BARBEE ST.
SUBDIVISION

0 E. BARBEE ST.
ZEBULON, NORTH CAROLINA

STORM IMPACT ANALYSIS

JOB CODE: SCBSZ
7 NOVEMBER 2022

REVISED:
1 03 FEB 2023

THE SITE GROUP

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

THE SITE GROUP, PLLC
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SCBSZ
February 3, 2023

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February 3, 2023

STORMWATER IMPACT ANALYSIS NARRATIVE

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THE SITE GROUP
CIVIL ENGINEERS • LANDSCAPE ARCHITECTS

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2 FEB 2023

Stormwater Impact Analysis Narrative

Barbee St. Subdivision
0 E. Barbee St
Zebulon, North Carolina

General Project Summary

This project site is located on Barbee Street in Zebulon, NC. This project includes two parcels, Wake County PIN:2705-65-0231 & 2705-55-7077. The proposed development will include 51 town homes and associated infrastructure. The combined parcel area totals 5.65 Acres (AC). The parcel is in the Neuse River Basin and is subject to structural stormwater controls. This property is zoned DTP. The existing impervious area of this lot totals 1,383 SF and the proposed impervious area totals 119,378 SF. The area of land disturbance for this project is 193,786 SF. Both parcels are currently vacant.

Existing Drainage Patterns

An existing drainage channel runs down the property line to the to the west and outlets into the existing creek at the bottom of the site. Hydraulic analysis was preformed at the point were the existing creek intersects the property line at the South of the property.

Stormwater Methodology

Pre-development and post development hydrologic analyses were completed for the site using the SCS method. The hydrologic analysis used Hydraflow™ Hydrographs modeling software, as incorporated into the AutoCAD Civil 3D computer program, to compute the time of concentration for individual Drainage Areas, generate hydrographs, route storm events through the proposed wet detention basin and to combine runoff hydrographs.

Computer simulated reservoir routing using Hydraflow™ modeling software was completed for the 2, 10, 25 & 100 year 24 hour storm events utilizing stage-storage and stage-discharge functions. Stage-storage was determined using the proposed grading contours of the wet detention basin and stage-discharge functions were developed using the proposed outlet structure. The outlet structures were designed to attenuate the post-development discharge rates for the 1 year 24 hour storm event equal to or less than pre-development levels.

One Point of analysis was examined for this report. A summary of the results is listed below in tabular format.

Pre Development Runoff (Q in CFS)					
Hydrograph #	**Description**	**Q1**	**Q10**	**Q25**	**Q100**
4	Pre Point A	2.779	16.730	24.220	36.910

Post Development Runoff (Q in CFS)									
Hydrograph #	**Description**	**Q1**	**% Change**	**Q10**	**% Change**	**Q25**	**% Change**	**Q100**	**% Change**
12	Post Point A	1.628	-41.4%	28.440	70.0%	34.750	43.5%	43.370	17.5%

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February 3, 2023

WET DETENTION BASIN WORKSHEETS

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2/03/2023

SCM #1 - WETPOND SIZING CALCULATIONS

(Drainage Area #1)

		Area (Ac.)
Total Impervious Landcover:	See A1 + A3 from	3.010
Total Drainage Area (DA):	Pre-post calcs	4.830
Percent of Impervious in Drainage Area (I):		62%

Calculate the required storage volume (Rv) for the 1" first flush storm event:

Rv = 0.05 + (0.009) ^{I} Where I = Percent of impervious from above.

Rv = 0.608

Calculate the required drainage volume from the 1" storm to be controlled:

WQV = (design rainfall)(Rv)(Drainage Area)

WQv=3600*Rd*Rv*A

Required WQV = 10,660 C.F.

Provided WQV = 12,327 C.F.

Calculate the Wet Pond Dimensions:

Elev.	Tot. Inc. SA	Forebay	Mainpool	FB Inc. Vol.	MP Inc. Vol.	Disc.	Inc. Vol.	Total Vol.
283	6441	1267	5174	1236	4876		6112	40430
282	5977	1205	4772	1175	4579		5753	34318
281	5529	1144	4385	1114	4199	WQv	5313	28565
280	5096	1083	4013	1052	3834		4886	23252
279	4676	1021	3655	447	1682	A-top shelf	2129	18366
278.5	3838	766	3072	329	1400	A-perm pool	1729	16238
278	3077	548	2529	460	2333	A-bot shelf	2793	14509
277	2508	371	2137	371	2137		2508	11717
276	2508	371	2137	371	2137		2508	9209
275	2508	371	2137	371	2137		2508	6701
274	2508	371	2137	320	1979		2298	4193
273	2088	268	1820	224	1671		1895	1895
272	1701	180	1521	144	1380		0	0
271	1347	108	1239	81	1107		0	0
270	1027	53	974	0	0	Sed Cleanout		
269.5						A-bot pond		
				2669	16280	16%	Forebay to Main Pool Volume	
						11,717	V-perm pool	
						12,327	V-water quality pool	

Required SA 2,861 S.F.

Provided SA 3,072 S.F.

Ave Depth Calcs			
Davg with shelf	5.30	d-ave	
Davg w/o shelf	6.37	d-ave	(use greater)
Ave Depth	6.37		6 (rounded down to nearest 0.5')
SA/DA	1.36		

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February 3, 2023

PRE-POST PEAK RUNOFF MODEL

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Hydraflow Table of Contents

SCBSZ PRE-POST.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Thursday, 02 / 2 / 2023

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	1.672	3.594	-------	-------	9.544	13.66	-------	20.60	AREA 1A
2	SCS Runoff	------	1.213	2.705	-------	-------	7.498	10.84	-------	16.49	AREA 1B
4	Combine	1, 2,	2.799	5.990	-------	-------	16.73	24.22	-------	36.91	COMBINED PRE
6	SCS Runoff	------	11.22	14.77	-------	-------	23.82	29.28	-------	37.75	Area To SCM
7	SCS Runoff	------	0.964	1.941	-------	-------	4.932	6.987	-------	10.43	SCM BYPASS 1
8	SCS Runoff	------	0.610	1.312	-------	-------	3.485	4.989	-------	7.522	SCM BYPASS 2
10	Reservoir	6	1.228	6.880	-------	-------	20.25	23.12	-------	26.05	POST A ROUTED
12	Combine	7, 8, 10,	1.628	8.834	-------	-------	28.44	34.75	-------	43.37	COMBINED POST

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

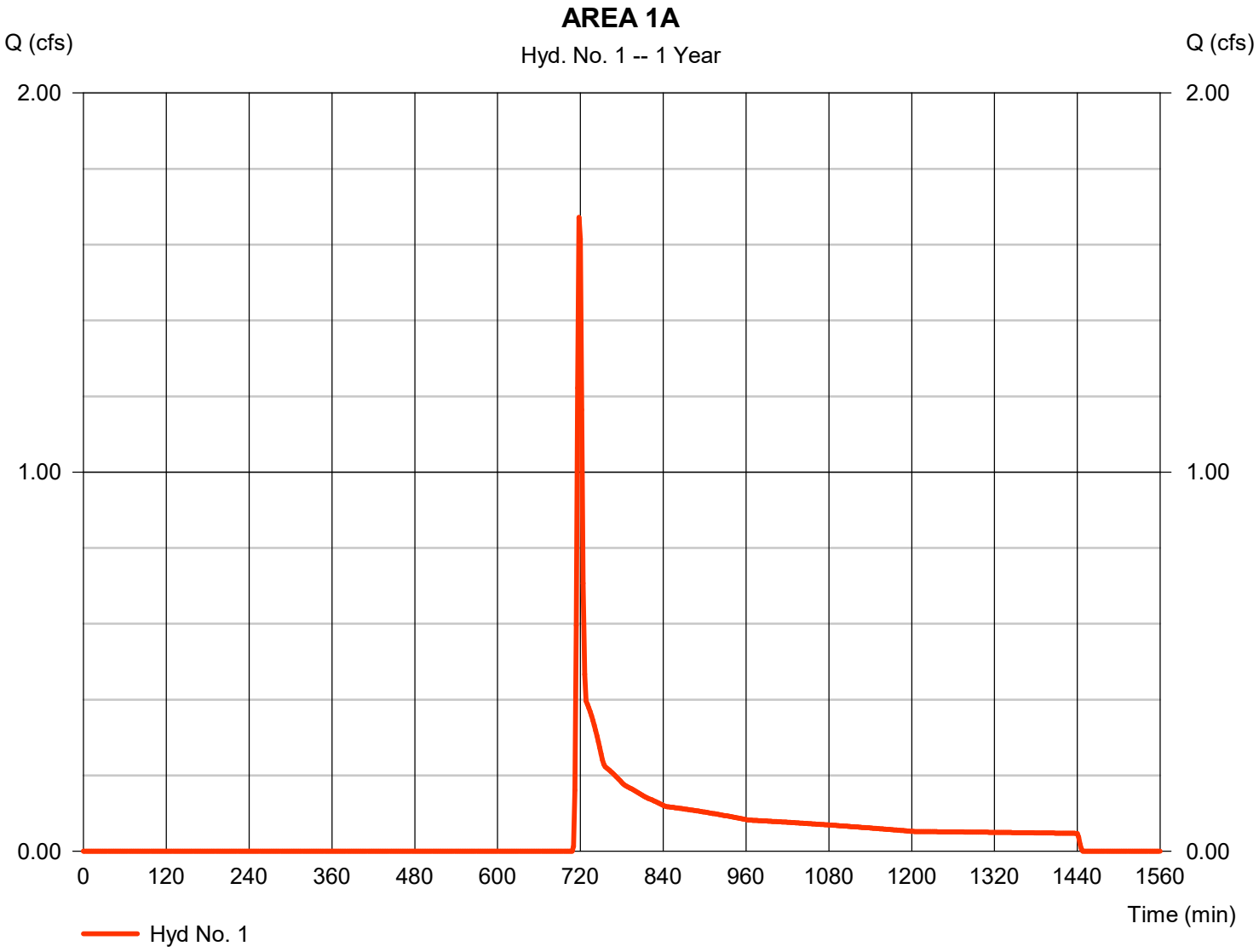
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.672	2	718	4,749	------	------	------	AREA 1A
2	SCS Runoff	1.213	2	722	4,353	------	------	------	AREA 1B
4	Combine	2.799	2	720	9,102	1, 2,	------	------	COMBINED PRE
6	SCS Runoff	11.22	2	716	22,701	------	------	------	Area To SCM
7	SCS Runoff	0.964	2	718	2,547	------	------	------	SCM BYPASS 1
8	SCS Runoff	0.610	2	718	1,734	------	------	------	SCM BYPASS 2
10	Reservoir	1.228	2	740	22,139	6	280.83	11,423	POST A ROUTED
12	Combine	1.628	2	718	26,420	7, 8, 10,	------	------	COMBINED POST

Hydrograph Report

Hyd. No. 1

AREA 1A

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.672 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	4,749 cuft
Drainage area	=	4.190 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.30 min
Total precip.	=	3.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No. 1

AREA 1A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 6.00		0.00		0.00		
Travel Time (min)	**= 3.42**	**+**	**0.00**	**+**	**0.00**	**=**	**3.42**
Shallow Concentrated Flow							
Flow length (ft)	= 448.00		0.00		0.00		
Watercourse slope (%)	= 5.80		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.89		0.00		0.00		
Travel Time (min)	**= 1.92**	**+**	**0.00**	**+**	**0.00**	**=**	**1.92**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

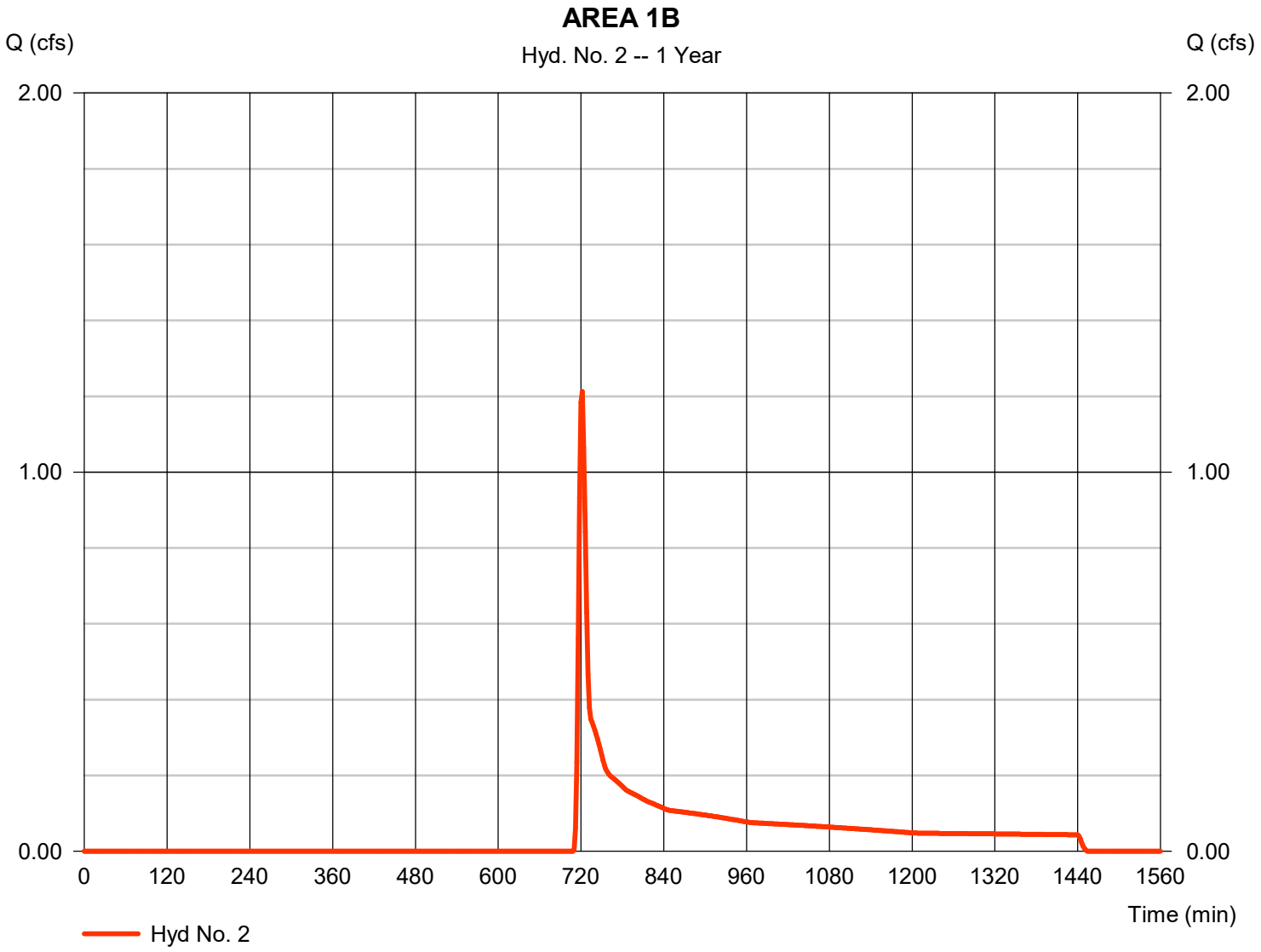
Total Travel Time, Tc ..... 5.30 min

Hydrograph Report

Hyd. No. 2

AREA 1B

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.213 cfs
Storm frequency	=	1 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	4,353 cuft
Drainage area	=	3.600 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.60 min
Total precip.	=	3.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 2

AREA 1B

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.60		0.00		0.00		
Land slope (%)	= 4.20		0.00		0.00		
Travel Time (min)	**= 3.94**	**+**	**0.00**	**+**	**0.00**	**=**	**3.94**
Shallow Concentrated Flow							
Flow length (ft)	= 686.00		0.00		0.00		
Watercourse slope (%)	= 2.30		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.45		0.00		0.00		
Travel Time (min)	**= 4.67**	**+**	**0.00**	**+**	**0.00**	**=**	**4.67**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

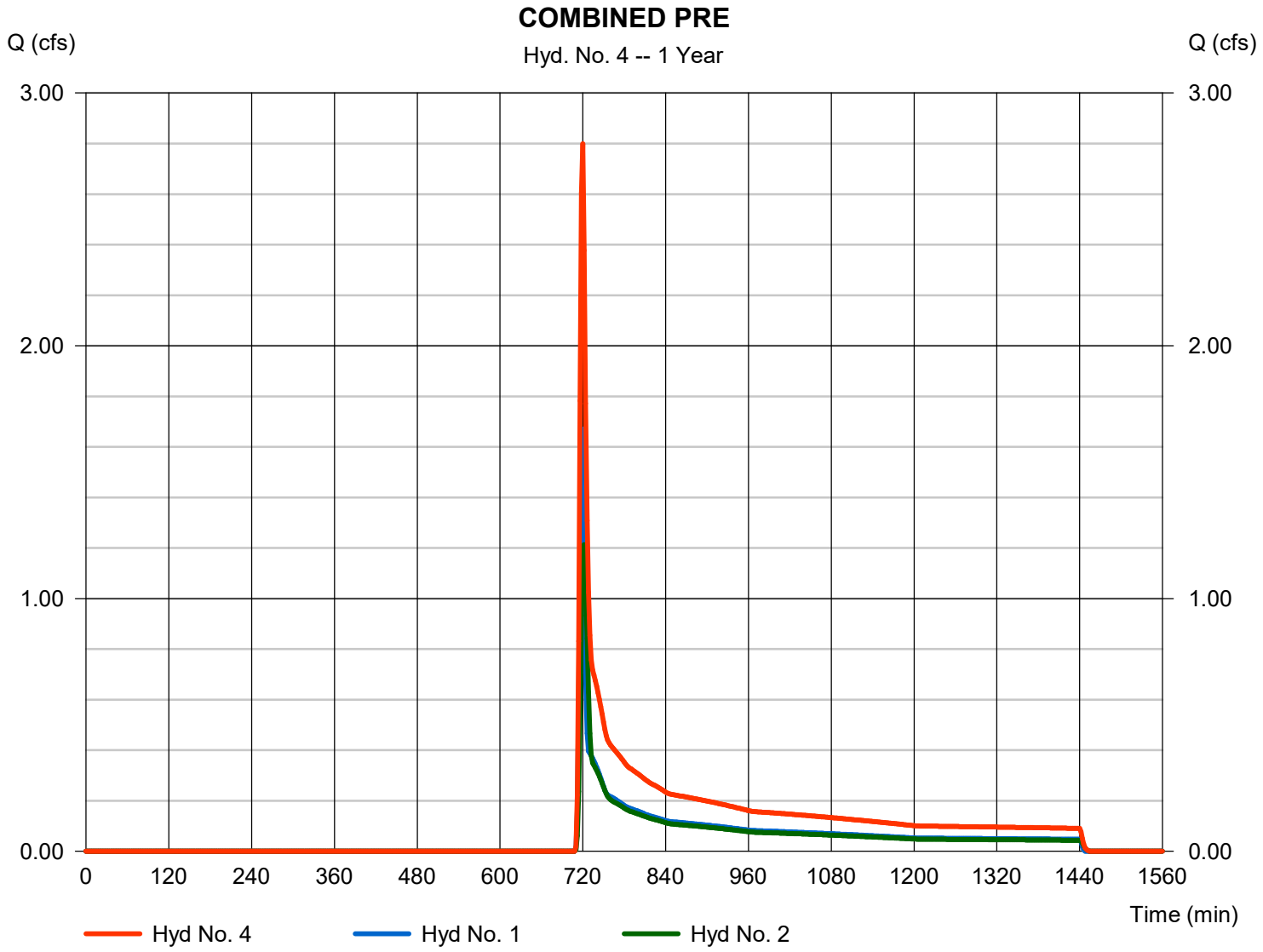
Total Travel Time, Tc ..... 8.60 min

Hydrograph Report

Hyd. No. 4

COMBINED PRE

Hydrograph type	=	Combine	Peak discharge	=	2.799 cfs
Storm frequency	=	1 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	9,102 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.790 ac

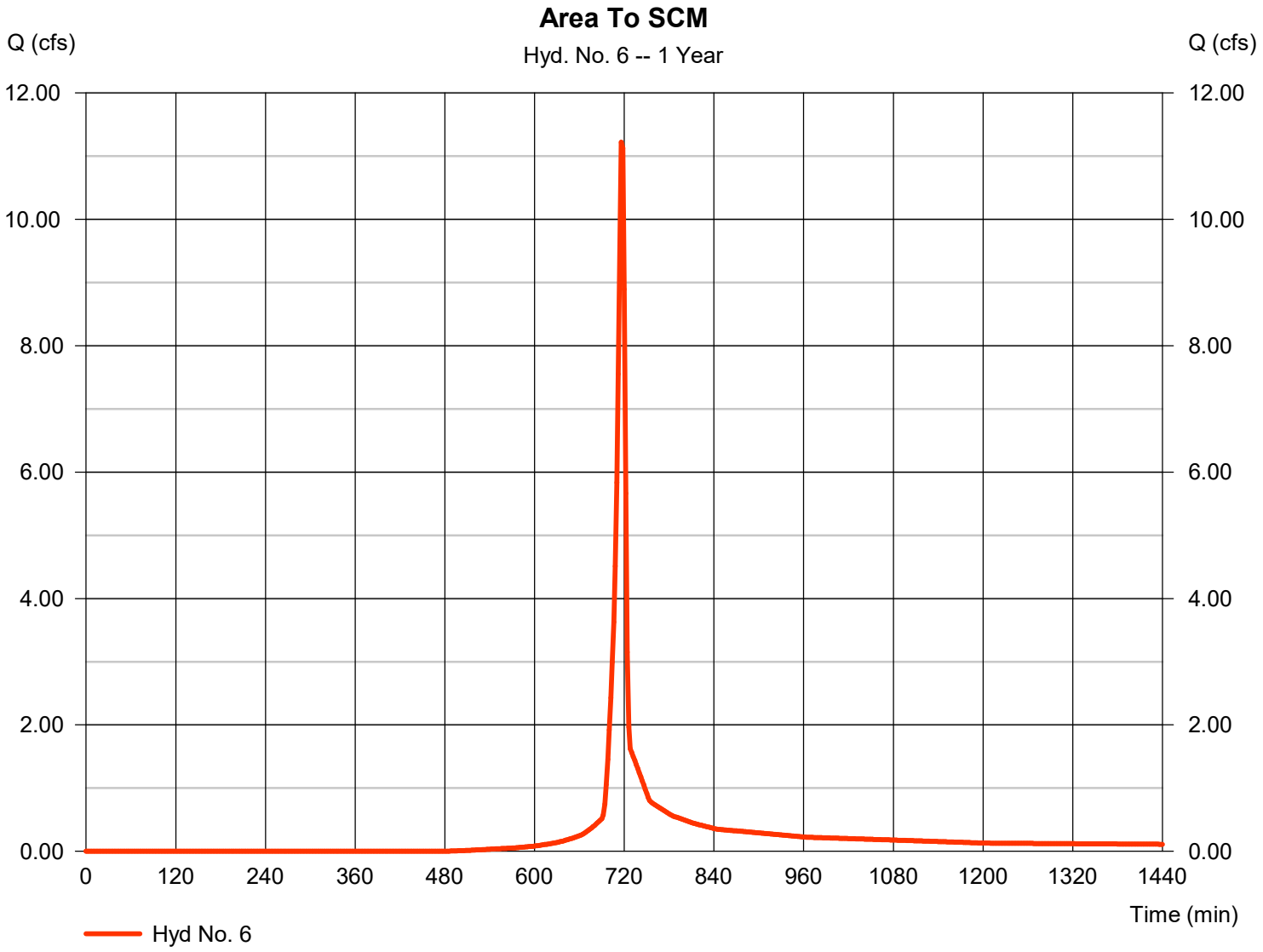


Hydrograph Report

Hyd. No. 6

Area To SCM

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.22 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	22,701 cuft
Drainage area	=	4.200 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

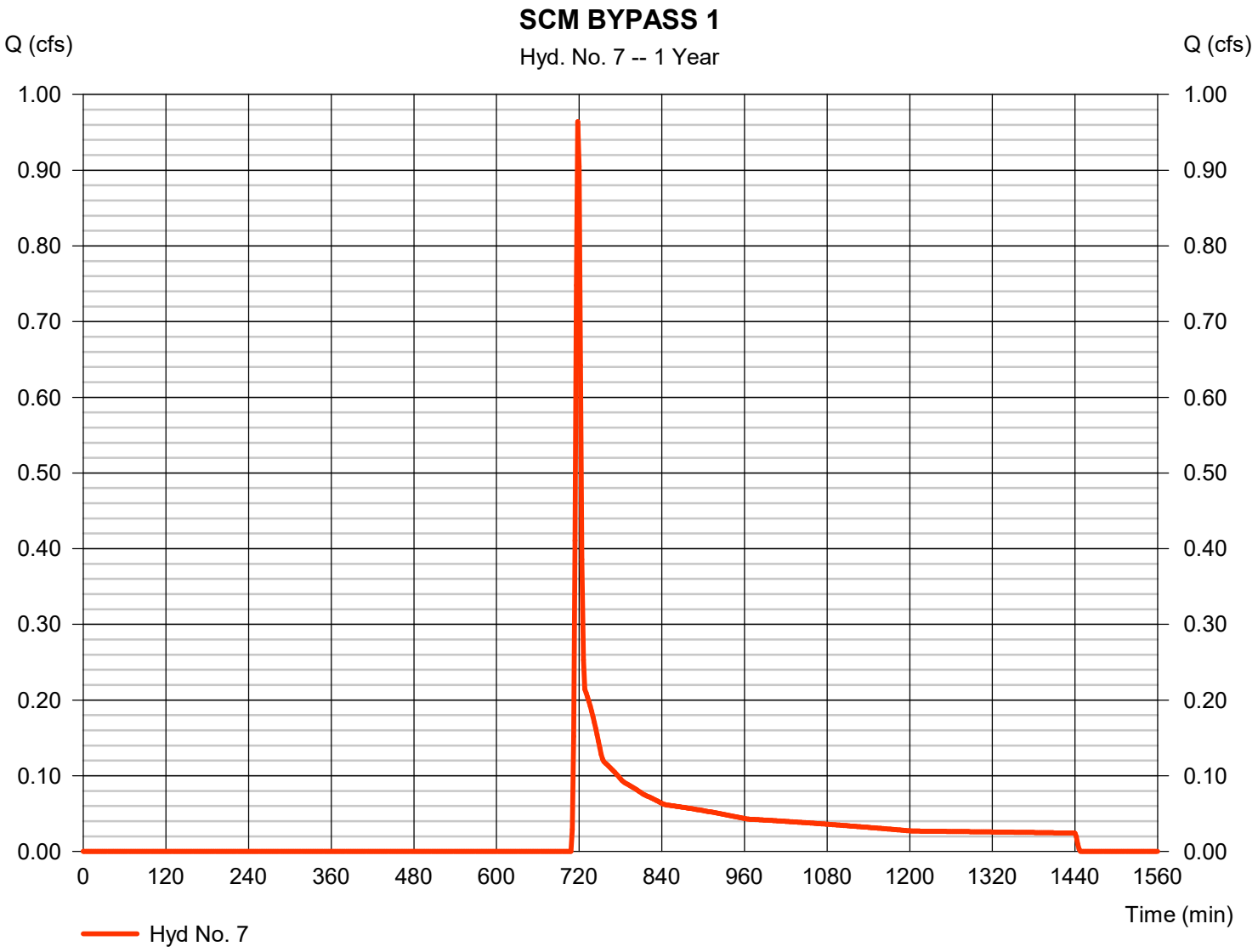


Hydrograph Report

Hyd. No. 7

SCM BYPASS 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.964 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	2,547 cuft
Drainage area	=	2.050 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

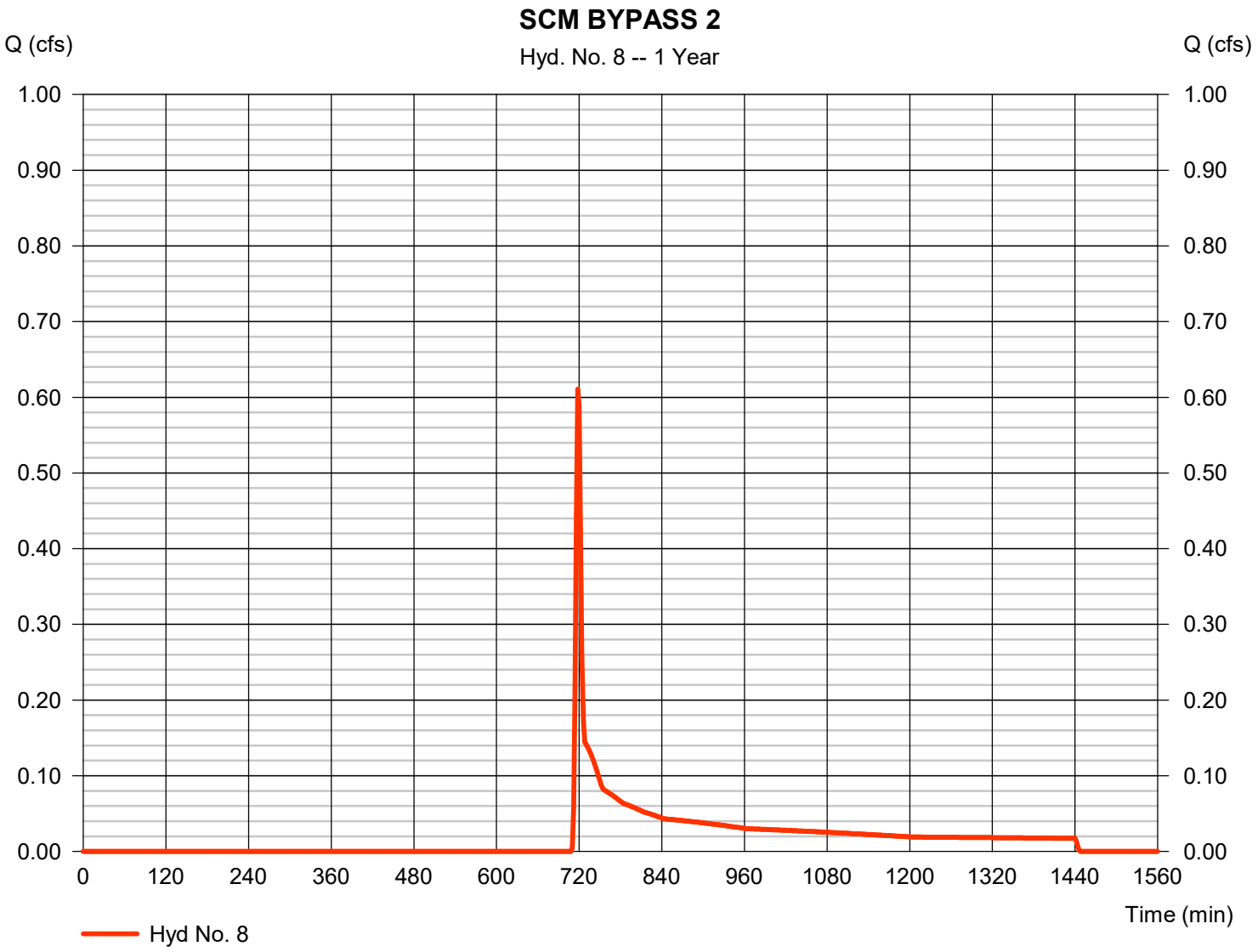


Hydrograph Report

Hyd. No. 8

SCM BYPASS 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.610 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,734 cuft
Drainage area	=	1.530 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



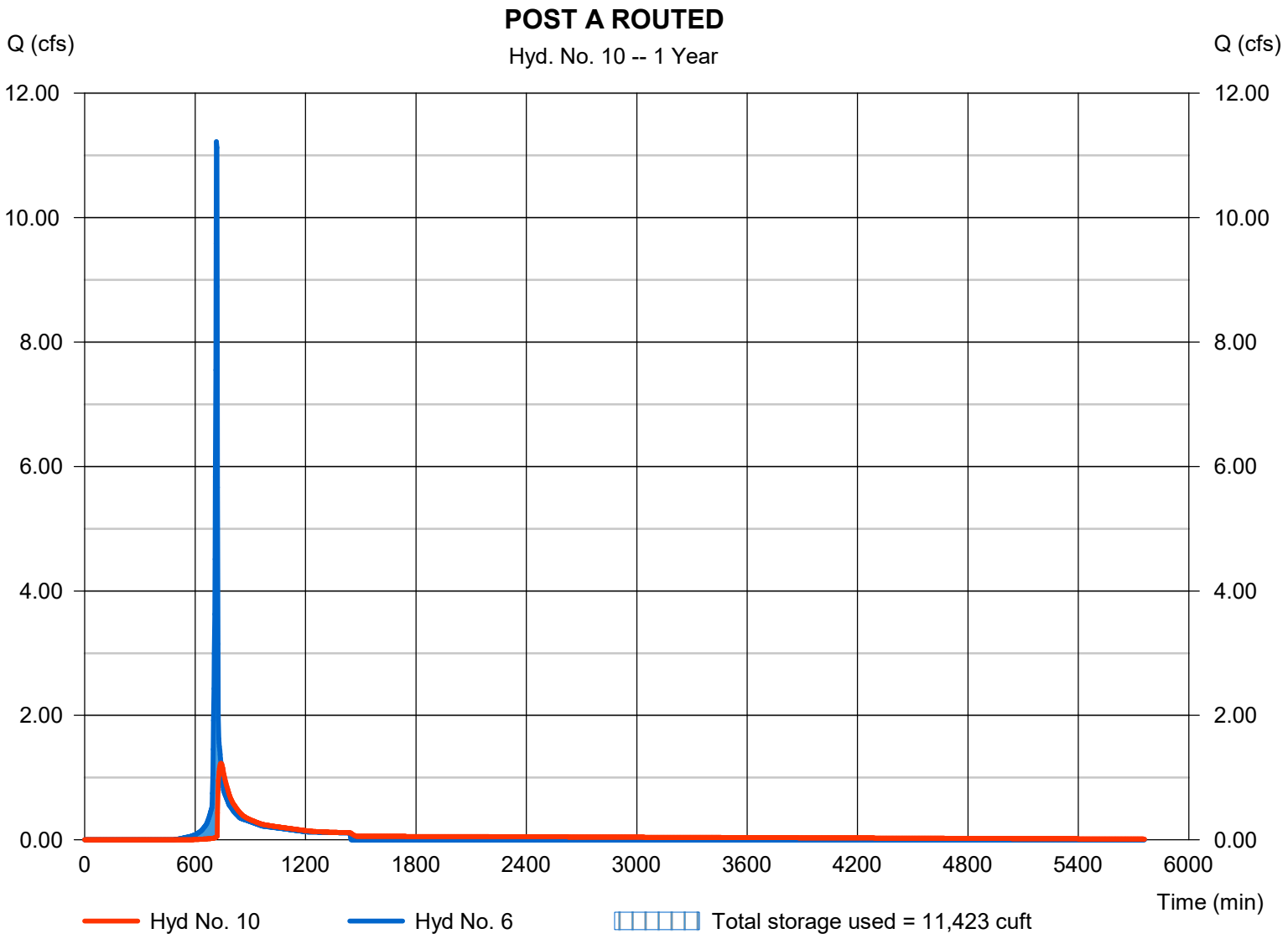
Hydrograph Report

Hyd. No. 10

POST A ROUTED

Hydrograph type	=	Reservoir	Peak discharge	=	1.228 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	22,139 cuft
Inflow hyd. No.	=	6 - Area To SCM	Max. Elevation	=	280.83 ft
Reservoir name	=	SCM #1	Max. Storage	=	11,423 cuft

Storage Indication method used.

