Appendix C

Run-On and Run-Off Control System Plan

Omaha Public Power District
North Omaha Station
Ash Disposal Area

Permit Modification

September 2023

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OPPD North Omaha Ash Disposal Area
Run-On and Run-Off Control System Plan

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Appendices

Professional Engineer Certification

"I hereby certify that this Run-on and Run-off Control System Plan for the CCR landfill known as the North Omaha Ash Disposal Area at the North Omaha Generating Station, owned, and operated by the Omaha Public Power District, meets the requirements of the Coal Combustion Residual Rule 40 CFR 257.81. I am a duly licensed independent Professional Engineer under the laws of the State of Nebraska."

Print Name: Garrett M. Williams

Signature: _____

Date: September 25, 2023

License #: E-15124

My license renewal date is December 31, 2024.

I. Introduction

A. Purpose

On April 17, 2015 the U.S. Environmental Protection Agency (EPA) published the final rule for the regulation and management of coal combustion residuals (CCR) under the Resource Conservation and Recovery Act (RCRA). Section 40 CFR 257.81 requires that an owner or operator of a CCR landfill amend the written run-on and run-off control system plan whenever there is a change in conditions that would substantially affect the written plan in effect. As a result, this plan is being updated concurrently with the 2023 major modification of the current approved Title 132 closure permit application. The plan must document how the control systems have been designed and constructed to meet the applicable requirements of the CCR rule, supported by appropriate engineering calculations. In accordance with the CCR rule 40 CFR 257.81, the intent of stormwater management is to design, construct, operate, and maintain:

- A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and
- A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm. Run-off from the active portion of the CCR unit must be handled in accordance with the surface water requirements under 40 CFR 257.3-3.

B. Facility Background

OPPD has a five-unit, fossil fuel-fired generating plant at the North Omaha Station (Station) in Omaha, Nebraska, along the west shore of the Missouri River. Recently Units 1-3 were retired from coal operations; Units 4 and 5 were retrofitted for air pollution control equipment and are still operating. The need for CCR disposal capacity is anticipated to continue through spring 2024. This Station has an existing CCR landfill (the North Omaha Ash Disposal Area) that is permitted under the current NDEE Title 132 regulations for fossil fuel combustion ash disposal area (Permit No. NE0054739, Facility ID 59763). Under the CCR rule, the North Omaha Ash Disposal Area is an existing CCR landfill since it has and will receive CCR both before and after October 19, 2015 – the effective date of the CCR rule. The North Omaha Ash Disposal Area is an unlined CCR landfill with an active area of approximately 13 acres. The North Omaha Ash Disposal Area will cease receipt of CCR and be capped in 2024. Throughout capping construction, a small area of approximately 1 acre will remain open for continued placement of CCR. This will be briefly discussed in the closure plan where the closure will be conducted in phases until final placement of CCR material.

The NDEE Title 132 permit for the North Omaha Ash Disposal Area includes an operations plan which describes the routine maintenance activities for the site drainage system. The permit also includes descriptions, calculations and figures of run-on and run-off control system features. This plan checks, expands and confirms compliance with the CCR rule for run-on and run-off controls from the active areas of the North Omaha Ash Disposal Area.

II. Run-On Control System

The run-on control system for the North Omaha Ash Disposal Area consists of perimeter ditches, access roads and grading sloped away from the ash disposal area to prevent and minimize stormwater run-on to the capped CCR landfill. As shown on Figure 1 in Appendix A, potential run-

on does not reach the CCR areas and is diverted around the North Omaha Ash Disposal Area. Grading and improved perimeter ditches will continue to intercept, divert, and prevent potential storm water run-on to the capped CCR landfill.

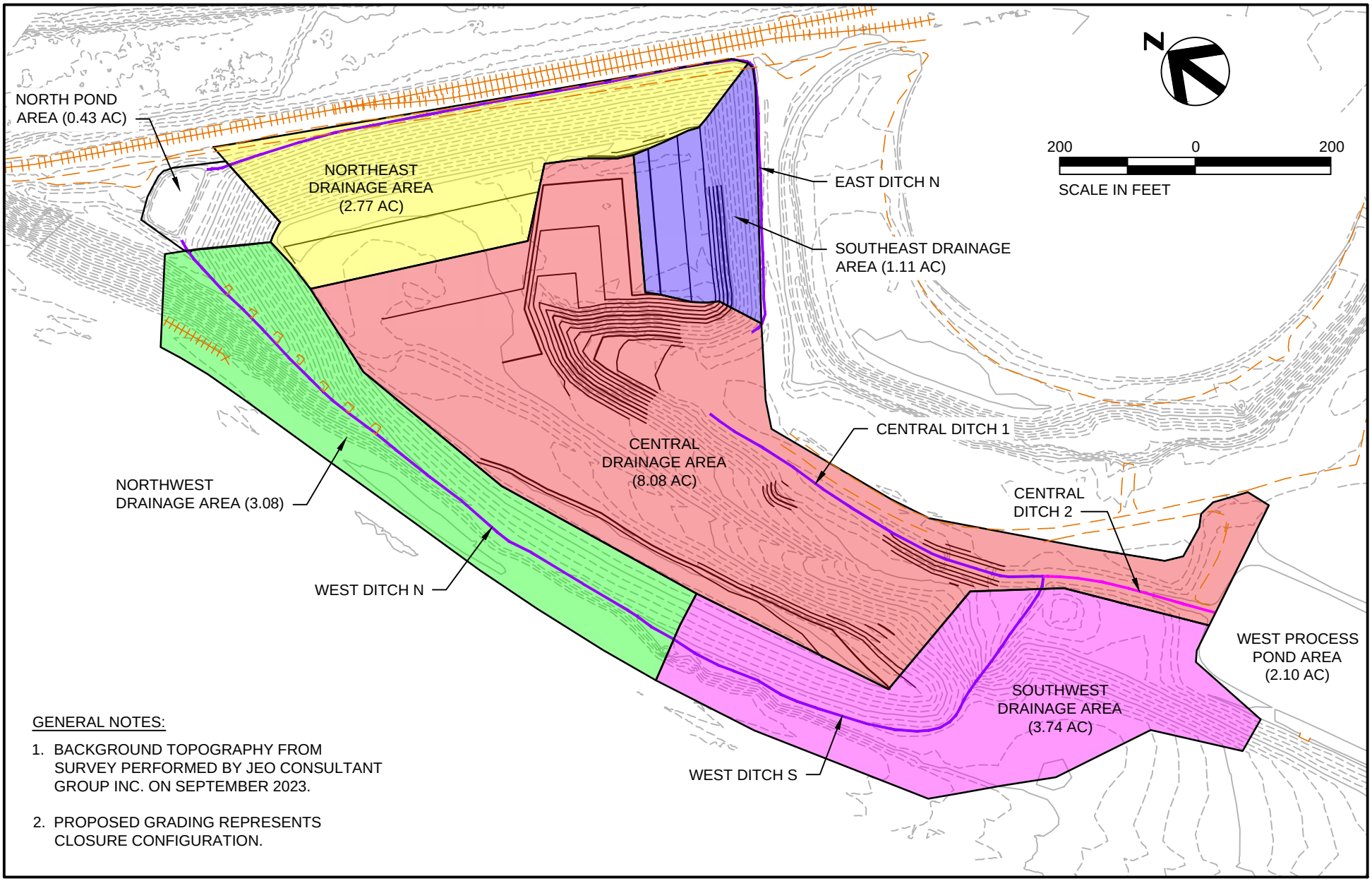
III. Run-Off Control System

Modifications made in 2017 rerouted all run-off from the capped CCR disposal area to a central drainage ditch which discharges to the existing Stormwater Pond, located south of the CCR disposal area. These modifications adequately support the management of stormwater during CCR disposal and post-closure arrangement.

The contributing volume of runoff was modeled for a 25-year, 24-hour storm event. The rainfall depths were obtained from NOAA Atlas 14. The results of the hydrologic modeling, with the current drainage areas schematic, are found in Appendix A. Generally, exterior slopes convey stormwater toward the north sediment pond while the top deck conveys water toward the south stormwater pond via the central drainage channel.

Calculations, figures, and management of stormwater run-off from the North Omaha Ash Disposal Area are contained in Appendices A, B, and C of this plan.

Appendix A
Stormwater Drainage Areas and Hydraflow Report



GENERAL NOTES:

1. BACKGROUND TOPOGRAPHY FROM SURVEY PERFORMED BY JEO CONSULTANT GROUP INC. ON SEPTEMBER 2023.
2. PROPOSED GRADING REPRESENTS CLOSURE CONFIGURATION.

