HAWKINS VALLEY
DRAINAGE CALCULATIONS – SUMMARY
1/29/2025

DESCRIPTION OF PROJECT

Hawkins Valley subdivision is an approximately 9.35 Acre development located in the Saline County, Arkansas east of Springhill Road. There is a large drainage basin on the site. Detention pond is located on the northeast corner of the site and discharged on the existing creek.

Stormwater Calculations were prepared with the intent to comply with the City of Bryant's Drainage Code. The primary intent of this analysis is to produce a drainage system adequately sized to convey post development runoff while attenuating post development discharge levels equal to or less than pre development flows.

Hydraulic calculations were made using the Rational Method. Design frequencies were analyzed for 2, 5, 10, 25, 50, and 100-year return periods.

These calculations are divided into the following sections:

Summary of Drainage Basins

Summary of Inlets

Summary of Pipes

Pipe Network Storage Summary

Appendices

Exhibit A – Pre-Development Drainage Basins

Exhibit B – Post-Development Drainage Basins

HAWKINS VALLEY
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SUMMARY OF DRAINAGE BASINS

PRE-DEVELOPMENT CONDITIONS

The entire area for pre-existing drainage area of the site drains to a creek to the east. There is a drainage basin in the site that flows onto the creek. Discharge will be captured and detained.

POST-DEVELOPMENT CONDITIONS

As previously described, this site is being developed into a residential subdivision. Slopes range from 1% to 10%. Runoff drains from the developed areas to detention pond on the northeast corner of the site. 100-year storm event is considered for detention. A concrete control structure is used to release the water without the loss of life or major property damage.

SUMMARY OF INLETS

On the drainage plan you will see labels for all of the inlets for these calculations. The flows shown are for the 25-year return storm. The distance from the back of the curb to the center of the street is 18 feet. One lane of traffic remains unobstructed by storm sewer discharges during a 25-year storm event.

SUMMARY OF PIPES

All pipes used in this project are HDPE and RCP. Therefore, a manning's of 0.012 was used on all pipes in the analysis.

POND SUMMARY

The pond in these calculations detains flows from all of the runoff of the site. The pond is located on the northeast corner of the site. Water collected in the storm water system is discharged into the pond via a pipe culvert and a ditch. A concrete control structure is constructed on the eastern edge of the pond. This control structure uses a slotted weir to limit the discharge through the structure to that of the pre-development flow. The Pond volume is designed to hold the 100-year storm event and a factor of safety of 25% is added on detention volumes.

Stormwater Calcs - Hawkins Valley
Using Rational Method

Pre-development

Calculated Tc values - Drainage Basin 1

							Shallow Concentrated												Shallow Concentrated									
Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Tsc =	$\frac{L}{60V}$	minutes	Flow	Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow	Tsc =	$\frac{L}{60V}$	minutes	Flow	Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow	Tsc =	$\frac{L}{60V}$	minutes	Open Channel
			V=	16.1345 * S^0.5	ft/sec	Unpaved	V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec		V=	16.1345 * S^0.5	ft/sec	Unpaved	V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec		V=	$\frac{1.49*(R)^{(2/3)}*S^{0.5}}{n}$	ft/sec	Open Channel
L1 =	150	feet	L1 =	400	feet		L1 =	50	feet		L1 =	570	feet		L1 =	50	feet		L1 =	1480	feet	
n1 =	0.6	Deciduous Timber					D=	2	feet						D=	2	feet		R=	0.95	feet	(V-Ditch 2 ' ht., 3:1 Slope)
S1 =	0.053	ft/ft	S1 =	0.070	ft/ft		S1 =	0.010	ft/ft		S1 =	0.016	ft/ft		S1 =	0.010	ft/ft		S1 =	0.026	ft/ft	
			$V_{calculated}$ =	4.27	ft/sec		n=	0.013			$V_{calculated}$ =	2.03	ft/sec		n=	0.013			n=	0.022	earth with short grass, few weeds
							$V_{calculated}$ =	7.22	ft/sec						$V_{calculated}$ =	7.22	ft/sec		$V_{calculated}$ =	4.16	ft/sec	
$Tc_{calculated}$	16.35	minutes	$Tc_{calculated}$	1.56	minutes		$Tc_{calculated}$	0.12	minutes		$Tc_{calculated}$	4.69	minutes		$Tc_{calculated}$	0.12	minutes		$Tc_{calculated}$	5.93	minutes	
Tc =	28.76	minutes																				
Use Tc =	**29.0**	minutes	I_{100} =	5.6	Inches/hr	I_{10} =	3.9	Inches/hr														
			I_{50} =	5.1	Inches/hr	I_5 =	3.5	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual													
			I_{25} =	4.6	Inches/hr	I_2 =	2.8	Inches/hr														

Stormwater Calcs - Hawkins Valley
Using Rational Method

Pre-development

Calculated Tc values - Drainage Basin 1

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Tsc =	$\frac{L}{60V}$	minutes	Shallow Cc	Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concen	Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow	Tsc =	$\frac{L}{60V}$	minutes	Open Channel		
			V=	16.1345 * S^0.5	ft/sec	Unpaved	V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec		V=	16.1345 * S^0.5	ft/sec	Unpaved	V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec		V=	$\frac{1.49*(R)^{(2/3)}*S^{0.5}}{n}$	ft/sec	Open Channel		
L1 =	150	feet	L1 =	400	feet		L1 =	50	feet		L1 =	570	feet		L1 =	50	feet		L1 =	1480	feet			
n1 =	0.6	Deciduous Timber					D=	2	feet						D=	2	feet		R=	0.95	feet	(V-Ditch 2 ' ht.,		
S1 =	0.053	ft/ft	S1 =	0.070	ft/ft		S1 =	0.010	ft/ft		S1 =	0.016	ft/ft		S1 =	0.010	ft/ft		S1 =	0.026	ft/ft	3:1 Slope)		
			$V_{calculated}$ =	4.27	ft/sec		n=	0.013			$V_{calculated}$ =	2.03	ft/sec		n=	0.013			n=	0.022	earth with short grass, few		
							$V_{calculated}$ =	7.22	ft/sec						$V_{calculated}$ =	7.22	ft/sec		$V_{calculated}$ =	4.16	ft/sec			
$Tc_{calculated}$	16.35	minutes	$Tc_{calculated}$	1.56	minutes		$Tc_{calculated}$	0.12	minutes		$Tc_{calculated}$	4.69	minutes		$Tc_{calculated}$	0.12	minutes		$Tc_{calculated}$	5.93	minutes			
Tc =	28.76	minutes																						
Use Tc =	**29.0**	minutes	I_{100} =	5.6	Inches/hr	I_{10} =	3.9	Inches/hr																
			I_{50} =	5.1	Inches/hr	I_5 =	3.5	Inches/hr		i from Exhibit 400-1 of Bryant Drainage Manual														
			I_{25} =	4.6	Inches/hr	I_2 =	2.8	Inches/hr																

Stormwater Calcs - Hawkins Valley
using Rational Method

Pre-development

Calculated C values - Drainage Basin 1

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2
Undeveloped	44.03	0.47	0.43	0.4	0.36	0.34	0.31
Total Area =	**44.03**	**0.47**	**0.43**	**0.40**	**0.36**	**0.34**	**0.31**

(C values taken from Table 400-1 of City of Bryant Drainage Manual)

Woodlands, Average, 2-7%

Stormwater Calcs - Hawkins Valley
using Rational Method

Post-development

Calculated C values - Drainage Basin 1A

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2
Undeveloped	34.68	0.47	0.43	0.4	0.36	0.34	0.31
Single Family House	9.35	0.70	0.65	0.60	0.50	0.45	0.40
Total Area =	**44.03**	**0.52**	**0.48**	**0.44**	**0.39**	**0.36**	**0.33**

(C values taken from Table 400-1 of City of Bryant Drainage Manual)
(C values taken from Page-50 of City of Bryant Drainage Manual)

Stormwater Calcs - Hawkins Valley
using Rational Method

Pre-development

Drainage Basin 1

Q_{100} =	115.89	CFS	Q_{50}=	96.56	CFS	Q_{25} =	81.02	CFS	Q_{10} =	61.82	CFS
c =	0.47		c =	0.43		c =	0.40		c =	0.36	
i=	5.60	in/hr	i=	5.10	in/hr	i=	4.60	in/hr	i=	3.90	in/hr
A=	44.03	acres	A=	44.03	acres	A=	44.03	acres	A=	44.03	acres

Q_{5} =	52.40	CFS	Q_{2} =	38.22	CFS	
c =	0.34		c =	0.31		
i=	3.50	in/hr	i=	2.80	in/hr	
A=	44.03	acres	A=	44.03	acres	

Post-development

Drainage Basin 1

Q_{100} =	127.93	CFS	Q_{50}=	107.05	CFS	Q_{25} =	89.62	CFS	Q_{10} =	66.92	CFS
c =	0.52		c =	0.48		c =	0.44		c =	0.39	
i=	5.60	in/hr	i=	5.10	in/hr	i=	4.60	in/hr	i=	3.90	in/hr
A=	44.03	acres	A=	44.03	acres	A=	44.03	acres	A=	44.03	acres

Q_{5} =	56.00	CFS	Q_{2} =	40.57	CFS	
c =	0.36		c =	0.33		
i=	3.50	in/hr	i=	2.80	in/hr	
A=	44.03	acres	A=	44.03	acres	

Stormwater Calcs - Hawkins Valley
using Rational Method
Culvert Capacities

CI-1
Q_{25} = 1.44 CFS
c = 0.86 Road/Asphalt
i= 8.4 in/hr
A= 0.20 acres

CI-2
Q_{25} = 1.37 CFS
c = 0.86 Road/Asphalt
i= 8.4 in/hr
A= 0.19 acres

CI-3
Q_{25} = 6.99 CFS
c = 0.64 Road/Asphalt
i= 8.4 in/hr
A= 1.30 acres

CI-4
Q_{25} = 1.23 CFS
c = 0.86 Road/Asphalt
i= 8.4 in/hr
A= 0.17 acres

CI-5
Q_{25} = 1.16 CFS
c = 0.86 Road/Asphalt
i= 8.4 in/hr
A= 0.16 acres

Pipe Name	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic	Flow Capacity (cfs)	% Capacity
18" RCP	CI-1	CI-2	1.44	0.0210	18	1	0.012	1.77	4.712	0.375	16.49	9%
18" HDPE	CI-2	CI-4	2.82	0.0310	18	1	0.012	1.77	4.712	0.375	20.04	14%
18" RCP	CI-3	CI-4	9.81	0.0140	18	1	0.012	1.77	4.712	0.375	13.46	73%
18" HDPE	CI-4	CI-5	11.03	0.0310	18	1	0.012	1.77	4.712	0.375	20.04	55%

Stormwater Calcs - Hawkins Valley
Using Rational Method

Mannings equation for ditch

n= 0.022 based on n for open channel earth with short grass, few weeds

Slope= 3 :1

Depth (ft)	Bottom (ft)	Top (ft)	area (ft^2)	rH	slope (ft/ft)	Velocity (ft/s)	Q (cfs)
2	1	13	14	1.03	0.01	6.89	96.44

Stormwater Calcs - Hawkins Valley
using Rational Method
Weir Sizing

Storm Event	Flow (cfs)
Q2 - Pre	38.22
Q10 - Pre	61.82
Q25 - Pre	81.02
Q50 - Pre	96.56
Q100 - Pre	115.89
Q2 - Post	40.57
Q10 - Post	66.92
Q25 - Post	89.62
Q50 - Post	107.05
Q100 - Post	127.93

Rectangular Weir

Q2

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**5.75**	5.75'
H	**1.9**	
Q (cfs)	**37.65**	

Q10

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**5.75**	5.75'
H	**2.6**	
Q (cfs)	**60.27**	

Q25

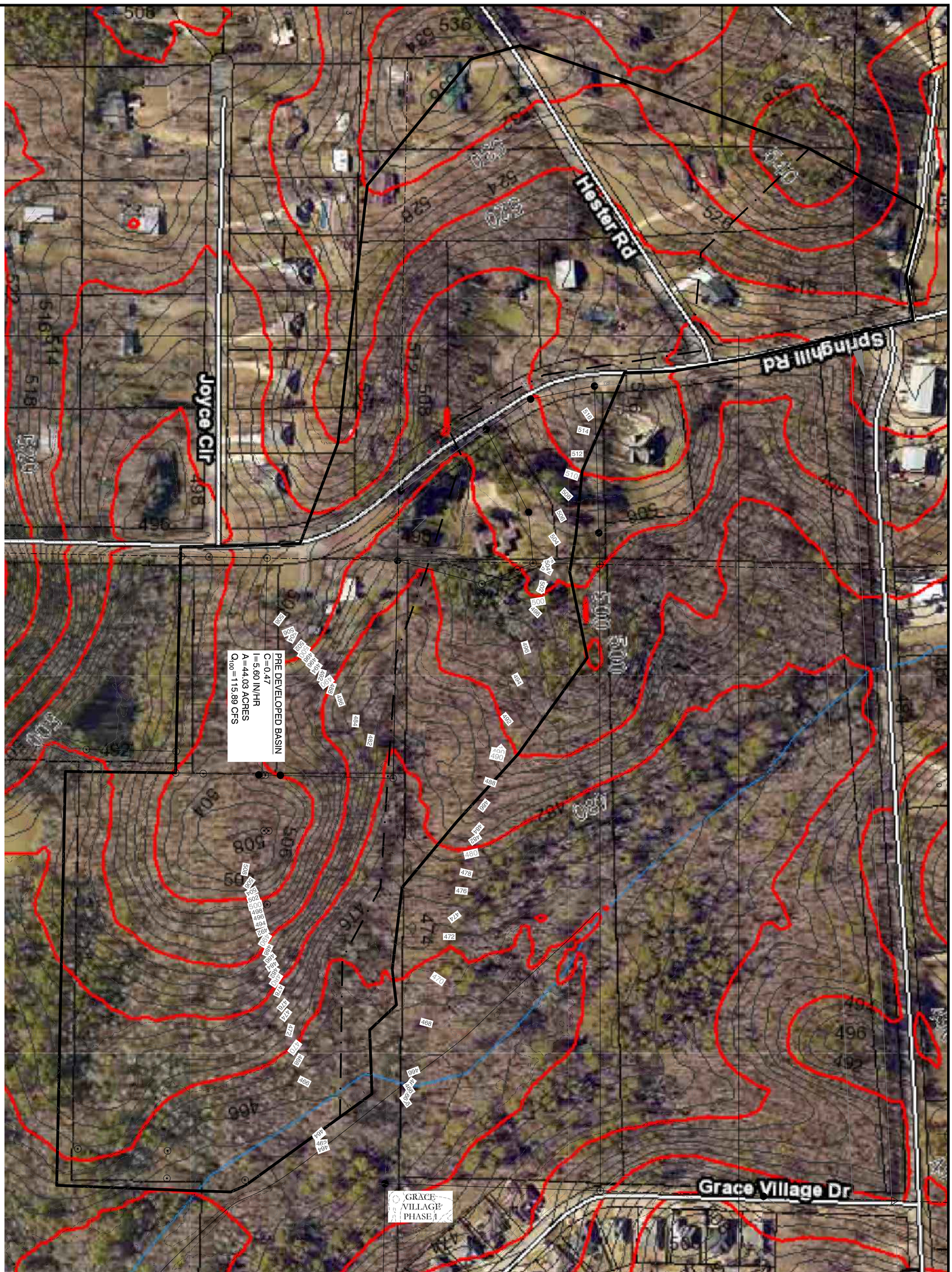
Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**5.75**	5.75'
H	**3.15**	
Q (cfs)	**80.37**	