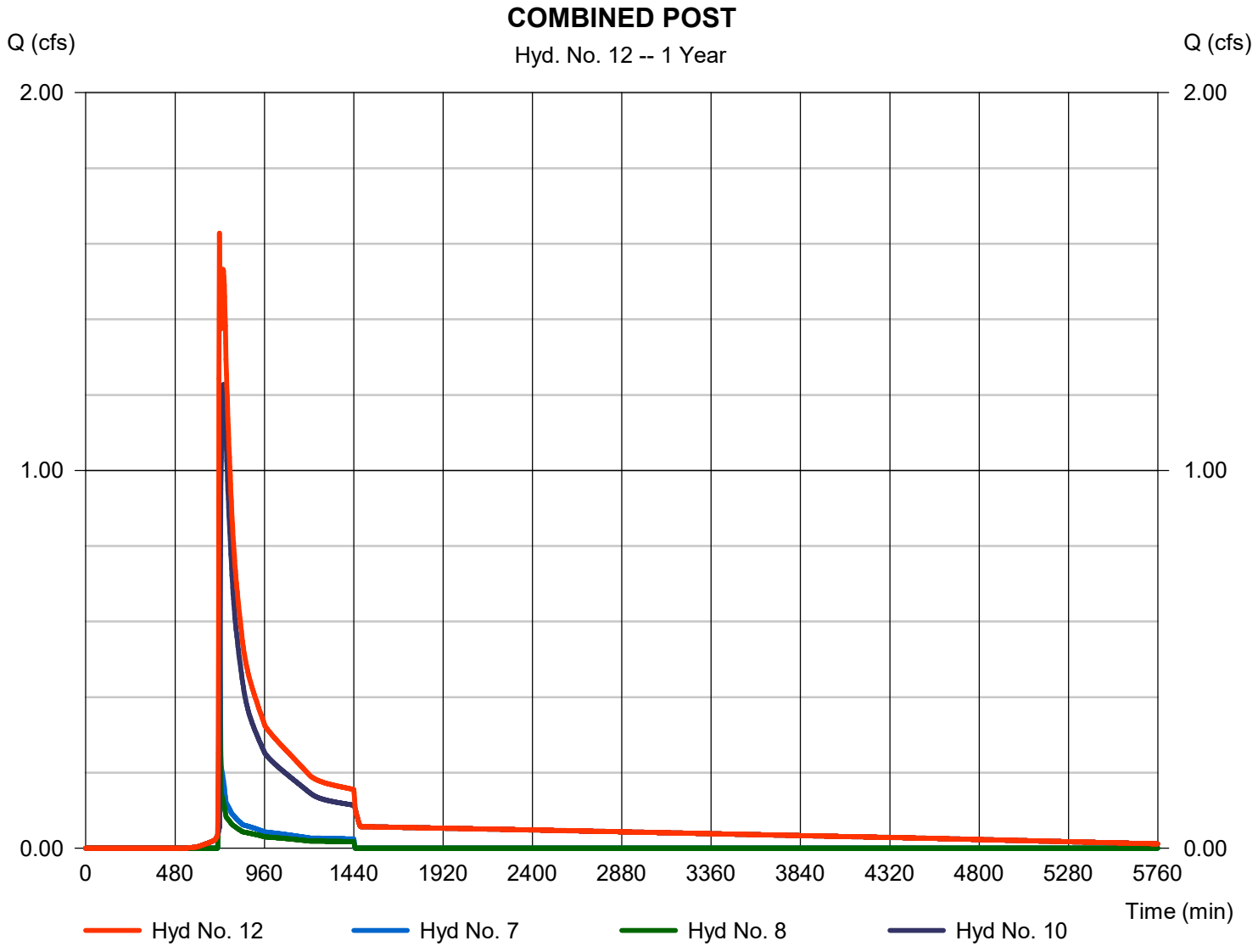


Hydrograph Report

Hyd. No. 12

COMBINED POST

Hydrograph type	=	Combine	Peak discharge	=	1.628 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	26,420 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	3.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

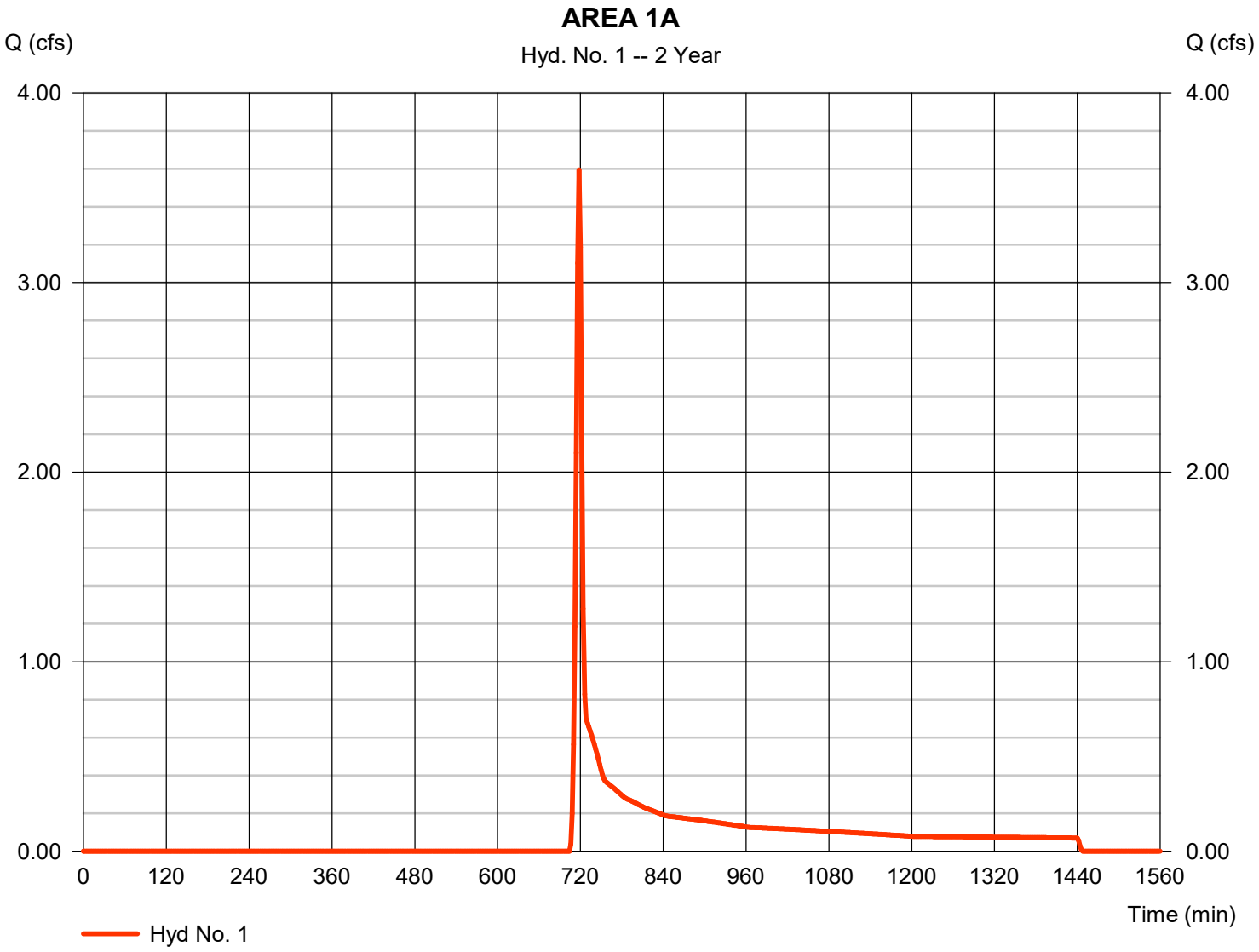
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.594	2	718	8,200	------	------	------	AREA 1A
2	SCS Runoff	2.705	2	720	7,515	------	------	------	AREA 1B
4	Combine	5.990	2	718	15,715	1, 2,	------	------	COMBINED PRE
6	SCS Runoff	14.77	2	716	30,069	------	------	------	Area To SCM
7	SCS Runoff	1.941	2	718	4,314	------	------	------	SCM BYPASS 1
8	SCS Runoff	1.312	2	718	2,994	------	------	------	SCM BYPASS 2
10	Reservoir	6.880	2	722	29,500	6	281.19	13,410	POST A ROUTED
12	Combine	8.834	2	722	36,808	7, 8, 10,	------	------	COMBINED POST

Hydrograph Report

Hyd. No. 1

AREA 1A

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.594 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	8,200 cuft
Drainage area	=	4.190 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.30 min
Total precip.	=	3.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

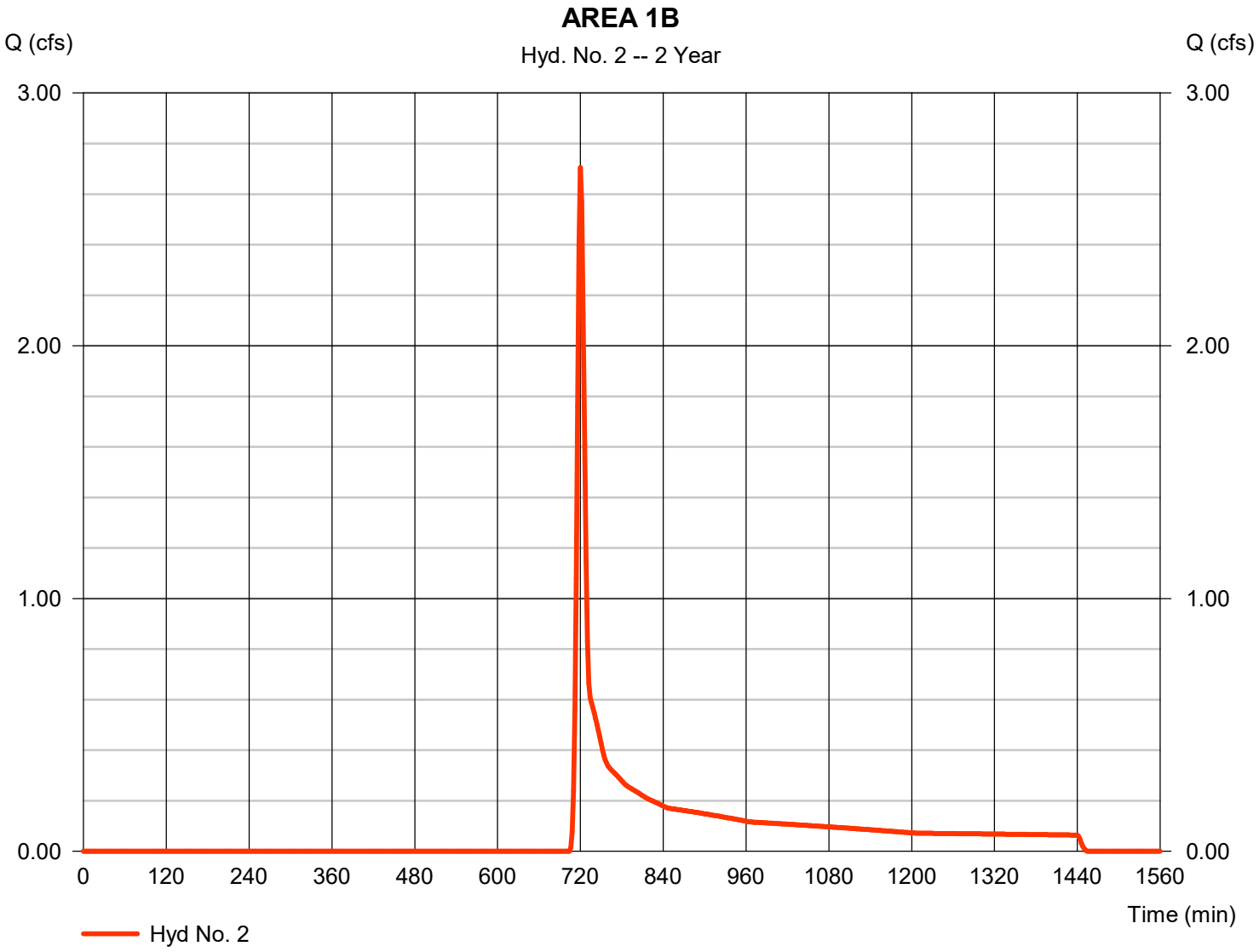


Hydrograph Report

Hyd. No. 2

AREA 1B

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.705 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	7,515 cuft
Drainage area	=	3.600 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.60 min
Total precip.	=	3.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

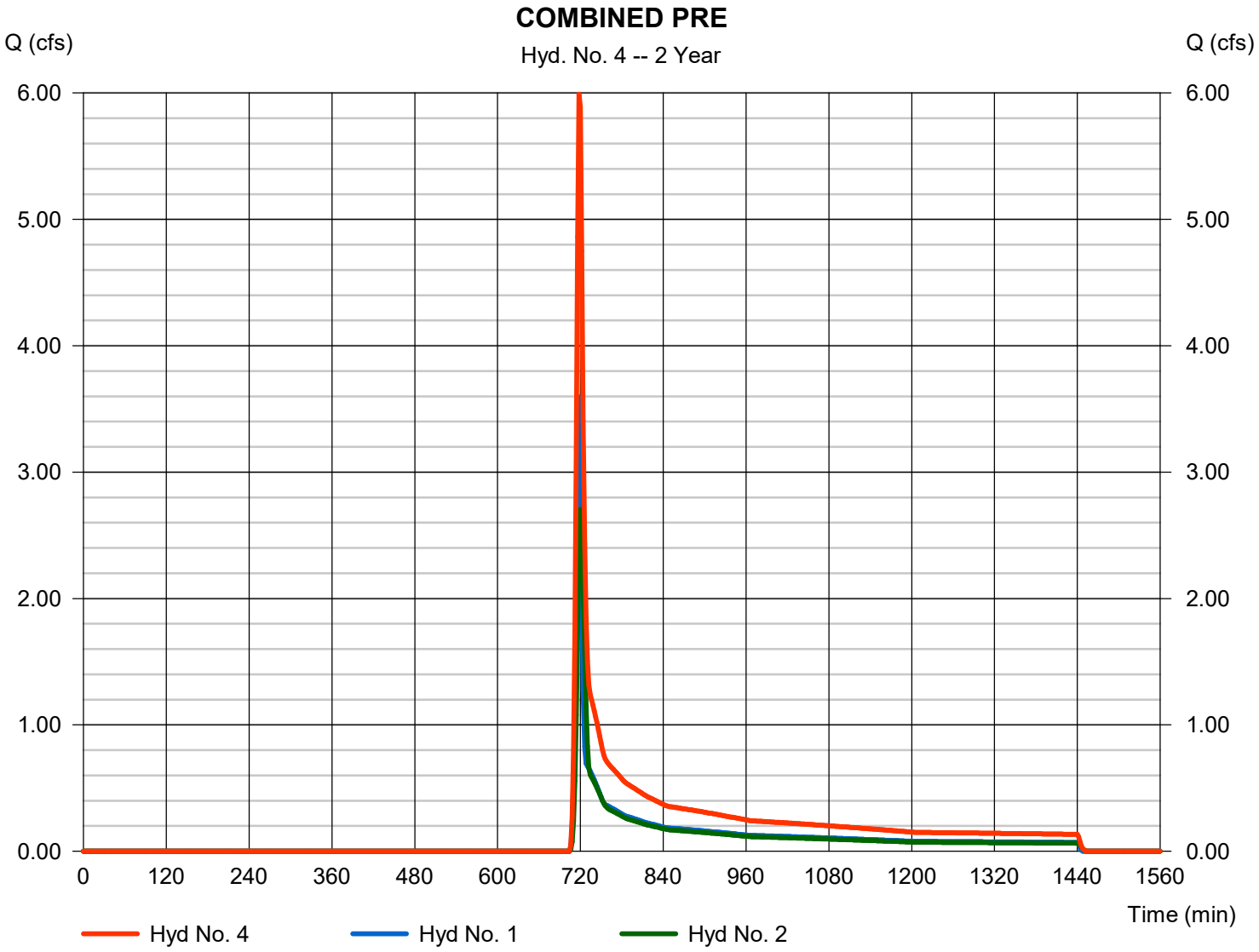


Hydrograph Report

Hyd. No. 4

COMBINED PRE

Hydrograph type	=	Combine	Peak discharge	=	5.990 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	15,715 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.790 ac

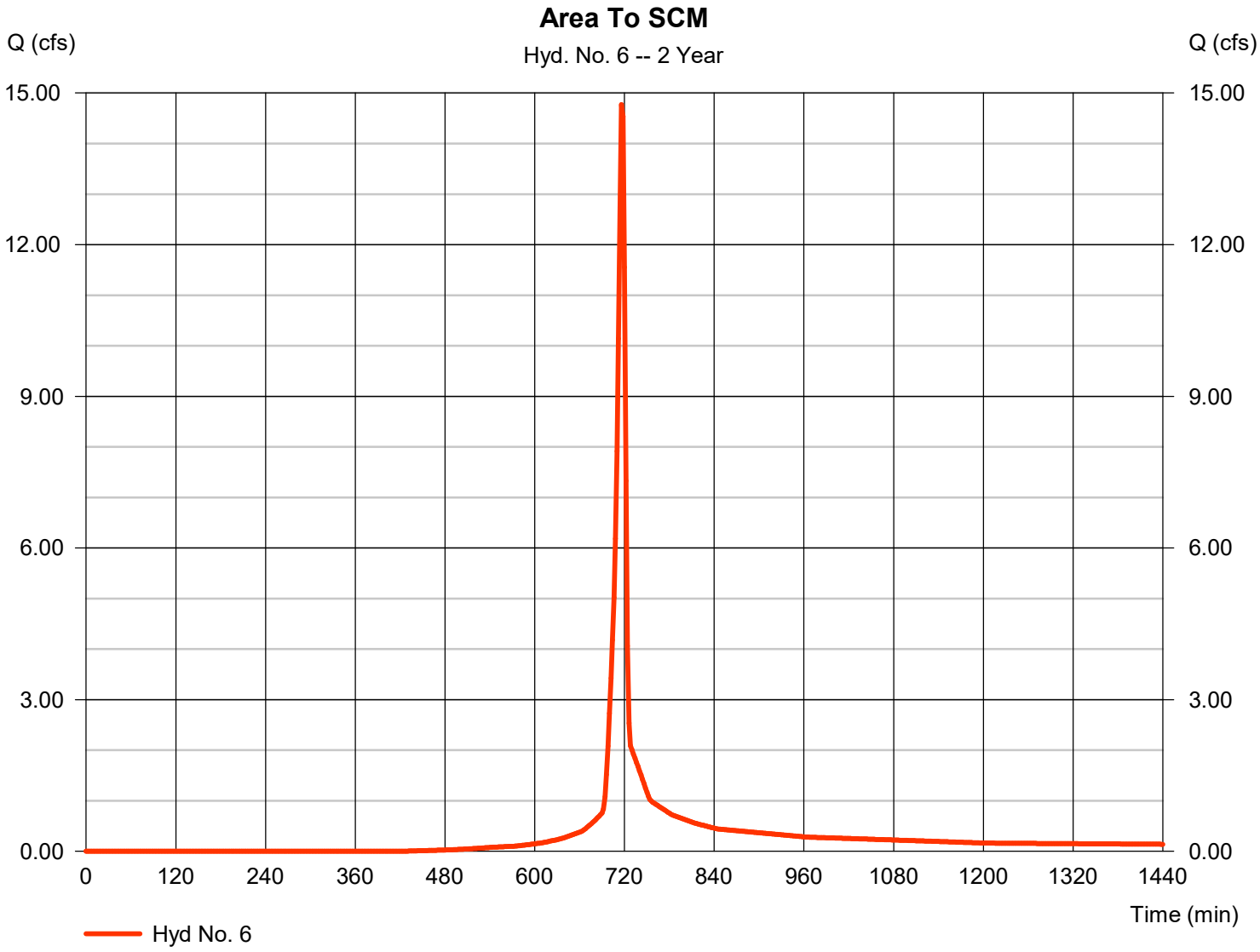


Hydrograph Report

Hyd. No. 6

Area To SCM

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.77 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	30,069 cuft
Drainage area	=	4.200 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

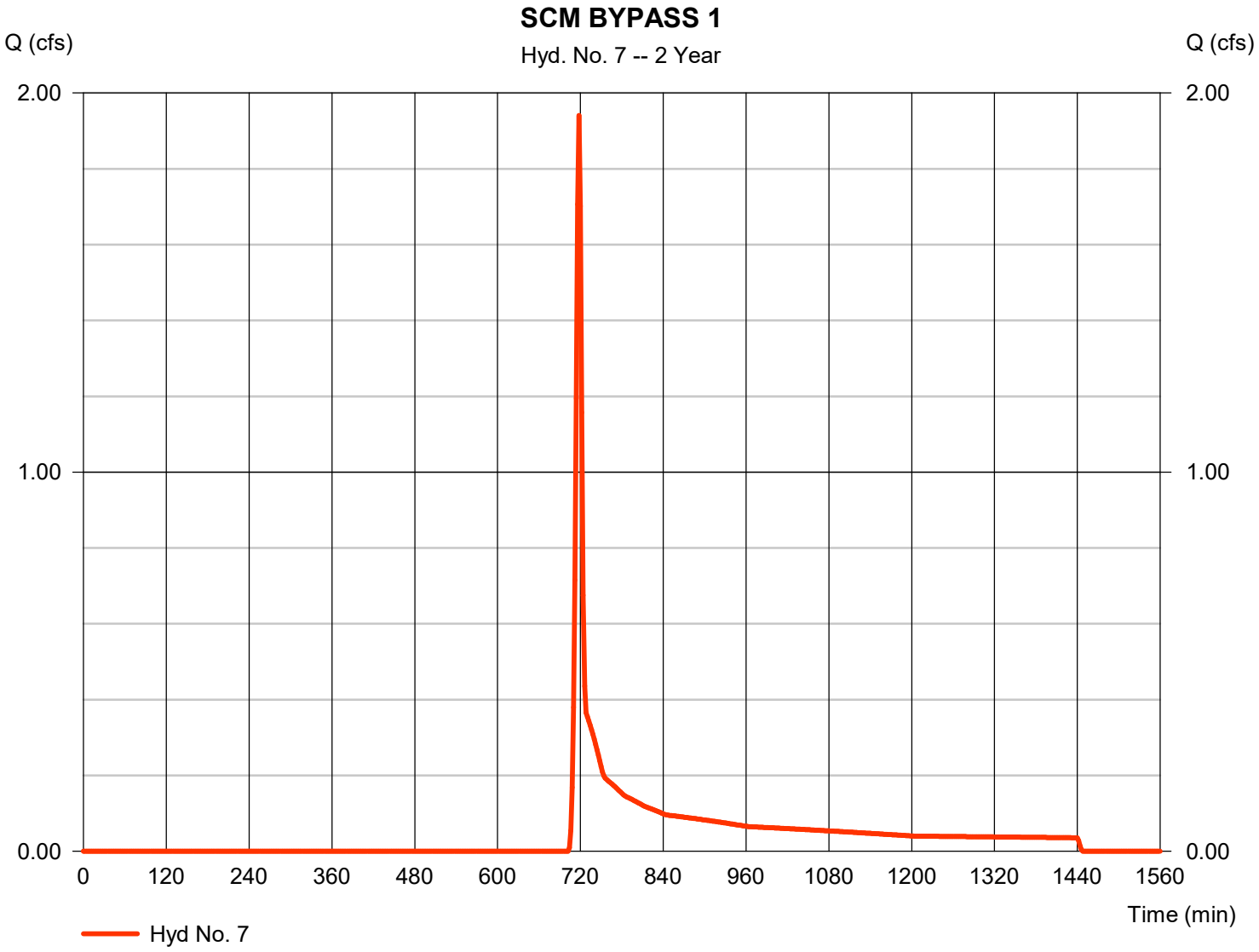


Hydrograph Report

Hyd. No. 7

SCM BYPASS 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.941 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	4,314 cuft
Drainage area	=	2.050 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

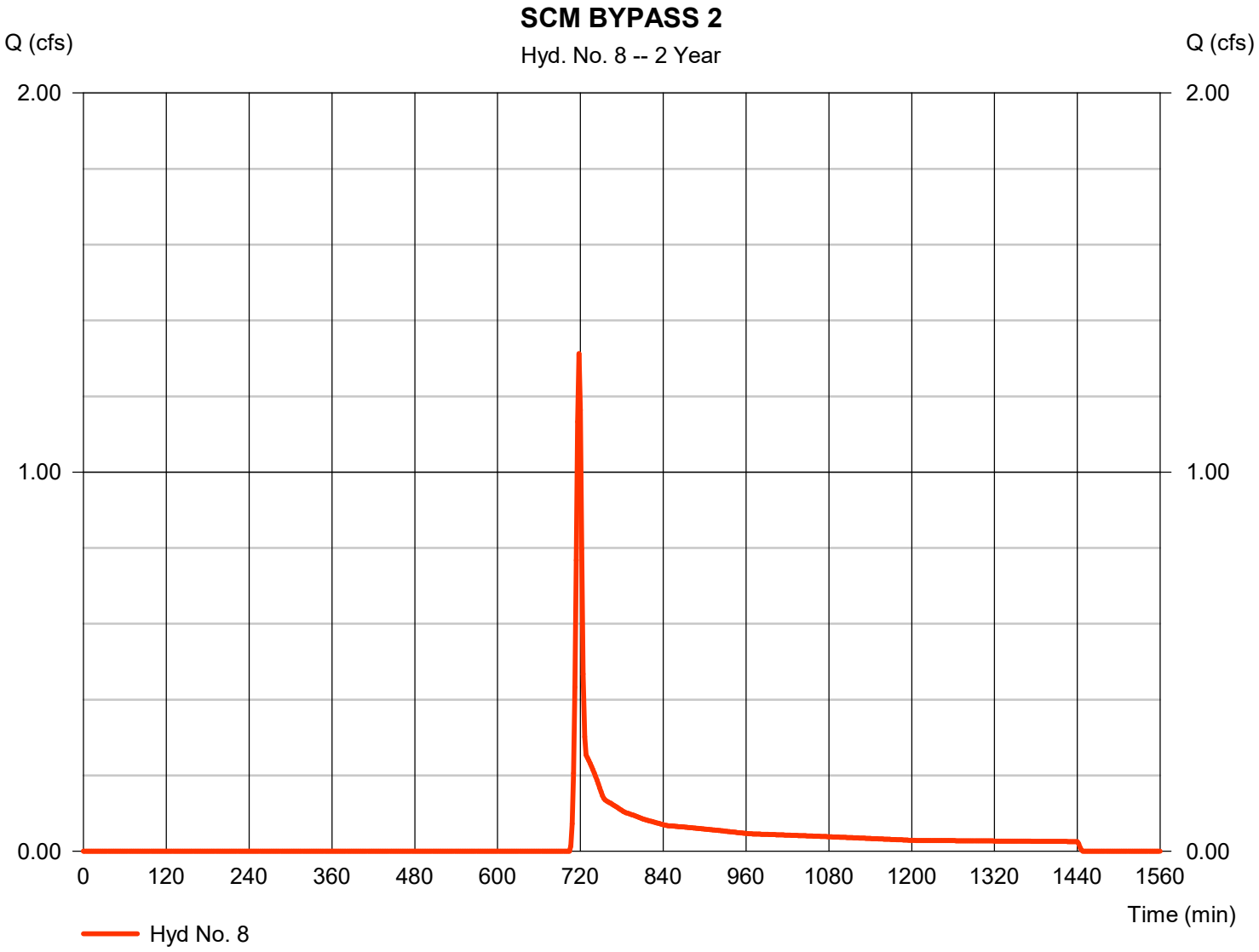


Hydrograph Report

Hyd. No. 8

SCM BYPASS 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.312 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	2,994 cuft
Drainage area	=	1.530 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



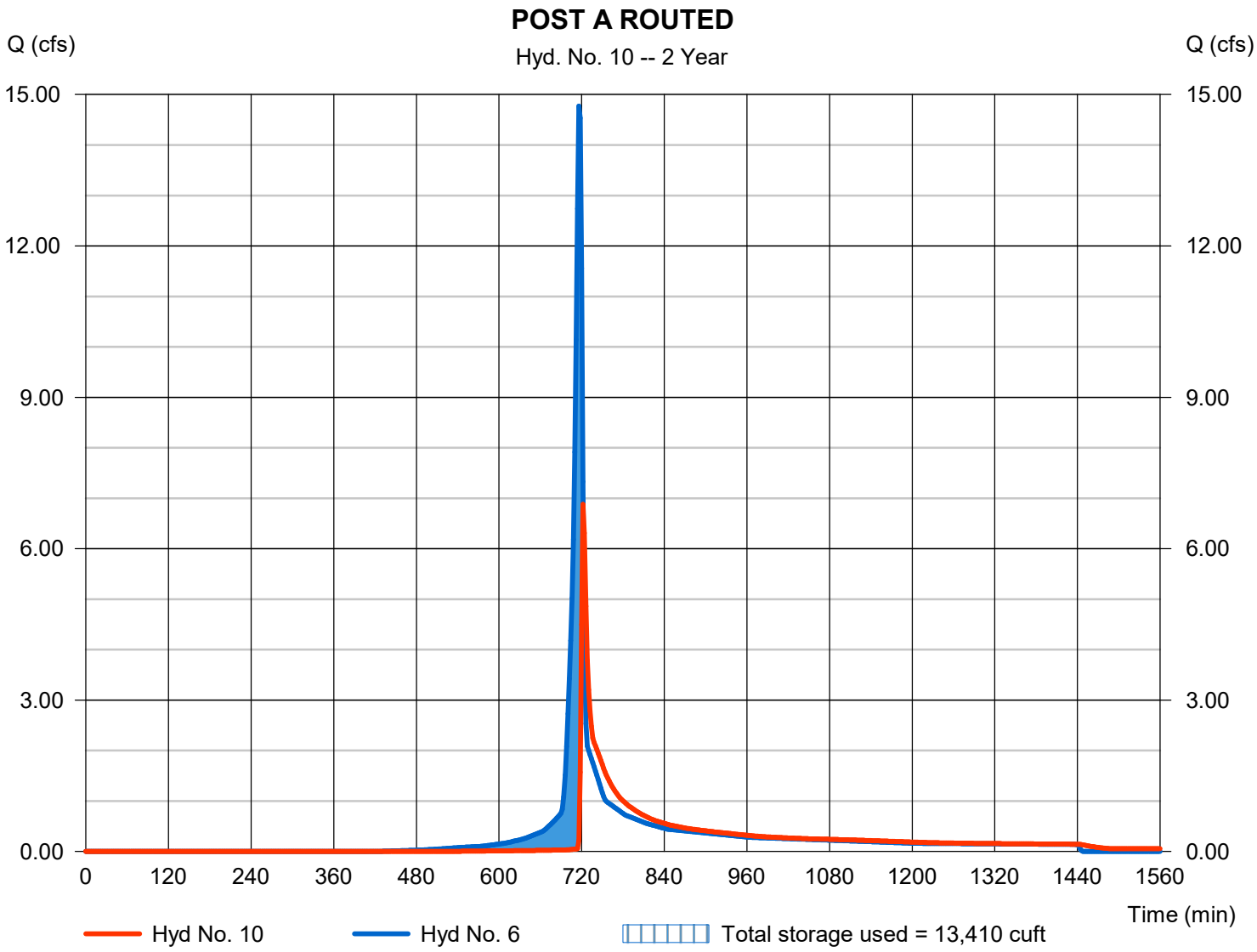
Hydrograph Report

Hyd. No. 10

POST A ROUTED

Hydrograph type	=	Reservoir	Peak discharge	=	6.880 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	29,500 cuft
Inflow hyd. No.	=	6 - Area To SCM	Max. Elevation	=	281.19 ft
Reservoir name	=	SCM #1	Max. Storage	=	13,410 cuft

Storage Indication method used.

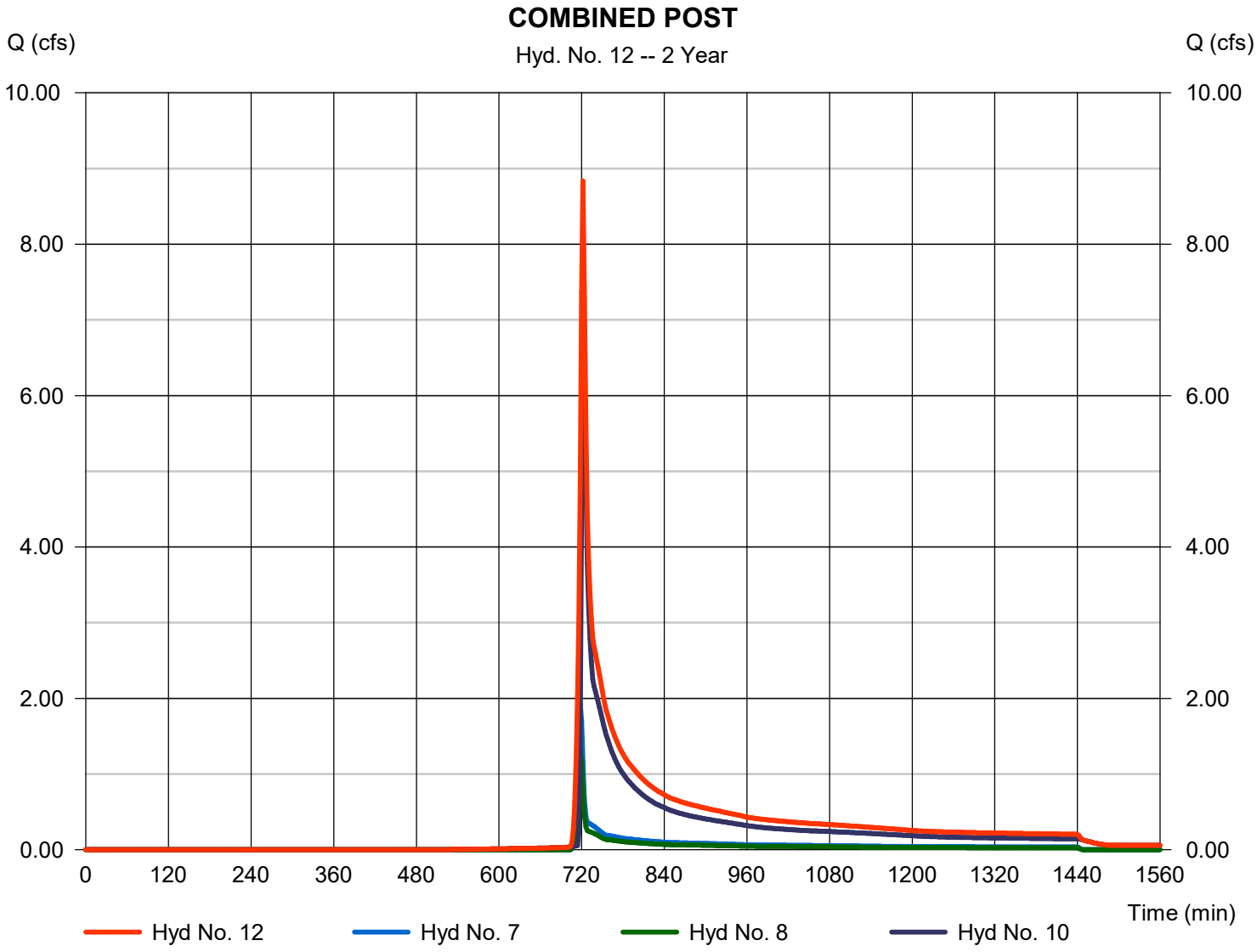


Hydrograph Report

Hyd. No. 12

COMBINED POST

Hydrograph type	=	Combine	Peak discharge	=	8.834 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	36,808 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	3.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

