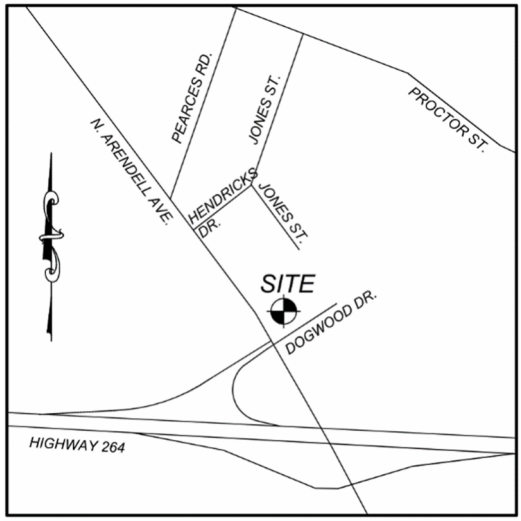
Engineering | Surveying | Planning | Environmental

Stormwater Management
& Sediment/Erosion Control Report

Submitted to:
Town of Zebulon, NC & Wake County, NC

Prepared for:
COOKOUT
1200 N Arendell Avenue
Zebulon, NC 27597

Project No: OUT-1502



VICINITY MAP
NTS

Prepared by:
Sambatek NC P.C.
8312 Creedmoor Road
Raleigh, North Carolina 27613

SAMBATEK NC P.C. REGISTERED CORPORATION C-4993 NORTH CAROLINA RALEIGH, NORTH CAROLINA

NORTH CAROLINA PROFESSIONAL SEAL 041458 ENGINEER JUSTIN W. ROHDE 04/02/2025

Date: 10/24/2022
Rev. 7/21/2023
Rev. 11/6/2023
Rev. 12/14/2023
Rev. 4/2/2025

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Project Narrative

This report addresses stormwater runoff quantity control, water quality treatment, and peak flow control for site improvements of an existing site in Zebulon, NC. The property is located on N. Arendell Ave. +/-900LF northeast of US-64. The property coordinates are 35° 50' 12.336'' N; 78° 19' 18.876'' W. The existing property is an undeveloped open space area. The proposed development of this site includes the construction of a new single-story fast-food restaurant with associated parking. The total site area is 83,368 SF with 0 SF of existing impervious area. After proposed development the site consists of 53,014 SF of impervious area.

Adjacent Areas

The site is bounded by commercial development. Limits of disturbance for this project remain on-site with the exception of utility connections.

Existing Conditions

The on-site runoff sheet flows from the center of the property and sheet flows off-site. Proposed development maintains existent drainage patterns.

Site Area = 83,368 SF
Existing Open Space = 83,368 SF
Existing Impervious = 0 SF

The USDA Soils Survey mapping included in Appendix A shows that the soils on-site are primarily Ur – Urban Land and WeB – Wedowee sandy loam.

Proposed Conditions

The proposed development consist of a single-story building with curb islands and associated parking. The development will result in 53,014 SF of impervious surface area being added to the site. In the post-development condition, stormwater runoff enters a proposed stormwater conveyance system then flows into an underground detention system. A portion of the detained runoff is directed through a Contech StormFilter water quality device, prior to exiting the site. Runoff volumes in excess of the water quality volume are detained and released at or below pre-development flow rates via the use of a multistage outlet control structure. The outlet pipe from the outlet control structure daylights in the rear of property along Jones St.

Site Area = 83,368 SF
Proposed Open Space = 30,354 SF
Proposed Impervious = 53,014 SF

Critical Erosion Areas

The most critical erosion area will be the surface of the working areas during construction operations. If grass is not established on dormant denuded areas then there is a significant potential for the covered areas to be eroded and for sediment to be carried in the runoff. To minimize the potential for erosion, covered areas that are temporarily inactive will be seeded within 14 working days after placement of the soil cover.

Erosion and Sediment Control Measures

All vegetative practices and erosion and sediment control features shall be designed, constructed, and maintained in accordance with the NCDEQ Erosion and Sediment Control and Wake County requirements. The erosion and sediment control plan shall be kept on site in a mailbox type structure located immediately adjacent to the posted permits if needed. Sediment shall be removed from the sediment control structures as necessary, but at a minimum of when the design capacity of each structure is reduced by 50%. Plan-view drawings with details and these same requirements are provided.

Silt Fence

Sediment fences will be provided down gradient of the proposed site grading at the locations shown on the drawings. Silt fences are not to be used across channels or in areas of concentrated flows.

Vegetative Stabilization

Vegetative cover shall be re-established within 14 calendar days after completion of the activity. Refer to plans for temporary and permanent seeding schedule and specifications.

Temporary Stabilization

Disturbed areas will be vegetated in accordance with NCDEQ Erosion and Sediment Control and Wake County requirements. Temporary control features will remain in place and will be maintained until the up-gradient disturbed area has been stabilized with vegetative cover.

Construction Sequence

The contractor is responsible for ensuring that erosion is minimized and that compliance with all applicable federal, state, and local laws, regulations, and ordinances are maintained throughout execution of this project.

Phase 1:

1. Obtain a land disturbing permit. Schedule a pre-construction meeting.
2. Install gravel construction pad, temporary diversions, silt fence, or other measures as shown on the approved plan. Clear only as necessary to install these devices. Seed temporary diversions and berms immediately after construction. See detail on seeding schedule. Contractor shall begin with sediment fencing and all other sediment containment devices followed by all diversion and by-pass ditches/berms and approved inlet protection devices.
3. Contact Karyn Pageau @ 919-786-8769 for a compliance inspection immediately following installation of the temporary sediment control devices and prior to mass grading of the site.

Phase 2:

1. Begin clearing/grubbing and general excavation on site. It is the responsibility of the contractor to phase/stage erosion control to allow for construction.

   Note: Contractor shall inspect and repair all erosion devices at least once a week and after every rainfall. Grading activity shall be prohibited in the areas of the sediment control devices until the areas upstream of these devices have been stabilized and approved.

2. Begin installing upstream storm drainage system. Install approved inlet protection. Additional measures may be required by the inspector due to the routing of the storm drainage system and actual field conditions.

   Note: Contractor shall ensure that the erosion control devices remain undisturbed during construction of the building pads and associated parking/drive areas adjacent to these devices until the contributing upstream areas have been stabilized and approved. Erosion control measures shall not be removed until approval from the environmental inspector.

3. Stabilize site as areas are brought up to finish grade with vegetation, paving, ditch linings, etc. Seed and mulch denuded areas within 14 working days or 30 calendar days after completion of any phase of construction, whichever period is stabilized. All areas shall be stabilized within 30 days.

Note: Contractor shall ensure that the erosion control devices remain undisturbed during construction of the building pads and associated parking/drive areas adjacent to these devices until the contributing upstream areas have been stabilized and approved.

Phase 3:

1. When construction is complete and all areas are stabilized completely, call for inspection by environmental inspector. When site is approved, remove silt fencing, inlet protection, etc. and seed or pave any resulting bare areas. All remaining permanent erosion control devices, such as outlet protection and permanent swale vegetation, should now be installed or brought online.
2. When vegetation has become established, call for a final site inspection by the environmental inspector. Obtain a certificate of completion.

Temporary Erosion and Sediment Control Maintenance

All erosion and sediment control measures will be checked for stability and operation following every runoff-producing rainfall but in no case less than twice every week, at least 72 hours apart. Any needed repairs will be made immediately to maintain all measures as designed.

Sediment fences and inlet protection shall be inspected at least twice every week, at least 72 hours apart. Repairs shall be made immediately. Sediment deposits shall be removed as needed to provide adequate storage volume for the next rainfall event, and to reduce pressure on the fence. Fencing materials and sediment deposits shall be removed, and the area brought to grade following stabilization of upgradient disturbed areas.

Proposed Stormwater Management Requirements

The stormwater management controls proposed provide water quantity volume control, peak flow reduction and water quality treatment. The appendices of this report provide detailed information regarding the hydrology and water quality improvements for the pre- and post-development conditions for the site.

Water Quantity Control Requirements and Compliance Methods

This project is located within the City of Zebulon city limits and is subject to the City of Zebulon Code of Ordinances Chapter 151 – Stormwater. Per Chapter 151.35, high-density projects shall control and treat runoff from the first inch of rainfall, and shall feature BMPs designed to ensure no net increase in peak flow rates leaving the site from the pre-development conditions for the one-year, 24-hour storm.

In order to address this control requirement, this project proposes to install an underground detention system with a multi-stage outlet control structure. Stormwater flows have been modeled for pre- and post-development flow rates to ensure compliance with the above stated regulations. In the post-development condition, the 1-year, 24-hour flow rates are controlled to below the pre-development conditions at both analysis points indicated on the attached drainage map exhibits within Appendix A. Please see Appendix B for the supporting peak flow calculations.

Water Quality Treatment Requirements

The project is located within the Neuse River watershed basin and is subject to water quality treatment requirements listed in the City of Zebulon Code of Ordinances, Chapter 151.35 (D) consisting of treatment to remove 85% Total Suspended Solids (TSS) from the first 1.0" of rainfall on-site. Post-construction runoff will be treated with a NCDEQ listed primary SCM (Contech StormFilter) which will provide the TSS treatment requirements to meet the City of Zebulon Ordinance requirements. The StormFilter SCM will be designed and sized in accordance with NCDEQ minimum design criteria listed in the NCDEQ Stormwater Design Manual, chapter D-1. See Appendix C and D for details.

Downstream Impact Analysis

A downstream impact analysis was performed in accordance with section 151.36 of the Zebulon Code of Ordinances to ensure there are no impacts on flooding or channel degradation downstream as a result of this project. Topographic mapping of the site as well as the downstream drainage areas were reviewed during the preparation of this analysis. Two downstream drainage areas and analysis points were identified and modeled using Hydraflows Hydrographs and the NRCS SCS-Method. Pre-development and post-development hydrograph models were prepared and used to confirm that there were no increases in the 10-year, 24-hour storm flow rates at the site boundaries nor at the downstream analysis points. Please see the summary of findings below, as well as the attached Hydraflows Hydrograph calculations (Appendix B) and Downstream Impact Analysis exhibit figure (Appendix F).

10-Year, 24-Hour Storm Peak Flow Summary Table:				
Analysis Point:	DA-1 (On-Site)	DA-1 (Downstream)	DA-2 (On-Site)	DA-2 (Downstream)
Pre-Development	3.476	15.88	4.823	32.71
Post-Development	1.033	14.32	2.823	32.51

Calculation Methodology

- The rainfall data was taken from NOAA Atlas 14. This rainfall depth was then input into Hydraflow 2017 along with a CN using the SCS method for pre- and post-development flow rates. Please reference the Appendix B within this report for additional information.
- Soils data for the site was taken from the NRCS USDA web soil survey website (http://websoilsurvey.nrcs.usda.gov/). Please reference the miscellaneous site data section within this report for additional information.
- The on- and off-site topography used in the analysis is from a field survey by Sambatek NC PC performed on June 6, 2022.

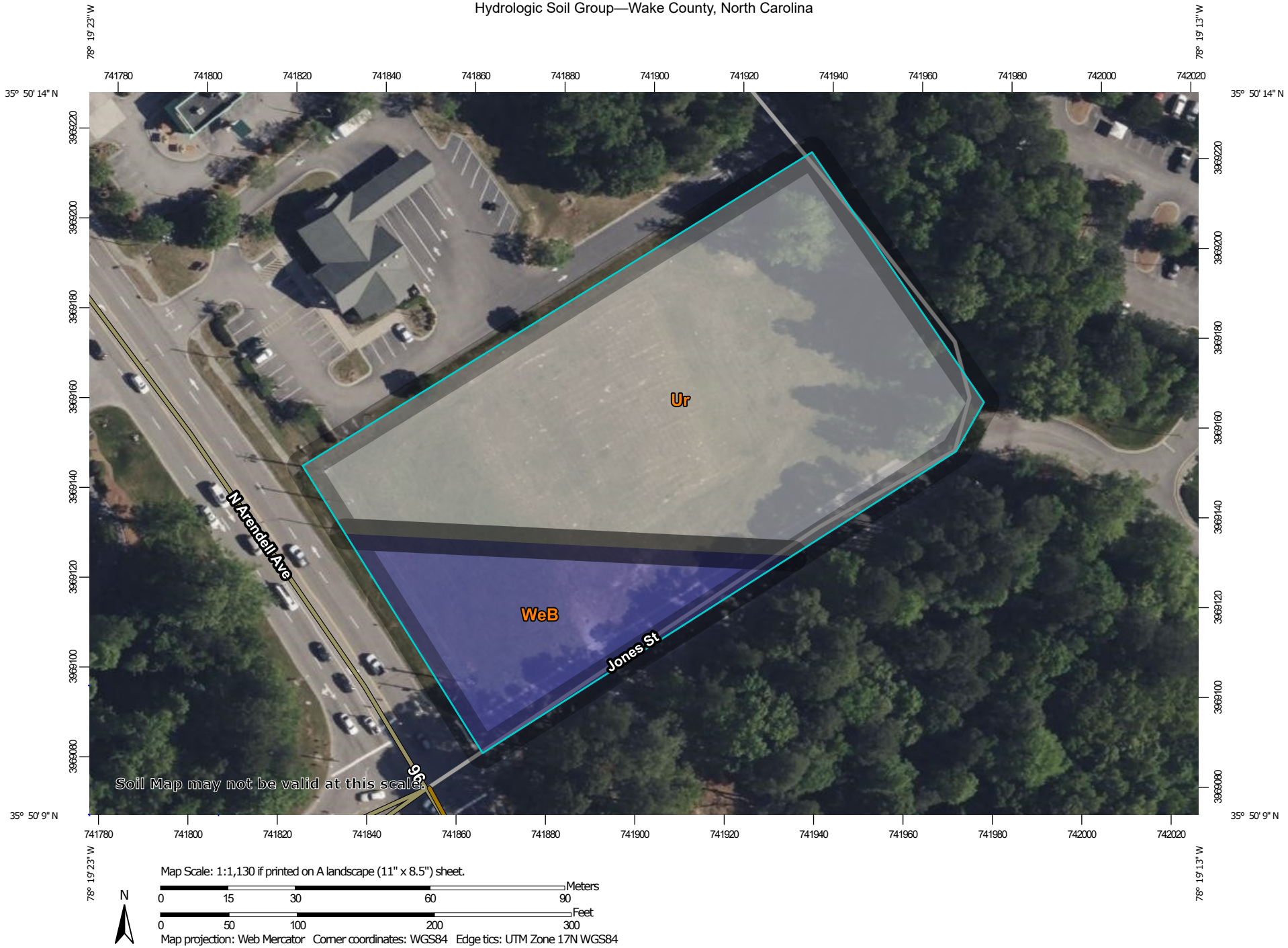
Stormwater SCM Maintenance

Frequent, thorough, and consistent inspections and maintenance are critical to the successful operation of the stormwater control measures. Inspections reveal the operational status of the system and identify needed maintenance actions. Therefore, the individuals responsible for inspecting and maintaining the SCM should thoroughly understand the stormwater control measures and processes. The type and frequency of maintenance for a specific stormwater system is determined by inspection results and the maintenance schedule for each stormwater device being proposed. Maintenance should be performed in accordance with system design information and safety procedures provided in Appendices. Performing timely maintenance is important in preventing system failure and will be less expensive in the long-term.

Construction Maintenance
During construction, the project site owner must implement a self-monitoring program that includes a written site evaluation of all erosion control measures and SCMs after each measurable storm event, and at least one time per week, in accordance with the requirements in the stormwater manual. All measures and controls must be repaired and maintained in proper operating condition.

Post-Construction Maintenance
After all construction activity has been completed, SCM maintenance is the responsibility of the property owner.

APPENDIX A



Map Scale: 1:1,130 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil 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 25, Oct 2, 2023

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		1.9	76.5%
WeB	Wedowee sandy loam, 2 to 6 percent slopes	B	0.6	23.5%
Totals for Area of Interest			**2.5**	**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

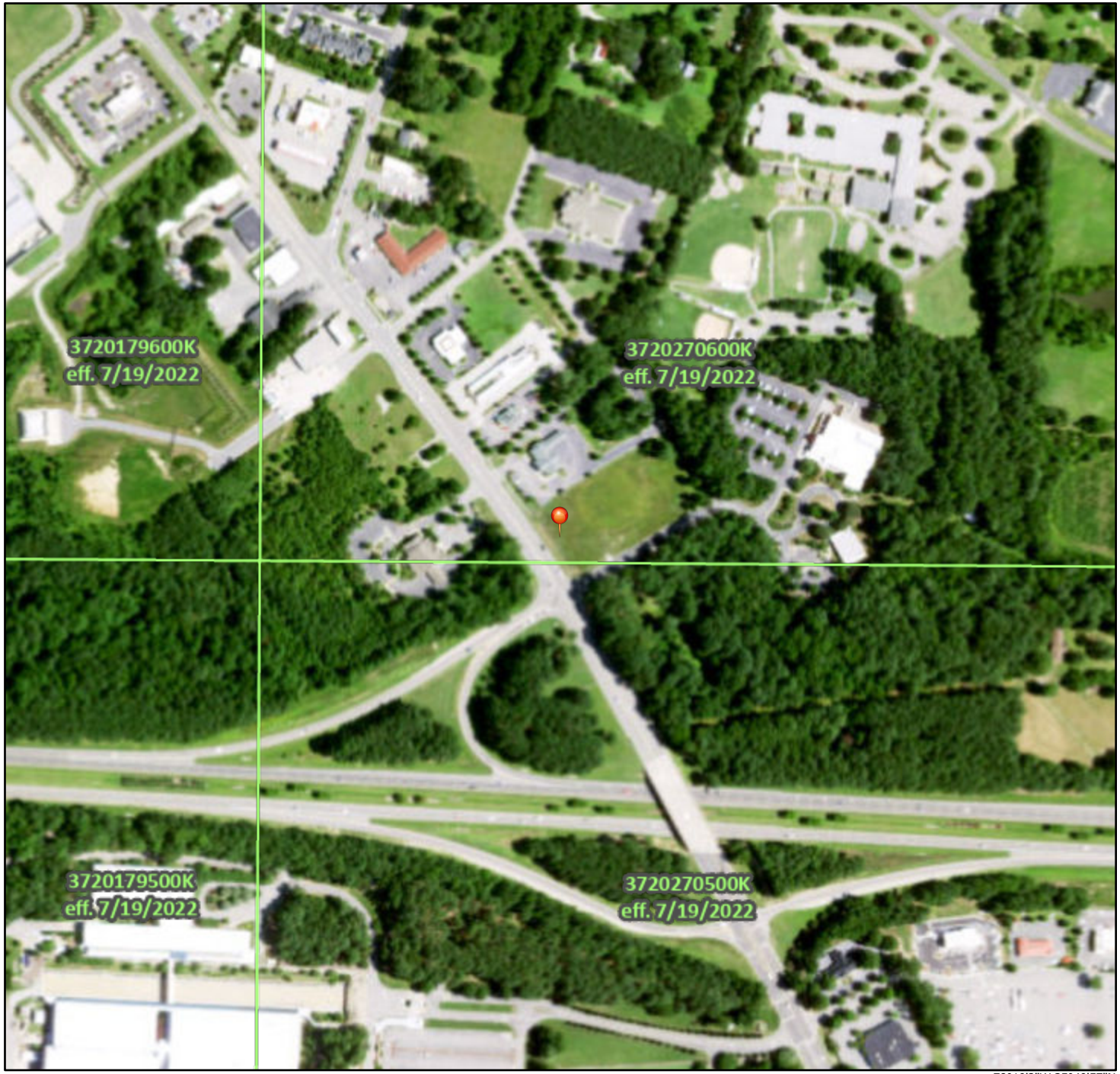
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

National Flood Hazard Layer FIRMette

78°19'39"W 35°50'26"N



78°19'2"W 35°49'57"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
- 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 10/17/2023 at 2:48 PM 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.

USGS
science for a changing world
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

ZEBULON QUADRANGLE
NORTH CAROLINA
7.5-MINUTE SERIES

Produced by the United States Geological Survey

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

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

Imagery.....NAIP, May 2016 - November 2016
Roads.....U.S. Census Bureau, 2016
Names.....GNIS, 1980 - 2019
Hydrography.....National Hydrography Dataset, 1899 - 2018
Contours.....National Elevation Dataset, 2008
Boundaries.....Multiple sources; see metadata file 2017 - 2018

Wetlands.....FWS National Wetlands Inventory 1983

MN
GN
9°31´
169 MILS
1°34´
28 MILS

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
QV
Grid Zone Designation 17S

SCALE 1:24 000

KILOMETERS 1 0.5 0 1 2
METERS 1000 500 0 1000 2000
MILES 1 0.5 0 1
FEET 1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

NORTH CAROLINA

QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

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

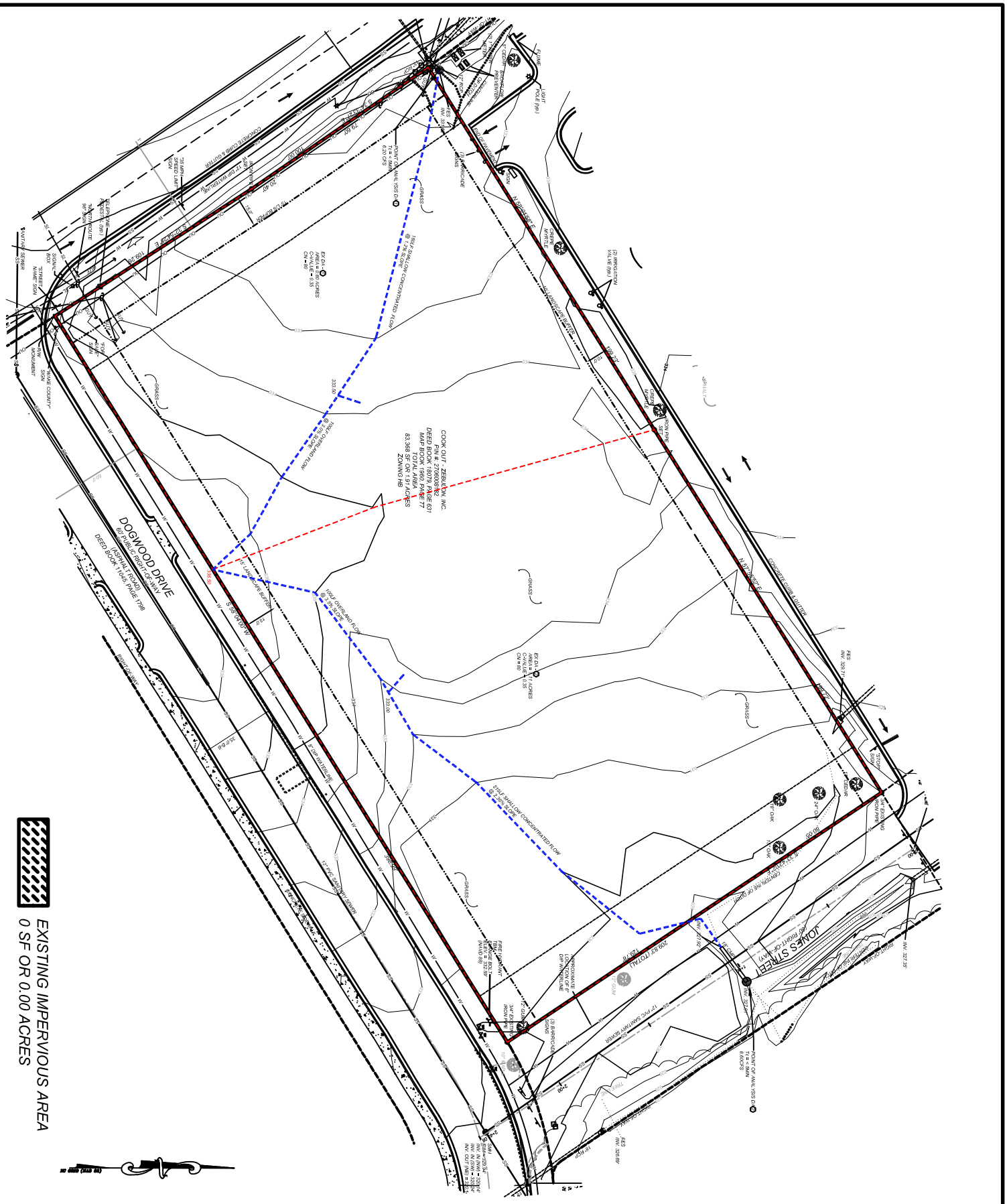
ADJOINING QUADRANGLES

ROAD CLASSIFICATION

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

ZEBULON, NC
2019

7643016379377
NSN. 7643016379377
NGA REF NO. USGSX24K72128

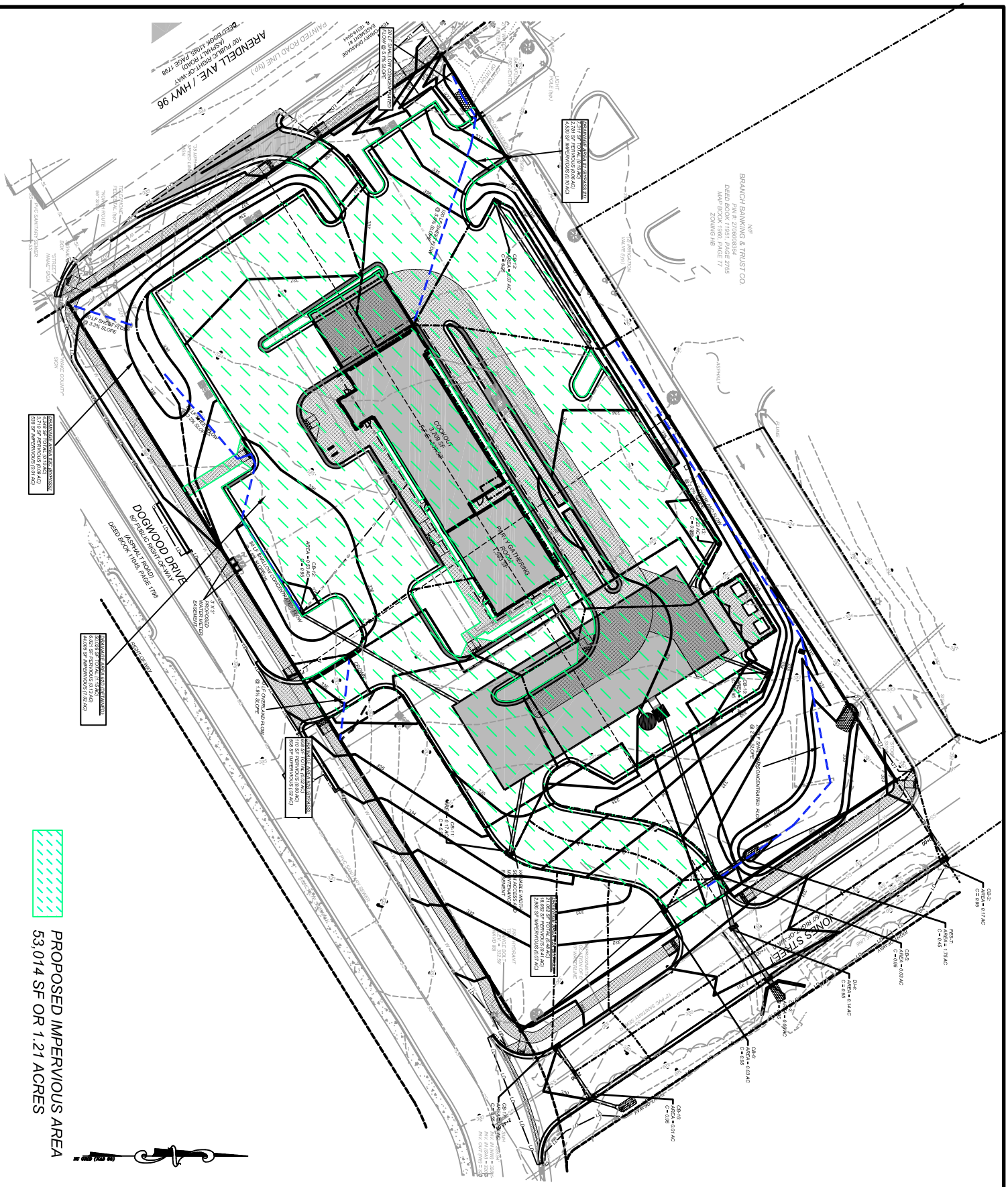


PROJECT NO.	OUT-1502
FILENAME:	OUT1502-EXA
SCALE:	1"= 60'
DATE:	10/17/2023

PRE-DEVELOPMENT IMPERVIOUS MAP

COOKOUT ZEBULON
1200 N ARENDELL AVE
ZEBULON, NC

COMMERCIAL SITE DESIGN
A Sambatek Company
8312 CREEDMOOR ROAD
RALEIGH, NORTH CAROLINA 27613
(919) 848-6121, FAX: (919) 848-3741
WWW.CSITEDESIGN.COM



PROJECT NO.	OUT-1502
FILENAME:	OUT1502-EXB
SCALE:	1"= 60'
DATE:	03/27/2025

POST-DEVELOPMENT IMPERVIOUS MAP

COOK OUT ZEBULON
1200 N ARENDELL AVE
ZEBULON, NC

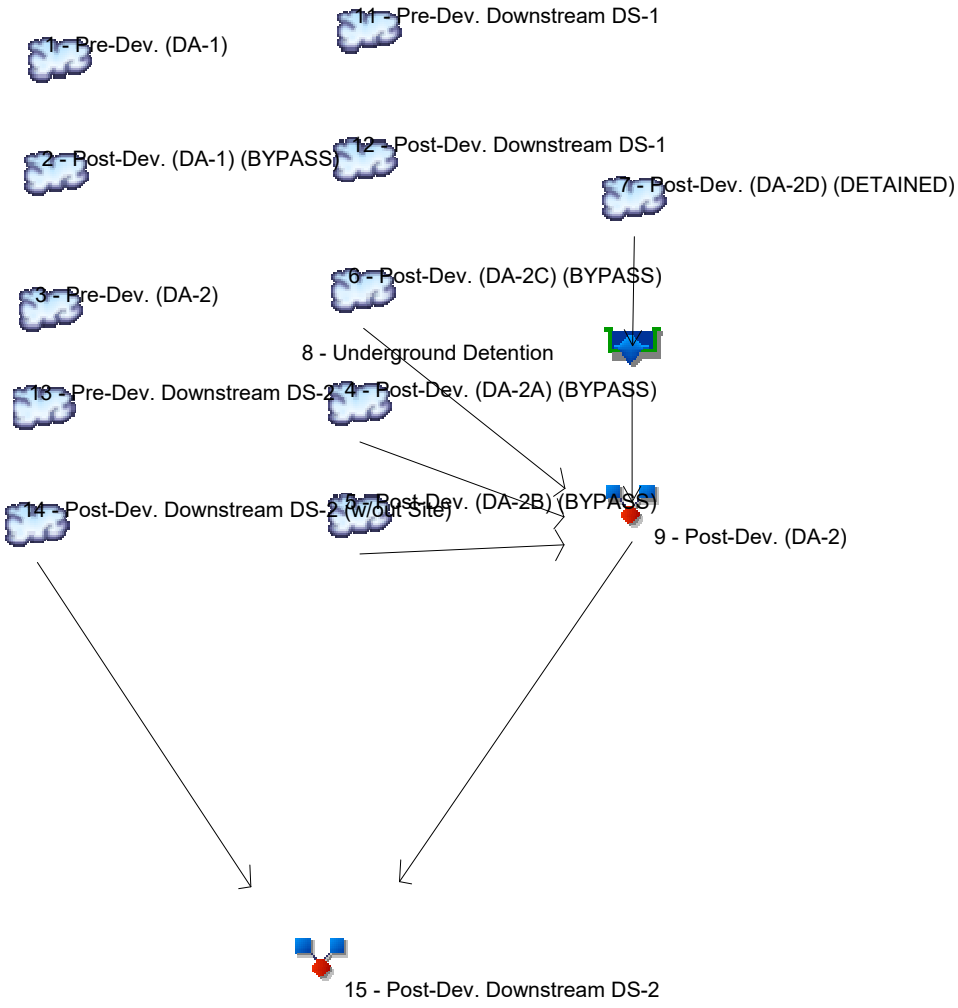
COMMERCIAL SITE DESIGN
A Sambatek Company
8312 CREEDMOOR ROAD
RALEIGH, NORTH CAROLINA 27613
(919) 848-6121, FAX: (919) 848-3741
WWW.CSITEDESIGN.COM

WAKE COUNTY, NORTH CAROLINA — SHEET NUMBER 43

APPENDIX B

Watershed Model Schematic

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



Legend

Hyd.	Origin	Description
1	SCS Runoff	Pre-Dev. (DA-1)
2	SCS Runoff	Post-Dev. (DA-1) (BYPASS)
3	SCS Runoff	Pre-Dev. (DA-2)
4	SCS Runoff	Post-Dev. (DA-2A) (BYPASS)
5	SCS Runoff	Post-Dev. (DA-2B) (BYPASS)
6	SCS Runoff	Post-Dev. (DA-2C) (BYPASS)
7	SCS Runoff	Post-Dev. (DA-2D) (DETAINED)
8	Reservoir	Underground Detention
9	Combine	Post-Dev. (DA-2)
11	SCS Runoff	Pre-Dev. Downstream DS-1
12	SCS Runoff	Post-Dev. Downstream DS-1
13	SCS Runoff	Pre-Dev. Downstream DS-2
14	SCS Runoff	Post-Dev. Downstream DS-2 (w/out Site)
15	Combine	Post-Dev. Downstream DS-2

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	1.300	-------	-------	-------	3.476	-------	-------	6.368	Pre-Dev. (DA-1)
2	SCS Runoff	------	0.507	-------	-------	-------	1.033	-------	-------	1.680	Post-Dev. (DA-1) (BYPASS)
3	SCS Runoff	------	1.803	-------	-------	-------	4.823	-------	-------	8.836	Pre-Dev. (DA-2)
4	SCS Runoff	------	0.734	-------	-------	-------	1.832	-------	-------	3.252	Post-Dev. (DA-2A) (BYPASS)
5	SCS Runoff	------	0.038	-------	-------	-------	0.070	-------	-------	0.109	Post-Dev. (DA-2B) (BYPASS)
6	SCS Runoff	------	0.065	-------	-------	-------	0.297	-------	-------	0.656	Post-Dev. (DA-2C) (BYPASS)
7	SCS Runoff	------	3.944	-------	-------	-------	7.489	-------	-------	11.85	Post-Dev. (DA-2D) (DETAINED)
8	Reservoir	7	0.460	-------	-------	-------	0.945	-------	-------	10.70	Underground Detention
9	Combine	4, 5, 6, 8	1.174	-------	-------	-------	2.823	-------	-------	14.26	Post-Dev. (DA-2)
11	SCS Runoff	------	6.955	-------	-------	-------	15.88	-------	-------	27.13	Pre-Dev. Downstream DS-1
12	SCS Runoff	------	6.425	-------	-------	-------	14.32	-------	-------	24.21	Post-Dev. Downstream DS-1
13	SCS Runoff	------	13.97	-------	-------	-------	32.71	-------	-------	56.56	Pre-Dev. Downstream DS-2
14	SCS Runoff	------	13.56	-------	-------	-------	31.00	-------	-------	53.02	Post-Dev. Downstream DS-2 (w/out S
15	Combine	9, 14	14.25	-------	-------	-------	32.51	-------	-------	55.59	Post-Dev. Downstream DS-2

