ARKANSAS STORAGE CENTER

BRYANT, AR

DRAINAGE REPORT

FOR
City of Bryant, Saline County, AR

January 2024

Owner & Developer: STUART FINLEY
Address: P.O Box 10, Bryant, AR. 72089

By:

HOPE
CONSULTING
ENGINEERS • SURVEYORS

PROJECT TITLE

ARKANSAS STORAGE CENTER

PROJECT PROPERTY OWNER

STUART FINLEY

PROJECT LOCATION

25300 I-30 North, Bryant, AR

PROJECT DESCRIPTION

The proposed self-storage facility development is located on High-way I-30 in the city of Bryant, Arkansas. The total development area is 24.31 acres.

DRAINAGE ANALYSIS

On Site Drainage- Rational method was used to determine the existing and proposed flows from proposed site. Detailed drainage calculations considering the future expected development have been conducted. Summary of the calculations are below:

Drainage Calculations for 100 yrs Return Period

- Pre-development total area: 26.06 acres.
    - Impervious area (gravel) = 4.65 ac
    - Landscape area (forest/woodland) = 21.4 ac
- Post-development area: 28.53 acres.
    - Impervious area (gravel) = 4.65 ac
    - Landscape area (forest/woodland) = 23.88 ac
- Pre-development composite runoff coefficient: 0.50
- Post-development composite runoff coefficient: 0.88
- Time of Concentration for Pre-development Area: 22 min
- Time of Concentration for Post-development Area: 8.6 min
- 5 ft wide rectangular weir
- Spillway elev. 255.30
- Pond top elev. 356.30
- 10 ft wide top of the levee
- One 18'' RCP with 0.5% slope is proposed for outflow culvert with an elevation of 353.5'

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

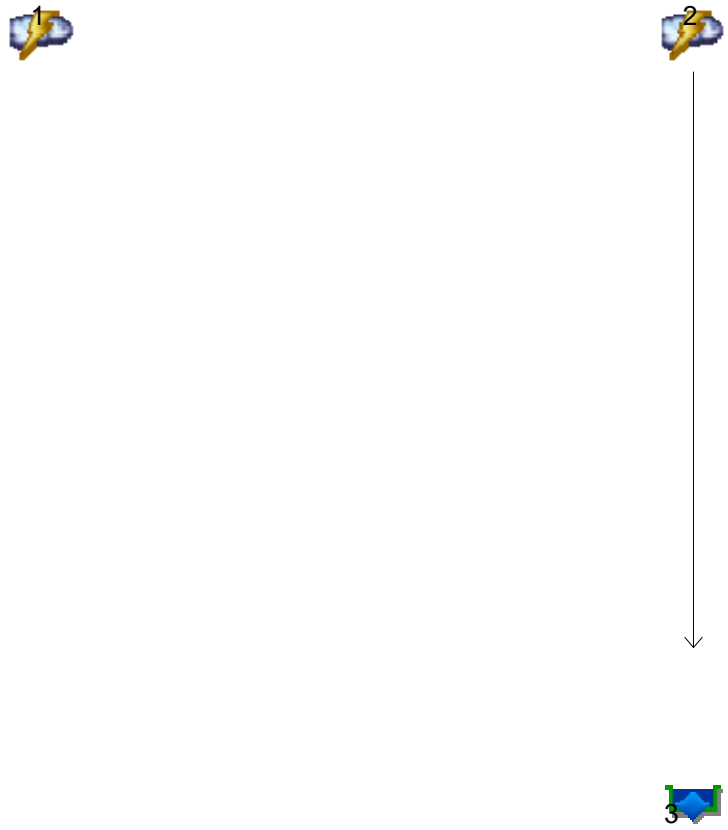
100- Years Storm Calculations

	Pre-Development	Post-Development without Retention	Post-Development with Retention
	Peak Flow (cfs)	Peak Flow (cfs)	Peak Flow (cfs)
2-Year	36.44	120.57	2.976
5-Year	40.19	134.40	3.359
10-Year	48.37	154.40	3.830
25-Year	55.73	176.35	4.413
50-Year	63.54	200.38	5.378
100-Year	67.97	212.42	6.129
TOC	**22 min**	**8.6 min**	

CONCLUSION

The onsite drainage calculation for pre and post condition has been provided.

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Pre-development
2	Rational	Post-Dev-No-Retention Pond
3	Reservoir	Post-Dev-RetentionPond

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	36.44	1	22	48,099	------	------	------	Pre-development
2	Rational	120.57	1	11	79,576	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	2.976	1	22	73,450	2	354.50	77,825	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	36.44 cfs
Storm frequency	=	2 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	48,099 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	3.330 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

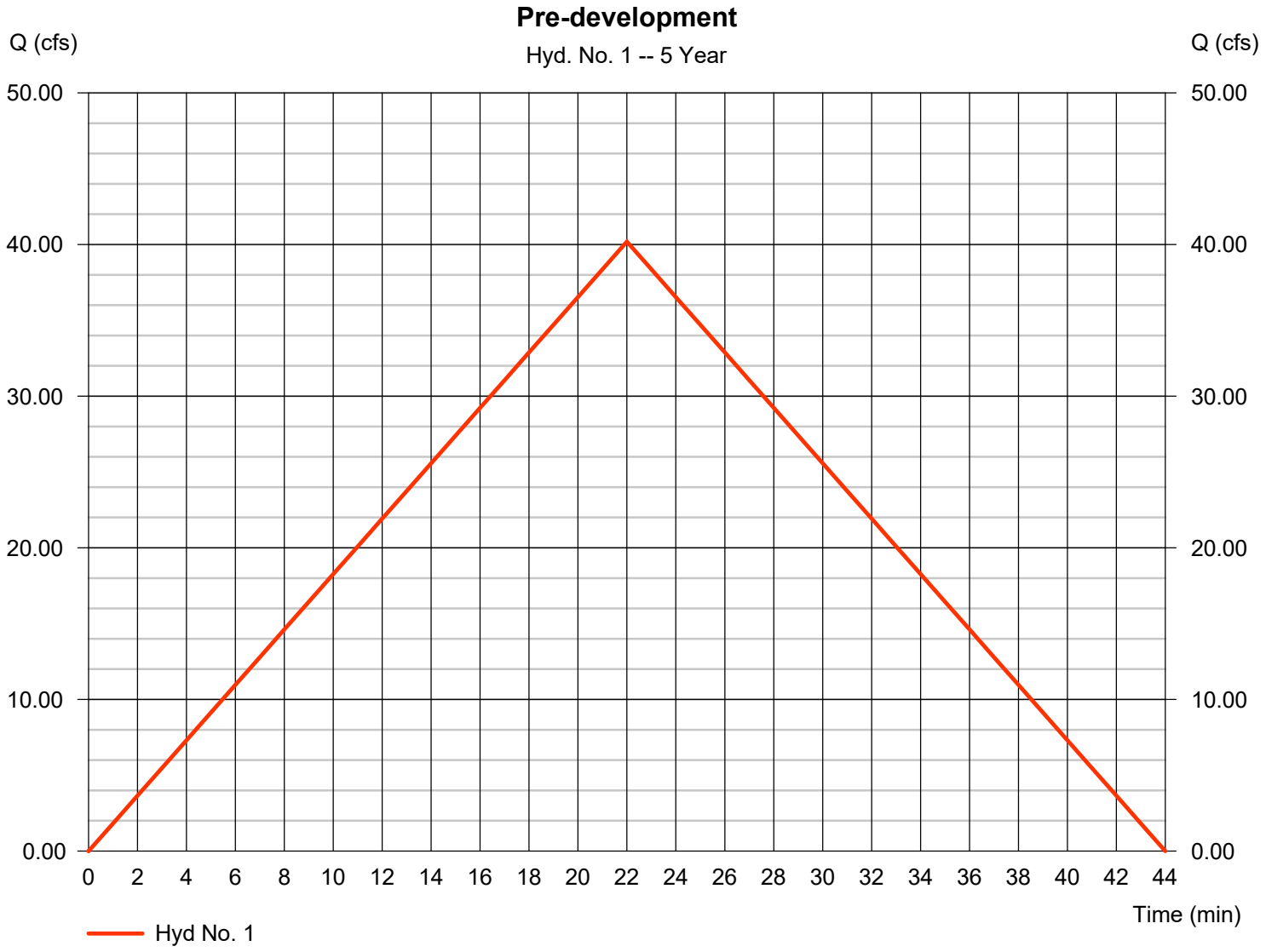
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	40.19	1	22	53,050	------	------	------	Pre-development
2	Rational	134.40	1	11	88,705	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	3.359	1	22	82,478	2	354.61	86,693	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	40.19 cfs
Storm frequency	=	5 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	53,050 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	3.673 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

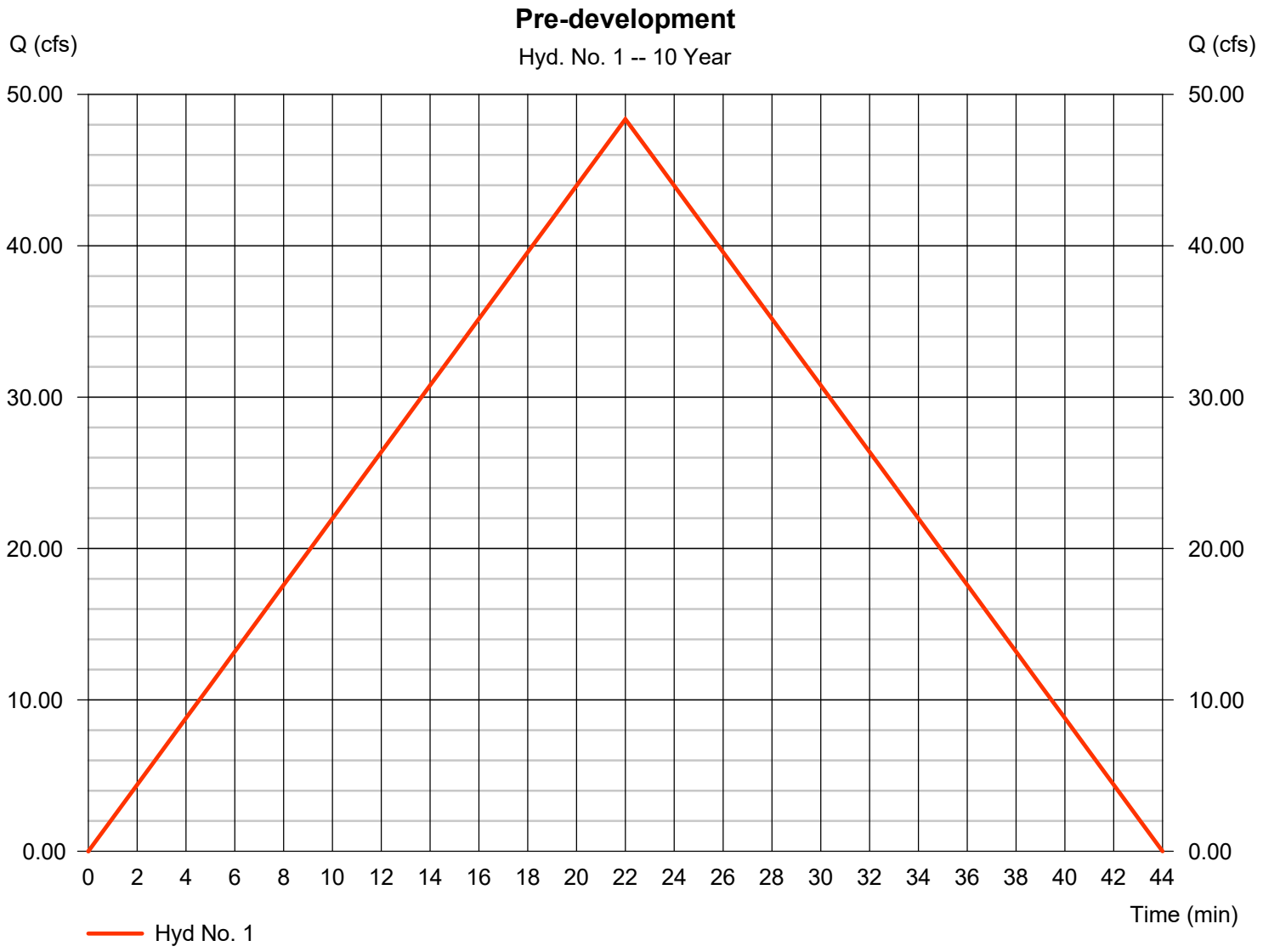
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	48.37	1	22	63,846	------	------	------	Pre-development
2	Rational	154.40	1	11	101,902	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	3.830	1	22	95,542	2	354.77	99,536	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	48.37 cfs
Storm frequency	=	10 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	63,846 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	4.421 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