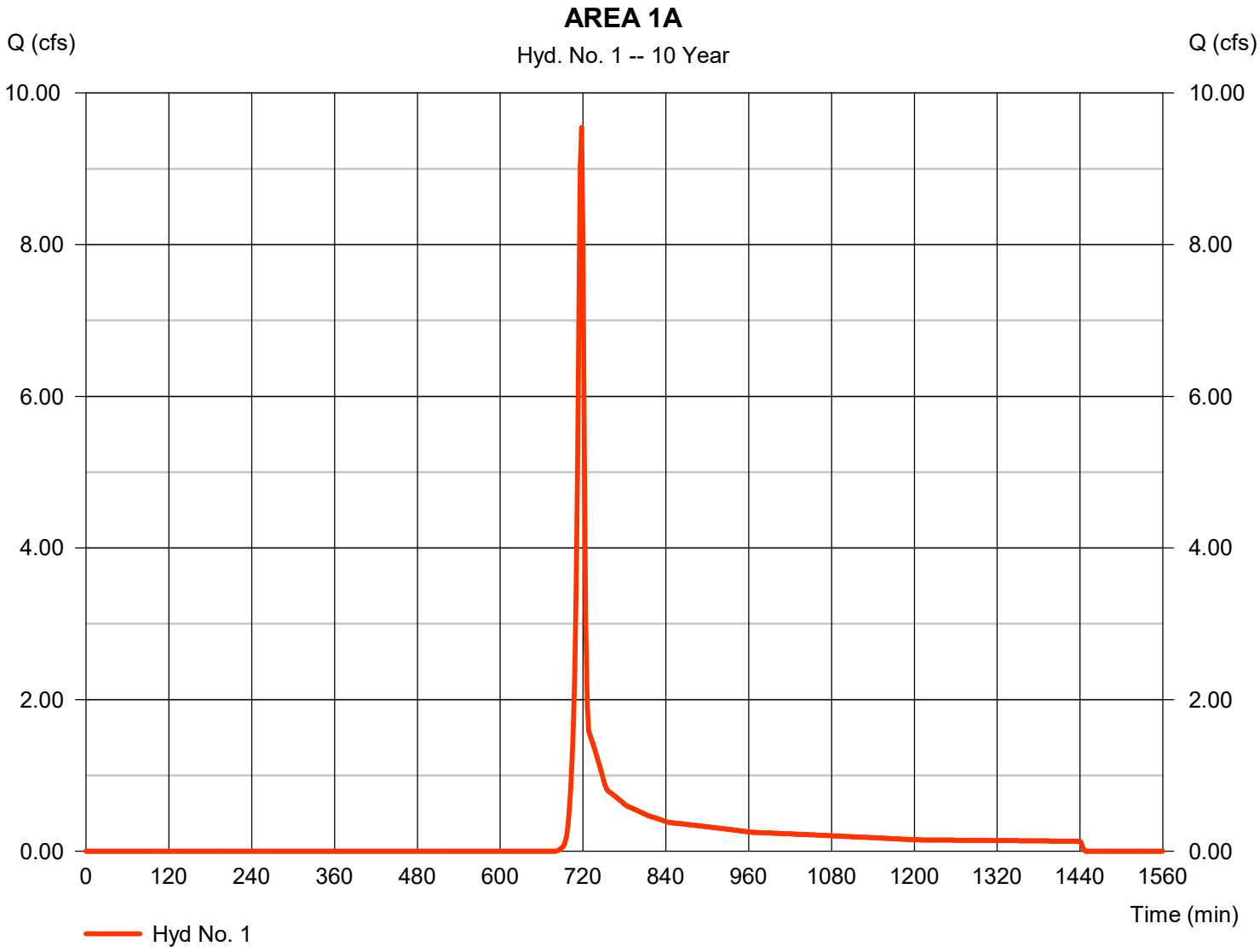
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.544	2	718	19,390	------	------	------	AREA 1A
2	SCS Runoff	7.498	2	720	17,771	------	------	------	AREA 1B
4	Combine	16.73	2	718	37,161	1, 2,	------	------	COMBINED PRE
6	SCS Runoff	23.82	2	716	49,463	------	------	------	Area To SCM
7	SCS Runoff	4.932	2	718	9,973	------	------	------	SCM BYPASS 1
8	SCS Runoff	3.485	2	718	7,080	------	------	------	SCM BYPASS 2
10	Reservoir	20.25	2	720	48,881	6	281.59	15,727	POST A ROUTED
12	Combine	28.44	2	718	65,934	7, 8, 10,	------	------	COMBINED POST

Hydrograph Report

Hyd. No. 1

AREA 1A

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.544 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	19,390 cuft
Drainage area	=	4.190 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.30 min
Total precip.	=	5.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

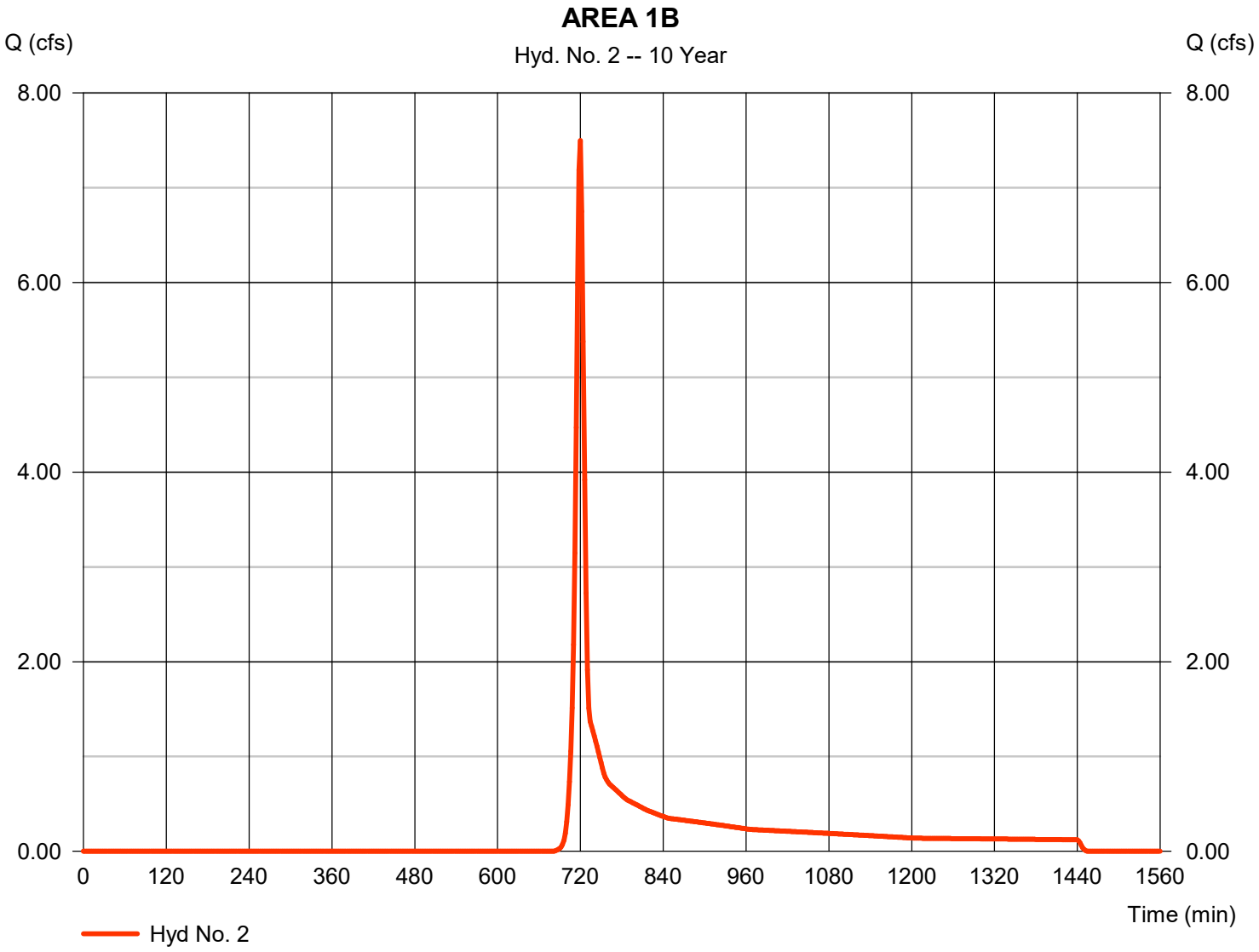


Hydrograph Report

Hyd. No. 2

AREA 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 7.498 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 17,771 cuft
Drainage area	= 3.600 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 8.60 min
Total precip.	= 5.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

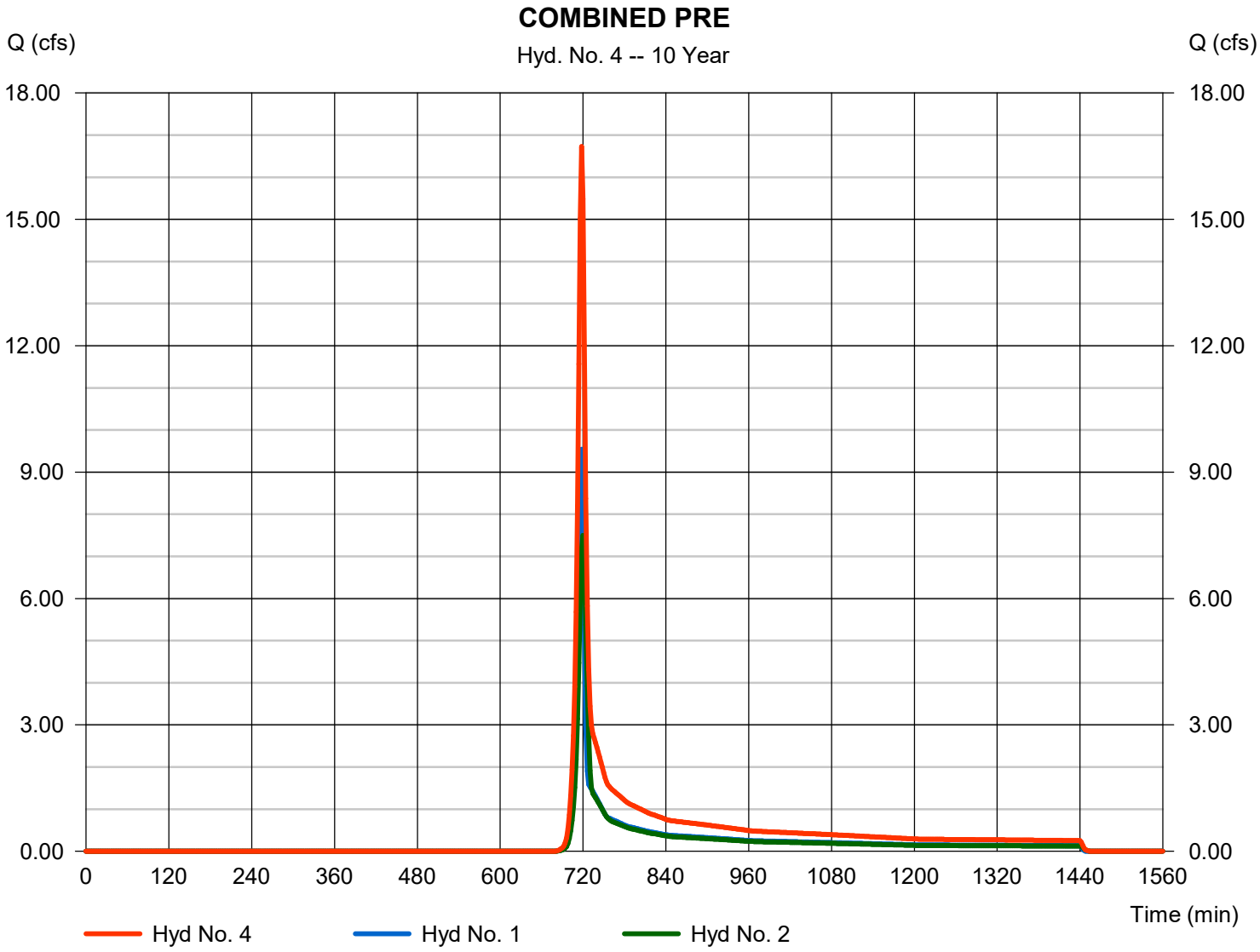


Hydrograph Report

Hyd. No. 4

COMBINED PRE

Hydrograph type	=	Combine	Peak discharge	=	16.73 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	37,161 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.790 ac

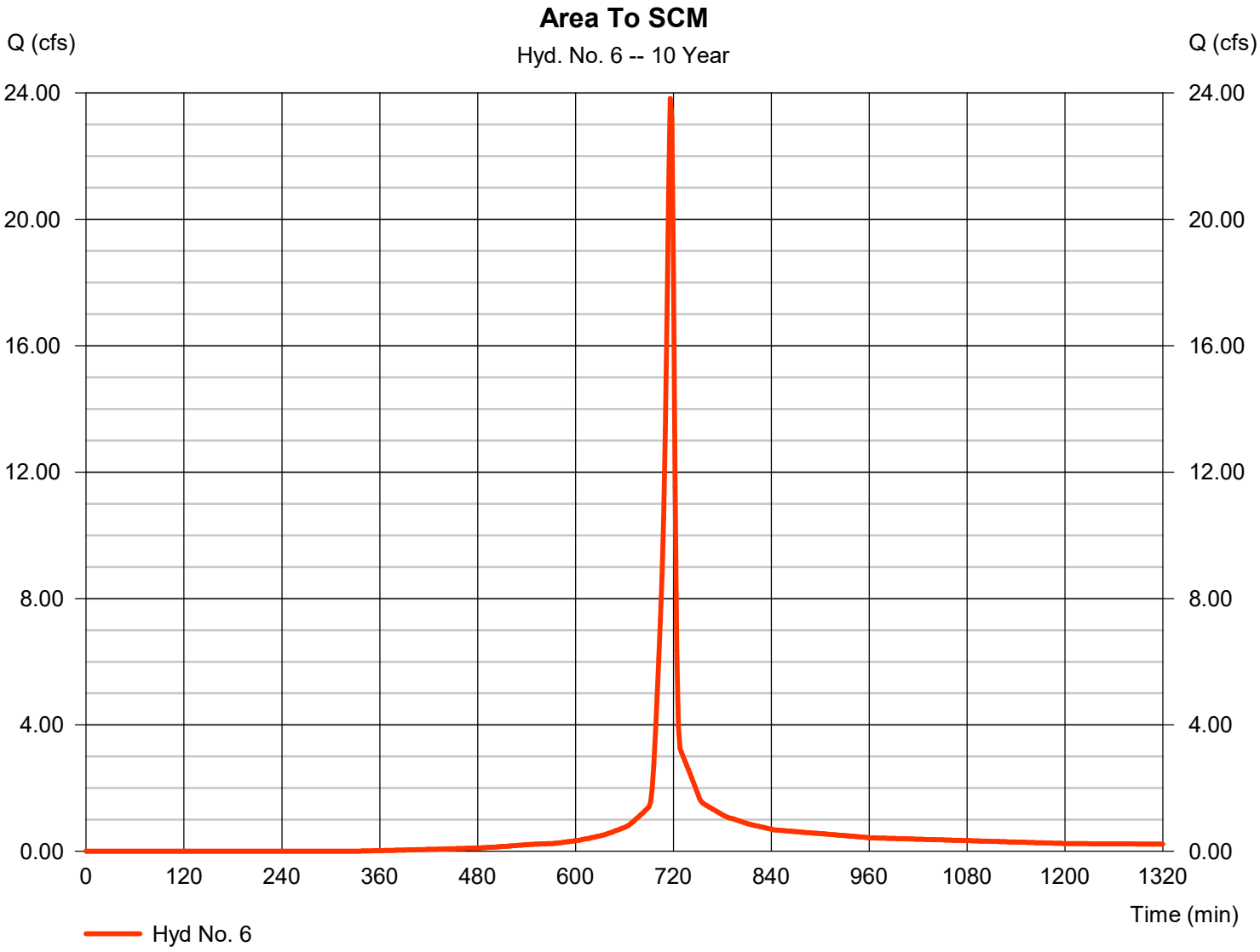


Hydrograph Report

Hyd. No. 6

Area To SCM

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.82 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	49,463 cuft
Drainage area	=	4.200 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

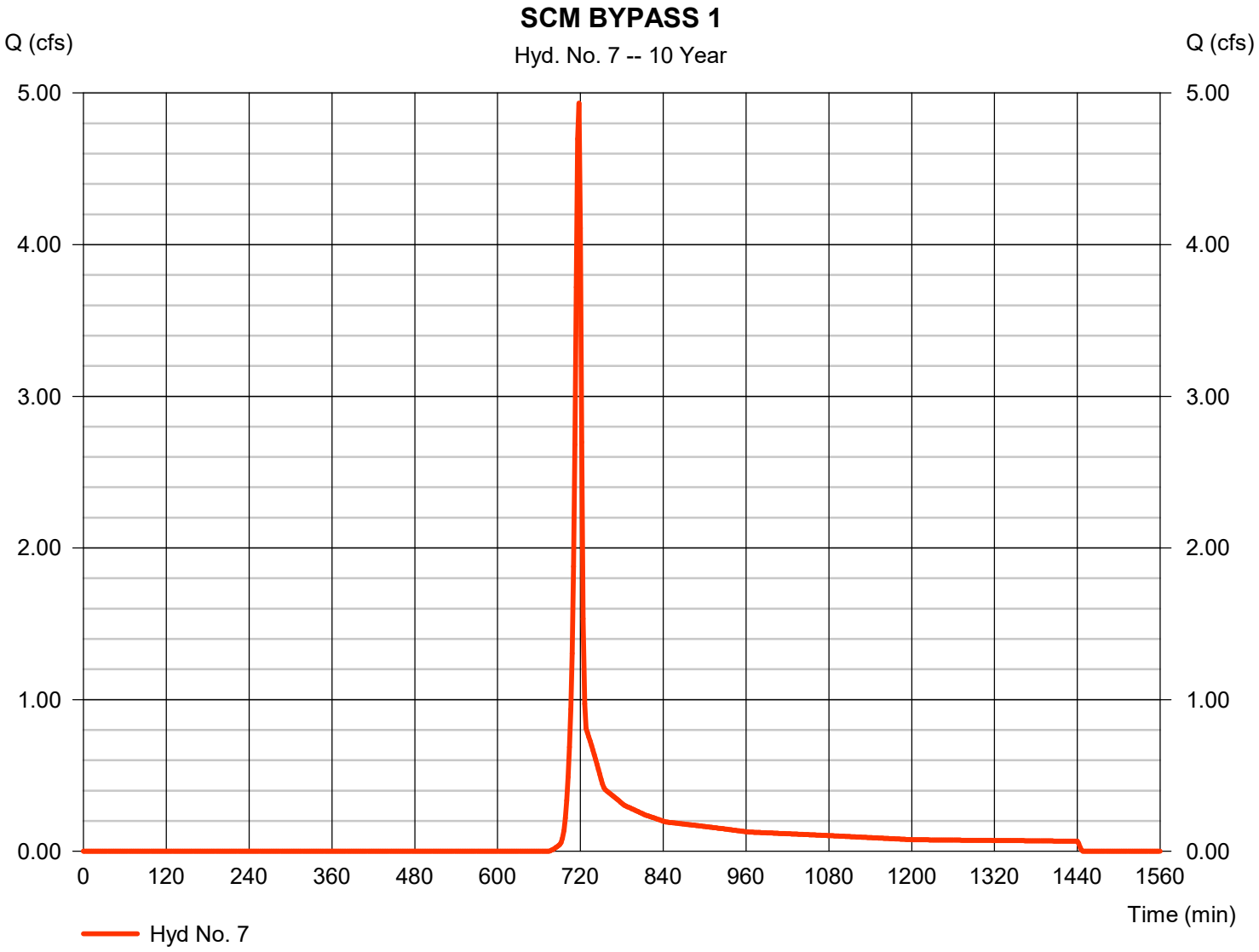


Hydrograph Report

Hyd. No. 7

SCM BYPASS 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.932 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	9,973 cuft
Drainage area	=	2.050 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

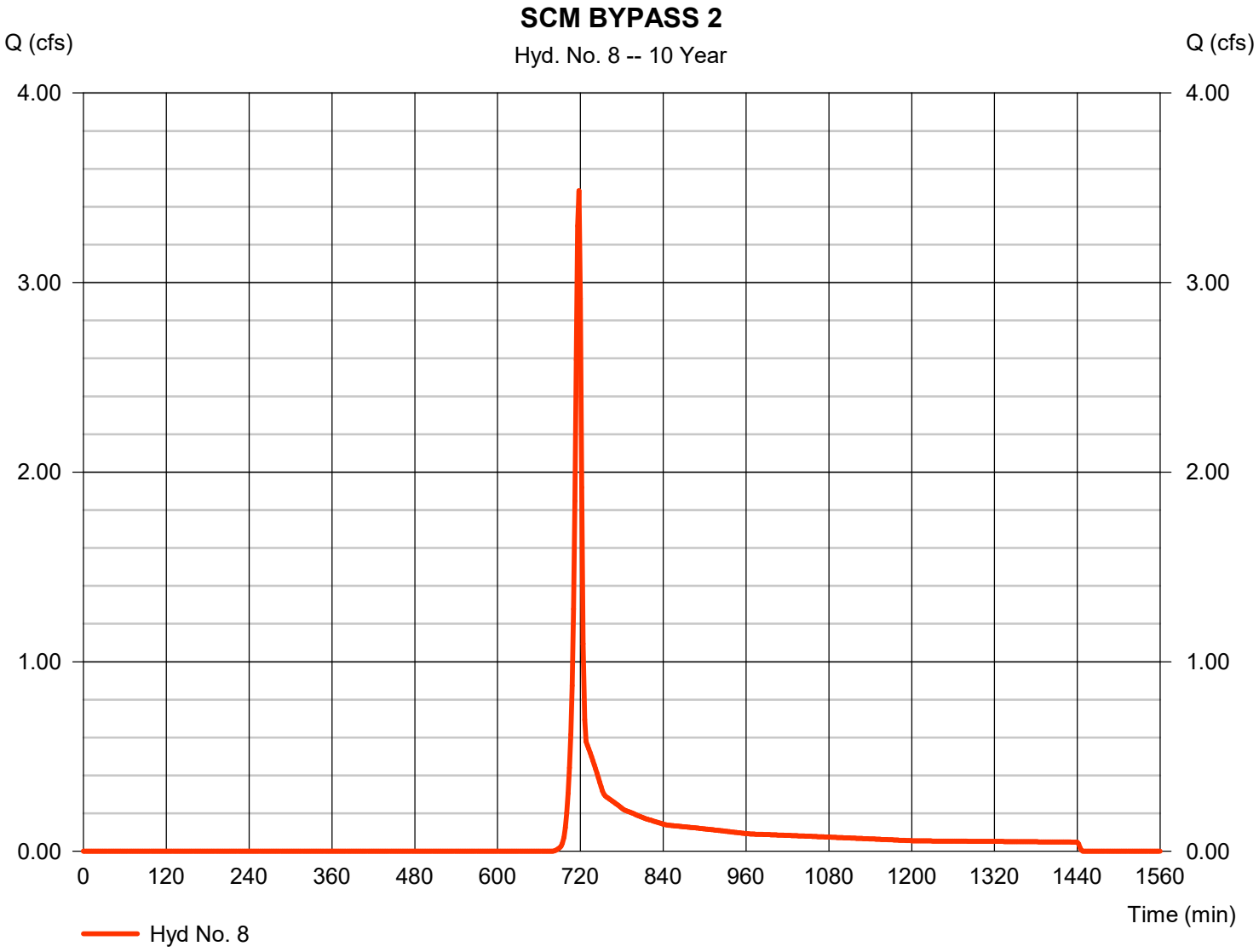


Hydrograph Report

Hyd. No. 8

SCM BYPASS 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.485 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	7,080 cuft
Drainage area	=	1.530 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



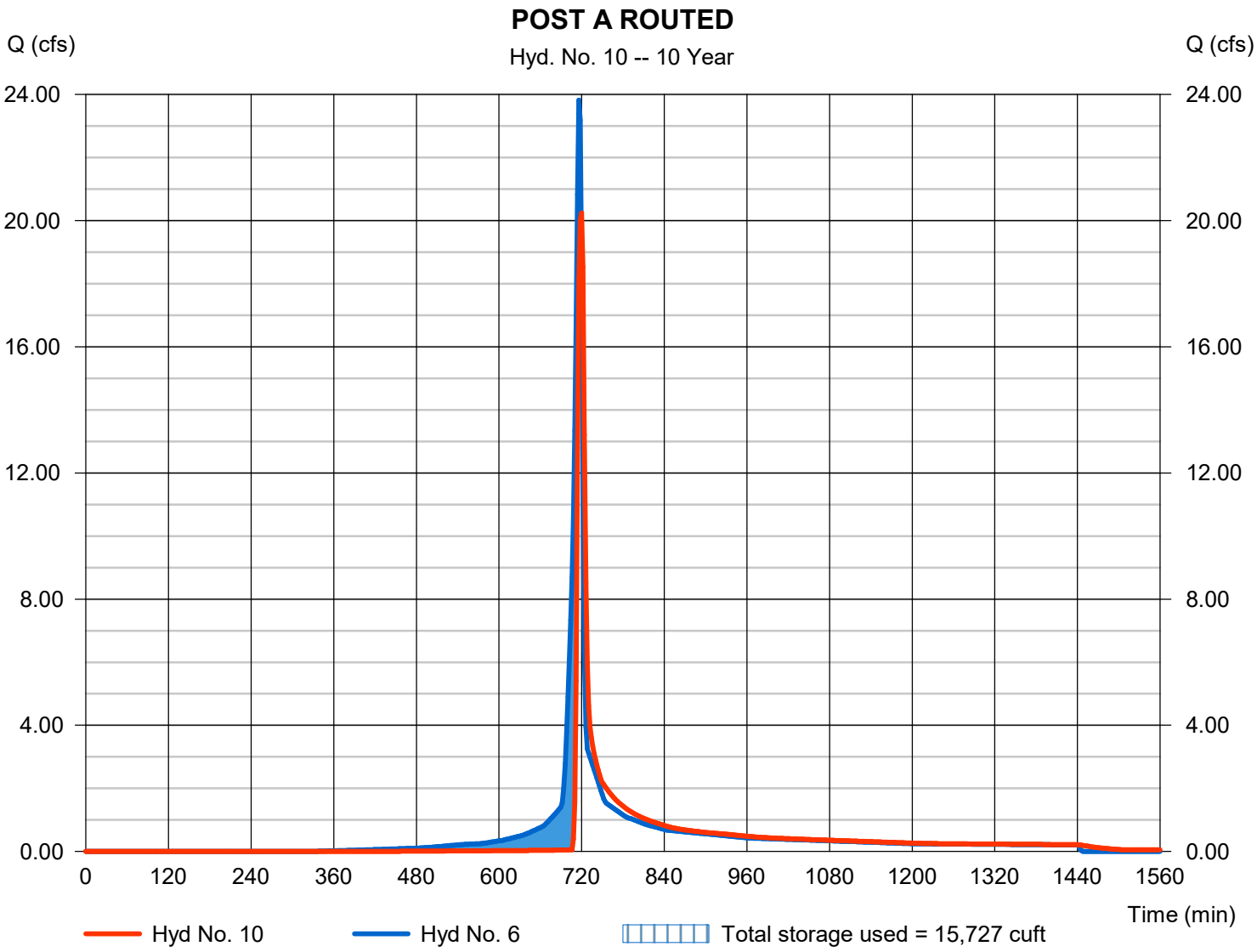
Hydrograph Report

Hyd. No. 10

POST A ROUTED

Hydrograph type	=	Reservoir	Peak discharge	=	20.25 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	48,881 cuft
Inflow hyd. No.	=	6 - Area To SCM	Max. Elevation	=	281.59 ft
Reservoir name	=	SCM #1	Max. Storage	=	15,727 cuft

Storage Indication method used.

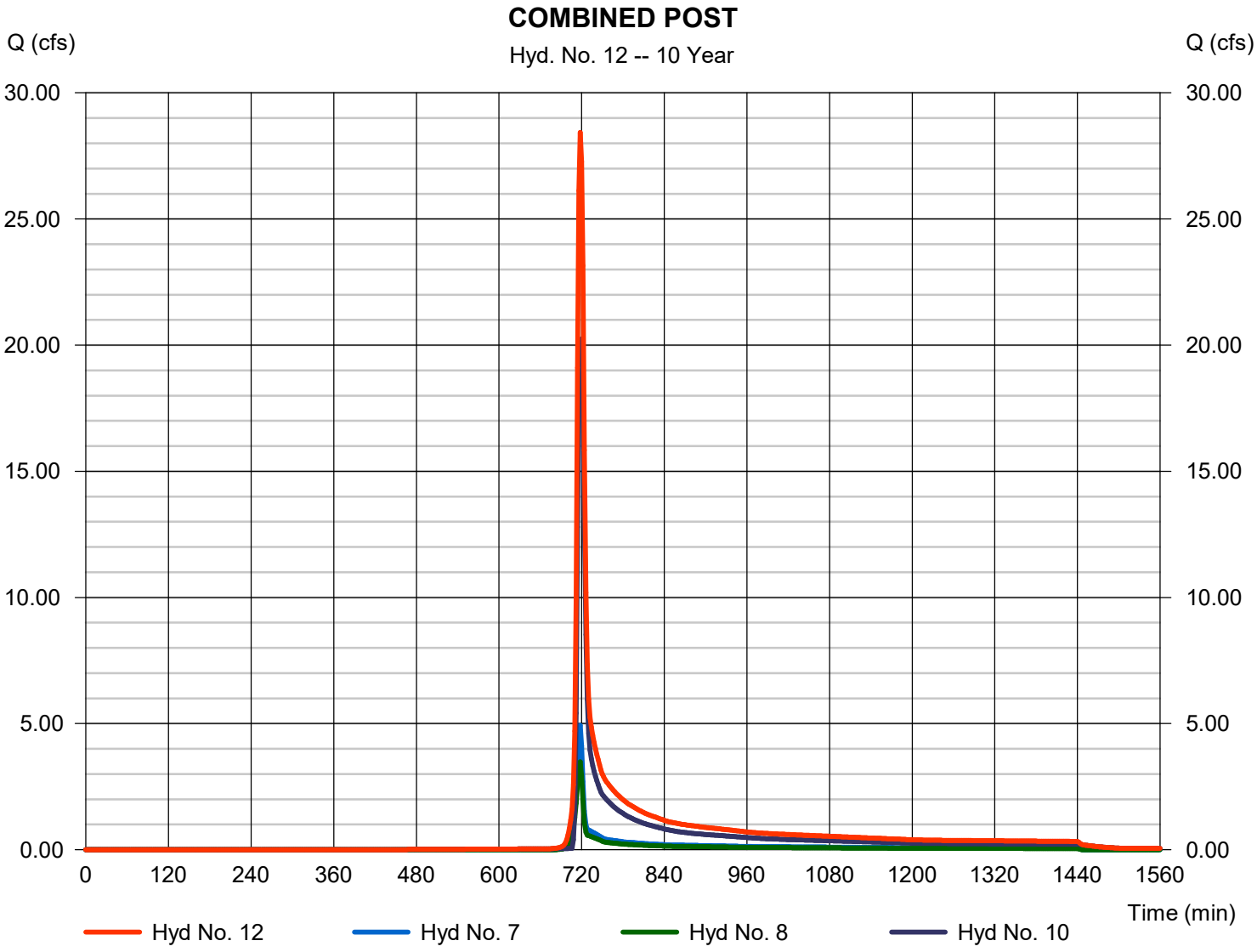


Hydrograph Report

Hyd. No. 12

COMBINED POST

Hydrograph type	=	Combine	Peak discharge	=	28.44 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	65,934 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	3.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

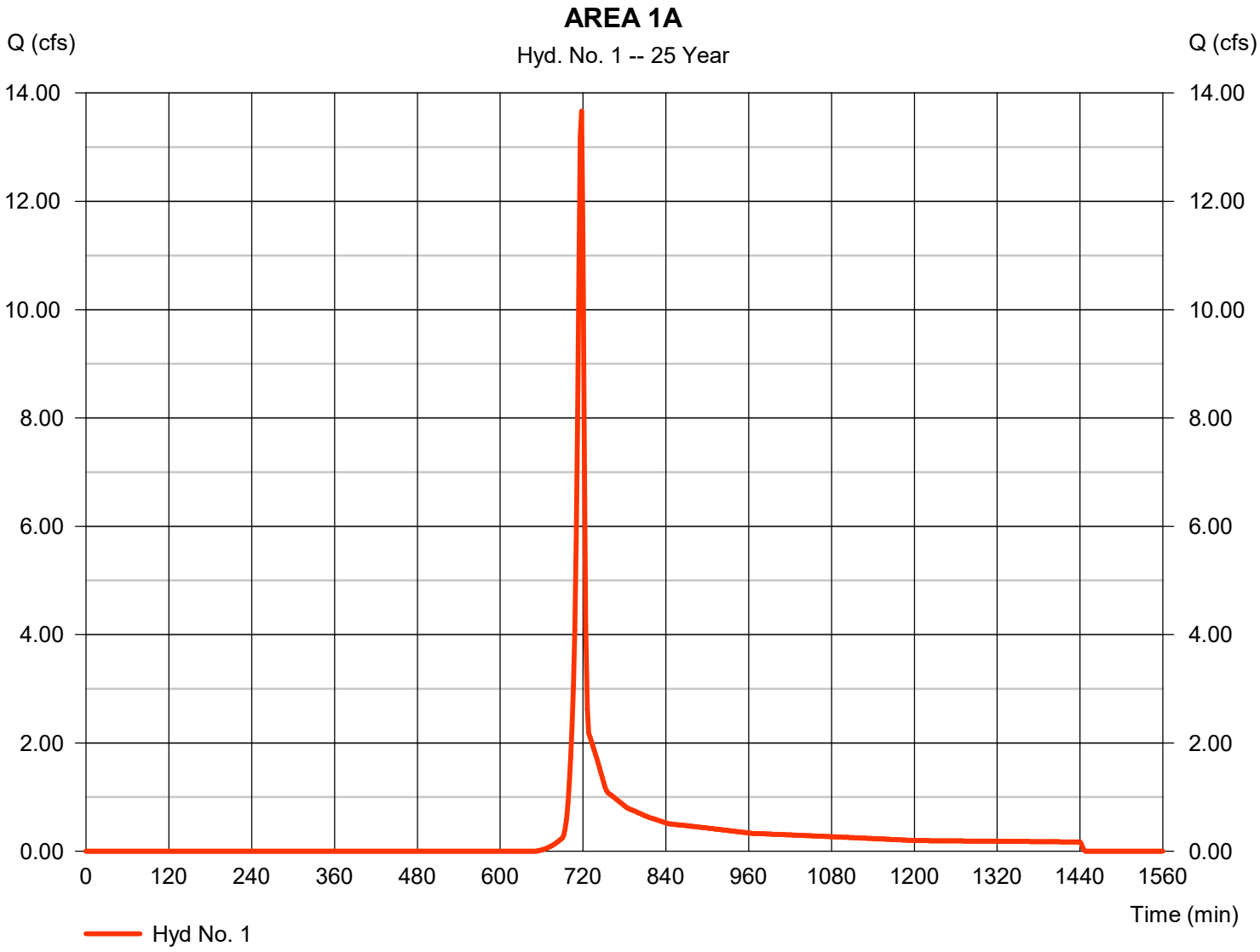
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	13.66	2	718	27,400	------	------	------	AREA 1A
2	SCS Runoff	10.84	2	720	25,111	------	------	------	AREA 1B
4	Combine	24.22	2	718	52,511	1, 2,	------	------	COMBINED PRE
6	SCS Runoff	29.28	2	716	61,496	------	------	------	Area To SCM
7	SCS Runoff	6.987	2	718	13,991	------	------	------	SCM BYPASS 1
8	SCS Runoff	4.989	2	718	10,005	------	------	------	SCM BYPASS 2
10	Reservoir	23.12	2	720	60,909	6	281.88	17,354	POST A ROUTED
12	Combine	34.75	2	718	84,906	7, 8, 10,	------	------	COMBINED POST

Hydrograph Report

Hyd. No. 1

AREA 1A

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.66 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	27,400 cuft
Drainage area	=	4.190 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.30 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

