CIVIL ENGINEERING
ENVIRONMENTAL
SURVEYING
LANDSCAPE ARCHITECTURE
GEOTECHNICAL

STORMWATER MANAGEMENT REPORT

Windsor Oaks
Subdivision
Block 34; Lot 4
West Windsor Township
Block 14; Lot 23
Robbinsville Township
Mercer County
New Jersey

Prepared For:
Pin Oak Builders, LLC
45 Roxy Avenue
Edison, New Jersey 08820
Revised Date: 07/08/2020

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1. INTRODUCTION

Engineering & Land Planning Associates, Inc. has prepared this Stormwater Management Report on behalf of Pin Oak Builders, LLC, to document the design methodology and the associated calculations for the project's stormwater management for the proposed development. The project is located on Edinburg Windsor Road on Lot 4, Block 34 in West Windsor Township and on Lot 23, Block 14 in Robbinsville Township. The proposed project consists of a 6-lot Major Subdivision. The design incorporates stormwater management measures which meet the NJDEP Phase II Stormwater Regulations for stormwater quantity, quality, and groundwater recharge.

2. METHODOLOGY

2.1 Product Description

The combined existing properties total 23.18 acres (1,009,720 square feet). The combined properties are bounded to the south by Edinburg Windsor Road (County Road #641), to the southeast and southwest by a residential property and by agricultural fields around the remaining portions of the property. The site is currently a horse farm and contains a dwelling, barns and associated improvements.

The project consists of a 6-lot subdivision including the construction of a proposed roadway generally along the municipal boundary. The project is considered a major project in accordance with the NJDEP Phase II Stormwater Regulations, as it will include greater than 1.0 acre of disturbance and creates greater than ¼ acre of new impervious surface. Stormwater management measures have been provided in accordance with NJDEP's Phase II Stormwater regulations.

The additional impervious coverage associated with the project results in an increase in stormwater runoff. The project proposes a stormwater management detention basin in the southern portion of the property with swales along the road to collect the runoff and direct it to the basin and two manufactured treatment devices. Through the use of these stormwater management measures, the NJDEP's Phase II regulations for water quantity, quality, and groundwater recharge are met.

2.2 Stormwater Runoff Quantity

The stormwater quantity runoff analysis has been performed utilizing the Soil Conservation Service (SCS) Technical Release 55 (TR-55) "Urban Hydrology for Small Watersheds," revised June 1986. The site runoff has been calculated for the 2 year, 10 year, and 100 year storm frequencies in accordance with NJDEP's storm water regulations for water quantity control (N.J.A.C. 7:8-5.4).

The analysis utilized New Jersey rainfall frequency data per the Natural Resources Conservation Service (NRCS) with type C rainfall distribution. The time of concentration (Tc) calculations were calculated based on the velocity method per Chapter 15 of the National Engineering Handbook. Several potential Tc flow paths were analyzed in order to determine the most appropriate flow path. CN values were calculated for each drainage area utilizing the "B" HSG for the (SacB, SacC) Sassafras sandy loam, (OthA) Othello Silt Loam and (WomfB) Woodstowm-Fallsington sandy loam soils and the "C" HSG for the (MBYB) Mattapex and Bertie loam soils found on the site, as indicated by the Mercer County Soil Survey. The summary of results and supporting calculations for the existing and proposed stormwater quantity runoff analysis can be found in Appendix B-D of this report.

2.3 Stormwater Runoff Quality

The storm water runoff quality analysis has been performed in accordance with NJDEP's Storm Water Management Regulations (N.J.A.C. 7:8-5.5). This storm water management plan serves to reduce the post-construction load of Total Suspended Solids (TSS) generated from the water quality design storm by 80 percent, as an annual average. This reduction has been applied to all areas of new development on the site. The water quality design storm consists of 1.25 inches of rain falling in 2 hours with the NJDEP distribution as illustrated in of N.J.A.C. 7:8-5.5 "Table 1 - Water Quality Design Storm Distribution".

Two manufactured treatment devices have been designed to obtain the required 80% TSS removal (see Appendix E and H).

2.4 Groundwater Recharge

A groundwater recharge analysis has been performed in accordance with NJDEP's Stormwater Management Rules (N.J.A.C. 7:8-5.4). The New Jersey Groundwater Recharge Spreadsheet (NJGRS) Version 2.0 (updated November 2003) was utilized to determine the groundwater recharge associated with the site. Computations of the pre-development and post-development annual groundwater recharge rate and the annual recharge deficit was prepared based on the New Jersey Geological Survey Report GSR-32 "A Method for Evaluating Ground-Water Recharge Areas in New Jersey", which is incorporated into the NJGSR spreadsheet (Refer to Appendix J of this report).

2.5 Non-Structural Stormwater Management Strategies

As per N.J.A.C. 7:8-5.3 requirements non-structural stormwater strategies have been incorporated into the design to the maximum extent practicable:

Natural drainage features and vegetation are maintained and maximized where possible.

The Time of Concentration is generally maintained from the pre-development condition to the post-development condition.

The use of natural open channel swales is utilized to convey the stormwater runoff through portions of the sites.

Land disturbance is being minimized to the maximum extend practicable.

The stormwater management control system was designed to prevent trash and debris from draining into the existing stormwater sewers. This is accomplished through the use of a trash racks and grates. The stormwater system will be cleaned and trash/debris will be removed according the Stormwater Management Maintenance Plan.

2.6 Stormwater Conveyance

The storm sewer hydraulics is based upon the Manning Equation as defined in the “Handbook of Hydraulics”, by Brater and King, Sixth Edition. Storm sewer capacity is based on full depth gravity flow. The project has been designed to convey water through a combined system of swales, inlets and closed pipes to the detention basin. Refer to Appendix I for calculations.

3. STORMWATER ANALYSIS

3.1 Stormwater Runoff Quantity

The Pre-Development Drainage Area Plan located on Sheet 21 in the preliminary and final major subdivision plans illustrates the existing drainage areas for the pre-development conditions. The stormwater management analysis area has been modeled as two distinct drainage areas.

Existing drainage area #1 (EDA#1) is modeled as 1.078 ac. of impervious coverage, 10.021 ac. of open space and 0.321 ac. attributed to woods. EDA#1 drains south toward Edinburg Windsor Road.

Existing drainage area #2 (EDA#2) is modeled with different land cover as follows: 0.016 ac. attributed to impervious coverage and 1.914 attributed to open space. EDA#2 drains north toward the preserved agricultural lands.

The composite curve numbers (CN), time of concentrations (Tc) have been calculated for each drainage area. A runoff hydrograph has been calculated for the 2, 10, and 100-year storms. The peak runoff (Q cfs) has been obtained from the runoff hydrograph for each drainage area.

The pre-development runoff from the drainage area is listed in the following table:

Drainage Area	2-year Storm	10-year Storm	100-year Storm
EDA#1 (Impervious)	2.684 CFS	4.528 CFS	8.111 CFS
EDA#1 (Pervious)	3.186 CFS	12.23 CFS	35.86 CFS
Site Run-off (South Discharge Point)	4.621 CFS	14.77 CFS	40.54 CFS
EDA#2 (Impervious)	0.049 CFS	0.075 CFS	0.126 CFS
EDA#2 (Pervious)	0.671 CFS	2.571 CFS	7.436 CFS
Site Run-off (North Discharge Point)	0.707 CFS	2.625 CFS	7.527 CFS

Refer to Appendices C and D for a summary of the composite curve numbers (CN), pre-development peak discharge rates for the 2, 10, and 100-year storms, and the associated runoff hydrographs.

The Post Development Drainage Area Plan illustrates the proposed drainage areas for the post-development condition. The proposed site improvements will not result in significant modifications to the natural overall drainage patterns. The proposed site maintains the same drainage areas as the exiting conditions.

Proposed drainage area #1 is separated into three sub-drainage areas (PDA#1A, PDA#1B, and PDA#1C). Proposed Drainage Area #1 consists of the portion of the site that drains toward Edinburg Windsor Road. The stormwater runoff from PDA#1A is conveyed via the use of swales and inlets located along the sides of the road, before it discharges into the proposed detention basin.

PDA#1A is modeled as 2.364 ac. of impervious coverage and 4.326 ac. of open space.

PDA#1B and PDA#1C are the areas of the site that drains toward Edinburg Windsor Road un-detained. PDA#1B is modeled as 0.203 ac. of impervious coverage and 3.717 ac. of open space. PDA#1C is modeled as 0.115 ac. of impervious coverage and 0.705 ac. of open space.

Proposed Drainage Area #2 consists of the section of the site that drains to the north towards the adjacent agricultural field. The runoff from PDA#2 drains overland, consistent with the existing conditions. PDA#2 is modeled as 1.920 ac. of open space.

The performance of the proposed detention system, and the proposed drainage areas discharge are summarized in the tables below:

Drainage Area	2-year Storm	10-year Storm	100-year Storm
PDA#1A (Impervious)	7.180 CFS	11.04 CFS	18.62 CFS
PDA#1A (Pervious)	1.518 CFS	5.811 CFS	16.81 CFS
PDA#1A (Total)	8.237 CFS	16.13 CFS	34.30 CFS
SWM (Basin Outflow)	0.710 CFS	3.844 CFS	17.58 CFS
PDA#1B Bypass (Impervious)	0.617 CFS	0.948 CFS	1.599 CFS
PDA#1B Bypass (Pervious)	1.304 CFS	4.993 CFS	14.44 CFS
PDA#1B Bypass (Total)	1.752 CFS	5.680 CFS	15.60 CFS
PDA#1C Bypass (Impervious)	0.349 CFS	0.537 CFS	1.906 CFS
Drywell (Basin Outflow)	0.098 CFS	0.108 CFS	0.129 CFS
PDA#1C Bypass (Pervious)	0.247 CFS	0.947 CFS	2.739 CFS
PDA#1C Bypass (Total)	0.344 CFS	1.052 CFS	2.860 CFS
Site Run-off (South Discharge Point)	2.301 CFS	8.606 CFS	32.01 CFS
PDA#2 Bypass (Site Run-off North Discharge Point)	0.674 CFS	2.579 CFS	7.459 CFS

PDA#1A To Proposed Detention Basin (Basin Outflow)			
Storm	Peak Basin Discharge	Water Surface Elevation	Max. Storage
2-year	0.710 CFS	94.15 FT	16,959 CF
10-year	3.844 CFS	94.60 FT	26,160 CF
100-year	17.58 CFS	95.47 FT	44,882 CF

The proposed Stormwater Management System provide the necessary detention time and storage to achieve the reduction factors required by N.J.A.C.7:8. A summary table has been provided below documenting the overall performance of the system:

South Discharge Point Runoff Comparison Table Comparing Existing Site Run-off & Proposed Site Run-off				
Storm	Existing Site Run-off	Reduction Required	Target Runoff	Prop. Site Run-off
1-year	1.408 CFS	N/A	N/A	0.782 CFS
2-year	4.621 CFS	50%	2.311 CFS	2.301 CFS
10-year	14.77 CFS	75%	11.078 CFS	8.606 CFS
100-year	40.54 CFS	80%	32.432 CFS	32.01 CFS

North Discharge Point Runoff Comparison Table Comparing Existing Site Run-off & Proposed Site Run-off				
Storm	Existing Site Run-off	Reduction Required	Target Runoff	Prop. Site Run-off
1-year	0.042 CFS	N/A	N/A	0.000 CFS
2-year	0.707 CFS	At or below Existing	=/<0.707 CFS	0.674 CFS
10-year	2.625 CFS	At or below Existing	=/<2.625 CFS	2.579 CFS
100-year	7.527 CFS	At or below Existing	=/<7.527 CFS	7.459 CFS

Refer to Appendices C and D for a summary of the composite curve numbers (CN), post-development peak discharge rates for the 2, 10, and 100-year storms, and the associated runoff hydrographs.

3.2 Stormwater Runoff Quality

Runoff quality has achieved the required TSS removal in accordance with NJDEP standards. The water quality storm hydrographs are contained in Appendix E. Quality treatment has been provided for PDA#1A and a portion of PDA#1B through manufactured treatment devices with a TSS removal rate of 80%. The proposed stormwater management measures result in an overall 80% TSS removal rate in accordance with the NJDEP Phase II standards.

3.3 Groundwater Recharge

The proposed development creates a groundwater recharge deficit of 49,399 CF. Twelve drywells have been proposed to infiltrate the groundwater recharge deficit. An annual recharge increase of 31,731 CF is observed in the post-development condition. The analysis has been performed based upon the approved NJDEP Recharge spreadsheet and can be found in Appendix J.

3.4 Stormwater Management Maintenance Plan

A recommended Stormwater Management Maintenance Plan has been established for this site in order to maintain the performance and efficiency of the proposed stormwater features. The plan is contained in Appendix L of this report.

3.5 Soil Erosion and Sediment Control

Soil Erosion and Sediment Control measures have been designed for the stormwater management system to ensure that water quality is maintained and that the system can safely and adequately control runoff from the property.

4. CONCLUSIONS

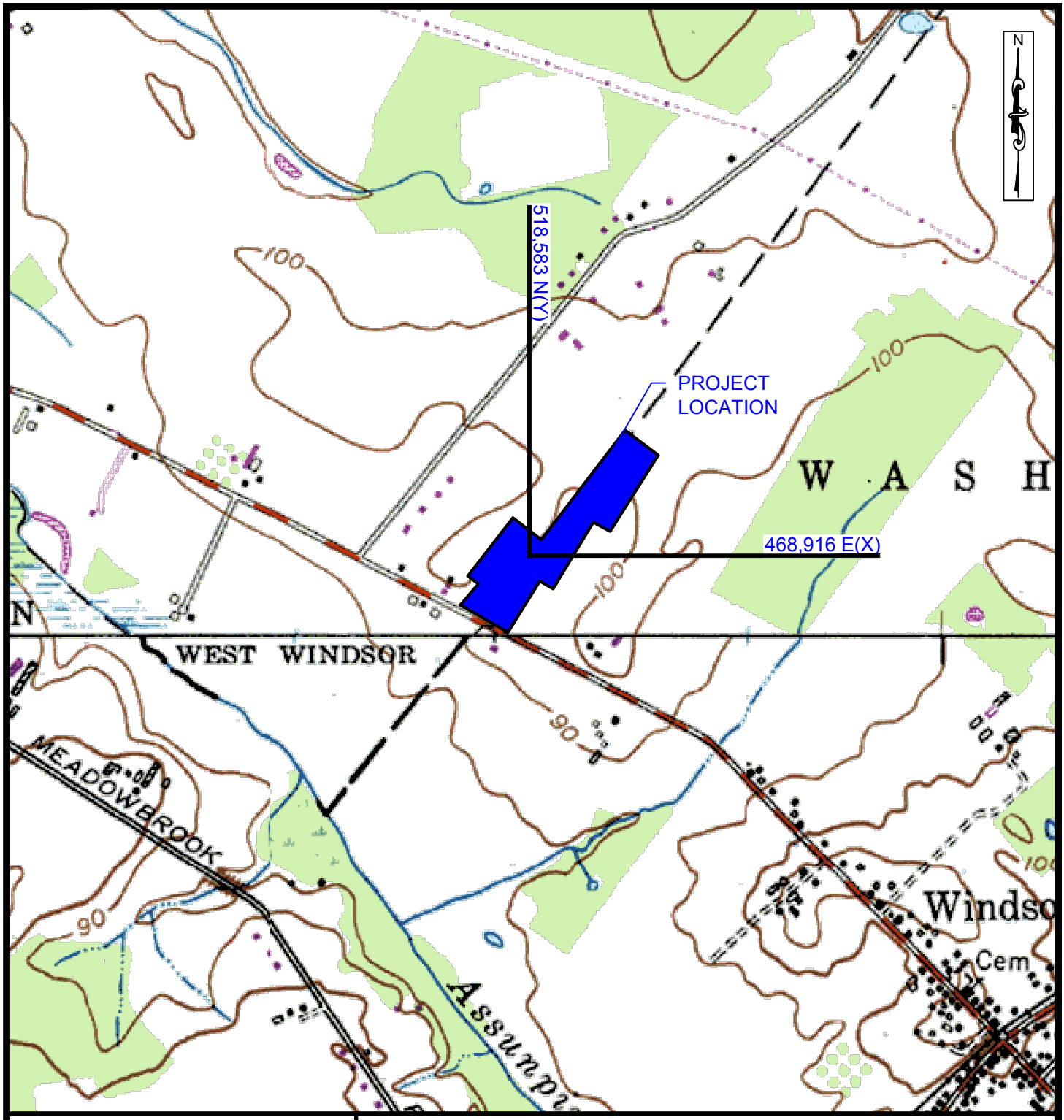
The proposed development will reduce peak flow from the site for the 2-, 10-, and 100-year storm events by factors greater than 50%, 75%, and 80% (NJDEP Standard) under the proposed conditions.

For the proposed condition, the peak runoff rates for the 2-, 10-, and 100-year storm events are reduced while existing drainage patterns are generally maintained.

All on-site storm conveyance systems were designed to accommodate the proposed site improvements under the 25-year storm event.

In conclusion, the proposed design includes a proposed stormwater management system for the property that meets all of the quantity, quality and recharge requirements outlined in the Stormwater Management Rules of N.J.A.C. 7:8.

APPENDIX A



SOURCE: UNITED STATES GEOLOGICAL SURVEY

1,000 0 1,000

Scale 1" = 1,000'

TITLE:

HIGHSTOWN & ALLENTOWN QUADRANGLES MAP

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140 WEST MAIN STREET CLINTON TOWNSHIP, NJ 08829
(908) 238-0544 FAX: (908)238-9572
C.O.A. #: 24GA28021500
A PROFESSIONAL ASSOCIATION

LOCATION:
BLOCK 34 LOT 4
WEST WINDSOR TOWNSHIP
BLOCK 14 LOT 23
ROBBINSVILLE TOWNSHIP
MERCER COUNTY
NEW JERSEY

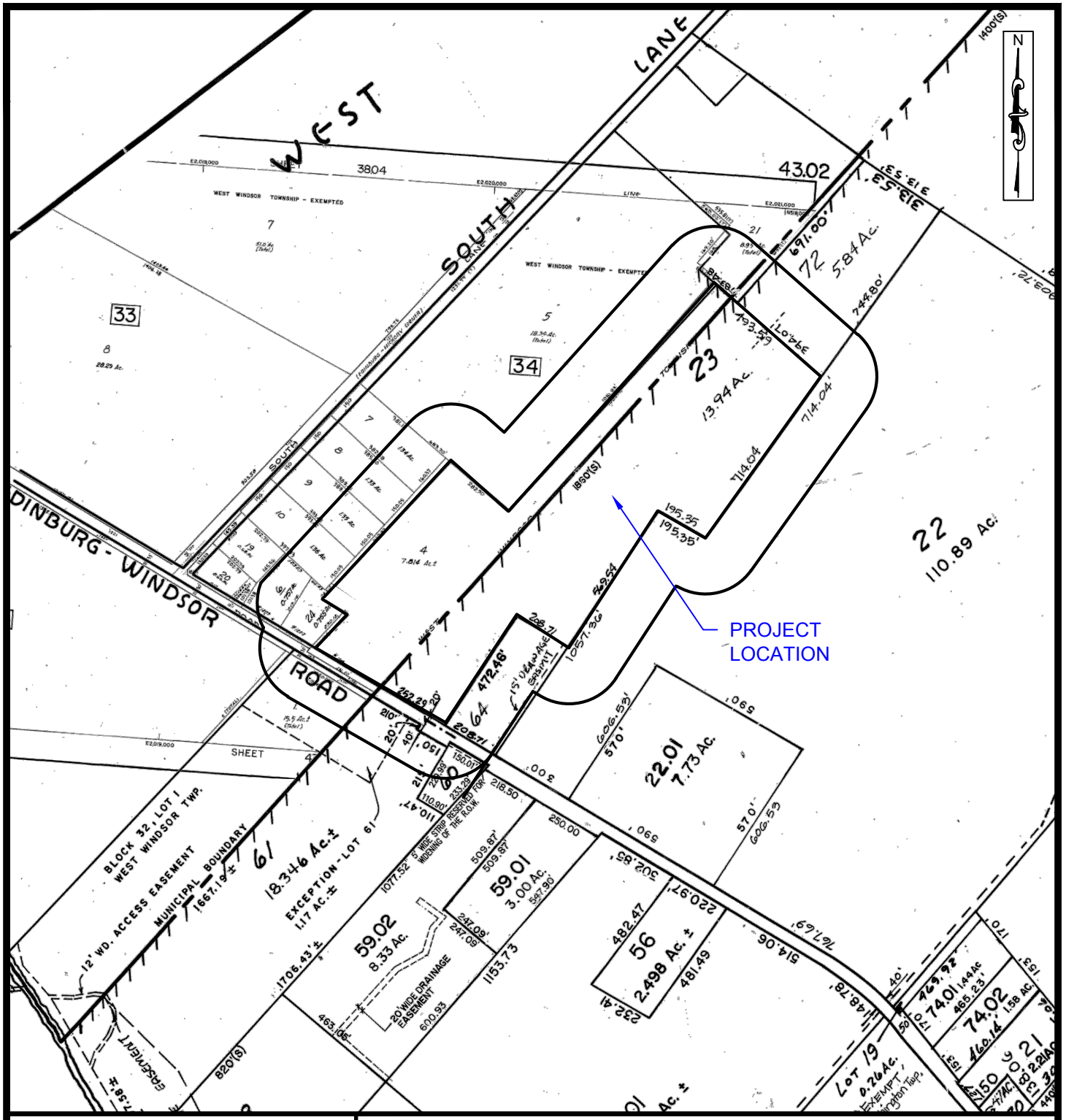
DATE: 08/02/2017

PROJECT NO.: 0116156

FILENAME: USGS.DWG

FIGURE No.

1



SOURCE:
WEST WINDSOR TWP
TAX SHEET 43.02
ROBBINSVILLE TWP
TAX SHEET 4

500 0 500

Scale 1" = 500'

TITLE:

TAX MAP

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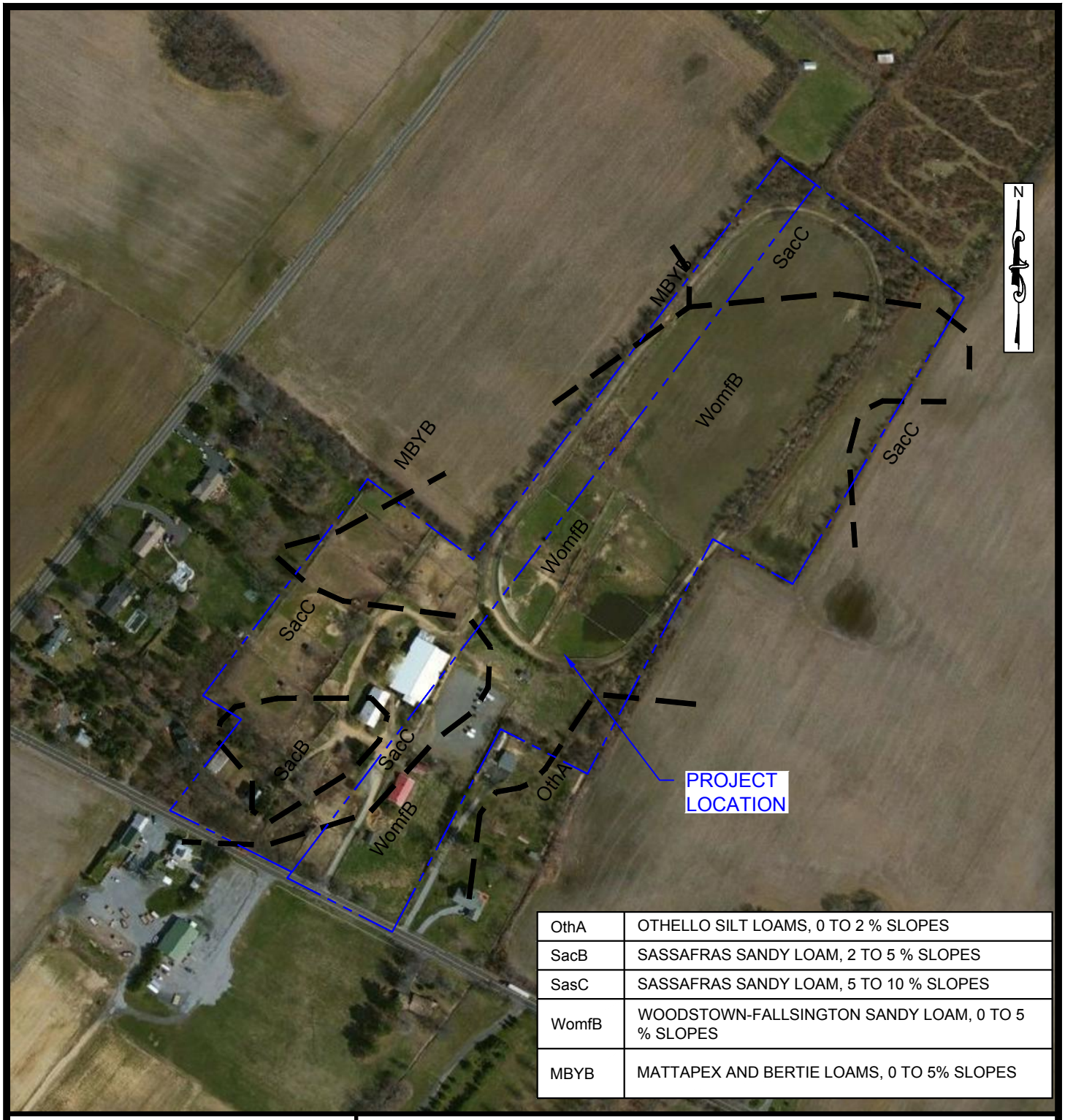
FILENAME: USGS.DWG

FIGURE No.

2



OthA	OTHELLO SILT LOAMS, 0 TO 2 % SLOPES
SacB	SASSAFRAS SANDY LOAM, 2 TO 5 % SLOPES
SasC	SASSAFRAS SANDY LOAM, 5 TO 10 % SLOPES
WomfB	WOODSTOWN-FALLSINGTON SANDY LOAM, 0 TO 5 % SLOPES
MBYB	MATTAPEX AND BERTIE LOAMS, 0 TO 5% SLOPES

SOURCE: U.S. DEPARTMENT OF AGRICULTURE WEB SOIL SURVEY

150 0 150

Scale 1" = 150'

TITLE: SOIL MAP

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140 WEST MAIN STREET CLINTON TOWNSHIP, NJ 08829
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NEW JERSEY

DATE: 08/02/2017

PROJECT NO.: 0116156

FILENAME: USGS.DWG

FIGURE No. 3

APPENDIX B

NOAA Atlas 14, Volume 2, Version 3
Location name: Princeton Junction, New Jersey, USA*
Latitude: 40.2508°, Longitude: -74.5958°
Elevation: 98.03 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.340** (0.307-0.377)	**0.406** (0.368-0.451)	**0.482** (0.436-0.534)	**0.538** (0.486-0.596)	**0.608** (0.545-0.672)	**0.658** (0.588-0.728)	**0.708** (0.630-0.785)	**0.756** (0.668-0.840)	**0.815** (0.713-0.910)	**0.860** (0.746-0.965)
10-min	**0.543** (0.490-0.602)	**0.649** (0.588-0.721)	**0.772** (0.698-0.855)	**0.861** (0.777-0.953)	**0.968** (0.869-1.07)	**1.05** (0.936-1.16)	**1.13** (1.00-1.25)	**1.20** (1.06-1.33)	**1.29** (1.13-1.44)	**1.35** (1.18-1.52)
15-min	**0.679** (0.613-0.752)	**0.816** (0.740-0.906)	**0.977** (0.883-1.08)	**1.09** (0.983-1.21)	**1.23** (1.10-1.36)	**1.33** (1.19-1.47)	**1.42** (1.26-1.58)	**1.51** (1.34-1.68)	**1.62** (1.42-1.81)	**1.70** (1.48-1.91)
30-min	**0.930** (0.840-1.03)	**1.13** (1.02-1.25)	**1.39** (1.25-1.54)	**1.58** (1.42-1.75)	**1.82** (1.63-2.01)	**2.00** (1.79-2.21)	**2.18** (1.94-2.41)	**2.35** (2.08-2.61)	**2.58** (2.26-2.88)	**2.75** (2.39-3.09)
60-min	**1.16** (1.05-1.29)	**1.41** (1.28-1.57)	**1.78** (1.61-1.97)	**2.06** (1.85-2.28)	**2.42** (2.17-2.68)	**2.71** (2.42-2.99)	**3.00** (2.67-3.33)	**3.30** (2.92-3.67)	**3.70** (3.24-4.14)	**4.02** (3.49-4.51)
2-hr	**1.41** (1.28-1.57)	**1.72** (1.56-1.91)	**2.19** (1.97-2.42)	**2.54** (2.29-2.81)	**3.03** (2.71-3.34)	**3.42** (3.05-3.78)	**3.83** (3.39-4.24)	**4.25** (3.74-4.72)	**4.84** (4.20-5.41)	**5.31** (4.57-5.95)
3-hr	**1.56** (1.40-1.74)	**1.89** (1.70-2.12)	**2.41** (2.16-2.69)	**2.80** (2.51-3.13)	**3.36** (3.00-3.75)	**3.81** (3.38-4.25)	**4.29** (3.77-4.79)	**4.79** (4.17-5.35)	**5.48** (4.71-6.16)	**6.05** (5.13-6.83)
6-hr	**1.97** (1.77-2.22)	**2.39** (2.14-2.69)	**3.02** (2.70-3.40)	**3.55** (3.15-3.97)	**4.30** (3.78-4.81)	**4.92** (4.31-5.50)	**5.60** (4.85-6.26)	**6.32** (5.42-7.09)	**7.37** (6.22-8.30)	**8.25** (6.87-9.34)
12-hr	**2.38** (2.12-2.72)	**2.89** (2.57-3.30)	**3.68** (3.26-4.19)	**4.35** (3.85-4.95)	**5.36** (4.69-6.07)	**6.23** (5.41-7.06)	**7.19** (6.16-8.13)	**8.25** (6.97-9.36)	**9.85** (8.15-11.2)	**11.2** (9.12-12.8)
24-hr	**2.74** (2.49-3.04)	**3.32** (3.02-3.68)	**4.26** (3.87-4.72)	**5.07** (4.59-5.60)	**6.28** (5.64-6.93)	**7.34** (6.54-8.08)	**8.52** (7.52-9.38)	**9.84** (8.59-10.8)	**11.8** (10.1-13.1)	**13.6** (11.5-15.0)
2-day	**3.17** (2.88-3.51)	**3.84** (3.50-4.26)	**4.94** (4.48-5.46)	**5.86** (5.31-6.47)	**7.23** (6.50-7.96)	**8.40** (7.50-9.25)	**9.70** (8.59-10.7)	**11.1** (9.74-12.3)	**13.3** (11.4-14.7)	**15.1** (12.9-16.8)
3-day	**3.36** (3.08-3.68)	**4.07** (3.74-4.47)	**5.20** (4.77-5.70)	**6.14** (5.62-6.73)	**7.53** (6.84-8.23)	**8.72** (7.86-9.51)	**10.0** (8.96-10.9)	**11.4** (10.1-12.5)	**13.5** (11.8-14.8)	**15.3** (13.2-16.9)
4-day	**3.55** (3.28-3.86)	**4.30** (3.98-4.68)	**5.46** (5.05-5.94)	**6.43** (5.93-6.99)	**7.84** (7.18-8.50)	**9.03** (8.22-9.78)	**10.3** (9.33-11.2)	**11.7** (10.5-12.7)	**13.8** (12.2-15.0)	**15.5** (13.6-16.9)
7-day	**4.16** (3.86-4.51)	**5.01** (4.64-5.44)	**6.26** (5.80-6.79)	**7.30** (6.74-7.92)	**8.82** (8.10-9.55)	**10.1** (9.22-10.9)	**11.5** (10.4-12.4)	**12.9** (11.7-14.0)	**15.1** (13.4-16.4)	**16.9** (14.9-18.4)
10-day	**4.74** (4.42-5.11)	**5.67** (5.30-6.11)	**6.99** (6.51-7.52)	**8.06** (7.50-8.68)	**9.59** (8.88-10.3)	**10.8** (9.99-11.7)	**12.2** (11.2-13.1)	**13.6** (12.4-14.6)	**15.6** (14.0-16.8)	**17.3** (15.4-18.7)
20-day	**6.41** (6.04-6.80)	**7.61** (7.18-8.08)	**9.13** (8.60-9.69)	**10.3** (9.73-11.0)	**12.0** (11.3-12.7)	**13.3** (12.5-14.1)	**14.7** (13.6-15.5)	**16.0** (14.8-17.0)	**17.9** (16.4-19.1)	**19.4** (17.7-20.7)
30-day	**7.97** (7.57-8.39)	**9.41** (8.94-9.92)	**11.1** (10.5-11.7)	**12.4** (11.7-13.0)	**14.1** (13.3-14.8)	**15.5** (14.6-16.3)	**16.8** (15.8-17.7)	**18.1** (17.0-19.1)	**19.9** (18.5-21.0)	**21.2** (19.6-22.5)
45-day	**10.2** (9.69-10.7)	**12.0** (11.4-12.6)	**13.9** (13.2-14.6)	**15.3** (14.6-16.1)	**17.2** (16.3-18.0)	**18.6** (17.6-19.5)	**19.9** (18.8-20.9)	**21.2** (20.0-22.3)	**22.9** (21.5-24.1)	**24.1** (22.5-25.4)
60-day	**12.2** (11.6-12.7)	**14.3** (13.7-15.0)	**16.4** (15.7-17.2)	**18.0** (17.2-18.8)	**20.0** (19.0-20.9)	**21.4** (20.4-22.4)	**22.8** (21.6-23.8)	**24.1** (22.8-25.2)	**25.6** (24.2-26.9)	**26.8** (25.2-28.2)

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

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

Please refer to NOAA Atlas 14 document for more information.

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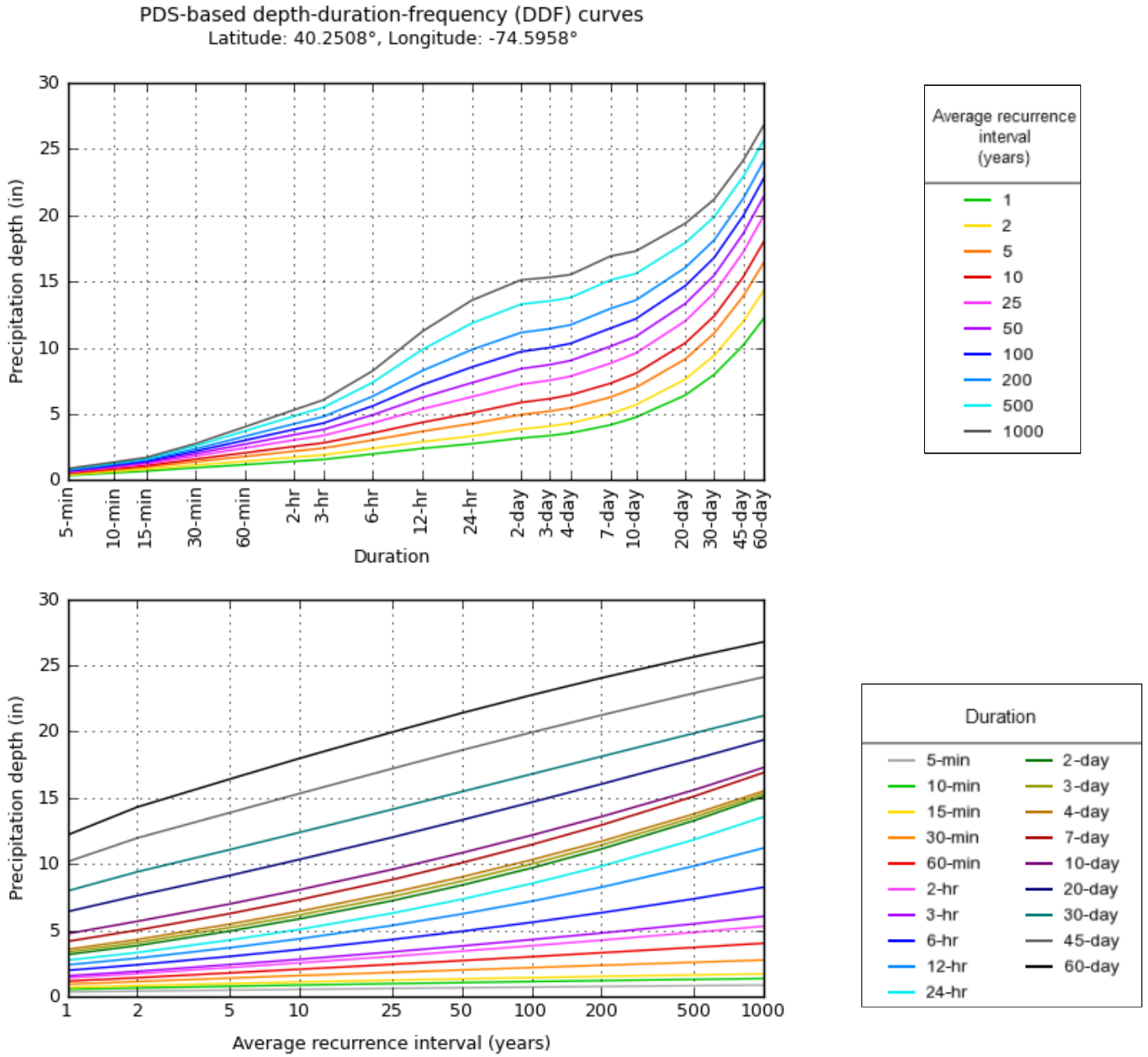
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Mon Feb 24 17:21:01 2020

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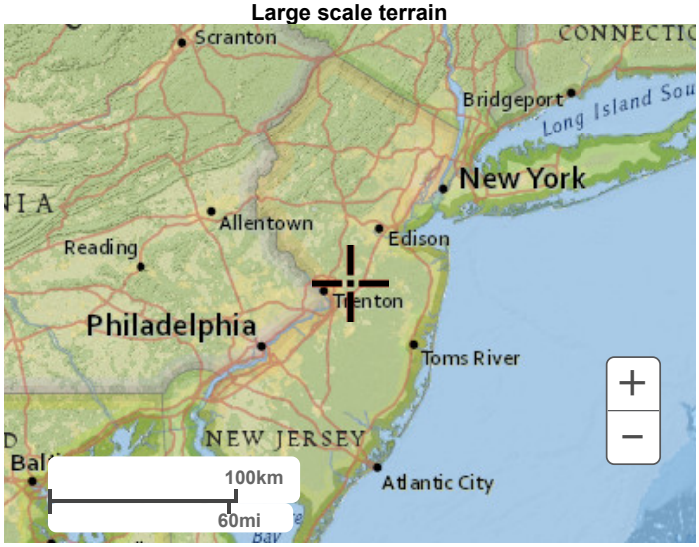
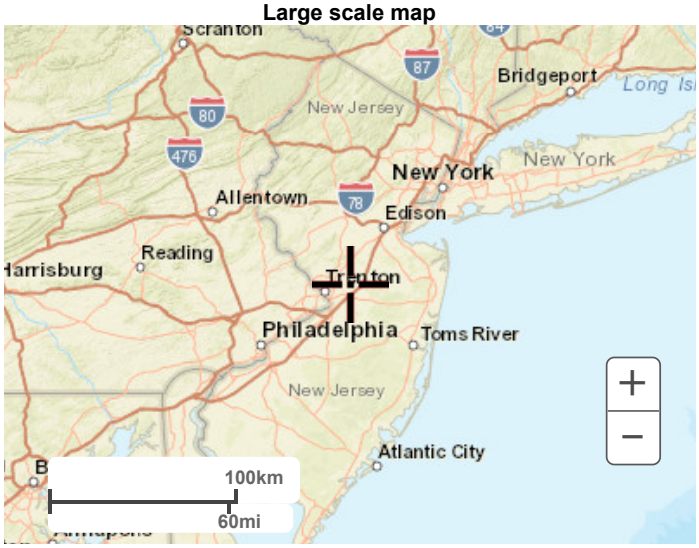
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX C

PROJECT AREA BREAKDOWN

Description	Area (ac.)
Total Area of Disturbance =	13.21
Total Area of New Impervious Coverage =	2.68
Total Area of New Vehicular Impervious Coverage =	1.43

BMPs INFLOW AREAS

Detention Basin	
Description	**Area (ac.)**
Total Area =	7.32
Total Area of New Impervious Coverage =	2.364
Total Area of New Vehicular Impervious Coverage =	1.24

Up-Flo Filter (provides treatment to detention basin outflow)	
Description	**Area (ac.)**
Total Area =	Basin Outflow
Total Area of New Impervious Coverage =	2.364
Total Area of New Vehicular Impervious Coverage =	1.24

Up-Flo Filter (provides treatment to vehicular impervious areas bypassing the detention basin)	
Description	**Area (ac.)**
Total Area =	0.99
Total Area of New Impervious Coverage =	0.106
Total Area of New Vehicular Impervious Coverage =	0.078

* (2) Drywell System (Typical)	
Description	**Area (ac.)**
Total Area =	0.115
Total Area of New Impervious Coverage =	0.115
Total Area of New Vehicular Impervious Coverage =	0

* There are a total of 10 drywells

CN - RUNOFF CURVE NUMBERS (TR55)
Existing Drainage Areas

DA	Soil Name HSG	Cover Description	CN	Area	CN*Area	CN (Weighted)
EDA#1 (Impervious)	SacB, SacC, WomfB (B)	Impervious Gravel Dirt	98 85 82	0.473 0.361 0.244	0.46 0.31 0.20	
Total				1.078	0.97	**90**
EDA#1 (Pervious)	SacC, WomfB (B) SacC, WomfB (B)	Open Space Woods	61 55	10.021 0.321	6.11 0.18	
Total				10.342	6.29	**61**
EDA#2 (Impervious)	SacC, WomfB (B)	Impervious	98	0.016	0.02	
Total				0.016	0.02	**98**
EDA#2 (Pervious)	SacC, WomfB (B) MBYB (C)	Open Space Open Space	61 74	1.861 0.053	1.14 0.04	
Total				1.914	1.17	**61**

Proposed Drainage Areas

DA	Soil Name HSG	Cover Description	CN	Area	CN*Area	CN (Weighted)
PDA#1A (Impervious)	SacB, SacC, WomfB (B)	Impervious	98	2.364	2.32	
Total				2.364	2.32	**98**
PDA#1A (Pervious)	SacB, SacC, WomfB (B)	Open Space	61	4.326	2.64	
Total				4.326	2.64	**61**
PDA#1B Bypass (Impervious)	WomfB (B)	Impervious	98	0.203	0.20	
Total				0.203	0.20	**98**
PDA#1B Bypass (Pervious)	SacB, SacC, WomfB (B)	Open Space	61	3.717	2.27	
Total				3.717	2.27	**61**
PDA#1C Bypass (Impervious)	SacC (B)	Impervious	98	0.115	0.11	
Total				0.115	0.11	**98**
PDA#1C Bypass (Pervious)	SacC, WomfB (B)	Open Space	61	0.705	0.43	
Total				0.705	0.43	**61**
PDA#2 Bypass (Pervious)	SacC, WomfB (B) MBYB (C)	Open Space Open Space	61 74	1.867 0.053	1.14 0.04	
Total				1.920	1.18	**61**

Project: **Windsor Oaks Subdivision**
Location: **Block 34 Lot 4 West Windsor Tonwship**
Block 14 Lot 23 Robbinsville Township

By: JZ
Date: 25-Feb-20
Chk'd: CN
Revised:

Drainage Area: **EDA#1**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Short Grass		
Manning's Roughness Coefficient, n (Table 15-1)		0.15		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	94		
Two Year 24 Hour Rainfall, P2	in.	3.32		
Land Slope, s	ft/ft	0.0200		
Tt = $\frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.1529	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1529**

Shallow Concentrated Flow

	Segment ID	A	B	C
Surface Description (Figure 15-4)		Short Grass	Pavement	Short Grass
Flow Length, L	ft	81	128	323
Watercourse Slope, s	ft/ft	0.0200	0.0300	0.017
Average Velocity, V (Figure 15-4)	fps	1.00	3.50	0.90
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0225	0.0102	0.0997
Shallow concentrated flow Subtotal Tt =	**hr**			**0.1324**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.2853 hours
= 17.12 minutes

Project: **Windsor Oaks Subdivision** By: JZ
Location: **Block 34 Lot 4 West Windsor Tonwship** Date: 25-Feb-20
Block 14 Lot 23 Robbinsville Township Chk'd: CN
Revised:

Drainage Area: **EDA#2**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Smooth Surface	Short Grass	
Manning's Roughness Coefficient, n (Table 15-1)		0.011	0.15	
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	15	103	
Two Year 24 Hour Rainfall, P2	in.	3.32	3.32	
Land Slope, s	ft/ft	0.0200	0.0240	
$Tt = \frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.0043	0.1529	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1573**

Shallow Concentrated Flow

	Segment ID	A	B	C
Surface Description (Figure 15-4)		Short Grass		
Flow Length, L	ft	138		
Watercourse Slope, s	ft/ft	0.0265		
Average Velocity, V (Figure 15-4)	fps	1.25		
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0307	0.0000	0.0000
Shallow concentrated flow Subtotal Tt =	**hr**			**0.0307**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.1880 hours
= 11.28 minutes

Project: **Windsor Oaks Subdivision** By: JZ
Location: **Block 34 Lot 4 West Windsor Tonwship** Date: 25-Feb-20
Block 14 Lot 23 Robbinsville Township Chk'd: CN
Revised:

Drainage Area: **PDA#1A**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Short Grass		
Manning's Roughness Coefficient, n (Table 15-1)		0.15		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	88		
Two Year 24 Hour Rainfall, P2	in.	3.32		
Land Slope, s	ft/ft	0.0175		
$Tt = \frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.1529	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1529**

Shallow Concentrated Flow

	Segment ID	A	B	C
Surface Description (Figure 15-4)		Short Grass	Pavement	Short Grass
Flow Length, L	ft	12	20	403
Watercourse Slope, s	ft/ft	0.0175	0.0150	0.026
Average Velocity, V (Figure 15-4)	fps	0.90	2.50	1.30
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0037	0.0022	0.0861
Shallow concentrated flow Subtotal Tt =	**hr**			**0.0920**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.2450 hours
= 14.70 minutes

Project: **Windsor Oaks Subdivision**
Location: **Block 34 Lot 4 West Windsor Tonwship**
Block 14 Lot 23 Robbinsville Township

By: JZ
Date: 25-Feb-20
Chk'd: CN
Revised:

Drainage Area: **PDA#1B (Bypass)**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Short Grass		
Manning's Roughness Coefficient, n (Table 15-1)		0.15		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	94		
Two Year 24 Hour Rainfall, P2	in.	3.32		
Land Slope, s	ft/ft	0.0200		
Tt = $\frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.1529	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1529**

Shallow Concentrated Flow

	Segment ID	A	B	C
Surface Description (Figure 15-4)		Short Grass	Smooth Surface	Short Grass
Flow Length, L	ft	225	4	67
Watercourse Slope, s	ft/ft	0.0300	0.0100	0.031
Average Velocity, V (Figure 15-4)	fps	1.20	2.00	1.20
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0521	0.0006	0.0155
Shallow concentrated flow Subtotal Tt =	**hr**			**0.0681**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.2211 hours
= 13.27 minutes

Project: **Windsor Oaks Subdivision**
Location: **Block 34 Lot 4 West Windsor Tonwship**
Block 14 Lot 23 Robbinsville Township

By: JZ
Date: 25-Feb-20
Chk'd: CN
Revised:

Drainage Area: **PDA#1C (Bypass)**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

	Segment ID	A	B	C
Surface Description (Table 15-1)		Short Grass		
Manning's Roughness Coefficient, n (Table 15-1)		0.15		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	87		
Two Year 24 Hour Rainfall, P2	in.	3.32		
Land Slope, s	ft/ft	0.0170		
Tt = $\frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.1529	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1529**

Shallow Concentrated Flow

	Segment ID	A		
Surface Description (Figure 15-4)		Short Grass		
Flow Length, L	ft	151		
Watercourse Slope, s	ft/ft	0.0170		
Average Velocity, V (Figure 15-4)	fps	0.85		
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0493	0.0000	0.0000
Shallow concentrated flow Subtotal Tt =	**hr**			**0.0493**

Open Channel Flow

	Segment ID			
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

	Segment ID			
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Tt = $\frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.2023 hours
= 12.14 minutes

Project: **Windsor Oaks Subdivision**
Location: **Block 34 Lot 4 West Windsor Tonwship**
Block 14 Lot 23 Robbinsville Township

By: JZ
Date: 25-Feb-20
Chk'd: CN
Revised:

Drainage Area: **PDA#2 (Bypass)**

TIME OF CONCENTRATION

(National Engineering Handbook Chapter 15 - Velocity Method)

Sheet Flow

Segment ID		A	B	C
Surface Description (Table 15-1)		Short Grass		
Manning's Roughness Coefficient, n (Table 15-1)		0.15		
Sheet Flow Length, L = (100)(sqrt(s))/n	ft.	105		
Two Year 24 Hour Rainfall, P2	in.	3.32		
Land Slope, s	ft/ft	0.0250		
$Tt = \frac{0.007(nL)^{0.8}}{(P2^{0.5})(s^{0.4})}$	hr	0.1529	0.0000	0.0000
Sheet flow Subtotal Tt =	**hr**			**0.1529**

Shallow Concentrated Flow

Segment ID		A	B	C
Surface Description (Figure 15-4)		Short Grass		
Flow Length, L	ft	145		
Watercourse Slope, s	ft/ft	0.0270		
Average Velocity, V (Figure 15-4)	fps	1.30		
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0310	0.0000	0.0000
Shallow concentrated flow Subtotal Tt =	**hr**			**0.0310**

Open Channel Flow

Segment ID				
Cross Sectional Flow Area, a	sq ft			
Wetted Perimeter, Pw	ft			
Hydraulic Radius, r = a/Pw	ft			
Channel Slope, s	ft/ft			
Manning's Roughness Coefficient, n				
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
Flow length, L	ft			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Channel flow Subtotal Tt =	**hr**			**0.0000**

Pipe Flow

Segment ID				
Structure 'From' - 'To'				
Flow Length, L	ft			
Pipe Diameter, D	in			
Manning's Roughness Coefficient, n				
Pipe Slope, s	ft/ft			
Velocity, V = (1.486)(r^2/3)(s^1/2)/n	fps			
$Tt = \frac{L}{(3600 \times V)}$	hr	0.0000		
Pipe flow Subtotal Tt =	**hr**			**0.0000**

Total Tt = 0.1839 hours
= 11.04 minutes

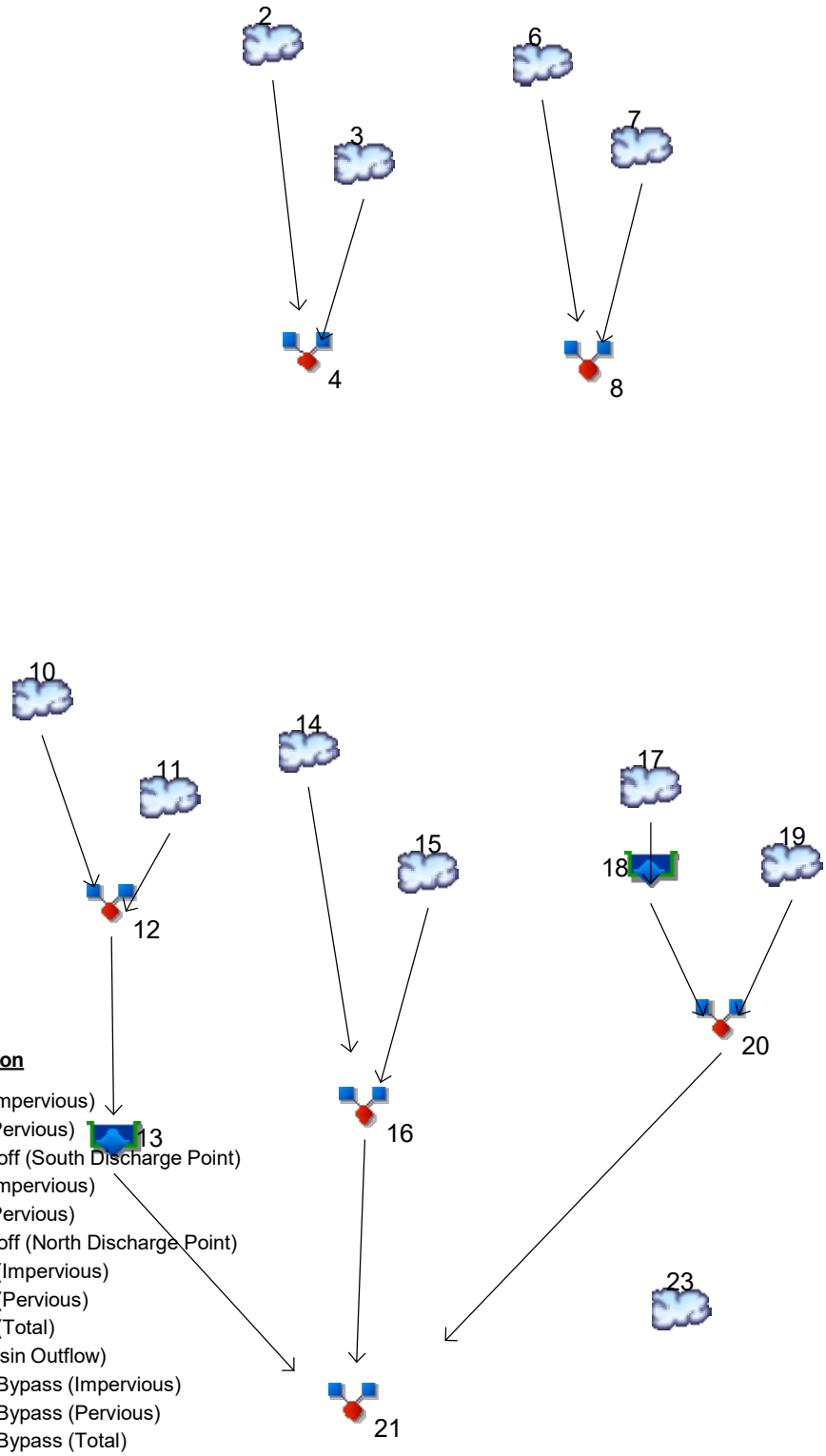
APPENDIX D

Hydraflow Table of Contents

SWM.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 03 / 5 / 2020

Watershed Model Schematic



Legend

Hyd.	Origin	Description
2	SCS Runoff	EDA#1 (Impervious)
3	SCS Runoff	EDA#1 (Pervious)
4	Combine	Site Run-off (South Discharge Point)
6	SCS Runoff	EDA#2 (Impervious)
7	SCS Runoff	EDA#2 (Pervious)
8	Combine	Site Run-off (North Discharge Point)
10	SCS Runoff	PDA#1A (Impervious)
11	SCS Runoff	PDA#1A (Pervious)
12	Combine	PDA#1A (Total)
13	Reservoir	SWM (Basin Outflow)
14	SCS Runoff	PDA#1B Bypass (Impervious)
15	SCS Runoff	PDA#1B Bypass (Pervious)
16	Combine	PDA#1B Bypass (Total)
17	SCS Runoff	PDA#1C Bypass (Impervious)
18	Reservoir	Drywell
19	SCS Runoff	PDA#1C Bypass (Pervious)
20	Combine	PDA#1C Bypass (Total)
21	Combine	Site Run-off (South Discharge Point)
23	SCS Runoff	PDA#2 Bypass (Site Run-off North Discharge Point)