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	55.73	1	22	73,563	------	------	------	Pre-development
2	Rational	176.35	1	11	116,393	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	4.143	1	22	109,897	2	354.94	113,699	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	55.73 cfs
Storm frequency	=	25 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	73,563 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	5.094 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

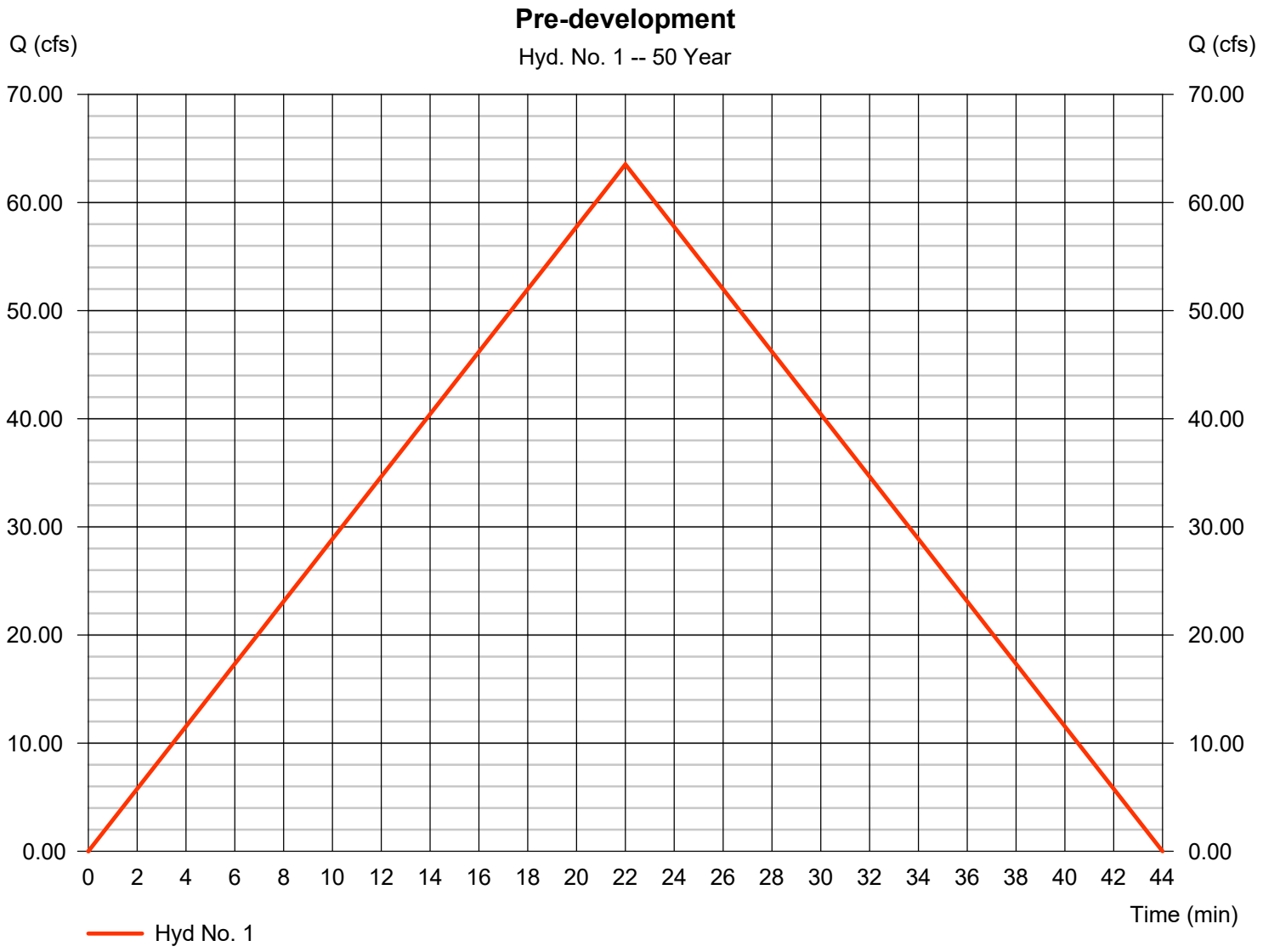
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	63.54	1	22	83,868	------	------	------	Pre-development
2	Rational	200.38	1	11	132,253	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	5.378	1	22	125,621	2	355.13	129,086	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	63.54 cfs
Storm frequency	=	50 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	83,868 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	5.807 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

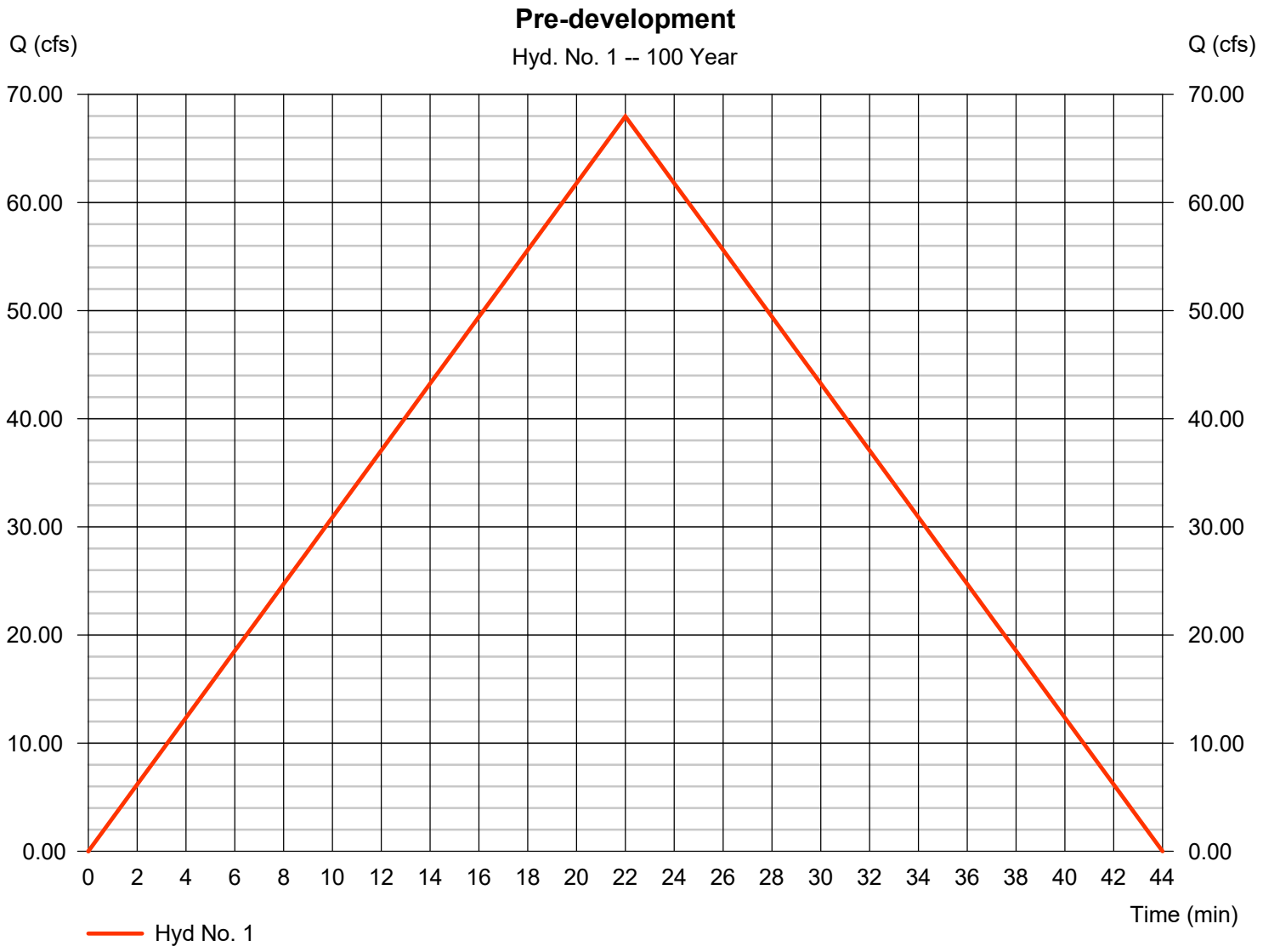
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	67.97	1	22	89,717	------	------	------	Pre-development
2	Rational	212.42	1	11	140,200	------	------	------	Post-Dev-No-Retention Pond
3	Reservoir	6.129	1	22	133,512	2	355.22	136,691	Post-Dev-RetentionPond

Hydrograph Report

Hyd. No. 1

Pre-development

Hydrograph type	=	Rational	Peak discharge	=	67.97 cfs
Storm frequency	=	100 yrs	Time to peak	=	22 min
Time interval	=	1 min	Hyd. volume	=	89,717 cuft
Drainage area	=	26.050 ac	Runoff coeff.	=	0.42
Intensity	=	6.212 in/hr	Tc by User	=	22.00 min
IDF Curve	=	Bryant 50.IDF	Asc/Rec limb fact	=	1/1



Multi-Hydrograph Plot

Hyd. No. 1

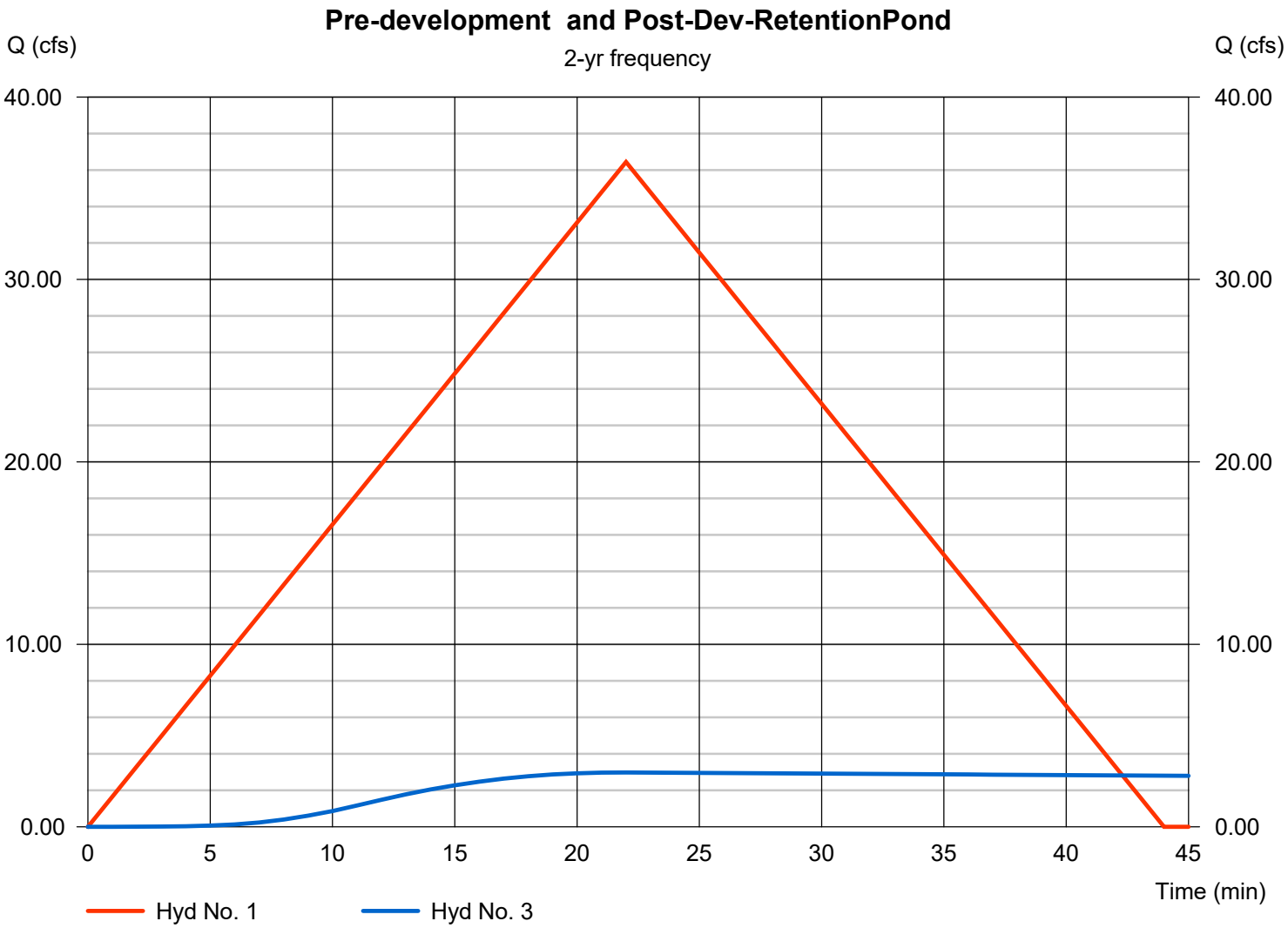
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	36.44 cfs
Time to peak	=	22 min
Hyd. Volume	=	48,099 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	2.98 cfs
Time to peak	=	22 min
Hyd. Volume	=	73,450 cuft