C:\pwworking\central01\d3330843\01C-GP01-01-BBrev1.dwg, Layout1, 9/25/2023 10:08:02 AM, MBICKFORD

Omaha Public Power District

OMAHA PUBLIC POWER DISTRICT
NORTH OMAHA STATION ASH DISPOSAL AREA
TITLE 132 CLOSURE PERMIT APPLICATION

STORMWATER DRAINAGE AREAS

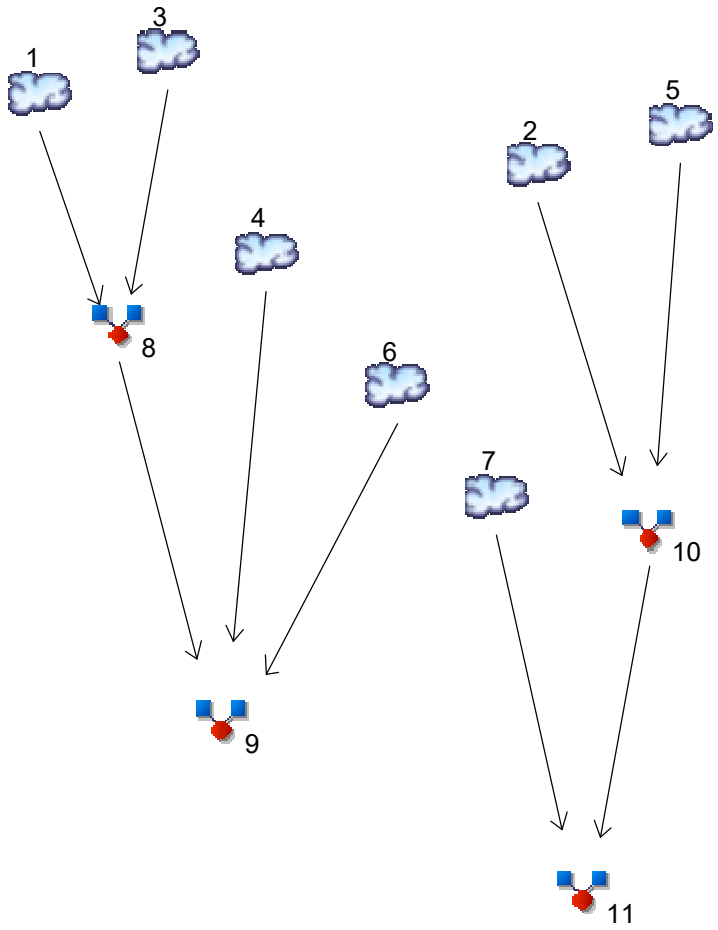
DATE

SEPTEMBER 2023

FIGURE

1

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Northeast Drainage Area
2	SCS Runoff	Central Drainage Area
3	SCS Runoff	Southeast Drainage Area
4	SCS Runoff	Northwest Drainage Area
5	SCS Runoff	Southwest Drainage Area
6	SCS Runoff	North Pond Direct Rainfall
7	SCS Runoff	West Process Pond Direct Rainfall
8	Combine	Northeast Channel
9	Combine	Total Runoff - North Pond
10	Combine	Central Drainageway
11	Combine	Total Runoff - West Process Pond

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	-------	7.069	-------	-------	Northeast Drainage Area
2	SCS Runoff	------	-------	-------	-------	-------	-------	20.95	-------	-------	Central Drainage Area
3	SCS Runoff	------	-------	-------	-------	-------	-------	2.952	-------	-------	Southeast Drainage Area
4	SCS Runoff	------	-------	-------	-------	-------	-------	8.027	-------	-------	Northwest Drainage Area
5	SCS Runoff	------	-------	-------	-------	-------	-------	9.710	-------	-------	Southwest Drainage Area
6	SCS Runoff	------	-------	-------	-------	-------	-------	3.096	-------	-------	North Pond Direct Rainfall
7	SCS Runoff	------	-------	-------	-------	-------	-------	15.12	-------	-------	West Process Pond Direct Rainfall
8	Combine	1, 3,	-------	-------	-------	-------	-------	10.02	-------	-------	Northeast Channel
9	Combine	4, 6, 8	-------	-------	-------	-------	-------	21.00	-------	-------	Total Runoff - North Pond
10	Combine	2, 5,	-------	-------	-------	-------	-------	30.66	-------	-------	Central Drainageway
11	Combine	7, 10	-------	-------	-------	-------	-------	45.07	-------	-------	Total Runoff - West Process Pond

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4

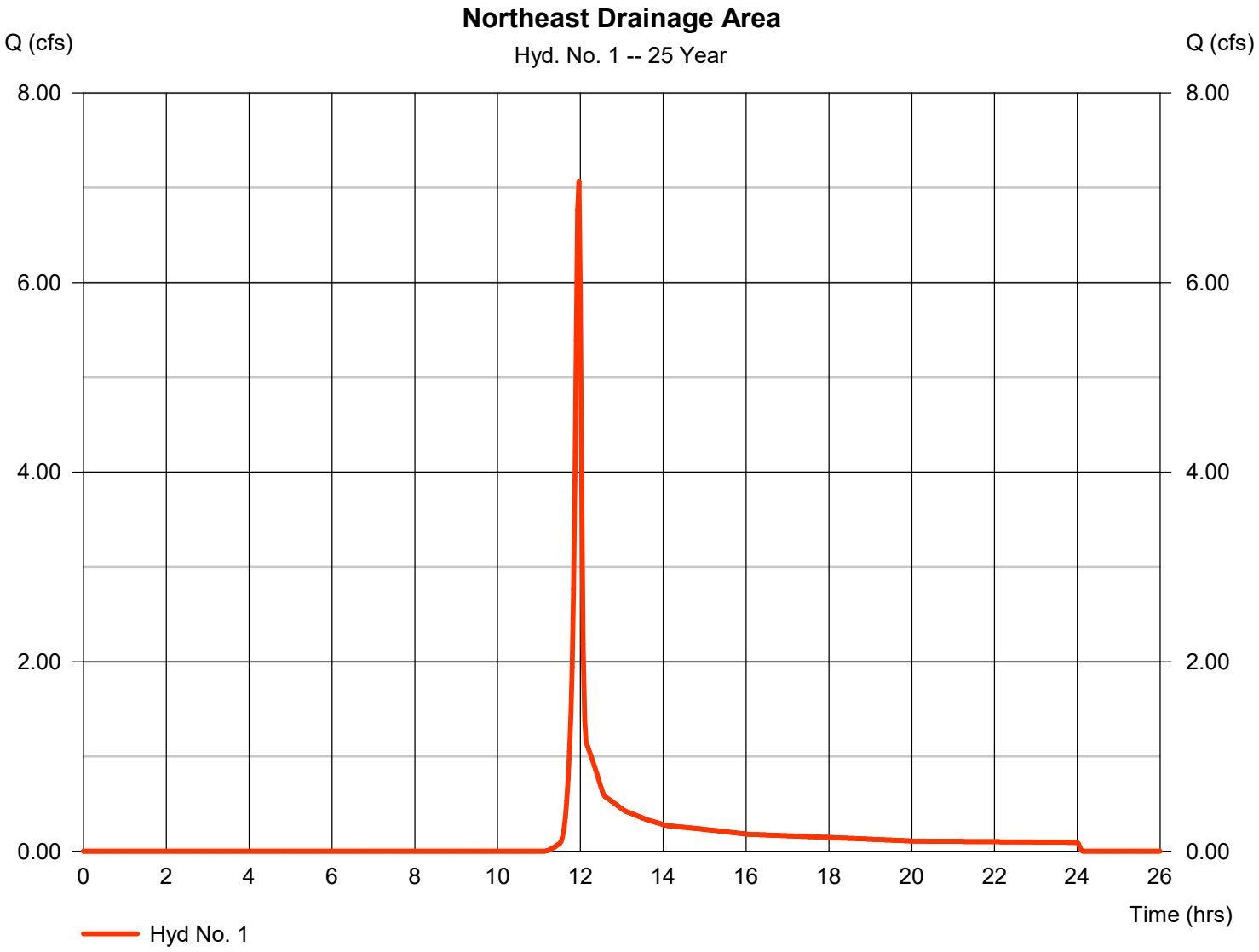
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.069	2	718	14,252	------	------	------	Northeast Drainage Area
2	SCS Runoff	20.95	2	718	42,234	------	------	------	Central Drainage Area
3	SCS Runoff	2.952	2	718	5,951	------	------	------	Southeast Drainage Area
4	SCS Runoff	8.027	2	718	16,184	------	------	------	Northwest Drainage Area
5	SCS Runoff	9.710	2	718	19,577	------	------	------	Southwest Drainage Area
6	SCS Runoff	3.096	2	716	7,712	------	------	------	North Pond Direct Rainfall
7	SCS Runoff	15.12	2	716	37,662	------	------	------	West Process Pond Direct Rainfall
8	Combine	10.02	2	718	20,203	1, 3,	------	------	Northeast Channel
9	Combine	21.00	2	718	44,099	4, 6, 8	------	------	Total Runoff - North Pond
10	Combine	30.66	2	718	61,811	2, 5,	------	------	Central Drainageway
11	Combine	45.07	2	718	99,473	7, 10	------	------	Total Runoff - West Process Pond

Hydrograph Report

Hyd. No. 1

Northeast Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 7.069 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 14,252 cuft
Drainage area	= 2.730 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.27 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

