HAWKINS VALLEY
DRAINAGE CALCULATIONS – SUMMARY
1/7/2025

DESCRIPTION OF PROJECT

Hawkins Valley subdivision is an approximately 7.11 Acre development located in the Saline County, Arkansas approximately three miles north of Springhill Road. There are three drainage basins on the site. Basin 1 and 3 will be captured future phases. Basin 2 will be detained in a pipe network storage located in the western end of the site. The detention for the storage network will be underground in 42" HDPE pipe.

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
1/7/2025

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 are three drainage basins in the site that flows through the site then discharges onto the creek. Basin 1 and 3 will be captured in future phases. Basin 2 will be captured and detained.

POST-DEVELOPMENT CONDITIONS

As previously described, this site is being developed into a residential subdivision. Slopes range from 2% to 10%. Runoff drains from the developed areas to underground detention in the east of the subdivision.

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 10-year return storm. The distance from the back of the curb to the center of the street are 14 feet and 18 feet.

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.

PIPE NETWORK STORAGE SUMMARY

The pipe network storage in these calculations detains flows from all of the runoff of the site. The pipe network storage is located parallel on the Hawkins Valley Drive. Water collected in the storm water system is discharged into the pipe network via a curb inlet. The pipe network storage is made of 277 linear feet of 42" HDPE pipe and has a volume of 2,665 cf. A concrete control structure is constructed on the end of the pipe network storage. This control structure uses a slotted weir to limit the discharge through the structure to that of the 2, 10, 25, 50, and 100-year pre-development flow. The pipe network storage is designed to hold the 100-year storm event.

Stormwater Calcs - Hawkins Valley
Using Rational Method

Pre-development

Calculated Tc values - Drainage Basin 1

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	360	feet	
n1 =	0.1	Heavy Stand of Timber	
S1 =	0.045	ft/ft	
$I_{assumed}$ =	7.20	inches	
$Tc_{calculated}$	553	seconds	
$Tc_{calculated}$	9.22	minutes	
Tc =	9.22	minutes	Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
I =	7.20	inches	i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
Use Tc =	**9.50**	minutes	

I_{100} =	8.6 Inches	I_{10} =	6.3 Inches
I_{50} =	8 Inches	I_{5} =	5.7 Inches
I_{25} =	7.20 Inches	I_{2} =	4.8 Inches

Calculated Tc values - Drainage Basin 2

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	590	feet	
n1 =	0.1	Heavy Stand of Timber	
S1 =	0.0695	ft/ft	
$I_{assumed}$ =	6.90	inches	
$Tc_{calculated}$	665	seconds	
$Tc_{calculated}$	11.08	minutes	
Tc =	11.08	minutes	Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
I =	6.90	inches	i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
Use Tc =	**11.00**	minutes	

I_{100} =	8.4 Inches	I_{10} =	6.0 Inches
I_{50} =	7.7 Inches	I_{5} =	5.5 Inches
I_{25} =	6.90 Inches	I_{2} =	4.7 Inches

Calculated Tc values - Drainage Basin 3

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	225	feet	
n1 =	0.1	Heavy Stand of Timber	
S1 =	0.031	ft/ft	
$I_{assumed}$ =	7.80	inches	
$Tc_{calculated}$	452	seconds	
$Tc_{calculated}$	7.54	minutes	
Tc =	7.54	minutes	Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
I =	7.80	inches	i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
Use Tc =	**7.50**	minutes	

I_{100} =	9.3 Inches	I_{10} =	6.8 Inches
I_{50} =	8.7 Inches	I_{5} =	6.2 Inches
I_{25} =	7.80 Inches	I_{2} =	5.3 Inches

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	
								(C values taken from Table 400-2 of City of Bryant Drainage Manual)
Undeveloped	3.82	0.47	0.43	0.4	0.36	0.34	0.31	Woodlands, Average, 2-7%
Total Area =	**3.82**	**0.47**	**0.43**	**0.40**	**0.36**	**0.34**	**0.31**	

Calculated C values - Drainage Basin 2

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2	
								(C values taken from Table 400-2 of City of Bryant Drainage Manual)
Greenspace	2.60	0.47	0.43	0.4	0.36	0.34	0.31	Woodlands, Average, 2-7%
Total Area =	**2.60**	**0.47**	**0.43**	**0.40**	**0.36**	**0.34**	**0.31**	

Calculated C values - Drainage Basin 3

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2	
								(C values taken from Table 400-2 of City of Bryant Drainage Manual)
Greenspace	2.5	0.47	0.43	0.4	0.36	0.34	0.31	Woodlands, Average, 2-7%
Total Area =	**2.50**	**0.47**	**0.43**	**0.40**	**0.36**	**0.34**	**0.31**	

Stormwater Calcs - Hawkins Valley
Using Rational Method

Post-development

Calculated Tc values - Drainage Basin 1

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

$$Tc = \frac{i6 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	730	feet
n1 =	0.013	Smooth Concrete/Asphalt
S1 =	0.012	ft/ft
$I_{assumed}$ =	8.20	inches
$Tc_{calculated}$	351	seconds
$Tc_{calculated}$	5.85	minutes

Tc =	5.85	minutes
I =	8.20	inches

Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual

Use Tc = **6.00** minutes

I_{100} =	9.8	Inches	I_{10} =	7.2	Inches
I_{50} =	9.1	Inches	I_{5} =	6.5	Inches
I_{25} =	8.2	Inches	I_{2} =	5.6	Inches

Calculated Tc values - Drainage Basin 2

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	50	feet	L1 =	625	feet
n1 =	0.013	Grass	n1 =	0.012	Concrete
S1 =	0.025	ft/ft	S1 =	0.06	ft/ft
$I_{assumed}$ =	8.40	inches	$I_{assumed}$ =	8.40	inches
$Tc_{calculated}$	56	seconds	$Tc_{calculated}$	186	seconds
$Tc_{calculated}$	0.93	minutes	$Tc_{calculated}$	3.10	minutes

Tc =	4.03	minutes
I =	8.40	inches

Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual

Use Tc = **5.00** minutes

I_{100} =	10	Inches	I_{10} =	7.6	Inches
I_{50} =	9.4	Inches	I_{5} =	6.8	Inches
I_{25} =	8.4	Inches	I_{2} =	5.9	Inches

Calculated Tc values - Drainage Basin 3

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	780	feet
n1 =	0.013	Concrete Smooth Forms
S1 =	0.006	ft/ft
$I_{assumed}$ =	7.60	inches
$Tc_{calculated}$	463	seconds
$Tc_{calculated}$	7.72	minutes

Tc =	7.72	minutes
I =	7.60	inches

Tc for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual
i for 25-yr Storm from Exhibit 400-1 of Bryant Drainage Manual

Use Tc = **8.00** minutes

I_{100} =	9.1	Inches	I_{10} =	6.7	Inches
I_{50} =	8.4	Inches	I_{5} =	6.0	Inches
I_{25} =	7.6	Inches	I_{2} =	5.2	Inches

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
Single Family House	2.16	0.70	0.65	0.60	0.50	0.45	0.40
Total Area =	**2.16**	**0.70**	**0.65**	**0.60**	**0.50**	**0.45**	**0.40**

(C values taken from Table 400-2 of City of Bryant Drainage Manual)

Calculated C values - Drainage Basin 2

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2
Single Family House	2.29	0.70	0.65	0.60	0.50	0.45	0.40
Total Area =	**2.29**	**0.70**	**0.65**	**0.60**	**0.50**	**0.45**	**0.40**

Calculated C values - Drainage Basin 3

	Area	C_{100}	C_{50}	C_{25}	C_{10}	C_5	C_2
Single Family House	2.66	0.70	0.65	0.60	0.50	0.45	0.40
Total Area =	**2.66**	**0.70**	**0.65**	**0.60**	**0.50**	**0.45**	**0.40**

Stormwater Calcs - Hawkins Valley
using Rational Method

Pre-development

Drainage Basin 1

Q_{100} =	15.44 CFS	Q_{50}=	13.14 CFS	Q_{25} =	11.00 CFS	Q_{10} =	8.66 CFS	Q_5 =	7.40 CFS	Q_2 =	5.68 CFS
c =	0.47	c =	0.43	c =	0.40	c =	0.36	c =	0.34	c =	0.31
i=	8.60 in/hr	i=	8.00 in/hr	i=	7.20 in/hr	i=	6.30 in/hr	i=	5.70 in/hr	i=	4.80 in/hr
A=	3.82 acres	A=	3.82 acres	A=	3.82 acres	A=	3.82 acres	A=	3.82 acres	A=	3.82 acres

Drainage Basin 2

Q_{100} =	10.26 CFS	Q_{50}=	8.61 CFS	Q_{25} =	7.18 CFS	Q_{10} =	5.62 CFS	Q_5 =	4.86 CFS	Q_2 =	3.79 CFS
c =	0.47	c =	0.43	c =	0.40	c =	0.36	c =	0.34	c =	0.31
i=	8.40 in/hr	i=	7.70 in/hr	i=	6.90 in/hr	i=	6.00 in/hr	i=	5.50 in/hr	i=	4.70 in/hr
A=	2.60 acres	A=	2.60 acres	A=	2.60 acres	A=	2.60 acres	A=	2.60 acres	A=	2.60 acres

Drainage Basin 3

Q_{100} =	10.93 CFS	Q_{50}=	9.35 CFS	Q_{25} =	7.80 CFS	Q_{10} =	6.12 CFS	Q_5 =	5.27 CFS	Q_2 =	4.11 CFS
c =	0.47	c =	0.43	c =	0.40	c =	0.36	c =	0.34	c =	0.31
i=	9.30 in/hr	i=	8.70 in/hr	i=	7.80 in/hr	i=	6.80 in/hr	i=	6.20 in/hr	i=	5.30 in/hr
A=	2.50 acres	A=	2.50 acres	A=	2.50 acres	A=	2.50 acres	A=	2.50 acres	A=	2.50 acres

Post-development

Drainage Basin 1

Q_{100} =	14.82 CFS	Q_{50}=	12.78 CFS	Q_{25} =	10.63 CFS	Q_{10} =	7.78 CFS	Q_5 =	6.32 CFS	Q_2 =	4.84 CFS
c =	0.70	c =	0.65	c =	0.60	c =	0.50	c =	0.45	c =	0.40
i=	9.80 in/hr	i=	9.10 in/hr	i=	8.20 in/hr	i=	7.20 in/hr	i=	6.50 in/hr	i=	5.60 in/hr
A=	2.16 acres	A=	2.16 acres	A=	2.16 acres	A=	2.16 acres	A=	2.16 acres	A=	2.16 acres

Drainage Basin 2

Q_{100} =	16.03 CFS	Q_{50}=	13.99 CFS	Q_{25} =	11.54 CFS	Q_{10} =	8.70 CFS	Q_5 =	7.01 CFS	Q_2 =	5.40 CFS
c =	0.70	c =	0.65	c =	0.60	c =	0.50	c =	0.45	c =	0.40
i=	10.00 in/hr	i=	9.40 in/hr	i=	8.40 in/hr	i=	7.60 in/hr	i=	6.80 in/hr	i=	5.90 in/hr
A=	2.29 acres	A=	2.29 acres	A=	2.29 acres	A=	2.29 acres	A=	2.29 acres	A=	2.29 acres

Drainage Basin 3

Q_{100} =	16.94 CFS	Q_{50}=	14.52 CFS	Q_{25} =	12.13 CFS	Q_{10} =	8.91 CFS	Q_5 =	7.18 CFS	Q_2 =	5.53 CFS
c =	0.70	c =	0.65	c =	0.60	c =	0.50	c =	0.45	c =	0.40
i=	9.10 in/hr	i=	8.40 in/hr	i=	7.60 in/hr	i=	6.70 in/hr	i=	6.00 in/hr	i=	5.20 in/hr
A=	2.66 acres	A=	2.66 acres	A=	2.66 acres	A=	2.66 acres	A=	2.66 acres	A=	2.66 acres

