7-Eleven Store

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

Stormwater and Erosion Control Design Calculations

Prepared By:

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PREPARED FOR:

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DECEMBER 5, 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 4.30 acres will be disturbed as part of this project for the construction of the site improvements, widening of Dogwood Drive, construction of Jones Street, and the addition of a lane to the US-64 exit ramp. 0.46 acres will be dedicated to 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 78,890 sf (1.81 ac). Table 1 below shows the break-down of the impervious area added to the site.

Table 1. Impervious Area Summary

Impervious Area Summary		
Existing Impervious Area	**5,724 sf**	**0.13 ac**
Proposed On-site Impervious Area	**78,890 sf**	**1.81 ac**
Buildings	4,895 sf	0.11 ac
Pavement	69,870 sf	1.60 ac
Sidewalk	4,125 sf	0.09 ac
Proposed Off-site Impervious Area	**25,560 sf**	**0.59 ac**
Pavement	20,830 sf	0.48 ac
Sidewalk	4,730 sf	0.11 ac

Floodplains and Streams

The proposed parcel is not located within a FEMA designated flood zone as shown on the combined FEMA FIRM Panels 3720270500K and 3720270600K (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.

PEAK RUNOFF ANALYSIS

Pre-Development Conditions

The site is currently a single-family residential and wooded area. The site has two drainage areas. For the purposes of SCM design and Downstream Impact Analysis, the drainage areas were analyzed in this report with their own study points, composite runoff curve numbers and points of analysis.

DA#1 Pre-Developed Area directs water to the southeast corner of the lot and is in the Moccasin Creek watershed. *DA#2 Pre-Developed Area* directs water to an existing storm sewer system in the northeast corner of the lot that drains to the Little River watershed. The characteristics for the pre-development condition are shown below and additional calculations such as can be found in Appendix B. A drainage map identifying the basin can also be found in Appendix B.

Table 2: Pre-Development Drainage Area Summaries

Basin ID	Total Area [acres]	On-Site Area [acres]	Composite Curve Number (CN)	Time of Concentration (Tc) [min.]
DA#1 Pre-Developed Area	3.41	2.62	57	24
DA#2 Pre-Developed Area	0.84	0.76	58	22.2

Post-Development Conditions

The post-development condition contains two drainage areas and two bypass drainage areas.

DA#1 Post-Developed Area consists of the proposed development area. The drainage area collects runoff with catch basins, curb inlets, and drainage pipes that connect to the proposed Stormwater Wetlands and discharges in the southeast corner of the lot towards Moccasin Creek. *DA#2 Post-Developed Area* directs water to an existing storm sewer system in the northeast corner of the lot that drains to the Little River watershed. The characteristics for the post-development drainage areas are shown below and calculations can be found in Appendix B. A drainage map identifying the area can be found in Appendix A.

Table 3: Post-Development Drainage Area Summaries

Basin ID	Total Area [acres]	On-Site Area [acres]	Composite Curve Number (CN)	Time of Concentration (Tc) [min.]
DA#1 Post-Developed Area	3.16	2.87	83	4.2
DA#2 Post-Developed Area	0.34	0.31	60	22.2

Table 4: Post Development Bypass Basin Summaries

Drainage Area ID	Area [acres]	Composite Curve Number (CN)	Time of Concentration (Tc) [min.]
DA#1 Post-Developed Bypass Area	0.13	73	5
DA#2 Post-Developed Bypass Area	0.00	98	5

Comparison of Peak Discharges

The pre- and post- development peak discharges are shown below for both drainage areas. Full calculations and hydrographs can be found on Appendix B.

Table 5: Drainage Area #1 Peak Discharges

Storm Event	Pre-Dev. Peak Discharge Rate (cfs)	Post-Dev. w/o Detention Peak Discharge Rate (cfs)	Post-Dev. w/ Detention Peak Discharge Rate (cfs)
1-yr 24-hr	0.224	7.077	0.198
2-yr 24-hr	0.743	9.702	0.475
10-yr 24-hr	3.321	17.25	2.697
100-yr 24-hr	9.617	30.29	11.62

Table 6: Drainage Area #2 Peak Discharges

Storm Event	Pre-Dev. Peak Discharge Rate (cfs)	Post-Dev. Peak Discharge Rate (cfs)
1-yr 24-hr	0.078	0.054
2-yr 24-hr	0.237	0.097
10-yr 24-hr	0.977	0.256
100-yr 24-hr	2.718	1.193

DOWNSTREAM IMPACT ANALYSIS

A downstream impact analysis is included per the 10% rule. For Drainage Area #1, the StreamStats analysis point has a drainage area of approximately 89.6 acres, more than the 10% of the proposed development drainage area, and a 10-year peak flood flow of 123 cfs. This estimates an impervious area of 20.02% using the NLCD 2006 impervious data set. The "full build-out" condition was modeled by changing this impervious area to 100% and it produced a flow of 498 cfs. The 123 and 498 cfs conditions were modeled as channels. The existing channel was identified and measured using Wake County iMaps. The channels were modeled with an assumed height of 4 ft and was able to contain both scenarios.

For Drainage Area #1 the Pre-Developed flow for the 10-year storm event is 3.321 cfs (per hydrographs). The Post-Developed condition, including bypass, results in 2.697 cfs. This is an decrease of 0.624. 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.

Table 7: Downstream Impact Analysis Summary Table (Drainage Area 1)

	Pre-Developed (Q-10)	Post-Developed (Q-10)
Site	3.061 cfs	2.697 cfs
10% Point	123 cfs	122.4 cfs
Full Build-Out Condition	498 cfs	497.4 cfs

For Drainage Area #2, the StreamStats analysis point has a drainage area of approximately 89.6 acres, more than the 10% of the proposed development drainage area, and a 10-year peak flood flow of 34.2 cfs. This estimates an impervious area of 14.48% using the NLCD 2006 impervious data set. The "full build-out" condition was modeled by changing this impervious area to 100% and it produced a flow of 153 cfs. The 34.2 and 153 cfs conditions were modeled as channels. The existing channel was identified and measured using Wake County iMaps. The channels were modeled with an assumed height of 4 ft and was able to contain both scenarios.

For Drainage Area #2 the Pre-Developed flow for the 10-year storm event is 0.977 cfs (per hydrographs). The Post-Developed condition, including bypass, results in 0.478 cfs. This is a

decrease of 0.490 cfs. There is a net decrease in peak flow from the pre-developed to post-developed condition. Therefore, there will be no impacts downstream.

Table 8: Downstream Impact Analysis Summary Table (Drainage Area 2)

	Pre-Developed (Q-10)	Post-Developed (Q-10)
Site	0.977 cfs	0.478 cfs
10% Point	34.2 cfs	33.71 cfs
Full Build-Out Condition	153 cfs	152.5 cfs

EROSION CONTROL

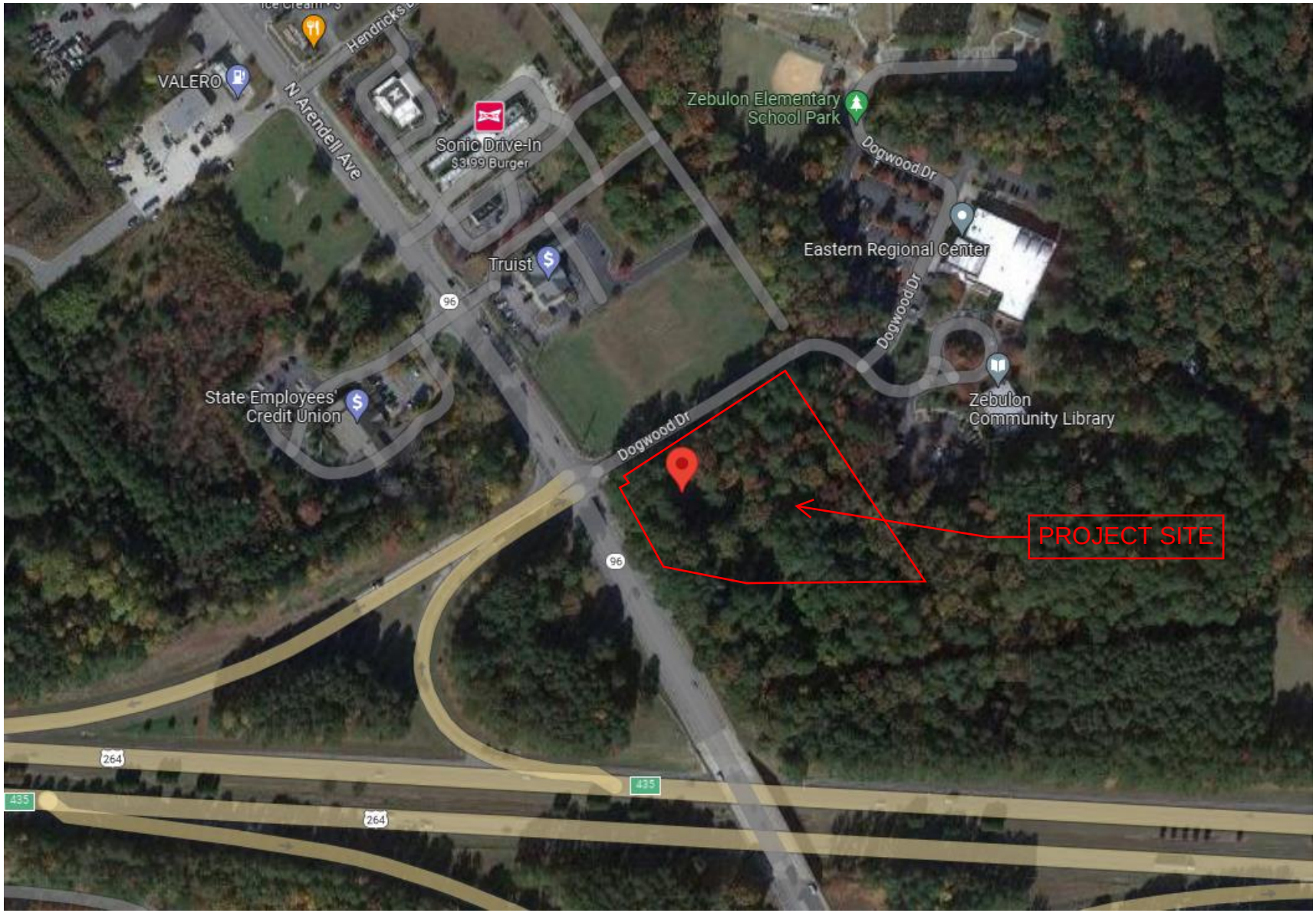
Erosion control measures have been designed in accordance with NCDEQ erosion control standards and regulations to minimize sediment laden runoff from exiting the site. Silt fence will be installed along the low sides of the site prior to construction. The construction entrance will be installed prior to construction commencing. A skimmer basin will be used to treat stormwater runoff prior to leaving the site. Accumulated sediment within the project site will need to be removed and the pond constructed to final design conditions prior to final acceptance of the project.

Site Stabilization

During construction phase, a temporary sediment basin will be placed on the site. Skimmers will be used in the temporary sediment basin to dewater the basin from the surface. After final grading is completed, permanent vegetation shall be applied in accordance with the seeding requirements from NCDEQ, the erosion control plan, and the landscape plan for this site.

APPENDIX A
Figures

Aerial Map
Soil Report
Topography Map
FEMA Flood Map
HUC
Surface Waters Classification
NOAA Point Precipitation Frequency Estimates
Pre-Development Drainage Map
Post-Development Drainage Map
Post-Development Bypass Drainage Map


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
PROJECT SITE
96
264
435
435
264

(Joins sheet 33)

(Joins sheet 43)

(Joins sheet 42)

(Joins sheet 44)

(Joins sheet 53)

Union Chapel

Wakefield

Hominy Creek

Beaverdam Creek

Little River

Buffalo Creek

Beckett Branch

Fall Branch

Privetts Pond

PROJECT SITE

43

N

1 Mile

5,000 Feet

Scale 1:15840

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.

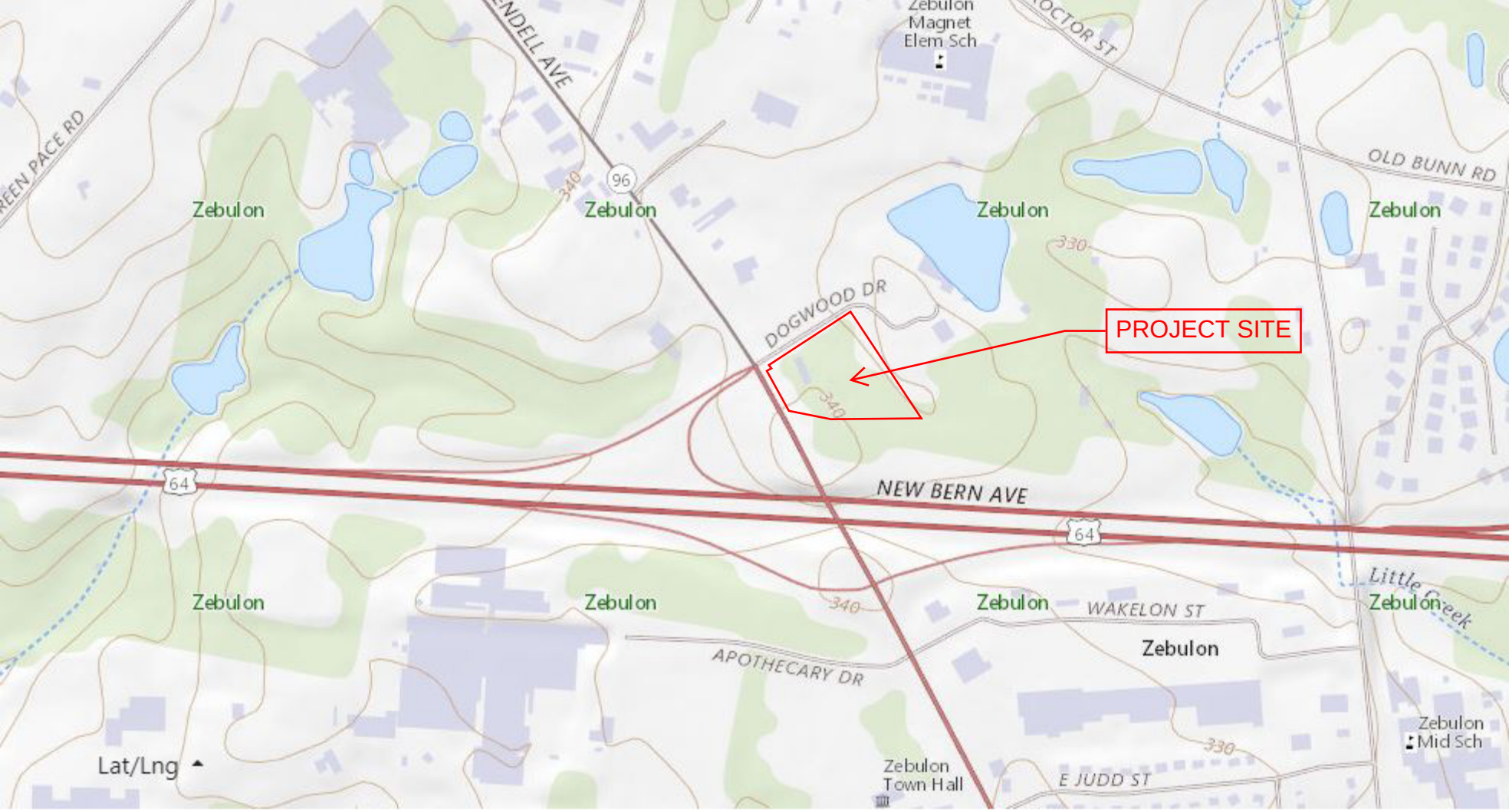
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

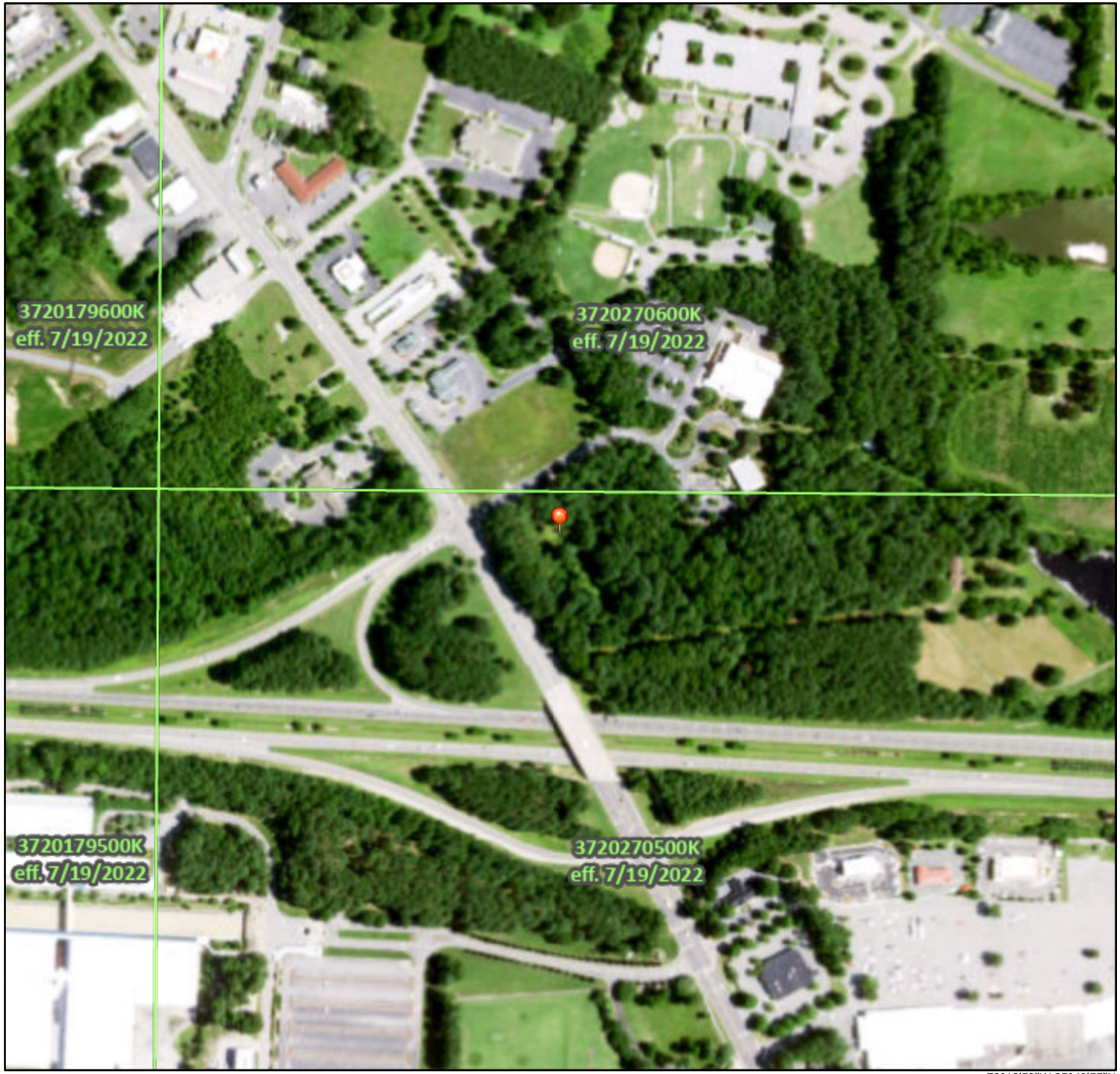
Component Percent Cutoff: None Specified

Tie-break Rule: Higher


Zebulon Magnet Elem Sch
OCTOR ST
OLD BUNN RD
ENDELL AVE
REEN PACE RD
Zebulon
Zebulon
Zebulon
Zebulon
340
96
330
DOGWOOD DR
PROJECT SITE
340
64
NEW BERN AVE
64
Zebulon
Zebulon
340
Zebulon
WAKELON ST
Zebulon
Little Creek
Zebulon
APOTHECARY DR
Zebulon Mid Sch
330
Zebulon Town Hall
E JUDD ST
Lat/Lng

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

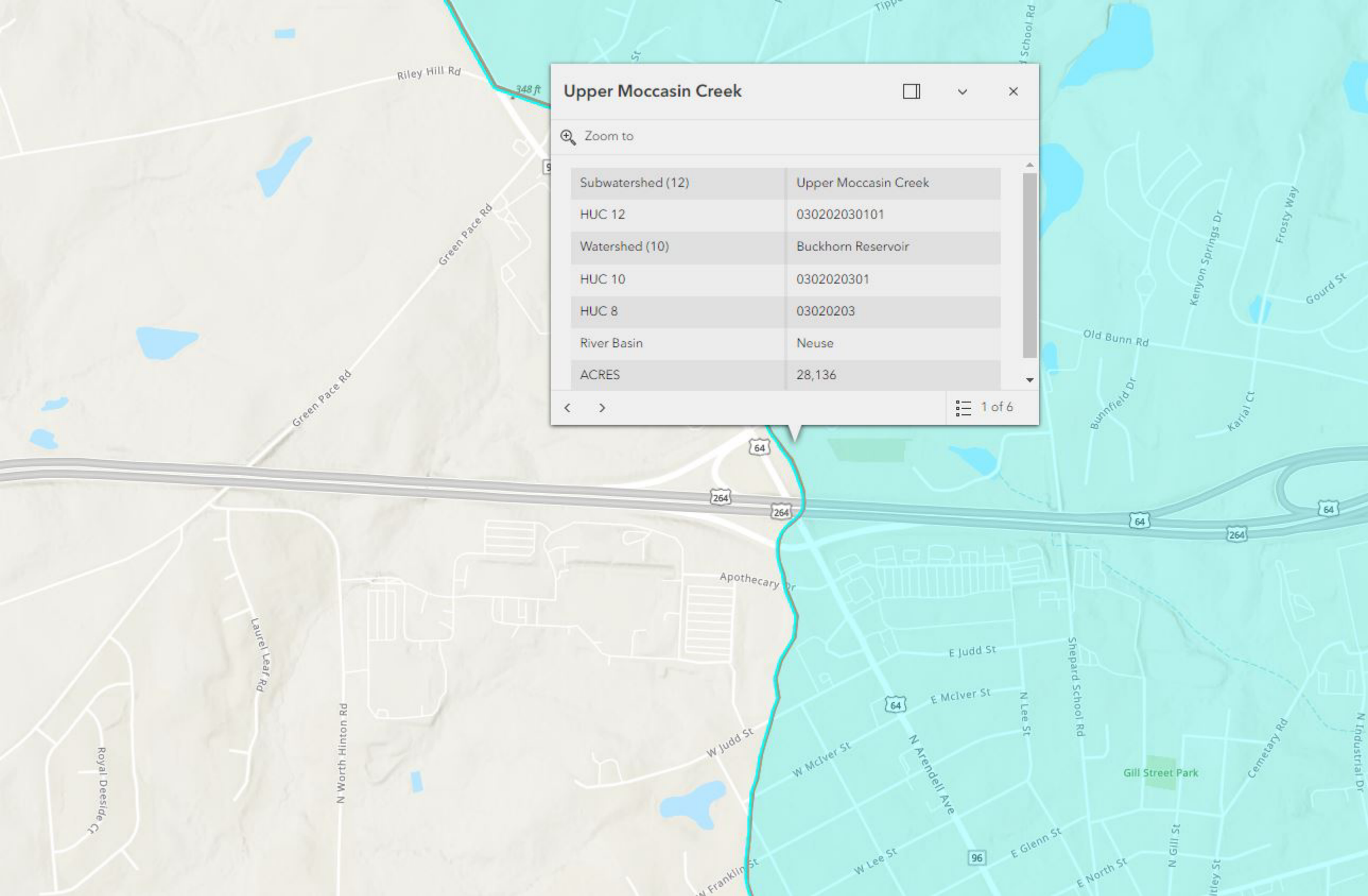
N

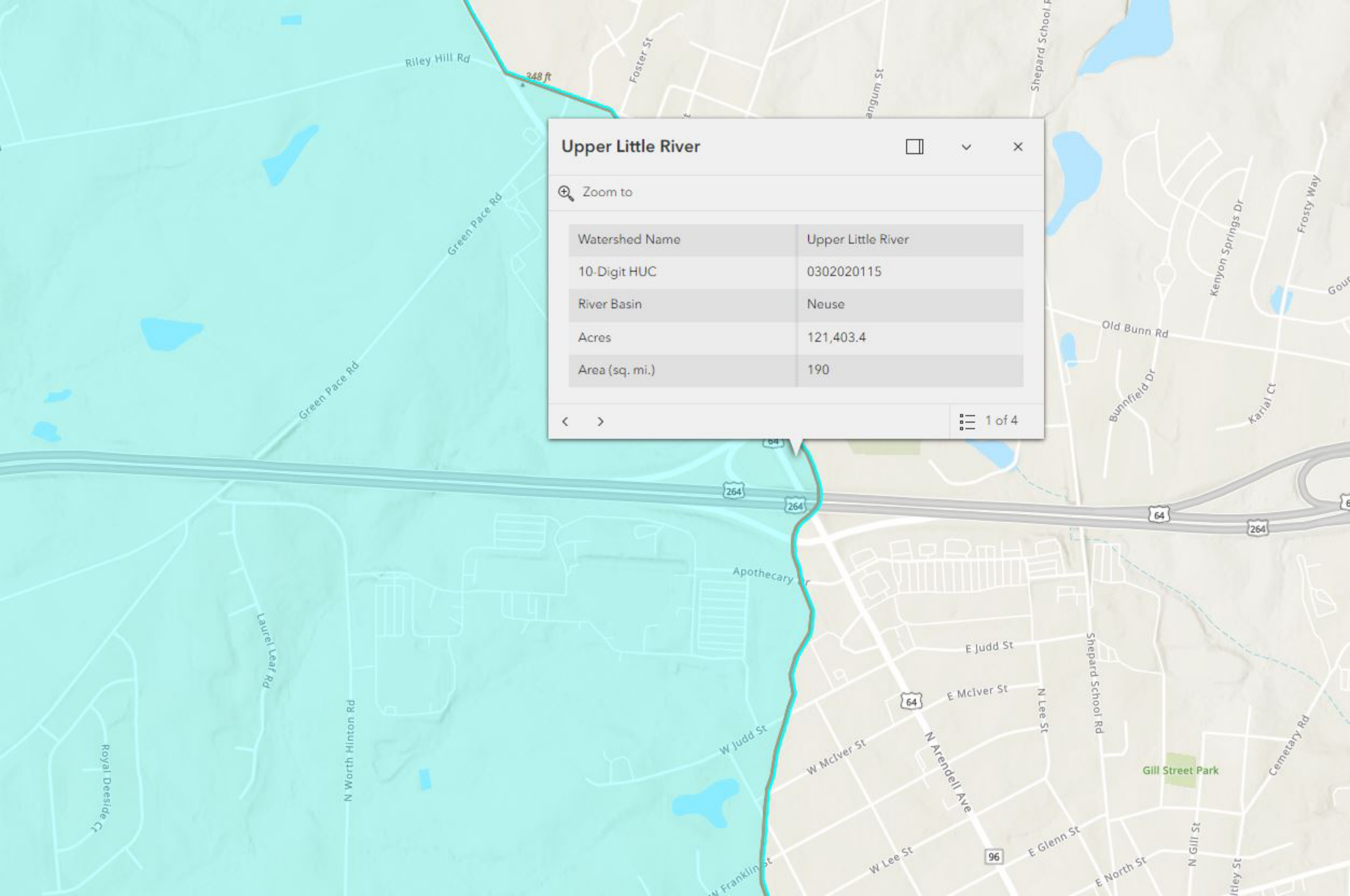
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

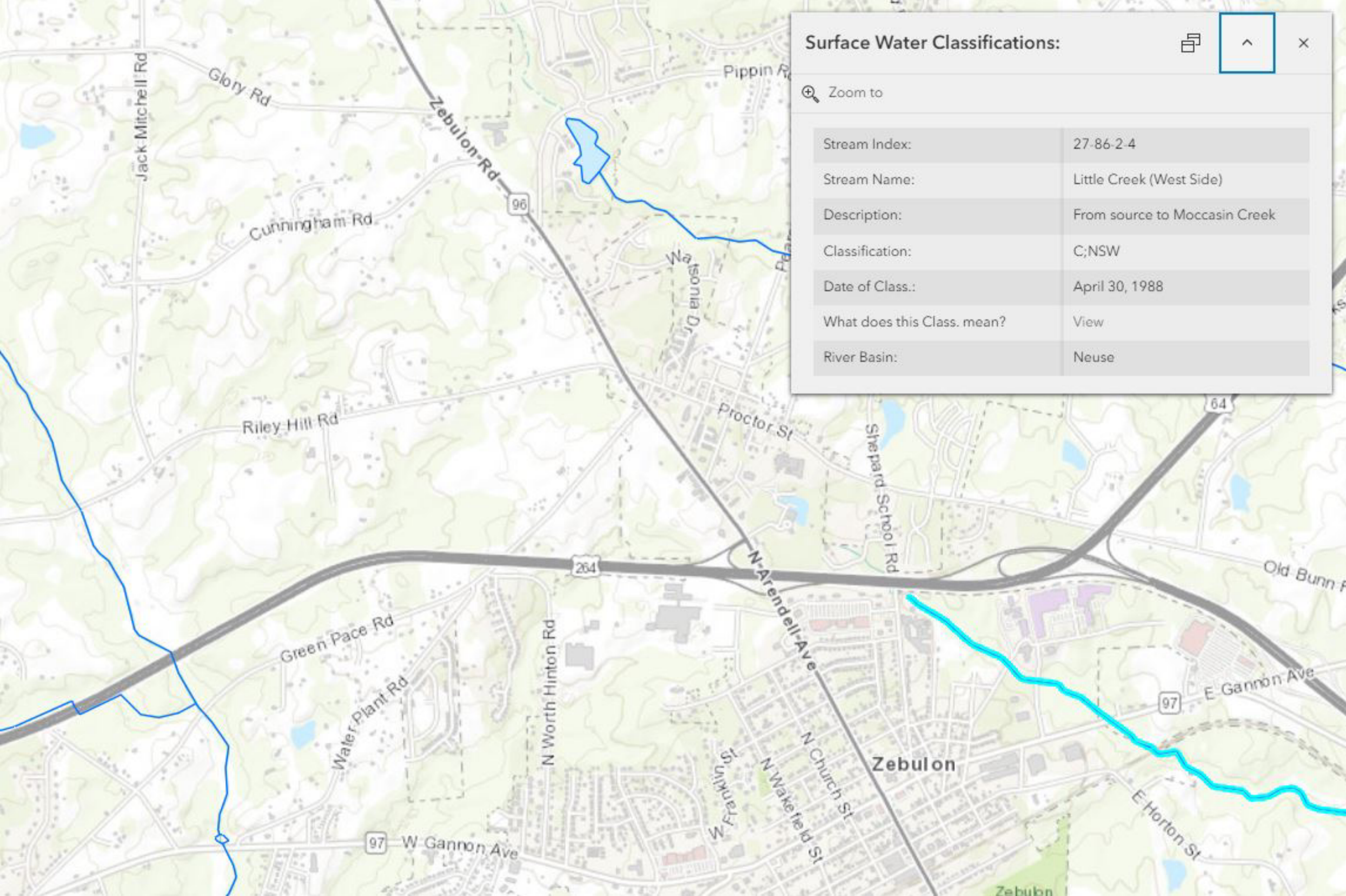
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

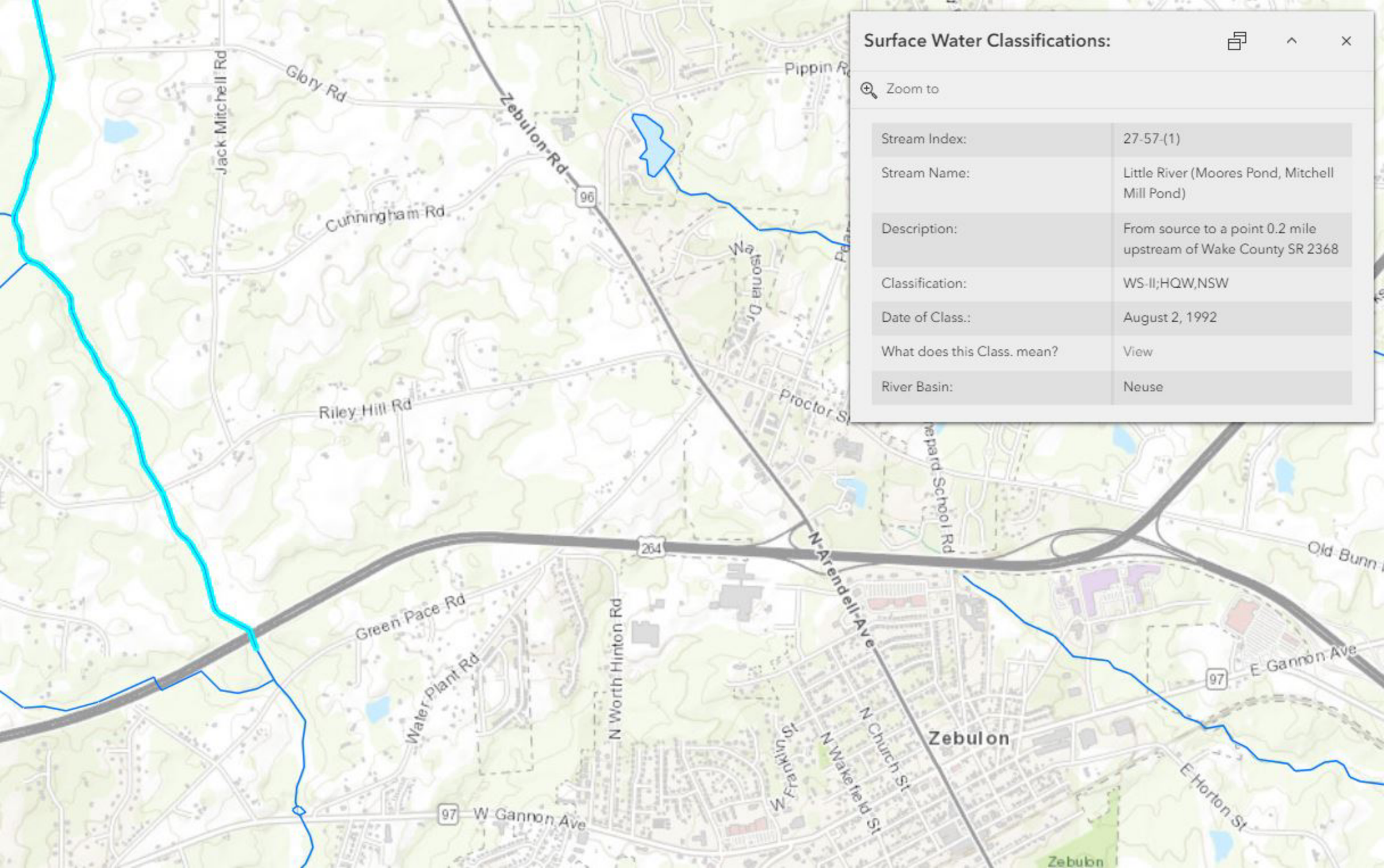
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/28/2023 at 8:31 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by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


Upper Moccasin Creek
Zoom to
Subwatershed (12) Upper Moccasin Creek
HUC 12 030202030101
Watershed (10) Buckhorn Reservoir
HUC 10 0302020301
HUC 8 03020203
River Basin Neuse
ACRES 28,136
1 of 6
Riley Hill Rd
348 ft
Green Pace Rd
Old Bunn Rd
Bunnfield Dr
Karial Ct
Kenyon Springs Dr
Frosty Way
Gourd St
Apothecary Dr
Laurel Leaf Rd
N Worth Hinton Rd
Royal Deeside Ct
W Judd St
E Judd St
E McIver St
W McIver St
N Arendell Ave
N Lee St
Shepard School Rd
Gill Street Park
Cemetery Rd
W Lee St
E Glenn St
E North St
N Gill St
64
264
96


Upper Little River
Zoom to
Watershed Name
Upper Little River
10-Digit HUC
0302020115
River Basin
Neuse
Acres
121,403.4
Area (sq. mi.)
190
1 of 4
Riley Hill Rd
348 ft
Foster St
Shepard School Rd
Green Pace Rd
Old Bunn Rd
Kenyon Springs Dr
Frosty Way
Bunnfield Dr
Karial Ct
264
64
Apothecary Dr
Laurel Leaf Rd
N Worth Hinton Rd
Royal Deeside Ct
E Judd St
W Judd St
E McIver St
W McIver St
N Arendell Ave
N Lee St
Shepard School Rd
Gill Street Park
Cemetery Rd
W Lee St
E Glenn St
E North St
96


Surface Water Classifications:
Zoom to
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
Jack Mitchell Rd
Glory Rd
Zebulon Rd
96
Cunningham Rd
Riley Hill Rd
Proctor St
Shepard School Rd
64
264
N Arendell Ave
Old Bunn
Green Pace Rd
Water Plant Rd
N Worth Hinton Rd
W Franklin St
N Wakefield St
N Church St
Zebulon
E Gannon Ave
97
W Gannon Ave
E Horton St


Surface Water Classifications:
Zoom to
Stream Index: 27-57-(1)
Stream Name: Little River (Moores Pond, Mitchell Mill Pond)
Description: From source to a point 0.2 mile upstream of Wake County SR 2368
Classification: WS-II;HQW,NSW
Date of Class.: August 2, 1992
What does this Class. mean? View
River Basin: Neuse
Jack Mitchell Rd
Glory Rd
Zebulon Rd
96
Cunningham Rd
Riley Hill Rd
264
Green Pace Rd
Water Plant Rd
N Worth Hinton Rd
N Arendell Ave
Zebulon
97
W Gannon Ave
E Gannon Ave
N Church St
N Wakefield St
E Horton St
Old Bunn

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.

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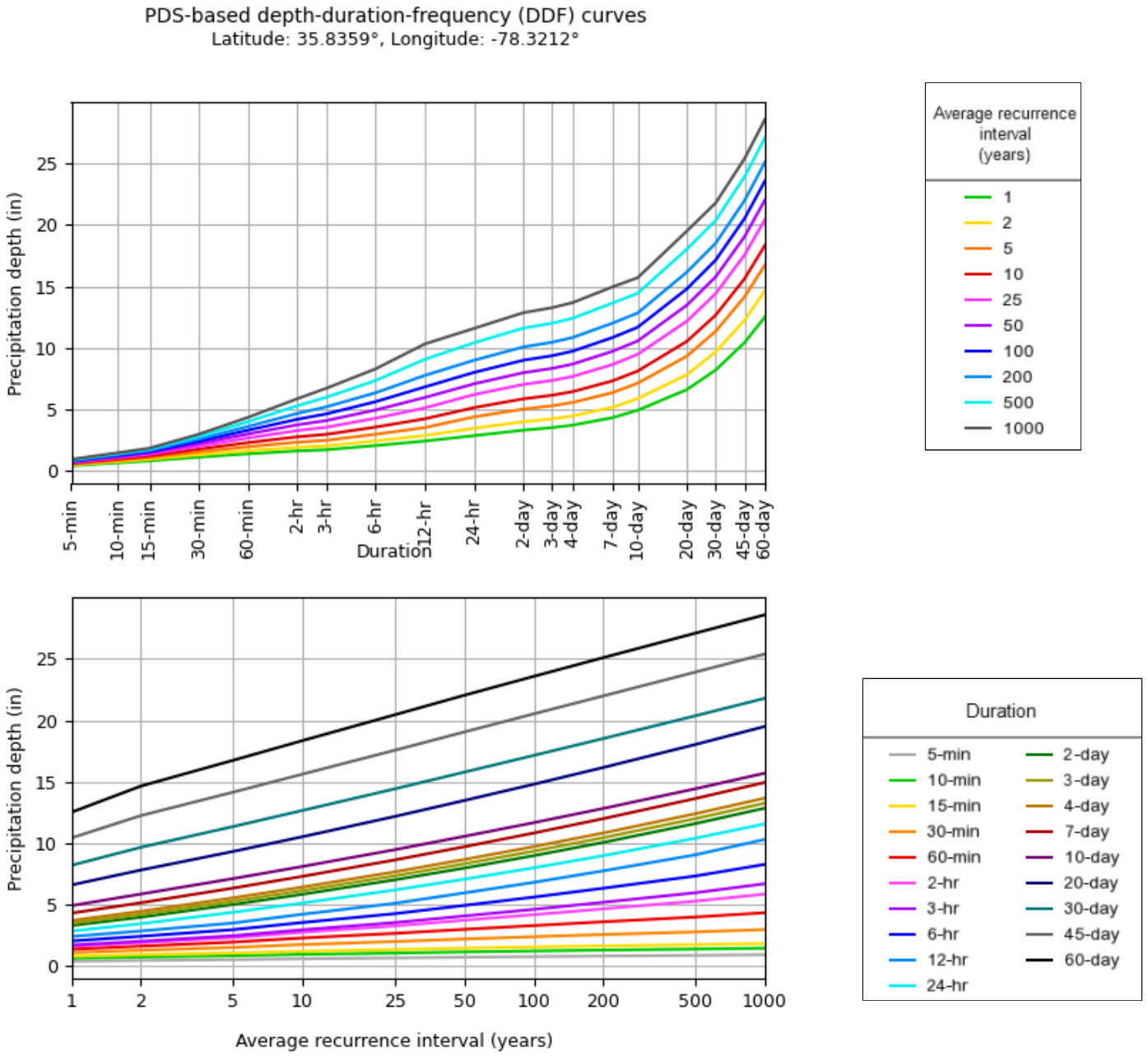
PF graphical



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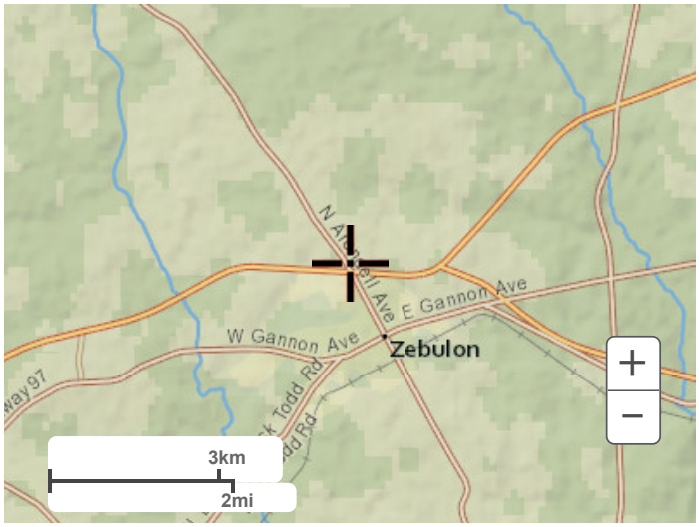
Small scale terrain



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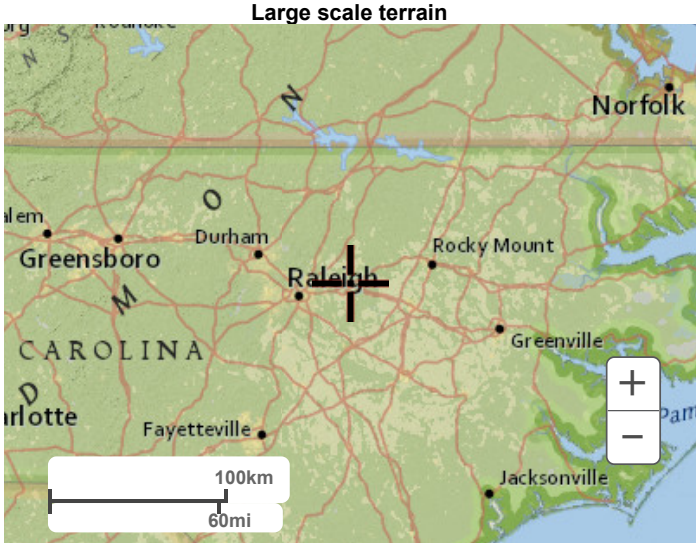

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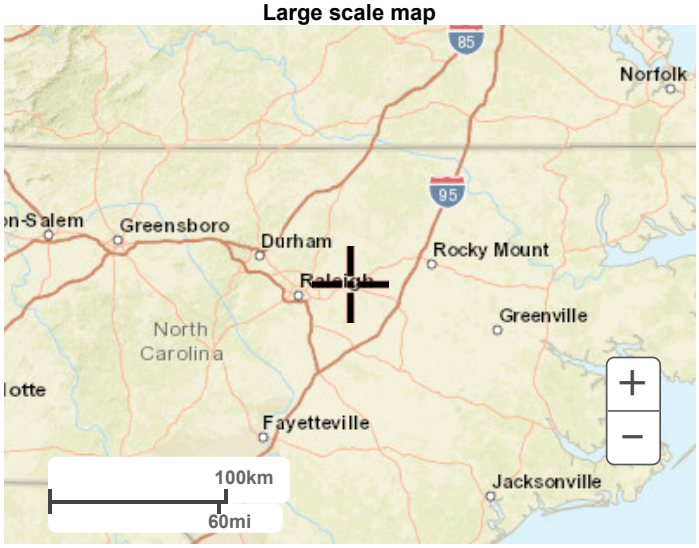

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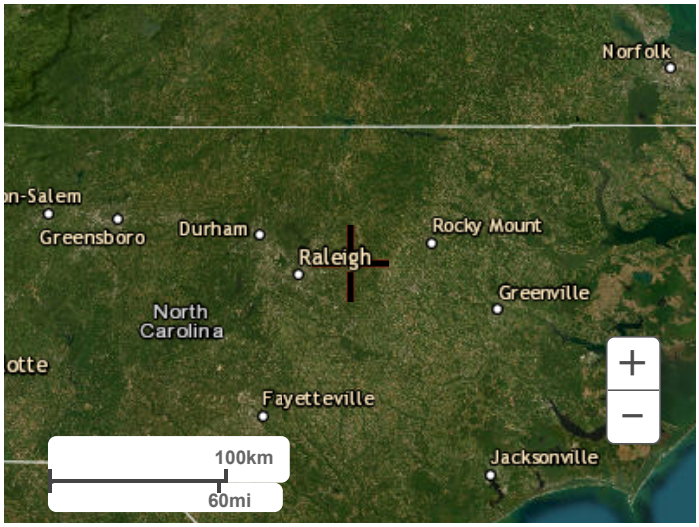

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National Oceanic and Atmospheric Administration
National Weather Service
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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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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.

