7-Eleven

1106 N. Arendell Ave

Proposed gas station and associated infrastructure

Zebulon, North Carolina

COORDINATES: 35.8336261 N, -78.321664 W

Project No.: 220163-01-002

Erosion Control & Storm Design Calculations

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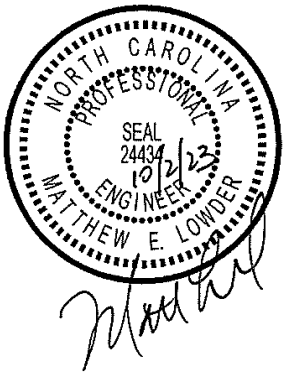

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SEPTEMBER 29, 2023

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OVERVIEW

This report contains the stormwater design calculations for the proposed 7-Eleven. The project site is located on the eastern corner of the intersection of N. Arendell Ave and Dogwood Dr. in the town of Zebulon, North Carolina, within Wake County. Currently, the project site is single-family residential and wooded area.

The proposed project site consists of 3.86 acres and approximately 4.02 acres will be disturbed as part of this project for the construction of the site improvements, widening of Dogwood Drive, and construction of Jones Street. 0.46 acres will be dedicated to future road right-of-way. The proposed development consists of a 4,761 sf building, two fuel canopies, stormwater control measures, and associated pavement, including parking areas, driveways, and curbs.

Background

The development on the site will result in an impervious area of 92,017 sf (2.11 ac impervious – 54.69% of site area). Table 1 below shows the break-down of the impervious area added to the site.

Table 1. Impervious Area Summary

Impervious Area Summary		
Buildings	13,777 sf	0.32 ac
Pavement	69,730 sf	1.60 ac
Sidewalk	8,510 sf	0.20 ac
Total Impervious Area	**92,017 sf**	**2.11 ac**
Existing Impervious Area	3,650 sf	0.08 ac

Floodplains and Streams

The proposed parcel is not located within a FEMA designated flood zone as shown on the combined FEMA FIRM Panel 3720270500K (July 19, 2022).

There are no existing streams and/or tributaries on the proposed property.

Soils

Based on the NRCS Web Soil Survey, the project site consists of Wedowee sandy loam (WeB) soils.

WeB soils are Group B with 2 to 6 percent slopes.

STORM DRAINAGE DESIGN REQUIREMENTS

The proposed stormwater drainage system design was based on standards presented in the Town of Zebulon Public Works Department Street and Storm Drainage Standards and Specifications Manual. The Town of Zebulon requires the following criteria:

- The minimum pipe culvert shall be 15" inches to minimize clogging and maintenance for all pipe culverts within Town of Zebulon Right-of-ways and easement.
- All pipe culverts to be a minimum class III reinforced concrete with a minimum pipe cover equal to 2 feet measured from the proposed finish grade to the top of the pipe. (*Section 5.0.2C*).

There are two storm drain systems proposed on site that drain to the proposed wet pond. There is a third storm drain system that collects a portion of Jones Street that will bypass the pond.

Rainfall Intensity and Time of Concentration

The 10-year, 5-minute rainfall intensity used in the design of the storm drainage system is **7.21 in/hr.** The time of concentration used in the design of the storm drainage system was assumed to be **5 minutes**.

A complete analysis of the rainfall data can be found in Appendix A of this report. A complete analysis of the storm drain design and calculations can be found in Appendix C of this report.

DOWNSTREAM IMPACT ANALYSIS

A downstream impact analysis is included per the 10% rule. The StreamStats analysis point has a drainage area of approximately 39.7 acres, more than the 10% of the proposed development drainage area, and a 10-year peak flood flow of 71.8 cfs. For the 7-Eleven site, the Pre-Developed flow for the 10-year storm event is 3.965 cfs (per hydrographs). The Post-Developed through Pond flow for the 10-year storm event of the site is 1.280 cfs (per hydrographs) and a total of 3.519 cfs including bypass. The difference in flow is 0.446 cfs. This incorporates the proposed development. Since the 10-year storm event is being attenuated through the wet pond, there is a net decrease in peak flow from the pre-developed to post-developed condition. Therefore, there will be no impacts downstream.

APPENDIX A
Figures

Aerial Map
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HUC & Water Surface Classification
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Stormwater Analysis

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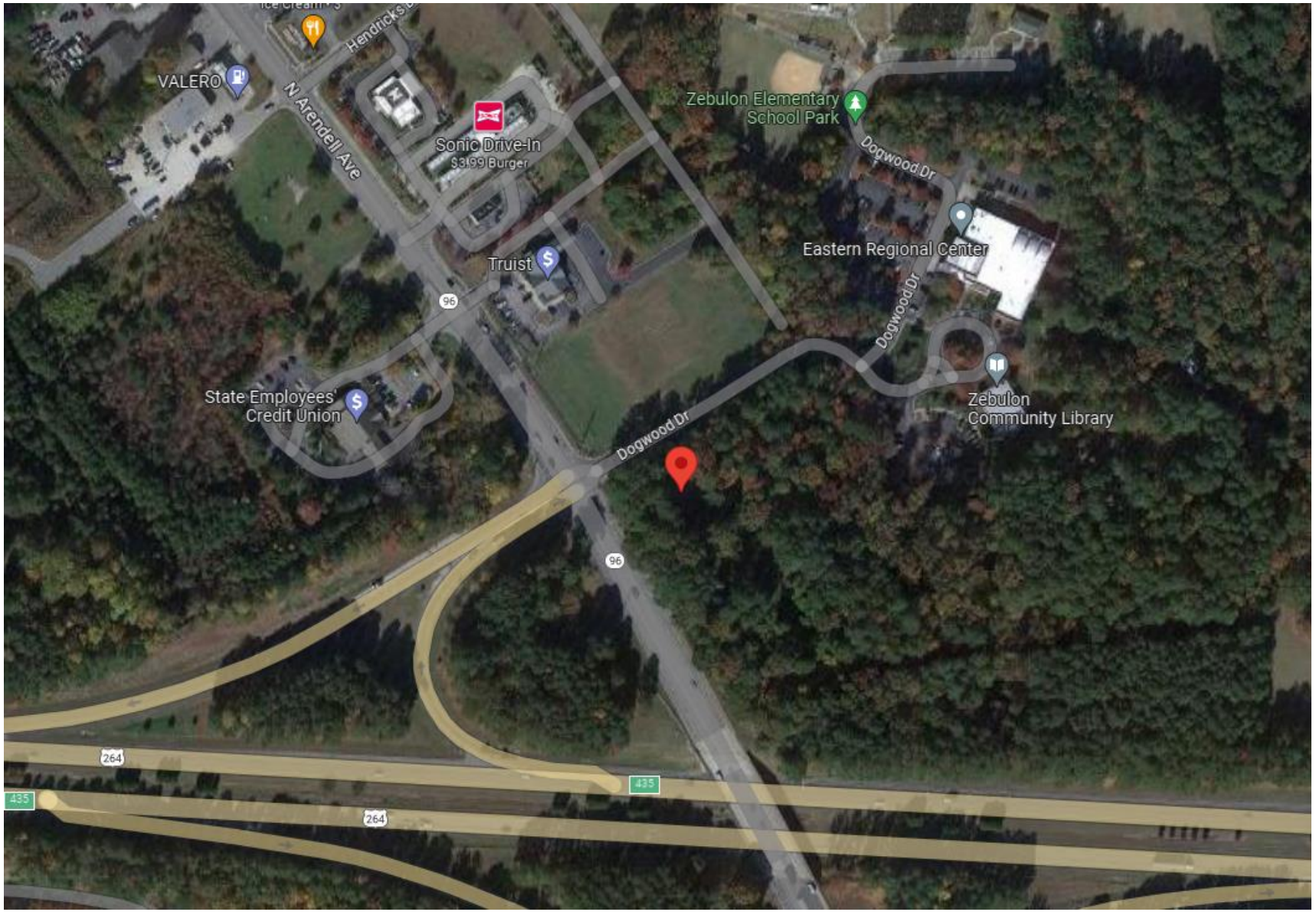

VALERO
N Arendell Ave
Sonic Drive-In
$3.99 Burger
Zebulon Elementary School Park
Dogwood Dr
Eastern Regional Center
Truist
96
Dogwood Dr
State Employees' Credit Union
Zebulon Community Library
Dogwood Dr
96
264
435
435
264

Map Scale: 1:2,090 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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 Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ur	Urban land		0.7	7.6%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	B	8.8	92.4%
Totals for Area of Interest			**9.5**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

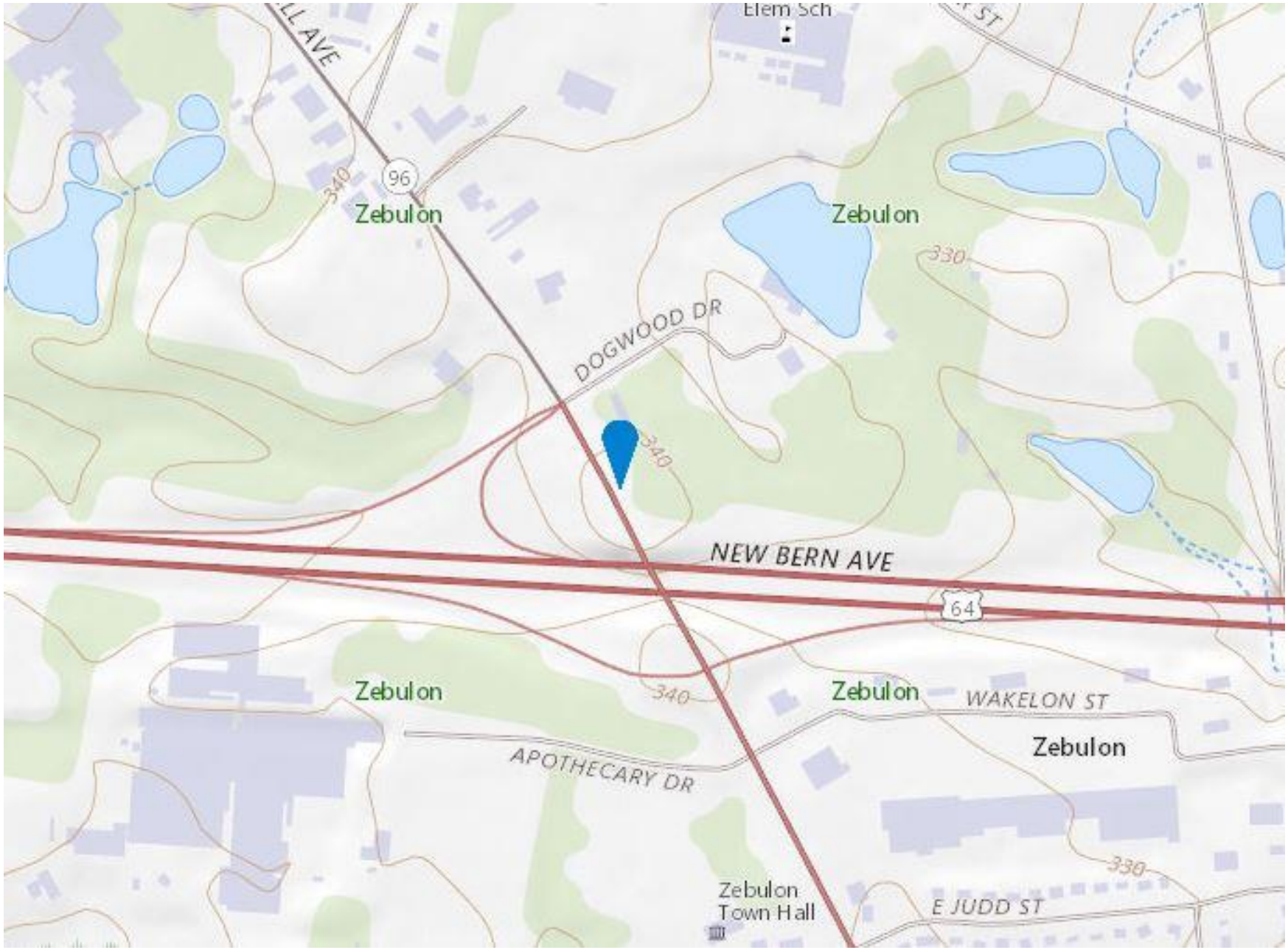
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

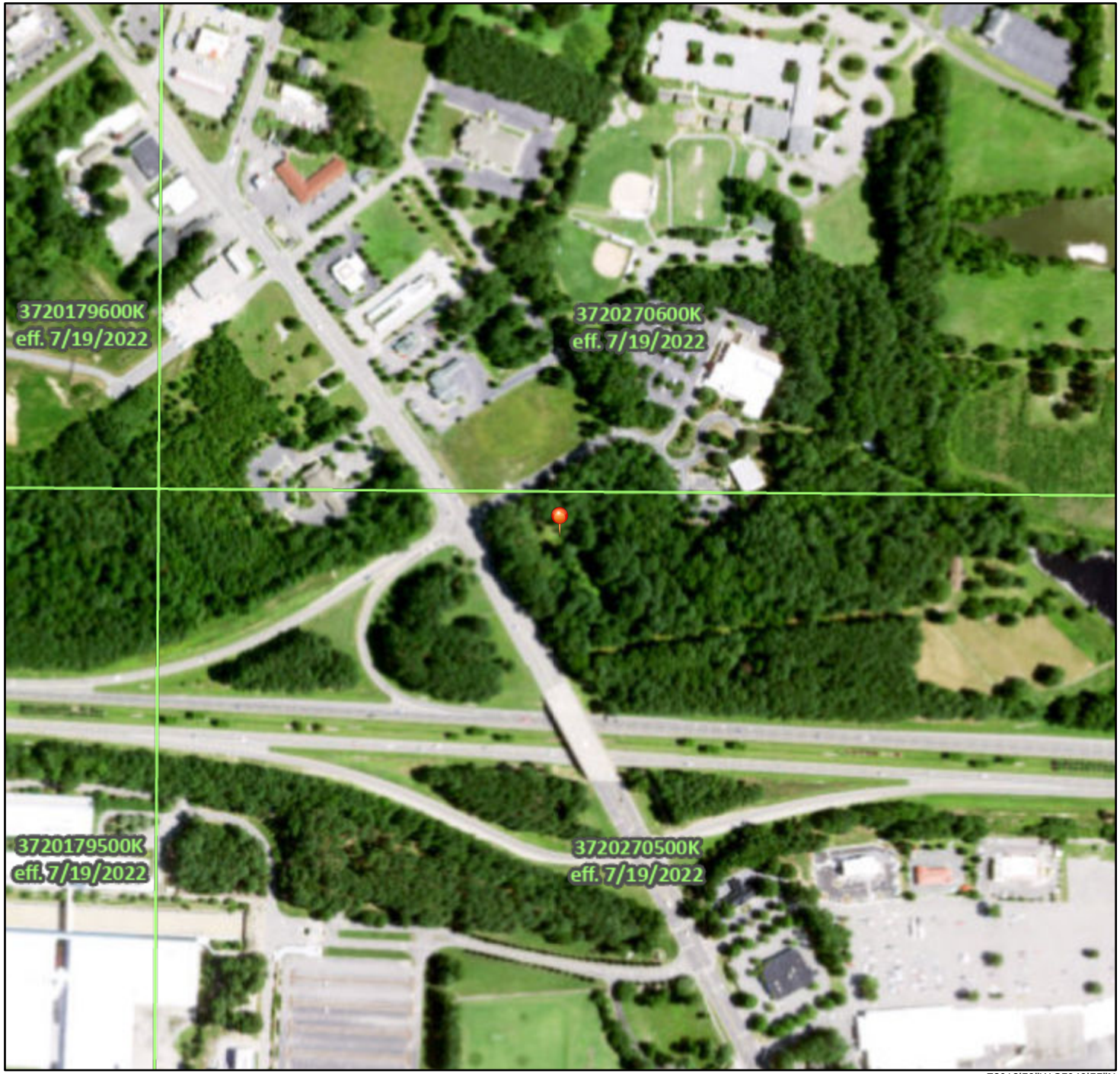
Component Percent Cutoff: None Specified

Tie-break Rule: Higher


Elem Sch
96
340
Zebulon
Zebulon
330
DOGWOOD DR
340
NEW BERN AVE
64
Zebulon
340
Zebulon
WAKELON ST
Zebulon
APOTHECARY DR
330
Zebulon
Town Hall
E JUDD ST

National Flood Hazard Layer FIRMette

78°19'36"W 35°50'24"N



78°18'59"W 35°49'55"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

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*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

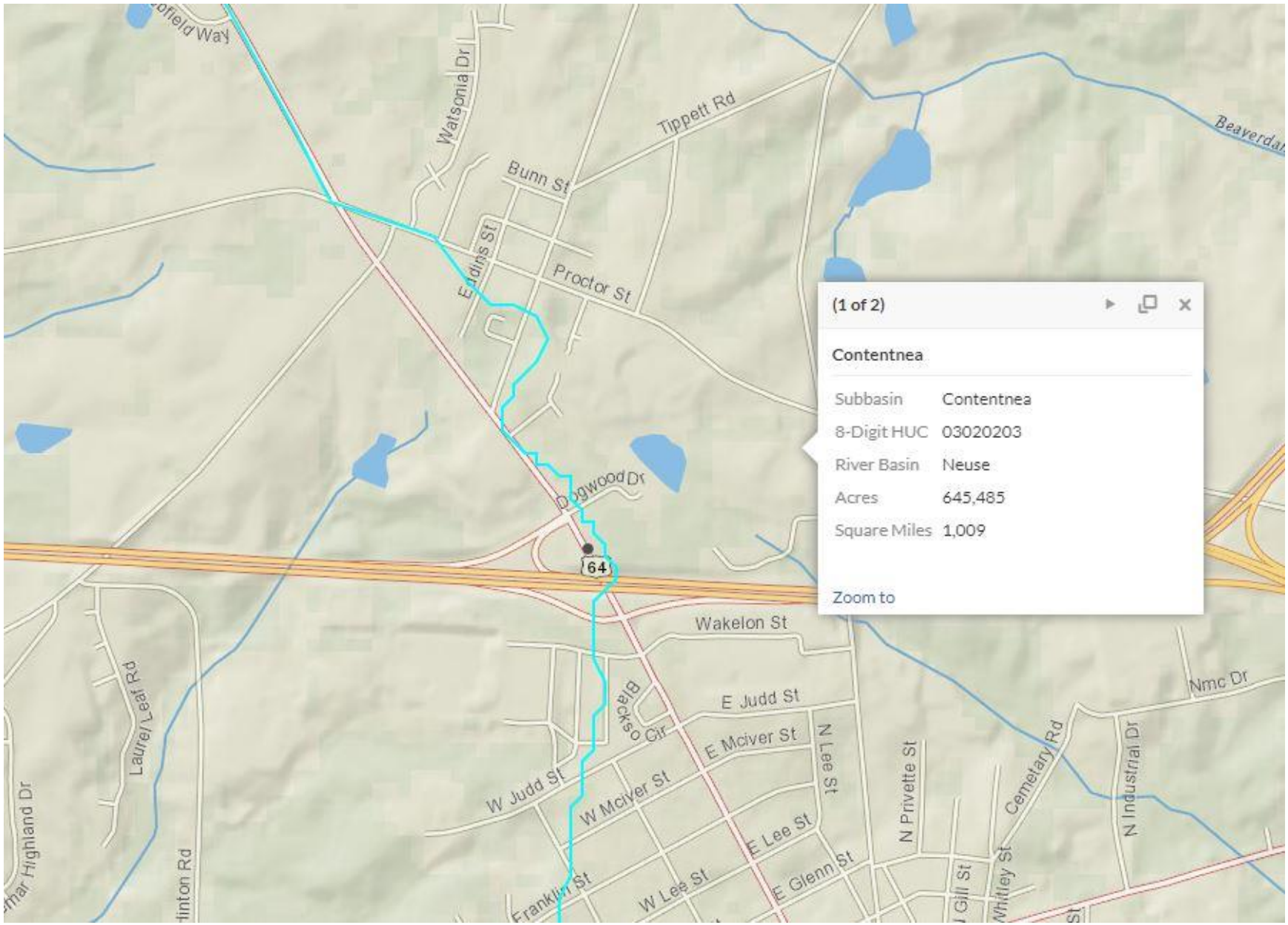
N

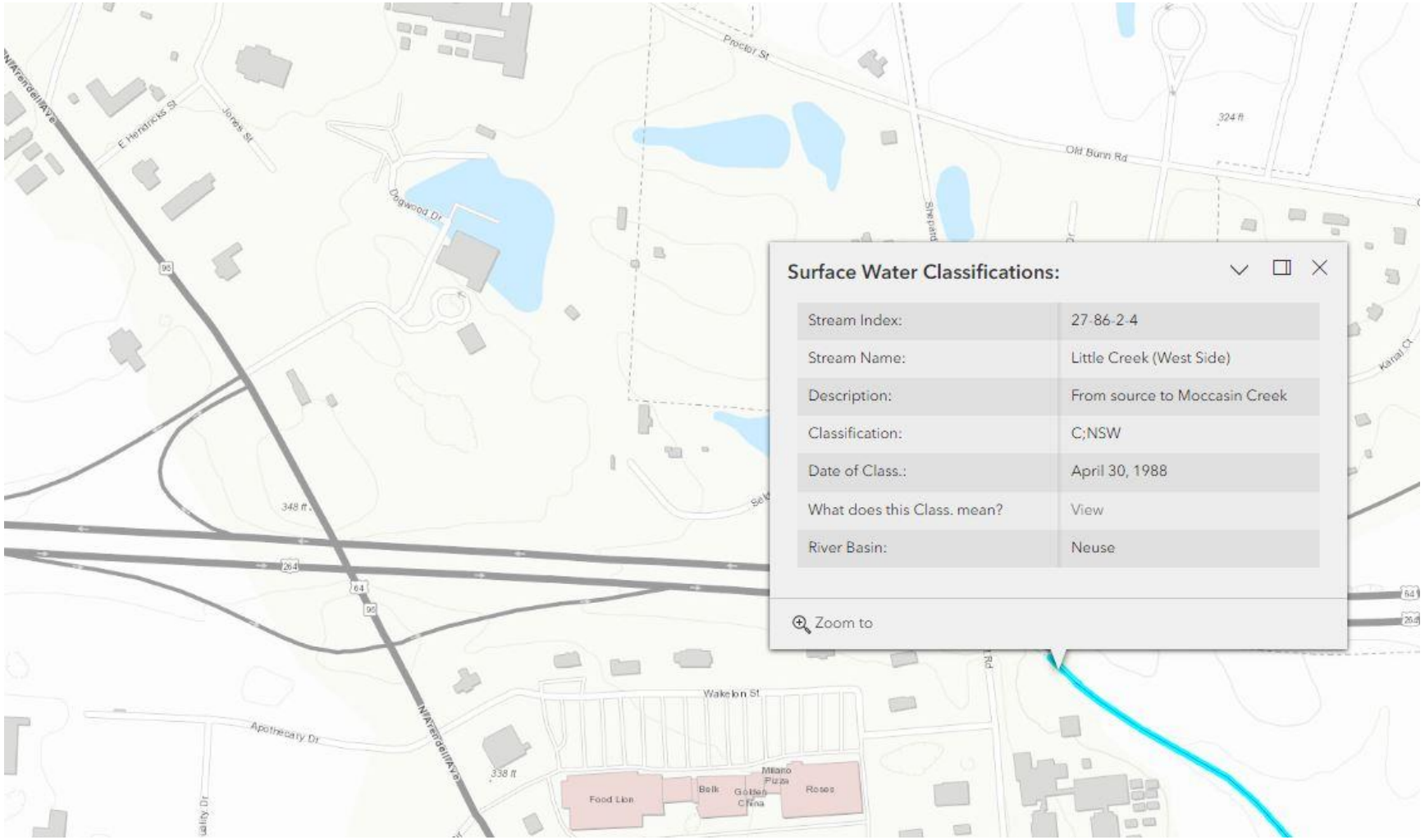
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/28/2023 at 8:31 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.


(1 of 2)
Contentnea
Subbasin Contentnea
8-Digit HUC 03020203
River Basin Neuse
Acres 645,485
Square Miles 1,009
Zoom to
Watsonia Dr
Tippett Rd
Bunn St
Proctor St
Dogwood Dr
64
Wakelon St
E Judd St
E Mciver St
W Judd St
W Mciver St
E Lee St
W Lee St
E Glenn St
N Lee St
N Privette St
Cemetary Rd
N Industrial Dr
Nmc Dr
Laurel Leaf Rd
Franklin St


Surface Water Classifications:
Stream Index: 27-86-2-4
Stream Name: Little Creek (West Side)
Description: From source to Moccasin Creek
Classification: C;NSW
Date of Class.: April 30, 1988
What does this Class. mean? View
River Basin: Neuse
Zoom to
Proctor St
Old Burn Rd
E Hendricks St
Jones St
Dogwood Dr
Wakelon St
Apothecary Dr
Food Lion
Bell's
Golden China
Milano Pizza
Roses
324 ft
348 ft
338 ft
95
264
64

NOAA Atlas 14, Volume 2, Version 3
Location name: Zebulon, North Carolina, USA*
Latitude: 35.8359°, Longitude: -78.3212°
Elevation: 336 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.405** (0.369-0.444)	**0.468** (0.428-0.512)	**0.530** (0.485-0.580)	**0.601** (0.548-0.657)	**0.670** (0.609-0.732)	**0.728** (0.658-0.795)	**0.780** (0.701-0.851)	**0.827** (0.739-0.904)	**0.880** (0.780-0.963)	**0.930** (0.818-1.02)
10-min	**0.646** (0.590-0.710)	**0.748** (0.685-0.819)	**0.849** (0.777-0.929)	**0.961** (0.877-1.05)	**1.07** (0.970-1.17)	**1.16** (1.05-1.27)	**1.24** (1.11-1.35)	**1.31** (1.17-1.43)	**1.39** (1.23-1.52)	**1.46** (1.29-1.61)
15-min	**0.808** (0.737-0.887)	**0.941** (0.861-1.03)	**1.07** (0.983-1.18)	**1.22** (1.11-1.33)	**1.35** (1.23-1.48)	**1.47** (1.33-1.60)	**1.57** (1.41-1.71)	**1.65** (1.48-1.81)	**1.75** (1.55-1.92)	**1.84** (1.62-2.02)
30-min	**1.11** (1.01-1.22)	**1.30** (1.19-1.42)	**1.53** (1.40-1.67)	**1.76** (1.61-1.92)	**2.00** (1.82-2.19)	**2.21** (2.00-2.42)	**2.40** (2.16-2.62)	**2.57** (2.30-2.81)	**2.79** (2.47-3.05)	**2.98** (2.62-3.27)
60-min	**1.38** (1.26-1.52)	**1.63** (1.49-1.78)	**1.96** (1.79-2.14)	**2.29** (2.09-2.51)	**2.67** (2.42-2.92)	**3.00** (2.71-3.27)	**3.30** (2.97-3.60)	**3.61** (3.23-3.95)	**4.00** (3.55-4.38)	**4.35** (3.82-4.77)
2-hr	**1.62** (1.46-1.79)	**1.91** (1.74-2.10)	**2.32** (2.11-2.56)	**2.76** (2.50-3.03)	**3.27** (2.94-3.59)	**3.74** (3.35-4.10)	**4.19** (3.73-4.59)	**4.66** (4.13-5.10)	**5.29** (4.63-5.79)	**5.86** (5.09-6.44)
3-hr	**1.71** (1.55-1.90)	**2.03** (1.85-2.24)	**2.47** (2.25-2.74)	**2.96** (2.68-3.26)	**3.54** (3.18-3.90)	**4.08** (3.65-4.49)	**4.62** (4.10-5.08)	**5.20** (4.57-5.71)	**5.97** (5.20-6.57)	**6.71** (5.77-7.39)
6-hr	**2.05** (1.87-2.27)	**2.43** (2.22-2.68)	**2.97** (2.70-3.27)	**3.55** (3.23-3.91)	**4.27** (3.85-4.68)	**4.94** (4.43-5.41)	**5.62** (4.99-6.14)	**6.34** (5.58-6.93)	**7.34** (6.37-8.02)	**8.28** (7.10-9.07)
12-hr	**2.41** (2.20-2.66)	**2.86** (2.62-3.15)	**3.51** (3.21-3.86)	**4.22** (3.84-4.64)	**5.11** (4.62-5.60)	**5.96** (5.34-6.50)	**6.82** (6.05-7.43)	**7.76** (6.80-8.44)	**9.06** (7.82-9.86)	**10.3** (8.77-11.2)
24-hr	**2.85** (2.65-3.09)	**3.46** (3.21-3.74)	**4.38** (4.06-4.74)	**5.14** (4.75-5.55)	**6.20** (5.71-6.69)	**7.07** (6.48-7.64)	**8.00** (7.29-8.64)	**8.99** (8.14-9.73)	**10.4** (9.34-11.3)	**11.6** (10.3-12.6)
2-day	**3.30** (3.07-3.56)	**3.98** (3.71-4.30)	**5.02** (4.66-5.41)	**5.85** (5.42-6.31)	**7.02** (6.47-7.58)	**7.98** (7.32-8.61)	**8.99** (8.21-9.71)	**10.1** (9.13-10.9)	**11.6** (10.4-12.6)	**12.9** (11.4-14.0)
3-day	**3.51** (3.27-3.77)	**4.22** (3.93-4.54)	**5.29** (4.92-5.68)	**6.14** (5.70-6.60)	**7.35** (6.79-7.90)	**8.33** (7.66-8.96)	**9.36** (8.57-10.1)	**10.5** (9.51-11.3)	**12.0** (10.8-13.0)	**13.3** (11.9-14.4)
4-day	**3.71** (3.46-3.98)	**4.46** (4.16-4.78)	**5.56** (5.18-5.95)	**6.44** (5.99-6.89)	**7.67** (7.11-8.22)	**8.68** (8.00-9.30)	**9.73** (8.93-10.4)	**10.8** (9.89-11.7)	**12.4** (11.2-13.4)	**13.7** (12.3-14.8)
7-day	**4.31** (4.03-4.61)	**5.16** (4.82-5.52)	**6.35** (5.93-6.80)	**7.31** (6.81-7.82)	**8.64** (8.02-9.24)	**9.71** (8.99-10.4)	**10.8** (9.97-11.6)	**12.0** (11.0-12.9)	**13.6** (12.4-14.7)	**15.0** (13.5-16.2)
10-day	**4.92** (4.61-5.25)	**5.87** (5.50-6.26)	**7.12** (6.67-7.59)	**8.11** (7.59-8.64)	**9.47** (8.83-10.1)	**10.6** (9.81-11.3)	**11.7** (10.8-12.5)	**12.8** (11.8-13.7)	**14.4** (13.2-15.5)	**15.7** (14.3-16.9)
20-day	**6.60** (6.21-7.03)	**7.82** (7.36-8.32)	**9.33** (8.77-9.93)	**10.5** (9.88-11.2)	**12.2** (11.4-12.9)	**13.5** (12.6-14.3)	**14.8** (13.8-15.8)	**16.2** (15.0-17.2)	**18.0** (16.6-19.3)	**19.5** (17.8-20.9)
30-day	**8.20** (7.74-8.70)	**9.67** (9.13-10.3)	**11.4** (10.7-12.0)	**12.7** (11.9-13.4)	**14.4** (13.5-15.3)	**15.8** (14.8-16.8)	**17.1** (16.0-18.2)	**18.5** (17.2-19.7)	**20.4** (18.9-21.7)	**21.8** (20.1-23.3)
45-day	**10.4** (9.90-11.0)	**12.3** (11.6-12.9)	**14.2** (13.4-14.9)	**15.6** (14.8-16.5)	**17.6** (16.6-18.6)	**19.0** (18.0-20.1)	**20.5** (19.3-21.7)	**22.0** (20.6-23.3)	**23.9** (22.3-25.4)	**25.4** (23.6-27.0)
60-day	**12.5** (11.9-13.2)	**14.7** (13.9-15.4)	**16.7** (15.9-17.6)	**18.4** (17.4-19.3)	**20.4** (19.4-21.5)	**22.0** (20.8-23.2)	**23.6** (22.2-24.9)	**25.1** (23.6-26.5)	**27.1** (25.4-28.7)	**28.6** (26.7-30.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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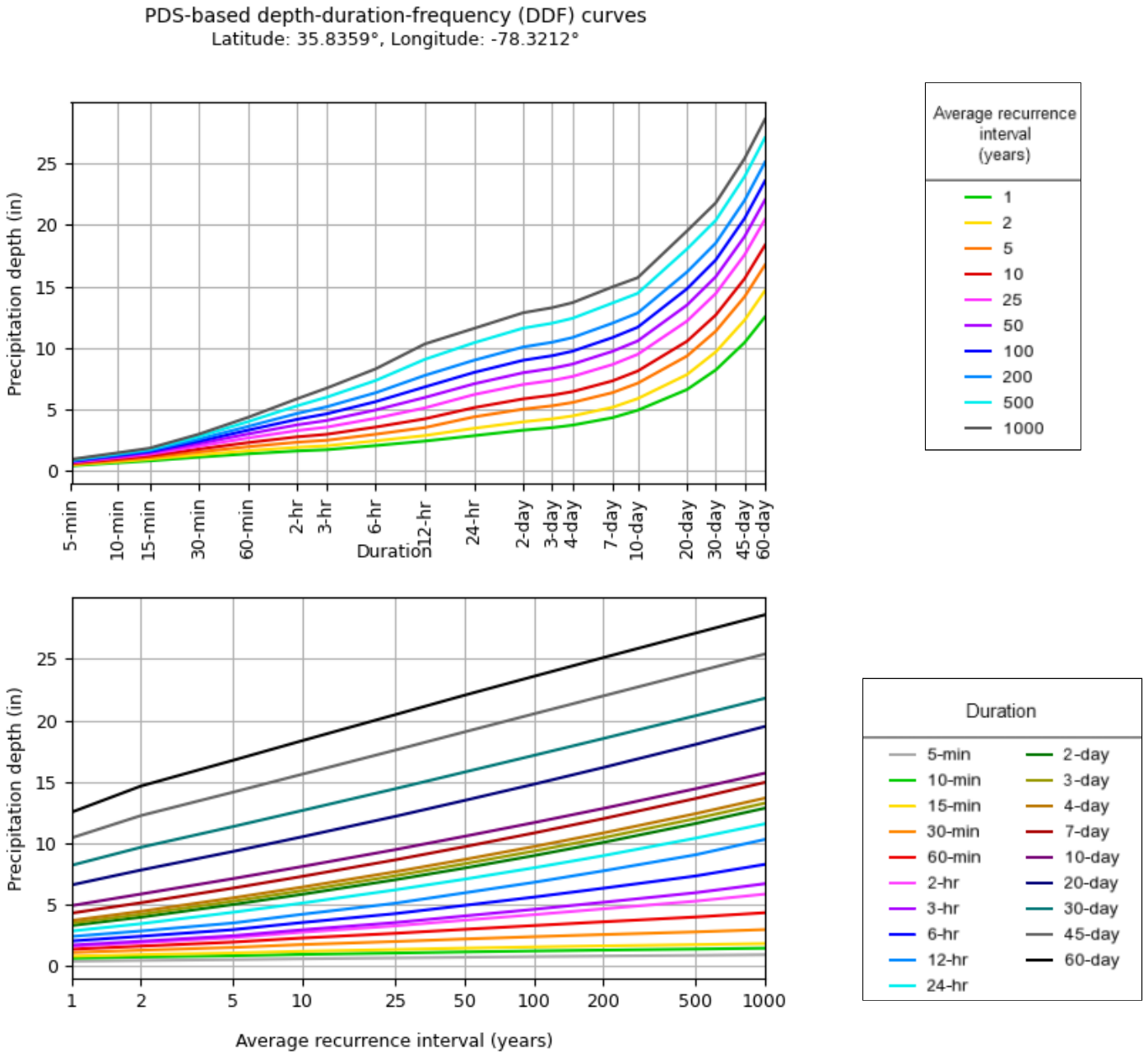
PF graphical