Detention Volume

Pond-1
for Q100

Cundev=	0.47	
Iundev=	8.40	in/hr
Cdev=	0.70	
Idev=	10.00	in/hr
R=	3.05	
A=	2.29	acres
Tc=	5.00	minutes
	60	sec/min
Detention Volume=	2,097	cubic feet

R= (Cdev*Idev)-(Cundev*Iundev)
Detention Volume= R*A*Tc*60

Stormwater Calcs - Hawkins Valley
using Rational Method
Required Detention Pipe

Pond Volume			
Volume Required		2096.72	CF
Use 42" Pipe			
	Dia =	42.00	
	A =	9.62	SF
	L (required) =	217.93	FT

OR

Pond Volume			
Volume Required		2096.72	CF
Use 30" Pipe			
	Dia =	30.00	
	A =	4.91	SF
	L (required) =	427.14	FT

Stormwater Calcs - Hawkins Valley
using Rational Method
Culvert Detention Sizes

PIPE NAME	DIAMETER (IN)	LENGTH (FT)	AREA (SF)	VOLUME (CF)
D-1	42.00	236	9.62	2270.59
D-2	42.00	41	9.62	394.47
TOTAL		277		2665.06

Stormwater Calcs - Hawkins Valley
using Rational Method
Weir Sizing

Storm Event	Flow (cfs)
Q2 - Pre	3.79
Q10 - Pre	5.62
Q25 - Pre	7.18
Q50 - Pre	8.61
Q100 - Pre	10.26
Q2 - Post	5.40
Q10 - Post	8.70
Q25 - Post	11.54
Q50 - Post	13.99
Q100 - Post	16.03

Rectangular Weir

Q2

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**0.625**	7.5"
H	**1.8**	
Q (cfs)	**3.77**	

Q10

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**0.625**	7.5"
H	**2.3**	
Q (cfs)	**5.45**	

Q25

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**0.625**	7.5"
H	**2.75**	
Q (cfs)	**7.13**	

Q50

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**0.625**	7.5"
H	**3.1**	
Q (cfs)	**8.53**	

Q100

Q (cfs)	**CLH^1.5**	
C	**2.5**	
L	**0.625**	7.5"
H	**3.5**	
Q (cfs)	**10.23**	

Stormwater Calcs - Hawkins Valley
using Rational Method
Culvert Capacities

CI-1			**CI-2**			**CI-3**			**CI-4**		
Q_{25} =	**0.94**	**CFS**	**Q_{25} =**	**0.65**	**CFS**	**Q_{25} =**	**8.38**	**CFS**	**Q_{25} =**	**0.72**	**CFS**
c =	0.86	Road/Asphalt	c =	0.86	Road/Asphalt	c =	0.86	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=	0.13	acres	A=	0.09	acres	A=	1.16	acres	A=	0.10	acres

CI-5			**CI-6**		
Q_{25} =	**6.50**	**CFS**	**Q_{25} =**	**0.58**	**CFS**
c =	0.86	Road/Asphalt	c =	0.86	Road/Asphalt
i=	8.4	in/hr	i=	8.4	in/hr
A=	0.90	acres	A=	0.08	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 Radius Full (ft)	Flow Capacity (cfs)	% Capacity
18" RCP	CI-1	CI-2	0.94	0.0210	18	1	0.012	1.77	4.712	0.375	16.49	6%
18" HDPE	CI-2	CI-4	1.59	0.0310	18	1	0.012	1.77	4.712	0.375	20.04	8%
18" RCP	CI-3	CI-4	9.97	0.0140	18	1	0.012	1.77	4.712	0.375	13.46	74%
42" HDPE	CI-4	CI-6	10.69	0.0004	42	1	0.012	9.62	10.996	0.875	20.97	51%
42" RCP	CI-5	CI-6	17.19	0.0004	42	1	0.012	9.62	10.996	0.875	20.97	82%

Stormwater Calcs - Hawkins Valley
using Rational Method
Outlet Pipe Capacity

Pipe Name	From	To	Design Flow (cfs):	Slope (ft/ft):	Diameter (inches)	No. Pipes	Manning's	Area Full (sf)	Wetted Perimeter Full (ft)	Hydraulic Radius Full (ft)	Flow Capacity (cfs)	% Capacity
18" HDPE	CI-6	FES-1	10.26	0.0340	18	1	0.012	1.77	4.712	0.375	20.98	49%

CKSON

001-03420-000
DARRELL &
BETTY CAMP

001-03424-000
THOMAS DB COLLINS LTD LLC

001-03457-000
ADRIAN F
ROBERTSON &
HILLARY A BAXTER

001-03425-000
WILMA J BARNES
IRR TRUST

001-03424-001
THOMAS DB COLLINS LTD LLC

001-03427-000
LEROY KYZER

SPRINGHILL ROAD
(50' ROW - ASPHALT)

POND

LEVEE

BASIN 3
C=0.47
I=9.3 IN/HR
A=2.50 ACRES
Q_{100}=10.93 CFS

BASIN 1
C=0.47
I=8.6 IN/HR
A=3.82 ACRES
Q_{100}=15.44 CFS

BASIN 2
C=0.47
I=8.4 IN/HR
A=2.60 ACRES
Q_{100}=10.26 CFS

NE1/4 NW1/
SEC.4-T1S-R14

WILLAGE
PHASE 1

PHASE 1

80' 40' 0 80'

REVISION	DATE	BY

GNE Designing our client's success

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HAWKINS VALLEY
SPRINGHILL RD & STRAWBERRY LN
SALINE COUNTY, ARKANSAS

PRELIMINARY

CONTENTS:
PRE
DRAINAGE
BASIN

PROJECT NO:
24076

DATE:
JAN 2025

SHEET NO:
1.0

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CKSON

001-03420-000
DARRELL &
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THOMAS DB COLLINS LTD LLC

001-03427-000
LEROY KYZER

HOPPER COURT (50' R/W)

BYERS COURT (50' R/W)

DUFFER DRIVE (50' R/W)

PENKHURST (50' R/W)

HAWKINS VALLEY DRIVE (50' R/W)

STRAWBERRY LANE (50' R/W)

LENORA DRIVE (50' R/W)

SPRINGHILL ROAD
(50' R/W - ASPHALT)
Design Speed = 40 mph
35 mph POSTED

RIGHT OF WAY
DEDICATION
2.33 ACRES
101119 Sq. Ft.

TRACT A
0.21 ACRES
9060 Sq. Ft.

POND

LEVEE

BP: 0+00.00

BP: 0+00.00

PI: 13+70.77

PI: 7+41.5

BASIN 3
C=0.70
I=9.10 IN/HR
A=2.66 ACRES
Q_{100}=16.94 CFS

BASIN 1
C=0.70
I=9.80 IN/HR
A=2.16 ACRES
Q_{100}=14.82 CFS

BASIN 2
C=0.70
I=10.00 IN/HR
A=2.29 ACRES
Q_{100}=16.03 CFS

1 0.19 AC. 8114 S.F.
2 0.15 AC. 6600 S.F.
3 0.15 AC. 6600 S.F.
4 0.15 AC. 6542 S.F.
5 0.18 AC. 8045 S.F.
6 0.19 AC. 8114 S.F.
7 0.18 AC.
8 0.15 AC. 6542 S.F.
9 0.15 AC. 6542 S.F.
10 0.15 AC. 6542 S.F.
11 0.15 AC. 6542 S.F.
12 0.18 AC. 8045 S.F.
13 0.16 AC. 6542 S.F.
14 0.16 AC. 6542 S.F.
15 0.15 AC. 6542 S.F.
16 0.16 AC. 6762 S.F.
17 0.16 AC. 6789 S.F.
18 0.19 AC. 8399 S.F.
19 0.14 AC. 6300 S.F.
20 0.14 AC. 6300 S.F.
21 0.14 AC. 6300 S.F.
22 0.14 AC. 6300 S.F.
23 0.14 AC. 6300 S.F.
24 0.14 AC. 6300 S.F.
25 0.14 AC. 6300 S.F.
26 0.14 AC. 6300 S.F.
27 0.14 AC. 6300 S.F.
28 0.19 AC. 8114 S.F.
29 0.15 AC. 6600 S.F.

NE1/4 NW1/
SEC.4-T1S-R14

VILLAGE
PHASE 1

VILLAGE
PHASE 1

N

80' 40' 0 80'

BY	REVISION	DATE

GNE Designing our client's success

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HAWKINS VALLEY
SPRINGHILL RD & STRAWBERRY LN
SALINE COUNTY, ARKANSAS

PRELIMINARY

CONTENTS:
POST
DRAINAGE
BASIN

PROJECT NO:
24076

DATE:
JAN 2025

SHEET NO:
2.0

\\192.168.0.90\Projects\2024 Projects\24076 Hawkins Valley Springhill Road Strawberry Lane Lot Paving\Drawings\Grading\24076-Springhill-Road-Drainage-Study.dwg

Stormwater Calcs - Hawkins Valley
Using Rational Method

Post-development Basin

Calculated Tc values - Drainage Basin SDMH-C1

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	300	feet
n1 =	0.013	Smooth Concrete/Asphalt
S1 =	0.031	ft/ft
$I_{assumed}$ =	7.60	inches
$Tc_{calculated}$	160	seconds
$Tc_{calculated}$	2.66	minutes
Tc =	2.66	minutes
I =	7.60	inches
Use Tc =	**5.00**	minutes

Calculated Tc values - Drainage Basin SDMH-C3

$$Tc = \frac{56 * L^{.6} * n^{.6}}{i^{.4} * S^{.3}} \text{ seconds}$$

L1 =	290	feet
n1 =	0.025	Grass and Roof
S1 =	0.031	ft/ft
$I_{assumed}$ =	7.60	inches
$Tc_{calculated}$	232	seconds
$Tc_{calculated}$	3.86	minutes
Tc =	3.86	minutes
I =	7.60	inches
Use Tc =	**5.00**	minutes

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)
	0.13	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.13**	**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)
	0.09	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.09**	**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)
	1.16	0.5	0.6	0.7	Single Family House
Total Area =	**1.16**	**0.50**	**0.60**	**0.70**	

SDMH-C4

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.10	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.10**	**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)
	0.90	0.5	0.6	0.7	Single Family House
Total Area =	**0.90**	**0.50**	**0.60**	**0.70**	

SDMH-C6

	Area	C_{10}	C_{25}	C_{100}	(C values taken from Table 400-2 of City of Bryant Drainage Manual)
	0.08	0.81	0.86	0.95	Road/Asphalt
Total Area =	**0.08**	**0.81**	**0.86**	**0.95**	

Stormwater Calcs - Hawkins Valley
using Rational Method
Post Development Flowrates

SDMH-C1

Q_{10} =	0.80	CFS
c =	0.81	
i=	7.60	in/hr
A=	0.13	acres

SDMH-C2

Q_{10} =	0.56	CFS
c =	0.81	
i=	7.60	in/hr
A=	0.09	acres

SDMH-C3

Q_{10} =	4.41	CFS
c =	0.50	
i=	7.60	in/hr
A=	1.16	acres

SDMH-C4

Q_{10} =	0.62	CFS
c =	0.81	
i=	7.60	in/hr
A=	0.10	acres

SDMH-C5

Q_{10} =	3.42	CFS
c =	0.50	
i=	7.60	in/hr
A=	0.90	acres

SDMH-C6

Q_{10} =	0.46	CFS
c =	0.81	
i=	7.60	in/hr
A=	0.08	acres

Hawkins Valley GUTTER SPREAD 10-YR STORM

SDMH-C1

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

Q	0.80	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.031	
T	**3.92**	ft

SDMH-C2

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

Q	0.56	cfs
n	0.012	
k_u	0.56	
S_x	0.03	
S_L	0.017	
T	**3.67**	ft

SDMH-C3

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

Q	4.41	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.03	
T	**7.57**	ft

SDMH-C4

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

Q	0.62	cfs
n	0.012	
k_u	0.56	
S_x	0.03	
S_L	0.03	
T	**3.47**	ft

SDMH-C5

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

Q	3.42	cfs
n	0.012	
k_u	0.56	
S_x	0.028	
S_L	0.03	
T	**6.80**	ft

SDMH-C6

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

Q	0.46	cfs
n	0.012	
k_u	0.56	
S_x	0.03	
S_L	0.03	
T	**3.11**	ft

Hawkins Valley - CURB INLETS

10-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	0.13	7.60	0.81	0.80	0.80	0.49	**0.78**	**4**	4' box
SDMH-C2	0.09	7.60	0.81	0.56	0.56	0.49	**0.54**	**4**	4' box
SDMH-C3	1.16	7.60	0.50	4.41	4.41	0.49	**4.28**	**4**	4' box with 4' wing
SDMH-C4	0.10	7.60	0.81	0.62	0.62	0.49	**0.60**	**5**	5' box
SDMH-C5	0.90	7.60	0.50	3.42	3.42	0.49	**3.32**	**5**	5' box
SDMH-C6	0.08	7.60	0.81	0.46	0.46	0.49	**0.45**	**5**	5' box

001-03425-000
WILMA J BARNES
IRR TRUST

001-03424-001
THOMAS DB COLLINS LTD LLC

001-03427-000
LEROY KYZER

RIGHT OF WAY DEDICATION
2.73 ACRES
118720 Sq. Ft.