Multi-Hydrograph Plot

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 1

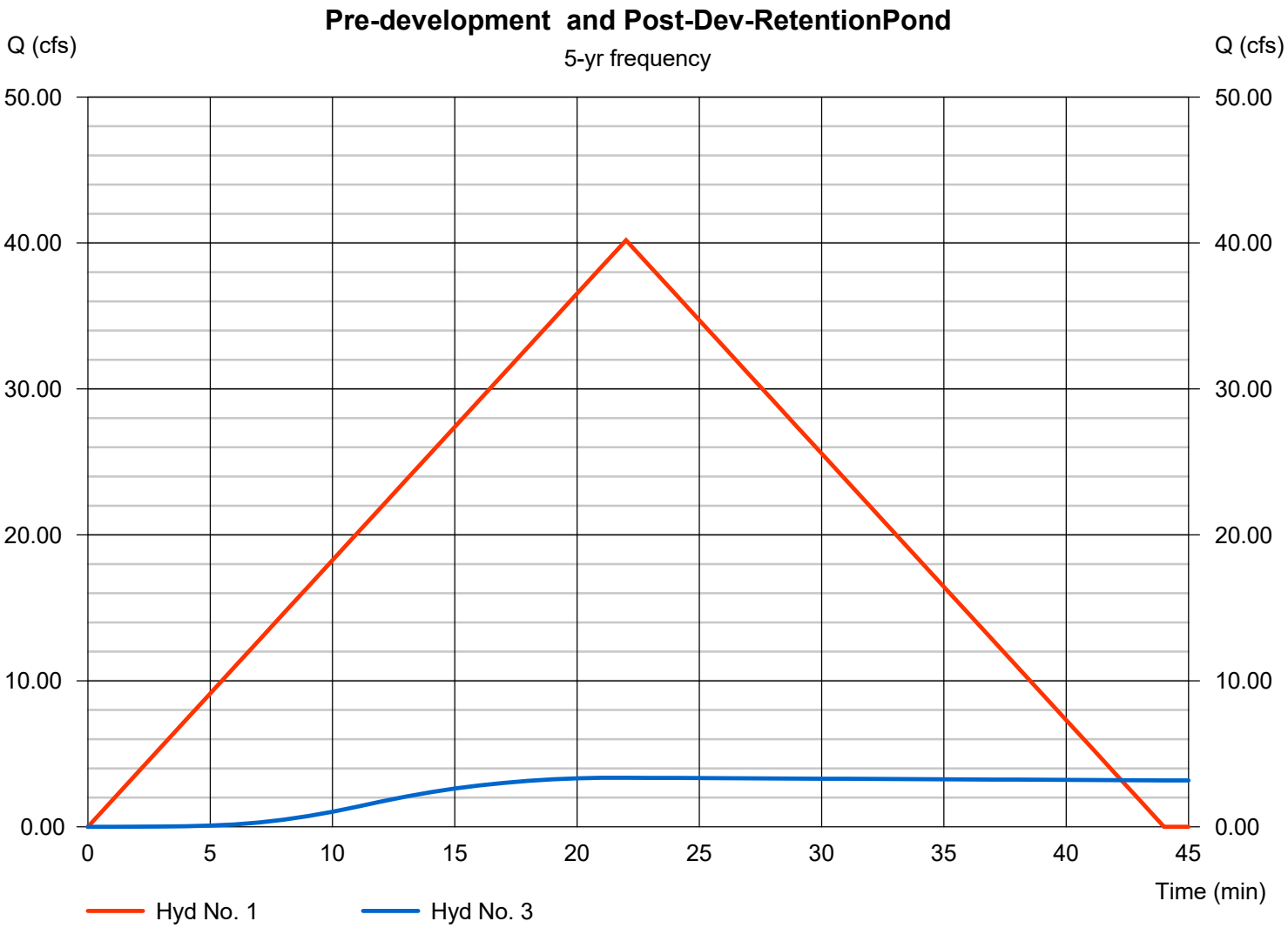
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	40.19 cfs
Time to peak	=	22 min
Hyd. Volume	=	53,050 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	3.36 cfs
Time to peak	=	22 min
Hyd. Volume	=	82,478 cuft



Multi-Hydrograph Plot

Hyd. No. 1

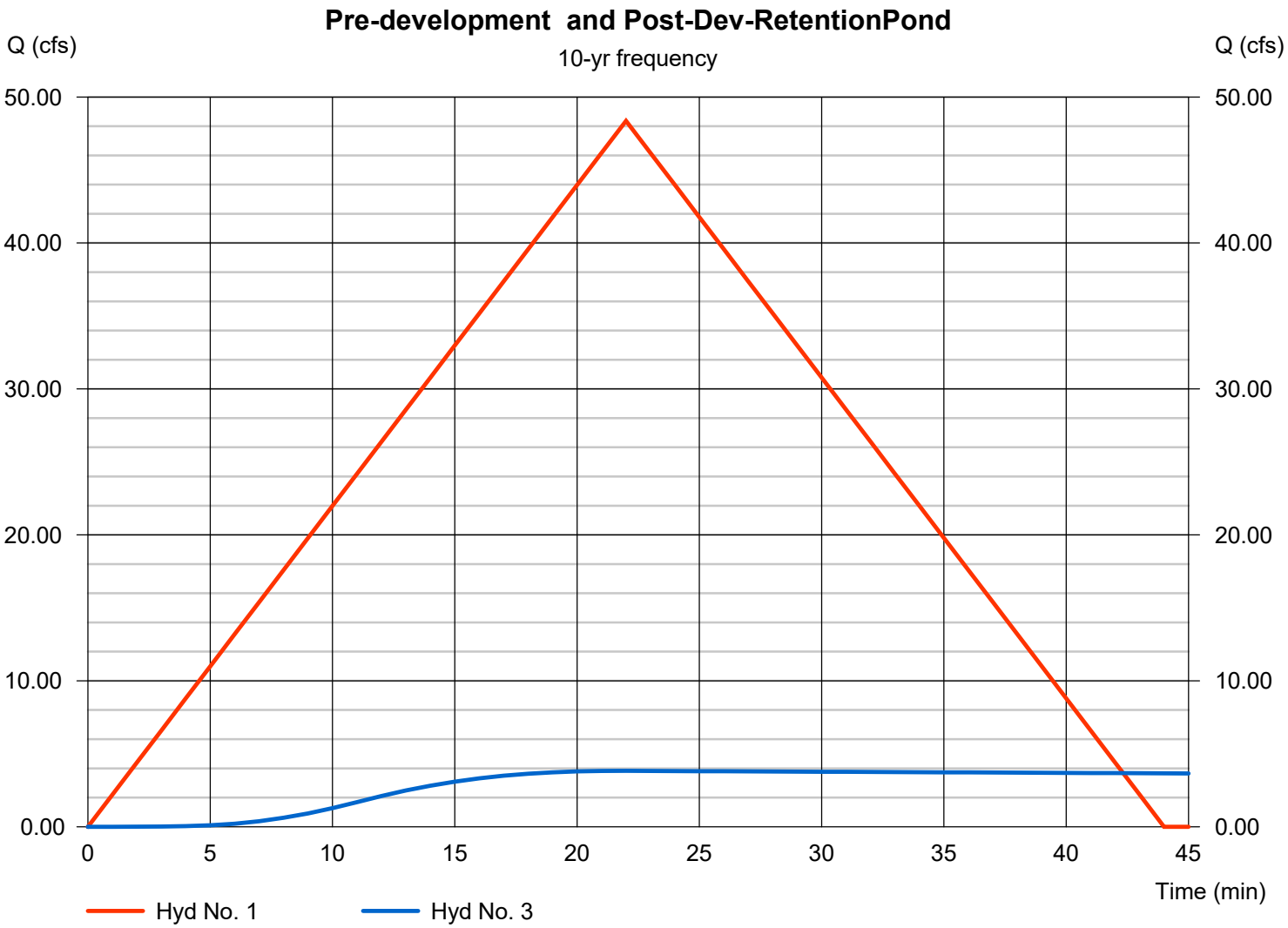
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	48.37 cfs
Time to peak	=	22 min
Hyd. Volume	=	63,846 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	3.83 cfs
Time to peak	=	22 min
Hyd. Volume	=	95,542 cuft



Multi-Hydrograph Plot

Hyd. No. 1

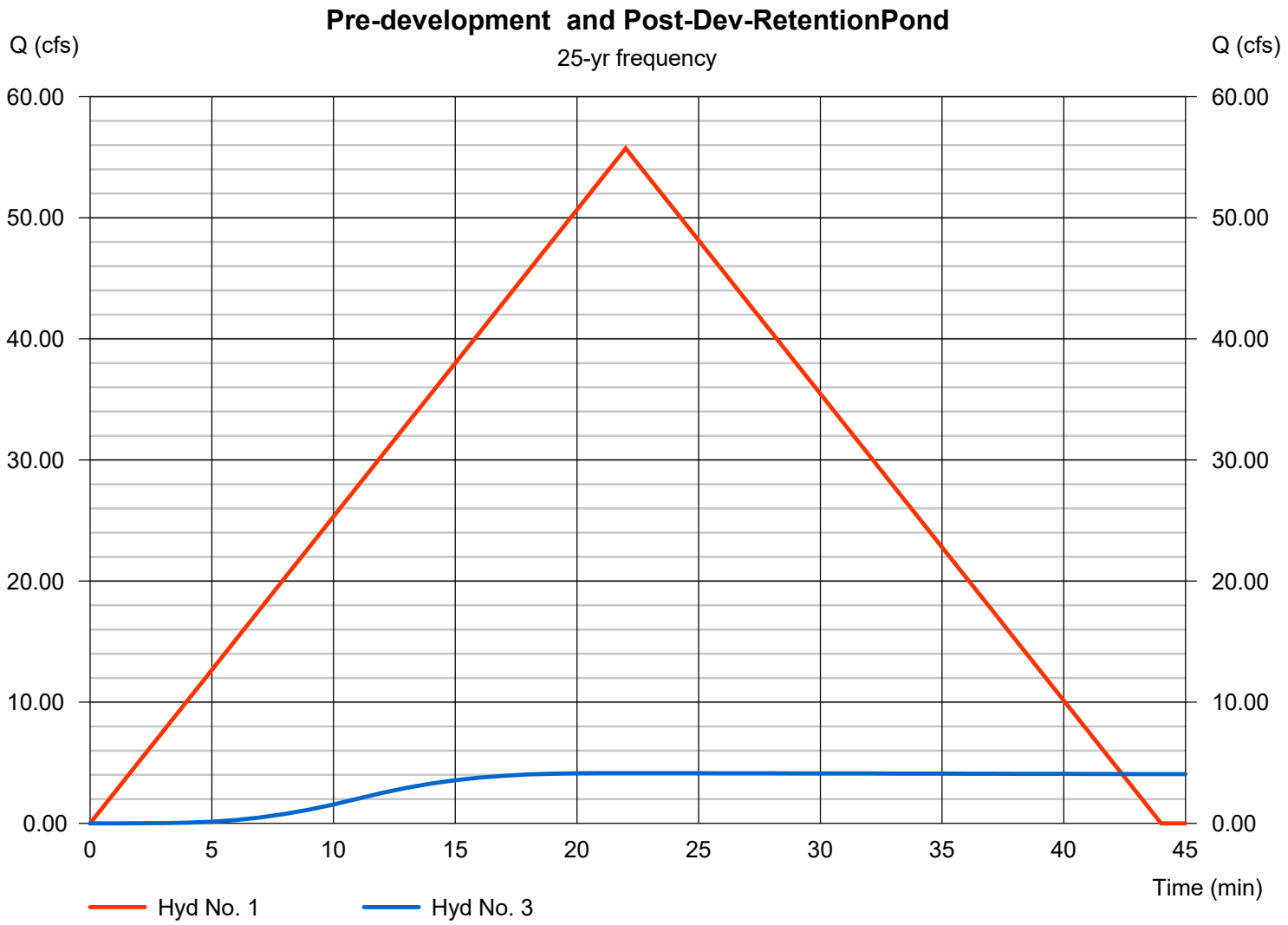
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	55.73 cfs
Time to peak	=	22 min
Hyd. Volume	=	73,563 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	4.14 cfs
Time to peak	=	22 min
Hyd. Volume	=	109,897 cuft



