PROPOSED RESIDENTIAL DEVELOPMENT
BRYANT, AR

DRAINAGE REPORT

FOR
City of Bryant, Saline County, AR

September 2026

Owner & Developer: Heritage Homes LLC

By:

HOPE
CONSULTING
ENGINEERS • SURVEYORS

TABLE OF CONTENTS

ITEM DESCRIPTION

1. Narrative & Summary
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Narrative & Summary

PROJECT TITLE

Proposed Residential Site

PROJECT PROPERTY OWNER

Heritage Homes LLC

PROJECT LOCATION

Prickett Road, Bryant, AR

PROJECT DESCRIPTION

The proposed residential development is at Bryant, AR. Total development site area is 5.85 acres.

DRAINAGE ANALYSIS

On-Site Drainage: The rational method was used to determine the existing and proposed flows from the proposed site. There will be one detention pond to detain water from this development. Detailed drainage calculations considering the expected development have been conducted to determine the required detention pond and culvert dimensions. A summary of the calculations is below:

Detention Pond -

- Pond is situated on the northwest side of the property.
- Pre-development area 6.28 acres.
- Post-development area 5.97 acres.
- Pre-development runoff coefficient 0.49
- Post-development runoff coefficient 0.80
- Pond has a bottom elevation of 392.0
- One outlet control structure is proposed for outflow.

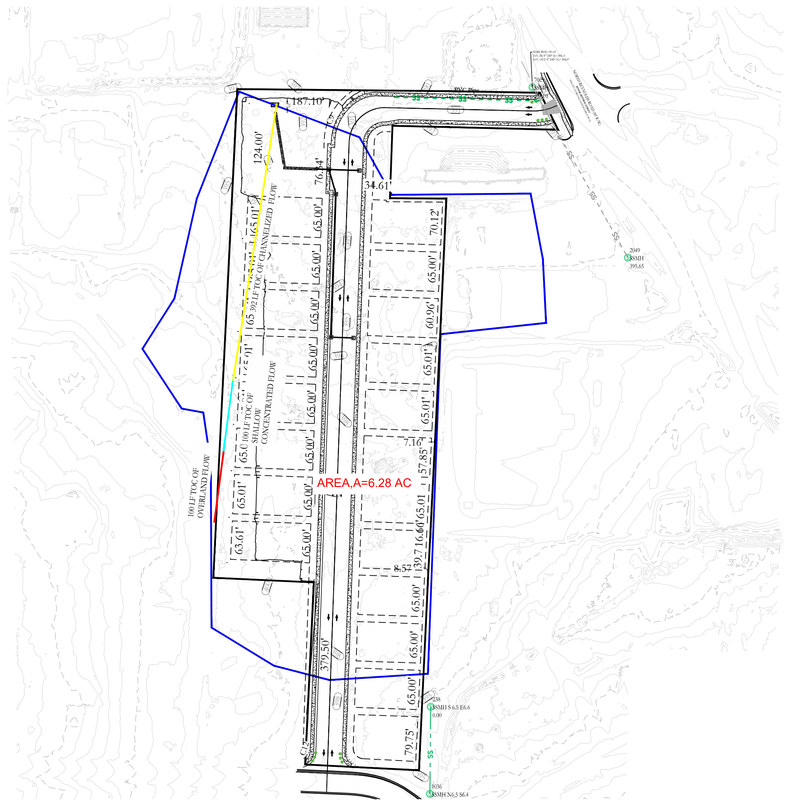
Peak flows for the pre-and post-development phase of the onsite area have been tabulated below-

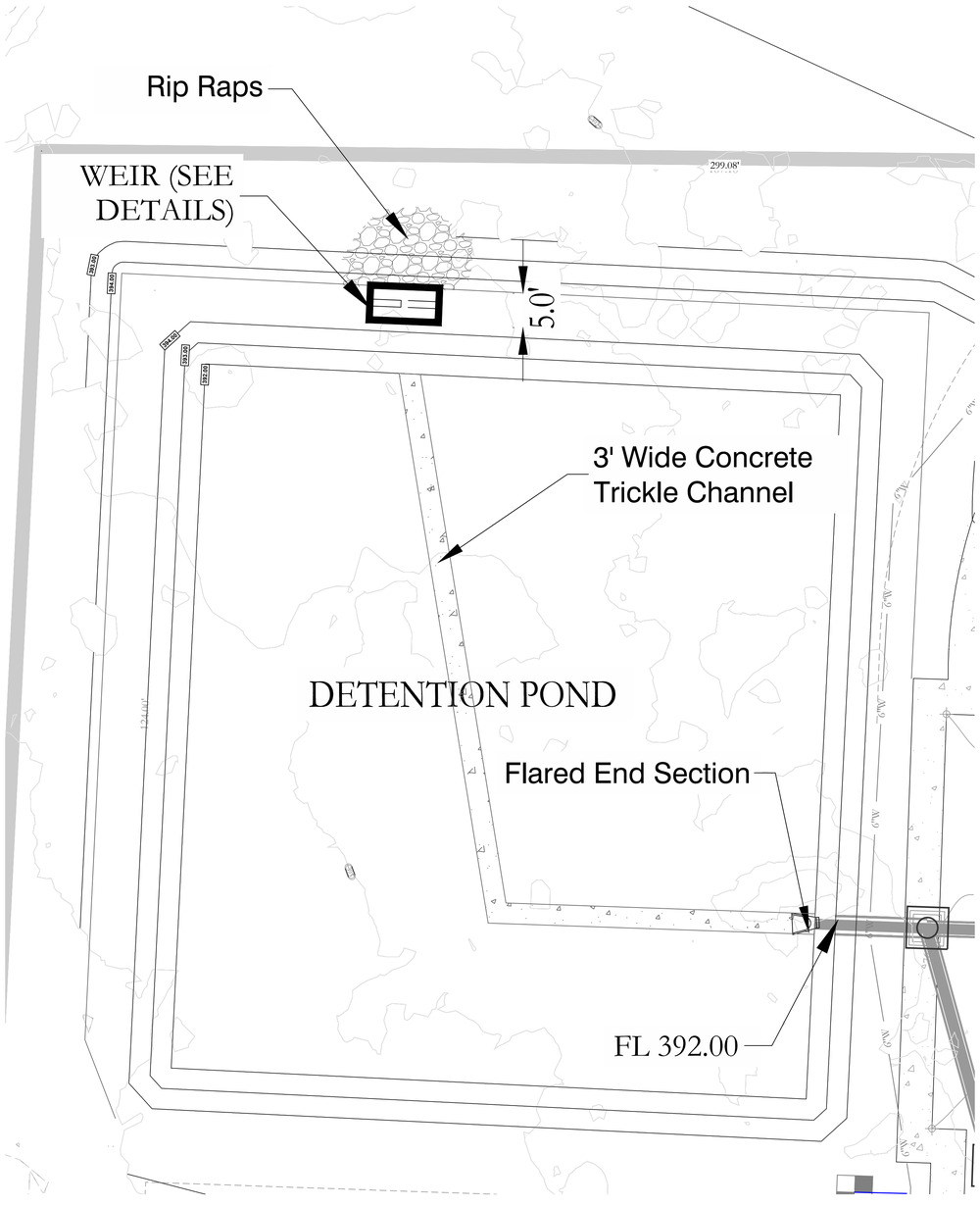
Time	Pre-development	Post-dev. With-out detention	Post-dev. With deten-tion (From Hydrograph)
	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)
2-Year	11.72	21.42	1.322
5-Year	13.96	25.41	1.697
10-Year	15.76	28.68	2.342
25-Year	18.07	32.90	3.378
50-Year	19.79	35.89	4.195
100-Year	21.44	38.99	5.174

CONCLUSION

The onsite drainage calculation shows that the proposed detention pond decreases the flow for all storm events.

