DYKSTRA WALKER
DESIGN DW GROUP

ENGINEERING, ENVIRONMENTAL SERVICES, PLANNING, SURVEYING

STORMWATER MANAGEMENT CALCULATIONS

For

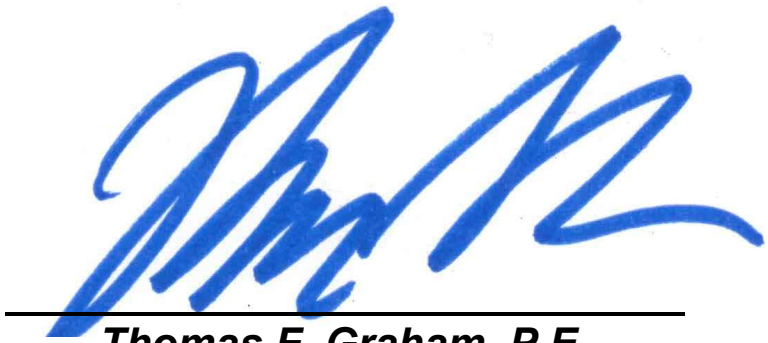
#465 CHERRY LANE

BLOCK 2401, LOT 28

Situated in the

BOROUGH OF MENDHAM

MORRIS COUNTY, NEW JERSEY



Thomas F. Graham, P.E.
Professional Engineer, NJ License No. 24GE03788100

February 7, 2024

Project Number 22208

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Project Overview

This report has been prepared to address the impacts to surface water runoff due to the redevelopment at property known as Block 2401, Lot 26 in the Borough of Mendham, Morris County, New Jersey. This report should be reviewed along with the complete development package submitted in support of the proposed project.

The subject property was previously developed with an existing dwelling, paved driveway, patio, shed, and other associated site improvements. The single-family dwelling is serviced by an on-site well and septic disposal system. In 2023, the site was approved for an alteration to the on-site disposal field. The proposed improvements disturbed less than one (1) acre of land and increased impervious coverage by less than one-quarter (1/4) acres. During construction, 2.8 acres of land were temporarily disturbed. This disturbance, being greater than one (1) acre, reclassifies this project as a major stormwater management development. This project proposes to finalize the improvements previously approved, regrade and revegetate the temporarily disturbed areas, as well as construct stormwater management facilities. Stormwater runoff from the proposed project will be managed by an underground infiltration basin and a surface infiltration basin located north and east of the proposed development.

All stormwater management facilities proposed for the subject property have been designed in accordance with the New Jersey Department of Environmental Protection (NJDEP) Stormwater Management rules at N.J.A.C. 7:8, the NJ Best Management Practices (BMP) manual, and the Standards for Soil Erosion and Sediment Control in New Jersey. Where the above standards provided conflicting requirements, the more restrictive requirement was utilized.

Existing and Proposed Site Conditions

The subject property is located at the southerly side of Cherry Lane and the Easterly side of Horseshoe Bend Road. The subject property is 5.5 acres in size and identified as Block 2401, Lot 28 on the Borough of Mendham tax maps. The site has been previously developed with a single family home, shed, paved driveway, and associated site improvements. The single-family dwelling is serviced by an on-site well and an on-site septic system.

Under existing conditions, runoff from the subject property diverges over a ridge line running from east to west through the subject property. The northerly portion of the site drains by overland flow into the Horseshoe Bend Road right-of-way (POS 1). The southerly portion of the site drains by overland flow into the Horseshoe Bend Road right-of-way (POS 2).

Under proposed conditions, existing drainage patterns will generally be maintained. Runoff from the site will be split by the on-site ridgeline, which will generally be maintained. A majority of the disturbed site is to be revegetated with brush to reflect the conditions at the site prior to disturbance. Runoff from a majority of the dwelling will be collected and diverted to a small-scale underground infiltration basin (PR 1C). Runoff from overflow of the underground infiltration basin along with the northeast corner of the site will be collected by a small-scale surface infiltration (Basin PR 1B), located at the north of the dwelling. The basin will treat the runoff for water quality and discharge the runoff at the westerly end of the property by overland flow to Horseshoe Bend Road (POS 1). The southerly portion of the property is to be revegetated and no stormwater management measures are proposed. Runoff south of the ridgeline will travel by overland flow to the Horseshoe Bend Road (POS 2).

On-Site Soils

Per the United States Department of Agriculture, soils at the subject property are in the Gladstone gravelly loam soils series. According to the US Department of Agriculture, Soil Conservation Service, Urban Hydrology for Small Watersheds publication, Gladstone soils are a type 'B' soil. Type 'B' soils have moderate infiltration rates and consist mainly of moderately deep to deep, moderately well drained soils with moderately fine to moderately course textures.

Soil test pits were conducted at the subject property during February of 2023 to evaluate the on-site soils for suitability to support the on-site septic system. The testing revealed sandy loam soils at the subject property with a permeability class rating of K3. The proposed stormwater management basins were designed based off of the previously conducted soil testing. Additional testing will be required at the proposed basin locations in order to verify the soil conditions. Refer to **Appendix A** for a copy of a soil survey map of the property and results from the on-site soil testing. The soil testing performed at the subject property yielded results consistent with the soil type listed at the USDA Web Soil Survey.

Green Infrastructure Standards

N.J.A.C. 7:8- 5.3 specifies the types of green infrastructure BMPs that may be utilized to satisfy the groundwater recharge, stormwater runoff quality, and stormwater runoff quantity. The proposed development utilizes small-scale bioretention systems in order to comply with the green infrastructure requirements. The maximum contributory drainage area to a small-scale infiltration basin is 2.5 acres. The following is a summary of the Green Infrastructure BMPs' criteria utilized during the design:

Green Infrastructure BMP Design Summary

	Surface infiltration Basin PR 1B	Subsurface infiltration Basin PR 1C
GI BMP Footprint Area	0.148 acres	0.003 acres
GI BMP Invert Elevation	632.00	636.00
Depth of Sand/Gravel Bed	6 inches (sand)	12 inches (gravel)
Bottom of BMP Elevation	631.50	635.75
Seasonal High Water Table Elevation	629.00	633.75
Separation Distance to SHWT	2.5 ft	2.0 ft
Depth of Water Quality Design Storm	0.42 ft	n/a
Infiltration proposed	Yes	Yes
Permeability Rate	0.58 in/hr	1 in/hr
Groundwater Mound	3.0 ft	2.3 ft
Maximum Design Drain Time	12.0 hours	16.9 hours
Contributary Drainage Area	0.95 acres	0.07 ares
Impervious Drainage Area	0.16 acres	0.07 acres
Motor Vehicle Surface Drainage Area	0.16 acres	0.00 acres

Stormwater Quantity Control

In accordance with the NJDEP Stormwater Management Rules at N.J.A.C. 7:8-5.6.(b), stormwater runoff quantity shall be controlled in one (1) of the following ways:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the current and projected two-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

2. Design stormwater management measures so that the post-construction peak runoff rates for the current and projected two-, 10-, and 100-year storm events are fifty (50), seventy-five (75), and eighty (80) percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the portion of the site on which the proposed development or project is to be constructed.

In order to determine compliance with the requirements set forth at the above, the peak rates of stormwater runoff were determined in accordance with the NJDEP Stormwater Management Rules at N.J.A.C. 7:8-5.7. Rainfall depths at the site were obtained from the National Oceanographic and Atmospheric Administration (NOAA), National Weather Service's Atlas 14, Point Precipitation Frequency Estimates: NJ. Rainfall data for the two-, 10-, and 100-year storm events was multiplied by a precipitation adjustment factor for both current precipitation amounts (per Table 5-5 at N.J.A.C. 7:8-5.7) as well as the

anticipated future rainfall amounts (per Table 5-6 at N.J.A.C. 7:8-5.7). Refer to **Appendix B** for the NOAA Rainfall data and the adjusted precipitation values based on the adjustment factors for precipitation in Morris County

In accordance with the NJDEP Stormwater Management Rules at N.J.A.C. 7:8-5.7, stormwater runoff quantities to Horseshoe Bend Road to the north (POS 1) and Horseshoe Bend Road to the south (POS 2) were calculated using the TR-55 Urban Hydrology for Small Watersheds Methodology. The TR-55 Method is acceptable methodology for small (less than 320 acres) drainage areas. Calculations were performed using the Hydraflow Hydrographs Extension for AutoCAD Civil 3D computer software. Runoff rates were calculated using both the current and future adjusted precipitation values. Refer to **Appendix C** for supporting information from the evaluation of pre- and post-development peak runoff rates, composite hydrographs, determination of allowable peak runoff rates and basin routing calculations with precipitation values adjusted for current conditions per Table 5-5 at N.J.A.C. 7:8-5.7.(c).2. Refer to **Appendix D** for supporting information from the evaluation of pre- and post-development peak runoff rates, composite hydrographs, determination of allowable peak runoff rates and basin routing calculations with precipitation values adjusted for current conditions per Table 5-5 at N.J.A.C. 7:8-5.7.(d).

Compliance with the NJDEP's stormwater management requirements for the area tributary to the northerly portion of Horseshoe Bend Road (POS 1) is demonstrated by option #1 above. The following table summarizes the allowable, pre-, and post-development runoff rates to Park Drive with precipitation amounts adjusted for both the current and future precipitation values.

Summary of Peak Runoff Rates to the Horseshoe Bend Road Right-of-Way (POS 1)

Storm Event	Existing Runoff	Allowable Runoff	Proposed Runoff
2-Year (Current)	1.2 cfs	0.8 cfs	0.8 cfs
2-Year (Future)	2.4 cfs	1.7 cfs	1.5 cfs
10-Year (Current)	5.0 cfs	4.2 cfs	3.7 cfs
10-Year (Future)	7.9 cfs	6.7 cfs	6.2 cfs
100-Year (Current)	15.9 cfs	14.0 cfs	14.0 cfs
100-Year (Future)	23.3 cfs	20.5 cfs	19.3 cfs

As indicated, the proposed development meets the stormwater quantity control requirements at N.J.A.C. 7:8.

Compliance with the NJDEP's stormwater management requirements for the area tributary to the Horseshoe Bend Road south (POS 2) by option #2 above. The following table summarizes the pre-, and post-development runoff rates to the Horseshoe Bend Road right-of-way with precipitation amounts adjusted for both the current and future precipitation values.

Summary of Peak Runoff Rates to Horseshoe Bend Road (POS 2)

	Peak Runoff Rates		Runoff Volumes		Time to Peak	
Storm Event	Existing	Proposed	Existing	Proposed	Existing	Proposed
2-Year (Current)	0.6 cfs	0.5 cfs	3,448 cf	3,299 cf	734 min.	735 min.
2-Year (Future)	1.1 cfs	1.1 cfs	5,353 cf	5,143 cf	734 min.	734 min.
10-Year (current)	2.6 cfs	2.5 cfs	10,393 cf	10,063 cf	733 min.	733 min.
10-Year (Future)	3.8 cfs	3.6 cfs	14,446 cf	14,043	733 min.	733 min.
100-Year (Current)	8.3 cfs	8.1 cfs	30,296 cf	29,698 cf	732 min.	733 min.
100-Year (Future)	11.2 cfs	11.0 cfs	40,626 cfs	39,949 cfs	732 min.	732 min.

As indicated, the proposed development meets the stormwater quantity control requirements at N.J.A.C. 7:8.

Groundwater Recharge

N.J.A.C. 7:8 provides standards for, among other things, groundwater recharge and stormwater quantity control. For groundwater recharge, N.J.A.C. 7:8-5.4(a).2 indicates that either one hundred (100) percent of the average annual pre-construction groundwater recharge volume for the site be maintained, or the increase in stormwater runoff volume from pre-construction to post-construction for the two (2) year storm event be infiltrated. Refer to **Appendix E** for an evaluation of the project groundwater recharge. According to the NJDEP's annual groundwater recharge analysis spreadsheet, the proposed basins will provide sufficient groundwater recharge to maintain the average annual pre-construction groundwater recharge volume and this project meets the groundwater recharge requirements at N.J.A.C. 7:8-5.4(b).

Groundwater Mounding

Soil and groundwater conditions used in the analysis are based on test pits excavated at the subject property by Dykstra Walker Design Group in February of 2023. No seepage was observed within the test pits, therefore, the depth of the test pit was assumed to be the established seasonal groundwater elevation. Depth to groundwater was assumed to be twelve (12) feet below the existing grade.

In accordance with the NJDEP's BMP manual, an assessment of the hydraulic impact on the groundwater table shall be performed when groundwater recharge is utilized in a stormwater management design. Due to the proximity of the infiltration basins to the

proposed buildings, a ground water mounding analysis was performed utilizing the USGS Scientific Investigation Report 2010-5102 Hantush Spreadsheet. Refer to **Appendix F** for results and supporting information.

As shown at **Appendix F**, the groundwater mound resulting from Surface Infiltration Basin 1B was calculated to be 3.3 feet at the center of the basin resulting in a groundwater mound elevation of approximately 632.3. The bottom of the proposed basin is at elevation 632.0, and as a result, the potential groundwater mound may impact basin drain time. An adjusted mounding analysis is also provided at **Appendix F** in order to determine the actual basin drain time as a result of the groundwater mound. The actual basin drain time is approximately twelve (12) hours, which is less than the maximum allowable drain time of (seventy-two) hours. Therefore, the potential groundwater mound as a result from Basin PR 1B will not adversely impact the performance of that basin.

As shown at **Appendix F**, the groundwater mound resulting from Subsurface Infiltration Basin 1C was calculated to be 2.3 feet at the center of the basin, resulting in a groundwater mound elevation of 635.6. The bottom of the proposed basin is at elevation 635.75, and therefore, the potential groundwater mound will not adversely impact the basin drain time.

The potential groundwater mounds from Subsurface Infiltration Basin 1C was evaluated for impacts on the existing building due to the proximity to the basin. The elevation of the groundwater mound associated with the basin was found to be below the first floor elevation of the proposed building, indicating that the potential groundwater mound will not adversely impact the existing dwelling.

Stormwater Quality Control

In accordance with the NJDEP Stormwater Management Rules at N.J.A.C. 7:8-5.5, stormwater runoff quality control shall be provided for project which result in an increase of one quarter (1/4) of an acre or more of regulated motor vehicle surfaces. This project will not increase the area of motor vehicle surfaces by one-quarter (1/4) of an acre or more and as a result, the standards at N.J.A.C. 7:8-5.5 do not apply.

However, stormwater runoff quality control has been be provided so that the average annual post-construction load of total suspended solids in stormwater runoff generated from the water quality design storm is reduced by eighty (80) percent from the anticipated load from the developed site. The water quality design storm is defined by the rules as 1.25 inches of rainfall in two (2) hours. Water quality control for this project is provided by the small-scale surface infiltration basin located onsite. Per N.J.A.C. 7:8-5.5(b), Table 2 and the NJDEP's Best Management Practices manual, small-scale surface infiltration basins provide an eighty (80) percent removal rate of total suspended

solids and this project meets the water quality control requirements at N.J.A.C. 7:8. Refer to **Appendix G** for routing calculations of the water quality design storm through the small-scale bioretention basins.

Stormwater Collection and Conveyance System

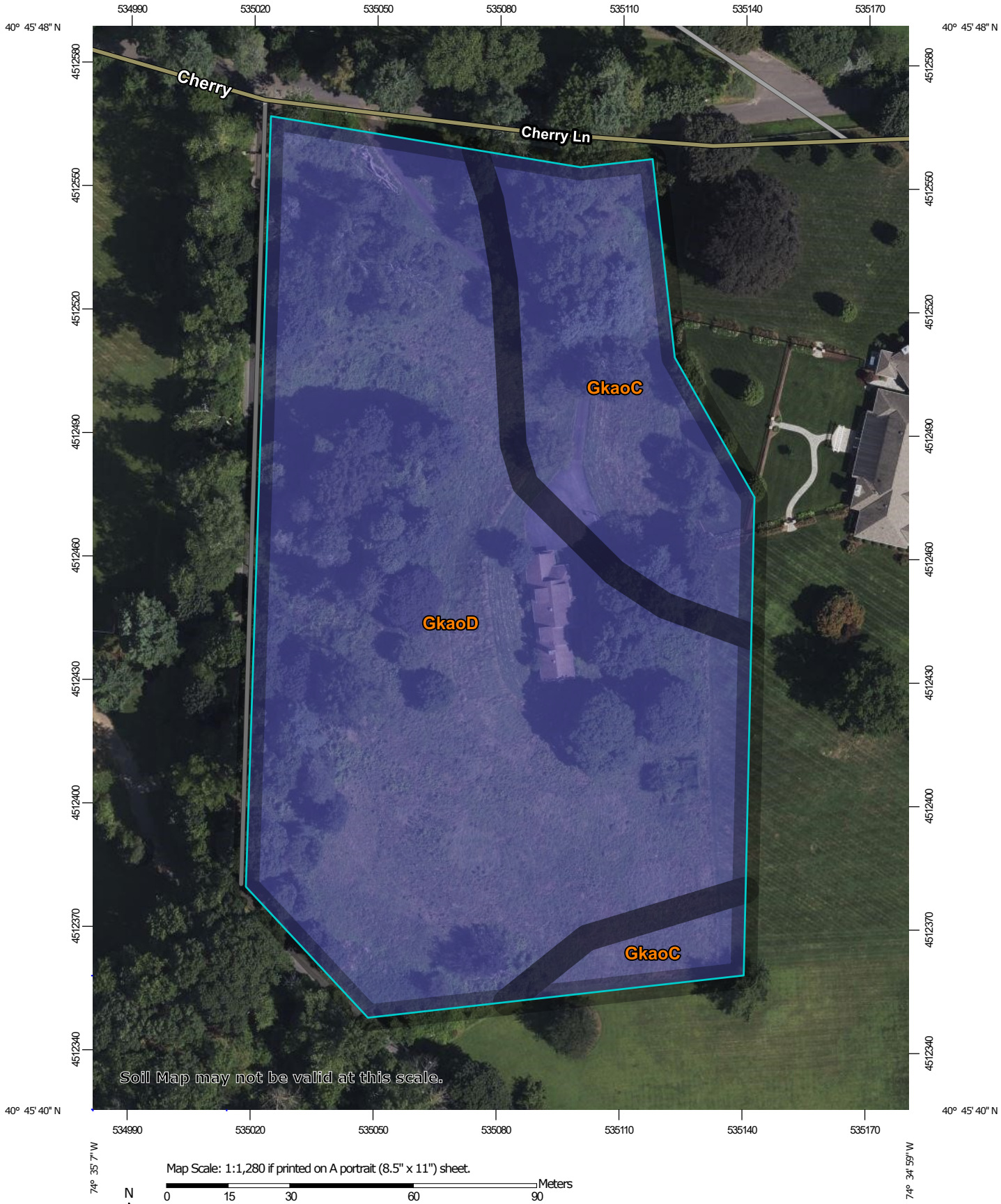
A stormwater collection and conveyance system has been designed for this project to collect stormwater runoff from impervious and other surfaces at the property and to control the rate of stormwater runoff from the site. Stormwater facilities proposed at the property include inlet structures, subsurface piping and the stormwater management basins. Pipes were designed for the twenty-five (25) year storm event. All pipes downstream of the small-scale bioretention basins were designed for the 100-year storm. The Rational Method was utilized to determine the quantity of runoff for pipe sizing calculations and Manning's formula was used to determine the required size of the stormwater pipes. Refer to **Appendix H** of this report for pipe calculations.

Soil Erosion & Sediment Control Plan

Temporary and permanent soil erosion and sediment control measures have been designed for this project in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, promulgated by the Morris County Soil Conservation District. The permanent measure proposed at the subject property includes rip-rap aprons holes at the pipe discharge locations. The twenty-five (25) year design storm was utilized for the design of the conduit outlet protection upstream of the basin. The 100-year design storm was utilized for the design of conduit outlet protection downstream of the basin. Refer to **Appendix I** for conduit outlet protection design information.

APPENDIX A

ON-SITE SOILS INFORMATION



Map Scale: 1:1,280 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Morris County, New Jersey
Survey Area Data: Version 18, Aug 29, 2023

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

Date(s) aerial images were photographed: Mar 13, 2021—Sep 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
GkaoC	Gladstone gravelly loam, 8 to 15 percent slopes	B	1.4	23.6%
GkaoD	Gladstone gravelly loam, 15 to 25 percent slopes	B	4.4	76.4%
Totals for Area of Interest			**5.7**	**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

COUNTY/MUNICIPALITY Morris Mendham

BLOCK 2401
LOT 28
JOB# 22208

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

Form 3C. Soil Permeability Class Rating Data

1. Test Number	1	Date Collected	2/24/2023		
2. Sample Depth	70 "	Soil Pit/Boring Number	1		
		Replicate Letter	**A**	**B**	
3. Coarse Fragment Content:					
Total Weight of Sample, W.T.			533.7	533.7	grams
Weight of Material Retained on 2 mm Sieve, W.C.F.			141.8	141.8	grams
Weight % Coarse Fragment (W.C.F./W.T.x100)			26.6	26.6	%
4. Oven Dried Weight (24 hours at 105 deg C) of					
		40 Gram Air Dried Sample	38.6	38.6	grams
5. Hydrometer Calibration, Rc			4	4	grams
6. Hydrometer Reading-40 Seconds, R1			17.5	17	grams
Temperature of Suspension			68	68	deg F
7. Corrected Hydrometer Reading, R1'			13.5	13	grams
8. Hydrometer Reading-2 Hours, R2			10	10.5	grams
Temperature of Suspension			68	68	deg F
9. Corrected Hydrometer Reading, R2'			6	6.5	grams
10. % Sand = (Wt.-R1')/Wt. x 100			65.0	66.3	%
11. % Clay = R2'/Wt. x 100			15.5	16.8	%
12. Sieve Analysis:					
a: Oven Dry Weight (2 hrs, 105 deg C) Total Sand Fraction (Soil Retained in 0.047 mm sieve)			26.3	27.20	grams
b: Weight of Fine Plus Very Fine Sand Fraction *(Sand Passing 0.25 mm Sieve)*			12.70	13.10	grams
c: % Fine Plus Very Fine Sand (b/a)			48.3	48.2	%
13. Soil Morphology (natural soil samples only)					
Structure of Soil Sample Tested:			subangular blocky		
Consistence of Soil Sample Tested:			loose		
14. Soil Permeability Class Rating (Based upon average textural analysis of this replicate and other replicate samples)			K3	K3	

15. I hereby certify that the information furnished on form 3c of this application is true and accurate in my professional opinion. I am aware that falsification of data is a violation of Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Signature of Soil Evaluator _____ Date: 2/28/2023

Michael Gimigliano, Ph.D. Environmental Consulting Associates
NJ & NY

Signature of Professional Engineer _____ NJ License #_____

APPENDIX B

RAINFALL DATA

RAINFALL DATA CURRENT PRECIPITATION ADJUSTMENT

RAINFALL DATA OBTAINED FROM THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION (NOAA), NATIONAL WEATHER SERVICES' ATLAS 14 POINT PRECIPITATION FREQURENCY ESTIMATES.

2-YEAR, 24-HOUR STORM: 3.51 INCHES

10-YEAR, 24-HOUR STORM: 5.21 INCHES

100-YEAR, 24-HOUR STORM: 8.41 INCHES

COUNTY: WARREN

CURRENT ADJUSTMENT FACTORS:

2-YEAR DESIGN STORM: 1.02

10-YEAR DESIGN STORM: 1.07

100-YEAR DESIGN STORM: 1.15

ADJUSTED RAINFALL DATA PER CURRENT ADJUSTMENT FACTORS:

2-YEAR, 24-HOUR STORM: 3.51 IN x 1.02 = **3.58 INCHES**

10-YEAR, 24-HOUR STORM: 5.21 IN x 1.07 = **5.57 INCHES**

100-YEAR, 24-HOUR STORM: 8.41 IN x 1.15 = **9.67 INCHES**

RAINFALL DATA FUTURE PRECIPITATION ADJUSTMENT

RAINFALL DATA OBTAINED FROM THE NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION (NOAA), NATIONAL WEATHER SERVICES' ATLAS 14 POINT PRECIPITATION FREQURENCY ESTIMATES.

2-YEAR, 24-HOUR STORM: 3.51 INCHES

10-YEAR, 24-HOUR STORM: 5.21 INCHES

100-YEAR, 24-HOUR STORM: 8.41 INCHES

COUNTY: WARREN

FUTURE CHANGE FACTORS:

2-YEAR DESIGN STORM: 1.20

10-YEAR DESIGN STORM: 1.25

100-YEAR DESIGN STORM: 1.37

ADJUSTED RAINFALL DATA PER CURRENT ADJUSTMENT FACTORS:

2-YEAR, 24-HOUR STORM: 3.51 IN x 1.2 = **4.21 INCHES**

10-YEAR, 24-HOUR STORM: 5.21 IN x 1.25 = **6.51 INCHES**

100-YEAR, 24-HOUR STORM: 8.41 IN x 1.37 = **11.52 INCHES**

NOAA Atlas 14, Volume 2, Version 3
Location name: Mendham, New Jersey, USA*
Latitude: 40.7622°, Longitude: -74.5842°
Elevation: 643 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	0.337 (0.307-0.372)	0.401 (0.366-0.443)	0.474 (0.431-0.523)	0.529 (0.479-0.582)	0.593 (0.535-0.652)	0.638 (0.573-0.701)	0.682 (0.610-0.749)	0.721 (0.641-0.793)	0.770 (0.680-0.848)	0.806 (0.707-0.889)
10-min	0.538 (0.489-0.593)	0.642 (0.584-0.708)	0.760 (0.689-0.837)	0.842 (0.763-0.927)	0.940 (0.849-1.03)	1.01 (0.909-1.11)	1.08 (0.964-1.18)	1.14 (1.01-1.25)	1.21 (1.07-1.34)	1.26 (1.11-1.39)
15-min	0.670 (0.610-0.740)	0.804 (0.732-0.888)	0.958 (0.869-1.06)	1.06 (0.963-1.17)	1.19 (1.07-1.31)	1.28 (1.15-1.40)	1.36 (1.22-1.50)	1.43 (1.28-1.58)	1.53 (1.35-1.68)	1.59 (1.39-1.75)
30-min	0.917 (0.834-1.01)	1.11 (1.01-1.22)	1.36 (1.23-1.50)	1.53 (1.39-1.69)	1.75 (1.58-1.93)	1.92 (1.72-2.11)	2.08 (1.86-2.28)	2.22 (1.98-2.44)	2.42 (2.13-2.66)	2.55 (2.24-2.82)
60-min	1.14 (1.04-1.26)	1.39 (1.26-1.53)	1.74 (1.58-1.92)	2.00 (1.81-2.20)	2.33 (2.11-2.57)	2.59 (2.33-2.85)	2.85 (2.55-3.13)	3.11 (2.76-3.42)	3.46 (3.05-3.80)	3.72 (3.26-4.10)
2-hr	1.40 (1.27-1.54)	1.70 (1.55-1.88)	2.16 (1.95-2.38)	2.51 (2.26-2.76)	3.00 (2.69-3.29)	3.39 (3.03-3.73)	3.80 (3.37-4.18)	4.23 (3.73-4.65)	4.83 (4.21-5.32)	5.31 (4.58-5.85)
3-hr	1.57 (1.43-1.74)	1.91 (1.74-2.12)	2.42 (2.20-2.68)	2.82 (2.55-3.11)	3.37 (3.03-3.71)	3.81 (3.41-4.20)	4.27 (3.79-4.70)	4.75 (4.19-5.23)	5.42 (4.72-5.97)	5.95 (5.14-6.56)
6-hr	2.02 (1.85-2.24)	2.46 (2.24-2.72)	3.11 (2.83-3.43)	3.64 (3.30-4.00)	4.40 (3.95-4.82)	5.03 (4.49-5.51)	5.71 (5.04-6.24)	6.44 (5.63-7.03)	7.49 (6.46-8.19)	8.36 (7.13-9.16)
12-hr	2.54 (2.31-2.82)	3.08 (2.81-3.42)	3.92 (3.56-4.34)	4.63 (4.18-5.10)	5.67 (5.07-6.22)	6.57 (5.82-7.19)	7.54 (6.62-8.24)	8.62 (7.47-9.43)	10.2 (8.70-11.2)	11.6 (9.72-12.7)
24-hr	2.91 (2.69-3.17)	3.51 (3.24-3.83)	4.43 (4.09-4.84)	5.21 (4.80-5.69)	6.36 (5.82-6.92)	7.34 (6.67-7.98)	8.41 (7.59-9.14)	9.58 (8.56-10.4)	11.3 (9.97-12.3)	12.8 (11.1-13.9)
2-day	3.42 (3.16-3.74)	4.14 (3.82-4.52)	5.23 (4.81-5.71)	6.12 (5.62-6.68)	7.42 (6.77-8.08)	8.50 (7.72-9.25)	9.66 (8.72-10.5)	10.9 (9.76-11.9)	12.7 (11.2-13.9)	14.2 (12.4-15.6)
3-day	3.60 (3.32-3.91)	4.34 (4.01-4.72)	5.47 (5.05-5.94)	6.39 (5.88-6.94)	7.71 (7.06-8.37)	8.81 (8.03-9.55)	9.99 (9.04-10.8)	11.2 (10.1-12.2)	13.1 (11.6-14.2)	14.6 (12.8-15.9)
4-day	3.77 (3.49-4.08)	4.54 (4.21-4.92)	5.71 (5.28-6.18)	6.65 (6.14-7.20)	8.01 (7.36-8.65)	9.13 (8.34-9.86)	10.3 (9.37-11.2)	11.6 (10.4-12.6)	13.4 (11.9-14.6)	14.9 (13.1-16.2)
7-day	4.44 (4.13-4.81)	5.33 (4.95-5.77)	6.60 (6.12-7.13)	7.64 (7.07-8.25)	9.13 (8.40-9.86)	10.4 (9.49-11.2)	11.7 (10.6-12.6)	13.1 (11.8-14.1)	15.1 (13.4-16.3)	16.7 (14.8-18.1)
10-day	5.11 (4.77-5.50)	6.11 (5.70-6.57)	7.46 (6.95-8.01)	8.55 (7.94-9.18)	10.1 (9.32-10.8)	11.3 (10.4-12.1)	12.6 (11.5-13.5)	14.0 (12.7-15.0)	15.9 (14.3-17.1)	17.4 (15.5-18.8)
20-day	6.90 (6.48-7.37)	8.19 (7.69-8.74)	9.77 (9.17-10.4)	11.0 (10.3-11.7)	12.7 (11.8-13.5)	14.0 (13.0-14.9)	15.3 (14.2-16.3)	16.6 (15.4-17.8)	18.4 (16.9-19.8)	19.8 (18.1-21.3)
30-day	8.59 (8.12-9.10)	10.1 (9.58-10.7)	11.8 (11.2-12.5)	13.1 (12.4-13.9)	14.8 (14.0-15.7)	16.1 (15.1-17.1)	17.4 (16.3-18.4)	18.6 (17.4-19.8)	20.2 (18.8-21.5)	21.4 (19.8-22.8)
45-day	10.9 (10.4-11.5)	12.8 (12.2-13.5)	14.8 (14.0-15.6)	16.2 (15.4-17.1)	18.1 (17.1-19.1)	19.5 (18.4-20.6)	20.8 (19.6-21.9)	22.0 (20.7-23.3)	23.6 (22.1-25.0)	24.7 (23.1-26.2)
60-day	13.1 (12.4-13.8)	15.3 (14.6-16.2)	17.5 (16.6-18.5)	19.1 (18.2-20.2)	21.2 (20.0-22.3)	22.6 (21.4-23.9)	24.0 (22.7-25.3)	25.3 (23.8-26.7)	26.8 (25.2-28.4)	27.9 (26.2-29.6)

[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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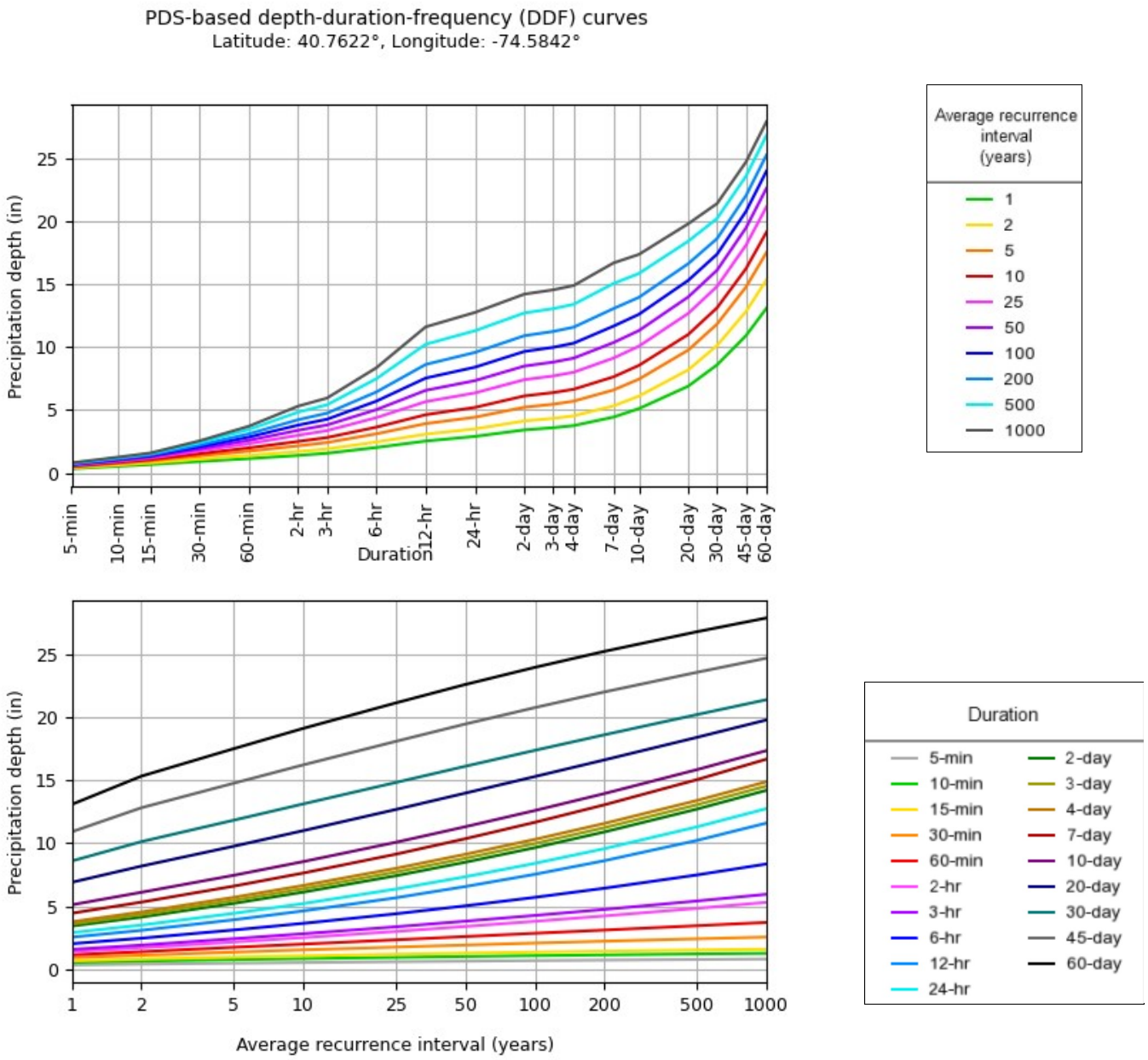
PF graphical



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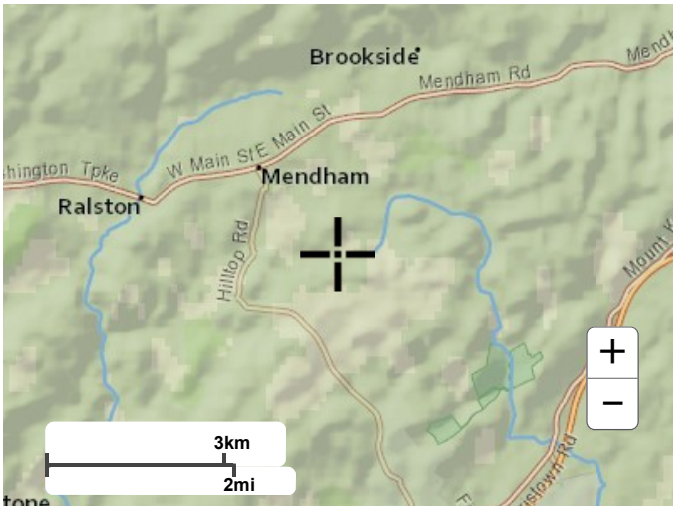
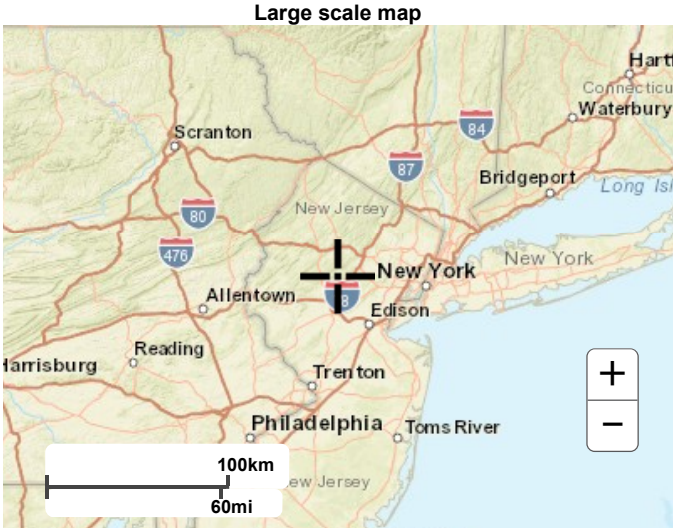
Maps & aerials

Small scale terrain



Large scale terrain

Large scale map



Large scale aerial

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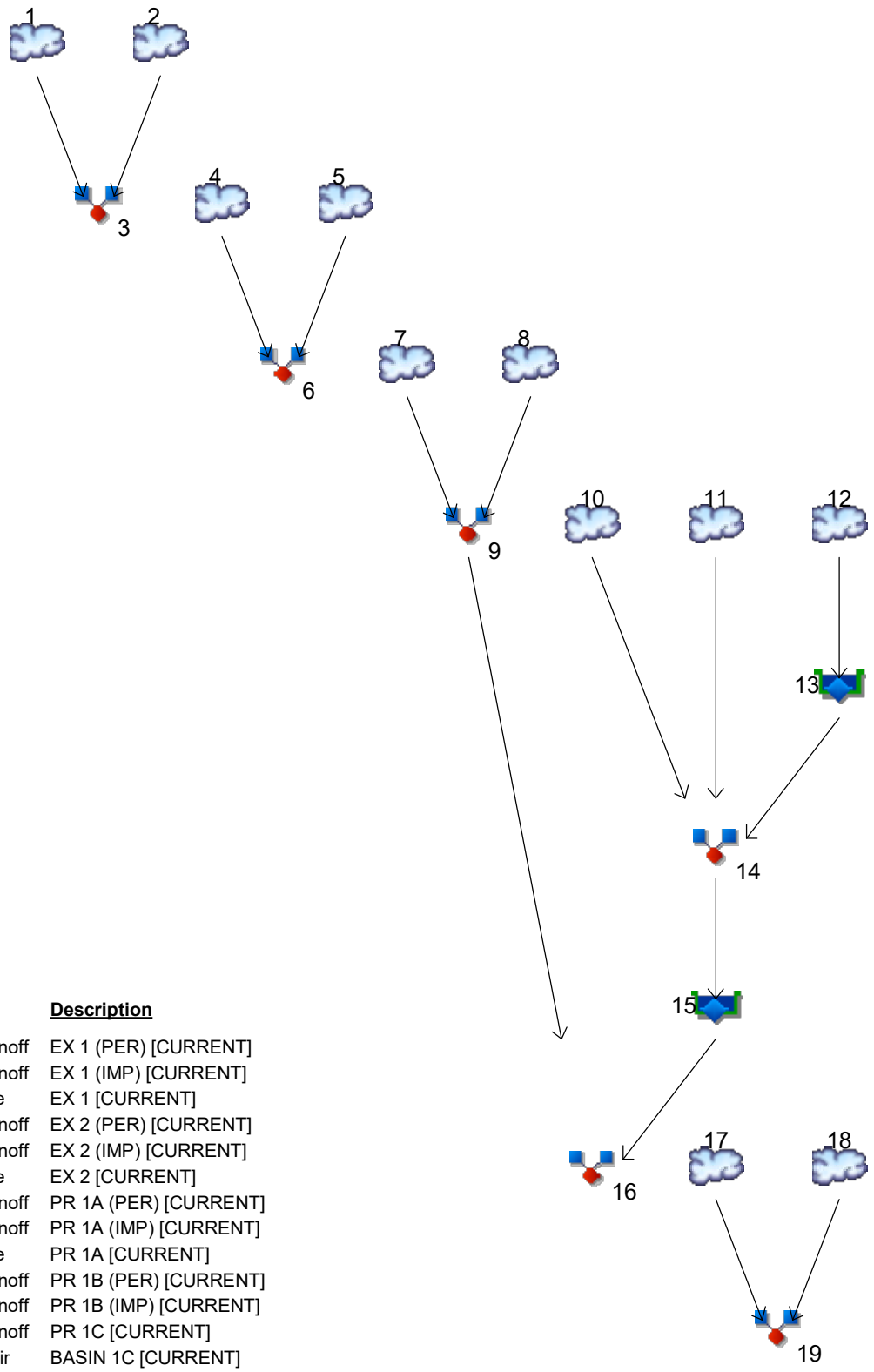
Disclaimer

APPENDIX C

DRAINAGE CALCULATIONS (CURRENT FACTOR)

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX 1 (PER) [CURRENT]
2	SCS Runoff	EX 1 (IMP) [CURRENT]
3	Combine	EX 1 [CURRENT]
4	SCS Runoff	EX 2 (PER) [CURRENT]
5	SCS Runoff	EX 2 (IMP) [CURRENT]
6	Combine	EX 2 [CURRENT]
7	SCS Runoff	PR 1A (PER) [CURRENT]
8	SCS Runoff	PR 1A (IMP) [CURRENT]
9	Combine	PR 1A [CURRENT]
10	SCS Runoff	PR 1B (PER) [CURRENT]
11	SCS Runoff	PR 1B (IMP) [CURRENT]
12	SCS Runoff	PR 1C [CURRENT]
13	Reservoir	BASIN 1C [CURRENT]
14	Combine	PR 1B [CURRENT]
15	Reservoir	BASIN 1B [CURRENT]
16	Combine	PR 1 [CURRENT]
17	SCS Runoff	PR 2 (PER) [CURRENT]
18	SCS Runoff	PR 2 (IMP) [CURRENT]
19	Combine	PR 2 [CURRENT]

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	------	-------	0.842	-------	-------	4.448	-------	-------	14.87	EX 1 (PER) [CURRENT]
2	SCS Runoff	------	-------	0.817	-------	-------	1.279	-------	-------	2.226	EX 1 (IMP) [CURRENT]
3	Combine	1, 2	-------	1.179	-------	-------	4.982	-------	-------	15.91	EX 1 [CURRENT]
4	SCS Runoff	------	-------	0.519	-------	-------	2.473	-------	-------	8.029	EX 2 (PER) [CURRENT]
5	SCS Runoff	------	-------	0.098	-------	-------	0.153	-------	-------	0.267	EX 2 (IMP) [CURRENT]
6	Combine	4, 5	-------	0.591	-------	-------	2.607	-------	-------	8.278	EX 2 [CURRENT]
7	SCS Runoff	------	-------	0.484	-------	-------	2.830	-------	-------	9.865	PR 1A (PER) [CURRENT]
8	SCS Runoff	------	-------	0.340	-------	-------	0.532	-------	-------	0.927	PR 1A (IMP) [CURRENT]
9	Combine	7, 8	-------	0.684	-------	-------	3.237	-------	-------	10.64	PR 1A [CURRENT]
10	SCS Runoff	------	-------	0.237	-------	-------	1.123	-------	-------	3.659	PR 1B (PER) [CURRENT]
11	SCS Runoff	------	-------	0.702	-------	-------	1.099	-------	-------	1.915	PR 1B (IMP) [CURRENT]
12	SCS Runoff	------	-------	0.274	-------	-------	0.428	-------	-------	0.746	PR 1C [CURRENT]
13	Reservoir	12	-------	0.191	-------	-------	0.420	-------	-------	0.738	BASIN 1C [CURRENT]
14	Combine	10, 11, 13	-------	1.001	-------	-------	2.269	-------	-------	5.483	PR 1B [CURRENT]
15	Reservoir	14	-------	0.170	-------	-------	1.054	-------	-------	3.835	BASIN 1B [CURRENT]
16	Combine	9, 15	-------	0.808	-------	-------	3.746	-------	-------	14.03	PR 1 [CURRENT]
17	SCS Runoff	------	-------	0.440	-------	-------	2.311	-------	-------	7.764	PR 2 (PER) [CURRENT]
18	SCS Runoff	------	-------	0.122	-------	-------	0.191	-------	-------	0.332	PR 2 (IMP) [CURRENT]
19	Combine	17, 18	-------	0.531	-------	-------	2.491	-------	-------	8.089	PR 2 [CURRENT]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.842	1	735	5,114	------	------	------	EX 1 (PER) [CURRENT]
2	SCS Runoff	0.817	1	726	2,429	------	------	------	EX 1 (IMP) [CURRENT]
3	Combine	1.179	1	728	7,543	1, 2	------	------	EX 1 [CURRENT]
4	SCS Runoff	0.519	1	736	3,077	------	------	------	EX 2 (PER) [CURRENT]
5	SCS Runoff	0.098	1	729	371	------	------	------	EX 2 (IMP) [CURRENT]
6	Combine	0.591	1	734	3,448	4, 5	------	------	EX 2 [CURRENT]
7	SCS Runoff	0.484	1	739	3,386	------	------	------	PR 1A (PER) [CURRENT]
8	SCS Runoff	0.340	1	728	1,215	------	------	------	PR 1A (IMP) [CURRENT]
9	Combine	0.684	1	734	4,600	7, 8	------	------	PR 1A [CURRENT]
10	SCS Runoff	0.237	1	739	1,476	------	------	------	PR 1B (PER) [CURRENT]
11	SCS Runoff	0.702	1	727	2,369	------	------	------	PR 1B (IMP) [CURRENT]
12	SCS Runoff	0.274	1	726	797	------	------	------	PR 1C [CURRENT]
13	Reservoir	0.191	1	728	220	12	638.21	323	BASIN 1C [CURRENT]
14	Combine	1.001	1	728	4,065	10, 11, 13	------	------	PR 1B [CURRENT]
15	Reservoir	0.170	1	779	3,342	14	633.06	1,896	BASIN 1B [CURRENT]
16	Combine	0.808	1	734	7,942	9, 15	------	------	PR 1 [CURRENT]
17	SCS Runoff	0.440	1	738	2,820	------	------	------	PR 2 (PER) [CURRENT]
18	SCS Runoff	0.122	1	730	478	------	------	------	PR 2 (IMP) [CURRENT]
19	Combine	0.531	1	735	3,299	17, 18	------	------	PR 2 [CURRENT]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.448	1	732	16,866	------	------	------	EX 1 (PER) [CURRENT]
2	SCS Runoff	1.279	1	726	3,871	------	------	------	EX 1 (IMP) [CURRENT]
3	Combine	4.982	1	731	20,738	1, 2	------	------	EX 1 [CURRENT]
4	SCS Runoff	2.473	1	733	9,802	------	------	------	EX 2 (PER) [CURRENT]
5	SCS Runoff	0.153	1	729	591	------	------	------	EX 2 (IMP) [CURRENT]
6	Combine	2.607	1	733	10,393	4, 5	------	------	EX 2 [CURRENT]
7	SCS Runoff	2.830	1	733	11,590	------	------	------	PR 1A (PER) [CURRENT]
8	SCS Runoff	0.532	1	728	1,936	------	------	------	PR 1A (IMP) [CURRENT]
9	Combine	3.237	1	733	13,526	7, 8	------	------	PR 1A [CURRENT]
10	SCS Runoff	1.123	1	734	4,701	------	------	------	PR 1B (PER) [CURRENT]
11	SCS Runoff	1.099	1	727	3,775	------	------	------	PR 1B (IMP) [CURRENT]
12	SCS Runoff	0.428	1	724	1,270	------	------	------	PR 1C [CURRENT]
13	Reservoir	0.420	1	726	622	12	638.32	337	BASIN 1C [CURRENT]
14	Combine	2.269	1	728	9,098	10, 11, 13	------	------	PR 1B [CURRENT]
15	Reservoir	1.054	1	745	8,375	14	633.86	3,326	BASIN 1B [CURRENT]
16	Combine	3.746	1	734	21,901	9, 15	------	------	PR 1 [CURRENT]
17	SCS Runoff	2.311	1	733	9,301	------	------	------	PR 2 (PER) [CURRENT]
18	SCS Runoff	0.191	1	730	762	------	------	------	PR 2 (IMP) [CURRENT]
19	Combine	2.491	1	733	10,063	17, 18	------	------	PR 2 [CURRENT]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	14.87	1	731	51,409	------	------	------	EX 1 (PER) [CURRENT]
2	SCS Runoff	2.226	1	726	6,846	------	------	------	EX 1 (IMP) [CURRENT]
3	Combine	15.91	1	730	58,254	1, 2	------	------	EX 1 [CURRENT]
4	SCS Runoff	8.029	1	732	29,250	------	------	------	EX 2 (PER) [CURRENT]
5	SCS Runoff	0.267	1	729	1,045	------	------	------	EX 2 (IMP) [CURRENT]
6	Combine	8.278	1	732	30,296	4, 5	------	------	EX 2 [CURRENT]
7	SCS Runoff	9.865	1	732	36,120	------	------	------	PR 1A (PER) [CURRENT]
8	SCS Runoff	0.927	1	728	3,423	------	------	------	PR 1A (IMP) [CURRENT]
9	Combine	10.64	1	732	39,542	7, 8	------	------	PR 1A [CURRENT]
10	SCS Runoff	3.659	1	733	14,029	------	------	------	PR 1B (PER) [CURRENT]
11	SCS Runoff	1.915	1	727	6,675	------	------	------	PR 1B (IMP) [CURRENT]
12	SCS Runoff	0.746	1	724	2,246	------	------	------	PR 1C [CURRENT]
13	Reservoir	0.738	1	726	1,543	12	638.44	352	BASIN 1C [CURRENT]
14	Combine	5.483	1	728	22,246	10, 11, 13	------	------	PR 1B [CURRENT]
15	Reservoir	3.835	1	739	21,524	14	634.60	5,590	BASIN 1B [CURRENT]
16	Combine	14.03	1	733	61,066	9, 15	------	------	PR 1 [CURRENT]
17	SCS Runoff	7.764	1	732	28,351	------	------	------	PR 2 (PER) [CURRENT]
18	SCS Runoff	0.332	1	730	1,348	------	------	------	PR 2 (IMP) [CURRENT]
19	Combine	8.089	1	732	29,698	17, 18	------	------	PR 2 [CURRENT]

CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: EX 1 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.35	82.3
WOODS	B	55	1.69	92.7
BRUSH	B	48	0.51	24.7
Total			**Σ= 3.5**	**Σ= 199.7**

$$CN = \frac{199.7}{3.5} = 56$$

DRAINAGE AREA DESIGNATION: EX 1 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.22	21.8
Total			**Σ= 0.2**	**Σ= 21.8**

$$CN = \frac{21.8}{0.2} = 98$$

DRAINAGE AREA DESIGNATION: EX 2 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.31	79.7
WOODS	B	55	0.05	3.0
BRUSH	B	48	0.58	28.0
Total			**Σ= 1.9**	**Σ= 110.8**

$$CN = \frac{110.8}{1.9} = 57$$

DRAINAGE AREA DESIGNATION: EX 2 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.03	2.6
Total			**Σ= 0.0**	**Σ= 2.6**

$$CN = \frac{2.6}{0.0} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 1 (PER) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.8 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	PAVED	FOREST	WOODLANDS
FLOW LENGTH, L (FT)=	201	8	30	165
LAND SLOPE, S (%)=	10	2	20	13.9
AVERAGE VELOCITY, V (FT/S)=	2.20	2.87	1.13	1.88
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.5 MIN.**	**0.0 MIN.**	**0.4 MIN.**	**1.5 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

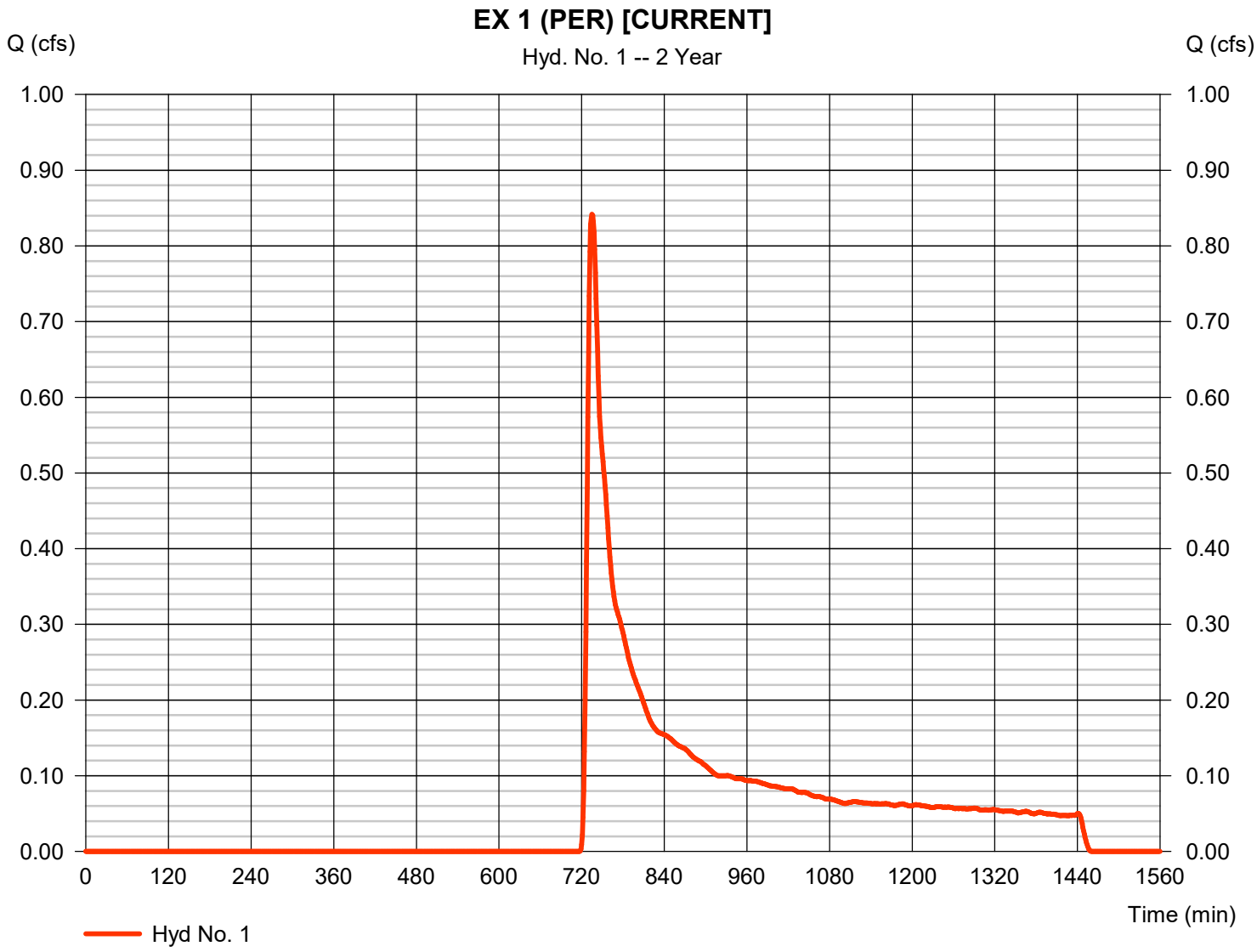
TOTAL SHEET FLOW TIME =	**8.8 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**3.5 MIN.**	**TIME OF CONCENTRATION=**	**12.3 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 1

EX 1 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.842 cfs
Storm frequency	=	2 yrs	Time to peak	=	735 min
Time interval	=	1 min	Hyd. volume	=	5,114 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Tables	Shape factor	=	484

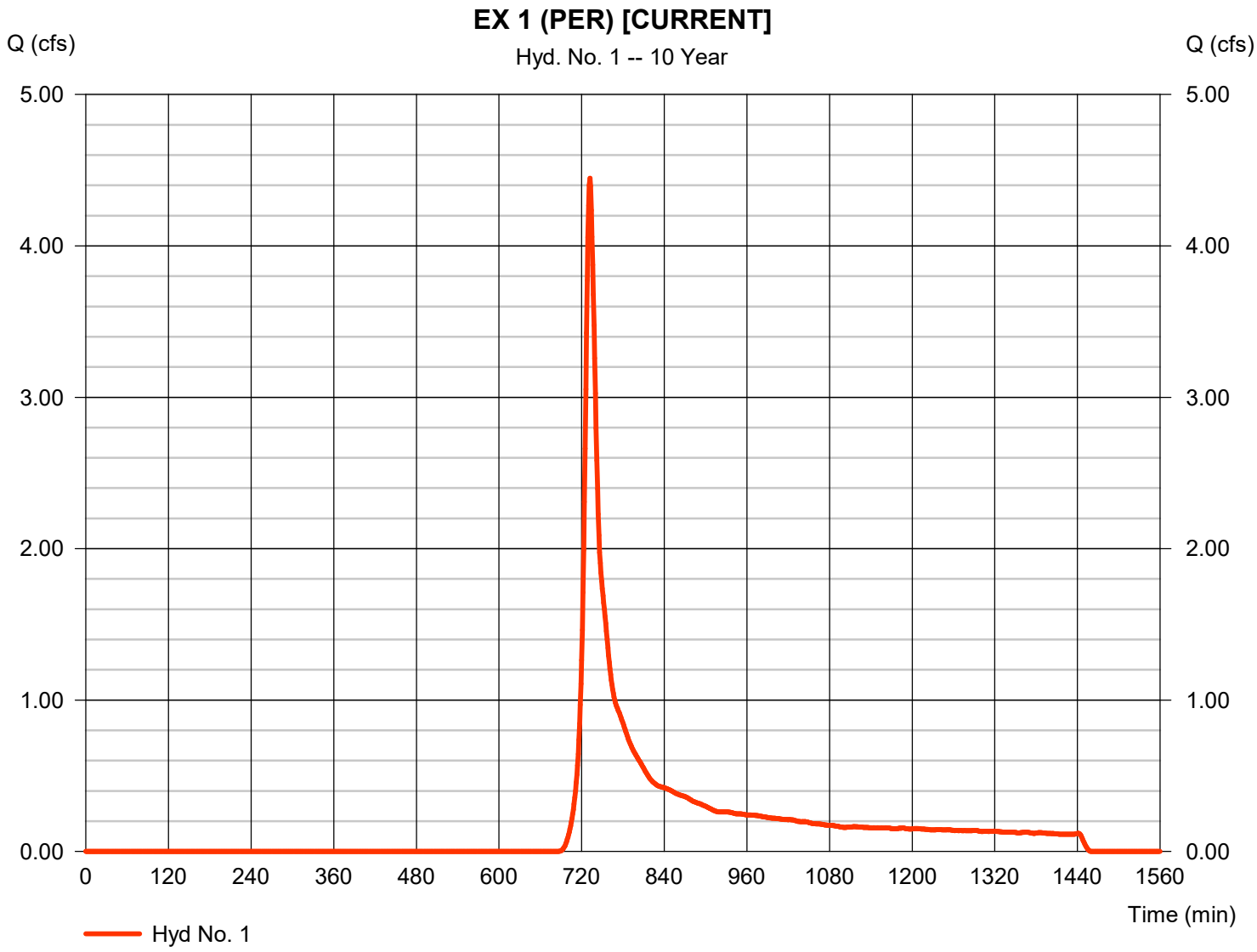


Hydrograph Report

Hyd. No. 1

EX 1 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.448 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	16,866 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



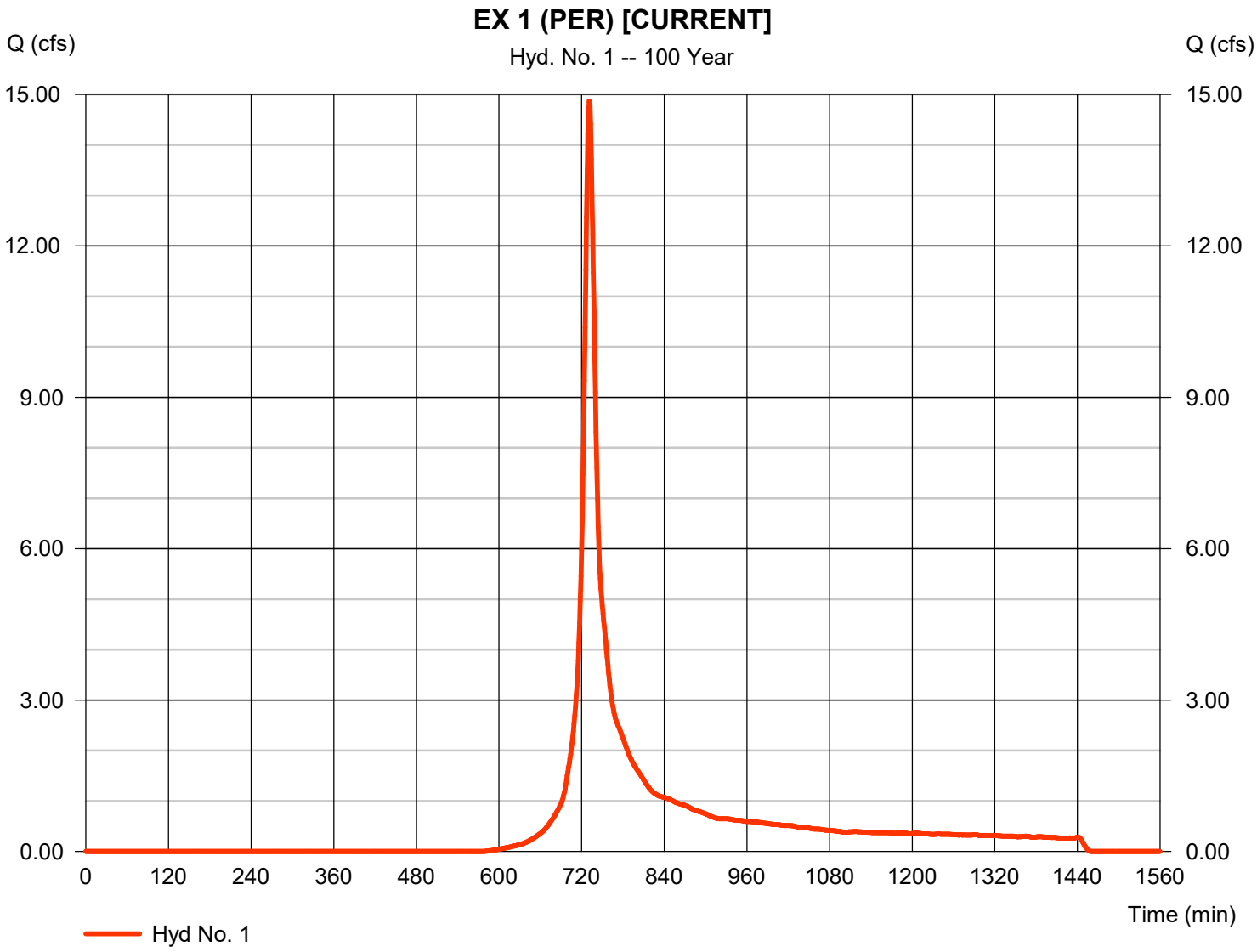
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 1

EX 1 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.87 cfs
Storm frequency	=	100 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	51,409 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.30 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 1 (IMP) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	75 (100 MAX)	25 (100 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58	3.58		
LAND SLOPE, S (%)=	3	33.3		
SHEET FLOW TIME, Tc (MIN.)=	**0.8 MIN.**	**1.4 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	WOODLANDS	
FLOW LENGTH, L (FT)=	15	38	188	
LAND SLOPE, S (%)=	33.3	13.2	12.8	
AVERAGE VELOCITY, V (FT/S)=	4.02	0.91	1.80	
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.1 MIN.**	**0.7 MIN.**	**1.7 MIN.**	

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME = **2.2 MIN.**

TOTAL SHALLOW CONCENTRATED FLOW TIME = **2.5 MIN.**

TOTAL CHANNEL FLOW TIME = **0.0 MIN.**

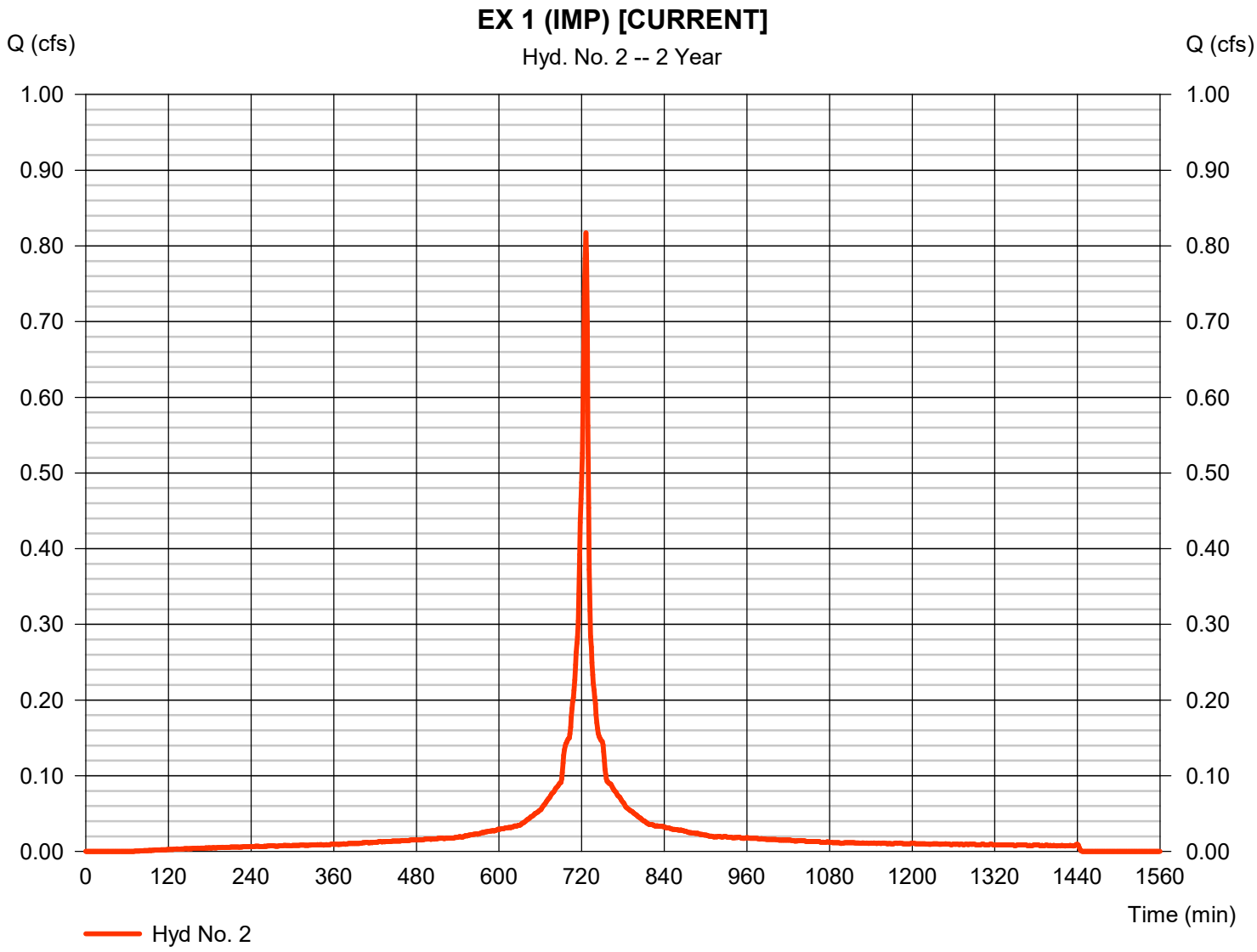
TIME OF CONCENTRATION= 4.7 MIN.

Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.817 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	2,429 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.70 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

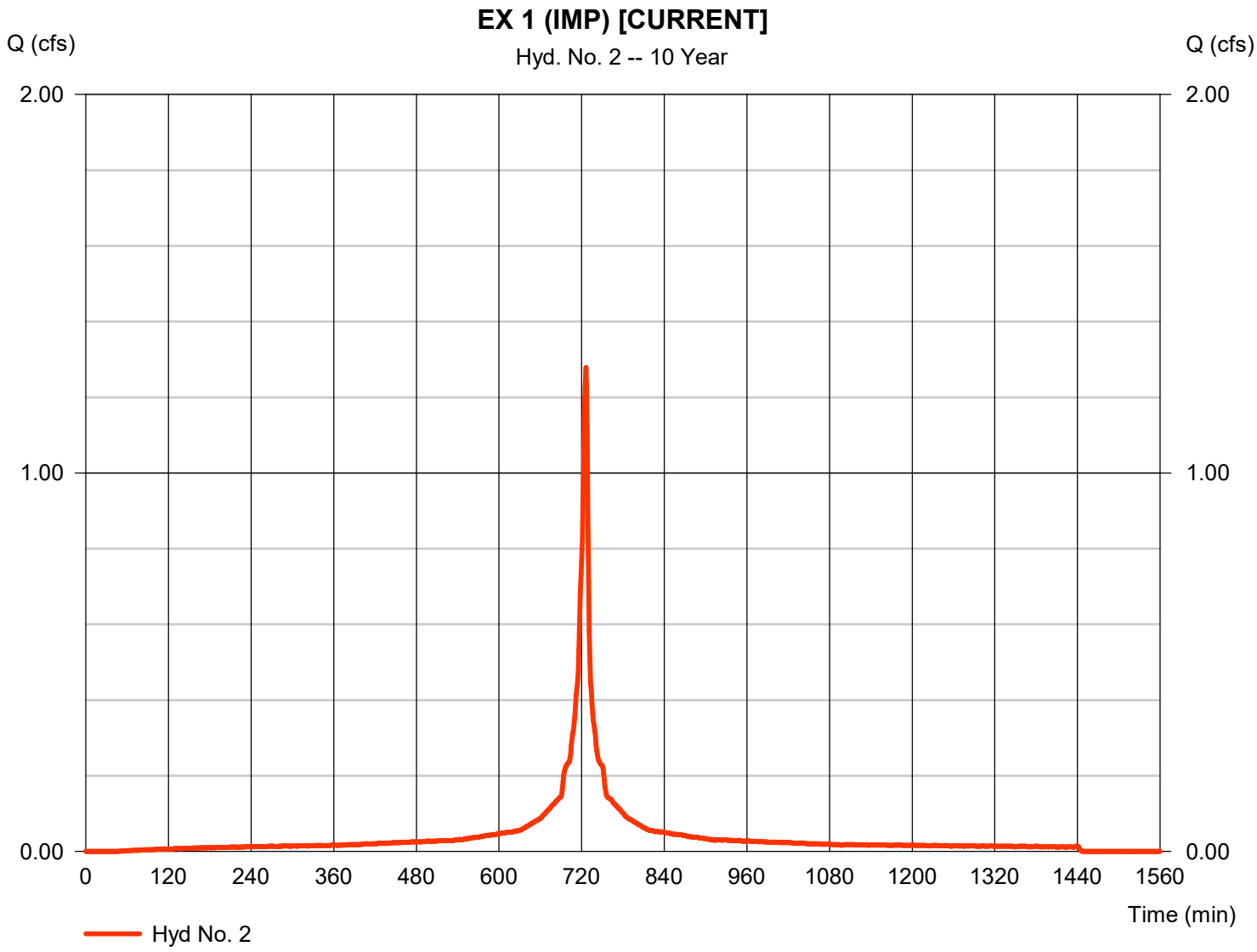


Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.279 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	3,871 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.70 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

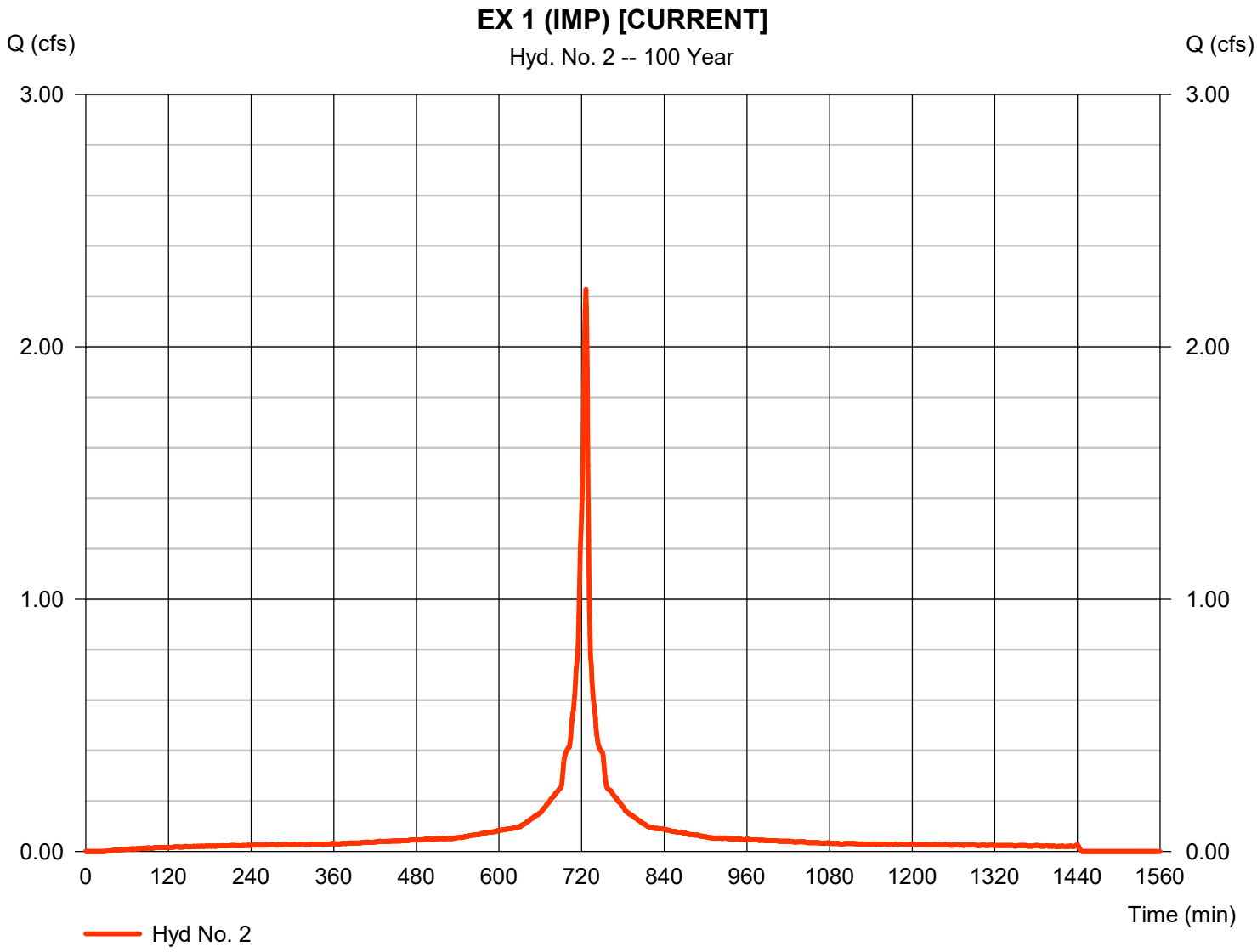


Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.226 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	6,846 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.70 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

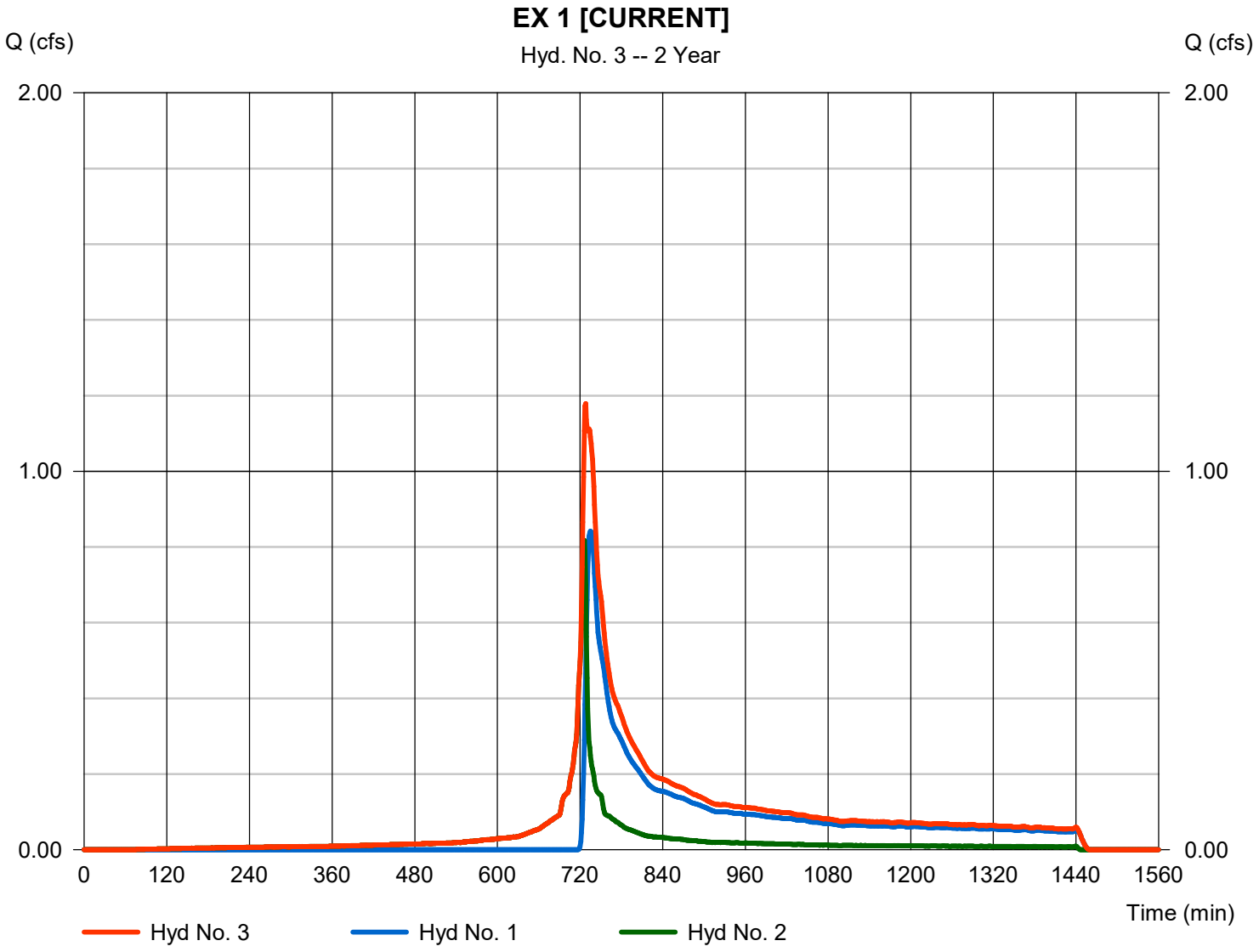


Hydrograph Report

Hyd. No. 3

EX 1 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 1.179 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 7,543 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 3.700 ac

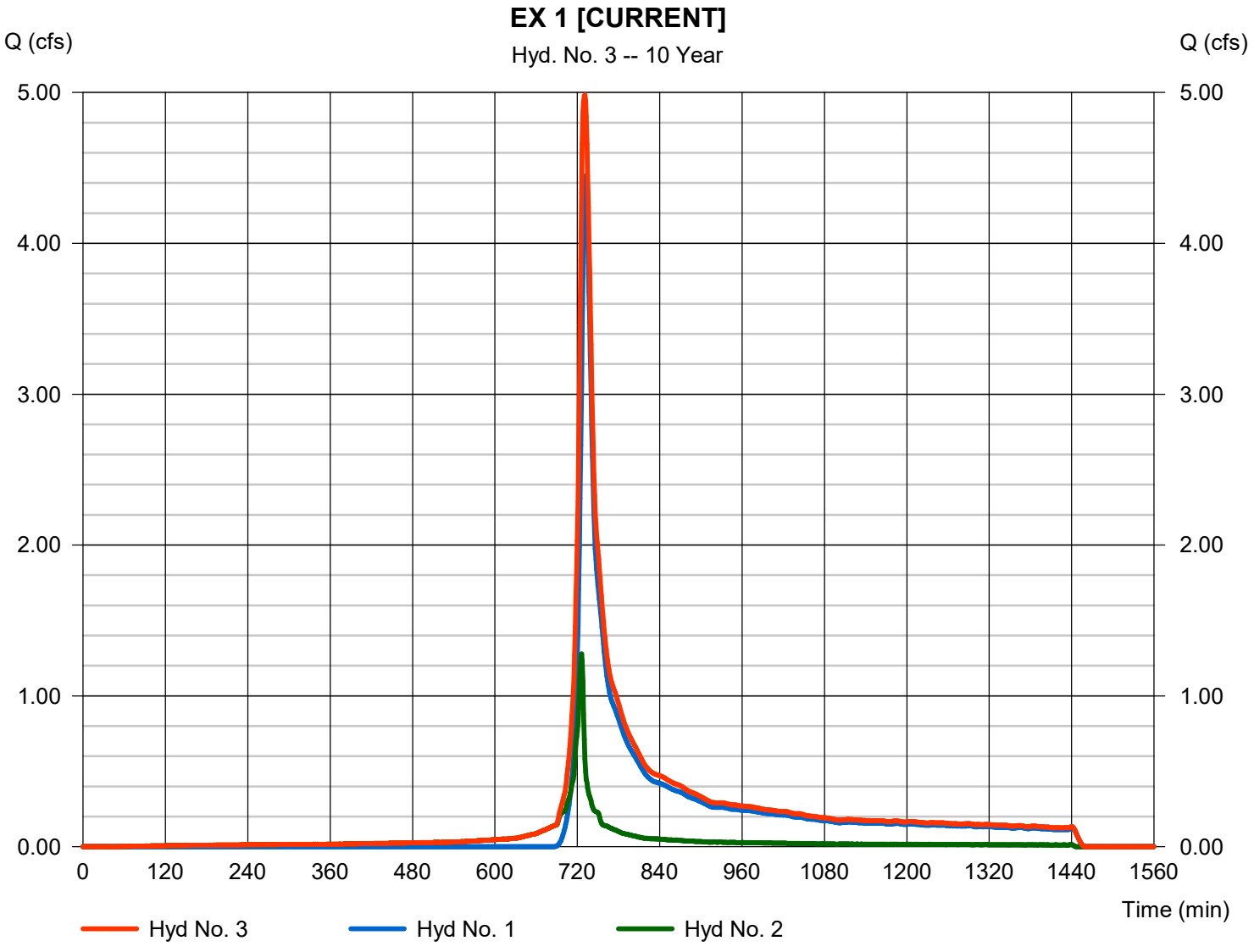


Hydrograph Report

Hyd. No. 3

EX 1 [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	4.982 cfs
Storm frequency	=	10 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	20,738 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	3.700 ac

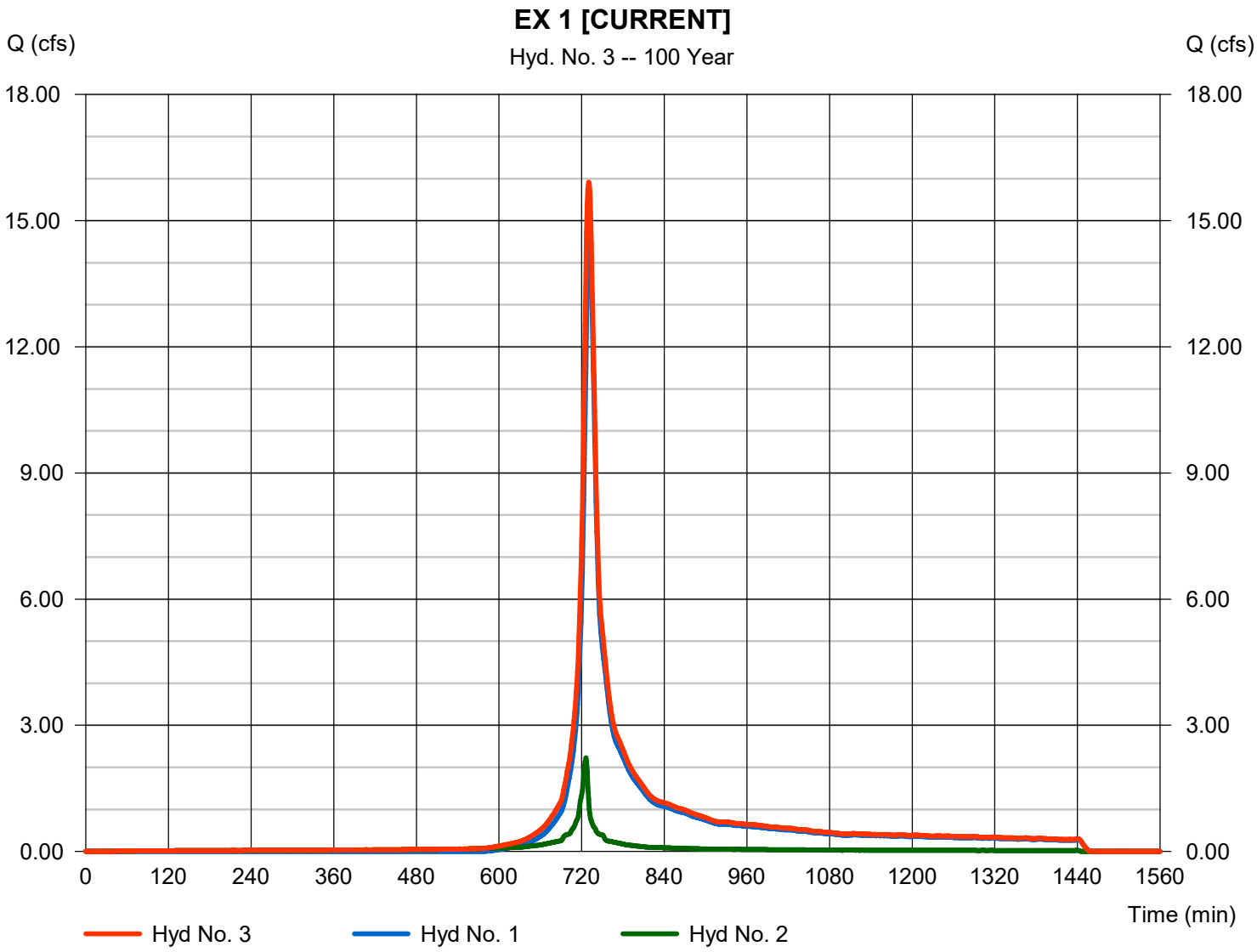


Hydrograph Report

Hyd. No. 3

EX 1 [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	15.91 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	58,254 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	3.700 ac



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 2 (PER) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.8 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	100	80	173	130
LAND SLOPE, S (%)=	5	16.3	13.6	11.5
AVERAGE VELOCITY, V (FT/S)=	1.56	1.02	2.57	0.85
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.1 MIN.**	**1.3 MIN.**	**1.1 MIN.**	**2.5 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**8.8 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.0 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

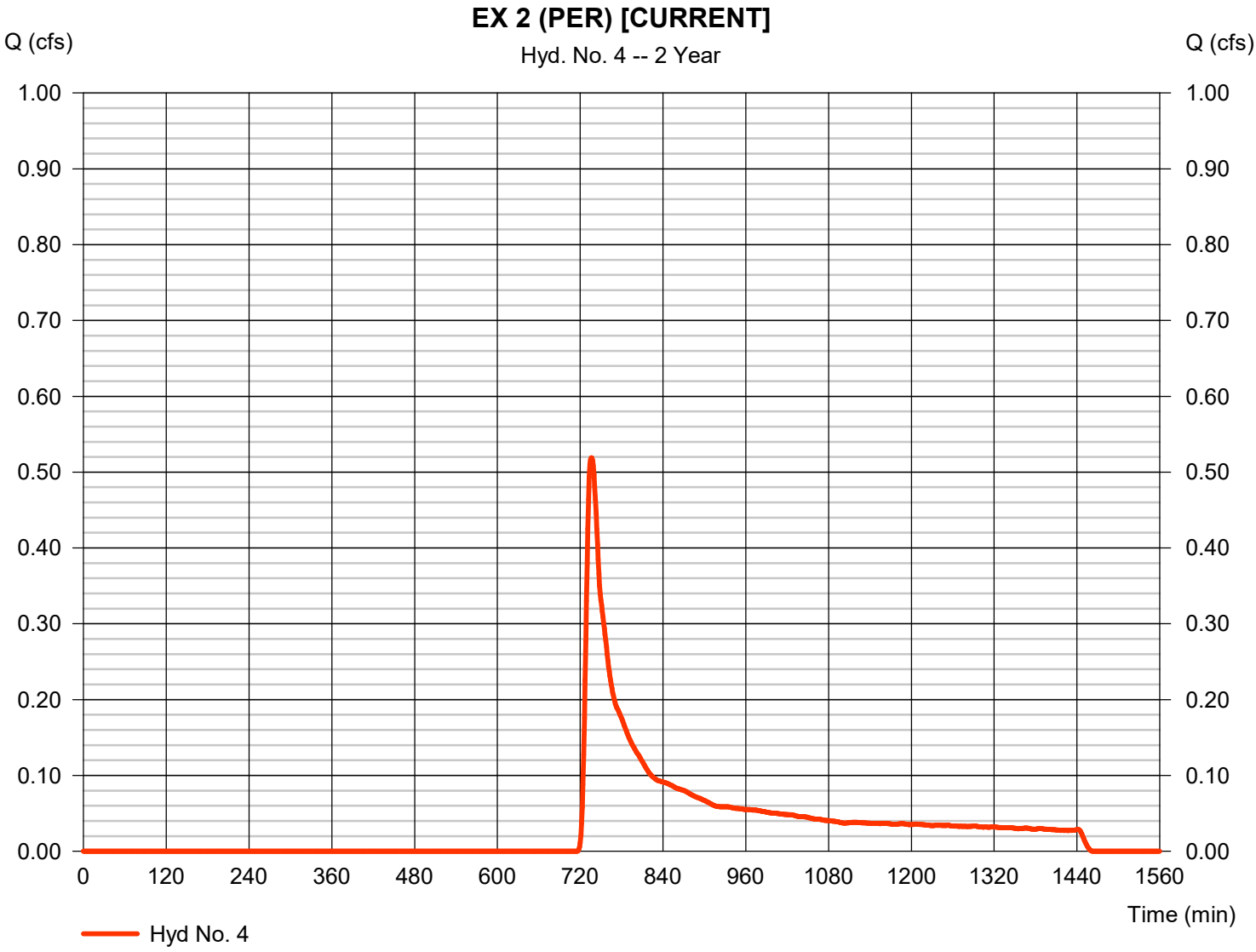
TIME OF CONCENTRATION= 14.9 MIN.

Hydrograph Report

Hyd. No. 4

EX 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.519 cfs
Storm frequency	=	2 yrs	Time to peak	=	736 min
Time interval	=	1 min	Hyd. volume	=	3,077 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.90 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

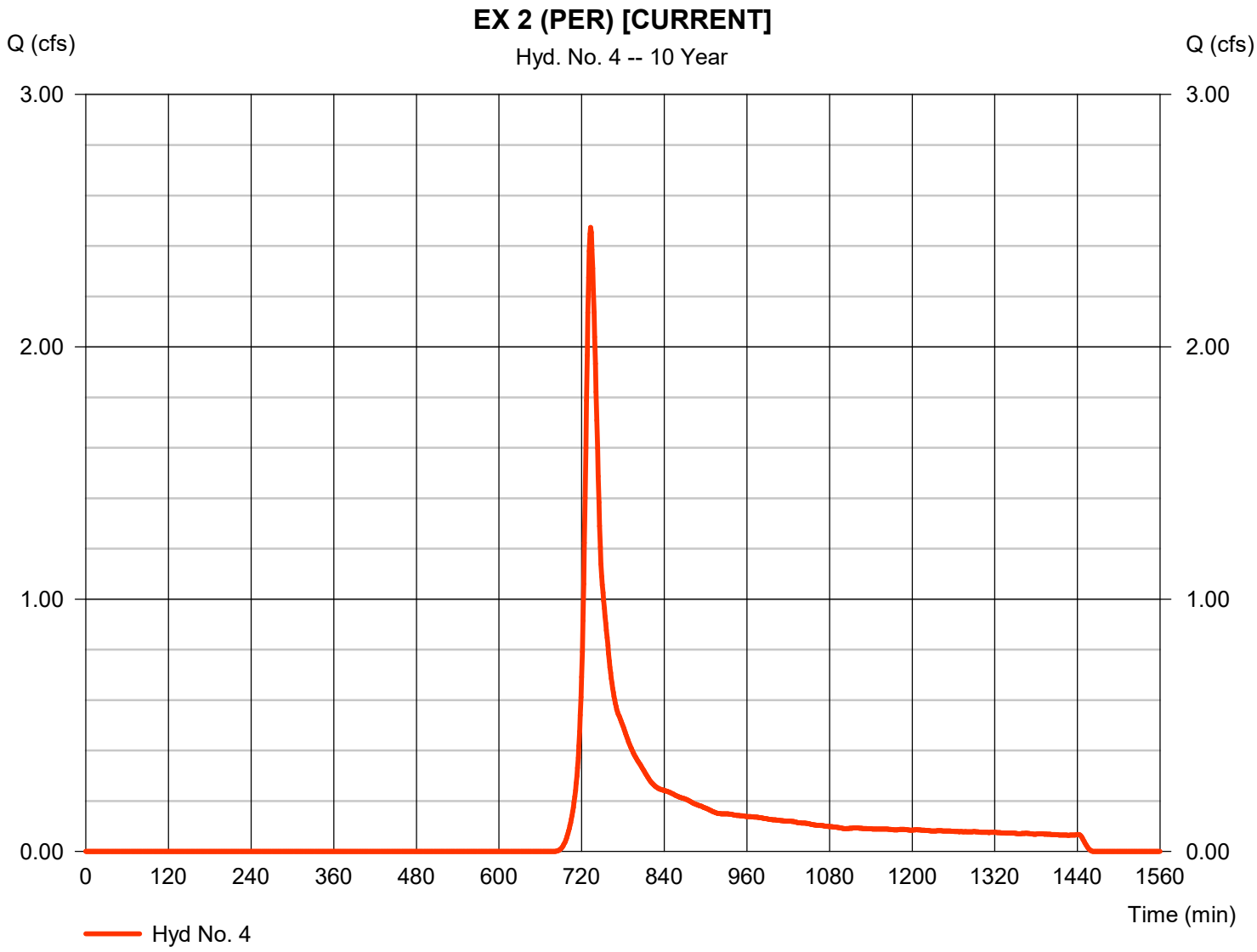


Hydrograph Report

Hyd. No. 4

EX 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.473 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	9,802 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.90 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

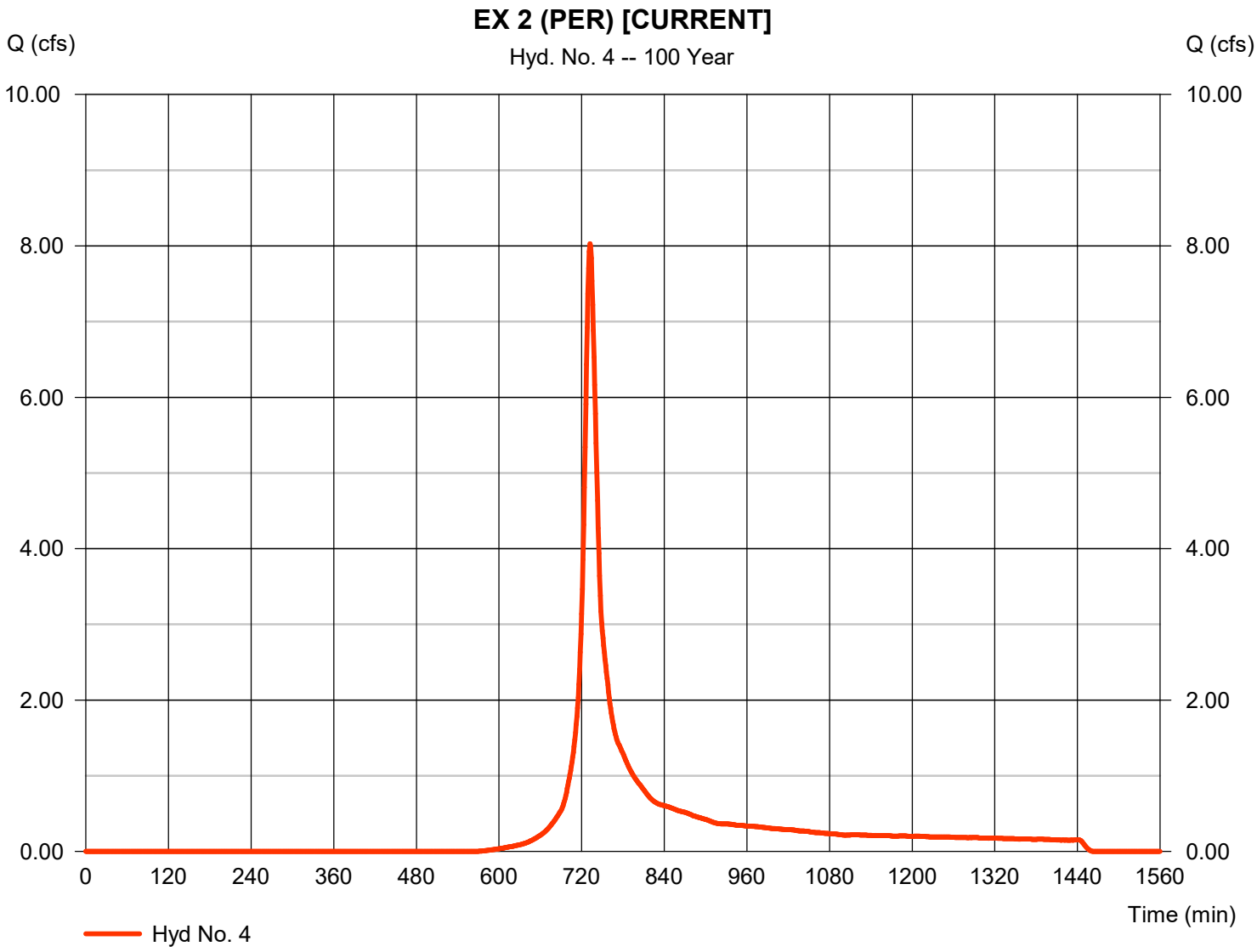


Hydrograph Report

Hyd. No. 4

EX 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.029 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	29,250 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.90 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 2 (IMP) [CURRENT]

SHEET FLOW:	**A**	**B**	**C**	**D**
MANNINGS N-VALUE, n=	0.011	0.24	0.24	
FLOW LENGTH, L (FT, 100 MAX)=	20 (100 MAX)	40 (93 MAX)	40 (100 MAX)	
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58	3.58	3.58	
$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$ LAND SLOPE, S (%)=	1	5	16	
SHEET FLOW TIME, Tc (MIN.)=	**0.4 MIN.**	**4.5 MIN.**	**2.8 MIN.**	

SHALLOW CONCENTRATED FLOW:	**A**	**B**	**C**	**D**
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST		
$T_c = \frac{L}{3600V}$ FLOW LENGTH, L (FT)=	147	130		
LAND SLOPE, S (%)=	16	11.5		
AVERAGE VELOCITY, V (FT/S)=	2.78	0.85		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.9 MIN.**	**2.5 MIN.**		

CHANNEL FLOW:	**A**	**B**	**C**	**D**
PIPE DIAMETER, D (IN)=				
$r = \frac{a}{P_W}$ CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
$T_C = \frac{L}{3600V}$ FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

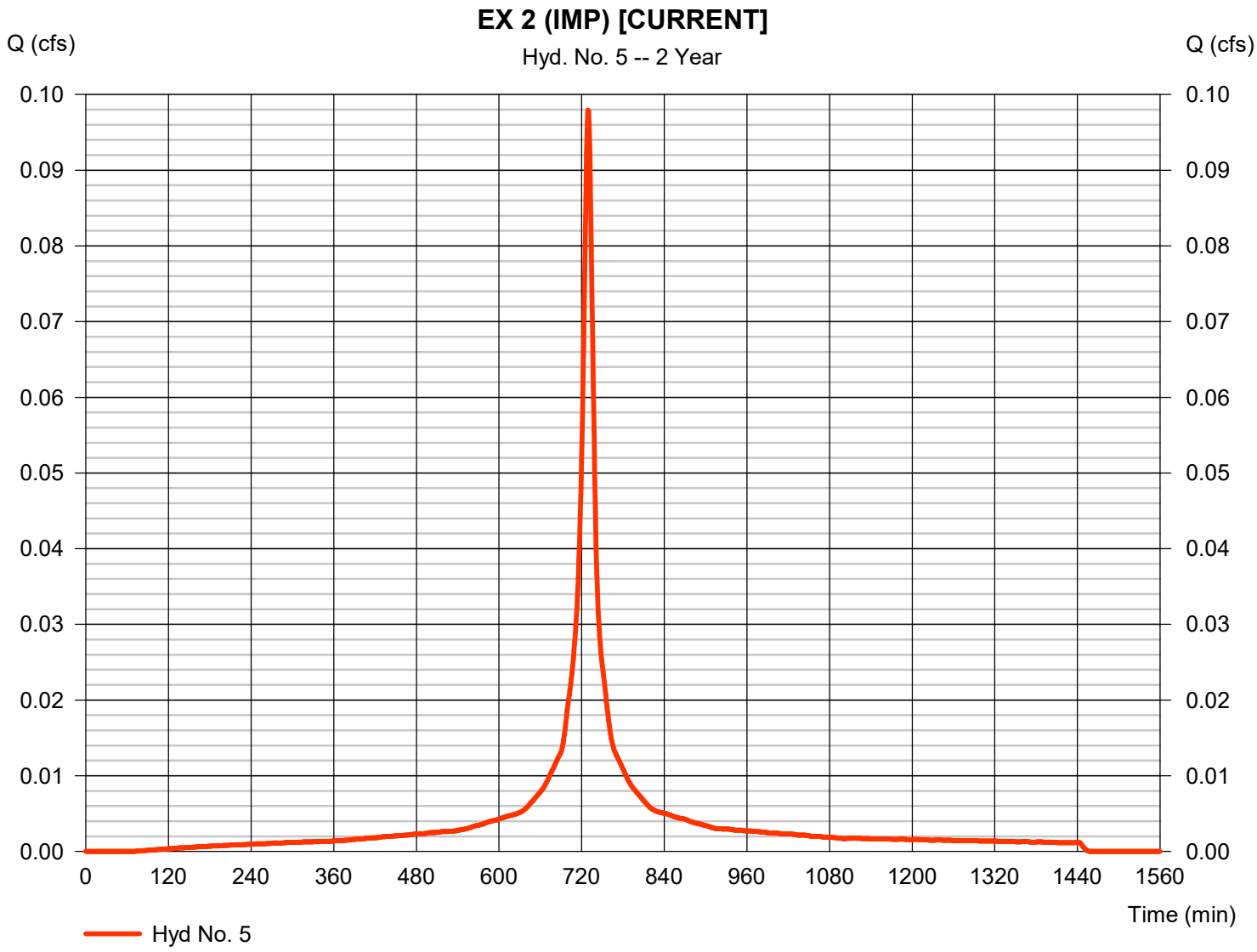
TOTAL SHEET FLOW TIME =	**7.7 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**3.4 MIN.**	**TIME OF CONCENTRATION=**	**11.2 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 5

EX 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.098 cfs
Storm frequency	=	2 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	371 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.20 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



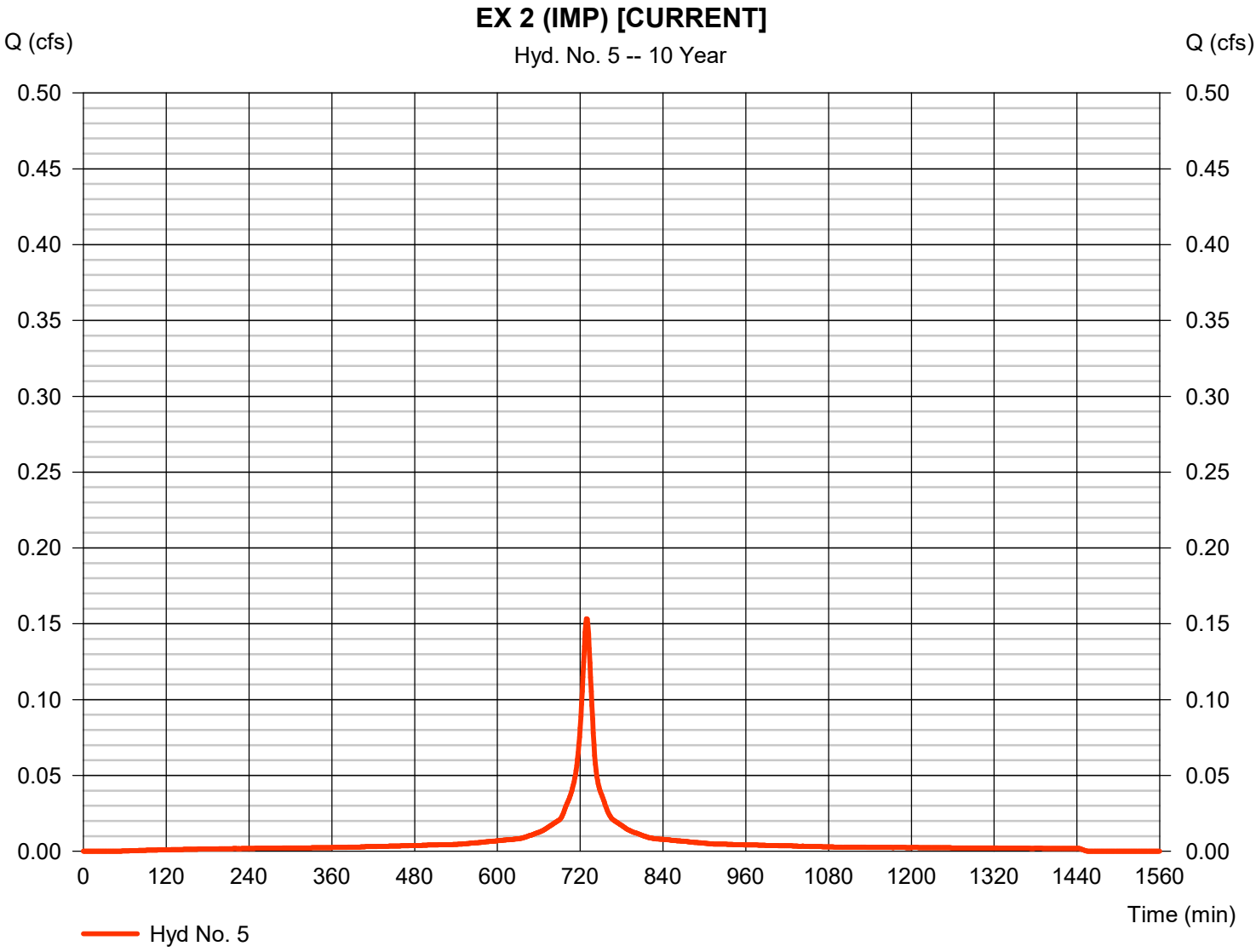
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 5

EX 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.153 cfs
Storm frequency	=	10 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	591 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.20 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

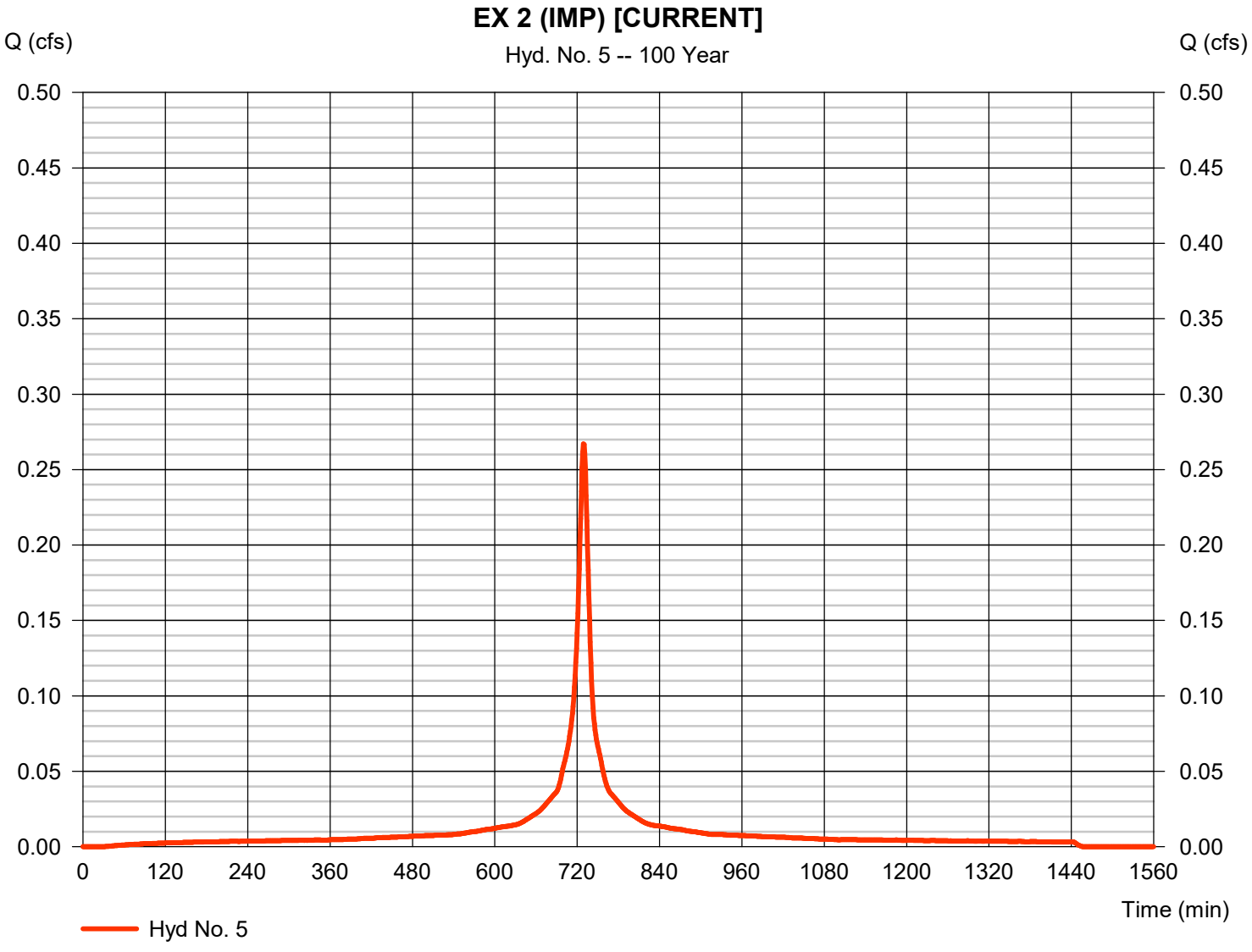


Hydrograph Report

Hyd. No. 5

EX 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.267 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	1,045 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.20 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

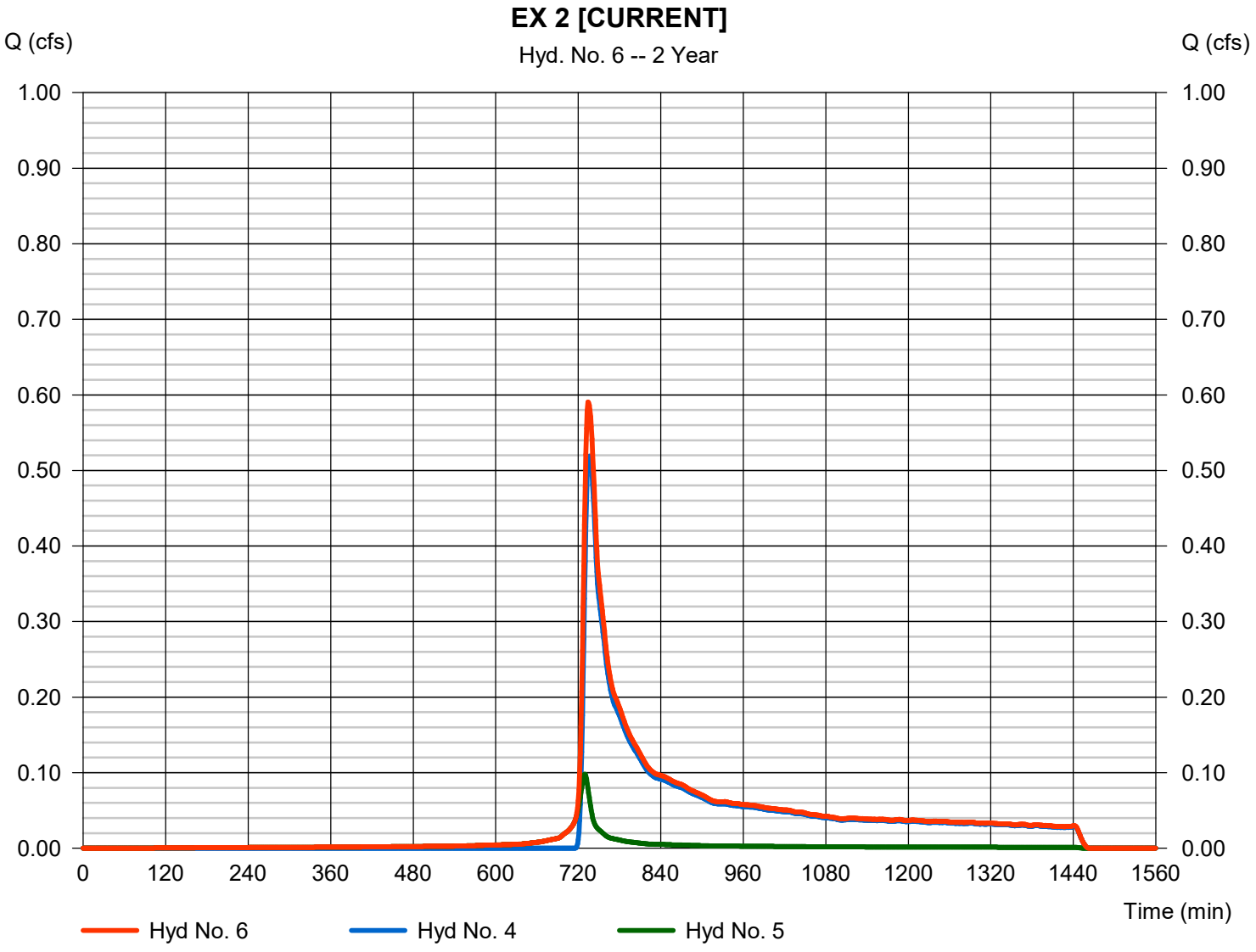


Hydrograph Report

Hyd. No. 6

EX 2 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 0.591 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 3,448 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac

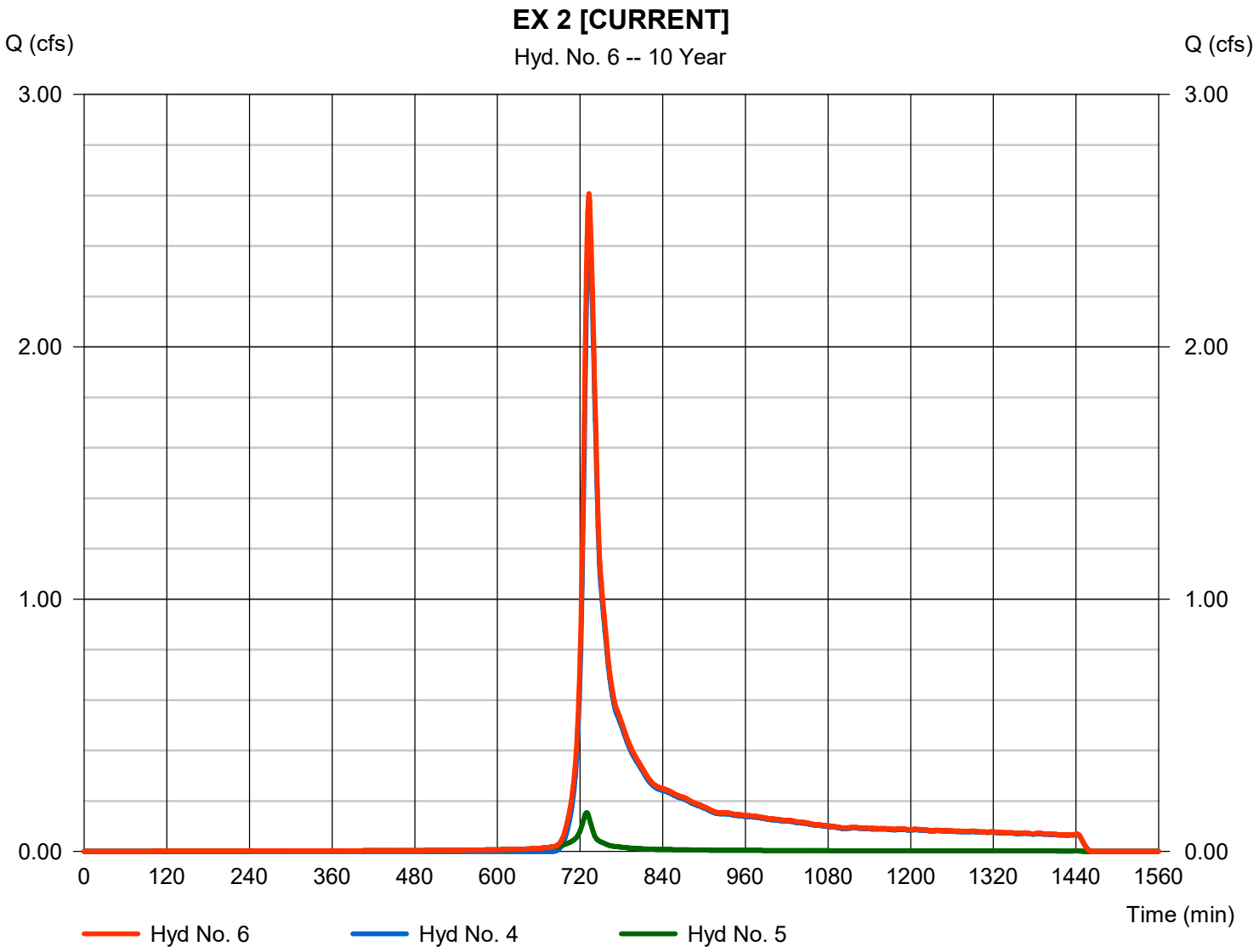


Hydrograph Report

Hyd. No. 6

EX 2 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 2.607 cfs
Storm frequency	= 10 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 10,393 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac

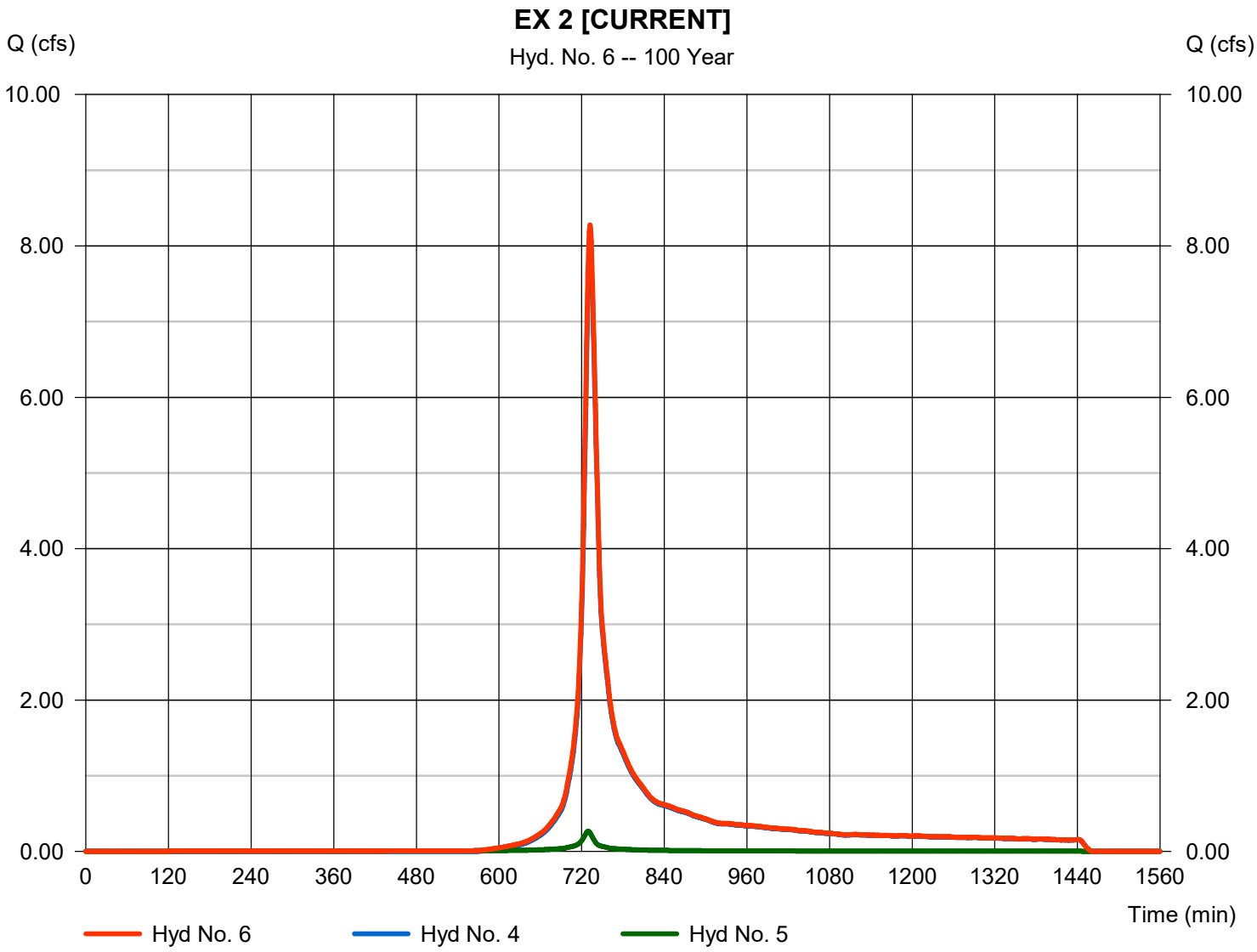


Hydrograph Report

Hyd. No. 6

EX 2 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 8.278 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 30,296 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac



PEAK FLOW REDUCTION CALCULATIONS

TO COMPLY WITH NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER MANAGEMENT REQUIREMENTS, THE POST-DEVELOPMENT PEAK RUNOFF RATES MUST BE REDUCED TO A PERCENTAGE OF PRE-DEVELOPMENT PEAK RUNOFF RATES, AS FOLLOWS:

$$\text{PROPOSED } Q_2 \leq 50\% \text{ EXISTING } Q_2$$
$$\text{PROPOSED } Q_{10} \leq 75\% \text{ EXISTING } Q_{10}$$
$$\text{PROPOSED } Q_{100} \leq 80\% \text{ EXISTING } Q_{10}$$

REDUCTION FACTORS ARE APPLIED TO THE DISTURBED PORTION OF THE TRIBUTARY DRAINAGE AREA ONLY:

EX 1 (CURRENT)

DRAINAGE AREA = 3.77 AC
AREA OF DISTURBANCE= 2.26 AC
PERCENT DISTURBANCE = 59.9%

APPLY REDUCTION FACTORS TO 59.9% OF EXISTING PEAK FLOWS.

EXISTING PEAK FLOWS:

Q_2= 1.2 CFS
Q_{10}= 5.0 CFS
Q_{100}= 15.9 CFS

CALCULATE ALLOWABLE RUNOFF:

Q_2= (0.50) x (0.6) x (1.2 CFS) + (0.4) x (1.2 CFS) = 0.8 CFS
Q_{10}= (0.75) x (0.6) x (5 CFS) + (0.4) x (5 CFS) = 4.2 CFS
Q_{100}= (0.80) x (0.6) x (15.9 CFS) + (0.4) x (15.9 CFS) = 14.0 CFS

`

CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1A PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	0.95	57.8
WOODS	B	55	0.88	48.2
BRUSH	B	48	0.72	34.6
Total			**Σ= 2.5**	**Σ= 140.7**

$$CN = \frac{140.7}{2.5} = 55$$

DRAINAGE AREA DESIGNATION: PR 1A IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.11	10.7
Total			**Σ= 0.1**	**Σ= 10.7**

$$CN = \frac{10.7}{0.1} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1A (PER) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	99 (99 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58			
LAND SLOPE, S (%)=	5.6			
SHEET FLOW TIME, Tc (MIN.)=	**8.9 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	WOODLANDS
FLOW LENGTH, L (FT)=	42	108	76	126
LAND SLOPE, S (%)=	5.6	3.2	11.8	11.4
AVERAGE VELOCITY, V (FT/S)=	1.65	0.45	2.39	1.70
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.4 MIN.**	**4.0 MIN.**	**0.5 MIN.**	**1.2 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**8.9 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.2 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

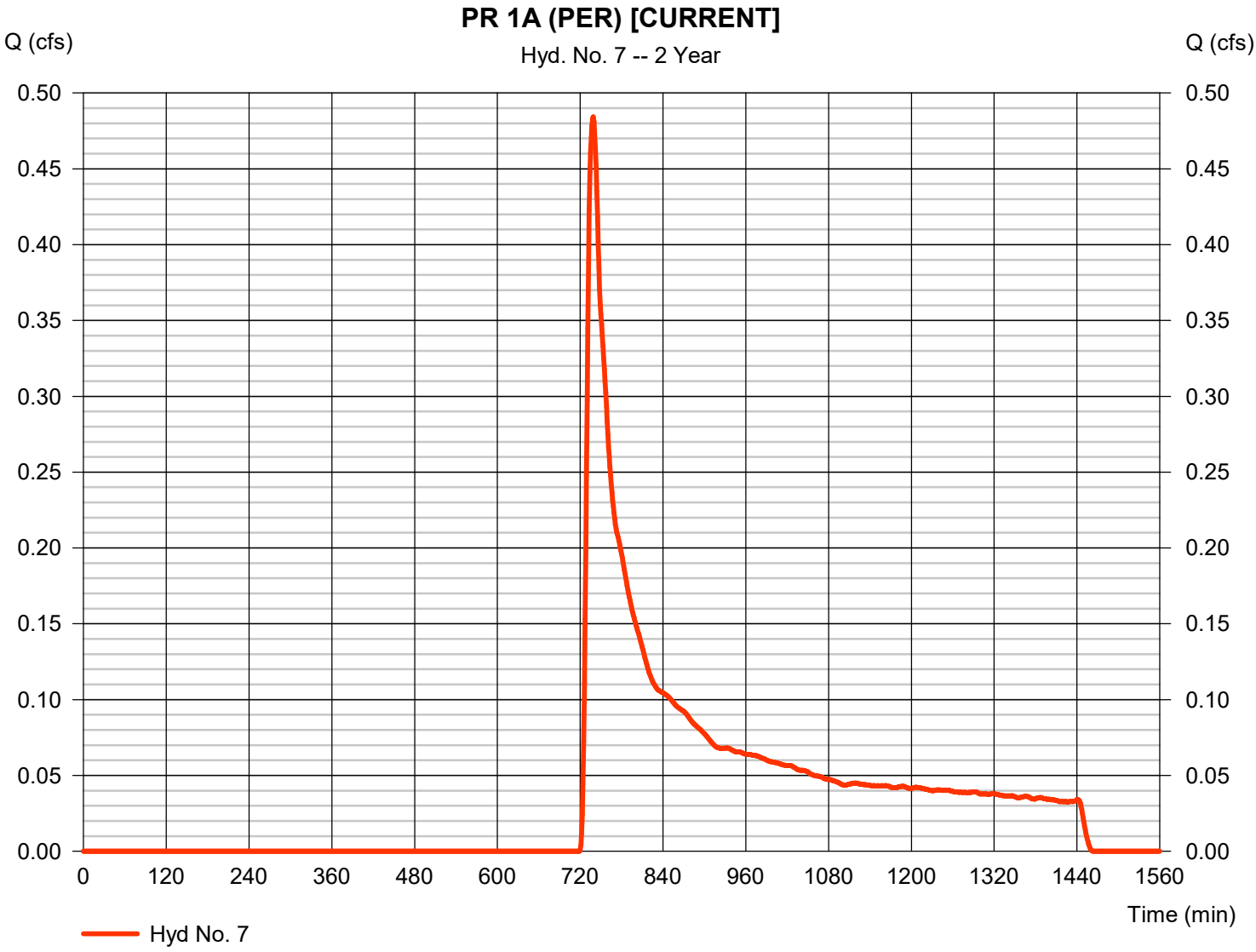
TIME OF CONCENTRATION= 15.1 MIN.

Hydrograph Report

Hyd. No. 7

PR 1A (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.484 cfs
Storm frequency	=	2 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	3,386 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.10 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

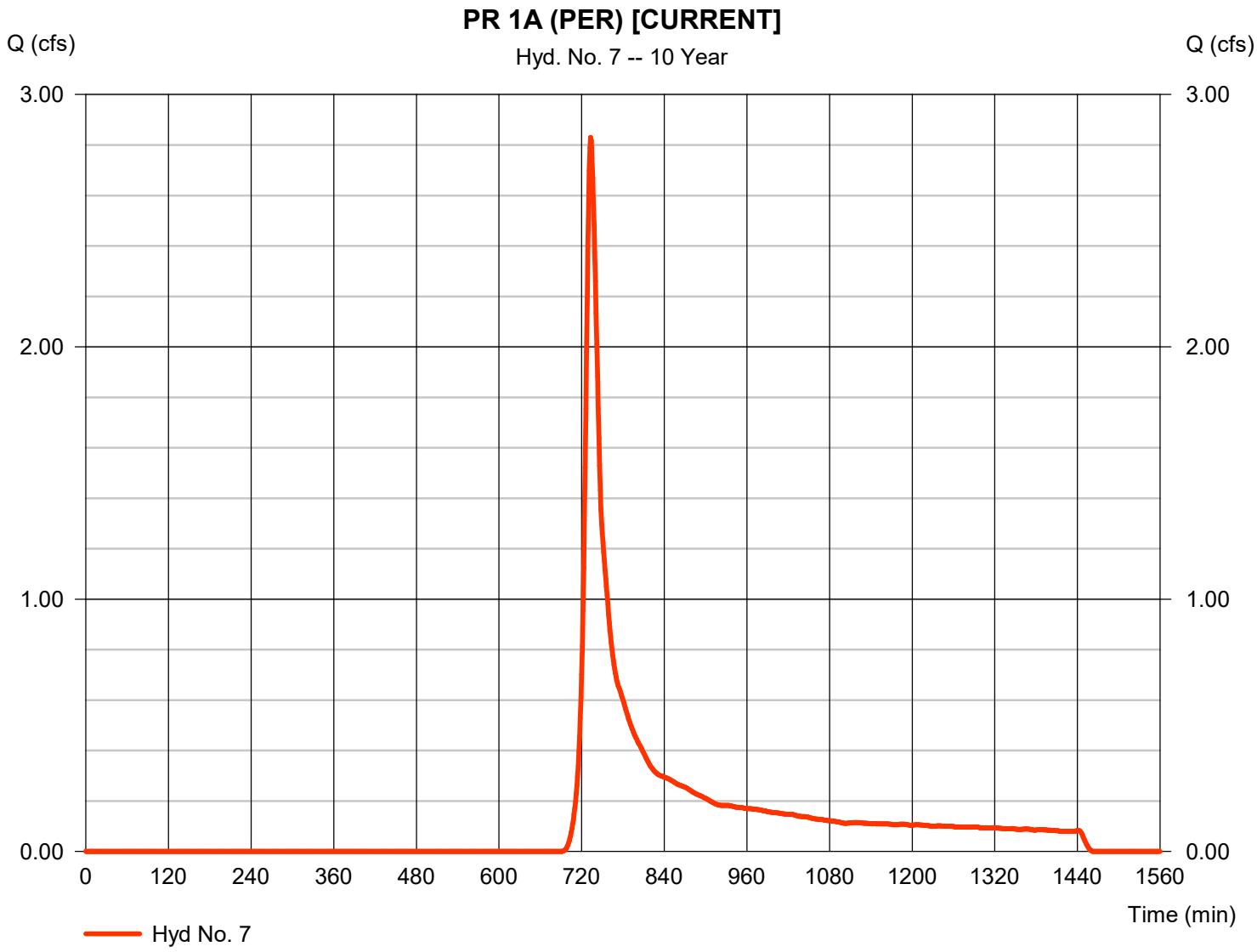


Hydrograph Report

Hyd. No. 7

PR 1A (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.830 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	11,590 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.10 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

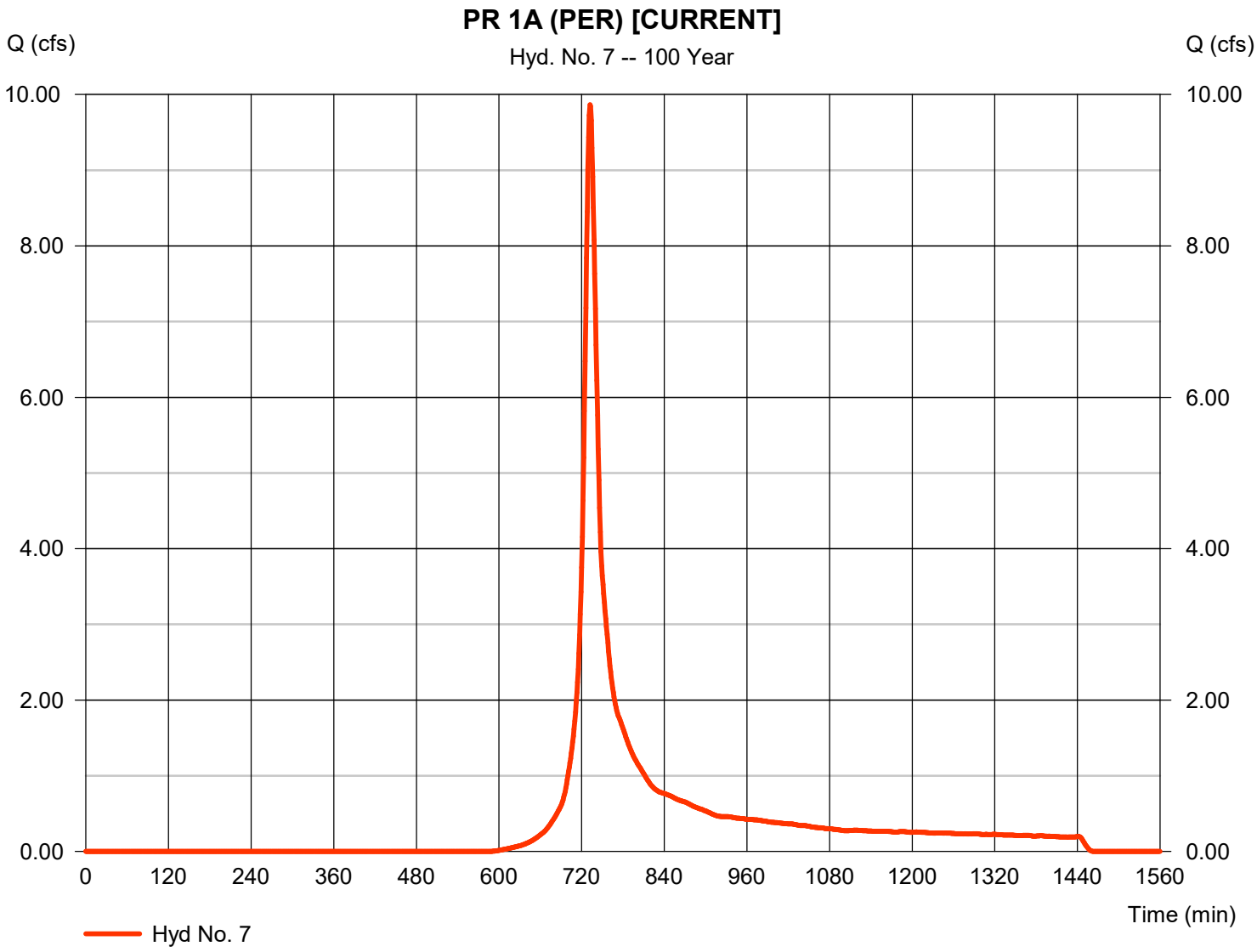


Hydrograph Report

Hyd. No. 7

PR 1A (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.865 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	36,120 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.10 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1A (IMP) [CURRENT]

SHEET FLOW:	**A**	**B**	**C**	**D**
MANNINGS N-VALUE, n=	0.011	0.24	0.24	
FLOW LENGTH, L (FT, 100 MAX)=	27 (100 MAX)	50 (76 MAX)	23 (100 MAX)	
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58	3.58	3.58	
$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$ LAND SLOPE, S (%)=	8.3	3.3	33.3	
SHEET FLOW TIME, Tc (MIN.)=	**0.2 MIN.**	**6.3 MIN.**	**1.4 MIN.**	

SHALLOW CONCENTRATED FLOW:	**A**	**B**	**C**	**D**
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS	FOREST	WOODLANDS
$T_c = \frac{L}{3600V}$ FLOW LENGTH, L (FT)=	40	60	28	60
LAND SLOPE, S (%)=	33.3	22	33.3	9
AVERAGE VELOCITY, V (FT/S)=	4.02	3.27	1.45	1.51
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.2 MIN.**	**0.3 MIN.**	**0.3 MIN.**	**0.7 MIN.**

CHANNEL FLOW:	**A**	**B**	**C**	**D**
PIPE DIAMETER, D (IN)=				
$r = \frac{a}{P_W}$ CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
$V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
$T_C = \frac{L}{3600V}$ FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

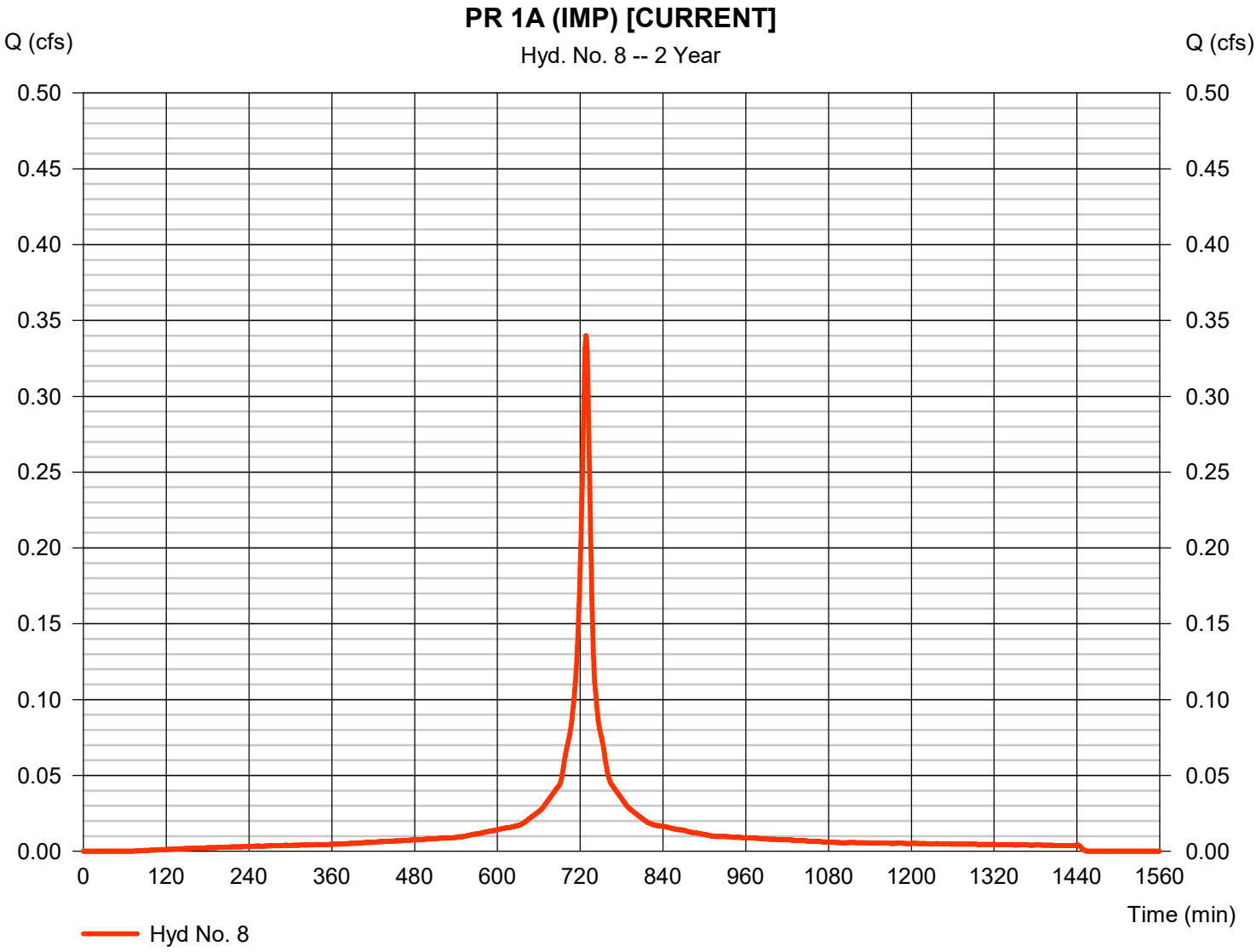
TOTAL SHEET FLOW TIME =	**7.9 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**1.5 MIN.**	**TIME OF CONCENTRATION=**	**9.4 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 8

PR 1A (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.340 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	1,215 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	9.40 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

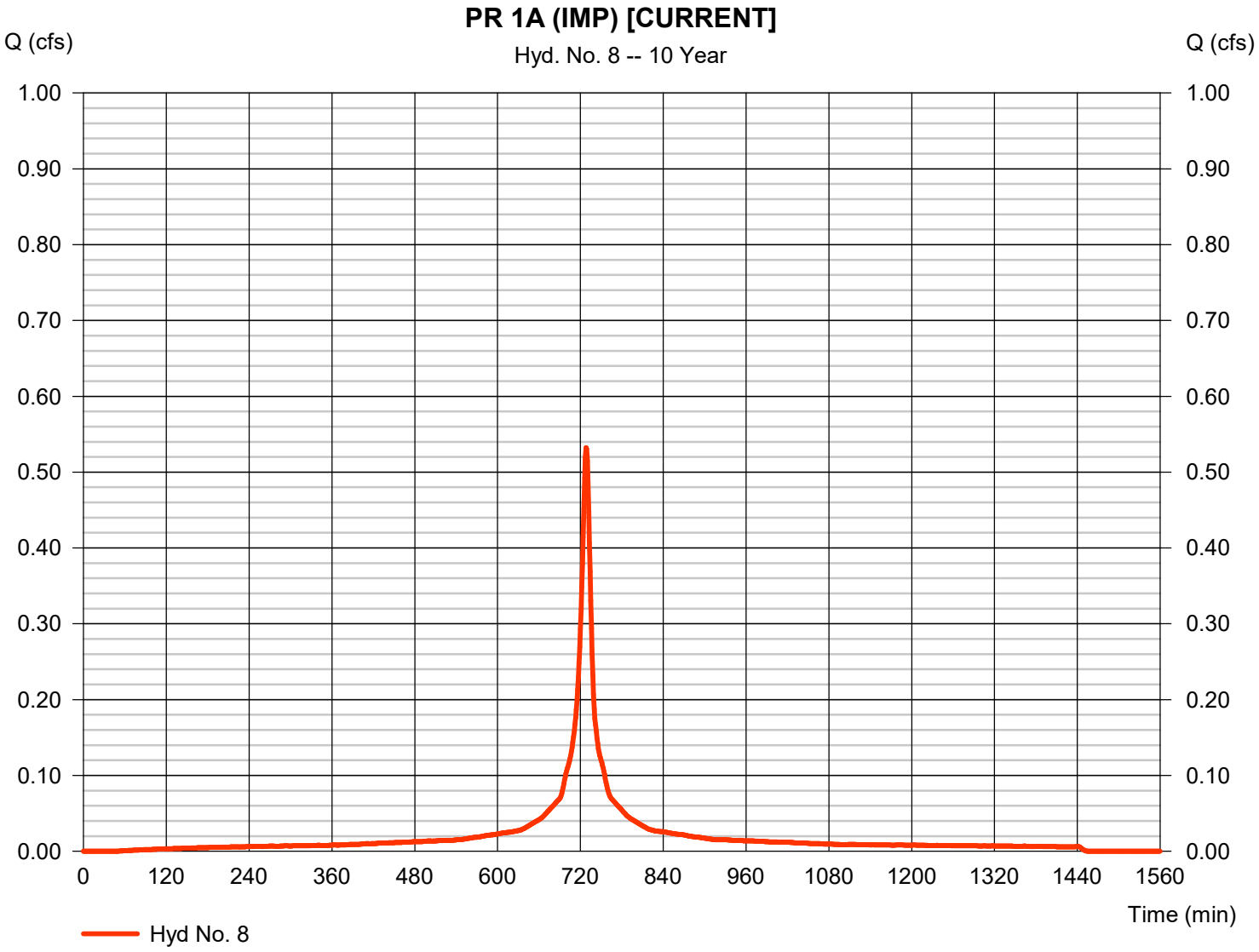


Hydrograph Report

Hyd. No. 8

PR 1A (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.532 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	1,936 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	9.40 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



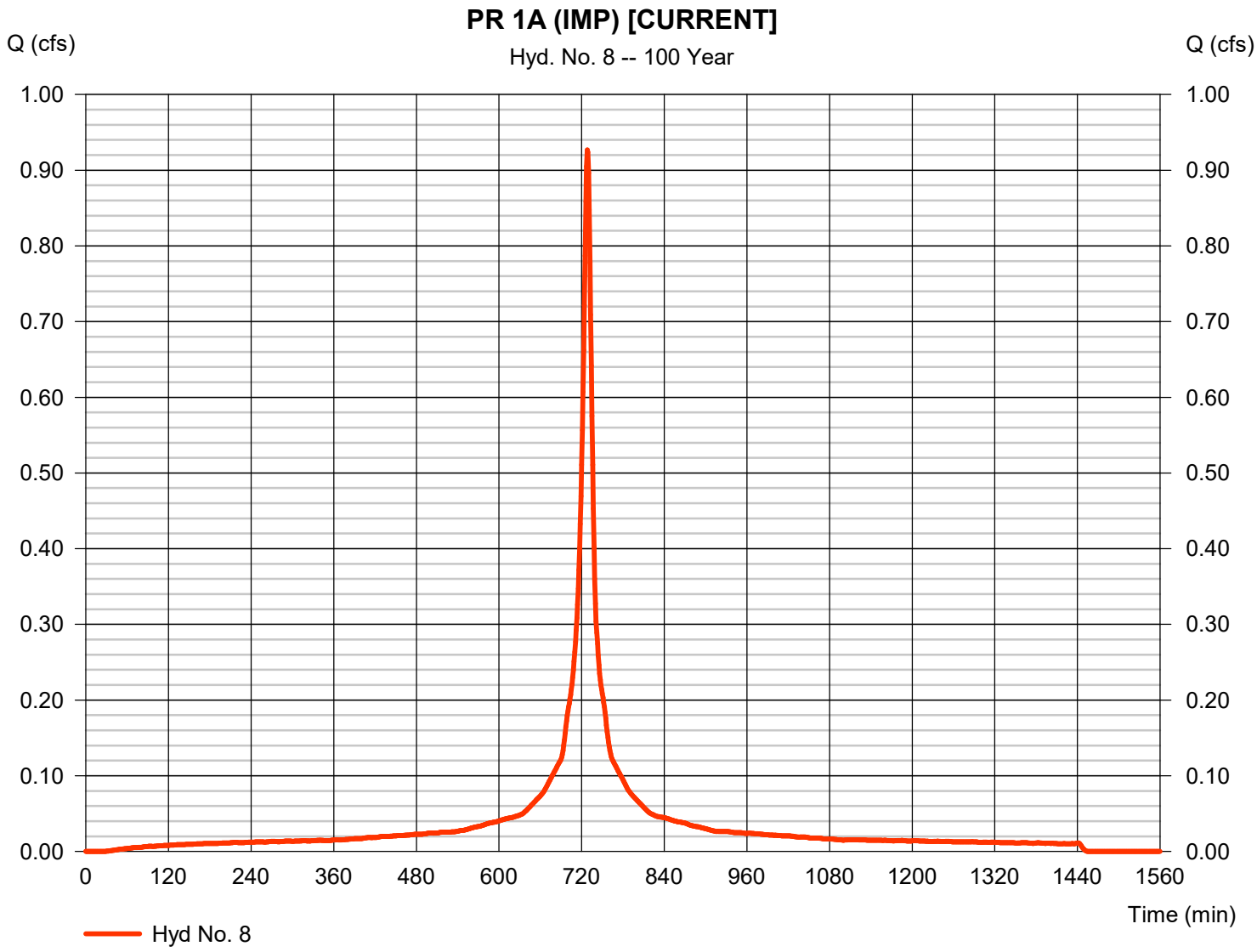
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 8

PR 1A (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.927 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	3,423 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	9.40 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

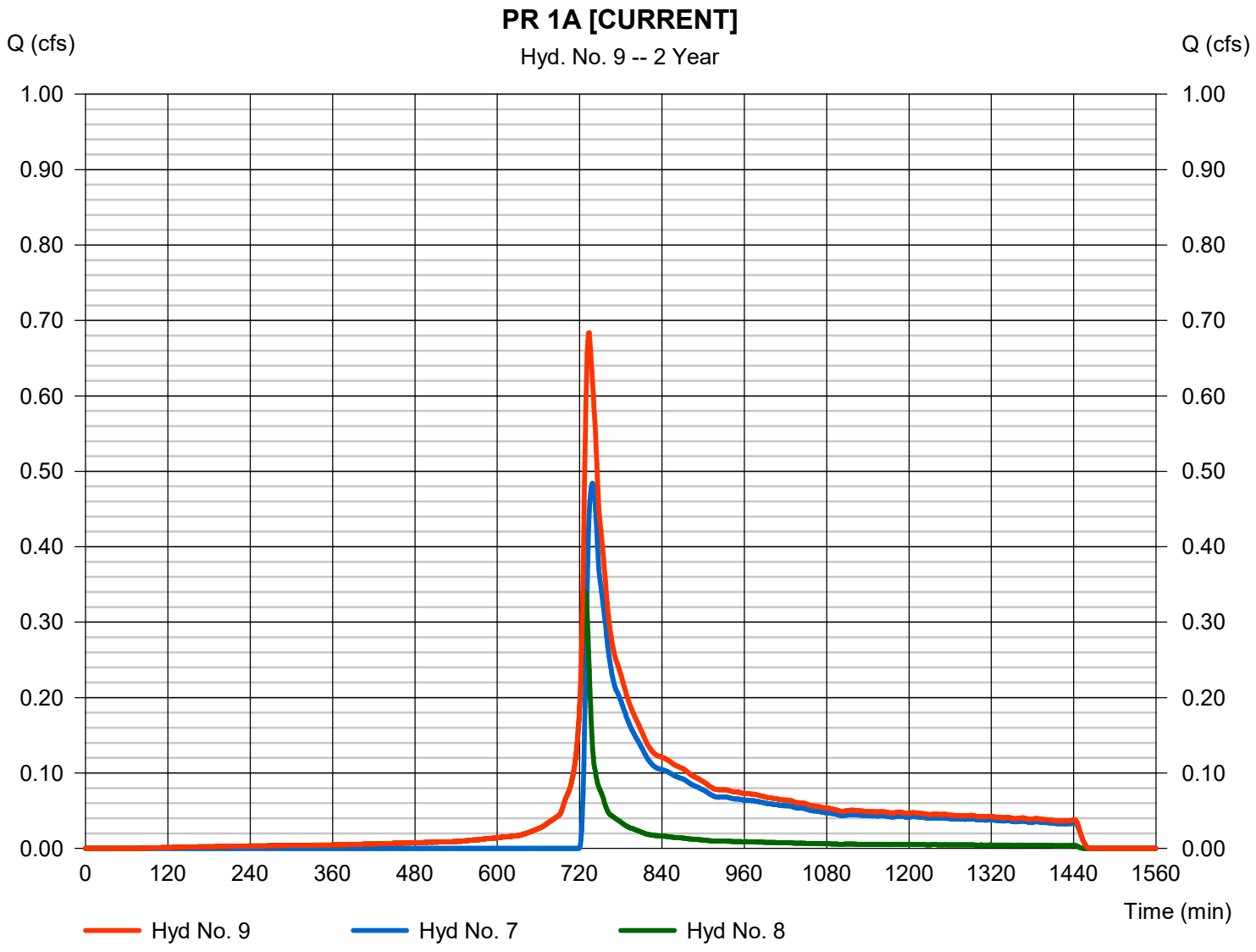


Hydrograph Report

Hyd. No. 9

PR 1A [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 0.684 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 4,600 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac

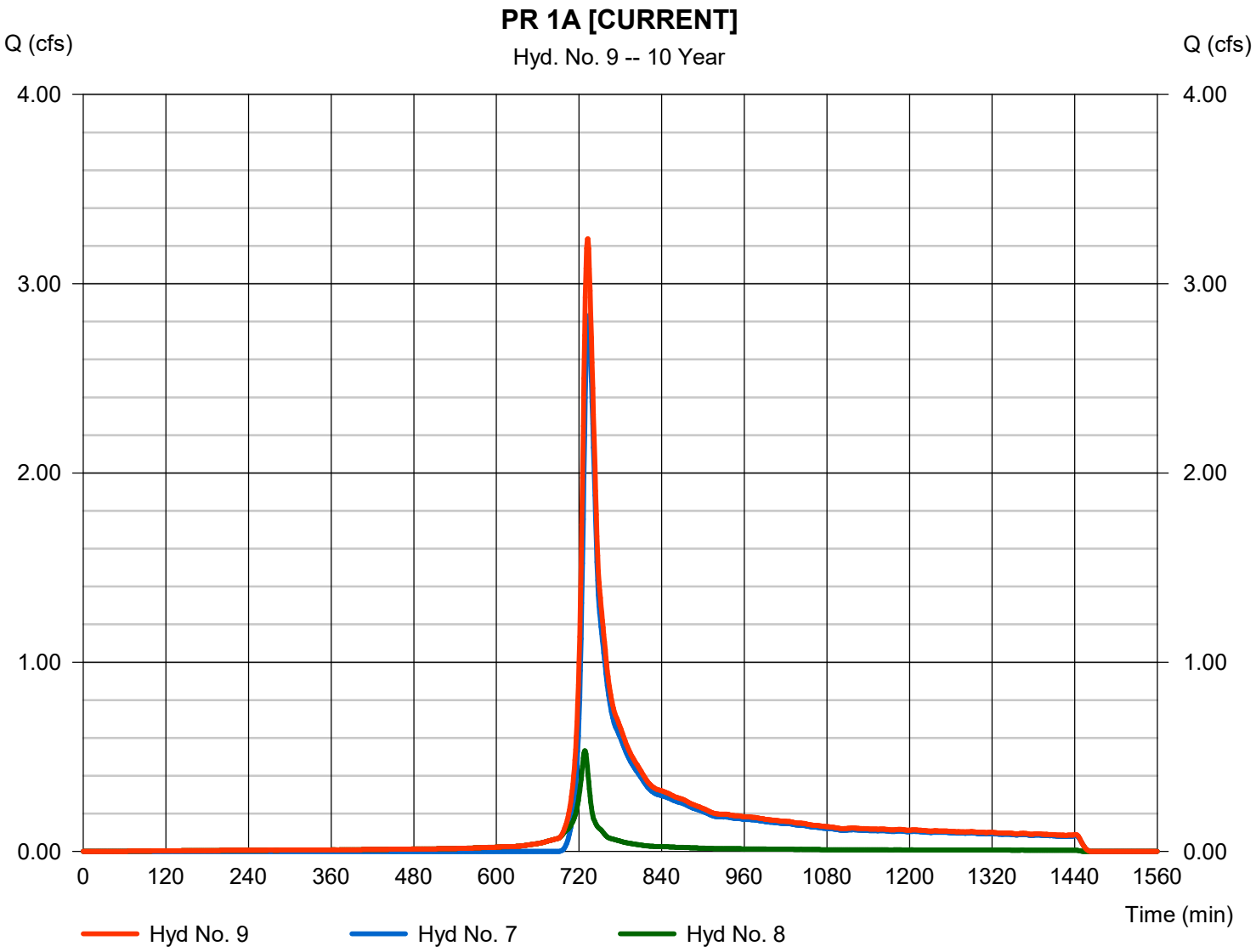


Hydrograph Report

Hyd. No. 9

PR 1A [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 3.237 cfs
Storm frequency	= 10 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 13,526 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac

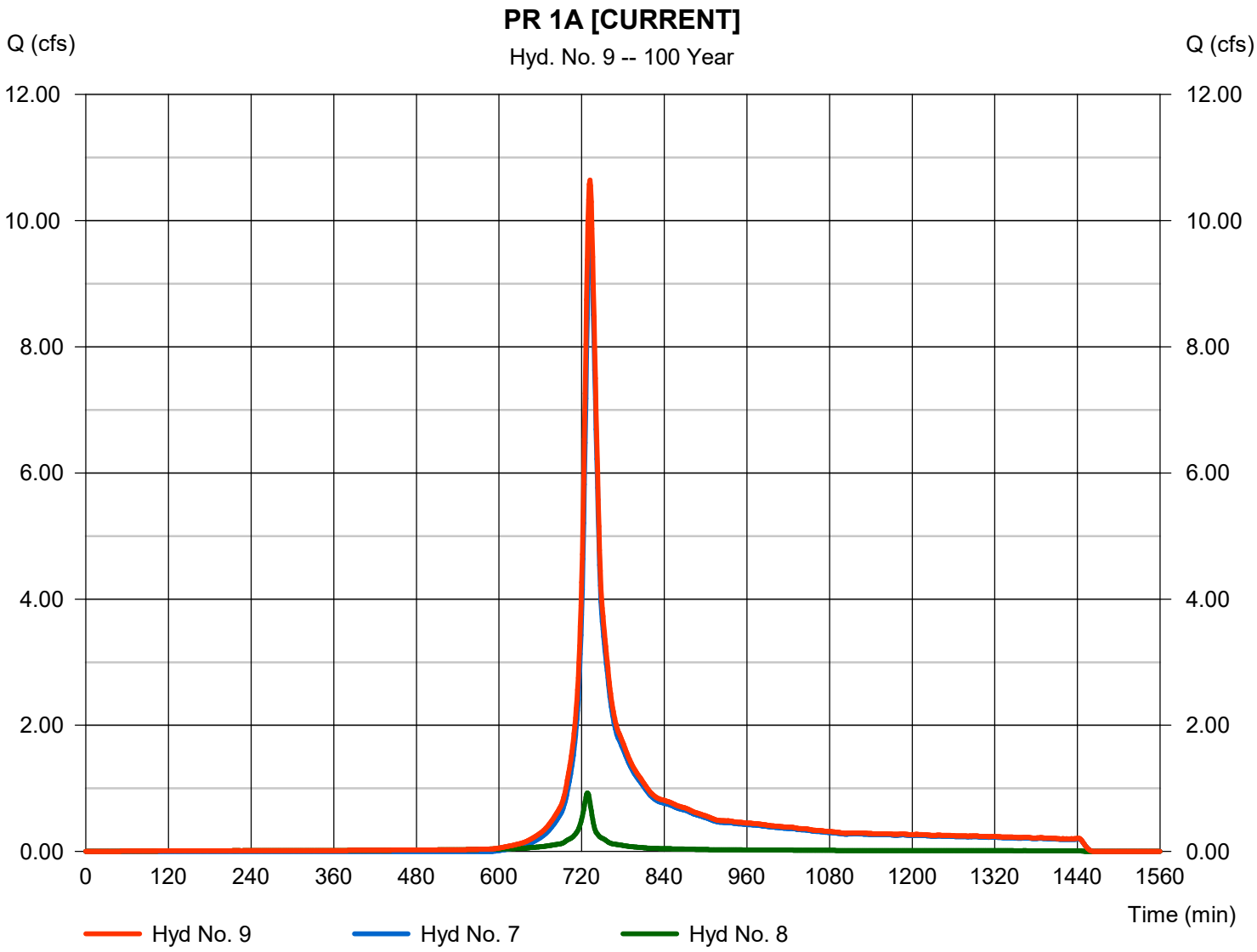


Hydrograph Report

Hyd. No. 9

PR 1A [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 10.64 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 39,542 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1B PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	0.63	38.5
WOODS	B	55	0.05	2.8
BRUSH	B	48	0.26	12.3
Total			**Σ= 0.9**	**Σ= 53.6**

$$CN = \frac{53.6}{0.9} = 57$$

DRAINAGE AREA DESIGNATION: PR 1B IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.16	15.5
Total			**Σ= 0.2**	**Σ= 15.5**

$$CN = \frac{15.5}{0.2} = 98$$

NOTE: BASIN AREA IS NOT INCLUDED IN THE CONTRIBUTARY DRAINAGE AREA

BASIN AREA = 0.15 ACRES

CONTRIBUTARY DRAINAGE AREA= 0.95 ACRES

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (PER) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.8 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST		
FLOW LENGTH, L (FT)=	87	165		
LAND SLOPE, S (%)=	6.9	4.2		
AVERAGE VELOCITY, V (FT/S)=	1.83	0.52		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.8 MIN.**	**5.3 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=	15			
CROSS SECTIONAL AREA, a (SF)=	1.23			
WETTER PERIMETER, Pw (FT)=	3.93			
HYDRAULIC RADIUS, r (FT)=	0.31			
CHANNEL SLOPE, S (%)=	2			
MANNINGS N-VALUE (n)=	0.01			
VELOCITY, V (FT/S)=	9.70			
FLOW LENGTH, L (FT)=	115			
CHANNEL FLOW TIME, T_c (MIN.)=	**0.2 MIN.**			

TOTAL SHEET FLOW TIME =	**8.8 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.1 MIN.**	**TIME OF CONCENTRATION=**	**15.2 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.2 MIN.**		

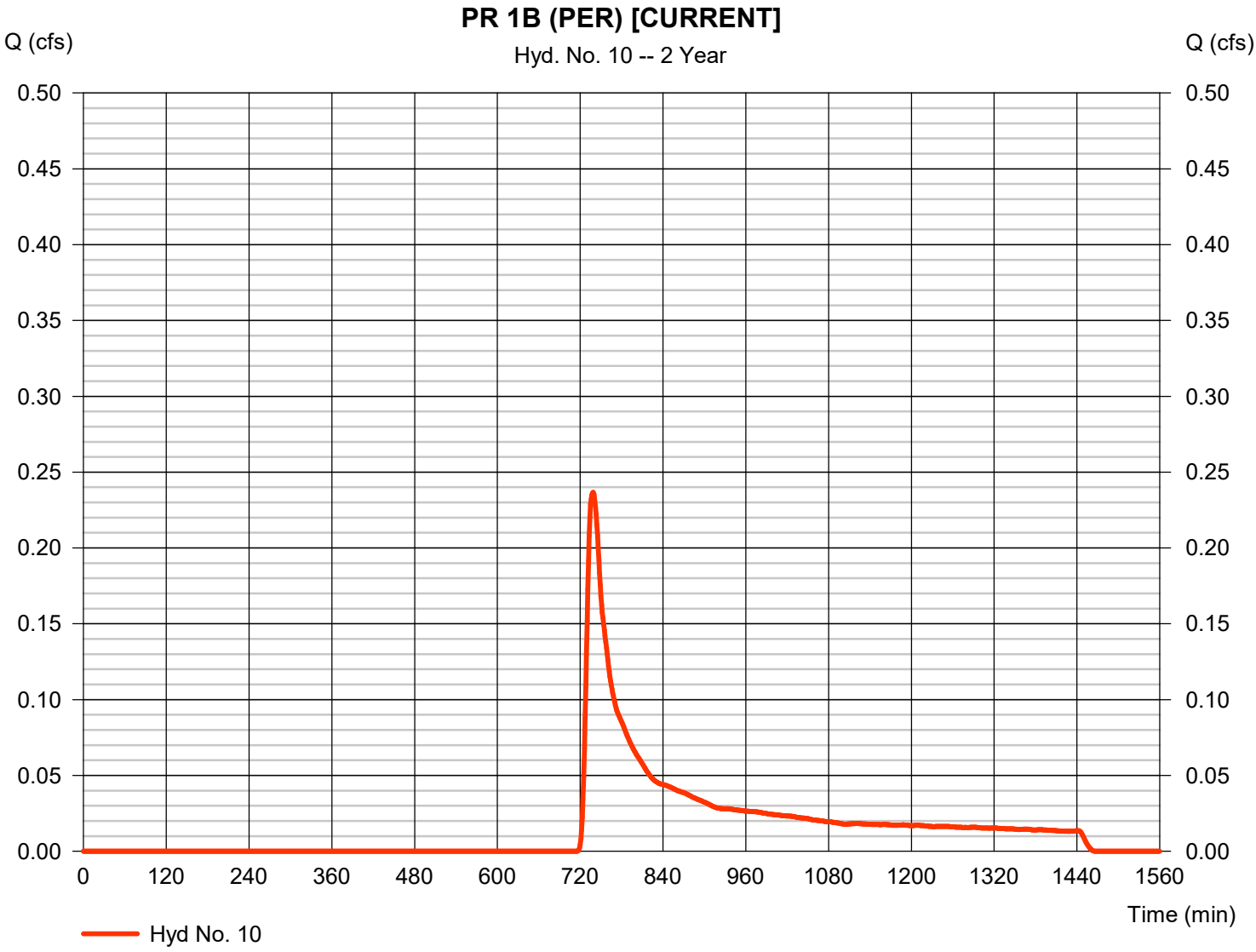
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 10

PR 1B (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.237 cfs
Storm frequency	=	2 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	1,476 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.20 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



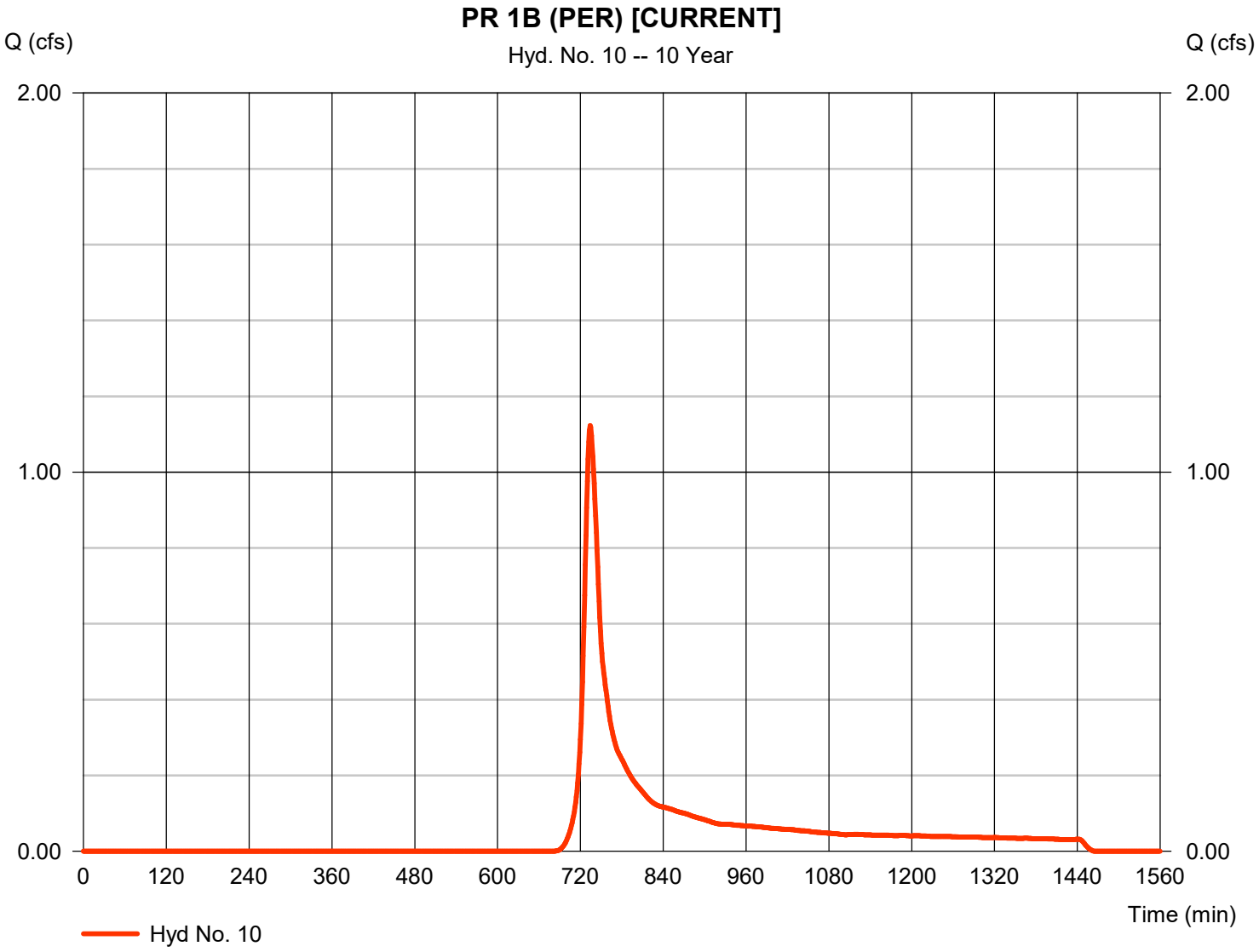
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 10

PR 1B (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.123 cfs
Storm frequency	=	10 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	4,701 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.20 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

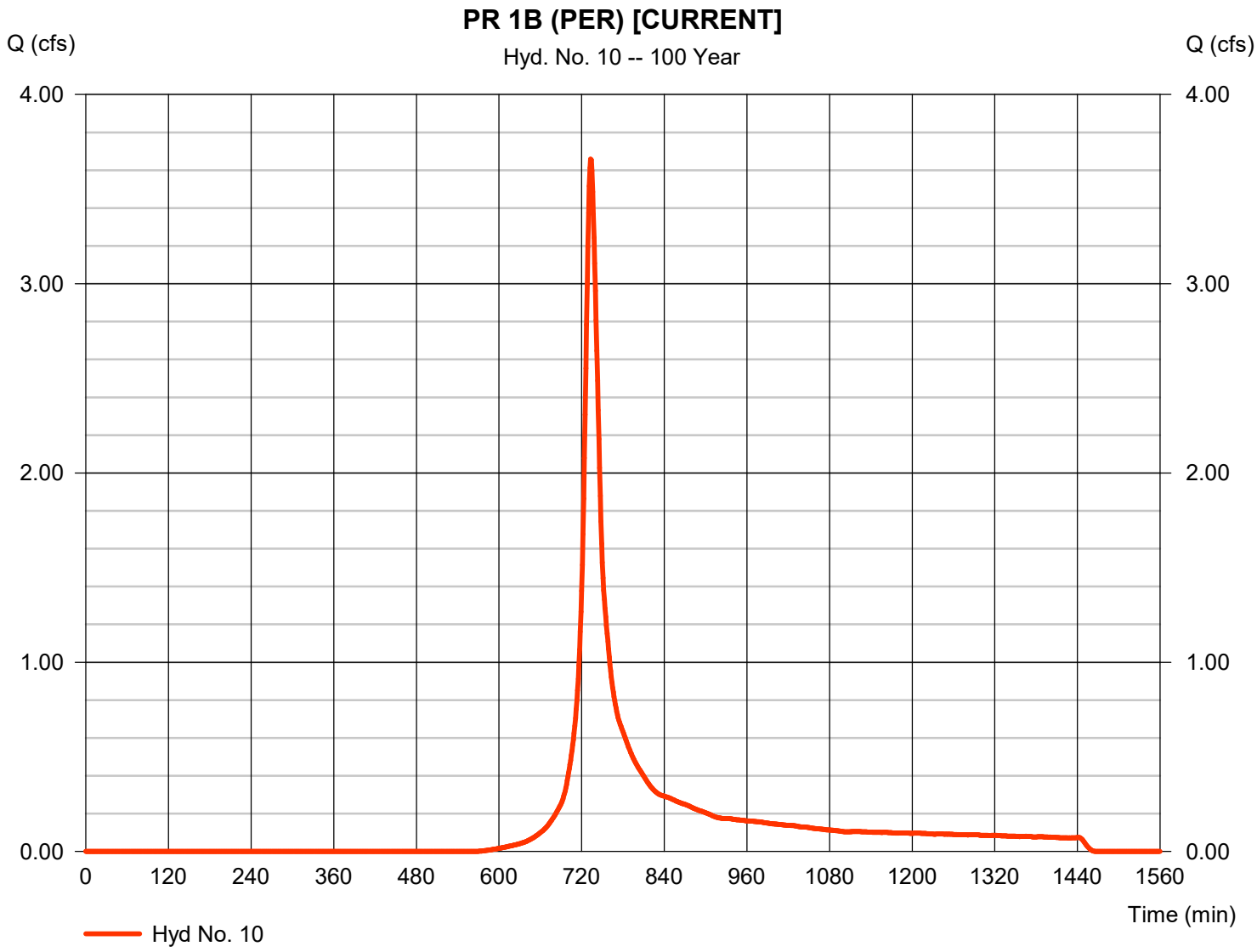


Hydrograph Report

Hyd. No. 10

PR 1B (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.659 cfs
Storm frequency	=	100 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	14,029 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.20 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (IMP) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	60 (100 MAX)	40 (59 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58	3.58		
LAND SLOPE, S (%)=	3	2		
SHEET FLOW TIME, Tc (MIN.)=	**0.6 MIN.**	**6.5 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS		
FLOW LENGTH, L (FT)=	35	22		
LAND SLOPE, S (%)=	2	33		
AVERAGE VELOCITY, V (FT/S)=	0.98	4.00		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.6 MIN.**	**0.1 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME = **7.1 MIN.**

TOTAL SHALLOW CONCENTRATED FLOW TIME = **0.7 MIN.**

TOTAL CHANNEL FLOW TIME = **0.0 MIN.**

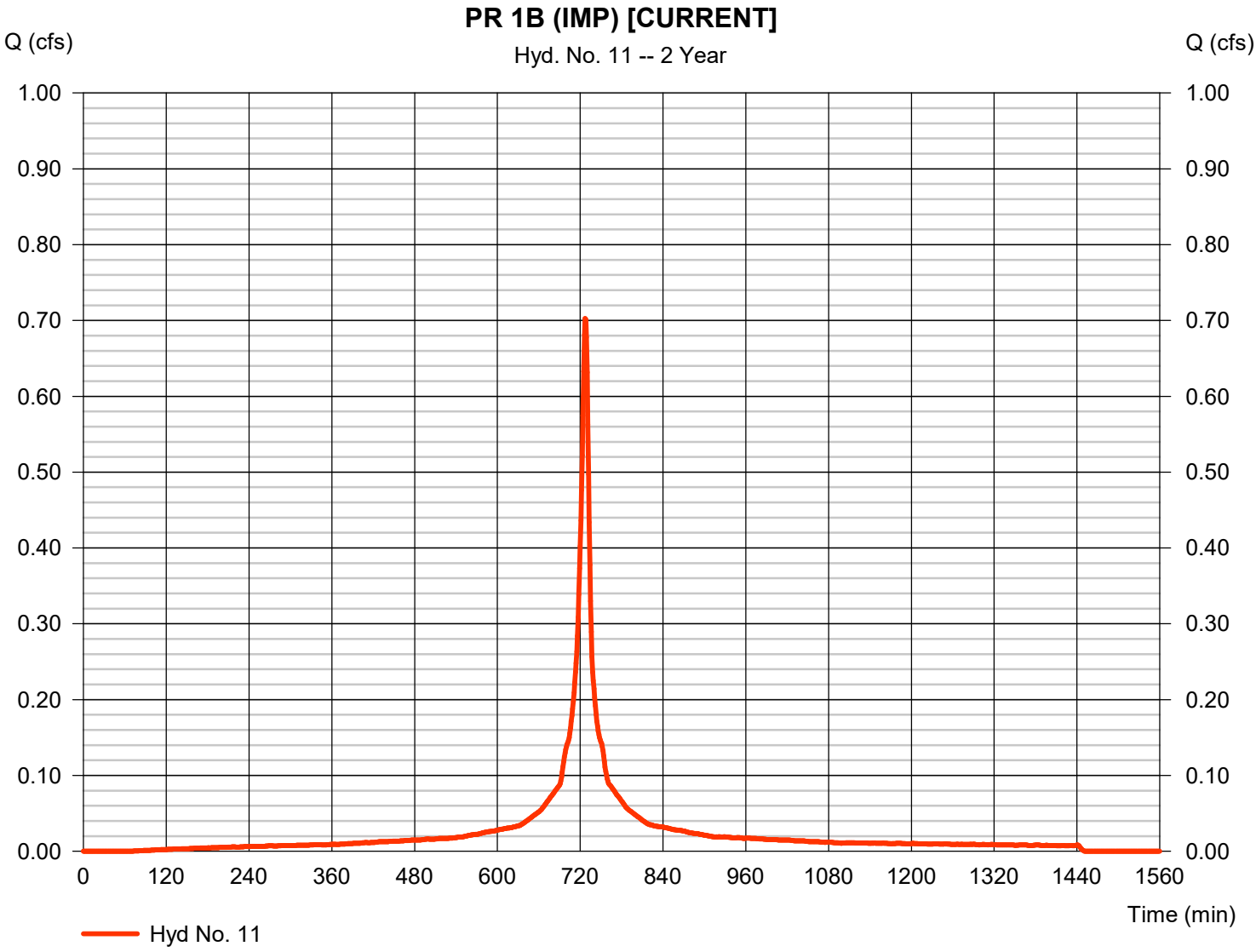
TIME OF CONCENTRATION= 7.8 MIN.

Hydrograph Report

Hyd. No. 11

PR 1B (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.702 cfs
Storm frequency	=	2 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	2,369 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.80 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

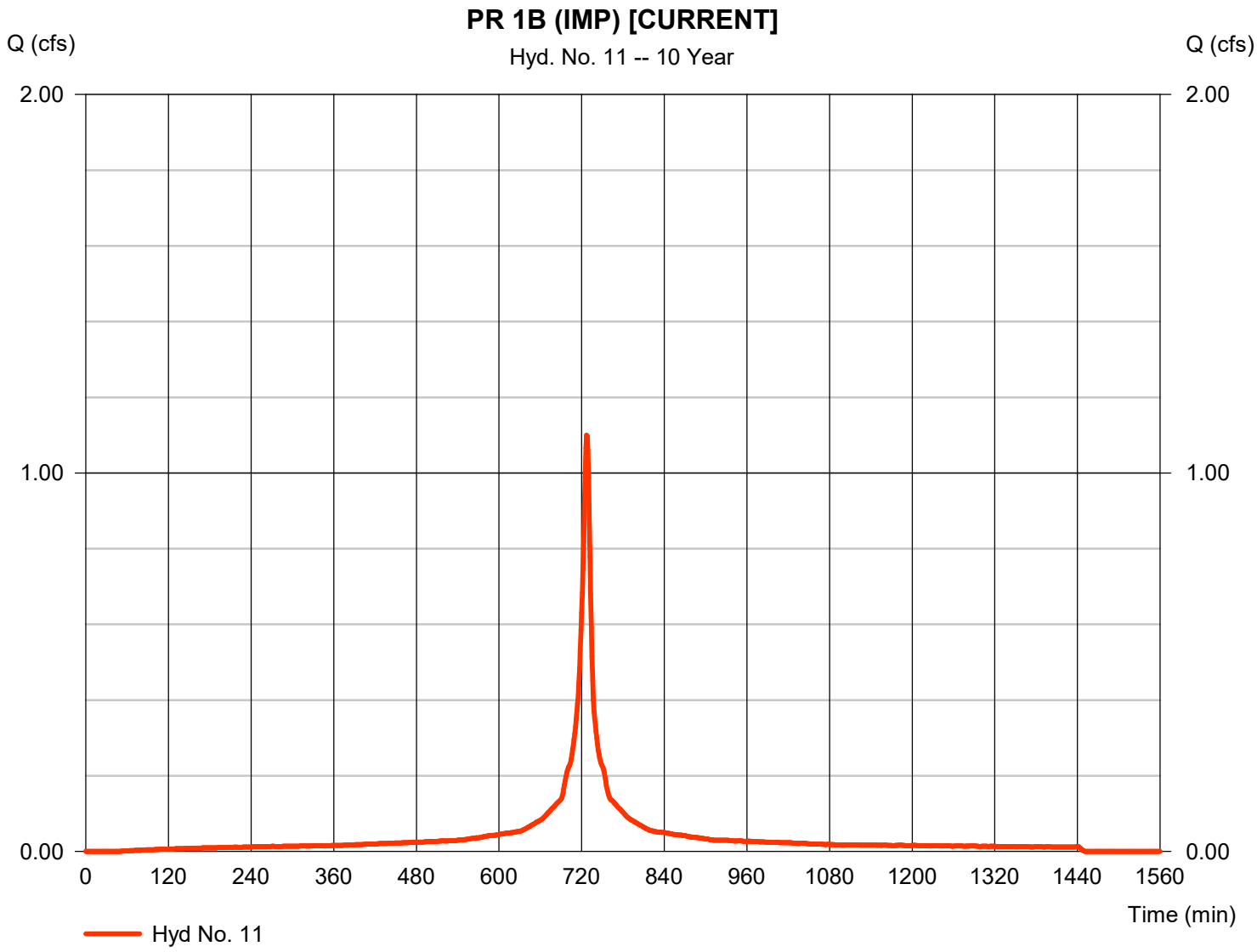


Hydrograph Report

Hyd. No. 11

PR 1B (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.099 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	3,775 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.80 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



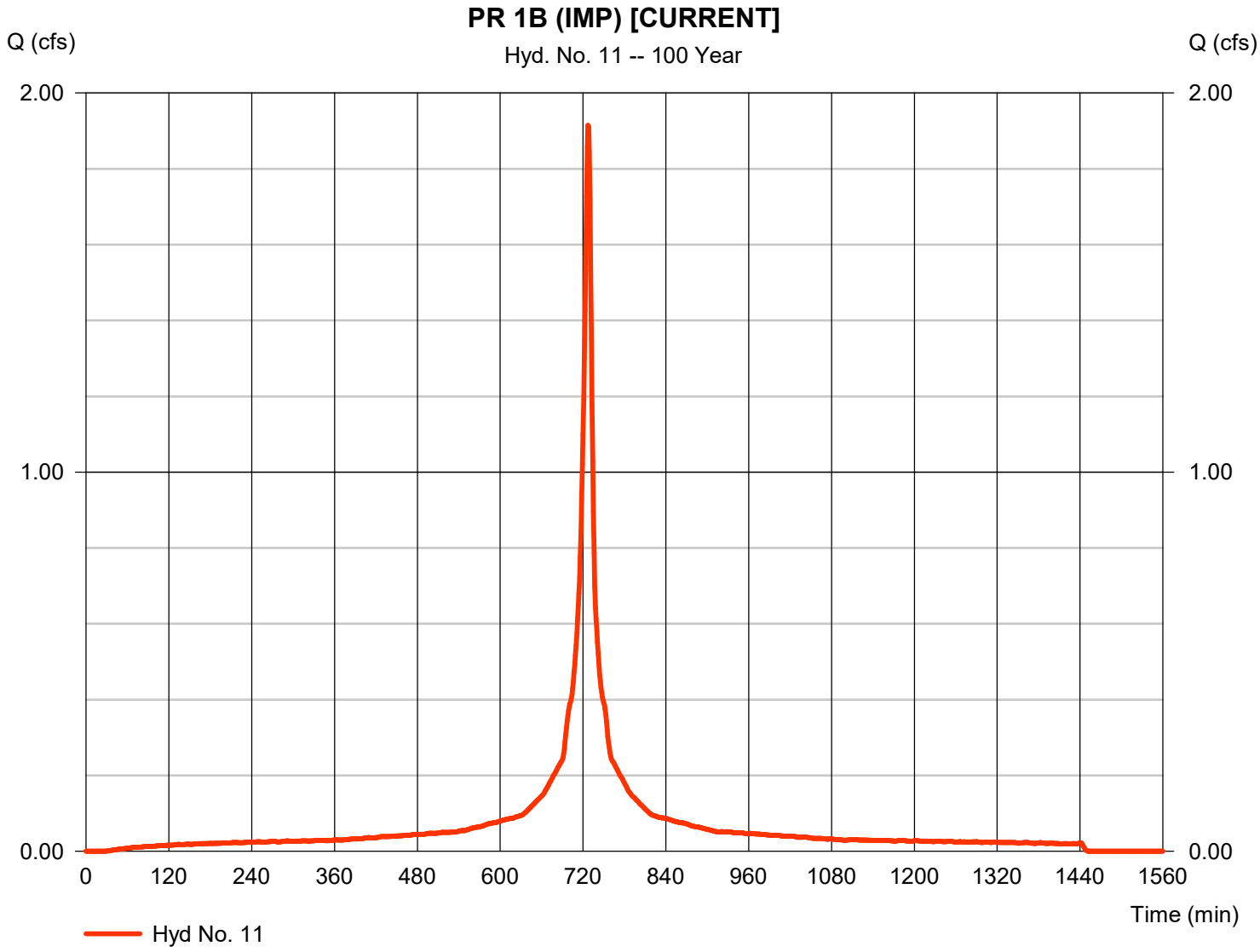
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 11

PR 1B (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.915 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	6,675 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.80 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1C IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.07	7.1
Total			**Σ= 0.1**	**Σ= 7.1**

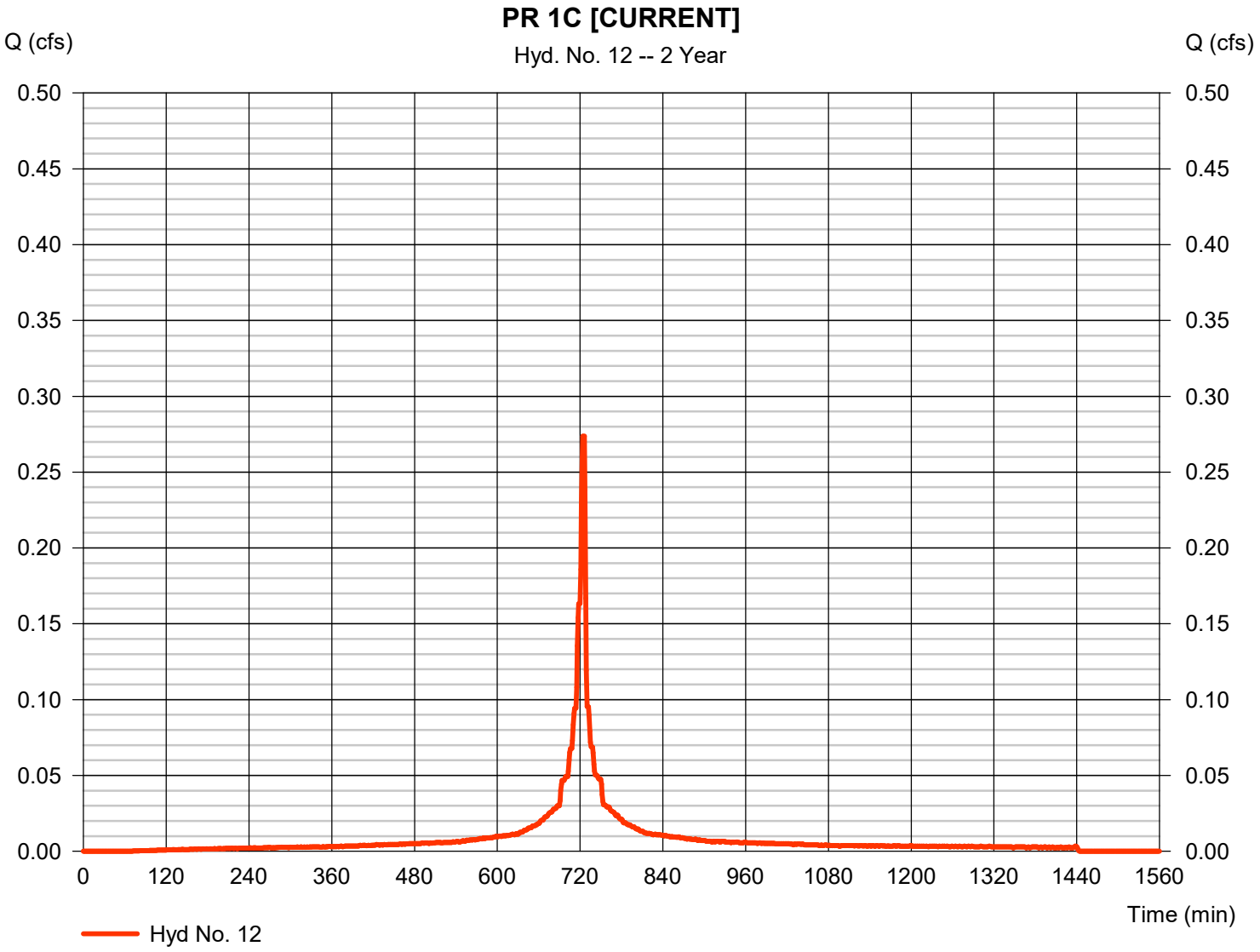
$$CN = \frac{7.1}{0.1} = 98$$

Hydrograph Report

Hyd. No. 12

PR 1C [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.274 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	797 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

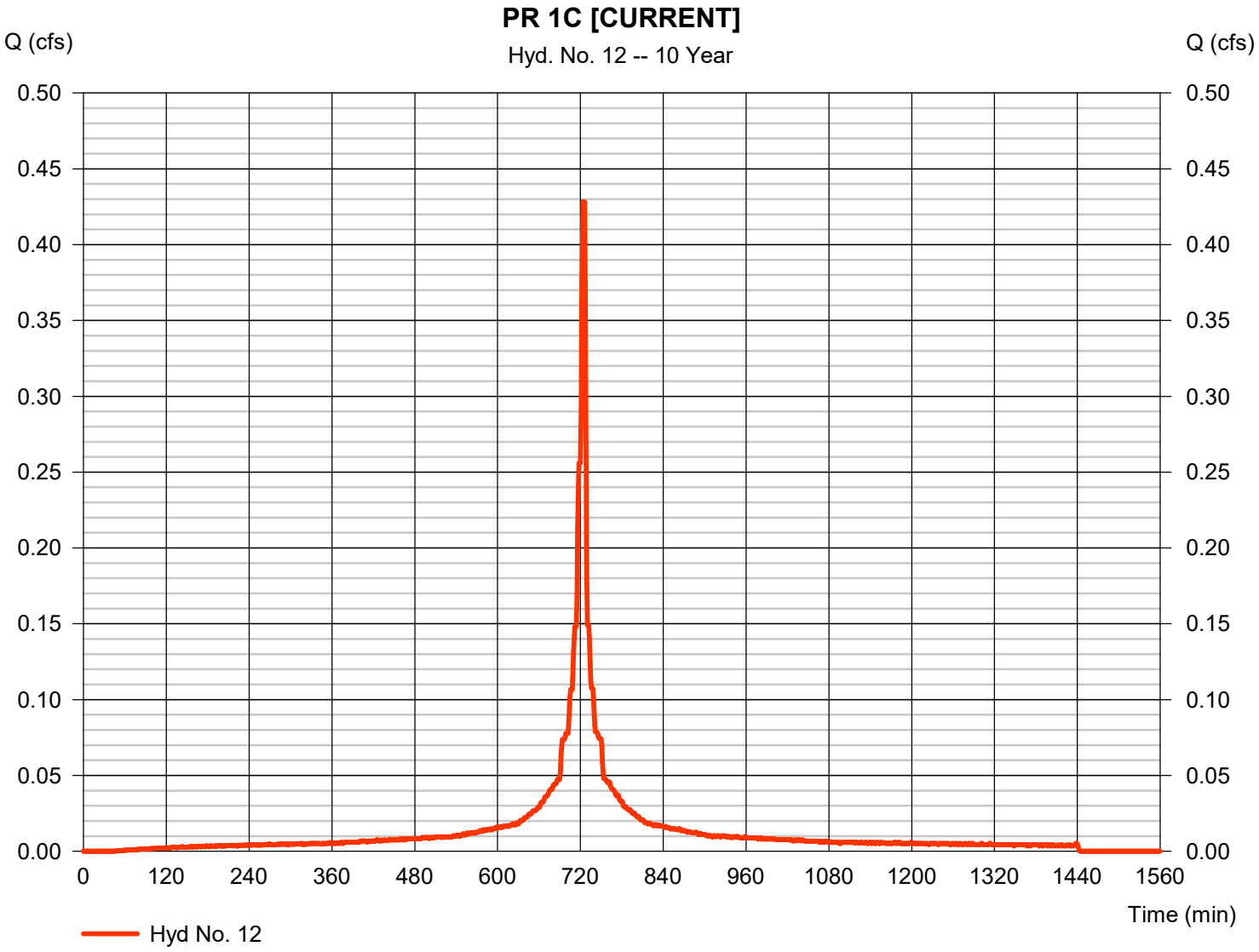


Hydrograph Report

Hyd. No. 12

PR 1C [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.428 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	1,270 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

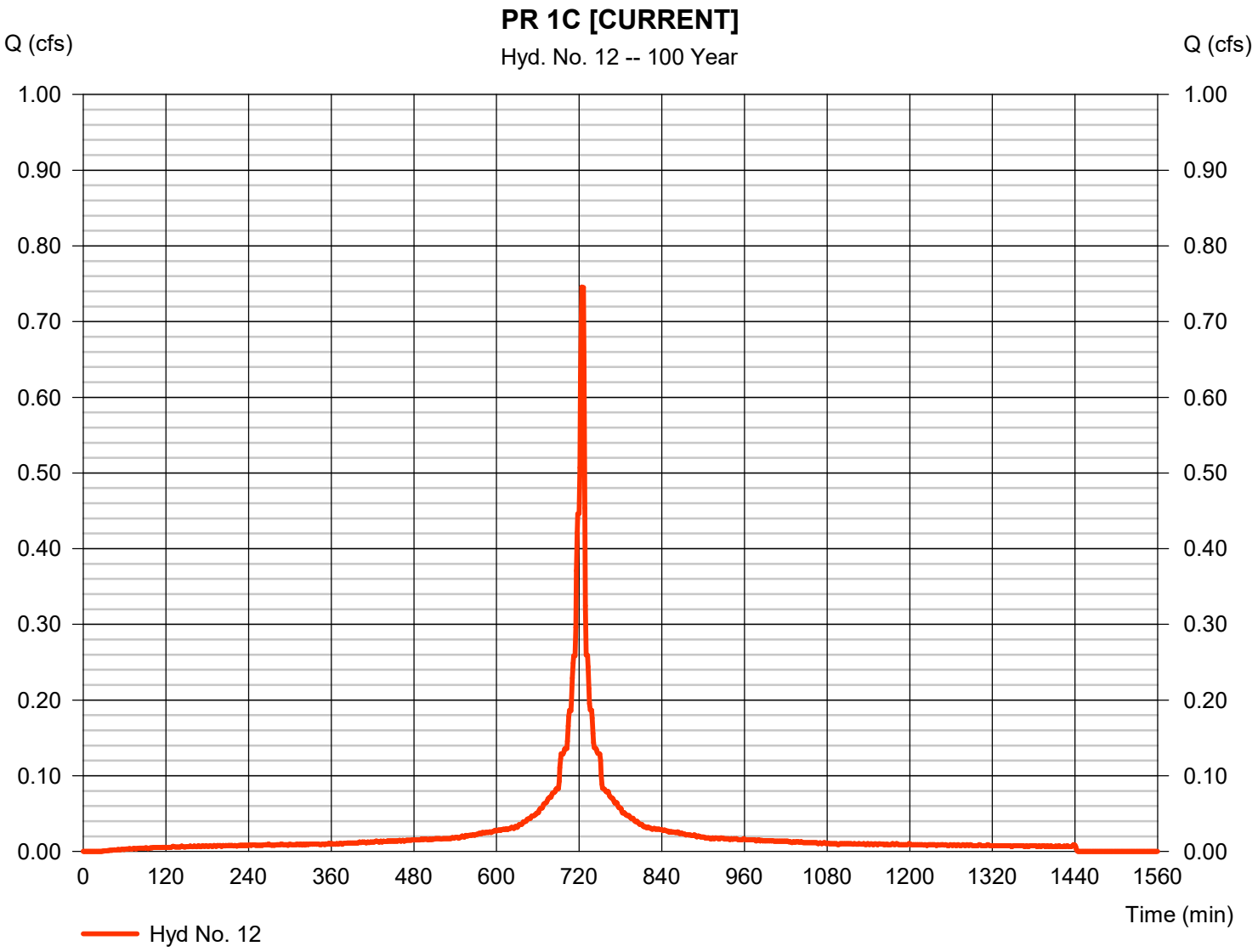


Hydrograph Report

Hyd. No. 12

PR 1C [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.746 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	2,246 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



Hydrograph Report

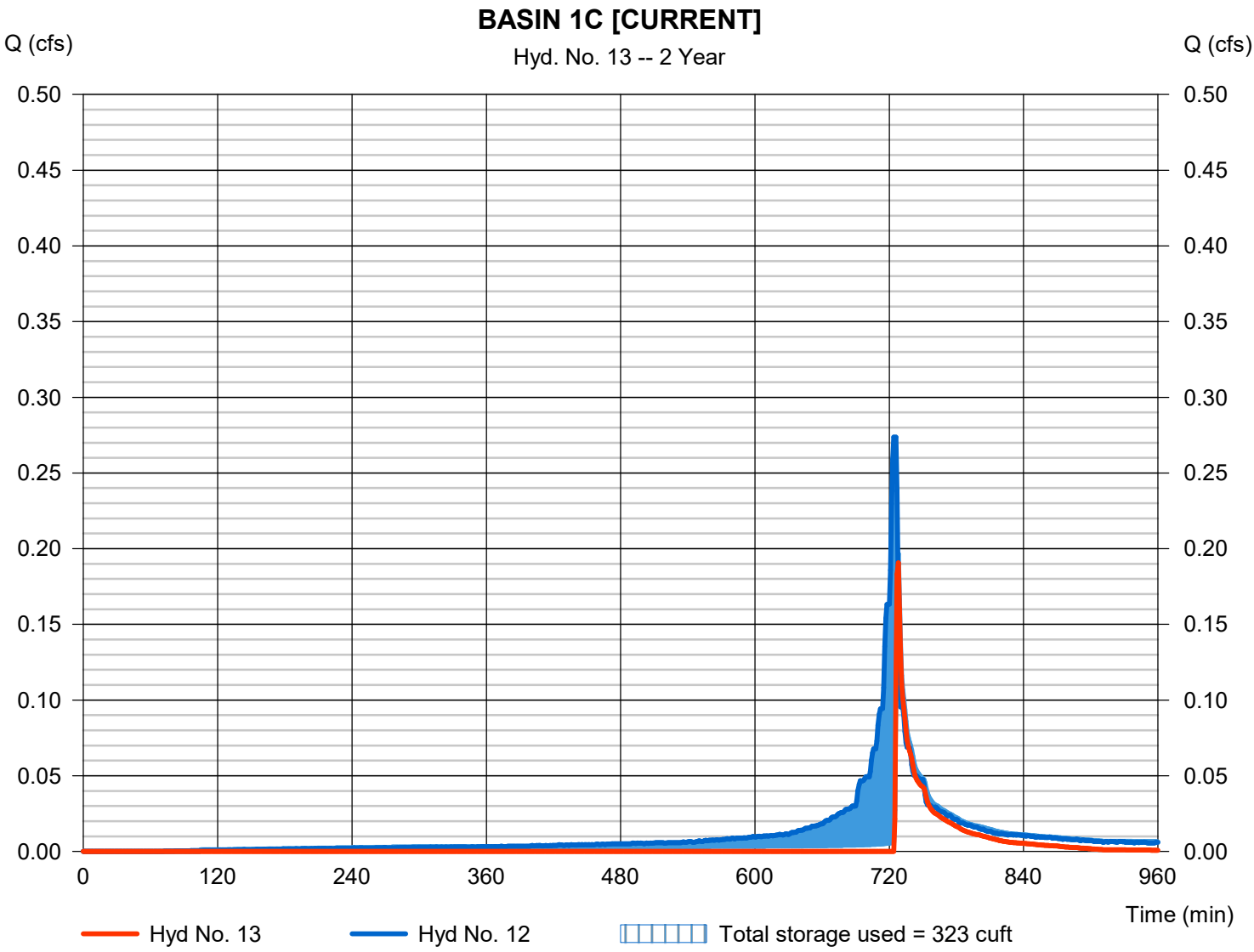
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	0.191 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	220 cuft
Inflow hyd. No.	=	12 - PR 1C [CURRENT]	Max. Elevation	=	638.21 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	323 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

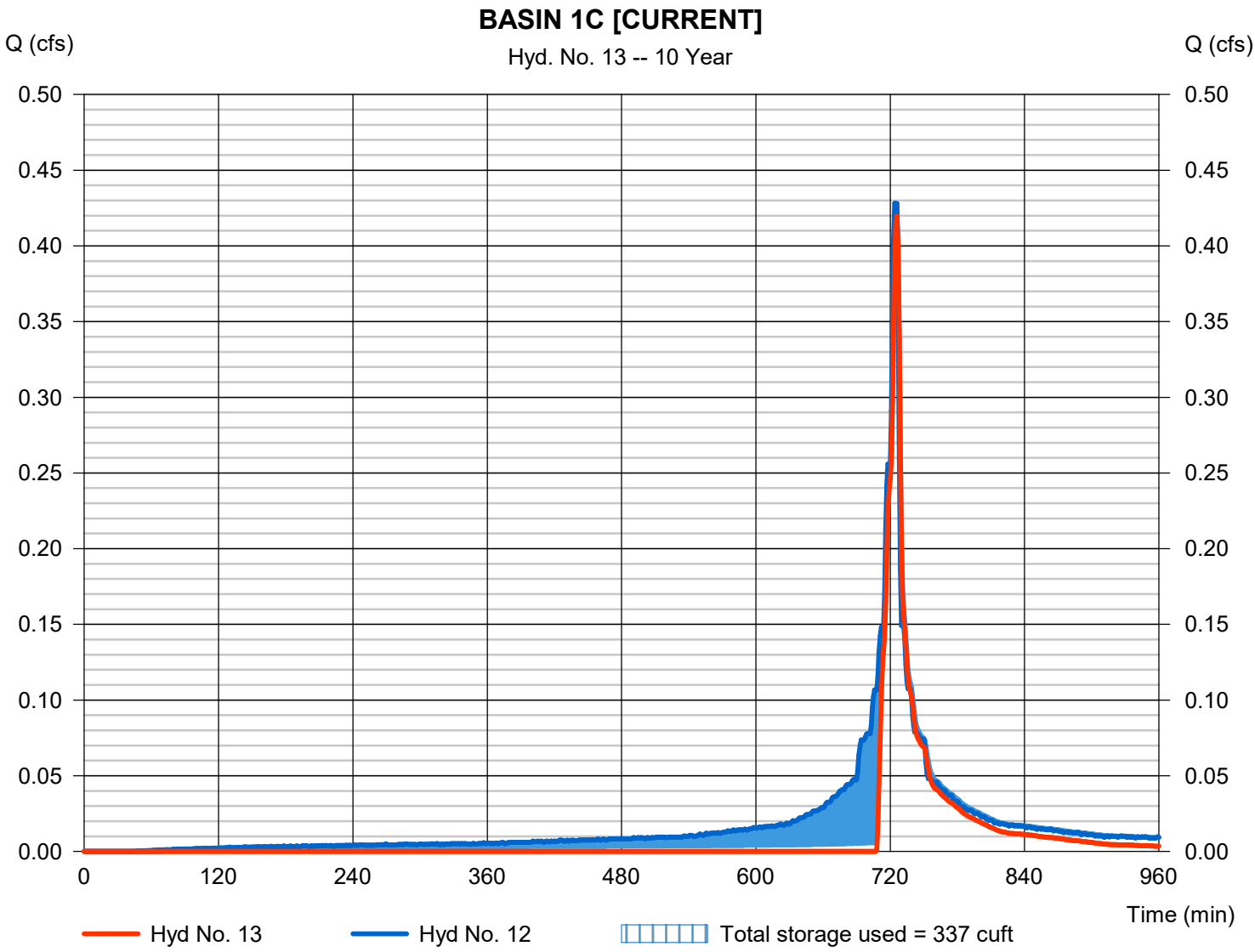
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	0.420 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	622 cuft
Inflow hyd. No.	=	12 - PR 1C [CURRENT]	Max. Elevation	=	638.32 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	337 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

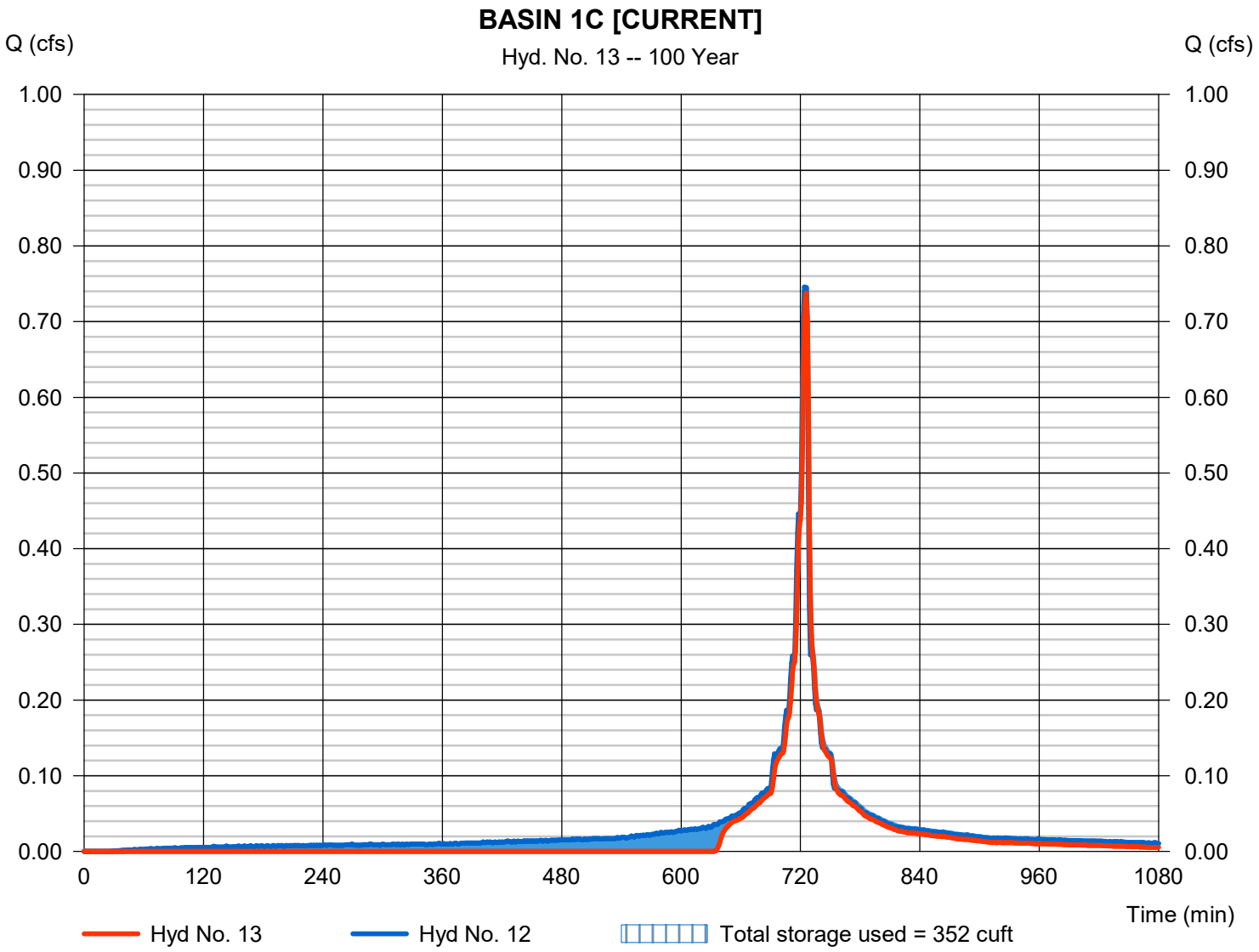
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	0.738 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	1,543 cuft
Inflow hyd. No.	=	12 - PR 1C [CURRENT]	Max. Elevation	=	638.44 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	352 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 2 - BASIN 1C

Pond Data

UG Chambers -Invert elev. = 636.75 ft, Rise x Span = 2.54 x 4.33 ft, Barrel Len = 4.92 ft, No. Barrels = 5, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 635.75 ft, Width = 5.33 ft, Height = 3.54 ft, Voids = 100.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	635.75	n/a	0	0
0.35	636.10	n/a	46	46
0.71	636.46	n/a	46	93
1.06	636.81	n/a	46	139
1.42	637.17	n/a	46	186
1.77	637.52	n/a	46	232
2.12	637.87	n/a	46	279
2.48	638.23	n/a	46	325
2.83	638.58	n/a	46	371
3.19	638.94	n/a	46	418
3.54	639.29	n/a	46	464

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 638.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 1.000 (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	635.75	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.04	5	635.79	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.07	9	635.82	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.11	14	635.86	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.14	19	635.89	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.18	23	635.93	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.21	28	635.96	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.25	32	636.00	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.28	37	636.03	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.32	42	636.07	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.35	46	636.10	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.39	51	636.14	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.42	56	636.17	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.46	60	636.21	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.50	65	636.25	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.53	70	636.28	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.57	74	636.32	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.60	79	636.35	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.64	84	636.39	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.67	88	636.42	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.71	93	636.46	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.74	97	636.49	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.78	102	636.53	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.81	107	636.56	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.85	111	636.60	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.88	116	636.64	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.92	121	636.67	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.96	125	636.71	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.99	130	636.74	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.03	135	636.78	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.06	139	636.81	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.10	144	636.85	0.00	---	---	---	---	---	---	---	0.004	---	0.004

Continues on next page...

BASIN 1C

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
1.13	149	636.88	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.17	153	636.92	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.20	158	636.95	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.24	162	636.99	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.27	167	637.02	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.31	172	637.06	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.35	176	637.10	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.38	181	637.13	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.42	186	637.17	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.45	190	637.20	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.49	195	637.24	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.52	200	637.27	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.56	204	637.31	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.59	209	637.34	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.63	214	637.38	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.66	218	637.41	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.70	223	637.45	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.73	227	637.48	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.77	232	637.52	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.81	237	637.56	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.84	241	637.59	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.88	246	637.63	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.91	251	637.66	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.95	255	637.70	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.98	260	637.73	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.02	265	637.77	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.05	269	637.80	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.09	274	637.84	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.12	279	637.87	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.16	283	637.91	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.19	288	637.94	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.23	292	637.98	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.27	297	638.02	0.00 ic	---	---	---	---	---	---	---	0.006	---	0.007
2.30	302	638.05	0.01 ic	---	---	---	---	---	---	---	0.006	---	0.017
2.34	306	638.09	0.03 ic	---	---	---	---	---	---	---	0.006	---	0.039
2.37	311	638.12	0.06 ic	---	---	---	---	---	---	---	0.006	---	0.071
2.41	316	638.16	0.11 ic	---	---	---	---	---	---	---	0.006	---	0.113
2.44	320	638.19	0.16 ic	---	---	---	---	---	---	---	0.006	---	0.164
2.48	325	638.23	0.22 ic	---	---	---	---	---	---	---	0.006	---	0.225
2.51	330	638.26	0.29 ic	---	---	---	---	---	---	---	0.006	---	0.295
2.55	334	638.30	0.37 ic	---	---	---	---	---	---	---	0.006	---	0.373
2.58	339	638.33	0.45 ic	---	---	---	---	---	---	---	0.006	---	0.459
2.62	344	638.37	0.55 ic	---	---	---	---	---	---	---	0.006	---	0.552
2.65	348	638.41	0.65 ic	---	---	---	---	---	---	---	0.006	---	0.653
2.69	353	638.44	0.75 ic	---	---	---	---	---	---	---	0.006	---	0.759
2.73	357	638.48	0.87 ic	---	---	---	---	---	---	---	0.006	---	0.873
2.76	362	638.51	0.98 ic	---	---	---	---	---	---	---	0.006	---	0.991
2.80	367	638.55	1.11 ic	---	---	---	---	---	---	---	0.006	---	1.113
2.83	371	638.58	1.23 ic	---	---	---	---	---	---	---	0.006	---	1.238
2.87	376	638.62	1.36 ic	---	---	---	---	---	---	---	0.006	---	1.368
2.90	381	638.65	1.49 ic	---	---	---	---	---	---	---	0.006	---	1.501
2.94	385	638.69	1.63 ic	---	---	---	---	---	---	---	0.006	---	1.635
2.97	390	638.72	1.76 ic	---	---	---	---	---	---	---	0.006	---	1.771
3.01	395	638.76	1.90 ic	---	---	---	---	---	---	---	0.006	---	1.904
3.04	399	638.79	2.03 ic	---	---	---	---	---	---	---	0.007	---	2.037
3.08	404	638.83	2.16 ic	---	---	---	---	---	---	---	0.007	---	2.168
3.12	409	638.87	2.29 ic	---	---	---	---	---	---	---	0.007	---	2.294
3.15	413	638.90	2.41 ic	---	---	---	---	---	---	---	0.007	---	2.414
3.19	418	638.94	2.52 ic	---	---	---	---	---	---	---	0.007	---	2.524
3.22	422	638.97	2.61 ic	---	---	---	---	---	---	---	0.007	---	2.621
3.26	427	639.01	2.69 ic	---	---	---	---	---	---	---	0.007	---	2.699
3.29	432	639.04	2.78 ic	---	---	---	---	---	---	---	0.007	---	2.791
3.33	436	639.08	2.87 ic	---	---	---	---	---	---	---	0.007	---	2.880
3.36	441	639.11	2.96 ic	---	---	---	---	---	---	---	0.007	---	2.967
3.40	446	639.15	3.04 ic	---	---	---	---	---	---	---	0.007	---	3.052
3.43	450	639.18	3.13 ic	---	---	---	---	---	---	---	0.007	---	3.134
3.47	455	639.22	3.21 ic	---	---	---	---	---	---	---	0.007	---	3.214
3.50	460	639.25	3.28 ic	---	---	---	---	---	---	---	0.007	---	3.292
3.54	464	639.29	3.36 ic	---	---	---	---	---	---	---	0.007	---	3.368

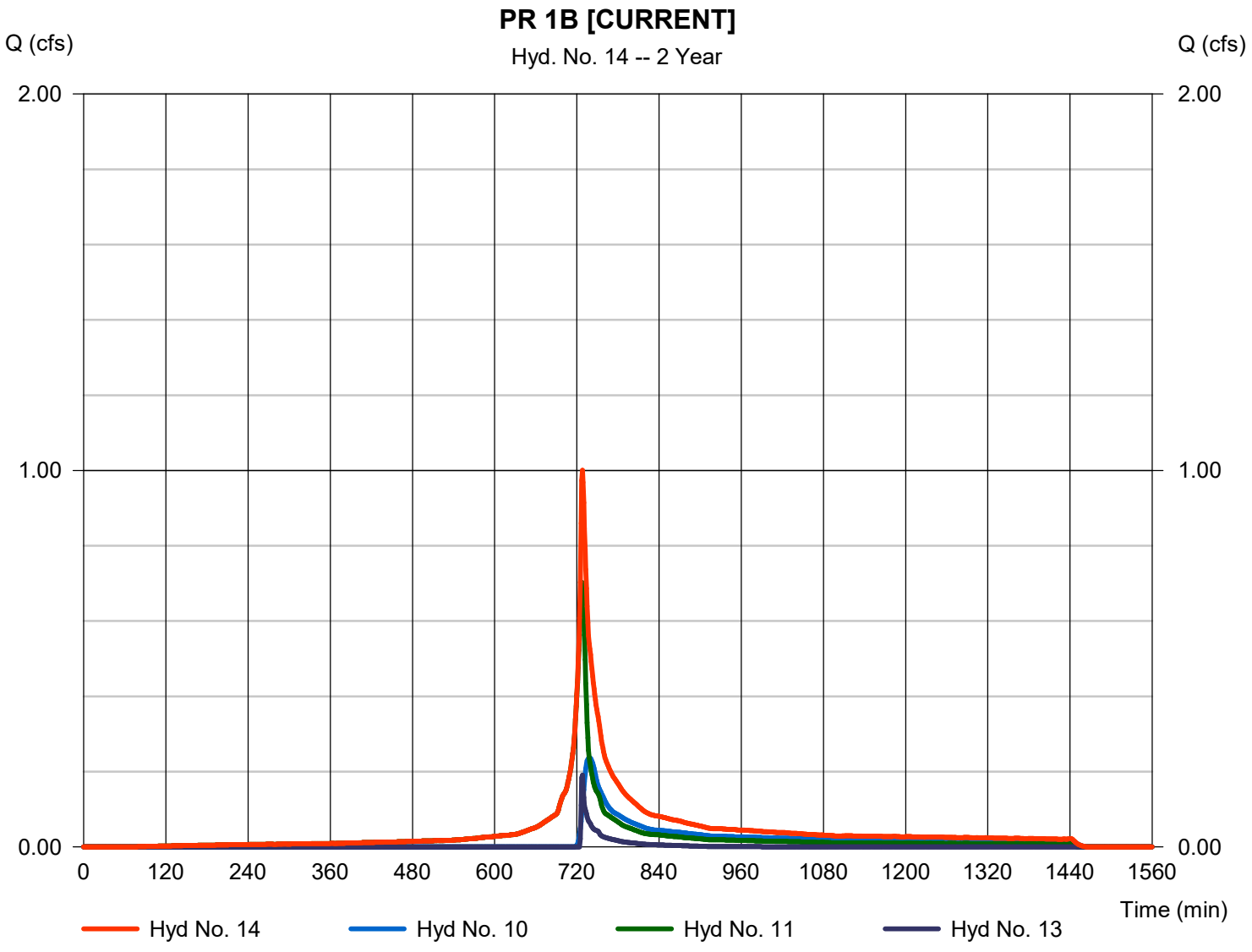
...End

Hydrograph Report

Hyd. No. 14

PR 1B [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 1.001 cfs
Storm frequency	= 2 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 4,065 cuft
Inflow hyds.	= 10, 11, 13	Contrib. drain. area	= 1.100 ac

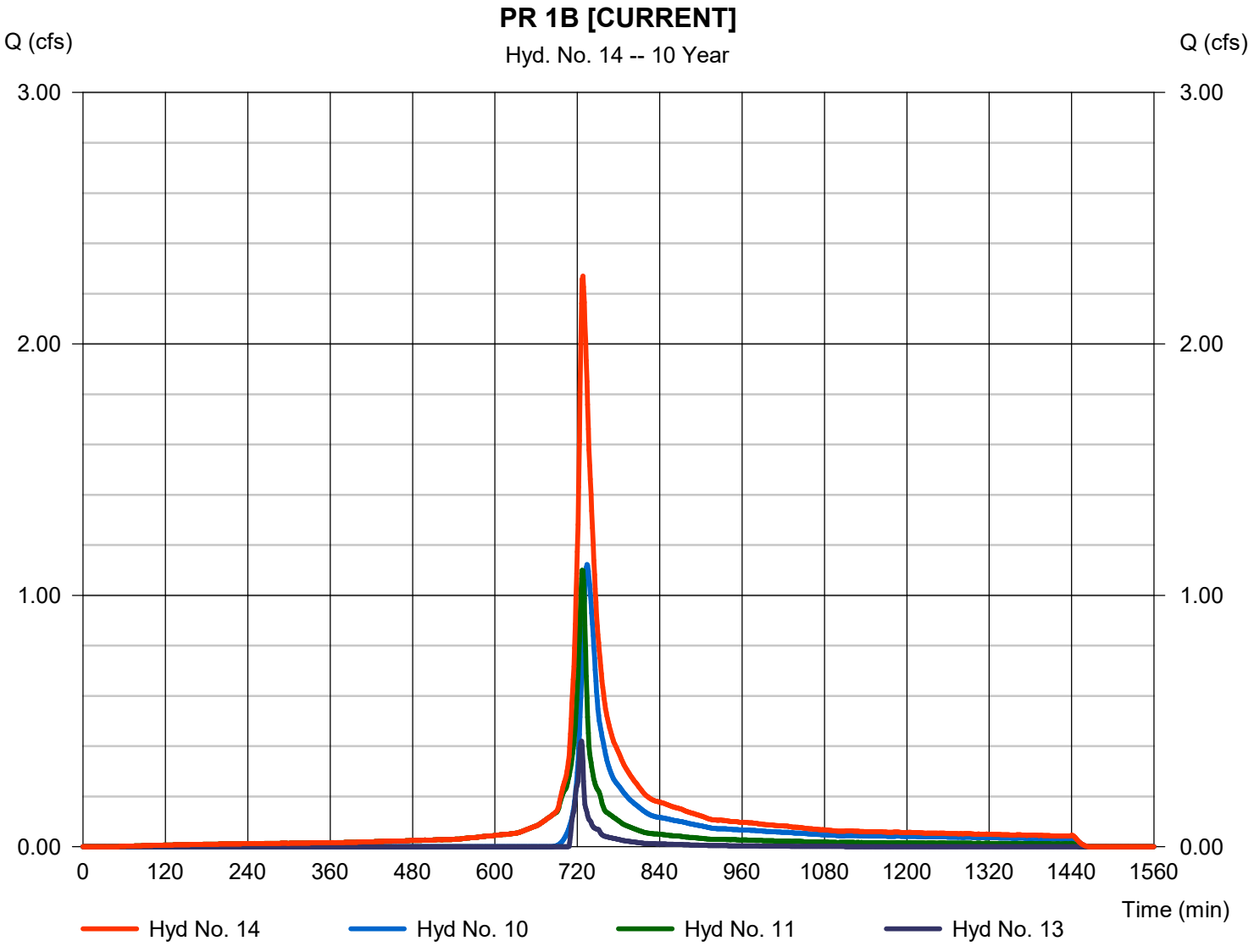


Hydrograph Report

Hyd. No. 14

PR 1B [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	2.269 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	9,098 cuft
Inflow hyds.	=	10, 11, 13	Contrib. drain. area	=	1.100 ac

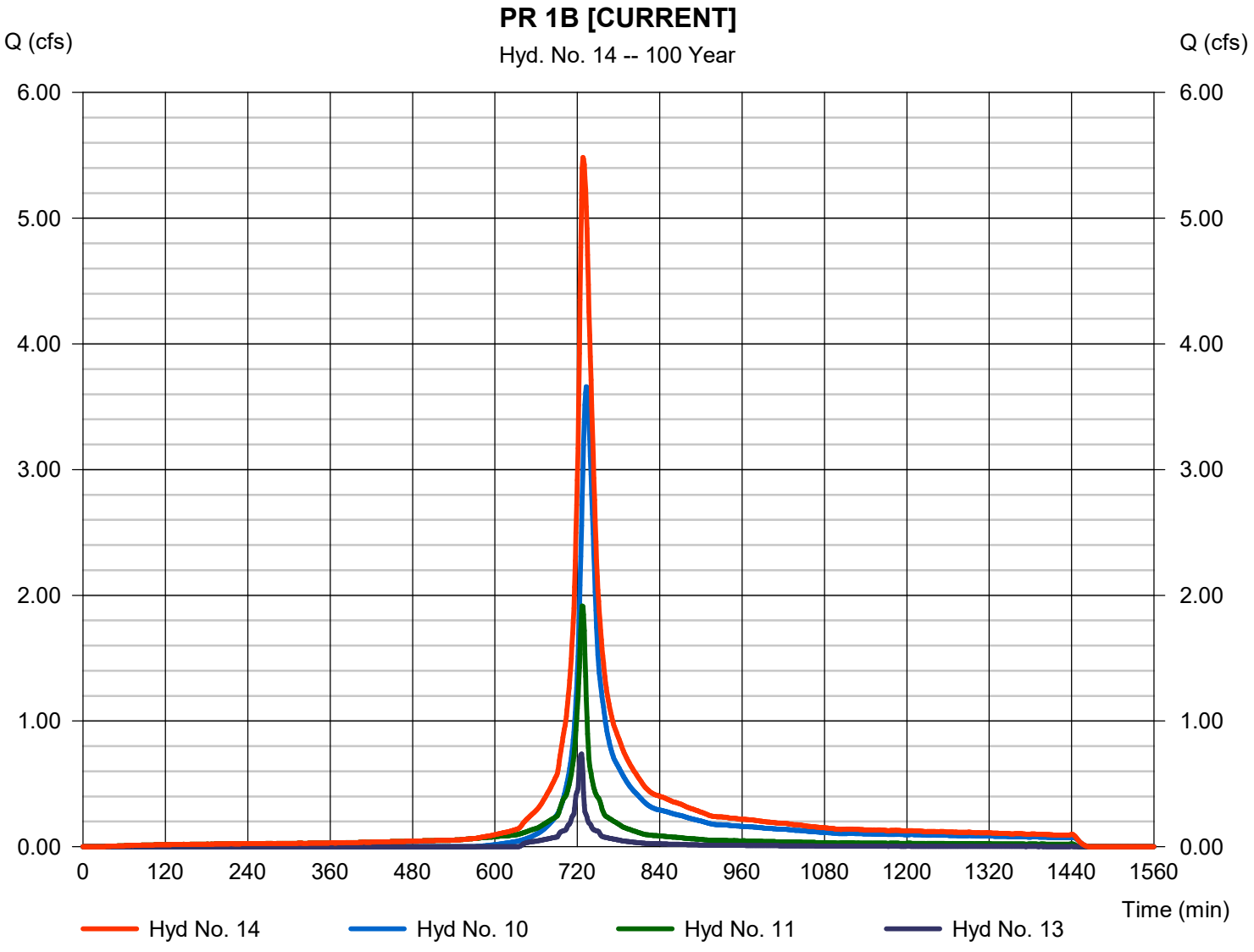


Hydrograph Report

Hyd. No. 14

PR 1B [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	5.483 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	22,246 cuft
Inflow hyds.	=	10, 11, 13	Contrib. drain. area	=	1.100 ac



Hydrograph Report

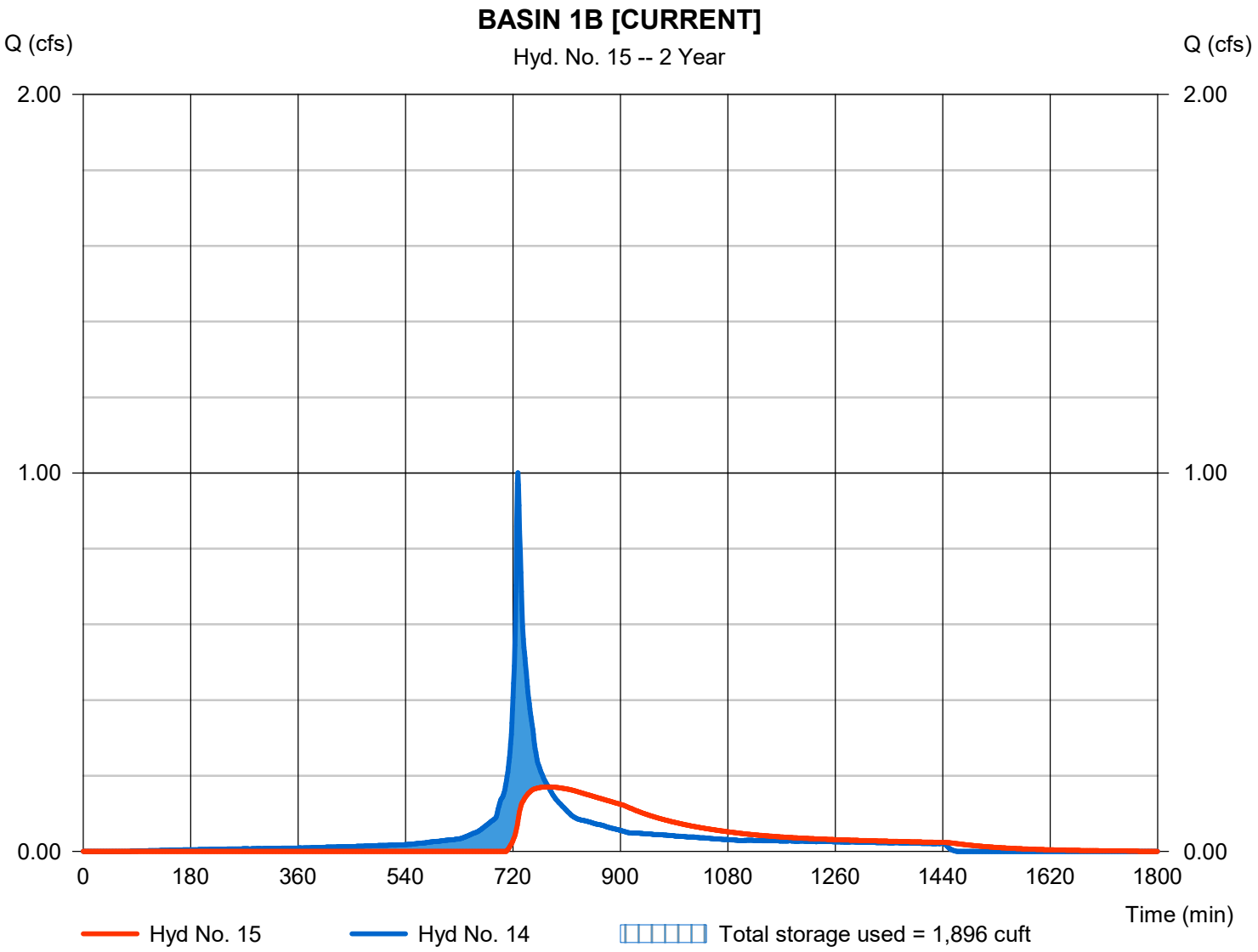
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 15

BASIN 1B [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	0.170 cfs
Storm frequency	=	2 yrs	Time to peak	=	779 min
Time interval	=	1 min	Hyd. volume	=	3,342 cuft
Inflow hyd. No.	=	14 - PR 1B [CURRENT]	Max. Elevation	=	633.06 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	1,896 cuft

Storage Indication method used.



Hydrograph Report

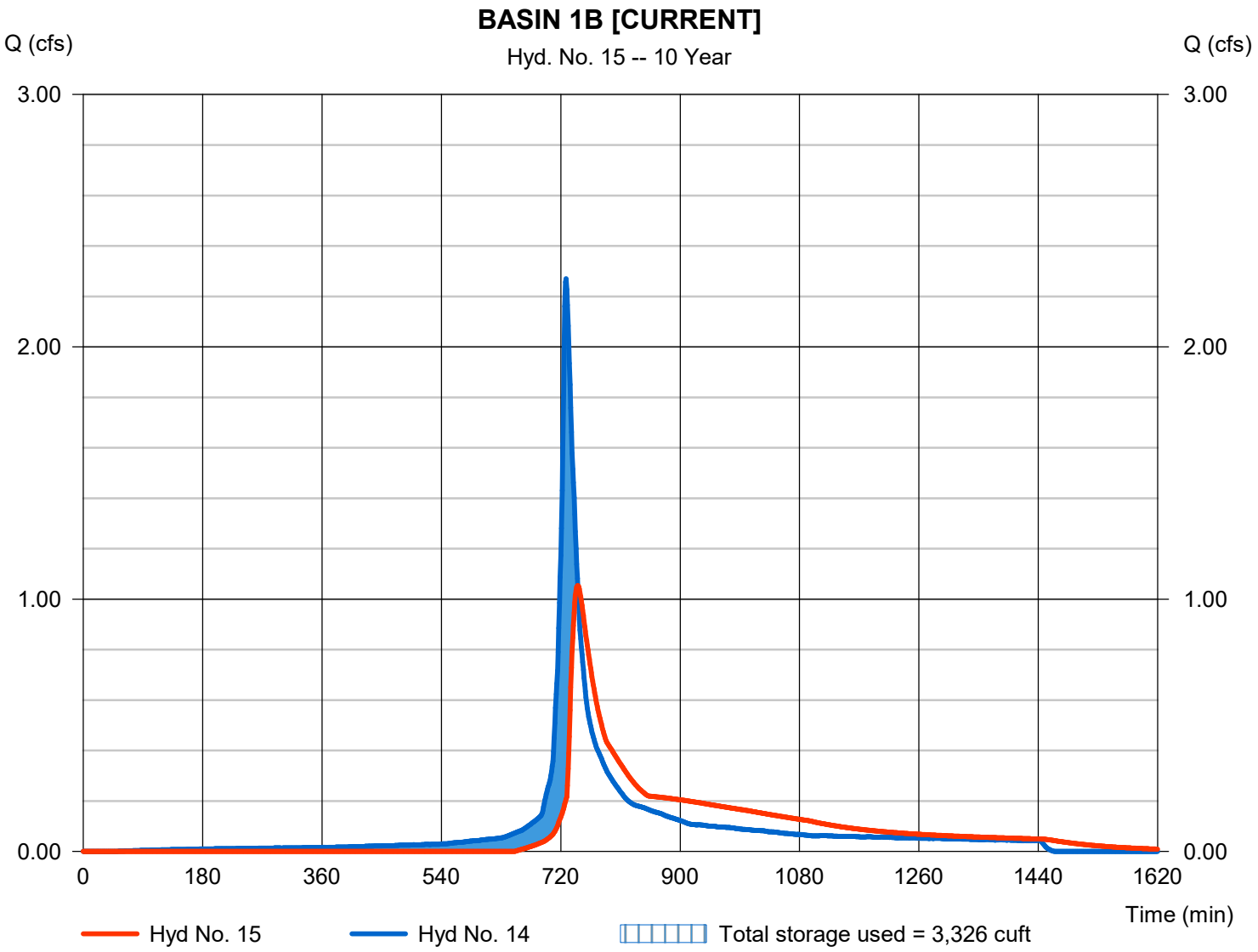
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 15

BASIN 1B [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	1.054 cfs
Storm frequency	=	10 yrs	Time to peak	=	745 min
Time interval	=	1 min	Hyd. volume	=	8,375 cuft
Inflow hyd. No.	=	14 - PR 1B [CURRENT]	Max. Elevation	=	633.86 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	3,326 cuft

Storage Indication method used.



