STORMWATER
CALCULATIONS FOR

Project Mustang

Joe Frank Porter Road

Mt. Pleasant,
TN Maury
County

GRESHAM SMITH PROJECT # 50114.00

July 23, 2025

7/24/2025

Gresham Smith

SUITE 1400

222 SECOND AVE. SOUTH NASHVILLE, TN 37201

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CONTENTS

PROJECT NARRATIVE

Project Description

The 36.9 acre proposed site is located west of Joe Frank Porter Road, just north of State Route 43 Lawrenceburg Highway in northeast Mt. Pleasant, Tennessee.

Property improvements include parking, stormwater infrastructure, and one driveway connecting to the existing Joe Frank Porter Road cul-de-sac.

Soil Conditions

The USDA Web Soil Survey data for this property shows:

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ae	Armour silt loam, eroded gently sloping phase	B	0.3	0.7%
Bk	Braxton silty clay loam, eroded sloping phase	C	0.0	0.1%
Bm	Burgin silt loam, phosphatic phase (Eagleville)	D	1.8	5.0%
Df	Donerail silt loam, gently sloping phase	C	2.1	5.7%
Dg	Dunning silty clay loam, phosphatic phase	C/D	0.2	0.5%
Ga	Godwin silt loam	C/D	16.3	44.0%
Hr	Huntington silt loam, local alluvium phosphatic phase	B	0.1	0.2%
Mb	Maury silt loam, eroded gently sloping phase	A	16.2	43.8%
Totals for Area of Interest			**36.9**	**100.0%**

Refer to Appendix B for existing soils information

Existing Stormwater Conditions

The site is currently undeveloped and consists of open land used for agriculture. Runoff drains across the parcel from northeast to southwest, across the site into an unnamed tributary of

Big Bigby Creek, TN06040003019, which is designated as impaired by nutrients. Two natural outfalls occur on the site and these will be analyzed in both the pre- and post- conditions.

Proposed Stormwater Conditions

All stormwater runoff will drain in a similar pattern as the existing site, from northeast to southwest. The two natural locations of stormwater discharge in the existing condition will be analyzed in the proposed condition. These discharge locations will be the Point of Interests (POI) AB and C.

POI AB:
On the developed portion of the site, POI AB, the stormwater will be collected via a combination of overland flow and underground pipe networks to either one of two riprap-lined ditches and/or a dry detention pond. A small portion of impervious area (0.74 acres) will directly flow into the detention pond without pre-treatment via a riprap-lined ditch. Stormwater that does not enter the storm network will bypass the detention pond and flow overland to the POI AB site outfall.

POI C:
For the undeveloped area at the south of the site, no changes will be made to the existing overland flow path to the POI C outfall. The area of drainage to this point of interest has been reduced from the pre- to the post- condition.

Refer to Appendix B for Existing and Proposed Hydrologic Plan Exhibits.

Stormwater Quantity

Storm Sewer System
The majority of all onsite water will be conveyed via a combination of surface runoff and the proposed storm network throughout the site. All disturbed areas of increased impervious runoff will be diverted to a dry detention pond before slow-release to the POI AB outfall.

The drainage area for each inlet and storm sewer calculations are provided in Appendix D.

Stormwater Detention
Stormwater detention for the proposed development has been provided through the use of the TR-55 method to meet the pre vs. post water quantity requirements, per the City of Mt. Pleasant. The calculations provided herein take into account all future parking and building expansion impervious areas shown on Site Plan. Stormwater over the disturbed portion of the site will be retained for a minimum of 24 hours in a dry detention basin before slow-releasing to the site outfall. The dry detention basin will also improve water quality by the provision for sediment and other pollutants to settle out over time, see Water Quality design.

The Detention Calculations are provided in Appendix D.

POI AB *Pre vs. Post Discharge Flow Rates (cfs)*						
	2-YR	**5-YR**	**10-YR**	**25-YR**	**50-YR**	**100-YR**
PRE	34.07	46.13	55.81	69.25	79.96	91.13
POST	18.07	22.05	24.87	28.70	31.69	34.74

POI C *Pre vs. Post Discharge Flow Rates (cfs)*						
	2-YR	**5-YR**	**10-YR**	**25-YR**	**50-YR**	**100-YR**
PRE	46.91	64.61	78.98	99.24	115.50	132.53
POST	17.20	22.75	27.16	33.24	38.06	43.08

Stormwater Quality

The City of Mt. Pleasant does not currently have water quality requirements for permitting but an effort was made to ensure that sediment transport to receiving waters would be minimal.

POI AB

The majority of surface drainage will be diverted through one of two riprap-lined ditches before being collected and detained in a dry detention basin. Stormwater routed through the pond will travel slowly over an elongated basin route before it discharges to POI AB. A trash rack will be located at the headwall of the basin outlet pipe to further deter negative impacts to receiving streams. There is a small area of impervious paving (0.74 acres) that will go directly to the dry detention basin without pre-treatment via a ditch.

POI C

The pre-construction drainage pattern for Watershed C (WS C) will continue undisturbed to POI C.

Erosion and Sediment Control

Ditches A & B:

Both ditches will be lined with riprap to diminish shear stress along the channel bottom and discourage sediment transport. The US Department of Transportation FHWA Hydraulic Toolbox 5.4 was used for the analysis of the channel lining and the Known Q was entered via watershed analysis using the Hydraflow Hydrograph Extension for Autodesk Civil 3D.

Ditch A

In order to analyze the channel lining for Ditch A, the Hydraflow Hydrograph Extension for Autodesk Civil 3D was utilized for Watershed 4 – POST WS A and the 10-year storm event. Ditch A conveys three (3) watersheds that enter at different points along the ditch, however, a conservative approach was taken to analyze the ditch as though all flows entered at the same point and were conveyed simultaneously. This ensures that Ditch A will not overflow and that flows entering the ditch will not produce any deleterious erosive effects along the length of the conveyance.

Ditch B

In order to analyze the channel lining for Ditch B, the Hydraflow Hydrograph Extension for Autodesk Civil 3D was utilized for watershed 10 – POST WS B and the 10-year storm event. Ditch B conveys two (2) watersheds that enter at different points along the ditch, however, a conservative approach was taken to analyze the ditch as though all flows entered at the same point and were conveyed simultaneously. This ensures that Ditch B will not overflow and that flows entering the ditch will not produce any deleterious erosive effects along the length of the conveyance.

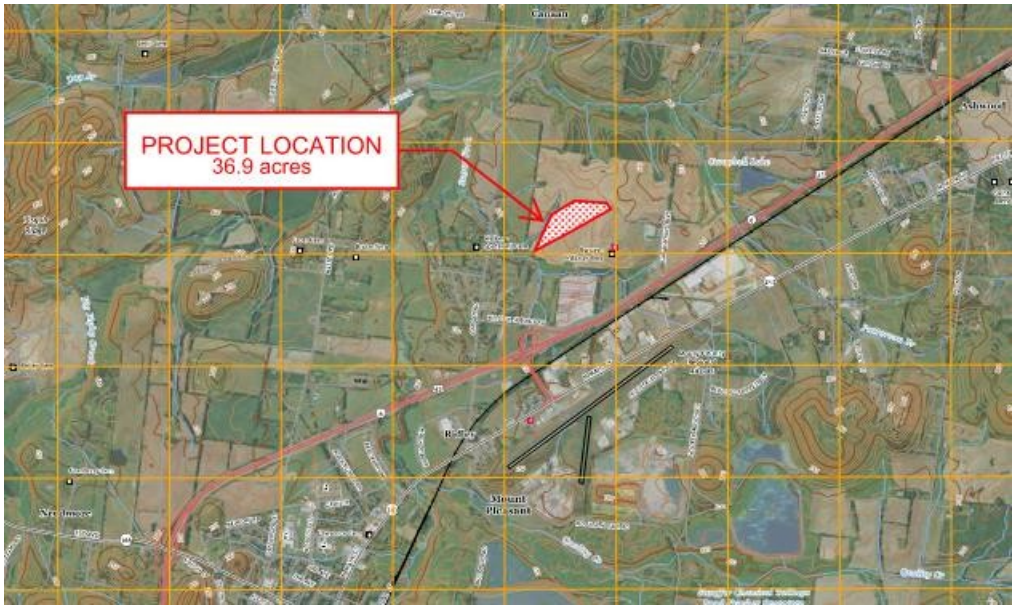
The Channel Lining Analysis Reports are provided in Appendix D.

For temporary and permanent construction measures, as well as sediment basin calculations, refer to the Stormwater Prevention Plan (SWPPP) for erosion control plan and details in Appendix D.

Offsite Drainage

The proposed site is downhill of agricultural land to the north that will contribute 12.21 acres of stormwater run-on. Due to the shape of the site, as well as the layout requirements of the building and vehicular circulation, it was difficult to bypass the entirety of the offsite drainage to the natural outfall of the site. Instead, approximately 12.05 acres of undeveloped offsite drainage will be diverted through the SCMs and treated within the detention pond before ultimately reaching the site outfall(s).

APPENDIX A: VICINITY MAP



VICINITY MAP
NOT TO SCALE

Mt. Pleasant, Tennessee

APPENDIX B: DRAINAGE MAP EXHIBITS

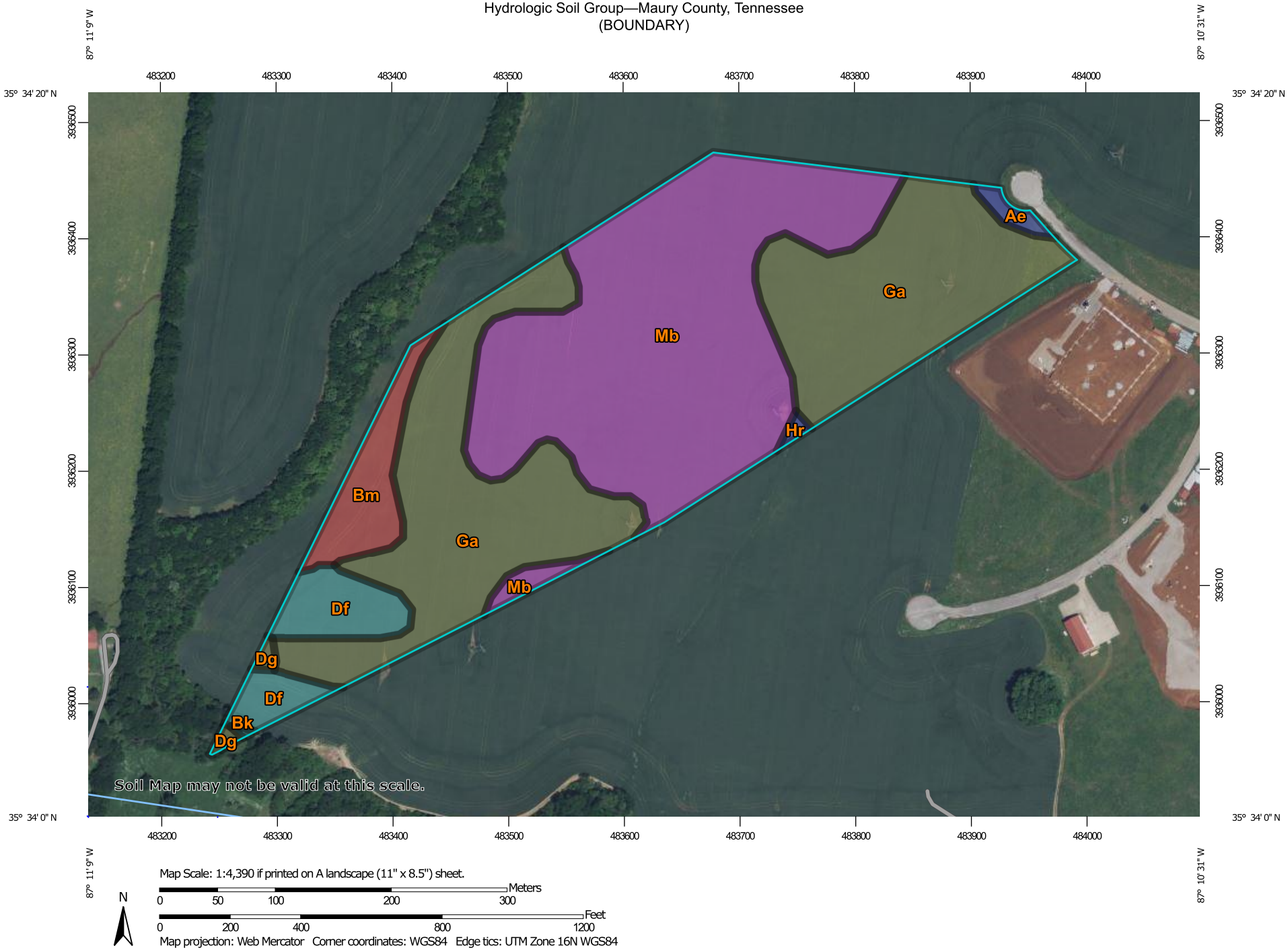
Soils Report

Existing Conditions Drainage Exhibit

Proposed Development Drainage Exhibit

NOAA Rainfall Data

Hydrologic Soil Group—Maury County, Tennessee
(BOUNDARY)



Map Scale: 1:4,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Lines

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Soil Rating Points

A
A/D
B
B/D
C
C/D
D
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails
Interstate Highways
US Routes
Major Roads
Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Maury County, Tennessee
Survey Area Data: Version 19, Sep 12, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 20, 2021—Jun 14, 2021

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Ae	Armour silt loam, eroded gently sloping phase	B	0.3	0.7%
Bk	Braxton silty clay loam, eroded sloping phase	C	0.0	0.1%
Bm	Burgin silt loam, phosphatic phase (Eagleville)	D	1.8	5.0%
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Dg	Dunning silty clay loam, phosphatic phase	C/D	0.2	0.5%
Ga	Godwin silt loam	C/D	16.3	44.0%
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Mb	Maury silt loam, eroded gently sloping phase	A	16.2	43.8%
Totals for Area of Interest			**36.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

PRE-WATERSHED A
19.04 ACRES
HSG A = 8.63 AC CN = 72
HSG C = 1.45 AC CN = 88
HSG C/D = 7.16 AC CN = 91
HSG D = 1.80 CN = 91
CN = 82
Tc = 32.8 min

PRE-OFFSITE WATERSHED
12.41 ACRES
HSG A = 10.71 AC CN = 72
HSG B = 0.62 AC CN = 81
HSG C/D = 0.71 AC CN = 91
IMP = 0.17 AC CN = 98
CN = 74
Tc = 27 min

PRE-WATERSHED B
17.89 ACRES
HSG A = 7.59 AC CN = 72
HSG B = 0.39 AC CN = 81
HSG C = 0.83 AC CN = 88
HSG C/D = 9.08 AC CN = 91
CN = 83
Tc = 34.6 min

POINT OF INTEREST - "POI AB"

POINT OF INTEREST - "POI C"

D
C
C/D
A
B

N58° 19' 24"E 1019.02'
N26° 57' 50"E 1288.70'
S63° 47' 43"W 836.67'
S63° 35' 04"W 548.98'
S58° 23' 51"W 352.55'
S58° 20' 27"W 485.14'
S58° 21' 53"W 515.00'
S82° 21' 50"E 852.21'

FUTURE RIGHT-OF-WAY

100' GRANT OF TRANSMISSION LINE EASEMENT BOOK 207, PAGE 323 & BOOK 207, PAGE 325

50' GAS LINE RIGHT-OF-WAY BOOK 285, PAGE 285 & BOOK 609, PAGE 609 R.O.M.C., TN

100 YEAR FLOODPLAIN (ZONE A)

NO EASEMENT DOCUMENT FOUND

NORTH

100' 0 100' 200'
GRAPHIC SCALE

Gresham Smith
GreshamSmith.com
222 Second Avenue South
Suite 1400
Nashville, TN 37201
615.770.8100

DCi

PROJECT MUSTANG

7th District of Maury County, Mount Pleasant, Tennessee
Being a portion of Tax Map 126 Parcel 041.01

Developer: DCi

MICHAEL DUANE HUNKLER
REGISTERED ENGINEER
No. 20051
AGRICULTURE
COMMERCE
STATE OF TENNESSEE

Revision

No.	Date	Description

EXISTING HYDROLOGIC PLAN

50114.00
06/10/2025

This Line Is 3 Inches When Printed Full Size

C:\Users\rockhiv\DCIACCDocs\Gresham Smith\50114.00 Project Mustang R25\Project Files\C3DSheets\Archive\50114.00_EXISTING DRAINAGE.dwg - Valerie Rockhill - 6/24/2025 12:58:20 PM

POST-Offsite A
11.97 ACRES
HSG A = 10.71 AC CN = 72
HSG B = 0.56 AC CN = 81
HSG D = 0.69 AC CN = 91
Impervious = 0.01 AC CN = 98
CN = 74
Tc = 27 min

POST-WS A2
5.57 ACRES
HSG D = 2.94 AC CN = 91
Impervious = 2.63 AC CN = 98
CN = 94
Tc = 12.9 min

POST-WS A1
2.99 ACRES
HSG A = 1.77 AC CN = 72
HSG D = 1.22 AC CN = 91
CN = 80
Tc = 17 min

POST-WS A3
5.33 ACRES
HSG D = 4.59 AC CN = 91
Impervious = 0.74 AC CN = 98
CN = 92
Tc = 16.6 min

Undisturbed Area
3.20 ACRES
HSG A = 0.21 AC CN = 72
HSG C = 0.56 AC CN = 88
HSG D = 2.43 AC CN = 91
CN = 89
Tc = 23.2 min

POINT OF INTEREST - "POI AB"

POINT OF INTEREST - "POI C"

POST-WS C
9.15 ACRES
HSG A = 2.60 AC CN = 72
HSG B = 0.26 AC CN = 81
HSG C = 0.83 AC CN = 88
HSG D = 5.46 AC CN = 91
CN = 85
Tc = 34.1 min

POST-WS B
10.68 ACRES
HSG D = 4.38 AC CN = 91
Impervious = 6.30 AC CN = 98
CN = 95
Tc = 11.5 min

POST-Offsite C
0.16 ACRES
HSG B = 0.03 AC CN = 81
HSG D = 0.02 AC CN = 91
Impervious = 0.11 AC CN = 98
CN = 94
Tc = 5 min

POST-Offsite B
0.08 ACRES
HSG D = 0.03 AC CN = 81
Impervious = 0.05 AC CN = 98
CN = 92
Tc = 5 min

NORTH

100' 0 100' 200'
GRAPHIC SCALE

Gresham Smith
GreshamSmith.com
222 Second Avenue South
Suite 1400
Nashville, TN 37201
615.770.8100

DCi

PROJECT MUSTANG

7th District of Maury County, Mount Pleasant, Tennessee
Being a portion of Tax Map 126 Parcel 041.01

Developer: DCi

THIS PLAN HAS BEEN SIGNED, SEALED, AND DATED DIGITALLY

Revision

No.	Date	Description

PROPOSED HYDROLOGIC PLAN

50114.00
07/08/2025

This Line Is 3 Inches When Printed Full Size

\\global.gspdata\rnfna_nf07\50114000\Work\01CAD\06LPISheets\25-0708_ERP Mass Grading\50114000_PROPOSED DRAINAGE.dwg - Valerie Rochhill - 7/22/2025 5:53:18 PM

NOAA Atlas 14, Volume 2, Version 3
Location name: Mount Pleasant, Tennessee, USA*
Latitude: 35.5717°, Longitude: -87.1786°
Elevation: 635 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	**0.409** (0.377-0.448)	**0.483** (0.445-0.528)	**0.564** (0.519-0.618)	**0.632** (0.580-0.690)	**0.724** (0.659-0.790)	**0.795** (0.719-0.866)	**0.869** (0.781-0.948)	**0.946** (0.843-1.03)	**1.05** (0.923-1.15)	**1.14** (0.986-1.24)
10-min	**0.653** (0.602-0.715)	**0.772** (0.711-0.845)	**0.904** (0.831-0.990)	**1.01** (0.927-1.10)	**1.15** (1.05-1.26)	**1.27** (1.15-1.38)	**1.38** (1.24-1.51)	**1.50** (1.34-1.64)	**1.66** (1.46-1.82)	**1.79** (1.55-1.96)
15-min	**0.817** (0.752-0.894)	**0.971** (0.894-1.06)	**1.14** (1.05-1.25)	**1.28** (1.17-1.40)	**1.46** (1.33-1.60)	**1.60** (1.45-1.75)	**1.75** (1.57-1.90)	**1.89** (1.68-2.06)	**2.09** (1.84-2.29)	**2.25** (1.95-2.46)
30-min	**1.12** (1.03-1.22)	**1.34** (1.24-1.47)	**1.62** (1.49-1.78)	**1.85** (1.70-2.02)	**2.16** (1.97-2.36)	**2.42** (2.18-2.63)	**2.68** (2.40-2.92)	**2.95** (2.62-3.21)	**3.33** (2.92-3.64)	**3.64** (3.16-3.98)
60-min	**1.40** (1.29-1.53)	**1.68** (1.55-1.84)	**2.08** (1.92-2.28)	**2.41** (2.21-2.64)	**2.88** (2.62-3.15)	**3.27** (2.96-3.56)	**3.68** (3.31-4.02)	**4.13** (3.68-4.50)	**4.78** (4.19-5.22)	**5.31** (4.61-5.81)
2-hr	**1.61** (1.48-1.78)	**1.94** (1.77-2.13)	**2.40** (2.19-2.63)	**2.78** (2.53-3.05)	**3.33** (3.00-3.64)	**3.79** (3.40-4.15)	**4.28** (3.81-4.69)	**4.82** (4.25-5.28)	**5.60** (4.86-6.14)	**6.25** (5.37-6.87)
3-hr	**1.75** (1.61-1.92)	**2.10** (1.93-2.31)	**2.58** (2.37-2.83)	**2.99** (2.73-3.28)	**3.57** (3.24-3.91)	**4.06** (3.66-4.45)	**4.59** (4.10-5.02)	**5.15** (4.56-5.64)	**5.97** (5.22-6.54)	**6.65** (5.74-7.29)
6-hr	**2.18** (2.00-2.39)	**2.59** (2.38-2.85)	**3.16** (2.91-3.47)	**3.65** (3.34-4.00)	**4.34** (3.94-4.74)	**4.92** (4.44-5.37)	**5.53** (4.95-6.03)	**6.19** (5.50-6.76)	**7.14** (6.27-7.81)	**7.92** (6.88-8.68)
12-hr	**2.64** (2.43-2.90)	**3.15** (2.90-3.46)	**3.84** (3.53-4.21)	**4.42** (4.04-4.83)	**5.22** (4.75-5.71)	**5.90** (5.34-6.44)	**6.61** (5.93-7.21)	**7.36** (6.57-8.05)	**8.43** (7.44-9.23)	**9.31** (8.13-10.2)
24-hr	**3.26** (3.02-3.52)	**3.89** (3.61-4.21)	**4.74** (4.40-5.14)	**5.41** (5.01-5.85)	**6.33** (5.84-6.84)	**7.06** (6.50-7.62)	**7.82** (7.17-8.42)	**8.58** (7.85-9.25)	**9.63** (8.75-10.4)	**10.5** (9.46-11.3)
2-day	**3.85** (3.56-4.18)	**4.61** (4.26-5.01)	**5.62** (5.19-6.10)	**6.42** (5.92-6.96)	**7.50** (6.91-8.14)	**8.37** (7.68-9.06)	**9.26** (8.46-10.0)	**10.2** (9.26-11.0)	**11.4** (10.3-12.3)	**12.4** (11.1-13.4)
3-day	**4.12** (3.82-4.44)	**4.92** (4.57-5.32)	**5.98** (5.55-6.46)	**6.80** (6.30-7.34)	**7.90** (7.31-8.52)	**8.77** (8.09-9.45)	**9.64** (8.87-10.4)	**10.5** (9.65-11.3)	**11.7** (10.7-12.6)	**12.6** (11.5-13.6)
4-day	**4.38** (4.08-4.70)	**5.23** (4.88-5.62)	**6.34** (5.90-6.81)	**7.18** (6.69-7.72)	**8.30** (7.71-8.90)	**9.17** (8.50-9.84)	**10.0** (9.27-10.8)	**10.9** (10.0-11.7)	**12.0** (11.0-12.9)	**12.9** (11.8-13.9)
7-day	**5.16** (4.84-5.49)	**6.15** (5.78-6.55)	**7.38** (6.93-7.86)	**8.32** (7.81-8.86)	**9.56** (8.96-10.2)	**10.5** (9.82-11.2)	**11.4** (10.7-12.2)	**12.3** (11.5-13.1)	**13.5** (12.5-14.4)	**14.4** (13.3-15.4)
10-day	**5.87** (5.52-6.23)	**6.97** (6.56-7.40)	**8.30** (7.80-8.80)	**9.32** (8.76-9.88)	**10.6** (10.0-11.3)	**11.7** (10.9-12.4)	**12.7** (11.9-13.4)	**13.7** (12.8-14.5)	**15.0** (13.9-15.9)	**16.0** (14.8-16.9)
20-day	**8.06** (7.62-8.51)	**9.51** (9.00-10.0)	**11.1** (10.5-11.7)	**12.2** (11.5-12.9)	**13.6** (12.9-14.4)	**14.7** (13.8-15.5)	**15.7** (14.8-16.5)	**16.6** (15.6-17.5)	**17.7** (16.6-18.7)	**18.5** (17.3-19.6)
30-day	**9.92** (9.41-10.4)	**11.7** (11.1-12.3)	**13.4** (12.7-14.1)	**14.6** (13.9-15.4)	**16.2** (15.3-17.0)	**17.3** (16.3-18.1)	**18.3** (17.3-19.2)	**19.2** (18.1-20.2)	**20.3** (19.2-21.4)	**21.1** (19.9-22.3)
45-day	**12.5** (11.9-13.1)	**14.6** (13.9-15.3)	**16.6** (15.8-17.4)	**18.0** (17.1-18.9)	**19.8** (18.8-20.8)	**21.1** (20.0-22.1)	**22.2** (21.1-23.3)	**23.3** (22.0-24.4)	**24.5** (23.2-25.8)	**25.4** (24.0-26.7)
60-day	**14.9** (14.2-15.7)	**17.5** (16.6-18.4)	**19.8** (18.8-20.8)	**21.4** (20.4-22.6)	**23.4** (22.2-24.7)	**24.8** (23.6-26.1)	**26.1** (24.7-27.5)	**27.3** (25.8-28.7)	**28.6** (27.0-30.1)	**29.5** (27.8-31.1)

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

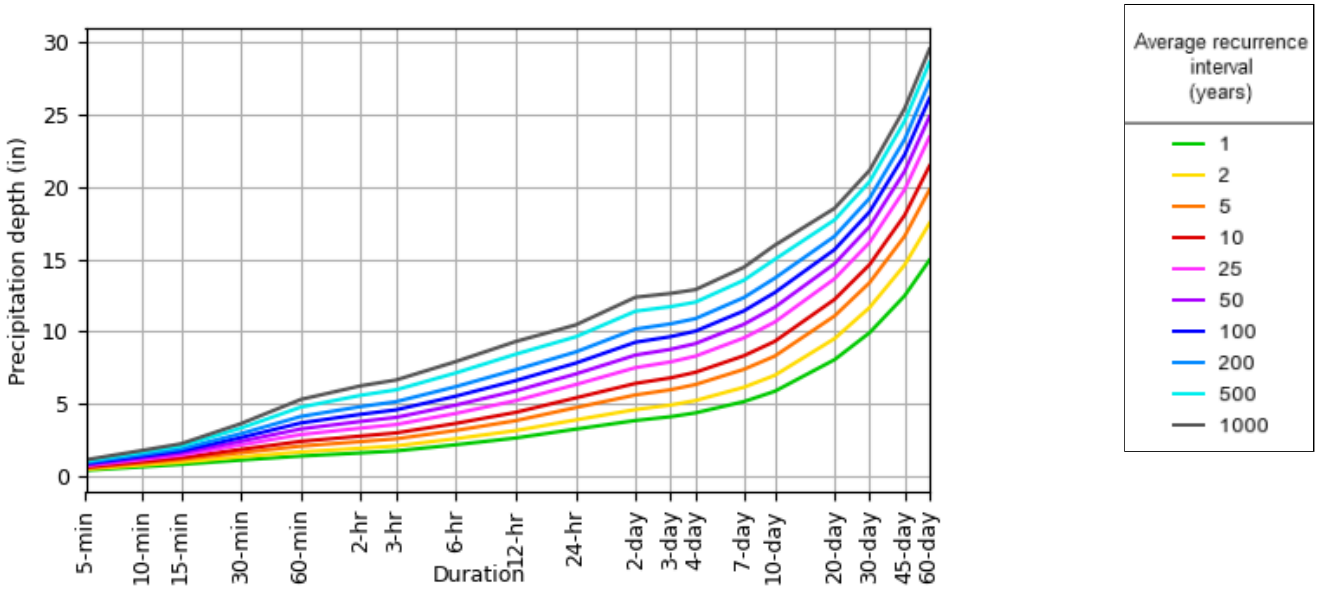
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

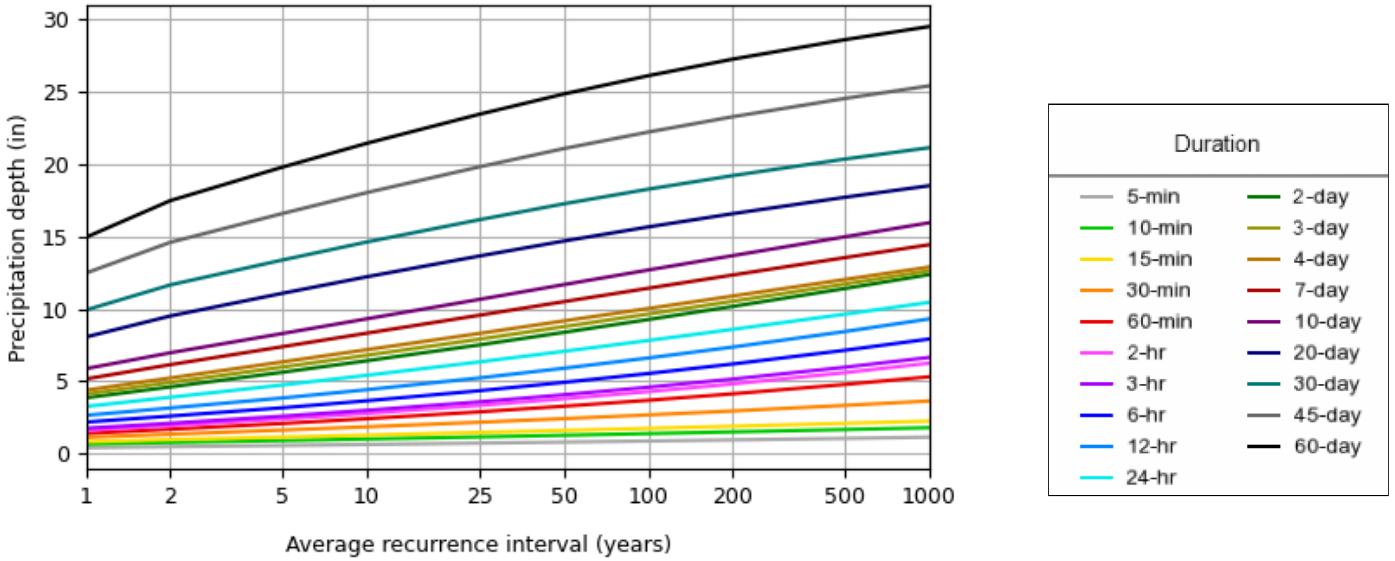
Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 35.5717°, Longitude: -87.1786°





NOAA Atlas 14, Volume 2, Version 3

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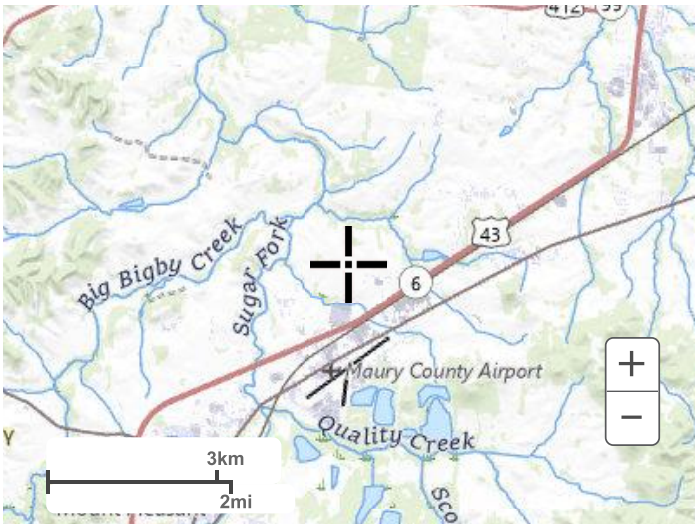
Back to Top

Maps & aerials

Small scale terrain



Large scale terrain

Large scale map

Large scale aerial

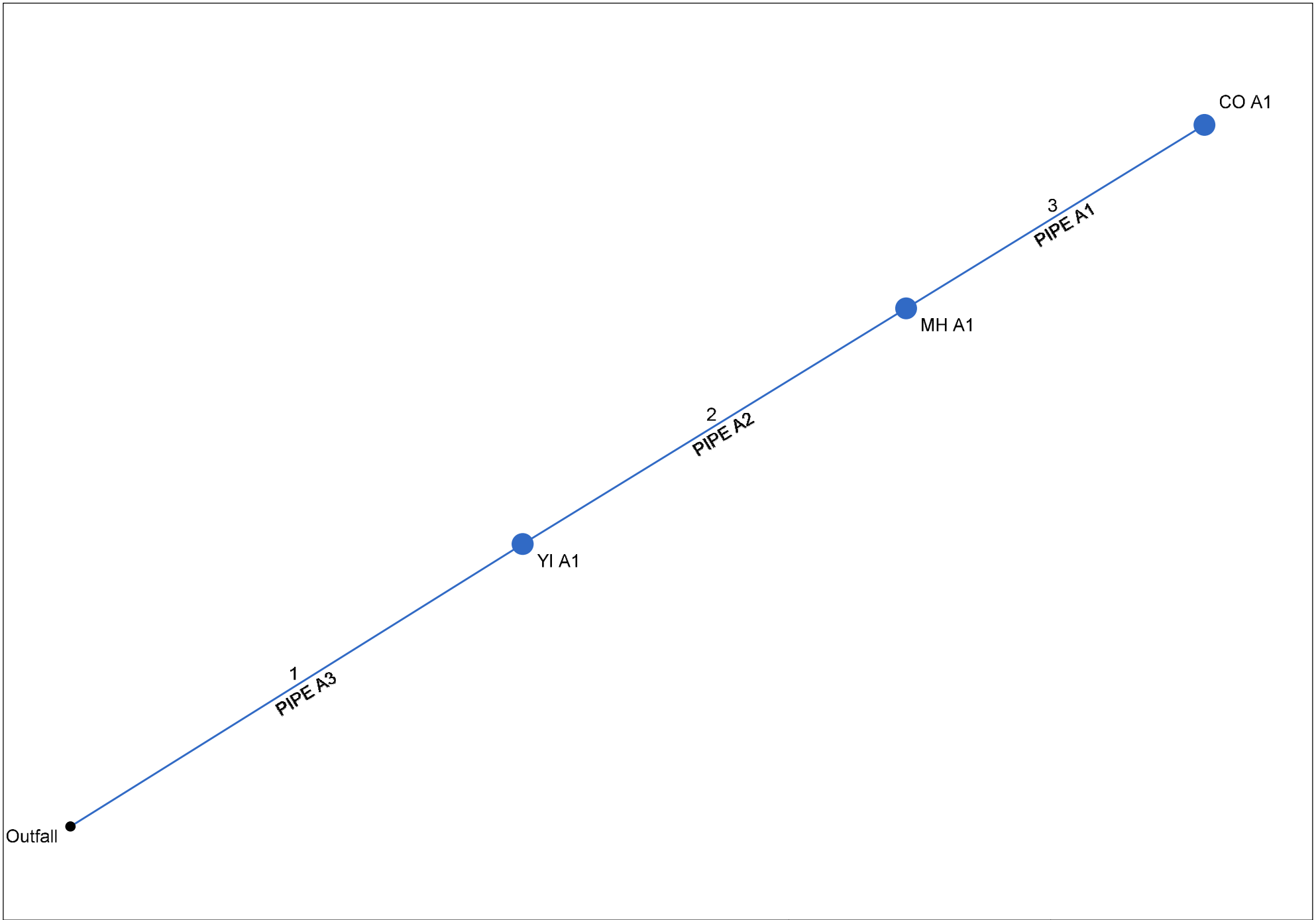
Back to Top

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

APPENDIX C: STORM SEWERS

STORM SEWER ANALYSIS REPORT – 10 YEAR

MUSTANG2



Project File: PIPE A_10.stm	Number of lines: 3	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	106.666	-32.084	DrGrt	0.00	0.30	0.39	5.0	612.74	7.74	621.00	15	Cir	0.012	0.50	625.70	PIPE A3
2	1	90.000	0.431	MH	0.00	0.18	0.95	5.0	621.00	2.03	622.83	12	Cir	0.012	0.15	625.38	PIPE A2
3	2	70.057	-0.017	MH	0.00	0.19	0.95	5.0	622.83	1.67	624.00	12	Cir	0.012	1.00	628.93	PIPE A1