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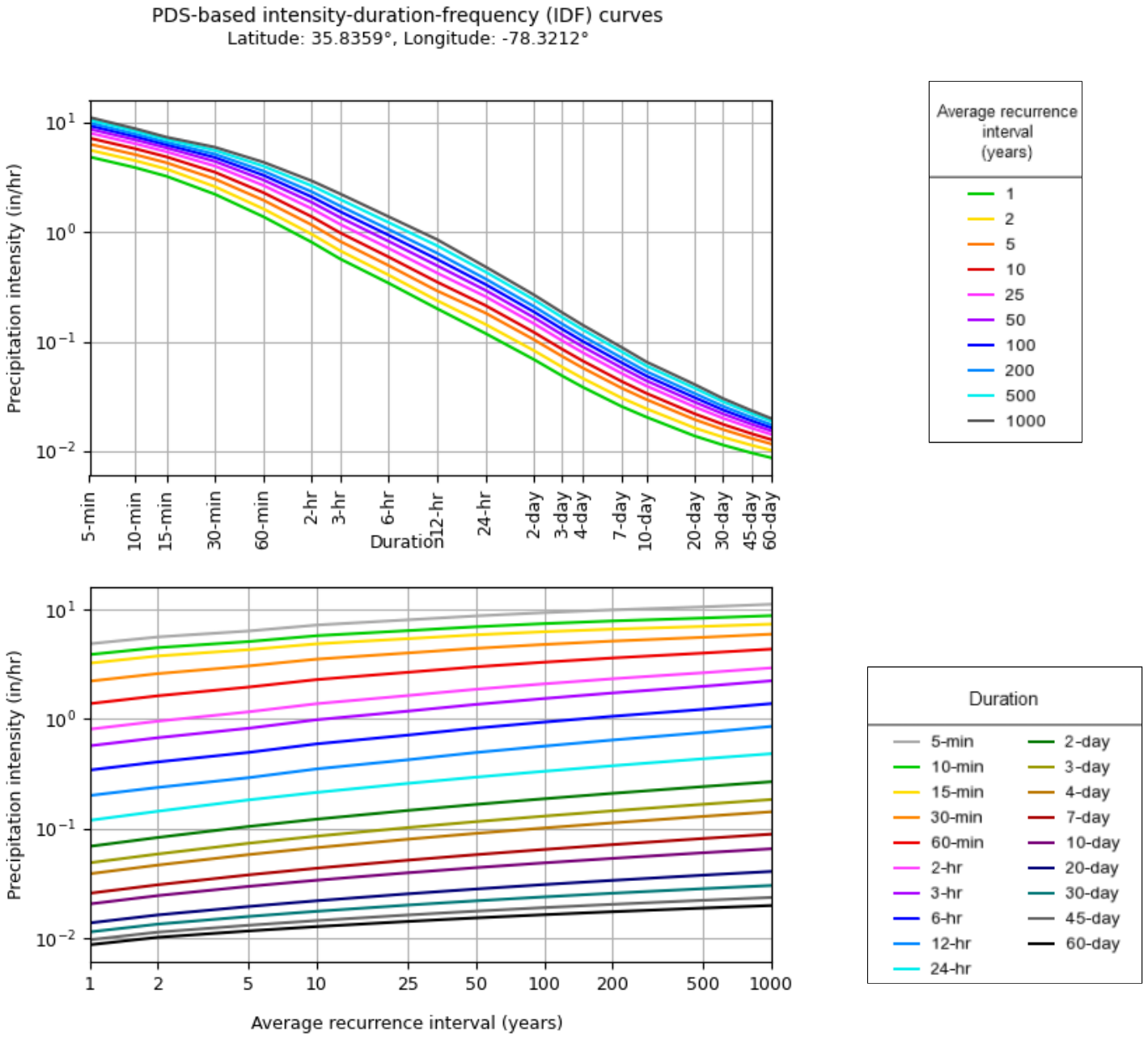
PF graphical



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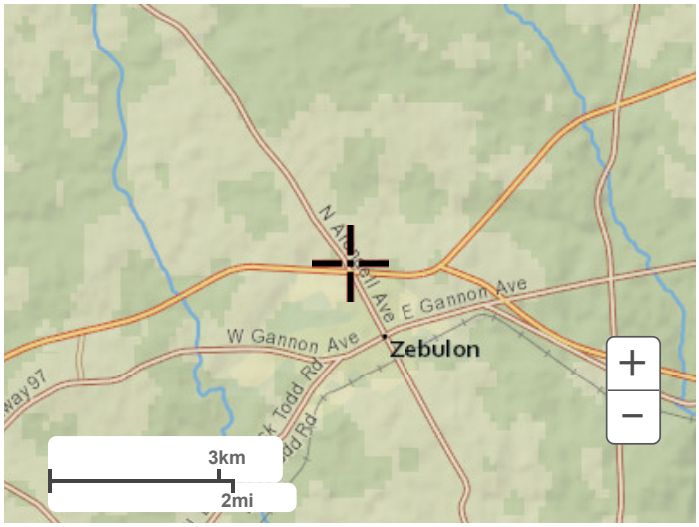

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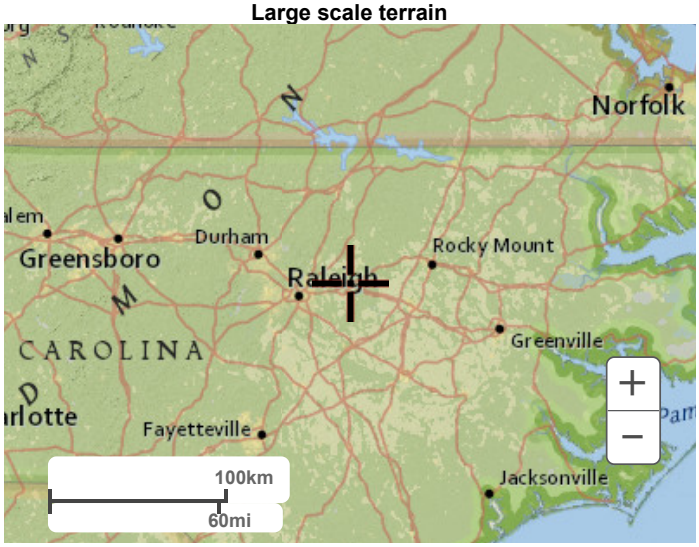

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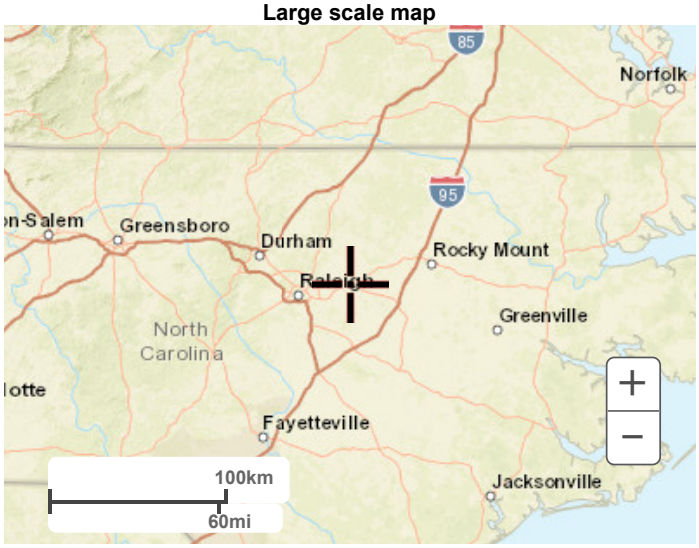

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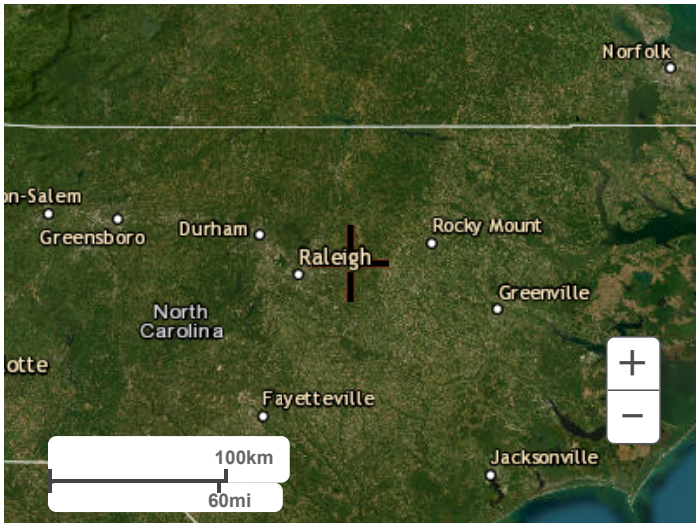

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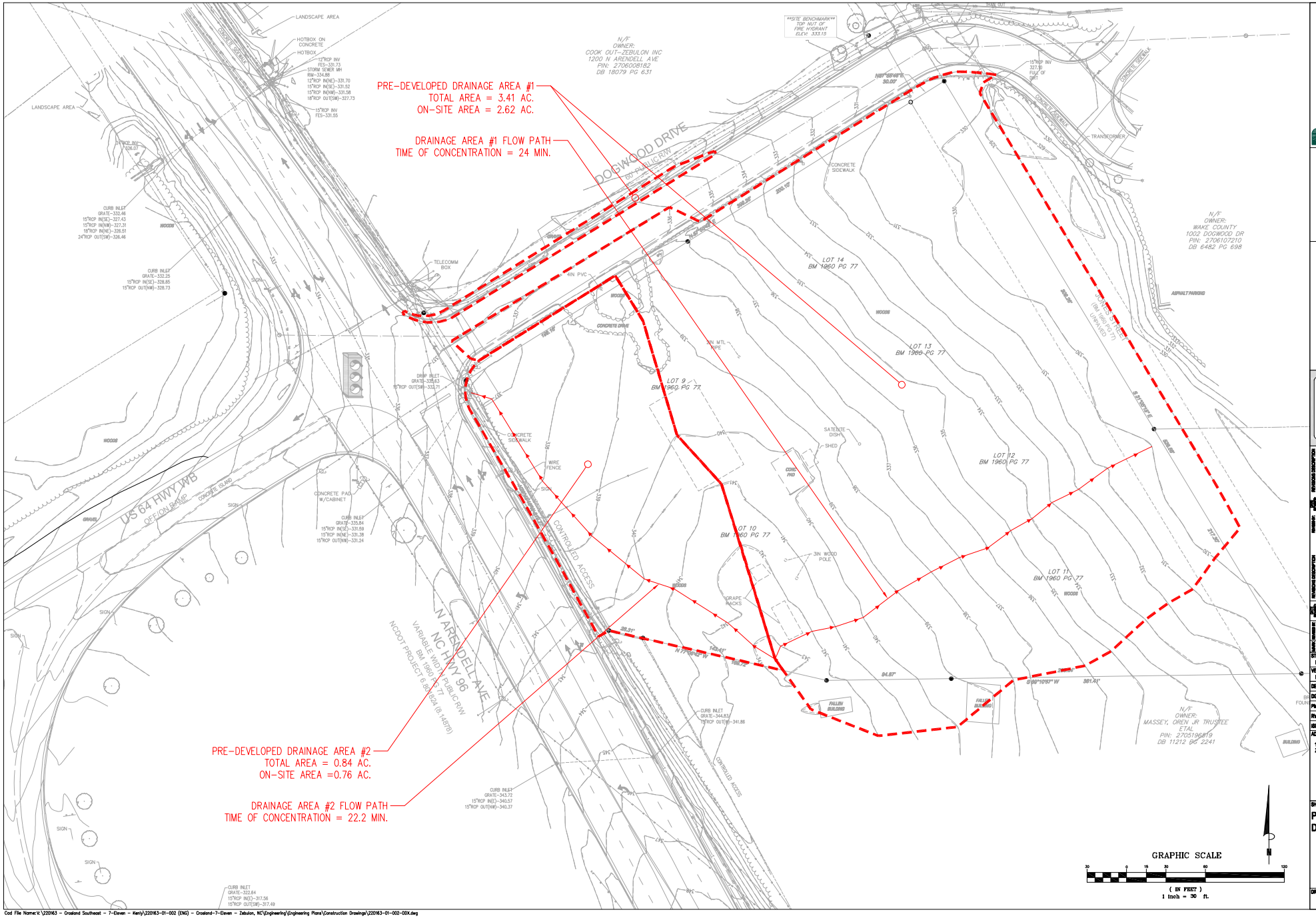

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DSNR: BRW & MCB
PM/DP: ML
RVWR: ML
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ADDRESS
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ZEBULON, NC 27597

SHEET TITLE
PRE-DEVELOPED DRAINAGE AREA

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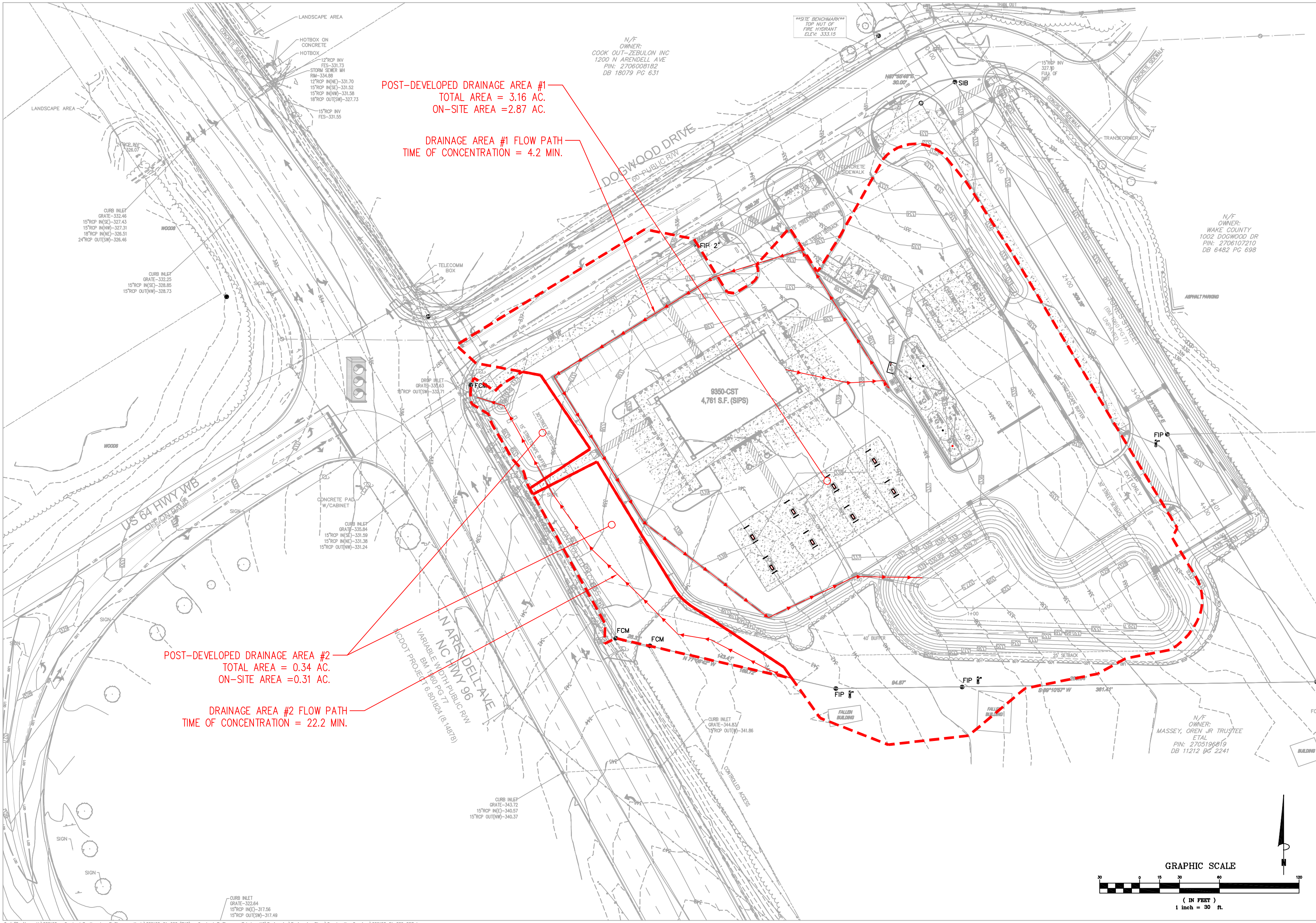

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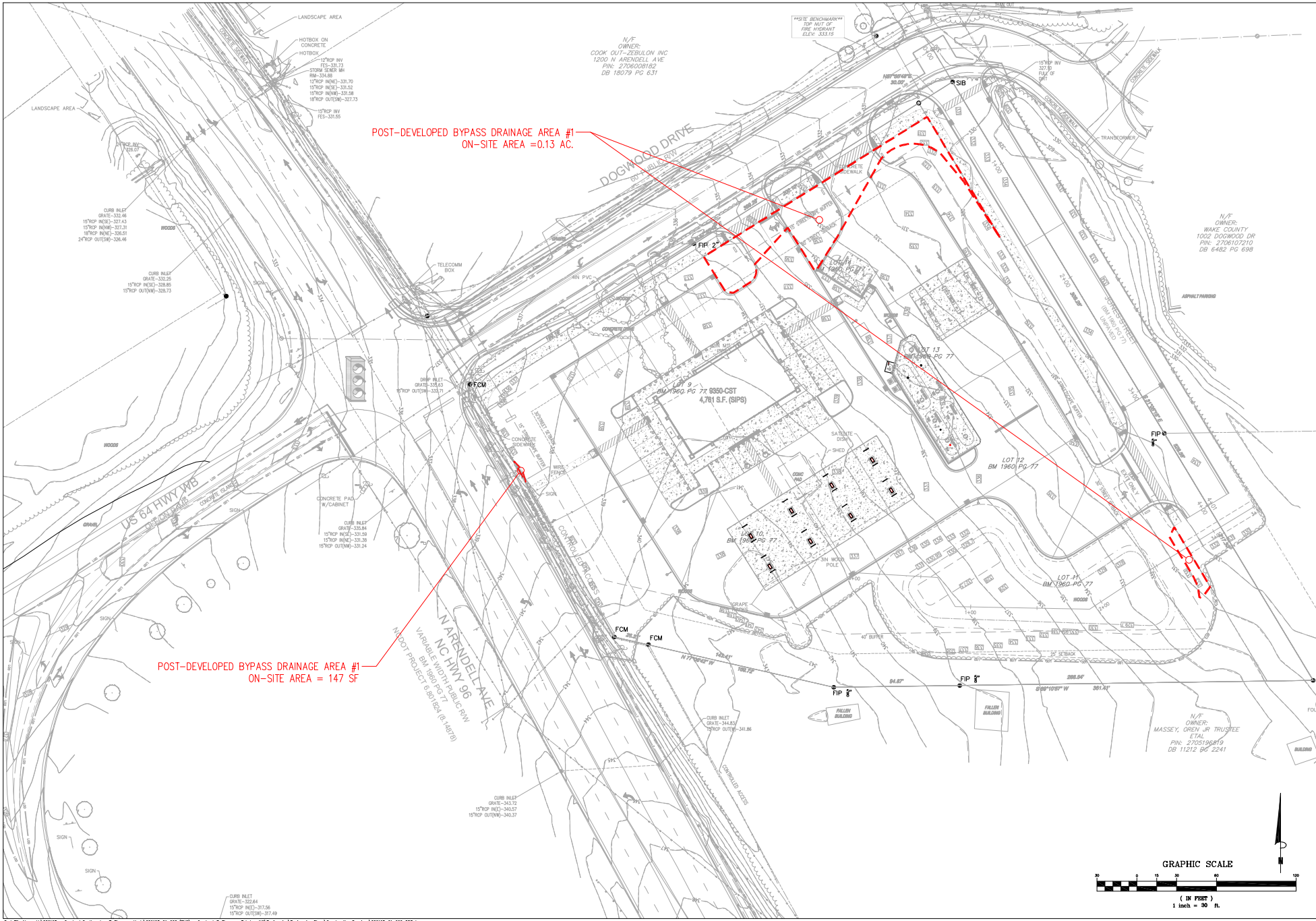
VERSION OR PROJECT ID: N/A
DESIGN TEAM
DSNGR. BRM & MCB
PM/DP. ML
RVWR. ML
ISSUE DATE: 10/2/2023
ADDRESS
1108 N ARENDELL AVE
ZEBULON, NC 27597

SHEET TITLE
POST-DEVELOPED DRAINAGE AREA

DRWG. NO.



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PRELIMINARY
DO NOT USE FOR CONSTRUCTION

Crosland Southeast
7-Eleven Store #42378
Zebulon, NC
WAKE COUNTY

MARK	REVISION	DATE	REVISION DESCRIPTION
1	BM	10/2023	TOWN OF ZEBULON REVIEW

STORE OR BLDG NO.: N/A
VERSION OR PROJECT ID: N/A
DESIGN TEAM
DSNR. BRM & MCB
PM/OP. ML
RVWR. ML
ISSUE DATE: 10/2023
ADDRESS
1106 N ARENDELL AVE
ZEBULON, NC 27597

SHEET TITLE
POST-DEVELOPED BYPASS DRAINAGE AREA

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-DOP.dwg

APPENDIX B
Stormwater Analysis

Wake County Stormwater Design Tool
CN Calculation (Bypass)
Stormwater Wetland Design and Details
Hydrographs (DA#1 & DA#2)
Downstream Impact Analysis (DA#1 & DA#2)

SITE DATA

Project Information		
Project Name:		**7-Eleven Zebulon**
Applicant:		C4 Cstore Holdings III, LLC
Applicant Contact Name:		Nick Carroll
Applicant Contact Number:		(502) 693-0396
Contact Email:		ncarroll@csere.com
Municipal Jurisdiction (Select from dropdown menu):		Zebulon
Last Updated:		Tuesday, December 5, 2023
Site Data:		
Total Site Area (Ac):		3.40
Existing Lake/Pond Area (Ac):		0.00
Proposed Disturbed Area (Ac):		4.30
Impervious Surface Area (acre):		1.81
Type of Development (Select from Dropdown menu):		Non-Residential
Percent Built Upon Area (BUA):		53%
Project Density:		High
Is the proposed project a site expansion?		No
Number of Drainage Areas on Site:		2
NOAA	**1-Year, 24-Hour Storm (inches) (See NOAA Website):**	2.85
	2-Year, 24-Hour Storm (inches) (See NOAA Website):	3.46
	10-Year, 24-Hour Storm (inches) (See NOAA Website):	5.14
Lot Data (if applicable):		
Total Acreage in Lots:		
Number of Lots:		
Average Lot Size (SF):		
Total Impervious Surface Area on Lots (SF):		
Average Impervious Surface Area Per Lot (SF):		

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

There is proposed storm water management facility (Stormwater Wetland) on site. The design includes the 7-Eleven site (3.40 ac) and right-of-way improvements. The SCM outlined in this report has been designed for post-development peak attenuation and water quality. The proposed site will have 1.81 acres of impervious area, and 1.77 of those acres will go to the stormwater wetland. The SCM is designed to capture a drainage area of 3.16 ac with an impervious area of 1.91 ac. This includes on and off-site areas. 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 Zebulon

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	3.41				3.16			
Site Acreage within Drainage=	2.62				2.87			
One-year, 24-hour rainfall (in)=	2.85							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.14							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition		2.29				0.22		
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition		0.25				0.88		
Reforestation (in dedicated OS)								
Connected Impervious		0.08				1.77		
Disconnected Impervious								

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=	100.00	82.00
Slope (ft/ft)=	0.040	0.010
Surface Cover:	Woods	Paved, Gravel, or Bare Soil
n-value=	0.400	0.011
T_t (hrs)=	0.287	0.024
Shallow Flow		
Length (ft)=	672.00	
Slope (ft/ft)=	0.010	
Surface Cover:	Unpaved	
Average Velocity (ft/sec)=	1.61	
T_t (hrs)=	0.12	
Channel Flow 1		
Length (ft)=		703.00
Slope (ft/ft)=		0.005
Cross Sectional Flow Area (ft^2)=		1.23
Wetted Perimeter (ft)=		3.93
Channel Lining:		Concrete, finished
n-value=		0.012
Hydraulic Radius (ft)=		0.31
Average Velocity (ft/sec)=		4.05
T_t (hrs)=		0.05

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.40	0.07
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	57	83
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**83**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	6,349	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.20	1.35
Volume of runoff (ft^3) =	1,917	14,050
Volume change (ft^3) =	12,133	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	0.272	7.323
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.40	1.85
Volume of runoff (ft^3) =	3,802	19,272
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	0.540	10.045
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.18	3.34
Volume of runoff (ft^3) =	11,206	31,762
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	1.591	18.091

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.84				0.34			
Site Acreage within Drainage=	0.76				0.31			
One-year, 24-hour rainfall (in)=	2.85							
Two-year, 24-hour rainfall (in)=	3.46							
Ten-year, 24-hour storm (in)=	5.14							
Total Lake/Pond Area (Acres)=								
Lake/Pond Area not in the Tc flow path (Acres)=								
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition		0.66				0.06		
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition		0.06				0.25		
Reforestation (in dedicated OS)								
Connected Impervious		0.05				0.00		
Disconnected Impervious								

SITE FLOW	PRE-DEVELOPMENT T_c	POST-DEVELOPMENT Tc
Sheet Flow		
Length (ft)=	100.00	100.00
Slope (ft/ft)=	0.025	0.025
Surface Cover:	Woods	Woods
n-value=	0.400	0.400
T_t (hrs)=	0.347	0.347
Shallow Flow		
Length (ft)=	226.00	190.00
Slope (ft/ft)=	0.023	0.035
Surface Cover:	Unpaved	Unpaved
Average Velocity (ft/sec)=	2.45	3.02
T_t (hrs)=	0.03	0.02
Channel Flow 1		
Length (ft)=		24.00
Slope (ft/ft)=		0.005
Cross Sectional Flow Area (ft^2)=		0.44
Wetted Perimeter (ft)=		2.36
Channel Lining:		Concrete, finished
n-value=		0.012
Hydraulic Radius (ft)=		0.19
Average Velocity (ft/sec)=		2.87
T_t (hrs)=		0.00

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

Channel Flow 2		
Length (ft)=		20.00
Slope (ft/ft)=		0.050
Cross Sectional Flow Area (ft^2)=		1.23
Wetted Perimeter (ft)=		3.93
Channel Lining:		Concrete, finished
n-value=		0.012
Hydraulic Radius (ft)=		0.31
Average Velocity (ft/sec)=		12.80
T_t (hrs)=		0.00
Channel Flow 3		
Length (ft)=		
Slope (ft/ft)=		
Cross Sectional Flow Area (ft^2)=		
Wetted Perimeter (ft)=		
Channel Lining:		
n-value=		
Hydraulic Radius (ft)=		
Average Velocity (ft/sec)=		
T_t (hrs)=		
Tc (hrs)=	0.37	0.37
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	58	60
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**60**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	72	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	0.23	0.29
Volume of runoff (ft^3) =	640	325
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	0.080	0.052
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	0.44	0.52
Volume of runoff (ft^3) =	1,227	591
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	0.153	0.095
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	1.26	1.40
Volume of runoff (ft^3) =	3,482	3,884
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	0.433	0.253

WAKE COUNTY
NORTH CAROLINA

Project Name: 7-Eleven Zebulon

DA SITE SUMMARY
STORMWATER PRE-POST CALCULATIONS

SITE SUMMARY

DRAINAGE AREA SUMMARIES

DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in) = $Q_{pre,1\text{-}year}$ =	0.20	0.23								
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	0.272	0.080								
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	1.77	0.00								
Runoff (in)=$Q_{1\text{-}year}$ =	1.35	0.29								
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	7.323	0.052								
Increase in volume per DA (ft^3)_1-yr storm=	12,133									
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =	6,349	72								

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	3.18	100%	N/A
C	0.00	0%	N/A
D	0.00	0%	N/A

Total Site Area (acres) =	3.18
Percent BUA (Includes Existing Lakes/Pond Areas) =	56%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	81
Minimum Volume to be Managed (Total Site) Per TCN Requirement= ft^3 =	N/A

Site Nitrogen Loading Data

HSG	TN export coefficient (lbs/ac/yr)	Site Acreage	N Export
Pasture	1.2	0.00	0.00
Woods, Poor Condition	1.6	0.00	0.00
Woods, Fair Condition	1.2	0.00	0.00
Woods, Good Condition	0.8	0.28	0.23
Open Space, Poor Condition	1.0	0.00	0.00
Open Space, Fair Condition	0.8	0.00	0.00
Open Space, Good Condition	0.6	1.12	0.67
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	1.77	37.55
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	12.10		
Nitrogen Load (lbs/yr)=	38.45		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=	27.01		

Site Nitrogen Loading Data For Expansions Only

	Existing	New
Impervious(acres)=	NA	NA
"Expansion Area" (acres=)		
Nitrogen Load (lbs/yr)=	NA	NA
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	NA	NA
Total Site loading rate (lbs/ac/yr)		
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)=	NA	

WAKE COUNTY
NORTH CAROLINA

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA1 Site Acreage=	2.87			
DA1 Off-Site Acreage=	0.29			
Total Required Storage Volume for Site TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA1 1" Rainfall for High Density (ft^3)=	6,349			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA1(a) (Ac)		Sub-DA1(b) (Ac)		Sub-DA1(c) (Ac)		Sub-DA1(d) (Ac)		Sub-DA1(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition	0.22									
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.88									
Reforestation (in dedicated OS)										
Impervious	1.77									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
Stormwater Wetland	Stormwater Wetlands	6,296	11,948	40%	38.19	15.27	65.33
				0%	22.91	0.00	
				0%	22.91	0.00	
				0%	22.91	0.00	
				0%	22.91	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**22.91**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

WAKE COUNTY
NORTH CAROLINA

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 1
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							
Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA1 BMP SUMMARY	
Total Volume Treated (ft^3)=	11,948
Nitrogen Mitigated(lbs)=	15.27
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	2,102
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.20
Post BMP $CN_{(1\text{-year})}$=	56
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.198
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	7,324
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.70
Post BMP $CN_{(2\text{-year})}$=	64
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	0.475
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	19,814
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	1.90
Post BMP $CN_{(10\text{-year})}$=	84
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	2.697

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 2
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA2 Site Acreage=	0.31			
DA2 Off-Site Acreage=	0.03			
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA2 1" Rainfall for High Density (ft3)=	72			
Will site use underground detention/cistern?	No	Enter % of the year water will be reused=	0%	Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA2(a) (Ac)		Sub-DA2(b) (Ac)		Sub-DA2(c) (Ac)		Sub-DA2(d) (Ac)		Sub-DA2(e) (Ac)	
	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site	Site	Off-site
Pasture										
Woods, Poor Condition										
Woods, Fair Condition										
Woods, Good Condition	0.06									
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.25									
Reforestation (in dedicated OS)										
Impervious	0.00									

Sub-DA1(a) BMP(s)

Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
	Stormwater Wetlands	67		40%	0.27	0.11	50
				0%	0.16	0.00	
				0%	0.16	0.00	
				0%	0.16	0.00	
				0%	0.16	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**0.16**					

Sub-DA1(b) BMP(s)

If Sub-DA1(b) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

Sub-DA1 (c) BMP(s)

If Sub-DA1(c) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

WAKE COUNTY
NORTH CAROLINA

Project Name: 7-Eleven Zebulon

DRAINAGE AREA 2
BMP CALCULATIONS

Sub-DA1(d) BMP(s)							
If Sub-DA1(d) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							
Sub-DA1(e) BMP(s)							
If Sub-DA1(e) is connected to upstream subbasin(s), enter the nitrogen leaving the most upstream subbasin(lbs):							
Device Name (As Shown on Plan)	Device Type	Water Quality Volume for Sub-DA (ft^3)	Provided Volume that will drawdown 2-5 days (ft^3)	Nitrogen Removal Efficiency	Sub-DA Nitrogen (lbs)	Nitrogen Removed (lbs)	Drawdown Time (hours)
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
				0%	0.00	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):							

DA2 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	0.11
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	325
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.29
Post BMP $CN_{(1\text{-year})}$=	60
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.065
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	591
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	0.52
Post BMP $CN_{(2\text{-year})}$=	60
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	0.111
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	3,884
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	3.44
Post BMP $CN_{(10\text{-year})}$=	98
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	0.277

Project Name: 7-Eleven Zebulon

DA SITE SUMMARY
BMP CALCULATIONS

BMP SUMMARY										
DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development (1-year, 24-hour storm)										
Runoff (in)=$Q^*_{1\text{-year}}$ =	0.20	0.23								
Peak Flow (cfs)=$Q_{1\text{-year}}$ =	0.272	0.080								
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =	NA									
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	0.20	0.29								
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	0.198	0.065								
Post BMP $CN_{(1\text{-year})}$=	56									
Post-BMP Nitrogen Loading										
TOTAL SITE NITROGEN MITIGATED (lbs)=	15.38									
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	7.26									
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=	**11.63**									

Project Name:	7-Eleven Zebulon

LOW IMPACT DEVELOPMENT SUMMARY

DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development										
Runoff (in) = $Q_{pre\_2\text{-}year}$ =	0.40	0.44								
Total Runoff Volume (ft^3)=	3,802	1,227								
Peak Flow (cfs)=$Q_{2\text{-}year}$ =	0.540	0.153								
Post-Development										
2-year, 24-hour storm (LID)										
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	0.70	0.52								
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	0.475	0.111								
Post BMP Volume of Runoff $(ft3)_{(2\text{-}year)}$=	7,324	591								
Does Runoff meet LID requirements?	No	No								
Does Peak Flow meet LID requirements?	Yes	Yes								
Does Runoff Volume meet LID requirements?	No	Yes								

SITE SUMMARY	
Site Data	
Target CN =	N/A
Post-Development CN =	64
Does CN meet LID requirements?	

LID CHECKLIST
Complete the below checklist if all requirements have been met above:

LID Narrative (limit to 600 characters - attach additional pages with submittal if necessary):
Describe in detail how the proposed development has utilized "Natural Site Design". Narrative should include the location of site buildings, roads and other land disturbances in the least environmentally-sensitive areas, preservation of steep slopes, and preservation of naturally well draining soils and other hydrologically valuable features.

LID Techniques (check all that apply)
At least **one** of the following techniques must be used to achieve LID classification:

☐	Bioretention
☐	On-site infiltration

Additional LID Techniques (check all that apply)
At least **two** (**one for Wendell**) of the following techniques must be used to achieve LID classification:

☐	Retention of 50% of vegetated area, including open space, landscaping or forests
☐	Use of permeable pavement for <u>all</u> private driveways, private roads, sidewalks and parking areas
☐	Installation of one rain cistern per lot or three rain barrels per lot
☐	Installation of vegetative roofs
☐	Increasing all buffers in the Riparian buffer zone or the Flood Protection Zone, whichever is greater, by 50 feet
☐	Use of reclaimed water for all buildings
☐	Use of innovative LID techniques subject to approval

Project Name:	7-Eleven Zebulon

DOWNSTREAM IMPACT ANALYSIS SITE SUMMARY

DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development										
Peak Discharge (cfs)=$Q_{10\text{-year}}$ =	1.59	0.43								
Volume of Runoff $(ft^3)_{(10\text{-year})}$ =	11,206	3,482								
Post-Development										
10-year, 24-hour storm (DIA)										
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	2.70	0.28								
Post BMP Volume of Runoff $(ft^3)_{(10\text{-year})}$=	19,814	3,884								

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

Curve Number Calculation (CN)

Post-Developed Bypass Conditions (Stormwater Wetland)

Drainage Area (acres): 0.13

Existing Soil Groups:

Soil Group	*Map Symbol*	*Soil Description*	*Acres*	*Percent of DA*
B	WeB	Wedowee Sandy Loam	0.13	100%

Existing Land Uses:

Land Use Description	*Existing Soil Group*	*Acres*	*Curve #*	*Weighted CN*
Open Space - Good	B	0.09	61	41.1
Impervious Area		0.04	98	32.0
			Cumulative Curve # =	73.1

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

Curve Number Calculation (CN)

Post-Developed Conditions (On-Site Bypass)

Drainage Area (acres): 0.0034

Existing Soil Groups:

Soil Group	*Map Symbol*	*Soil Description*	*Acres*	*Percent of DA*
B	WeB	Wedowee Sandy Loam	0.00	100%

Existing Land Uses:

Land Use Description	*Existing Soil Group*	*Acres*	*Curve #*	*Weighted CN*
Impervious Area		0.00	98	98.0
			Cumulative Curve # =	98.0

Proposed Stormwater Wetland

Project Information

Project Name:	7-Eleven (Zebulon)		
Project #:	220163-01-002		
Designed by:	MCB	Date:	9/27/2023
Revised by:	MCB	Date:	12/4/2023
Checked by:		Date:	

Site Information

Sub Area Location:	Drainage To Proposed Stormwater Wetland			
Drainage Area (DA) =	3.16	Acres	137,464	sf
Impervious Area (IA) =	1.91	Acres	83,063	sf
Percent Impervious (I) =			60.43	%

Required WQv Storage Volume

Design Storm =	1	inch	(Non-Coastal county)
Determine Rv Value =	0.05 + .009 (I) =	0.594	in/in
Storage Volume Required =	6,802	cf (above Permanent Pool)	

Surface Area Requirements:

Storage Volume Required =	6,802	cf (above Permanent Pool)
Maximum ponding depth =	1.25	ft
Surface Area Required=	5,442	sf
Surface Area Provided=	8130	sf

Breakdown of Surface Area:

Forebay	1200.00	sf
	14.8%	of Wetland Surface Area (10-15%)
Non-Forebay Deep Pools	1020.00	sf
	12.5%	of Wetland Surface Area (5% to 15%)
Shallow Water (low marsh)	3490.00	sf
	42.9%	of Wetland Surface Area (35% to 45%)
Shallow Land (high marsh)	2620.00	sf
	32.2%	of Wetland Surface Area (30% to 45%)
Total	8,330	sf
	102.5%	of Wetland Surface Area

STORMWATER WETLAND

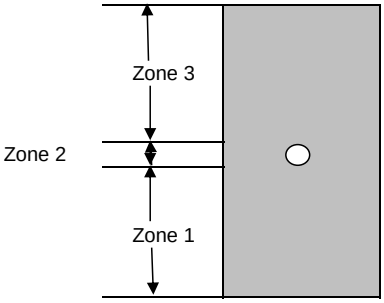
INCREMENTAL DRAWDOWN METHOD-Water Quality Volume

Project Information

Project Name: 7-Eleven (Zebulon)
Project #: 220163-01-002
Designed by: MCB Date: 9/27/2023
Revised by: MCB Date: 12/4/2023
Checked by: Date:

Water Quality Orifice

* Incremental Determination of Water Quality Volume Drawdown Time



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

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

$Q_1 = 0$

		in		
Orifice Diameter (D) =	1.5			
Cd =	0.6	Orifice Inv.		
Ei =	329.7	to	329.7	
Zone 1 Range =	0.00	to	329.8	
Zone 2 Range =	329.7	to	330.95	
Zone 3 Range =	329.8			

Incremental Drawdown Method

Countour	Contour Area	Incremental Volume	Stage, Z	Zone	Q	Drawdown Time
	sq ft	cu ft	ft		cfs	min
329.70	**8,130**	0	0.30	3.00	0.029	1,488
330.00	**8,980**	2,566	1.25	3.00	0.064	2,432
330.95	**10,770**	9,381				
			--	--	--	**3,920**
Total	--	**11,947**				

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

Summary

		cf
Total Volume =	**11,947**	**min**
Total Time =	**3,920**	**days**
Total Time =	**2.72**	

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:	MCB	Date:	12/4/2023
Checked by:		Date:	

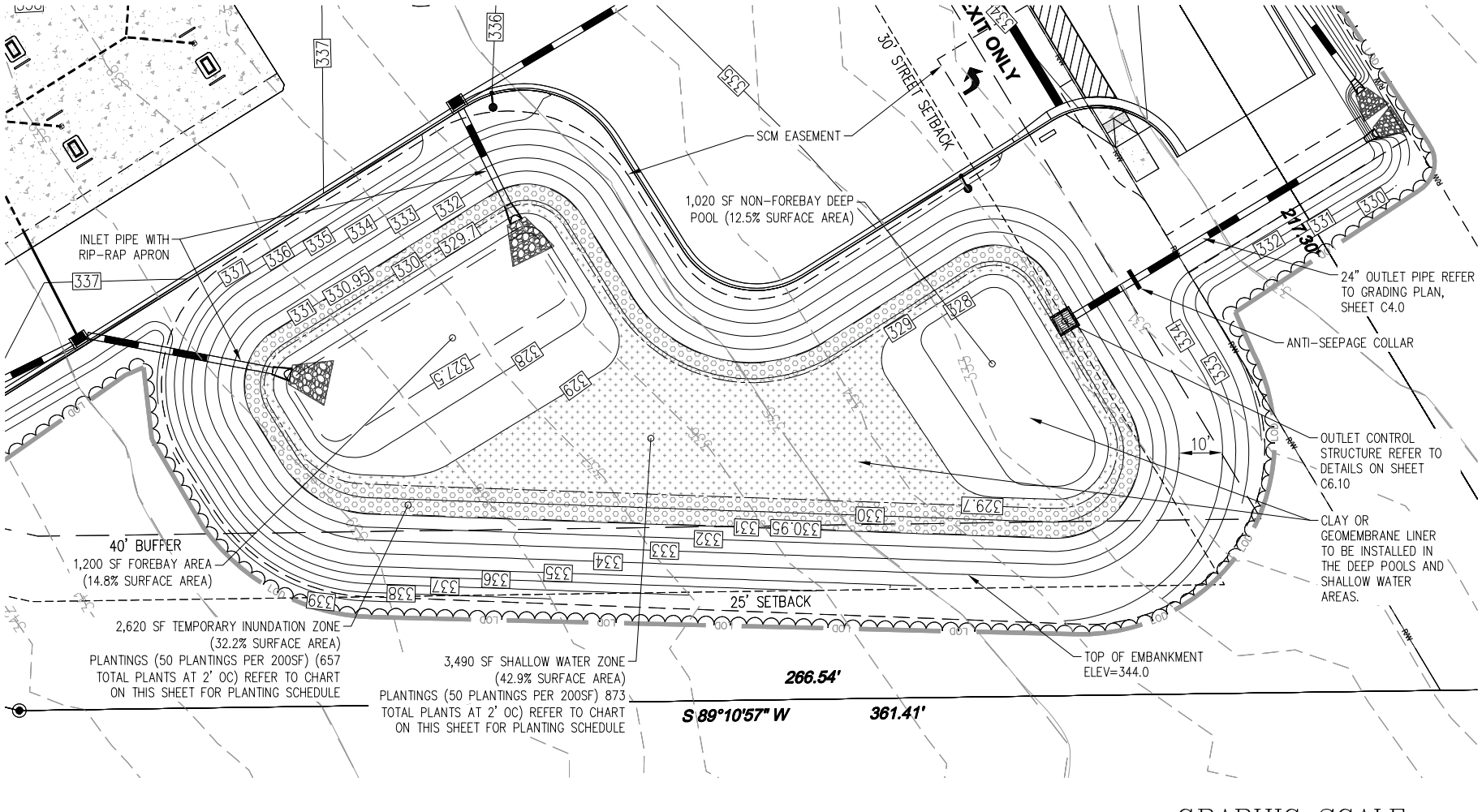
Site Information

Sub Area Location:	Drainage to Proposed Stormwater Wetland	
Drainage Area (DA) =	3.16	Acres
Impervious Area (IA) =	1.91	Acres
Percent Impervious (I) =	60.43	% (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:	4792	lbs	
Volume of Concrete Req'd:	31.9	cf	(Unit WT of Concrete = 150 pcf)
Volume Provided:	69.5	cf	(4'x4' riser x 2.0' = 32.0cf, 5'x5' footing x 1.5' = 37.5cf)



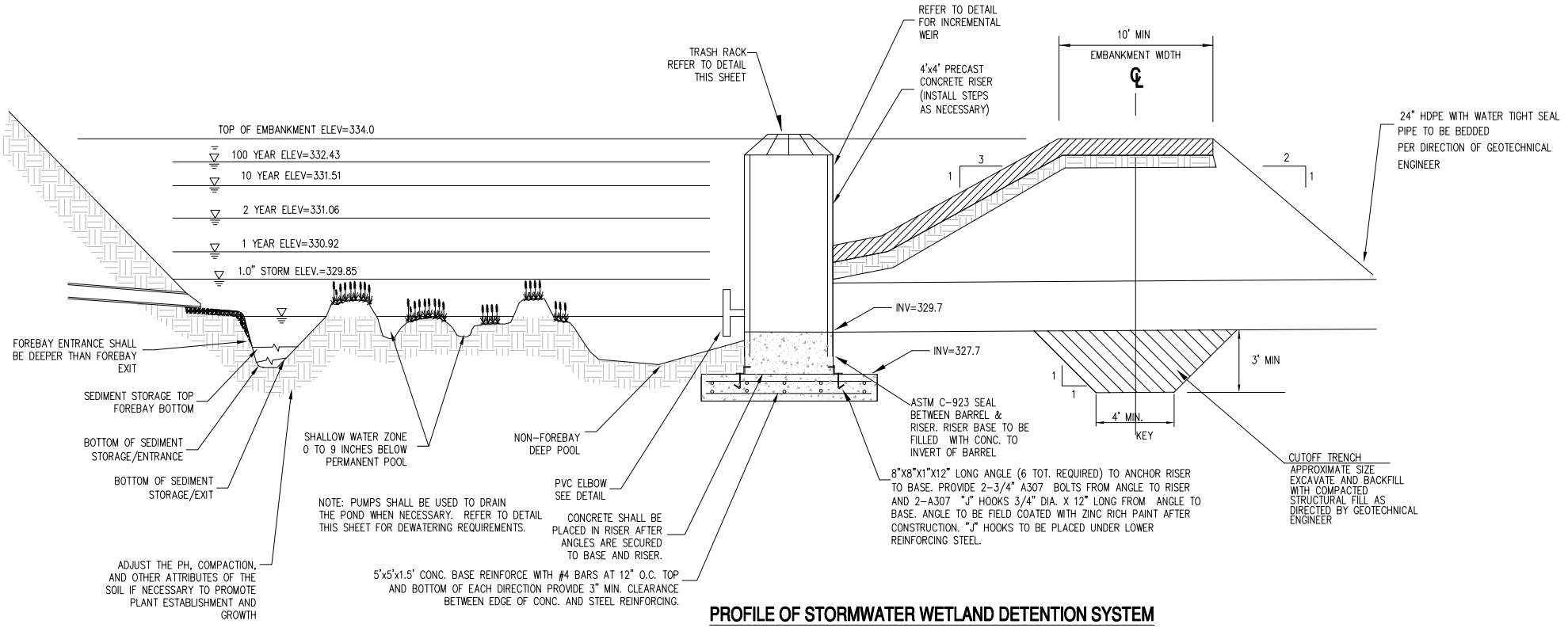
PLAN VIEW

GRAPHIC SCALE

30 0 15 30 60 120

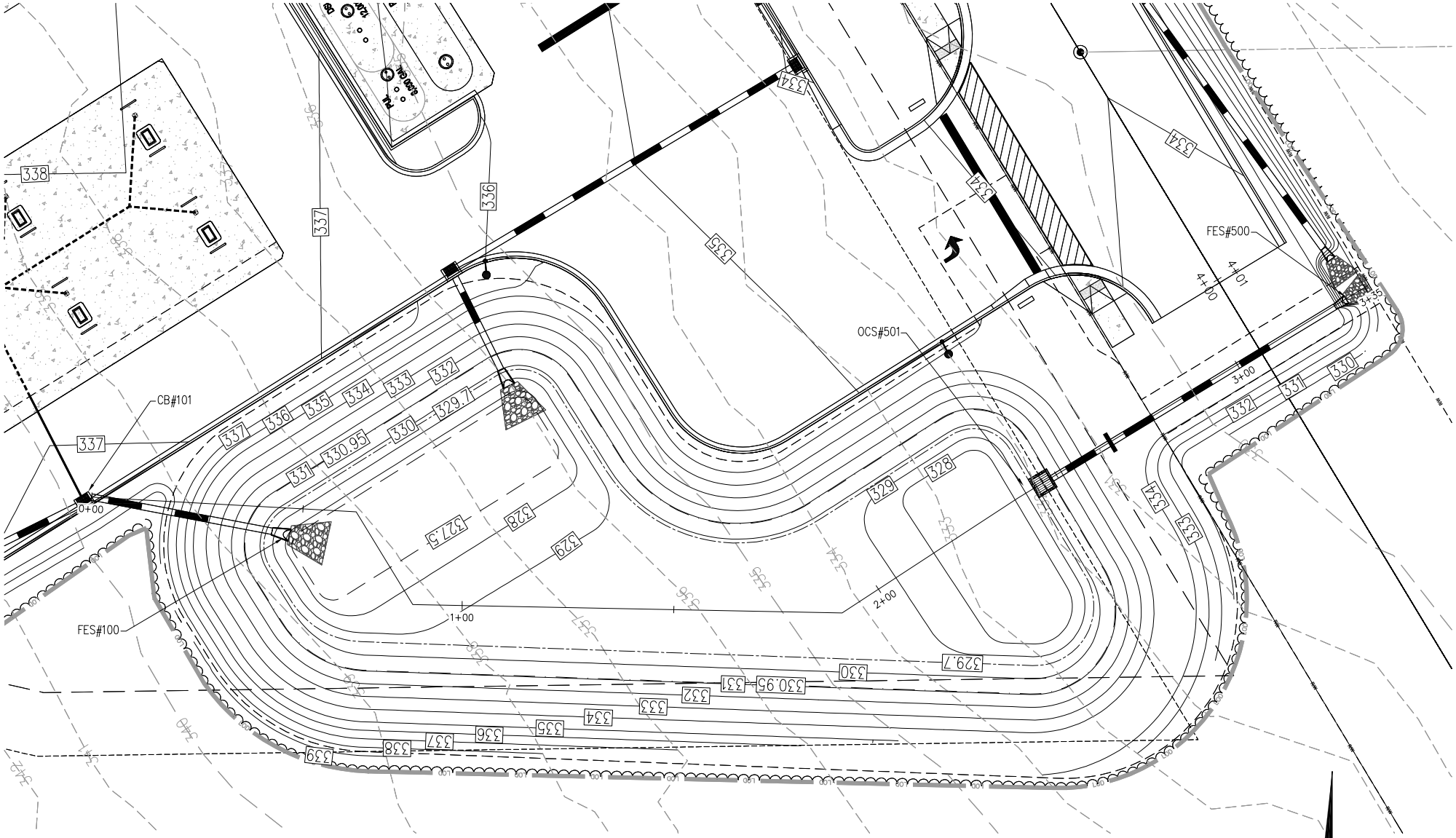
(IN FEET)

1 inch = 30 ft.

