Prairie Song Courtyards

USH 18
City of Waukesha
Waukesha County, WI

Preliminary

Storm Water Management Plan

Prepared By:

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Submittal Date:
August 9, 2019

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APPENDICES

Introduction

The Townhomes at Prairie Song is a proposed 24-unit multi-family development comprised of two (2) 6-unit buildings and three (3) 4-unit buildings situated around a private loop drive, set on 4.027 acres on the south side of Summit Avenue (USH 18), across from the Woodland Hills Condominiums. The eastern perimeter of the site is described as existing Koenig Street right-of-way, although no public road currently exists.

The property was previously planned to be part of the Capernwray PUD, which was approved in 2008 and identified 24 units of multi-family on this site alone. Although the Capernwray project did not move forward to construction, and each of the several properties within it may develop separately, this project provides illustrations for how it can integrate with future development on these other properties.

The subject site is bordered by the Oakmont subdivision to the west, the West Reserve at Fiddler's Creek to the east, USH 18 to the north and INRA woodlands to the south. The site's topography is a uniform slope from northwest to southeast, with USH 18 being notably higher in elevation than the site. An open house meeting with the neighbors brought attention to the storm water drainage control efforts recently undertaken by the West Reserve at Fiddler's Creek residents, since a majority of the runoff flowing to and through this site continues to drain in their direction. A majority of the runoff is due to the USH 18 roadside ditch, which discharges and drains across this site, ultimately existing the site within the Koenig Street right-of-way in the southeast corner of the project area.

With this understanding of how the area drains, this storm water management plan sets the following goals: 1) promote infiltration through the use of rain gardens and infiltration areas to reduce post-development runoff volume to the extent practicable; and 2) ensure that the post-development peak flow rates are less than the existing peak flow rates.

Owner

The owner and responsible entity for installation and maintenance of the storm water management practices is:

Bielinski Homes, Inc.
1830 Meadow Lane, Suite A
Pewaukee, WI 53072
Contact: Nancy Washburn
(262) 542-9494

Design Requirements

The following design standards have been used to develop the storm water management plan for the *Courtyards at Prairie Song*:

- City of Waukesha Stormwater Management Ordinance – Chapter 32
- Wisconsin Department of Natural Resources (WDNR) Technical Standards, NR 151 and NR 216.
- Summary of design requirements:

- Peak Discharge: Peak flow rates from the post-development site shall be reduced to less than the corresponding event under existing conditions for the 2, 10, and 100-year storm events.
- Water Quality (Total Suspended Solids): Reduce, to the maximum extent practicable, the total suspended solids load by 80%, based on an average annual rainfall, as compared to no runoff management controls.
- Infiltration: Infiltrate runoff in accordance with one of the following (Residential): i) Infiltrate runoff volume so that the post-development volume shall be at least 90% of the pre-development infiltration volume, based on average annual rainfall.

Analysis Overview

Existing and post development stormwater runoff conditions for the Townhomes at Prairie Song have been analyzed for**:** runoff volume, peak volume, discharge, pond storage capacity required, outlet structures and storm sewer system requirements. The software package used for modeling and analysis was Hydraflow© 2007 Version 9.23 by Intelisolve. Hydraflow uses NRCS methods to generate runoff and pond routing hydrographs. Hydraflow's capabilities include: modeling simple or complex drainage basins, combining hydrographs to determine runoff and storage requirements, analyzing interconnected detention basins and detention basin and outlet structure sizing.

The computer model analyzed the two, ten, one hundred-year storm events. TR-55 Type II rainfall distribution is used. The necessary hydrographs were generated to determine the stormwater runoff rates, depths and volumes for pre & post development conditions. This information is used to calculate detention basin size and outlet requirements.

The rainfall depths for the 24-hour duration storm are:

Rainfall Depths for 24-Hour Storm Duration

(per Sec. 38-206)

1-year	2-year	10-year	100-year
2.40	2.70	3.81	6.18

Run-off curve numbers for the onsite areas were determined using the requirements outlined in the NRCS TR-55 Manual and City and WDNR standards. The existing soils on the site are silt loams, with Type B St. Charles Silt Loam (ScB) and Hochheim Silt Loam (HmC2) present across the west/southwest half and Lamartine Silt Loam (LmB) and Theresa Silt Loam (ThB) present across the east/northeast half.

