Stormwater Management Report
DUTCH BROS COFFEE

4347 Portage Street NW
North Canton, Stark County, Ohio
WEG Project No. 20260084
November 3, 2026

Prepared by:



wohlwend
engineering group
4547 Mogadore Road, Suite W
Kent, OH 44240
Phone: (330)-673-2400

PURPOSE OF STUDY

The purpose of this study is to analyze the hydrological effects of the construction of a new drive-thru coffee shop and associated parking on Jackson Township's storm water drainage system in accordance with the Stark County Engineer's Storm Water Regulations.

PROJECT LOCATION

The project is located on the northwest corner of Jackson Street NW and Freedom Avenue.

CURRENT CONDITIONS AND WATERSHED

The existing site was home to a past business and parking.

PROPOSED DEVELOPMENT DESCRIPTION

The proposed development consists of constructing a new drive-thru coffee shop and associated parking.

This project will not require detention because the proposed impervious area is less than the existing impervious areas and reduces stormwater flows to the existing storm sewer system.

The project will not require water quality treatment because the disturbed area is less than an acre.

METHOD OF ANALYSIS AND RAINFALL DATA

The modified rational method was used to generate all calculations for the 1 through 100-year storm events for both the existing and developed conditions for sizing the detention facilities. The rainfall data used for the analysis was obtained from the NOAA Atlas 14 data.

Time of concentrations shown in the summary tables were calculated using the TR-55 method. A minimum time of concentration of 10 minutes was used when the calculated time of concentration was less than 10 minutes.

DRAINAGE AREA SUMMARY

Predeveloped

Description	Area (Acres)	%	C
Impervious Area (HSG Type A)	0.53	67.1	0.95
Lawn Area (HSG Type A)	0.26	32.9	0.30
Total	0.79	100.00	0.88

	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Flows (CFS)	1.746	2.095	2.550	2.883	3.313	3.625	3.935

Proposed

Description	Area (Acres)	%	C
Grass / Open Area (HSG Type A)	0.34	43.0	0.30
Impervious Area (HSG Type A)	0.45	57.0	0.95
Total	0.79	100.00	0.67

	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Flows (CFS)	1.580	1.897	2.309	2.610	3.000	3.283	3.563

The post-developed peak flows from every respective storm event are less than the pre-developed flows thus proving that storm water management is not required.

EXISTING HYDROGRAPH

Hydrograph Report

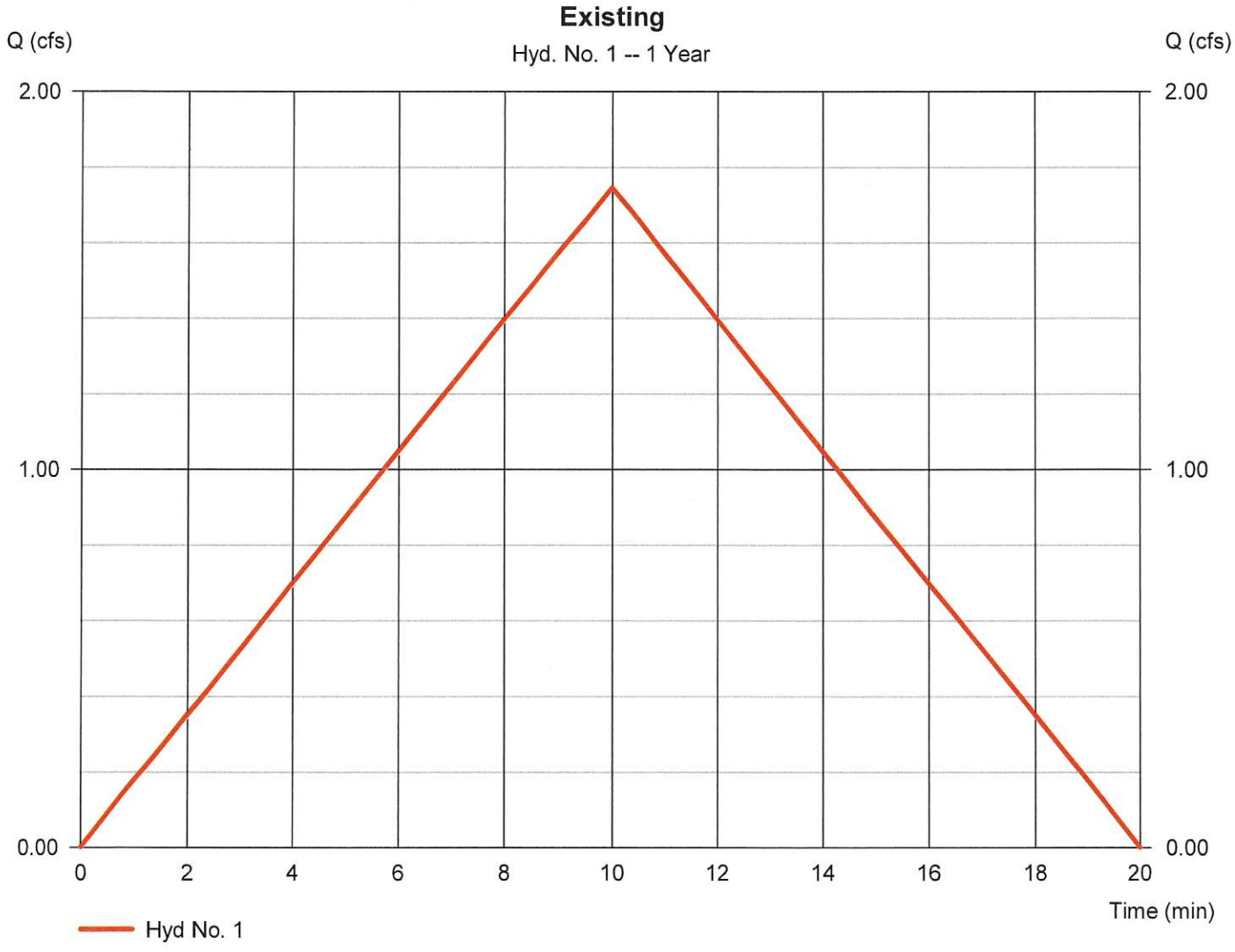
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Monday, 11 / 2 / 2026

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 1.746 cfs
Storm frequency	= 1 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,047 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 2.986 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



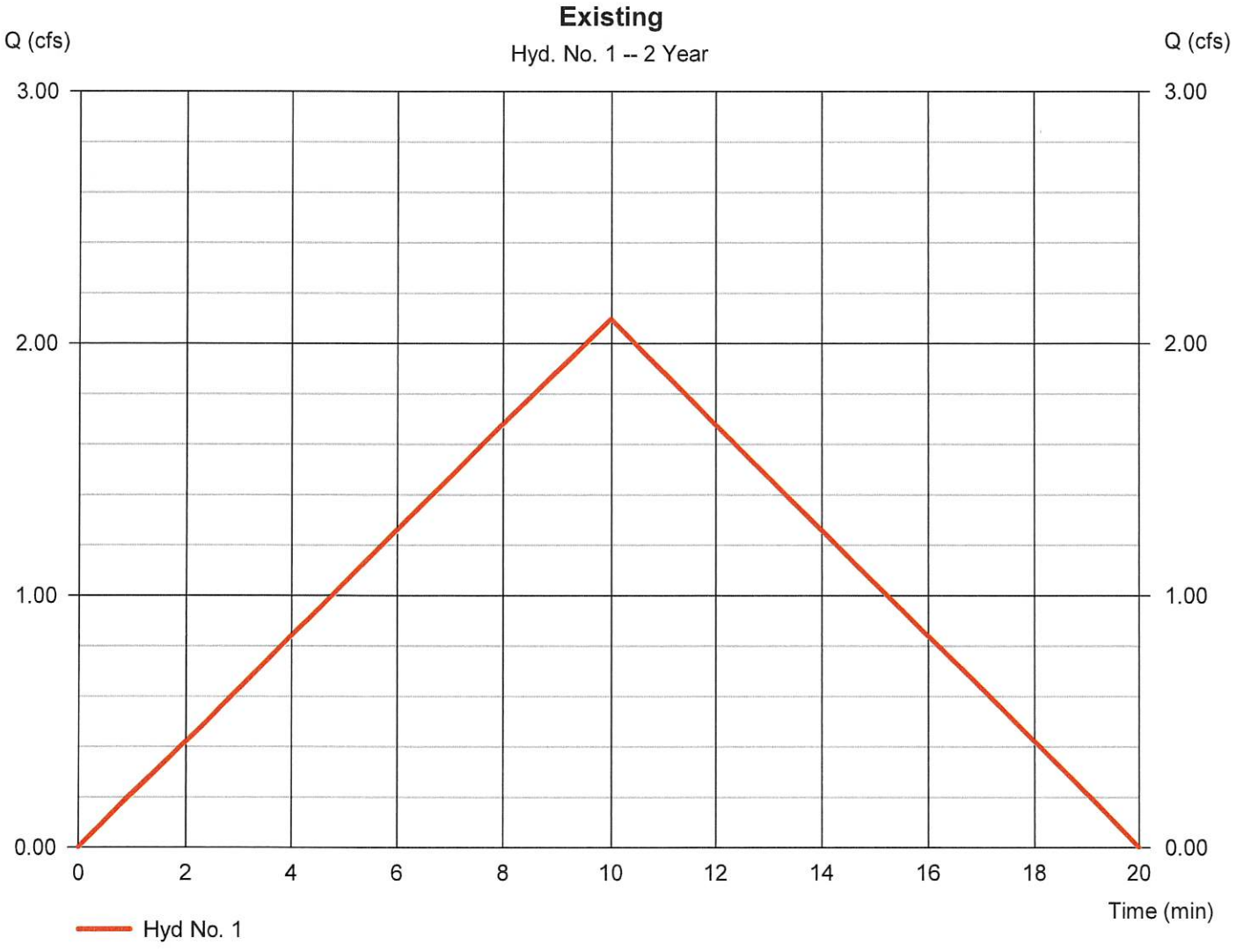
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 2.095 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,257 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 3.584 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