Multi-Hydrograph Plot

Hyd. No. 1

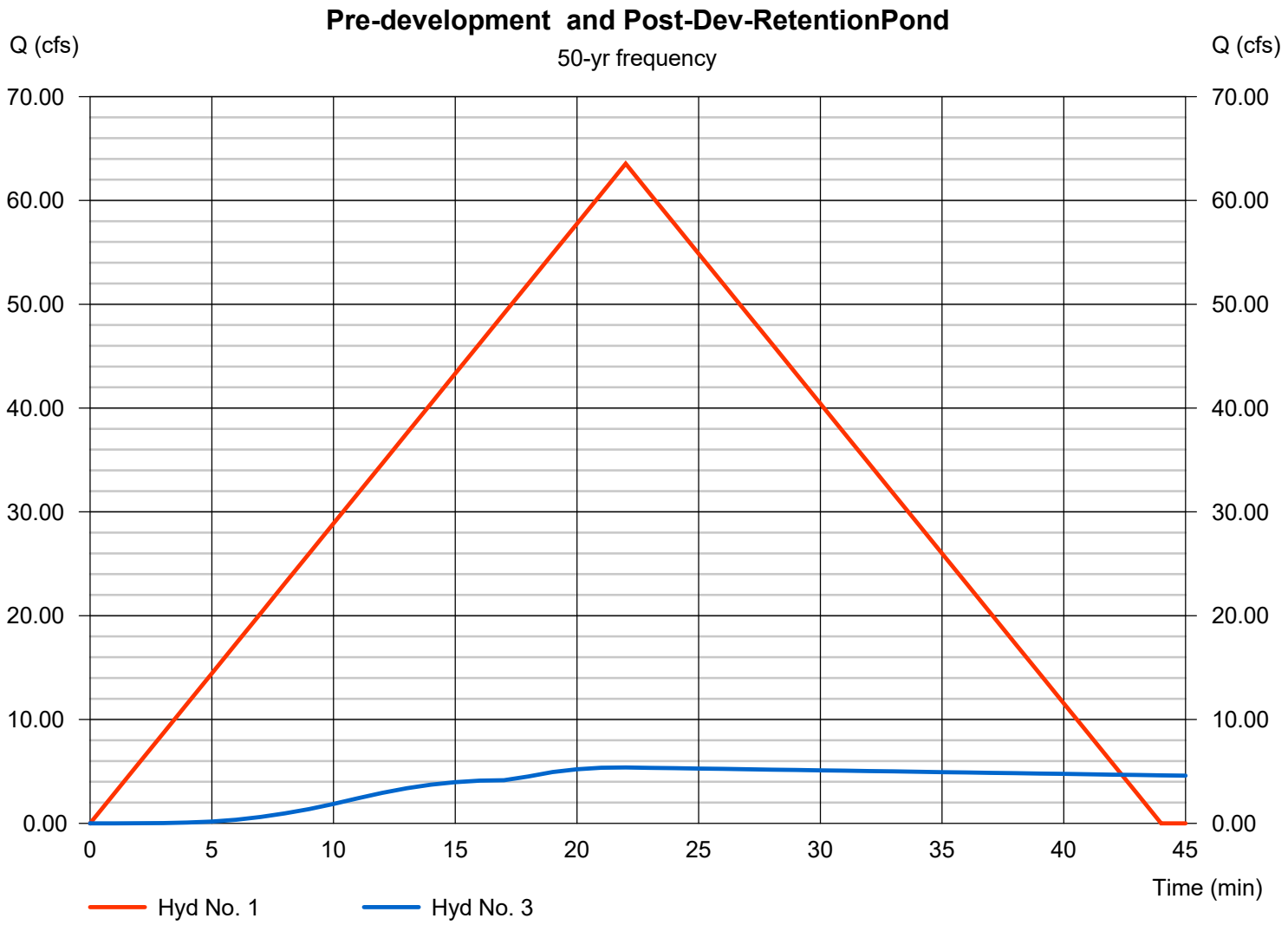
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	63.54 cfs
Time to peak	=	22 min
Hyd. Volume	=	83,868 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	5.38 cfs
Time to peak	=	22 min
Hyd. Volume	=	125,621 cuft



Multi-Hydrograph Plot

Hyd. No. 1

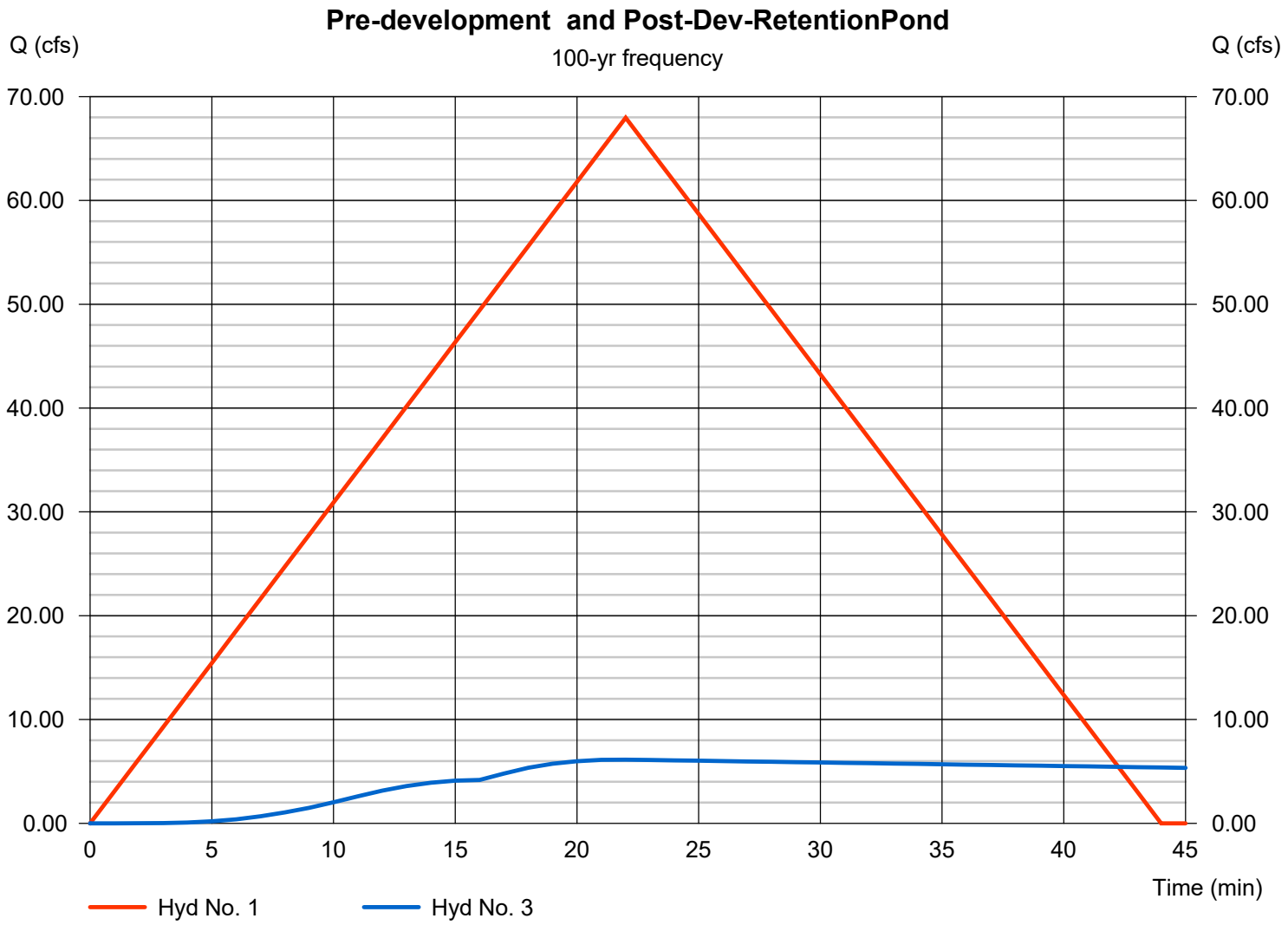
Pre-development

Hydrograph type	=	Rational
Peak discharge	=	67.97 cfs
Time to peak	=	22 min
Hyd. Volume	=	89,717 cuft

Hyd. No. 3

Post-Dev-RetentionPond

Hydrograph type	=	Reservoir
Peak discharge	=	6.13 cfs
Time to peak	=	22 min
Hyd. Volume	=	133,512 cuft



Pond Report

Pond No. 1 - <New Pond>

Pond Data

Trapezoid -Bottom L x W = 254.9 x 300.0 ft, Side slope = 3.00:1, Bottom elev. = 353.50 ft, Depth = 2.80 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	353.50	76,470	0	0
0.28	353.78	77,405	21,542	21,542
0.56	354.06	78,346	21,805	43,347
0.84	354.34	79,292	22,069	65,417
1.12	354.62	80,244	22,335	87,751
1.40	354.90	81,202	22,602	110,354
1.68	355.18	82,165	22,871	133,225
1.96	355.46	83,134	23,142	156,367
2.24	355.74	84,108	23,414	179,781
2.52	356.02	85,089	23,688	203,468
2.80	356.30	86,075	23,963	227,431

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	Inactive	Inactive	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 353.50	0.00	0.00	0.00
Length (ft)	= 26.00	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