The following describes the curve numbers assigned for composite calculations:

Curve Numbers: Impervious Area (Rooftop, Pavement, Sidewalk, Etc.), CN = 98 *
Grass/Open Space in Good Condition: Type "B" Soil, CN = 61
Grass/Open Space in Good Condition: Type "C" Soil, CN = 71
Grass/Open Space in Good Condition: Type "D" Soil, CN = 78
Woods in Good Condition: Type "B" Soil, CN = 55
Woods in Good Condition: Type "C" Soil, CN = 70

Woods in Good Condition: Type "D" Soil, CN = 77

Existing Site Description & Drainage Summary

Description

The existing drainage analysis identifies the existing discharge from the development site. The drainage controls created by the upslope Oakmont Subdivision are accurately reflected in these drainage boundaries.

The development site is divided in to three drainage areas based on direction of discharge; they are:
E-1: The 2.161 acre contains the northern majority of the site that slopes east southeast across the site.
E-2: The 1.336 acre southwest corner that slopes south from the site.
E-3: The 0.131 southeast corner of the site which drains in the southeast direction.

All runoff from this site ultimately reaches Fiddler's Creek and Pebble Creek.

The following is a summary of the existing conditions analysis:

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	------	1.491	1.981	-------	-------	4.014	-------	-------	8.980	E-1
2	SCS Runoff	------	0.384	0.594	-------	-------	1.606	-------	-------	4.311	E-2
3	SCS Runoff	------	0.024	0.043	-------	-------	0.150	-------	-------	0.451	E-3
5	Combine	1, 2, 3,	1.890	2.617	-------	-------	5.750	-------	-------	13.68	Existing Total

Post-Development Site Description & Drainage Summary

Description

The proposed development is a series of five (5) buildings with two (2) being 6-units and three (3) being 4-unit townhomes with individual direct entry garages, all situated around a private loop drive connected to the proposed road in the Koenig Street right-of-way.

The project proposes to create two (2) rain gardens with one (RG-1) in the center of the site and the other (RG-1) on the eastern edge of the site. A wet pond (P-1) is located at the southern edge of the site. Together, these practices promote infiltration of development runoff to the extent practicable.

The following sections describe the proposed drainage areas for this development.

Proposed Drainage Areas

Area P-1 encompasses the northern portion of the site which is made up of rear yards and roof tops. This area is tributary to Rain Garden RG-1.
Area P-2 is associated with the central rain garden (#2) and includes adjacent rooftops, sidewalk and open space.
Area P-3 encompasses the eastern and southern portions of the site which is made up of rear yards and roof tops. This area is tributary to Wet Pond P-3.
Area UD-1 includes the rear yard undetained and portion of the private circulation drive at the eastern perimeter of the development.
Area UD-2 includes the back slope of Wet Pond P-3.

Proposed Drainage Summary

The following provides a summary of the peak discharge rates for the proposed drainage areas and rain gardens. Please refer to the attachments for additional information.

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	
7	SCS Runoff	------	0.975	1.268	-------	-------	2.465	-------	-------	5.311	P-1
8	SCS Runoff	------	2.768	3.204	-------	-------	4.808	-------	-------	8.180	P-2
9	SCS Runoff	------	0.511	0.720	-------	-------	1.612	-------	-------	3.890	P-3
10	SCS Runoff	------	0.981	1.179	-------	-------	1.927	-------	-------	3.542	UD-1
11	SCS Runoff	------	0.003	0.008	-------	-------	0.071	-------	-------	0.287	UD-2
13	Reservoir	7	0.943	1.236	-------	-------	2.432	-------	-------	5.291	RG-1
14	Reservoir	8	0.267	0.267	-------	-------	1.684	-------	-------	6.892	RG-2
15	Combine	9, 14	0.739	0.966	-------	-------	3.290	-------	-------	10.52	INFLOW TO P-3
16	Reservoir	15	0.099	0.107	-------	-------	0.328	-------	-------	4.365	POND P-3
18	Combine	10, 11, 13, 16	1.220	1.582	-------	-------	3.312	-------	-------	10.57	PROPOSED TOTAL