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	1.300	2	722	3,410	------	------	------	Pre-Dev. (DA-1)
2	SCS Runoff	0.507	2	716	1,052	------	------	------	Post-Dev. (DA-1) (BYPASS)
3	SCS Runoff	1.803	2	722	4,731	------	------	------	Pre-Dev. (DA-2)
4	SCS Runoff	0.734	2	724	2,312	------	------	------	Post-Dev. (DA-2A) (BYPASS)
5	SCS Runoff	0.038	2	716	89	------	------	------	Post-Dev. (DA-2B) (BYPASS)
6	SCS Runoff	0.065	2	718	149	------	------	------	Post-Dev. (DA-2C) (BYPASS)
7	SCS Runoff	3.944	2	718	9,614	------	------	------	Post-Dev. (DA-2D) (DETAINED)
8	Reservoir	0.460	2	740	9,610	7	331.87	5,082	Underground Detention
9	Combine	1.174	2	726	12,161	4, 5, 6, 8	------	------	Post-Dev. (DA-2)
11	SCS Runoff	6.955	2	736	33,756	------	------	------	Pre-Dev. Downstream DS-1
12	SCS Runoff	6.425	2	736	31,142	------	------	------	Post-Dev. Downstream DS-1
13	SCS Runoff	13.97	2	744	79,332	------	------	------	Pre-Dev. Downstream DS-2
14	SCS Runoff	13.56	2	744	76,855	------	------	------	Post-Dev. Downstream DS-2 (w/out S
15	Combine	14.25	2	742	89,016	9, 14	------	------	Post-Dev. Downstream DS-2

Hydrograph Report

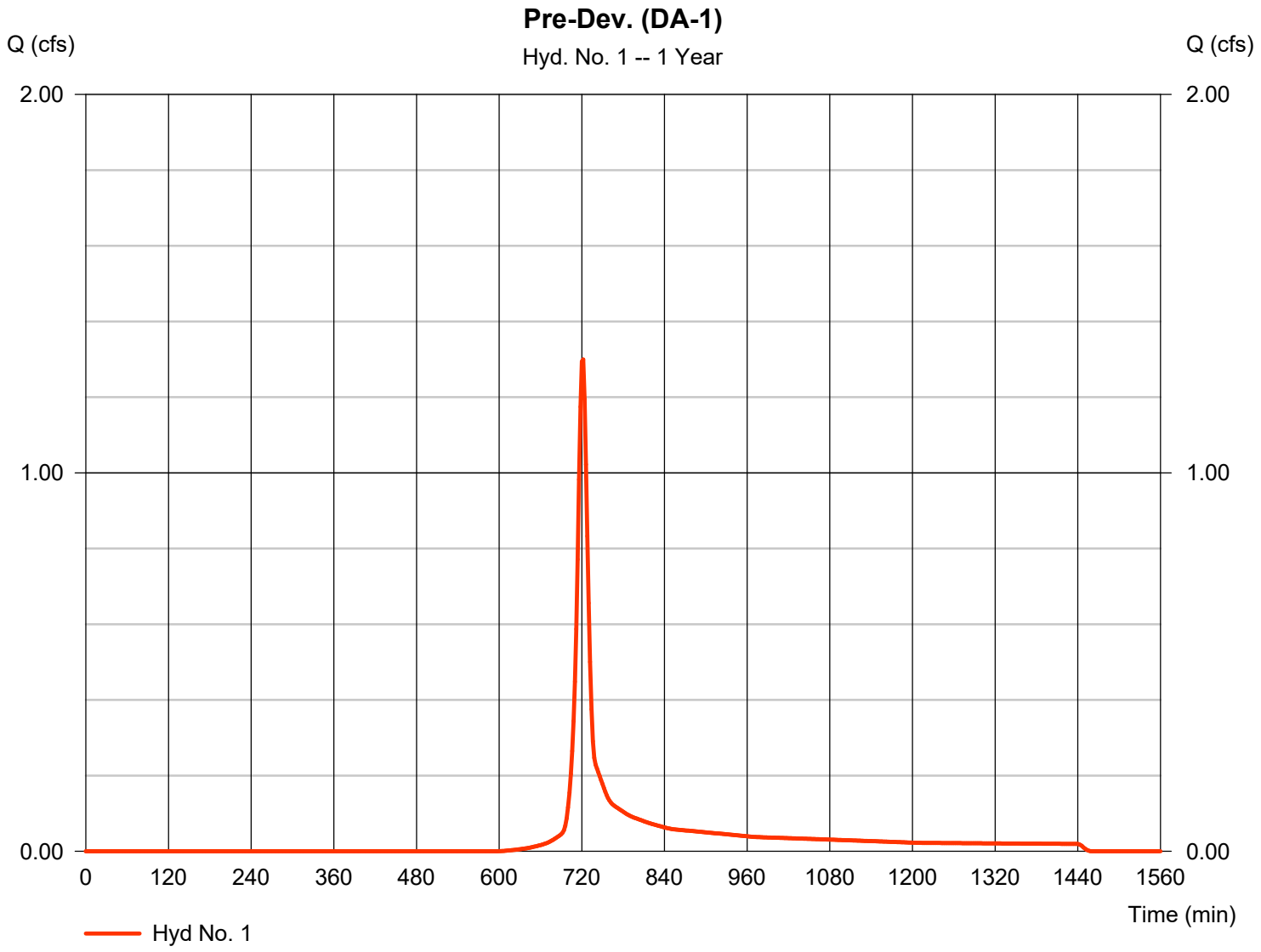
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 1

Pre-Dev. (DA-1)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.300 cfs
Storm frequency	= 1 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 3,410 cuft
Drainage area	= 0.800 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.20 min
Total precip.	= 2.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.800 x 80)] / 0.800



Hydrograph Report

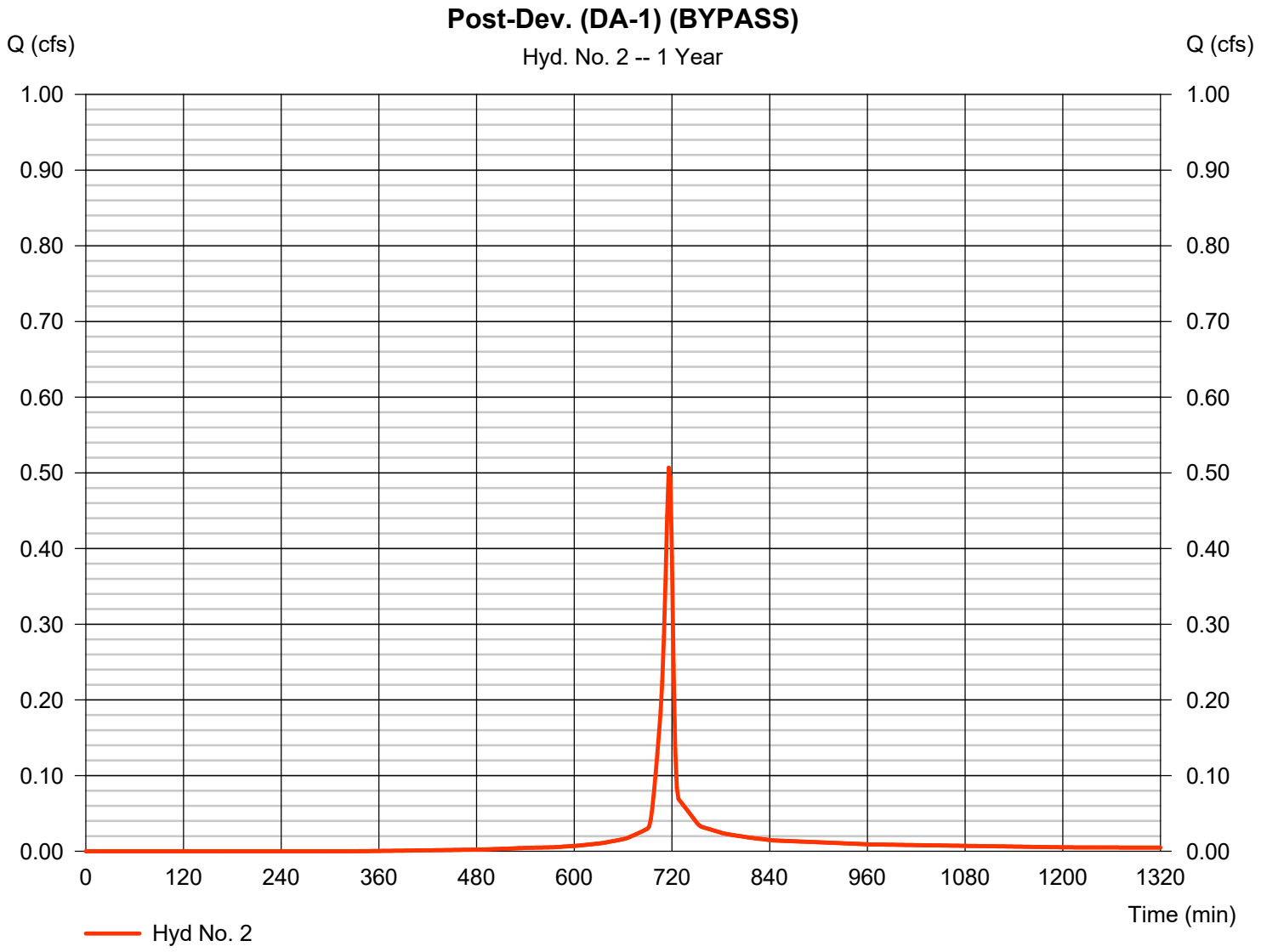
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 2

Post-Dev. (DA-1) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.507 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,052 cuft
Drainage area	=	0.160 ac	Curve number	=	91*
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

* Composite (Area/CN) = [(0.100 x 98) + (0.060 x 80)] / 0.160



Hydrograph Report

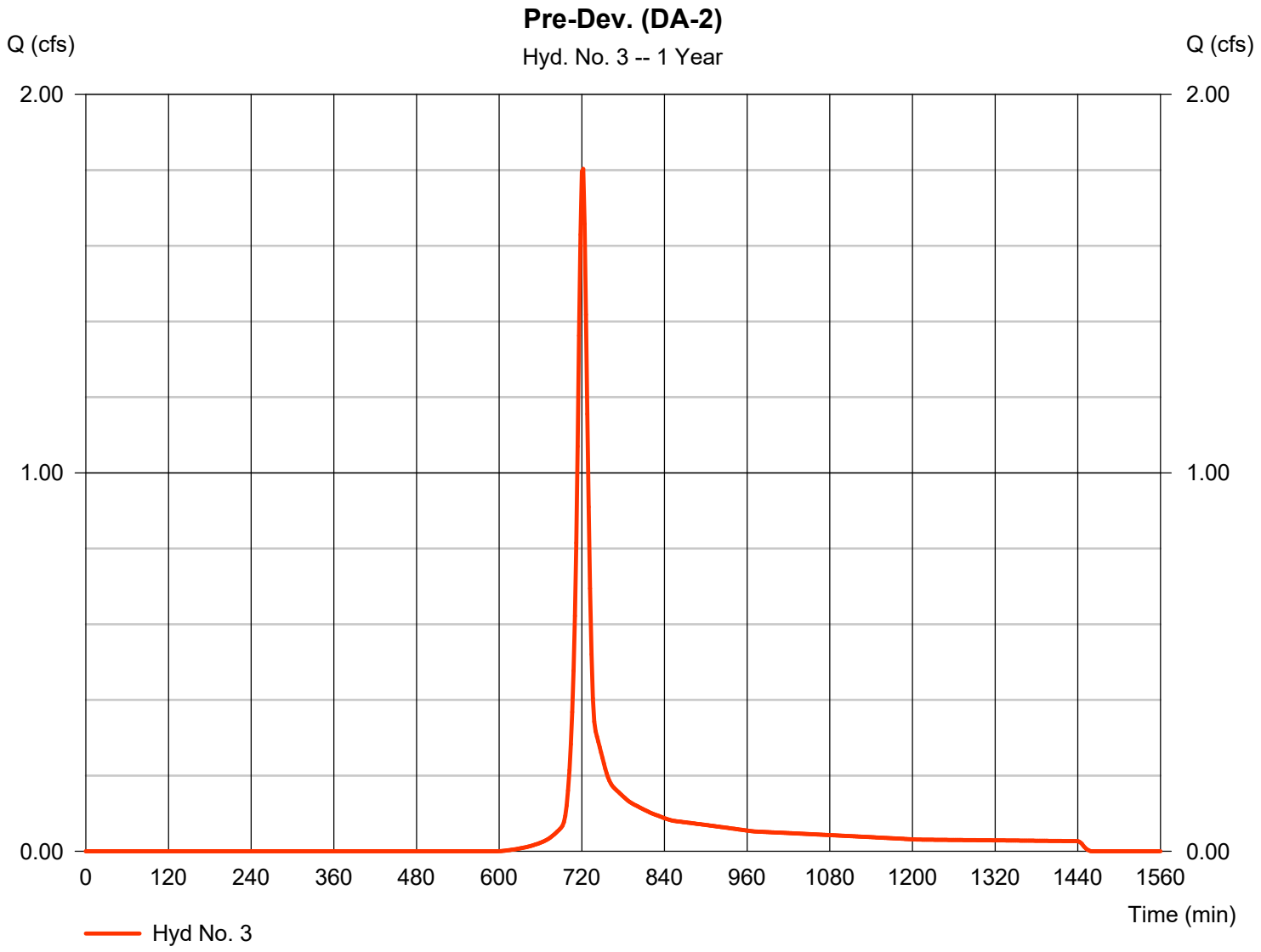
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 3

Pre-Dev. (DA-2)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.803 cfs
Storm frequency	=	1 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	4,731 cuft
Drainage area	=	1.110 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.40 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = + (1.110 x 80)] / 1.110



Hydrograph Report

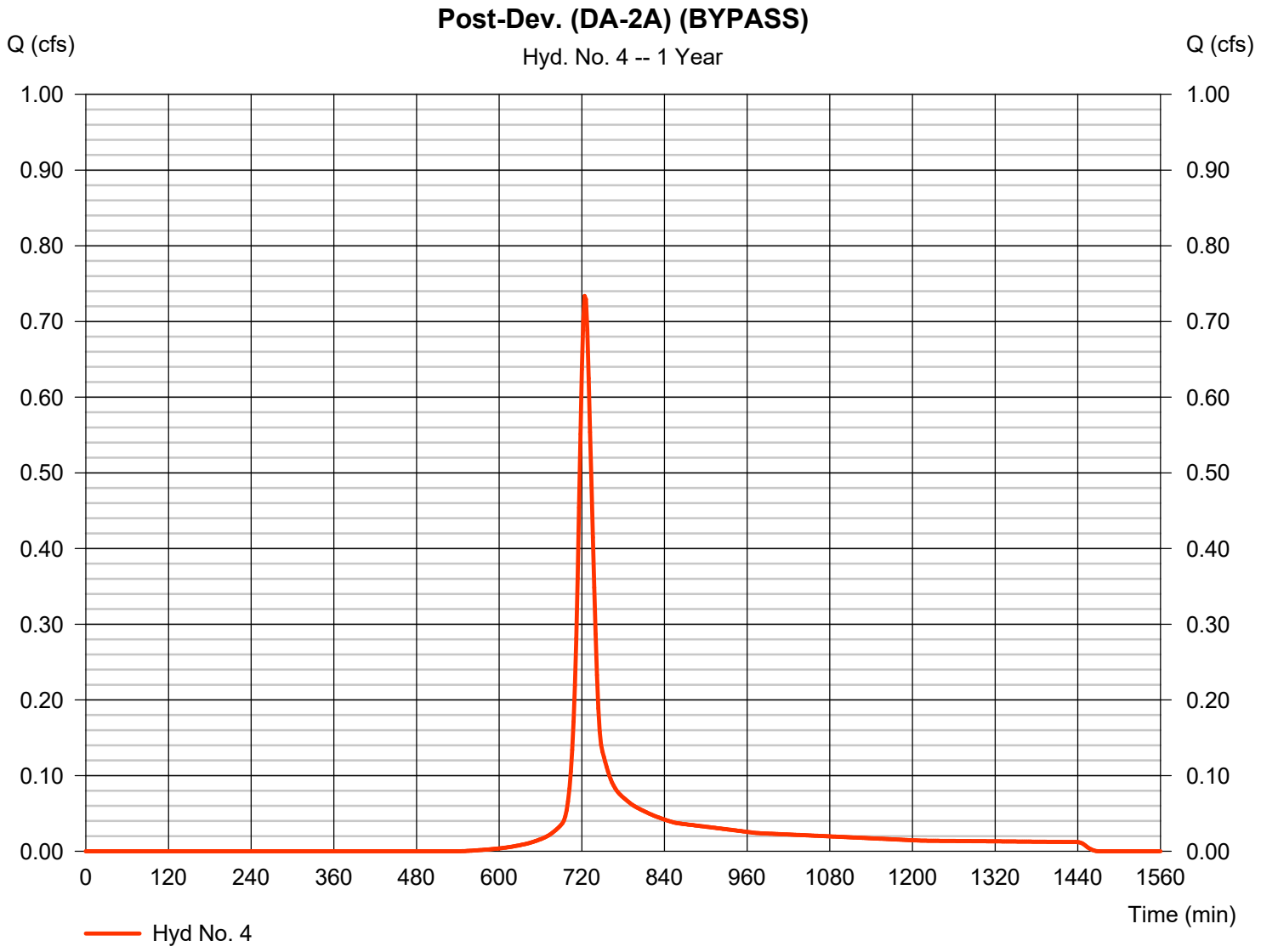
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 4

Post-Dev. (DA-2A) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.734 cfs
Storm frequency	=	1 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	2,312 cuft
Drainage area	=	0.480 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.50 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.410 x 80)] / 0.480



Hydrograph Report

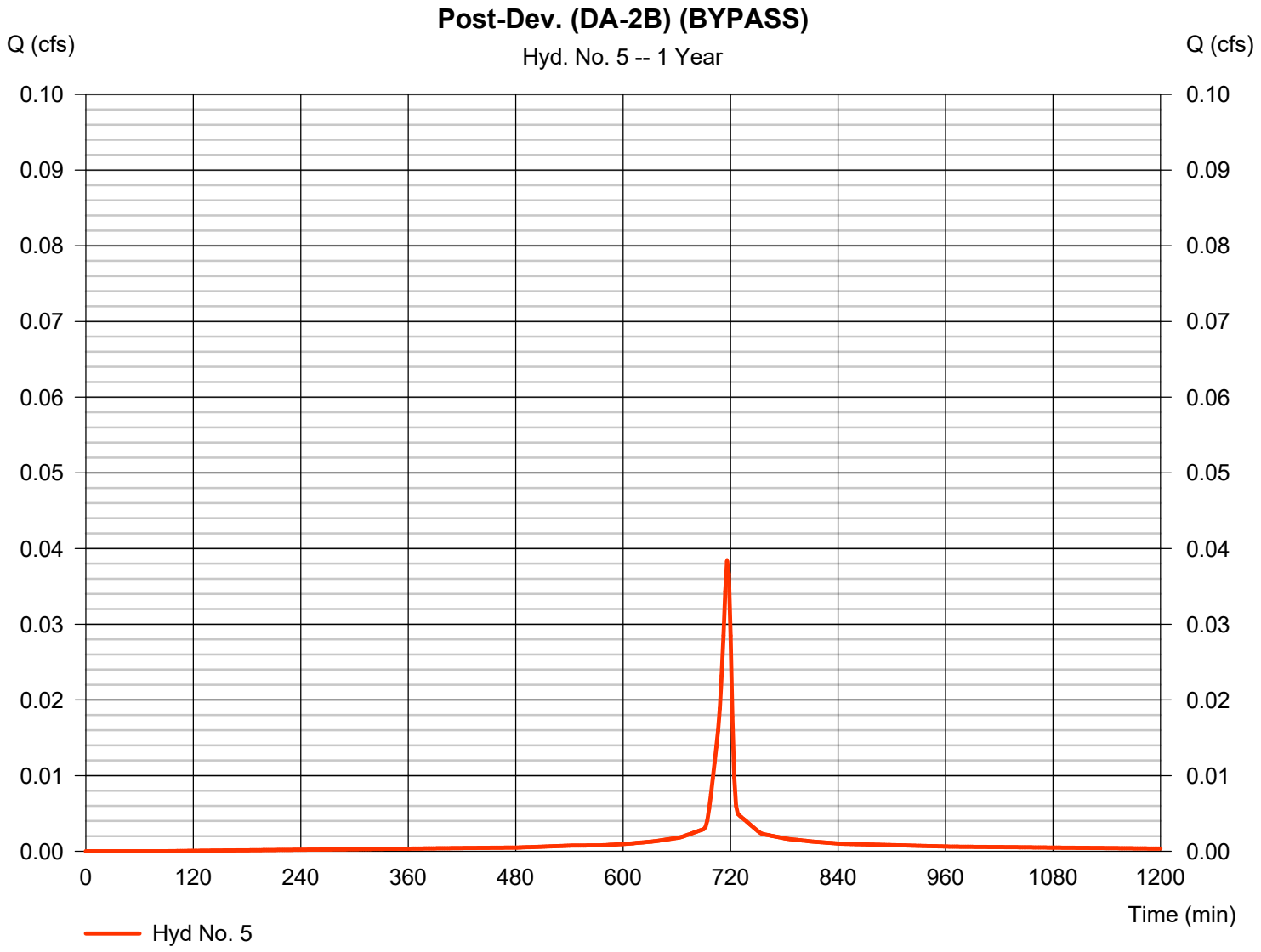
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 5

Post-Dev. (DA-2B) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.038 cfs
Storm frequency	=	1 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	89 cuft
Drainage area	=	0.010 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

* Composite (Area/CN) = [(0.010 x 98)] / 0.010



Hydrograph Report

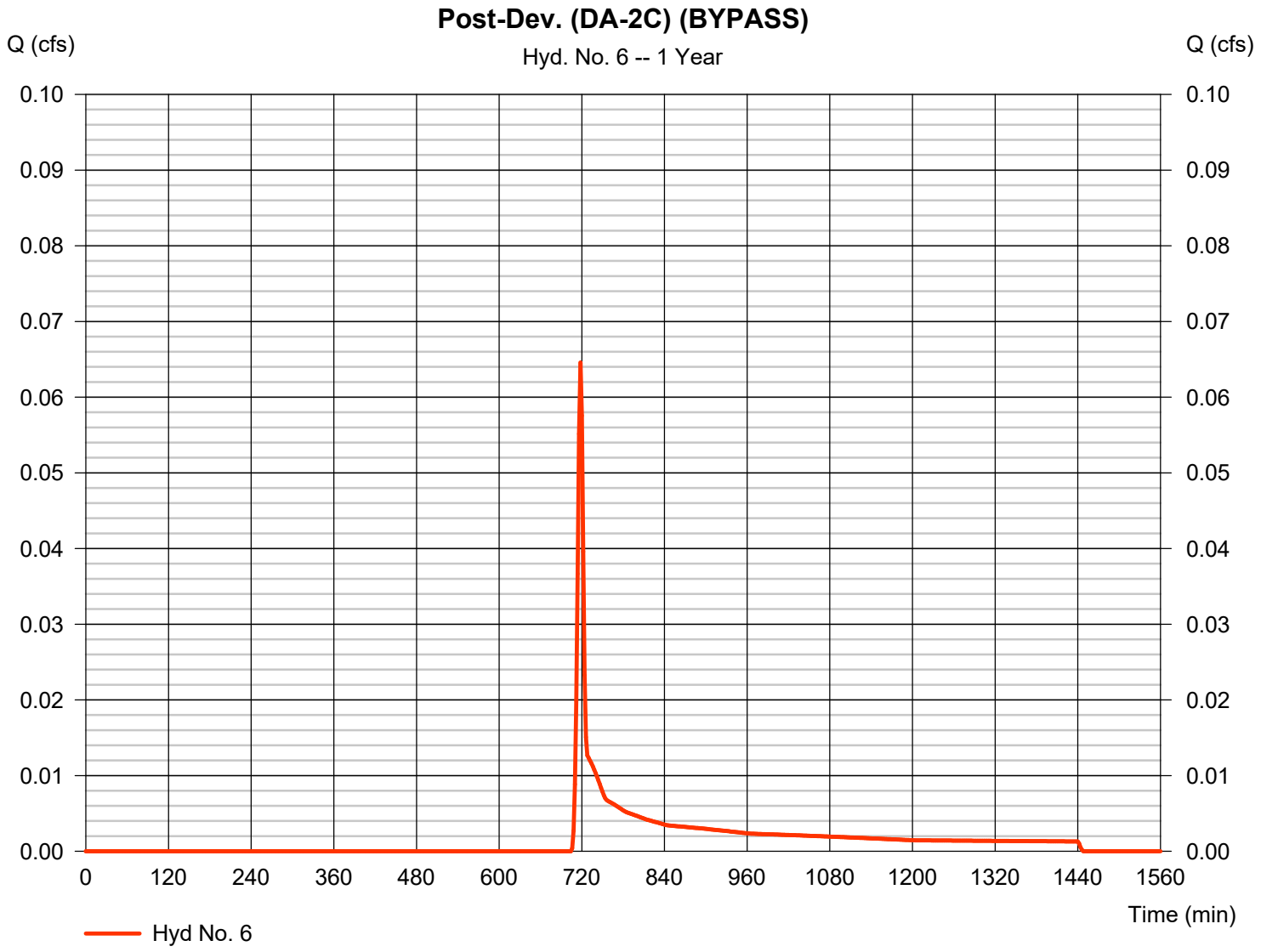
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 6

Post-Dev. (DA-2C) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.065 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	149 cuft
Drainage area	=	0.100 ac	Curve number	=	65*
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

* Composite (Area/CN) = [(0.010 x 98) + (0.090 x 61)] / 0.100



Hydrograph Report

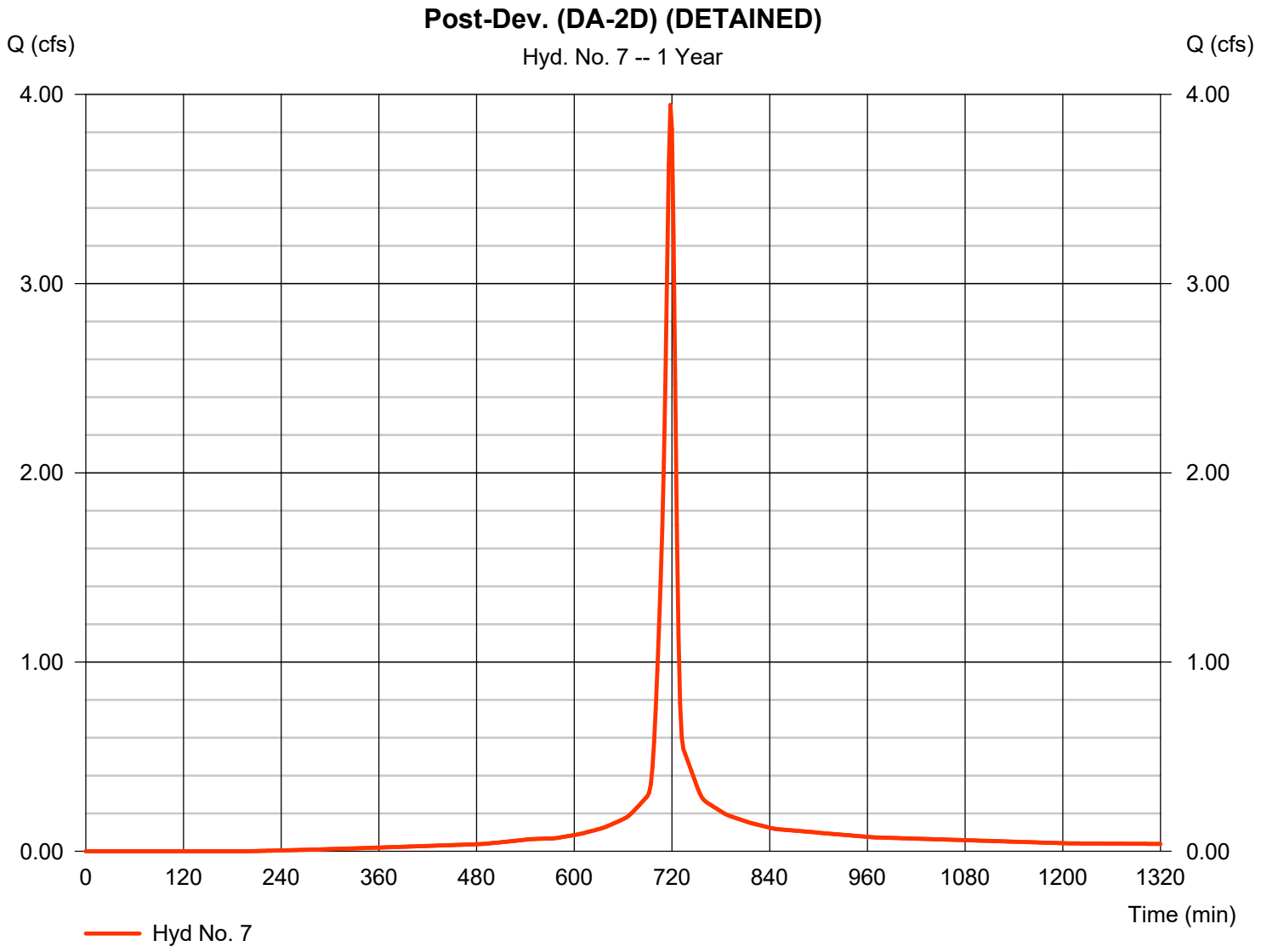
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 7

Post-Dev. (DA-2D) (DETAINED)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.944 cfs
Storm frequency	=	1 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	9,614 cuft
Drainage area	=	1.150 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.00 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.020 x 98) + (0.060 x 80) + (0.070 x 61)] / 1.150



Hydrograph Report

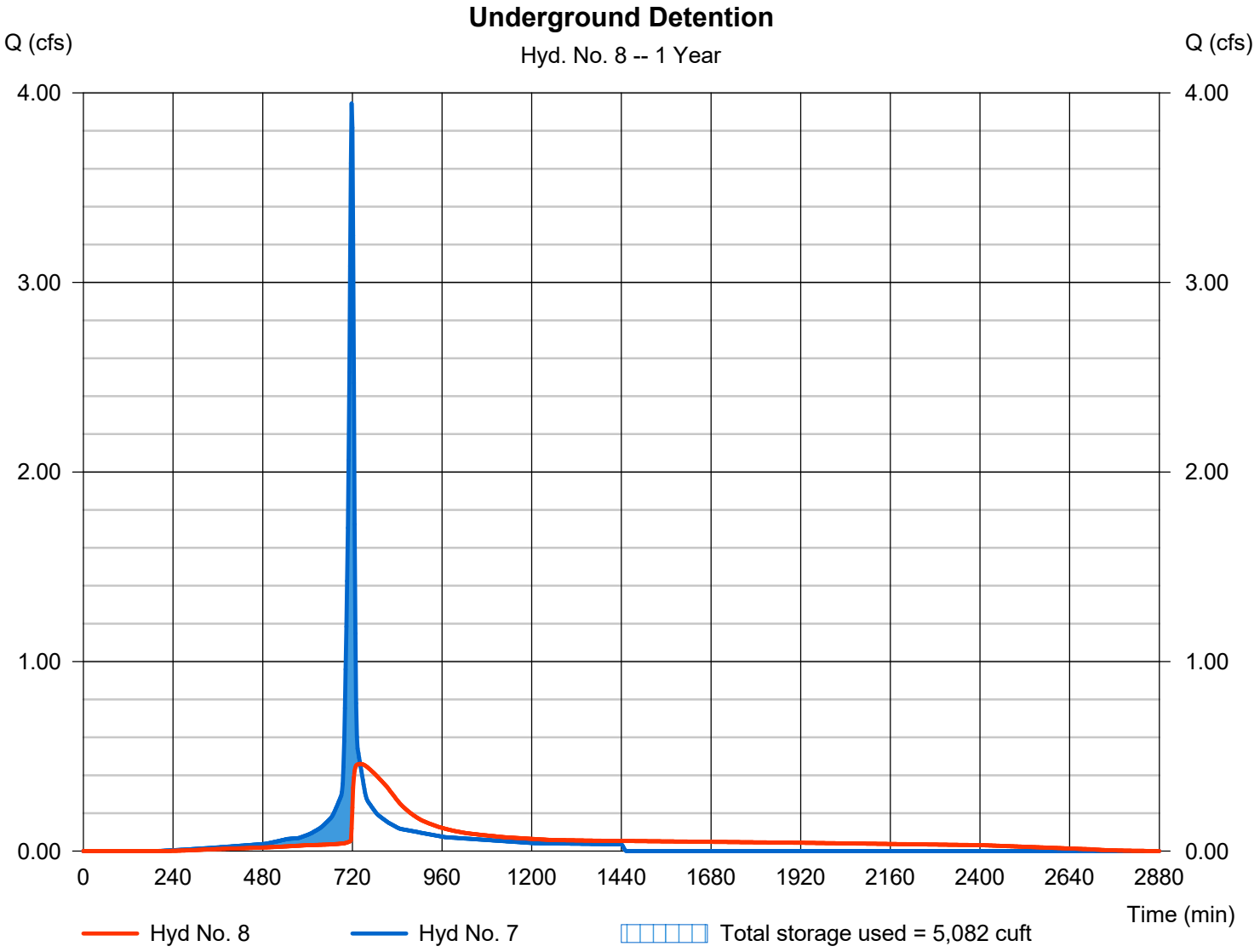
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 8

Underground Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.460 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	9,610 cuft
Inflow hyd. No.	=	7 - Post-Dev. (DA-2D) (DETAINED)	Max. Elevation	=	331.87 ft
Reservoir name	=	UG Detention System	Max. Storage	=	5,082 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Pond No. 1 - UG Detention System

Pond Data

UG Chambers -Invert elev. = 330.00 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 123.00 ft, No. Barrels = 8, Slope = 0.25%, Headers = No

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	330.00	n/a	0	0
0.43	330.43	n/a	389	389
0.86	330.86	n/a	1,096	1,485
1.29	331.29	n/a	1,420	2,905
1.72	331.72	n/a	1,600	4,505
2.15	332.15	n/a	1,680	6,185
2.58	332.58	n/a	1,680	7,866
3.02	333.02	n/a	1,600	9,466
3.45	333.45	n/a	1,419	10,885
3.88	333.88	n/a	1,095	11,980
4.31	334.31	n/a	387	12,368

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	1.33	5.00	0.00
Span (in)	= 18.00	1.33	5.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 328.70	328.70	331.30	0.00
Length (ft)	= 40.00	0.50	0.50	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.61	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	5.00	Inactive	0.00
Crest El. (ft)	= 336.00	333.40	333.20	0.00
Weir Coeff.	= 3.33	3.33	1.05	3.33
Weir Type	= 1	Rect	45 degV	---
Multi-Stage	= Yes	Yes	Yes	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).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	330.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.43	389	330.43	4.08 oc	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.031
0.86	1,485	330.86	4.08 oc	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.044
1.29	2,905	331.29	4.08 oc	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.054
1.72	4,505	331.72	4.08 oc	0.06 ic	0.30 ic	---	0.00	0.00	---	---	---	---	0.366
2.15	6,185	332.15	4.08 oc	0.07 ic	0.53 ic	---	0.00	0.00	---	---	---	---	0.597
2.58	7,866	332.58	4.08 oc	0.08 ic	0.68 ic	---	0.00	0.00	---	---	---	---	0.757
3.02	9,466	333.02	4.08 oc	0.08 ic	0.81 ic	---	0.00	0.00	---	---	---	---	0.888
3.45	10,885	333.45	4.08 oc	0.09 ic	0.91 ic	---	0.00	0.16	---	---	---	---	1.166
3.88	11,980	333.88	6.58 oc	0.09 ic	1.01 ic	---	0.00	5.48	---	---	---	---	6.578
4.31	12,368	334.31	15.29 ic	0.06 ic	0.84 ic	---	0.00	14.39	---	---	---	---	15.29