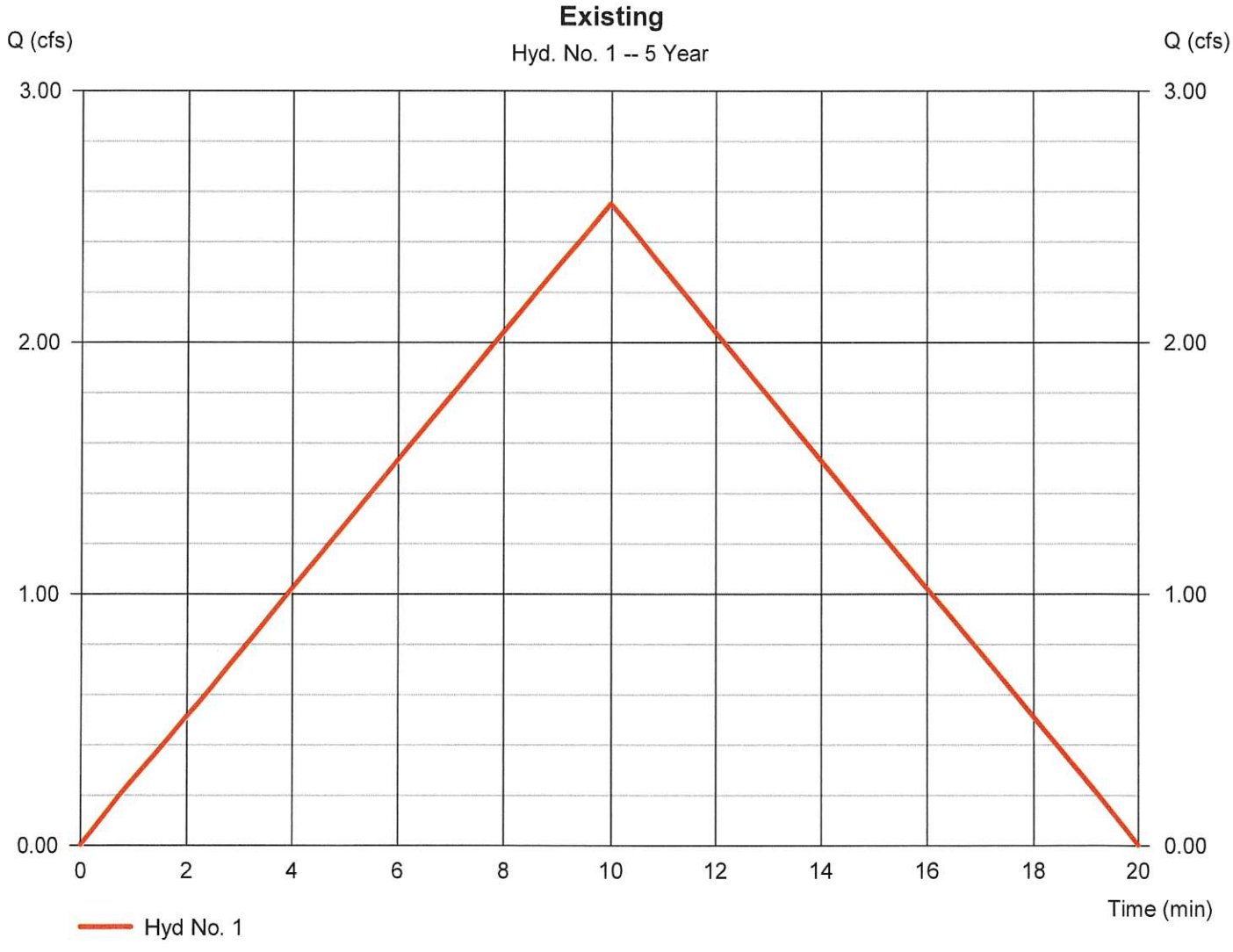
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 2.550 cfs
Storm frequency	= 5 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,530 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 4.362 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



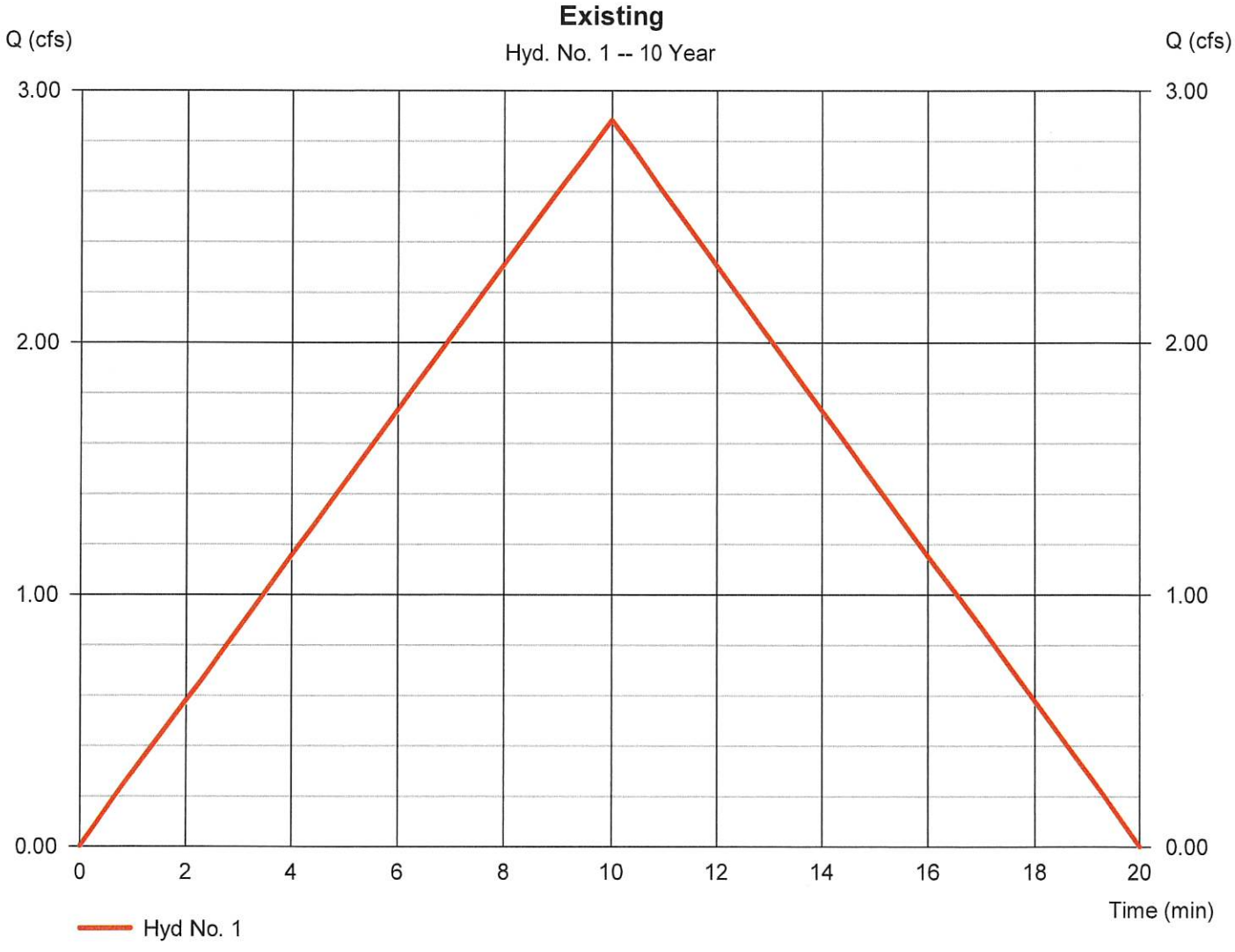
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 2.883 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,730 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 4.932 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