MUSTANG2 | Number of lines: 3 | Date: 7/8/2025

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	PIPE A3	3.37	15	Cir	106.666	612.74	621.00	7.744	613.42	621.74	n/a	621.74	End	DropGrate
2	PIPE A2	2.58	12	Cir	90.000	621.00	622.83	2.033	621.74	623.52	n/a	623.52 j	1	Manhole
3	PIPE A1	1.37	12	Cir	70.057	622.83	624.00	1.670	623.52	624.49	n/a	624.49	2	Manhole

MUSTANG2 | Number of lines: 3 | Run Date: 7/8/2025

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

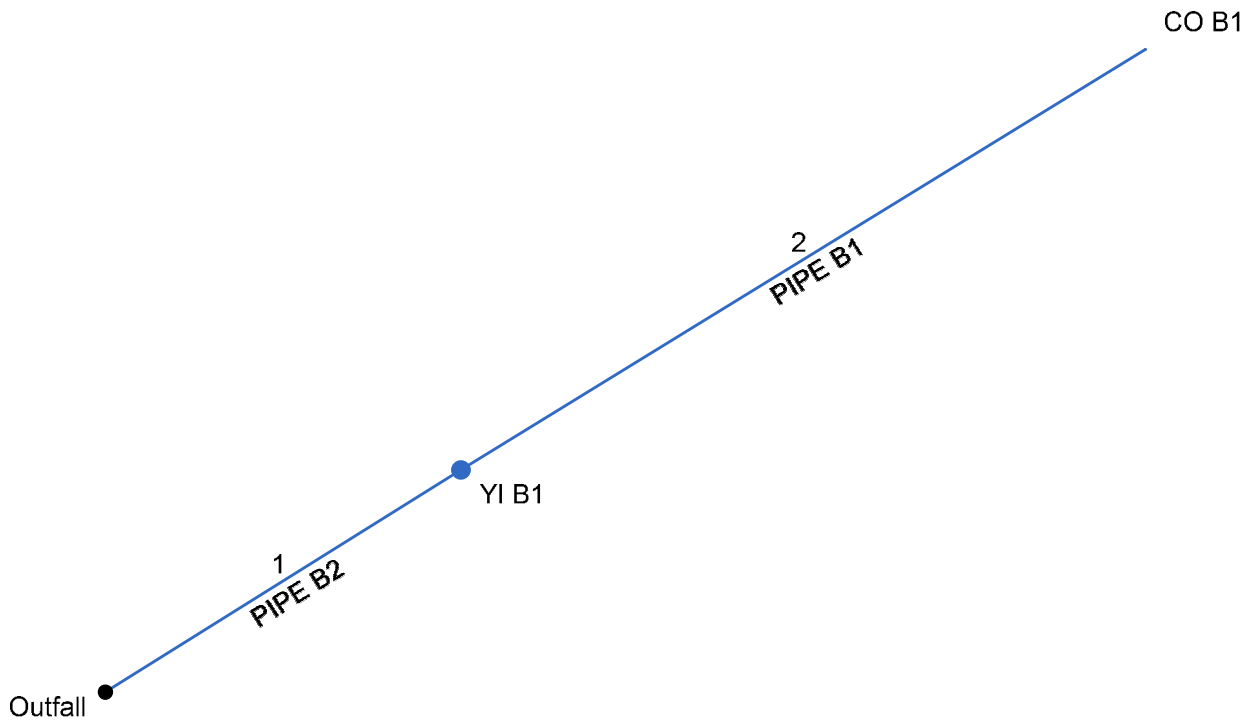
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI A1	0.89	2.66	3.55	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.013	0.26	27.72	0.26	27.72	0.0	Off
2	MH A1	1.30	1.37	0.00	2.66	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	CO A1	1.37	0.00	0.00	1.37	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	2

MUSTANG2 | Number of lines: 3 | Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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



Project File: Pipe B.stm	Number of lines: 2	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	100.213	-32.119	DrGrt	0.00	0.37	0.41	5.0	617.00	3.99	621.00	12	Cir	0.012	0.50	627.83	PIPE B2
2	1	192.000	0.434	None	0.00	0.77	0.95	5.0	621.00	2.08	625.00	12	Cir	0.012	1.00	628.36	PIPE B1

Project File: Pipe B.stm | Number of lines: 2 | Date: 7/8/2025

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	YI B1	DropGrate	627.83	Cir	4.00	4.00	12	Cir	621.00	12	Cir	621.00
2	CO B1	None	628.36	n/a	n/a	n/a	12	Cir	625.00			

Project File: Pipe B.stm | Number of Structures: 2 | Run Date: 7/8/2025

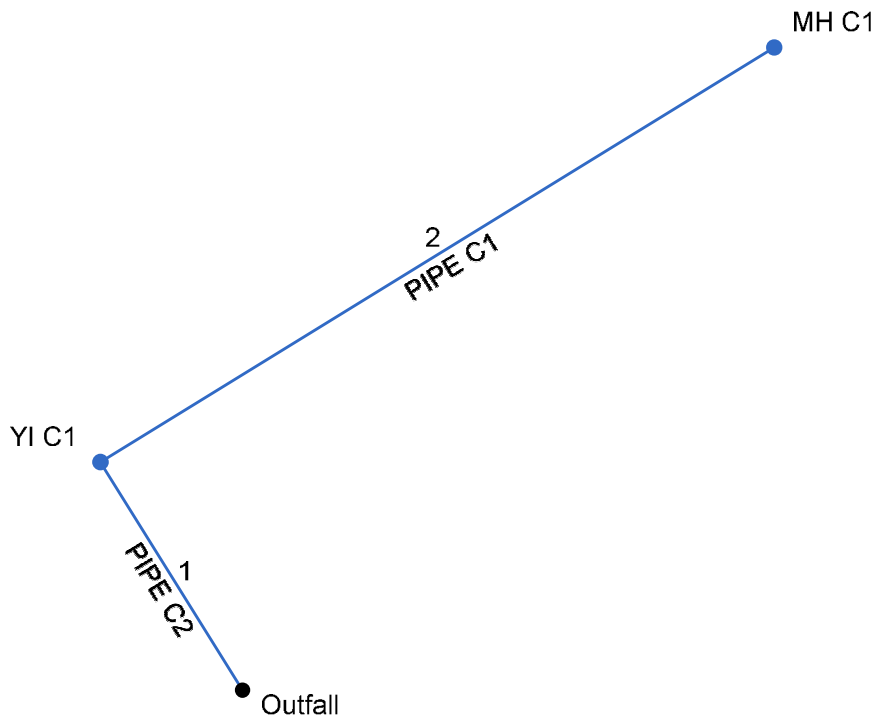
Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI B1	1.15	5.54	6.69	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.050	0.020	0.013	0.39	41.27	0.39	41.27	0.0	Off
2	CO B1	5.54	0.00	0.00	5.54	None	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1

Project File: Pipe B.stm | Number of lines: 2 | Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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



Project File: PIPE C.stm	Number of lines: 2	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	78.957	-121.816	DrGrt	0.00	0.32	0.42	5.0	619.00	2.53	621.00	15	Cir	0.012	1.50	628.29	PIPE C2
2	1	232.000	90.102	MH	0.00	0.93	0.95	5.0	621.00	1.29	624.00	15	Cir	0.012	1.00	628.29	PIPE C1

Project File: PIPE C.stm | Number of lines: 2 | Date: 7/8/2025

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	YI C1	DropGrate	628.29	Cir	4.00	4.00	15	Cir	621.00	15	Cir	621.00
2	MH C1	Manhole	628.29	Cir	4.00	4.00	15	Cir	624.00			

Project File: PIPE C.stm | Number of Structures: 2 | Run Date: 7/8/2025

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI C1	1.02	6.69	7.71	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.050	0.020	0.013	0.43	45.17	0.43	45.17	0.0	Off
2	MH C1	6.69	0.00	0.00	6.69	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1

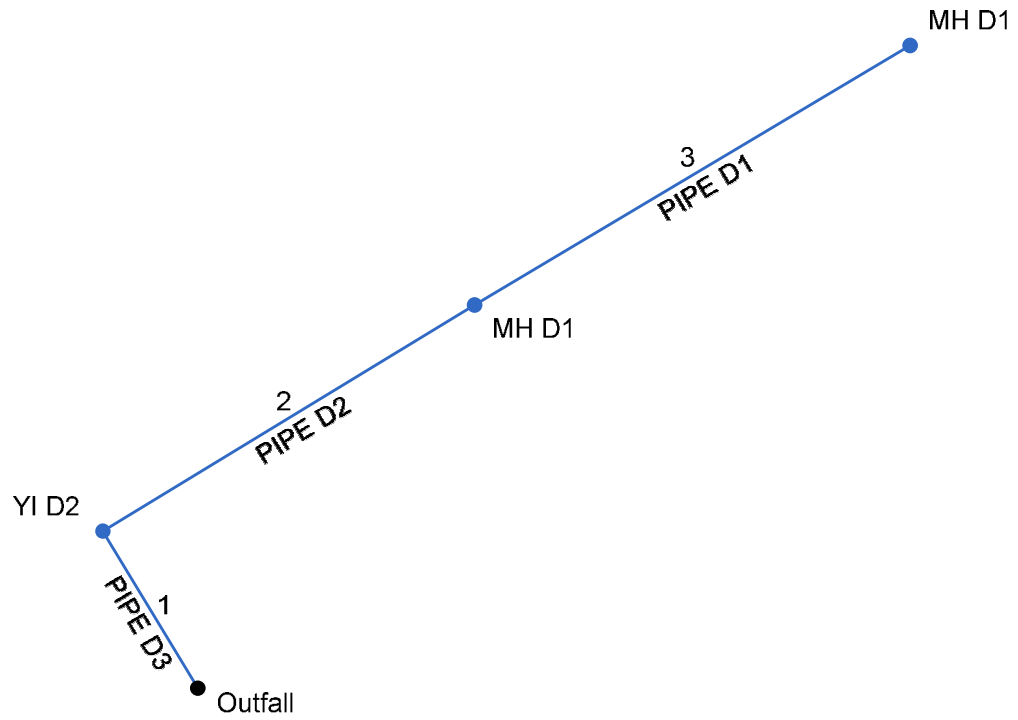
Project File: PIPE C.stm

Number of lines: 2

Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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



Project File: Pipe D.stm	Number of lines: 3	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	57.977	-121.017	DrGrt	0.00	0.25	0.52	5.0	621.00	1.72	622.00	15	Cir	0.012	1.50	628.14	PIPE D3
2	1	137.257	89.592	MH	0.00	0.51	0.35	5.0	622.00	0.73	623.00	15	Cir	0.012	0.15	628.73	PIPE D2
3	2	159.944	0.530	MH	0.00	0.67	0.95	5.0	623.00	0.63	624.00	15	Cir	0.012	1.00	629.42	PIPE D1

Project File: Pipe D.stm | Number of lines: 3 | Date: 7/8/2025

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	YI D2	DropGrate	628.14	Cir	4.00	4.00	15	Cir	622.00	15	Cir	622.00
2	MH D1	Manhole	628.73	Cir	4.00	4.00	15	Cir	623.00	15	Cir	623.00
3	MH D1	Manhole	629.42	Cir	4.00	4.00	15	Cir	624.00			

Project File: Pipe D.stm | Number of Structures: 3 | Run Date: 7/8/2025

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI D2	0.98	6.17	7.16	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.013	0.41	43.07	0.41	43.07	0.0	Off
2	MH D1	1.35	4.82	0.00	6.17	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1
3	MH D1	4.82	0.00	0.00	4.82	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	2

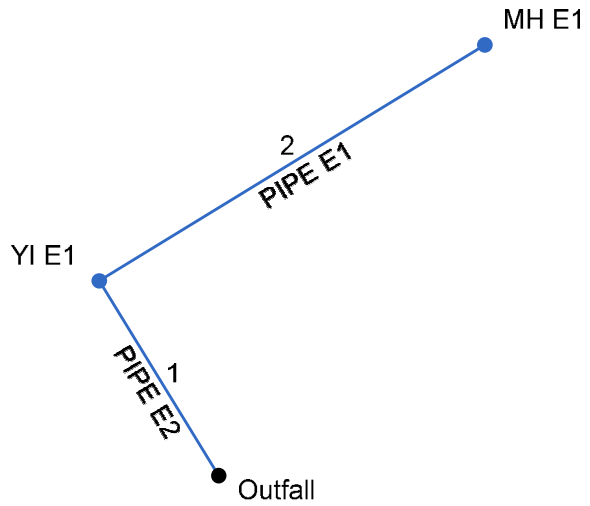
Project File: Pipe D.stm

Number of lines: 3

Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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



Project File: Pipe E.stm	Number of lines: 2	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	72.177	-121.419	DrGrt	0.00	0.25	0.52	5.0	624.00	1.39	625.00	15	Cir	0.012	1.50	628.67	PIPE E2
2	1	142.604	89.850	MH	0.00	0.65	0.95	5.0	625.00	0.70	626.00	15	Cir	0.012	1.00	628.71	PIPE E1

Project File: Pipe E.stm | Number of lines: 2 | Date: 7/8/2025

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	YI E1	DropGrate	628.67	Cir	4.00	4.00	15	Cir	625.00	15	Cir	625.00
2	MH E1	Manhole	628.71	Cir	4.00	4.00	15	Cir	626.00			

Project File: Pipe E.stm | Number of Structures: 2 | Run Date: 7/8/2025

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI E1	0.98	4.68	5.66	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.050	0.020	0.013	0.35	37.13	0.35	37.13	0.0	Off
2	MH E1	4.68	0.00	0.00	4.68	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	1

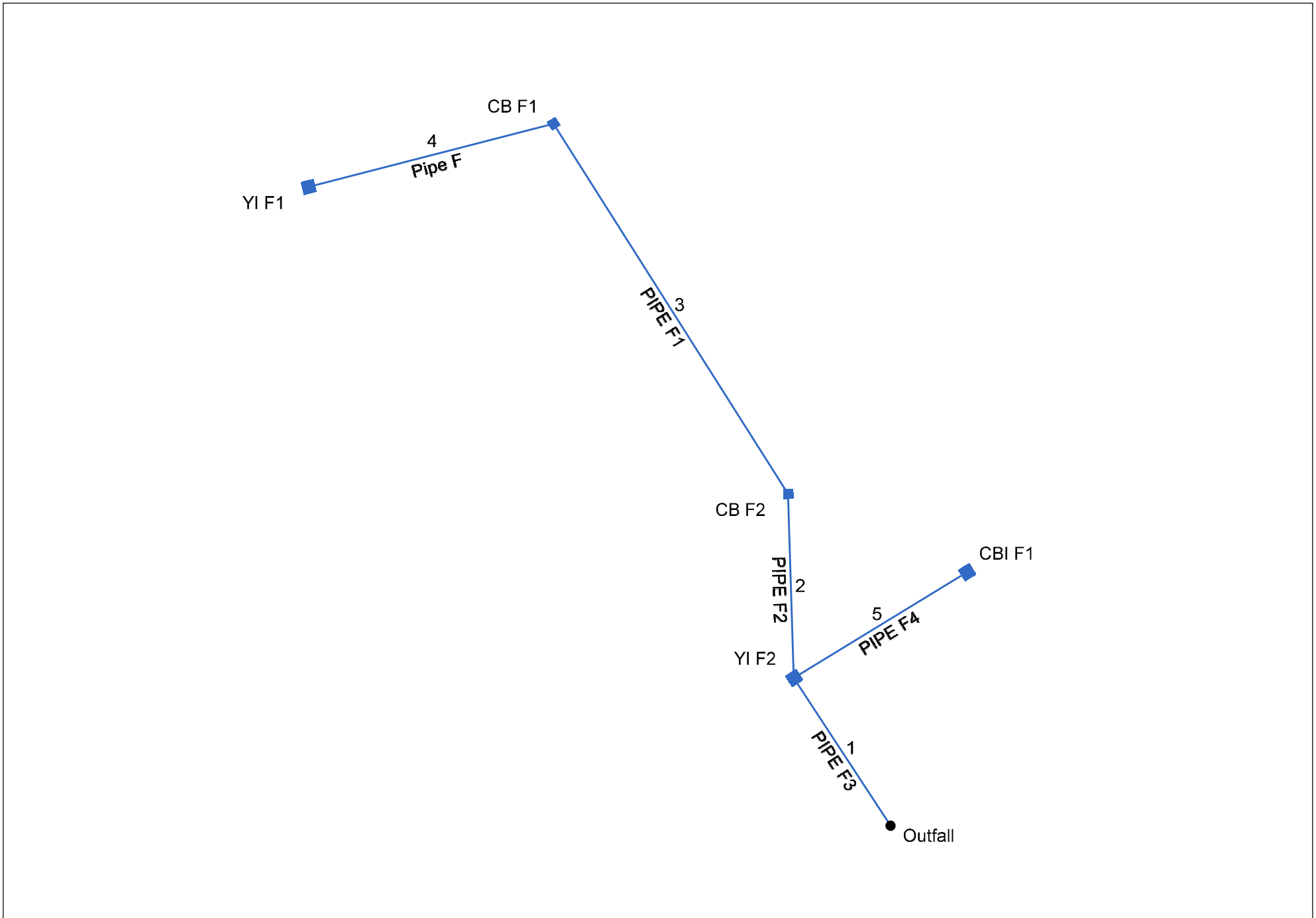
Project File: Pipe E.stm

Number of lines: 2

Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

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



Project File: Pipe F.stm	Number of lines: 5	Date: 7/8/2025

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	55.317	-123.151	DrGrt	0.00	0.19	0.57	5.0	624.00	0.90	624.50	24	Cir	0.012	1.50	627.50	PIPE F3
2	1	57.777	31.416	DrCrb	0.00	0.67	0.69	5.0	624.50	0.87	625.00	18	Cir	0.012	0.84	627.89	PIPE F2
3	2	137.271	-30.514	DrCrb	0.00	0.74	0.95	5.0	625.00	0.44	625.60	18	Cir	0.012	1.44	627.92	PIPE F1
4	3	79.000	-72.295	DrGrt	0.00	0.57	0.35	5.0	625.60	0.51	626.00	18	Cir	0.012	1.00	628.72	Pipe F
5	1	63.350	91.625	Curb	0.00	0.70	0.71	5.0	624.70	1.26	625.50	15	Cir	0.012	1.00	629.02	PIPE F4

Project File: Pipe F.stm | Number of lines: 5 | Date: 7/8/2025

Structure Report

Struct No.	Structure ID	Junction Type	Rim Elev (ft)	Structure			Line Out			Line In		
				Shape	Length (ft)	Width (ft)	Size (in)	Shape	Invert (ft)	Size (in)	Shape	Invert (ft)
1	YI F2	DropGrate	627.50	Rect	4.00	4.00	24	Cir	624.50	18 15	Cir Cir	624.50 624.70
2	CB F2	DropCurb	627.89	Rect	3.00	3.00	18	Cir	625.00	18	Cir	625.00
3	CB F1	DropCurb	627.92	Rect	3.00	3.00	18	Cir	625.60	18	Cir	625.60
4	YI F1	DropGrate	628.72	Rect	4.00	4.00	18	Cir	626.00			
5	CBI F1	Curb-Horiz	629.02	Rect	4.00	4.00	15	Cir	625.50			

Project File: Pipe F.stm | Number of Structures: 5 | Run Date: 7/8/2025

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	YI F2	0.82	0.00	0.82	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.050	0.020	0.013	0.10	11.69	0.10	11.69	0.0	Off
2	CB F2	3.50	0.00	3.50	0.00	DrCrb	4.0	6.07	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.33	inf.00	0.33	inf.00	0.0	1
3	CB F1	5.33	0.00	5.33	0.00	DrCrb	4.0	9.22	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.33	inf.00	0.33	inf.00	0.0	2
4	YI F1	1.51	0.00	1.51	0.00	DrGrt	0.0	0.00	5.06	2.53	2.00	Sag	2.00	0.020	0.020	0.013	0.15	16.55	0.15	16.55	0.0	3
5	CBI F1	3.76	0.00	3.76	0.00	Curb	4.0	6.52	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.36	14.83	0.36	14.83	0.0	1

Project File: Pipe F.stm | Number of lines: 5 | Run Date: 7/8/2025

NOTES: Inlet N-Values = 0.016; Intensity = 73.40 / (Inlet time + 12.20) ^ 0.80; Return period = 10 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

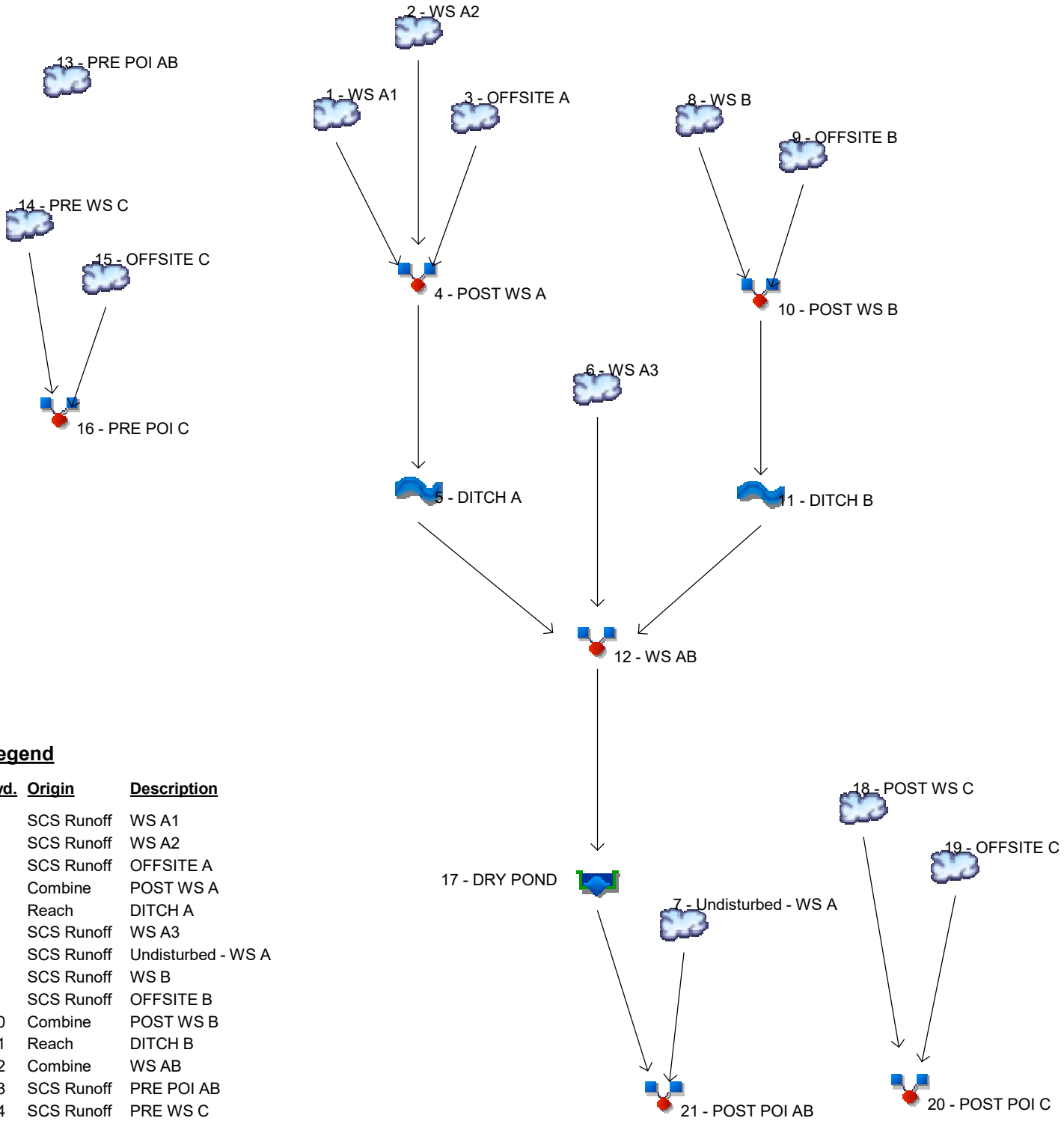
APPENDIX D: HYDROLOGIC CALCULATIONS

Hydraflow Watershed Analysis Report

Channel and Channel Lining Reports – 10 Year

Sediment Basin Calculations

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	WS A1
2	SCS Runoff	WS A2
3	SCS Runoff	OFFSITE A
4	Combine	POST WS A
5	Reach	DITCH A
6	SCS Runoff	WS A3
7	SCS Runoff	Undisturbed - WS A
8	SCS Runoff	WS B
9	SCS Runoff	OFFSITE B
10	Combine	POST WS B
11	Reach	DITCH B
12	Combine	WS AB
13	SCS Runoff	PRE POI AB
14	SCS Runoff	PRE WS C
15	SCS Runoff	OFFSITE C
16	Combine	PRE POI C
17	Reservoir	DRY POND
18	SCS Runoff	POST WS C
19	SCS Runoff	OFFSITE C
20	Combine	POST POI C
21	Combine	POST POI AB

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	------	-------	6.753	-------	9.260	11.28	14.10	16.35	18.70	WS A1
2	SCS Runoff	------	-------	24.31	-------	30.21	34.84	41.15	46.15	51.33	WS A2
3	SCS Runoff	------	-------	15.96	-------	23.14	29.09	37.61	44.52	51.81	OFFSITE A
4	Combine	1, 2, 3	-------	41.61	-------	55.49	66.74	82.47	95.13	108.40	POST WS A
5	Reach	4	-------	35.35	-------	47.99	58.32	72.86	84.60	96.97	DITCH A
6	SCS Runoff	------	-------	19.50	-------	24.51	28.44	33.80	38.04	42.43	WS A3
7	SCS Runoff	------	-------	9.222	-------	11.84	13.90	16.71	18.94	21.25	Undisturbed - WS A
8	SCS Runoff	------	-------	47.52	-------	58.76	67.57	79.62	89.15	99.05	WS B
9	SCS Runoff	------	-------	0.382	-------	0.479	0.556	0.659	0.742	0.827	OFFSITE B
10	Combine	8, 9	-------	47.81	-------	59.12	67.99	80.11	89.70	99.66	POST WS B
11	Reach	10	-------	41.17	-------	51.45	59.55	70.67	79.50	88.70	DITCH B
12	Combine	5, 6, 11	-------	92.41	-------	119.07	140.42	170.09	193.82	218.68	WS AB
13	SCS Runoff	------	-------	34.07	-------	46.13	55.81	69.25	79.96	91.13	PRE POI AB
14	SCS Runoff	------	-------	31.02	-------	41.67	50.20	61.99	71.39	81.17	PRE WS C
15	SCS Runoff	------	-------	16.28	-------	23.60	29.68	38.36	45.41	52.85	OFFSITE C
16	Combine	14, 15	-------	46.91	-------	64.61	78.98	99.24	115.50	132.53	PRE POI C
17	Reservoir	12	-------	11.38	-------	12.90	14.02	15.44	16.49	29.23	DRY POND
18	SCS Runoff	------	-------	17.11	-------	22.64	27.03	33.09	37.89	42.89	POST WS C
19	SCS Runoff	------	-------	0.797	-------	0.989	1.140	1.345	1.508	1.677	OFFSITE C
20	Combine	18, 19	-------	17.20	-------	22.75	27.16	33.24	38.06	43.08	POST POI C
21	Combine	7, 17,	-------	18.07	-------	22.05	24.87	28.70	31.69	34.74	POST POI AB

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.753	2	724	21,177	------	------	------	WS A1
2	SCS Runoff	24.31	2	720	67,070	------	------	------	WS A2
3	SCS Runoff	15.96	2	732	65,875	------	------	------	OFFSITE A
4	Combine	41.61	2	722	154,121	1, 2, 3	------	------	POST WS A
5	Reach	35.35	2	730	154,118	4	------	------	DITCH A
6	SCS Runoff	19.50	2	722	56,808	------	------	------	WS A3
7	SCS Runoff	9.222	2	726	32,159	------	------	------	Undisturbed - WS A
8	SCS Runoff	47.52	2	720	132,840	------	------	------	WS B
9	SCS Runoff	0.382	2	716	820	------	------	------	OFFSITE B
10	Combine	47.81	2	720	133,660	8, 9	------	------	POST WS B
11	Reach	41.17	2	724	133,657	10	------	------	DITCH B
12	Combine	92.41	2	726	344,583	5, 6, 11	------	------	WS AB
13	SCS Runoff	34.07	2	732	147,606	------	------	------	PRE POI AB
14	SCS Runoff	31.02	2	734	140,667	------	------	------	PRE WS C
15	SCS Runoff	16.28	2	732	67,195	------	------	------	OFFSITE C
16	Combine	46.91	2	734	207,862	14, 15	------	------	PRE POI C
17	Reservoir	11.38	2	774	344,581	12	611.35	157,199	DRY POND
18	SCS Runoff	17.11	2	734	77,487	------	------	------	POST WS C
19	SCS Runoff	0.797	2	716	1,751	------	------	------	OFFSITE C
20	Combine	17.20	2	734	79,238	18, 19	------	------	POST POI C
21	Combine	18.07	2	728	376,740	7, 17,	------	------	POST POI AB

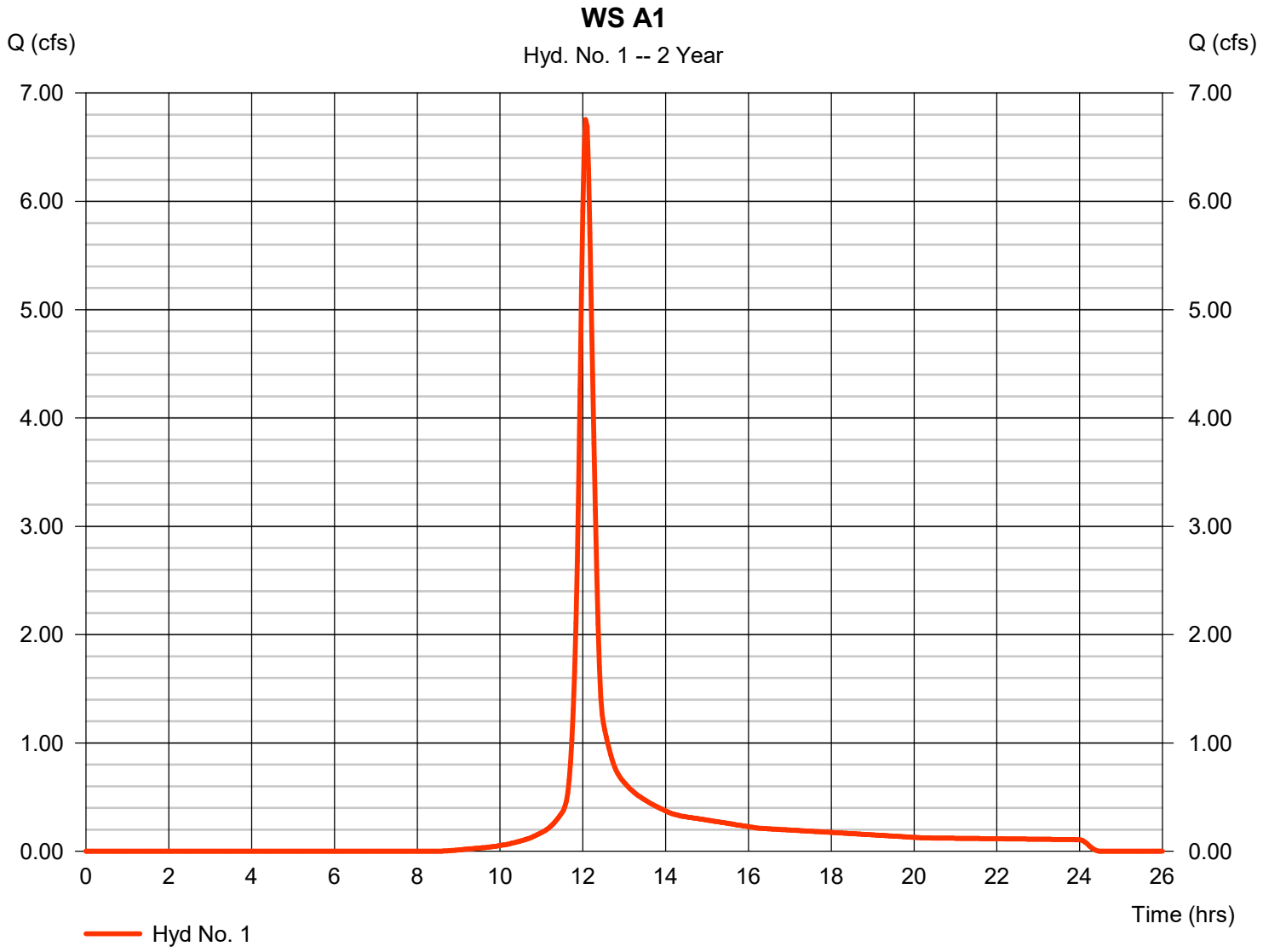
Hydrograph Report

Hyd. No. 1

WS A1

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.753 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	21,177 cuft
Drainage area	=	2.990 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.00 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.770 x 72) + (1.220 x 91)] / 2.990



TR55 Tc Worksheet

Hyd. No. 1

WS A1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 0.62		0.00		0.00		
Travel Time (min)	**= 15.69**	**+**	**0.00**	**+**	**0.00**	**=**	**15.69**
Shallow Concentrated Flow							
Flow length (ft)	= 101.00		0.00		0.00		
Watercourse slope (%)	= 0.62		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.27		0.00		0.00		
Travel Time (min)	**= 1.33**	**+**	**0.00**	**+**	**0.00**	**=**	**1.33**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 17.00 min

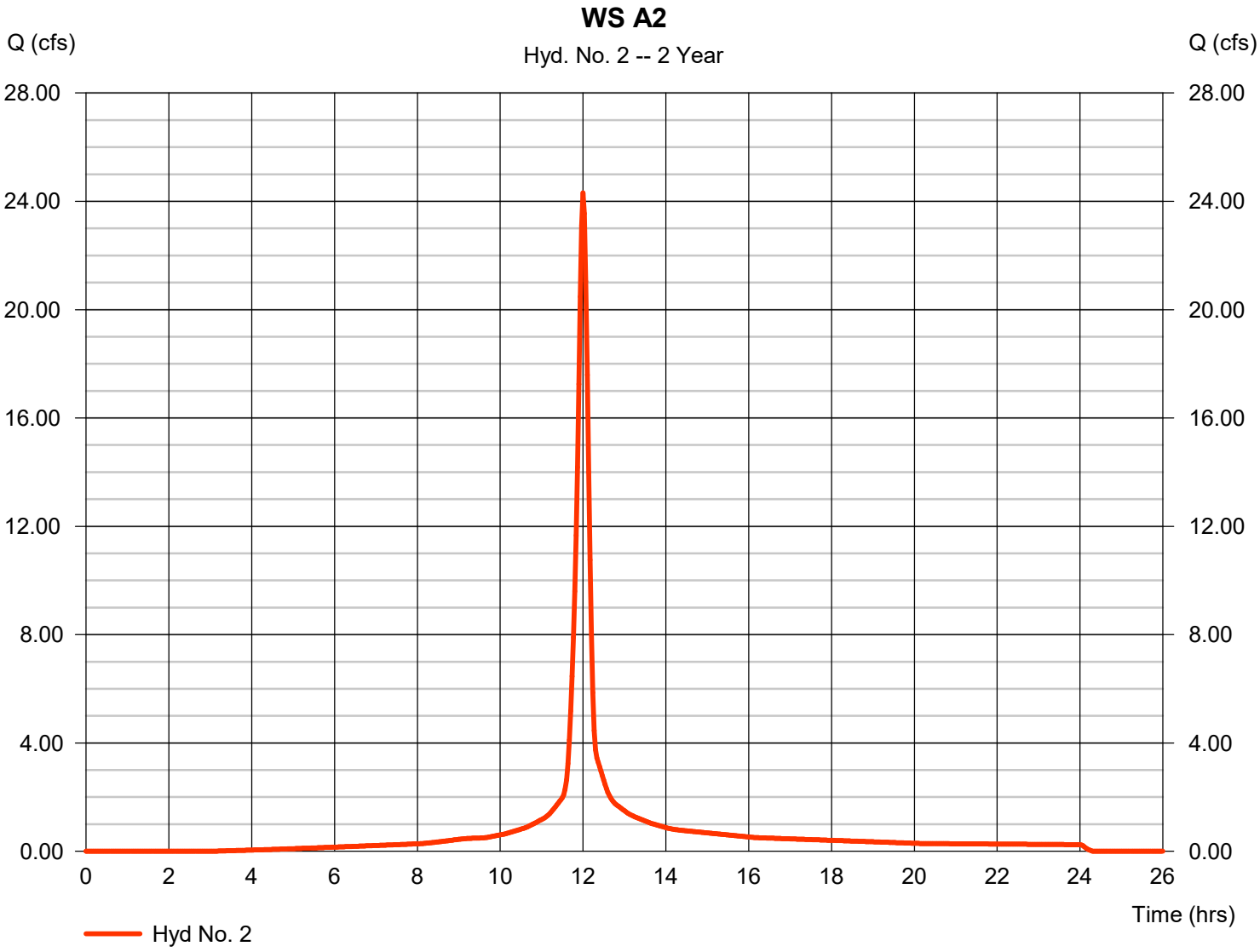
Hydrograph Report

Hyd. No. 2

WS A2

Hydrograph type	=	SCS Runoff	Peak discharge	=	24.31 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	67,070 cuft
Drainage area	=	5.570 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.90 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.940 x 91) + (2.630 x 98)] / 5.570