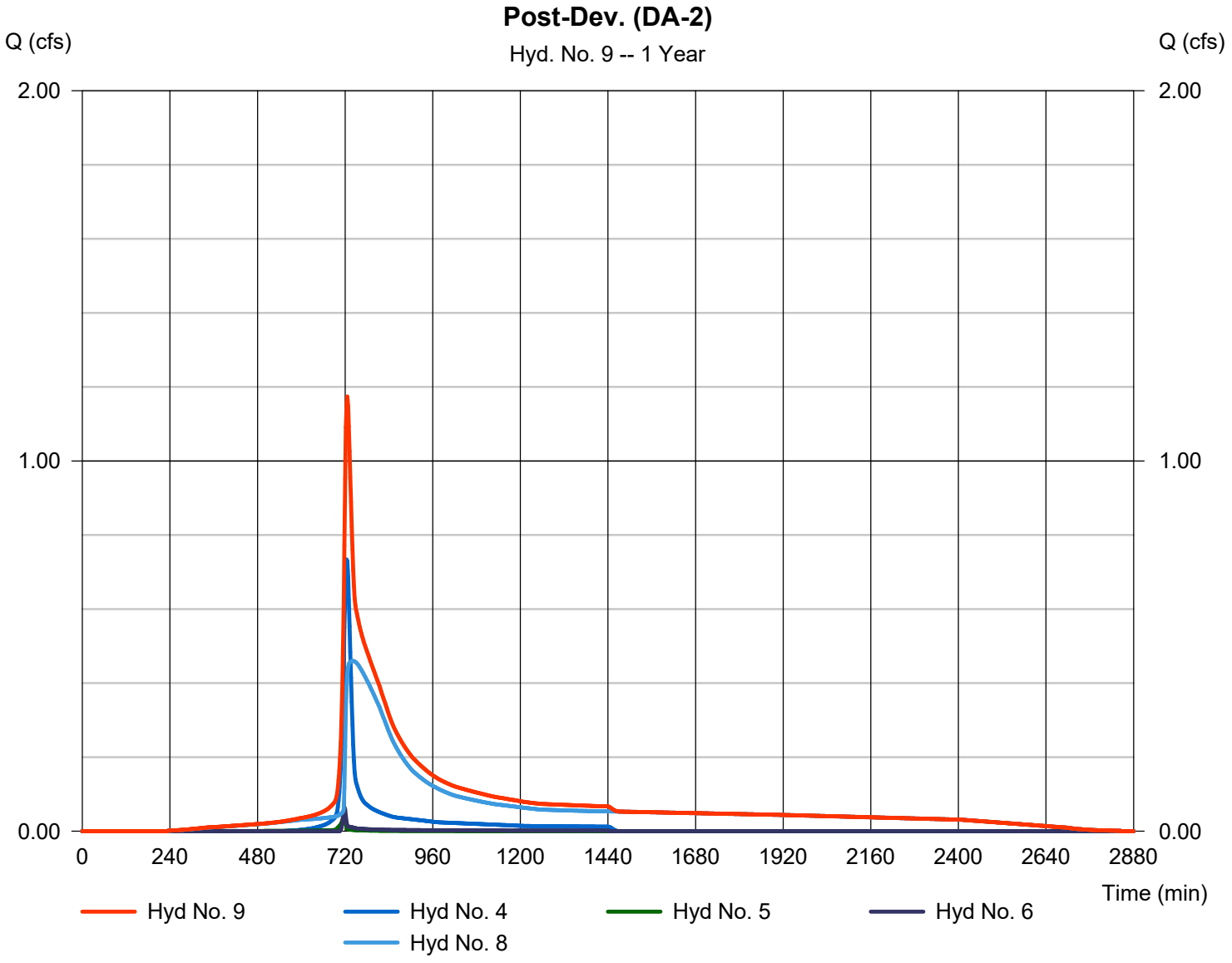
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 9

Post-Dev. (DA-2)

Hydrograph type	= Combine	Peak discharge	= 1.174 cfs
Storm frequency	= 1 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 12,161 cuft
Inflow hyds.	= 4, 5, 6, 8	Contrib. drain. area	= 0.590 ac



Hydrograph Report

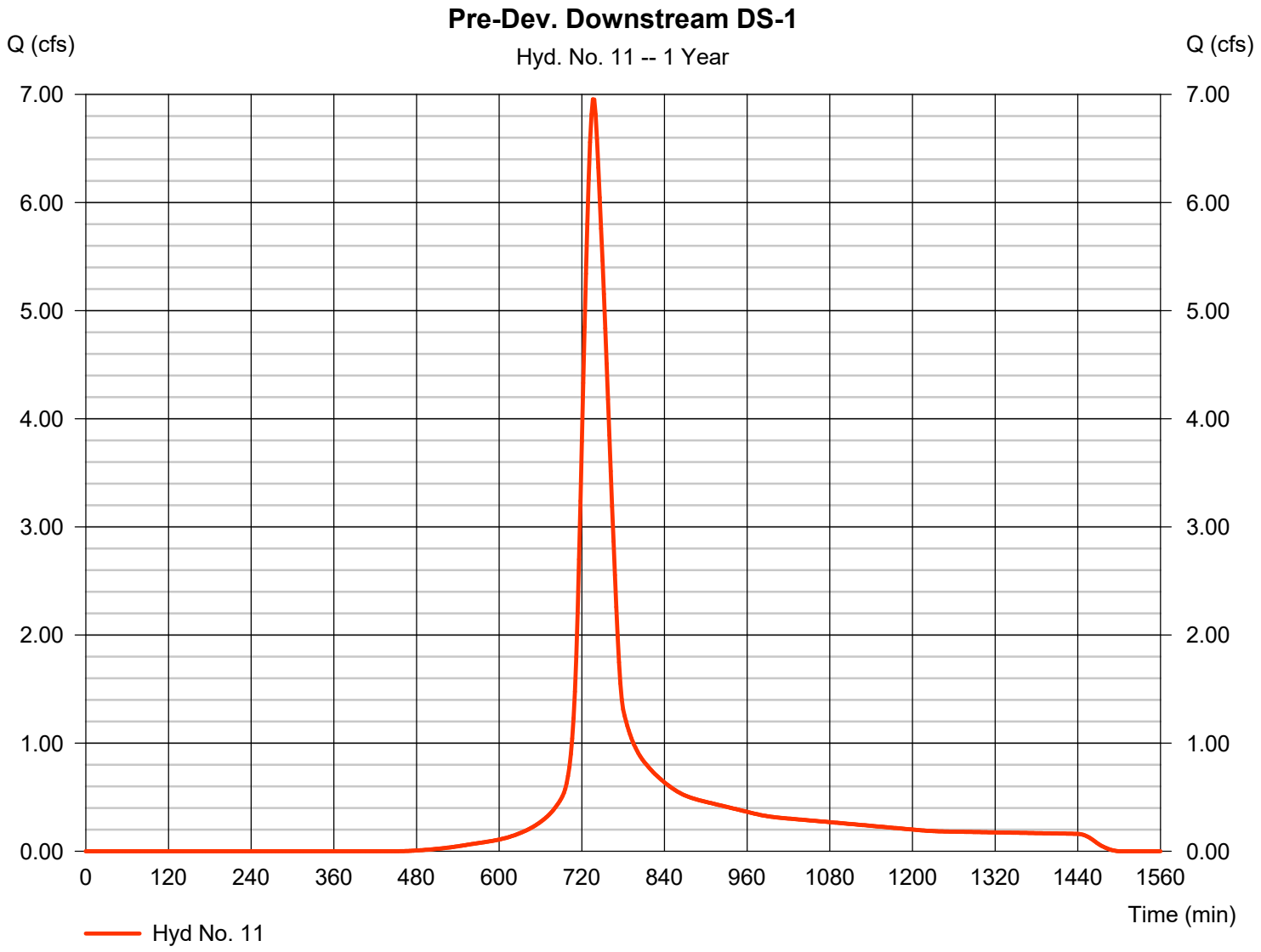
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 11

Pre-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.955 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	33,756 cuft
Drainage area	=	5.780 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.180 x 98) + (3.600 x 80)] / 5.780



Hydrograph Report

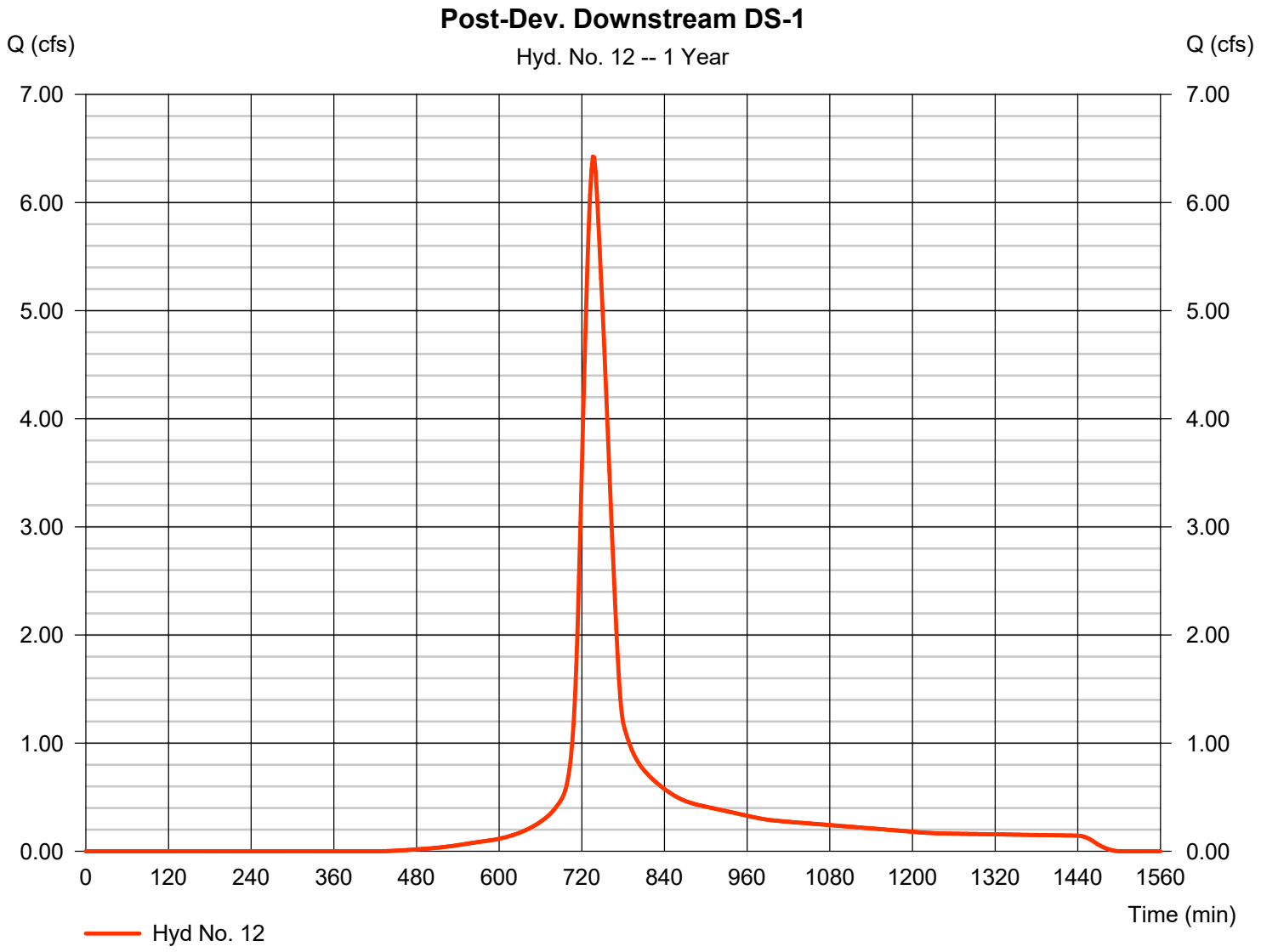
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 12

Post-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.425 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	31,142 cuft
Drainage area	=	5.090 ac	Curve number	=	88*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.310 x 98) + (2.780 x 80)] / 5.090



Hydrograph Report

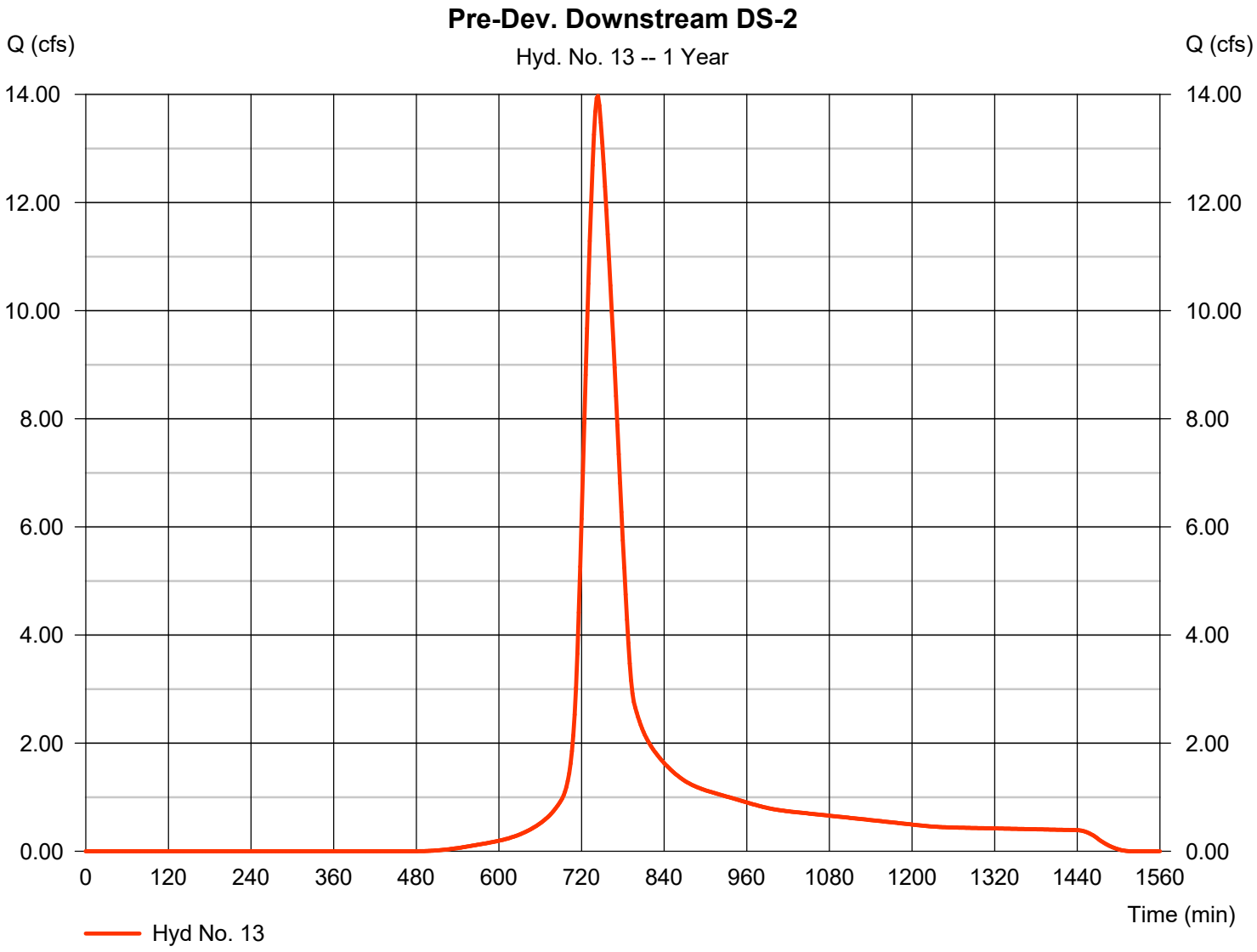
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 13

Pre-Dev. Downstream DS-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.97 cfs
Storm frequency	=	1 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	79,332 cuft
Drainage area	=	14.240 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	49.10 min
Total precip.	=	2.85 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.930 x 98) + (9.310 x 80)] / 14.240



Hydrograph Report

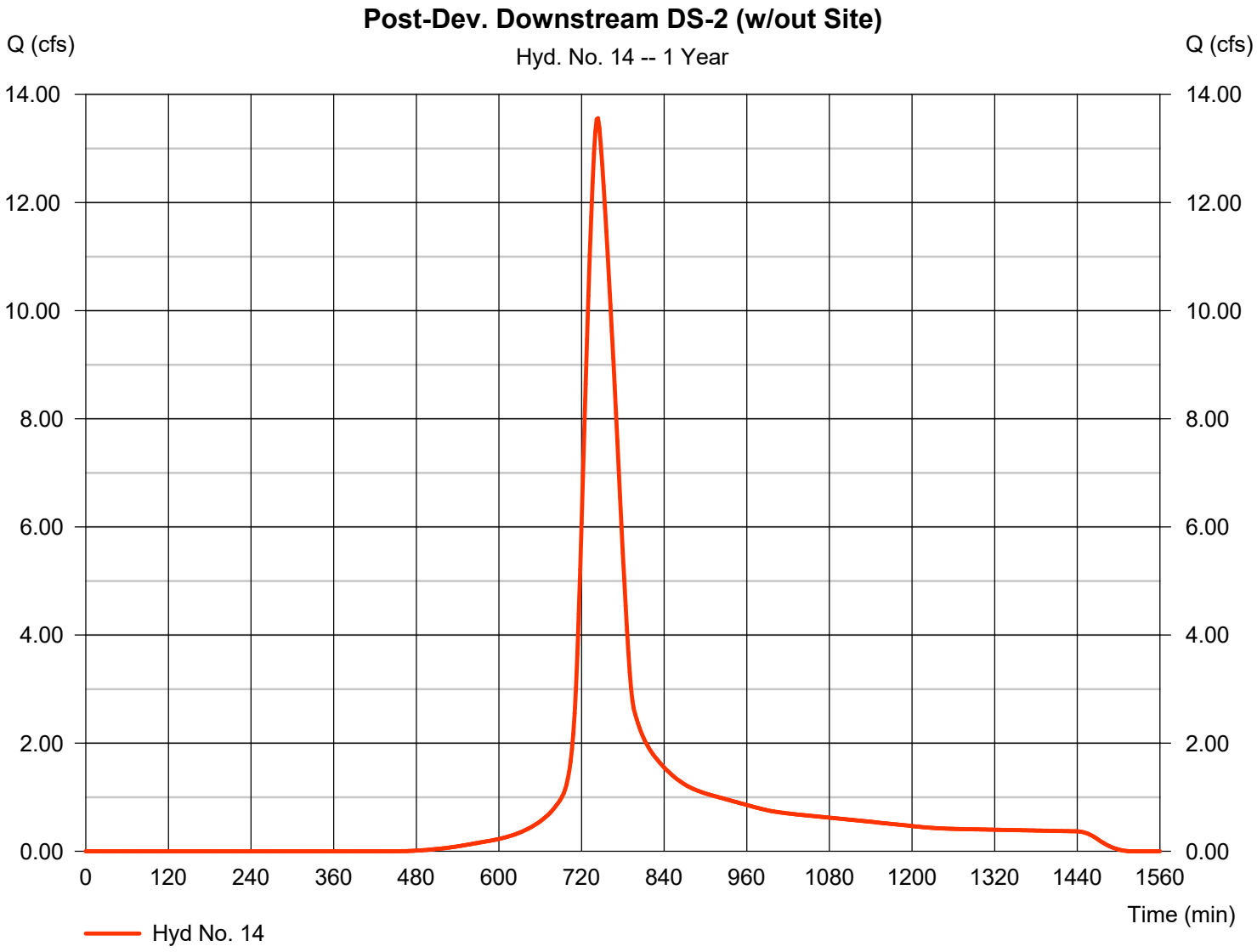
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 14

Post-Dev. Downstream DS-2 (w/out Site)

Hydrograph type	= SCS Runoff	Peak discharge	= 13.56 cfs
Storm frequency	= 1 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 76,855 cuft
Drainage area	= 13.160 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 49.10 min
Total precip.	= 2.85 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.220 x 98) + (7.940 x 80)] / 13.160



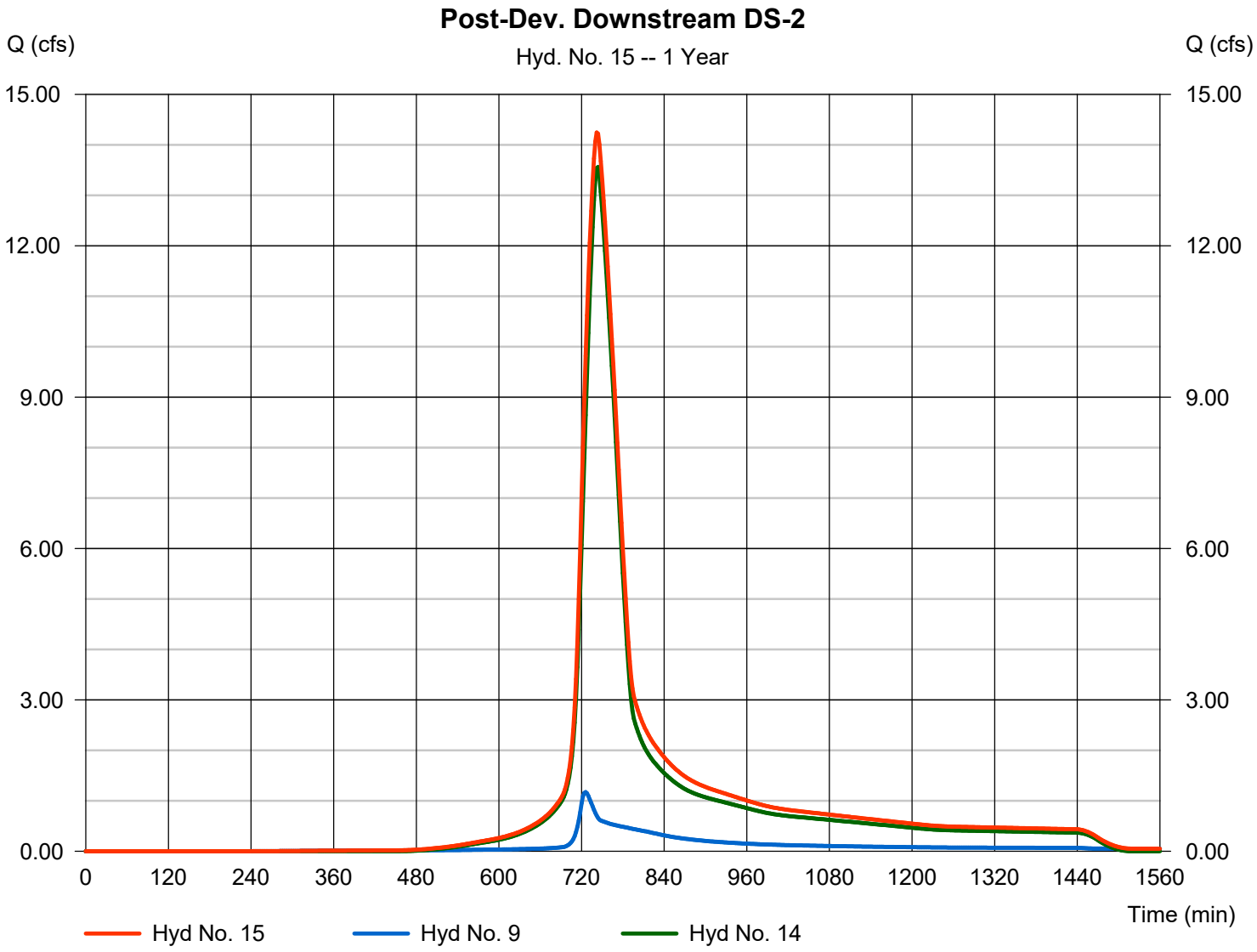
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 15

Post-Dev. Downstream DS-2

Hydrograph type	= Combine	Peak discharge	= 14.25 cfs
Storm frequency	= 1 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 89,016 cuft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 13.160 ac



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	3.476	2	720	9,030	------	------	------	Pre-Dev. (DA-1)
2	SCS Runoff	1.033	2	716	2,242	------	------	------	Post-Dev. (DA-1) (BYPASS)
3	SCS Runoff	4.823	2	720	12,529	------	------	------	Pre-Dev. (DA-2)
4	SCS Runoff	1.832	2	724	5,752	------	------	------	Post-Dev. (DA-2A) (BYPASS)
5	SCS Runoff	0.070	2	716	167	------	------	------	Post-Dev. (DA-2B) (BYPASS)
6	SCS Runoff	0.297	2	718	595	------	------	------	Post-Dev. (DA-2C) (BYPASS)
7	SCS Runoff	7.489	2	718	19,028	------	------	------	Post-Dev. (DA-2D) (DETAINED)
8	Reservoir	0.945	2	736	19,024	7	333.22	10,157	Underground Detention
9	Combine	2.823	2	724	25,538	4, 5, 6, 8	------	------	Post-Dev. (DA-2)
11	SCS Runoff	15.88	2	736	77,617	------	------	------	Pre-Dev. Downstream DS-1
12	SCS Runoff	14.32	2	736	70,250	------	------	------	Post-Dev. Downstream DS-1
13	SCS Runoff	32.71	2	742	185,978	------	------	------	Pre-Dev. Downstream DS-2
14	SCS Runoff	31.00	2	742	176,720	------	------	------	Post-Dev. Downstream DS-2 (w/out S
15	Combine	32.51	2	742	202,257	9, 14	------	------	Post-Dev. Downstream DS-2

Hydrograph Report

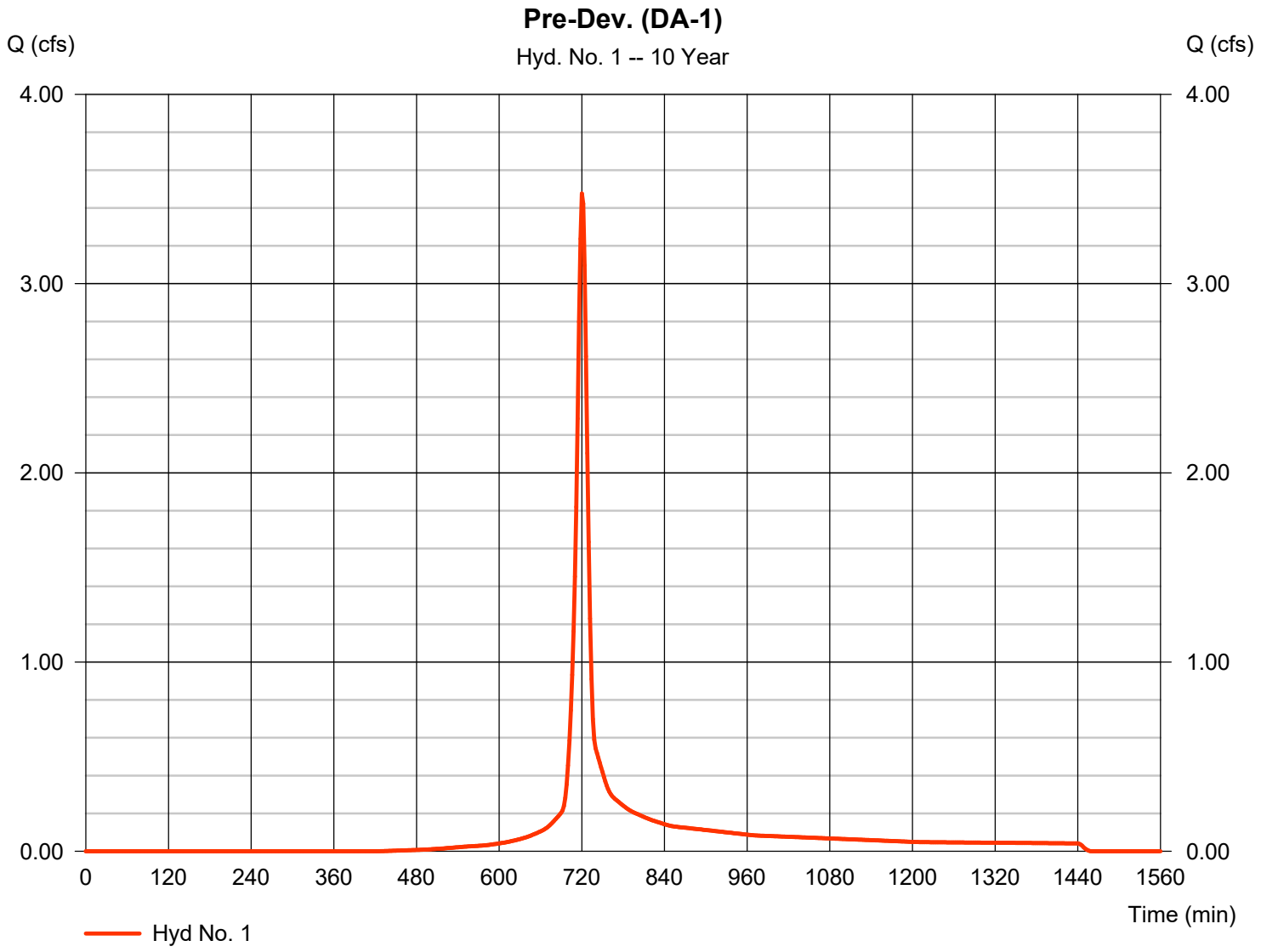
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 1

Pre-Dev. (DA-1)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.476 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 9,030 cuft
Drainage area	= 0.800 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.20 min
Total precip.	= 5.14 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.800 x 80)] / 0.800



Hydrograph Report

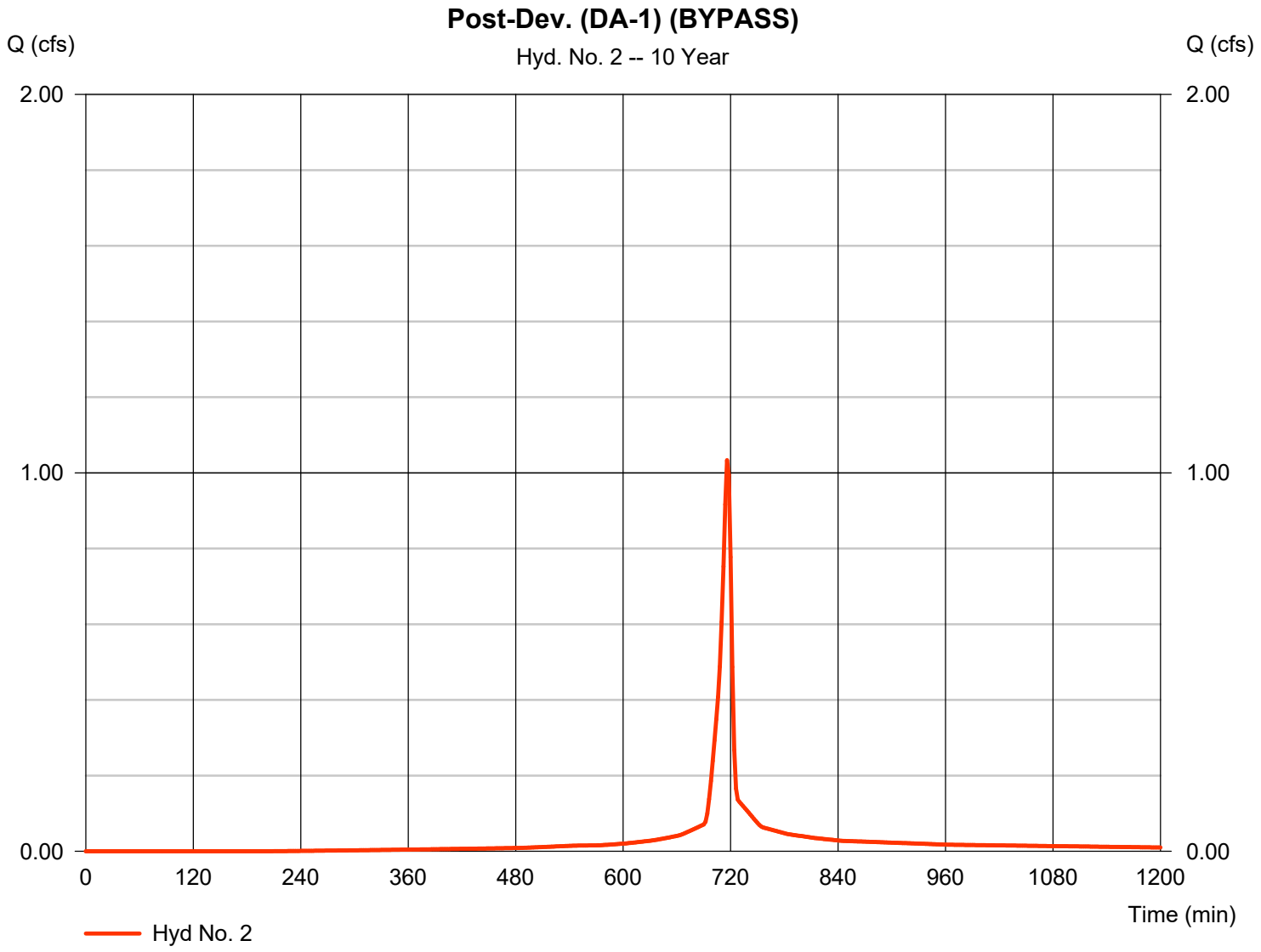
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 2

Post-Dev. (DA-1) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.033 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,242 cuft
Drainage area	=	0.160 ac	Curve number	=	91*
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

* Composite (Area/CN) = [(0.100 x 98) + (0.060 x 80)] / 0.160



Hydrograph Report

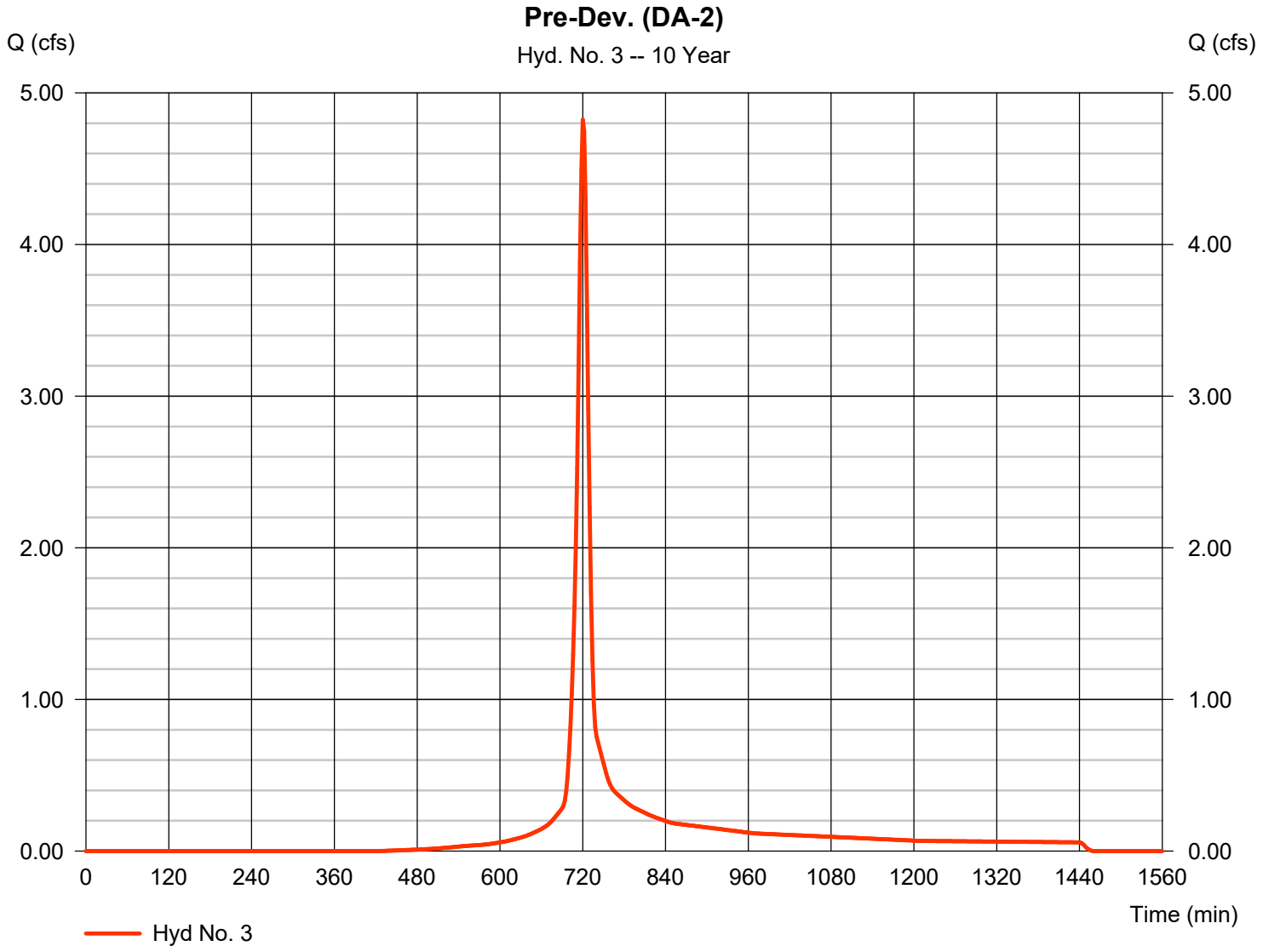
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 3

