HAWKINS VALLEY
DRAINAGE CALCULATIONS – SUMMARY
2/3/2025

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
DRAINAGE CALCULATIONS – SUMMARY
2/3/2025

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. The amount of pre development flow is 115.89 cfs.

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. The amount of post development flow is 127.93 cfs. 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. The Pond volume is designed to hold the 100-year storm event and a factor of safety of 25% is added on detention volumes. The pond storage is 44,804 cft. A concrete control structure is constructed on the eastern edge of the pond. This control structure uses 5.75 feet wide slotted weir to limit the discharge through the structure to that of the 2, 10, 25, 50, and 100-year pre-development flow.

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 (Eqn 400-3)	
L1 =	150	feet	
n1 =	0.6	Deciduous Timber (n values taken from Table 400-3 of City of Bryant Drainage Manual)	
S1 =	0.053	ft/ft	
$Tc_{calculated}$	16.35	minutes	

Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow (Eqn 400-4)
V=	16.1345 * S^0.5	ft/sec	Unpaved (Eqn 400-5)
L1 =	400	feet	
S1 =	0.070	ft/ft	
$V_{calculated}$ =	4.27	ft/sec	
$Tc_{calculated}$	1.56	minutes	

Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow (Eqn 400-4)
V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec	
L1 =	50	feet	
D=	2	feet	
S1 =	0.010	ft/ft	
n=	0.013	concrete pipe (n values from Table 600-3 of COB Drainage Manual)	
$V_{calculated}$ =	7.22	ft/sec	
$Tc_{calculated}$	0.12	minutes	

Tsc =	$\frac{L}{60V}$	minutes	Shallow Concentrated Flow
V=	16.1345 * S^0.5	ft/sec	Unpaved (Eqn 400-5)
L1 =	570	feet	
S1 =	0.016	ft/ft	
$V_{calculated}$ =	2.03	ft/sec	
$Tc_{calculated}$	4.69	minutes	

Tsc =	$\frac{L}{60V}$	minutes	Pipe Flow (Eqn 400-4)
V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec	
L1 =	50	feet	
D=	2	feet	
S1 =	0.010	ft/ft	
n=	0.013	concrete pipe	
$V_{calculated}$ =	7.22	ft/sec	
$Tc_{calculated}$	0.12	minutes	

Tsc =	$\frac{L}{60V}$	minutes	Open Channel (Eqn 400-4)
V=	$\frac{1.49*(R)^{(2/3)}*S^{0.5}}{n}$	ft/sec	Open Channel
L1 =	1480	feet	
R=	0.95	feet	(V-Ditch 2 ' ht., 3:1 Slope)
S1 =	0.026	ft/ft	
n=	0.022	earth with short grass, few weeds (n values from Table 500-1 of COB Drainage Manual)	
$V_{calculated}$ =	4.16	ft/sec	
$Tc_{calculated}$	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_{25} =	4.6 Inches/hr	I_{2} =	2.8 Inches/hr

i from Exhibit 400-1 of Bryant Drainage Manual

Stormwater Calcs - Hawkins Valley
Using Rational Method

Post-development

Calculated Tc values - Drainage Basin 1

Tc =	$\frac{0.83 * L^{.467} * n^{.467}}{S^{.5}}$	minutes (Eqn 400-3)
L1 =	150	feet
n1 =	0.6	Deciduous Timber (n values taken from Table 400-3 of City of Bryant Drainage Manual)
S1 =	0.053	ft/ft
$Tc_{calculated}$	16.35	minutes

Shallow Concentrated Flow (Eqn 400-4) Unpaved (Eqn 400-5)

Tsc =	$\frac{L}{60V}$	minutes
V=	16.1345 * S^0.5	ft/sec
L1 =	400	feet
S1 =	0.070	ft/ft
$V_{calculated}$ =	4.27	ft/sec
$Tc_{calculated}$	1.56	minutes

Pipe Flow (Eqn 400-4)

Tsc =	$\frac{L}{60V}$	minutes
V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec
L1 =	50	feet
D=	2	feet
S1 =	0.010	ft/ft
n=	0.013	concrete pipe (n values from Table 600-3 of COB Drainage Manual)
$V_{calculated}$ =	7.22	ft/sec
$Tc_{calculated}$	0.12	minutes

Shallow Concentrated Flow Unpaved (Eqn 400-5)

Tsc =	$\frac{L}{60V}$	minutes
V=	16.1345 * S^0.5	ft/sec
L1 =	570	feet
S1 =	0.016	ft/ft
$V_{calculated}$ =	2.03	ft/sec
$Tc_{calculated}$	4.69	minutes

Pipe Flow (Eqn 400-4)

Tsc =	$\frac{L}{60V}$	minutes
V=	$\frac{1.49*(D/4)^{(2/3)}*S^{0.5}}{n}$	ft/sec
L1 =	50	feet
D=	2	feet
S1 =	0.010	ft/ft
n=	0.013	concrete pipe
$V_{calculated}$ =	7.22	ft/sec
$Tc_{calculated}$	0.12	minutes

Open Channel (Eqn 400-4) Open Channel

Tsc =	$\frac{L}{60V}$	minutes
V=	$\frac{1.49*(R)^{(2/3)}*S^{0.5}}{n}$	ft/sec
L1 =	1480	feet
R=	0.95	feet (V-Ditch 2 ' ht., 3:1 Slope)
S1 =	0.026	ft/ft
n=	0.022	earth with short grass, few weeds (n values from Table 500-1 of COB Drainage Manual)
$V_{calculated}$ =	4.16	ft/sec
$Tc_{calculated}$	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 1

	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	(C values taken from Table 400-1 of City of Bryant Drainage Manual)
Single Family House	9.35	0.70	0.65	0.60	0.50	0.45	0.40	(C values taken from Page-50 of City of Bryant Drainage Manual)
Total Area =	**44.03**	**0.52**	**0.48**	**0.44**	**0.39**	**0.36**	**0.33**	

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	Q_5 = 52.40 CFS	Q_2 = 38.22 CFS
c = 0.47	c = 0.43	c = 0.40	c = 0.36	c = 0.34	c = 0.31
i= 5.60 in/hr	i= 5.10 in/hr	i= 4.60 in/hr	i= 3.90 in/hr	i= 3.50 in/hr	i= 2.80 in/hr
A= 44.03 acres	A= 44.03 acres	A= 44.03 acres	A= 44.03 acres	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	Q_5 = 56.00 CFS	Q_2 = 40.57 CFS
c = 0.52	c = 0.48	c = 0.44	c = 0.39	c = 0.36	c = 0.33
i= 5.60 in/hr	i= 5.10 in/hr	i= 4.60 in/hr	i= 3.90 in/hr	i= 3.50 in/hr	i= 2.80 in/hr
A= 44.03 acres	A= 44.03 acres	A= 44.03 acres	A= 44.03 acres	A= 44.03 acres	A= 44.03 acres

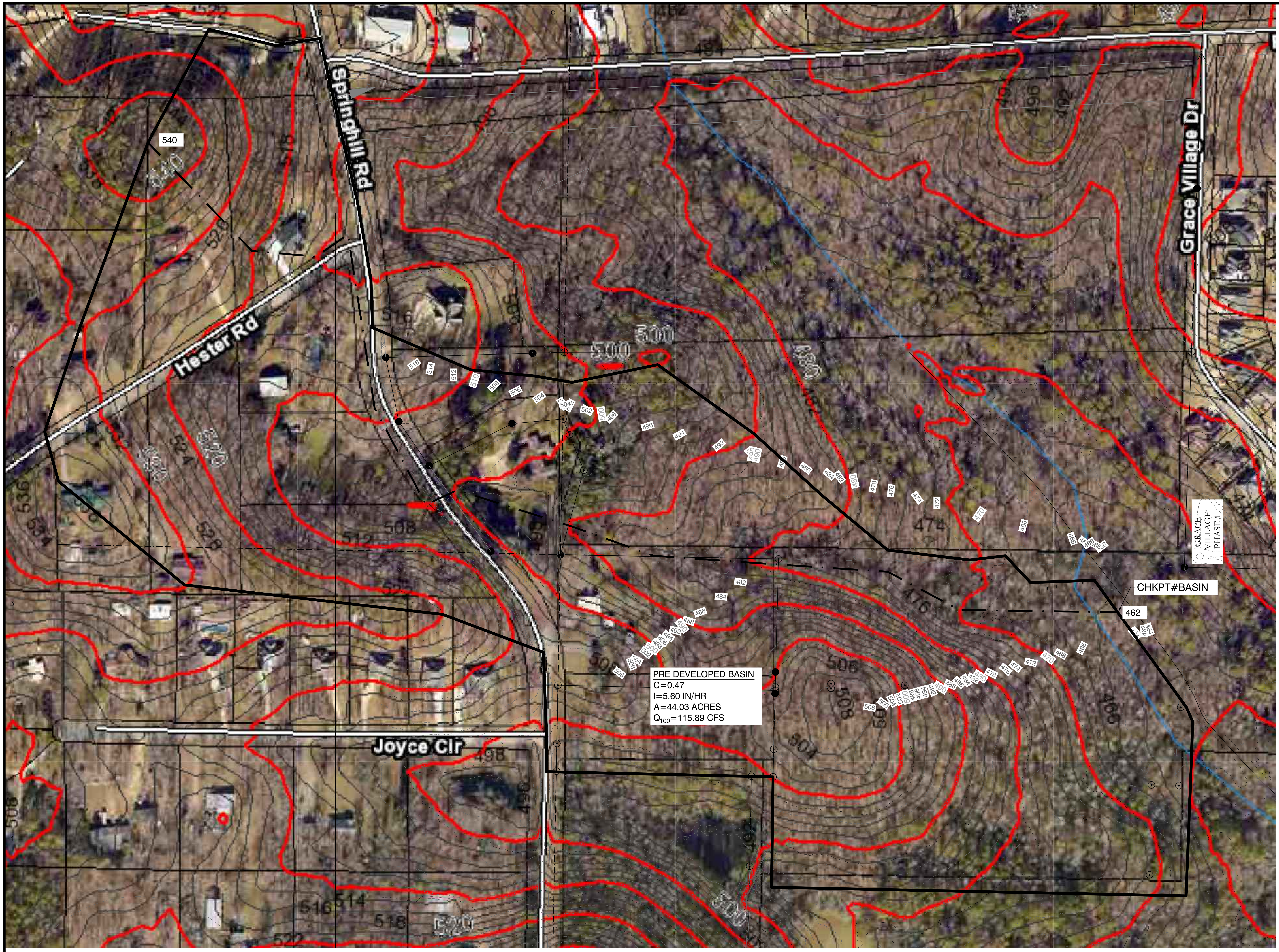
Stormwater Calcs - Hawkins Valley
Using Rational Method
Ditch Capacity

Mannings equation for ditch

n=	0.022	based on n for open channel earth with short grass, few weeds (n values from Table 500-1 of COB Drai
Slope=	3	:1

Design Q100= 63.75 cfs

Depth	Bottom	Top	area	rH	slope	Velocity	Q
(ft)	(ft)	(ft)	(ft^2)		(ft/ft)	(ft/s)	(cfs)
2	0	12	12	0.95	0.01	6.54	78.47