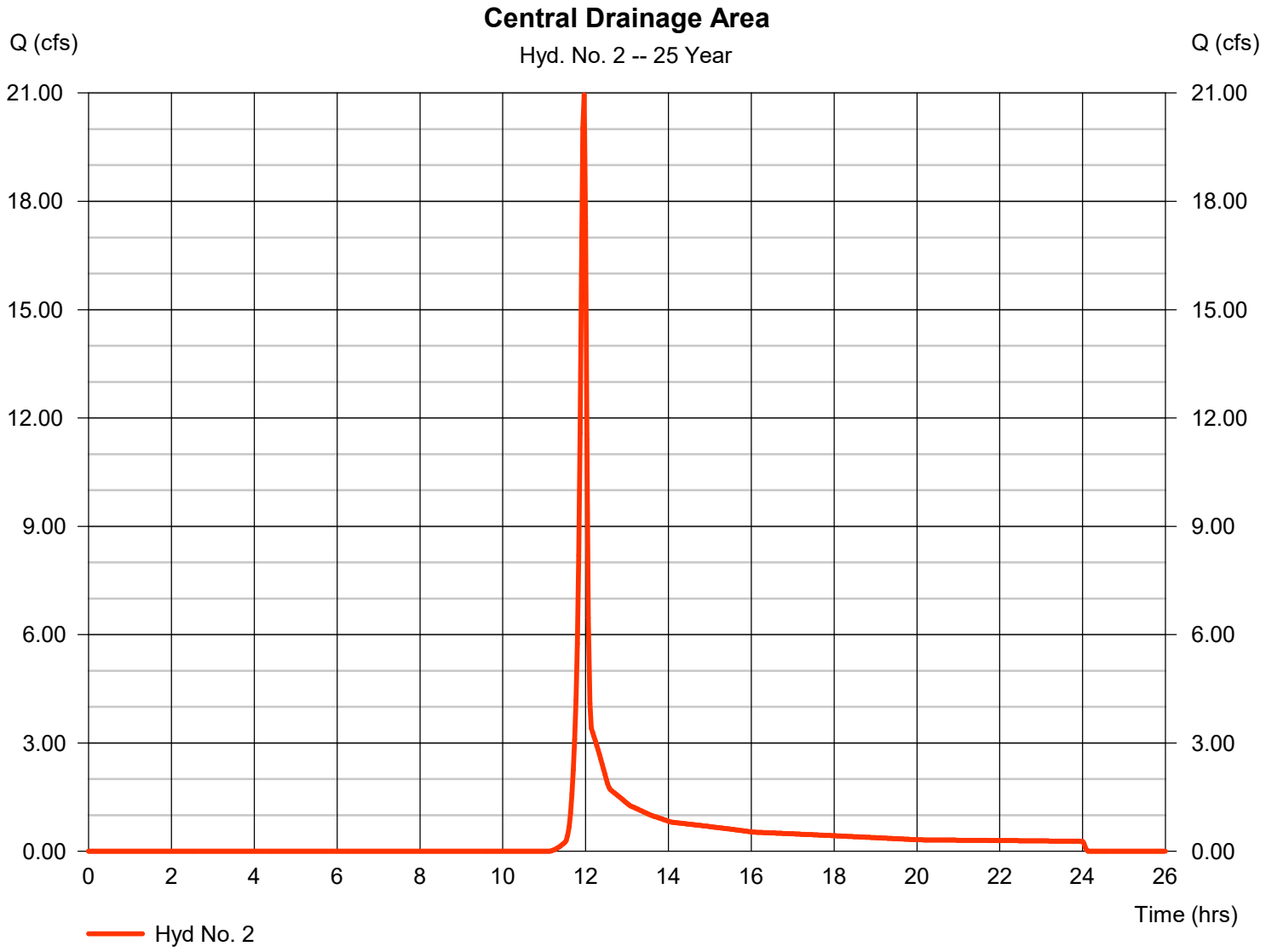


Hydrograph Report

Hyd. No. 2

Central Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 20.95 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 42,234 cuft
Drainage area	= 8.090 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.27 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

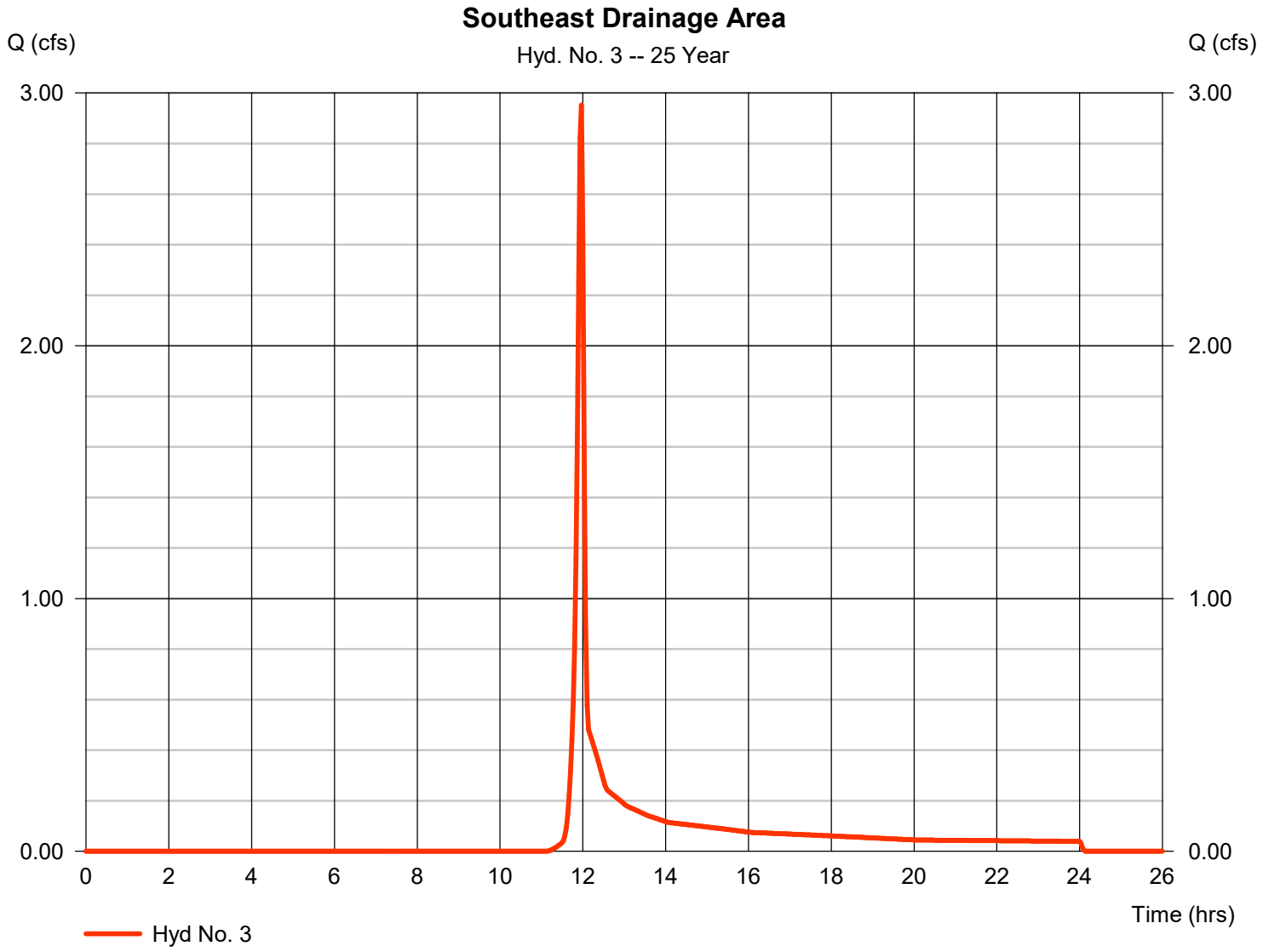


Hydrograph Report

Hyd. No. 3

Southeast Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 2.952 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 5,951 cuft
Drainage area	= 1.140 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.27 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

