to detain water from this development. Detailed drainage calculation considering the future expected development has been conducted to determine the required pond and culvert dimension. Summary of the calculation is below:

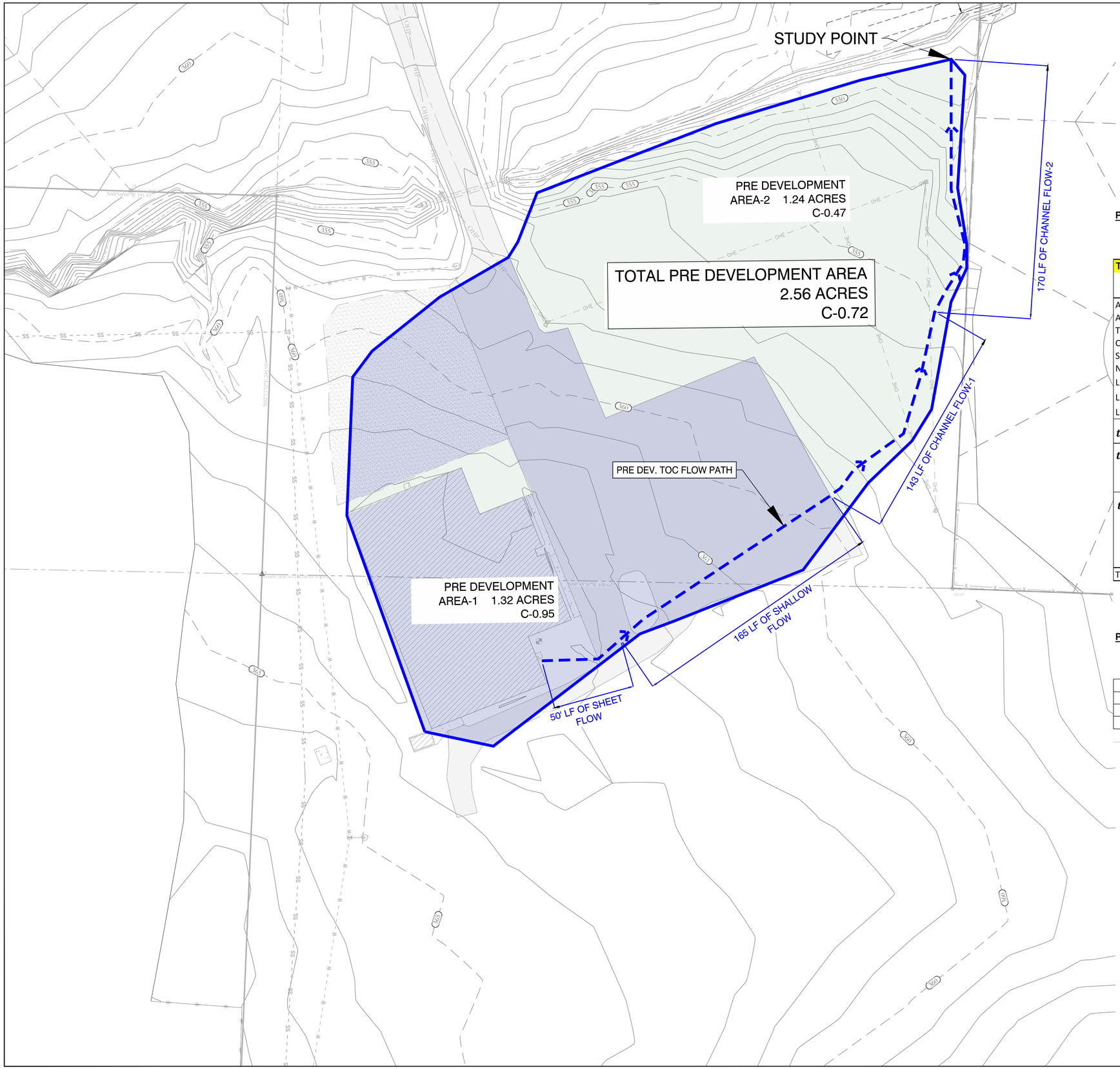
Detention Pond –North East Pond:

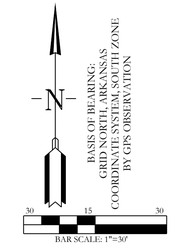
- Pond is situated on the north east side of the property.
- Pre-development area 2.56 acres.
- Post-development area 2.56 acres.
- Pre-development runoff coefficient 0.72.
- Post-development runoff coefficient 0.78.
- Pond has a bottom elevation of 351.00'.
- One 18" RCP with 0.72% slope is proposed for outflow culverts.

Peak flows for Pre and post development phase of onsite area have been tabulated below-

Period of time	Pre-development	Post-dev. Without detention	Post-dev. With detention
	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)
2-Year	11.24	12.18	4.697
5-Year	13.34	14.45	5.052
10-Year	15.03	16.28	6.287
25-Year	17.25	18.68	7.520
50--Year	18.98	20.57	8.389
100-Year	20.42	22.12	9.706

CONCLUSION: From the onsite drainage calculation, it is seen that there is decrease in flow for all storm events due to the proposed pond.





VICINITY MAP:



PRE DEVELOPMENT TOC:

Time of Concentration, tc (min)

Area (ft2)	111672.9						
Area (Acre)	*2.56*						
Total Length, L (ft)	***528.0***						
Change in Elevation (ft)	16						
Slope, S (ft/ft)	*0.030*						
N (Coeff. Of roughness, Table 400-3)	0.020						
L_i (overland/sheet flow, ft)	50.0						
L_{scs}(shallow concentrated, ft)	165.0	Velocity, V (ft/sec)	Length, L (ft)	Height, h (ft)	Slope, S (ft/ft)	Mannings, n	Hydraulic Radius, R
$t_i = 0.83 \frac{(N L_i)^{0.467}}{S^{0.5}}$, (min)	*2.07*		50.0	1.0	*0.020*		
$t_{scs} = \frac{L_{scs}}{60\,V}$, (min) , paved V=20.3282(S^0.5)	*1.00*	*2.74*	165.0	3.0	*0.018*		
$t_{cs} = \frac{L_{cs}}{60\,V}$, (min)							
$V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ Channel flow-1	*1.00*	*2.37*	143.0	5.0	*0.035*	0.050	*0.278*
Channel flow-2	*0.68*	*4.17*	170.0	7.0	*0.041*	0.050	*0.573*
Total time of concentration, tc (min)	**4.76**						
USE	**5**						

PRE DEVELOPMENT RUNOFF COEFFICIENT

	Area (acer)	C 100 year	Corrected C 100 year
PRE DEV. AREA-1	1.32	0.95	1.254
PRE DEV. AREA-2	1.24	0.47	0.5828
Tot =	2.56		0.72

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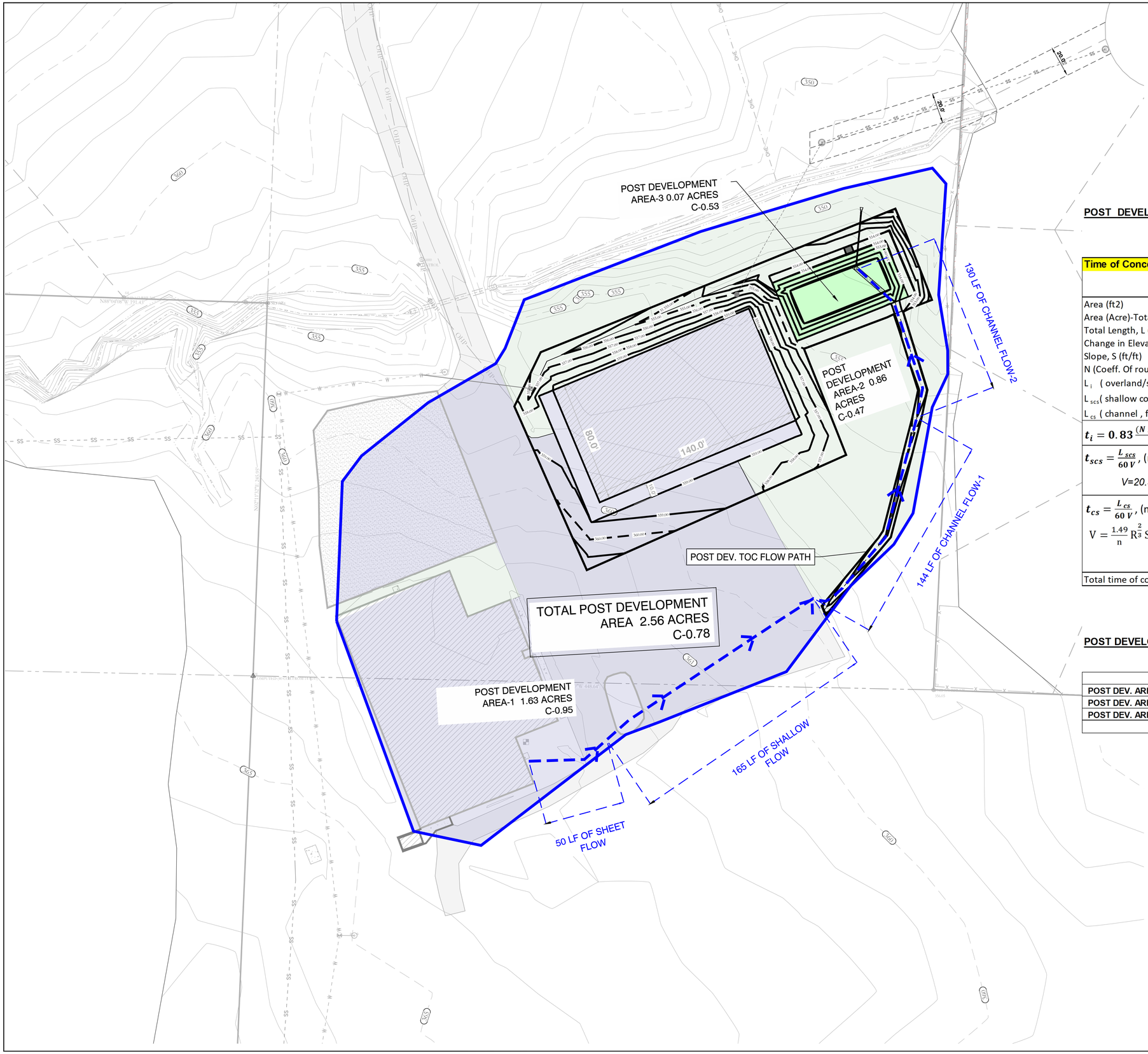
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FOR USE AND BENEFIT OF:
STUART FINLEY

25-1210 Comm./ 25300 I30 N
PRE DEVELOPMENT DRAINAGE EXHIBITION
A COMMERCIAL IN BRYANT CITY, SALINE COUNTY, ARKANSAS

DATE:	11/05/2025	C.A.D. BY:	DRAWING NUMBER:
REVISED:	##	CHECKED BY:	25-1210
SHEET:		SCALE: 1"=30'	

500	01S	14W	0	13	400	62	1664



VICINITY MAP:



POST DEVELOPMENT TOC:

Time of Concentration, tc (min)

Area (ft2)	111672.9						
Area (Acre)-Total	*2.56*						
Total Length, L (ft)	***489.0***						
Change in Elevation (ft)	13						
Slope, S (ft/ft)	*0.027*						
N (Coeff. Of roughness, Table 400-3)	0.020						
L_i (overland/sheet flow, ft)	*50.0*						
L_{scs}(shallow concentrated, ft)	*165.0*	Velocity, V	Length,	Height,	Slope,	Mannings,	Hydraulic
L_{cs} (channel , ft)	274.0	(ft/sec)	L (ft)	h (ft)	S (ft/ft)	n	Radius, R
$t_i = 0.83 \frac{(N L_i)^{0.467}}{S^{0.5}}$, (min)	*2.07*		50.0	1.0	*0.020*		
$t_{scs} = \frac{L_{scs}}{60 V}$, (min) , paved							
V=20.3282(S^0.5)	*1.00*	*2.74*	165.0	3.0	*0.018*		
$t_{cs} = \frac{L_{cs}}{60 V}$, (min)							
$V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ Channel flow-1	*0.96*	*2.49*	144.0	5.0	*0.035*	0.050	*0.300*
Channel flow-2	*0.60*	*3.61*	130.0	4.0	*0.031*	0.050	*0.573*
Total time of concentration, tc (min)	**4.64**						
USE	**5**						

POST DEVELOPMENT RUNOFF COEFFICIENT

	Area (acer)	C 25 year	Corrected C 100 year
POST DEV. AREA-1	1.63	0.95	1.55
POST DEV. AREA-2	0.86	0.47	0.4042
POST DEV. AREA-3	0.07	0.53	0.0371
Tot =	2.56		0.78

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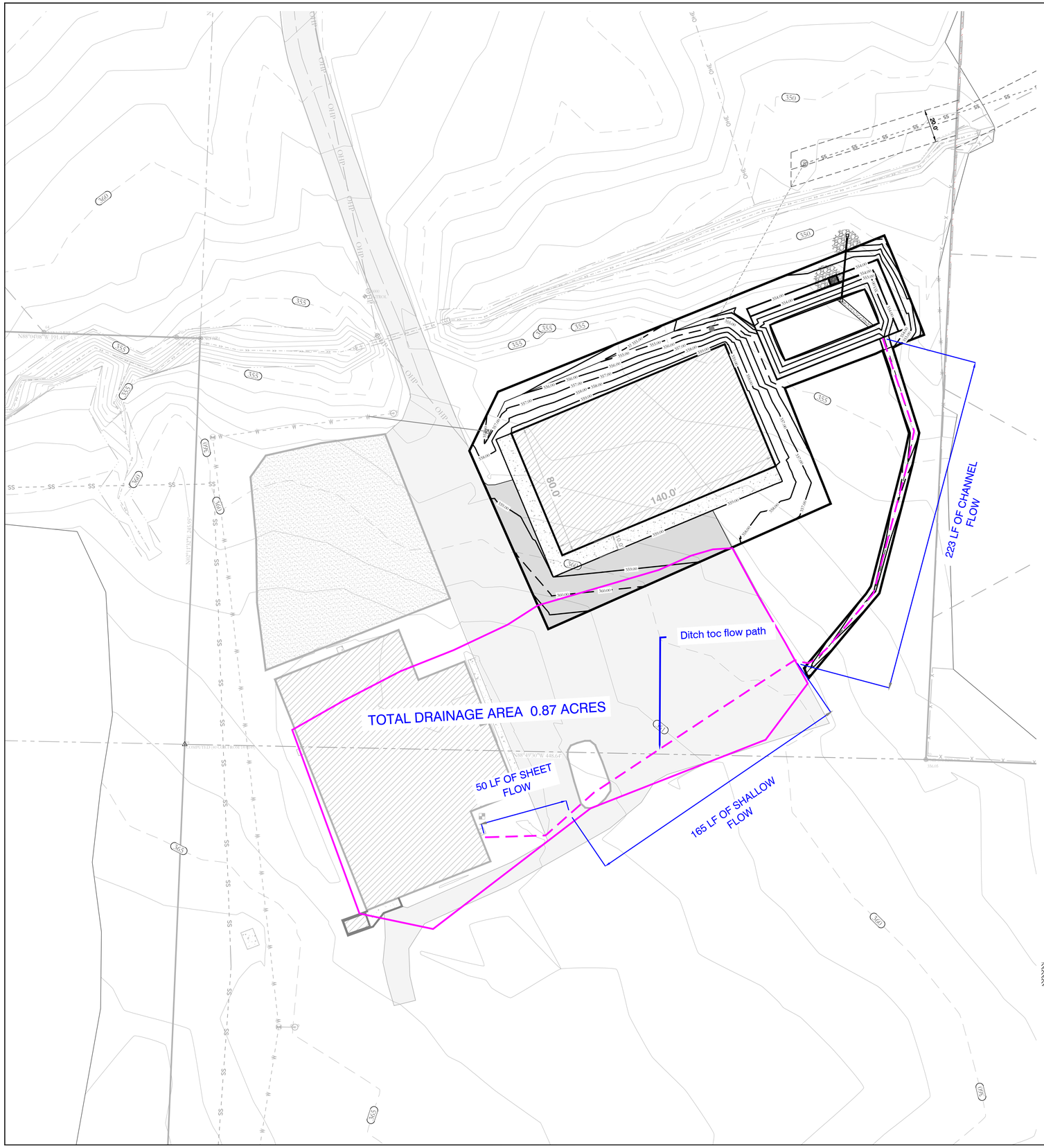
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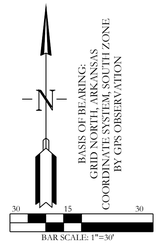
25-1210 Comm./ 25300 I30 N
POST DEVELOPMENT DRAINAGE EXHIBITION
A COMMERCIAL IN BRYANT CITY, SALINE COUNTY, ARKANSAS