Q50

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**5.75**	5.75'
H	**3.55**	
Q (cfs)	**96.15**	

Q100

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**5.75**	5.75'
H	**4**	
Q (cfs)	**115.00**	



SHEET NO:	DATE:	PROJECT NO:	CONTENTS:
1.0	JAN 2025	24076	PRE DRAINAGE BASIN

PRELIMINARY

FOR: THOMAS DB COLLINS, LTD, LLC
HAWKINS VALLEY
PHASE 1
SALINE COUNTY, ARKANSAS

GNE Designing our client's success

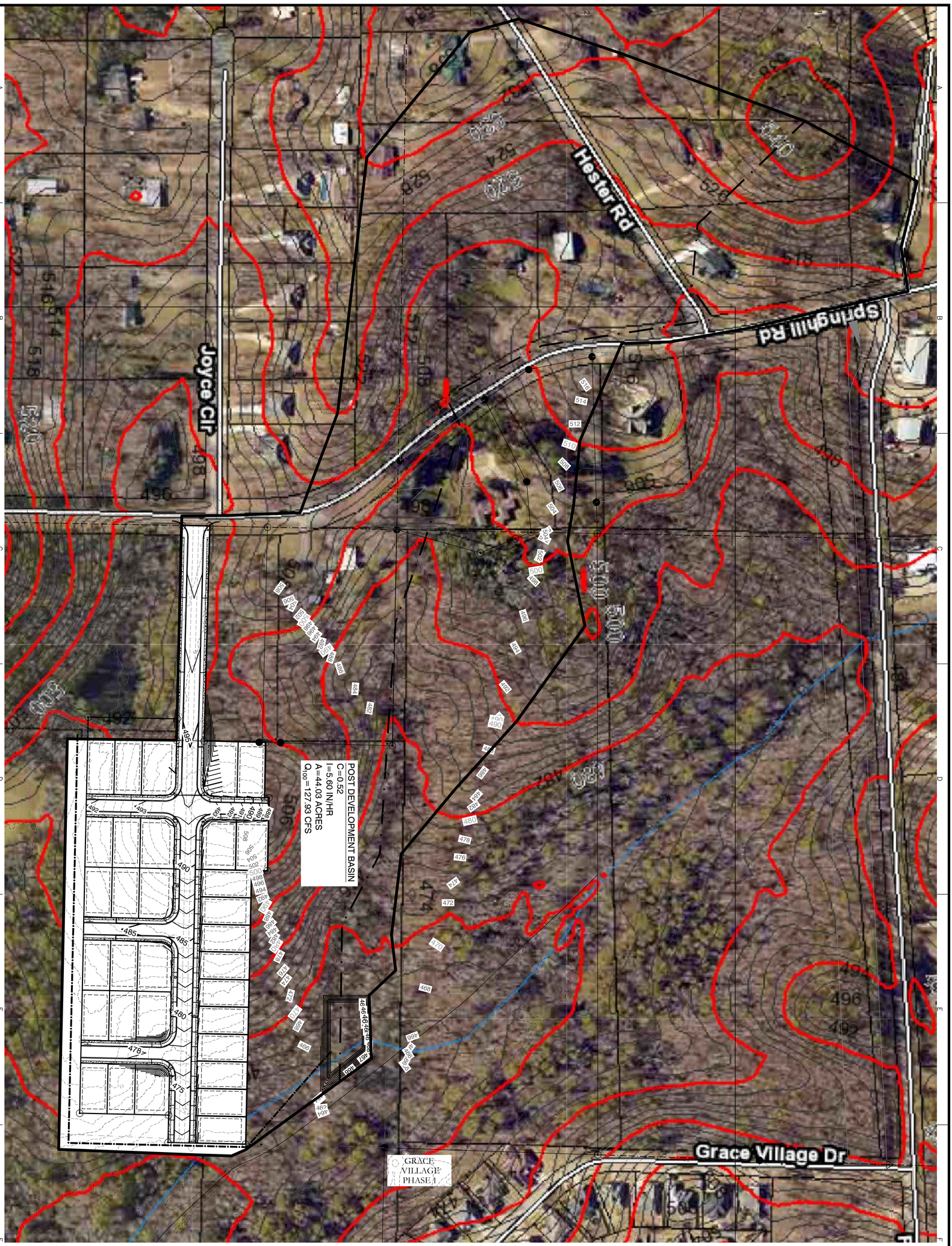
GarNat Engineering, LLC

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3825 Mt Carmel Rd
Bryant, AR 72022
garnatengineering@gmail.com

DATE	REVISION	BY

\\192.168.0.58\J\Projects\2024 Projects\24076 Hawkins Valley Springhill Road Strawberry Lane Lee Pengelly\Drawings\DWGs\Design\24076-Springhill-Road-Drainage Map-R5.dwg



PRELIMINARY

FOR: THOMAS DB COLLINS, LTD, LLC
HAWKINS VALLEY
PHASE 1
SALINE COUNTY, ARKANSAS

SHEET NO: 2.0
DATE: JAN 2025
PROJECT NO: 24076
CONTENTS: POST DRAINAGE BASIN

GNE Designing our client's success
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3825 Mt Carmel Rd, Bryant, AR 72022, garnatengineering@gmail.com

DATE	REVISION	BY

\\192.168.0.58\J\Projects\2024 Projects\24076 Hawkins Valley Springhill Road Strawberry Lane Lee Pengelly\Drawings\DWGs\Design\24076-Springhill-Road-Drainage Map-R5.dwg

Stormwater Calcs - Hawkins Valley
Using Rational Method

Calculated Tc values - Drainage Basin CI-1

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Overland Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
				V=	20.3282 * S^0.5	ft/sec	Paved
L1 =	150	feet		L1 =	115	feet	
n1 =	0.013	concrete					
S1 =	0.026	ft/ft	Z1=493.65	S1 =	0.032	ft/ft	Z1=489.77
			Z2=489.77				Z2=486.12
				$V_{calculated}$ =	3.62	ft/sec	
$Tc_{calculated}$	3.39	minutes		$Tc_{calculated}$	0.53	minutes	
Tc =	3.92	minutes					
Use Tc =	**5.0**	minutes		I_{100} =	10	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual
				I_{25} =	8.4	Inches/hr	
				I_{10} =	7.6	Inches/hr	

Calculated Tc values - Drainage Basin CI-2

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Overland Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
				V=	20.3282 * S^0.5	ft/sec	Paved
L1 =	150	feet		L1 =	120	feet	
n1 =	0.013	concrete					
S1 =	0.024	ft/ft	Z1=493.41	S1 =	0.032	ft/ft	Z1=489.82
			Z2=489.82				Z2=486.01
				$V_{calculated}$ =	3.62	ft/sec	
$Tc_{calculated}$	3.47	minutes		$Tc_{calculated}$	0.55	minutes	
Tc =	4.03	minutes					
Use Tc =	**5.0**	minutes		I_{100} =	10	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual
				I_{25} =	8.4	Inches/hr	
				I_{10} =	7.6	Inches/hr	

Calculated Tc values - Drainage Basin CI-3

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Overland Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
				V=	20.3282 * S^0.5	ft/sec	Paved
L1 =	150	feet		L1 =	125	feet	
n1 =	0.013	concrete					
S1 =	0.029	ft/ft	Z1=486.12	S1 =	0.029	ft/ft	Z1=481.77
			Z2=481.77				Z2=478.13
				$V_{calculated}$ =	3.47	ft/sec	
$Tc_{calculated}$	3.28	minutes		$Tc_{calculated}$	0.60	minutes	
Tc =	3.88	minutes					
Use Tc =	**5.0**	minutes		I_{100} =	10	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual
				I_{25} =	8.4	Inches/hr	
				I_{10} =	7.6	Inches/hr	

Calculated Tc values - Drainage Basin CI-4

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Overland Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
				V=	20.3282 * S^0.5	ft/sec	Paved
L1 =	150	feet		L1 =	86	feet	
n1 =	0.013	concrete					
S1 =	0.031	ft/ft	Z1=486.01	S1 =	0.042	ft/ft	Z1=481.34
			Z2=481.34				Z2=478.57
				$V_{calculated}$ =	4.18	ft/sec	
$Tc_{calculated}$	3.21	minutes		$Tc_{calculated}$	0.34	minutes	
Tc =	3.55	minutes					
Use Tc =	**5.0**	minutes		I_{100} =	10	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual
				I_{25} =	8.4	Inches/hr	
				I_{10} =	7.6	Inches/hr	

Calculated Tc values - Drainage Basin CI-5

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes	Overland Flow	Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
				V=	20.3282 * S^0.5	ft/sec	Paved
L1 =	150	feet		L1 =	85	feet	
n1 =	0.013	concrete					
S1 =	0.032	ft/ft	Z1=478.57	S1 =	0.031	ft/ft	Z1=473.84
			Z2=473.84				Z2=471.22
				$V_{calculated}$ =	3.57	ft/sec	
$Tc_{calculated}$	3.20	minutes		$Tc_{calculated}$	0.40	minutes	
Tc =	3.60	minutes					
Use Tc =	**5.0**	minutes		I_{100} =	10	Inches/hr	i from Exhibit 400-1 of Bryant Drainage Manual
				I_{25} =	8.4	Inches/hr	
				I_{10} =	7.6	Inches/hr	

Stormwater Calcs - Hawkins Valley
using Rational Method
POST-DEV C VALUES

SDMH-C1

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.20	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.20**	**0.81**	**0.86**	**0.95**	

SDMH-C2

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.19	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.19**	**0.81**	**0.86**	**0.95**	

SDMH-C3

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.20	0.81	0.86	0.95	Road/Asphalt
	1.10	0.5	0.6	0.7	Single Family House
Total Area =	**1.30**	**0.55**	**0.64**	**0.74**	

SDMH-C4

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.17	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.17**	**0.81**	**0.86**	**0.95**	

SDMH-C5

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.16	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.16**	**0.81**	**0.86**	**0.95**	

Stormwater Calcs - Hawkins Valley
using Rational Method
Post Development Flowrates

SDMH-C1

Q_{10} =	1.21 CFS	Q_{25} =	1.43 CFS	Q_{100} =	1.87 CFS
c =	0.81	c =	0.86	c =	0.95
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	0.20 acres	A=	0.20 acres	A=	0.20 acres

SDMH-C2

Q_{10} =	1.19 CFS	Q_{25} =	1.40 CFS	Q_{100} =	1.84 CFS
c =	0.81	c =	0.86	c =	0.95
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	0.19 acres	A=	0.19 acres	A=	0.19 acres

SDMH-C3

Q_{10} =	5.43 CFS	Q_{25} =	7.00 CFS	Q_{100} =	9.62 CFS
c =	0.55	c =	0.64	c =	0.74
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	1.30 acres	A=	1.30 acres	A=	1.30 acres

SDMH-C4

Q_{10} =	1.02 CFS	Q_{25} =	1.19 CFS	Q_{100} =	1.57 CFS
c =	0.81	c =	0.86	c =	0.95
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	0.17 acres	A=	0.17 acres	A=	0.17 acres

SDMH-C5

Q_{10} =	1.01 CFS	Q_{25} =	1.18 CFS	Q_{100} =	1.55 CFS
c =	0.81	c =	0.86	c =	0.95
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	0.16 acres	A=	0.16 acres	A=	0.16 acres

Hawkins Valley GUTTER SPREAD 25-YR STORM

SDMH-C1

$$T = \left(\frac{Q^* n}{k_u^* S_x^{1.67} * S_L^{0.5}} \right)^{.375}$$

Q= Flowrate(cfs)
n=manning's number
k=0.56
S_x= cross slope
S_L= longitudinal slope
T= Gutter Spread

Q	1.43	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.031	
T	**4.87**	ft

SDMH-C2

$$T = \left(\frac{Q^* n}{k_u^* S_x^{1.67} * S_L^{0.5}} \right)^{.375}$$

Q	1.40	cfs
n	0.012	
k_u	0.56	
S_x	0.03	
S_L	0.017	
T	**5.18**	ft

SDMH-C3

$$T = \left(\frac{Q^* n}{k_u^* S_x^{1.67} * S_L^{0.5}} \right)^{.375}$$

Q	7.00	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.03	
T	**9.01**	ft

SDMH-C4

$$T = \left(\frac{Q^* n}{k_u^* S_x^{1.67} * S_L^{0.5}} \right)^{.375}$$

Q	1.19	cfs
n	0.012	
k_u	0.56	
S_x	0.03	
S_L	0.03	
T	**4.44**	ft

SDMH-C5

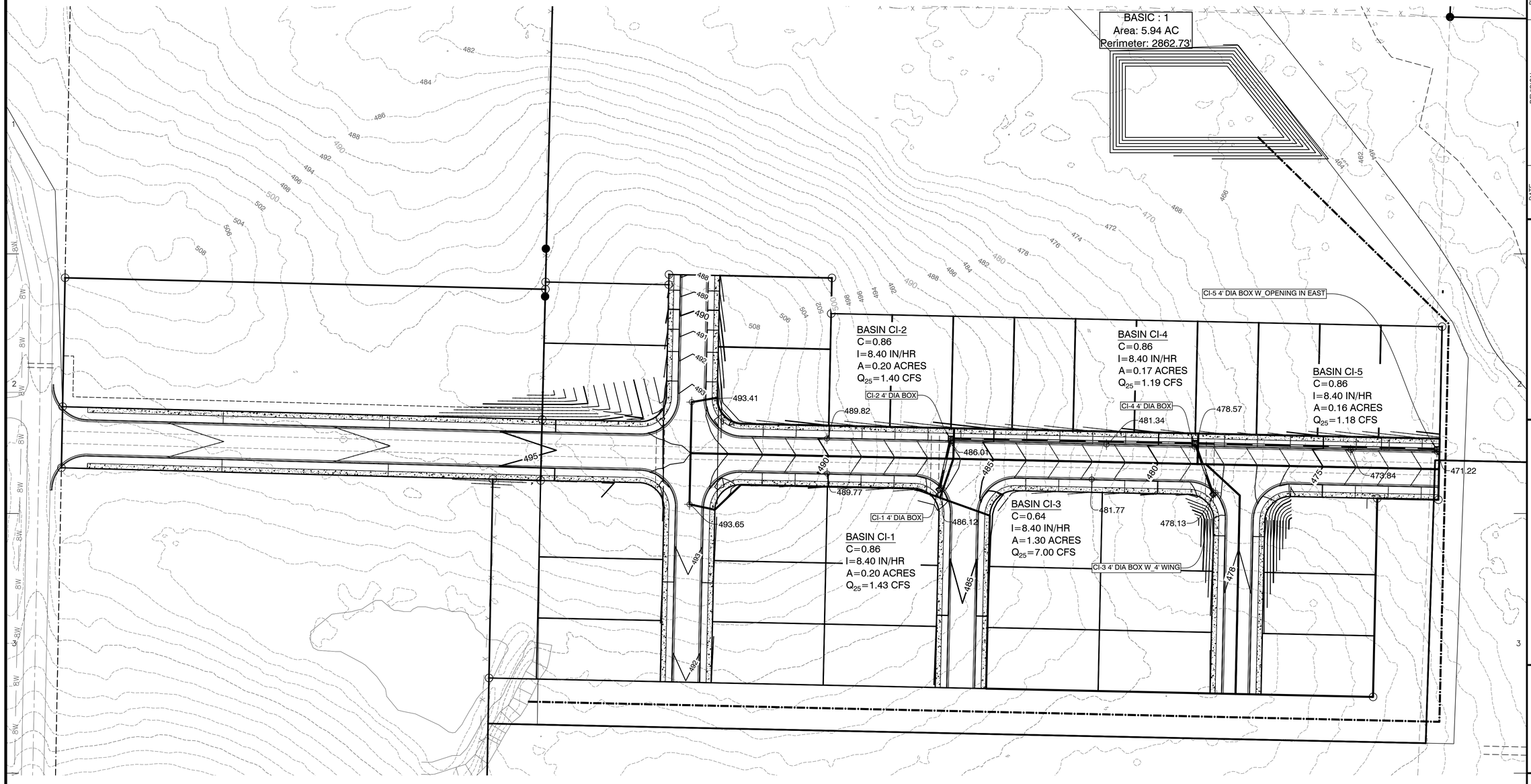
$$T = \left(\frac{Q^* n}{k_u^* S_x^{1.67} * S_L^{0.5}} \right)^{.375}$$