POND

TRACT A
0.21 ACRES
9126 Sq. Ft.

DUFFER DRIVE (50' R/W)

PENNHURST (50' R/W)

HAWKINS VALLEY DRIVE (60' R/W)

ST JACQUET DRIVE (50' R/W)

LENOBA DRIVE (50' R/W)

LEVEE

CI-6 & OUTLET STRUCTURE 7X5' BOX

FES-1

CI-2 4' DIA BOX

CI-4 5' DIA BOX

CI-1 4' DIA BOX

CI-5 5' DIA BOX

CI-3 4' DIA BOX W_4' WING

BASIN CI-1
C=0.81
I=7.60 IN/HR
A=0.13 ACRES
Q_{10}=0.80 CFS

BASIN CI-2
C=0.81
I=7.60 IN/HR
A=0.09 ACRES
Q_{10}=0.56 CFS

BASIN CI-3
C=0.50
I=7.60 IN/HR
A=1.16 ACRES
Q_{10}=4.41 CFS

BASIN CI-4
C=0.81
I=7.60 IN/HR
A=0.10 ACRES
Q_{10}=0.62 CFS

BASIN CI-5
C=0.50
I=7.60 IN/HR
A=0.90 ACRES
Q_{10}=3.42 CFS

BASIN CI-6
C=0.81
I=7.60 IN/HR
A=0.08 ACRES
Q_{10}=0.46 CFS

N

50' 25' 0 50'

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

\\192.168.0.50\Projects\2024 Projects\24076 Hawkins Valley Springhill Blvd Strawberry Lee Lee Perry\Engineering\Plans\Design\24076-Springhill-Road-Drainage Map-Rev.dwg

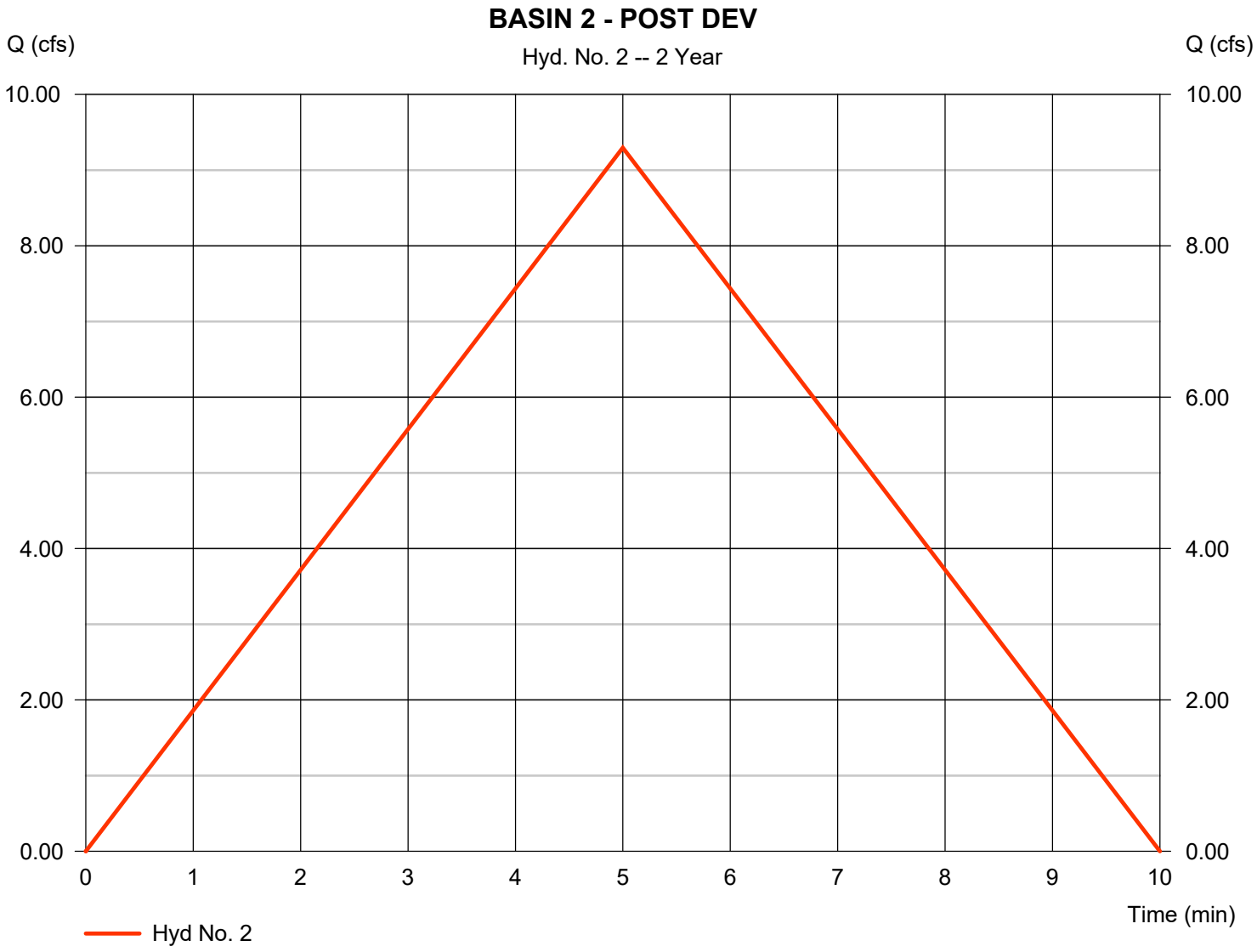
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 2

BASIN 2 - POST DEV

Hydrograph type	= Rational	Peak discharge	= 9.296 cfs
Storm frequency	= 2 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 2,789 cuft
Drainage area	= 2.290 ac	Runoff coeff.	= 0.7
Intensity	= 5.799 in/hr	Tc by User	= 5.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



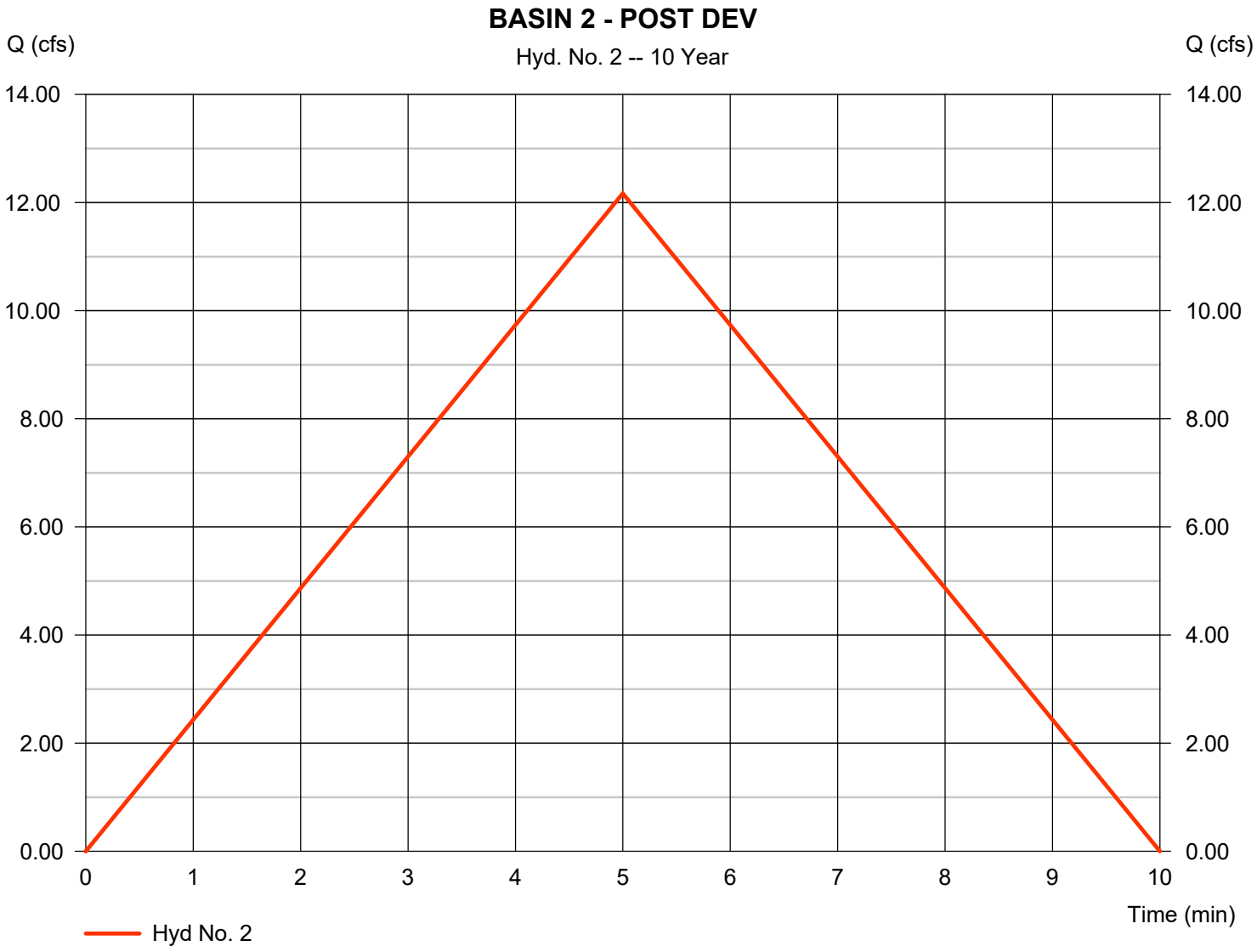
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 2

BASIN 2 - POST DEV

Hydrograph type	= Rational	Peak discharge	= 12.17 cfs
Storm frequency	= 10 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 3,651 cuft
Drainage area	= 2.290 ac	Runoff coeff.	= 0.7
Intensity	= 7.592 in/hr	Tc by User	= 5.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