NOAA Atlas 14, Volume 2, Version 3

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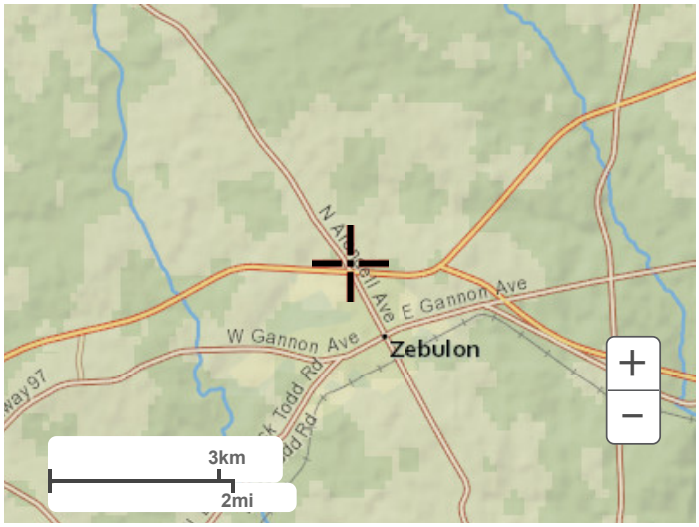
Maps & aerials

Small scale terrain



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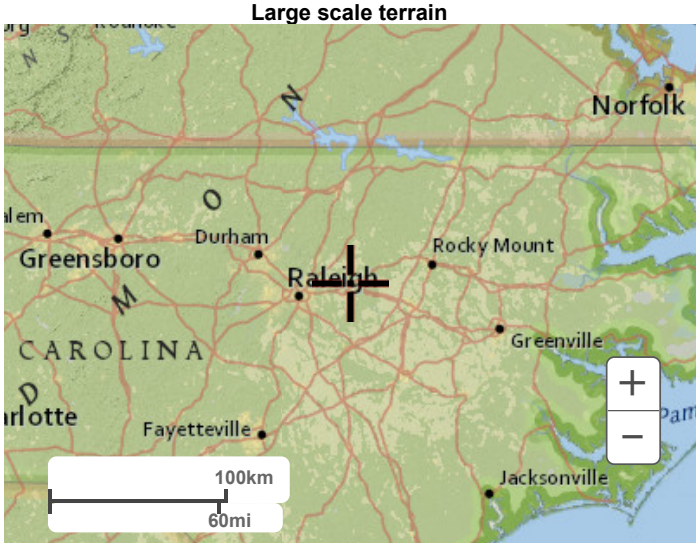
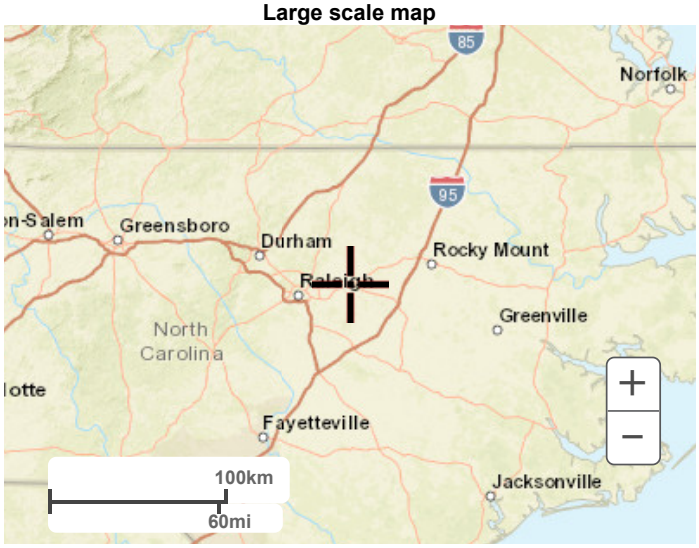
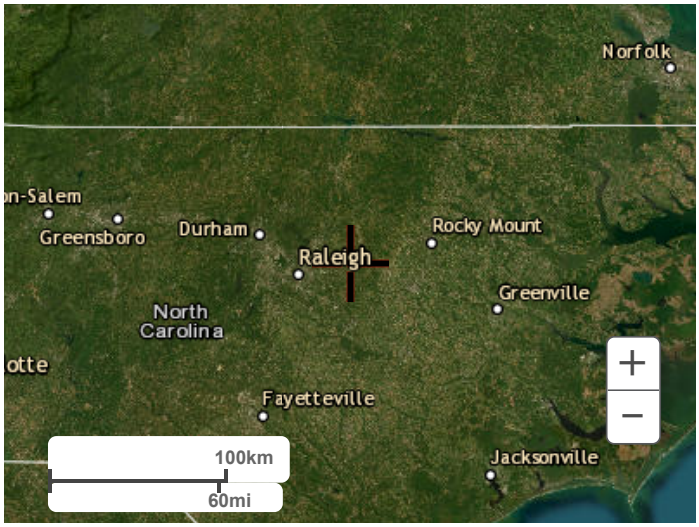


Large scale map



Large scale aerial



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National Weather Service
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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 2, Version 3
Location name: Zebulon, North Carolina, USA*
Latitude: 35.8359°, Longitude: -78.3212°
Elevation: 336 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.86** (4.43-5.33)	**5.62** (5.14-6.14)	**6.36** (5.82-6.96)	**7.21** (6.58-7.88)	**8.04** (7.31-8.78)	**8.74** (7.90-9.54)	**9.36** (8.41-10.2)	**9.92** (8.87-10.8)	**10.6** (9.36-11.6)	**11.2** (9.82-12.3)
10-min	**3.88** (3.54-4.26)	**4.49** (4.11-4.91)	**5.09** (4.66-5.57)	**5.77** (5.26-6.30)	**6.41** (5.82-7.00)	**6.95** (6.29-7.60)	**7.43** (6.68-8.11)	**7.86** (7.03-8.59)	**8.35** (7.40-9.14)	**8.79** (7.73-9.64)
15-min	**3.23** (2.95-3.55)	**3.76** (3.44-4.12)	**4.30** (3.93-4.70)	**4.86** (4.44-5.32)	**5.41** (4.92-5.91)	**5.87** (5.31-6.42)	**6.26** (5.63-6.84)	**6.61** (5.91-7.23)	**7.01** (6.21-7.67)	**7.36** (6.46-8.07)
30-min	**2.22** (2.02-2.43)	**2.60** (2.38-2.84)	**3.05** (2.79-3.34)	**3.52** (3.21-3.85)	**4.01** (3.64-4.38)	**4.42** (4.00-4.83)	**4.80** (4.31-5.23)	**5.15** (4.60-5.63)	**5.57** (4.94-6.10)	**5.96** (5.23-6.53)
60-min	**1.38** (1.26-1.52)	**1.63** (1.49-1.78)	**1.96** (1.79-2.14)	**2.29** (2.09-2.51)	**2.67** (2.42-2.92)	**3.00** (2.71-3.27)	**3.30** (2.97-3.60)	**3.61** (3.23-3.95)	**4.00** (3.55-4.38)	**4.35** (3.82-4.77)
2-hr	**0.807** (0.731-0.894)	**0.956** (0.870-1.05)	**1.16** (1.06-1.28)	**1.38** (1.25-1.52)	**1.64** (1.47-1.79)	**1.87** (1.68-2.05)	**2.10** (1.86-2.29)	**2.33** (2.06-2.55)	**2.64** (2.32-2.90)	**2.93** (2.54-3.22)
3-hr	**0.569** (0.516-0.633)	**0.675** (0.615-0.746)	**0.823** (0.748-0.911)	**0.985** (0.892-1.09)	**1.18** (1.06-1.30)	**1.36** (1.22-1.50)	**1.54** (1.36-1.69)	**1.73** (1.52-1.90)	**1.99** (1.73-2.19)	**2.23** (1.92-2.46)
6-hr	**0.342** (0.311-0.379)	**0.405** (0.370-0.447)	**0.495** (0.451-0.545)	**0.593** (0.538-0.652)	**0.712** (0.643-0.781)	**0.825** (0.739-0.903)	**0.938** (0.833-1.03)	**1.06** (0.931-1.16)	**1.22** (1.06-1.34)	**1.38** (1.18-1.51)
12-hr	**0.200** (0.182-0.220)	**0.237** (0.217-0.261)	**0.291** (0.266-0.320)	**0.350** (0.319-0.385)	**0.424** (0.383-0.464)	**0.494** (0.443-0.539)	**0.565** (0.502-0.616)	**0.643** (0.564-0.700)	**0.751** (0.649-0.818)	**0.856** (0.727-0.932)
24-hr	**0.118** (0.110-0.128)	**0.143** (0.133-0.155)	**0.182** (0.169-0.197)	**0.214** (0.197-0.231)	**0.258** (0.237-0.278)	**0.294** (0.270-0.318)	**0.333** (0.303-0.360)	**0.374** (0.339-0.405)	**0.433** (0.389-0.470)	**0.482** (0.429-0.525)
2-day	**0.068** (0.063-0.074)	**0.082** (0.077-0.089)	**0.104** (0.097-0.112)	**0.121** (0.112-0.131)	**0.146** (0.134-0.157)	**0.166** (0.152-0.179)	**0.187** (0.170-0.202)	**0.209** (0.190-0.226)	**0.241** (0.217-0.262)	**0.267** (0.238-0.292)
3-day	**0.048** (0.045-0.052)	**0.058** (0.054-0.063)	**0.073** (0.068-0.078)	**0.085** (0.079-0.091)	**0.102** (0.094-0.109)	**0.115** (0.106-0.124)	**0.129** (0.119-0.140)	**0.145** (0.132-0.156)	**0.166** (0.150-0.180)	**0.184** (0.164-0.200)
4-day	**0.038** (0.036-0.041)	**0.046** (0.043-0.049)	**0.057** (0.053-0.062)	**0.067** (0.062-0.071)	**0.079** (0.074-0.085)	**0.090** (0.083-0.096)	**0.101** (0.092-0.108)	**0.112** (0.102-0.121)	**0.129** (0.116-0.139)	**0.142** (0.127-0.154)
7-day	**0.025** (0.023-0.027)	**0.030** (0.028-0.032)	**0.037** (0.035-0.040)	**0.043** (0.040-0.046)	**0.051** (0.047-0.055)	**0.057** (0.053-0.061)	**0.064** (0.059-0.069)	**0.071** (0.065-0.076)	**0.081** (0.073-0.087)	**0.089** (0.080-0.096)
10-day	**0.020** (0.019-0.021)	**0.024** (0.022-0.026)	**0.029** (0.027-0.031)	**0.033** (0.031-0.036)	**0.039** (0.036-0.042)	**0.043** (0.040-0.046)	**0.048** (0.045-0.051)	**0.053** (0.049-0.057)	**0.060** (0.055-0.064)	**0.065** (0.059-0.070)
20-day	**0.013** (0.012-0.014)	**0.016** (0.015-0.017)	**0.019** (0.018-0.020)	**0.021** (0.020-0.023)	**0.025** (0.023-0.026)	**0.028** (0.026-0.029)	**0.030** (0.028-0.032)	**0.033** (0.031-0.035)	**0.037** (0.034-0.040)	**0.040** (0.037-0.043)
30-day	**0.011** (0.010-0.012)	**0.013** (0.012-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.020** (0.018-0.021)	**0.021** (0.020-0.023)	**0.023** (0.022-0.025)	**0.025** (0.023-0.027)	**0.028** (0.026-0.030)	**0.030** (0.027-0.032)
45-day	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.013** (0.012-0.013)	**0.014** (0.013-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.019** (0.017-0.020)	**0.020** (0.019-0.021)	**0.022** (0.020-0.023)	**0.023** (0.021-0.025)
60-day	**0.008** (0.008-0.009)	**0.010** (0.009-0.010)	**0.011** (0.011-0.012)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.021)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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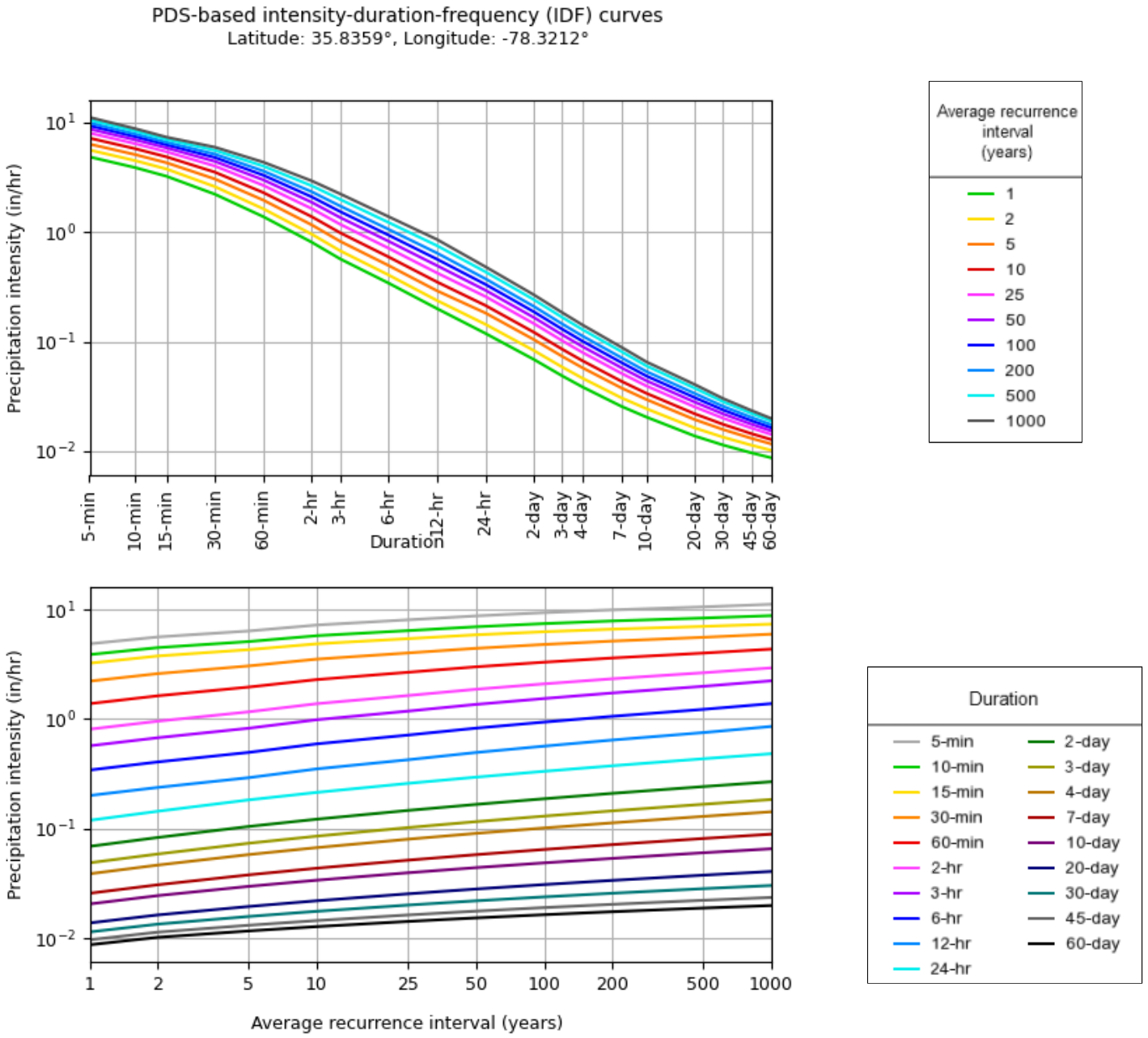
PF graphical



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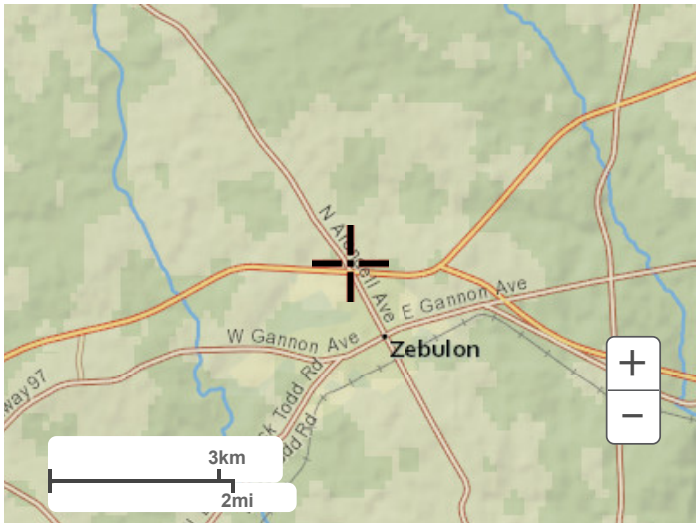
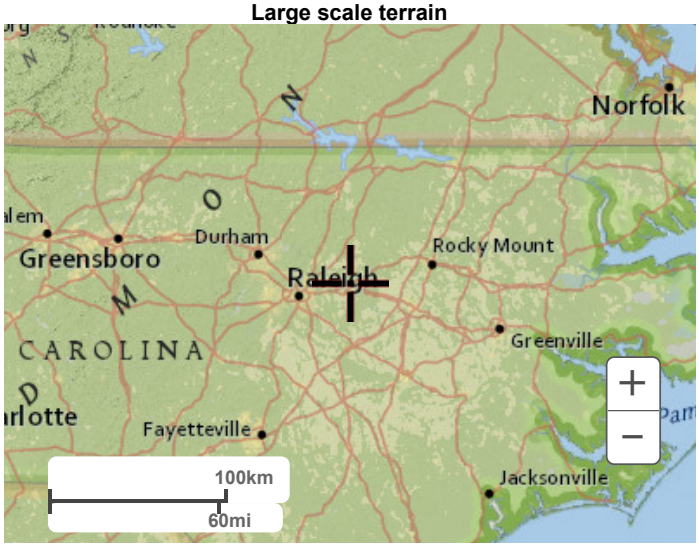
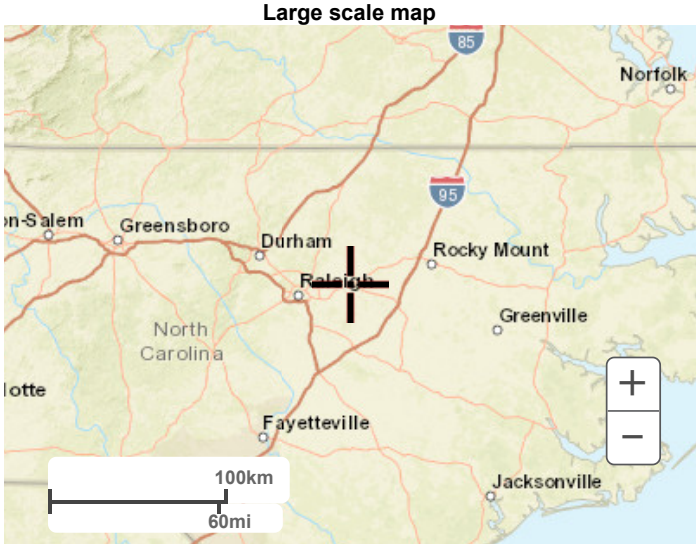
Small scale terrain



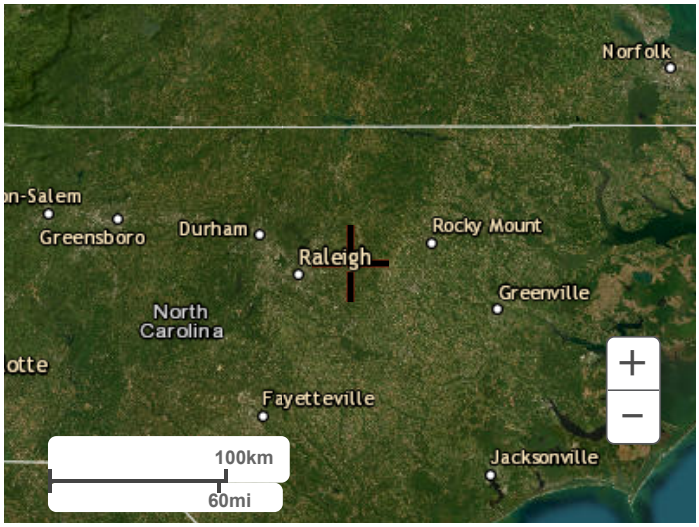
Large scale terrain



Large scale map



Large scale aerial



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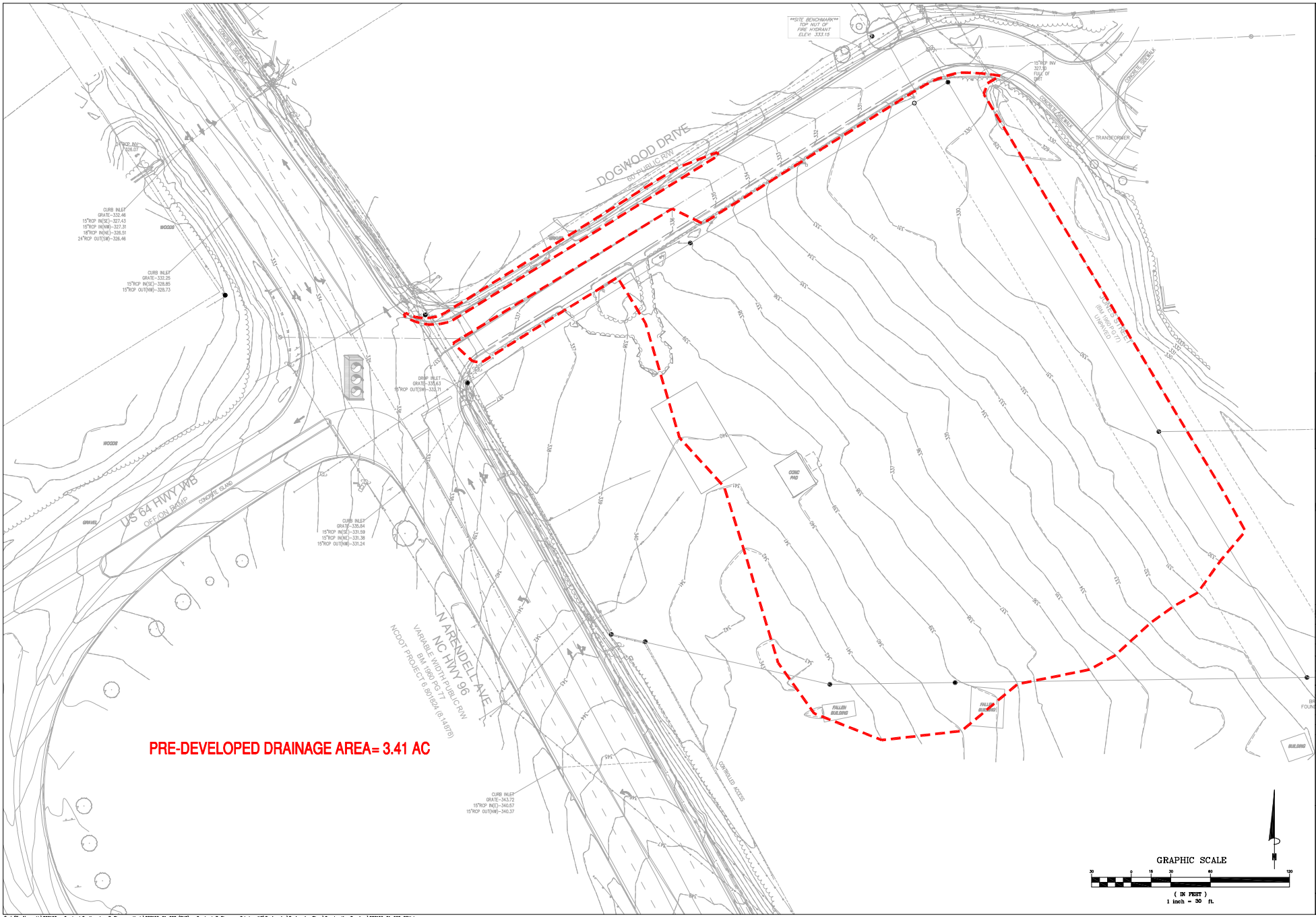

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SHEET TITLE
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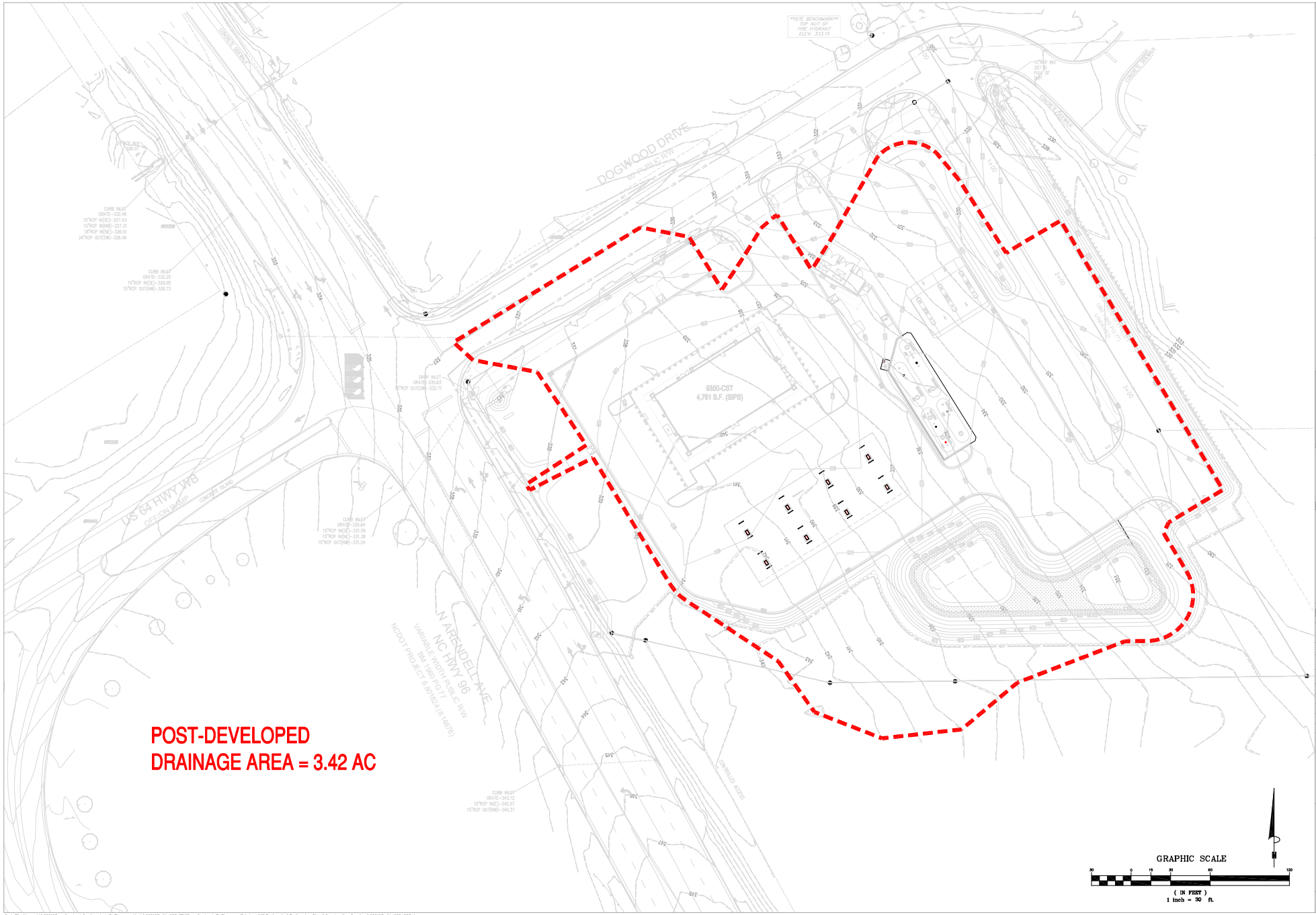
Cad File Name:V:\220163 - Crosland Southeast - 7-Eleven - Kenly\220163-01-002 (ENG) - Crosland-7-Eleven - Zebulon, NC\Engineering\Engineering Plans\Construction Drawings\220163-01-002-DDX.dwg



