STARLIGHT VILLAGE SUBDIVISION

DRAINAGE REPORT

FOR

City of Bryant, AR

March 2024
Mt. Carmel Rd.
Bryant, AR

By:

HOPE
CONSULTING
ENGINEERS • SURVEYORS

Storm Drainage Summary for Starlight Village subdivision

The Starlight Village is a proposed residential subdivision within the City of Bryant jurisdiction. This subdivision is anticipated to be built in several phases.

Ponds C and D are designed for the total buildout. Summary of the Phase-C and D calculations are below:

Detention Pond C

- Pond is situated on the North side of the property.
- Pond has an area of 0.51 acres with bottom elevation of 369'.
- Two 36'' RCP with 2.0% slope are considered for outflow culvert.
- For 100-year frequency, the peak discharges for pre-development and post development stage have been calculated as 129.49 cfs and 103.15 cfs respectively (Attachment- Pond-C).
- Peak flows for Pre and post development phase have been tabulated below-

	Pre-development Pond C	Post-development Pond C
	Peak Flow (cfs)	Peak Flow (cfs)
2-Year	64.42	55.40
10-Year	89.93	75.58
25-Year	104.75	85.49
50-Year	118.17	96.48
100-Year	129.49	103.15

Detention Pond D

- Pond is situated on the south side of the property.
- Pond has an area of 0.30 acres with bottom elevation of 362.00'.
- One 24'' RCP 0.50% slope is considered for outflow culvert.
- For 100-year frequency, the peak discharges for pre-development and post development stage have been calculated as 31.99 cfs and 29.32 cfs respectively (Attachment- Pond D).
- Peak flows for Pre and post development phase have been tabulated below-

	Pre-development Pond D	Post-development Pond D
	Peak Flow (cfs)	Peak Flow (cfs)
2-Year	16.12	13.36
10-Year	22.30	19.73
25-Year	25.93	22.85
50-Year	29.33	25.70
100-Year	31.99	29.32

Multi-Hydrograph Plot

Hyd. No. 1

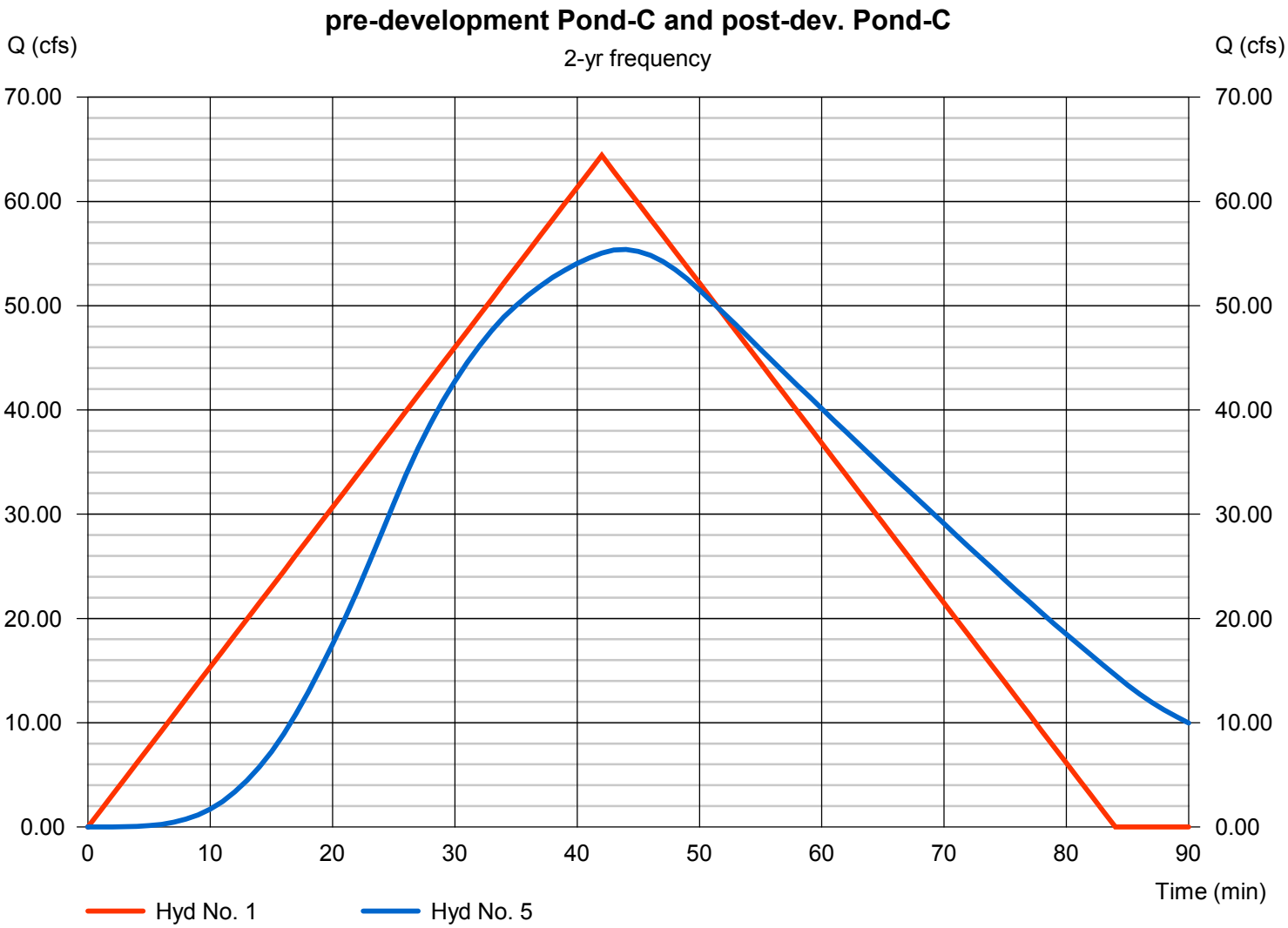
pre-development Pond-C

Hydrograph type	=	Rational
Peak discharge	=	64.42 cfs
Time to peak	=	42 min
Hyd. Volume	=	162,337 cuft

Hyd. No. 5

post-dev. Pond-C

Hydrograph type	=	Reservoir
Peak discharge	=	55.40 cfs
Time to peak	=	44 min
Hyd. Volume	=	175,540 cuft