Hydrograph Report

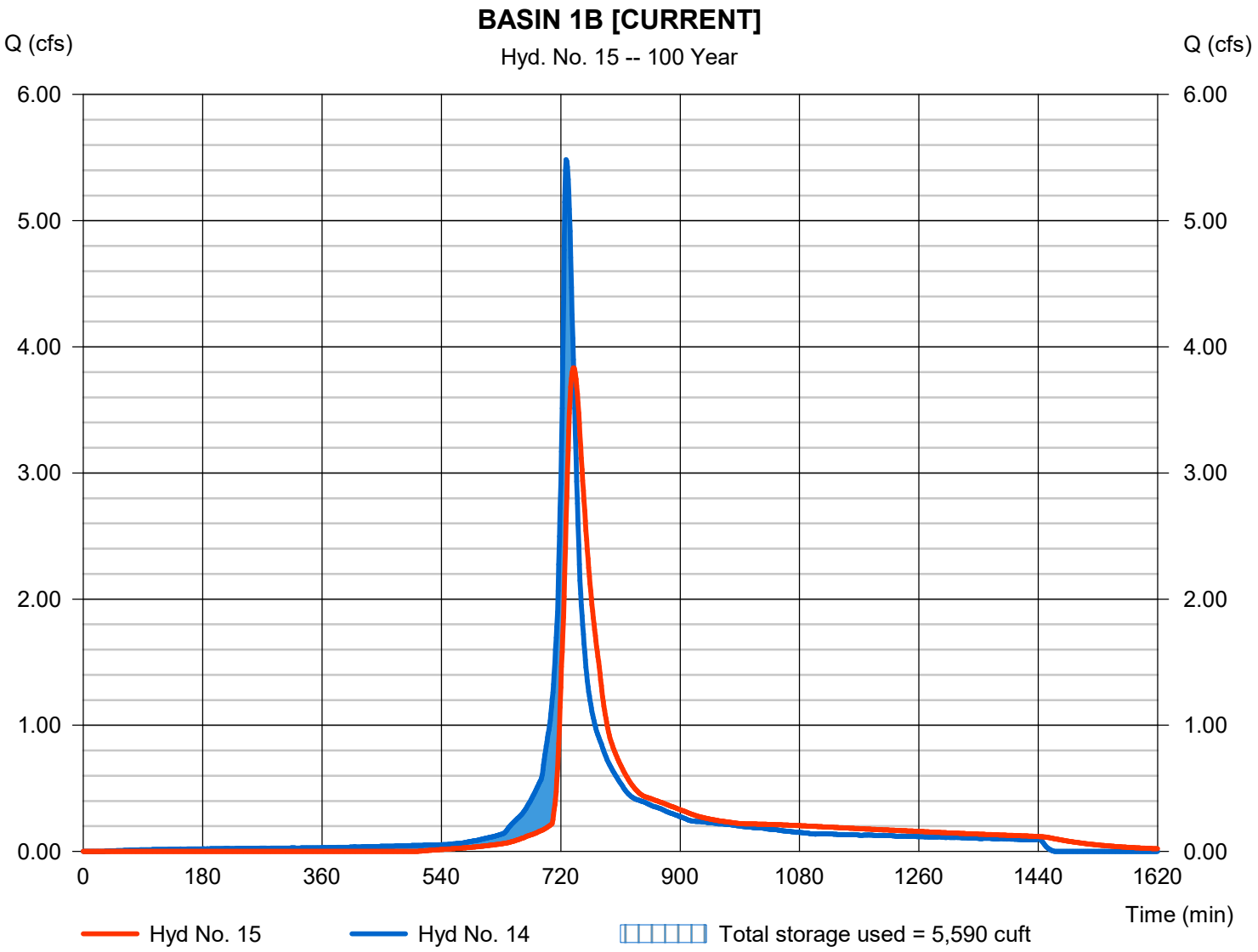
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 15

BASIN 1B [CURRENT]

Hydrograph type	=	Reservoir	Peak discharge	=	3.835 cfs
Storm frequency	=	100 yrs	Time to peak	=	739 min
Time interval	=	1 min	Hyd. volume	=	21,524 cuft
Inflow hyd. No.	=	14 - PR 1B [CURRENT]	Max. Elevation	=	634.60 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	5,590 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Pond No. 1 - BASIN 1B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 632.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	632.00	1,270	0	0
2.00	634.00	2,370	3,583	3,583
4.00	636.00	4,435	6,697	10,280
6.00	638.00	6,440	10,812	21,092

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 3.00	0.00	0.00	0.00
Span (in)	= 3.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 632.41	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 0.83	0.00	0.00	0.00
Crest El. (ft)	= 633.43	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	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

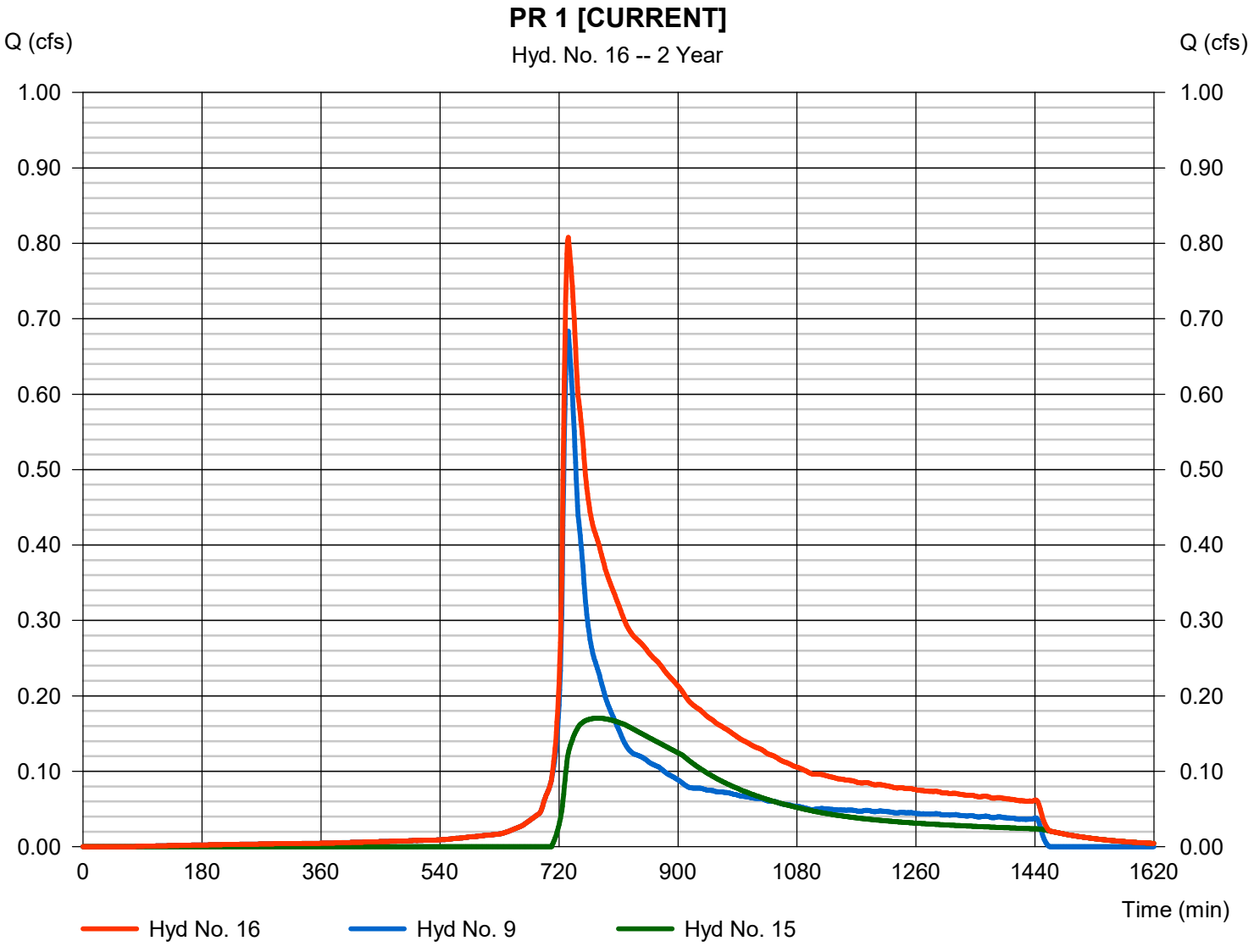
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	632.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	358	632.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	717	632.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.60	1,075	632.60	0.06 ic	---	---	---	0.00	---	---	---	---	---	0.059
0.80	1,433	632.80	0.12 ic	---	---	---	0.00	---	---	---	---	---	0.122
1.00	1,791	633.00	0.16 ic	---	---	---	0.00	---	---	---	---	---	0.161
1.20	2,150	633.20	0.19 ic	---	---	---	0.00	---	---	---	---	---	0.193
1.40	2,508	633.40	0.22 ic	---	---	---	0.00	---	---	---	---	---	0.220
1.60	2,866	633.60	0.24 ic	---	---	---	0.19	---	---	---	---	---	0.438
1.80	3,225	633.80	0.27 ic	---	---	---	0.62	---	---	---	---	---	0.888
2.00	3,583	634.00	0.29 ic	---	---	---	1.19	---	---	---	---	---	1.475
2.20	4,253	634.20	0.30 ic	---	---	---	1.87	---	---	---	---	---	2.173
2.40	4,922	634.40	0.32 ic	---	---	---	2.64	---	---	---	---	---	2.963
2.60	5,592	634.60	0.34 ic	---	---	---	3.50	---	---	---	---	---	3.837
2.80	6,262	634.80	0.36 ic	---	---	---	4.43	---	---	---	---	---	4.788
3.00	6,932	635.00	0.37 ic	---	---	---	5.44	---	---	---	---	---	5.809
3.20	7,601	635.20	0.39 ic	---	---	---	6.51	---	---	---	---	---	6.895
3.40	8,271	635.40	0.40 ic	---	---	---	7.64	---	---	---	---	---	8.043
3.60	8,941	635.60	0.41 ic	---	---	---	8.84	---	---	---	---	---	9.249
3.80	9,611	635.80	0.43 ic	---	---	---	10.09	---	---	---	---	---	10.51
4.00	10,280	636.00	0.44 ic	---	---	---	11.39	---	---	---	---	---	11.83
4.20	11,361	636.20	0.45 ic	---	---	---	12.74	---	---	---	---	---	13.19
4.40	12,443	636.40	0.46 ic	---	---	---	14.15	---	---	---	---	---	14.61
4.60	13,524	636.60	0.48 ic	---	---	---	15.60	---	---	---	---	---	16.08
4.80	14,605	636.80	0.49 ic	---	---	---	17.10	---	---	---	---	---	17.59
5.00	15,686	637.00	0.50 ic	---	---	---	18.64	---	---	---	---	---	19.14
5.20	16,767	637.20	0.51 ic	---	---	---	20.23	---	---	---	---	---	20.74
5.40	17,849	637.40	0.52 ic	---	---	---	21.86	---	---	---	---	---	22.38
5.60	18,930	637.60	0.53 ic	---	---	---	23.54	---	---	---	---	---	24.07
5.80	20,011	637.80	0.54 ic	---	---	---	25.25	---	---	---	---	---	25.79
6.00	21,092	638.00	0.55 ic	---	---	---	27.00	---	---	---	---	---	27.55

Hydrograph Report

Hyd. No. 16

PR 1 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 0.808 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 7,942 cuft
Inflow hyds.	= 9, 15	Contrib. drain. area	= 0.000 ac

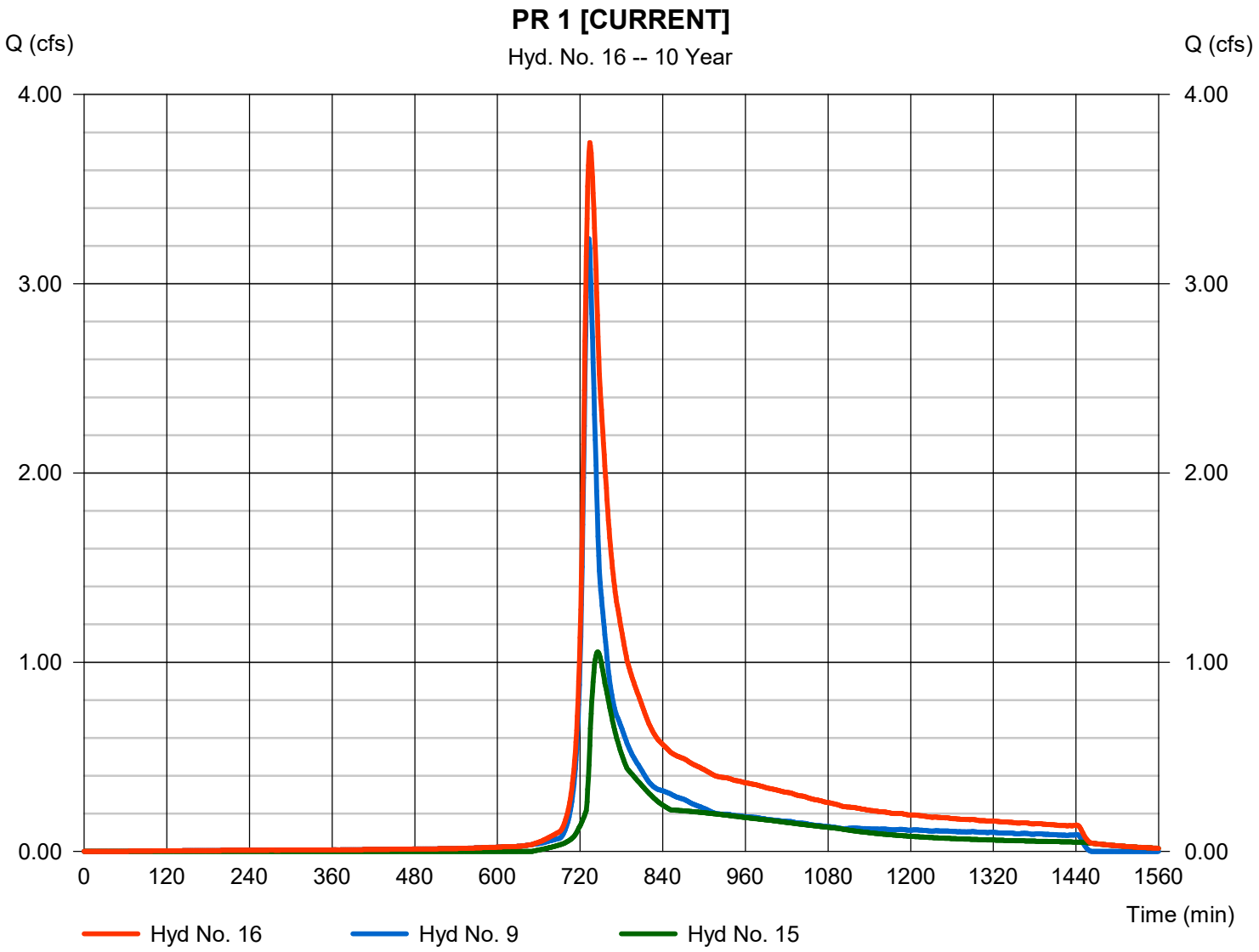


Hydrograph Report

Hyd. No. 16

PR 1 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 3.746 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 21,901 cuft
Inflow hyds.	= 9, 15	Contrib. drain. area	= 0.000 ac

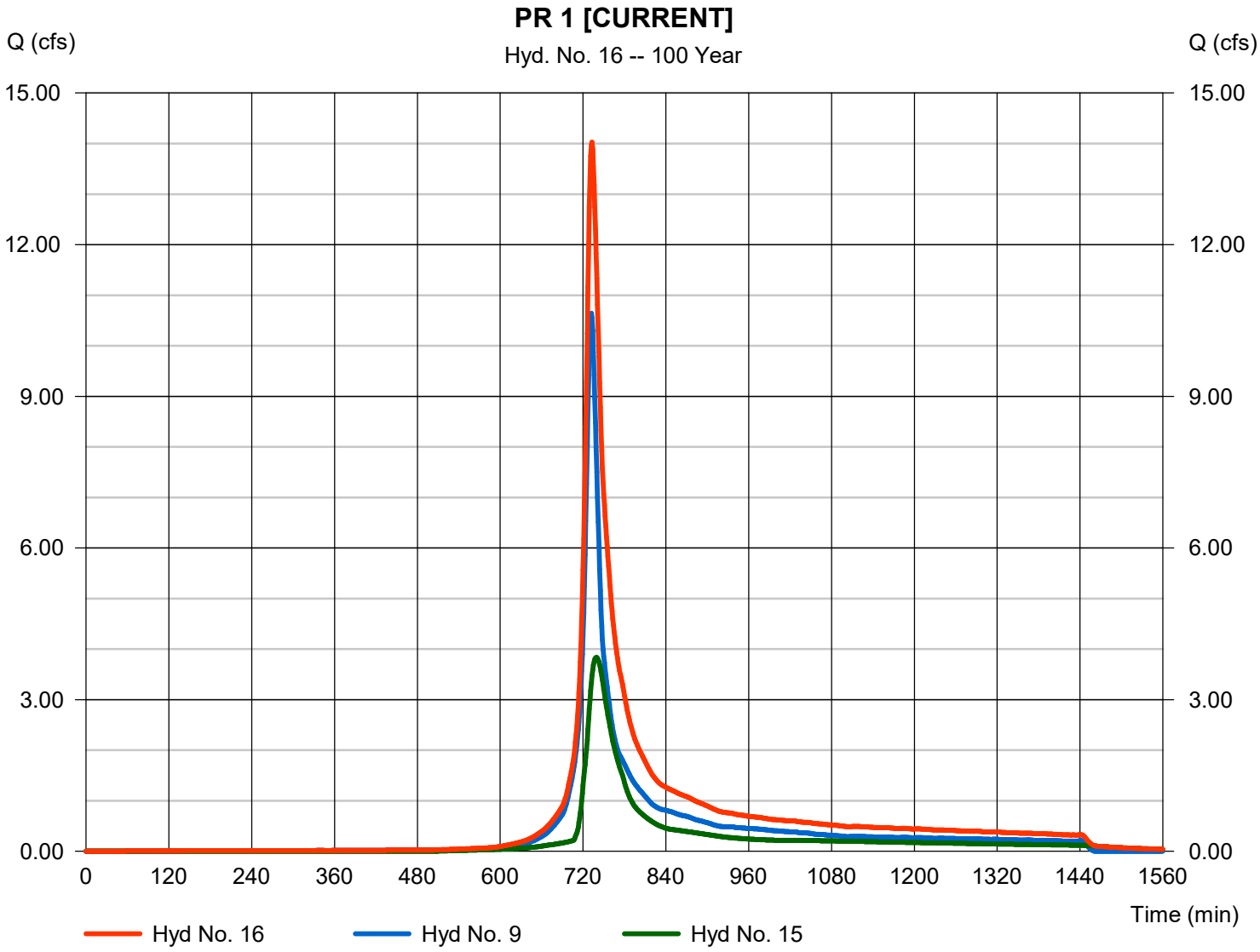


Hydrograph Report

Hyd. No. 16

PR 1 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 14.03 cfs
Storm frequency	= 100 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 61,066 cuft
Inflow hyds.	= 9, 15	Contrib. drain. area	= 0.000 ac



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 2 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.16	70.5
WOODS	B	55	0.05	3.0
BRUSH	B	48	0.72	34.8
Total			**Σ= 1.9**	**Σ= 108.3**

$$CN = \frac{108.3}{1.9} = 56$$

DRAINAGE AREA DESIGNATION: PR 2 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.04	3.6
Total			**Σ= 0.0**	**Σ= 3.6**

$$CN = \frac{3.6}{0.0} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 2 (PER) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.8 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	100	58	199	130
LAND SLOPE, S (%)=	4	15.5	14.1	10
AVERAGE VELOCITY, V (FT/S)=	1.39	0.99	2.61	0.80
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.2 MIN.**	**1.0 MIN.**	**1.3 MIN.**	**2.7 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**8.8 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.2 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

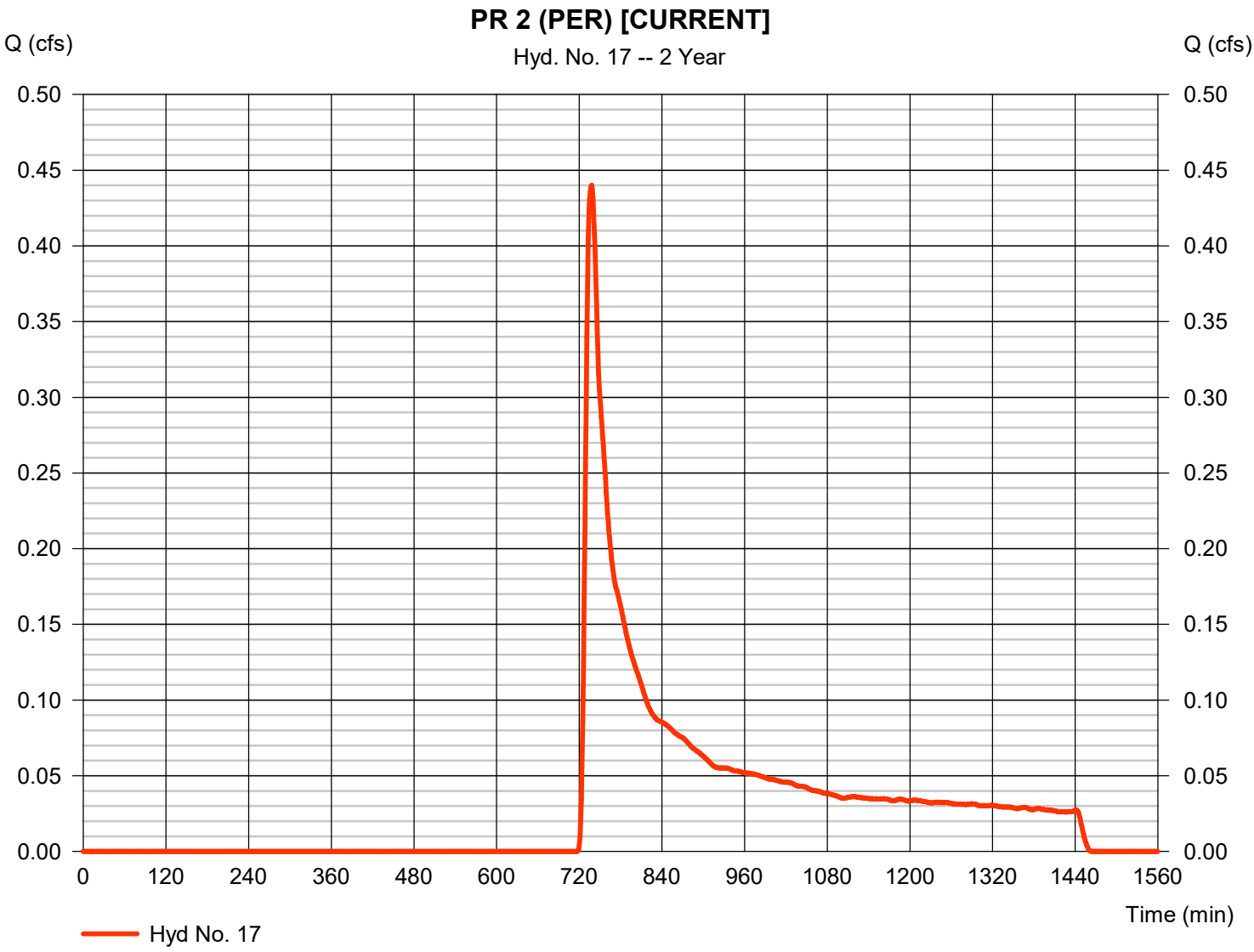
TIME OF CONCENTRATION= 15.0 MIN.

Hydrograph Report

Hyd. No. 17

PR 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.440 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	1 min	Hyd. volume	=	2,820 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

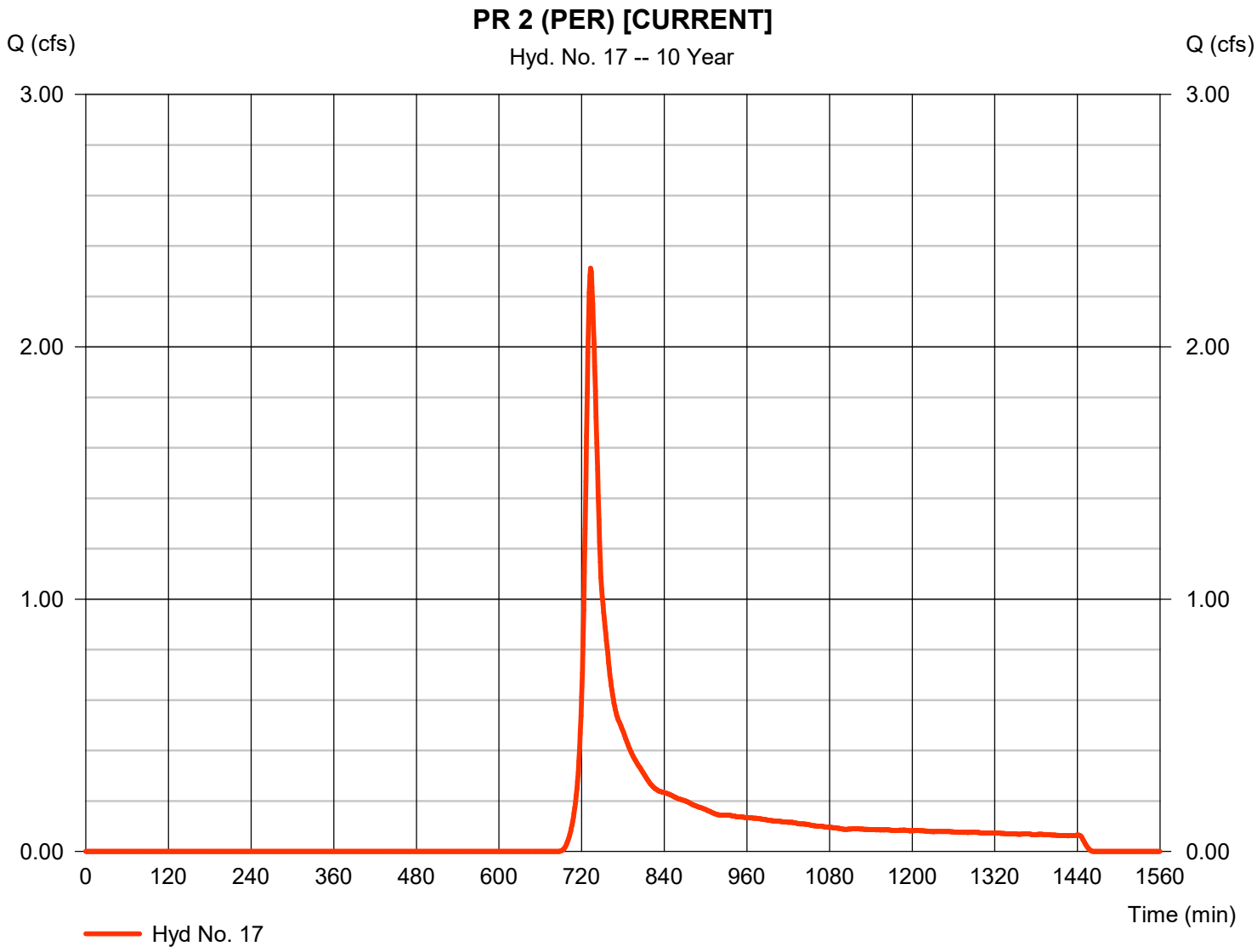


Hydrograph Report

Hyd. No. 17

PR 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.311 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	9,301 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

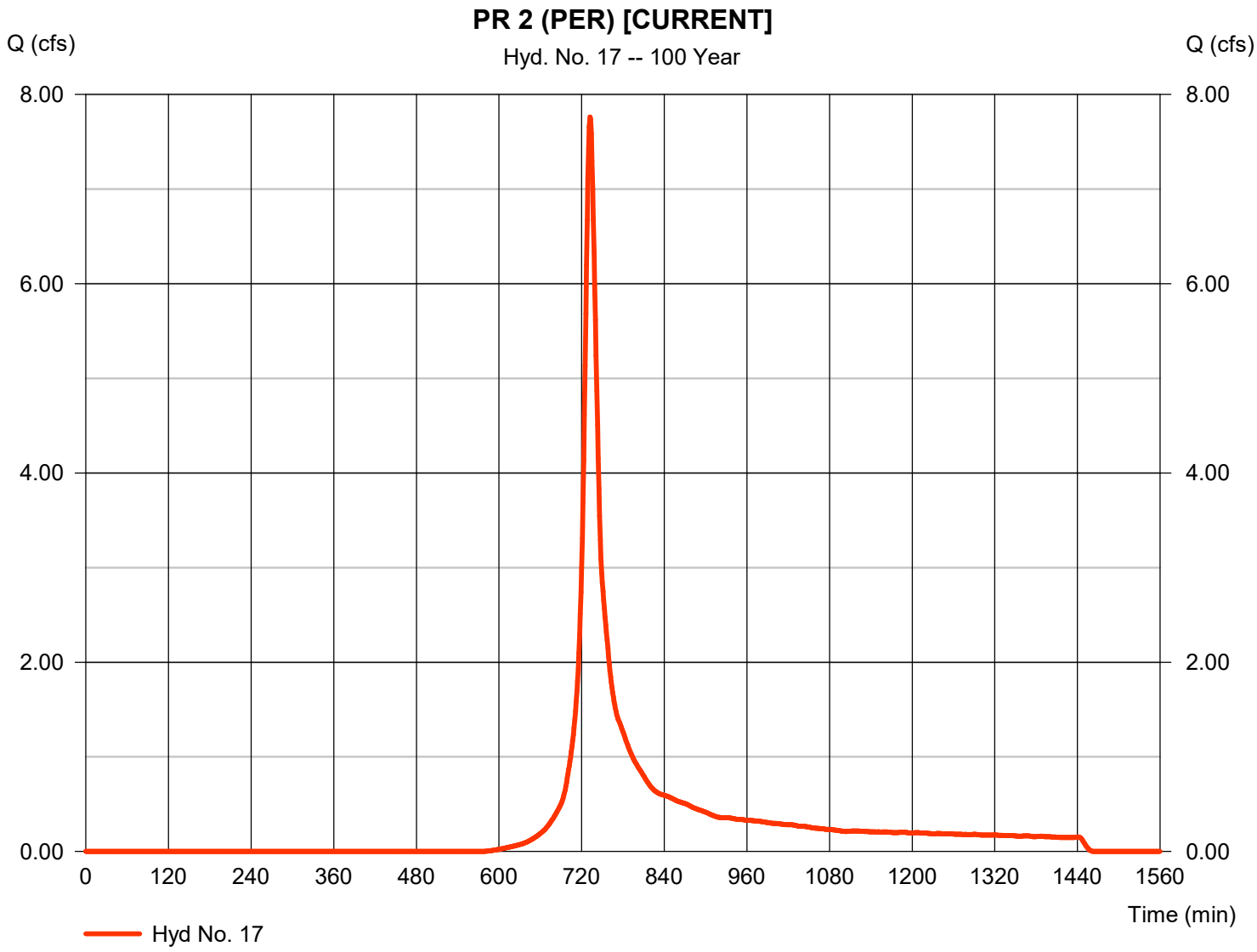


Hydrograph Report

Hyd. No. 17

PR 2 (PER) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.764 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	28,351 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 2 (IMP) [CURRENT]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	27 (100 MAX)	62 (62 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	3.58	3.58		
LAND SLOPE, S (%)=	1	2.2		
SHEET FLOW TIME, Tc (MIN.)=	**0.5 MIN.**	**8.9 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	18	75	75	130
LAND SLOPE, S (%)=	2.2	33.3	10.7	10
AVERAGE VELOCITY, V (FT/S)=	1.03	4.02	2.28	0.80
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.3 MIN.**	**0.3 MIN.**	**0.5 MIN.**	**2.7 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**9.4 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**3.9 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

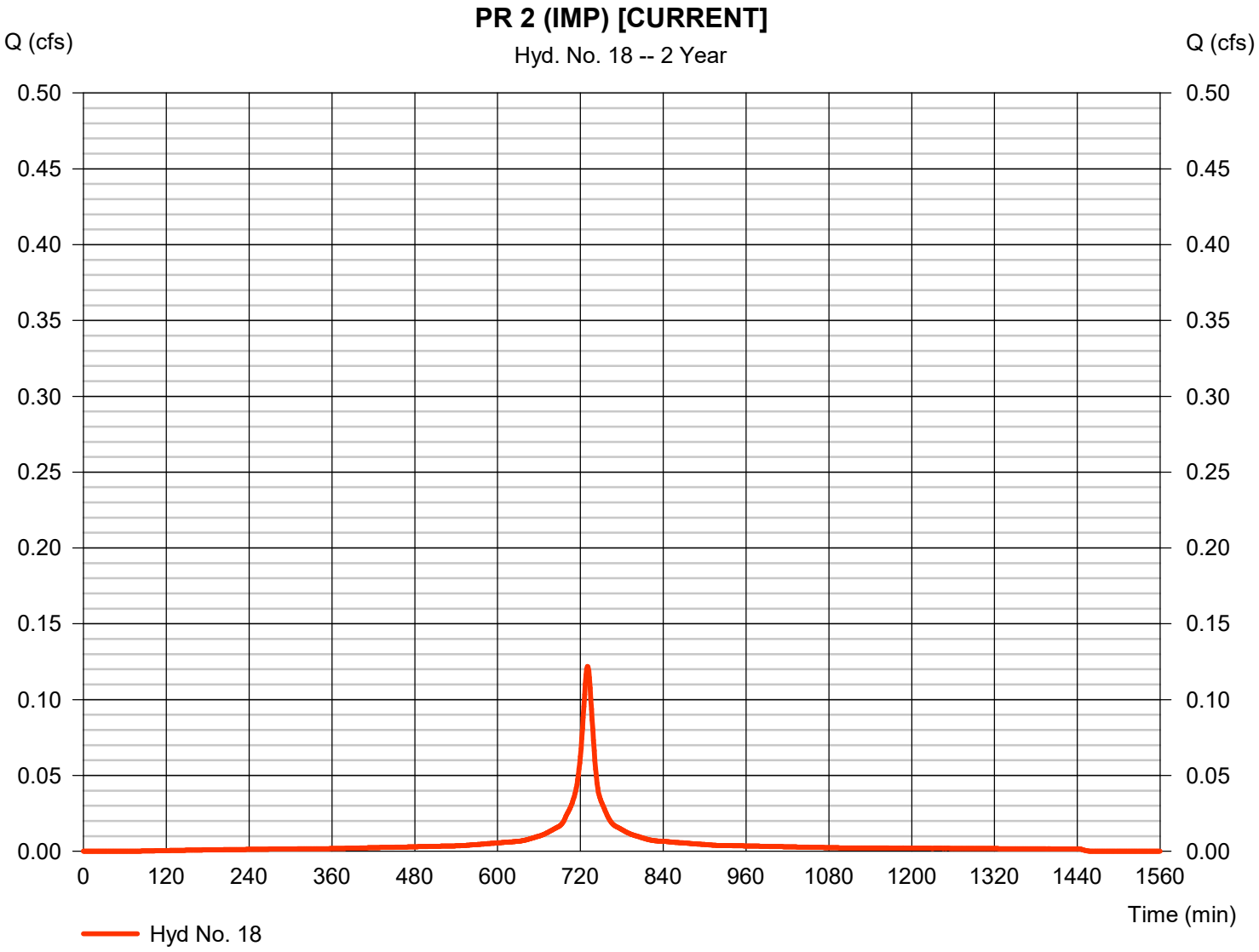
TIME OF CONCENTRATION= 13.3 MIN.

Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.122 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	478 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.30 min
Total precip.	=	3.58 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

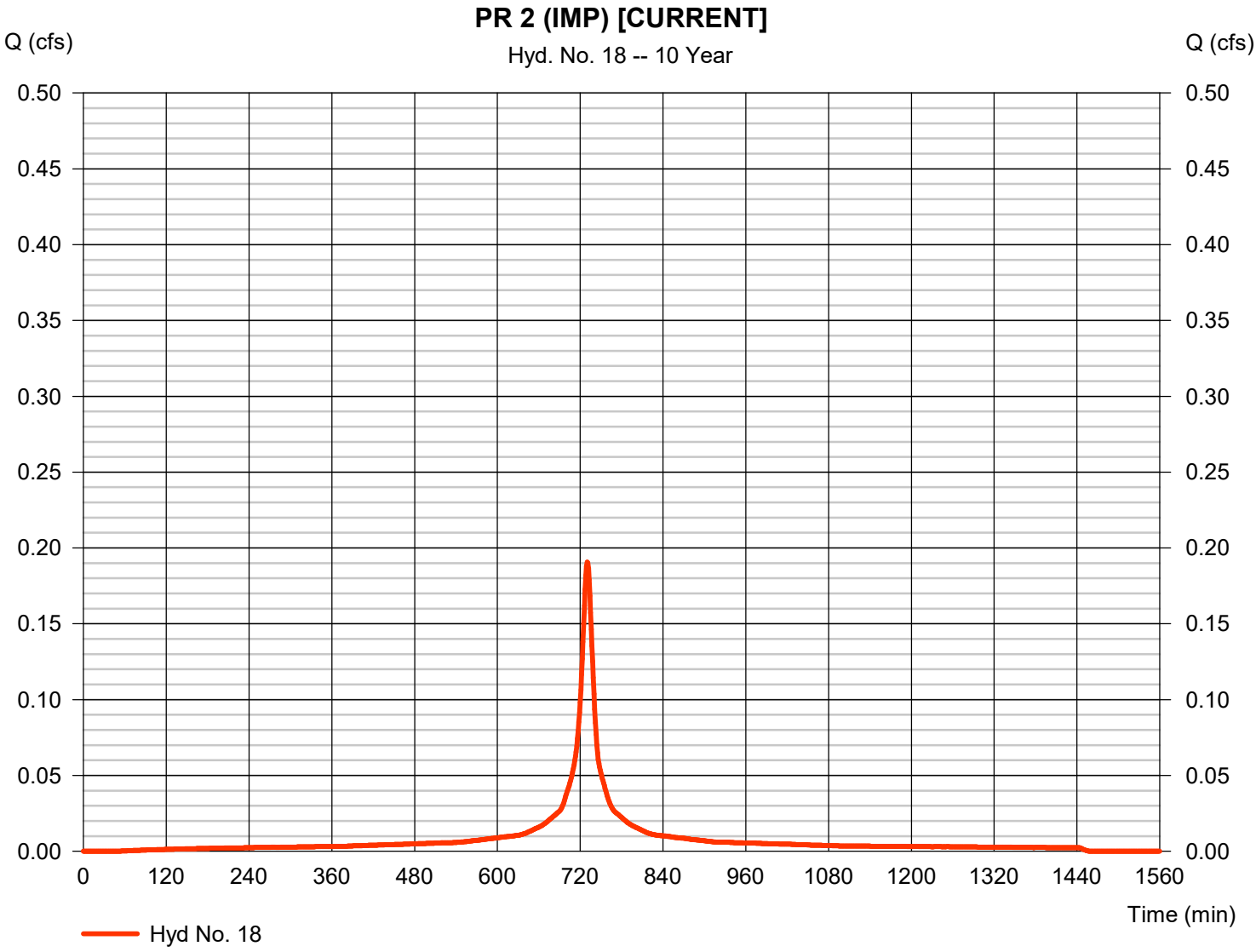


Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.191 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	762 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.30 min
Total precip.	=	5.57 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

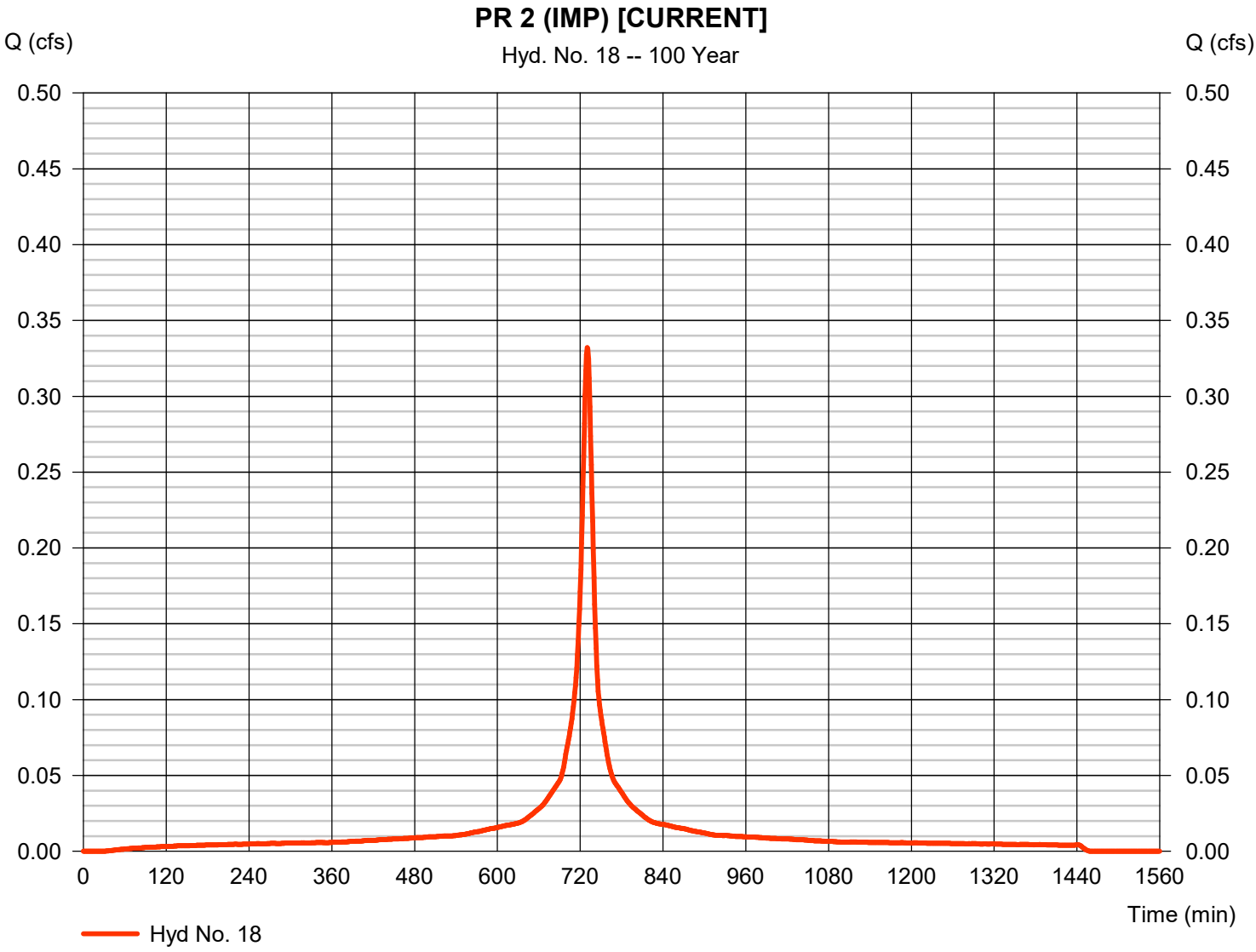


Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [CURRENT]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.332 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	1,348 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.30 min
Total precip.	=	9.67 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

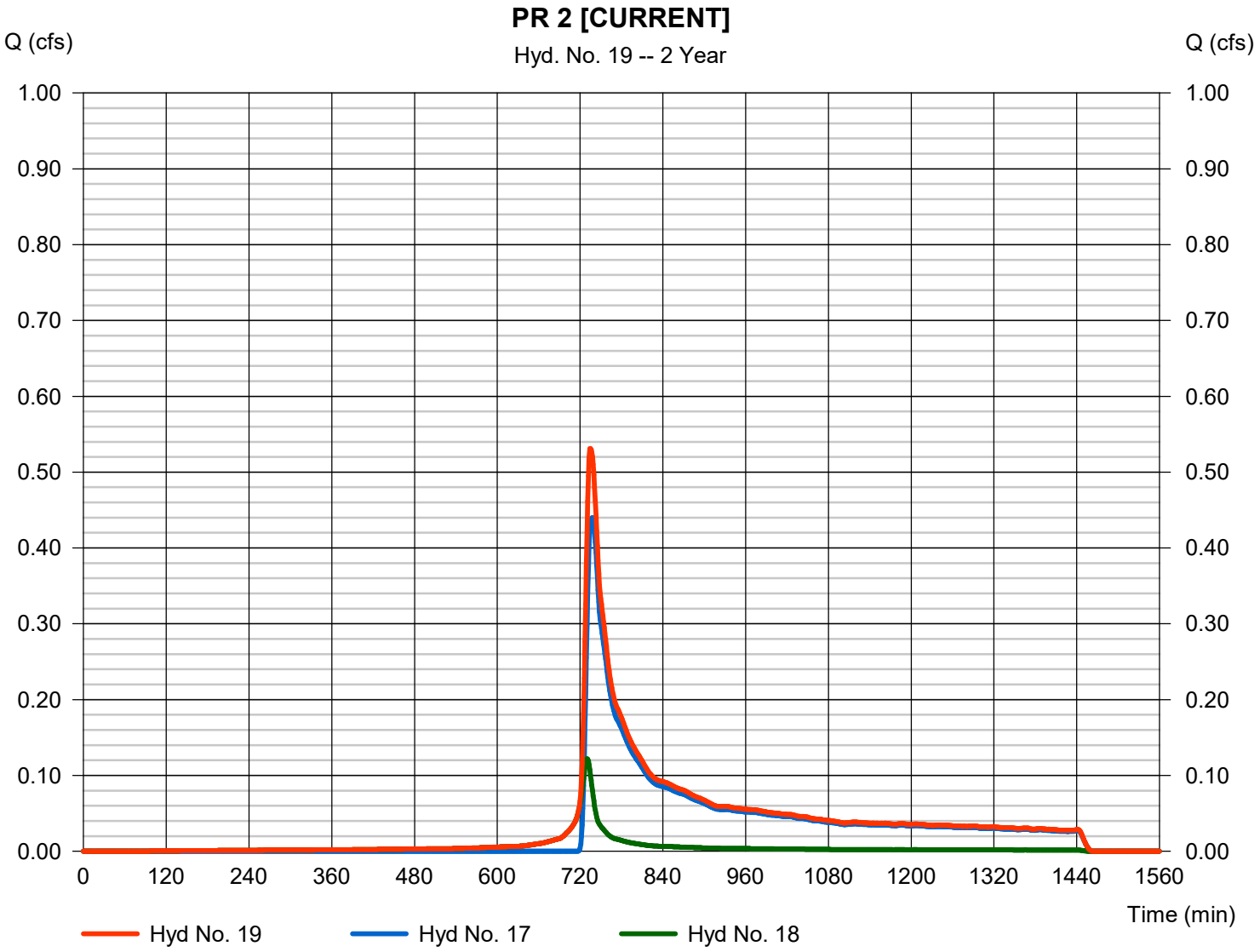


Hydrograph Report

Hyd. No. 19

PR 2 [CURRENT]

Hydrograph type	= Combine	Peak discharge	= 0.531 cfs
Storm frequency	= 2 yrs	Time to peak	= 735 min
Time interval	= 1 min	Hyd. volume	= 3,299 cuft
Inflow hyds.	= 17, 18	Contrib. drain. area	= 1.940 ac

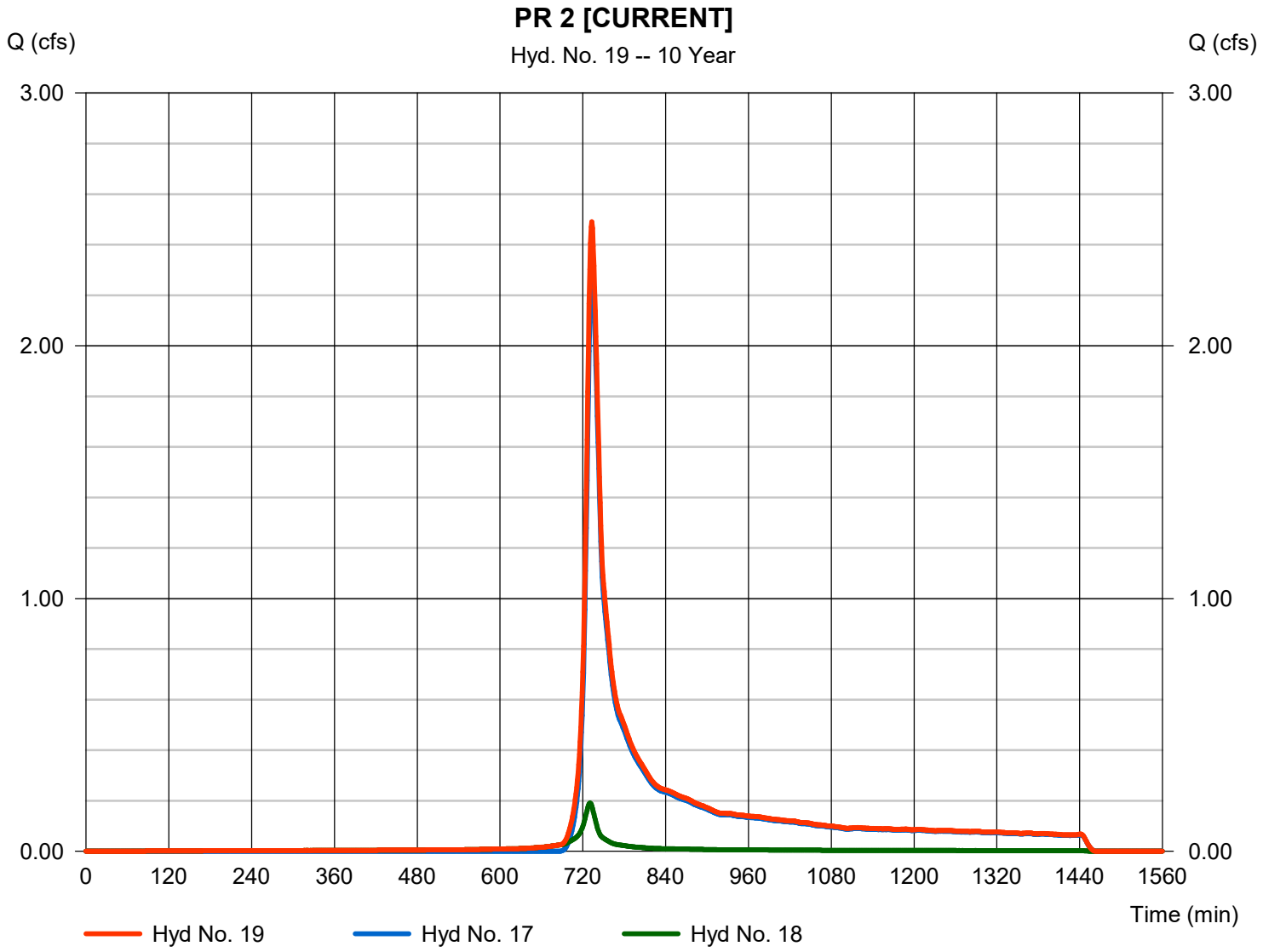


Hydrograph Report

Hyd. No. 19

PR 2 [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	2.491 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	10,063 cuft
Inflow hyds.	=	17, 18	Contrib. drain. area	=	1.940 ac

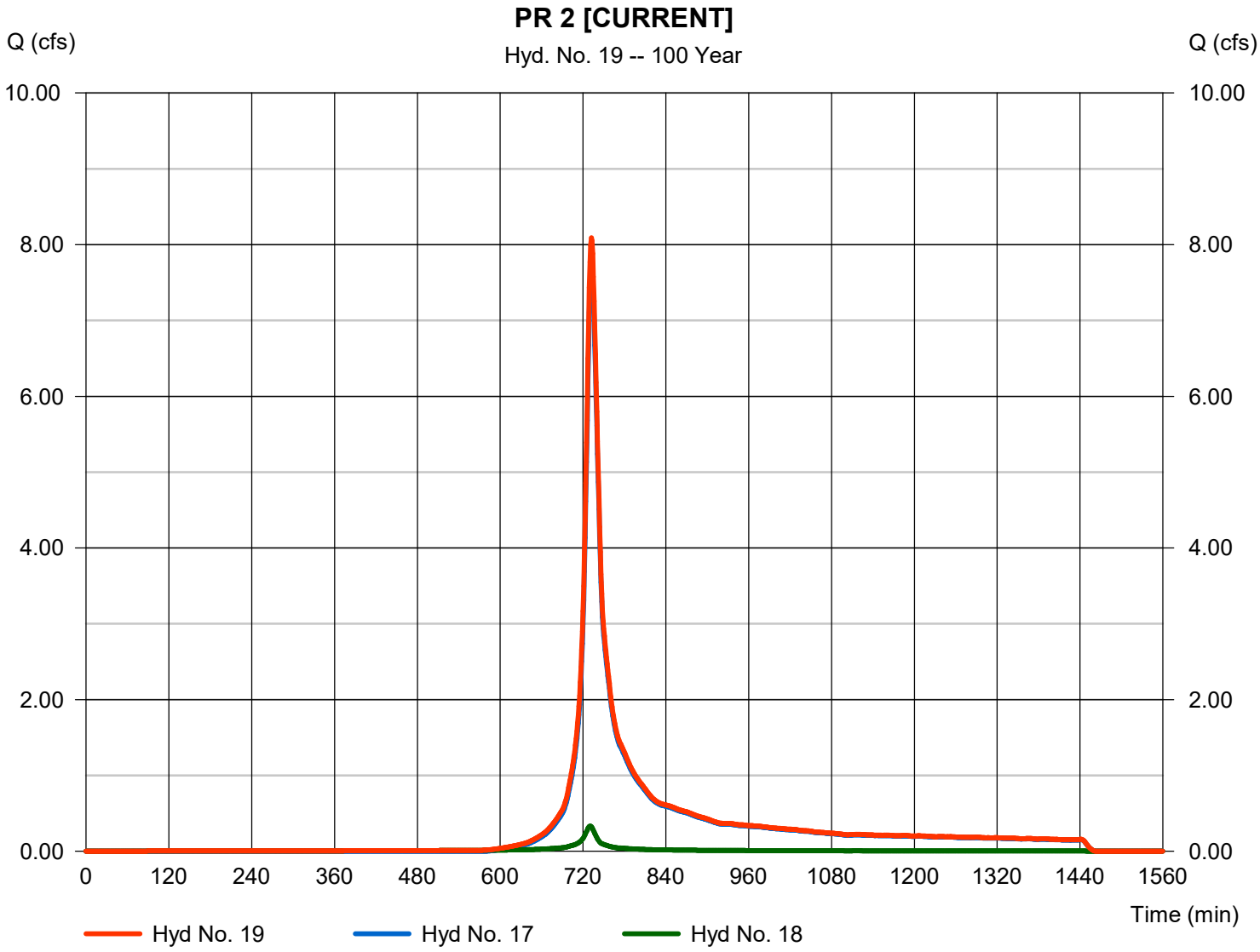


Hydrograph Report

Hyd. No. 19

PR 2 [CURRENT]

Hydrograph type	=	Combine	Peak discharge	=	8.089 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	29,698 cuft
Inflow hyds.	=	17, 18	Contrib. drain. area	=	1.940 ac



Multi-Hydrograph Plot

Hyd. No. 6

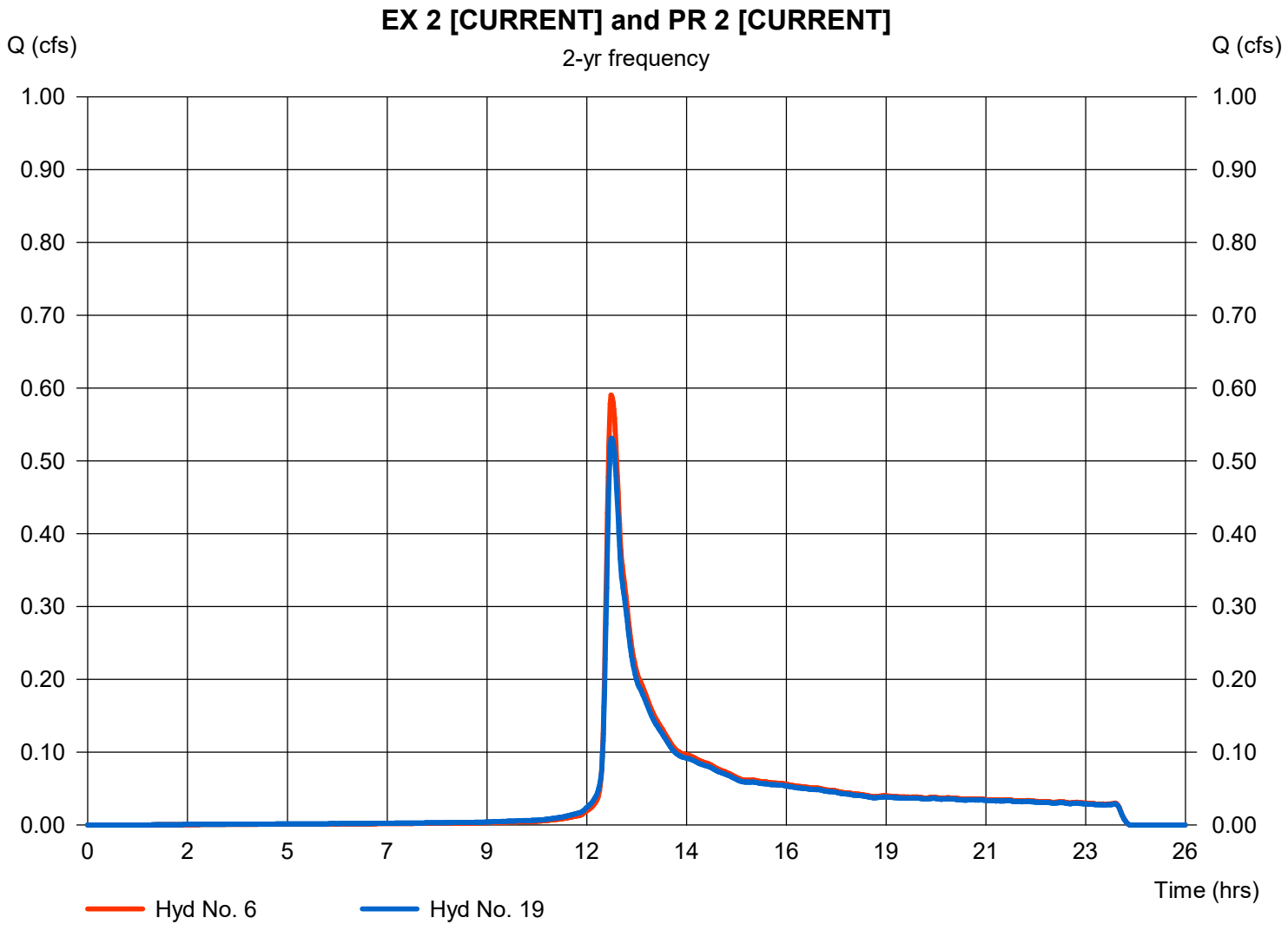
EX 2 [CURRENT]

Hydrograph type	=	Combine
Peak discharge	=	0.591 cfs
Time to peak	=	12.23 hrs
Hyd. Volume	=	3,448 cuft

Hyd. No. 19

PR 2 [CURRENT]

Hydrograph type	=	Combine
Peak discharge	=	0.53 cfs
Time to peak	=	12.25 hrs
Hyd. Volume	=	3,299 cuft



Multi-Hydrograph Plot

Hyd. No. 6

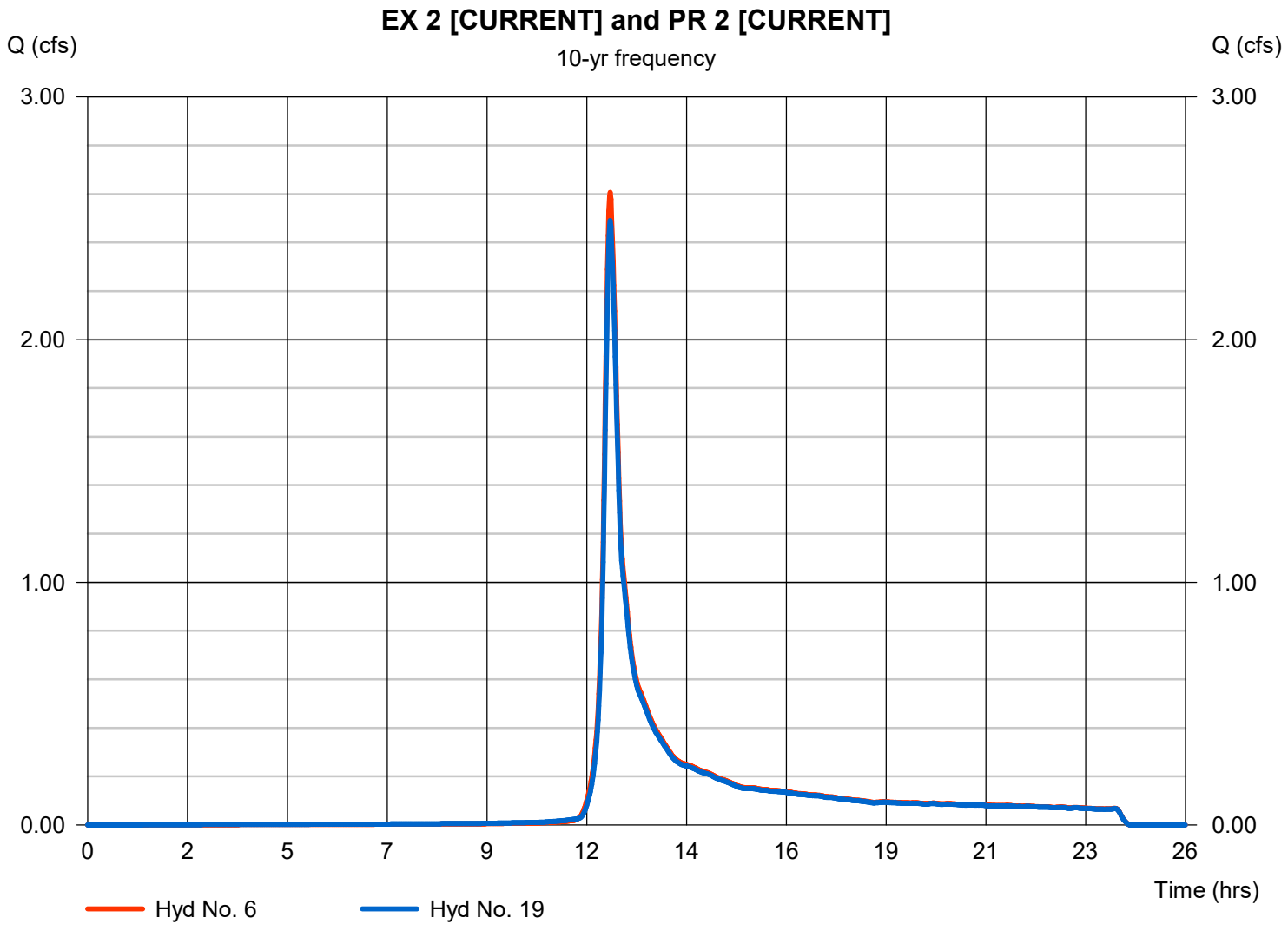
EX 2 [CURRENT]

Hydrograph type	=	Combine
Peak discharge	=	2.607 cfs
Time to peak	=	12.22 hrs
Hyd. Volume	=	10,393 cuft

Hyd. No. 19

PR 2 [CURRENT]

Hydrograph type	=	Combine
Peak discharge	=	2.49 cfs
Time to peak	=	12.22 hrs
Hyd. Volume	=	10,063 cuft



Multi-Hydrograph Plot

Hyd. No. 6

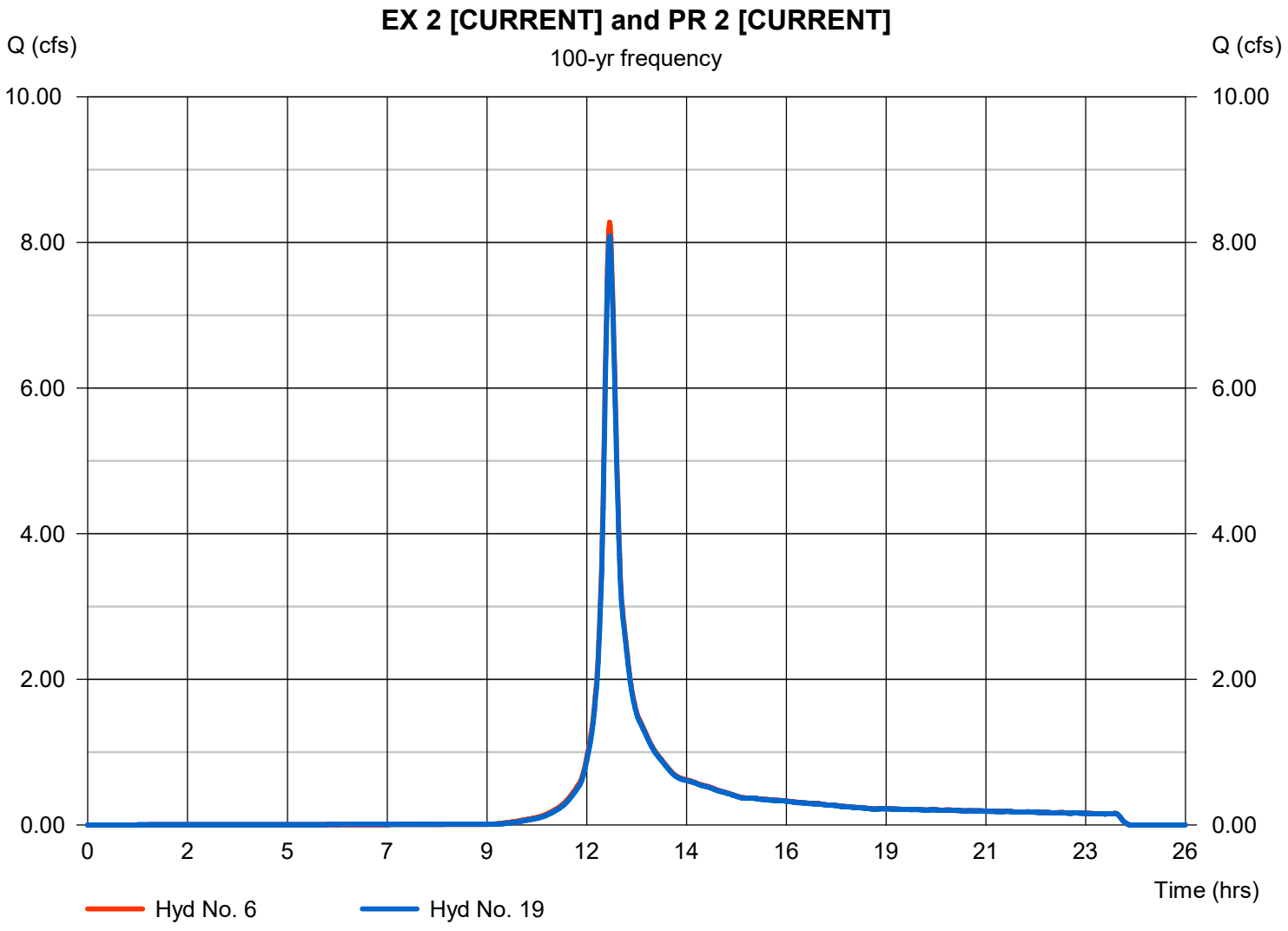
EX 2 [CURRENT]

Hydrograph type	=	Combine
Peak discharge	=	8.278 cfs
Time to peak	=	12.20 hrs
Hyd. Volume	=	30,296 cuft

Hyd. No. 19

PR 2 [CURRENT]

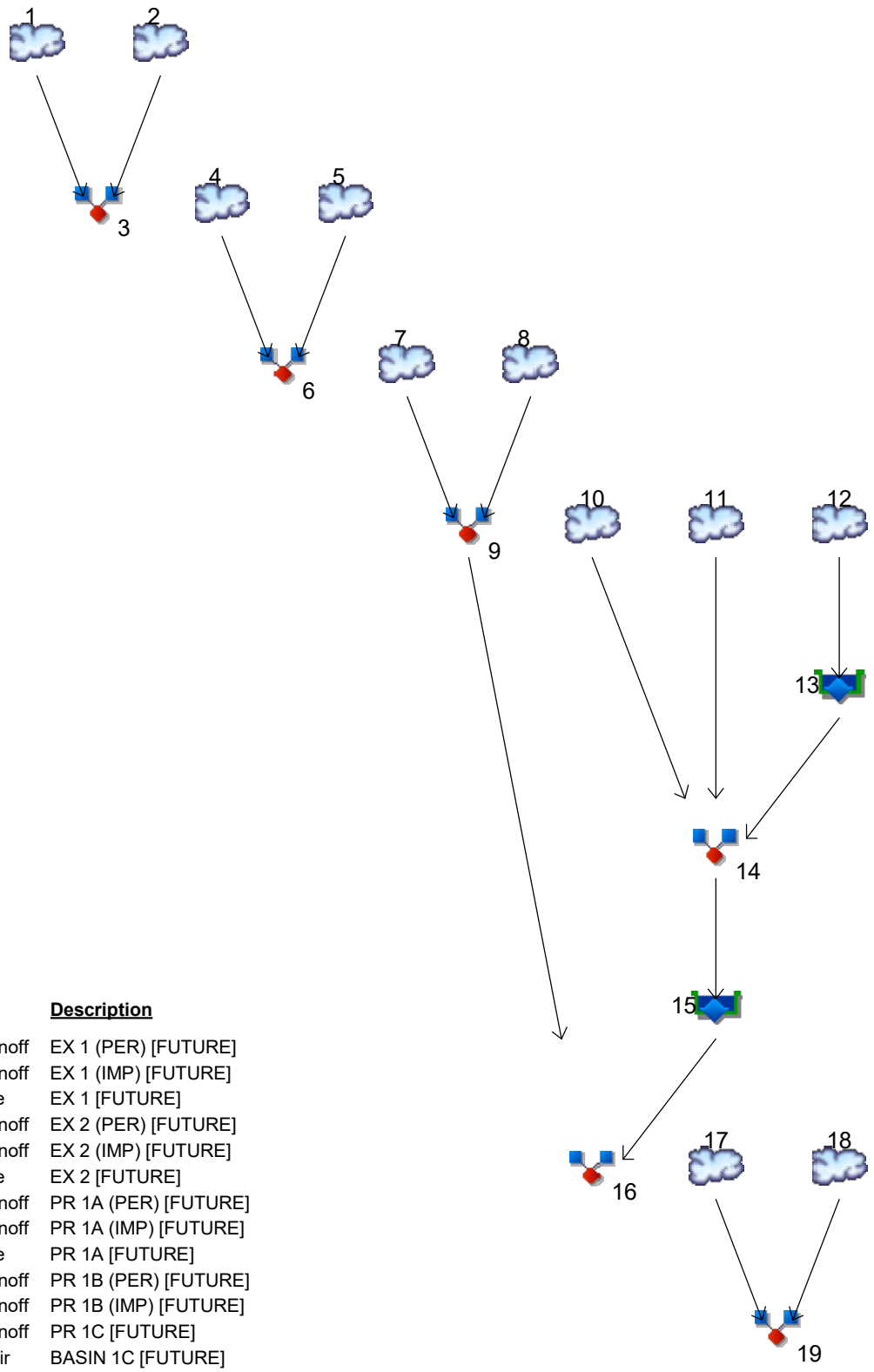
Hydrograph type	=	Combine
Peak discharge	=	8.09 cfs
Time to peak	=	12.20 hrs
Hyd. Volume	=	29,698 cuft



APPENDIX D

DRAINAGE CALCULATIONS (FUTURE FACTOR)

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	EX 1 (PER) [FUTURE]
2	SCS Runoff	EX 1 (IMP) [FUTURE]
3	Combine	EX 1 [FUTURE]
4	SCS Runoff	EX 2 (PER) [FUTURE]
5	SCS Runoff	EX 2 (IMP) [FUTURE]
6	Combine	EX 2 [FUTURE]
7	SCS Runoff	PR 1A (PER) [FUTURE]
8	SCS Runoff	PR 1A (IMP) [FUTURE]
9	Combine	PR 1A [FUTURE]
10	SCS Runoff	PR 1B (PER) [FUTURE]
11	SCS Runoff	PR 1B (IMP) [FUTURE]
12	SCS Runoff	PR 1C [FUTURE]
13	Reservoir	BASIN 1C [FUTURE]
14	Combine	PR 1B [FUTURE]
15	Reservoir	BASIN 1B [FUTURE]
16	Combine	PR 1 [FUTURE]
17	SCS Runoff	PR 2 (PER) [FUTURE]
18	SCS Runoff	PR 2 (IMP) [FUTURE]
19	Combine	PR 2 [FUTURE]

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	1.950	-------	-------	7.071	-------	-------	21.75	EX 1 (PER) [FUTURE]
2	SCS Runoff	------	-------	0.964	-------	-------	1.496	-------	-------	2.653	EX 1 (IMP) [FUTURE]
3	Combine	1, 2	-------	2.412	-------	-------	7.891	-------	-------	23.31	EX 1 [FUTURE]
4	SCS Runoff	------	-------	1.048	-------	-------	3.615	-------	-------	10.87	EX 2 (PER) [FUTURE]
5	SCS Runoff	------	-------	0.115	-------	-------	0.179	-------	-------	0.318	EX 2 (IMP) [FUTURE]
6	Combine	4, 5	-------	1.142	-------	-------	3.771	-------	-------	11.16	EX 2 [FUTURE]
7	SCS Runoff	------	-------	1.079	-------	-------	4.261	-------	-------	13.52	PR 1A (PER) [FUTURE]
8	SCS Runoff	------	-------	0.401	-------	-------	0.623	-------	-------	1.104	PR 1A (IMP) [FUTURE]
9	Combine	7, 8	-------	1.364	-------	-------	4.752	-------	-------	14.45	PR 1A [FUTURE]
10	SCS Runoff	------	-------	0.496	-------	-------	1.712	-------	-------	5.147	PR 1B (PER) [FUTURE]
11	SCS Runoff	------	-------	0.828	-------	-------	1.287	-------	-------	2.282	PR 1B (IMP) [FUTURE]
12	SCS Runoff	------	-------	0.323	-------	-------	0.501	-------	-------	0.889	PR 1C [FUTURE]
13	Reservoir	12	-------	0.310	-------	-------	0.493	-------	-------	0.881	BASIN 1C [FUTURE]
14	Combine	10, 11, 13	-------	1.426	-------	-------	3.088	-------	-------	7.469	PR 1B [FUTURE]
15	Reservoir	14	-------	0.243	-------	-------	1.725	-------	-------	5.327	BASIN 1B [FUTURE]
16	Combine	9, 15	-------	1.532	-------	-------	6.214	-------	-------	19.29	PR 1 [FUTURE]
17	SCS Runoff	------	-------	0.933	-------	-------	3.426	-------	-------	10.57	PR 2 (PER) [FUTURE]
18	SCS Runoff	------	-------	0.144	-------	-------	0.223	-------	-------	0.396	PR 2 (IMP) [FUTURE]
19	Combine	17, 18	-------	1.060	-------	-------	3.636	-------	-------	10.96	PR 2 [FUTURE]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.950	1	732	8,578	------	------	------	EX 1 (PER) [FUTURE]
2	SCS Runoff	0.964	1	726	2,886	------	------	------	EX 1 (IMP) [FUTURE]
3	Combine	2.412	1	728	11,464	1, 2	------	------	EX 1 [FUTURE]
4	SCS Runoff	1.048	1	734	4,912	------	------	------	EX 2 (PER) [FUTURE]
5	SCS Runoff	0.115	1	729	441	------	------	------	EX 2 (IMP) [FUTURE]
6	Combine	1.142	1	734	5,353	4, 5	------	------	EX 2 [FUTURE]
7	SCS Runoff	1.079	1	734	5,589	------	------	------	PR 1A (PER) [FUTURE]
8	SCS Runoff	0.401	1	728	1,443	------	------	------	PR 1A (IMP) [FUTURE]
9	Combine	1.364	1	733	7,031	7, 8	------	------	PR 1A [FUTURE]
10	SCS Runoff	0.496	1	734	2,327	------	------	------	PR 1B (PER) [FUTURE]
11	SCS Runoff	0.828	1	727	2,813	------	------	------	PR 1B (IMP) [FUTURE]
12	SCS Runoff	0.323	1	724	947	------	------	------	PR 1C [FUTURE]
13	Reservoir	0.310	1	726	343	12	638.27	331	BASIN 1C [FUTURE]
14	Combine	1.426	1	727	5,483	10, 11, 13	------	------	PR 1B [FUTURE]
15	Reservoir	0.243	1	775	4,760	14	633.42	2,546	BASIN 1B [FUTURE]
16	Combine	1.532	1	733	11,792	9, 15	------	------	PR 1 [FUTURE]
17	SCS Runoff	0.933	1	734	4,575	------	------	------	PR 2 (PER) [FUTURE]
18	SCS Runoff	0.144	1	730	568	------	------	------	PR 2 (IMP) [FUTURE]
19	Combine	1.060	1	734	5,143	17, 18	------	------	PR 2 [FUTURE]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.071	1	731	24,649	------	------	------	EX 1 (PER) [FUTURE]
2	SCS Runoff	1.496	1	726	4,553	------	------	------	EX 1 (IMP) [FUTURE]
3	Combine	7.891	1	729	29,202	1, 2	------	------	EX 1 [FUTURE]
4	SCS Runoff	3.615	1	733	13,751	------	------	------	EX 2 (PER) [FUTURE]
5	SCS Runoff	0.179	1	729	695	------	------	------	EX 2 (IMP) [FUTURE]
6	Combine	3.771	1	733	14,446	4, 5	------	------	EX 2 [FUTURE]
7	SCS Runoff	4.261	1	733	16,511	------	------	------	PR 1A (PER) [FUTURE]
8	SCS Runoff	0.623	1	728	2,276	------	------	------	PR 1A (IMP) [FUTURE]
9	Combine	4.752	1	732	18,787	7, 8	------	------	PR 1A [FUTURE]
10	SCS Runoff	1.712	1	733	6,514	------	------	------	PR 1B (PER) [FUTURE]
11	SCS Runoff	1.287	1	727	4,439	------	------	------	PR 1B (IMP) [FUTURE]
12	SCS Runoff	0.501	1	724	1,494	------	------	------	PR 1C [FUTURE]
13	Reservoir	0.493	1	726	825	12	638.35	341	BASIN 1C [FUTURE]
14	Combine	3.088	1	728	11,778	10, 11, 13	------	------	PR 1B [FUTURE]
15	Reservoir	1.725	1	741	11,056	14	634.07	3,822	BASIN 1B [FUTURE]
16	Combine	6.214	1	733	29,843	9, 15	------	------	PR 1 [FUTURE]
17	SCS Runoff	3.426	1	733	13,146	------	------	------	PR 2 (PER) [FUTURE]
18	SCS Runoff	0.223	1	730	896	------	------	------	PR 2 (IMP) [FUTURE]
19	Combine	3.636	1	733	14,043	17, 18	------	------	PR 2 [FUTURE]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	21.75	1	730	71,883	------	------	------	EX 1 (PER) [FUTURE]
2	SCS Runoff	2.653	1	726	8,188	------	------	------	EX 1 (IMP) [FUTURE]
3	Combine	23.31	1	729	80,071	1, 2	------	------	EX 1 [FUTURE]
4	SCS Runoff	10.87	1	732	39,376	------	------	------	EX 2 (PER) [FUTURE]
5	SCS Runoff	0.318	1	729	1,250	------	------	------	EX 2 (IMP) [FUTURE]
6	Combine	11.16	1	732	40,626	4, 5	------	------	EX 2 [FUTURE]
7	SCS Runoff	13.52	1	732	49,072	------	------	------	PR 1A (PER) [FUTURE]
8	SCS Runoff	1.104	1	728	4,094	------	------	------	PR 1A (IMP) [FUTURE]
9	Combine	14.45	1	732	53,166	7, 8	------	------	PR 1A [FUTURE]
10	SCS Runoff	5.147	1	732	18,652	------	------	------	PR 1B (PER) [FUTURE]
11	SCS Runoff	2.282	1	727	7,984	------	------	------	PR 1B (IMP) [FUTURE]
12	SCS Runoff	0.889	1	724	2,687	------	------	------	PR 1C [FUTURE]
13	Reservoir	0.881	1	726	1,972	12	638.48	358	BASIN 1C [FUTURE]
14	Combine	7.469	1	729	28,607	10, 11, 13	------	------	PR 1B [FUTURE]
15	Reservoir	5.327	1	737	27,885	14	634.91	6,616	BASIN 1B [FUTURE]
16	Combine	19.29	1	733	81,051	9, 15	------	------	PR 1 [FUTURE]
17	SCS Runoff	10.57	1	732	38,337	------	------	------	PR 2 (PER) [FUTURE]
18	SCS Runoff	0.396	1	730	1,612	------	------	------	PR 2 (IMP) [FUTURE]
19	Combine	10.96	1	732	39,949	17, 18	------	------	PR 2 [FUTURE]

CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: EX 1 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.35	82.3
WOODS	B	55	1.69	92.7
BRUSH	B	48	0.51	24.7
Total			**Σ= 3.5**	**Σ= 199.7**

$$CN = \frac{199.7}{3.5} = 56$$

DRAINAGE AREA DESIGNATION: EX 1 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.22	21.8
Total			**Σ= 0.2**	**Σ= 21.8**

$$CN = \frac{21.8}{0.2} = 98$$

DRAINAGE AREA DESIGNATION: EX 2 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.31	79.7
WOODS	B	55	0.05	3.0
BRUSH	B	48	0.58	28.0
Total			**Σ= 1.9**	**Σ= 110.8**

$$CN = \frac{110.8}{1.9} = 57$$

DRAINAGE AREA DESIGNATION: EX 2 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.03	2.6
Total			**Σ= 0.0**	**Σ= 2.6**

$$CN = \frac{2.6}{0.0} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 1 (PER) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.2 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	PAVED	FOREST	WOODLANDS
FLOW LENGTH, L (FT)=	201	8	30	165
LAND SLOPE, S (%)=	10	2	20	13.9
AVERAGE VELOCITY, V (FT/S)=	2.20	2.87	1.13	1.88
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.5 MIN.**	**0.0 MIN.**	**0.4 MIN.**	**1.5 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