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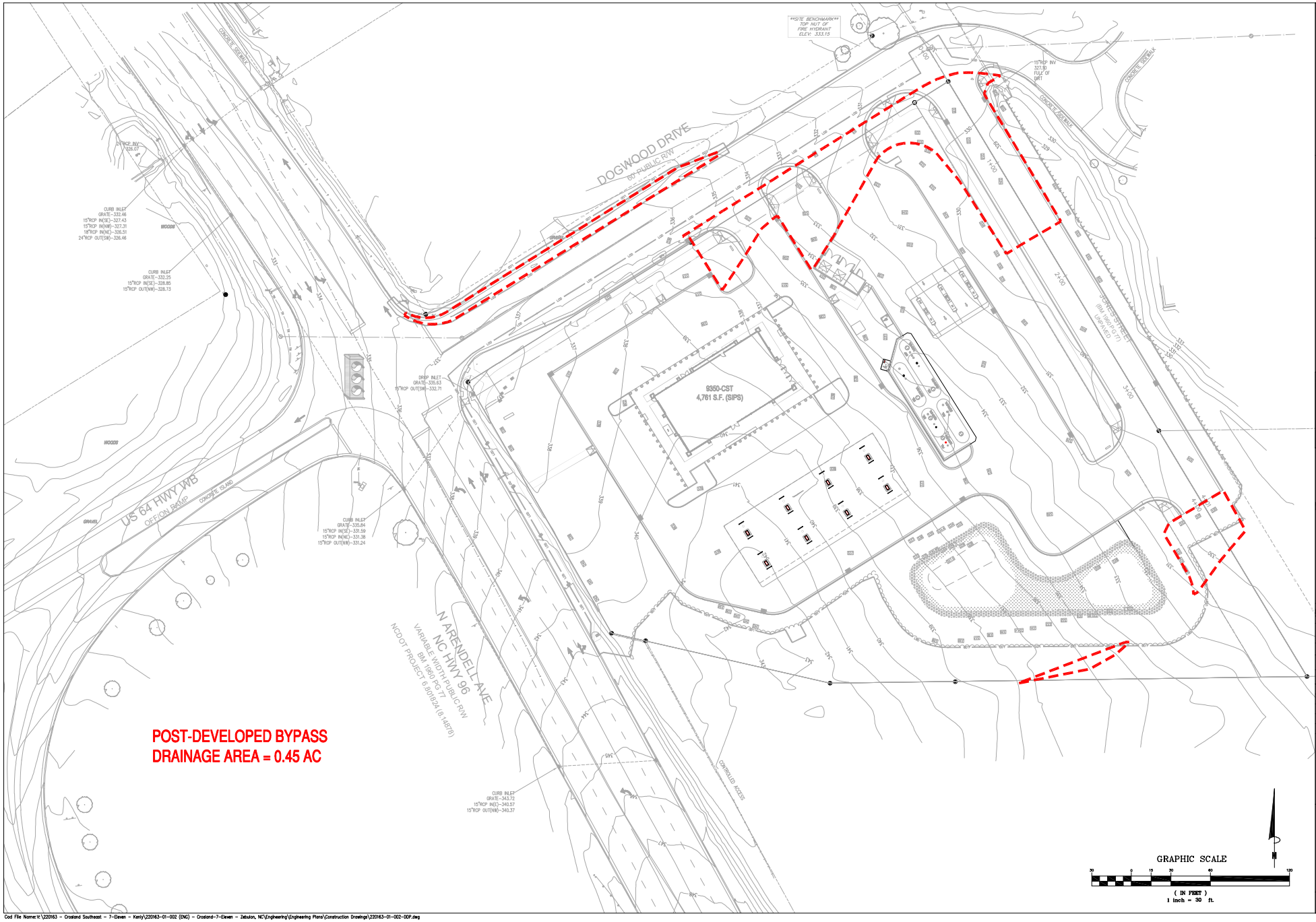

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SITE DATA

Project Information	
Project Name:	**7-Eleven**
Permit No (if known):	
Applicant:	Crosland Southest
Applicant Contact Name:	Nick Carroll
Applicant Contact Number:	(502) 693-0396
Contact Email:	ncarroll@csere.com
Last Modified Date:	Thursday, September 28, 2023
Site Data:	
River Basin:	Neuse
Regulatory Watershed:	N/A
Physiographic/Geologic Region:	Piedmont
Type of Development (Select from Dropdown menu):	Non-Residential
Zoning:	General Business
Total Site Area (Ac):	3.08
Existing Lake/Pond Area (Ac):	0.00
Proposed Disturbed Area (Ac):	4.02
Proposed Impervious Surface Area from DA Sheets (acre):	1.95
Percent Built Upon Area (BUA):	63%
Is the proposed project a site expansion?	No
Number of Drainage Areas on Site (Points of Analysis):	1
Annual Rainfall (in):	45.41
One-year, 24-hour rainfall (in):	3.00
Two-year, 24-hour rainfall (in):	3.60
Proposed Residential Stormwater Details (if applicable):	
Site Square Footage:	133,966
Total Acreage in Lots:	
Lot Square Footage:	
Number of Lots:	
Average Lot Size (SF):	
Proposed Impervious Surface Area from DA sheets (SF):	84,971
Proposed Impervious Surface Area Devoted to Lots (SF):	
Total Impervious Surface Area Devoted to Roads (SF):	
Other Impervious Surface Area (SF):	

Stormwater Narrative (limit to 1,200 characters - attach additional pages with submittal if necessary):

There is a proposed stormwater management facility (stormwater wetland) on site. The design includes the 7-Eleven site (168,247 sf - 3.86 ac) and parts of Dogwood Drive and Jones Street. The SCM outlined in this report has been designed for post-development peak attenuation and water quality. The SCM is designed to capture a drainage area of 3.42 acres wiith an impervious area of 2.16 acres. The site grading and storm drainage systems are designed to convey stormwater runoff from the impervious areas of the site to the stormwater wetland. The site is not located within a coastal county, therefore the design storm for water quality is a 1.0" storm event. The SCMs are designed per the Town of Zebulon stormwater UDO.

Project Name: 7-Eleven

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT	POST-DEVELOPMENT
Drainage Area (Acres)=	3.41	3.42
Site Acreage within Drainage=	2.91	3.08
One-year, 24-hour rainfall (in)=	3.00	

Land Use (acres) by Soil Group:	A Soils		B Soils		C Soils		D Soils		A Soils		B Soils		C Soils		D Soils	
Commercial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot											1.37					
Roof											0.32					
Open/Landscaped											0.56					
Industrial	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Parking lot																
Roof																
Open/Landscaped																
Transportation	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
High Density (interstate, main)																
High Density (Grassed Right-of-ways)																
Low Density (secondary, feeder)				0.08							0.12	0.21				
Low Density (Grassed Right-of-ways)				0.05							0.03	0.01				
Rural																
Rural (Grassed Right-of-ways)																
Sidewalk				0.03							0.15					
Misc. Pervious	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Managed pervious (Open Space)																
Unmanaged (pasture)																
Woods (not on lots)											0.20	0.12				
Residential	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Roadway																
Grassed Right-of-ways																
Driveway			0.02													
Parking lot																
Roof			0.05													
Sidewalk (Includes Patios)			0.01													
Lawn																
Managed pervious (Open Space)																
Woods (on lots)			2.83	0.35												
Land Taken up by BMP											0.33					
JURISDICTIONAL LANDS	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland																
Riparian buffer (Zone 1 only)																
Open water																
Totals (Ac)=	0.00	0.00	2.91	0.50	0.00	0.00	0.00	0.00	0.00	0.00	3.08	0.34	0.00	0.00	0.00	0.00

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=	100.00	100.00
Slope (ft/ft)=	0.04	0.01
Surface Cover:	Woods	Paved, Gravel, or Bare Soil
n-value=	0.40	0.011
T_t (hrs)=	0.25	0.03
Shallow Flow		
Length (ft)=	672.00	97.00
Slope (ft/ft)=	0.01	0.01
Surface Cover:	Unpaved	Paved
Average Velocity (ft/sec)=	1.89	1.85
T_t (hrs)=	0.10	0.01
Channel Flow 1		
Length (ft)=		377.00
Slope (ft/ft)=		0.01
Cross Sectional Flow Area (ft^2)=		1.23
Wetted Perimeter (ft)=		3.93
Channel Lining:		Concrete, finished
n-value=		0.012
Hydraulic Radius (ft)=	0.00	0.31
Average Velocity (ft/sec)=	0.00	4.05
T_t (hrs)=	0.00	0.03
Tc (hrs)=	0.35	0.08
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Site Impervious Surface Area (Ac) =	0.08	1.95
Lot Impervious Surface Area (Ac) =	0.08	0.00
1-year, 24-hour storm (Peak Flow)		
Volume of runoff (ft^3) =	4,285	23,260
Volume change (ft^3) =	18,975	
Runoff (inches) = Q*=	0.3462	1.8745
Peak Discharge (cfs)= Q=	0.5689	10.5668
Composite Curve Number (DA)=	58	84
Composite Curve Number (Site only)=	56	84

DISCONNECTED IMPERVIOUS - Credit given only to residential development with drainage area with less than 30% impervious	
Percent Disconnected Impervious Credit (Residential Only) =	
Disconnected impervious area (Ac) =	0.00
Drainage Area $CN_{adjusted}$=	84
Site Only $CN_{adjusted}$=	84

Post-development peak flow exceeds pre-development peak flow for this DA!

Project Name: 7-Eleven

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY						
DRAINAGE AREA SUMMARIES						
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6
Pre-Development (1-year, 24-hour storm)						
Runoff (in)=Q* =	0.346					
Peak Flow (cfs)=Q_{post} =	0.569					
Post-Development (1-year, 24-hour storm)						
Proposed Impervious Surface (acre) =	1.95					
Runoff (in)=Q* =	1.874					
Peak Flow (cfs)=Q_{post} =	10.567					

TARGET CURVE NUMBER (TCN) - Residential Only			
SITE \SOIL COMPOSITION			
HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	3.08	100%	N/A
C	0.00	0%	N/A
D	0.00	0%	N/A
Total Site Area (acres) =	3.08		
Zoning =	General Business		
Target Curve Number (TCN) =	N/A		
% Impervious =	63%		
Post Development $CN_{adjusted}$ =	84		
Required Volume to be Managed (TCN)= ft^3 =	N/A		

SITE NITROGEN AND PHOSPHORUS LOADING	
Nitrogen and Phosphorus Targets (Based on Regulatory Watershed)	
Target Nitrogen Load (lb/ac/yr)=	**3.6**
Target Phosphorus Load (Falls and Jordan Lakes Only) (lb/ac/yr)=	**N/A**
% N Loading Reduction Option for Expansions (Falls and Jordan Lakes Only) =	N/A
% Loading Reduction Nitrogen Target (Falls and Jordan Lakes Only) (lb/ac/yr)=	N/A
% P Loading Reduction Option for Expansions (Falls and Jordan Lakes Only) =	N/A
% Loading Reduction Phosphorus Target (Falls and Jordan Lakes Only) (lb/ac/yr)=	N/A
Pre Development Nitrogen and Phosphorus Load	
Total Nitrogen (lb/ac/yr)=	**1.08**
Total Phosphorus (lb/ac/yr)=	**N/A**
Post Development Nitrogen and Phosphorus Load	
Total Nitrogen (lb/ac/yr)=	**9.94**
Total Phosphorus (lb/ac/yr)=	**N/A**

Project Name: 7-Eleven

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS

DA1 Site Acreage=	3.08			
DA1 Off-Site Acreage=	0.34			
Total Required Storage Volume for Site TCN Requirement (ft^3)=				
Will site use underground water harvesting?	No	Enter % volume reduction in decimal form=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER AREA TREATED BY BMP

Land Use (acres)	Sub-DA1(a) (Ac)		Sub-DA1(b) (Ac)		Sub-DA1(c) (Ac)		Sub-DA1(d) (Ac)		Sub-DA1(e) (Ac)	
Commercial	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Parking lot	1.37									
Roof	0.32									
Open/Landscaped	0.56									
Industrial	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Parking lot										
Roof										
Open/Landscaped										
Transportation	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
High Density (interstate, main)										
High Density (Grassed Right-of-ways)										
Low Density (secondary, feeder)	0.12	0.21								
Low Density (Grassed Right-of-ways)	0.03	0.01								
Rural										
Rural (Grassed Right-of-ways)										
Sidewalk	0.15									
Misc. Pervious	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Managed pervious										
Unmanaged (pasture)										
Woods (not on lots)	0.20	0.12								
Residential	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Roadway										
Grassed Right-of-ways										
Driveway										
Parking lot										
Roof										
Sidewalk										
Lawn										
Managed pervious										
Woods (on lots)										
Land Taken up by BMP	0.33									
JURISDICTIONAL LANDS	Site	Off-site	Site	Offsite	Site	Offsite	Site	Offsite	Site	Offsite
Natural wetland										
Riparian buffer (Zone 1 only)										
Totals (Ac)=	3.08	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume (c.f.)	Inflow N EMC (mg/L)	Total Inflow N (lb/ac/yr)	Inflow P EMC (mg/L)	Total Inflow P (lb/ac/yr)	Outflow N EMC (mg/L)	Total Outflow N (lb/ac/yr)	Outflow P EMC (mg/L)	Total Outflow P (lb/ac/yr)	Provided Volume Managed (c.f.)
Constructed Wetland	Wetland	7,678	1.35	10.00	0.24	1.81	1.11	6.60	0.13	0.79	9,812
Outflow Total Nitrogen (lb/ac/yr)=		6.60									
Outflow Total Phosphorus (lb/ac/yr)=										0.79	

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream sub-basin(s), select all contributing sub-basin(s from dropdown menus):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume (c.f.)	Inflow N EMC (mg/L)	Total Inflow N (lb/ac/yr)	Inflow P EMC (mg/L)	Total Inflow P (lb/ac/yr)	Outflow N EMC (mg/L)	Total Outflow N (lb/ac/yr)	Outflow P EMC (mg/L)	Total Outflow P (lb/ac/yr)	Provided Volume Managed (c.f.)
Outflow Total Nitrogen (lb/ac/yr)=			Outflow Total Phosphorus (lb/ac/yr)=								

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream sub-basin(s), select all contributing sub-basin(s):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume (c.f.)	Inflow N EMC (mg/L)	Total Inflow N (lb/ac/yr)	Inflow P EMC (mg/L)	Total Inflow P (lb/ac/yr)	Outflow N EMC (mg/L)	Total Outflow N (lb/ac/yr)	Outflow P EMC (mg/L)	Total Outflow P (lb/ac/yr)	Provided Volume Managed (c.f.)
Outflow Total Nitrogen (lb/ac/yr)=			Outflow Total Phosphorus (lb/ac/yr)=								

Sub-DA1 (d) BMP(s)

If Sub-DA1(d) is connected to upstream sub-basin(s), select all contributing sub-basin(s):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume (c.f.)	Inflow N EMC (mg/L)	Total Inflow N (lb/ac/yr)	Inflow P EMC (mg/L)	Total Inflow P (lb/ac/yr)	Outflow N EMC (mg/L)	Total Outflow N (lb/ac/yr)	Outflow P EMC (mg/L)	Total Outflow P (lb/ac/yr)	Provided Volume Managed (c.f.)
Outflow Total Nitrogen (lb/ac/yr)=			Outflow Total Phosphorus (lb/ac/yr)=								

Sub-DA1 (e) BMP(s)

If Sub-DA1(e) is connected to upstream sub-basin(s), select all contributing sub-basin(s):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume (c.f.)	Inflow N EMC (mg/L)	Total Inflow N (lb/ac/yr)	Inflow P EMC (mg/L)	Total Inflow P (lb/ac/yr)	Outflow N EMC (mg/L)	Total Outflow N (lb/ac/yr)	Outflow P EMC (mg/L)	Total Outflow P (lb/ac/yr)	Provided Volume Managed (c.f.)
Outflow Total Nitrogen (lb/ac/yr)=			Outflow Total Phosphorus (lb/ac/yr)=								

DA1 BMP SUMMARY

Total Volume Treated (c.f.)=	9812
DA1 Outflow Total Nitrogen (lb/ac/yr)=	6.60
DA1 Outflow Total Phosphorus (lb/ac/yr)=	0.79
1-year, 24-hour storm	
Pre Development Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.57
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.19

Project Name: 7-Eleven

DA SITE SUMMARY
BMP CALCULATIONS

BMP SUMMARY						
DRAINAGE AREA SUMMARIES						
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6
Post-Development (1-year, 24-hour storm)						
Peak Flow (cfs)=$Q_{1\text{-year}}$ =	10.57					
Post-Development with BMPs (1-year, 24-hour storm)						
% Impervious =	**63%**					
Volume Managed (CF)=	9,812					
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.19					
Have Target Curve Number Requirements been met?	N/A					
Pre Development Nitrogen and Phosphorus Load						
Total Nitrogen (lb/ac/yr)=	1.08					
Total Phosphorus (lb/ac/yr)=	N/A					
Post Development Nitrogen and Phosphorus Load						
Total Nitrogen (lb/ac/yr)=	9.94					
Total Phosphorus (lb/ac/yr)=	N/A					
Post-BMP Nitrogen Loading						
Outflow Total Nitrogen (lb/ac/yr)=	6.60					
Outflow Total Phosphorus (lb/ac/yr)=	0.79					
Has site met the Target?	NO					
Has site met requirements for offsetting?	YES					

1106 N Arendell Ave, Zebulon, NC
Bowman North Carolina, Ltd.

Curve Number Calculation (CN)

Pre-Developed Conditions (Overall Site)

Drainage Area (acres): 3.41

Existing Soil Groups:

Soil Group	*Map Symbol*	*Soil Description*	*Acres*	*Percent of DA*
B	WeB	Wedowee Sandy Loam	3.41	100%

Existing Land Uses:

Land Use Description	*Existing Soil Group*	*Acres*	*Curve #*	*Weighted CN*
Wooded - Good	B	3.22	55	51.9
Impervious Area		0.19	98	5.4
			Cumulative Curve # =	57.4

1106 N Arendell Ave, Zebulon, NC
Bowman North Carolina, Ltd.

Curve Number Calculation (CN)

Post-Developed Conditions (Stormwater Wetland)

Drainage Area (acres): 3.42

Existing Soil Groups:

Soil Group	*Map Symbol*	*Soil Description*	*Acres*	*Percent of DA*
B	WeB	Wedowee Sandy Loam	3.42	100%

Existing Land Uses:

Land Use Description	*Existing Soil Group*	*Acres*	*Curve #*	*Weighted CN*
Wooded - Good	B	0.32	55	5.2
Open Space - Good	B	0.94	61	16.8
Impervious Area		2.16	98	61.9
			Cumulative Curve # =	83.8

1106 N Arendell Ave, Zebulon, NC
Bowman North Carolina, Ltd.

Curve Number Calculation (CN)

Post-Developed Bypass Conditions (Stormwater Wetland)

Drainage Area (acres): 0.45

Existing Soil Groups:

Soil Group	*Map Symbol*	*Soil Description*	*Acres*	*Percent of DA*
B	WeB	Wedowee Sandy Loam	0.45	100%

Existing Land Uses:

Land Use Description	*Existing Soil Group*	*Acres*	*Curve #*	*Weighted CN*
Open Space - Good	B	0.16	61	21.6
Impervious Area		0.29	98	63.3
			Cumulative Curve # =	84.9

Proposed Stormwater Wetland

Project Information

Project Name: 7-Eleven (Zebulon)
Project #: 220163-01-002
Designed by: MCB Date: 9/27/2023
Revised by: Date:
Checked by: Date:

Site Information

Sub Area Location:	Drainage To Proposed Stormwater Wetland			
Drainage Area (DA) =	3.42	Acres	148,987	sf
Impervious Area (IA) =	2.16	Acres	94,097	sf
Percent Impervious (I) =			63.16	%

Required WQv Storage Volume

Design Storm =	1	inch	(Non-Coastal county)
Determine Rv Value =	0.05 + .009 (I) =	0.618	in/in
Storage Volume Required =	7,678	cf (above Permanent Pool)	

Surface Area Requirements:

Storage Volume Required =	7,678	cf (above Permanent Pool)
Maximum ponding depth =	1.25	ft
Surface Area Required=	6,142	sf
Surface Area Provided=	6850	sf

Breakdown of Surface Area:

Forebay	850.00	sf
	12.4%	of Wetland Surface Area (10-15%)
Non-Forebay Deep Pools	645.00	sf
	9.4%	of Wetland Surface Area (5% to 10%)
Shallow Water (low marsh)	2520.00	sf
	36.8%	of Wetland Surface Area (40%)
Shallow Land (high marsh)	2085.00	sf
	30.4%	of Wetland Surface Area (30% to 45%)
Total	6,100	sf
	89.1%	of Wetland Surface Area

STORMWATER WETLAND

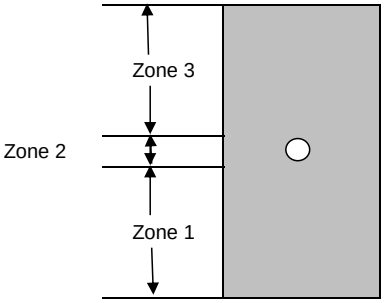
INCREMENTAL DRAWDOWN METHOD-Water Quality Volume

Project Information

Project Name: 7-Eleven (Zebulon)
Project #: 220163-01-002
Designed by: MCB Date: 9/27/2023
Checked by: Date:

Water Quality Orifice

* Incremental Determination of Water Quality Volume Drawdown Time



$Q_3 = 0.0437\ C_D * D^2\ (Z-D/24-Ei)^{\wedge(1/2)}$

$Q_2 = 0.372\ C_D * D*(Z-Ei)^{\wedge(3/2)}$

$Q_1 = 0$

Orifice Diameter (D) =	1 in		
Cd =	0.6		
Ei =	329.7	Orifice Inv.	
Zone 1 Range =	0.00	to	329.7
Zone 2 Range =	329.7	to	329.8
Zone 3 Range =	329.8	to	330.9

Incremental Drawdown Method

Countour	Contour Area	Incremental Volume	Stage, Z	Zone	Q	Drawdown Time
	sq ft	cu ft	ft		cfs	min
329.70	**6,850**	0	0.00	0.00	0.000	--
330.00	7260	2,116	0.30	3.00	0.013	2,646
330.95	8940	7,695	1.25	3.00	0.029	4,450
Total	**--**	**9,811**	**--**	**--**	**--**	**7,096**

Drawdown Time = Incremental Volume / Q / 60sec/min

Summary

Total Volume = 9,811 cf
Total Time = 7,096 min
Total Time = 4.93 days

Proposed Stormwater Wetland

Anti-Floatation Calculations for OCS

Project Information

Project Name:	7-Eleven (Zebulon)		
Project #:	220163-01-002		
Designed by:	MCB	Date:	9/27/2023
Revised by:		Date:	
Checked by:		Date:	

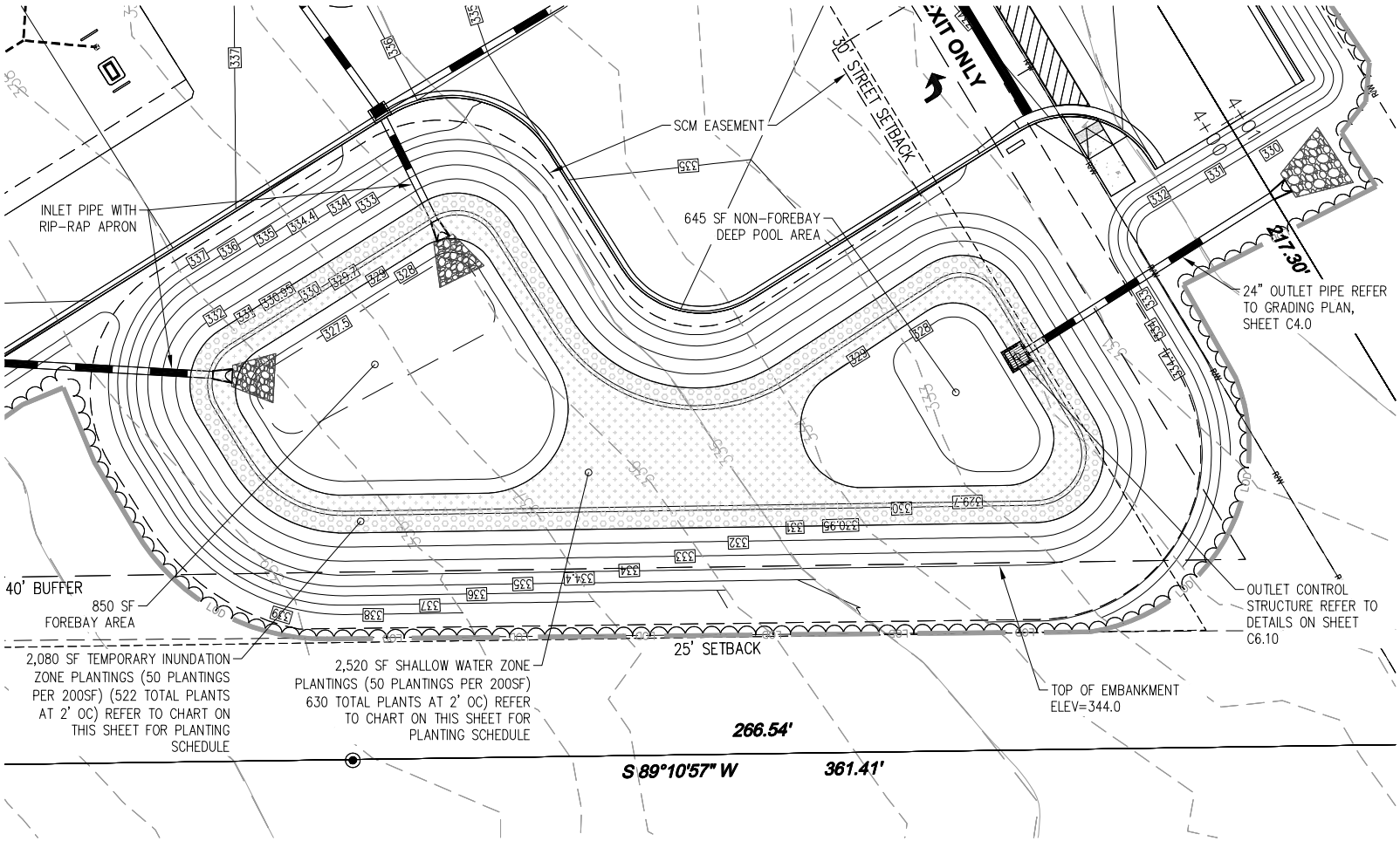
Site Information

Sub Area Location:	Drainage to Proposed Stormwater Wetland	
Drainage Area (DA) =	3.42	Acres
Impervious Area (IA) =	2.16	Acres
Percent Impervious (I) =	61.99	% (Drainage Area)

Anti-Flotation Device

4' x 4' Outlet Structure

Area:	16.0	sf	
Volume:	64.0	cf	(Water Displaced - Top of Pond to Bottom of Pond)
Weight:	3994	lbs	
Factor of Safety	1.20		
WT Req'd of Anti-Flotation Device:	4,792	lbs	
Volume of Concrete Req'd:	31.9	cf	(Unit WT of Concrete = 150 pcf)
Volume Provided:	101.5	cf	(4'x4' riser x 4.0' = 64.0cf, 5'x5' footing x 1.5' = 37.5cf)



GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)

1 inch = 30 ft.