Q	1.18	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.03	
T	**4.56**	ft

Hawkins Valley - CURB INLETS

25-YEAR STORM

Area #	Area	I	C	Q (cfs)	Weir Q=3.0LY^1.5 Q (cfs)	Y (ft)	Required L (ft)	Actual L (ft)	
SDMH-C1	0.20	8.40	0.86	1.43	1.43	0.49	**1.39**	**4**	4' box
SDMH-C2	0.19	8.40	0.86	1.40	1.40	0.49	**1.36**	**4**	4' box
SDMH-C3	1.30	8.40	0.64	7.00	7.00	0.49	**6.81**	**4**	4' box with 4' wing
SDMH-C4	0.17	8.40	0.86	1.19	1.19	0.49	**1.16**	**4**	4' box
SDMH-C5	0.16	8.40	0.86	1.18	1.18	0.49	**1.15**	**4**	4' box



BY	REVISION	DATE

GNE Designing our client's success

GarNat Engineering, LLC
P.O. Box 116
Benton, AR 72018
3825 Mt Carmel Rd
Bryant, AR 72022
Ph (501) 408-4650
garnatengineering@gmail.com

FOR: THOMAS DB COLLINS, LTD, LLC
HAWKINS VALLEY
PHASE 1
SALINE COUNTY, ARKANSAS

PRELIMINARY

CONTENTS:
INLET BASIN PLAN

PROJECT NO: 24076

DATE: JAN 2025

SHEET NO: 3.0

\\192.168.0.90\Projects\2024 Projects\24076 Hawkins Valley Springhill Road Strawberry Lane Expansion\Drawings\Drawings\24076-Springhill-Road-Drainage Map-v05.dwg

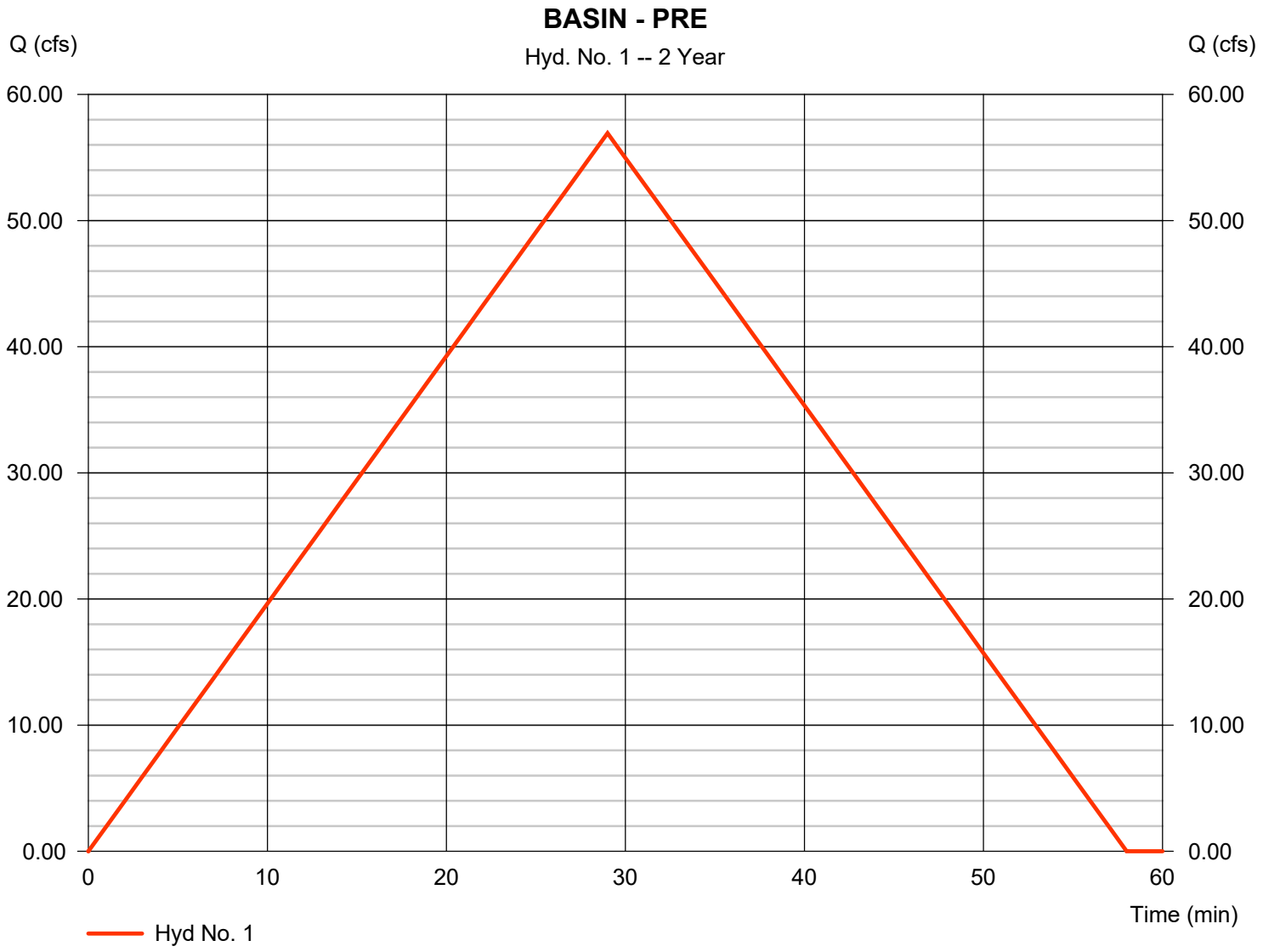
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 1

BASIN - PRE

Hydrograph type	=	Rational	Peak discharge	=	56.93 cfs
Storm frequency	=	2 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	99,054 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.47
Intensity	=	2.751 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



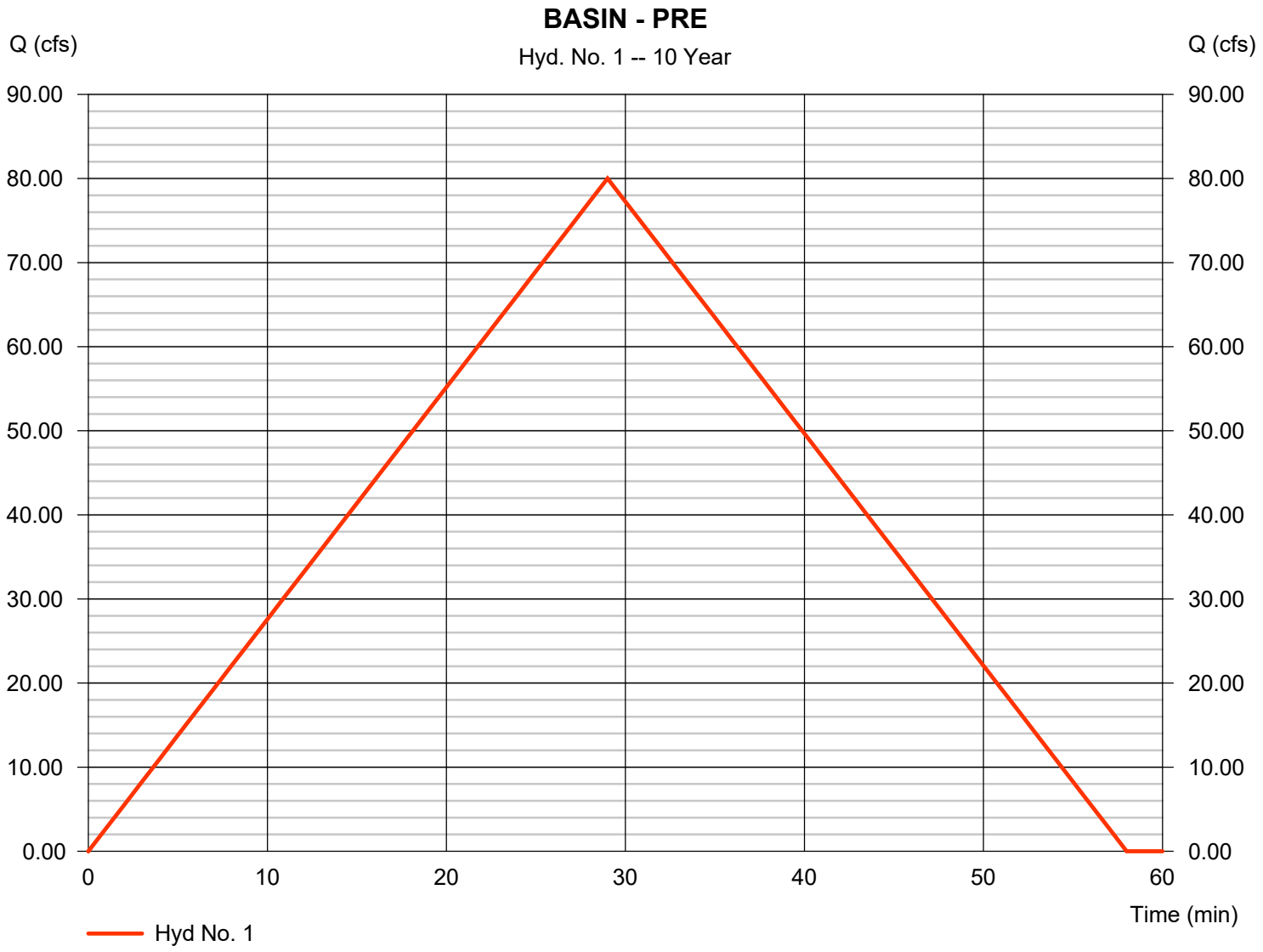
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 1

BASIN - PRE

Hydrograph type	= Rational	Peak discharge	= 80.01 cfs
Storm frequency	= 10 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 139,223 cuft
Drainage area	= 44.030 ac	Runoff coeff.	= 0.47
Intensity	= 3.866 in/hr	Tc by User	= 29.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



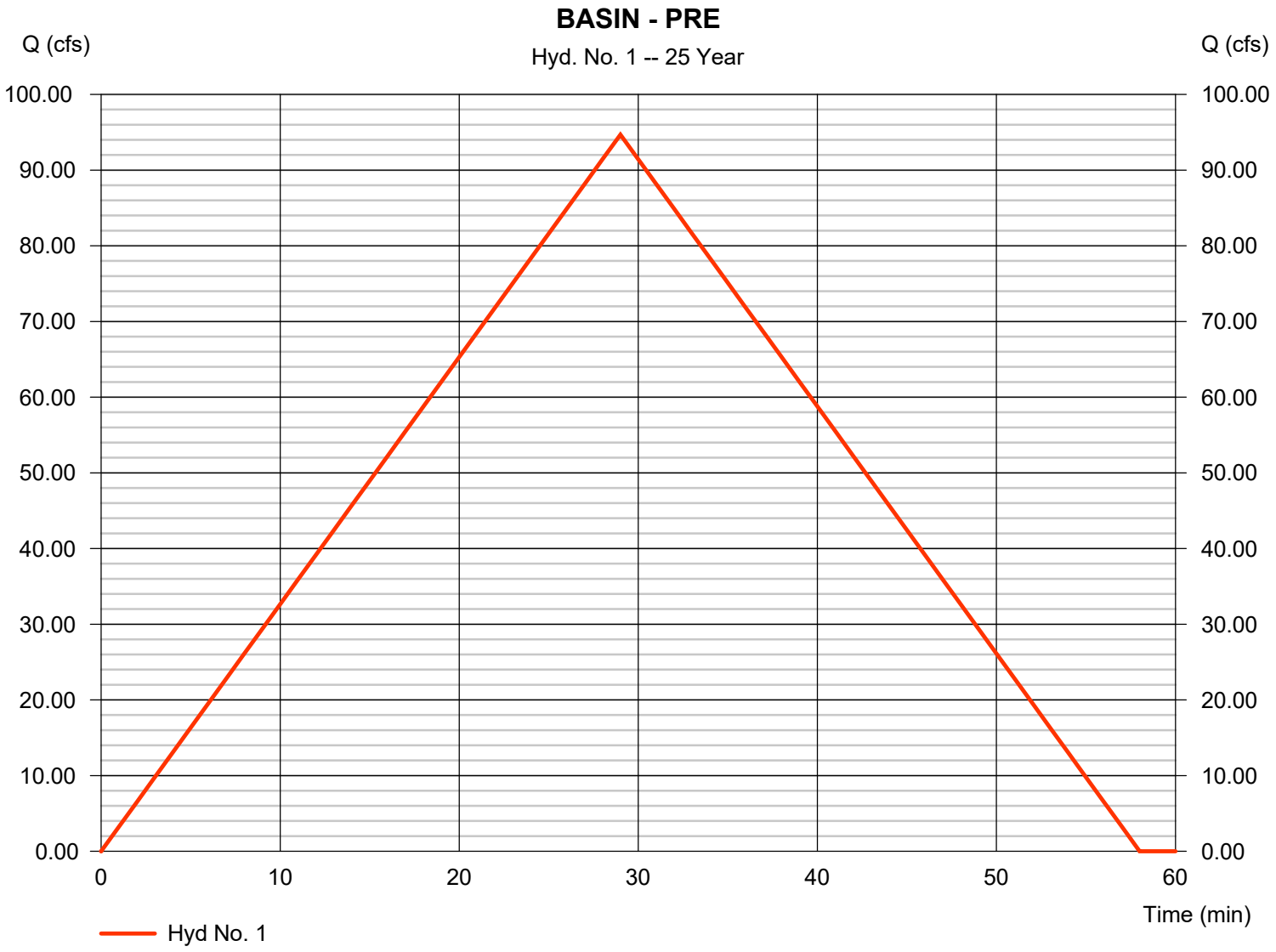
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 1

BASIN - PRE

Hydrograph type	= Rational	Peak discharge	= 94.69 cfs
Storm frequency	= 25 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 164,756 cuft
Drainage area	= 44.030 ac	Runoff coeff.	= 0.47
Intensity	= 4.576 in/hr	Tc by User	= 29.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