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

Hyd. No. 2

WS A2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		100.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		3.89		0.00		
Land slope (%)	= 1.50		2.55		0.00		
Travel Time (min)	**= 11.02**	**+**	**1.00**	**+**	**0.00**	**=**	**12.02**
Shallow Concentrated Flow							
Flow length (ft)	= 47.00		57.00		0.00		
Watercourse slope (%)	= 0.75		2.55		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.40		3.25		0.00		
Travel Time (min)	**= 0.56**	**+**	**0.29**	**+**	**0.00**	**=**	**0.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.90 min

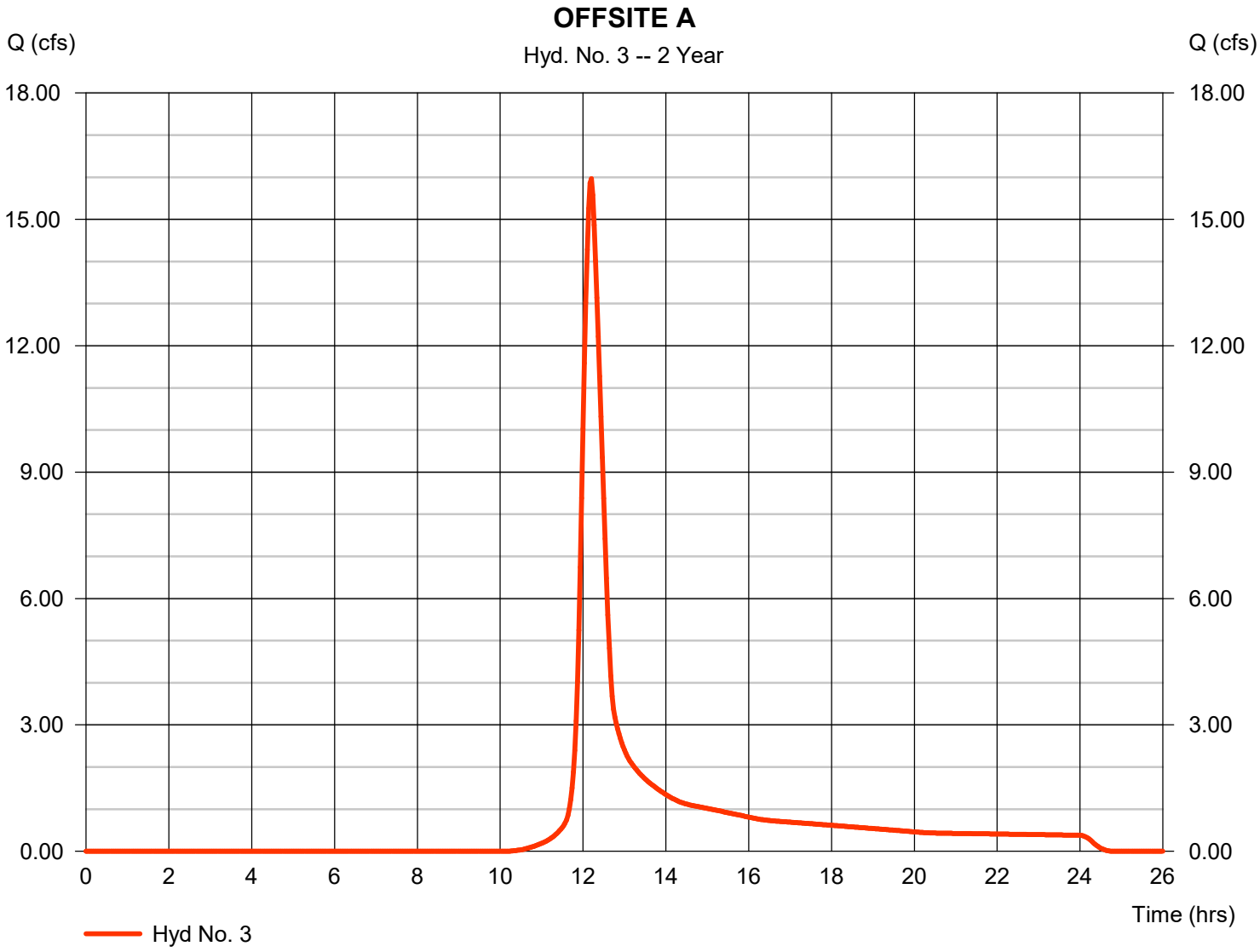
Hydrograph Report

Hyd. No. 3

OFFSITE A

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.96 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	65,875 cuft
Drainage area	=	11.970 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	27.00 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(10.710 x 72) + (0.560 x 81) + (0.690 x 91) + (0.010 x 98)] / 11.970



TR55 Tc Worksheet

Hyd. No. 3

OFFSITE A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 0.62		0.00		0.00		
Travel Time (min)	**= 15.69**	**+**	**0.00**	**+**	**0.00**	**=**	**15.69**
Shallow Concentrated Flow							
Flow length (ft)	= 864.00		0.00		0.00		
Watercourse slope (%)	= 0.62		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.27		0.00		0.00		
Travel Time (min)	**= 11.33**	**+**	**0.00**	**+**	**0.00**	**=**	**11.33**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

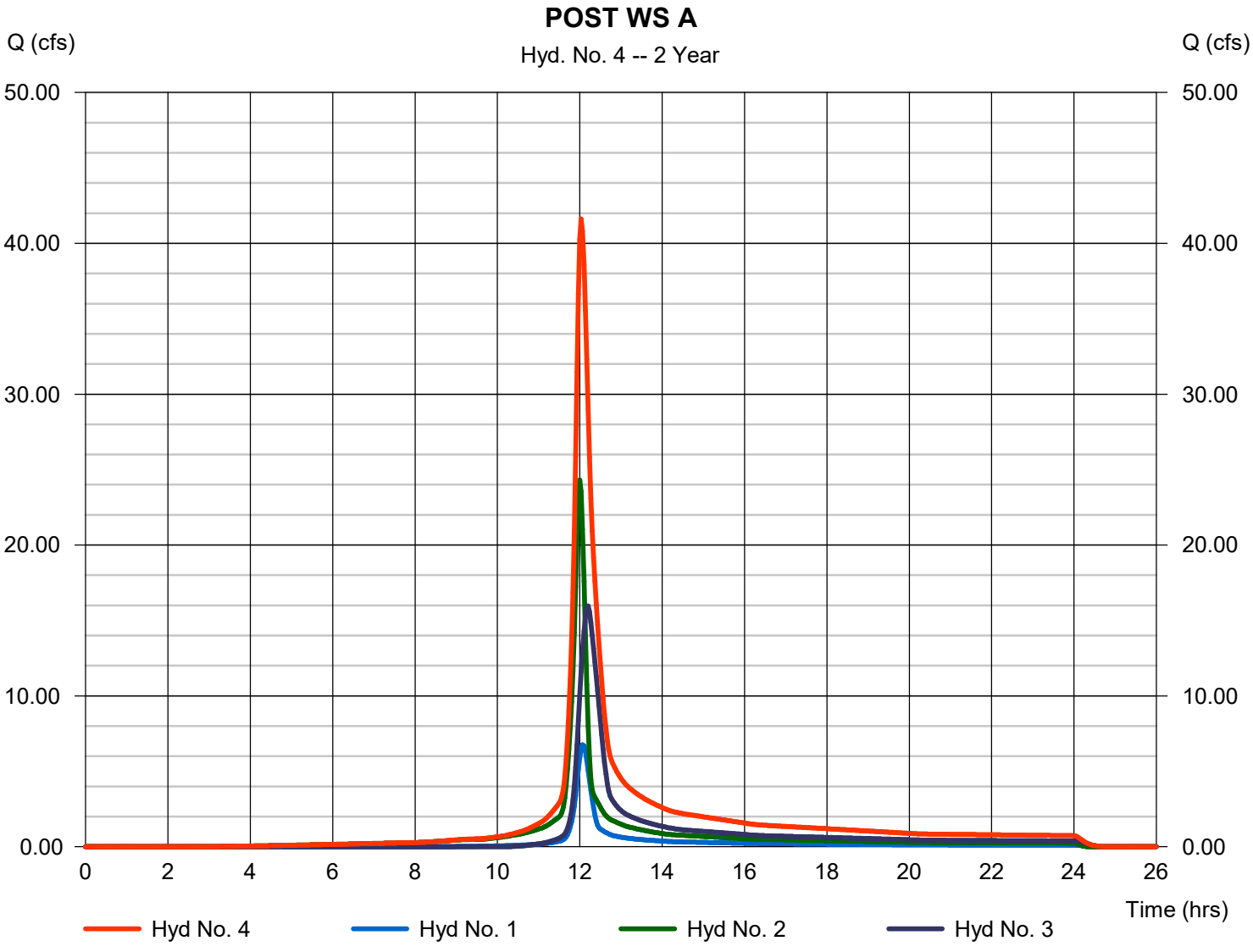
Total Travel Time, Tc ..... 27.00 min

Hydrograph Report

Hyd. No. 4

POST WS A

Hydrograph type	= Combine	Peak discharge	= 41.61 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 154,121 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 20.530 ac



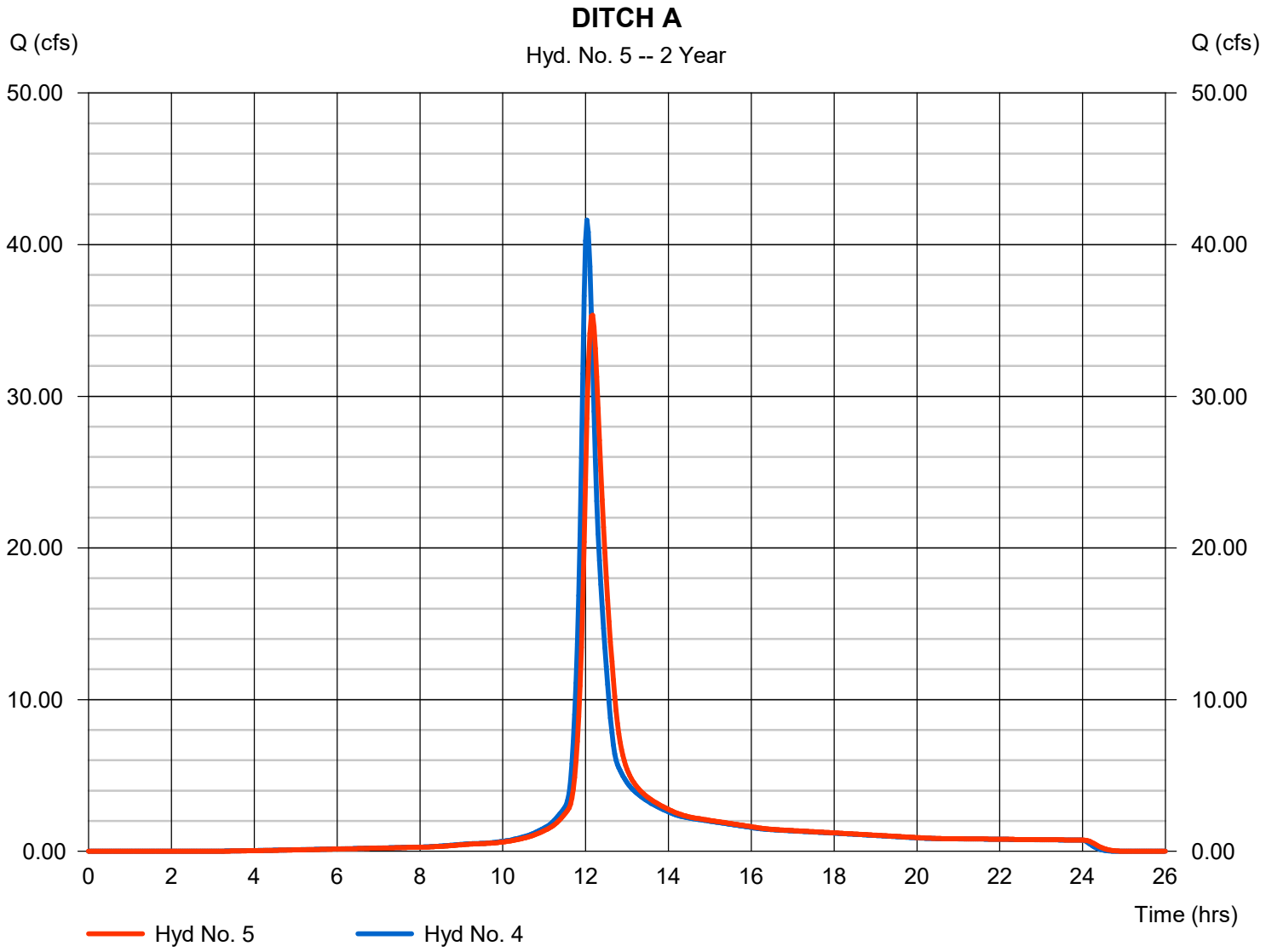
Hydrograph Report

Hyd. No. 5

DITCH A

Hydrograph type	=	Reach	Peak discharge	=	35.35 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	154,118 cuft
Inflow hyd. No.	=	4 - POST WS A	Section type	=	Trapezoidal
Reach length	=	2104.0 ft	Channel slope	=	1.3 %
Manning's n	=	0.035	Bottom width	=	3.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.306	Rating curve m	=	1.248
Ave. velocity	=	4.10 ft/s	Routing coeff.	=	0.2546

Modified Att-Kin routing method used.



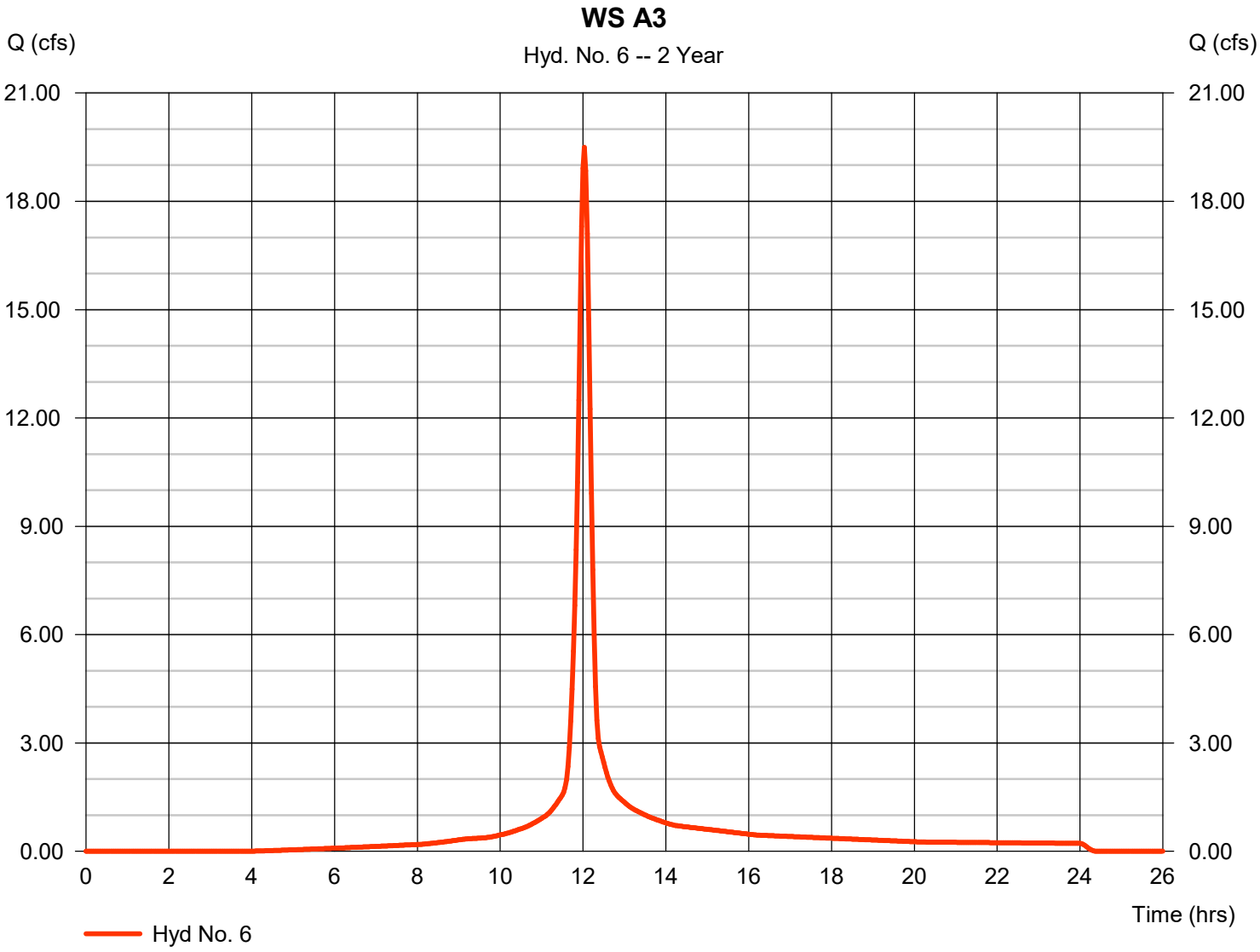
Hydrograph Report

Hyd. No. 6

WS A3

Hydrograph type	=	SCS Runoff	Peak discharge	=	19.50 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	56,808 cuft
Drainage area	=	5.330 ac	Curve number	=	92*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.590 x 91) + (0.740 x 98)] / 5.330



TR55 Tc Worksheet

Hyd. No. 6

WS A3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 100.0		22.0		100.0		
Two-year 24-hr precip. (in)	= 3.89		3.89		3.89		
Land slope (%)	= 0.50		27.27		0.50		
Travel Time (min)	**= 1.91**	**+**	**0.12**	**+**	**1.91**	**=**	**3.94**
Shallow Concentrated Flow							
Flow length (ft)	= 496.00		39.00		290.00		
Watercourse slope (%)	= 0.50		0.50		0.50		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=1.14		1.44		1.14		
Travel Time (min)	**= 7.25**	**+**	**0.45**	**+**	**4.24**	**=**	**11.93**
Channel Flow							
X sectional flow area (sqft)	= 0.79		0.79		0.00		
Wetted perimeter (ft)	= 3.14		3.14		0.00		
Channel slope (%)	= 2.08		3.99		0.00		
Manning's n-value	= 0.013		0.013		0.015		
Velocity (ft/s)	=6.53						
			9.04				
					0.00		
Flow length (ft)	({0})192.0		100.0		0.0		
Travel Time (min)	**= 0.49**	**+**	**0.18**	**+**	**0.00**	**=**	**0.67**

Total Travel Time, Tc ..... 16.60 min

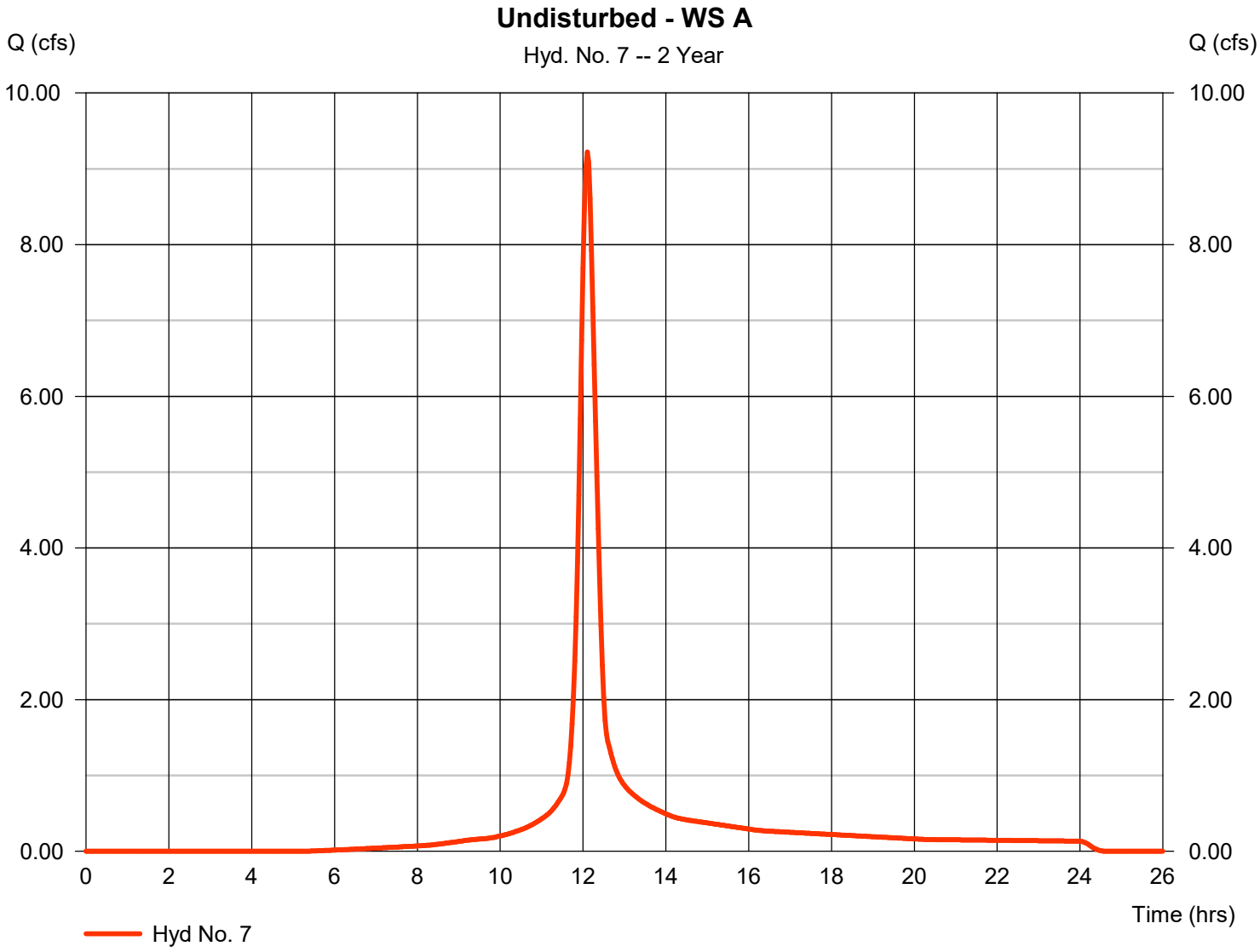
Hydrograph Report

Hyd. No. 7

Undisturbed - WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.222 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	32,159 cuft
Drainage area	=	3.200 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	23.20 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.210 x 72) + (0.560 x 88) + (2.430 x 91)] / 3.200



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

Hyd. No. 7

Undisturbed - WS A

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 1.73		0.00		0.00		
Travel Time (min)	**= 10.41**	**+**	**0.00**	**+**	**0.00**	**=**	**10.41**
Shallow Concentrated Flow							
Flow length (ft)	= 1630.00		0.00		0.00		
Watercourse slope (%)	= 1.73		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.12		0.00		0.00		
Travel Time (min)	**= 12.80**	**+**	**0.00**	**+**	**0.00**	**=**	**12.80**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 23.20 min

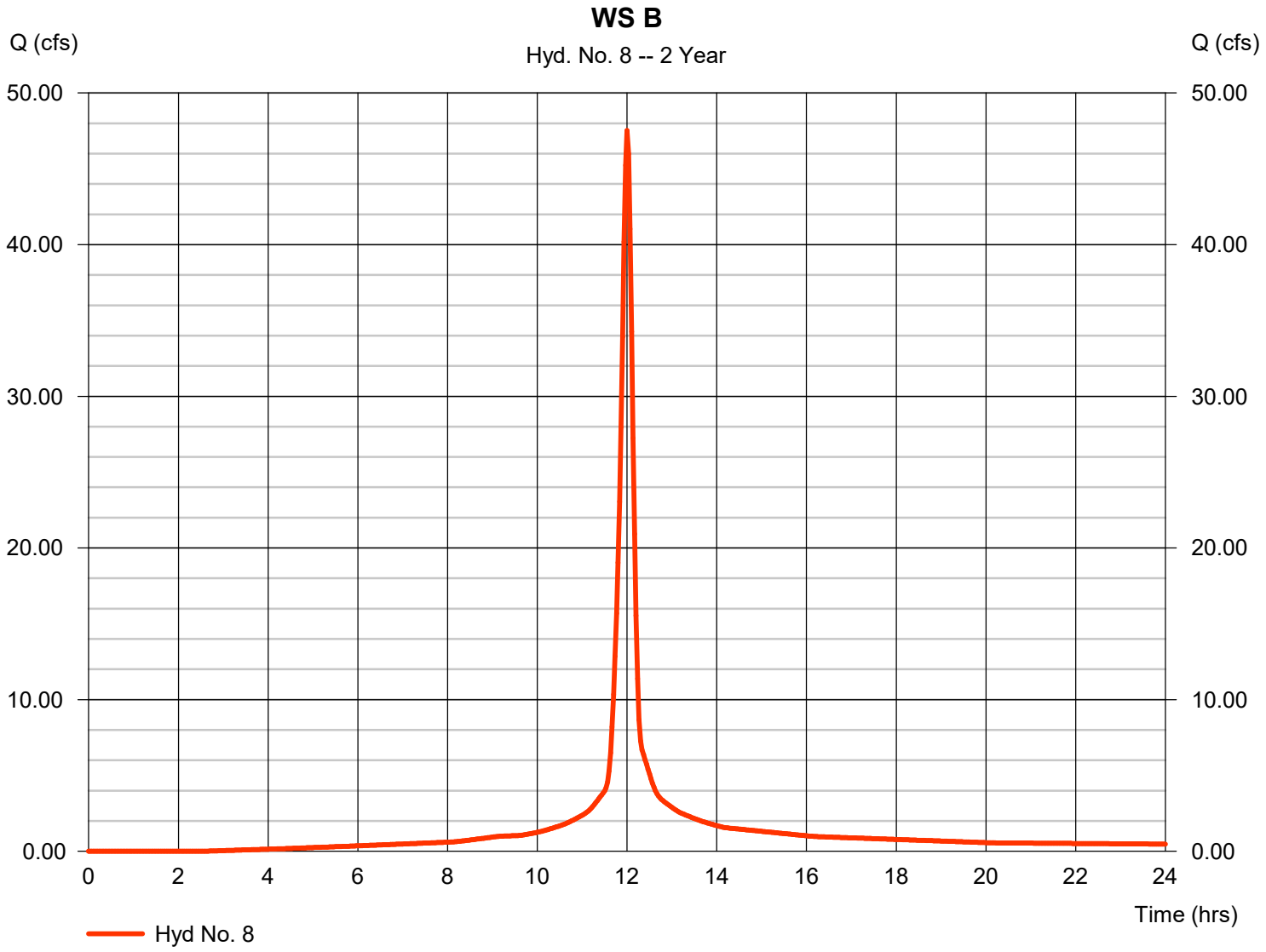
Hydrograph Report

Hyd. No. 8

WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	47.52 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	132,840 cuft
Drainage area	=	10.680 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.50 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.380 x 91) + (6.300 x 98)] / 10.680



TR55 Tc Worksheet

Hyd. No. 8

WS B

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.011		0.011		0.011		
Flow length (ft)	= 18.0		41.0		100.0		
Two-year 24-hr precip. (in)	= 3.89		3.89		3.89		
Land slope (%)	= 33.33		7.32		0.50		
Travel Time (min)	**= 0.09**	**+**	**0.32**	**+**	**1.91**	**=**	**2.32**
Shallow Concentrated Flow							
Flow length (ft)	= 311.00		0.00		0.00		
Watercourse slope (%)	= 0.50		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=1.14		0.00		0.00		
Travel Time (min)	**= 4.54**	**+**	**0.00**	**+**	**0.00**	**=**	**4.54**
Channel Flow							
X sectional flow area (sqft)	= 26.25		0.00		0.00		
Wetted perimeter (ft)	= 18.81		0.00		0.00		
Channel slope (%)	= 1.40		0.00		0.00		
Manning's n-value	= 0.035		0.015		0.015		
Velocity (ft/s)	=6.30						
			0.00				
					0.00		
Flow length (ft)	({0})1752.0		0.0		0.0		
Travel Time (min)	**= 4.64**	**+**	**0.00**	**+**	**0.00**	**=**	**4.64**

Total Travel Time, Tc ..... 11.50 min

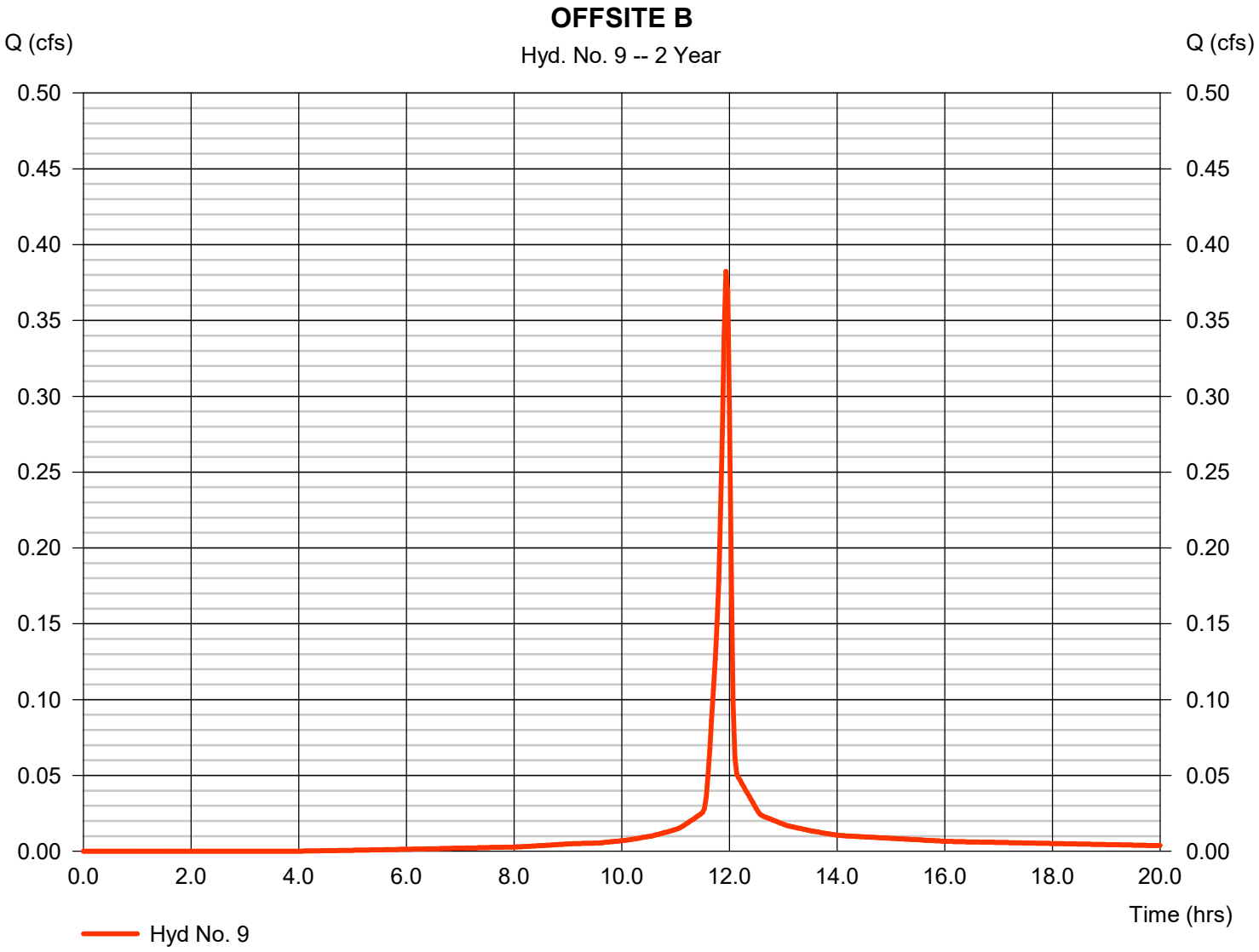
Hydrograph Report

Hyd. No. 9

OFFSITE B

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.382 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	820 cuft
Drainage area	=	0.080 ac	Curve number	=	92*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.030 x 81) + (0.050 x 98)] / 0.080

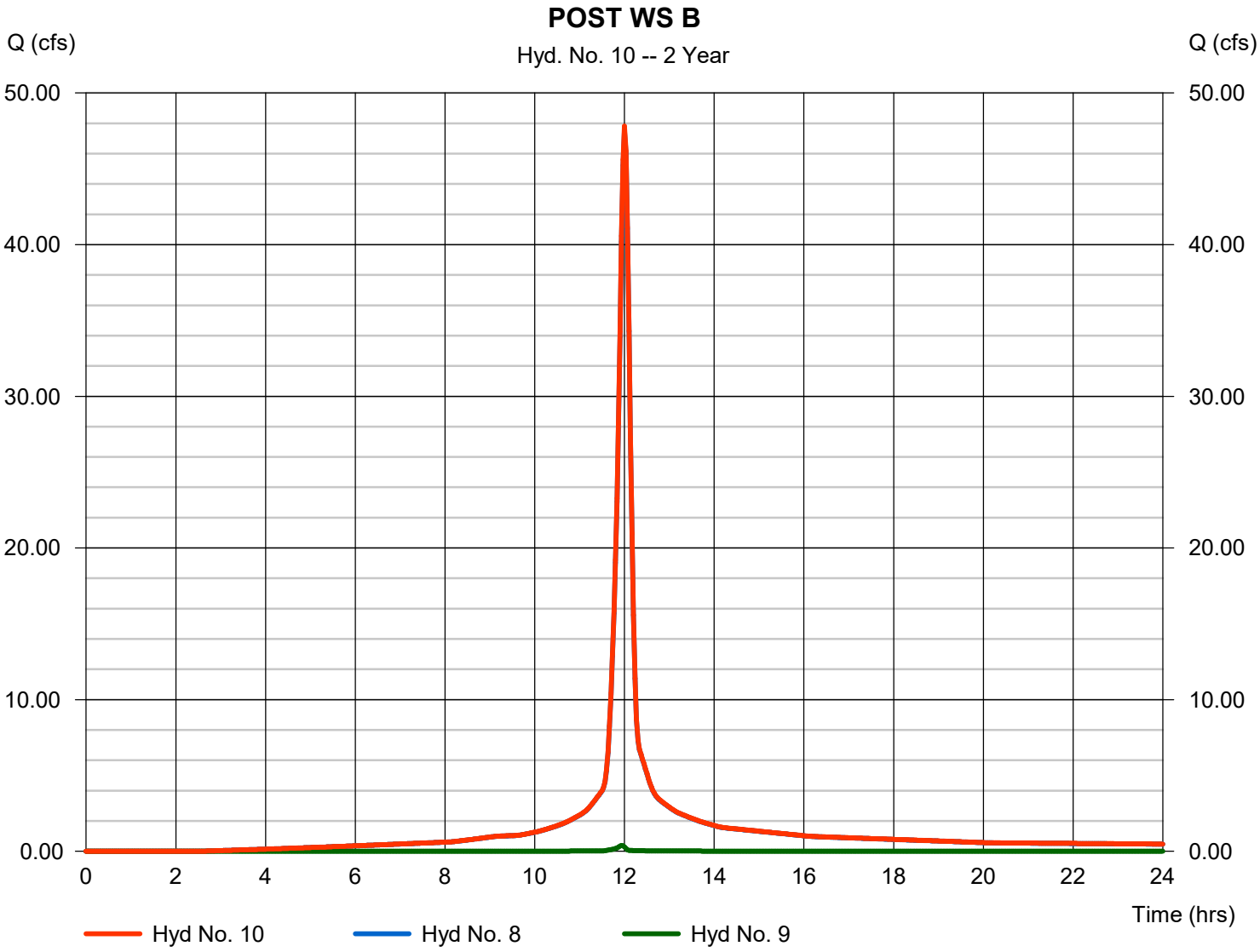


Hydrograph Report

Hyd. No. 10

POST WS B

Hydrograph type	=	Combine	Peak discharge	=	47.81 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	133,660 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	10.760 ac



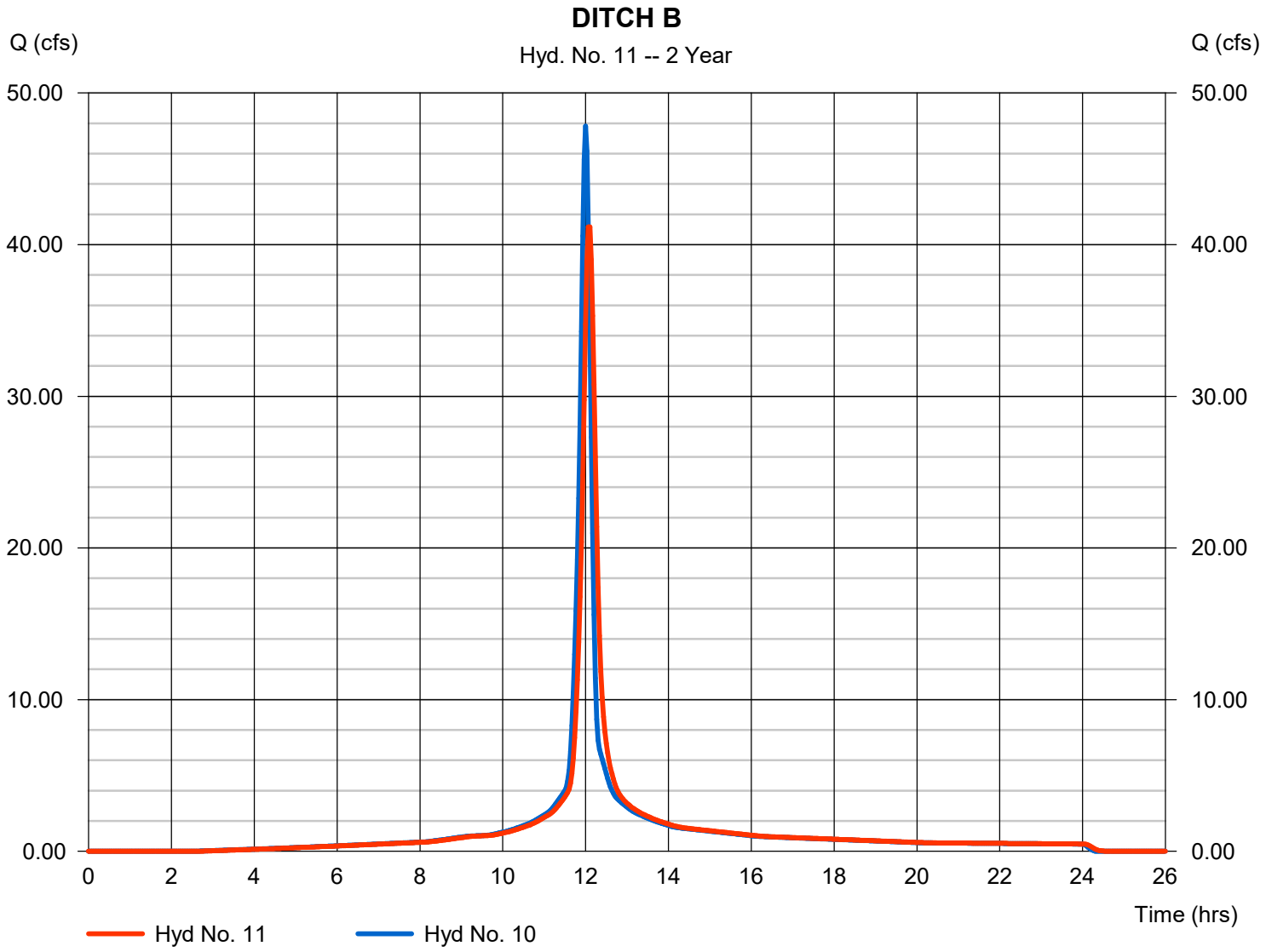
Hydrograph Report

Hyd. No. 11

DITCH B

Hydrograph type	=	Reach	Peak discharge	=	41.17 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	133,657 cuft
Inflow hyd. No.	=	10 - POST WS B	Section type	=	Trapezoidal
Reach length	=	1752.0 ft	Channel slope	=	1.4 %
Manning's n	=	0.035	Bottom width	=	3.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.421	Rating curve m	=	1.248
Ave. velocity	=	4.38 ft/s	Routing coeff.	=	0.3155

Modified Att-Kin routing method used.