Hydrograph Summary Report


1187.10'
124.00'
76.34'
34.61'
70.12'
65.00'
60.05'
65.01'
7.16'
157.85'
65.01'
16.60'
8.52'
379.50'
79.75'
392 LF TOC OF CHANNELIZED FLOW
100 LF TOC OF SHALLOW CONCENTRATED FLOW
100 LF TOC OF OVERLAND FLOW
AREA,A=6.28 AC
SS
RIM 1187.10
RIM 1186.50
RIM 1186.50
RIM 1186.50



DETENTION POND

DETENTION POND MAINTENANCE PLAN

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

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

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

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

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

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

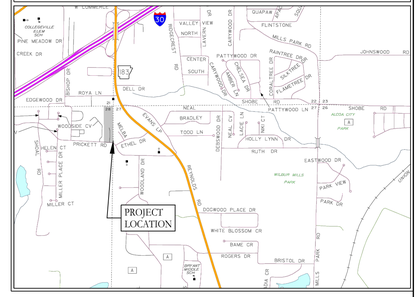
-Re-growth of trees on or around the pond bank. These should be cut and removed from the pond area.

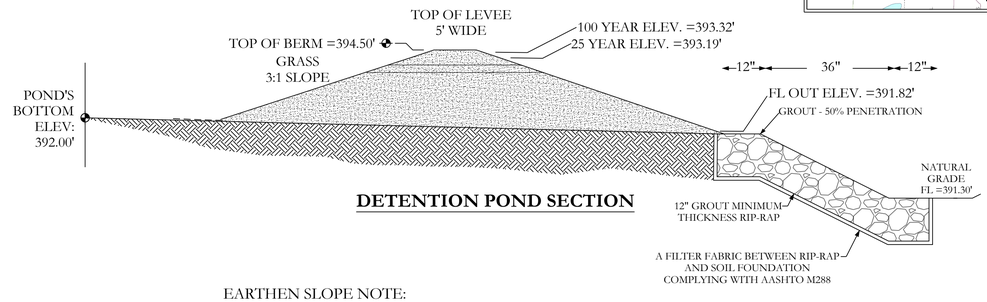
-Sediment from the site may accumulate in the pond bottom and reduce the pond to below design volume requirements. The pond should be excavated if the pond bottom elevation reached a level that allows excessive aquatic growth or reduces the pond efficiency such, that the sediments are passing the discharge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

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

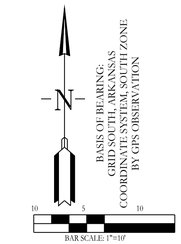
-Any other maintenance or repairs which would minimize other maintenance to the pond or outfall structures.

VICINITY MAP:





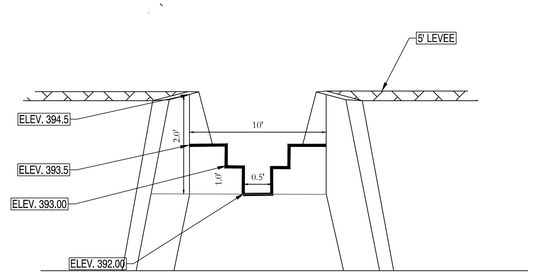
DETENTION POND SECTION



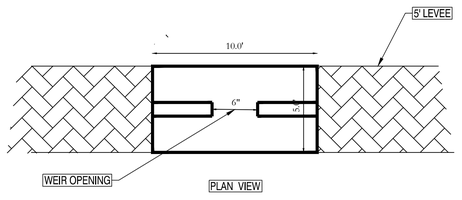
EARTHEN SLOPE NOTE:
EARTHEN DETENTION POND SLOPES ON BOTH THE INTERIOR AND EXTERIOR OF THE POND SHALL HAVE A MAXIMUM SLOPE OF 3:1.

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

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



FRONT VIEW



PLAN VIEW

POND WEIR

CERTIFICATE OF AUTHORIZATION
HOPE CONSULTING, INC.
No. 1931
ARKANSAS

HOPE CONSULTING
ENGINEERS - SURVEYORS
129N. Main Street,
Benton, Arkansas 72015
PH. (501)315-2626
FAX (501) 315-0024
www.hopeconsulting.com

FOR USE AND BENEFIT OF:
HERITAGE HOMES

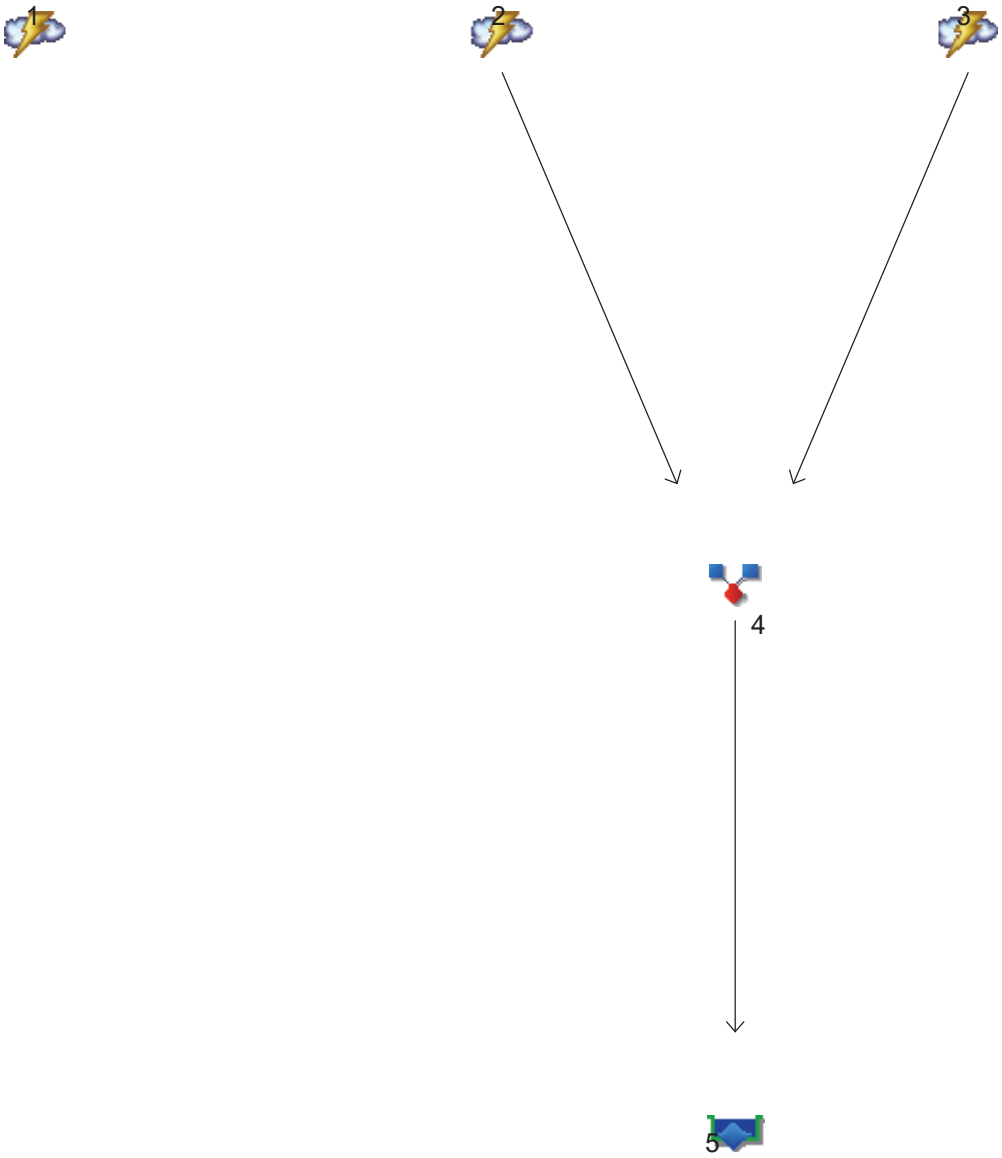
THE COTTAGES OF BRYANT
DETENTION POND
PRICKETT ROAD, BRYANT ,ARKANSAS

DATE:	9/23/2026	C.A.D. BY:	DRAWING NUMBER:
REVISED:		CHECKED BY:	26-0288
SHEET:	C-6.0	SCALE:	