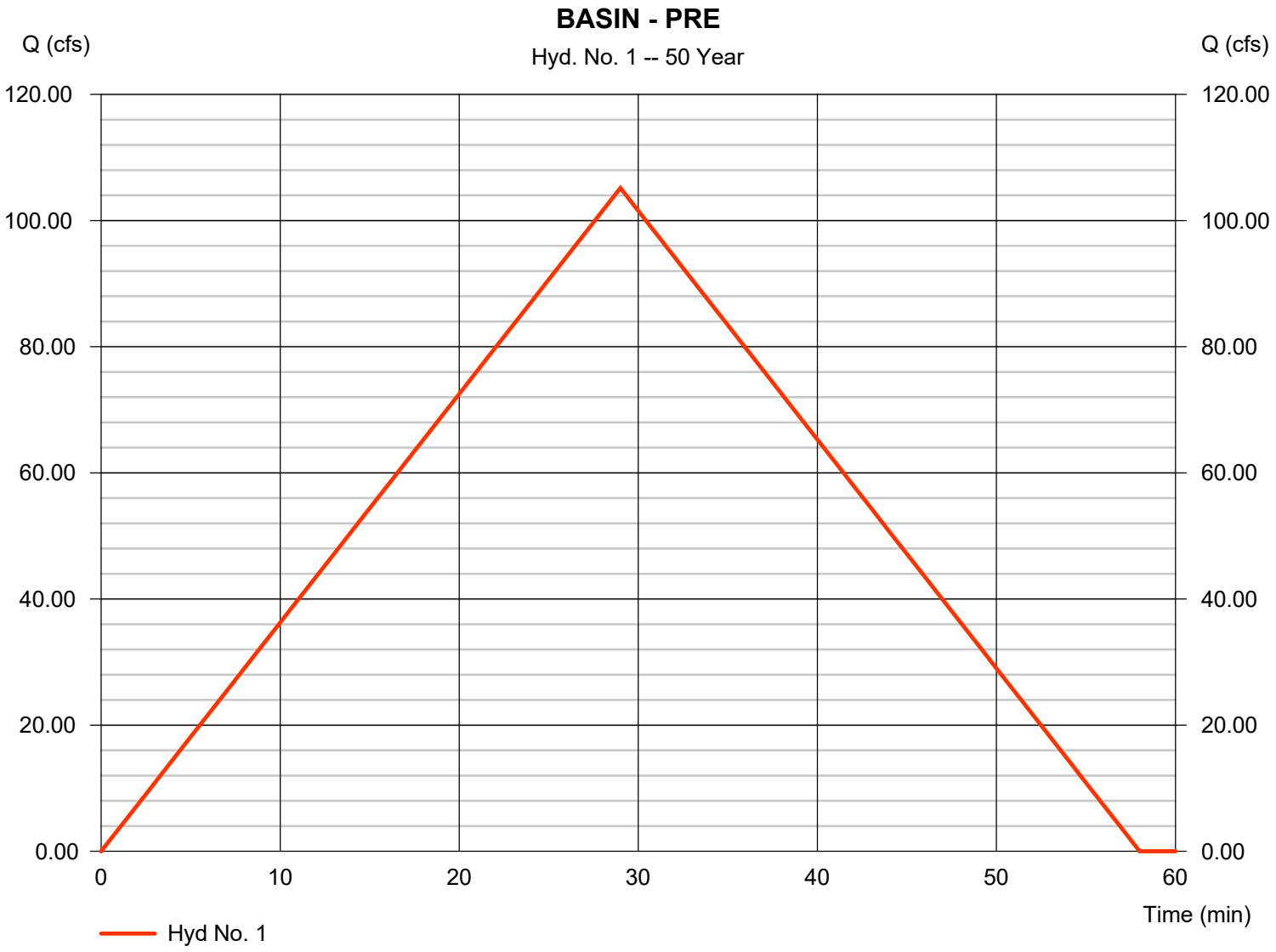
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 1

BASIN - PRE

Hydrograph type	=	Rational	Peak discharge	=	105.16 cfs
Storm frequency	=	50 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	182,986 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.47
Intensity	=	5.082 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



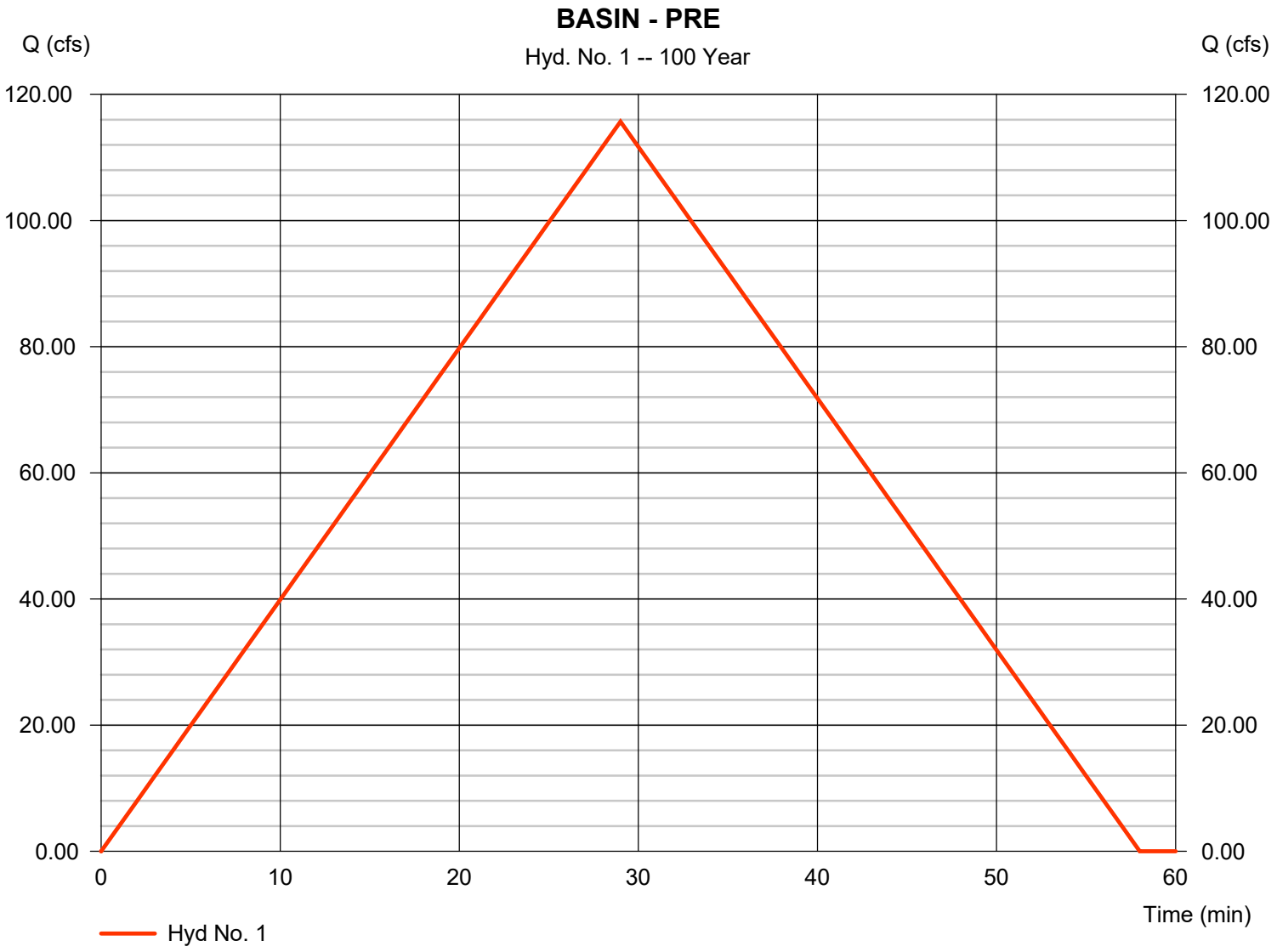
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 1

BASIN - PRE

Hydrograph type	=	Rational	Peak discharge	=	115.69 cfs
Storm frequency	=	100 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	201,307 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.47
Intensity	=	5.591 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



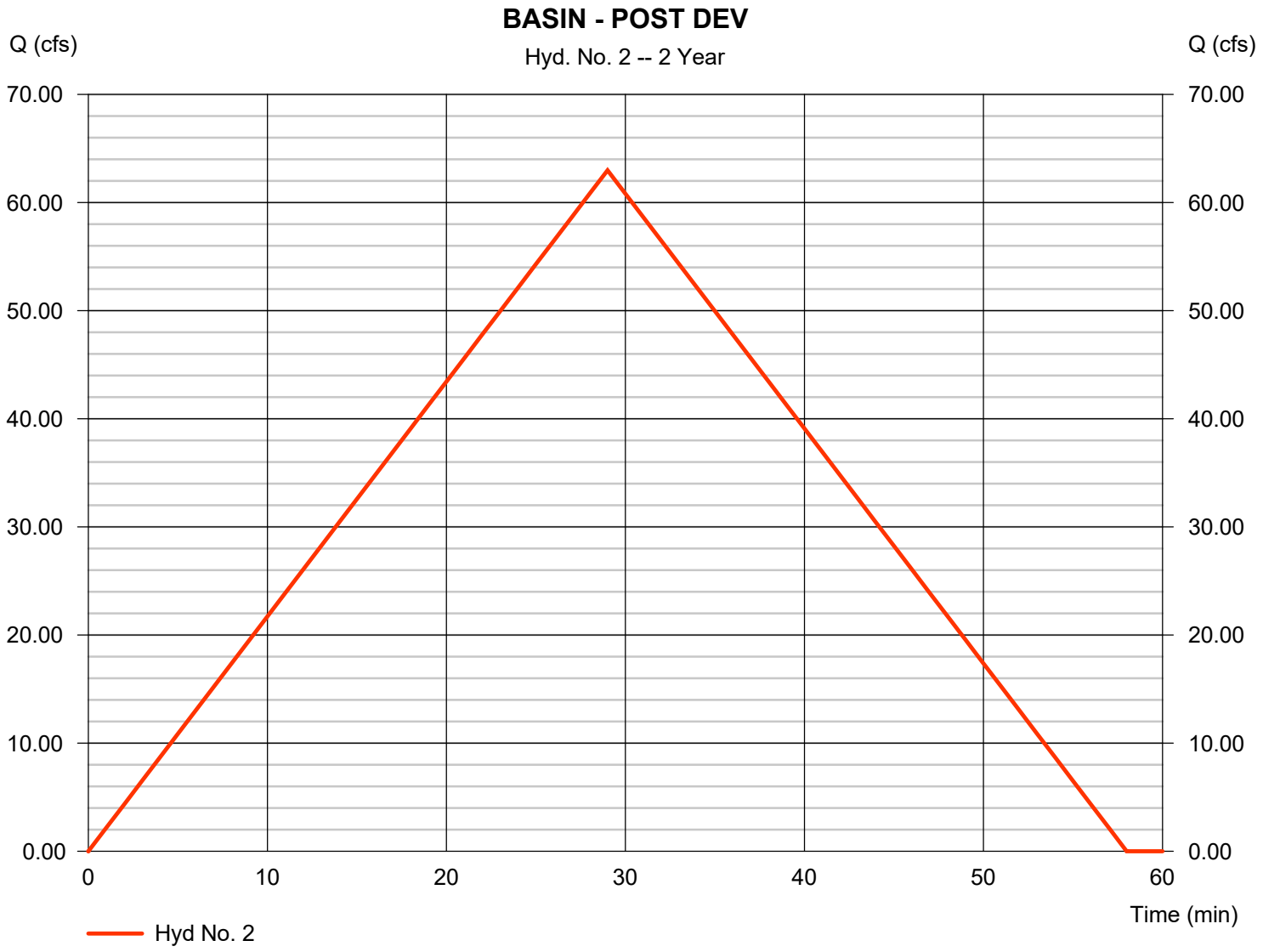
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 2

BASIN - POST DEV

Hydrograph type	=	Rational	Peak discharge	=	62.98 cfs
Storm frequency	=	2 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	109,592 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.52
Intensity	=	2.751 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



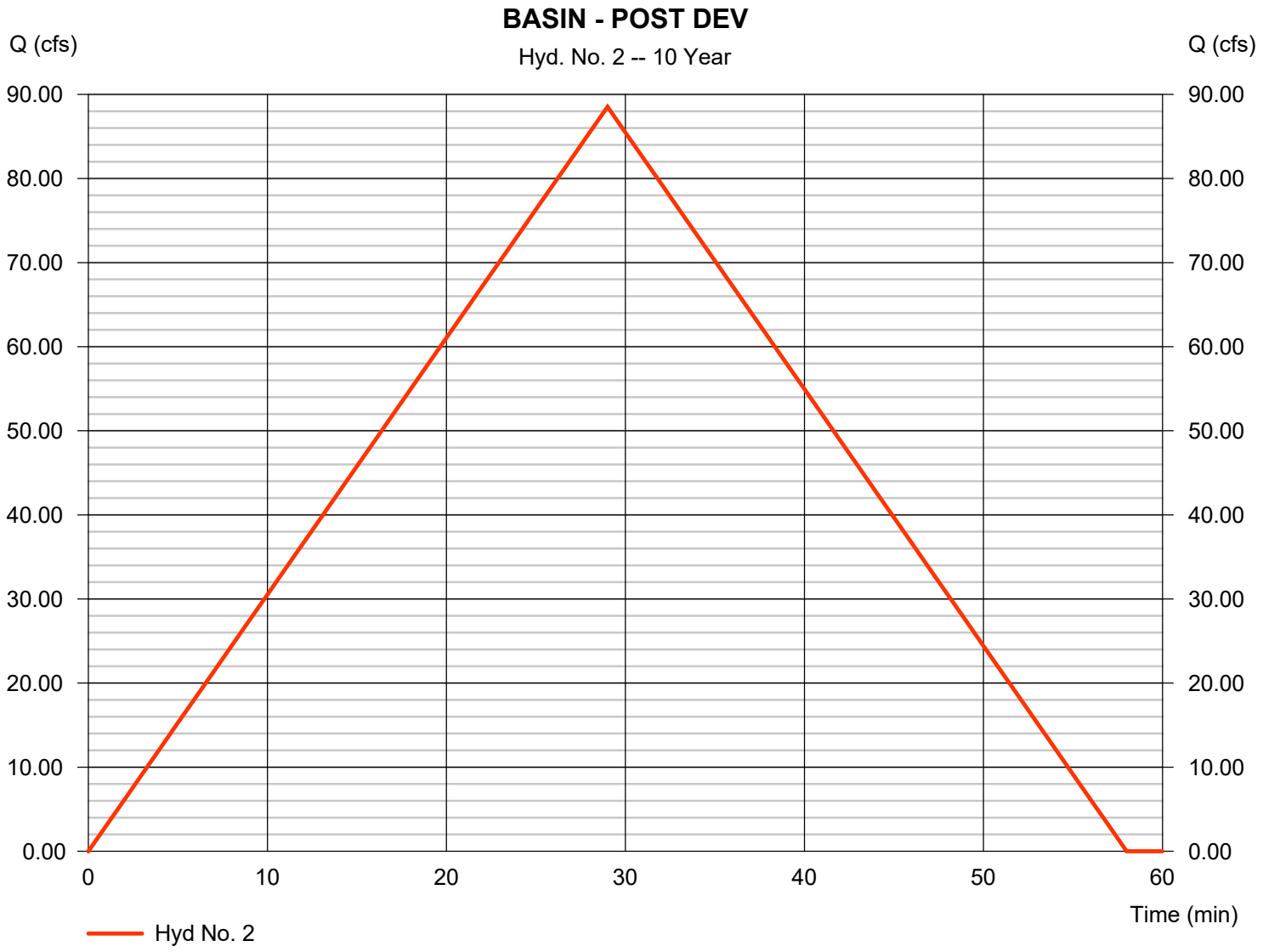
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 2

BASIN - POST DEV

Hydrograph type	= Rational	Peak discharge	= 88.53 cfs
Storm frequency	= 10 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 154,034 cuft
Drainage area	= 44.030 ac	Runoff coeff.	= 0.52
Intensity	= 3.866 in/hr	Tc by User	= 29.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