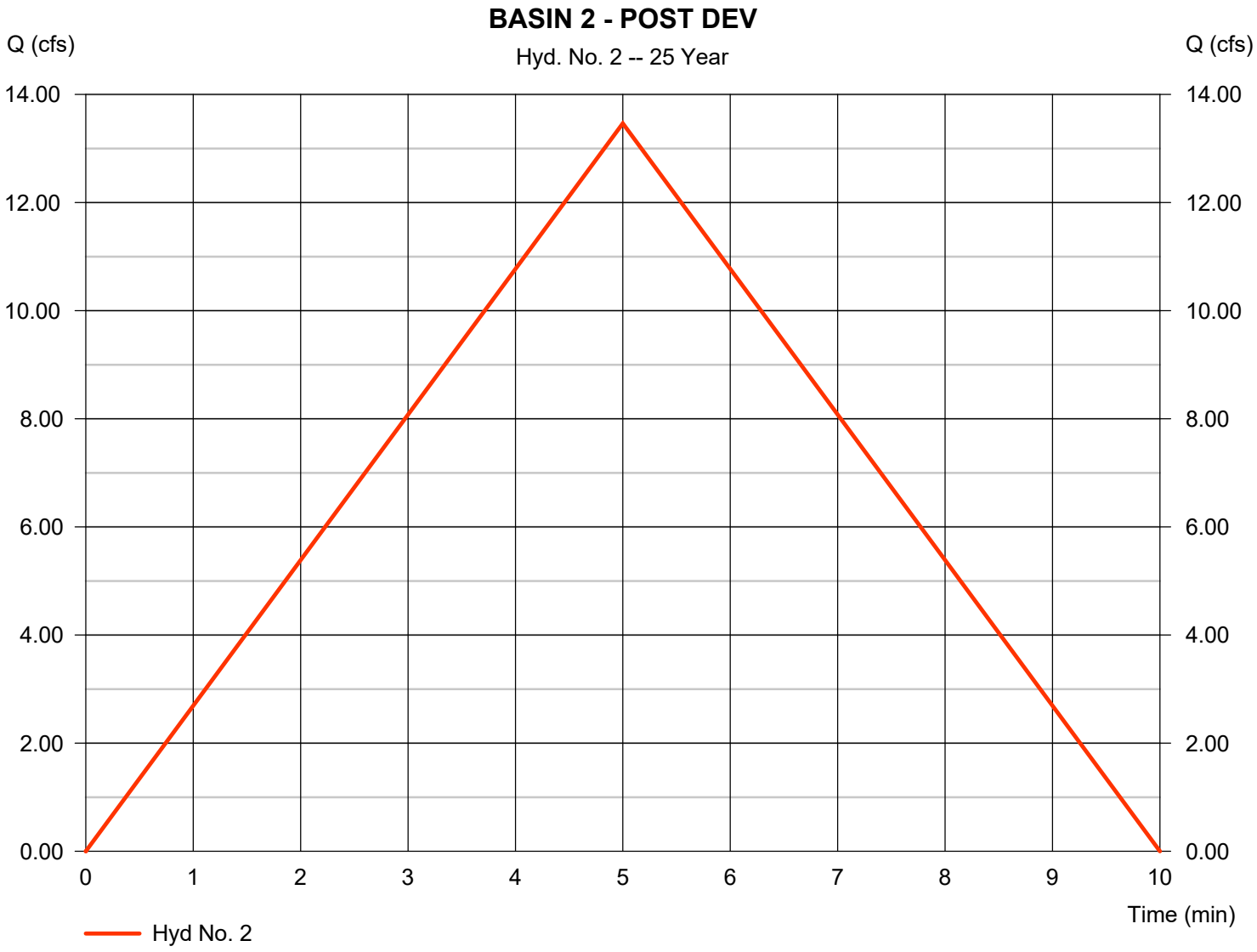
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 2

BASIN 2 - POST DEV

Hydrograph type	= Rational	Peak discharge	= 13.46 cfs
Storm frequency	= 25 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 4,039 cuft
Drainage area	= 2.290 ac	Runoff coeff.	= 0.7
Intensity	= 8.400 in/hr	Tc by User	= 5.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



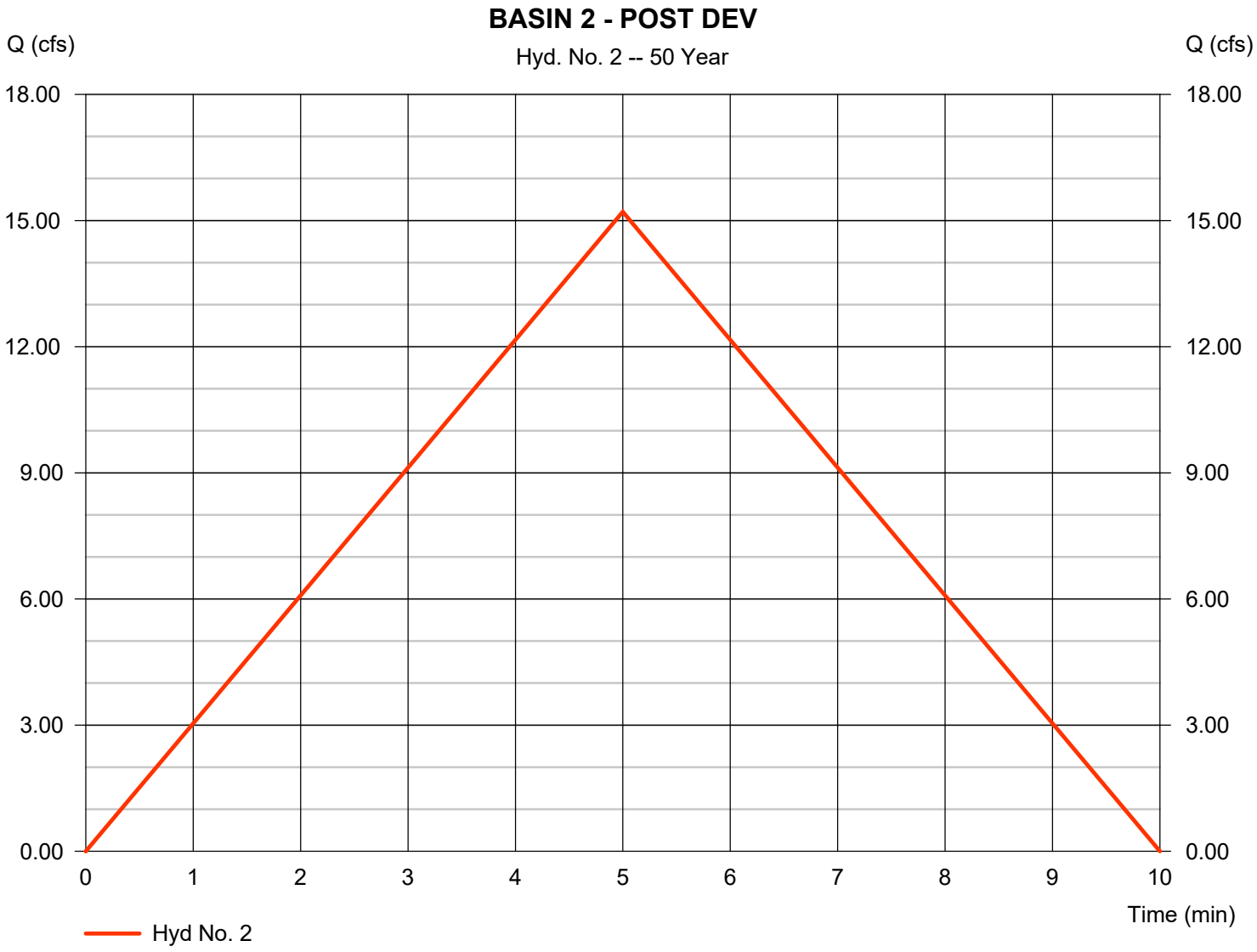
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 2

BASIN 2 - POST DEV

Hydrograph type	= Rational	Peak discharge	= 15.21 cfs
Storm frequency	= 50 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 4,562 cuft
Drainage area	= 2.290 ac	Runoff coeff.	= 0.7
Intensity	= 9.487 in/hr	Tc by User	= 5.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



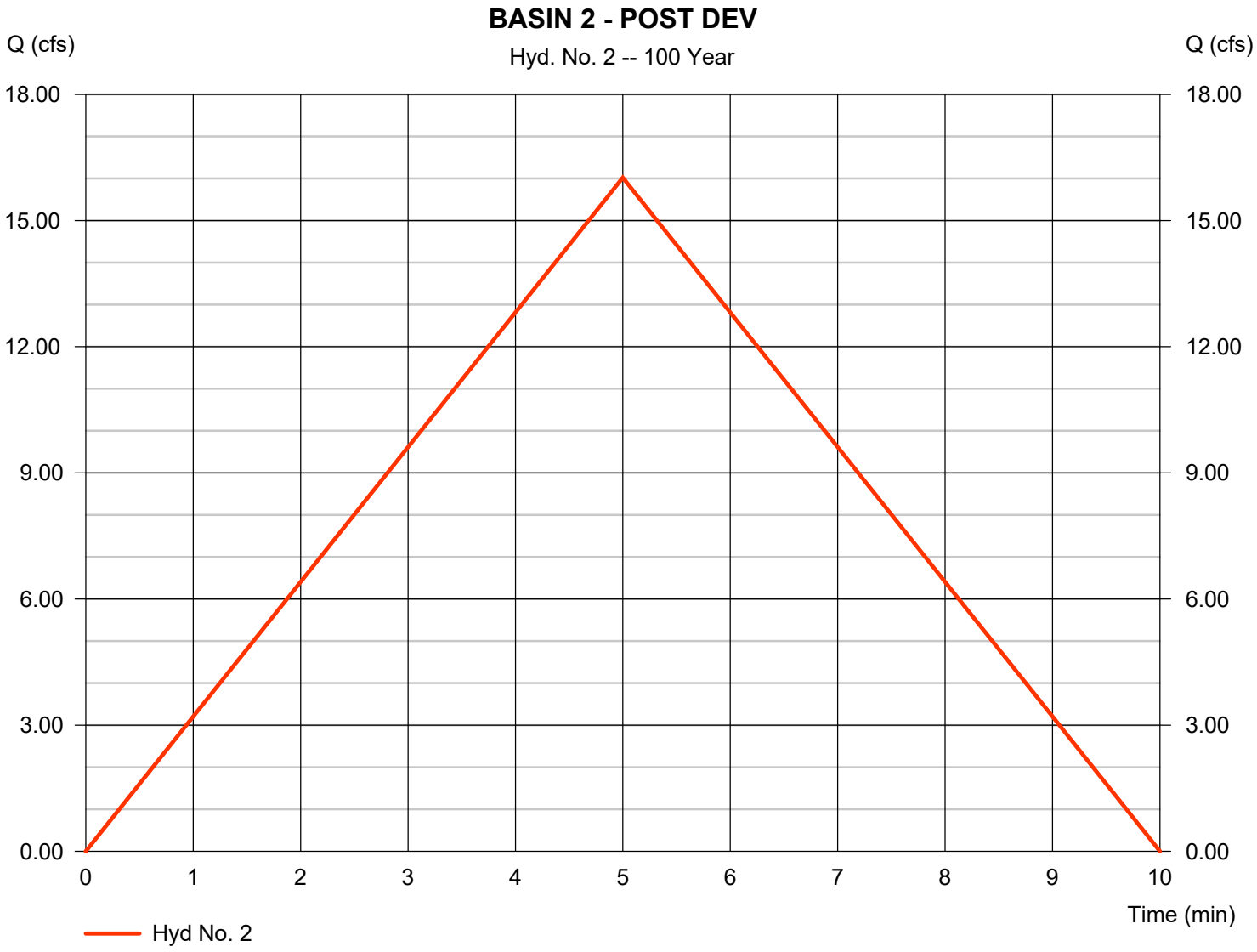
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 2

BASIN 2 - POST DEV

Hydrograph type	= Rational	Peak discharge	= 16.02 cfs
Storm frequency	= 100 yrs	Time to peak	= 5 min
Time interval	= 1 min	Hyd. volume	= 4,806 cuft
Drainage area	= 2.290 ac	Runoff coeff.	= 0.7
Intensity	= 9.994 in/hr	Tc by User	= 5.00 min
IDF Curve	= BRYANT IDF.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