500	01S	14W	0	28		62	1664

H:\SUBMITTED\HOPECONSULTING\LAND PROJECTS 2004\SUBDIVISIONS\2026\26-0288 HERITAGE HOMES - PRICKETT RD\26-0288 PUD PRICKETT ROAD DRAINAGE AND DETENTION (9-15-26).DWG

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Pre Dev. Flow
2	Rational	DEV GENERATED FLOW-(ONSITE)
3	Rational	DEV GENERATED FLOW(OFF SITE)
4	Combine	<no description>
5	Reservoir	POST DEVELOPMENT FLOW

Multi-Hydrograph Plot

Hyd. No. 1

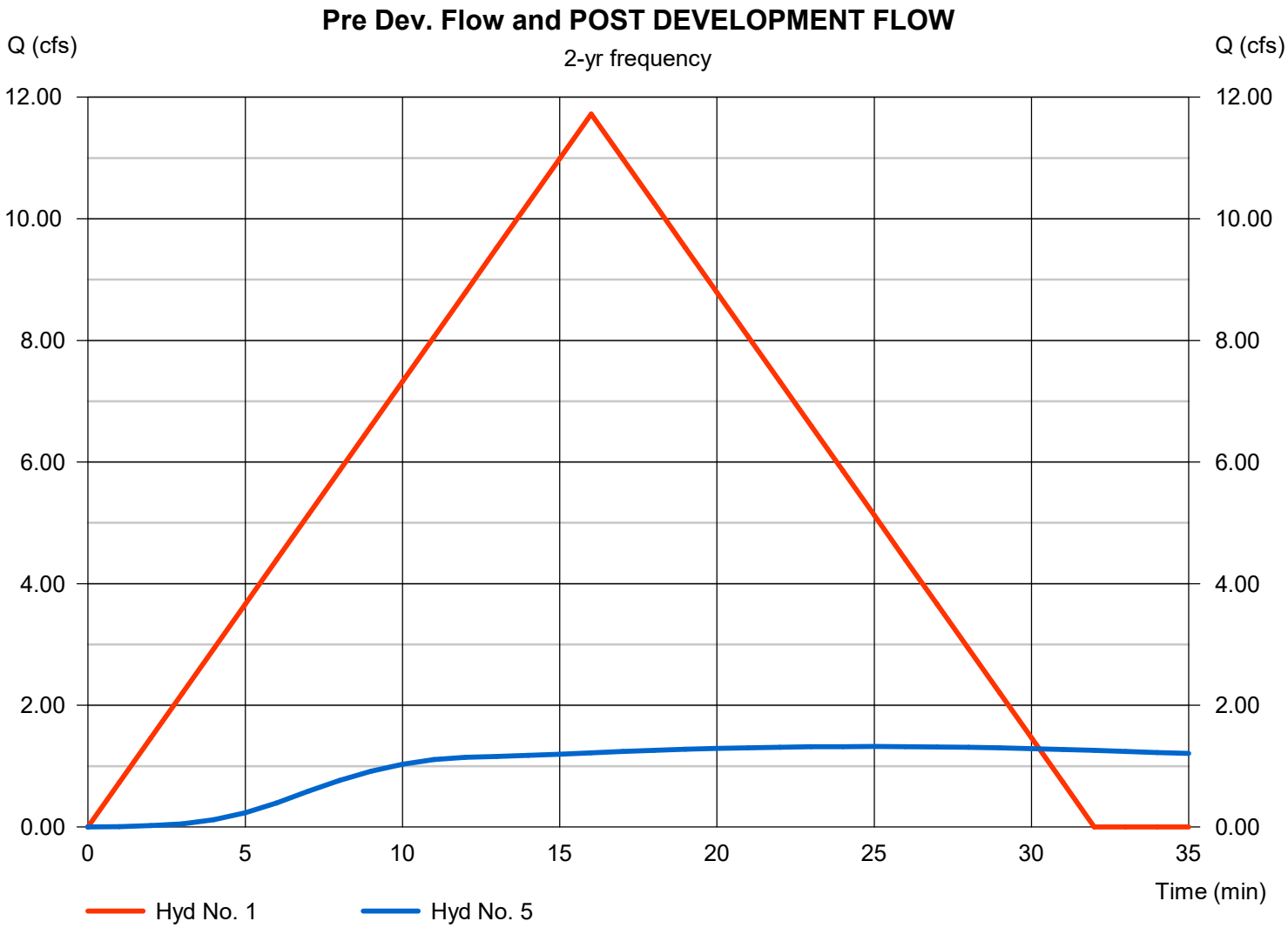
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	11.72 cfs
Time to peak	=	16 min
Hyd. Volume	=	11,251 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	1.32 cfs
Time to peak	=	25 min
Hyd. Volume	=	10,125 cuft



Multi-Hydrograph Plot

Hyd. No. 1

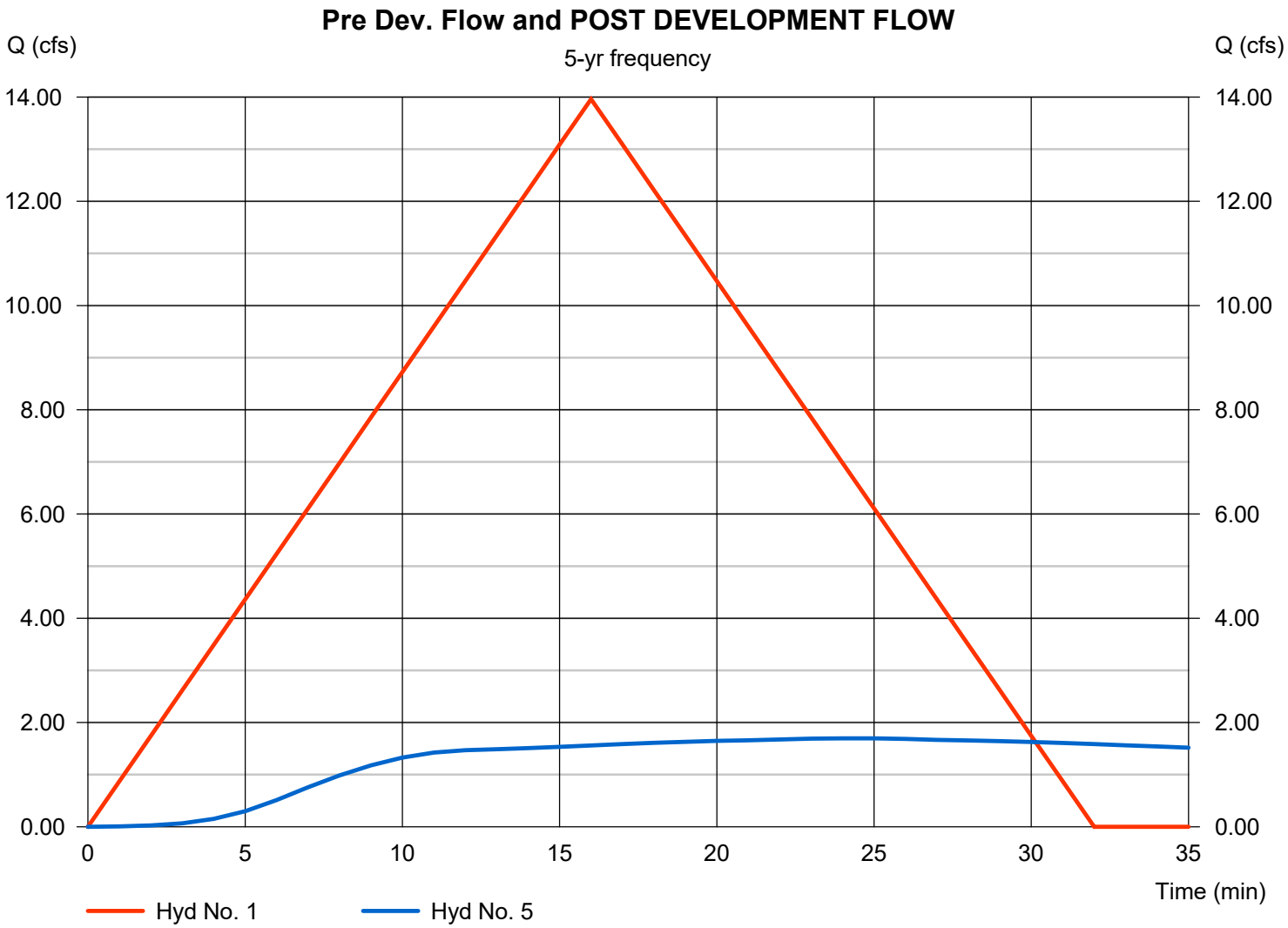
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	13.96 cfs
Time to peak	=	16 min
Hyd. Volume	=	13,401 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	1.70 cfs
Time to peak	=	24 min
Hyd. Volume	=	12,027 cuft