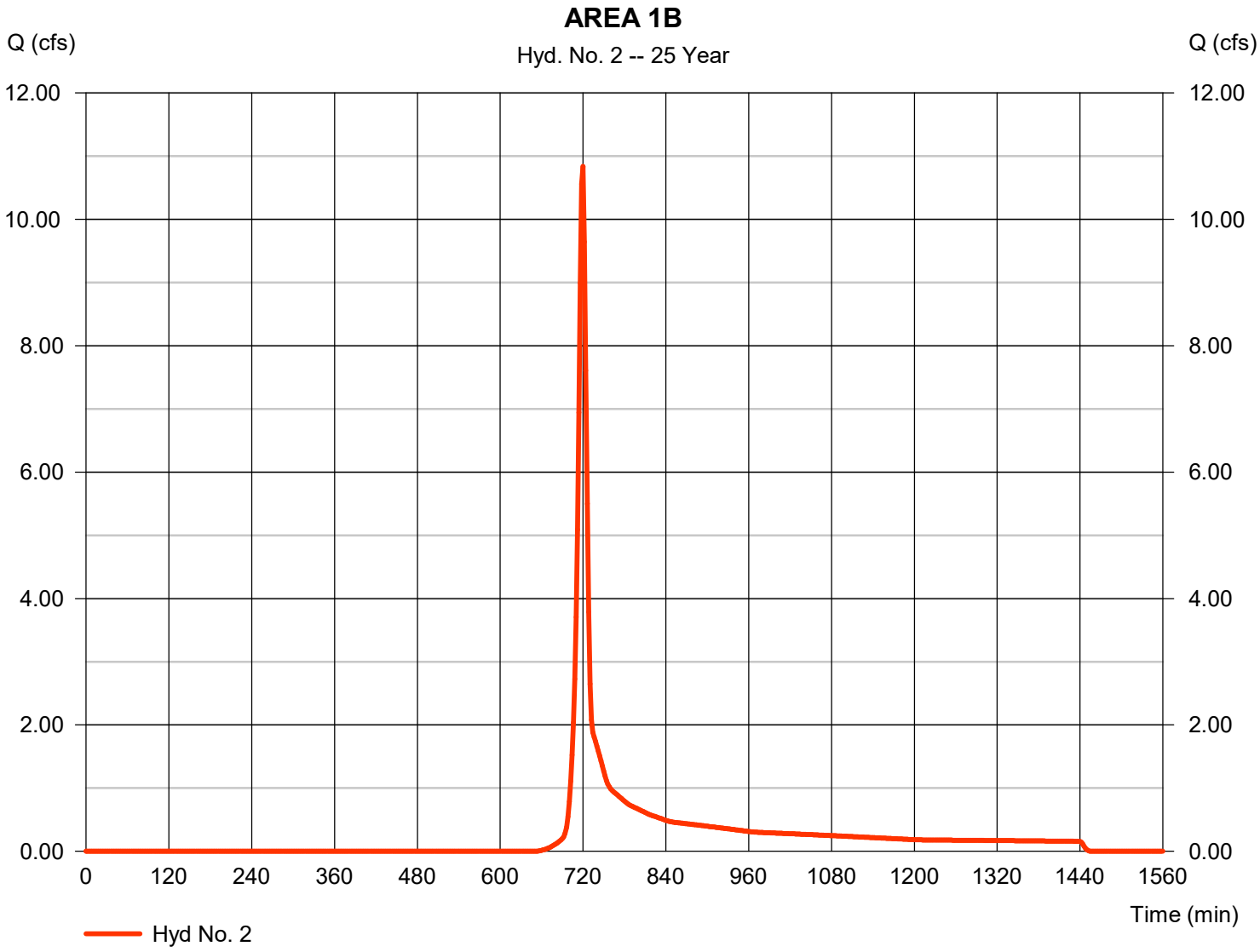


Hydrograph Report

Hyd. No. 2

AREA 1B

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.84 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	25,111 cuft
Drainage area	=	3.600 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.60 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

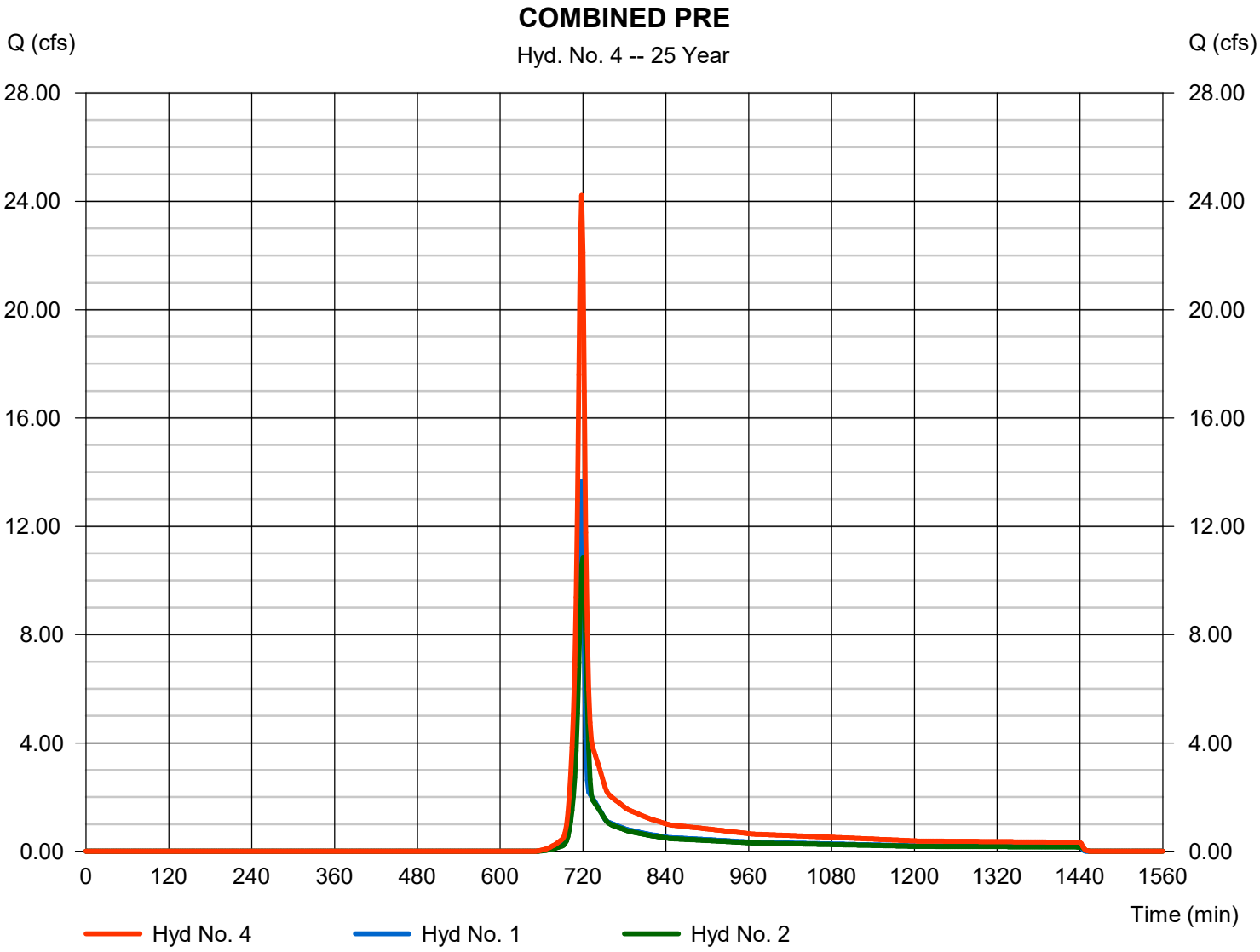


Hydrograph Report

Hyd. No. 4

COMBINED PRE

Hydrograph type	=	Combine	Peak discharge	=	24.22 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	52,511 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.790 ac

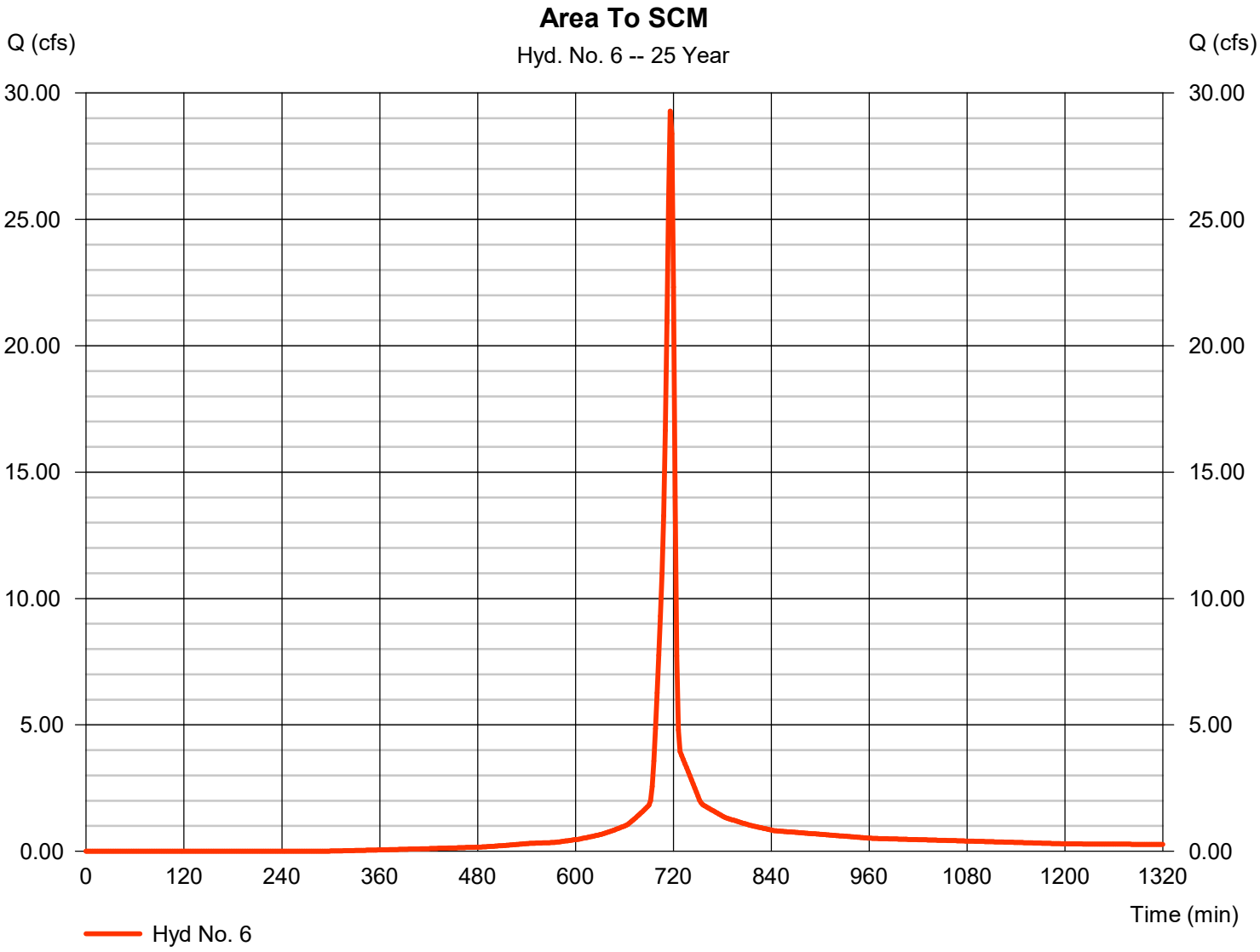


Hydrograph Report

Hyd. No. 6

Area To SCM

Hydrograph type	=	SCS Runoff	Peak discharge	=	29.28 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	61,496 cuft
Drainage area	=	4.200 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

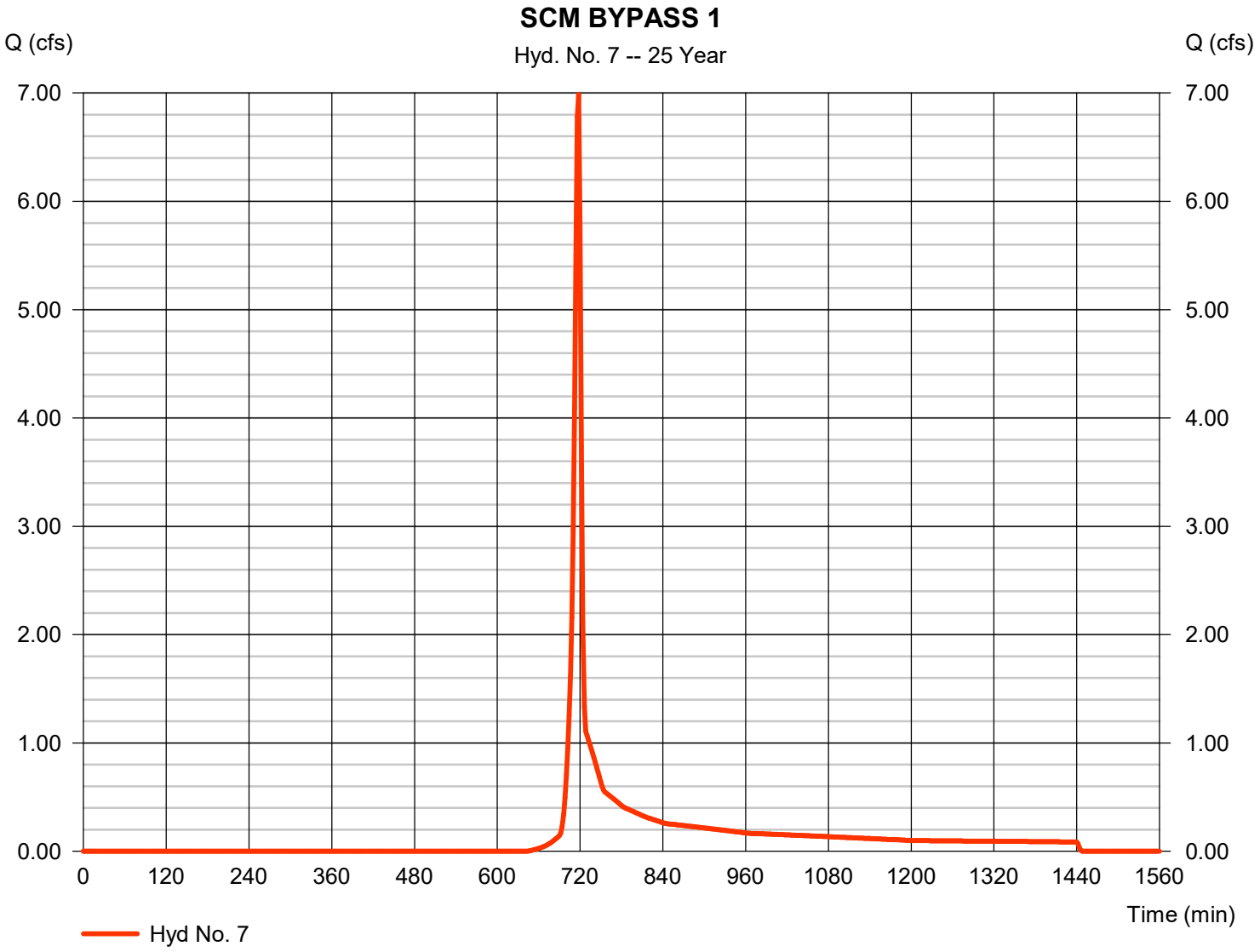


Hydrograph Report

Hyd. No. 7

SCM BYPASS 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.987 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	13,991 cuft
Drainage area	=	2.050 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

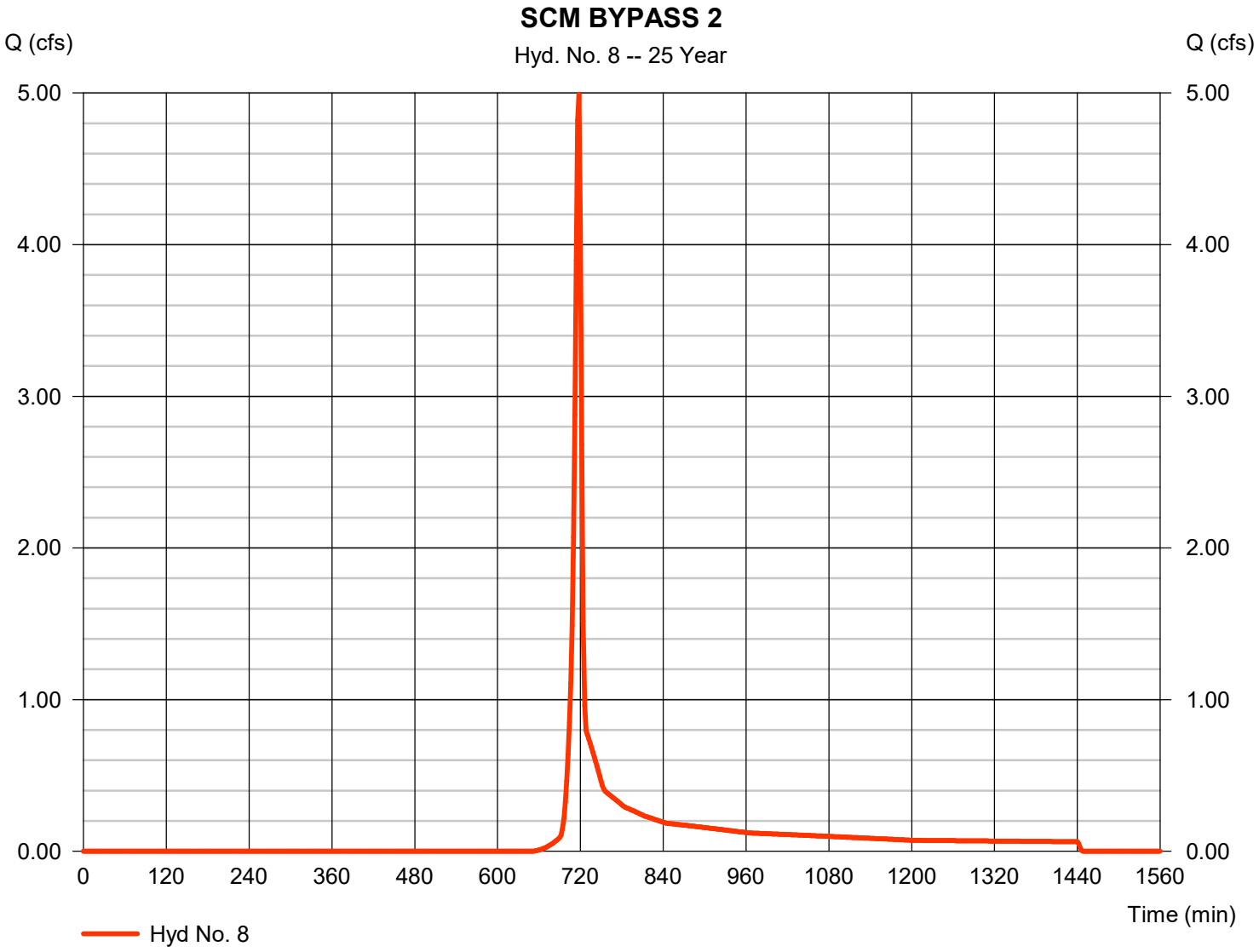


Hydrograph Report

Hyd. No. 8

SCM BYPASS 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.989 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	10,005 cuft
Drainage area	=	1.530 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



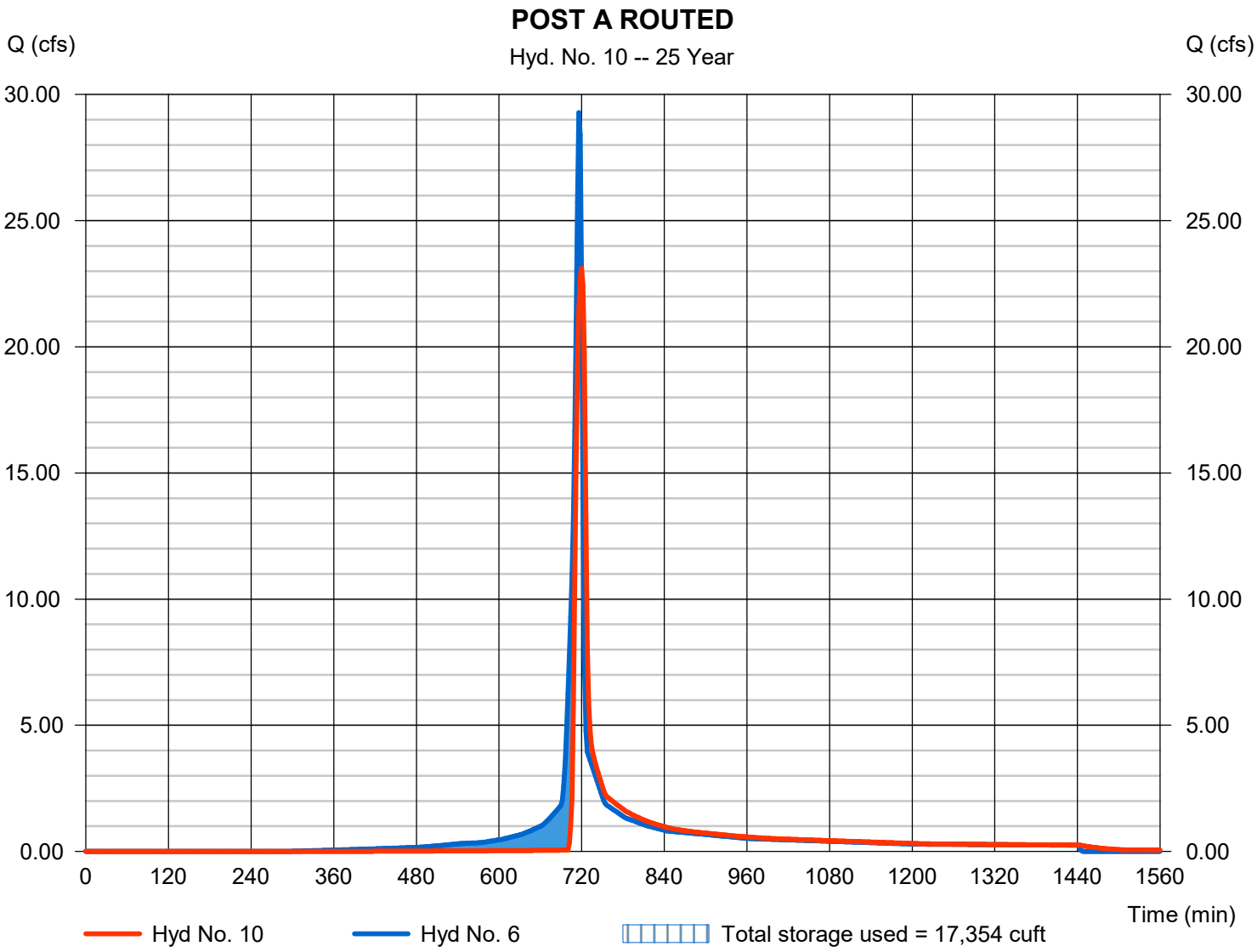
Hydrograph Report

Hyd. No. 10

POST A ROUTED

Hydrograph type	=	Reservoir	Peak discharge	=	23.12 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	60,909 cuft
Inflow hyd. No.	=	6 - Area To SCM	Max. Elevation	=	281.88 ft
Reservoir name	=	SCM #1	Max. Storage	=	17,354 cuft

Storage Indication method used.

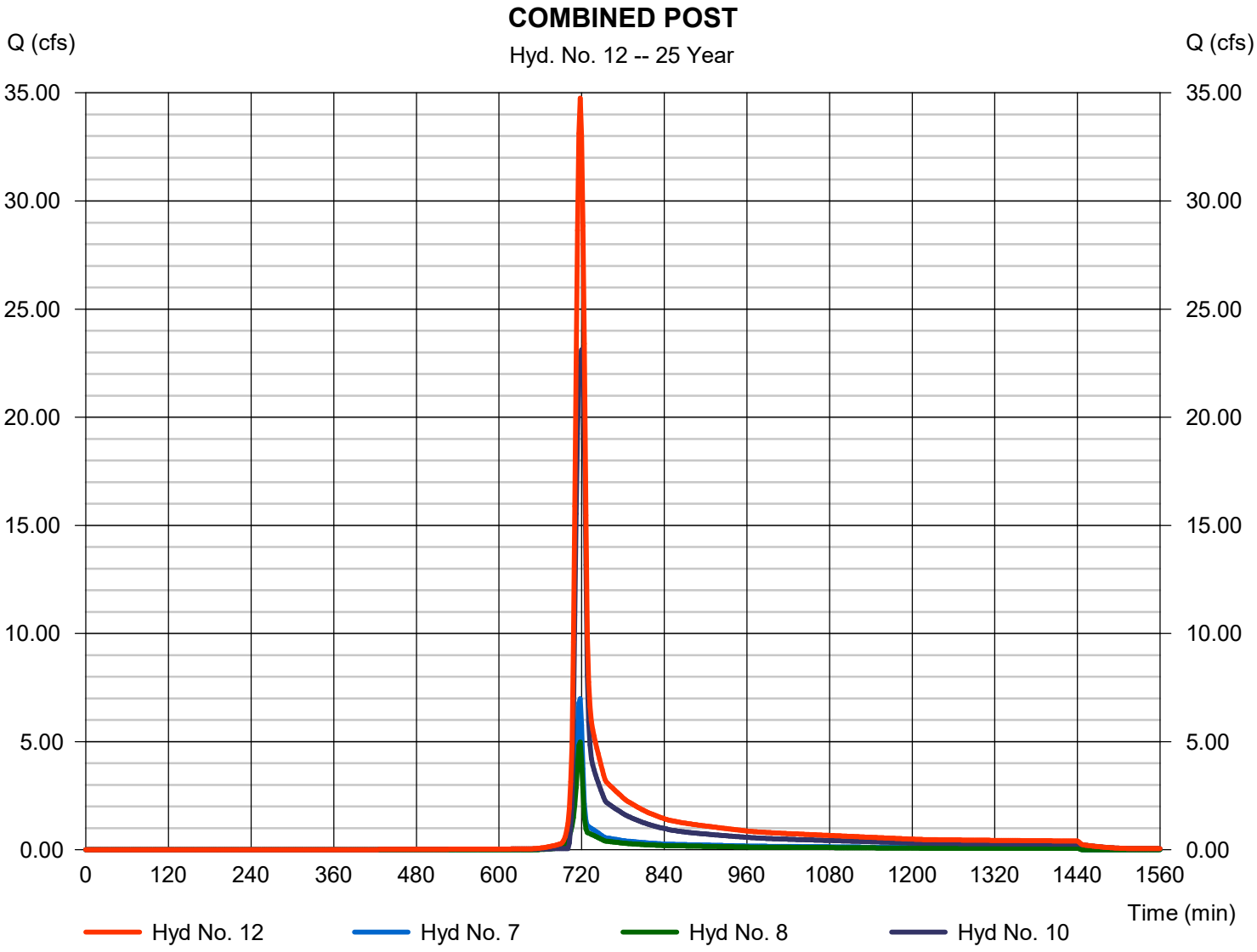


Hydrograph Report

Hyd. No. 12

COMBINED POST

Hydrograph type	=	Combine	Peak discharge	=	34.75 cfs
Storm frequency	=	25 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	84,906 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	3.580 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

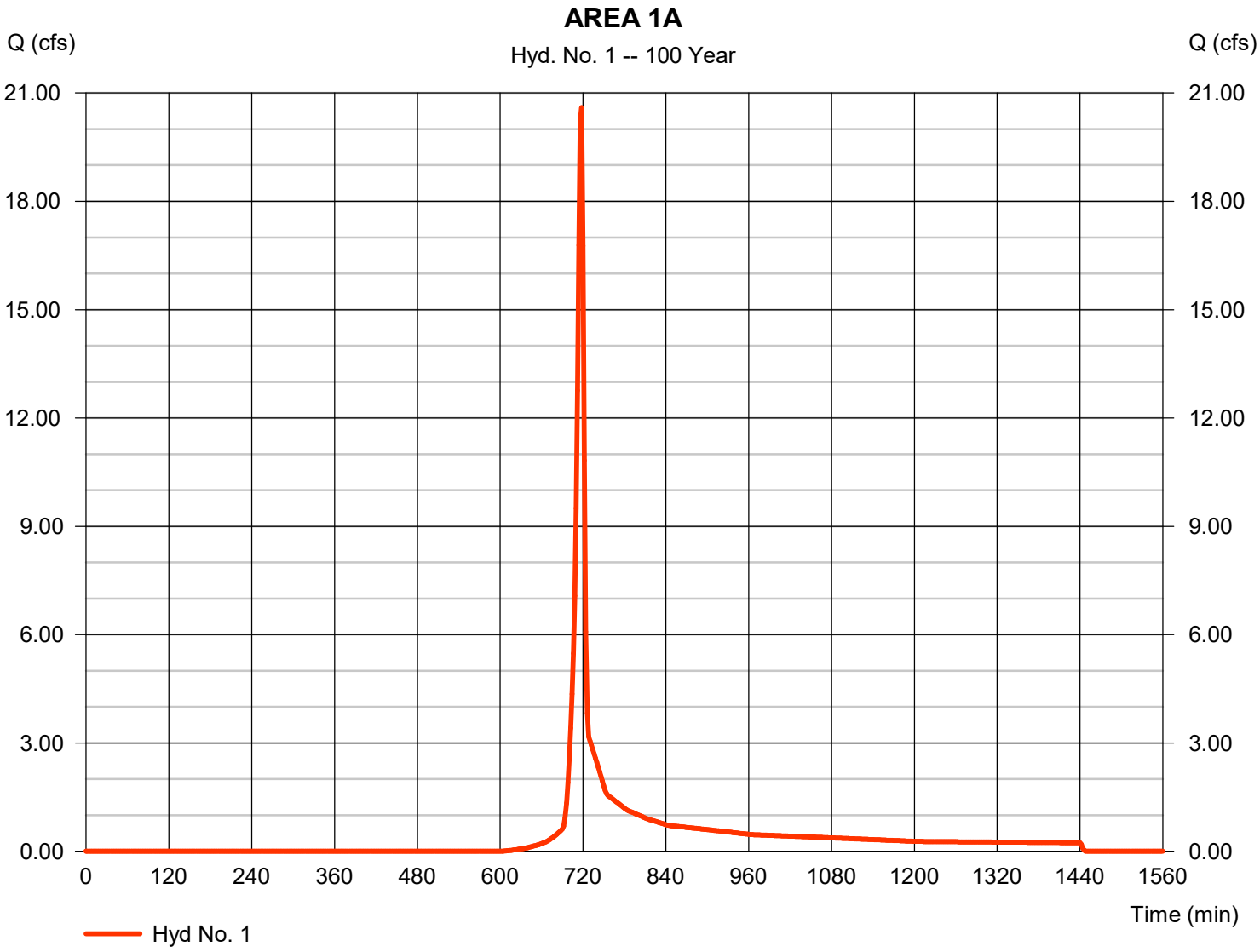
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	20.60	2	718	41,214	------	------	------	AREA 1A
2	SCS Runoff	16.49	2	720	37,772	------	------	------	AREA 1B
4	Combine	36.91	2	718	78,986	1, 2,	------	------	COMBINED PRE
6	SCS Runoff	37.75	2	716	80,553	------	------	------	Area To SCM
7	SCS Runoff	10.43	2	718	20,888	------	------	------	SCM BYPASS 1
8	SCS Runoff	7.522	2	718	15,050	------	------	------	SCM BYPASS 2
10	Reservoir	26.05	2	720	79,961	6	282.40	20,543	POST A ROUTED
12	Combine	43.37	2	718	115,899	7, 8, 10,	------	------	COMBINED POST

Hydrograph Report

Hyd. No. 1

AREA 1A

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.60 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	41,214 cuft
Drainage area	=	4.190 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	5.30 min
Total precip.	=	7.40 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

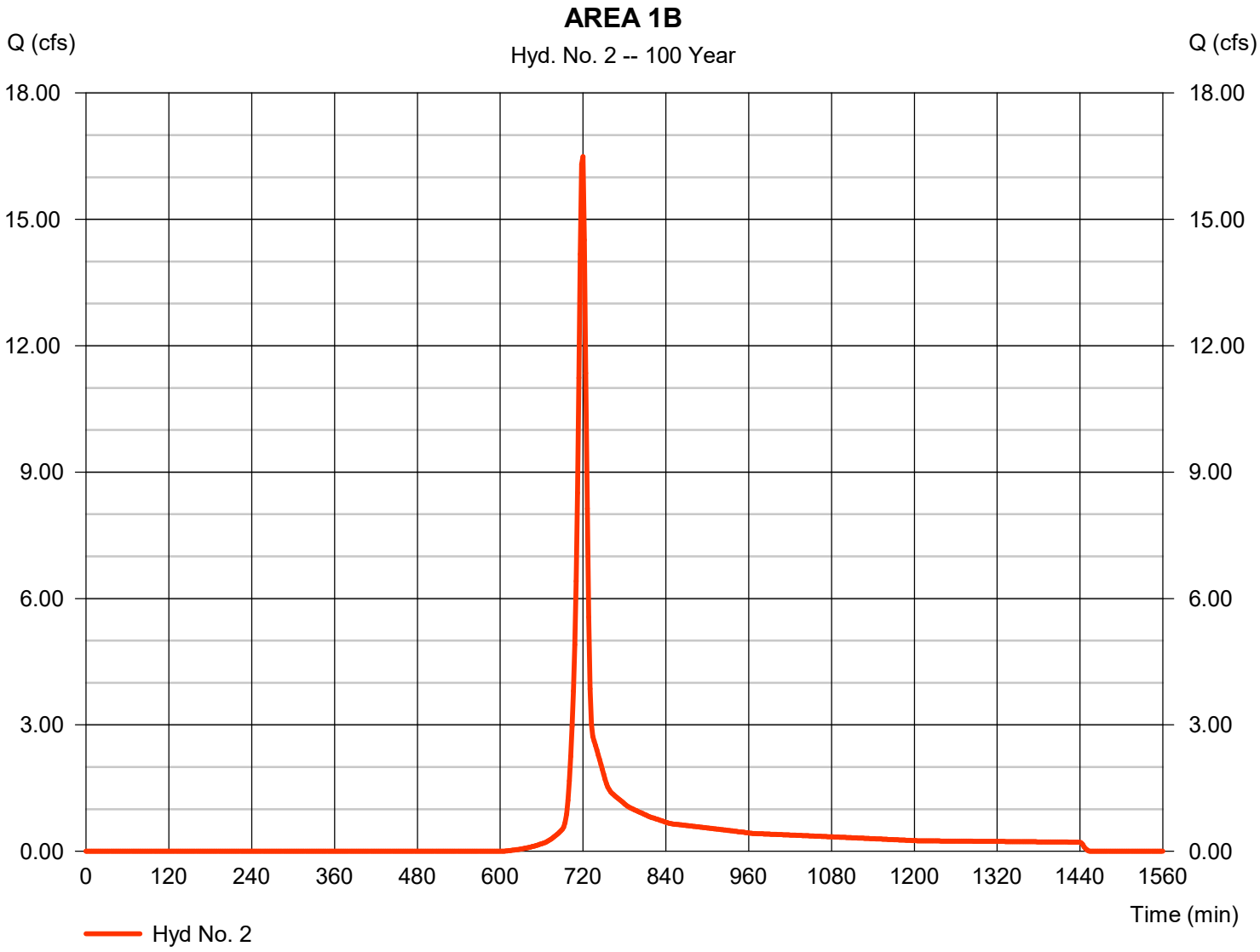


Hydrograph Report

Hyd. No. 2

AREA 1B

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.49 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	37,772 cuft
Drainage area	=	3.600 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.60 min
Total precip.	=	7.40 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

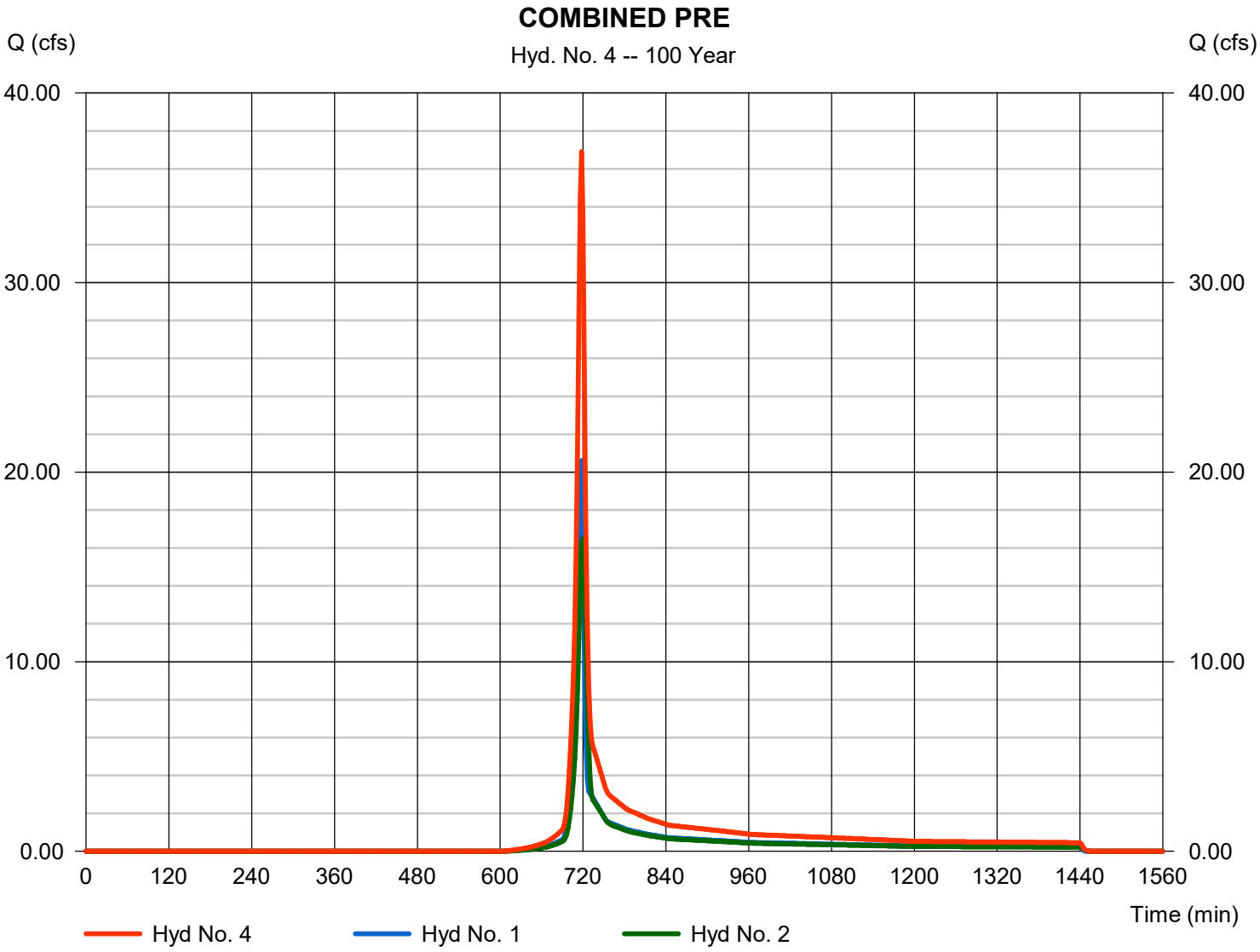


Hydrograph Report

Hyd. No. 4

COMBINED PRE

Hydrograph type	=	Combine	Peak discharge	=	36.91 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	78,986 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	7.790 ac