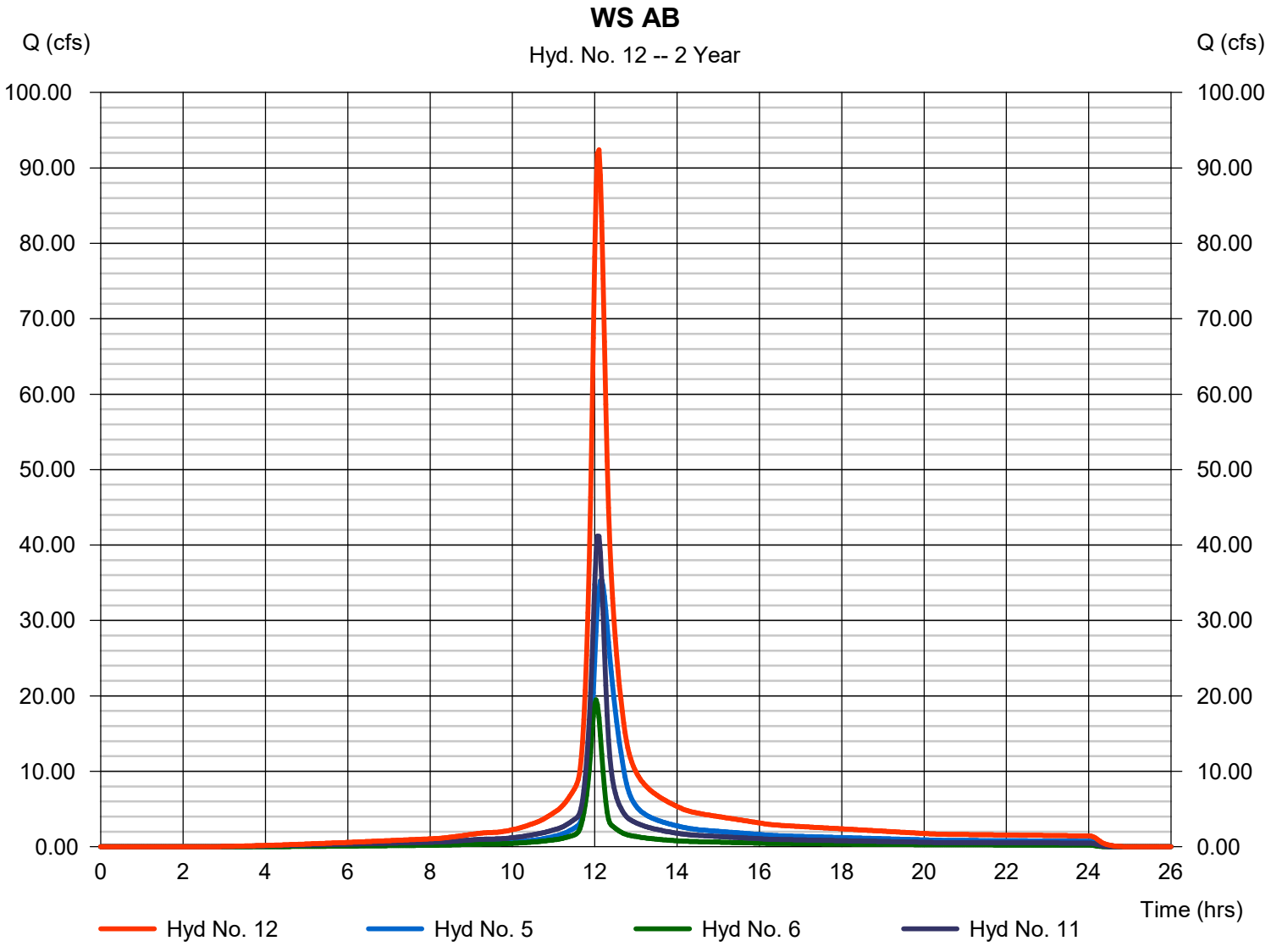


Hydrograph Report

Hyd. No. 12

WS AB

Hydrograph type	=	Combine	Peak discharge	=	92.41 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	344,583 cuft
Inflow hyds.	=	5, 6, 11	Contrib. drain. area	=	5.330 ac



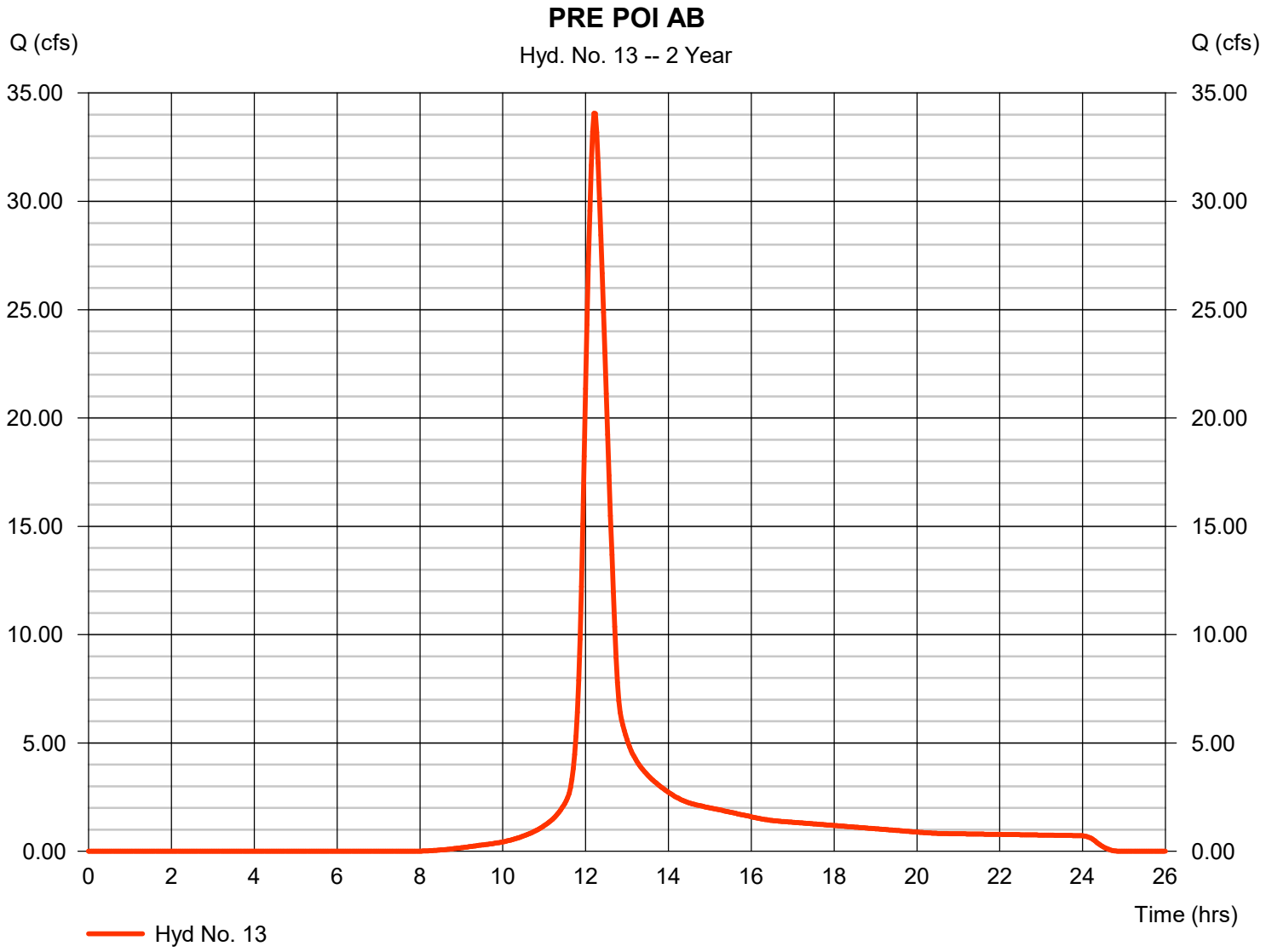
Hydrograph Report

Hyd. No. 13

PRE POI AB

Hydrograph type	=	SCS Runoff	Peak discharge	=	34.07 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	147,606 cuft
Drainage area	=	19.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	32.80 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(8.630 x 72) + (1.450 x 88) + (7.160 x 91) + (1.800 x 91)] / 19.040



TR55 Tc Worksheet

Hyd. No. 13

PRE POI AB

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 0.50		0.00		0.00		
Travel Time (min)	**= 17.10**	**+**	**0.00**	**+**	**0.00**	**=**	**17.10**
Shallow Concentrated Flow							
Flow length (ft)	= 1872.00		0.00		0.00		
Watercourse slope (%)	= 1.52		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.99		0.00		0.00		
Travel Time (min)	**= 15.68**	**+**	**0.00**	**+**	**0.00**	**=**	**15.68**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 32.80 min

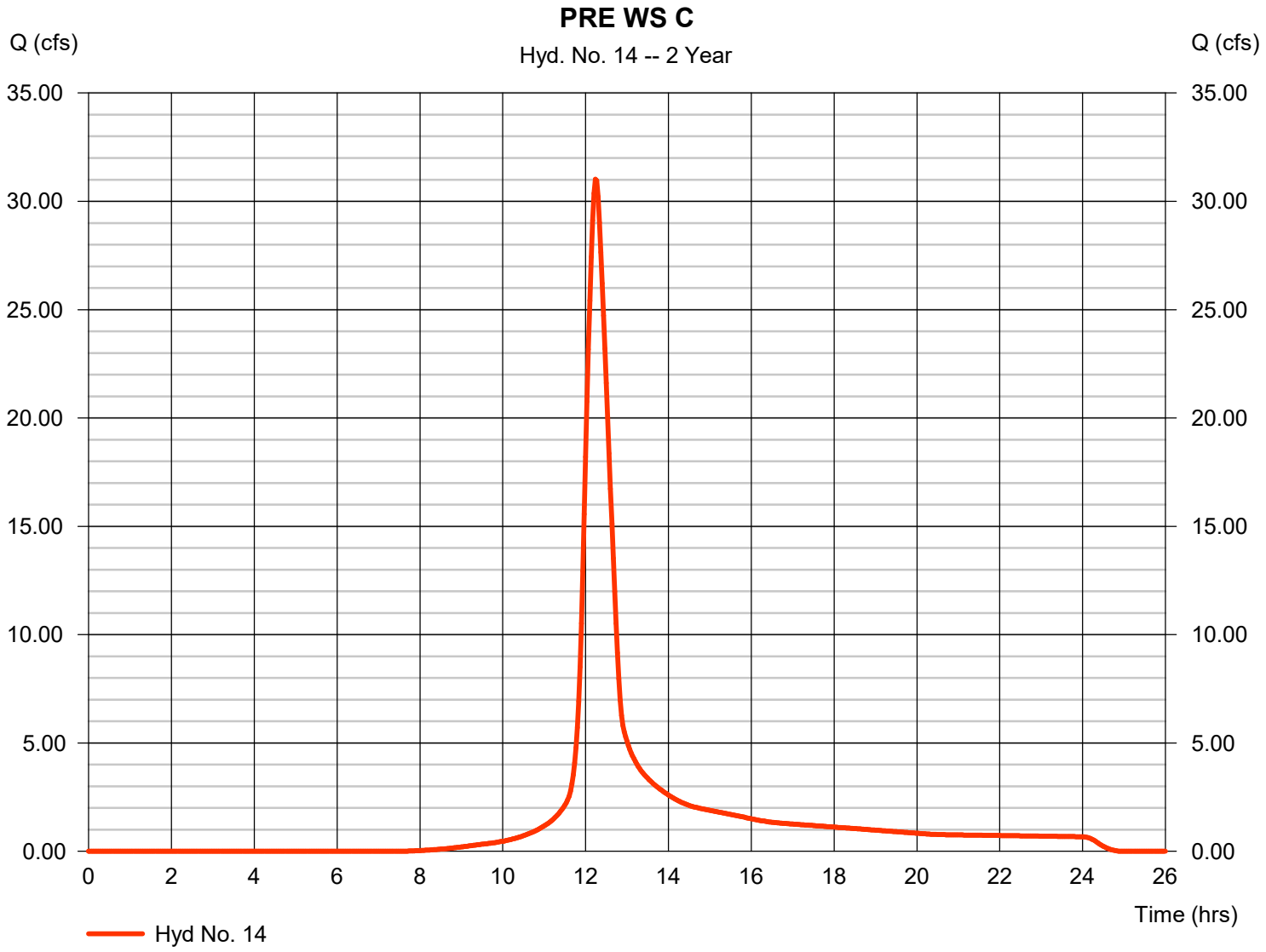
Hydrograph Report

Hyd. No. 14

PRE WS C

Hydrograph type	=	SCS Runoff	Peak discharge	=	31.02 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	140,667 cuft
Drainage area	=	17.890 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.60 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(7.590 x 72) + (0.390 x 81) + (0.830 x 88) + (9.080 x 91)] / 17.890



TR55 Tc Worksheet

Hyd. No. 14

PRE WS C

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 1.34		0.00		0.00		
Travel Time (min)	**= 11.53**	**+**	**0.00**	**+**	**0.00**	**=**	**11.53**
Shallow Concentrated Flow							
Flow length (ft)	= 2584.00		0.00		0.00		
Watercourse slope (%)	= 1.34		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.87		0.00		0.00		
Travel Time (min)	**= 23.06**	**+**	**0.00**	**+**	**0.00**	**=**	**23.06**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 34.60 min

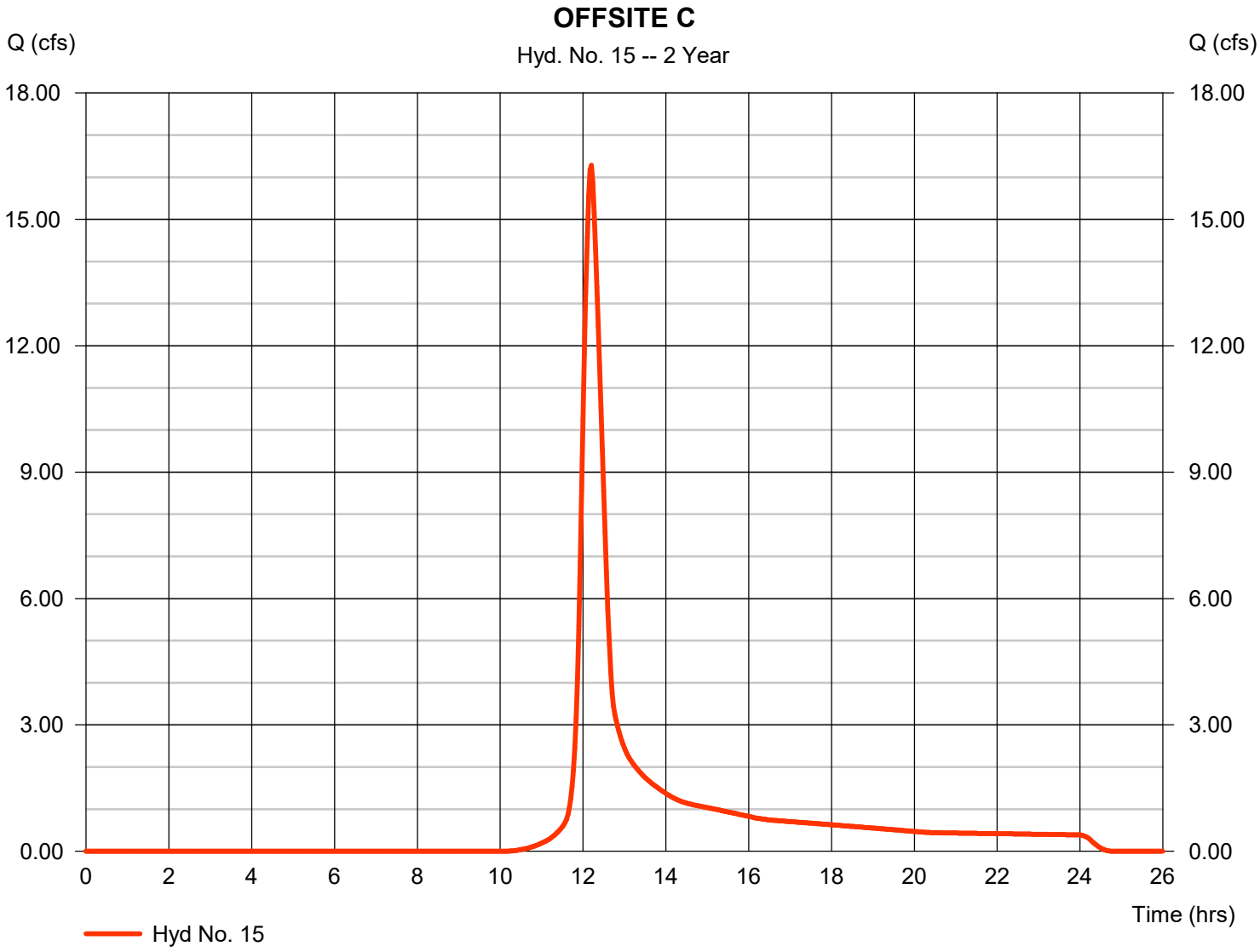
Hydrograph Report

Hyd. No. 15

OFFSITE C

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.28 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	67,195 cuft
Drainage area	=	12.210 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	27.00 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(10.710 x 72) + (0.620 x 81) + (0.710 x 91) + (0.170 x 98)] / 12.210



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

Hyd. No. 15

OFFSITE C

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 0.62		0.00		0.00		
Travel Time (min)	**= 15.69**	**+**	**0.00**	**+**	**0.00**	**=**	**15.69**
Shallow Concentrated Flow							
Flow length (ft)	= 864.00		0.00		0.00		
Watercourse slope (%)	= 0.62		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.27		0.00		0.00		
Travel Time (min)	**= 11.33**	**+**	**0.00**	**+**	**0.00**	**=**	**11.33**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

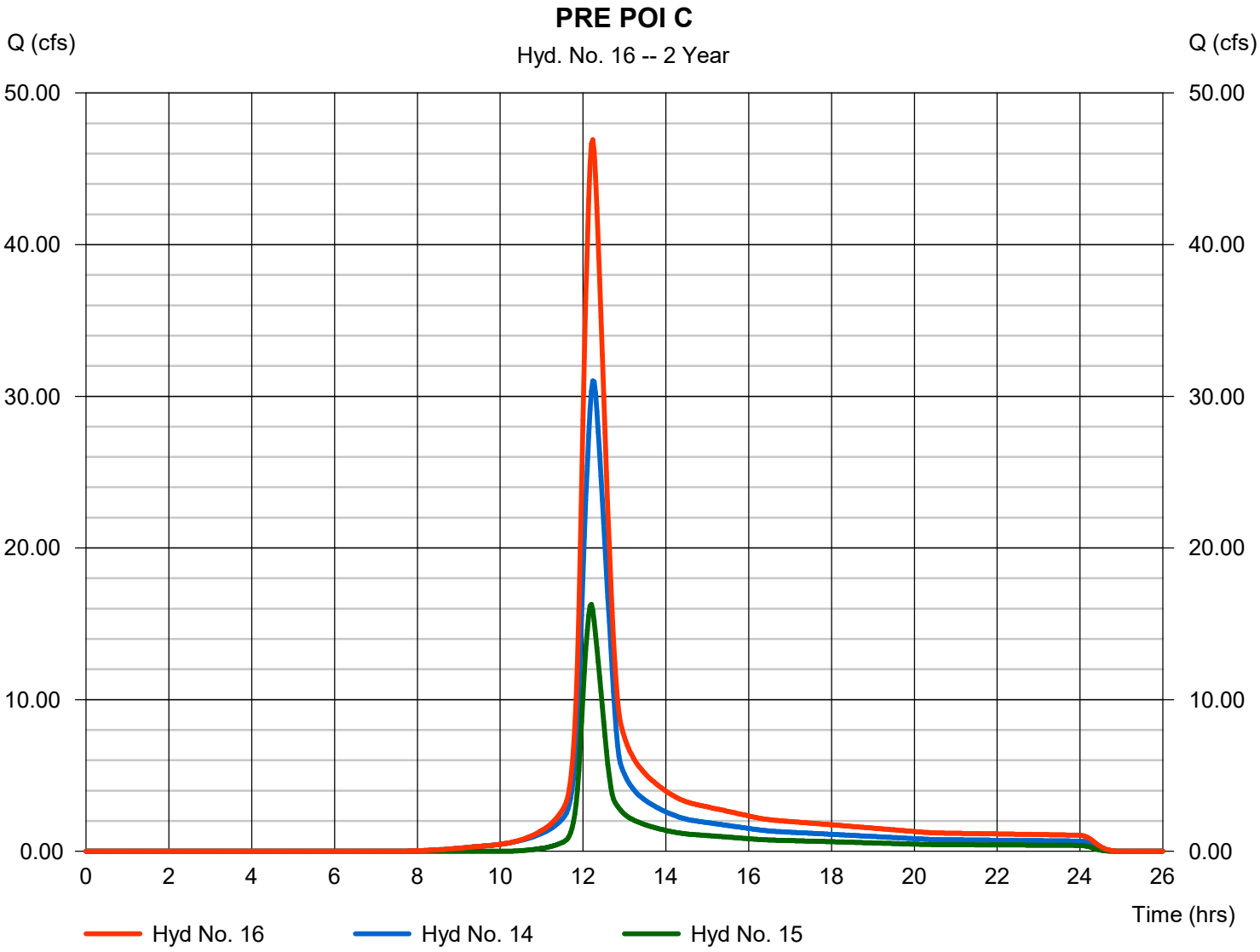
Total Travel Time, Tc ..... 27.00 min

Hydrograph Report

Hyd. No. 16

PRE POI C

Hydrograph type	= Combine	Peak discharge	= 46.91 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 207,862 cuft
Inflow hyds.	= 14, 15	Contrib. drain. area	= 30.100 ac



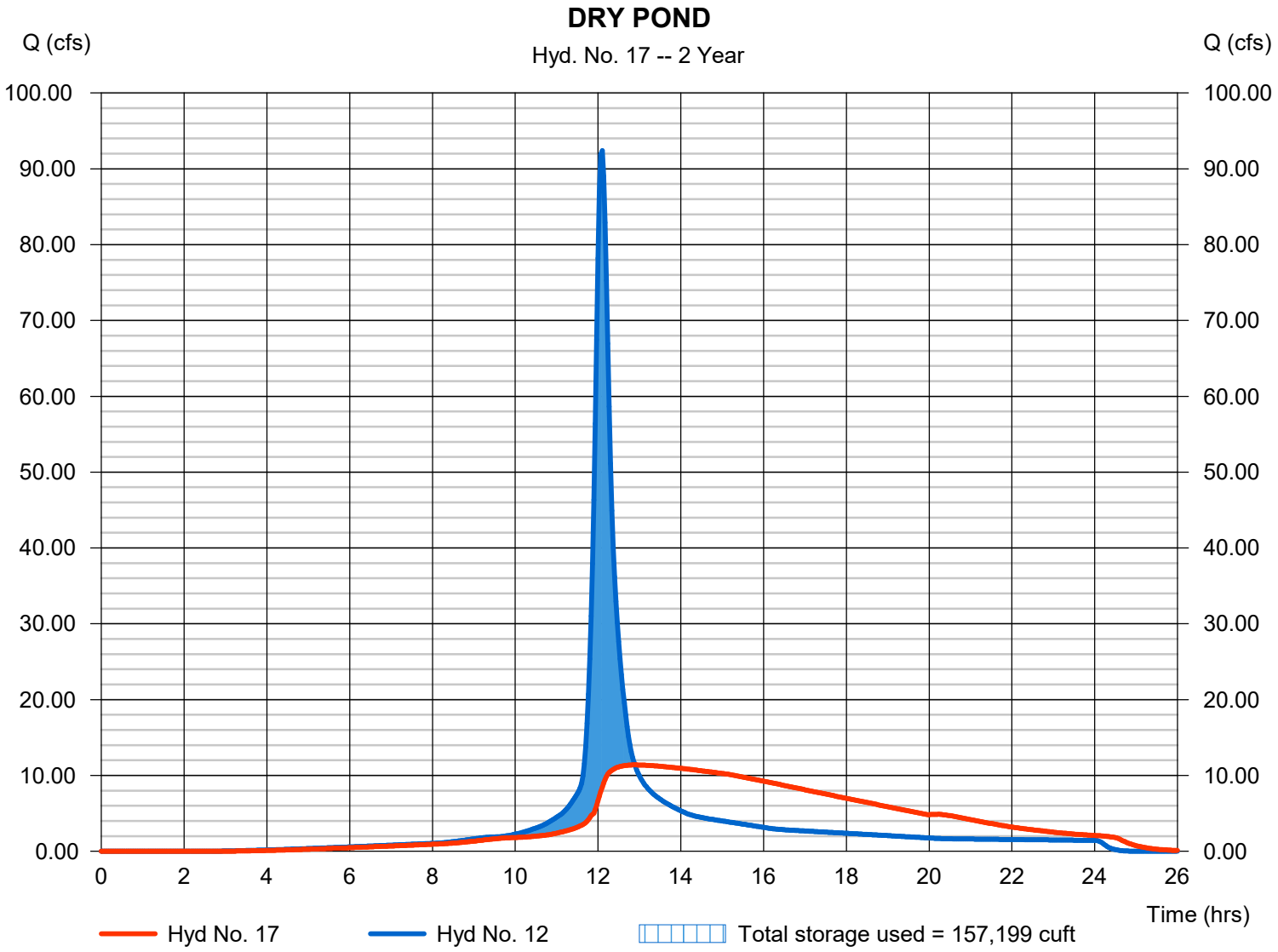
Hydrograph Report

Hyd. No. 17

DRY POND

Hydrograph type	=	Reservoir	Peak discharge	=	11.38 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.90 hrs
Time interval	=	2 min	Hyd. volume	=	344,581 cuft
Inflow hyd. No.	=	12 - WS AB	Max. Elevation	=	611.35 ft
Reservoir name	=	DRY POND	Max. Storage	=	157,199 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - DRY POND

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 609.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	609.00	13,063	0	0
1.00	610.00	50,447	31,755	31,755
2.00	611.00	117,425	83,936	115,691
3.00	612.00	121,802	119,614	235,305
4.00	613.00	127,271	124,537	359,841
5.00	614.00	133,397	130,334	490,175
6.00	615.00	140,392	136,895	627,070
7.00	616.00	148,314	144,353	771,423

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	0.00
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 608.50	0.00	0.00	0.00
Length (ft)	= 58.00	0.00	0.00	0.00
Slope (%)	= 0.51	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	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 50.00	0.00	0.00	0.00
Crest El. (ft)	= 613.30	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	Yes

Exfil.(in/hr) = 0.000 (by Wet area)

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	609.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	31,755	610.00	4.83 oc	---	---	---	0.00	---	---	---	---	---	4.831
2.00	115,691	611.00	10.11 oc	---	---	---	0.00	---	---	---	---	---	10.11
3.00	235,305	612.00	13.46 oc	---	---	---	0.00	---	---	---	---	---	13.46
4.00	359,841	613.00	16.13 oc	---	---	---	0.00	---	---	---	---	---	16.13
5.00	490,175	614.00	18.41 oc	---	---	---	97.52	---	---	---	---	---	115.93
6.00	627,070	615.00	20.40 ic	---	---	---	369.06	---	---	---	---	---	389.46
7.00	771,423	616.00	22.10 ic	---	---	---	738.69	---	---	---	---	---	760.79

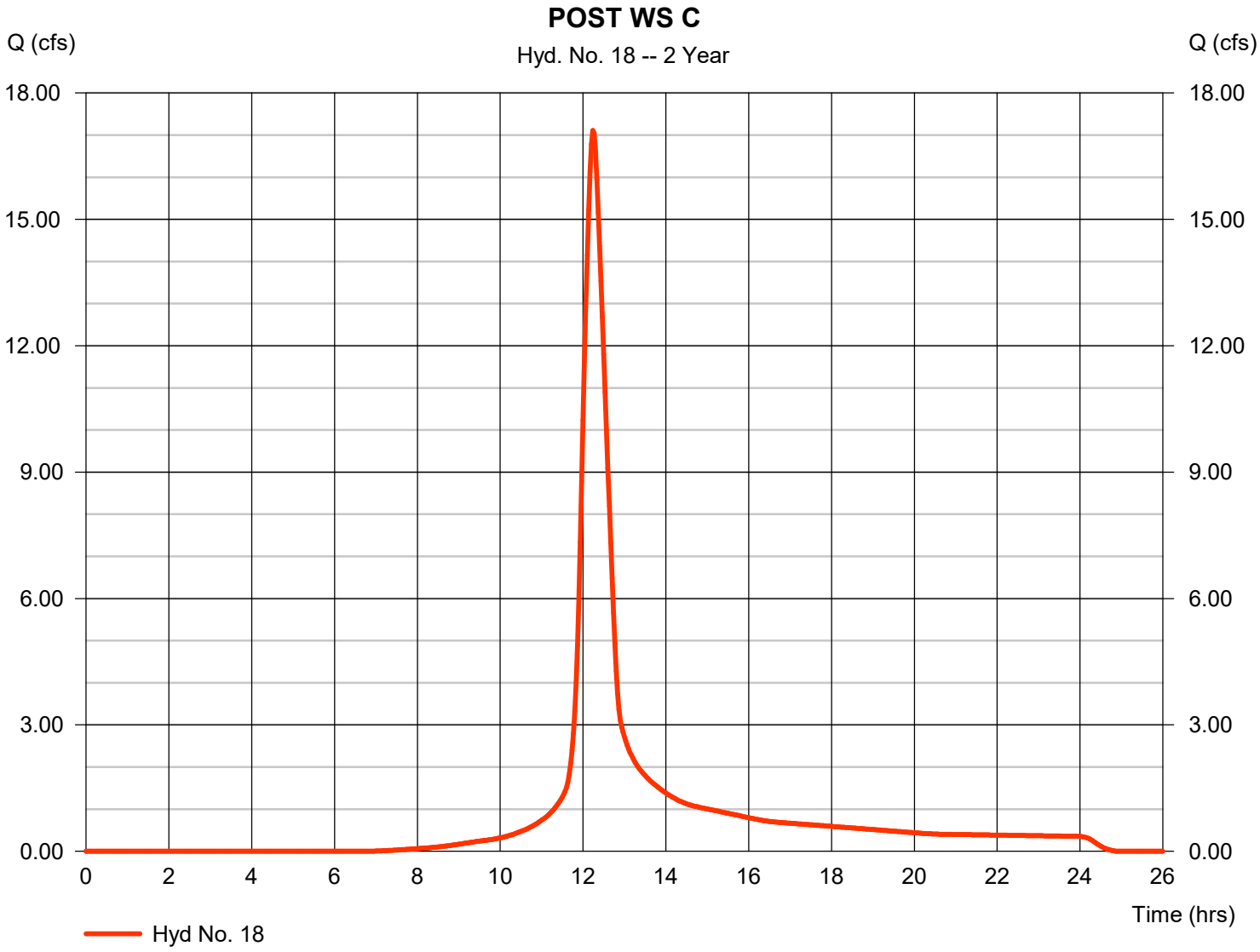
Hydrograph Report

Hyd. No. 18

POST WS C

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.11 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	77,487 cuft
Drainage area	=	9.150 ac	Curve number	=	85*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.10 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.600 x 72) + (0.260 x 81) + (0.830 x 88) + (5.460 x 91)] / 9.150



TR55 Tc Worksheet

Hyd. No. 18

POST WS C

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.89		0.00		0.00		
Land slope (%)	= 1.50		0.00		0.00		
Travel Time (min)	**= 11.02**	**+**	**0.00**	**+**	**0.00**	**=**	**11.02**
Shallow Concentrated Flow							
Flow length (ft)	= 2584.00		0.00		0.00		
Watercourse slope (%)	= 1.34		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.87		0.00		0.00		
Travel Time (min)	**= 23.06**	**+**	**0.00**	**+**	**0.00**	**=**	**23.06**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 34.10 min