Multi-Hydrograph Plot

Hyd. No. 1

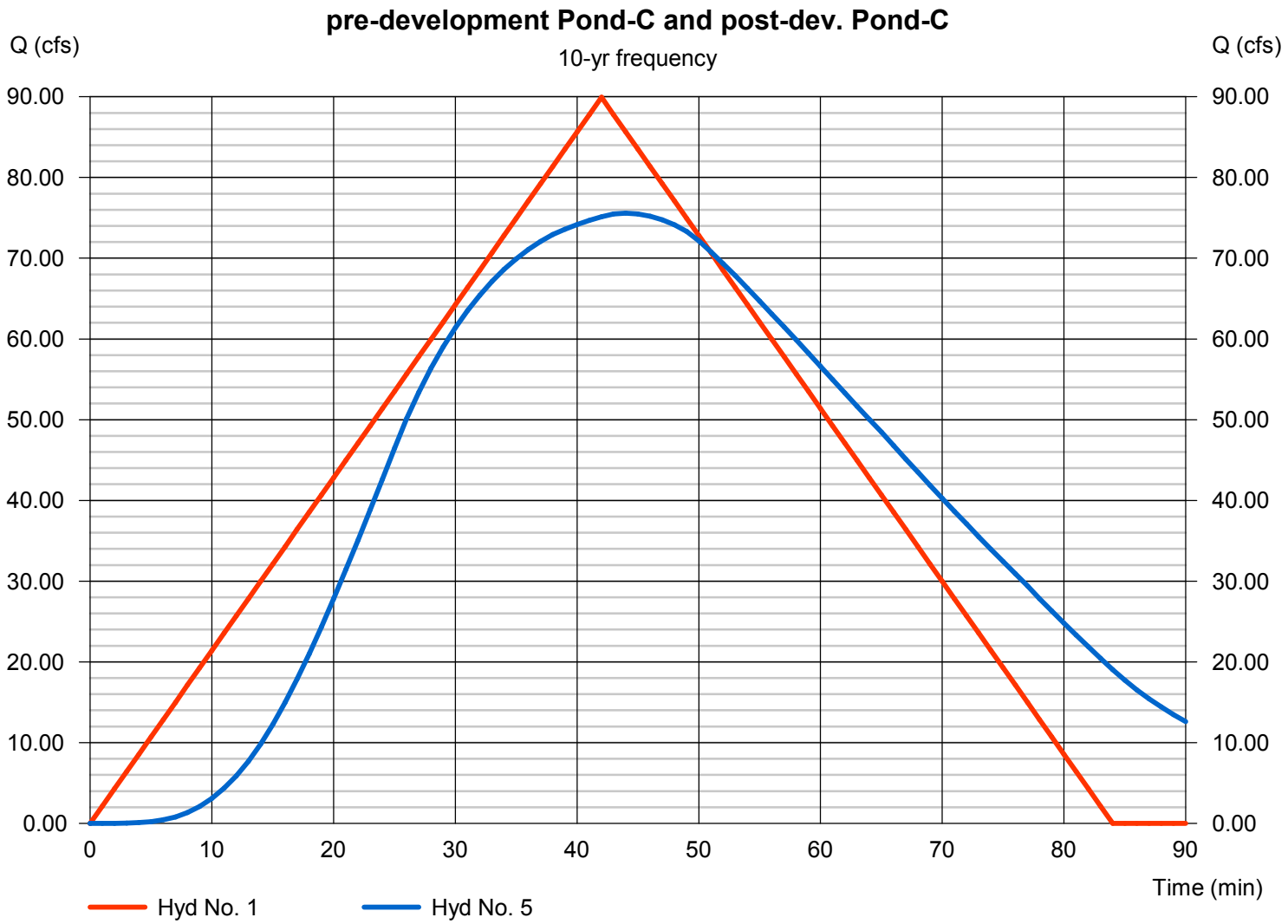
pre-development Pond-C

Hydrograph type	=	Rational
Peak discharge	=	89.93 cfs
Time to peak	=	42 min
Hyd. Volume	=	226,617 cuft

Hyd. No. 5

post-dev. Pond-C

Hydrograph type	=	Reservoir
Peak discharge	=	75.58 cfs
Time to peak	=	44 min
Hyd. Volume	=	241,988 cuft



Multi-Hydrograph Plot

Hyd. No. 1

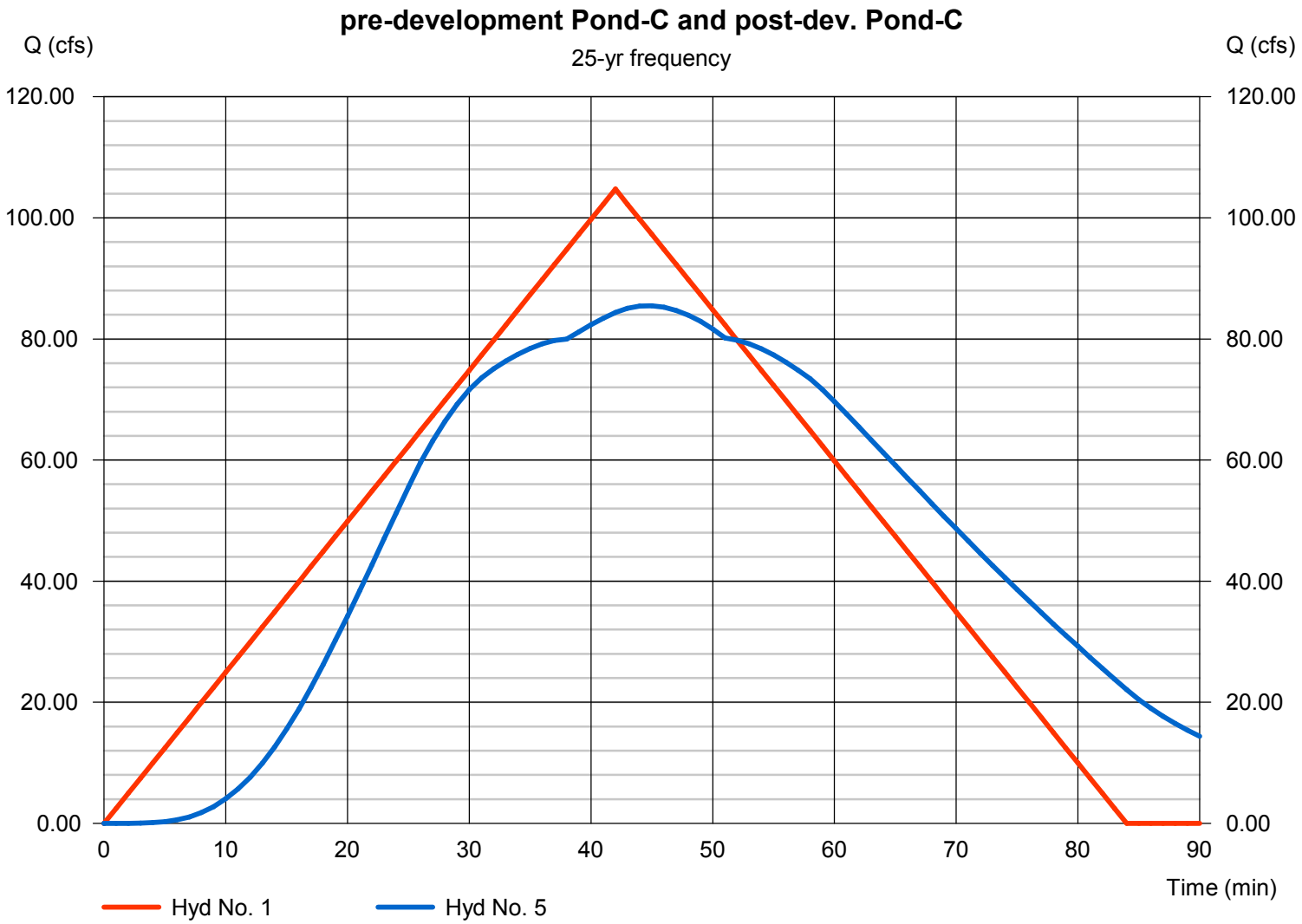
pre-development Pond-C

Hydrograph type	=	Rational
Peak discharge	=	104.75 cfs
Time to peak	=	42 min
Hyd. Volume	=	263,981 cuft

Hyd. No. 5

post-dev. Pond-C

Hydrograph type	=	Reservoir
Peak discharge	=	85.49 cfs
Time to peak	=	45 min
Hyd. Volume	=	281,139 cuft