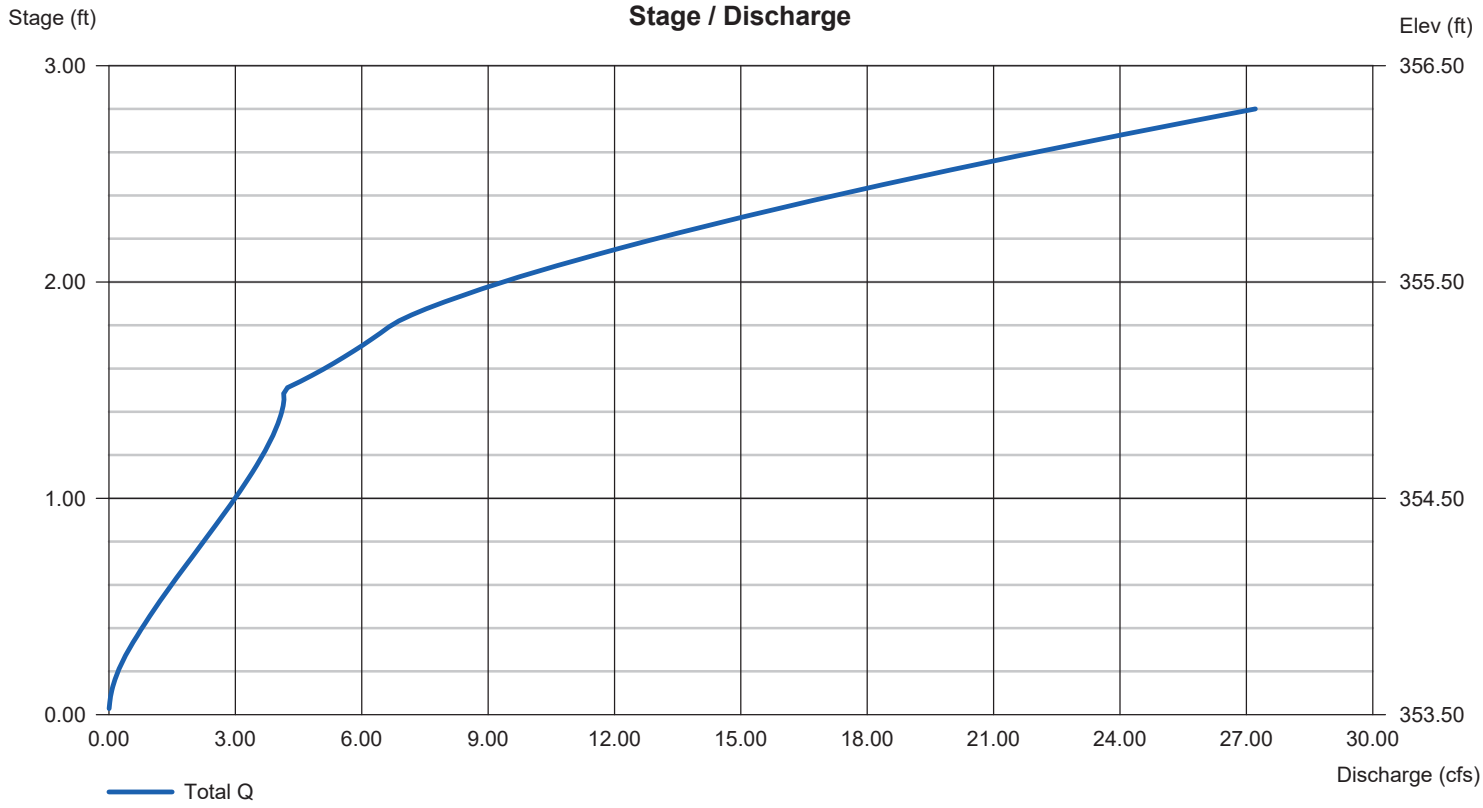
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 355.30	0.00	0.00	0.00
Weir Coeff.	= 3.09	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

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

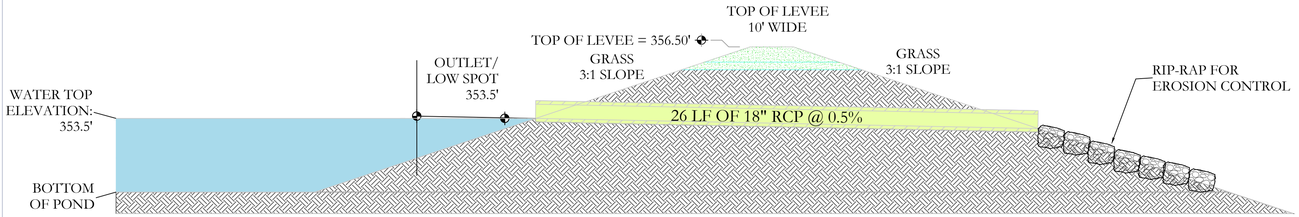
TW Elev. (ft) = 0.00

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

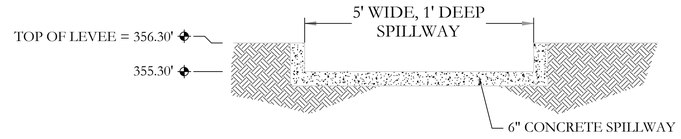


BASIS OF BEARINGS:
GRID NORTH, ARKANSAS
COORDINATE SYSTEM, SOUTH ZONE
BY GPS OBSERVATION

WET POND OUTLET SECTION
NTS



SPILLWAY END VIEW
NTS



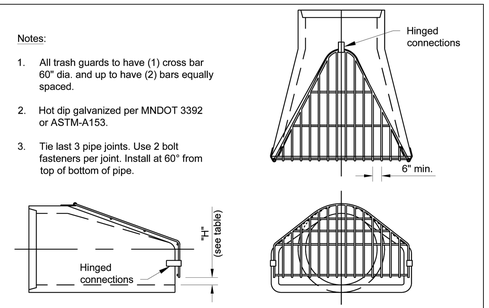
LEGEND

EXISTING CONTOUR LINE — 363 —
PROPOSED CONTOUR LINE — 363 —
PROPOSED HDPE STORM PIPE
PROPOSED RCP STORM PIPE

FLARED END SECTION TRASH RACK
NTS

Notes:

1. All trash guards to have (1) cross bar 60" dia. and up to have (2) bars equally spaced.
2. Hot dip galvanized per MNDOT 3392 or ASTM-A153.
3. Tie last 3 pipe joints. Use 2 bolt fasteners per joint. Install at 60° from top of bottom of pipe.



BAR SIZES									
	STANDARD DESIGN					HEAVY DESIGN			
	PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE		PIPE SIZE	HOLE DIA. REQ'D	BOLT DIA.	BAR SIZE
ROUND	12"-24"	3/4"	5/8"	5/8"	ROUND	12"-18"	3/4"	5/8"	3/4"
	27"-48"	7/8"	3/4"	3/4"		21"-42"	7/8"	3/4"	1"
	54"-90"	1 1/8"	1"	1"		48"-90"	1 1/8"	1"	1 1/4"
ARCH	22"-29"	3/4"	5/8"	5/8"	ARCH	22"	3/4"	5/8"	3/4"
	36"-59"	7/8"	3/4"	3/4"		29"-51"	7/8"	3/4"	1"
	65"-88"	1 1/8"	1"	1"		59"-88"	1 1/8"	1"	1 1/4"
BOLT LG. = PIPEWALL THICKNESS + 2 1/2"									

VALUES FOR "H"			
ROUND PIPE		ARCH PIPE	
PIPE SIZE	H	PIPE SIZE	H
12"	2 1/2"	22"-29"	4"
15"	3"	36"-44"	5"
18"-24"	4"	51"-55"	6"
27"-36"	5"	73"-88"	7"
42"-54"	6"		
60"-72"	7"		
78"-90"	8"		

DETENTION POND MAINTENANCE PLAN

Background
There will be one retention pond in this project.The retention pond is located at the North-East of the subject property. It is designed to temporarily detain stormwater to meet water quantity criteria before discharging off the property.

Routine Maintenance
The property owners association will maintain the drainage easements. 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.

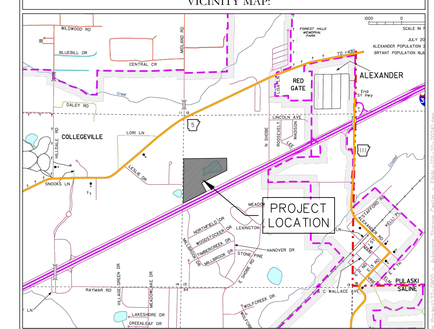
-Sediment from the site may accumulate in the pond bottom and reduce the pond to below design volume requirements. The pond should be excavated if the pond bottom elevation reached a level that allows excessive aquatic growth or reduces the pond efficiency such, that the sediments are passing the discharge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

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

VICINITY MAP:



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

FOR USE AND BENEFIT OF:
STUART FINLEY

ARKANSAS STORAGE CENTER
RETENTION POND PLAN
BRYANT, SALINE COUNTY, ARKANSAS

DATE:	01-24-2023	C.A.D. BY:	DRAWING NUMBER:
REVISED:		CHECKED BY:	22-0800
SHEET:	C-5.4	SCALE:	

500 | 01S | 14W | 0 | 21 | 300 | 62 | 1762

• Pre-Development Time of Concentration

#22-0800
1/23/24

* (A-B) Overland Flow, toc:

- $t_i = \frac{0.93[NL]^{0.467}}{S^{0.5}}$

$t_i = \frac{0.93[0.4(58.4)]^{0.467}}{(0.047)^{0.5}}$

t_i = 16.7 min

- N = 0.40 (Pasture, average, grass cover)
- L = 58 ft
- S = 0.047

*(B-C) Shallow Concentrated Flow, toc:

- V_k unpaved = $16.1345(S)^{0.5}$

V_k unpaved = $16.1345(0.021)^{0.5}$

V_k unpaved = 2.34 ft/s

- $t_{sh} = \frac{L}{60(V_k)} = \frac{409\ ft}{60(2.34\ ft/s)}$

t_{sh} = 2.92 min

- L = 409 ft
- S = 0.021
- $V_{unp} = 16.1345(S)^{0.5}$
- V_{unp} = 2.34 ft/s

1/5

• Pre-Development time of Concentration

1/23/24

* (C-D) Open Channel Flow #1, toc:

- $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.019}(0.36)^{2/3}(0.033)^{0.5}$

V_c = 7.21 ft/s

- $t_t = \frac{L}{60(V)} = \frac{77\ ft}{60(7.21\ ft/s)}$

t_t = 0.18 min

- n = 0.019
- L = 77 ft
- S = 0.033
- r = 0.36

* (D-E) Open Channel Flow #2, toc:

- $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.019}(0.70)^{2/3}(0.030)^{1/2}$

V_c = 10.72 ft/s

- $t_c = \frac{L}{60(V)} = \frac{208\ ft}{60(10.72\ ft/s)}$

t_t = 0.32 min

- n = 0.019
- L = 208 ft
- S = 0.030
- r = 0.70

3/5

• Pre-Development time of Concentration

#22-0800
1/23/24

* Open Channel Flow #3, toc:

- $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.019}(0.495)^{2/3}(0.030)^{1/2}$

V_c = 6.53 ft/s

- $t_t = \frac{L}{(60)(V)} = \frac{172\ ft}{(60)(6.53\ ft/s)} = 0.44$ min

- n = 0.019
- L = 172 ft
- S = 0.030
- R = 0.45

*Open Channel Flow #4, toc

- $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.019}(0.49)^{2/3}(0.010)^{1/2}$

V_c = 4.84 ft/s

- $t_t = \frac{L}{60(V)} = \frac{361\ ft}{60(4.84\ ft/s)} = 1.24$ min

- n = 0.019
- L = 361 ft
- S = 0.010
- R = 0.49

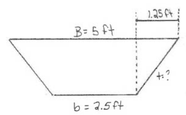
∴ Pre-Dev. TOC = 16.7 min + 2.92 min + 0.18 min + 0.32 min + 0.44 min + 1.24 min

= 21.8 min

3/5

① Open Channel Cross Sectional Area #1:

#22-0800
1/23/24



- Area = (b + ty)(y)
= (2.5 + (2.5)(0.5))(0.5)
= 1.88 ft²

- $R = \frac{A}{P} = \frac{1.88\ ft^2}{5.19\ ft} = 0.36$

$y = \frac{1.25\ ft}{t}$

$t = \frac{1.25\ ft}{0.5\ ft}$

t = 2.5

- Wetted Perimeter (P) = b + 2yw

$w = (1 + t^2)^{0.5}$

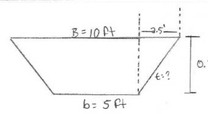
$w = (1 + (2.5)^2)^{0.5}$

w = 2.69

- P = 2.5' + 2(0.5')(2.69)

P = 5.19 ft

② Open Channel Flow Cross Sectional Area #2:



- Area = (b + ty)(y)
= (5 + (2.5')(0.97))(0.97)
= 7.28 ft²

- $R = \frac{A}{P} = \frac{7.28\ ft^2}{10.37\ ft} = 0.70$

$y = 2.5\ ft$

$t = \frac{2.5\ ft}{0.97}$

t = 2.58 ft

- Wetted Perimeter (P) = b + 2yw

$w = (1 + t^2)^{0.5}$

$w = (1 + (2.58)^2)^{0.5}$

w = 2.77

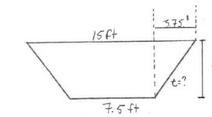
- P = 5 + 2(0.97')(2.77)

P = 10.37 ft

4/5

③ Open Channel Flow Cross Sectional Area #3:

#22-0800
1/23/24



- Area = (b + ty)(y)
= (7.5 + (6.2)(0.61))(0.61)
= 6.88 ft²

- $R = \frac{A}{P} = \frac{6.88\ ft^2}{15.16} = 0.45$

$y = \frac{3.75\ ft}{t}$

$t = \frac{3.75\ ft}{0.61\ ft}$

t = 6.2

- Wetted Perimeter (P) = b + 2yw

$w = (1 + t^2)^{0.5}$

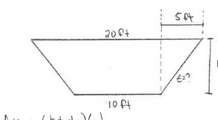
$w = (1 + (6.2)^2)^{0.5}$

w = 6.28

- P = 7.5 + 2(0.61)(6.28)