100' 50' 0 100

DATE	REVISION	BY

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

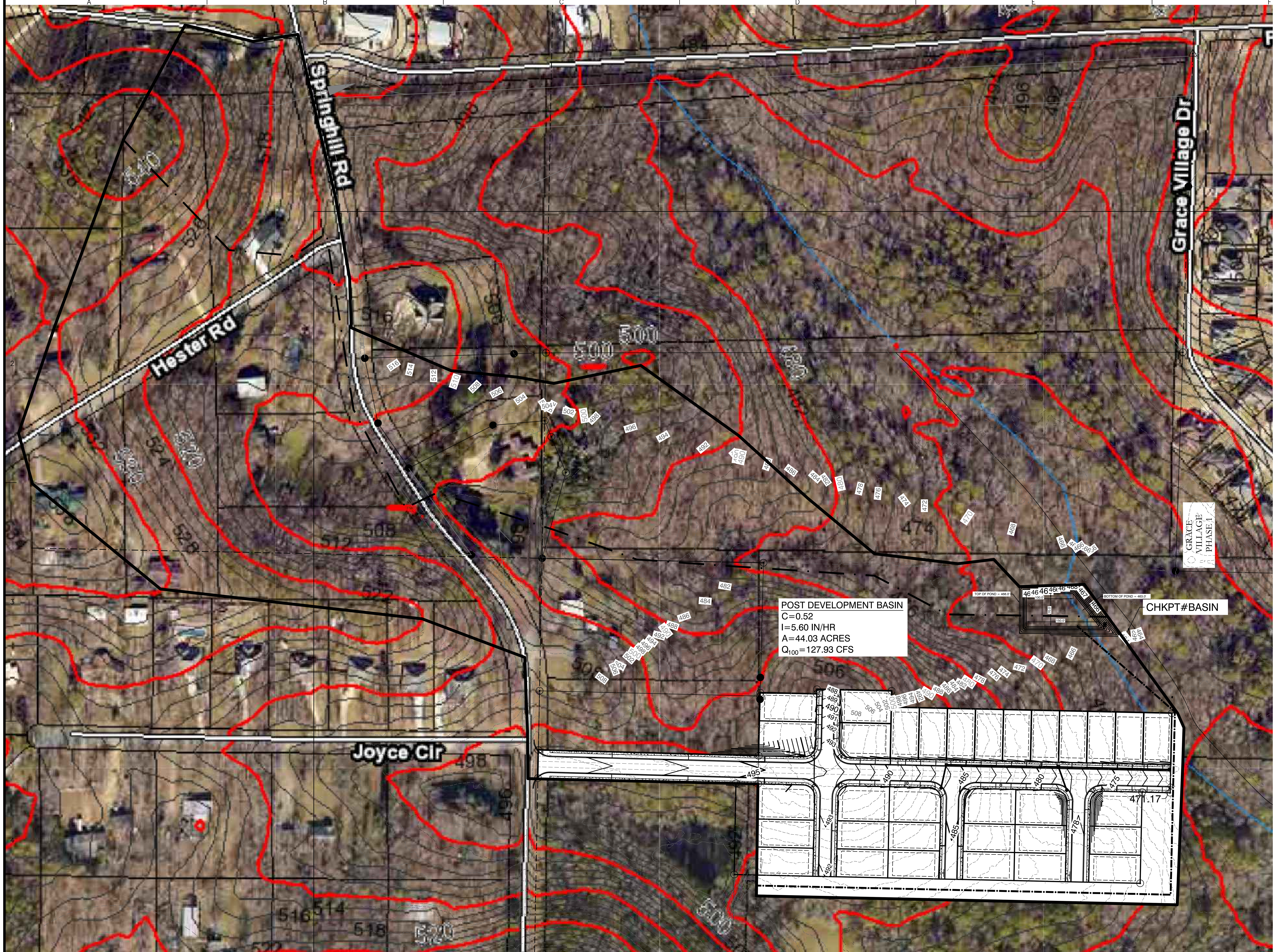
PRELIMINARY

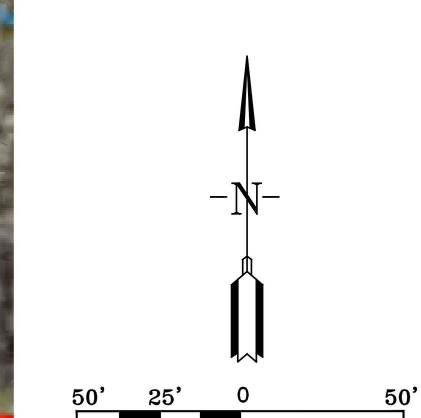
CONTENTS:
PRE DRAINAGE BASIN

PROJECT NO: 24076

DATE: JAN 2025

SHEET NO: 1.0





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

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DATE	REVISION	BY

PRELIMINARY

CONTENTS:
POST DRAINAGE BASIN

PROJECT NO: 24076

DATE: JAN 2025

SHEET NO: 2.0

Stormwater Calcs - Hawkins Valley
Using Rational Method

Calculated Tc values - Drainage Basin CI-1

Tc =	0.83 * L^.467 * n^.467	minutes	Overland Flow	Tsc =	L	minutes	Shallow Concentrated Flow
	S^.5				60V		
				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 =	0.83 * L^.467 * n^.467	minutes	Overland Flow	Tsc =	L	minutes	Shallow Concentrated Flow
	S^.5				60V		
				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 =	0.83 * L^.467 * n^.467	minutes	Overland Flow	Tsc =	L	minutes	Shallow Concentrated Flow
	S^.5				60V		
				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 =	0.83 * L^.467 * n^.467 / S^.5	minutes	Overland Flow	Tsc =	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 Z2=481.34	S1 =	0.042	ft/ft	Z1=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 =	0.83 * L^.467 * n^.467 / S^.5	minutes	Overland Flow	Tsc =	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 Z2=473.84	S1 =	0.031	ft/ft	Z1=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	

Calculated Tc values - Drainage Basin A1, A2, A3, A4, A5, A6, A7

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 400-1 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 400-1 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 400-1 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	(C values taken from Page-50 of City of Bryant Drainage
Total Area =	**1.30**	**0.55**	**0.64**	**0.74**		

SDMH-C4

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-1 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 400-1 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**	

SDMH-A1

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-1 of City of Bryant Drainage Manual)
	0.51	0.36	0.42	0.49	Pasture, Average 2-7%
	0.53	0.81	0.86	0.95	Road/Asphalt
Total Area =	**1.04**	**0.59**	**0.64**	**0.72**	

SDMH-A2

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-1 of City of Bryant Drainage Manual)
	0.07	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.07**	**0.81**	**0.86**	**0.95**	

SDMH-A3

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-1 of City of Bryant Drainage Manual)	
	0.81	0.36	0.42	0.49	Pasture, Average 2-7%	
	1.48	0.5	0.6	0.7	Single Family House	(C values taken from Page-50 of City of Bryant Drainage
Total Area =	**2.29**	**0.45**	**0.54**	**0.63**		

SDMH-A4

	Area	C_{10}	C_{25}	C_{100}		
	1.31	0.5	0.6	0.7	Single Family House	(C values taken from Page-50 of City of Bryant Drainage
Total Area =	**1.31**	**0.50**	**0.60**	**0.70**		

SDMH-A5

	Area	C_{10}	C_{25}	C_{100}		
	1.14	0.5	0.6	0.7	Single Family House	(C values taken from Page-50 of City of Bryant Drainage
Total Area =	**1.14**	**0.50**	**0.60**	**0.70**		

SDMH-A6	Area	C_{10}	C_{25}	C_{100}		
	0.75	0.5	0.6	0.7	Single Family House	(C values taken from Page-50 of City of Bryant Drainage
Total Area =	**0.75**	**0.50**	**0.60**	**0.70**		

SDMH-A7	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-1 of City of Bryant Drainage Manual)
	0.53	0.35	0.39	0.46	Good Condition, Averaage 2-7%
Total Area =	**0.53**	**0.35**	**0.39**	**0.46**	

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

SDMH-A1

Q_{10} =	4.64 CFS	Q_{25} =	5.61 CFS	Q_{100} =	7.51 CFS
c =	0.59	c =	0.64	c =	0.72
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	1.04 acres	A=	1.04 acres	A=	1.04 acres

SDMH-A2

Q_{10} =	0.43 CFS	Q_{25} =	0.50 CFS	Q_{100} =	0.66 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=	0.07 acres	A=	0.07 acres	A=	0.07 acres

SDMH-A3

Q_{10} =	7.83 CFS	Q_{25} =	10.30 CFS	Q_{100} =	14.30 CFS
c =	0.45	c =	0.54	c =	0.63
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	2.29 acres	A=	2.29 acres	A=	2.29 acres

SDMH-A4

Q_{10} =	4.96 CFS	Q_{25} =	6.58 CFS	Q_{100} =	9.14 CFS
c =	0.50	c =	0.60	c =	0.70
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	1.31 acres	A=	1.31 acres	A=	1.31 acres

SDMH-A5

Q_{10} =	4.34 CFS	Q_{25} =	5.75 CFS	Q_{100} =	7.99 CFS
c =	0.50	c =	0.60	c =	0.70
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	1.14 acres	A=	1.14 acres	A=	1.14 acres

SDMH-A6

Q_{10} =	2.85 CFS	Q_{25} =	3.78 CFS	Q_{100} =	5.25 CFS
c =	0.50	c =	0.60	c =	0.70
i=	7.60 in/hr	i=	8.40 in/hr	i=	10.00 in/hr
A=	0.75 acres	A=	0.75 acres	A=	0.75 acres

SDMH-A7

Q_{10} =	1.41	CFS	Q_{25} =	1.74	CFS	Q_{100} =	2.44	CFS
c =	0.35		c =	0.39		c =	0.46	
i=	7.60	in/hr	i=	8.40	in/hr	i=	10.00	in/hr
A=	0.53	acres	A=	0.53	acres	A=	0.53	acres

TOTAL

Q_{10} =	**36.31**	**CFS**	**Q_{25} =**	**46.46**	**CFS**	**Q_{100} =**	**63.75**	**CFS**

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

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

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

Stormwater Calcs - Hawkins Valley
using Rational Method
Culvert Capacities

	CI-1		CI-2		CI-3		CI-4
Q_{25} =	**1.44 CFS**	**Q_{25} =**	**1.37 CFS**	**Q_{25} =**	**6.99 CFS**	**Q_{25} =**	**1.23 CFS**
c =	0.86 Road/Asphalt	c =	0.86 Road/Asphalt	c =	0.64 Road/Asphalt	c =	0.86 Road/Asphalt
i=	8.4 in/hr	i=	8.4 in/hr	i=	8.4 in/hr	i=	8.4 in/hr
A=	0.20 acres	A=	0.19 acres	A=	1.30 acres	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%

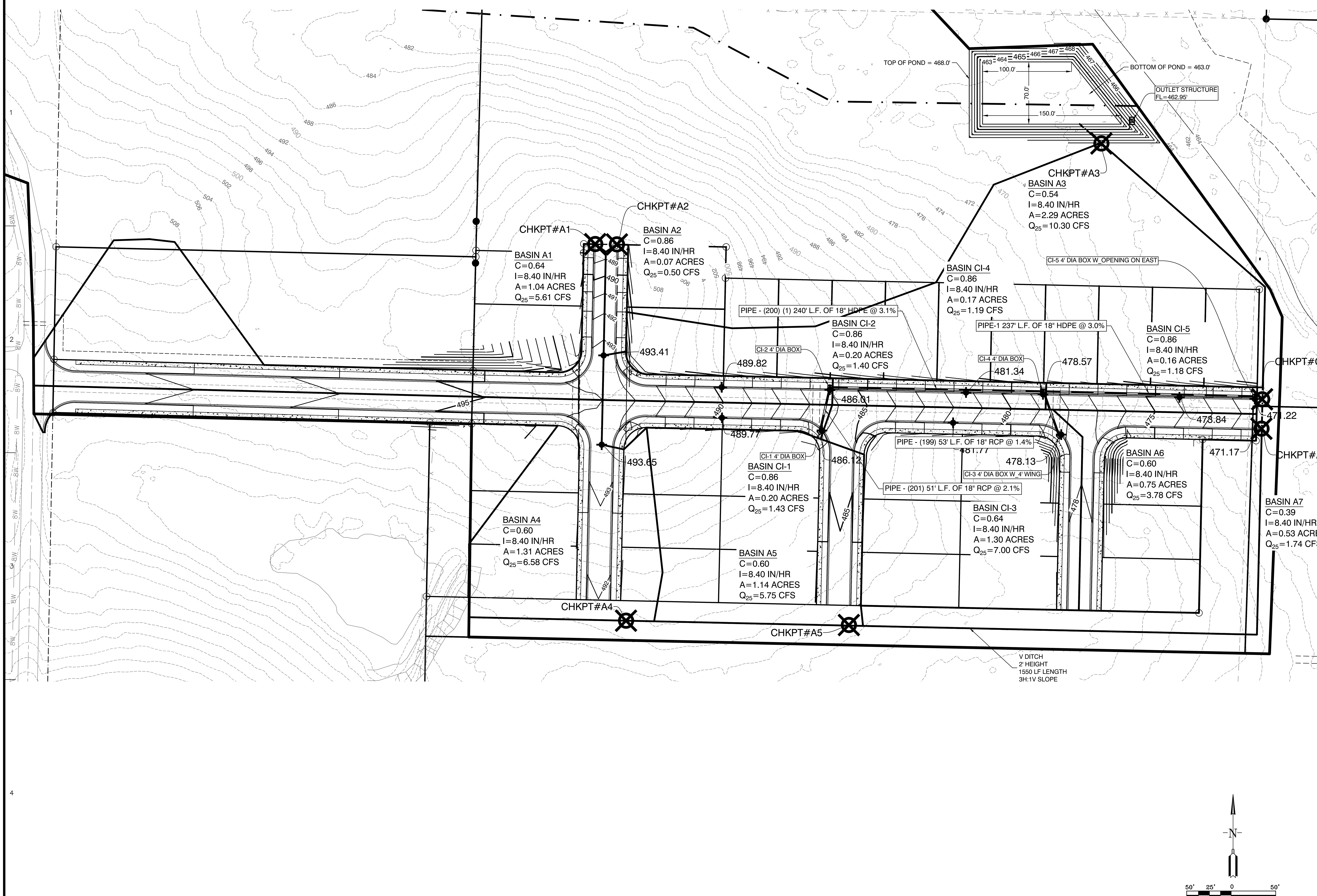
Stormwater Calcs - Hawkins Valley
Using Rational Method
Ditch Capacity

Mannings equation for ditch

n=	0.022	based on n for open channel earth with short grass, few weeds	(n values from Table 500-1 of COB Drainage Manual)
Slope=	3	:1	

Design Q100= 63.75 cfs

Depth (ft)	Bottom (ft)	Top (ft)	area (ft^2)	rH	slope (ft/ft)	Velocity (ft/s)	Q (cfs)
2	0	12	12	0.95	0.01	6.54	78.47



BY	REVISION	DATE

GNE Designing our client's success

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

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

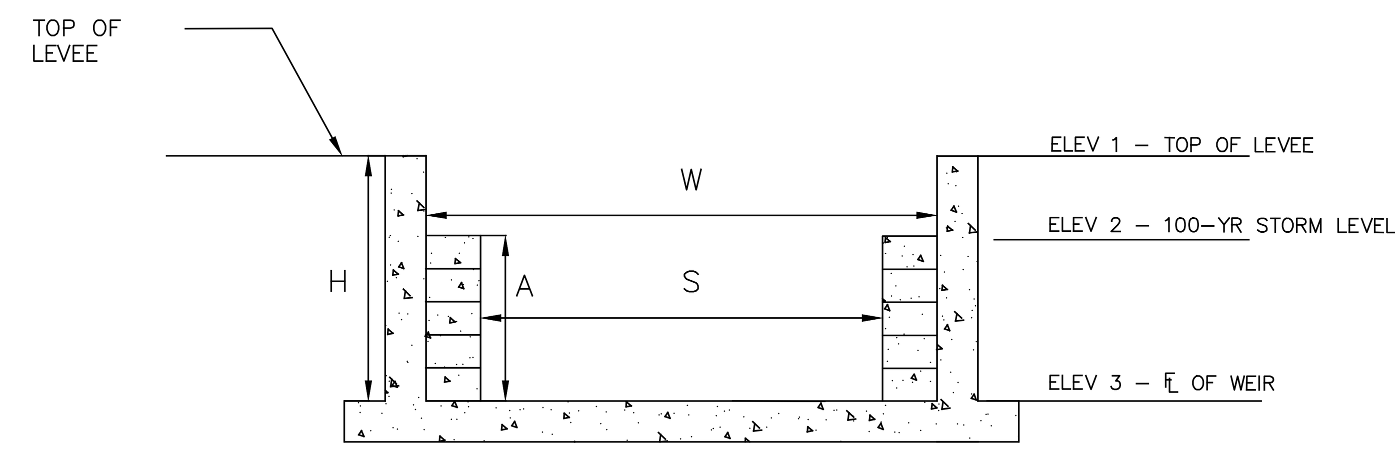
PRELIMINARY

CONTENTS:
INLET BASIN PLAN

PROJECT NO:
24076

DATE:
JAN 2025

SHEET NO:
3.0



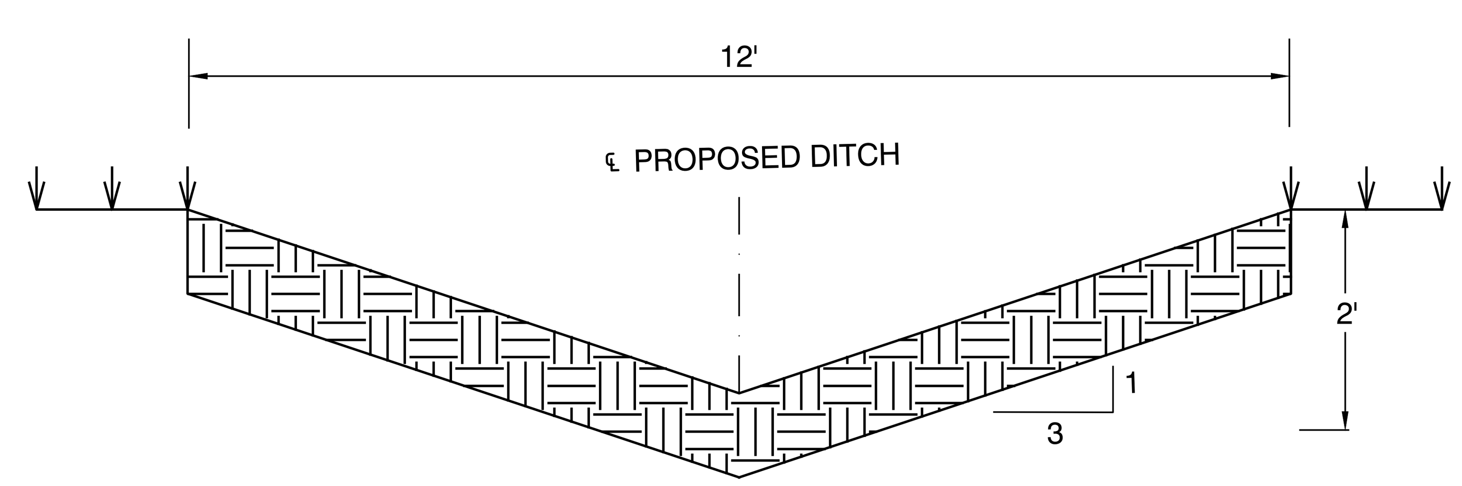
DETENTION OUTLET SECTION

NOT TO SCALE

CONTROL STRUCTURE								
OUTLET STRUCTURE	L	W	H	ELEV 1	ELEV 2	ELEV 3	S	A
1	5'–0"	7'–8"	5'–1"	468.00	467.00	462.95	5'–9"	4'–0"