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	
2	SCS Runoff	------	-------	2.684	-------	-------	4.528	-------	-------	8.111	EDA#1 (Impervious)
3	SCS Runoff	------	-------	3.186	-------	-------	12.23	-------	-------	35.86	EDA#1 (Pervious)
4	Combine	2, 3	-------	4.621	-------	-------	14.77	-------	-------	40.54	Site Run-off (South Discharge Point)
6	SCS Runoff	------	-------	0.049	-------	-------	0.075	-------	-------	0.126	EDA#2 (Impervious)
7	SCS Runoff	------	-------	0.671	-------	-------	2.571	-------	-------	7.436	EDA#2 (Pervious)
8	Combine	6, 7	-------	0.707	-------	-------	2.625	-------	-------	7.527	Site Run-off (North Discharge Point)
10	SCS Runoff	------	-------	7.180	-------	-------	11.04	-------	-------	18.62	PDA#1A (Impervious)
11	SCS Runoff	------	-------	1.518	-------	-------	5.811	-------	-------	16.81	PDA#1A (Pervious)
12	Combine	10, 11	-------	8.237	-------	-------	16.13	-------	-------	34.30	PDA#1A (Total)
13	Reservoir	12	-------	0.710	-------	-------	3.844	-------	-------	17.58	SWM (Basin Outflow)
14	SCS Runoff	------	-------	0.617	-------	-------	0.948	-------	-------	1.599	PDA#1B Bypass (Impervious)
15	SCS Runoff	------	-------	1.304	-------	-------	4.993	-------	-------	14.44	PDA#1B Bypass (Pervious)
16	Combine	14, 15	-------	1.752	-------	-------	5.680	-------	-------	15.60	PDA#1B Bypass (Total)
17	SCS Runoff	------	-------	0.349	-------	-------	0.537	-------	-------	0.906	PDA#1C Bypass (Impervious)
18	Reservoir	17	-------	0.098	-------	-------	0.108	-------	-------	0.129	Drywell
19	SCS Runoff	------	-------	0.247	-------	-------	0.947	-------	-------	2.739	PDA#1C Bypass (Pervious)
20	Combine	18, 19	-------	0.344	-------	-------	1.052	-------	-------	2.860	PDA#1C Bypass (Total)
21	Combine	13, 16, 20	-------	2.301	-------	-------	8.606	-------	-------	32.01	Site Run-off (South Discharge Point)
23	SCS Runoff	------	-------	0.674	-------	-------	2.579	-------	-------	7.459	PDA#2 Bypass (Site Run-off North Di

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

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
2	SCS Runoff	2.684	3	726	8,364	------	------	------	EDA#1 (Impervious)
3	SCS Runoff	3.186	3	738	19,126	------	------	------	EDA#1 (Pervious)
4	Combine	4.621	3	732	27,490	2, 3	------	------	Site Run-off (South Discharge Point)
6	SCS Runoff	0.049	3	726	168	------	------	------	EDA#2 (Impervious)
7	SCS Runoff	0.671	3	732	3,432	------	------	------	EDA#2 (Pervious)
8	Combine	0.707	3	732	3,600	6, 7	------	------	Site Run-off (North Discharge Point)
10	SCS Runoff	7.180	3	726	24,835	------	------	------	PDA#1A (Impervious)
11	SCS Runoff	1.518	3	732	7,758	------	------	------	PDA#1A (Pervious)
12	Combine	8.237	3	729	32,593	10, 11	------	------	PDA#1A (Total)
13	Reservoir	0.710	3	810	32,590	12	94.15	16,959	SWM (Basin Outflow)
14	SCS Runoff	0.617	3	726	2,133	------	------	------	PDA#1B Bypass (Impervious)
15	SCS Runoff	1.304	3	732	6,666	------	------	------	PDA#1B Bypass (Pervious)
16	Combine	1.752	3	732	8,798	14, 15	------	------	PDA#1B Bypass (Total)
17	SCS Runoff	0.349	3	726	1,208	------	------	------	PDA#1C Bypass (Impervious)
18	Reservoir	0.098	3	741	1,205	17	92.56	282	Drywell
19	SCS Runoff	0.247	3	732	1,264	------	------	------	PDA#1C Bypass (Pervious)
20	Combine	0.344	3	732	2,469	18, 19	------	------	PDA#1C Bypass (Total)
21	Combine	2.301	3	732	43,858	13, 16, 20	------	------	Site Run-off (South Discharge Point)
23	SCS Runoff	0.674	3	732	3,443	------	------	------	PDA#2 Bypass (Site Run-off North Di

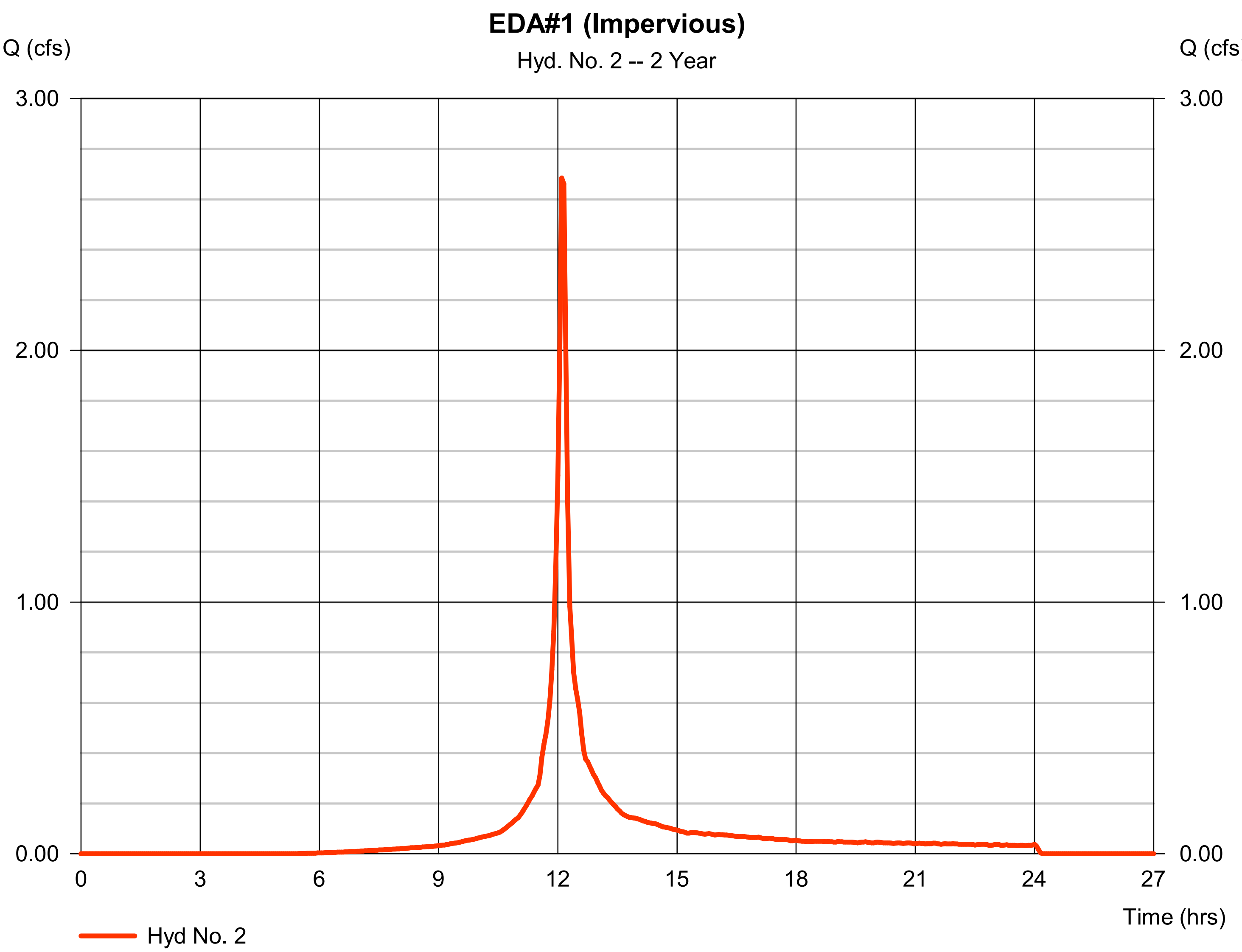
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 2

EDA#1 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.684 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 8,364 cuft
Drainage area	= 1.078 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484



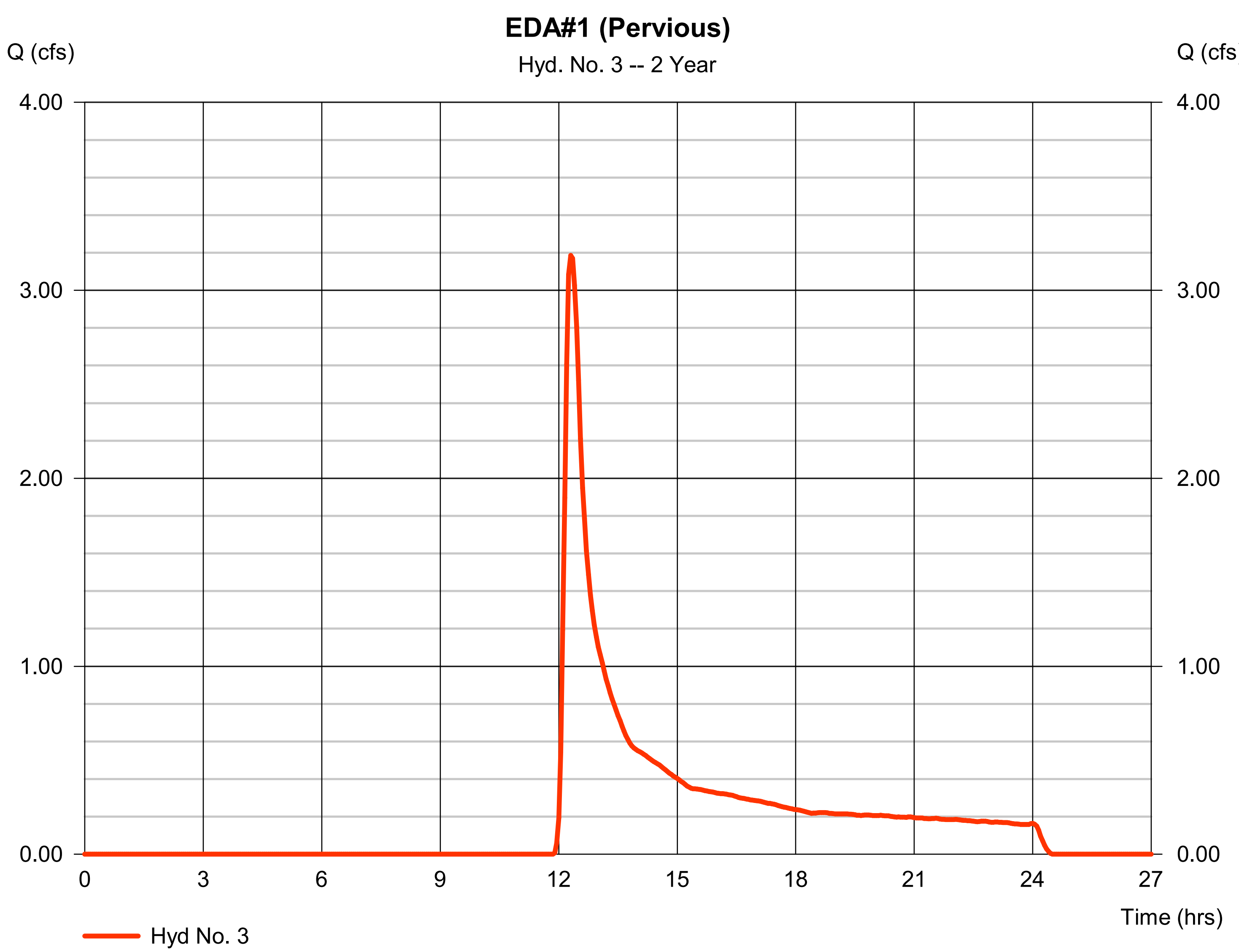
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 07 / 9 / 2020

Hyd. No. 3

EDA#1 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.186 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.30 hrs
Time interval	= 3 min	Hyd. volume	= 19,126 cuft
Drainage area	= 10.342 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.10 min
Total precip.	= 3.32 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

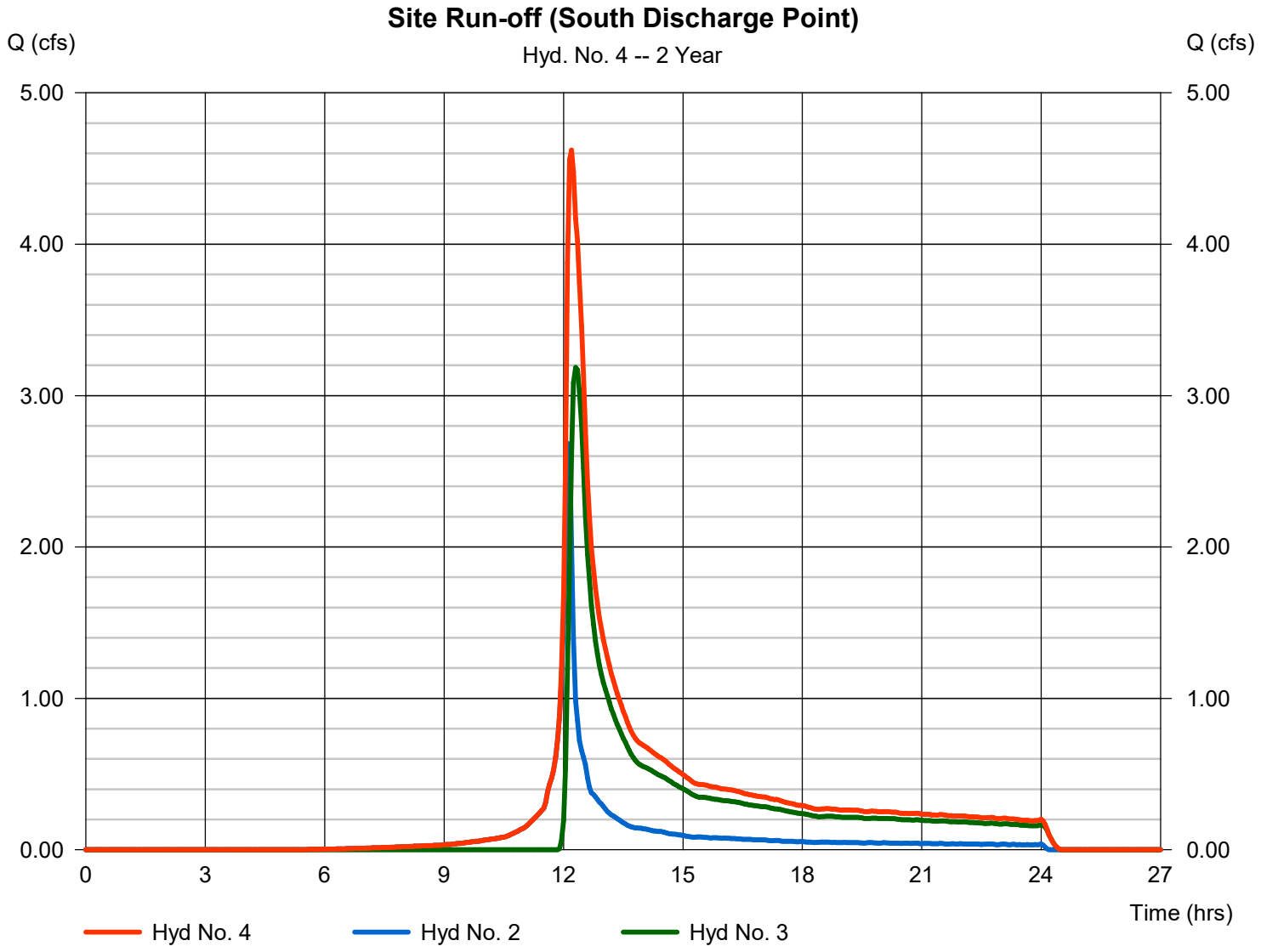


Hydrograph Report

Hyd. No. 4

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 4.621 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 27,490 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 11.420 ac



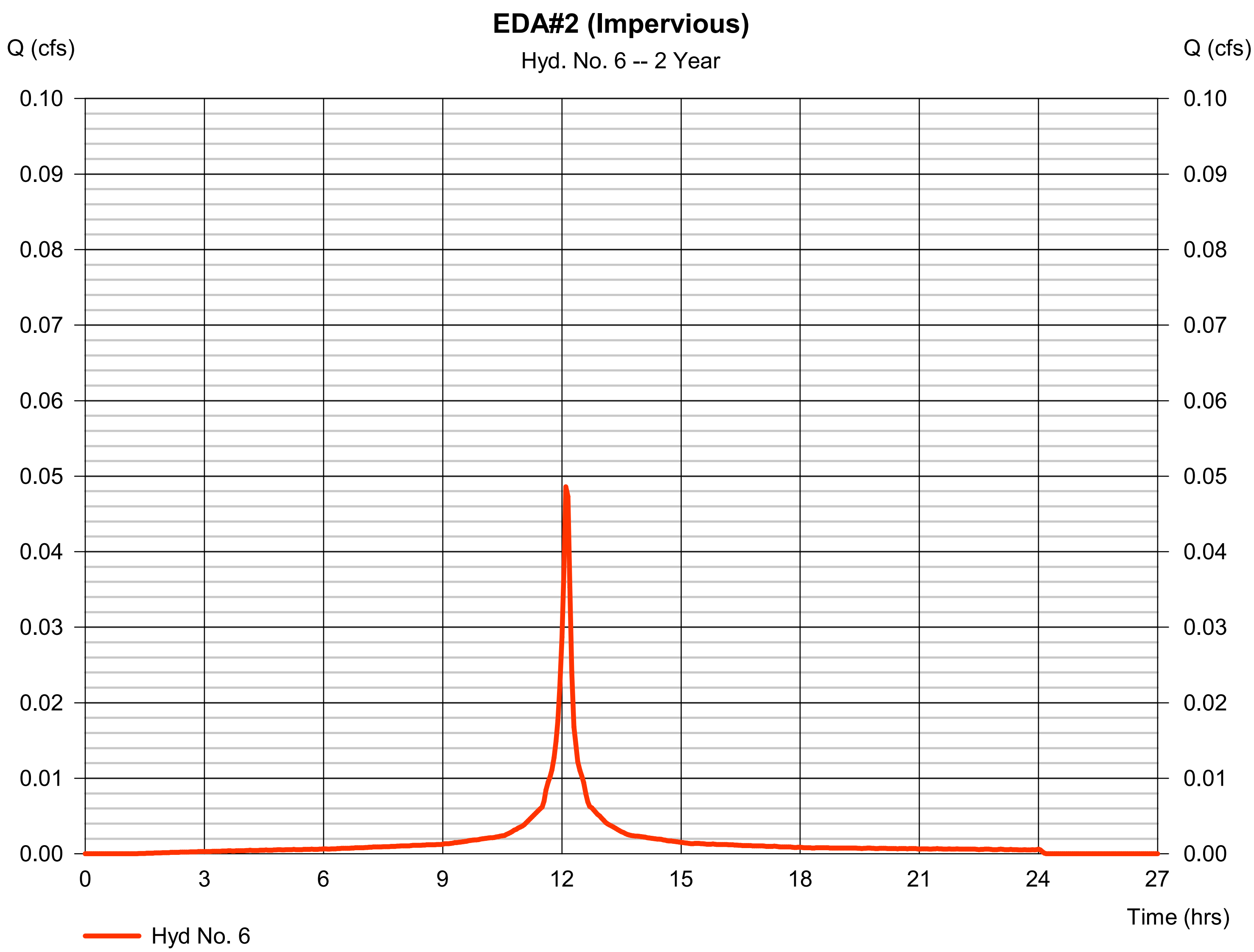
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 07 / 9 / 2020

Hyd. No. 6

EDA#2 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.049 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 168 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.hrfcdcds	Shape factor	= 484

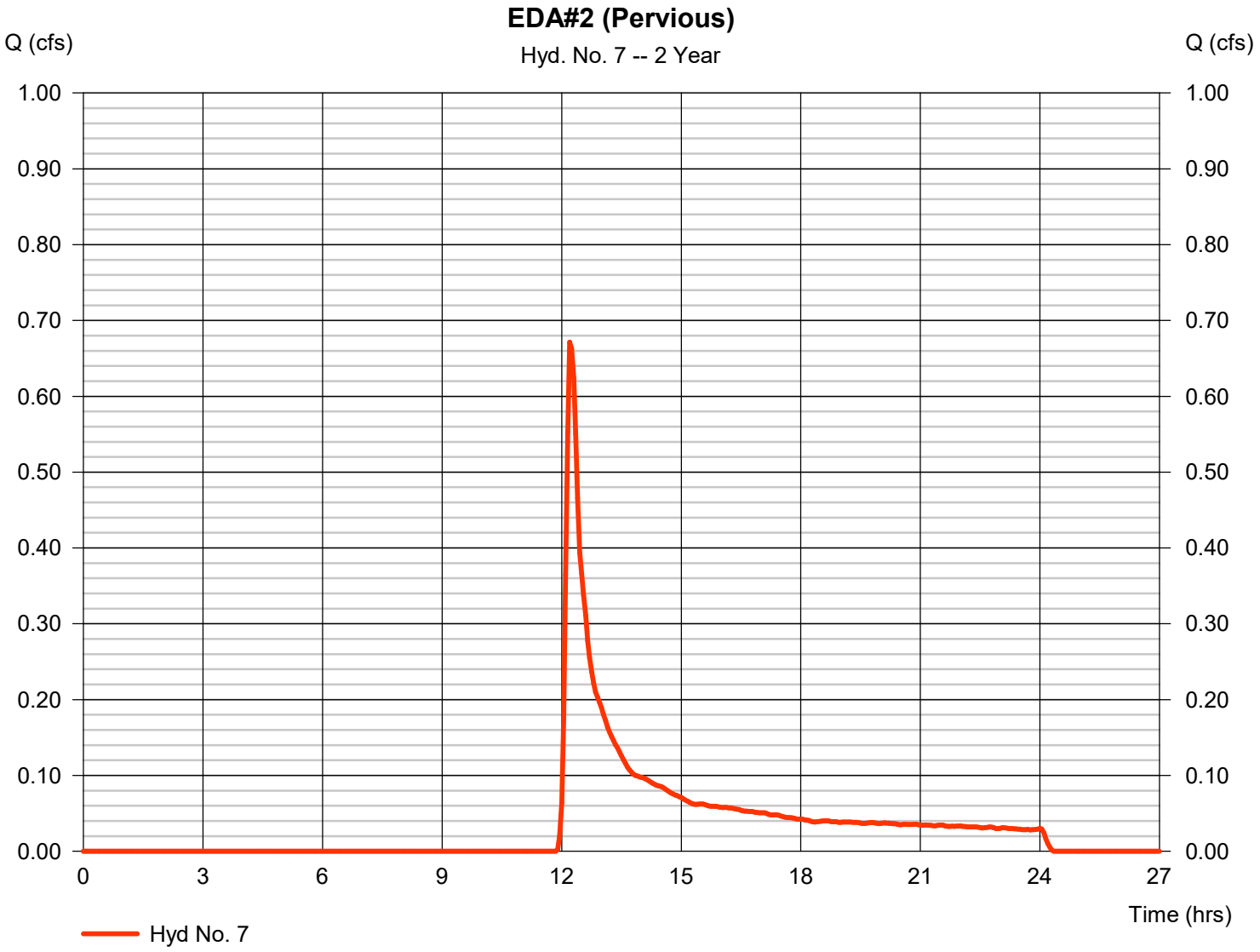


Hydrograph Report

Hyd. No. 7

EDA#2 (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.671 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	3,432 cuft
Drainage area	=	1.914 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.20 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Atlas 14 factors	S_1_factor	=	484

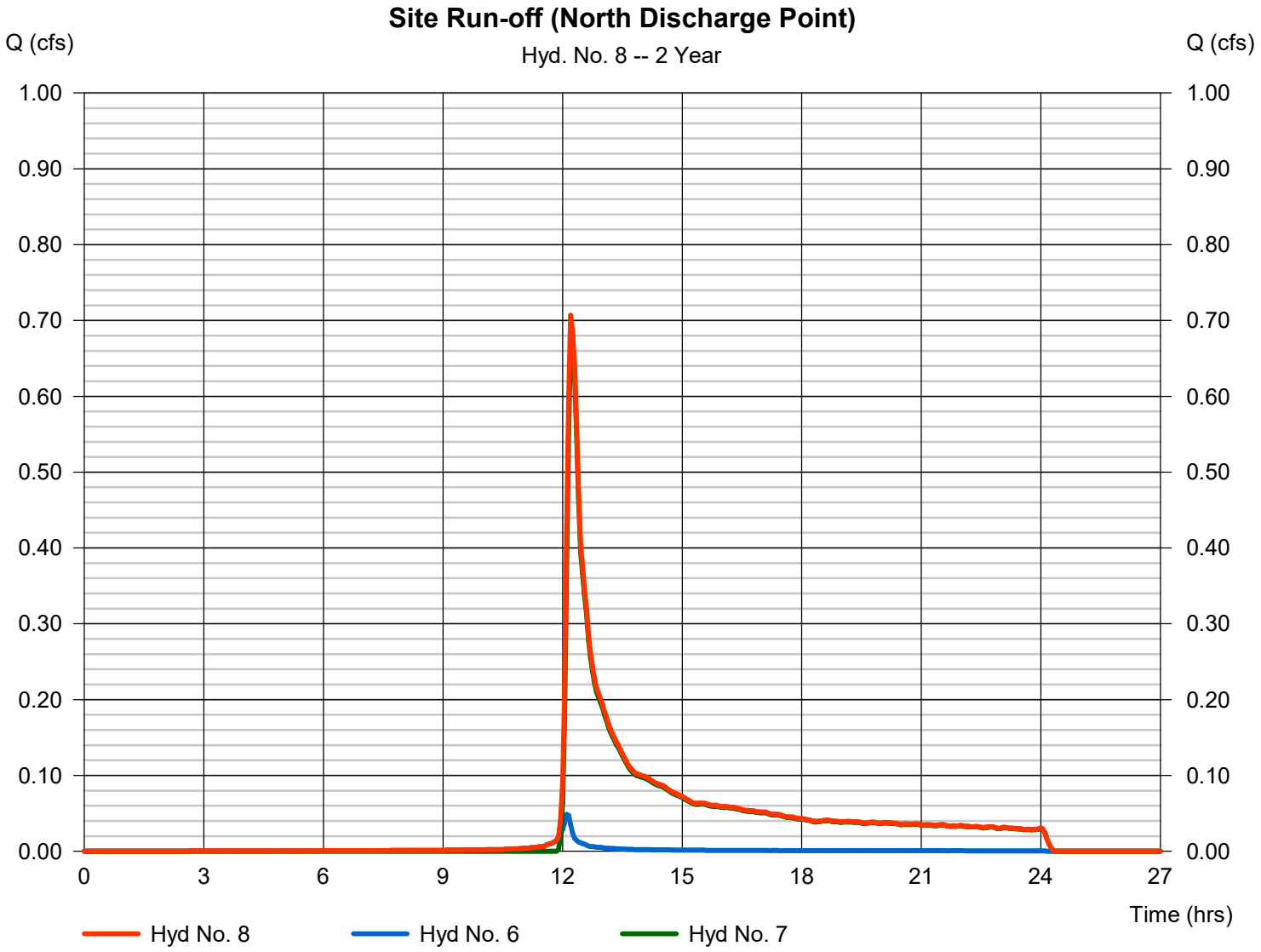


Hydrograph Report

Hyd. No. 8

Site Run-off (North Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 0.707 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 3,600 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.930 ac

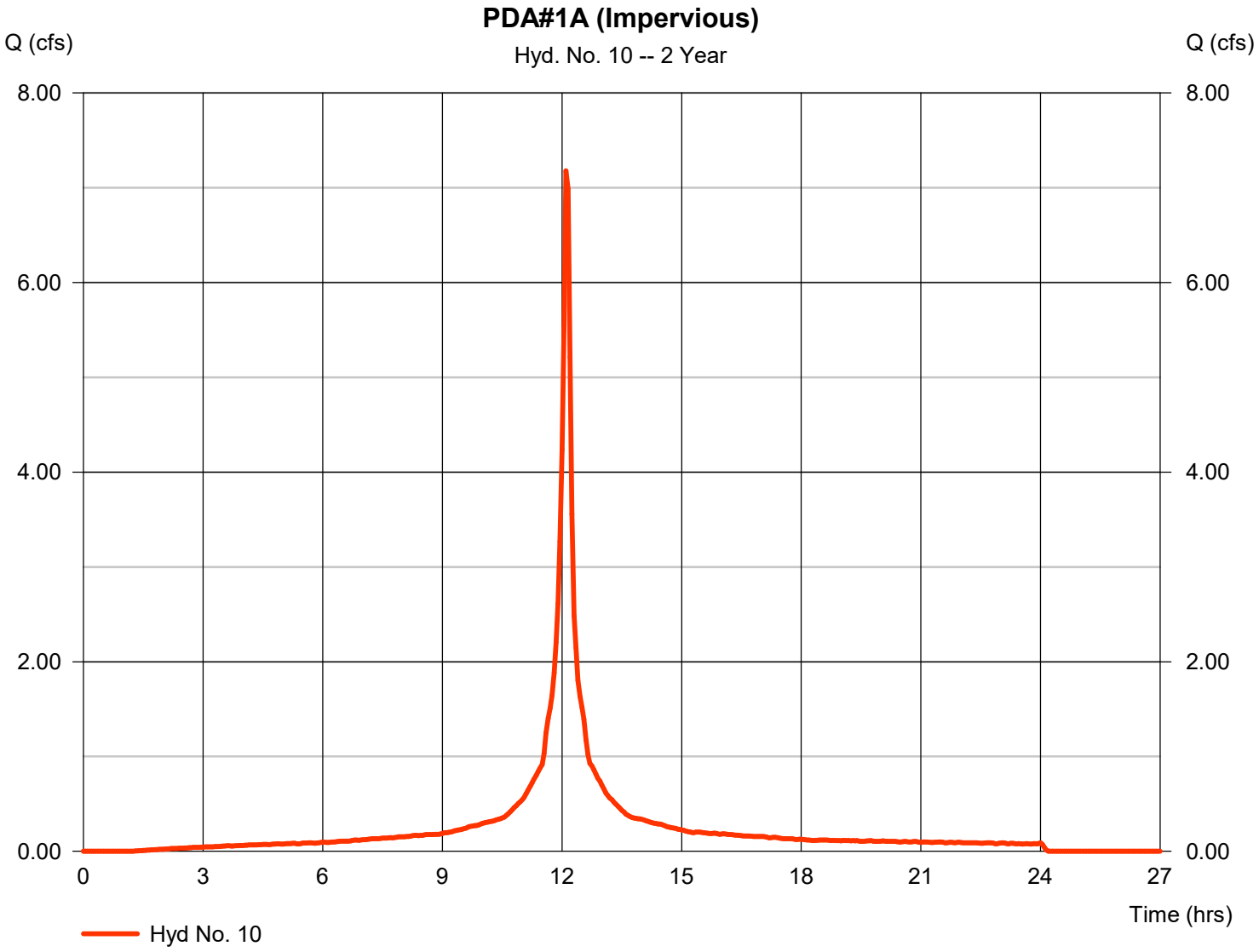


Hydrograph Report

Hyd. No. 10

PDA#1A (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.180 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	24,835 cuft
Drainage area	=	2.364 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Coefficients	Shape factor	=	484

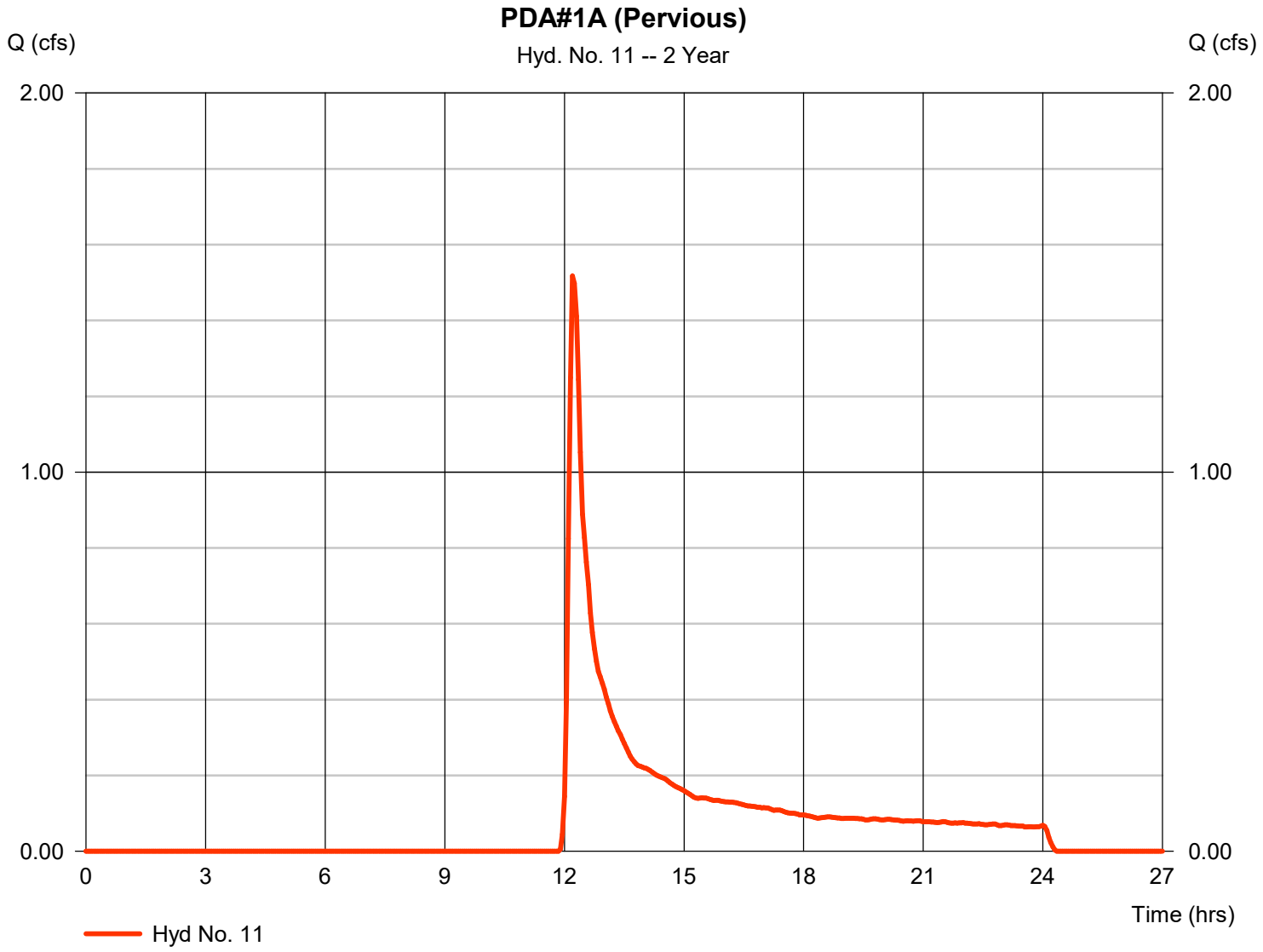


Hydrograph Report

Hyd. No. 11

PDA#1A (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.518 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	7,758 cuft
Drainage area	=	4.326 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.70 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sheet.tcd	Shape factor	=	484

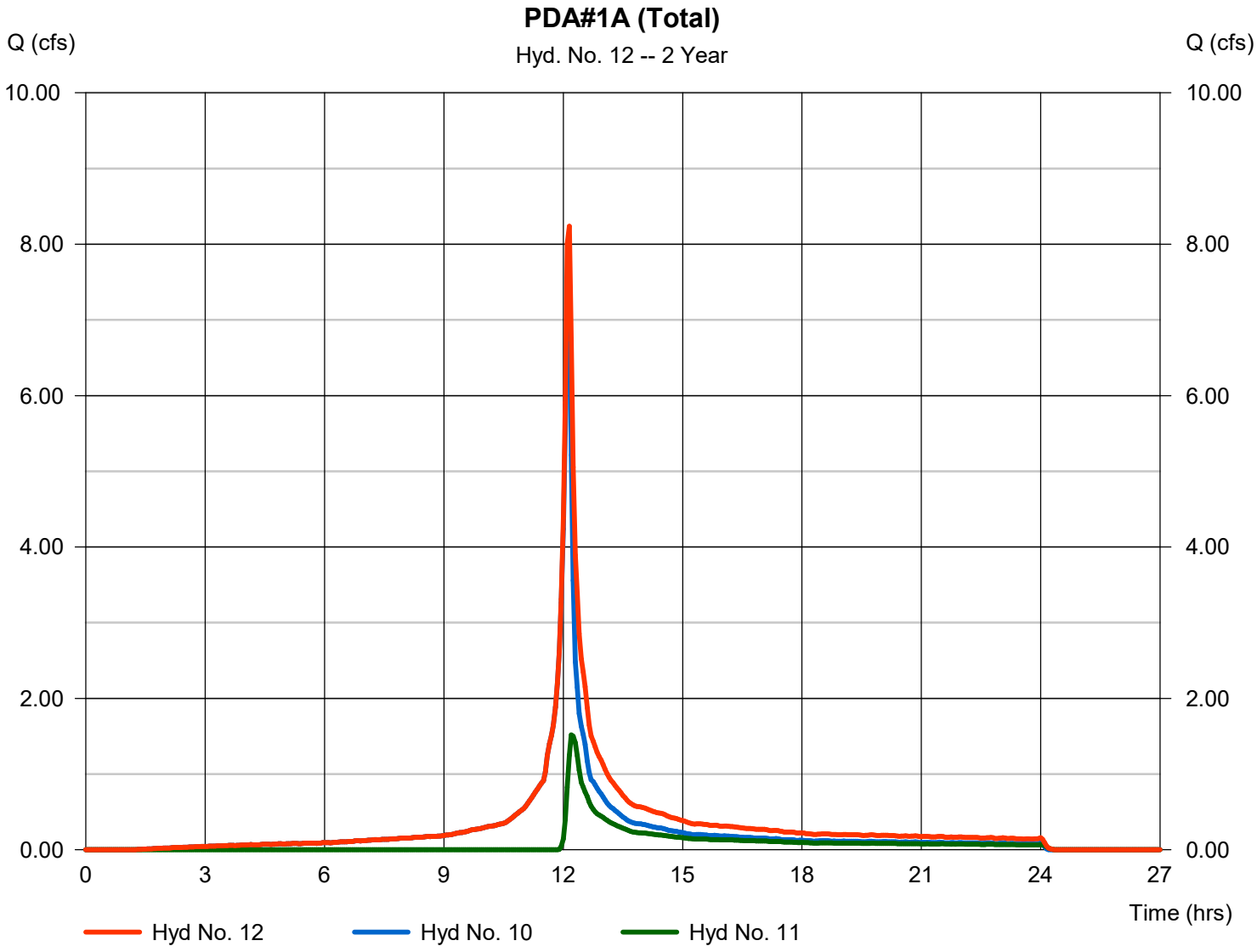


Hydrograph Report

Hyd. No. 12

PDA#1A (Total)

Hydrograph type	= Combine	Peak discharge	= 8.237 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.15 hrs
Time interval	= 3 min	Hyd. volume	= 32,593 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 6.690 ac



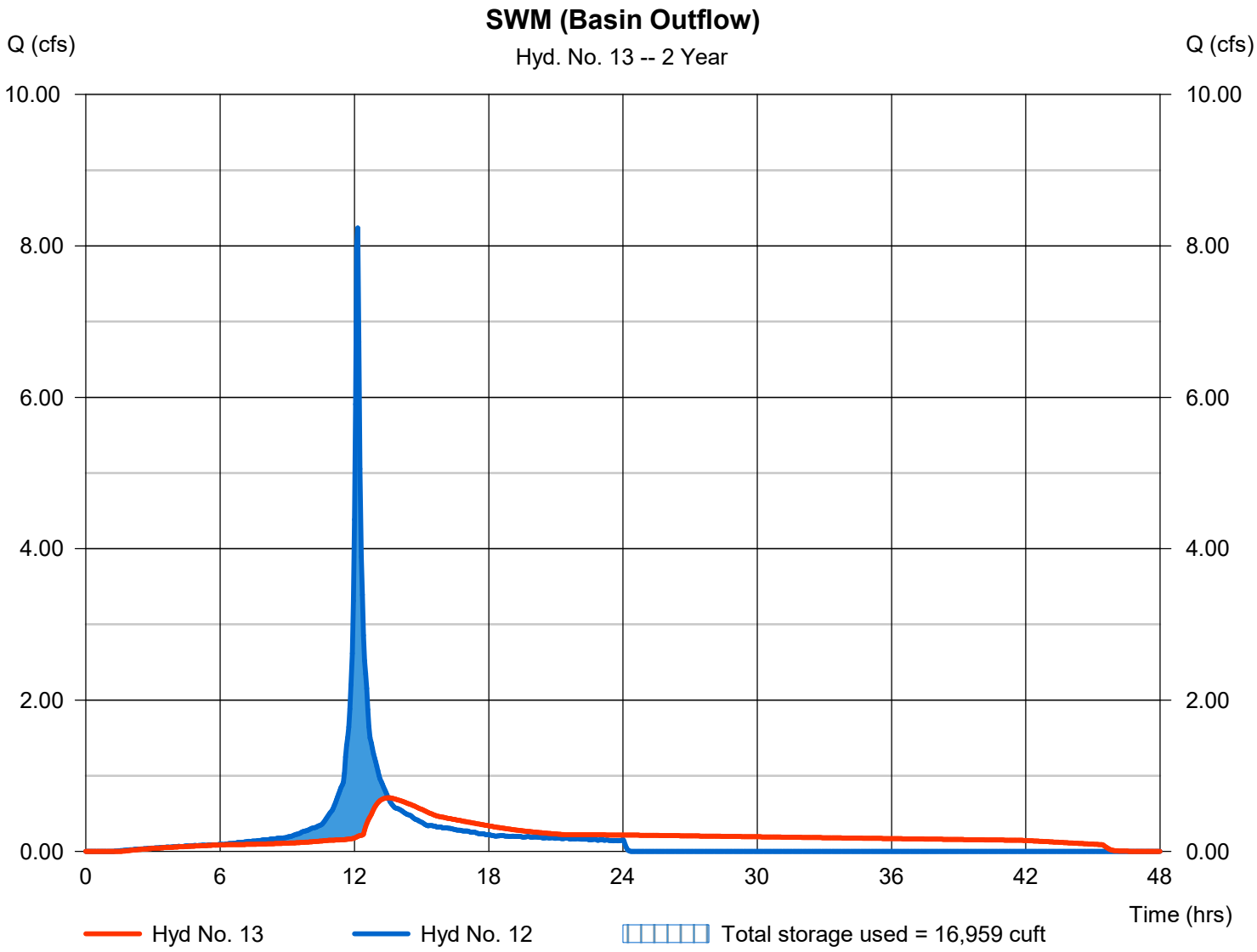
Hydrograph Report

Hyd. No. 13

SWM (Basin Outflow)

Hydrograph type	=	Reservoir	Peak discharge	=	0.710 cfs
Storm frequency	=	2 yrs	Time to peak	=	13.50 hrs
Time interval	=	3 min	Hyd. volume	=	32,590 cuft
Inflow hyd. No.	=	12 - PDA#1A (Total)	Max. Elevation	=	94.15 ft
Reservoir name	=	Basin	Max. Storage	=	16,959 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 92.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	92.10	01	0	0
0.40	92.50	702	97	97
0.90	93.00	6,248	1,507	1,604
1.90	94.00	19,367	12,204	13,808
2.90	95.00	21,610	20,476	34,285
3.90	96.00	23,954	22,770	57,054
4.40	96.50	27,025	12,736	69,790

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	0.00	0.00
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 90.00	92.10	0.00	0.00
Length (ft)	= 33.00	0.00	0.00	0.00
Slope (%)	= 6.60	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	2.30	20.00	0.00
Crest El. (ft)	= 95.30	94.00	95.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

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	92.10	0.00	0.00	---	---	0.00	0.00	0.00	---	---	---	0.000
0.40	97	92.50	15.86 ic	0.09 ic	---	---	0.00	0.00	0.00	---	---	---	0.089
0.90	1,604	93.00	15.86 ic	0.15 ic	---	---	0.00	0.00	0.00	---	---	---	0.146
1.90	13,808	94.00	15.86 ic	0.22 ic	---	---	0.00	0.00	0.00	---	---	---	0.220
2.90	34,285	95.00	15.86 ic	0.27 ic	---	---	0.00	7.66	0.00	---	---	---	7.933
3.90	57,054	96.00	33.09 ic	0.08 ic	---	---	22.40 s	10.61 s	18.38	---	---	---	51.47
4.40	69,790	96.50	35.26 ic	0.04 ic	---	---	26.54 s	8.67 s	52.00	---	---	---	87.25

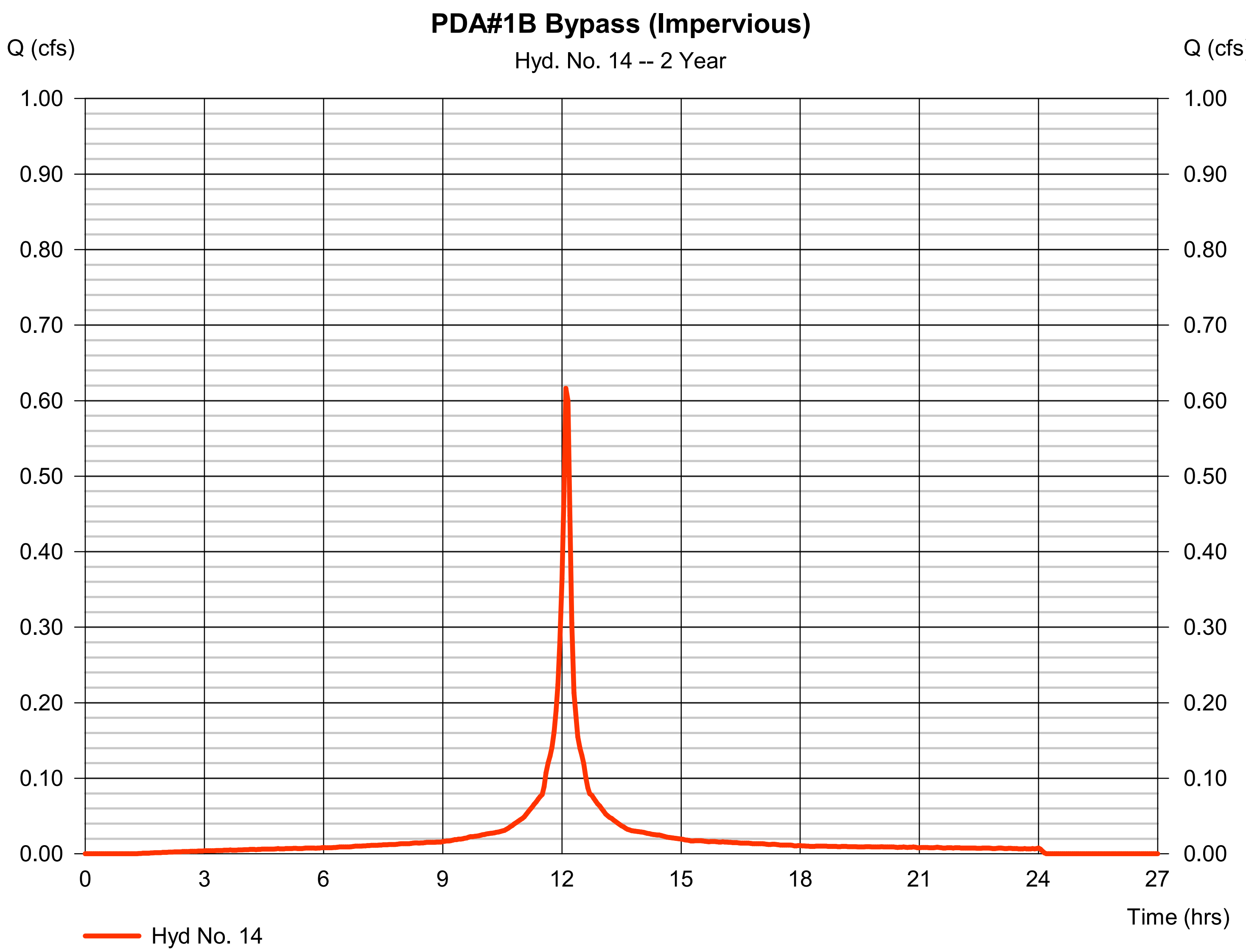
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 14

PDA#1B Bypass (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.617 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 2,133 cuft
Drainage area	= 0.203 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.32 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

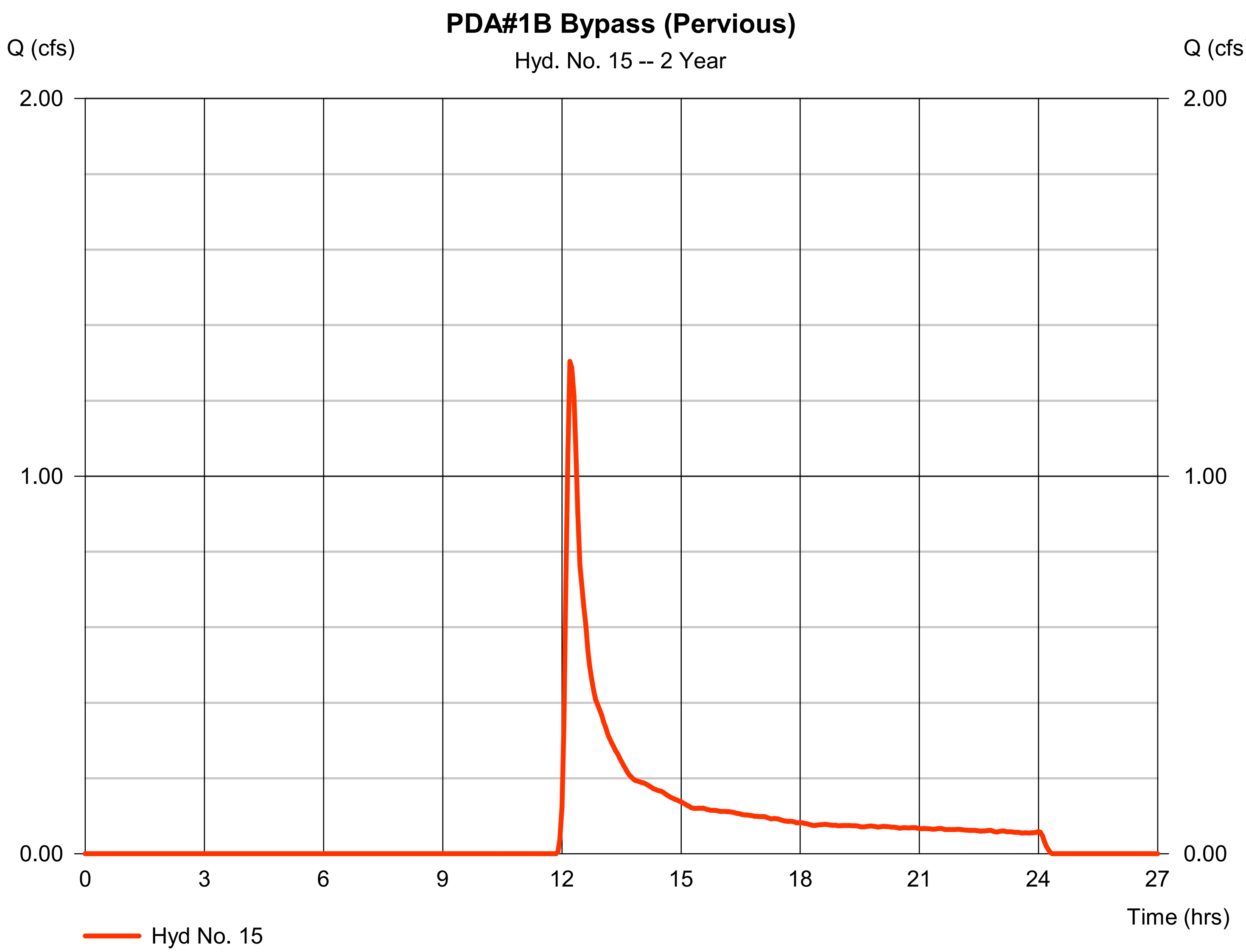


Hydrograph Report

Hyd. No. 15

PDA#1B Bypass (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.304 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 6,666 cuft
Drainage area	= 3.717 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.30 min
Total precip.	= 3.32 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

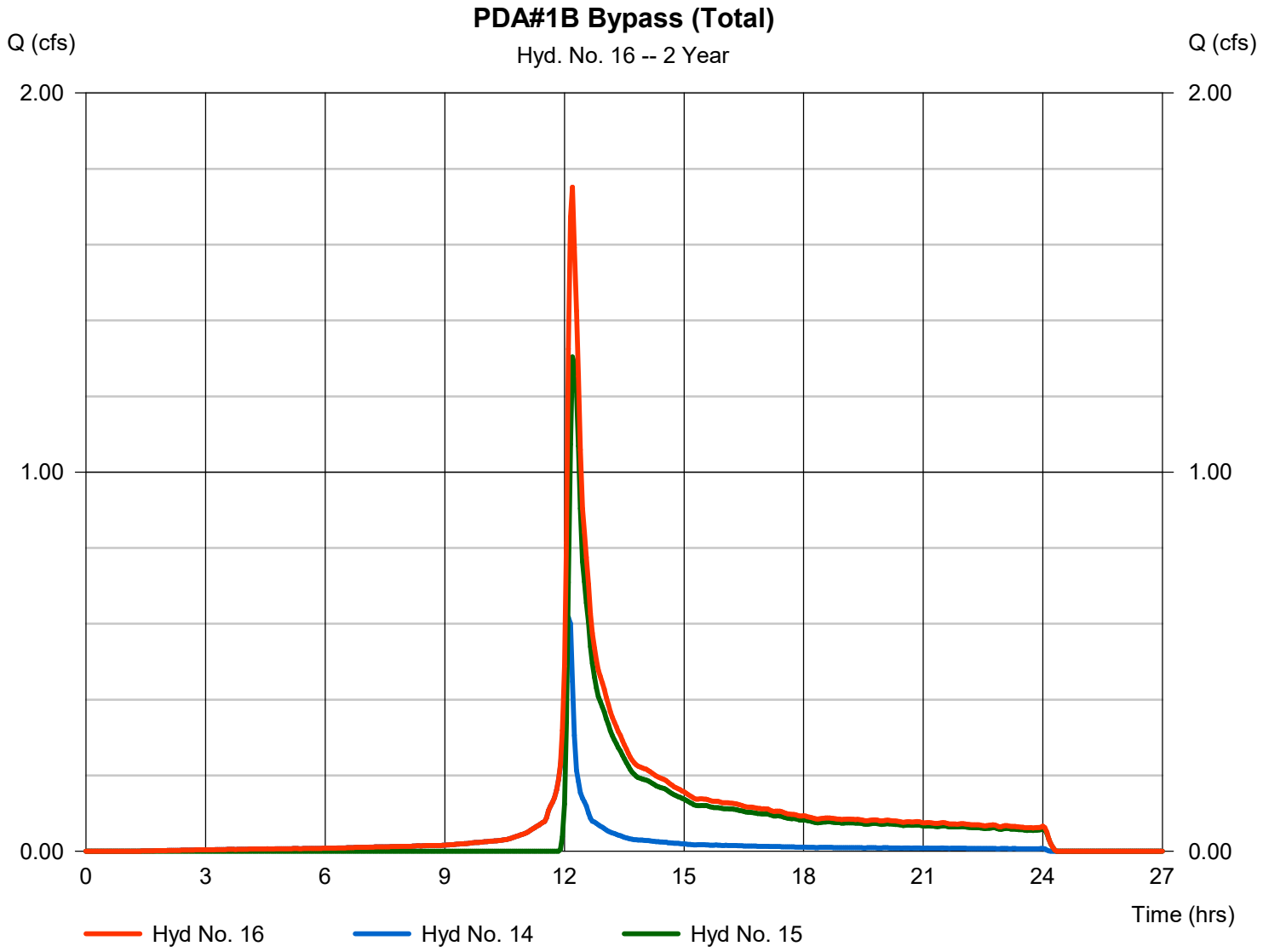


Hydrograph Report

Hyd. No. 16

PDA#1B Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 1.752 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 8,798 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 3.920 ac