P = 15.16 ft

④ Open Channel Flow Cross Sectional Area #4



- Area = (b + ty)(y)
= (10 + (7.69)(0.65))(0.65)
= 9.75 ft²

- $R = \frac{A}{P} = \frac{9.75\ ft^2}{20.08\ ft} = 0.49$

$V = \frac{5\ ft}{t}$

$t = \frac{5\ ft}{0.65\ ft}$

t = 7.69

- Wetted Perimeter: P = b + 2yw

$w = (1 + t^2)^{0.5}$

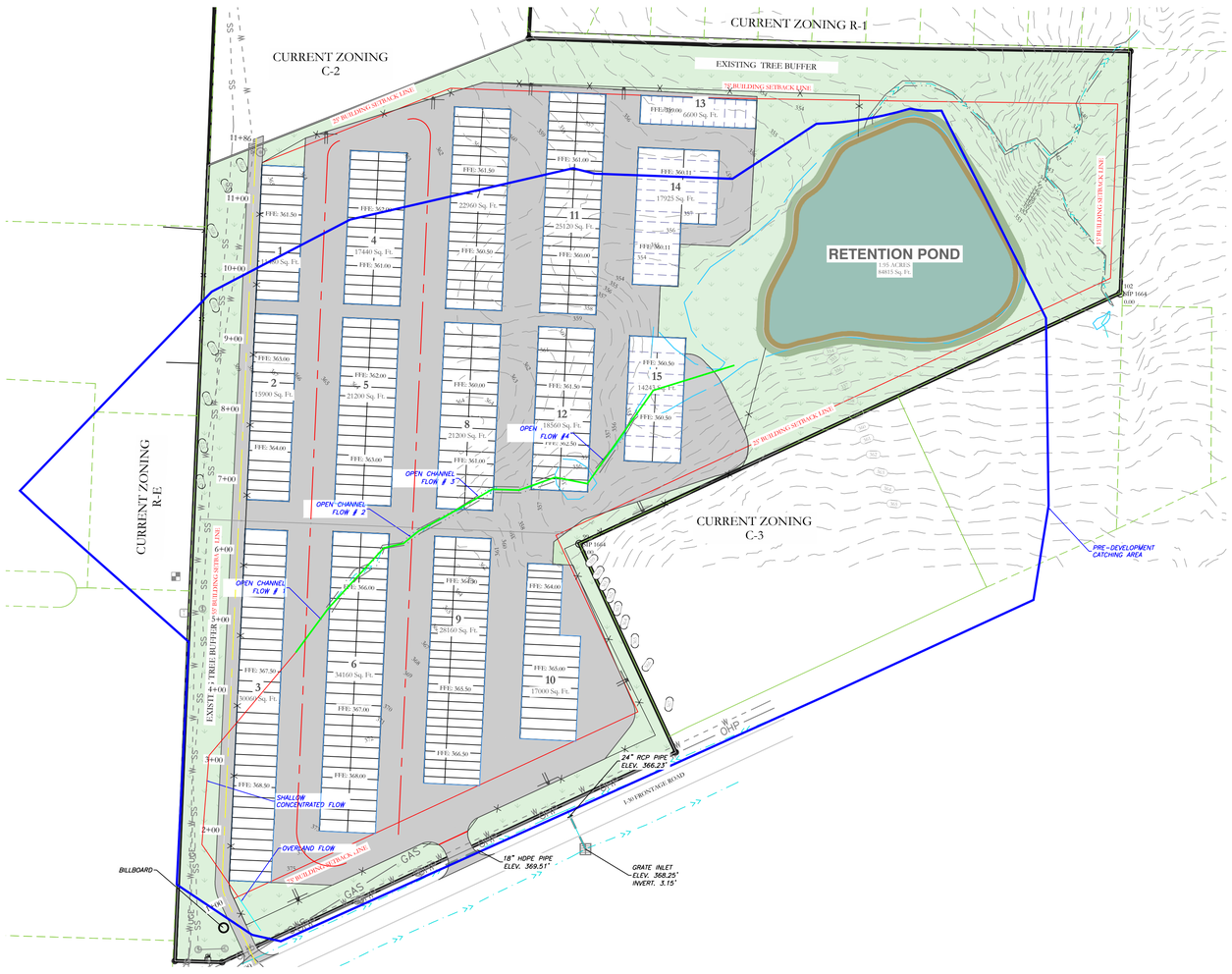
$w = (1 + (7.69)^2)^{0.5}$

w = 7.75

- P = 10 + 2(0.65)(7.75)

P = 20.08 ft

1/5



Pre-Development Time of Concentration Summary									
Reach	Description of Flow	n	Length (ft)	Slope (ft/ft)	Cross. Area (sqft)	Welted Perimeter (ft)	Hydraulic Radius	Velocity (Ft/s)	Travel Time (min)
A-B	Overland	0.4	58.40	0.047					16.68
B-C	Shallow Flow		409.00	0.021				2.34	2.92
C-D	Open Channel #1	0.019	77.00	0.033	1.88	5.19	0.36	7.21	0.18
D-E	Open Channel #2	0.019	208.00	0.030	7.28	10.37	0.70	10.72	0.32
E-F	Open Channel #3	0.019	172.00	0.020	6.88	15.16	0.45	6.53	0.44
F-G	Open Channel #4	0.019	361.00	0.010	9.75	20.08	0.49	4.84	1.24
								Total Time	21.77

Pre Development Drainage Calculations

Total Area, A= 26.06 ac
Impervious area (gravel)= 4.65 ac
Landscape (forest/woodland)= 21.4 ac

For 25 years,
Runoff Coefficient , C=0.50 (gravel)
=0.40(forest/woodland)
Composite Co-efficient,C = 0.42
Time of Concentration,t=21.8 min=22 min

For 100 years,
Runoff Coefficient , C=0.65 (gravel)
=0.47 (forest/woodland)
Composite Co-efficient,C =0.50
Time of Concentration,t=21.8min=22 min

LEGEND

EXISTING CONTOUR LINE — — 363 — —
PROPOSED CONTOUR LINE —— 363 ——
PROPOSED HDPE STORM PIPE
PROPOSED RCP STORM PIPE

LEGEND

POST DEVELOPMENT AREA
PRE DEVELOPMENT AREA
CHANNELIZED FLOW TOC LENGTH
SHALLOW CONCENTRATED FLOW TOC LENGTH
OVERLAND FLOW TOC LENGTH

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

N

BASIS OF BEARING:
GRID NORTH, ARKANSAS
COORDINATE SYSTEM, SOUTH ZONE
BY GPS OBSERVATION

100' 50' 0 100'

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

FOR USE AND BENEFIT OF:
STUART FINLEY

ARKANSAS STORAGE CENTER
PRE-DEVELOPMENT CALCULATIONS
BRYANT, SALINE COUNTY, ARKANSAS

DATE:	1-24-2024	C.A.D. BY:	DRAWING NUMBER:
REVISED:		CHECKED BY:	22-0800
SHEET:	C-5.5	SCALE: 1" = 100'	

500 | 01S | 14W | 0 | 21 | 300 | 62 | 1762

· Post-Development time of Concentration

#22-0800
1/23/2024

*(A-B) Overland flow, toc:

$t_i = \frac{0.83\,[NL]^{0.467}}{S^{0.5}}$

$t_i = \frac{0.83\,[(0.02)(51.3)]^{0.467}}{(0.045)^{0.5}}$

$t_i = 3.96$ min

· W = 0.02 (smooth & Impervious Surfaces)
· L = 51.3 ft
· S = 0.045

*(B-C) Shallow Concentrated Flow, toc:

$V_{paved} = 20.328(S)^{0.5}$

$V_{pav} = 20.328(0.02)^{0.5}$

$V_{pav} = 2.87$ ft/s

$t_i = \frac{L}{60(V)}$

$t_i = \frac{256\text{ ft}}{60(2.87\text{ ft/s})}$

$t_i = 1.48$ min

· L = 256 ft
· S = 0.02

WG 1/3

· Post-Development time of Concentration

#22-0800
1/23/24

*(C-D) 18" HDPE Pipe Channeled Flow, toc:

· $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.012}(0.38)^{2/3}(0.005)^{1/2}$

$V_c = 4.55$ ft/s

· $t_t = \frac{L}{60(V)} = \frac{302\text{ ft}}{60(4.55\text{ ft/s})} = 1.11$ min

· n = 0.012 HDPE Manning's
· L = 302 ft
· Diameter = 18" = 1.5'
· $R = \frac{D}{4} = \frac{1.5'}{4} = 0.38$
· S = 0.005

*(D-E) 24" HDPE Pipe Channeled Flow, toc:

· $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.012}(0.50)^{2/3}(0.010)^{1/2}$

$V_c = 7.92$ ft/s

· $t_i = \frac{L}{60(V)} = \frac{145\text{ ft}}{60(7.92\text{ ft/s})} = 0.31$ min

· n = 0.012 HDPE Manning's
· L = 145 ft
· Diameter = 24" → 2'
· $R = \frac{D}{4} = \frac{2}{4} = 0.50$
· S = 0.010

*(E-F) 24" HDPE Pipe Channeled Flow, toc:

· $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.012}(0.5)^{2/3}(0.011)^{1/2}$

$V_c = 8.18$ ft/s

· $t_i = \frac{L}{60(V)} = \frac{140\text{ ft}}{60(8.18\text{ ft/s})} = 0.29$ min

· n = 0.012
· L = 140 ft
· Diameter = 24" → 2'
· $R = \frac{D}{4} = \frac{2}{4} = 0.5$
· S = 0.011

WG 2/3

· Post-Development time of Concentration

#22-0800
1/23/24

*(F-G) 30" HDPE Pipe Channeled Flow

· $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.012}(0.63)^{2/3}(0.007)^{1/2}$

$V_c = 7.74$ ft/s

· $t_t = \frac{L}{60(V)} = \frac{296\text{ ft}}{60(7.74\text{ ft/s})} = 0.64$ min

· n = 0.012 HDPE Manning's
· L = 296 ft
· Diameter = 30" → 2.5'
· $R = \frac{D}{4} \rightarrow \frac{2.5}{4} = 0.63$
· S = 0.007

*(G-H) HDPE Pipe Channeled Flow

· $V_c = \frac{1.49}{n}(R)^{2/3}(S)^{1/2}$

$V_c = \frac{1.49}{0.012}(0.75)^{2/3}(0.005)^{1/2}$

$V_c = 7.24$ ft/s

· $t_t = \frac{L}{60(V)} = \frac{347\text{ ft}}{60(7.24\text{ ft/s})} = 0.80$ min

· n = 0.012 HDPE Manning's
· L = 347 ft
· Diameter = 36" = 3'
· $R = \frac{D}{4} = \frac{3}{4} = 0.75$
· S = 0.005