DETENTION OUTLET NOTES:

1. ALL CONCRETE WALLS SHALL BE A MINIMUM OF 6" THICK & REINFORCED WITH #4'S @ 12" O.C. BOTH WAYS.
2. BOTTOM SLAB SHALL BE 12" THICK & REINFORCED WITH #4'S @ 12" O.C. BOTH WAYS.



TYPICAL DITCH CROSS SECTION

(N.T.S)

BY	REVISION	DATE

GNE Designing our client's success
GarNat Engineering, LLC
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Benton, AR 72018
Ph (501) 408-4650
3825 Mt Carmel Rd
Bryant, AR 72022
garnatengineering@gmail.com

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

STATE OF ARKANSAS
REGISTERED PROFESSIONAL ENGINEER
NO. 9551
VERNON J. WILLIAMS

1-06-2025

CONTENTS:
OUTLET STRUCTURE DETAILS

PROJECT NO: 24076

DATE: JAN 2025

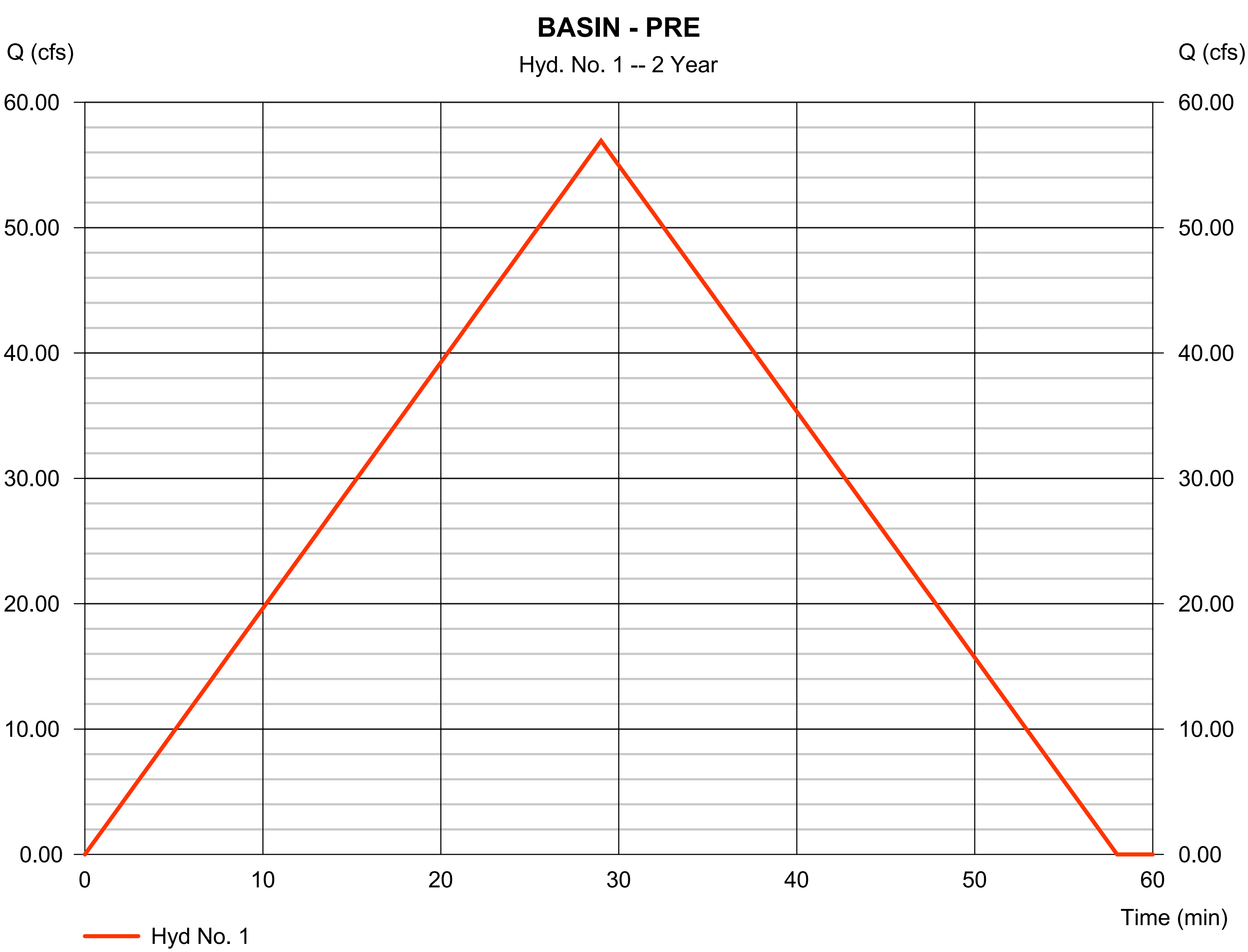
SHEET NO: C3.2

Hydrograph Report

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

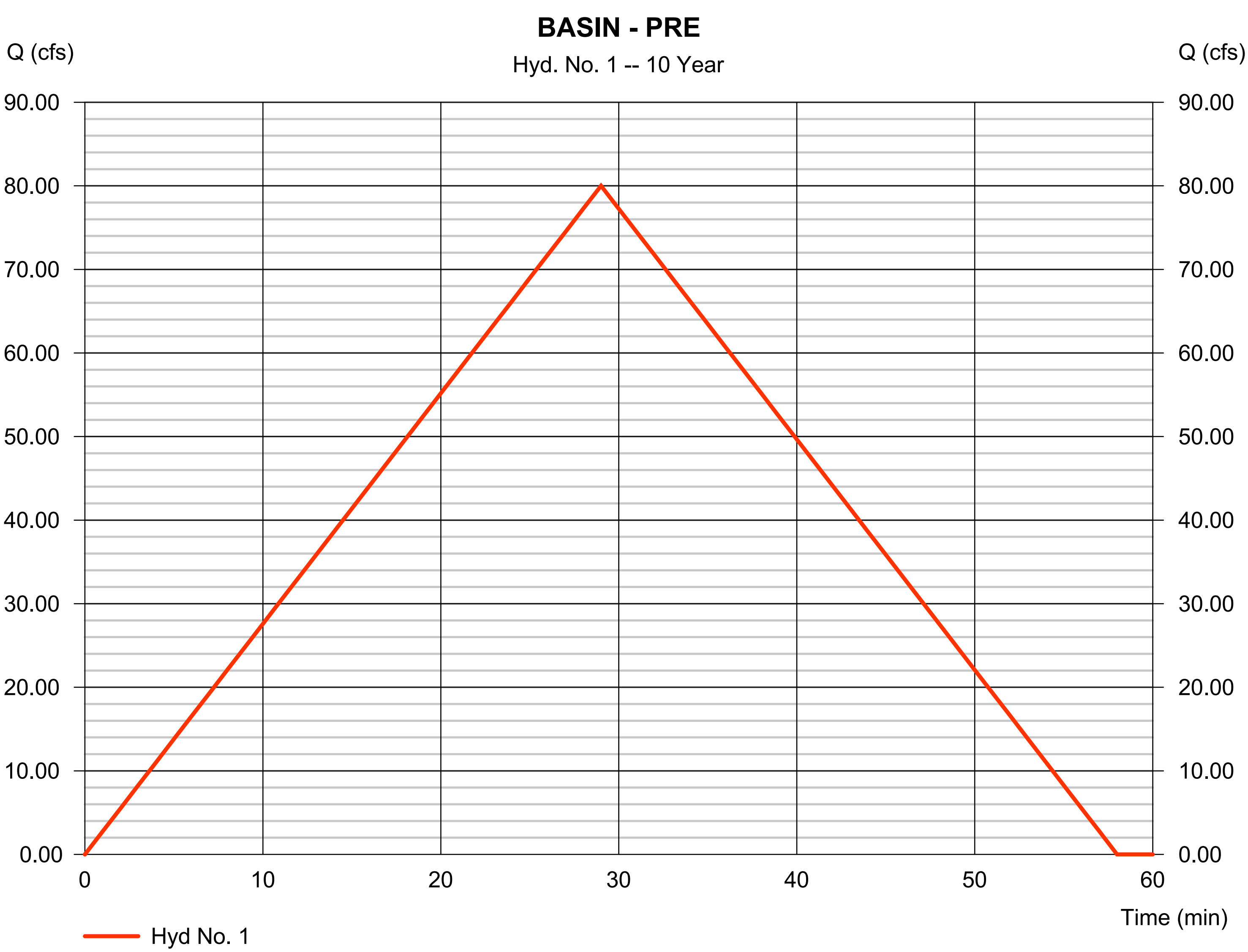


Hydrograph Report

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

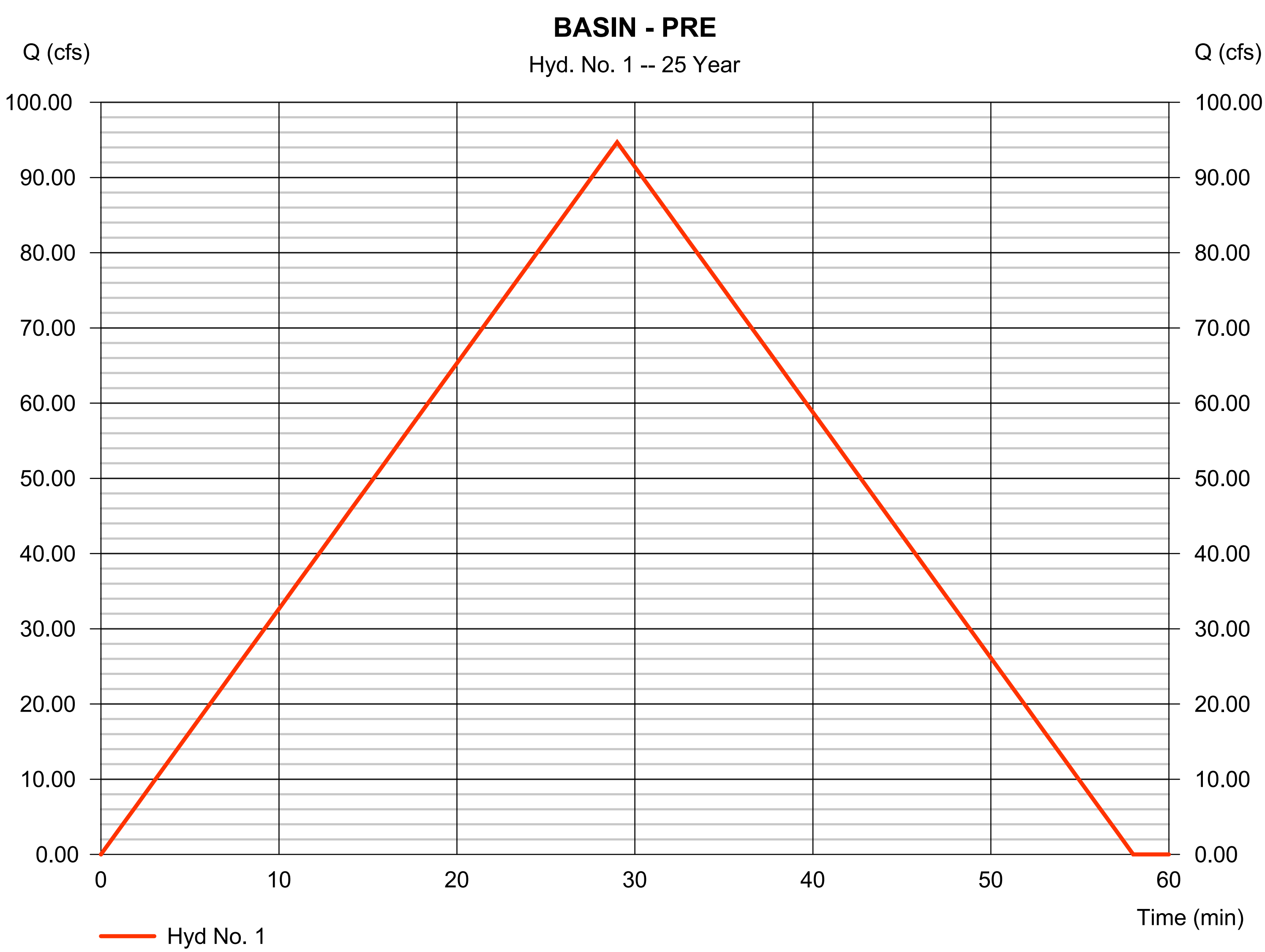


Hydrograph Report

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

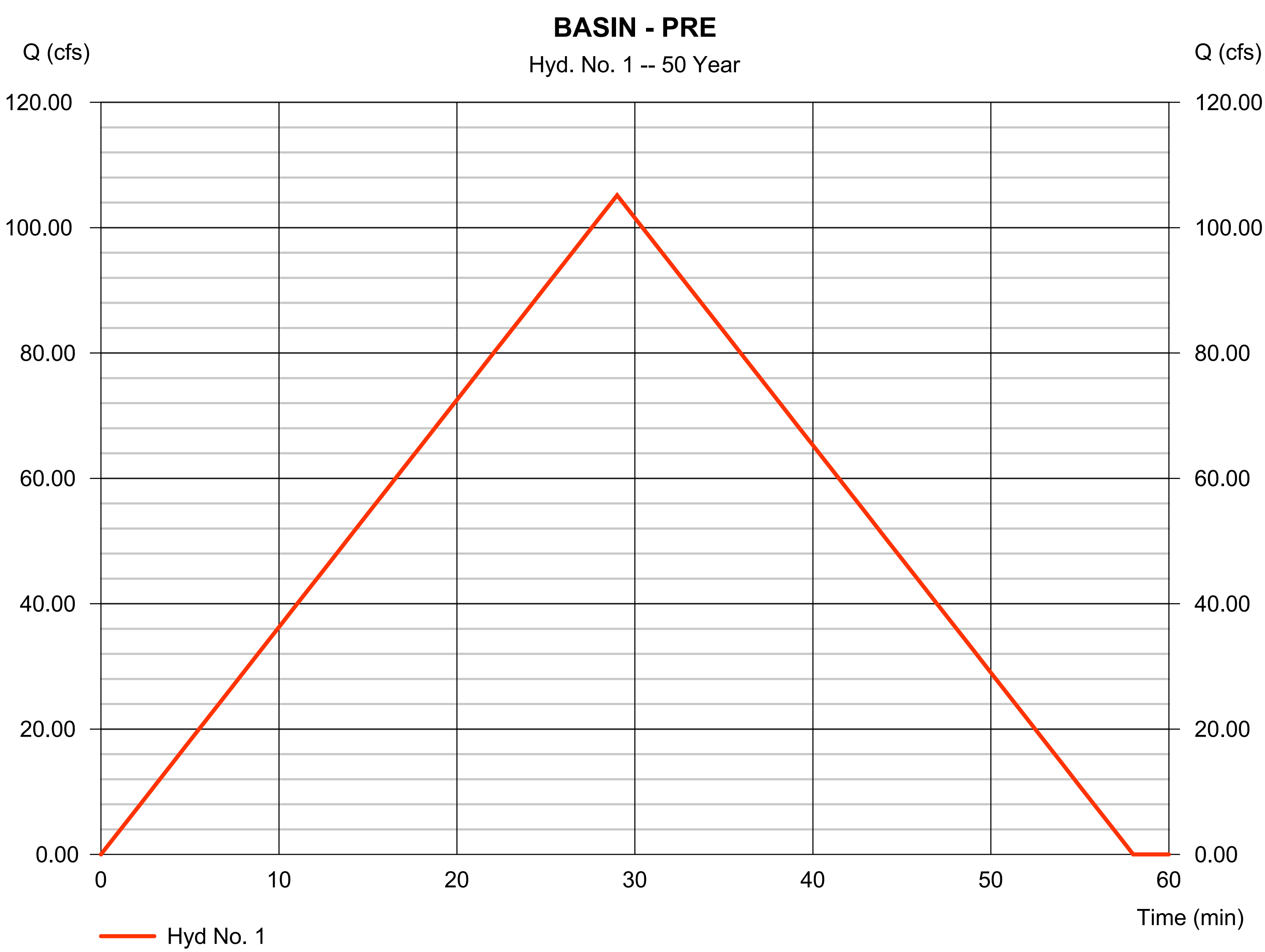


Hydrograph Report

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

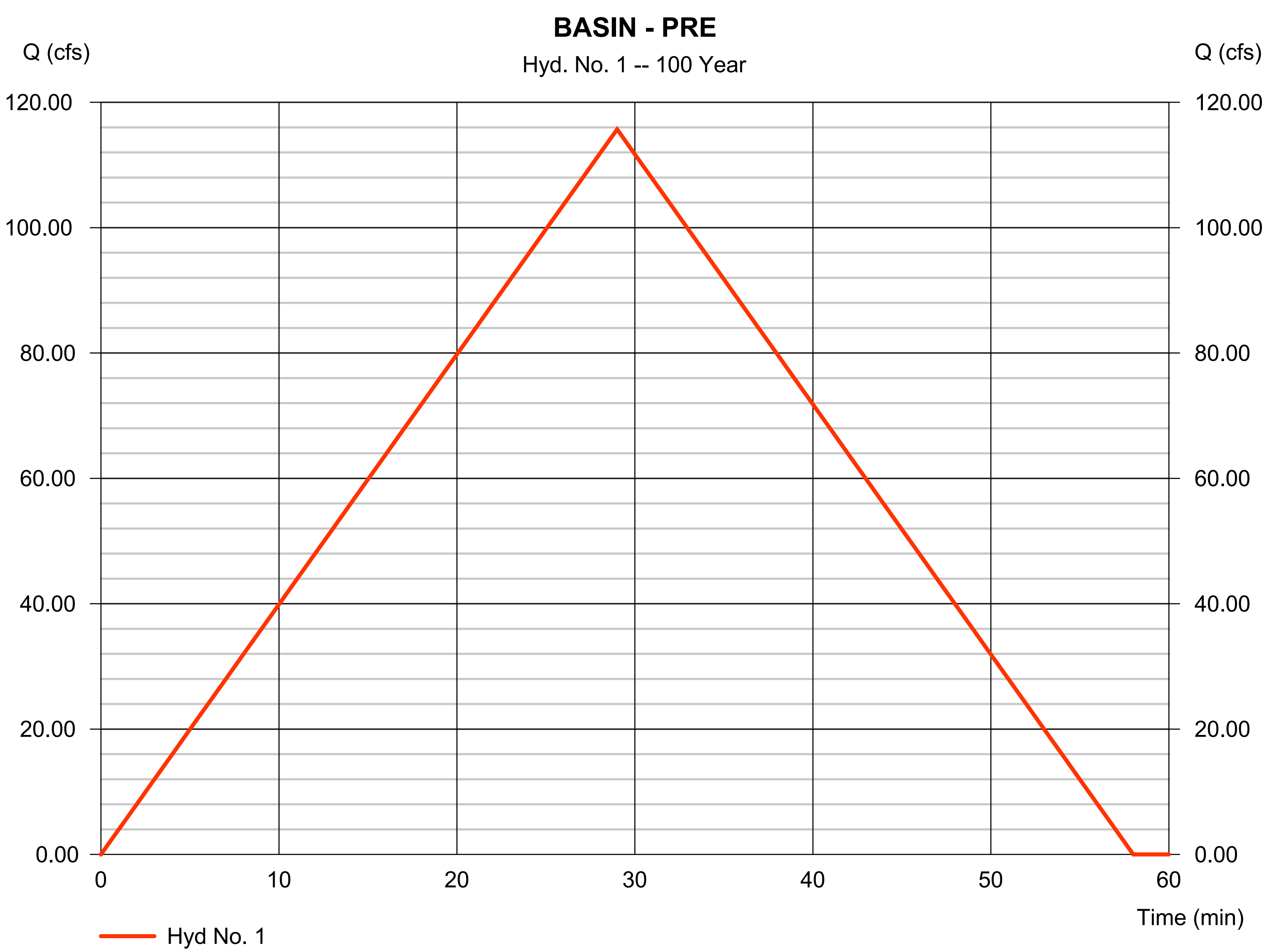


Hydrograph Report

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

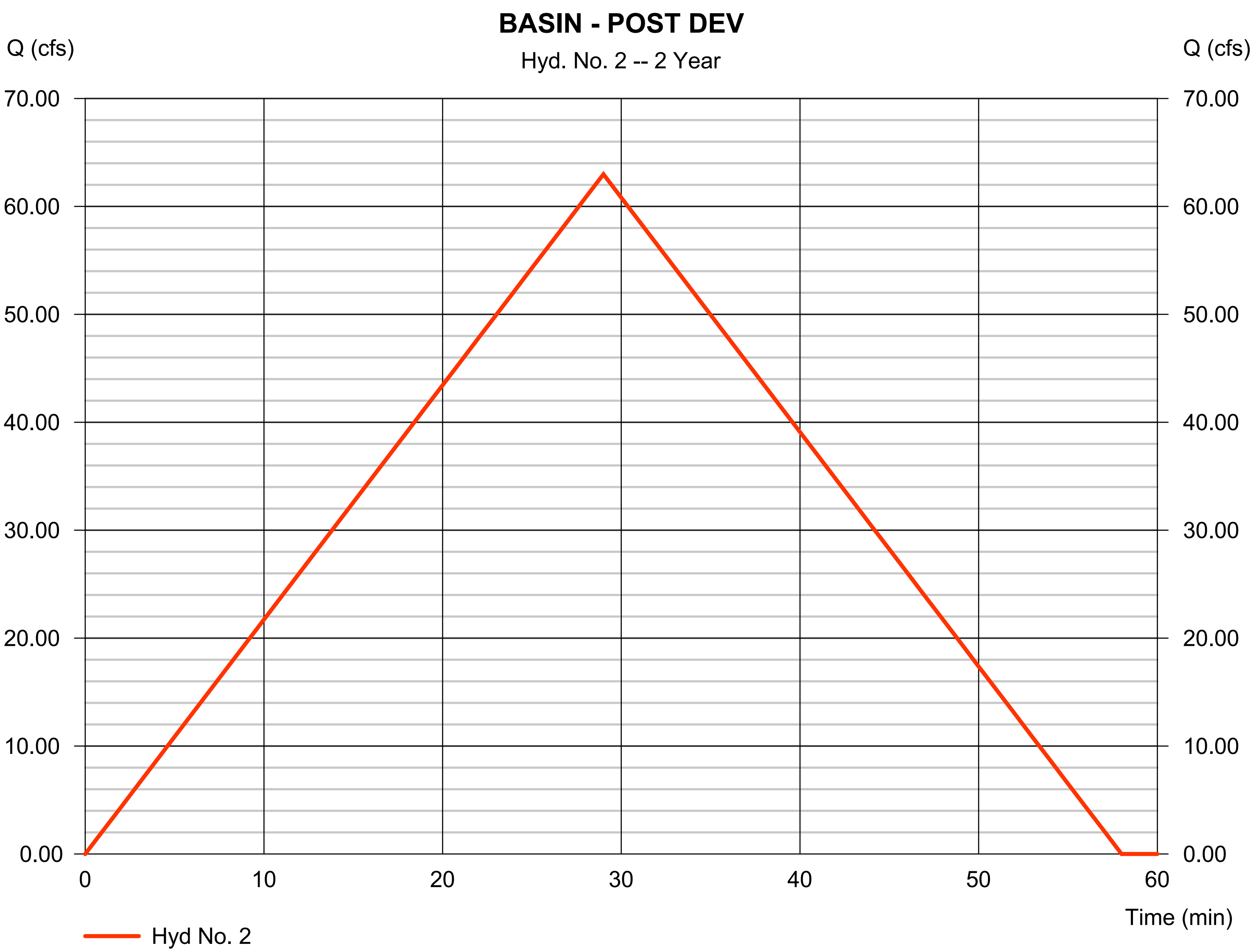