Multi-Hydrograph Plot

Hyd. No. 1

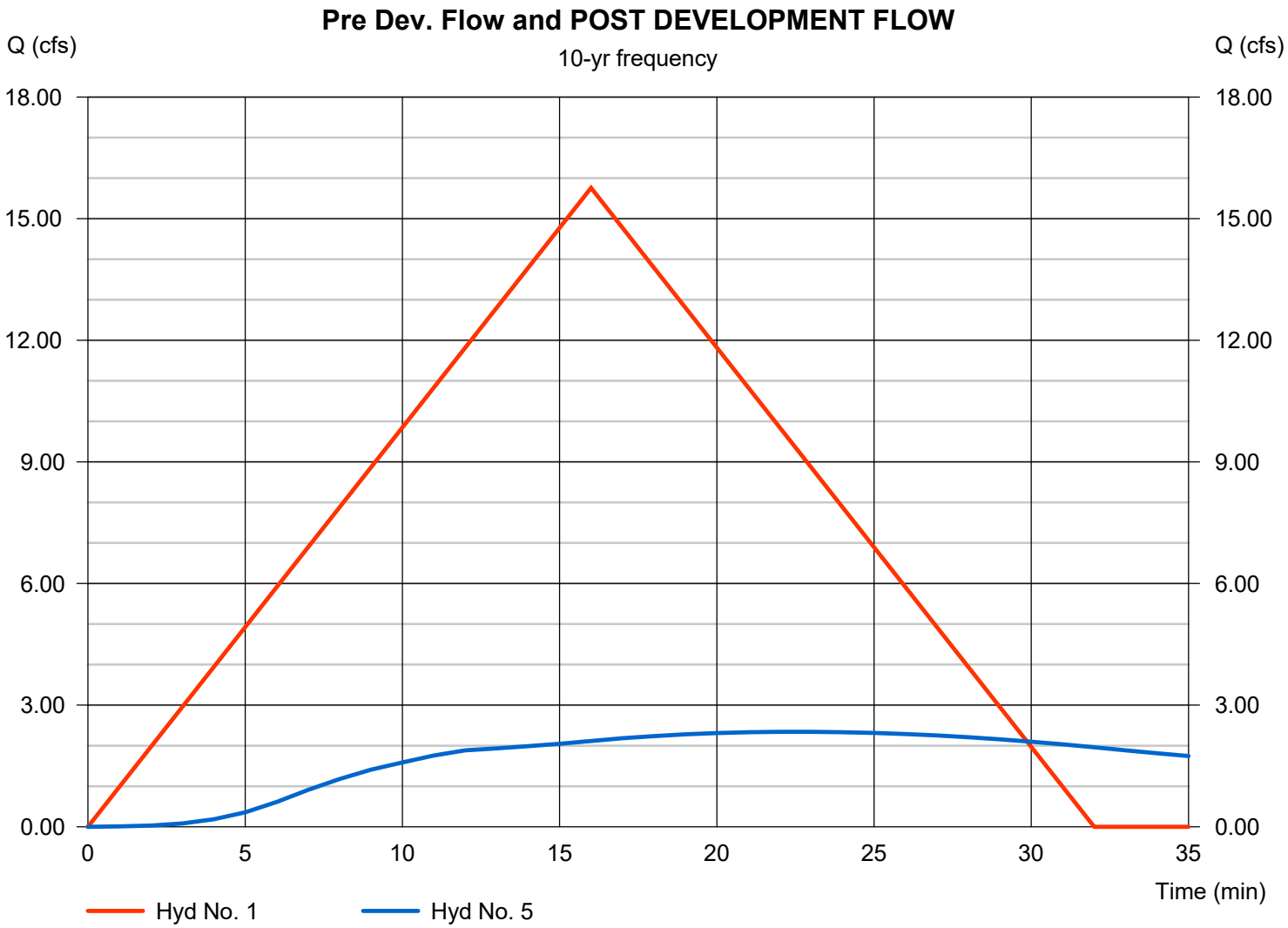
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	15.76 cfs
Time to peak	=	16 min
Hyd. Volume	=	15,128 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	2.34 cfs
Time to peak	=	23 min
Hyd. Volume	=	13,576 cuft