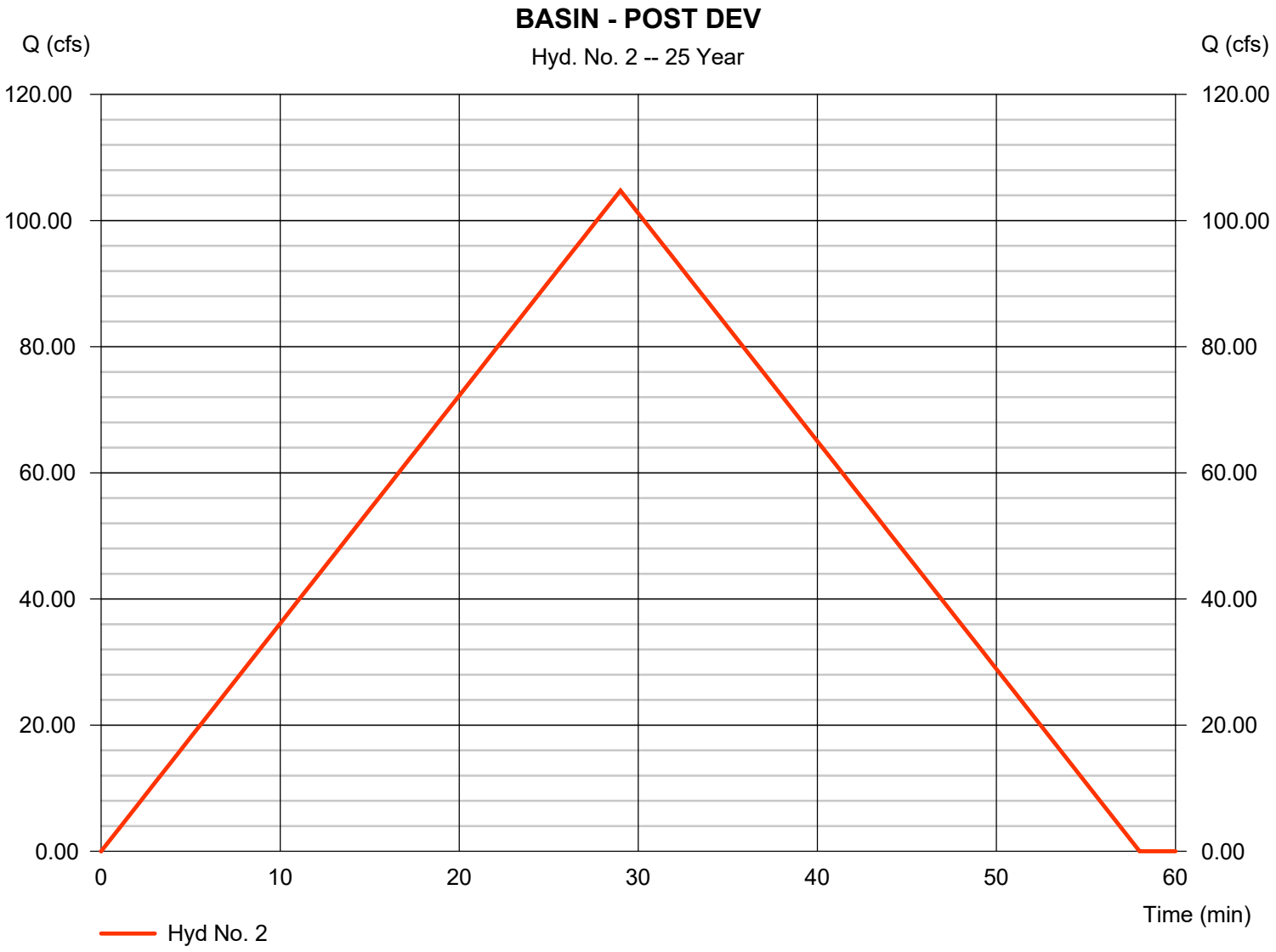
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 2

BASIN - POST DEV

Hydrograph type	=	Rational	Peak discharge	=	104.76 cfs
Storm frequency	=	25 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	182,283 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.52
Intensity	=	4.576 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



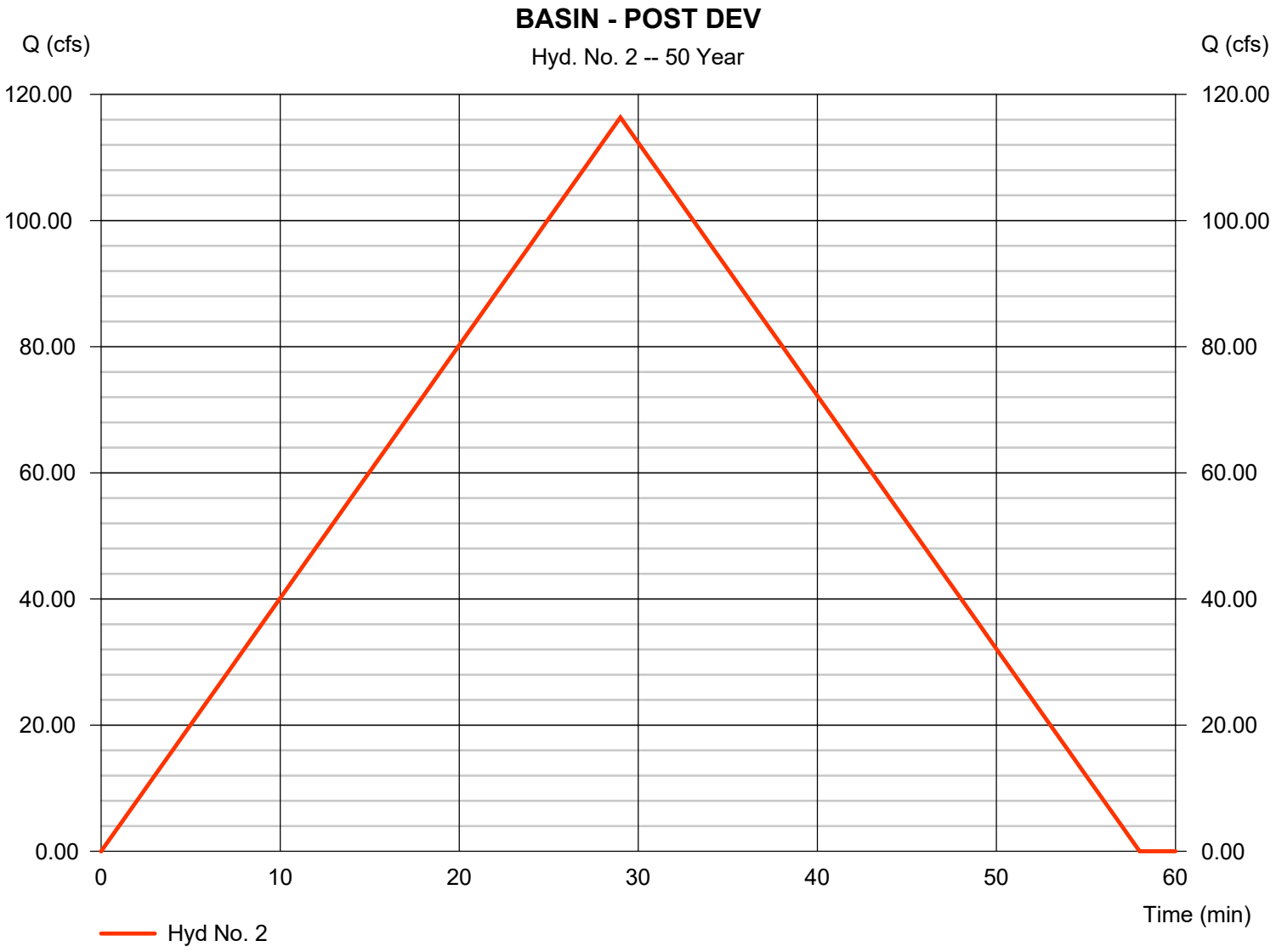
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 2

BASIN - POST DEV

Hydrograph type	=	Rational	Peak discharge	=	116.35 cfs
Storm frequency	=	50 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	202,453 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.52
Intensity	=	5.082 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



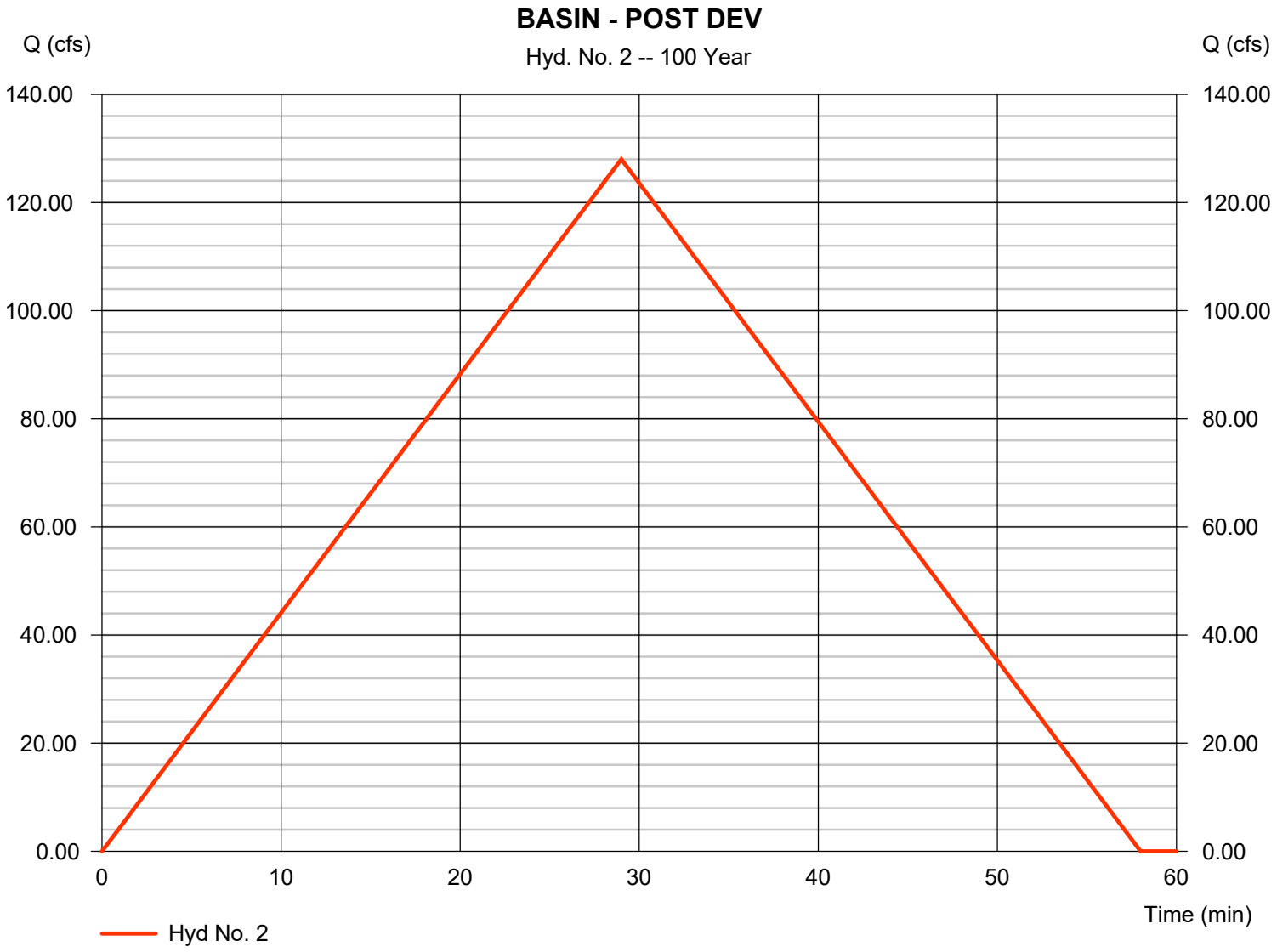
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 2

BASIN - POST DEV

Hydrograph type	=	Rational	Peak discharge	=	128.00 cfs
Storm frequency	=	100 yrs	Time to peak	=	29 min
Time interval	=	1 min	Hyd. volume	=	222,723 cuft
Drainage area	=	44.030 ac	Runoff coeff.	=	0.52
Intensity	=	5.591 in/hr	Tc by User	=	29.00 min
IDF Curve	=	BRYANT IDF.IDF	Asc/Rec limb fact	=	1/1



Hydrograph Report

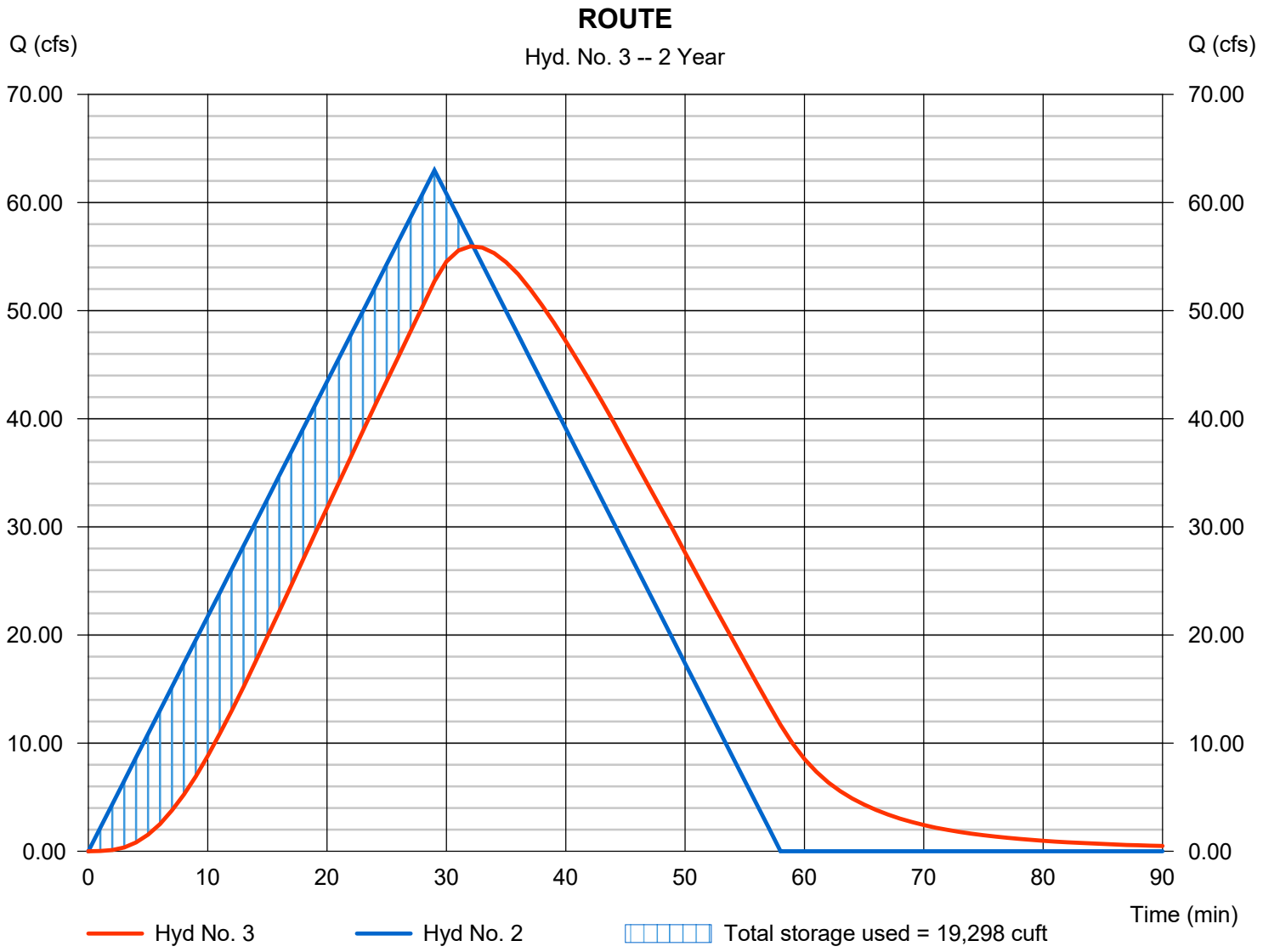
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 55.95 cfs
Storm frequency	= 2 yrs	Time to peak	= 32 min
Time interval	= 1 min	Hyd. volume	= 109,590 cuft
Inflow hyd. No.	= 2 - BASIN - POST DEV	Max. Elevation	= 465.47 ft
Reservoir name	= POND	Max. Storage	= 19,298 cuft

Storage Indication method used.