Pre-Dev. (DA-2)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.823 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 12,529 cuft
Drainage area	= 1.110 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.40 min
Total precip.	= 5.14 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (1.110 x 80)] / 1.110



Hydrograph Report

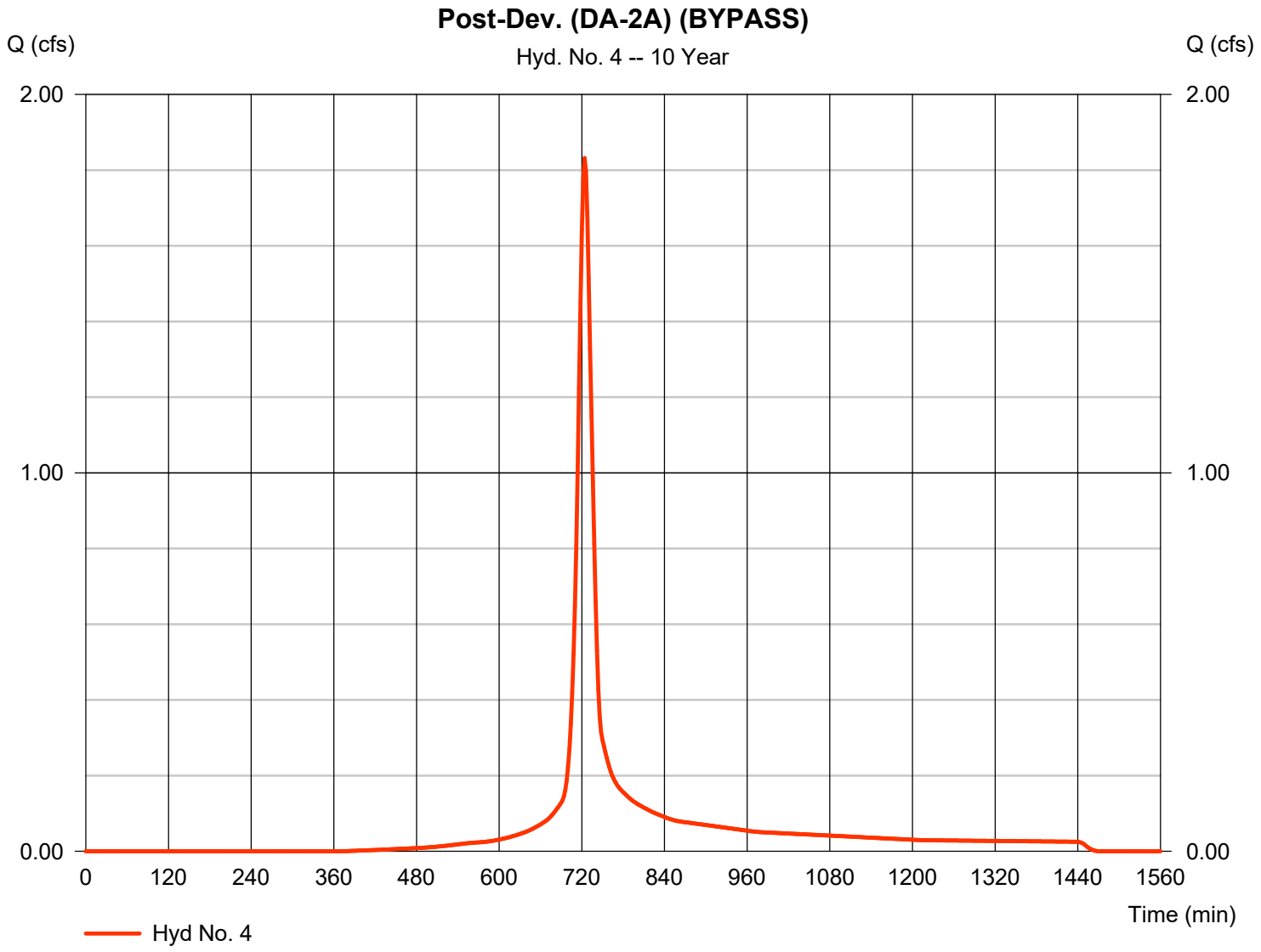
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 4

Post-Dev. (DA-2A) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.832 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	5,752 cuft
Drainage area	=	0.480 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.50 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.410 x 80)] / 0.480



Hydrograph Report

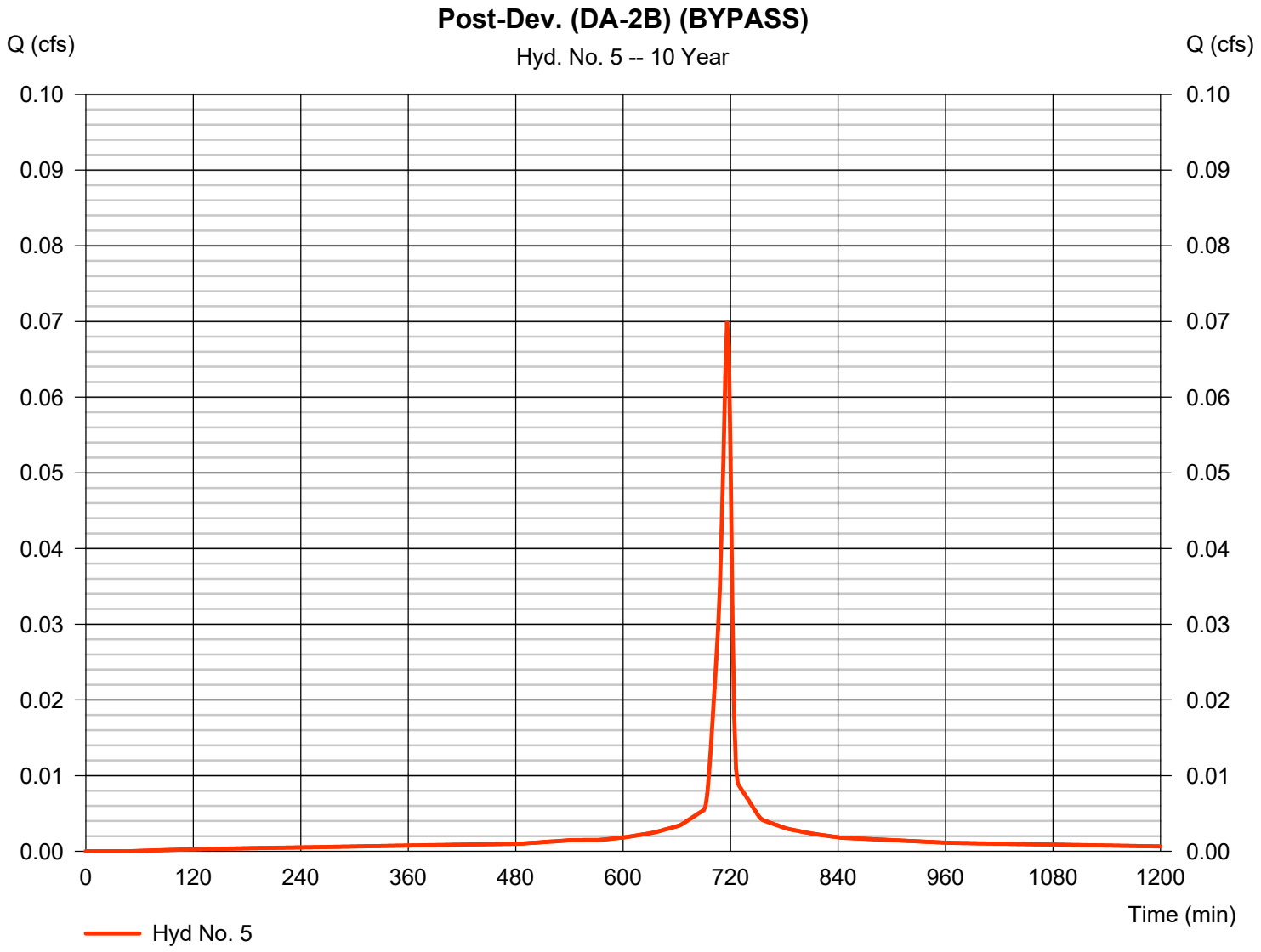
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 5

Post-Dev. (DA-2B) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.070 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	167 cuft
Drainage area	=	0.010 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

* Composite (Area/CN) = [(0.010 x 98)] / 0.010



Hydrograph Report

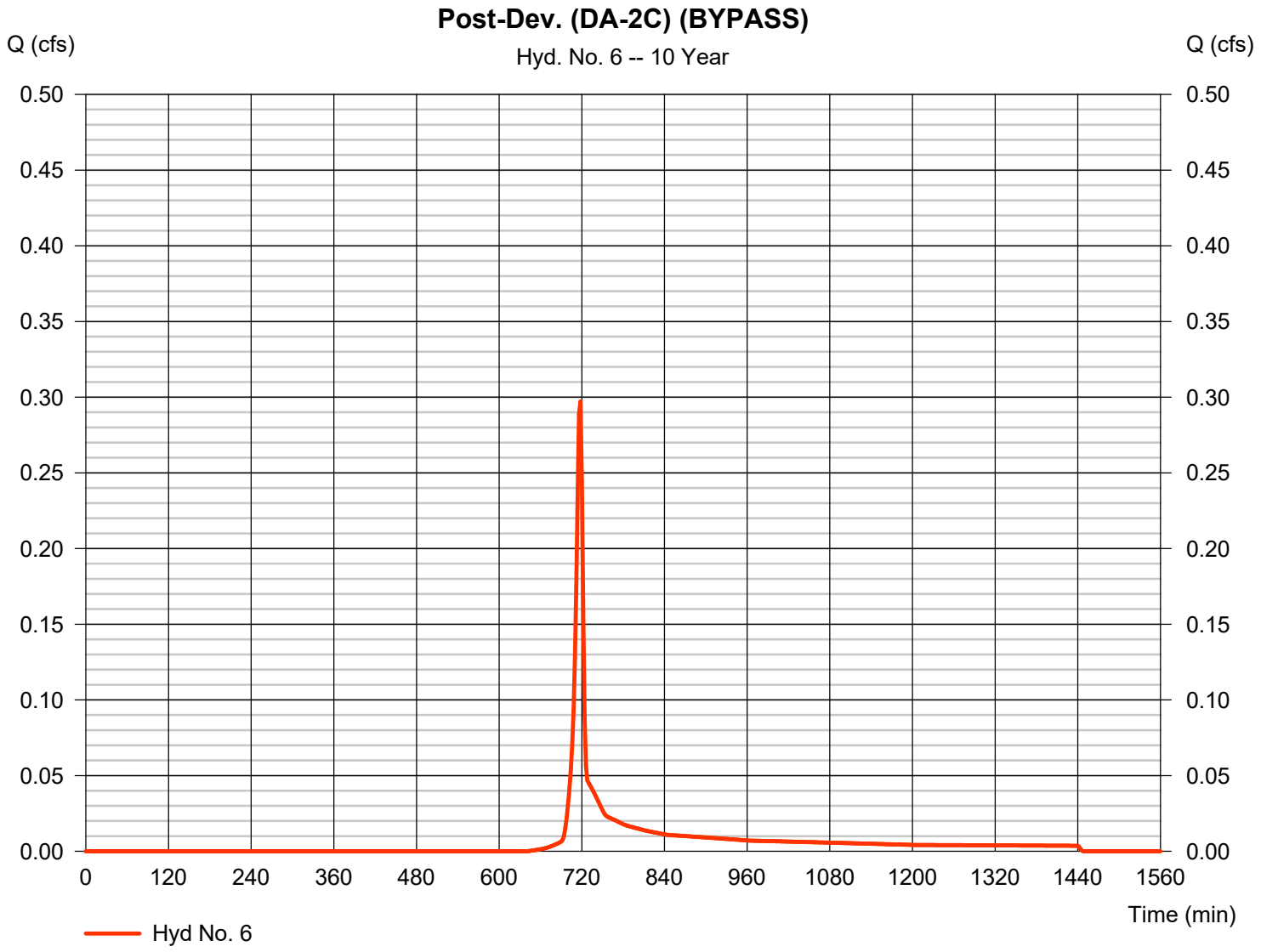
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 6

Post-Dev. (DA-2C) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.297 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	595 cuft
Drainage area	=	0.100 ac	Curve number	=	65*
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

* Composite (Area/CN) = [(0.010 x 98) + (0.090 x 61)] / 0.100



Hydrograph Report

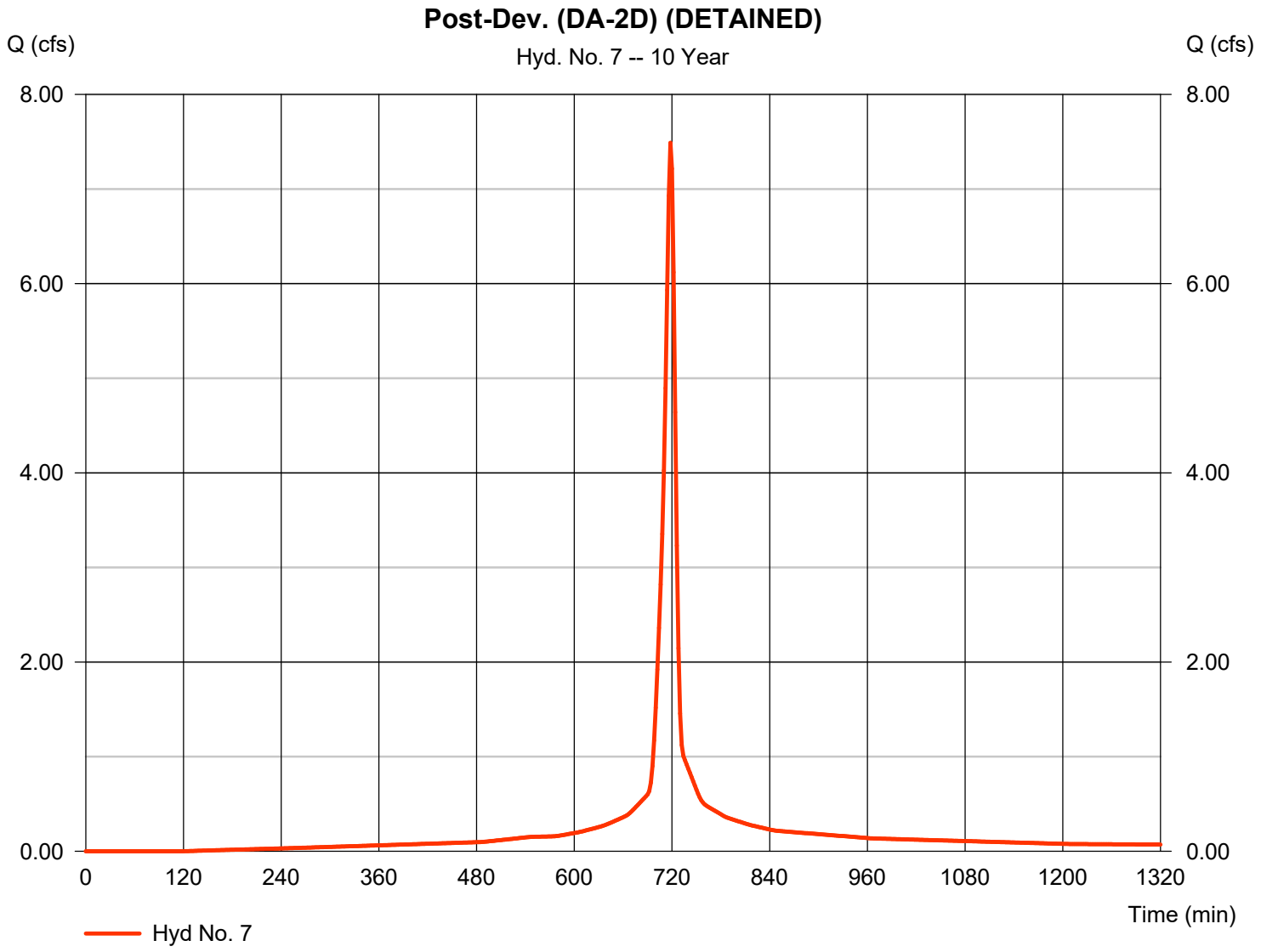
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 7

Post-Dev. (DA-2D) (DETAINED)

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.489 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	19,028 cuft
Drainage area	=	1.150 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.00 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.020 x 98) + (0.060 x 80) + (0.070 x 61)] / 1.150



Hydrograph Report

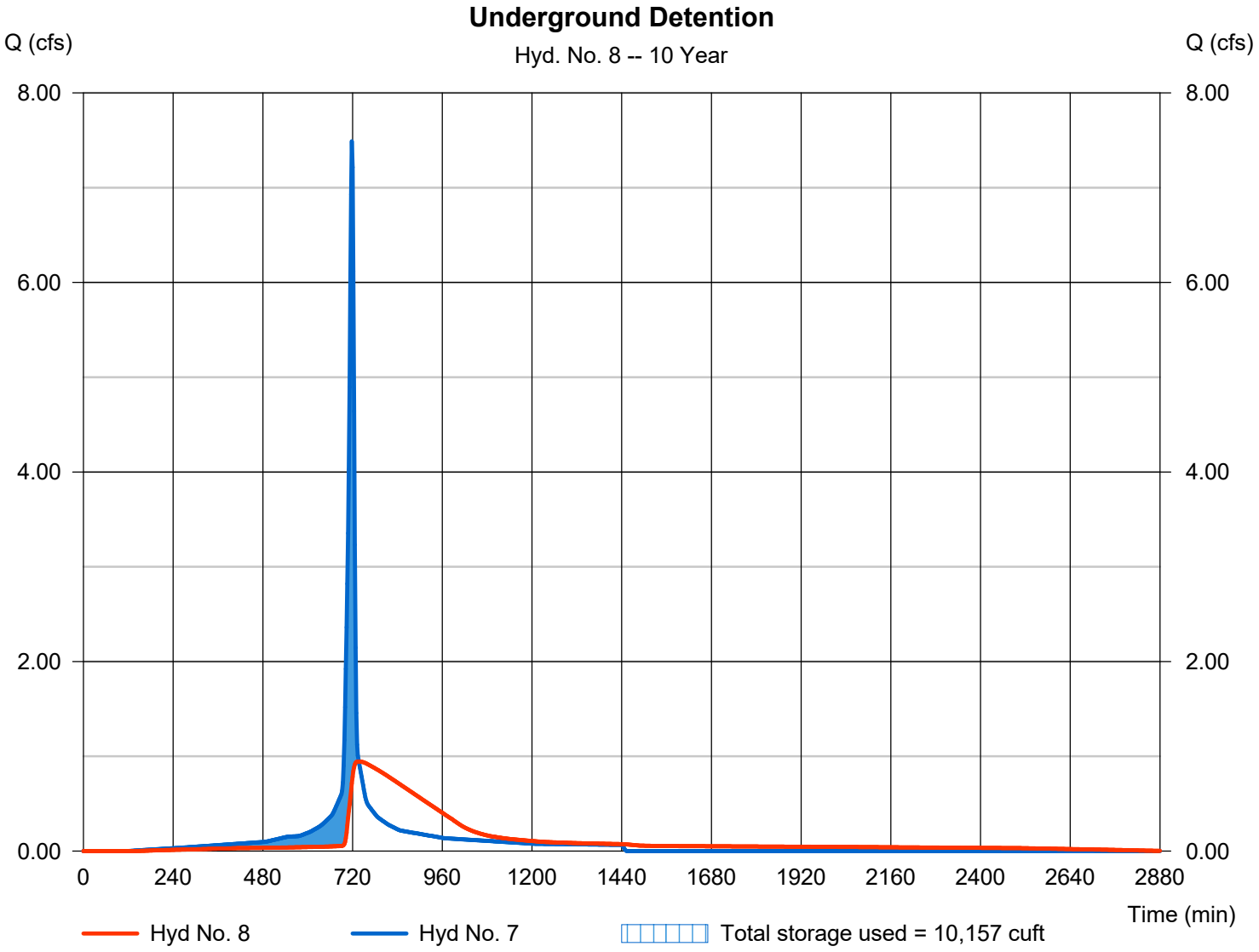
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 8

Underground Detention

Hydrograph type	=	Reservoir	Peak discharge	=	0.945 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	19,024 cuft
Inflow hyd. No.	=	7 - Post-Dev. (DA-2D) (DETAINED)	Max. Elevation	=	333.22 ft
Reservoir name	=	UG Detention System	Max. Storage	=	10,157 cuft

Storage Indication method used.



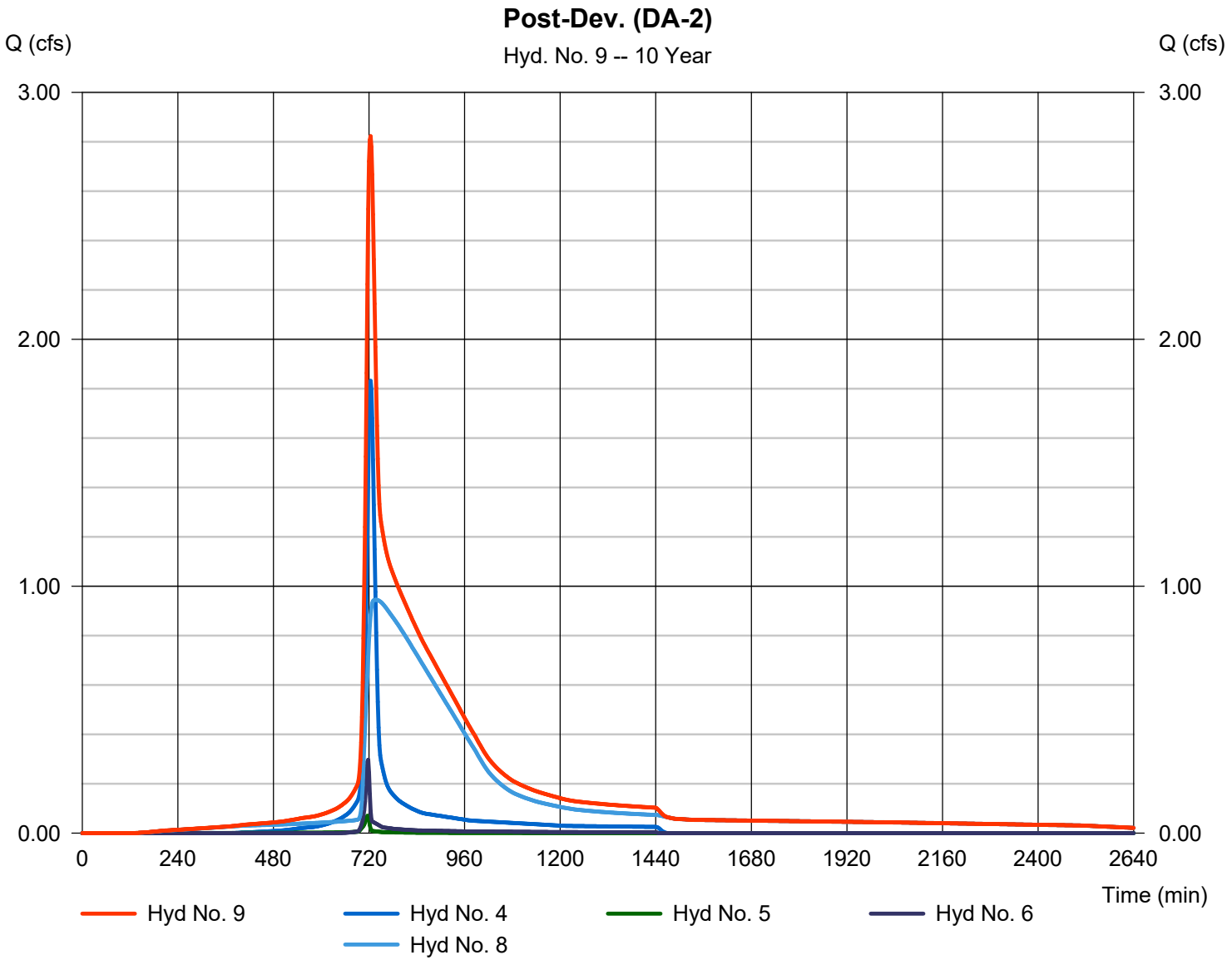
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 9

Post-Dev. (DA-2)

Hydrograph type	= Combine	Peak discharge	= 2.823 cfs
Storm frequency	= 10 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 25,538 cuft
Inflow hyds.	= 4, 5, 6, 8	Contrib. drain. area	= 0.590 ac



Hydrograph Report

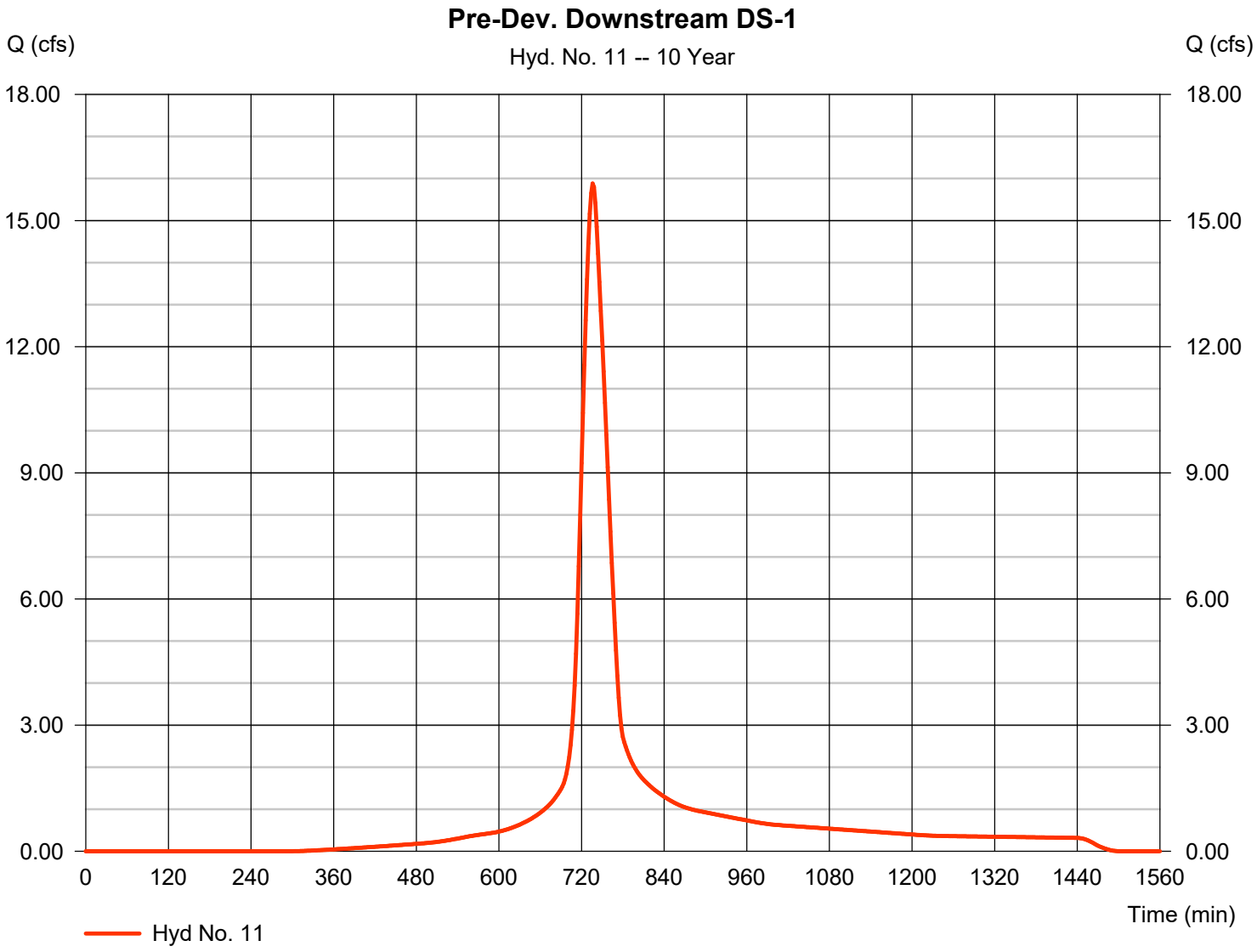
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 11

Pre-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	77,617 cuft
Drainage area	=	5.780 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.180 x 98) + (3.600 x 80)] / 5.780



Hydrograph Report

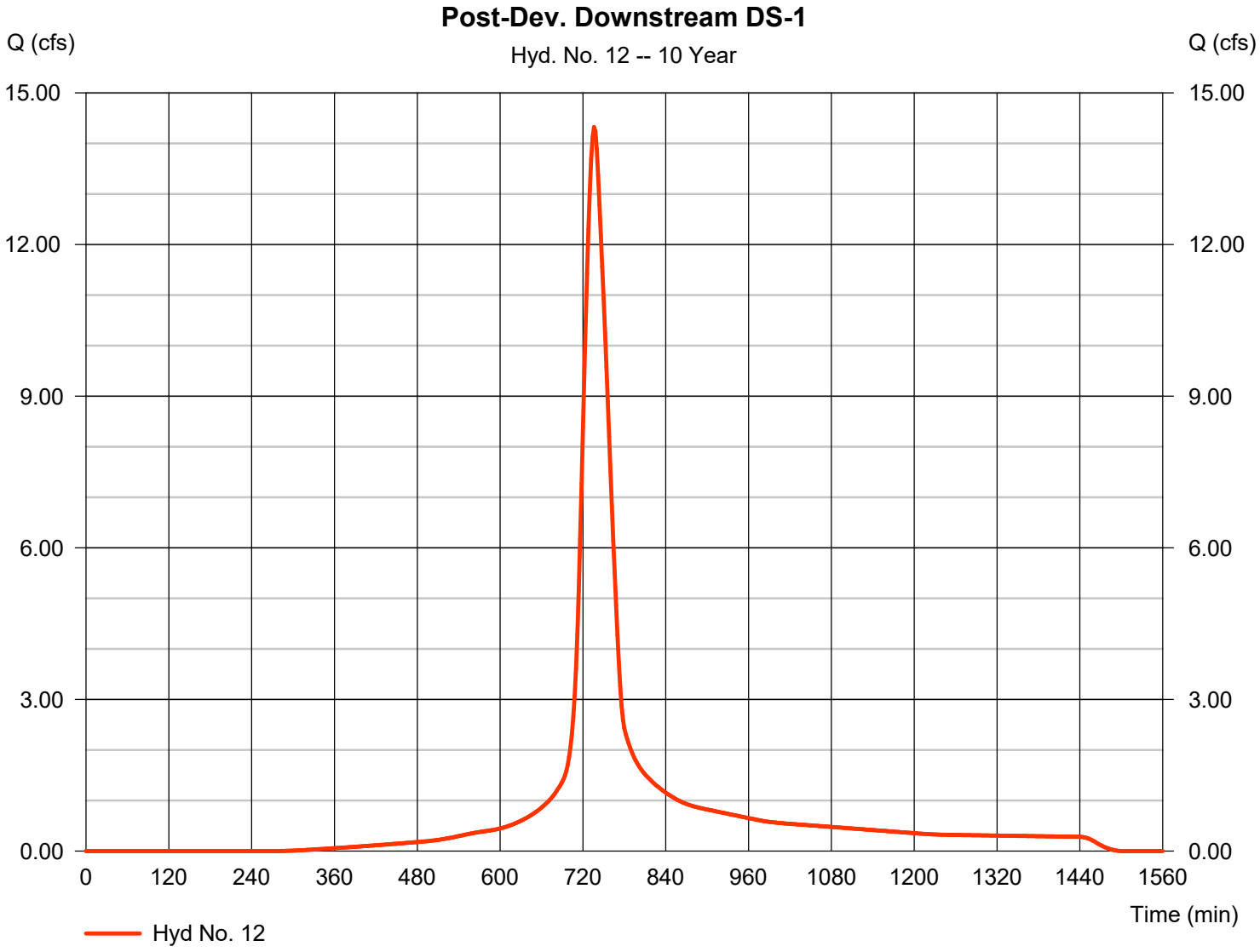
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 12

Post-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.32 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	70,250 cuft
Drainage area	=	5.090 ac	Curve number	=	88*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.310 x 98) + (2.780 x 80)] / 5.090