Hydrograph Report

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

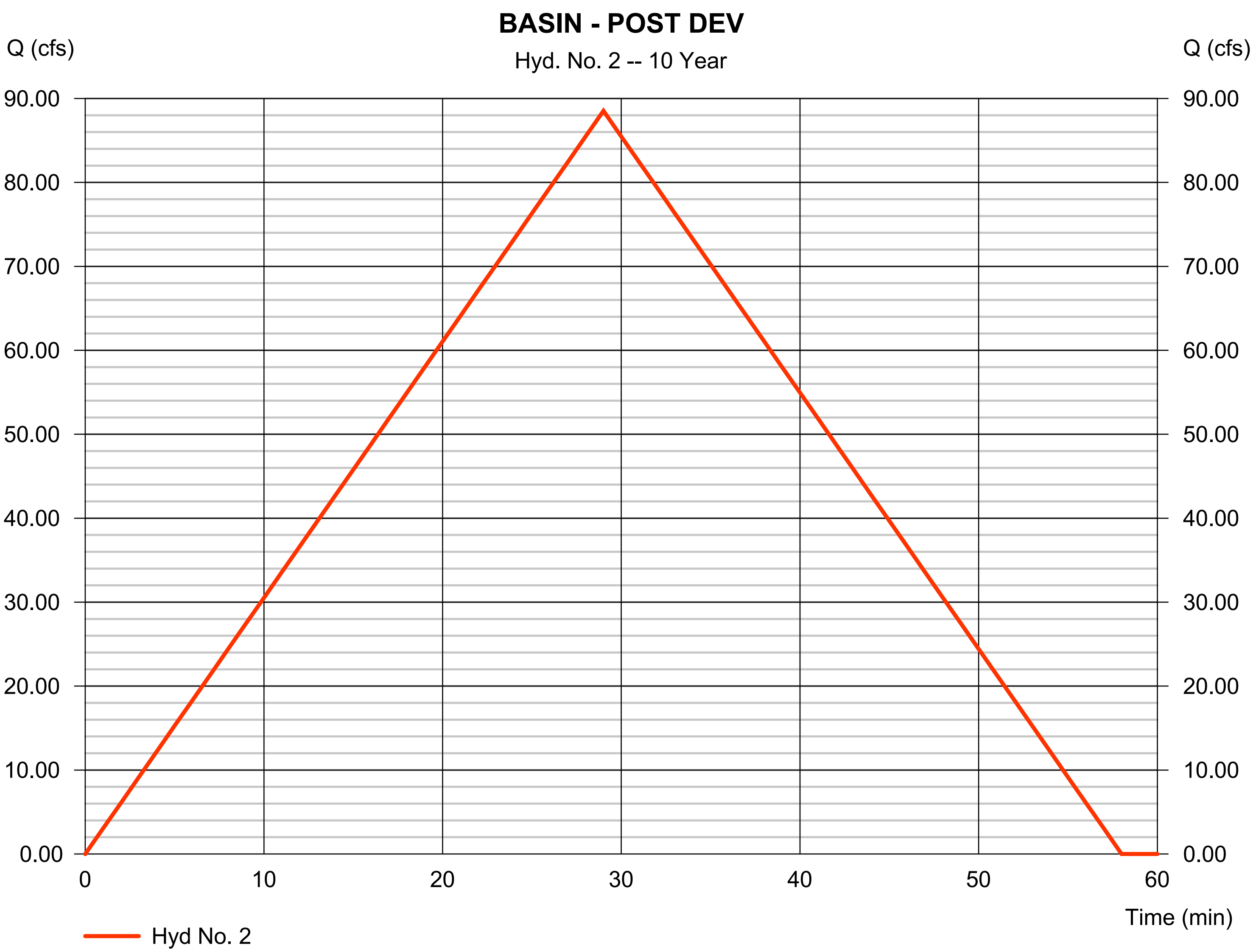


Hydrograph Report

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

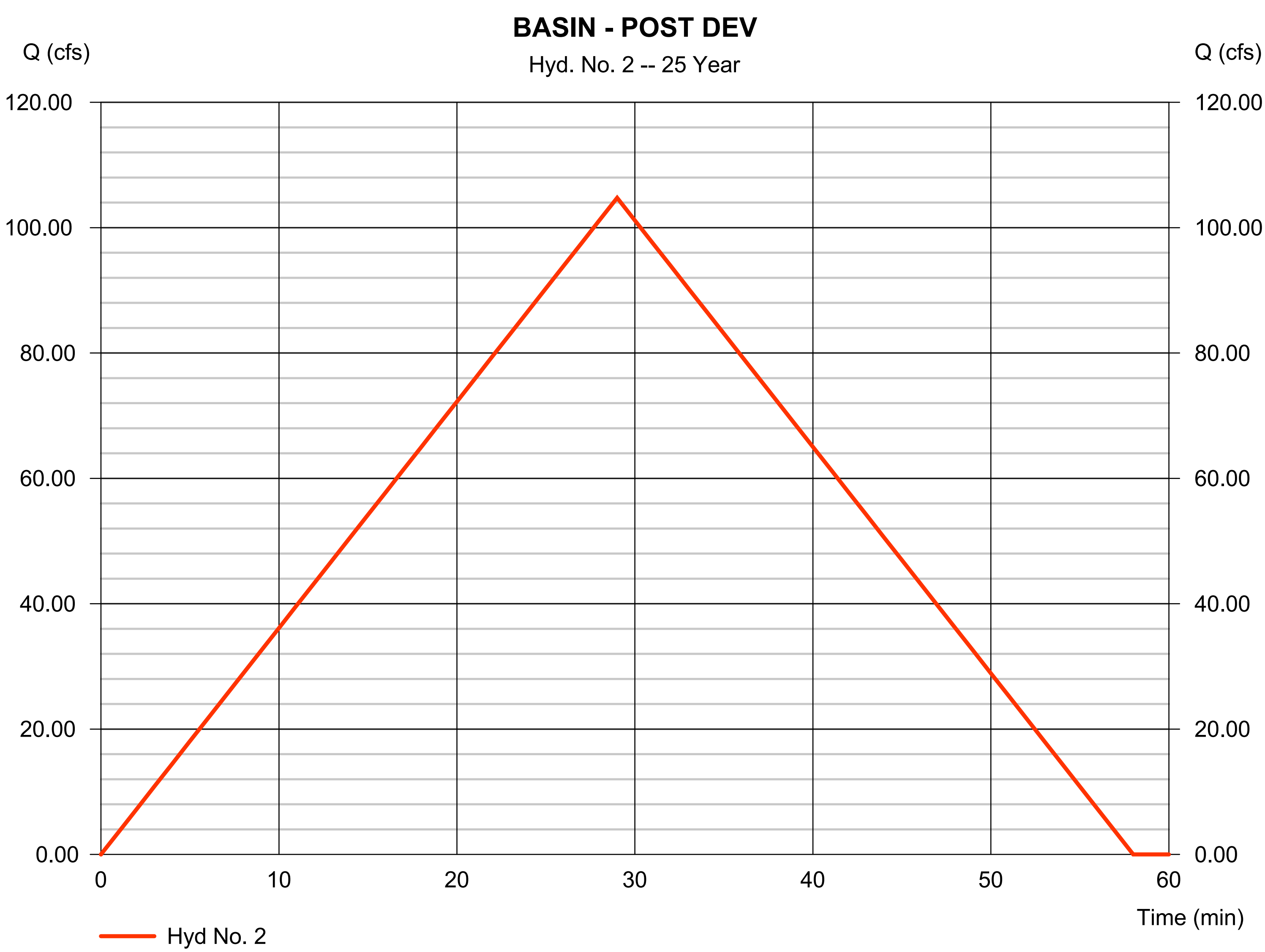


Hydrograph Report

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

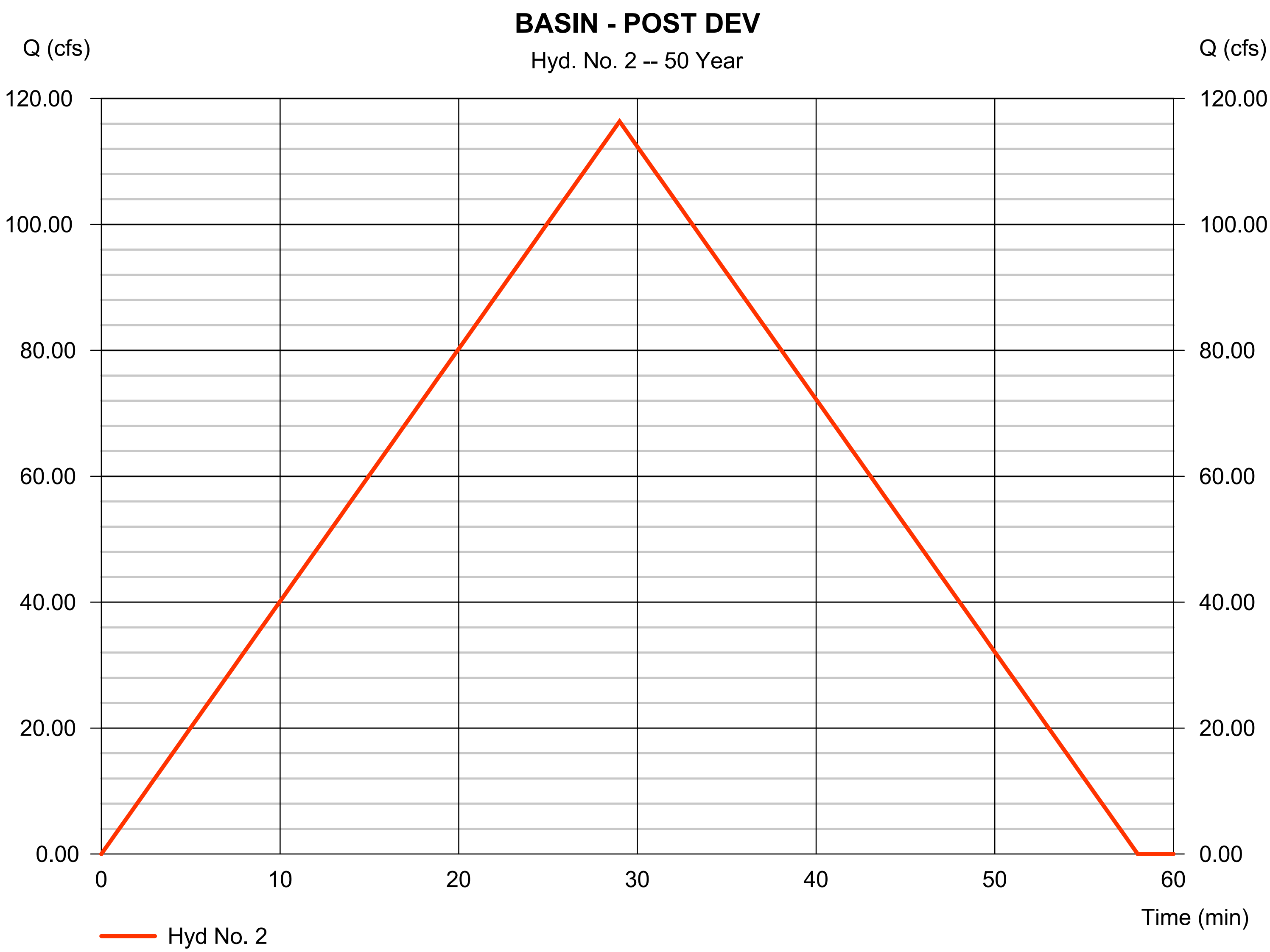


Hydrograph Report

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

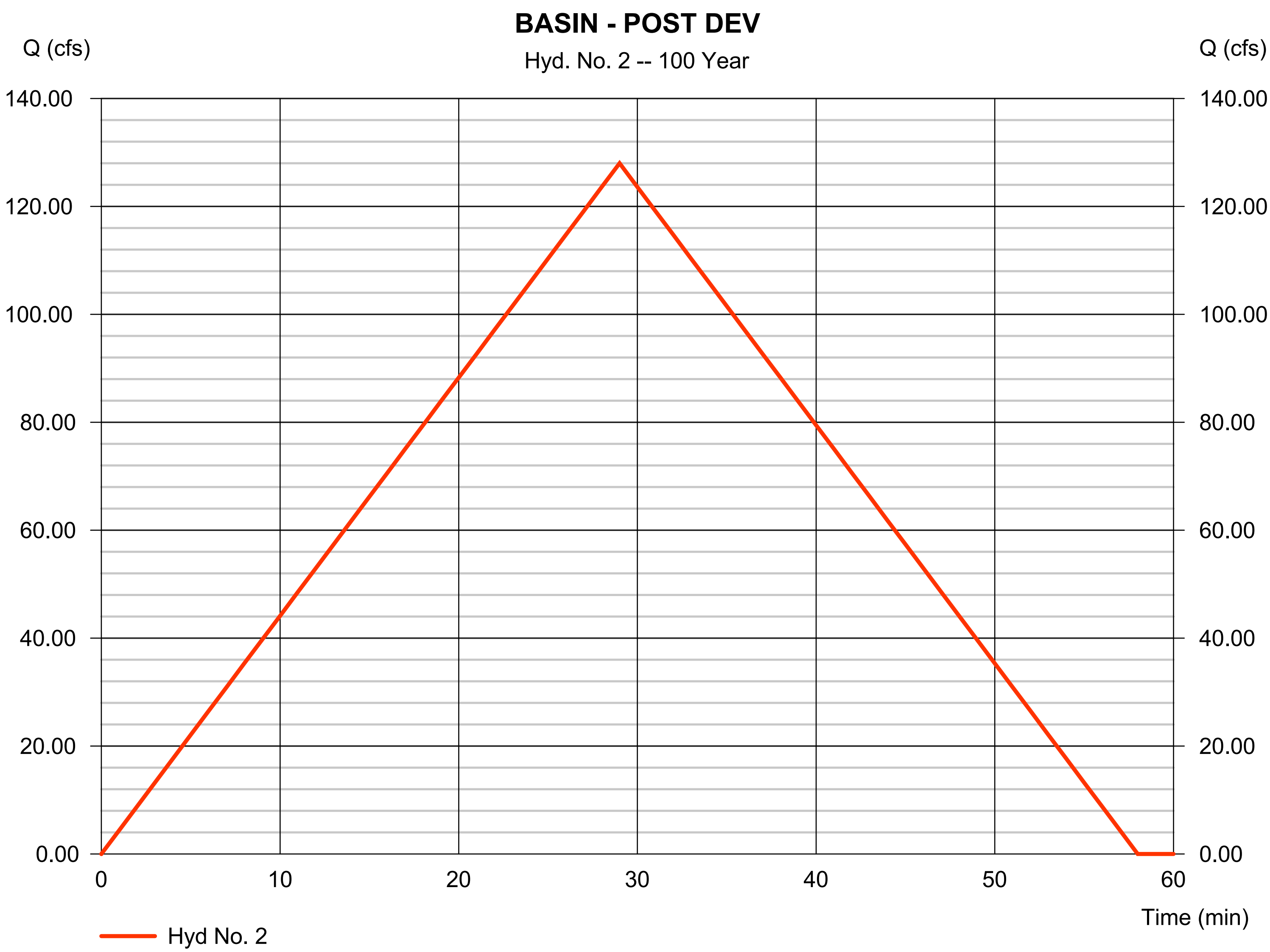


Hydrograph Report

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



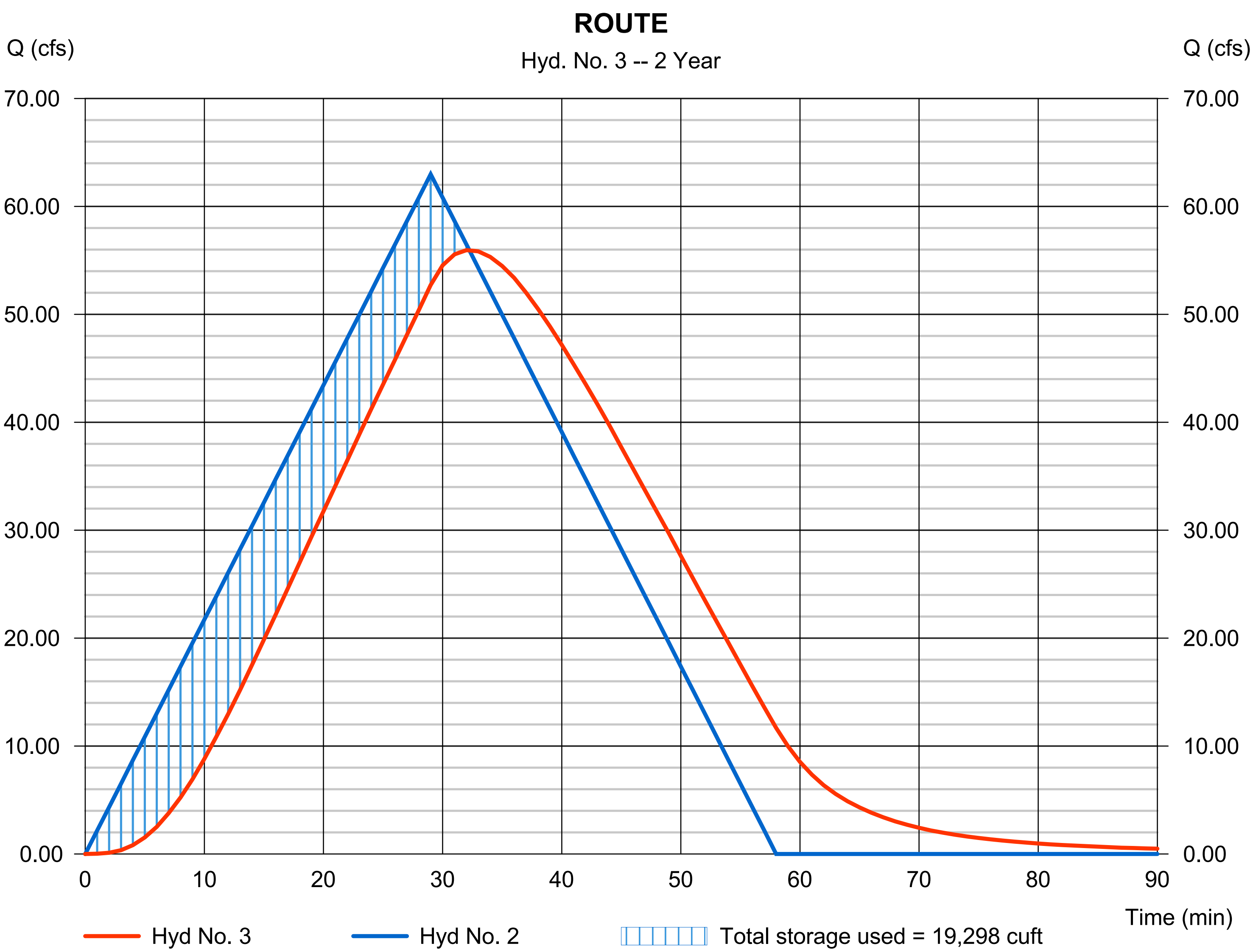
Hydrograph Report

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.