Multi-Hydrograph Plot

Hyd. No. 1

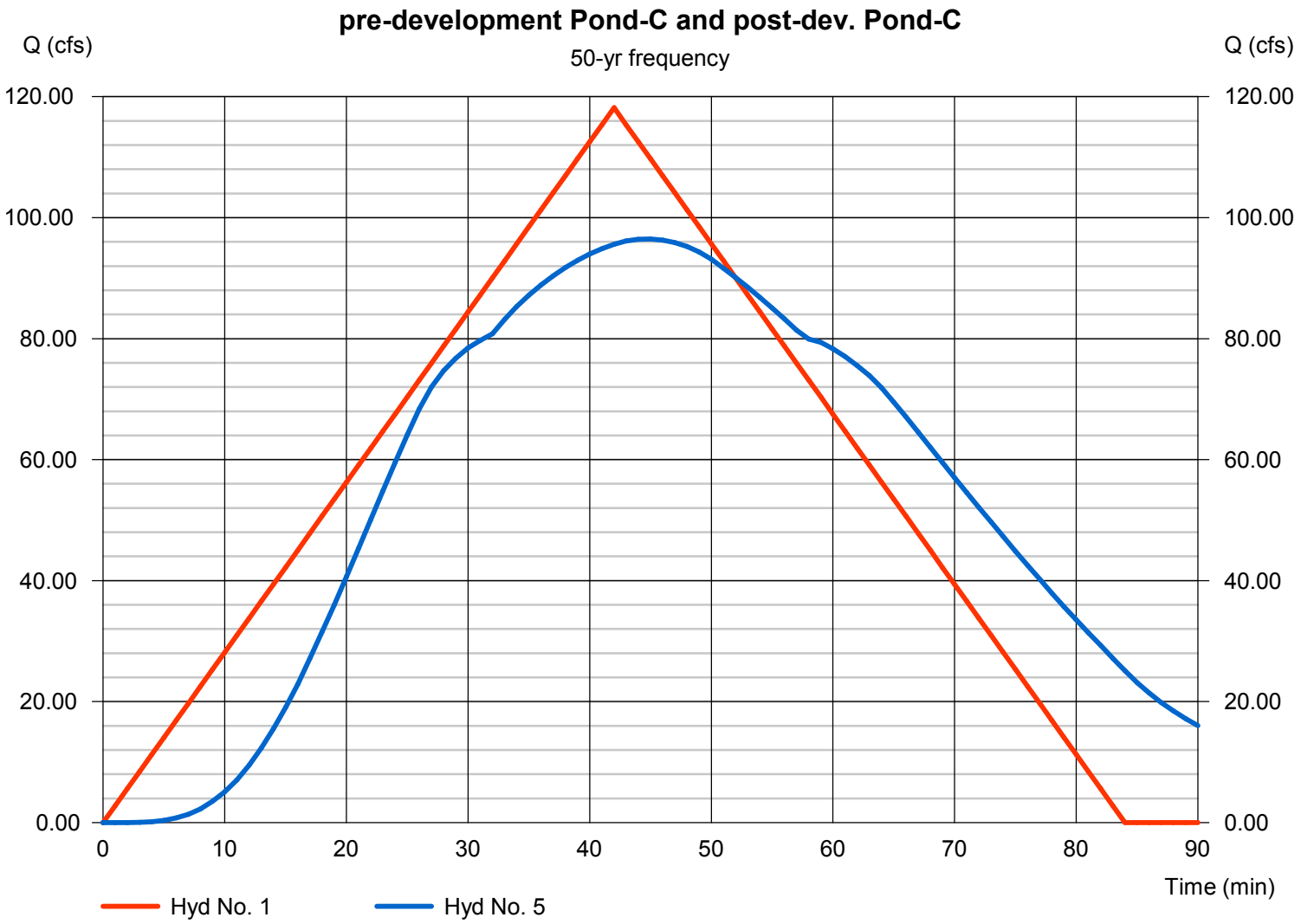
pre-development Pond-C

Hydrograph type	=	Rational
Peak discharge	=	118.17 cfs
Time to peak	=	42 min
Hyd. Volume	=	297,793 cuft

Hyd. No. 5

post-dev. Pond-C

Hydrograph type	=	Reservoir
Peak discharge	=	96.48 cfs
Time to peak	=	45 min
Hyd. Volume	=	318,062 cuft



Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No. 1

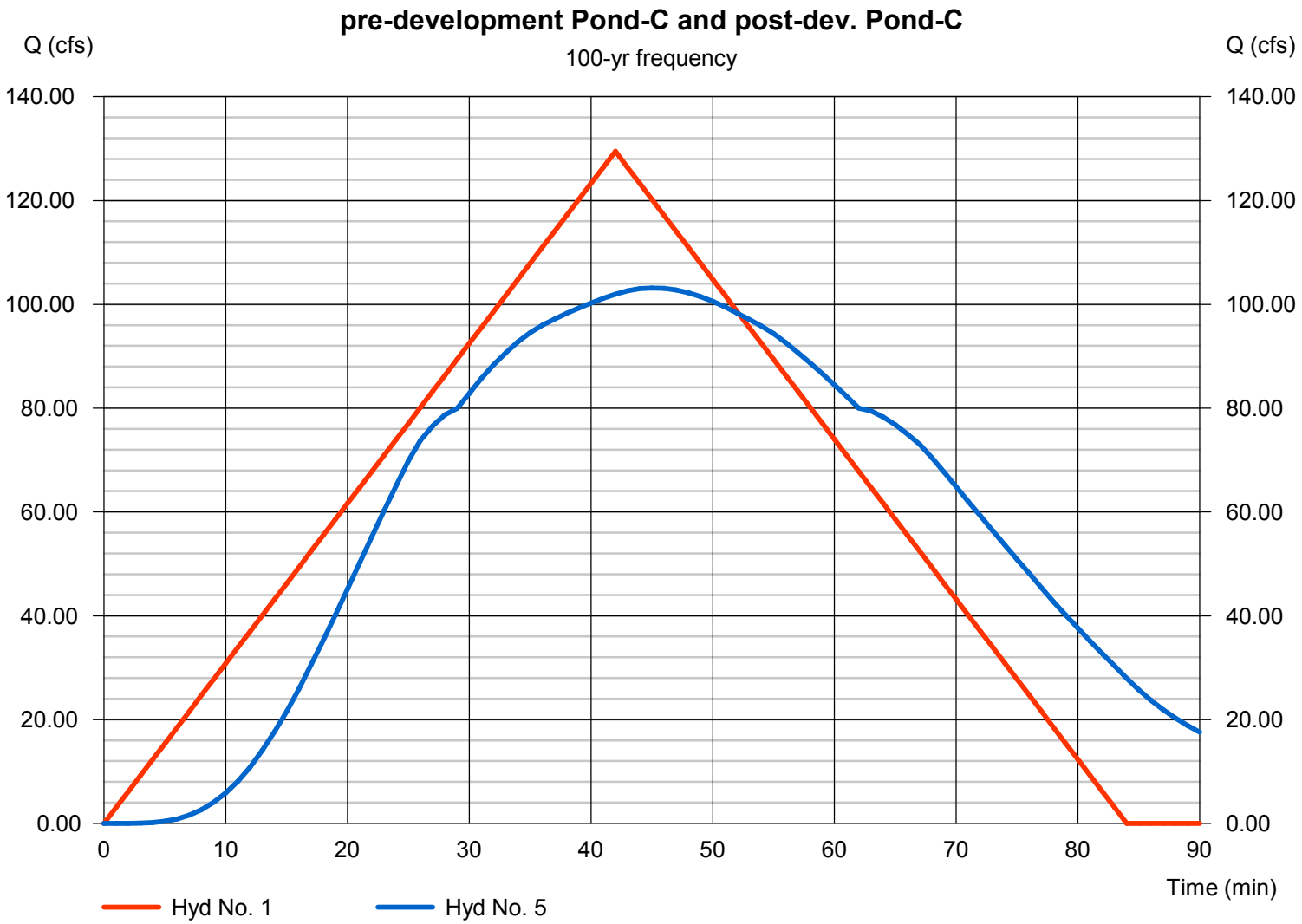
pre-development Pond-C

Hydrograph type	=	Rational
Peak discharge	=	129.49 cfs
Time to peak	=	42 min
Hyd. Volume	=	326,304 cuft

Hyd. No. 5

post-dev. Pond-C

Hydrograph type	=	Reservoir
Peak discharge	=	103.15 cfs
Time to peak	=	45 min
Hyd. Volume	=	346,406 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Trapezoid -Bottom L x W = 152.0 x 145.0 ft, Side slope = 3.00:1, Bottom elev. = 369.00 ft, Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	369.00	22,040	0	0
0.50	369.50	22,940	11,244	11,244
1.00	370.00	23,858	11,699	22,943
1.50	370.50	24,794	12,162	35,105
2.00	371.00	25,748	12,635	47,740
2.50	371.50	26,720	13,116	60,856
3.00	372.00	27,710	13,607	74,463
3.50	372.50	28,718	14,106	88,569
4.00	373.00	29,744	14,615	103,184
4.50	373.50	30,788	15,132	118,316
5.00	374.00	31,850	15,659	133,975