Multi-Hydrograph Plot

Hyd. No. 1

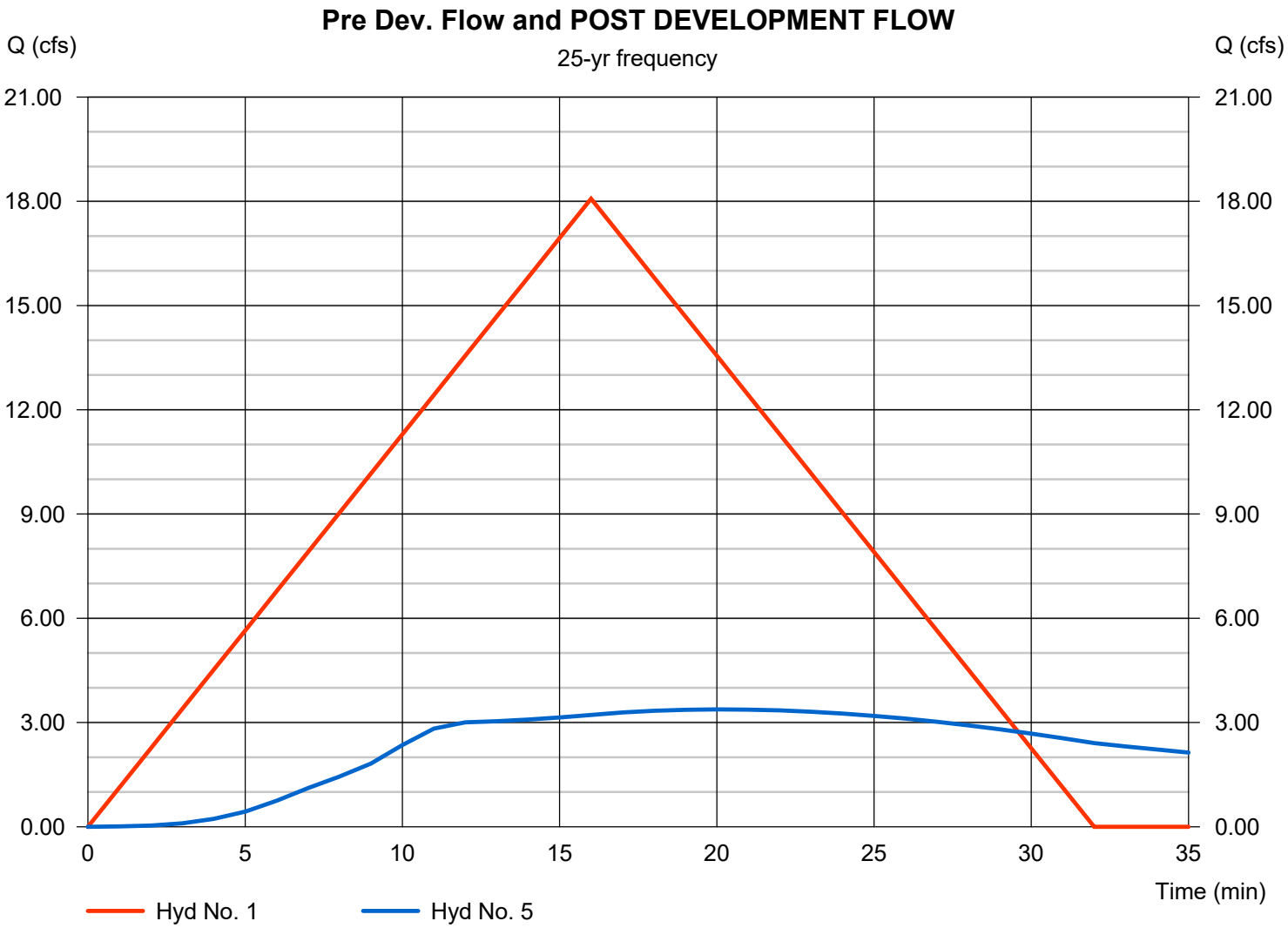
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	18.07 cfs
Time to peak	=	16 min
Hyd. Volume	=	17,350 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	3.38 cfs
Time to peak	=	20 min
Hyd. Volume	=	15,575 cuft



Multi-Hydrograph Plot

Hyd. No. 1

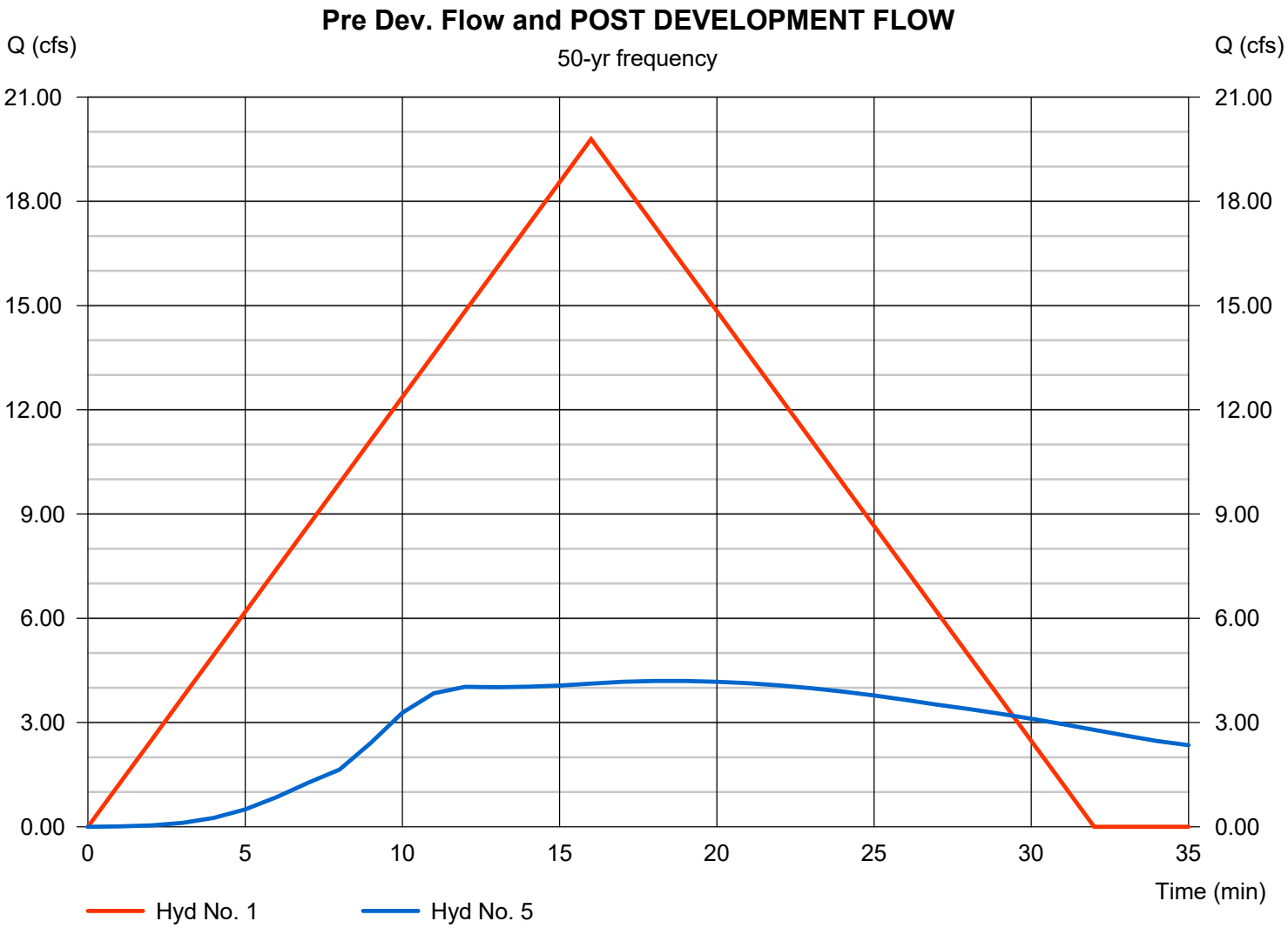
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	19.79 cfs
Time to peak	=	16 min
Hyd. Volume	=	18,995 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	4.20 cfs
Time to peak	=	19 min
Hyd. Volume	=	17,008 cuft