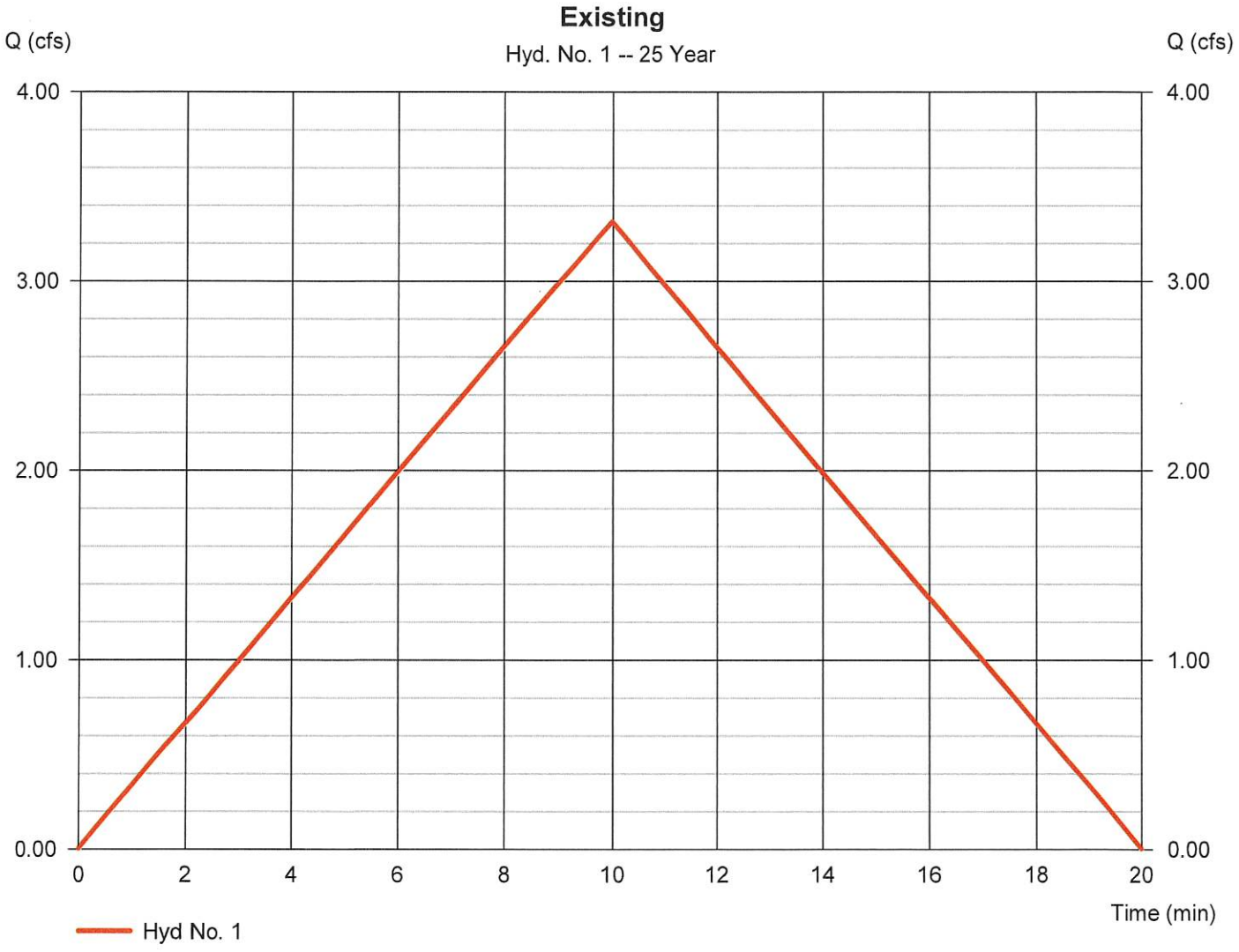
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 3.313 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,988 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 5.667 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



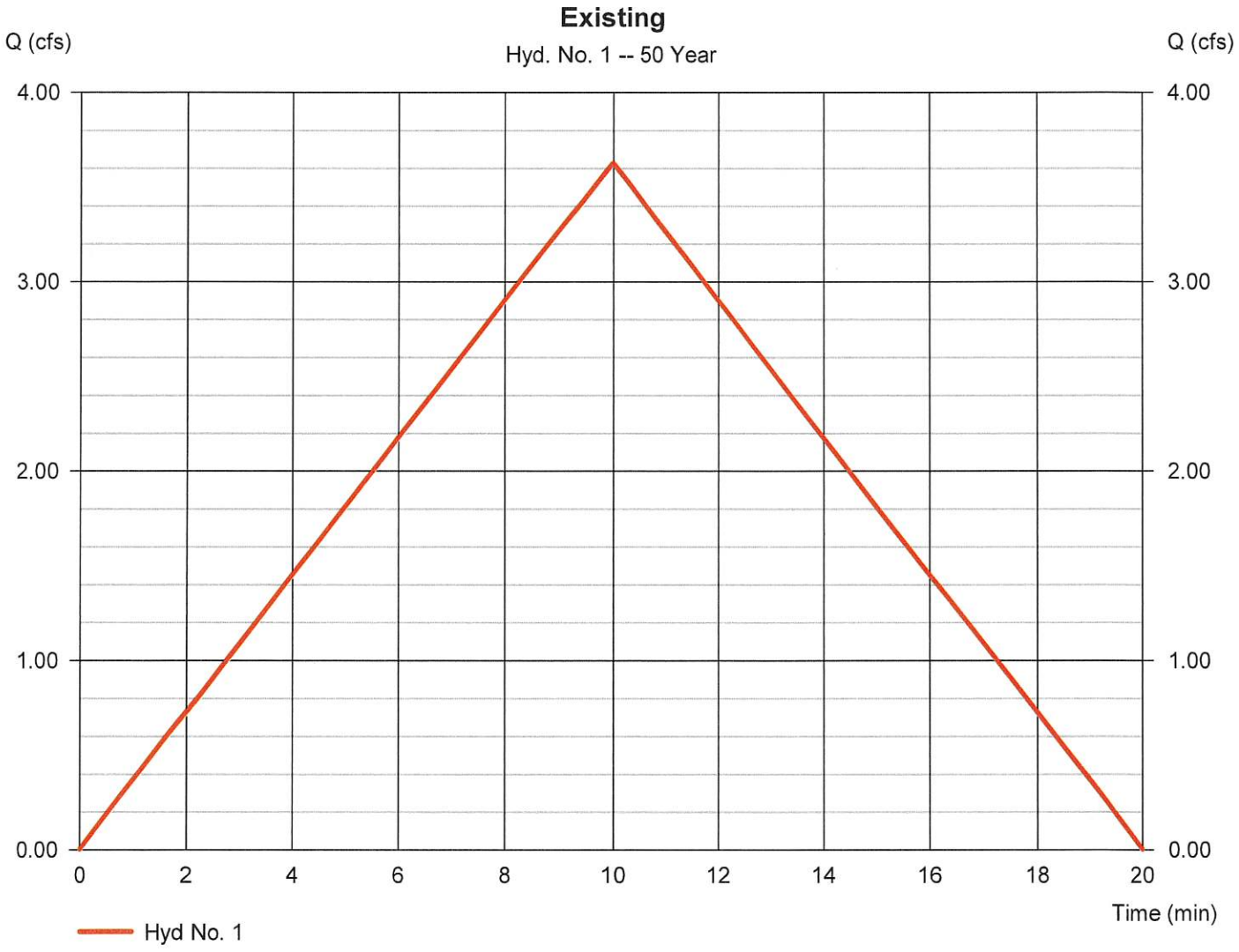
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 3.625 cfs
Storm frequency	= 50 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 2,175 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 6.202 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