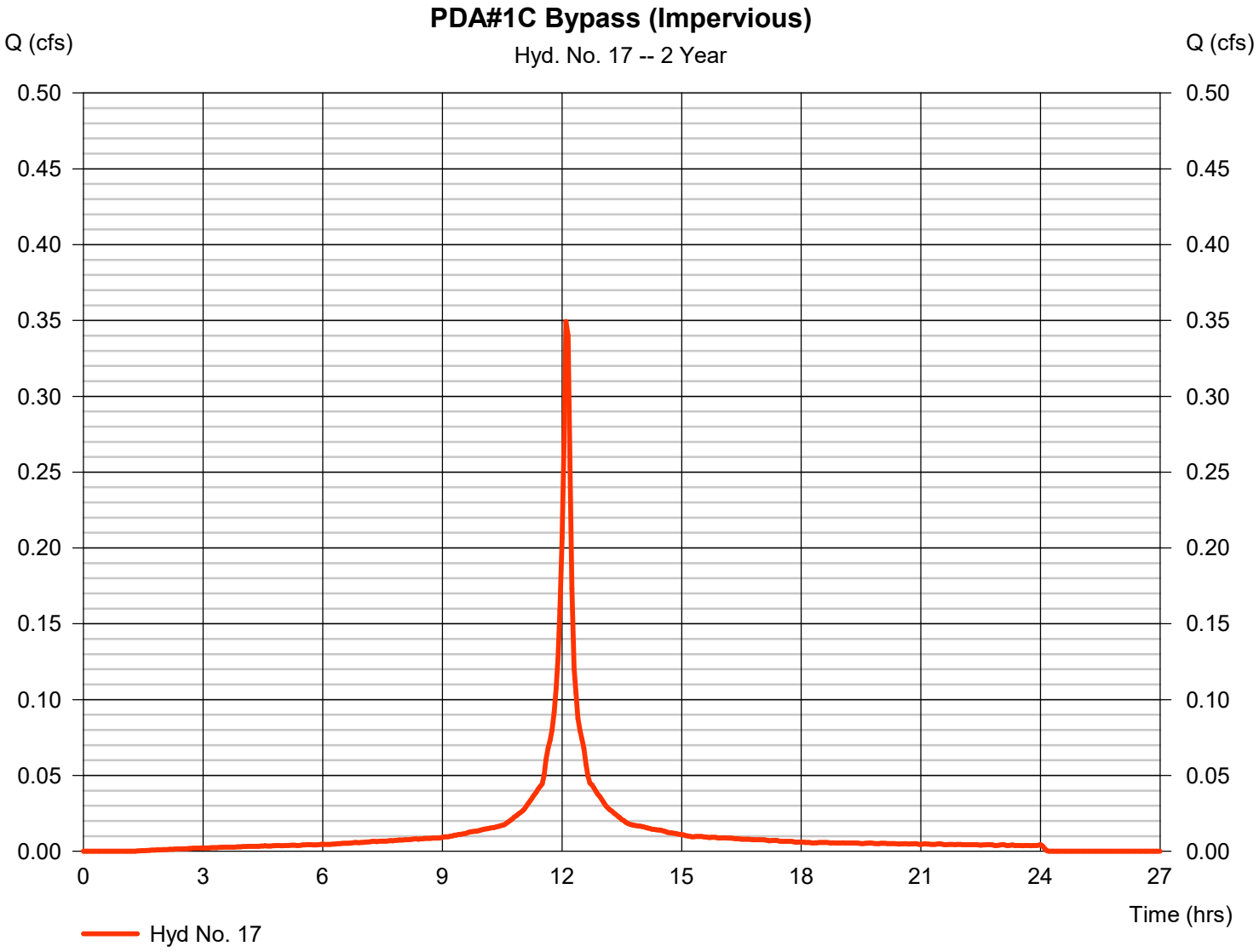


Hydrograph Report

Hyd. No. 17

PDA#1C Bypass (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.349 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	1,208 cuft
Drainage area	=	0.115 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sc_1 factors		=	484



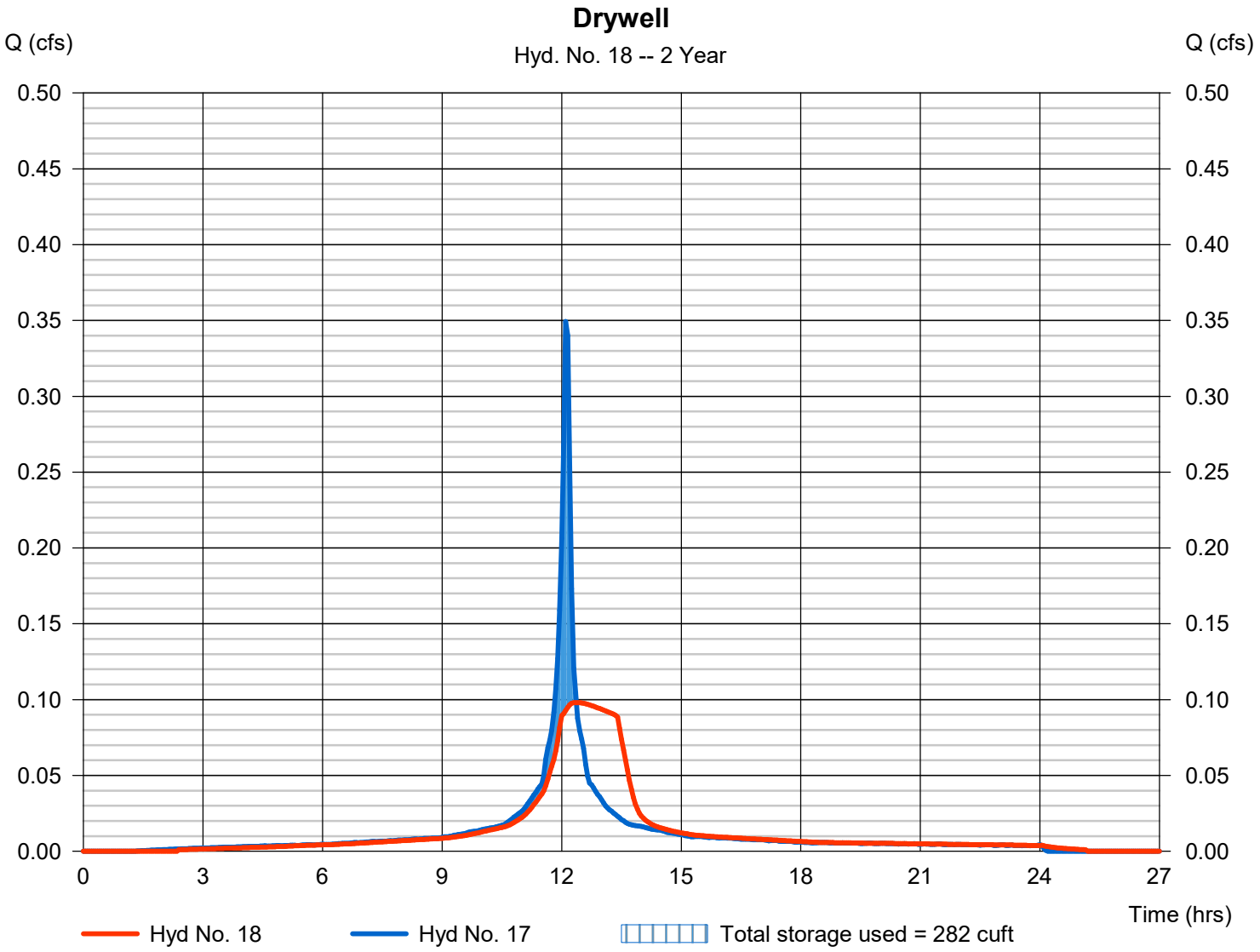
Hydrograph Report

Hyd. No. 18

Drywell

Hydrograph type	=	Reservoir	Peak discharge	=	0.098 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.35 hrs
Time interval	=	3 min	Hyd. volume	=	1,205 cuft
Inflow hyd. No.	=	17 - PDA#1C Bypass (Impervious)	Max. Elevation	=	92.56 ft
Reservoir name	=	Basin	Max. Storage	=	282 cuft

Storage Indication method used.



Pond No. 1 - Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 92.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	92.10	01	0	0
0.40	92.50	702	97	97
0.90	93.00	6,248	1,507	1,604
1.90	94.00	19,367	12,204	13,808
2.90	95.00	21,610	20,476	34,285
3.90	96.00	23,954	22,770	57,054
4.40	96.50	27,025	12,736	69,790

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	0.00	0.00
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 90.00	92.10	0.00	0.00
Length (ft)	= 33.00	0.00	0.00	0.00
Slope (%)	= 6.60	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	2.30	20.00	0.00
Crest El. (ft)	= 95.30	94.00	95.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

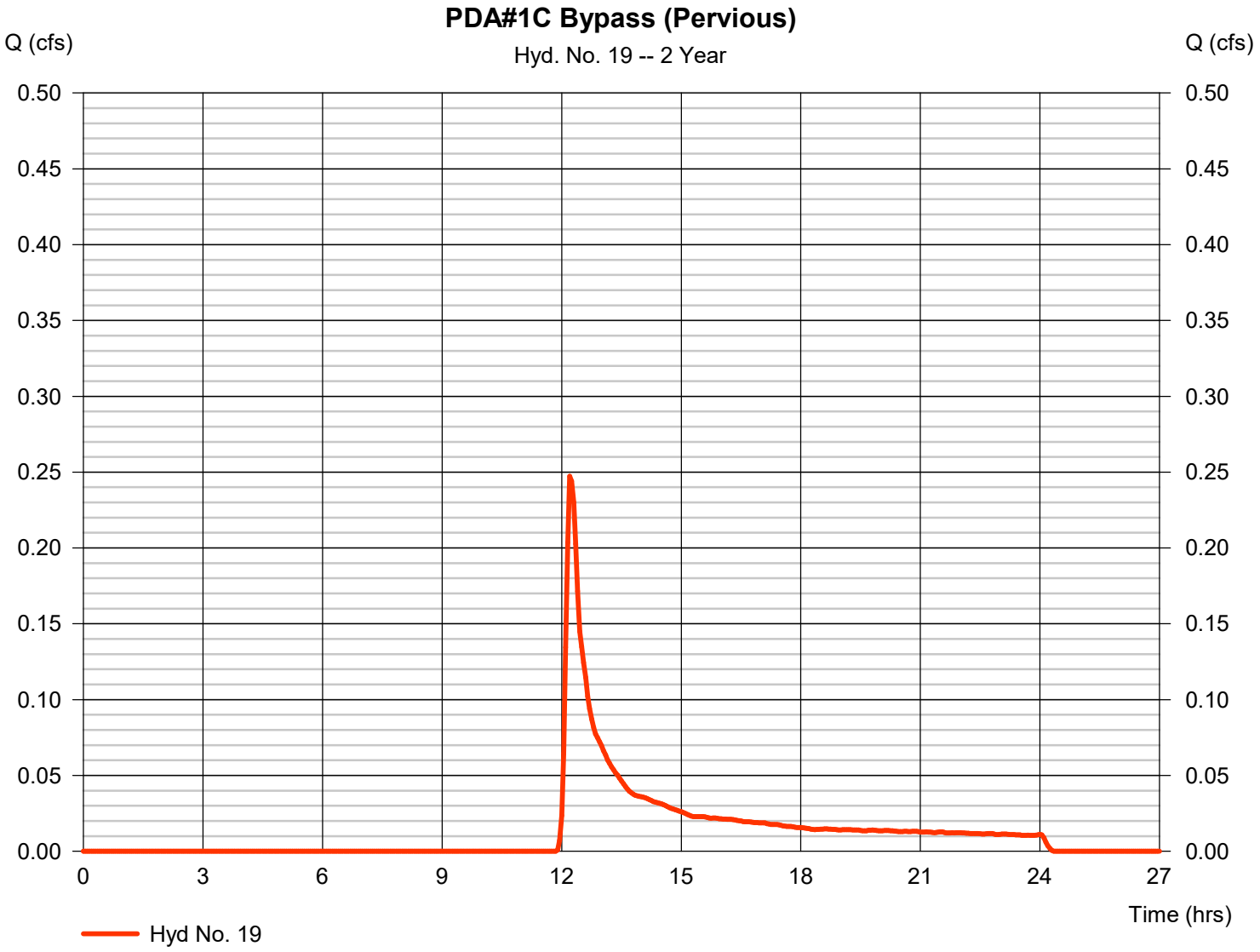
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	92.10	0.00	0.00	---	---	0.00	0.00	0.00	---	---	---	0.000
0.40	97	92.50	15.86 ic	0.09 ic	---	---	0.00	0.00	0.00	---	---	---	0.089
0.90	1,604	93.00	15.86 ic	0.15 ic	---	---	0.00	0.00	0.00	---	---	---	0.146
1.90	13,808	94.00	15.86 ic	0.22 ic	---	---	0.00	0.00	0.00	---	---	---	0.220
2.90	34,285	95.00	15.86 ic	0.27 ic	---	---	0.00	7.66	0.00	---	---	---	7.933
3.90	57,054	96.00	33.09 ic	0.08 ic	---	---	22.40 s	10.61 s	18.38	---	---	---	51.47
4.40	69,790	96.50	35.26 ic	0.04 ic	---	---	26.54 s	8.67 s	52.00	---	---	---	87.25

Hydrograph Report

Hyd. No. 19

PDA#1C Bypass (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.247 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	1,264 cuft
Drainage area	=	0.705 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.10 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sc_1 factors			

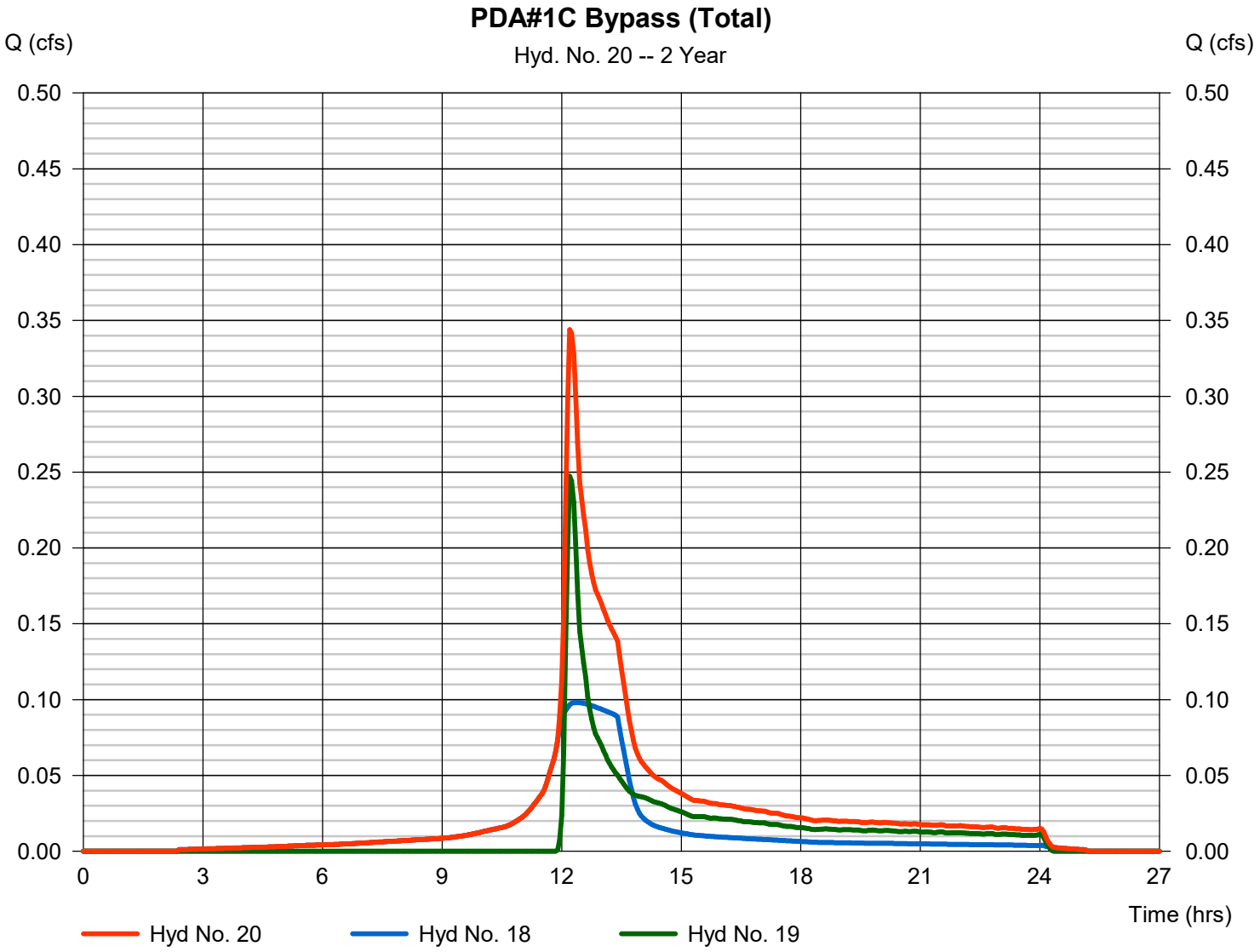


Hydrograph Report

Hyd. No. 20

PDA#1C Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 0.344 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 2,469 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 0.705 ac

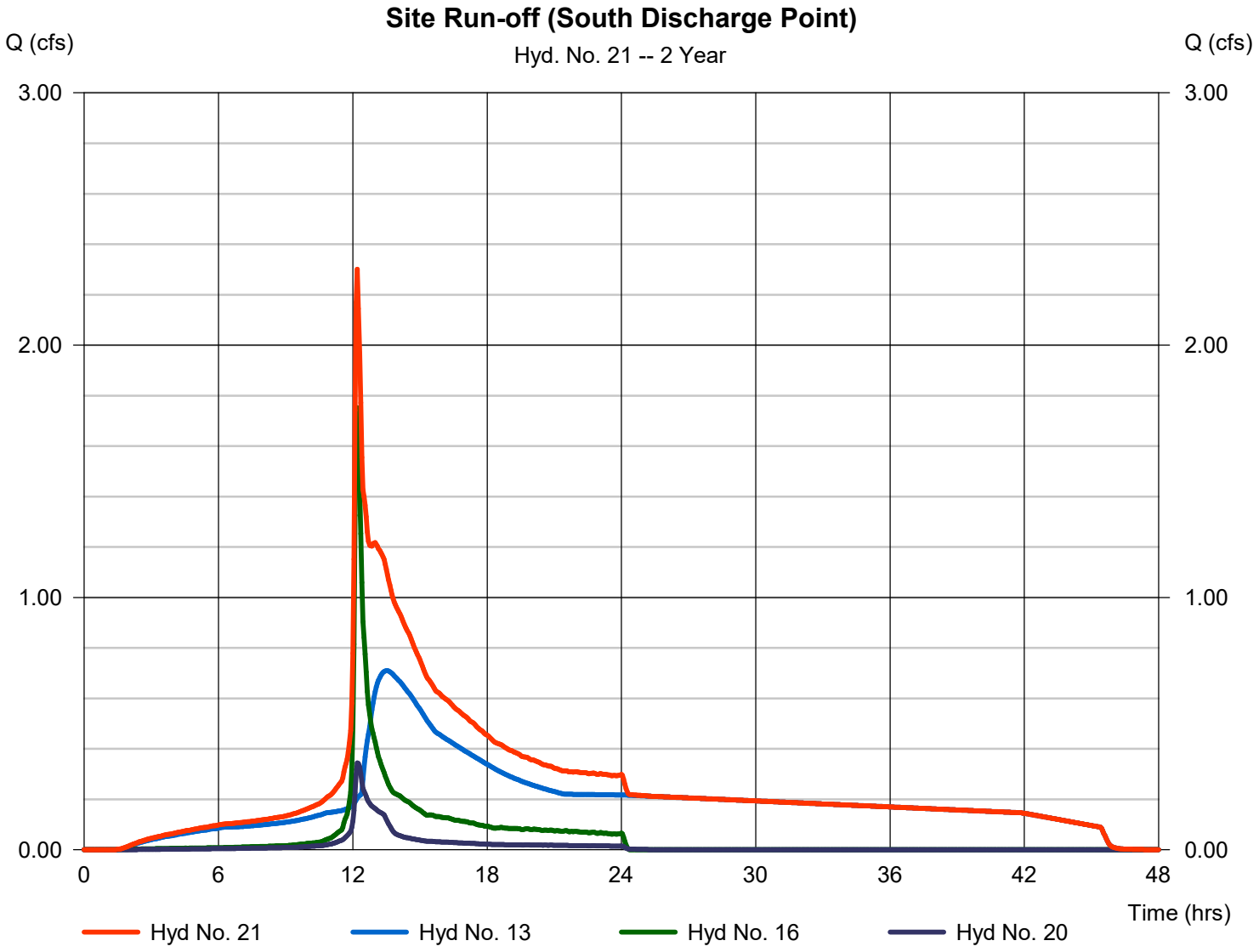


Hydrograph Report

Hyd. No. 21

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 2.301 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 43,858 cuft
Inflow hyds.	= 13, 16, 20	Contrib. drain. area	= 0.000 ac

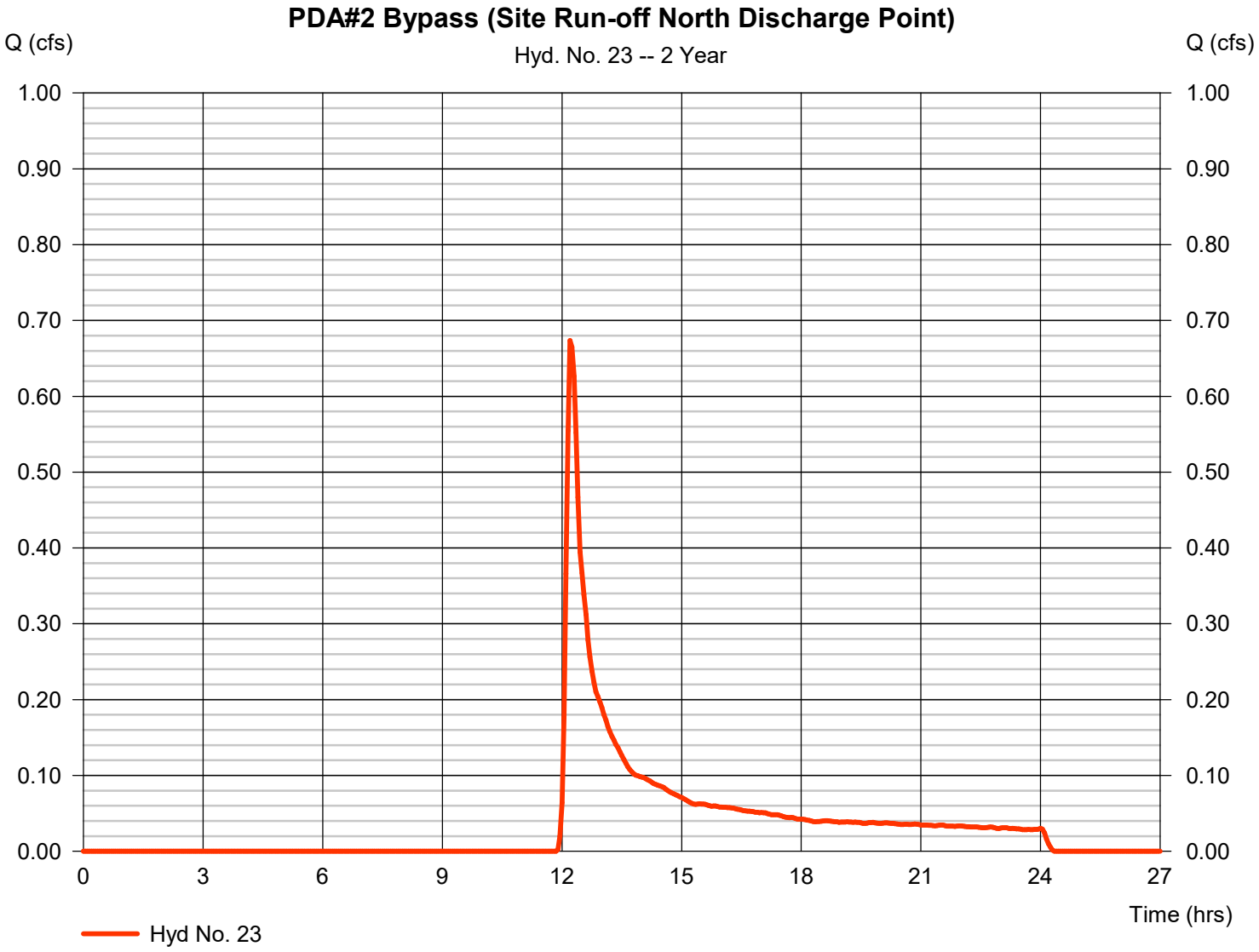


Hydrograph Report

Hyd. No. 23

PDA#2 Bypass (Site Run-off North Discharge Point)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.674 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	3,443 cuft
Drainage area	=	1.920 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.70 min
Total precip.	=	3.32 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA_Cumulative.tcd	Shape factor	=	484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

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
2	SCS Runoff	4.528	3	726	14,468	------	------	------	EDA#1 (Impervious)
3	SCS Runoff	12.23	3	735	54,639	------	------	------	EDA#1 (Pervious)
4	Combine	14.77	3	732	69,107	2, 3	------	------	Site Run-off (South Discharge Point)
6	SCS Runoff	0.075	3	726	263	------	------	------	EDA#2 (Impervious)
7	SCS Runoff	2.571	3	732	9,806	------	------	------	EDA#2 (Pervious)
8	Combine	2.625	3	732	10,069	6, 7	------	------	Site Run-off (North Discharge Point)
10	SCS Runoff	11.04	3	726	38,882	------	------	------	PDA#1A (Impervious)
11	SCS Runoff	5.811	3	732	22,162	------	------	------	PDA#1A (Pervious)
12	Combine	16.13	3	729	61,044	10, 11	------	------	PDA#1A (Total)
13	Reservoir	3.844	3	756	61,041	12	94.60	26,160	SWM (Basin Outflow)
14	SCS Runoff	0.948	3	726	3,339	------	------	------	PDA#1B Bypass (Impervious)
15	SCS Runoff	4.993	3	732	19,042	------	------	------	PDA#1B Bypass (Pervious)
16	Combine	5.680	3	732	22,381	14, 15	------	------	PDA#1B Bypass (Total)
17	SCS Runoff	0.537	3	726	1,891	------	------	------	PDA#1C Bypass (Impervious)
18	Reservoir	0.108	3	753	1,888	17	92.64	520	Drywell
19	SCS Runoff	0.947	3	732	3,612	------	------	------	PDA#1C Bypass (Pervious)
20	Combine	1.052	3	732	5,500	18, 19	------	------	PDA#1C Bypass (Total)
21	Combine	8.606	3	732	88,923	13, 16, 20	------	------	Site Run-off (South Discharge Point)
23	SCS Runoff	2.579	3	732	9,836	------	------	------	PDA#2 Bypass (Site Run-off North Di

Hydrograph Report

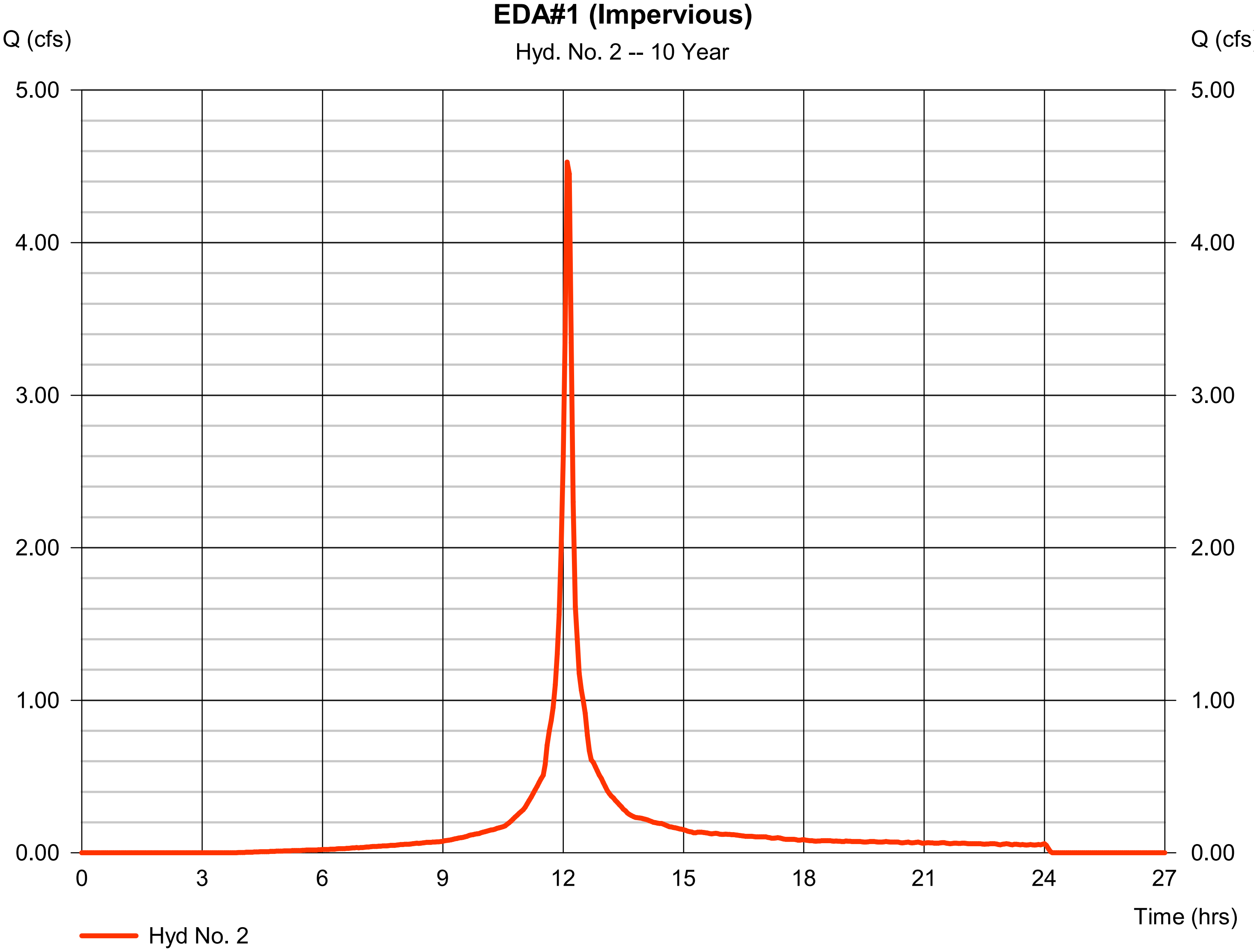
Hyd. No. 2

EDA#1 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 4.528 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 14,468 cuft
Drainage area	= 1.078 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

EDA#1 (Impervious)

Hyd. No. 2 -- 10 Year



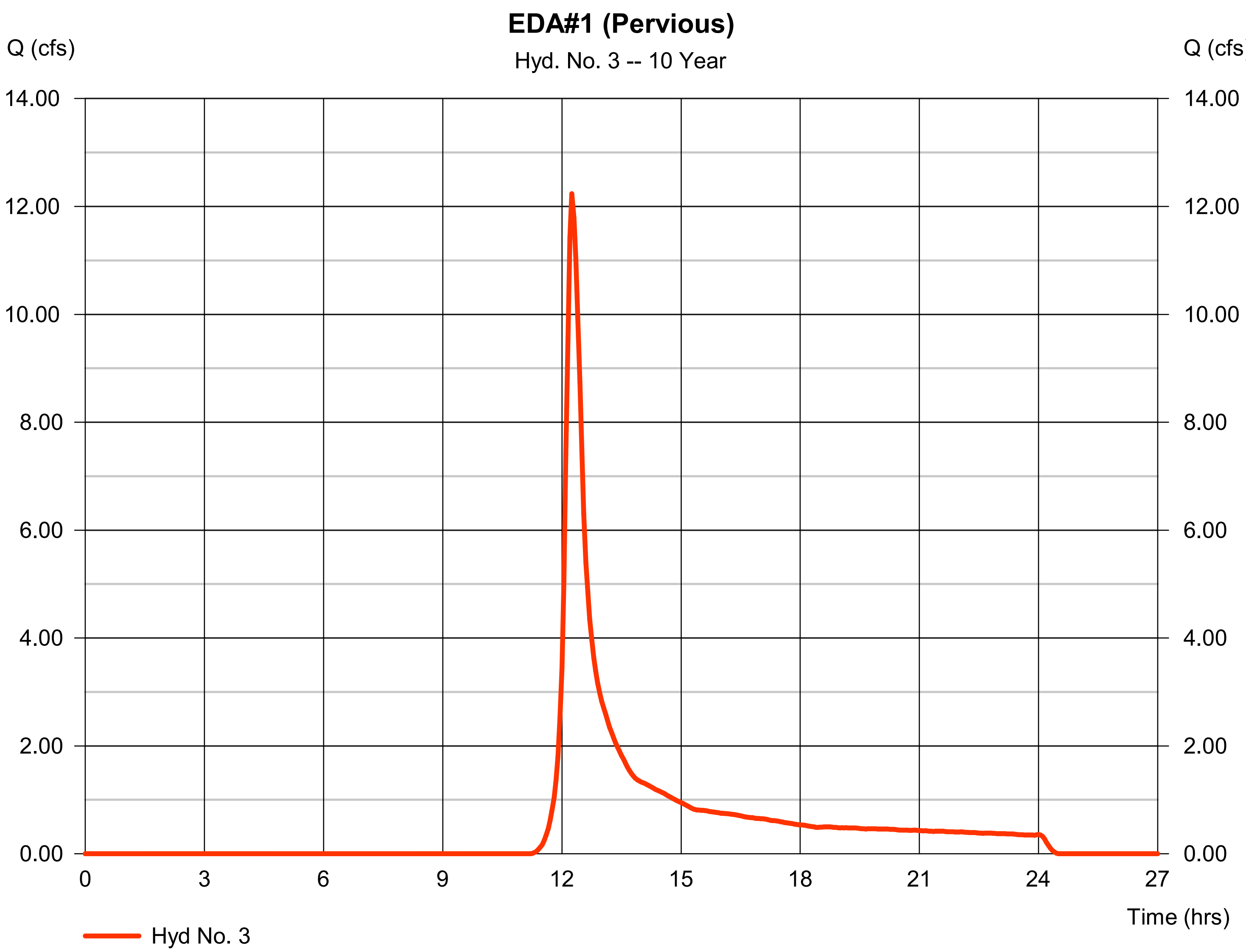
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 3

EDA#1 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 12.23 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.25 hrs
Time interval	= 3 min	Hyd. volume	= 54,639 cuft
Drainage area	= 10.342 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.10 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

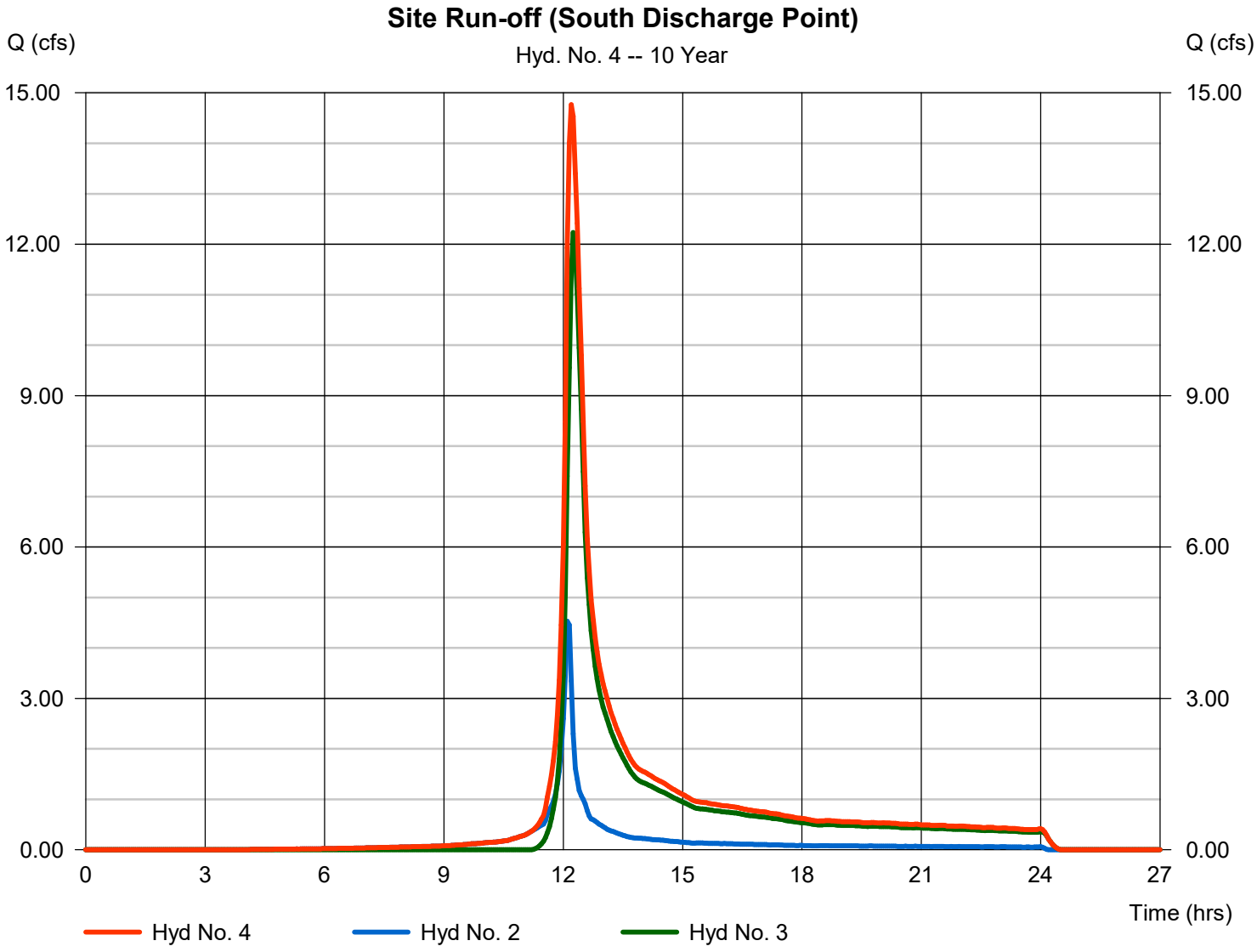


Hydrograph Report

Hyd. No. 4

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 14.77 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 69,107 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 11.420 ac

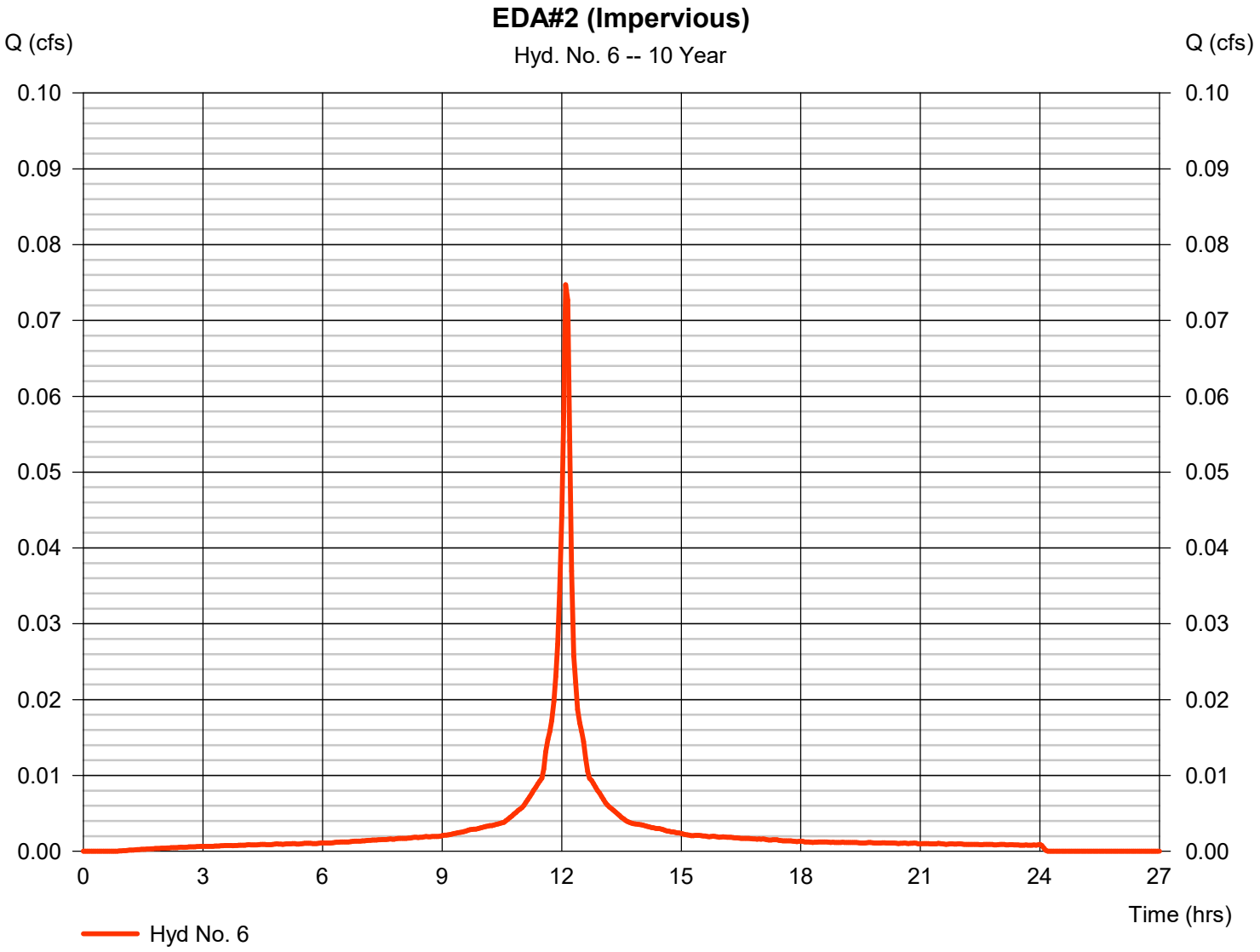


Hydrograph Report

Hyd. No. 6

EDA#2 (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.075 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	263 cuft
Drainage area	=	0.016 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.07 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Supplemental_1_factors	Shape factor	=	484



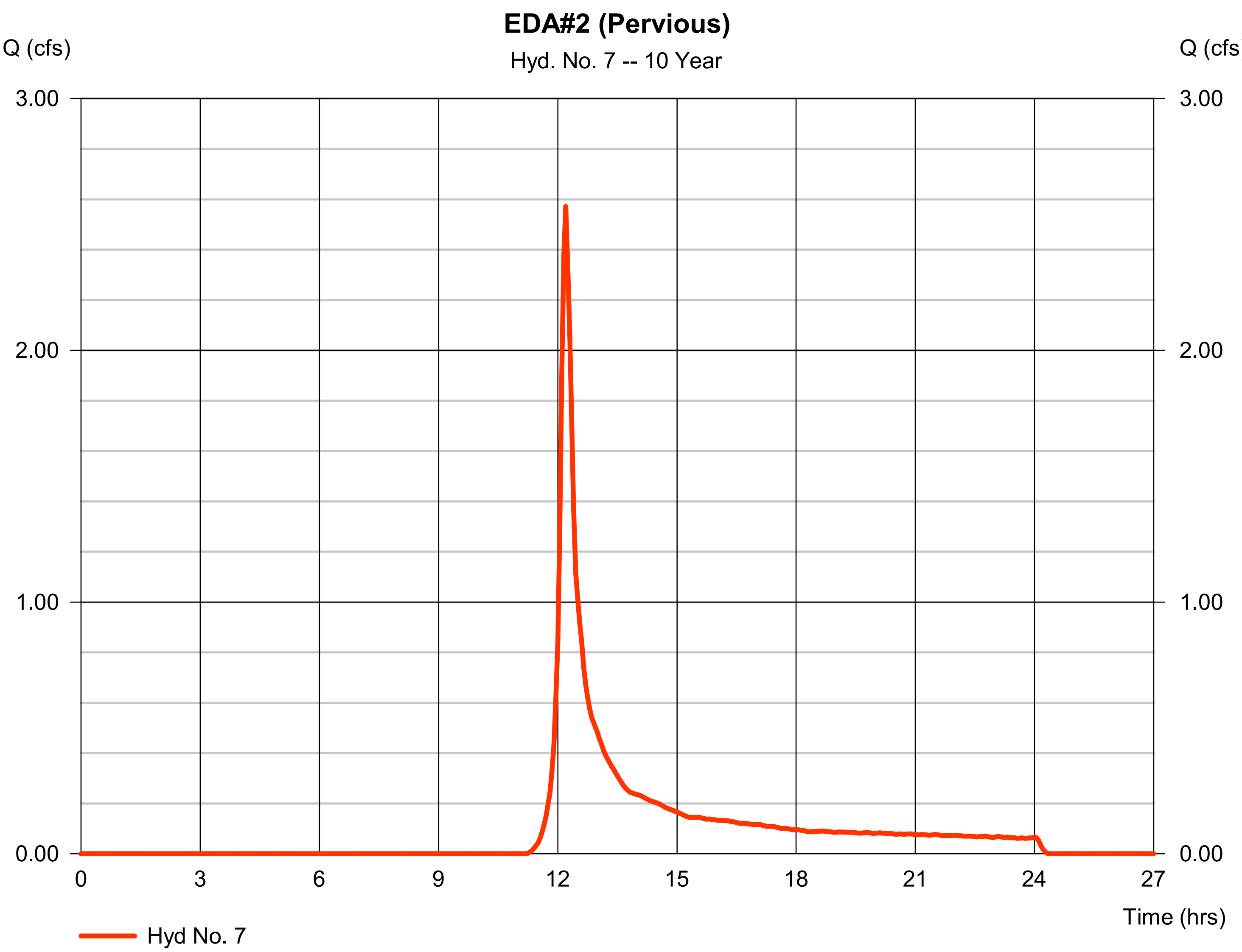
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 7

EDA#2 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.571 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 9,806 cuft
Drainage area	= 1.914 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.20 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

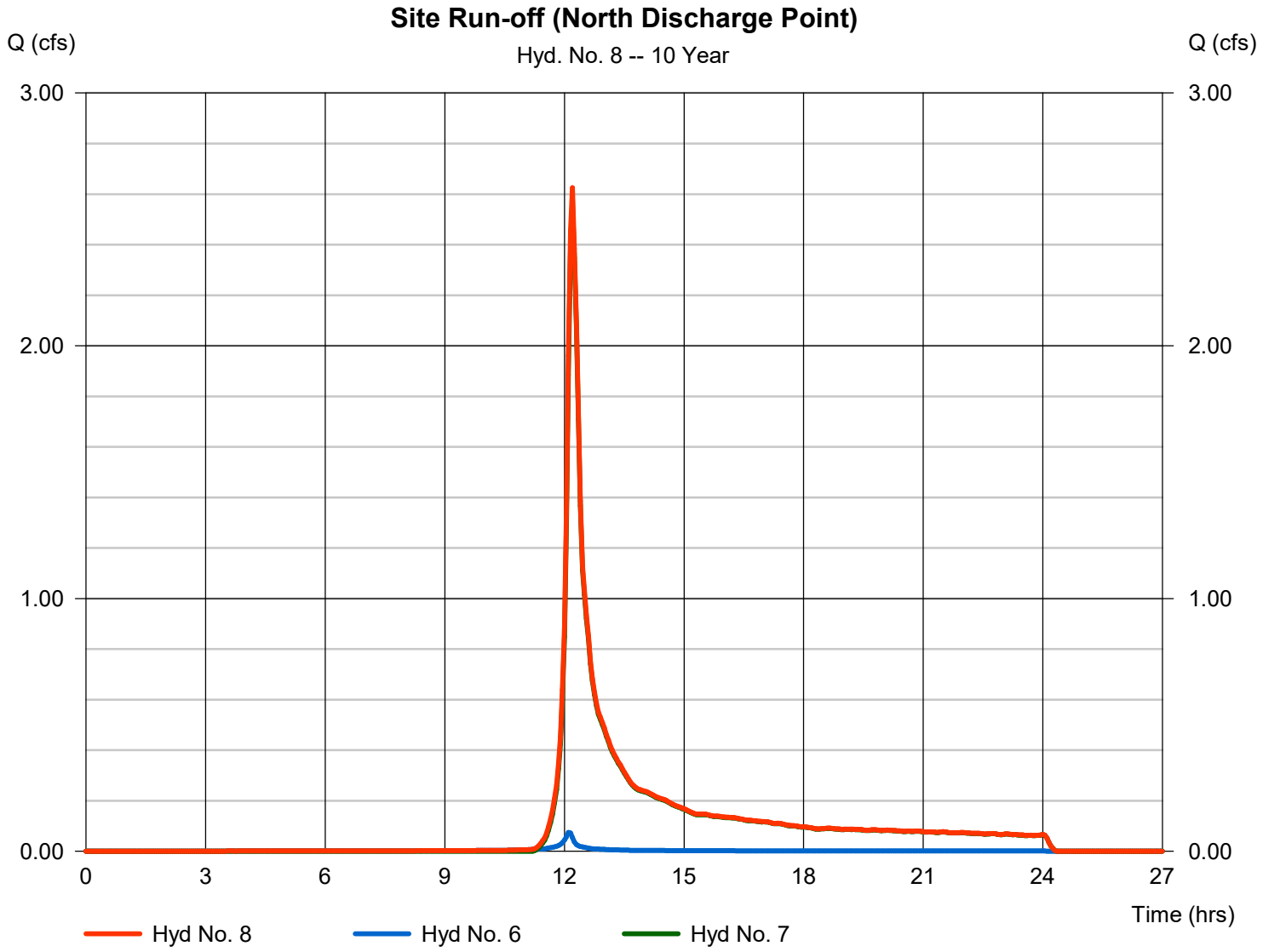


Hydrograph Report

Hyd. No. 8

Site Run-off (North Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 2.625 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 10,069 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.930 ac

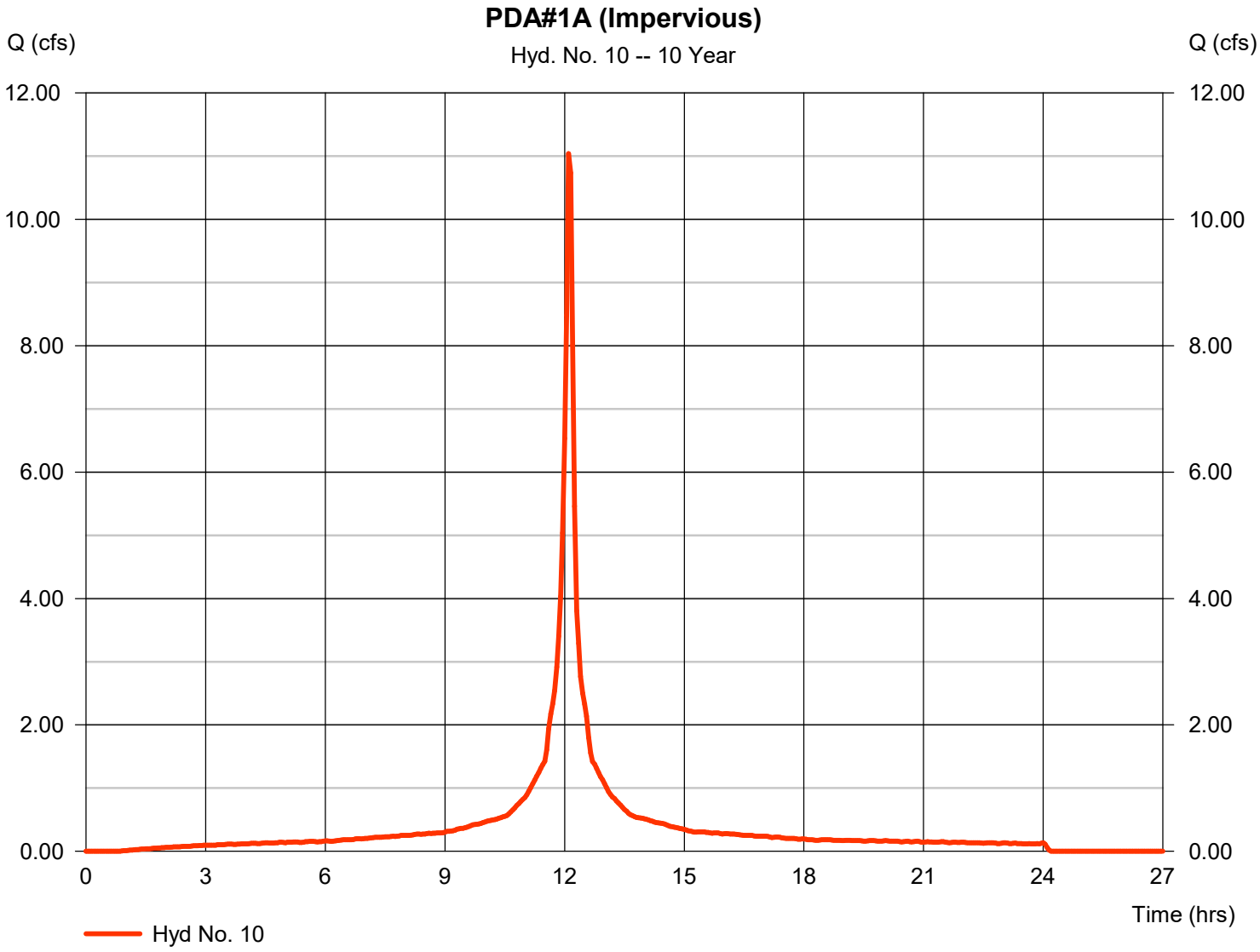


Hydrograph Report

Hyd. No. 10

PDA#1A (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.04 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	38,882 cuft
Drainage area	=	2.364 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	5.07 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sheets\24 hr.tcd	Shape factor	=	484