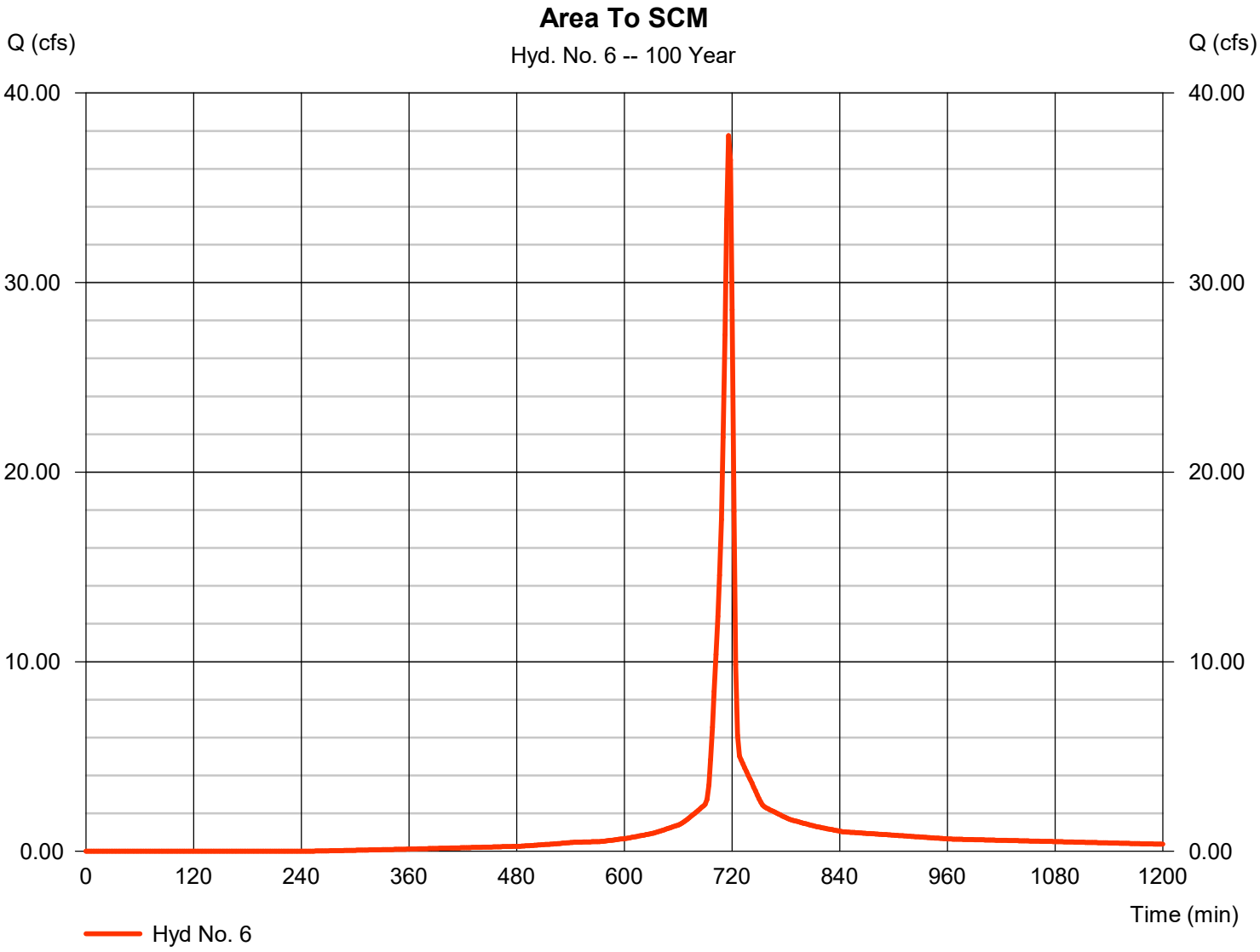


Hydrograph Report

Hyd. No. 6

Area To SCM

Hydrograph type	=	SCS Runoff	Peak discharge	=	37.75 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	80,553 cuft
Drainage area	=	4.200 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.40 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

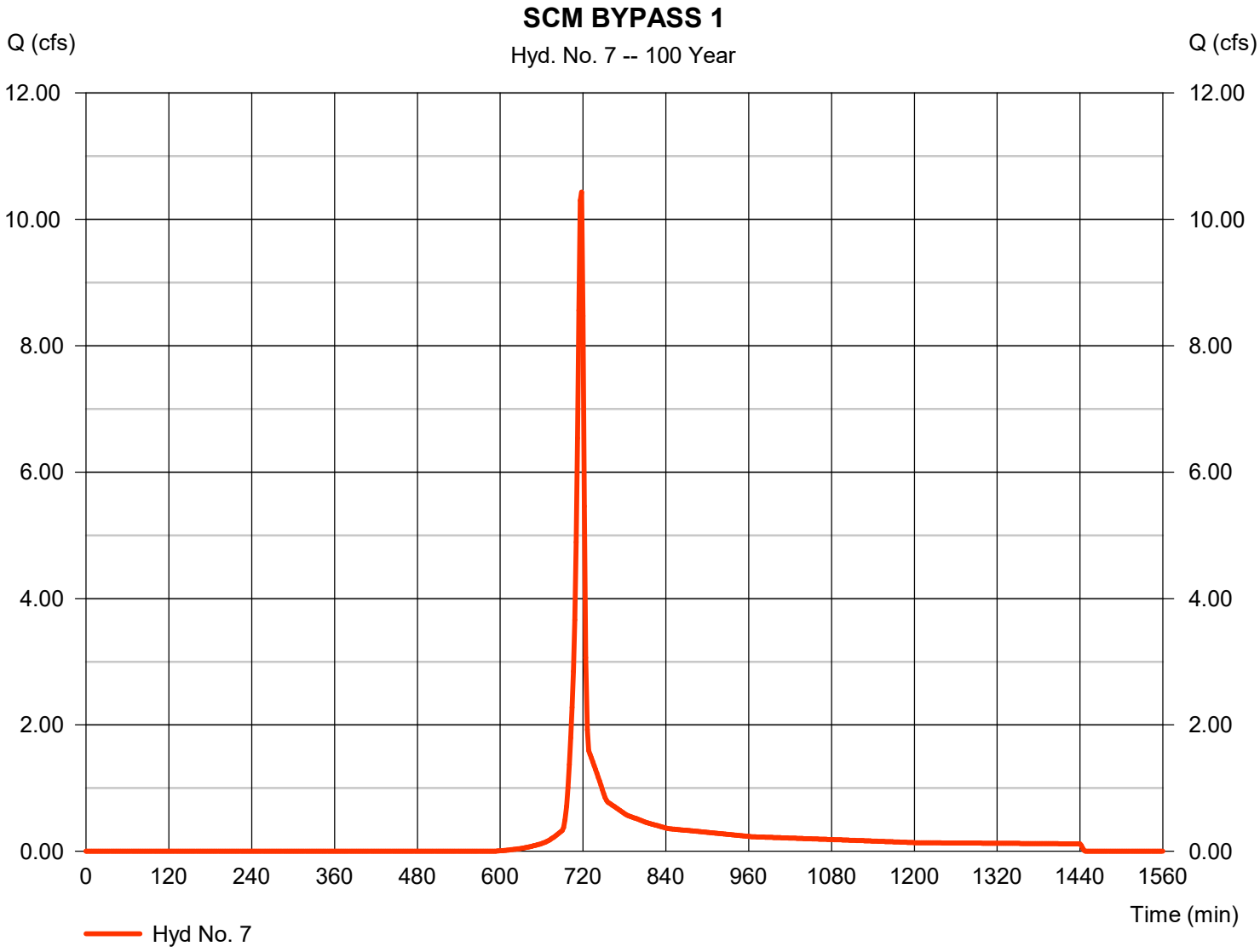


Hydrograph Report

Hyd. No. 7

SCM BYPASS 1

Hydrograph type	= SCS Runoff	Peak discharge	= 10.43 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 20,888 cuft
Drainage area	= 2.050 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

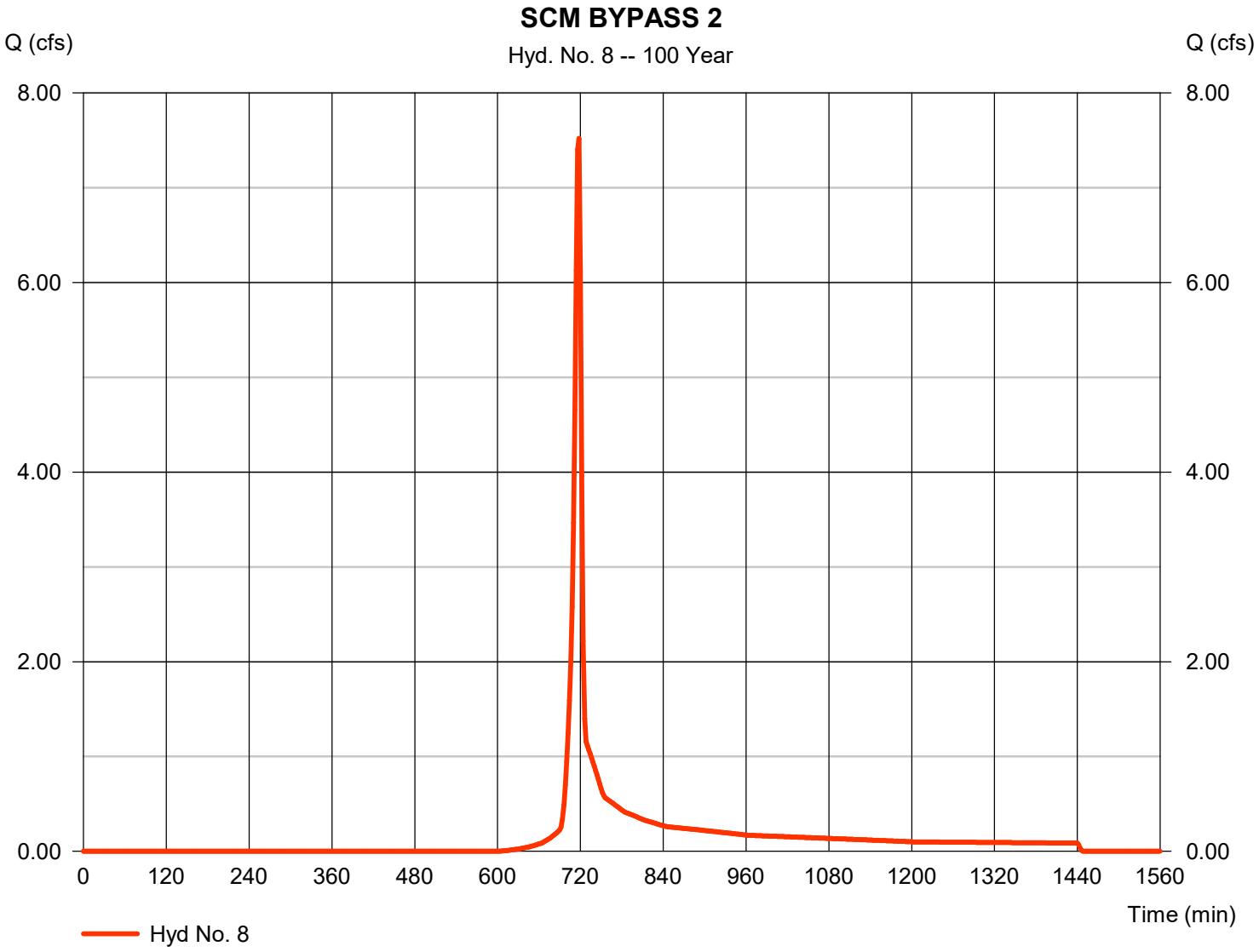


Hydrograph Report

Hyd. No. 8

SCM BYPASS 2

Hydrograph type	= SCS Runoff	Peak discharge	= 7.522 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 15,050 cuft
Drainage area	= 1.530 ac	Curve number	= 60
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



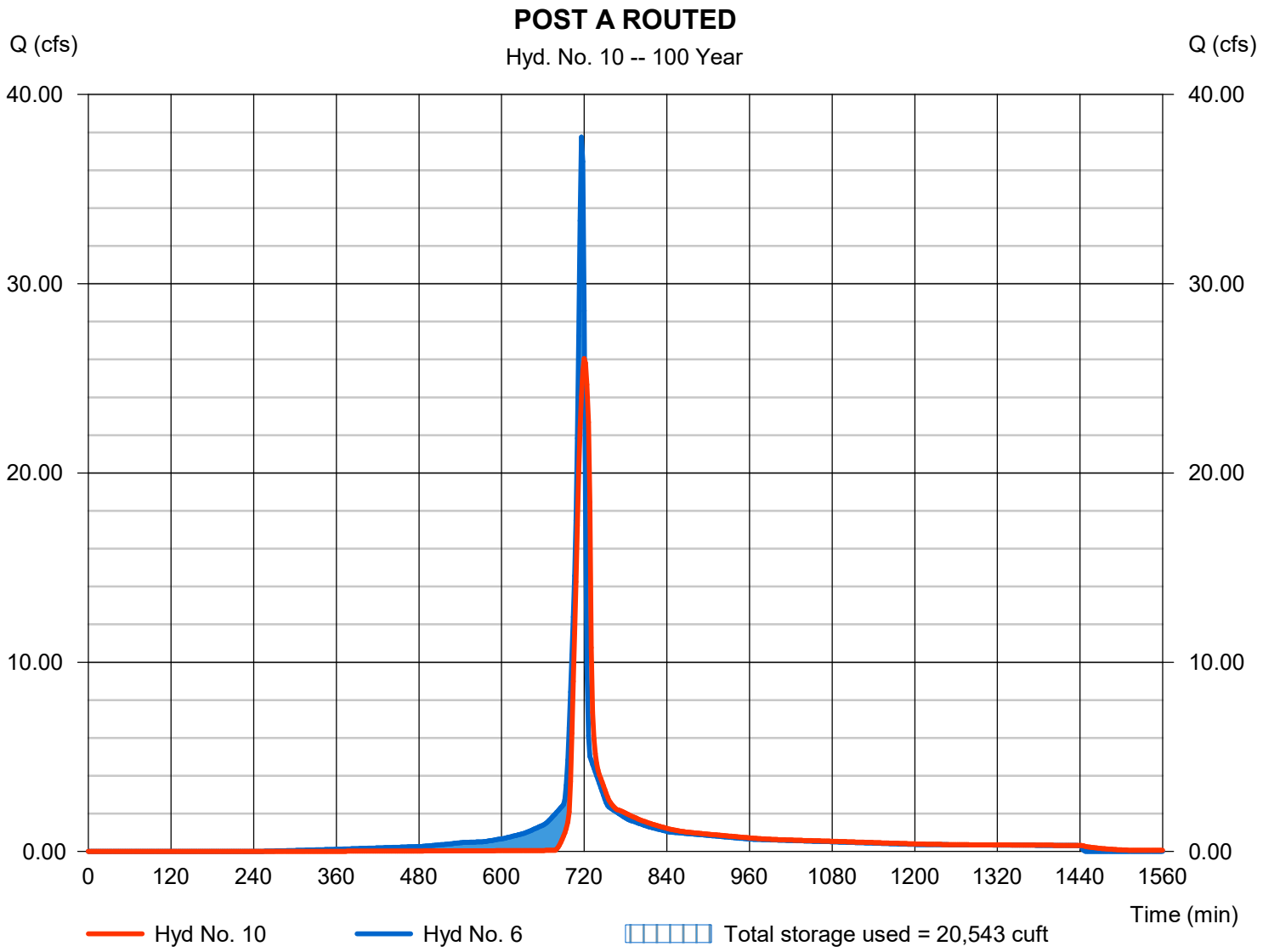
Hydrograph Report

Hyd. No. 10

POST A ROUTED

Hydrograph type	=	Reservoir	Peak discharge	=	26.05 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	79,961 cuft
Inflow hyd. No.	=	6 - Area To SCM	Max. Elevation	=	282.40 ft
Reservoir name	=	SCM #1	Max. Storage	=	20,543 cuft

Storage Indication method used.

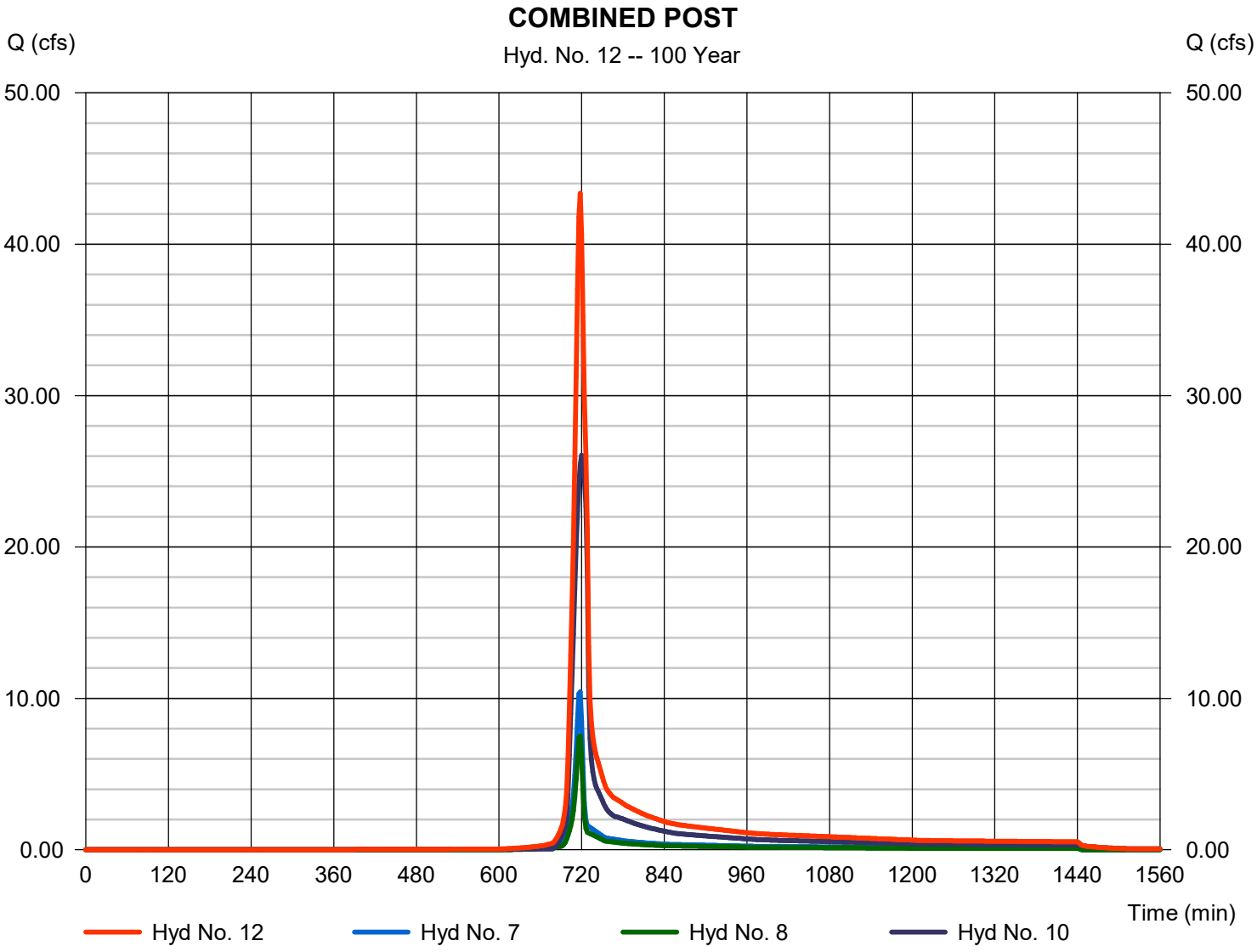


Hydrograph Report

Hyd. No. 12

COMBINED POST

Hydrograph type	=	Combine	Peak discharge	=	43.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	115,899 cuft
Inflow hyds.	=	7, 8, 10	Contrib. drain. area	=	3.580 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	63.5777	12.3000	0.8784	--------
2	78.5639	13.0000	0.8827	--------
3	0.0000	0.0000	0.0000	--------
5	81.2314	13.0000	0.8422	--------
10	76.9967	12.3000	0.8007	--------
25	67.5119	11.0000	0.7384	--------
50	61.9950	10.2000	0.6972	--------
100	56.8465	9.3000	0.6584	--------

File name: Wake County.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	5.20	4.16	3.48	3.00	2.65	2.37	2.15	1.97	1.82	1.69	1.58	1.48
2	6.13	4.93	4.15	3.59	3.17	2.84	2.58	2.36	2.18	2.03	1.90	1.78
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	7.12	5.79	4.91	4.27	3.80	3.42	3.12	2.87	2.66	2.48	2.32	2.19
10	7.86	6.41	5.45	4.77	4.25	3.84	3.51	3.24	3.01	2.82	2.65	2.50
25	8.71	7.13	6.09	5.35	4.79	4.35	4.00	3.70	3.46	3.24	3.06	2.90
50	9.30	7.63	6.54	5.76	5.18	4.72	4.35	4.04	3.78	3.56	3.37	3.20
100	9.86	8.10	6.96	6.15	5.55	5.07	4.69	4.37	4.10	3.87	3.67	3.49

Tc = time in minutes. Values may exceed 60.

Precip. file name: H:\The SITE Group\Projects\CPSAORR\Hydro\APEX.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	3.00	3.60	0.00	4.40	5.10	6.00	6.70	7.40
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

SCBSZ
February 3, 2023

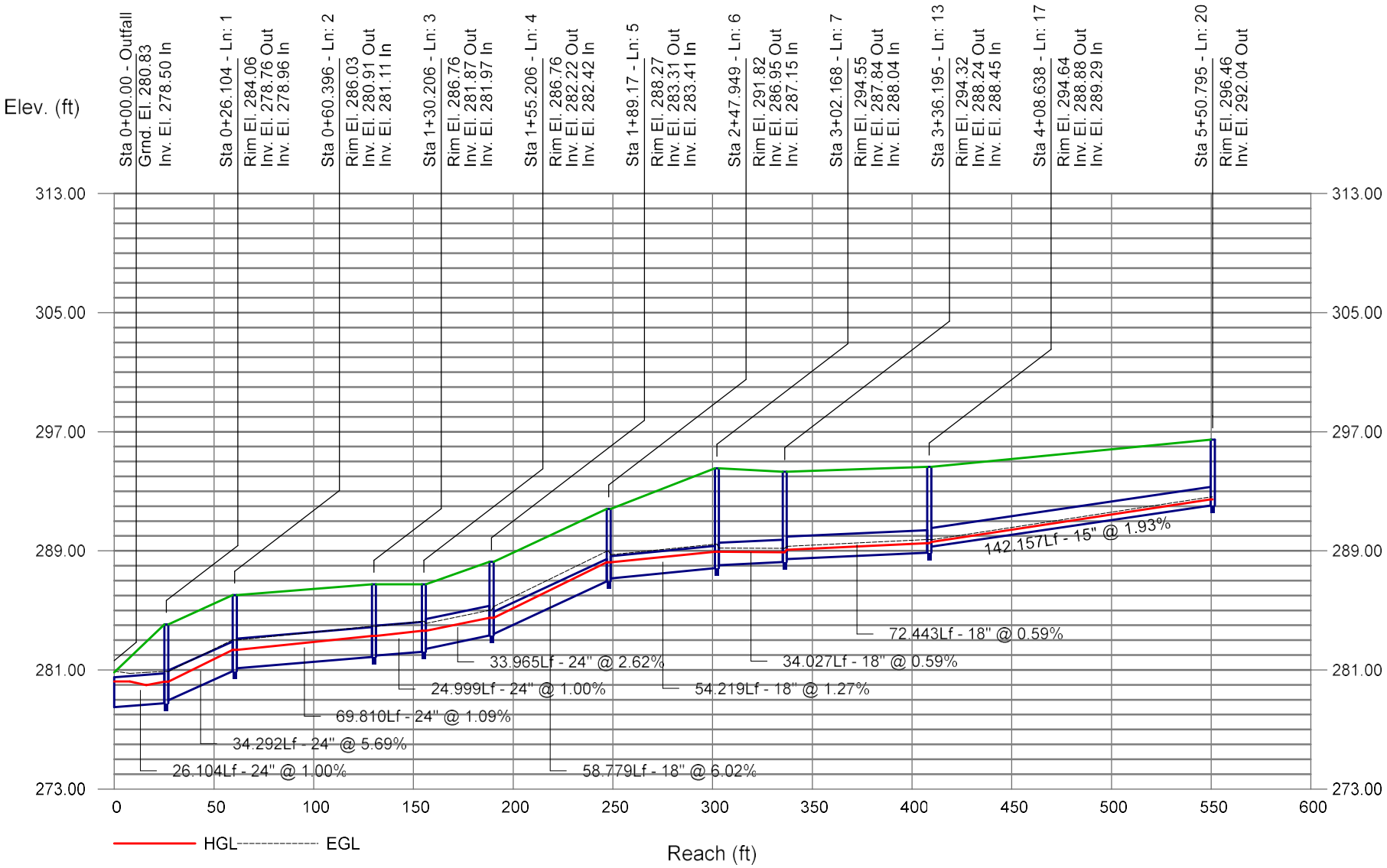
RATIONAL PIPE SIZING

The SITE Group
1111 Oberlin Road
Raleigh NC 27605

919-832-6658 (o)
919-839-2255 (f)

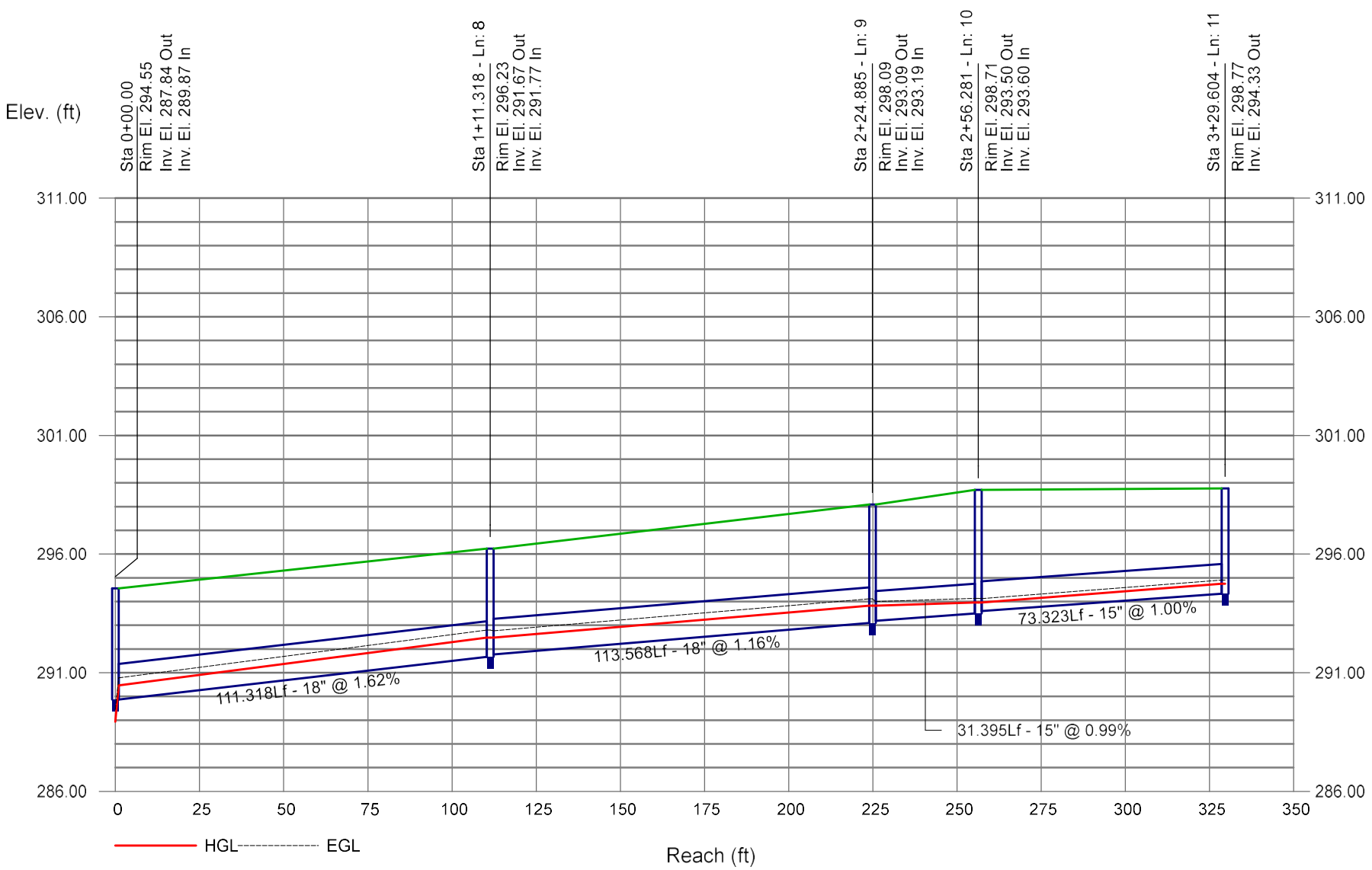
Storm Sewer Profile

Proj. file: SCBSZ_Storm Sewer.stm



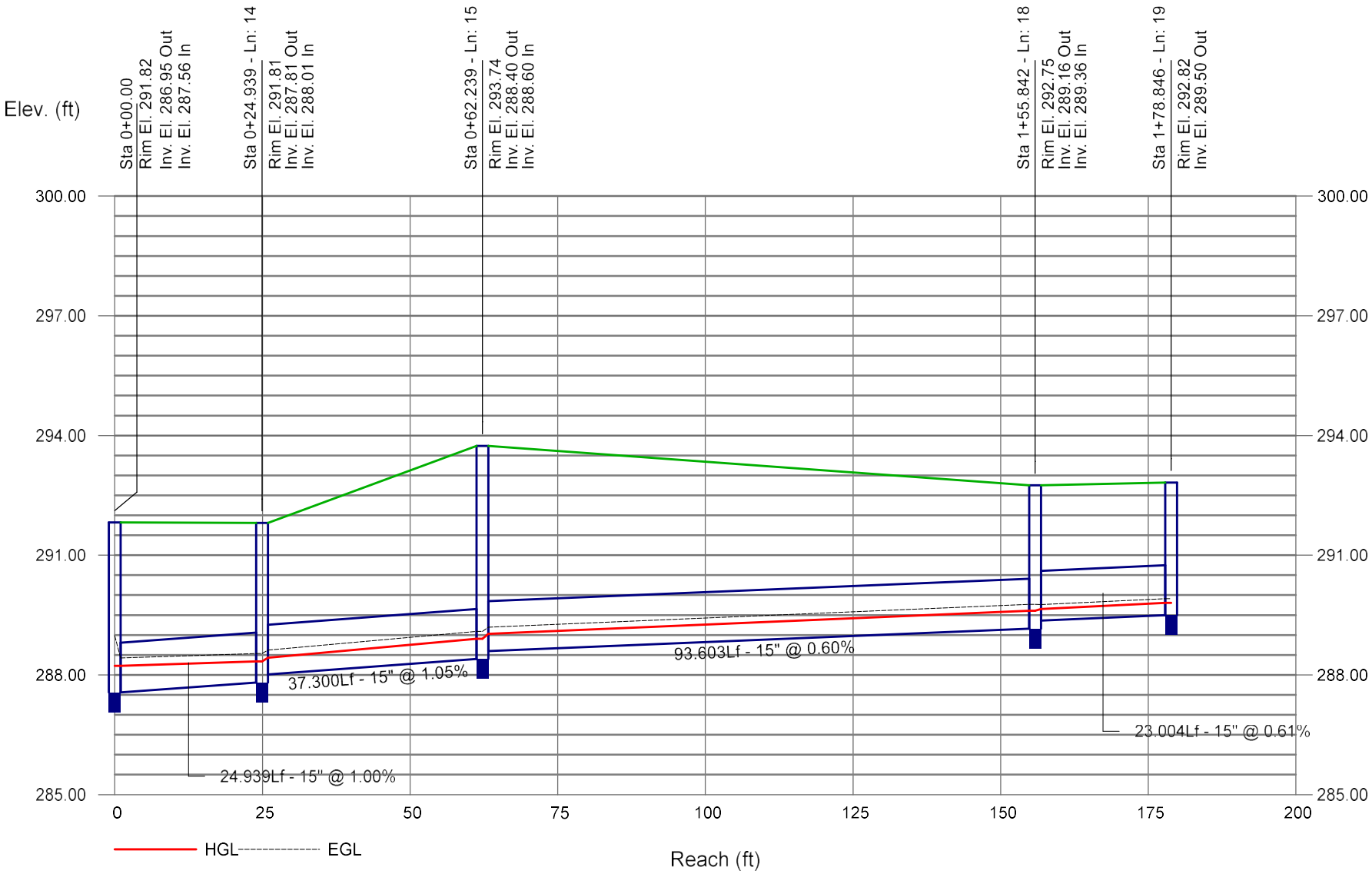
Storm Sewer Profile

Proj. file: SCBSZ_Storm Sewer.stm



Storm Sewer Profile

Proj. file: SCBSZ_Storm Sewer.stm



Storm Sewer Profile

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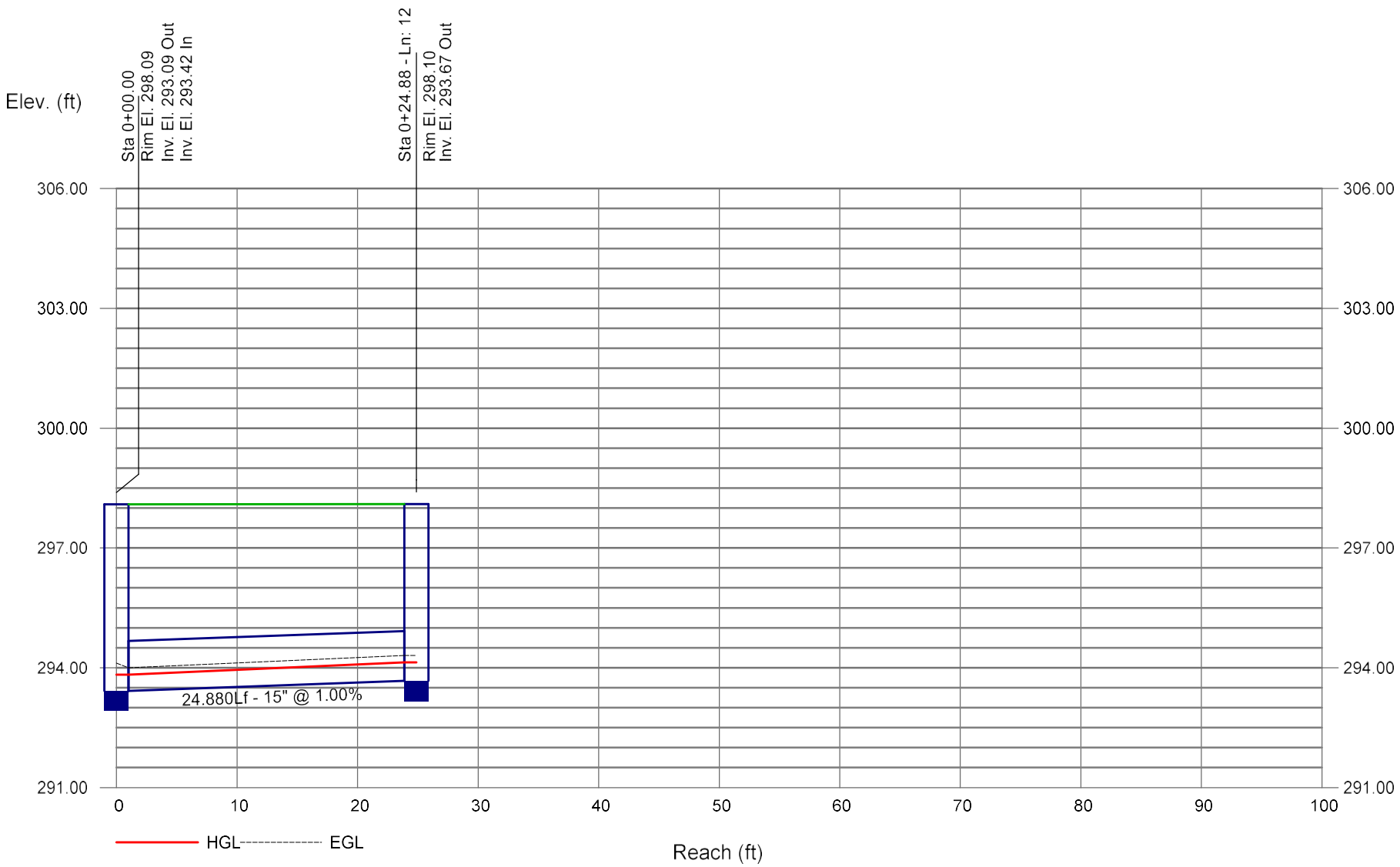