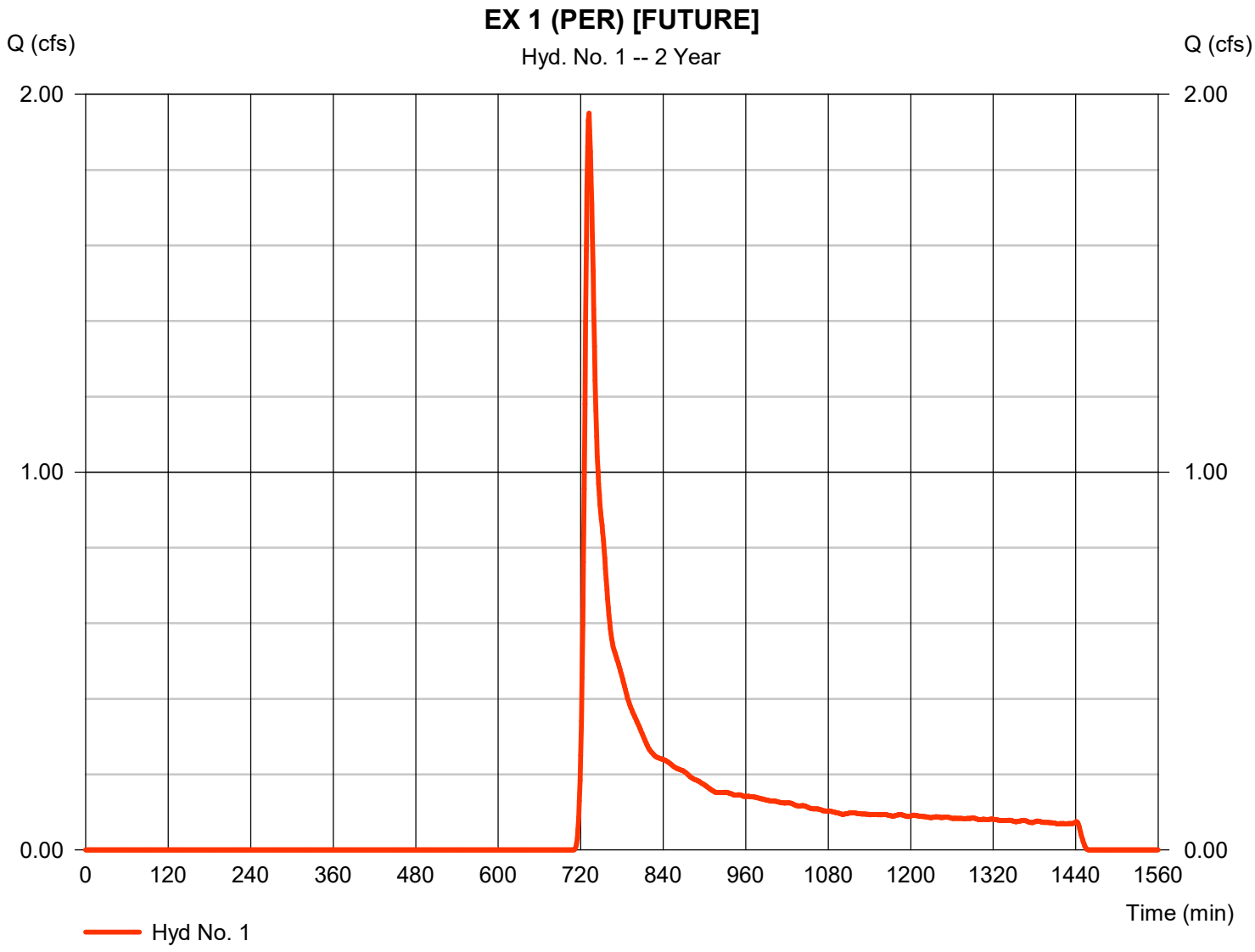
TOTAL SHEET FLOW TIME =	**8.2 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**3.5 MIN.**	**TIME OF CONCENTRATION=**	**11.6 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 1

EX 1 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.950 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	8,578 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.60 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

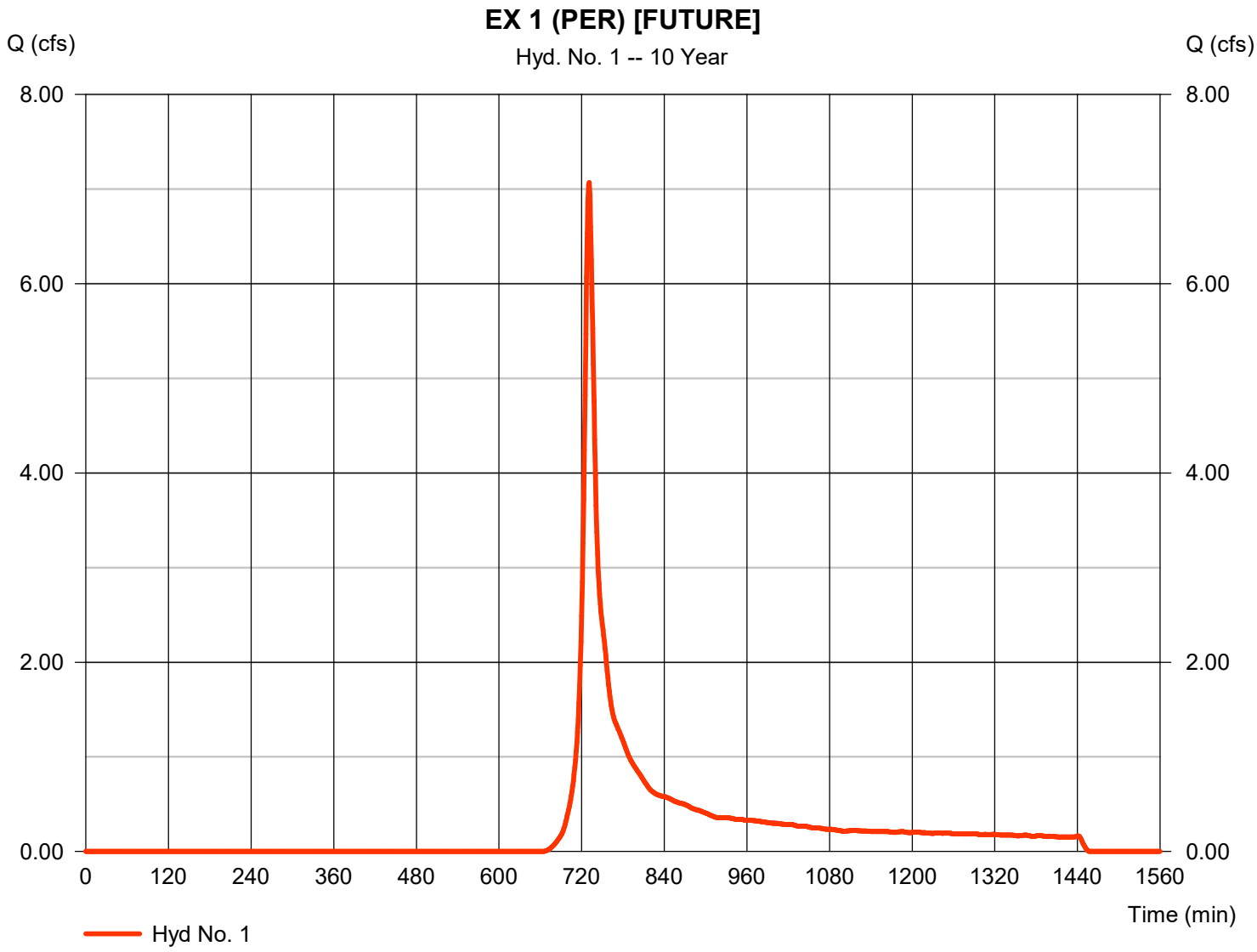


Hydrograph Report

Hyd. No. 1

EX 1 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.071 cfs
Storm frequency	=	10 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	24,649 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.60 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



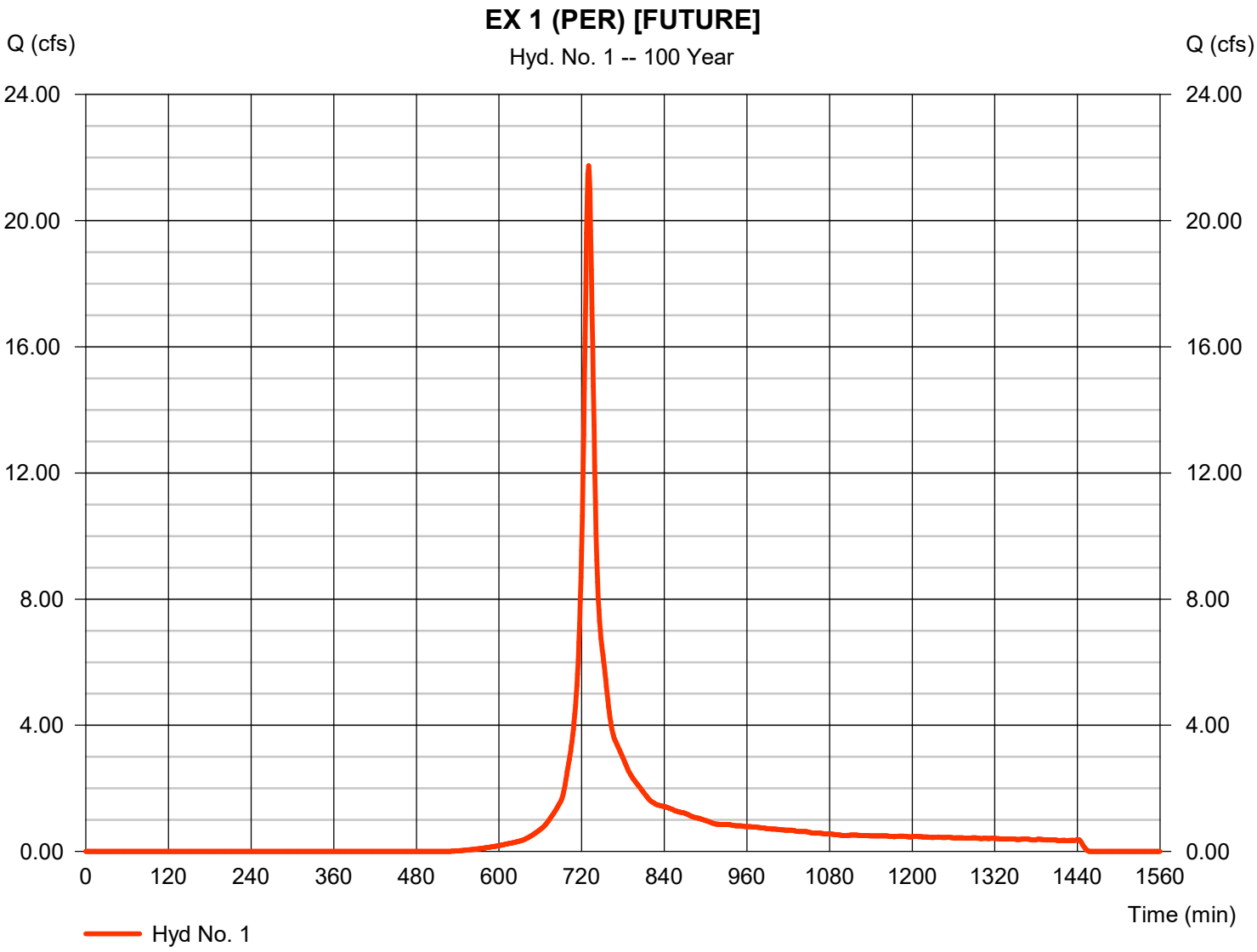
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 1

EX 1 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	21.75 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	71,883 cuft
Drainage area	=	3.500 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	11.60 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 1 (IMP) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	75 (100 MAX)	25 (100 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21	4.21		
LAND SLOPE, S (%)=	3	33.3		
SHEET FLOW TIME, Tc (MIN.)=	**0.7 MIN.**	**1.3 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	WOODLANDS	
FLOW LENGTH, L (FT)=	15	38	188	
LAND SLOPE, S (%)=	33.3	13.2	12.8	
AVERAGE VELOCITY, V (FT/S)=	4.02	0.91	1.80	
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.1 MIN.**	**0.7 MIN.**	**1.7 MIN.**	

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**2.0 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**2.5 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

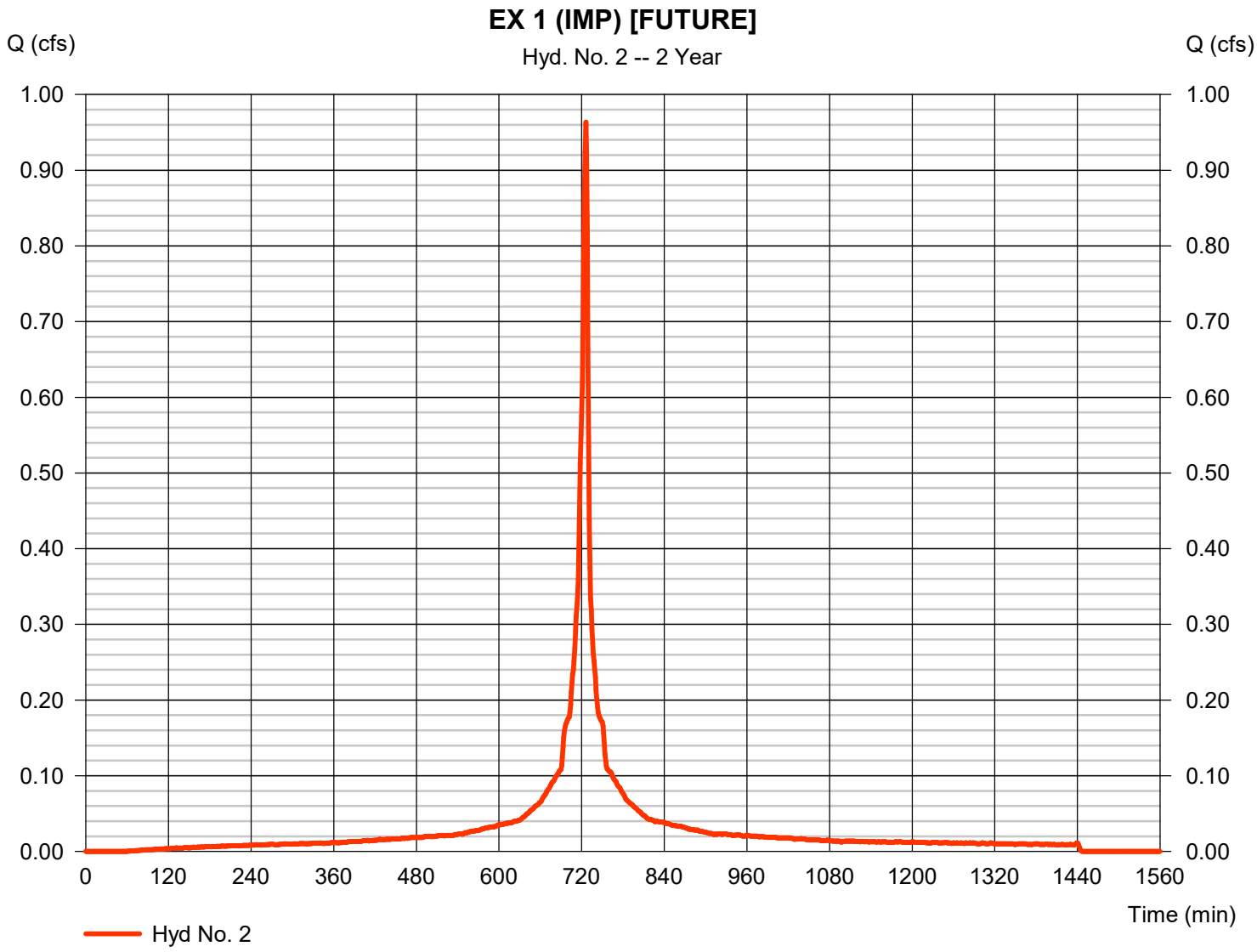
TIME OF CONCENTRATION= 4.5 MIN.

Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.964 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	2,886 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.50 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

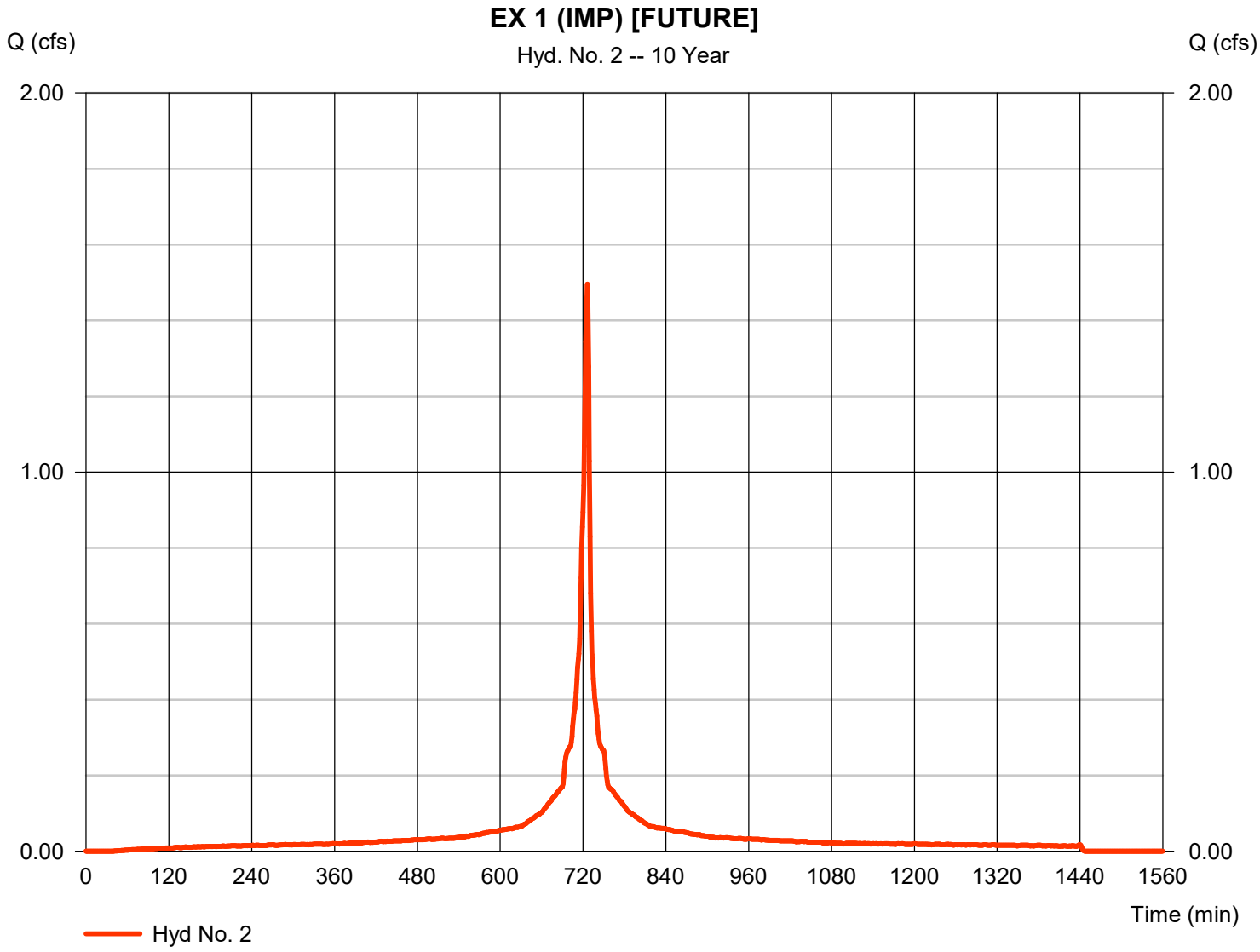


Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.496 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	4,553 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.50 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

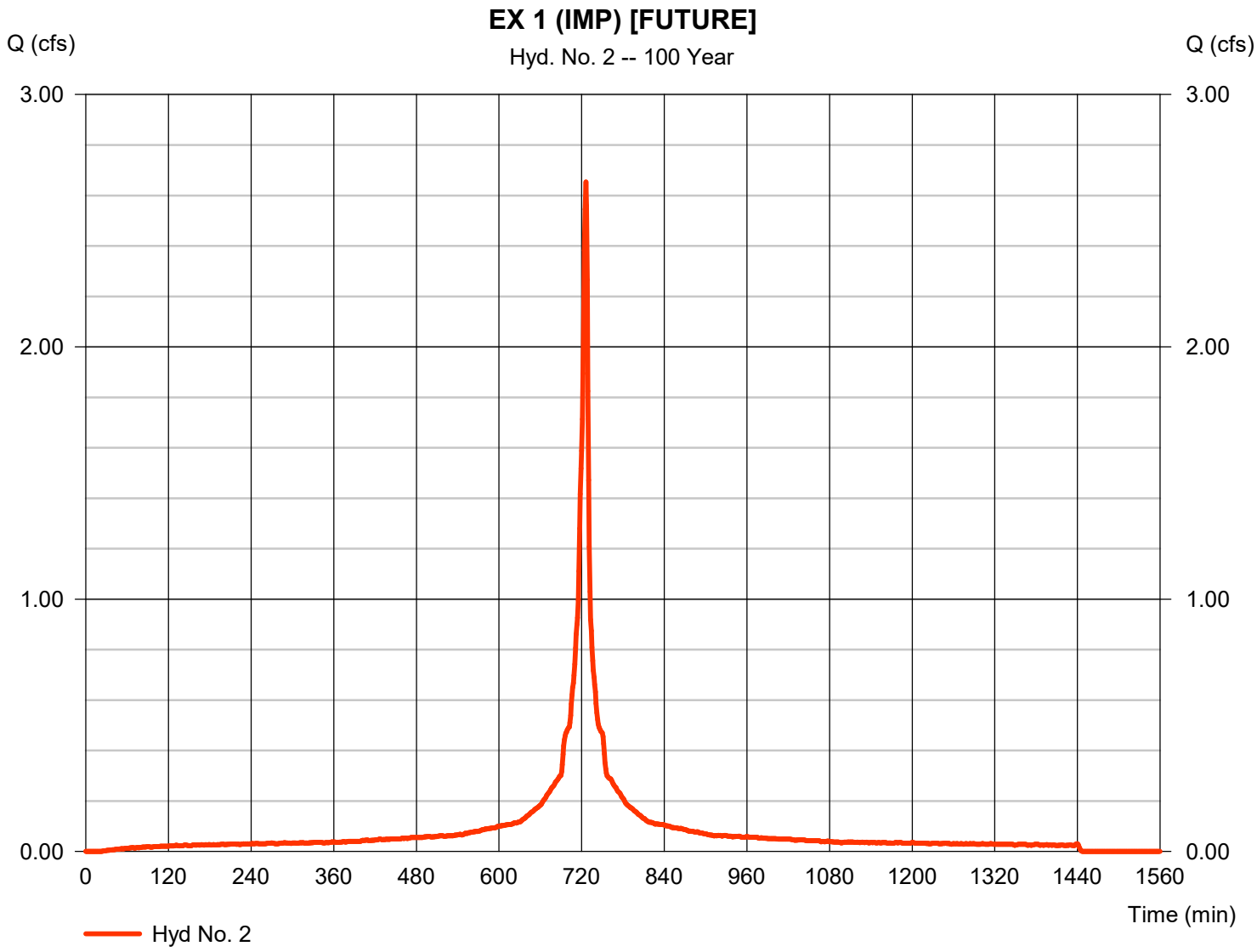


Hydrograph Report

Hyd. No. 2

EX 1 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.653 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	8,188 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	4.50 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



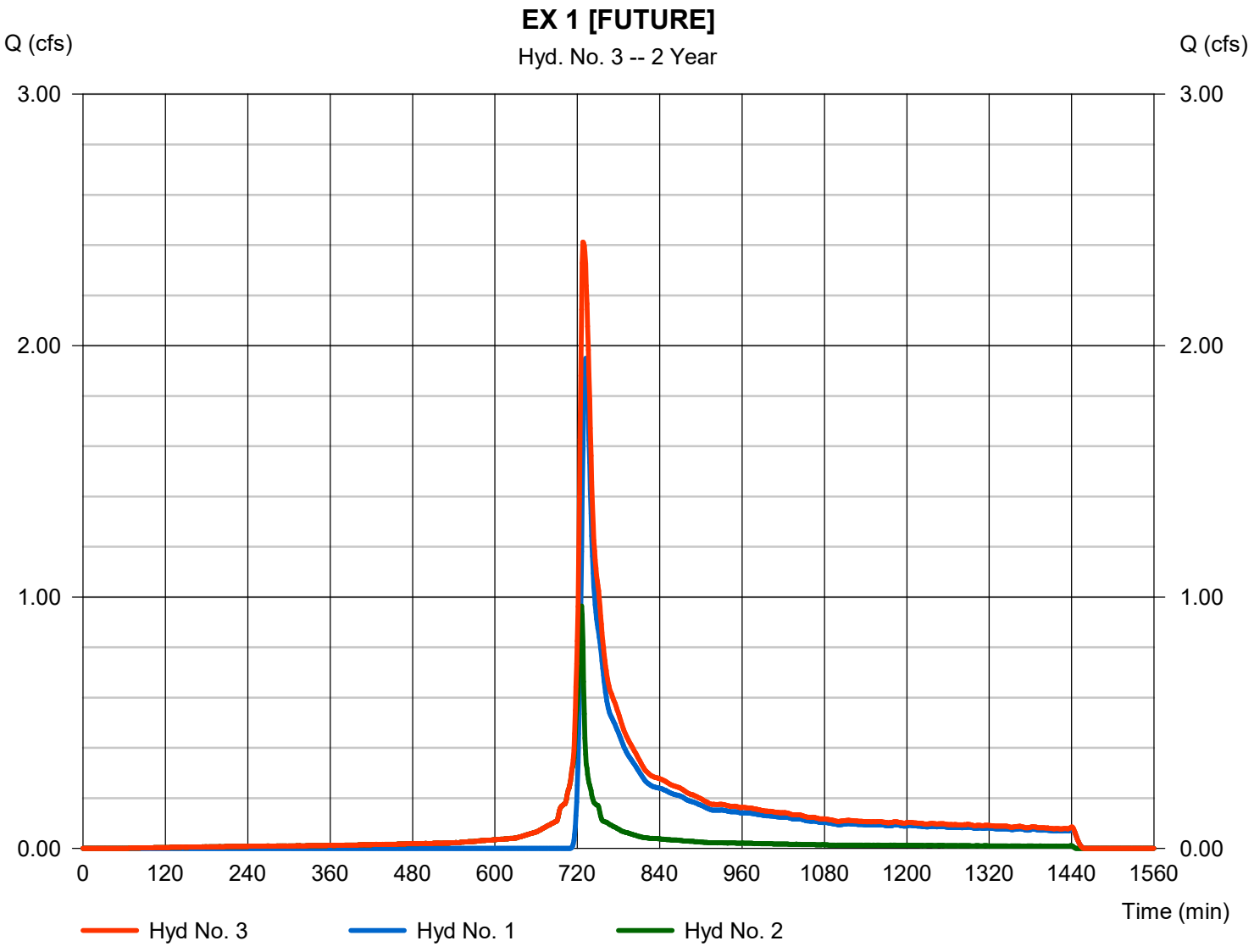
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 3

EX 1 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	2.412 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	11,464 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	3.700 ac

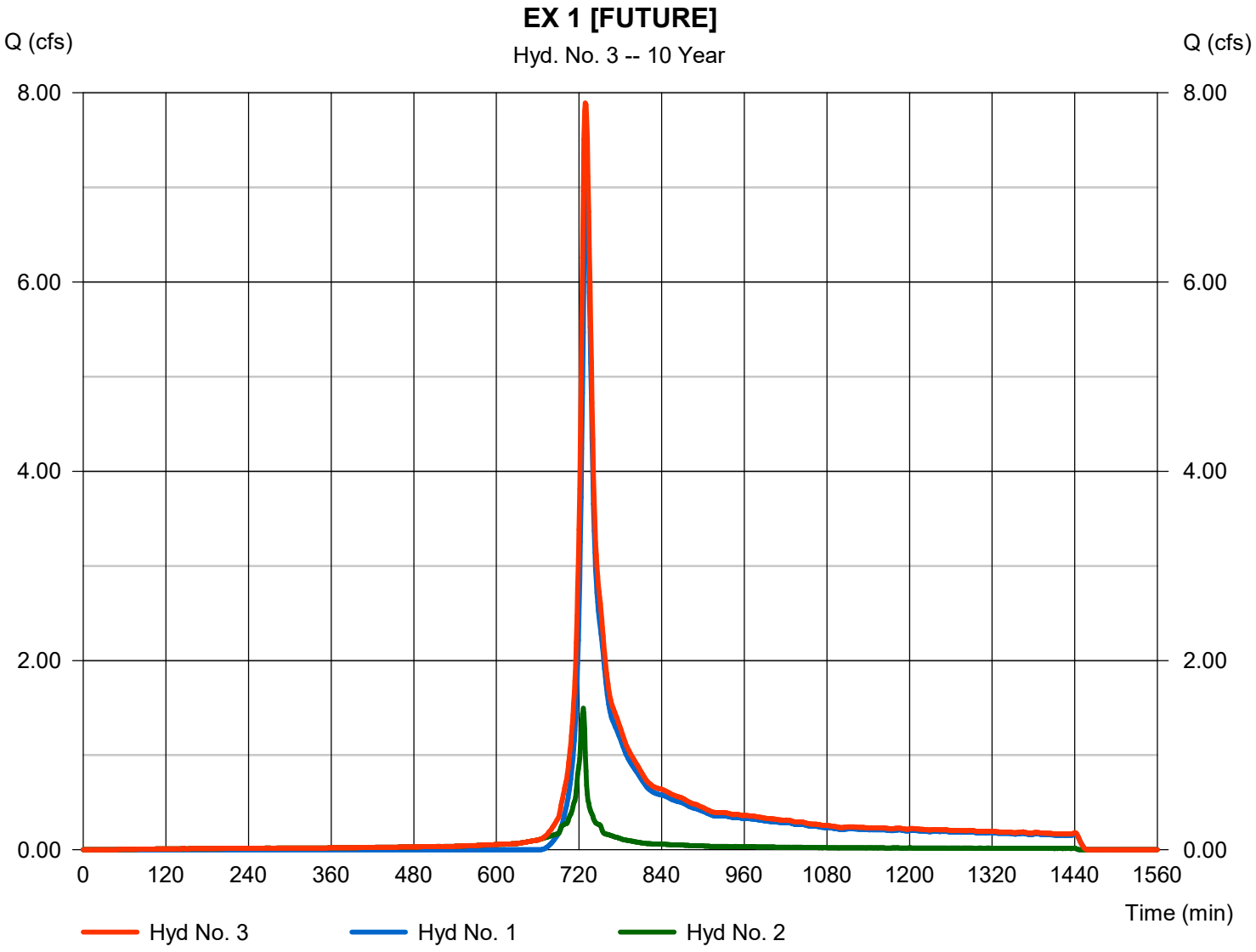


Hydrograph Report

Hyd. No. 3

EX 1 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	7.891 cfs
Storm frequency	=	10 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	29,202 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	3.700 ac

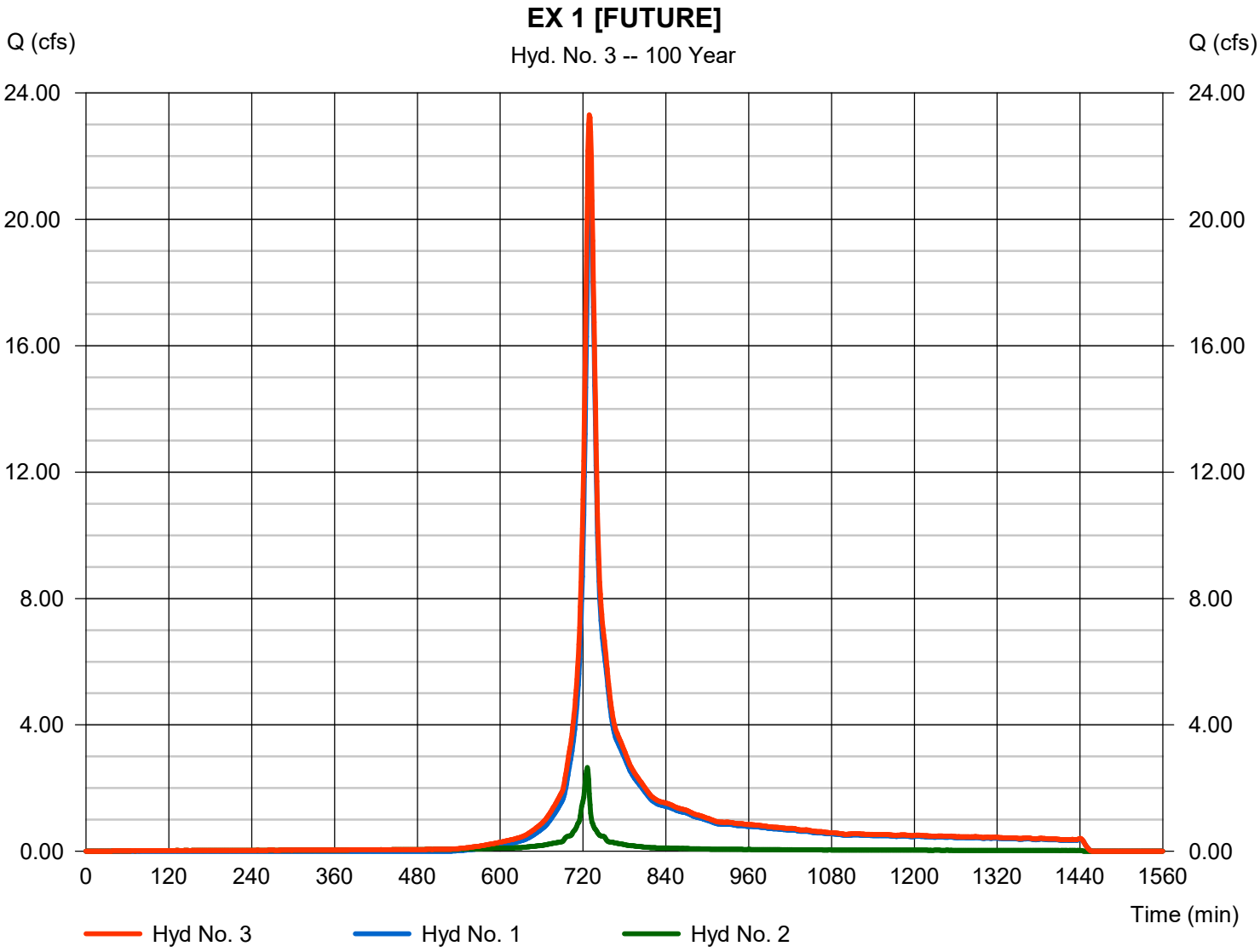


Hydrograph Report

Hyd. No. 3

EX 1 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	23.31 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	80,071 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	3.700 ac



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 2 (PER) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.2 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	100	80	173	130
LAND SLOPE, S (%)=	5	16.3	13.6	11.5
AVERAGE VELOCITY, V (FT/S)=	1.56	1.02	2.57	0.85
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.1 MIN.**	**1.3 MIN.**	**1.1 MIN.**	**2.5 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

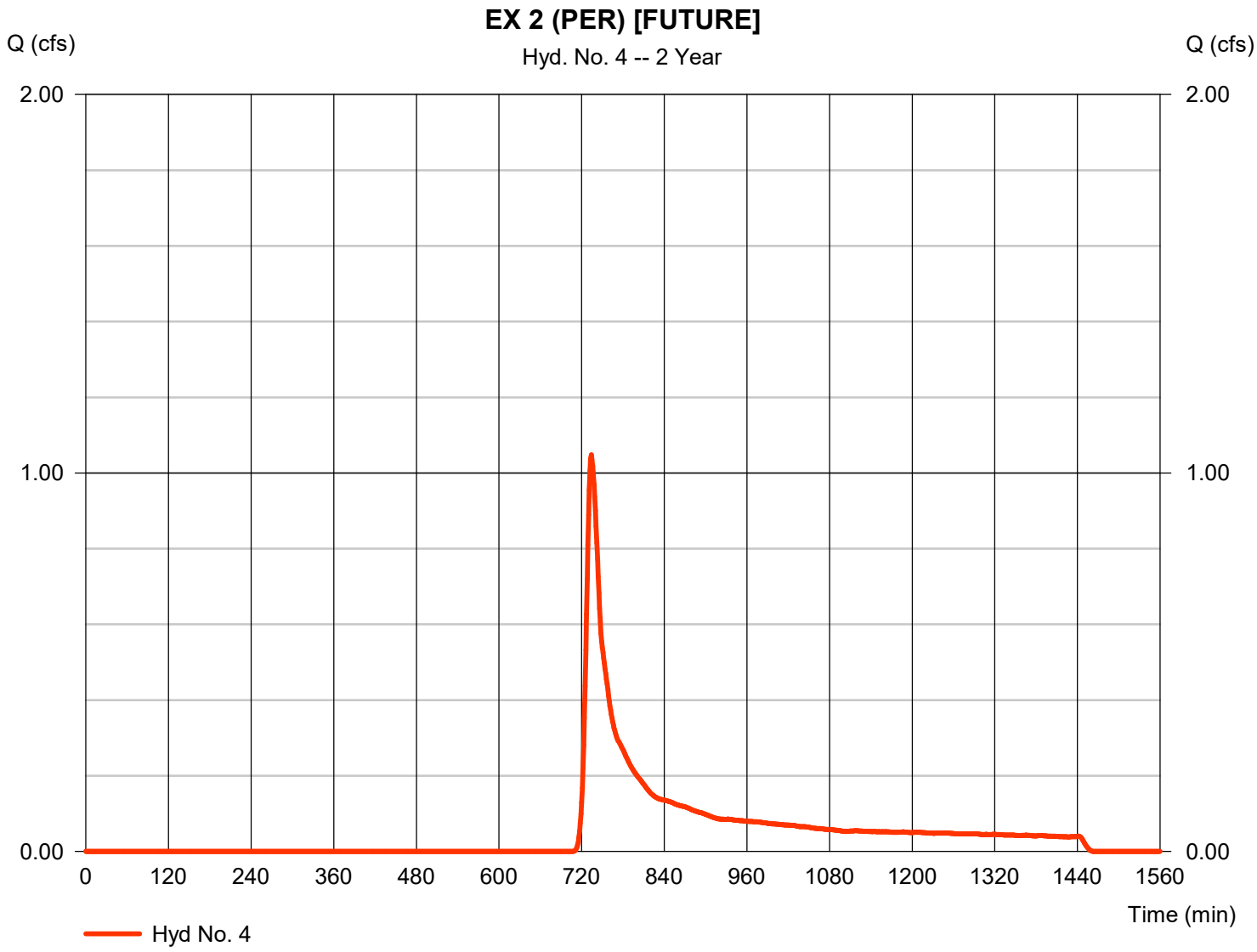
TOTAL SHEET FLOW TIME =	**8.2 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.0 MIN.**	**TIME OF CONCENTRATION=**	**14.2 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 4

EX 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.048 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	4,912 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.20 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

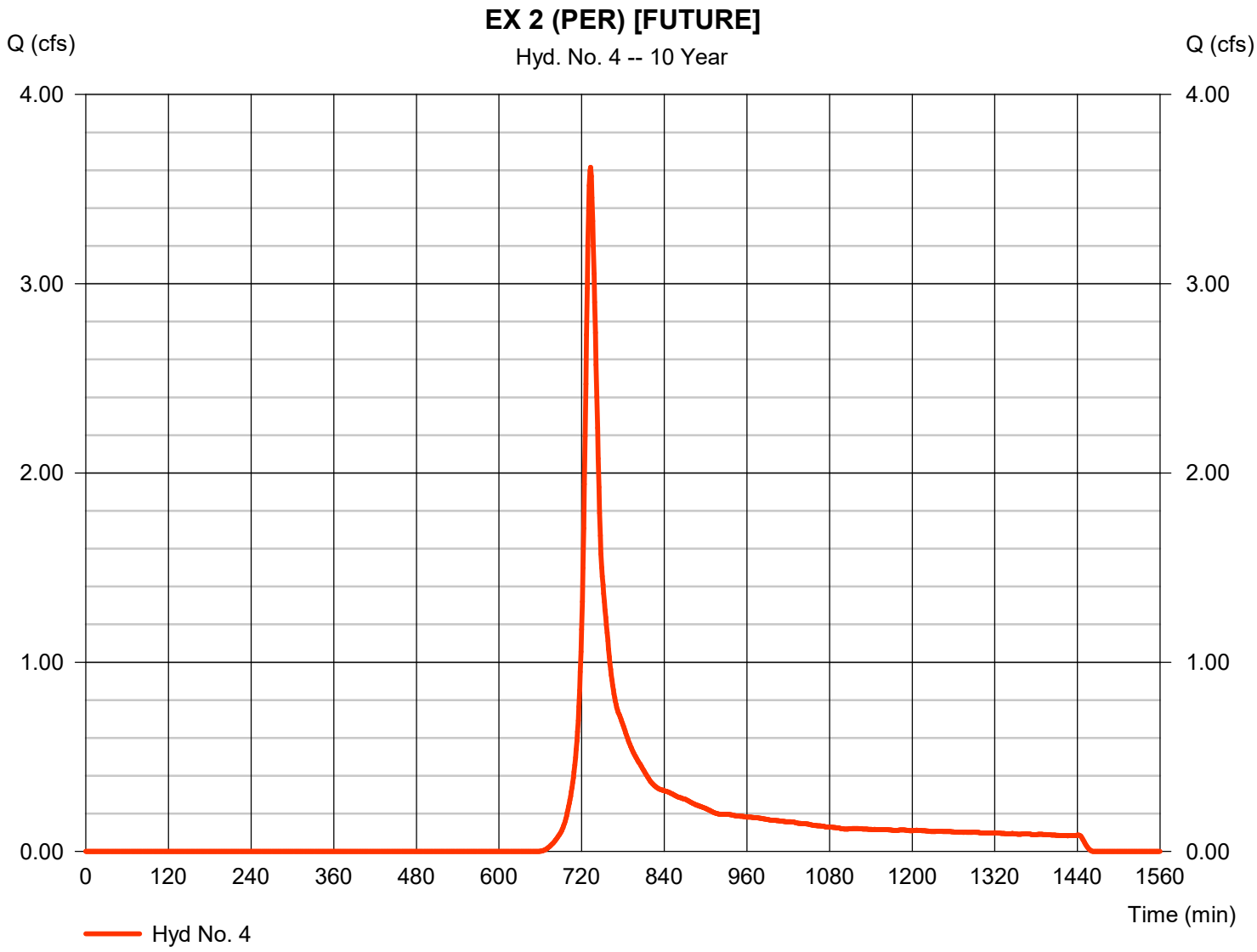


Hydrograph Report

Hyd. No. 4

EX 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.615 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	13,751 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.20 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

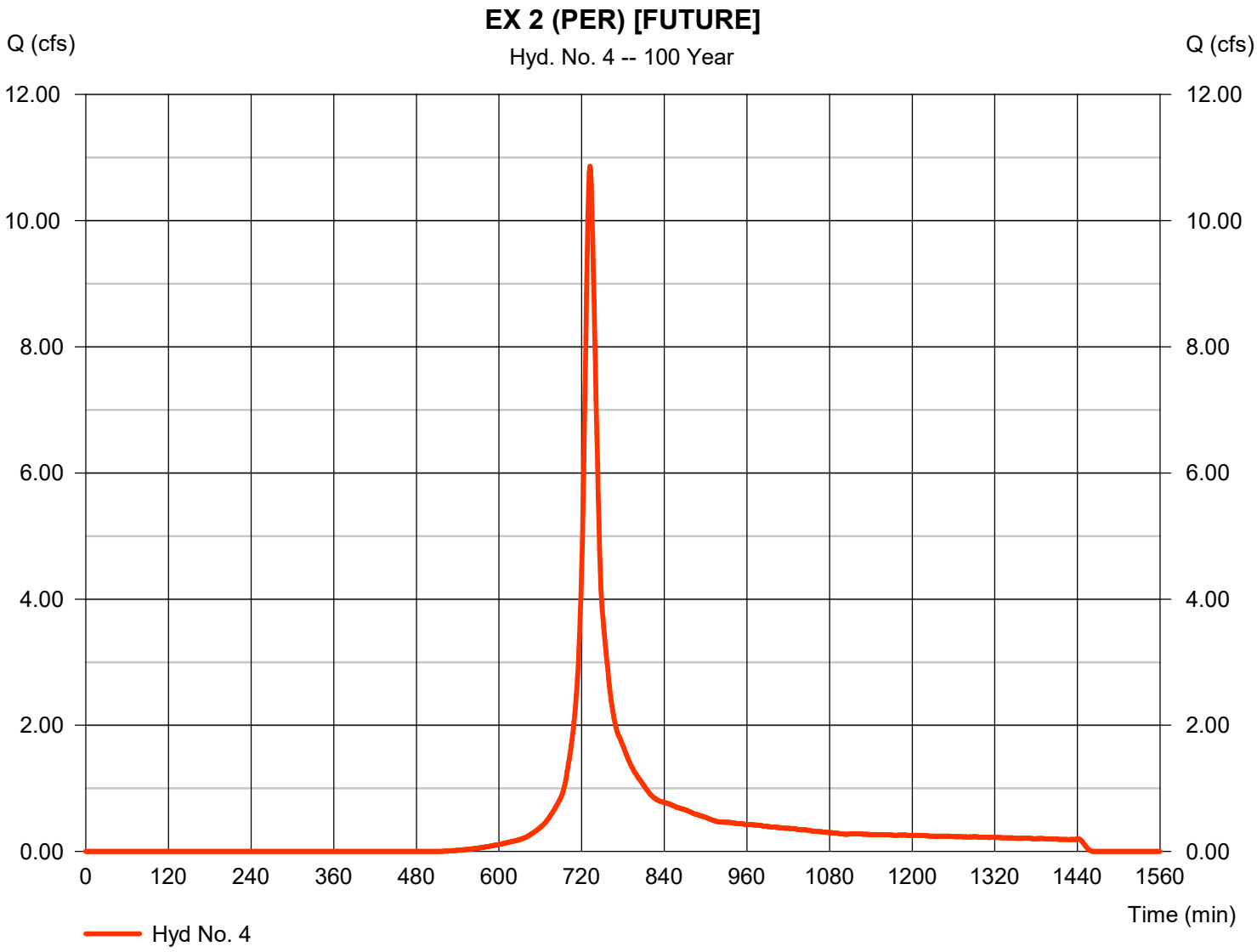


Hydrograph Report

Hyd. No. 4

EX 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.87 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	39,376 cuft
Drainage area	=	1.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.20 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: EX 2 (IMP) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24	0.24	
FLOW LENGTH, L (FT, 100 MAX)=	20 (100 MAX)	40 (93 MAX)	40 (100 MAX)	
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21	4.21	4.21	
LAND SLOPE, S (%)=	1	5	16	
SHEET FLOW TIME, Tc (MIN.)=	**0.4 MIN.**	**4.1 MIN.**	**2.6 MIN.**	

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST		
FLOW LENGTH, L (FT)=	147	130		
LAND SLOPE, S (%)=	16	11.5		
AVERAGE VELOCITY, V (FT/S)=	2.78	0.85		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.9 MIN.**	**2.5 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME = **7.1 MIN.**

TOTAL SHALLOW CONCENTRATED FLOW TIME = **3.4 MIN.**

TOTAL CHANNEL FLOW TIME = **0.0 MIN.**

TIME OF CONCENTRATION= 10.5 MIN.

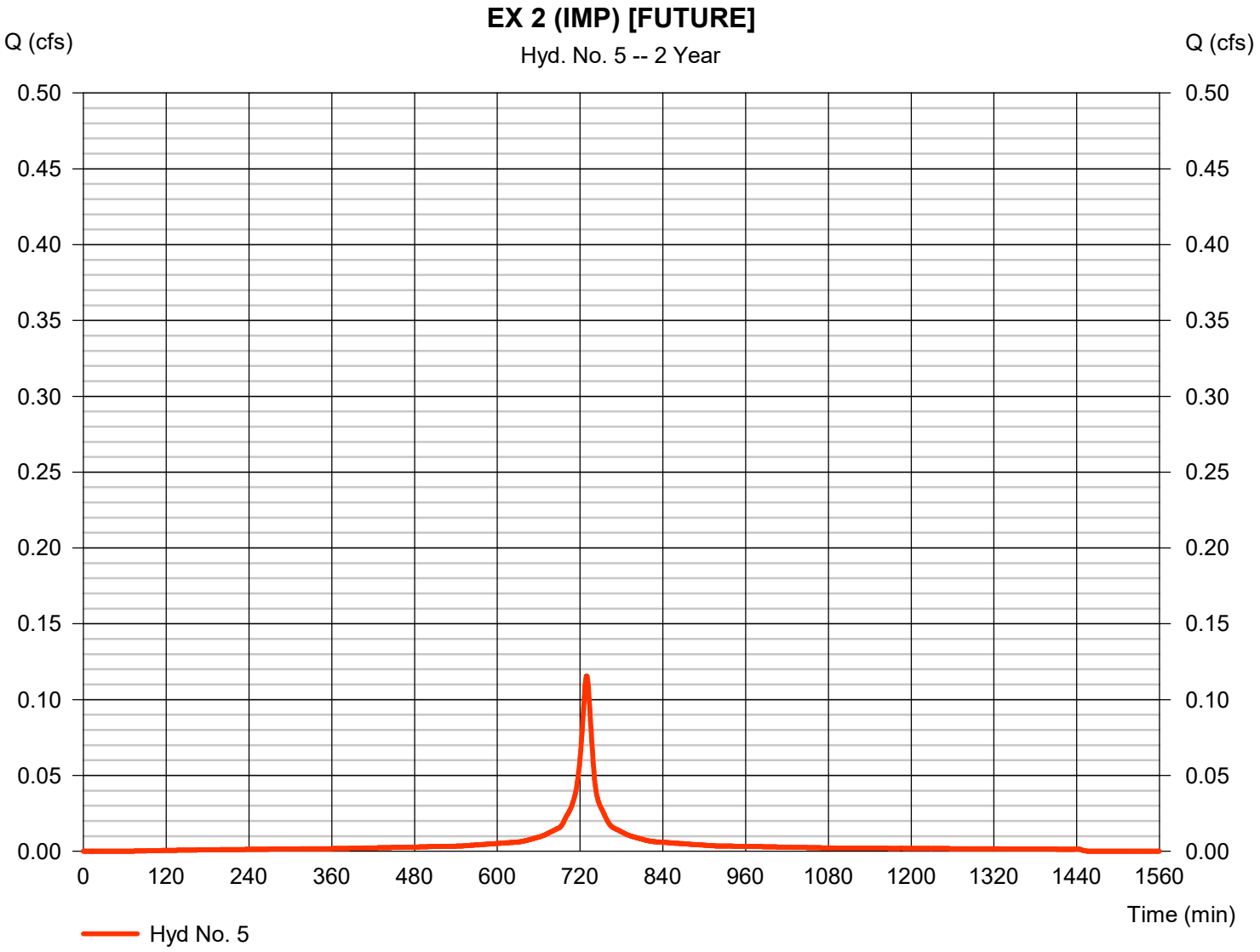
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 5

EX 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.115 cfs
Storm frequency	=	2 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	441 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.50 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

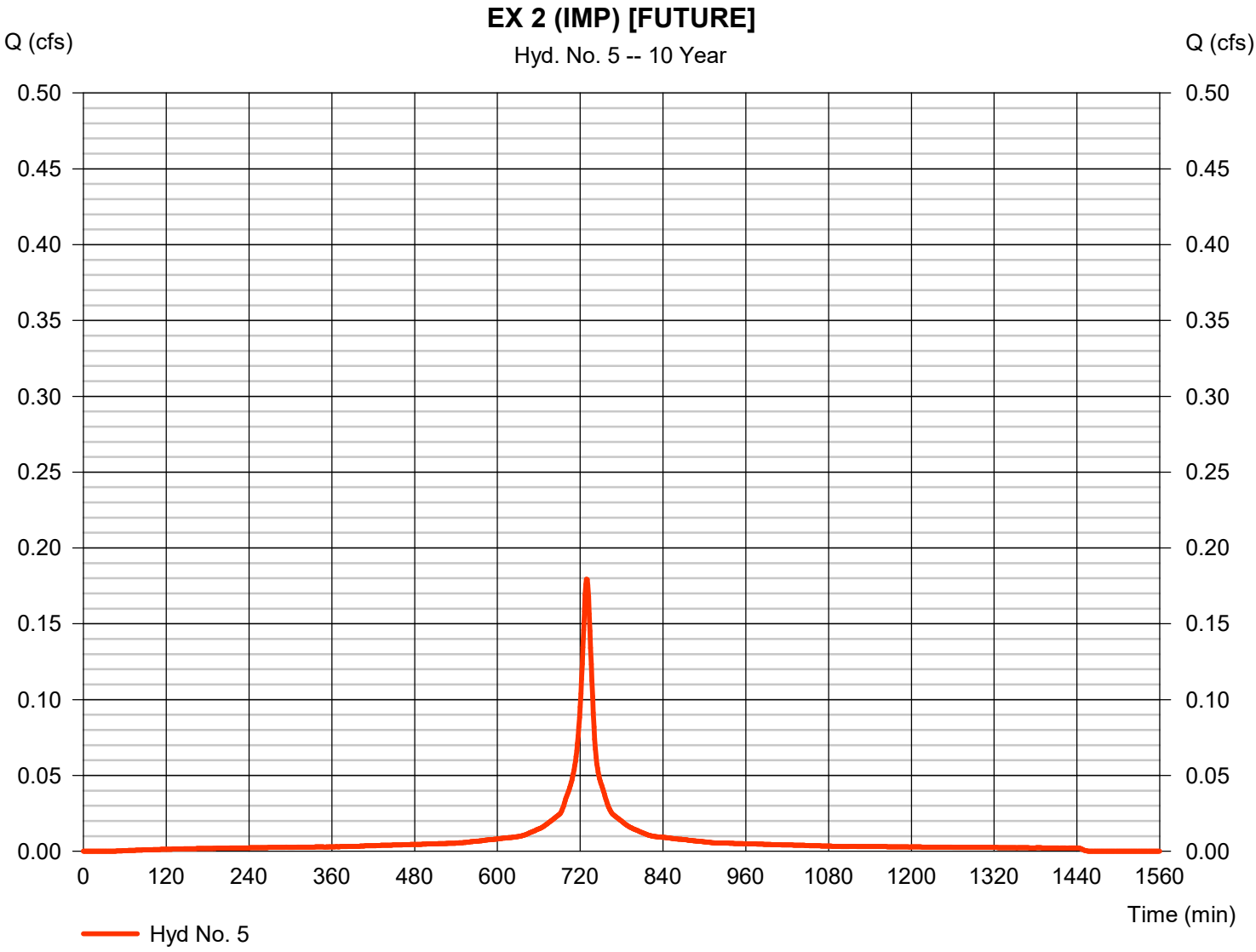


Hydrograph Report

Hyd. No. 5

EX 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.179 cfs
Storm frequency	=	10 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	695 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.50 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



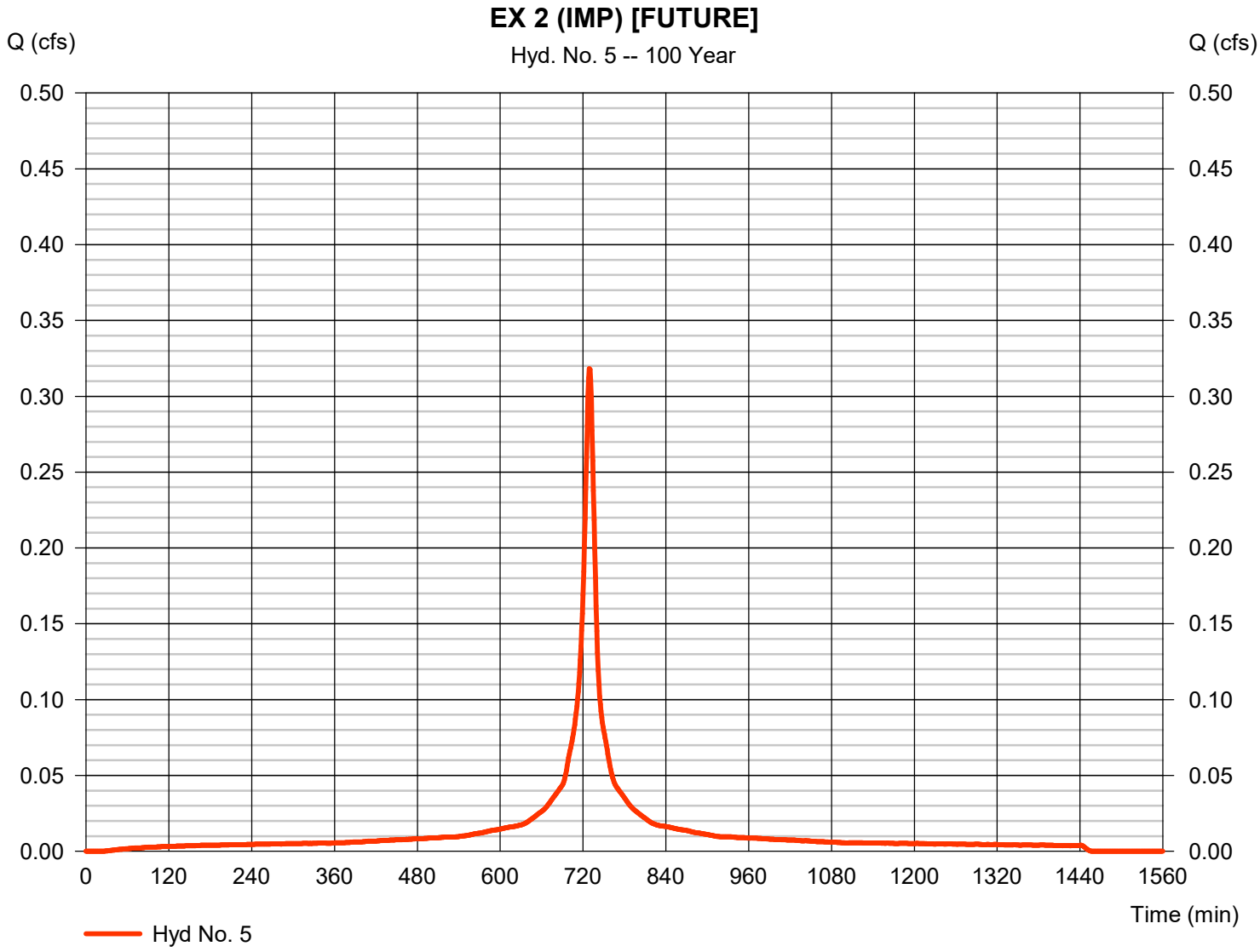
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 5

EX 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.318 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	1,250 cuft
Drainage area	=	0.030 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.50 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

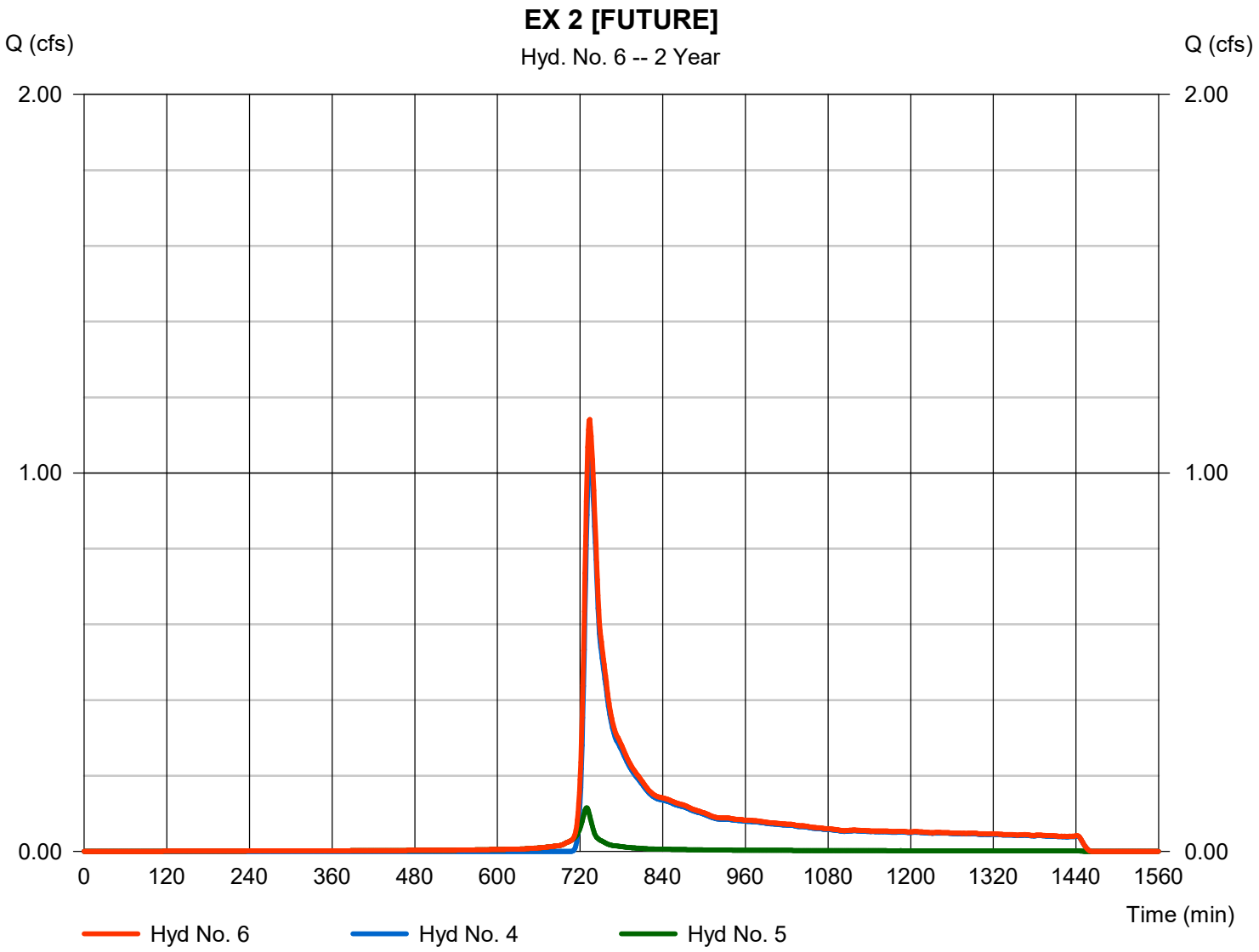


Hydrograph Report

Hyd. No. 6

EX 2 [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 1.142 cfs
Storm frequency	= 2 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 5,353 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac

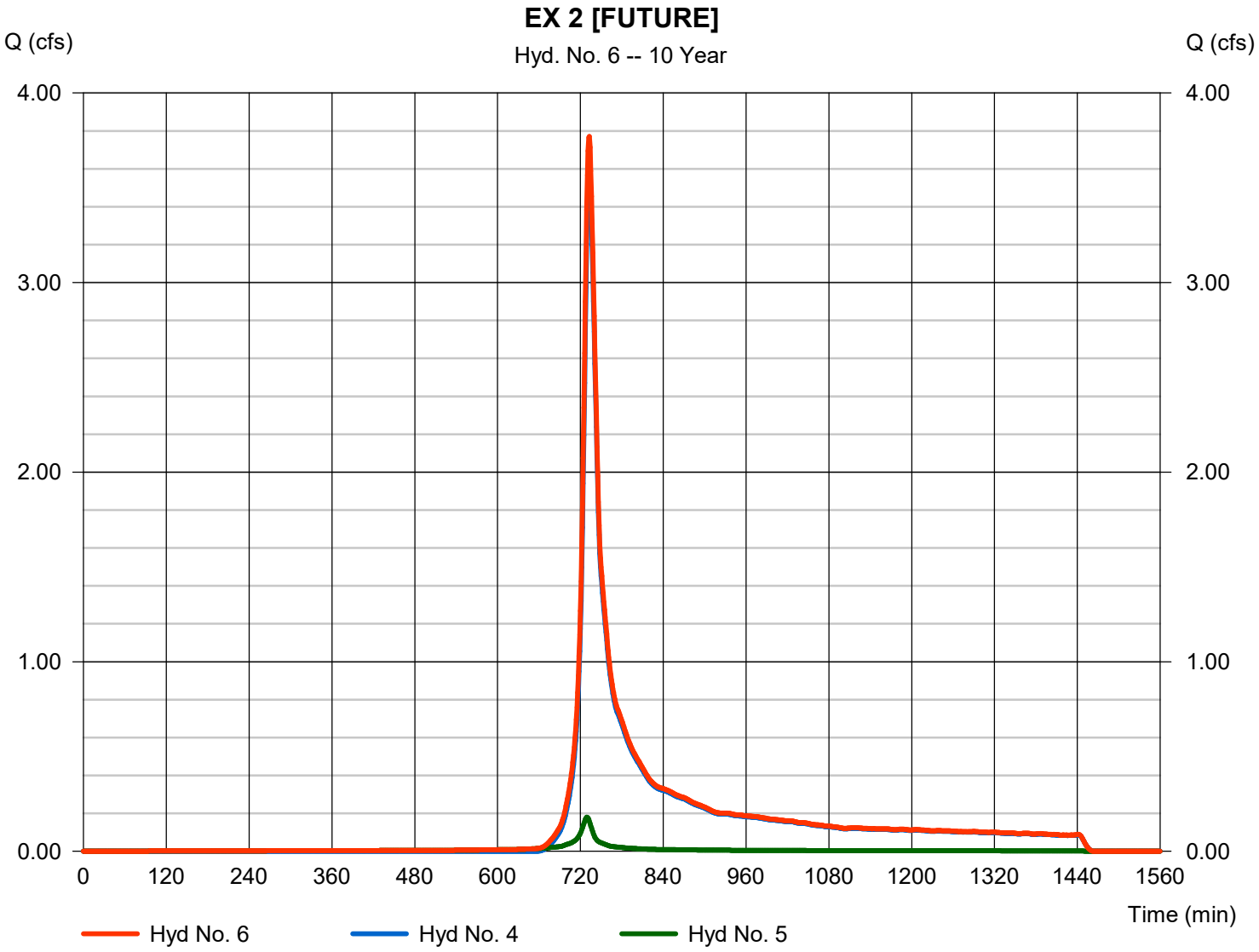


Hydrograph Report

Hyd. No. 6

EX 2 [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 3.771 cfs
Storm frequency	= 10 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 14,446 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac

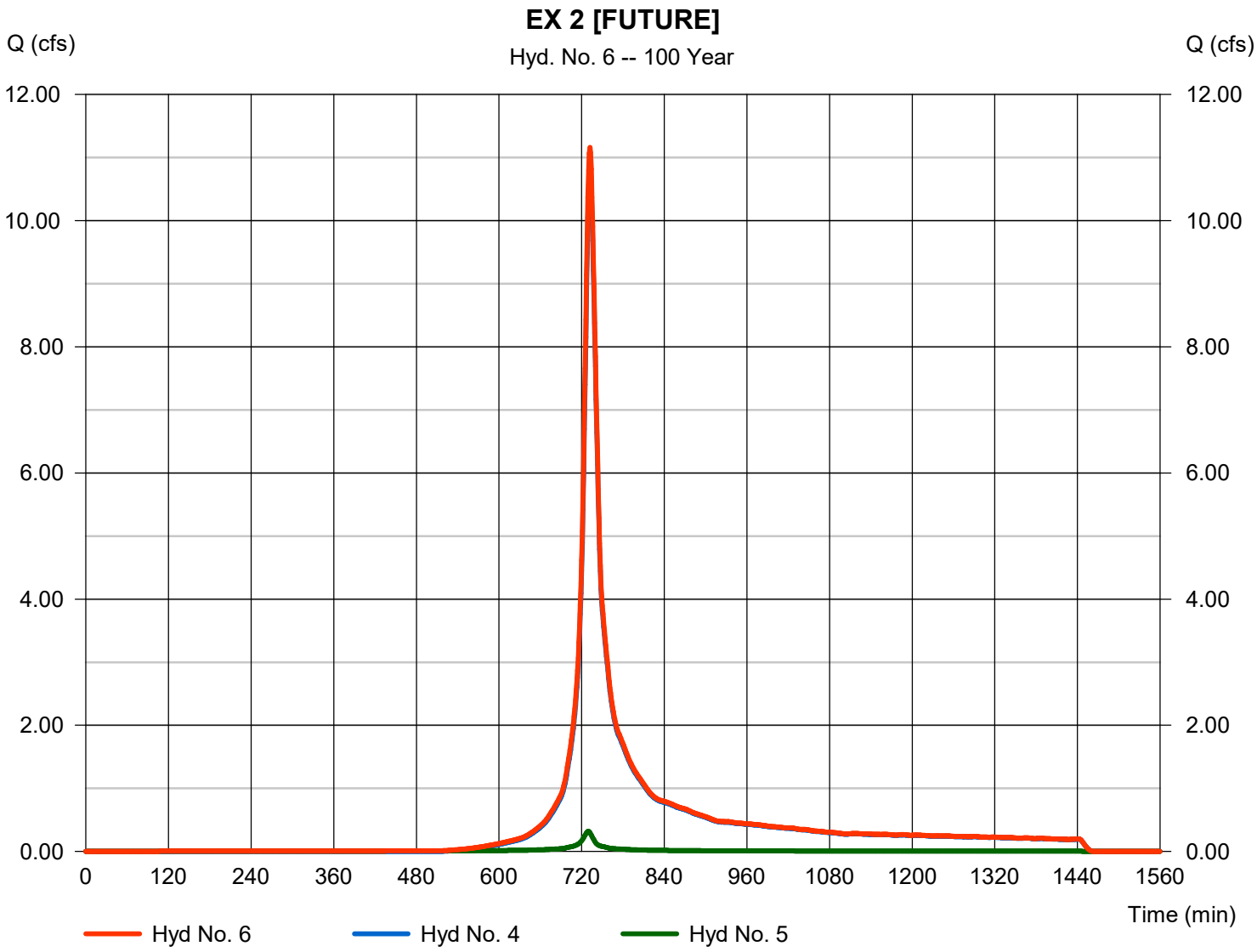


Hydrograph Report

Hyd. No. 6

EX 2 [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 11.16 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 40,626 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 1.930 ac



PEAK FLOW REDUCTION CALCULATIONS

TO COMPLY WITH NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION STORMWATER MANAGEMENT REQUIREMENTS, THE POST-DEVELOPMENT PEAK RUNOFF RATES MUST BE REDUCED TO A PERCENTAGE OF PRE-DEVELOPMENT PEAK RUNOFF RATES, AS FOLLOWS:

$$\text{PROPOSED } Q_2 \leq 50\% \text{ EXISTING } Q_2$$
$$\text{PROPOSED } Q_{10} \leq 75\% \text{ EXISTING } Q_{10}$$
$$\text{PROPOSED } Q_{100} \leq 80\% \text{ EXISTING } Q_{10}$$

REDUCTION FACTORS ARE APPLIED TO THE DISTURBED PORTION OF THE TRIBUTARY DRAINAGE AREA ONLY:

EX 1 (FUTURE)

DRAINAGE AREA = 3.77 AC
AREA OF DISTURBANCE= 2.26 AC
PERCENT DISTURBANCE = 59.9%

APPLY REDUCTION FACTORS TO 59.9% OF EXISTING PEAK FLOWS.