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VICINITY MAP:



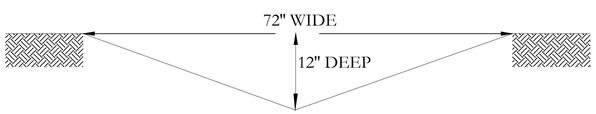
Ditch Size Calculation

Time of Concentration, tc (min)								
Area (ft2)	37737.2							
Area (Acre)	*0.87*							
Total Length, L (ft)	***438.0***							
Change in Elevation (ft)	10							
Gross Slope, S (ft/ft)	*0.023*							
N (Coeff. Of roughness, Table 400	*0.020*							
L_i (overland/sheet flow, ft)	50.0							
L_{scs}(shallow concentrated, ft)	165.0	Velocity, V (ft/sec)	Length, L (ft)	Height, h (ft)	Slope, S (ft/ft)	Mannings, n	Hydraulic Radius, R	
L_{cs} (channel , ft)	223.0							
$t_i = 0.83 \frac{(N L_i)^{0.467}}{S^{0.5}}$, (min)	*2.07*	-	50.0	1.0	*0.020*	0.020	-	
$t_{scs} = \frac{L_{scs}}{60\,V}$, (min) , paved								
V=20.3282(S^0.5)	*1.00*	*2.74*	165.0	3.0	*0.018*	-	-	
$t_{cs} = \frac{L_{cs}}{60\,V}$, (min)								
$V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$ Ch1	*1.80*	*2.07*	223.0	6.0	*0.027*	0.050	*0.275*	
Total time of concentration, tc (m	**4.87**							
USE MIN	**5**							

Design Peak Runoff Rates, Qp (cfs)				
tc =	5.00	Runoff	Toal A	Q
	Intensity, I (in/hr)	Coefficient,		
100year	11.10	**0.950**	**0.87 acer**	**9.14**

Channel/ Ditch Dimension Calculation												
Total Length, L (ft)	***223.0***											
Total Change in Elevation (ft)	6											
Slope, S (ft/ft)	*0.027*											
Target Discharge, Q (ft^3/s)	***9.1***											
		Channel Dimenstion										
$Q = V A$		Velocity, V (ft/sec)	Bottom Width, (ft)	Depth, (ft)	Top Width, (ft)	Ch Side Slope 1:Z	Area, (ft^2)	Length, L (ft)	Elevation, h (ft)	Slope, S (ft/ft)	Mannings, n	Hydraulic Radius, R
$V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$												
C Flow	*14.87*	*4.96*	0.00	1.00	*6.00*	3	*3.00*	223.0	6.0	*0.0269*	0.030	*0.474*
Discharge Capacity, Q =	**14.87**	ft^3/s										

Adequate size



DITCH SECTION

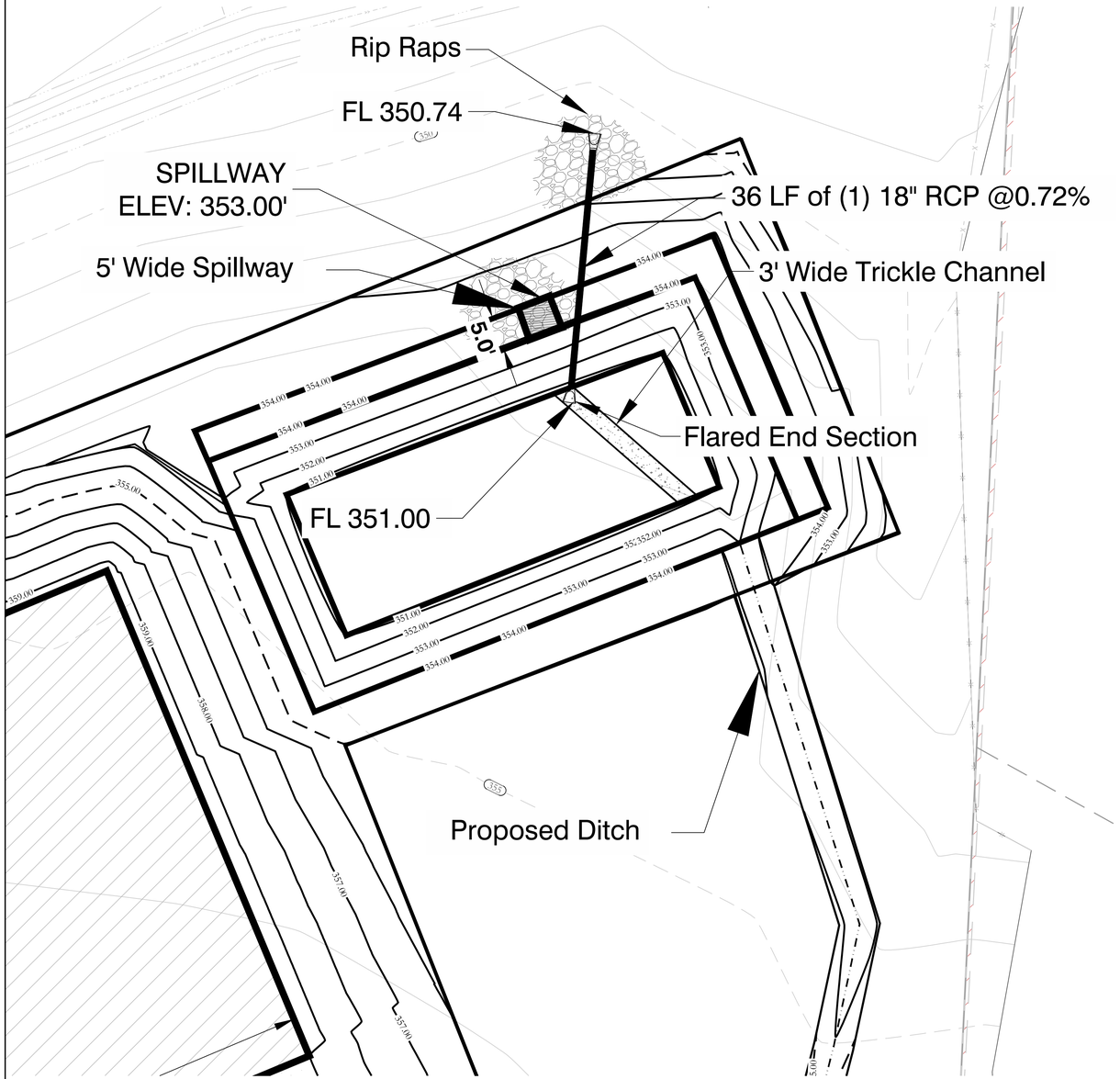
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25-1210 Comm./ 25300 I30 N
DITCH CALCULATION
A COMMERCIAL IN BRYANT CITY, SALINE COUNTY, ARKANSAS

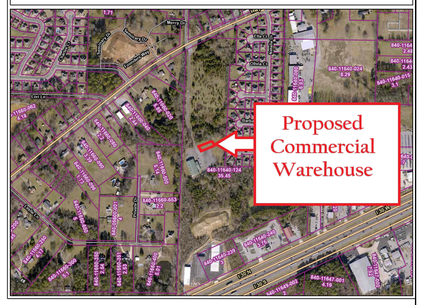
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REVISED:	##	CHECKED BY:	25-1210
SHEET:		SCALE: 1"=30'	

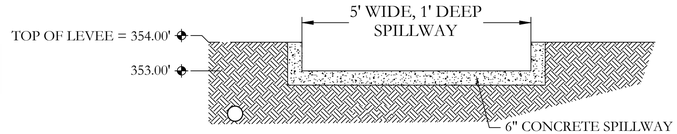
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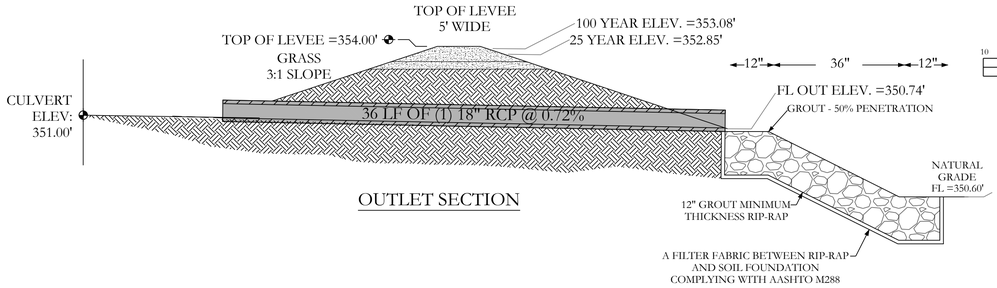
NORTH EAST DETENTION POND

VICINITY MAP:

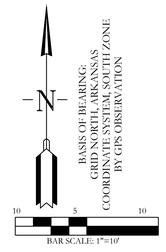




SPILLWAY END VIEW
NTS



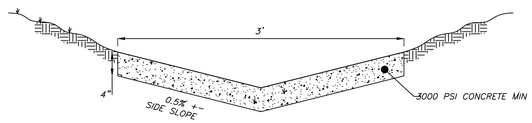
OUTLET SECTION



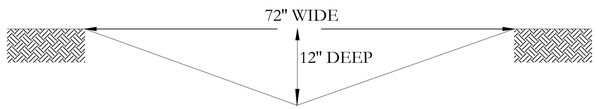
EARTHEN SLOPE NOTE:
EARTHEN DETENTION POND SLOPES ON BOTH THE INTERIOR AND EXTERIOR OF THE POND SHALL HAVE A MAXIMUM SLOPE OF 3:1.

NOTE:
1. DETENTION POND WILL BE REQUIRED TO BE STABILIZED WITH SOLID SOD/SEED STABILIZATION PER THE STORM WATER MANAGEMENT MANUAL.

2. DETENTION POND WILL HAVE A 5' WIDE LEVEE.



DETAIL (NTS)
TRICKLE CHANNEL SECTION



DITCH SECTION

DETENTION POND MAINTENANCE PLAN

Background
The Detention pond is located at the North East of the subjected property. It is designed to temporarily detain stormwater to meet water quantity criteria before discharging off the property.

Routine Maintenance
Routine maintenance will include but not be limited to:
-Moving of the bank slopes and area around the pond on a monthly basis during the growing season and as needed during the cooler months.

-The outlet pipe from the pond and other areas will be inspected monthly for debris which could inhibit the proper flow of discharge. Any debris will be removed immediately and disposed of or placed in a location to prevent future maintenance and to not cause impact up or downstream of the structure.

-Trash will be removed from around the pond to prevent entering the pond. Generally, the site should be kept free of loose trash which could be carried off site by wind or rain.

-Inspect the pond and outlet pipe for non-routine maintenance need.

Periodic or Non-Routine Maintenance
The routine inspection of the pond area and discharge pipe will identify needed repairs and non-routine maintenance. These items may include but not be limited to:

-Re-growth of trees on or around the pond bank. These should be cut and removed from the pond area.

-Sediment from the site may accumulate in the pond bottom and reduce the pond to below design volume requirements. The pond should be excavated if the pond bottom elevation reached a level that allows excessive aquatic growth or reduces the pond efficiency such, that the sediments are passing the discharge structure and release off site.

-Stabilization or re-grading of side slopes may be required periodically or after excessive rain events. Any disturbance of slopes should be reseeded or may require installation of erosion control materials until seeding can reestablish adequate grasses to prevent future erosion.

-Any other maintenance or repairs which would minimize other maintenance to the pond or outfall structures.

For questions or concerns about Tract "A", contact at (501)315-2626.

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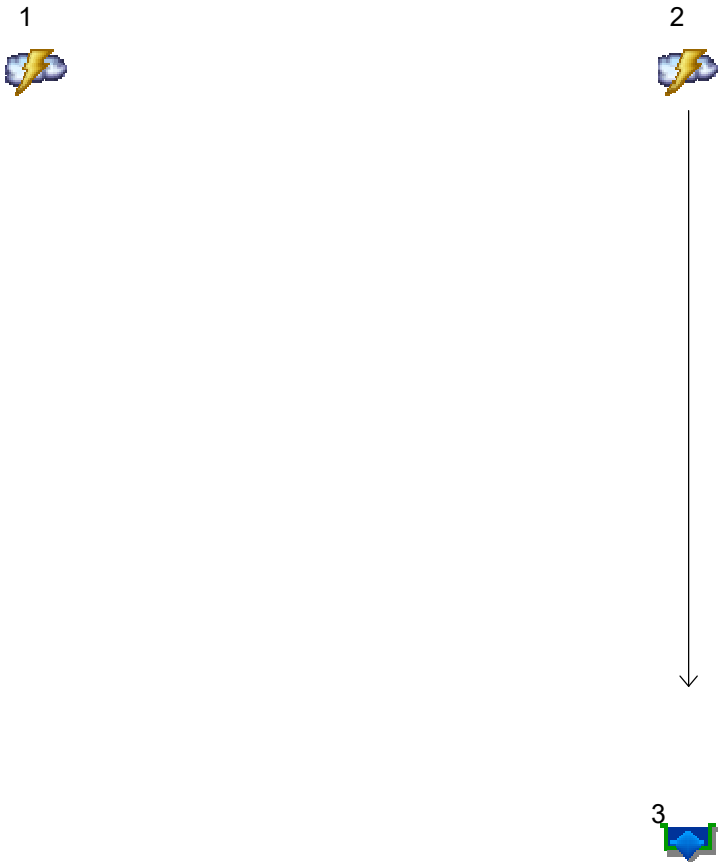
FOR USE AND BENEFIT OF:
STUART FINLEY

25-1210 Comm./ 25300 I30 N
NORTH EAST DETENTION POND
A COMMERCIAL IN BRYANT CITY, SALINE COUNTY, ARKANSAS

DATE:	11/05/2025	C.A.D. BY:				DRAWING NUMBER:	
REVISED:	##	CHECKED BY:				25-1210	
SHEET:	C-3.0	SCALE:	1"=10'				
500	01S	14W	0	13	400	62	1664

Hydrograph Summary Report
North East Detention Pond

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Pre-Development
2	Rational	Dev. Generated Flow
3	Reservoir	Post Dev. Flow