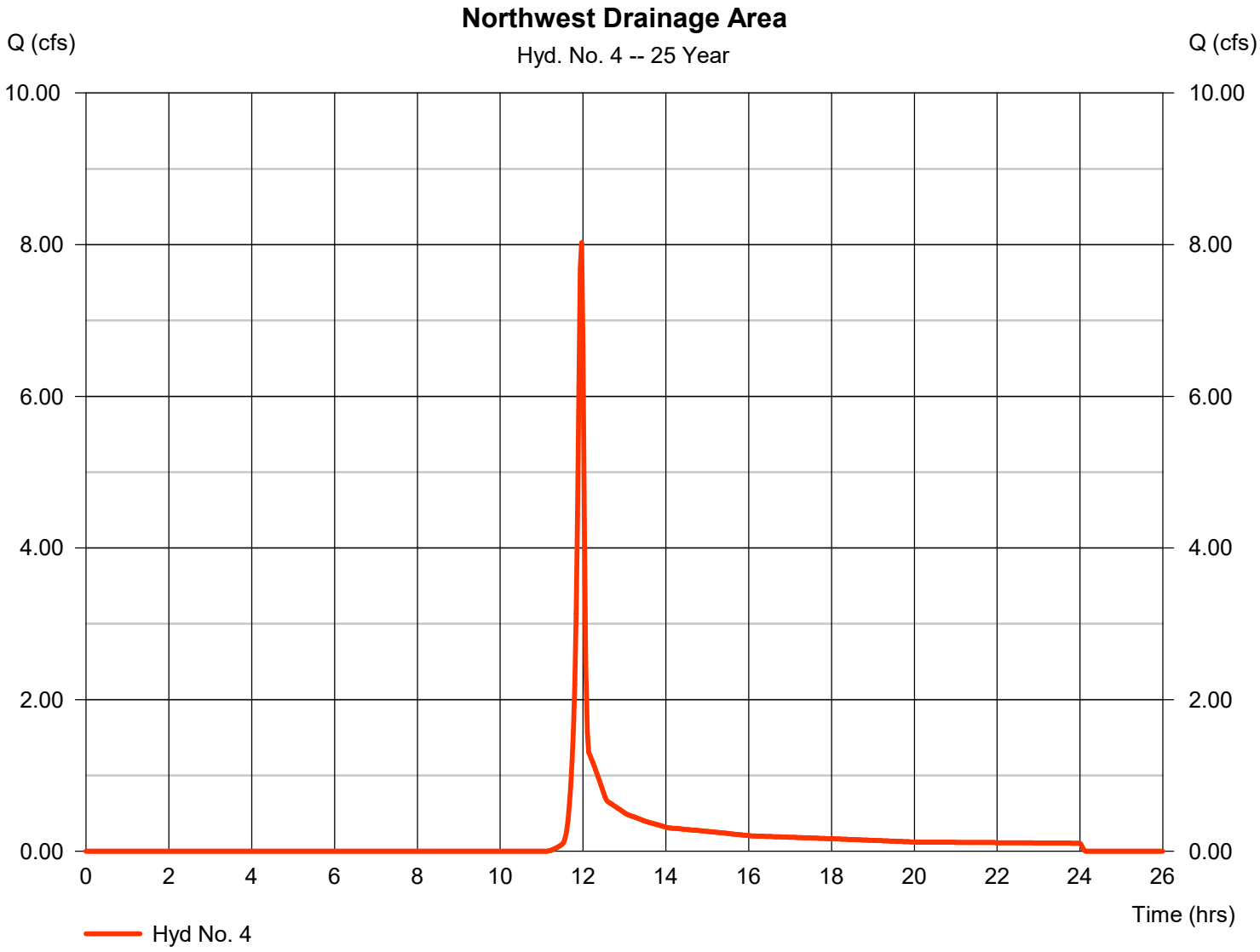


Hydrograph Report

Hyd. No. 4

Northwest Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 8.027 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 16,184 cuft
Drainage area	= 3.100 ac	Curve number	= 61
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.27 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

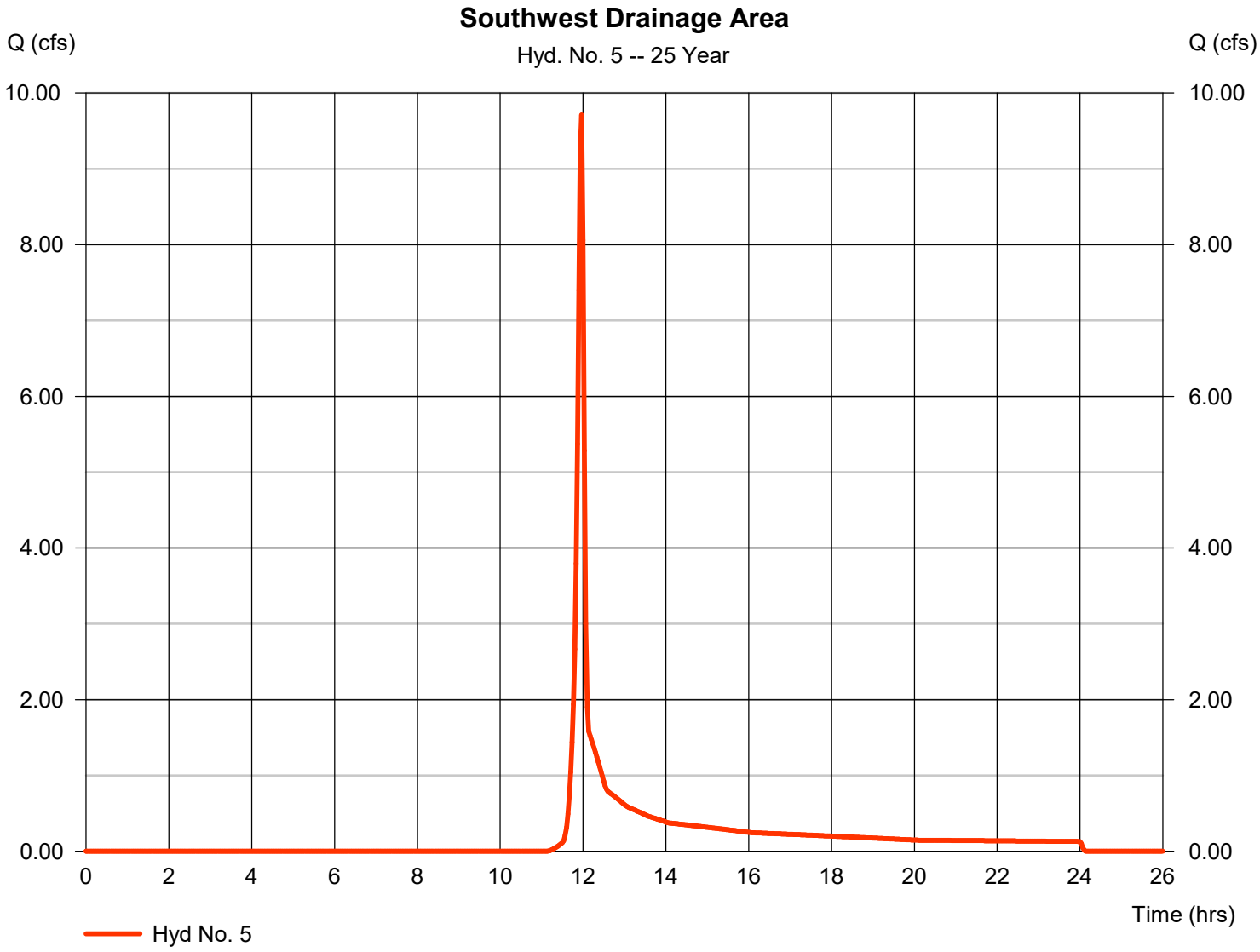


Hydrograph Report

Hyd. No. 5

Southwest Drainage Area

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.710 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	19,577 cuft
Drainage area	=	3.750 ac	Curve number	=	61
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.27 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