Descriptions & Summaries of Storm Water Practices

Rain Garden RG-1

Located along the eastern perimeter of the site, this rain garden receives run off from drainage area P-1 and discharges in the southeast direction, matching existing conditions. This rain garden is designed to promote infiltration of the smaller storms and first flush of runoff, by temporary ponding water for direct infiltration before overtopping the 8' wide spillway and discharging to a swale, and ultimately offsite. The rain garden footprint will be landscaped with a wet mesic prairie/infiltration basin plant mix comprised of aesthetically pleasing native plants that can withstand periods of wet and dry conditions. The 100-year ponding depth is 0.90 feet.

The following provides a summary of this Kettle:

- Top of Berm = 129.00
- Overflow Weir = 128.00
- 100-year = 128.12
- Bottom = 127.50

Rain Garden RG-2

Located in the center of the site, this rain garden receives run off from drainage area P-2 and discharges to Wet Pond P-1. This rain garden is designed to promote infiltration of the smaller storms and first flush of runoff, by temporary ponding water for direct infiltration before discharging to an outlet structure. The rain garden footprint will be landscaped with a wet mesic prairie/infiltration basin plant mix comprised of aesthetically pleasing native plants that can withstand periods of wet and dry conditions. The 100-year ponding depth is 2.49 feet.

The following provides a summary of this Kettle:

- Top of Berm = 135.00
- Overflow Weir = 134.00
- 3' dia. Riser = 133.50
- 3" Outlet Pipe = 132.00
- 12" Outlet Pipe = 129.50
- 100-year = 133.99
- 10-year = 133.67
- 2-year = 133.40
- Bottom = 131.50

Wet Pond P-3

Located at the southern perimeter, runoff from drainage are P-3 and discharge from RG-2 enter this facility. The 3' riser structure contains a low flow orifice to promote water quality and peak rate control. The outlet structure discharges southeast direction, matching existing conditions.

The following provides a summary of this Kettle:

- Top of Berm = 130.00
- Overflow Weir = 129.00
- 3' dia. Riser = 128.50
- 2" Orifice = 127.00
- 12" Outlet Pipe = 127.00
- 100-year = 128.90
- 10-year = 128.52
- 2-year = 128.20
- NWL = 127.00

Infiltration

The development utilizes two (2) rain gardens to meet the City's infiltration requirement by Infiltrating runoff volume so that the post-development volume shall be at least 90% of the pre-development infiltration volume, based on average annual rainfall.

This development will meet this requirement, and further documentation will be provided with future iteration of this report.

Total Site Release Rates

The table below summarizes the stormwater release rates associated with this proposed development. The Allowable Release Rate is defined as the pre-development release rate. The Total Proposed Release Rate is calculated as the addition of Wetpond P-3, Rain Garden RG-1, and two (2) un-detained areas UD-1 & UD-2.

The table verifies that the Stormwater Management Plan meets the City of Waukesha Storm Water Management requirements by reducing the post-developed flow rates to less than the Allowable Release Rates.

Site Discharge

Storm Event	**Total Proposed Release Rate**	**Allowable Release Rate**
(Year)	***(cfs)***	***(cfs)***
2	**1.582**	**2.617**
10	**3.312**	**5.750**

100	**10.570**	**13.680**

* Total Peak Runoff Rates are based on the addition of the peak discharge rates from the associated hydrographs at the peak time for the site; due to varying peak times, the total discharge rates are not a direct summation of the peak rates for each. Refer to the attached calculations for additional information.

Water Quality – TSS Reduction

The proposed development contains two (2) rain gardens and a Wet pond to provide water quality improvements. The rain gardens have been designed to allow for temporary ponding for direct infiltration, which will bring the water quality to upwards of 100% over an average annual year. WinSLAMM © will be utilized in the subsequent final storm water management plan to calculate the exact total suspended solids loadings from the site and reductions produced by the rain gardens, wet forebay(s) and infiltration area. The development will meet and exceed the City's requirement for 80% TSS reduction.