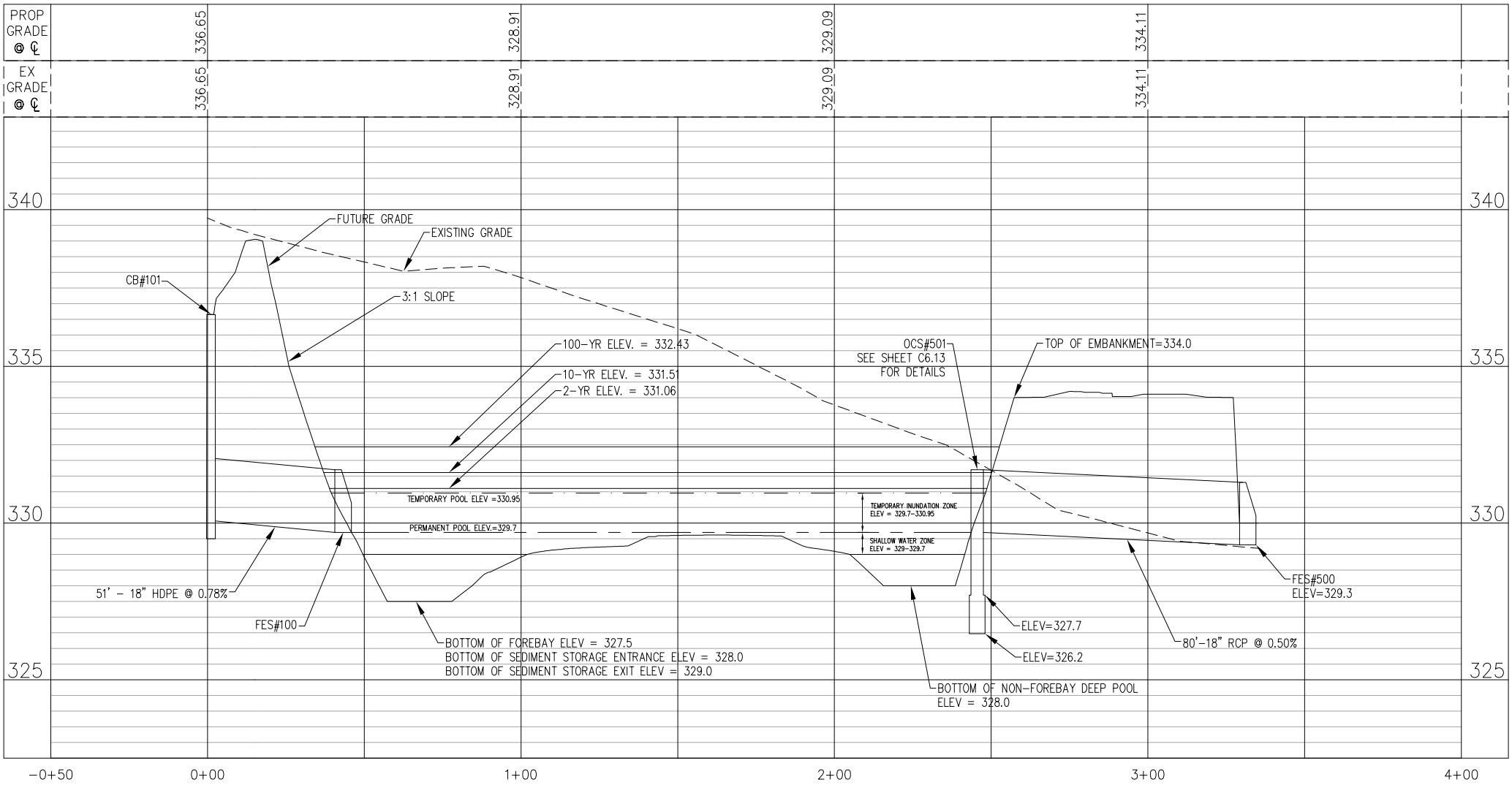


PROFILE OF STORMWATER WETLAND DETENTION SYSTEM

SCALE: N.T.S.


CB#101
FES#100
FES#500
OCS#501
0+00
1+00
2+00
3+00
4+00
4+01
3+35
337
336
335
334
333
332
330.95
330
329.7
331
328
329
327.5
338
339
GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.
N

PLAN VIEW



POND PROFILE VIEW

HORIZONTAL SCALE: 1"=30'

VERTICAL SCALE: 1"=3'

STAGE/STORAGE TABLE

STAGE (FT)	ELEVATION (FT)	CONTOUR AREA (SF)	INCREMENTAL STORAGE (CF)	TOTAL STORAGE (CF)
0.0	329.7	8,130	0	0
0.3	330.0	8,980	2,566	2,566
1.25	330.95	10,770	9,381	11,948 (WQV)
1.3	331.0	10,840	540	12,488
2.3	332.0	12,400	11,620	24,108
3.3	333.0	14,010	13,205	37,313
4.3	334.0	15,680	14,845	52,158

STORMWATER MANAGEMENT DESIGN STORMWATER WETLAND:

RIVER BASIN: NEUSE
RECEIVING STREAM: MOCCASIN 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:	3.16 ACRES
SITE IMPERVIOUS AREA TO POND:	1.77 ACRES
OFF-SITE DESIGN IMPERVIOUS AREA TO POND:	0.14 ACRES
TOTAL DESIGN IMPERVIOUS AREA TO POND:	1.91 ACRES

	PRE-DEVELOPED TO POND	POST-DEVELOPED TO POND	POST DEVELOPED THROUGH POND	POST DEVELOPED BYPASS	POST DEVELOPED COMBINED
DRAINAGE AREA:	3.41 AC	3.16 AC		0.13 AC	
CURVE NUMBER:	57	83		73	
TIME OF CONCENTRATION:	24 MIN	5 MIN		10 MIN	
1.0" STORM EVENT:		0.245 CFS	0.018 CFS		
1-YEAR STORM EVENT:	0.224 CFS	7.077 CFS	0.062 CFS	0.136 CFS	0.198 CFS
2-YEAR STORM EVENT:	0.743 CFS	9.702 CFS	0.263 CFS	0.212 CFS	0.475 CFS
10-EAR STORM EVENT:	3.321 CFS	17.25 CFS	2.248 CFS	0.449 CFS	2.697 CFS
100-YEAR STORM EVENT:	9.617 CFS	30.29 CFS	10.72 CFS	0.902 CFS	11.62 CFS

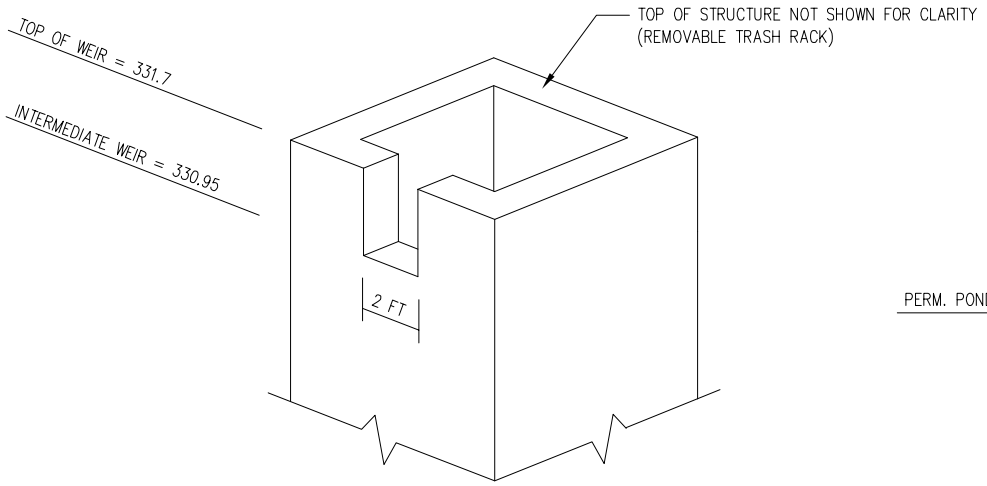
TYPICAL SHALLOW WATER PLANTING SCHEDULE

SCIENTIFIC NAME	COMMON NAME	PLANTING ZONE	QUANTITY	HEIGHT	IDEAL DEPTH	NURSERY CONTAINER TYPE	SPACING	PLANTING SEASON
Juncus effusus	Common Rush	SHALLOW WATER	291	9" FOLIAGE HEIGHT	0-2"	4" TEA POT	2' O.C.	SPRING/SUMMER
Lilaeopsis carolinensis	Carolina Grasswort	SHALLOW WATER	291	9" FOLIAGE HEIGHT	0-9"	4" TEA POT	2' O.C.	SPRING/SUMMER
Schoenoplectus tabernaemontani	Softstem Bulrush	SHALLOW WATER	291	9" FOLIAGE HEIGHT	0-6"	4" TEA POT	2' O.C.	SPRING/SUMMER

TYPICAL TEMPORARY INUNDATION ZONE PLANTING SCHEDULE

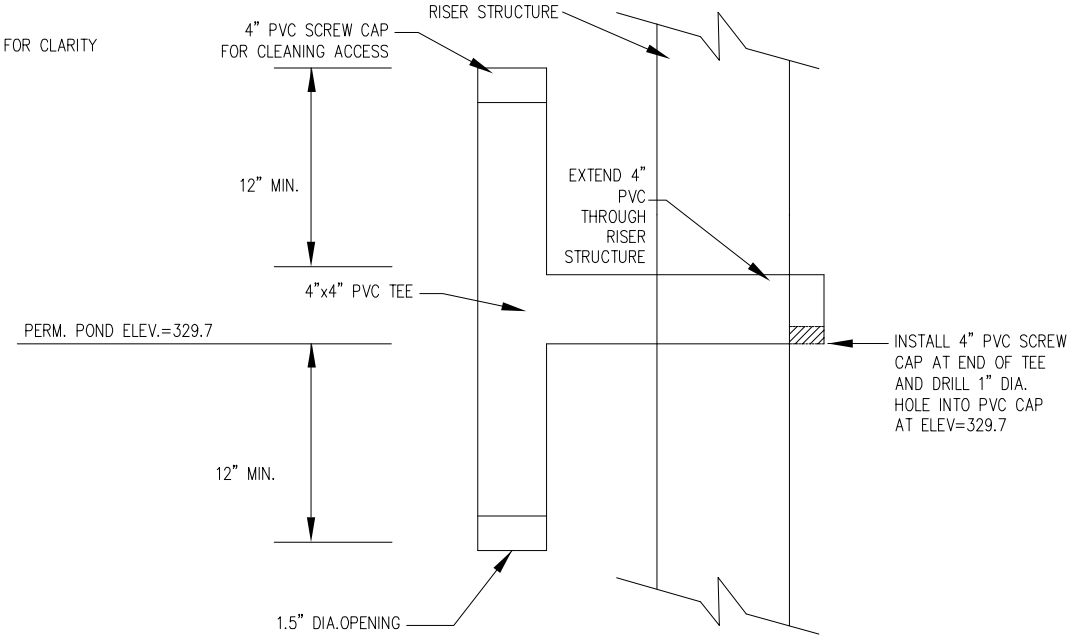
SCIENTIFIC NAME	COMMON NAME	PLANTING ZONE	QUANTITY	HEIGHT	NURSERY CONTAINER TYPE	SPACING	PLANTING SEASON
Eutrochium dubium	Coastal Joy Pye Weed	SHALLOW LAND	219	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER
Eupatorium erfoliatum	Boneset	SHALLOW LAND	219	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER
Rhynchospora colorata	Starrush Whitetop	SHALLOW LAND	219	9" FOLIAGE HEIGHT	4" TEA POT	2' O.C.	SPRING/SUMMER

PLANTINGS



OUTLET CONTROL STRUCTURE - INCREMENTAL WEIR

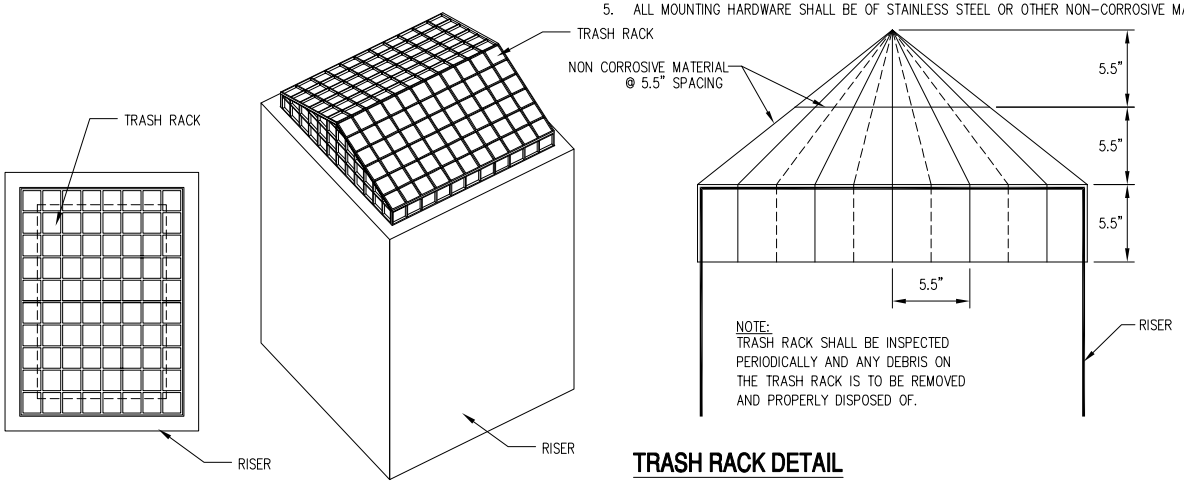
SCALE: N.T.S.



PVC DRAIN OUTLET

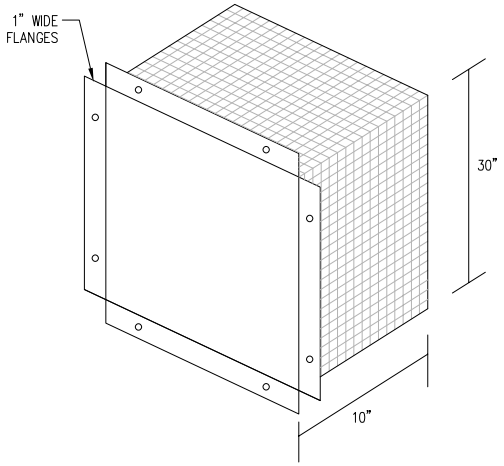
SCALE: N.T.S.

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



CONTRACTOR SHALL FABRICATE THE TRASH TRAP FROM ⅜" MESH, GALVANIZED WIRE. ATTACHED TO CONCRETE STRUCTURE TO BE MADE USING 8-#8 STAINLESS STEEL CONCRETE SCREWS AND WASHERS.

Hydrograph Summary Report

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

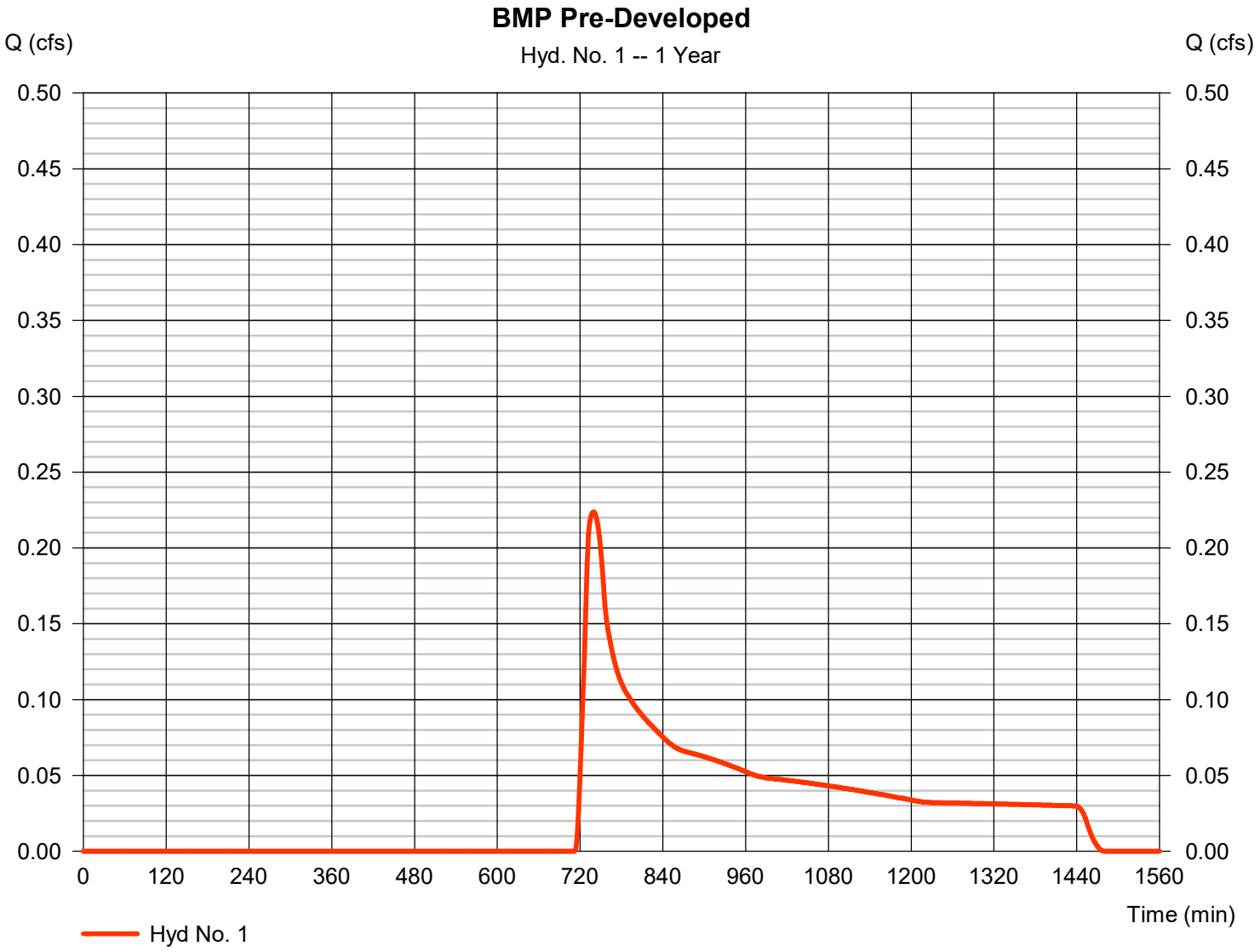
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.224	2	740	2,464	------	------	------	BMP Pre-Developed
2	SCS Runoff	7.077	2	718	14,268	------	------	------	BMP Post-Developed
3	Reservoir	0.062	2	1442	13,023	2	330.92	11,643	Post Through Detention
4	SCS Runoff	0.136	2	722	375	------	------	------	BMP Post-Developed Bypass
7	SCS Runoff	0.245	2	152	1,420	------	------	------	BMP Post-Developed
8	Reservoir	0.018	2	366	1,234	7	329.85	1,289	1.0-in Storm Thru Pond

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.224 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	2,464 cuft
Drainage area	=	3.410 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	24.00 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

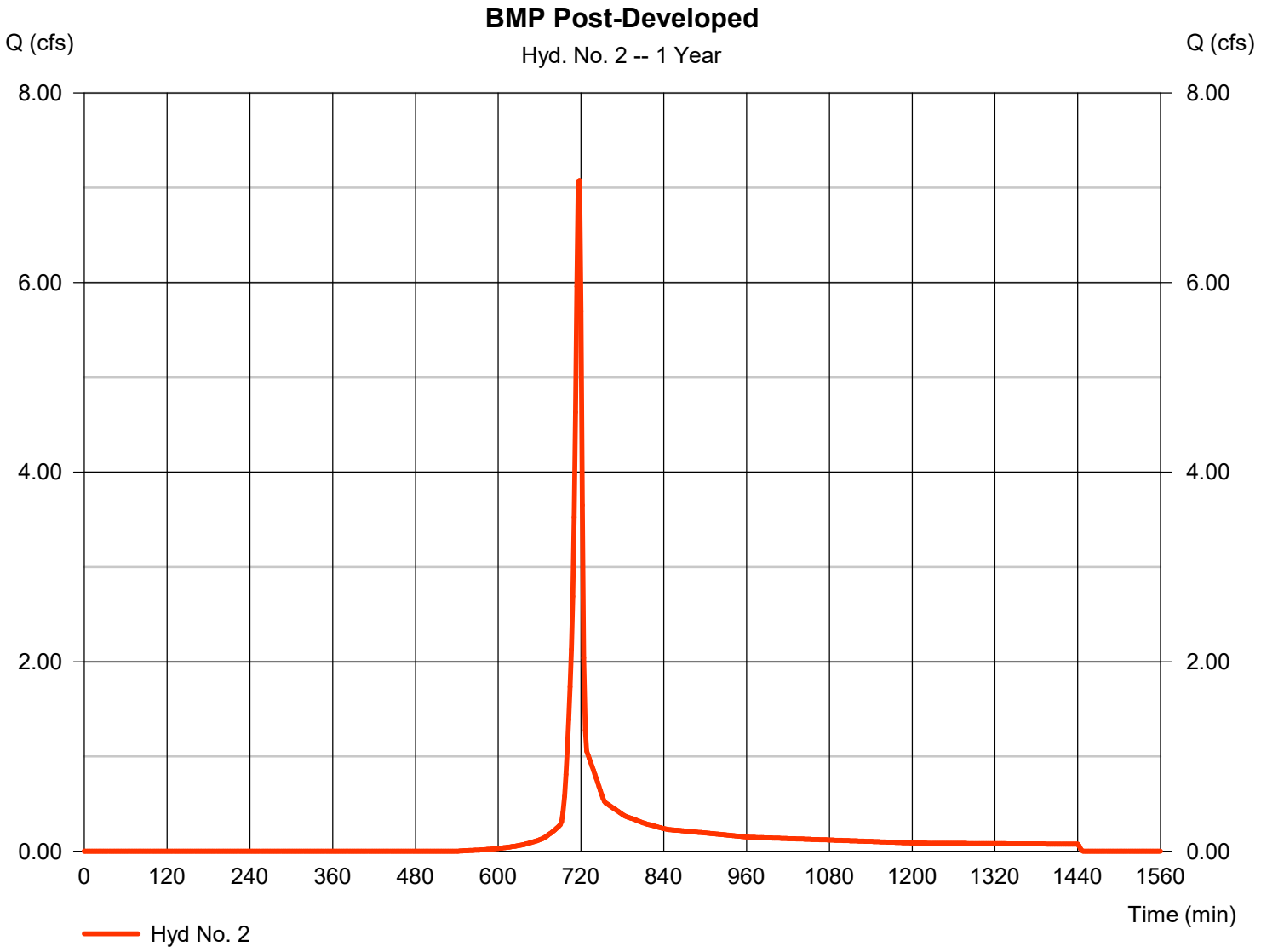


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.077 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	14,268 cuft
Drainage area	=	3.160 ac	Curve number	=	83
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



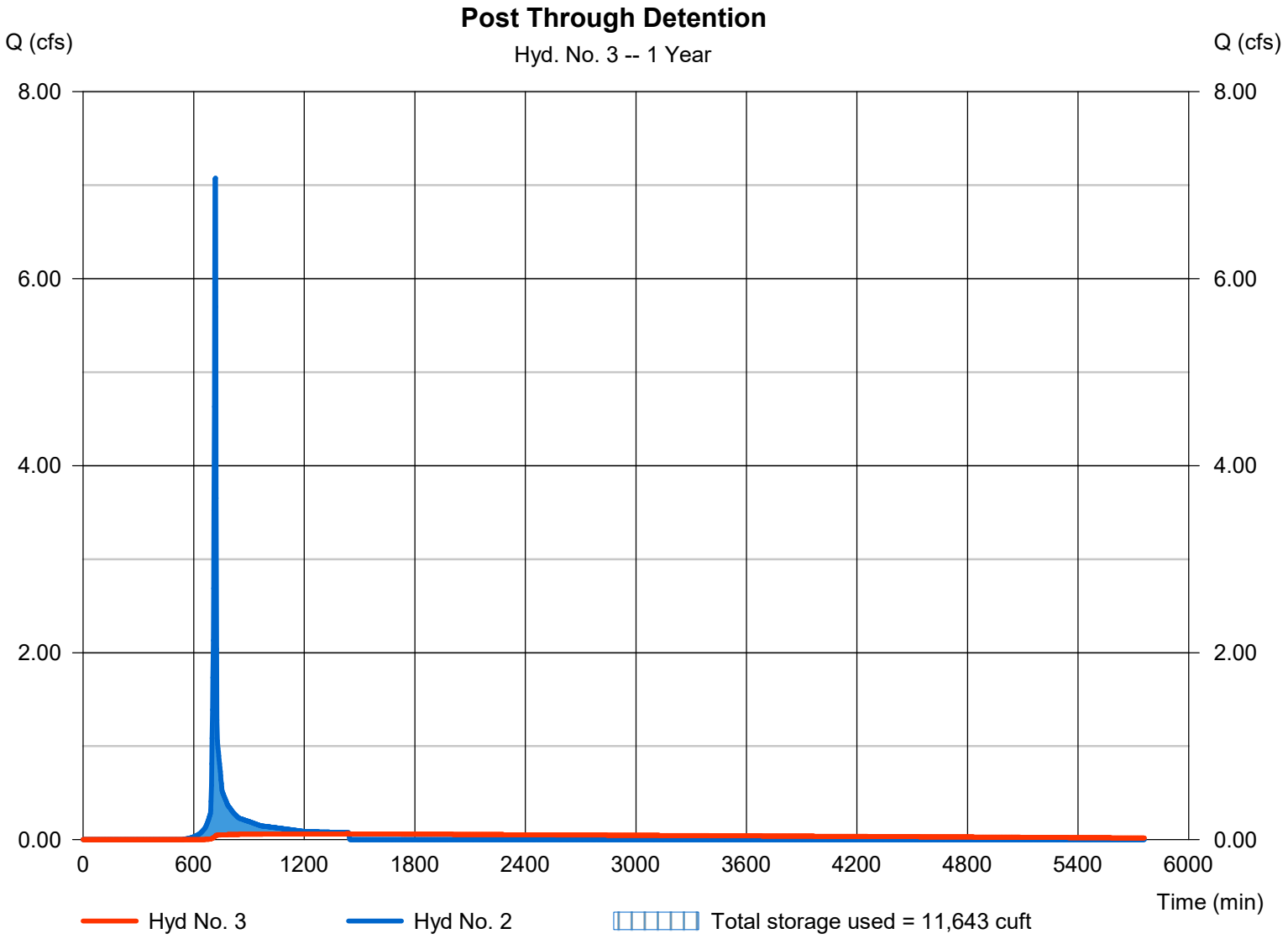
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.062 cfs
Storm frequency	=	1 yrs	Time to peak	=	1442 min
Time interval	=	2 min	Hyd. volume	=	13,023 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	330.92 ft
Reservoir name	=	BMP Pond	Max. Storage	=	11,643 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	8,130	0	0
0.30	330.00	8,980	2,566	2,566
1.25	330.95	10,770	9,381	11,948
1.30	331.00	10,840	540	12,488
2.30	332.00	12,400	11,620	24,108
3.30	333.00	14,010	13,205	37,313
4.30	334.00	15,680	14,845	52,158

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.50	Inactive	0.00
Span (in)	= 18.00	1.50	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 329.70	329.70	330.95	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

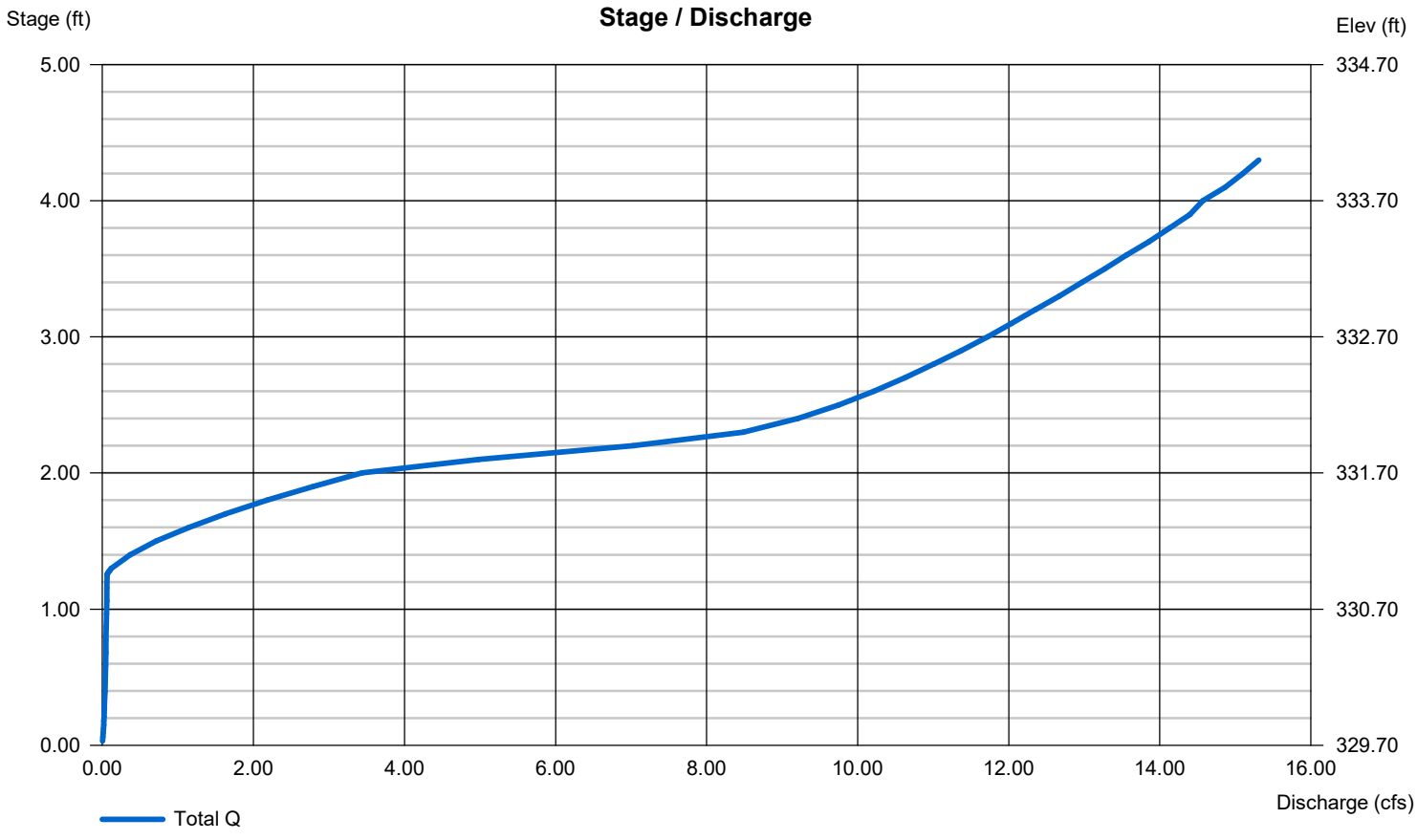
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	14.00	Inactive	Inactive
Crest El. (ft)	= 330.95	331.70	0.00	0.00
Weir Coeff.	= 2.60	2.60	3.33	3.33
Weir Type	= Rect	Broad	Rect	---
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).

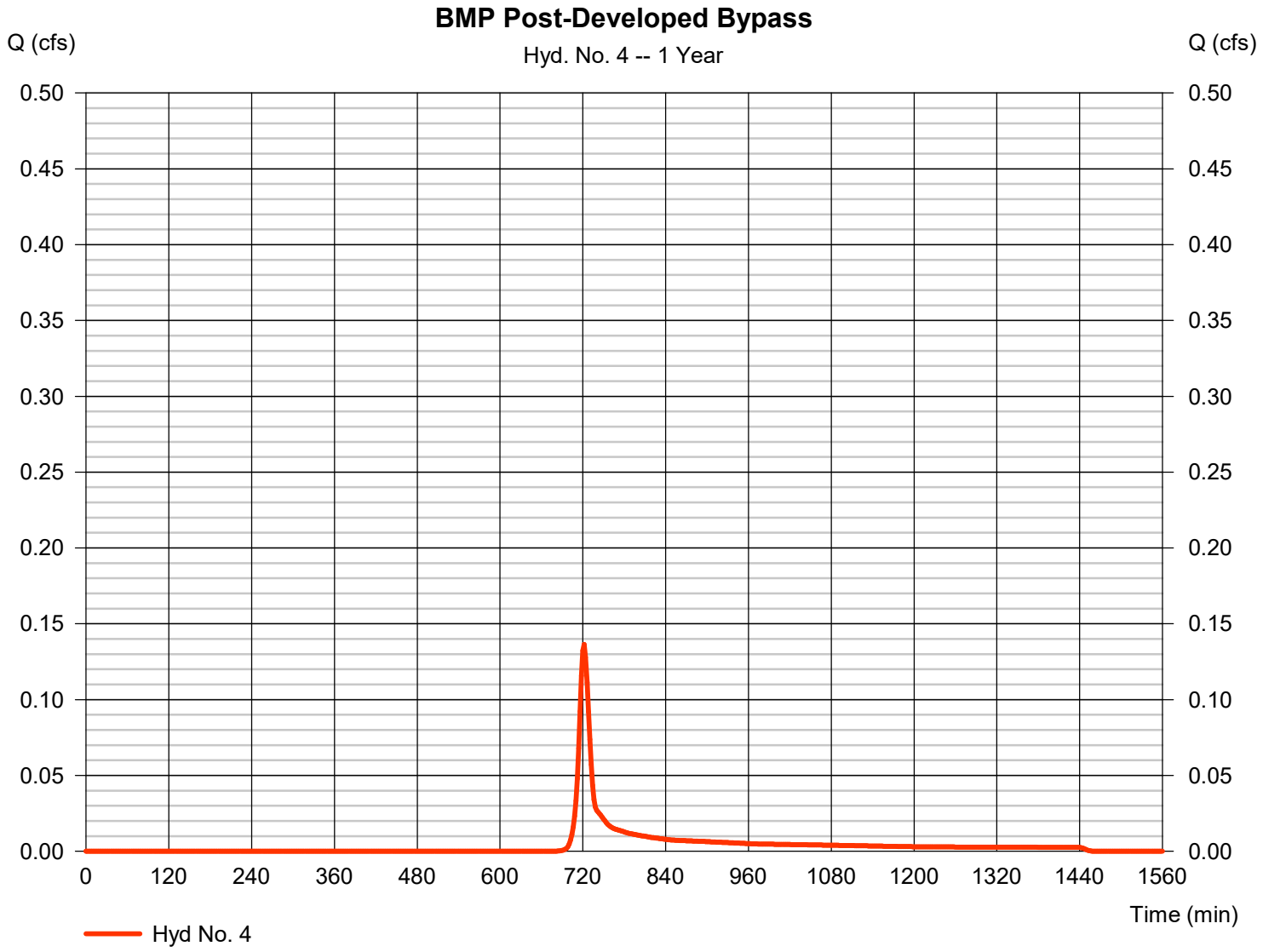


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.136 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 375 cuft
Drainage area	= 0.130 ac	Curve number	= 73.1
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

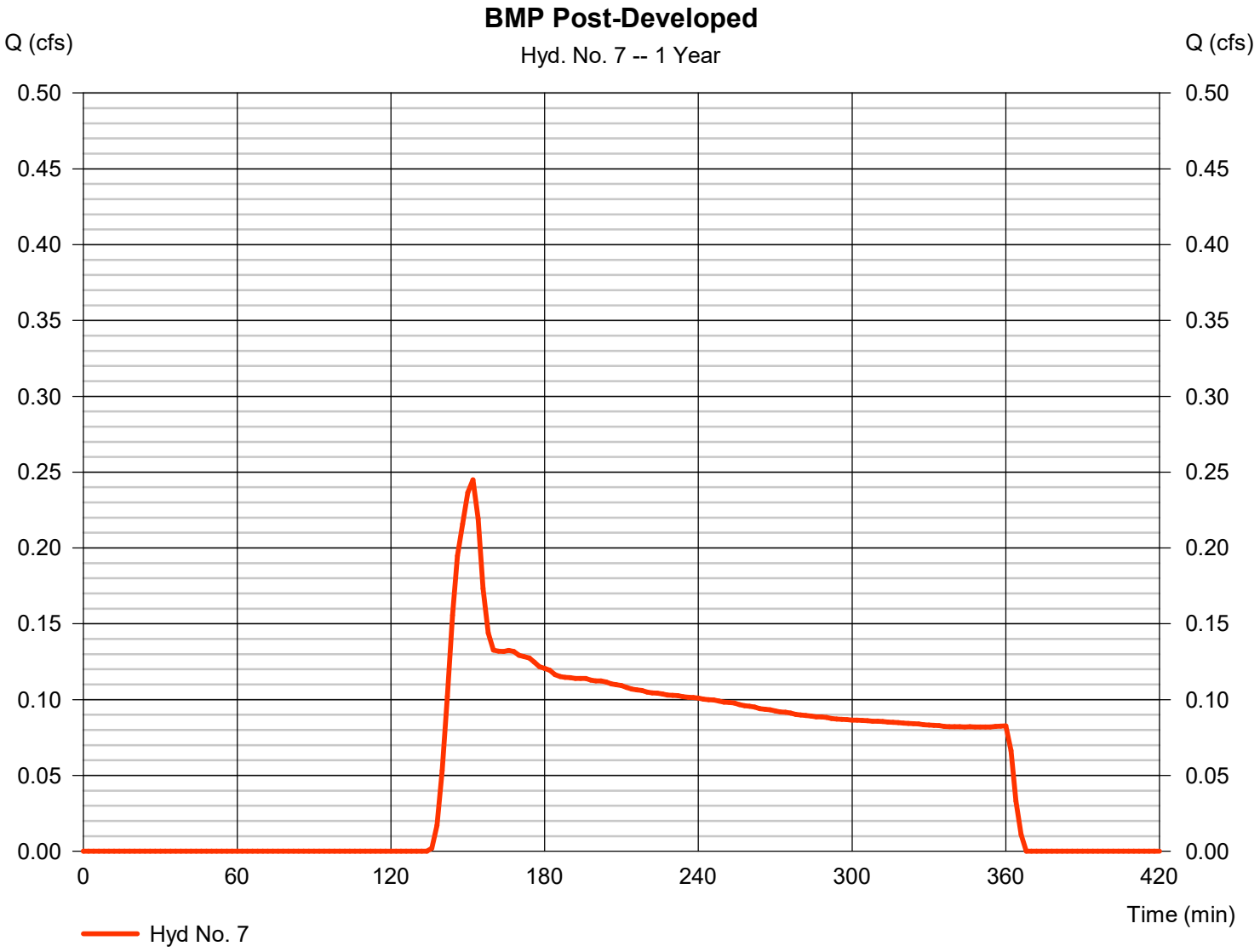


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.245 cfs
Storm frequency	=	1 yrs	Time to peak	=	152 min
Time interval	=	2 min	Hyd. volume	=	1,420 cuft
Drainage area	=	3.160 ac	Curve number	=	83
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



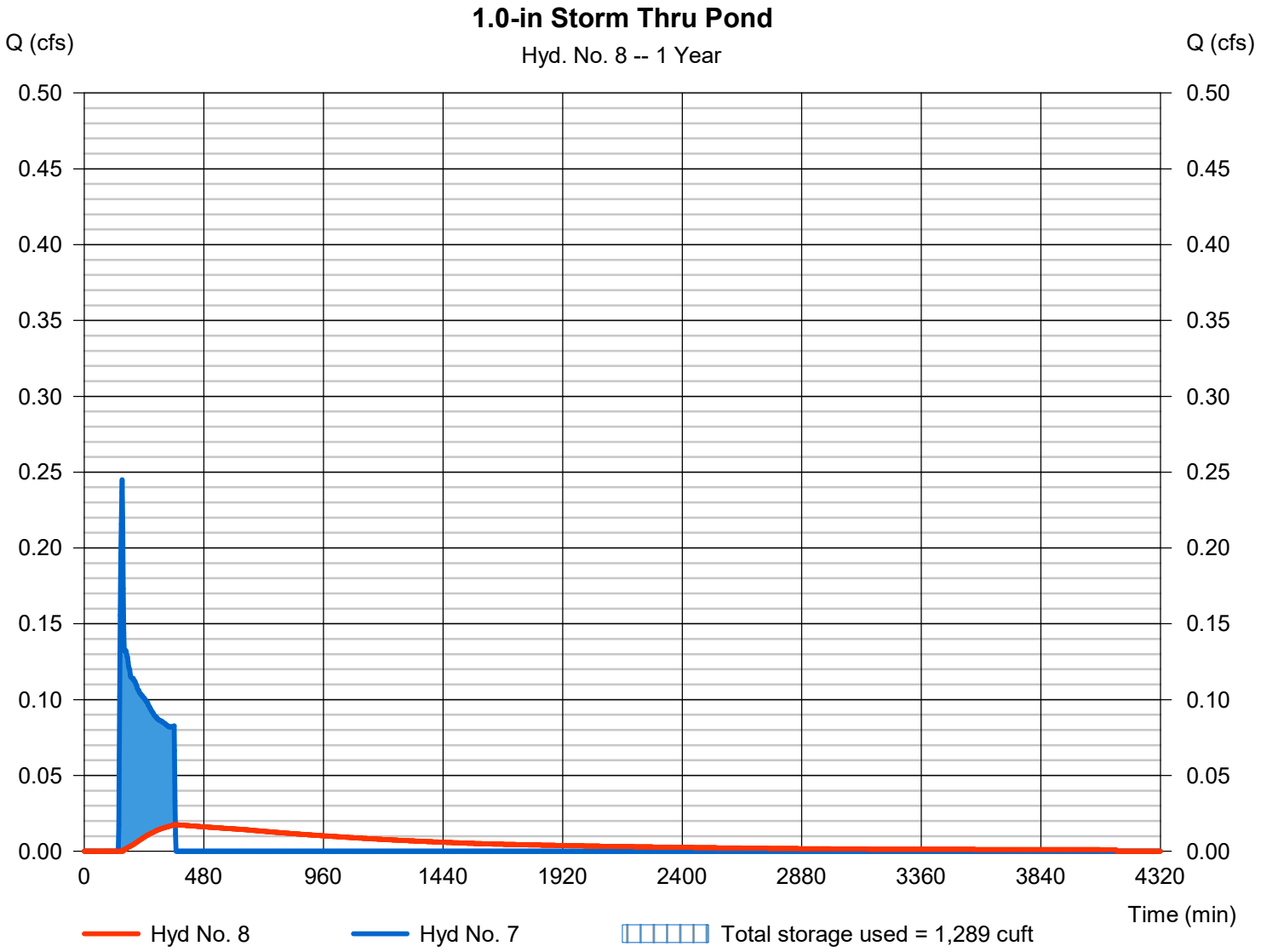
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.018 cfs
Storm frequency	=	1 yrs	Time to peak	=	366 min
Time interval	=	2 min	Hyd. volume	=	1,234 cuft
Inflow hyd. No.	=	7 - BMP Post-Developed	Max. Elevation	=	329.85 ft
Reservoir name	=	BMP Pond	Max. Storage	=	1,289 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	8,130	0	0
0.30	330.00	8,980	2,566	2,566
1.25	330.95	10,770	9,381	11,948
1.30	331.00	10,840	540	12,488
2.30	332.00	12,400	11,620	24,108
3.30	333.00	14,010	13,205	37,313
4.30	334.00	15,680	14,845	52,158

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.50	Inactive	0.00
Span (in)	= 18.00	1.50	0.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 329.70	329.70	330.95	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