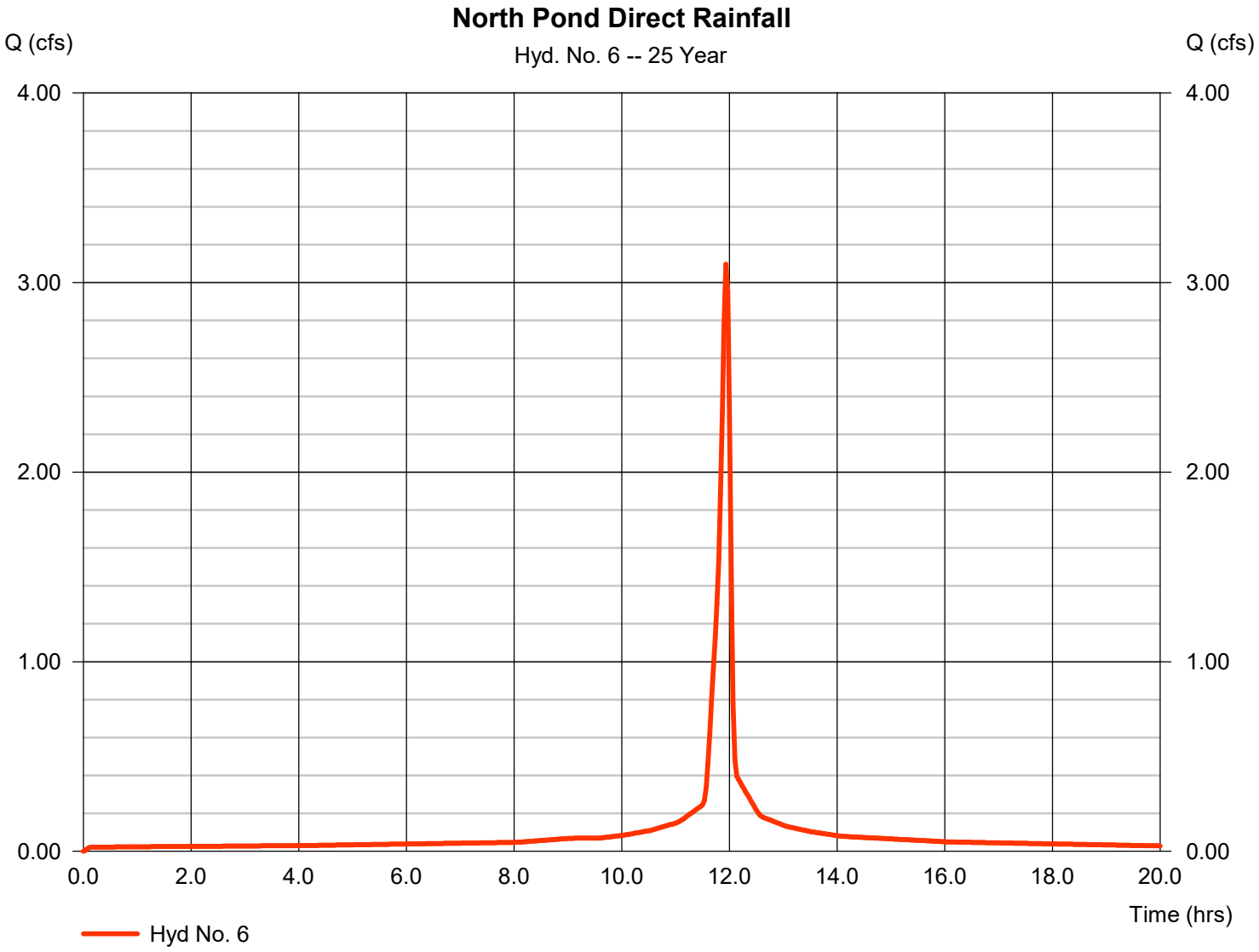


Hydrograph Report

Hyd. No. 6

North Pond Direct Rainfall

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.096 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	7,712 cuft
Drainage area	=	0.430 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.27 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

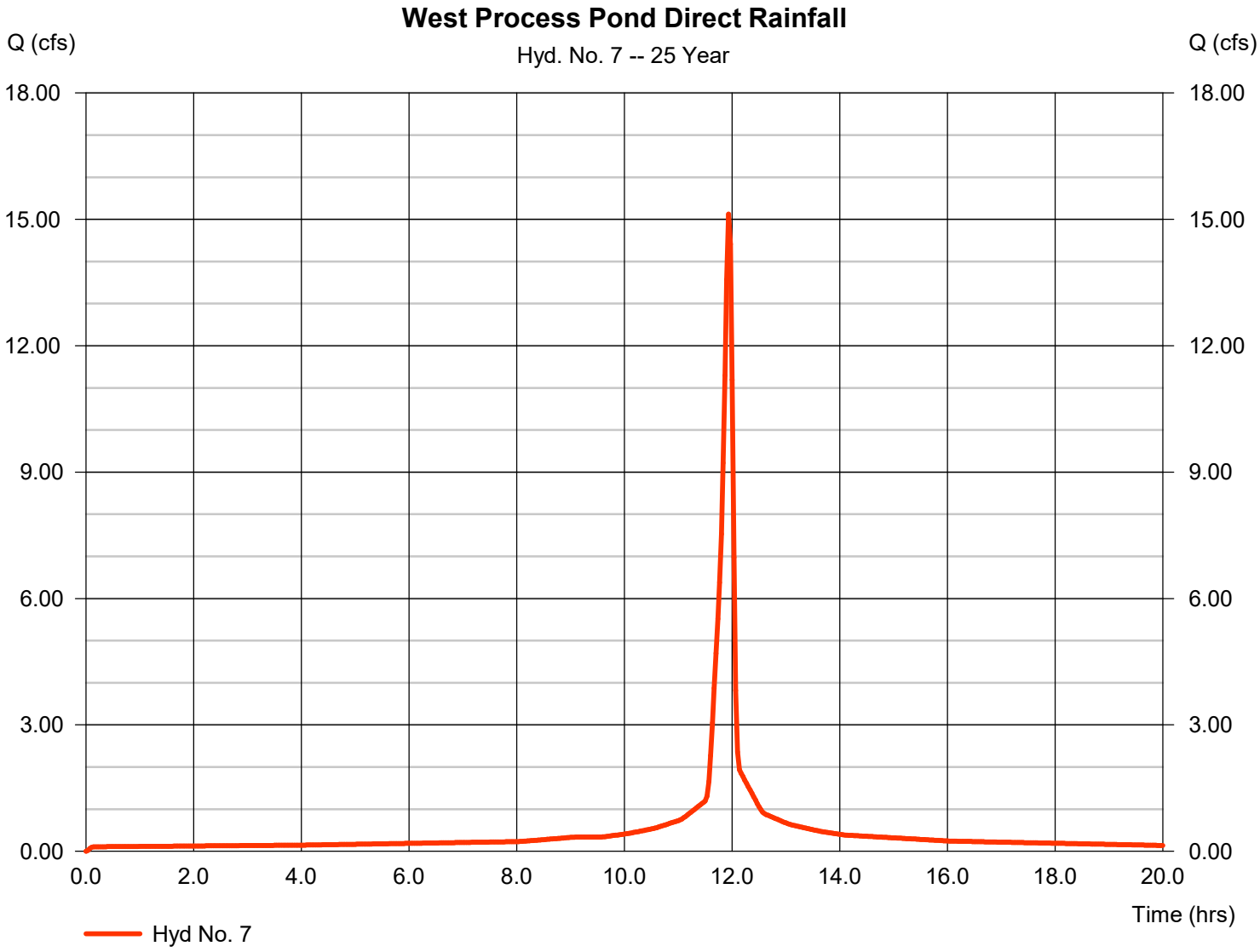


Hydrograph Report

Hyd. No. 7

West Process Pond Direct Rainfall

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.12 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	37,662 cuft
Drainage area	=	2.100 ac	Curve number	=	100
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.27 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

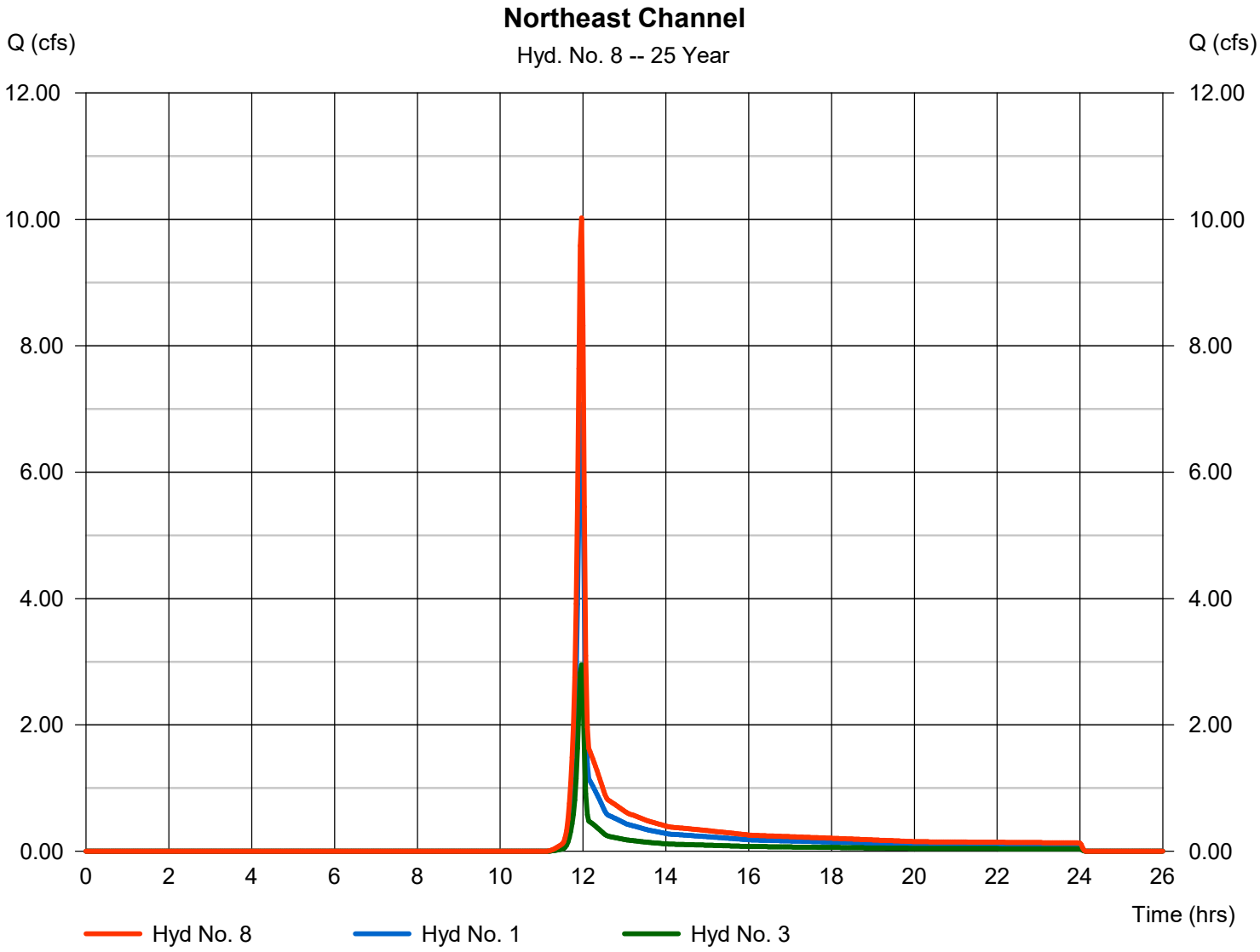


Hydrograph Report

Hyd. No. 8

Northeast Channel

Hydrograph type	=	Combine	Peak discharge	=	10.02 cfs
Storm frequency	=	25 yrs	Time to peak	=	11.97 hrs
Time interval	=	2 min	Hyd. volume	=	20,203 cuft
Inflow hyds.	=	1, 3	Contrib. drain. area	=	3.870 ac