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	36.00	Inactive	Inactive
Span (in)	= 36.00	36.00	12.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 369.00	369.00	369.00	0.00
Length (ft)	= 131.00	41.00	41.00	0.00
Slope (%)	= 2.00	2.00	2.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

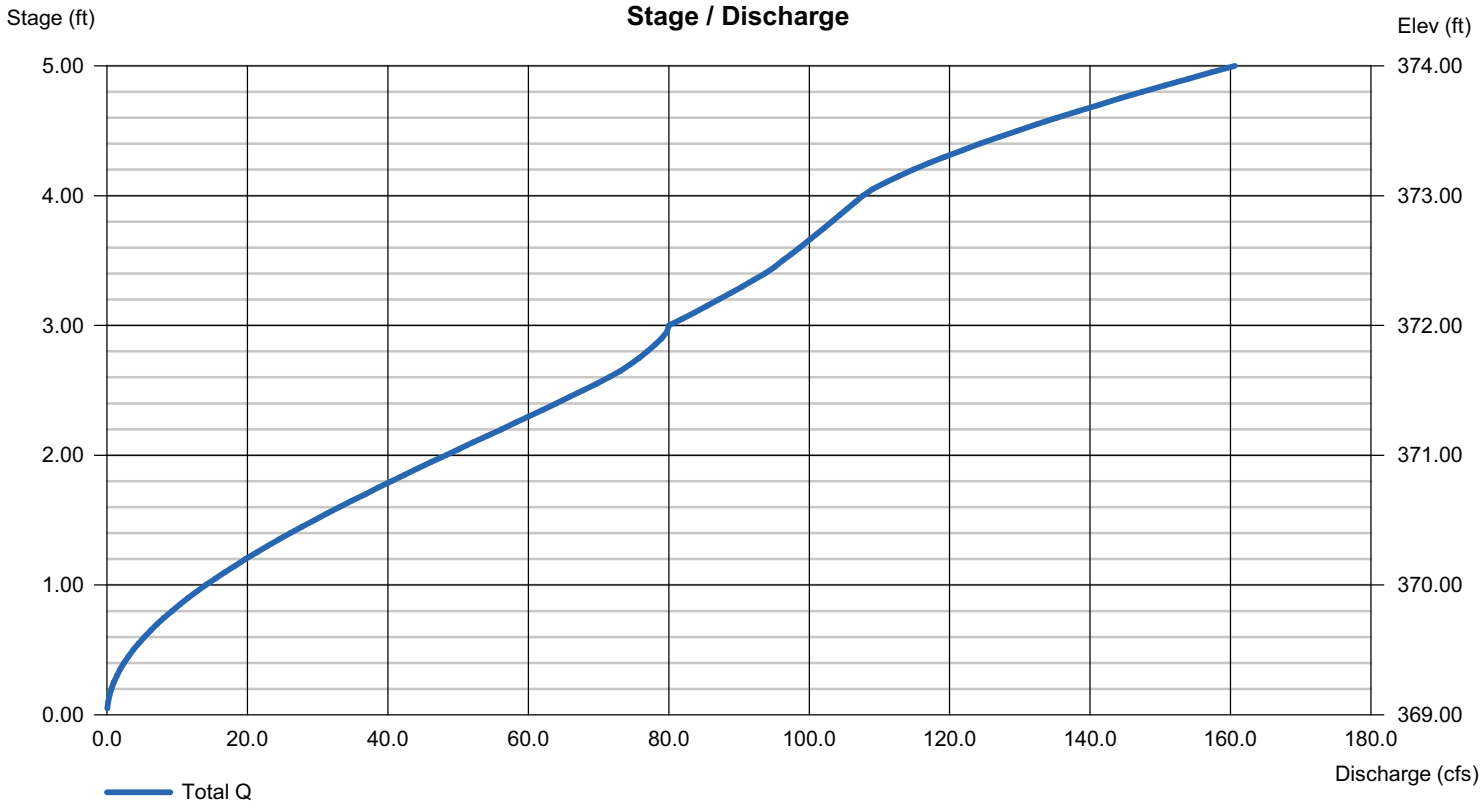
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 373.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

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

TW Elev. (ft) = 0.00

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



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	64.42	1	42	162,337	------	------	------	pre-development Area-A
2	Rational	48.30	1	42	121,707	------	------	------	Post Development area-D
3	Rational	35.91	1	25	53,862	------	------	------	Post Development area-E
4	Combine	64.66	1	25	175,569	2, 3	------	------	Post Development Combination
5	Reservoir	55.40	1	44	175,540	4	371.18	52,485	123

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	89.93	1	42	226,617	------	------	------	pre-development Area-A
2	Rational	67.42	1	42	169,899	------	------	------	Post Development area-D
3	Rational	48.08	1	25	72,118	------	------	------	Post Development area-E
4	Combine	88.21	1	25	242,017	2, 3	------	------	Post Development Combination
5	Reservoir	75.58	1	44	241,988	4	371.74	67,459	123

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	104.75	1	42	263,981	------	------	------	pre-development Area-A
2	Rational	78.54	1	42	197,911	------	------	------	Post Development area-D
3	Rational	55.50	1	25	83,257	------	------	------	Post Development area-E
4	Combine	102.25	1	25	281,168	2, 3	------	------	Post Development Combination
5	Reservoir	85.49	1	45	281,139	4	372.15	78,764	123

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

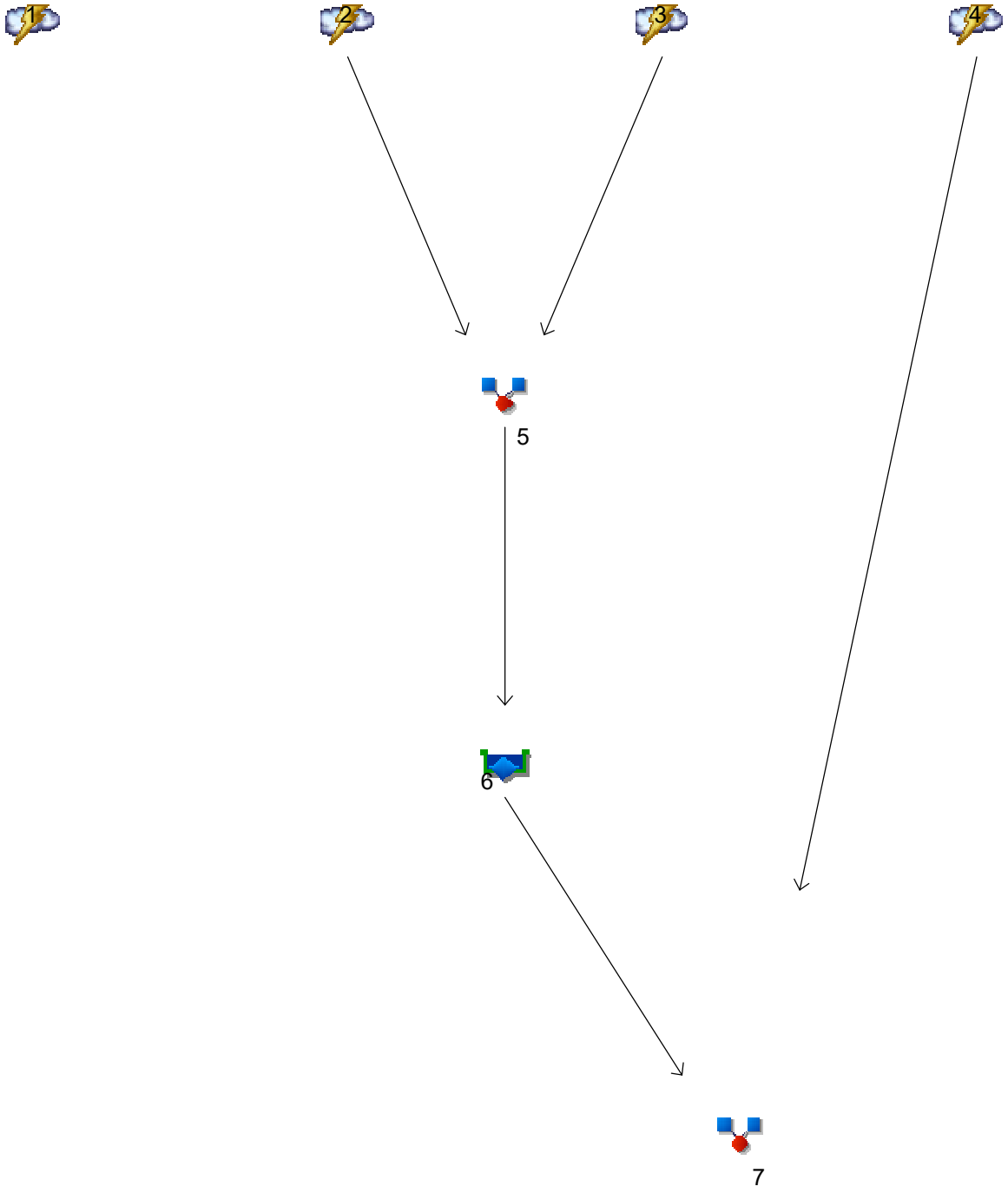
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	118.17	1	42	297,793	------	------	------	pre-development Area-A
2	Rational	88.60	1	42	223,261	------	------	------	Post Development area-D
3	Rational	63.22	1	25	94,830	------	------	------	Post Development area-E
4	Combine	115.96	1	25	318,091	2, 3	------	------	Post Development Combination
5	Reservoir	96.48	1	45	318,062	4	372.51	88,842	123