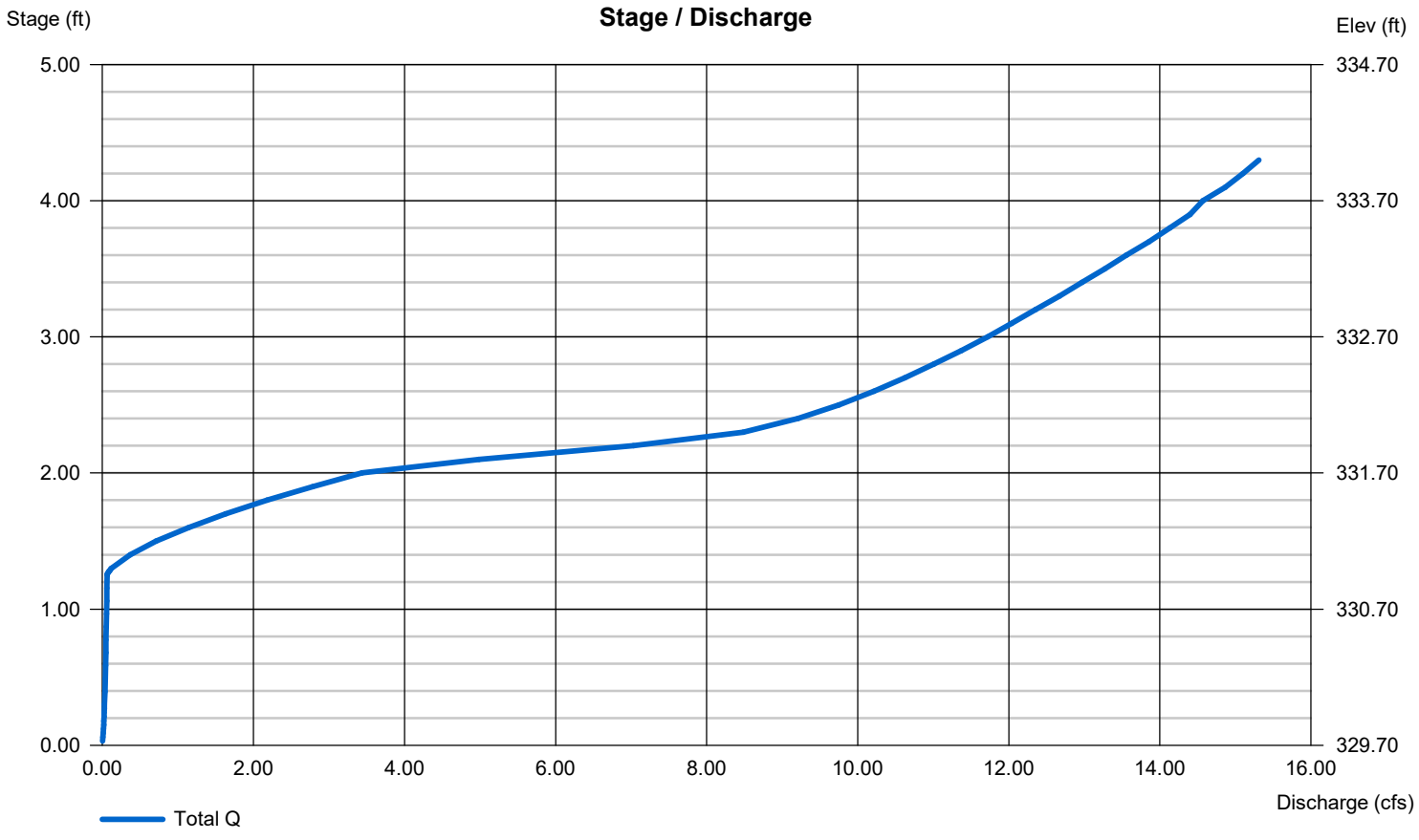
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 2.00	14.00	Inactive	Inactive
Crest El. (ft)	= 330.95	331.70	0.00	0.00
Weir Coeff.	= 2.60	2.60	3.33	3.33
Weir Type	= Rect	Broad	Rect	---
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

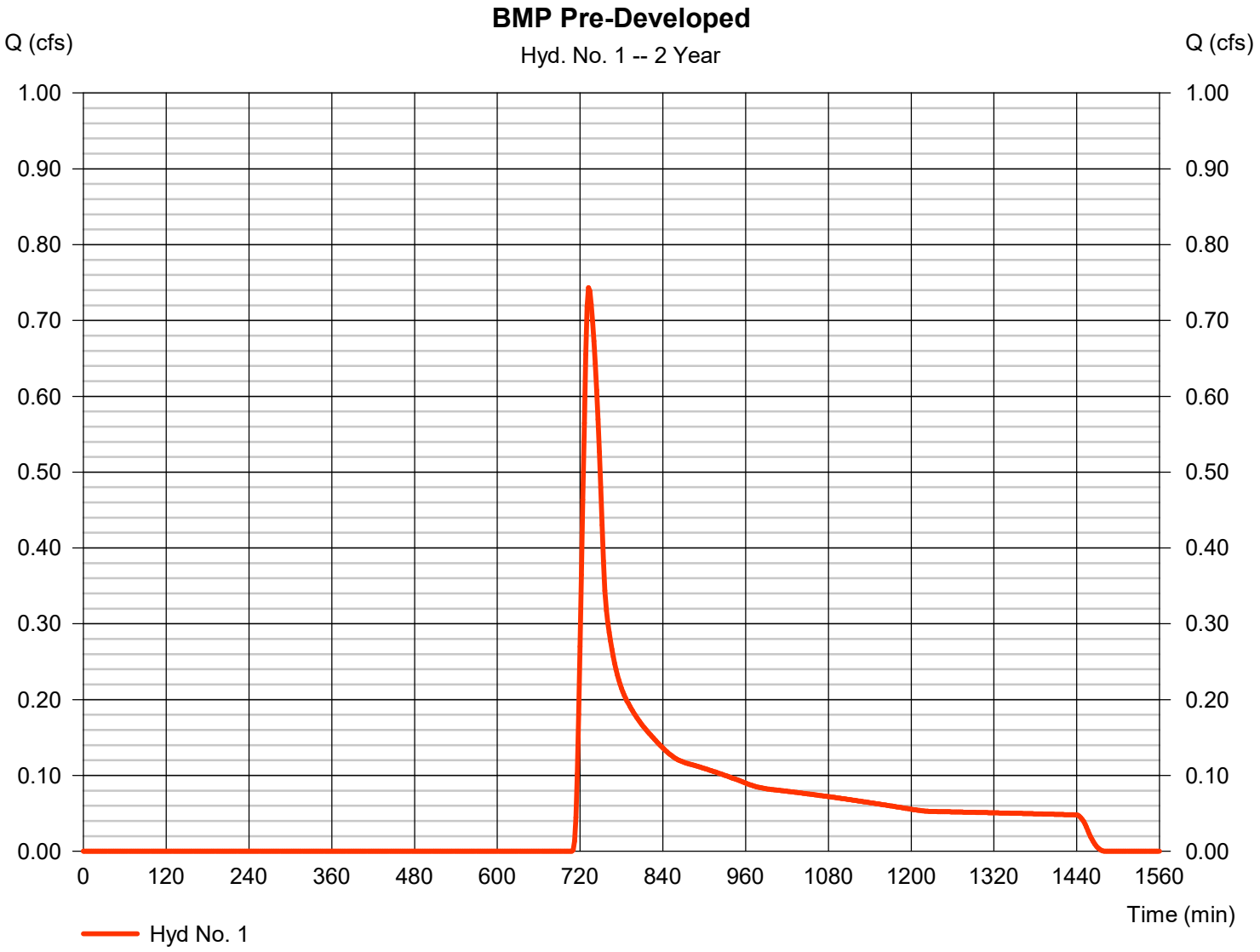
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.743	2	732	4,885	------	------	------	BMP Pre-Developed
2	SCS Runoff	9.702	2	716	19,625	------	------	------	BMP Post-Developed
3	Reservoir	0.263	2	888	18,194	2	331.06	13,164	Post Through Detention
4	SCS Runoff	0.212	2	722	564	------	------	------	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	=	0.743 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	4,885 cuft
Drainage area	=	3.410 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	24.00 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

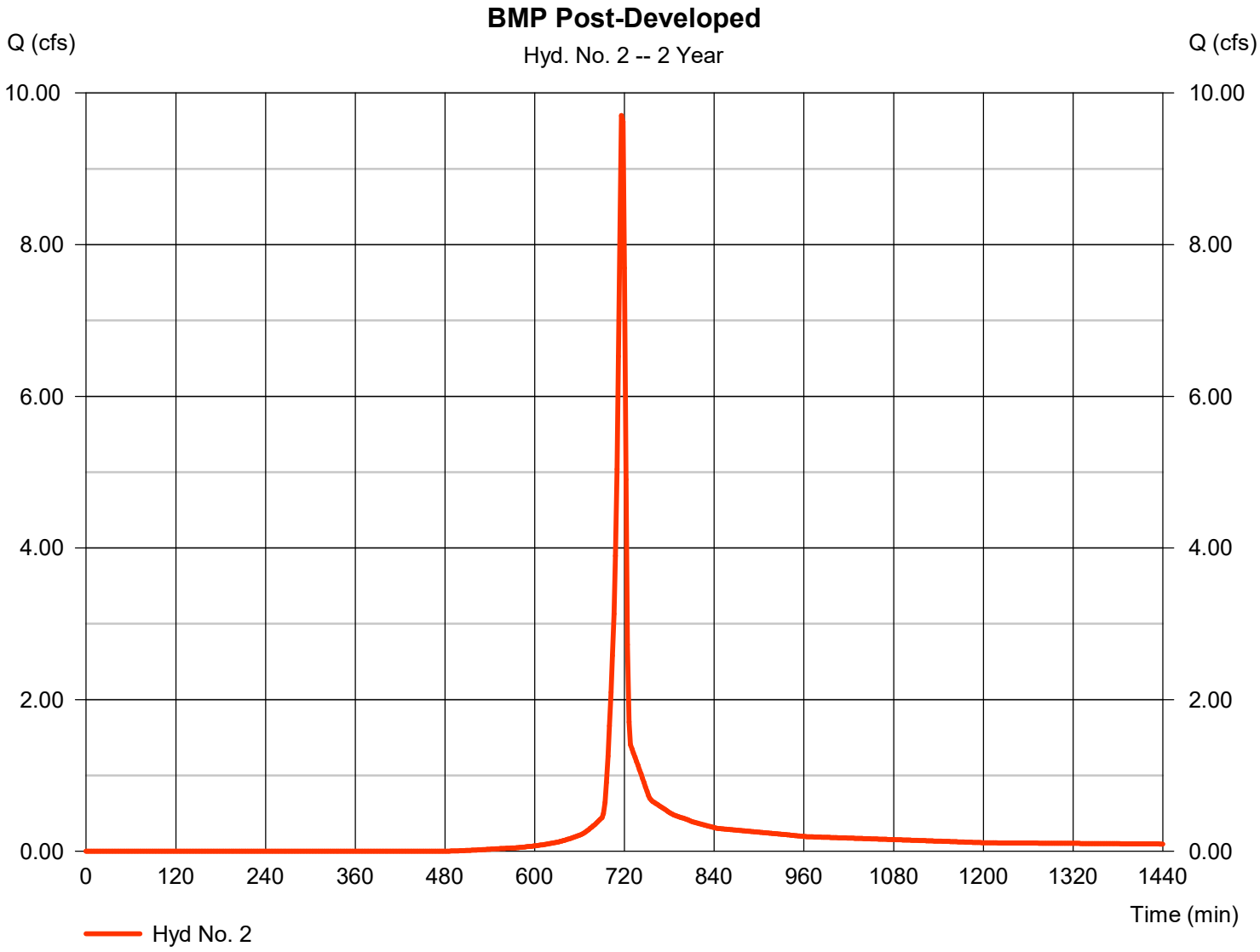


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 9.702 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 19,625 cuft
Drainage area	= 3.160 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.46 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



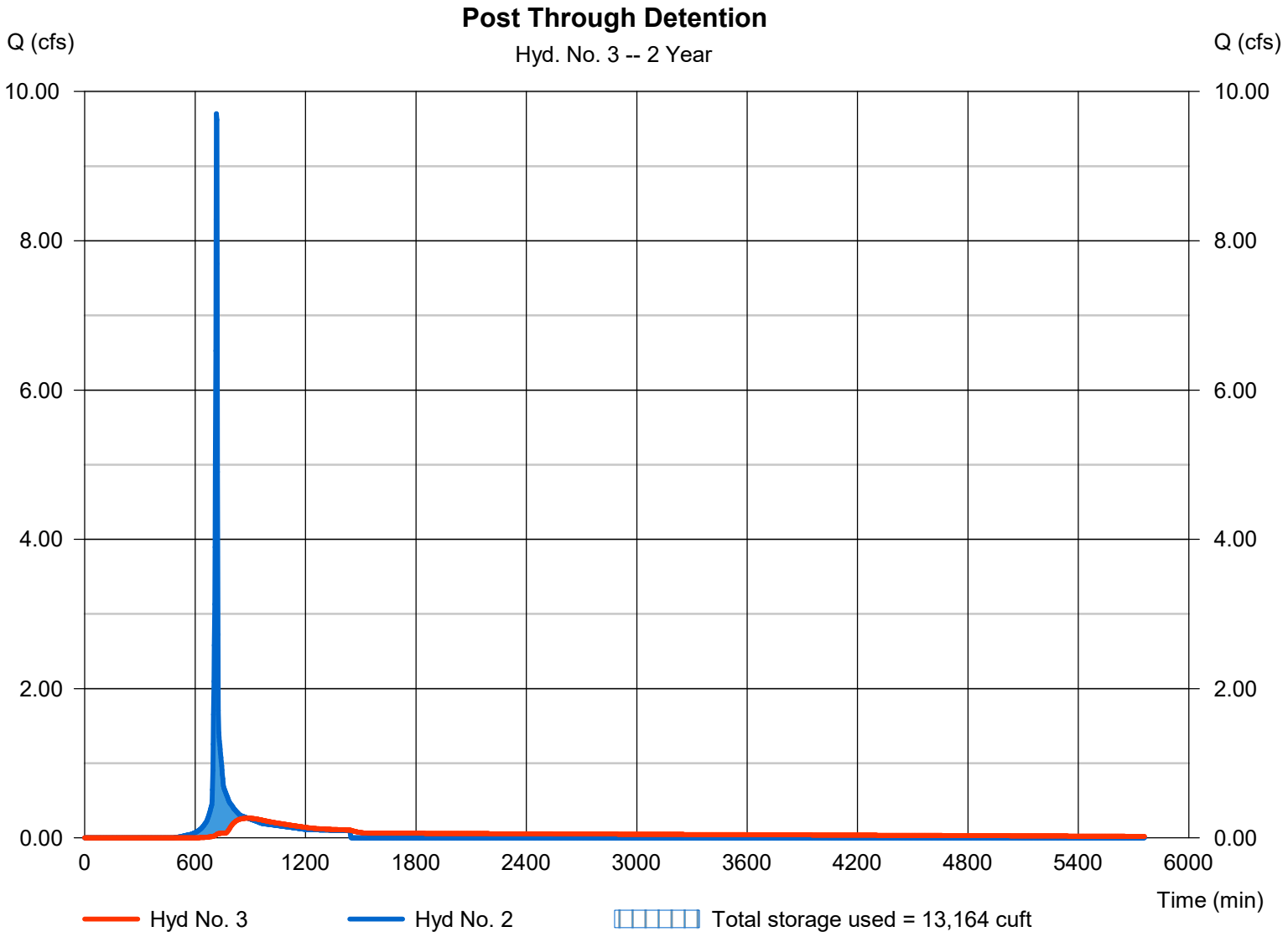
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.263 cfs
Storm frequency	=	2 yrs	Time to peak	=	888 min
Time interval	=	2 min	Hyd. volume	=	18,194 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	331.06 ft
Reservoir name	=	BMP Pond	Max. Storage	=	13,164 cuft

Storage Indication method used.

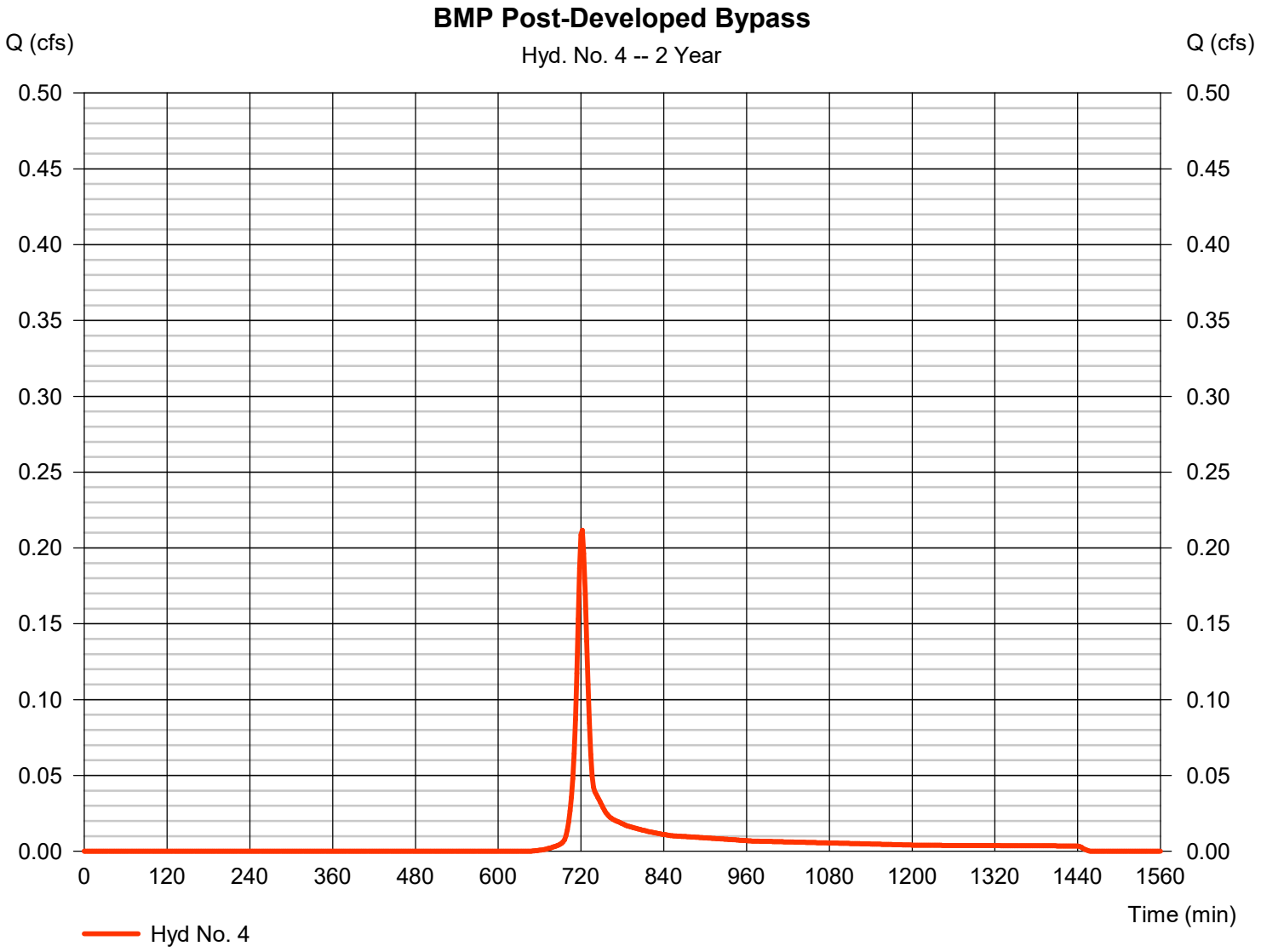


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.212 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	564 cuft
Drainage area	=	0.130 ac	Curve number	=	73.1
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

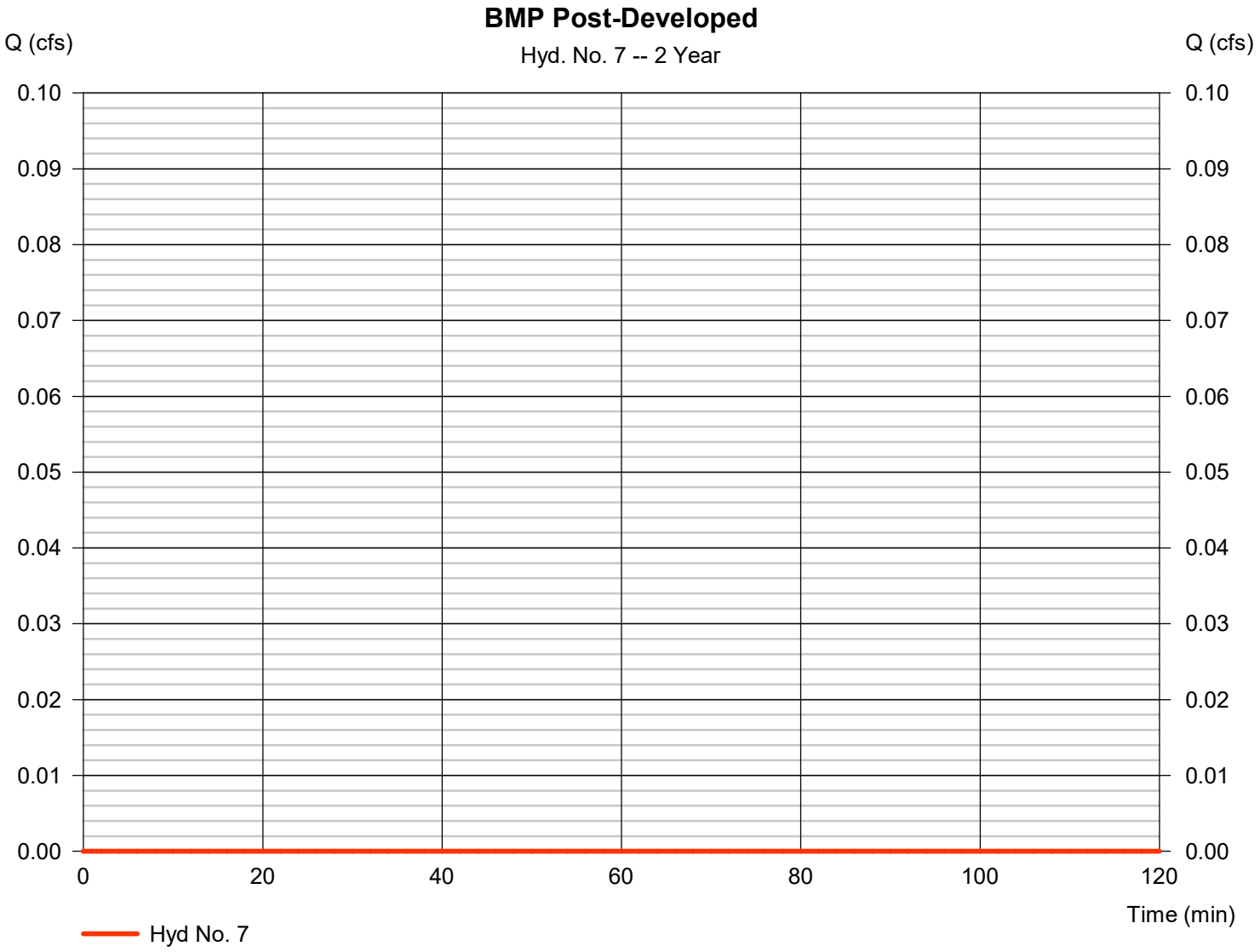


Hydrograph Report

Hyd. No. 7

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	n/a
Time interval	=	2 min	Hyd. volume	=	0 cuft
Drainage area	=	3.160 ac	Curve number	=	83
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



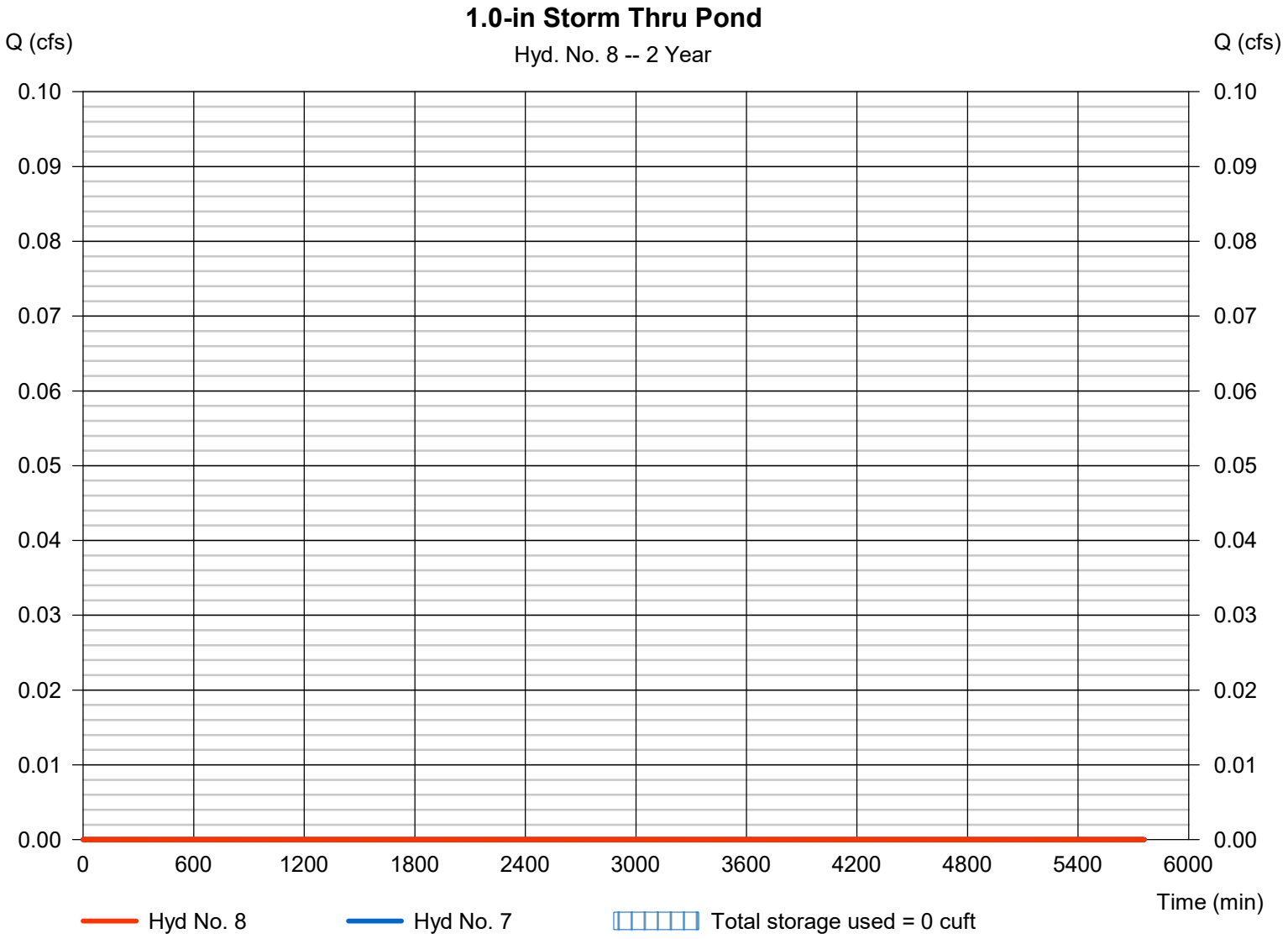
Hydrograph Report

Hyd. No. 8

1.0-in Storm Thru Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 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

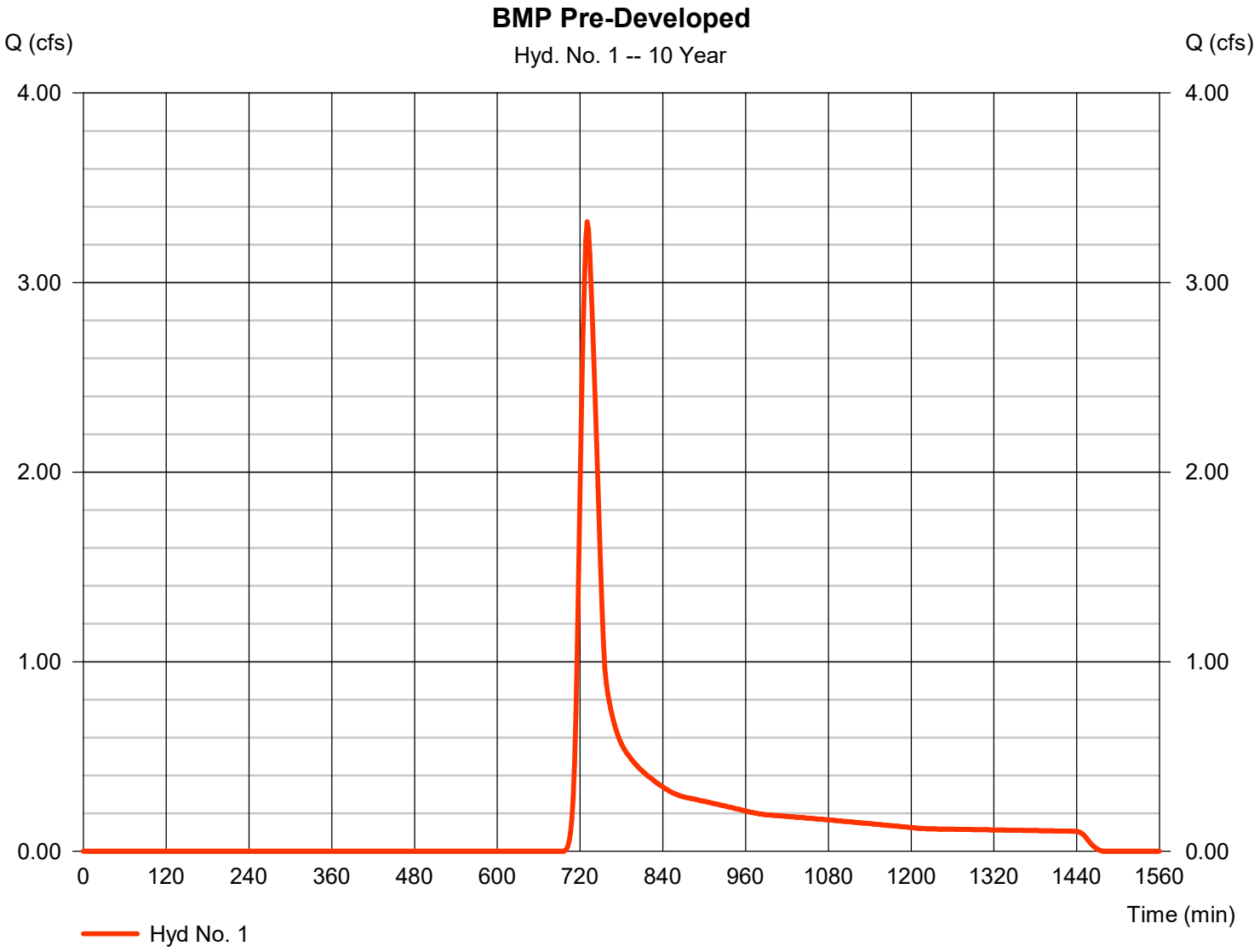
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.321	2	730	14,377	------	------	------	BMP Pre-Developed
2	SCS Runoff	17.25	2	716	35,499	------	------	------	BMP Post-Developed
3	Reservoir	2.248	2	730	34,021	2	331.51	18,422	Post Through Detention
4	SCS Runoff	0.449	2	720	1,168	------	------	------	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	=	3.321 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	14,377 cuft
Drainage area	=	3.410 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	24.00 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

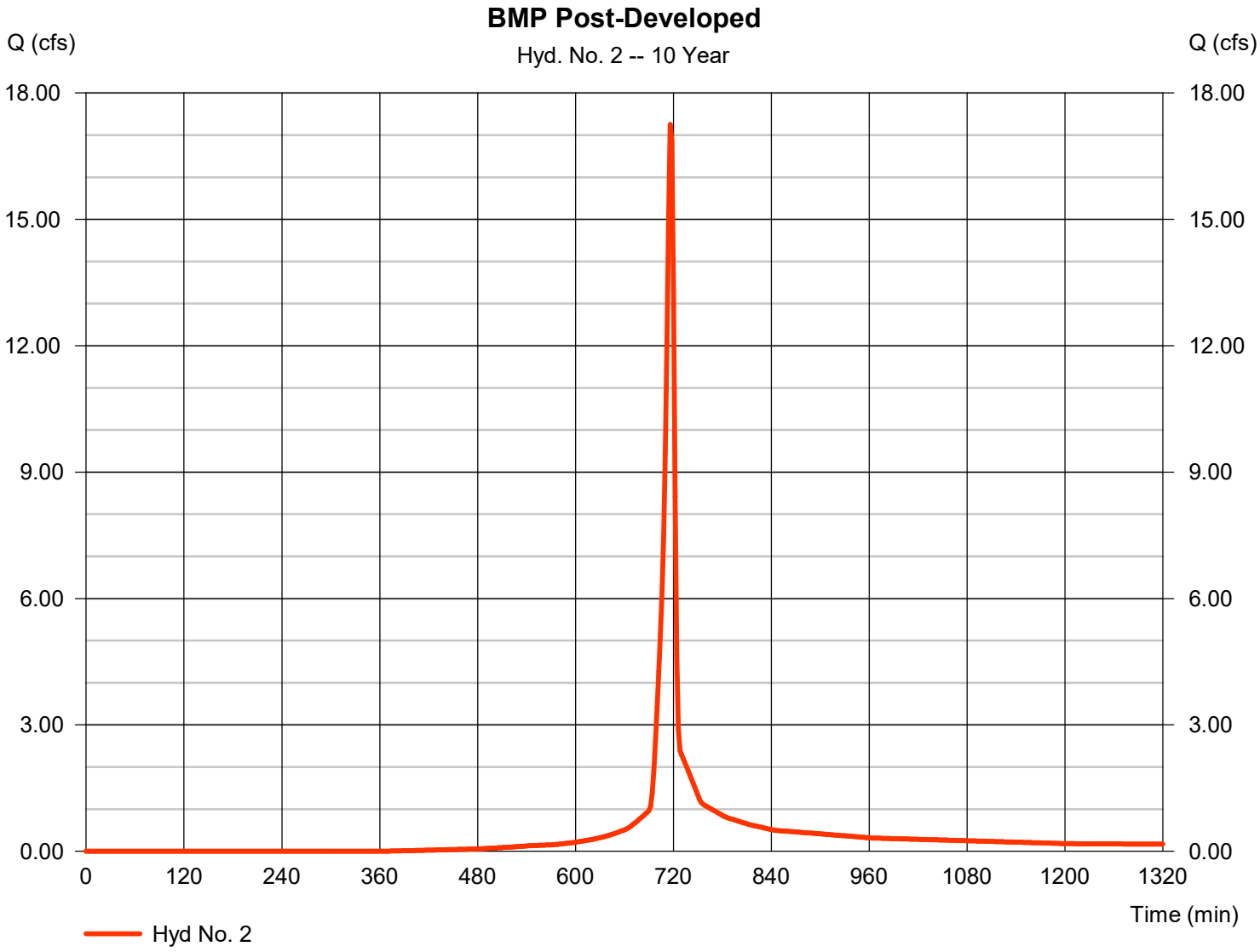


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.25 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	35,499 cuft
Drainage area	=	3.160 ac	Curve number	=	83
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



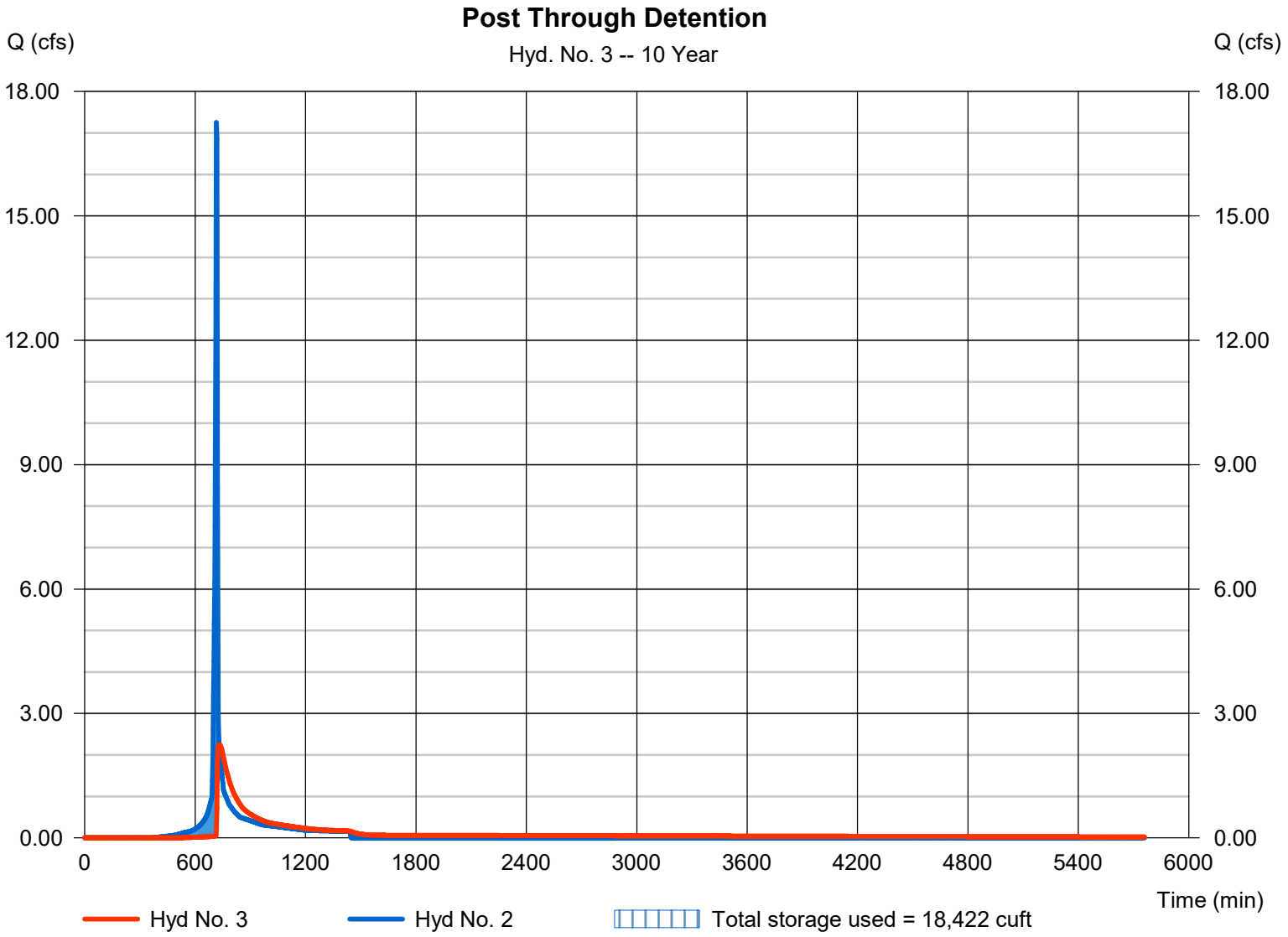
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	2.248 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	34,021 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	331.51 ft
Reservoir name	=	BMP Pond	Max. Storage	=	18,422 cuft

Storage Indication method used.

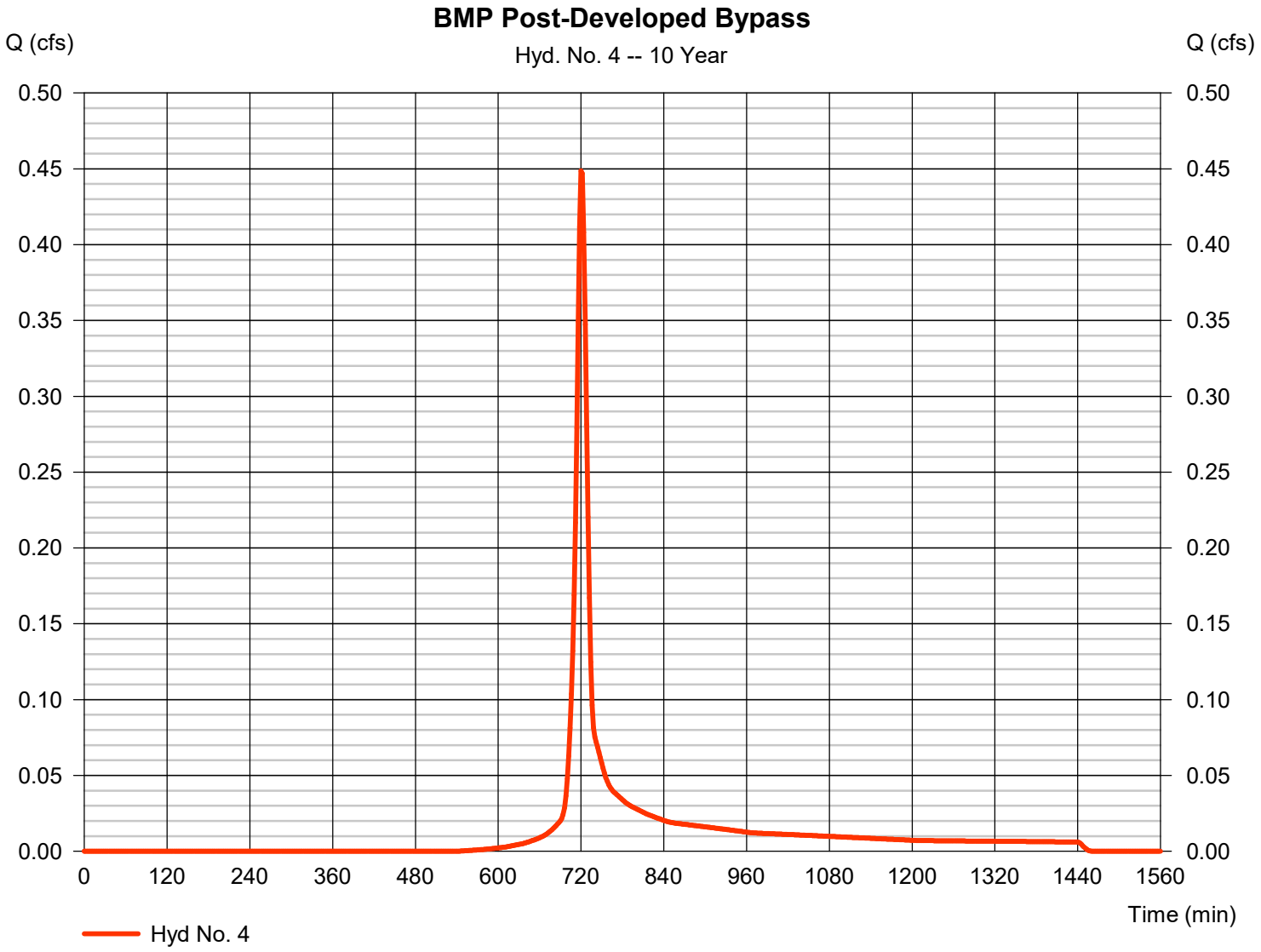


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.449 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	1,168 cuft
Drainage area	=	0.130 ac	Curve number	=	73.1
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

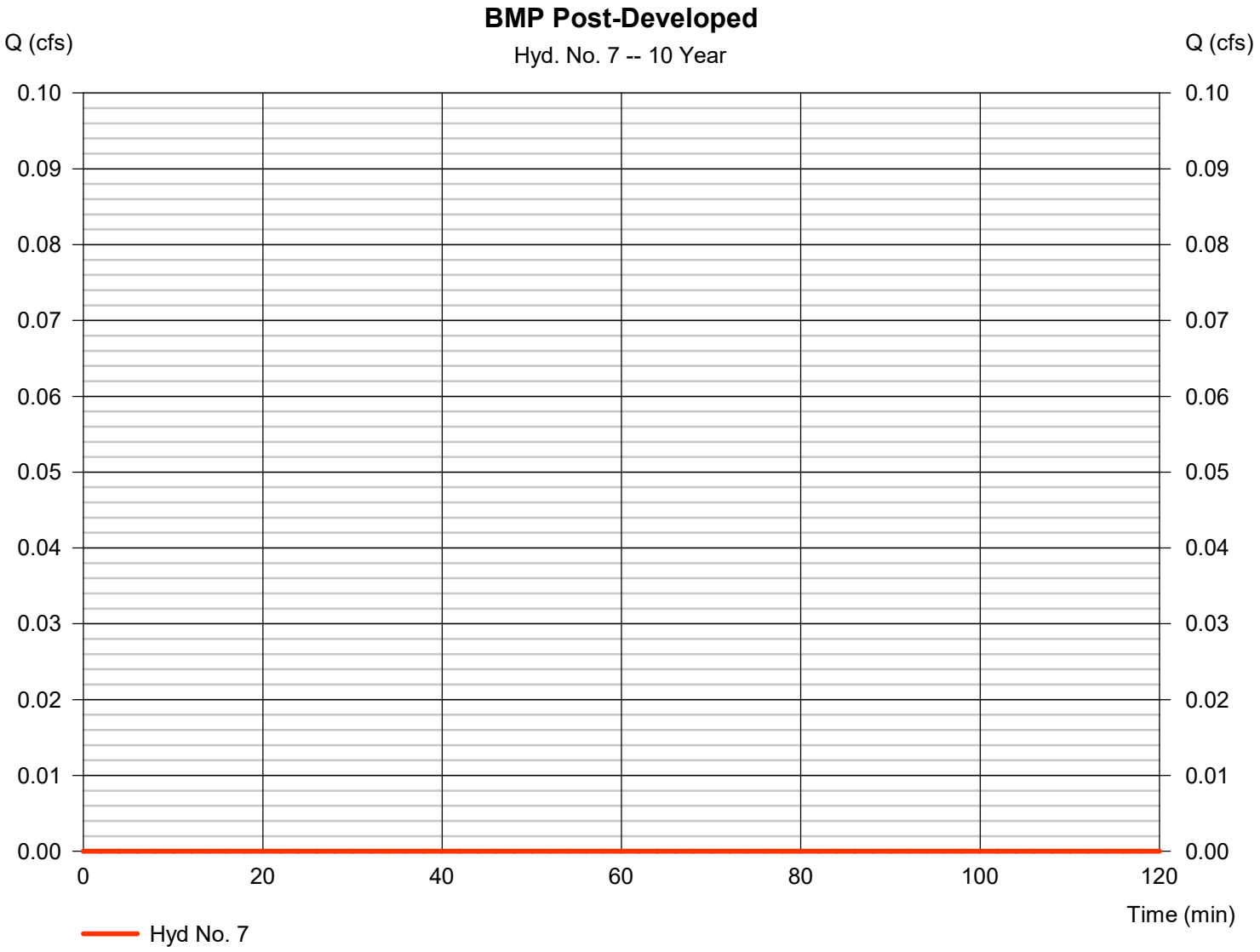


Hydrograph Report

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	=	3.160 ac	Curve number	=	83
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