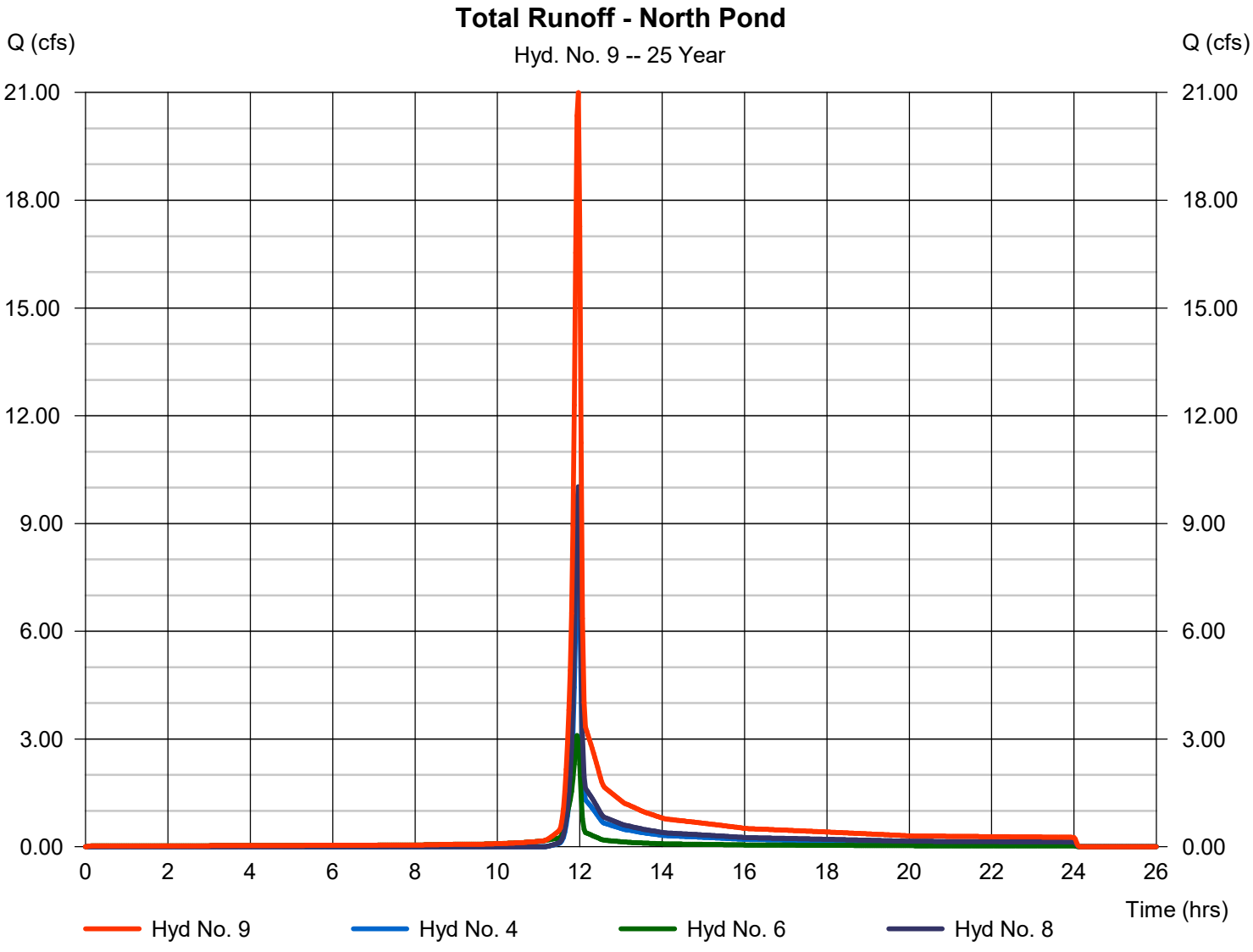


Hydrograph Report

Hyd. No. 9

Total Runoff - North Pond

Hydrograph type	= Combine	Peak discharge	= 21.00 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 44,099 cuft
Inflow hyds.	= 4, 6, 8	Contrib. drain. area	= 3.530 ac

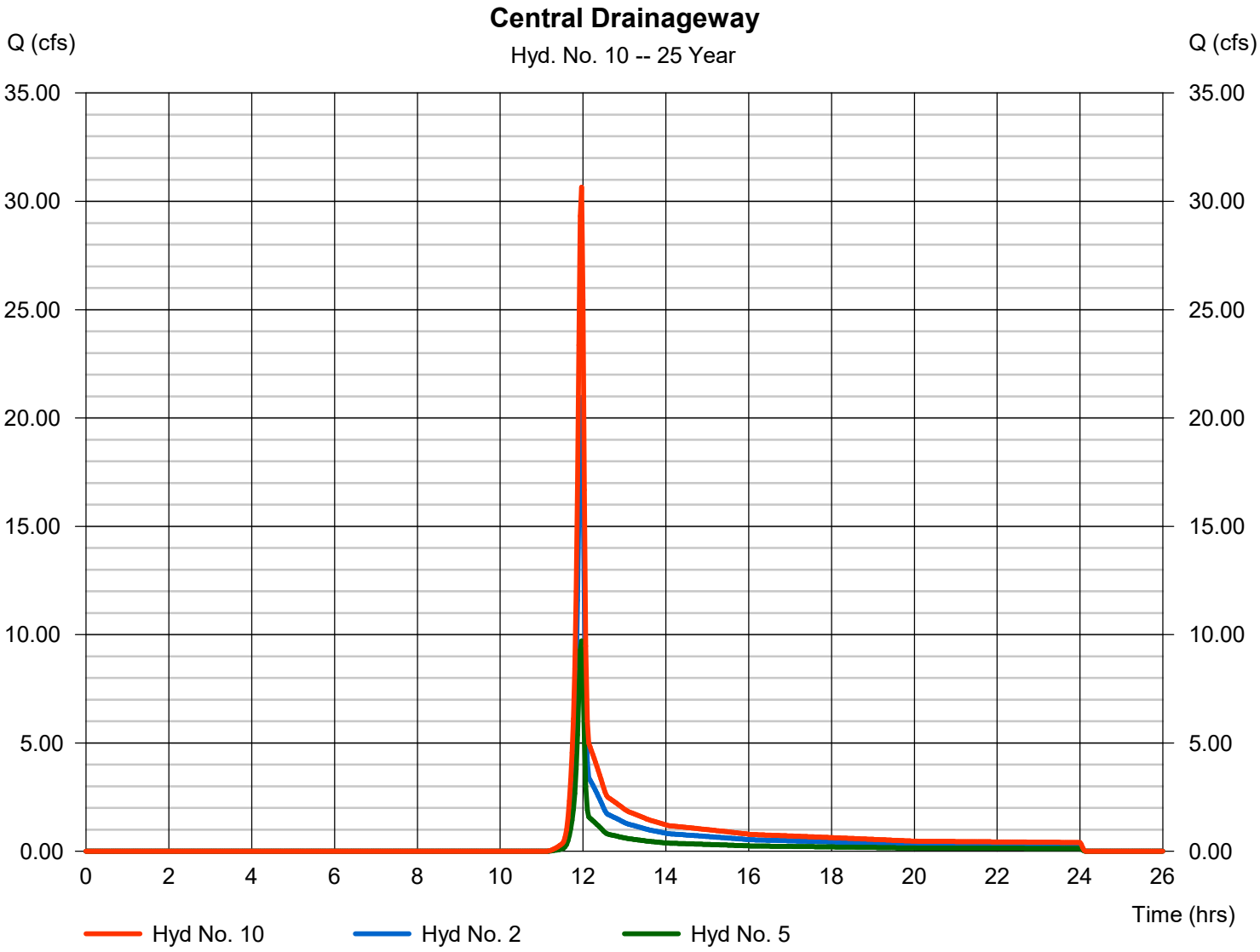


Hydrograph Report

Hyd. No. 10

Central Drainageway

Hydrograph type	= Combine	Peak discharge	= 30.66 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 61,811 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 11.840 ac