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	129.49	1	42	326,304	------	------	------	pre-development Area-A
2	Rational	97.08	1	42	244,636	------	------	------	Post Development area-D
3	Rational	67.87	1	25	101,799	------	------	------	Post Development area-E
4	Combine	125.65	1	25	346,435	2, 3	------	------	Post Development Combination
5	Reservoir	103.15	1	45	346,406	4	372.80	97,255	123

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Pre-development Flow
2	Rational	Development Generated Flow-D
3	Rational	Development Generated Flow-E
4	Rational	<no description>
5	Combine	<no description>
6	Reservoir	Detention Pond
7	Combine	Post-development Flow

Multi-Hydrograph Plot

Hyd. No. 1

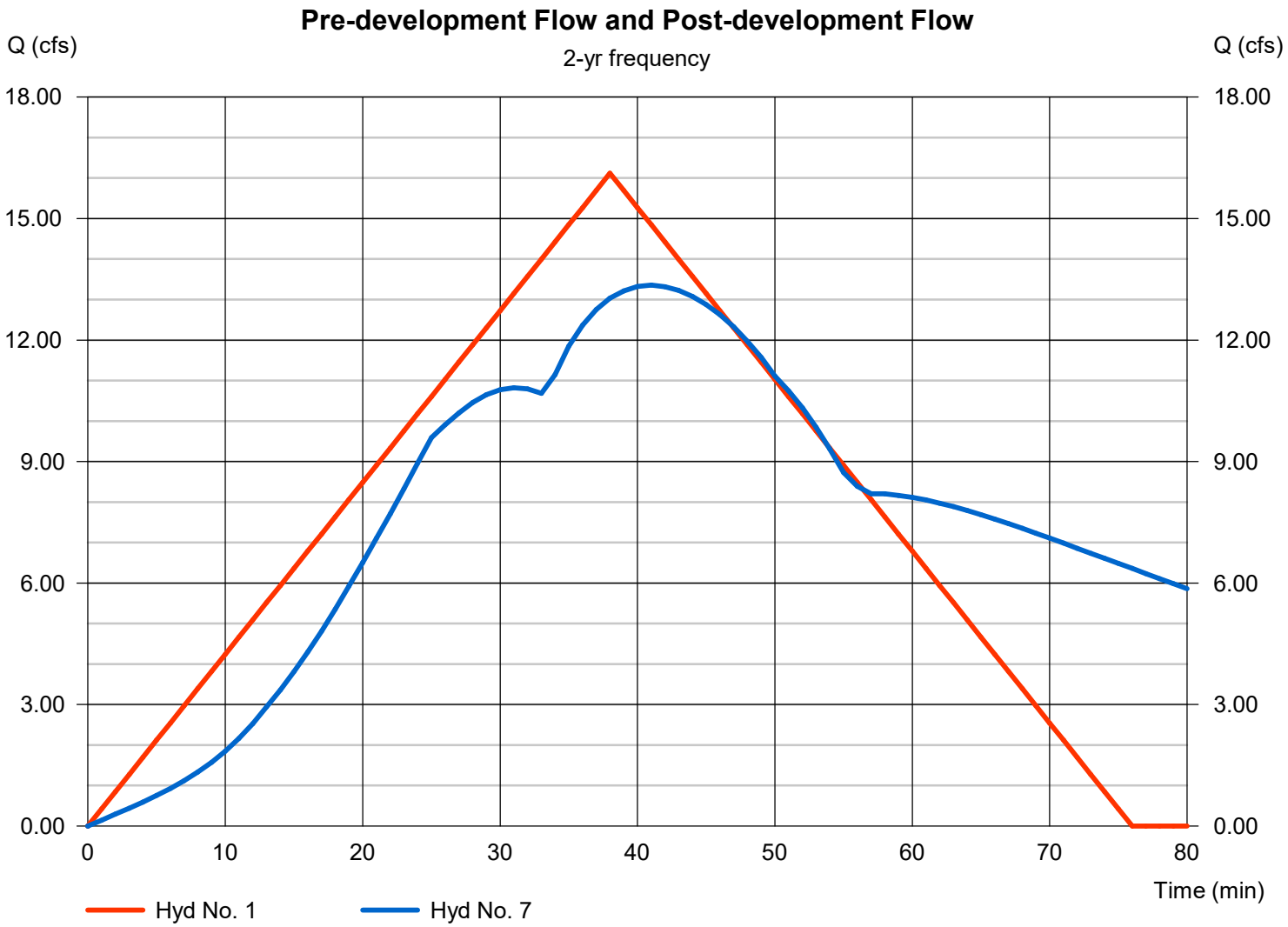
Pre-development Flow

Hydrograph type	=	Rational
Peak discharge	=	16.12 cfs
Time to peak	=	38 min
Hyd. Volume	=	36,750 cuft

Hyd. No. 7

Post-development Flow

Hydrograph type	=	Combine
Peak discharge	=	13.36 cfs
Time to peak	=	41 min
Hyd. Volume	=	55,457 cuft