Multi-Hydrograph Plot

Hyd. No. 1

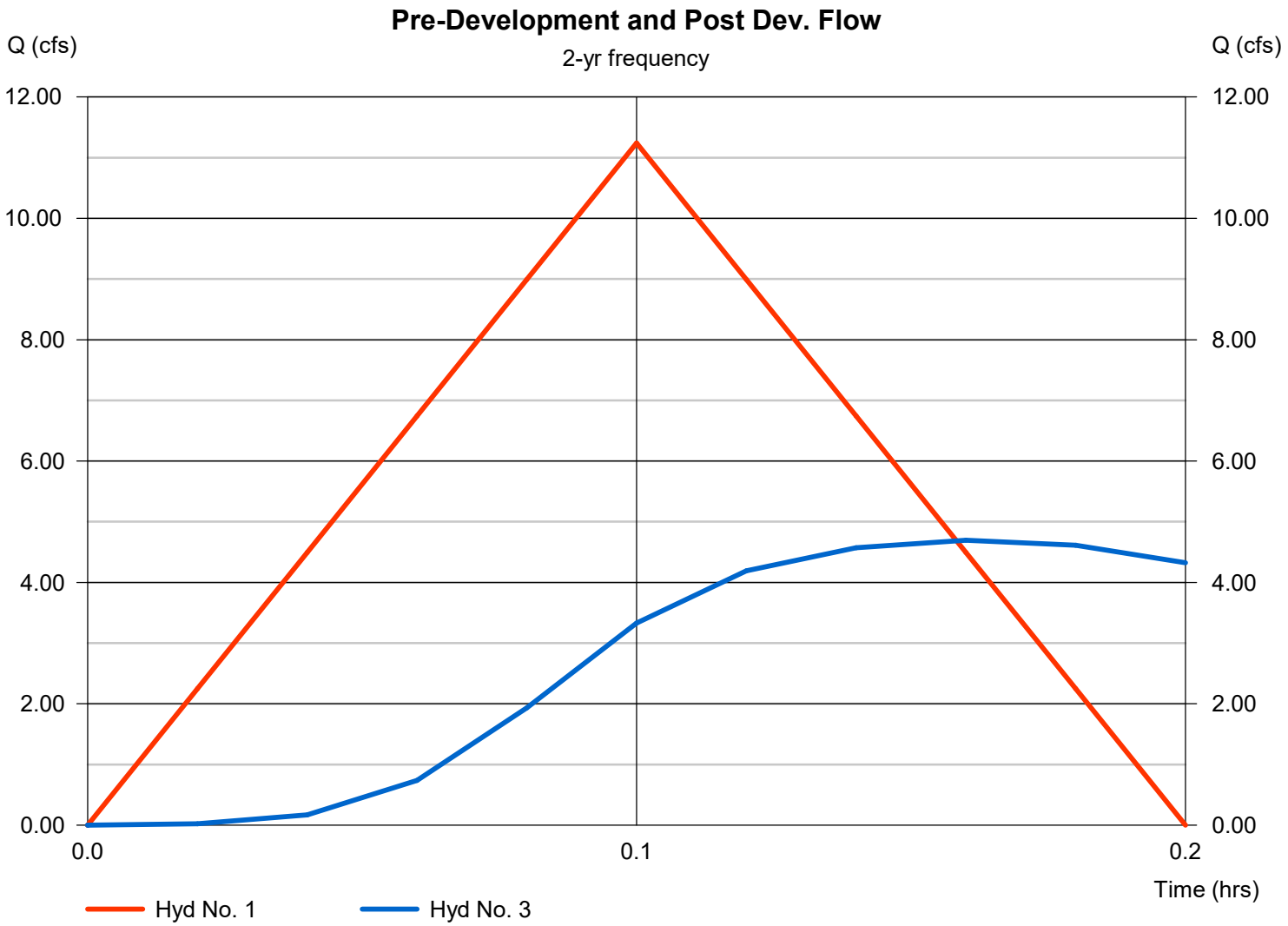
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	11.24 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	3,372 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	4.70 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	3,650 cuft



Multi-Hydrograph Plot

Hyd. No. 1

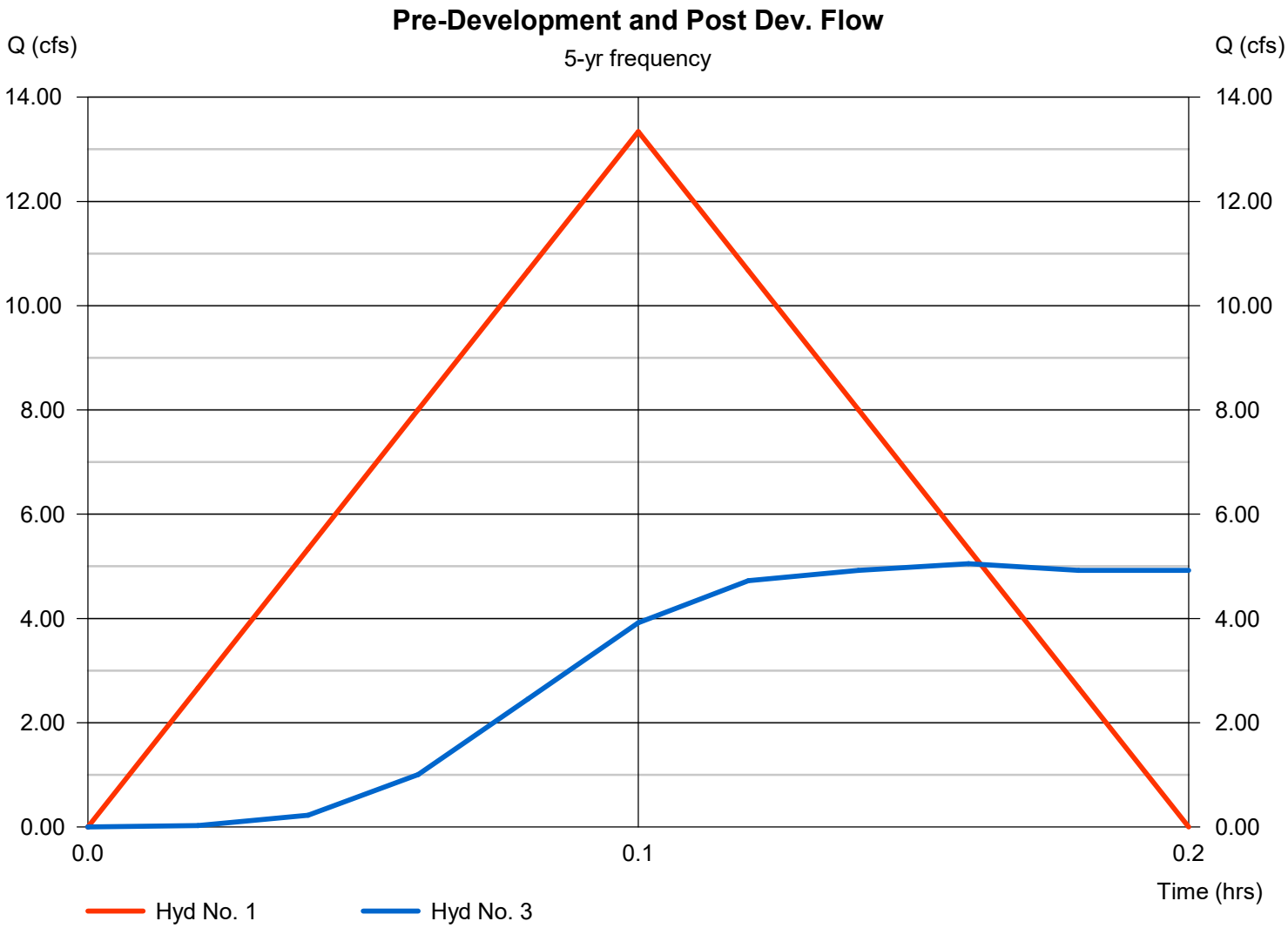
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	13.34 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	4,002 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	5.05 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	4,332 cuft



Multi-Hydrograph Plot

Hyd. No. 1

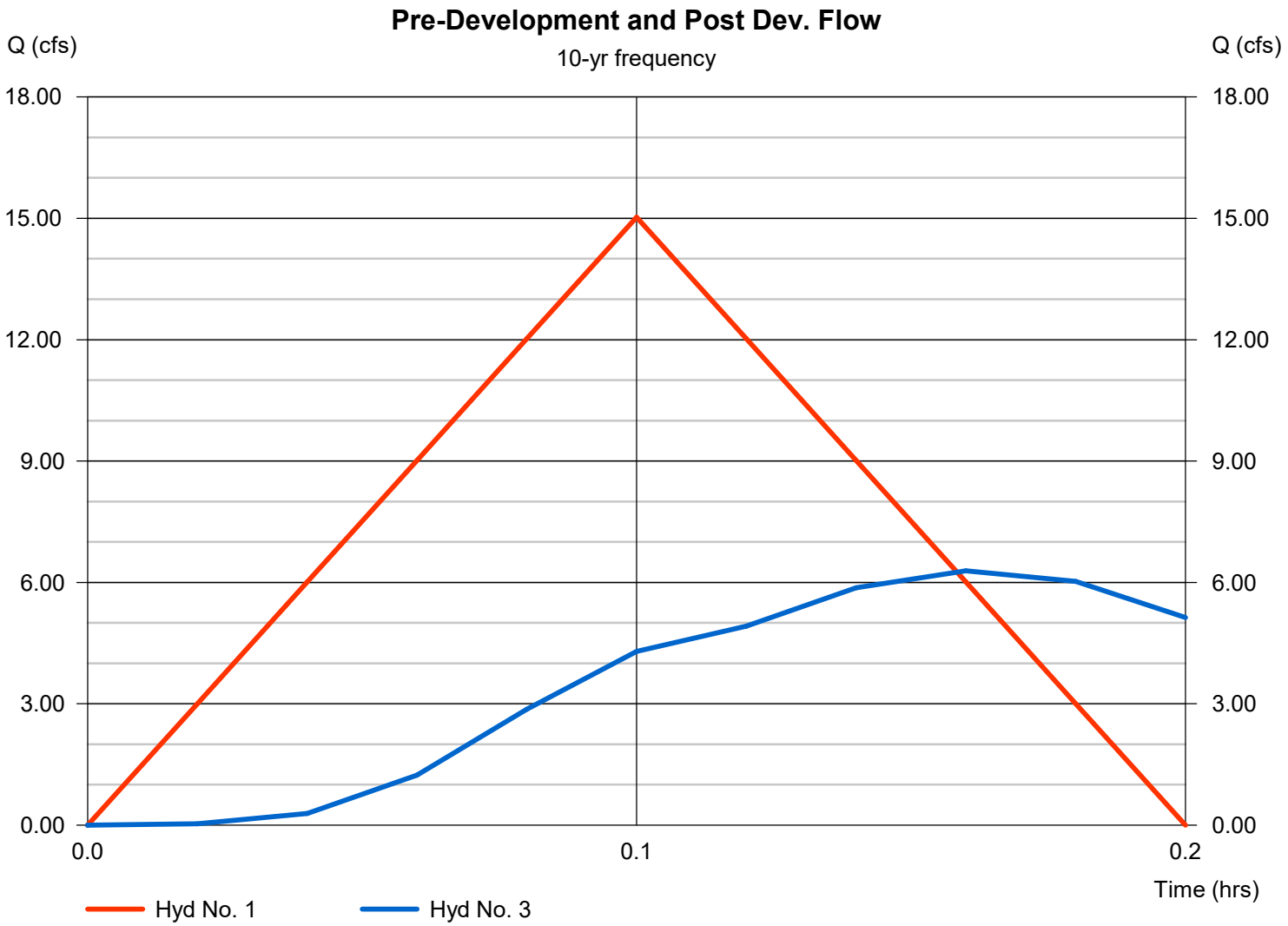
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	15.03 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	4,508 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	6.29 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	4,881 cuft



Multi-Hydrograph Plot

Hyd. No. 1

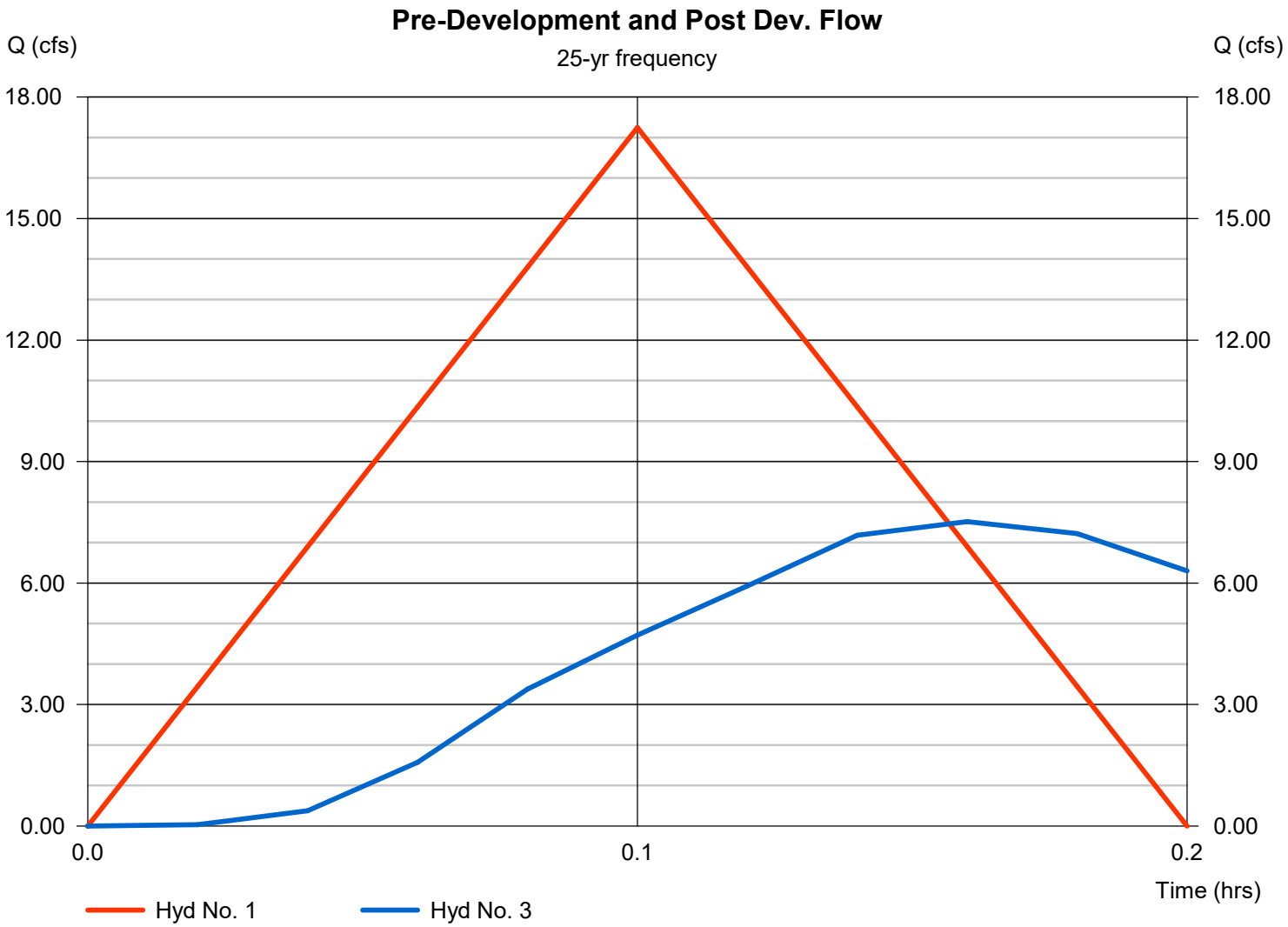
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	17.25 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	5,174 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	7.52 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	5,602 cuft