Storm Sewer Profile

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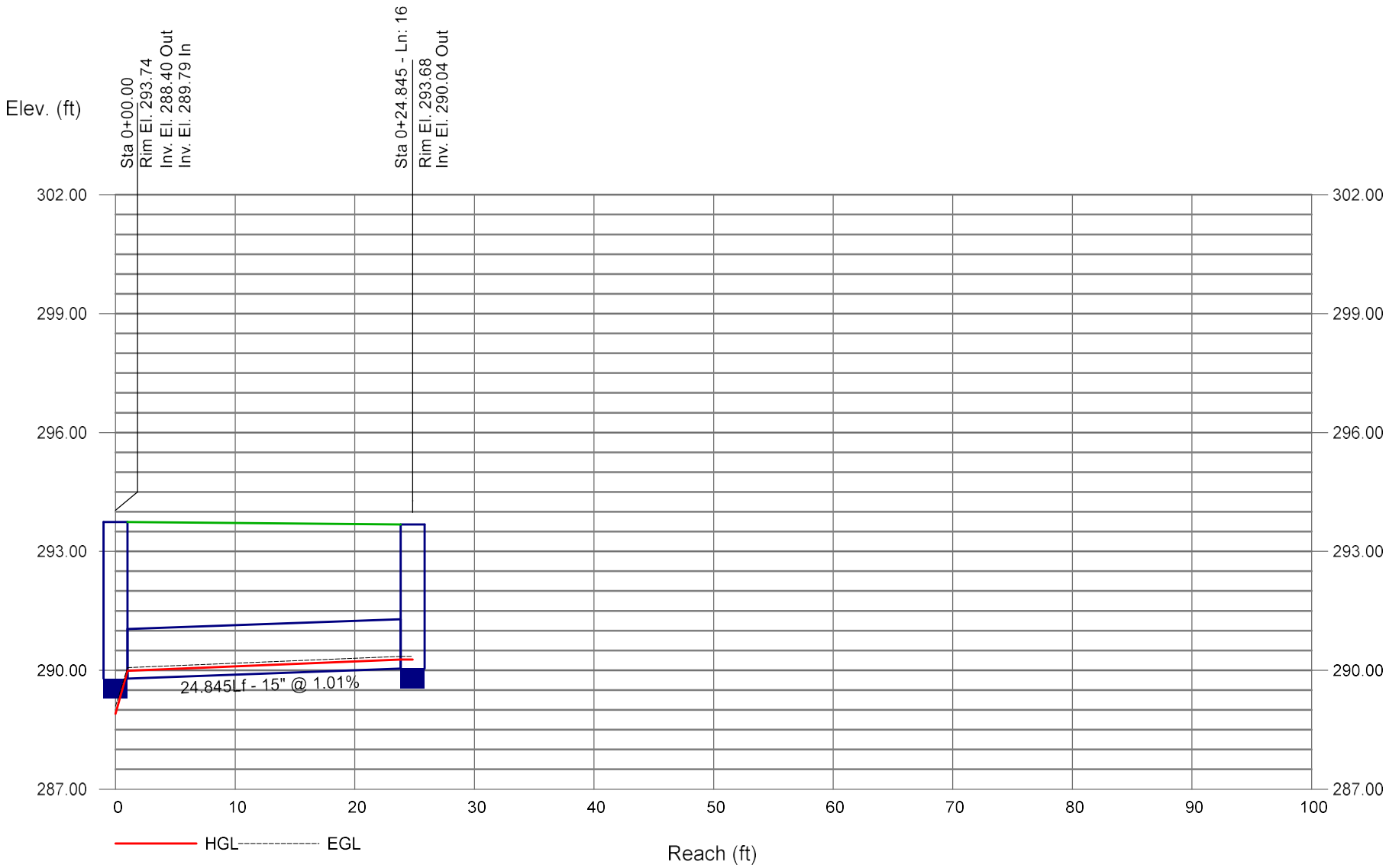

Storm Sewer Profile

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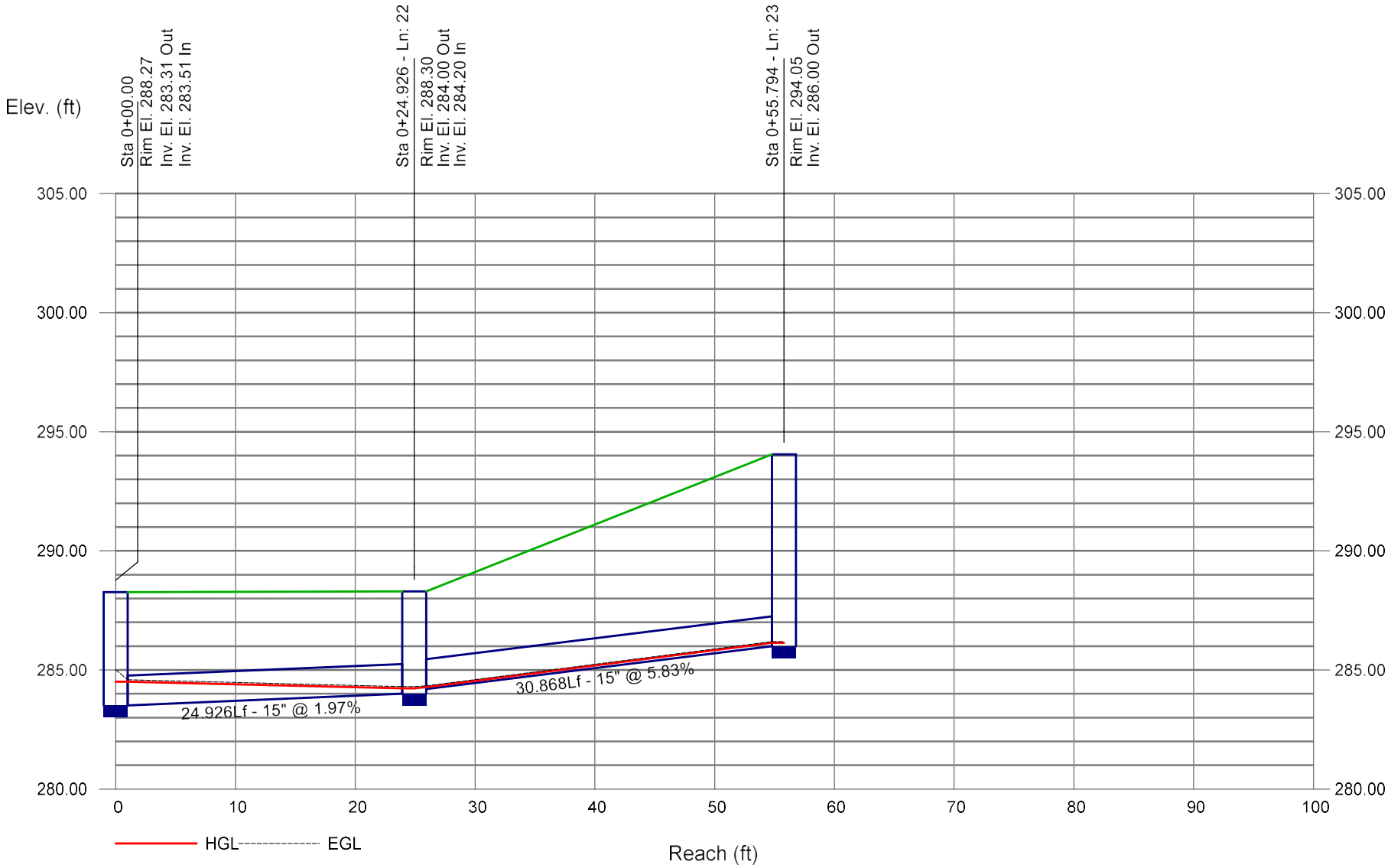

Storm Sewer Profile

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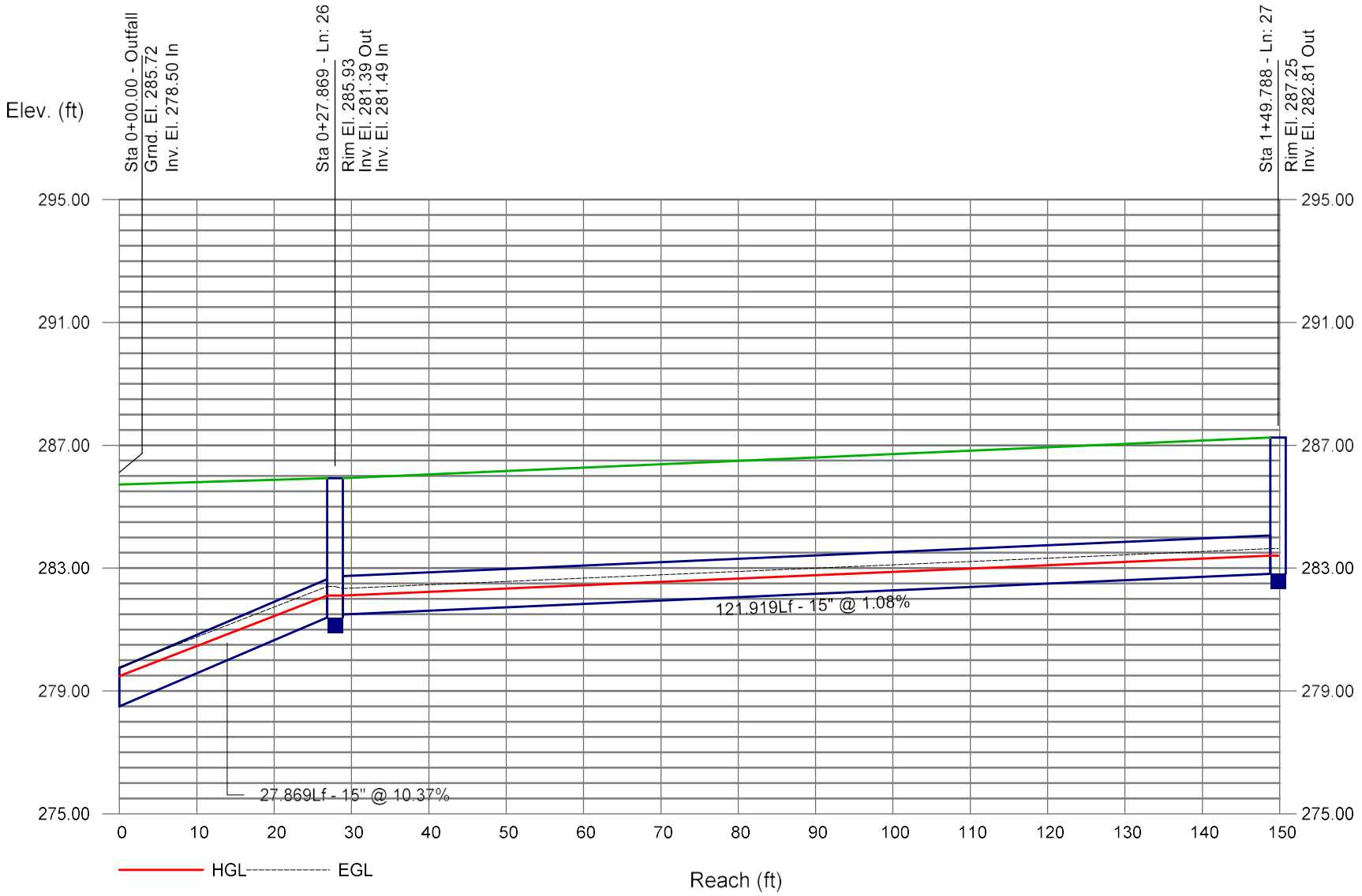
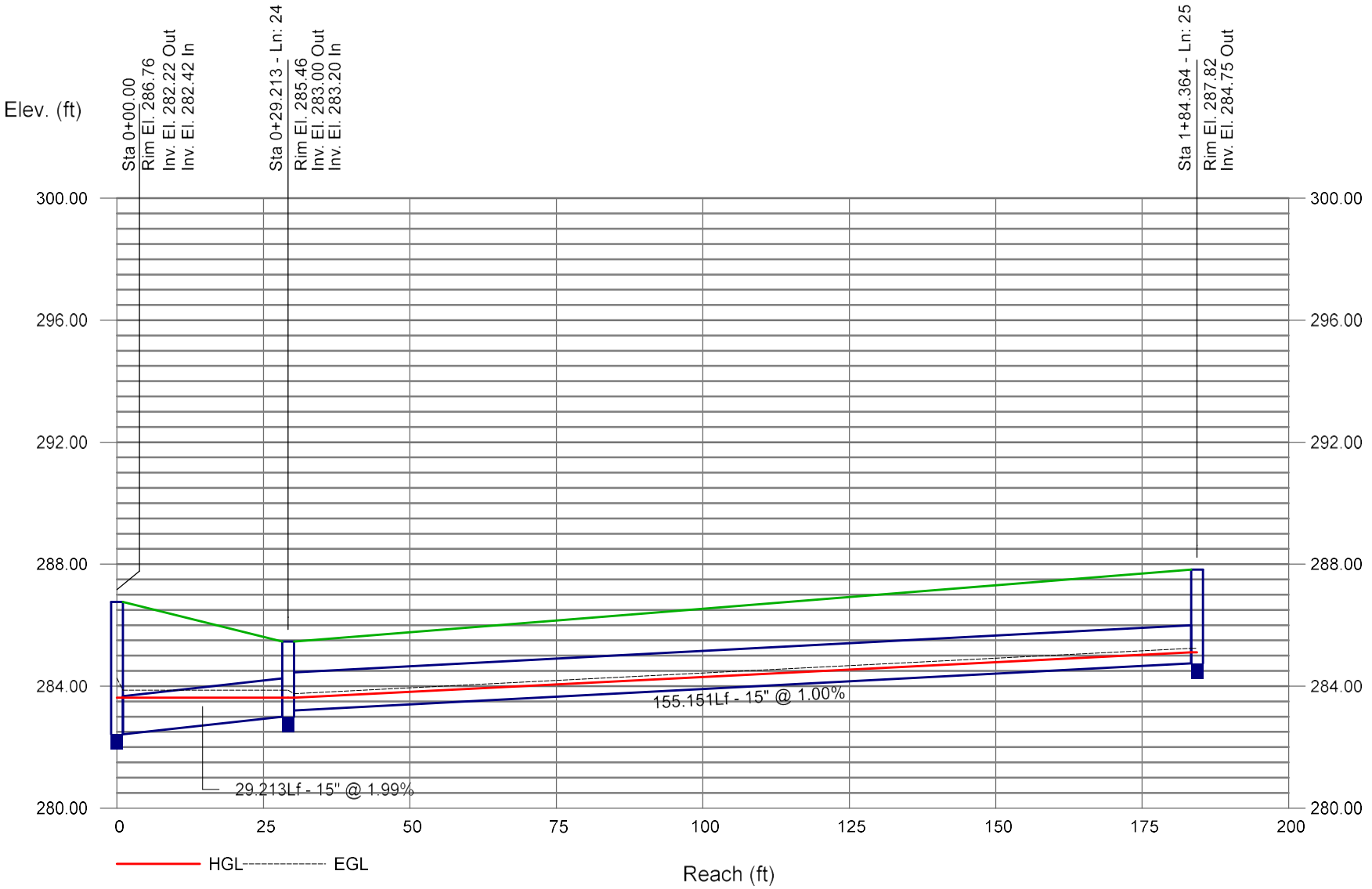


Storm Sewer Profile

Proj. file: SCBSZ_Storm Sewer.stm



Storm Sewer Profile

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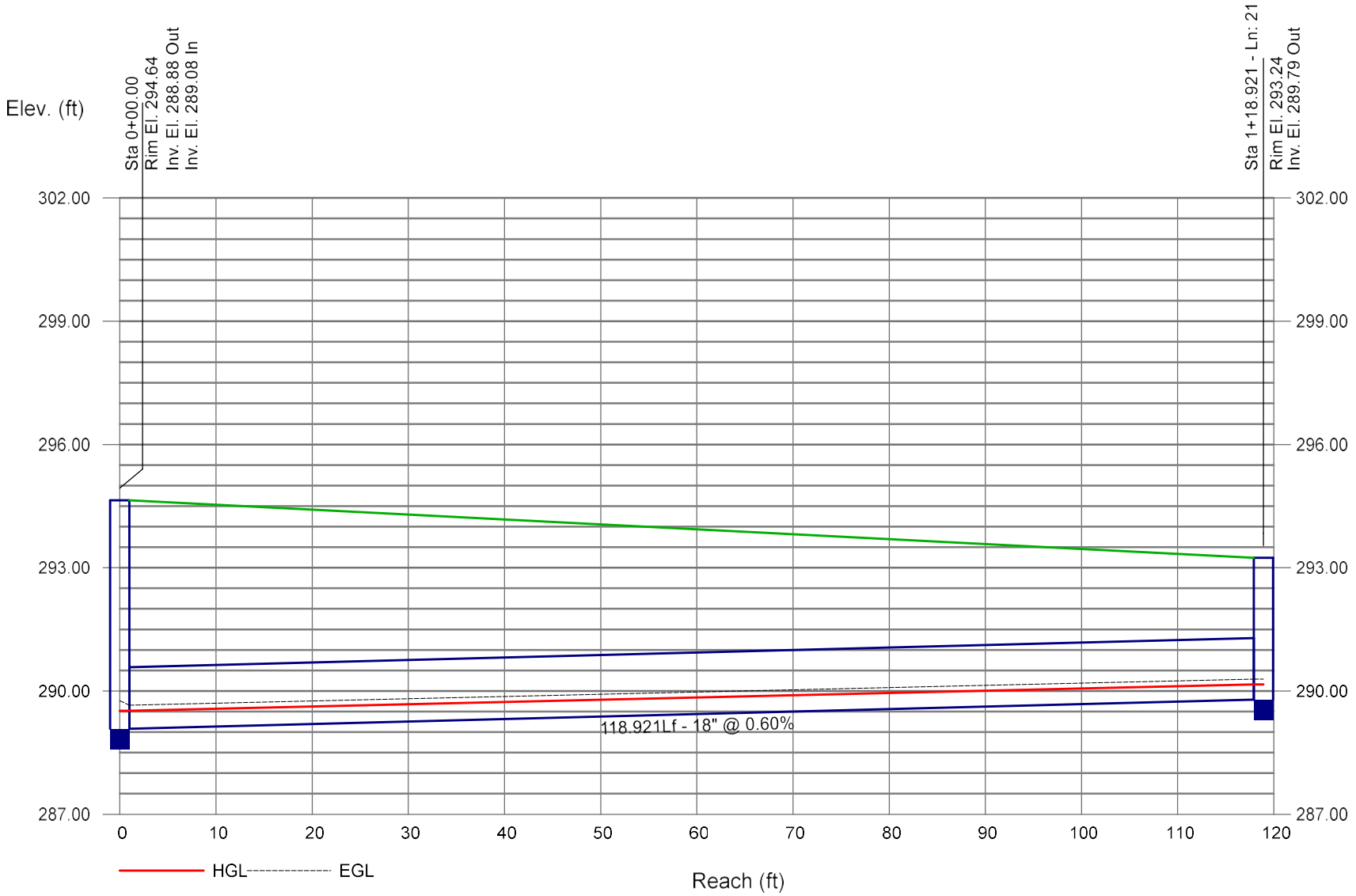
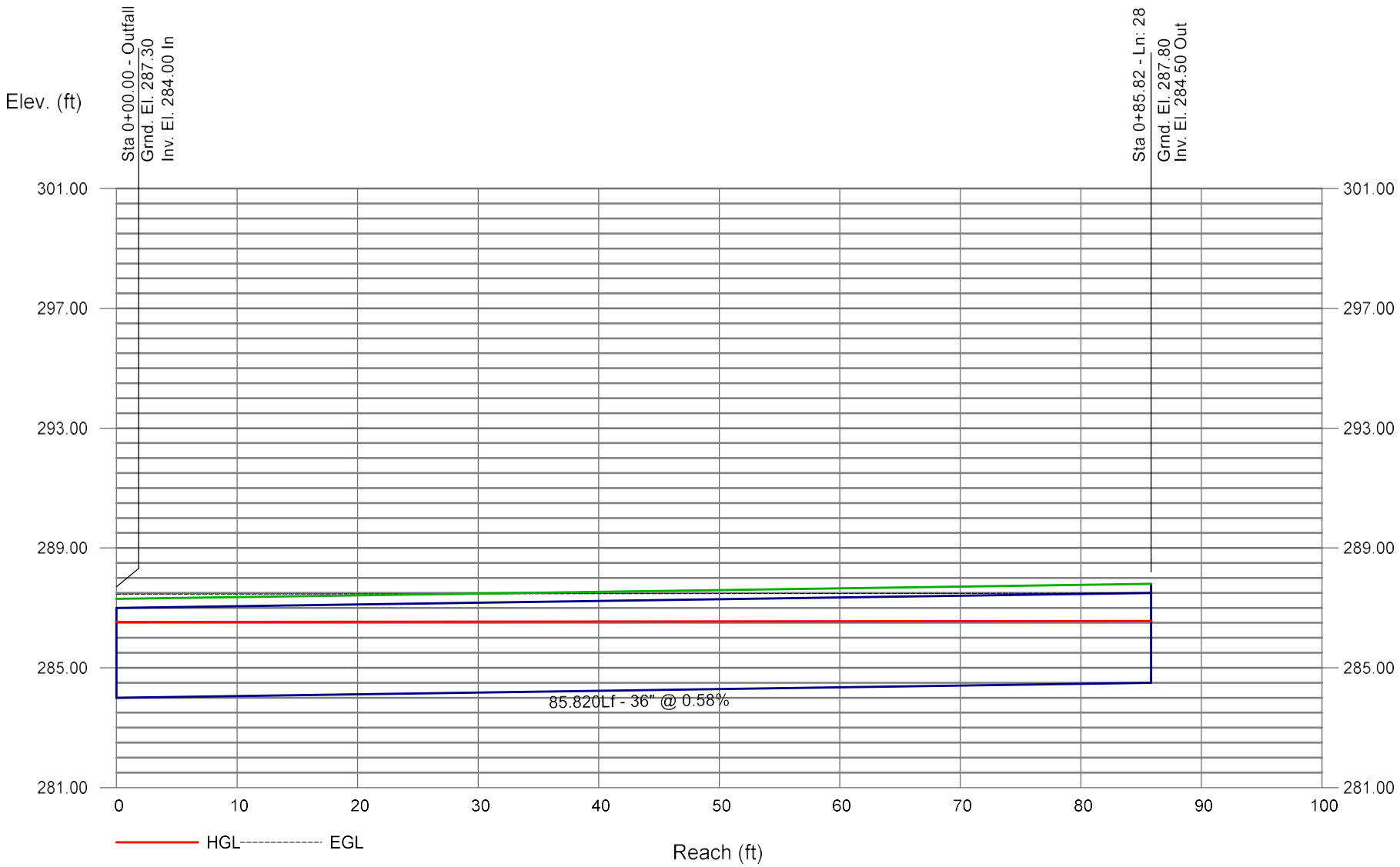


Storm Sewer Profile

Proj. file: SCBSZ_Storm Sewer.stm



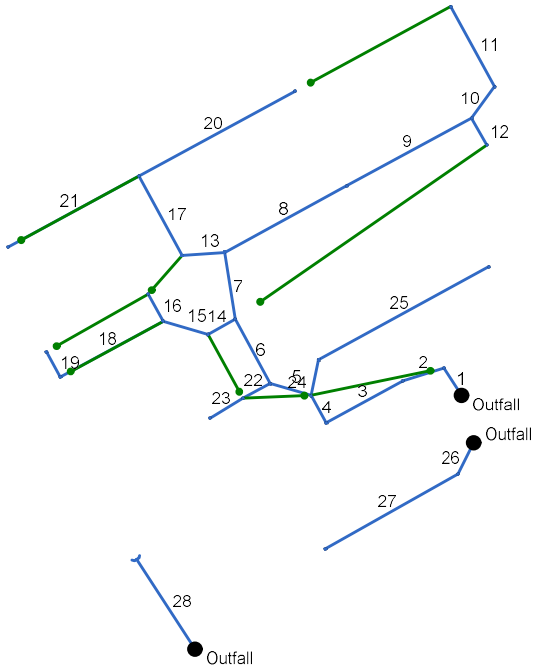
SCBSZ
February 3, 2023

INLET SIZING

The SITE Group
1111 Oberlin Road
Raleigh NC 27605

919-832-6658 (o)
919-839-2255 (f)

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



Project File: SCBSZ_Storm Sewer.stm	Number of lines: 28	Date: 2/3/2023

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)
1	CI-01	Combination	284.06	Rect	2.00	2.00	24	Cir	278.76	24	Cir	278.96
2	CI-02	Combination	286.03	Rect	2.00	2.00	24	Cir	280.91	24	Cir	281.11
3	CI-03	Combination	286.76	Rect	2.00	2.00	24	Cir	281.87	24	Cir	281.97
4	CI-04	Combination	286.76	Rect	2.00	2.00	24	Cir	282.22	24 15	Cir Cir	282.42 282.42
5	CI-05	Combination	288.27	Rect	2.00	2.00	24	Cir	283.31	18 15	Cir Cir	283.41 283.51
6	CI-06	Combination	291.82	Rect	2.00	2.00	18	Cir	286.95	18 15	Cir Cir	287.15 287.56
7	CI-07	Combination	294.55	Rect	2.00	2.00	18	Cir	287.84	18 18	Cir Cir	289.87 288.04
8	CI-08	Combination	296.23	Rect	2.00	2.00	18	Cir	291.67	18	Cir	291.77
9	CI-09	Combination	298.09	Rect	2.00	2.00	18	Cir	293.09	15 15	Cir Cir	293.19 293.42
10	YI-10	DropGrate	298.71	Rect	2.00	2.00	15	Cir	293.50	15	Cir	293.60
11	YI-11	DropGrate	298.77	Rect	2.00	2.00	15	Cir	294.33			
12	CI-21	Combination	298.10	Rect	2.00	2.00	15	Cir	293.67			
13	YI-18	DropGrate	294.32	Rect	2.00	2.00	18	Cir	288.24	18	Cir	288.45
14	CI-15	Combination	291.81	Rect	2.00	2.00	15	Cir	287.81	15	Cir	288.01
15	CI-16	Combination	293.74	Rect	2.00	2.00	15	Cir	288.40	15 15	Cir Cir	289.79 288.60
16	CI-17	Combination	293.68	Rect	2.00	2.00	15	Cir	290.04			
17	YI-19	DropGrate	294.64	Rect	2.00	2.00	18	Cir	288.88	15 18	Cir Cir	289.29 289.08
18	CI-16A	Combination	292.75	Rect	2.00	2.00	15	Cir	289.16	15	Cir	289.36
19	CI-16B	Combination	292.82	Rect	2.00	2.00	15	Cir	289.50			

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)
20	YI-20	DropGrate	296.46	Rect	2.00	2.00	15	Cir	292.04			
21	YI-19A	DropGrate	293.24	Rect	2.00	2.00	18	Cir	289.79			
22	CI-05A	Combination	288.30	Rect	2.00	2.00	15	Cir	284.00	15	Cir	284.20
23	YI-14	DropGrate	294.05	Rect	2.00	2.00	15	Cir	286.00			
24	YI-12	DropGrate	285.46	Rect	2.00	2.00	15	Cir	283.00	15	Cir	283.20
25	YI-13	DropGrate	287.82	Rect	2.00	2.00	15	Cir	284.75			
26	YI-22	DropGrate	285.93	Rect	2.00	2.00	15	Cir	281.39	15	Cir	281.49
27	YI-23	DropGrate	287.25	Rect	2.00	2.00	15	Cir	282.81			
28	FES-27	OpenHeadwall	287.80	n/a	n/a	n/a	36	Cir	284.50			

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
1	P 1-FES1	16.28	24	Cir	26.104	278.50	278.76	0.996	280.23	280.21	n/a	280.21 j	End	Combination
2	P 2-1	15.86	24	Cir	34.292	278.96	280.91	5.686	280.21	282.34	0.34	282.34	1	Combination
3	P 3-2	15.45	24	Cir	69.810	281.11	281.87	1.089	282.34	283.29	n/a	283.29	2	Combination
4	P 4-3	15.14	24	Cir	24.999	281.97	282.22	1.000	283.29	283.62	n/a	283.62	3	Combination
5	P 5-4	11.17	24	Cir	33.965	282.42	283.31	2.620	283.62	284.51	n/a	284.51	4	Combination
6	P 6-5	11.14	18	Cir	58.779	283.41	286.95	6.023	284.51	288.23	n/a	288.23	5	Combination
7	P 7-6	7.95	18	Cir	54.219	287.15	287.84	1.273	288.23	288.93	n/a	288.93	6	Combination
8	P 8-7	4.41	18	Cir	111.318	289.87	291.67	1.617	290.46	292.47	n/a	292.47	7	Combination
9	P 9-8	3.73	18	Cir	113.568	291.77	293.09	1.162	292.47	293.83	n/a	293.83	8	Combination
10	P 10-9	1.37	15	Cir	31.395	293.19	293.50	0.987	293.83	293.96	n/a	293.96	9	DropGrate
11	P 11-10	1.15	15	Cir	73.323	293.60	294.33	0.996	293.96	294.75	n/a	294.75	10	DropGrate
12	P 21-9	1.39	15	Cir	24.880	293.42	293.67	1.005	293.83	294.14	n/a	294.14	9	Combination
13	P 18-7	3.09	18	Cir	34.027	288.04	288.24	0.588	288.93	288.91	n/a	288.91	7	DropGrate
14	P 15-6	1.75	15	Cir	24.939	287.56	287.81	1.002	288.23	288.34	n/a	288.34	6	Combination
15	P 16-15	1.61	15	Cir	37.300	288.01	288.40	1.046	288.43	288.90	n/a	288.90	14	Combination
16	P 17-16	0.36	15	Cir	24.845	289.79	290.04	1.006	289.99	290.27	n/a	290.27	15	Combination
17	P 19-18	2.85	18	Cir	72.443	288.45	288.88	0.594	289.06	289.52	n/a	289.52	13	DropGrate
18	P 16A-16	1.28	15	Cir	93.603	288.60	289.16	0.598	289.03	289.61	n/a	289.61	15	Combination
19	P 16B-16A	0.61	15	Cir	23.004	289.36	289.50	0.609	289.65	289.80	n/a	289.80	18	Combination
20	P 20-19	1.15	15	Cir	142.157	289.29	292.04	1.934	289.59	292.46	n/a	292.46	17	DropGrate
21	P 19A-19	0.98	18	Cir	118.921	289.08	289.79	0.597	289.52	290.16	n/a	290.16	17	DropGrate
22	P 5A-5	0.34	15	Cir	24.926	283.51	284.00	1.966	284.51	284.23	n/a	284.23	5	Combination
23	P 14-5A	0.13	15	Cir	30.868	284.20	286.00	5.831	284.28	286.14	n/a	286.14	22	DropGrate
24	P 12-4	2.41	15	Cir	29.213	282.42	283.00	1.985	283.62	283.62	n/a	283.62	4	DropGrate

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

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
25	P 13-12	0.85	15	Cir	155.151	283.20	284.75	0.999	283.62	285.11	n/a	285.11	24	DropGrate
26	P 22-FES21	3.17	15	Cir	27.869	278.50	281.39	10.370	279.48	282.11	n/a	282.11	End	DropGrate
27	P 23-22	2.23	15	Cir	121.919	281.49	282.81	1.083	282.11	283.41	n/a	283.41	26	DropGrate
28	P 27-FES26	40.00	36	Cir	85.820	284.00	284.50	0.583	286.53	286.56	n/a	286.56	End	OpenHeadwall

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

NOTES: Return period = 10 Yrs. ; j - Line contains hyd. jump.

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)	
1	CI-01	0.58	0.76	1.34	0.00	Comb	4.0	3.00	6.99	3.00	2.33	Sag	2.00	0.050	0.020	0.000	0.12	3.10	0.29	3.10	2.0	Off
2	CI-02	0.63	0.01	0.58	0.07	Comb	4.0	3.00	0.00	3.00	2.33	0.010	2.00	0.050	0.020	0.013	0.15	4.70	0.23	1.35	2.0	1
3	CI-03	0.43	0.00	0.42	0.01	Comb	4.0	3.00	0.00	3.00	2.33	0.013	2.00	0.050	0.020	0.013	0.13	3.47	0.20	0.73	2.0	2
4	CI-04	2.21	0.00	1.52	0.70	Comb	4.0	3.00	0.00	3.00	2.33	0.013	2.00	0.050	0.020	0.013	0.22	7.95	0.32	4.58	2.0	1
5	CI-05	0.20	0.40	0.59	0.00	Comb	4.0	3.00	0.00	3.00	2.33	0.050	2.00	0.050	0.020	0.013	0.11	2.71	0.18	0.36	2.0	4
6	CI-06	1.88	0.29	1.78	0.40	Comb	4.0	3.00	0.00	3.00	2.33	0.069	2.00	0.050	0.020	0.013	0.17	5.36	0.26	1.85	2.0	5
7	CI-07	0.87	0.18	1.05	0.00	Comb	4.0	3.00	6.99	3.00	2.33	Sag	2.00	0.050	0.020	0.000	0.12	3.10	0.29	3.10	2.0	Off
8	CI-08	0.86	0.22	0.91	0.18	Comb	4.0	3.00	0.00	3.00	2.33	0.016	2.00	0.050	0.020	0.013	0.17	5.46	0.26	1.80	2.0	7
9	CI-09	1.16	0.05	0.98	0.22	Comb	4.0	3.00	0.00	3.00	2.33	0.016	2.00	0.050	0.020	0.013	0.17	5.74	0.26	1.96	2.0	8
10	YI-10	0.29	0.00	0.24	0.05	DrGrt	0.0	0.00	0.00	3.00	2.00	0.005	2.00	0.020	0.020	0.013	0.07	9.10	0.07	9.10	0.0	9
11	YI-11	1.15	0.00	0.62	0.53	DrGrt	0.0	0.00	0.00	3.00	2.00	0.018	2.00	0.020	0.020	0.013	0.09	11.10	0.09	11.10	0.0	20
12	CI-21	1.39	0.00	1.09	0.29	Comb	4.0	3.00	0.00	3.00	2.33	0.016	2.00	0.050	0.020	0.013	0.18	6.15	0.28	2.44	2.0	6
13	YI-18	0.36	0.00	0.28	0.08	DrGrt	0.0	0.00	0.00	3.00	2.00	0.006	2.00	0.020	0.020	0.013	0.07	9.10	0.07	9.10	0.0	16
14	CI-15	0.18	0.00	0.18	0.00	Comb	4.0	3.00	0.00	3.00	2.33	0.069	2.00	0.050	0.020	0.013	0.07	1.38	0.17	0.00	2.0	22
15	CI-16	0.08	0.00	0.08	0.00	Comb	4.0	3.00	0.00	3.00	2.33	0.010	2.00	0.050	0.020	0.013	0.07	1.44	0.17	0.00	2.0	18
16	CI-17	0.36	0.08	0.41	0.02	Comb	4.0	3.00	0.00	3.00	2.33	0.010	2.00	0.050	0.020	0.013	0.14	3.76	0.21	0.87	2.0	19
17	YI-19	1.10	0.89	1.50	0.49	DrGrt	0.0	0.00	0.00	3.00	2.00	0.001	2.00	0.020	0.020	0.013	0.20	22.10	0.20	22.10	0.0	21
18	CI-16A	0.70	0.00	0.70	0.00	Comb	4.0	3.00	6.99	3.00	2.33	Sag	2.00	0.050	0.020	0.000	0.09	1.96	0.26	1.96	2.0	Off
19	CI-16B	0.61	0.02	0.63	0.00	Comb	4.0	3.00	6.99	3.00	2.33	Sag	2.00	0.050	0.020	0.000	0.08	1.85	0.25	1.85	2.0	Off
20	YI-20	1.15	0.53	0.79	0.89	DrGrt	0.0	0.00	0.00	3.00	2.00	0.019	2.00	0.020	0.020	0.013	0.10	12.10	0.10	12.10	0.0	17
21	YI-19A	0.98	0.49	1.47	0.00	DrGrt	0.0	0.00	6.00	3.00	2.00	Sag	2.00	0.020	0.020	0.000	0.13	15.39	0.13	15.39	0.0	Off
22	CI-05A	0.27	0.00	0.27	0.00	Comb	4.0	3.00	0.00	3.00	2.33	0.050	2.00	0.050	0.020	0.013	0.09	1.70	0.17	0.00	2.0	4
23	YI-14	0.13	0.00	0.13	0.00	DrGrt	0.0	0.00	6.00	3.00	2.00	Sag	2.00	0.020	0.020	0.000	0.03	4.67	0.03	4.67	0.0	Off

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

NOTES: Inlet N-Values = 0.016; Intensity = 118.93 / (Inlet time + 17.60) ^ 0.86; Return period = 10 Yrs. ; * Indicates Known Q added.All curb inlets are throat.