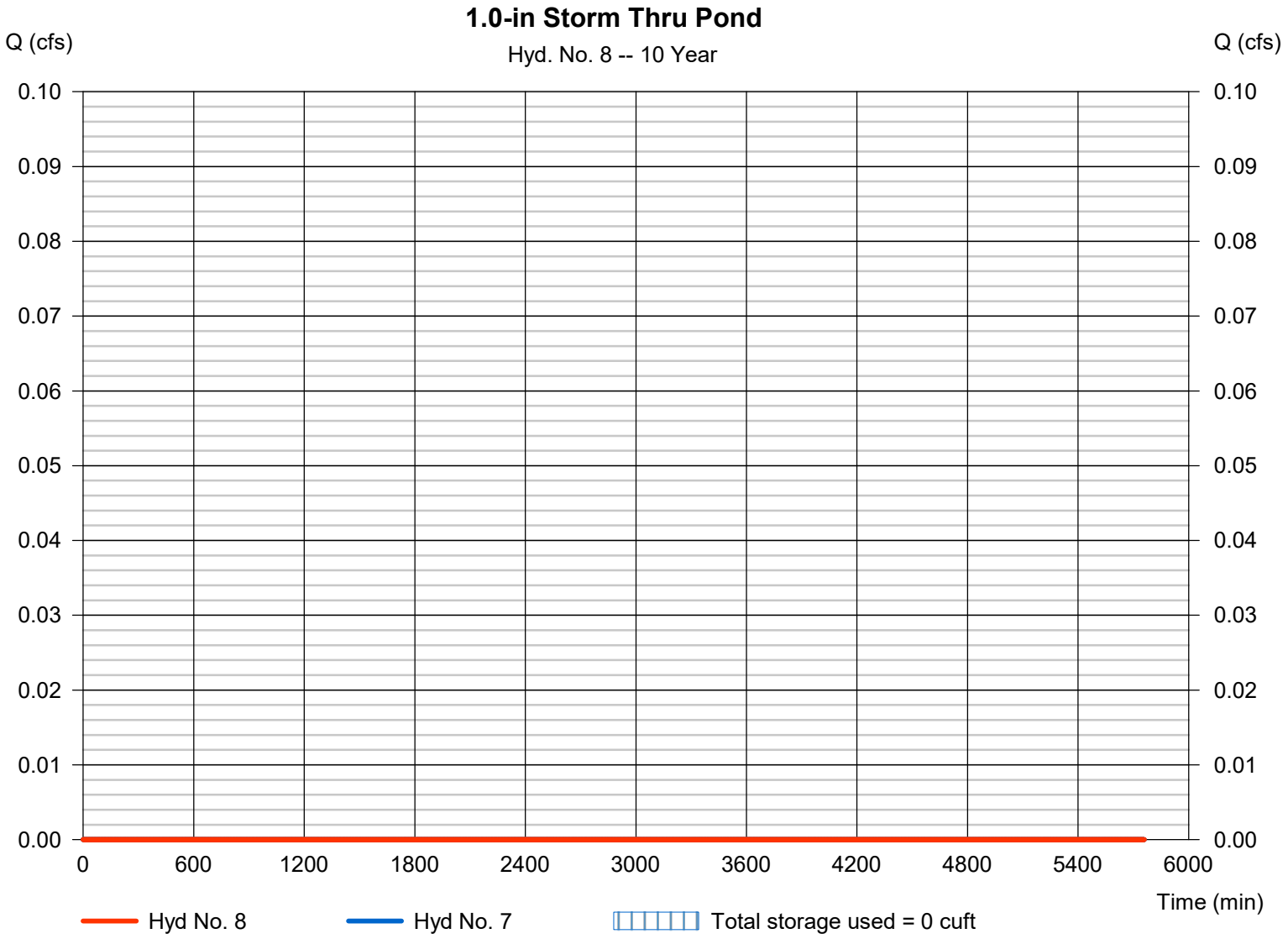
Hydrograph Report

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

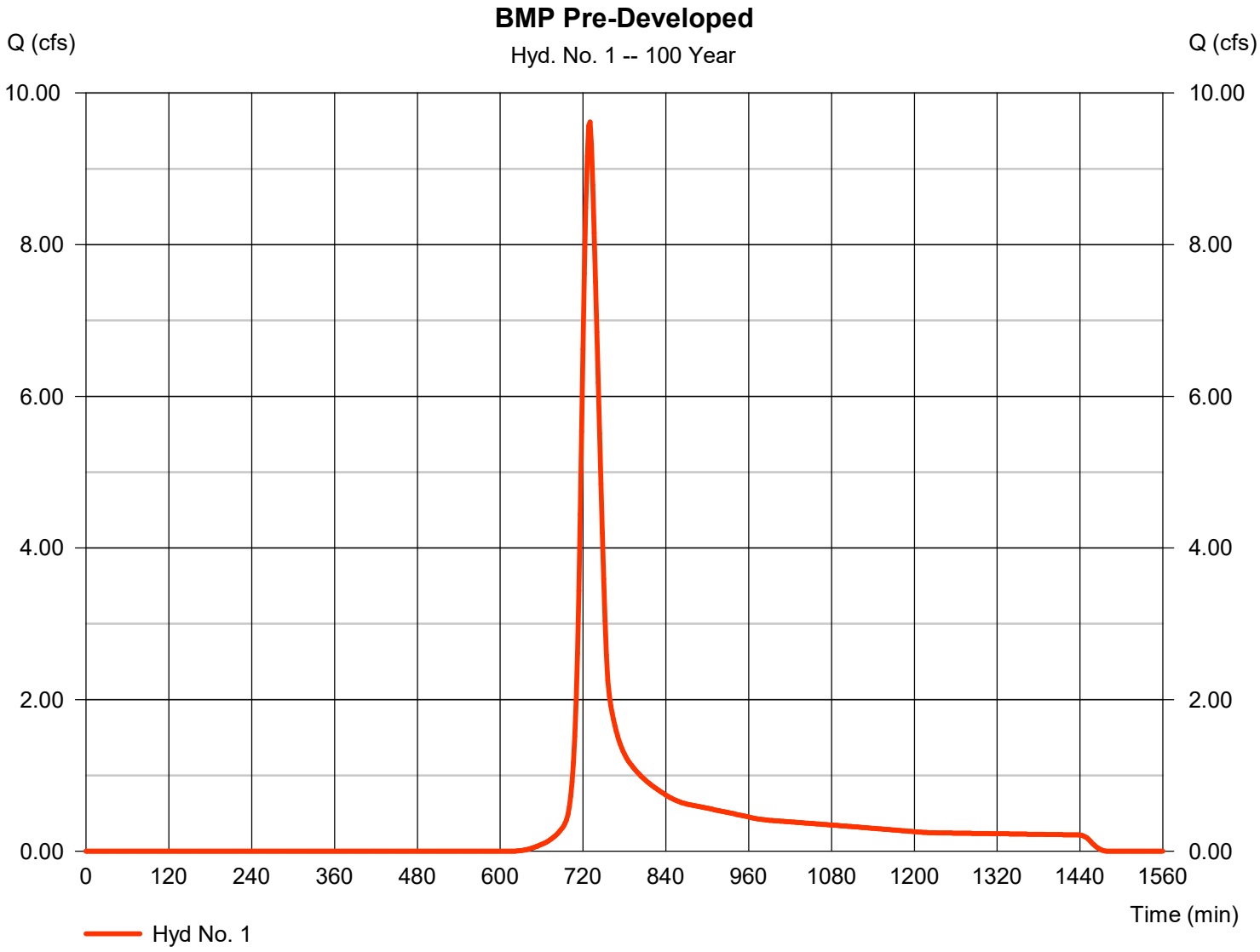
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.617	2	730	36,581	------	------	------	BMP Pre-Developed
2	SCS Runoff	30.29	2	716	64,280	------	------	------	BMP Post-Developed
3	Reservoir	10.72	2	724	62,756	2	332.43	29,723	Post Through Detention
4	SCS Runoff	0.902	2	720	2,346	------	------	------	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	=	9.617 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	36,581 cuft
Drainage area	=	3.410 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	24.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

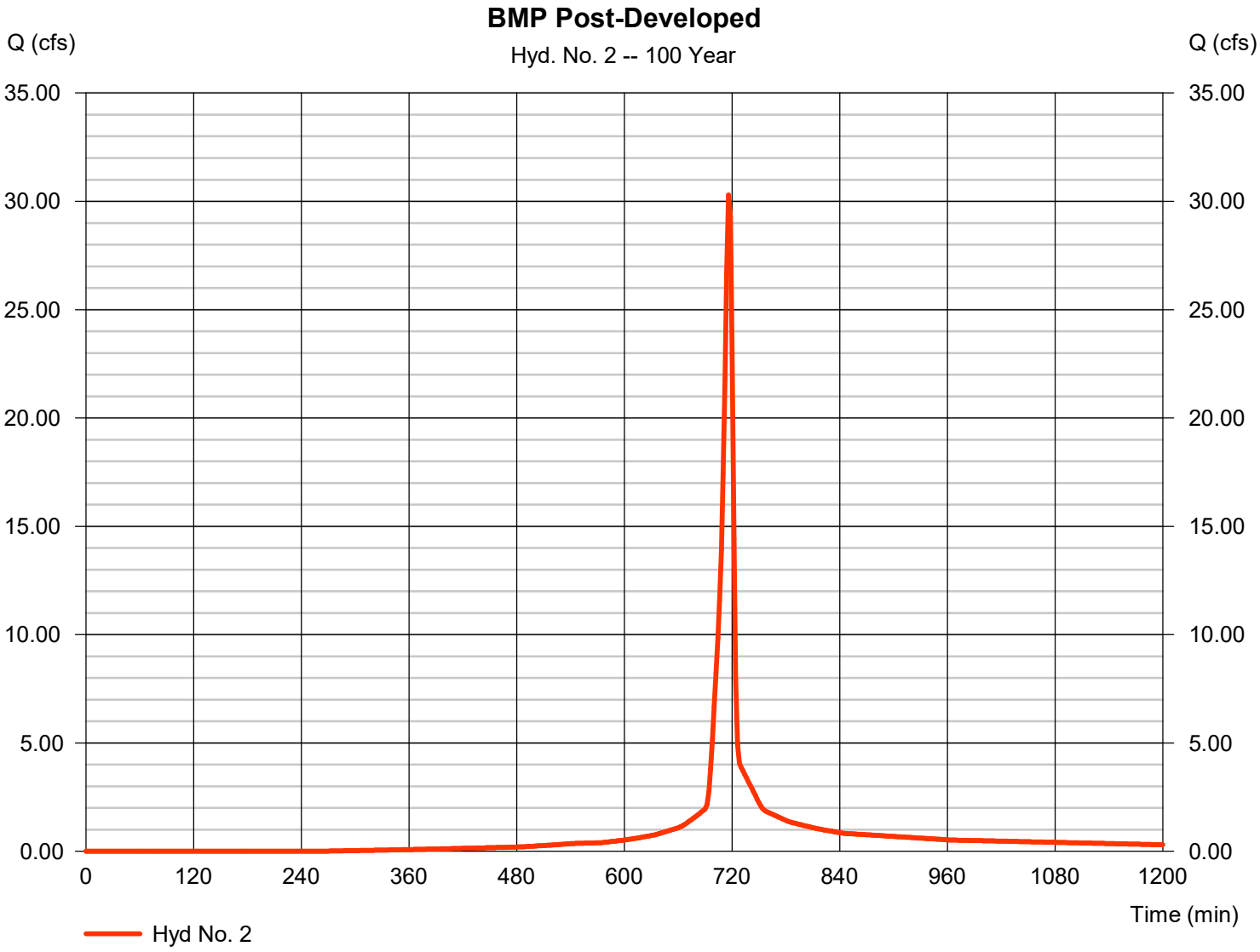


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	30.29 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	64,280 cuft
Drainage area	=	3.160 ac	Curve number	=	83
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



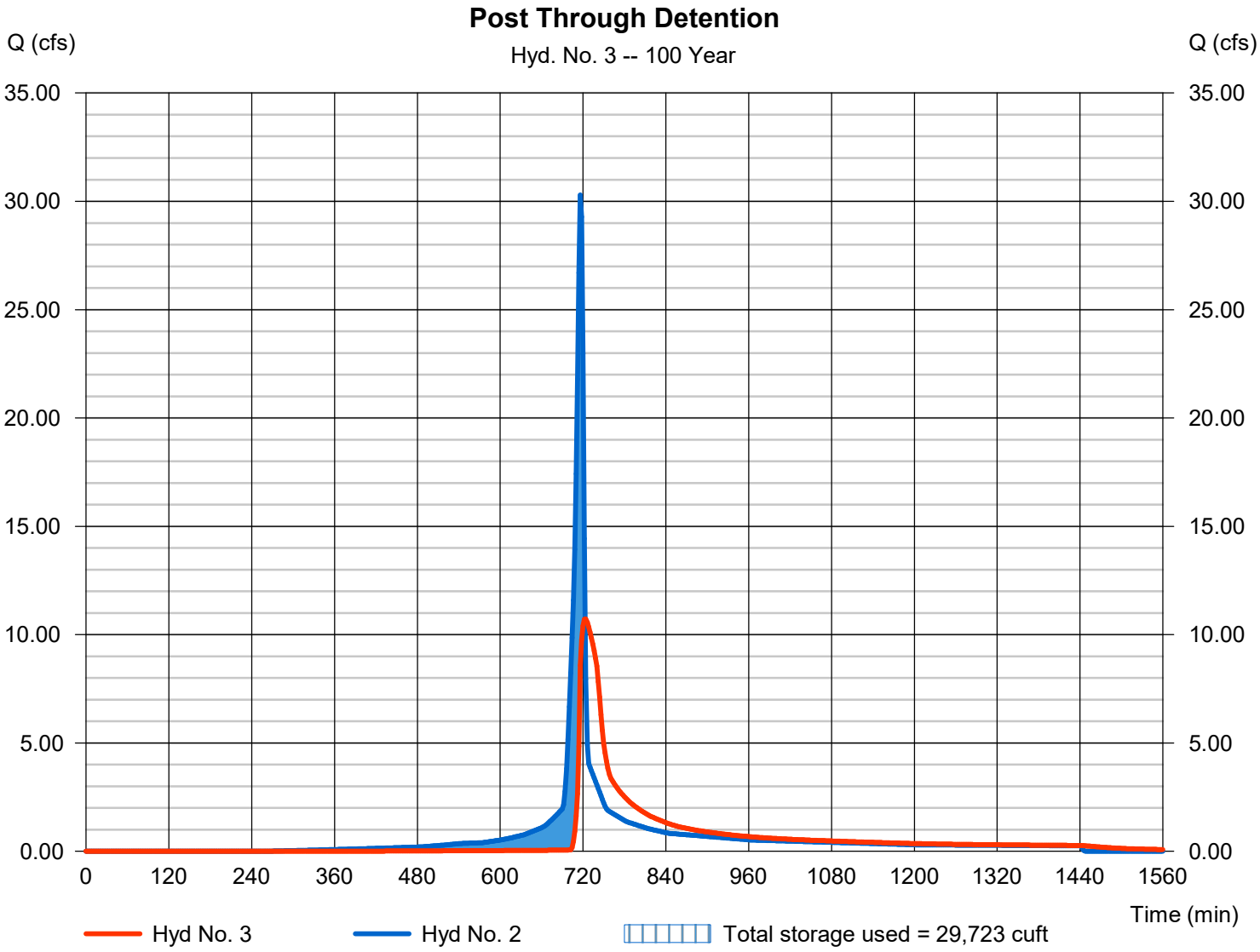
Hydrograph Report

Hyd. No. 3

Post Through Detention

Hydrograph type	=	Reservoir	Peak discharge	=	10.72 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	62,756 cuft
Inflow hyd. No.	=	2 - BMP Post-Developed	Max. Elevation	=	332.43 ft
Reservoir name	=	BMP Pond	Max. Storage	=	29,723 cuft

Storage Indication method used.

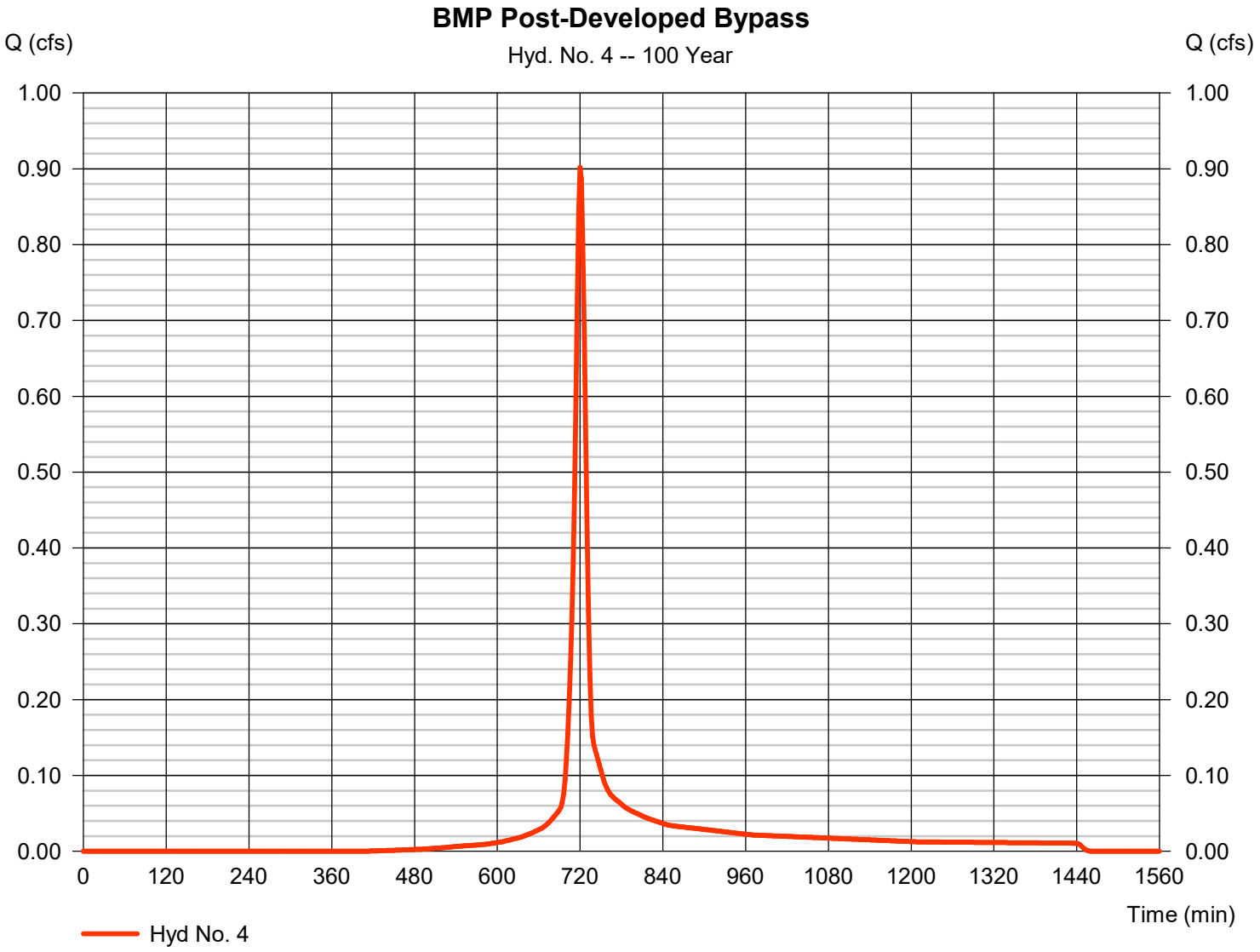


Hydrograph Report

Hyd. No. 4

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.902 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	2,346 cuft
Drainage area	=	0.130 ac	Curve number	=	73.1
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

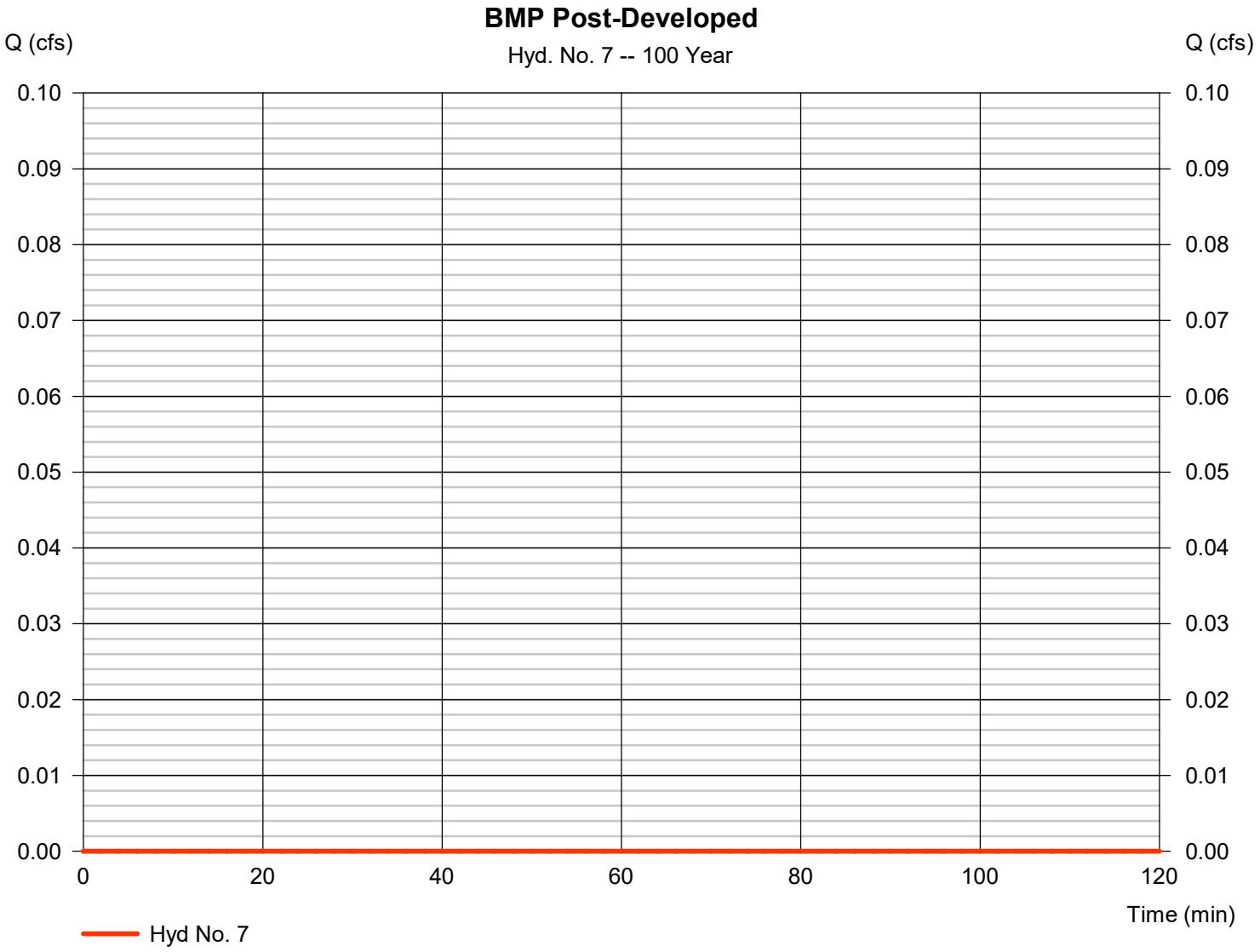


Hydrograph Report

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	=	3.160 ac	Curve number	=	83
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



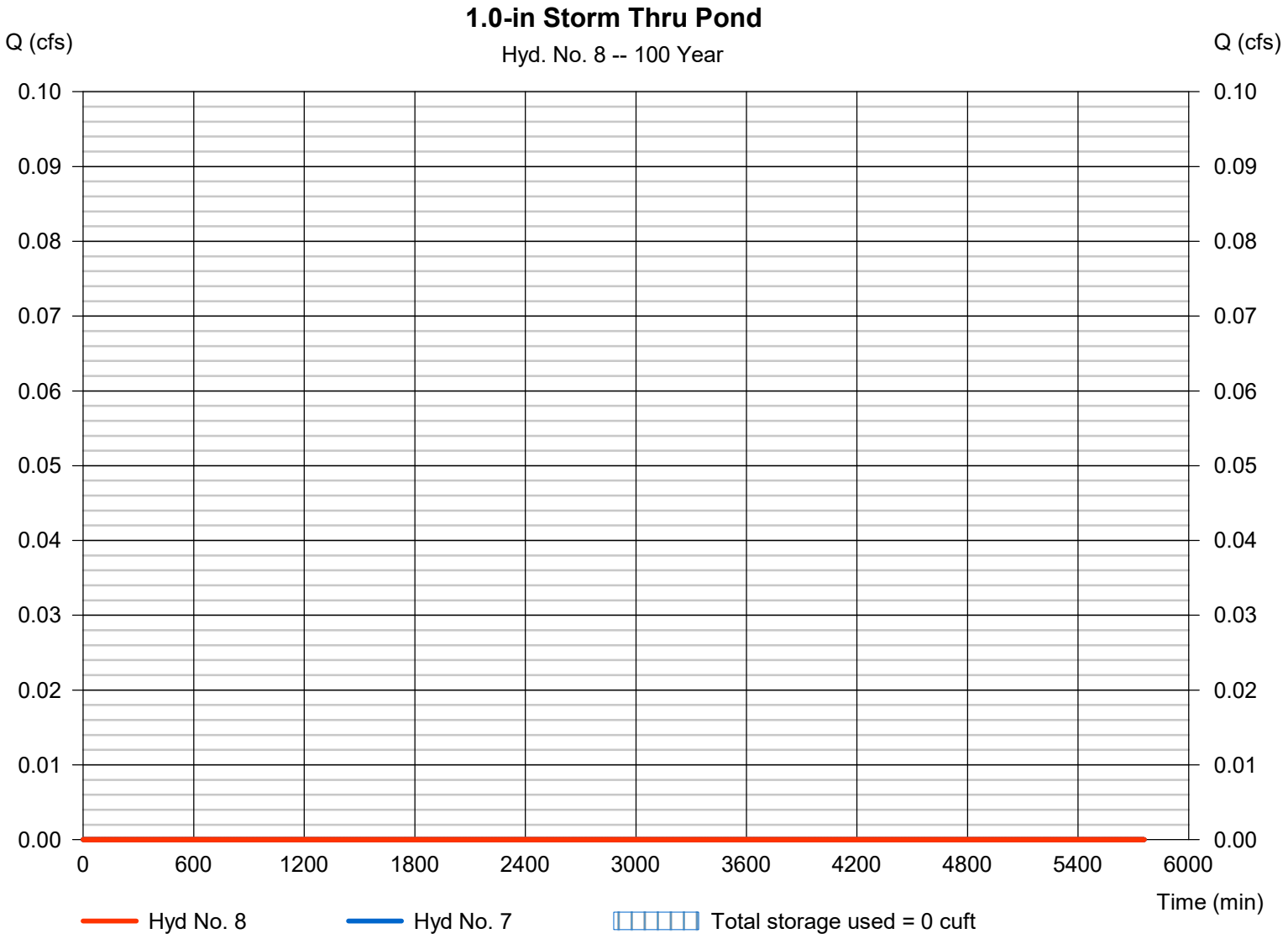
Hydrograph Report

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.



Hydrograph Summary Report

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

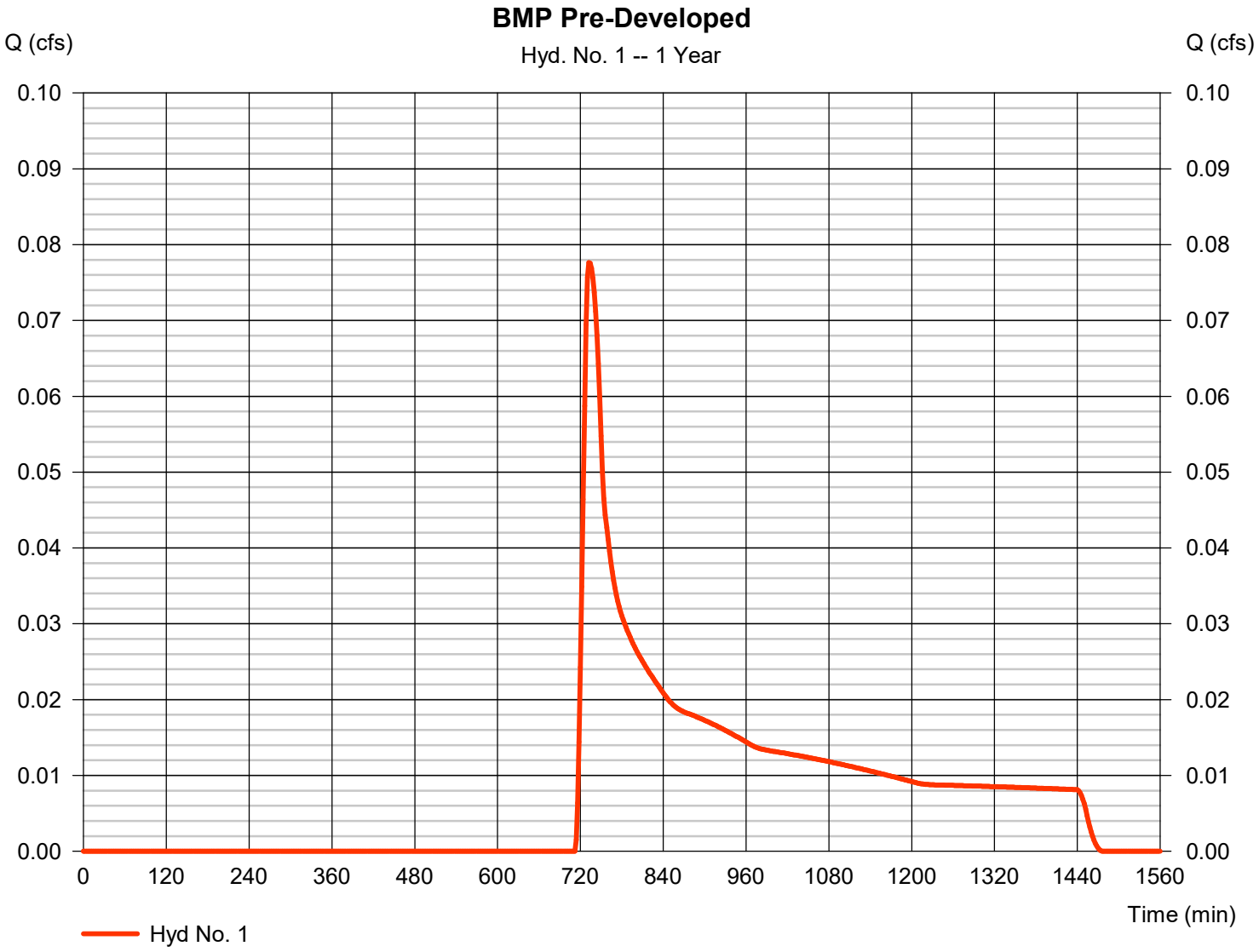
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.078	2	732	705	------	------	------	BMP Pre-Developed
2	SCS Runoff	0.049	2	732	353	------	------	------	BMP Post-Developed
3	SCS Runoff	0.013	2	716	30	------	------	------	BMP Post-Developed Bypass

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.078 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	705 cuft
Drainage area	=	0.840 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

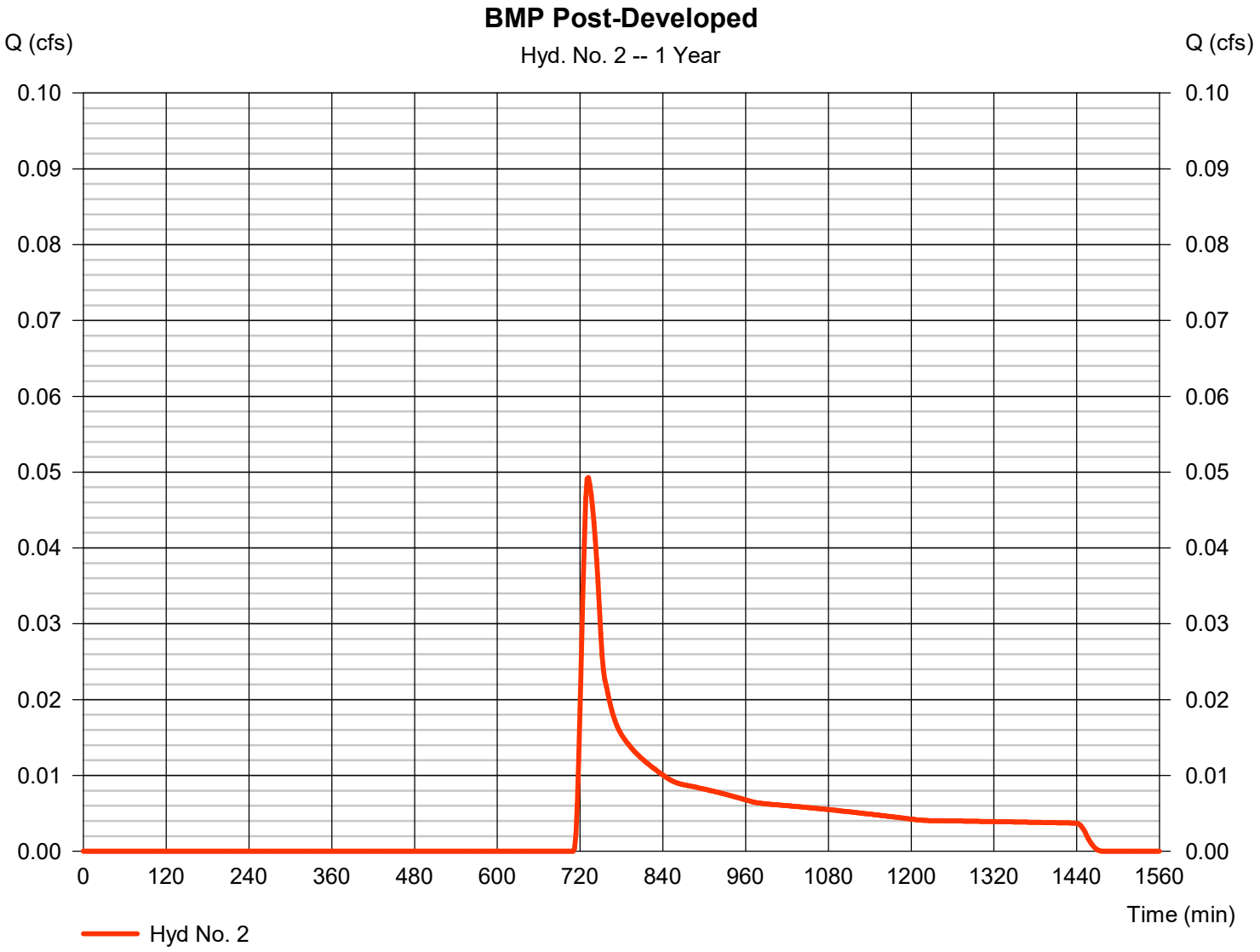


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.049 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	353 cuft
Drainage area	=	0.340 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

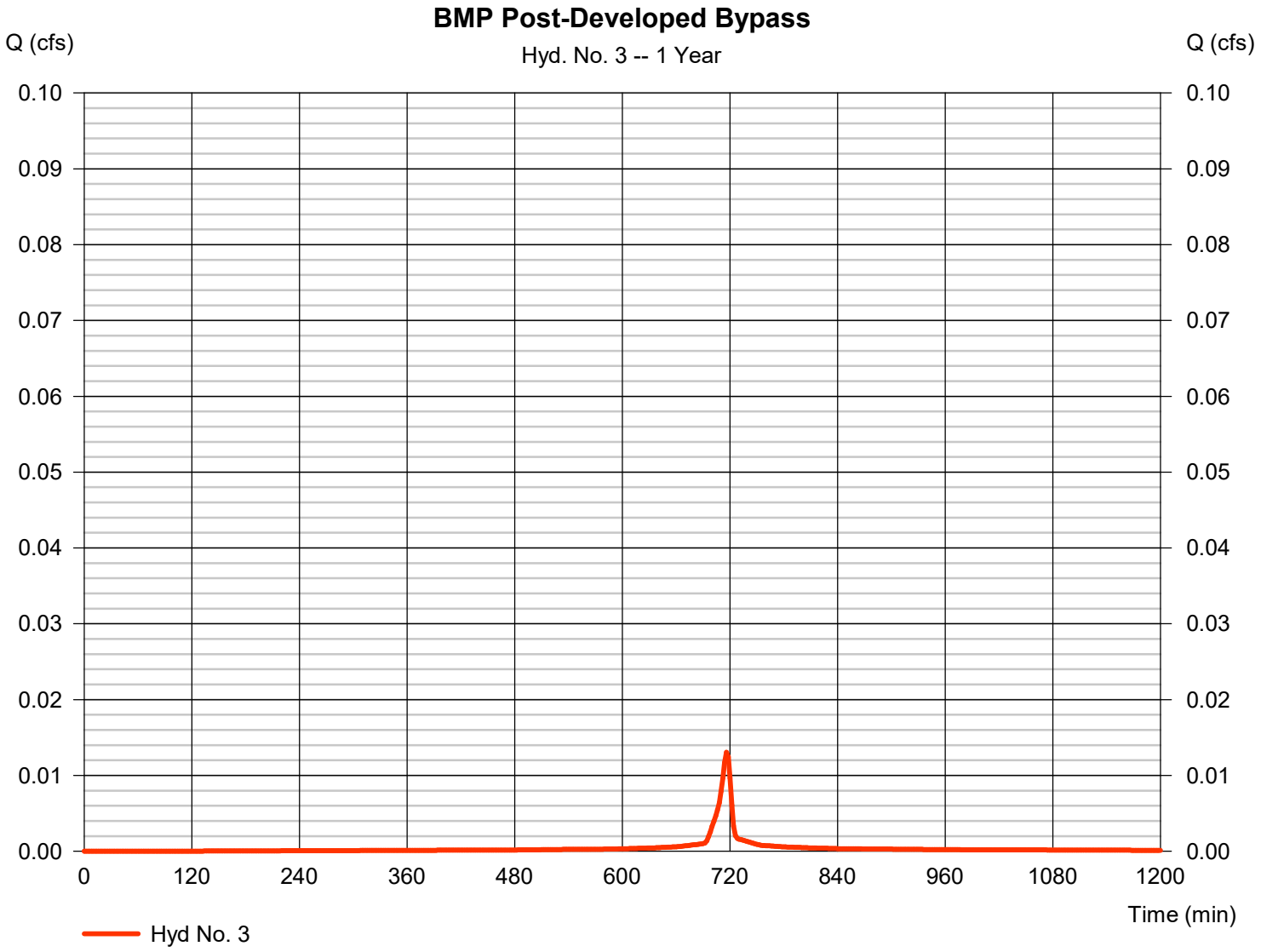


Hydrograph Report

Hyd. No. 3

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.013 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	30 cuft
Drainage area	=	0.003 ac	Curve number	=	98
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 Summary Report

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

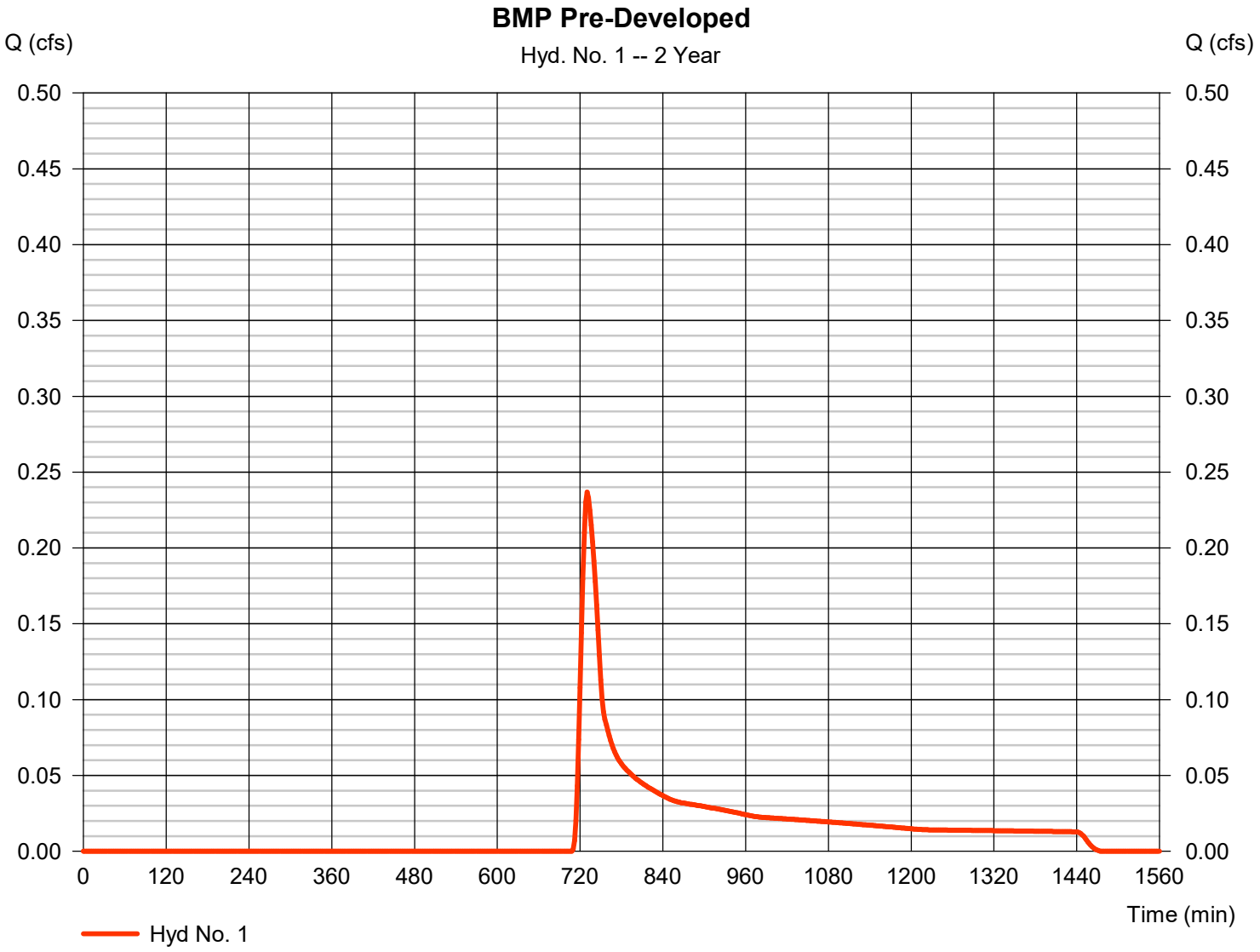
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.237	2	730	1,357	------	------	------	BMP Pre-Developed
2	SCS Runoff	0.127	2	730	646	------	------	------	BMP Post-Developed
3	SCS Runoff	0.016	2	716	37	------	------	------	BMP Post-Developed Bypass

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.237 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	1,357 cuft
Drainage area	=	0.840 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

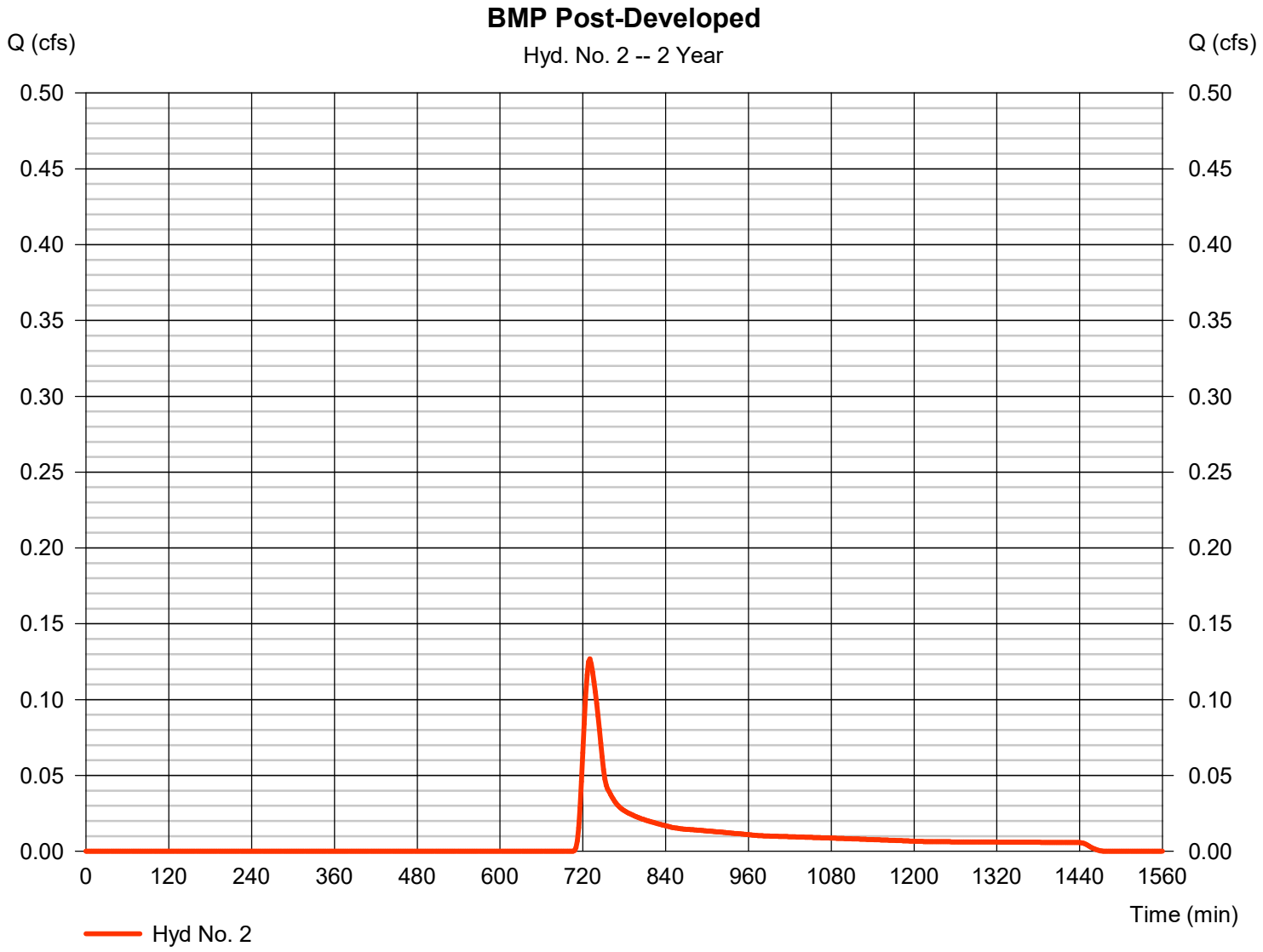


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.127 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	646 cuft
Drainage area	=	0.340 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	3.46 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