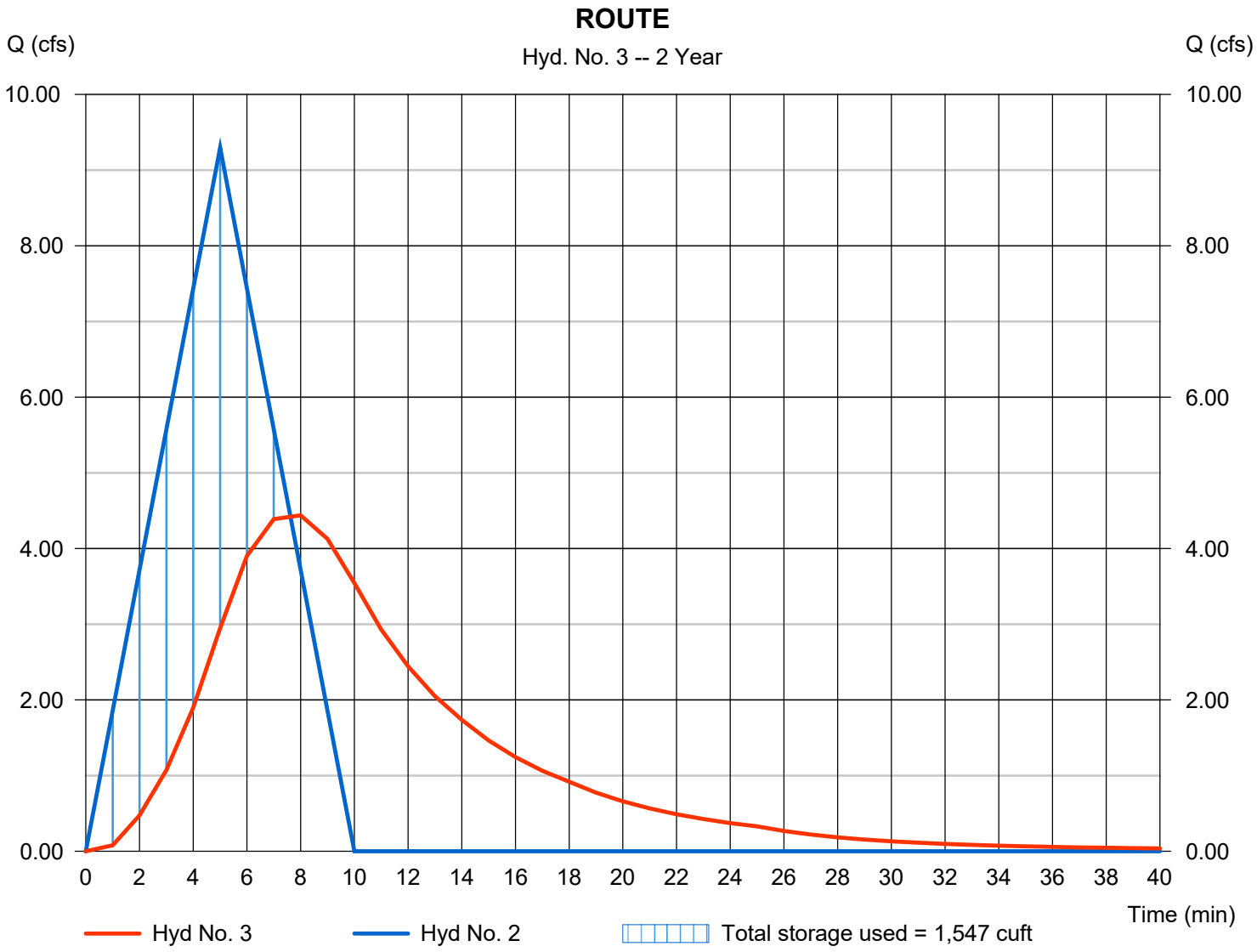
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Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 4.438 cfs
Storm frequency	= 2 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 2,787 cuft
Inflow hyd. No.	= 2 - BASIN 2 - POST DEV	Max. Elevation	= 467.49 ft
Reservoir name	= 42 INCH UGD POND	Max. Storage	= 1,547 cuft

Storage Indication method used.



Hydrograph Report

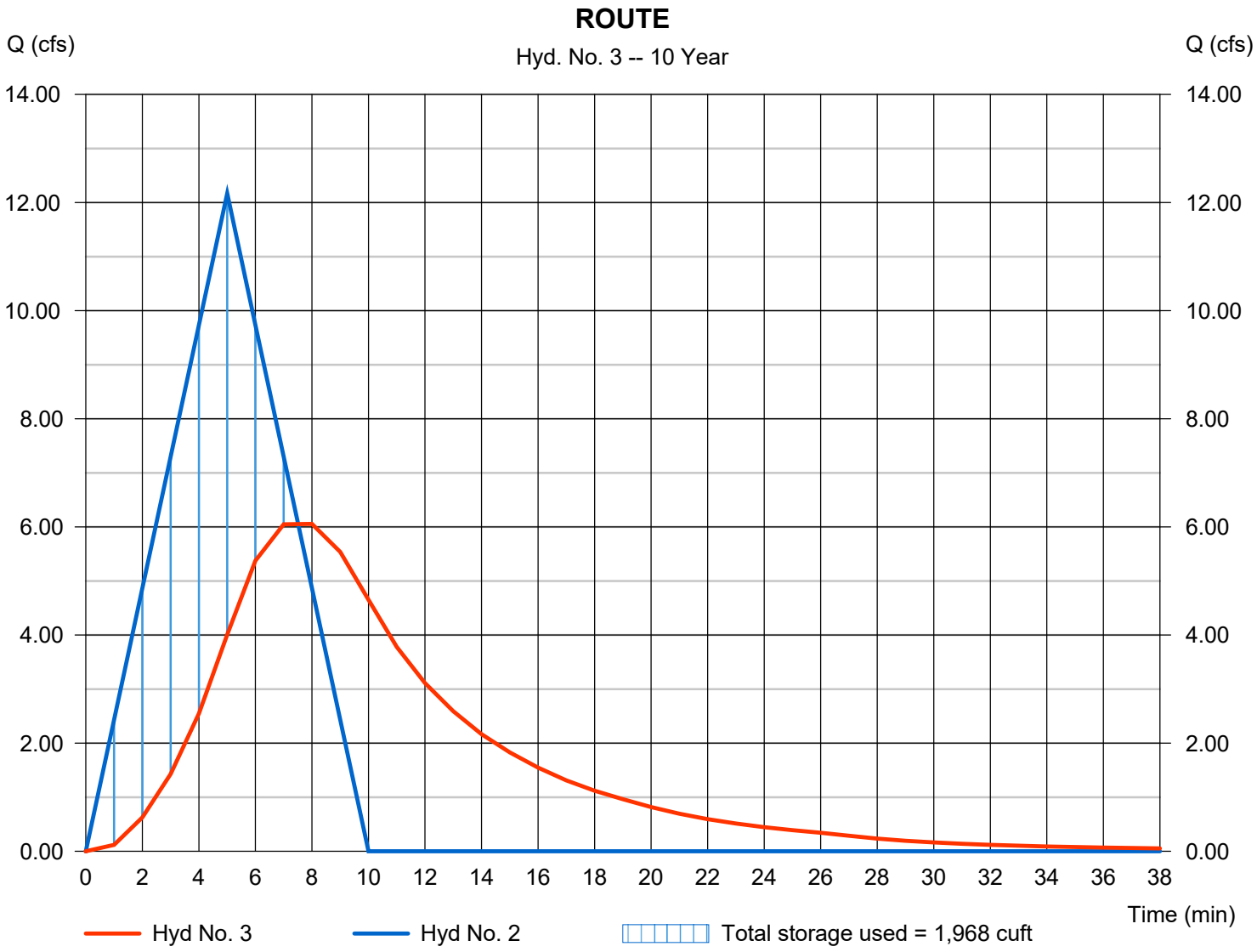
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Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 6.056 cfs
Storm frequency	= 10 yrs	Time to peak	= 8 min
Time interval	= 1 min	Hyd. volume	= 3,649 cuft
Inflow hyd. No.	= 2 - BASIN 2 - POST DEV	Max. Elevation	= 467.95 ft
Reservoir name	= 42 INCH UGD POND	Max. Storage	= 1,968 cuft

Storage Indication method used.



Hydrograph Report

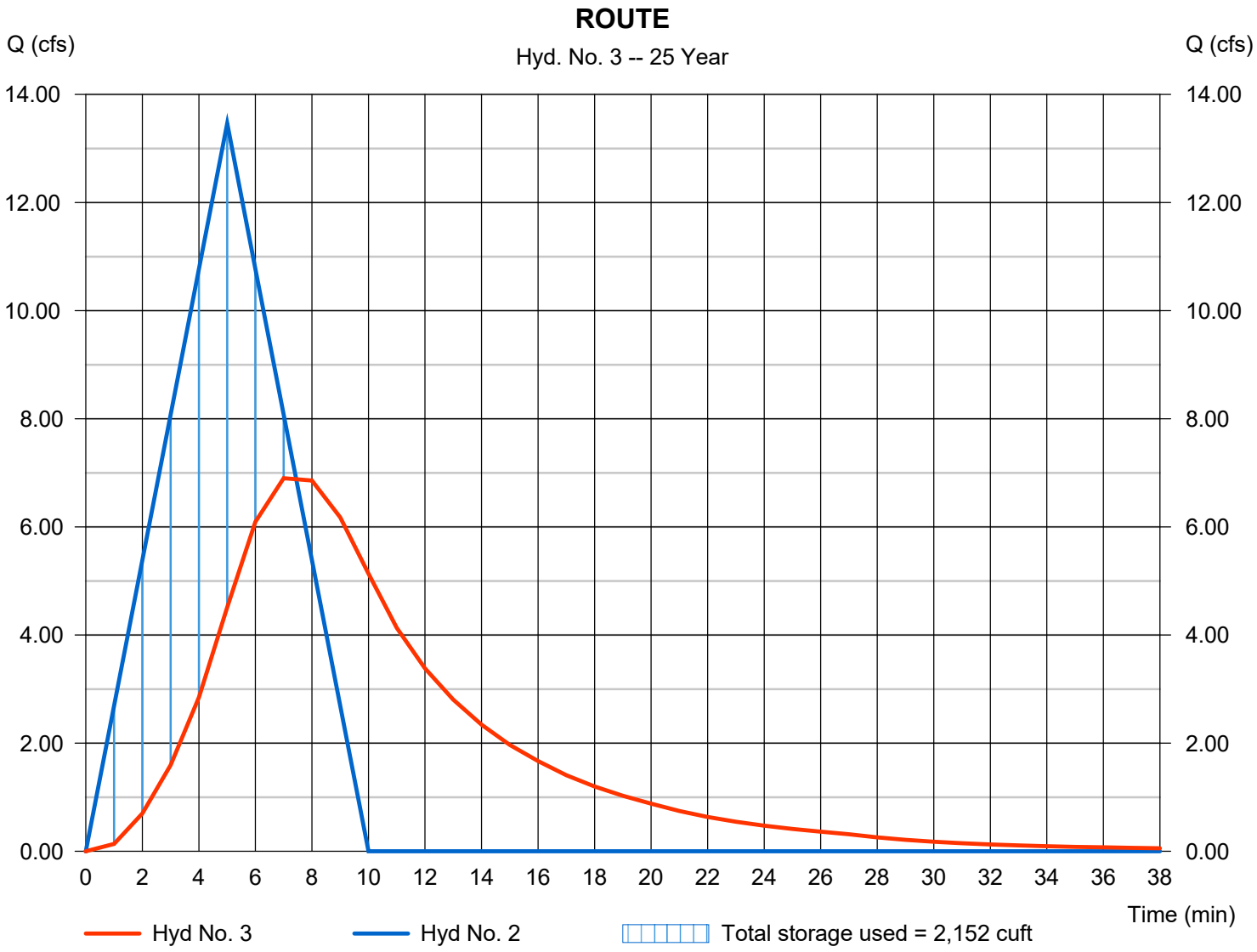
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Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 6.901 cfs
Storm frequency	= 25 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 4,038 cuft
Inflow hyd. No.	= 2 - BASIN 2 - POST DEV	Max. Elevation	= 468.18 ft
Reservoir name	= 42 INCH UGD POND	Max. Storage	= 2,152 cuft

Storage Indication method used.