Hydrograph Report

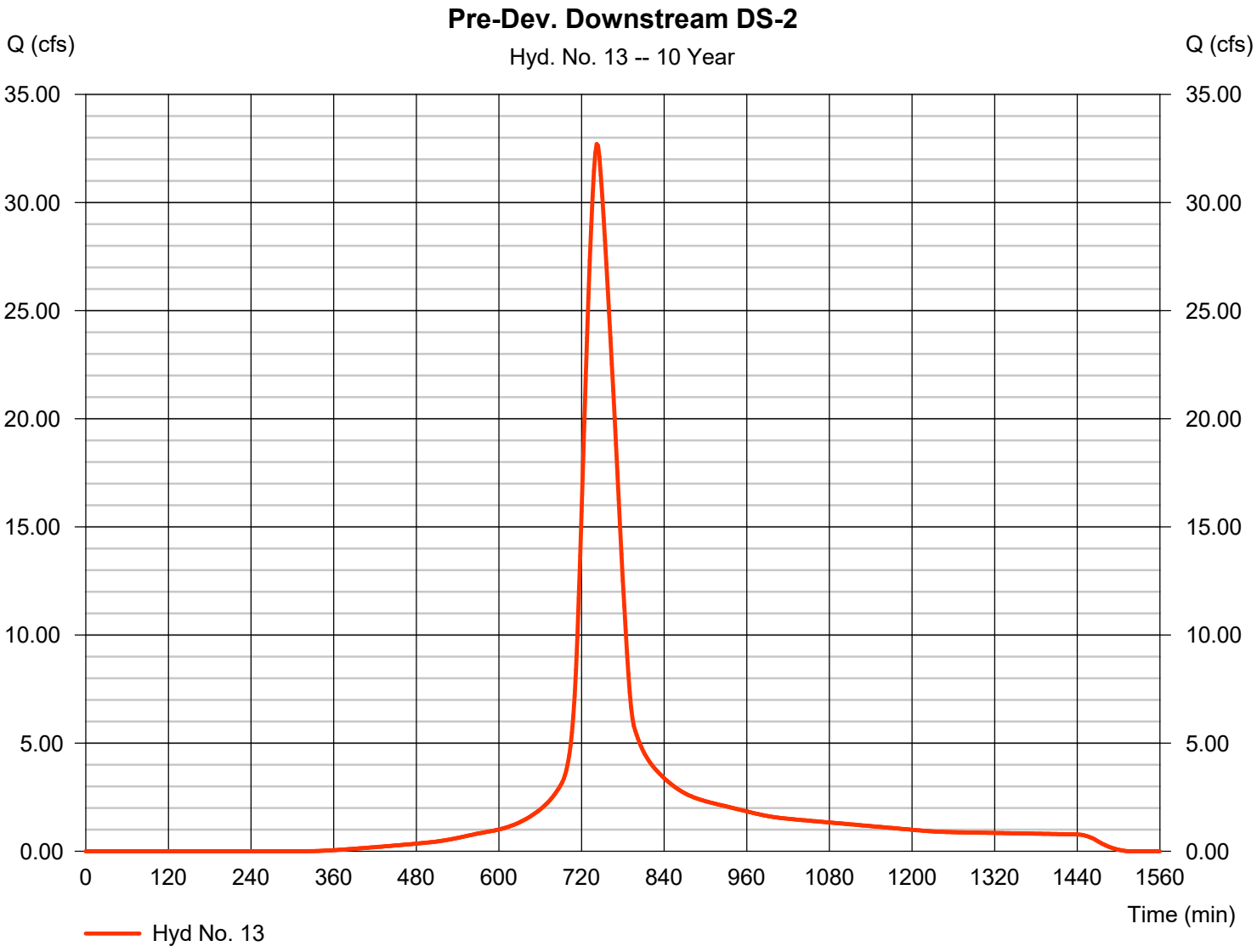
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 13

Pre-Dev. Downstream DS-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	32.71 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	185,978 cuft
Drainage area	=	14.240 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	49.10 min
Total precip.	=	5.14 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.930 x 98) + (9.310 x 80)] / 14.240



Hydrograph Report

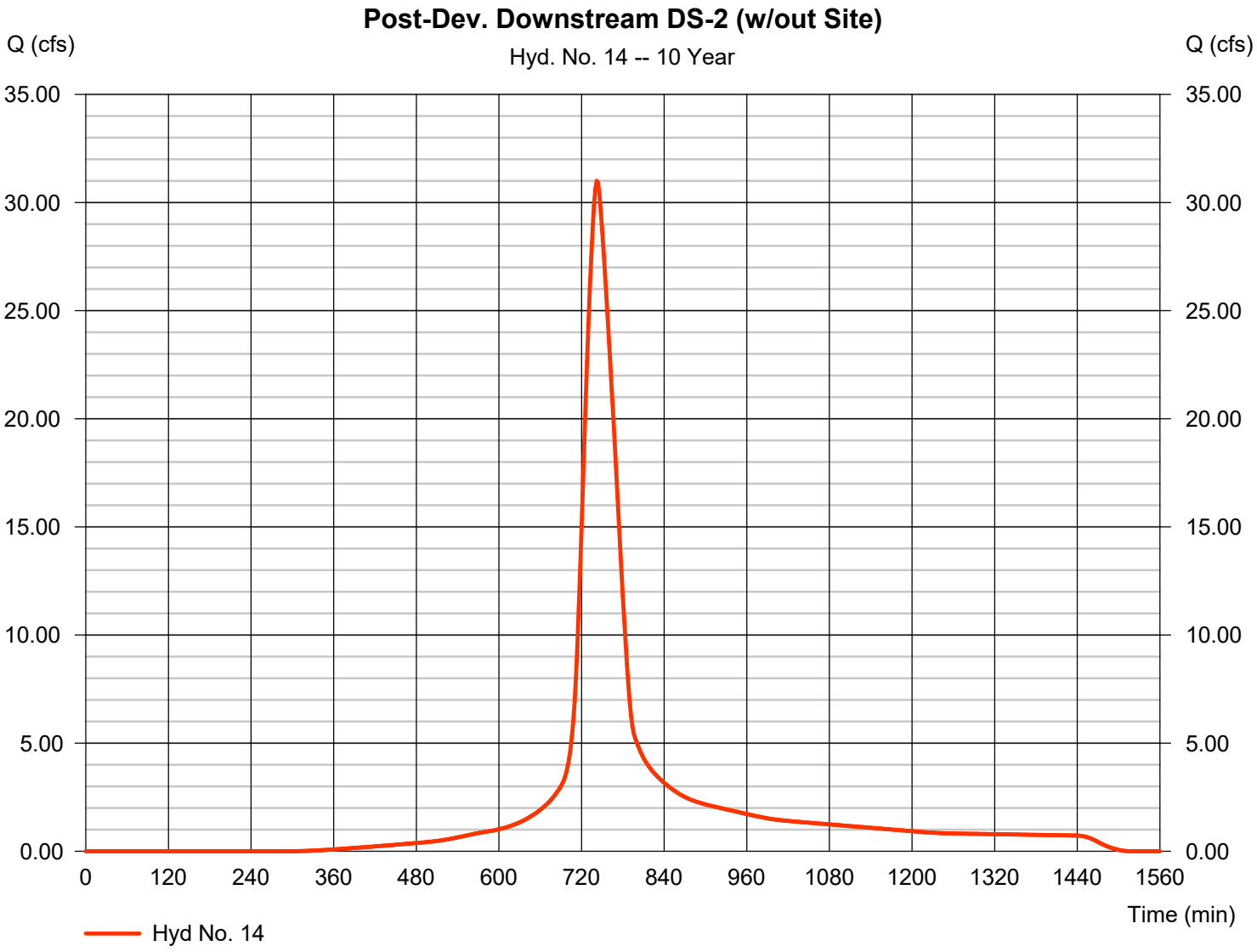
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 14

Post-Dev. Downstream DS-2 (w/out Site)

Hydrograph type	= SCS Runoff	Peak discharge	= 31.00 cfs
Storm frequency	= 10 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 176,720 cuft
Drainage area	= 13.160 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 49.10 min
Total precip.	= 5.14 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.220 x 98) + (7.940 x 80)] / 13.160



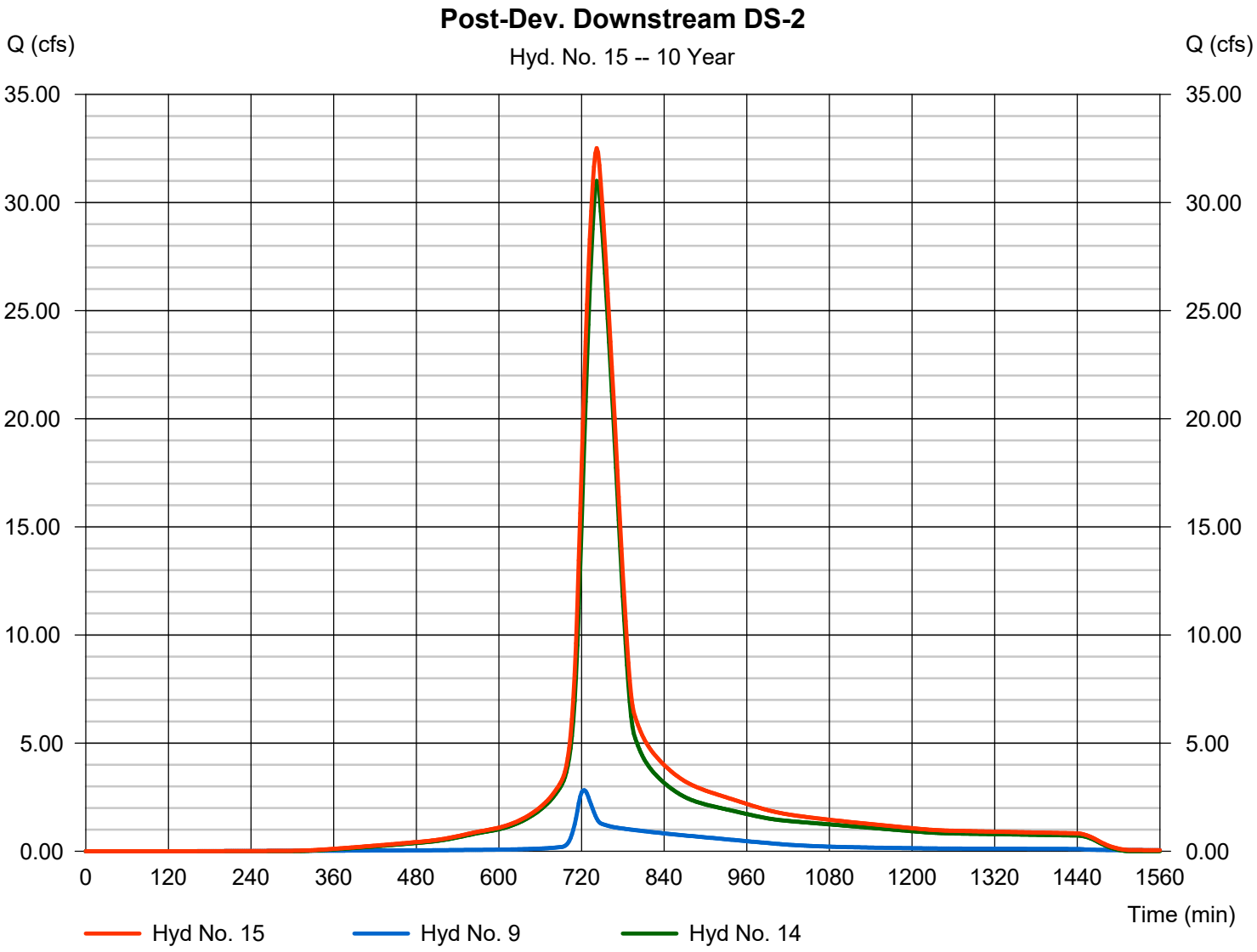
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 15

Post-Dev. Downstream DS-2

Hydrograph type	= Combine	Peak discharge	= 32.51 cfs
Storm frequency	= 10 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 202,257 cuft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 13.160 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.368	2	720	16,845	------	------	------	Pre-Dev. (DA-1)
2	SCS Runoff	1.680	2	716	3,770	------	------	------	Post-Dev. (DA-1) (BYPASS)
3	SCS Runoff	8.836	2	720	23,373	------	------	------	Pre-Dev. (DA-2)
4	SCS Runoff	3.252	2	724	10,415	------	------	------	Post-Dev. (DA-2A) (BYPASS)
5	SCS Runoff	0.109	2	716	264	------	------	------	Post-Dev. (DA-2B) (BYPASS)
6	SCS Runoff	0.656	2	716	1,325	------	------	------	Post-Dev. (DA-2C) (BYPASS)
7	SCS Runoff	11.85	2	718	30,897	------	------	------	Post-Dev. (DA-2D) (DETAINED)
8	Reservoir	10.70	2	722	30,893	7	334.09	12,173	Underground Detention
9	Combine	14.26	2	722	42,897	4, 5, 6, 8	------	------	Post-Dev. (DA-2)
11	SCS Runoff	27.13	2	736	135,324	------	------	------	Pre-Dev. Downstream DS-1
12	SCS Runoff	24.21	2	736	121,358	------	------	------	Post-Dev. Downstream DS-1
13	SCS Runoff	56.56	2	742	327,277	------	------	------	Pre-Dev. Downstream DS-2
14	SCS Runoff	53.02	2	742	308,108	------	------	------	Post-Dev. Downstream DS-2 (w/out S
15	Combine	55.59	2	742	351,005	9, 14	------	------	Post-Dev. Downstream DS-2

Hydrograph Report

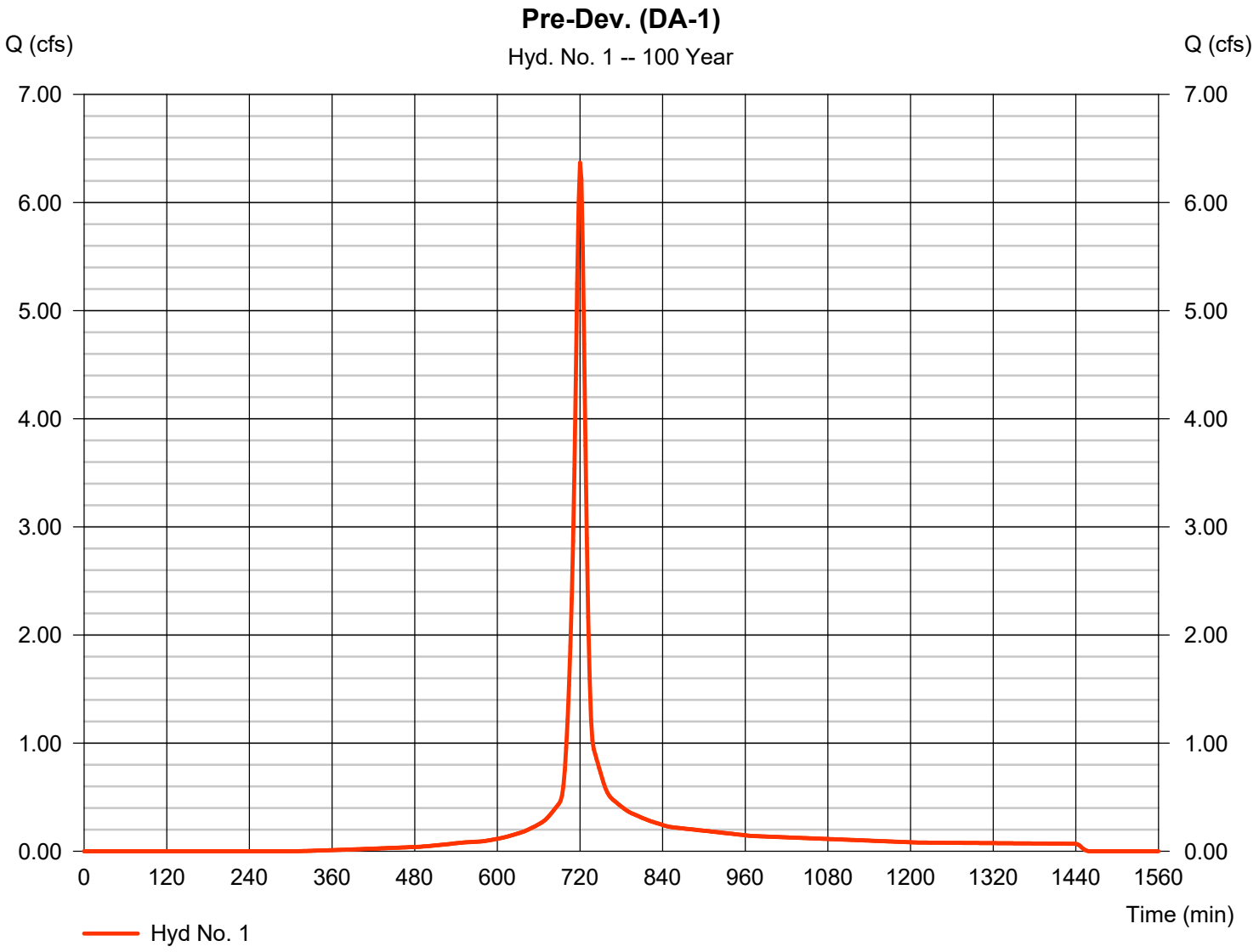
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 1

Pre-Dev. (DA-1)

Hydrograph type	= SCS Runoff	Peak discharge	= 6.368 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 16,845 cuft
Drainage area	= 0.800 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.20 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (0.800 x 80)] / 0.800



Hydrograph Report

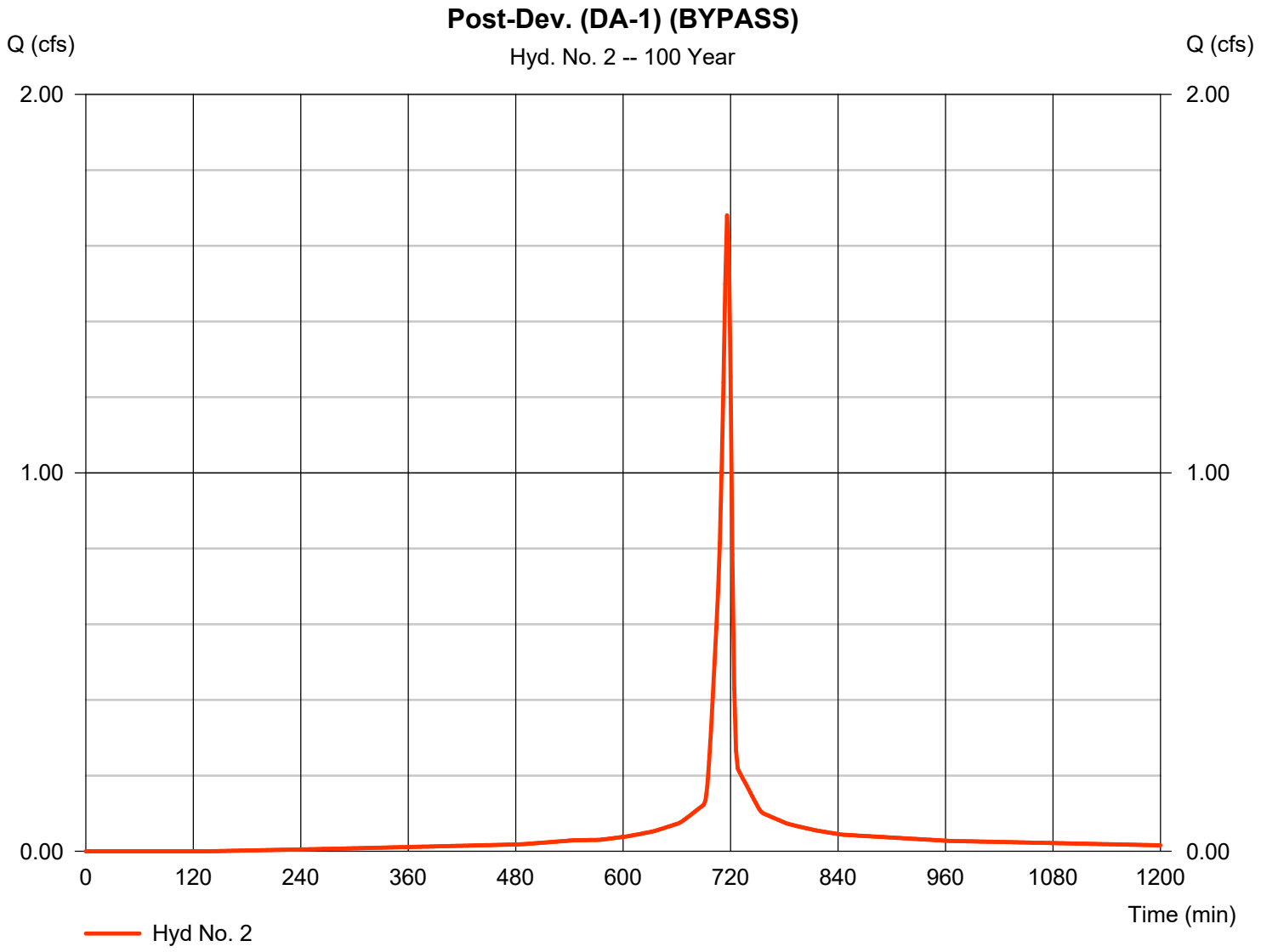
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 2

Post-Dev. (DA-1) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.680 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	3,770 cuft
Drainage area	=	0.160 ac	Curve number	=	91*
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

* Composite (Area/CN) = [(0.100 x 98) + (0.060 x 80)] / 0.160



Hydrograph Report

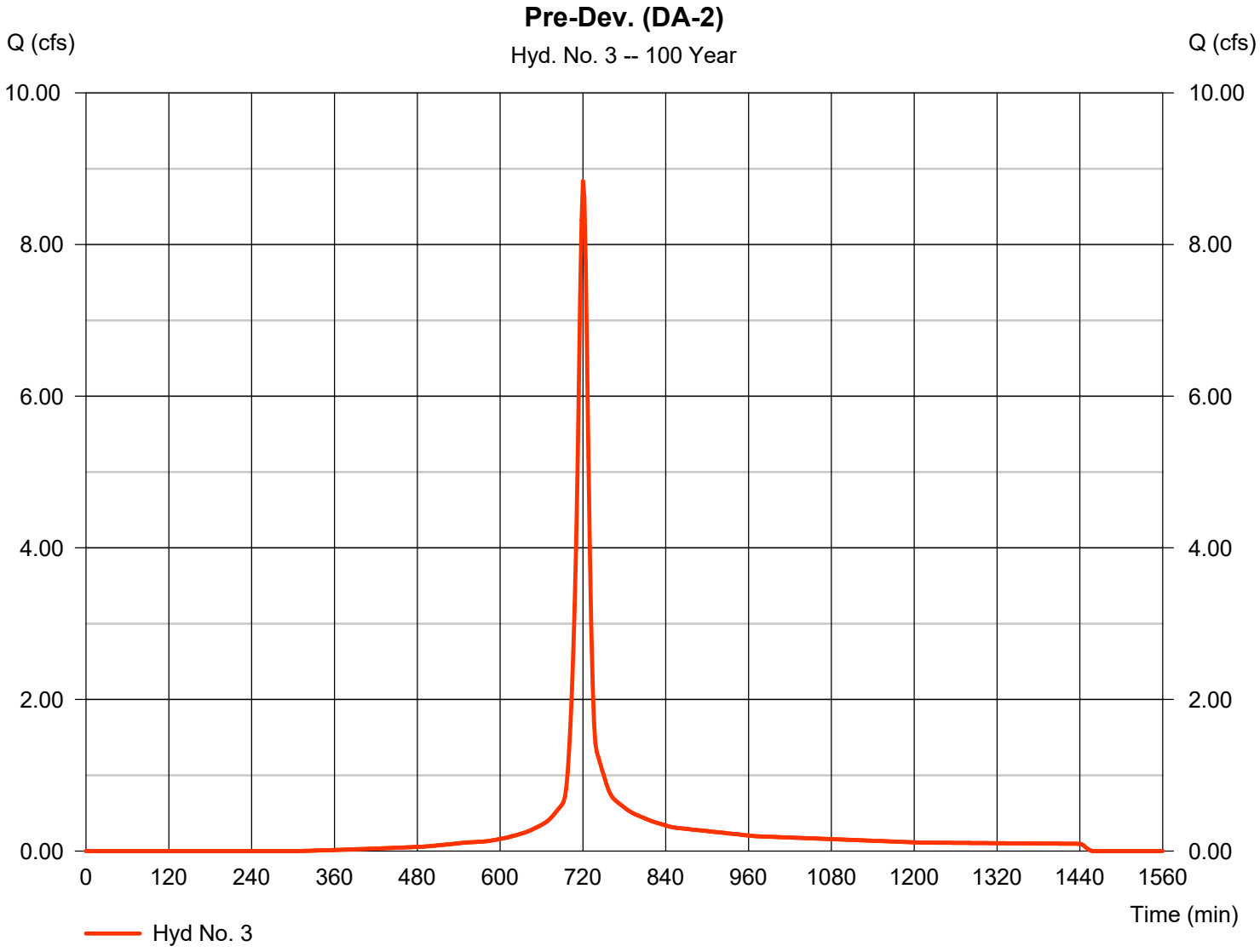
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 3

Pre-Dev. (DA-2)

Hydrograph type	= SCS Runoff	Peak discharge	= 8.836 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 23,373 cuft
Drainage area	= 1.110 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.40 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = + (1.110 x 80)] / 1.110



Hydrograph Report

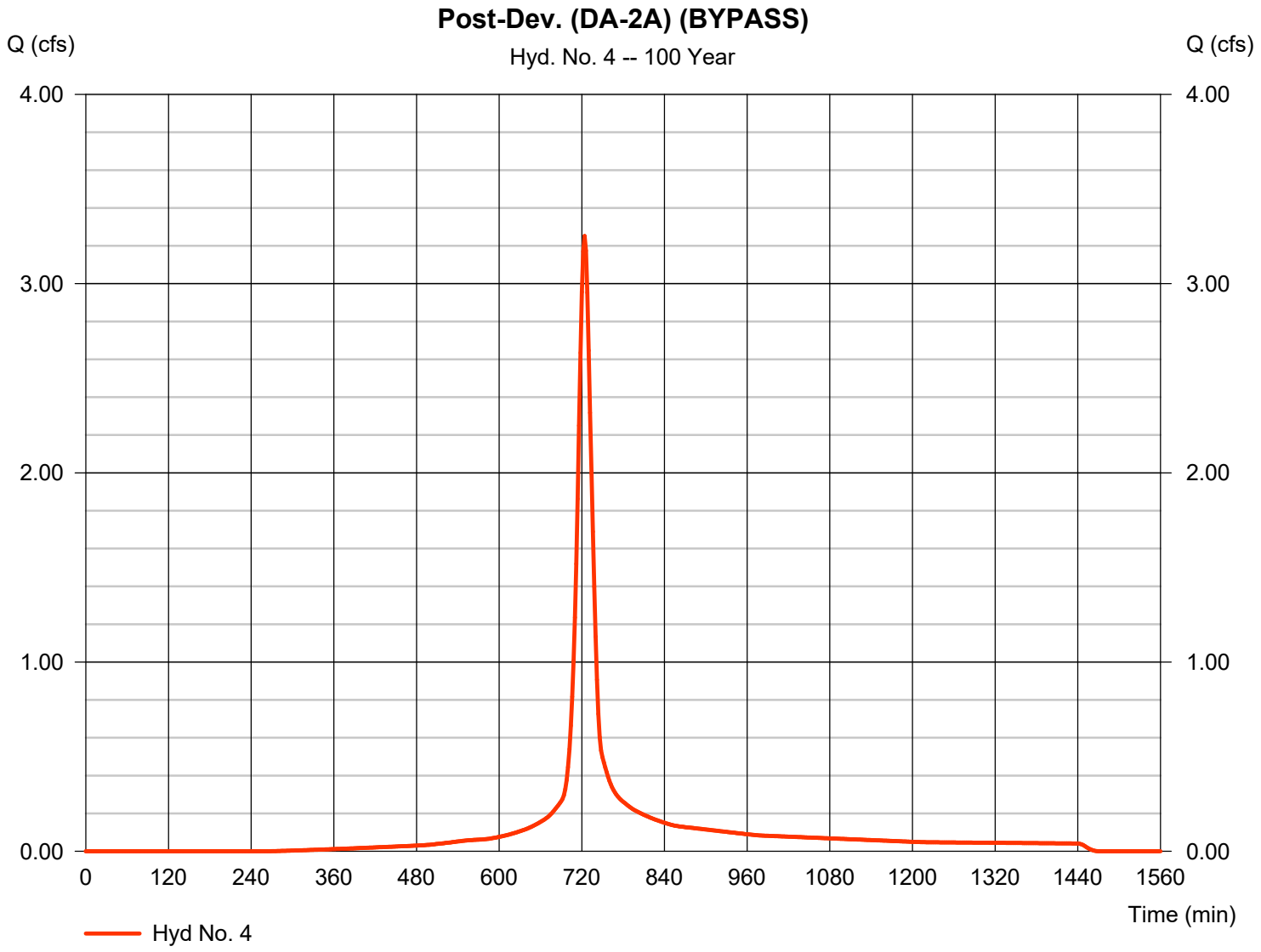
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 4

Post-Dev. (DA-2A) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.252 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	10,415 cuft
Drainage area	=	0.480 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.50 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.410 x 80)] / 0.480



Hydrograph Report

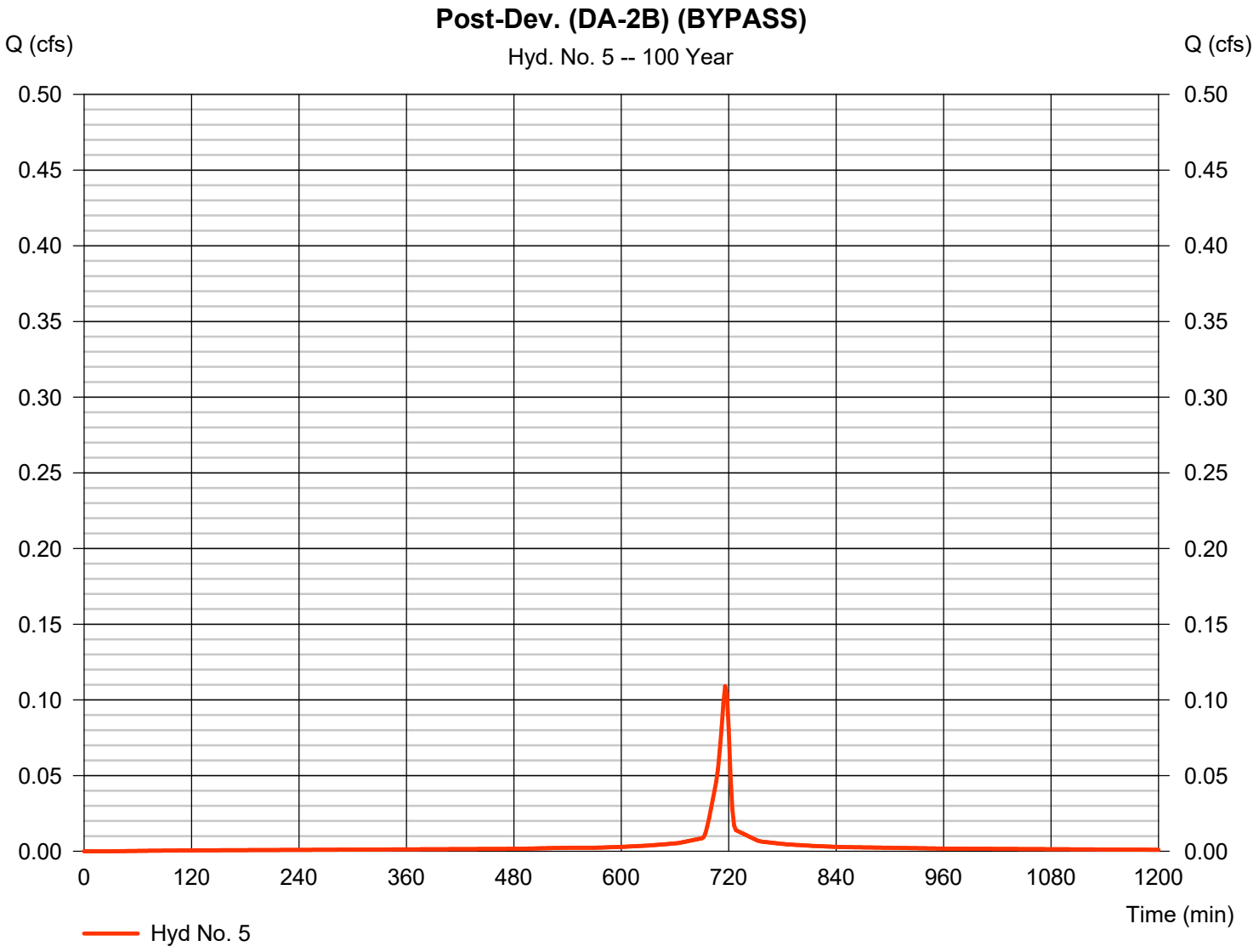
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 5

Post-Dev. (DA-2B) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.109 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	264 cuft
Drainage area	=	0.010 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

* Composite (Area/CN) = [(0.010 x 98)] / 0.010



Hydrograph Report

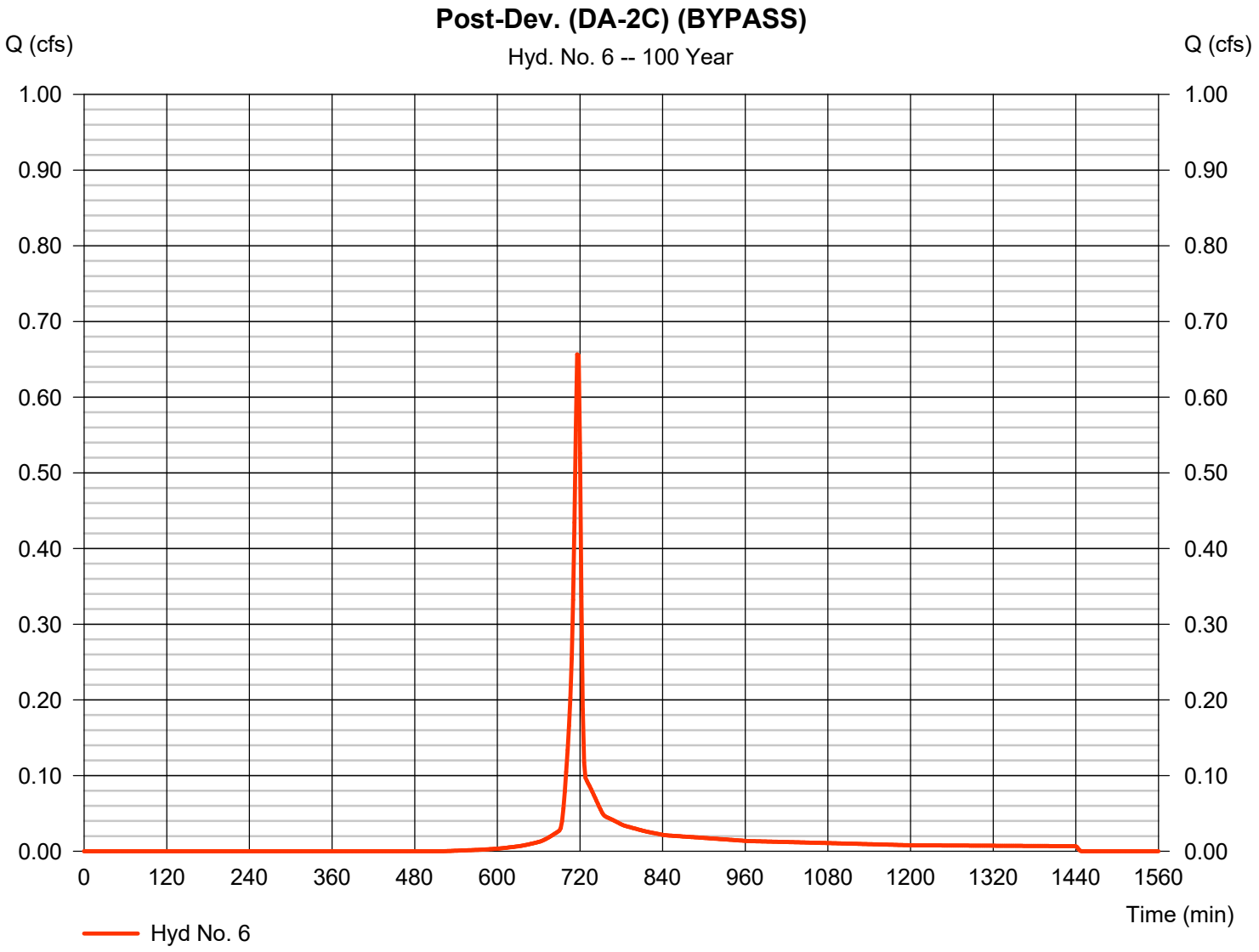
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 6

Post-Dev. (DA-2C) (BYPASS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.656 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,325 cuft
Drainage area	=	0.100 ac	Curve number	=	65*
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