Conclusion

The proposed development plan for the Courtyards and Prairie Song meets and exceeds the storm water management requirements of the City of Waukesha and WDNR NR 151. The proposed site accounts for all runoff from and through the property, and includes strategic improvements to better the drainage characteristics in this area. The incorporation of two (2) rain gardens and a wet pond maximizes infiltration to the extent practicable and provides compliance with current City and WDNR requirements.

Storm Water Maintenance Agreement

A storm water maintenance agreement will be created and recorded for this development to outline the function, operation and maintenance requirements of the storm water practices described herein.

APPENDIX 1

Soils Map

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT

For the

Proposed Prairie Song Residential Development
Ruppnow Property
SWC of Koenig Street and Summit Avenue (USH 18)
Waukesha, Wisconsin

Prepared for:

Bielinski Homes
1830 Meadow Lane, Suite A
Pewaukee, WI 53072

Prepared by:

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, Wisconsin 53189
Phone (262) 521-2125
Fax (262) 521-2471

PSI Report Number: 00521251-1

June 2, 2015

psi Information To Build On
Engineering • Consulting • Testing

Timothy M. Leonard, E.I.T.
Staff Engineer
Geotechnical Services

Paul J. Koszarek, P.E.
Department Manager
Geotechnical Services

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Information To Build On
Engineering • Consulting • Testing

June 2, 2015

Bielinski Homes
1830 Meadow Lane, Suite A
Pewaukee, WI 53072

Attn: Ms. Nancy Washburn
Acquisitions and Development Manager

Re: Preliminary Geotechnical Exploration Report
Proposed Prairie Song Residential Development
Ruppnow Property
Waukesha, Wisconsin
PSI Report No. 00521251-1

Dear Ms. Washburn:

Professional Service Industries, Inc. (PSI) is pleased to transmit our Preliminary Geotechnical Exploration Report for the proposed Prairie Song Residential Development to be located on the Ruppnow property on the southwest corner of Koenig Street and Summit Avenue (USH 18) in Waukesha, Wisconsin. This report includes the results of field and laboratory testing, as well as preliminary recommendations for footings, floor slabs, pavements and storm water areas for the planned project.

PSI appreciates the opportunity to perform this Geotechnical Study and looks forward to continuing our participation during the design and construction phases of this project. If you have questions pertaining to this report, or if PSI may be of further service, please contact us at your convenience.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

Timothy M. Leonard, E.I.T
Staff Engineer
Geotechnical Services

Paul J. Koszarek, P.E.
Department Manager
Geotechnical Services

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PROJECT INFORMATION

Project Authorization

The following Table summarizes, in chronological order, the Project Authorization History for the services performed and represented in this report by Professional Service Industries, Inc. (PSI):

DOCUMENT AND REFERENCE NUMBER	DATE	SOURCE OF REQUEST	AUTHOR OR AGENT & TITLE
PSI Proposal Number: PO-052-128731R1	4/13/2015	PSI	Mr. Paul J. Koszarek, P.E. Mr. David M. Barndt, P.E.
Notice to Proceed	4/18/2015	Bielinski Homes	Ms. Nancy Washburn

Project Description

PSI understands that the project consists of a new residential development on an approximate 4 acre partially wooded vacant parcel located to the southwest of the intersection of Koenig Street and Summit Avenue (USH 18) in Waukesha, Wisconsin. This project is in the preliminary stages of development; however, PSI understands that this parcel is planned to be developed with 6 multi-family units, an access roadway and parking areas. Due to the preliminary nature of the project, final grading is not yet known, however this report is based on rough grading for the pavements and building pads not exceeding 5 feet. The following Table lists the material and information provided for this project:

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Preliminary Storm Water Management Plan	Mr. Josh Pudelko, M.S., P.E. Trio Engineering	4/24/2015
Overall Concept Plan	Mr. Josh Pudelko, M.S., P.E. Trio Engineering	4/15/2015

Additional site work will include the construction of an infiltration pond near the middle of the site and a bypass pond near the southeast corner of the site. There are four rain gardens proposed to be constructed between the building units. The depth to the bottom of the ponds has not been determined at the time of this report; however, PSI anticipates the bottom of the ponds will be within 8± feet of existing grade.