Multi-Hydrograph Plot

Hyd. No. 1

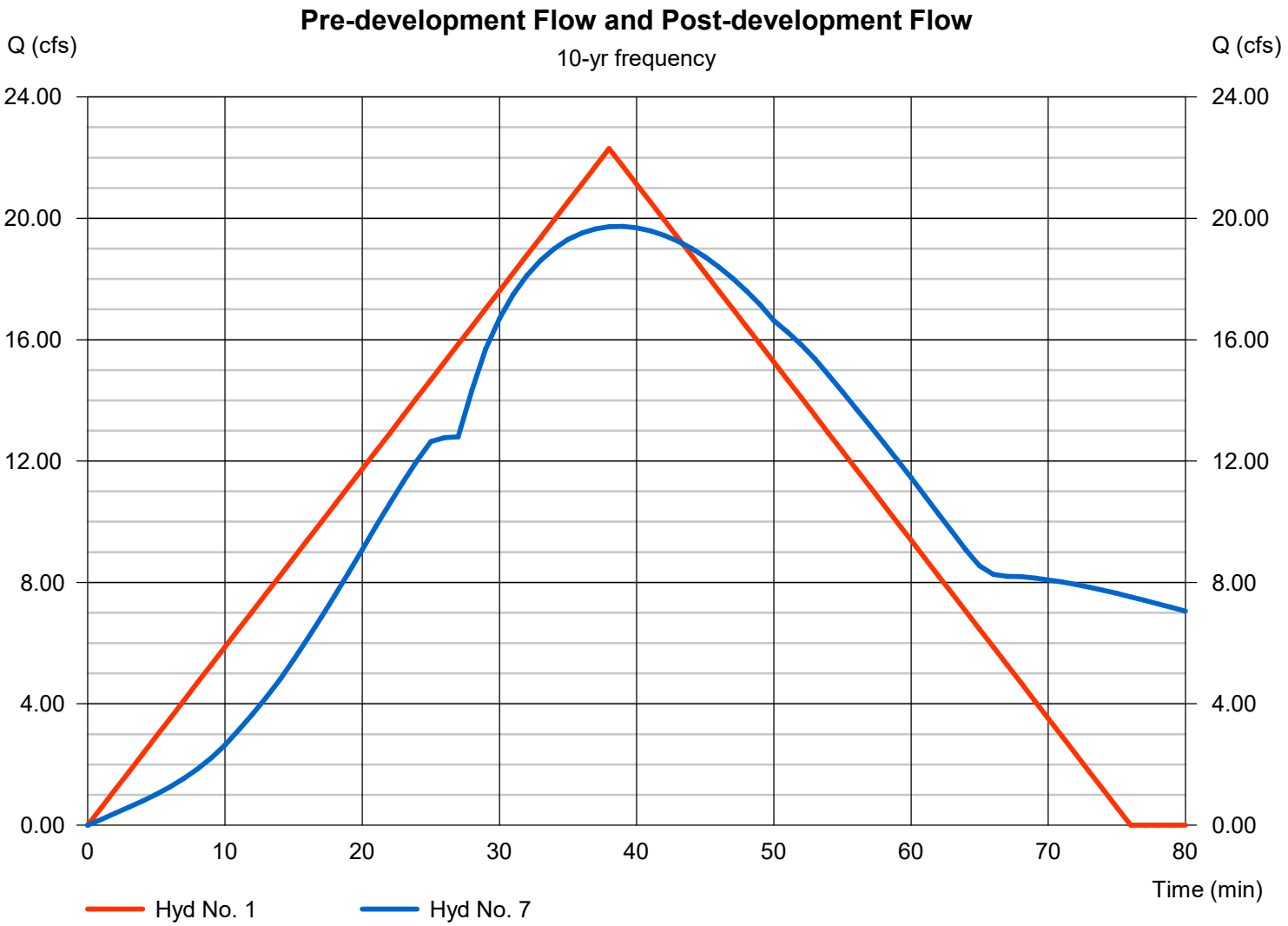
Pre-development Flow

Hydrograph type	=	Rational
Peak discharge	=	22.30 cfs
Time to peak	=	38 min
Hyd. Volume	=	50,851 cuft

Hyd. No. 7

Post-development Flow

Hydrograph type	=	Combine
Peak discharge	=	19.73 cfs
Time to peak	=	39 min
Hyd. Volume	=	74,666 cuft



Multi-Hydrograph Plot

Hyd. No. 1

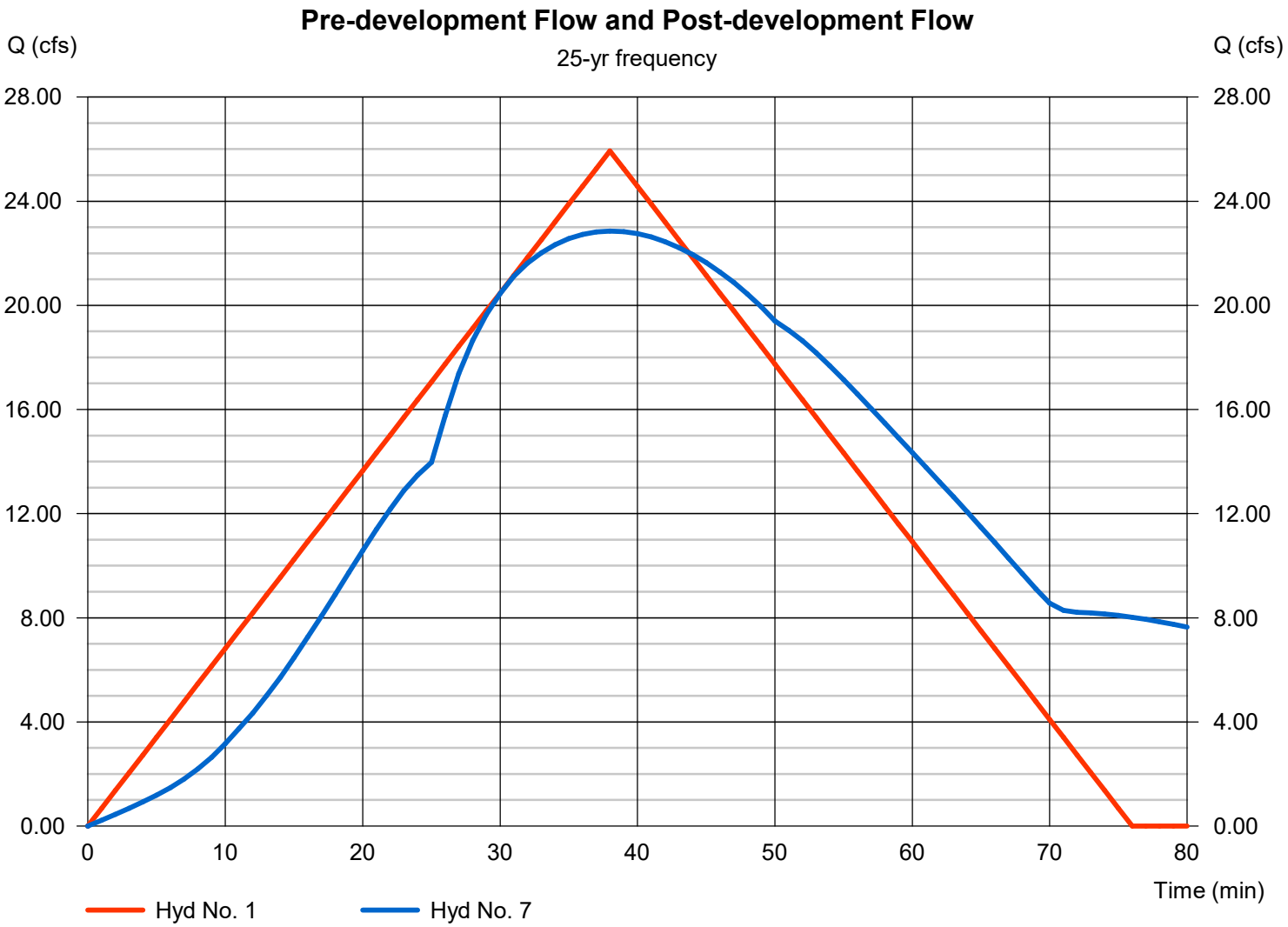
Pre-development Flow

Hydrograph type	=	Rational
Peak discharge	=	25.93 cfs
Time to peak	=	38 min
Hyd. Volume	=	59,126 cuft

Hyd. No. 7

Post-development Flow

Hydrograph type	=	Combine
Peak discharge	=	22.85 cfs
Time to peak	=	38 min
Hyd. Volume	=	86,308 cuft