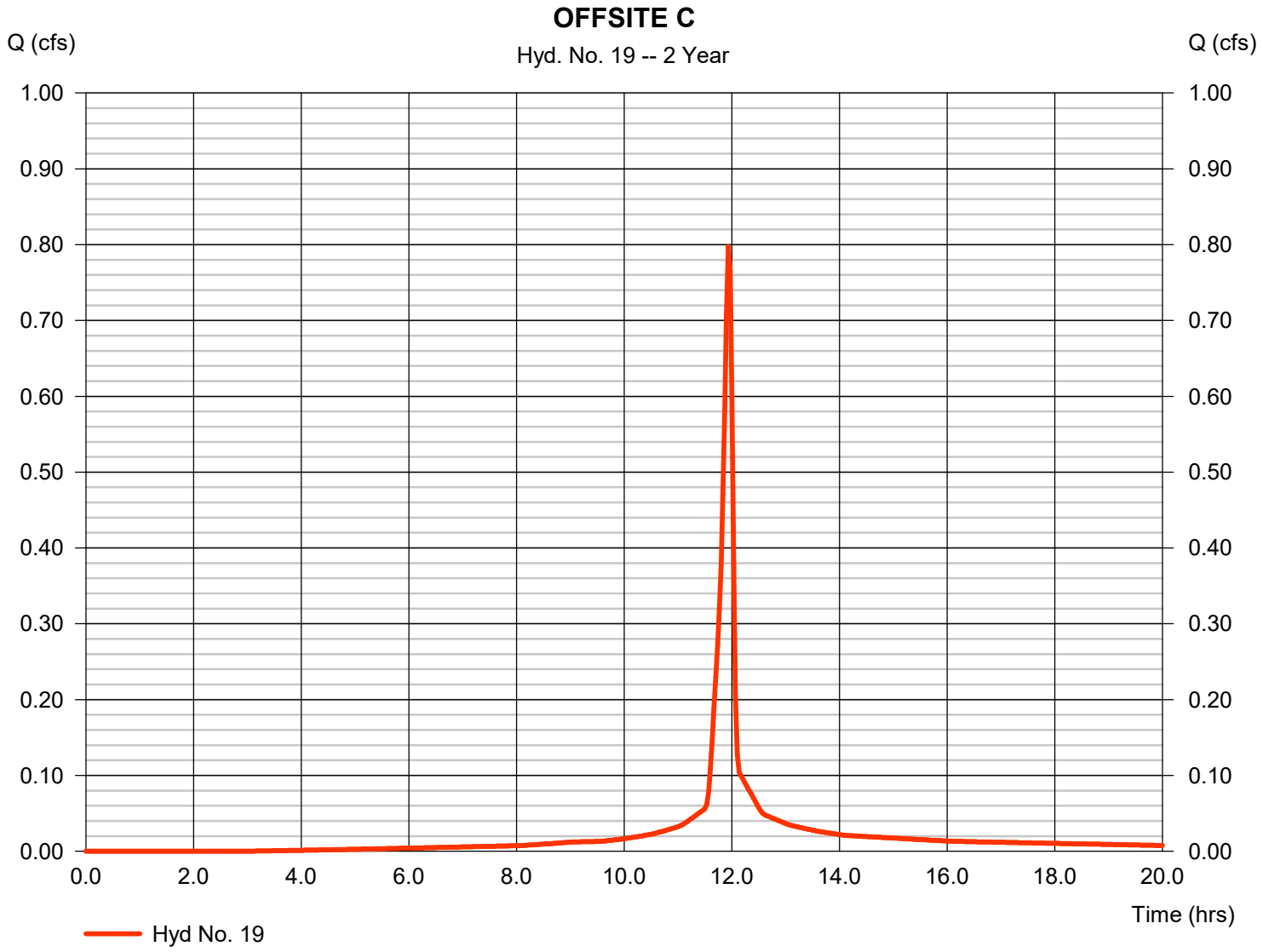
Hydrograph Report

Hyd. No. 19

OFFSITE C

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.797 cfs
Storm frequency	=	2 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	1,751 cuft
Drainage area	=	0.160 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.89 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.030 x 81) + (0.020 x 91) + (0.110 x 98)] / 0.160

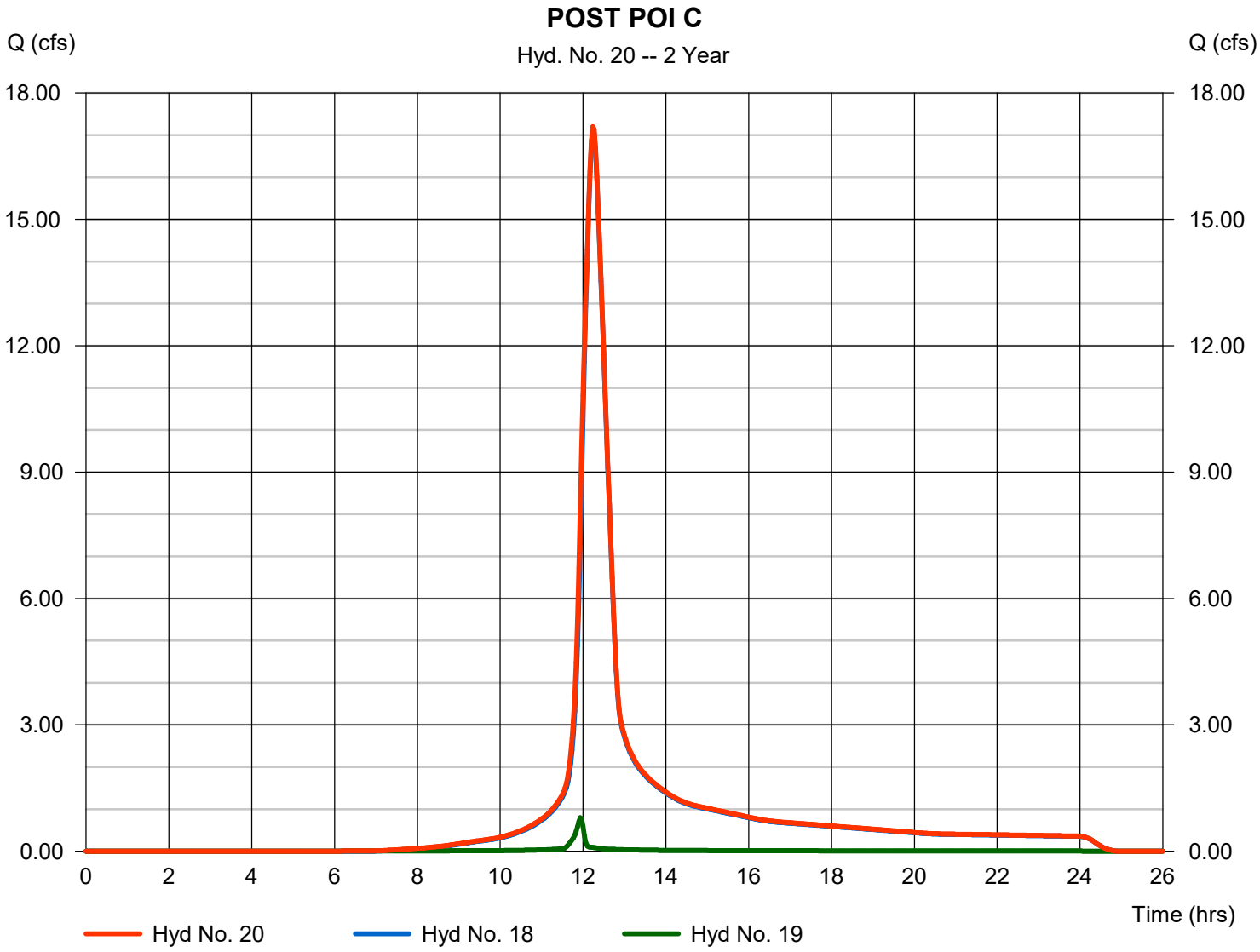


Hydrograph Report

Hyd. No. 20

POST POI C

Hydrograph type	=	Combine	Peak discharge	=	17.20 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	79,238 cuft
Inflow hyds.	=	18, 19	Contrib. drain. area	=	9.310 ac

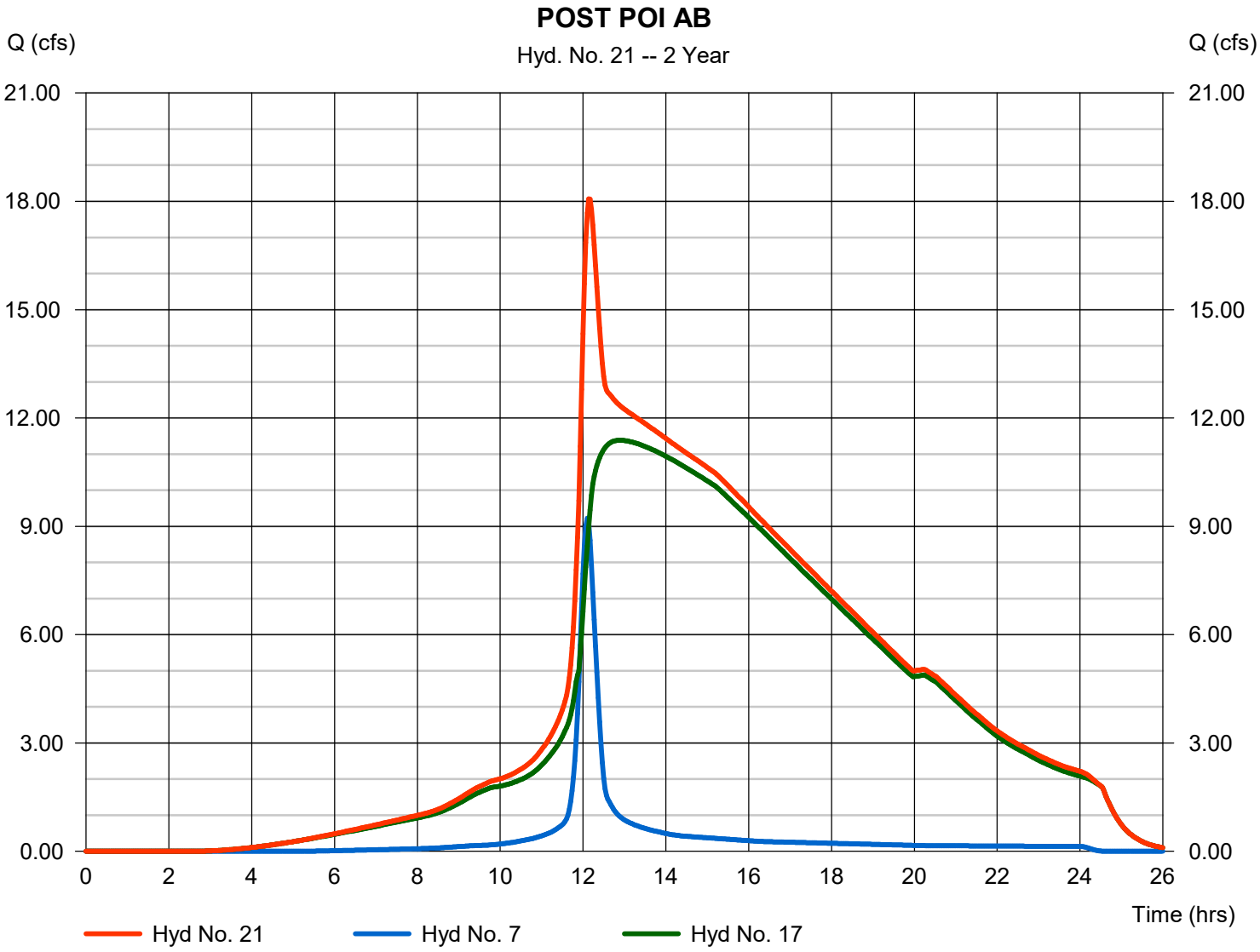


Hydrograph Report

Hyd. No. 21

POST POI AB

Hydrograph type	=	Combine	Peak discharge	=	18.07 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	376,740 cuft
Inflow hyds.	=	7, 17	Contrib. drain. area	=	3.200 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

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	18.70	2	724	59,223	------	------	------	WS A1
2	SCS Runoff	51.33	2	720	148,103	------	------	------	WS A2
3	SCS Runoff	51.81	2	730	207,045	------	------	------	OFFSITE A
4	Combine	108.40	2	722	414,371	1, 2, 3	------	------	POST WS A
5	Reach	96.97	2	728	414,368	4	------	------	DITCH A
6	SCS Runoff	42.43	2	722	129,509	------	------	------	WS A3
7	SCS Runoff	21.25	2	726	76,974	------	------	------	Undisturbed - WS A
8	SCS Runoff	99.05	2	720	288,736	------	------	------	WS B
9	SCS Runoff	0.827	2	716	1,869	------	------	------	OFFSITE B
10	Combine	99.66	2	720	290,605	8, 9	------	------	POST WS B
11	Reach	88.70	2	724	290,603	10	------	------	DITCH B
12	Combine	218.68	2	726	834,479	5, 6, 11	------	------	WS AB
13	SCS Runoff	91.13	2	732	398,114	------	------	------	PRE POI AB
14	SCS Runoff	81.17	2	734	372,741	------	------	------	PRE WS C
15	SCS Runoff	52.85	2	730	211,196	------	------	------	OFFSITE C
16	Combine	132.53	2	732	583,938	14, 15	------	------	PRE POI C
17	Reservoir	29.23	2	768	834,479	12	613.47	421,093	DRY POND
18	SCS Runoff	42.89	2	734	198,326	------	------	------	POST WS C
19	SCS Runoff	1.677	2	716	3,868	------	------	------	OFFSITE C
20	Combine	43.08	2	734	202,193	18, 19	------	------	POST POI C
21	Combine	34.74	2	728	911,452	7, 17,	------	------	POST POI AB

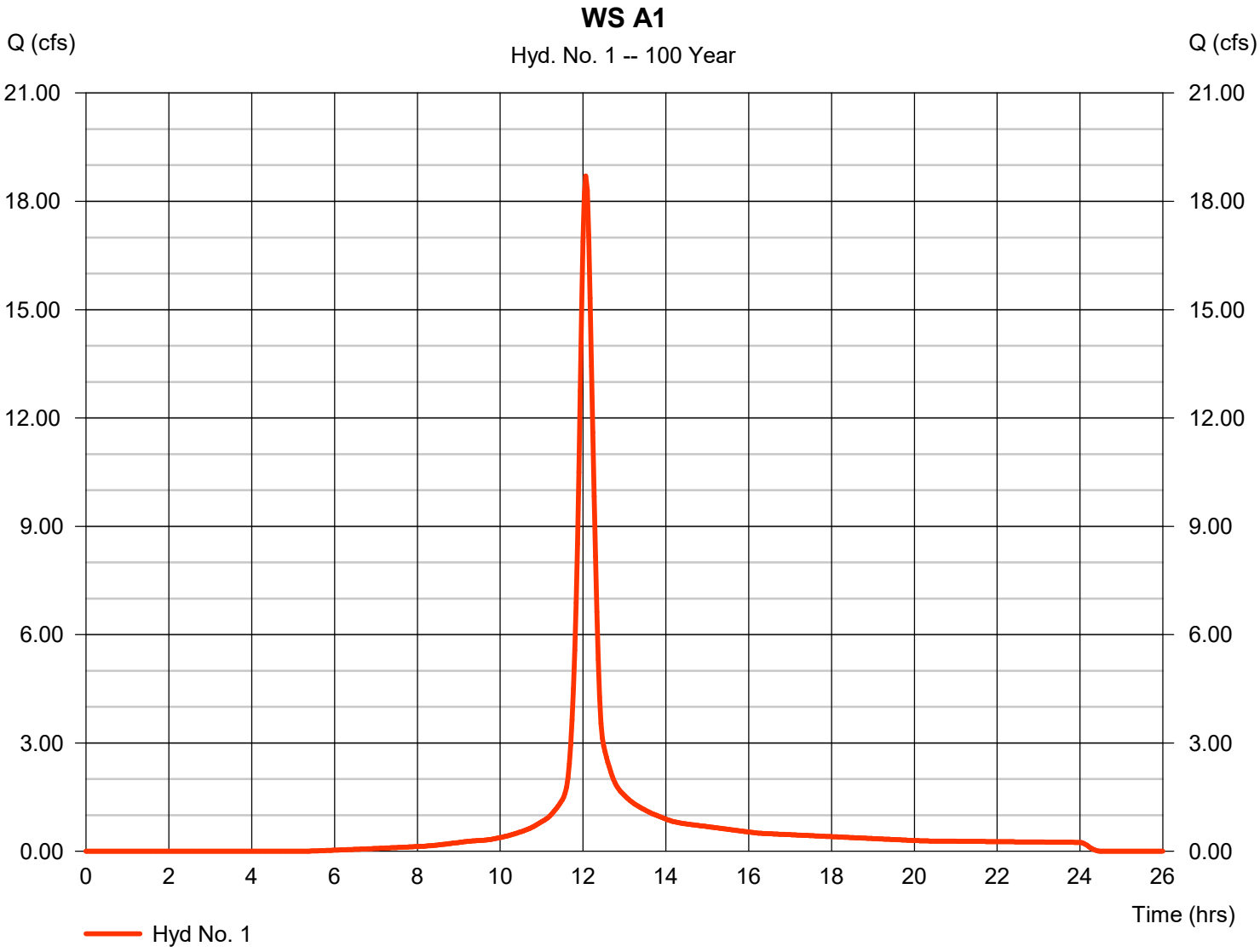
Hydrograph Report

Hyd. No. 1

WS A1

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.70 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	59,223 cuft
Drainage area	=	2.990 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.00 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.770 x 72) + (1.220 x 91)] / 2.990



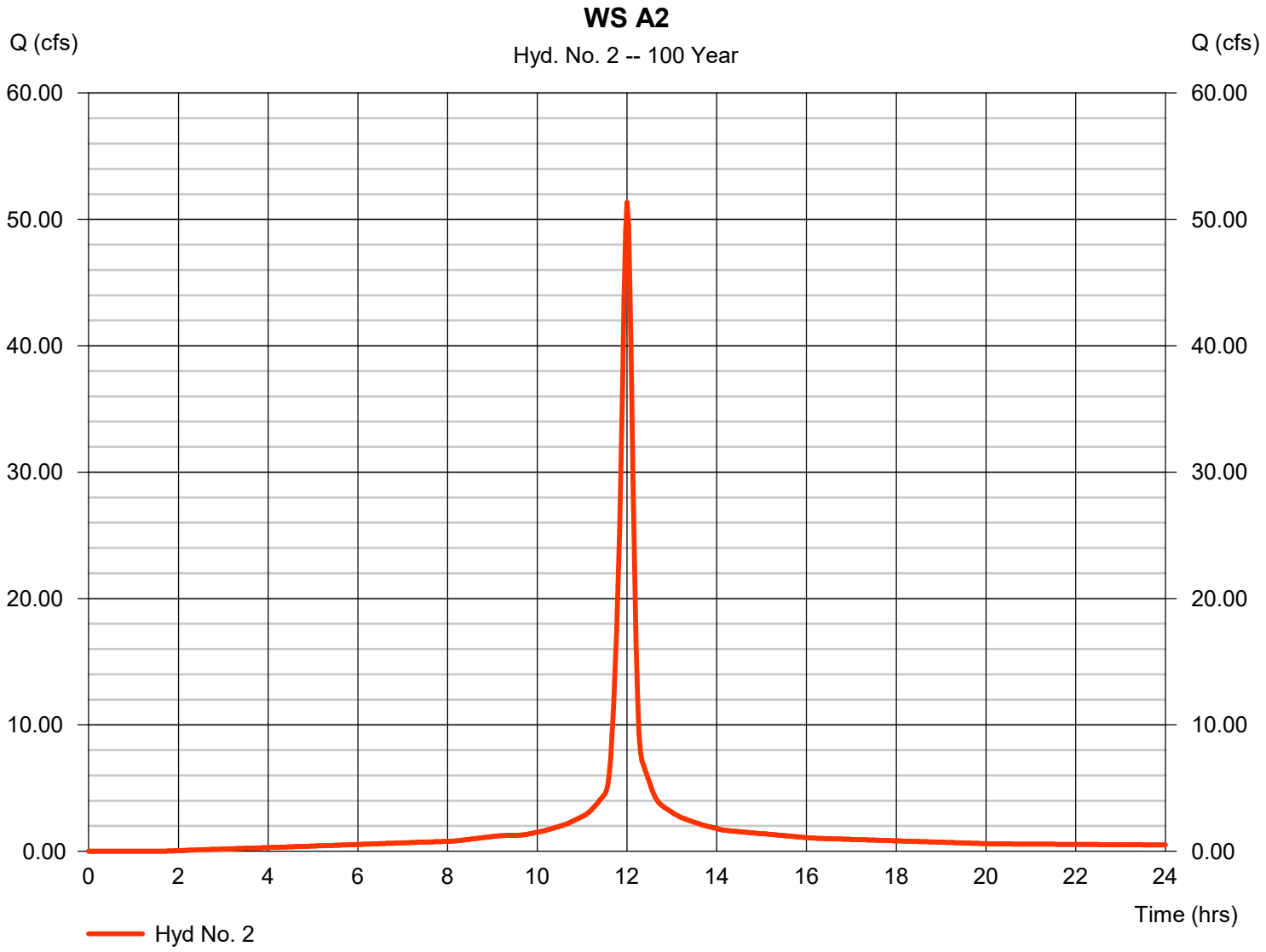
Hydrograph Report

Hyd. No. 2

WS A2

Hydrograph type	=	SCS Runoff	Peak discharge	=	51.33 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	148,103 cuft
Drainage area	=	5.570 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.90 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.940 x 91) + (2.630 x 98)] / 5.570



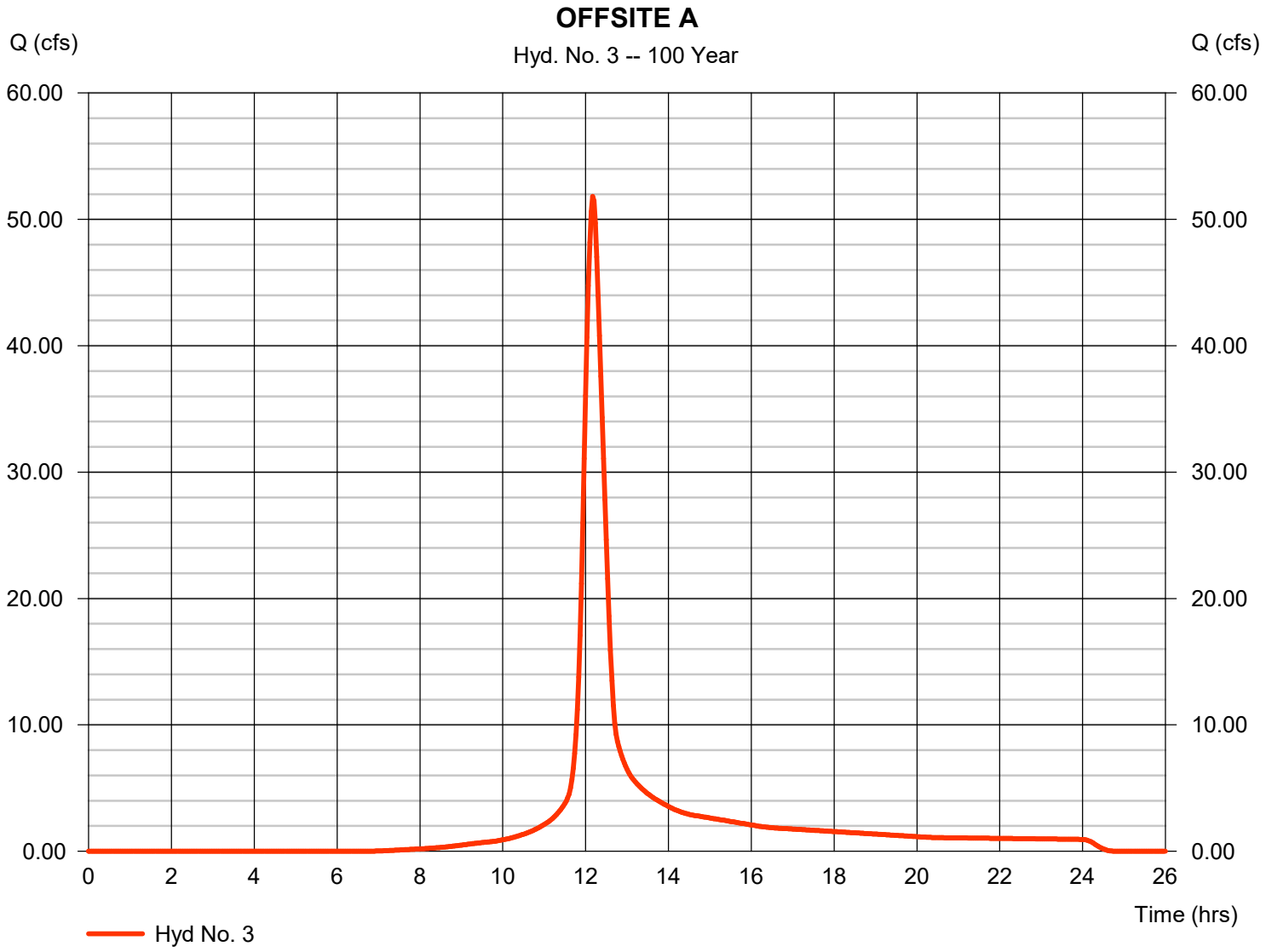
Hydrograph Report

Hyd. No. 3

OFFSITE A

Hydrograph type	=	SCS Runoff	Peak discharge	=	51.81 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	207,045 cuft
Drainage area	=	11.970 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	27.00 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(10.710 x 72) + (0.560 x 81) + (0.690 x 91) + (0.010 x 98)] / 11.970

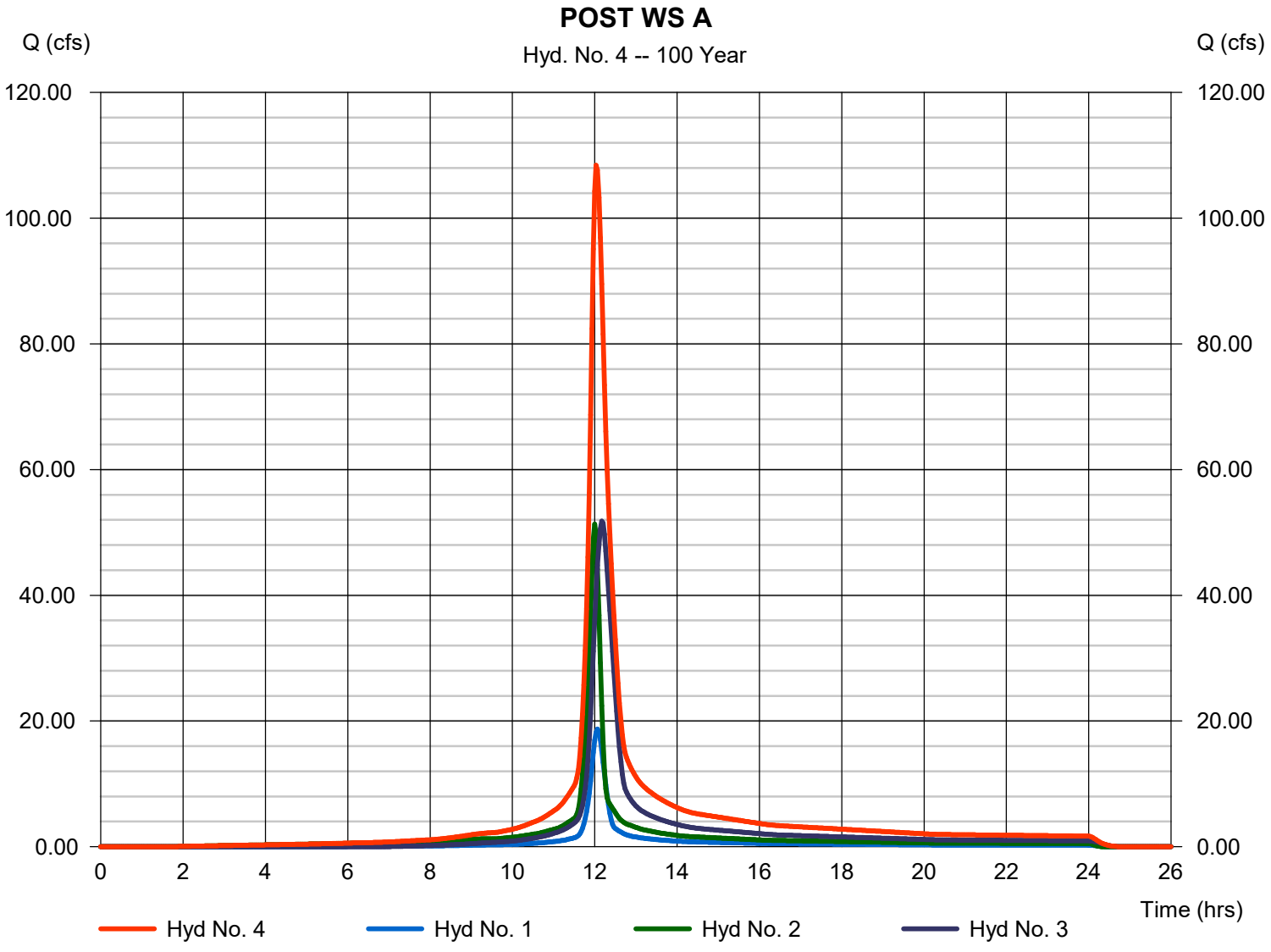


Hydrograph Report

Hyd. No. 4

POST WS A

Hydrograph type	= Combine	Peak discharge	= 108.40 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 414,371 cuft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 20.530 ac



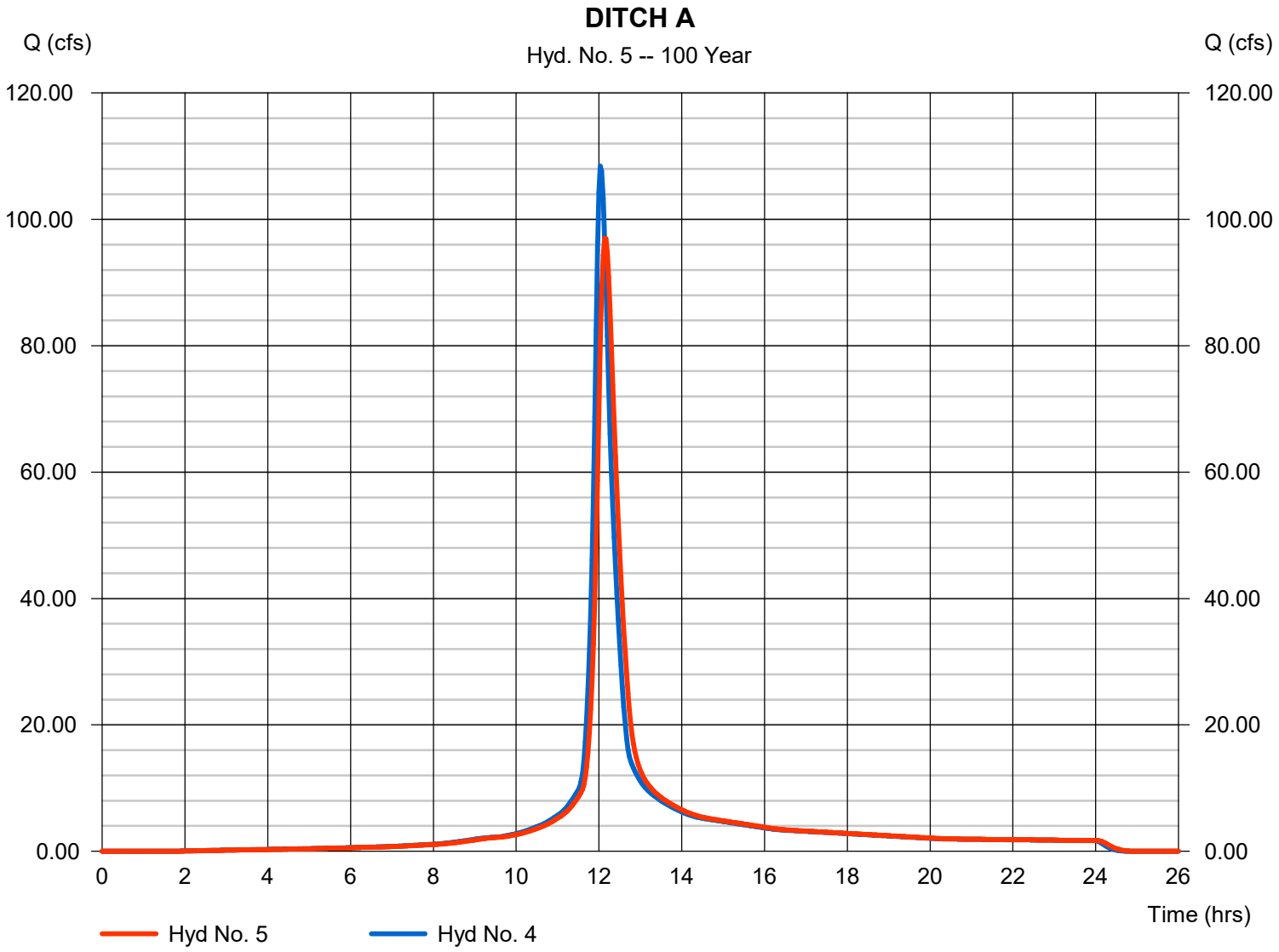
Hydrograph Report

Hyd. No. 5

DITCH A

Hydrograph type	=	Reach	Peak discharge	=	96.97 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	414,368 cuft
Inflow hyd. No.	=	4 - POST WS A	Section type	=	Trapezoidal
Reach length	=	2104.0 ft	Channel slope	=	1.3 %
Manning's n	=	0.035	Bottom width	=	3.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.306	Rating curve m	=	1.248
Ave. velocity	=	4.96 ft/s	Routing coeff.	=	0.3000

Modified Att-Kin routing method used.