Multi-Hydrograph Plot

Hyd. No. 1

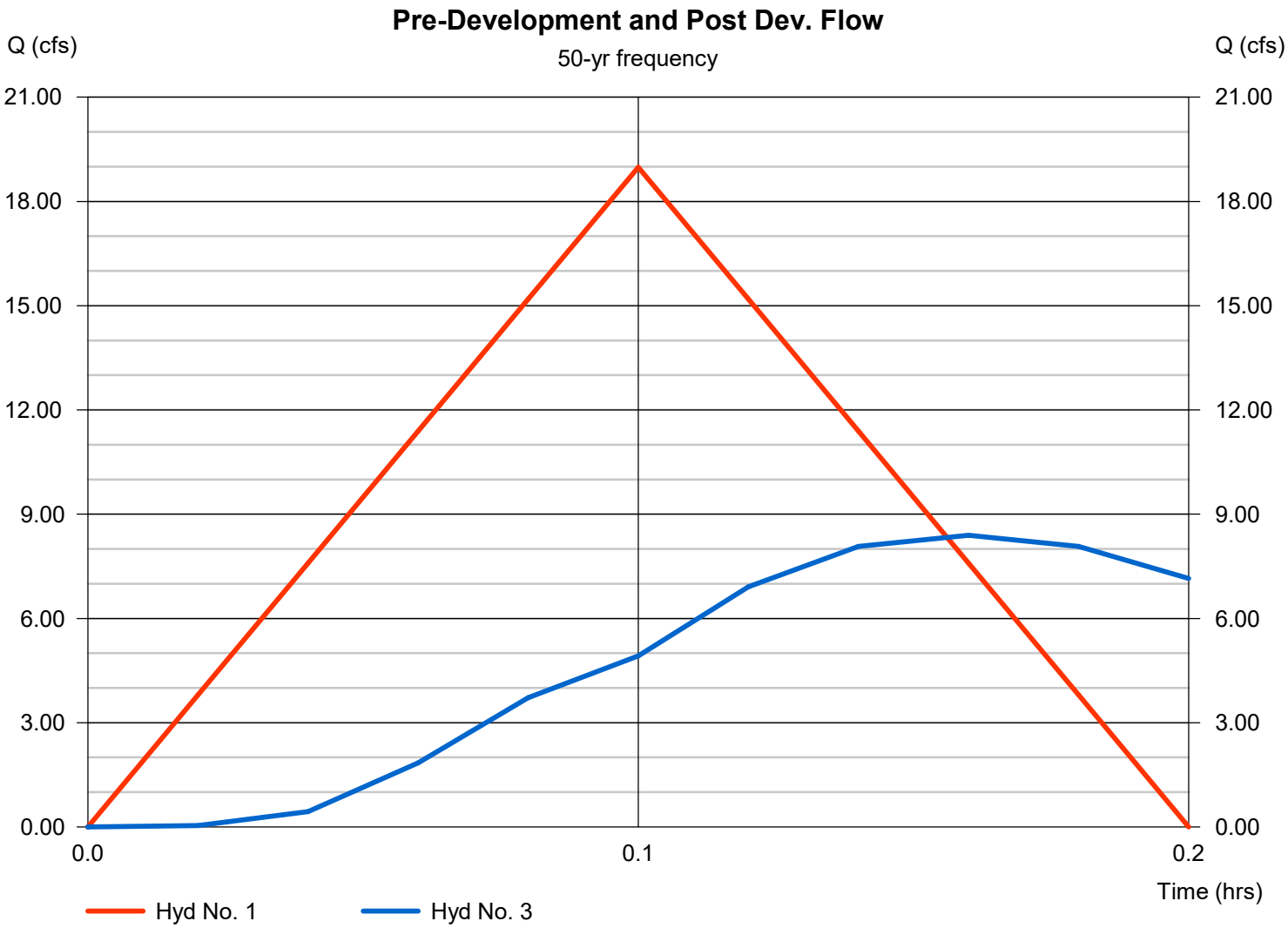
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	18.98 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	5,695 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	8.39 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	6,167 cuft



Multi-Hydrograph Plot

Hyd. No. 1

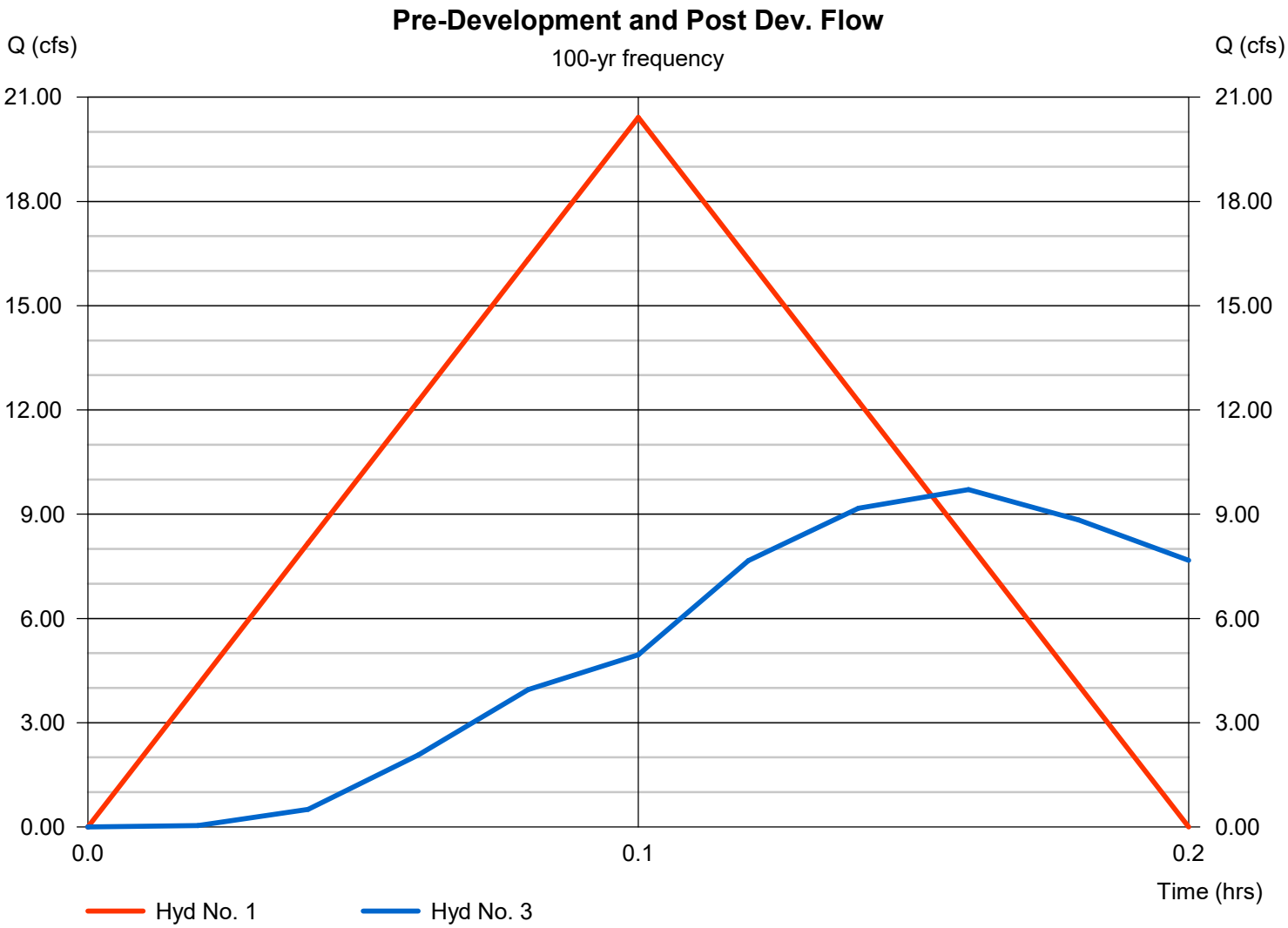
Pre-Development

Hydrograph type	=	Rational
Peak discharge	=	20.42 cfs
Time to peak	=	0.08 hrs
Hyd. Volume	=	6,126 cuft

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir
Peak discharge	=	9.71 cfs
Time to peak	=	0.13 hrs
Hyd. Volume	=	6,633 cuft



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	Rational	------	-------	11.24	-------	13.34	15.03	17.25	18.98	20.42	Pre-Development
2	Rational	------	-------	12.18	-------	14.45	16.28	18.68	20.57	22.12	Dev. Generated Flow
3	Reservoir	2	-------	4.697	-------	5.052	6.287	7.520	8.389	9.706	Post Dev. Flow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	11.24	1	5	3,372	------	------	------	Pre-Development
2	Rational	12.18	1	5	3,653	------	------	------	Dev. Generated Flow
3	Reservoir	4.697	1	8	3,650	2	352.30	2,322	Post Dev. Flow

Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	11.24 cfs
Storm frequency	=	2 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	3,372 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	6.098 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560

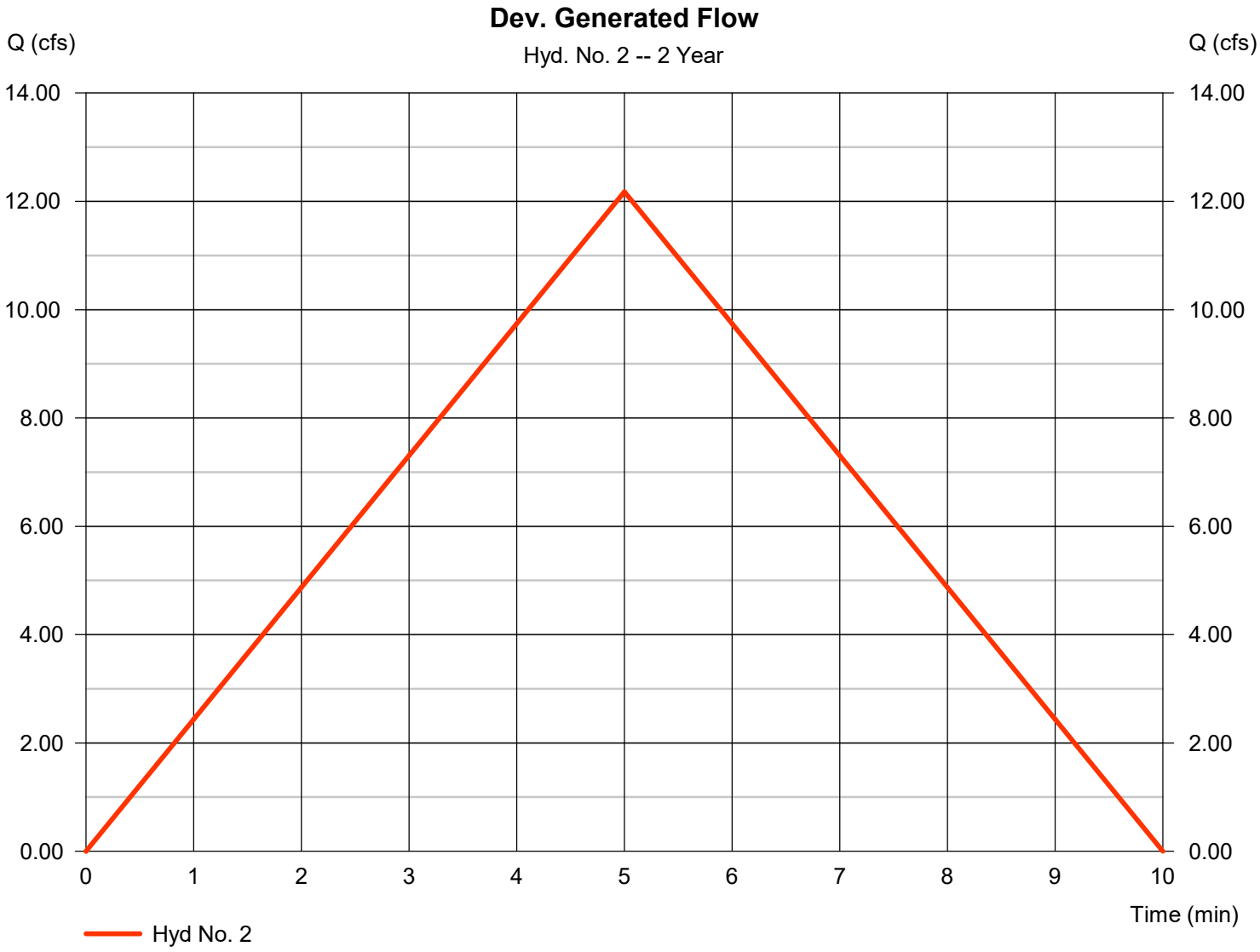


Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	12.18 cfs
Storm frequency	=	2 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	3,653 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	6.098 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



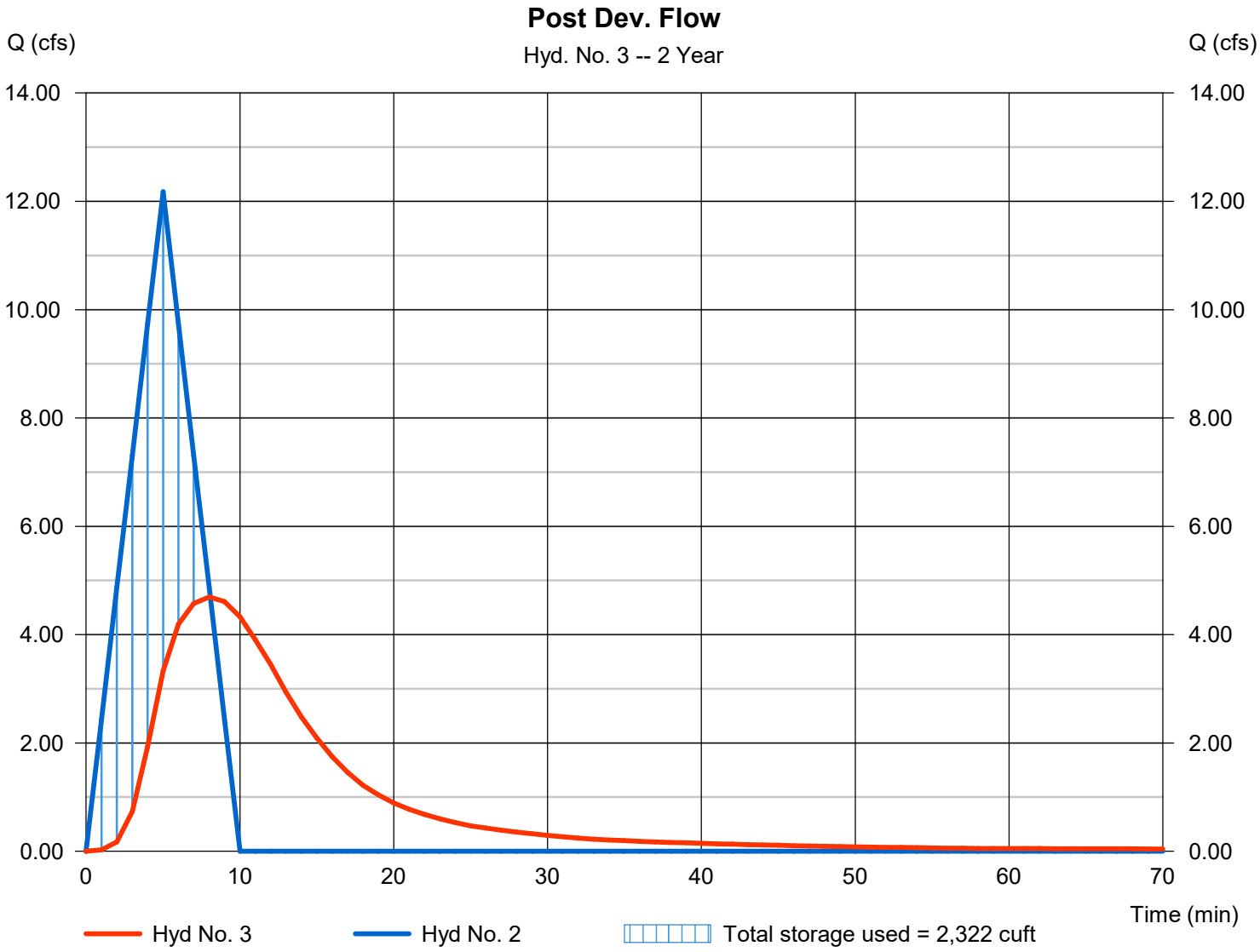
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	4.697 cfs
Storm frequency	=	2 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	3,650 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	352.30 ft
Reservoir name	=	detention	Max. Storage	=	2,322 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - detention

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 351.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	351.00	1,390	0	0
1.00	352.00	1,930	1,652	1,652
2.00	353.00	2,542	2,229	3,881
3.00	354.00	3,225	2,876	6,758

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	Inactive	Inactive	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 351.00	0.00	0.00	0.00
Length (ft)	= 36.00	0.00	0.00	0.00
Slope (%)	= 0.72	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