Hydrograph Report

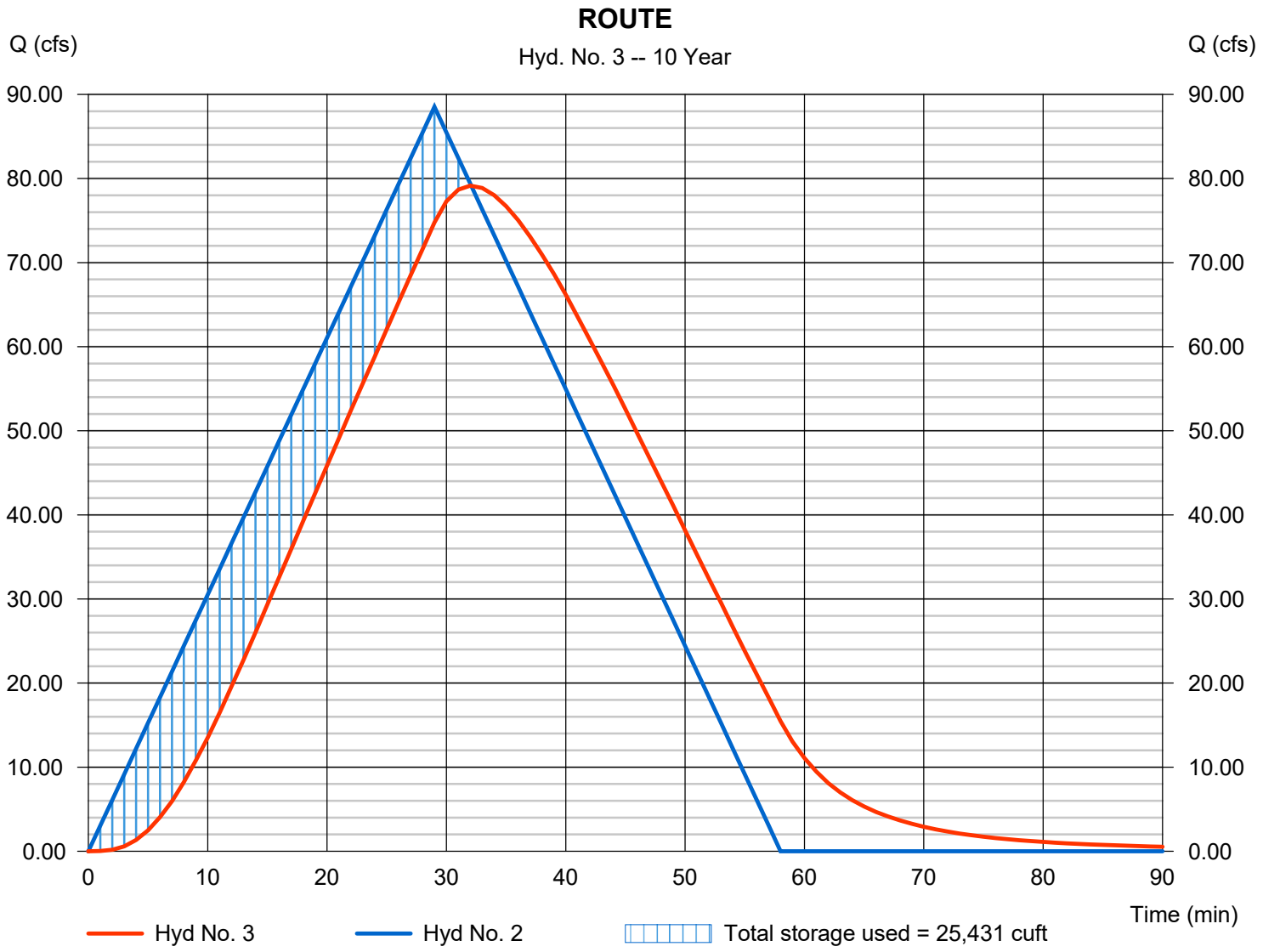
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Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 79.14 cfs
Storm frequency	= 10 yrs	Time to peak	= 32 min
Time interval	= 1 min	Hyd. volume	= 154,032 cuft
Inflow hyd. No.	= 2 - BASIN - POST DEV	Max. Elevation	= 466.12 ft
Reservoir name	= POND	Max. Storage	= 25,431 cuft

Storage Indication method used.



Hydrograph Report

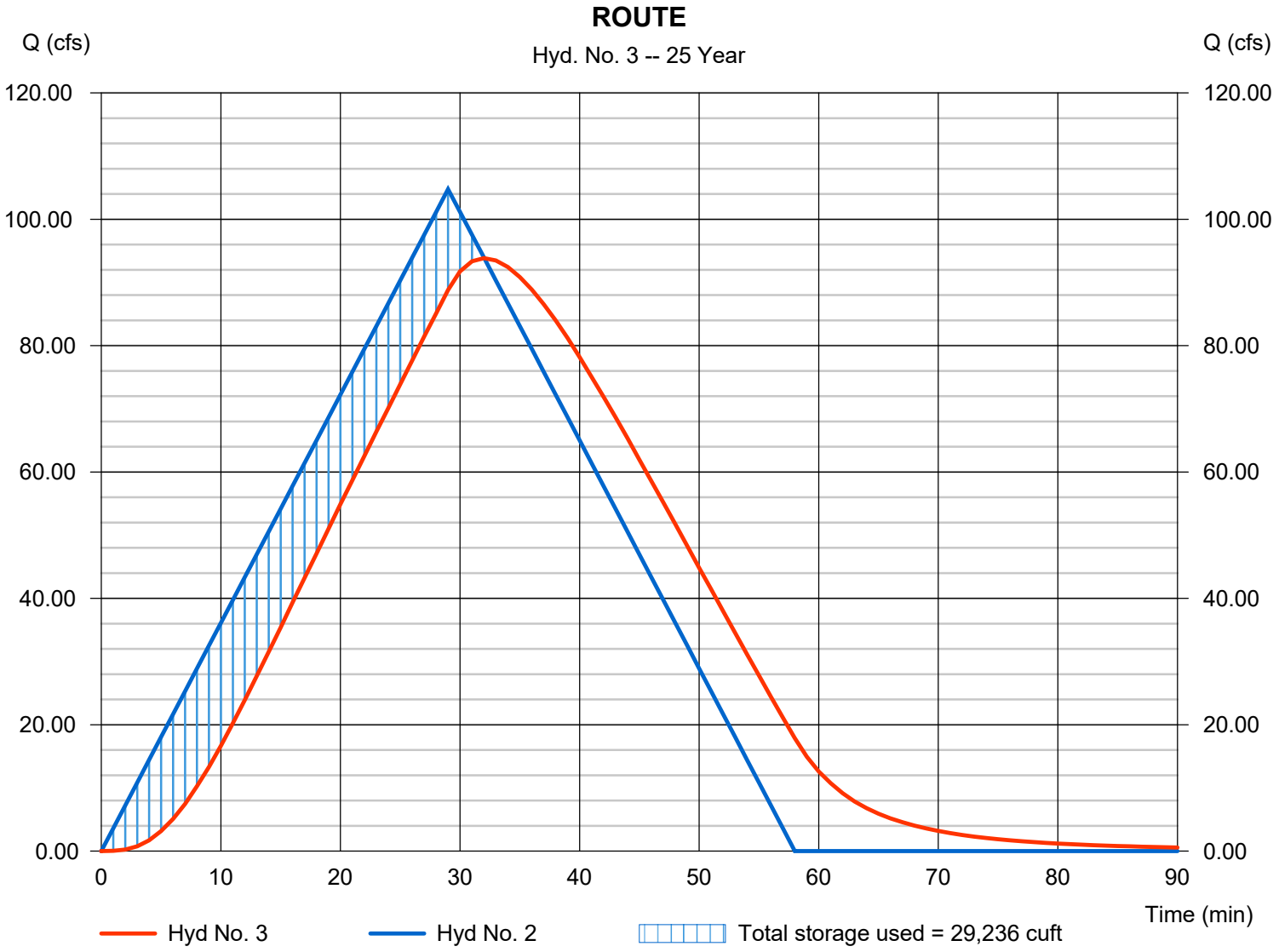
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 93.85 cfs
Storm frequency	= 25 yrs	Time to peak	= 32 min
Time interval	= 1 min	Hyd. volume	= 182,281 cuft
Inflow hyd. No.	= 2 - BASIN - POST DEV	Max. Elevation	= 466.49 ft
Reservoir name	= POND	Max. Storage	= 29,236 cuft

Storage Indication method used.



Hydrograph Report

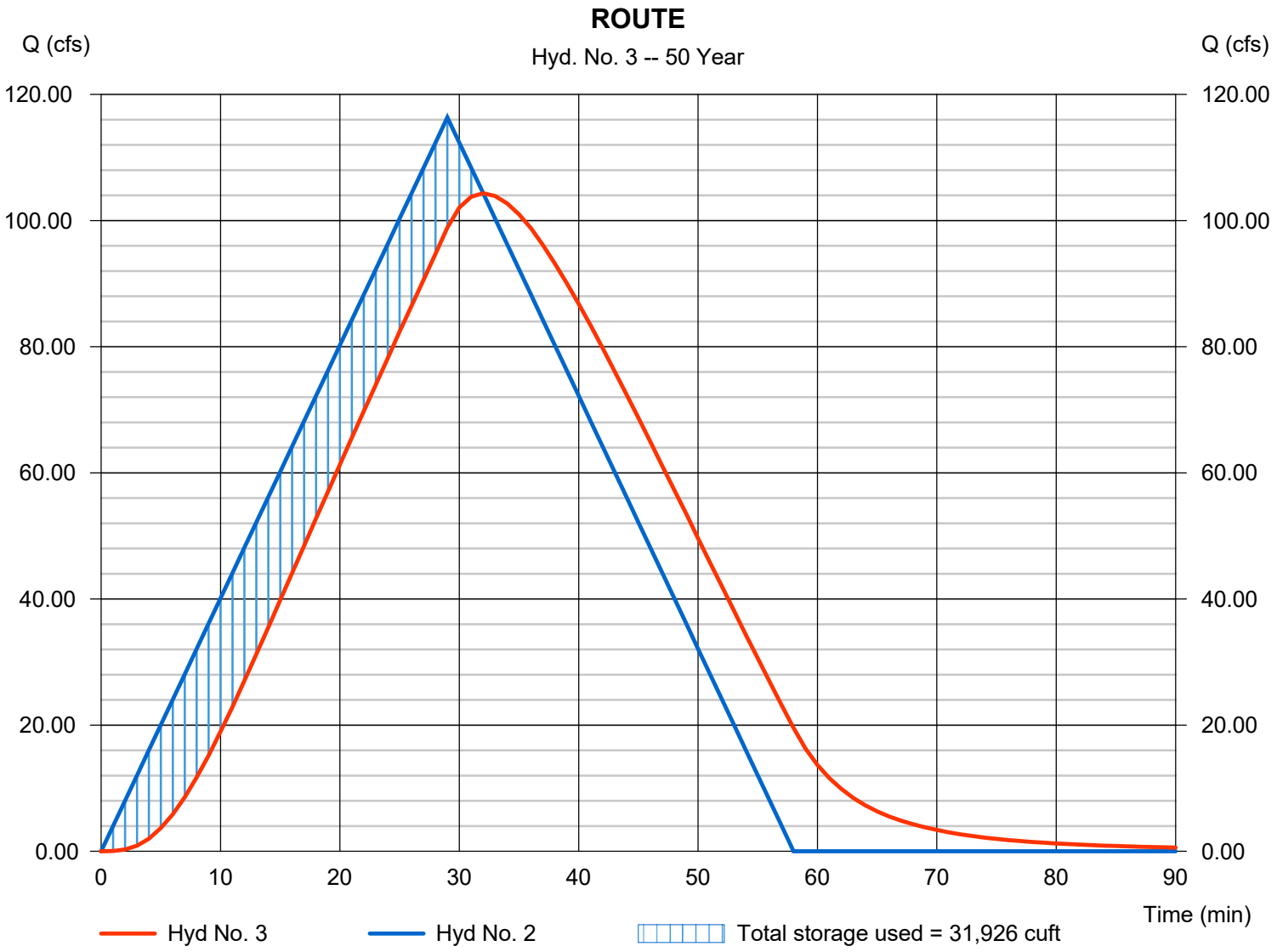
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	=	Reservoir	Peak discharge	=	104.32 cfs
Storm frequency	=	50 yrs	Time to peak	=	32 min
Time interval	=	1 min	Hyd. volume	=	202,450 cuft
Inflow hyd. No.	=	2 - BASIN - POST DEV	Max. Elevation	=	466.75 ft
Reservoir name	=	POND	Max. Storage	=	31,926 cuft

Storage Indication method used.



Hydrograph Report

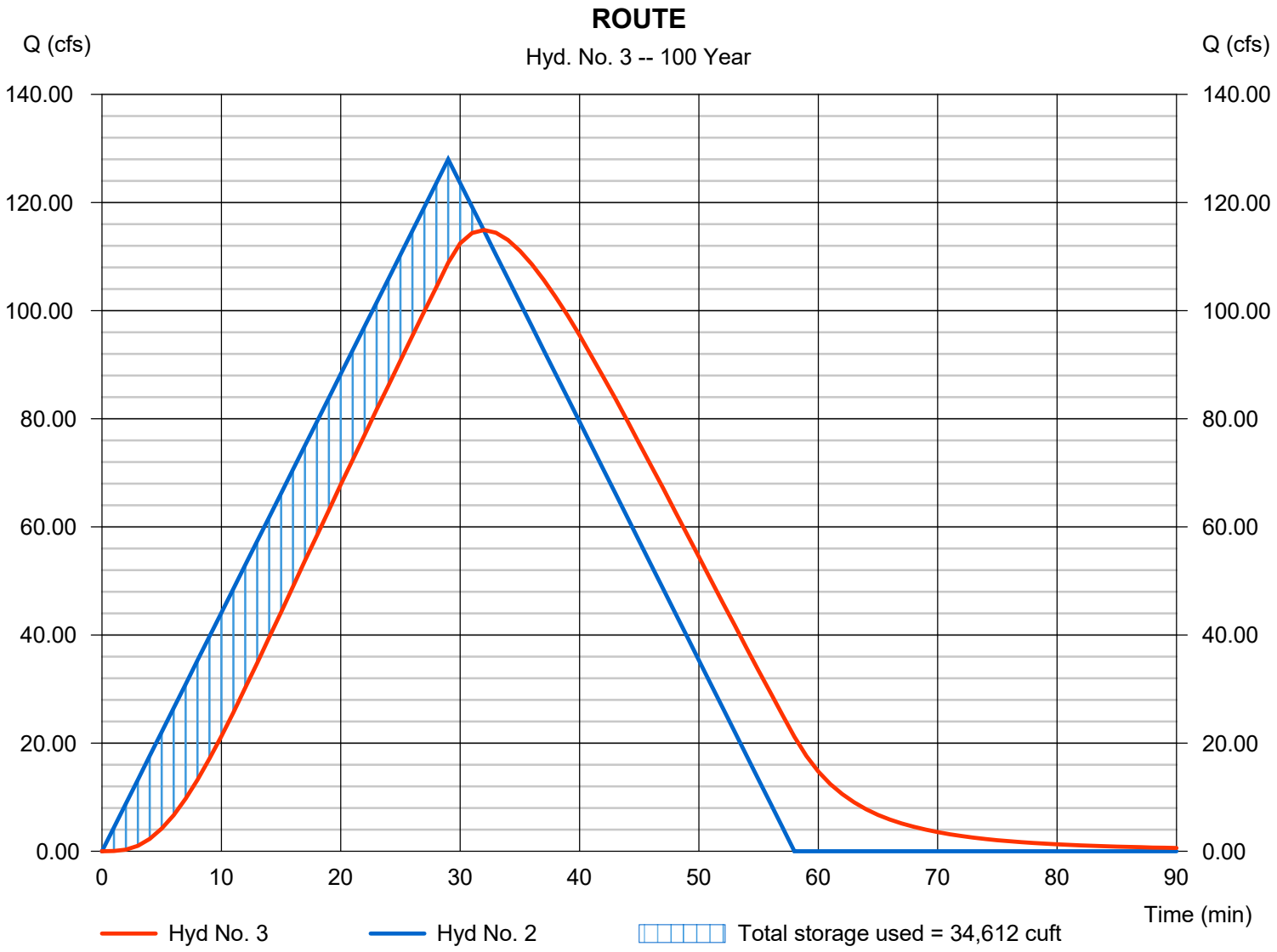
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 114.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 32 min
Time interval	= 1 min	Hyd. volume	= 222,721 cuft
Inflow hyd. No.	= 2 - BASIN - POST DEV	Max. Elevation	= 467.00 ft
Reservoir name	= POND	Max. Storage	= 34,612 cuft

Storage Indication method used.