* Composite (Area/CN) = [(0.010 x 98) + (0.090 x 61)] / 0.100



Hydrograph Report

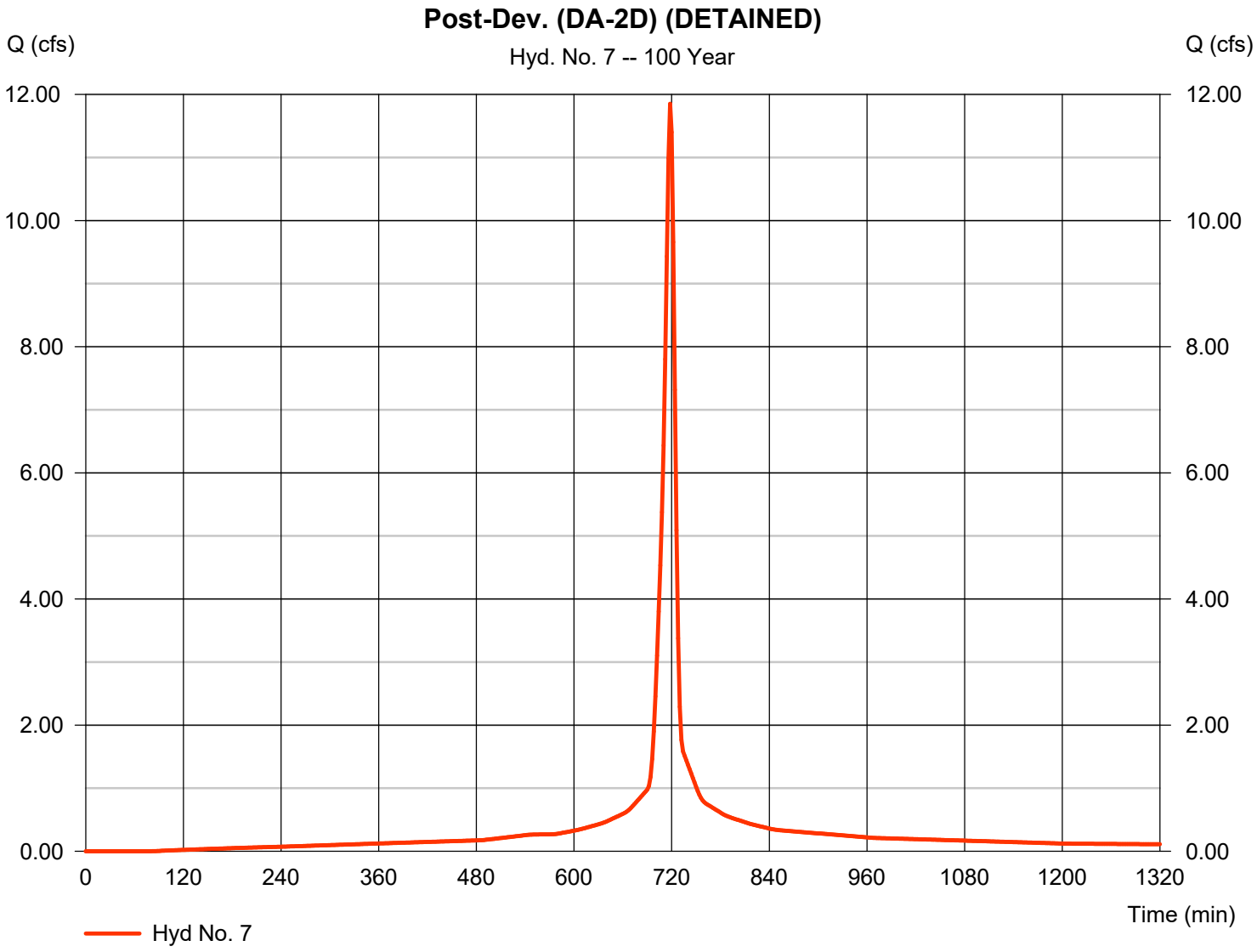
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 7

Post-Dev. (DA-2D) (DETAINED)

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.85 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	30,897 cuft
Drainage area	=	1.150 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	8.00 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.020 x 98) + (0.060 x 80) + (0.070 x 61)] / 1.150



Hydrograph Report

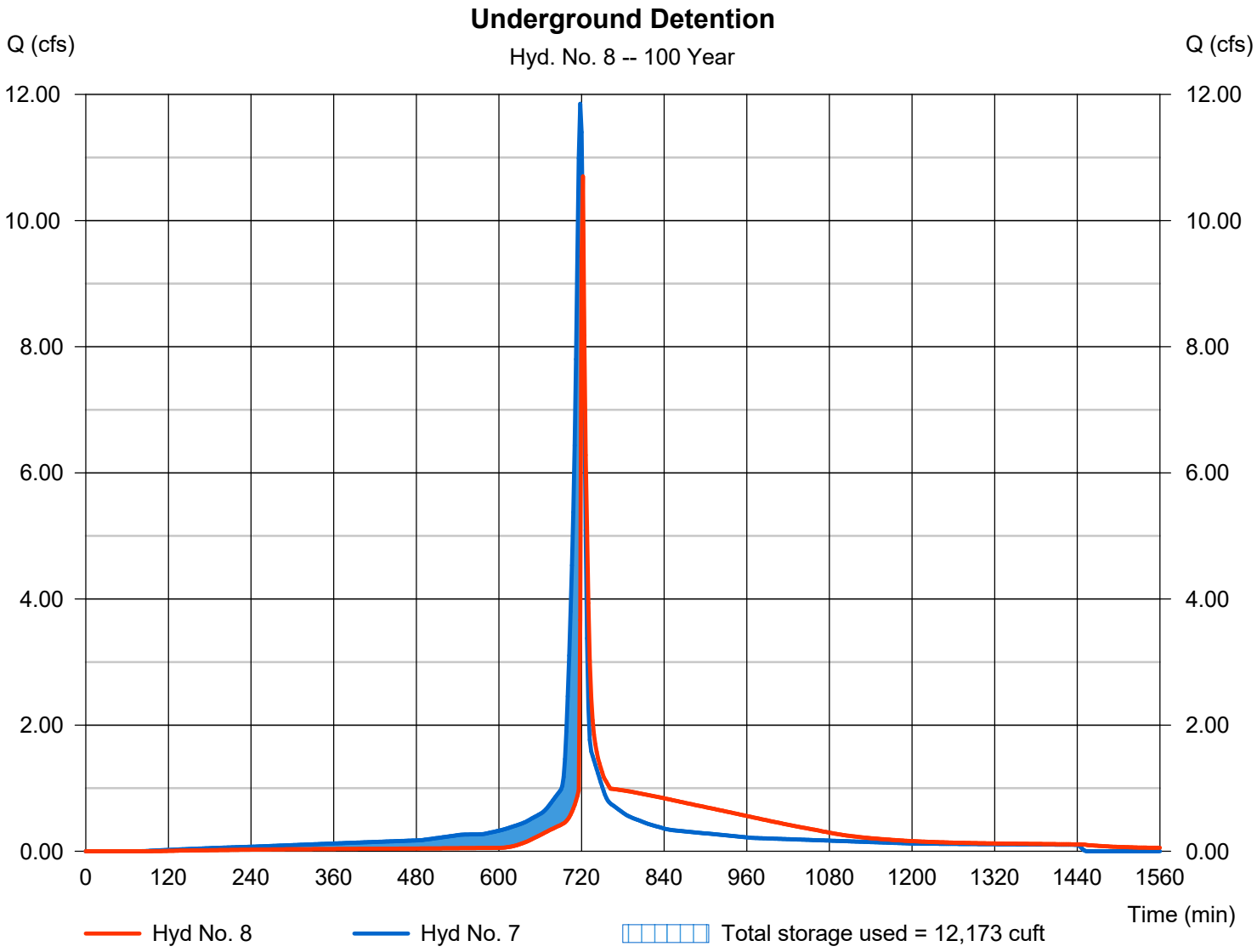
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 8

Underground Detention

Hydrograph type	=	Reservoir	Peak discharge	=	10.70 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	30,893 cuft
Inflow hyd. No.	=	7 - Post-Dev. (DA-2D) (DETAINED)	Max. Elevation	=	334.09 ft
Reservoir name	=	UG Detention System	Max. Storage	=	12,173 cuft

Storage Indication method used.



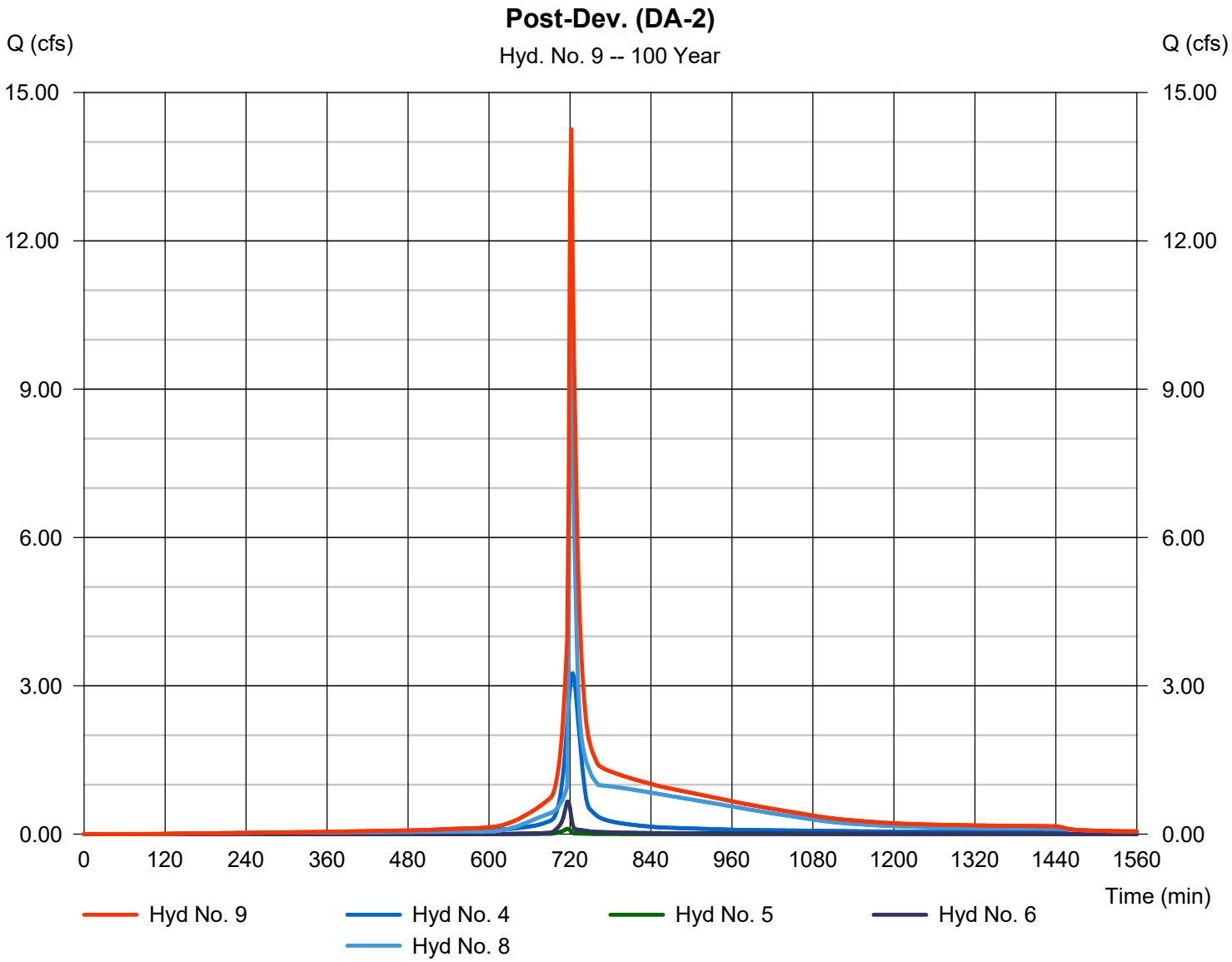
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 9

Post-Dev. (DA-2)

Hydrograph type	= Combine	Peak discharge	= 14.26 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 42,897 cuft
Inflow hyds.	= 4, 5, 6, 8	Contrib. drain. area	= 0.590 ac



Hydrograph Report

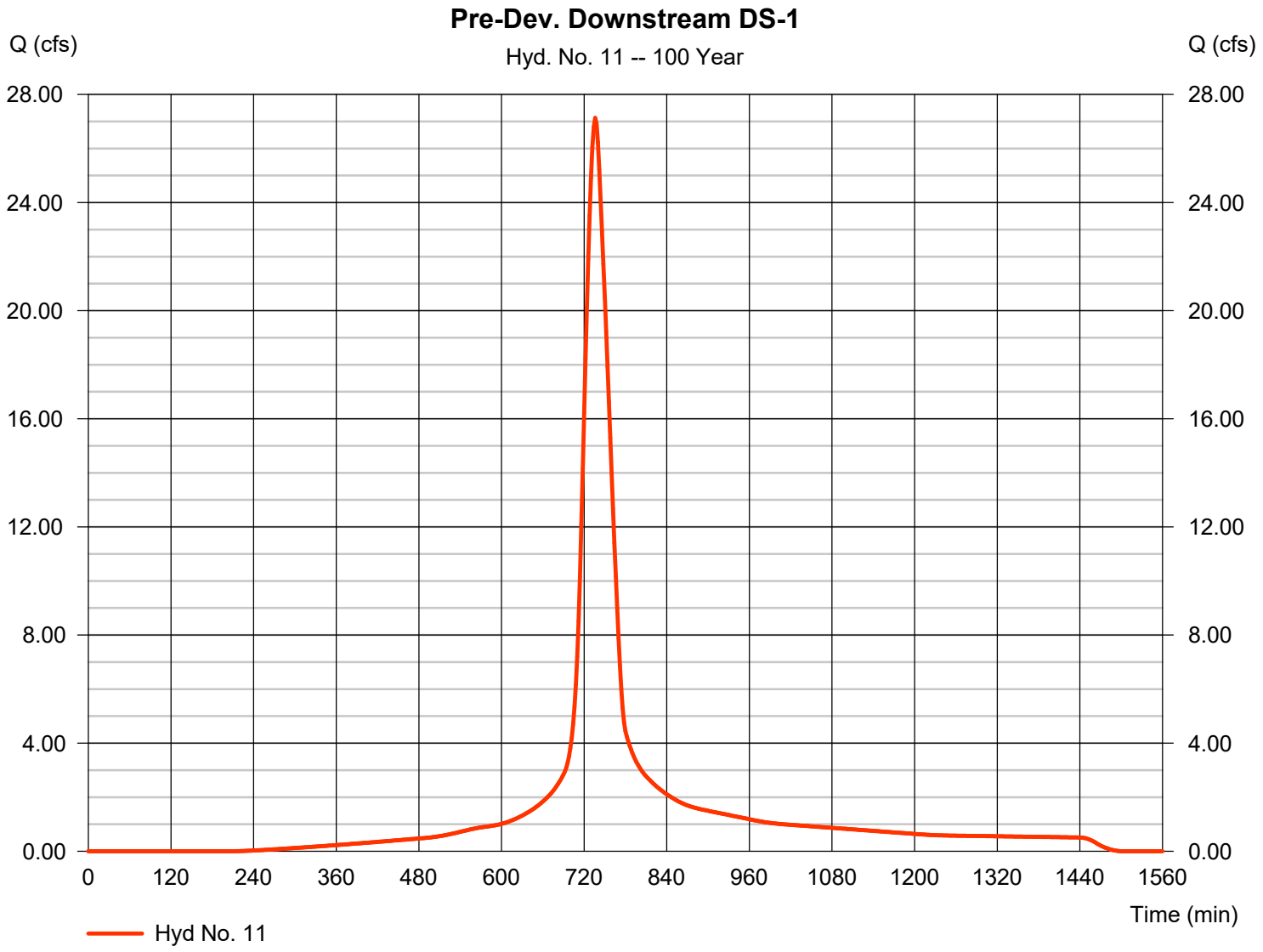
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 11

Pre-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	27.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	135,324 cuft
Drainage area	=	5.780 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.180 x 98) + (3.600 x 80)] / 5.780



Hydrograph Report

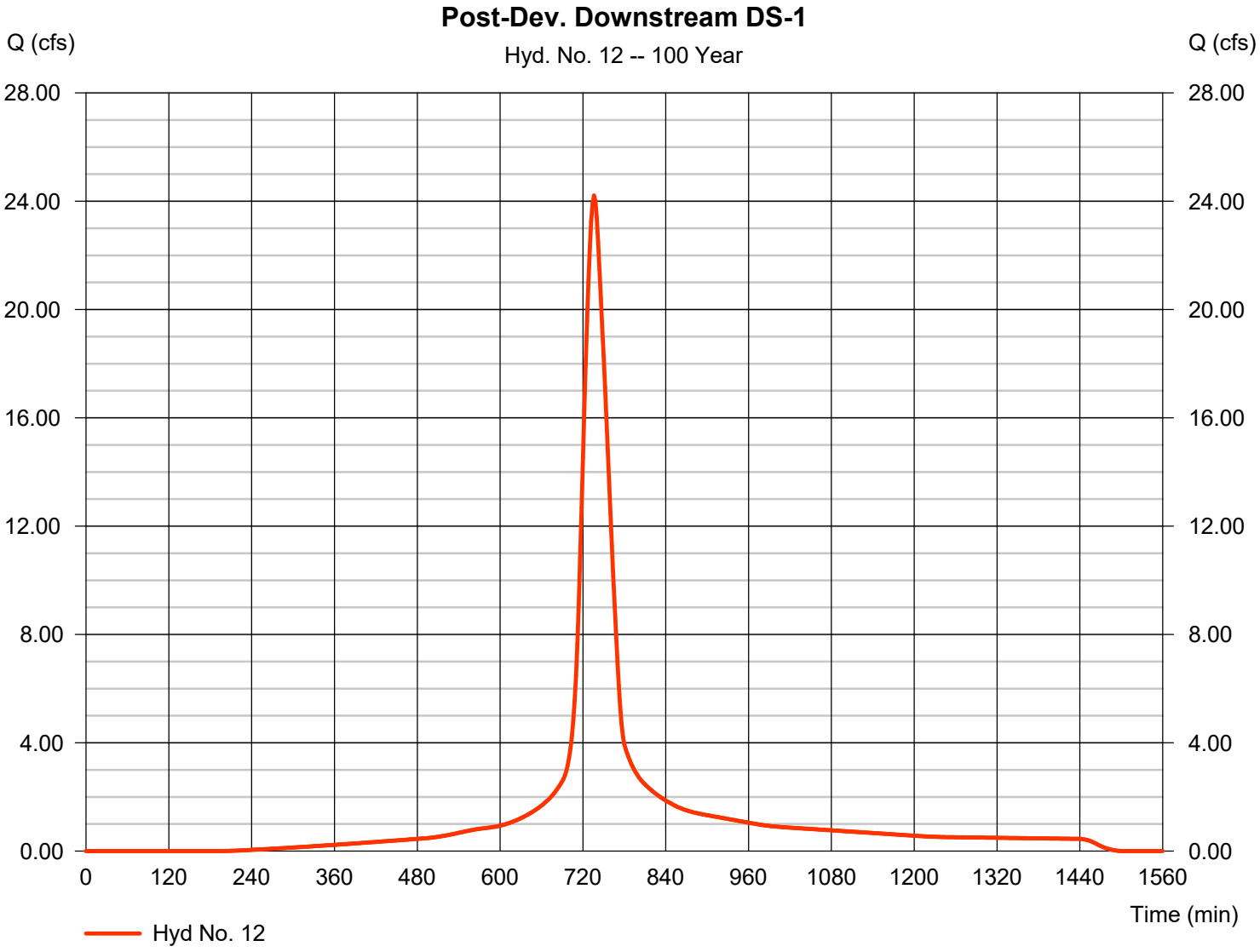
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 12

Post-Dev. Downstream DS-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.21 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	121,358 cuft
Drainage area	=	5.090 ac	Curve number	=	88*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	40.10 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.310 x 98) + (2.780 x 80)] / 5.090



Hydrograph Report

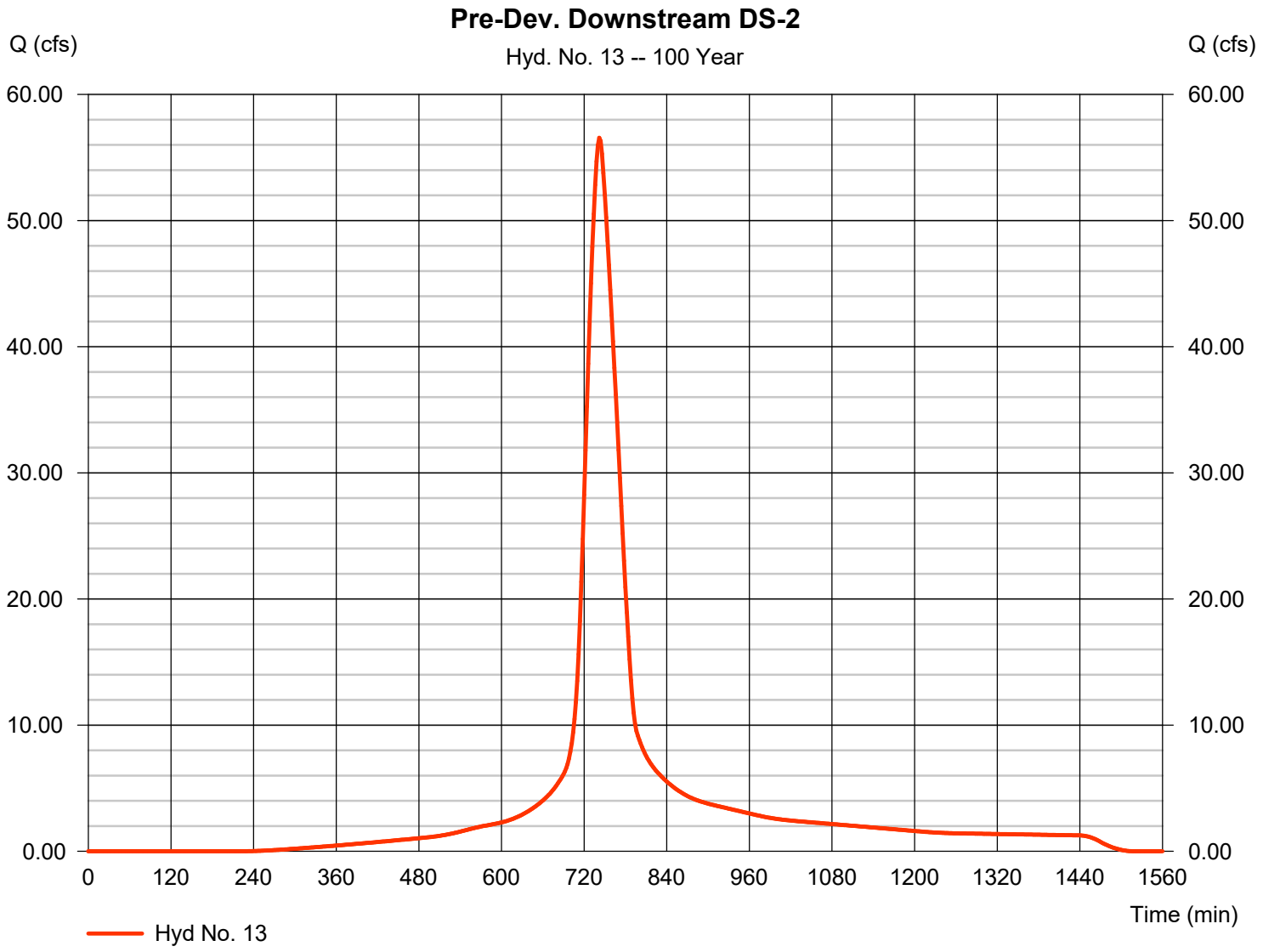
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 13

Pre-Dev. Downstream DS-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.56 cfs
Storm frequency	=	100 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	327,277 cuft
Drainage area	=	14.240 ac	Curve number	=	86*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	49.10 min
Total precip.	=	8.00 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.930 x 98) + (9.310 x 80)] / 14.240



Hydrograph Report

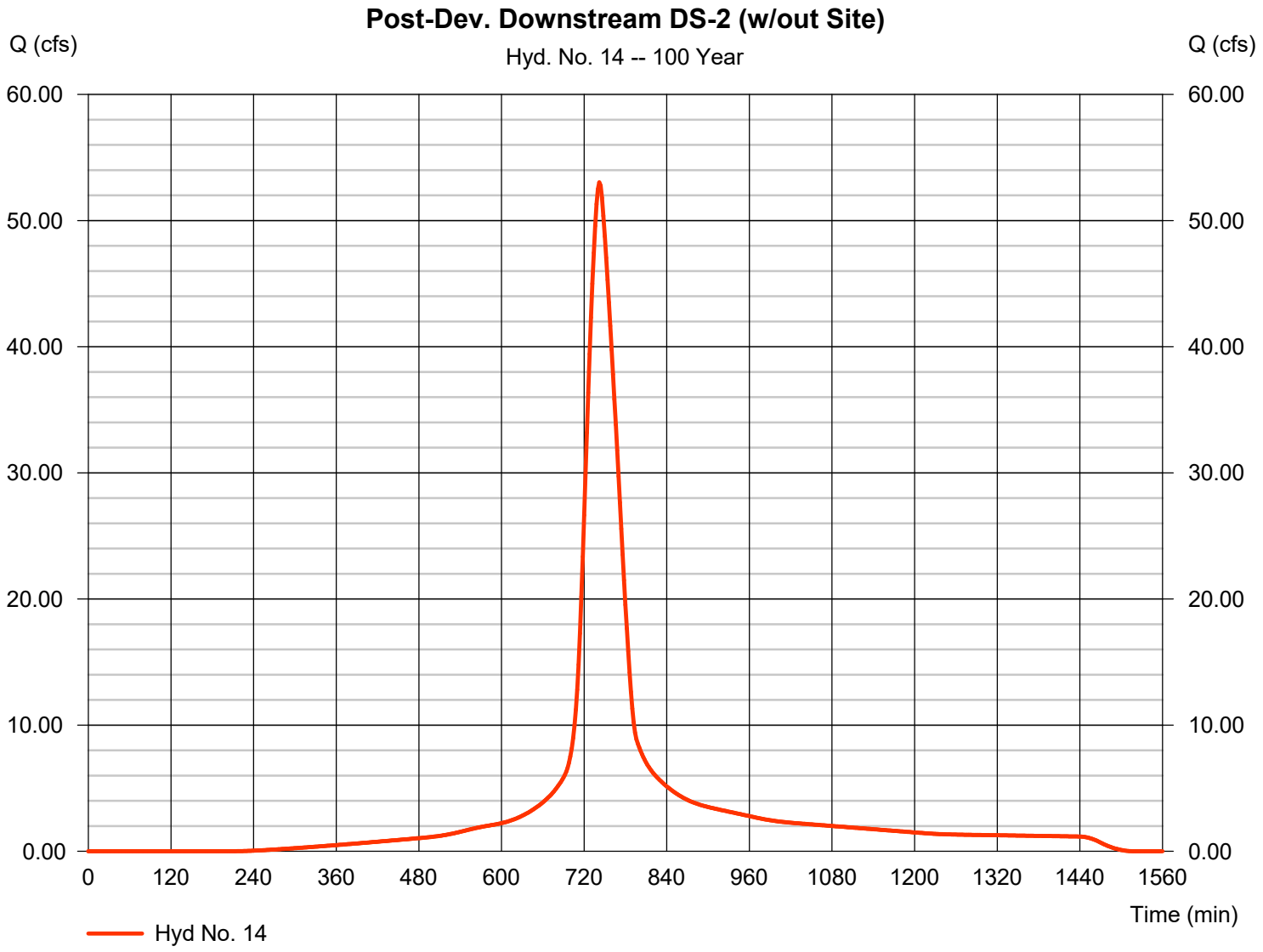
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 14

Post-Dev. Downstream DS-2 (w/out Site)

Hydrograph type	= SCS Runoff	Peak discharge	= 53.02 cfs
Storm frequency	= 100 yrs	Time to peak	= 742 min
Time interval	= 2 min	Hyd. volume	= 308,108 cuft
Drainage area	= 13.160 ac	Curve number	= 87*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 49.10 min
Total precip.	= 8.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(5.220 x 98) + (7.940 x 80)] / 13.160



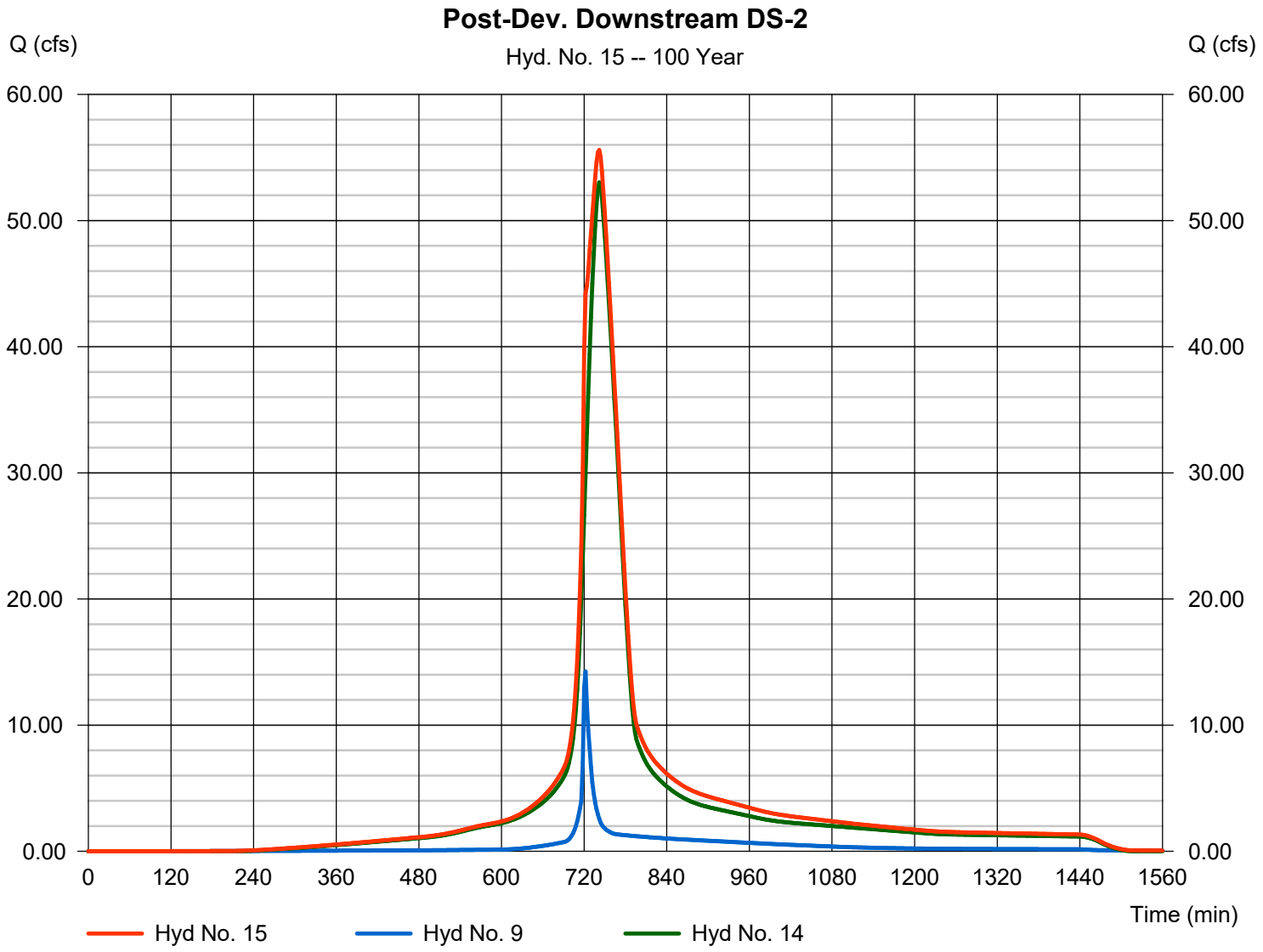
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Hyd. No. 15

Post-Dev. Downstream DS-2

Hydrograph type	=	Combine	Peak discharge	=	55.59 cfs
Storm frequency	=	100 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	351,005 cuft
Inflow hyds.	=	9, 14	Contrib. drain. area	=	13.160 ac



Hydraflow Rainfall Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 Thursday, 03 / 27 / 2025

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	65.1130	13.0000	0.8983	--------
2	71.2172	12.9000	0.8806	--------
3	0.0000	0.0000	0.0000	--------
5	68.0041	12.5000	0.8280	--------
10	71.4662	12.4000	0.8035	--------
25	63.2015	11.1000	0.7421	--------
50	56.4878	9.9000	0.6912	--------
100	54.2579	9.3000	0.6606	--------

File name: OUT-1502 IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.85	3.89	3.26	2.82	2.48	2.22	2.01	1.84	1.70	1.58	1.47	1.38
2	5.61	4.52	3.80	3.28	2.90	2.60	2.36	2.16	2.00	1.86	1.74	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.36	5.16	4.37	3.81	3.38	3.05	2.78	2.56	2.37	2.22	2.08	1.96
10	7.20	5.88	5.00	4.37	3.89	3.52	3.22	2.97	2.76	2.58	2.43	2.29
25	8.04	6.58	5.62	4.93	4.42	4.01	3.68	3.41	3.18	2.99	2.82	2.67
50	8.73	7.15	6.12	5.40	4.85	4.42	4.07	3.79	3.55	3.34	3.16	3.00
100	9.36	7.68	6.59	5.83	5.25	4.80	4.43	4.13	3.88	3.66	3.47	3.30

Tc = time in minutes. Values may exceed 60.

e: X:\OUT - Cookout\1500 Sites\1502 - Zebulon, NC\Engineering\Stormwater\Stormwater Model\OUT-1502 Evt Mgr.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.85	3.46	0.00	4.38	5.14	6.20	7.07	8.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

COOK OUT - ZEBULON, NC
OUT-1502

WQV DRAWDOWN CALCULATIONS

3/27/2025

WATER QUALITY VOLUME

WQv = 3630 * Rd * Rv * A

where,

WQv = Water quality volume (acre-feet)
Rv = 0.05 + 0.009 x I
I = Percent impervious
A = Area (acres)
P = Rainfall (inches)

Total area to UG Detention, A =	1.15	acres
Impervious area to UG Detention =	1.02	acres
Percent impervious, I =	88.70	%
Runoff coefficient, Rv =	0.85	
Rainfall for WQ storm, Rd =	1.00	inches
Water quality volume, WQv =	**3541**	**cf**
75% WQv =	**2656**	**cf**

WATER QUALITY VOLUME DRAWDOWN

T = WQv / Q / 86400 (sec/day)

where,

T = Drawdown Time (days)
WQv = Water Quality Volume (cf)
Q = Cd * A * (2gh)^(1/2)

Diameter of orifice, D =	1.33	inches
Cross sectional area of orifice, A =	0.002	sf
Orifice invert elevation =	328.70	ft
WQv elevation =	331.08	ft
Orifice coefficient =	0.61	
Driving head on orifice @WQv, h =	2.38	
Orifice flowrate, Q =	0.0061	
Drawdown time, T =	**5.06**	**days**
	121.50	**hours**

Determining Number of Cartridges for Volume-Based Design in NC

Design Engineer:	lrs		**Blue Cells = Input**
Date	10/11/2024		**Black Cells = Calculation**

Site Information

Project Name	Cook Out REV2		
Project State	NC		
Project Location	Zebulon		
Drainage Area, Ad	1.15	ac	
Impervious Area, Ai	1.01	ac	
Pervious Area, Ap	0.14		
% Impervious	88%		
Runoff Coefficient, Rv	0.84		=0.05+0.9*(Ai/Ad)