Hydrograph Report

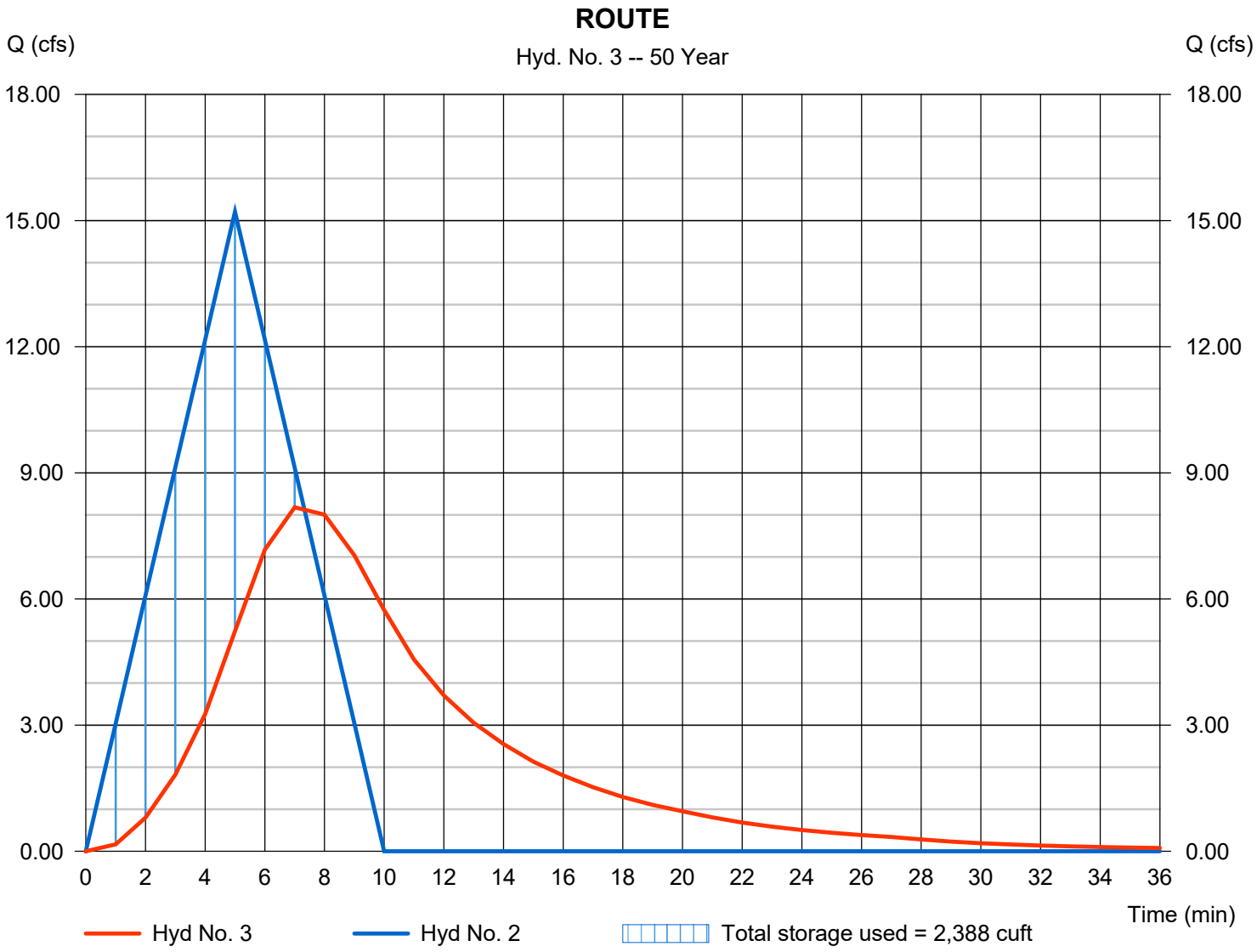
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Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 8.181 cfs
Storm frequency	= 50 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 4,561 cuft
Inflow hyd. No.	= 2 - BASIN 2 - POST DEV	Max. Elevation	= 468.50 ft
Reservoir name	= 42 INCH UGD POND	Max. Storage	= 2,388 cuft

Storage Indication method used.



Hydrograph Report

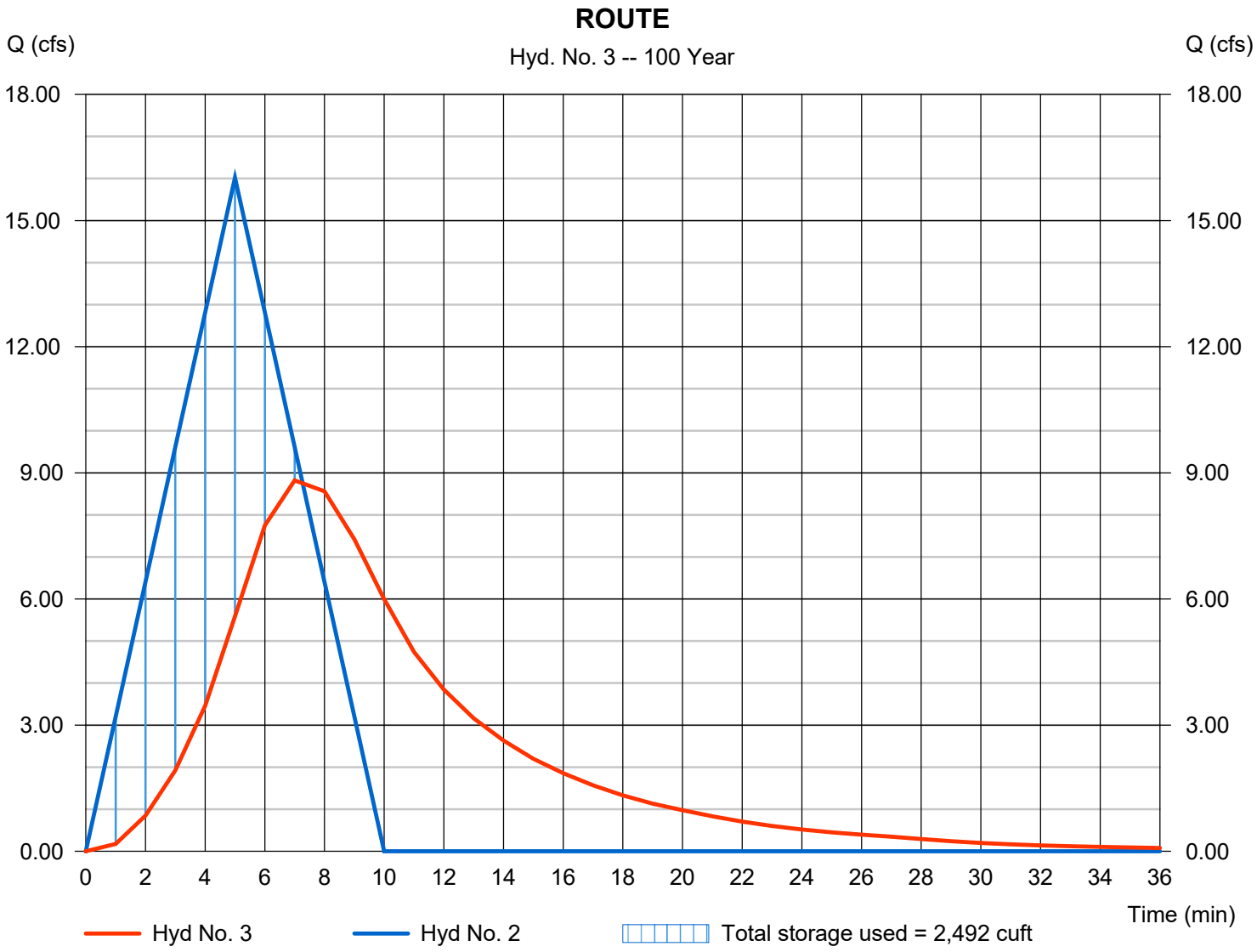
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Hyd. No. 3

ROUTE

Hydrograph type	= Reservoir	Peak discharge	= 8.820 cfs
Storm frequency	= 100 yrs	Time to peak	= 7 min
Time interval	= 1 min	Hyd. volume	= 4,805 cuft
Inflow hyd. No.	= 2 - BASIN 2 - POST DEV	Max. Elevation	= 468.65 ft
Reservoir name	= 42 INCH UGD POND	Max. Storage	= 2,492 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Tuesday, 01 / 7 / 2025

Pond No. 1 - 42 INCH UGD POND

Pond Data

UG Chambers -Invert elev. = 465.50 ft, Rise x Span = 3.50 x 3.50 ft, Barrel Len = 273.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	465.50	n/a	0	0
0.35	465.85	n/a	137	137
0.70	466.20	n/a	237	374
1.05	466.55	n/a	289	663
1.40	466.90	n/a	318	981
1.75	467.25	n/a	332	1,314
2.10	467.60	n/a	332	1,646
2.45	467.95	n/a	318	1,964
2.80	468.30	n/a	289	2,253
3.15	468.65	n/a	237	2,491
3.50	469.00	n/a	137	2,627

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

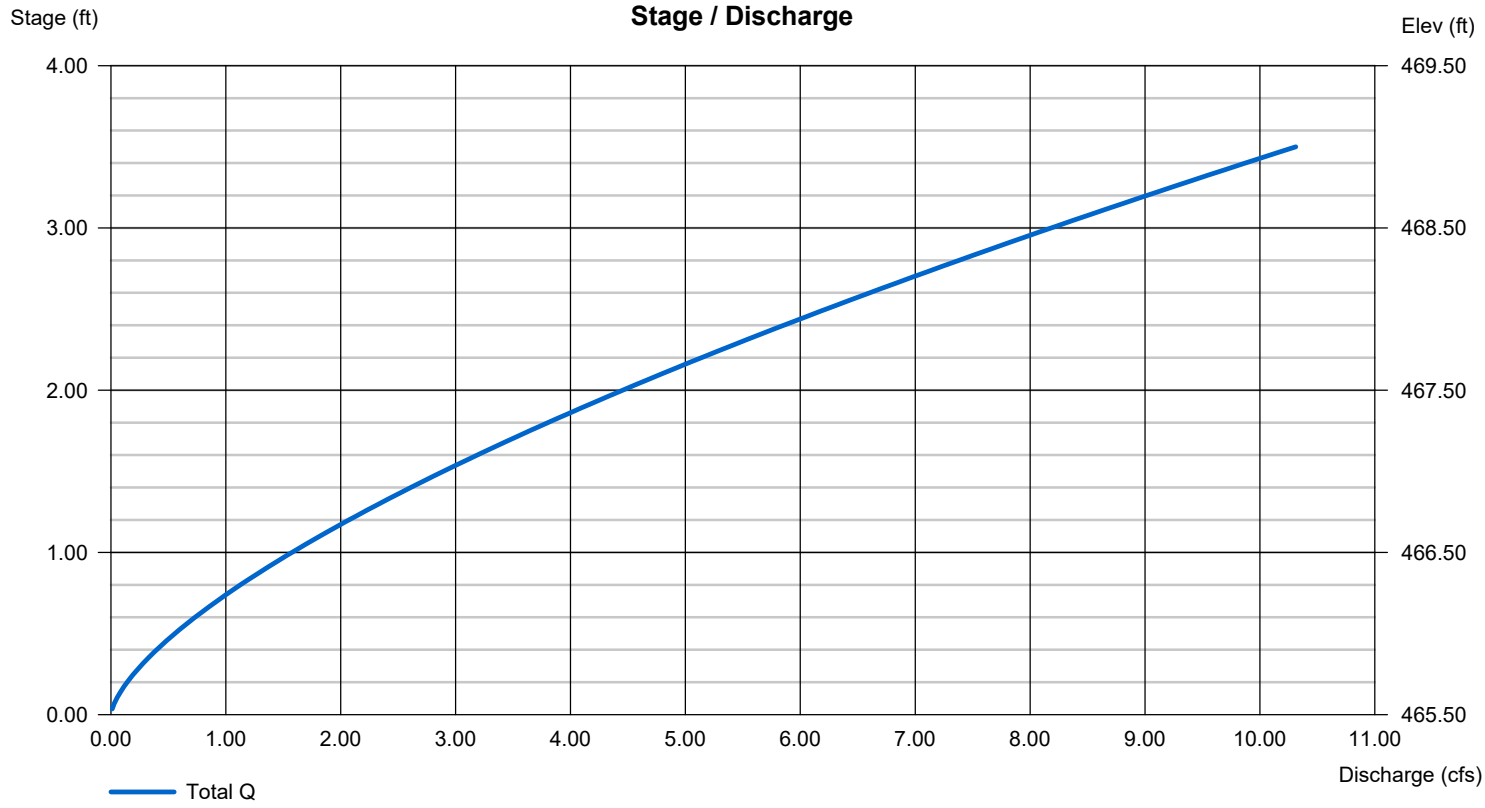
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.63	0.00	0.00	0.00
Crest El. (ft)	= 465.50	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 / 7 / 2025