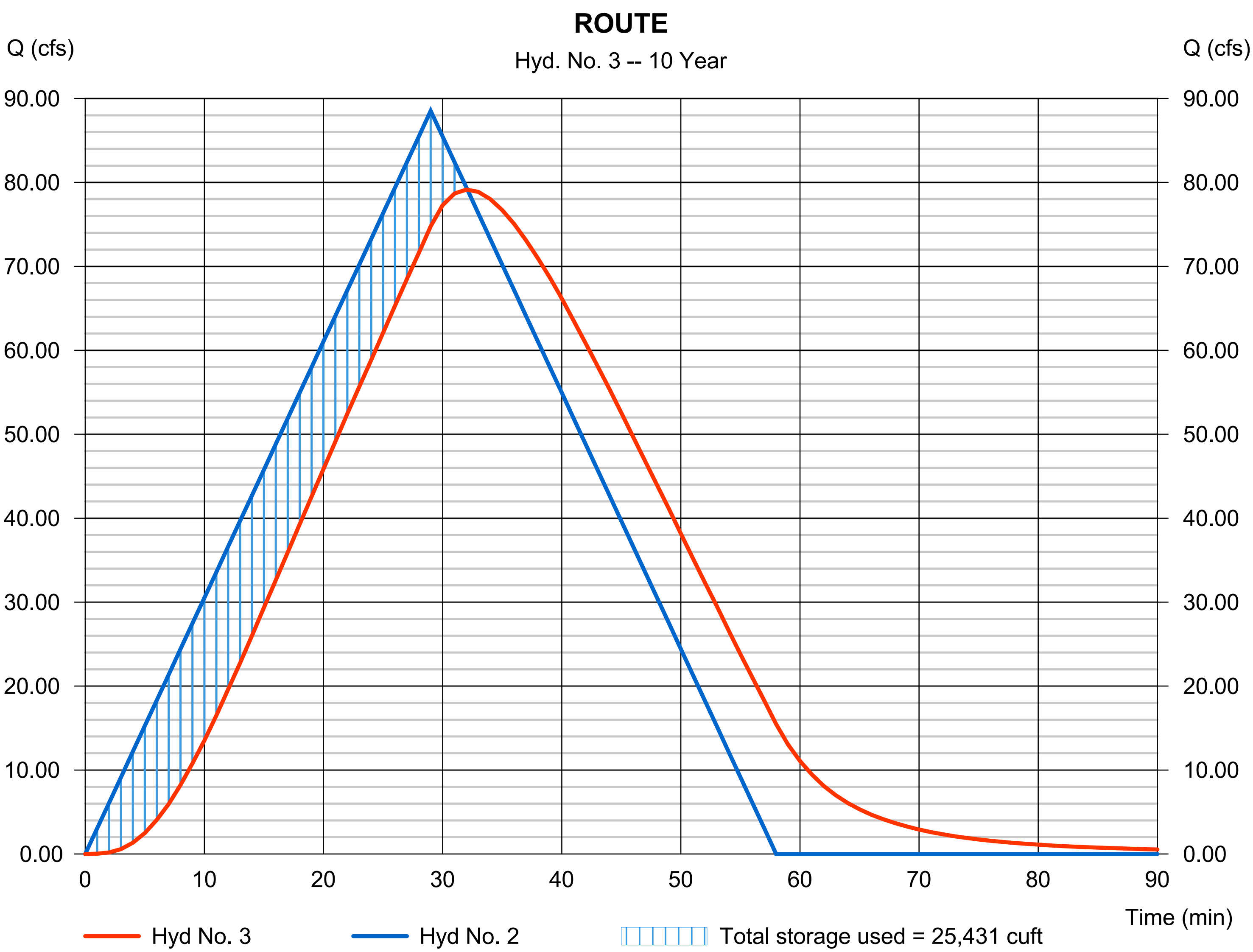
Hydrograph Report

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.



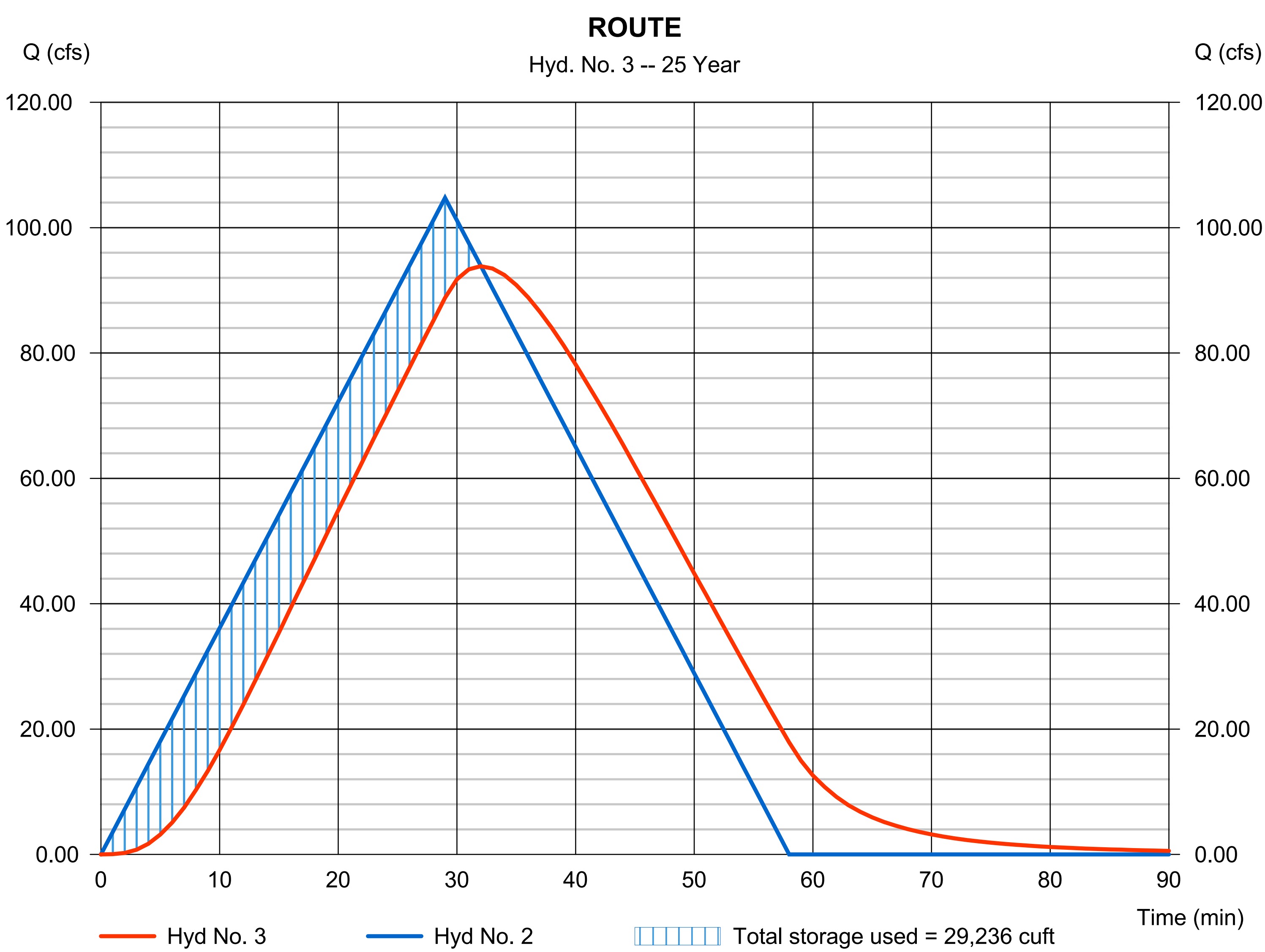
Hydrograph Report

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.



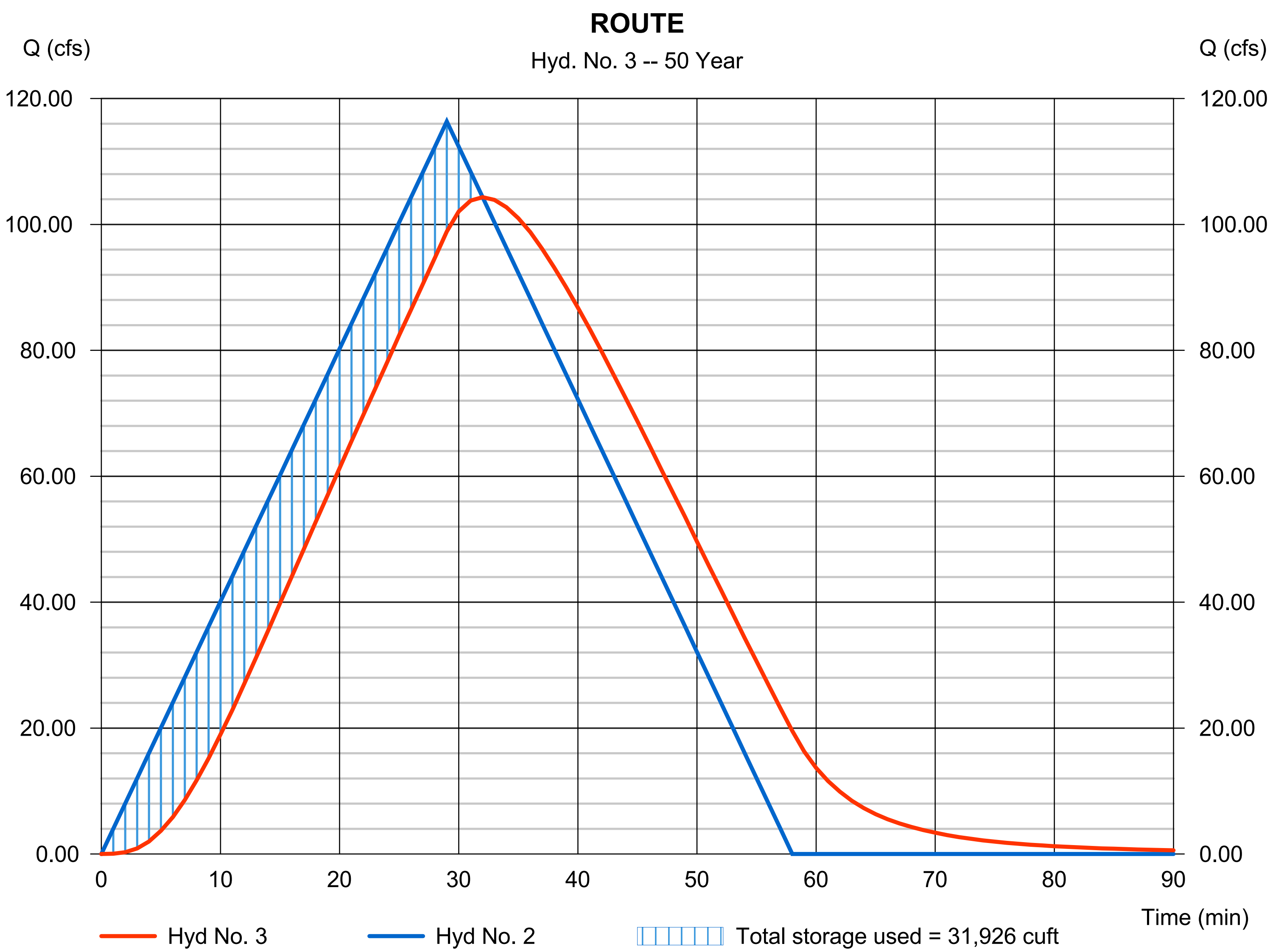
Hydrograph Report

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

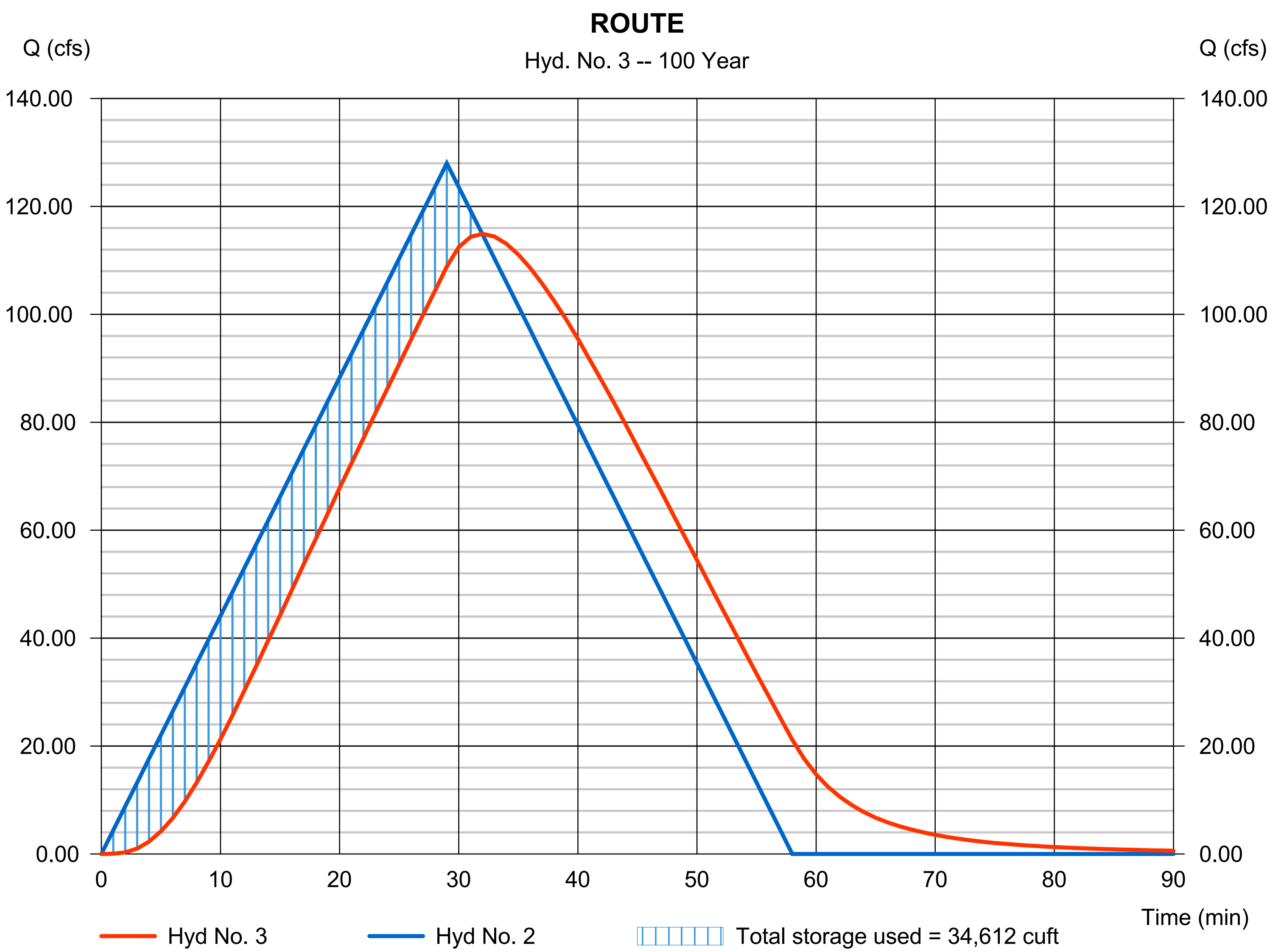
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 28 / 2025