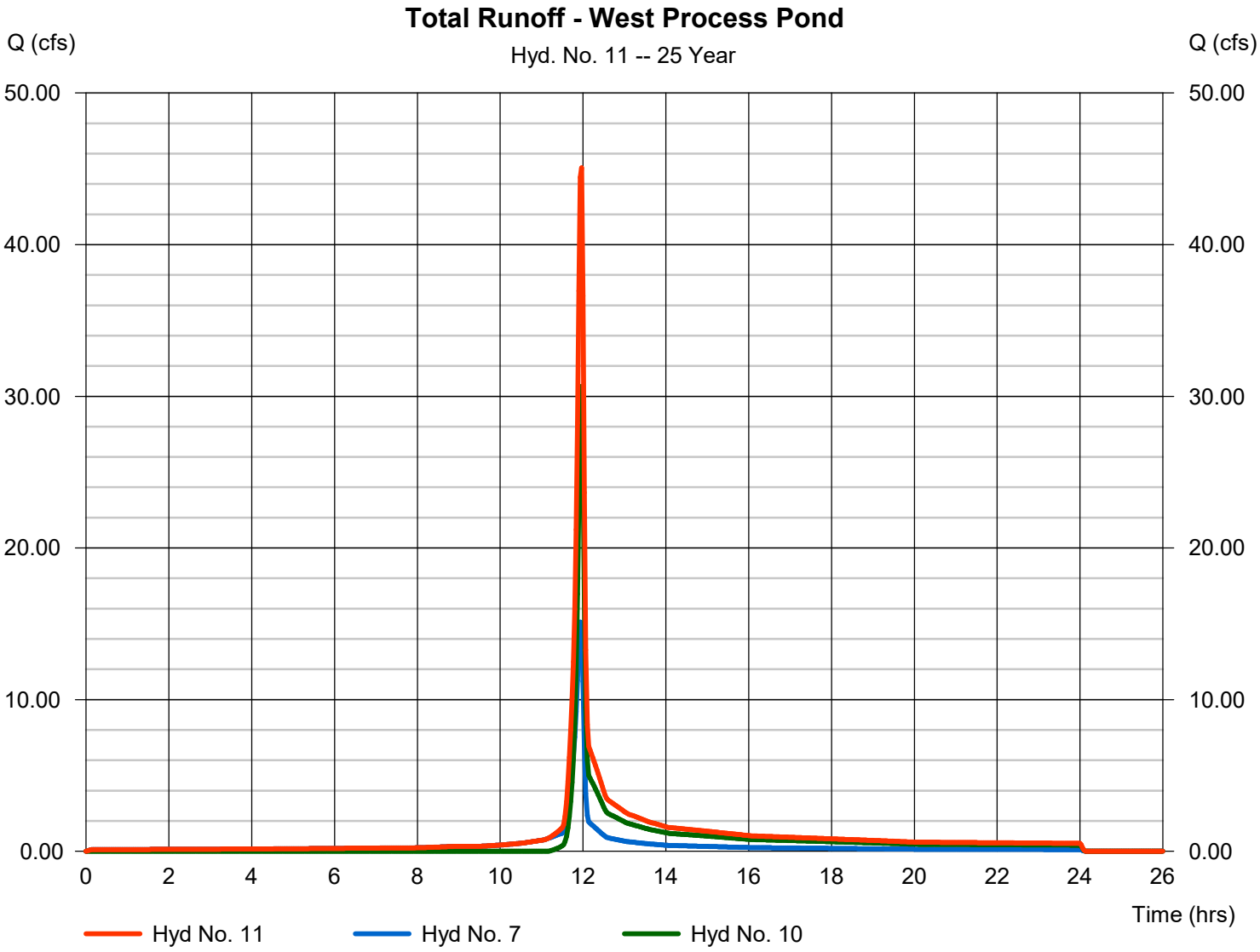


Hydrograph Report

Hyd. No. 11

Total Runoff - West Process Pond

Hydrograph type	= Combine	Peak discharge	= 45.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 99,473 cuft
Inflow hyds.	= 7, 10	Contrib. drain. area	= 2.100 ac



Appendix B
Perimeter Ditch Sizing Calculations

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 23 2023

NW Drainage Channel

Trapezoidal

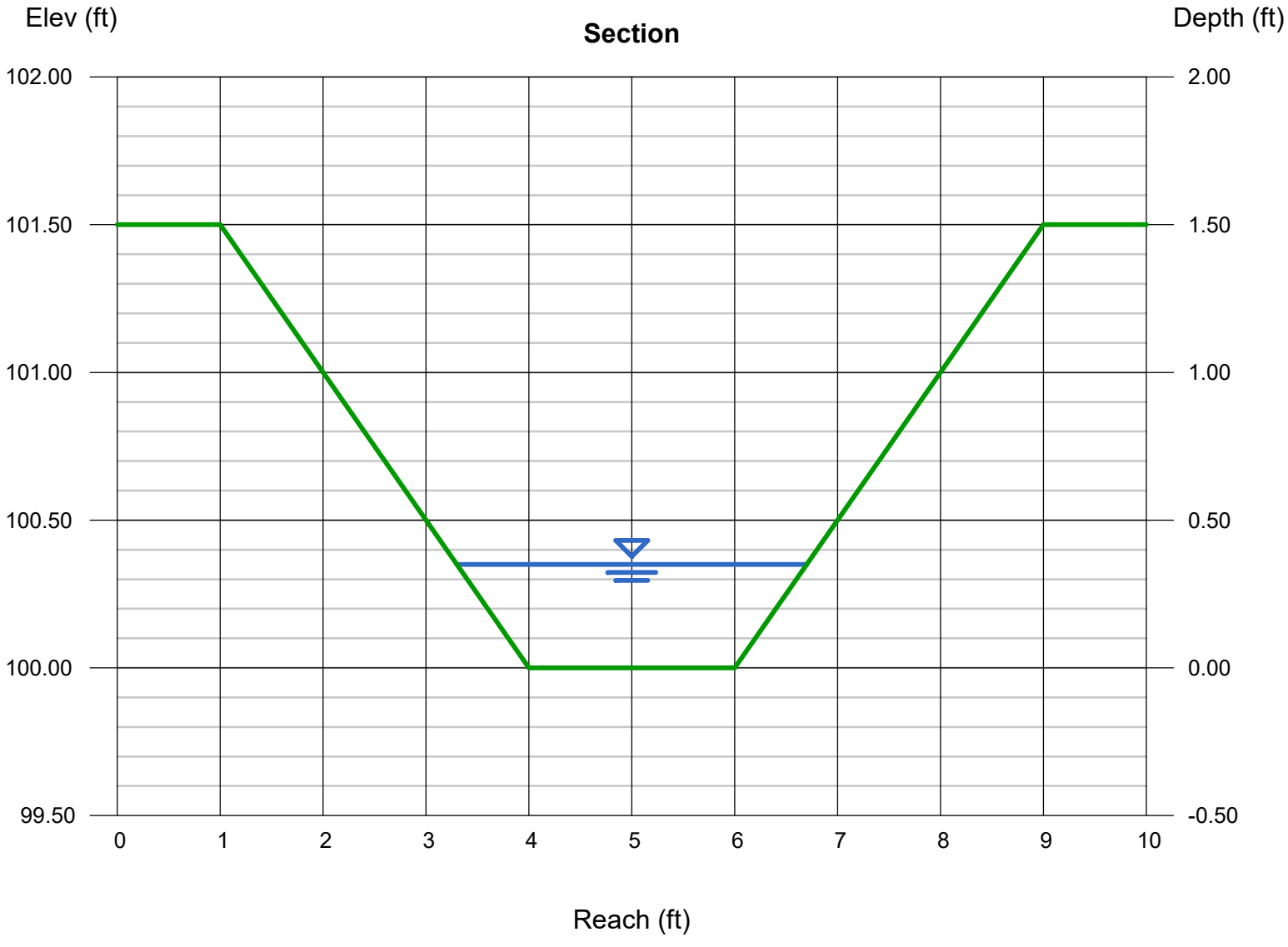
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 10.00
N-Value	= 0.022

Calculations

Compute by:	Known Q
Known Q (cfs)	= 8.03

Highlighted

Depth (ft)	= 0.35
Q (cfs)	= 8.030
Area (sqft)	= 0.94
Velocity (ft/s)	= 8.50
Wetted Perim (ft)	= 3.57
Crit Depth, Yc (ft)	= 0.64
Top Width (ft)	= 3.40
EGL (ft)	= 1.47