EXISTING PEAK FLOWS:

Q_2= 2.4 CFS
Q_{10}= 7.9 CFS
Q_{100}= 23.3 CFS

CALCULATE ALLOWABLE RUNOFF:

Q_2= (0.50) x (0.6) x (2.4 CFS) + (0.4) x (2.4 CFS) = 1.7 CFS
Q_{10}= (0.75) x (0.6) x (7.9 CFS) + (0.4) x (7.9 CFS) = 6.7 CFS
Q_{100}= (0.80) x (0.6) x (23.3 CFS) + (0.4) x (23.3 CFS) = 20.5 CFS

`

CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1A PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	0.95	57.8
WOODS	B	55	0.88	48.2
BRUSH	B	48	0.72	34.6
Total			**Σ= 2.5**	**Σ= 140.7**

$$CN = \frac{140.7}{2.5} = 55$$

DRAINAGE AREA DESIGNATION: PR 1A IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.11	10.7
Total			**Σ= 0.1**	**Σ= 10.7**

$$CN = \frac{10.7}{0.1} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1A (PER) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	99 (99 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21			
LAND SLOPE, S (%)=	5.6			
SHEET FLOW TIME, Tc (MIN.)=	**8.2 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	WOODLANDS
FLOW LENGTH, L (FT)=	42	108	76	126
LAND SLOPE, S (%)=	5.6	3.2	11.8	11.4
AVERAGE VELOCITY, V (FT/S)=	1.65	0.45	2.39	1.70
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.4 MIN.**	**4.0 MIN.**	**0.5 MIN.**	**1.2 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

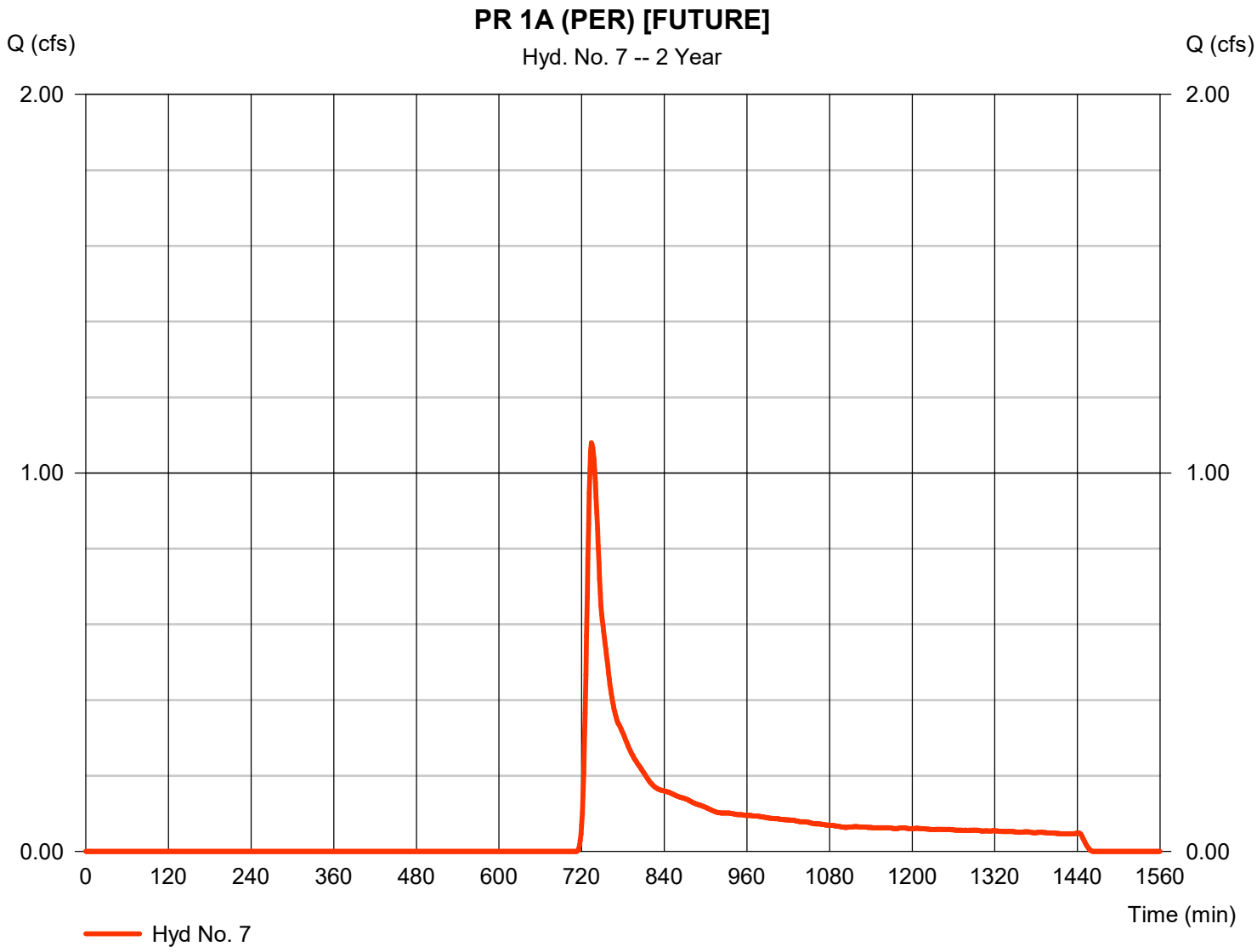
TOTAL SHEET FLOW TIME =	**8.2 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.2 MIN.**	**TIME OF CONCENTRATION=**	**14.4 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 7

PR 1A (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.079 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	5,589 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.40 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



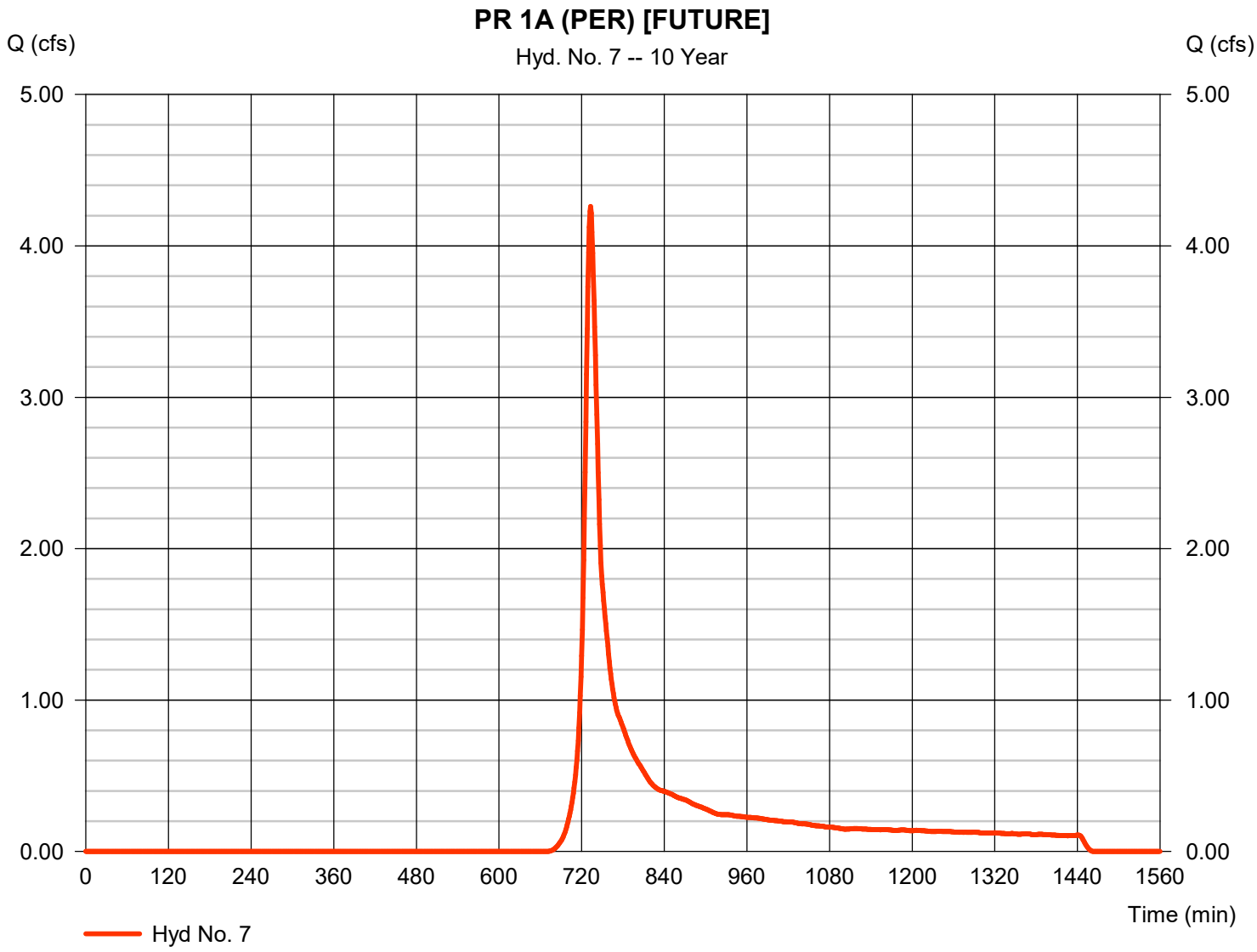
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 7

PR 1A (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.261 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	16,511 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.40 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

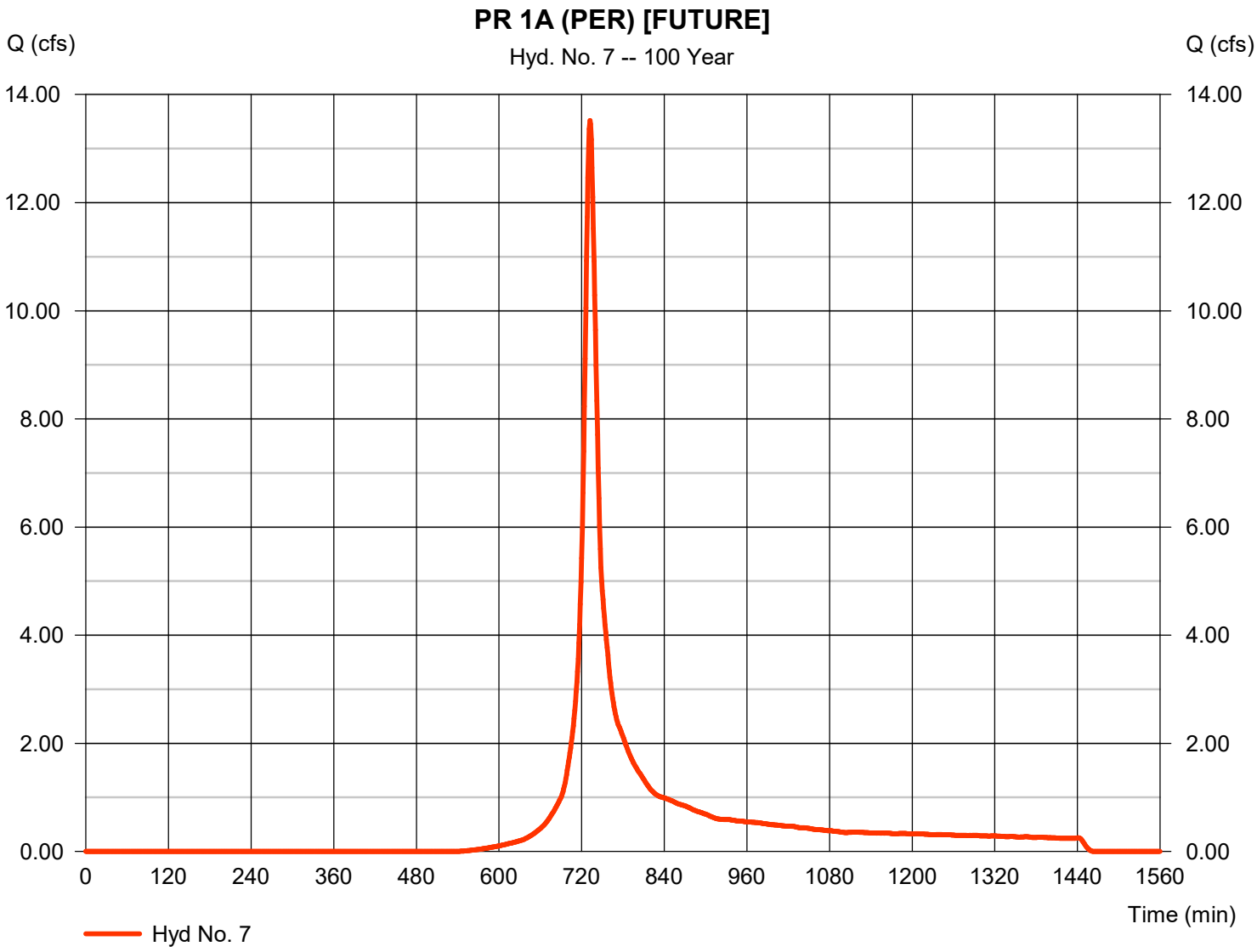


Hydrograph Report

Hyd. No. 7

PR 1A (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.52 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	49,072 cuft
Drainage area	=	2.500 ac	Curve number	=	55
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.40 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1A (IMP) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24	0.24	
FLOW LENGTH, L (FT, 100 MAX)=	27 (100 MAX)	50 (76 MAX)	23 (100 MAX)	
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21	4.21	4.21	
LAND SLOPE, S (%)=	8.3	3.3	33.3	
SHEET FLOW TIME, Tc (MIN.)=	**0.2 MIN.**	**5.8 MIN.**	**1.2 MIN.**	

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS	FOREST	WOODLANDS
FLOW LENGTH, L (FT)=	40	60	28	60
LAND SLOPE, S (%)=	33.3	22	33.3	9
AVERAGE VELOCITY, V (FT/S)=	4.02	3.27	1.45	1.51
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.2 MIN.**	**0.3 MIN.**	**0.3 MIN.**	**0.7 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME =	**7.3 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**1.5 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**

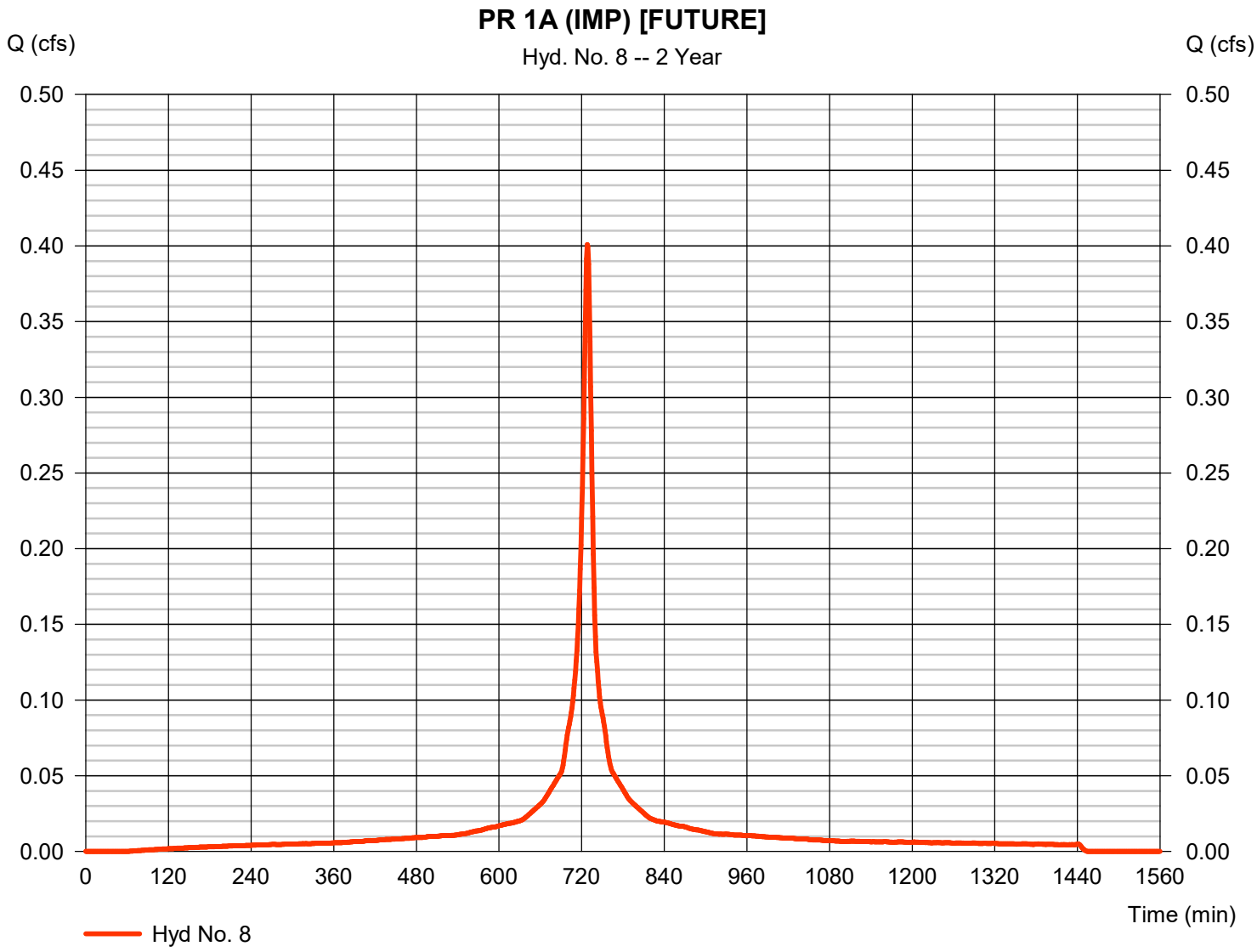
TIME OF CONCENTRATION= 8.8 MIN.

Hydrograph Report

Hyd. No. 8

PR 1A (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.401 cfs
Storm frequency	=	2 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	1,443 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	8.80 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

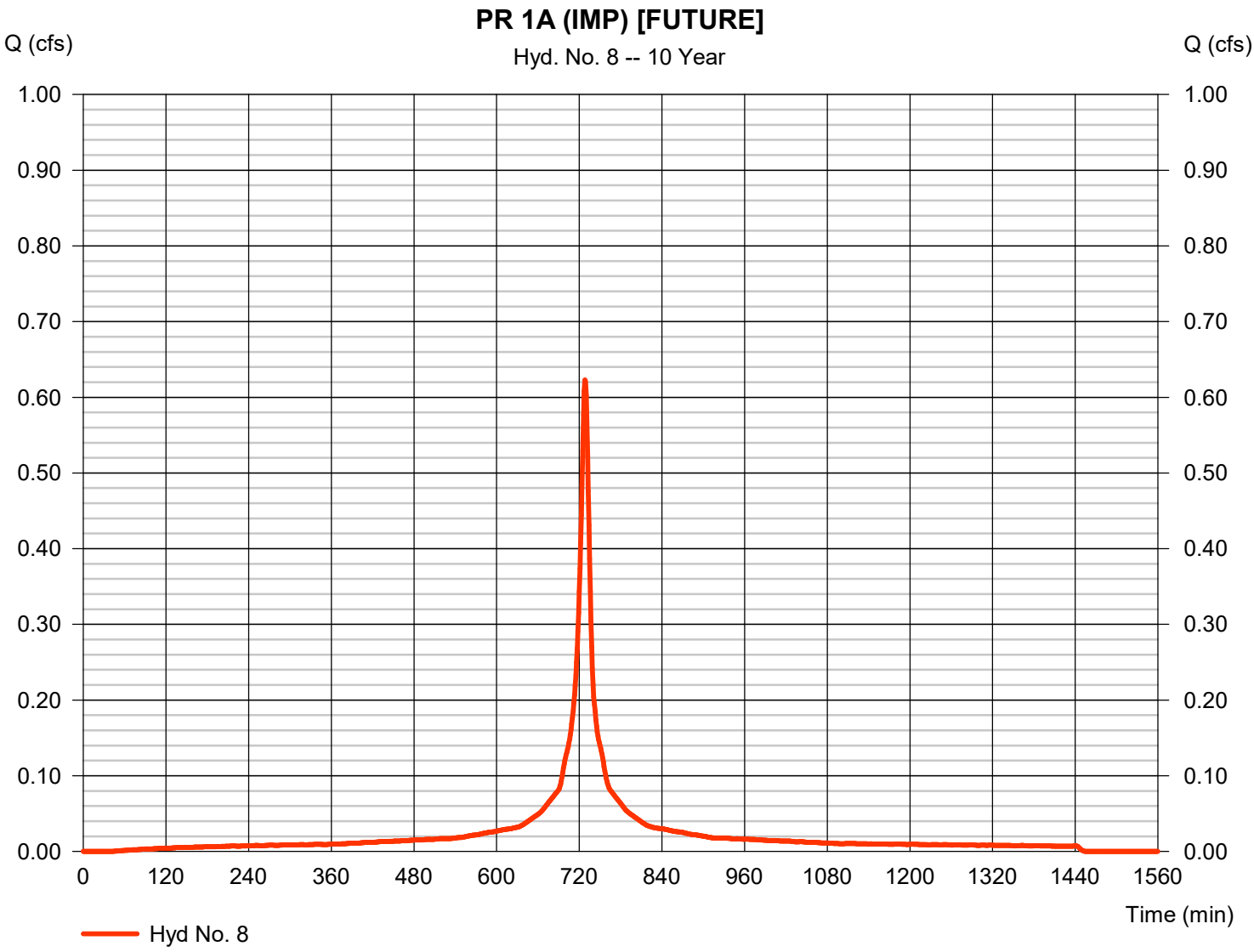


Hydrograph Report

Hyd. No. 8

PR 1A (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.623 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	2,276 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	8.80 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

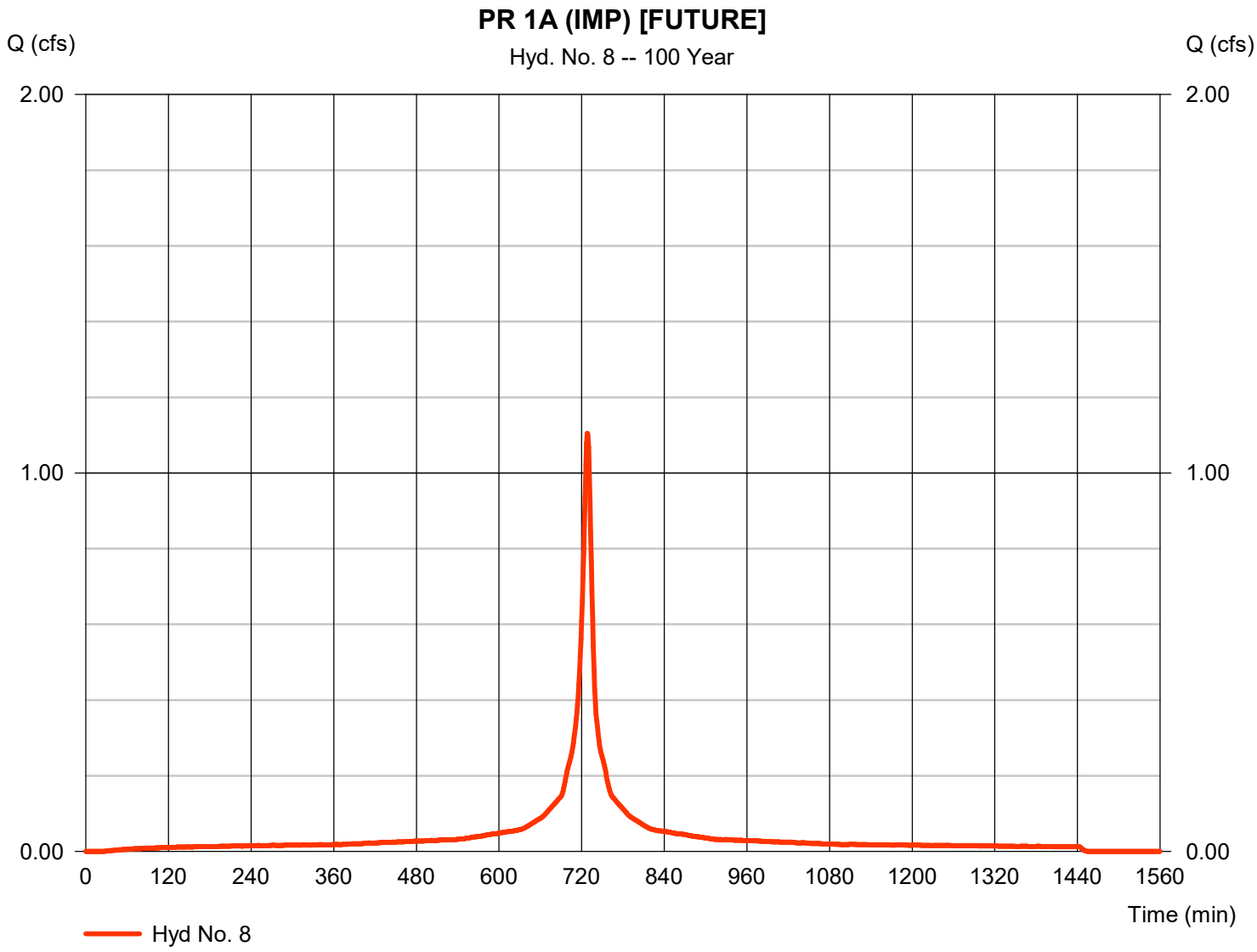


Hydrograph Report

Hyd. No. 8

PR 1A (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.104 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	4,094 cuft
Drainage area	=	0.100 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	8.80 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

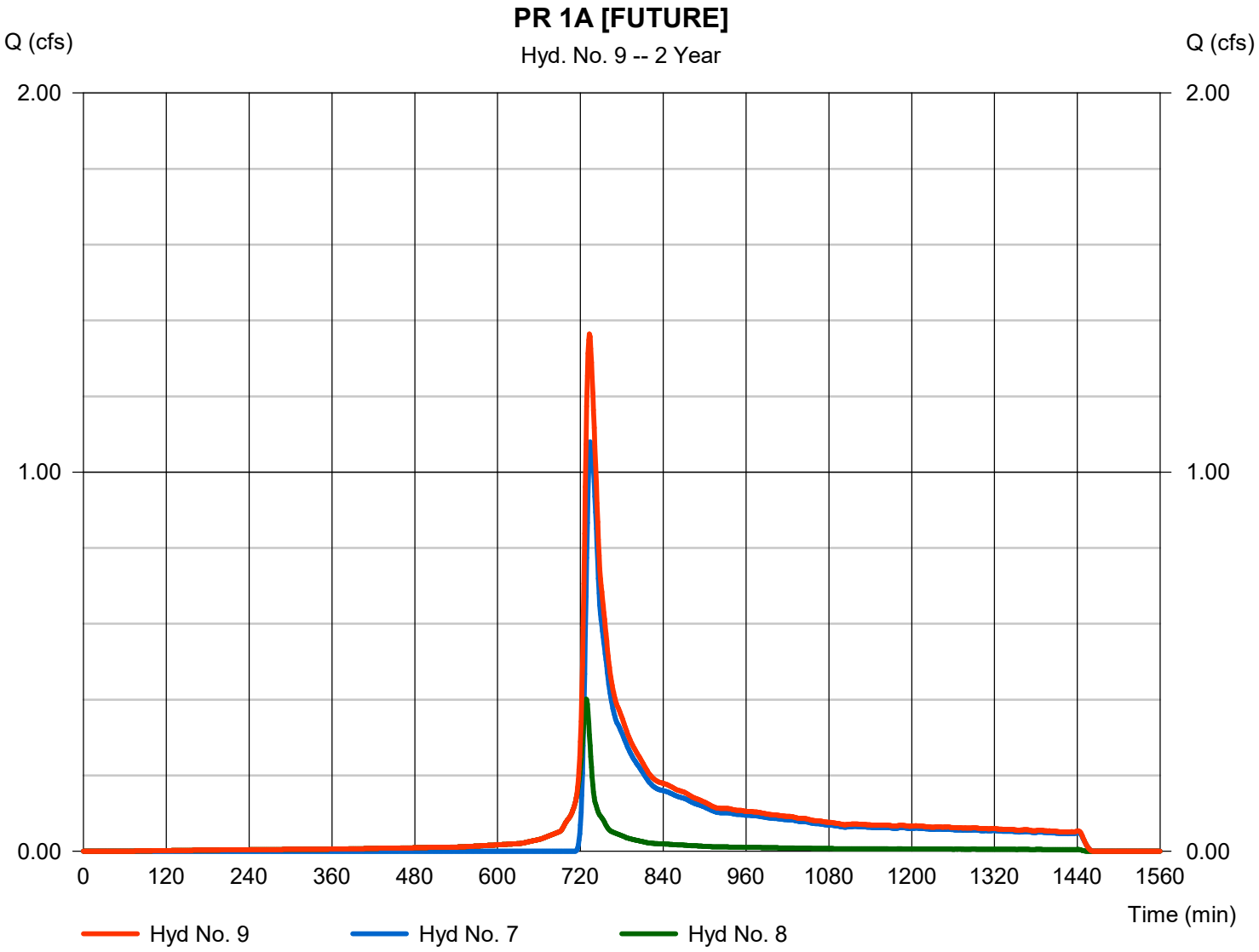


Hydrograph Report

Hyd. No. 9

PR 1A [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 1.364 cfs
Storm frequency	= 2 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 7,031 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac

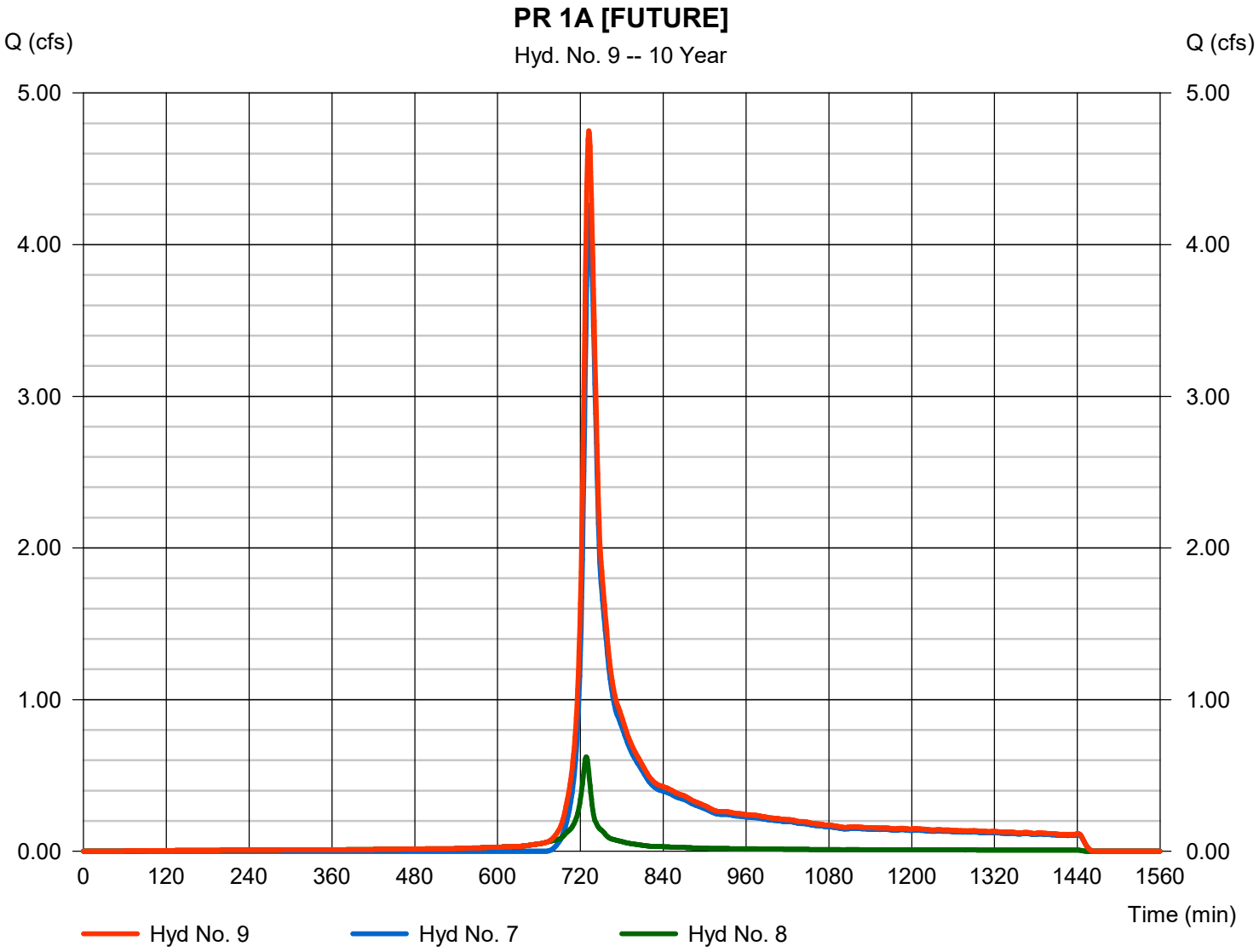


Hydrograph Report

Hyd. No. 9

PR 1A [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 4.752 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 18,787 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac

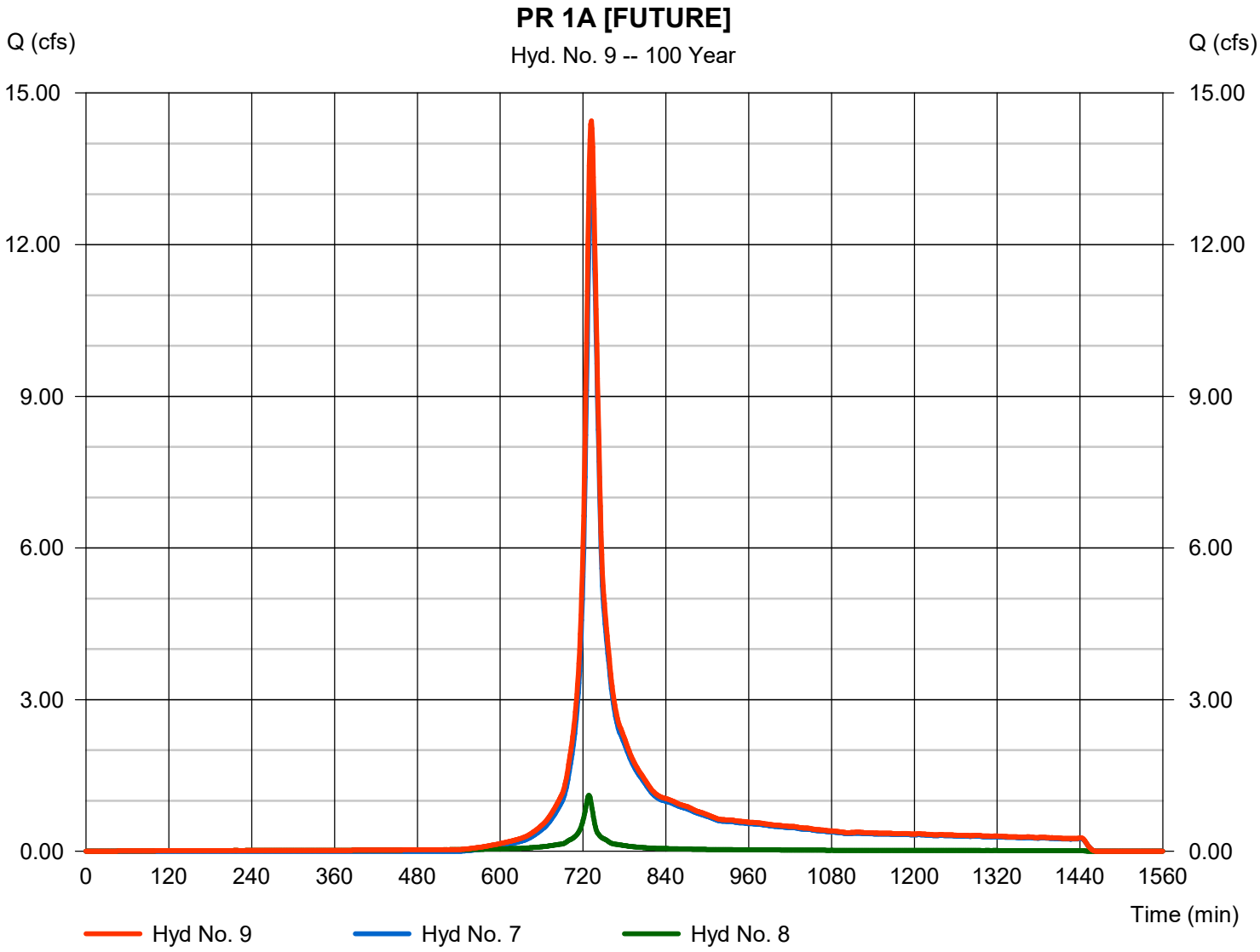


Hydrograph Report

Hyd. No. 9

PR 1A [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 14.45 cfs
Storm frequency	= 100 yrs	Time to peak	= 732 min
Time interval	= 1 min	Hyd. volume	= 53,166 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 2.600 ac



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1B PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	0.63	38.5
WOODS	B	55	0.05	2.8
BRUSH	B	48	0.26	12.3
Total			**Σ= 0.9**	**Σ= 53.6**

$$CN = \frac{53.6}{0.9} = 57$$

DRAINAGE AREA DESIGNATION: PR 1B IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.16	15.5
Total			**Σ= 0.2**	**Σ= 15.5**

$$CN = \frac{15.5}{0.2} = 98$$

NOTE: BASIN AREA IS NOT INCLUDED IN THE CONTRIBUTARY DRAINAGE AREA

BASIN AREA = 0.15 ACRES

CONTRIBUTARY DRAINAGE AREA= 0.95 ACRES

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (PER) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.2 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST		
FLOW LENGTH, L (FT)=	87	165		
LAND SLOPE, S (%)=	6.9	4.2		
AVERAGE VELOCITY, V (FT/S)=	1.83	0.52		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.8 MIN.**	**5.3 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=	15			
CROSS SECTIONAL AREA, a (SF)=	1.23			
WETTER PERIMETER, Pw (FT)=	3.93			
HYDRAULIC RADIUS, r (FT)=	0.31			
CHANNEL SLOPE, S (%)=	2			
MANNINGS N-VALUE (n)=	0.01			
VELOCITY, V (FT/S)=	9.70			
FLOW LENGTH, L (FT)=	115			
CHANNEL FLOW TIME, T_c (MIN.)=	**0.2 MIN.**			

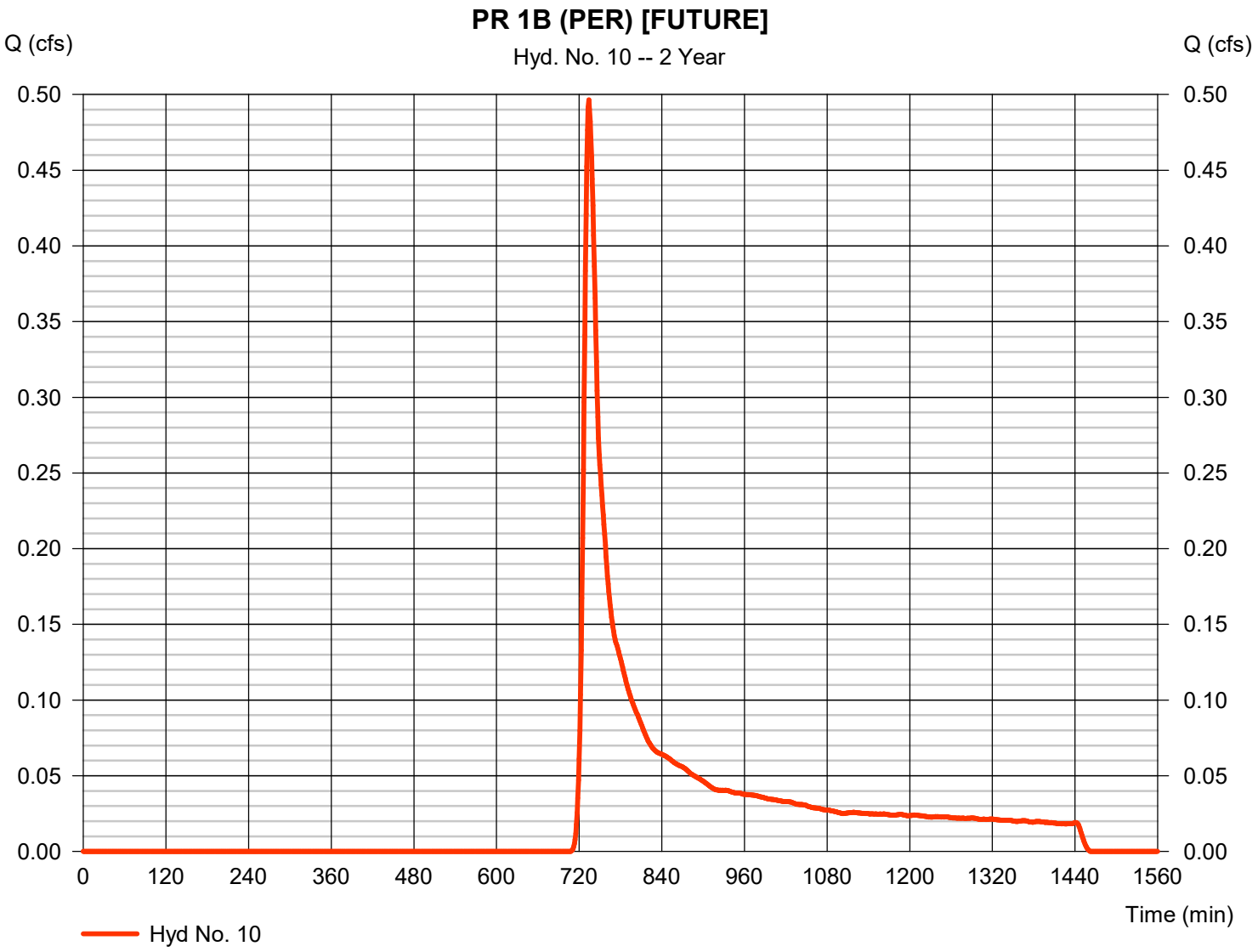
TOTAL SHEET FLOW TIME =	**8.2 MIN.**	
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.1 MIN.**	**TIME OF CONCENTRATION= 14.5 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.2 MIN.**	

Hydrograph Report

Hyd. No. 10

PR 1B (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.496 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	2,327 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.50 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

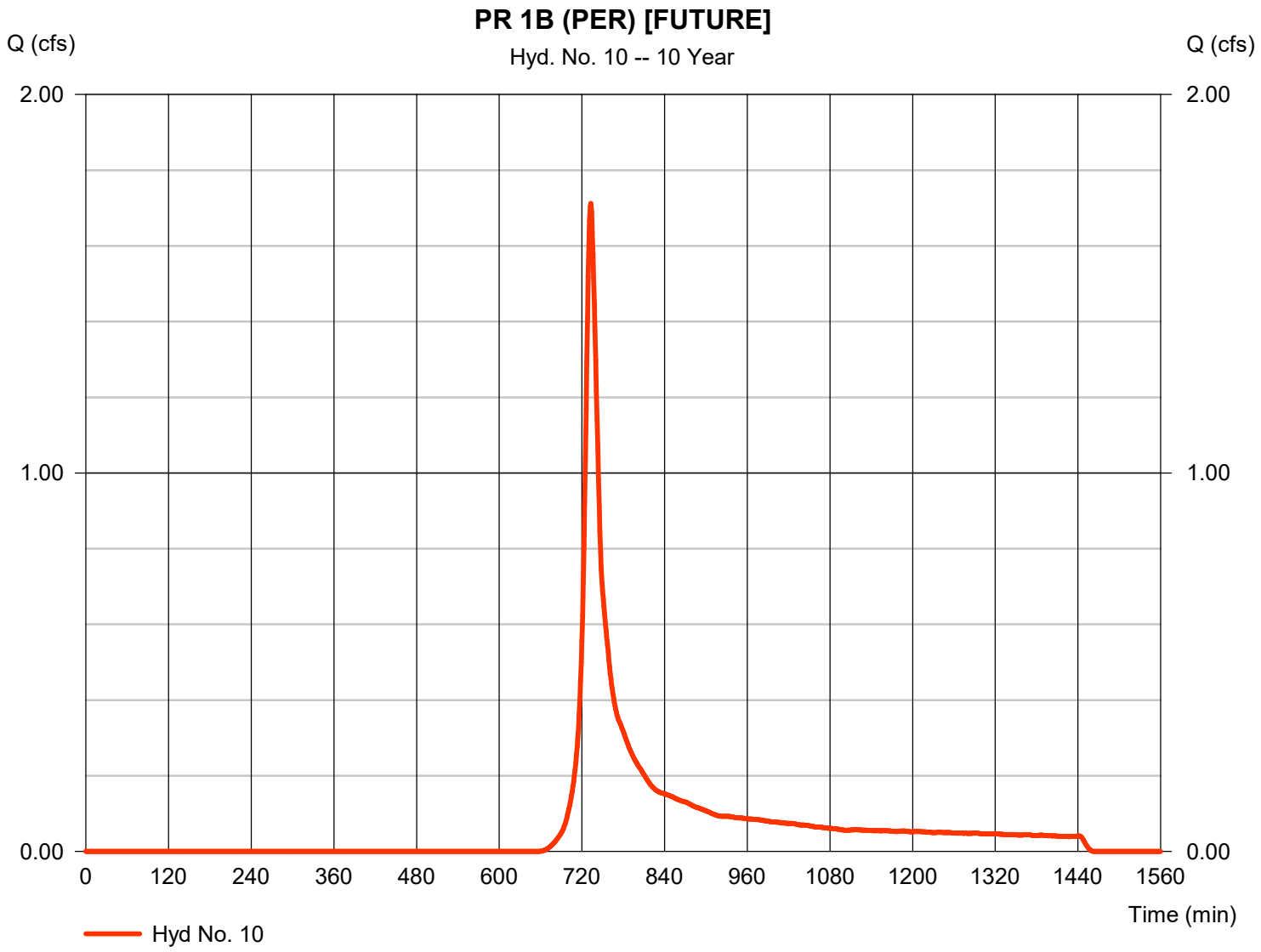


Hydrograph Report

Hyd. No. 10

PR 1B (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.712 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	6,514 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.50 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

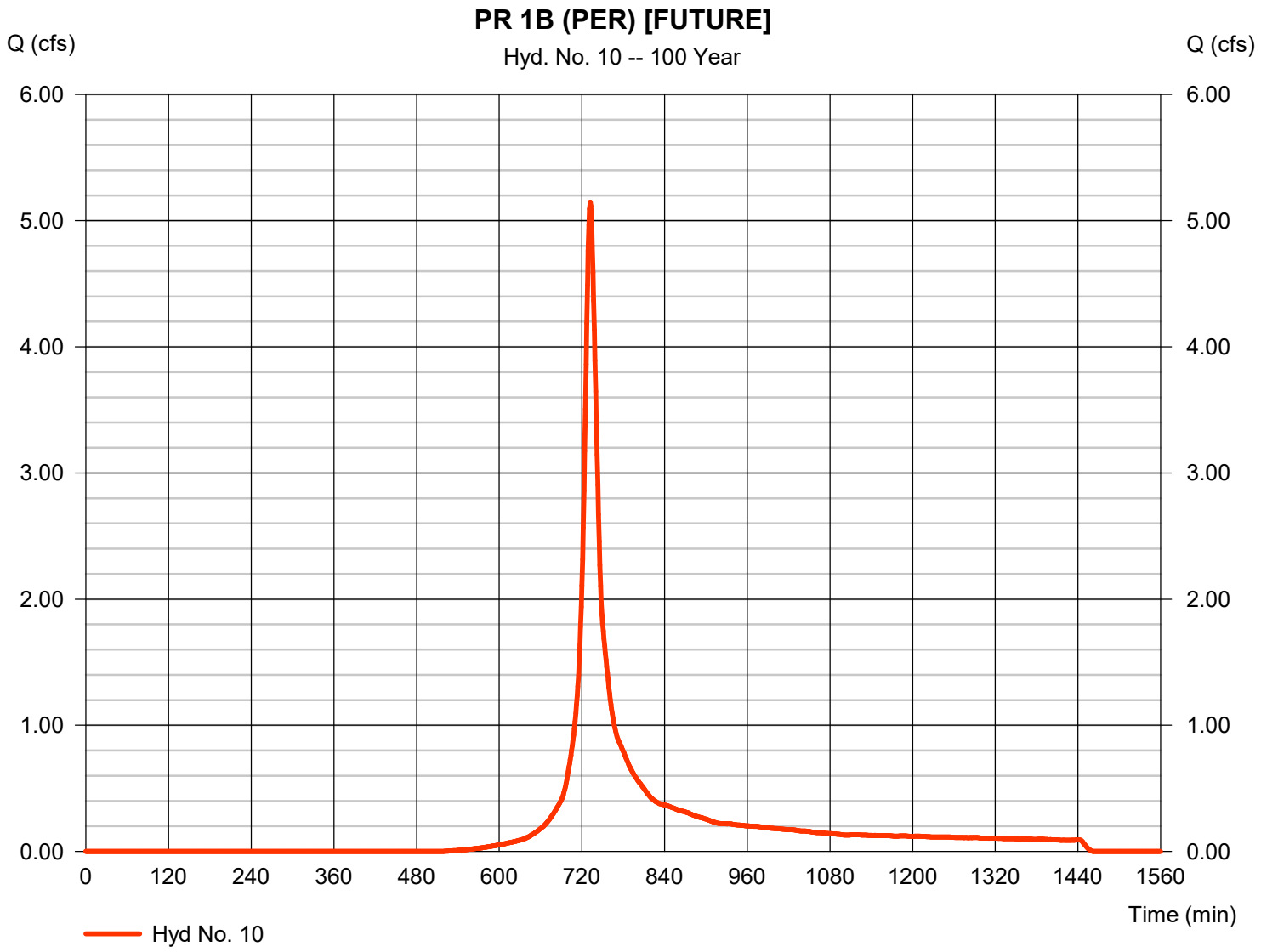


Hydrograph Report

Hyd. No. 10

PR 1B (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.147 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	18,652 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.50 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (IMP) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	60 (100 MAX)	40 (59 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21	4.21		
LAND SLOPE, S (%)=	3	2		
SHEET FLOW TIME, Tc (MIN.)=	**0.6 MIN.**	**6.0 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS		
FLOW LENGTH, L (FT)=	35	22		
LAND SLOPE, S (%)=	2	33		
AVERAGE VELOCITY, V (FT/S)=	0.98	4.00		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.6 MIN.**	**0.1 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME = **6.6 MIN.**

TOTAL SHALLOW CONCENTRATED FLOW TIME = **0.7 MIN.**

TOTAL CHANNEL FLOW TIME = **0.0 MIN.**

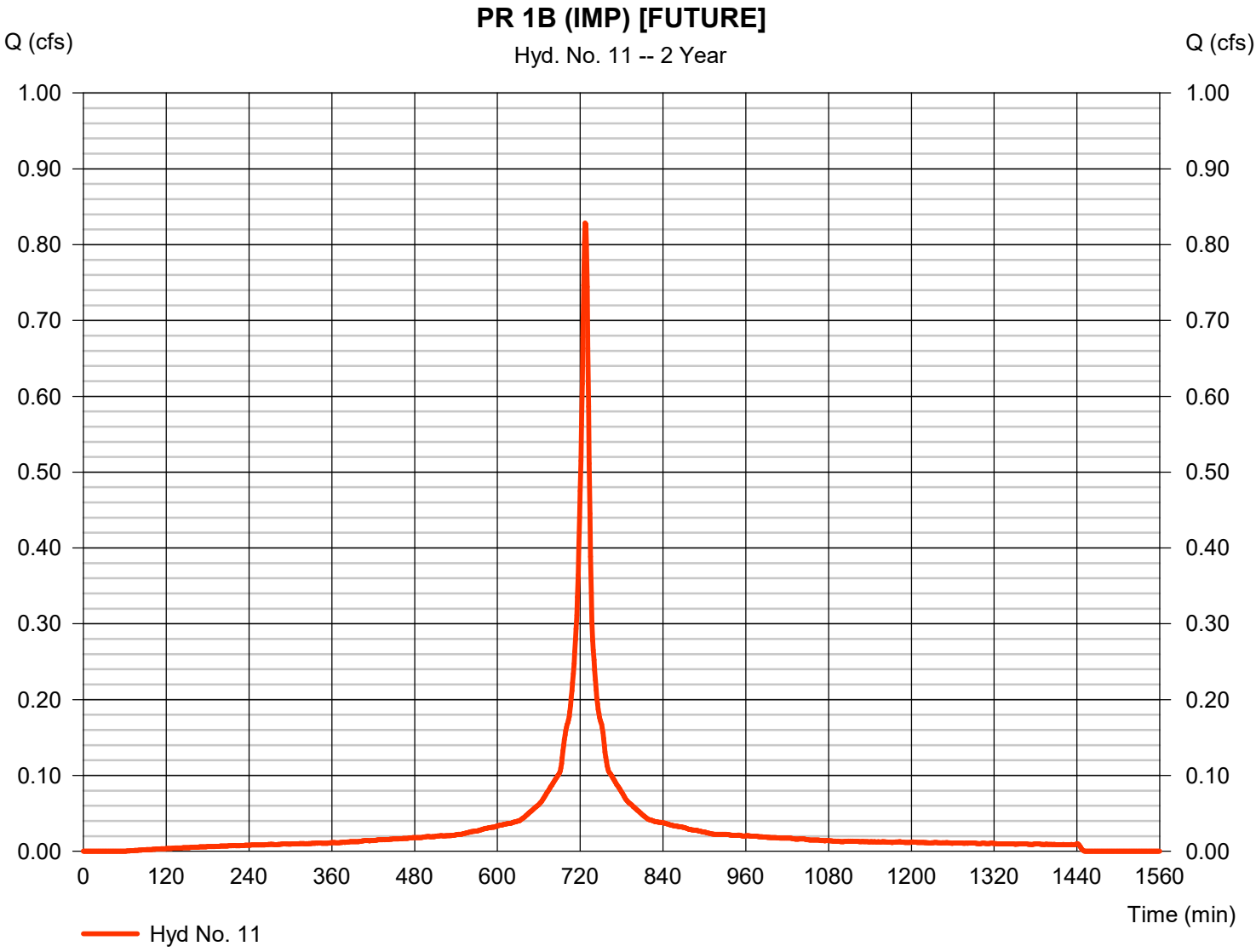
TIME OF CONCENTRATION= 7.3 MIN.

Hydrograph Report

Hyd. No. 11

PR 1B (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.828 cfs
Storm frequency	=	2 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	2,813 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



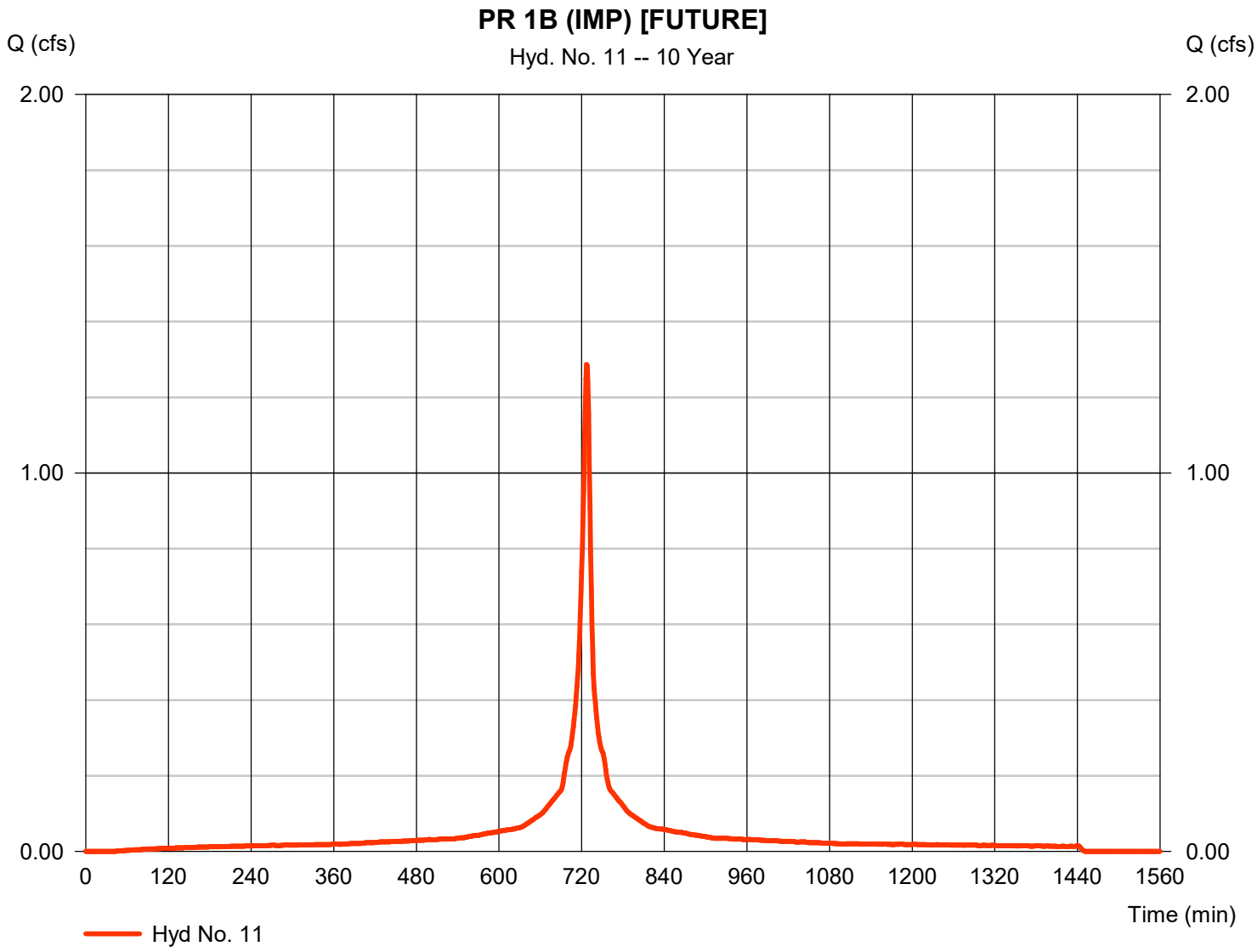
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 11

PR 1B (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.287 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	4,439 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

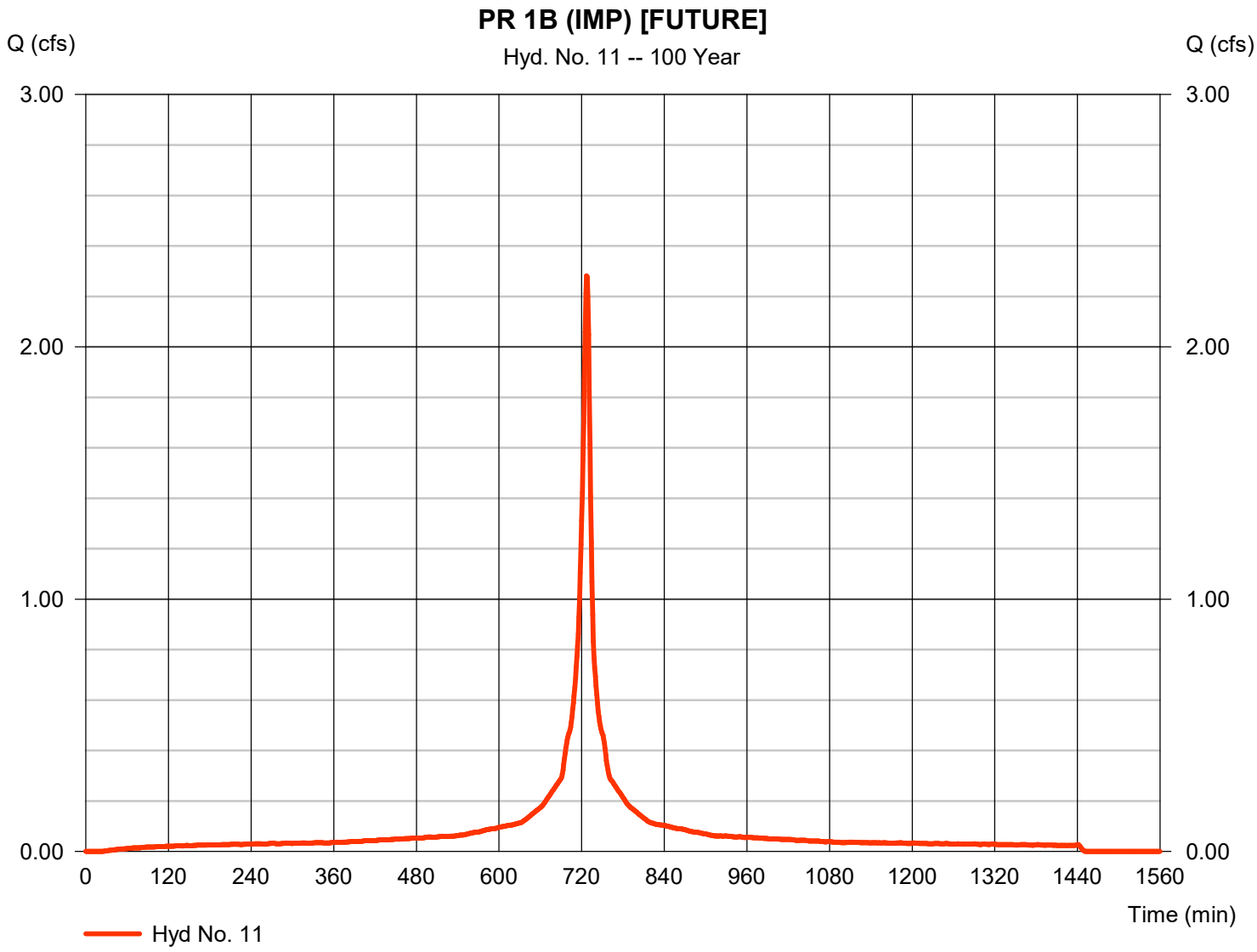


Hydrograph Report

Hyd. No. 11

PR 1B (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.282 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	7,984 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.30 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1C IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.07	7.1
Total			**Σ= 0.1**	**Σ= 7.1**

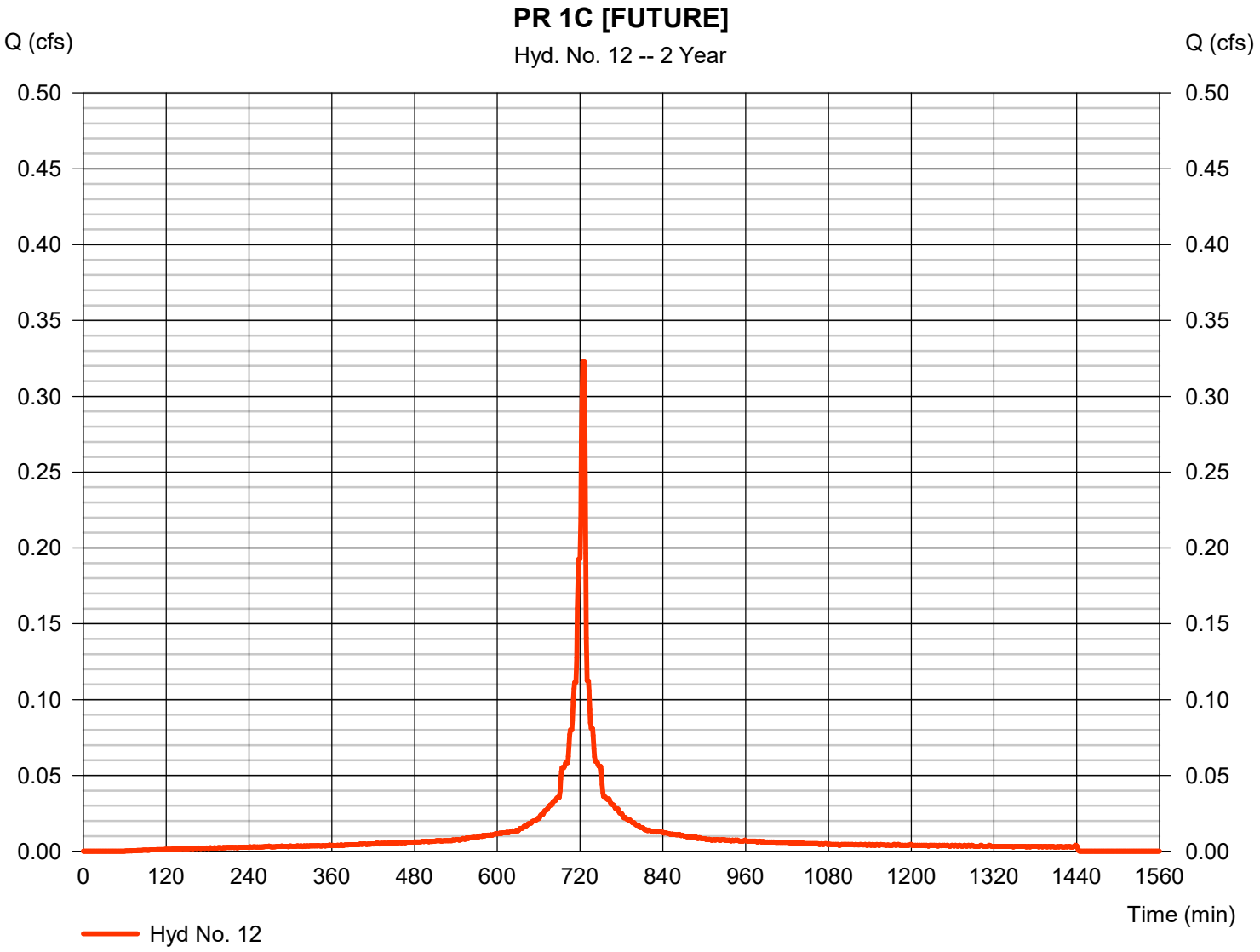
$$CN = \frac{7.1}{0.1} = 98$$

Hydrograph Report

Hyd. No. 12

PR 1C [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.323 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	947 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

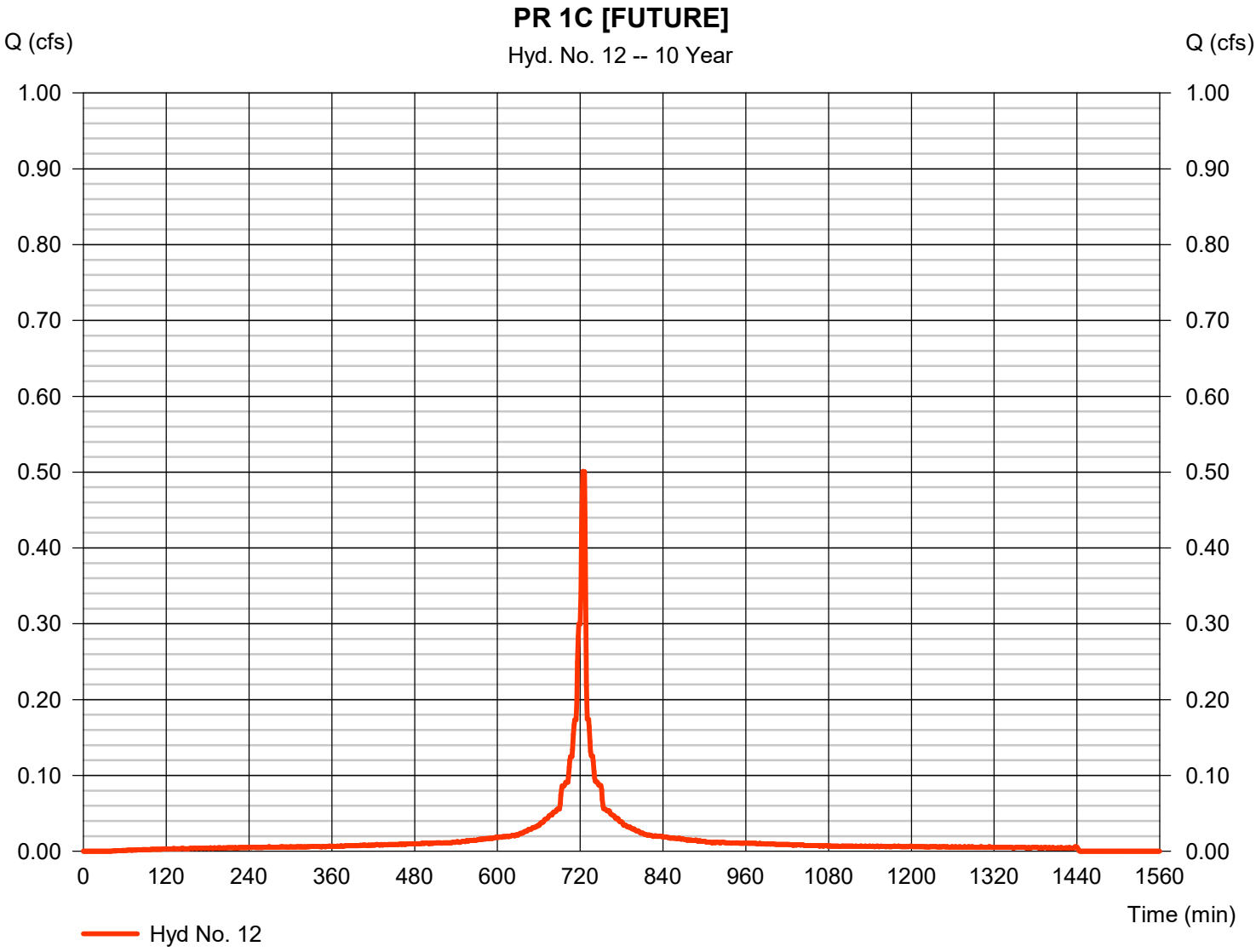


Hydrograph Report

Hyd. No. 12

PR 1C [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.501 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	1,494 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

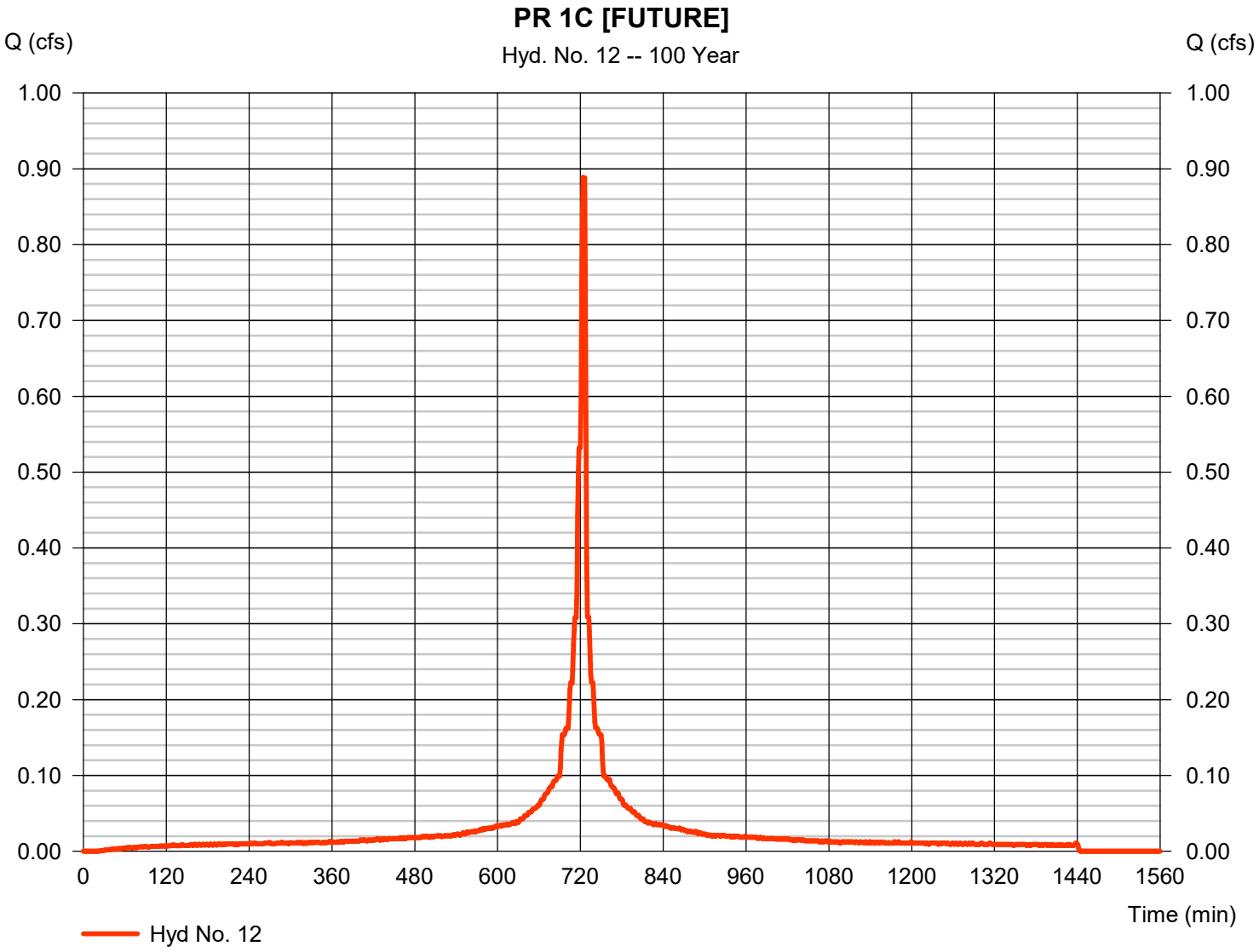


Hydrograph Report

Hyd. No. 12

PR 1C [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.889 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	2,687 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



Hydrograph Report

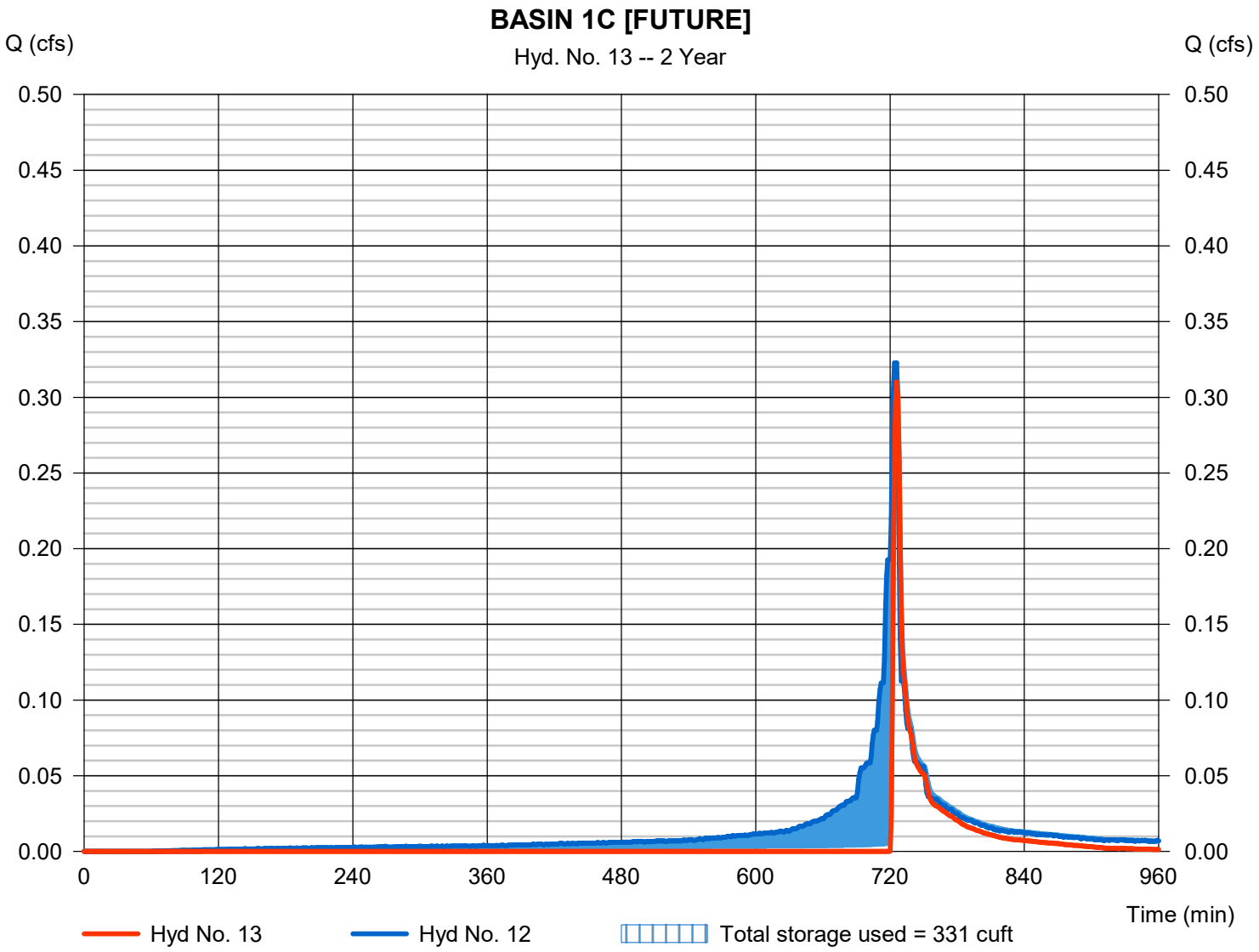
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	0.310 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	343 cuft
Inflow hyd. No.	=	12 - PR 1C [FUTURE]	Max. Elevation	=	638.27 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	331 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

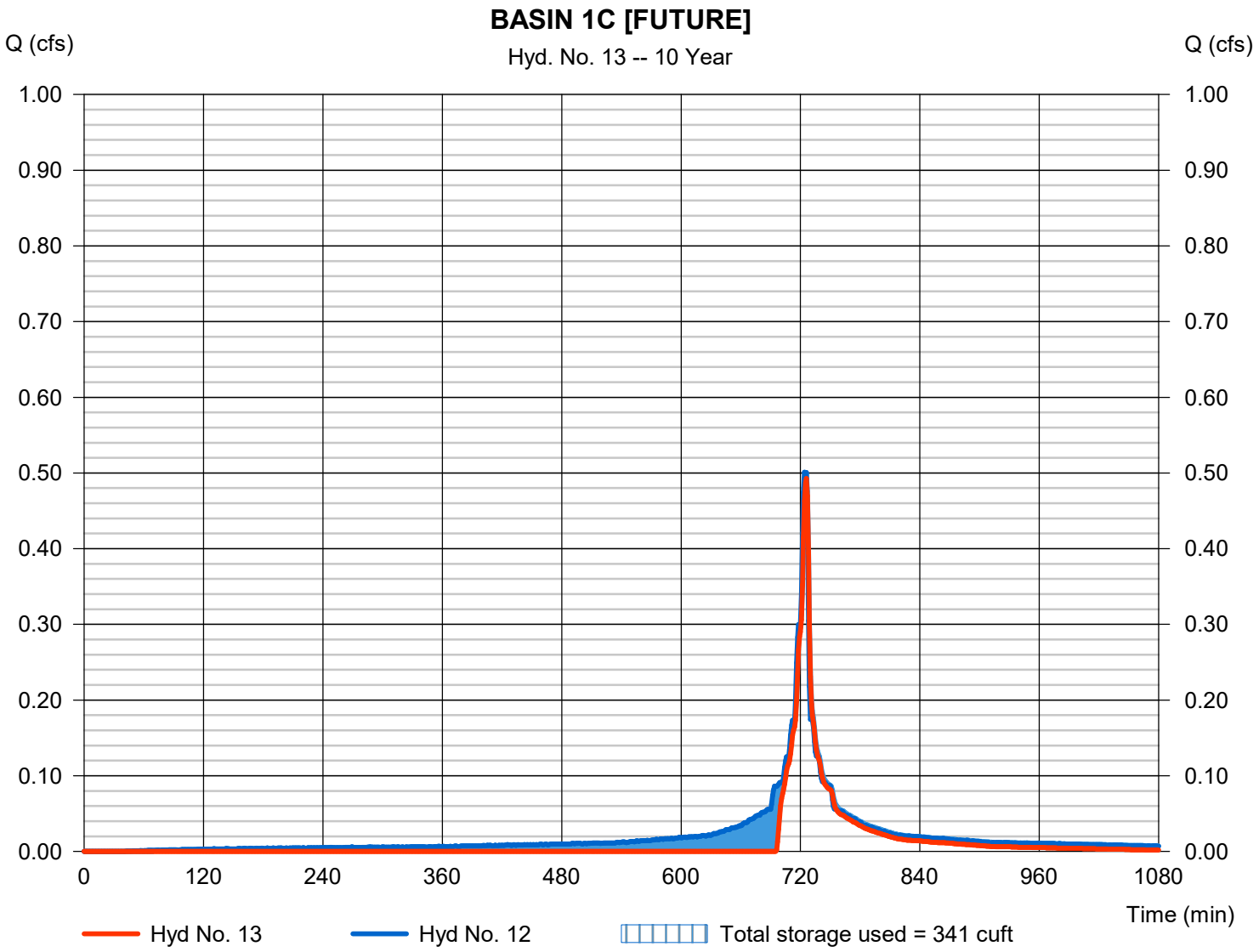
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	0.493 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	825 cuft
Inflow hyd. No.	=	12 - PR 1C [FUTURE]	Max. Elevation	=	638.35 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	341 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

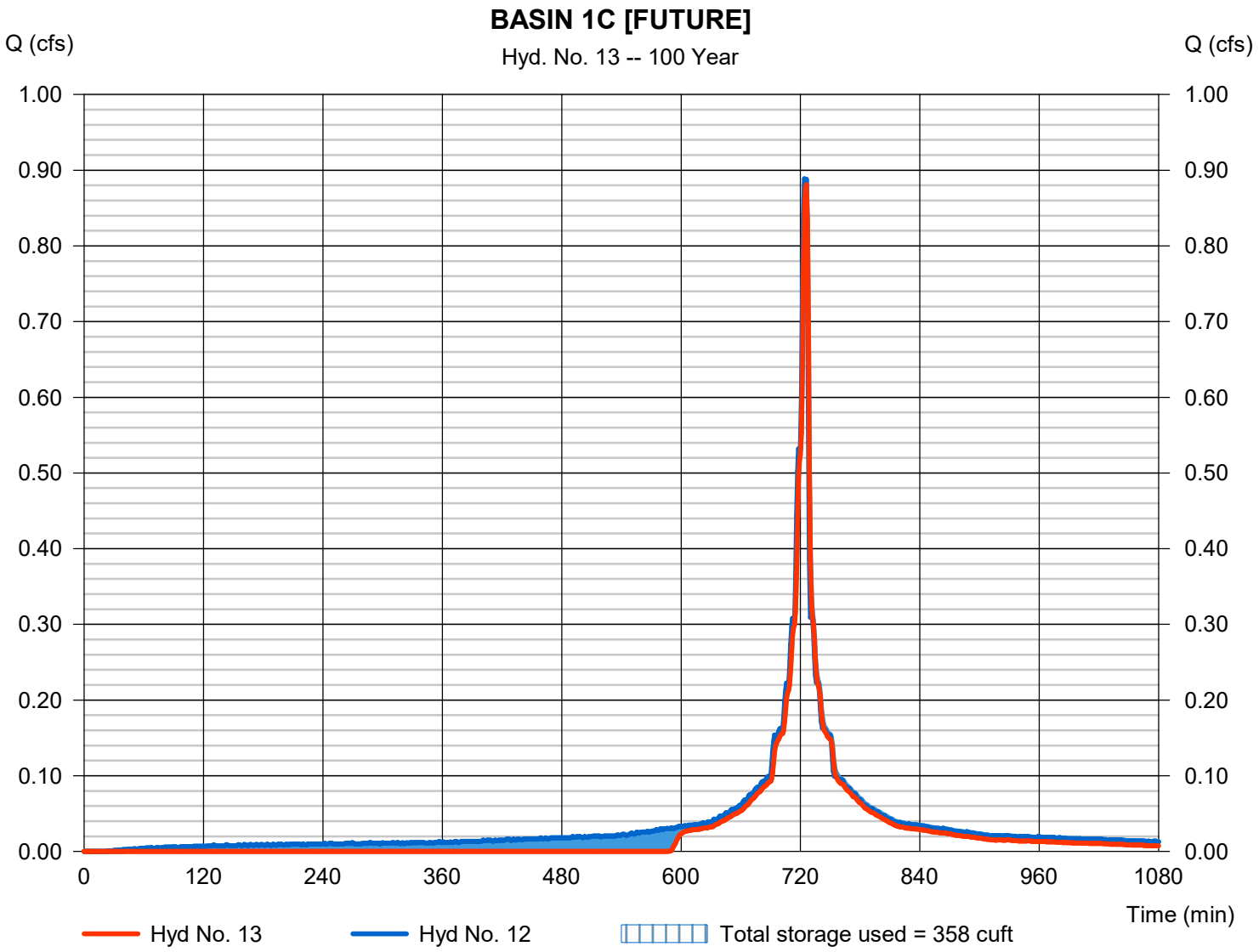
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 13

BASIN 1C [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	0.881 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	1,972 cuft
Inflow hyd. No.	=	12 - PR 1C [FUTURE]	Max. Elevation	=	638.48 ft
Reservoir name	=	BASIN 1C	Max. Storage	=	358 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 2 - BASIN 1C

Pond Data

UG Chambers -Invert elev. = 636.75 ft, Rise x Span = 2.54 x 4.33 ft, Barrel Len = 4.92 ft, No. Barrels = 5, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 635.75 ft, Width = 5.33 ft, Height = 3.54 ft, Voids = 100.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	635.75	n/a	0	0
0.35	636.10	n/a	46	46
0.71	636.46	n/a	46	93
1.06	636.81	n/a	46	139
1.42	637.17	n/a	46	186
1.77	637.52	n/a	46	232
2.12	637.87	n/a	46	279
2.48	638.23	n/a	46	325
2.83	638.58	n/a	46	371
3.19	638.94	n/a	46	418
3.54	639.29	n/a	46	464

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 638.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 1.000 (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	635.75	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.04	5	635.79	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.07	9	635.82	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.11	14	635.86	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.14	19	635.89	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.18	23	635.93	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.21	28	635.96	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.25	32	636.00	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.28	37	636.03	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.32	42	636.07	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.35	46	636.10	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.39	51	636.14	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.42	56	636.17	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.46	60	636.21	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.50	65	636.25	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.53	70	636.28	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.57	74	636.32	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.60	79	636.35	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.64	84	636.39	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.67	88	636.42	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.71	93	636.46	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.74	97	636.49	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.78	102	636.53	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.81	107	636.56	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.85	111	636.60	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.88	116	636.64	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.92	121	636.67	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.96	125	636.71	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.99	130	636.74	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.03	135	636.78	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.06	139	636.81	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.10	144	636.85	0.00	---	---	---	---	---	---	---	0.004	---	0.004

Continues on next page...