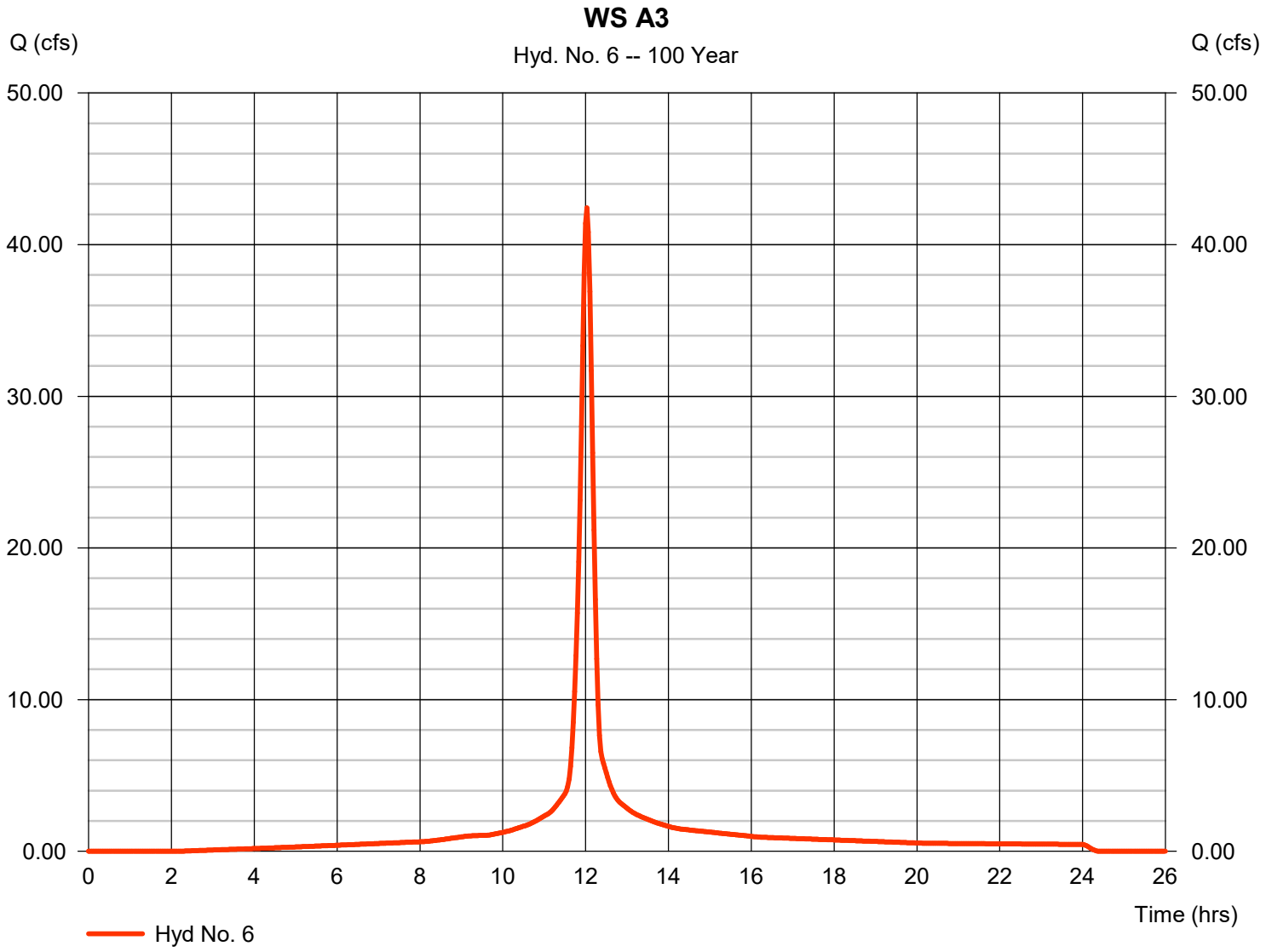
Hydrograph Report

Hyd. No. 6

WS A3

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.43 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	129,509 cuft
Drainage area	=	5.330 ac	Curve number	=	92*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	16.60 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.590 x 91) + (0.740 x 98)] / 5.330



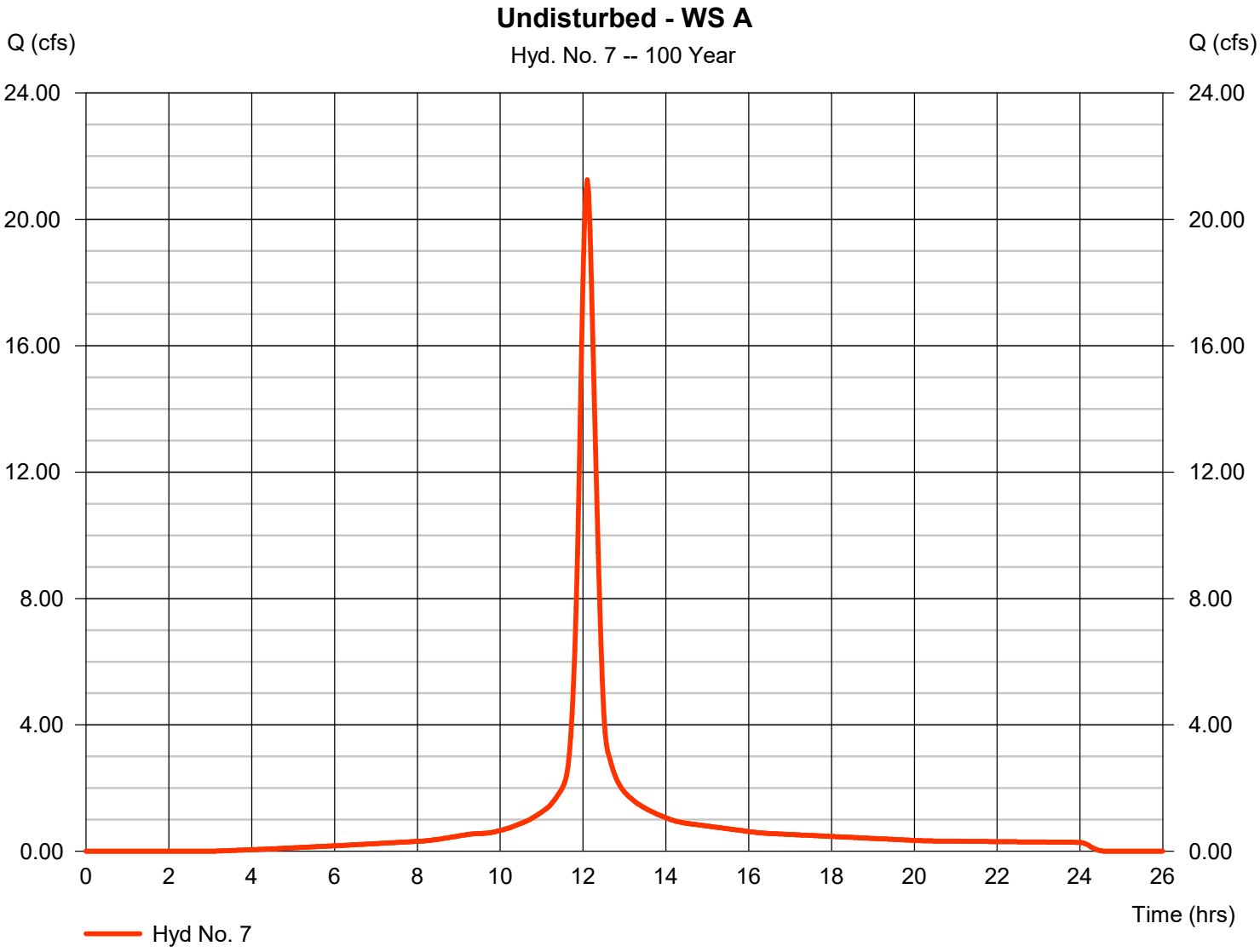
Hydrograph Report

Hyd. No. 7

Undisturbed - WS A

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.25 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	76,974 cuft
Drainage area	=	3.200 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	23.20 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.210 x 72) + (0.560 x 88) + (2.430 x 91)] / 3.200



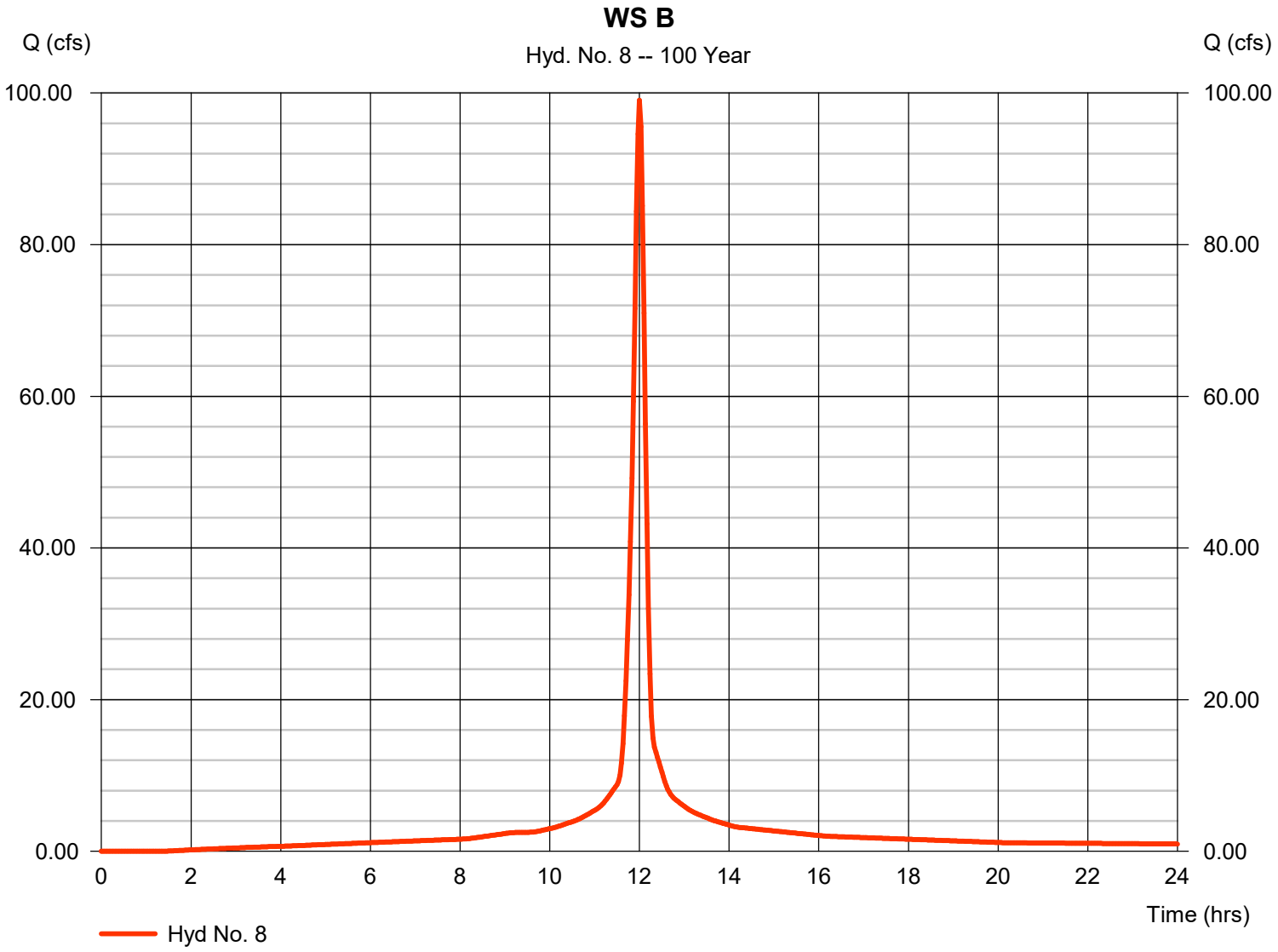
Hydrograph Report

Hyd. No. 8

WS B

Hydrograph type	=	SCS Runoff	Peak discharge	=	99.05 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	288,736 cuft
Drainage area	=	10.680 ac	Curve number	=	95*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	11.50 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(4.380 x 91) + (6.300 x 98)] / 10.680



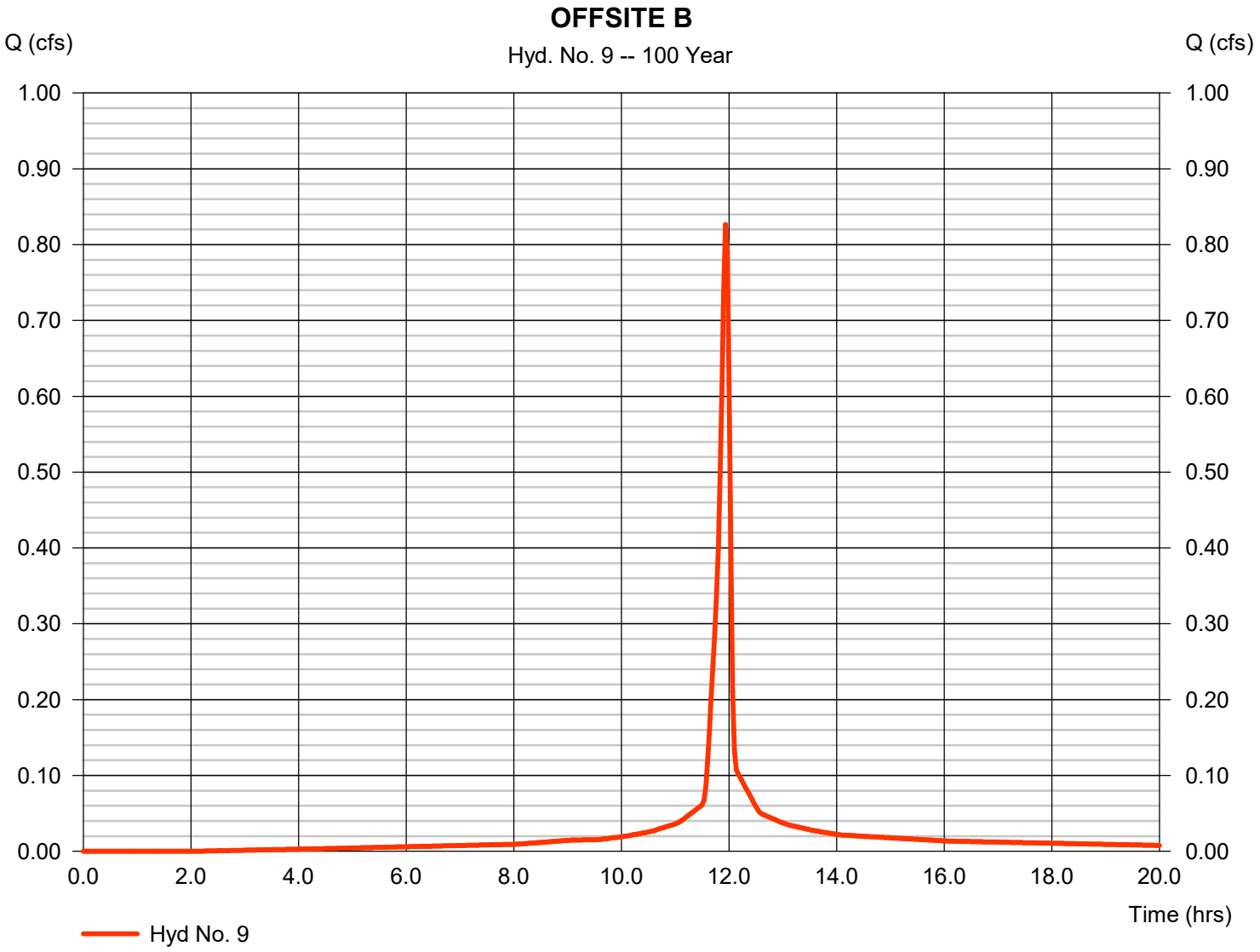
Hydrograph Report

Hyd. No. 9

OFFSITE B

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.827 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	1,869 cuft
Drainage area	=	0.080 ac	Curve number	=	92*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.030 x 81) + (0.050 x 98)] / 0.080

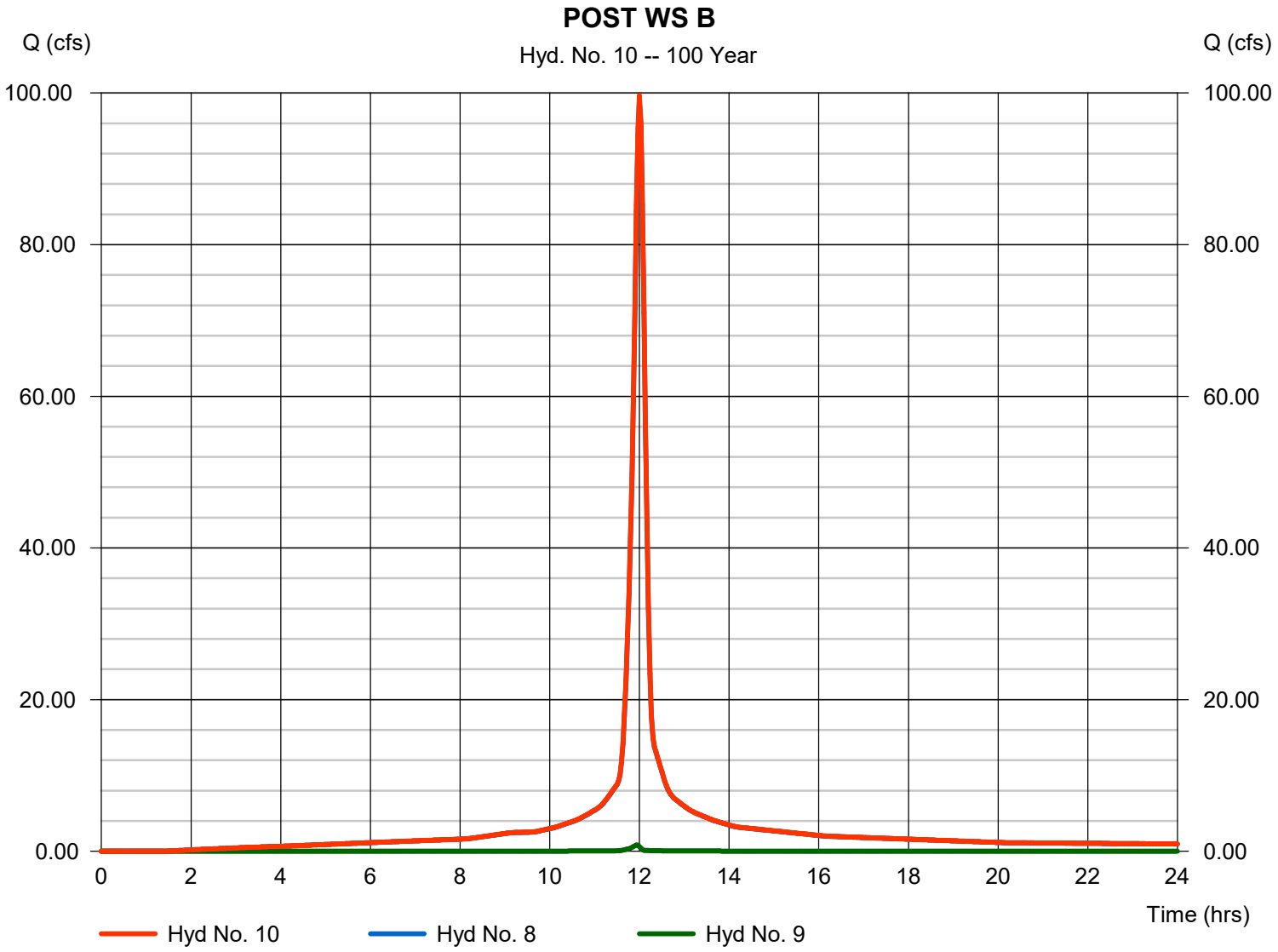


Hydrograph Report

Hyd. No. 10

POST WS B

Hydrograph type	= Combine	Peak discharge	= 99.66 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 290,605 cuft
Inflow hyds.	= 8, 9	Contrib. drain. area	= 10.760 ac



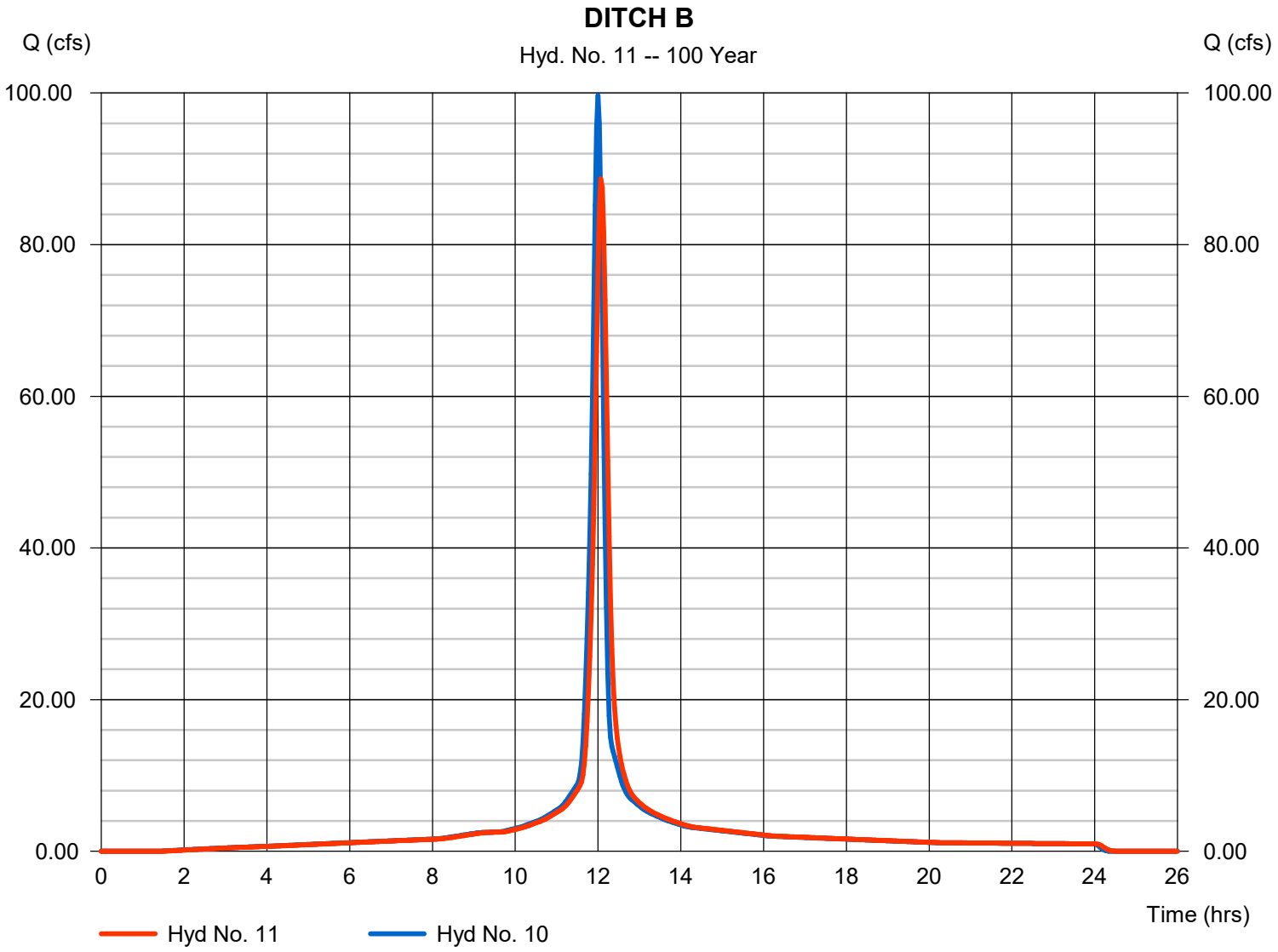
Hydrograph Report

Hyd. No. 11

DITCH B

Hydrograph type	=	Reach	Peak discharge	=	88.70 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	290,603 cuft
Inflow hyd. No.	=	10 - POST WS B	Section type	=	Trapezoidal
Reach length	=	1752.0 ft	Channel slope	=	1.4 %
Manning's n	=	0.035	Bottom width	=	3.0 ft
Side slope	=	3.0:1	Max. depth	=	3.0 ft
Rating curve x	=	2.421	Rating curve m	=	1.248
Ave. velocity	=	5.07 ft/s	Routing coeff.	=	0.3563

Modified Att-Kin routing method used.

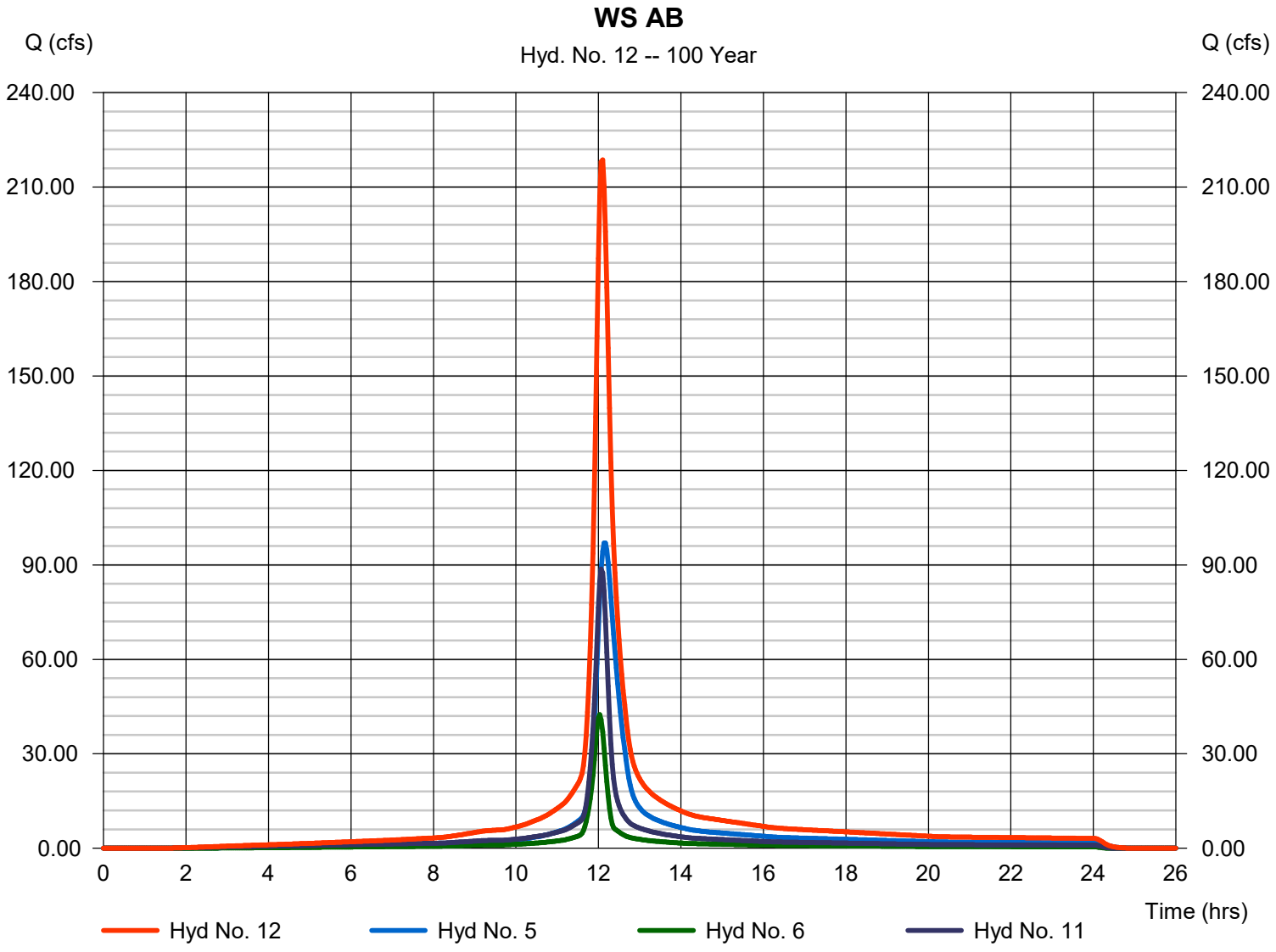


Hydrograph Report

Hyd. No. 12

WS AB

Hydrograph type	= Combine	Peak discharge	= 218.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 834,479 cuft
Inflow hyds.	= 5, 6, 11	Contrib. drain. area	= 5.330 ac



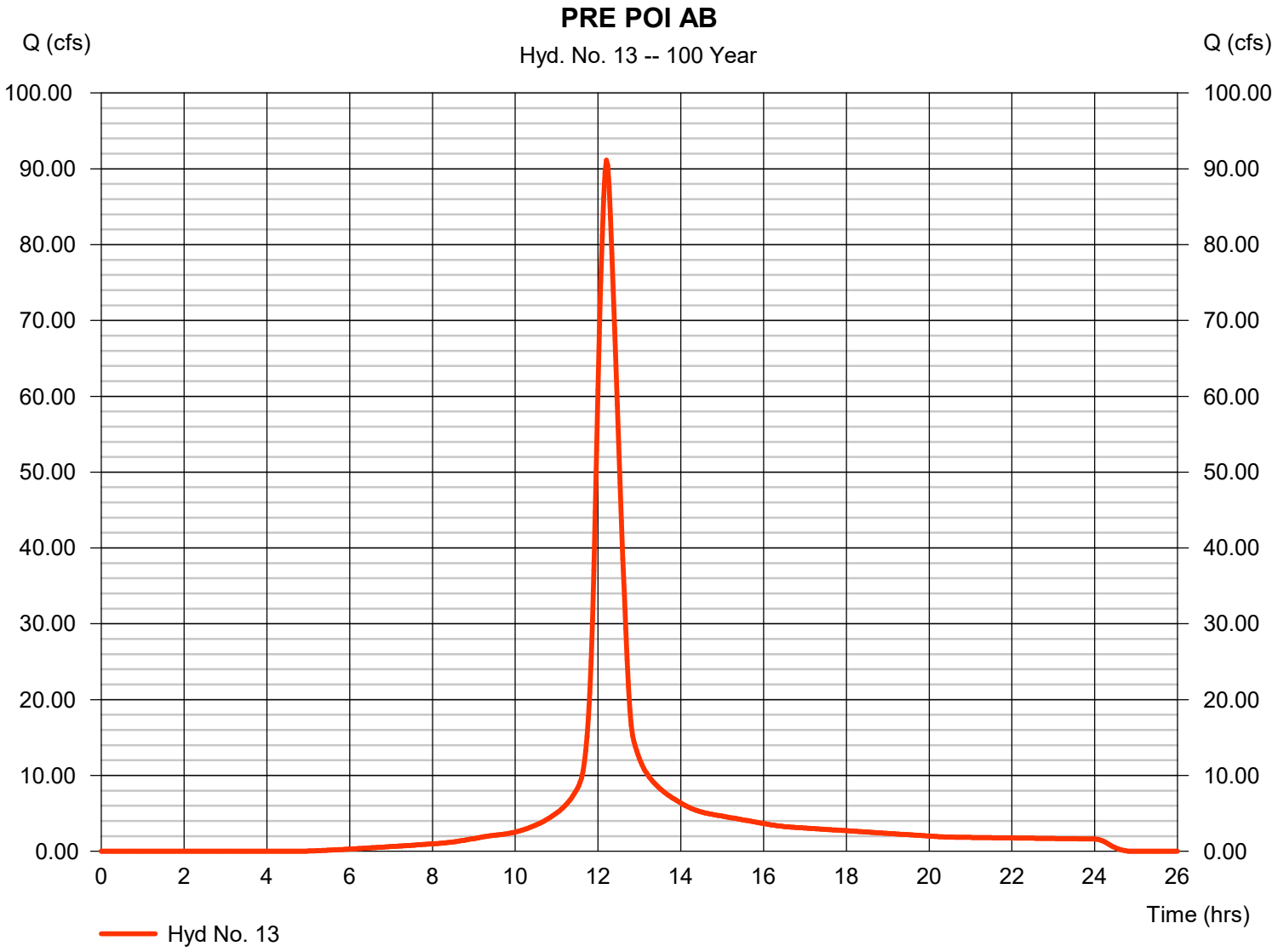
Hydrograph Report

Hyd. No. 13

PRE POI AB

Hydrograph type	=	SCS Runoff	Peak discharge	=	91.13 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	398,114 cuft
Drainage area	=	19.040 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	32.80 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(8.630 x 72) + (1.450 x 88) + (7.160 x 91) + (1.800 x 91)] / 19.040



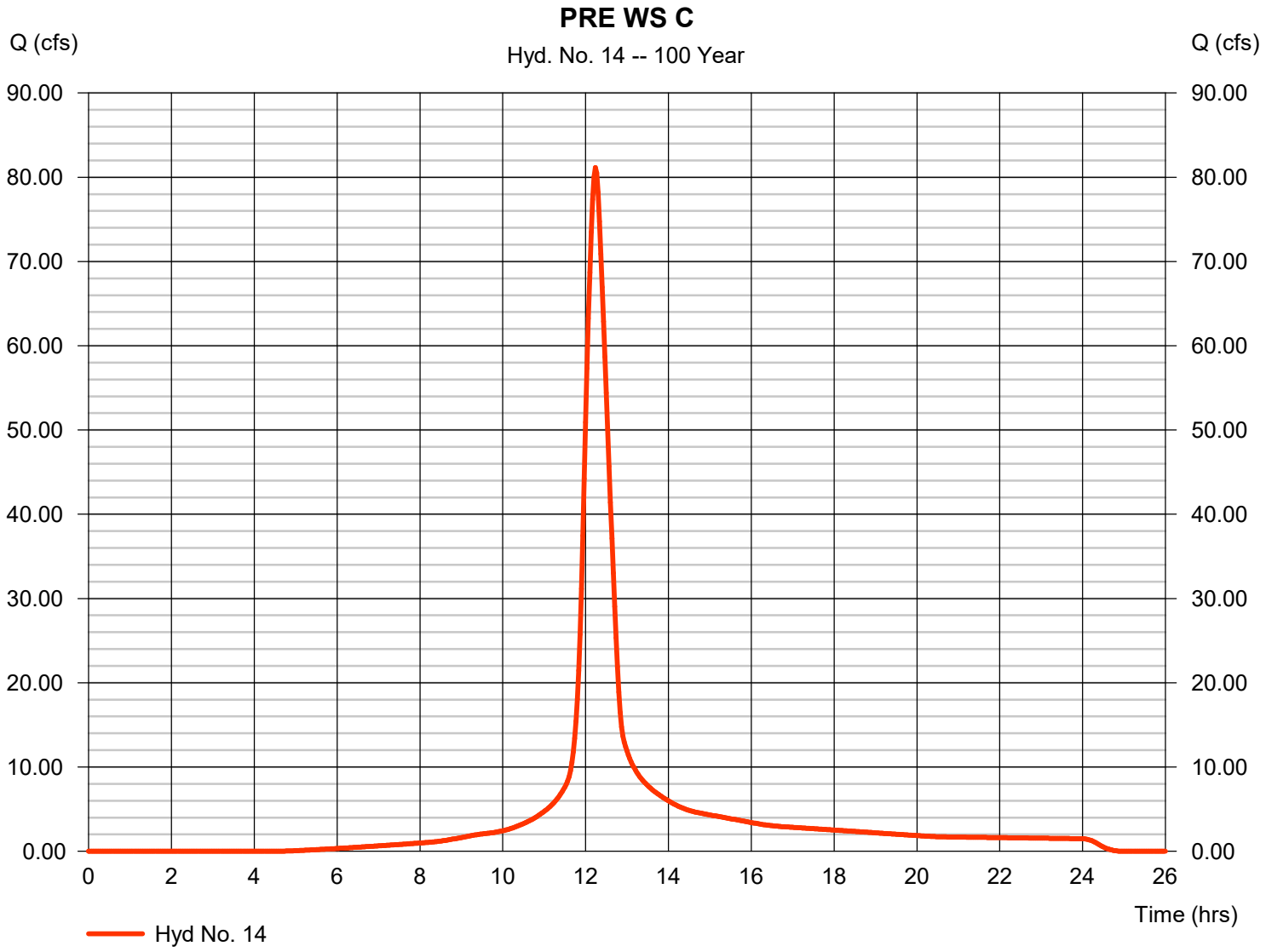
Hydrograph Report

Hyd. No. 14

PRE WS C

Hydrograph type	=	SCS Runoff	Peak discharge	=	81.17 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	372,741 cuft
Drainage area	=	17.890 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.60 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(7.590 x 72) + (0.390 x 81) + (0.830 x 88) + (9.080 x 91)] / 17.890



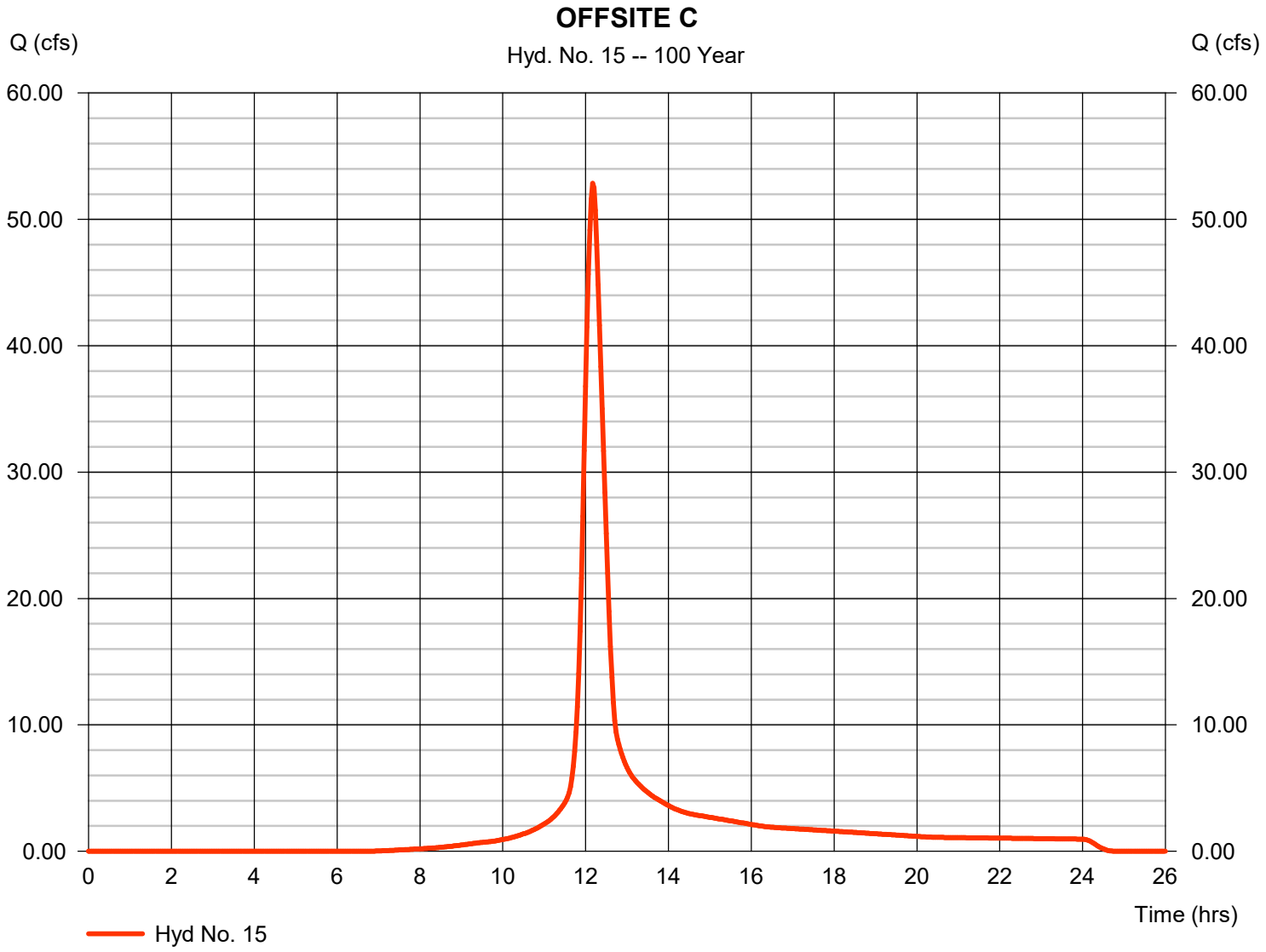
Hydrograph Report

Hyd. No. 15

OFFSITE C

Hydrograph type	=	SCS Runoff	Peak discharge	=	52.85 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	211,196 cuft
Drainage area	=	12.210 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	27.00 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(10.710 x 72) + (0.620 x 81) + (0.710 x 91) + (0.170 x 98)] / 12.210