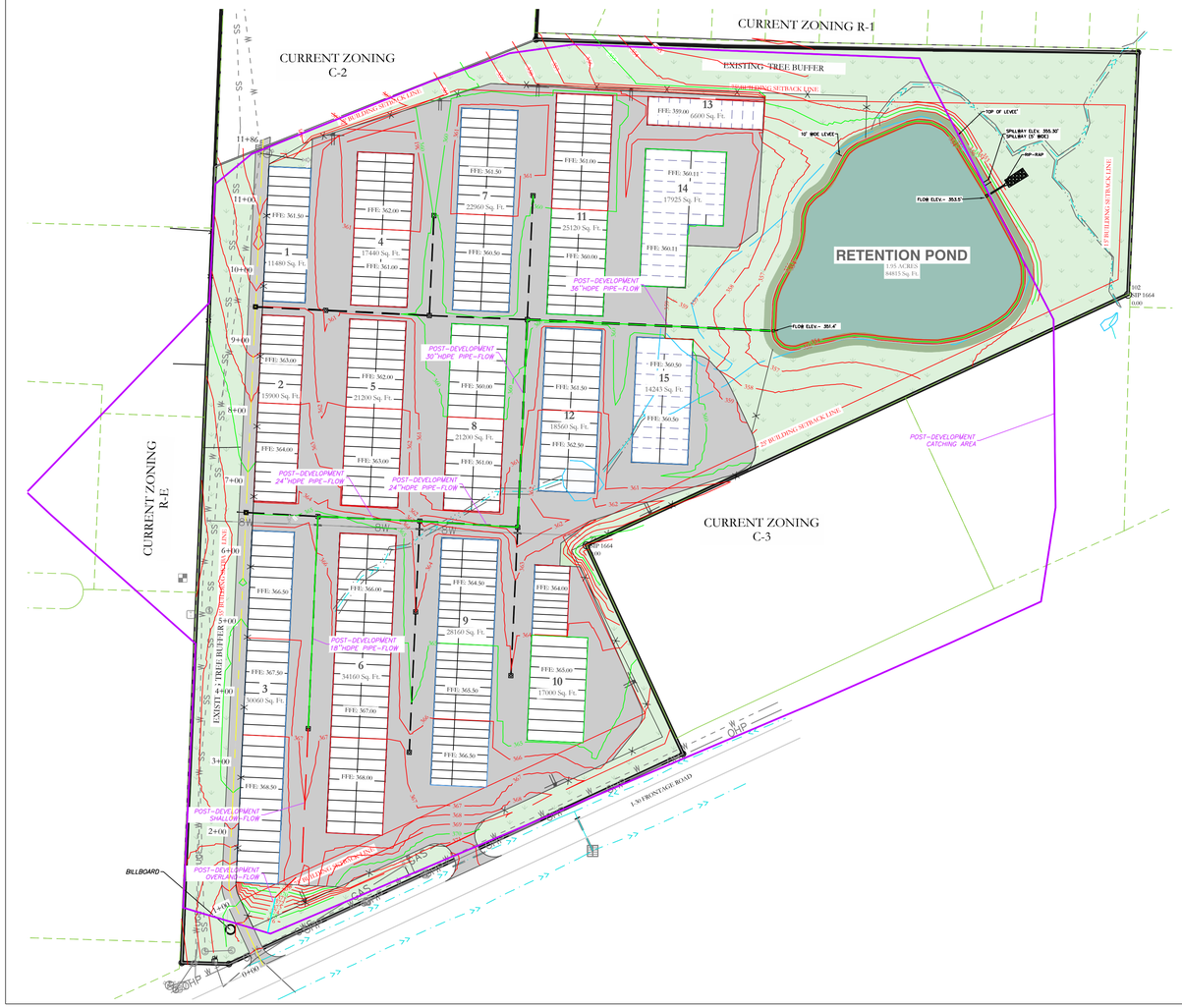
∴ Total TOC = 3.96 min + 1.48 min + 1.11 min + 0.31 min + 0.29 min + 0.64 min + 0.80 min

= 8.59 min

WG 3/3

Post-Development Time of Concentration Summary

Reach	Description of Flow	n	Length (ft)	Slope (ft/ft)	Diameter (ft)	Hydraulic Radius	Velocity (Ft/s)	Travel Time (min)
A-B	Overland	0.02	51.30	0.045				3.96
B-C	Shallow Flow		256.00	0.020			2.87	1.48
C-D	18" HDPE Pipe	0.012	302.00	0.005	1.50	0.38	4.55	1.11
D-E	24" HDPE Pipe	0.012	145.00	0.010	2.00	0.50	7.92	0.31
E-F	24" HDPE Pipe	0.012	140.00	0.011	2.00	0.50	8.18	0.29
F-G	30" HDPE Pipe	0.012	296.00	0.007	2.50	0.63	7.74	0.64
G-H	36" HDPE Pipe	0.012	347.00	0.005	3.00	0.75	7.24	0.80
							Total Time	**8.58**



Post Development Drainage Calculations

Total Area, A= 28.53 ac
Impervious area (gravel)= 4.65 ac
Landscape (forest/woodland)= 23.88 ac

For 25 years,
Runoff Coefficient , C=0.50 (gravel)
=0.88(asphalt)
Composite Co-efficient,C = 0.82
Time of Concentration,t=8.58 min=8.6 min

For 100 years,
Runoff Coefficient , C=0.65 (gravel)
=0.97 (asphalt)
Composite Co-efficient,C = 0.92
Time of Concentration,t=8.58min=8.6 min

LEGEND

EXISTING CONTOUR LINE — — 363 — —
PROPOSED CONTOUR LINE ——— 363 ———
PROPOSED HDPE STORM PIPE
PROPOSED RCP STORM PIPE

LEGEND

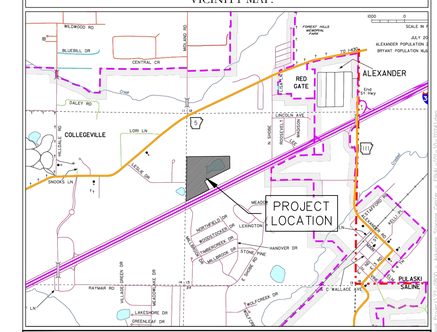
POST DEVELOPMENT AREA
PRE DEVELOPMENT AREA
CHANNELIZED FLOW TOC LENGTH
SHALLOW CONCENTRATED FLOW TOC LENGTH
OVERLAND FLOW TOC LENGTH

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

BASIS OF BEARING:
GRID NORTH, ARKANSAS
COORDINATE SYSTEM, SOUTH ZONE
BY GPS OBSERVATION

100' 50' 0 100'

VICINITY MAP:



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

FOR USE AND BENEFIT OF:
STUART FINLEY

ARKANSAS STORAGE CENTER

POST-DEVELOPMENT FLOW

BRYANT, SALINE COUNTY, ARKANSAS

DATE: 01-24-2024	C.A.D. BY:		DRAWING NUMBER:
REVISED:	CHECKED BY:		22-0800
SHEET: C-5.6	SCALE: 1" = 100'		

500	01S	14W	0	21	300	62	1762

INLET SIZE CALCULATIONS:

For 25 yr:

SN	Element ID	X Coordinate	Y Coordinate	Description	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Max (Rim) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)
1	CB-(1)	1173461.18	2029030.25		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.50	366.00	4.50	361.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
2	CB-(10)	1173633.39	2029618.03		FHWA HEC-22 GENERIC	N/A	On Sag	1	354.56	359.50	4.94	354.56	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
3	CB-(11)	1173635.69	2029760.23		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.41	359.91	4.50	355.41	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
4	CB-(12)	1173780.89	2029788.60		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.50	360.00	4.50	355.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
5	CB-(13)	1173386.20	2029630.46		FHWA HEC-22 GENERIC	N/A	On Sag	1	357.63	362.82	5.19	357.63	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
6	CB-(14)	1173372.72	2029337.75		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.06	365.96	4.91	361.06	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
7	CB-(2)	1173475.03	2029332.17		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.49	365.75	6.26	359.49	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
8	CB-(3)	1173619.88	2029325.53		FHWA HEC-22 GENERIC	N/A	On Sag	1	357.90	362.99	5.09	357.90	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
9	CB-(4)	1173759.15	2029316.66		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.90	361.40	5.50	355.90	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
10	CB-(5)	1173772.77	2029612.26		FHWA HEC-22 GENERIC	N/A	On Sag	1	353.25	359.31	6.06	353.25	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
11	CB-(6)	1173604.77	2028996.64		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.50	366.78	5.28	361.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
12	CB-(7)	1173613.96	2029196.43		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.50	364.00	4.50	359.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
13	CB-(8)	1173749.43	2029105.75		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.50	364.05	4.55	359.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
14	CB-(9)	1173486.08	2029625.44		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.87	360.78	4.91	355.87	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620

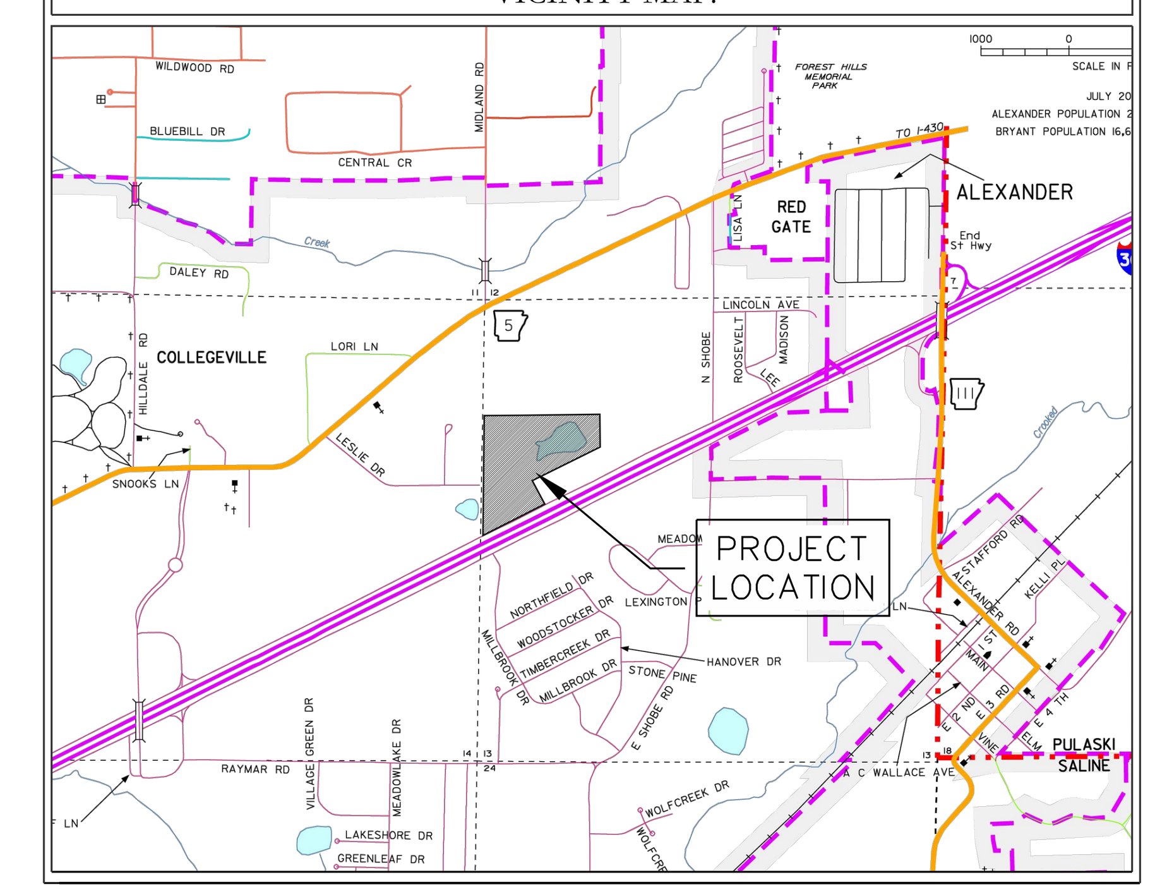
SN	Gutter Width (ft)	Gutter Depression (inches)	Median Ditch Longitudinal Slope (ft/ft)	Median Ditch Bottom Width (ft)	Median Ditch Left Side Slope (V:H)	Median Ditch Right Side Slope (V:H)	Median Ditch Manning's Roughness	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Maximum Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
1	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	366.13	0.13	0 00:00	0.00	0.00
2	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	359.63	0.13	0 00:00	0.00	0.00
3	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.04	0.13	0 00:00	0.00	0.00
4	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.13	0.13	0 00:00	0.00	0.00
5	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	362.95	0.13	0 00:00	0.00	0.00
6	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.50	366.10	0.14	0 00:00	0.00	0.00
7	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	365.87	0.13	0 00:00	0.00	0.00
8	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	363.11	0.13	0 00:00	0.00	0.00
9	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	361.53	0.13	0 00:00	0.00	0.00
10	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	359.44	0.13	0 00:00	0.00	0.00
11	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	366.90	0.13	0 00:00	0.00	0.00
12	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	364.13	0.13	0 00:00	0.00	0.00
13	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	364.17	0.13	0 00:00	0.00	0.00
14	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.91	0.13	0 00:00	0.00	0.00

For 100 yr:

SN	Element ID	X Coordinate	Y Coordinate	Description	Inlet Manufacturer	Manufacturer Part Number	Inlet Location	Number of Inlets	Catchbasin Invert Elevation (ft)	Max (Rim) Elevation (ft)	Max (Rim) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Ponded Area (ft^2)	Grate Clogging Factor (%)	Roadway Longitudinal Slope (ft/ft)	Roadway Cross Slope (ft/ft)	Roadway Manning's Roughness	Gutter Cross Slope (ft/ft)
1	CB-(1)	1173461.18	2029030.25		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.50	366.00	4.50	361.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
2	CB-(10)	1173633.39	2029618.03		FHWA HEC-22 GENERIC	N/A	On Sag	1	354.56	359.50	4.94	354.56	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
3	CB-(11)	1173635.69	2029760.23		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.41	359.91	4.50	355.41	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
4	CB-(12)	1173780.89	2029788.60		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.50	360.00	4.50	355.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
5	CB-(13)	1173386.20	2029630.46		FHWA HEC-22 GENERIC	N/A	On Sag	1	357.63	362.82	5.19	357.63	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
6	CB-(14)	1173372.72	2029337.75		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.06	365.96	4.91	361.06	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
7	CB-(2)	1173475.03	2029332.17		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.49	365.75	6.26	359.49	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
8	CB-(3)	1173619.88	2029325.53		FHWA HEC-22 GENERIC	N/A	On Sag	1	357.90	362.99	5.09	357.90	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
9	CB-(4)	1173759.15	2029316.66		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.90	361.40	5.50	355.90	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
10	CB-(5)	1173772.77	2029612.26		FHWA HEC-22 GENERIC	N/A	On Sag	1	353.25	359.31	6.06	353.25	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
11	CB-(6)	1173604.77	2028996.64		FHWA HEC-22 GENERIC	N/A	On Sag	1	361.50	366.78	5.28	361.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
12	CB-(7)	1173613.96	2029196.43		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.50	364.00	4.50	359.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
13	CB-(8)	1173749.43	2029105.75		FHWA HEC-22 GENERIC	N/A	On Sag	1	359.50	364.05	4.55	359.50	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620
14	CB-(9)	1173486.08	2029625.44		FHWA HEC-22 GENERIC	N/A	On Sag	1	355.87	360.78	4.91	355.87	0.00	0.00	0.00	N/A	0.0200	0.0160	0.0620

SN	Gutter Width (ft)	Gutter Depression (inches)	Median Ditch Longitudinal Slope (ft/ft)	Median Ditch Bottom Width (ft)	Median Ditch Left Side Slope (V:H)	Median Ditch Right Side Slope (V:H)	Median Ditch Manning's Roughness	Peak Flow (cfs)	Peak Lateral Inflow (cfs)	Peak Flow Intercepted by Inlet (cfs)	Peak Flow Bypassing Inlet (cfs)	Inlet Efficiency during Peak Flow (%)	Allowable Spread (ft)	Max Gutter Spread during Peak Flow (ft)	Max Gutter Water Elev. during Peak Flow (ft)	Max Gutter Water Depth during Peak Flow (ft)	Time of Maximum Depth Occurrence (days hh:mm)	Total Flooded Volume (ac-inches)	Total Time Flooded (minutes)
1	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	366.13	0.13	0 00:00	0.00	0.00
2	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	359.63	0.13	0 00:00	0.00	0.00
3	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.04	0.13	0 00:00	0.00	0.00
4	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.13	0.13	0 00:00	0.00	0.00
5	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	362.95	0.13	0 00:00	0.00	0.00
6	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.50	366.10	0.14	0 00:00	0.00	0.00
7	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	365.87	0.13	0 00:00	0.00	0.00
8	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	363.11	0.13	0 00:00	0.00	0.00
9	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	361.53	0.13	0 00:00	0.00	0.00
10	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	359.44	0.13	0 00:00	0.00	0.00
11	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	366.90	0.13	0 00:00	0.00	0.00
12	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	364.13	0.13	0 00:00	0.00	0.00
13	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	364.17	0.13	0 00:00	0.00	0.00
14	2.00	2.0000	45.0000	45.0000	64	64	45.0000	0.00	0.00	N/A	N/A	N/A	7.00	1.00	360.91	0.13	0 00:00	0.00	0.00

VICINITY MAP:



PIPE SIZE CALCULATIONS:

For 25 yr:

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (inches)	Pipe Width (inches)
1	Pipe-(10)		CB-(5)	Out-1Pipe-(10)	346.75	353.25	0.00	351.47	0.00	1.78	0.5100	CIRCULAR	36.000	36.00
2	Pipe-(11)		CB-(6)	CB-(7)	200.00	361.50	0.00	359.50	0.00	2.00	1.0000	CIRCULAR	18.000	18.00
3	Pipe-(12)		CB-(7)	CB-(3)	129.24	359.50	0.00	358.50	0.60	1.00	0.7700	CIRCULAR	18.000	18.00
4	Pipe-(13)		CB-(8)	CB-(4)	211.13	359.50	0.00	356.40	0.50	3.10	1.4700	CIRCULAR	18.000	18.00
5	Pipe-(14)		CB-(9)	CB-(10)	147.50	355.87	0.00	354.56	0.00	1.31	0.8900	CIRCULAR	24.000	24.00
6	Pipe-(15)		CB-(10)	CB-(5)	139.49	354.56	0.00	353.86	0.61	0.70	0.5000	CIRCULAR	24.000	24.00
7	Pipe-(16)		CB-(11)	CB-(10)	142.34	355.41	0.00	354.70	0.14	0.71	0.5000	CIRCULAR	18.000	18.00
8	Pipe-(17)		CB-(12)	CB-(5)	176.53	355.50	0.00	354.62	1.37	0.88	0.5000	CIRCULAR	18.000	18.00
9	Pipe-(18)		CB-(14)	CB-(2)	102.45	361.06	0.00	359.49	0.00	1.57	1.5300	CIRCULAR	24.000	24.00
10	Pipe-(19)		CB-(13)	CB-(9)	100.00	357.63	0.00	355.87	0.00	1.76	1.7600	CIRCULAR	24.000	24.00
11	Pipe-(6)		CB-(1)	CB-(2)	302.23	361.50	0.00	359.99	0.50	1.51	0.5000	CIRCULAR	18.000	18.00
12	Pipe-(7)		CB-(2)	CB-(3)	145.01	359.49	0.00	358.00	0.10	1.49	1.0300	CIRCULAR	24.000	24.00
13	Pipe-(8)		CB-(3)	CB-(4)	139.55	357.90	0.00	356.40	0.50	1.50	1.0700	CIRCULAR	24.000	24.00
14	Pipe-(9)		CB-(4)	CB-(5)	295.92	355.90	0.00	353.75	0.50	2.15	0.7300	CIRCULAR	30.000	30.00

SN	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	Lengthening Factor	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Reported Condition
1	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		51.84	0.00	0.00	0.00	0.00	Calculated
2	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		11.38	0.00	0.00	0.00	0.00	Calculated
3	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		10.01	0.00	0.00	0.00	0.00	Calculated
4	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		13.79	0.00	0.00	0.00	0.00	Calculated
5	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		23.11	0.00	0.00	0.00	0.00	Calculated
6	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		17.33	0.00	0.00	0.00	0.00	Calculated
7	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
8	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
9	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		30.31	0.00	0.00	0.00	0.00	Calculated
10	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		32.52	0.00	0.00	0.00	0.00	Calculated
11	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
12	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		24.83	0.00	0.00	0.00	0.00	Calculated
13	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		25.39	0.00	0.00	0.00	0.00	Calculated
14	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		37.89	0.00	0.00	0.00	0.00	Calculated

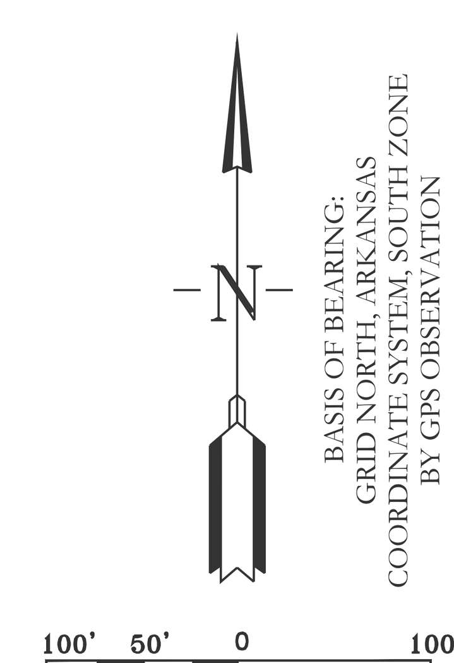
For 100 yr:

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (inches)	Pipe Width (inches)
1	Pipe-(10)		CB-(5)	Out-1Pipe-(10)	346.75	353.25	0.00	351.47	0.00	1.78	0.5100	CIRCULAR	36.000	36.00
2	Pipe-(11)		CB-(6)	CB-(7)	200.00	361.50	0.00	359.50	0.00	2.00	1.0000	CIRCULAR	18.000	18.00
3	Pipe-(12)		CB-(7)	CB-(3)	129.24	359.50	0.00	358.50	0.60	1.00	0.7700	CIRCULAR	18.000	18.00
4	Pipe-(13)		CB-(8)	CB-(4)	211.13	359.50	0.00	356.40	0.50	3.10	1.4700	CIRCULAR	18.000	18.00
5	Pipe-(14)		CB-(9)	CB-(10)	147.50	355.87	0.00	354.56	0.00	1.31	0.8900	CIRCULAR	24.000	24.00
6	Pipe-(15)		CB-(10)	CB-(5)	139.49	354.56	0.00	353.86	0.61	0.70	0.5000	CIRCULAR	24.000	24.00
7	Pipe-(16)		CB-(11)	CB-(10)	142.34	355.41	0.00	354.70	0.14	0.71	0.5000	CIRCULAR	18.000	18.00
8	Pipe-(17)		CB-(12)	CB-(5)	176.53	355.50	0.00	354.62	1.37	0.88	0.5000	CIRCULAR	18.000	18.00
9	Pipe-(18)		CB-(14)	CB-(2)	102.45	361.06	0.00	359.49	0.00	1.57	1.5300	CIRCULAR	24.000	24.00
10	Pipe-(19)		CB-(13)	CB-(9)	100.00	357.63	0.00	355.87	0.00	1.76	1.7600	CIRCULAR	24.000	24.00
11	Pipe-(6)		CB-(1)	CB-(2)	302.23	361.50	0.00	359.99	0.50	1.51	0.5000	CIRCULAR	18.000	18.00
12	Pipe-(7)		CB-(2)	CB-(3)	145.01	359.49	0.00	358.00	0.10	1.49	1.0300	CIRCULAR	24.000	24.00
13	Pipe-(8)		CB-(3)	CB-(4)	139.55	357.90	0.00	356.40	0.50	1.50	1.0700	CIRCULAR	24.000	24.00
14	Pipe-(9)		CB-(4)	CB-(5)	295.92	355.90	0.00	353.75	0.50	2.15	0.7300	CIRCULAR	30.000	30.00

SN	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	Lengthening Factor	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Reported Condition
1	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		51.84	0.00	0.00	0.00	0.00	Calculated
2	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		11.38	0.00	0.00	0.00	0.00	Calculated
3	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		10.01	0.00	0.00	0.00	0.00	Calculated
4	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		13.79	0.00	0.00	0.00	0.00	Calculated
5	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		23.11	0.00	0.00	0.00	0.00	Calculated
6	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		17.33	0.00	0.00	0.00	0.00	Calculated
7	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
8	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
9	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		30.31	0.00	0.00	0.00	0.00	Calculated
10	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		32.52	0.00	0.00	0.00	0.00	Calculated
11	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		8.05	0.00	0.00	0.00	0.00	Calculated
12	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		24.83	0.00	0.00	0.00	0.00	Calculated
13	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		25.39	0.00	0.00	0.00	0.00	Calculated
14	0.0120	0.5000	0.5000	0.0000	0.00	NO	1.00	0.00	0 00:00	0.00		37.89	0.00	0.00	0.00	0.00	Calculated

LEGEND

EXISTING CONTOUR LINE — 363
PROPOSED CONTOUR LINE — 363
PROPOSED HDPE STORM PIPE
PROPOSED RCP STORM PIPE



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

FOR USE AND BENEFIT OF:
STUART FINLEY

ARKANSAS STORAGE CENTER

POST-DEVELOPMENT CALCULATIONS

BRYANT, SALINE COUNTY, ARKANSAS

DATE: 01-24-2024	C.A.D. BY:	DRAWING NUMBER:	
REVISED:	CHECKED BY:	22-0800	
SHEET: C-5.7	SCALE: 1" = 100'		
500	01S	14W	0 21 300 62 1762