BASIN 1C

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
1.13	149	636.88	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.17	153	636.92	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.20	158	636.95	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.24	162	636.99	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.27	167	637.02	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.31	172	637.06	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.35	176	637.10	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.38	181	637.13	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.42	186	637.17	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.45	190	637.20	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.49	195	637.24	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.52	200	637.27	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.56	204	637.31	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.59	209	637.34	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.63	214	637.38	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.66	218	637.41	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.70	223	637.45	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.73	227	637.48	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.77	232	637.52	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.81	237	637.56	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.84	241	637.59	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.88	246	637.63	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.91	251	637.66	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.95	255	637.70	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.98	260	637.73	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.02	265	637.77	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.05	269	637.80	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.09	274	637.84	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.12	279	637.87	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.16	283	637.91	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.19	288	637.94	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.23	292	637.98	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.27	297	638.02	0.00 ic	---	---	---	---	---	---	---	0.006	---	0.007
2.30	302	638.05	0.01 ic	---	---	---	---	---	---	---	0.006	---	0.017
2.34	306	638.09	0.03 ic	---	---	---	---	---	---	---	0.006	---	0.039
2.37	311	638.12	0.06 ic	---	---	---	---	---	---	---	0.006	---	0.071
2.41	316	638.16	0.11 ic	---	---	---	---	---	---	---	0.006	---	0.113
2.44	320	638.19	0.16 ic	---	---	---	---	---	---	---	0.006	---	0.164
2.48	325	638.23	0.22 ic	---	---	---	---	---	---	---	0.006	---	0.225
2.51	330	638.26	0.29 ic	---	---	---	---	---	---	---	0.006	---	0.295
2.55	334	638.30	0.37 ic	---	---	---	---	---	---	---	0.006	---	0.373
2.58	339	638.33	0.45 ic	---	---	---	---	---	---	---	0.006	---	0.459
2.62	344	638.37	0.55 ic	---	---	---	---	---	---	---	0.006	---	0.552
2.65	348	638.41	0.65 ic	---	---	---	---	---	---	---	0.006	---	0.653
2.69	353	638.44	0.75 ic	---	---	---	---	---	---	---	0.006	---	0.759
2.73	357	638.48	0.87 ic	---	---	---	---	---	---	---	0.006	---	0.873
2.76	362	638.51	0.98 ic	---	---	---	---	---	---	---	0.006	---	0.991
2.80	367	638.55	1.11 ic	---	---	---	---	---	---	---	0.006	---	1.113
2.83	371	638.58	1.23 ic	---	---	---	---	---	---	---	0.006	---	1.238
2.87	376	638.62	1.36 ic	---	---	---	---	---	---	---	0.006	---	1.368
2.90	381	638.65	1.49 ic	---	---	---	---	---	---	---	0.006	---	1.501
2.94	385	638.69	1.63 ic	---	---	---	---	---	---	---	0.006	---	1.635
2.97	390	638.72	1.76 ic	---	---	---	---	---	---	---	0.006	---	1.771
3.01	395	638.76	1.90 ic	---	---	---	---	---	---	---	0.006	---	1.904
3.04	399	638.79	2.03 ic	---	---	---	---	---	---	---	0.007	---	2.037
3.08	404	638.83	2.16 ic	---	---	---	---	---	---	---	0.007	---	2.168
3.12	409	638.87	2.29 ic	---	---	---	---	---	---	---	0.007	---	2.294
3.15	413	638.90	2.41 ic	---	---	---	---	---	---	---	0.007	---	2.414
3.19	418	638.94	2.52 ic	---	---	---	---	---	---	---	0.007	---	2.524
3.22	422	638.97	2.61 ic	---	---	---	---	---	---	---	0.007	---	2.621
3.26	427	639.01	2.69 ic	---	---	---	---	---	---	---	0.007	---	2.699
3.29	432	639.04	2.78 ic	---	---	---	---	---	---	---	0.007	---	2.791
3.33	436	639.08	2.87 ic	---	---	---	---	---	---	---	0.007	---	2.880
3.36	441	639.11	2.96 ic	---	---	---	---	---	---	---	0.007	---	2.967
3.40	446	639.15	3.04 ic	---	---	---	---	---	---	---	0.007	---	3.052
3.43	450	639.18	3.13 ic	---	---	---	---	---	---	---	0.007	---	3.134
3.47	455	639.22	3.21 ic	---	---	---	---	---	---	---	0.007	---	3.214
3.50	460	639.25	3.28 ic	---	---	---	---	---	---	---	0.007	---	3.292
3.54	464	639.29	3.36 ic	---	---	---	---	---	---	---	0.007	---	3.368

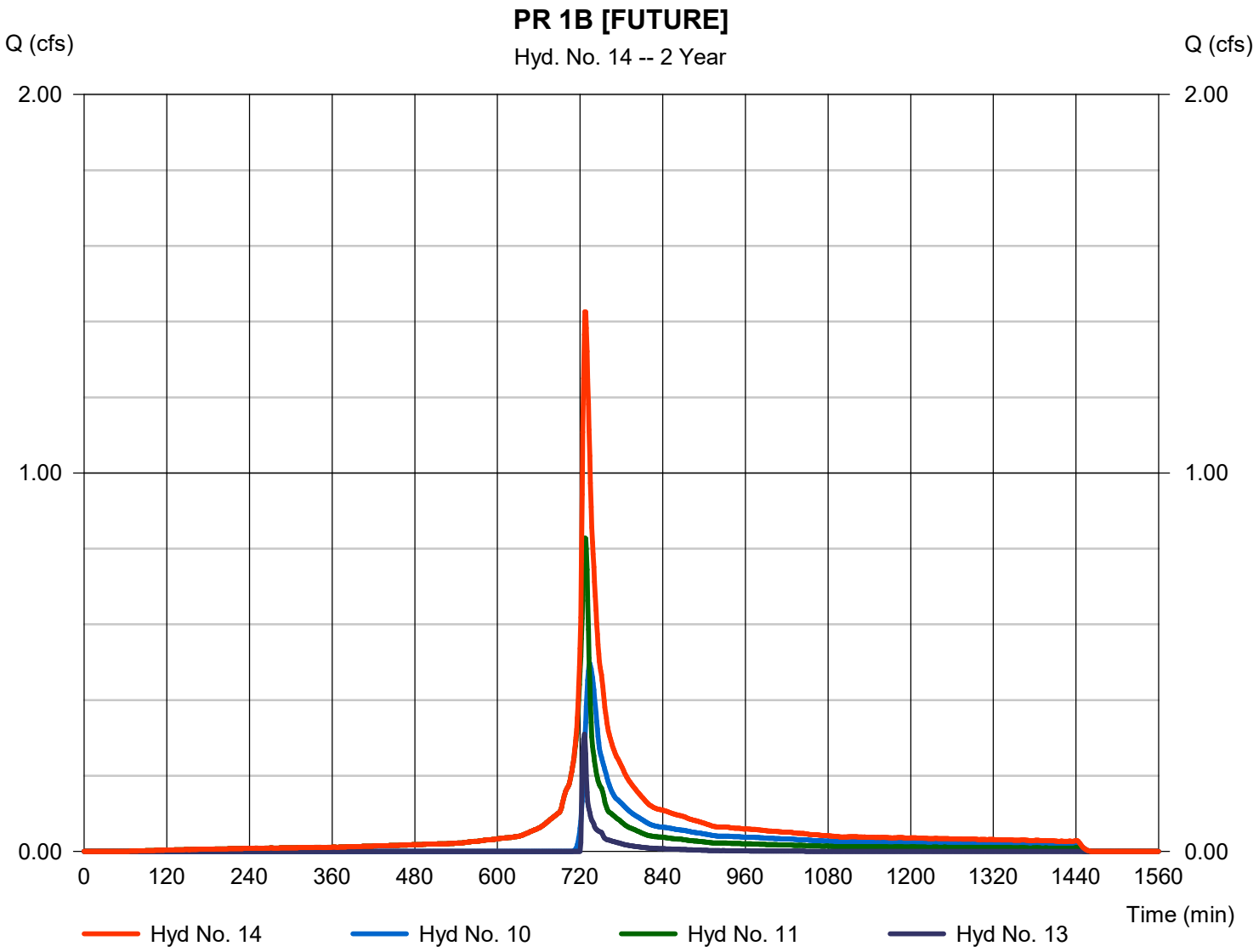
...End

Hydrograph Report

Hyd. No. 14

PR 1B [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	1.426 cfs
Storm frequency	=	2 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	5,483 cuft
Inflow hyds.	=	10, 11, 13	Contrib. drain. area	=	1.100 ac

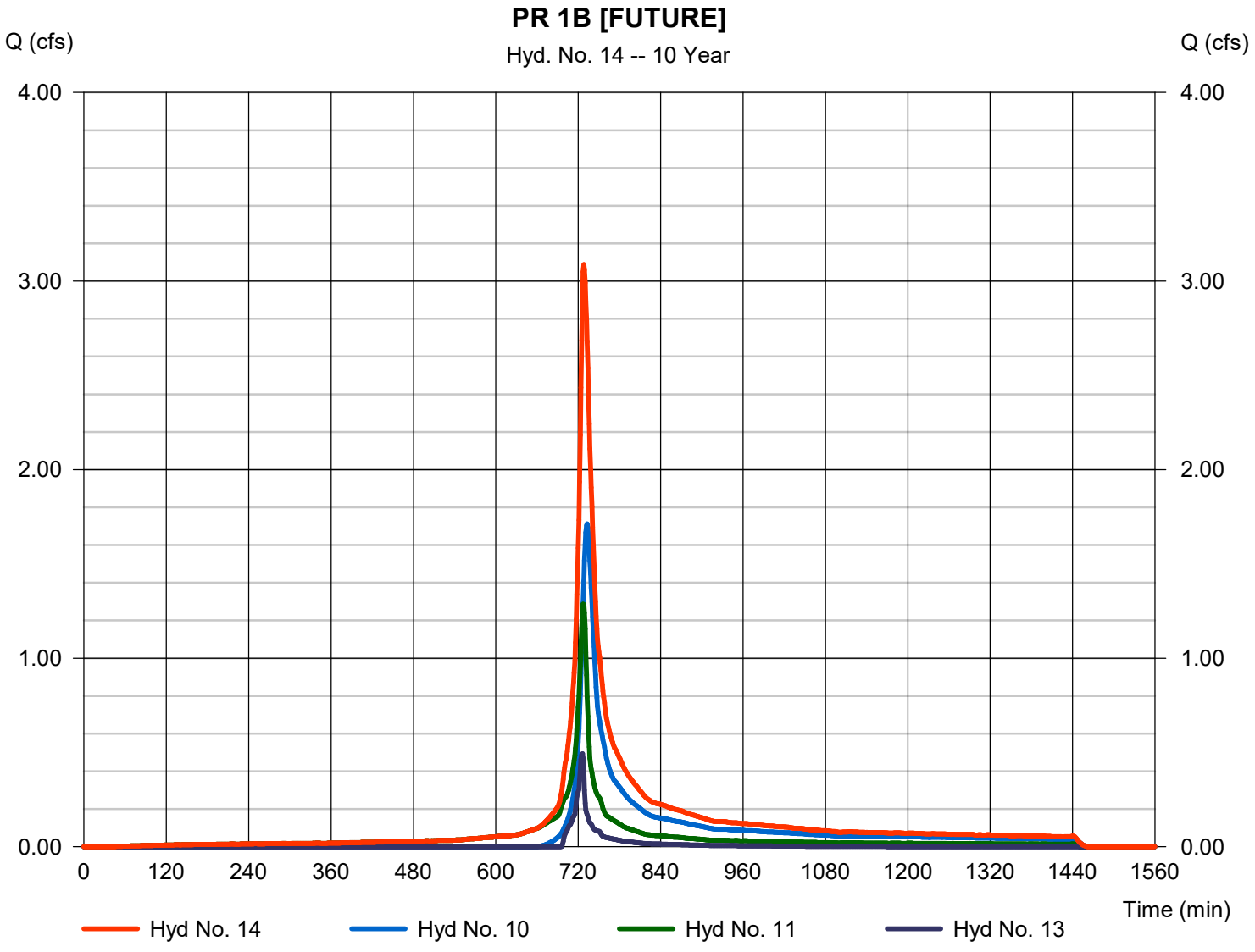


Hydrograph Report

Hyd. No. 14

PR 1B [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	3.088 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	11,778 cuft
Inflow hyds.	=	10, 11, 13	Contrib. drain. area	=	1.100 ac

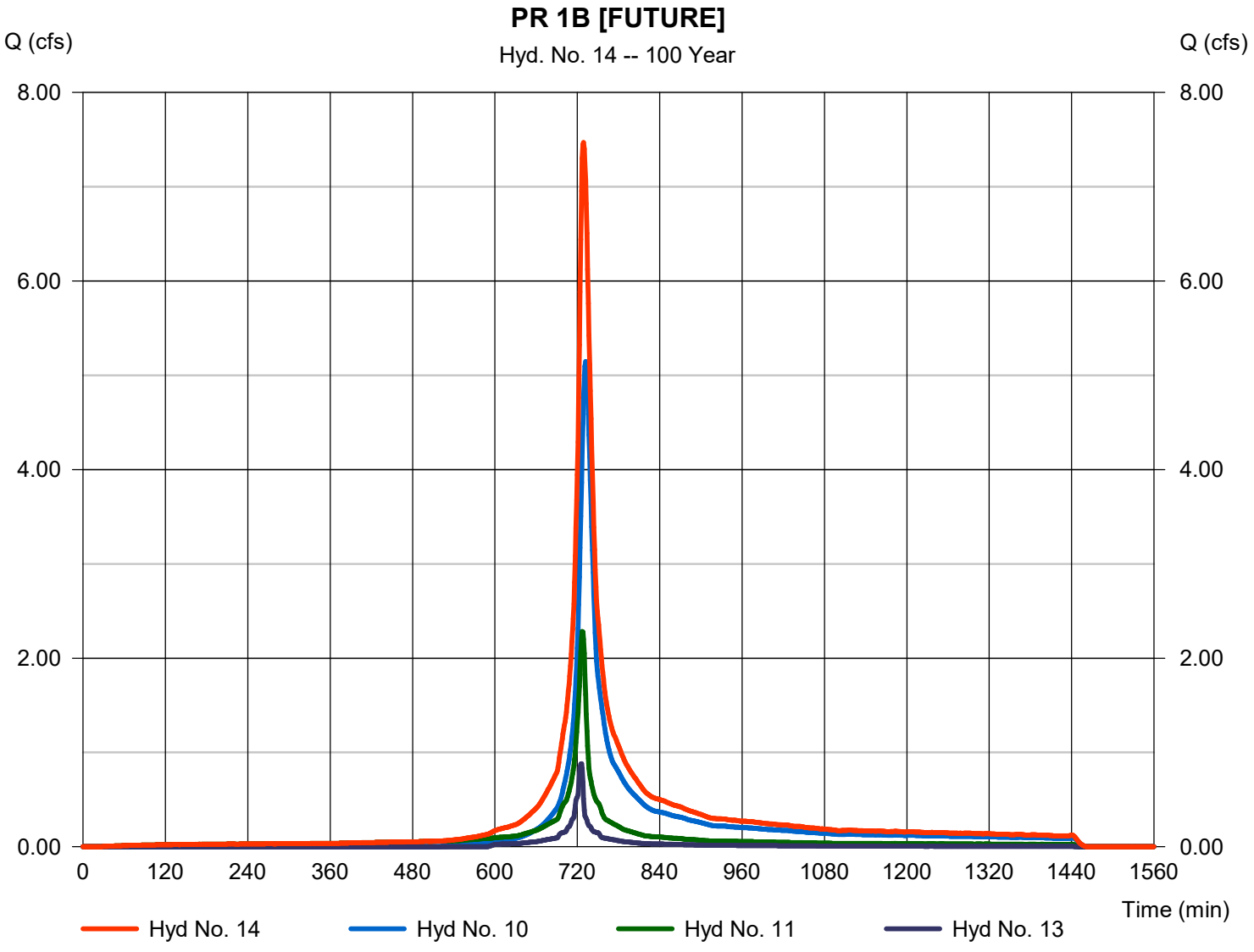


Hydrograph Report

Hyd. No. 14

PR 1B [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	7.469 cfs
Storm frequency	=	100 yrs	Time to peak	=	729 min
Time interval	=	1 min	Hyd. volume	=	28,607 cuft
Inflow hyds.	=	10, 11, 13	Contrib. drain. area	=	1.100 ac



Hydrograph Report

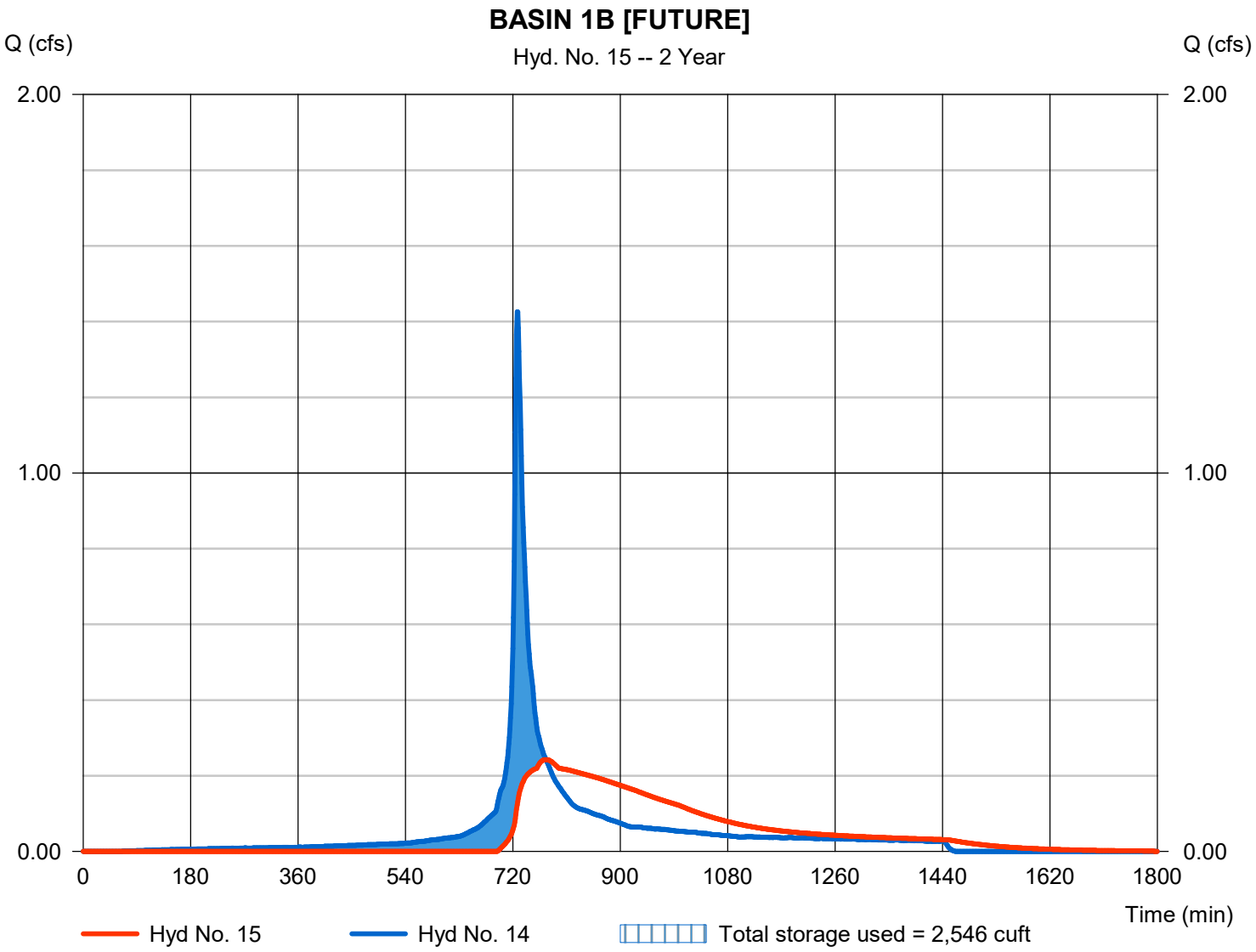
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 15

BASIN 1B [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	0.243 cfs
Storm frequency	=	2 yrs	Time to peak	=	775 min
Time interval	=	1 min	Hyd. volume	=	4,760 cuft
Inflow hyd. No.	=	14 - PR 1B [FUTURE]	Max. Elevation	=	633.42 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	2,546 cuft

Storage Indication method used.



Hydrograph Report

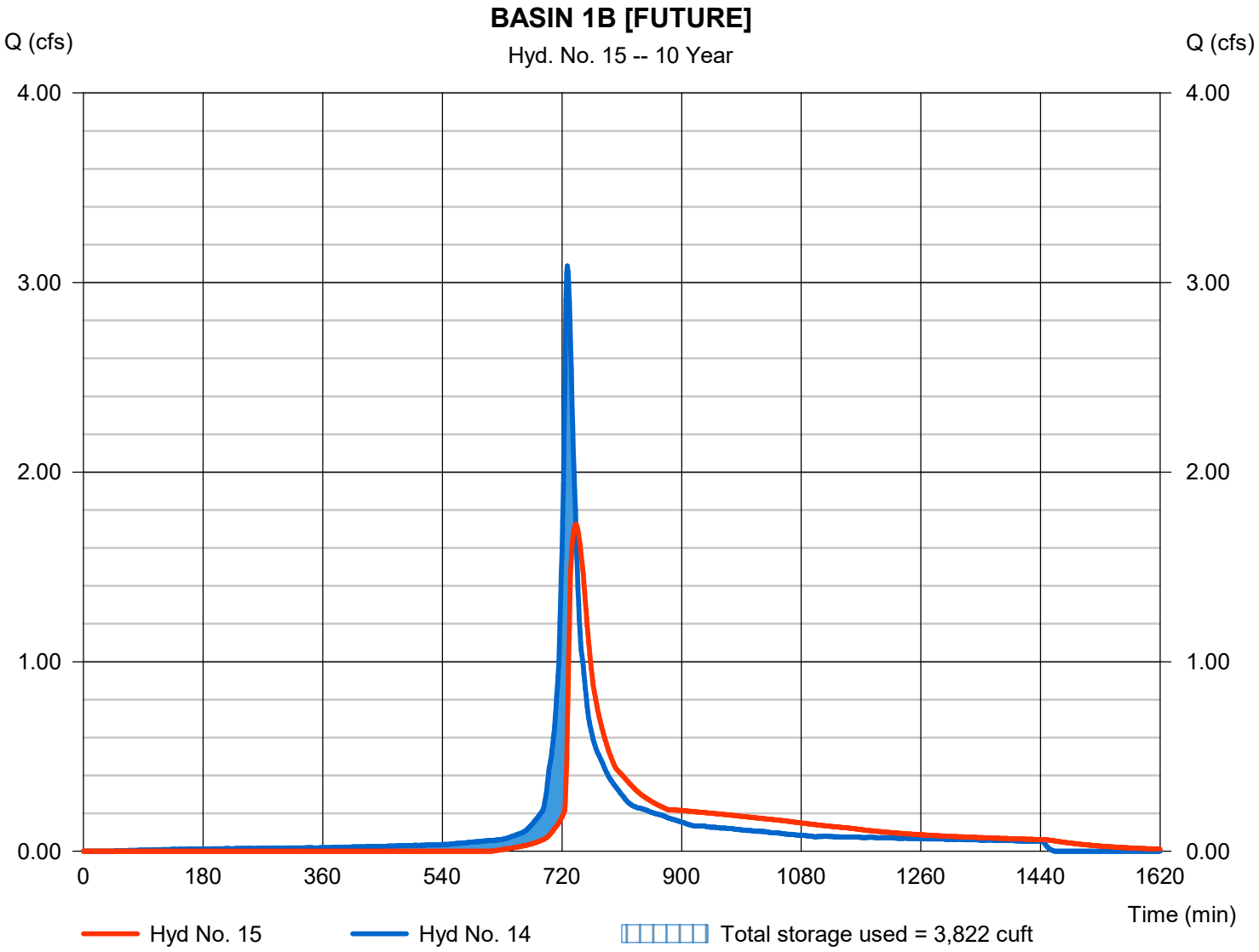
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 15

BASIN 1B [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	1.725 cfs
Storm frequency	=	10 yrs	Time to peak	=	741 min
Time interval	=	1 min	Hyd. volume	=	11,056 cuft
Inflow hyd. No.	=	14 - PR 1B [FUTURE]	Max. Elevation	=	634.07 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	3,822 cuft

Storage Indication method used.



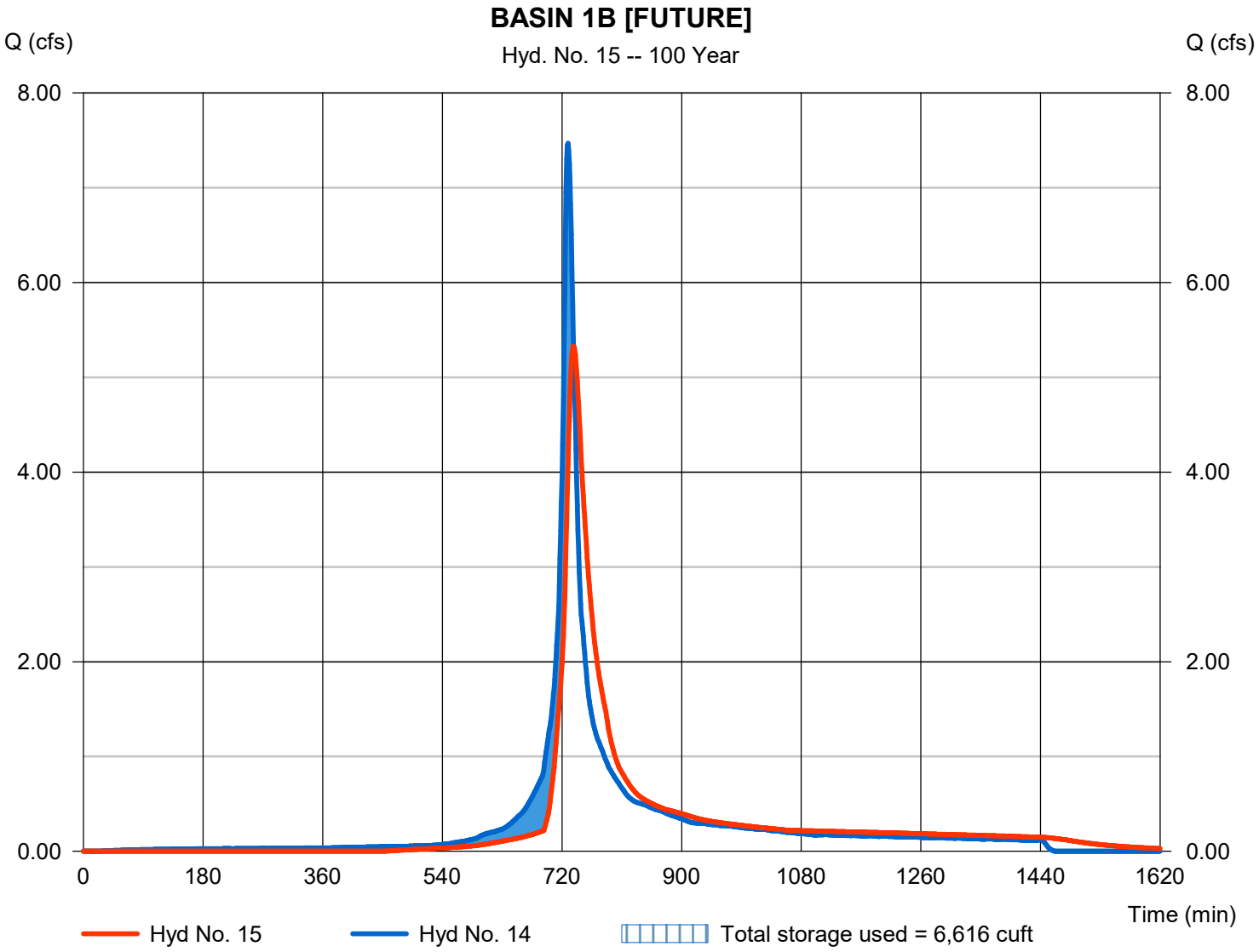
Hydrograph Report

Hyd. No. 15

BASIN 1B [FUTURE]

Hydrograph type	=	Reservoir	Peak discharge	=	5.327 cfs
Storm frequency	=	100 yrs	Time to peak	=	737 min
Time interval	=	1 min	Hyd. volume	=	27,885 cuft
Inflow hyd. No.	=	14 - PR 1B [FUTURE]	Max. Elevation	=	634.91 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	6,616 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Pond No. 1 - BASIN 1B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 632.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	632.00	1,270	0	0
2.00	634.00	2,370	3,583	3,583
4.00	636.00	4,435	6,697	10,280
6.00	638.00	6,440	10,812	21,092

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 3.00	0.00	0.00	0.00
Span (in)	= 3.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 632.41	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 0.83	0.00	0.00	0.00
Crest El. (ft)	= 633.43	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

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

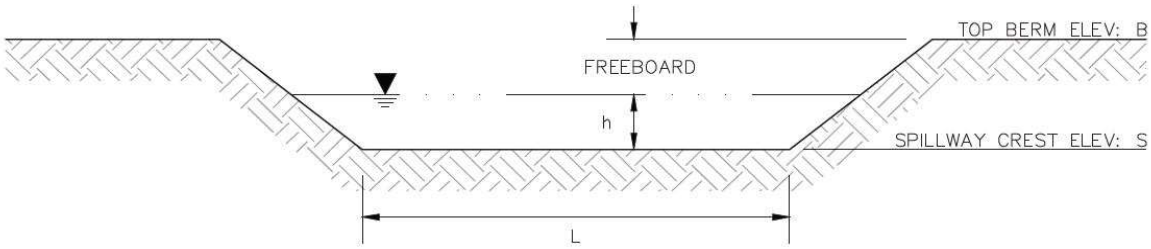
TW Elev. (ft) = 0.00

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	632.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.20	358	632.20	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.40	717	632.40	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.60	1,075	632.60	0.06 ic	---	---	---	0.00	---	---	---	---	---	0.059
0.80	1,433	632.80	0.12 ic	---	---	---	0.00	---	---	---	---	---	0.122
1.00	1,791	633.00	0.16 ic	---	---	---	0.00	---	---	---	---	---	0.161
1.20	2,150	633.20	0.19 ic	---	---	---	0.00	---	---	---	---	---	0.193
1.40	2,508	633.40	0.22 ic	---	---	---	0.00	---	---	---	---	---	0.220
1.60	2,866	633.60	0.24 ic	---	---	---	0.19	---	---	---	---	---	0.438
1.80	3,225	633.80	0.27 ic	---	---	---	0.62	---	---	---	---	---	0.888
2.00	3,583	634.00	0.29 ic	---	---	---	1.19	---	---	---	---	---	1.475
2.20	4,253	634.20	0.30 ic	---	---	---	1.87	---	---	---	---	---	2.173
2.40	4,922	634.40	0.32 ic	---	---	---	2.64	---	---	---	---	---	2.963
2.60	5,592	634.60	0.34 ic	---	---	---	3.50	---	---	---	---	---	3.837
2.80	6,262	634.80	0.36 ic	---	---	---	4.43	---	---	---	---	---	4.788
3.00	6,932	635.00	0.37 ic	---	---	---	5.44	---	---	---	---	---	5.809
3.20	7,601	635.20	0.39 ic	---	---	---	6.51	---	---	---	---	---	6.895
3.40	8,271	635.40	0.40 ic	---	---	---	7.64	---	---	---	---	---	8.043
3.60	8,941	635.60	0.41 ic	---	---	---	8.84	---	---	---	---	---	9.249
3.80	9,611	635.80	0.43 ic	---	---	---	10.09	---	---	---	---	---	10.51
4.00	10,280	636.00	0.44 ic	---	---	---	11.39	---	---	---	---	---	11.83
4.20	11,361	636.20	0.45 ic	---	---	---	12.74	---	---	---	---	---	13.19
4.40	12,443	636.40	0.46 ic	---	---	---	14.15	---	---	---	---	---	14.61
4.60	13,524	636.60	0.48 ic	---	---	---	15.60	---	---	---	---	---	16.08
4.80	14,605	636.80	0.49 ic	---	---	---	17.10	---	---	---	---	---	17.59
5.00	15,686	637.00	0.50 ic	---	---	---	18.64	---	---	---	---	---	19.14
5.20	16,767	637.20	0.51 ic	---	---	---	20.23	---	---	---	---	---	20.74
5.40	17,849	637.40	0.52 ic	---	---	---	21.86	---	---	---	---	---	22.38
5.60	18,930	637.60	0.53 ic	---	---	---	23.54	---	---	---	---	---	24.07
5.80	20,011	637.80	0.54 ic	---	---	---	25.25	---	---	---	---	---	25.79
6.00	21,092	638.00	0.55 ic	---	---	---	27.00	---	---	---	---	---	27.55

EMERGENCY SPILLWAY CALCULATIONS



BASIN # 1A [FUTURE]

TOP OF BERM ELEV (B): 638.00

QDESIGN = Q_{100} = 7.47 CFS

SPILLWAY CREST ELEV (S): 636.85

LENGTH OF SPILLWAY (L): 45.0 FT

$Q_{CAP} = CLH^{3/2} =$ $(3.0)(45)(638 - 636.85)^{3/2} =$

$Q_{CAP} =$ 166.49 CFS > 7.47 CFS [OK]

$$h_{DESIGN} = \left(\frac{Q}{CL}\right)^{2/3} = \left(\frac{7.47\ CFS}{(3.0)(45\ FT)}\right)^{2/3} = 0.145\ FT/S$$

FREEBOARD = (638 - 636.85) - 0.145 = 1 FT [OK]

$$V = \frac{Q}{A} = \frac{7.47\ CFS}{(45)(0.145\ FT)} = 1.14\ FT/S < 2.5\ FT/S$$ [OK]

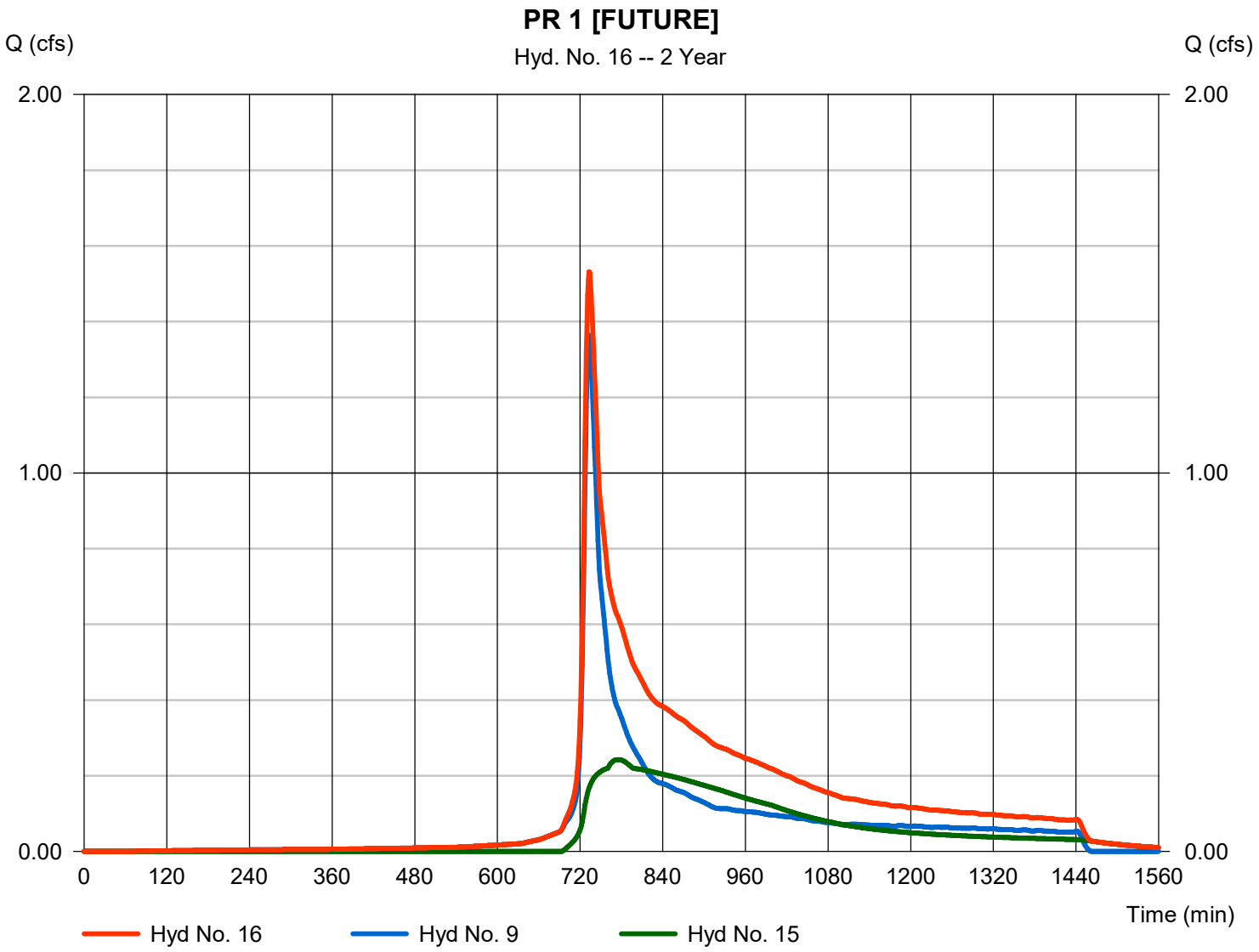
NO RIP RAP REQUIRED

Hydrograph Report

Hyd. No. 16

PR 1 [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 1.532 cfs
Storm frequency	= 2 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 11,792 cuft
Inflow hyds.	= 9, 15	Contrib. drain. area	= 0.000 ac

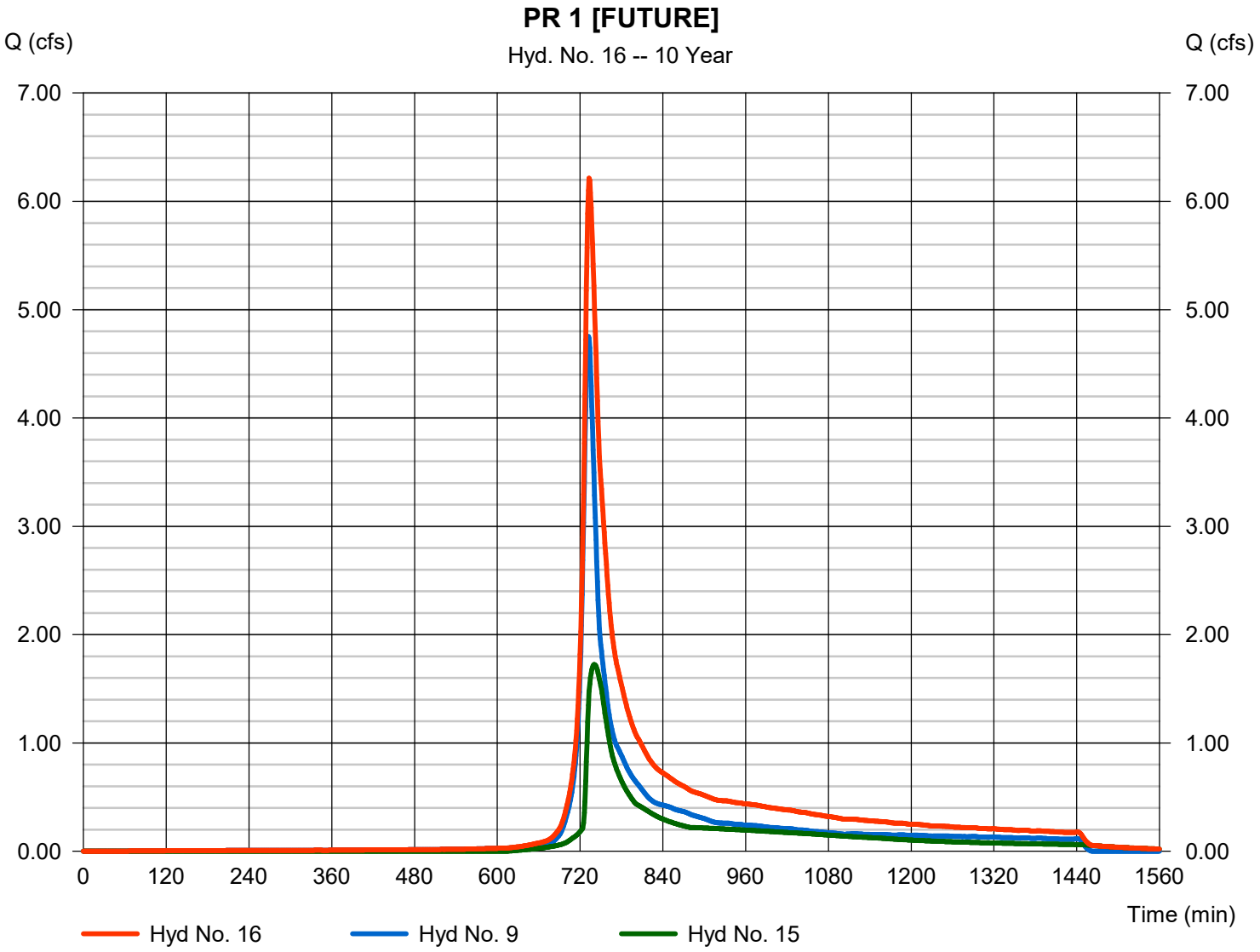


Hydrograph Report

Hyd. No. 16

PR 1 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	6.214 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	29,843 cuft
Inflow hyds.	=	9, 15	Contrib. drain. area	=	0.000 ac

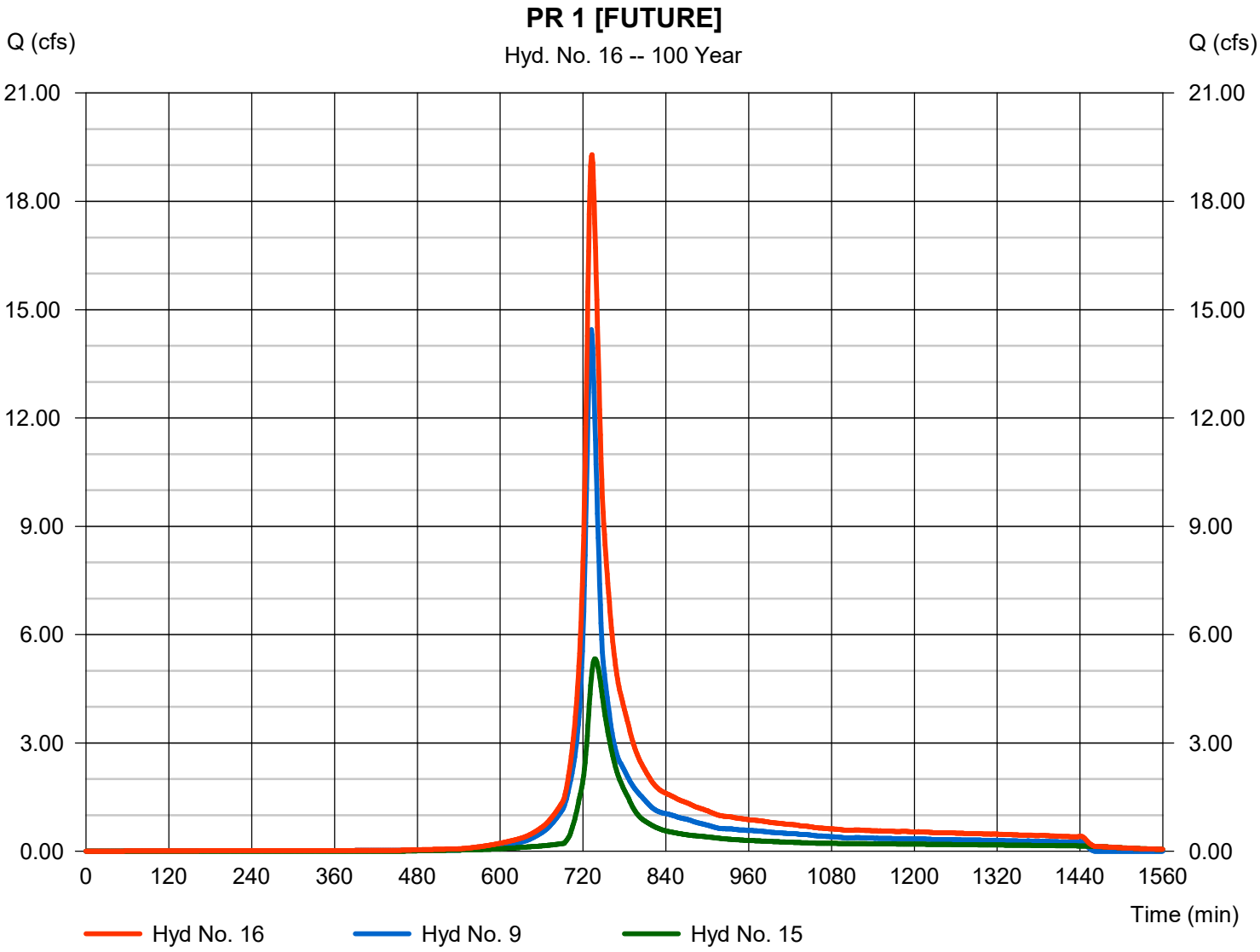


Hydrograph Report

Hyd. No. 16

PR 1 [FUTURE]

Hydrograph type	= Combine	Peak discharge	= 19.29 cfs
Storm frequency	= 100 yrs	Time to peak	= 733 min
Time interval	= 1 min	Hyd. volume	= 81,051 cuft
Inflow hyds.	= 9, 15	Contrib. drain. area	= 0.000 ac



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 2 PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	1.16	70.5
WOODS	B	55	0.05	3.0
BRUSH	B	48	0.72	34.8
Total			**Σ= 1.9**	**Σ= 108.3**

$$CN = \frac{108.3}{1.9} = 56$$

DRAINAGE AREA DESIGNATION: PR 2 IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.04	3.6
Total			**Σ= 0.0**	**Σ= 3.6**

$$CN = \frac{3.6}{0.0} = 98$$

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 2 (PER) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.2 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	100	58	199	130
LAND SLOPE, S (%)=	4	15.5	14.1	10
AVERAGE VELOCITY, V (FT/S)=	1.39	0.99	2.61	0.80
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**1.2 MIN.**	**1.0 MIN.**	**1.3 MIN.**	**2.7 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

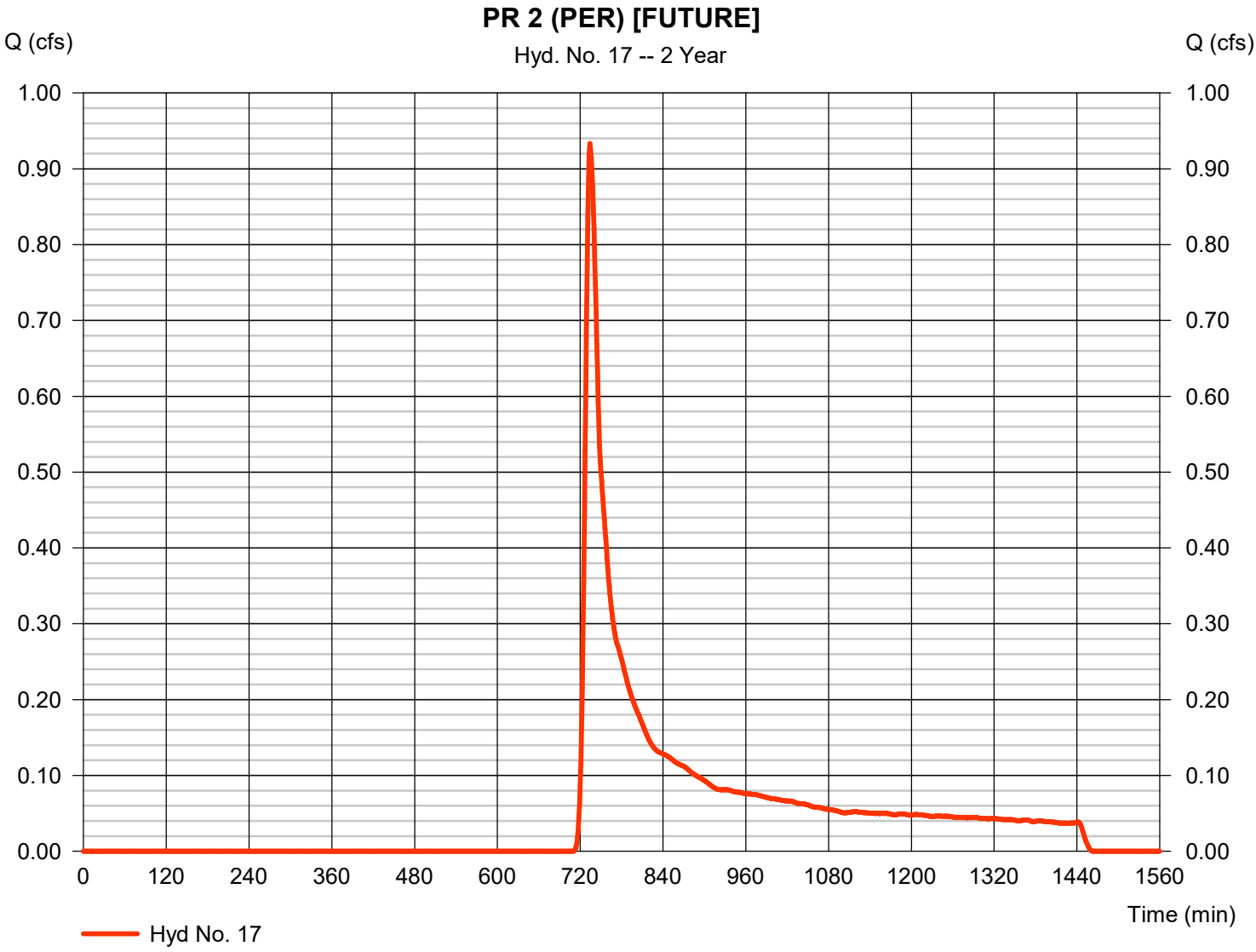
TOTAL SHEET FLOW TIME =	**8.2 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.2 MIN.**	**TIME OF CONCENTRATION=**	**14.3 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 17

PR 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.933 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	4,575 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.30 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

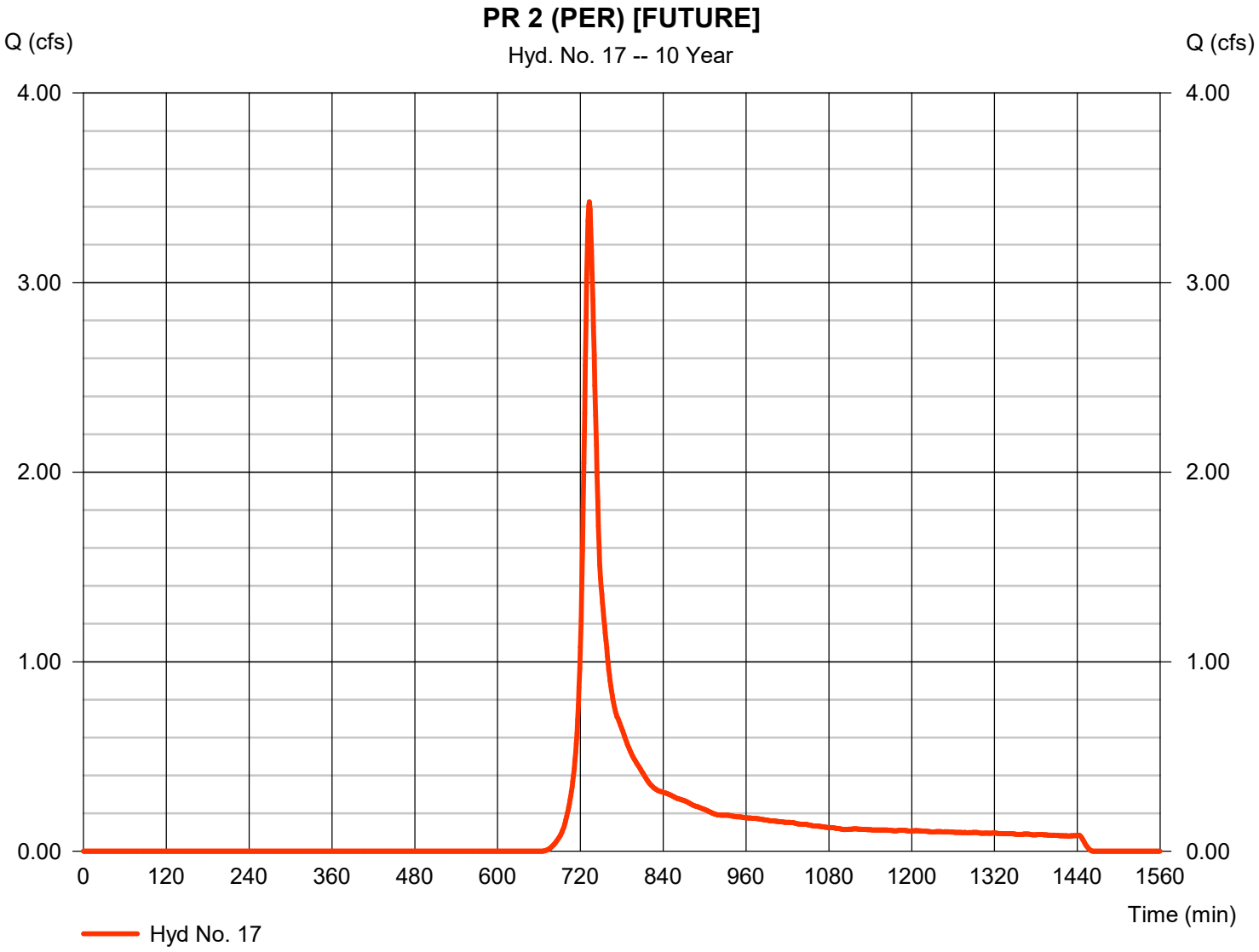


Hydrograph Report

Hyd. No. 17

PR 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.426 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	13,146 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.30 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

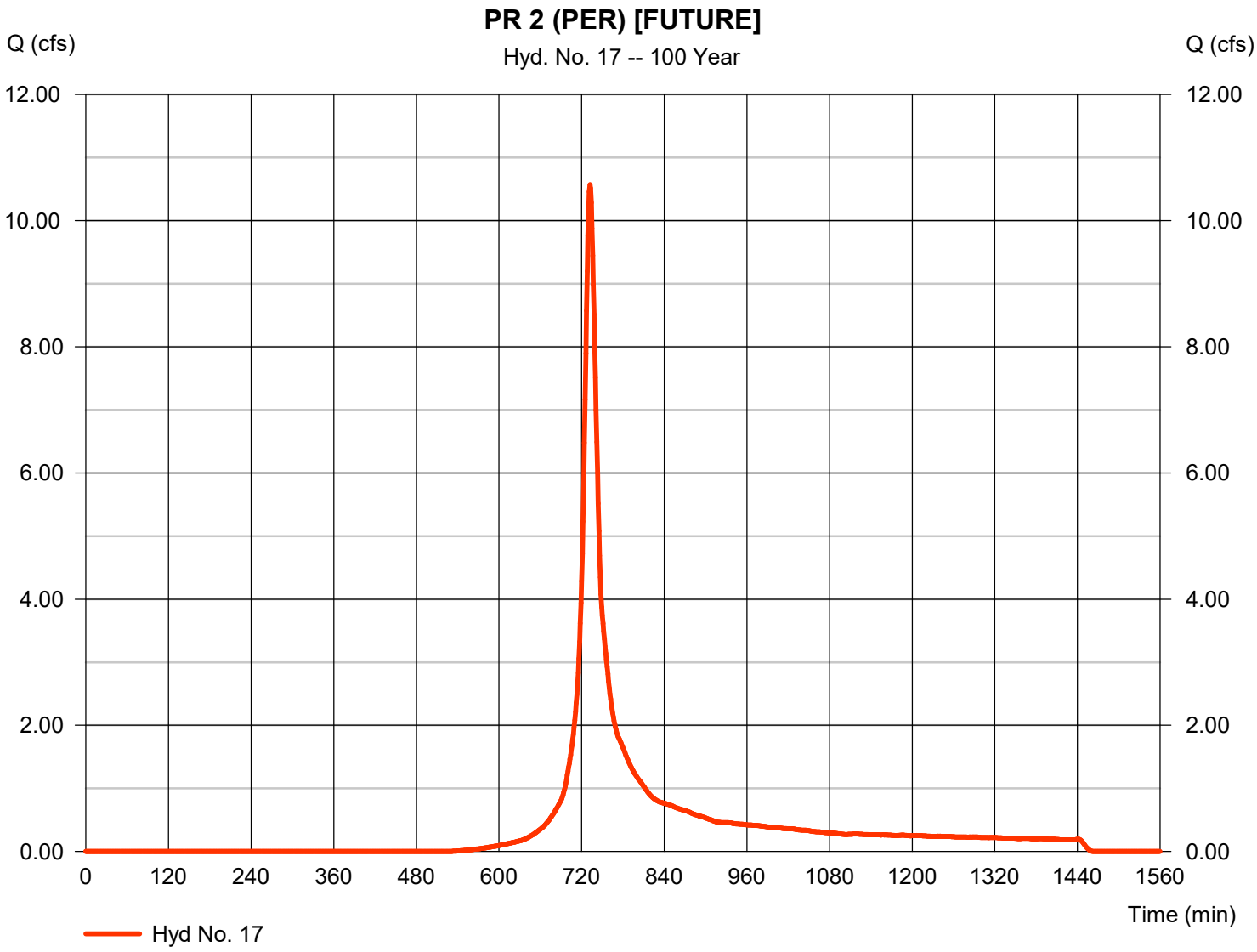


Hydrograph Report

Hyd. No. 17

PR 2 (PER) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.57 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	38,337 cuft
Drainage area	=	1.900 ac	Curve number	=	56
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	14.30 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 2 (IMP) [FUTURE]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	27 (100 MAX)	62 (62 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	4.21	4.21		
LAND SLOPE, S (%)=	1	2.2		
SHEET FLOW TIME, Tc (MIN.)=	**0.5 MIN.**	**8.2 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS	SHORT-GRASS	FOREST
FLOW LENGTH, L (FT)=	18	75	75	130
LAND SLOPE, S (%)=	2.2	33.3	10.7	10
AVERAGE VELOCITY, V (FT/S)=	1.03	4.02	2.28	0.80
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.3 MIN.**	**0.3 MIN.**	**0.5 MIN.**	**2.7 MIN.**

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

TOTAL SHEET FLOW TIME = **8.7 MIN.**

TOTAL SHALLOW CONCENTRATED FLOW TIME = **3.9 MIN.**

TOTAL CHANNEL FLOW TIME = **0.0 MIN.**

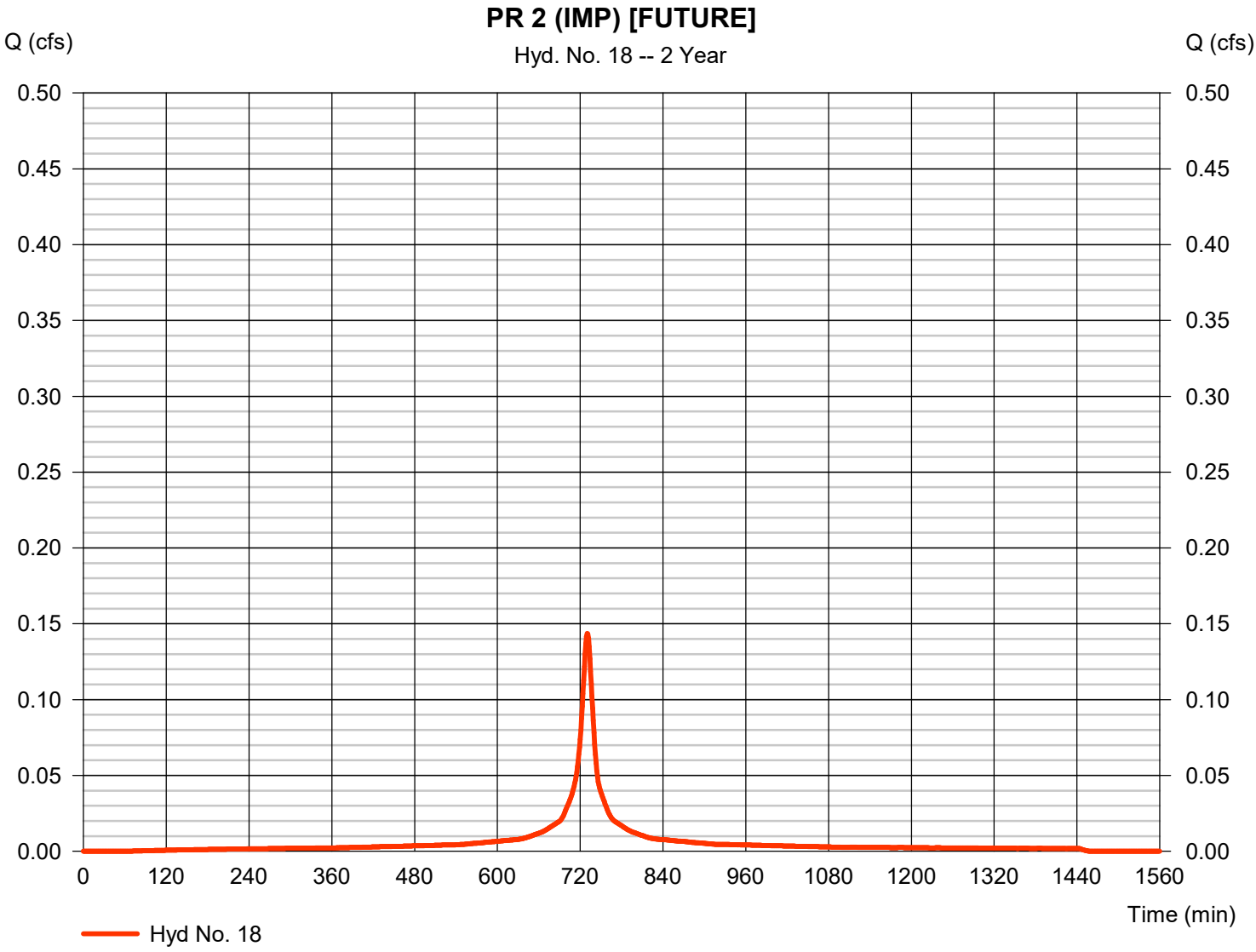
TIME OF CONCENTRATION= 12.5 MIN.

Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.144 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	568 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.50 min
Total precip.	=	4.21 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

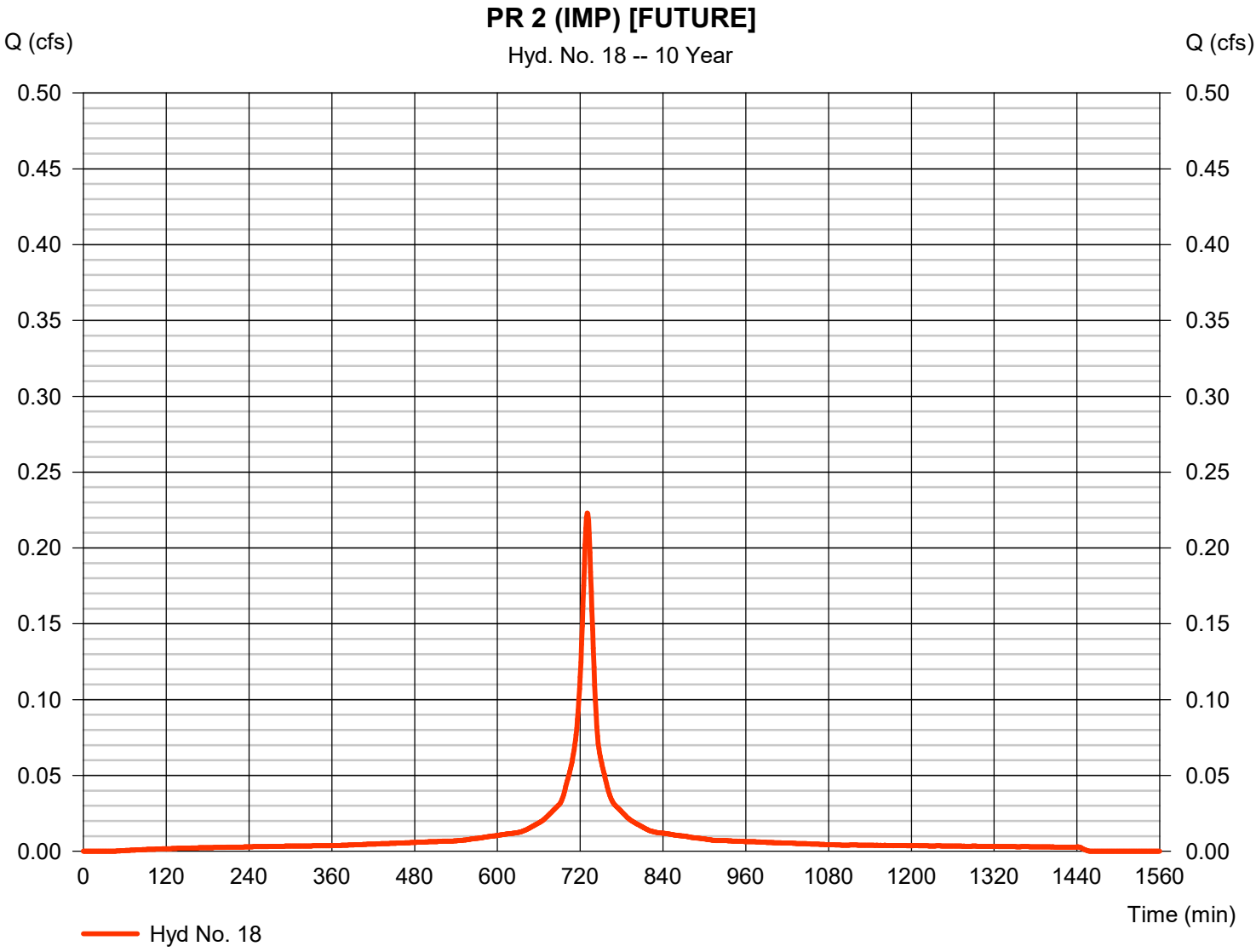


Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.223 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	896 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.50 min
Total precip.	=	6.51 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

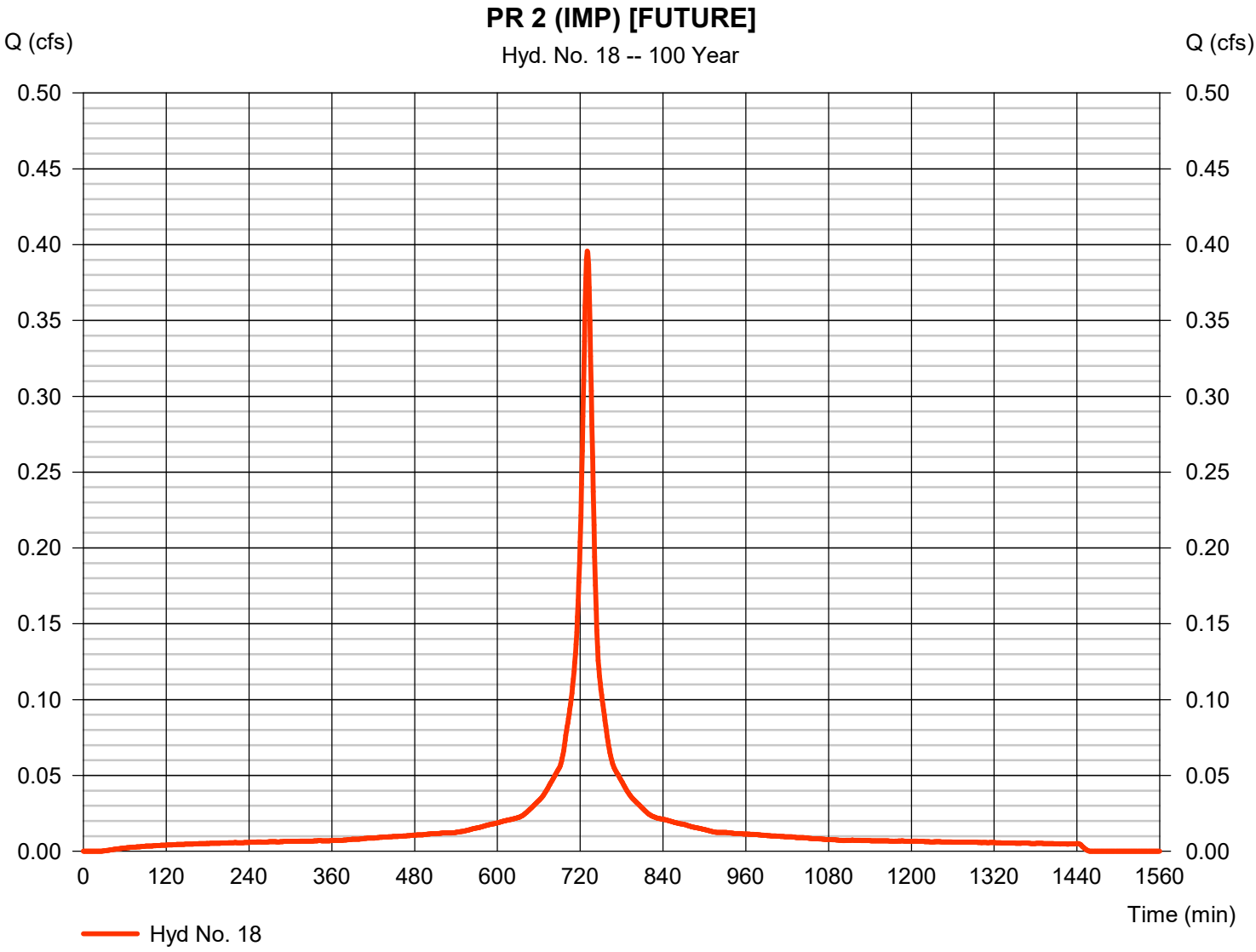


Hydrograph Report

Hyd. No. 18

PR 2 (IMP) [FUTURE]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.396 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	1 min	Hyd. volume	=	1,612 cuft
Drainage area	=	0.040 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.50 min
Total precip.	=	11.52 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484

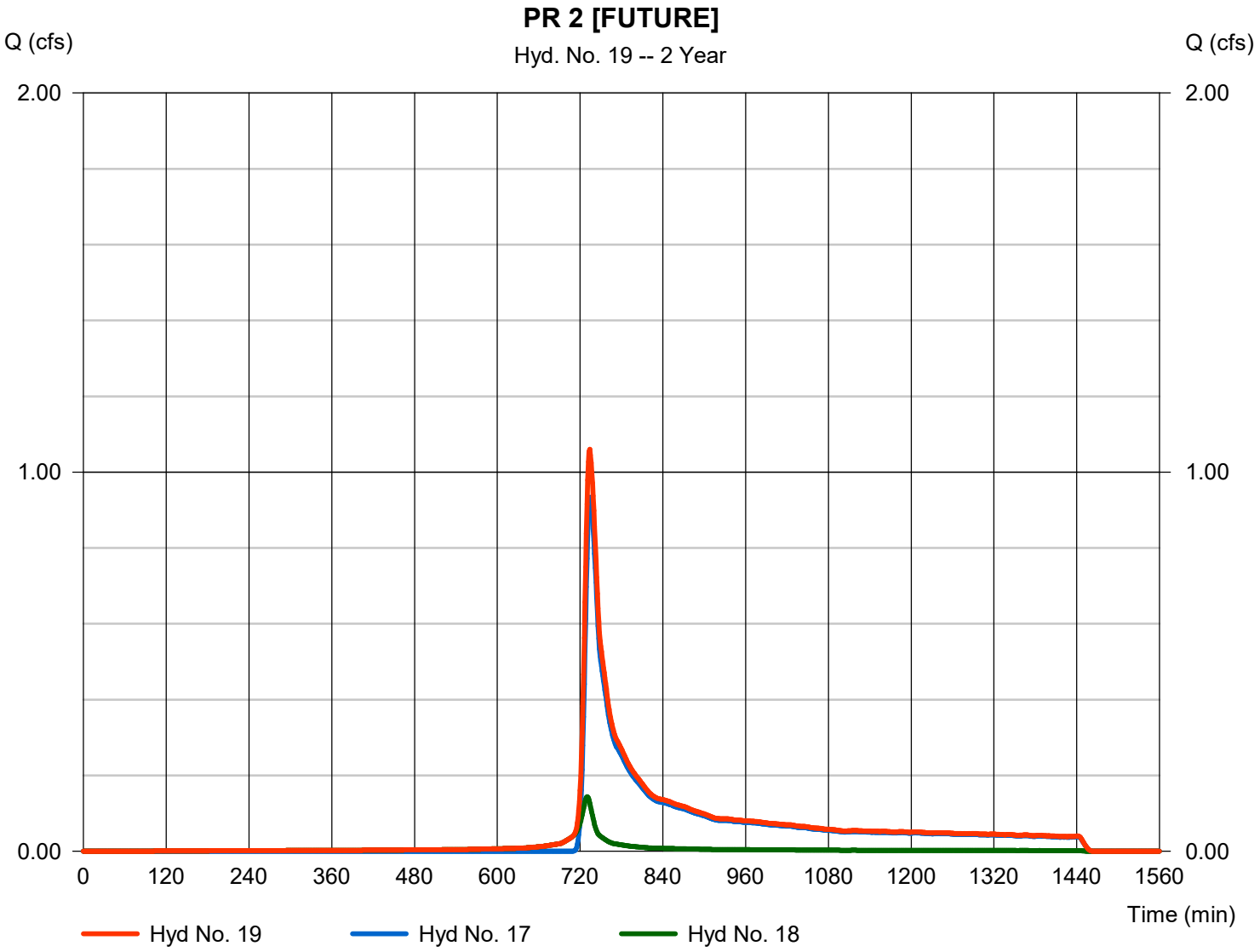


Hydrograph Report

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	1.060 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	1 min	Hyd. volume	=	5,143 cuft
Inflow hyds.	=	17, 18	Contrib. drain. area	=	1.940 ac

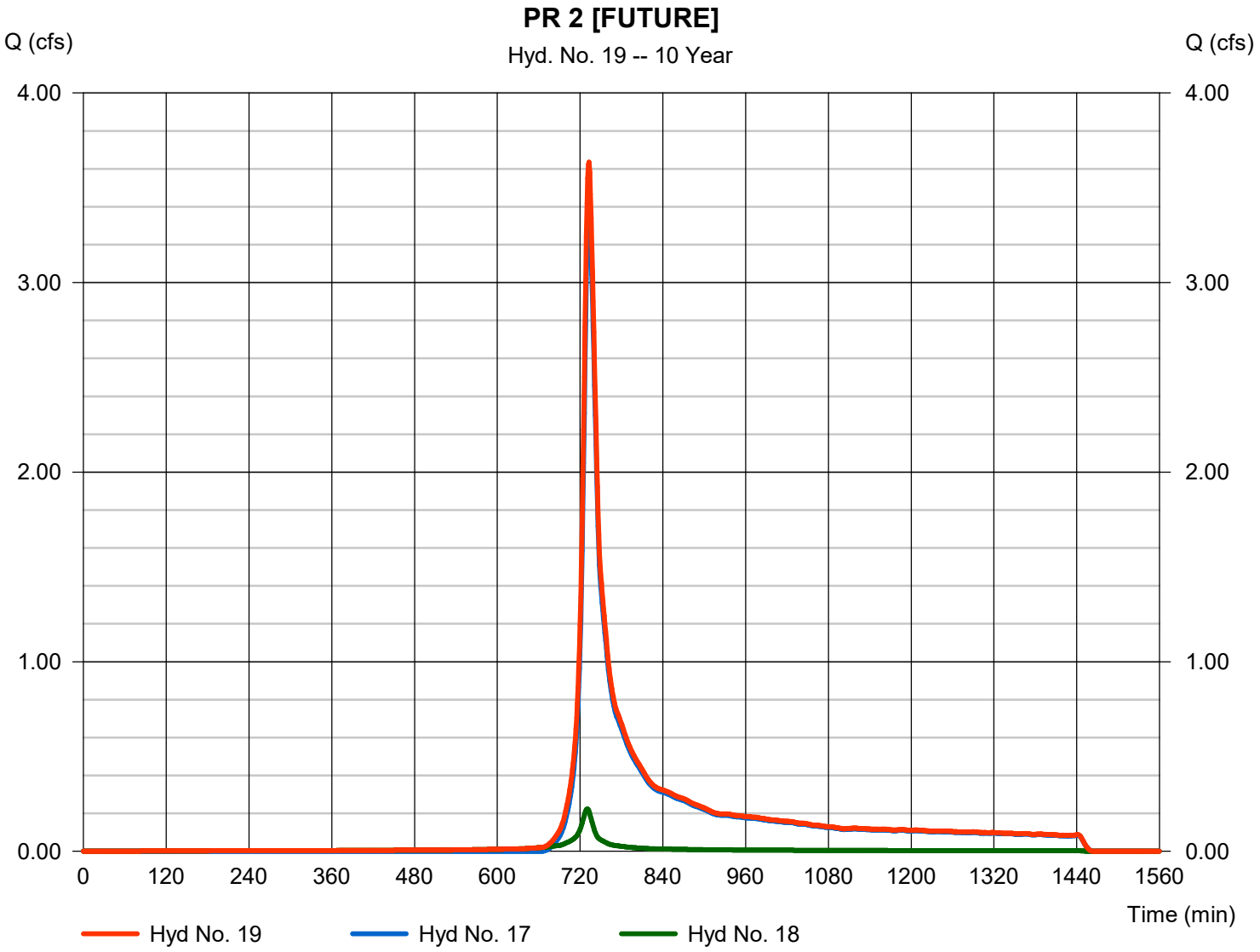


Hydrograph Report

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	3.636 cfs
Storm frequency	=	10 yrs	Time to peak	=	733 min
Time interval	=	1 min	Hyd. volume	=	14,043 cuft
Inflow hyds.	=	17, 18	Contrib. drain. area	=	1.940 ac

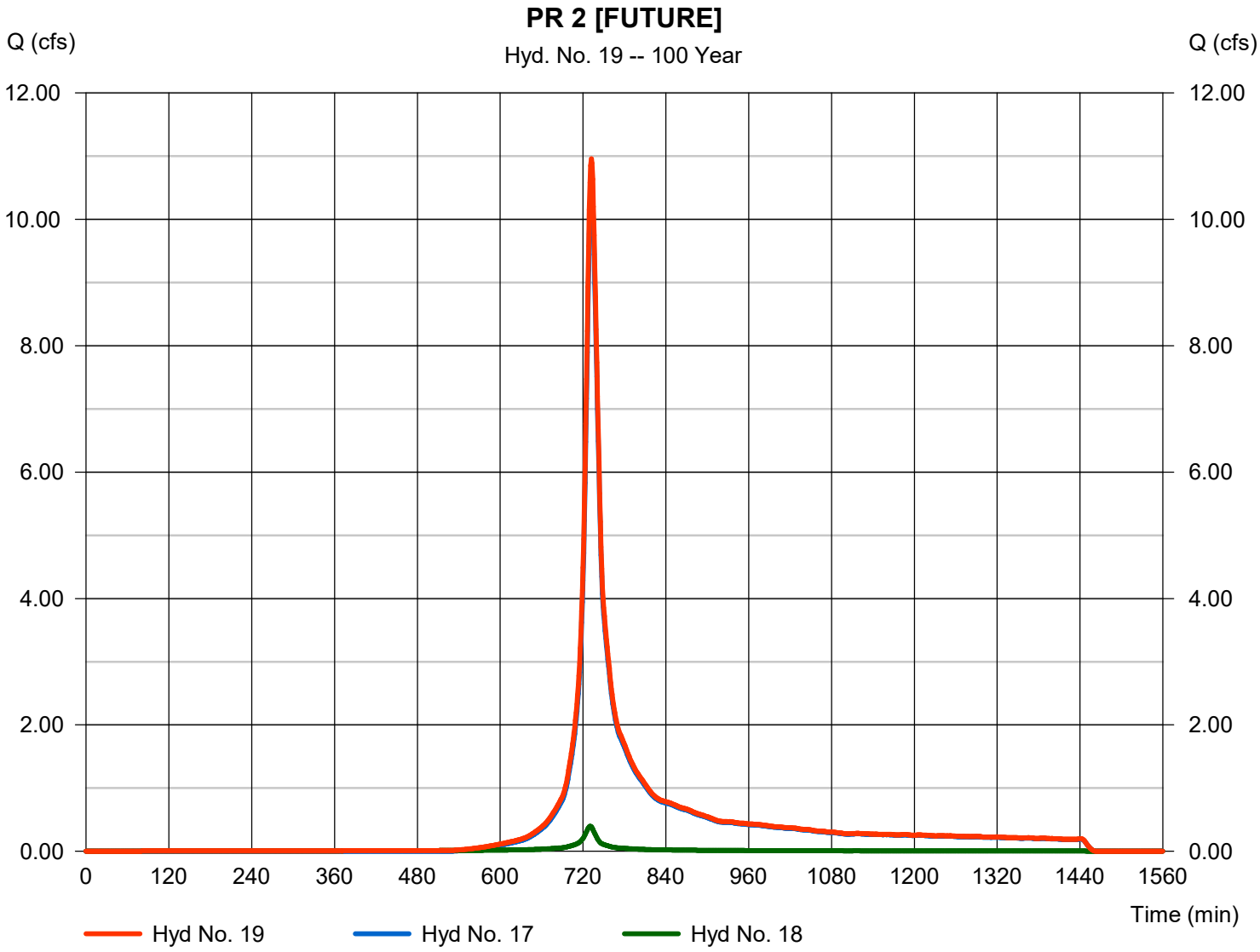


Hydrograph Report

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine	Peak discharge	=	10.96 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	39,949 cuft
Inflow hyds.	=	17, 18	Contrib. drain. area	=	1.940 ac