PLAN VIEW

STAGE/STORAGE TABLE

STAGE (FT)	ELEVATION (FT)	CONTOUR AREA (SF)	INCREMENTAL STORAGE (CF)	TOTAL STORAGE (CF)
0.0	329.7	6,850	0	0
0.3	330.0	7,260	2,116	2,116
1.25	330.95	8,940	7,695	9,812 (WQV)
1.3	331.0	9,020	449	10,260
2.3	332.0	10,490	9,755	20,015
3.3	333.0	12,020	11,255	31,270
4.3	334.0	13,600	12,810	44,080

STORMWATER MANAGEMENT DESIGN STORMWATER WETLAND:

RIVER BASIN: **NEUSE**
RECEIVING STREAM: **LITTLE CREEK**
STREAM INDEX: **27-86-2-4**
STREAM CLASS: **C;NSW**
HUC: **03020203**
PROJECT COORDINATES: **35.836261°N, -78.321664°W**

POND DESIGN SUMMARY

DRAINAGE AREA TO POND:	3.42 ACRES
SITE IMPERVIOUS AREA TO POND:	1.78 ACRES
OFF-SITE DESIGN IMPERVIOUS AREA TO POND:	0.38 ACRES
TOTAL DESIGN IMPERVIOUS AREA TO POND:	2.16 ACRES

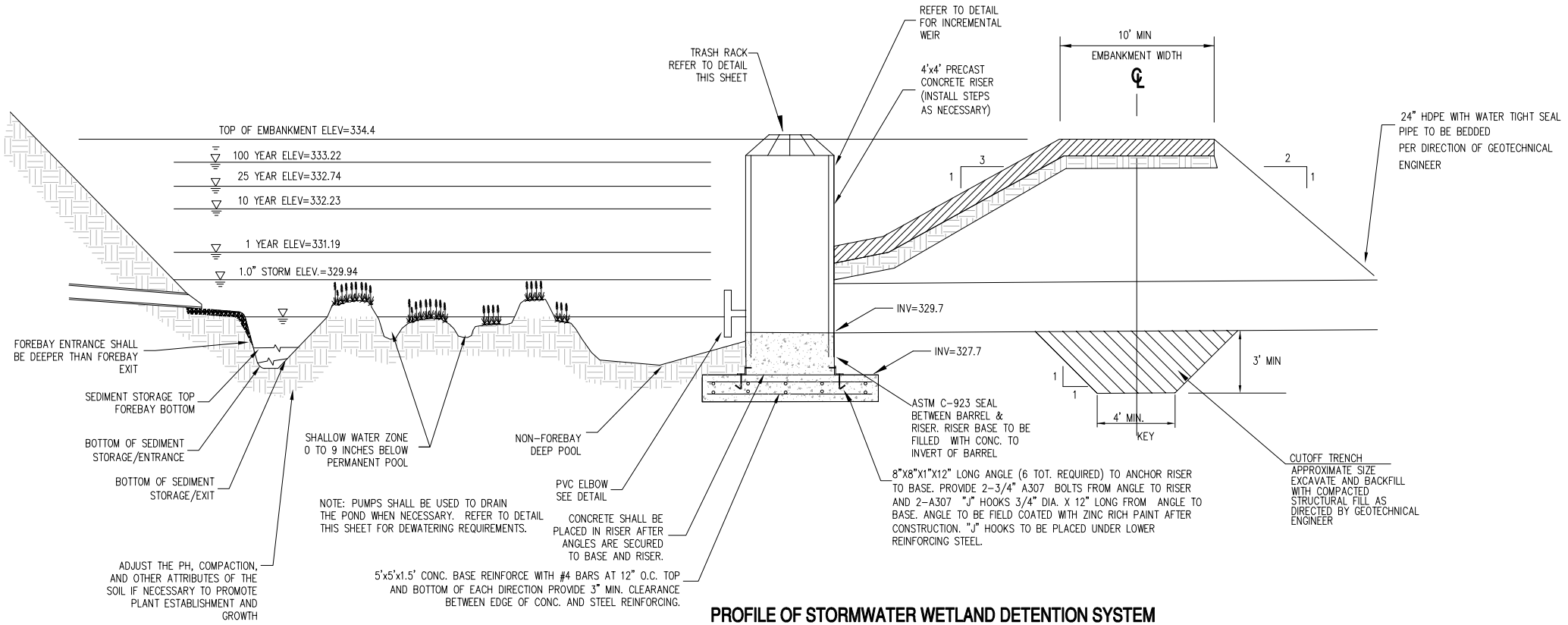
	PRE-DEVELOPED TO POND	POST-DEVELOPED TO POND	POST DEVELOPED THROUGH POND	POST DEVELOPED BYPASS	POST DEVELOPED COMBINED
DRAINAGE AREA:	3.41 AC	3.42 AC		0.45 AC	
CURVE NUMBER:	58	84		85	
TIME OF CONCENTRATION:	21 MIN	5 MIN		10 MIN	
1.0" STORM EVENT:		0.326 CFS	0.012 CFS		
1-YEAR STORM EVENT:	0.315 CFS	8.034 CFS	0.131 CFS	0.950 CFS	1.081 CFS
10-YEAR STORM EVENT:	3.965 CFS	19.14 CFS	1.280 CFS	2.239 CFS	3.519 CFS
25-YEAR STORM EVENT:	6.394 CFS	24.37 CFS	2.562 CFS	2.845 CFS	5.407 CFS
100-YEAR STORM EVENT:	11.04 CFS	33.24 CFS	17.25 CFS	3.872 CFS	21.12 CFS

TYPICAL SHALLOW WATER PLANTING SCHEDULE

SCIENTIFIC NAME	COMMON NAME	PLANTING ZONE	QUANTITY	HEIGHT	IDEAL DEPTH	NURSERY CONTAINER TYPE	SPACING	PLANTING SEASON
Juncus effusus	Common Rush	SHALLOW WATER	210	9" FOLIAGE HEIGHT	0-2"	4" TEA POT	2' O.C.	SPRING/SUMMER
Liliaceae carolinensis	Carolina Grasswort	SHALLOW WATER	210	9" FOLIAGE HEIGHT	0-9"	4" TEA POT	2' O.C.	SPRING/SUMMER
Schoenoplectus tabernaemontani	Softstem Bulrush	SHALLOW WATER	210	9" FOLIAGE HEIGHT	0-6"	4" TEA POT	2' O.C.	SPRING/SUMMER

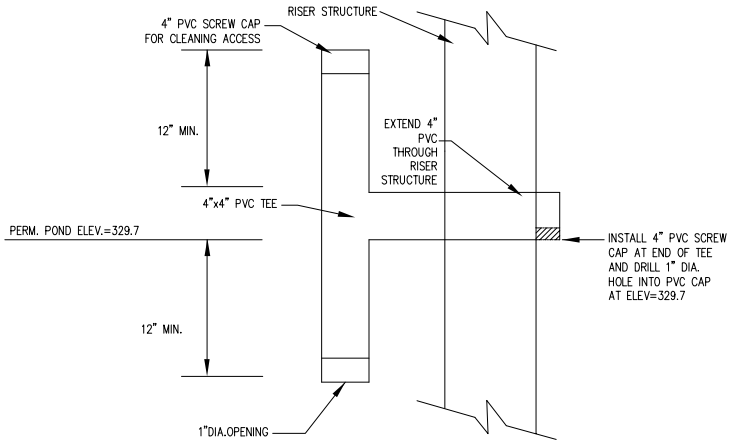
TYPICAL TEMPORARY INUNDATION ZONE PLANTING SCHEDULE

SCIENTIFIC NAME	COMMON NAME	PLANTING ZONE	QUANTITY	HEIGHT	NURSERY CONTAINER TYPE	SPACING	PLANTING SEASON
Eutrochium dubium	Coastal Joy Pye Weed	SHALLOW LAND	174	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER
Eupatorium erfoliatum	Boneset	SHALLOW LAND	174	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER
Rhynchospora colorata	Starrush Whitetop	SHALLOW LAND	174	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER



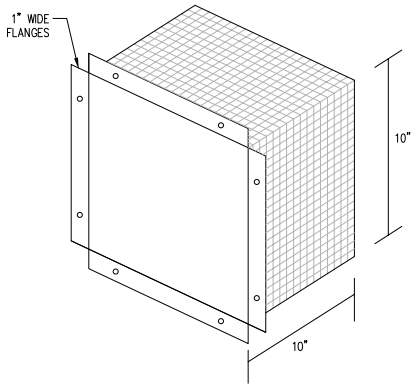
PROFILE OF STORMWATER WETLAND DETENTION SYSTEM

SCALE: N.T.S.

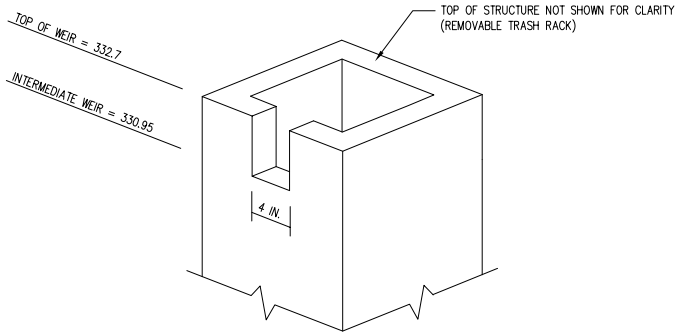


PVC DRAIN OUTLET

SCALE: N.T.S.

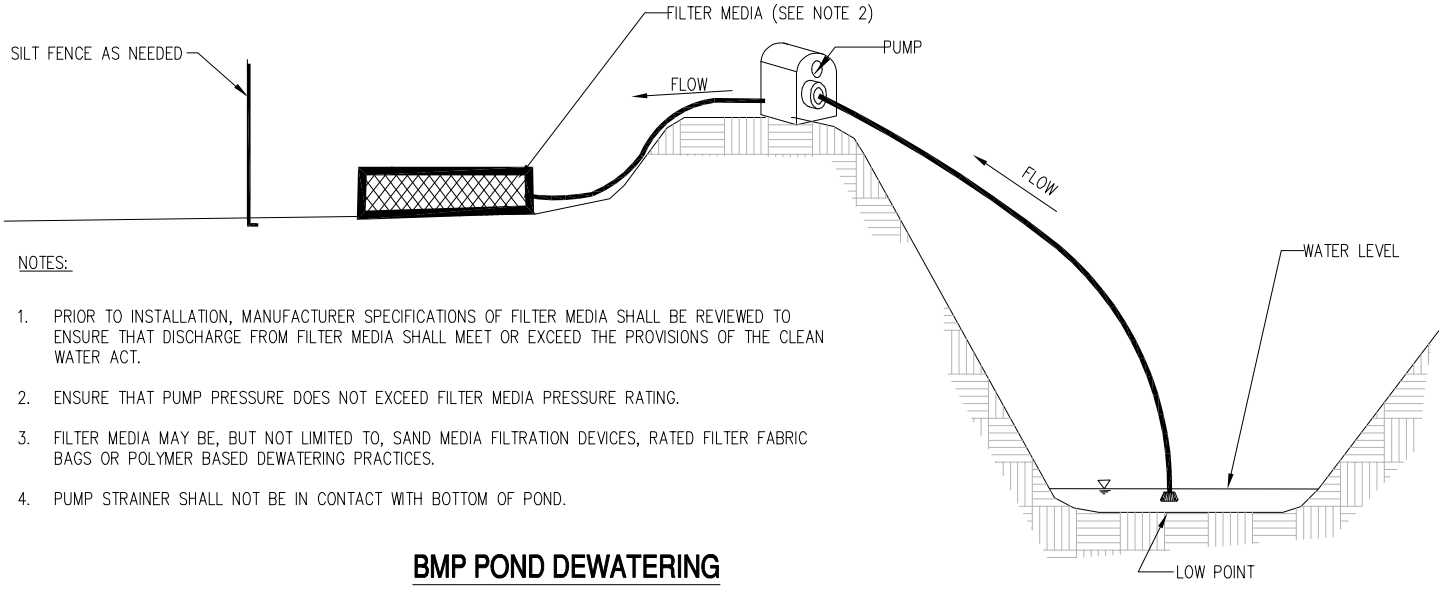


CONTRACTOR SHALL FABRICATE THE TRASH TRAP FROM ½" MESH, GALVANIZED WIRE. ATTACHED TO CONCRETE STRUCTURE TO BE MADE USING 8-#8 STAINLESS STEEL CONCRETE SCREWS AND WASHERS.



OUTLET CONTROL STRUCTURE - INCREMENTAL WEIR

SCALE: N.T.S.



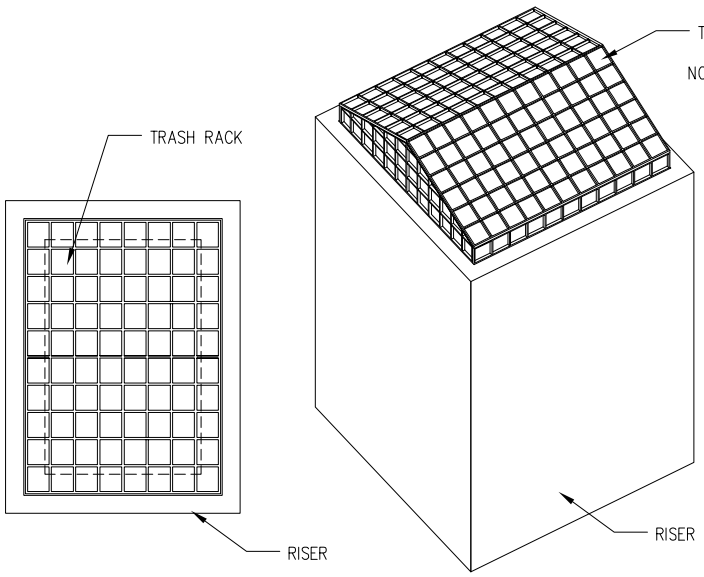
NOTES:

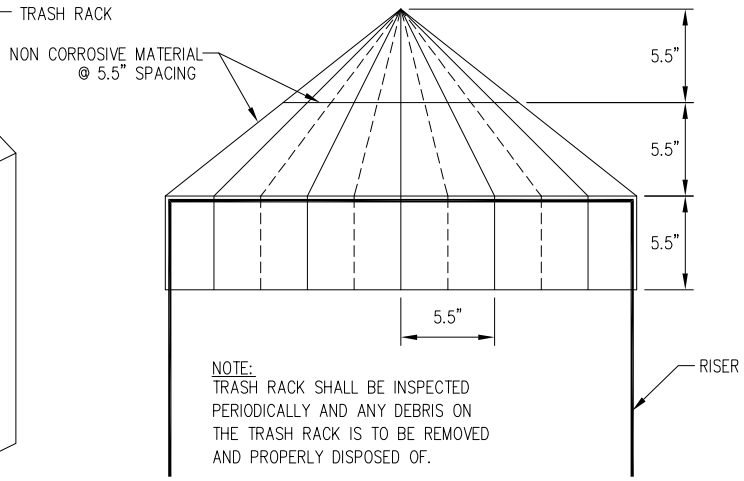
1. PRIOR TO INSTALLATION, MANUFACTURER SPECIFICATIONS OF FILTER MEDIA SHALL BE REVIEWED TO ENSURE THAT DISCHARGE FROM FILTER MEDIA SHALL MEET OR EXCEED THE PROVISIONS OF THE CLEAN WATER ACT.
2. ENSURE THAT PUMP PRESSURE DOES NOT EXCEED FILTER MEDIA PRESSURE RATING.
3. FILTER MEDIA MAY BE, BUT NOT LIMITED TO, SAND MEDIA FILTRATION DEVICES, RATED FILTER FABRIC BAGS OR POLYMER BASED DEWATERING PRACTICES.
4. PUMP STRAINER SHALL NOT BE IN CONTACT WITH BOTTOM OF POND.

BMP POND DEWATERING

NOTES:

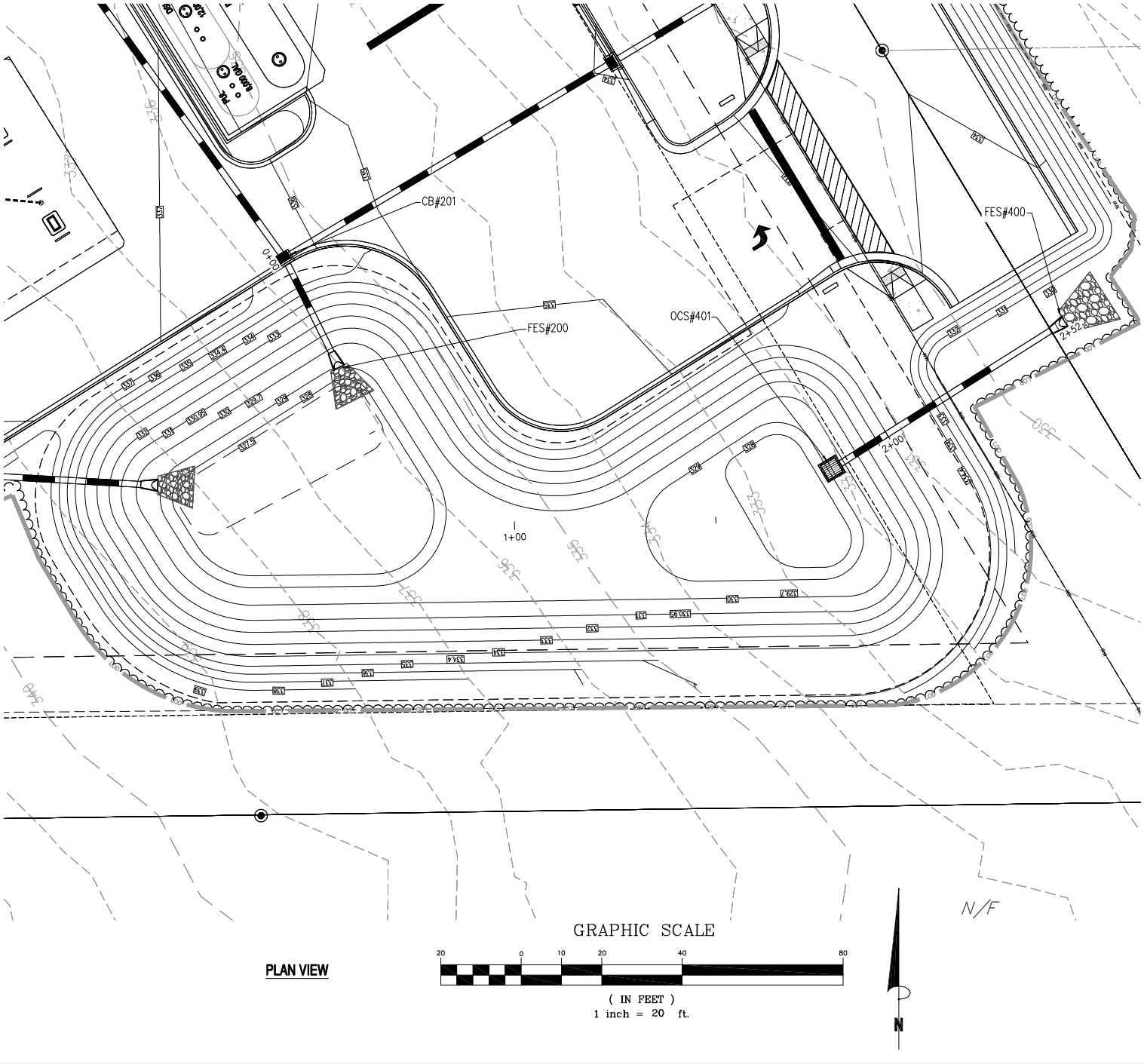
1. SEE DESIGN PLANS FOR SPECIFIED DIMENSIONS OF RISER.
2. TRASH RACK DIMENSION CRITERIA SPECIFIED IS APPROXIMATE AND VARIES BY MANUFACTURER.
3. INSTALLATION OF TRASH RACK SHALL BE ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
4. ALL COMPONENTS OF TRASH RACK SHALL BE OF STAINLESS STEEL OR OTHER NON-CORROSIVE MATERIAL.
5. ALL MOUNTING HARDWARE SHALL BE OF STAINLESS STEEL OR OTHER NON-CORROSIVE MATERIAL.



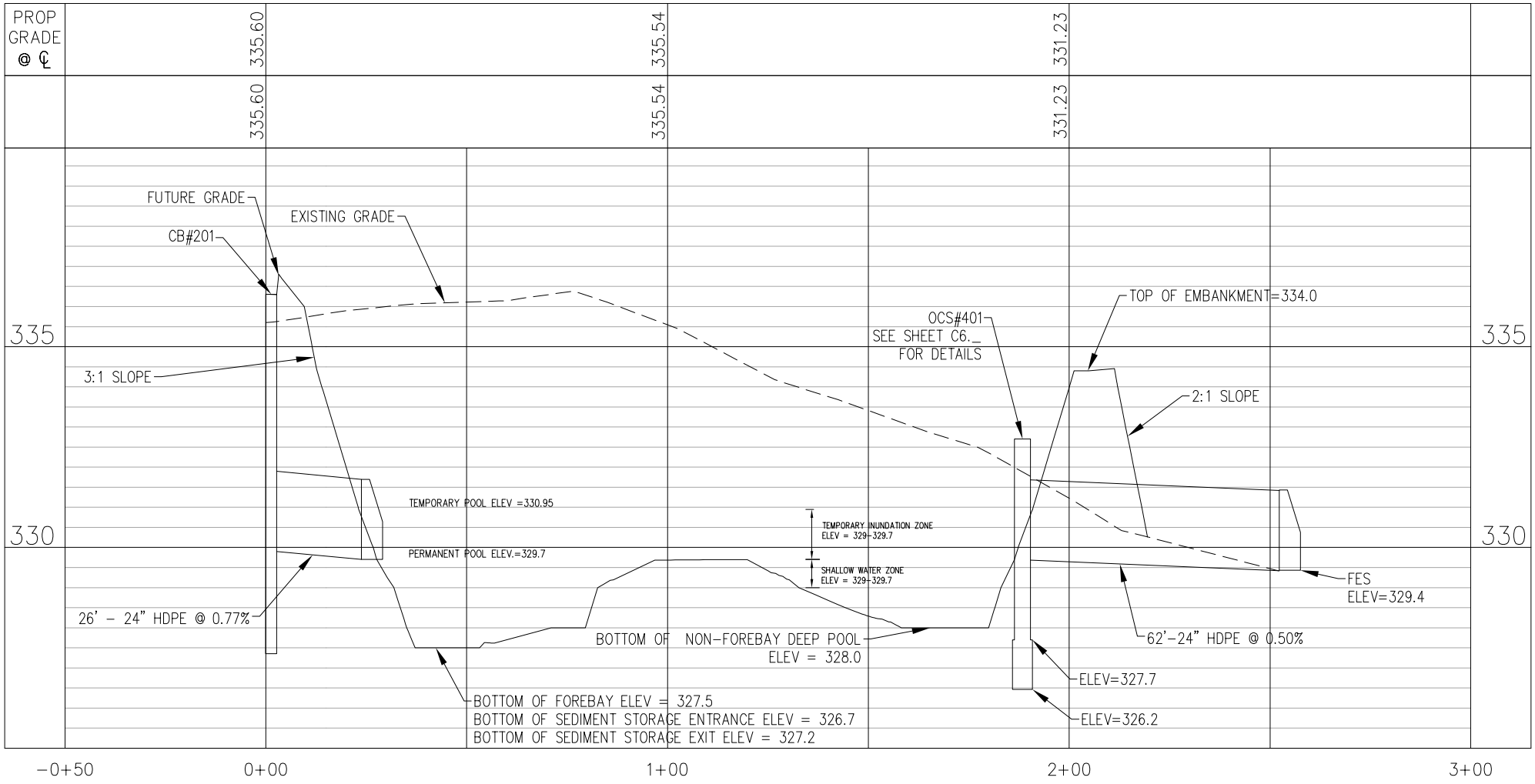


NOTE:
TRASH RACK SHALL BE INSPECTED PERIODICALLY AND ANY DEBRIS ON THE TRASH RACK IS TO BE REMOVED AND PROPERLY DISPOSED OF.

TRASH RACK DETAIL


CB#201
FES#200
OCS#401
FES#400
0+00
1+00
2+00
2+52
N/F
GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.
N

PLAN VIEW



STORMWATER WETLAND PROFILE VIEW

HORIZONTAL SCALE: 1"=30'

VERTICAL SCALE: 1"=3'

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

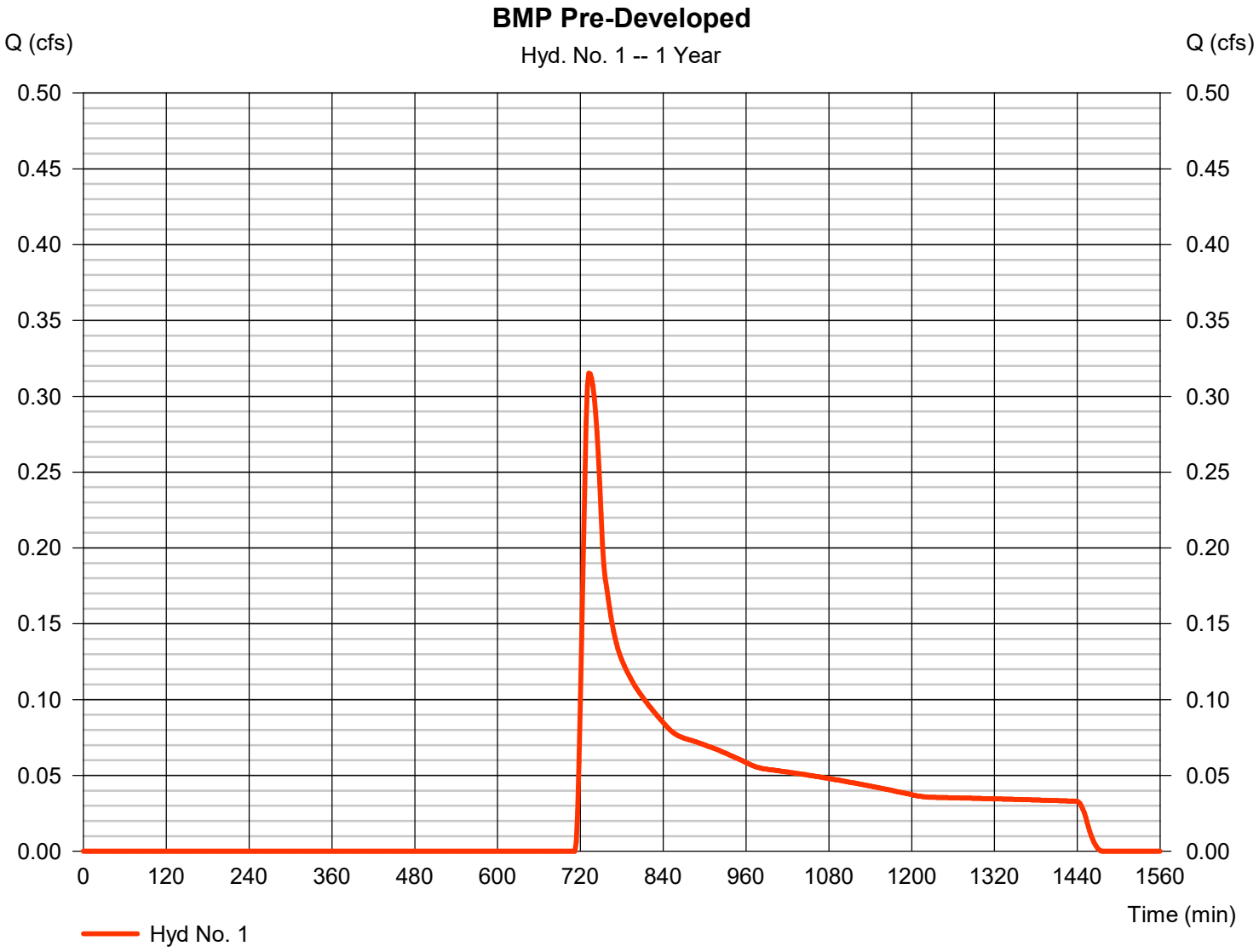
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.315	2	732	2,864	------	------	------	BMP Pre-Developed
2	SCS Runoff	8.034	2	716	16,222	------	------	------	BMP Post-Developed
3	Reservoir	0.131	2	1084	11,754	2	331.19	12,095	Post Through Detention
4	SCS Runoff	0.950	2	720	2,465	------	------	------	BMP Post-Developed Bypass
7	SCS Runoff	0.326	2	152	1,767	------	------	------	BMP Post-Developed
8	Reservoir	0.012	2	366	1,564	7	329.94	1,662	1.0-in Storm Thru Pond

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.315 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	2,864 cuft
Drainage area	=	3.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

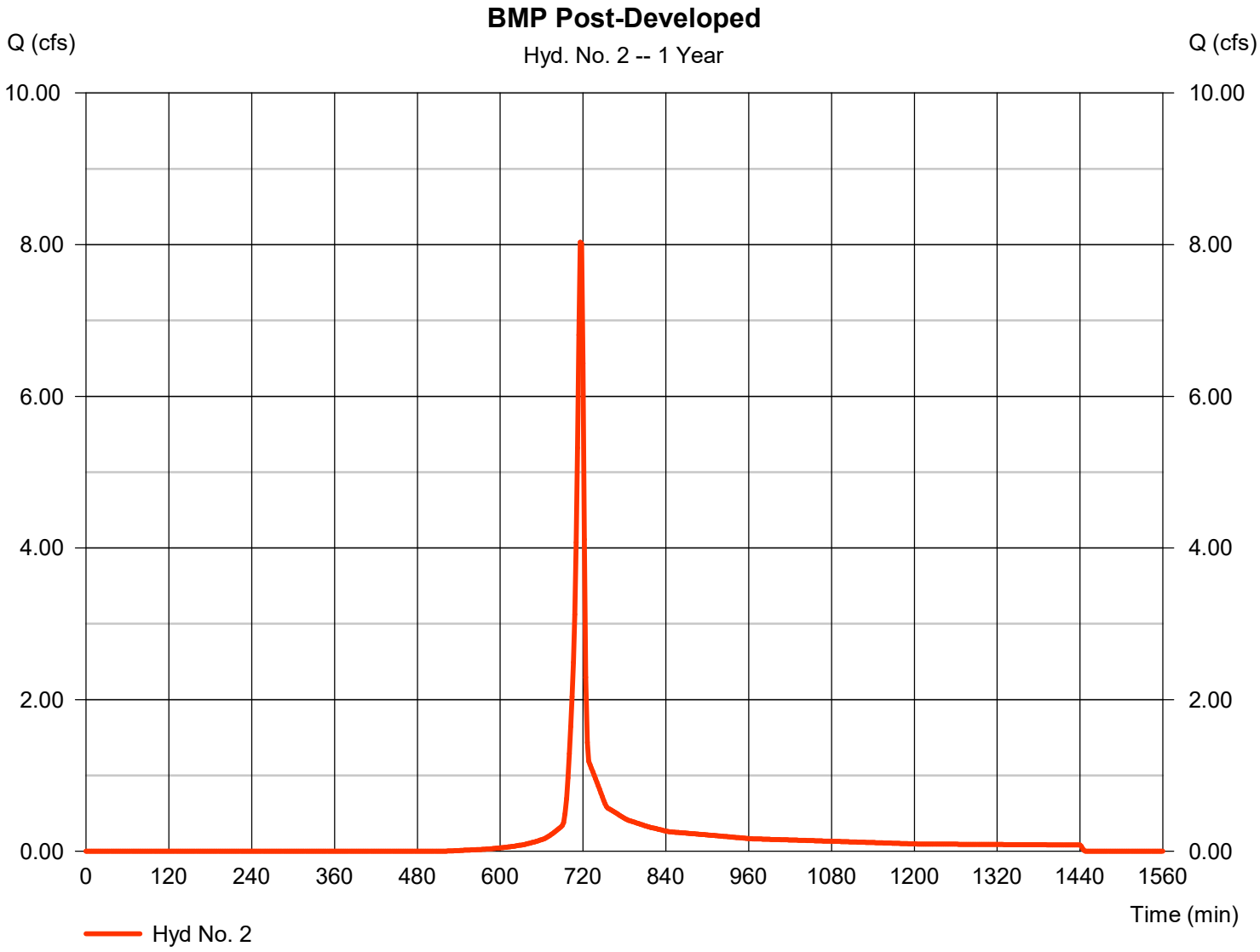


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.034 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	16,222 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



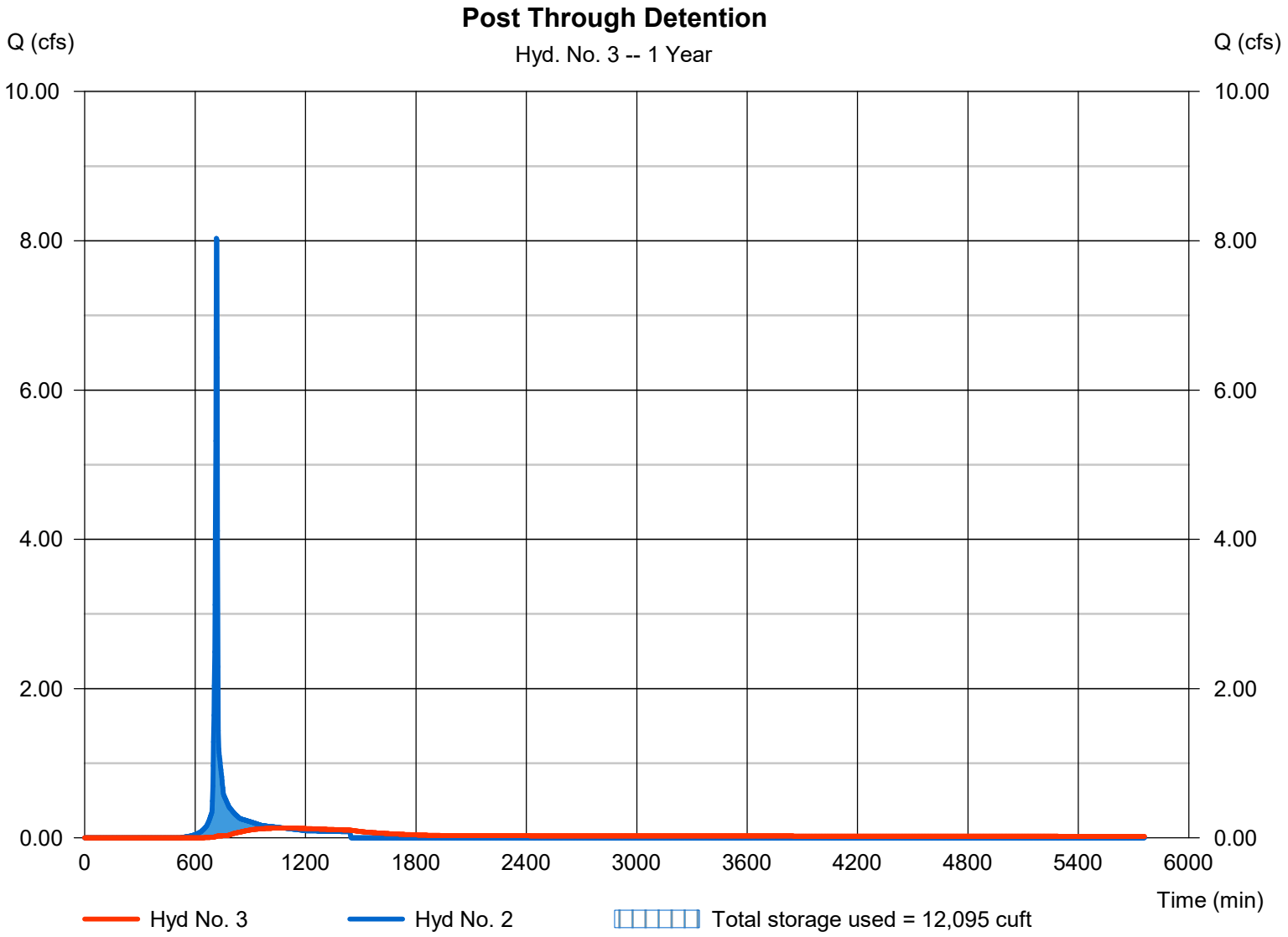
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.131 cfs
Storm frequency	=	1 yrs	Time to peak	=	1084 min
Time interval	=	2 min	Hyd. volume	=	11,754 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	331.19 ft
Reservoir name	=	BMP Pond	Max. Storage	=	12,095 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BMP Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 329.70 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	329.70	6,850	0	0
0.30	330.00	7,260	2,116	2,116
1.25	330.95	8,940	7,695	9,812
1.30	331.00	9,020	449	10,260
2.30	332.00	10,490	9,755	20,015
3.30	333.00	12,020	11,255	31,270
4.30	334.00	13,600	12,810	44,080