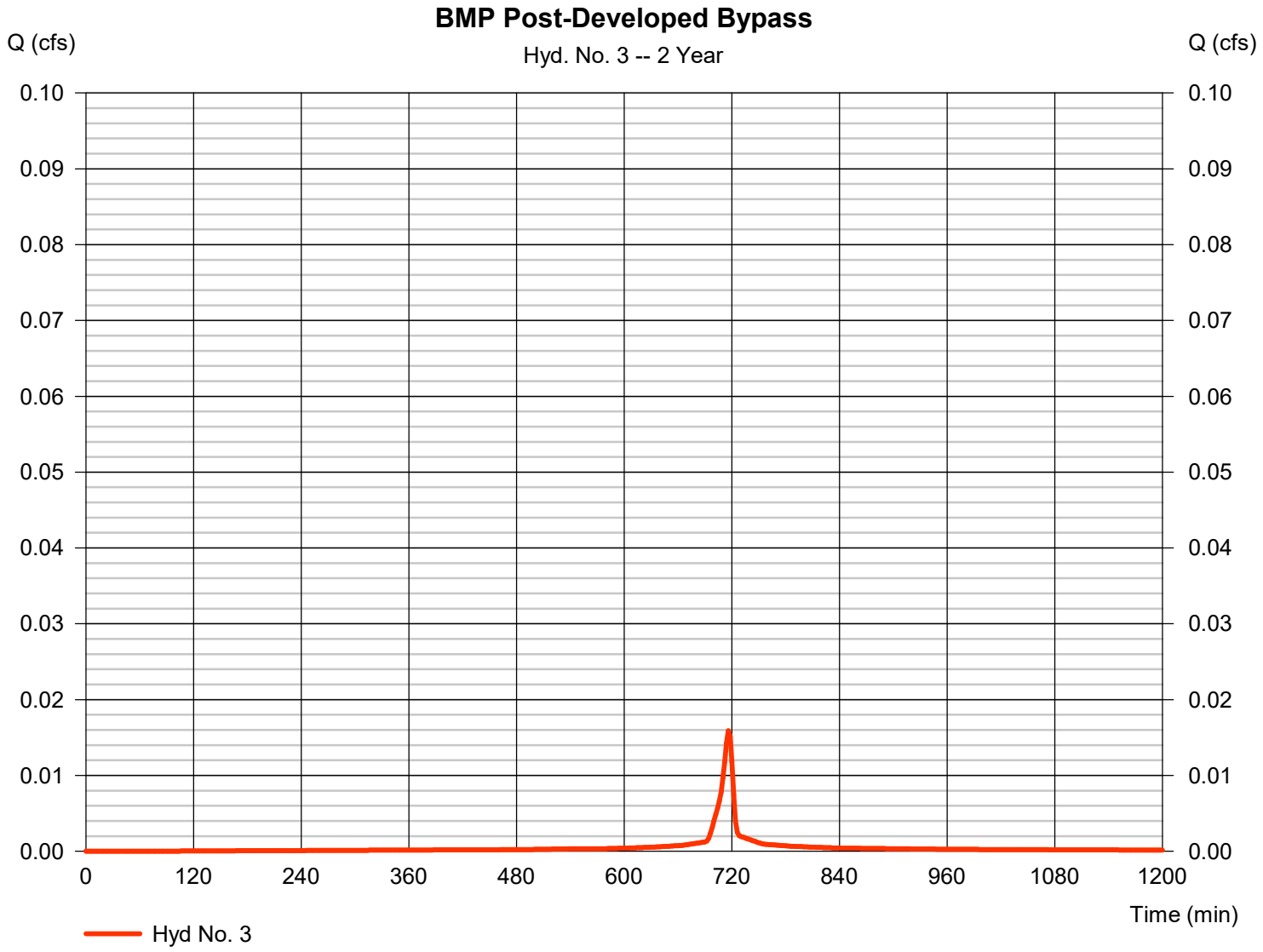


Hydrograph Report

Hyd. No. 3

BMP Post-Developed Bypass

Hydrograph type	= SCS Runoff	Peak discharge	= 0.016 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 2 min	Hyd. volume	= 37 cuft
Drainage area	= 0.003 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.46 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

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

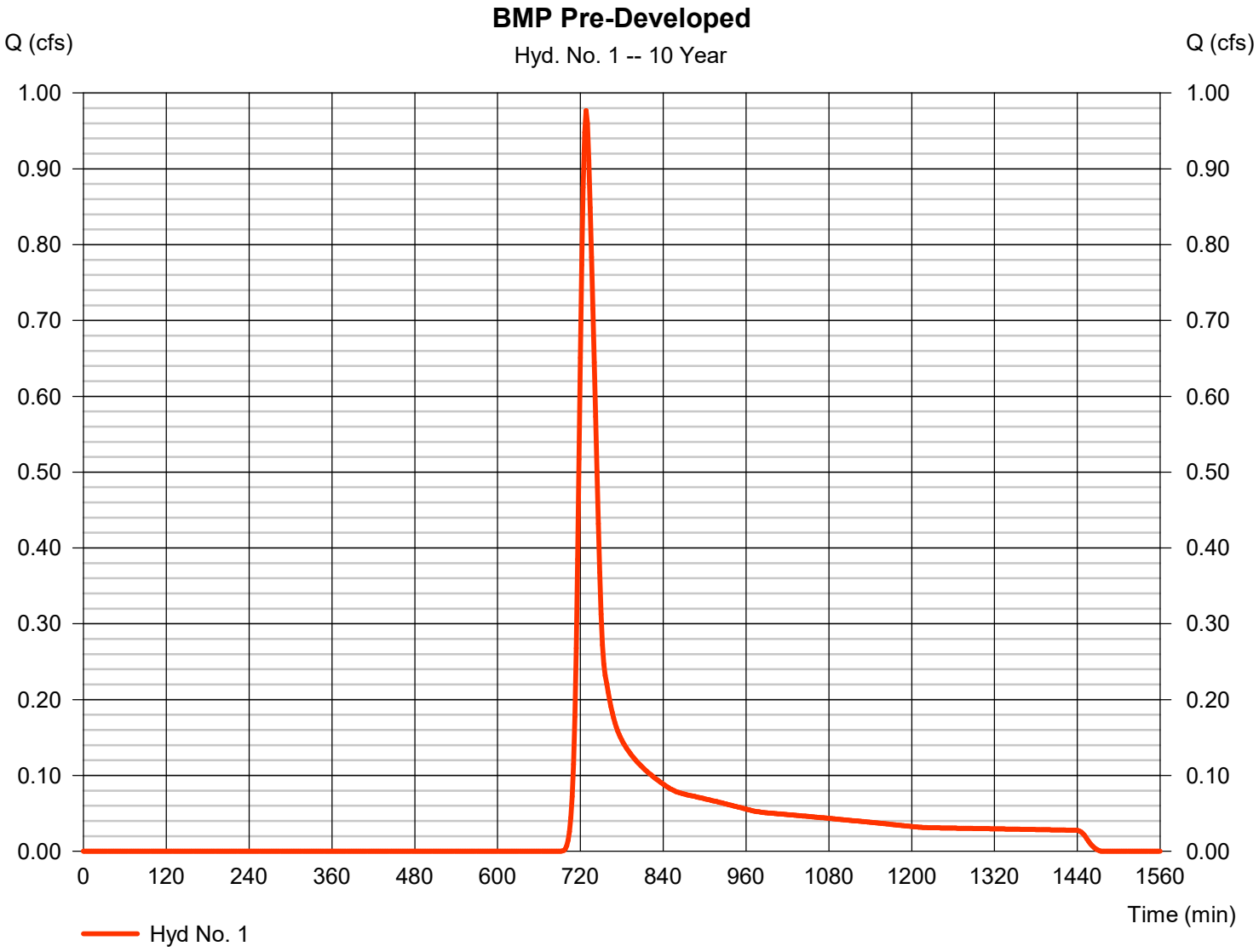
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.977	2	728	3,869	------	------	------	BMP Pre-Developed
2	SCS Runoff	0.454	2	728	1,738	------	------	------	BMP Post-Developed
3	SCS Runoff	0.024	2	716	57	------	------	------	BMP Post-Developed Bypass

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.977 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	3,869 cuft
Drainage area	=	0.840 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

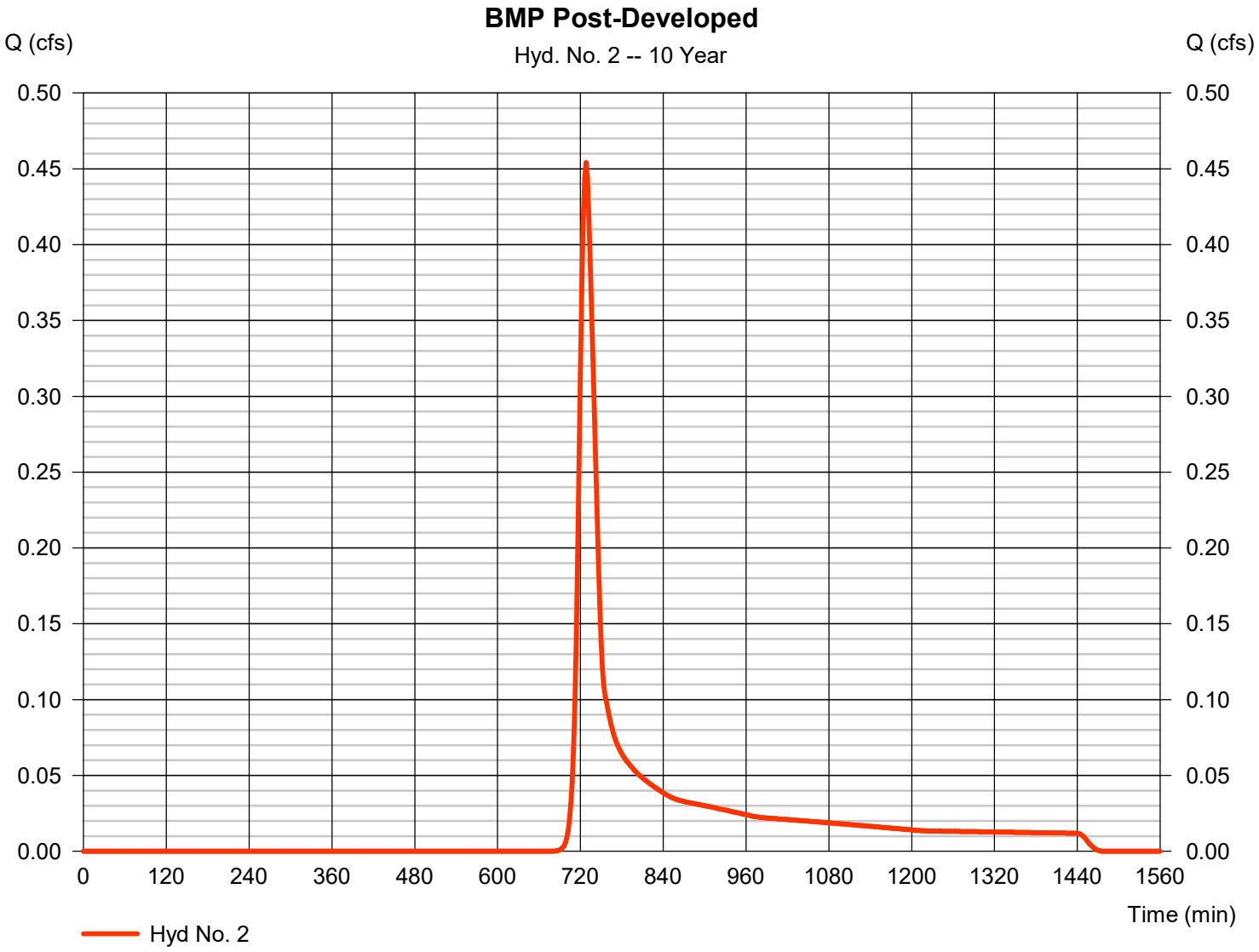


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.454 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	1,738 cuft
Drainage area	=	0.340 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

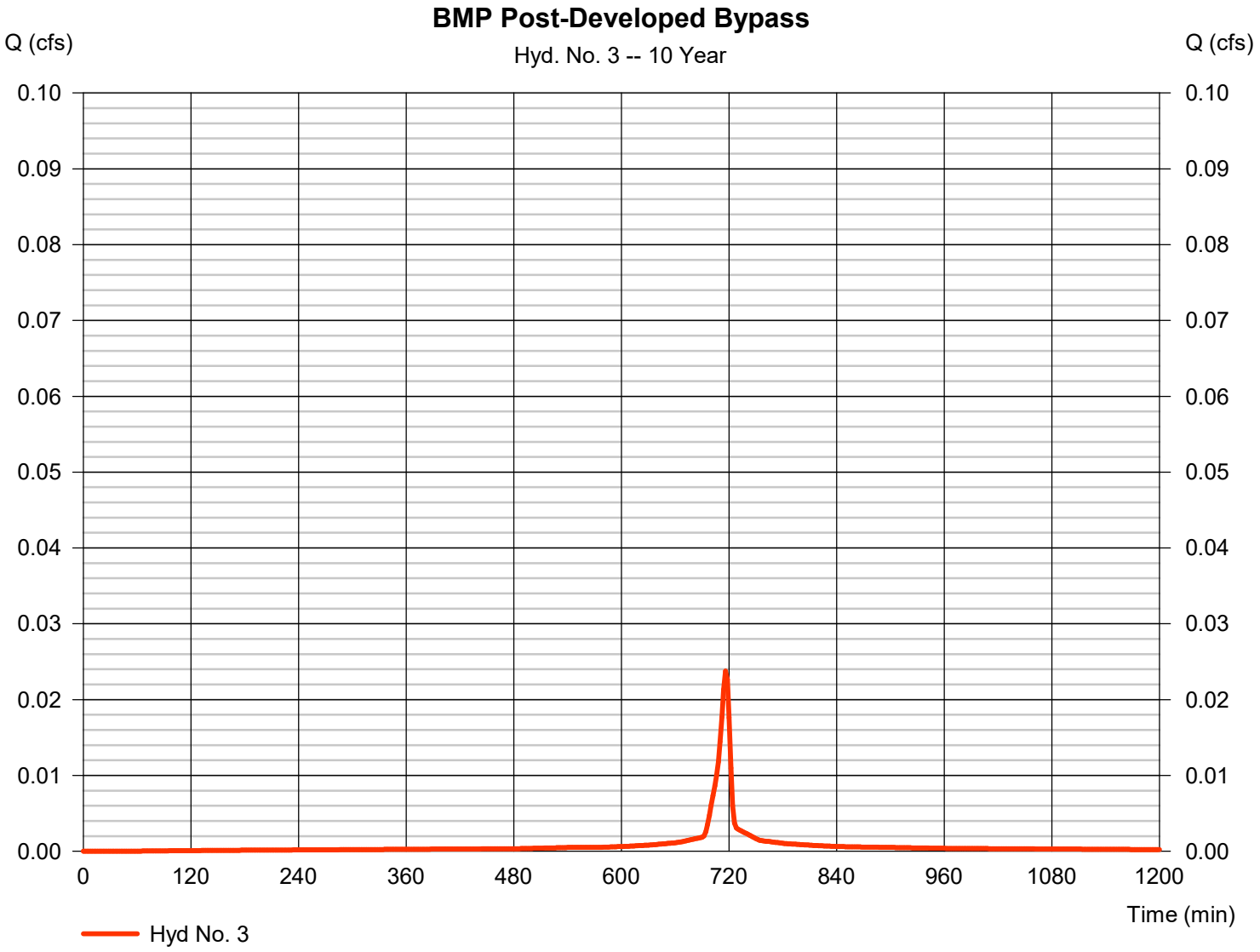


Hydrograph Report

Hyd. No. 3

BMP Post-Developed Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.024 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	57 cuft
Drainage area	=	0.003 ac	Curve number	=	98
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 Summary Report

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

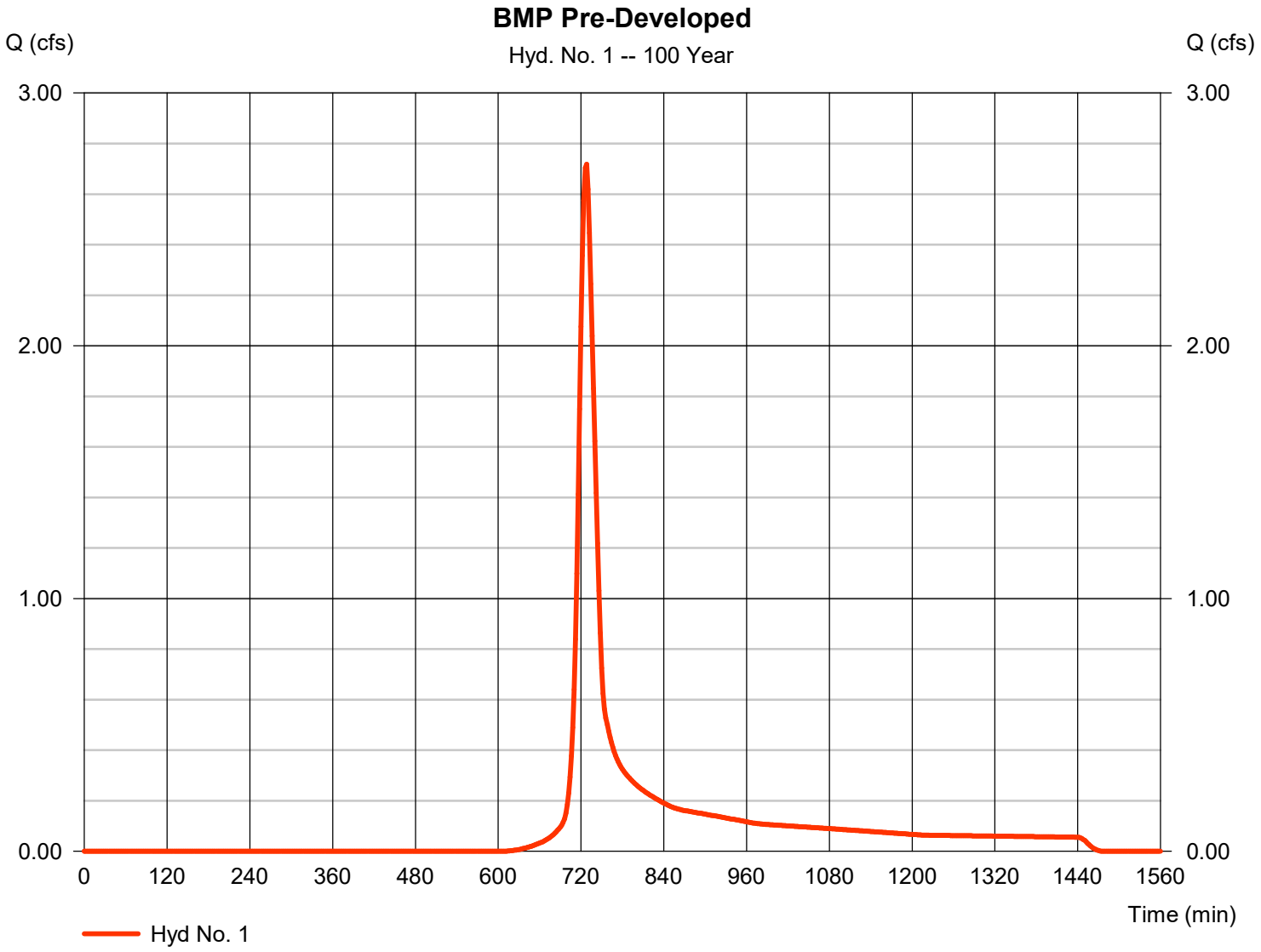
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.718	2	728	9,659	------	------	------	BMP Pre-Developed
2	SCS Runoff	1.188	2	728	4,187	------	------	------	BMP Post-Developed
3	SCS Runoff	0.037	2	716	90	------	------	------	BMP Post-Developed Bypass

Hydrograph Report

Hyd. No. 1

BMP Pre-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.718 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	9,659 cuft
Drainage area	=	0.840 ac	Curve number	=	58
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

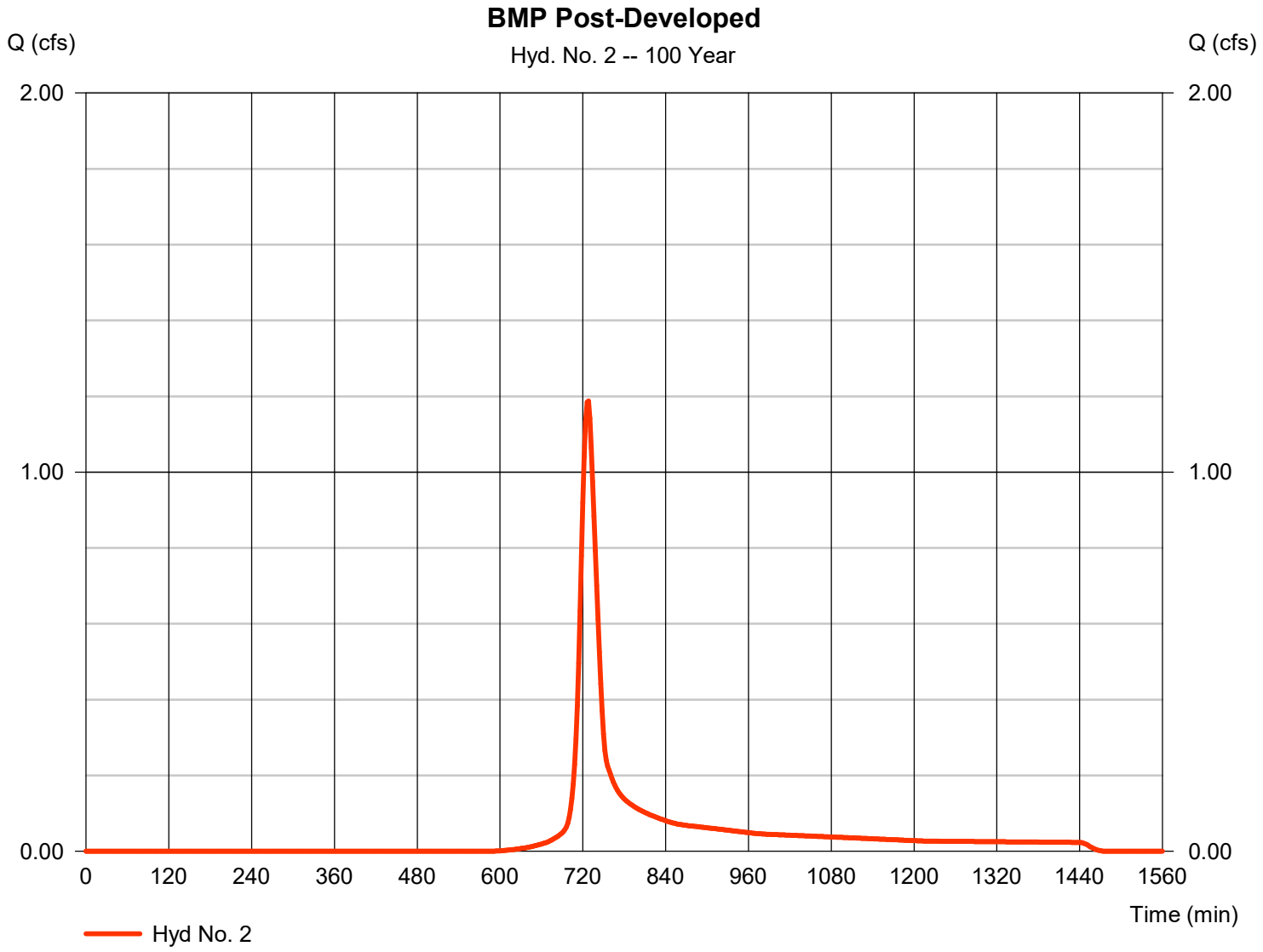


Hydrograph Report

Hyd. No. 2

BMP Post-Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.188 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	4,187 cuft
Drainage area	=	0.340 ac	Curve number	=	60
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.20 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

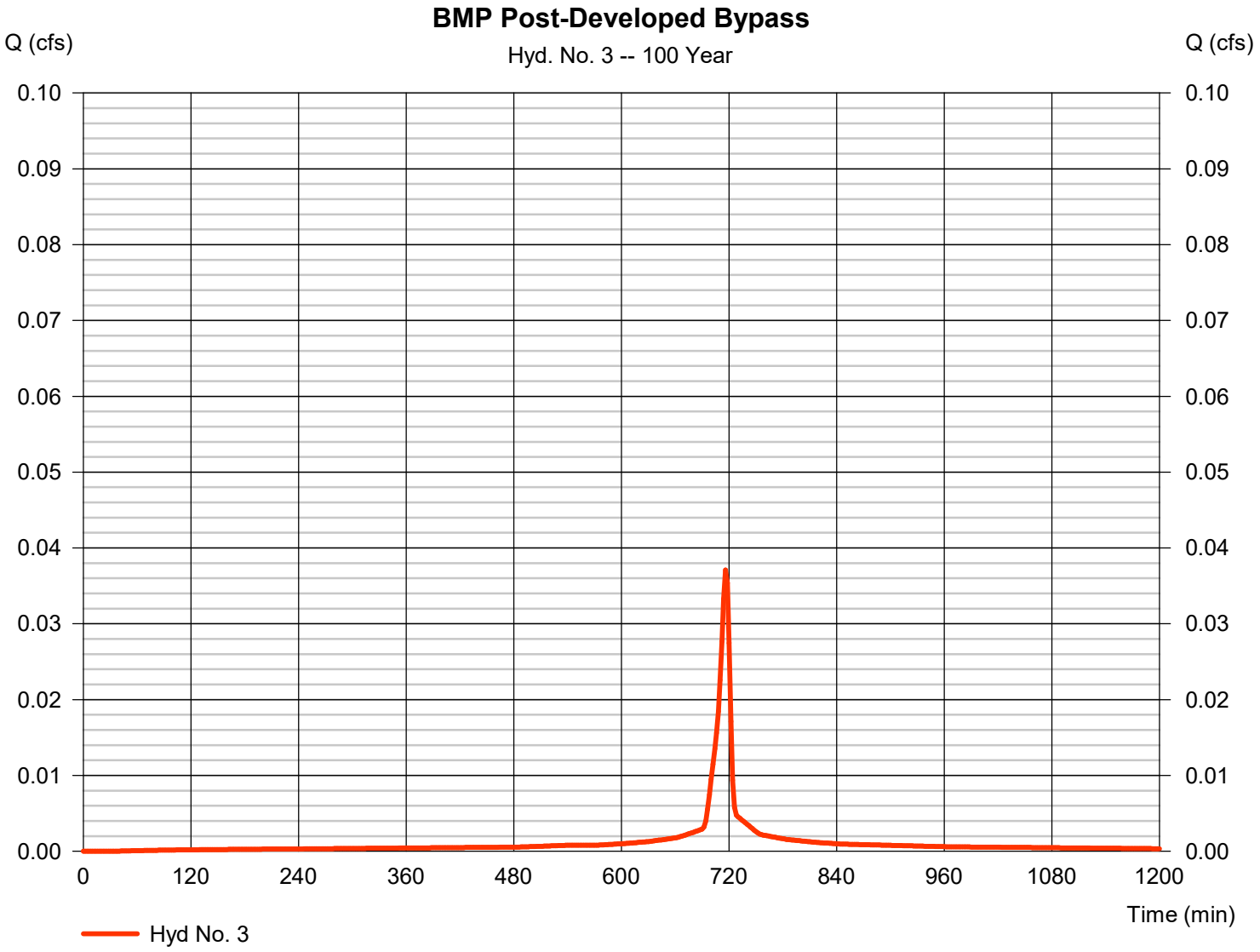


Hydrograph Report

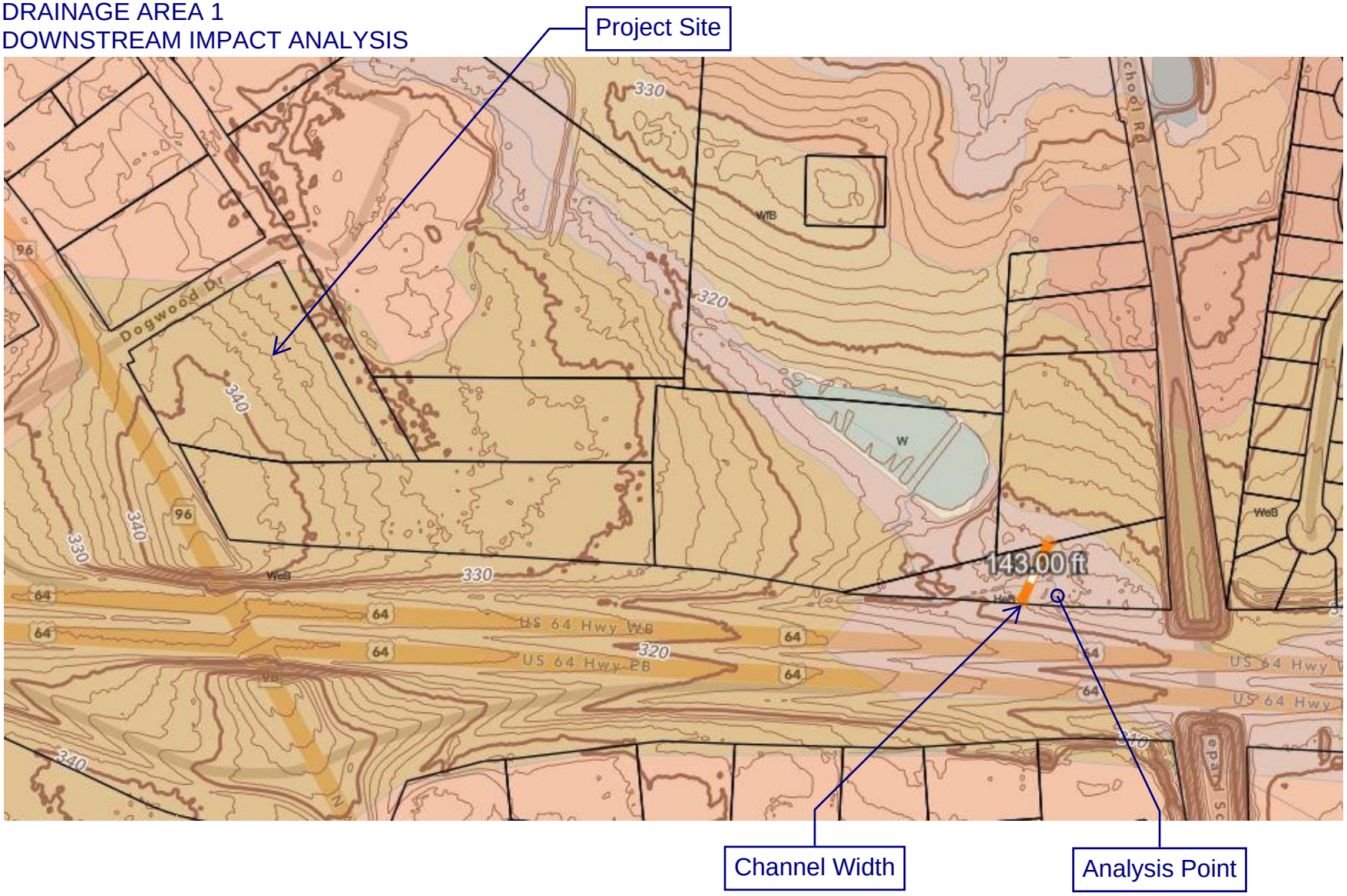
Hyd. No. 3

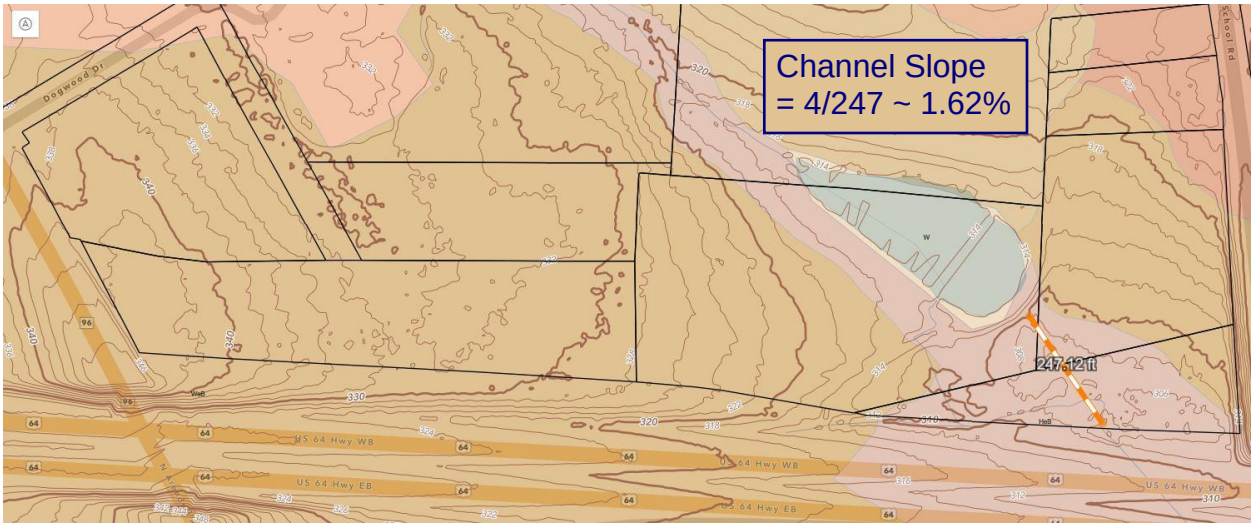
BMP Post-Developed Bypass

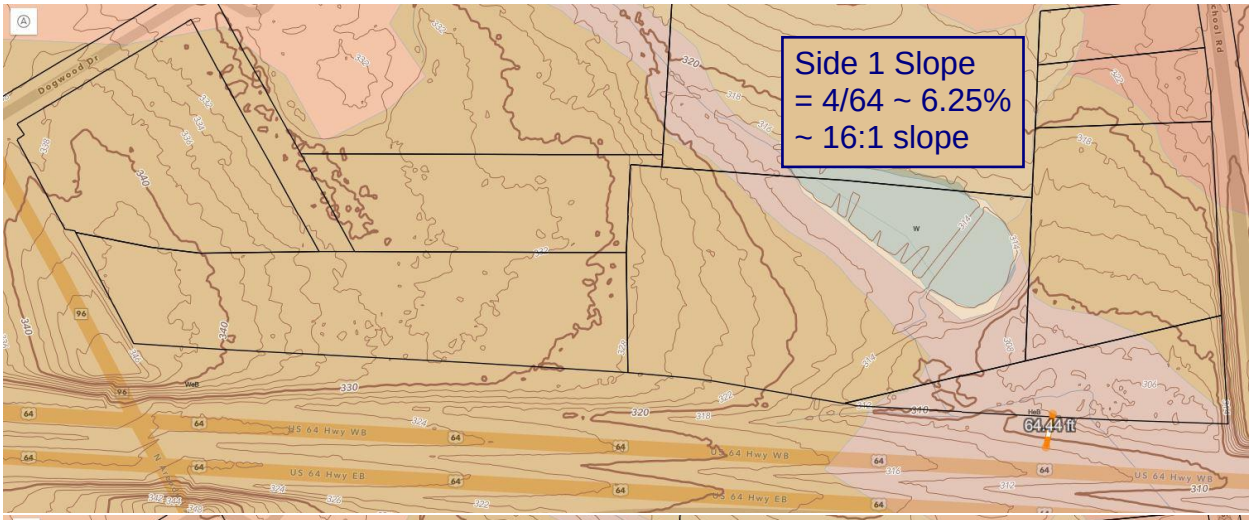
Hydrograph type	=	SCS Runoff	Peak discharge	=	0.037 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	90 cuft
Drainage area	=	0.003 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

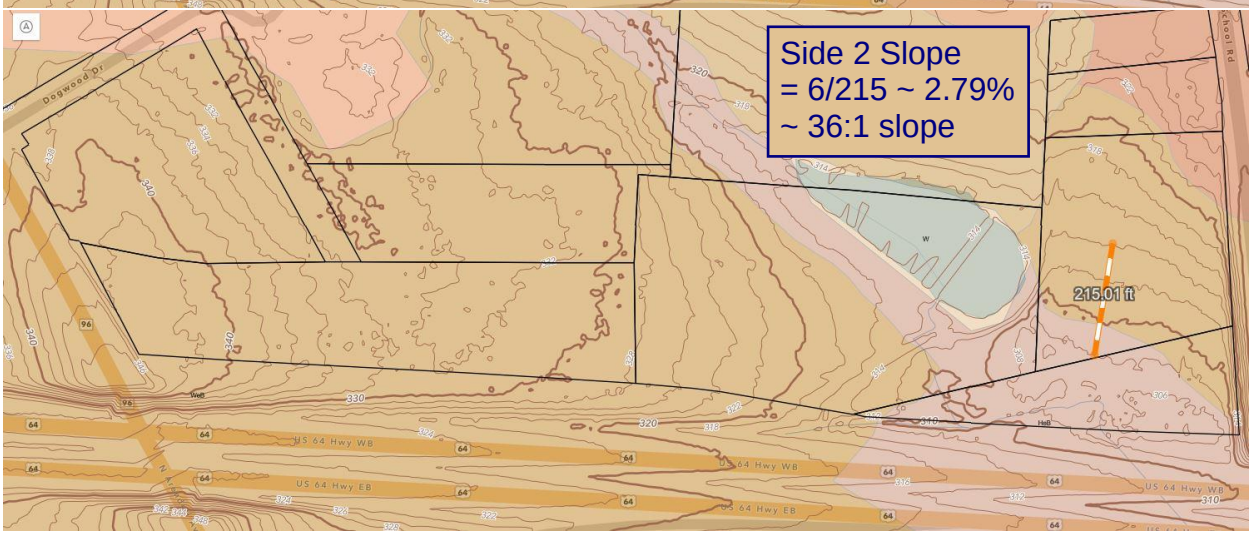


DRAINAGE AREA 1
DOWNSTREAM IMPACT ANALYSIS



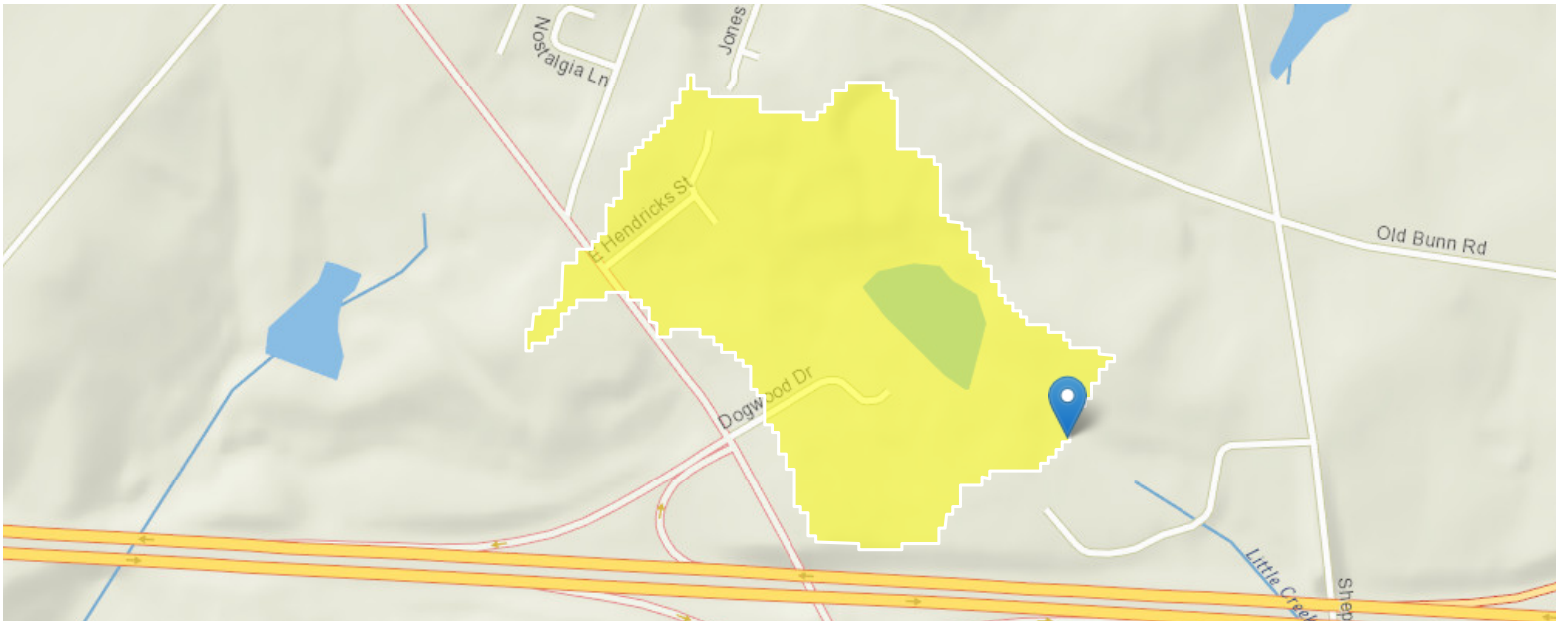

Channel Slope
= 4/247 ~ 1.62%
247.12 ft
Dogwood Dr
School Rd
US 64 Hwy WB
US 64 Hwy EB


Side 1 Slope
= 4/64 ~ 6.25%
~ 16:1 slope
64.44 ft
Dogwood Dr
School Rd
US 64 Hwy WB
US 64 Hwy EB


Side 2 Slope
= 6/215 ~ 2.79%
~ 36:1 slope
215.01 ft
Dogwood Dr
School Rd
US 64 Hwy WB
US 64 Hwy EB

StreamStats Report

Region ID: NC
Workspace ID: NC20231128205353275000
Clicked Point (Latitude, Longitude): 35.83610, -78.31765
Time: 2023-11-28 15:54:15 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0829	square miles
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	21.62	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	0.0829	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	21.62	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

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
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	0.0829	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	54.1	ft^3/s
20-percent AEP flood	73.4	ft^3/s
10-percent AEP flood	85.2	ft^3/s
4-percent AEP flood	97.9	ft^3/s
2-percent AEP flood	106	ft^3/s
1-percent AEP flood	115	ft^3/s
0.5-percent AEP flood	122	ft^3/s
0.2-percent AEP flood	137	ft^3/s

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

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	29.9	ft^3/s	16.3	54.7	36.8
20-percent AEP flood	55.4	ft^3/s	31.1	98.7	35.8
10-percent AEP flood	76.6	ft^3/s	42.7	138	36.3
4-percent AEP flood	106	ft^3/s	56.6	199	38.4
2-percent AEP flood	133	ft^3/s	70.3	252	39.8
1-percent AEP flood	160	ft^3/s	82.7	310	41.3
0.5-percent AEP flood	188	ft^3/s	95	372	42.8
0.2-percent AEP flood	225	ft^3/s	111	456	44.4

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. (http://pubs.usgs.gov/sir/2014/5030/)
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. (https://pubs.er.usgs.gov/publication/sir20235006)

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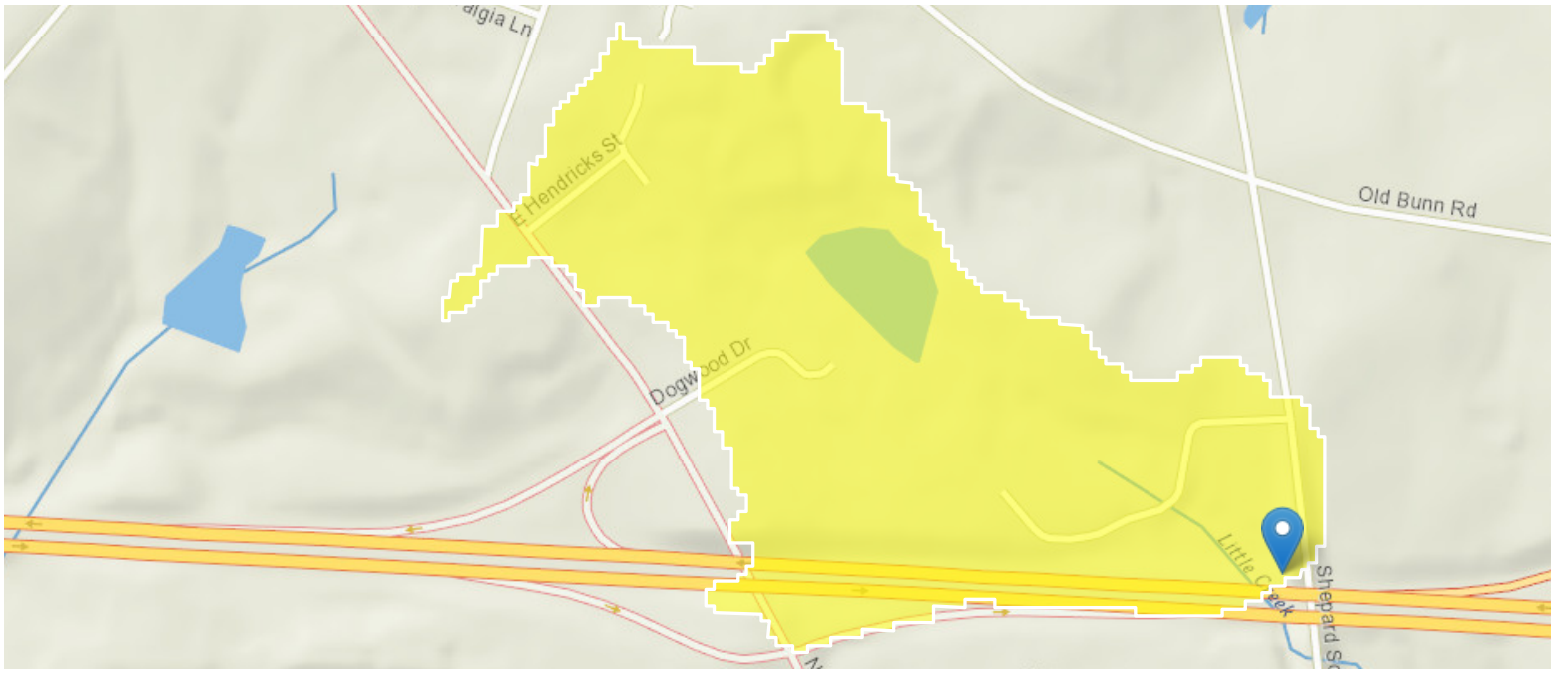
Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

StreamStats Report

Region ID: NC
Workspace ID: NC20231128212959058000
Clicked Point (Latitude, Longitude): 35.83438, -78.31432
Time: 2023-11-28 16:30:21 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.14	square miles
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	100	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

General Disclaimers

Parameter values have been edited, computed flows may not apply.