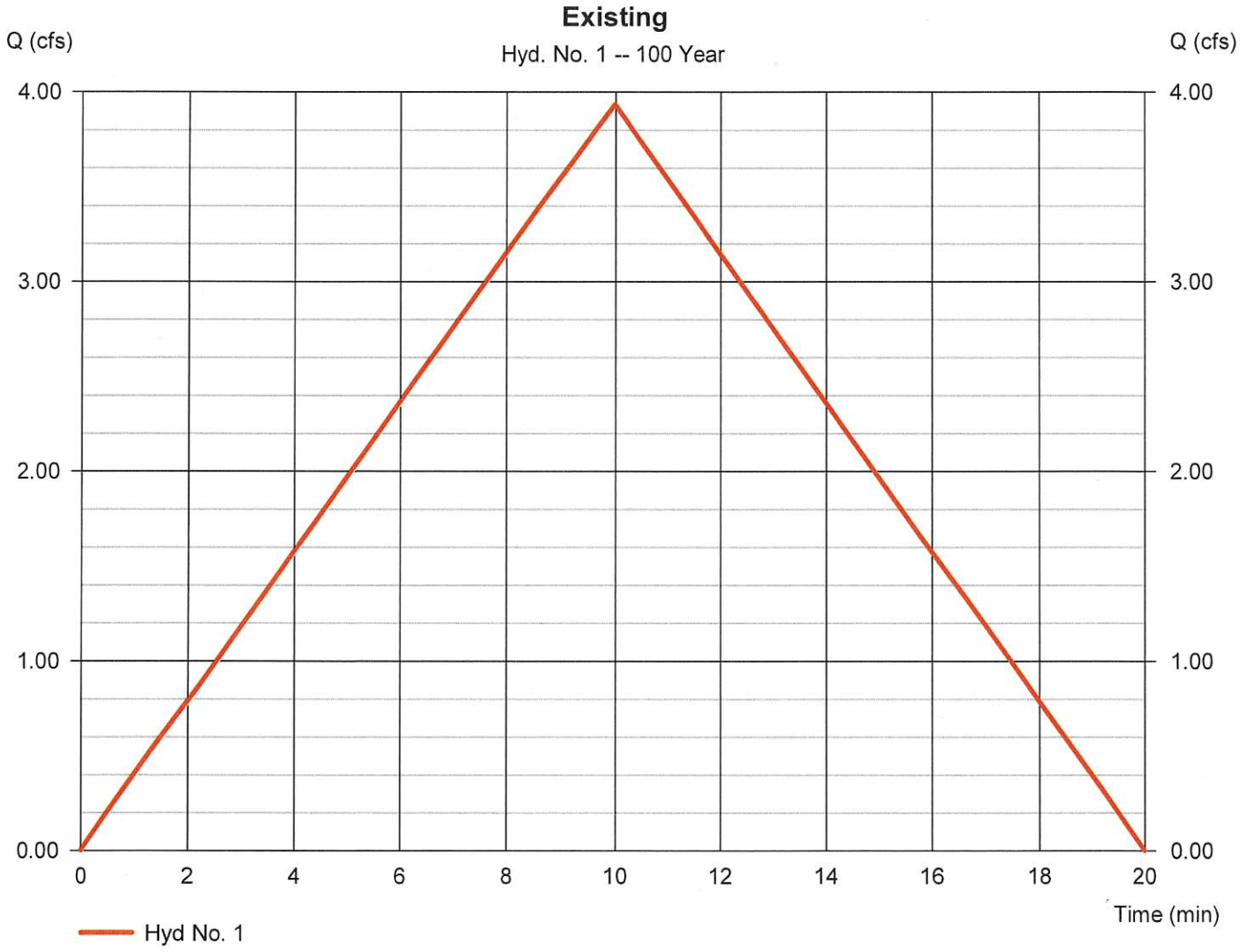
Hydrograph Report

Hyd. No. 1

Existing

Hydrograph type	= Rational	Peak discharge	= 3.935 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 2,361 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.74*
Intensity	= 6.731 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Asc/Rec limb fact	= 1/1

* Composite (Area/C) = [(0.260 x 0.30) + (0.530 x 0.95)] / 0.790



PROPOSED HYDROGRAPH

Hydrograph Report

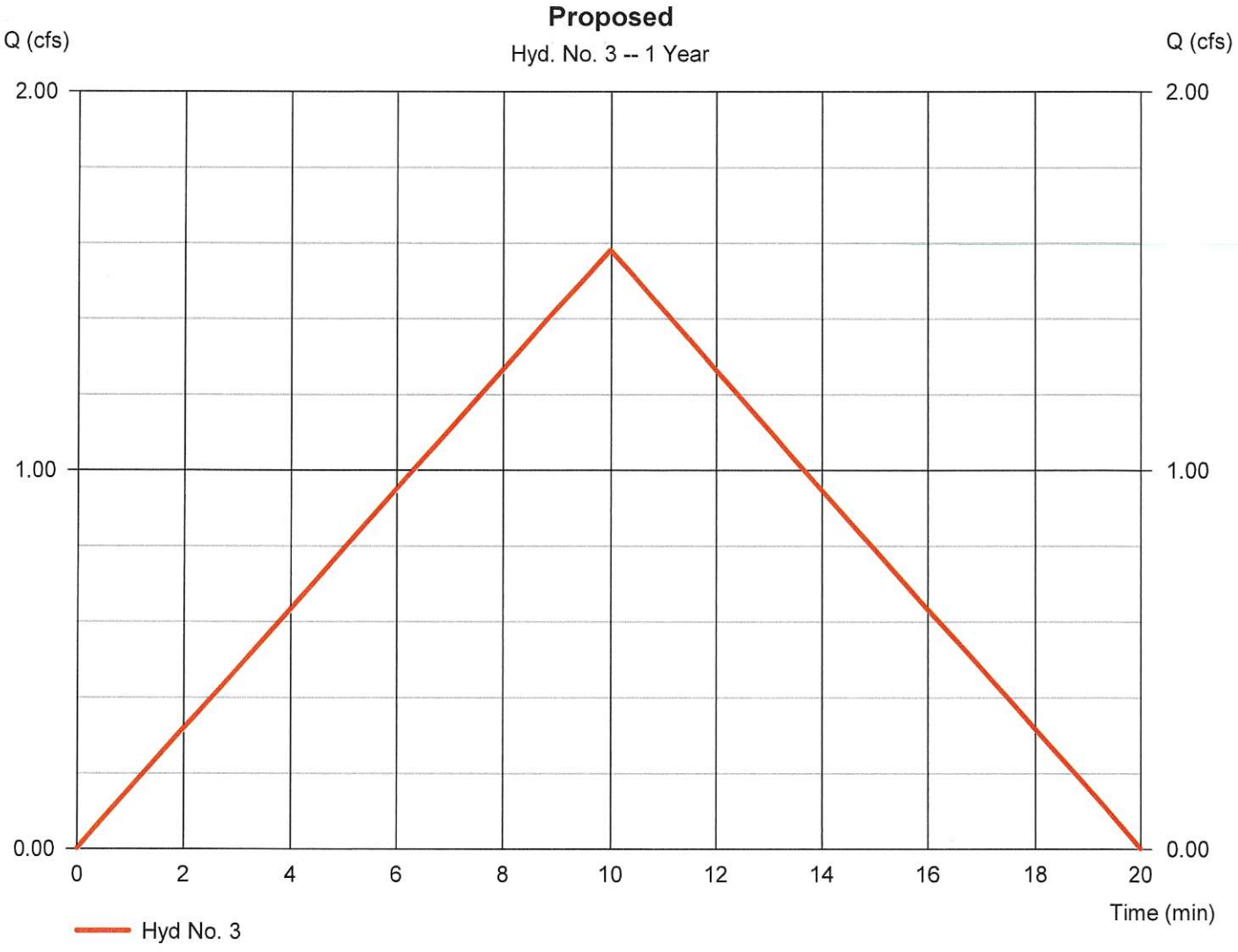
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024 Tuesday, 11 / 3 / 2026

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 1.580 cfs
Storm frequency	= 1 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 948 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 2.986 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