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	1.00	Inactive	0.00
Span (in)	= 24.00	1.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 329.70	329.70	0.00	0.00
Length (ft)	= 62.00	0.50	0.00	0.00
Slope (%)	= 0.50	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

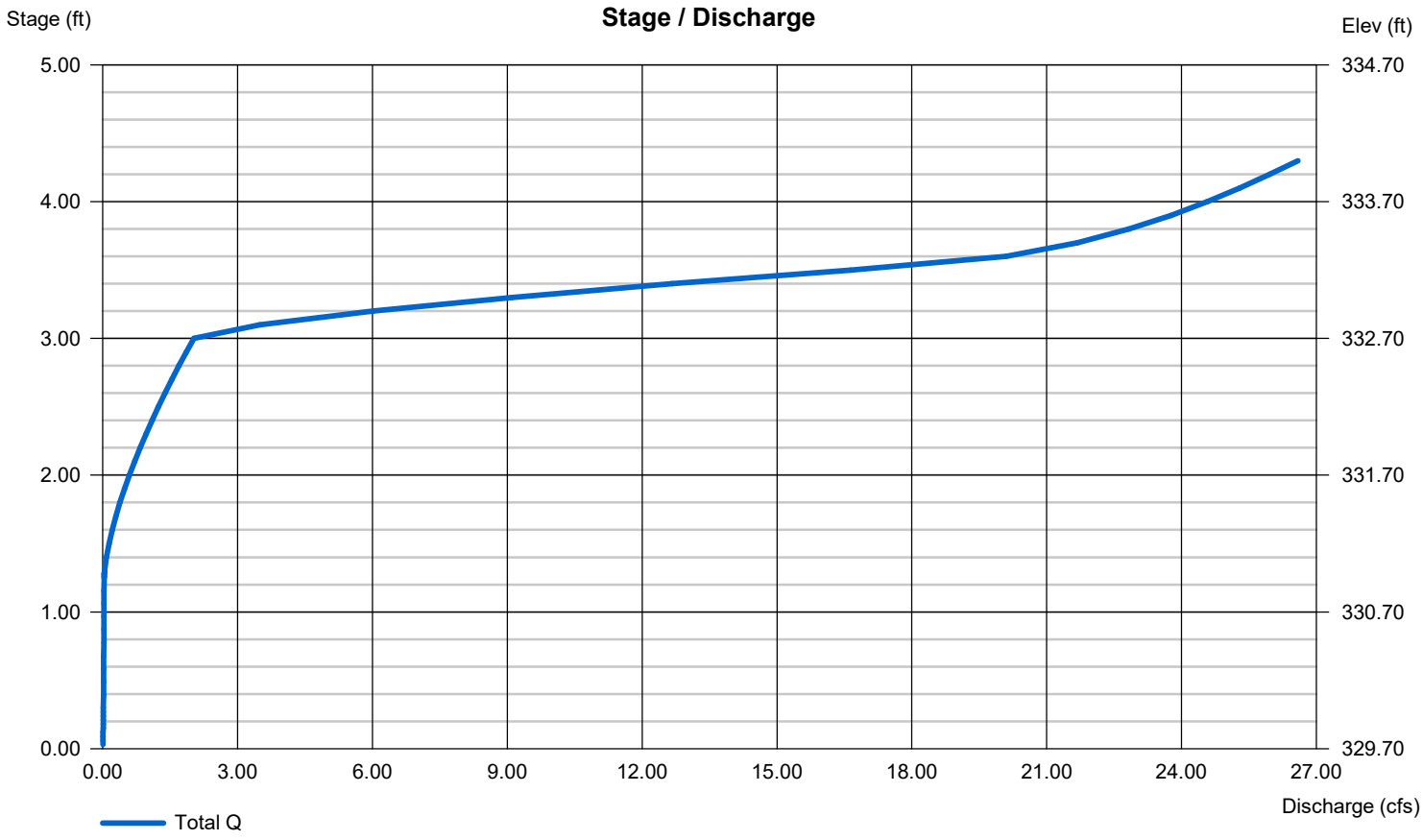
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.33	15.67	Inactive	Inactive
Crest El. (ft)	= 330.95	332.70	275.25	0.00
Weir Coeff.	= 2.60	2.60	2.60	3.33
Weir Type	= Broad	Broad	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

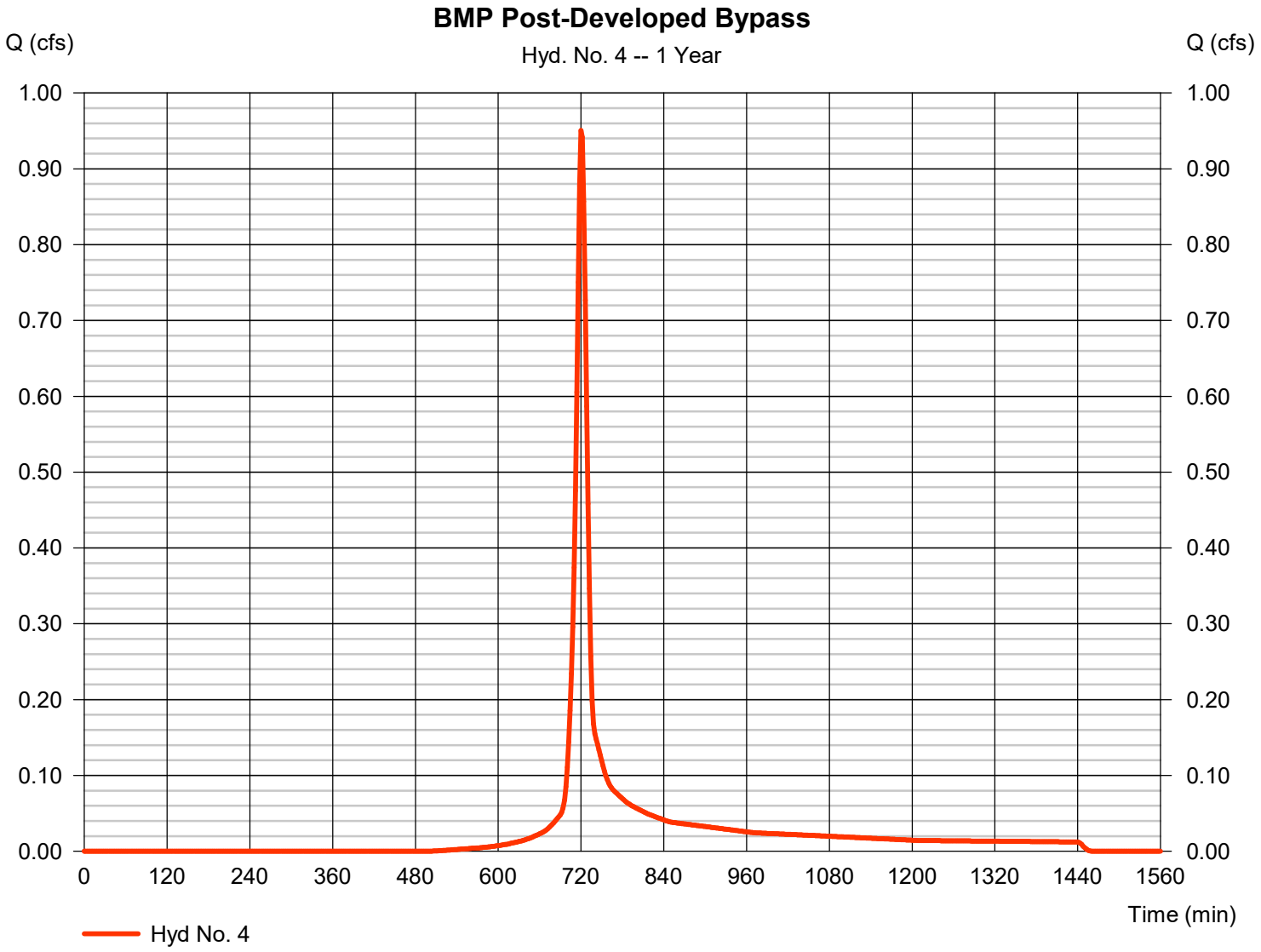


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.950 cfs
Storm frequency	=	1 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	2,465 cuft
Drainage area	=	0.450 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

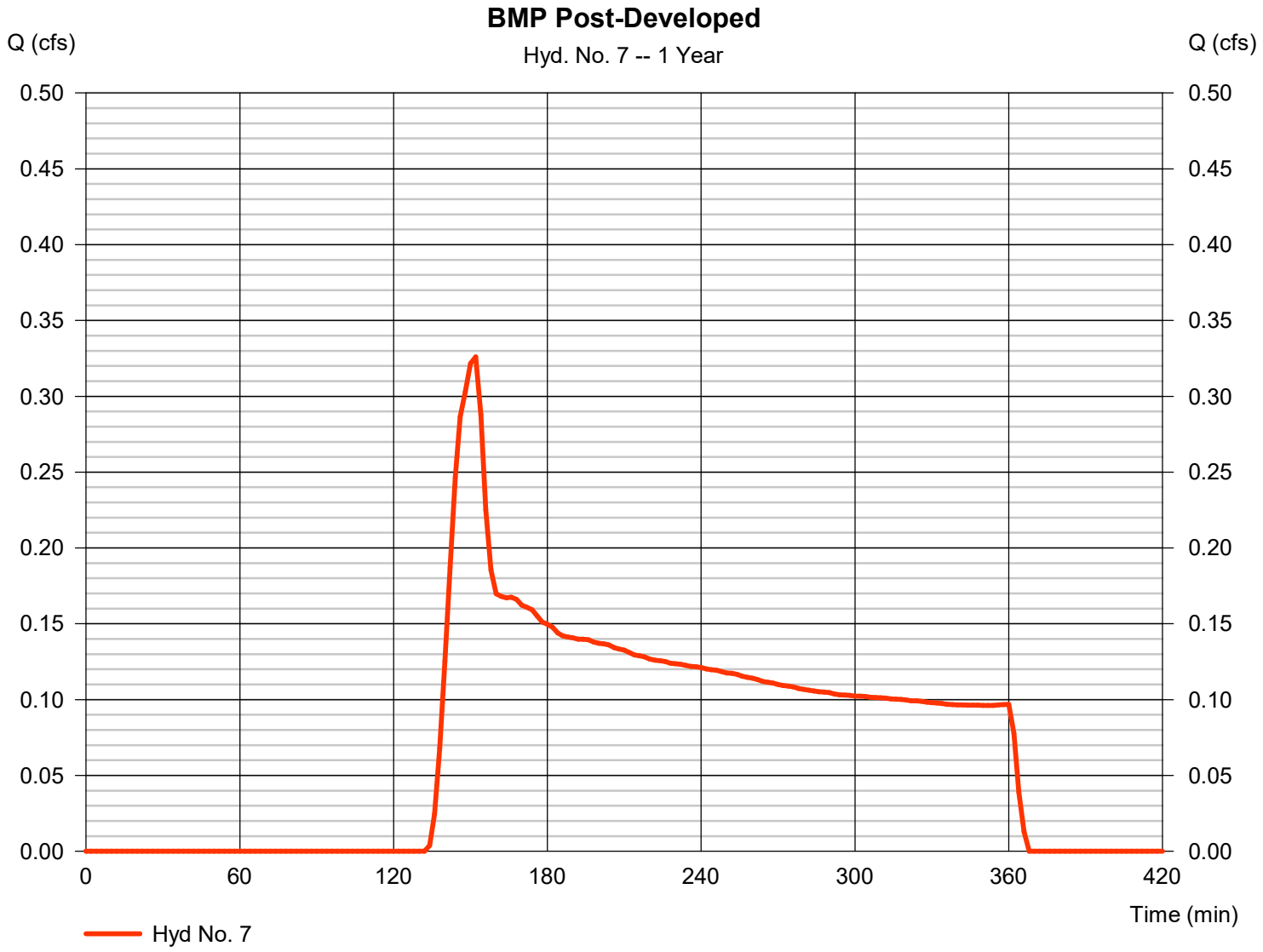


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 0.326 cfs
Storm frequency	= 1 yrs	Time to peak	= 152 min
Time interval	= 2 min	Hyd. volume	= 1,767 cuft
Drainage area	= 3.420 ac	Curve number	= 84
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.00 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



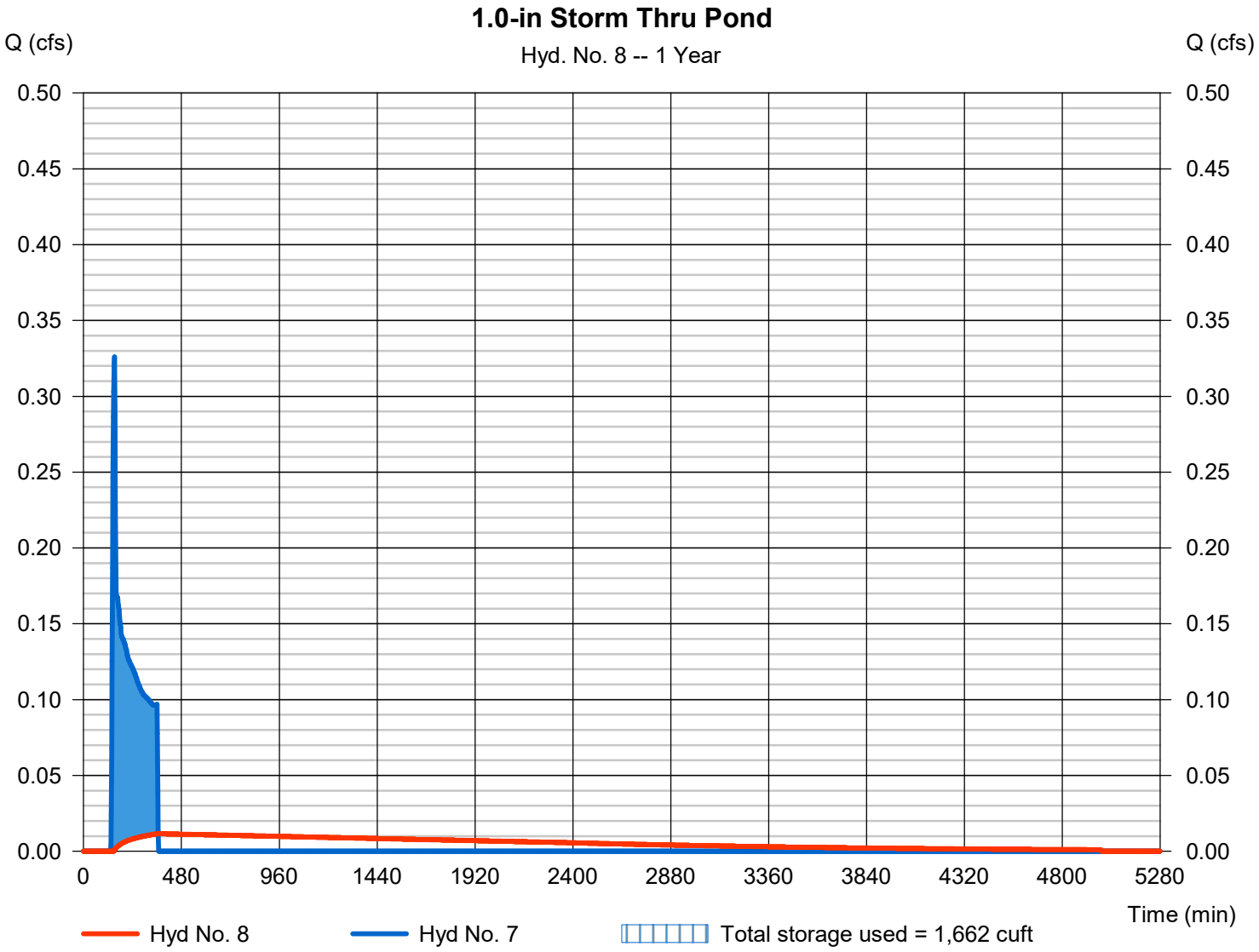
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.012 cfs
Storm frequency	=	1 yrs	Time to peak	=	366 min
Time interval	=	2 min	Hyd. volume	=	1,564 cuft
Inflow hyd. No.	=	7 - BMP Post-Developed	Max. Elevation	=	329.94 ft
Reservoir name	=	BMP Pond	Max. Storage	=	1,662 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - BMP Pond

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 329.70 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	329.70	6,850	0	0
0.30	330.00	7,260	2,116	2,116
1.25	330.95	8,940	7,695	9,812
1.30	331.00	9,020	449	10,260
2.30	332.00	10,490	9,755	20,015
3.30	333.00	12,020	11,255	31,270
4.30	334.00	13,600	12,810	44,080

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	1.00	Inactive	0.00
Span (in)	= 24.00	1.00	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 329.70	329.70	0.00	0.00
Length (ft)	= 62.00	0.50	0.00	0.00
Slope (%)	= 0.50	1.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

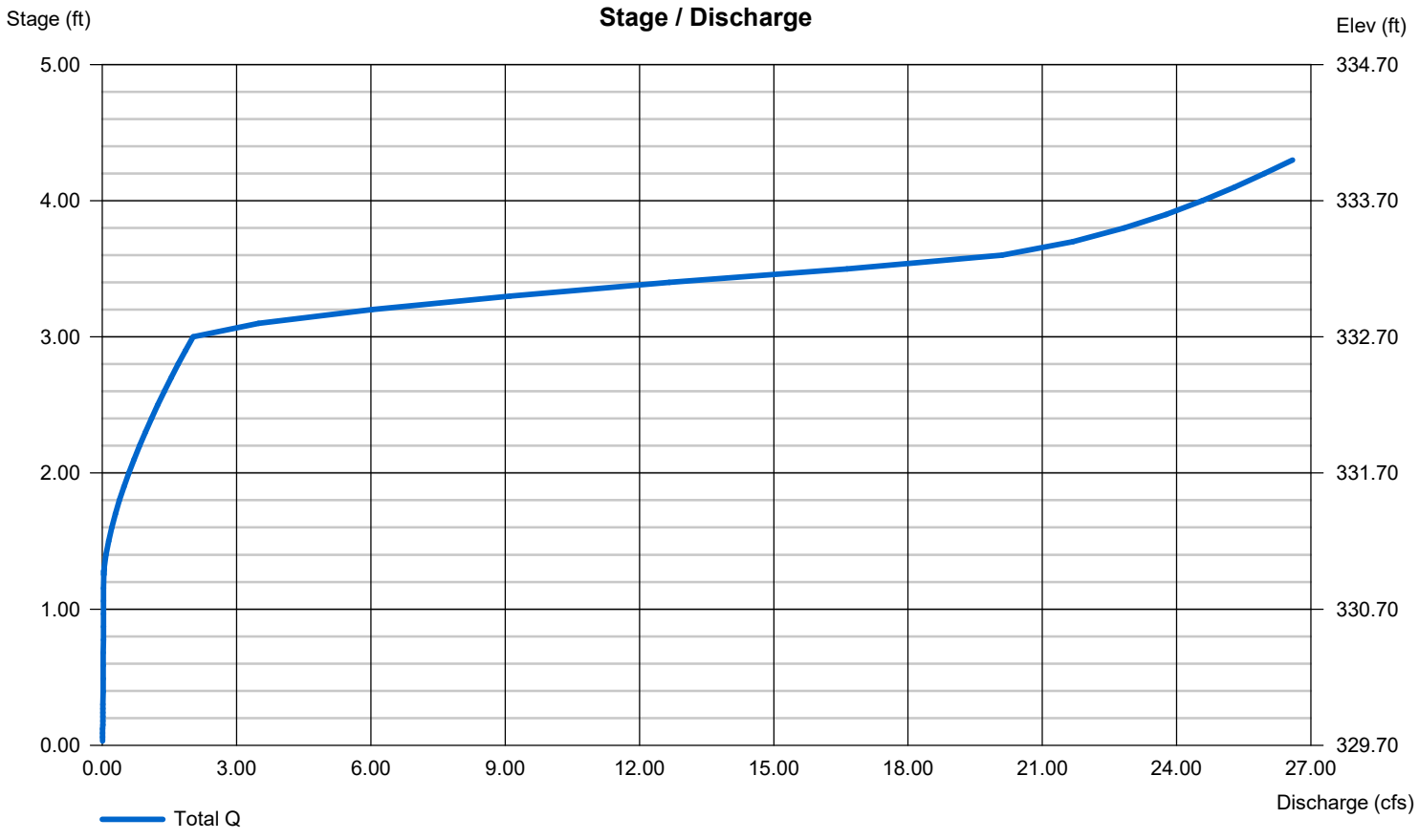
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.33	15.67	Inactive	Inactive
Crest El. (ft)	= 330.95	332.70	275.25	0.00
Weir Coeff.	= 2.60	2.60	2.60	3.33
Weir Type	= Broad	Broad	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

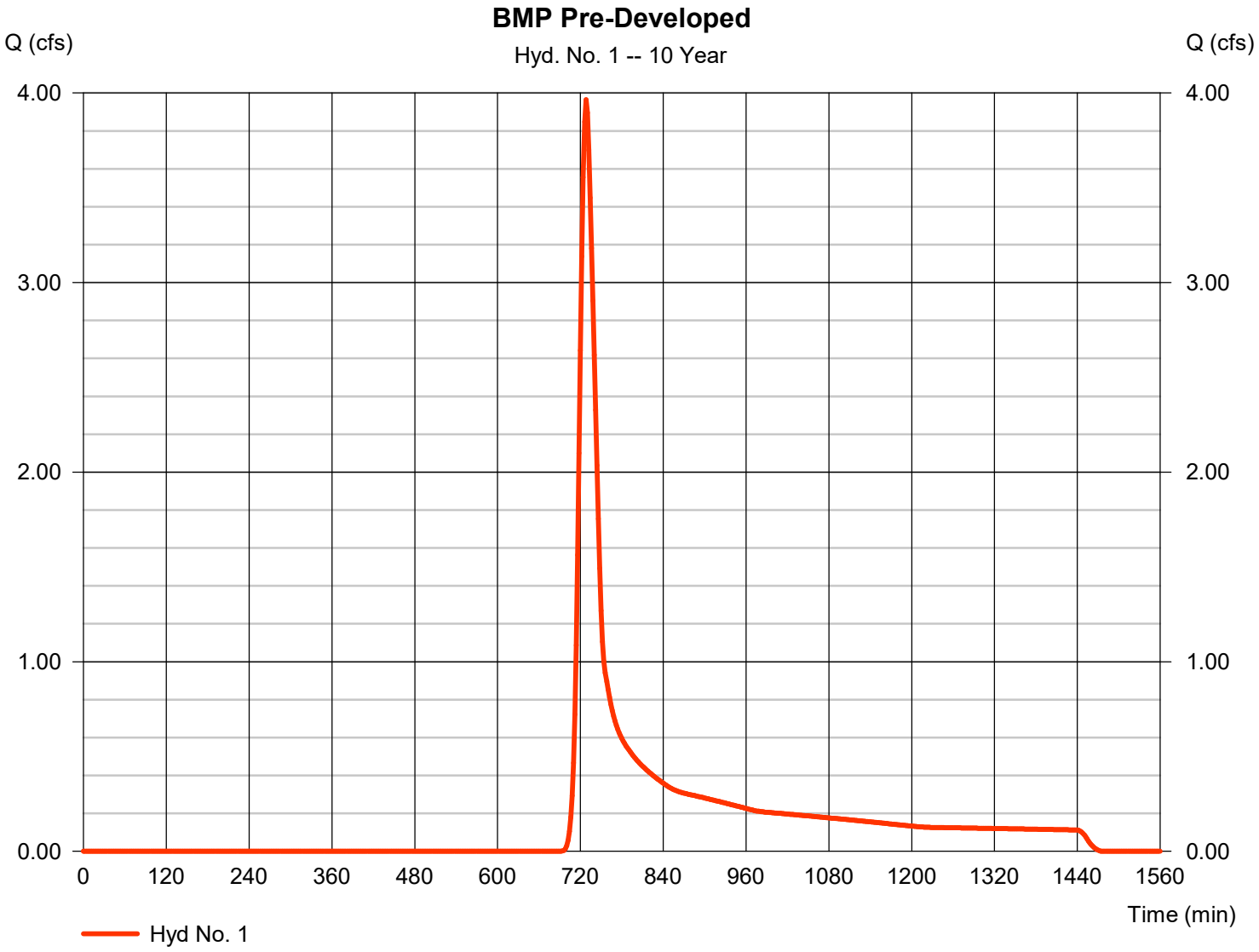
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.965	2	728	15,706	------	------	------	BMP Pre-Developed
2	SCS Runoff	19.14	2	716	39,557	------	------	------	BMP Post-Developed
3	Reservoir	1.280	2	754	34,864	2	332.23	22,600	Post Through Detention
4	SCS Runoff	2.239	2	720	5,892	------	------	------	BMP Post-Developed Bypass
7	SCS Runoff	0.000	2	n/a	0	------	------	------	BMP Post-Developed
8	Reservoir	0.000	2	n/a	0	7	329.70	0.000	1.0-in Storm Thru Pond

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.965 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	15,706 cuft
Drainage area	=	3.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

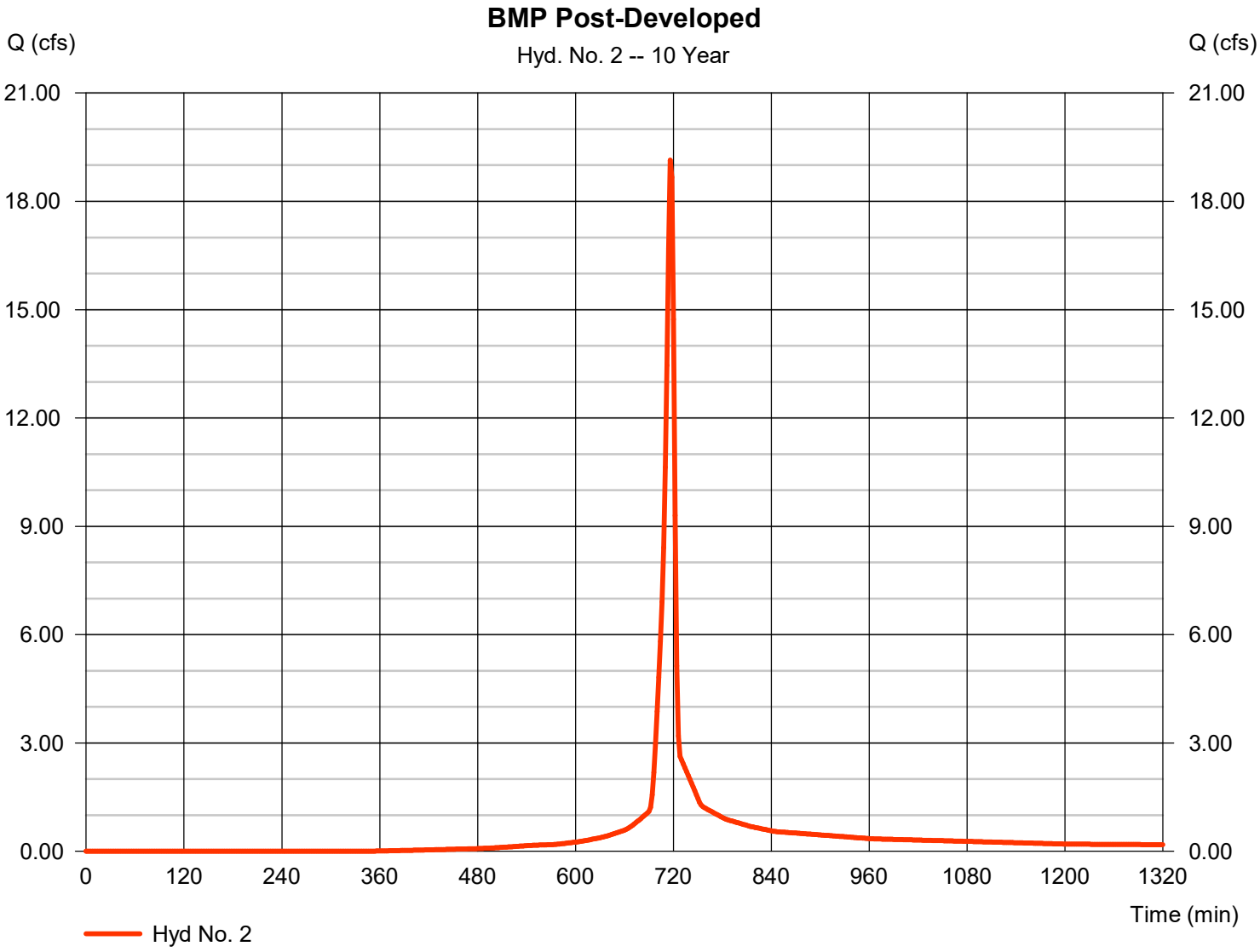


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.14 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	39,557 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



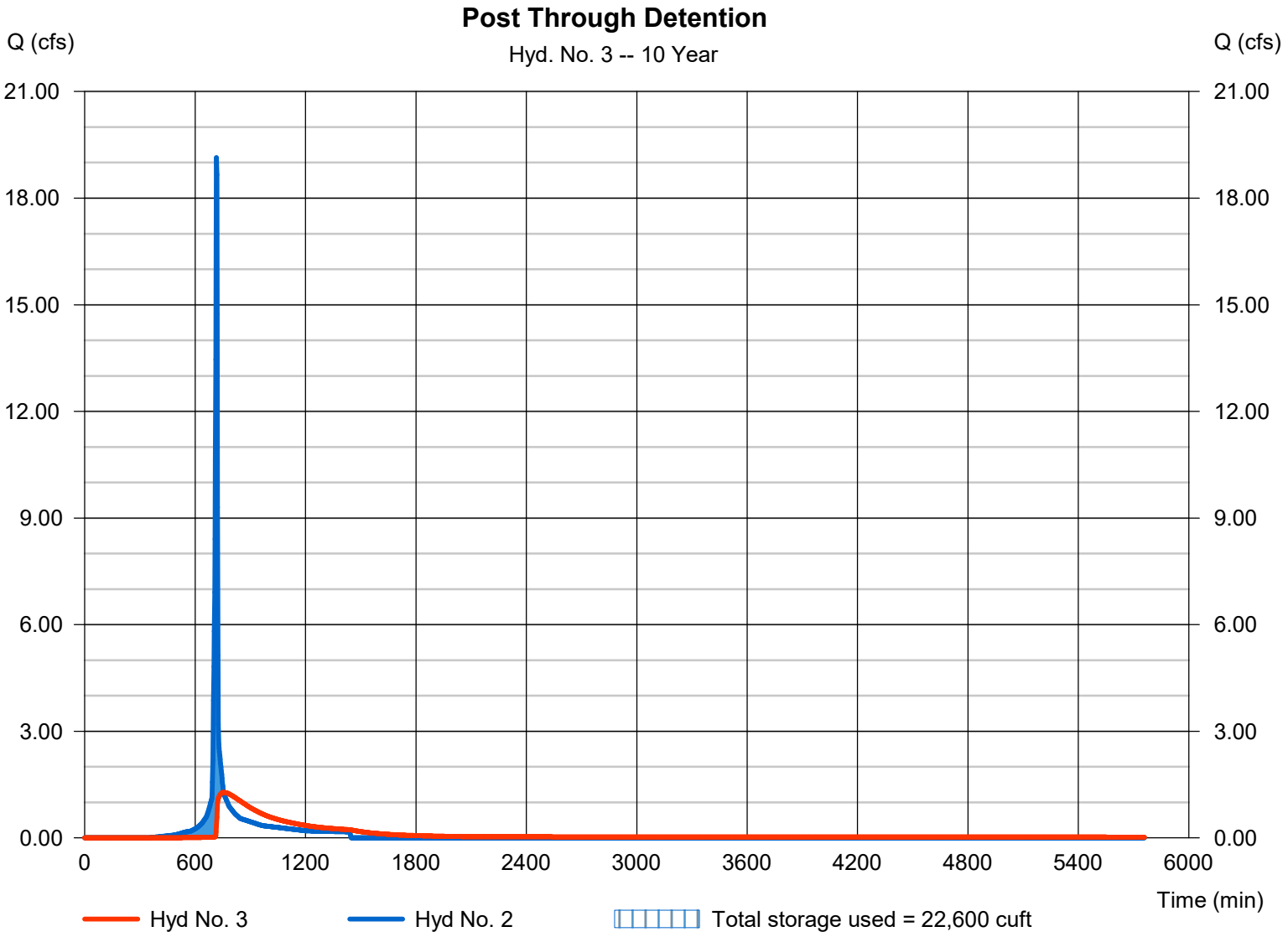
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	1.280 cfs
Storm frequency	=	10 yrs	Time to peak	=	754 min
Time interval	=	2 min	Hyd. volume	=	34,864 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	332.23 ft
Reservoir name	=	BMP Pond	Max. Storage	=	22,600 cuft

Storage Indication method used.