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	0.14	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	100	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	0.14	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	865	ft^3/s
20-percent AEP flood	610	ft^3/s
10-percent AEP flood	498	ft^3/s
4-percent AEP flood	382	ft^3/s
2-percent AEP flood	313	ft^3/s
1-percent AEP flood	269	ft^3/s
0.5-percent AEP flood	228	ft^3/s
0.2-percent AEP flood	210	ft^3/s

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

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PIL	PIU	ASEp
50-percent AEP flood	41.9	ft^3/s	22.9	76.6	36.8
20-percent AEP flood	77.1	ft^3/s	43.3	137	35.8
10-percent AEP flood	106	ft^3/s	59.1	190	36.3
4-percent AEP flood	147	ft^3/s	78.5	275	38.4
2-percent AEP flood	183	ft^3/s	96.8	346	39.8
1-percent AEP flood	219	ft^3/s	113	423	41.3
0.5-percent AEP flood	258	ft^3/s	131	510	42.8

Statistic	Value	Unit	PIL	PIU	ASEp
0.2-percent AEP flood	308	ft^3/s	152	623	44.4

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. (http://pubs.usgs.gov/sir/2014/5030/)

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. (https://pubs.er.usgs.gov/publication/sir20235006)

Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 29 2023

<Name>

Trapezoidal

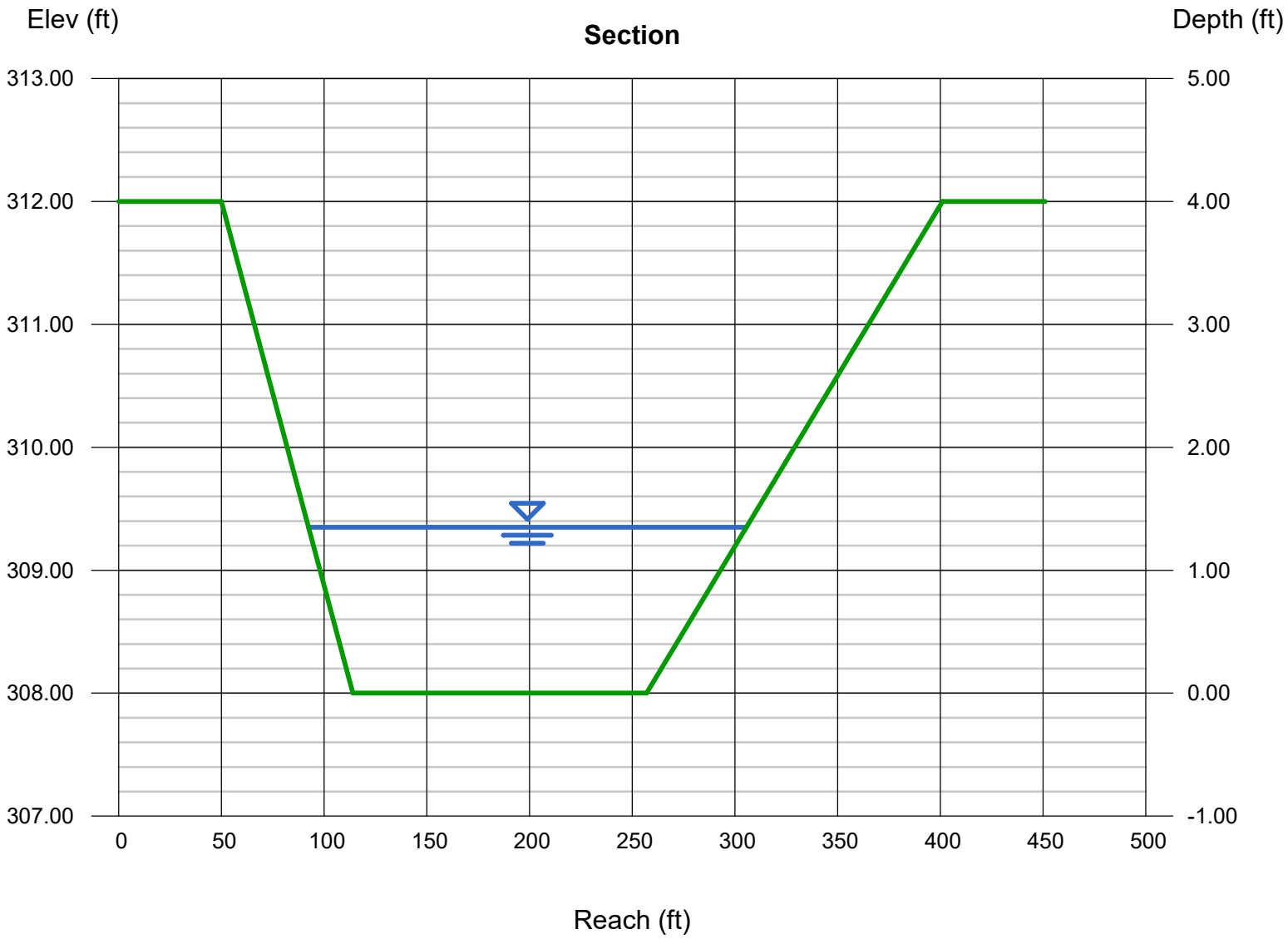
Bottom Width (ft)	= 143.00
Side Slopes (z:1)	= 16.00, 36.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 308.00
Slope (%)	= 1.62
N-Value	= 0.400

Calculations

Compute by:	Known Q
Known Q (cfs)	= 123.00

Highlighted

Depth (ft)	= 1.35
Q (cfs)	= 123.00
Area (sqft)	= 240.43
Velocity (ft/s)	= 0.51
Wetted Perim (ft)	= 213.26
Crit Depth, Yc (ft)	= 0.28
Top Width (ft)	= 213.20
EGL (ft)	= 1.35



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 29 2023

<Name>

Trapezoidal

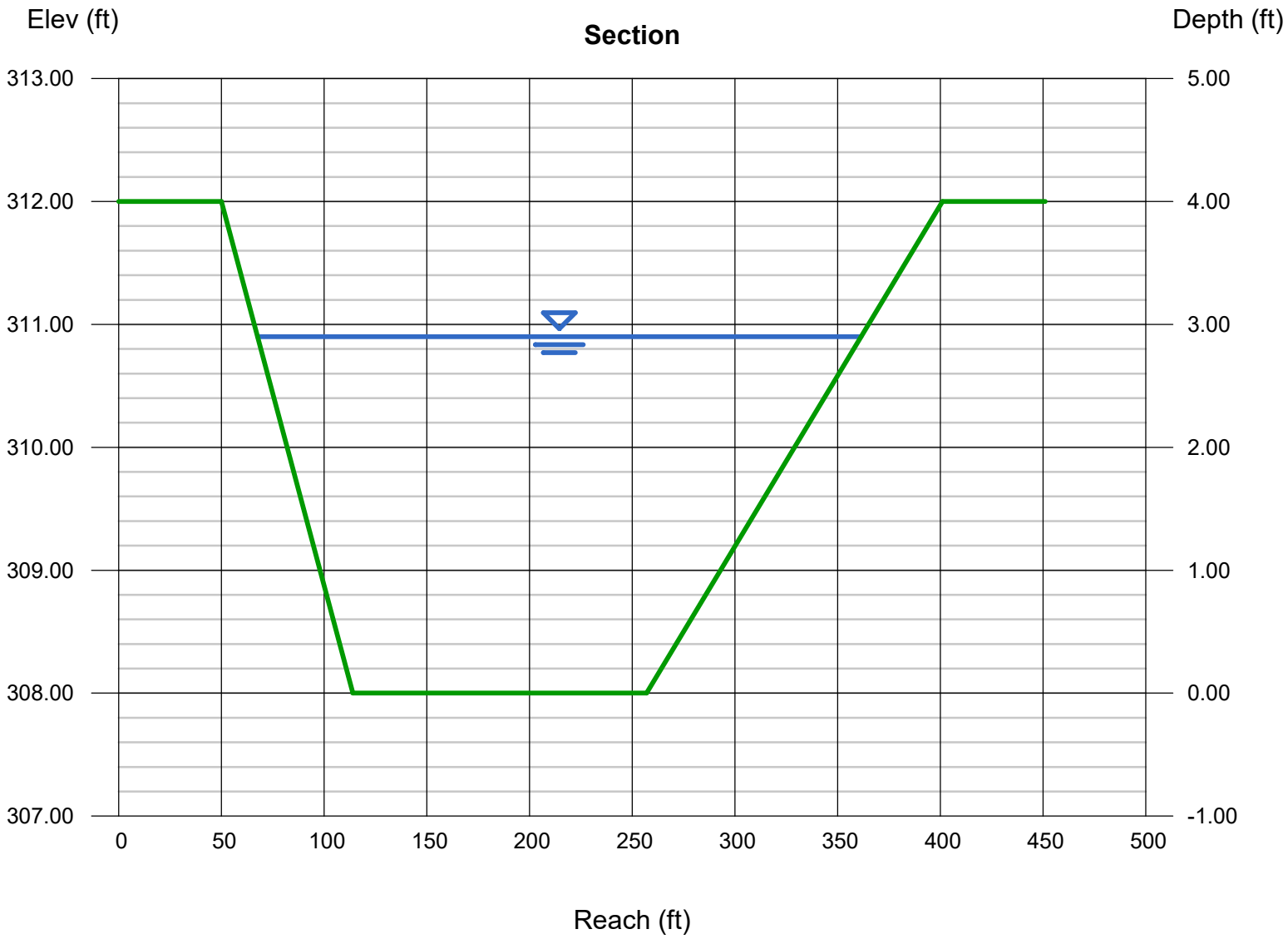
Bottom Width (ft)	= 143.00
Side Slopes (z:1)	= 16.00, 36.00
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 308.00
Slope (%)	= 1.62
N-Value	= 0.400

Calculations

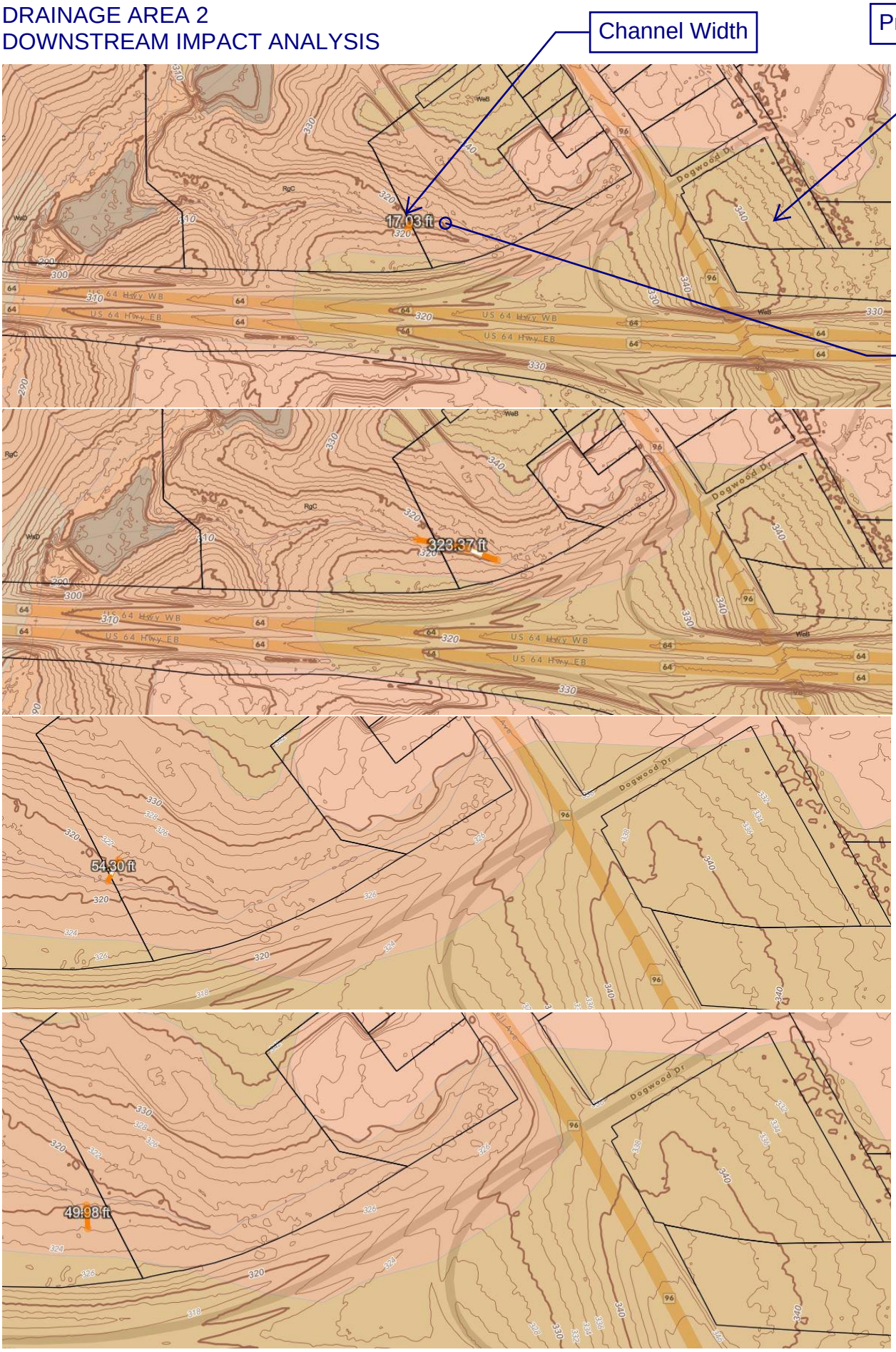
Compute by:	Known Q
Known Q (cfs)	= 498.00

Highlighted

Depth (ft)	= 2.90
Q (cfs)	= 498.00
Area (sqft)	= 633.36
Velocity (ft/s)	= 0.79
Wetted Perim (ft)	= 293.93
Crit Depth, Yc (ft)	= 0.70
Top Width (ft)	= 293.80
EGL (ft)	= 2.91

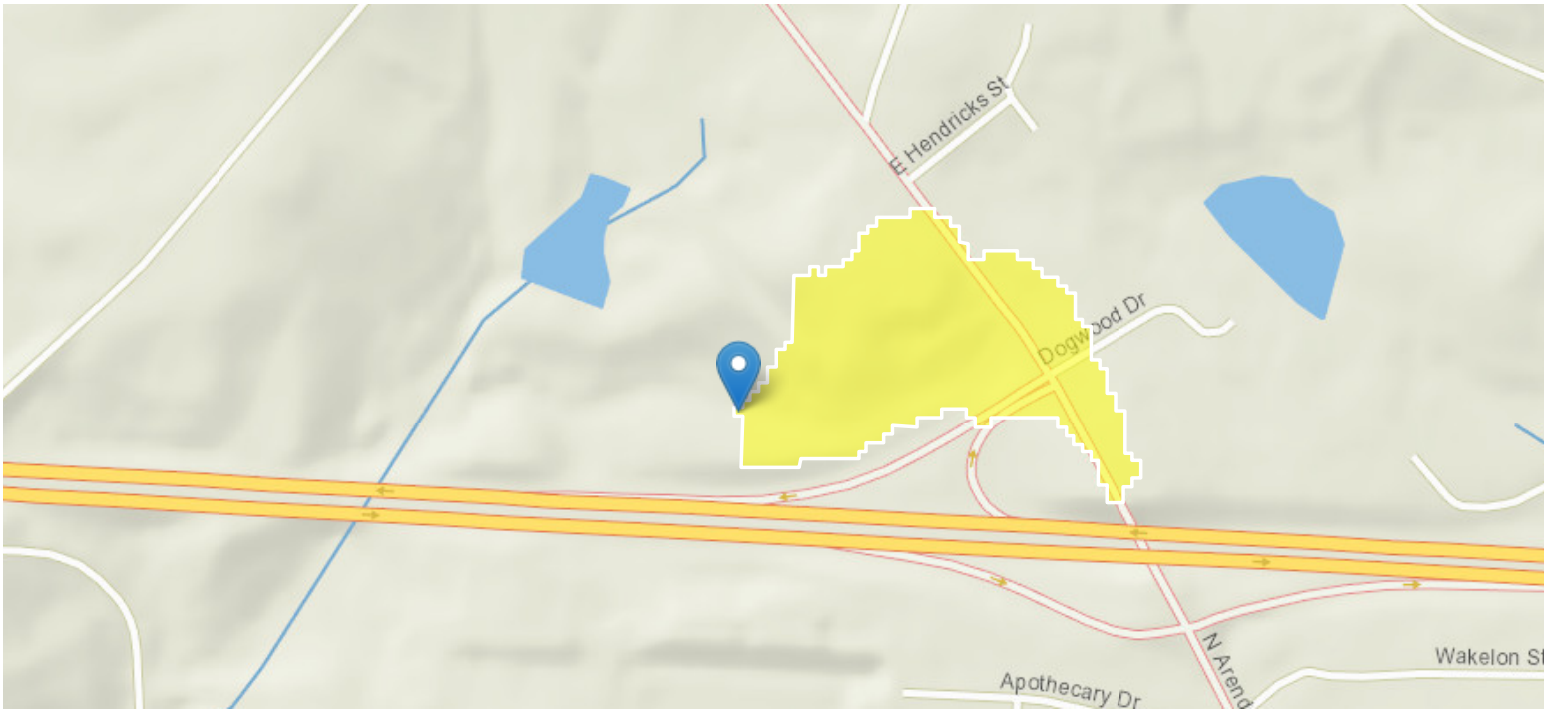


DRAINAGE AREA 2
DOWNSTREAM IMPACT ANALYSIS



StreamStats Report

Region ID: NC
Workspace ID: NC20231129140440784000
Clicked Point (Latitude, Longitude): 35.83572, -78.32615
Time: 2023-11-29 09:05:02 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0292	square miles
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	14.48	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	0.0292	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	14.48	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	0.0292	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	20.7	ft^3/s
20-percent AEP flood	29.1	ft^3/s
10-percent AEP flood	34.2	ft^3/s
4-percent AEP flood	39.9	ft^3/s
2-percent AEP flood	43.8	ft^3/s
1-percent AEP flood	47.6	ft^3/s
0.5-percent AEP flood	50.9	ft^3/s
0.2-percent AEP flood	58.5	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	15.2	ft^3/s
20-percent AEP flood	28.7	ft^3/s

Statistic	Value	Unit
10-percent AEP flood	40	ft^3/s
4-percent AEP flood	55.9	ft^3/s
2-percent AEP flood	70.3	ft^3/s
1-percent AEP flood	85	ft^3/s
0.5-percent AEP flood	100	ft^3/s
0.2-percent AEP flood	121	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. (http://pubs.usgs.gov/sir/2014/5030/)

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. (https://pubs.er.usgs.gov/publication/sir20235006)

Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 29 2023

<Name>

Trapezoidal

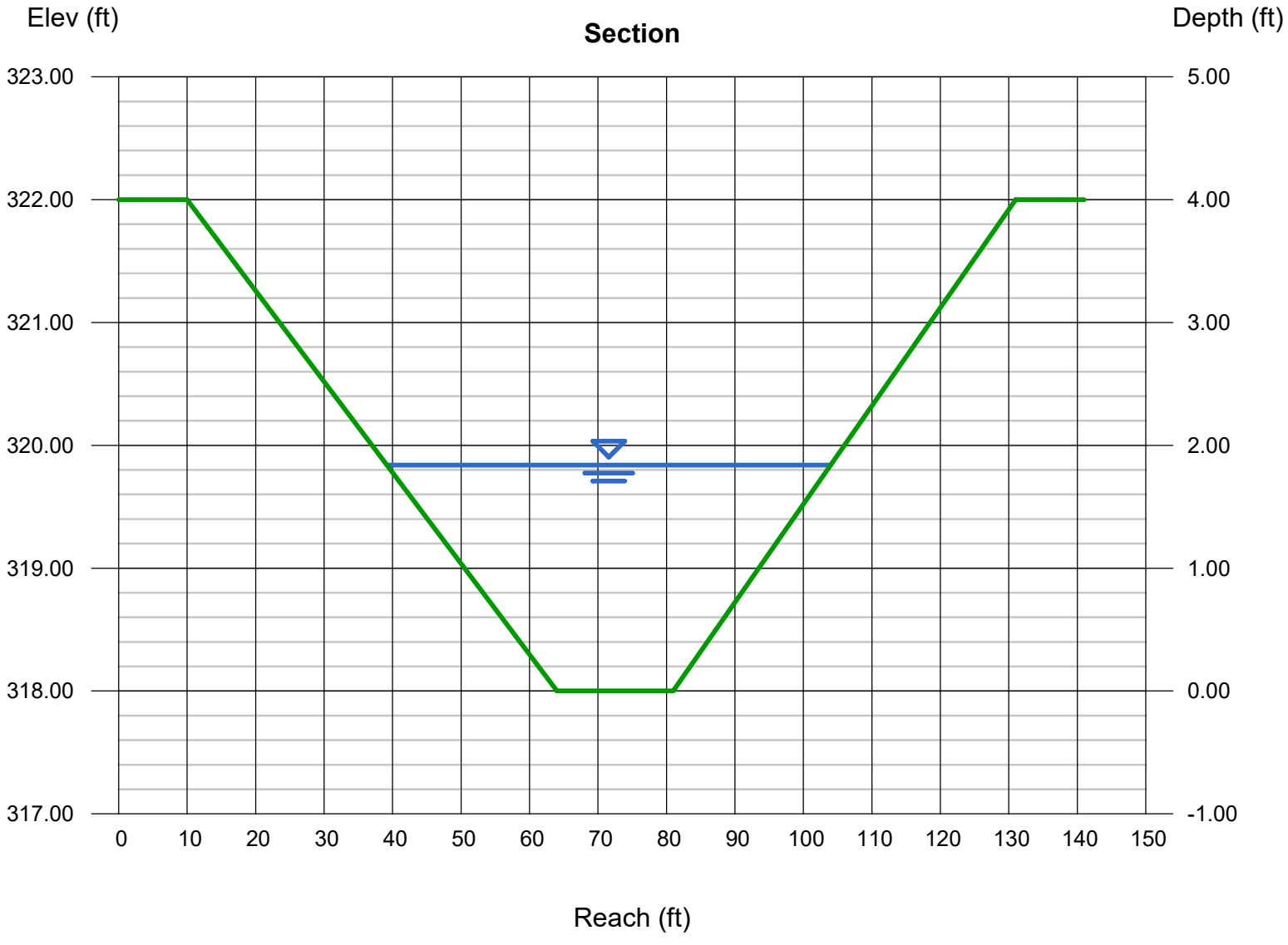
Bottom Width (ft)	= 17.00
Side Slopes (z:1)	= 13.50, 12.50
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 318.00
Slope (%)	= 1.23
N-Value	= 0.400

Calculations

Compute by:	Known Q
Known Q (cfs)	= 34.20

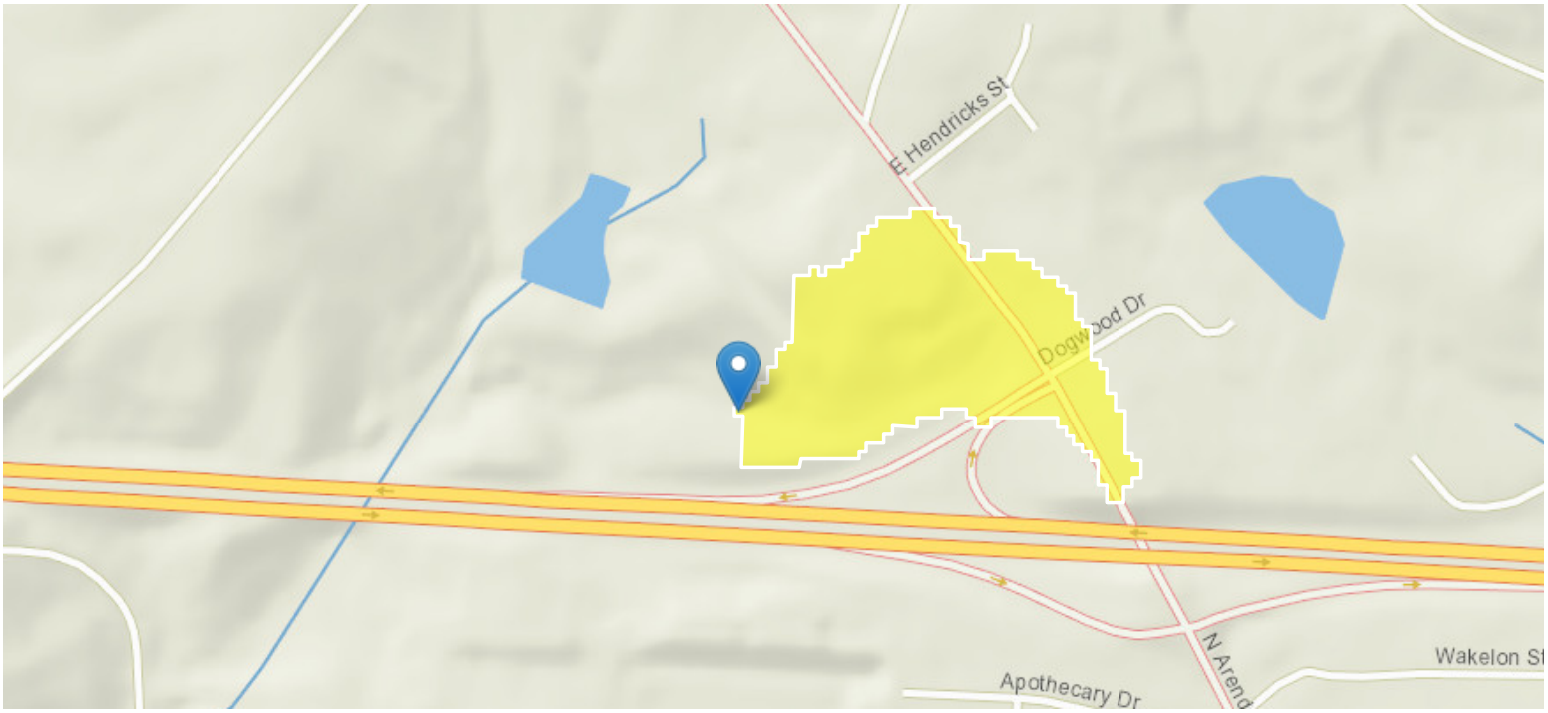
Highlighted

Depth (ft)	= 1.84
Q (cfs)	= 34.20
Area (sqft)	= 75.29
Velocity (ft/s)	= 0.45
Wetted Perim (ft)	= 64.98
Crit Depth, Yc (ft)	= 0.45
Top Width (ft)	= 64.84
EGL (ft)	= 1.84



StreamStats Report

Region ID: NC
Workspace ID: NC20231129140440784000
Clicked Point (Latitude, Longitude): 35.83572, -78.32615
Time: 2023-11-29 09:05:02 -0500



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0292	square miles
LC06IMP	Percentage of impervious area determined from NLCD 2006 impervious dataset	100	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

General Disclaimers

Parameter values have been edited, computed flows may not apply.

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	0.0292	square miles	0.1	1
LC06IMP	Percent Impervious NLCD2006	100	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	0.0292	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	285	ft^3/s
20-percent AEP flood	193	ft^3/s
10-percent AEP flood	153	ft^3/s
4-percent AEP flood	113	ft^3/s
2-percent AEP flood	90.8	ft^3/s
1-percent AEP flood	76.4	ft^3/s
0.5-percent AEP flood	63.2	ft^3/s
0.2-percent AEP flood	58.5	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	15.2	ft^3/s
20-percent AEP flood	28.7	ft^3/s
10-percent AEP flood	40	ft^3/s
4-percent AEP flood	55.9	ft^3/s
2-percent AEP flood	70.3	ft^3/s
1-percent AEP flood	85	ft^3/s
0.5-percent AEP flood	100	ft^3/s
0.2-percent AEP flood	121	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. (http://pubs.usgs.gov/sir/2014/5030/)

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. (https://pubs.er.usgs.gov/publication/sir20235006)

Application Version: 4.18.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Wednesday, Nov 29 2023

<Name>

Trapezoidal

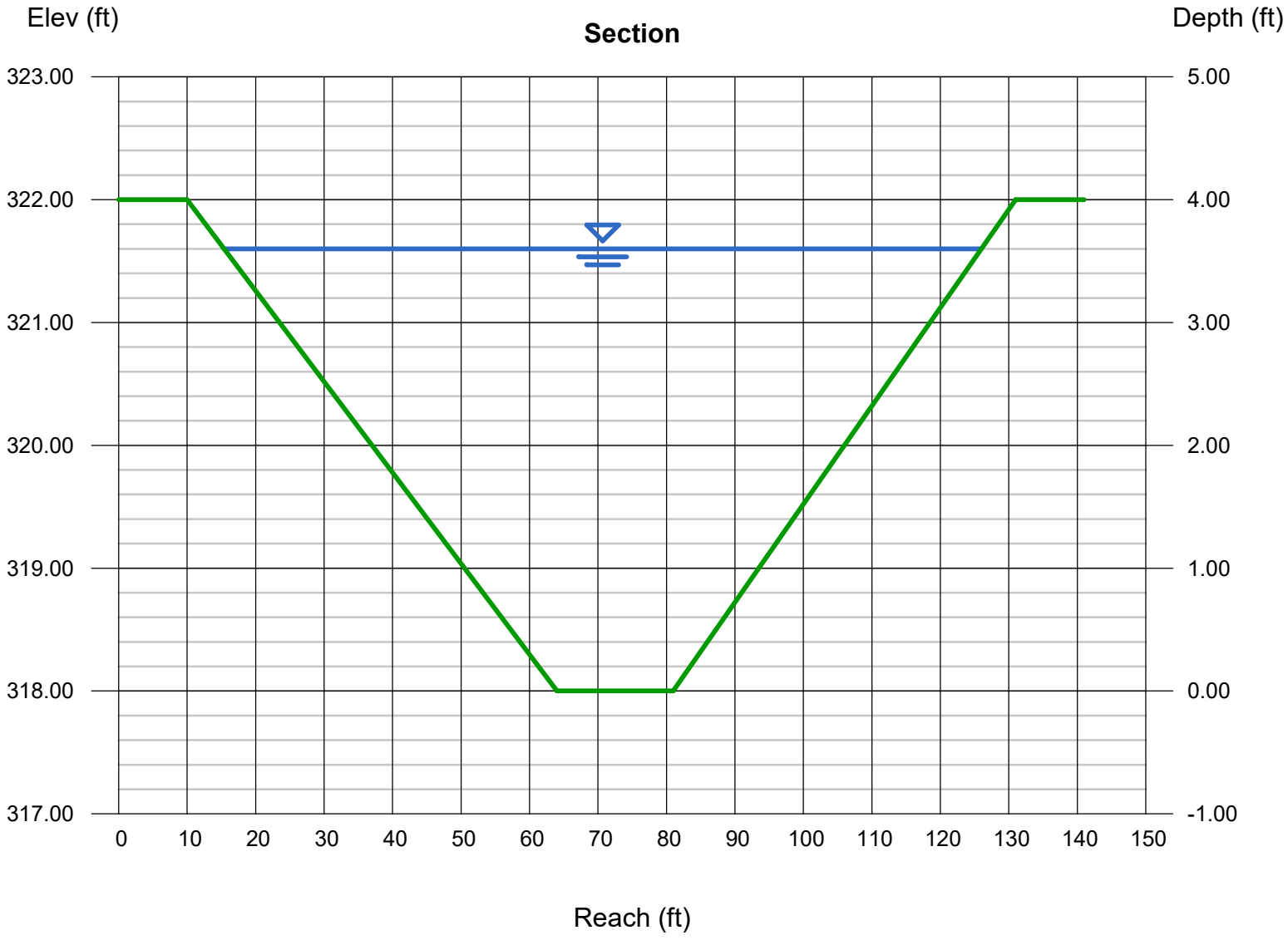
Bottom Width (ft)	= 17.00
Side Slopes (z:1)	= 13.50, 12.50
Total Depth (ft)	= 4.00
Invert Elev (ft)	= 318.00
Slope (%)	= 1.23
N-Value	= 0.400

Calculations

Compute by:	Known Q
Known Q (cfs)	= 153.00

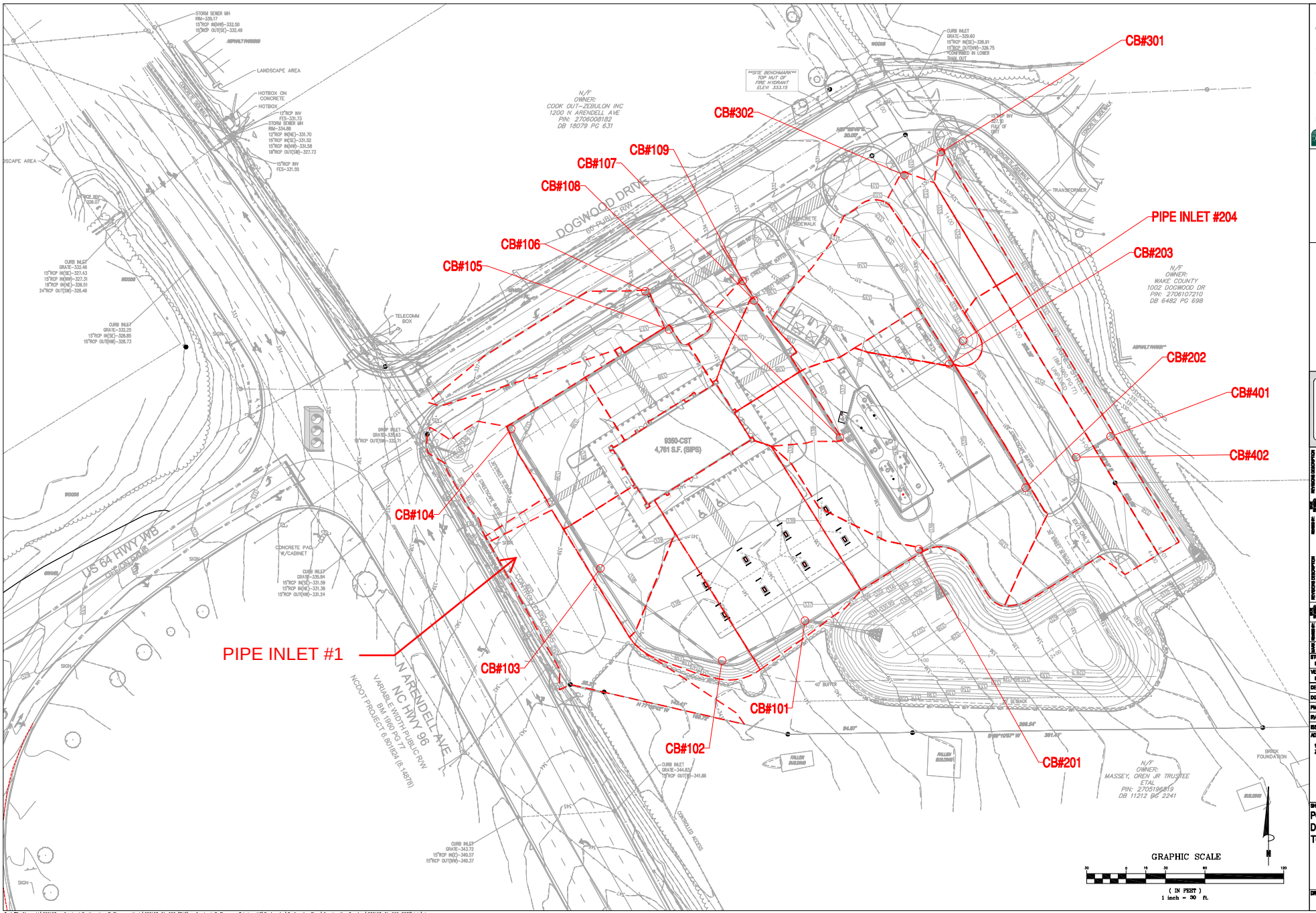
Highlighted

Depth (ft)	= 3.60
Q (cfs)	= 153.00
Area (sqft)	= 229.68
Velocity (ft/s)	= 0.67
Wetted Perim (ft)	= 110.88
Crit Depth, Yc (ft)	= 1.05
Top Width (ft)	= 110.60
EGL (ft)	= 3.61



APPENDIX C
Storm Drainage Design Calculations

Post-Development Drainage Map (Inlets)
100 System
200 System
300 System
400 System
500 System
Pipe Inlet #1



Bowman
Bowman North Carolina Ltd.
4020 Westchase Blvd. OR
Suite 104
RALEIGH, NC 27609
Phone: (919) 825-4070

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

Crosland Southeast
7-Eleven Store #42378
Zebulon, NC
WAKE COUNTY

7-ELEVEN

MARK	REVISION BY	DATE	REVISION DESCRIPTION
1	BM	10/2023	TOWN OF ZEBULON REVIEW

This drawing is the property of Bowman and is not to be used in connection with any work except as authorized and permitted in writing by Bowman.

STORE OR BLDG NO.:
N/A
VERSION OR PROJECT ID:
N/A
DESIGN TEAM
DSNR: BRM & MCB
PM/CP: ML
RVWR: ML
ISSUE DATE: 10/2/2023
ADDRESS
1108 N ARENDELL AVE
ZEBULON, NC 27597

SHEET TITLE
POST-DEVELOPED DRAINAGE AREA TO INLETS

DRWG. NO.

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

Catch Basin#105

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#106

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#107

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#108

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

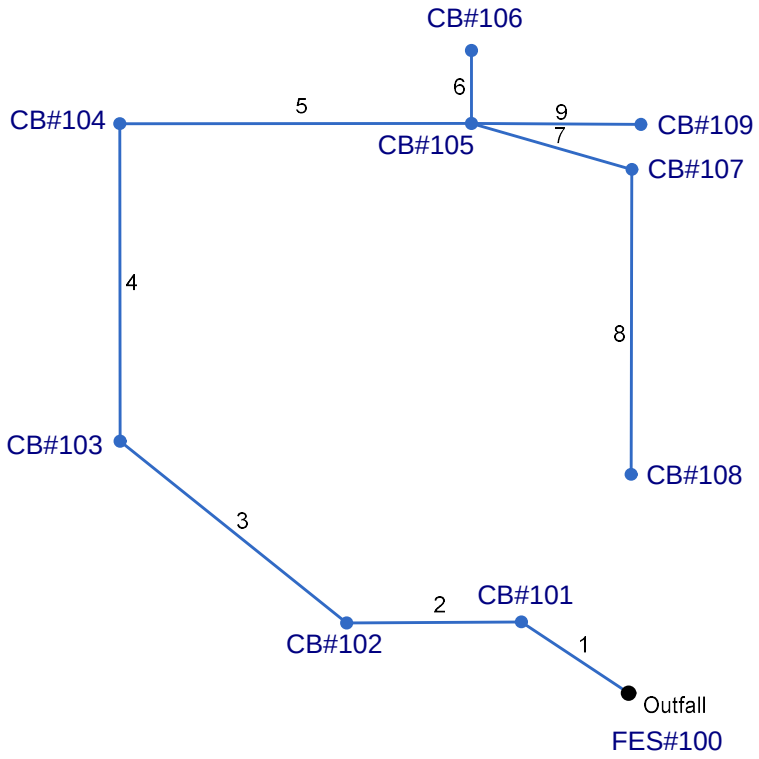
Catch Basin#109

Drainage Area (acres): 0.03

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.03	100%	0.95	0.95
Lawn	0.00	0%	0.3	0.00
Wooded	0.00	0%	0.2	0.00
Total Area=	0.03	Cumulative "C" =		0.95
		i_{10}=		7.21
		Q_{10}=		0.23

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



Project File: 100 System.stm	Number of lines: 9	Date: 12/5/2023

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	0.78	330.10	18	Cir	0.012	0.92	336.60	
2	1	69.000	-34.053	Curb	0.75	0.00	0.00	0.0	330.10	0.58	330.50	18	Cir	0.012	1.02	337.00	
3	2	115.000	39.225	Curb	0.67	0.00	0.00	0.0	330.60	0.52	331.20	18	Cir	0.012	1.22	337.40	
4	3	126.000	51.059	Curb	0.91	0.00	0.00	0.0	331.20	0.63	332.00	15	Cir	0.012	1.50	336.70	
5	4	139.000	90.054	Curb	1.44	0.00	0.00	0.0	332.10	0.58	332.90	15	Cir	0.012	1.50	336.50	
6	5	29.000	-89.926	Curb	0.80	0.00	0.00	0.0	333.00	0.69	333.20	15	Cir	0.012	1.00	335.70	
7	5	66.000	16.053	Curb	0.52	0.00	0.00	0.0	333.00	0.61	333.40	15	Cir	0.012	1.45	335.60	
8	7	121.000	74.103	Curb	0.41	0.00	0.00	0.0	333.50	0.58	334.20	15	Cir	0.012	1.00	337.50	
9	5	67.000	0.318	Curb	0.23	0.00	0.00	0.0	332.98	0.51	333.32	8	Cir	0.012	1.00	334.83	

Project File: 100 System.stm | Number of lines: 9 | Date: 12/5/2023

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	18	Cir	330.10	18	Cir	330.10
2		Curb-	337.00	Cir	4.00	4.00	18	Cir	330.50	18	Cir	330.60
3		Curb-	337.40	Cir	4.00	4.00	18	Cir	331.20	15	Cir	331.20
4		Curb-	336.70	Cir	4.00	4.00	15	Cir	332.00	15	Cir	332.10
5		Curb-	336.50	Cir	4.00	4.00	15	Cir	332.90	15 15 8	Cir Cir Cir	333.00 333.00 332.98
6		Curb-	335.70	Cir	4.00	4.00	15	Cir	333.20			
7		Curb-	335.60	Cir	4.00	4.00	15	Cir	333.40	15	Cir	333.50
8		Curb-	337.50	Cir	4.00	4.00	15	Cir	334.20			
9		Curb-	334.83	Cir	4.00	4.00	8	Cir	333.32			

Project File: 100 System.stm | Number of Structures: 9 | Run Date: 12/5/2023

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		7.89	18	Cir	51.000	329.70	330.10	0.784	330.70	331.19	0.47	331.19	End	Curb-
2		5.73	18	Cir	69.000	330.10	330.50	0.580	331.19	331.42	n/a	331.42	1	Curb-
3		4.98	18	Cir	115.000	330.60	331.20	0.522	331.44	332.06	0.43	332.06	2	Curb-
4		4.31	15	Cir	126.000	331.20	332.00	0.635	332.06	332.84	n/a	332.84 j	3	Curb-
5		3.40	15	Cir	139.000	332.10	332.90	0.576	332.84	333.64	n/a	333.64	4	Curb-
6		0.80	15	Cir	29.000	333.00	333.20	0.690	333.64	333.55	n/a	333.55	5	Curb-
7		0.93	15	Cir	66.000	333.00	333.40	0.606	333.64	333.78	n/a	333.78 j	5	Curb-
8		0.41	15	Cir	121.000	333.50	334.20	0.579	333.78	334.45	n/a	334.45 j	7	Curb-
9		0.23	8	Cir	67.000	332.98	333.32	0.507	333.64	333.67	0.02	333.69	5	Curb-

Project File: 100 System.stm | Number of lines: 9 | Run Date: 12/5/2023

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

Hydraulic Grade Line Computations

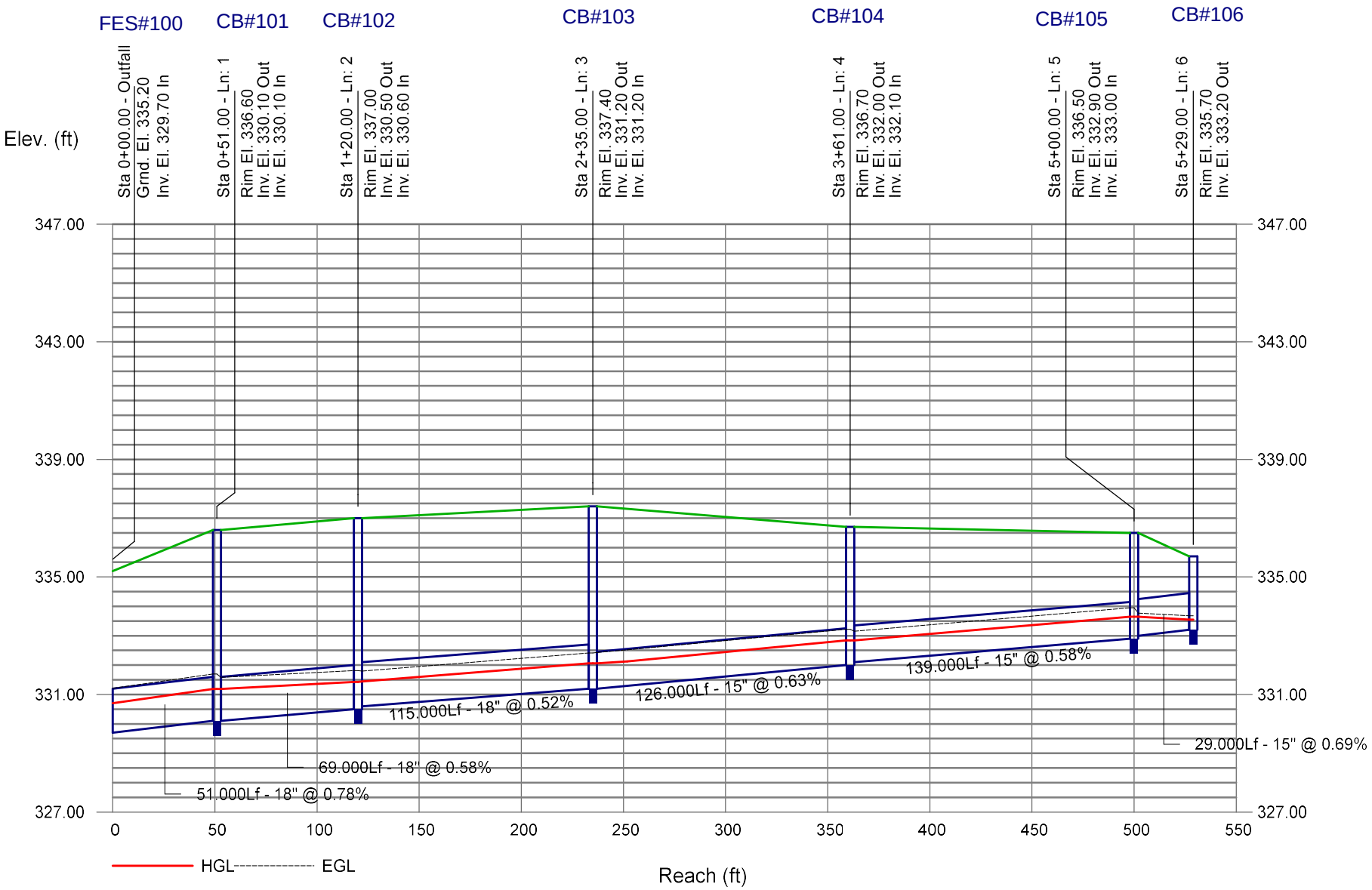
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	7.89	329.70	330.70	1.00	1.25	6.31	0.51	331.21	0.000	51.000	330.10	331.19	1.09**	1.37	5.75	0.51	331.70	0.000	0.000	n/a	0.92	0.47
2	18	5.73	330.10	331.19	1.09	1.14	4.18	0.39	331.58	0.000	69.000	330.50	331.42	0.92**	1.14	5.02	0.39	331.82	0.000	0.000	n/a	1.02	n/a
3	18	4.98	330.60	331.44	0.84*	1.02	4.87	0.35	331.80	0.000	115.000	331.20	332.06	0.86**	1.04	4.77	0.35	332.41	0.000	0.000	n/a	1.22	0.43
4	15	4.31	331.20	332.06	0.86	0.88	4.80	0.38	332.43	0.000	126.000	332.00	332.84 j	0.84**	0.88	4.91	0.38	333.22	0.000	0.000	n/a	1.50	n/a
5	15	3.40	332.10	332.84	0.74	0.76	4.49	0.31	333.15	0.000	139.000	332.90	333.64	0.74**	0.76	4.47	0.31	333.95	0.000	0.000	n/a	1.50	n/a
6	15	0.80	333.00	333.64	0.64	0.28	1.26	0.13	333.77	0.000	29.000	333.20	333.55	0.35**	0.28	2.85	0.13	333.68	0.000	0.000	n/a	1.00	n/a
7	15	0.93	333.00	333.64	0.64	0.31	1.46	0.14	333.78	0.000	66.000	333.40	333.78 j	0.38**	0.31	2.97	0.14	333.92	0.000	0.000	n/a	1.45	0.20
8	15	0.41	333.50	333.78	0.28	0.17	2.01	0.09	333.87	0.000	121.000	334.20	334.45 j	0.25**	0.17	2.37	0.09	334.54	0.000	0.000	n/a	1.00	n/a
9	8	0.23	332.98	333.64	0.66	0.35	0.66	0.01	333.65	0.029	67.000	333.32	333.67	0.35	0.19	1.24	0.02	333.69	0.105	0.067	0.045	1.00	0.02