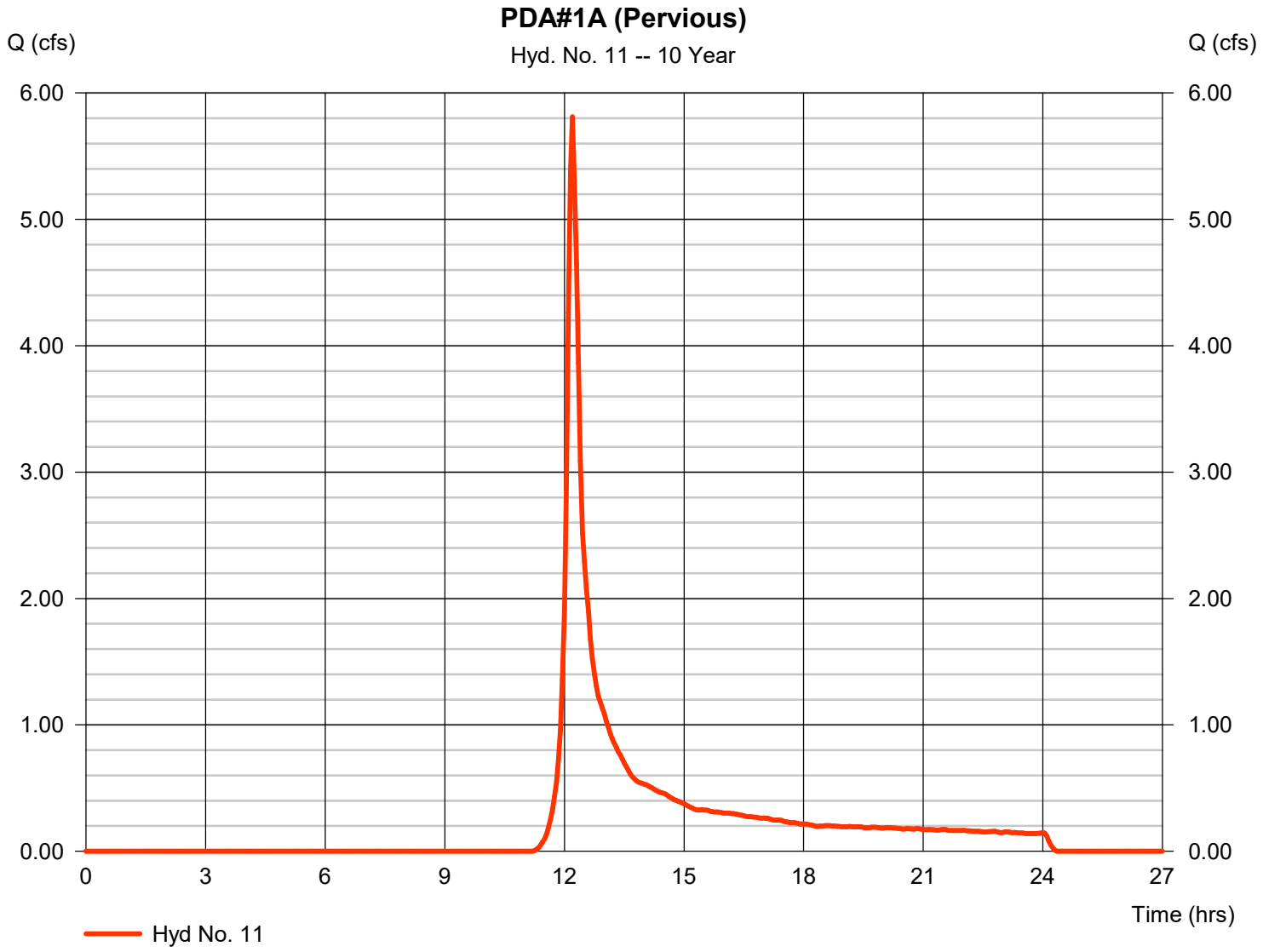


Hydrograph Report

Hyd. No. 11

PDA#1A (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.811 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	22,162 cuft
Drainage area	=	4.326 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.70 min
Total precip.	=	5.07 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Data\24hr.cd	Shape factor	=	484

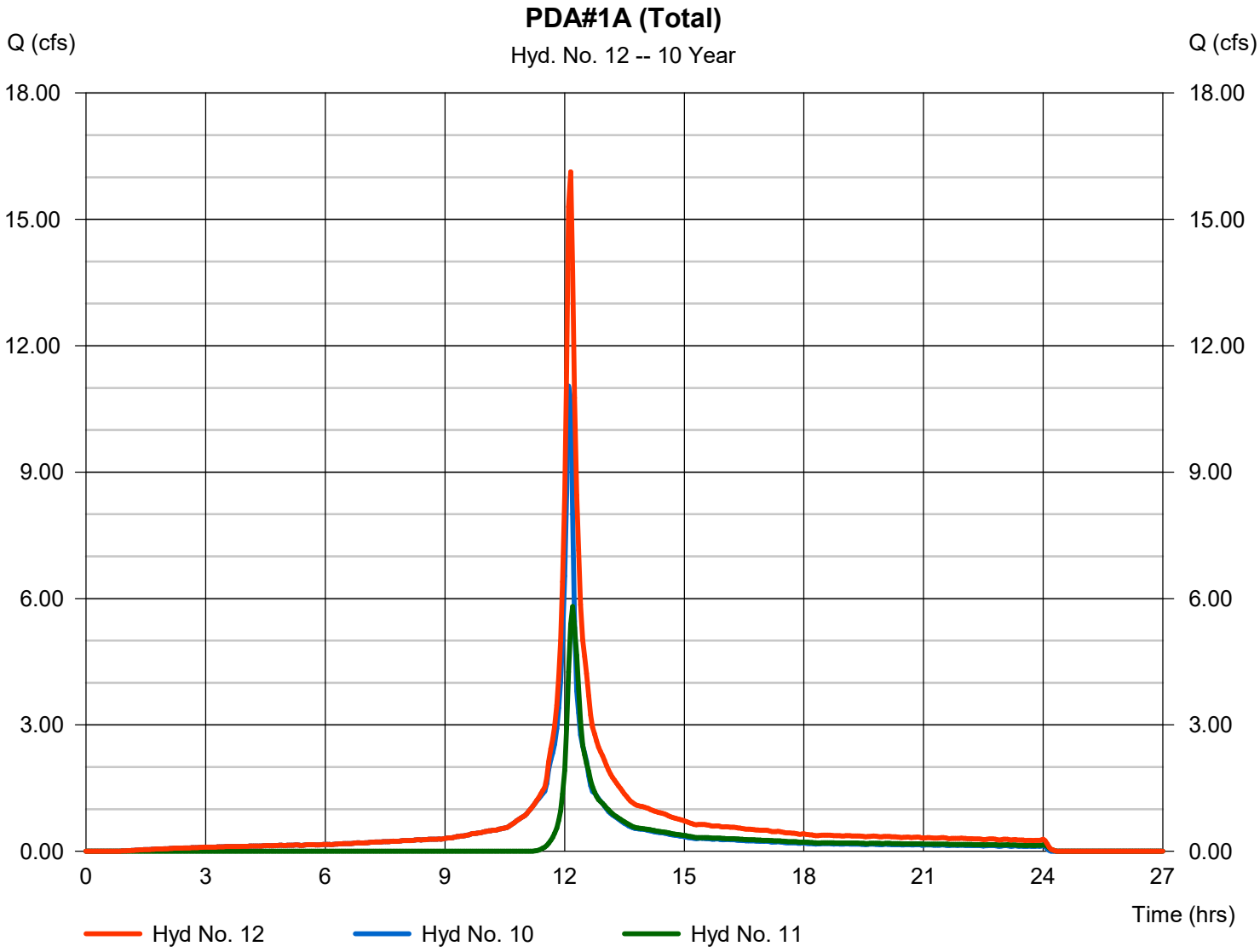


Hydrograph Report

Hyd. No. 12

PDA#1A (Total)

Hydrograph type	= Combine	Peak discharge	= 16.13 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.15 hrs
Time interval	= 3 min	Hyd. volume	= 61,044 cuft
Inflow hyds.	= 10, 11	Contrib. drain. area	= 6.690 ac



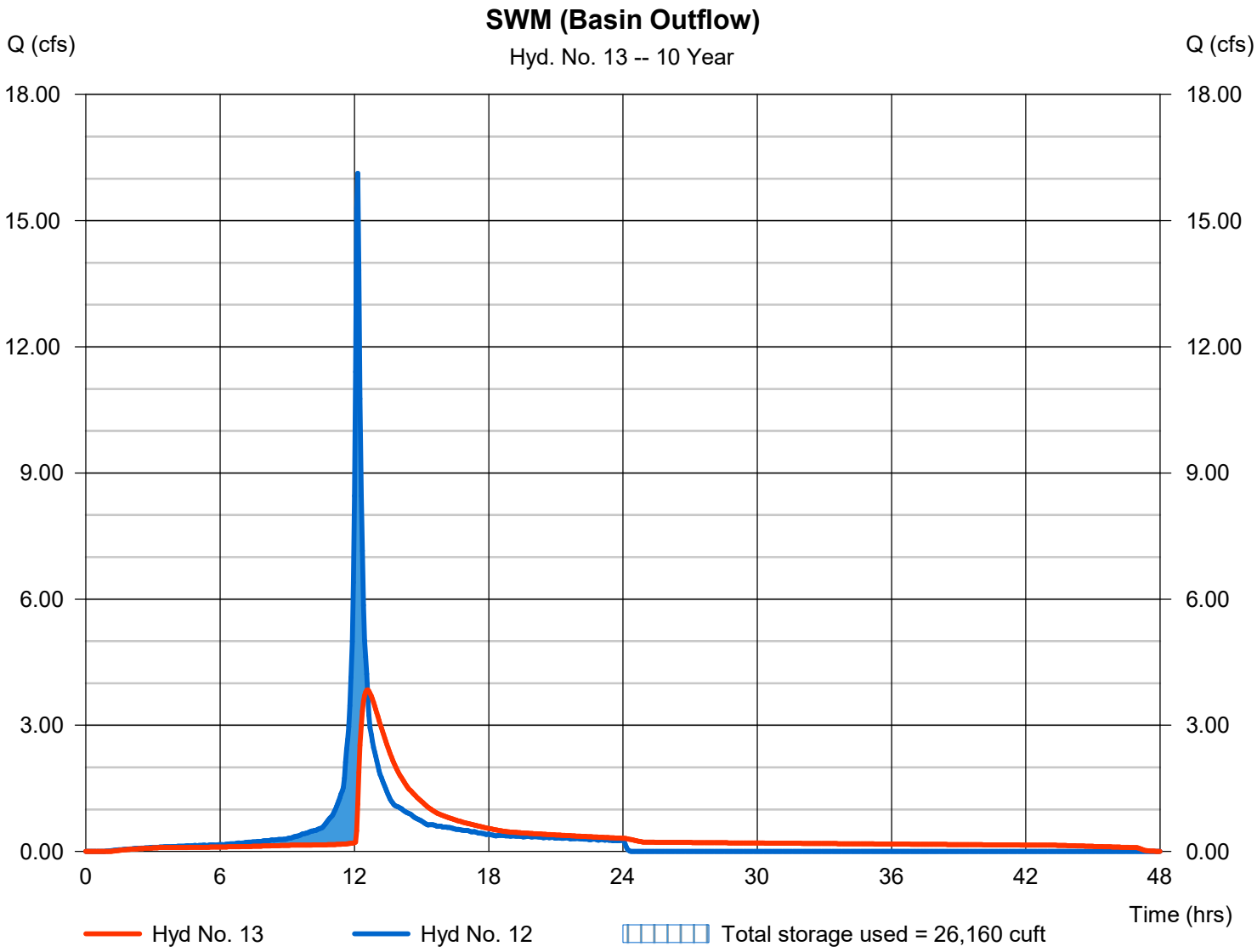
Hydrograph Report

Hyd. No. 13

SWM (Basin Outflow)

Hydrograph type	=	Reservoir	Peak discharge	=	3.844 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.60 hrs
Time interval	=	3 min	Hyd. volume	=	61,041 cuft
Inflow hyd. No.	=	12 - PDA#1A (Total)	Max. Elevation	=	94.60 ft
Reservoir name	=	Basin	Max. Storage	=	26,160 cuft

Storage Indication method used.



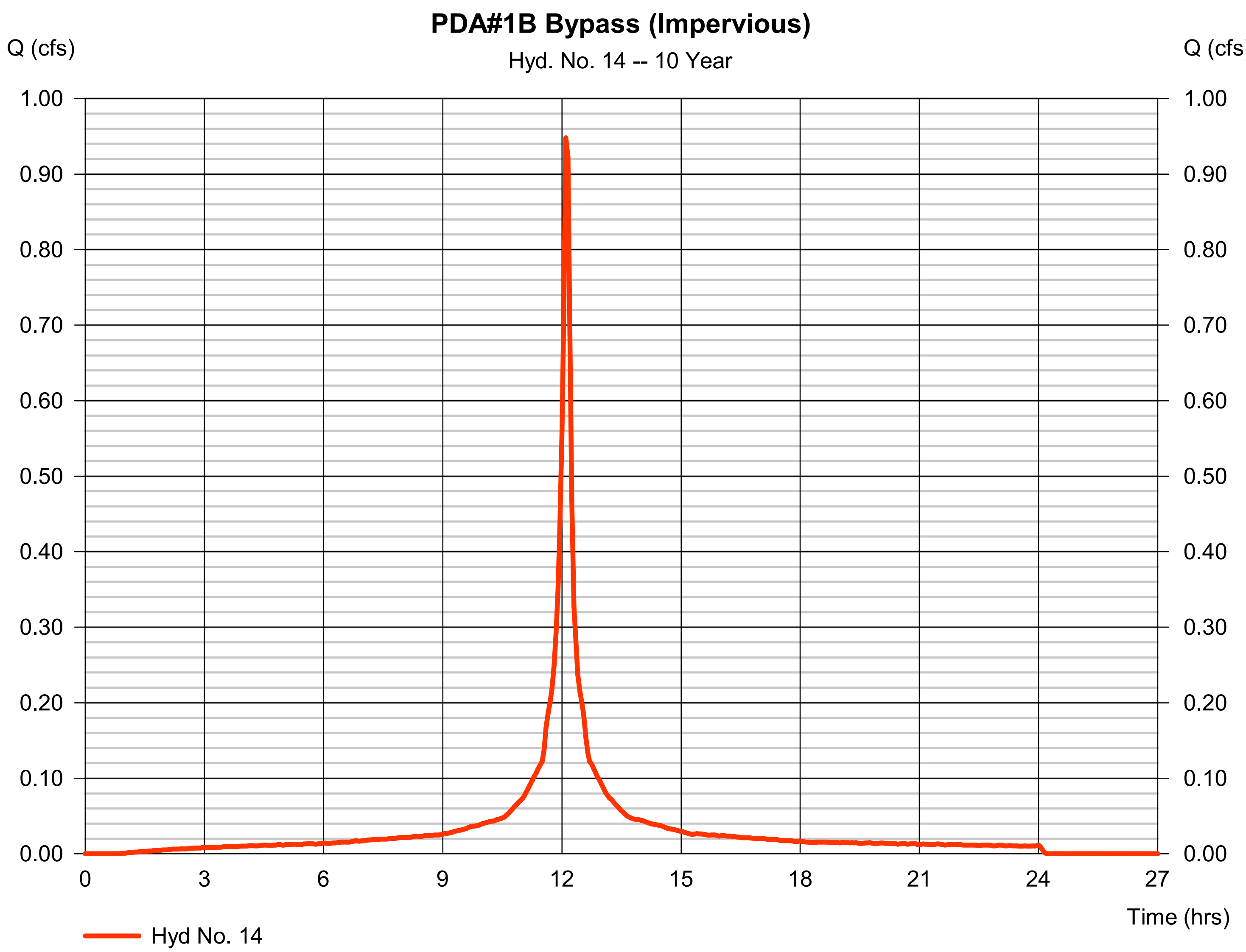
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 — Thursday, 07 / 9 / 2020

Hyd. No. 14

PDA#1B Bypass (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.948 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 3,339 cuft
Drainage area	= 0.203 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

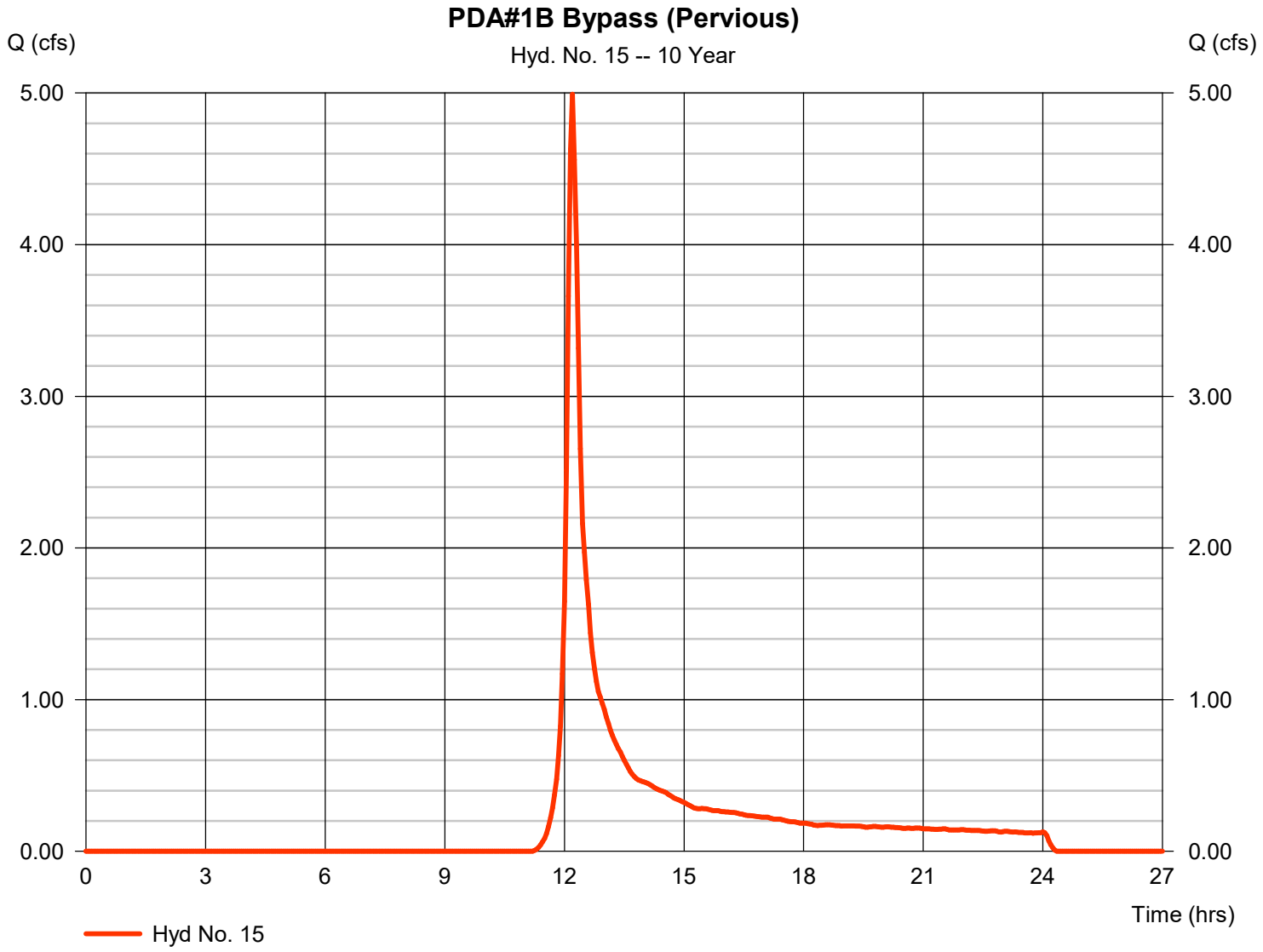


Hydrograph Report

Hyd. No. 15

PDA#1B Bypass (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.993 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	19,042 cuft
Drainage area	=	3.717 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.30 min
Total precip.	=	5.07 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sc_1 factors	Storm frequency	=	484

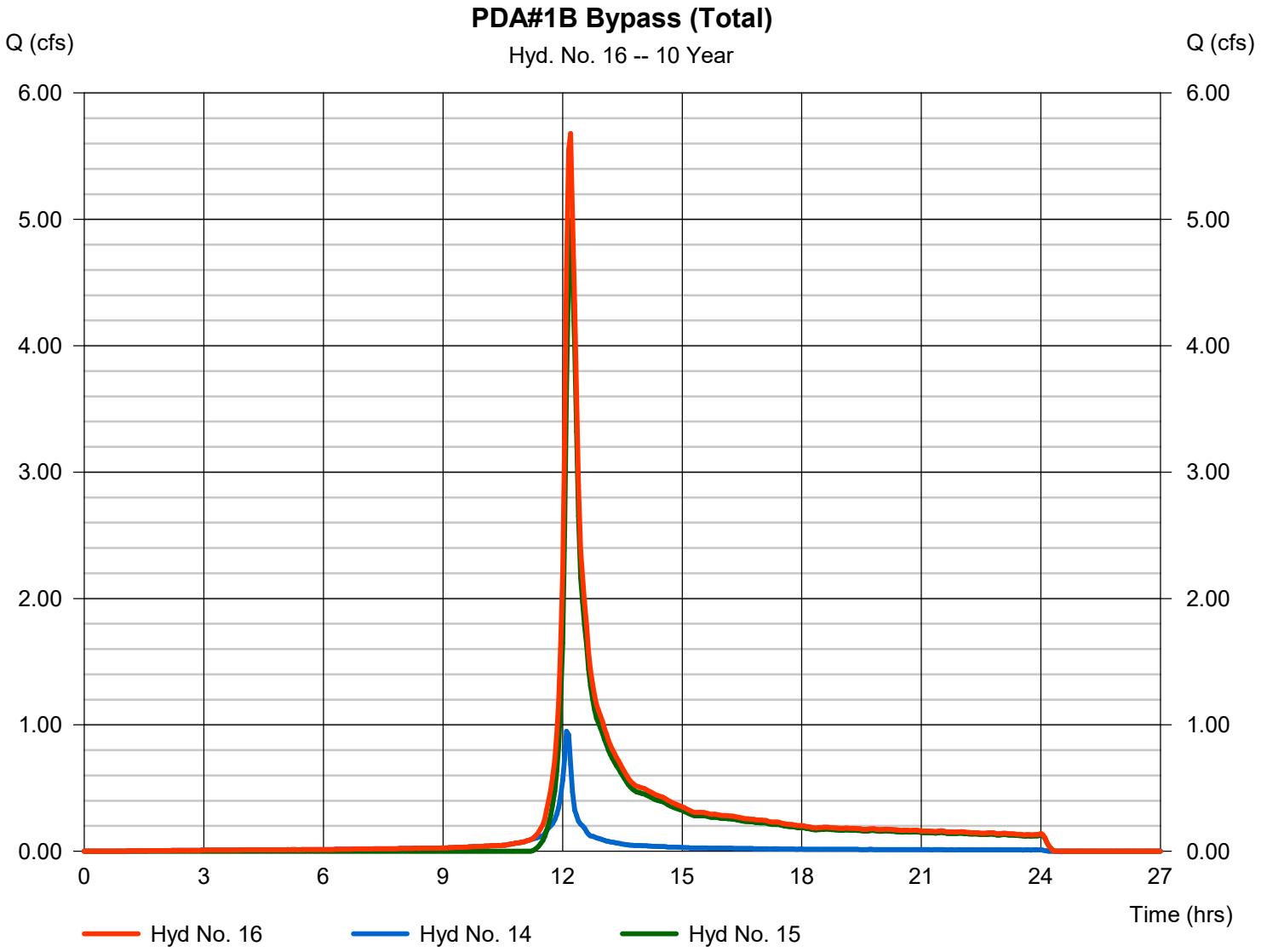


Hydrograph Report

Hyd. No. 16

PDA#1B Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 5.680 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 22,381 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 3.920 ac



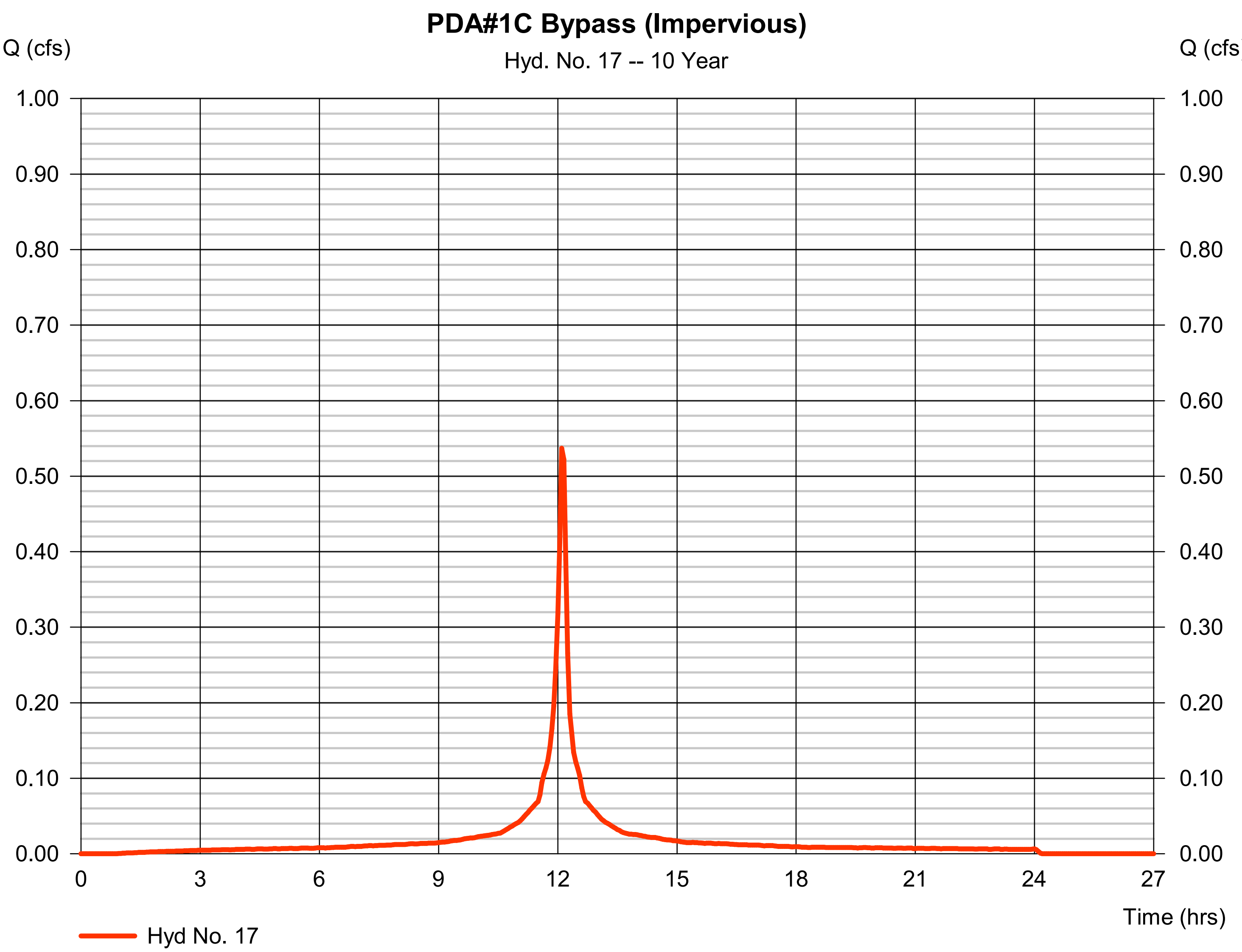
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 17

PDA#1C Bypass (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.537 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,891 cuft
Drainage area	= 0.115 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484



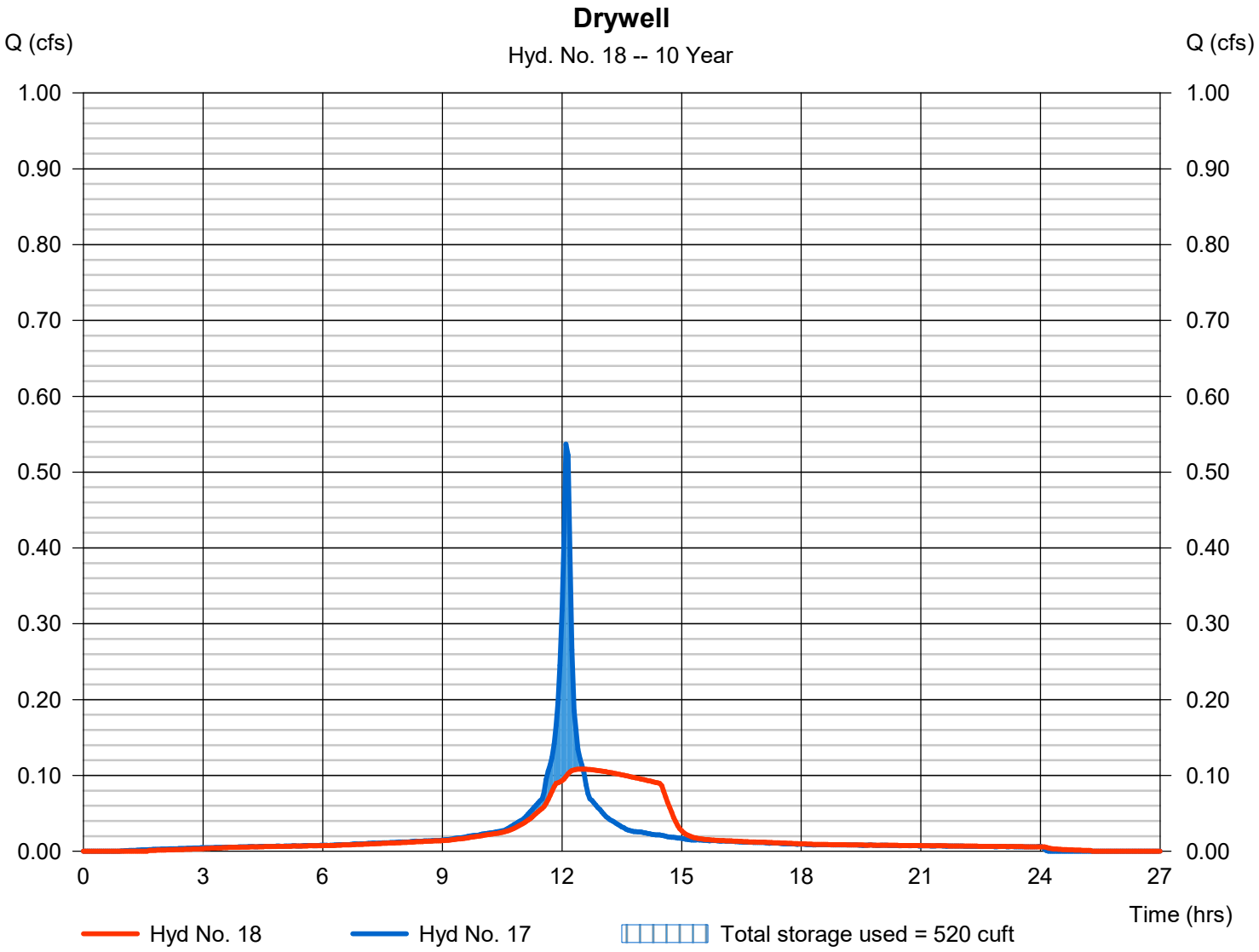
Hydrograph Report

Hyd. No. 18

Drywell

Hydrograph type	=	Reservoir	Peak discharge	=	0.108 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.55 hrs
Time interval	=	3 min	Hyd. volume	=	1,888 cuft
Inflow hyd. No.	=	17 - PDA#1C Bypass (Impervious)	Max. Elevation	=	92.64 ft
Reservoir name	=	Basin	Max. Storage	=	520 cuft

Storage Indication method used.

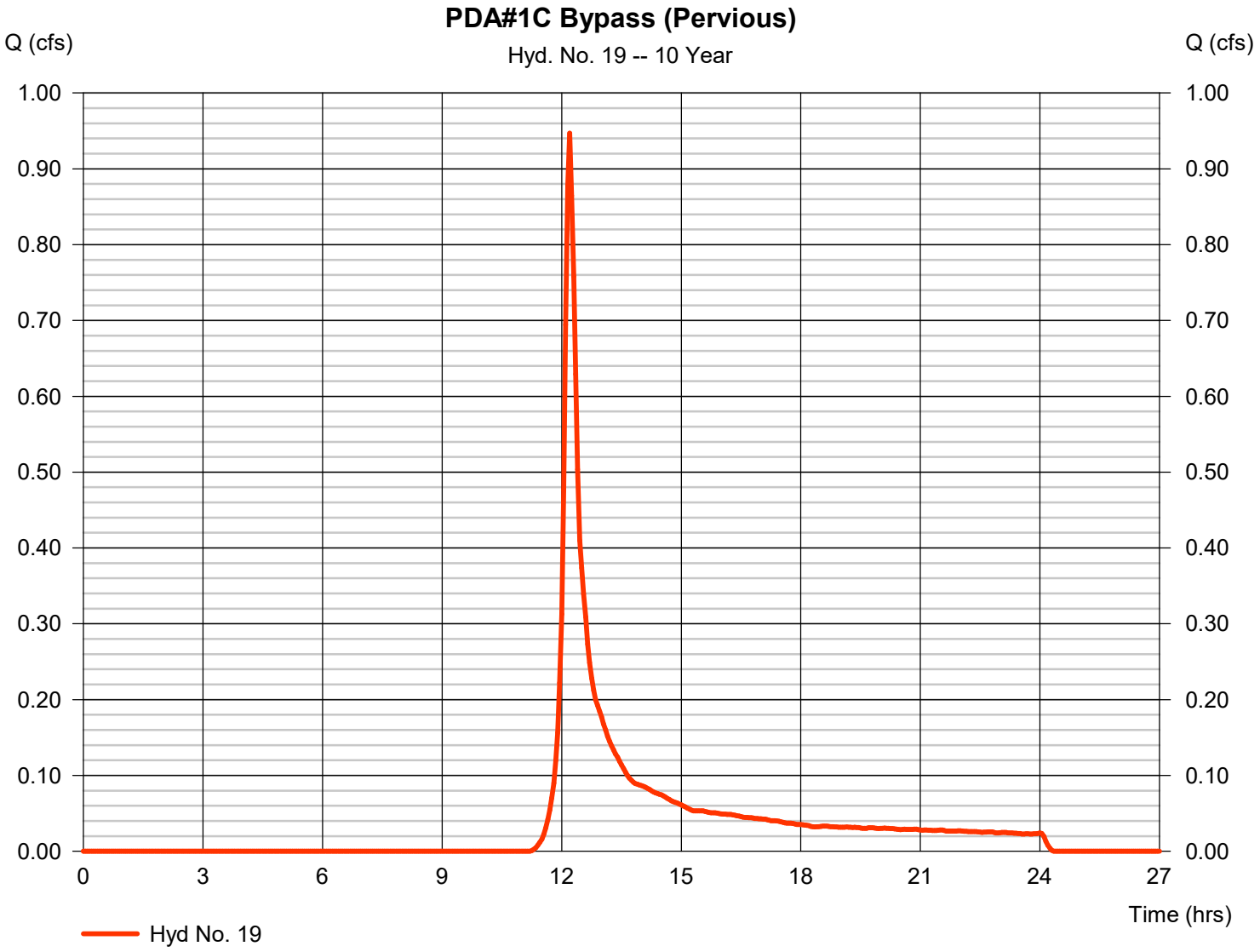


Hydrograph Report

Hyd. No. 19

PDA#1C Bypass (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.947 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	3,612 cuft
Drainage area	=	0.705 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.10 min
Total precip.	=	5.07 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sc_1 factors			

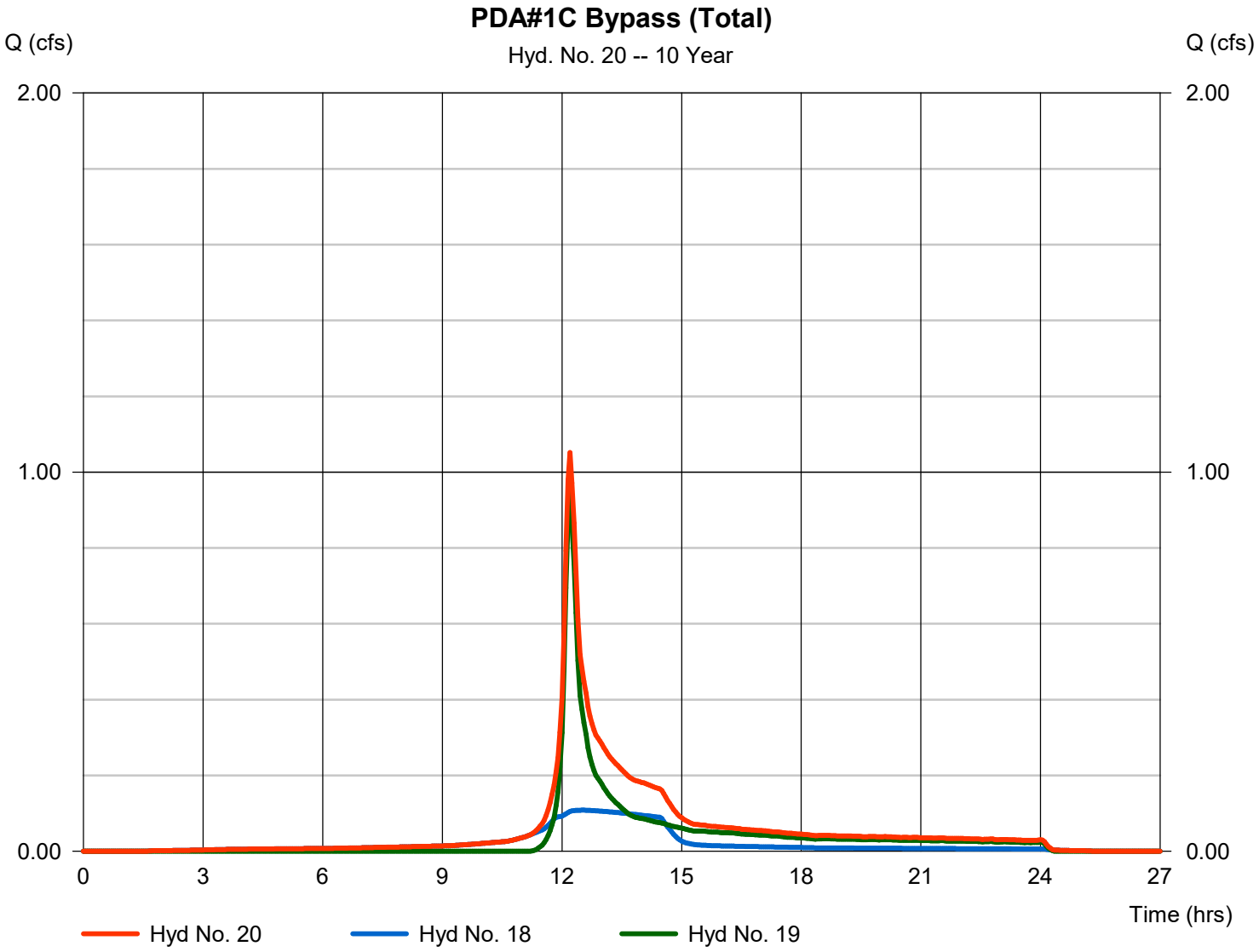


Hydrograph Report

Hyd. No. 20

PDA#1C Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 1.052 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 5,500 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 0.705 ac

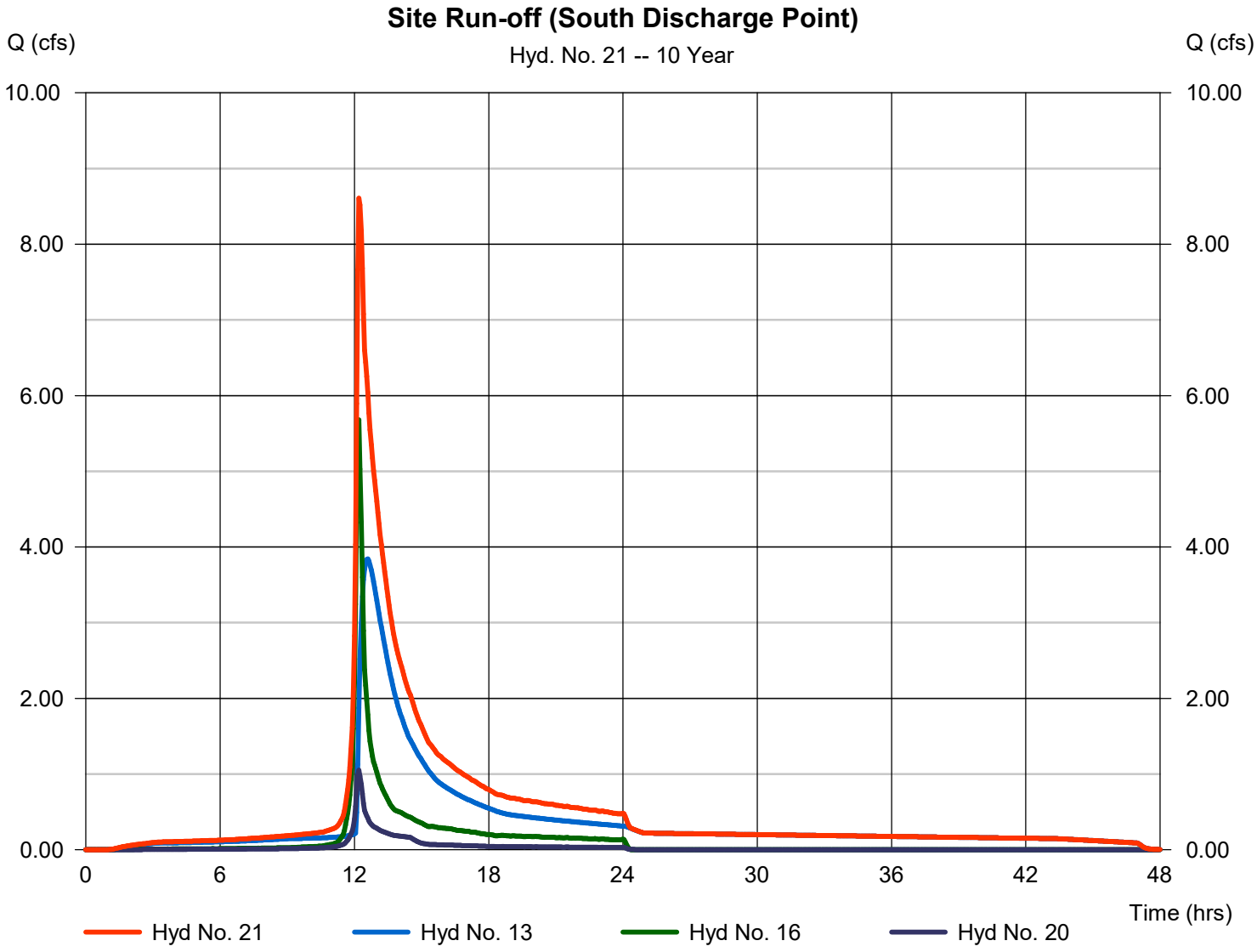


Hydrograph Report

Hyd. No. 21

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 8.606 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 88,923 cuft
Inflow hyds.	= 13, 16, 20	Contrib. drain. area	= 0.000 ac



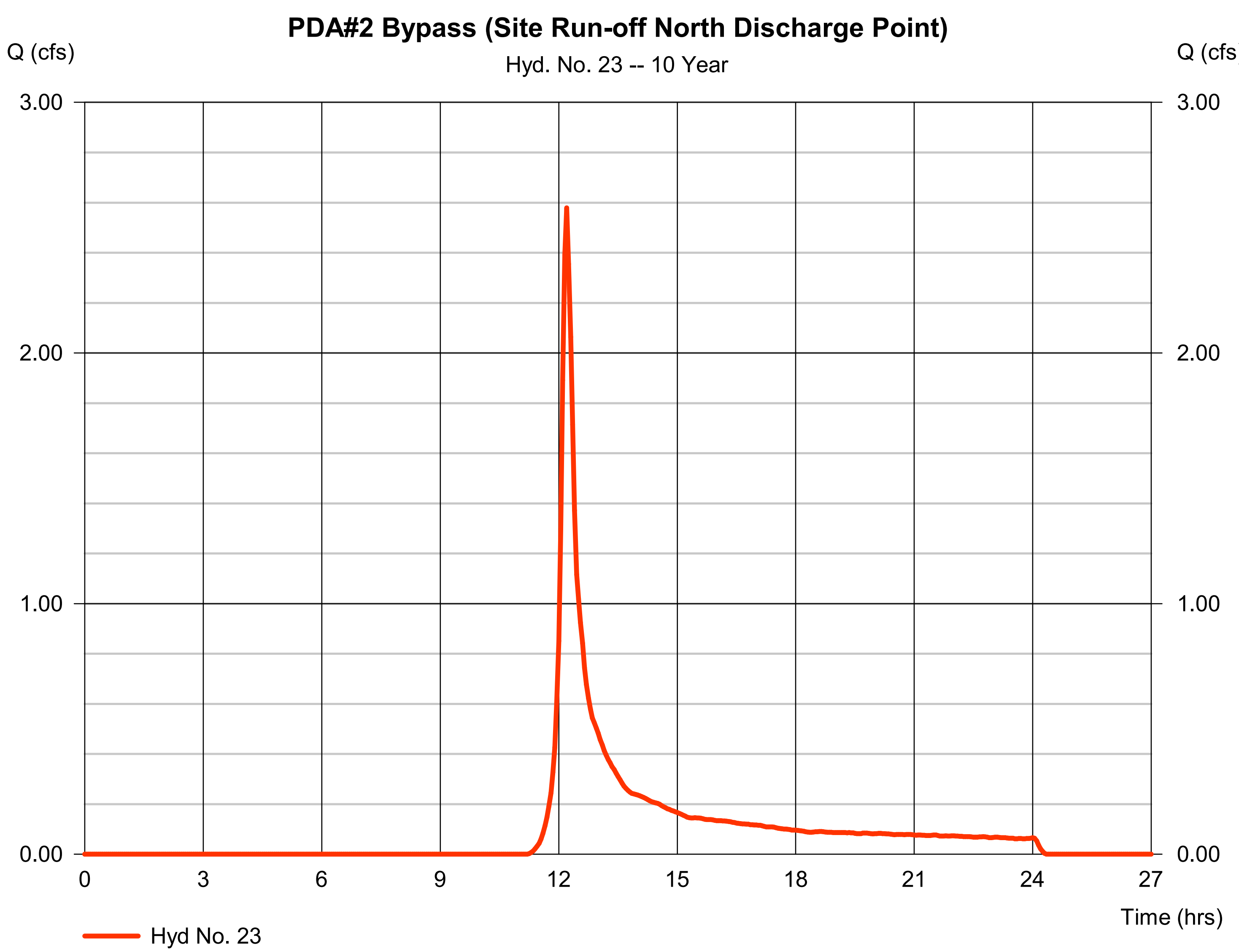
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 23

PDA#2 Bypass (Site Run-off North Discharge Point)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.579 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 9,836 cuft
Drainage area	= 1.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.70 min
Total precip.	= 5.07 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.m.cds	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

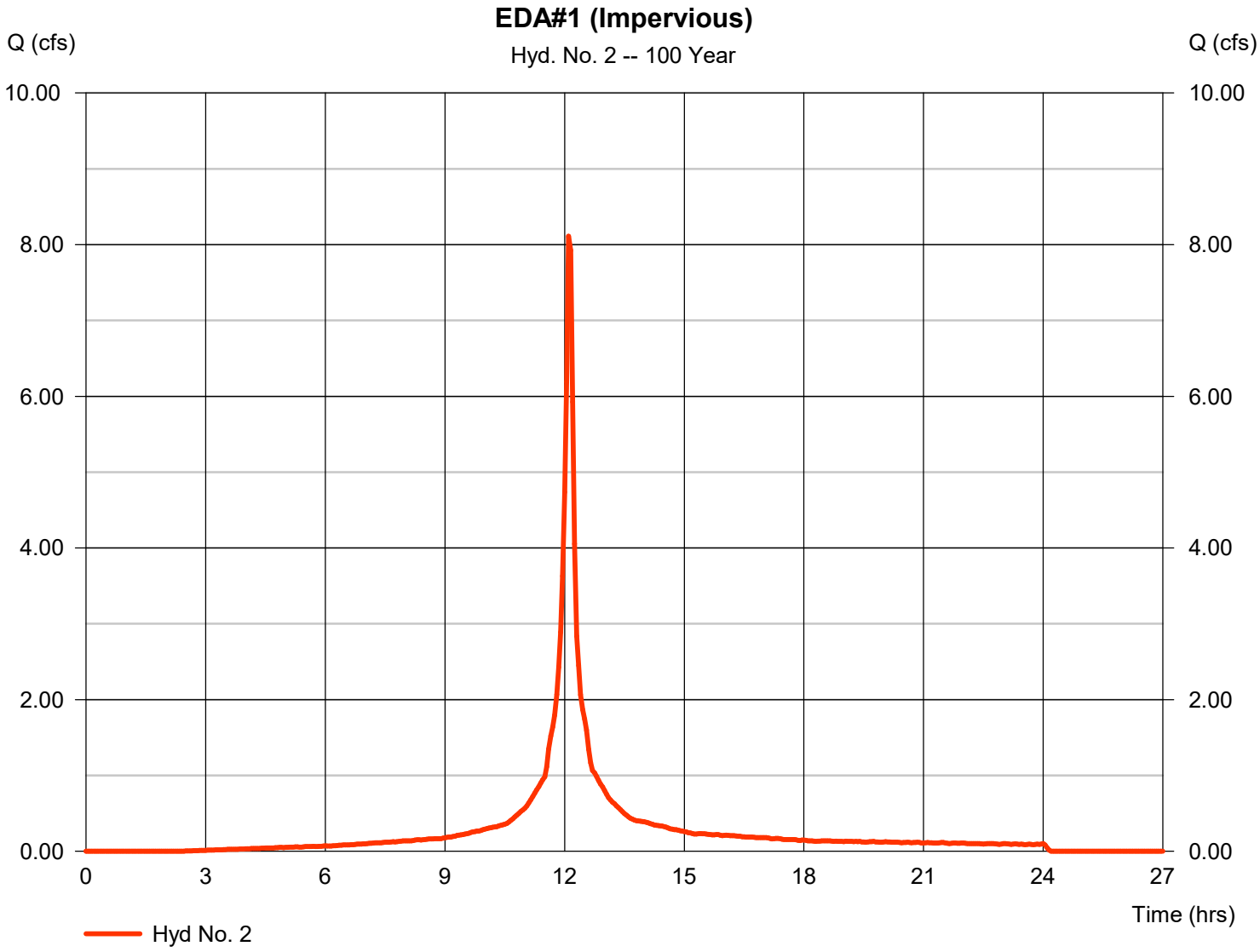
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
2	SCS Runoff	8.111	3	726	26,846	------	------	------	EDA#1 (Impervious)
3	SCS Runoff	35.86	3	735	148,889	------	------	------	EDA#1 (Pervious)
4	Combine	40.54	3	732	175,735	2, 3	------	------	Site Run-off (South Discharge Point)
6	SCS Runoff	0.126	3	726	451	------	------	------	EDA#2 (Impervious)
7	SCS Runoff	7.436	3	732	26,720	------	------	------	EDA#2 (Pervious)
8	Combine	7.527	3	732	27,171	6, 7	------	------	Site Run-off (North Discharge Point)
10	SCS Runoff	18.62	3	726	66,612	------	------	------	PDA#1A (Impervious)
11	SCS Runoff	16.81	3	732	60,392	------	------	------	PDA#1A (Pervious)
12	Combine	34.30	3	729	127,004	10, 11	------	------	PDA#1A (Total)
13	Reservoir	17.58	3	738	127,001	12	95.47	44,882	SWM (Basin Outflow)
14	SCS Runoff	1.599	3	726	5,720	------	------	------	PDA#1B Bypass (Impervious)
15	SCS Runoff	14.44	3	732	51,890	------	------	------	PDA#1B Bypass (Pervious)
16	Combine	15.60	3	732	57,610	14, 15	------	------	PDA#1B Bypass (Total)
17	SCS Runoff	0.906	3	726	3,240	------	------	------	PDA#1C Bypass (Impervious)
18	Reservoir	0.129	3	759	3,237	17	92.82	1,065	Drywell
19	SCS Runoff	2.739	3	732	9,842	------	------	------	PDA#1C Bypass (Pervious)
20	Combine	2.860	3	732	13,079	18, 19	------	------	PDA#1C Bypass (Total)
21	Combine	32.01	3	735	197,690	13, 16, 20	------	------	Site Run-off (South Discharge Point)
23	SCS Runoff	7.459	3	732	26,804	------	------	------	PDA#2 Bypass (Site Run-off North Di

Hydrograph Report

Hyd. No. 2

EDA#1 (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.111 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	26,846 cuft
Drainage area	=	1.078 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Coefficients	S_1_factor	=	484

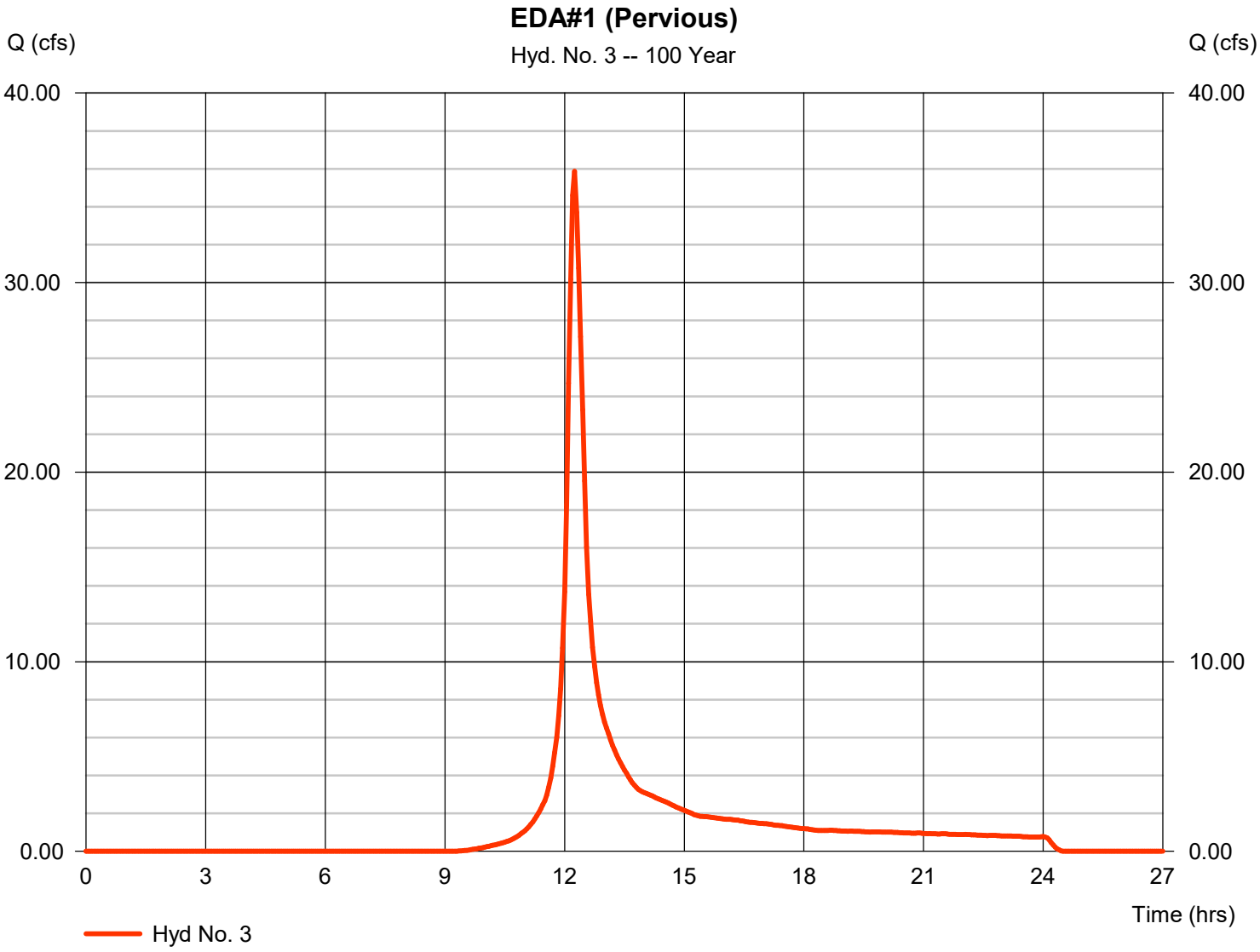


Hydrograph Report

Hyd. No. 3

EDA#1 (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.86 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.25 hrs
Time interval	=	3 min	Hyd. volume	=	148,889 cuft
Drainage area	=	10.342 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.10 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Coefficients	Shape factor	=	484