Water Quality Volume Calculations

Design storm rainfall depth, Rd	1.0	in	
Water quality volume, WQV	3508.4	ft^3	=Ad*Rv*Rd*(43560/12)

Storage Component Calculations

Capture 75% of WQV	2631.3	ft^3	=0.75*WQV
Pretreatment credit (estimated or calculated), %pre	30%		

Mass loading calculations

Mean Annual Rainfall, P	45	in	
Agency required % removal	85%		
Percent Runoff Capture (% capture)	90%		
Mean Annual Runoff, V_t	143,100	ft^3	=P*Ad*Rv*(43560/12)*%capture
Event Mean Concentration of Pollutant, EMC	70.0	mg/l	(Suggestion: Use 60 for residential, 70 for Commercial, 100 for Industrial)
Annual Mass Load, M_{total}	624.96	lbs	=EMC*Vt*(28.3)*(0.000001)*(2.2046)

Filter System

Filtration brand	StormFilter		
Cartridge height	18	in	

Cartridge Quantity Calculation

Mass removed by pretreatment system, M_{pre}	187	lbs	=Mtotal * %removal
Mass load to filters after pretreatment, M_{pass1}	437	lbs	=Mtotal - Mpre
Estimate the required filter efficiency, E_{filter}	79%		=1+(%removal - 1)/(1 - %pre)
Mass to be captured by filters, M_{filter}	344	lbs	=Mpass1 * Efilter
Maximum Cartridge Flow rate, Q_{cart}	7.5	gpm	=q * (7.5 ft2/cartridge)
Mass load per cartridge, M_{cart} (lbs)	36	lbs	=lookup mass load per cartridge
Number of Cartridges required, N_{mass}	10		=ROUNDUP(Mfilter/Mcart,0)
Maximum Treatment Capacity	0.17		=Nmass*(Qcart/449)

SUMMARY

Maximum Treatment Flow Rate, cfs	0.17
Cartridge Flow Rate, gpm	7.5
Number of Cartridges	10
Stormfilter Size	96" MH

Target Pollutant(s):	TSS, N&P
Media:	Phosphosorb

2022-10-20_County Response to Comments Letter

APPENDIX C

COOK OUT
1200 N. ARENDELL AVE.
ZEBULON, NC 27597
OUT-1502

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 3 2023

Flume #1

Rectangular Weir

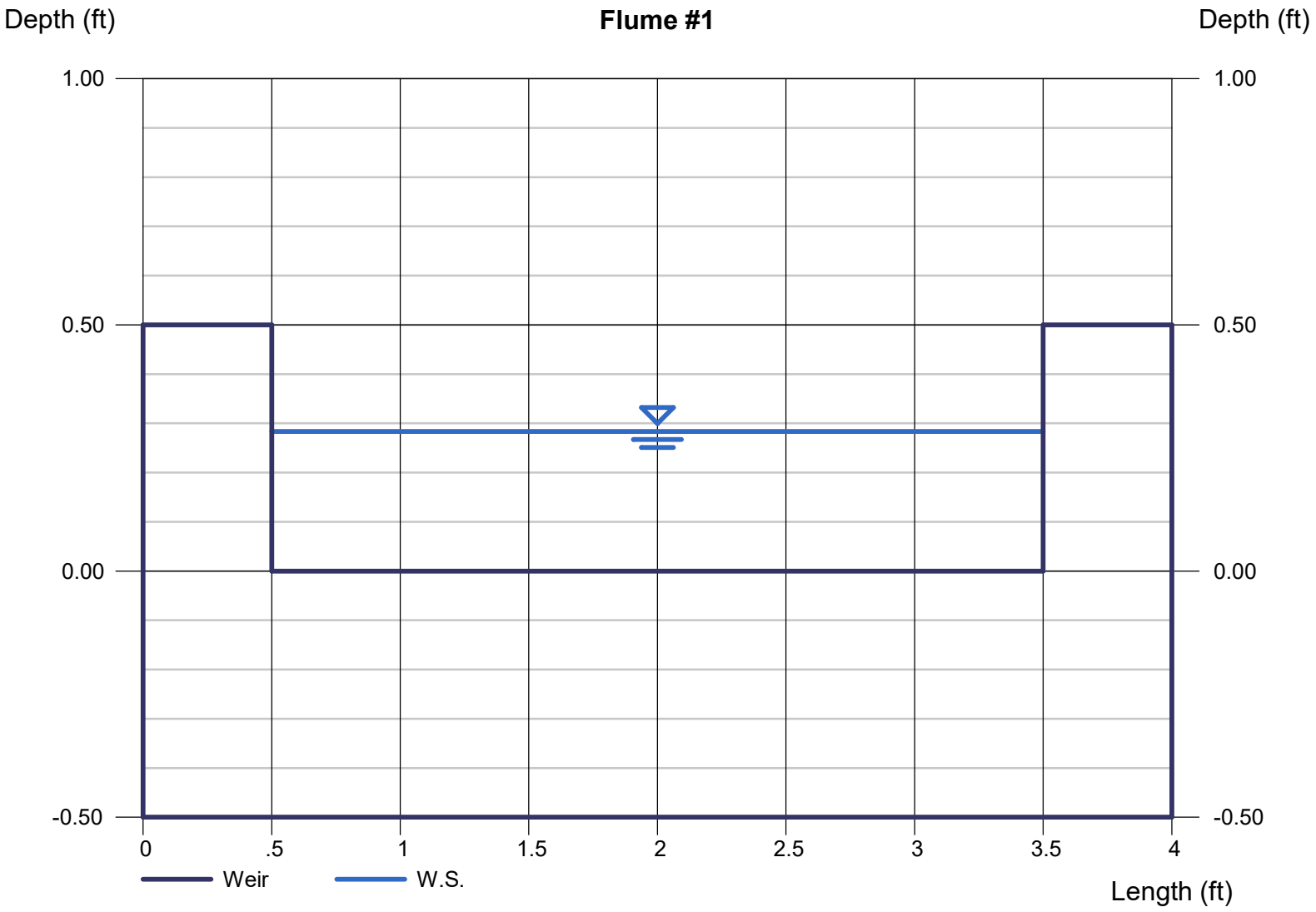
Crest	= Sharp
Bottom Length (ft)	= 3.00
Total Depth (ft)	= 0.50

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 1.51

Highlighted

Depth (ft)	= 0.28
Q (cfs)	= 1.510
Area (sqft)	= 0.85
Velocity (ft/s)	= 1.77
Top Width (ft)	= 3.00



DESIGN OF RIPRAP OUTLET PROTECTION

New York DOT Dissipator Method For Use in Defined Chann

(Source: "Bank and channel lining procedures", New York Department of Transportation, Division of Design and Construction, 1971.)

Guide to Color Key:	User Input Data	Calculated Value

Designed By:	JAS	**Date:**
Checked By:		**Date:**
Company:	Sambatek	
Project Name:	Cookout Zebulon	
Project No.:	OUT-1502	

Site Location (City/Town)	Zebulon
Culvert Id.	Flume #1

Estimation of Stone Size and Dimensions For Culvert Aprons

Step 1) Compute flow velocity V_o at culvert or paved channel outlet.

Step 2) For pipe culverts D_o is diameter.
For pipe arch, arch and box culverts, and paved channel outlets, $D_o = A_o$ where A. = cross-sectional area of flow at outlet.

For multiple culverts, use $D_o = 1.25 \times D_o$ of single culvert.

Velocity (ft/s)	1.77
Opening type	Paved Channel Outlet
Single or multiple openings?	Single
Outlet pipe diameter, D_o (ft)	0.85

NOTE 1: If opening type is anything other than "Pipe Culvert", $D_o=A_o$ (Cross-sectional area of flow at outlet).

NOTE 2: If multiple openings, $D_o=1.25 \times D_o$ of single culvert.

Step 3) For apron grades of 10% or steeper, use recommendations For next higher zone. (Zones 1 through 6).

Zone	1	Figure 8.06c
Will apron have >/=10% grade?	No	

NOTE: For apron slopes equal to or greater than 10%, use next higher Zone in Figure 8.06d to determine apron length.

Apron length (ft)	10	Figure 8.06d

Determination of Stone Sizes For Dumped Stone Channel Linings and Revetments

Step 1. Use figure 8.06.e to determine maximum stone size (e.g. for 12 Fps = 20" or 550 lbs.

Max. stone size (in.)	5	Figure 8.06e

Step 2. Use figure 8.06.f to determine acceptable size range for stone (for 12 FPS it is 125-500 lbs. for 75% of stone, and the maximum and minimum range in weight should be 25-500 lbs.).

NOTE: In determining channel velocities for stone linings and revetment, use the following coefficients of roughness:

	Diameter (inches)	Manning's "n"	Min. thickness of lining	(inches)
Fine	3	0.031	9	12
Light	6	0.035	12	18
Medium	13	0.040	18	24
Heavy	23	0.044	30	36
			(Channels)	(Dissapators)

Min. & max range of stones (lbs)	5-25	Figure 8.05f
Weight range of 75% of stones (lbs)	5-25	Figure 8.05f

Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Oct 3 2023

Flume #2

Rectangular Weir

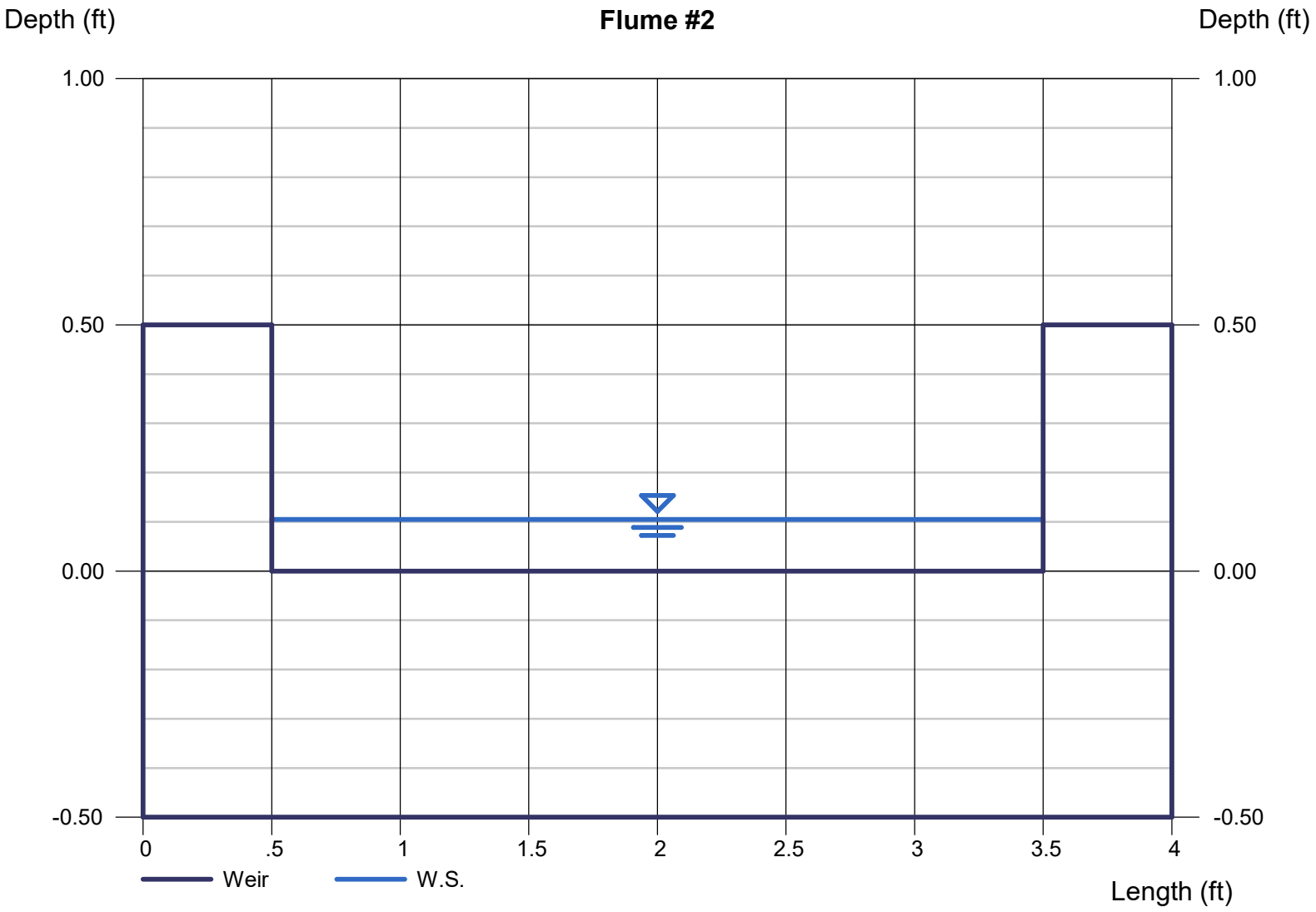
Crest	= Sharp
Bottom Length (ft)	= 3.00
Total Depth (ft)	= 0.50

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Known Q
Known Q (cfs)	= 0.34

Highlighted

Depth (ft)	= 0.10
Q (cfs)	= 0.340
Area (sqft)	= 0.31
Velocity (ft/s)	= 1.08
Top Width (ft)	= 3.00



DESIGN OF RIPRAP OUTLET PROTECTION

New York DOT Dissipator Method For Use in Defined Chann

(Source: "Bank and channel lining procedures", New York Department of Transportation, Division of Design and Construction, 1971.)

Guide to Color Key:	User Input Data	Calculated Value

Designed By:	JAS	**Date:**
Checked By:		**Date:**
Company:	Sambatek	
Project Name:	Cookout Zebulon	
Project No.:	OUT-1502	

Site Location (City/Town)	Zebulon
Culvert Id.	Flume #1

Estimation of Stone Size and Dimensions For Culvert Aprons

Step 1) Compute flow velocity V_o at culvert or paved channel outlet.

Step 2) For pipe culverts D_o is diameter.
For pipe arch, arch and box culverts, and paved channel outlets, $D_o = A_o$ where A. = cross-sectional area of flow at outlet.

For multiple culverts, use $D_o = 1.25 \times D_o$ of single culvert.

Velocity (ft/s)	1.08
Opening type	Paved Channel Outlet
Single or multiple openings?	Single
Outlet pipe diameter, D_o (ft)	0.31

NOTE 1: If opening type is anything other than "Pipe Culvert", $D_o=A_o$ (Cross-sectional area of flow at outlet).

NOTE 2: If multiple openings, $D_o=1.25 \times D_o$ of single culvert.

Step 3) For apron grades of 10% or steeper, use recommendations For next higher zone. (Zones 1 through 6).

Zone	1	Figure 8.06c
Will apron have >/=10% grade?	No	

NOTE: For apron slopes equal to or greater than 10%, use next higher Zone in Figure 8.06d to determine apron length.

Apron length (ft)	10	Figure 8.06d

Determination of Stone Sizes For Dumped Stone Channel Linings and Revetments

Step 1. Use figure 8.06.e to determine maximum stone size (e.g. for 12 Fps = 20" or 550 lbs.

Max. stone size (in.)	5	Figure 8.06e

Step 2. Use figure 8.06.f to determine acceptable size range for stone (for 12 FPS it is 125-500 lbs. for 75% of stone, and the maximum and minimum range in weight should be 25-500 lbs.).

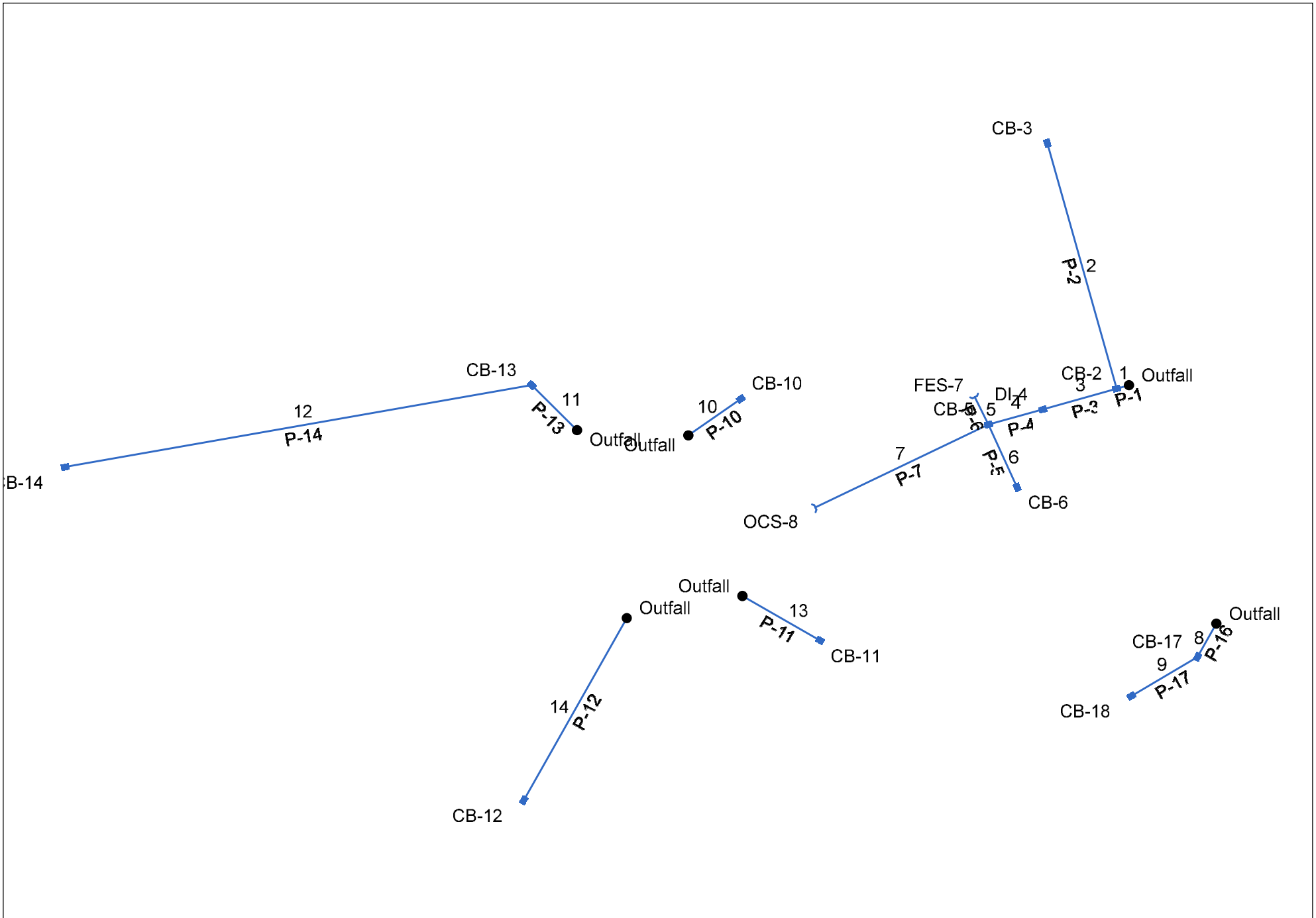
NOTE: In determining channel velocities for stone linings and revetment, use the following coefficients of roughness:

	Diameter (inches)	Manning's "n"	Min. thickness of lining	(inches)
Fine	3	0.031	9	12
Light	6	0.035	12	18
Medium	13	0.040	18	24
Heavy	23	0.044	30	36
			(Channels)	(Dissapators)

Min. & max range of stones (lbs)	5-25	Figure 8.05f
Weight range of 75% of stones (lbs)	5-25	Figure 8.05f

APPENDIX D

OUT-1502 Storm Sewer Model



Project File: OUT-1502 Storm Sewer.stm	Number of lines: 14	Date: 10/9/2024

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	5.000	164.292	Comb	0.00	0.06	0.95	5.0	326.55	3.00	326.70	18	Cir	0.013	1.50	331.15	P-1
2	1	100.000	90.000	Comb	0.00	0.17	0.95	5.0	326.90	0.50	327.40	18	Cir	0.013	1.00	331.40	P-2
3	1	30.000	0.000	DrGrt	0.00	0.14	0.95	5.0	326.90	0.67	327.10	18	Cir	0.013	0.50	330.65	P-3
4	3	22.000	0.000	Comb	0.00	0.03	0.95	5.0	327.20	1.36	327.50	18	Cir	0.013	1.59	331.80	P-4
5	4	12.000	79.422	Hdwl	0.00	1.75	0.35	5.0	327.50	10.00	328.70	18	Cir	0.013	1.00	330.20	P-6
6	4	27.000	-98.729	Comb	0.00	0.03	0.95	5.0	327.50	1.48	327.90	18	Cir	0.013	1.00	332.00	P-5
7	4	75.000	-10.000	Hdwl	7.50	0.01	0.95	5.0	327.50	0.87	328.15	18	Cir	0.013	1.00	335.90	P-7
8	End	15.000	119.344	Comb	0.00	0.01	0.95	5.0	327.00	0.67	327.10	18	Cir	0.013	0.83	330.00	P-16
9	8	30.000	30.000	Comb	0.00	0.05	0.95	5.0	327.10	0.50	327.25	18	Cir	0.013	1.00	330.00	P-17
10	End	25.000	-35.000	Comb	0.00	0.15	0.95	5.0	330.25	0.60	330.40	18	Cir	0.013	1.00	334.20	P-10
11	End	25.000	-135.000	Comb	0.00	0.23	0.95	5.0	330.40	0.80	330.60	18	Cir	0.013	1.27	334.50	P-13
12	11	185.000	-55.000	Comb	0.00	0.07	0.95	5.0	330.60	0.92	332.30	18	Cir	0.013	1.00	335.80	P-14
13	End	35.000	30.000	Comb	0.00	0.17	0.95	5.0	330.25	1.00	330.60	15	Cir	0.013	1.00	334.30	P-11
14	End	82.000	119.344	Comb	0.00	0.53	0.95	5.0	330.35	0.79	331.00	15	Cir	0.013	1.00	334.70	P-12

OUT-1502 Storm Sewer Model | Number of lines: 14 | Date: 10/9/2024

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	CB-2	Combination	331.15	Rect	3.00	2.33	18	Cir	326.70	18 18	Cir Cir	326.90 326.90
2	CB-3	Combination	331.40	Rect	3.00	2.33	18	Cir	327.40			
3	DI-4	DropGrate	330.65	Rect	3.00	2.33	18	Cir	327.10	18	Cir	327.20
4	CB-5	Combination	331.80	Rect	3.00	2.33	18	Cir	327.50	18 18 18	Cir Cir Cir	327.50 327.50 327.50
5	FES-7	OpenHeadwall	330.20	n/a	n/a	n/a	18	Cir	328.70			
6	CB-6	Combination	332.00	Rect	3.00	2.33	18	Cir	327.90			
7	OCS-8	OpenHeadwall	335.90	n/a	n/a	n/a	18	Cir	328.15			
8	CB-17	Combination	330.00	Rect	3.00	2.33	18	Cir	327.10	18	Cir	327.10
9	CB-18	Combination	330.00	Rect	3.00	2.33	18	Cir	327.25			
10	CB-10	Combination	334.20	Rect	3.00	2.33	18	Cir	330.40			
11	CB-13	Combination	334.50	Rect	3.00	2.33	18	Cir	330.60	18	Cir	330.60
12	CB-14	Combination	335.80	Rect	3.00	2.33	18	Cir	332.30			
13	CB-11	Combination	334.30	Rect	3.00	2.33	15	Cir	330.60			
14	CB-12	Combination	334.70	Rect	3.00	2.33	15	Cir	331.00			

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	P-1	13.78	18	Cir	5.000	326.55	326.70	3.000	327.53	328.07	n/a	328.07	End	Combination
2	P-2	1.16	18	Cir	100.000	326.90	327.40	0.500	328.07	327.80	n/a	327.80	1	Combination
3	P-3	12.46	18	Cir	30.000	326.90	327.10	0.667	328.40*	328.82*	0.39	329.21	1	DropGrate
4	P-4	11.66	18	Cir	22.000	327.20	327.50	1.364	329.21*	329.48*	1.08	330.56	3	Combination
5	P-6	4.41	18	Cir	12.000	327.50	328.70	10.000	330.56*	330.58*	0.10	330.68	4	OpenHeadwall
6	P-5	0.21	18	Cir	27.000	327.50	327.90	1.481	330.56*	330.56*	0.00	330.56	4	Combination
7	P-7	7.57	18	Cir	75.000	327.50	328.15	0.867	330.56*	330.95*	0.29	331.23	4	OpenHeadwall
8	P-16	0.37	18	Cir	15.000	327.00	327.10	0.667	327.21	327.32	n/a	327.32	End	Combination
9	P-17	0.34	18	Cir	30.000	327.10	327.25	0.500	327.32	327.47	0.07	327.54	8	Combination
10	P-10	1.03	18	Cir	25.000	330.25	330.40	0.600	330.61	330.78	0.13	330.78	End	Combination
11	P-13	1.37	18	Cir	25.000	330.40	330.60	0.800	330.79	331.04	n/a	331.04	End	Combination
12	P-14	0.48	18	Cir	185.000	330.60	332.30	0.919	331.04	332.56	n/a	332.56 j	11	Combination
13	P-11	1.16	15	Cir	35.000	330.25	330.60	1.000	330.61	331.02	n/a	331.02	End	Combination
14	P-12	3.63	15	Cir	82.000	330.35	331.00	0.793	331.07	331.77	n/a	331.77	End	Combination

OUT-1502 Storm Sewer Model | Number of lines: 14 | Run Date: 10/9/2024

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB-2	0.41	0.00	0.41	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.12	3.13	0.12	3.13	0.0	Off
2	CB-3	1.16	0.00	1.16	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.20	6.77	0.20	6.77	0.0	Off
3	DI-4	0.96	0.00	0.96	0.00	DrGrt	0.0	0.00	3.00	2.00	3.00	Sag	2.00	0.020	0.020	0.000	0.10	13.05	0.10	13.05	0.0	Off
4	CB-5	0.21	0.00	0.21	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.10	2.00	0.10	2.00	0.0	Off
5	FES-7	4.41	0.00	4.41	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
6	CB-6	0.21	0.00	0.21	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.10	2.00	0.10	2.00	0.0	Off
7	OCS-8	7.57*	0.00	7.57	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
8	CB-17	0.07	0.00	0.07	0.00	Comb	4.0	3.00	0.00	3.00	2.00	0.008	2.00	0.050	0.020	0.013	0.07	1.44	0.00	0.00	0.0	Off
9	CB-18	0.34	0.00	0.34	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.11	2.72	0.11	2.72	0.0	Off
10	CB-10	1.03	0.00	1.03	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.18	6.19	0.18	6.19	0.0	Off
11	CB-13	1.57	0.00	1.57	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.23	8.39	0.23	8.39	0.0	Off
12	CB-14	0.48	0.00	0.48	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.13	3.53	0.13	3.53	0.0	Off
13	CB-11	1.16	0.00	1.16	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.20	6.77	0.20	6.77	0.0	Off
14	CB-12	3.63	0.00	3.63	0.00	Comb	4.0	3.00	3.00	3.00	2.00	Sag	2.00	0.050	0.020	0.000	0.36	15.00	0.36	15.00	0.0	Off

OUT-1502 Storm Sewer Model | Number of lines: 14 | Run Date: 10/9/2024

NOTES: Inlet N-Values = 0.016; Intensity = 71.47 / (Inlet time + 12.40) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Inclined throat.

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	13.78	326.55	327.53	0.98	1.22	11.27	1.03	328.56	0.000	5.000	326.70	328.07	1.37**	1.70	8.13	1.03	329.10	0.000	0.000	n/a	1.50	n/a
2	18	1.16	326.90	328.07	1.17	0.38	0.78	0.14	328.22	0.000	100.000	327.40	327.80	0.40**	0.38	3.04	0.14	327.95	0.000	0.000	n/a	1.00	n/a
3	18	12.46	326.90	328.40	1.50*	1.77	7.05	0.77	329.17	1.409	30.000	327.10	328.82	1.50	1.77	7.05	0.77	329.60	1.409	1.409	0.423	0.50	0.39
4	18	11.66	327.20	329.21	1.50	1.77	6.60	0.68	329.89	1.233	22.000	327.50	329.48	1.50	1.77	6.60	0.68	330.16	1.233	1.233	0.271	1.59	1.08
5	18	4.41	327.50	330.56	1.50	1.77	2.50	0.10	330.65	0.176	12.000	328.70	330.58	1.50	1.77	2.50	0.10	330.68	0.176	0.176	0.021	1.00	0.10
6	18	0.21	327.50	330.56	1.50	1.77	0.12	0.00	330.56	0.000	27.000	327.90	330.56	1.50	1.77	0.12	0.00	330.56	0.000	0.000	0.000	1.00	0.00
7	18	7.57	327.50	330.56	1.50	1.77	4.28	0.29	330.84	0.520	75.000	328.15	330.95	1.50	1.77	4.28	0.29	331.23	0.519	0.520	0.390	1.00	0.29
8	18	0.37	327.00	327.21	0.21*	0.15	2.41	0.08	327.29	0.000	15.000	327.10	327.32	0.22**	0.16	2.23	0.08	327.40	0.000	0.000	n/a	0.83	n/a
9	18	0.34	327.10	327.32	0.22	0.16	2.08	0.07	327.39	0.462	30.000	327.25	327.47	0.22**	0.16	2.15	0.07	327.54	0.508	0.485	0.146	1.00	0.07
10	18	1.03	330.25	330.61	0.36*	0.33	3.15	0.13	330.74	0.000	25.000	330.40	330.78	0.38**	0.35	2.94	0.13	330.91	0.000	0.000	n/a	1.00	0.13
11	18	1.37	330.40	330.79	0.39	0.37	3.75	0.16	330.95	0.000	25.000	330.60	331.04	0.44**	0.43	3.19	0.16	331.20	0.000	0.000	n/a	1.27	n/a
12	18	0.48	330.60	331.04	0.44	0.20	1.11	0.09	331.13	0.000	185.000	332.30	332.56 j	0.26**	0.20	2.39	0.09	332.64	0.000	0.000	n/a	1.00	n/a
13	15	1.16	330.25	330.61	0.36	0.29	3.97	0.16	330.77	0.000	35.000	330.60	331.02	0.42**	0.37	3.16	0.16	331.18	0.000	0.000	n/a	1.00	n/a
14	15	3.63	330.35	331.07	0.72*	0.73	4.95	0.33	331.40	0.000	82.000	331.00	331.77	0.77**	0.79	4.58	0.33	332.09	0.000	0.000	n/a	1.00	n/a

OUT-1502 Storm Sewer Model | Number of lines: 14 | Run Date: 10/9/2024

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

APPENDIX E

STATE OF NORTH CAROLINA
WAKE COUNTY

STORMWATER AGREEMENT

THIS AGREEMENT, made and entered into this the _____ day of _____, _____, by and between Wake County, hereinafter referred to as County, and _____, hereinafter referred to as Owner;

WITNESSETH

THAT WHEREAS, Owner is this day accepting responsibility for the stormwater device(s) installed on that certain real property known as_____, Permit Number _____as shown on the plat thereof recorded in the Book of Maps _____, Page _____, Wake County Registry; and

WHEREAS, as a part of the construction of the residence/development the Wake County Environmental Services – Watershed Management Section required that a stormwater device(s) be constructed; and

WHEREAS, the Owner accepts responsibility for the maintenance of the stormwater device(s) as prescribed in the Maintenance Agreement signed and notarized, dated _____, 20____; and

WHEREAS, the Owner grants access to Wake County to inspect the stormwater device(s); and

WHEREAS, the Owner understands that this Agreement shall endure to the benefit of his successors in title, whomsoever they may be in the future.

NOW, THEREFORE, it is understood and agreed by and between the parties:

1. The maintenance of the stormwater device(s) shall be the sole responsibility of the Owner.
2. The responsibility for the maintenance of the stormwater device shall pass in the chain of title to the Owner's successor in interest.
3. Access is granted to Wake County to inspect the stormwater device(s).
4. Annually, the Owner shall provide an inspection report b~~y June~~ 30th.

The report should be uploaded to the Permit Portal at Wakegov.com. You will need to Register in the Permit Portal and contact Watershed Management at watershedmanagement@wakegov.com to request access to your permit case files. (Subject Line: Add Case Contact)

Owner: _____

Date: _____

I, _____ THE UNDERSIGNED notary Public of the County and State aforesaid, certify that _____ personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

WITNESS my hand and notarial seal, this the _____ day of _____, _____.