Multi-Hydrograph Plot

Hyd. No. 1

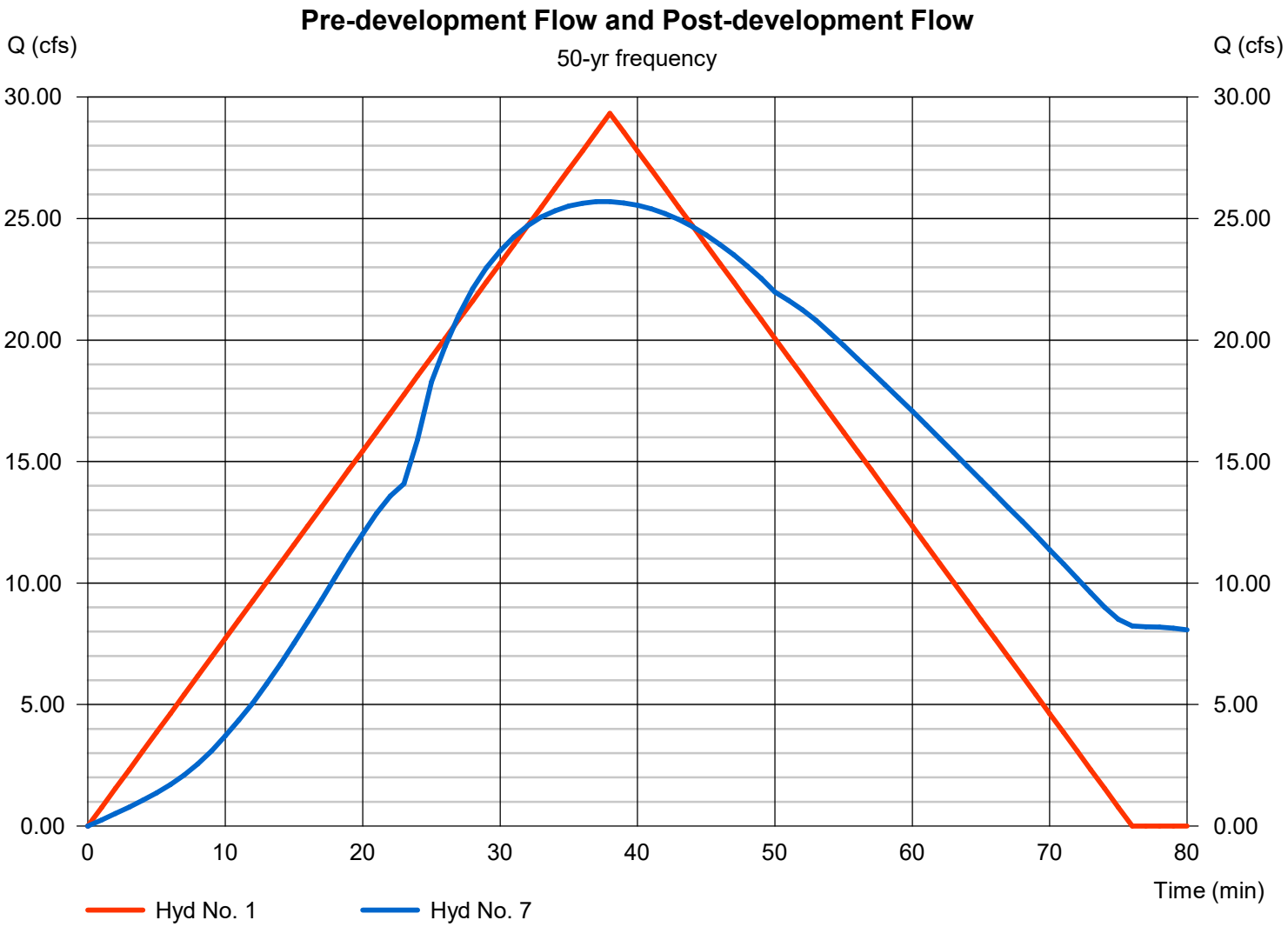
Pre-development Flow

Hydrograph type	=	Rational
Peak discharge	=	29.33 cfs
Time to peak	=	38 min
Hyd. Volume	=	66,871 cuft

Hyd. No. 7

Post-development Flow

Hydrograph type	=	Combine
Peak discharge	=	25.70 cfs
Time to peak	=	38 min
Hyd. Volume	=	98,231 cuft



Multi-Hydrograph Plot

Hyd. No. 1

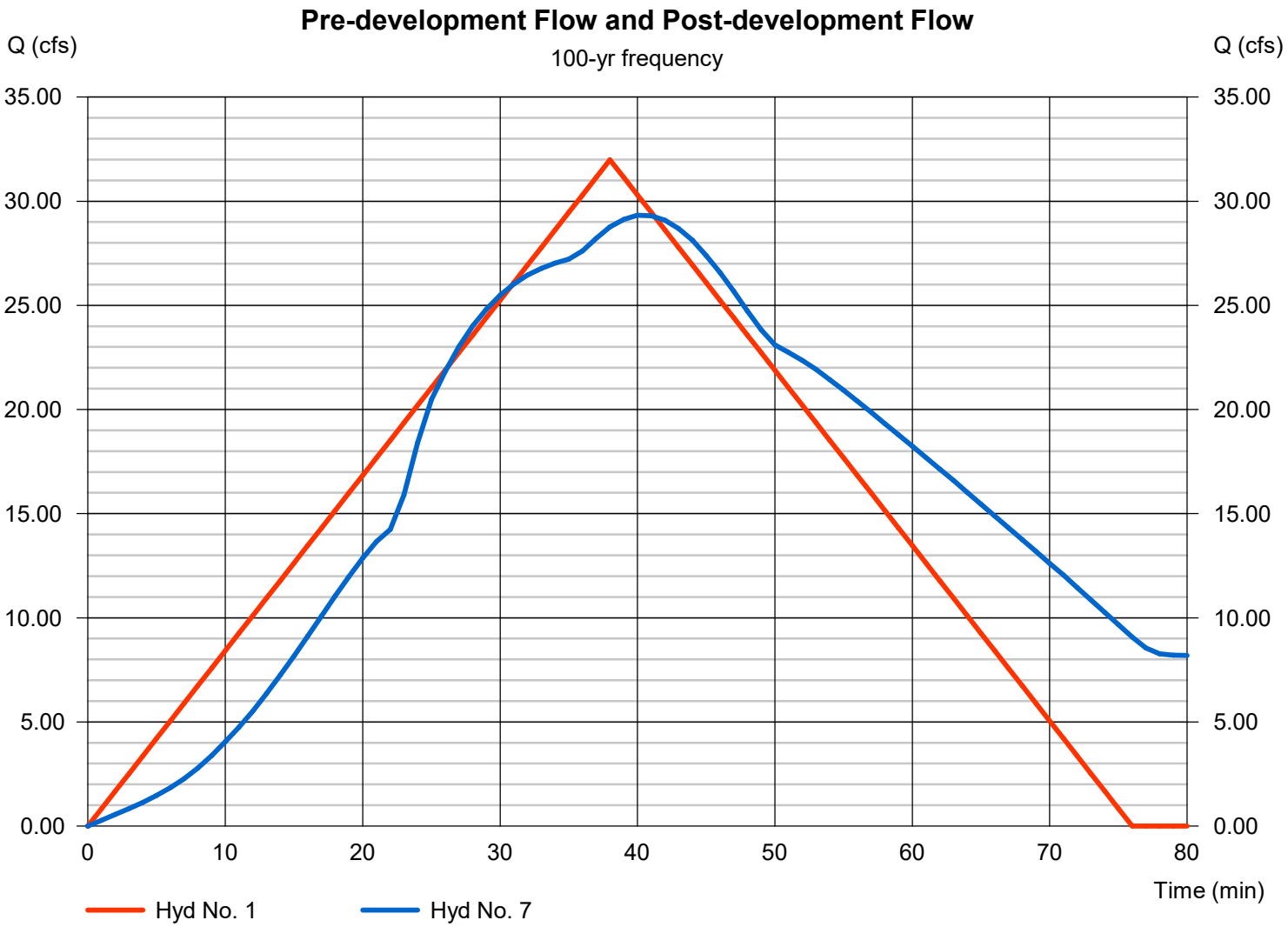
Pre-development Flow

Hydrograph type	=	Rational
Peak discharge	=	31.99 cfs
Time to peak	=	38 min
Hyd. Volume	=	72,927 cuft