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

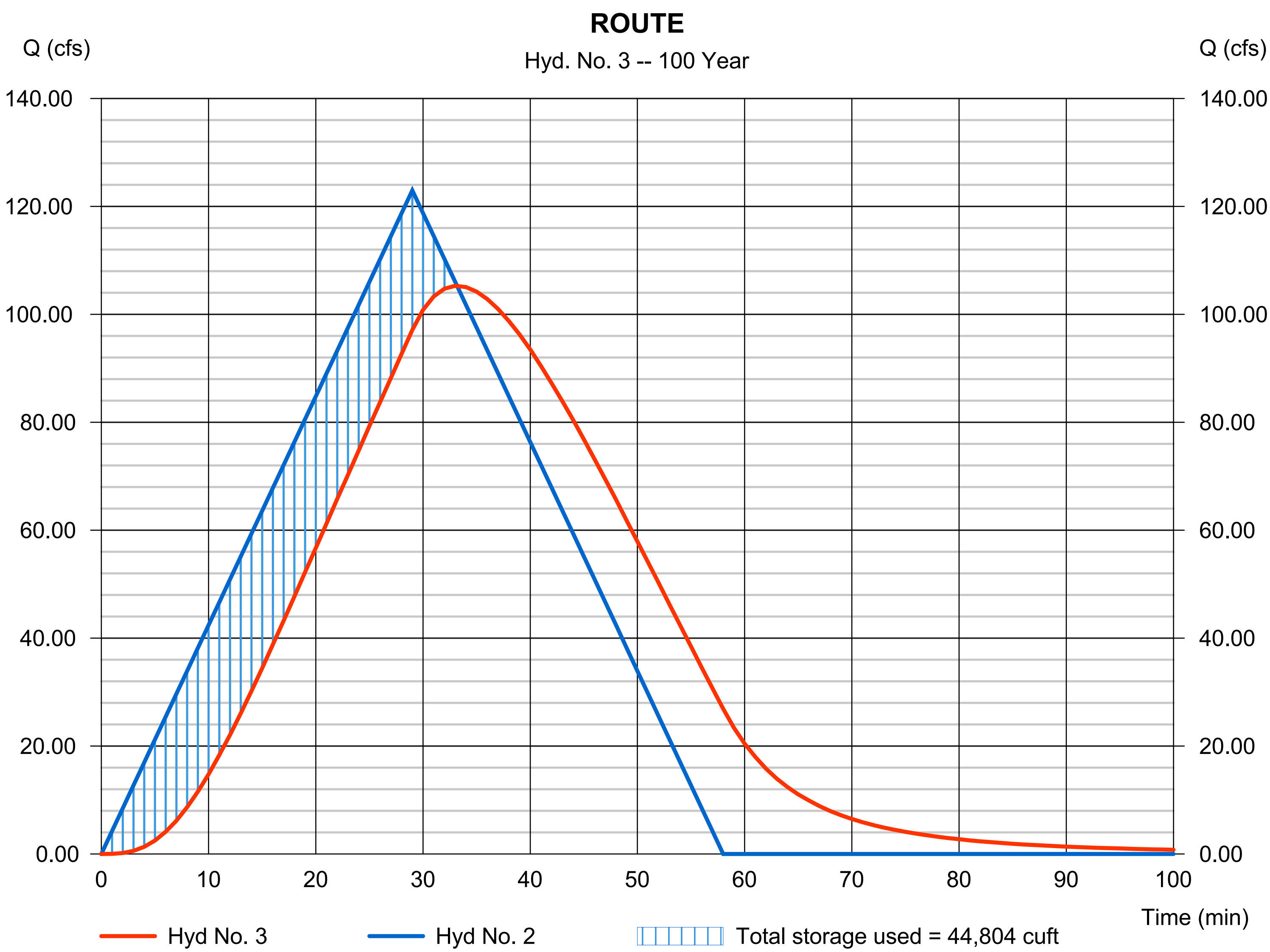
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 — Tuesday, 01 / 28 / 2025

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

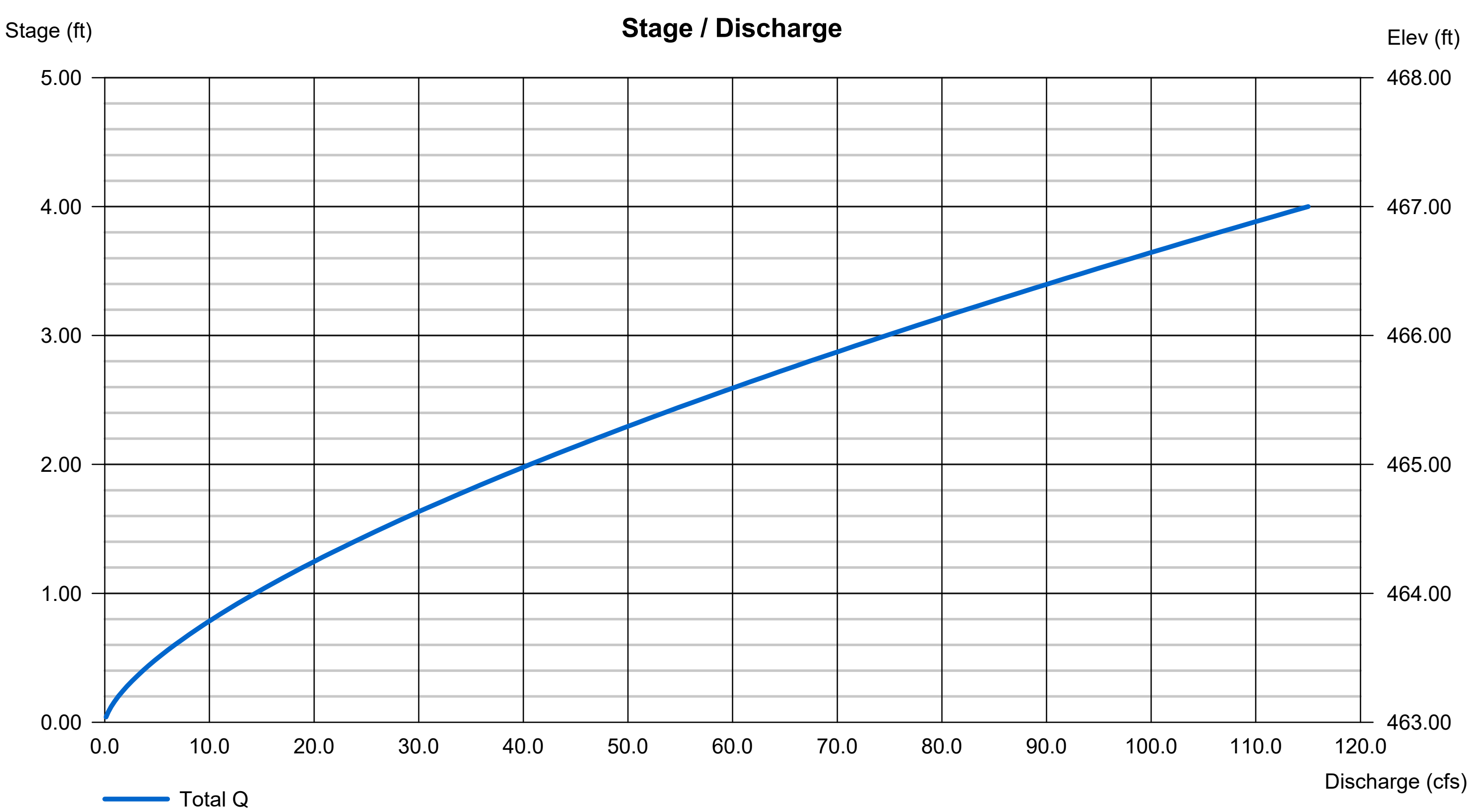
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