Hydrograph Report

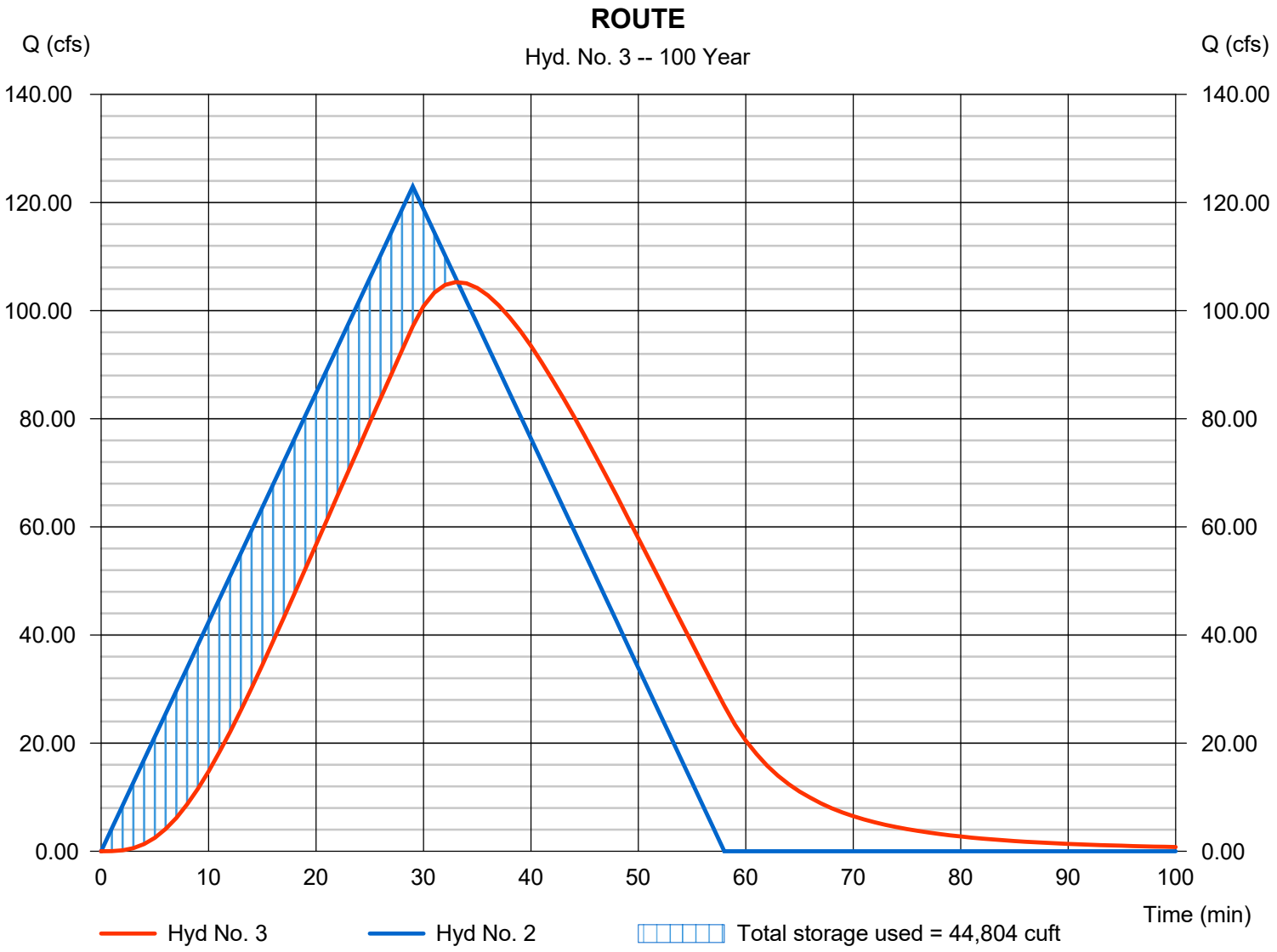
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 105.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 33 min
Time interval	= 1 min	Hyd. volume	= 213,968 cuft
Inflow hyd. No.	= 2 - BASIN - POST DEV	Max. Elevation	= 466.86 ft
Reservoir name	= POND	Max. Storage	= 44,804 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Pond No. 1 - POND

Pond Data

Trapezoid -Bottom L x W = 130.0 x 70.0 ft, Side slope = 3.00:1, Bottom elev. = 463.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	463.00	9,100	0	0
0.40	463.40	9,586	3,737	3,737
0.80	463.80	10,083	3,933	7,670
1.20	464.20	10,592	4,135	11,805
1.60	464.60	11,112	4,340	16,145
2.00	465.00	11,644	4,551	20,696
2.40	465.40	12,187	4,766	25,462
2.80	465.80	12,742	4,986	30,447
3.20	466.20	13,309	5,210	35,657
3.60	466.60	13,887	5,439	41,096
4.00	467.00	14,476	5,672	46,768

Culvert / Orifice Structures

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

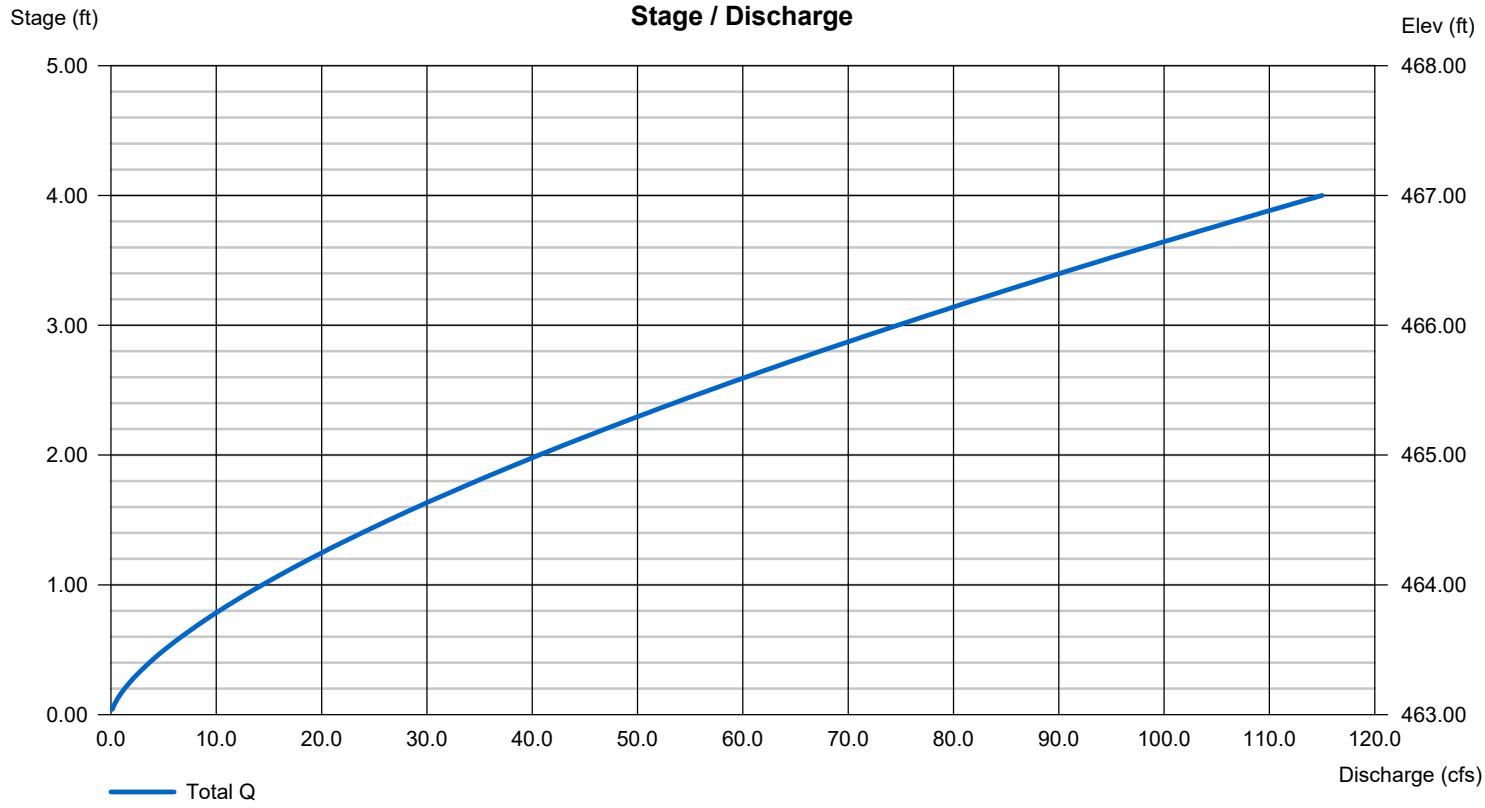
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.75	0.00	0.00	0.00
Crest El. (ft)	= 463.00	0.00	0.00	0.00
Weir Coeff.	= 2.50	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

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



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

Pond No. 1 - POND

Pond Data

Trapezoid -Bottom L x W = 130.0 x 70.0 ft, Side slope = 3.00:1, Bottom elev. = 463.00 ft, Depth = 4.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	463.00	9,100	0	0
0.40	463.40	9,586	3,737	3,737
0.80	463.80	10,083	3,933	7,670
1.20	464.20	10,592	4,135	11,805
1.60	464.60	11,112	4,340	16,145
2.00	465.00	11,644	4,551	20,696
2.40	465.40	12,187	4,766	25,462
2.80	465.80	12,742	4,986	30,447
3.20	466.20	13,309	5,210	35,657
3.60	466.60	13,887	5,439	41,096
4.00	467.00	14,476	5,672	46,768

Culvert / Orifice Structures

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

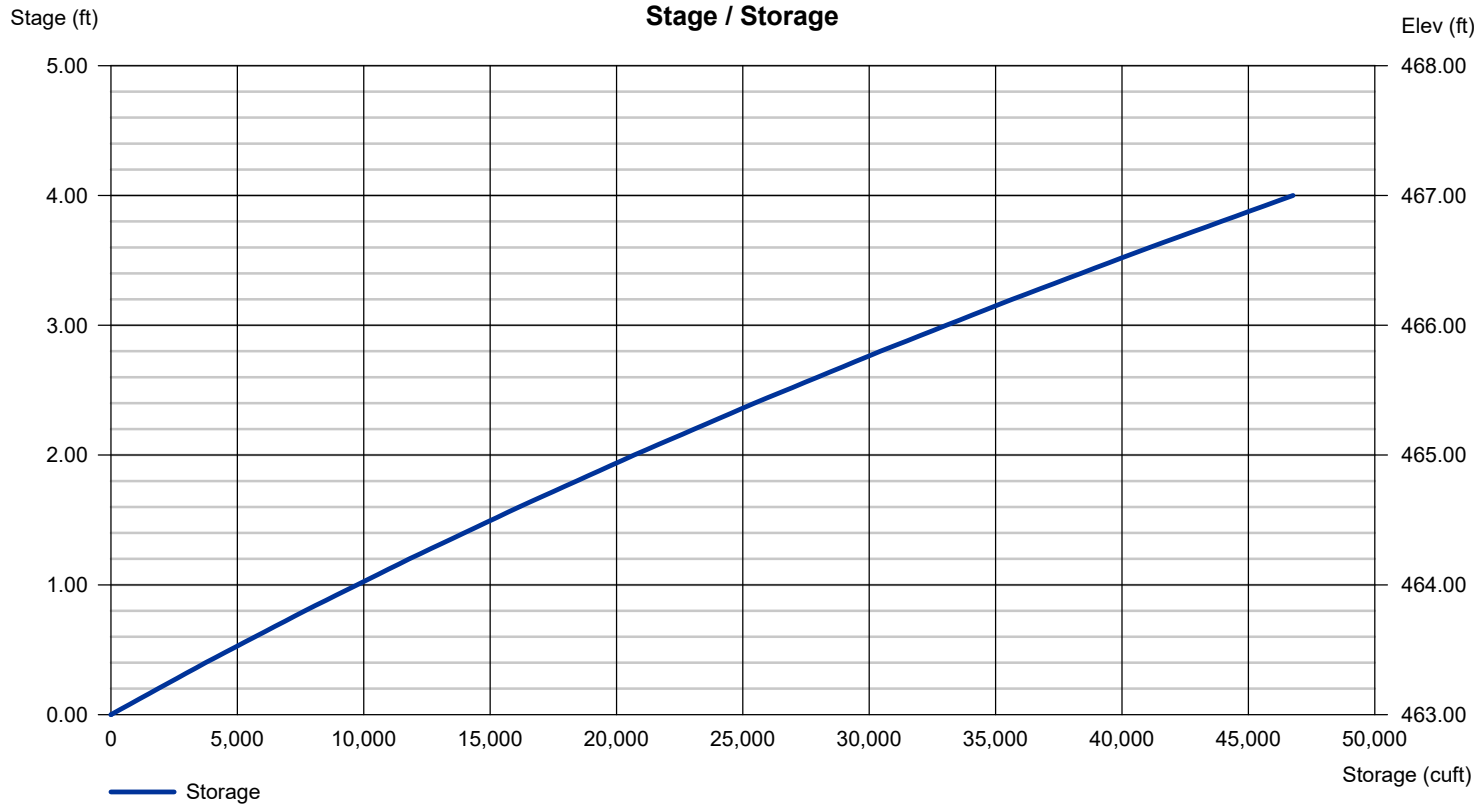
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.75	0.00	0.00	0.00
Crest El. (ft)	= 463.00	0.00	0.00	0.00
Weir Coeff.	= 2.50	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