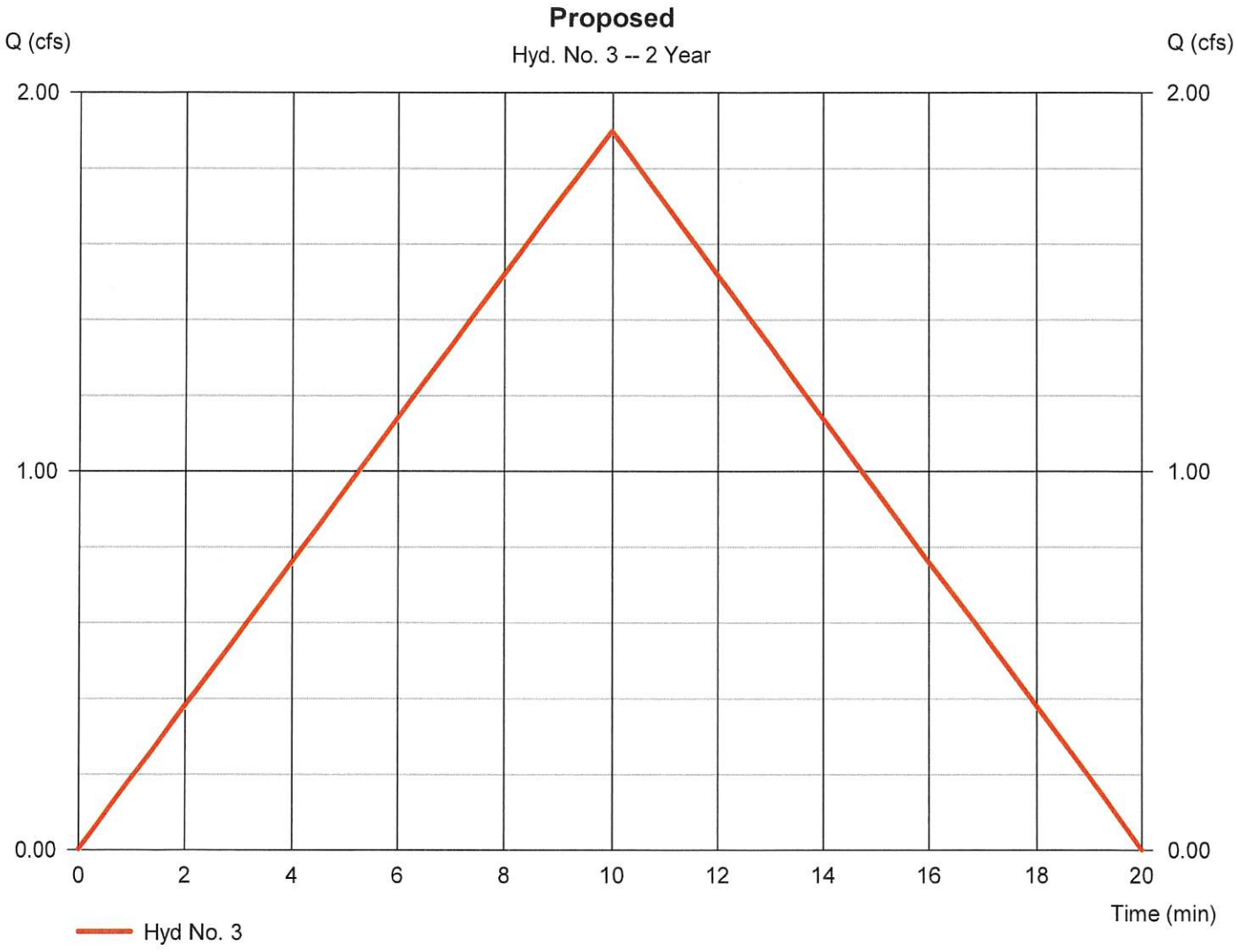
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 1.897 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,138 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 3.584 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



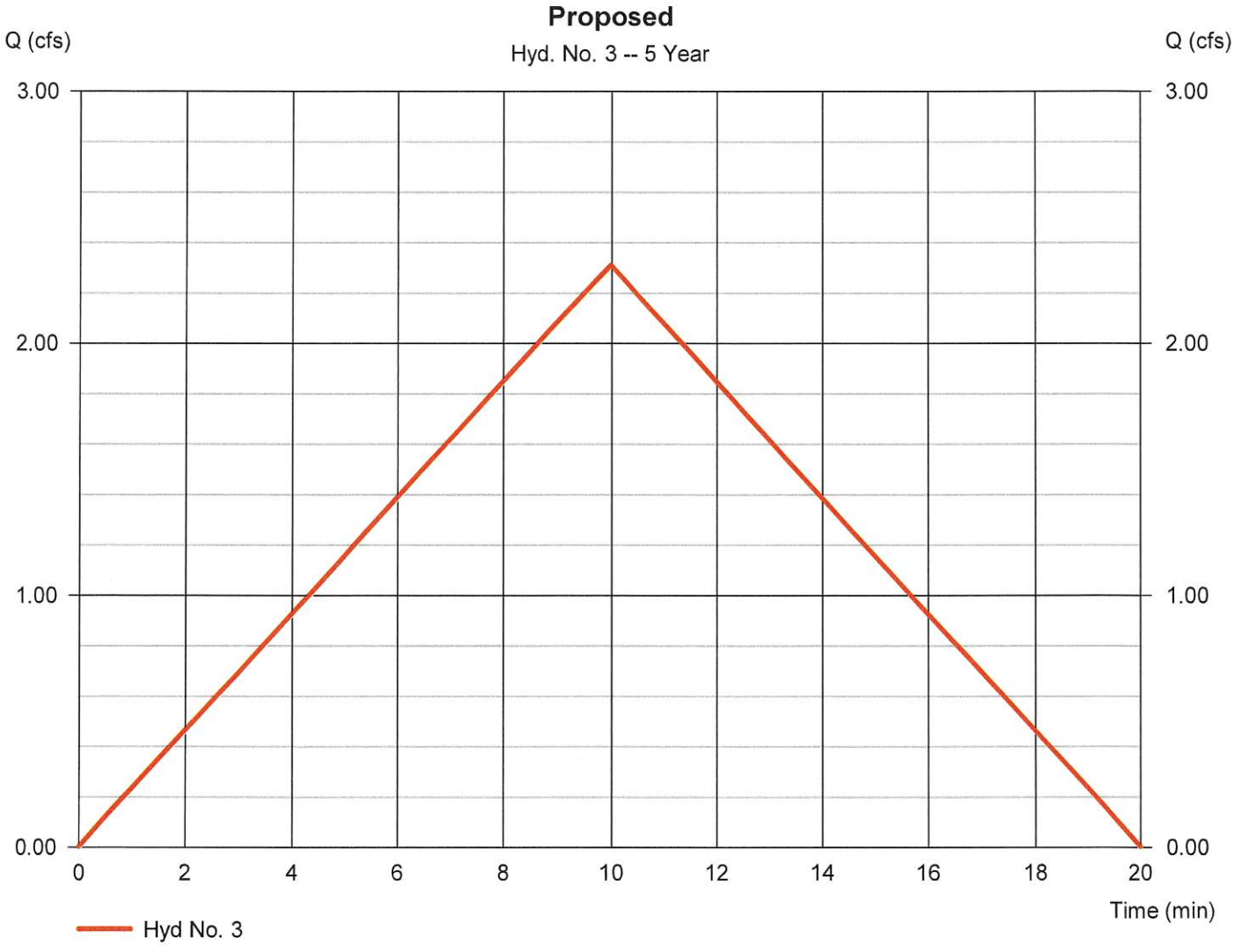
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 2.309 cfs
Storm frequency	= 5 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,385 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 4.362 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



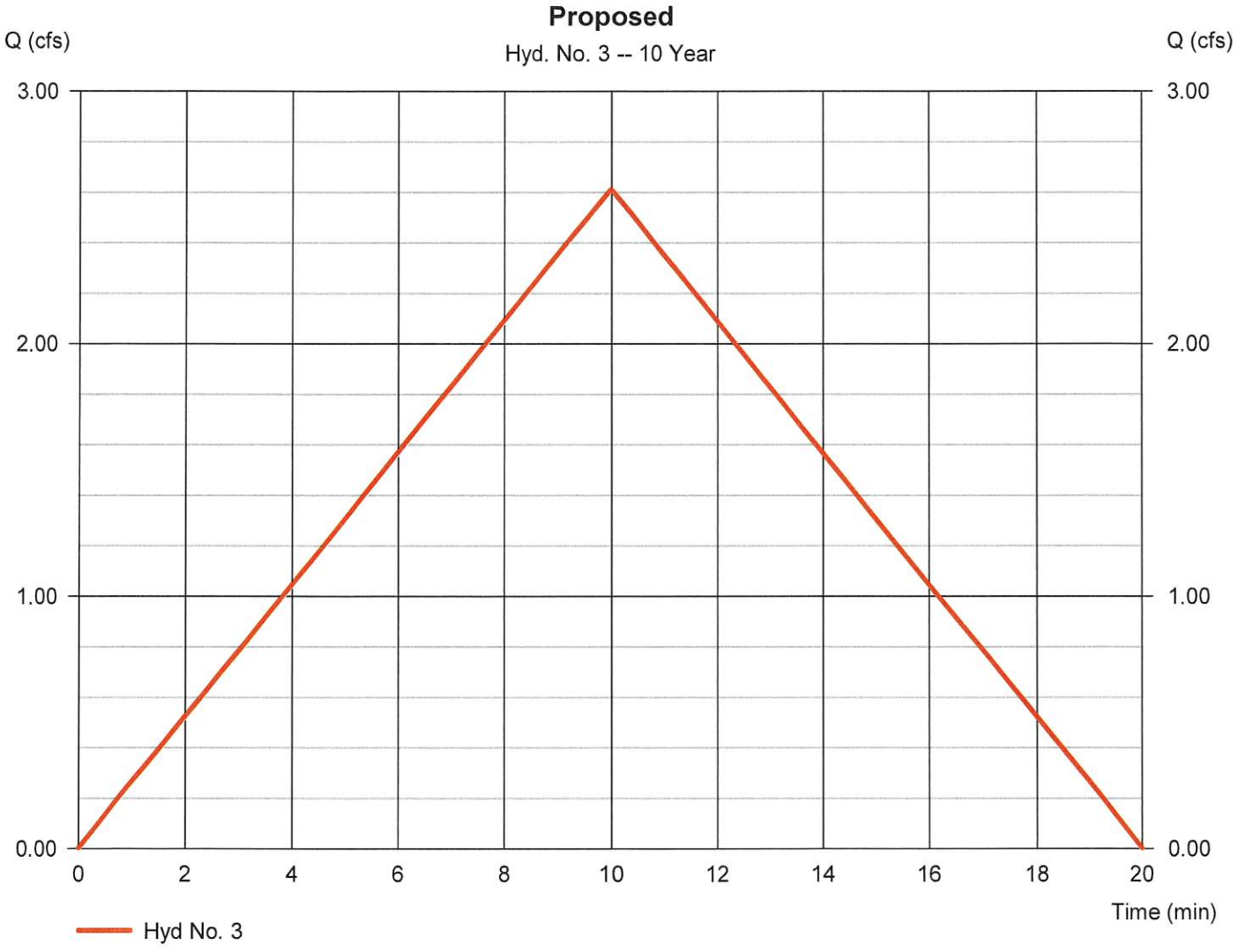
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 2.610 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,566 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 4.932 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