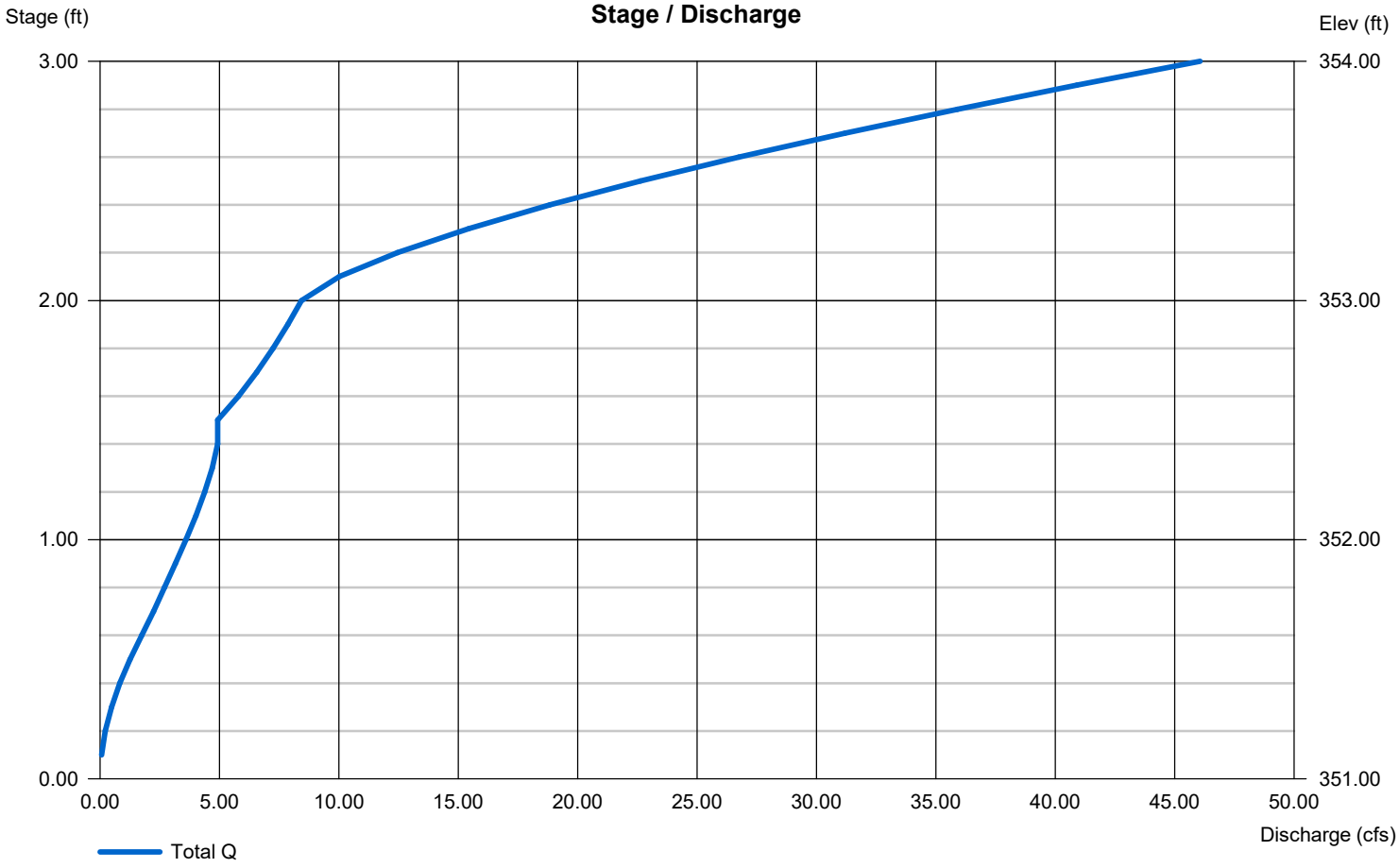
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	Inactive	Inactive	0.00
Crest El. (ft)	= 353.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	Rect	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	13.34	1	5	4,002	------	------	------	Pre-Development
2	Rational	14.45	1	5	4,335	------	------	------	Dev. Generated Flow
3	Reservoir	5.052	1	8	4,332	2	352.51	2,800	Post Dev. Flow

Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	13.34 cfs
Storm frequency	=	5 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	4,002 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	7.237 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560



Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	14.45 cfs
Storm frequency	=	5 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	4,335 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	7.237 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



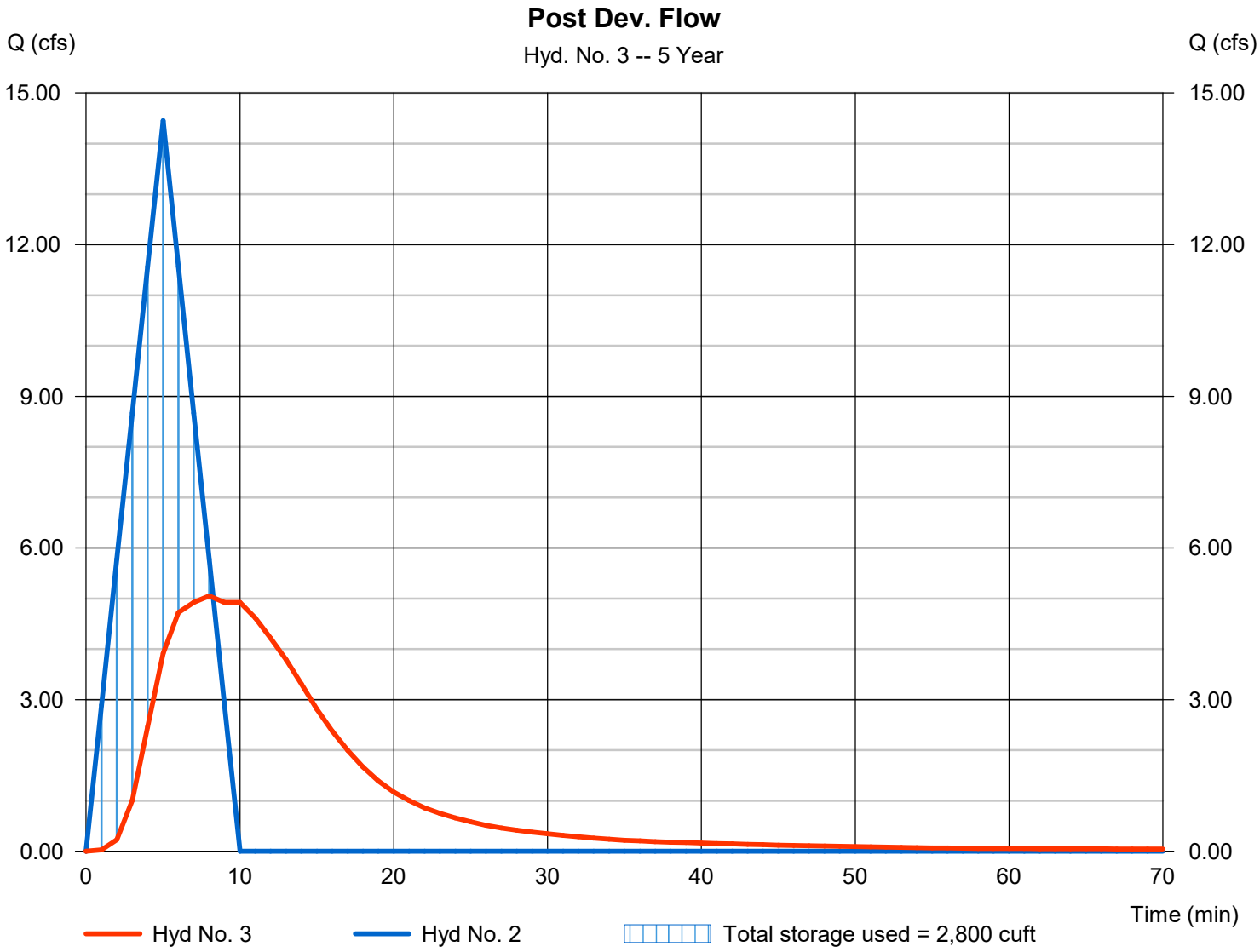
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	5.052 cfs
Storm frequency	=	5 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	4,332 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	352.51 ft
Reservoir name	=	detention	Max. Storage	=	2,800 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	15.03	1	5	4,508	------	------	------	Pre-Development
2	Rational	16.28	1	5	4,884	------	------	------	Dev. Generated Flow
3	Reservoir	6.287	1	8	4,881	2	352.66	3,134	Post Dev. Flow

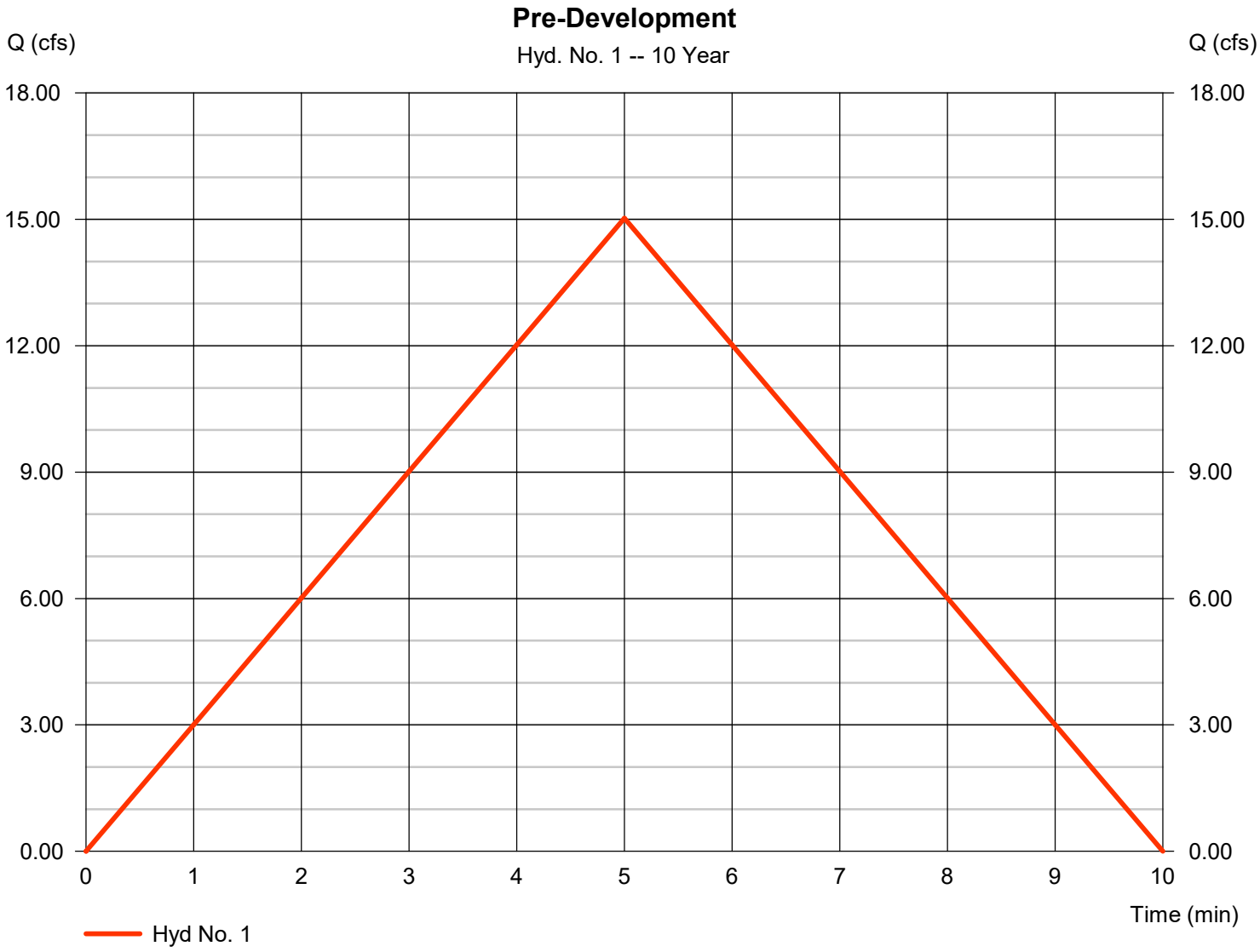
Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	15.03 cfs
Storm frequency	=	10 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	4,508 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	8.153 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560

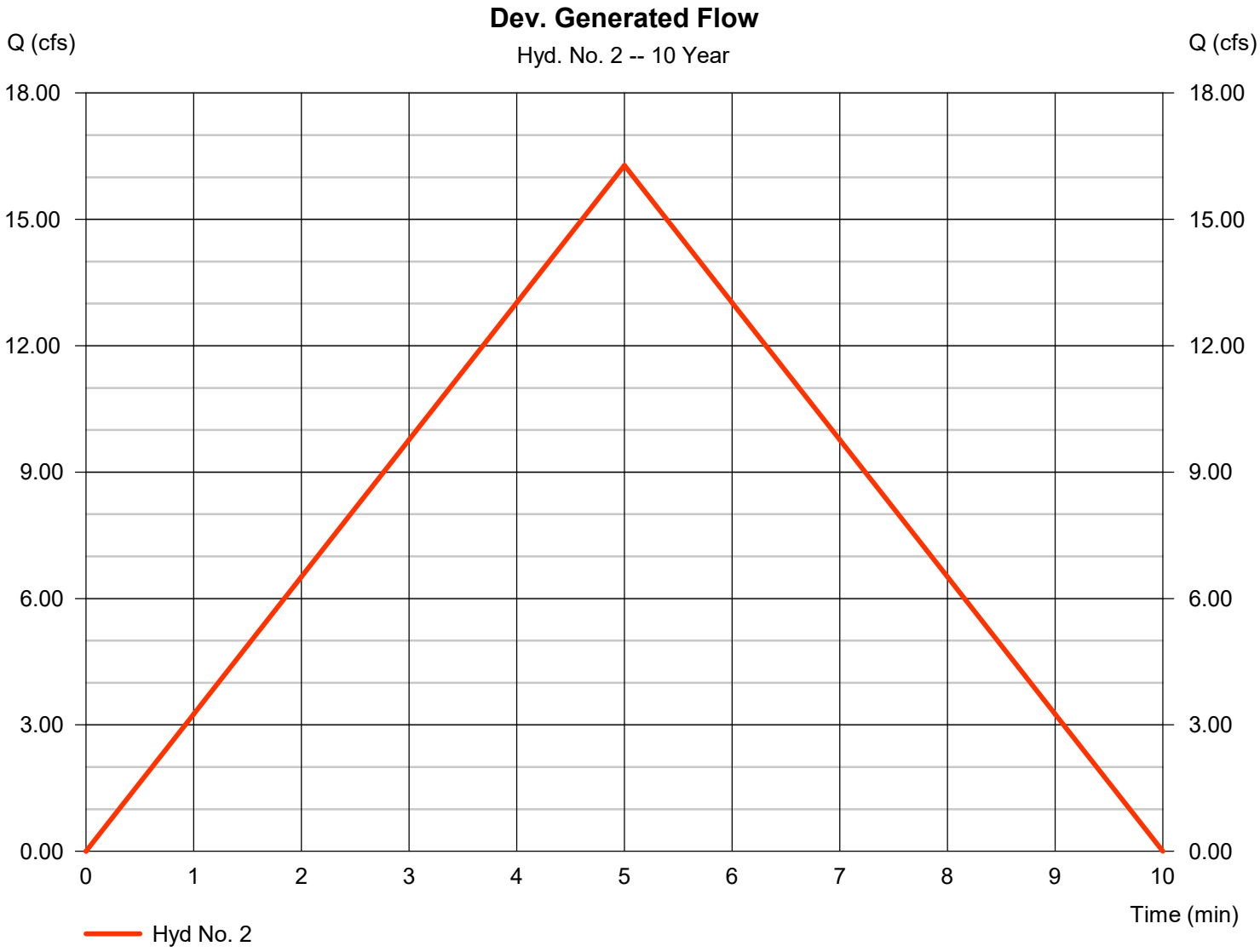


Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	16.28 cfs
Storm frequency	=	10 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	4,884 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	8.153 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