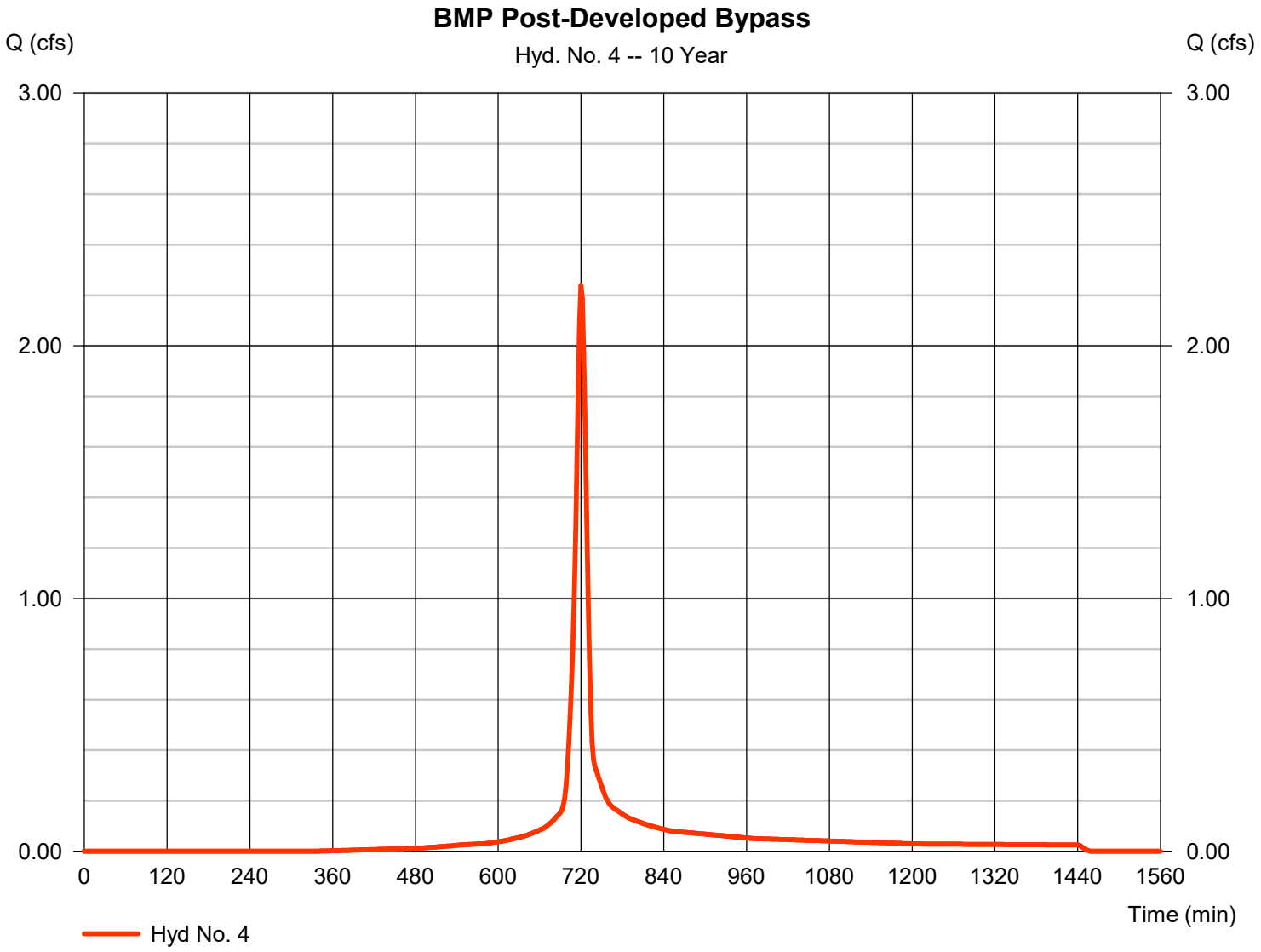


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.239 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	5,892 cuft
Drainage area	=	0.450 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

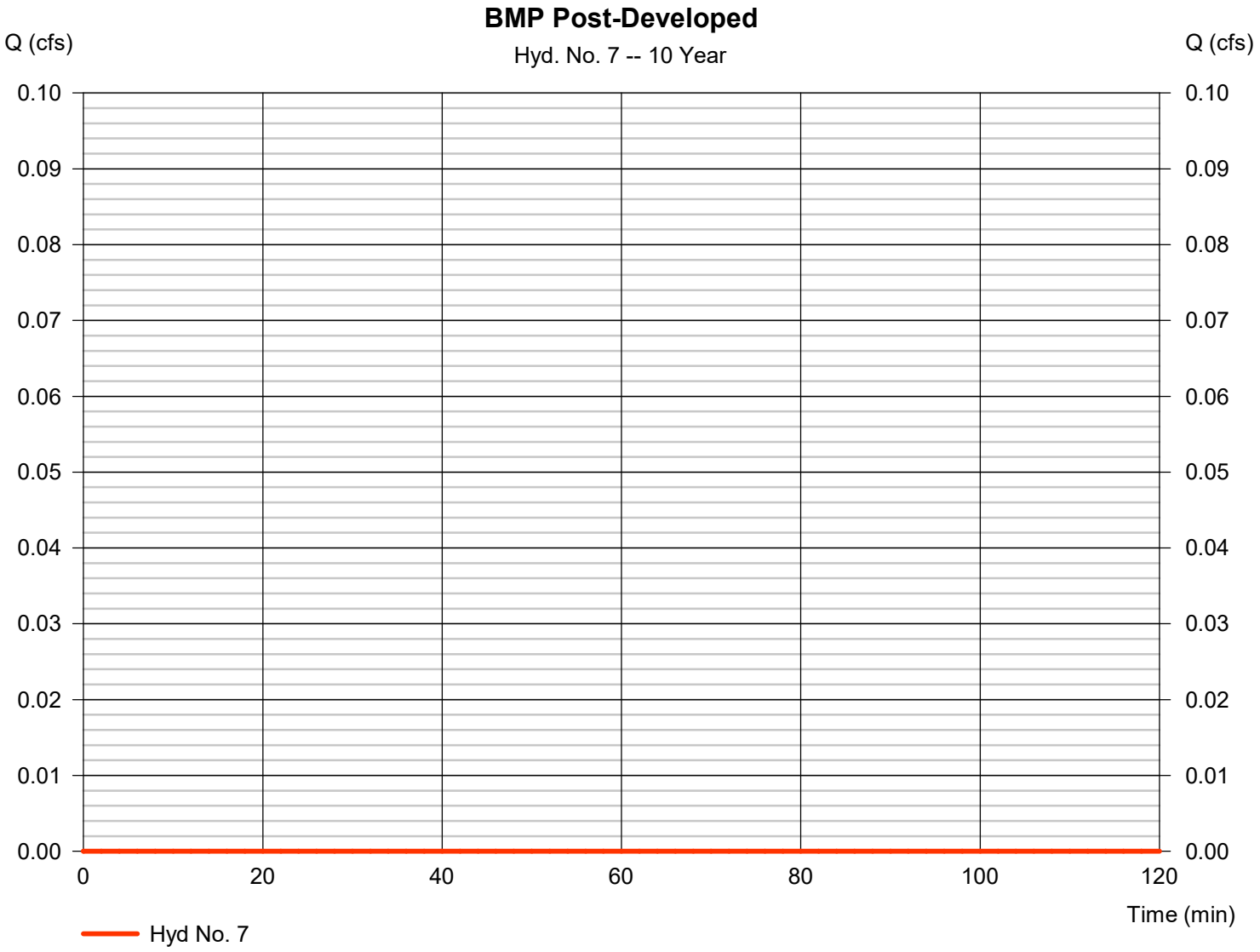


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.00 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



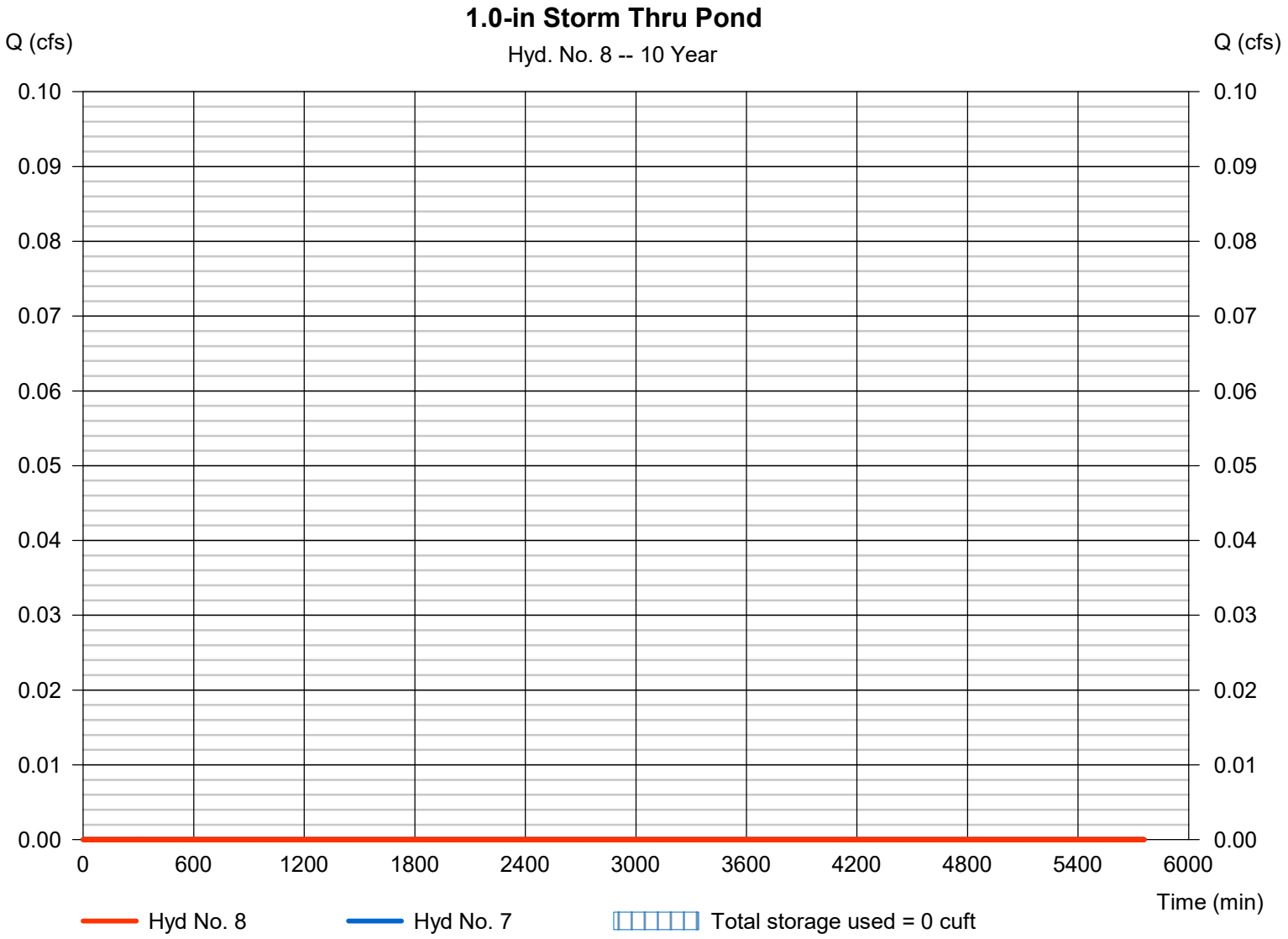
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	7 - BMP Post-Developed	Max. Elevation	=	329.70 ft
Reservoir name	=	BMP Pond	Max. Storage	=	0 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

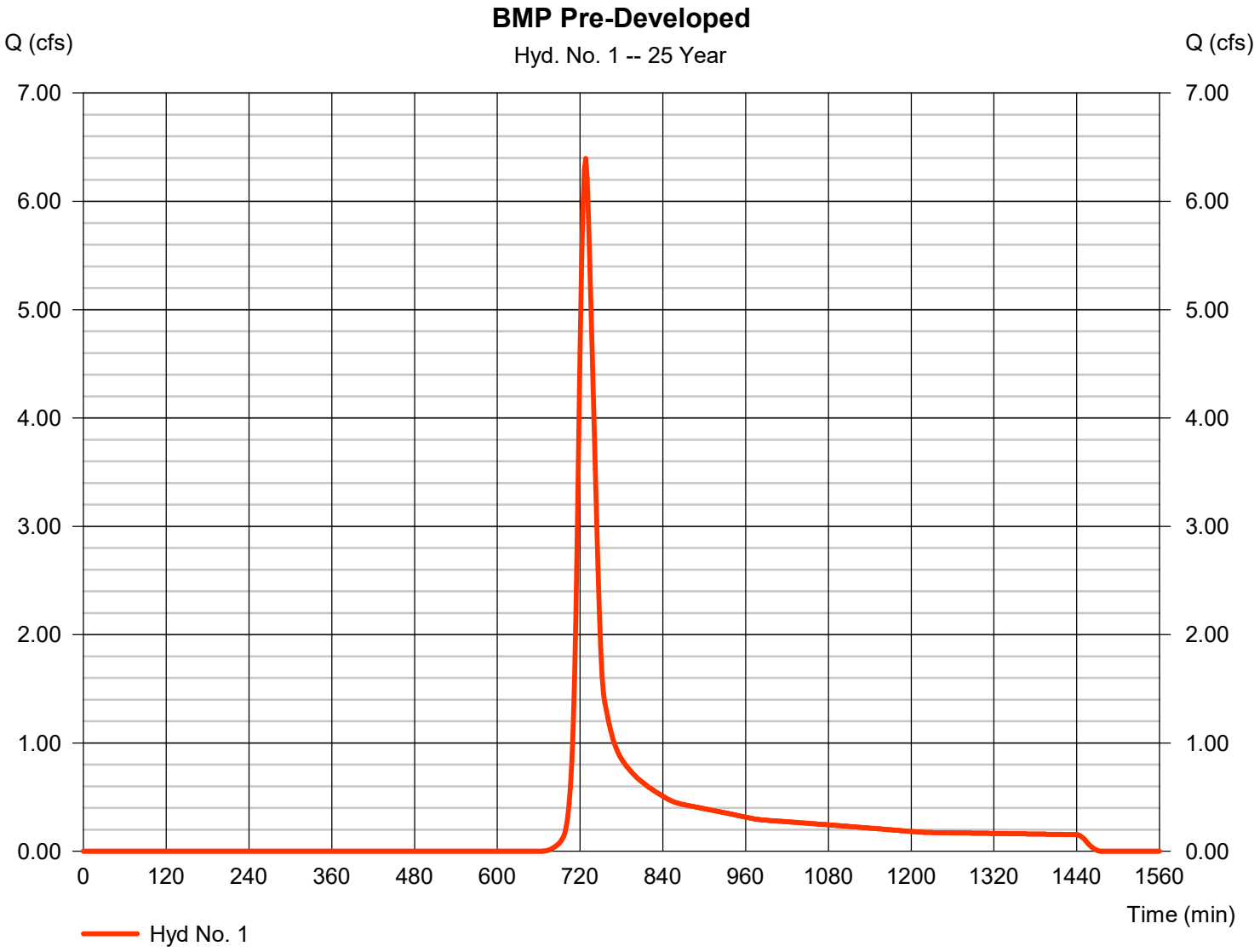
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.394	2	728	23,720	------	------	------	BMP Pre-Developed
2	SCS Runoff	24.37	2	716	51,024	------	------	------	BMP Post-Developed
3	Reservoir	2.562	2	740	46,287	2	332.74	28,306	Post Through Detention
4	SCS Runoff	2.845	2	720	7,566	------	------	------	BMP Post-Developed Bypass
7	SCS Runoff	0.000	2	n/a	0	------	------	------	BMP Post-Developed
8	Reservoir	0.000	2	n/a	0	7	329.70	0.000	1.0-in Storm Thru Pond

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.394 cfs
Storm frequency	=	25 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	23,720 cuft
Drainage area	=	3.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	6.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

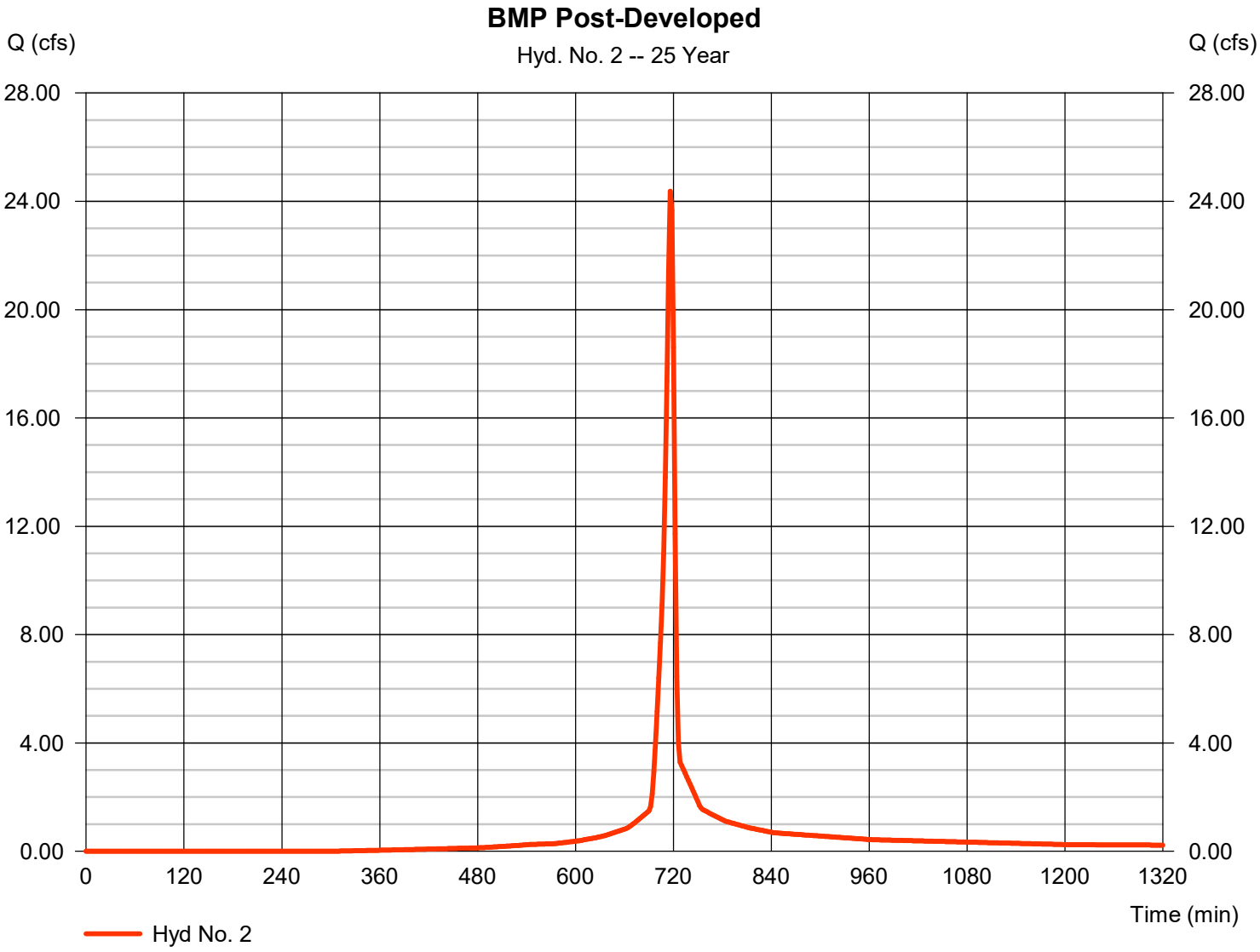


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.37 cfs
Storm frequency	=	25 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	51,024 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	6.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



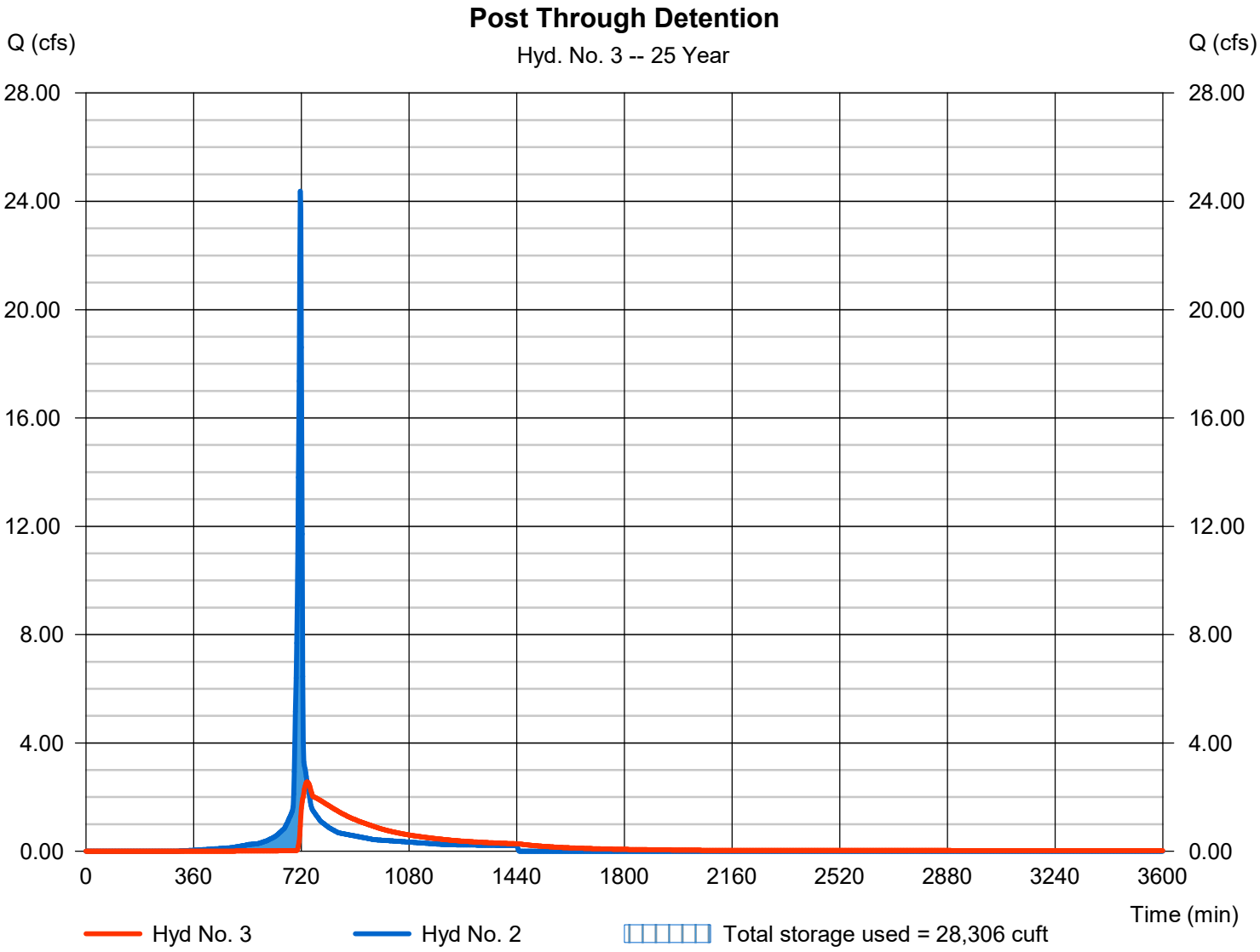
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	2.562 cfs
Storm frequency	=	25 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	46,287 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	332.74 ft
Reservoir name	=	BMP Pond	Max. Storage	=	28,306 cuft

Storage Indication method used.

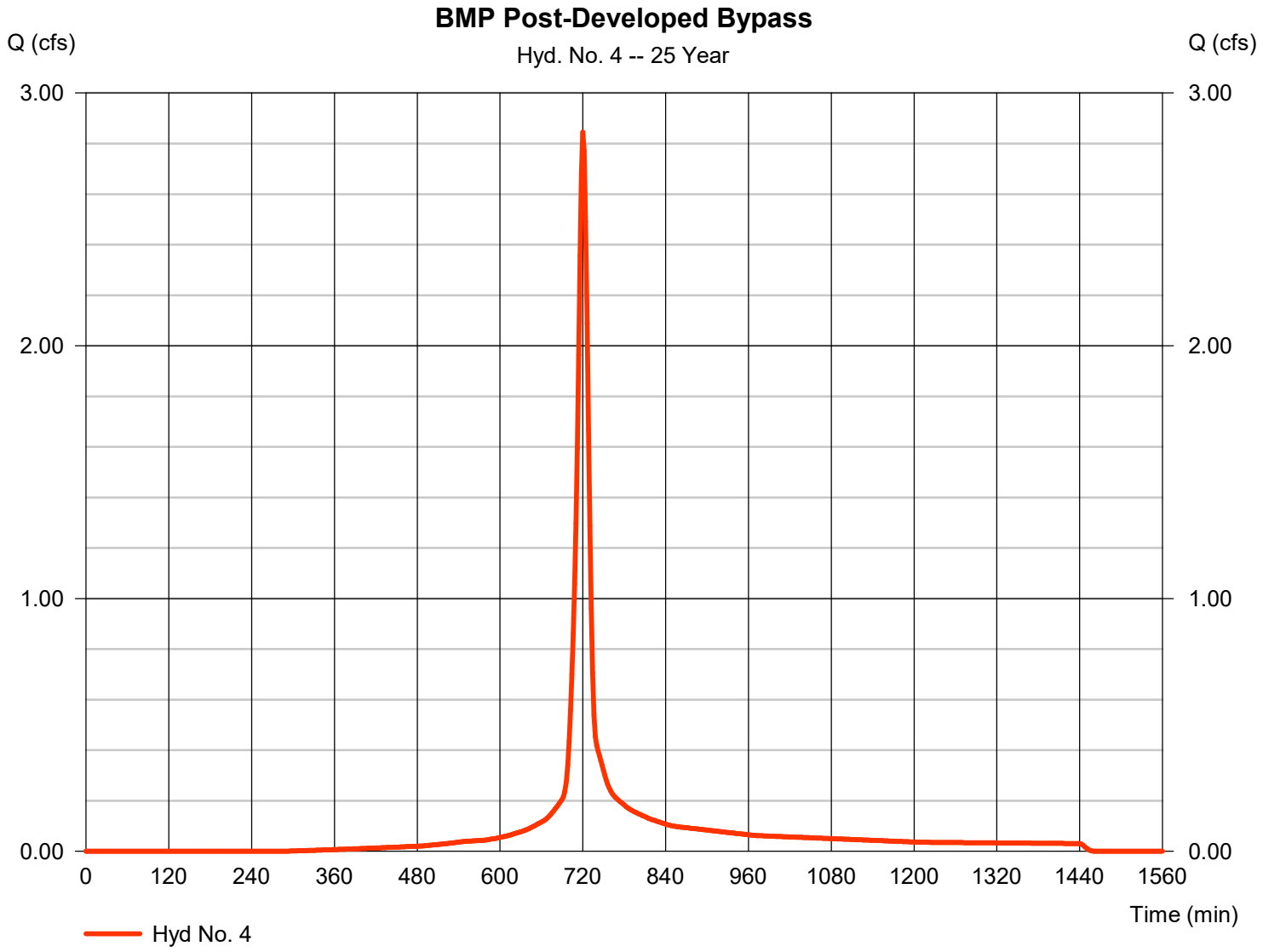


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.845 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	7,566 cuft
Drainage area	=	0.450 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