The geotechnical recommendations presented in this report are based on the available project information and the materials described in this report. If the noted information is incorrect, subsurface please inform PSI in writing so that we may amend the recommendations presented in this report if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

Purpose and Scope of Services

The purpose of this study was to explore the subsurface conditions at the site and develop preliminary geotechnical design criteria regarding footings, floor slabs, pavements and storm water areas for the proposed project. Subgrade preparation recommendations and construction considerations are also provided. PSI's scope of services included drilling a total of six soil test borings, select laboratory testing, and preparation of this geotechnical report.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project site is located on a partially wooded vacant parcel located to the southwest of the intersection of Koenig Street and Summit Avenue (USH 18) in Waukesha, Wisconsin. The parcel measures approximately 4 acres in size and is currently used for agricultural purposes. The site is partially wooded along the southern, western and northern edges. A building and three stormwater features are proposed to be located within the wooded areas along the southern edge. The project site is bounded to the west by a partially wooded area and residential properties and to the north by a partially wooded area and Summit Avenue (USH 18). The site is bounded to the east by Koenig Street and a wooded parcel and bounded to the south by a heavily wooded parcel. The site slopes from the northwest to the southeast with approximately 19± feet of relief within the area for the proposed development. The Latitude and Longitude for the site is approximately 43.021378°N and 88.294937°W, respectively.

Subsurface Conditions

The subsurface conditions were explored with six soil test borings (R-1 through R-6). The borings were completed within the proposed development area and were scheduled to be completed to depths in the range of 20 to 30 feet beneath existing grade. Due to auger refusal on probable cobbles, boulders or bedrock, the two 30-foot borings (R-5 and R-6) were completed to depths ranging from 11 to 18 feet beneath existing grade. **If soil information is required at greater depths in the locations where auger refusal was encountered, test pits should be performed to determine the suitability of the underlying soils.**

The borings were located in the field by a representative of PSI based on the concept plan provided by Trio Engineering. The boring elevations were determined by plotting the boring locations on the concept plan that included a topographic survey provided by Trio Engineering. The boring elevations should be considered accurate to within about 3±

feet. The attached Boring Location Plan shows the approximate locations of the borings. The borings were advanced utilizing hollow-stem auger drilling methods and soil samples were routinely obtained during the drilling process. Drilling and sampling techniques were accomplished generally in accordance with ASTM procedures. The following table depicts the boring location, elevation and depth of auger refusal (if encountered) of the borings:

BORING NO.	GENERAL LOCATION	ELEVATION OF BORING (FEET LOCAL)	SCHEDULED DEPTH OF BORING BENEATH EXISTING GRADE (FEET)	DEPTH OF AUGER REFUSAL BENEATH EXISTING GRADE (FEET)
R-1	NW Portion of Site	139	20	N/A
R-2	NE Portion of Site	129	20	N/A
R-3	SW Portion of Site	134	20	N/A
R-4	South Central Portion of Site	132	20	N/A
R-5	Proposed Bypass Pond	128	30	11
R-6	Proposed Infiltration Pond	134	30	18

Representative soil samples were obtained from the soil borings and were returned to PSI's laboratory where they were visually classified using the Unified Soil Classification System (USCS) as a guideline. Further, PSI conducted limited laboratory testing on select soil samples to aid in identifying and describing the physical characteristics of the soils and to aid in defining the site soil stratigraphy. The results of the field exploration and laboratory tests were used in PSI's engineering analysis and in the formulation of our engineering recommendations.

Based on the soil boring data, the subsurface soil profile generally consisted of a surficial layer of topsoil underlain by native lean clay and sand soils. The surficial layer of topsoil varied in thickness from 6 to 8 inches. Native lean clay was observed beneath the surficial topsoil in four of the soil borings and was typically observed to extend to depths in the range of approximately 1 to 4½ feet beneath the existing grades. The moisture contents of the native lean clay ranged from 18% to 26%, indicating a moist to very moist soil condition. The pocket penetrometer values observed within the native lean clay soil were generally observed in the range of ½ to 1½ tons per square foot (tsf), indicating a medium stiff to stiff soil consistency.