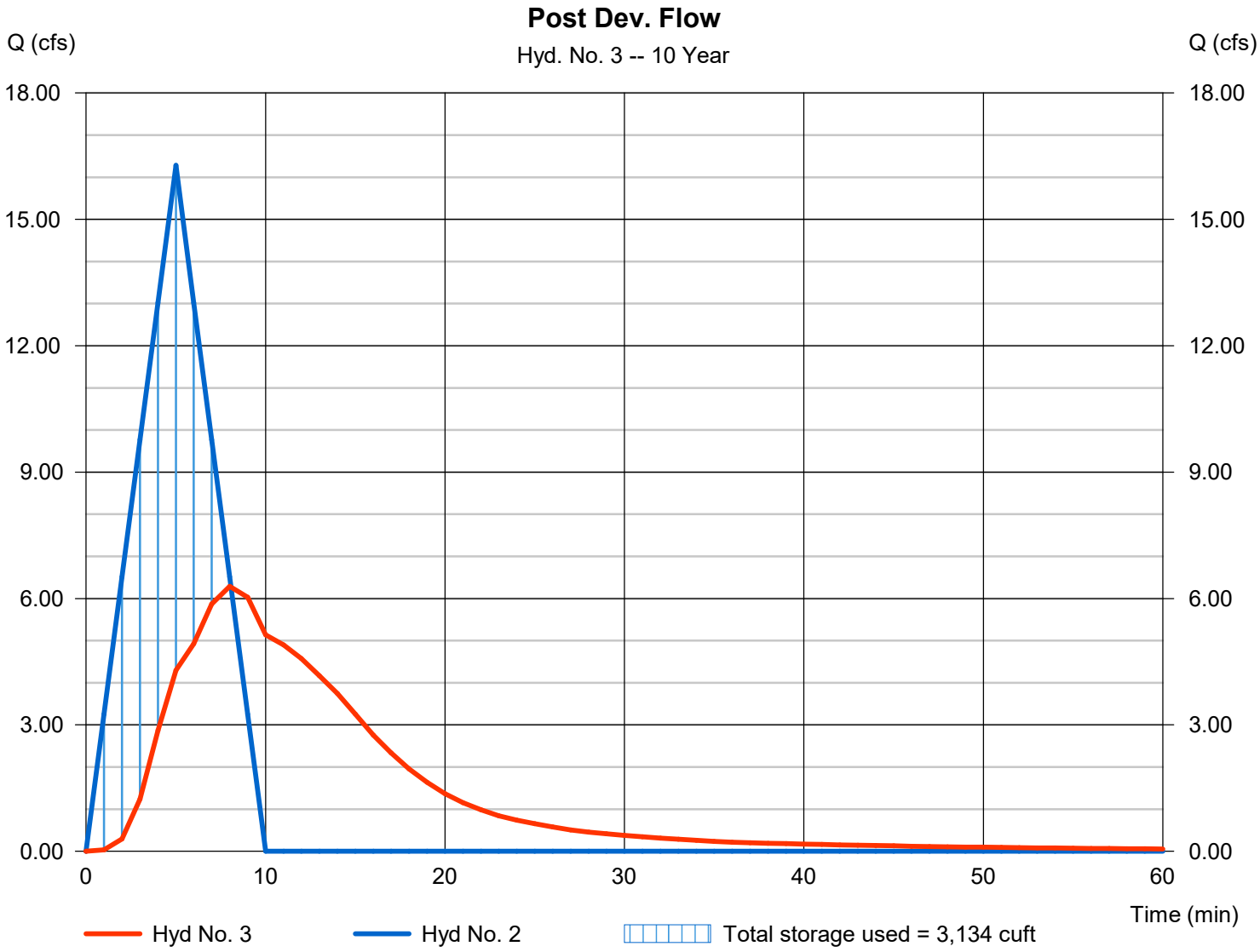
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	6.287 cfs
Storm frequency	=	10 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	4,881 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	352.66 ft
Reservoir name	=	detention	Max. Storage	=	3,134 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	17.25	1	5	5,174	------	------	------	Pre-Development
2	Rational	18.68	1	5	5,605	------	------	------	Dev. Generated Flow
3	Reservoir	7.520	1	8	5,602	2	352.85	3,539	Post Dev. Flow

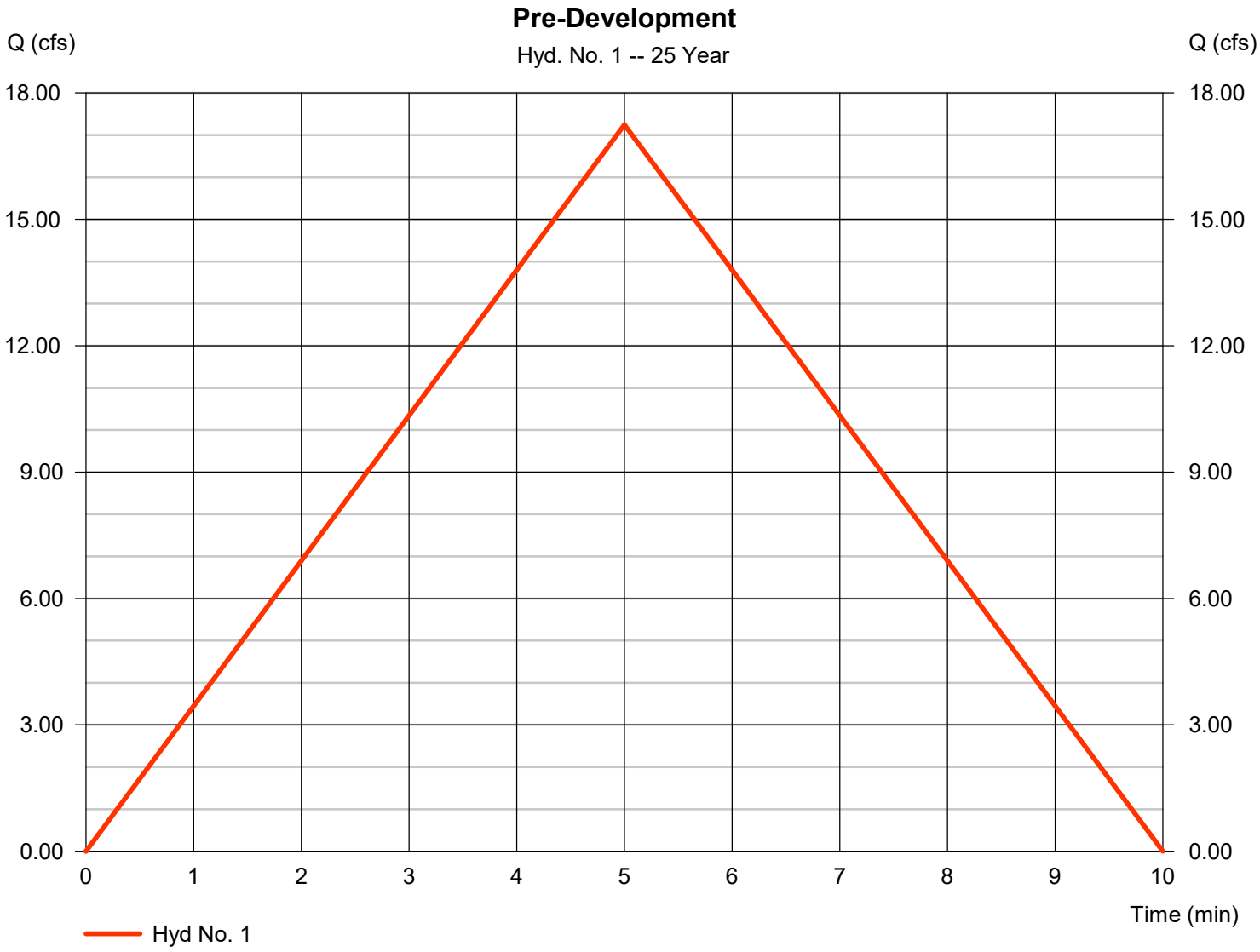
Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	17.25 cfs
Storm frequency	=	25 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	5,174 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	9.356 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560

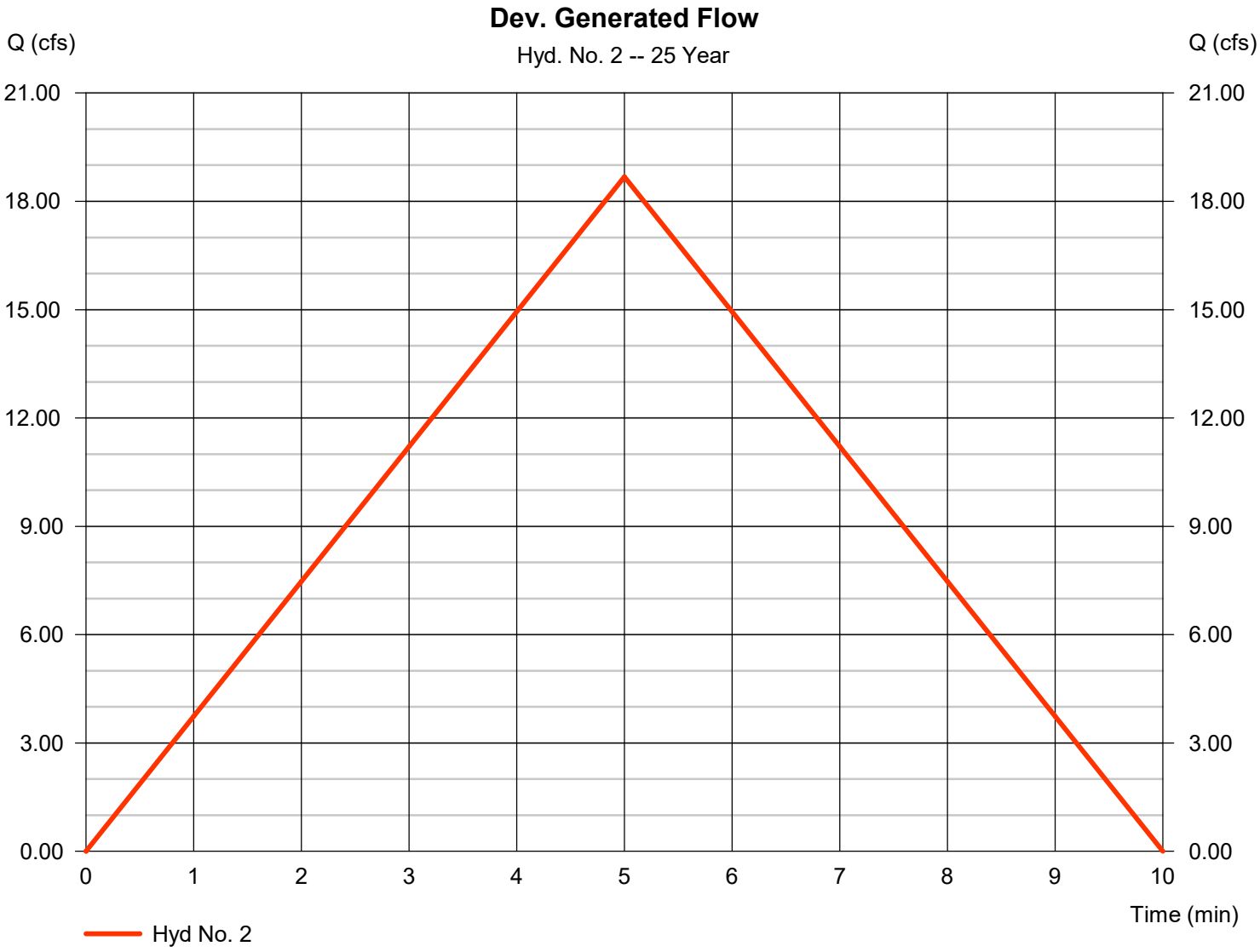


Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	18.68 cfs
Storm frequency	=	25 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	5,605 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	9.356 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



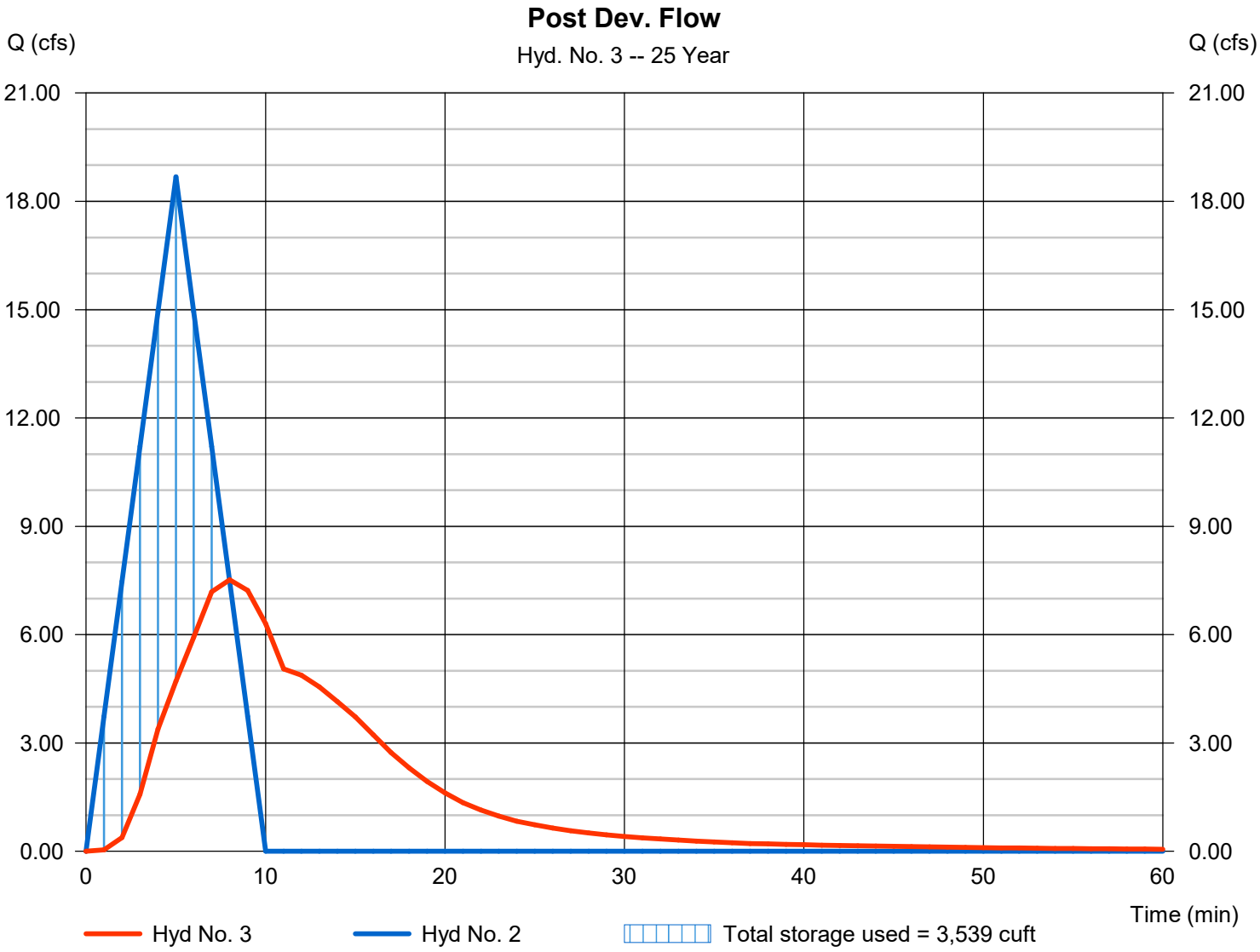
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	7.520 cfs
Storm frequency	=	25 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	5,602 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	352.85 ft
Reservoir name	=	detention	Max. Storage	=	3,539 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	18.98	1	5	5,695	------	------	------	Pre-Development
2	Rational	20.57	1	5	6,170	------	------	------	Dev. Generated Flow
3	Reservoir	8.389	1	8	6,167	2	352.99	3,867	Post Dev. Flow