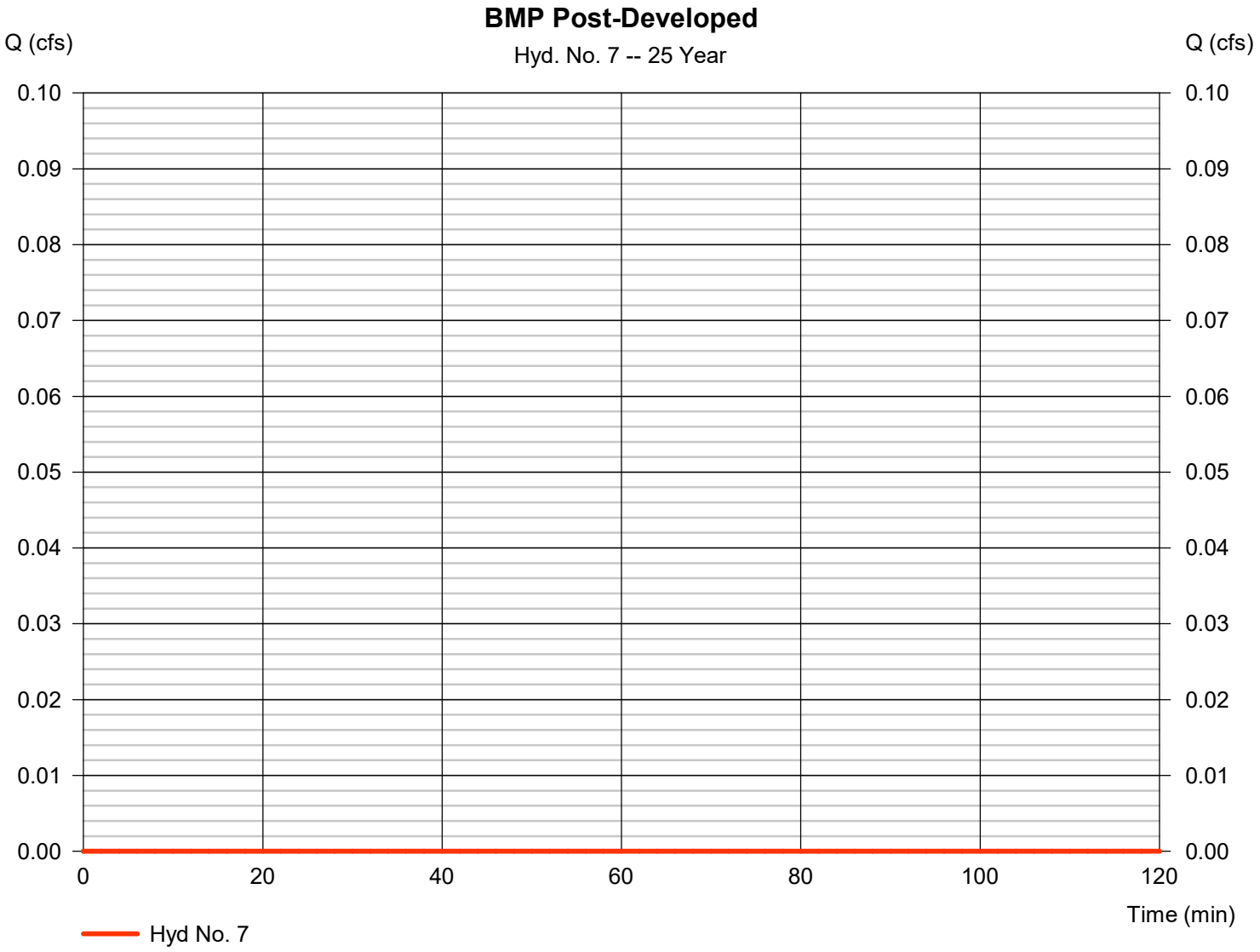


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	25 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.00 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



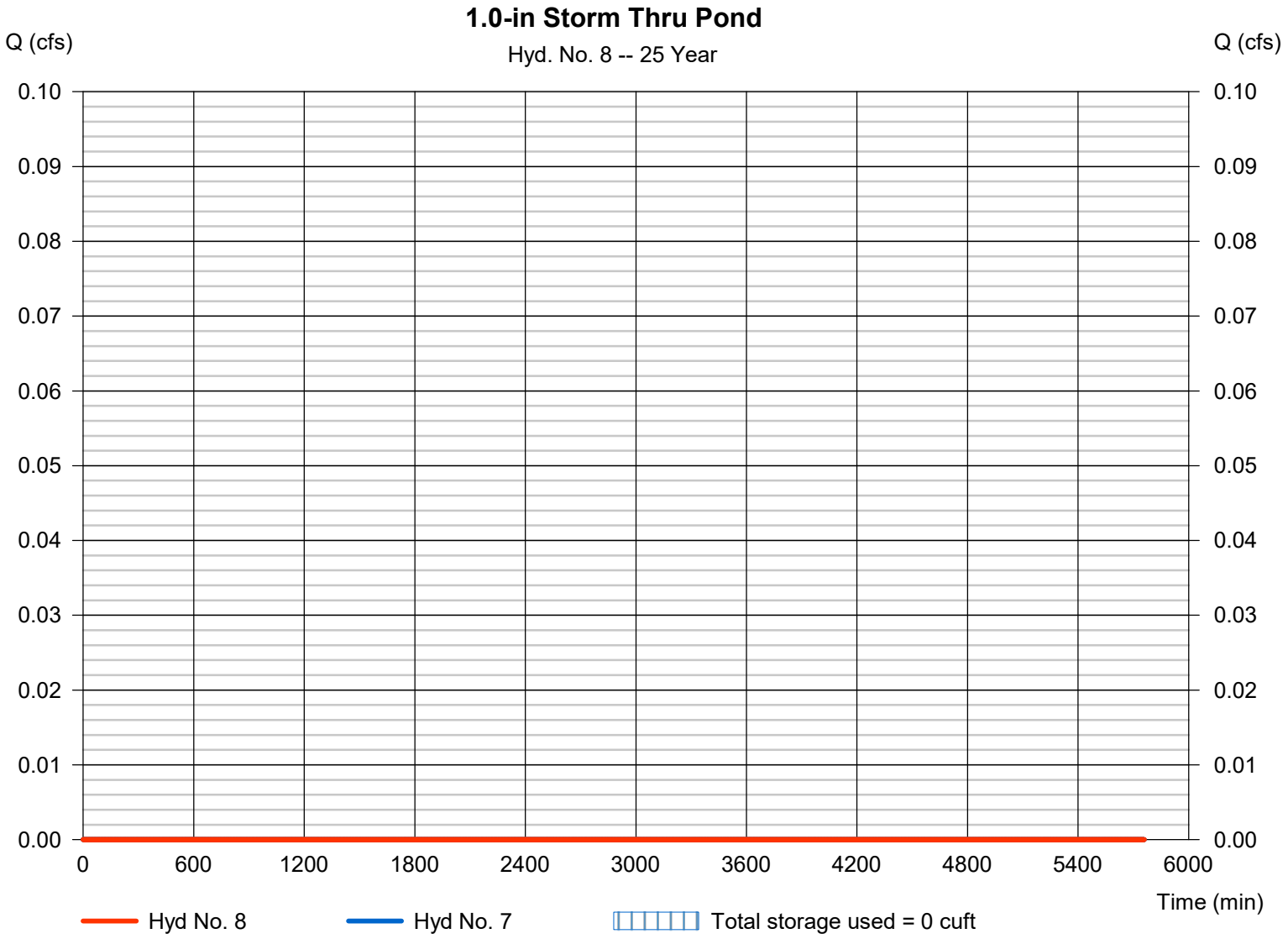
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	25 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	7 - BMP Post-Developed	Max. Elevation	=	329.70 ft
Reservoir name	=	BMP Pond	Max. Storage	=	0 cuft

Storage Indication method used.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

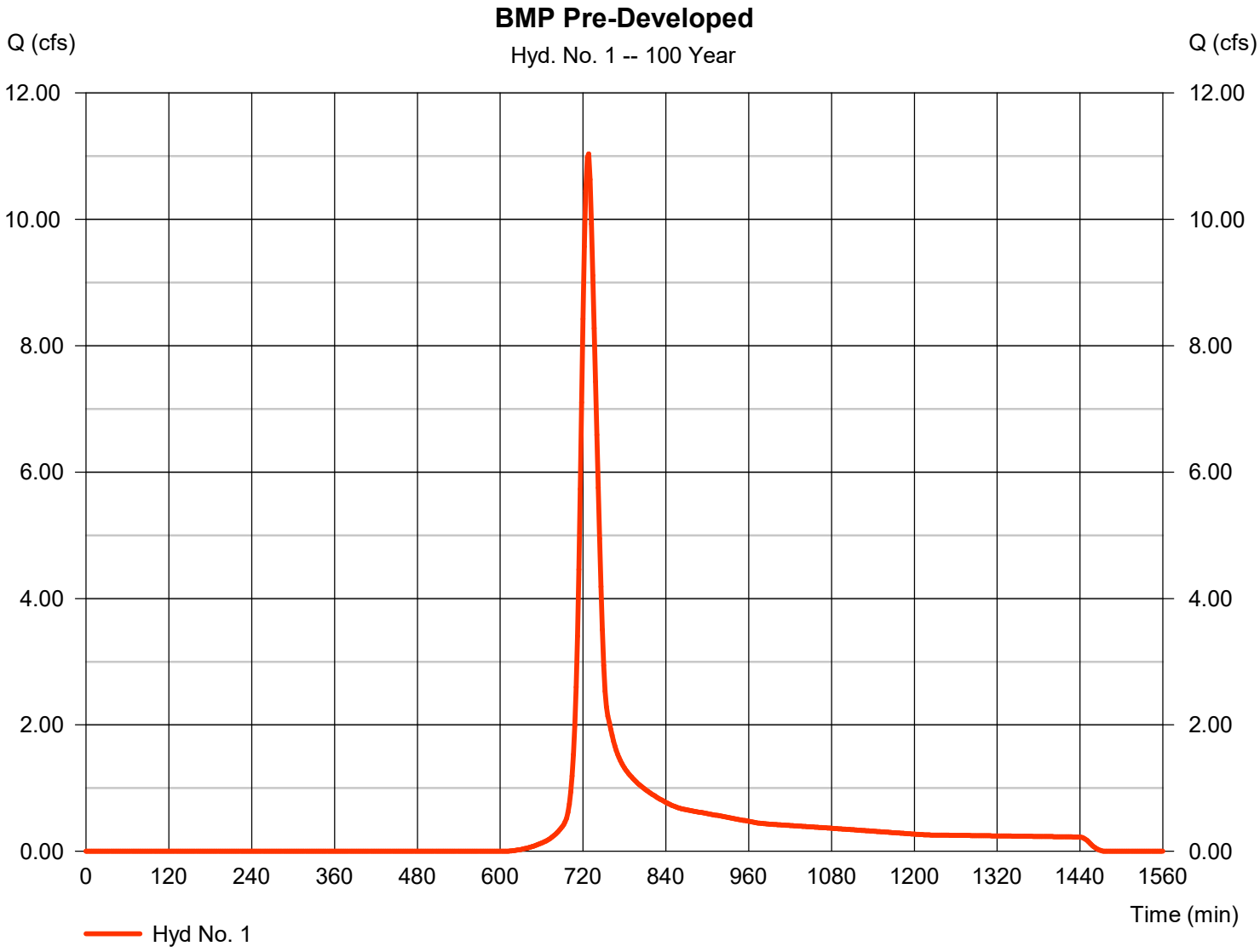
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	11.04	2	728	39,210	------	------	------	BMP Pre-Developed
2	SCS Runoff	33.24	2	716	70,941	------	------	------	BMP Post-Developed
3	Reservoir	17.25	2	722	66,153	2	333.22	34,060	Post Through Detention
4	SCS Runoff	3.872	2	720	10,466	------	------	------	BMP Post-Developed Bypass
7	SCS Runoff	0.000	2	n/a	0	------	------	------	BMP Post-Developed
8	Reservoir	0.000	2	n/a	0	7	329.70	0.000	1.0-in Storm Thru Pond

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.04 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	39,210 cuft
Drainage area	=	3.410 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

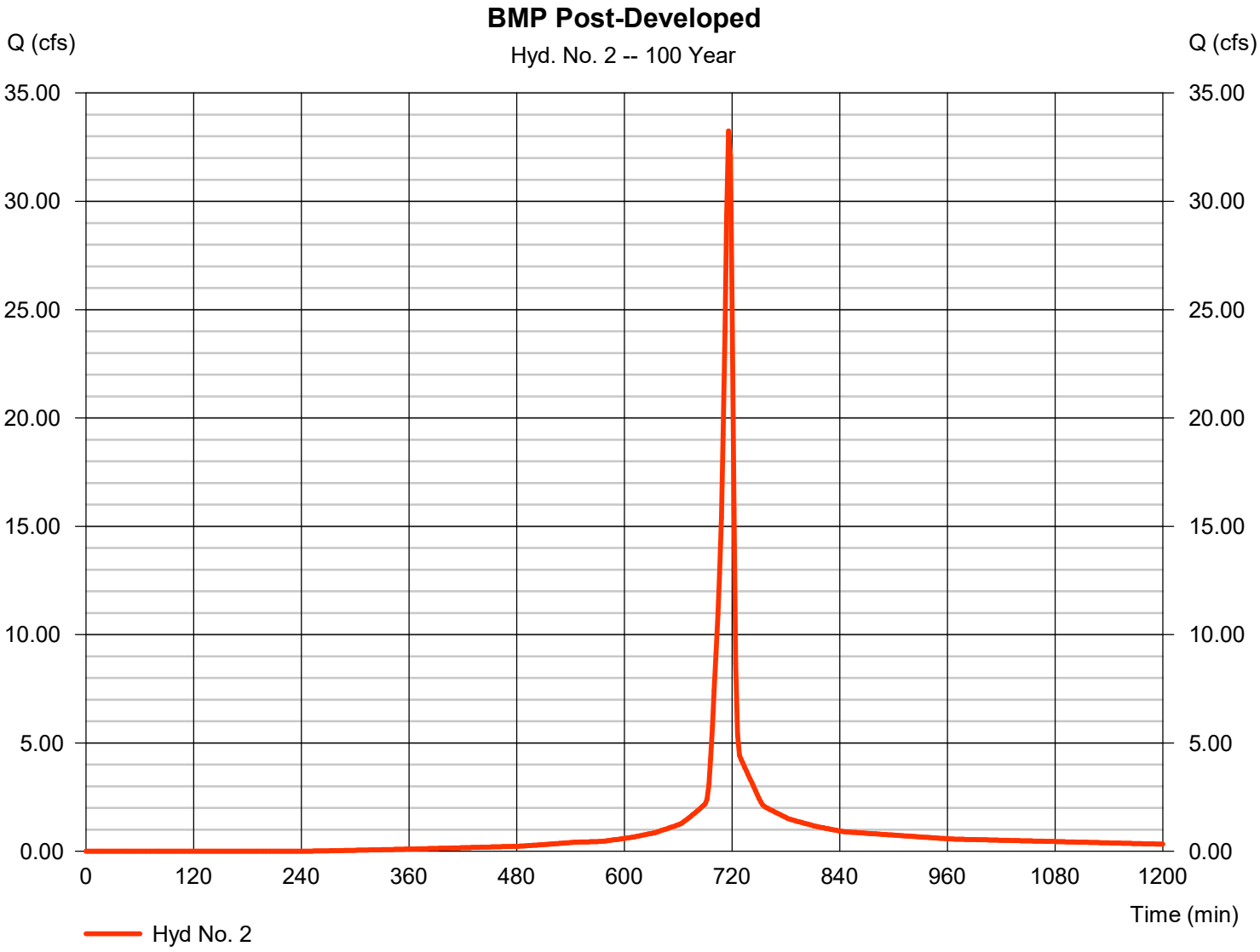


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	33.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	70,941 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484



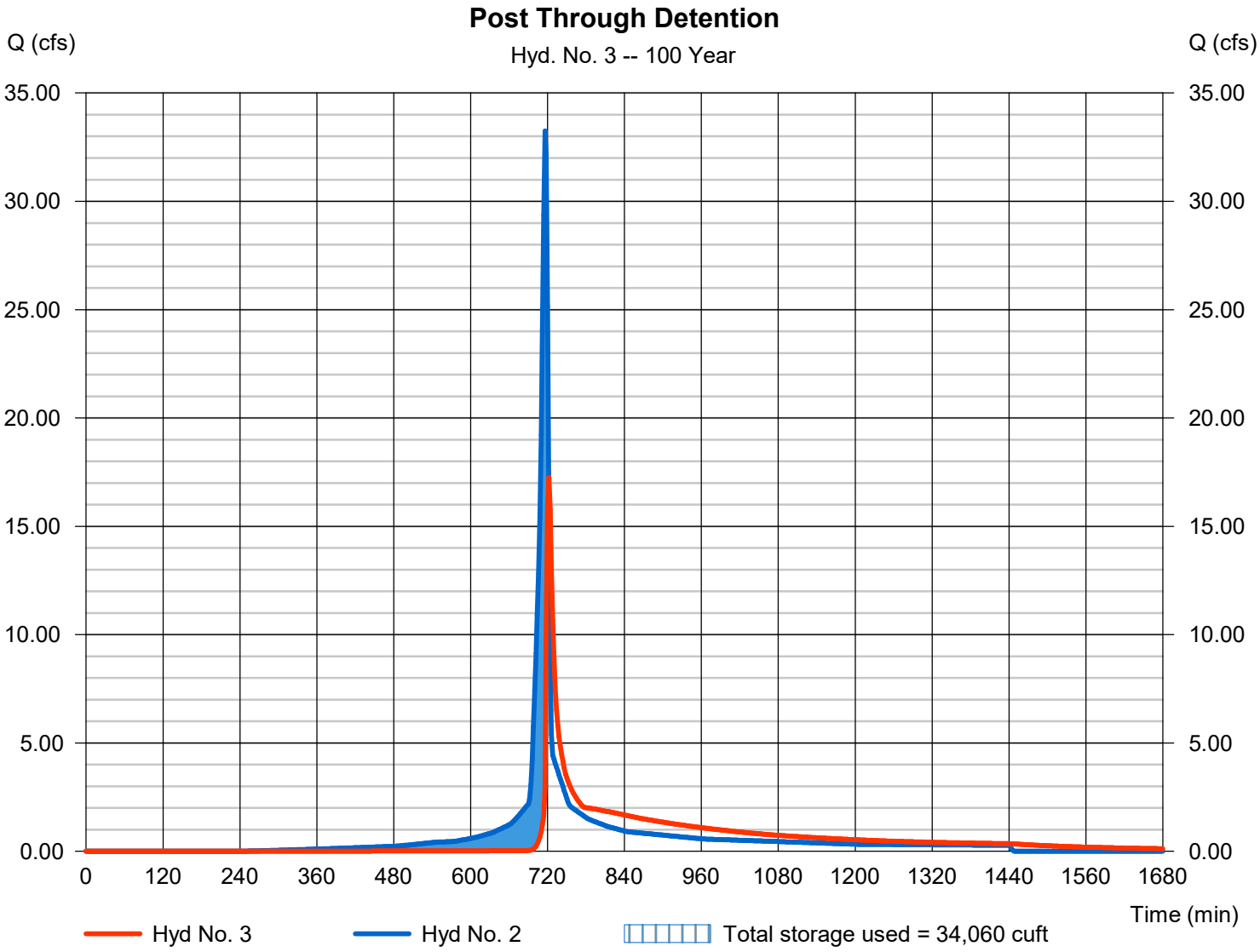
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	17.25 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	66,153 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	333.22 ft
Reservoir name	=	BMP Pond	Max. Storage	=	34,060 cuft

Storage Indication method used.

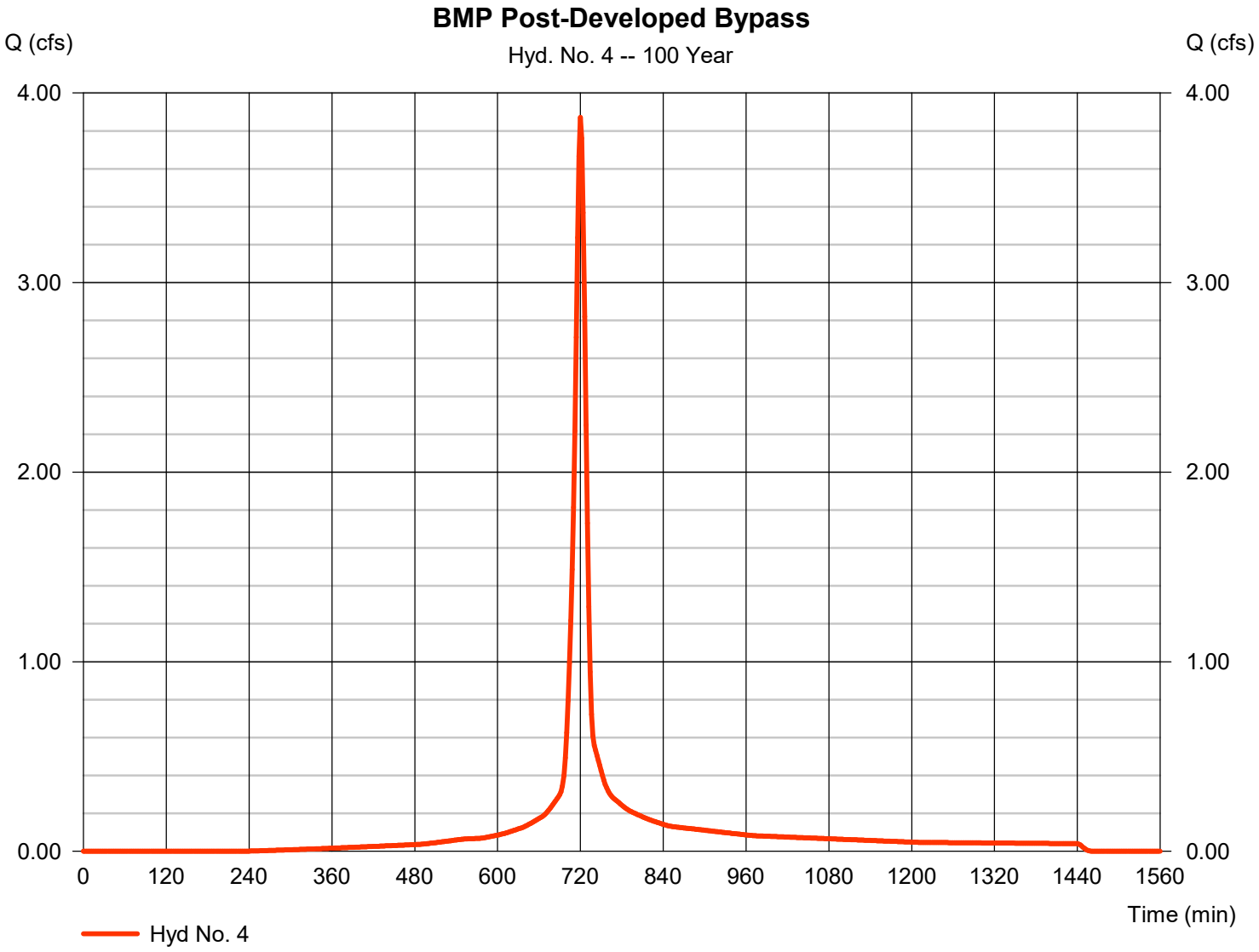


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.872 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,466 cuft
Drainage area	=	0.450 ac	Curve number	=	85
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

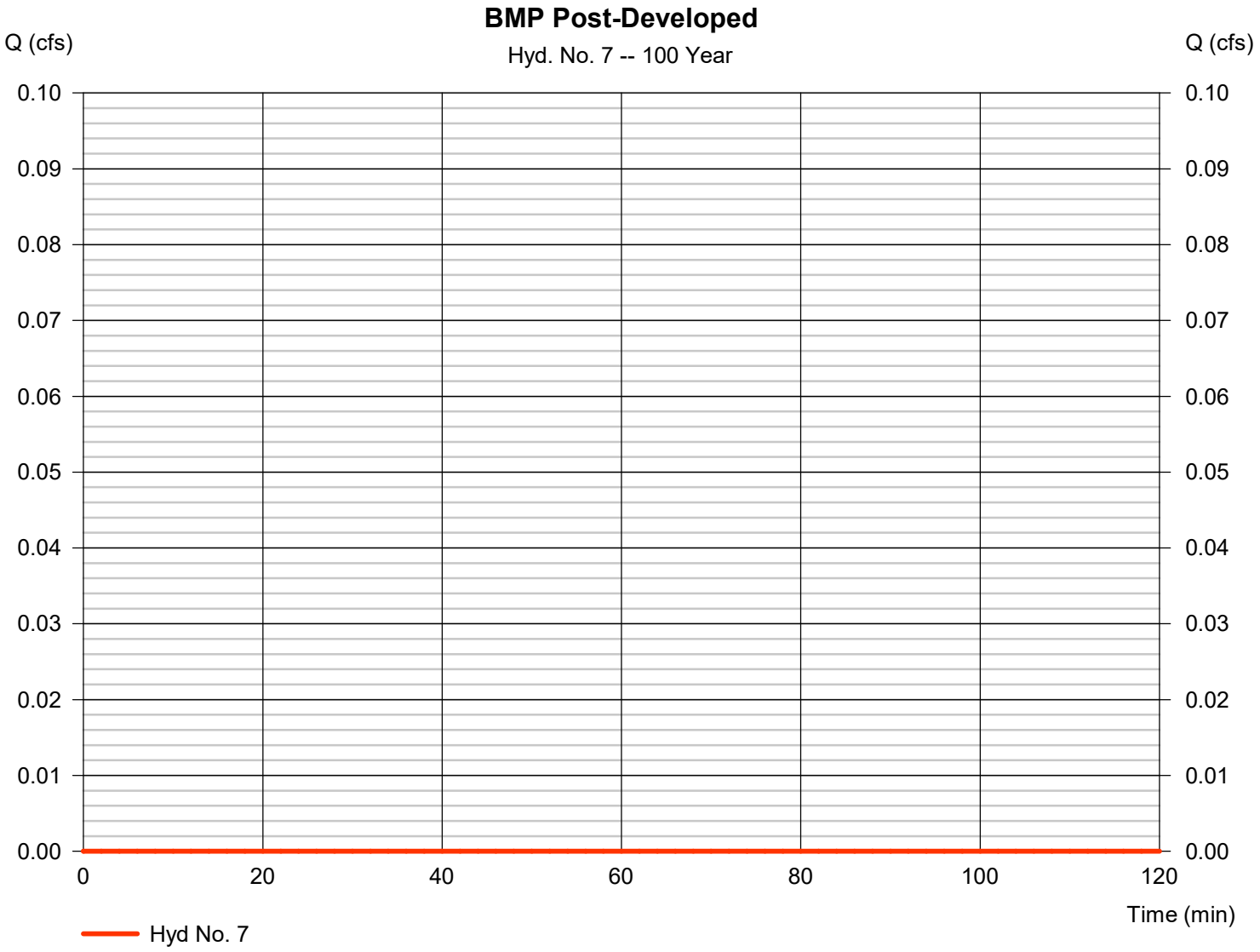


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	100 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Drainage area	=	3.420 ac	Curve number	=	84
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	0.00 in	Distribution	=	SCS 6-Hr
Storm duration	=	6.00 hrs	Shape factor	=	484



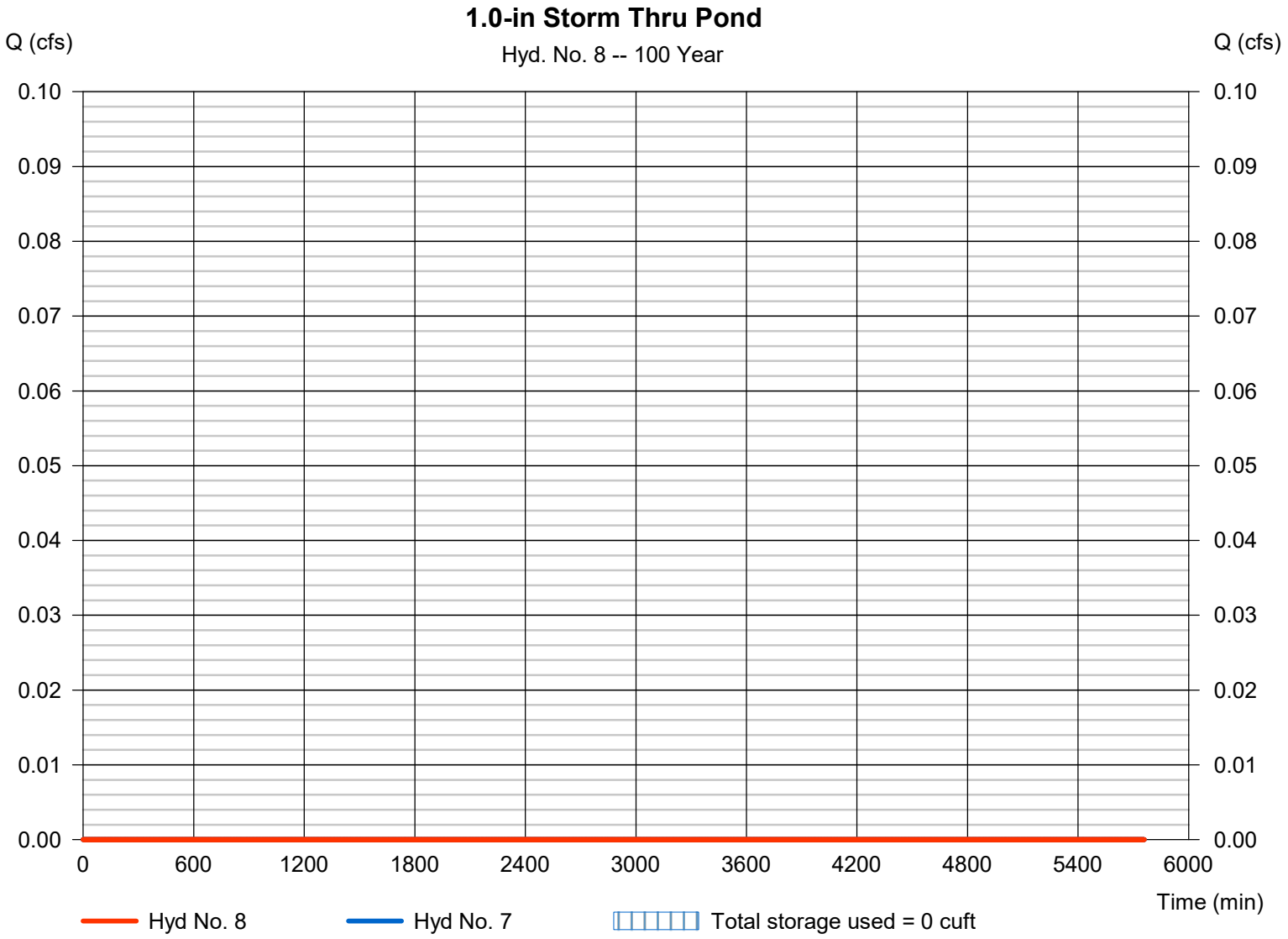
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

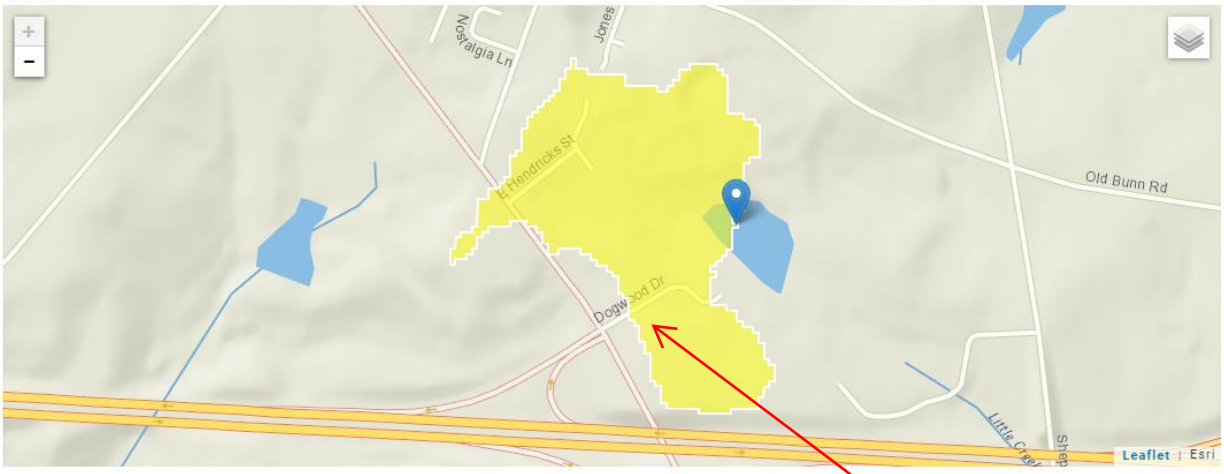
Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	100 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	7 - BMP Post-Developed	Max. Elevation	=	329.70 ft
Reservoir name	=	BMP Pond	Max. Storage	=	0 cuft

Storage Indication method used.