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 23 2023

Northeast Stormwater Channel

Trapezoidal

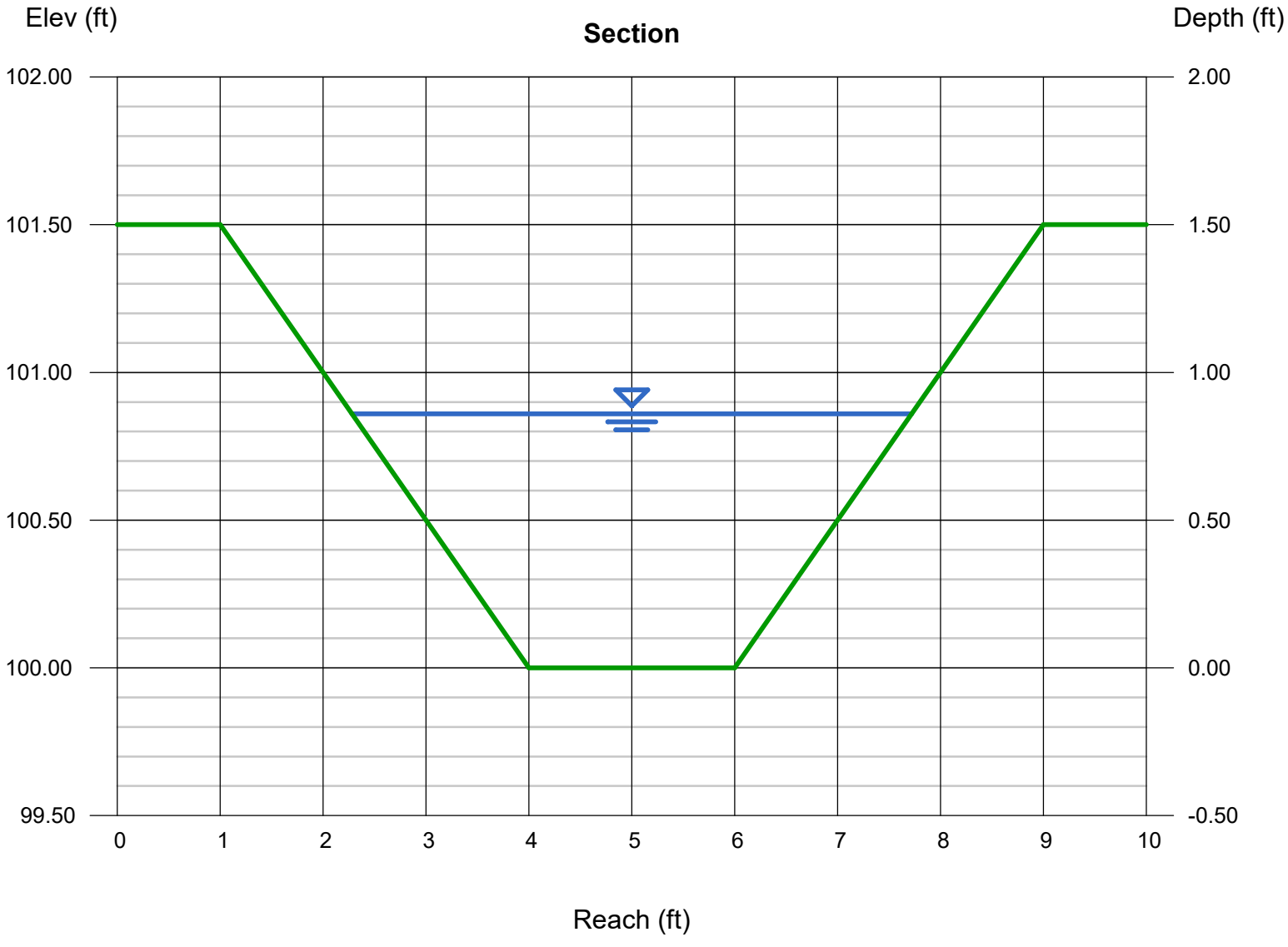
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.50
N-Value	= 0.022

Calculations

Compute by:	Known Q
Known Q (cfs)	= 10.02

Highlighted

Depth (ft)	= 0.86
Q (cfs)	= 10.02
Area (sqft)	= 3.20
Velocity (ft/s)	= 3.13
Wetted Perim (ft)	= 5.85
Crit Depth, Yc (ft)	= 0.73
Top Width (ft)	= 5.44
EGL (ft)	= 1.01



Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 23 2023

SE Drainage Channel

Trapezoidal

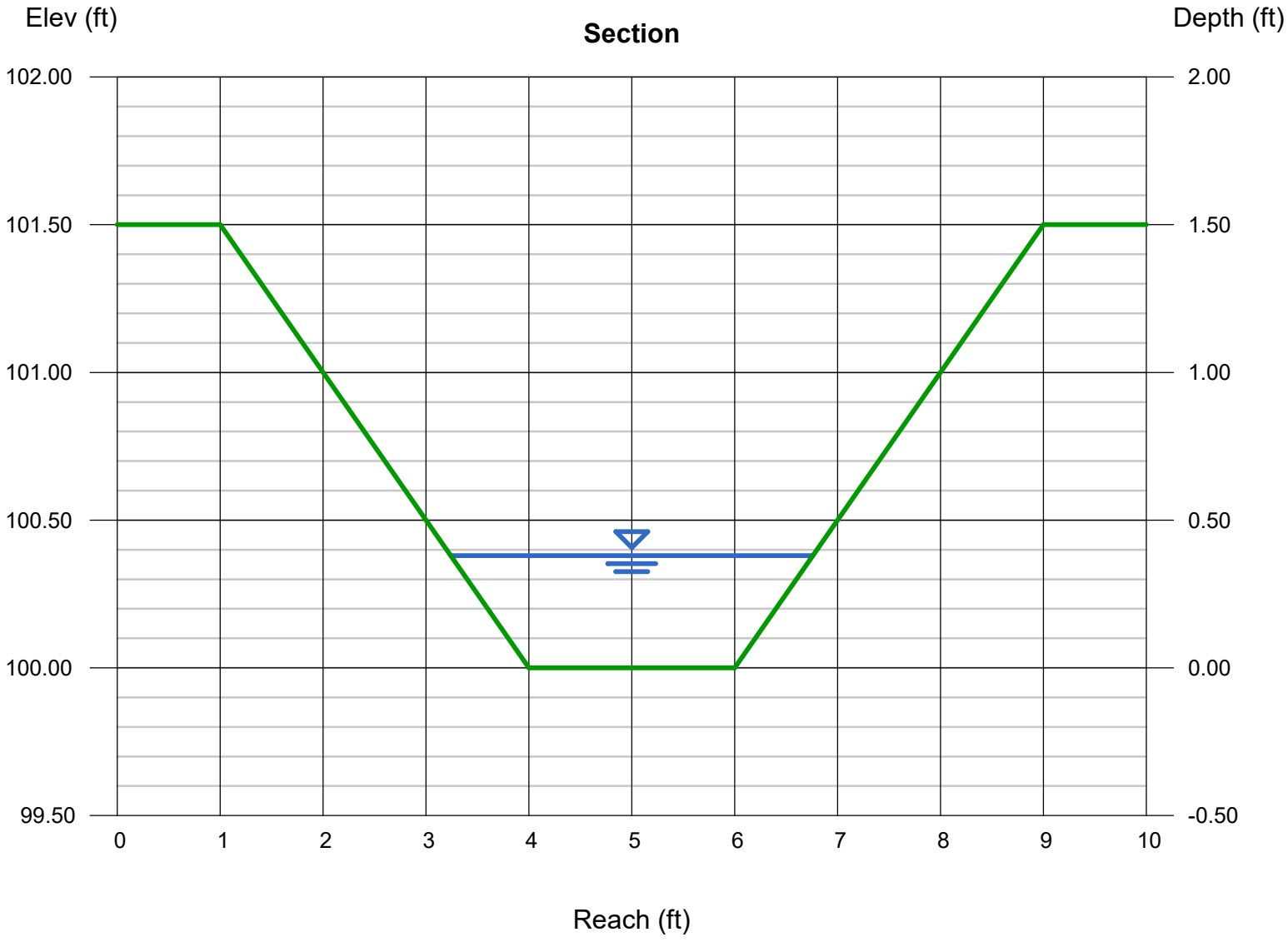
Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.00
N-Value	= 0.022

Calculations

Compute by:	Known Q
Known Q (cfs)	= 2.95

Highlighted

Depth (ft)	= 0.38
Q (cfs)	= 2.950
Area (sqft)	= 1.05
Velocity (ft/s)	= 2.81
Wetted Perim (ft)	= 3.70
Crit Depth, Yc (ft)	= 0.36
Top Width (ft)	= 3.52
EGL (ft)	= 0.50



Appendix C
Central Drainage Channel

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Thursday, Mar 23 2023

Central Drainage Channel

Trapezoidal

Bottom Width (ft)	= 2.00
Side Slopes (z:1)	= 2.00, 2.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 1.50
N-Value	= 0.022

Calculations

Compute by:	Known Q
Known Q (cfs)	= 30.66

Highlighted

Depth (ft)	= 1.13
Q (cfs)	= 30.66
Area (sqft)	= 4.81
Velocity (ft/s)	= 6.37
Wetted Perim (ft)	= 7.05
Crit Depth, Yc (ft)	= 1.30
Top Width (ft)	= 6.52
EGL (ft)	= 1.76