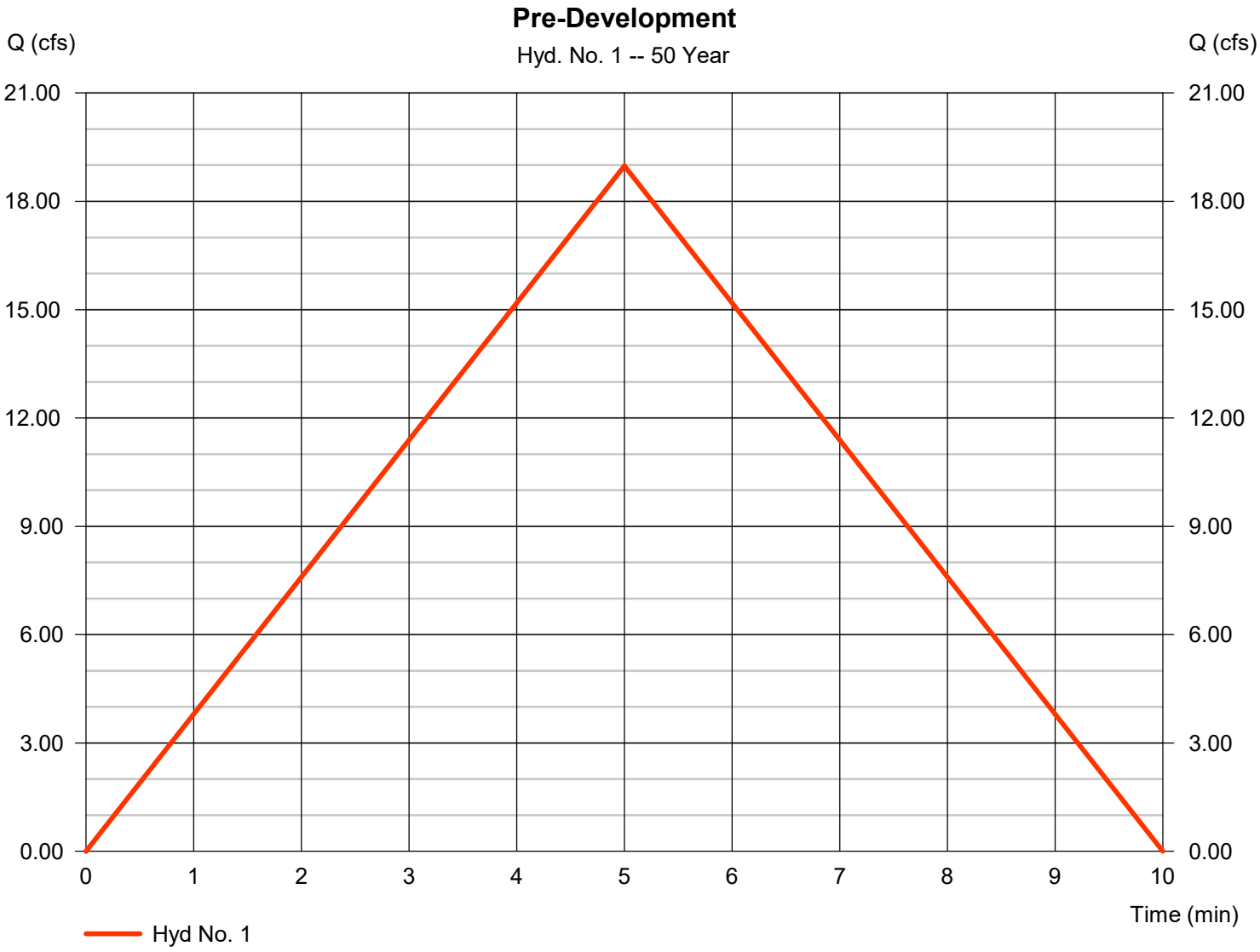
Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	18.98 cfs
Storm frequency	=	50 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	5,695 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	10.300 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560

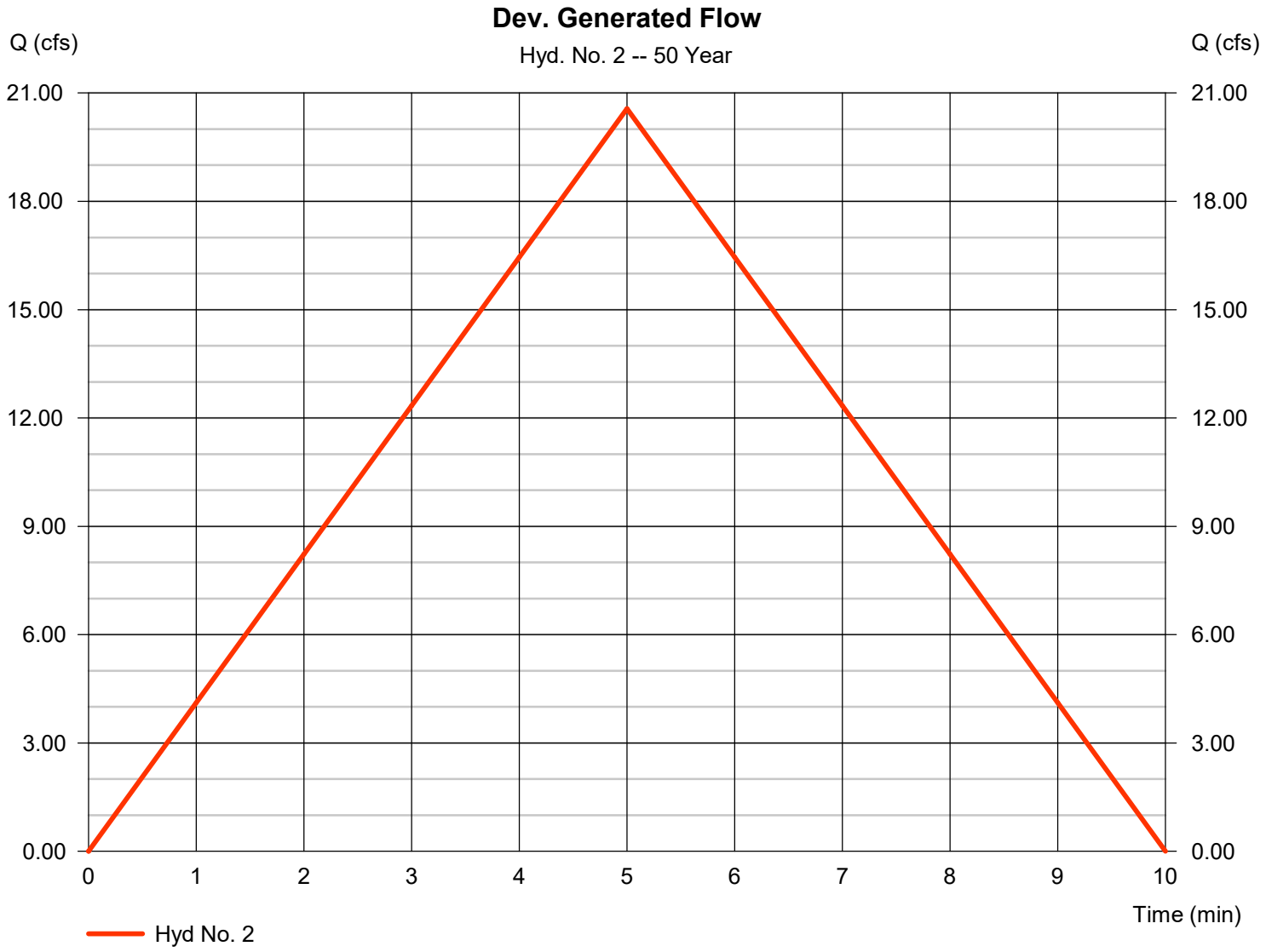


Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	20.57 cfs
Storm frequency	=	50 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	6,170 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	10.300 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



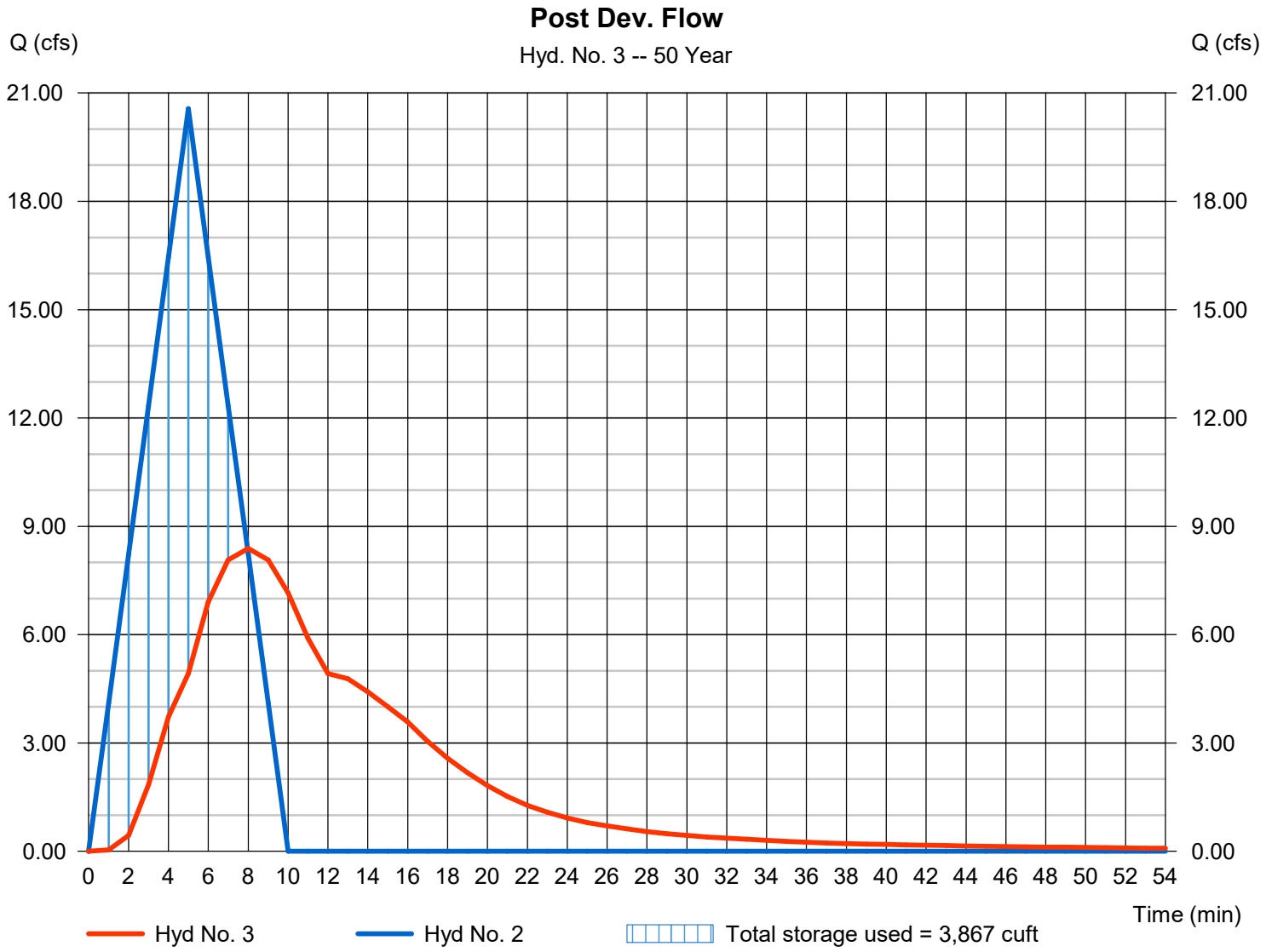
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	8.389 cfs
Storm frequency	=	50 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	6,167 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	352.99 ft
Reservoir name	=	detention	Max. Storage	=	3,867 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	Rational	20.42	1	5	6,126	------	------	------	Pre-Development
2	Rational	22.12	1	5	6,636	------	------	------	Dev. Generated Flow
3	Reservoir	9.706	1	8	6,633	2	353.08	4,113	Post Dev. Flow

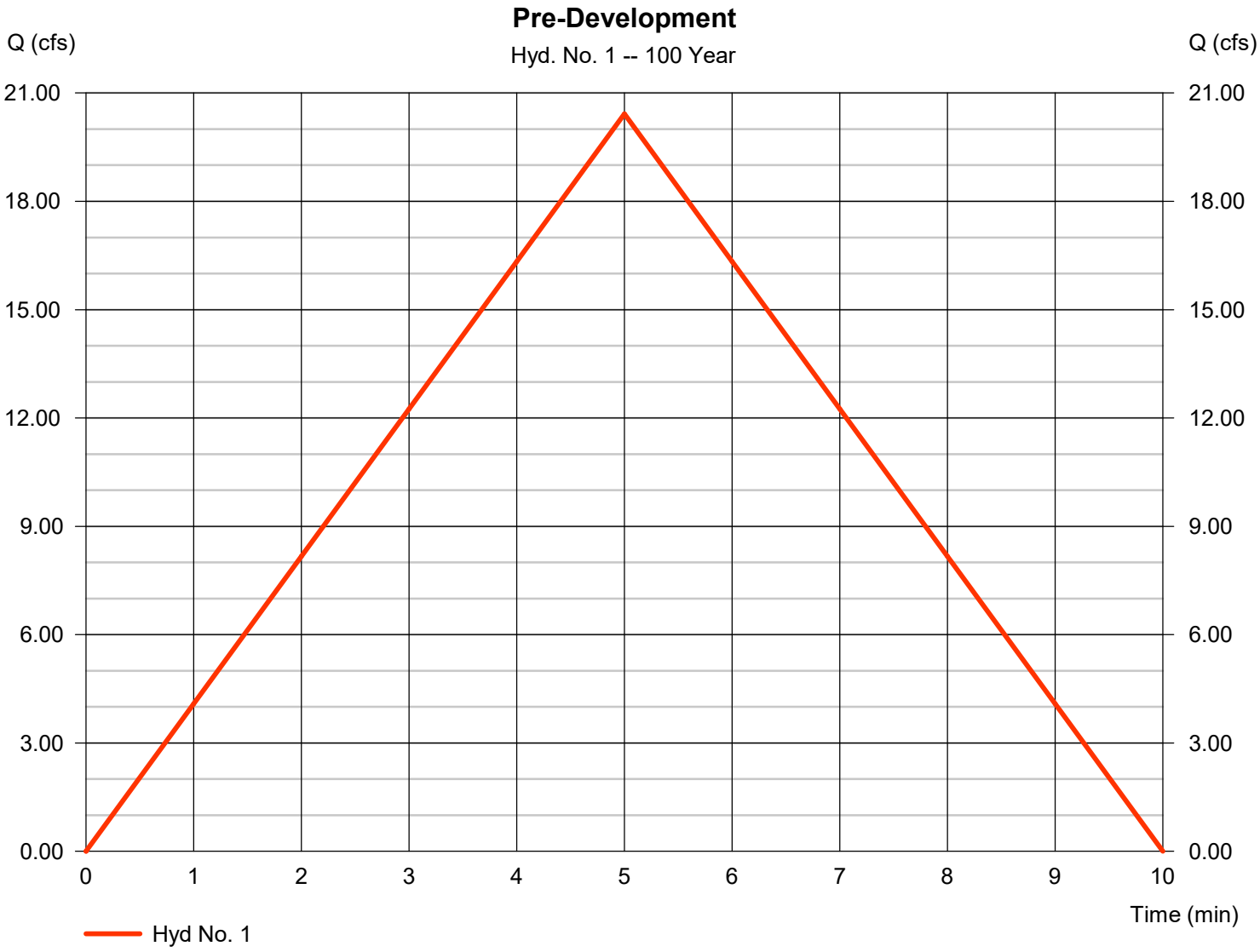
Hydrograph Report

Hyd. No. 1

Pre-Development

Hydrograph type	=	Rational	Peak discharge	=	20.42 cfs
Storm frequency	=	100 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	6,126 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.72*
Intensity	=	11.078 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1