Pond No. 1 - 42 INCH UGD POND

Pond Data

UG Chambers -Invert elev. = 465.50 ft, Rise x Span = 3.50 x 3.50 ft, Barrel Len = 273.00 ft, No. Barrels = 1, Slope = 0.00%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	465.50	n/a	0	0
0.35	465.85	n/a	137	137
0.70	466.20	n/a	237	374
1.05	466.55	n/a	289	663
1.40	466.90	n/a	318	981
1.75	467.25	n/a	332	1,314
2.10	467.60	n/a	332	1,646
2.45	467.95	n/a	318	1,964
2.80	468.30	n/a	289	2,253
3.15	468.65	n/a	237	2,491
3.50	469.00	n/a	137	2,627

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

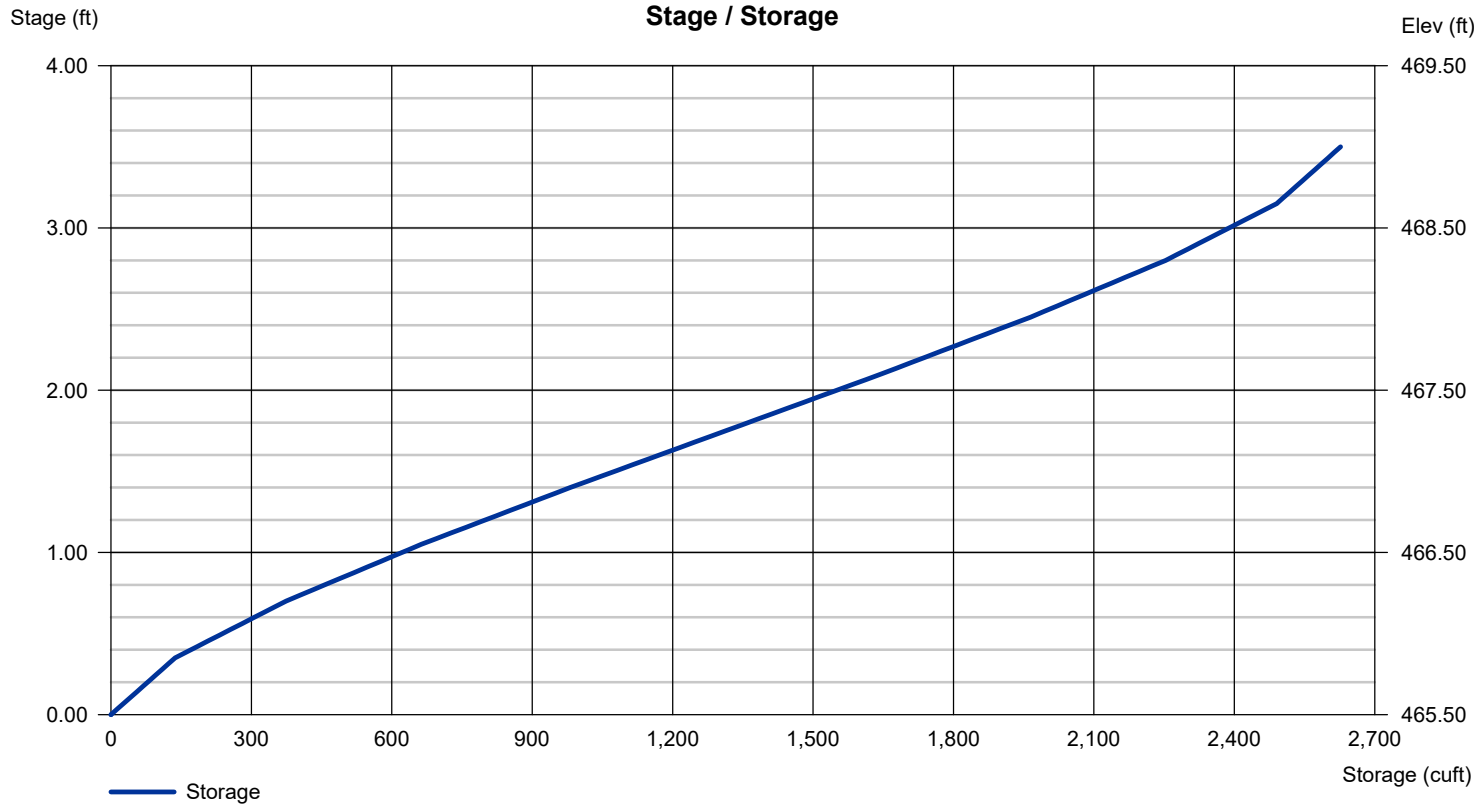
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.63	0.00	0.00	0.00
Crest El. (ft)	= 465.50	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

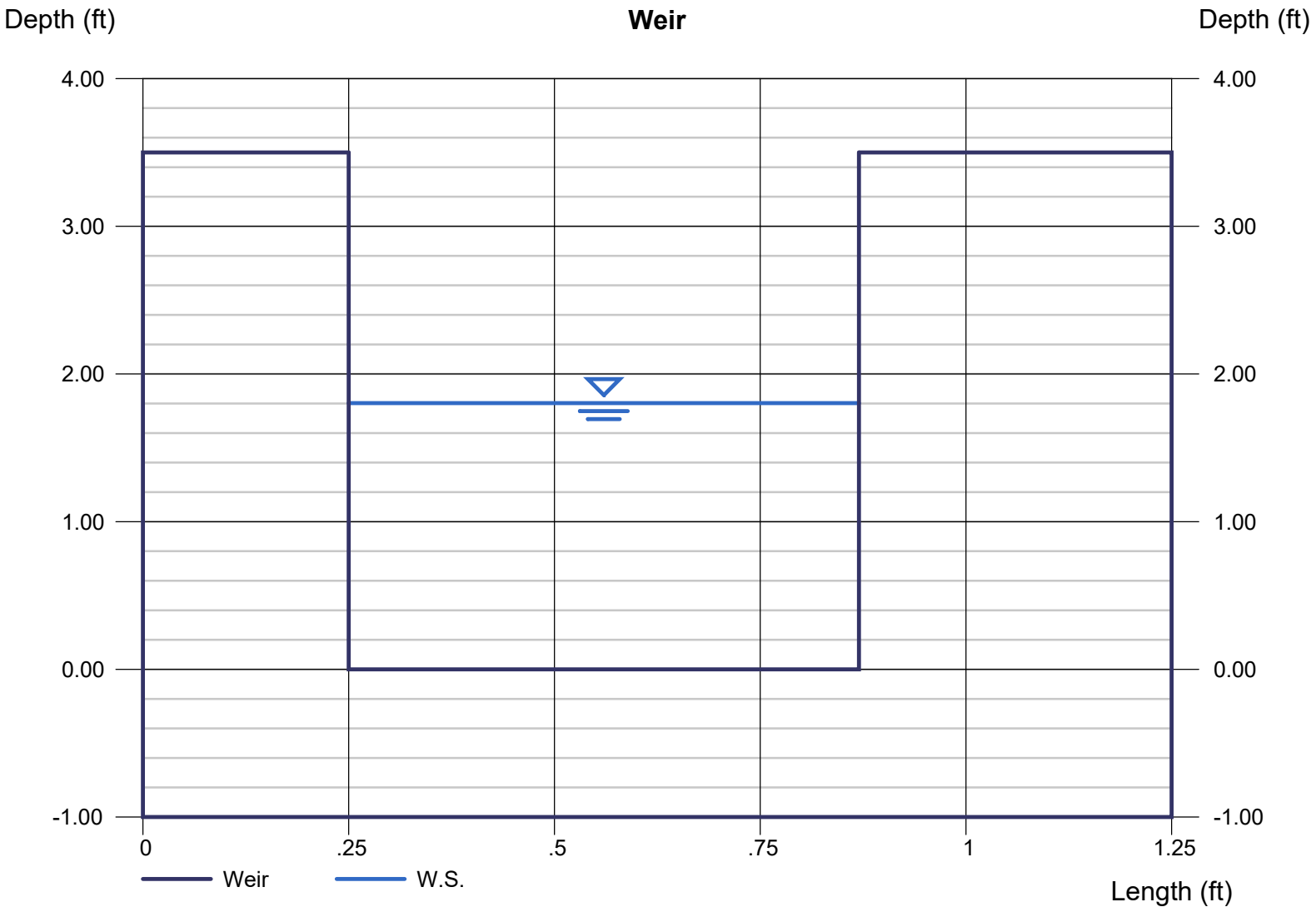
Crest	= Broad
Bottom Length (ft)	= 0.62
Total Depth (ft)	= 3.50

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 3.75

Highlighted

Depth (ft)	= 1.80
Q (cfs)	= 3.750
Area (sqft)	= 1.12
Velocity (ft/s)	= 3.36
Top Width (ft)	= 0.62