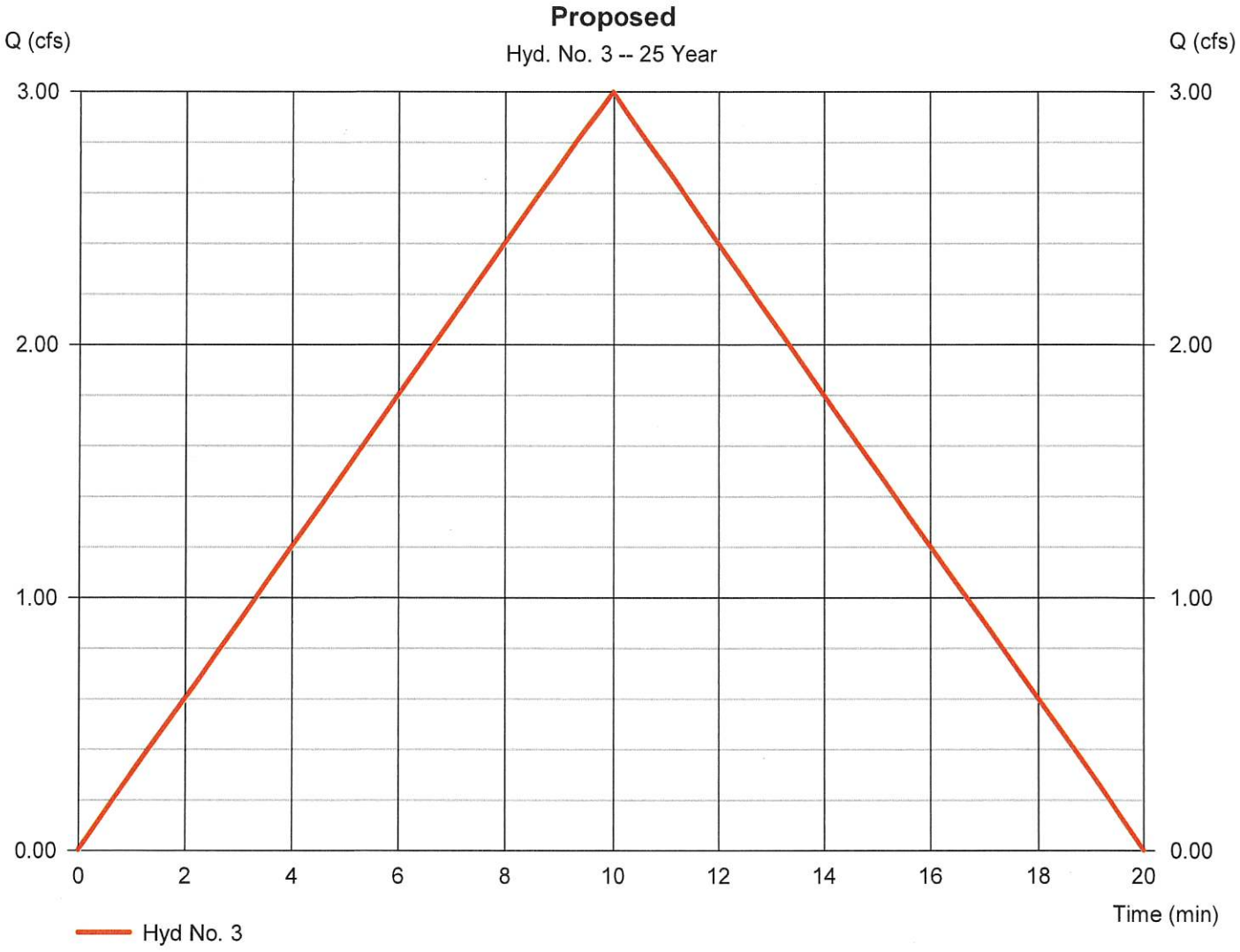
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 3.000 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,800 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 5.667 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



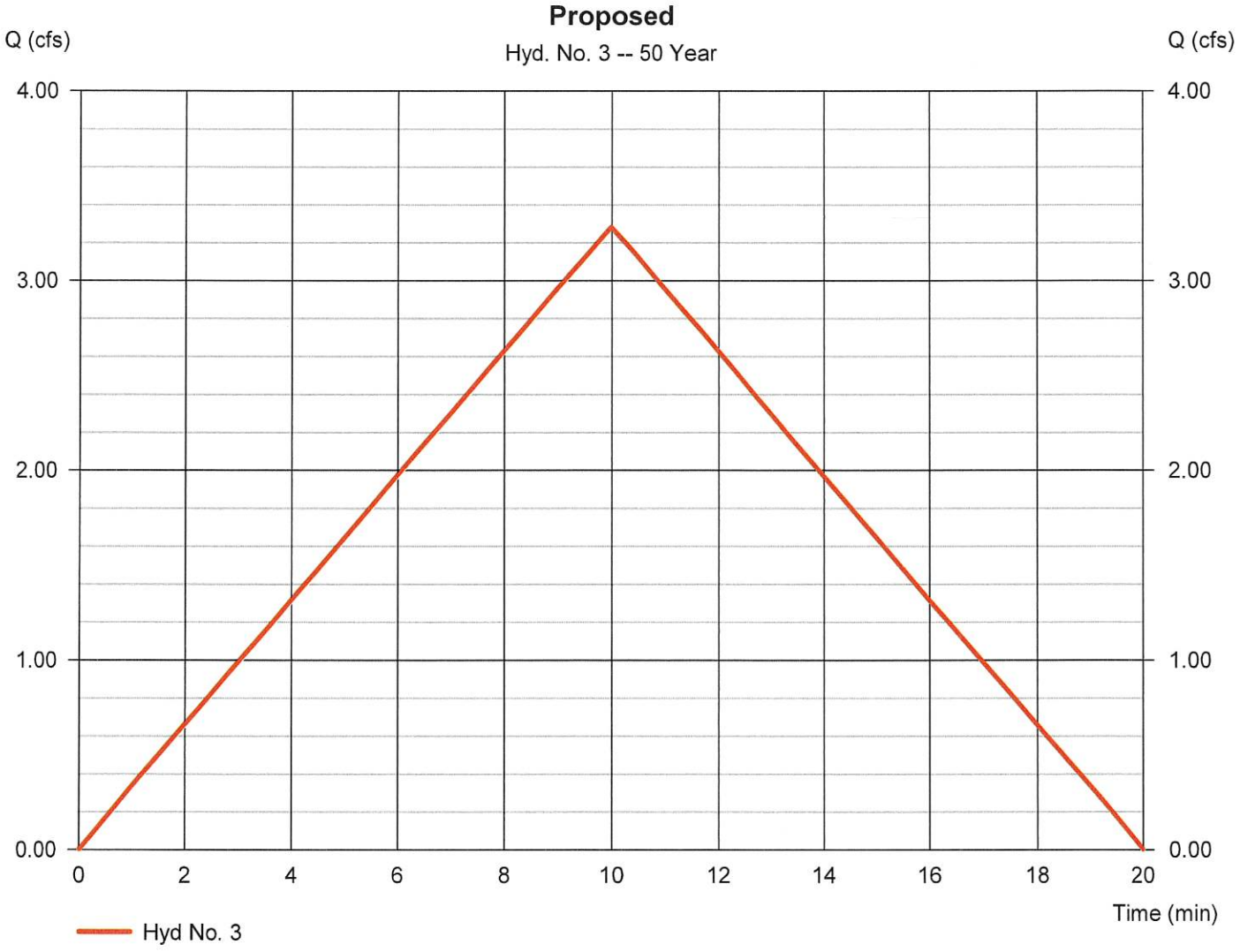
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 3.283 cfs
Storm frequency	= 50 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,970 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 6.202 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