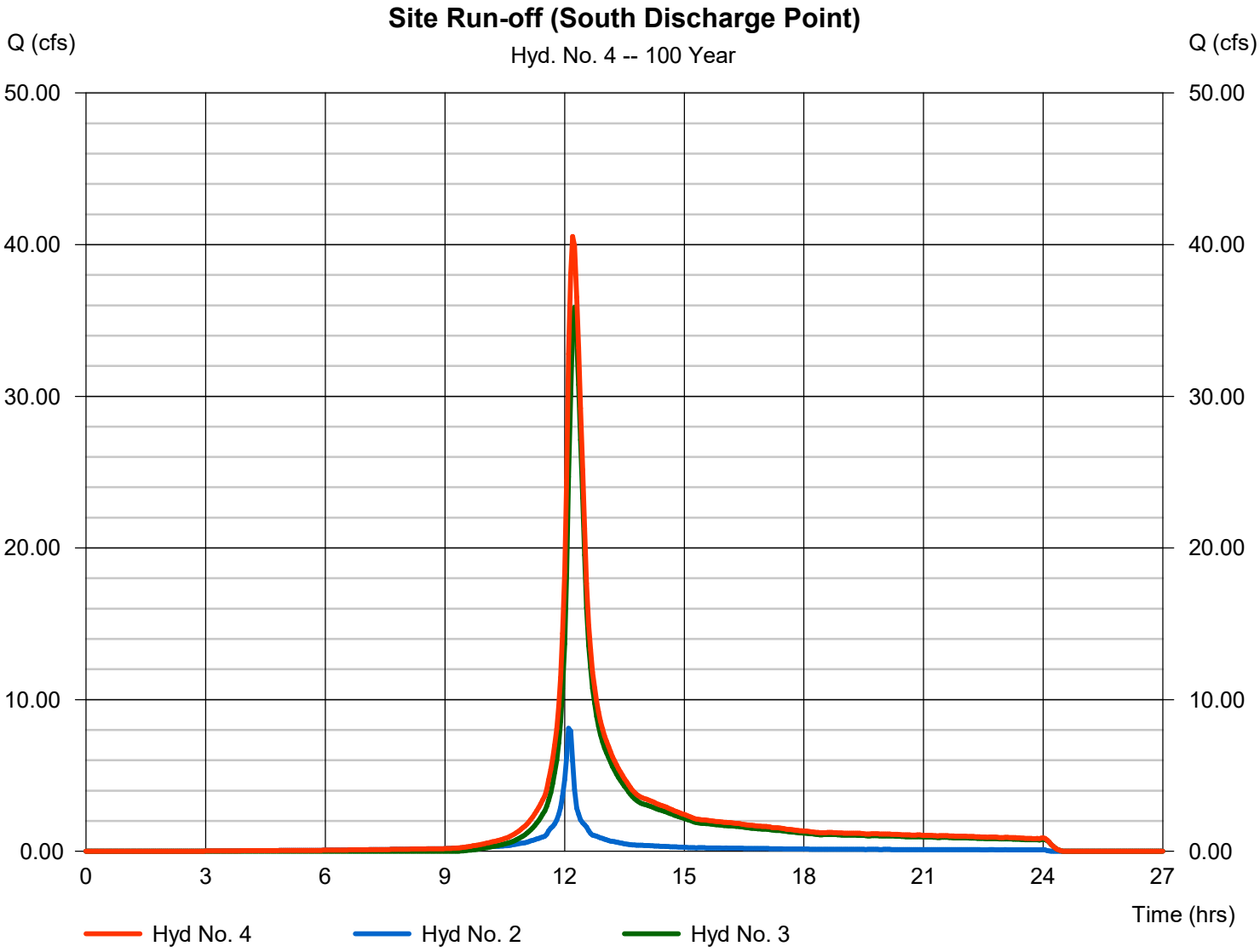


Hydrograph Report

Hyd. No. 4

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 40.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 175,735 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 11.420 ac

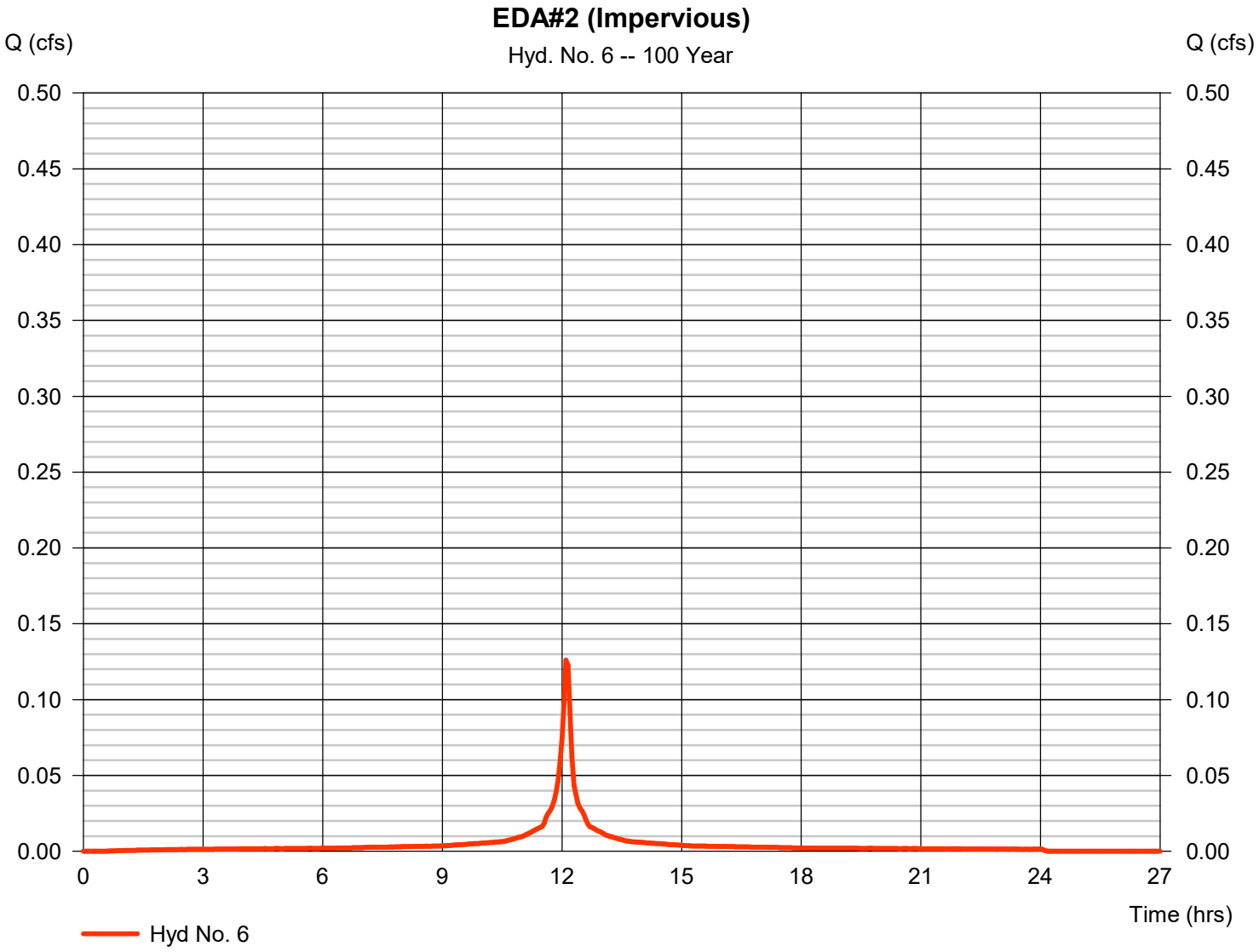


Hydrograph Report

Hyd. No. 6

EDA#2 (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.126 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	451 cuft
Drainage area	=	0.016 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA_Coefficients	Shape factor	=	484

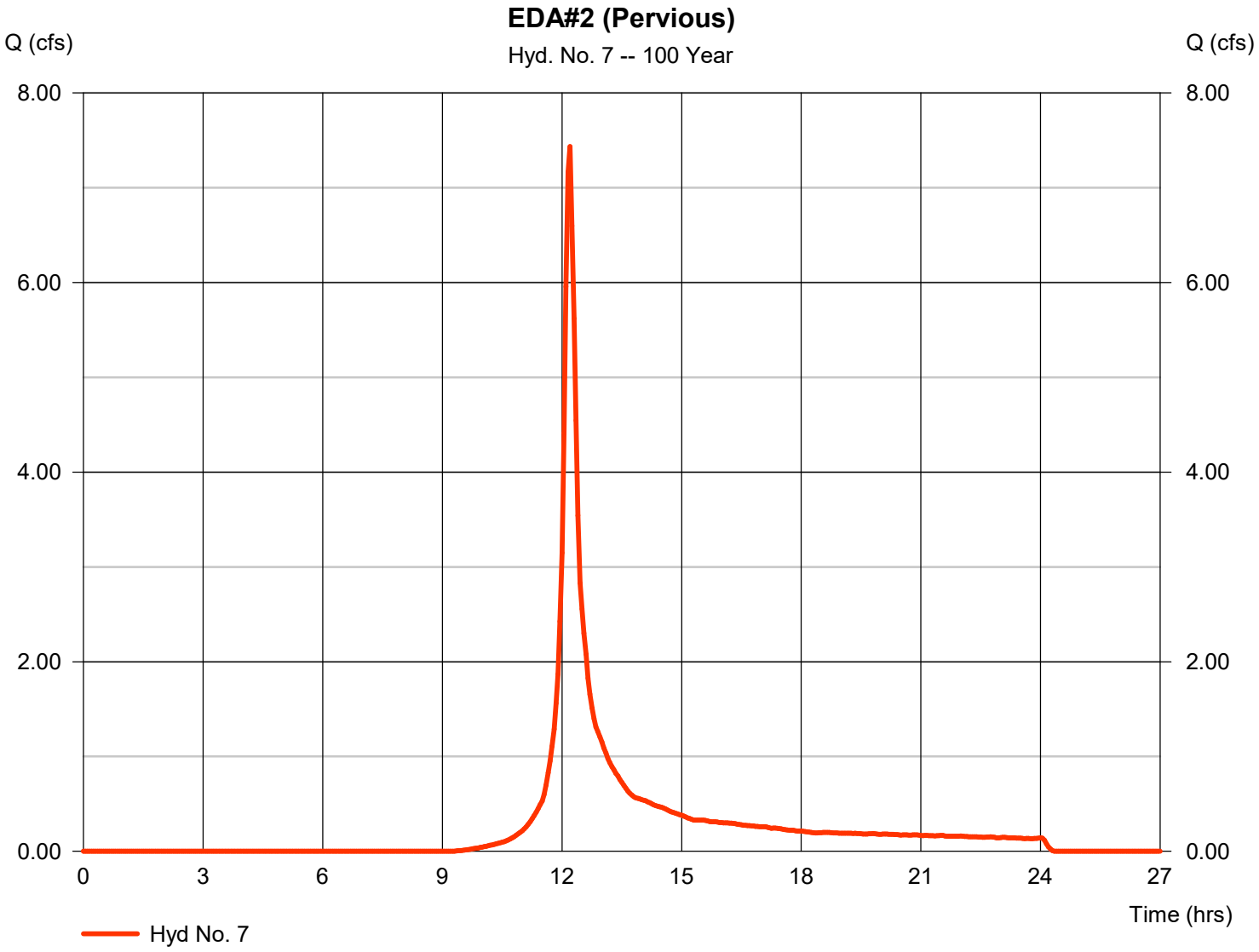


Hydrograph Report

Hyd. No. 7

EDA#2 (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.436 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	26,720 cuft
Drainage area	=	1.914 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.20 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sheet.tcd	S_1_factors	=	484

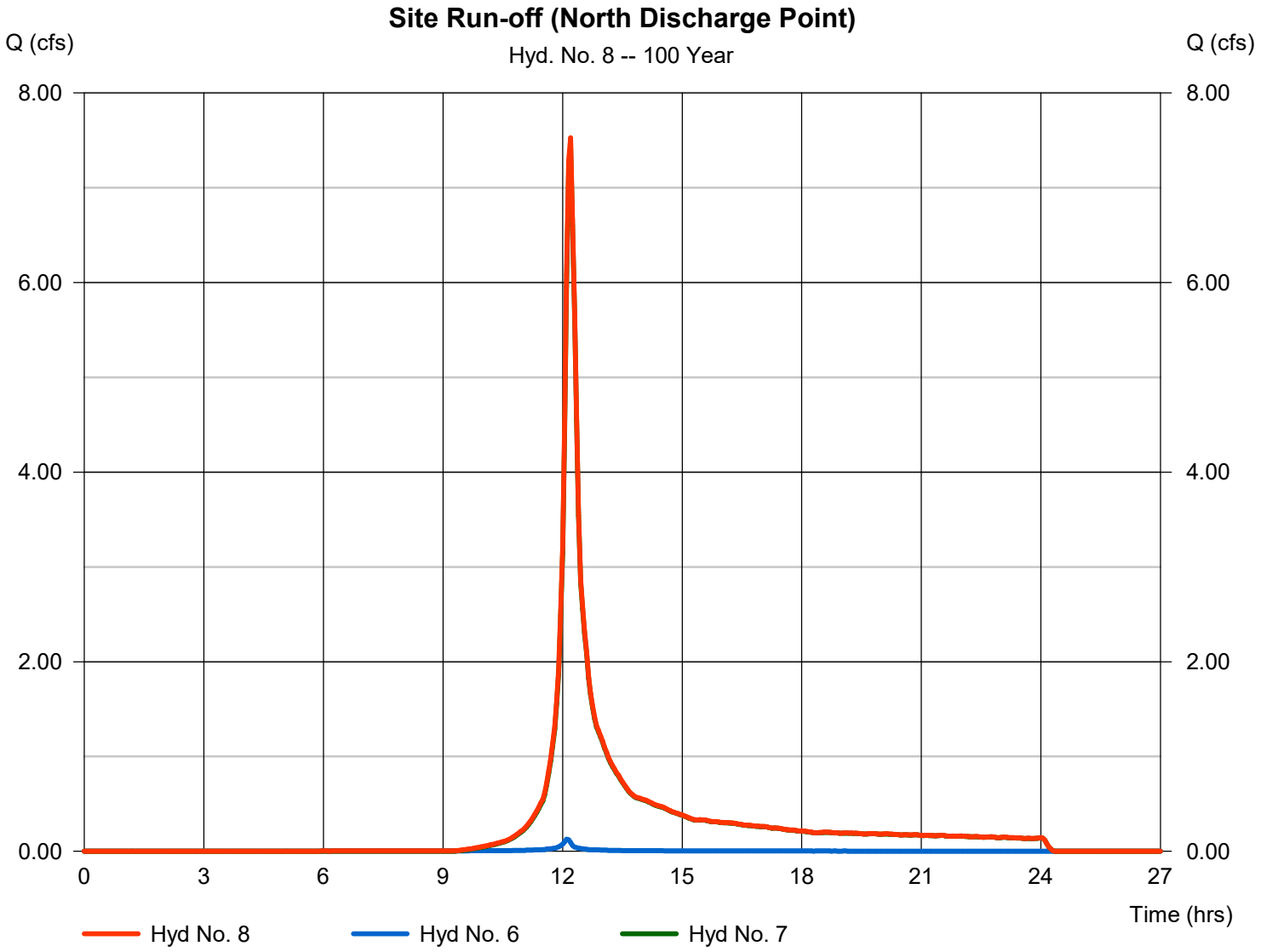


Hydrograph Report

Hyd. No. 8

Site Run-off (North Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 7.527 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 27,171 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.930 ac

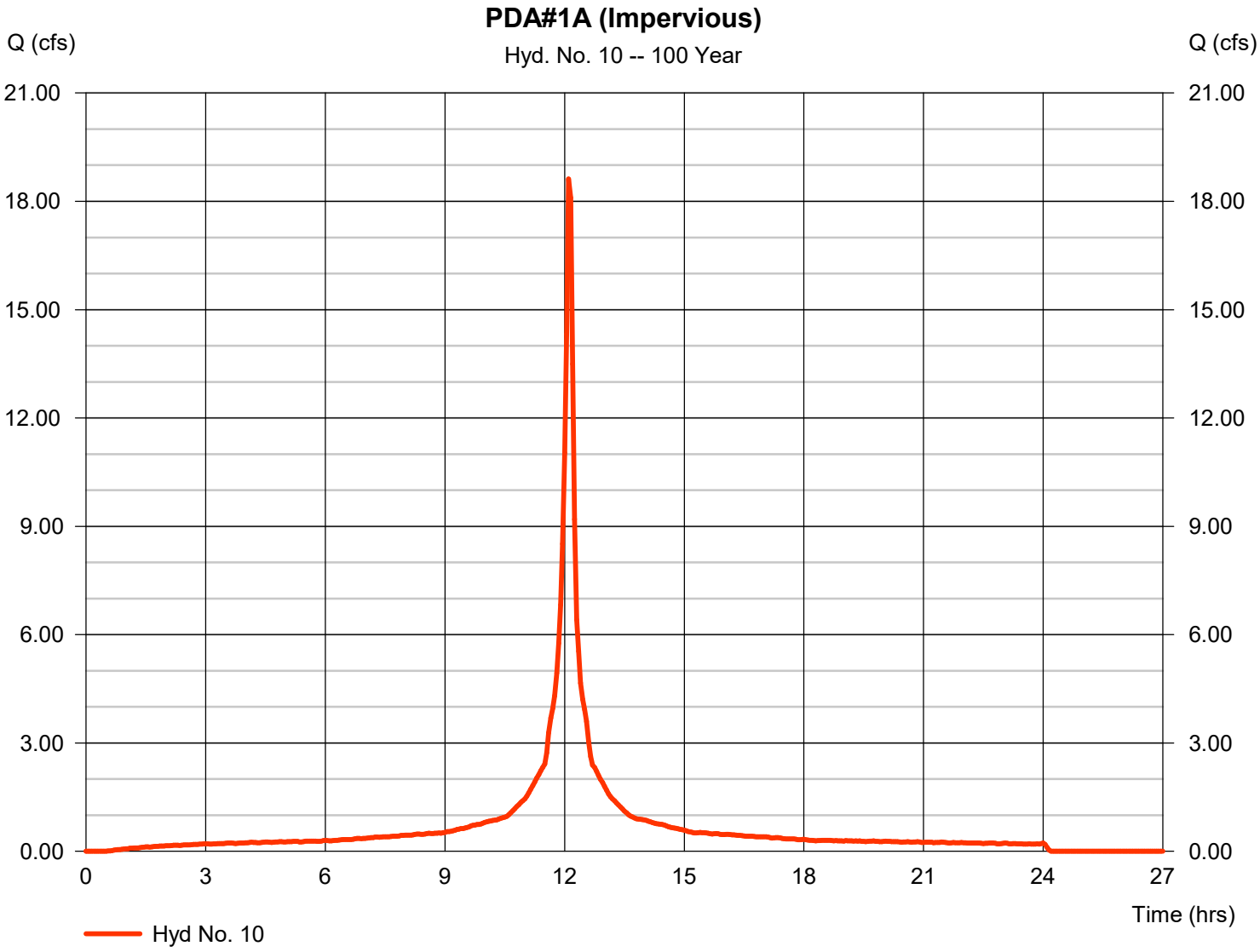


Hydrograph Report

Hyd. No. 10

PDA#1A (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.62 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	66,612 cuft
Drainage area	=	2.364 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Supplemental\C_1.tab	Shape factor	=	484



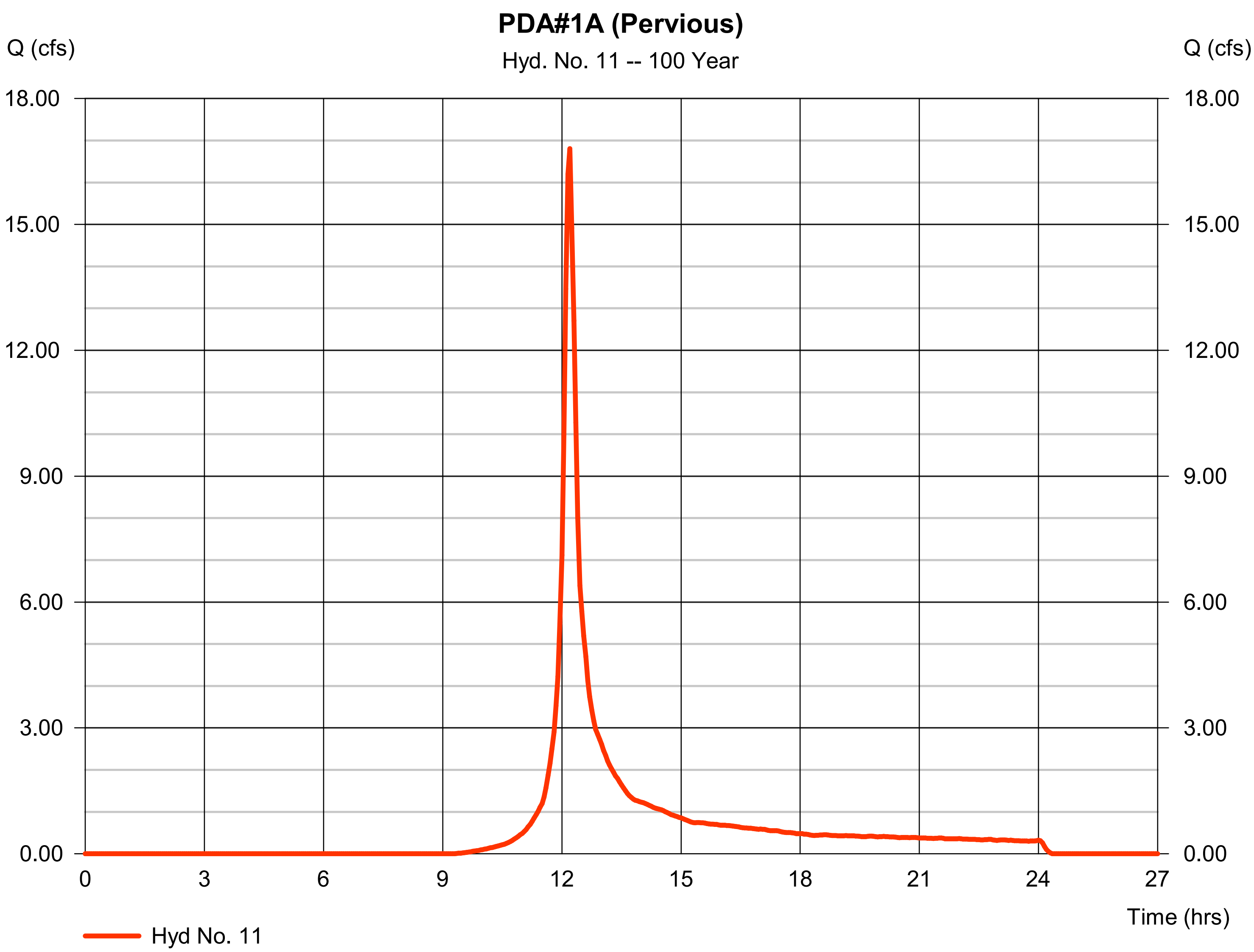
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 07 / 9 / 2020

Hyd. No. 11

PDA#1A (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 16.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 60,392 cuft
Drainage area	= 4.326 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.70 min
Total precip.	= 8.52 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

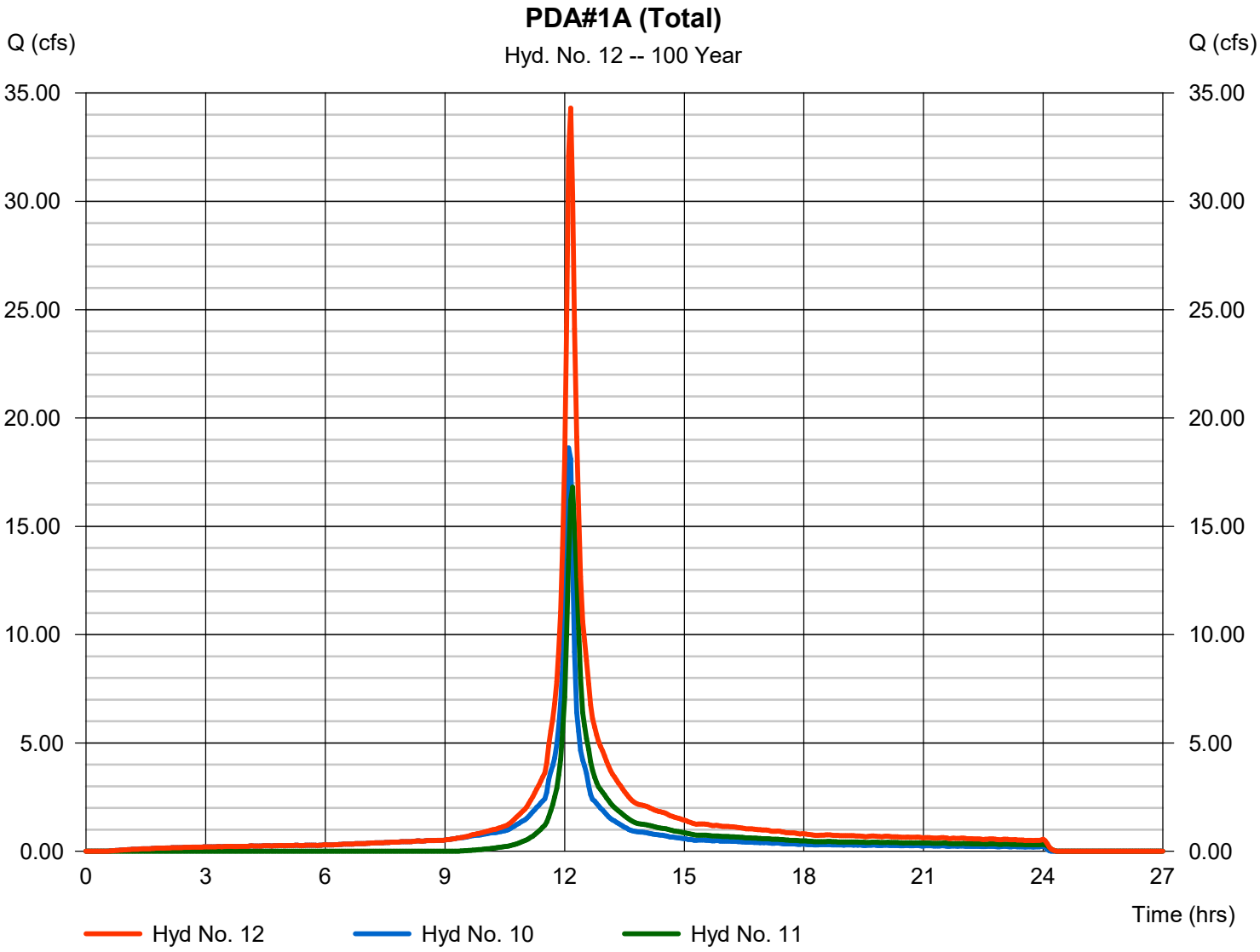


Hydrograph Report

Hyd. No. 12

PDA#1A (Total)

Hydrograph type	=	Combine	Peak discharge	=	34.30 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.15 hrs
Time interval	=	3 min	Hyd. volume	=	127,004 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	6.690 ac



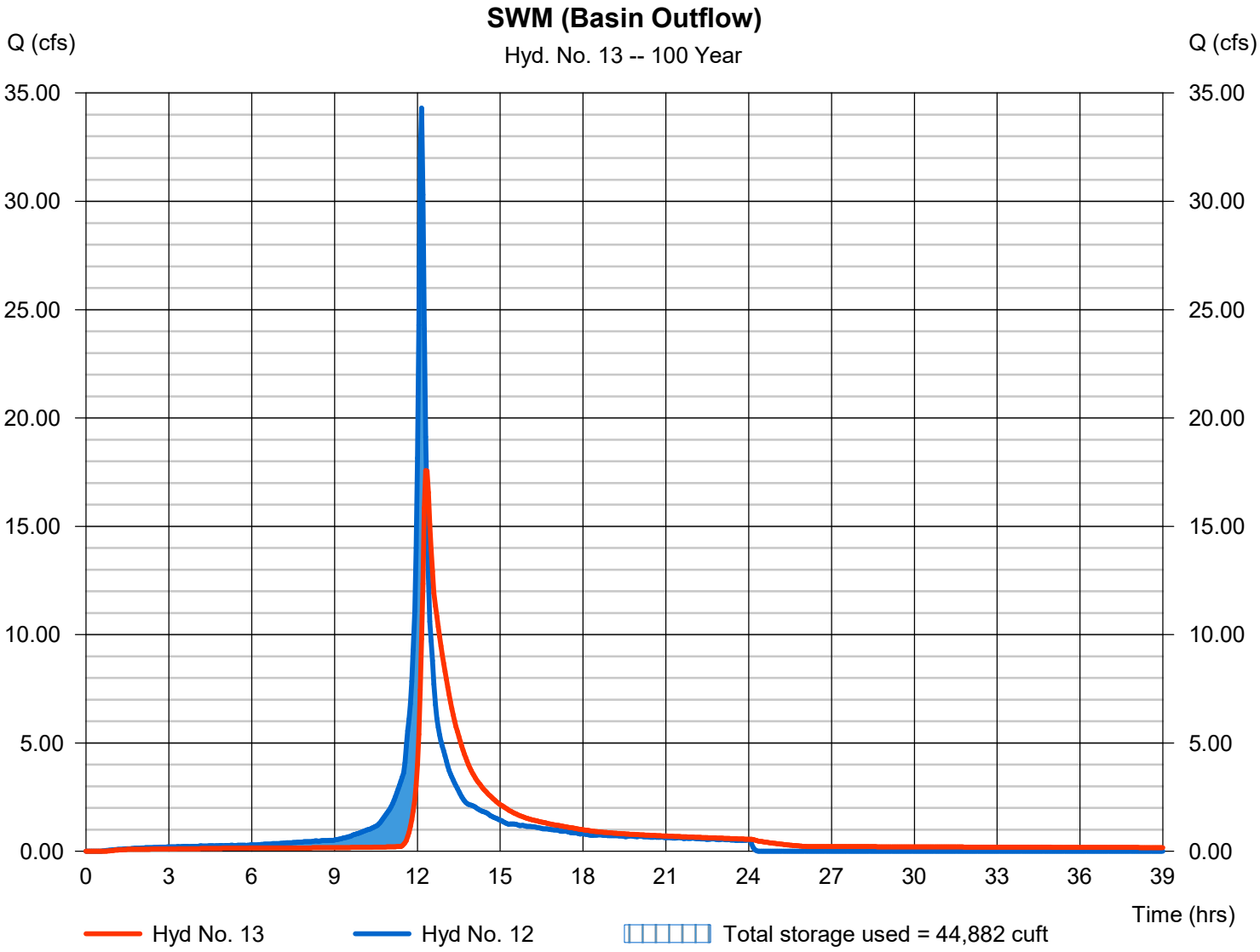
Hydrograph Report

Hyd. No. 13

SWM (Basin Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 17.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.30 hrs
Time interval	= 3 min	Hyd. volume	= 127,001 cuft
Inflow hyd. No.	= 12 - PDA#1A (Total)	Max. Elevation	= 95.47 ft
Reservoir name	= Basin	Max. Storage	= 44,882 cuft

Storage Indication method used.

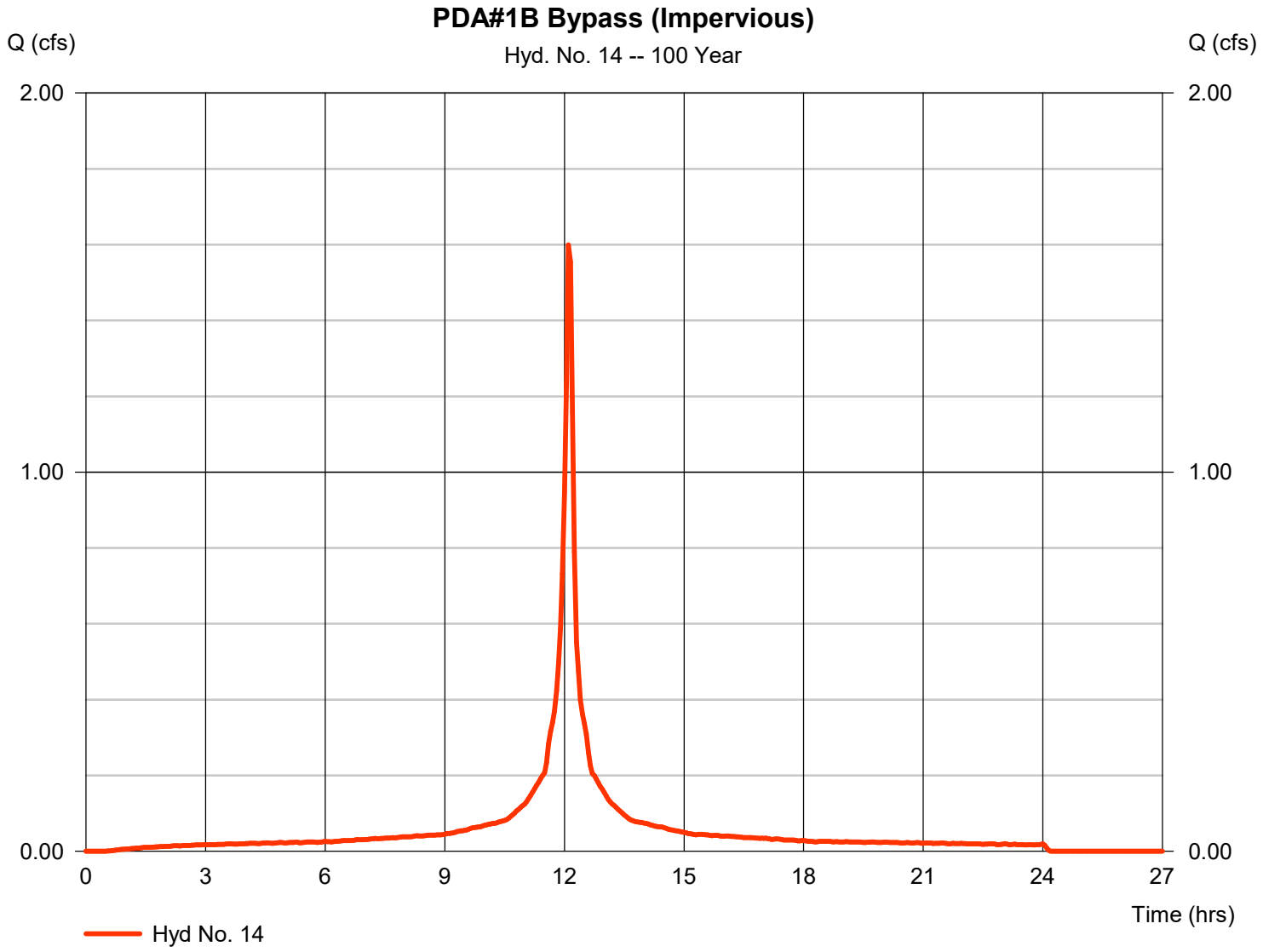


Hydrograph Report

Hyd. No. 14

PDA#1B Bypass (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.599 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	5,720 cuft
Drainage area	=	0.203 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Sheets\24 hr.tcd	Shape factor	=	484

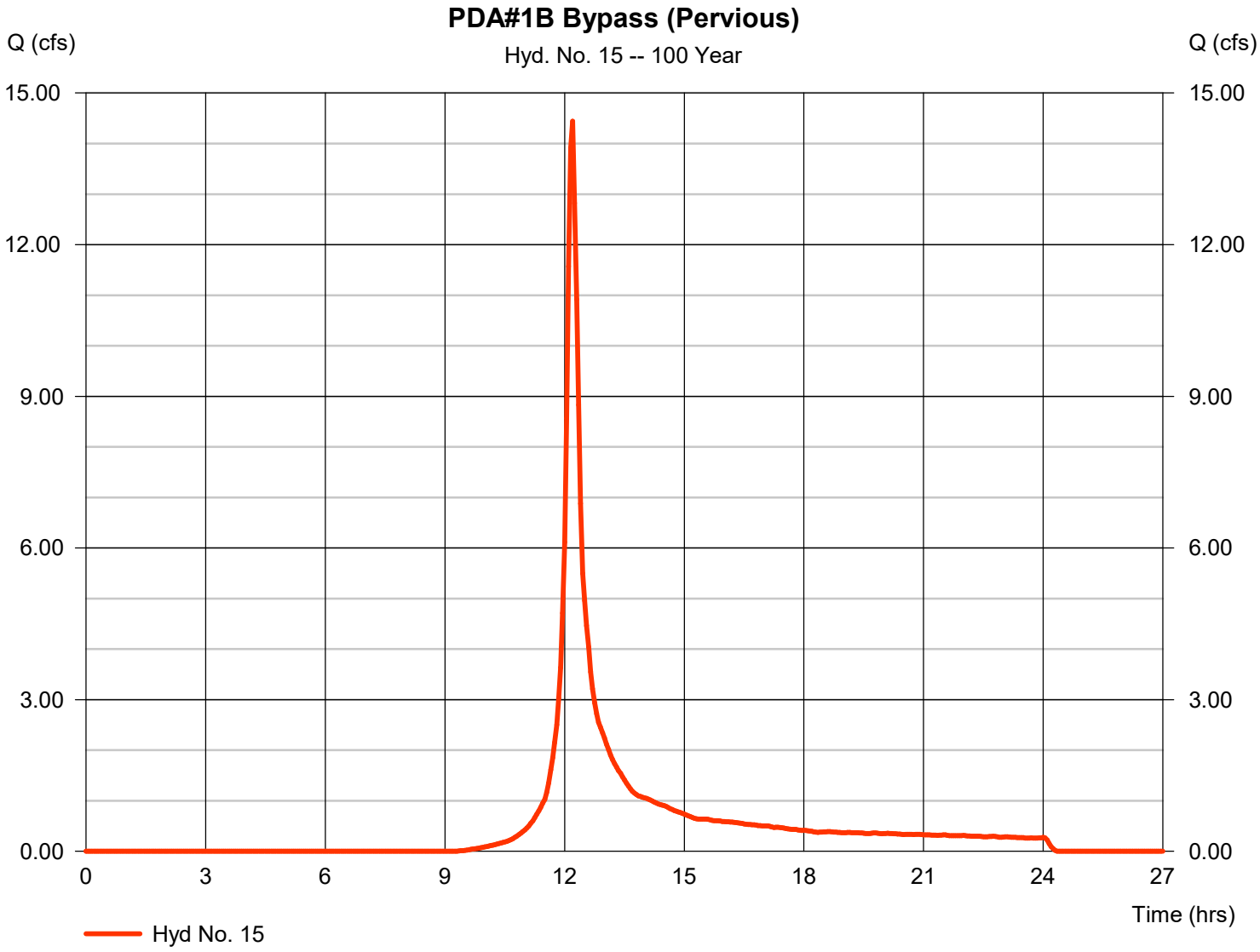


Hydrograph Report

Hyd. No. 15

PDA#1B Bypass (Pervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	3 min	Hyd. volume	=	51,890 cuft
Drainage area	=	3.717 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.30 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Supplemental	S_1_1 factor	=	484

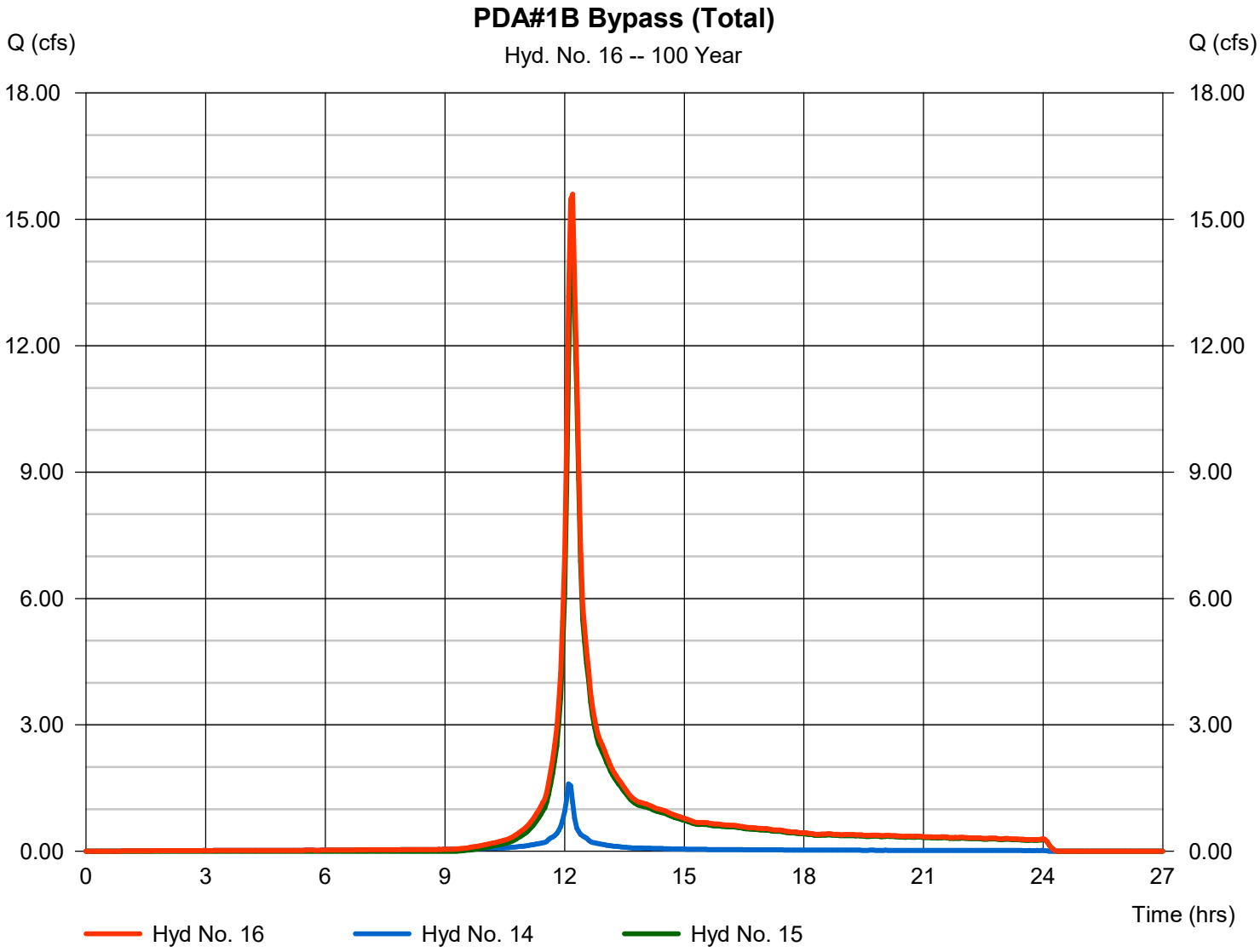


Hydrograph Report

Hyd. No. 16

PDA#1B Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 15.60 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 57,610 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 3.920 ac

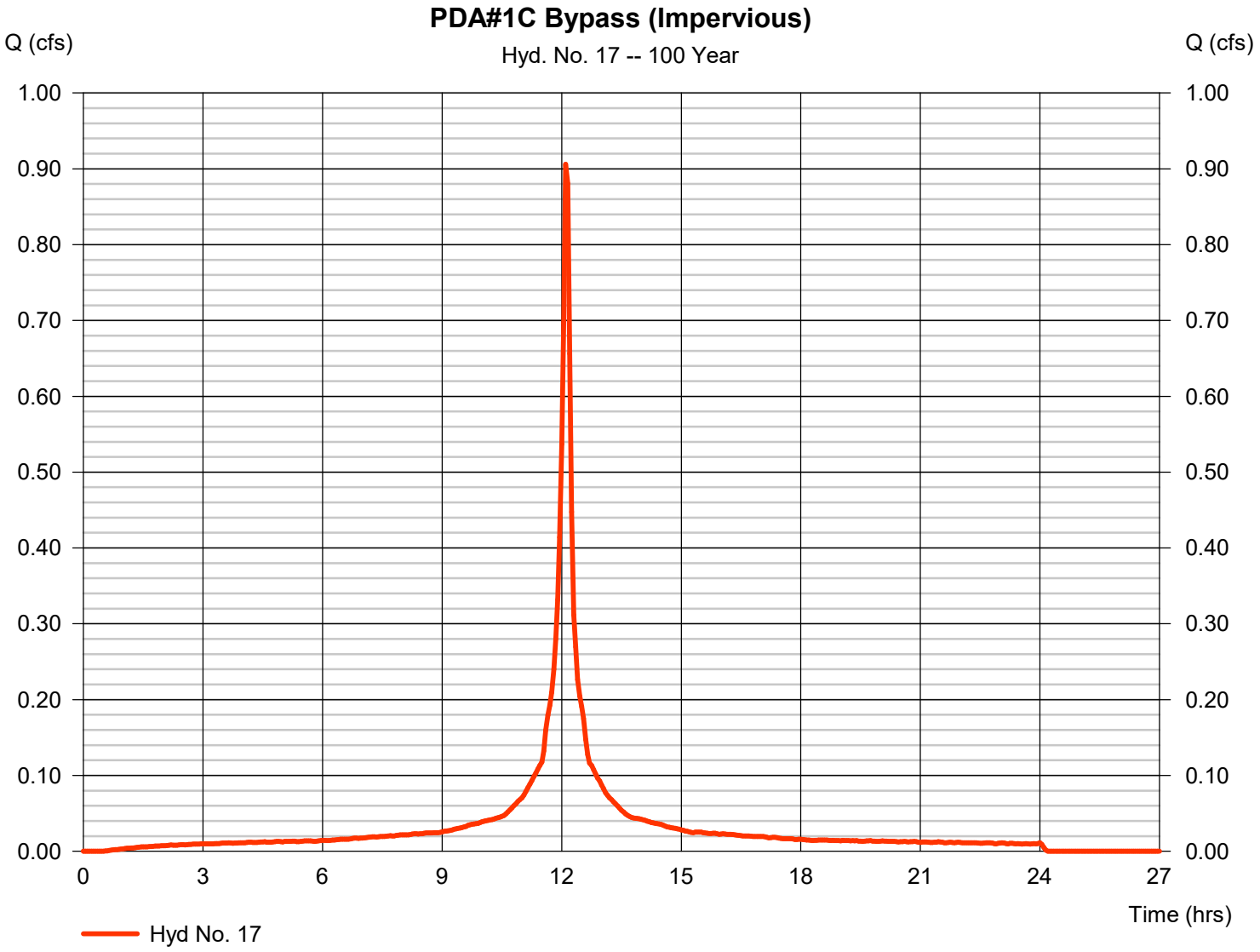


Hydrograph Report

Hyd. No. 17

PDA#1C Bypass (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.906 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	3 min	Hyd. volume	=	3,240 cuft
Drainage area	=	0.115 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	8.52 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\NOAA Atlas 14 factors_1.tab	Shape factor	=	484



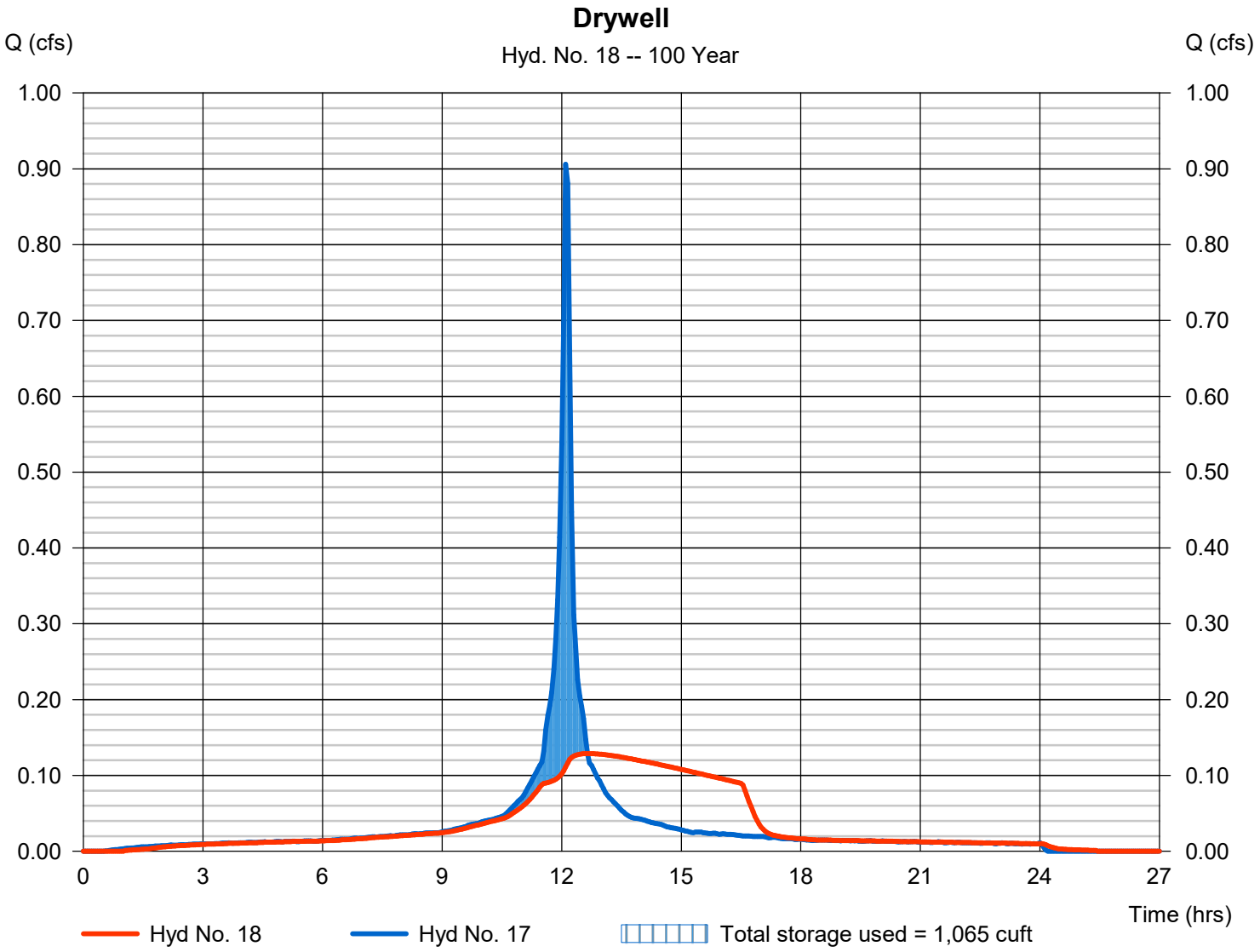
Hydrograph Report

Hyd. No. 18

Drywell

Hydrograph type	=	Reservoir	Peak discharge	=	0.129 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.65 hrs
Time interval	=	3 min	Hyd. volume	=	3,237 cuft
Inflow hyd. No.	=	17 - PDA#1C Bypass (Impervious)	Max. Elevation	=	92.82 ft
Reservoir name	=	Basin	Max. Storage	=	1,065 cuft

Storage Indication method used.