Weir Report

Weir

Rectangular Weir

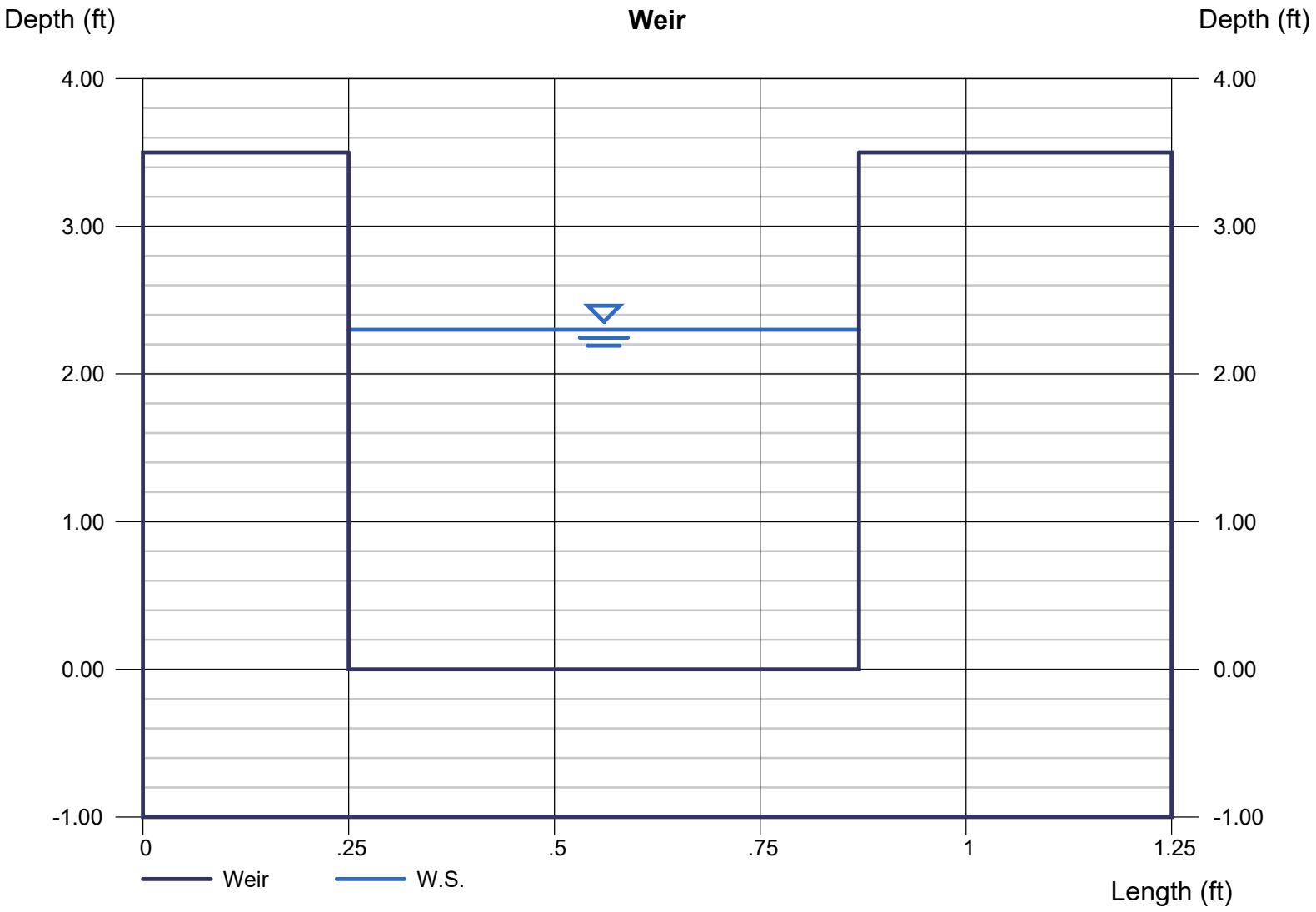
Crest	= Broad
Bottom Length (ft)	= 0.62
Total Depth (ft)	= 3.50

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 5.40

Highlighted

Depth (ft)	= 2.30
Q (cfs)	= 5.400
Area (sqft)	= 1.43
Velocity (ft/s)	= 3.79
Top Width (ft)	= 0.62



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 7 2025

Weir

Rectangular Weir

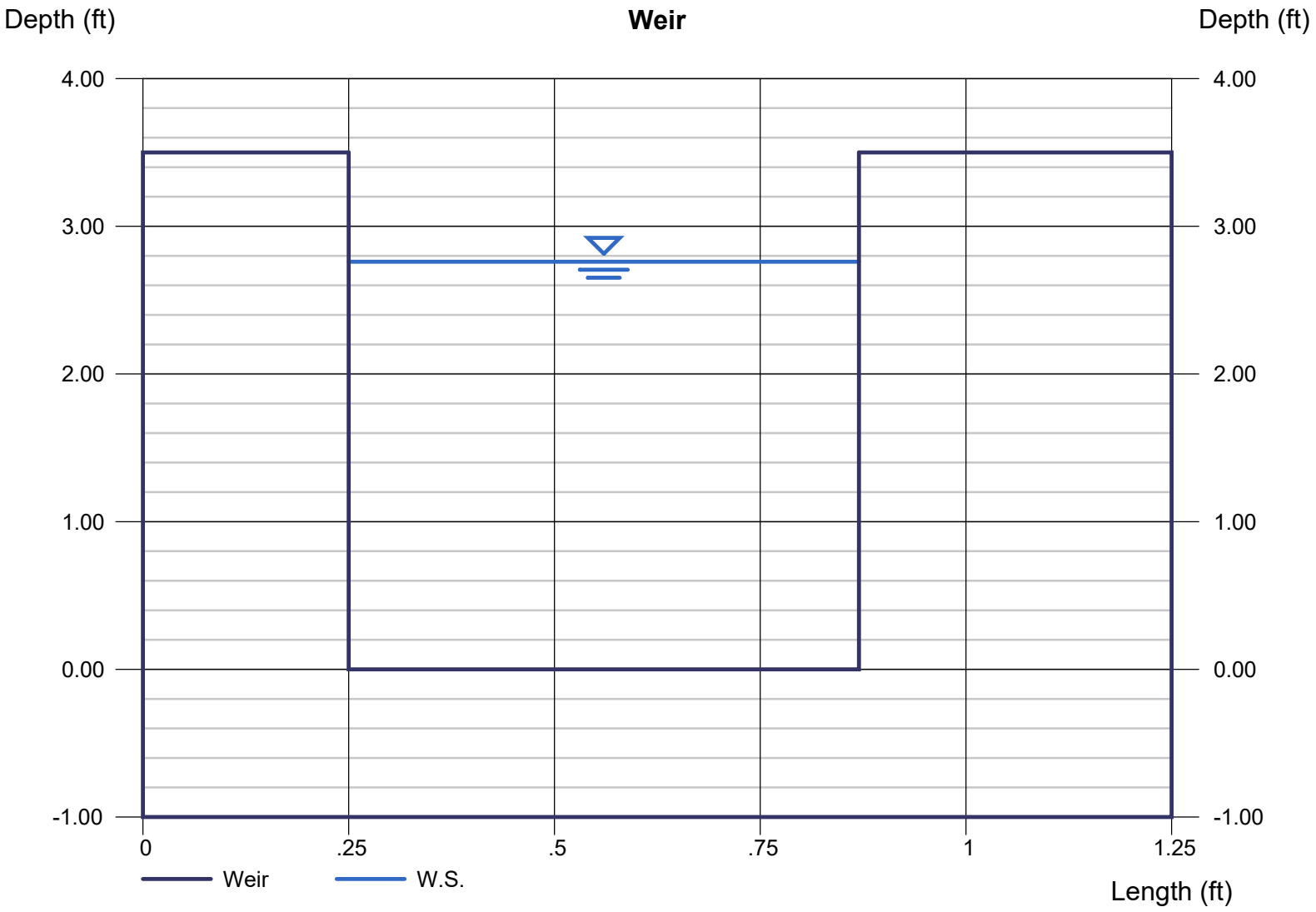
Crest	= Broad
Bottom Length (ft)	= 0.62
Total Depth (ft)	= 3.50

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 7.10

Highlighted

Depth (ft)	= 2.76
Q (cfs)	= 7.100
Area (sqft)	= 1.71
Velocity (ft/s)	= 4.15
Top Width (ft)	= 0.62



Weir Report

Weir

Rectangular Weir

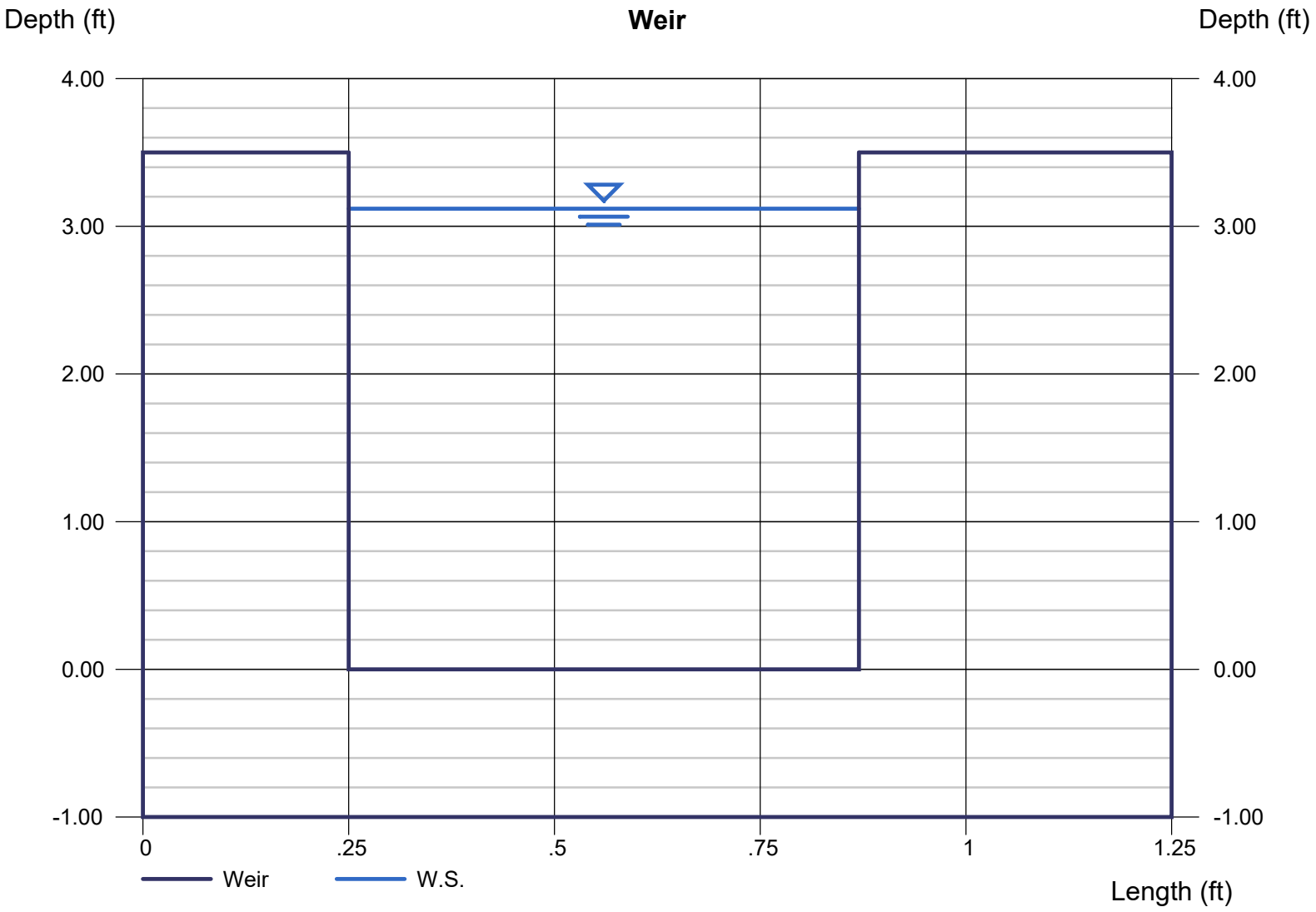
Crest	= Broad
Bottom Length (ft)	= 0.62
Total Depth (ft)	= 3.50

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 8.53

Highlighted

Depth (ft)	= 3.12
Q (cfs)	= 8.530
Area (sqft)	= 1.93
Velocity (ft/s)	= 4.41
Top Width (ft)	= 0.62



Weir Report

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Weir

Rectangular Weir

Crest	= Broad
Bottom Length (ft)	= 0.62
Total Depth (ft)	= 3.50

Calculations

Weir Coeff. Cw	= 2.50
Compute by:	Known Q
Known Q (cfs)	= 10.12

Highlighted

Depth (ft)	= 3.50
Q (cfs)	= 10.12
Area (sqft)	= 2.17
Velocity (ft/s)	= 4.67
Top Width (ft)	= 0.62