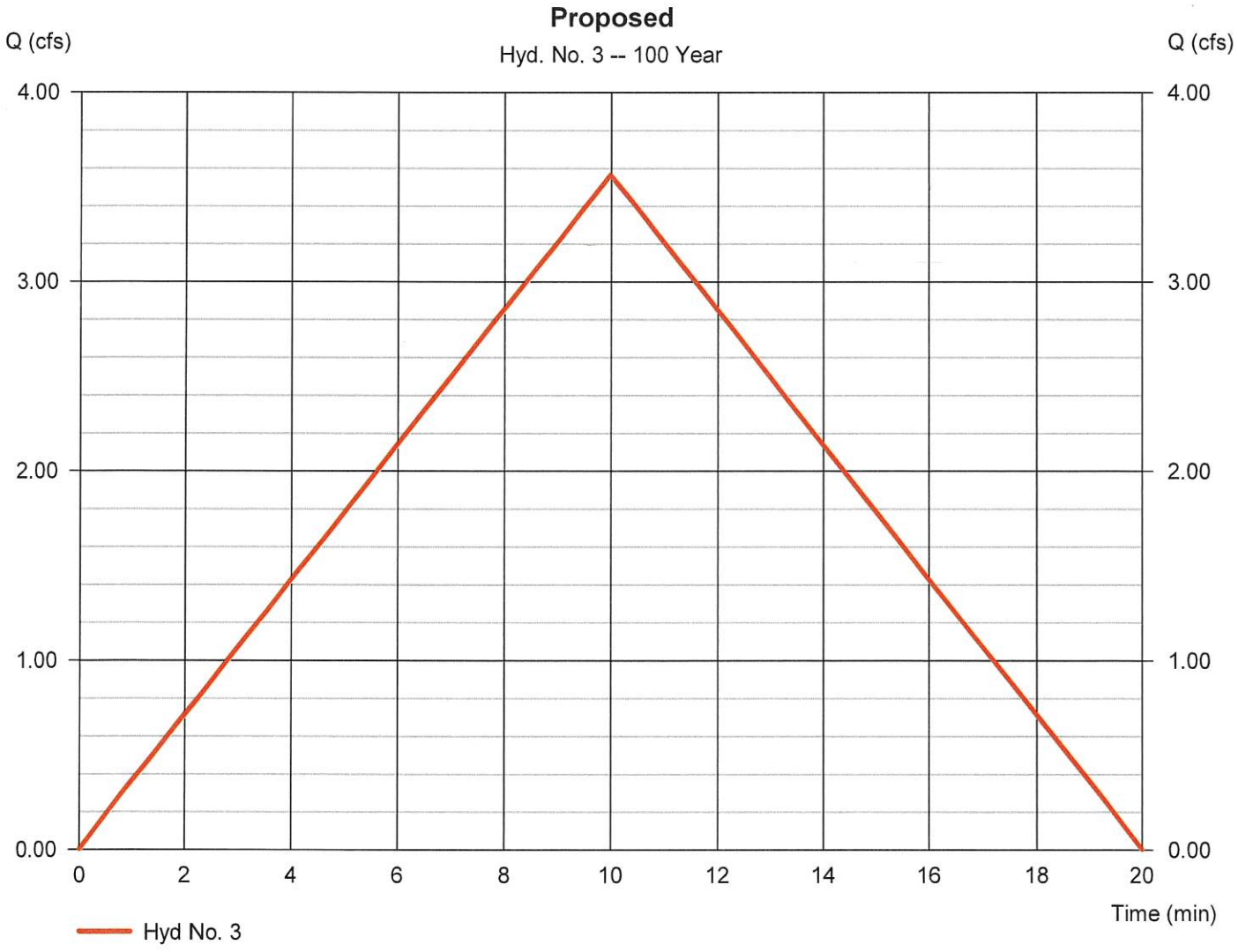
Hydrograph Report

Hyd. No. 3

Proposed

Hydrograph type	= Mod. Rational	Peak discharge	= 3.563 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 2,138 cuft
Drainage area	= 0.790 ac	Runoff coeff.	= 0.67*
Intensity	= 6.731 in/hr	Tc by User	= 10.00 min
IDF Curve	= Jackson Twp.IDF	Storm duration	= 1.0 x Tc
Target Q	=n/a	Est. Req'd Storage	=n/a

* Composite (Area/C) = [(0.340 x 0.30) + (0.450 x 0.95)] / 0.790



DRAINAGE MAPS

(See Sheet C-4.4 of the Site Improvement Drawings)

SUPPLEMENTAL INFORMATION



Map Scale: 1:590 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Stark County, Ohio
Survey Area Data: Version 22, Sep 8, 2025

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

Date(s) aerial images were photographed: Jun 2, 2025—Jul 12, 2025

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
CuB	Chili-Urban land complex, undulating	A	0.9	100.0%
Totals for Area of Interest			**0.9**	**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

NOAA Atlas 14, Volume 2, Version 3
Location name: North Canton, Ohio, USA*
Latitude: 40.8819°, Longitude: -81.4283°
Elevation: 1073 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	3.85 (3.52-4.22)	4.60 (4.20-5.03)	5.58 (5.08-6.10)	6.31 (5.75-6.90)	7.26 (6.59-7.92)	7.98 (7.21-8.70)	8.68 (7.81-9.44)	9.38 (8.41-10.2)	10.3 (9.22-11.2)	11.0 (9.78-12.0)
10-min	2.99 (2.74-3.28)	3.59 (3.28-3.92)	4.33 (3.95-4.73)	4.87 (4.43-5.32)	5.56 (5.03-6.06)	6.05 (5.47-6.59)	6.53 (5.88-7.10)	7.01 (6.28-7.63)	7.60 (6.77-8.26)	8.03 (7.12-8.72)
15-min	2.45 (2.24-2.68)	2.93 (2.67-3.20)	3.54 (3.23-3.88)	4.00 (3.64-4.36)	4.57 (4.14-4.99)	4.99 (4.51-5.44)	5.41 (4.87-5.88)	5.81 (5.21-6.32)	6.32 (5.64-6.87)	6.69 (5.93-7.27)
30-min	1.62 (1.48-1.77)	1.96 (1.79-2.14)	2.43 (2.21-2.65)	2.78 (2.52-3.03)	3.23 (2.93-3.52)	3.57 (3.22-3.89)	3.91 (3.51-4.25)	4.24 (3.80-4.62)	4.68 (4.18-5.09)	5.02 (4.45-5.45)
60-min	0.988 (0.903-1.08)	1.20 (1.10-1.31)	1.52 (1.39-1.66)	1.77 (1.61-1.93)	2.09 (1.90-2.28)	2.35 (2.12-2.56)	2.61 (2.35-2.84)	2.88 (2.58-3.13)	3.24 (2.89-3.52)	3.52 (3.12-3.83)
2-hr	0.572 (0.520-0.629)	0.695 (0.632-0.766)	0.893 (0.811-0.981)	1.05 (0.954-1.15)	1.28 (1.16-1.40)	1.48 (1.33-1.61)	1.68 (1.51-1.84)	1.91 (1.70-2.08)	2.23 (1.98-2.42)	2.51 (2.21-2.72)
3-hr	0.403 (0.367-0.445)	0.490 (0.445-0.539)	0.628 (0.570-0.690)	0.742 (0.671-0.815)	0.907 (0.817-0.993)	1.04 (0.938-1.14)	1.20 (1.07-1.30)	1.36 (1.21-1.48)	1.60 (1.41-1.74)	1.80 (1.58-1.95)
6-hr	0.244 (0.222-0.270)	0.294 (0.267-0.326)	0.373 (0.339-0.413)	0.441 (0.398-0.486)	0.540 (0.486-0.594)	0.624 (0.559-0.685)	0.716 (0.638-0.783)	0.818 (0.724-0.893)	0.968 (0.848-1.05)	1.10 (0.953-1.19)
12-hr	0.143 (0.130-0.159)	0.172 (0.157-0.192)	0.216 (0.196-0.241)	0.255 (0.231-0.282)	0.311 (0.280-0.344)	0.361 (0.322-0.397)	0.415 (0.369-0.455)	0.475 (0.419-0.520)	0.564 (0.493-0.616)	0.641 (0.556-0.699)
24-hr	0.084 (0.078-0.092)	0.101 (0.093-0.110)	0.126 (0.116-0.137)	0.147 (0.135-0.160)	0.178 (0.163-0.194)	0.205 (0.186-0.223)	0.235 (0.211-0.255)	0.268 (0.238-0.291)	0.316 (0.277-0.343)	0.357 (0.309-0.388)
2-day	0.048 (0.045-0.053)	0.058 (0.054-0.063)	0.071 (0.066-0.078)	0.083 (0.076-0.090)	0.100 (0.091-0.108)	0.114 (0.104-0.124)	0.129 (0.117-0.141)	0.146 (0.131-0.159)	0.171 (0.151-0.186)	0.192 (0.166-0.209)
3-day	0.034 (0.032-0.037)	0.041 (0.038-0.045)	0.050 (0.047-0.055)	0.058 (0.054-0.063)	0.070 (0.064-0.075)	0.079 (0.072-0.086)	0.089 (0.081-0.097)	0.100 (0.090-0.109)	0.116 (0.103-0.126)	0.130 (0.114-0.141)
4-day	0.027 (0.025-0.030)	0.033 (0.030-0.035)	0.040 (0.037-0.043)	0.046 (0.042-0.050)	0.055 (0.050-0.059)	0.062 (0.056-0.066)	0.069 (0.063-0.075)	0.077 (0.070-0.083)	0.089 (0.079-0.096)	0.099 (0.087-0.107)
7-day	0.019 (0.017-0.020)	0.022 (0.021-0.024)	0.027 (0.025-0.029)	0.031 (0.029-0.033)	0.036 (0.034-0.039)	0.041 (0.038-0.044)	0.046 (0.042-0.049)	0.051 (0.046-0.054)	0.058 (0.052-0.062)	0.063 (0.057-0.069)
10-day	0.015 (0.014-0.016)	0.018 (0.017-0.019)	0.021 (0.020-0.023)	0.024 (0.023-0.026)	0.028 (0.026-0.030)	0.031 (0.029-0.033)	0.035 (0.032-0.037)	0.038 (0.035-0.041)	0.043 (0.039-0.046)	0.046 (0.042-0.050)
20-day	0.010 (0.010-0.011)	0.012 (0.011-0.013)	0.014 (0.014-0.015)	0.016 (0.015-0.017)	0.018 (0.017-0.020)	0.020 (0.019-0.022)	0.022 (0.021-0.023)	0.024 (0.022-0.025)	0.026 (0.024-0.028)	0.028 (0.026-0.030)
30-day	0.008 (0.008-0.009)	0.010 (0.009-0.011)	0.012 (0.011-0.012)	0.013 (0.012-0.014)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.019 (0.017-0.020)	0.020 (0.019-0.022)	0.021 (0.020-0.023)
45-day	0.007 (0.007-0.008)	0.008 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.011)	0.012 (0.011-0.013)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.015-0.018)
60-day	0.006 (0.006-0.007)	0.008 (0.007-0.008)	0.009 (0.008-0.009)	0.010 (0.009-0.010)	0.011 (0.010-0.011)	0.011 (0.011-0.012)	0.012 (0.011-0.013)	0.013 (0.012-0.013)	0.014 (0.013-0.014)	0.014 (0.013-0.015)