* Composite (Area/C) = [(11.990 x 0.44) + (4.630 x 0.90)] / 2.560

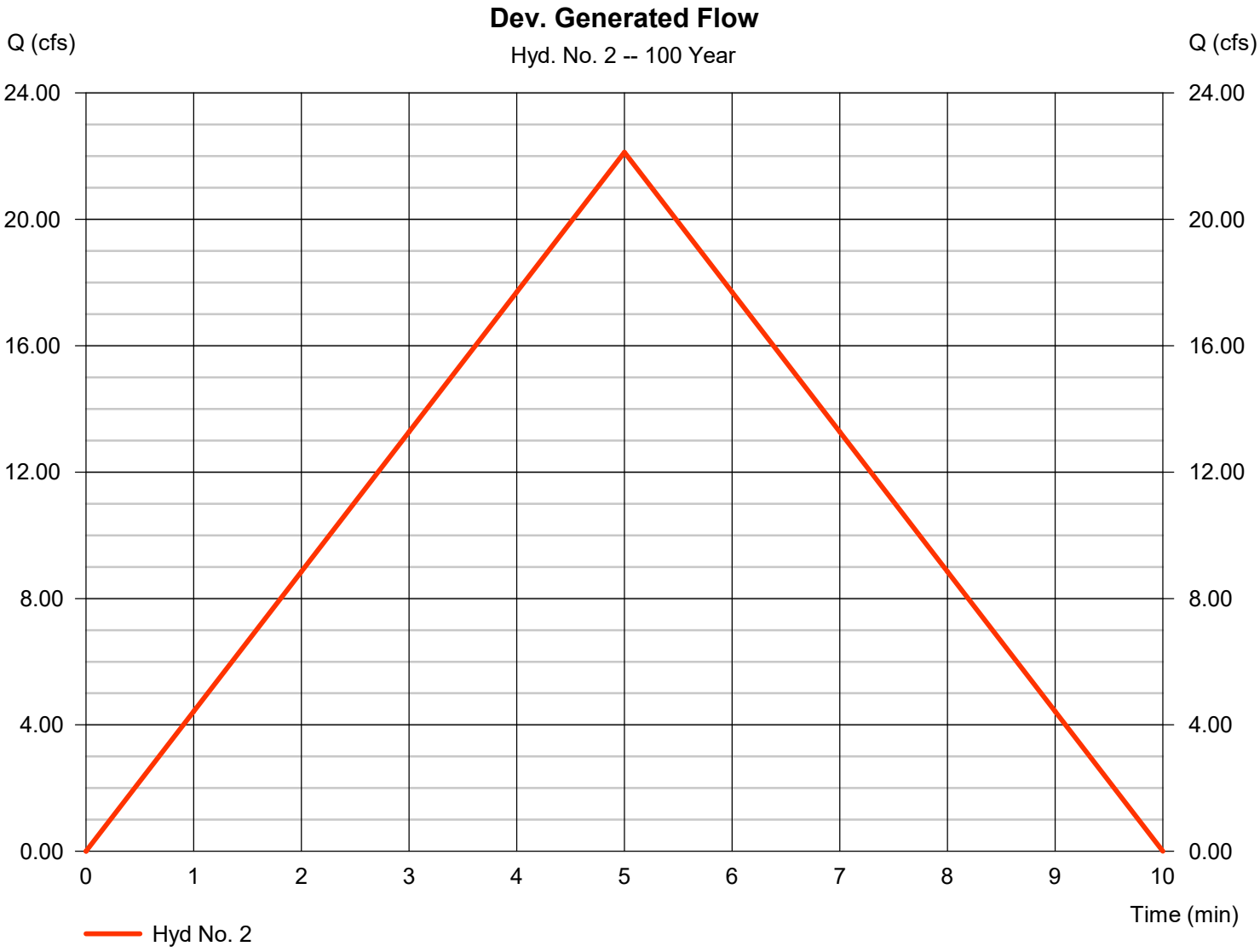


Hydrograph Report

Hyd. No. 2

Dev. Generated Flow

Hydrograph type	=	Rational	Peak discharge	=	22.12 cfs
Storm frequency	=	100 yrs	Time to peak	=	5 min
Time interval	=	1 min	Hyd. volume	=	6,636 cuft
Drainage area	=	2.560 ac	Runoff coeff.	=	0.78
Intensity	=	11.078 in/hr	Tc by User	=	5.00 min
IDF Curve	=	BRYANT.IDF	Asc/Rec limb fact	=	1/1



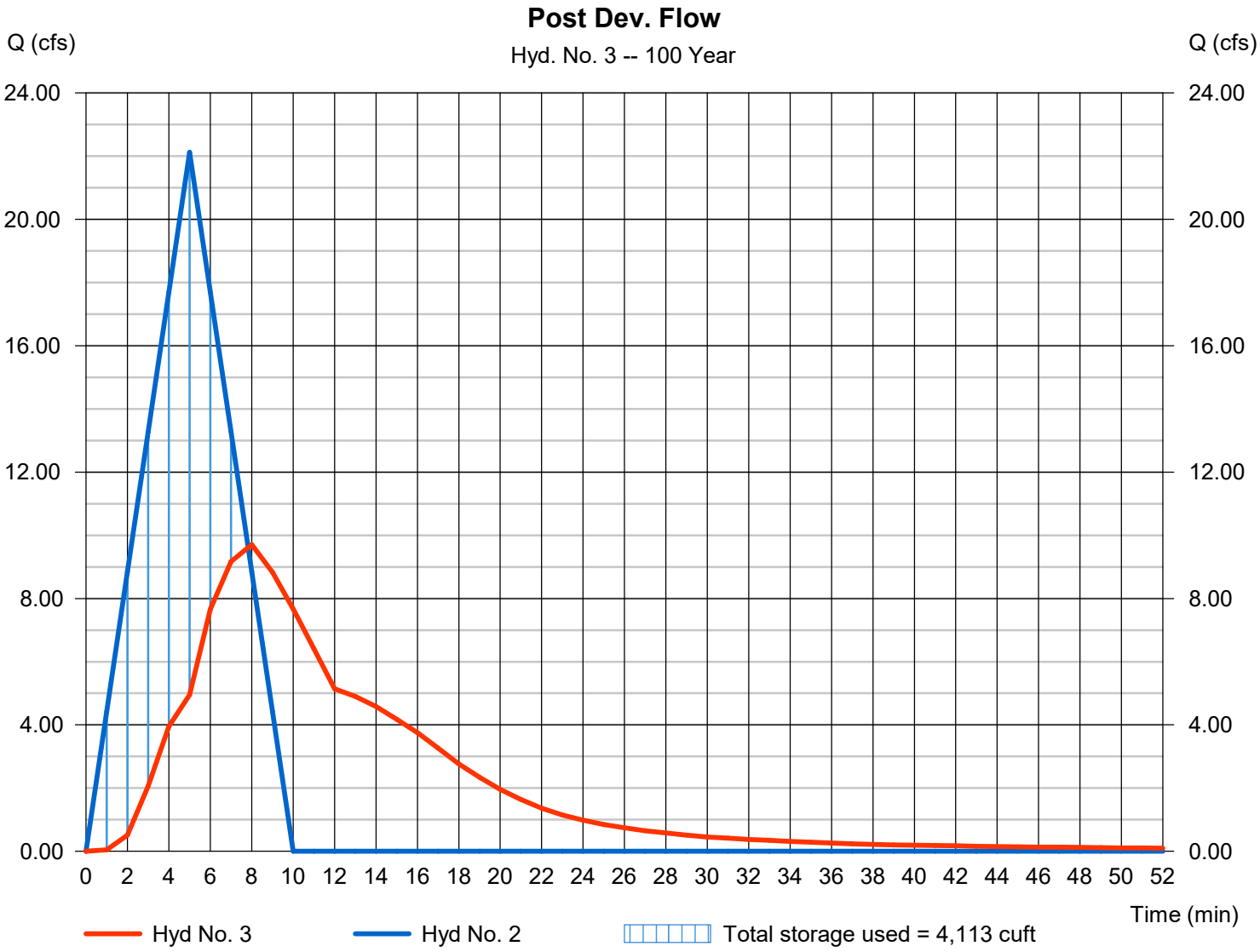
Hydrograph Report

Hyd. No. 3

Post Dev. Flow

Hydrograph type	=	Reservoir	Peak discharge	=	9.706 cfs
Storm frequency	=	100 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	6,633 cuft
Inflow hyd. No.	=	2 - Dev. Generated Flow	Max. Elevation	=	353.08 ft
Reservoir name	=	detention	Max. Storage	=	4,113 cuft

Storage Indication method used.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	23.7902	4.9000	0.6469	--------
2	29.4041	5.6000	0.6664	--------
3	0.0000	0.0000	0.0000	--------
5	34.6508	5.6000	0.6634	--------
10	39.6208	5.7000	0.6670	--------
25	45.2262	5.7000	0.6648	--------
50	46.6831	5.2000	0.6507	--------
100	48.6942	5.1000	0.6402	--------

File name: BRYANT.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	5.40	4.14	3.44	2.97	2.64	2.39	2.19	2.03	1.90	1.78	1.69	1.60
2	6.10	4.71	3.92	3.39	3.01	2.72	2.49	2.31	2.15	2.02	1.91	1.81
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	7.24	5.60	4.66	4.03	3.58	3.24	2.97	2.75	2.57	2.41	2.28	2.16
10	8.15	6.31	5.25	4.54	4.04	3.65	3.34	3.10	2.89	2.71	2.56	2.43
25	9.36	7.25	6.03	5.23	4.64	4.20	3.85	3.56	3.33	3.12	2.95	2.80
50	10.30	7.94	6.60	5.72	5.08	4.60	4.22	3.91	3.65	3.43	3.24	3.08
100	11.08	8.56	7.13	6.19	5.51	4.99	4.58	4.25	3.97	3.74	3.54	3.36

Tc = time in minutes. Values may exceed 60.

Precip. file name: C:\Documents and Settings\Will\Desktop\Fleming\fleming.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3.50	0.00	0.00	4.80	5.40	0.00	6.70

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NOAA Atlas 14, Volume 9, Version 2
Location name: Bryant, Arkansas, USA*
Latitude: 34.6406°, Longitude: -92.4706°
Elevation: 388 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.450** (0.363-0.553)	**0.510** (0.411-0.627)	**0.605** (0.486-0.745)	**0.681** (0.544-0.843)	**0.782** (0.603-0.990)	**0.858** (0.647-1.10)	**0.930** (0.679-1.22)	**1.00** (0.703-1.35)	**1.09** (0.738-1.51)	**1.16** (0.764-1.64)
10-min	**0.659** (0.532-0.809)	**0.746** (0.602-0.917)	**0.885** (0.711-1.09)	**0.997** (0.797-1.23)	**1.15** (0.883-1.45)	**1.26** (0.948-1.61)	**1.36** (0.995-1.79)	**1.47** (1.03-1.98)	**1.60** (1.08-2.22)	**1.69** (1.12-2.40)
15-min	**0.803** (0.648-0.987)	**0.910** (0.734-1.12)	**1.08** (0.867-1.33)	**1.22** (0.972-1.50)	**1.40** (1.08-1.77)	**1.53** (1.16-1.97)	**1.66** (1.21-2.18)	**1.79** (1.26-2.41)	**1.95** (1.32-2.70)	**2.06** (1.36-2.92)
30-min	**1.20** (0.966-1.47)	**1.36** (1.10-1.67)	**1.62** (1.30-2.00)	**1.83** (1.46-2.26)	**2.10** (1.62-2.66)	**2.30** (1.74-2.96)	**2.50** (1.82-3.28)	**2.68** (1.88-3.62)	**2.92** (1.97-4.05)	**3.09** (2.04-4.37)
60-min	**1.60** (1.29-1.97)	**1.81** (1.46-2.23)	**2.16** (1.73-2.66)	**2.43** (1.94-3.01)	**2.80** (2.16-3.55)	**3.08** (2.33-3.96)	**3.36** (2.45-4.42)	**3.63** (2.55-4.90)	**3.98** (2.69-5.52)	**4.23** (2.80-5.98)
2-hr	**2.01** (1.63-2.44)	**2.27** (1.84-2.77)	**2.69** (2.18-3.29)	**3.04** (2.45-3.73)	**3.51** (2.73-4.42)	**3.86** (2.94-4.94)	**4.22** (3.11-5.52)	**4.57** (3.23-6.14)	**5.03** (3.43-6.94)	**5.37** (3.57-7.55)
3-hr	**2.26** (1.85-2.74)	**2.55** (2.08-3.10)	**3.03** (2.47-3.69)	**3.43** (2.78-4.19)	**3.98** (3.12-5.01)	**4.41** (3.38-5.63)	**4.84** (3.59-6.32)	**5.28** (3.76-7.08)	**5.87** (4.02-8.08)	**6.31** (4.21-8.83)
6-hr	**2.71** (2.24-3.26)	**3.08** (2.54-3.71)	**3.70** (3.04-4.47)	**4.23** (3.46-5.13)	**4.99** (3.95-6.26)	**5.60** (4.33-7.10)	**6.22** (4.65-8.08)	**6.86** (4.92-9.16)	**7.75** (5.35-10.6)	**8.43** (5.67-11.7)
12-hr	**3.20** (2.66-3.81)	**3.68** (3.06-4.39)	**4.50** (3.73-5.39)	**5.23** (4.30-6.28)	**6.27** (5.02-7.83)	**7.12** (5.56-9.00)	**8.00** (6.03-10.4)	**8.93** (6.46-11.9)	**10.2** (7.11-14.0)	**11.2** (7.60-15.5)
24-hr	**3.74** (3.14-4.43)	**4.34** (3.64-5.14)	**5.36** (4.48-6.37)	**6.27** (5.21-7.48)	**7.60** (6.14-9.44)	**8.68** (6.84-10.9)	**9.83** (7.47-12.6)	**11.0** (8.05-14.6)	**12.7** (8.93-17.3)	**14.1** (9.59-19.3)
2-day	**4.38** (3.71-5.14)	**5.05** (4.27-5.94)	**6.22** (5.24-7.32)	**7.25** (6.07-8.57)	**8.76** (7.14-10.8)	**10.0** (7.94-12.5)	**11.3** (8.67-14.5)	**12.7** (9.34-16.7)	**14.7** (10.4-19.8)	**16.2** (11.1-22.1)
3-day	**4.80** (4.08-5.60)	**5.51** (4.69-6.45)	**6.75** (5.72-7.91)	**7.83** (6.60-9.22)	**9.42** (7.70-11.5)	**10.7** (8.54-13.3)	**12.1** (9.28-15.3)	**13.5** (9.95-17.6)	**15.5** (11.0-20.8)	**17.1** (11.7-23.2)
4-day	**5.12** (4.38-5.97)	**5.88** (5.02-6.85)	**7.17** (6.09-8.37)	**8.29** (7.01-9.73)	**9.91** (8.13-12.1)	**11.2** (8.98-13.9)	**12.6** (9.72-15.9)	**14.0** (10.4-18.3)	**16.0** (11.4-21.5)	**17.6** (12.2-23.9)
7-day	**5.94** (5.11-6.87)	**6.77** (5.82-7.83)	**8.16** (6.99-9.47)	**9.36** (7.97-10.9)	**11.1** (9.13-13.4)	**12.4** (10.0-15.2)	**13.9** (10.8-17.4)	**15.3** (11.4-19.8)	**17.3** (12.4-23.0)	**18.9** (13.1-25.5)
10-day	**6.72** (5.81-7.74)	**7.58** (6.55-8.74)	**9.03** (7.77-10.4)	**10.3** (8.77-11.9)	**12.0** (9.93-14.4)	**13.4** (10.8-16.3)	**14.8** (11.5-18.5)	**16.3** (12.1-20.9)	**18.3** (13.1-24.2)	**19.8** (13.8-26.6)
20-day	**9.11** (7.94-10.4)	**10.0** (8.75-11.5)	**11.6** (10.1-13.3)	**12.9** (11.1-14.8)	**14.7** (12.2-17.4)	**16.0** (13.1-19.3)	**17.4** (13.7-21.5)	**18.9** (14.2-24.0)	**20.7** (15.0-27.2)	**22.2** (15.6-29.6)
30-day	**11.1** (9.69-12.6)	**12.1** (10.6-13.8)	**13.9** (12.1-15.8)	**15.4** (13.3-17.6)	**17.3** (14.5-20.4)	**18.8** (15.4-22.5)	**20.3** (16.0-24.9)	**21.8** (16.4-27.5)	**23.7** (17.1-30.9)	**25.1** (17.7-33.4)
45-day	**13.4** (11.8-15.1)	**14.8** (13.0-16.7)	**17.0** (15.0-19.3)	**18.9** (16.4-21.5)	**21.3** (17.8-24.9)	**23.1** (18.9-27.4)	**24.8** (19.6-30.2)	**26.5** (20.0-33.3)	**28.7** (20.8-37.1)	**30.2** (21.4-40.0)
60-day	**15.3** (13.5-17.2)	**17.1** (15.1-19.2)	**19.9** (17.5-22.5)	**22.1** (19.4-25.1)	**25.1** (21.1-29.2)	**27.2** (22.4-32.2)	**29.3** (23.2-35.6)	**31.3** (23.7-39.2)	**33.8** (24.6-43.6)	**35.6** (25.2-47.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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