Multi-Hydrograph Plot

Hyd. No. 1

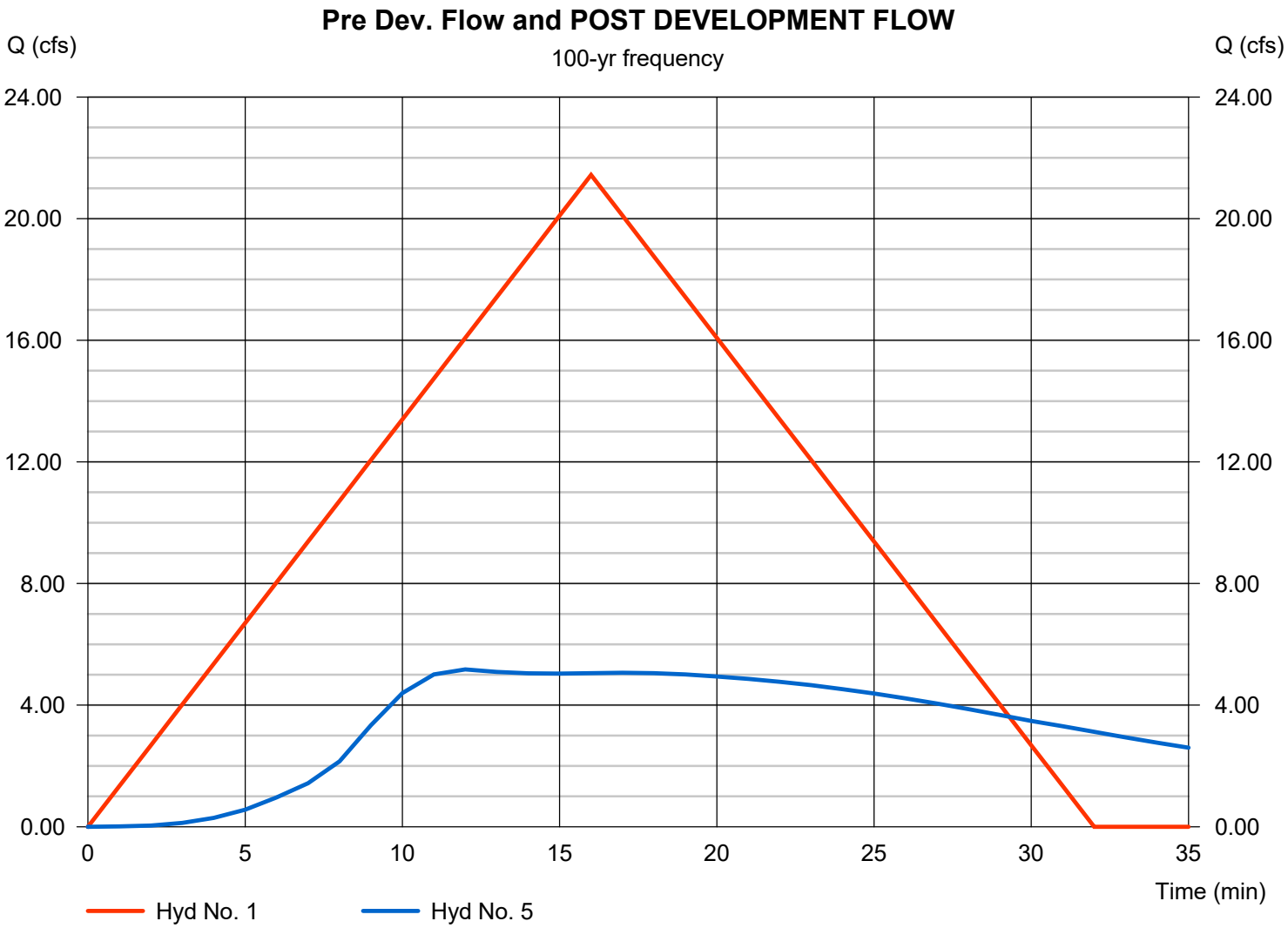
Pre Dev. Flow

Hydrograph type	=	Rational
Peak discharge	=	21.44 cfs
Time to peak	=	16 min
Hyd. Volume	=	20,582 cuft

Hyd. No. 5

POST DEVELOPMENT FLOW

Hydrograph type	=	Reservoir
Peak discharge	=	5.17 cfs
Time to peak	=	12 min
Hyd. Volume	=	18,467 cuft



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026 Tuesday, 09 / 22 / 2026

Pond No. 1 - Detention Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 392.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	392.00	9,384	0	0
1.00	393.00	10,584	9,977	9,977
2.00	394.00	11,856	11,213	21,190
2.50	394.50	12,519	6,092	27,282

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 392.00	0.00	0.00	0.00
Length (ft)	= 24.00	0.00	0.00	0.00
Slope (%)	= 1.45	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

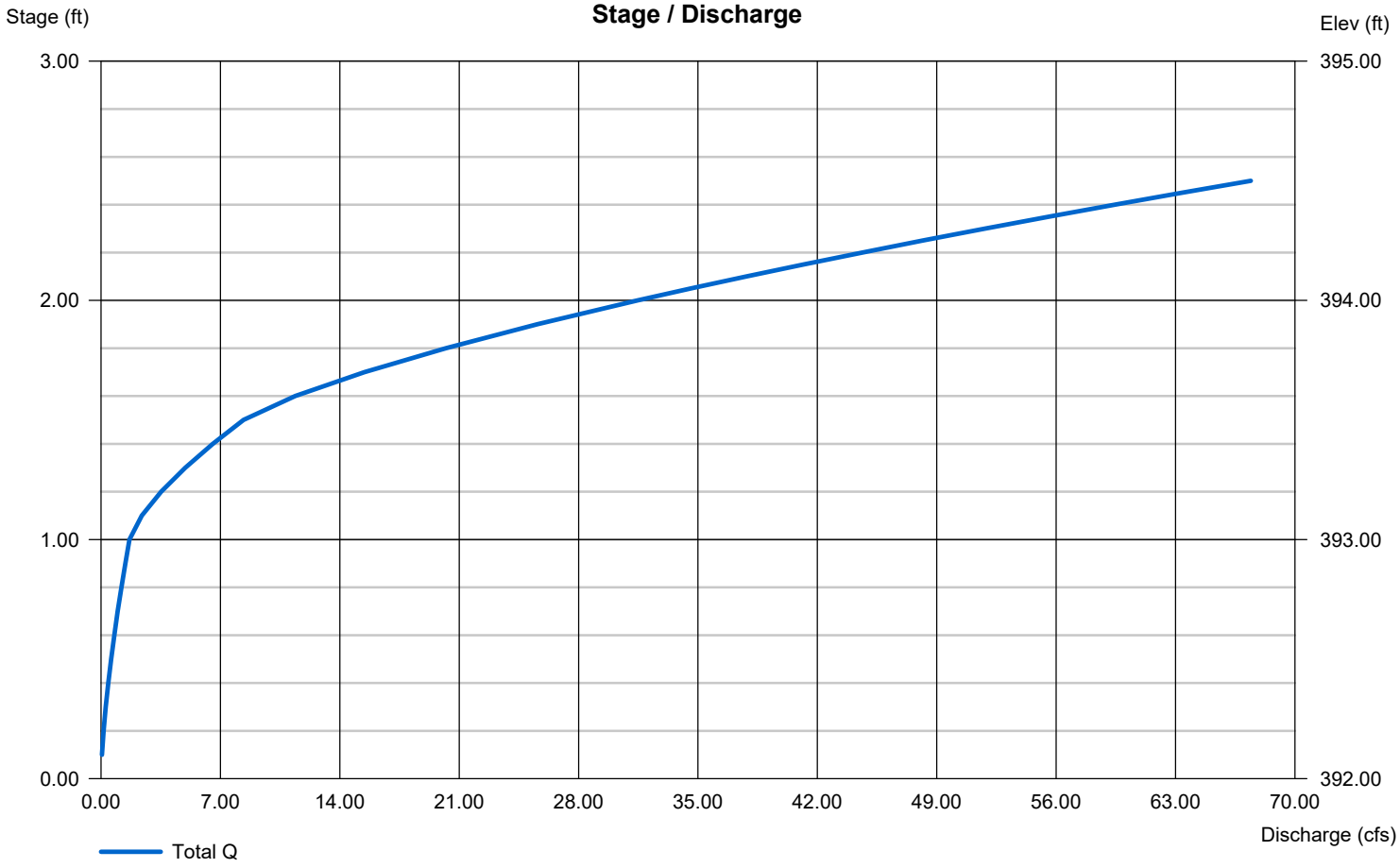
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.50	4.50	10.00	0.00
Crest El. (ft)	= 392.00	393.00	393.50	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Rect	Rect	---
Multi-Stage	= No	No	No	No