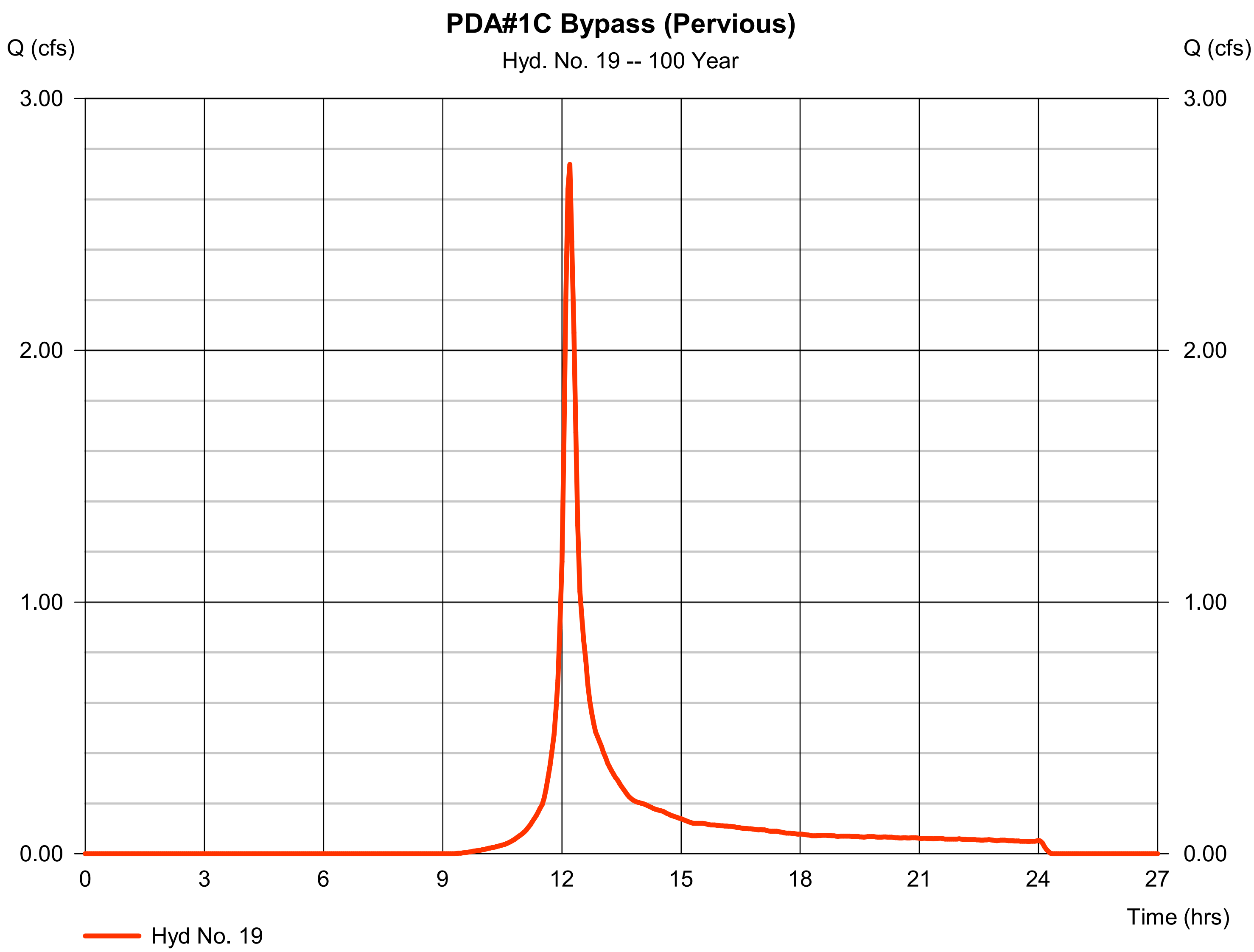
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 | Thursday, 07 / 9 / 2020

Hyd. No. 19

PDA#1C Bypass (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.739 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 9,842 cuft
Drainage area	= 0.705 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 8.52 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA_C_1.cds	Shape factor	= 484

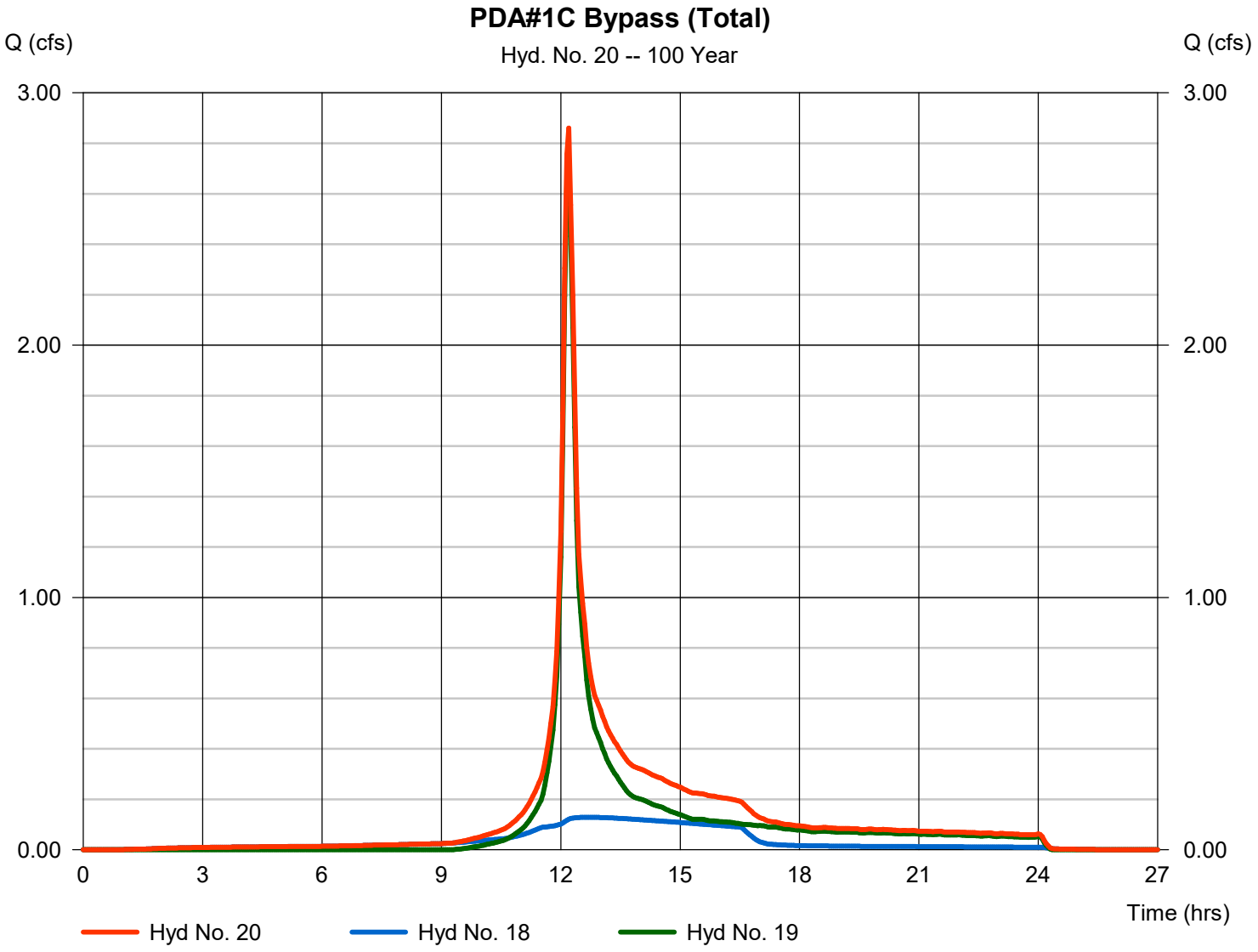


Hydrograph Report

Hyd. No. 20

PDA#1C Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 2.860 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 13,079 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 0.705 ac

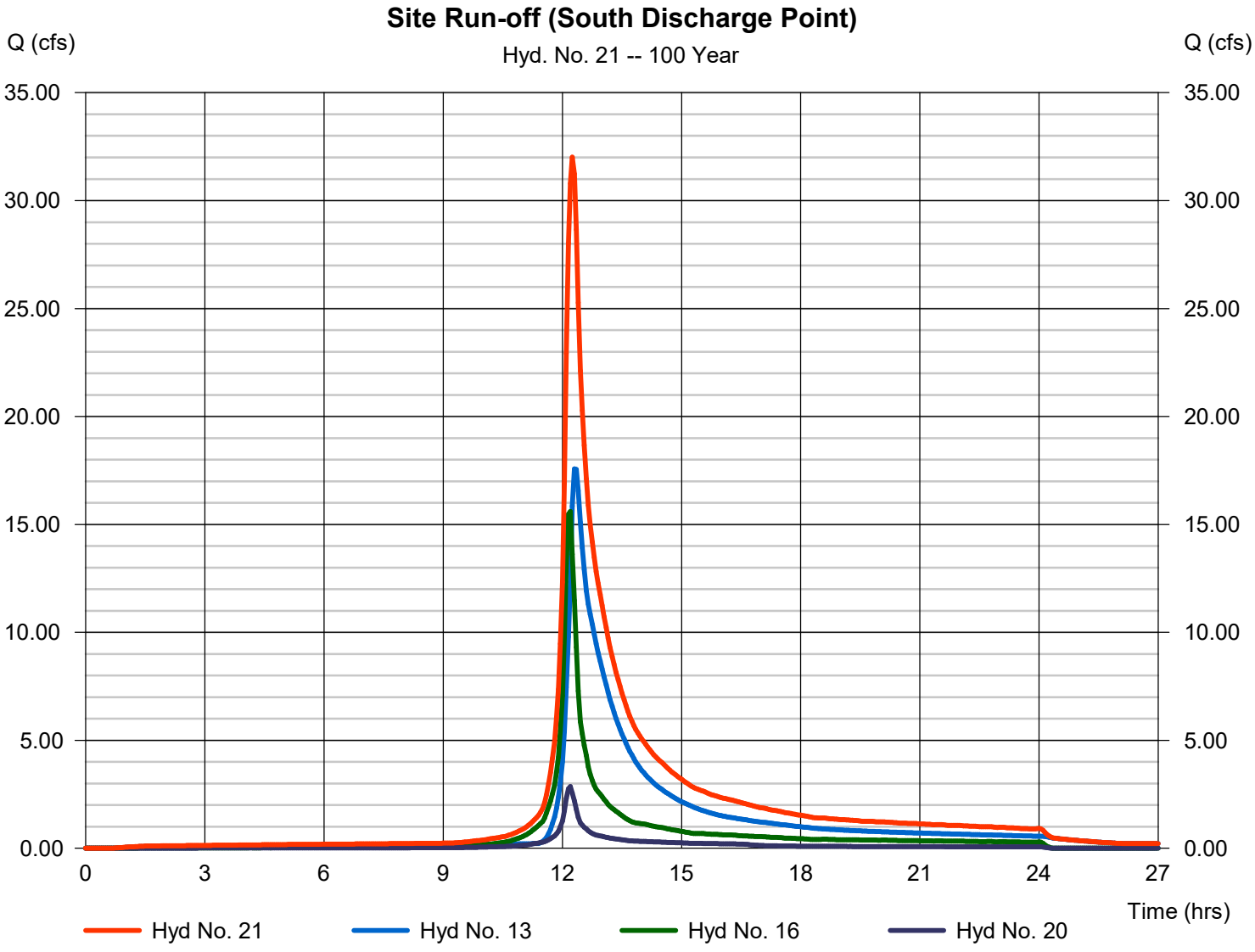


Hydrograph Report

Hyd. No. 21

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 32.01 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.25 hrs
Time interval	= 3 min	Hyd. volume	= 197,690 cuft
Inflow hyds.	= 13, 16, 20	Contrib. drain. area	= 0.000 ac

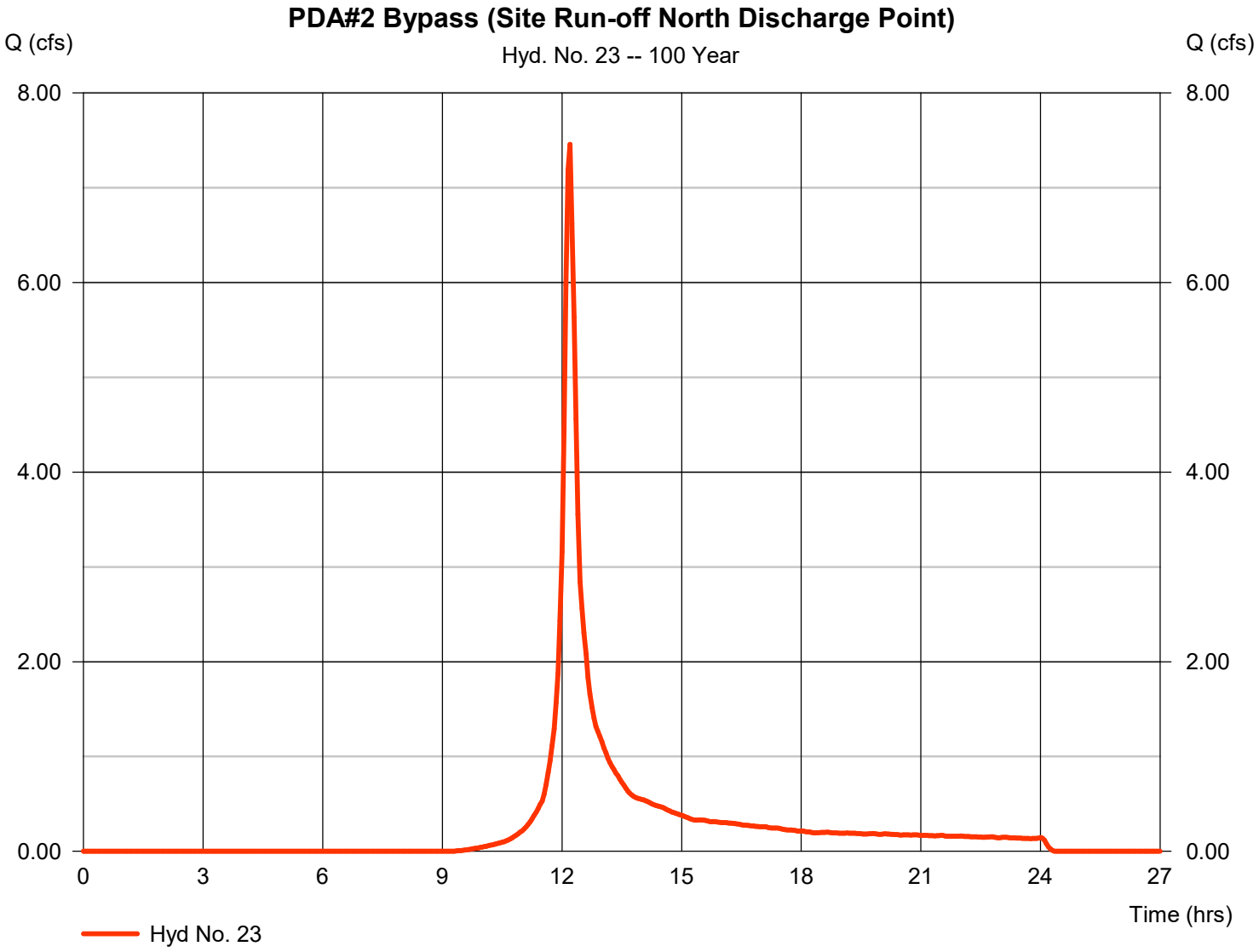


Hydrograph Report

Hyd. No. 23

PDA#2 Bypass (Site Run-off North Discharge Point)

Hydrograph type	= SCS Runoff	Peak discharge	= 7.459 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.20 hrs
Time interval	= 3 min	Hyd. volume	= 26,804 cuft
Drainage area	= 1.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.70 min
Total precip.	= 8.52 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\NOAA Sheet.tcd	Shape factor	= 484



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
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	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

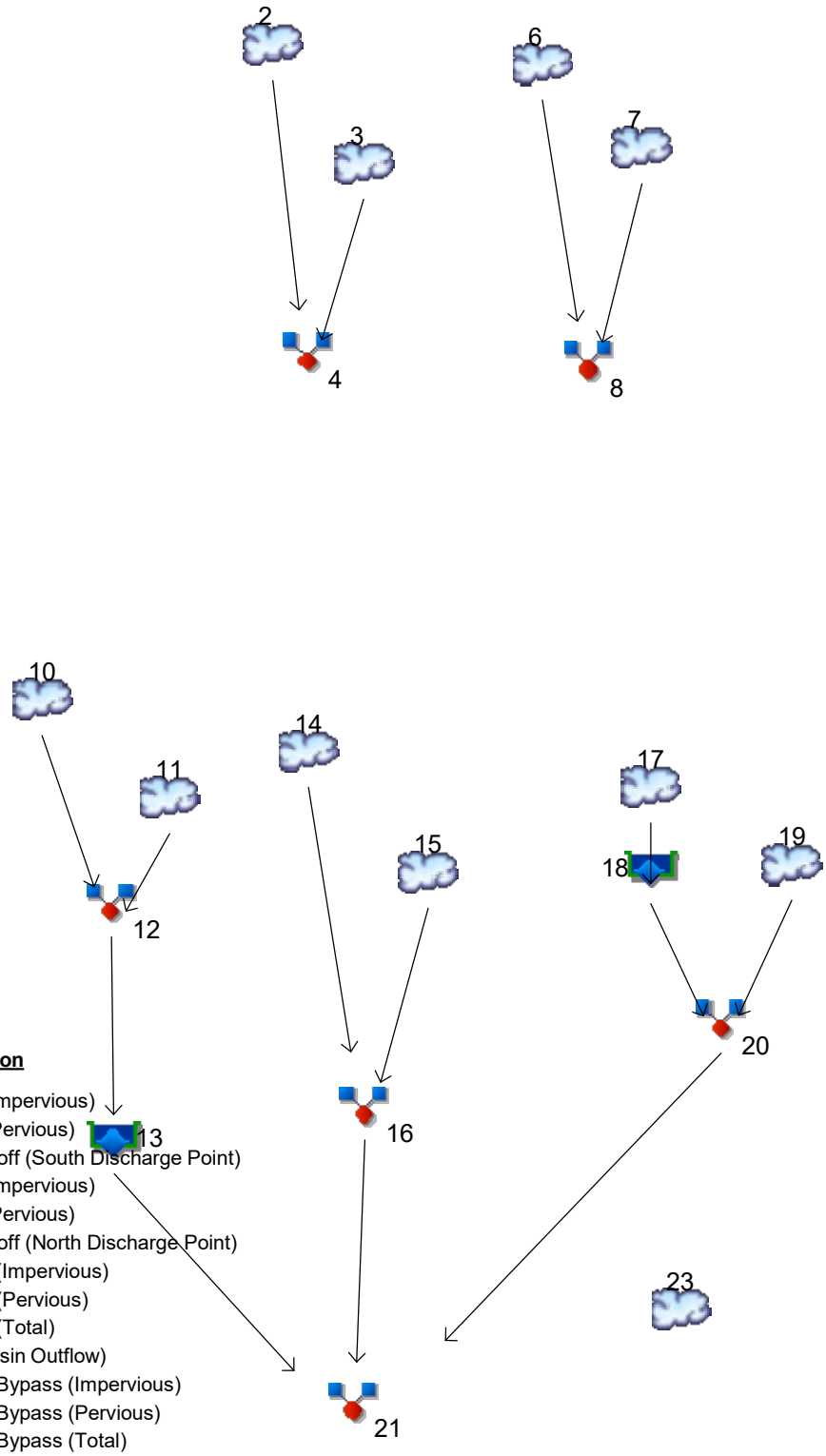
Precip. file name: F:\Hydroflow Standards\Mercer.pcp

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	0.00	3.32	0.00	4.20	5.07	6.20	7.20	8.52
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	1.25	3.32	0.00	0.00	5.07	0.00	0.00	8.52

APPENDIX E

Hydraflow Table of Contents

Watershed Model Schematic



Legend

Hyd.	Origin	Description
2	SCS Runoff	EDA#1 (Impervious)
3	SCS Runoff	EDA#1 (Pervious)
4	Combine	Site Run-off (South Discharge Point)
6	SCS Runoff	EDA#2 (Impervious)
7	SCS Runoff	EDA#2 (Pervious)
8	Combine	Site Run-off (North Discharge Point)
10	SCS Runoff	PDA#1A (Impervious)
11	SCS Runoff	PDA#1A (Pervious)
12	Combine	PDA#1A (Total)
13	Reservoir	SWM (Basin Outflow)
14	SCS Runoff	PDA#1B Bypass (Impervious)
15	SCS Runoff	PDA#1B Bypass (Pervious)
16	Combine	PDA#1B Bypass (Total)
17	SCS Runoff	PDA#1C Bypass (Impervious)
18	Reservoir	Drywell
19	SCS Runoff	PDA#1C Bypass (Pervious)
20	Combine	PDA#1C Bypass (Total)
21	Combine	Site Run-off (South Discharge Point)
23	SCS Runoff	PDA#2 Bypass (Site Run-off North Discharge Point)

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020

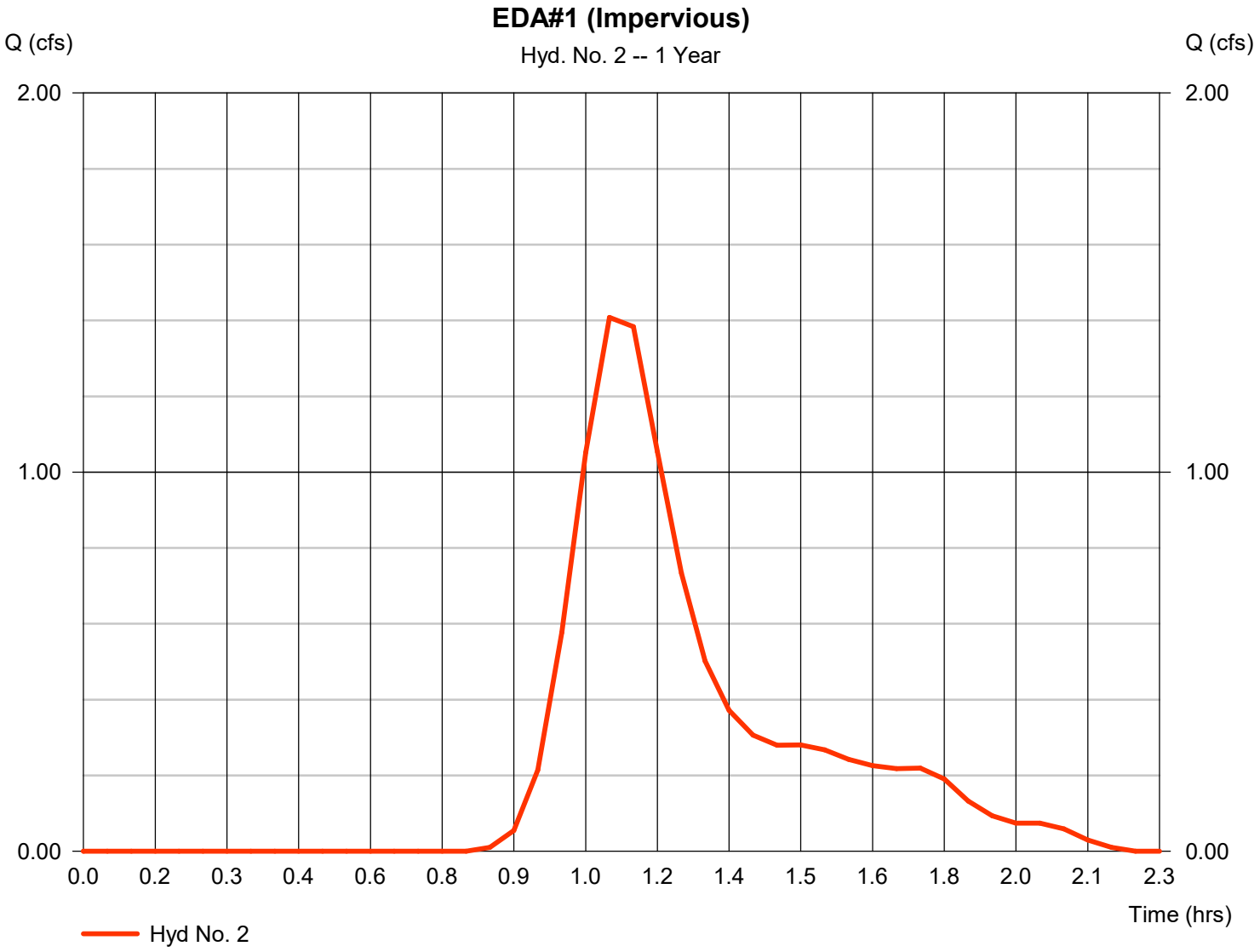
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
2	SCS Runoff	1.408	3	66	1,811	------	------	------	EDA#1 (Impervious)
3	SCS Runoff	0.000	3	n/a	0	------	------	------	EDA#1 (Pervious)
4	Combine	1.408	3	66	1,811	2, 3	------	------	Site Run-off (South Discharge Point)
6	SCS Runoff	0.042	3	66	56	------	------	------	EDA#2 (Impervious)
7	SCS Runoff	0.000	3	n/a	0	------	------	------	EDA#2 (Pervious)
8	Combine	0.042	3	66	56	6, 7	------	------	Site Run-off (North Discharge Point)
10	SCS Runoff	6.190	3	66	8,323	------	------	------	PDA#1A (Impervious)
11	SCS Runoff	0.000	3	n/a	0	------	------	------	PDA#1A (Pervious)
12	Combine	6.190	3	66	8,323	10, 11	------	------	PDA#1A (Total)
13	Reservoir	0.185	3	123	8,320	12	93.48	7,433	SWM (Basin Outflow)
14	SCS Runoff	0.532	3	66	715	------	------	------	PDA#1B Bypass (Impervious)
15	SCS Runoff	0.000	3	n/a	0	------	------	------	PDA#1B Bypass (Pervious)
16	Combine	0.532	3	66	715	14, 15	------	------	PDA#1B Bypass (Total)
17	SCS Runoff	0.301	3	66	405	------	------	------	PDA#1C Bypass (Impervious)
18	Reservoir	0.094	3	78	402	17	92.53	194	Drywell
19	SCS Runoff	0.000	3	n/a	0	------	------	------	PDA#1C Bypass (Pervious)
20	Combine	0.094	3	78	402	18, 19	------	------	PDA#1C Bypass (Total)
21	Combine	0.782	3	66	9,437	13, 16, 20	------	------	Site Run-off (South Discharge Point)
23	SCS Runoff	0.000	3	n/a	0	------	------	------	PDA#2 Bypass (Site Run-off North Di

Hydrograph Report

Hyd. No. 2

EDA#1 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.408 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,811 cuft
Drainage area	= 1.078 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distribution\24-1.25in2hrstorm-3 MIN	Shape factor	= 484

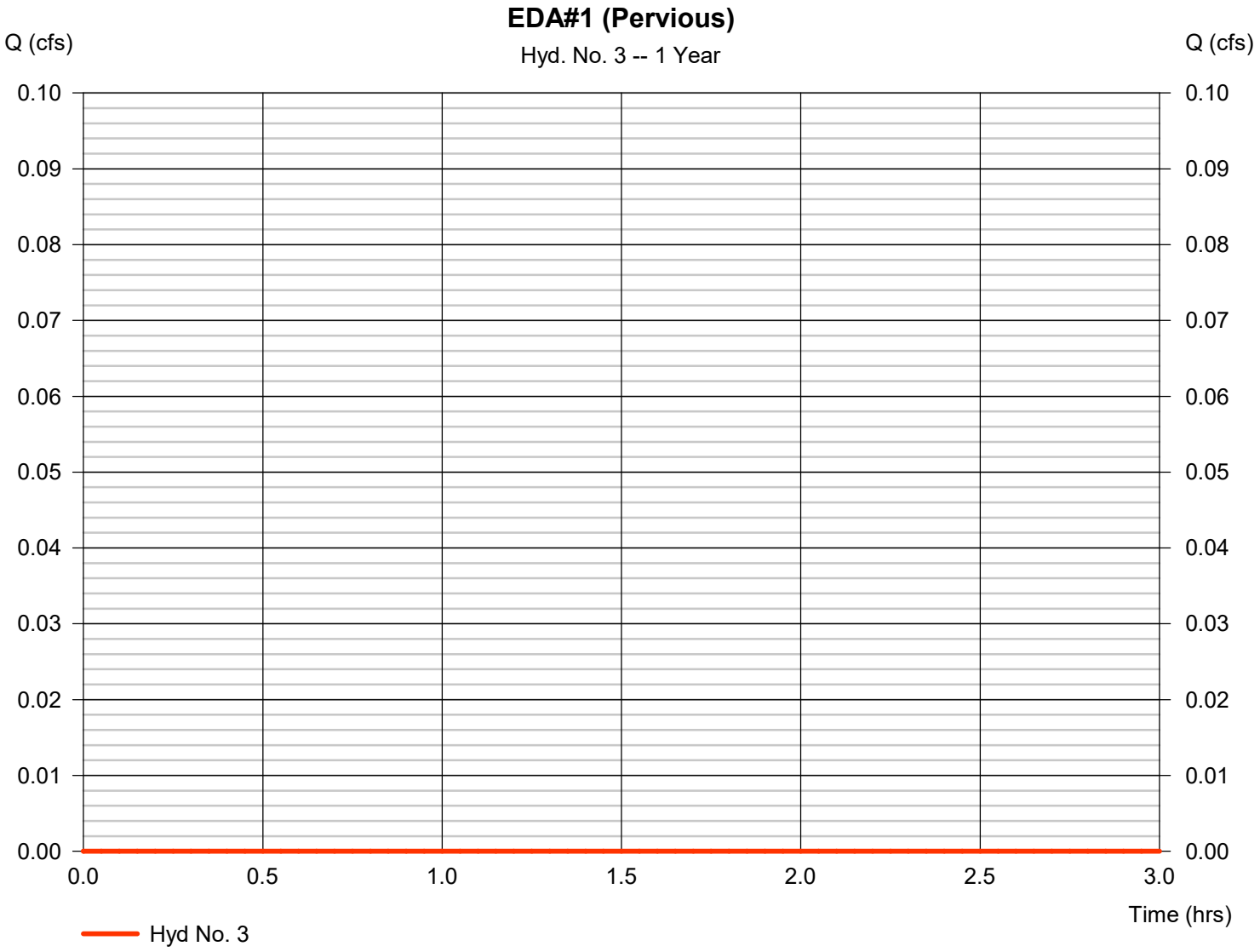


Hydrograph Report

Hyd. No. 3

EDA#1 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 10.342 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 17.10 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN		

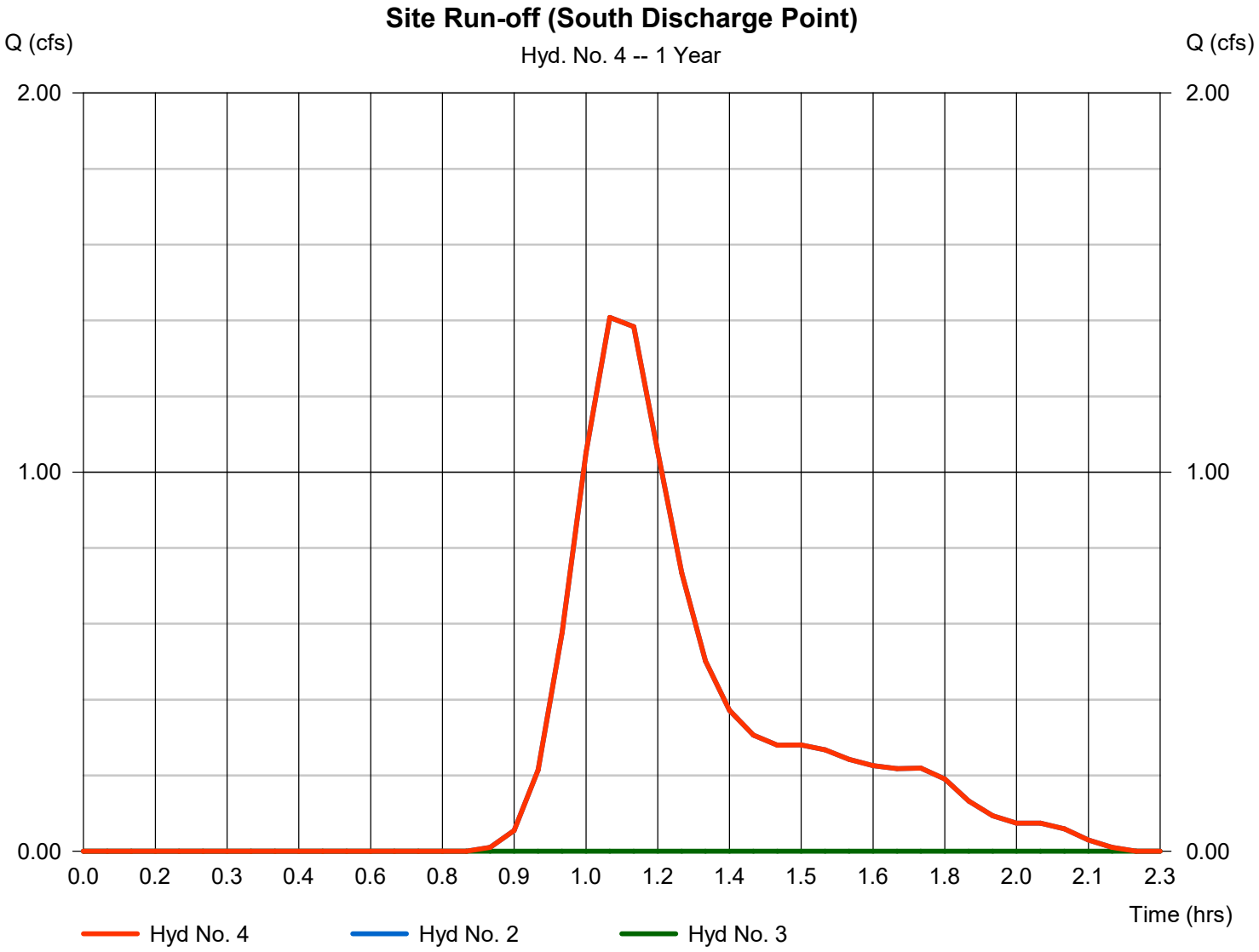


Hydrograph Report

Hyd. No. 4

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 1.408 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 1,811 cuft
Inflow hyds.	= 2, 3	Contrib. drain. area	= 11.420 ac

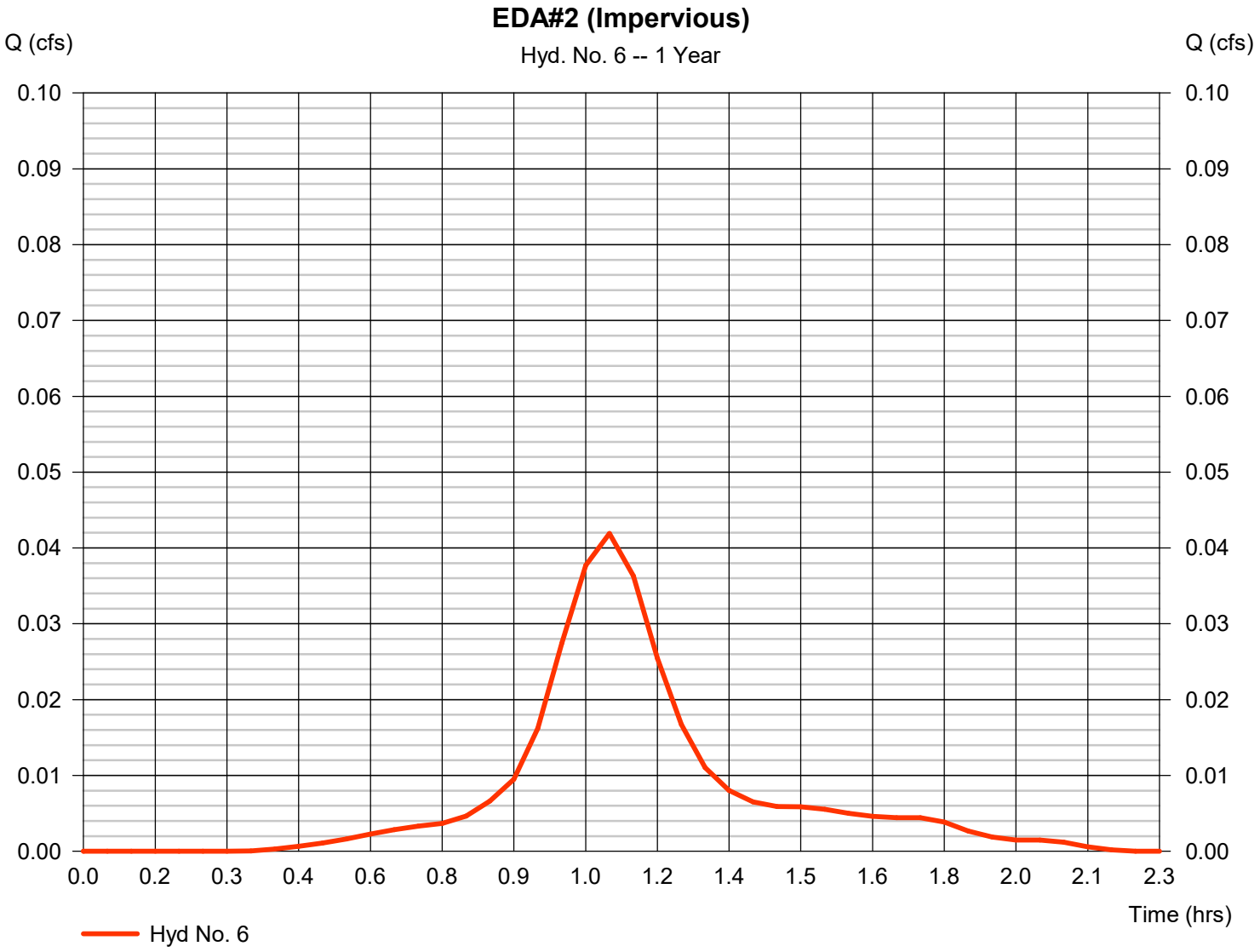


Hydrograph Report

Hyd. No. 6

EDA#2 (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.042 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 56 cuft
Drainage area	= 0.016 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterSupply\Rainfall Distribution\484.25in2hrstorm-3 MIN	Shape factor	= 484

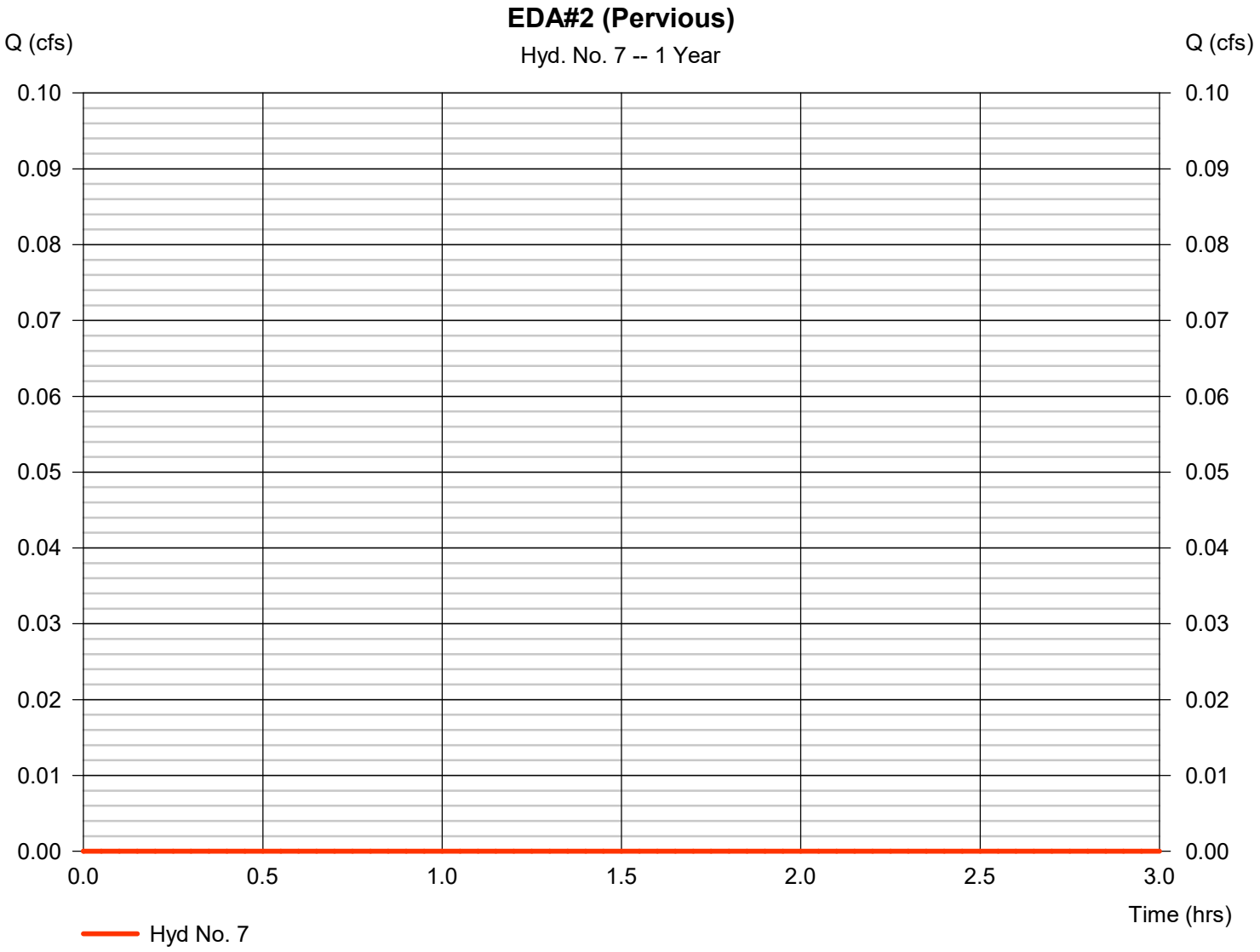


Hydrograph Report

Hyd. No. 7

EDA#2 (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 1.914 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.20 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterSupplyFarm\Quality Rainfall Distribution\484.25in2hrstorm-3 MIN		

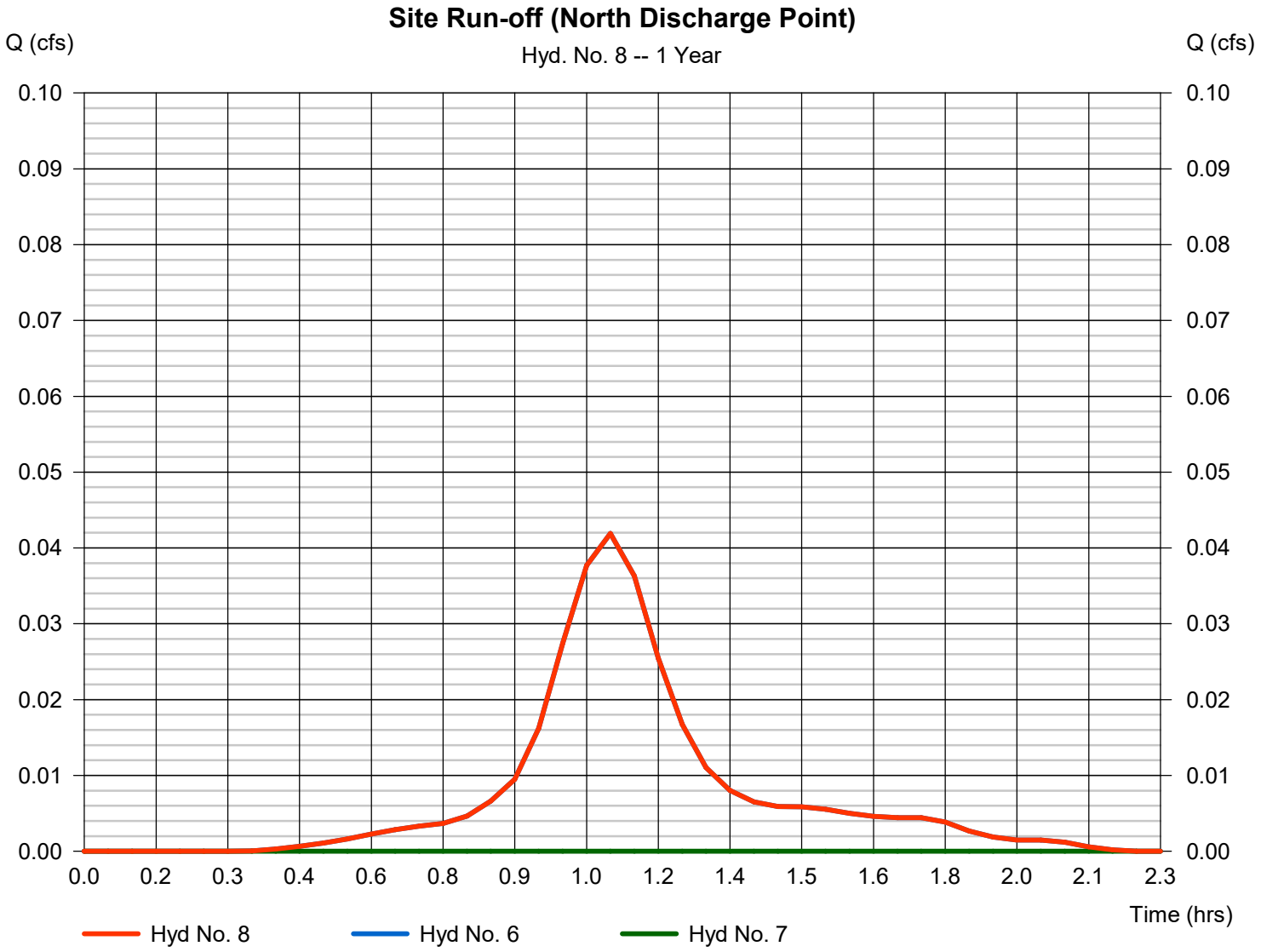


Hydrograph Report

Hyd. No. 8

Site Run-off (North Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 0.042 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 56 cuft
Inflow hyds.	= 6, 7	Contrib. drain. area	= 1.930 ac

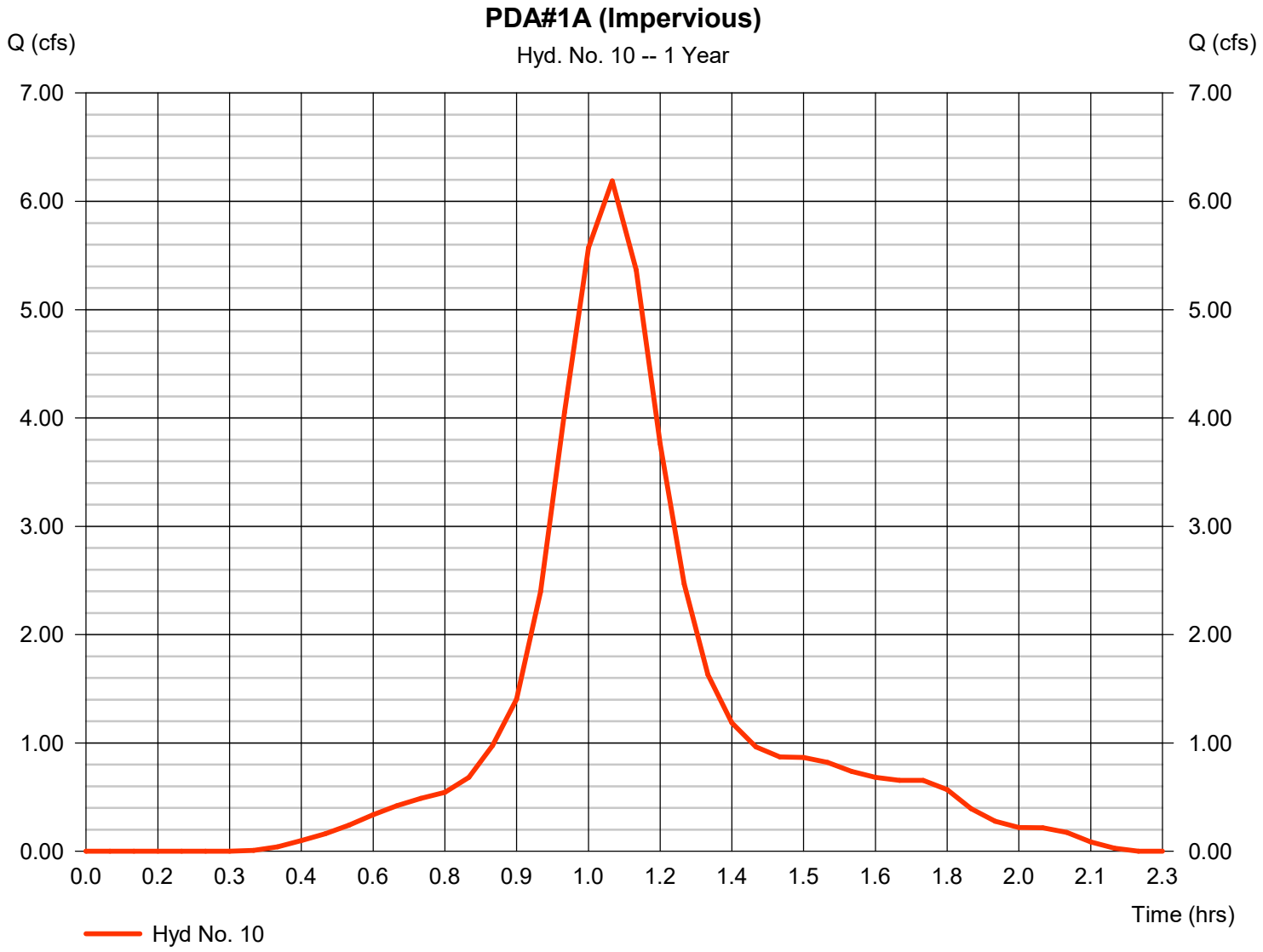


Hydrograph Report

Hyd. No. 10

PDA#1A (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.190 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.10 hrs
Time interval	=	3 min	Hyd. volume	=	8,323 cuft
Drainage area	=	2.364 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN			

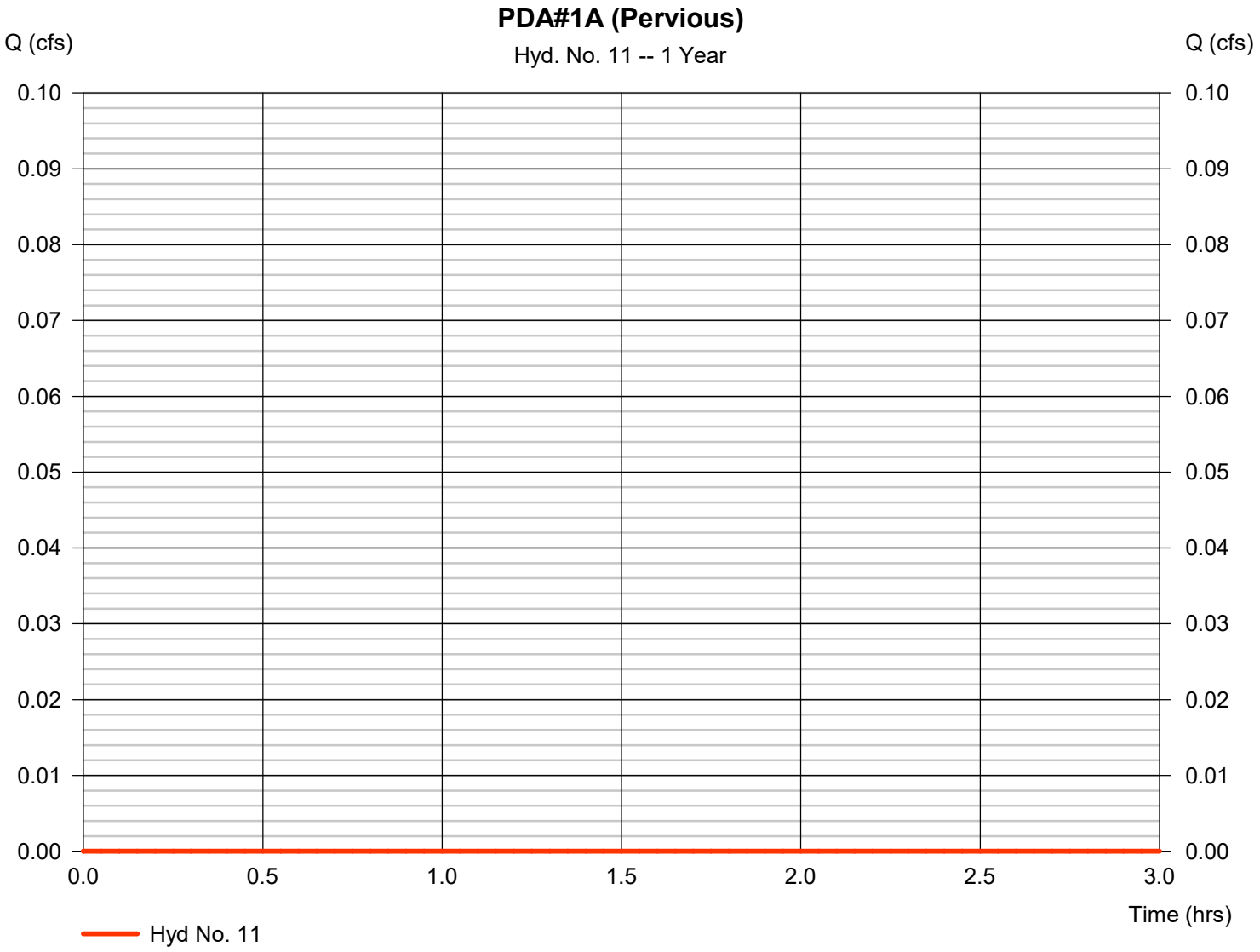


Hydrograph Report

Hyd. No. 11

PDA#1A (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 4.326 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 14.70 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\1.25in2hrstorm-3 MIN	Shape factor	= 484

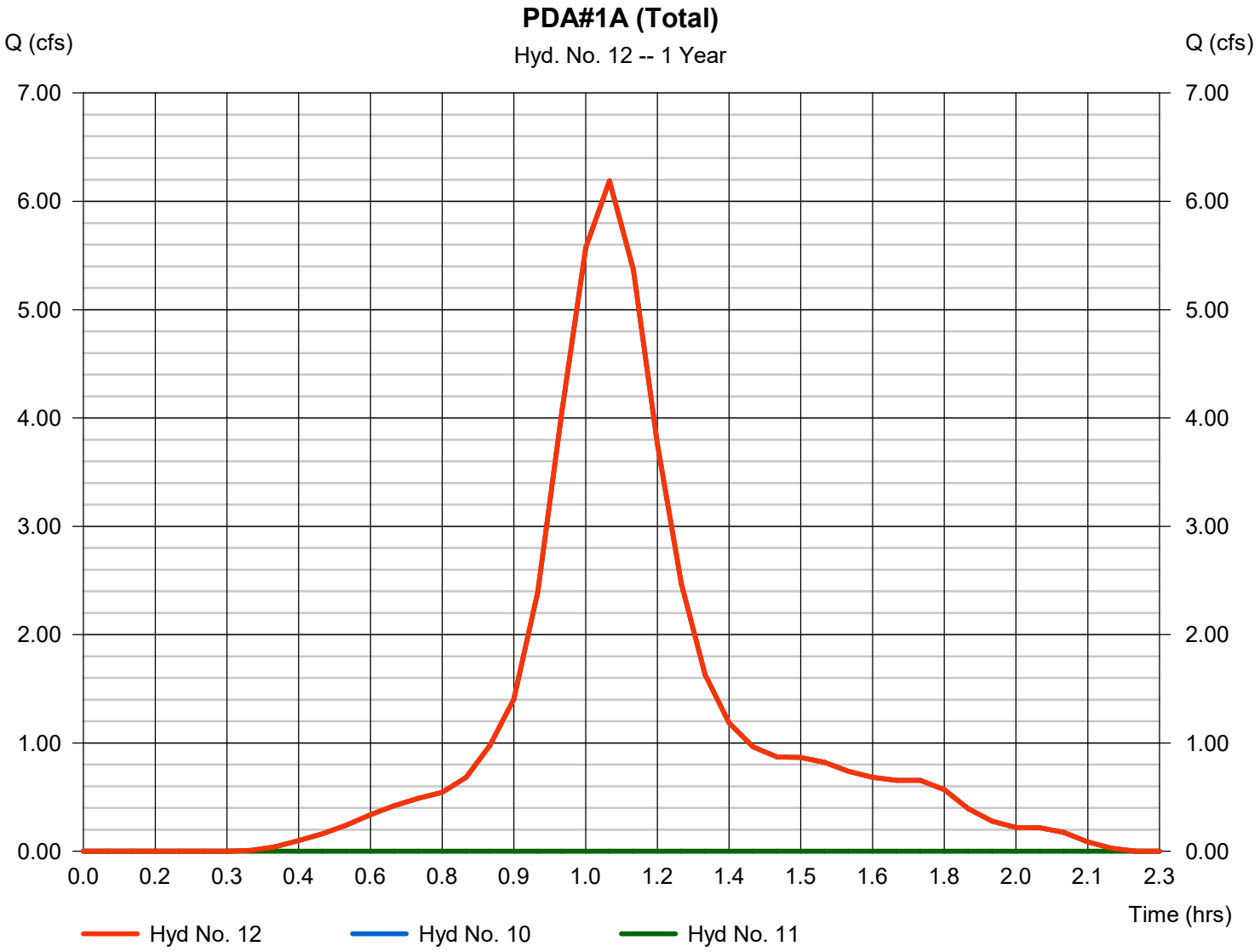


Hydrograph Report

Hyd. No. 12

PDA#1A (Total)

Hydrograph type	=	Combine	Peak discharge	=	6.190 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.10 hrs
Time interval	=	3 min	Hyd. volume	=	8,323 cuft
Inflow hyds.	=	10, 11	Contrib. drain. area	=	6.690 ac