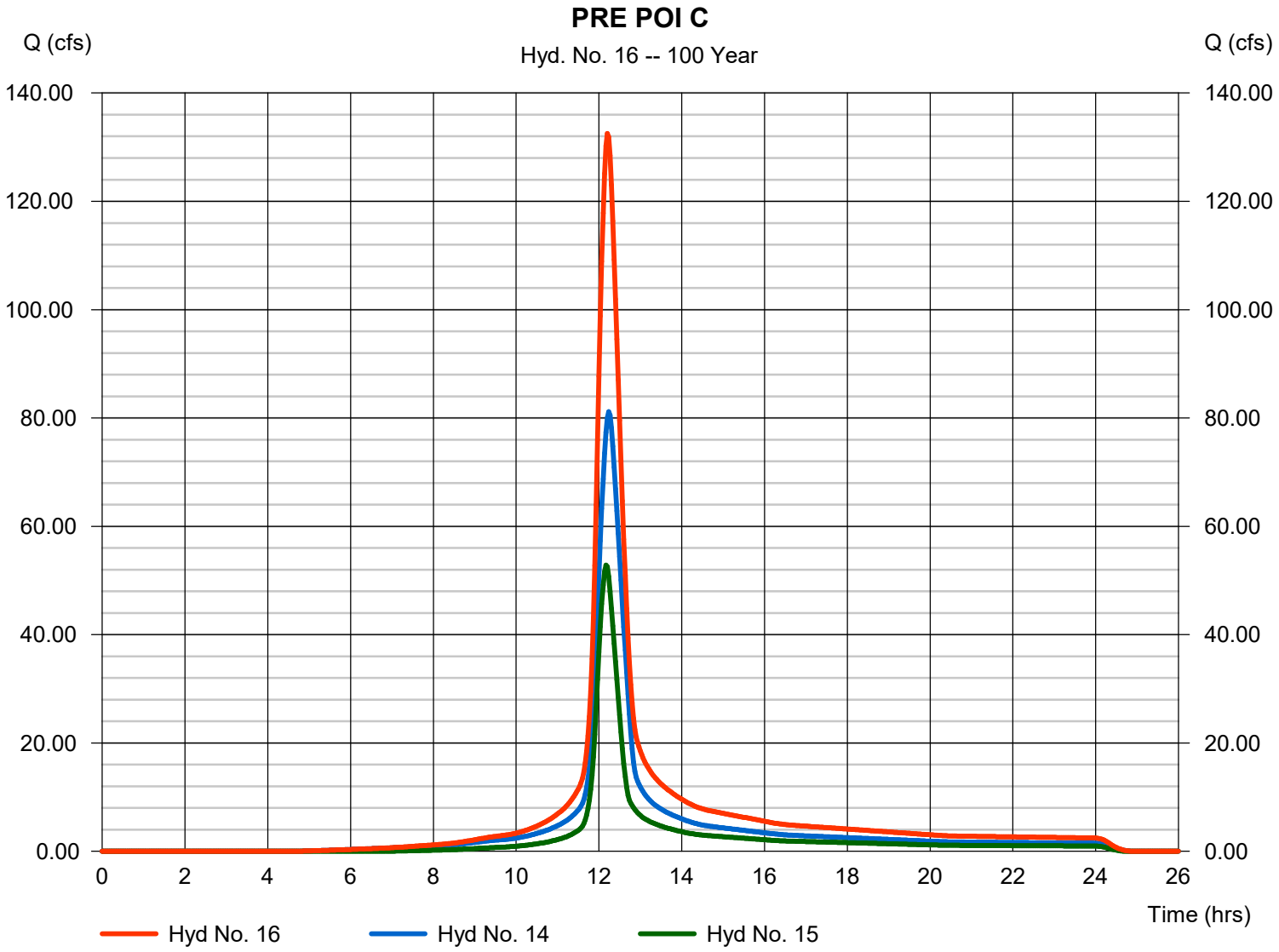


Hydrograph Report

Hyd. No. 16

PRE POI C

Hydrograph type	=	Combine	Peak discharge	=	132.53 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	583,938 cuft
Inflow hyds.	=	14, 15	Contrib. drain. area	=	30.100 ac



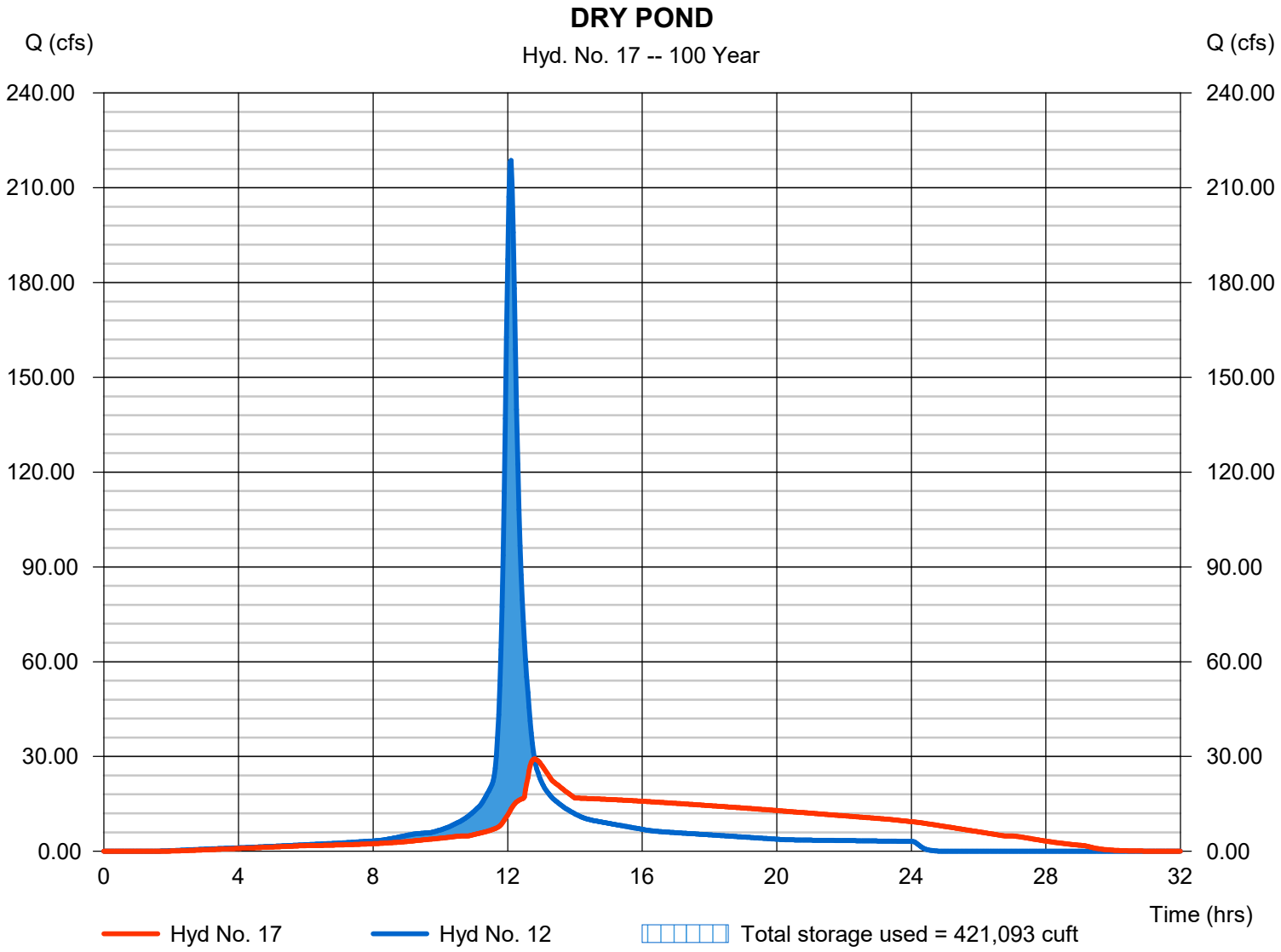
Hydrograph Report

Hyd. No. 17

DRY POND

Hydrograph type	=	Reservoir	Peak discharge	=	29.23 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.80 hrs
Time interval	=	2 min	Hyd. volume	=	834,479 cuft
Inflow hyd. No.	=	12 - WS AB	Max. Elevation	=	613.47 ft
Reservoir name	=	DRY POND	Max. Storage	=	421,093 cuft

Storage Indication method used.



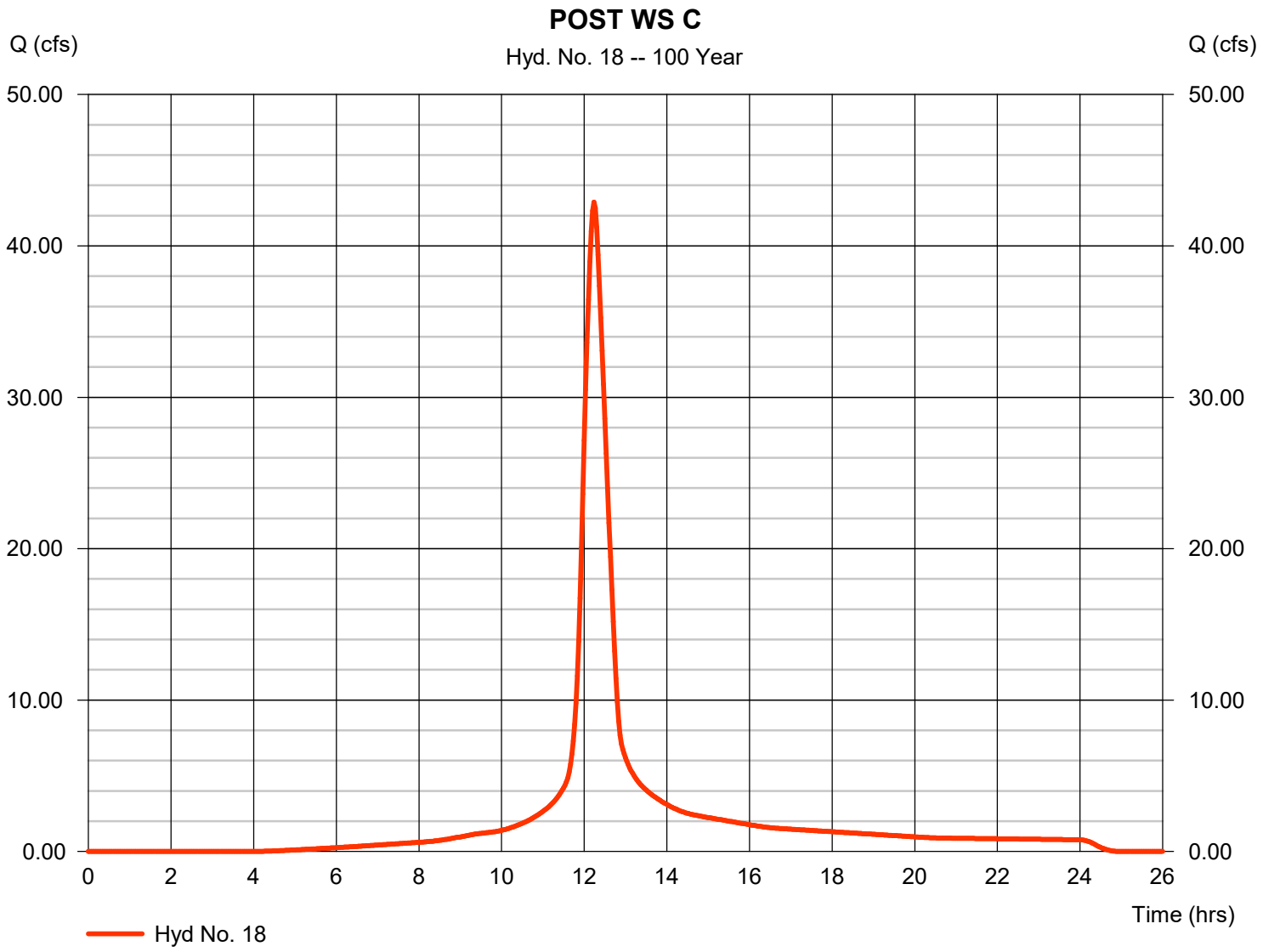
Hydrograph Report

Hyd. No. 18

POST WS C

Hydrograph type	=	SCS Runoff	Peak discharge	=	42.89 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	198,326 cuft
Drainage area	=	9.150 ac	Curve number	=	85*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	34.10 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.600 x 72) + (0.260 x 81) + (0.830 x 88) + (5.460 x 91)] / 9.150



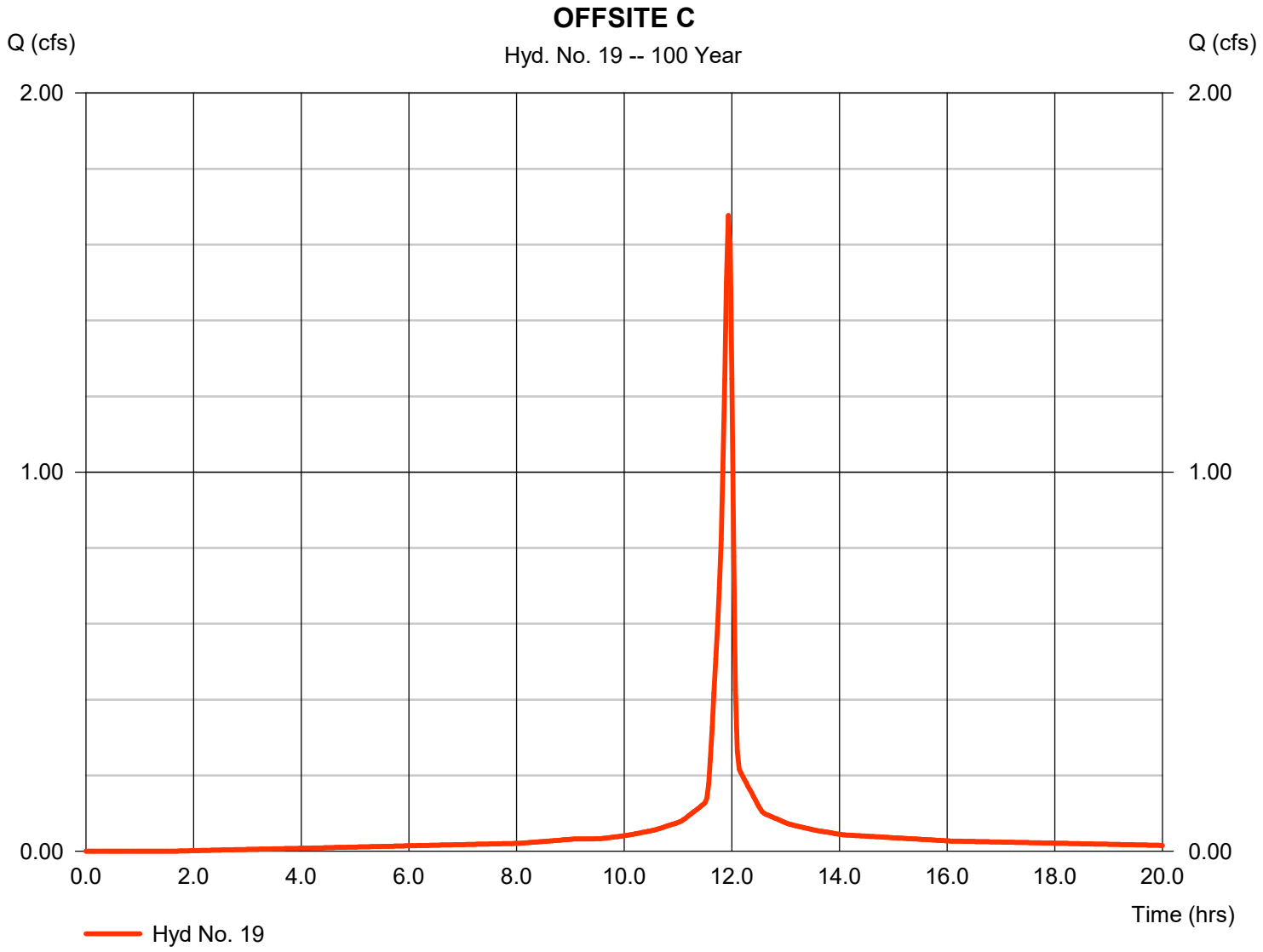
Hydrograph Report

Hyd. No. 19

OFFSITE C

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.677 cfs
Storm frequency	=	100 yrs	Time to peak	=	11.93 hrs
Time interval	=	2 min	Hyd. volume	=	3,868 cuft
Drainage area	=	0.160 ac	Curve number	=	94*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	7.82 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.030 x 81) + (0.020 x 91) + (0.110 x 98)] / 0.160

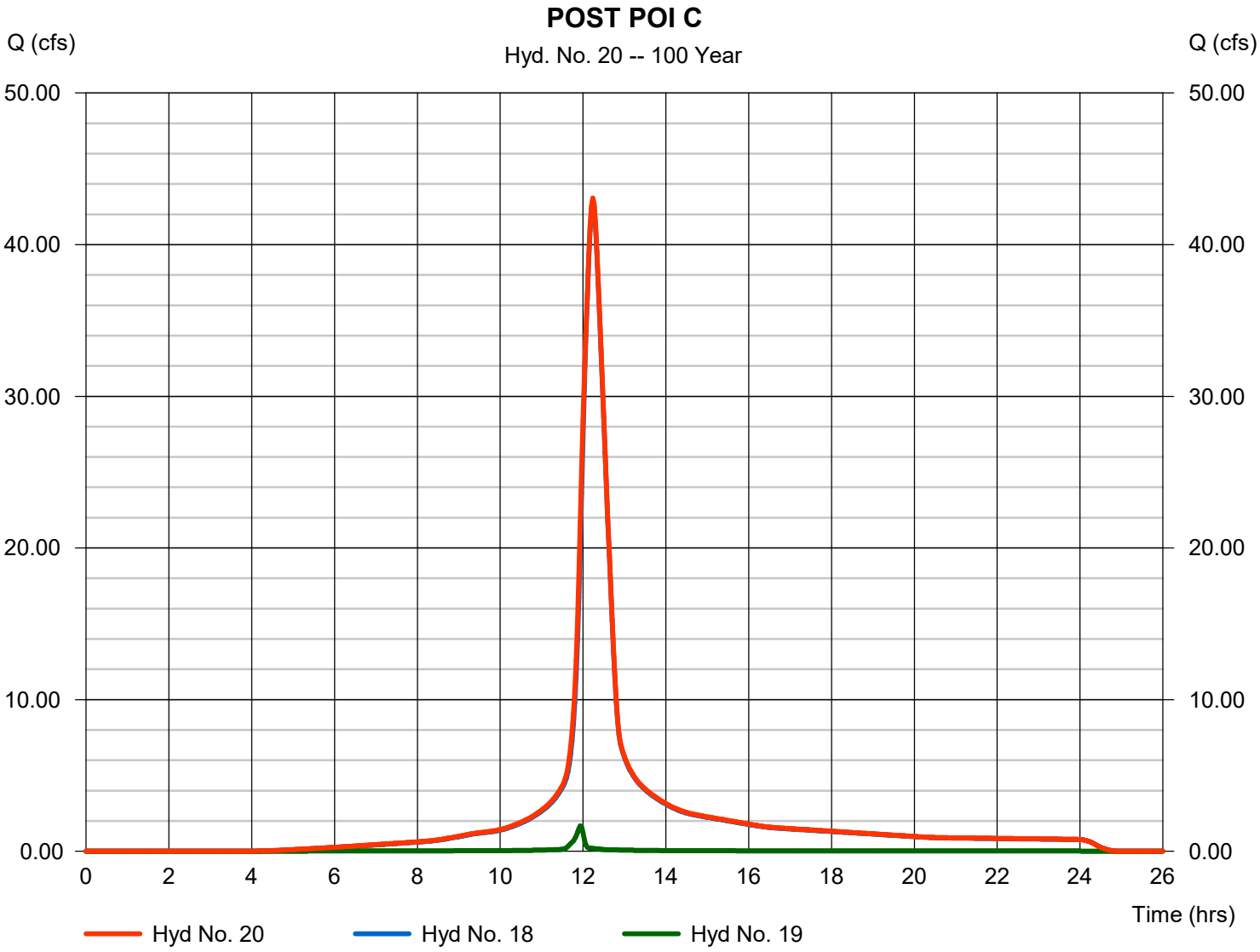


Hydrograph Report

Hyd. No. 20

POST POI C

Hydrograph type	= Combine	Peak discharge	= 43.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 202,193 cuft
Inflow hyds.	= 18, 19	Contrib. drain. area	= 9.310 ac

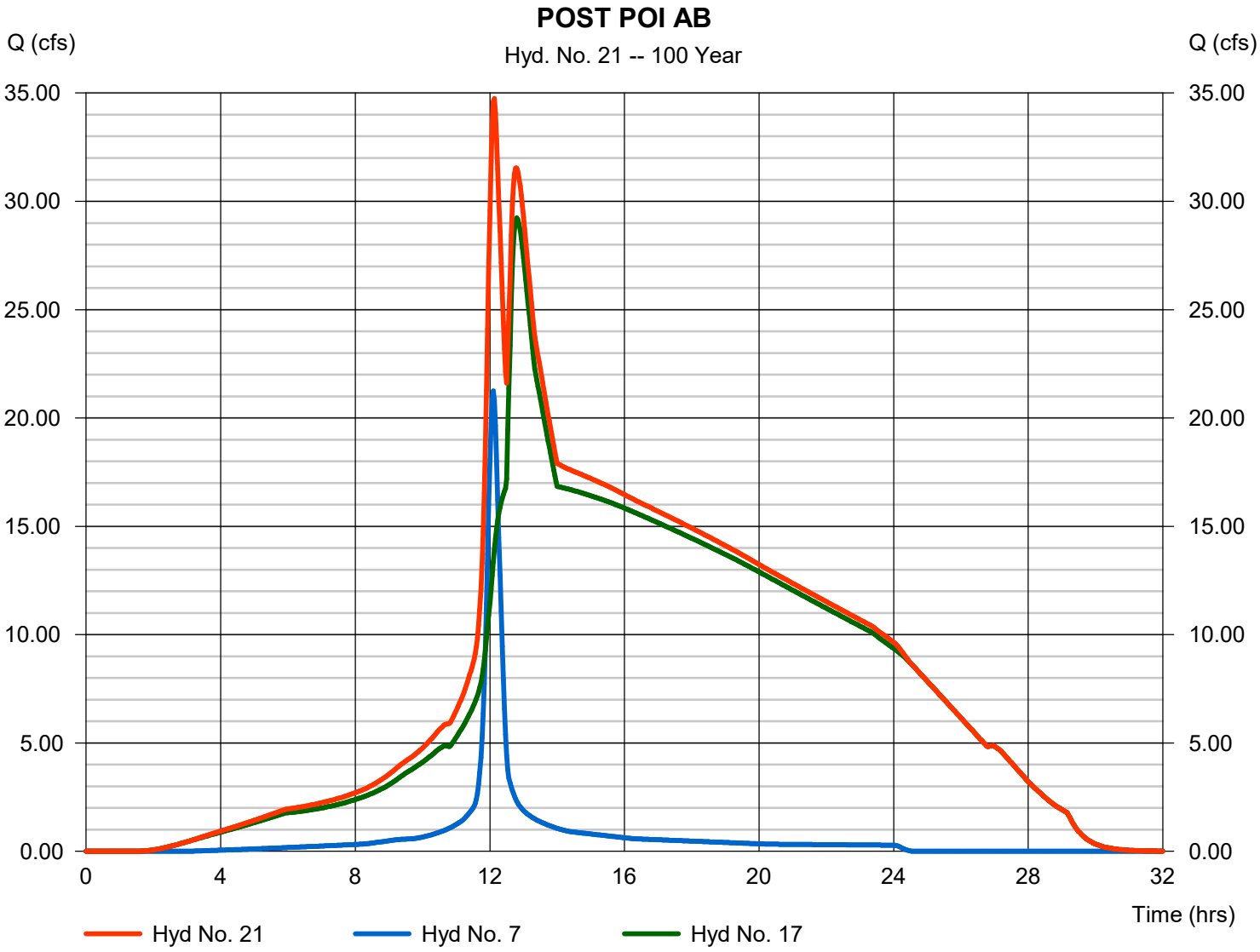


Hydrograph Report

Hyd. No. 21

POST POI AB

Hydrograph type	=	Combine	Peak discharge	=	34.74 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	911,452 cuft
Inflow hyds.	=	7, 17	Contrib. drain. area	=	3.200 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	59.7370	12.3000	0.8768	--------
2	72.8679	12.8000	0.8792	--------
3	0.0000	0.0000	0.0000	--------
5	78.0930	13.1000	0.8448	--------
10	73.4003	12.2000	0.7983	--------
25	69.2214	11.2000	0.7454	--------
50	64.0304	10.2000	0.6997	--------
100	61.0502	9.5000	0.6622	--------

File name: Mt. Pleasant.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.91	3.93	3.29	2.84	2.50	2.24	2.03	1.86	1.72	1.60	1.49	1.40
2	5.80	4.66	3.92	3.39	2.99	2.68	2.43	2.23	2.06	1.91	1.79	1.68
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	6.76	5.50	4.66	4.06	3.61	3.25	2.96	2.72	2.53	2.36	2.21	2.08
10	7.57	6.18	5.25	4.59	4.09	3.70	3.38	3.12	2.90	2.71	2.55	2.41
25	8.68	7.11	6.07	5.33	4.77	4.33	3.98	3.68	3.44	3.22	3.04	2.88
50	9.54	7.82	6.70	5.90	5.30	4.83	4.45	4.13	3.87	3.64	3.44	3.27
100	10.39	8.54	7.34	6.49	5.85	5.35	4.94	4.61	4.32	4.08	3.87	3.68

Tc = time in minutes. Values may exceed 60.

Precip. file name: \\global.gsp\data\nf\na_nf07\5011400\03ProjInfo\00DueDilg\NOAA\Mt. Pleasant.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	3.89	0.00	4.74	5.41	6.33	7.06	7.82
SCS 6-Hr	0.00	2.59	0.00	3.16	3.65	4.34	4.92	5.53
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hydraflow Table of Contents

Mustang.gpw

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025 Sunday, 07 / 20 / 2025

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, Jul 20 2025

DITCH A

Trapezoidal

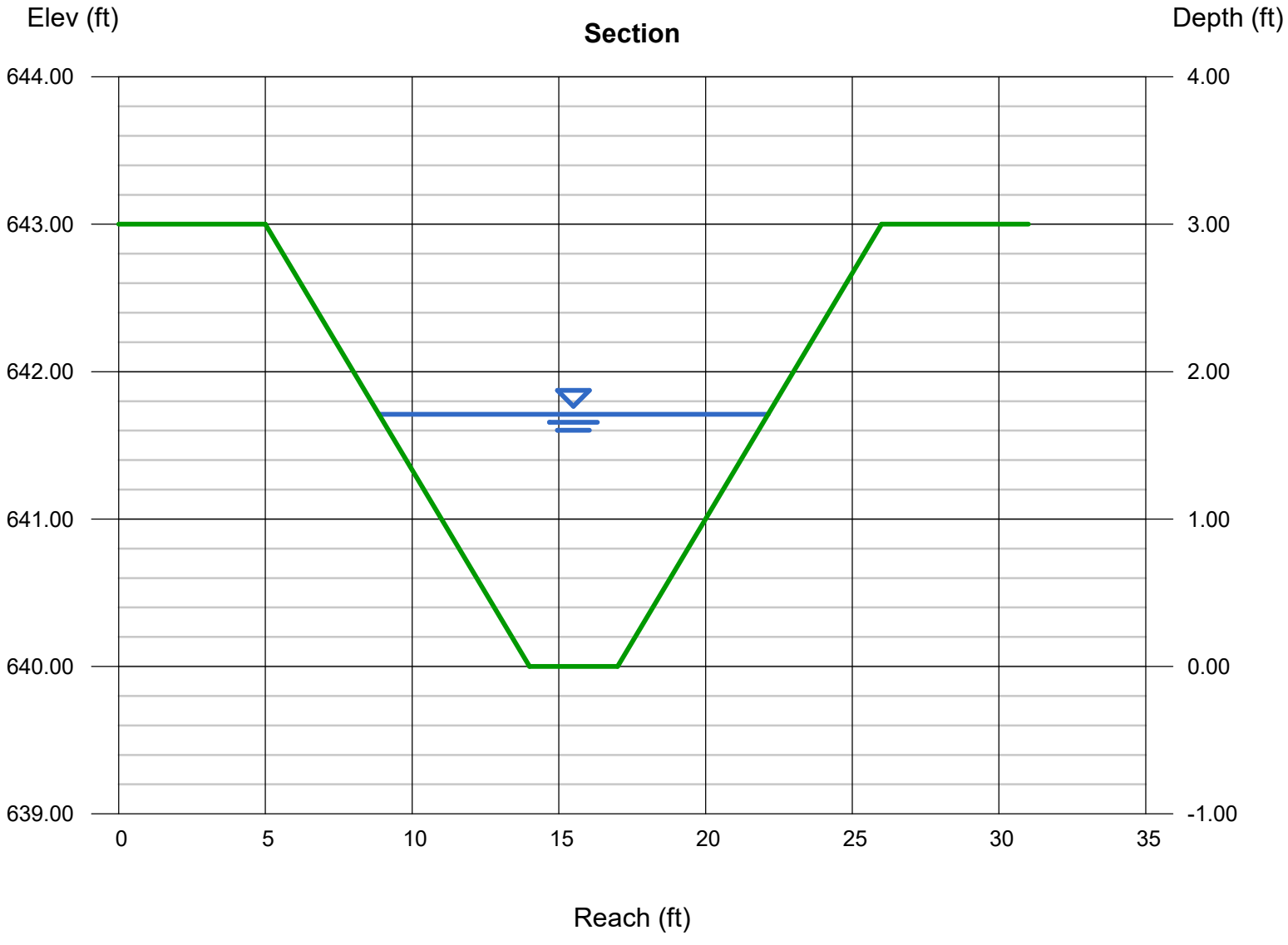
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 640.00
Slope (%)	= 1.27
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 66.74

Highlighted

Depth (ft)	= 1.71
Q (cfs)	= 66.74
Area (sqft)	= 13.90
Velocity (ft/s)	= 4.80
Wetted Perim (ft)	= 13.81
Crit Depth, Yc (ft)	= 1.56
Top Width (ft)	= 13.26
EGL (ft)	= 2.07



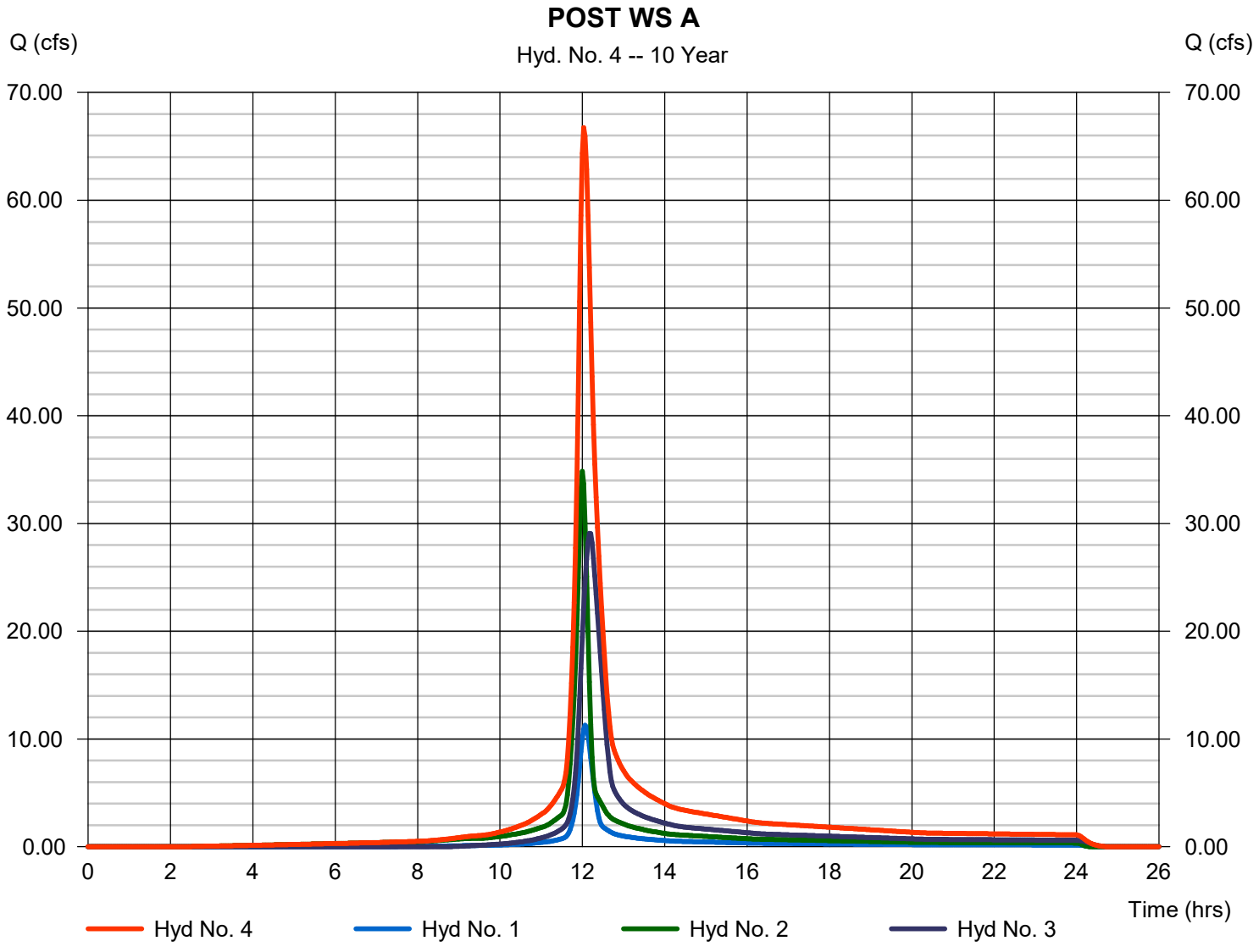
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025 Sunday, 07 / 20 / 2025

Hyd. No. 4

POST WS A

Hydrograph type	=	Combine	Peak discharge	=	66.74 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	250,699 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	20.530 ac



Hydraulic Analysis Report

Project Data

Project Title: Ditch A

Designer:

Project Date: Sunday, June 22, 2025

Project Units: U.S. Customary Units

Notes:

Channel Analysis: 10 yr

Notes:

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Channel Width 3.00 ft

Longitudinal Slope: 0.0127 ft/ft

Manning's n: 0.0618

Flow 66.7400 cfs

Result Parameters

Depth 2.2058 ft

Area of Flow 21.2135 ft^2

Wetted Perimeter 16.9505 ft

Hydraulic Radius 1.2515 ft

Average Velocity 3.1461 ft/s

Top Width 16.2346 ft

Froude Number: 0.4850

Maximum Applied Shear Stress in open-channel flow:

$$\tau_d = \gamma d S_0 \qquad \textit{(HEC 15, Eqn. 3.1)}$$

Critical Depth 1.5578 ft

Critical Velocity 5.5834 ft/s

Critical Slope: 0.0594 ft/ft

Critical Top Width 12.35 ft

τ_d = shear stress in channel at maximum depth, lb/ft2
γ = specific weight of water, lb/ft3
d = depth of flow in channel, ft
So = channel bottom slope, ft/ft

Calculated Max Shear Stress 1.7480 lb/ft^2 = (62.4*2.2058*0.0127) = 1.748 lb/ft2

Calculated Avg Shear Stress 0.9918 lb/ft^2

Channel Lining Analysis: Riprap-10 yr

Notes:

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 152.40 mm = 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.00016

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 2.61337 ft

Manning's n method: Blodgett

Manning's n: 0.0618112

Channel Bottom Shear Results

V*: 0.94975

Reynold's Number: 39020.1

Shield's Parameter: 0.047

Shear stress on channel bottom: 1.74802 lb/ft^2

Permissible shear stress for channel bottom: 2.4111 lb/ft^2

Permissible Shear Stress of a loose rock lining:

$$\tau p = F*(\gamma s - \gamma)D50 \qquad \text{(FHWA HEC 15, Eqn. 6.7)}$$

τp = permissible shear strength

F* = Shield's parameter

Reynolds number	F* (Shields' parameter)	SF
$\leq 4x10^4$	0.047	1.0
$4x10^4<R_e<2x10^5$	Linear interpolation	Linear Interpolation
$\geq 2x10^5$	0.15	1.5