Project File: 100 System.stm | Number of lines: 9 | Run Date: 12/5/2023

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

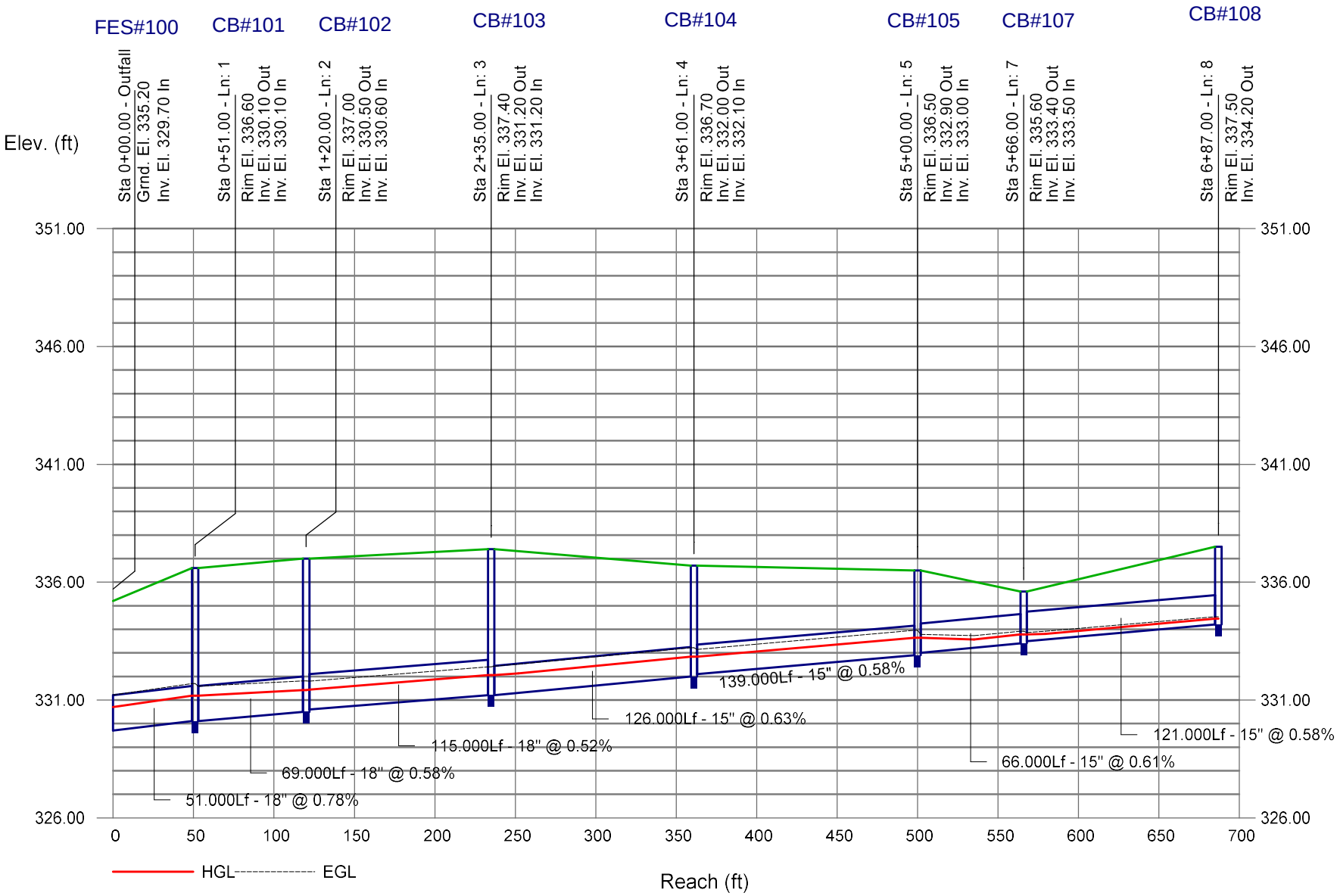
Storm Sewer Profile

Proj. file: 100 System.stm



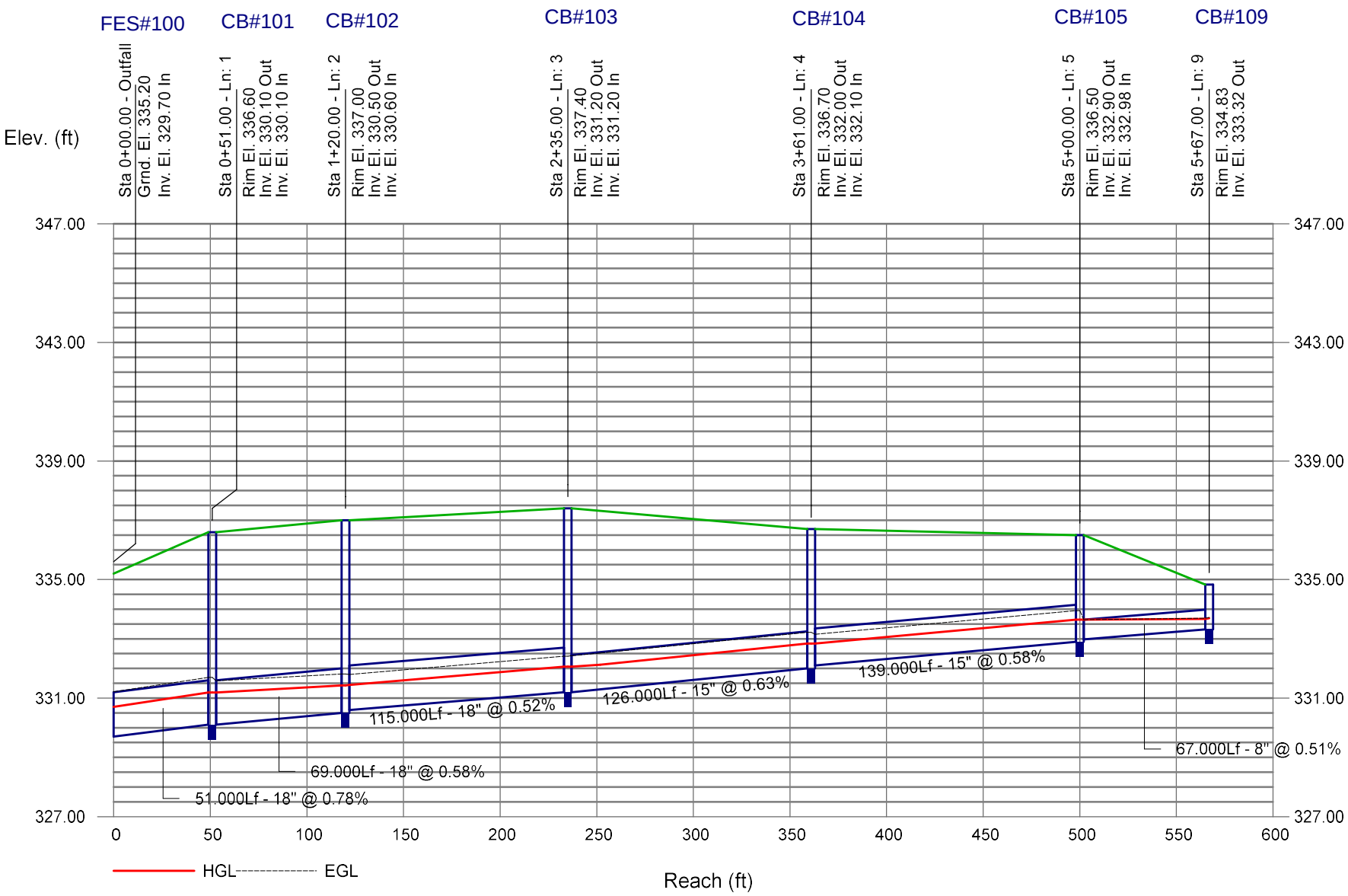
Storm Sewer Profile

Proj. file: 100 System.stm



Storm Sewer Profile

Proj. file: 100 System.stm



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): 0.48

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#203

Drainage Area (acres): 0.04

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.04	100%	0.95	0.95
Asphalt/Concrete Pavement	0.00	0%	0.95	0.00
Lawn	0.00	0%	0.3	0.00
Wooded	0.00	0%	0.2	0.00
Total Area=	0.04	Cumulative "C" =		0.95
		i_{10}=		7.21
		Q_{10}=		0.25

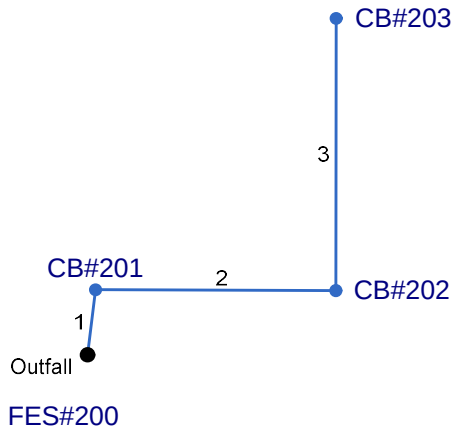
Pipe Inlet #204

Drainage Area (acres): 0.25

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.15	60%	0.95	0.57
Lawn	0.10	40%	0.3	0.12
Wooded	0.00	0%	0.2	0.00
Total Area=	0.25	Cumulative "C" =		0.69
		i_{10}=		7.21
		Q_{10}=		1.23

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



Project File: 200 System.stm	Number of lines: 3	Date: 12/5/2023

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	18	Cir	0.012	1.49	336.30	
2	1	95.000	83.248	Comb	3.12	0.00	0.00	0.0	329.90	0.53	330.40	18	Cir	0.012	1.50	333.90	
3	2	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	

Project File: 200 System.stm

Number of lines: 3

Date: 12/5/2023

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	18	Cir	329.90	18	Cir	329.90
2		Combination	333.90	Cir	4.00	4.00	18	Cir	330.40	18	Cir	330.40
3		Curb-	335.00	Cir	4.00	4.00	18	Cir	331.00			

Project File: 200 System.stm | Number of Structures: 3 | Run Date: 12/5/2023

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		5.06	18	Cir	26.000	329.70	329.90	0.769	330.46	330.76	0.53	330.76	End	Curb-
2		4.69	18	Cir	95.000	329.90	330.40	0.526	330.76	331.23	n/a	331.23 j	1	Combination
3		1.57	18	Cir	108.000	330.40	331.00	0.560	331.23	331.47	n/a	331.47 j	2	Curb-

Project File: 200 System.stm | Number of lines: 3 | Run Date: 12/5/2023

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

Hydraulic Grade Line Computations

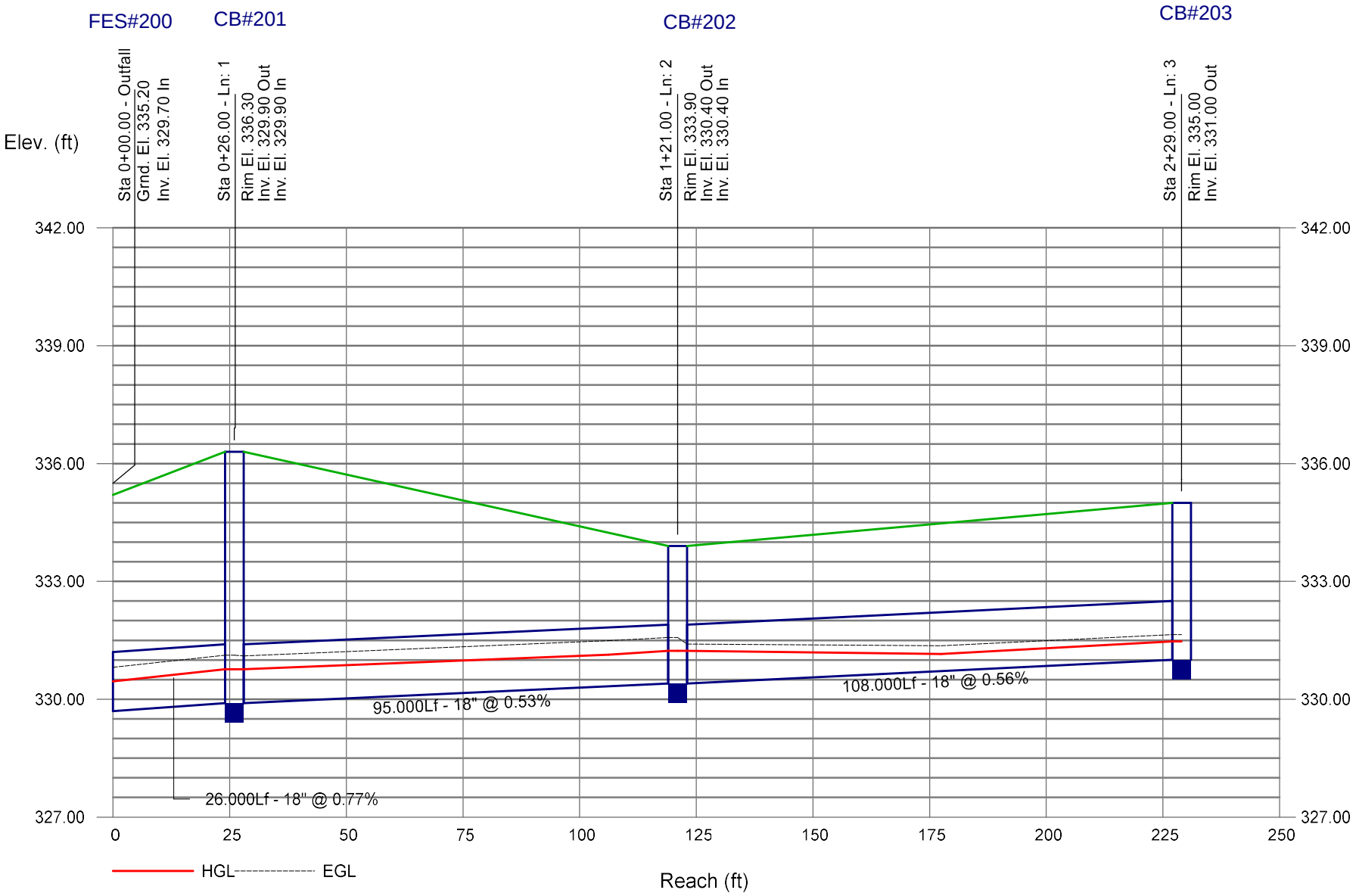
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	18	5.06	329.70	330.46	0.76	0.89	5.66	0.36	330.81	0.000	26.000	329.90	330.76	0.86**	1.06	4.80	0.36	331.12	0.000	0.000	n/a	1.49	0.53
2	18	4.69	329.90	330.76	0.86	1.01	4.44	0.34	331.10	0.000	95.000	330.40	331.23 j	0.83**	1.01	4.67	0.34	331.57	0.000	0.000	n/a	1.50	n/a
3	18	1.57	330.40	331.23	0.83	0.47	1.56	0.17	331.40	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

Project File: 200 System.stm | Number of lines: 3 | Run Date: 12/5/2023

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

Storm Sewer Profile

Proj. file: 200 System.stm



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

Rational Runoff Coefficient "C"

Catch Basin#301

Drainage Area (acres): 0.04

Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.04	100%	0.95	0.95
Lawn	0.00	0%	0.3	0.00
Wooded	0.00	0%	0.2	0.00
Total Area=	0.04	Cumulative "C" =		0.95
		i_{10}=		7.21
		Q_{10}=		0.30

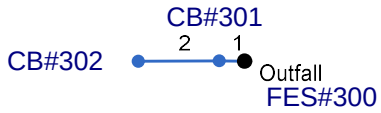
Catch Basin#302

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	0.06	70%	0.95	0.67
Lawn	0.02	30%	0.3	0.09
Wooded	0.00	0%	0.2	0.00
Total Area=	0.08	Cumulative "C" =		0.76
		i_{10}=		7.21
		Q_{10}=		0.46

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



Project File: 300 System.stm	Number of lines: 2	Date: 12/5/2023

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: 12/5/2023

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: 12/5/2023

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

Hydraulic Grade Line Computations

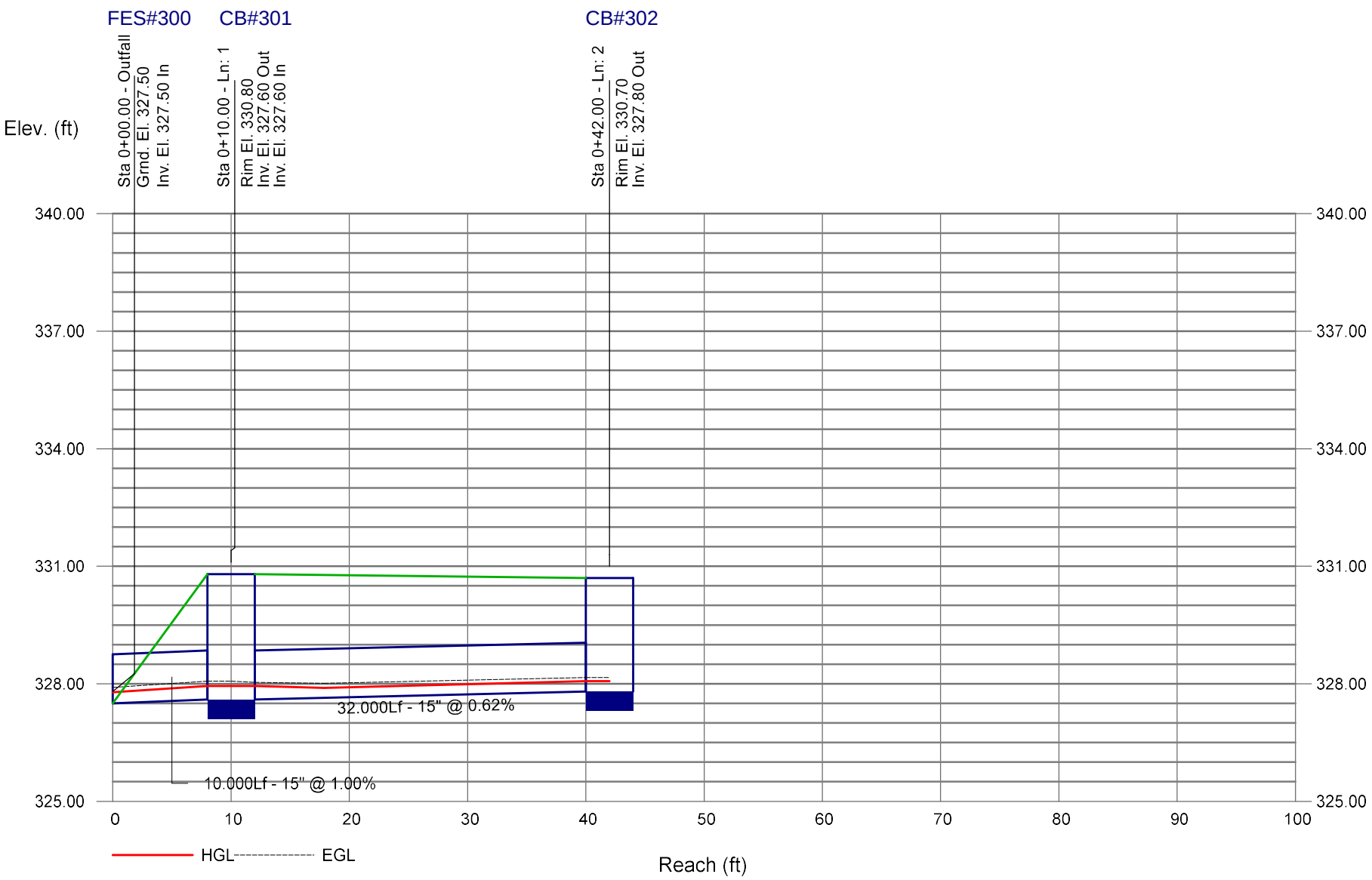
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(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: 12/5/2023

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

Storm Sewer Profile

Proj. file: 300 System.stm



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

Rational Runoff Coefficient "C"

Catch Basin#401

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

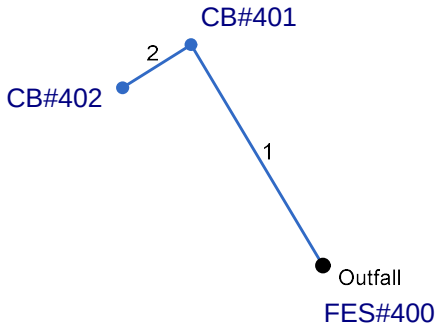
Catch Basin#402

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

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



Project File: 400 System.stm	Number of lines: 2	Date: 12/5/2023

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	102.000	-120.750	Curb	0.69	0.00	0.00	0.0	329.40	0.49	329.90	15	Cir	0.012	1.50	333.38	
2	1	32.000	-91.522	Curb	1.69	0.00	0.00	0.0	329.90	0.63	330.10	15	Cir	0.012	1.00	333.38	

Project File: 400 System.stm

Number of lines: 2

Date: 12/5/2023

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-	333.38	Cir	4.00	4.00	15	Cir	329.90	15	Cir	329.90
2		Curb-	333.38	Cir	4.00	4.00	15	Cir	330.10			

Project File: 400 System.stm | Number of Structures: 2 | Run Date: 12/5/2023

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		2.38	15	Cir	102.000	329.40	329.90	0.490	330.01	330.52	n/a	330.52	End	Curb-
2		1.69	15	Cir	32.000	329.90	330.10	0.625	330.52	330.62	n/a	330.62 j	1	Curb-

Project File: 400 System.stm

Number of lines: 2

Run Date: 12/5/2023

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

Hydraulic Grade Line Computations

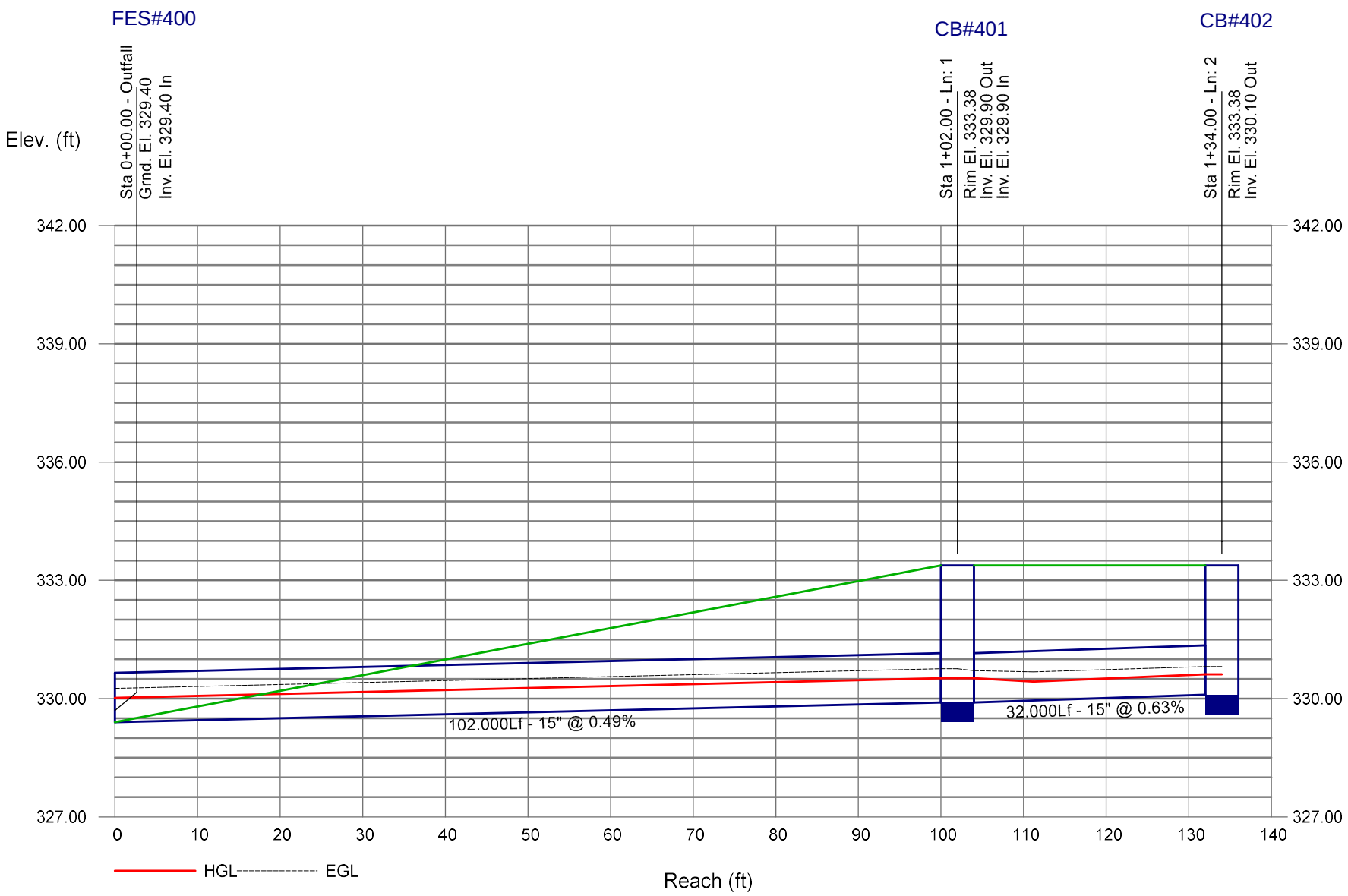
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	15	2.38	329.40	330.01	0.61	0.60	3.96	0.24	330.26	0.000	102.000	329.90	330.52	0.62**	0.60	3.95	0.24	330.76	0.000	0.000	n/a	1.50	n/a
2	15	1.69	329.90	330.52	0.62	0.48	2.80	0.19	330.71	0.000	32.000	330.10	330.62 j	0.52**	0.48	3.54	0.19	330.81	0.000	0.000	n/a	1.00	n/a

Project File: 400 System.stm | Number of lines: 2 | Run Date: 12/5/2023

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

Storm Sewer Profile

Proj. file: 400 System.stm



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

Project File: Pond Outfall.stm	Number of lines: 1	Date: 12/5/2023

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	62.000	7.392	MH	2.25	0.00	0.00	0.0	329.40	0.48	329.70	24	Cir	0.012	1.00	334.00	

Project File: Pond Outfall.stm | Number of lines: 1 | Date: 12/5/2023

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		Manhole	334.00	Cir	4.00	4.00	24	Cir	329.70			

Project File: Pond Outfall.stm | Number of Structures: 1 | Run Date: 12/5/2023

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		2.25	24	Cir	62.000	329.40	329.70	0.484	329.89	330.22	n/a	330.22	End	Manhole

Project File: Pond Outfall.stm | Number of lines: 1 | Run Date: 12/5/2023

NOTES: Return period = 10 Yrs.

Hydraulic Grade Line Computations

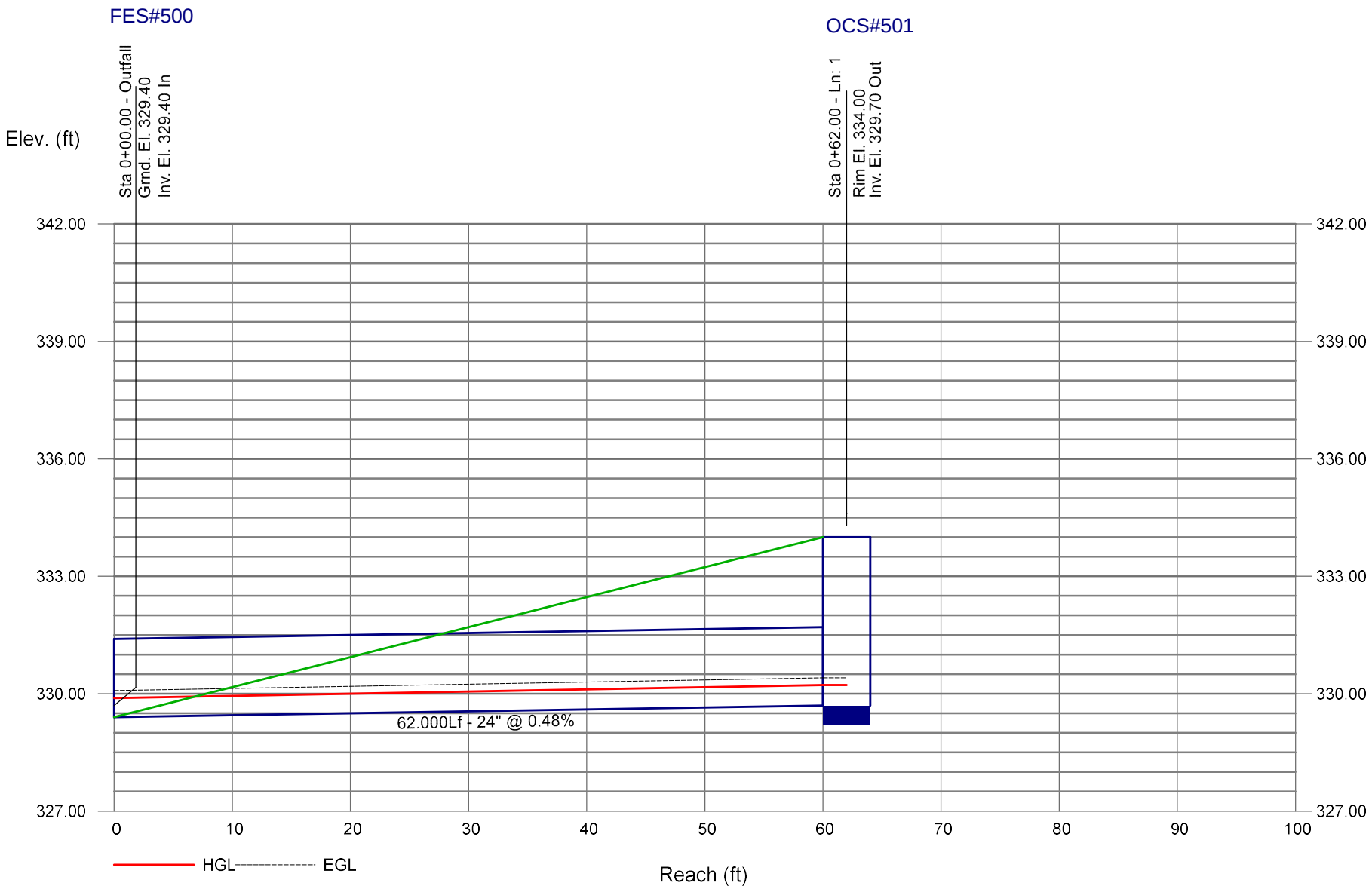
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	24	2.25	329.40	329.89	0.49	0.60	3.76	0.19	330.08	0.000	62.000	329.70	330.22	0.52**	0.65	3.46	0.19	330.41	0.000	0.000	n/a	1.00	n/a

Project File: Pond Outfall.stm | Number of lines: 1 | Run Date: 12/5/2023

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

Storm Sewer Profile

Proj. file: Pond Outfall.stm



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

Rational Runoff Coefficient "C"

Pipe Inlet #1

Drainage Area (acres): 0.32

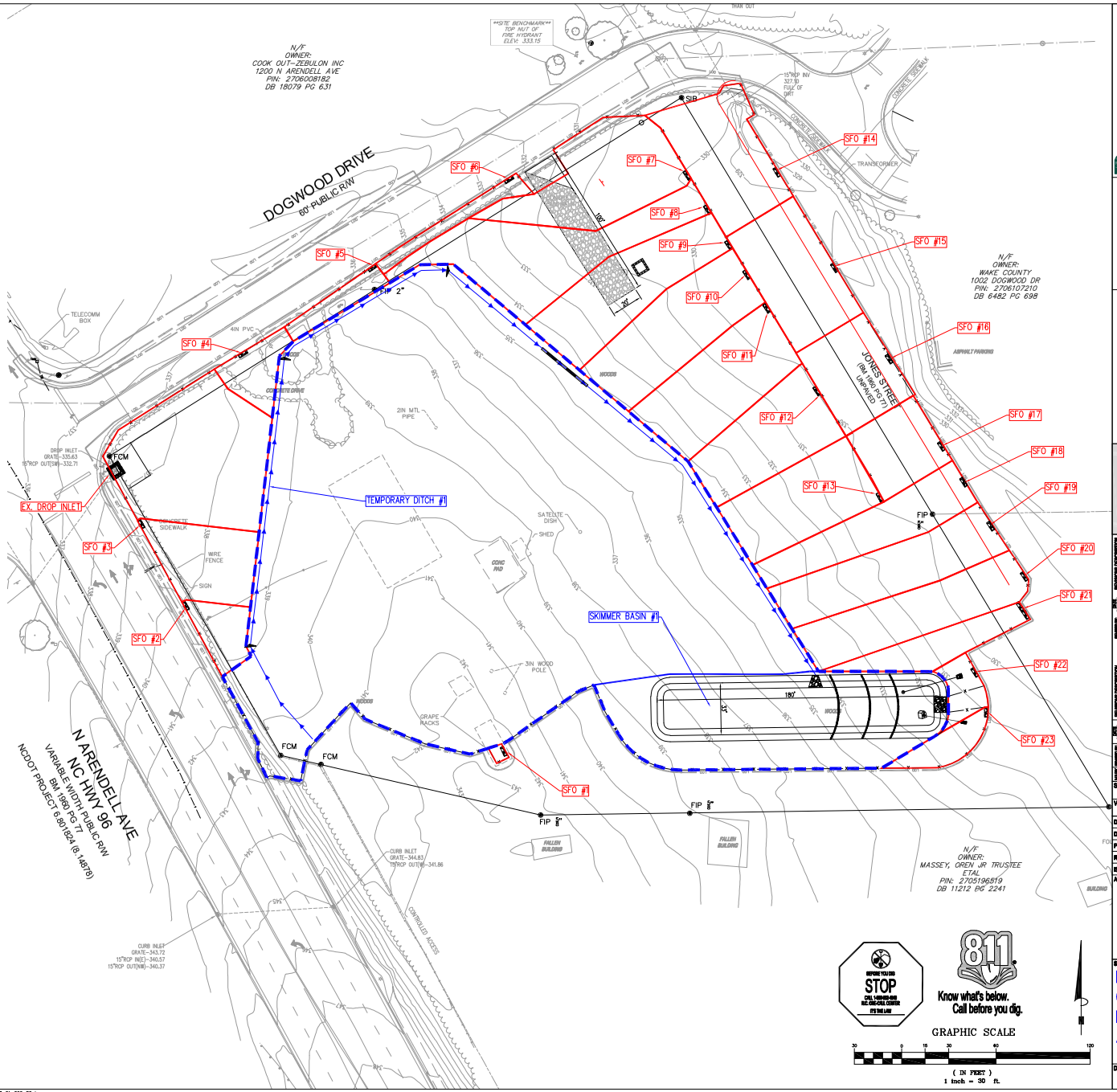
Proposed Land Uses:

Land Use Description	*Acres*	*% Site*	*Runoff "C"*	*"C"*
Roofs	0.00	0%	0.95	0.00
Asphalt/Concrete Pavement	0.00	1%	0.95	0.01
Lawn	0.32	99%	0.3	0.30
Wooded	0.00	0%	0.2	0.00
Total Area=	0.32	Cumulative "C" =		0.31
		i_{10}=		7.21
		Q_{10}=		0.71

APPENDIX D
Erosion Control Calculations

Rip-Rap Apron
Skimmer Basin
Skimmer Sizing
Anti-flotation Calculation
Temporary Diversion Ditches

EROSION CONTROL MEASURES DRAINAGE AREAS	
MEASURE	DRAINAGE AREA
SKIMMER BASIN #1 (INITIAL)	1.95 AC
SKIMMER BASIN #1 (FINAL)	3.39 AC SAME AS STORMWATER WETLANDS
TEMPORARY DITCH #1	1.67 AC
SFO #1	95 SF
SFO #2	1265 SF
SFO #3	2985 SF
EX. DROP INLET	7585 SF
SFO #4	1325 SF
SFO #5	925 SF
SFO #6	950 SF
SFO #7	5295 SF
SFO #8	6185 SF
SFO #9	4850 SF
SFO #10	4995 SF
SFO #11	4910 SF
SFO #12	4170 SF
SFO #13	4270 SF
SFO #14	4460 SF
SFO #15	4300 SF
SFO #16	3125 SF
SFO #17	2430 SF
SFO #18	3665 SF
SFO #19	4580 SF
SFO #20	4465 SF
SFO #21	2030 SF
SFO #22	890 SF
SFO #23	1060 SF



Bowman
Bowman North Carolina Ltd.
4008 BARRETT DR
Suite 104
RALEIGH, NC 27609
Phone: (919) 553-4570
bowman.com

PRELIMINARY
DO NOT USE FOR CONSTRUCTION

Crosland Southeast
7-Eleven Store #42378
Zebulon, NC
WAKE COUNTY

MARK	REVISED BY:	DATE	REVISION DESCRIPTION
1	BM	10/2023	TOWN OF ZEBULON REVIEW

This drawing is the property of Bowman and is not to be used or reproduced without written consent of Bowman.

STORE OR BLDG NO.: N/A
VERSION OR PROJECT ID: N/A
DESIGN TEAM
DSNR. BRM & MCB
PM/QP. ML
RVWR. ML
ISSUE DATE: 10/20/2023
ADDRESS
1105 N ARENDELL AVE
ZEBULON, NC 27597

SHEET TITLE
EROSION CONTROL DRAINAGE AREAS

DRWG. NO.

811 Know what's below. Call before you dig.

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

EROSION CONTROL CALCS (RIP-RAP CALCULATIONS)

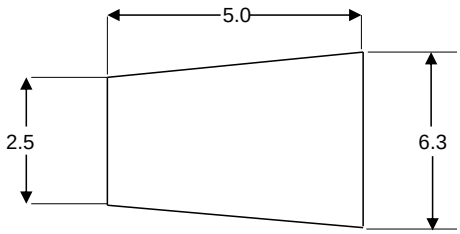
Project Information

Project Name:	7-Eleven Zebulon, NC		
Project #:	220163-01-002		
Designed by:	MCB	Date:	10/4/2023
Revised by:	MCB	Date:	12/4/2023
Checked by:		Date:	

Rip-Rap Apron#1

Pipe Diameter	d=	15	
Pipe Slope	s=	0.59	%
Manning's number	n=	0.013	
Flow	Q=	4.49	cfs
Velocity	V =	4.89	ft/s

Dissipator Dimensions *	Zone =	1	
	Stone Filling Class =	A	
	Entry Width (2 X D_0) =	2.5	ft
	Length (4 X D_0) =	5.0	ft
	Width (La + D_0) =	6.3	ft
	Min. Thickness =	12	inches
	Min. Stone Diameter=	3	inches



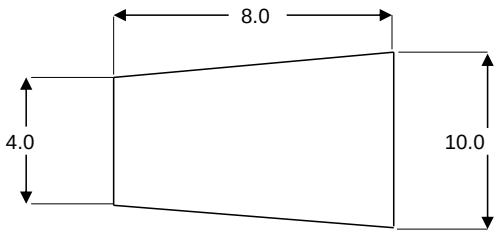
* All units are in feet

** Dissipator pad designed for full flow of pipe

Rip-Rap Apron#2

Pipe Diameter	d=	24	in
Pipe Slope	s=	0.77	%
Manning's number	n=	0.013	
Flow	Q=	10.61	cfs
Velocity	V =	6.82	ft/s

Dissipator Dimensions *	Zone =	1	
	Stone Filling Class =	A	
	Entry Width (3 X D_0) =	4.0	ft
	Length (6 X D_0) =	8.0	ft
	Width (La + D_0) =	10.0	ft
	Min. Thickness =	12	inches
	Min. Stone Diameter=	3	inches



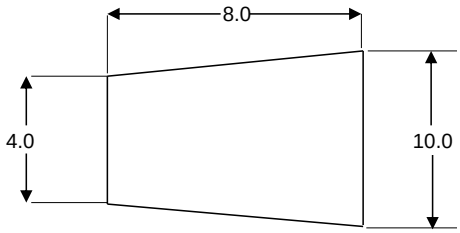
* All units are in feet

** Dissipator pad designed for full flow of pipe

Rip-Rap Apron#3

Pipe Diameter	d=	24	
Pipe Slope	s=	0.5	%
Manning's number	n=	0.013	
Flow	Q=	3.519	cfs
Velocity	V =	4.27	ft/s

Dissipator Dimensions *	Zone =	1	
	Stone Filling Class =	A	
	Entry Width (3 X D_0) =	4.0	ft
	Length (6 X D_0) =	8.0	ft
	Width (La + D_0) =	10.0	ft
	Min. Thickness =	12	inches
	Min. Stone Diameter=	3	inches

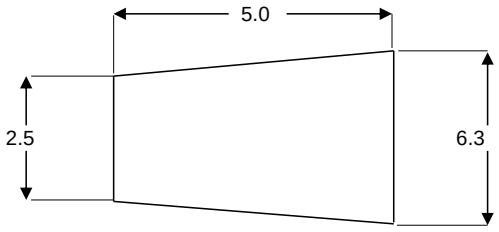


* All units are in feet
** Dissipator pad designed for full flow of pipe

Rip-Rap Apron#4

Pipe Diameter	d=	15	in
Pipe Slope	s=	1	%
Manning's number	n=	0.013	
Flow	Q=	0.78	cfs
Velocity	V =	3.76	ft/s

Dissipator Dimensions *	Zone =	1	
	Stone Filling Class =	A	
	Entry Width (3 X D_0) =	2.5	ft
	Length (6 X D_0) =	5.0	ft
	Width (La + D_0) =	6.3	ft
	Min. Thickness =	12	inches
	Min. Stone Diameter=	3	inches

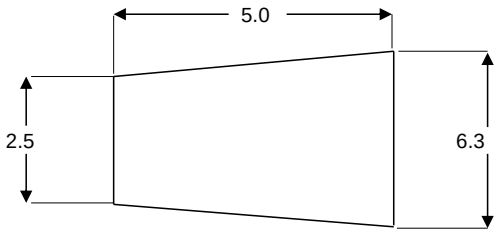


* All units are in feet
** Dissipator pad designed for full flow of pipe

Rip-Rap Apron#5

Pipe Diameter	d=	15	in
Pipe Slope	s=	0.5	%
Manning's number	n=	0.013	
Flow	Q=	2.38	cfs
Velocity	V =	3.96	ft/s

Dissipator Dimensions *	Zone =	1	
	Stone Filling Class =	A	
	Entry Width (3 X D_0) =	2.5	ft
	Length (6 X D_0) =	5.0	ft
	Width (La + D_0) =	6.3	ft
	Min. Thickness =	12	inches
	Min. Stone Diameter=	3	inches



* All units are in feet

** Dissipator pad designed for full flow of pipe

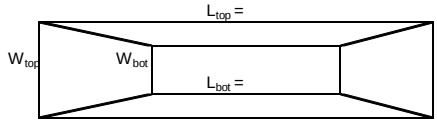
EROSION CONTROL CALCS (SKIMMER BASINS)

Project Information

Project Name: 7-Eleven Zebulon, NC
Project #: 220163-01-002
Designed by: MCB Date: 10/4/2023
Revised by: MCB Date: 11/29/2023
Checked by: Date:

Skimmer Basin #1

Initial Drainage Area	Total, A_T=	1.95	Ac	
	Disturbed, A_D=	1.95	Ac	
Final Drainage Area	Total, A_T=	3.39	Ac	
	Disturbed, A_D=	3.39	Ac	
25-year Runoff (Q25)	C =	0.50		
	T_c =	5.00	min	
	I25 =	8.04	in/hr	
	Q25 =	**13.6**	**cfs**	
Surface Area Required	SA =	425sf x Q25		
	SA =	**5,792**	**sf**	
Volume Required	V_R =	1800 cf/Ac x A_D		
	V_R =	**6,102**	**cf**	
Sediment Trap Dimensions	L =	180	ft	(Spillway Length)
	W =	33	ft	(Spillway Width)
	D =	2.0	ft	(Depth of Storage)
	Side Slopes =	2	:1	
	L_{top} =	188	ft	
	L_{bot} =	172	ft	
	W_{top} =	41	ft	
	W_{bot} =	25	ft	
	L/W Ratio=	5.5	:1 (must be 2:1 to 6:1)	



Elevations

Description	*Elevation*	
Top of Berm	334.00	(allow 1ft freeboard above spillway flow height)
Emergency Spillway	332.50	
Sediment Storage	332.00	
Cleanout Mark	331.00	(half of storage height)
Bottom	330.00	

Provided	**SA_P=**	**5,940**	**sf**	**>**	**5,792**
	V_P =	**10,240.0**	**cf**	**>**	**6,102**

Emergency Spillway - 10 Year Storm	I25 =	8.04	in/hr
	Q25 =	**13.63**	**cfs**
	h =	0.5	ft
	C_w =	3	
	L_W =	**10**	**ft**

Calculate Skimmer Size

Basin Volume in Cubic Feet	10,240	Cu.Ft	**Skimmer Size**	**2.5**	Inch
Days to Drain*	3	Days	Orifice Radius	**0.9**	Inch[es]
			Orifice Diameter	**1.9**	Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin

	Length	Width				
Top of water surface in feet	180	33	Feet	**VOLUME**	**10240**	**Cu. Ft.**
Bottom dimensions in feet	172	25	Feet			
Depth in feet	2		Feet			

EROSION CONTROL CALCS (SKIMMER BASINS)

Project Information

Project Name:	7-Eleven Zebulon, NC		
Project #:	220163-01-002		
Designed by:	MCB	Date:	10/4/2023
Revised by:	MCB	Date:	11/29/2023
Checked by:		Date:	

Anti-Flotation Device

4' x 4' Outlet Structure

Area:	16.0	sf	
Top of Basin Elev.:	332.0		
Bottom of Basin Elev.:	330.0		
Volume:	32.0	cf	(Water Displaced - Top of Pond to Bottom of Pond)
Weight:	1997	lbs	
Factor of Safety	1.20		
WT Req'd of Anti-Flotation Device:	2396	lbs	
Volume of Concrete Req'd:	16.0	cf	(Unit WT of Concrete = 150 pcf)
Volume Provided:	69.5	cf	(4'x4' riser x 2.0' = 32 cf, 5'x5' footing x 1.5' =37.5cf)

EROSION CONTROL CALCS (TEMPORARY DITCH #1)

Project Information

Project Name:	7-Eleven Zebulon, NC		
Project #:	220163-01-002		
Designed by:	MCB	Date:	10/4/2023
Revised by:		Date:	
Checked by:		Date:	

Temporary Ditch #1

Drainage Area	Total, A_T=	1.67	Ac
25-year Runoff (Q_{25})	C =	0.50	
	T_c =	5.00	min
	I_{25} =	8.04	in/hr
	Q_{25} =	**6.7**	**cfs**

North American Green
5401 St. Wendel-Cynthiana Rd.
Poseyville, Indiana 47633
Tel. 800.772.2040
>Fax 812.867.0247
www.nagreen.com
ECMDS v7.0

CHANNEL ANALYSIS

> > > Temporary Ditch #1

Name	Temporary Ditch #1
Discharge	6.7
Channel Slope	0.009
Channel Bottom Width	1
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	None
Vegetation Density	None
Soil Type	Sandy Loam (GM)

DS75

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Underlying Substrate	Straight	6.7 cfs	2.55 ft/s	0.92 ft	0.035	1.51 lbs/ft2	0.29 lbs/ft2	5.27	STABLE	D
DS75 Unvegetated	Straight	6.7 cfs	2.55 ft/s	0.92 ft	0.035	1.6 lbs/ft2	0.52 lbs/ft2	3.09	STABLE	D