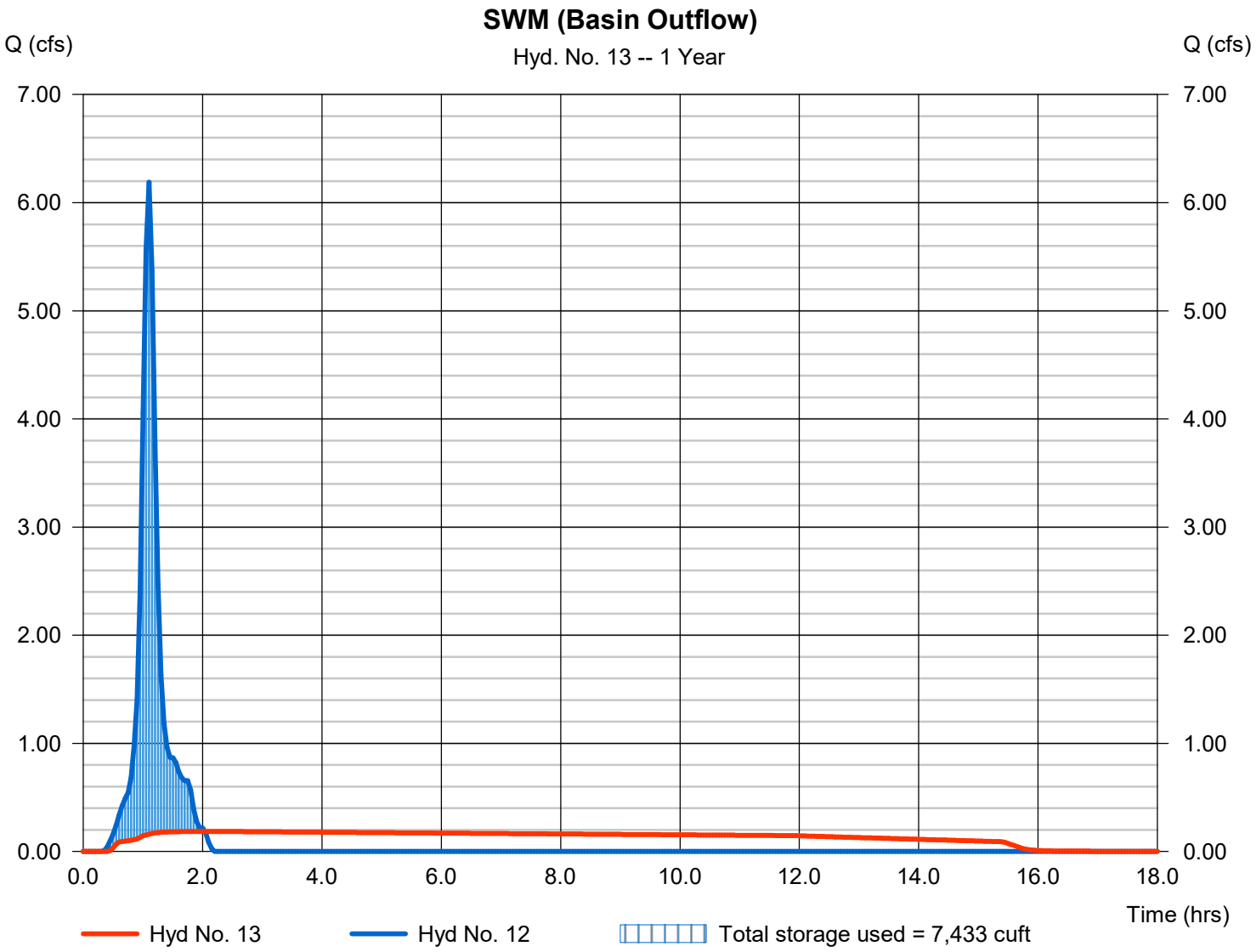
Hydrograph Report

Hyd. No. 13

SWM (Basin Outflow)

Hydrograph type	=	Reservoir	Peak discharge	=	0.185 cfs
Storm frequency	=	1 yrs	Time to peak	=	2.05 hrs
Time interval	=	3 min	Hyd. volume	=	8,320 cuft
Inflow hyd. No.	=	12 - PDA#1A (Total)	Max. Elevation	=	93.48 ft
Reservoir name	=	Basin	Max. Storage	=	7,433 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 92.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	92.10	01	0	0
0.40	92.50	702	97	97
0.90	93.00	6,248	1,507	1,604
1.90	94.00	19,367	12,204	13,808
2.90	95.00	21,610	20,476	34,285
3.90	96.00	23,954	22,770	57,054
4.40	96.50	27,025	12,736	69,790

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	0.00	0.00
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 90.00	92.10	0.00	0.00
Length (ft)	= 33.00	0.00	0.00	0.00
Slope (%)	= 6.60	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	2.30	20.00	0.00
Crest El. (ft)	= 95.30	94.00	95.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

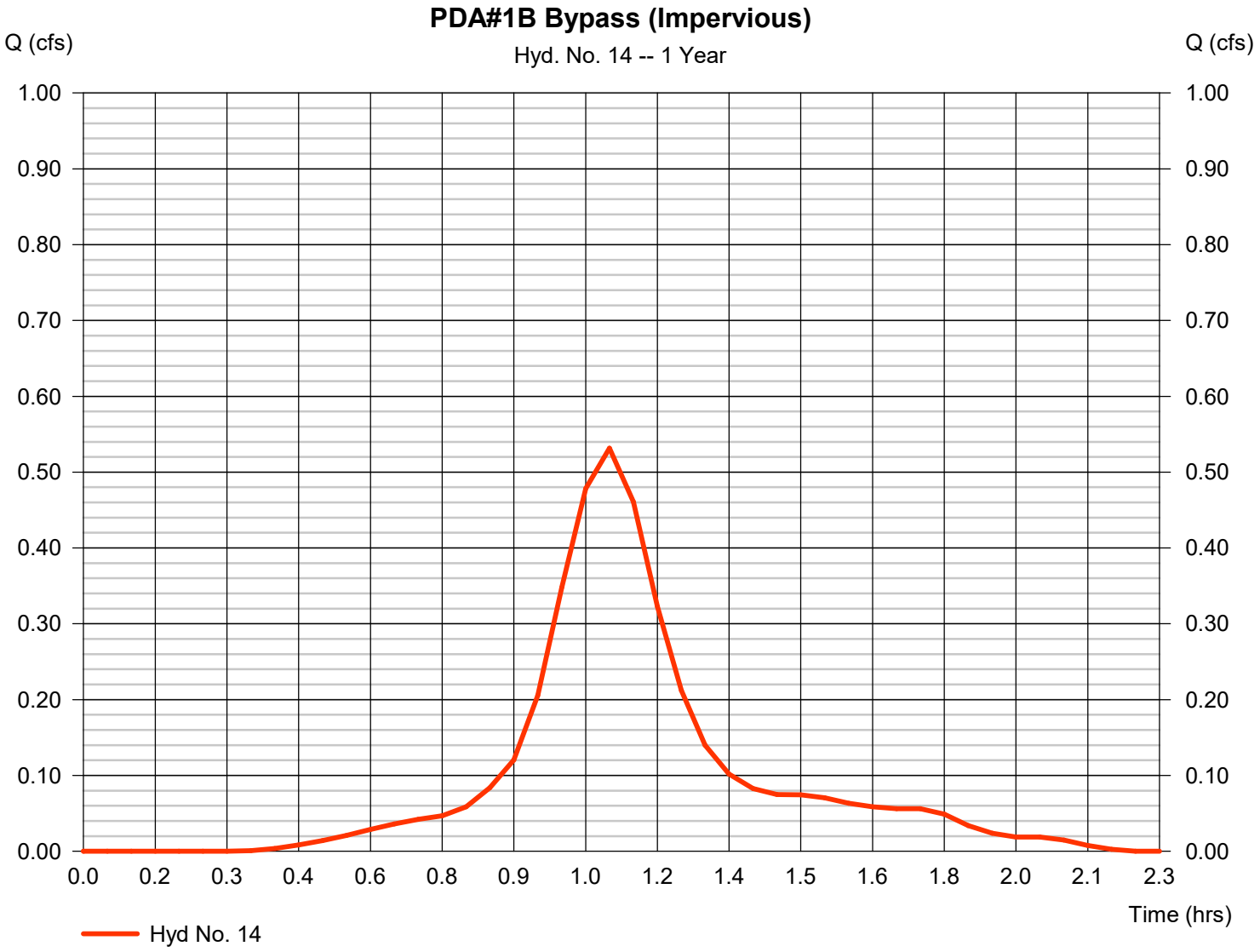
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	92.10	0.00	0.00	---	---	0.00	0.00	0.00	---	---	---	0.000
0.40	97	92.50	15.86 ic	0.09 ic	---	---	0.00	0.00	0.00	---	---	---	0.089
0.90	1,604	93.00	15.86 ic	0.15 ic	---	---	0.00	0.00	0.00	---	---	---	0.146
1.90	13,808	94.00	15.86 ic	0.22 ic	---	---	0.00	0.00	0.00	---	---	---	0.220
2.90	34,285	95.00	15.86 ic	0.27 ic	---	---	0.00	7.66	0.00	---	---	---	7.933
3.90	57,054	96.00	33.09 ic	0.08 ic	---	---	22.40 s	10.61 s	18.38	---	---	---	51.47
4.40	69,790	96.50	35.26 ic	0.04 ic	---	---	26.54 s	8.67 s	52.00	---	---	---	87.25

Hydrograph Report

Hyd. No. 14

PDA#1B Bypass (Impervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.532 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 715 cuft
Drainage area	= 0.203 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\Water Quality Rainfall Distributions\24-1.25in2hrstorm-3 MIN		

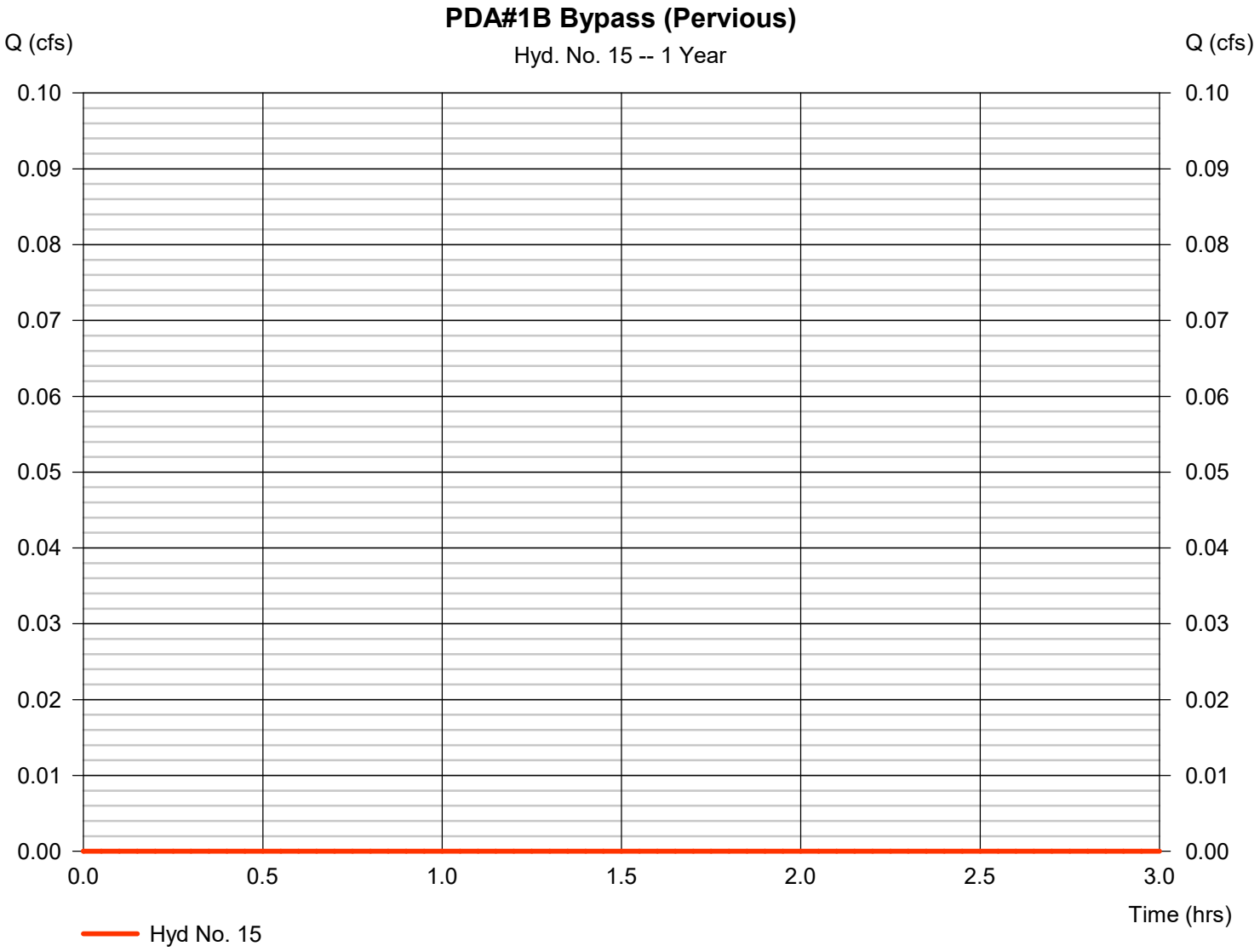


Hydrograph Report

Hyd. No. 15

PDA#1B Bypass (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 3.717 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 13.30 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN	Shape factor	= 484

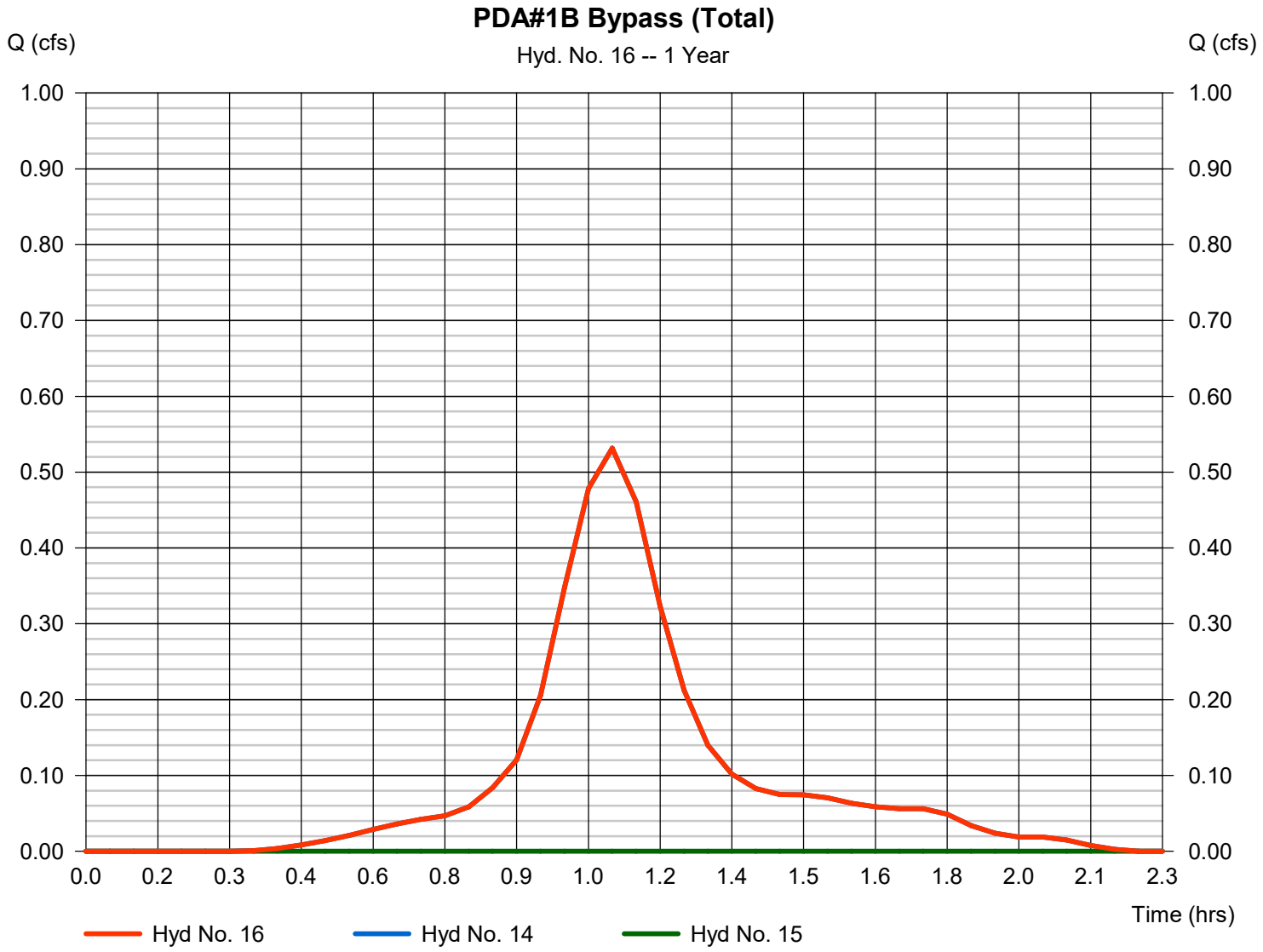


Hydrograph Report

Hyd. No. 16

PDA#1B Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 0.532 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 715 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 3.920 ac

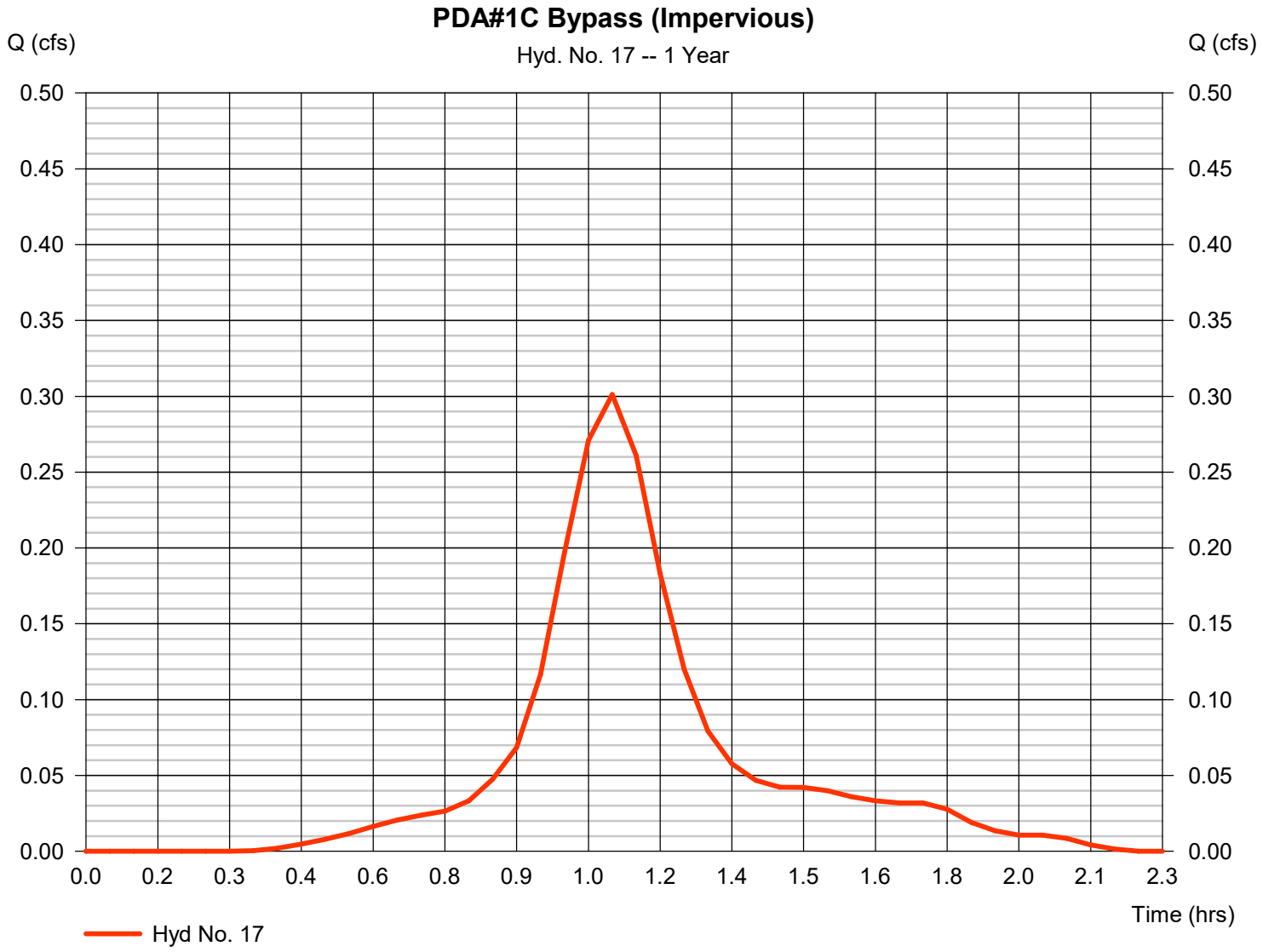


Hydrograph Report

Hyd. No. 17

PDA#1C Bypass (Impervious)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.301 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.10 hrs
Time interval	=	3 min	Hyd. volume	=	405 cuft
Drainage area	=	0.115 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN			



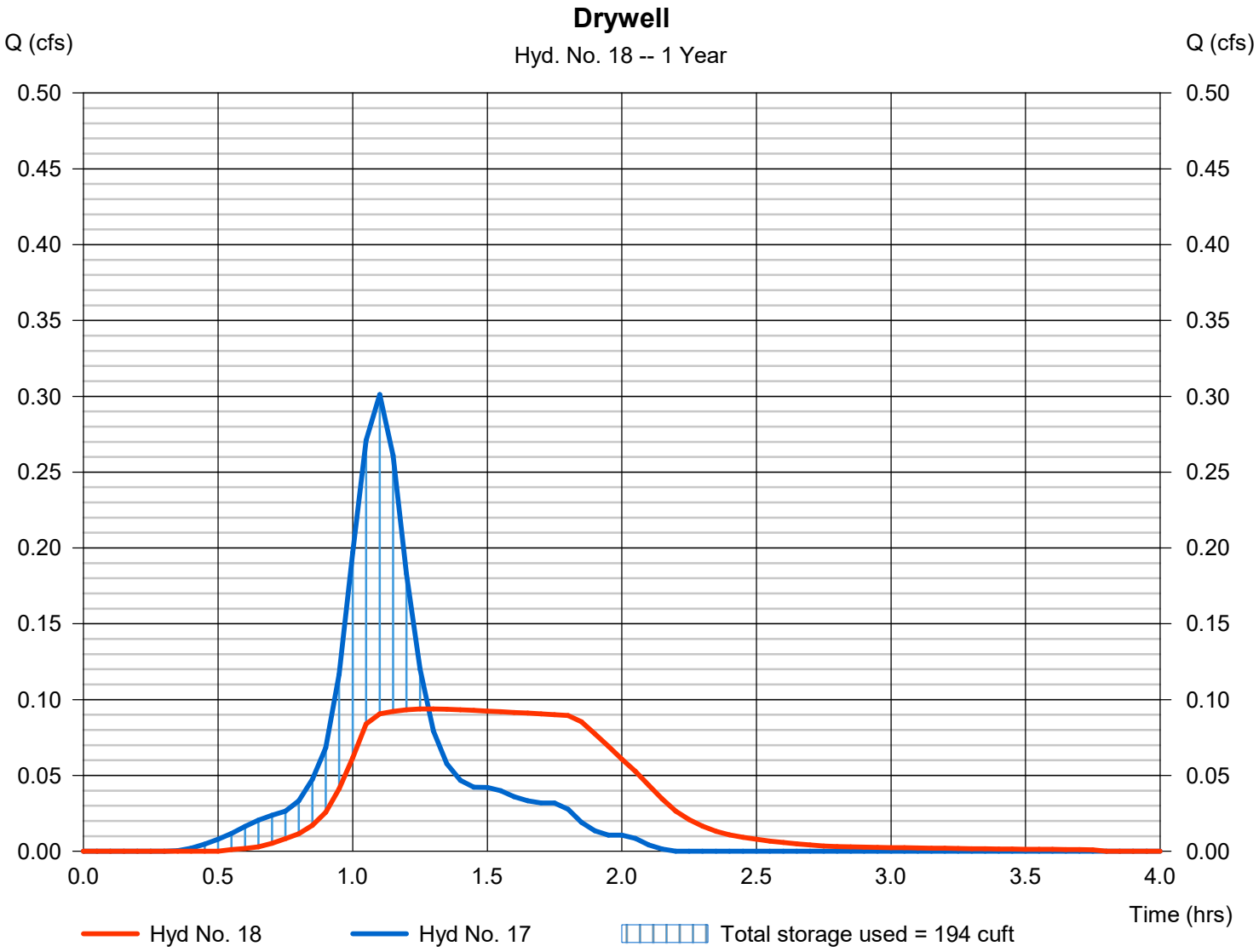
Hydrograph Report

Hyd. No. 18

Drywell

Hydrograph type	=	Reservoir	Peak discharge	=	0.094 cfs
Storm frequency	=	1 yrs	Time to peak	=	1.30 hrs
Time interval	=	3 min	Hyd. volume	=	402 cuft
Inflow hyd. No.	=	17 - PDA#1C Bypass (Impervious)	Max. Elevation	=	92.53 ft
Reservoir name	=	Basin	Max. Storage	=	194 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 92.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	92.10	01	0	0
0.40	92.50	702	97	97
0.90	93.00	6,248	1,507	1,604
1.90	94.00	19,367	12,204	13,808
2.90	95.00	21,610	20,476	34,285
3.90	96.00	23,954	22,770	57,054
4.40	96.50	27,025	12,736	69,790

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	0.00	0.00
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 90.00	92.10	0.00	0.00
Length (ft)	= 33.00	0.00	0.00	0.00
Slope (%)	= 6.60	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	2.30	20.00	0.00
Crest El. (ft)	= 95.30	94.00	95.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

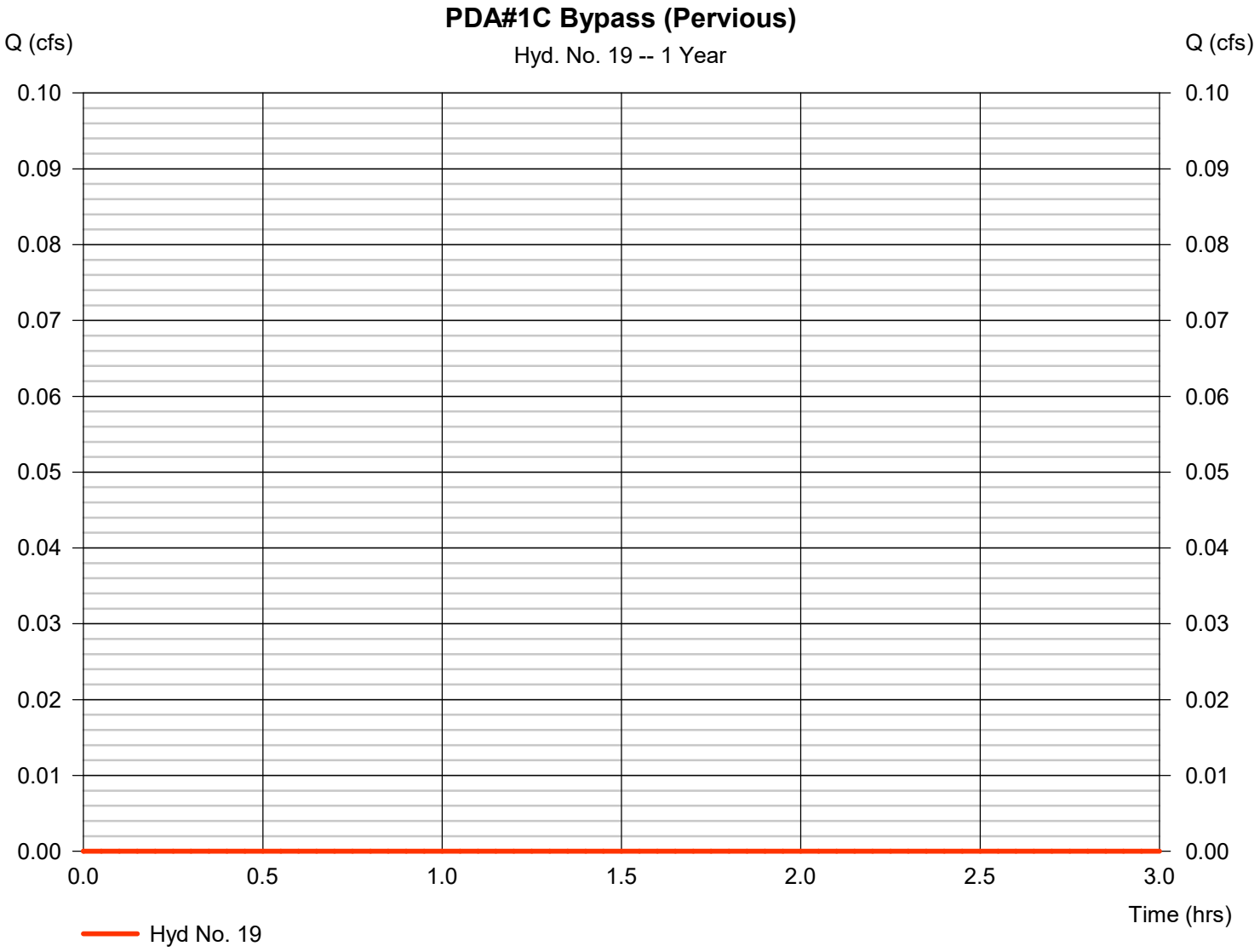
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	92.10	0.00	0.00	---	---	0.00	0.00	0.00	---	---	---	0.000
0.40	97	92.50	15.86 ic	0.09 ic	---	---	0.00	0.00	0.00	---	---	---	0.089
0.90	1,604	93.00	15.86 ic	0.15 ic	---	---	0.00	0.00	0.00	---	---	---	0.146
1.90	13,808	94.00	15.86 ic	0.22 ic	---	---	0.00	0.00	0.00	---	---	---	0.220
2.90	34,285	95.00	15.86 ic	0.27 ic	---	---	0.00	7.66	0.00	---	---	---	7.933
3.90	57,054	96.00	33.09 ic	0.08 ic	---	---	22.40 s	10.61 s	18.38	---	---	---	51.47
4.40	69,790	96.50	35.26 ic	0.04 ic	---	---	26.54 s	8.67 s	52.00	---	---	---	87.25

Hydrograph Report

Hyd. No. 19

PDA#1C Bypass (Pervious)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 0.705 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.10 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN		

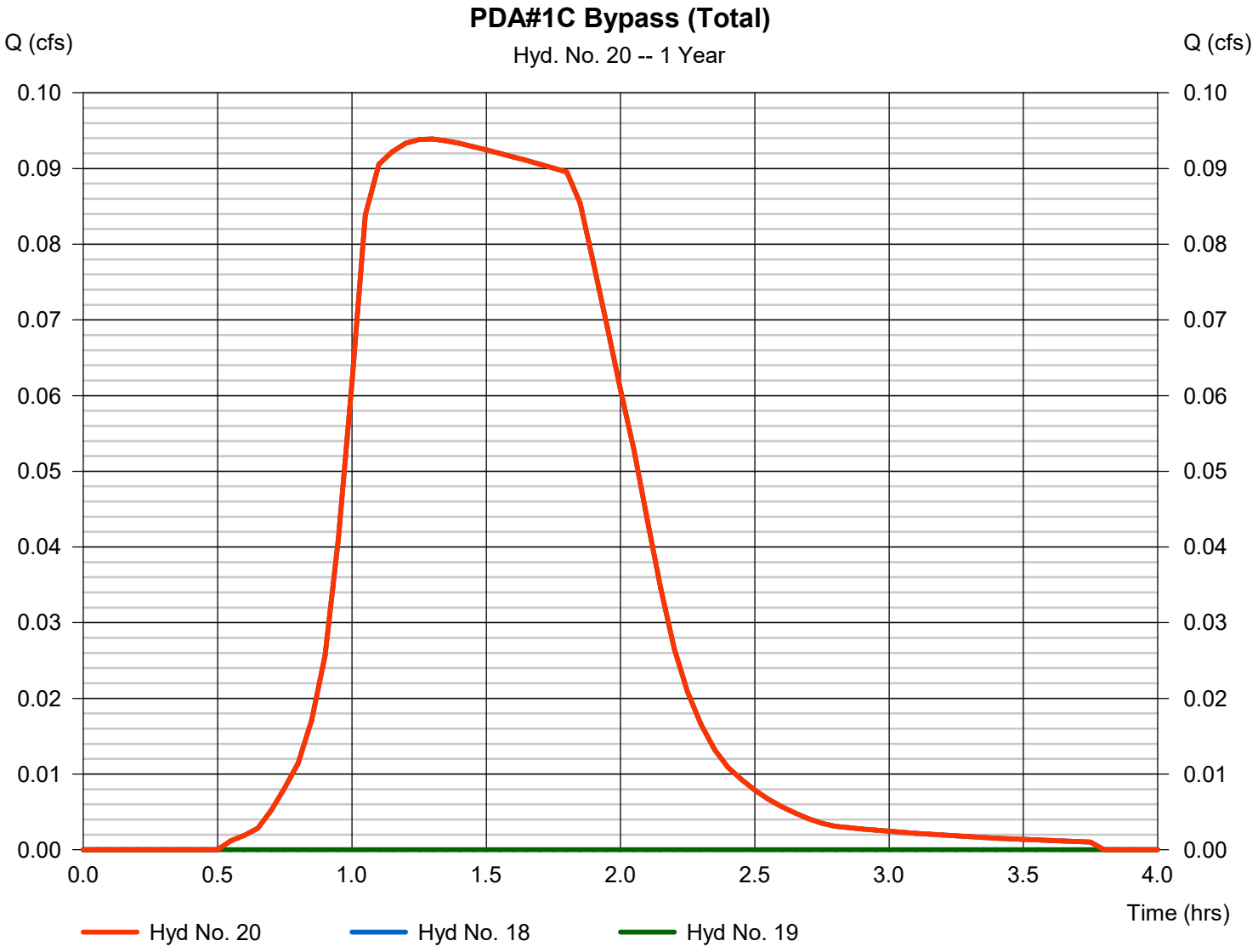


Hydrograph Report

Hyd. No. 20

PDA#1C Bypass (Total)

Hydrograph type	= Combine	Peak discharge	= 0.094 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.30 hrs
Time interval	= 3 min	Hyd. volume	= 402 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 0.705 ac

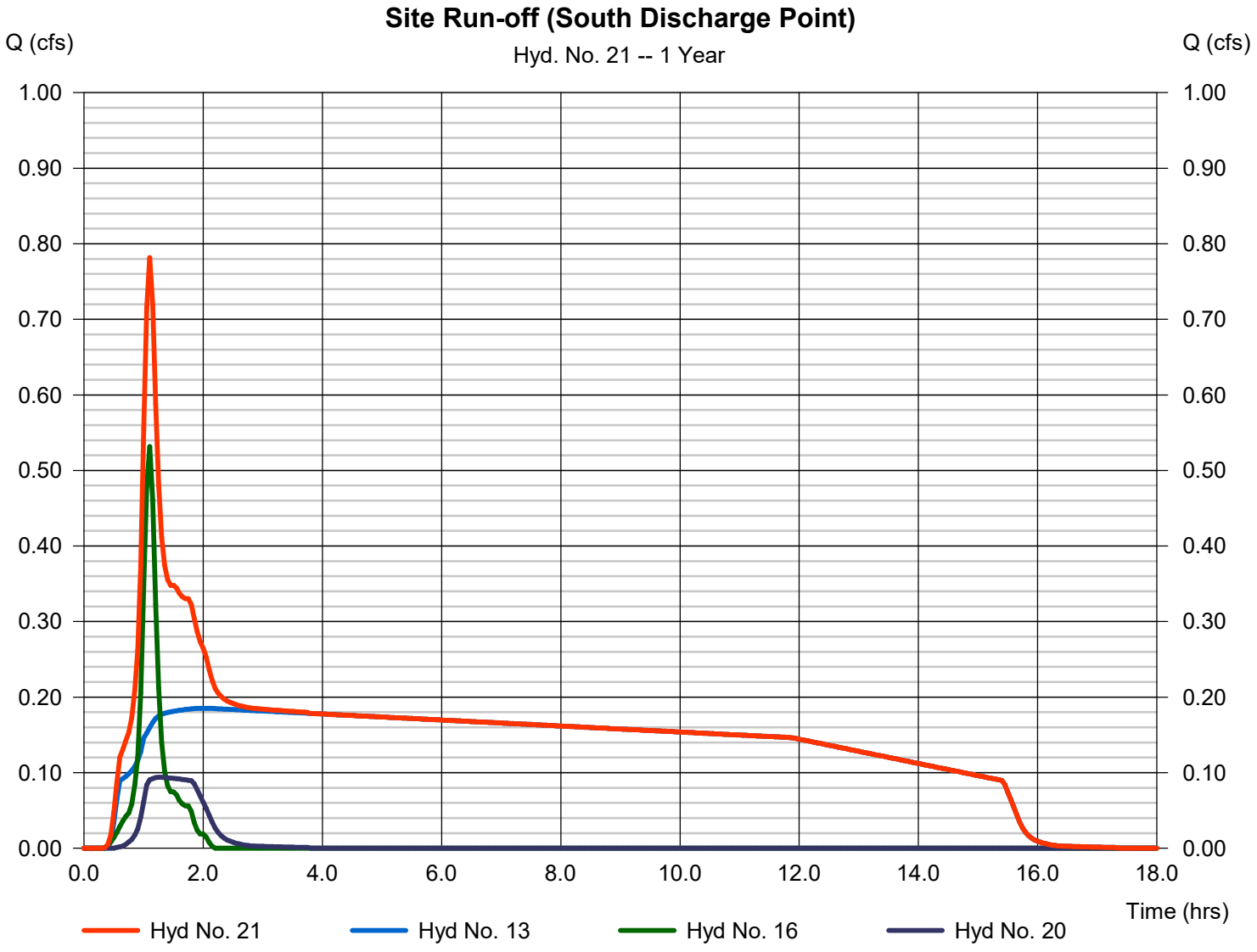


Hydrograph Report

Hyd. No. 21

Site Run-off (South Discharge Point)

Hydrograph type	= Combine	Peak discharge	= 0.782 cfs
Storm frequency	= 1 yrs	Time to peak	= 1.10 hrs
Time interval	= 3 min	Hyd. volume	= 9,437 cuft
Inflow hyds.	= 13, 16, 20	Contrib. drain. area	= 0.000 ac

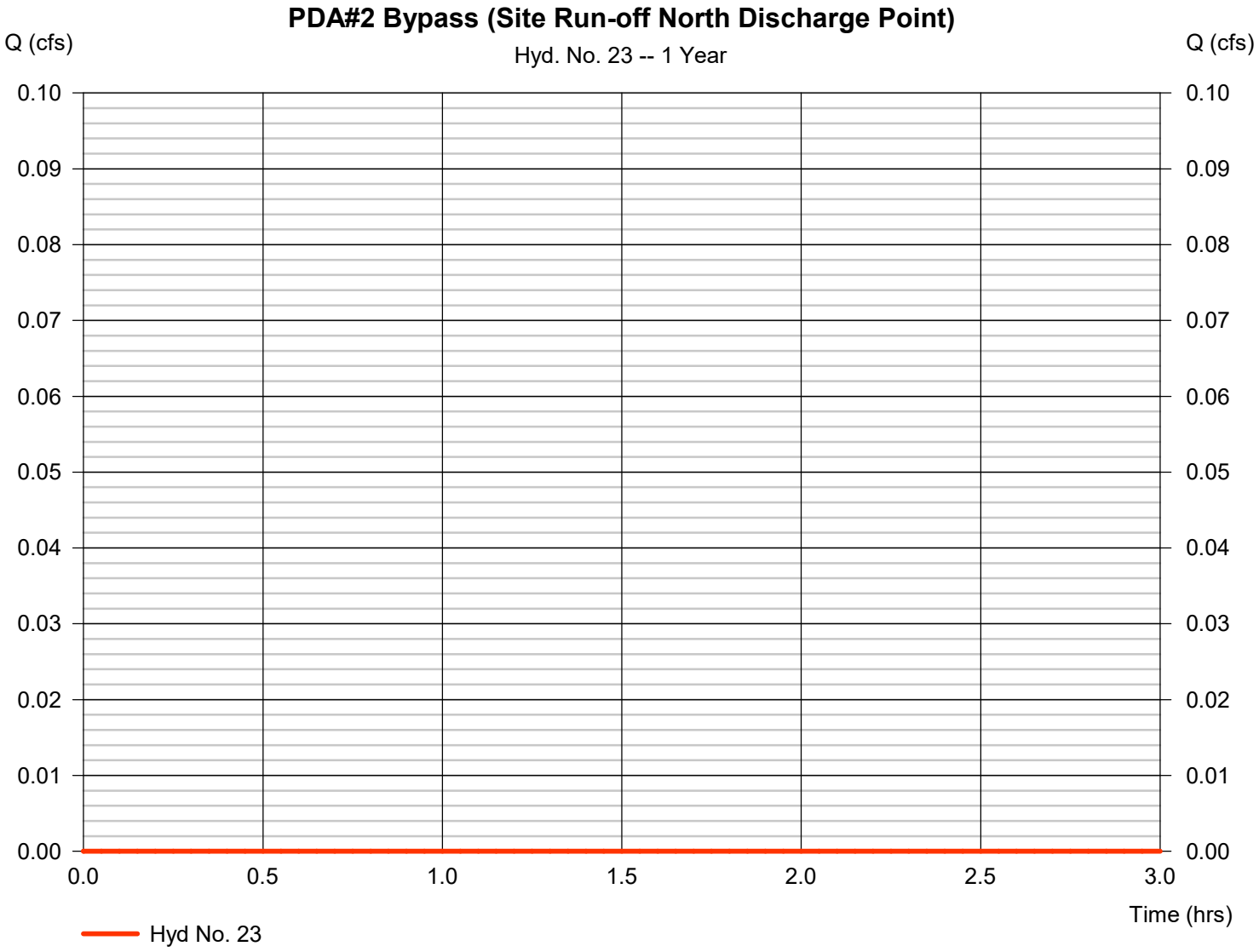


Hydrograph Report

Hyd. No. 23

PDA#2 Bypass (Site Run-off North Discharge Point)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= n/a
Time interval	= 3 min	Hyd. volume	= 0 cuft
Drainage area	= 1.920 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.70 min
Total precip.	= 1.25 in	Distribution	= Custom
Storm duration	= R:\Hydroflow Standards\WaterShapeyard\Rainfall Distribution\484.25in2hrstorm-3 MIN		



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	69.8703	13.1000	0.8658	--------
3	0.0000	0.0000	0.0000	--------
5	79.2597	14.6000	0.8369	--------
10	88.2351	15.5000	0.8279	--------
25	102.6072	16.5000	0.8217	--------
50	114.8193	17.2000	0.8199	--------
100	127.1596	17.8000	0.8186	--------

File name: SampleFHA.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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
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	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

Precip. file name: F:\Hydroflow Standards\Mercer.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	0.00	3.32	0.00	4.20	5.07	6.20	7.20	8.52
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	1.25	3.32	0.00	0.00	5.07	0.00	0.00	8.52

APPENDIX F

Drywell Storage & Draining Calculations:

Drywell Storage Target Volume:
(3 inches rain)(1/12)(5,000 sf) = **1,250 cf**

Drywell Storage Volume:

Volume of Stone:

Bottom Width	12.00	Ft
Bottom Length	12.00	Ft
Bottom Area (A)	144.00	SF
Depth of Stone	8.38	Ft
Volume of Stone & Drywell	1206.72	CF
Volume of Stone	835.76	CF
Void Ratio	0.40	
Stone Storage Volume	**334.30**	**CF**
Number of Drywells	2	
Total Drywell Storage (V)	**1291.46**	**CF**

Volume of Drywell:

Outter Radius	4.00	Ft
Outter Area	50.27	SF
Drywell Depth	7.38	Ft
Drywell Outter Volume	370.96	CF
Inner Radius	3.67	Ft
Inner Area	42.20	SF
Drywell Storage Volume	**311.43**	**CF**

Rate of Infiltration:

Q=KIA
Q: Rate of Infiltration (cfs)
K: Design Permeability (fps)
I: Hydraulic Gradient
A: Area of Infiltration (SF)

K	0.5	in/hr
	1.15741E-05	**fps**

I=Davg/d
Davg=(D1+D2)/2
D1: Min Distance to Groundwater
D2: Max Distance to Groundwater
d: distance from bottom of drywell to Groundwater

D1	2	Ft
D2	8.38	Ft
Davg	5.19	Ft
d	2	Ft
I	**2.595**	
A: Bottom	**288.00**	**SF**
Q	**0.00865**	**CFS**
	31.140	**CF/Hr**

Drain Time:

t=V/Q

41.5 Hours

<72 Hours

SEDIMENT BASIN CALCULATIONS

JOB NAME:	New Rose Subdivision				
JOB NUMBER:	0116156	DWN:	AA	CHK:	ADR
DATE:	07/08/2020	LAST REVISED:	N/A		Page 1 of 1

Minimum width:

$W = 10 \times (Q_5)^{1/2}$

where: W = the width in feet

Q_5 = peak discharge from a 5-year frequency storm, in CFS

$W = 10 \times (1.951)^{1/2}$

W = 13.97

Use 14 feet

Sediment Storage Capacity plus 2-Year Storm Runoff Volume

$V = (DA)\ (A)\ (DR)\ (TE)\ (1/\gamma_s)\ (2{,}000\ lbs./tons)\ (1/43{,}560\ ft^2/ac)$

where: V = the volume of sediment trapped in acre-feet/year

DA = the total drainage area in acres, use 6.69 acres

A = the average annual erosion in tons/acre/year, use 50 tons/ac/yr

DR = the delivery ratio, per Curve 24-2, use 80%

TE = trap efficiency, use 75%

γ_s = the submerged density in a wet sediment pool, use 65 lbs/ft^3

$V = (6.69\ ac)*(50\ tons/ac/yr)*(80\%)*(75\%)*(1/65\ lbs/ft^3)*$
$(2{,}000\ lbs/ton)*(1/43{,}560\ ft^2/ac)$

V = 0.14 acre-feet/year

Minimum length:

$L = V / (W * H)$

where: W = 14 feet

V = 0.14 acre-feet/year *or* 6,098 ft^3/year

H = 4 feet (Standards call for a minimum average depth of 4 feet)

L = 6,098 / (14 * 4)

L = 108.90

Use 109 feet The Standards specify the length be at least twice the width

Note: Design values used above were calculated following guidelines on Chapter 24-1 of the *"Standards for Soil Erosion & Sediment Control in New Jersey."*

APPENDIX G

Detention Basin Detention Time & TSS Removal Rate

Time to Peak Elevation (hr)	Peak Storage Volume for WQ Design Storm (cf)	10% Peak Storage Volume	Time to 10% WQ Volume (hr)	Detention Time Used (12<=Td<=24)(hr)	% TSS Removal
2	7,158	715.8	12	10	0

Hydrograph Report

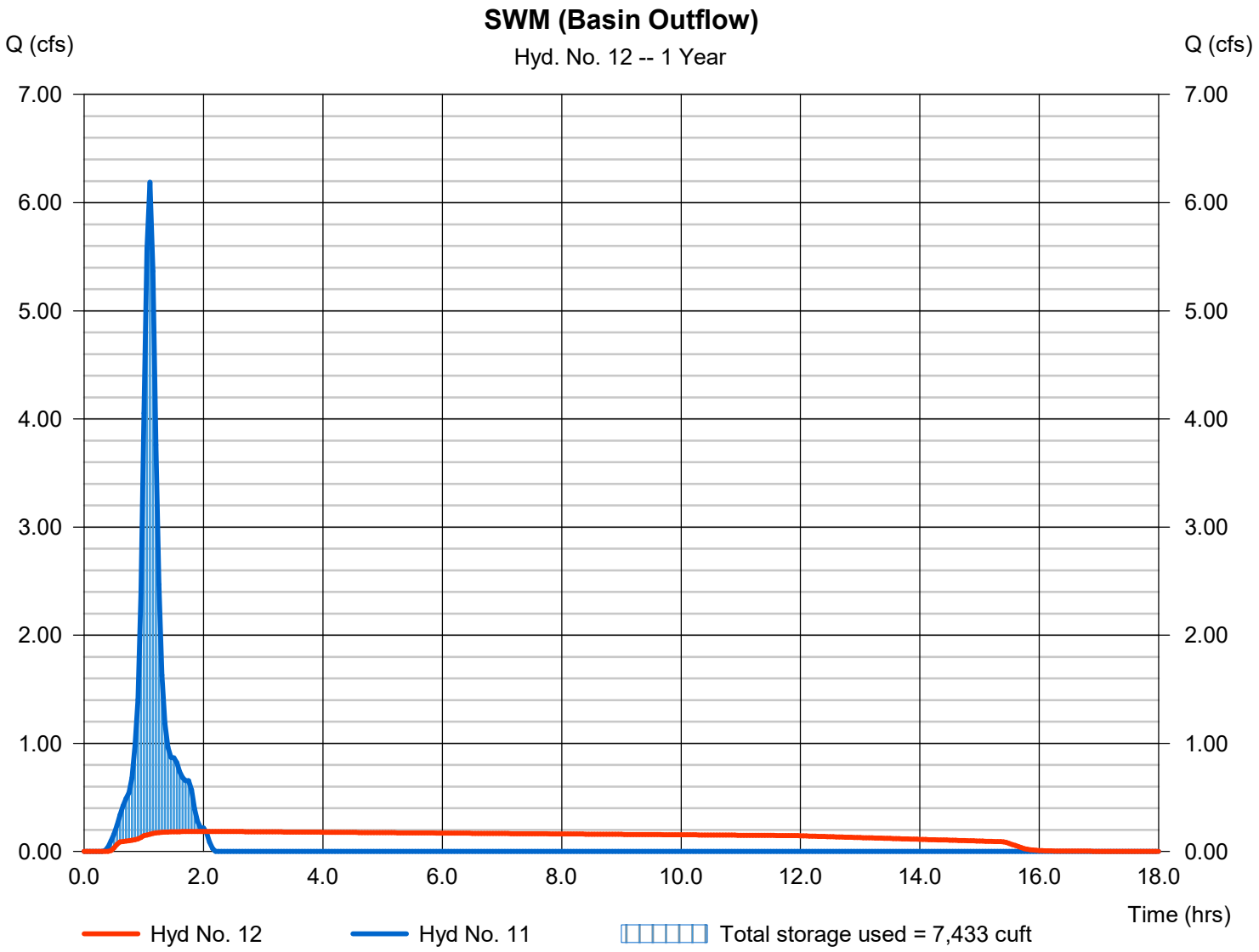
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Wednesday, 07 / 8 / 2020

Hyd. No. 12

SWM (Basin Outflow)

Hydrograph type	= Reservoir	Peak discharge	= 0.185 cfs
Storm frequency	= 1 yrs	Time to peak	= 2.05 hrs
Time interval	= 3 min	Hyd. volume	= 8,320 cuft
Inflow hyd. No.	= 11 - PDA#1A (Total)	Max. Elevation	= 93.48 ft
Reservoir name	= Basin	Max. Storage	= 7,433 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Basin

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 92.10 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	92.10	01	0	0
0.40	92.50	702	97	97
0.90	93.00	6,248	1,507	1,604
1.90	94.00	19,367	12,204	13,808
2.90	95.00	21,610	20,476	34,285
3.90	96.00	23,954	22,770	57,054
4.40	96.50	27,025	12,736	69,790

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	2.50	0.00	0.00
Span (in)	= 24.00	2.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 90.00	92.10	0.00	0.00
Length (ft)	= 33.00	0.00	0.00	0.00
Slope (%)	= 6.60	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.00	2.30	20.00	0.00
Crest El. (ft)	= 95.30	94.00	95.50	0.00
Weir Coeff.	= 3.33	3.33	2.60	3.33
Weir Type	= 1	Rect	Broad	---
Multi-Stage	= Yes	Yes	No	No

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

TW Elev. (ft) = 0.00

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

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	92.10	0.00	0.00	---	---	0.00	0.00	0.00	---	---	---	0.000
0.04	10	92.14	15.86 ic	0.00 ic	---	---	0.00	0.00	0.00	---	---	---	0.003
0.08	19	92.18	15.86 ic	0.01 ic	---	---	0.00	0.00	0.00	---	---	---	0.012
0.12	29	92.22	15.86 ic	0.02 ic	---	---	0.00	0.00	0.00	---	---	---	0.024
0.16	39	92.26	15.86 ic	0.04 ic	---	---	0.00	0.00	0.00	---	---	---	0.039
0.20	49	92.30	15.86 ic	0.05 ic	---	---	0.00	0.00	0.00	---	---	---	0.051
0.24	58	92.34	15.86 ic	0.06 ic	---	---	0.00	0.00	0.00	---	---	---	0.060
0.28	68	92.38	15.86 ic	0.07 ic	---	---	0.00	0.00	0.00	---	---	---	0.069
0.32	78	92.42	15.86 ic	0.08 ic	---	---	0.00	0.00	0.00	---	---	---	0.076
0.36	88	92.46	15.86 ic	0.08 ic	---	---	0.00	0.00	0.00	---	---	---	0.083
0.40	97	92.50	15.86 ic	0.09 ic	---	---	0.00	0.00	0.00	---	---	---	0.089
0.45	248	92.55	15.86 ic	0.10 ic	---	---	0.00	0.00	0.00	---	---	---	0.097
0.50	399	92.60	15.86 ic	0.10 ic	---	---	0.00	0.00	0.00	---	---	---	0.103
0.55	549	92.65	15.86 ic	0.11 ic	---	---	0.00	0.00	0.00	---	---	---	0.110
0.60	700	92.70	15.86 ic	0.12 ic	---	---	0.00	0.00	0.00	---	---	---	0.116
0.65	851	92.75	15.86 ic	0.12 ic	---	---	0.00	0.00	0.00	---	---	---	0.121
0.70	1,002	92.80	15.86 ic	0.13 ic	---	---	0.00	0.00	0.00	---	---	---	0.127
0.75	1,152	92.85	15.86 ic	0.13 ic	---	---	0.00	0.00	0.00	---	---	---	0.132
0.80	1,303	92.90	15.86 ic	0.14 ic	---	---	0.00	0.00	0.00	---	---	---	0.137
0.85	1,454	92.95	15.86 ic	0.14 ic	---	---	0.00	0.00	0.00	---	---	---	0.142
0.90	1,604	93.00	15.86 ic	0.15 ic	---	---	0.00	0.00	0.00	---	---	---	0.146
1.00	2,825	93.10	15.86 ic	0.16 ic	---	---	0.00	0.00	0.00	---	---	---	0.155
1.10	4,045	93.20	15.86 ic	0.16 ic	---	---	0.00	0.00	0.00	---	---	---	0.164
1.20	5,266	93.30	15.86 ic	0.17 ic	---	---	0.00	0.00	0.00	---	---	---	0.172
1.30	6,486	93.40	15.86 ic	0.18 ic	---	---	0.00	0.00	0.00	---	---	---	0.179
1.40	7,706	93.50	15.86 ic	0.19 ic	---	---	0.00	0.00	0.00	---	---	---	0.187
1.50	8,927	93.60	15.86 ic	0.19 ic	---	---	0.00	0.00	0.00	---	---	---	0.194
1.60	10,147	93.70	15.86 ic	0.20 ic	---	---	0.00	0.00	0.00	---	---	---	0.201
1.70	11,368	93.80	15.86 ic	0.21 ic	---	---	0.00	0.00	0.00	---	---	---	0.207
1.80	12,588	93.90	15.86 ic	0.21 ic	---	---	0.00	0.00	0.00	---	---	---	0.214
1.90	13,808	94.00	15.86 ic	0.22 ic	---	---	0.00	0.00	0.00	---	---	---	0.220
2.00	15,856	94.10	15.86 ic	0.23 ic	---	---	0.00	0.24	0.00	---	---	---	0.468
2.10	17,904	94.20	15.86 ic	0.23 ic	---	---	0.00	0.69	0.00	---	---	---	0.917
2.20	19,951	94.30	15.86 ic	0.24 ic	---	---	0.00	1.26	0.00	---	---	---	1.496
2.30	21,999	94.40	15.86 ic	0.24 ic	---	---	0.00	1.94	0.00	---	---	---	2.181
2.40	24,046	94.50	15.86 ic	0.25 ic	---	---	0.00	2.71	0.00	---	---	---	2.956

Continues on next page...