Multi-Hydrograph Plot

Hyd. No. 6

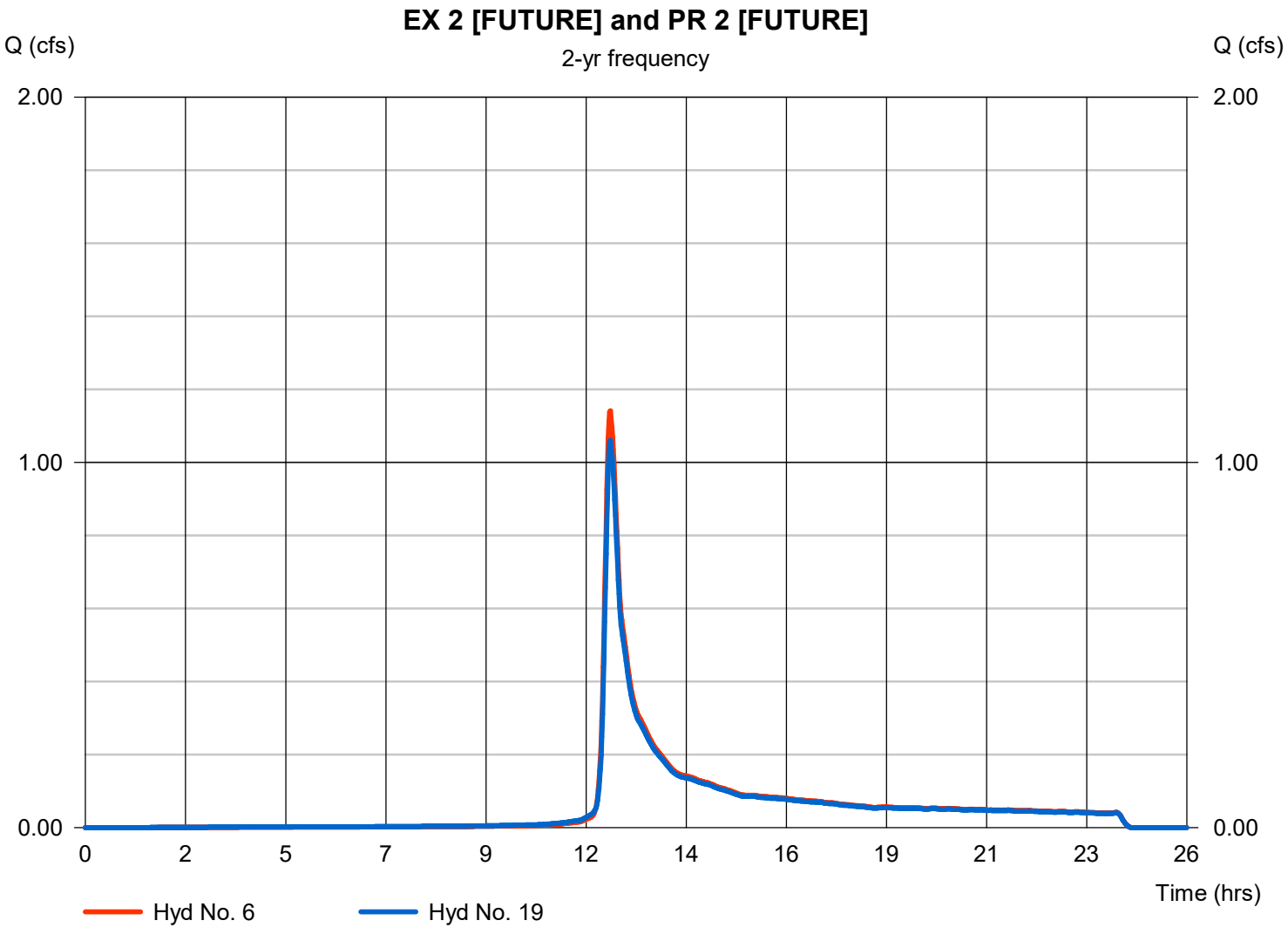
EX 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	1.142 cfs
Time to peak	=	12.23 hrs
Hyd. Volume	=	5,353 cuft

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	1.06 cfs
Time to peak	=	12.23 hrs
Hyd. Volume	=	5,143 cuft



Multi-Hydrograph Plot

Hyd. No. 6

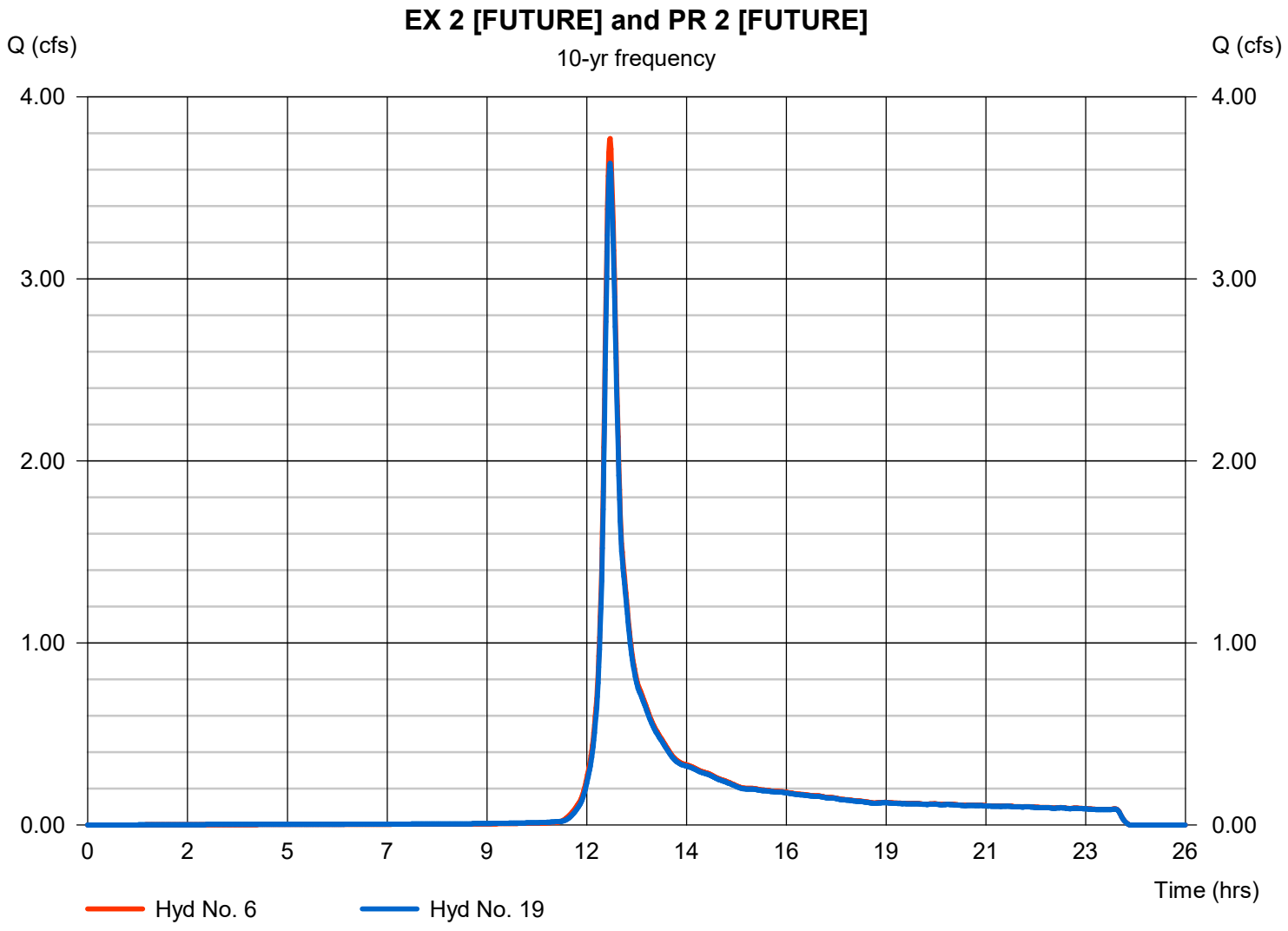
EX 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	3.771 cfs
Time to peak	=	12.22 hrs
Hyd. Volume	=	14,446 cuft

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	3.64 cfs
Time to peak	=	12.22 hrs
Hyd. Volume	=	14,043 cuft



Multi-Hydrograph Plot

Hyd. No. 6

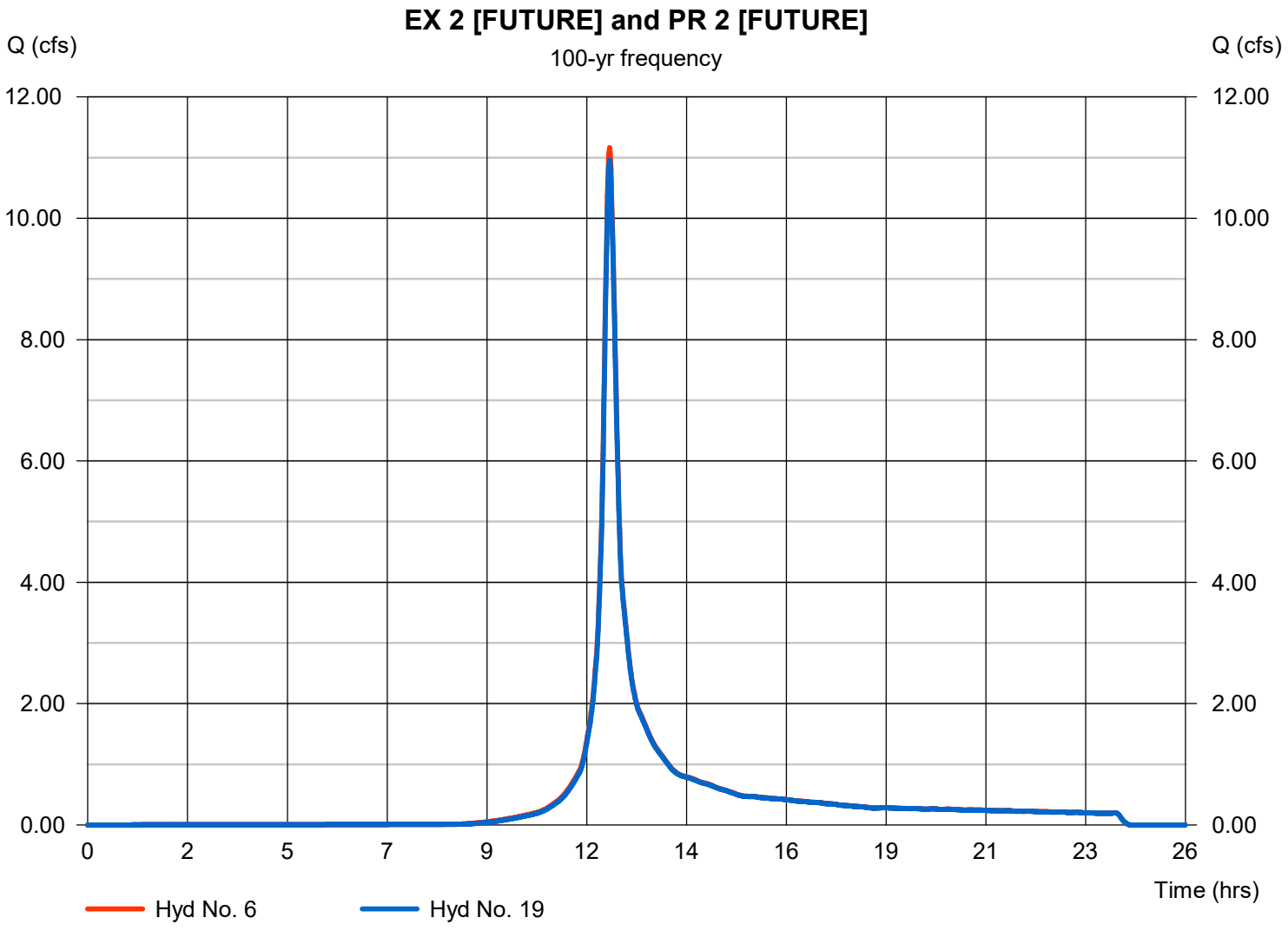
EX 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	11.16 cfs
Time to peak	=	12.20 hrs
Hyd. Volume	=	40,626 cuft

Hyd. No. 19

PR 2 [FUTURE]

Hydrograph type	=	Combine
Peak discharge	=	10.96 cfs
Time to peak	=	12.20 hrs
Hyd. Volume	=	39,949 cuft



APPENDIX E

GROUNDWATER RECHARGE ANALYSIS

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

Annual Groundwater Recharge Analysis (based on GSR-32)

Select Township ↓	Average Annual P (in)	Climatic Factor
MORRIS CO., MENDHAM BORO	50.1	1.73

Project Name:	VEMAN RESIDENCE
Description:	VARIANCE PLAN
Analysis Date:	02/07/24

Pre-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.25	Impervious areas	Gladstone	0.0	-
2	2.38	Open space	Gladstone	18.9	163,098
3	1.1	Brush	Gladstone	20.2	80,800
4	1.73	Woods	Gladstone	19.5	122,155
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.5			Total Annual Recharge (in)	Total Annual Recharge (cu-ft)
				18.5	366,054

Post-Developed Conditions

Land Segment	Area (acres)	TR-55 Land Cover	Soil	Annual Recharge (in)	Annual Recharge (cu.ft)
1	0.33	Impervious areas	Gladstone	0.0	-
2	2.45	Open space	Gladstone	18.9	167,895
3	1.71	Brush	Gladstone	20.2	125,608
4	0.97	Woods	Gladstone	19.5	68,492
5	0				
6	0				
7	0				
8	0				
9	0				
10	0				
11	0				
12	0				
13	0				
14	0				
15	0				
Total =	5.5			Total Annual Recharge (in)	Total Annual Recharge (cu.ft)
				18.3	361,995

Annual Recharge Requirements Calculation ↓

% of Pre-Developed Annual Recharge to Preserve =	100%	Total Impervious Area (sq.ft)
		14,375
Post-Development Annual Recharge Deficit=	***4,059***	(cubic feet)

Recharge Efficiency Parameters Calculations (area averages)

RWC=	6.19	(in)	DRWC=	6.19	(in)
ERWC =	0.84	(in)	EDRWC=	0.84	(in)

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

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

Project Name	Description	Analysis Date	BMP or LID Type
VEMAN RESIDENCE	VARIANCE PLAN	02/07/24	BASIN 1B

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	1270.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	1.1	in
Upper level of the BMP surface (negative if above ground)	dBMPu	-4.9	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	0.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	2	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.74	in
ERWC Modified to consider dEXC	EDRWC	0.74	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.58	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.10	in
Inches of Rainfall to capture	Pdesign	0.16	in
Recharge Provided Avg. over Imp. Area		3.4	in
Runoff Captured Avg. over imp. Area		7.4	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.09	unitless
BMP Volume	VBMP	118	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Parameter	Symbol	Value	Unit
Post-D Deficit Recharge (or desired recharge volume)	Vdef	4,059	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	14,375	sq.ft
Root Zone Water Capacity	RWC	5.48	in
RWC Modified to consider dEXC	DRWC	5.48	in
Climatic Factor	C-factor	1.73	no units
Average Annual P	Pavg	50.1	in
Recharge Requirement over Imp. Area	dr	3.4	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		4,059	cu.ft
Avg BMP Recharge Efficiency		45.6%	Represents % Infiltration Recharged
%Rainfall became Runoff		78.7%	%
%Runoff Infiltrated		18.9%	%
%Runoff Recharged		8.6%	%
%Rainfall Recharged		6.8%	%

OTHER NOTES

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

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

Project Name	Description	Analysis Date	BMP or LID Type
VEMAN RESIDENCE	VARIANCE PLAN	02/07/24	BASIN 1C

Recharge BMP Input Parameters

Parameter	Symbol	Value	Unit
BMP Area	ABMP	187.0	sq.ft
BMP Effective Depth, this is the design variable	dBMP	3.3	in
Upper level of the BMP surface (negative if above ground)	dBMPu	51.0	in
Depth of lower surface of BMP, must be>=dBMPu	dEXC	78.0	in
Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined	SegBMP	2	unitless

Root Zone Water capacity Calculated Parameters

Parameter	Symbol	Value	Unit
Empty Portion of RWC under Post-D Natural Recharge	ERWC	0.74	in
ERWC Modified to consider dEXC	EDRWC	0.00	in
Empty Portion of RWC under Infilt. BMP	RERWC	0.00	in

Recharge Design Parameters

Parameter	Symbol	Value	Unit
Inches of Runoff to capture	Qdesign	0.05	in
Inches of Rainfall to capture	Pdesign	0.10	in
Recharge Provided Avg. over Imp. Area		3.4	in
Runoff Captured Avg. over imp. Area		3.4	in

BMP Calculated Size Parameters

ABMP/Aimp	Aratio	0.01	unitless
BMP Volume	VBMP	51	cu.ft

CALCULATION CHECK MESSAGES

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

Parameters from Annual Recharge Worksheet

Post-D Deficit Recharge (or desired recharge volume)	Vdef	4,059	cu.ft
Post-D Impervious Area (or target Impervious Area)	Aimp	14,375	sq.ft
Root Zone Water Capacity	RWC	5.48	in
RWC Modified to consider dEXC	DRWC	0.00	in
Climatic Factor	C-factor	1.73	no units
Average Annual P	Pavg	50.1	in
Recharge Requirement over Imp. Area	dr	3.4	in

System Performance Calculated Parameters

Annual BMP Recharge Volume		4,059	cu.ft
Avg BMP Recharge Efficiency		100.0%	Represents % Infiltration Recharged
%Rainfall became Runoff		78.7%	%
%Runoff Infiltrated		8.6%	%
%Runoff Recharged		8.6%	%
%Rainfall Recharged		6.8%	%

OTHER NOTES

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

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

APPENDIX F

GROUNDWATER MOUNDING ANALYSIS

GROUNDWATER MOUNDING ANALYSIS

- ANALYSIS PERFORMED USING USGS SCIENTIFIC INVESTIGATION REPORT 2010 - 5102 HANTUSH SPREADSHEET.

- INPUT DATA PER NJDEP "GROUNDWATER TABLE HYDRAULIC IMPACT ASSESSMENT GUIDE FOR INFILTRATION BMPS," JANUARY 2019 (DRAFT) AND USGS SCIENTIFIC INVESTIGATIONS REPORT 2010 - 5102 "SIMULATION OF GROUNDWATER MOUNDING

- SPECIFIC YIELD (S_Y) VALUES OF 0.20 FOR SANDY LOAM SOILS BASED ON DISCUSSIONS WITH NJDOT. DEFAULT S_Y VALUES OF 0.15 USED FOR ALL OTHER SOILS.

-DEFAULT VALUES OF 10 FT USED FOR INITIAL THICKNESS OF SATURATED ZONE (H_I).

INFILTRATION BASIN PR 1B:

RECHARGE (R) = 2.0 IN/HR x 0.5 = 1 IN/HR

USE S_Y = 0.15 (DEFAULT) H_I = 10 FT (DEFAULT)

HORIZONTAL HYDRAULIC CONDUCTIVITY (Kh) = R = 1 IN/HR (OUTSIDE THE COSTAL PLAN)

BASIN DIMENSIONS (X,Y) = X = 75 FT Y = 20 FT

DURATION OF INFILTRATION (t) :

BASIN BOTTOM AREA= 1,270 SF

VOLUME AT ORIFICE (V) = 732 CF

$$t = \frac{V \times 12\ IN/FT}{AREA \times R} = \frac{732\ CF \times 12\ IN/FT}{1270\ SF \times 1\ IN/HR} = 6.9\ HOURS$$

SUBSURFACE INFILTRATION BASIN PR 1C:

RECHARGE (R) = 2.0 IN/HR x 0.5 = 1 IN/HR

USE S_Y = 0.15 (DEFAULT) H_I = 10 FT (DEFAULT)

HORIZONTAL HYDRAULIC CONDUCTIVITY (Kh) = R = 1 IN/HR (OUTSIDE THE COSTAL PLAN)

BASIN DIMENSIONS (X,Y) = X = 35 FT Y = 5 FT

DURATION OF INFILTRATION (t) :

BASIN BOTTOM AREA= 187 SF

VOLUME AT ORIFICE (V) = 263 CF

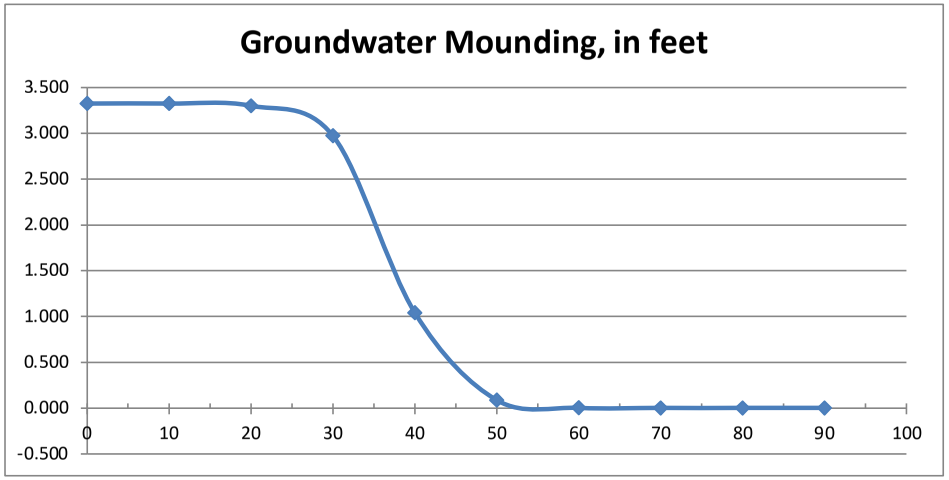
$$t = \frac{V \times 12\ IN/FT}{AREA \times R} = \frac{263\ CF \times 12\ IN/FT}{187\ SF \times 1\ IN/HR} = 16.9\ HOURS$$

Input Values

1.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
1.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
37.500	x	1/2 length of basin (x direction, in feet)
10.000	y	1/2 width of basin (y direction, in feet)
6.90	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)
13.325	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
3.325	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
3.325	0
3.325	10
3.300	20
2.973	30
1.040	40
0.088	50
0.004	60
0.001	70
0.001	80
0.001	90

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

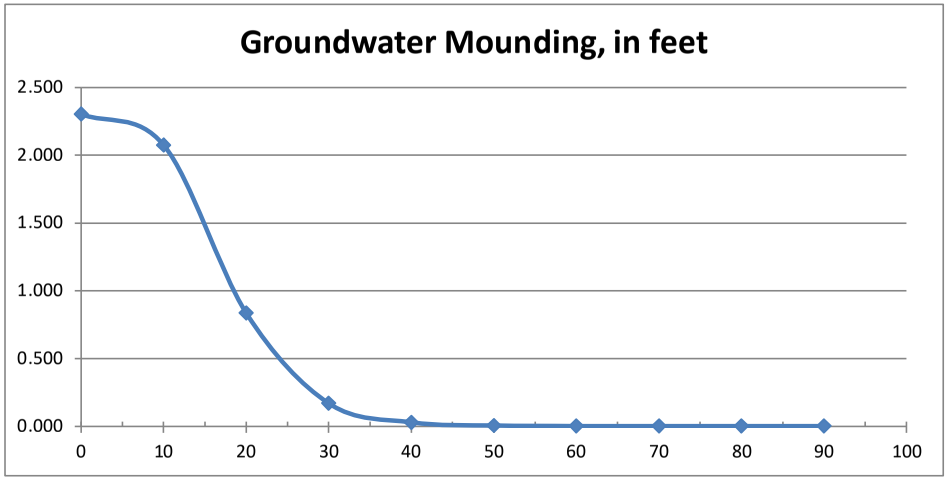
Input Values

1.00	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
1.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
17.500	x	1/2 length of basin (x direction, in feet)
2.666	y	1/2 width of basin (y direction, in feet)
16.90	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

12.303	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.303	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.303	0
2.074	10
0.836	20
0.170	30
0.029	40
0.006	50
0.003	60
0.003	70
0.003	80
0.003	90

Re-Calculate Now



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GROUNDWATER MOUNDING ANALYSIS

SURFACE INFILTRATION BASIN 1B MOUNDING RESULTS:

SEASONAL HIGH GROUNDWATER ELEVATION= 629 PER SOIL TESTING
MOUND AT BASIN = 3.3 (PER HANTUSH SPREADSHEET)
GROUNDWATER MOUND ELEVATION= 632.3
BASIN BOTTOM ELEVATION= 632 > 632.3 [CHECK DRAIN TIME]

SUBSURFACE INFILTRATION BASIN PR 1C MOUNDING RESULTS:

SEASONAL HIGH GROUNDWATER ELEVATION= 633 PER SOIL TESTING
MOUND AT BASIN = 2.3 (PER HANTUSH SPREADSHEET)
GROUNDWATER MOUND ELEVATION= 635.3
BASIN BOTTOM ELEVATION= 635.75 > 635.3 [OK]

MOUND AT BUILDING = 0.6 (22 FT FROM BASIN CENTER)
GROUNDWATER MOUND ELEVATION = 633.6
FLOOR ELEVATION = 635.6 > 633.6 [OK]

BASIN DRAIN TIME CALCULATIONS

INFILTRATION BASIN PR 1B DRAIN TIME:

DRAIN TIME WITHOUT MOUND =

FOR t = 12.0 HRS ; $R = \frac{732\ CF \times 12\ IN/FT}{1270\ SF \times 12.0\ HRS}$ = 0.58 IN/HR [12 HRS < 72 HRS] [OK]

SEASONAL HIGH GROUNDWATER ELEVATION = 629
MOUND AT BASIN = 3 (PER HANTUSH SPREADSHEET)
GROUNDWATER MOUND ELEVATION = 632
BASIN BOTTM ELEVATION = 632 > 632 [OK]

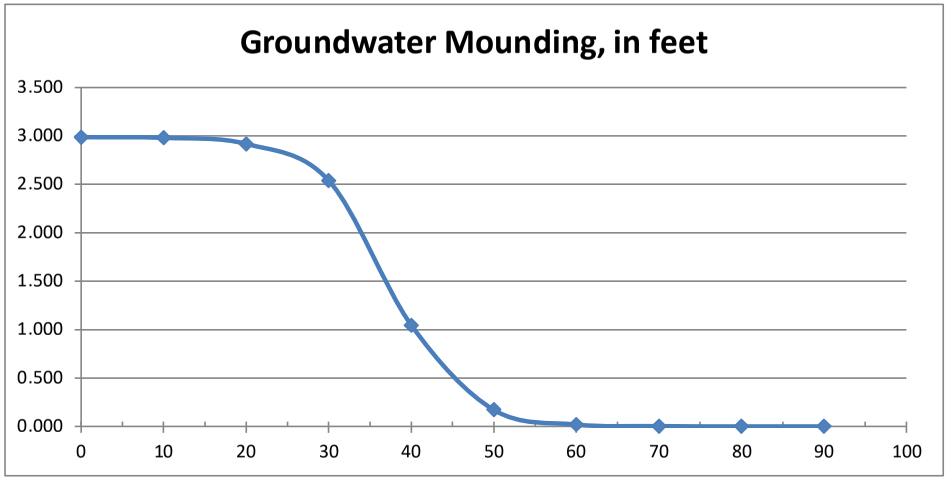
Input Values

0.58	R	Recharge rate (permeability rate) (in/hr)
0.150	Sy	Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted
1.00	Kh	Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan
37.500	x	1/2 length of basin (x direction, in feet)
10.000	y	1/2 width of basin (y direction, in feet)
12.00	t	Duration of infiltration period (hours)
10.00	hi(0)	Initial thickness of saturated zone (feet)

12.986	h(max)	Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
2.986	Δh(max)	Maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
2.986	0
2.979	10
2.917	20
2.537	30
1.044	40
0.173	50
0.019	60
0.002	70
0.001	80
0.001	90

Re-Calculate Now



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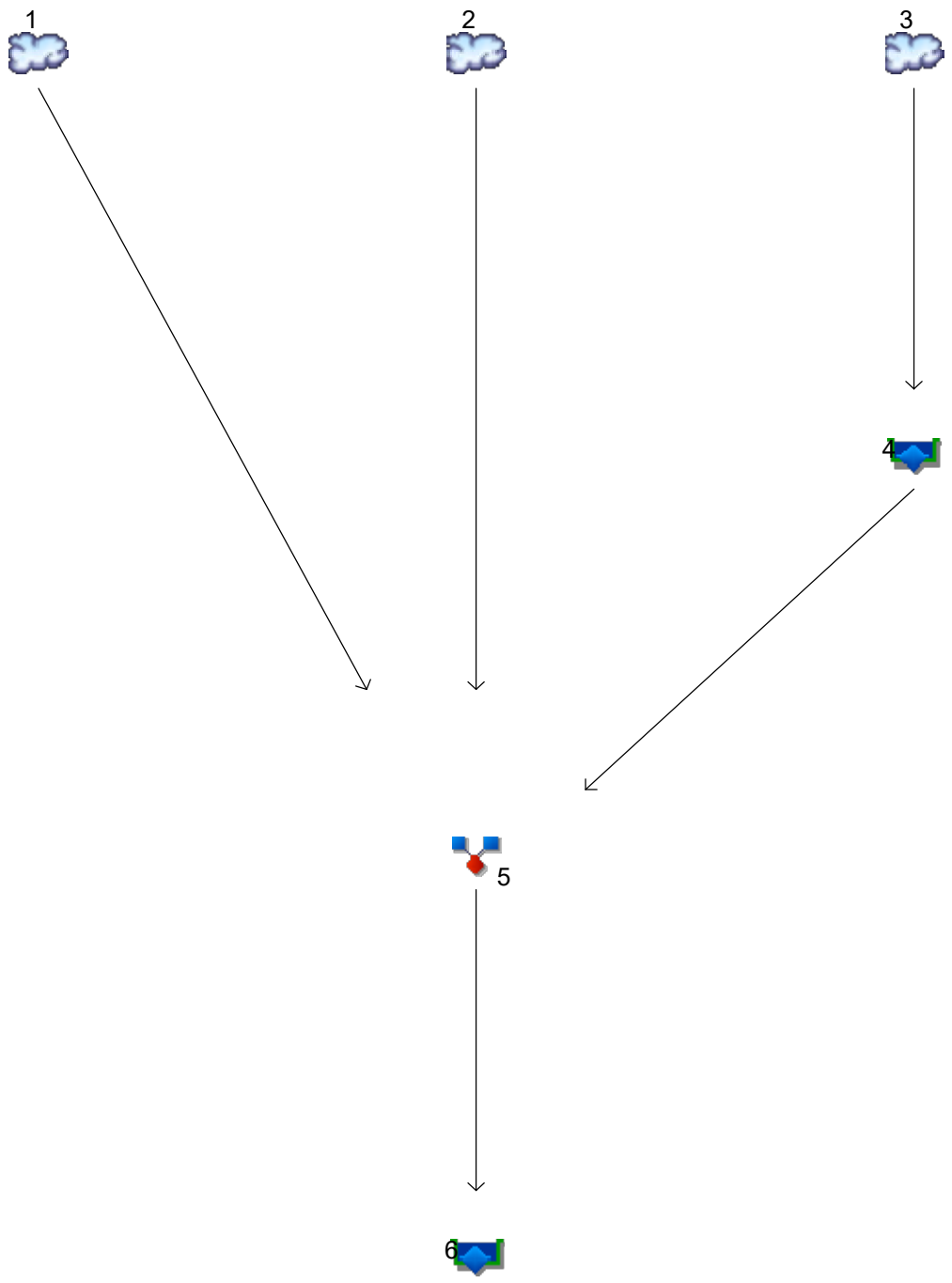
APPENDIX G

WATER QUALITY DESIGN STORM

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	PR 1B (PER) [WQ]
2	SCS Runoff	PR 1B (IMP) [WQ]
3	SCS Runoff	PR 1C [WQ]
4	Reservoir	BASIN 1C [WQ]
5	Combine	PR 1B [WQ]
6	Reservoir	BASIN 1B [WQ]

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	------	0.000	-------	-------	-------	-------	-------	-------	-------	PR 1B (PER) [WQ]
2	SCS Runoff	------	0.232	-------	-------	-------	-------	-------	-------	-------	PR 1B (IMP) [WQ]
3	SCS Runoff	------	0.091	-------	-------	-------	-------	-------	-------	-------	PR 1C [WQ]
4	Reservoir	3	0.000	-------	-------	-------	-------	-------	-------	-------	BASIN 1C [WQ]
5	Combine	1, 2, 4	0.232	-------	-------	-------	-------	-------	-------	-------	PR 1B [WQ]
6	Reservoir	5	0.000	-------	-------	-------	-------	-------	-------	-------	BASIN 1B [WQ]

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.000	1	n/a	0	------	------	------	PR 1B (PER) [WQ]
2	SCS Runoff	0.232	1	728	732	------	------	------	PR 1B (IMP) [WQ]
3	SCS Runoff	0.091	1	726	246	------	------	------	PR 1C [WQ]
4	Reservoir	0.000	1	631	0	3	636.71	125	BASIN 1C [WQ]
5	Combine	0.232	1	728	732	1, 2, 4	------	------	PR 1B [WQ]
6	Reservoir	0.000	1	n/a	0	5	632.41	732	BASIN 1B [WQ]

CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1B PER

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
OPEN SPACE GOOD CONDITION	B	61	0.63	38.5
WOODS	B	55	0.05	2.8
BRUSH	B	48	0.26	12.3
Total			**Σ= 0.9**	**Σ= 53.6**

$$CN = \frac{53.6}{0.9} = 57$$

DRAINAGE AREA DESIGNATION: PR 1B IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.16	15.5
Total			**Σ= 0.2**	**Σ= 15.5**

$$CN = \frac{15.5}{0.2} = 98$$

NOTE: BASIN AREA IS NOT INCLUDED IN THE CONTRIBUTARY DRAINAGE AREA

BASIN AREA = 0.15 ACRES

CONTRIBUTARY DRAINAGE AREA= 0.95 ACRES

TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (PER) [WQ]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.24			
FLOW LENGTH, L (FT, 100 MAX)=	59 (59 MAX)			
2-YR, 24 HR RAIN, P_2 (IN.)=	3.51			
LAND SLOPE, S (%)=	2			
SHEET FLOW TIME, Tc (MIN.)=	**8.9 MIN.**			

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	FOREST		
FLOW LENGTH, L (FT)=	87	165		
LAND SLOPE, S (%)=	6.9	4.2		
AVERAGE VELOCITY, V (FT/S)=	1.83	0.52		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.8 MIN.**	**5.3 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=	15			
CROSS SECTIONAL AREA, a (SF)=	1.23			
WETTER PERIMETER, Pw (FT)=	3.93			
HYDRAULIC RADIUS, r (FT)=	0.31			
CHANNEL SLOPE, S (%)=	2			
MANNINGS N-VALUE (n)=	0.01			
VELOCITY, V (FT/S)=	9.70			
FLOW LENGTH, L (FT)=	115			
CHANNEL FLOW TIME, T_c (MIN.)=	**0.2 MIN.**			

TOTAL SHEET FLOW TIME =	**8.9 MIN.**
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**6.1 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.2 MIN.**

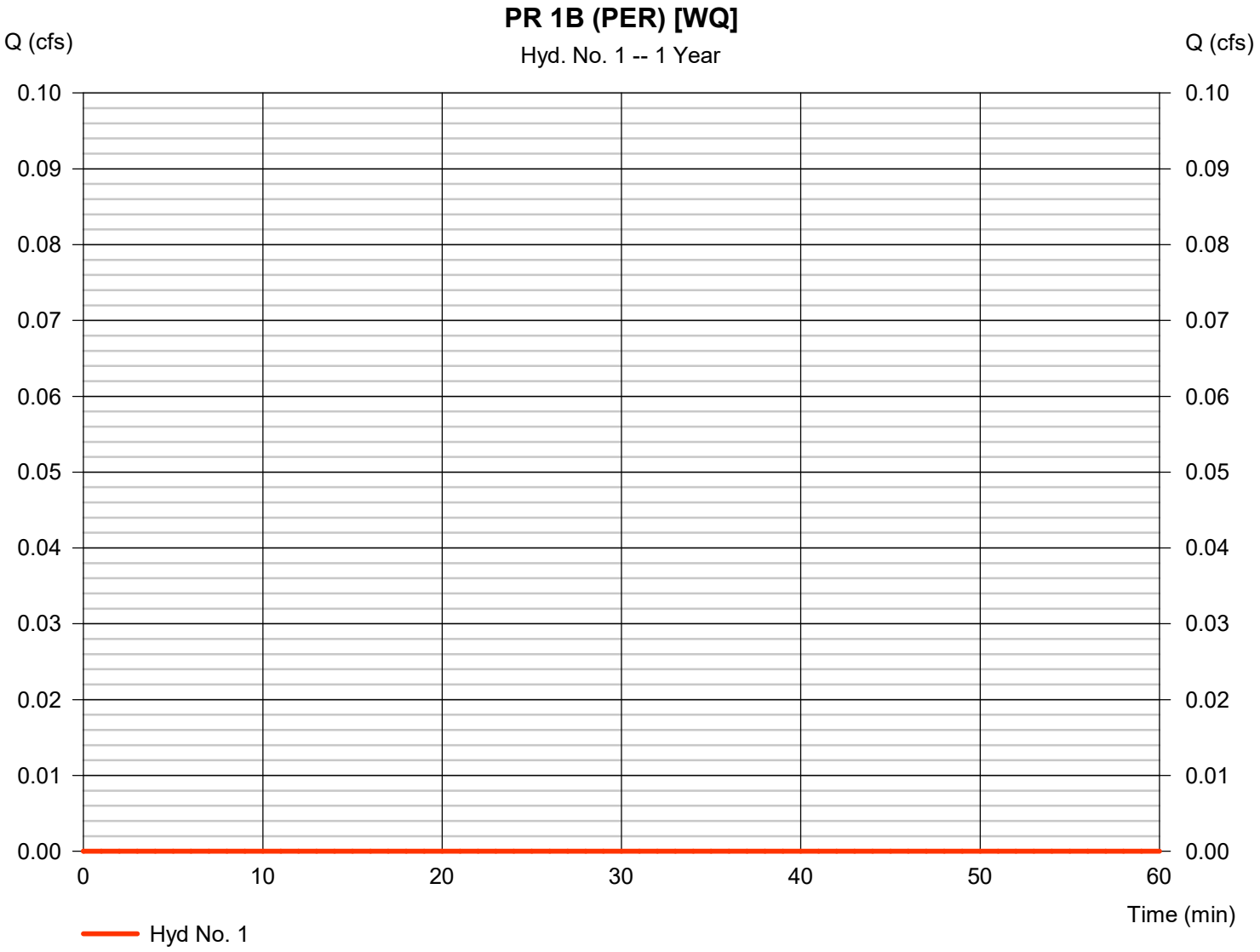
TIME OF CONCENTRATION= 15.3 MIN.

Hydrograph Report

Hyd. No. 1

PR 1B (PER) [WQ]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Drainage area	=	0.900 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.30 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



TIME OF CONCENTRATION CALCULATIONS

DRAINAGE AREA: PR 1B (IMP) [WQ]

SHEET FLOW:

$$T_C = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,S^{0.4}}$$

	A	B	C	D
MANNINGS N-VALUE, n=	0.011	0.24		
FLOW LENGTH, L (FT, 100 MAX)=	60 (100 MAX)	40 (59 MAX)		
2-YR, 24 HR RAIN, P_2 (IN.)=	3.51	3.51		
LAND SLOPE, S (%)=	3	2		
SHEET FLOW TIME, Tc (MIN.)=	**0.7 MIN.**	**6.5 MIN.**		

SHALLOW CONCENTRATED FLOW:

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

	A	B	C	D
FLOW TYPE PER NEH-4 PART 630, TABLE 15-3=	SHORT-GRASS	SHORT-GRASS		
FLOW LENGTH, L (FT)=	35	22		
LAND SLOPE, S (%)=	2	33		
AVERAGE VELOCITY, V (FT/S)=	0.98	4.00		
IALLOW CONCENTRATED FLOW TIME, T_C (MIN.)=	**0.6 MIN.**	**0.1 MIN.**		

CHANNEL FLOW:

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

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

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

	A	B	C	D
PIPE DIAMETER, D (IN)=				
CROSS SECTIONAL AREA, a (SF)=				
WETTER PERIMETER, Pw (FT)=				
HYDRAULIC RADIUS, r (FT)=				
CHANNEL SLOPE, S (%)=				
MANNINGS N-VALUE (n)=				
VELOCITY, V (FT/S)=				
FLOW LENGTH, L (FT)=				
CHANNEL FLOW TIME, T_c (MIN.)=				

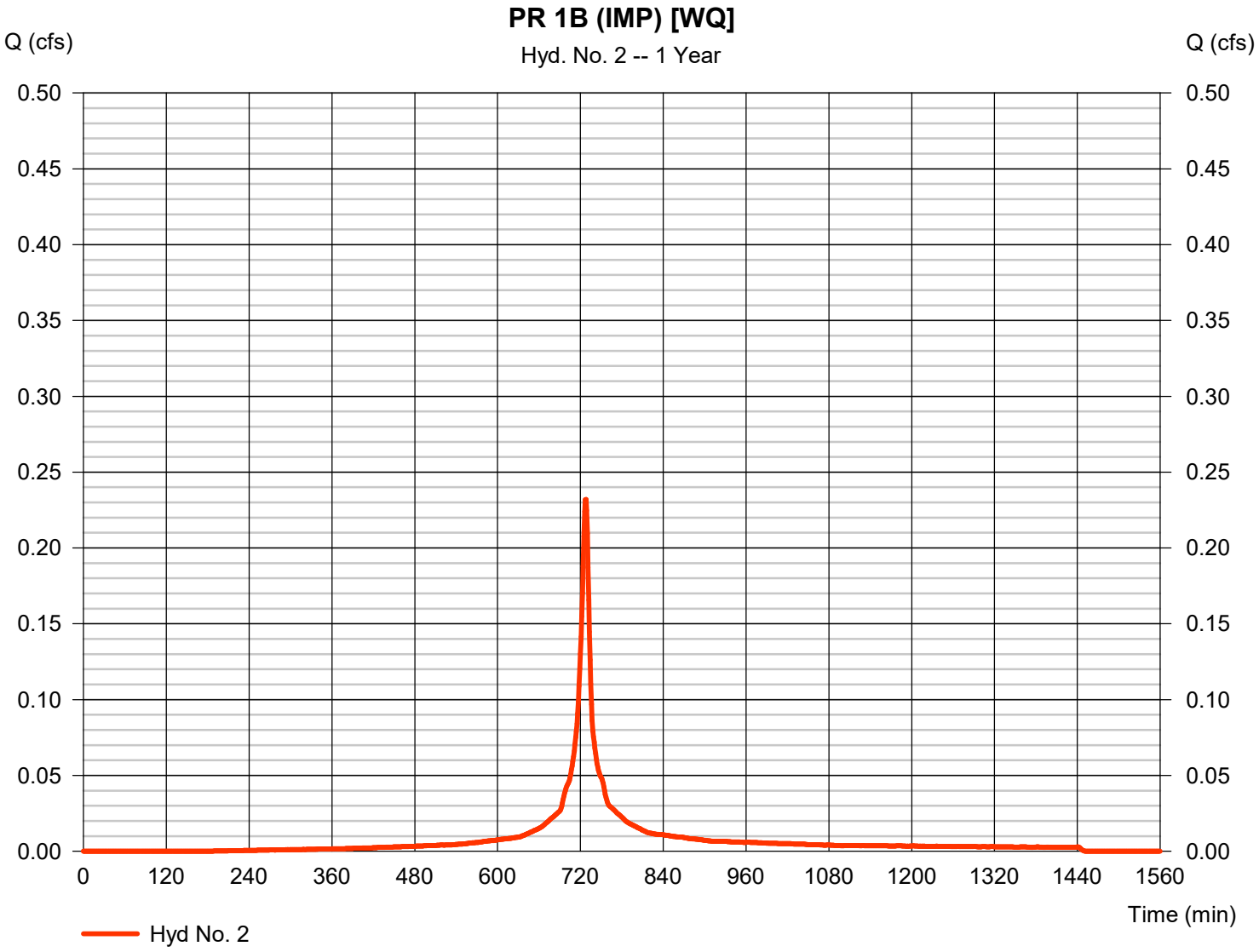
TOTAL SHEET FLOW TIME =	**7.2 MIN.**		
TOTAL SHALLOW CONCENTRATED FLOW TIME =	**0.7 MIN.**	**TIME OF CONCENTRATION=**	**7.9 MIN.**
TOTAL CHANNEL FLOW TIME =	**0.0 MIN.**		

Hydrograph Report

Hyd. No. 2

PR 1B (IMP) [WQ]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.232 cfs
Storm frequency	=	1 yrs	Time to peak	=	728 min
Time interval	=	1 min	Hyd. volume	=	732 cuft
Drainage area	=	0.200 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	7.90 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



CURVE NUMBER CALCULATIONS:

*REFER TO THE ATTACHED WEB SOIL SURVEY MAP AND INFORATION.

DRAINAGE AREA DESIGNATION: PR 1C IMP

COVER TYPE	SOIL GROUP	CN	AREA	A x CN
IMPERVIOUS AREA	B	98	0.07	7.1
Total			**Σ= 0.1**	**Σ= 7.1**

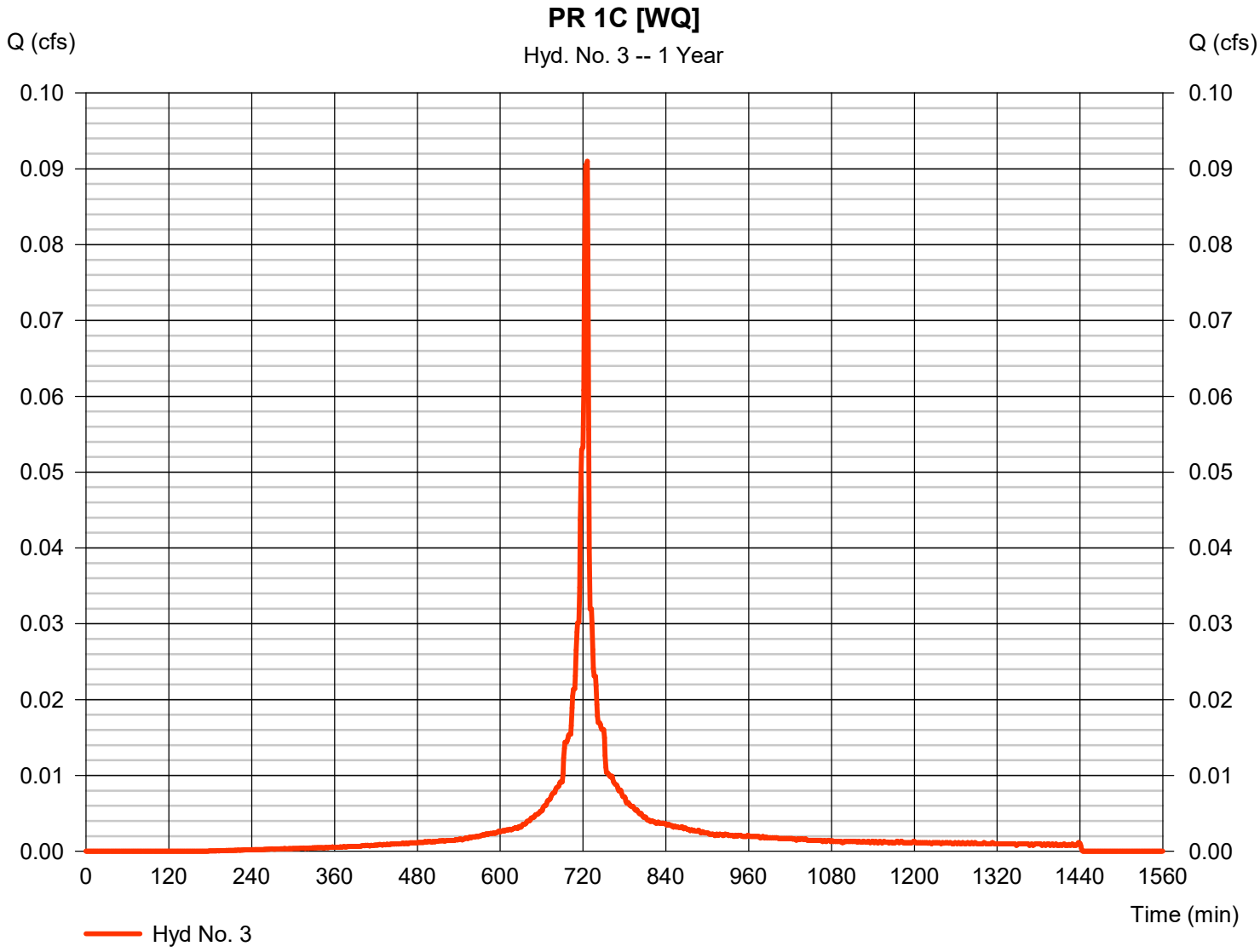
$$CN = \frac{7.1}{0.1} = 98$$

Hydrograph Report

Hyd. No. 3

PR 1C [WQ]

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.091 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	246 cuft
Drainage area	=	0.070 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	1.60 min
Total precip.	=	1.25 in	Distribution	=	Custom
Storm duration	=	J:\sdsk\PROJ\22\22208\STM\NOAA Table	Shape factor	=	484



Hydrograph Report

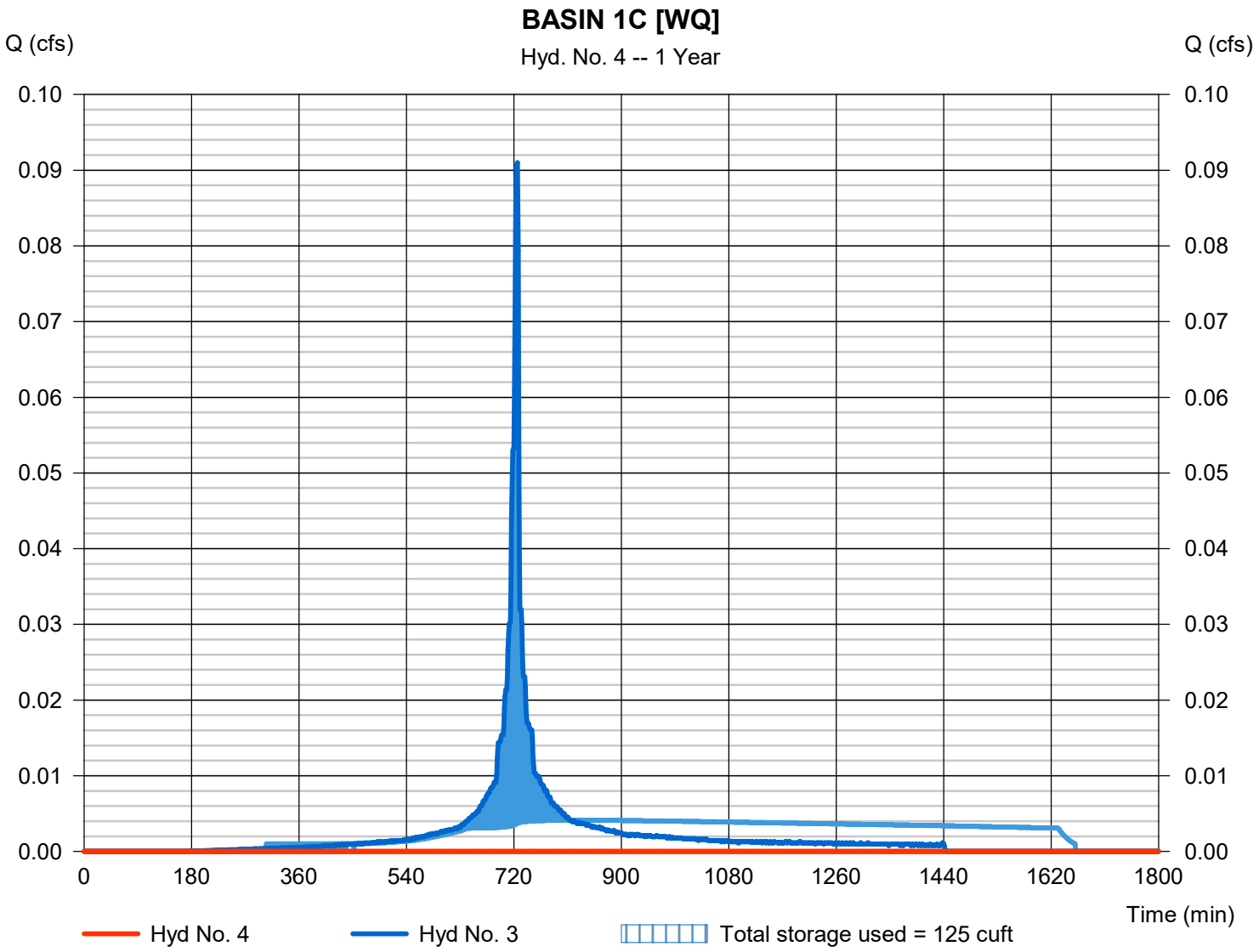
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Hyd. No. 4

BASIN 1C [WQ]

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 1 yrs	Time to peak	= 631 min
Time interval	= 1 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - PR 1C [WQ]	Max. Elevation	= 636.71 ft
Reservoir name	= BASIN 1C	Max. Storage	= 125 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Pond No. 2 - BASIN 1C

Pond Data

UG Chambers -Invert elev. = 636.75 ft, Rise x Span = 2.54 x 4.33 ft, Barrel Len = 4.92 ft, No. Barrels = 5, Slope = 0.00%, Headers = No
Encasement -Invert elev. = 635.75 ft, Width = 5.33 ft, Height = 3.54 ft, Voids = 100.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	635.75	n/a	0	0
0.35	636.10	n/a	46	46
0.71	636.46	n/a	46	93
1.06	636.81	n/a	46	139
1.42	637.17	n/a	46	186
1.77	637.52	n/a	46	232
2.12	637.87	n/a	46	279
2.48	638.23	n/a	46	325
2.83	638.58	n/a	46	371
3.19	638.94	n/a	46	418
3.54	639.29	n/a	46	464

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 638.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 1.000 (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	635.75	0.00	---	---	---	---	---	---	---	0.000	---	0.000
0.04	5	635.79	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.07	9	635.82	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.11	14	635.86	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.14	19	635.89	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.18	23	635.93	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.21	28	635.96	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.25	32	636.00	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.28	37	636.03	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.32	42	636.07	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.35	46	636.10	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.39	51	636.14	0.00	---	---	---	---	---	---	---	0.003	---	0.003
0.42	56	636.17	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.46	60	636.21	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.50	65	636.25	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.53	70	636.28	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.57	74	636.32	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.60	79	636.35	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.64	84	636.39	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.67	88	636.42	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.71	93	636.46	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.74	97	636.49	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.78	102	636.53	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.81	107	636.56	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.85	111	636.60	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.88	116	636.64	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.92	121	636.67	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.96	125	636.71	0.00	---	---	---	---	---	---	---	0.004	---	0.004
0.99	130	636.74	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.03	135	636.78	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.06	139	636.81	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.10	144	636.85	0.00	---	---	---	---	---	---	---	0.004	---	0.004

Continues on next page...

BASIN 1C

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
1.13	149	636.88	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.17	153	636.92	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.20	158	636.95	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.24	162	636.99	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.27	167	637.02	0.00	---	---	---	---	---	---	---	0.004	---	0.004
1.31	172	637.06	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.35	176	637.10	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.38	181	637.13	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.42	186	637.17	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.45	190	637.20	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.49	195	637.24	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.52	200	637.27	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.56	204	637.31	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.59	209	637.34	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.63	214	637.38	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.66	218	637.41	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.70	223	637.45	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.73	227	637.48	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.77	232	637.52	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.81	237	637.56	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.84	241	637.59	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.88	246	637.63	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.91	251	637.66	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.95	255	637.70	0.00	---	---	---	---	---	---	---	0.005	---	0.005
1.98	260	637.73	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.02	265	637.77	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.05	269	637.80	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.09	274	637.84	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.12	279	637.87	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.16	283	637.91	0.00	---	---	---	---	---	---	---	0.005	---	0.005
2.19	288	637.94	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.23	292	637.98	0.00	---	---	---	---	---	---	---	0.006	---	0.006
2.27	297	638.02	0.00 ic	---	---	---	---	---	---	---	0.006	---	0.007
2.30	302	638.05	0.01 ic	---	---	---	---	---	---	---	0.006	---	0.017
2.34	306	638.09	0.03 ic	---	---	---	---	---	---	---	0.006	---	0.039
2.37	311	638.12	0.06 ic	---	---	---	---	---	---	---	0.006	---	0.071
2.41	316	638.16	0.11 ic	---	---	---	---	---	---	---	0.006	---	0.113
2.44	320	638.19	0.16 ic	---	---	---	---	---	---	---	0.006	---	0.164
2.48	325	638.23	0.22 ic	---	---	---	---	---	---	---	0.006	---	0.225
2.51	330	638.26	0.29 ic	---	---	---	---	---	---	---	0.006	---	0.295
2.55	334	638.30	0.37 ic	---	---	---	---	---	---	---	0.006	---	0.373
2.58	339	638.33	0.45 ic	---	---	---	---	---	---	---	0.006	---	0.459
2.62	344	638.37	0.55 ic	---	---	---	---	---	---	---	0.006	---	0.552
2.65	348	638.41	0.65 ic	---	---	---	---	---	---	---	0.006	---	0.653
2.69	353	638.44	0.75 ic	---	---	---	---	---	---	---	0.006	---	0.759
2.73	357	638.48	0.87 ic	---	---	---	---	---	---	---	0.006	---	0.873
2.76	362	638.51	0.98 ic	---	---	---	---	---	---	---	0.006	---	0.991
2.80	367	638.55	1.11 ic	---	---	---	---	---	---	---	0.006	---	1.113
2.83	371	638.58	1.23 ic	---	---	---	---	---	---	---	0.006	---	1.238
2.87	376	638.62	1.36 ic	---	---	---	---	---	---	---	0.006	---	1.368
2.90	381	638.65	1.49 ic	---	---	---	---	---	---	---	0.006	---	1.501
2.94	385	638.69	1.63 ic	---	---	---	---	---	---	---	0.006	---	1.635
2.97	390	638.72	1.76 ic	---	---	---	---	---	---	---	0.006	---	1.771
3.01	395	638.76	1.90 ic	---	---	---	---	---	---	---	0.006	---	1.904
3.04	399	638.79	2.03 ic	---	---	---	---	---	---	---	0.007	---	2.037
3.08	404	638.83	2.16 ic	---	---	---	---	---	---	---	0.007	---	2.168
3.12	409	638.87	2.29 ic	---	---	---	---	---	---	---	0.007	---	2.294
3.15	413	638.90	2.41 ic	---	---	---	---	---	---	---	0.007	---	2.414
3.19	418	638.94	2.52 ic	---	---	---	---	---	---	---	0.007	---	2.524
3.22	422	638.97	2.61 ic	---	---	---	---	---	---	---	0.007	---	2.621
3.26	427	639.01	2.69 ic	---	---	---	---	---	---	---	0.007	---	2.699
3.29	432	639.04	2.78 ic	---	---	---	---	---	---	---	0.007	---	2.791
3.33	436	639.08	2.87 ic	---	---	---	---	---	---	---	0.007	---	2.880
3.36	441	639.11	2.96 ic	---	---	---	---	---	---	---	0.007	---	2.967
3.40	446	639.15	3.04 ic	---	---	---	---	---	---	---	0.007	---	3.052
3.43	450	639.18	3.13 ic	---	---	---	---	---	---	---	0.007	---	3.134
3.47	455	639.22	3.21 ic	---	---	---	---	---	---	---	0.007	---	3.214
3.50	460	639.25	3.28 ic	---	---	---	---	---	---	---	0.007	---	3.292
3.54	464	639.29	3.36 ic	---	---	---	---	---	---	---	0.007	---	3.368

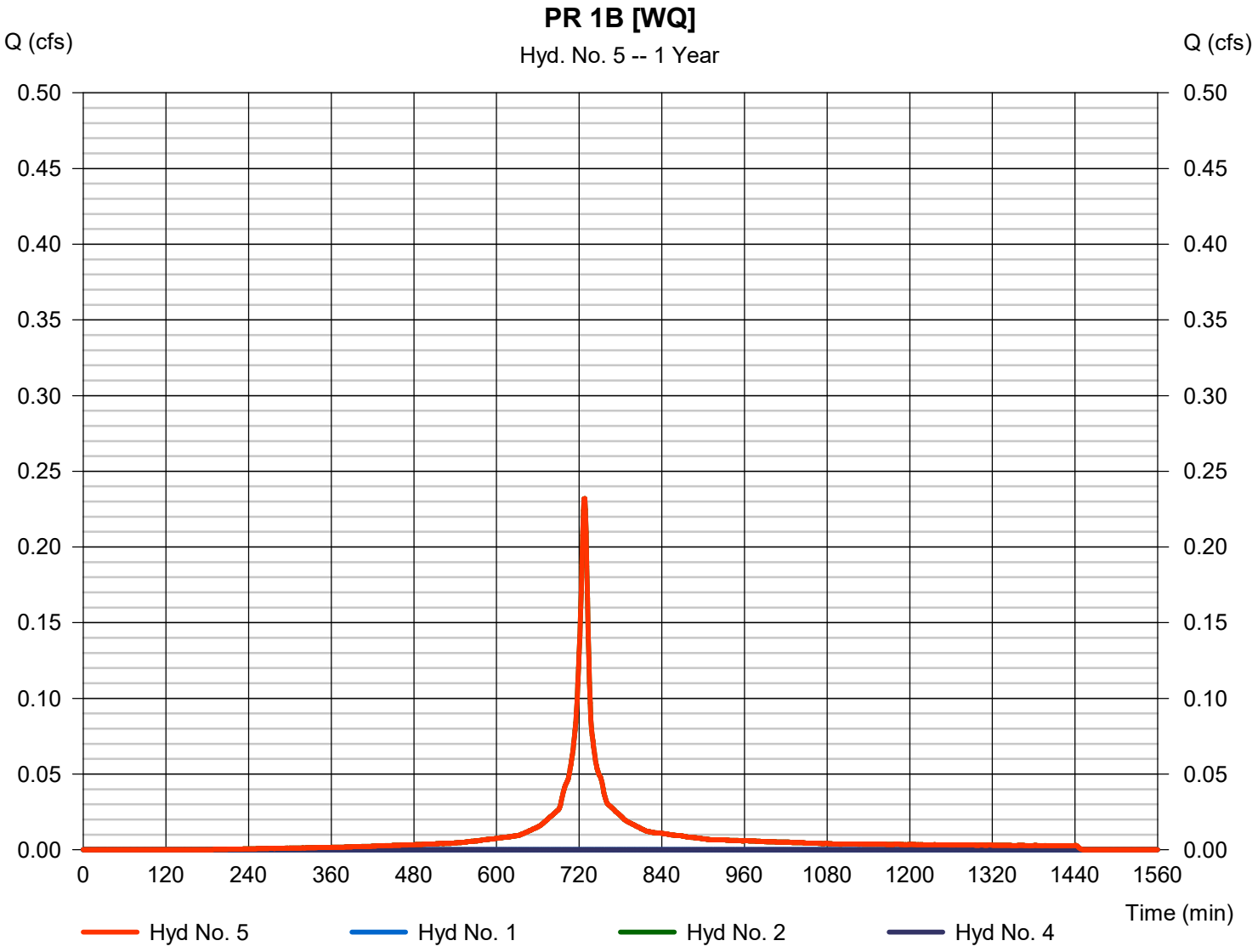
...End

Hydrograph Report

Hyd. No. 5

PR 1B [WQ]

Hydrograph type	= Combine	Peak discharge	= 0.232 cfs
Storm frequency	= 1 yrs	Time to peak	= 728 min
Time interval	= 1 min	Hyd. volume	= 732 cuft
Inflow hyds.	= 1, 2, 4	Contrib. drain. area	= 1.100 ac



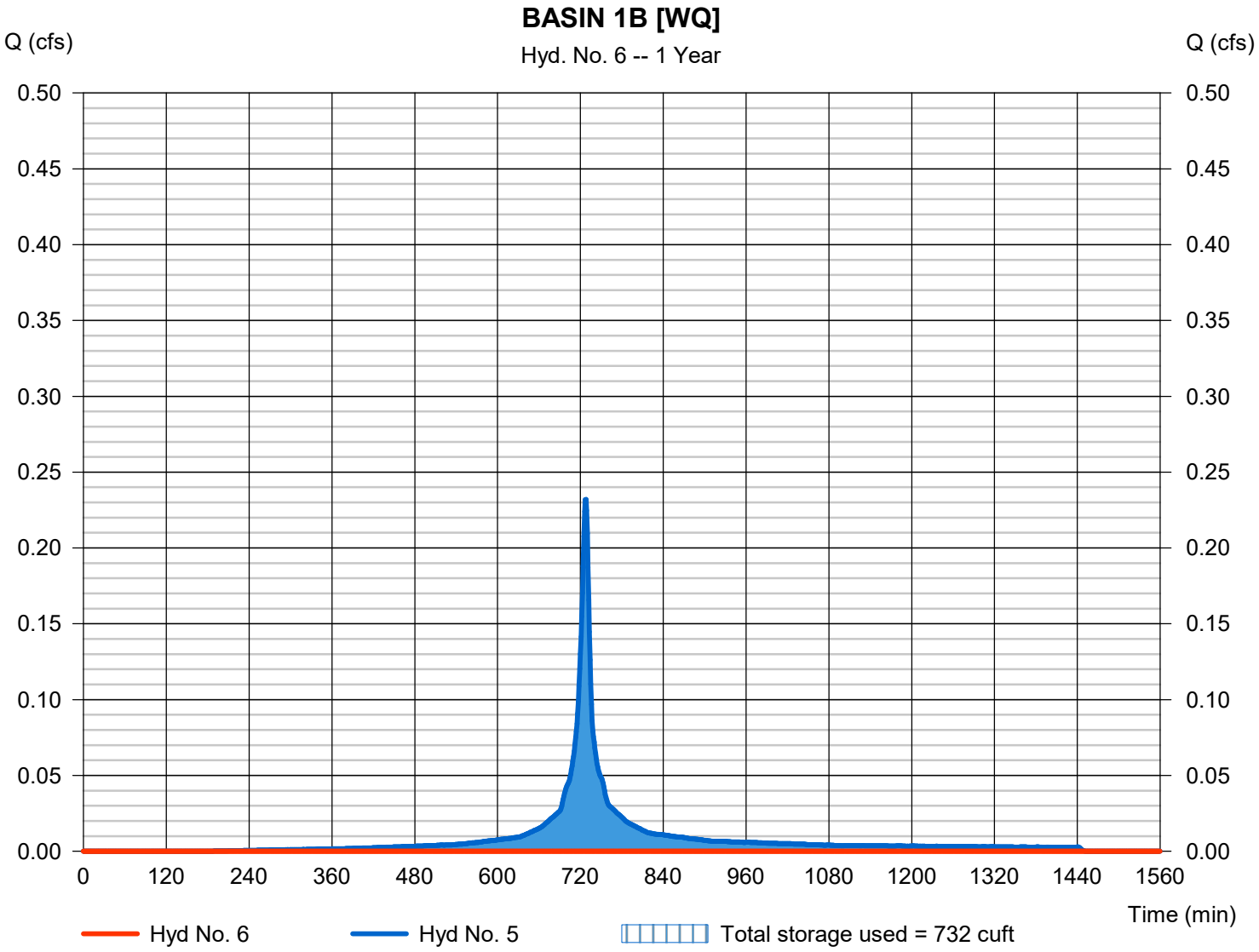
Hydrograph Report

Hyd. No. 6

BASIN 1B [WQ]

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	1 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	5 - PR 1B [WQ]	Max. Elevation	=	632.41 ft
Reservoir name	=	BASIN 1B	Max. Storage	=	732 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2020.4 Thursday, 02 / 8 / 2024

Pond No. 1 - BASIN 1B

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 632.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	632.00	1,270	0	0
2.00	634.00	2,370	3,583	3,583
4.00	636.00	4,435	6,697	10,280
6.00	638.00	6,440	10,812	21,092

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	Inactive	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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)	= 2.00	0.00	0.00	0.00
Crest El. (ft)	= 634.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	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	632.00	---	---	---	---	0.00	---	---	---	---	---	0.000
0.20	358	632.20	---	---	---	---	0.00	---	---	---	---	---	0.000
0.40	717	632.40	---	---	---	---	0.00	---	---	---	---	---	0.000
0.60	1,075	632.60	---	---	---	---	0.00	---	---	---	---	---	0.000
0.80	1,433	632.80	---	---	---	---	0.00	---	---	---	---	---	0.000
1.00	1,791	633.00	---	---	---	---	0.00	---	---	---	---	---	0.000
1.20	2,150	633.20	---	---	---	---	0.00	---	---	---	---	---	0.000
1.40	2,508	633.40	---	---	---	---	0.00	---	---	---	---	---	0.000
1.60	2,866	633.60	---	---	---	---	0.00	---	---	---	---	---	0.000
1.80	3,225	633.80	---	---	---	---	0.00	---	---	---	---	---	0.000
2.00	3,583	634.00	---	---	---	---	0.00	---	---	---	---	---	0.000
2.20	4,253	634.20	---	---	---	---	0.60	---	---	---	---	---	0.596
2.40	4,922	634.40	---	---	---	---	1.69	---	---	---	---	---	1.685
2.60	5,592	634.60	---	---	---	---	3.10	---	---	---	---	---	3.095
2.80	6,262	634.80	---	---	---	---	4.77	---	---	---	---	---	4.765
3.00	6,932	635.00	---	---	---	---	6.66	---	---	---	---	---	6.661
3.20	7,601	635.20	---	---	---	---	8.76	---	---	---	---	---	8.756
3.40	8,271	635.40	---	---	---	---	11.03	---	---	---	---	---	11.03
3.60	8,941	635.60	---	---	---	---	13.48	---	---	---	---	---	13.48
3.80	9,611	635.80	---	---	---	---	16.09	---	---	---	---	---	16.09
4.00	10,280	636.00	---	---	---	---	18.84	---	---	---	---	---	18.84
4.20	11,361	636.20	---	---	---	---	21.73	---	---	---	---	---	21.73
4.40	12,443	636.40	---	---	---	---	24.76	---	---	---	---	---	24.76
4.60	13,524	636.60	---	---	---	---	27.92	---	---	---	---	---	27.92
4.80	14,605	636.80	---	---	---	---	31.20	---	---	---	---	---	31.20
5.00	15,686	637.00	---	---	---	---	34.61	---	---	---	---	---	34.61
5.20	16,767	637.20	---	---	---	---	38.13	---	---	---	---	---	38.13
5.40	17,849	637.40	---	---	---	---	41.76	---	---	---	---	---	41.76
5.60	18,930	637.60	---	---	---	---	45.49	---	---	---	---	---	45.49
5.80	20,011	637.80	---	---	---	---	49.34	---	---	---	---	---	49.34
6.00	21,092	638.00	---	---	---	---	53.28	---	---	---	---	---	53.28

APPENDIX H

PIPE CALCULATIONS

Job #:	**22208**
Job Description:	**VEMAN RESIDENCE**
Designed By:	**KLA**
Checked By:	**TFG**
Date:	**February 7, 2024**
Location:	**MENDHAM BOROUGH**
Design Storm:	**25**

Surface	"C"
Impervious	0.99
Grassed Area	0.51
1/3 acre Residential	0.67
Woods	0.45
Runoff Coefficient Adjustment Factor =	**0.88**

INLET #	TOTAL AREA (AC)	Impervious Area (Ac) C = 0.99	Grassed Area Area (Ac) C = 0.51	/3 acre Residentia Area (Ac) C = 0.67	Woods Area (Ac) C = 0.45	WEIGHTED C	ADJUSTED WEIGHTED C (*)	A X C	TC
1	0.23	0.00	0.23	0.00	0.00	0.51	0.45	0.12	10.0
2		0.00	0.00	0.00	0.00				
RECHARGER									
3		0.00	0.00	0.00	0.00				
4									
5		0.00	0.00	0.00	0.00				
ROOF	0.07	0.07	0.00	0.00	0.00	0.99	0.99	0.07	10.0

Total Impervious Area (Ac.)	**0.07**	**Σ A =**	**0.30**	**Σ CxA =**	**0.19**
Percent Impervious	**23.3%**	**Total Composite 'C'**	**0.62**		

Dykstra Walker Design Group
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21 Bowling Green Parkway, Lake Mopatcong, New Jersey 07849
Phone: (973) 663-6540
Fax: (973) 663-0042

Project No. **22208**
Project Name: **VEMAN RESIDENCE**
Computed By: **KLA**
Checked By: **TFG**
Date: **February 7, 2024**
Location: **MENDHAM BOROUGH**

Design Storm Frequency: **25** yr

Sheet 1

STRUCTURE					RUNOFF DATA						SEWER DESIGN DATA					
UP	DN	AREA (AC)	"C"	INLET A X C (AC)	TOTAL A X C (AC)	OVERLAND "Tc" (MIN)	PIPE "Tp" (MIN)	LONGEST "Tc" (MIN)	RAINFALL INTENSITY (IN/HOUR)	PEAK "Q" (CFS)	PIPE SIZE (IN)	PIPE LENGTH (FT)	USE SLOPE (%)	CAPACITY (CFS)	VEL. FULL (FPS)	VEL. ACTUAL (FPS)
1	2	0.23	0.45	0.12	0.12	10	0.45	10.00	6.78	0.8	15	110	2.00	9.15	7.46	4.1
ROOF	RECHARGE	0.07	0.99	0.07	0.07	10	0.29	10.00	6.78	0.5	6	110	2.00	0.92	6.25	6.3
RECHARGE	3	USE FUTURE 100 YEAR OUTFLOW								0.9	12	110	4.50	7.57	9.65	5.9
4	5	USE FUTURE 100 YEAR OUTFLOW								5.3	15	172	16.84	26.55	21.64	16.4

APPENDIX I

CONDUIT OUTLET PROTECTION DESIGN INFORMATION

RIP RAP CALCULATIONS 22208
VEMAN

Structure: 2

Q =	**0.80**	C.F.S.
Do=	**1.25**	FT.
Wo=	**1.25**	FT.
Tw=.2xDo=	0.25	FT.
q =	0.64	C.F.S. q=Q/Wo

Length of apron Tw < 1/2 Do

$$La = \frac{1.8xq + 7xDo}{Do*1/2}$$ = **9.8** **L.F.** **10 L.F. PROVIDED**

Width of apron (downstream end) Tw < 1/2 Do

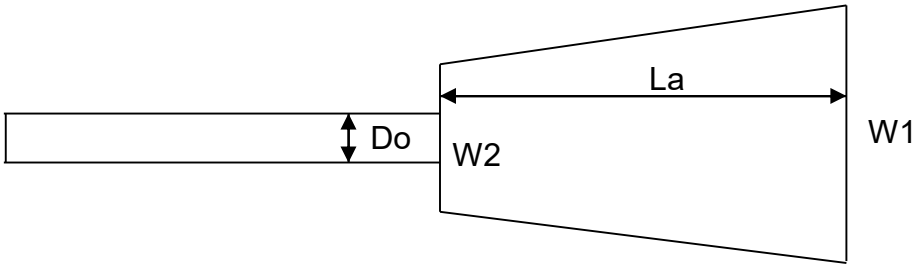
W1 = 3xWo + La = **13.5** **L.F.** **14 L.F. PROVIDED**

Width of apron (outlet end)

W2 = 3xWo **3.8** **L.F.** **4 L.F. PROVIDED**

d50 Stone size Tw < 1/2 Do

$$d50 = \frac{0.02 * q^{4/3}}{Tw}$$ = **0.04** **F.T.** **2 " STONE USED 3 d50 THICK**



RIP RAP CALCULATIONS 22208
VEMAN

Structure: 3

Q =	**0.90**	C.F.S.	
Do=	**1.00**	FT.	
Wo=	1	FT.	
Tw=.2xDo=	0.2	FT.	
q =	0.9	C.F.S.	q=Q/Wo

Length of apron Tw < 1/2 Do

$$La = \frac{1.8xq + 7xDo}{Do*1/2}$$ = **8.6** **L.F.** **9 L.F. PROVIDED**

Width of apron (downstream end) Tw < 1/2 Do

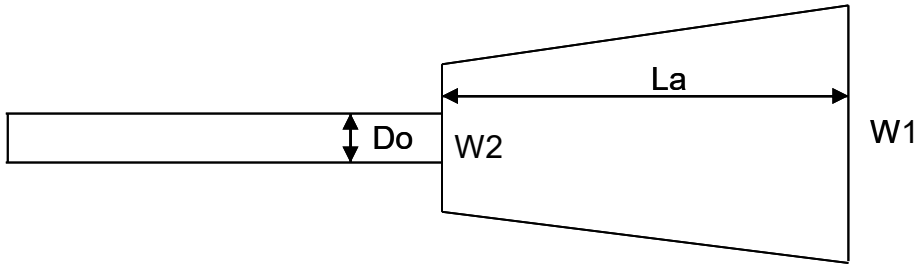
W1 = 3xWo + La = **11.6** **L.F.** **12 L.F. PROVIDED**

Width of apron (outlet end)

W2 = 3xWo **3.0** **L.F.** **3 L.F. PROVIDED**

d50 Stone size Tw < 1/2 Do

$$d50 = \frac{0.02 * q^{4/3}}{Tw}$$ = **0.09** **F.T.** **2 " STONE USED 3 d50 THICK**



RIP RAP CALCULATIONS 22208
VEMAN

Structure: 5

Q =	**5.33**	C.F.S.	
Do=	**1.25**	FT.	
Wo=	1.25	FT.	
Tw=.2xDo=	0.25	FT.	
q =	4.264	C.F.S.	q=Q/Wo

Length of apron Tw < 1/2 Do

$$La = \frac{1.8xq + 7xDo}{Do*1/2}$$ = **15.6** **L.F.** **16 L.F. PROVIDED**

Width of apron (downstream end) Tw < 1/2 Do

W1 = 3xWo + La = **19.4** **L.F.** **20 L.F. PROVIDED**

Width of apron (outlet end)

W2 = 3xWo **3.8** **L.F.** **4 L.F. PROVIDED**

d50 Stone size Tw < 1/2 Do

$$d50 = \frac{0.02 * q^{4/3}}{Tw}$$ = **0.55** **F.T.** **8 " STONE USED 3 d50 THICK**