Hyd. No. 7

Post-development Flow

Hydrograph type	=	Combine
Peak discharge	=	29.32 cfs
Time to peak	=	40 min
Hyd. Volume	=	105,697 cuft



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 — Wednesday, 03 / 13 / 2024

Pond No. 2 - Pond-D

Pond Data

Trapezoid -Bottom L x W = 130.0 x 100.0 ft, Side slope = 3.00:1, Bottom elev. = 362.00 ft, Depth = 4.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	362.00	13,000	0	0
0.45	362.45	13,628	5,991	5,991
0.90	362.90	14,271	6,277	12,268
1.35	363.35	14,929	6,569	18,837
1.80	363.80	15,601	6,869	25,706
2.25	364.25	16,287	7,174	32,880
2.70	364.70	16,988	7,486	40,366
3.15	365.15	17,704	7,805	48,172
3.60	365.60	18,435	8,131	56,302
4.05	366.05	19,179	8,463	64,765
4.50	366.50	19,939	8,801	73,566

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	Inactive	Inactive	Inactive
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 362.00	0.00	0.00	0.00
Length (ft)	= 42.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

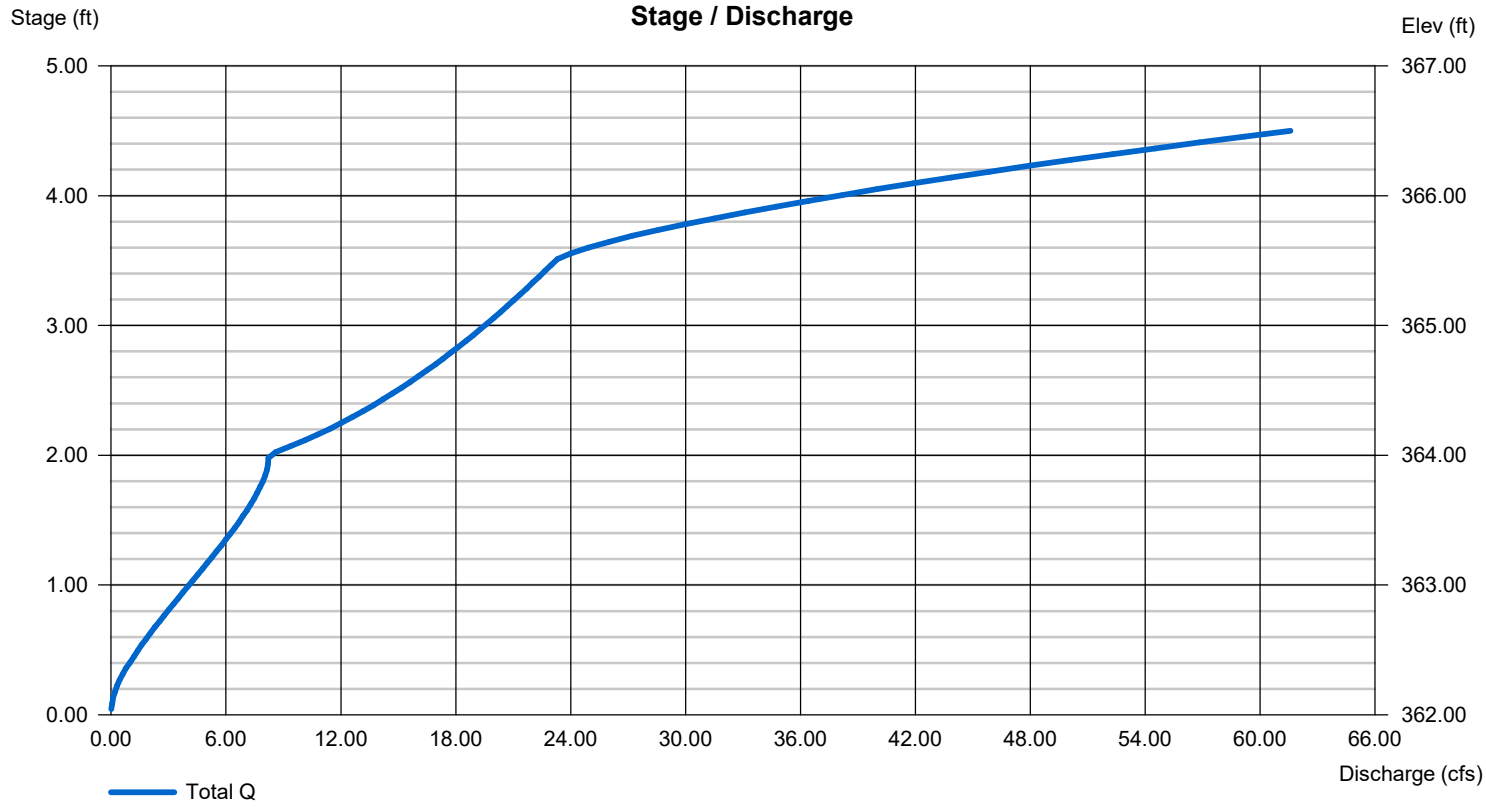
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	Inactive	Inactive	Inactive
Crest El. (ft)	= 365.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	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).



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	16.12	1	38	36,750	------	------	------	Pre-development Flow
2	Rational	1.245	1	30	2,241	------	------	------	Development Generated Flow-D
3	Rational	29.51	1	27	47,814	------	------	------	Development Generated Flow-E
4	Rational	3.632	1	25	5,448	------	------	------	<no description>
5	Combine	30.64	1	27	50,055	2, 3,	------	------	<no description>
6	Reservoir	12.21	1	43	50,009	5	364.26	33,102	Detention Pond
7	Combine	13.36	1	41	55,457	4, 6	------	------	Post-development Flow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	22.30	1	38	50,851	------	------	------	Pre-development Flow
2	Rational	1.689	1	30	3,041	------	------	------	Development Generated Flow-D
3	Rational	39.74	1	27	64,376	------	------	------	Development Generated Flow-E
4	Rational	4.863	1	25	7,295	------	------	------	<no description>
5	Combine	41.26	1	27	67,417	2, 3,	------	------	<no description>
6	Reservoir	17.89	1	43	67,371	5	364.81	42,201	Detention Pond
7	Combine	19.73	1	39	74,666	4, 6	------	------	Post-development Flow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	25.93	1	38	59,126	------	------	------	Pre-development Flow
2	Rational	1.956	1	30	3,521	------	------	------	Development Generated Flow-D
3	Rational	45.93	1	27	74,411	------	------	------	Development Generated Flow-E
4	Rational	5.614	1	25	8,422	------	------	------	<no description>
5	Combine	47.69	1	27	77,932	2, 3,	------	------	<no description>
6	Reservoir	20.65	1	43	77,886	5	365.14	48,075	Detention Pond
7	Combine	22.85	1	38	86,308	4, 6	------	------	Post-development Flow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	29.33	1	38	66,871	------	------	------	Pre-development Flow
2	Rational	2.223	1	30	4,001	------	------	------	Development Generated Flow-D
3	Rational	52.27	1	27	84,683	------	------	------	Development Generated Flow-E
4	Rational	6.395	1	25	9,592	------	------	------	<no description>
5	Combine	54.27	1	27	88,685	2, 3,	------	------	<no description>
6	Reservoir	23.17	1	43	88,639	5	365.49	54,345	Detention Pond
7	Combine	25.70	1	38	98,231	4, 6	------	------	Post-development Flow

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	31.99	1	38	72,927	------	------	------	Pre-development Flow
2	Rational	2.401	1	30	4,322	------	------	------	Development Generated Flow-D
3	Rational	56.25	1	27	91,125	------	------	------	Development Generated Flow-E
4	Rational	6.865	1	25	10,297	------	------	------	<no description>
5	Combine	58.41	1	27	95,446	2, 3,	------	------	<no description>
6	Reservoir	26.89	1	42	95,400	5	365.68	57,764	Detention Pond
7	Combine	29.32	1	40	105,697	4, 6	------	------	Post-development Flow