_____
Notary Public

My Comm. Exp. _____

After recording return to:
Watershed Management Section
336 Fayetteville St. PO Box 550
Raleigh, NC 27602

Project Name: OUT-1502 Cookout Zebulon

DRAINAGE AREA 1
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	0.80				0.16			
Site Acreage within Drainage=	0.80				0.16			
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)=	0.00				0.00			
Lake/Pond Area not in the Tc flow path (Acres)=	0.00				0.00			
Site Land Use (acres):	A	B	C	D	A	B	C	D
Pasture								
Woods, Poor Condition								
Woods, Fair Condition								
Woods, Good Condition								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition				0.80				0.06
Reforestation (in dedicated OS)								
Connected Impervious								0.10
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				116.00			
Slope (ft/ft)=	0.030				0.320			
Surface Cover:	Grass				Paved, Gravel, or Bare Soil			
n-value=	0.240				0.011			
T_t (hrs)=	0.214				0.008			
Shallow Flow								
Length (ft)=	160.00				32.00			
Slope (ft/ft)=	0.012				0.051			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	1.77				3.64			
T_t (hrs)=	0.03				0.00			
Channel Flow 1								
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)=								

Project Name: OUT-1502 Cookout 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)=	0.24	0.10
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	80	91
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**91**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	356	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	1.14	1.95
Volume of runoff (ft^3) =	3,307	1,135
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	1.051	0.493
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.60	2.53
Volume of runoff (ft^3) =	4,660	1,468
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	1.482	0.638
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	3.02	4.14
Volume of runoff (ft^3) =	8,757	12,037
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	2.785	1.047

Project Name: OUT-1502 Cookout Zebulon

DRAINAGE AREA 2
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=	1.11				1.75			
Site Acreage within Drainage=	1.11				1.75			
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition				1.11				0.63
Reforestation (in dedicated OS)								
Connected Impervious								1.12
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=	100.00				208.00			
Slope (ft/ft)=	0.035				0.026			
Surface Cover:	Grass				Grass			
n-value=	0.240				0.240			
T_t (hrs)=	0.201				0.408			
Shallow Flow								
Length (ft)=	215.00				105.00			
Slope (ft/ft)=	0.024				0.020			
Surface Cover:	Unpaved				Unpaved			
Average Velocity (ft/sec)=	2.48				2.28			
T_t (hrs)=	0.02				0.01			
Channel Flow 1								
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)=								

Project Name: OUT-1502 Cookout Zebulon

DRAINAGE AREA 2
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)=	0.20	0.10
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=	80	92
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=	**92**	
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =	3,977	
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=	1.14	1.98
Volume of runoff (ft^3) =	4,588	12,560
Volume change (ft^3) =	7,972	
Peak Discharge (cfs)= $Q_{1\text{-}year}$=	1.580	5.460
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=	1.60	2.55
Volume of runoff (ft^3) =	6,466	16,215
Peak Discharge (cfs)= $Q_{2\text{-}year}$=	2.226	7.049
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=	3.02	4.17
Volume of runoff (ft^3) =	12,150	16,819
Peak Discharge (cfs)= $Q_{10\text{-}year}$=	4.183	11.528

Project Name: OUT-1502 Cookout Zebulon

DRAINAGE AREA 3
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=					40.00			
Slope (ft/ft)=					0.019			
Surface Cover:					Paved, Gravel, or Bare Soil			
n-value=					0.011			
T_t (hrs)=					0.010			
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

Project Name: OUT-1502 Cookout Zebulon

DRAINAGE AREA 3
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)=		
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 4
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 4
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)=		
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 5
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 5
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 6
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 6
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 7
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 7
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 8
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 8
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 9
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 9
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

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DRAINAGE AREA 10
STORMWATER PRE-POST CALCULATIONS

LAND USE & SITE DATA	PRE-DEVELOPMENT				POST-DEVELOPMENT			
Drainage Area (Acres)=								
Site Acreage within Drainage=								
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								
Open Space, Poor Condition								
Open Space, Fair condition								
Open Space, Good Condition								
Reforestation (in dedicated OS)								
Connected Impervious								
Disconnected Impervious								
SITE FLOW	**PRE-DEVELOPMENT T_c**				**POST-DEVELOPMENT Tc**			
Sheet Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
n-value=								
T_t (hrs)=								
Shallow Flow								
Length (ft)=								
Slope (ft/ft)=								
Surface Cover:								
Average Velocity (ft/sec)=								
T_t (hrs)=								
Channel Flow 1								
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)=								

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DRAINAGE AREA 10
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)=	0.00	0.00
RESULTS	**PRE-DEVELOPMENT**	**POST-DEVELOPMENT**
Composite Curve Number=		
Disconnected Impervious Adjustment		
Disconnected impervious area (acre) =		
$CN_{adjusted\ (1\text{-}year)}$=		
High Density Only		
Volume of runoff from 1" rainfall for DA HIGH DENSITY REQUIREMENT = (ft^3) =		
1-year, 24-hour storm (Peak Flow)		
Runoff (inches) = $Q^*_{1\text{-}year}$=		
Volume of runoff (ft^3) =		
Volume change (ft^3) =		
Peak Discharge (cfs)= $Q_{1\text{-}year}$=		
2-year, 24-hour storm (LID)		
Runoff (inches) = $Q^*_{2\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{2\text{-}year}$=		
10-year, 24-hour storm (DIA)		
Runoff (inches) = $Q^*_{10\text{-}year}$=		
Volume of runoff (ft^3) =		
Peak Discharge (cfs)= $Q_{10\text{-}year}$=		

Project Name:

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) = $Q_{pre,1\text{-}year}$ =	1.14	1.14								
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	1.051	1.580								
Post-Development (1-year, 24-hour storm)										
Proposed Impervious Surface (acre) =	0.10	1.12								
Runoff (in)=$Q_{1\text{-}year}$ =	1.95	1.98								
Peak Flow (cfs)=$Q_{1\text{-}year}$ =	0.493	5.460								
Increase in volume per DA (ft^3)_1-yr storm=		7,972								
Minimum Volume to be Managed for DA HIGH DENSITY REQUIREMENT = (ft^3) =	356	3,977								

TARGET CURVE NUMBER (TCN)

Site Data

SITE \SOIL COMPOSITION

HYDROLOGIC SOIL GROUP	Site Area	%	Target CN
A	0.00	0%	N/A
B	0.00	0%	N/A
C	0.00	0%	N/A
D	1.91	100%	N/A

Total Site Area (acres) =	1.91
Percent BUA (Includes Existing Lakes/Pond Areas) =	64%
Project Density =	High
Target Curve Number (TCN) =	N/A
$CN_{adjusted\ (1\text{-}year)}$=	91
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	0.00	0.00
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	0.69	0.41
Reforestation (in dedicated OS)	0.6	0.00	0.00
Impervious	21.2	1.22	25.86

SITE NITROGEN LOADING RATE (lbs/ac/yr)=	13.76
Nitrogen Load (lbs/yr)=	26.28
TOTAL SITE NITROGEN TO MITIGATE (lbs/yr)_Wendell Only=	19.40

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	

Project Name:

DRAINAGE AREA 1
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA1 Site Acreage=	0.16			
DA1 Off-Site Acreage=				
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)=	356			
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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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%	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):							

Project Name:

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	50
				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)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	1,135
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.95
Post BMP $CN_{(1\text{-year})}$=	91
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	1,468
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	2.53
Post BMP $CN_{(2\text{-year})}$=	91
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	12,037
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	20.72
Post BMP $CN_{(10\text{-year})}$=	98
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 2
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA2 Site Acreage=	1.75			
DA2 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA2 1" Rainfall for High Density (ft3)=	3,977			
Will site use underground detention/cistern?	Yes	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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition	0.41				0.09		0.13			
Reforestation (in dedicated OS)										
Impervious	0.07		0.02		0.01		1.02			

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)
		150		0%	1.73	0.00	
				0%	1.73	0.00	
				0%	1.73	0.00	
				0%	1.73	0.00	
				0%	1.73	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**1.73**					

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)
		4		0%	0.42	0.00	
				0%	0.42	0.00	
				0%	0.42	0.00	
				0%	0.42	0.00	
				0%	0.42	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**0.42**					

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)
		20		0%	0.27	0.00	
				0%	0.27	0.00	
				0%	0.27	0.00	
				0%	0.27	0.00	
				0%	0.27	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**0.27**					

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Project Name:

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)
Underground Detention	Cistern/Underground Detention	2,399	2,399	0%	21.70	0.00	120
StormFilter	Sand Filter			35%	21.70	7.60	120
				0%	14.11	0.00	
				0%	14.11	0.00	
				0%	14.11	0.00	
Total Nitrogen remaining leaving the subbasin (lbs):		**14.11**					
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)=	2,399
Nitrogen Mitigated(lbs)=	7.60
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	10,161
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.60
Post BMP $CN_{(1\text{-year})}$=	86
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	1.174
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	13,816
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	2.17
Post BMP $CN_{(2\text{-year})}$=	87
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	1.631
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	14,420
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	2.27
Post BMP $CN_{(10\text{-year})}$=	88
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	2.823

Project Name:

DRAINAGE AREA 3
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA3 Site Acreage=				
DA3 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA3 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA3(a) (Ac)		Sub-DA3(b) (Ac)		Sub-DA3(c) (Ac)		Sub-DA3(d) (Ac)		Sub-DA3(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 3
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):							

DA3 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 4
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA4 Site Acreage=				
DA4 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA4 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?	Yes	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-DA4(a) (Ac)		Sub-DA4(b) (Ac)		Sub-DA4(c) (Ac)		Sub-DA4(d) (Ac)		Sub-DA4(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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:

DRAINAGE AREA 4
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):							

DA4 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-}year)}$=	
Post BMP $CN_{(1\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-}year}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	
Post BMP $CN_{(2\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-}year)}$=	
Post BMP $CN_{(10\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-}year)}$=	

Project Name:

DRAINAGE AREA 5
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA5 Site Acreage=				
DA5 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA5 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA5(a) (Ac)		Sub-DA5(b) (Ac)		Sub-DA5(c) (Ac)		Sub-DA5(d) (Ac)		Sub-DA5(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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:

DRAINAGE AREA 5
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):							

DA5 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 6
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA6 Site Acreage=				
DA6 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA6 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA6(a) (Ac)		Sub-DA6(b) (Ac)		Sub-DA6(c) (Ac)		Sub-DA6(d) (Ac)		Sub-DA6(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 6
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):							

DA6 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 7
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA7 Site Acreage=				
DA7 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA7 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA7(a) (Ac)		Sub-DA7(b) (Ac)		Sub-DA7(c) (Ac)		Sub-DA7(d) (Ac)		Sub-DA7(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 7
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):							

DA7 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

DRAINAGE AREA 8
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA8 Site Acreage=				
DA8 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA8 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA8(a) (Ac)		Sub-DA8(b) (Ac)		Sub-DA8(c) (Ac)		Sub-DA8(d) (Ac)		Sub-DA8(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 8
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):							

DA8 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-}year)}$=	
Post BMP $CN_{(1\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-}year}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	
Post BMP $CN_{(2\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-}year)}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-}year)}$=	
Post BMP $CN_{(10\text{-}year)}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-}year)}$=	

Project Name:

DRAINAGE AREA 9
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA9 Site Acreage=				
DA9 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA9 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA9(a) (Ac)		Sub-DA9(b) (Ac)		Sub-DA9(c) (Ac)		Sub-DA9(d) (Ac)		Sub-DA9(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 9
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):							

DA9 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

WAKE COUNTY
NORTH CAROLINA

Project Name:

DRAINAGE AREA 10
BMP CALCULATIONS

DRAINAGE AREA 1 - BMP DEVICES AND ADJUSTMENTS				
DA10 Site Acreage=				
DA10 Off-Site Acreage=				
Total Required Storage Volume TCN Requirement (ft^3)=	N/A			
Total Required Storage Volume for DA10 1" Rainfall for High Density (ft3)=				
Will site use underground detention/cistern?		Enter % of the year water will be reused=		Note: Supporting information/details should be submitted to demonstrate water usage.

ENTER ACREAGE FOR ALL SUB-DRAINAGE AREAS IN DA

HSG	Sub-DA10(a) (Ac)		Sub-DA10(b) (Ac)		Sub-DA10(c) (Ac)		Sub-DA10(d) (Ac)		Sub-DA10(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										
Open Space, Poor Condition										
Open Space, Fair Condition										
Open Space, Good Condition										
Reforestation (in dedicated OS)										
Impervious										

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)
				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(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):							

Project Name:

DRAINAGE AREA 10
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):							

DA10 BMP SUMMARY	
Total Volume Treated (ft^3)=	
Nitrogen Mitigated(lbs)=	
1-year, 24-hour storm	
Post BMP Volume of Runoff (ft^3)$_{(1\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	
Post BMP $CN_{(1\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=	
2-year, 24-hour storm (LID)	
Post BMP Volume of Runoff (ft3)$_{(2\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(2\text{-year})}$=	
Post BMP $CN_{(2\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-year})}$=	
10-year, 24-hour storm (DIA)	
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	
Post BMP Runoff (inches) = $Q^*_{(10\text{-year})}$=	
Post BMP $CN_{(10\text{-year})}$=	
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=	

Project Name:

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)=$Q^*_{1\text{-year}}$ =	1.14	1.14								
Peak Flow (cfs)=$Q_{1\text{-year}}$ =	1.051	1.580								
Post-Development (1-year, 24-hour storm)										
Target Curve Number (TCN) =	NA									
Post BMP Runoff (inches) = $Q^*_{(1\text{-year})}$=	1.95	1.60								
Post BMP Peak Discharge (cfs)= $Q_{1\text{-year}}$=		1.174								
Post BMP $CN_{(1\text{-year})}$=	86									
Post-BMP Nitrogen Loading										
TOTAL SITE NITROGEN MITIGATED (lbs)=	7.60									
SITE NITROGEN LOADING RATE (lbs/ac/yr)=	9.78									
TOTAL SITE NITROGEN LEFT TO MITIGATE_Wendell Only (lbs)=	**11.81**									

Project Name:	

LOW IMPACT DEVELOPMENT SUMMARY

DRAINAGE AREA SUMMARIES										
DRAINAGE AREA:	DA1	DA2	DA3	DA4	DA5	DA6	DA7	DA8	DA9	DA10
Pre-Development										
Runoff (in) = $Q_{pre\_2\text{-}year}$ =	1.60	1.60								
Total Runoff Volume (ft^3)=	4,660	6,466								
Peak Flow (cfs)=$Q_{2\text{-}year}$ =	1.482	2.226								
Post-Development										
2-year, 24-hour storm (LID)										
Post BMP Runoff (inches) = $Q^*_{(2\text{-}year)}$=	2.53	2.17								
Post BMP Peak Discharge (cfs)= $Q_{(2\text{-}year)}$=		1.631								
Post BMP Volume of Runoff $(ft3)_{(2\text{-}year)}$=	1,468	13,816								
Does Runoff meet LID requirements?	No	No								
Does Peak Flow meet LID requirements?	Yes	Yes								
Does Runoff Volume meet LID requirements?	Yes	No								

SITE SUMMARY	
Site Data	
Target CN =	N/A
Post-Development CN =	87
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:	

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)=$Q_{10\text{-year}}$ =	2.78	4.18								
Volume of Runoff (ft^3)$_{(10\text{-year})}$ =	8,757	12,150								
Post-Development										
10-year, 24-hour storm (DIA)										
Post BMP Peak Discharge (cfs)= $Q_{(10\text{-year})}$=		2.82								
Post BMP Volume of Runoff (ft^3)$_{(10\text{-year})}$=	12,037	14,420								

CALCULATIONS AND REFERENCE

TARGET CURVE NUMBER				
MAXIMUM CURVE NUMBER AFTER DEVELOPMENT				
PROJECT DENSITY	**A**	**B**	**C**	**D**
Ultra-Low	43	63	76	81
Low	48	66	78	83
High	N/A	N/A	N/A	N/A

WEIGHTED CURVE NUMBER				
RUNOFF CURVE NUMBERS FOR URBAN AREAS				
LAND USE	**A**	**B**	**C**	**D**
Pasture	39	61	74	80
Woods, Poor Condition[1]	45	66	77	83
Woods, Fair Condition[2]	36	60	73	79
Woods, Good Condition[3]	30	55	70	77
Open Space, Poor Condition[4]	68	79	86	89
Open Space, Fair Condition[5]	49	69	79	84
Open Space, Good Condition[6]	39	61	74	80
Reforestation (in dedicated OS)[7]	30	55	70	77
Impervious[8]	98	98	98	98

Notes:
[1] Poor Condition = Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
[2] Fair Condition = Woods are grazed but not burned, and some forest litter covers the soil.
[3] Good Condition = Woods that are protected from grazing, litter, and brush adequately cover the soil
[4] Poor Condition = Grass Cover <50% (lawns, parks, golf courses, cemeteries, etc.)
[5] Fair Condition = Grass Cover = 50% - 75% (lawns, parks, golf courses, cemeteries, etc.)
[6] Good Condition = Grass Cover >75% (lawns, parks, golf courses, cemeteries, etc.)
[7] Includes paved/gravel/compacted soil driveways and roads, roofs, etc.
[8] Includes paved/gravel/compacted soil driveways and roads, roofs, etc.

SCS RUNOFF METHOD

$$Q^* = (P-.2S)^2/(P+.8S)$$

Where:
Q*= Runoff (in)
P= Precipitation (in)
S= Potential max retention after runoff begins (in) = (1000/CN)-10

Notes:
Calculations used on Drainage Area Sheets

DISCRETE RUNOFF METHOD (HIGH DENSITY ONLY)

$$Q^*_{High} = Q^*_{(imp)} \times DA_{(imp)} + Q^*_{(pervious)} \times DA_{(pervious)}$$

$Q^*_{(imp)}$ = Runoff from Impervious Area (in)
$DA_{(imp)}$ = Drainage from impervious area (acre)
$Q^*_{(pervious)}$ = Runoff from pervious area (in)
$DA_{(pervious)}$ = Drainage from pervious area (acre)

PEAK FLOW

Method: TR-55 Graphical Peak Discharge Method for Type II Distribution

$$Q_p = q_u A_m Q^* F_p$$

Where:
Q_p = Peak Discharge (cfs)
q_u = Unit peak discharge (csm/in) *TR-55 Appendix F*
A_m = Drainage Area (mi^2)
Q* = runoff (inches)
F_p = pond adjustment factor

$$\log(q_u) = C_o + C_1 \log(Tc) + C_2 [\log(Tc)]^2$$

Where:
C_o, C_1, C_2 = coefficient from Table F-1
T_c = time of concentration (hr)

Limitations:
The watershed must be hydrologically homogeneous
The watershed may have only one main stream or, if more than one, the branches must have nearly equal T_c's.
The Fp factor can be applied only for ponds or swamps that are not in the T_c flow path
This method should be used only if the weighted CN is greater than 40.
When this method is used to develop estimates of peak discharge for both pre and post development, use the same procedure for estimating Tc.
T_c values with this method may range from 0.1 to 10 hours.

TIME OF CONCENTRATION

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours

T_c = sum of T_t values for consecutive flow segments

$T_c = T_1 + T_2 + T_3 + \ldots T_m$

T_c = time of concentration (hr)
m = # of flow segments

Note: Minimal 5 minute Tc

SHEET FLOW (FOR FLOW LESS THAN 300 FEET)

$$T_t = \frac{0.0007(nL)^{0.8}}{(P_2)^{0.5}s^{0.4}}$$

T_t =travel time (hr)
n = Manning's roughness coefficient (Table 3-1)
L = flow length (ft)
P_2 = 2-year, 24-hour rainfall (in)
s = slope of hydraulic grade line (land slope, ft/ft)

SHALLOW FLOW

Surface Cover

Unpaved: $V = 16.1345(s)^{0.5}$

Paved: $V = 20.3282(s)^{0.6}$

V=Average Velocity (ft/s)
s = slope of hydraulic grade line (watercourse slope, ft/ft)

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor from seconds to hours

OPEN CHANNEL FLOW

$$V = \frac{1.49r^{2/3}s^{1/2}}{n}$$

V=Average Velocity (ft/s)
r = hydraulic radius (ft)
s = slope of hydraulic grade line (channel slope, ft/ft)
n = Manning's roughness coefficient for open channel flow

$$r = \frac{a}{p_w}$$

a = cross sectional flow area (ft2)
p_w=wetted perimeter (ft)

$$T_t = \frac{L}{3600V}$$

T_t =travel time (hr)
L = flow length (ft)
V = average velocity (ft/s)
3600 = conversion factor (sec-hrs)

Modified Table 3-1 for Stormwater Tool

SURFACE DESCRIPTION	n
Paved, Gravel, or Bare Soil	0.011
Grass	0.24
Woods	0.40

TABLE 4-1, TR-55
I_a values for runoff curve numbers

CN	I_a (in)	CN	I_a (in)	CN	I_a (in)
40	3.000	60	1.333	80	0.500
41	2.878	61	1.279	81	0.469
42	2.762	62	1.226	82	0.439
43	2.651	63	1.175	83	0.410
44	2.545	64	1.125	84	0.381
45	2.444	65	1.077	85	0.353
46	2.348	66	1.030	86	0.326
47	2.255	67	0.985	87	0.299
48	2.167	68	0.941	88	0.273
49	2.082	69	0.899	89	0.247
50	2.000	70	0.857	90	0.222
51	1.922	71	0.817	91	0.198
52	1.846	72	0.778	92	0.174
53	1.774	73	0.740	93	0.151
54	1.704	74	0.703	94	0.128
55	1.636	75	0.667	95	0.105
56	1.571	76	0.632	96	0.083
57	1.509	77	0.597	97	0.062
58	1.448	78	0.564	98	0.041
59	1.390	79	0.532		

TABLE 3-9, TR-55
Rational Runoff Coefficients

CHANNEL LINING	n
Asphalt	0.016
Concrete, finished	0.012
Concrete, unfinished	0.014
Grass	0.035
Gravel Bottom/riprap sides	0.033
Weeds	0.040

DISCONNECTED IMPERVIOUS CALCULATION

$$CN_{adjusted} = CN_p + [(P_{imp}/100)*(98-CN_p)*(1-(0.5*R))]$$

Where:

$CN_{adjusted}$ = Composite Curve Number

CN_p = Pervious runoff curve number =(PostCN - (Pimp/100)*98)/(1 -(Pimp/100))

P_{imp} = Percent Imperviousness

R = ratio of unconnected impervious area to total impervious area

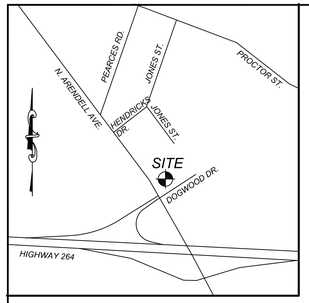
TABLE 4-1, SW BMP MANUAL
BMP ABILITY FOR SW QUANTITY CONTROL

BMP	TSS	TN
Bioretention without IWS	**85%**	**35%**
Bioretention with IWS	**85%**	**40%**
Stormwater Wetlands	**85%**	**40%**
Wet Detention Basin	**85%**	**25%**
Sand Filter	**85%**	**35%**
Filter Strip	**25-40%**	**20%**
Grass Swale	**35%**	**20%**
Restored Riparian Buffer	**60%**	**30%**
Infiltration Device	**85%**	**30%**
Dry Extended Detention Basin	**50%**	**10%**
Permeable Pavement	**0%**	**0%**
Rooftop Runoff Management (Excluding Cisterns)	**0%**	**0%**
Cistern/Underground Detention	**See Note**	**100%**

[1] Use of underground detention reduces total volume required for storage as well total nitrogen load. To receive total reduction,

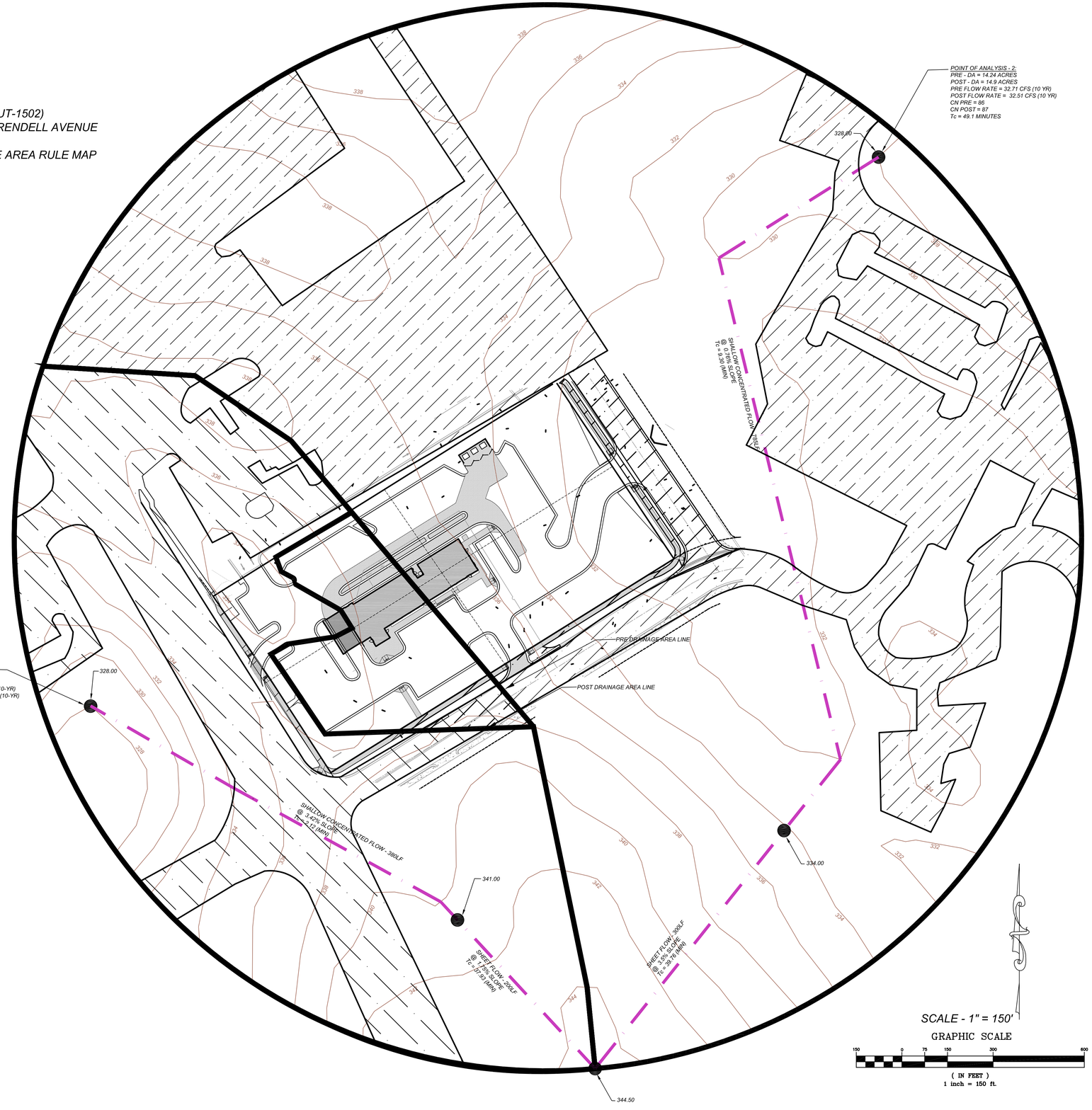
	engineer must show year-round use of reclaimed water. If water is not reused year-round, a percent of the total reduction may be given (See DA BMP sheets).

APPENDIX F



N.T.S

COOK OUT (OUT-1502)
1200 NORTH ARENDELL AVENUE
ZEBULON, NC
10% DRAINAGE AREA RULE MAP
10/09/2024



REVISIONS

NO.	DATE	DESCRIPTION	BY

COMMERCIAL SITE DESIGN
A Sambatek Company
(919) 848-4911, FAX: (919) 848-3741
WWW.CSITEDESIGN.COM
8917 CREEDMOOR ROAD
RALEIGH, NORTH CAROLINA 27613

CLIENT/OWNER:
COOK OUT
15 LAURA LANE, SUITE 300
THOMASVILLE, NC 27360
TELEPHONE: (336) 215-7025
FAX: (336) 474-1849

Z:\Shared Documents\NEW CSD PROTOTYPES\DOGWOOD PROTOTYPES\Cook Out.mpd

1200 NORTH ARENDELL AVENUE
ZEBULON, NORTH CAROLINA
DOWNSTREAM ANALYSIS 10% MAP

OUT1502	
OUT1502-POSTDSA	
OUT-1502	
1" =150'	
10-09-2023	
DIA	

APPENDIX G

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 27 2025

Clean Water Diversion

Trapezoidal

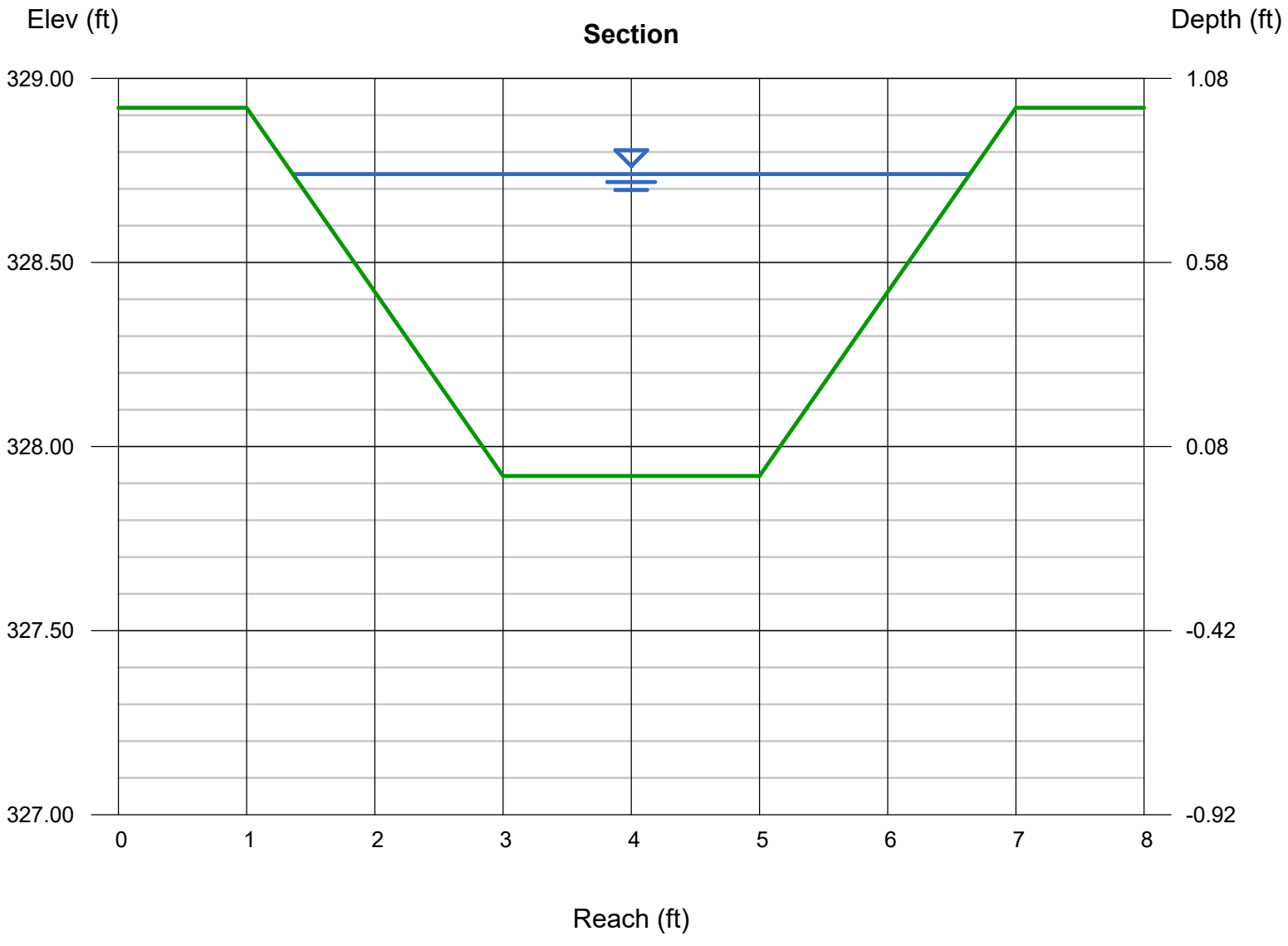
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 327.92
Slope (%)	= 1.40
N-Value	= 0.025

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.50

Highlighted

Depth (ft)	= 0.82
Q (cfs)	= 13.50
Area (sqft)	= 2.98
Velocity (ft/s)	= 4.52
Wetted Perim (ft)	= 5.67
Crit Depth, Yc (ft)	= 0.85
Top Width (ft)	= 5.28
EGL (ft)	= 1.14



Culvert Report

Offsite 18 in. Culvert - Max Flow

Invert Elev Dn (ft)	=	329.70
Pipe Length (ft)	=	55.00
Slope (%)	=	0.87
Invert Elev Up (ft)	=	330.18
Rise (in)	=	18.0
Shape	=	Circular
Span (in)	=	18.0
No. Barrels	=	1
n-Value	=	0.013
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Square edge w/headwall (C)
Coeff. K,M,c,Y,k	=	0.0098, 2, 0.0398, 0.67, 0.5

Embankment

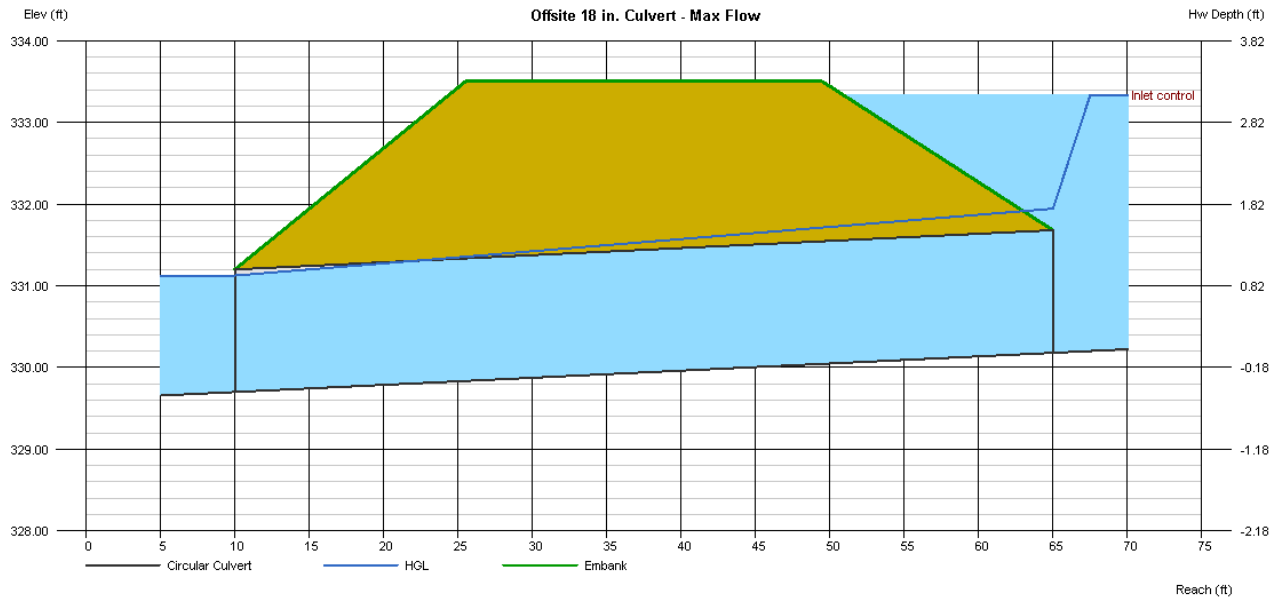
Top Elevation (ft)	=	333.50
Top Width (ft)	=	24.00
Crest Width (ft)	=	100.00

Calculations

Qmin (cfs)	=	13.00
Qmax (cfs)	=	13.60
Tailwater Elev (ft)	=	(dc+D)/2

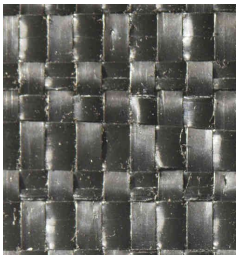
Highlighted

Qtotal (cfs)	=	13.00
Qpipe (cfs)	=	13.00
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	7.50
Veloc Up (ft/s)	=	7.36
HGL Dn (ft)	=	331.13
HGL Up (ft)	=	331.94
Hw Elev (ft)	=	333.33
Hw/D (ft)	=	2.10
Flow Regime	=	Inlet Control



US 200

Woven Geotextile



NTPEP APPROVED - GTX-2019-01-287. US 200 is a woven geotextile made of 100% polypropylene slit film yarns. US 200 resists ultraviolet and biological deterioration, rotting, naturally encountered basics and acids. Polypropylene is stable within a pH range of 2 to 13. US 200 will satisfy the requirements as outlined in AASHTO M-288-06 for Class 3 Stabilization & Separation applications and meets the following M.A.R.V. values except where noted:

PROPERTY	TEST METHOD	ENGLISH	METRIC
Weight Typical	ASTM D-5261	4 oz/y²	135.6 g/m²
Grab Tensile Strength	ASTM D-4632	200 lbs	889 N
Elongation @ Break	ASTM D-4632	15 %	15 %
Mullen Burst(3)	ASTM D-3786	400 psi	2,758 kPa
Pin Puncture(3)	ASTM D-4833	90 lbs	400 N
CBR Puncture	ASTM D-6241	700 lbs	3,115 N
Trapezoidal Tear	ASTM D-4533	75 lbs	334 N
Apparent Opening Size(1,2)	ASTM D-4751	40 US Sieve	0.425 mm
Permittivity(1)	ASTM D-4491	0.05 Sec^{-1}	0.05 Sec^{-1}
Water Flow Rate(1)	ASTM D-4491	5 g/min/f²	204 L/min/m²
UV Resistance @ 500 Hours	ASTM D-4355	70 %	70 %

(1) At the time of manufacturing. Handling, storage, and shipping may change these properties.
(2) Maximum average roll value (MaxARV).
(3) Historical reference values. These properties are no longer recognized by ASTM or AASHTO for geosynthetics.

US 200 Shipping & Packaging Information

SIZE	DIAMETER	WIDTH	WEIGHT	AREA	ROLLS PER TRAILER
12.5' x 432'	12"	12.5'	200 lbs	600 y²	240
15' x 360'	12"	15'	200 lbs	600 y²	240
17.5' x 309'	12"	17.5'	200 lbs	600 y²	210

US Fabrics, Inc. | 3904 Virginia Avenue | Cincinnati, OH 45227
Phone: (800) 518-2290 | Fax: (513) 271-4420 | email: info@usfabrics.com