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

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

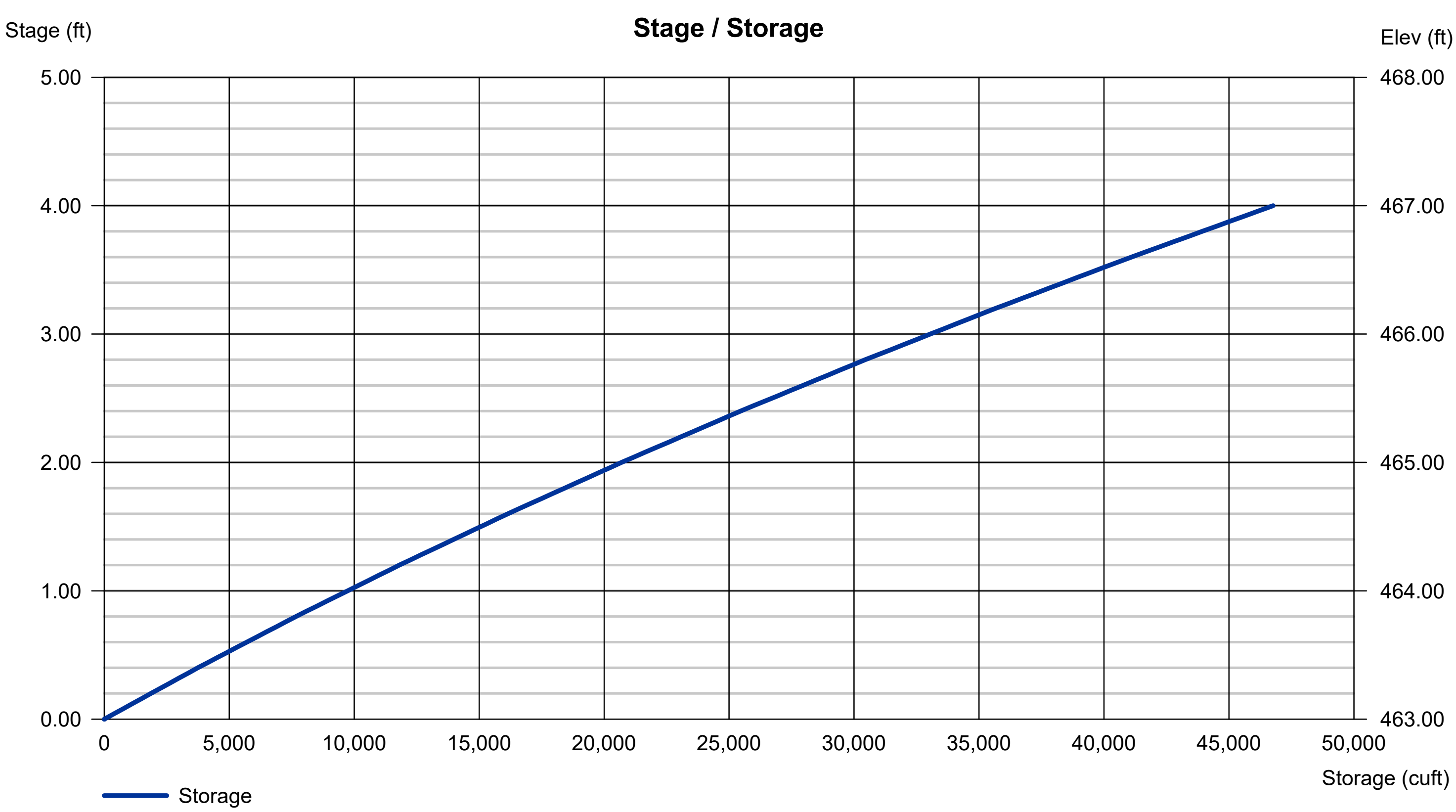
Weir Structures

	[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

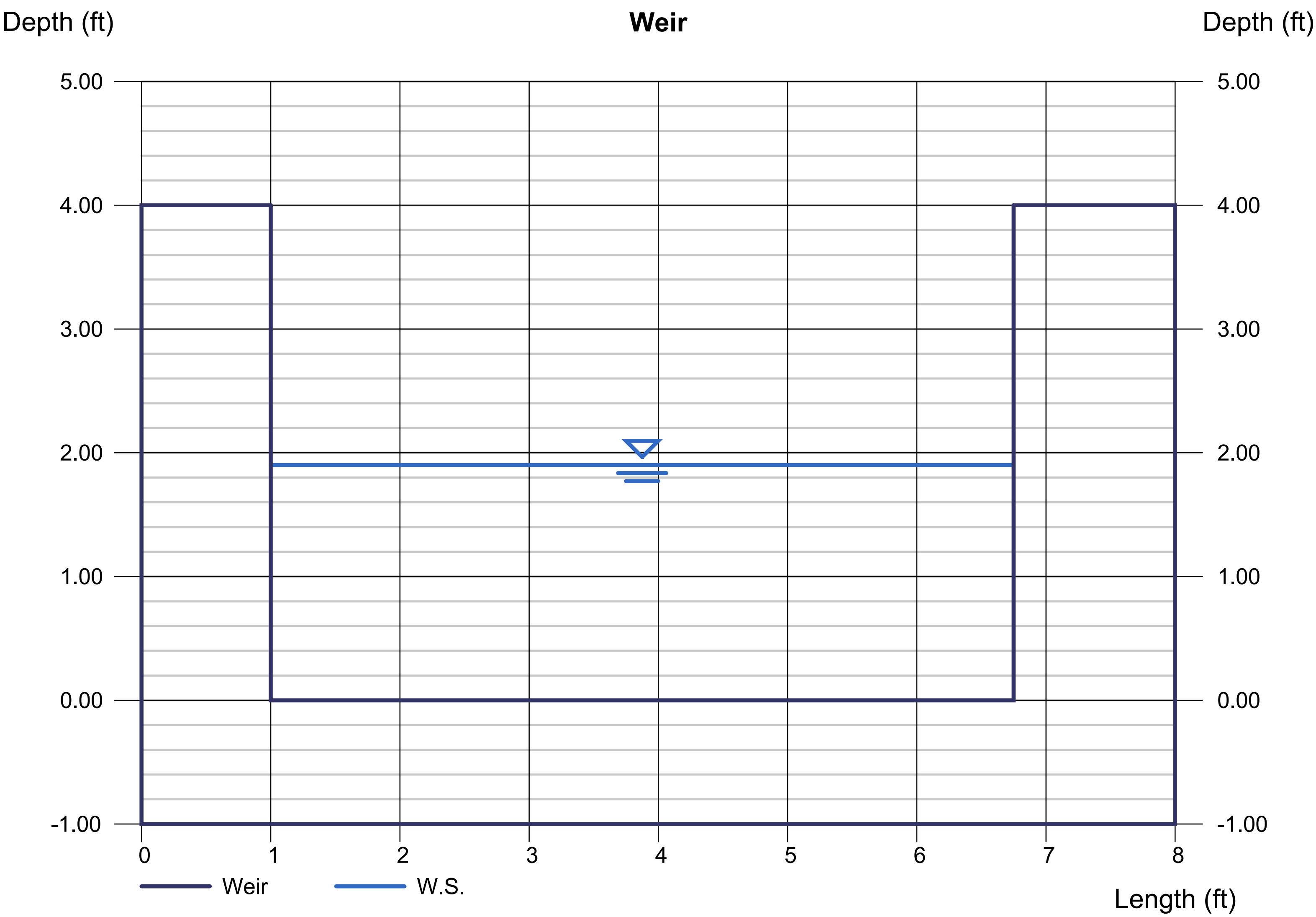
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

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

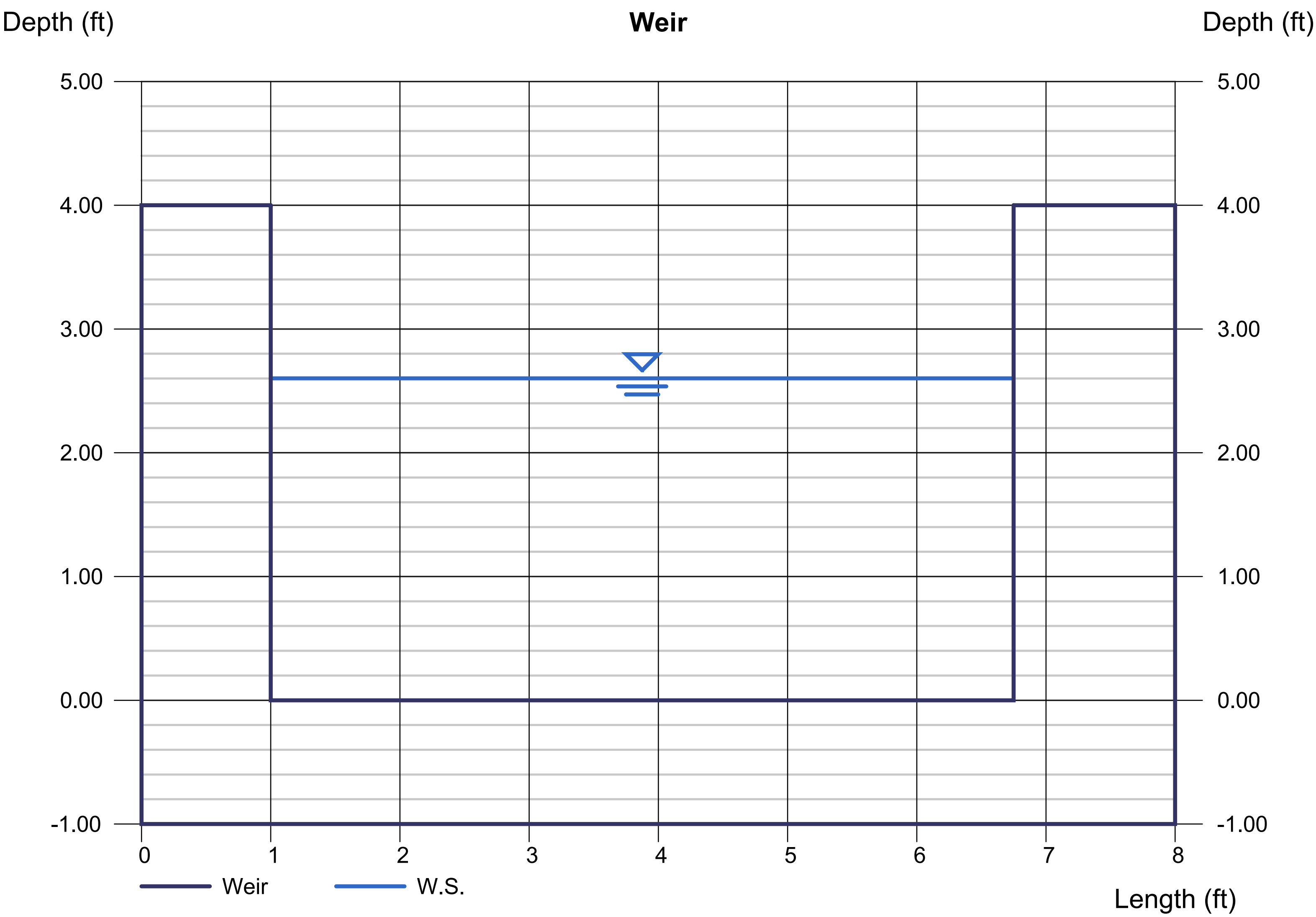
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

Calculations

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

Highlighted

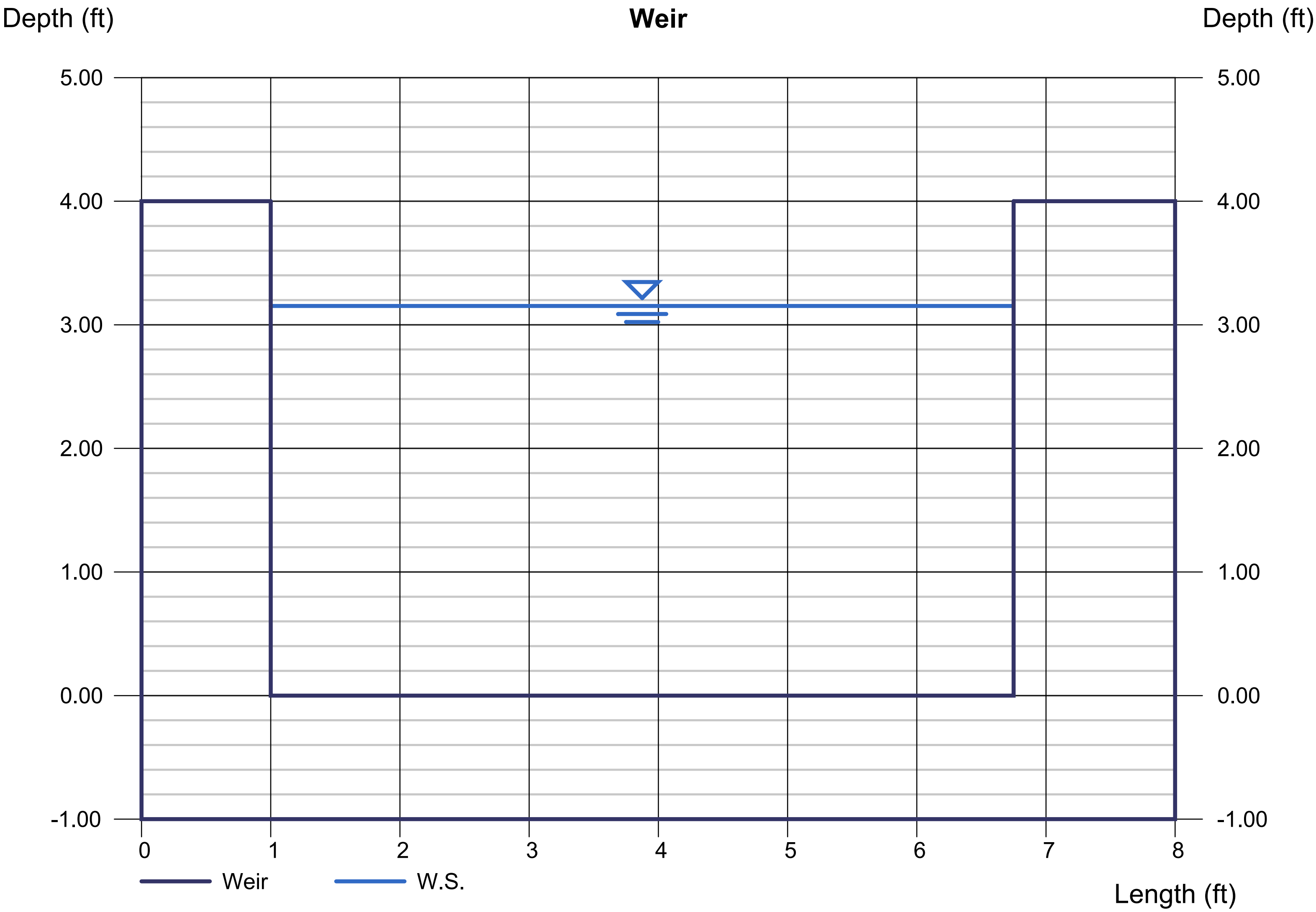
Depth (ft)	= 2.60
Q (cfs)	= 60.27
Area (sqft)	= 14.96
Velocity (ft/s)	= 4.03
Top Width (ft)	= 5.75



Weir Report

Weir

Rectangular Weir		**Highlighted**	
Crest	= Broad	Depth (ft)	= 3.15
Bottom Length (ft)	= 5.75	Q (cfs)	= 80.37
Total Depth (ft)	= 4.00	Area (sqft)	= 18.12
		Velocity (ft/s)	= 4.43
Calculations		Top Width (ft)	= 5.75
Weir Coeff. Cw	= 2.50		
Compute by:	Known Q		
Known Q (cfs)	= 80.37		



Weir Report

Weir

Rectangular Weir

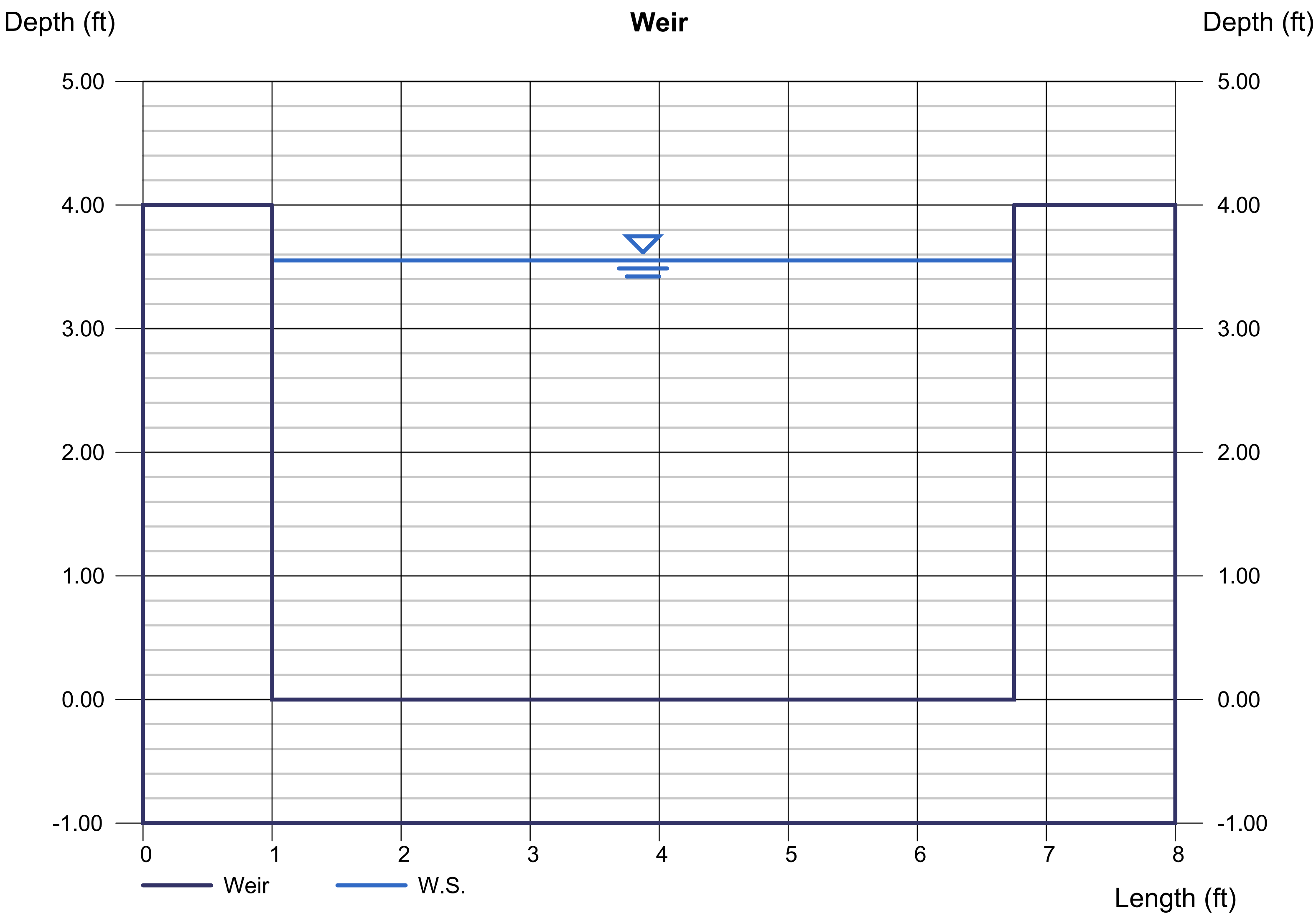
Crest	= Broad
Bottom Length (ft)	= 5.75
Total Depth (ft)	= 4.00

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