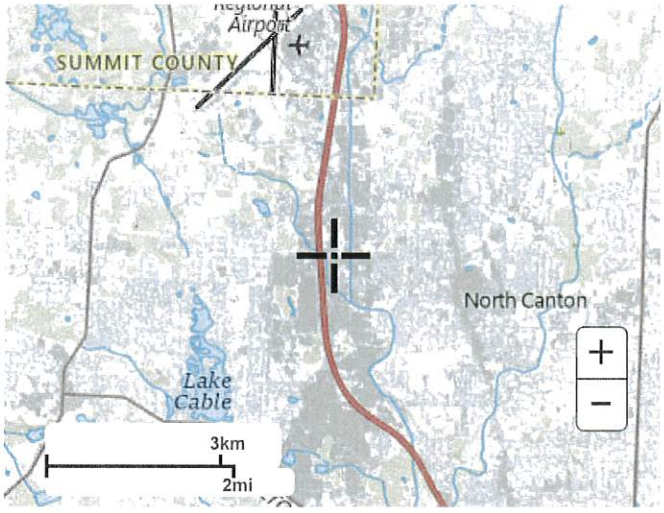
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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

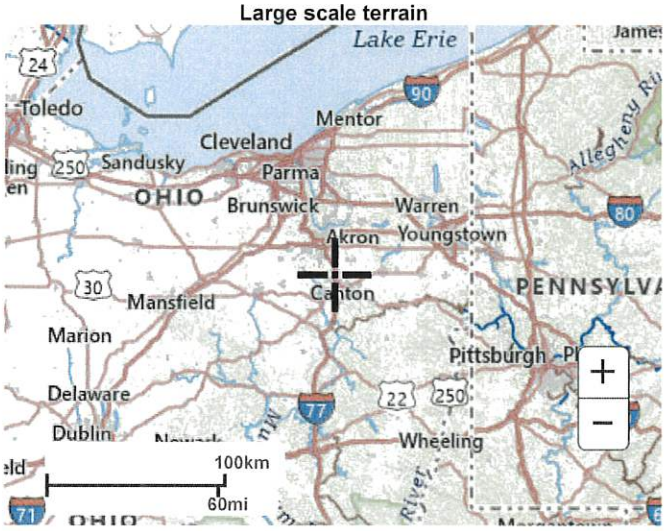
Please refer to NOAA Atlas 14 document for more information.

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PF graphical



Large scale terrain



Large scale map



Large scale aerial

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	35.183	0.04	0.64	0.40	0.02	0.52	10.0	14.6	4.8	2.50	2.76	4.13	12	0.51	1068.32	1068.50	1069.00	1069.27	1072.02	1072.61	Pipe - (90) (1)
2	1	54.433	0.12	0.45	0.82	0.10	0.36	10.0	12.1	5.2	1.90	2.72	2.63	12	0.50	1068.50	1068.77	1069.48	1069.57	1072.61	1072.90	Pipe - (90)
3	2	63.371	0.11	0.33	0.82	0.09	0.27	10.0	11.5	5.3	1.42	2.78	2.46	12	0.52	1068.77	1069.10	1069.63	1069.69	1072.90	1073.40	Pipe - (89)
4	3	56.027	0.10	0.10	0.85	0.09	0.09	10.0	10.0	5.7	0.48	3.01	1.70	12	0.61	1069.10	1069.44	1069.80	1069.73	1073.40	1073.21	Pipe - (88)
5	3	52.772	0.12	0.12	0.76	0.09	0.09	10.0	10.0	5.7	0.52	3.87	1.76	12	1.00	1069.10	1069.63	1069.80	1069.93	1073.40	1074.10	Pipe - (93)
6	1	42.880	0.07	0.15	0.95	0.07	0.14	10.0	13.9	4.9	0.70	2.70	1.88	12	0.49	1068.50	1068.71	1069.48	1069.06	1072.61	1072.76	Pipe - (92)
7	6	126.791	0.08	0.08	0.95	0.08	0.08	10.0	10.0	5.7	0.43	2.74	2.13	12	0.50	1068.71	1069.35	1069.06	1069.62	1072.76	1072.00	Pipe - (91)

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NOTES:Intensity = 48.01 / (Inlet time + 7.70) ^ 0.74; Return period =Yrs. 25 ; c = cir e = ellip b = box

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	12	2.50	1068.32	1069.00	0.68	0.57	4.40	0.30	1069.30	0.647	35.183	1068.50	1069.27	0.77	0.65	3.87	0.23	1069.50	0.481	0.564	0.198	0.90	0.21
2	12	1.90	1068.50	1069.48	0.98	0.78	2.44	0.09	1069.57	0.216	54.433	1068.77	1069.57	0.80	0.68	2.82	0.12	1069.70	0.253	0.235	0.128	0.42	0.05
3	12	1.42	1068.77	1069.63	0.85	0.71	1.99	0.06	1069.69	0.127	63.371	1069.10	1069.69	0.59	0.48	2.94	0.13	1069.83	0.314	0.220	0.140	0.79	0.11
4	12	0.48	1069.10	1069.80	0.70	0.19	0.82	0.10	1069.90	0.000	56.027	1069.44	1069.73	0.29**	0.19	2.58	0.10	1069.83	0.000	0.000	n/a	1.00	0.10
5	12	0.52	1069.10	1069.80	0.70	0.20	0.88	0.11	1069.91	0.000	52.772	1069.63	1069.93 j	0.30**	0.20	2.63	0.11	1070.04	0.000	0.000	n/a	1.00	0.11
6	12	0.70	1068.50	1069.48	0.98	0.24	0.89	0.13	1069.60	0.000	42.880	1068.71	1069.06	0.35**	0.24	2.87	0.13	1069.19	0.000	0.000	n/a	0.31	n/a
7	12	0.43	1068.71	1069.06	0.35	0.17	1.77	0.10	1069.16	0.000	126.791	1069.35	1069.62 j	0.27**	0.17	2.50	0.10	1069.72	0.000	0.000	n/a	1.00	0.10

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