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

TW Elev. (ft) = 0.00

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



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	11.72	1	16	11,251	------	------	------	Pre Dev. Flow
2	Rational	20.31	1	6	7,313	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	2.949	1	16	2,831	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	21.42	1	6	10,144	2, 3	------	------	<no description>
5	Reservoir	1.322	1	25	10,125	4	392.86	8,547	POST DEVELOPMENT FLOW

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	13.96	1	16	13,401	------	------	------	Pre Dev. Flow
2	Rational	24.10	1	6	8,675	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	3.512	1	16	3,372	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	25.41	1	6	12,046	2, 3	------	------	<no description>
5	Reservoir	1.697	1	24	12,027	4	393.00	10,026	POST DEVELOPMENT FLOW

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	15.76	1	16	15,128	------	------	------	Pre Dev. Flow
2	Rational	27.19	1	6	9,789	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	3.965	1	16	3,806	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	28.68	1	6	13,595	2, 3	------	------	<no description>
5	Reservoir	2.342	1	23	13,576	4	393.09	11,017	POST DEVELOPMENT FLOW

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	18.07	1	16	17,350	------	------	------	Pre Dev. Flow
2	Rational	31.19	1	6	11,229	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	4.547	1	16	4,365	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	32.90	1	6	15,594	2, 3	------	------	<no description>
5	Reservoir	3.378	1	20	15,575	4	393.19	12,070	POST DEVELOPMENT FLOW

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

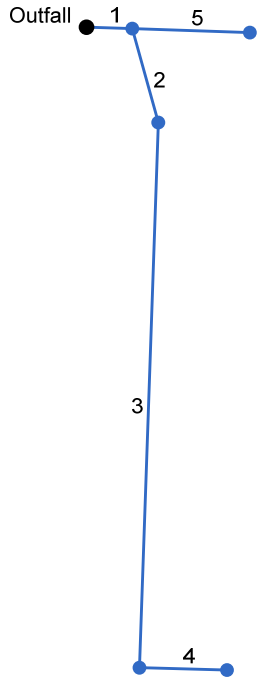
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	19.79	1	16	18,995	------	------	------	Pre Dev. Flow
2	Rational	34.02	1	6	12,247	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	4.978	1	16	4,779	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	35.89	1	6	17,026	2, 3	------	------	<no description>
5	Reservoir	4.195	1	19	17,008	4	393.25	12,753	POST DEVELOPMENT FLOW

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2026

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	21.44	1	16	20,582	------	------	------	Pre Dev. Flow
2	Rational	36.96	1	6	13,307	------	------	------	DEV GENERATED FLOW-(ONSITE)
3	Rational	5.394	1	16	5,178	------	------	------	DEV GENERATED FLOW(OFF SITE
4	Combine	38.99	1	6	18,486	2, 3	------	------	<no description>
5	Reservoir	5.174	1	12	18,467	4	393.32	13,509	POST DEVELOPMENT FLOW

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: storm analysis 9-21-2026.stm	Number of lines: 5	Date: 9/23/2026

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
5	1	43.000	0.072	Curb	0.00	0.21	0.80	6.0	392.07	0.49	392.28	14X22	Ell	0.012	1.00	394.75	Pipe - (18)
4	3	32.000	-90.463	Curb	0.00	0.26	0.80	6.0	393.70	0.66	393.91	14X22	Ell	0.012	1.00	397.80	Pipe - (13)
3	2	200.344	17.431	Curb	0.00	0.28	0.80	6.0	392.53	0.58	393.70	14X22	Ell	0.012	1.50	397.11	Pipe - (10)
2	1	35.743	72.743	Curb	0.00	0.16	0.80	6.0	392.07	0.50	392.25	14X22	Ell	0.012	0.52	394.59	Pipe - (8)
1	End	16.793	1.818	Curb	0.00	0.06	0.80	6.0	392.00	0.42	392.07	19X30	Ell	0.012	1.44	395.00	Pipe - (9)

Project File: storm analysis 9-21-2026.stm | Number of lines: 5 | Date: 9/23/2026

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
5	ST-05	Curb-	394.75	Cir	4.00	4.00	14x22	Ellip	392.28			
4	ST-4	Curb-	397.80	Cir	4.00	4.00	14x22	Ellip	393.91			
3	ST-3	Curb-	397.11	Cir	4.00	4.00	14x22	Ellip	393.70	14x22	Ellip	393.70
2	ST-2	Curb-	394.59	Cir	4.00	4.00	14x22	Ellip	392.25	14x22	Ellip	392.53
1	ST-1	Curb-	395.00	Cir	4.00	4.00	19x30	Ellip	392.07	14x22 14x22	Ellip Ellip	392.07 392.07

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
5	Pipe - (18)	1.63	14x22	Ell	43.000	392.07	392.28	0.488	393.21	392.79	0.08	392.79	1	Curb-
4	Pipe - (13)	2.01	14x22	Ell	32.000	393.70	393.91	0.656	394.66	394.47	n/a	394.47	3	Curb-
3	Pipe - (10)	4.15	14x22	Ell	200.344	392.53	393.70	0.584	393.35	394.49	0.25	394.49	2	Curb-
2	Pipe - (8)	5.14	14x22	Ell	35.743	392.07	392.25	0.504	393.21	393.14	n/a	393.14	1	Curb-
1	Pipe - (9)	7.07	19x30	Ell	16.793	392.00	392.07	0.417	392.92	393.02	0.28	393.02	End	Curb-

Project File: storm analysis 9-21-2026.stm

Number of lines: 5

Run Date: 9/23/2026

NOTES: Return period = 50 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
5	1	43.000	0.21	0.21	0.80	0.17	0.17	6.0	6.0	9.7	1.63	7.31	2.78	14 x 22 e	0.49	392.07	392.28	393.21	392.79	395.00	394.75	Pipe - (18)
4	3	32.000	0.26	0.26	0.80	0.21	0.21	6.0	6.0	9.7	2.01	8.47	3.25	14 x 22 e	0.66	393.70	393.91	394.66	394.47	397.11	397.80	Pipe - (13)
3	2	200.344	0.28	0.54	0.80	0.22	0.43	6.0	6.2	9.6	4.15	7.99	4.02	14 x 22 e	0.58	392.53	393.70	393.35	394.49	394.59	397.11	Pipe - (10)
2	1	35.743	0.16	0.70	0.80	0.13	0.56	6.0	7.0	9.2	5.14	7.42	4.20	14 x 22 e	0.50	392.07	392.25	393.21	393.14	395.00	394.59	Pipe - (8)
1	End	16.793	0.06	0.97	0.80	0.05	0.78	6.0	7.1	9.1	7.07	15.33	4.13	19 x 30 e	0.42	392.00	392.07	392.92	393.02	392.07	395.00	Pipe - (9)

Project File: storm analysis 9-21-2026.stm

Number of lines: 5

Run Date: 9/23/2026

NOTES:Intensity = 47.96 / (Inlet time + 5.50) ^ 0.65; Return period =Yrs. 50 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
5	ST-05	1.63	0.00	1.63	0.00	Curb	4.0	5.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.25	9.45	0.25	9.45	0.0	Off
4	ST-4	2.01	0.00	2.01	0.00	Curb	4.0	10.00	0.00	0.00	0.00	0.005	1.50	0.050	0.020	0.013	0.24	9.59	0.25	0.00	3.0	3
3	ST-3	2.17	0.00	1.99	0.18	Curb	4.0	8.00	0.00	0.00	0.00	0.005	1.50	0.050	0.020	0.013	0.24	9.88	0.28	3.26	2.0	2
2	ST-2	1.24	0.18	1.42	0.00	Curb	4.0	8.00	0.00	0.00	0.00	0.005	1.50	0.050	0.020	0.013	0.21	8.34	0.20	0.59	2.0	1
1	ST-1	0.46	0.00	0.47	0.00	Curb	4.0	5.00	0.00	0.00	0.00	Sag	1.50	0.050	0.020	0.013	0.13	4.44	0.13	4.44	0.0	Off