Basin

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
2.50	26,094	94.60	15.86 ic	0.25 ic	---	---	0.00	3.56	0.00	---	---	---	3.814
2.60	28,142	94.70	15.86 ic	0.26 ic	---	---	0.00	4.49	0.00	---	---	---	4.745
2.70	30,189	94.80	15.86 ic	0.26 ic	---	---	0.00	5.48	0.00	---	---	---	5.745
2.80	32,237	94.90	15.86 ic	0.27 ic	---	---	0.00	6.54	0.00	---	---	---	6.809
2.90	34,285	95.00	15.86 ic	0.27 ic	---	---	0.00	7.66	0.00	---	---	---	7.933
3.00	36,562	95.10	15.86 ic	0.28 ic	---	---	0.00	8.84	0.00	---	---	---	9.115
3.10	38,839	95.20	15.86 ic	0.28 ic	---	---	0.00	10.07	0.00	---	---	---	10.35
3.20	41,115	95.30	15.86 ic	0.29 ic	---	---	0.00	11.35	0.00	---	---	---	11.64
3.30	43,392	95.40	15.86 ic	0.29 ic	---	---	1.68	12.69	0.00	---	---	---	14.67
3.40	45,669	95.50	19.12 ic	0.28 ic	---	---	4.77	14.07	0.00	---	---	---	19.12
3.50	47,946	95.60	24.49 ic	0.23 ic	---	---	8.75	15.50	1.64	---	---	---	26.13
3.60	50,223	95.70	28.92 ic	0.17 ic	---	---	13.48	15.27 s	4.65	---	---	---	33.57
3.70	52,500	95.80	31.46 ic	0.11 ic	---	---	18.75 s	12.59 s	8.54	---	---	---	40.00
3.80	54,777	95.90	32.43 ic	0.09 ic	---	---	20.97 s	11.36 s	13.15	---	---	---	45.58
3.90	57,054	96.00	33.09 ic	0.08 ic	---	---	22.40 s	10.61 s	18.38	---	---	---	51.47
3.95	58,328	96.05	33.36 ic	0.07 ic	---	---	22.98 s	10.31 s	21.21	---	---	---	54.57
4.00	59,601	96.10	33.62 ic	0.07 ic	---	---	23.51 s	10.04 s	24.17	---	---	---	57.78
4.05	60,875	96.15	33.85 ic	0.06 ic	---	---	23.98 s	9.80 s	27.25	---	---	---	61.10
4.10	62,149	96.20	34.08 ic	0.06 ic	---	---	24.42 s	9.59 s	30.46	---	---	---	64.53
4.15	63,422	96.25	34.29 ic	0.05 ic	---	---	24.83 s	9.40 s	33.78	---	---	---	68.06
4.20	64,696	96.30	34.50 ic	0.05 ic	---	---	25.21 s	9.23 s	37.21	---	---	---	71.70
4.25	65,969	96.35	34.70 ic	0.05 ic	---	---	25.57 s	9.07 s	40.75	---	---	---	75.44
4.30	67,243	96.40	34.89 ic	0.05 ic	---	---	25.91 s	8.92 s	44.40	---	---	---	79.28
4.35	68,516	96.45	35.08 ic	0.04 ic	---	---	26.23 s	8.79 s	48.15	---	---	---	83.22
4.40	69,790	96.50	35.26 ic	0.04 ic	---	---	26.54 s	8.67 s	52.00	---	---	---	87.25

...End

Hydrograph Report

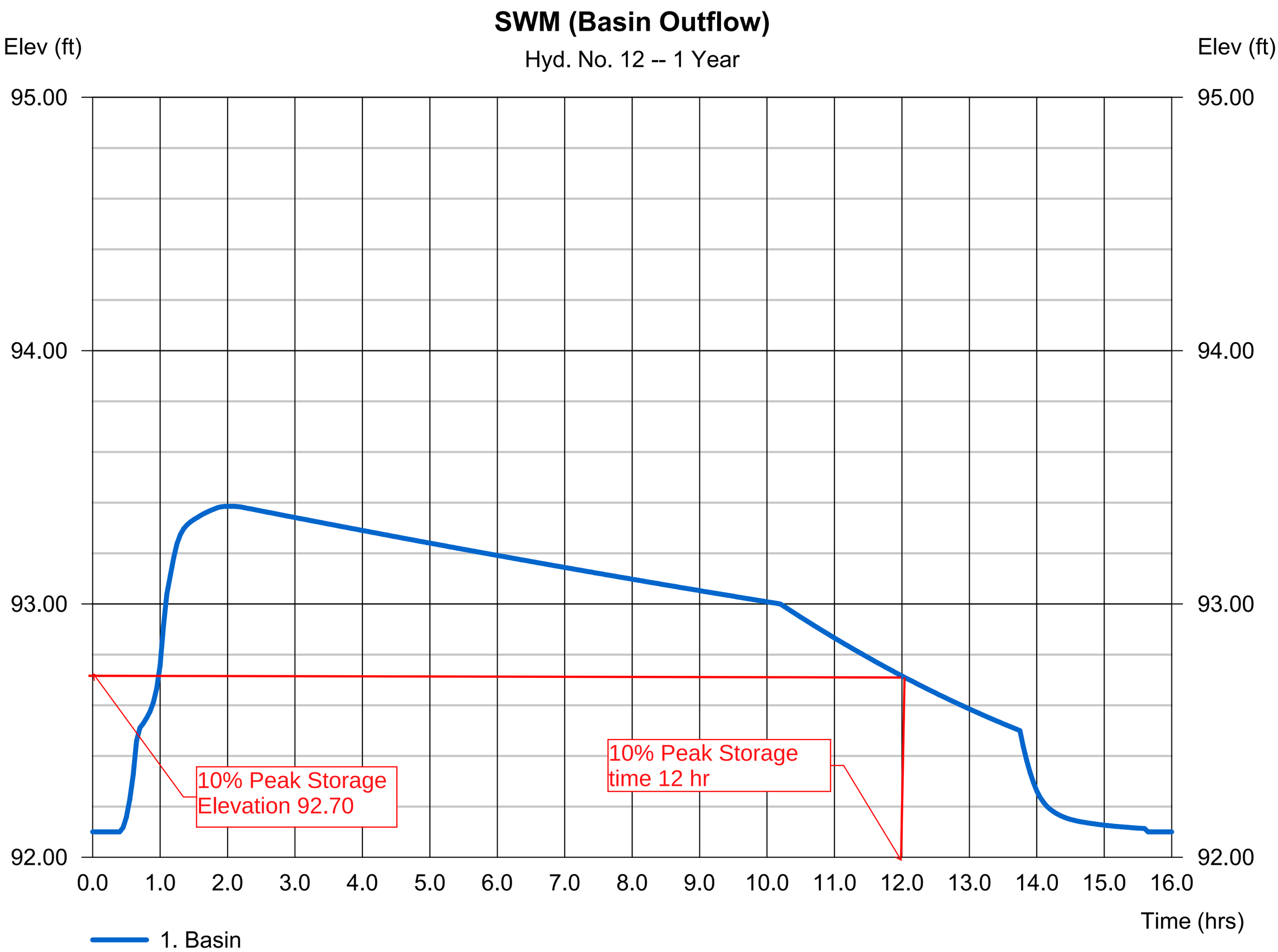
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020 Thursday, 03 / 5 / 2020

Hyd. No. 12

SWM (Basin Outflow)

Hydrograph type	=	Reservoir	Peak discharge	=	0.178 cfs
Storm frequency	=	1 yrs	Time to peak	=	2.00 hrs
Time interval	=	3 min	Hyd. volume	=	7,158 cuft
Inflow hyd. No.	=	11 - PDA#1A (Total)	Max. Elevation	=	93.39 ft
Reservoir name	=	Basin	Max. Storage	=	6,309 cuft

Storage Indication method used.



APPENDIX H

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
Mail Code 401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

January 11, 2017

David Scott, CPSWQ
General Manager
Hydro International
94 Hutchins Drive
Portland, ME 04102

Re: MTD Laboratory Certification
Up-Flo® Filter by Hydro International
Off-line Installation

TSS Removal Rate 80%

Dear Mr. Scott:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7(c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). Hydro International has requested a Laboratory Certification for the Up-Flo® Filter System.

This project falls under the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advanced Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Filtration Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the afore-mentioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the Up-Flo® Filter by Hydro International at a TSS removal rate of 80%, when designed, operated and maintained in accordance with the information provided in the Verification Appendix and subject to the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5. The MTFR is calculated based on a verified loading rate of 1.264 gpm/sf of effective filtration treatment area.

2. The Up-Flo® Filter shall be installed using the same configuration as the unit verified by NJCAT, and sized in accordance with the criteria specified in item 6 below.

3. This device cannot be used in series with another MTD or a media filter (such as a sand filter), to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Up-Flo® Filter, which is attached to this document. However, it is recommended to review the maintenance website at http://www.hydro-int.com/sites/default/files/nj_uff_inspection_and_maintnenance.pdf for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for an Up-Flo® Filter.

   Example: A 0.25-acre impervious site is to be treated to 80% TSS removal using an Up-Flo® Filter. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs or 354.58 gpm.

   The selection of configuration for use in the Up-Flo® Filter is based upon both the MTFR and the maximum inflow drainage area. It is necessary to select the configuration using both methods and to rely on the method that results in the larger configuration determined by the two methods.

   Inflow Drainage Area Evaluation:

   The drainage area to the Up-Flo® Filter in this example is 0.25 acres. Based upon the information in Table 1 below, the following minimum configuration is required in an Up-Flo® Filter to treat the impervious area without exceeding the maximum drainage area:

Model Size UFF-ZV-19-285R with MTFR of 285 gpm and Maximum Allowable Inflow Drainage Area of 0.264 acre

Maximum Treatment Flow Rate (MTFR) Evaluation:

The site runoff (Q) was determined based on the following:

time of concentration = 10 minutes
i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
c=0.99 (runoff coefficient for impervious)
Q=ciA=0.99x3.2x0.25=0.79 cfs=0.79x448.83 gpm=354.58 gpm

Based on a flow rate of 354.58 gpm, the following minimum configurations are required in an Up-Flo® Filter System to treat the impervious area without exceeding the MTFR:

Model Size UFF-ZV-38-285R with MTFR of 570 gpm and Maximum Allowable Inflow Drainage Area of 0.528 acre

The MTFR Evaluation results will be used since that method results in the higher minimum configuration determined by the two methods.

The sizing table corresponding to the available system models are noted below:

Table 1 Up-Flo® Filter Configurations and NJDEP Sizing Table

Configuration	Model Size	Number of Filter Modules	Max. Filtration Rate[1] (gpm)	Minimum Sedimentation Area [1,2] (sq.ft.)	Minimum Wet Volume [1,2] (cu.ft.)	Total Filtration Area [1] (sq.ft.)	Total Mass Capture [1] (lbs)	Maximum Allowable Inflow Area [1] (Acres)
Manhole	UFF-MH-285R	6	90	12.57	31.30	71.22	50.0	0.083
Vault	UFF-ZV-19-285R	19	285	39.79	99.12	225.5	158	0.264
Vault	UFF-ZV-38-285R	38	570	79.59	198.2	451.1	317	0.528
Vault	UF-ZV-57-285R	57	855	119.4	297.4	676.6	475	0.792

[1] Refer to Table A-1 of NJCAT Verification Report dated December 2016: UFF Design Specifications for the design parameters
[2] The precast structure housing the filter modules shall have at least the "Min. Sedimentation Area"

Be advised a detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Shashi Nayak of my office at (609) 633-7021.

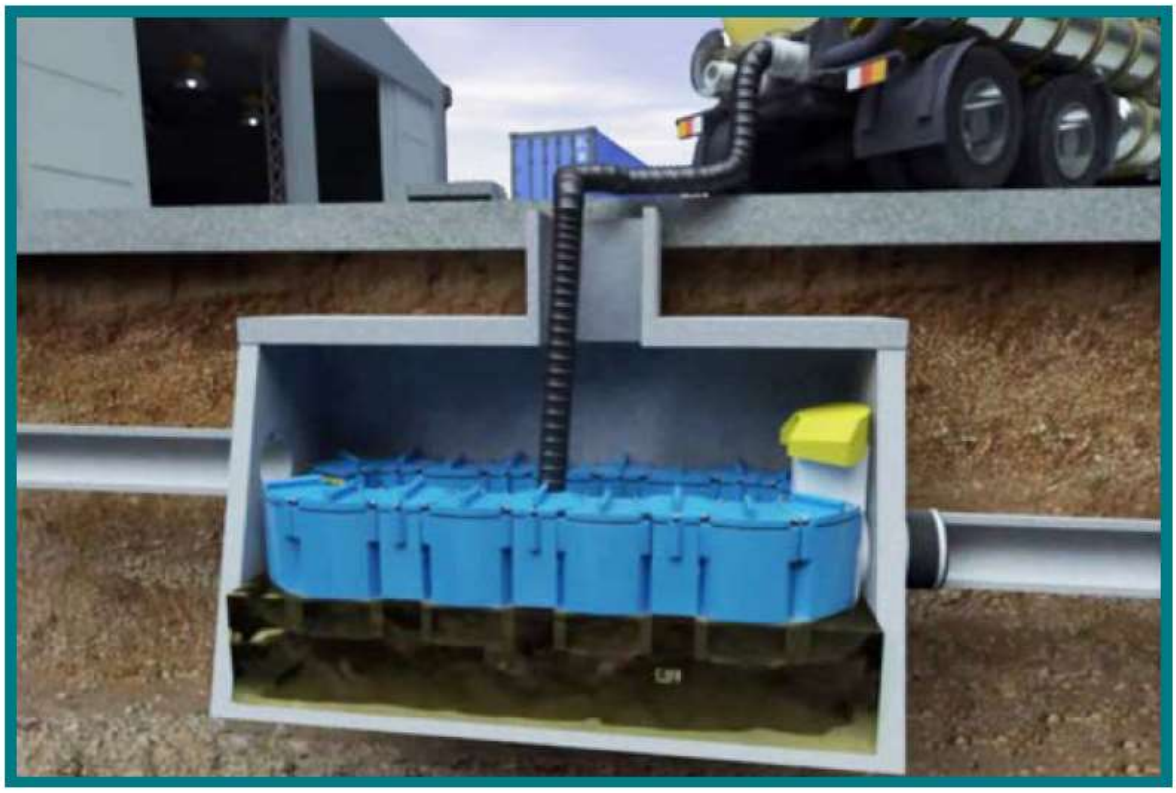
Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP – BNPC

Hydro International



Operation and Maintenance Manual

Up-Flo® Filter

Filtration System for Stormwater Treatment

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Overview & Product Description

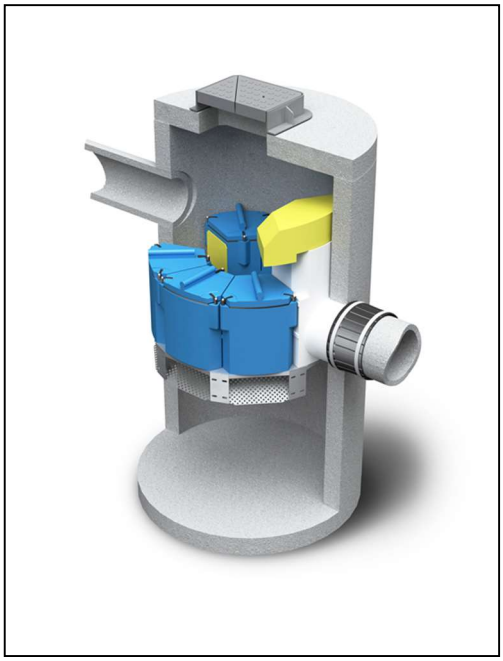
DON'T WANT TO GO IT ALONE? CALL HYDRO AND WE'LL TAKE CARE OF INSPECTION, REPLACEMENT MEDIA AND CLEANOUT.

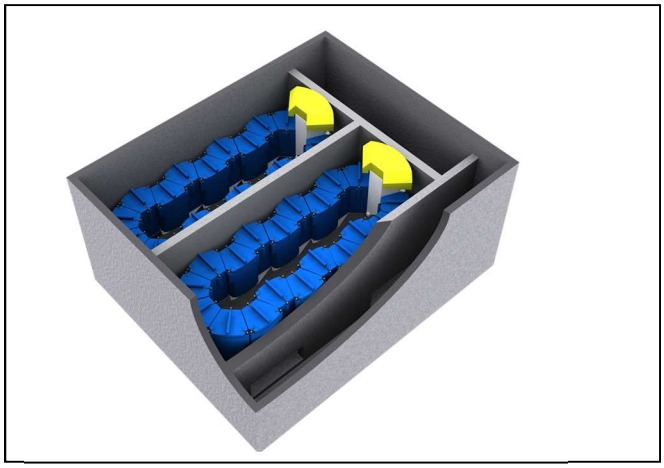
CALL 1 (888) 382-7808 FOR A QUOTE

The Up-Flo® Filter is a modular high-rate stormwater filtration device designed to capture trash, oil, sediment and remove fine pollutants such as dissolved and particulate metals and nutrients from stormwater runoff. In general, a minimum of two inspections are required per year to monitor sediment and gross pollutant accumulations.

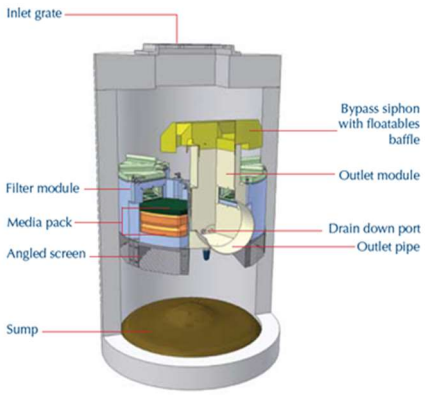
In order to sustain expected flow and removal rates for the Up-Flo® Filter, annual replacement of the Media Pack and removal of accumulated sediment from the sump is required. Depending on site use and pollutant characteristics, annual rainfall, design and functionality of the stormdrain conveyance system, annual replacement and clean out may be more or less often.

The Up-Flo Filter has modular components that connect together to form a ring of 1-6 Filter Modules or linearly to fit into rectangular precast structures with filter bays. Each filter bay can house 1-19 Filter Modules and precast structures can be constructed with multiple filter bays. Each Filter Module will have either a filtration Media Pack or filtration Ribbons.

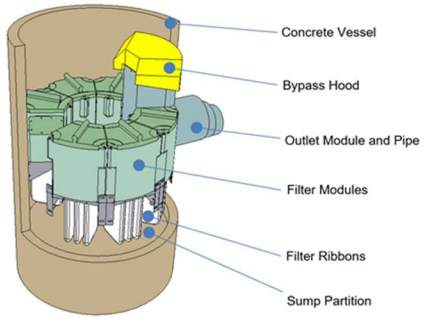




It does not matter what type of media is used, the Filter Modules house the filtration medium and the precast structure is used to suspend the Filter Modules to provide a sedimentation sump. Stainless steel support frames are used to support the Filter Modules and attach them to the precast structure. An Outlet Module (with hood) is used to connect the Filter Modules to a discharge pipe and convey filtered water away from the treatment area. A Draindown Filter and screen are provided when filtration media is used but not with filtration Ribbons.



Up-Flo with Filtration Media



Up-Flo with Filtration Ribbons

Maintenance activities can be categorized by those that can be performed from outside the Up-Flo® vessel and those that are performed inside the vessel. Maintenance performed from outside the vessel includes removal of floatables and oils that have accumulated on the water surface and removal of sediment from the sump. Maintenance performed inside the vessel includes removal and replacement of Media Packs (Filter Bags, flow Distribution Media and Draindown) or filtration Ribbons. A vactor truck is required for removal of oils, water, sediment, and to enter the vessel for performing inside maintenance. OSHA Confined Space Entry procedures need to be followed when entering the Up-Flo® vessel.

Inspection

The frequency of inspection and maintenance can be determined in the field after installation. Based on site characteristics such as contributing area, types of surfaces (e.g., paved and/or landscaped), site activities (e.g., short-term or long-term parking), and site maintenance (e.g., sanding and sweeping), inspection and maintenance should be conducted at intervals of no more than six months during the first year of operation. Typically, maintenance is recommended once per year thereafter.

By removing the manhole cover during a storm and monitoring the water level in the manhole or vault, site personnel can determine whether the filter is in bypass. A properly-sized filter that is in bypass during a storm that is producing runoff at, or below, the filter's design filtration rate needs maintenance. Otherwise, scheduled inspections will determine when one or more of the following maintenance thresholds have been reached:

- Sediment depth at sump storage capacity. Minimum 8" should separate the Draindown filter inlet from stored sediment in the sump or 6" should separate the bottom of the filtration Ribbons and sump floor. A simple probe, such as the Sludge-Judge®, can be used to determine the depth of the solids in the sump.
- Clogging of the Media Bags. Minimum filtration rate is generally reached when the Media Bags have accumulated approximately 20 lbs of sediment or when filtration Ribbons from one module have accumulated approximately 8 lbs. Determining the amount of accumulated sediment will be accomplished by removing both of the Media Bags from one of the Media Packs and weighing the bags separately or removing the filter Ribbon assembly as weighing. A spent Media Bag weighs approximately 50 lbs wet and a filter Ribbon assembly from one module weighs approximately 15 lbs spent .
- Draindown filter clogged. With modules supplied with filtration media, the Drain Down Filter is designed to lower the water level in the Up-Flo® vessel to an elevation below the bottom of the Filter Modules between storm events. If inspection one to two days after a storm event indicates otherwise, the Drain Down Filter has likely become clogged with sediment.
- Slime and debris covering the flow distribution media, angled screens or filtration Ribbons. After removal of the Media Bags or filtration Ribbons, the bottom flow distribution media should be removed and inspected to determine if it is coated with slime or debris. Similarly, the angled screen should be inspected for blockages and ragging.
- Oil forming a measureable thickness on the surface of the water. Since water in the Up-Flo® vessel drains down to an elevation below the bottom of the Filter Modules when the system is idle, the amount of accumulated oils must be minimized so that oils are not entrained into the Media Pack when stormwater begins to fill the vessel at the start of a storm event.
- Floatables completely covering the surface of the water. Similar to oils, the amount of accumulated floatables must be minimized to prevent trash and loose debris from becoming trapped on the angled screens when stormwater begins to fill the Up-Flo® vessel at the start of a storm event.

The site-specific solids loading rate in the sump and in the Media Packs will be determined during the first year of Up-Flo® Filter operation. Starting with a clean sump, the solids loading rate in the sump will be calculated by measuring the sediment depth in the sump and dividing the depth by the correlating interval of time since it was cleaned. Similarly, starting with fresh Media Bags or Ribbons, the solids loading rate in the Media Packs and Ribbons will be calculated by weighing the Media Bags or Ribbons and dividing the weights by the respective time interval since they were installed. The wet weight of the heaviest bag or Ribbon assembly from a single module will be used to determine the loading rate.

After completion of the first year of operation, the inspection and maintenance intervals for cleaning the sump and replacing Media Bags or Ribbons will be established to keep the solids loading within the respective limits of the sump and filter medium. Replacement of the Draindown Filter, replacement of flow Distribution Media, and removal of oils and floatables will occur at the same frequency unless the first year of operation indicates otherwise. Keeping to the established maintenance intervals will keep treatment flow rates at, or above, the design flow rate.

Maintenance

The access port located at the top of the manhole or vault provides access to the Up-Flo® vessel for maintenance personnel to enter the vessel and comfortably remove and replace Media Packs or Ribbon assemblies. The same access would be used for maintenance personnel working from the surface to net or skim debris and floatables or to vactor out sediment, oil, and water. Unless the Up-Flo® Filter has been installed in a very shallow unit, it is necessary to have personnel with OSHA-confined space entry performing the maintenance that occurs inside the vessel.

Maintenance activities include inspection, floatables removal, oil removal, sediment removal, Media Pack and Ribbon assembly replacement, and Draindown Filter replacement. Filtration medium housed in the Filter Modules is easily accessed by loosening three latches used to secure the Filter Module Lid. Maintenance intervals are determined from monitoring the Up-Flo® Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of floatables removal, a vactor truck is not required. Otherwise, a vactor truck is normally required for oil removal, removal of sediment from the sump, and to dewater the vessel for replacement of the Media Packs and Draindown Filter. All inspection and maintenance activities would be recorded in an Inspection and Maintenance Log.

Good housekeeping practices upstream of the Up-Flo® Filter can significantly extend Media Bag life. For example, sweeping paved surfaces, collecting leaves and grass trimmings, and protecting bare ground from the elements will reduce loading to the system. Media Packs should not be installed in the Filter Modules until construction activities are complete and site stabilization is effective.

Up-Flo Filter Inspection & Maintenance Logs

SITE REFERENCE NAME OR NUMBER FOR THIS UP-FLO® FILTER LOCATION:	
SITE NAME:	
SITE LOCATION:	
OWNER:	SITE CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

CONFIGURATION (CIRCLE ONE): MANHOLE VAULT SYSTEM

TOTAL NUMBER OF UP-FLO® FILTER MODULES: _____

Hydro International

Up-Flo® Filter Inspection Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions*: _____

**(Stable, Under Construction, Needing Maintenance, etc.)*

Inspection Frequency Key: A=annual; M=monthly; S=after major storms

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	M			
Inlets and Outlets free of debris?	M			
Facility (internally) free of debris?	M			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into Up-Flo® Filter)	A			
Grass mowed?	M			
Water retention where required				
Water holding chamber(s) at normal pool?	A			
Evidence of erosion?	A			
Sediment Deposition				
Filtration Chamber free of sediments?	A			
Sedimentation sump not more than 50% full?	A			
Structural Components				
Any evidence of structural deterioration?	A			
Grates in good condition?	A			
Spalling or cracking of structural parts?	A			
Outlet/Overflow Spillway	A			
Other				
Noticeable odors?	A			
Any evidence of filter(s) clogging?	M			
Evidence of flow bypassing facility?	A			

Inspector Comments: _____

_____

_____

_____

Overall Condition of Up-Flo® Filter**: ☐ Acceptable ☐ Unacceptable

***"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.*

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below or on the Maintenance Log provided on page 15 of the Up-Flo® Filter Operation & Maintenance Manual:

Maintenance Action Needed	Due Date

The next routine inspection is schedule for approximately: (date) _____

Inspected by: (signature) _____

Inspected by: (printed) _____

Hydro International

Up-Flo® Filter Maintenance Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____
**(Stable, Under Construction, Needing Maintenance, etc.)*

Estimated volume of oil/floatable trash removed: _____

Sediment depth measured in sump prior to removal: _____

Number of Filter Modules fitted with new media packs: _____

Inspector Comments: _____

_____

_____

_____

Overall Condition of Up-Flo® Filter: ☐ Acceptable ☐ Unacceptable
***"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.*

Maintained by: (signature) _____

Maintained by: (printed) _____

Do it Right the First Time

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CALL **1 (888) 382-7808** TO SCHEDULE AN INSPECTION

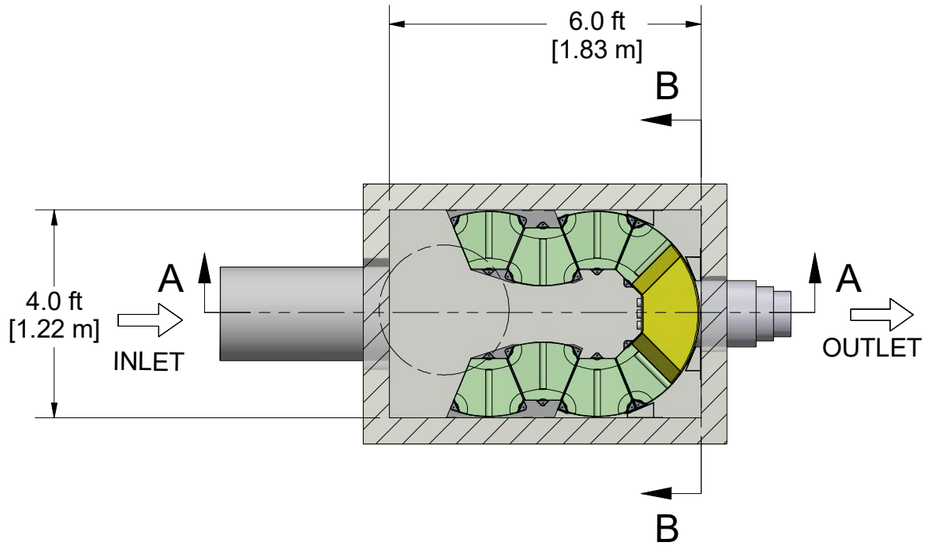
Stormwater Solutions

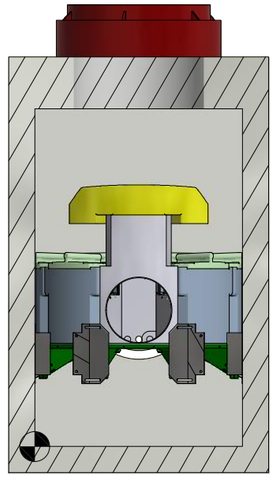
94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

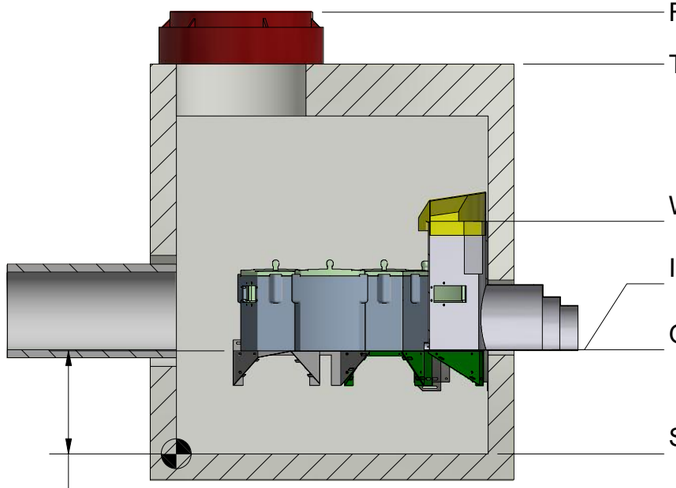
www.hydro-int.com

Turning Water Around...®





SECTION B-B



SECTION A-A

CAPACITIES:

- Minimum performance: 80% removal. Washington DOE/NJCAT verified at the peak treatment flow.
- Peak treatment flow:
  .033 CFS (0.9 LPS) (15 GPM) per module (Ribbons)
  .022 CFS (0.6 LPS) (10 GPM) per module (Long Ribbons)
  .056 CFS (1.6 LPS) (25 GPM) per module (CPZ)
- Maximum number of ribbon modules per outlet module: 36
- Maximum number of CPZ modules per outlet module: 18 (contract Hydro if more are required)

ADDITIONAL DESIGN INFORMATION:

- Normal operating W.S.E. is 26-30" (660-762mm) above the outlet invert
- Media Types Available: Ribbons, CPZ

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

TOLERENCES ARE:
FRACTIONS ± 1/16
DECIMALS:
X.X ± .06
X.XX ± .03
X.XXX ± .015
ANGLES: ± .5°

PROJECTION

COMMENTS:

1. STRUCTURE WALL AND SLAB THICKNESSES ARE NOT TO SCALE
2. CONTACT HYDRO INTERNATIONAL FOR A BOTTOM OF STRUCTURE ELEVATION PRIOR TO SETTING THE STRUCTURE
3. NOT FOR CONSTURCION CONTACT HYDRO FOR SITE SPECIFIC DRAWING
4. NOT ALL SIZES AVAILABLE IN ALL AREAS
5. SUMP DEPTH AVAILABLE IN 24" (610mm) CPZ, RIBBONS AND 36" (914mm) LONG RIBBONS DEPTH

REVISION HISTORY			
REV	BY	DESCRIPTION	DATE
-	ER	FIRST RELEASE	7/3/2019

DATE: 7/3/2019
SCALE: 1:35
DRAWN BY: ER
CHECKED BY:
APPROVED BY

Title
UP-FLO FILTER
4ft (1220 mm) X 6ft (1830 mm)

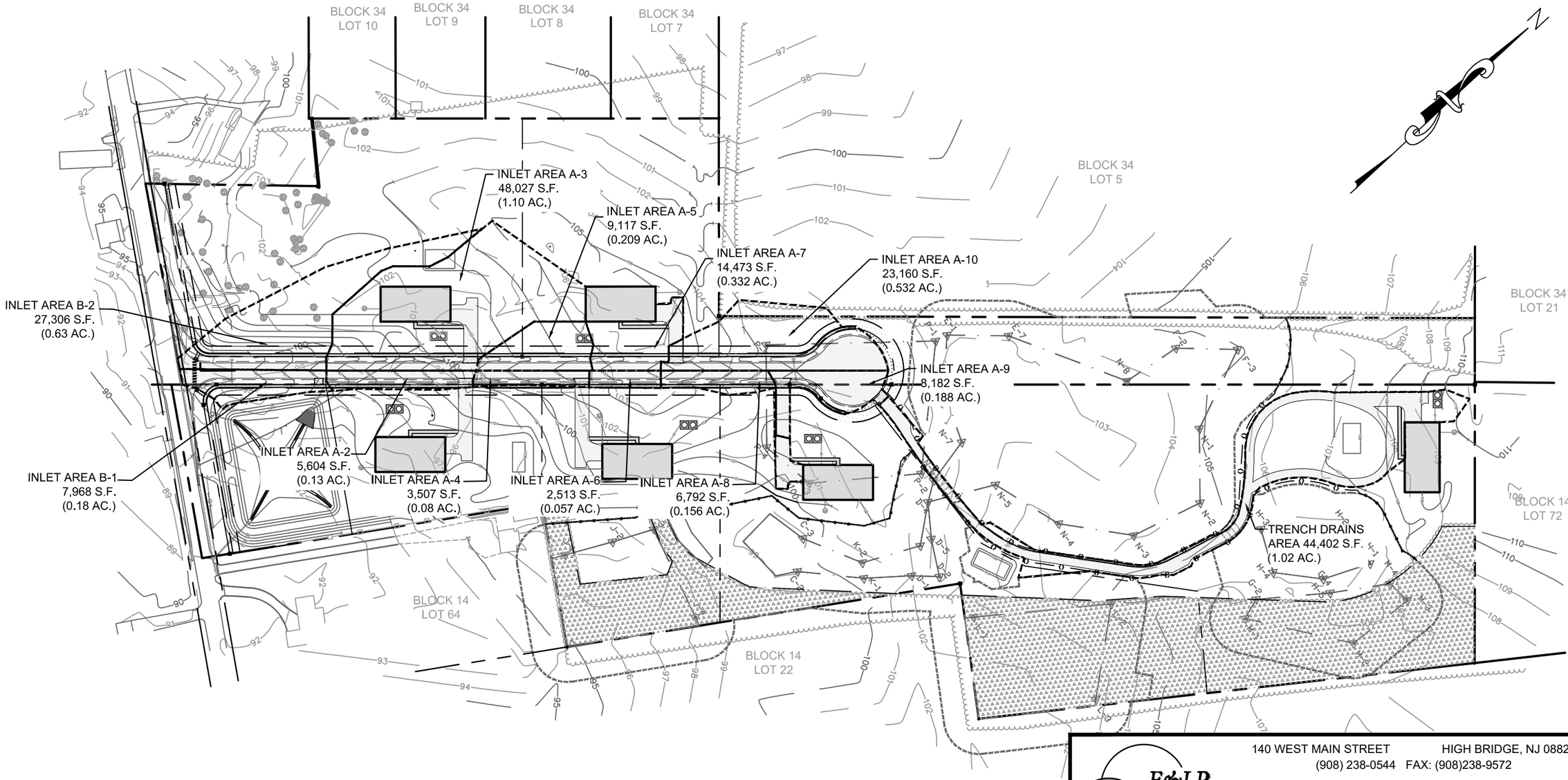
8 MODULES MAX

GENERAL ASSEMBLY

Hydro International®
94 Hutchins Drive
Portland, ME 04102
Tel: +1 (207) 756-6200
Fax: +1 (207) 756-6212
hydro-int.com

WEIGHT: N/A
MATERIAL:
NEXT ASSEMBLY: 4X6-1
DRAWING NO.: 4X6-UFF-1
SHEET SIZE: B
SHEET: 1 OF 1
Rev: -

APPENDIX I



150 0 150

Scale 1" = 150'

E&LP
140 WEST MAIN STREET HIGH BRIDGE, NJ 08829
(908) 238-0544 FAX: (908)238-9572
A PROFESSIONAL ASSOCIATION

TITLE:

INLET DRAINAGE AREA PLAN

LOCATION: BLOCK 34 LOT 4 WEST WINDSOR TOWNSHIP BLOCK 14 LOT 23 ROBBINSVILLE TOWNSHIP MERCER COUNTY, NJ	SCALE: 1"=150'	PROJECT NO.:	0116156
	DATE: 02/25/2020	DRAWN BY:	EAJ
	FILENAME: INLET.DWG	SHEET NO.:	1

Windsor Oaks Subdivision

Project No. 0116156

25-Year Storm Pipe Computation **February 25, 2020**

Run		Drainage Area							Runoff				Pipe Data				
From	To	Area [1] (ac)(Impervious)	Area [2] (ac)(Pervious)	Total	C[1]	C[2]	C - WT. Ave.	CA	TC (min)	I (in)	Q (cfs)	Cum. Q (cfs)	Pipe Size (in)	Pipe Slope (ft/ft)	n	Pipe Cap. (cfs)	V velocity (ft/sec)
TRENCH DRAINS	A9	0.411	0.609	1.020	0.99	0.25	0.55	**0.56**	6.00	6.20	**3.5**	**3.5**	12	0.0050	0.009	**3.6**	**4.6**
A10	A9	0.180	0.352	0.532	0.99	0.25	0.50	**0.27**	6.00	6.20	**1.7**	**1.7**	15	0.0310	0.009	**16.4**	**13.3**
A9	A8	0.164	0.024	0.188	0.99	0.25	0.90	**0.17**	6.00	6.20	**1.0**	**6.2**	24	0.0060	0.009	**25.3**	**8.0**
A8	A6	0.106	0.050	0.156	0.99	0.25	0.75	**0.12**	6.00	6.20	**0.7**	**6.9**	24	0.0060	0.009	**25.3**	**8.0**
A7	A6	0.208	0.124	0.332	0.99	0.25	0.71	**0.24**	6.00	6.20	**1.5**	**1.5**	15	0.0340	0.009	**17.1**	**14.0**
A6	A4	0.036	0.022	0.057	0.99	0.25	0.71	**0.04**	6.00	6.20	**0.3**	**8.6**	24	0.0060	0.009	**25.3**	**8.0**
A5	A4	0.056	0.153	0.209	0.99	0.25	0.45	**0.09**	6.00	6.20	**0.6**	**0.6**	15	0.0330	0.009	**16.9**	**13.8**
A4	A2	0.053	0.027	0.080	0.99	0.25	0.74	**0.06**	6.00	6.20	**0.4**	**9.6**	24	0.0060	0.009	**25.3**	**8.0**
A3	A2	0.250	0.850	1.100	0.99	0.25	0.42	**0.46**	6.00	6.20	**2.9**	**2.9**	15	0.0060	0.009	**7.2**	**5.9**
A2	A1 (Basin)	0.077	0.053	0.130	0.99	0.25	0.69	**0.09**	6.00	6.20	**0.6**	**13.0**	24	0.0060	0.011	**20.7**	**6.6**
B2	B1	0.072	0.558	0.630	0.99	0.25	0.33	**0.21**	6.00	6.20	**1.3**	**1.3**	15	0.0100	0.009	**9.3**	**7.6**
B1	Ex. Inlet	0.085	0.095	0.180	0.99	0.25	0.60	**0.11**	6.00	6.20	**0.7**	**2.0**	15	0.0080	0.009	**8.3**	**6.8**

Windsor Oaks Subdivision

Project No. 0116156

100-Year Storm Pipe Computation **July 7, 2020**

Run		Drainage Area							Runoff				Pipe Data				
From	To	Area [1] (ac)(Impervious)	Area [2] (ac)(Pervious)	Total	C[1]	C[2]	C - WT. Ave.	CA	TC (min)	I (in)	Q (cfs)	Cum. Q (cfs)	Pipe Size (in)	Pipe Slope (ft/ft)	n	Pipe Cap. (cfs)	V velocity (ft/sec)
A10	A9	0.180	0.352	0.532	0.99	0.25	0.50	**0.27**	6.00	8.52	**2.3**	**2.3**	15	0.0310	0.009	**16.4**	**13.3**
A9	A8	0.125	0.024	0.149	0.99	0.25	0.87	**0.13**	6.00	8.52	**1.1**	**3.4**	24	0.0060	0.009	**25.3**	**8.0**
A8	A6	0.055	0.050	0.105	0.99	0.25	0.64	**0.07**	6.00	8.52	**0.6**	**3.9**	24	0.0060	0.009	**25.3**	**8.0**
A7	A6	0.157	0.124	0.281	0.99	0.25	0.66	**0.19**	6.00	8.52	**1.6**	**1.6**	15	0.0340	0.009	**17.1**	**14.0**
A6	A4	0.036	0.022	0.057	0.99	0.25	0.71	**0.04**	6.00	8.52	**0.3**	**5.9**	24	0.0060	0.009	**25.3**	**8.0**
A5	A4	0.056	0.153	0.209	0.99	0.25	0.45	**0.09**	6.00	8.52	**0.8**	**0.8**	15	0.0330	0.009	**16.9**	**13.8**
A4	A2	0.053	0.027	0.080	0.99	0.25	0.74	**0.06**	6.00	8.52	**0.5**	**7.2**	24	0.0060	0.009	**25.3**	**8.0**
A3	A2	0.250	0.850	1.100	0.99	0.25	0.42	**0.46**	6.00	8.52	**3.9**	**3.9**	15	0.0060	0.009	**7.2**	**5.9**
A2	A1 (Basin)	0.077	0.053	0.130	0.99	0.25	0.69	**0.09**	6.00	8.52	**0.8**	**11.9**	24	0.0060	0.011	**20.7**	**6.6**
B2	B1	0.072	0.558	0.630	0.99	0.25	0.33	**0.21**	6.00	8.52	**1.8**	**1.8**	15	0.0100	0.009	**9.3**	**7.6**
B1	Ex. Inlet	0.085	0.095	0.180	0.99	0.25	0.60	**0.11**	6.00	8.52	**0.9**	**2.7**	15	0.0080	0.009	**8.3**	**6.8**

WINDSOR OAKS SUBDIBISION

BLOCK 34 LOT 4 WEST WINDSOR TOWNSHIP

BLOCK 14 LOT 23 ROBBINSVILLE TOWNSHIP

MERCER COUNTY, NEW JERSEY

TYPICAL GRASS SWALE CAPACITY & STABILITY CALCULATIONS

BOTTOM WIDTH (FT)	TOP WIDTH (FT)	DEPTH (FT)	SIDE SLOPE (FT/FT)	AREA (S.F.)	PERIMETER (FT)	CROSS. SLOPE (FT/FT)	N	CAPACITY (CFS)	FLOW (10-YR STORM) (CFS)	ACTUAL VELOCITY (FS)	ALLOWABLE VELOCITY (FS)
4	9	0.5	0.25	3.25	9.1	0.025	0.03	111.24	3.55	1.09	4
BOTTOM WIDTH (FT)	**TOP WIDTH (FT)**	**DEPTH (FT)**	**SIDE SLOPE (FT/FT)**	**AREA (S.F.)**	**PERIMETER (FT)**	**CROSS. SLOPE (FT/FT)**	**N**	**CAPACITY (CFS)**	**FLOW (100-YR STORM) (CFS)**	**ACTUAL VELOCITY (FS)**	**ALLOWABLE VELOCITY (FS)**
4	9	0.5	0.25	3.25	9.1	0.025	0.03	111.24	4.76	1.46	4

Christopher Nusser
Professional Engineer
N.J. P.E. No. 24GE049025

PROJECT- WINDSOR OAKS SUBDIVISION
NUMBER- 116156
BY- EAJ
DATE- 8/21/2018

RIPRAP APRON CALCULATIONS B-1

Do =	2.00	
Wo =	2.00	
TW =	0.40	(0.2 Do ASSUMED)
Q =	10.00	CFS MAX. FLOW BASED ON HW
Y =	DEPTH OF SCOUR HOLE BELOW INVERT	
q=	5.00	CFS/FT (Q/Wo)

CASE 1 - TW < 1/2 Do

La =	1.8 (q/(Do ^0.5)) + 7Do	=	20.36	FEET
		USE	21.0	FEET
Wa =	3Wo +La	=	27.0	FEET
		USE	27.0	FEET

CASE 2 - TW > 1/2 Do

La =	3*Do (q/(Do ^0.5))	=	21.21	FEET
		USE	22.0	FEET
Wa =	3Wo + 0.4La	=	14.8	FEET
		USE	15.0	FEET

RIPRAP SIZING

D50 =	$\frac{0.02}{Tw} q^{1.33} \times 12$	=	5.10	INCHES
		USE	6.0	INCHES

APPENDIX J

New Jersey Groundwater Recharge Spreadsheet
Version 2.0
November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MERCER CO., WEST WINDSOR TWP	44.9	1.43

Project Name:	**Sample Project**
Description:	**Windsor Oaks Subdivision**
Analysis Date:	**06/19/19**

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	1.094	Impervious areas	Sassafras	0.0	-
2	4.859	Open space	Woodstown	11.3	199,209
3	6.72	Open space	Sassafras	13.2	322,344
4	0.016	Open space	Mattapex	10.4	606
5	0.15	Woods	Woodstown	11.0	5,974
6	0.171	Woods	Sassafras	13.3	8,239
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	13.0			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				11.4	536,373

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	2.346	Impervious areas	Sassafras	0.0	-
2	3.5	Open space	Woodstown	11.3	143,493
3	7.148	Open space	Sassafras	13.2	342,875
4	0.016	Open space	Mattapex	10.4	606
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	13.0			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				10.3	486,974
				Total Impervious Area (sq.ft)	102,192

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	
Post-Development Annual Recharge Deficit=	*49,399*	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	4.84	(in)	DRWC=	0.38	(in)
ERWC =	1.38	(in)	EDRWC=	0.11	(in)

Procedure to fill the Pre-Development and Post-Development Conditions Tables

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

Project Name	Description	Analysis Date	BMP or LID Type
Sample Project	Windsor Oaks Subdivision	06/19/19	Drywells

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	1440.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	30.0	in
Upper level of the BMP surface (negative if above ground)	dBMPu	1.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	72.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	0	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	1.38	in
ERWC Modified to consider dEXC	EDRWC	0.11	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.08	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	1.46	in
Inches of Rainfall to capture	Pdesign	1.68	in
Recharge Provided Avg. over Imp. Area		32.5	in
Runoff Captured Avg. over imp. Area		32.8	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.05	unitless
BMP Volume	VBMP	3,600	cu.ft

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	49,399	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	30,000	sq.ft
Root Zone Water Capacity	RWC	4.84	in
RWC Modified to consider dEXC	DRWC	0.38	in
Climatic Factor	C-factor	1.43	no units
Average Annual P	Pavg	44.9	in
Recharge Requirement over Imp. Area	dr	5.8	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		81,130	cu.ft
Avg BMP Recharge Efficiency		99.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		77.7%	%
%Runoff Infiltrated		93.9%	%
%Runoff Recharged		27.3%	%
%Rainfall Recharged		21.2%	%

CALCULATION CHECK MESSAGES

Volume Balance-> **Solve Problem to satisfy Annual Recharge**
dBMP Check---> **OK**
dEXC Check---> **OK**
BMP Location---> **Location is selected as distributed or undetermined**

OTHER NOTES

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

How to solve for different recharge volumes: By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

APPENDIX K

SOIL LOG & INTERPRETATION – FORM 2B

Municipality Robbinsville Block 14 Lot 23

1. Log Number SL-15
2. Soil Log Date Soil Log Conducted 12/9/16

Depth (inches) Top-Bottom	
0 - 8”	Topsoil;
8 - 20”	10YR 4/4; Clay; 2% Gravel; Massive, Moist, Firm;
20 -66"	10YR 7/1; Clay; 5% Gravel; Many, Medium, Prominent Mottling, 10YR 7/1 in Color, 20 - 66" in Depth; Massive, Moist, Firm;
66 - 120"	10YR 7/8; Loamy Sand; 5% Gravel; Few, Fine, Faint Mottling, 10 YR 7/1 in Color, 66 - 120" in Depth; Single Grain, Moist, Friable; Seepage @ 76";

3. Ground Water Observations:
   - ✓ Seepage – Indicate Depth 76"
   - __ Pit/Boring Flooded – Depth after _____ Hours _____

4. Soil Limiting Zones (Check Appropriate Categories):
   - __ Fractured Rock Substratum – Depth to Top _____
   - __ Massive Rock Substratum – Depth to Top _____
   - __ Excessively Coarse Horizon – Depth Top to Bottom _____
   - __ Excessively Coarse Substratum – Depth to Top _____
   - __ Hydraulically Restrictive Horizon – Depth Top to Bottom _____
   - __ Hydraulically Restrictive Substratum – Depth top to Bottom _____
   - __ Perched Zone of Saturation – Depth top to Bottom _____
   - ✓ Regional Zone of saturation – Depth to Top 20"

5. Soil Suitability Classification: IIIWR

6. I hereby certify that the information furnished on Form 2B of this application (and the attachments thereof) is true and accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Site Evaluator _____ Date _____

Signature & Seal of Professional Engineer _____ License # _____

Date _____

APPLICATION FOR PERMIT TO CONSTRUCT/ALTER/REPAIR
AN INDIVIDUAL SUBSURFACE SEWAGE DISPOSAL SYSTEM

Form 3c: **Soil Permeability Class Rating Data**

1. COUNTY:	Mercer	MUNICIPALITY:	Robbinsville Twp		
2. STREET:	New Rose Stables	BLOCK:	14	LOT:	23
3. SOIL PIT/BORING NO:	SL-15	SAMPLE DEPTH:	120"	DATE COLLECTED:	12/9/2016
4. TEST NO:	A	REPLICATE:	B		

5. COARSE FRAGMENT CONTENT:
   a. Total Weight of Sample (W.T.), grams 200.1
   b. Weight of Material retained on 2 mm sieve, (W.C.F), grams. 18.1
   c. Wt. % Coarse Fragment (W.C.F./W.T. x 100). **9.0**
6. Oven Dry Weight (24 Hrs, 105° C) of 40 Gram Air Dry Sample, grams, (Wt). . . . 39.8
7. Hydrometer Calibration, Rc. 3.0
8. Hydrometer Reading- 40 seconds, grams, R1. . . . . 13.0
   Temperature of Suspension, °F. 48.0
9. Corrected Hydrometer Reading, grams R1'. **6.0**
10. Hydrometer Reading 2 Hours, grams R2. . . . . 10.0
    Temperature of Suspension, °F. 48.0
11. Corrected Hydrometer Reading, grams , R2'. **3.0**
12. % Sand = (Wt. - R1') / Wt. x 100 = (39.8 - 6.0) / 39.8 x 100= **84.9**
13. % Clay = R2' / Wt. x 100 = (3.0 / 39.8) x 100= **7.5**
14. Sieve Analysis:
    a. Oven Dry Wt. (2 Hrs., 105 °C) Total Sand Fraction. 33.3
       (Soil Retained in 0.047 mm Sieve, grams
    b. Wt. Of Fine Plus Very Fine Sand Fraction. 3.6
       (Sand Passing 0.25 mm Sieve grams)
    c. % Fine Plus Very Fine Sand (b/a). **10.8**

15. Soil Morphology (Natural Soil Samples Only)
    Structure of Soil Horizon Tested. . . . . Single Grain:
    Consistence of Soil Horizon Tested: Dry:_____ Moist: friable

16. Soil Permeability Class Rating (Based upon average textural analysis of this replicate and other replicate samples. . . . . .

17. I hereby certify that the information furnished on Form 3C of this application is true accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-J et. Seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

SIGNATURE OF SITE EVALUATOR: _____ DATE: _____

SIGNATURE OF PROFESSIONAL ENGINEER: _____

New Jersey Professional Engineer License No.

APPLICATION FOR PERMIT TO CONSTRUCT/ALTER/REPAIR

AN INDIVIDUAL SUBSURFACE SEWAGE DISPOSAL SYSTEM

Form 3c: **Soil Permeability Class Rating Data**

1. COUNTY:	Mercer	MUNICIPALITY:	Robbinsville Twp		
2. STREET:		BLOCK:	14	LOT:	23
3. SOIL PIT/BORING NO:	SL-15	SAMPLE DEPTH:	120"	DATE COLLECTED:	12/9/2016
4. TEST NO:	B	REPLICATE:	A		

5. COARSE FRAGMENT CONTENT:
   a. Total Weight of Sample (W.T.), grams 200.2
   b. Weight of Material retained on 2 mm sieve, (W.C.F), grams. 15.4
   c. Wt. % Coarse Fragment (W.C.F./W.T. x 100). **7.7**
6. Oven Dry Weight (24 Hrs, 105° C) of 40 Gram Air Dry Sample, grams, (Wt). . . . 39.8
7. Hydrometer Calibration, Rc. 3.0
8. Hydrometer Reading- 40 seconds, grams, R1. . . . . 13.5
   Temperature of Suspension, °F. 48.0
9. Corrected Hydrometer Reading, grams R1'. **6.5**
10. Hydrometer Reading 2 Hours, grams R2. . . . . 10.5
    Temperature of Suspension, °F. 48.0
11. Corrected Hydrometer Reading, grams , R2'. **3.5**
12. % Sand = (Wt. - R1') / Wt. x 100 = (39.8 - 6.5) / 39.8 x 100= **83.7**
13. % Clay = R2' / Wt. x 100 = (3.5 / 39.8) x 100= **8.8**
14. Sieve Analysis:
    a. Oven Dry Wt. (2 Hrs., 105 °C) Total Sand Fraction. 33.8
       (Soil Retained in 0.047 mm Sieve, grams
    b. Wt. Of Fine Plus Very Fine Sand Fraction. 3.4
       (Sand Passing 0.25 mm Sieve grams)
    c. % Fine Plus Very Fine Sand (b/a). **10.1**

15. Soil Morphology (Natural Soil Samples Only)
    Structure of Soil Horizon Tested. . . . . Single Grain:
    Consistence of Soil Horizon Tested: Dry:_____ Moist: friable

16. Soil Permeability Class Rating (Based upon average textural analysis of this replicate and other replicate samples. . . . . .

17. I hereby certify that the information furnished on Form 3C of this application is true accurate. I am aware that falsification of data is a violation of the Water Pollution Control Act (N.J.S.A. 58:10A-J et. Seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

SIGNATURE OF SITE EVALUATOR: _____ DATE: _____

SIGNATURE OF PROFESSIONAL ENGINEER: _____

New Jersey Professional Engineer License No.