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



Weir Report

Weir

Rectangular Weir

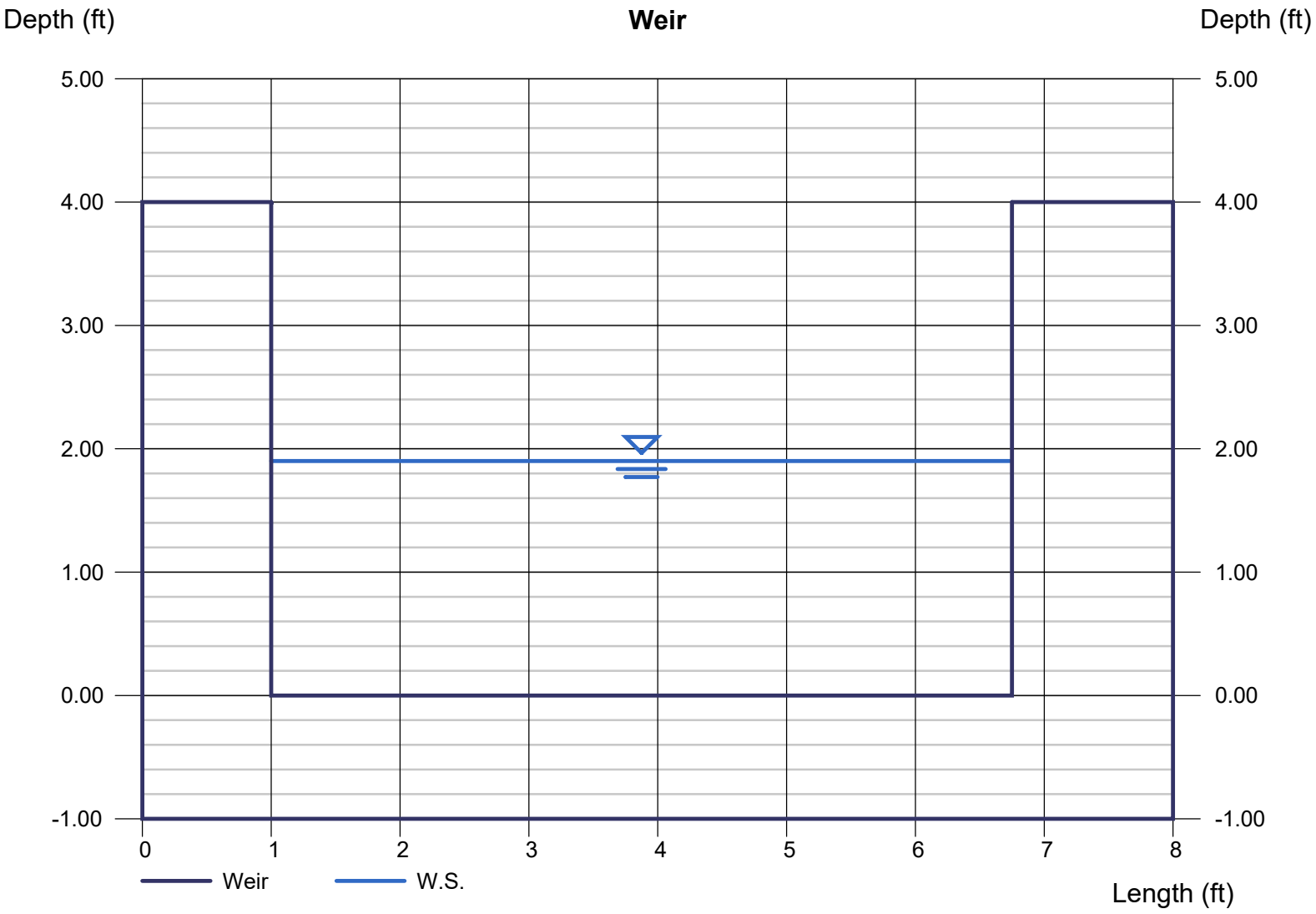
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 37.65

Highlighted

Depth (ft)	= 1.90
Q (cfs)	= 37.65
Area (sqft)	= 10.93
Velocity (ft/s)	= 3.44
Top Width (ft)	= 5.75



Weir Report

Weir

Rectangular Weir

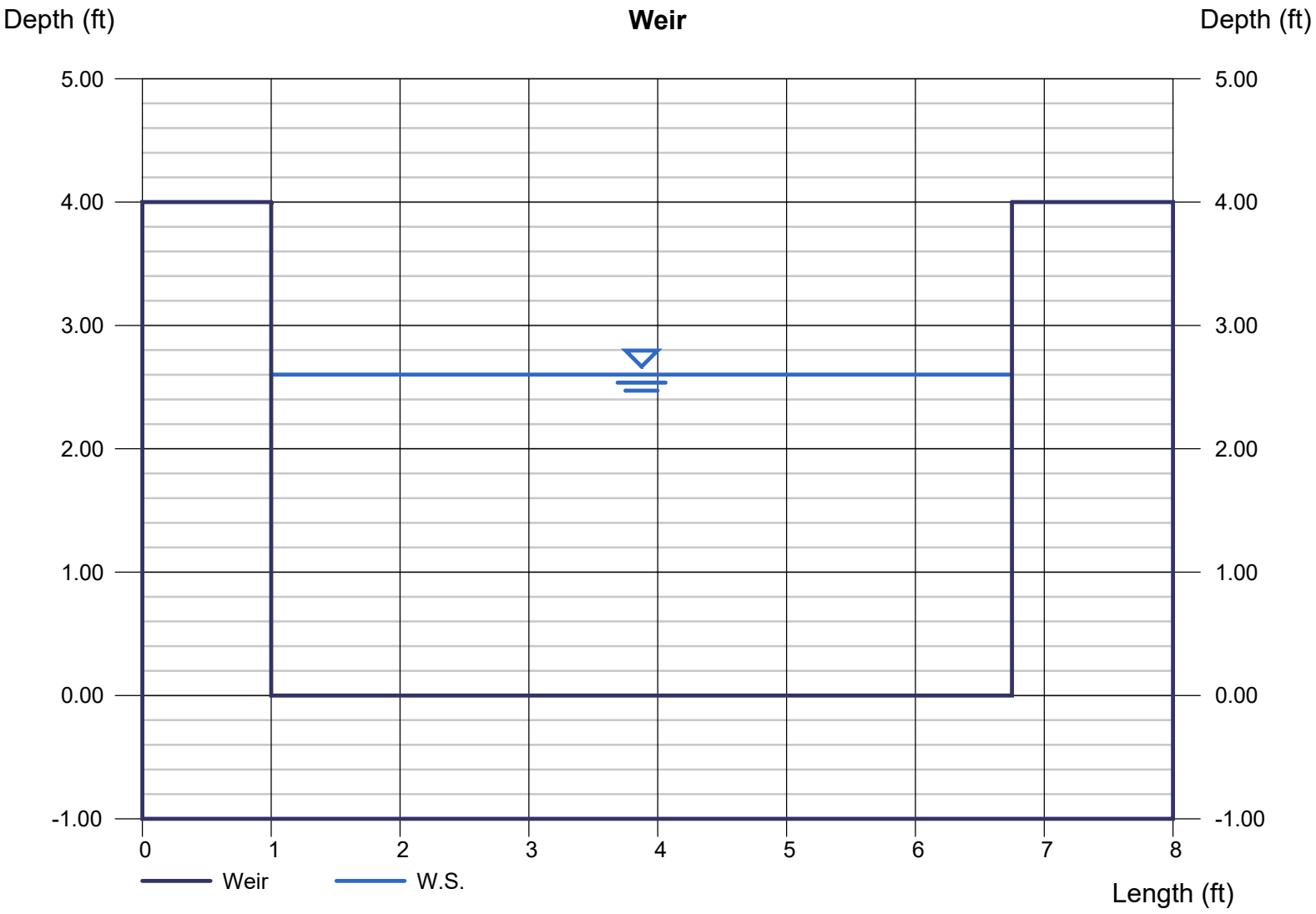
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 60.27

Highlighted

Depth (ft)	= 2.60
Q (cfs)	= 60.27
Area (sqft)	= 14.96
Velocity (ft/s)	= 4.03
Top Width (ft)	= 5.75



Weir Report

Weir

Rectangular Weir

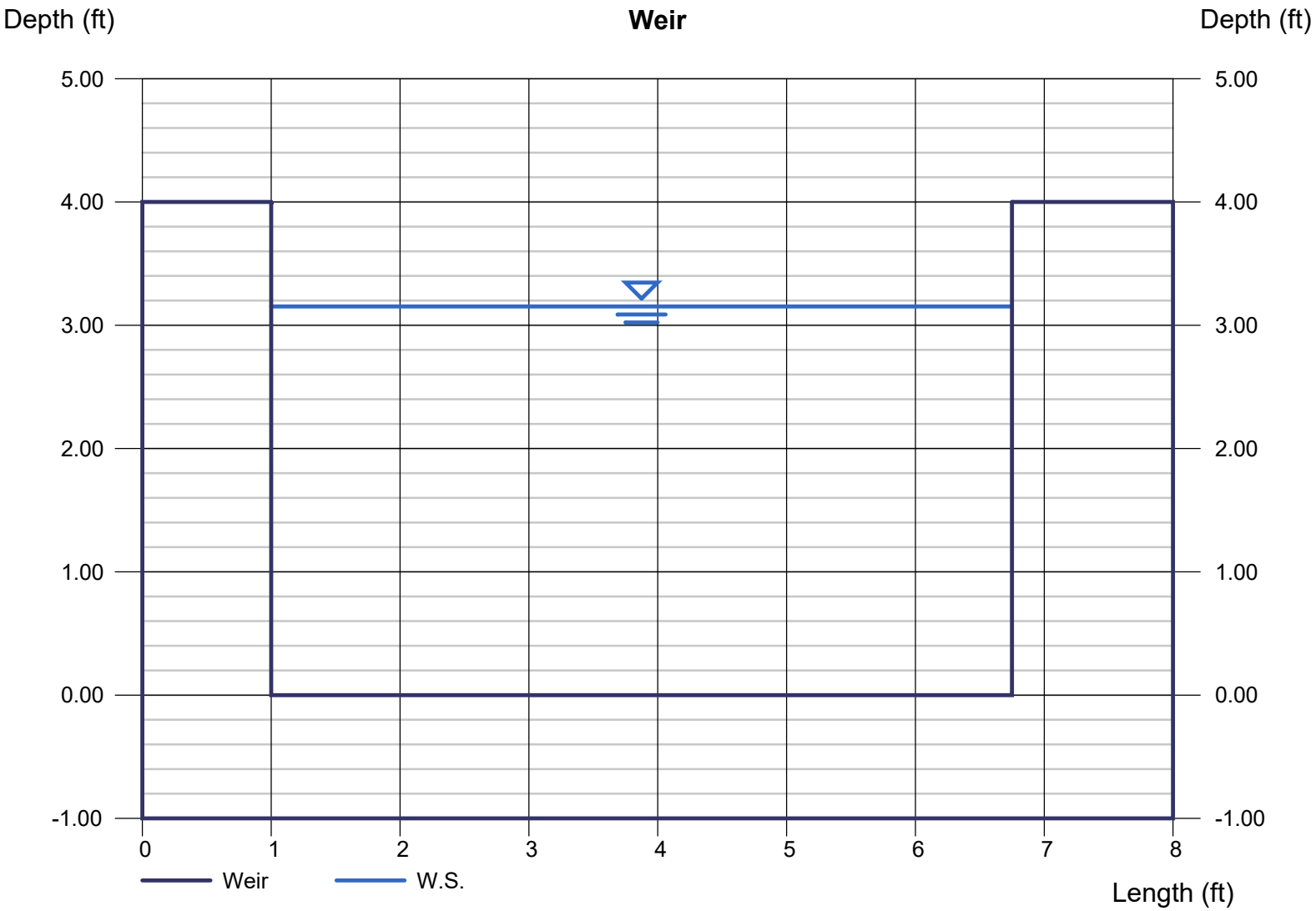
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 80.37

Highlighted

Depth (ft)	= 3.15
Q (cfs)	= 80.37
Area (sqft)	= 18.12
Velocity (ft/s)	= 4.43
Top Width (ft)	= 5.75



Weir Report

Weir

Rectangular Weir

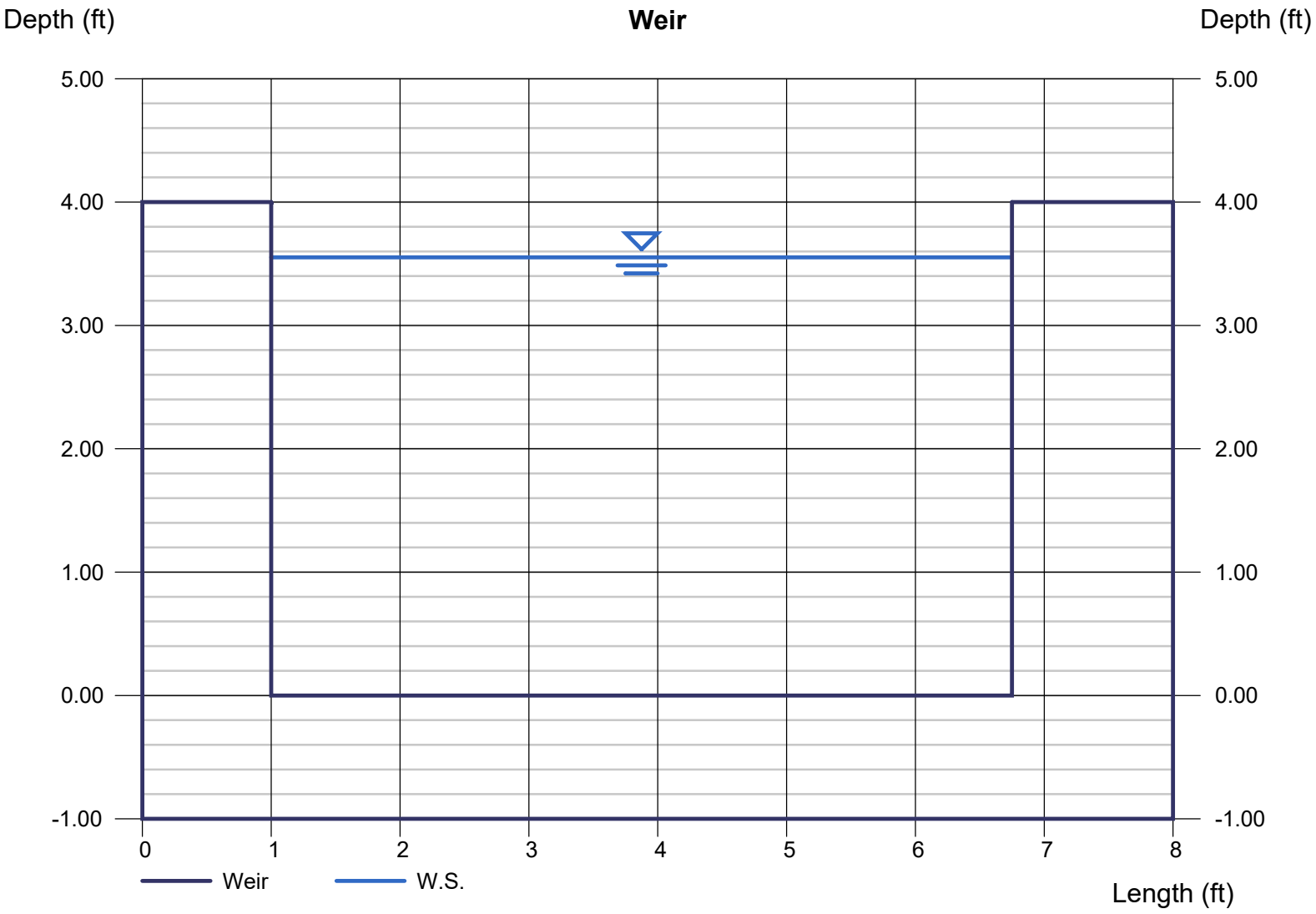
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 96.15

Highlighted

Depth (ft)	= 3.55
Q (cfs)	= 96.15
Area (sqft)	= 20.43
Velocity (ft/s)	= 4.71
Top Width (ft)	= 5.75



Weir Report

Weir

Rectangular Weir

Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 115.00

Highlighted

Depth (ft)	= 4.00
Q (cfs)	= 115.00
Area (sqft)	= 22.99
Velocity (ft/s)	= 5.00
Top Width (ft)	= 5.75