γs = specific weight of rock, lb/ft3

γ = specific weight of water, lb/ft3

D50 = size-fraction of proposed rock, ft

$$\tau p = F*(\gamma s - \gamma)D50$$

$$= 0.047(165–62.4)*0.5$$

= 2.4111 lb/ft2

Channel bottom is stable	Permissible Shear Stress > Max Shear Stress

Stable D50: 110.506 mm

Channel Side Shear Results

K1: 0.868

K2: 0.876959

Kb: 0

Shear stress on side of channel: 1.74802 lb/ft^2

Permissible shear stress for side of channel: 2.11444 lb/ft^2

Stable Side D50: 0.358848 lb/ft^2

Side of channel is stable

Channel Lining Stability Results 2

The channel is stable

Channel Summary

Name of Selected Channel: 10 yr

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Sunday, Jul 20 2025

DITCH B

Trapezoidal

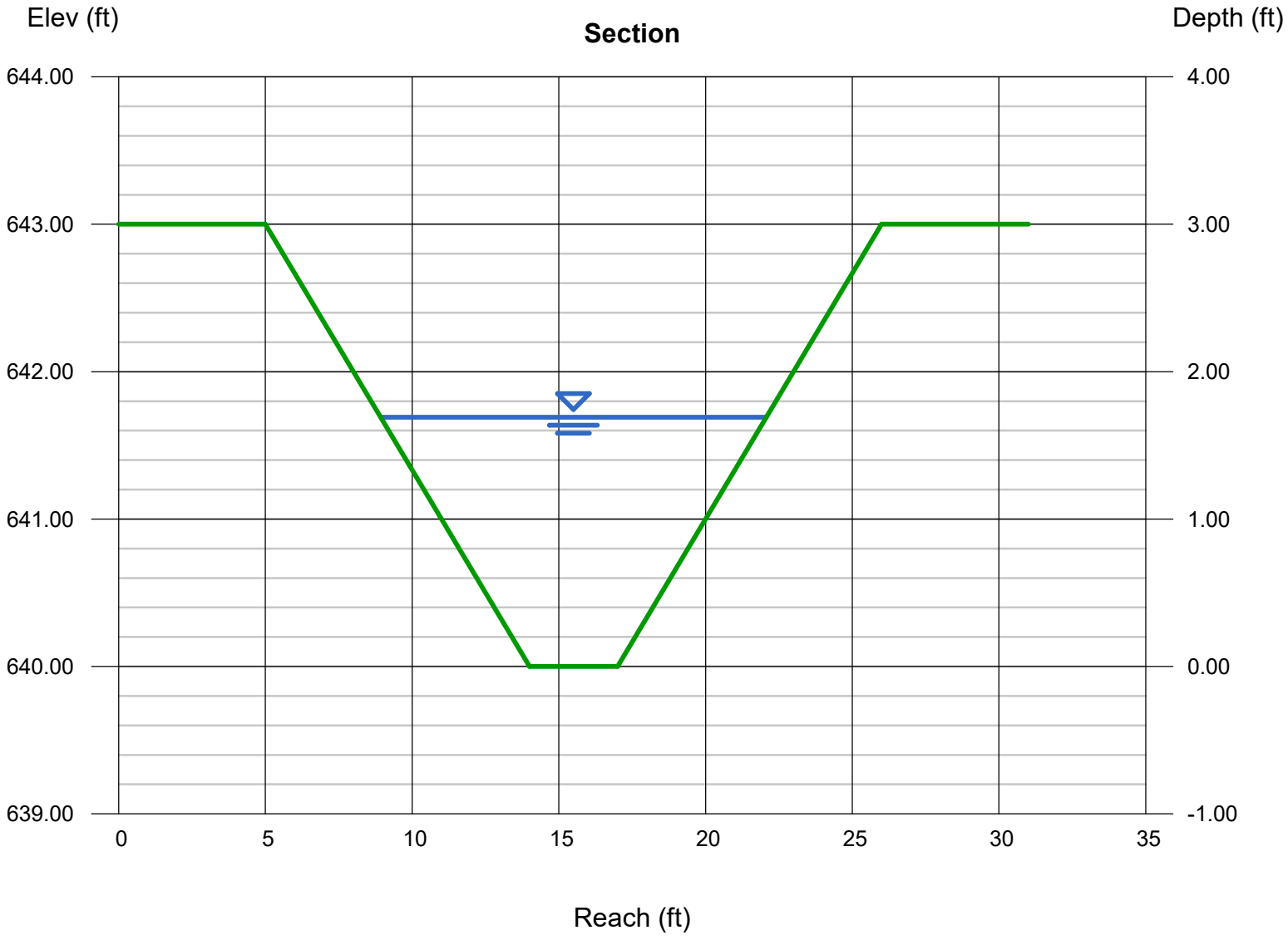
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 3.00, 3.00
Total Depth (ft)	= 3.00
Invert Elev (ft)	= 640.00
Slope (%)	= 1.40
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 67.99

Highlighted

Depth (ft)	= 1.69
Q (cfs)	= 67.99
Area (sqft)	= 13.64
Velocity (ft/s)	= 4.99
Wetted Perim (ft)	= 13.69
Crit Depth, Yc (ft)	= 1.58
Top Width (ft)	= 13.14
EGL (ft)	= 2.08



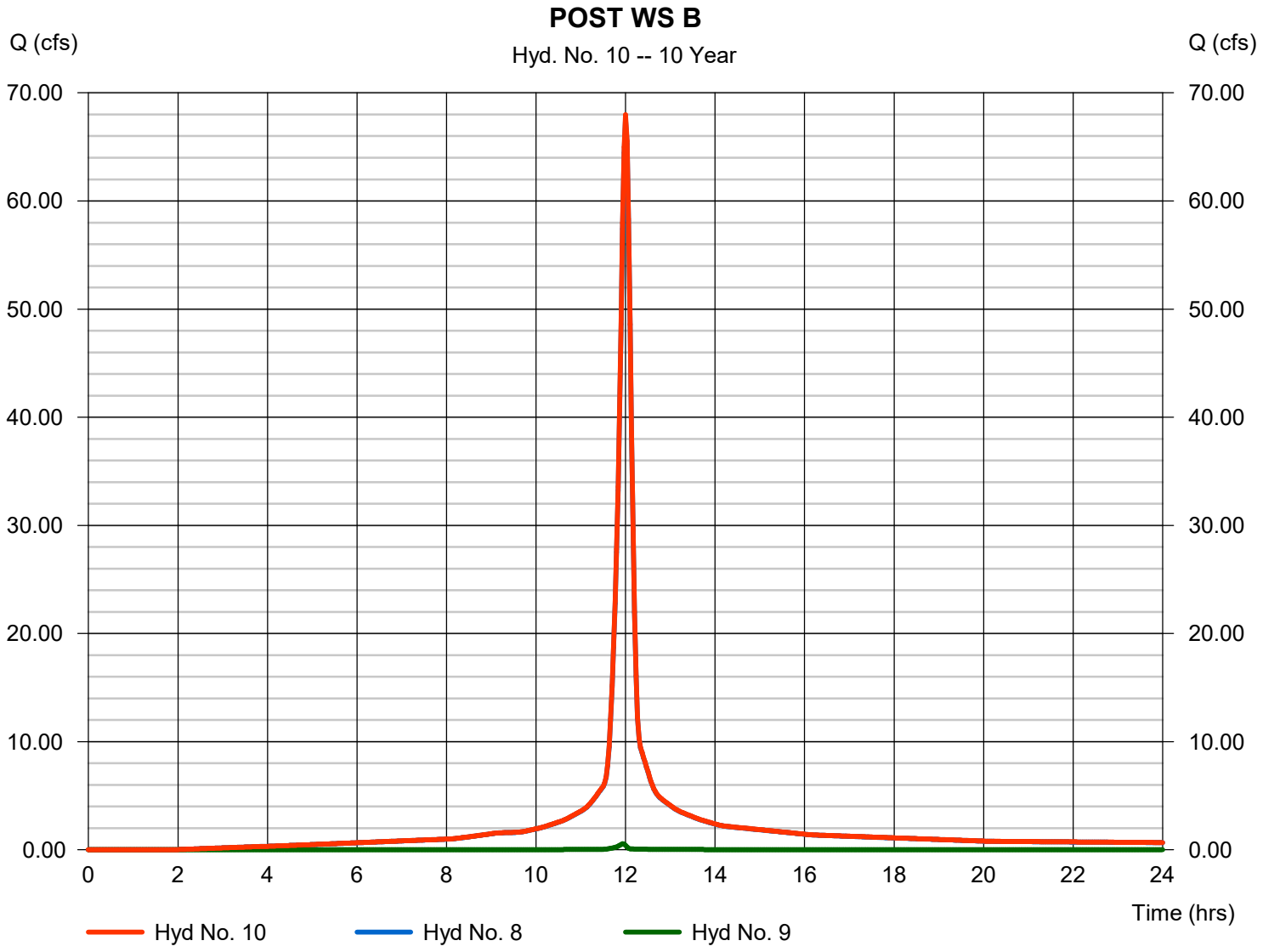
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025 Sunday, 07 / 20 / 2025

Hyd. No. 10

POST WS B

Hydrograph type	=	Combine	Peak discharge	=	67.99 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	194,163 cuft
Inflow hyds.	=	8, 9	Contrib. drain. area	=	10.760 ac



Hydraulic Analysis Report

Project Data

Project Title: DITCH B

Designer:

Project Date: Sunday, June 22, 2025

Project Units: U.S. Customary Units

Notes:

Channel Analysis: 10 yr

Notes: FHWA Hydraulic Toolbox 5.4

Input Parameters

Channel Type: Trapezoidal

Side Slope 1 (Z1): 3.0000 ft/ft

Side Slope 2 (Z2): 3.0000 ft/ft

Channel Width 3.00 ft

Longitudinal Slope: 0.0140 ft/ft

Manning's n: 0.0624

Flow 64.9500 cfs

Result Parameters

Depth 2.1414 ft

Area of Flow 20.1817 ft^2

Wetted Perimeter 16.5437 ft

Hydraulic Radius 1.2199 ft

Average Velocity 3.2183 ft/s

Top Width 15.8487 ft

Froude Number: 0.5026

Maximum Applied Shear Stress in open-channel flow:

$$\tau_d = \gamma d S_0 \qquad \textit{(HEC 15, Eqn. 3.1)}$$

Critical Depth 1.5371 ft

Critical Velocity 5.5517 ft/s

Critical Slope: 0.0607 ft/ft

Critical Top Width 12.22 ft

τ_d = shear stress in channel at maximum depth, lb/ft2
γ = specific weight of water, lb/ft3
d = depth of flow in channel, ft
So = channel bottom slope, ft/ft

Calculated Max Shear Stress 1.8708 lb/ft^2 = (62.4*2.1414*0.014) = 1.871 lb/ft2

Calculated Avg Shear Stress 1.0657 lb/ft^2

Channel Lining Analysis: Riprap-10 yr

Notes: FHWA Hydraulic Toolbox 5.4

Lining Input Parameters

Channel Lining Type: Riprap, Cobble, or Gravel

D50: 152.40 mm = 0.5 ft

Riprap Specific Weight: 165 lb/ft^3

Water Specific Weight: 62.4 lb/ft^3

Riprap Shape is Angular

Safety Factor: 1

Calculated Safety Factor: 1.0013

Lining Results

Angle of Repose: 41.15 degrees

Relative Flow Depth: 2.5468 ft

Manning's n method: Blodgett

Manning's n: 0.0623708

Channel Bottom Shear Results

V*: 0.982528

Reynold's Number: 40366.8

Shield's Parameter: 0.0472361

Shear stress on channel bottom: 1.87076 lb/ft^2

Permissible shear stress for channel bottom: 2.42321 lb/ft^2

Permissible Shear Stress of a loose rock lining:

$$\tau p = F*(\gamma s - \gamma)D50 \qquad \text{(FHWA HEC 15, Eqn. 6.7)}$$

τp = permissible shear strength

F* = Shield's parameter

Reynolds number	F* (Shields' parameter)	SF
$\leq 4x10^4$	0.047	1.0
$4x10^4<R_e<2x10^5$	Linear interpolation	Linear Interpolation
$\geq 2x10^5$	0.15	1.5

γs = specific weight of rock, lb/ft3

γ = specific weight of water, lb/ft3

D50 = size-fraction of proposed rock, ft

$$\tau p = F*(\gamma s - \gamma)D50$$

$$= 0.0472361(165–62.4)*0.5$$

= 2.4232 lb/ft2

Channel bottom is stable	Permissible Shear Stress > Max Shear Stress

Stable D50: 117.809 mm

Channel Side Shear Results

K1: 0.868

K2: 0.876959

Kb: 0

Shear stress on side of channel: 1.87076 lb/ft^2

Permissible shear stress for side of channel: 2.12506 lb/ft^2

Stable Side D50: 0.382563 lb/ft^2

Side of channel is stable

Channel Lining Stability Results 2

The channel is stable

Channel Summary

Name of Selected Channel: 10 yr

Sediment Basin Calculations:

Total Drainage Area: 36.62 acres

Required Storage:

Total Storage Volume: 3618 cf/ac * 36.62 ac = 132,491.16 cf

Wet Storage: 1809 cf/ac * 36.62 ac = 66,245.58 cf

Dry Storage: 1809 cf/ac * 36.62 ac = 66,245.58 cf

- Forebay: 453.6 cf/ac * 36.62 = 16,610.83 cf
- Main Basin: 66,245.58 cf – 16,610.83 cf = 49,634.75 cf

Provided Storage:

Wet Storage:

- Bottom Dimensions (609.00 ft): 13,063.44 sf
- Permanent Pool Dimensions (611.00 ft): 89,656.47 sf

$$V = \frac{(13{,}063.44 + 89{,}656.47) * 2}{2} = 102{,}719.91\ cf$$

Total Wet Storage (Bottom of Pond to Permanent Pool): 102,719.91 cf > 66,245.58 cf

Dry Storage:

Forebay A:

- Bottom of Forebay A Dimensions (611.00 ft): 13,854.73 sf
- Top of Forebay A Dimensions (613.00 ft): 16,704.68 sf

$$V = \frac{(13{,}854.73 + 16{,}704.68) * 2}{2} = 30{,}559.41\ cf$$

Forebay B:

- Bottom of Forebay B Dimensions (611.00 ft): 12,378.46 sf
- Top of Forebay B Dimensions (613.00 ft): 15,570.87 sf

$$V = \frac{(12{,}378.46 + 15{,}570.87) * 2}{2} = 27{,}949.33\ cf$$

Total Forebay Storage: 58,508.74 cf > 16,610.83 cf

Main Basin:

- Dimensions at Permanent Pool (611.00 ft): 89,656.47 sf
- Dimensions at Top (613.00 ft): 95,017.49 sf

$$V = \frac{(89{,}656.47 + 95{,}017.49) * 2}{2} = 184{,}673.96\ cf$$

Main Basin Storage: 184,673.96 > 49,634.75 cf

Total Dry Storage, including Forebay:

58,508.74 cf + 184,673.96 = 243,182.70 cf > 66,245.58 cf

Total Provided Storage:

102,720 cf + 243,183 cf = 345,903 cf > 132,491 cf

Principal Spillway:

Elevation: 612.30 ft

$Qp_{5yr,24hr}$= 119.07 cfs

Emergency Spillway:

Elevation: 613.30 ft

$Qp_{25yr,24hr}$= 170.09 cfs*

*TR-55 generated via Hydraflow Hydrographs Extension for Autodesk Civil 3D

Weir Length = 38 ft

Design Flow:

170.09 cfs – 31.39 cfs* = 138.70 cfs

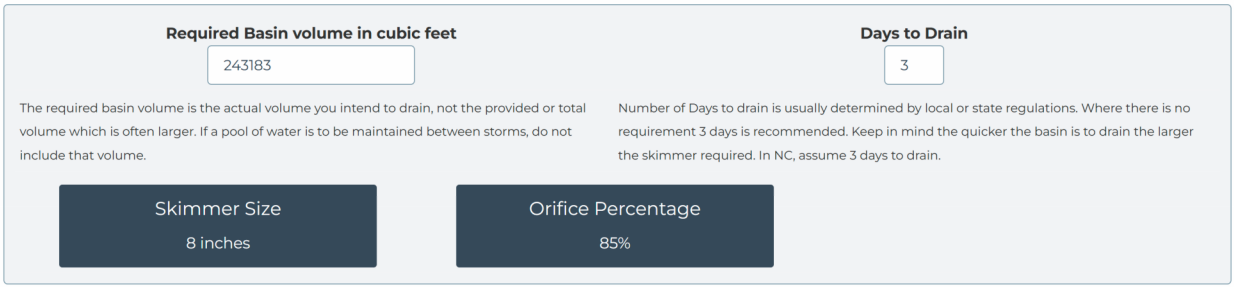
*Interpolated flow credited to 3 ft diameter principal spillway at 1 ft head over crest given by Hydraflow Express Extension for Autodesk Civil 3D

Top of Berm: 616.00 ft

613.00 ft (E-spillway Elev) + 1.02 ft* (depth of 25 yr storm) + 1 ft (min. freeboard) = 615.02 ft

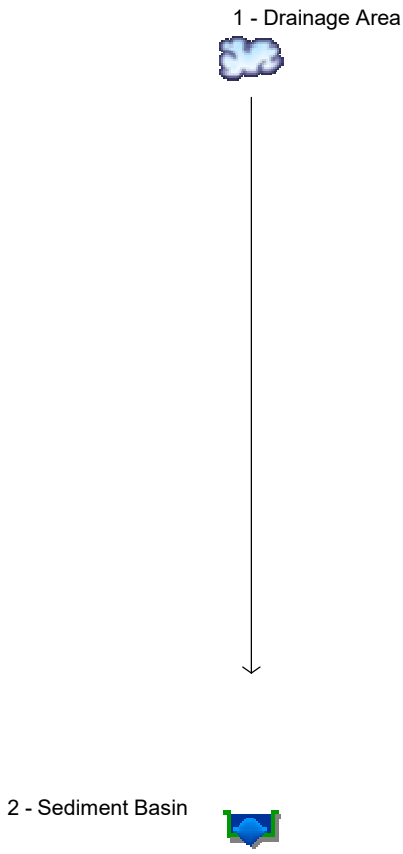
*Flow control depth given by Hydraflow Express Extension for Autodesk Civil 3D at the design flow Q

Skimmer:



Using the Simple Faircloth Skimmer Sizing Calculator at https://fairclothskimmer.com/sediment-skimmer-calculator/

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Drainage Area
2	Reservoir	Sediment Basin

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	------	-------	-------	-------	167.98	-------	241.97	-------	-------	Drainage Area
2	Reservoir	1	-------	-------	-------	5.706	-------	16.45	-------	-------	Sediment Basin

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

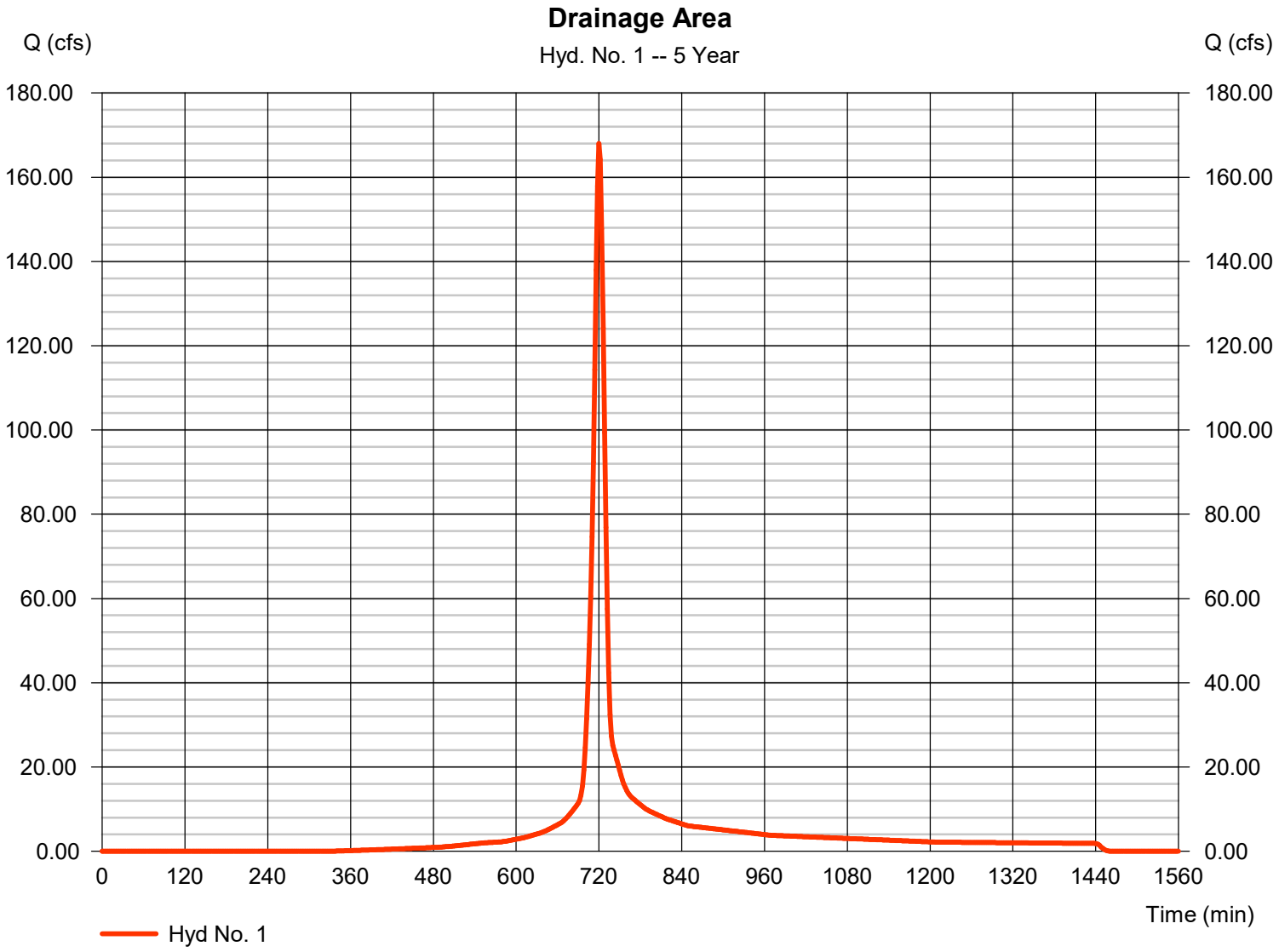
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	167.98	2	720	442,111	------	------	------	Drainage Area
2	Reservoir	5.706	2	866	169,428	1	612.62	312,516	Sediment Basin

Hydrograph Report

Hyd. No. 1

Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 167.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 442,111 cuft
Drainage area	= 36.620 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.50 min
Total precip.	= 4.74 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



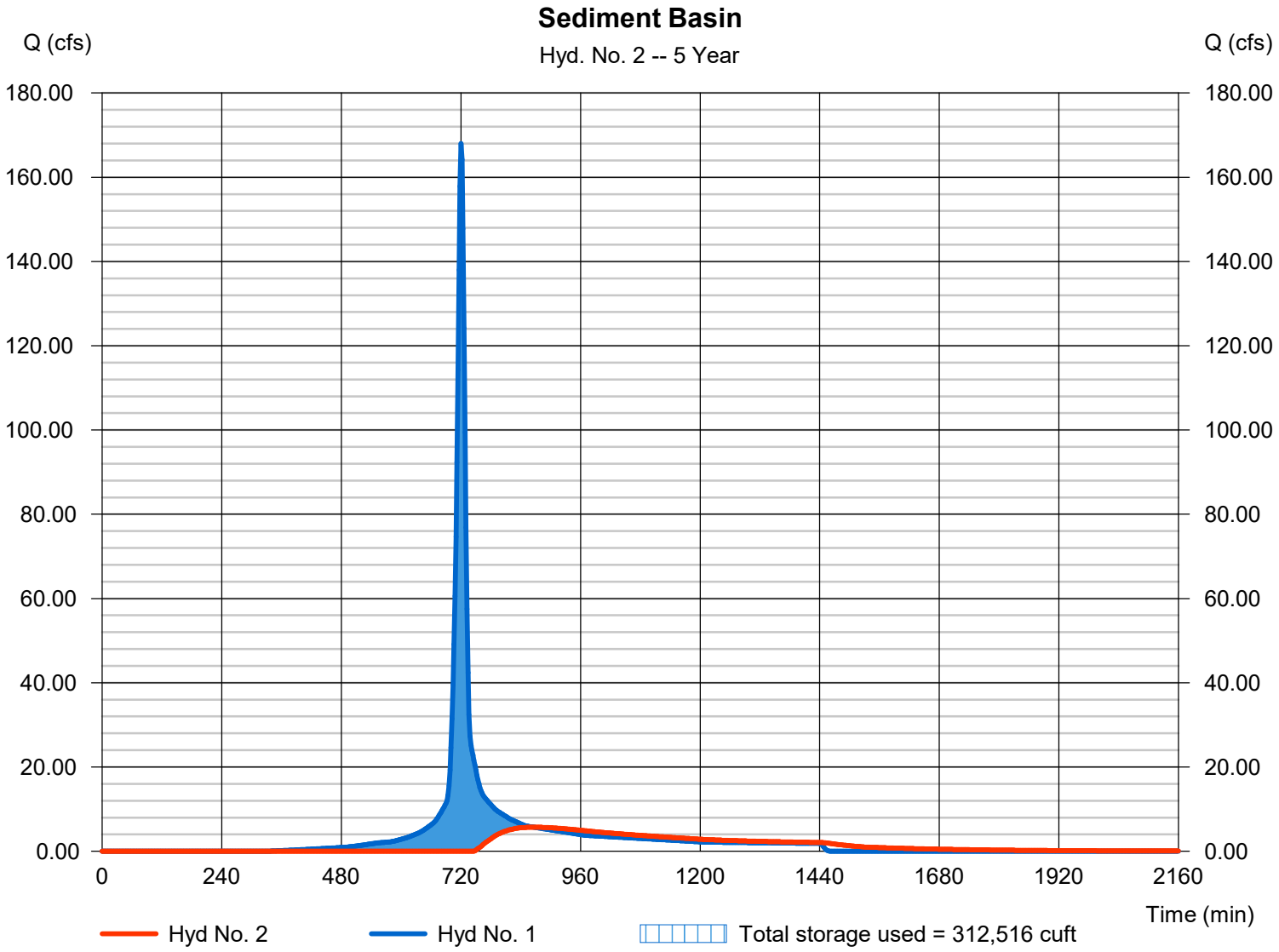
Hydrograph Report

Hyd. No. 2

Sediment Basin

Hydrograph type	=	Reservoir	Peak discharge	=	5.706 cfs
Storm frequency	=	5 yrs	Time to peak	=	866 min
Time interval	=	2 min	Hyd. volume	=	169,428 cuft
Inflow hyd. No.	=	1 - Drainage Area	Max. Elevation	=	612.62 ft
Reservoir name	=	Reservoir	Max. Storage	=	312,516 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Reservoir

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 609.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	609.00	13,063	0	0
1.00	610.00	50,447	31,755	31,755
2.00	611.00	117,425	83,936	115,691
3.00	612.00	121,802	119,614	235,305
4.00	613.00	127,302	124,552	359,857
5.00	614.00	133,450	130,376	490,233
6.00	615.00	140,445	136,947	627,180
7.00	616.00	148,356	144,401	771,581

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	0.00	0.00	Inactive
Span (in)	= 18.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 608.90	0.00	0.00	0.00
Length (ft)	= 58.80	0.00	0.00	0.00
Slope (%)	= 0.51	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	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.42	38.00	0.00	0.00
Crest El. (ft)	= 612.30	613.30	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	Ciplti	---	---
Multi-Stage	= Yes	No	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	609.00	0.00	---	---	---	0.00	0.00	---	---	---	---	0.000
1.00	31,755	610.00	0.06 ic	---	---	---	0.00	0.00	---	---	---	---	0.000
2.00	115,691	611.00	0.06 ic	---	---	---	0.00	0.00	---	---	---	---	0.000
3.00	235,305	612.00	0.06 ic	---	---	---	0.00	0.00	---	---	---	---	0.000
4.00	359,857	613.00	14.35 oc	---	---	---	14.35 s	0.00	---	---	---	---	14.35
5.00	490,233	614.00	17.42 oc	---	---	---	17.42 s	74.11	---	---	---	---	91.53
6.00	627,180	615.00	19.59 oc	---	---	---	19.55 s	280.48	---	---	---	---	300.04
7.00	771,581	616.00	21.43 ic	---	---	---	21.42 s	561.41	---	---	---	---	582.82

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2025

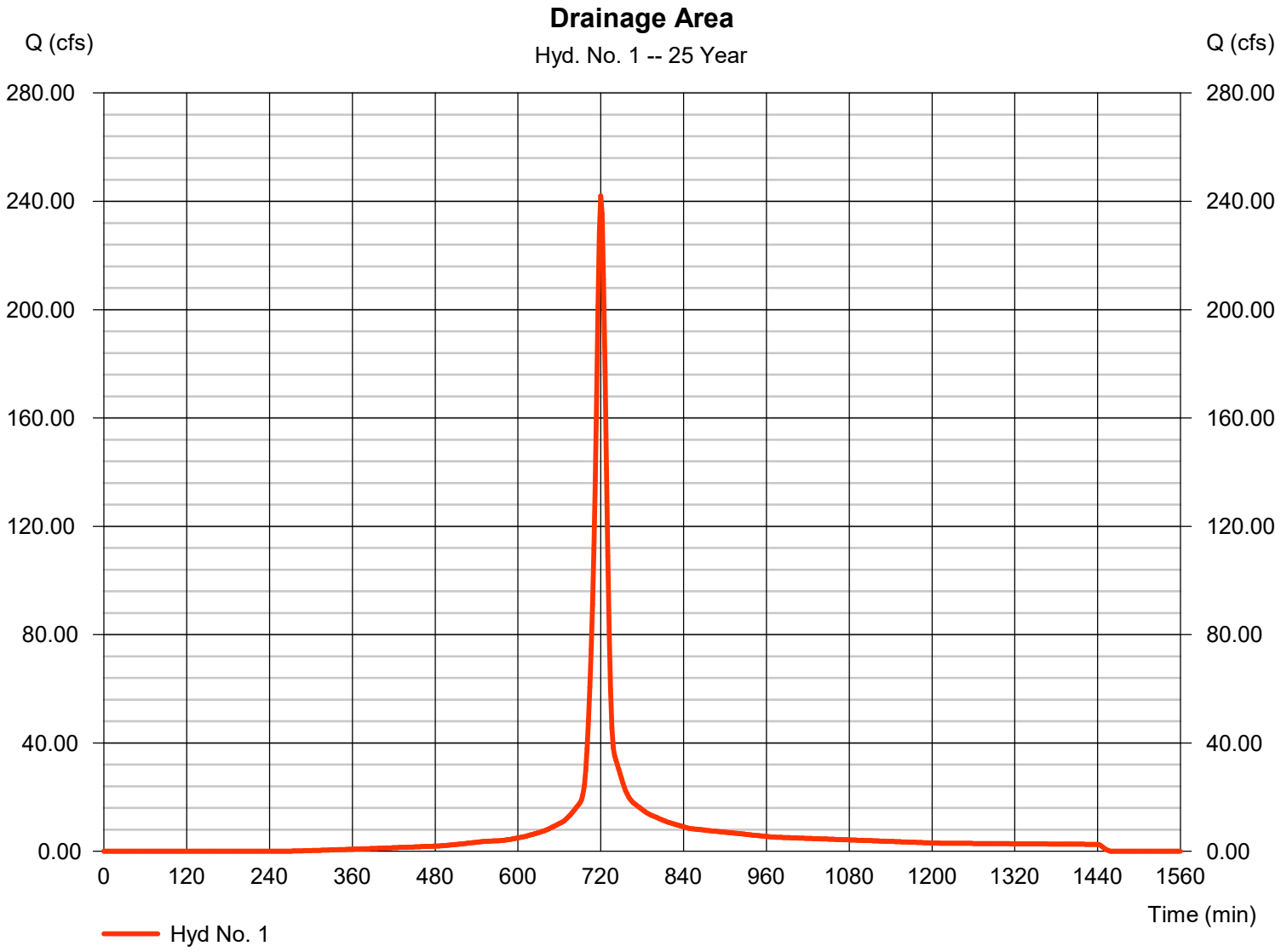
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	241.97	2	720	647,551	------	------	------	Drainage Area
2	Reservoir	16.45	2	774	374,868	1	613.32	401,655	Sediment Basin

Hydrograph Report

Hyd. No. 1

Drainage Area

Hydrograph type	= SCS Runoff	Peak discharge	= 241.97 cfs
Storm frequency	= 25 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 647,551 cuft
Drainage area	= 36.620 ac	Curve number	= 86
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.50 min
Total precip.	= 6.33 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



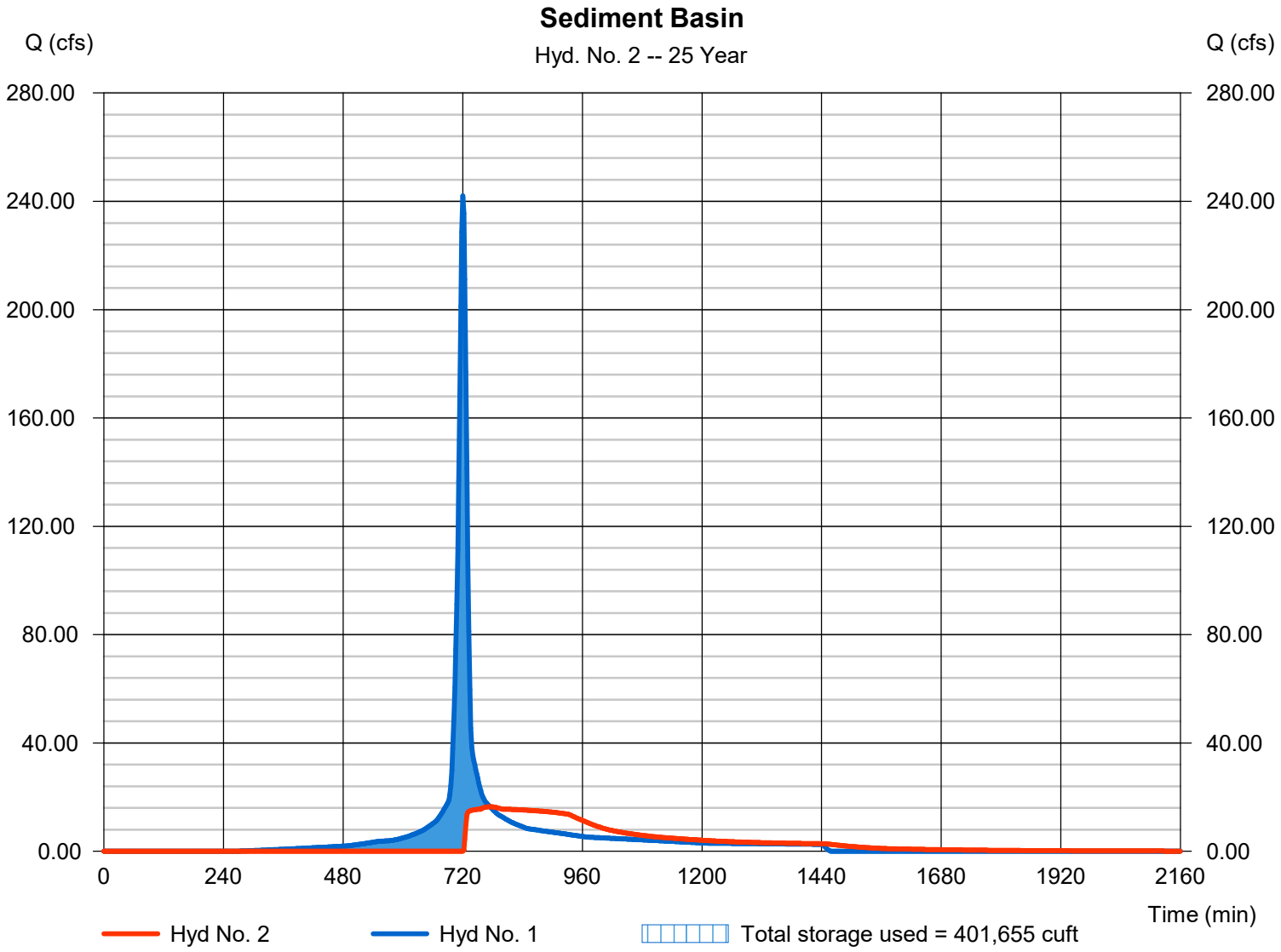
Hydrograph Report

Hyd. No. 2

Sediment Basin

Hydrograph type	=	Reservoir	Peak discharge	=	16.45 cfs
Storm frequency	=	25 yrs	Time to peak	=	774 min
Time interval	=	2 min	Hyd. volume	=	374,868 cuft
Inflow hyd. No.	=	1 - Drainage Area	Max. Elevation	=	613.32 ft
Reservoir name	=	Reservoir	Max. Storage	=	401,655 cuft

Storage Indication method used.



Weir Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jul 22 2025

Flow Control Depth at Design Q

Rectangular Weir

Crest	= Sharp
Bottom Length (ft)	= 38.00
Total Depth (ft)	= 3.00

Calculations

Weir Coeff. Cw	= 3.33
Compute by:	Q vs Depth
No. Increments	= 50

Highlighted

Depth (ft)	= 1.02
Q (cfs)	= 130.36
Area (sqft)	= 38.76
Velocity (ft/s)	= 3.36
Top Width (ft)	= 38.00