Project File: storm analysis 9-21-2026.stm

Number of lines: 5

Run Date: 9/23/2026

NOTES: Inlet N-Values = 0.016; Intensity = 47.96 / (Inlet time + 5.50) ^ 0.65; Return period = 50 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

FL-DOT Report

Line No	To Line	Type of struc	n - Value	Len	Drainage Area			Time of conc	Time of Flow in sect	Inten (I)	Total CA	Add Q	Inlet elev	Elev of HGL			Rise	HGL	ADD		Date: 9/23/2026
					C1 = 0.2 C2 = 0.5 C3 = 0.9							Total Flow		Elev of Crown			Span	Pipe	Full Flow		Frequency: 50 yrs
					Increment (ac)	Sub-Total (ac)	Sum CA					Q		Elev of Invert Up	Down	Fall	Size	Slope	Vel	Cap	Proj: storm analysis 9-21-2
				(ft)				(min)	(min)	(in/hr)		(cfs)	(ft)	(ft)	(ft)	(ft)	(in)	(%)	(ft/s)	(cfs)	Line description
5	1	Curb	0.012	43.000	0.00	0.00	0.00	6.00	0.26	9.69	0.17	0.00	394.75	392.79	393.21	-0.42	14	-0.98	2.78	1.63	Pipe - (18)
					0.00	0.00	0.00					1.63		393.45	393.24		22	0.49	4.35	7.31	
					0.00	0.00	0.00							392.28	392.07	0.21	Elip				
---	---																				
4	3	Curb	0.012	32.000	0.00	0.00	0.00	6.00	0.16	9.69	0.21	0.00	397.80	394.47	394.66	-0.19	14	-0.60	3.25	2.01	Pipe - (13)
					0.00	0.00	0.00					2.01		395.08	394.87		22	0.66	5.04	8.47	
					0.00	0.00	0.00							393.91	393.70	0.21	Elip				
3	2	Curb	0.012	200.344	0.00	0.00	0.00	6.16	0.83	9.60	0.43	0.00	397.11	394.49	393.35	1.15	14	0.57	4.02	4.15	Pipe - (10)
					0.00	0.00	0.00					4.15		394.87	393.70		22	0.58	4.76	7.99	
					0.00	0.00	0.00							393.70	392.53	1.17	Elip				
2	1	Curb	0.012	35.743	0.00	0.00	0.00	7.00	0.14	9.17	0.56	0.00	394.59	393.14	393.21	-0.08	14	-0.21	4.20	5.14	Pipe - (8)
					0.00	0.00	0.00					5.14		393.42	393.24		22	0.50	4.42	7.42	
					0.00	0.00	0.00							392.25	392.07	0.18	Elip				
1	End	Curb	0.012	16.793	0.00	0.00	0.00	7.14	0.07	9.11	0.78	0.00	395.00	393.02	392.92	0.10	19	0.60	4.13	7.07	Pipe - (9)
					0.00	0.00	0.00					7.07		393.65	393.58		30	0.42	4.93	15.33	
					0.00	0.00	0.00							392.07	392.00	0.07	Elip				

NOTES: Intensity = 47.96 / (Inlet time + 5.50) ^ 0.65 (in/hr)

Project File: storm analysis 9-21-2026.stm

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
5	14 22 e	1.63	392.07	393.21	1.14	0.50	3.23	0.08	393.30	0.000	43.000	392.28	392.79	0.51**	0.70	2.33	0.08	392.88	0.000	0.000	n/a	1.00	0.08
4	14 22 e	2.01	393.70	394.66	0.96	0.50	4.00	0.10	394.76	0.000	32.000	393.91	394.47	0.56**	0.81	2.50	0.10	394.57	0.000	0.000	n/a	1.00	n/a
3	14 22 e	4.15	392.53	393.35	0.82	0.87	4.75	0.17	393.51	0.000	200.344	393.70	394.49	0.79**	1.26	3.29	0.17	394.66	0.000	0.000	n/a	1.50	0.25
2	14 22 e	5.14	392.07	393.21	1.14	1.08	4.74	0.21	393.42	0.000	35.743	392.25	393.14	0.89**	1.40	3.66	0.21	393.35	0.000	0.000	n/a	0.52	n/a
1	19 30 e	7.07	392.00	392.92	0.92	1.49	4.74	0.19	393.11	0.000	16.793	392.07	393.02	0.95**	2.01	3.52	0.19	393.21	0.000	0.000	n/a	1.44	0.28

Project File: storm analysis 9-21-2026.stm

Number of lines: 5

Run Date: 9/23/2026

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

Supplemental Friction Slope Calculation (Manning's Equation)

Project file: storm analysis 9-21-2026.stm | Hydraflow run date: 9/23/2026 | Return period: 50 yr | Manning's n: 0.012 (RCP)

Purpose

Hydraflow Storm Sewers does not report friction slope (Sf) for lines whose upstream end is controlled by critical depth. All five lines in this run are critical at the upstream end (see HGL Computations, ** notation). This sheet computes Sf separately to document pipe friction for each line. It supplements, and does not replace, the Hydraflow output.

Method

$S_f = [\, Q\, n / (1.486\, A\, R^{2/3}) \,]^2$ where R = A / P (Q = flow, cfs; A = flow area, sq ft; P = wetted perimeter, ft; R = hydraulic radius, ft)

Flow rates (Q) and flow areas (A) at each end of each line are taken directly from the Hydraflow HGL Computations report. Wetted perimeter is computed from horizontal elliptical pipe geometry at the flow depth that produces the Hydraflow area. Average Sf = (Sf downstream + Sf upstream) / 2; friction loss h_f = Average Sf / 100 x Line length.

Line	Size (in, ellip)	Q (cfs)	DOWNSTREAM					UPSTREAM					Avg Sf (%)	Length (ft)	h_f (ft)
			A (sq ft)	P (ft)	R (ft)	V (ft/s)	Sf (%)	A (sq ft)	P (ft)	R (ft)	V (ft/s)	Sf (%)			
1	19 x 30	7.07	1.49	3.20	0.466	4.74	**0.406**	2.01	3.62	0.555	3.52	**0.177**	**0.292**	16.793	0.049
2	14 x 22	5.14	1.08	2.66	0.407	4.76	**0.490**	1.40	3.12	0.449	3.67	**0.256**	**0.373**	35.743	0.133
3	14 x 22	4.15	0.87	2.42	0.360	4.77	**0.580**	1.26	2.89	0.436	3.29	**0.214**	**0.397**	200.344	0.795
4	14 x 22	2.01	0.50	1.99	0.251	4.02	**0.665**	0.81	2.35	0.344	2.48	**0.166**	**0.416**	32.000	0.133
5	14 x 22	1.63	0.50	1.99	0.251	3.26	**0.437**	0.70	2.23	0.314	2.33	**0.166**	**0.302**	43.000	0.130

Notes

1. Hydraflow does not report friction slope for lines whose upstream end is controlled by critical depth. Friction slopes above were computed separately using Manning's equation and the flow areas reported by Hydraflow.
2. Lines 2, 4 and 5 contain supercritical flow with a hydraulic jump near the downstream end. Downstream flow areas are the supercritical (pre-jump) values reported by Hydraflow, so downstream Sf is conservative (high).
3. Energy loss (EGL upstream minus EGL downstream) is not reported for these reaches because friction alone does not balance the energy equation where critical depth and a hydraulic jump occur. The friction loss hf shown is pipe friction only.
4. HGL and EGL elevations are as computed by Hydraflow .