StreamStats Report

Region ID:	NC
Workspace ID:	NC20230929124651864000
Clicked Point (Latitude, Longitude):	35.83772, -78.31992
Time:	2023-09-29 08:47:19 -0400



Project Site

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.062	square miles
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	24.34	percent
PCTREG1	Percentage of drainage area located in Region 1 - Piedmont / Ridge and Valley	100	percent
PCTREG2	Percentage of drainage area located in Region 2 - Blue Ridge	0	percent
PCTREG3	Percentage of drainage area located in Region 3 - Sandhills	0	percent
PCTREG4	Percentage of drainage area located in Region 4 - Coastal Plains	0	percent
PCTREG5	Percentage of drainage area located in Region 5 - Lower Tifton Uplands	0	percent

Peak-Flow Statistics

Peak-Flow Statistics Parameters [Region 1 Piedmont rural under 1 sqmi 2014 5030]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.062	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	24.34	percent	0	47.9

Peak-Flow Statistics Parameters [Peak Southeast US NC 2023 5006]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
PCTREG1	Percent Area in Region 1	100	percent	0	100
PCTREG2	Percent Area in Region 2	0	percent	0	100
PCTREG3	Percent Area in Region 3	0	percent	0	100
PCTREG5	Percent Area in Region 5	0	percent	0	100
DRNAREA	Drainage Area	0.062	square miles	0.08	8902
PCTREG4	Percent Area in Region 4	0	percent	0	100

Peak-Flow Statistics Disclaimers [Region 1 Piedmont rural under 1 sqmi 2014 5030]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Region 1 Piedmont rural under 1 sqmi 2014 5030]

Statistic	Value	Unit
50-percent AEP flood	47.8	ft^3/s
20-percent AEP flood	63	ft^3/s
10-percent AEP flood	71.8	ft^3/s
4-percent AEP flood	80.8	ft^3/s
2-percent AEP flood	86.4	ft^3/s
1-percent AEP flood	92.2	ft^3/s
0.5-percent AEP flood	96.7	ft^3/s
0.2-percent AEP flood	108	ft^3/s

Peak-Flow Statistics Disclaimers [Peak Southeast US NC 2023 5006]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors.

Peak-Flow Statistics Flow Report [Peak Southeast US NC 2023 5006]

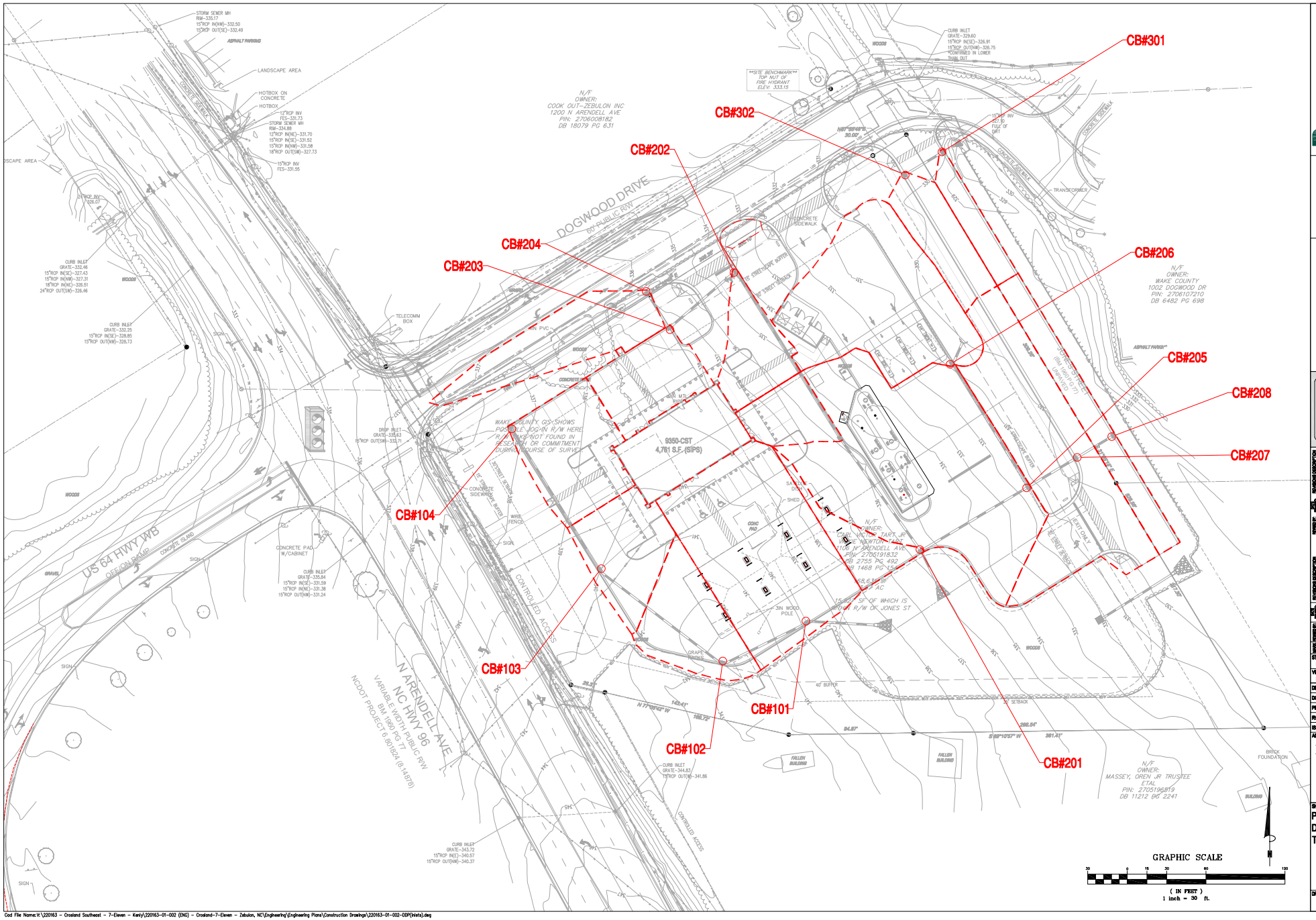
Statistic	Value	Unit
50-percent AEP flood	24.8	ft^3/s
20-percent AEP flood	46.1	ft^3/s
10-percent AEP flood	63.9	ft^3/s
4-percent AEP flood	88.8	ft^3/s
2-percent AEP flood	111	ft^3/s
1-percent AEP flood	134	ft^3/s
0.5-percent AEP flood	158	ft^3/s
0.2-percent AEP flood	189	ft^3/s

Peak-Flow Statistics Citations

Feaster, T.D., Gotvald, A.J., and Weaver, J.C.,2014, Methods for estimating the magnitude and frequency of floods for urban and small, rural streams in Georgia, South Carolina, and North Carolina, 2011 (ver. 1.1, March 2014): U.S. Geological Survey Scientific Investigations Report 2014–5030, 104 p.

Feaster, T.D., Gotvald, A.J., Musser, J.W., Weaver, J.C, Kolb, K.R., Veilleux, A.G., and Wagner, D.M.2023, Magnitude and frequency of floods for rural streams in Georgia, South Carolina, and North Carolina, 2017—Results: U.S. Geological Survey Scientific Investigations Report 2023-5006, 75 p.

Application Version: 4.17.0
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1



Bowman
Bowman North Carolina Ltd.
4005 BARRETT DR
Suite 104
RALEIGH, NC 27609
Phone: (919) 553-4570
bowman.com

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

Crosland Southeast
7-Eleven
Zebulon, NC
WAKE COUNTY

MARK	DESIGNATION	APPR.	REVISIONS DESCRIPTION	APPR.	REVISIONS DESCRIPTION

STORE OR BLDG NO.:
N/A
VERSION OR PROJECT ID:
N/A
DESIGN TEAM
DSNR: BRM & MCB
PM/OP: ML
RVWR: ML
ISSUE DATE: 9/16/2023
ADDRESS
1106 N ARENDELL AVE
ZEBULON, NC 27597

SHEET TITLE
POST-DEVELOPED DRAINAGE AREA TO INLETS

DRWG NO.

Cad File Name:V:\220163 - Crosland Southeast - 7-Eleven - Kenly\220163-01-002 (ENG) - Crosland-7-Eleven - Zebulon, NC\Engineering\Engineering Plans\Construction Drawings\220163-01-002-DDP(Inlets).dwg

7-Eleven, Zebulon, NC
Bowman North Carolina, Ltd.

Rational Runoff Coefficient "C"

Catch Basin#101

Drainage Area (acres): 0.33

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.31	95%	0.95	0.90
Lawn	0.02	5%	0.3	0.02
Wooded	0.00	0%	0.2	0.00
Total Area=	0.33	Cumulative "C" =		0.91
		i_{10}=		7.21
		Q_{10}=		2.16

Catch Basin#102

Drainage Area (acres): 0.12

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.10	83%	0.95	0.79
Lawn	0.02	17%	0.3	0.05
Wooded	0.00	0%	0.2	0.00
Total Area=	0.12	Cumulative "C" =		0.84
		i_{10}=		7.21
		Q_{10}=		0.75

Catch Basin#103

Drainage Area (acres): 0.11

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.09	79%	0.95	0.75
Lawn	0.02	21%	0.3	0.06
Wooded	0.00	0%	0.2	0.00
Total Area=	0.11	Cumulative "C" =		0.81
		i_{10}=		7.21
		Q_{10}=		0.67

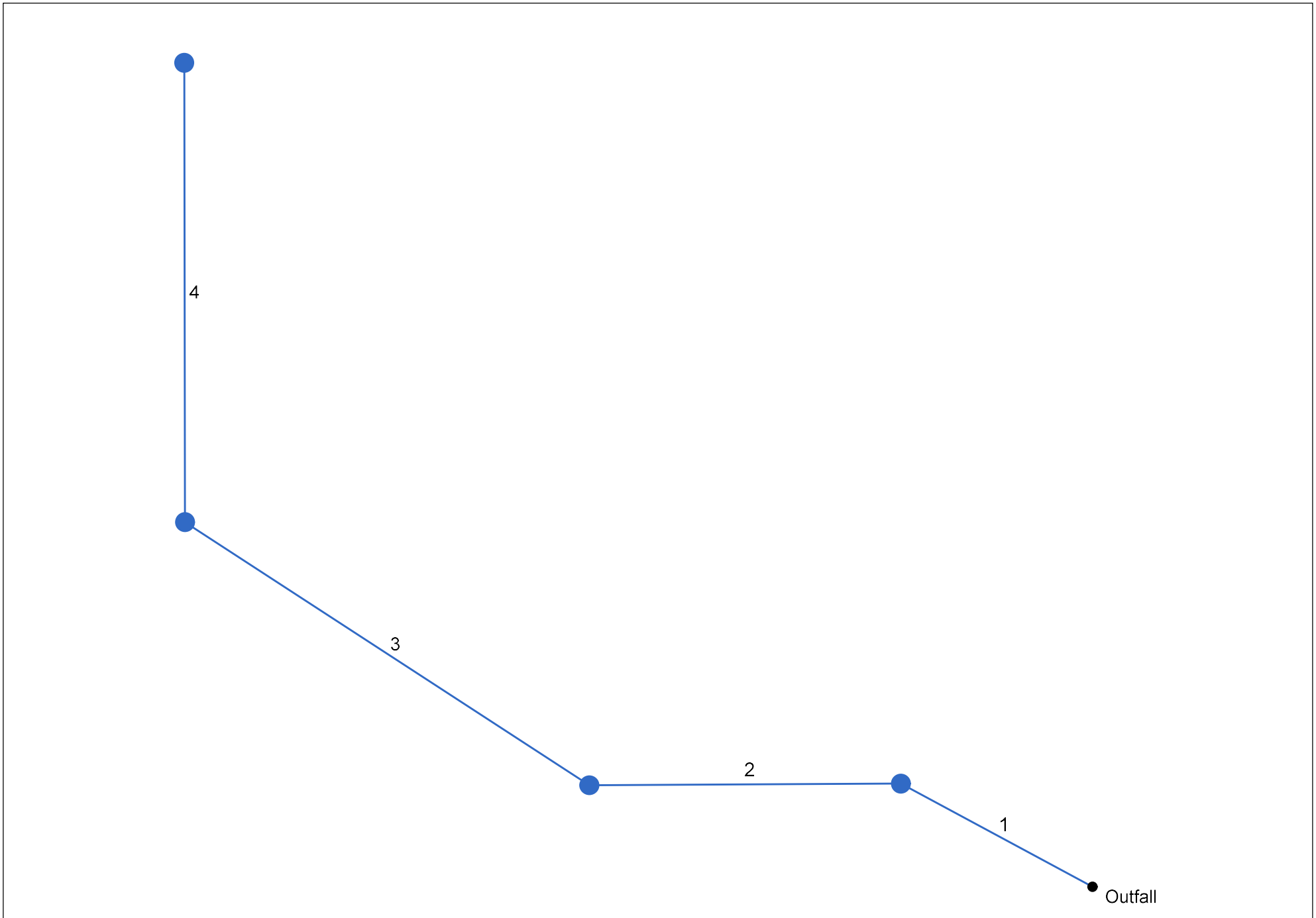
Catch Basin#104

Drainage Area (acres): 0.14

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.13	89%	0.95	0.84
Lawn	0.02	11%	0.3	0.03
Wooded	0.00	0%	0.2	0.00
Total Area=	0.14	Cumulative "C" =		0.88
		i_{10}=		7.21
		Q_{10}=		0.91

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



Project File: 100 System.stm	Number of lines: 4	Date: 9/28/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	51.000	-146.310	Curb	2.16	0.00	0.00	0.0	329.70	0.59	330.00	15	Cir	0.012	0.92	336.60	
2	1	69.000	-34.053	Curb	0.75	0.00	0.00	0.0	330.00	0.58	330.40	15	Cir	0.012	1.02	337.00	
3	2	115.000	39.225	Curb	0.67	0.00	0.00	0.0	330.40	0.52	331.00	15	Cir	0.012	1.22	337.40	
4	3	126.000	51.059	Curb	0.91	0.00	0.00	0.0	331.00	0.56	331.70	15	Cir	0.012	1.00	336.70	

Project File: 100 System.stm | Number of lines: 4 | Date: 9/28/2023

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		Curb-	336.60	Cir	4.00	4.00	15	Cir	330.00	15	Cir	330.00
2		Curb-	337.00	Cir	4.00	4.00	15	Cir	330.40	15	Cir	330.40
3		Curb-	337.40	Cir	4.00	4.00	15	Cir	331.00	15	Cir	331.00
4		Curb-	336.70	Cir	4.00	4.00	15	Cir	331.70			

Project File: 100 System.stm | Number of Structures: 4 | Run Date: 9/28/2023

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		4.49	15	Cir	51.000	329.70	330.00	0.588	330.57	330.88	0.34	331.22	End	Curb-
2		2.33	15	Cir	69.000	330.00	330.40	0.580	331.22	331.01	n/a	331.01	1	Curb-
3		1.58	15	Cir	115.000	330.40	331.00	0.522	331.01	331.50	n/a	331.50 j	2	Curb-
4		0.91	15	Cir	126.000	331.00	331.70	0.556	331.50	332.07	n/a	332.07 j	3	Curb-

Project File: 100 System.stm | Number of lines: 4 | Run Date: 9/28/2023

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

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	15	4.49	329.70	330.57	0.87	0.92	4.89	0.37	330.95	0.588	51.000	330.00	330.88	0.88	0.92	4.89	0.37	331.25	0.587	0.588	0.300	0.92	0.34
2	15	2.33	330.00	331.22	1.22	0.59	1.91	0.24	331.46	0.000	69.000	330.40	331.01	0.61**	0.59	3.92	0.24	331.25	0.000	0.000	n/a	1.02	n/a
3	15	1.58	330.40	331.01	0.61	0.46	2.66	0.19	331.20	0.000	115.000	331.00	331.50 j	0.50**	0.46	3.47	0.19	331.68	0.000	0.000	n/a	1.22	0.23
4	15	0.91	331.00	331.50	0.50	0.31	2.00	0.14	331.63	0.000	126.000	331.70	332.07 j	0.37**	0.31	2.95	0.14	332.21	0.000	0.000	n/a	1.00	0.14

Project File: 100 System.stm | Number of lines: 4 | Run Date: 9/28/2023

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

7-Eleven, Zebulon, NC
Bowman North Carolina, Ltd.

Rational Runoff Coefficient "C"

Catch Basin#201

Drainage Area (acres): 0.05

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.05	98%	0.95	0.93
Lawn	0.00	2%	0.3	0.01
Wooded	0.00	0%	0.2	0.00
Total Area=	0.05	Cumulative "C" =		0.94
		i_{10}=		7.21
		Q_{10}=		0.37

Catch Basin#202

Drainage Area (acres): 0.06

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.06	94%	0.95	0.89
Lawn	0.00	6%	0.3	0.02
Wooded	0.00	0%	0.2	0.00
Total Area=	0.06	Cumulative "C" =		0.91
		i_{10}=		7.21
		Q_{10}=		0.41

Catch Basin#203

Drainage Area (acres): 0.08

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.07	88%	0.95	0.83
Lawn	0.01	12%	0.3	0.04
Wooded	0.00	0%	0.2	0.00
Total Area=	0.08	Cumulative "C" =		0.87
		i_{10}=		7.21
		Q_{10}=		0.52

Catch Basin#204

Drainage Area (acres): 0.21

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.11	53%	0.95	0.50
Asphalt/Concrete Pavement	0.10	45%	0.95	0.43
Lawn	0.00	2%	0.3	0.01
Wooded	0.00	0%	0.2	0.00
Total Area=	0.21	Cumulative "C" =		0.94
		i_{10}=		7.21
		Q_{10}=		1.44

Catch Basin#205

Drainage Area (acres): 0.14

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.11	75%	0.95	0.71
Lawn	0.04	25%	0.3	0.08
Wooded	0.00	0%	0.2	0.00
Total Area=	0.14	Cumulative "C" =		0.79
		i_{10}=		7.21
		Q_{10}=		0.80

Catch Basin#206

Drainage Area (acres): 0.48

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.44	91%	0.95	0.87
Lawn	0.04	9%	0.3	0.03
Wooded	0.00	0%	0.2	0.00
Total Area=	0.48	Cumulative "C" =		0.89
		i_{10}=		7.21
		Q_{10}=		3.12

Catch Basin#207

Drainage Area (acres): 0.30

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.04	12%	0.95	0.12
Asphalt/Concrete Pavement	0.16	55%	0.95	0.52
Lawn	0.10	33%	0.3	0.10
Wooded	0.00	0%	0.2	0.00
Total Area=	0.30	Cumulative "C" =		0.74
		i_{10}=		7.21
		Q_{10}=		1.57

Catch Basin#208

Drainage Area (acres): 0.32

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.21	67%	0.95	0.64
Lawn	0.10	33%	0.3	0.10
Wooded	0.00	0%	0.2	0.00
Total Area=	0.32	Cumulative "C" =		0.74
		i_{10}=		7.21
		Q_{10}=		1.69

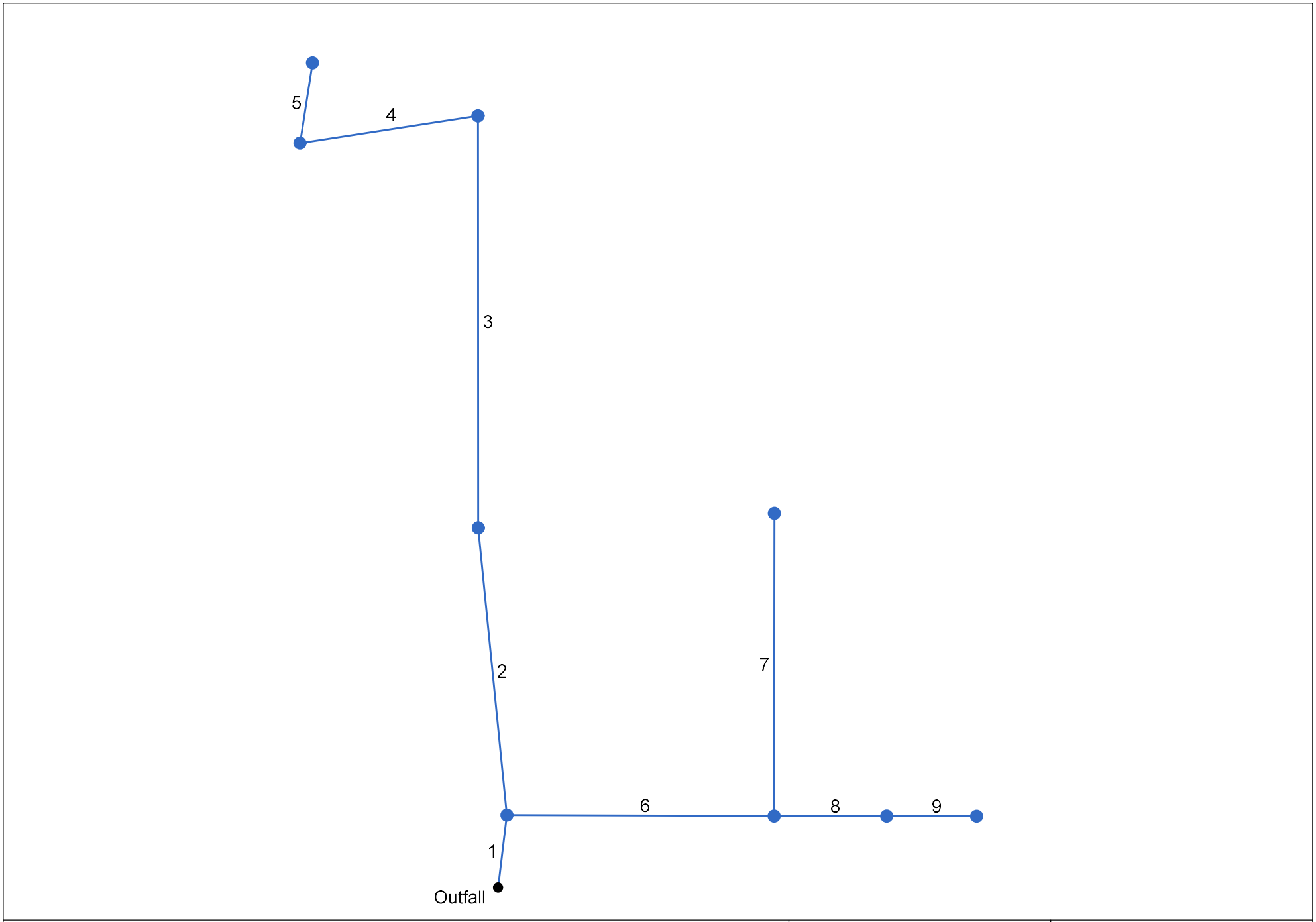
Catch Basin#209

Drainage Area (acres): 0.10

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.10	100%	0.95	0.95
Lawn	0.00	0%	0.3	0.00
Wooded	0.00	0%	0.2	0.00
Total Area=	0.10	Cumulative "C" =		0.95
		i_{10}=		7.21
		Q_{10}=		0.69

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



Project File: 200 System.stm	Number of lines: 9	Date: 9/28/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	26.000	-83.058	Curb	0.37	0.00	0.00	0.0	329.70	0.77	329.90	24	Cir	0.012	1.49	336.30	
2	1	103.000	-12.618	Curb	0.41	0.00	0.00	0.0	329.90	0.58	330.50	18	Cir	0.012	0.50	335.00	
3	2	147.000	5.644	Curb	0.52	0.00	0.00	0.0	330.50	0.54	331.30	18	Cir	0.012	1.50	334.50	
4	3	64.000	-98.707	Curb	1.44	0.00	0.00	0.0	331.30	0.63	331.70	18	Cir	0.012	1.50	336.50	
5	4	29.000	107.518	Curb	0.80	0.00	0.00	0.0	331.70	0.69	331.90	15	Cir	0.012	1.00	335.70	
6	1	95.000	83.248	Comb	3.12	0.00	0.00	0.0	329.90	0.53	330.40	24	Cir	0.012	1.50	333.90	
7	6	108.000	-90.139	Curb	1.57	0.00	0.00	0.0	330.40	0.56	331.00	18	Cir	0.012	1.00	335.00	
8	6	40.000	-0.129	Curb	1.69	0.00	0.00	0.0	330.40	0.50	330.60	15	Cir	0.012	0.50	333.38	
9	8	32.000	-0.024	Curb	0.69	0.00	0.00	0.0	330.60	0.62	330.80	15	Cir	0.012	1.00	333.38	

Project File: 200 System.stm

Number of lines: 9

Date: 9/28/2023

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		Curb-	336.30	Cir	4.00	4.00	24	Cir	329.90	18 24	Cir Cir	329.90 329.90
2		Curb-	335.00	Cir	4.00	4.00	18	Cir	330.50	18	Cir	330.50
3		Curb-	334.50	Cir	4.00	4.00	18	Cir	331.30	18	Cir	331.30
4		Curb-	336.50	Cir	4.00	4.00	18	Cir	331.70	15	Cir	331.70
5		Curb-	335.70	Cir	4.00	4.00	15	Cir	331.90			
6		Combination	333.90	Cir	4.00	4.00	24	Cir	330.40	18 15	Cir Cir	330.40 330.40
7		Curb-	335.00	Cir	4.00	4.00	18	Cir	331.00			
8		Curb-	333.38	Cir	4.00	4.00	15	Cir	330.60	15	Cir	330.60
9		Curb-	333.38	Cir	4.00	4.00	15	Cir	330.80			

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		10.61	24	Cir	26.000	329.70	329.90	0.769	330.69	331.07	n/a	331.07	End	Curb-
2		3.17	18	Cir	103.000	329.90	330.50	0.583	331.07	331.18	n/a	331.18 j	1	Curb-
3		2.76	18	Cir	147.000	330.50	331.30	0.544	331.18	331.93	n/a	331.93 j	2	Curb-
4		2.24	18	Cir	64.000	331.30	331.70	0.625	331.93	332.27	n/a	332.27 j	3	Curb-
5		0.80	15	Cir	29.000	331.70	331.90	0.690	332.27	332.25	n/a	332.25 j	4	Curb-
6		7.07	24	Cir	95.000	329.90	330.40	0.526	331.07	331.34	n/a	331.34 j	1	Combination
7		1.57	18	Cir	108.000	330.40	331.00	0.560	331.34	331.47	n/a	331.47 j	6	Curb-
8		2.38	15	Cir	40.000	330.40	330.60	0.500	331.34	331.22	n/a	331.22	6	Curb-
9		0.69	15	Cir	32.000	330.60	330.80	0.625	331.22	331.12	n/a	331.12	8	Curb-

Project File: 200 System.stm | Number of lines: 9 | Run Date: 9/28/2023

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

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	24	10.61	329.70	330.69	0.99	1.56	6.82	0.48	331.18	0.000	26.000	329.90	331.07	1.17**	1.90	5.58	0.48	331.55	0.000	0.000	n/a	1.49	n/a
2	18	3.17	329.90	331.07	1.17	0.77	2.15	0.26	331.33	0.000	103.000	330.50	331.18 j	0.68**	0.77	4.09	0.26	331.44	0.000	0.000	n/a	0.50	n/a
3	18	2.76	330.50	331.18	0.68	0.70	3.56	0.24	331.42	0.000	147.000	331.30	331.93 j	0.63**	0.70	3.92	0.24	332.17	0.000	0.000	n/a	1.50	n/a
4	18	2.24	331.30	331.93	0.63	0.61	3.18	0.21	332.14	0.000	64.000	331.70	332.27 j	0.56**	0.61	3.68	0.21	332.48	0.000	0.000	n/a	1.50	n/a
5	15	0.80	331.70	332.27	0.56	0.28	1.49	0.13	332.39	0.000	29.000	331.90	332.25 j	0.35**	0.28	2.85	0.13	332.38	0.000	0.000	n/a	1.00	n/a
6	24	7.07	329.90	331.07	1.17	1.46	3.72	0.37	331.43	0.000	95.000	330.40	331.34 j	0.94**	1.46	4.85	0.37	331.71	0.000	0.000	n/a	1.50	0.55
7	18	1.57	330.40	331.34	0.94	0.47	1.34	0.17	331.51	0.000	108.000	331.00	331.47 j	0.47**	0.47	3.31	0.17	331.65	0.000	0.000	n/a	1.00	0.17
8	15	2.38	330.40	331.34	0.94	0.60	2.40	0.24	331.58	0.000	40.000	330.60	331.22	0.62**	0.60	3.95	0.24	331.46	0.000	0.000	n/a	0.50	n/a
9	15	0.69	330.60	331.22	0.62	0.25	1.14	0.12	331.33	0.000	32.000	330.80	331.12	0.32**	0.25	2.73	0.12	331.24	0.000	0.000	n/a	1.00	n/a

Project File: 200 System.stm | Number of lines: 9 | Run Date: 9/28/2023

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

7-Eleven, Zebulon, NC
Bowman North Carolina, Ltd.

Rational Runoff Coefficient "C"

Catch Basin#301

Drainage Area (acres): 0.05

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.05	100%	0.95	0.95
Lawn	0.00	0%	0.3	0.00
Wooded	0.00	0%	0.2	0.00
Total Area=	0.05	Cumulative "C" =		0.95
		i_{10}=		7.21
		Q_{10}=		0.31

Catch Basin#302

Drainage Area (acres): 0.09

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.06	71%	0.95	0.67
Lawn	0.02	29%	0.3	0.09
Wooded	0.00	0%	0.2	0.00
Total Area=	0.09	Cumulative "C" =		0.76
		i_{10}=		7.21
		Q_{10}=		0.47

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

Project File: 300 System.stm	Number of lines: 2	Date: 9/28/2023

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	10.000	-179.326	Curb	0.31	0.00	0.00	0.0	327.50	1.00	327.60	15	Cir	0.012	0.50	330.80	
2	1	32.000	-0.954	Curb	0.47	0.00	0.00	0.0	327.60	0.62	327.80	15	Cir	0.012	1.00	330.70	

Project File: 300 System.stm

Number of lines: 2

Date: 9/28/2023

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		Curb-	330.80	Cir	4.00	4.00	15	Cir	327.60	15	Cir	327.60
2		Curb-	330.70	Cir	4.00	4.00	15	Cir	327.80			

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		0.78	15	Cir	10.000	327.50	327.60	1.000	327.78	327.95	0.06	327.95	End	Curb-
2		0.47	15	Cir	32.000	327.60	327.80	0.625	327.95	328.07	n/a	328.07 j	1	Curb-

Project File: 300 System.stm

Number of lines: 2

Run Date: 9/28/2023

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

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	15	0.78	327.50	327.78	0.28	0.21	3.76	0.12	327.91	0.000	10.000	327.60	327.95	0.35**	0.28	2.82	0.12	328.07	0.000	0.000	n/a	0.50	0.06
2	15	0.47	327.60	327.95	0.35	0.19	1.70	0.09	328.04	0.000	32.000	327.80	328.07 j	0.27**	0.19	2.45	0.09	328.16	0.000	0.000	n/a	1.00	0.09

Project File: 300 System.stm | Number of lines: 2 | Run Date: 9/28/2023

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