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)	
24	YI-12	1.89	0.35	2.24	0.00	DrGrt	0.0	0.00	6.00	3.00	2.00	Sag	2.00	0.020	0.020	0.000	0.18	19.74	0.18	19.74	0.0	Off
25	YI-13	0.85	0.00	0.50	0.35	DrGrt	0.0	0.00	0.00	3.00	2.00	0.017	2.00	0.020	0.020	0.013	0.08	10.10	0.08	10.10	0.0	24
26	YI-22	1.07	1.31	1.18	1.21	DrGrt	0.0	0.00	0.00	3.00	2.00	0.010	2.00	0.020	0.020	0.013	0.14	16.10	0.14	16.10	0.0	Off
27	YI-23	2.23	0.00	0.91	1.31	DrGrt	0.0	0.00	0.00	3.00	2.00	0.053	2.00	0.020	0.020	0.013	0.10	12.10	0.10	12.10	0.0	26
28	FES-27	40.00*	0.00	40.00	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

NOTES: Inlet N-Values = 0.016; Intensity = 118.93 / (Inlet time + 17.60) ^ 0.86; Return period = 10 Yrs. ; * Indicates Known Q added.All curb inlets are throat.

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in) (2)	(cfs) (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft) (12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K) (23)	(ft) (24)
1	24	16.28	278.50	280.23	1.73	2.45	5.65	0.69	280.91	0.000	26.104	278.76	280.21 j	1.45**	2.45	6.66	0.69	280.90	0.000	0.000	n/a	1.46	n/a
2	24	15.86	278.96	280.21	1.25	2.07	7.65	0.67	280.89	0.000	34.292	280.91	282.34	1.43**	2.41	6.58	0.67	283.02	0.000	0.000	n/a	0.50	0.34
3	24	15.45	281.11	282.34	0.00	0.00	7.59	0.00	282.34	0.000	69.810	281.87	283.29	0.00**	0.00	6.50	0.00	283.29	0.000	0.000	0.000	1.50	n/a
4	24	15.14	281.97	283.29	0.00	0.00	6.90	0.00	283.29	0.000	24.999	282.22	283.62	0.00**	0.00	6.44	0.00	283.62	0.000	0.000	0.000	1.56	n/a
5	24	11.17	282.42	283.62	0.00	0.00	5.67	0.00	283.62	0.000	33.965	283.31	284.51	0.00**	0.00	5.69	0.00	284.51	0.000	0.000	0.000	1.68	n/a
6	18	11.14	283.41	284.51	0.00	0.00	8.04	0.00	284.51	0.000	58.779	286.95	288.23	0.00**	0.00	6.96	0.00	288.23	0.000	0.000	0.000	1.50	n/a
7	18	7.95	287.15	288.23	0.00	0.00	5.86	0.00	288.23	0.000	54.219	287.84	288.93	0.00**	0.00	5.77	0.00	288.93	0.000	0.000	0.000	1.50	n/a
8	18	4.41	289.87	290.46	0.00	0.00	6.78	0.00	290.46	0.000	111.318	291.67	292.47	0.00**	0.00	4.57	0.00	292.47	0.000	0.000	0.000	0.50	n/a
9	18	3.73	291.77	292.47	0.00	0.00	4.58	0.00	292.47	0.000	113.568	293.09	293.83	0.00**	0.00	4.32	0.00	293.83	0.000	0.000	0.000	1.50	n/a
10	15	1.37	293.19	293.83	0.00	0.00	2.18	0.00	293.83	0.000	31.395	293.50	293.96	0.00**	0.00	3.32	0.00	293.96	0.000	0.000	0.000	1.38	n/a
11	15	1.15	293.60	293.96	0.00	0.00	3.89	0.00	293.96	0.000	73.323	294.33	294.75	0.00**	0.00	3.15	0.00	294.75	0.000	0.000	0.000	1.00	n/a
12	15	1.39	293.42	293.83	0.00	0.00	3.99	0.00	293.83	0.000	24.880	293.67	294.14	0.00**	0.00	3.33	0.00	294.14	0.000	0.000	0.000	1.00	n/a
13	18	3.09	288.04	288.93	0.00	0.00	2.83	0.00	288.93	0.000	34.027	288.24	288.91	0.00**	0.00	4.06	0.00	288.91	0.000	0.000	0.000	1.39	n/a
14	15	1.75	287.56	288.23	0.00	0.00	2.64	0.00	288.23	0.000	24.939	287.81	288.34	0.00**	0.00	3.58	0.00	288.34	0.000	0.000	0.000	1.14	n/a
15	15	1.61	288.01	288.43	0.00	0.00	4.44	0.00	288.43	0.000	37.300	288.40	288.90	0.00**	0.00	3.49	0.00	288.90	0.000	0.000	0.000	1.13	n/a
16	15	0.36	289.79	289.99	0.00	0.00	2.82	0.00	289.99	0.000	24.845	290.04	290.27	0.00**	0.00	2.28	0.00	290.27	0.000	0.000	0.000	1.00	n/a
17	18	2.85	288.45	289.06	0.00	0.00	4.18	0.00	289.06	0.000	72.443	288.88	289.52	0.00**	0.00	3.96	0.00	289.52	0.000	0.000	0.000	1.50	n/a
18	15	1.28	288.60	289.03	0.00	0.00	3.40	0.00	289.03	0.000	93.603	289.16	289.61	0.00**	0.00	3.25	0.00	289.61	0.000	0.000	0.000	1.50	n/a
19	15	0.61	289.36	289.65	0.00	0.00	2.78	0.00	289.65	0.000	23.004	289.50	289.80	0.00**	0.00	2.64	0.00	289.80	0.000	0.000	0.000	1.00	n/a
20	15	1.15	289.29	289.59	0.00	0.00	5.02	0.00	289.59	0.000	142.157	292.04	292.46	0.00**	0.00	3.15	0.00	292.46	0.000	0.000	0.000	1.00	n/a
21	18	0.98	289.08	289.52	0.00	0.00	2.27	0.00	289.52	0.000	118.921	289.79	290.16	0.00**	0.00	2.90	0.00	290.16	0.000	0.000	0.000	1.00	n/a

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
(1)	(in) (2)	(cfs) (3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(ft) (12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(K) (23)	(ft) (24)
22	15	0.34	283.51	284.51	0.00	0.00	0.32	0.00	284.51	0.000	24.926	284.00	284.23	0.00**	0.00	2.25	0.00	284.23	0.000	0.000	0.000	0.50	n/a
23	15	0.13	284.20	284.28	0.00	0.00	3.86	0.00	284.28	0.000	30.868	286.00	286.14	0.00**	0.00	1.75	0.00	286.14	0.000	0.000	0.000	1.00	n/a
24	15	2.41	282.42	283.62	0.00	0.00	1.99	0.00	283.62	0.000	29.213	283.00	283.62	0.00**	0.00	3.96	0.00	283.62	0.000	0.000	0.000	1.20	n/a
25	15	0.85	283.20	283.62	0.00	0.00	2.35	0.00	283.62	0.000	155.151	284.75	285.11	0.00**	0.00	2.89	0.00	285.11	0.000	0.000	0.000	1.00	n/a
26	15	3.17	278.50	279.48	0.00	0.00	3.06	0.00	279.48	0.000	27.869	281.39	282.11	0.00**	0.00	4.36	0.00	282.11	0.000	0.000	0.000	0.92	n/a
27	15	2.23	281.49	282.11	0.00	0.00	3.70	0.00	282.11	0.000	121.919	282.81	283.41	0.00**	0.00	3.86	0.00	283.41	0.000	0.000	0.000	1.00	n/a
28	36	40.00	284.00	286.53	0.00	0.00	6.29	0.00	286.53	0.000	85.820	284.50	286.56	0.00**	0.00	7.74	0.00	286.56	0.000	0.000	0.000	1.00	n/a

Project File: SCBSZ_Storm Sewer.stm | Number of lines: 28 | Run Date: 2/3/2023

Notes: ; ** Critical depth.; j-Line contains hyd. jump ; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

General Procedure:

Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

SCBSZ
February 3, 2023

EROSION CONTROL CALCULATIONS

The SITE Group
1111 Oberlin Road
Raleigh NC 27605

919-832-6658 (o)
919-839-2255 (f)

Skimmer Sediment Basin Design Calculations By: NLB

Basin 1

SCBSZ

February 3, 2022

Composite C Calculation				
Land Use	"c" Value	Area (acres)	% Area	Weighted C
Graded	0.45	3.50	1.00	0.45
			0.00	0.00
			0.00	0.00
			0.00	0.00
	Total Area =	3.50	Composite c =	0.45

Peak Flow Q=CIA	
C	0.45
I-10	4.60
A (acres)	3.50
Q-10(cfs)	7.25

Time of Concentration Tc=((L^3/H)^0.385)/128		
L=	2384	feet
H=	24.5	feet
Tc=	18.14	minutes
I-10=	4.6	*interpolate

Required Dimensions		
Minimum Area Required (sf)		
A = 325 sf per cfs of Q10		
Min. Area	0.05	acres
	2,355	sf
Minimum Storage Volume Required (cf)		
V = 1800 ft3 / acre drainage		
Min. Volume	6,300	cf

Design Data	
Top of Dam Elevation	283.0
Spillway Elevation	282.0
Bottom Elevation	279.0
Bottom Area (sf)	4,100
Surface Area at Spillway (sf)	6,833
Volume (cf)	23,605

Calculate Skimmer Size

Basin Volume in Cubic Feet	23,605	Cu.Ft	**Skimmer Size**	**3.0**	Inch
Days to Drain*	3	Days	Orifice Radius	**1.3**	Inch[es]
			Orifice Diameter	**2.7**	Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin

	Length	Width				
Top of water surface in feet			Feet	**VOLUME**	**0**	**Cu. Ft.**
Bottom dimensions in feet			Feet			
Depth in feet			Feet			

Channel Liner Analysis
Project: SCBSZ
Date: 11/7/2022

Swale # 1

Physical Characteristics of Drainage Swale

Chan Bot Width (ft)	Side Slope	Side Slope Length (ft)	Design Depth (ft)	Channel Area (sf)	Wetted Perim., Pw (ft)	Hydraulic Radius (ft)	Channel Slope (ft/ft)
1	2	2.2	1	3.0	5.47	0.55	0.03178

Rational Equation for 2 year storm				Addition flow from upstream Swales			
C Factor	Intensity Inch/hr	Drainage Area (Acres)	Q2 Discharge (Cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	**Total Flow (cfs)**
0.45	5.62	1.32	**3.34**	0.00	0.00	0.00	**3.34**

Rational Equation for 10 year storm				Addition flow from upstream Swales			
C Factor	Intensity Inch/hr	Drainage Area (Acres)	Q10 Discharge (Cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	**Total Flow (cfs)**
0.45	7.22	1.32	**4.29**	0.00	0.00	0.00	**4.29**

Bare Soil calculations (Q2)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.020	26.69	4.6	4.99	0.75

Temporary liner calculations (Q2)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.055	9.71	7.4	2.40	1.23

Permanent liner calculations (Q10)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.055	9.71	8.3	2.61	1.37

Bare Soil

Material	Recommended n Values for Flow Depth			Permissible velocitiy (fps)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Bare Soil	0.023	0.02	0.02	2.00

Temporary Liners

*Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Unvegetated				
S75	0.055	0.028	0.021	1.55
S150	0.055	0.028	0.021	1.65
SC150	0.050	0.025	0.018	1.80
C125	0.022	0.014	0.014	2.25
C350	0.040	0.025	0.02	2.25
P300	0.034	0.024	0.02	2.00

Rip Rap Liners

Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Class A	0.044	0.033	0.03	1.65
Class B	0.066	0.041	0.034	3.00
Class I	0.104	0.069	0.035	4.50
Class II	-	0.078	0.04	6.00

Permanent Liners

*Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Vegetated				
C350 Phase 2	0.044	0.044	0.044	4.50
C300 Phase 2	0.044	0.044	0.044	4.00
C350 Phase 3	0.049	0.049	0.049	8.00
P300 Phase 3	0.049	0.049	0.049	8.00

Permanent Liners

Material	Recommended n Values	Permissible velocitiy (fps)
Grass Mixture	0.030	5.00

Notes:
Spreadsheet works for trapezoidal channel only
Side slope = horiz./vert.
Needs input
Output taken from AutoCad's Trapezoidial Ditch Calculater
* The Material lists refers to North American Green products. Contractor to use referenced material or approved equal.

Shear Stress, T= y*(d/12)*s
T = shear stress in lb/sq. ft.
y = unit weight of water, 62.4 lb/cu. ft.
d = flow depth in in.
s = channel slope in ft./ft.

Selected Temporary Liner: S75

Selected Permanent Liner: N/A

Channel Liner Analysis
Project: SCBSZ
Date: 11/7/2022

Swale # 2

Physical Characteristics of Drainage Swale

Chan Bot Width (ft)	Side Slope	Side Slope Length (ft)	Design Depth (ft)	Channel Area (sf)	Wetted Perim., Pw (ft)	Hydraulic Radius (ft)	Channel Slope (ft/ft)
1	2	2.2	1	3.0	5.47	0.55	0.0479

Rational Equation for 2 year storm				Addition flow from upstream Swales			
C Factor	Intensity Inch/hr	Drainage Area (Acres)	Q2 Discharge (Cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	**Total Flow (cfs)**
0.45	5.62	2.61	**6.60**	0.00	0.00	0.00	**6.60**

Rational Equation for 10 year storm				Addition flow from upstream Swales			
C Factor	Intensity Inch/hr	Drainage Area (Acres)	Q10 Discharge (Cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	Upstream swale# - Flow (cfs)	**Total Flow (cfs)**
0.45	7.22	2.61	**8.48**	0.00	0.00	0.00	**8.48**

Bare Soil calculations (Q2)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.020	32.77	5.8	7.02	1.43

Temporary liner calculations (Q2)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.028	23.40	6.4	6.05	1.58

Permanent liner calculations (Q10)

Mannings "n"	Q Allow.	AutoCad Depth (in)	AutoCad Velocity (fps)	Shear Stress (lb/sf)
0.030	21.84	7.2	6.42	1.79

Bare Soil

Material	Recommended n Values for Flow Depth			Permissible velocitiy (fps)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Bare Soil	0.023	0.02	0.02	2.00

Temporary Liners

*Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Unvegetated				
S75	0.055	0.028	0.021	1.55
S150	0.055	0.028	0.021	1.65
SC150	0.050	0.025	0.018	1.80
C125	0.022	0.014	0.014	2.25
C350	0.040	0.025	0.02	2.25
P300	0.034	0.024	0.02	2.00

Rip Rap Liners

Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Class A	0.044	0.033	0.03	1.65
Class B	0.066	0.041	0.034	3.00
Class I	0.104	0.069	0.035	4.50
Class II	-	0.078	0.04	6.00

Permanent Liners

*Material	Recommended n Values for Flow Depth			Allowable Shear Stress (lb/sf)
	0-0.5 ft	0.5-2.0 ft	> 2.0 ft	
Vegetated				
C350 Phase 2	0.044	0.044	0.044	4.50
C300 Phase 2	0.044	0.044	0.044	4.00
C350 Phase 3	0.049	0.049	0.049	8.00
P300 Phase 3	0.049	0.049	0.049	8.00

Permanent Liners

Material	Recommended n Values	Permissible velocitiy (fps)
Grass Mixture	0.030	5.00

Notes:
Spreadsheet works for trapezoidal channel only
Side slope = horiz./vert.
Needs input
Output taken from AutoCad's Trapezoidal Ditch Calculater
* The Material lists refers to North American Green products. Contractor to use referenced material or approved equal.

Shear Stress, T= y*(d/12)*s
T = shear stress in lb/sq. ft.
y = unit weight of water, 62.4 lb/cu. ft.
d = flow depth in in.
s = channel slope in ft./ft.

Selected Temporary Liner: SC150

Selected Permanent Liner: N/A

SCBSZ
February 3, 2023

SUPPORTING DOCUMENTATION

The SITE Group
1111 Oberlin Road
Raleigh NC 27605

919-832-6658 (o)
919-839-2255 (f)

WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 54

54

N

SITE

(Joins sheet 44)

(Joins sheet 53)

(Joins inset, sheet 63)

ZEBULON

Scale 1:15840

1 Mile

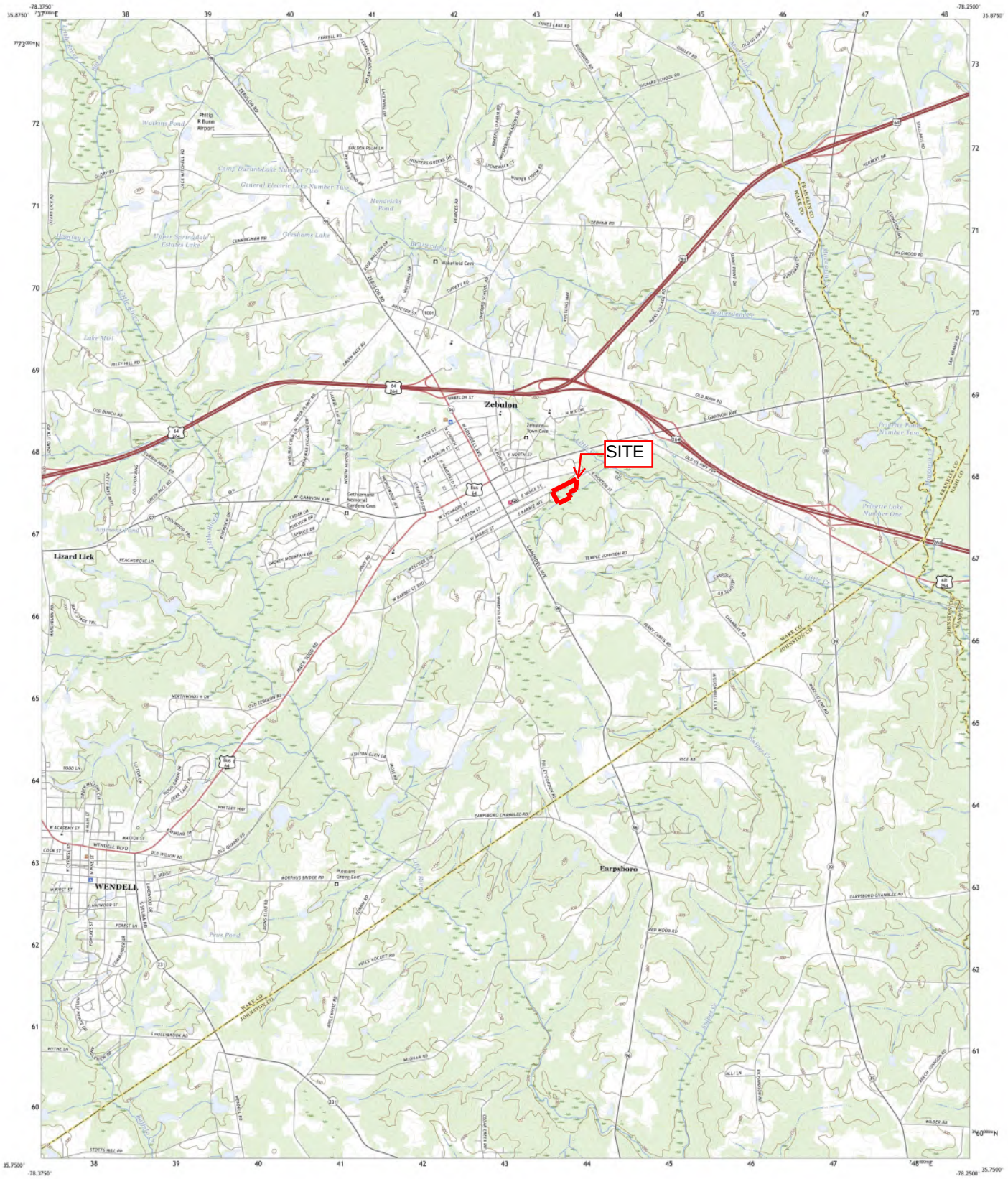
5000 Feet

0 1000 2000 3000 4000 5000

USGS
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

ZEBULON QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 17S

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, July 2020 - July 2020
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2022
Hydrography.....National Hydrography Dataset, 2001 - 2021
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 2019 - 2021

Wetlands.....FWS National Wetlands Inventory Not Available

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

ADJOINING QUADRANGLES
1 Rolesville
2 Bunn West
3 Bunn East
4 Knightdale
5 Middlesex
6 Clayton
7 Flowers
8 Stancils Chapel

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

ZEBULON, NC
2022

NSN 7643016793577
MGA REF NO. USGX2447128

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR ZONE DESCRIPTIONS AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT
HTTPS://FRIS.NC.GOV/FRIS
HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99* With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with Average Depth Less Than One Foot or With Drainage Areas of Less Than One Square Mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	Areas Determined to be Outside the 0.2% Annual Chance Floodplain *Zone X*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	17 — 16.2 — Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 — Coastal Transect

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at https://msc.fema.gov. An accompanying Flood Insurance Study report, Letter of Map Revision (LOMR) or Letter of Map Amendment (LOMA) revising portions of this panel, and digital versions of this FIRM may be available. Visit the North Carolina Floodplain Mapping Program website at https://flood.nc.gov/ncflood, or contact the FEMA Map Service Center.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in the community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Flood Insurance Study (FIS) means an examination, evaluation, and determination of flood hazards, corresponding water surface elevations, flood hazard risk zones, and other flood data in a community issued by the North Carolina Floodplain Mapping Program (NCFMP). The Flood Insurance Study (FIS) is comprised of the following products used together: the Digital Flood Hazard Database, the Water Surface Elevation Rasters, the digitally derived, autogenerated Flood Insurance Rate Map and the Flood Insurance Survey Report. A Flood Insurance Survey is a compilation and presentation of flood risk data for specific watercourses, lakes, and coastal flood hazard areas within a community. This report contains detailed flood elevation data, data tables and FIRM indices. When a flood study is completed for the NFIP, the digital information, reports and maps are assembled into an FIS. Information shown on this FIRM is provided in digital format by the NCFMP. Base map information shown on this FIRM was provided in digital FLOOD database and is the Technical Support Data Notebook (TSDN).

ACCREDITED LEVEE NOTES TO USERS: If an accredited levee note appears on this panel check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

PROVISIONALLY ACCREDITED LEVEE NOTES TO USERS: If a Provisionally Accredited Levee (PAL) note appears on this panel, check with your local community to obtain more information, such as the estimated level of protection provided (which may exceed the 1-percent-annual-chance level) and Emergency Action Plan, on the levee system(s) shown as providing protection for areas on this panel. To maintain accreditation, the levee owner or community is required to submit the data and documentation necessary to comply with Section 65.10 of the NFIP regulations. If the community or owner does not provide the necessary data and documentation or if the data and documentation provided indicate the levee system does not comply with Section 65.10 requirements, FEMA will revise the flood hazard and risk information for this area to reflect de-accreditation of the levee system. To mitigate flood risk in residual risk areas, property owners and residents are encouraged to consider flood insurance and floodproofing or other protective measures. For more information on flood insurance, interested parties should visit the FEMA Website at https://www.fema.gov/national-flood-insurance-program.

LIMIT OF MODERATE WAVE ACTION NOTES TO USERS: For some coastal flooding zones the AE Zone category has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA or between the shoreline and the LiMWA for areas where VE Zones are not identified will be similar to, but less severe than those in the VE Zone.

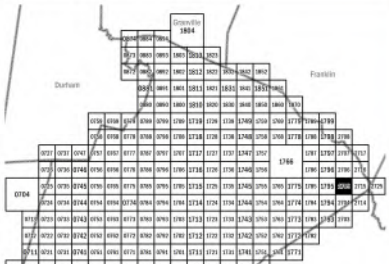
SCALE

Map Projection:
North Carolina State Plane Projection Feet (Zone 3200)
Datum: NAD 1983 (Horizontal), NAVD 1988 (Vertical)

1 inch = 500 feet 1:6,000

0 250 500 1,000 Feet
0 75 150 300 Meters

PANEL LOCATOR



FEMA
National Flood Insurance Program

NORTH CAROLINA FLOODPLAIN MAPPING PROGRAM
NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

NORTH CAROLINA

PANEL 2705

FEMA

Panel Contains:

COMMUNITY	CID	PANEL	SUFFIX
WAKE COUNTY	370368	2705	K
ZEBULON, TOWN OF	370246	2705	K

United States Department of Agriculture

NRCS

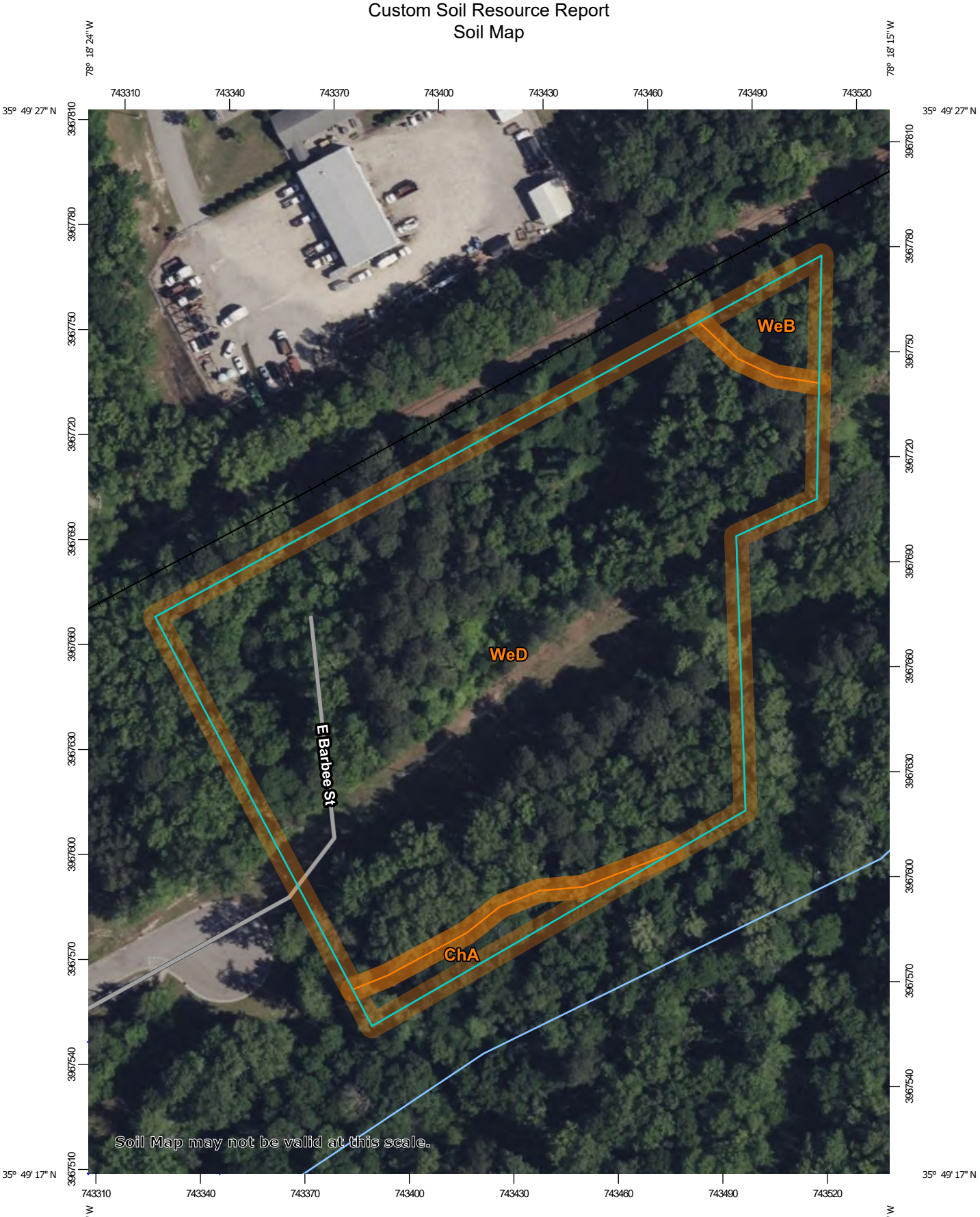
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Wake County, North Carolina

November 5, 2022

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,480 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Wake County, North Carolina
Survey Area Data: Version 23, Sep 12, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 24, 2022—May 9, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
ChA	Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded	0.2	3.5%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	0.2	3.4%
WeD	Wedowee sandy loam, 10 to 15 percent slopes	5.1	93.2%
Totals for Area of Interest		**5.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Wake County, North Carolina

ChA—Chewacla and Wehadkee soils, 0 to 2 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2qwpj
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

Map Unit Composition

Chewacla, frequently flooded, and similar soils: 50 percent
Wehadkee, frequently flooded, and similar soils: 45 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chewacla, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 4 inches: loam
Bw1 - 4 to 26 inches: silty clay loam
Bw2 - 26 to 38 inches: loam
Bw3 - 38 to 60 inches: clay loam
C - 60 to 80 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D
Ecological site: F136XY610GA - Flood plain forest, wet
Hydric soil rating: No

Description of Wehadkee, Frequently Flooded

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy alluvium derived from igneous and metamorphic rock

Typical profile

A - 0 to 7 inches: silt loam
Bg - 7 to 49 inches: clay loam
Cg - 49 to 80 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: NoneFrequent
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F136XY600NC - Flood plain swamp forest, hydric soils
Hydric soil rating: Yes

WeB—Wedowee sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2xn40
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

WeD—Wedowee sandy loam, 10 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2xn3y
Elevation: 70 to 560 feet
Mean annual precipitation: 39 to 47 inches
Mean annual air temperature: 55 to 63 degrees F
Frost-free period: 200 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Wedowee and similar soils: 94 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wedowee

Setting

Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Saprolite residuum weathered from granite and gneiss and/or saprolite residuum weathered from schist

Typical profile

Ap - 0 to 4 inches: sandy loam
E - 4 to 7 inches: sandy loam
BC - 23 to 35 inches: clay loam
C - 35 to 80 inches: sandy clay loam

Properties and qualities

Slope: 10 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: F136XY820GA - Acidic upland forest, moist
Hydric soil rating: No

THE SITE GROUP

Project: Barbee St. Subdivision | Project No.: SCBSZ
Calculated By:Wade Randle, EI | 7-Nov-22

DRAINAGE AREA BREAKDOWNS

Soil Types on Site		HSG	%
WeD	Wedowee Sandy Loam	B	100

PRE-DEVELOPMENT

AREA 1A				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	0	0.00	98	0
Lawn	0	0.00	61	0
Wooded	182704	4.19	60	60
Total	182704	4.19		**60**

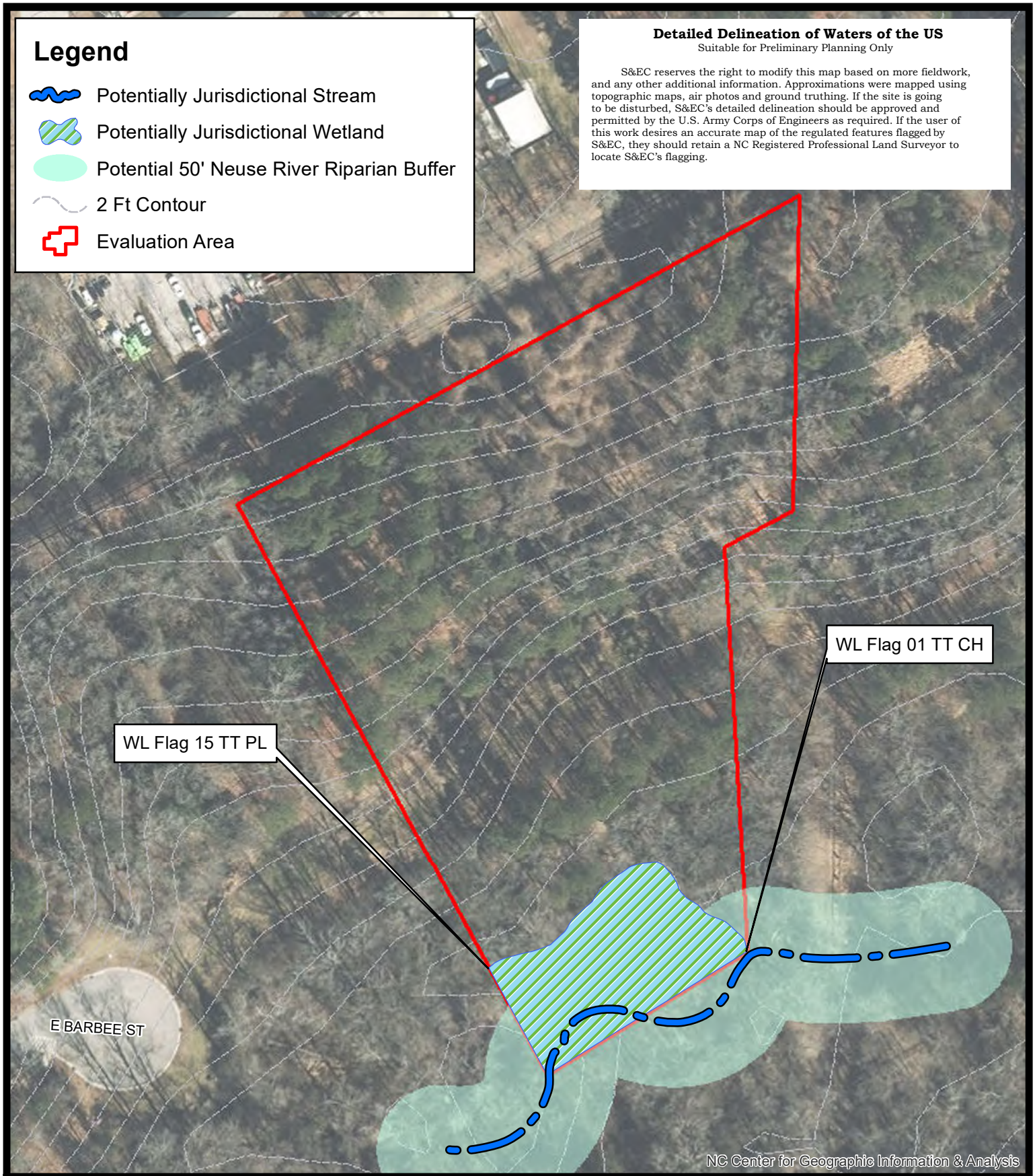
AREA 2A				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	1383	0.03	98	1
Lawn		0.00	61	0
Wooded	155146	3.56	60	59
Total	156529	3.59		**60**

POST DEVELOPMENT

AREA TO SCM				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	119378	2.74	98	64
Lawn	63737	1.46	61	21
Wooded	0	0.00	60	0
Total	183115	4.20		**85**

SCM BYPASS 1				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious		0.00	98	0
Lawn	89507	2.05	61	61
Wooded	0	0.00	60	0
Total	89507	2.05		**61**

SCM BYPASS 2				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious		0.00	98	0
Lawn		0.00	61	0
Wooded	66669	1.53	60	60
Total	66669	1.53		**60**



Project Number: 15274.W1

Project Manager: SB

Scale: 1" = 100'

Date: 05/26/2022

Map Title:

Wetland Sketch Map

Barbee St. Zebulon
Wake County, NC

Source: Aerials from NC OneMap

0 100 200
Feet

N

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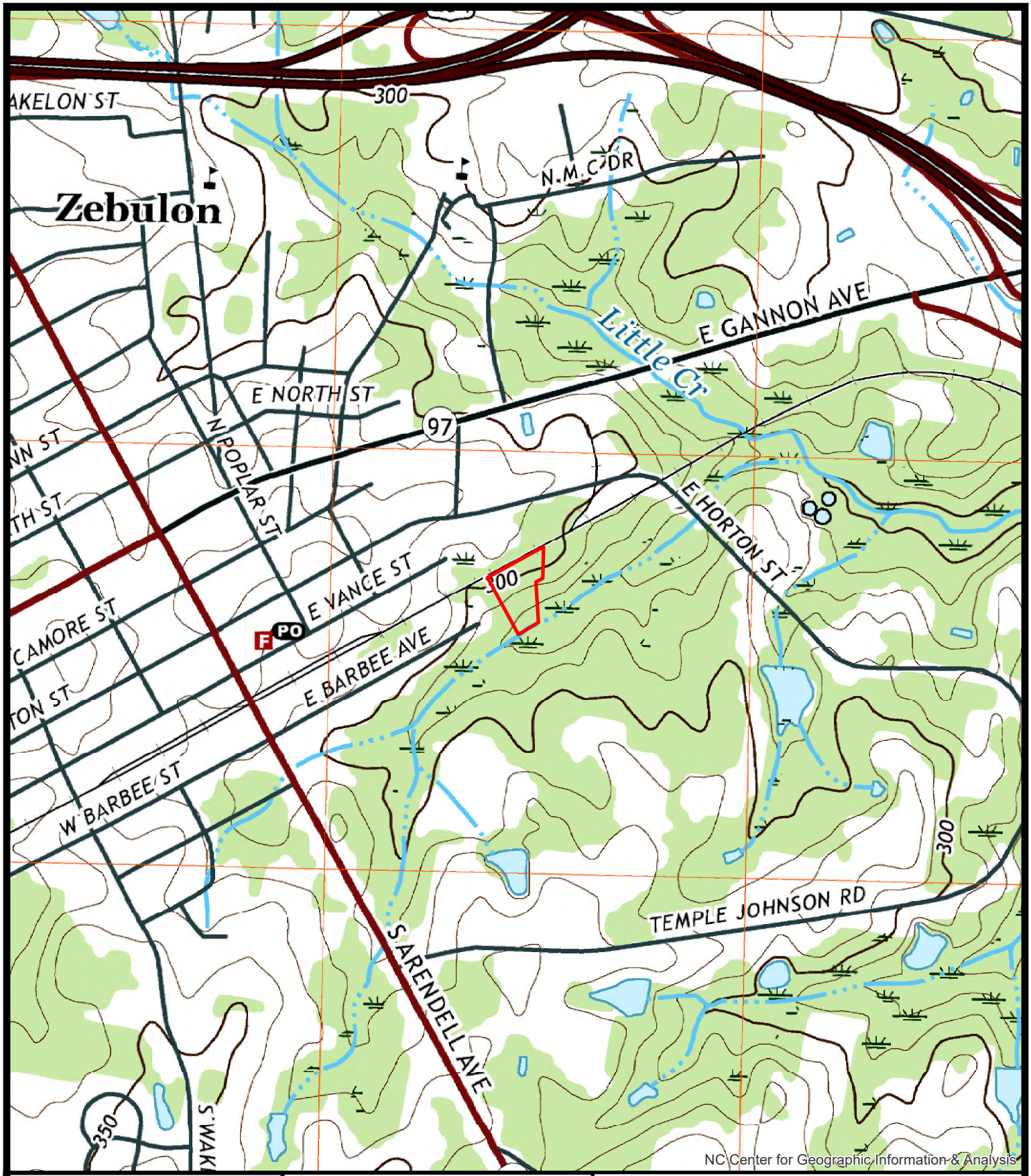
Soil & Environmental Consultants, PA
8412 Falls of Neuse Road, Suite 104, Raleigh, NC 27615 • Phone: (919) 846-5900 • Fax: (919) 846-9467
sandec.com



Project Number: 15274.W1	**Map Title:** Figure 1 - USGS Map Barbee St. Zebulon Wake County, NC
Project Manager: SB	
Scale: 1" = 1000'	
Date: 05/16/2022	**Source:** 2019 Zebulon Quadrangle

0 1,000 2,000
Feet

N

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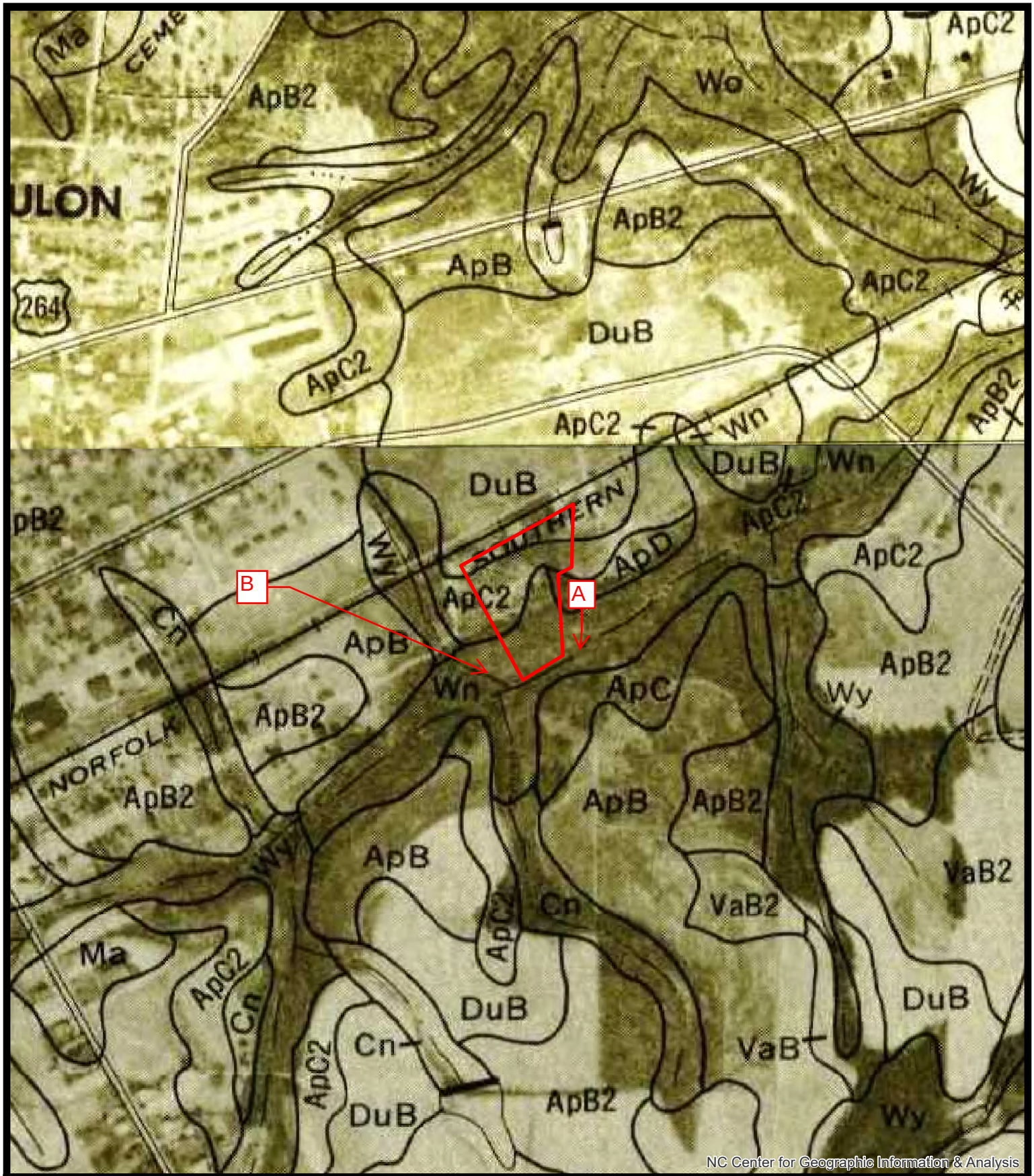

Project Number: 15274.W1	**Map Title:** Figure 2 - Soil Survey Map
Project Manager: SB	Barbee St. Zebulon Wake County, NC
Scale: 1" = 500'	**Source:** Soil Survey Sheet No. 44 & 54
Date: 05/16/2022	

0 500 1,000
Feet

N

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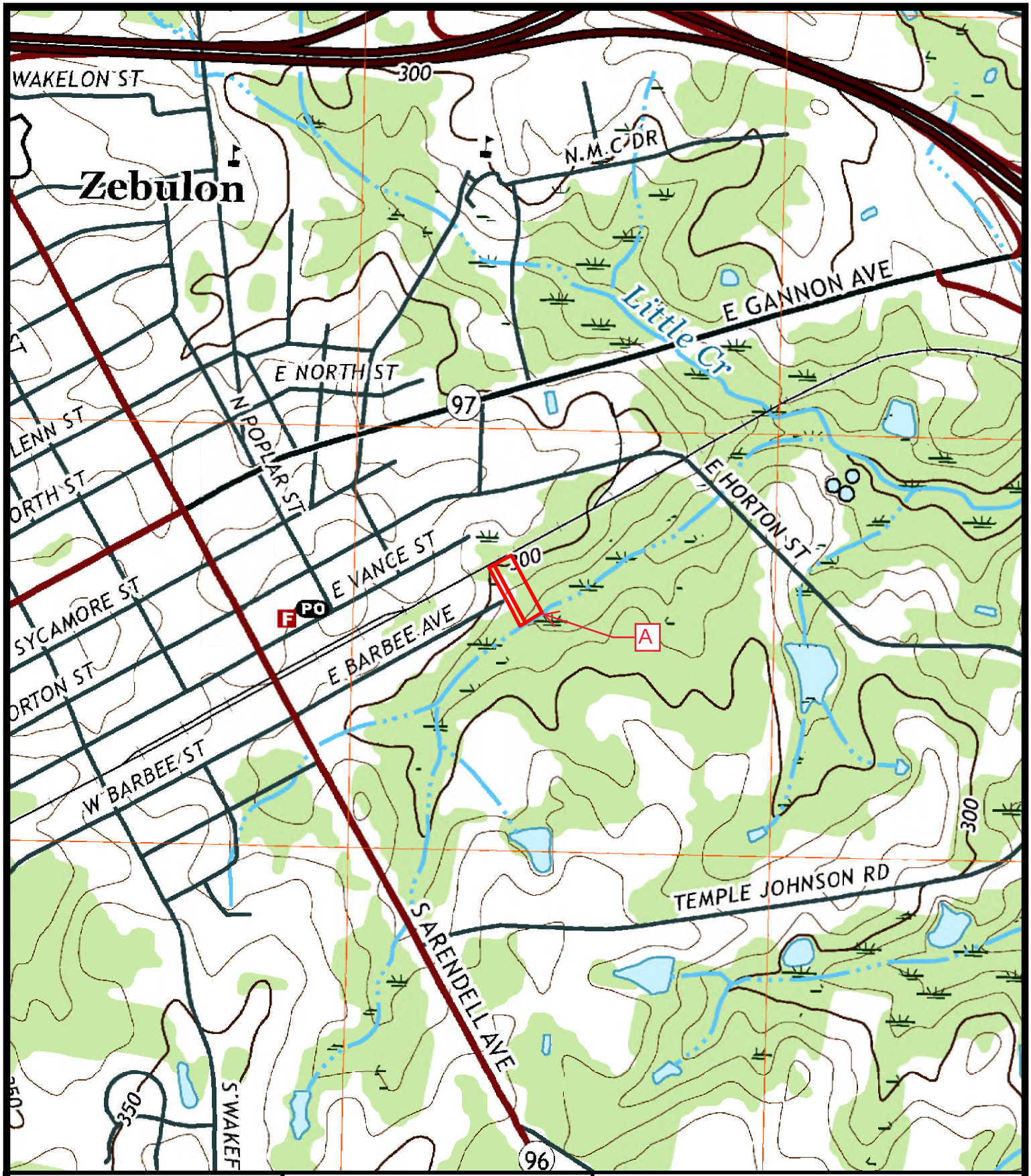

Project Number: 15274.W5	**Map Title:** Figure 1 - USGS Map 400 E Barbee St. Property Wake County, NC
Project Manager: SB	
Scale: 1" = 1000'	
Date: 08/19/2022	**Source:** 2019 Zebulon Quadrangle

0 1,000 2,000
Feet

N

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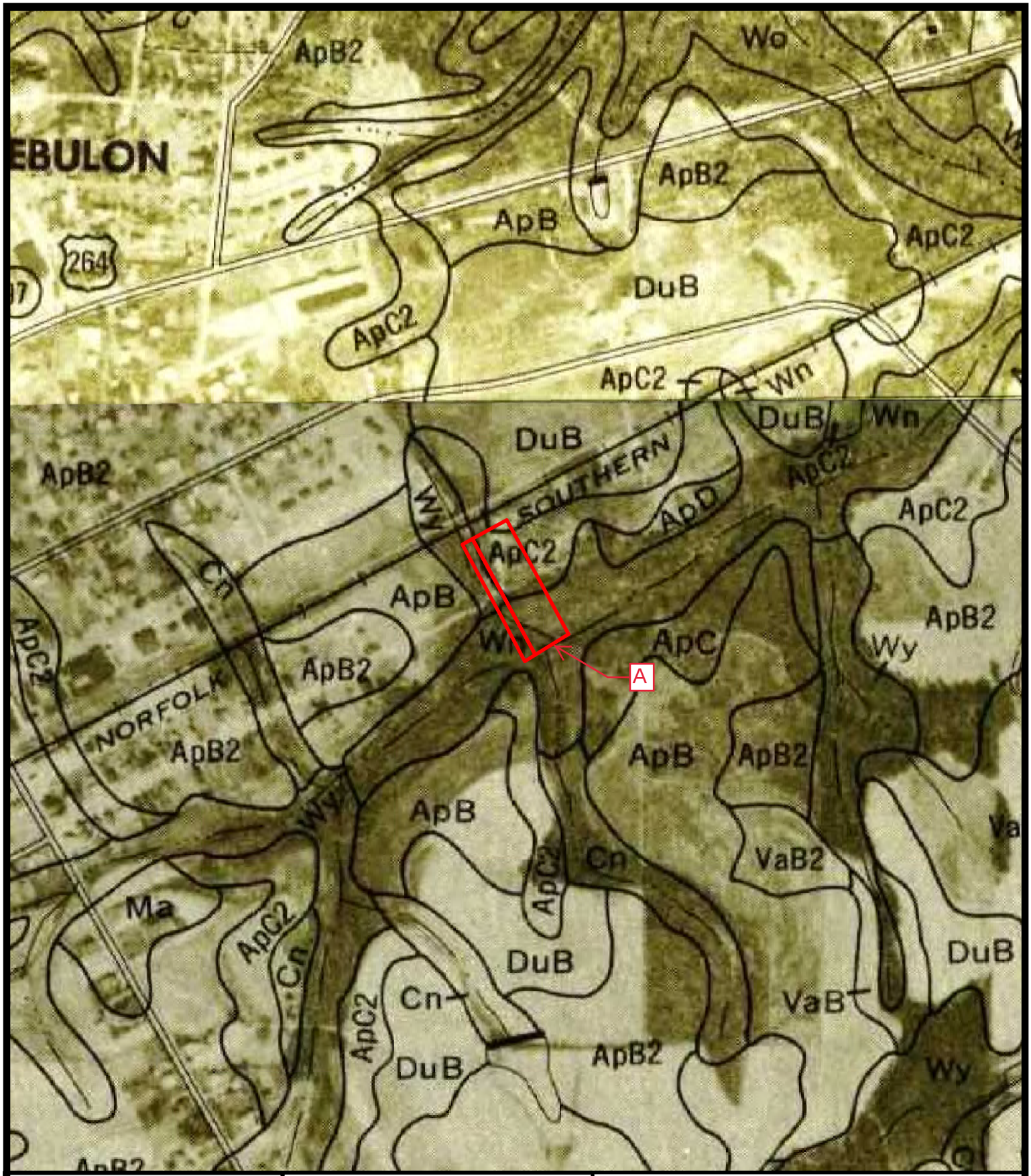

Project Number: 15274.W5	**Map Title:** Figure 2 - Soil Survey Map
Project Manager: SB	400 E Barbee St. Property Wake County, NC
Scale: 1" = 500'	**Source:** Soil Survey Sheet No. 44 & 54
Date: 08/19/2022	

0 500 1,000
Feet

N

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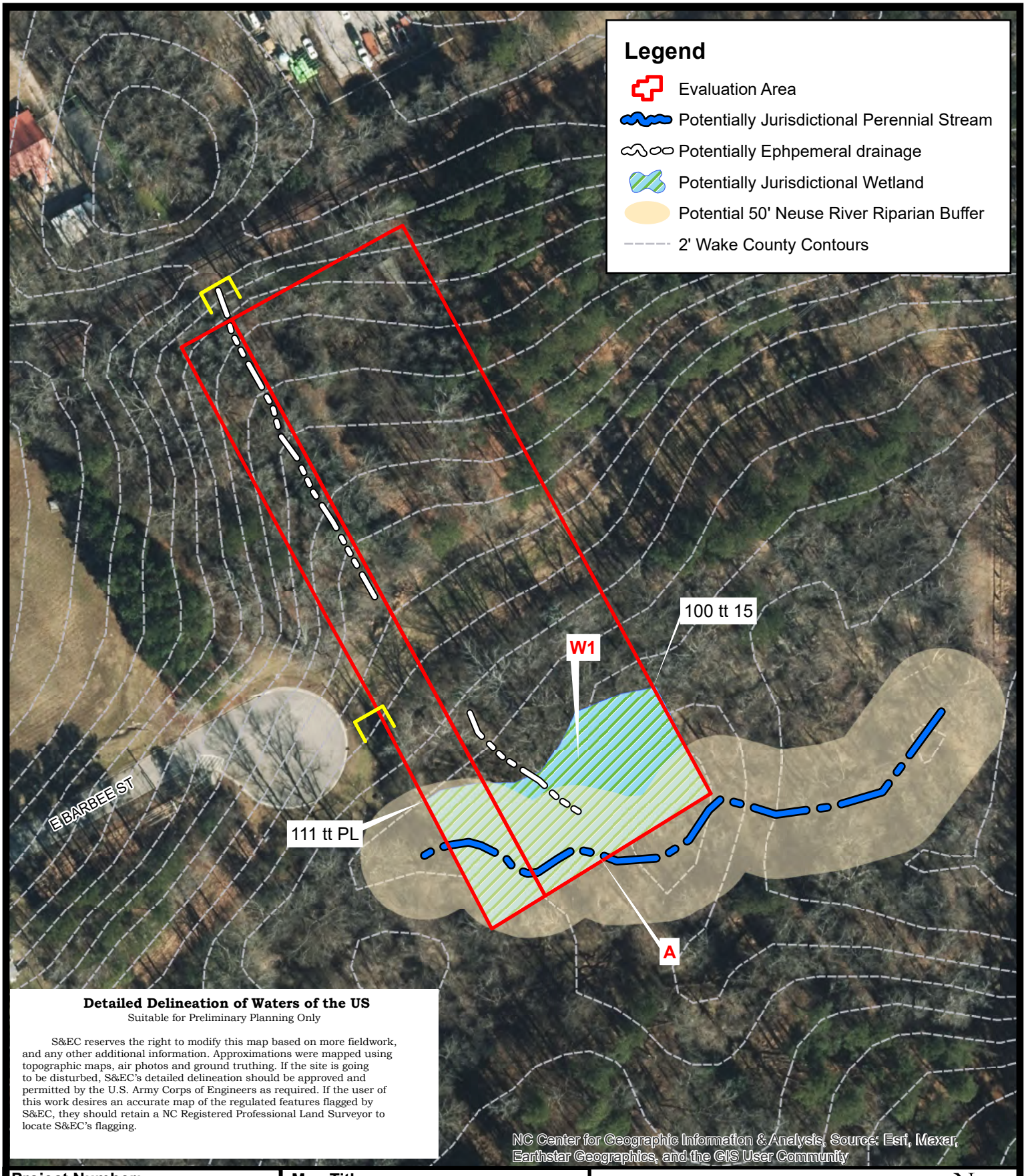

Detailed Delineation of Waters of the US
Suitable for Preliminary Planning Only

S&EC reserves the right to modify this map based on more fieldwork, and any other additional information. Approximations were mapped using topographic maps, air photos and ground truthing. If the site is going to be disturbed, S&EC's detailed delineation should be approved and permitted by the U.S. Army Corps of Engineers as required. If the user of this work desires an accurate map of the regulated features flagged by S&EC, they should retain a NC Registered Professional Land Surveyor to locate S&EC's flagging.

Project Number:	15274.W5
Project Manager:	SB
Scale:	1" = 100'
Date:	09/02/2022

Map Title:
Wetland Sketch Map
400 E Barbee St. Property
Wake County, NC

Source: Aerials from ESRI

0 100 200
Feet

N

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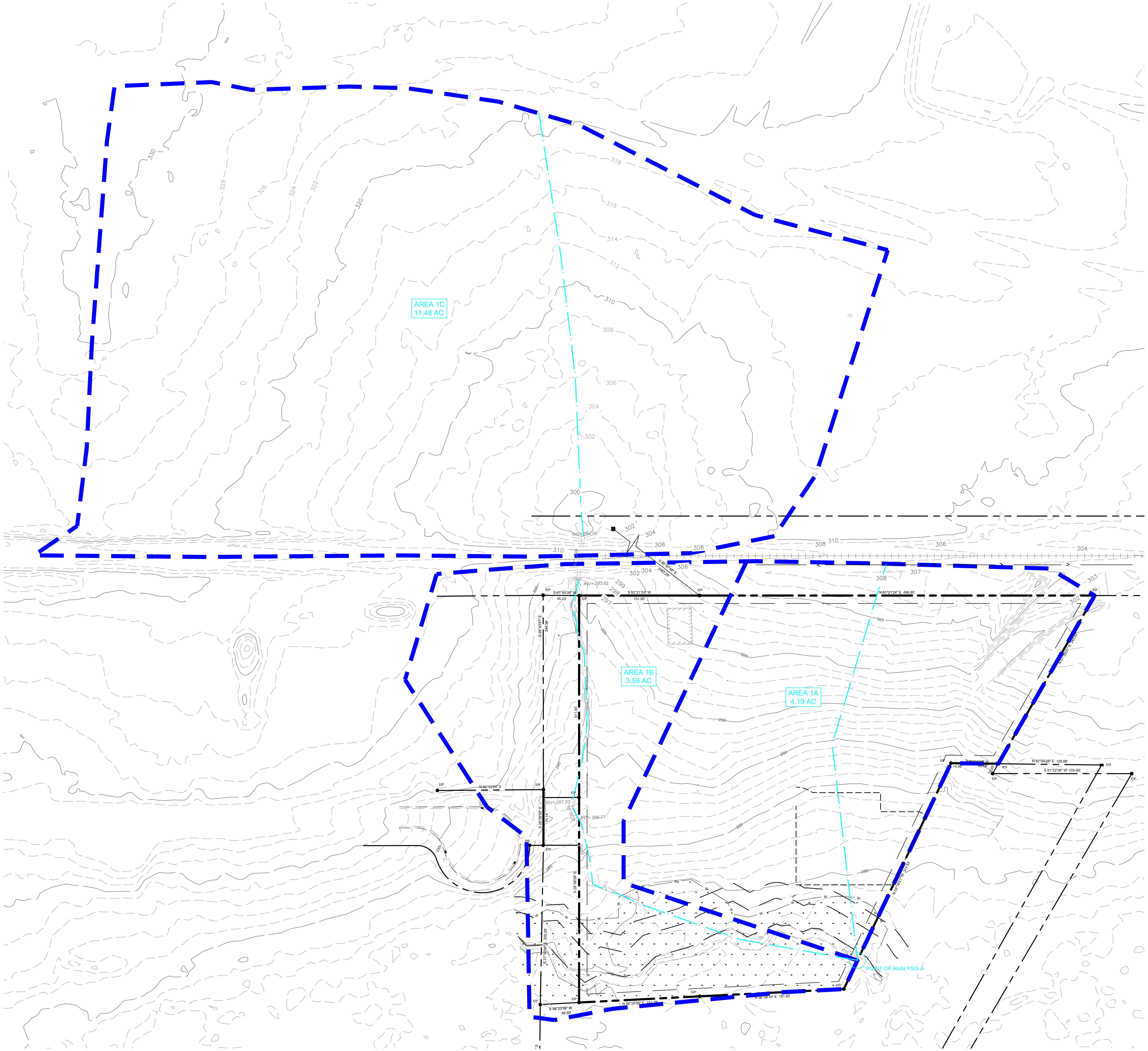

DRAINAGE AREA BREAKDOWNS

Soil Types on Site		HSG	%
WeD	Wedowee Sandy Loam	B	100

PRE-DEVELOPMENT

AREA 1A				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	0	0.00	98	0
Lawn	0	0.00	61	0
Wooded	182704	4.19	60	60
Total	182704	4.19		**60**

AREA 1B				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	1383	0.03	98	1
Lawn		0.00	61	0
Wooded	155146	3.56	60	59
Total	156529	3.59		**60**

AREA 1C				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	157799	3.62	98	31
Lawn	274922	6.31	61	33
Wooded	72346	1.66	60	9
Total	505067	11.59		**72**

POST DEVELOPMENT

AREA TO SCM				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious	119378	2.74	98	64
Lawn	63737	1.46	61	21
Wooded	0	0.00	60	0
Total	183115	4.20		**85**

SCM BYPASS 1A				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious		0.00	98	0
Lawn	89507	2.05	61	61
Wooded	0	0.00	60	0
Total	89507	2.05		**61**

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Total	505067	11.59		**72**

SCM BYPASS 2				
	Area (sf)	Area (ac)	CN	Weighted CN
Impervious		0.00	98	0
Lawn		0.00	61	0
Wooded	66669	1.53	60	60
Total	66669	1.53		**60**

NORTH

PRE DEVELOPMENT DRAINAGE AREA

SCALE: 1" = 60' (DRAWING SCALED FOR 24x36 INCH PLOTS)

0 60 120 180 240

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NC ENGINEERING LICENSE NO. P-0803

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1111 Oberlin Road
Raleigh, NC 27605-1136 USA
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Fax: 919.839.2255
E Mail: SRN@thesitegroup.net

CONSTRUCTION DRAWINGS FOR:
BARBEE ST. SUBDIVISION
0 E. BARBEE STREET
ZEBULON, NORTH CAROLINA

Drawn By WRR
Checked By SRN

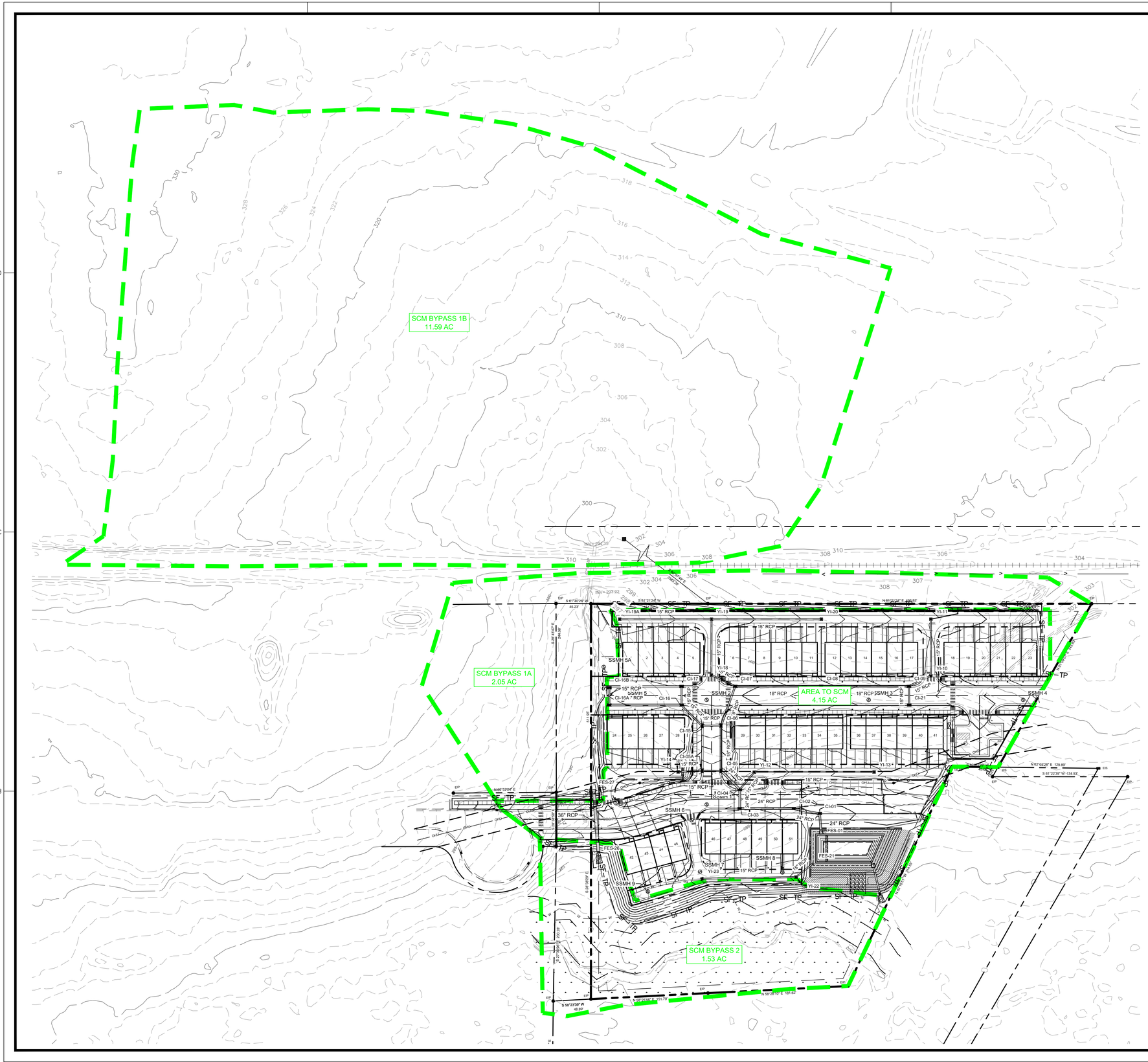
DATE:
07 NOV 2022
REVISED:
1 03 FEB 2023

CONSTRUCTION DRAWINGS

PRE DEVELOPMENT DRAINAGE AREA

Job Code SCBSZ

Dwg No.
DA 1.0



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NORTH

POST DEVELOPMENT DRAINAGE AREA

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0 60 120 180 240

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CERT. NO. 353
NORTH CAROLINA
RALEIGH, N.C.

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0 E. BARBEE STREET
ZEBULON, NORTH CAROLINA

Drawn By WRR
Checked By SRN

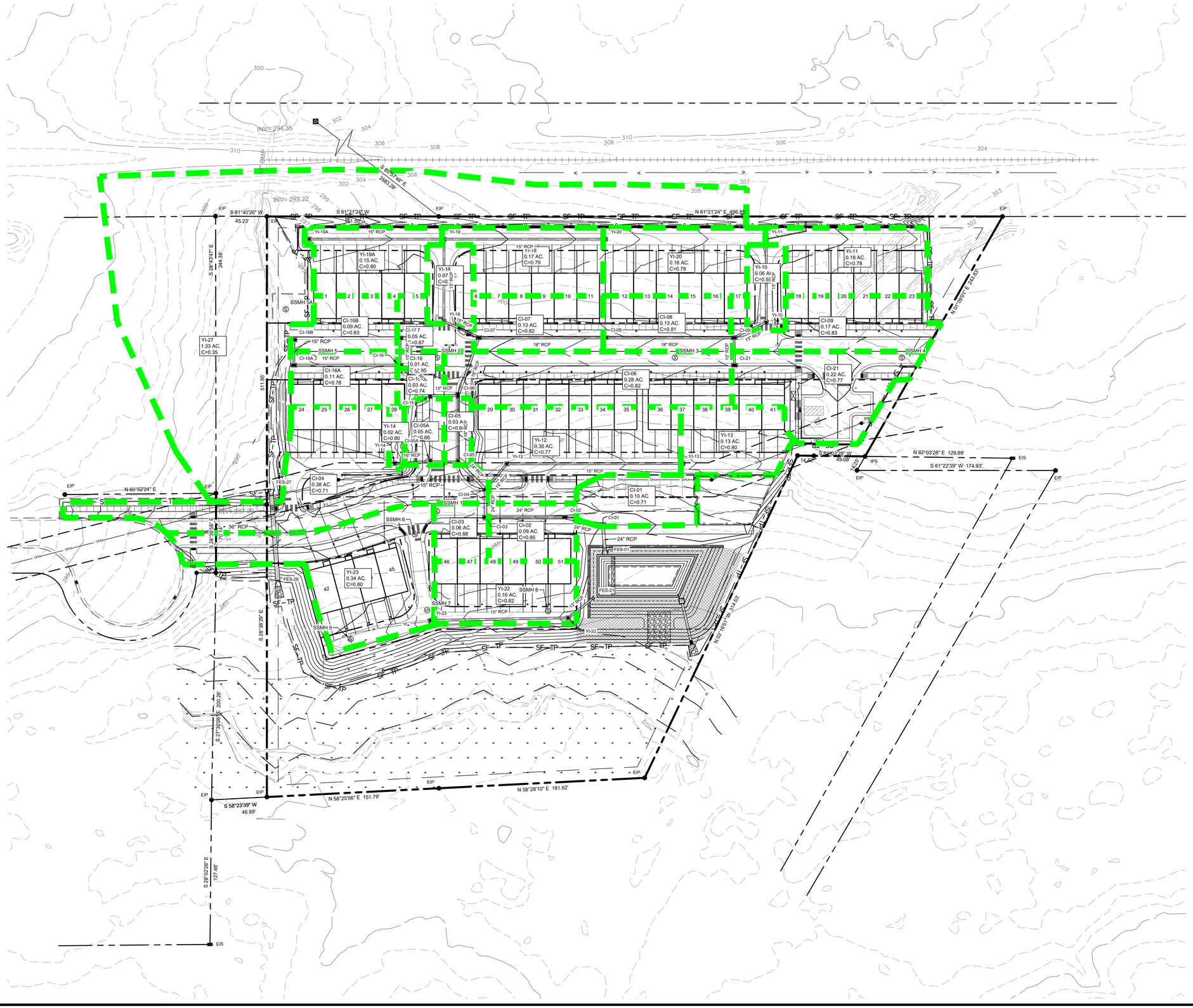
DATE:
07 NOV 2022
REVISED:
1 03 FEB 2023

CONSTRUCTION DRAWINGS

POST DEVELOPMENT DRAINAGE AREA

Job Code SCBSZ

Dwg No. DA 1.0



NORTH

INLET DRAINAGE AREA MAP

SCALE: 1" = 60' (DRAWING SCALED FOR 24x36 INCH PLOTS)

0 60 120 180 240

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03 FEB 2023

CONSTRUCTION DRAWINGS

INLET DRAINAGE AREA MAP

Job Code: SCBSZ

Dwg No.
DA 3.0