Native sand soils were generally observed beneath the native lean clay or surficial topsoil in select borings and extended to the termination of the borings. The moisture contents of the native sand soils ranged from 2% to 10%, indicating a moist soil condition. The "N-Values" within the native sand soils were observed in the range of 11 to greater than 50 blows per foot (bpf), indicating a medium dense to very dense relative soil density but typically observed in the range of 26 to greater than 50 bpf.

The above subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included

in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not discarded during classification or altered by laboratory testing will be retained for 60 days from the date of this report and then will be discarded.

Groundwater Information

Groundwater was observed during drilling operations within two borings at depths ranging from 14 to 16 feet beneath existing ground surface. The following table depicts the highest observed water level at each of the borings where groundwater was observed.

Boring Number	Surface Elevation (Ft. Local)	Depth of Highest Groundwater Level Observed (ft.)	Approximate Elevation of Groundwater Observed (ft. Local)
R-2	129	16	113
R-4	132	14	118

The seasonal high groundwater level is indicated by soil colorization and mottling in the soil. For this site, soil colorization was observed in Boring B-4 at approximately 18 feet beneath existing grade (elevation 114 feet (local)). The observed groundwater levels observed in Borings R-2 and R-4 are considered the seasonal high groundwater levels. In the borings performed in the proposed storm water ponds (R-5 and R-6), groundwater was not observed in either borings. Therefore, PSI believes the seasonal high groundwater within the vicinity of these borings is below PSI's zone of exploration.

Due to the mostly granular nature of the native soils in which the groundwater was observed, it is likely that the observed groundwater level is indicative of the long-term groundwater table for this site. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the Borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.

EVALUATION AND RECOMMENDATIONS

Geotechnical Discussion

There is one primary geotechnical related concern at this site, which will mainly affect earthwork operations for this project. The following summarizes this concern:

1) It should be anticipated that some near surface lean clay soils will be in a very moist condition upon stripping the existing topsoil and will required to be dried/stabilized in construction areas;

It should be noted that the lean clay soils observed beneath the surficial topsoil in Borings R-2, R-3 and R-5 were observed to be in a very moist soil condition. The higher moisture contents will cause the lean clay soils to be unstable during construction, especially when subjected to construction traffic. If observed to be unstable during construction, these soils may either be scarified, dried and recompacted to a minimum of 95% of the maximum dry density as obtained by the modified Proctor test (ASTM D157) or dried/stabilized using chemical methods such as lime kiln dust or lime.

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

Site Preparation

Prior to the placement of new fill or preparation of the construction area subgrade, PSI recommends that the existing surficial organic matter, trees including root bulbs, frozen soils and topsoil be removed from within and a minimum of 10 feet beyond the building pads and pavement areas. Unsuitable soils encountered should be selectively undercut and/or stabilized in place. A representative of a qualified geotechnical engineer should determine the need for and depth of removal or stabilization at the time of construction.

In proposed pavement areas where undercuts are performed in clay soils, the edges of the overexcavations should be feathered into the surrounding suitable soil grade so that edge failure of the overexcavated area will not occur. Due to the clayey soils, if undercuts occur within the pavement areas and they are backfilled with granular soils, the bottom of the overexcavation should be sloped to a draintile that is in kind sloped toward the nearest storm sewer or drainage ditch. Minimum slopes of gravity type draintiles should be ½%. If drains are not inserted in undercuts, water will accumulate and likely lead to premature subgrade failure and pavement heave. The proofrolling and undercutting activities should be documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather.

It should be noted that the clayey soils at this site are moisture susceptible, meaning that severe decreases in bearing will occur if these soils become wet or saturated. After topsoil removal, the stability of these soils, and therefore the amount of stabilization or undercut required, will be directly related to their moisture condition at the time of construction. In addition, given the sensitivity of these soils the action of continual construction traffic will likely cause these soils to become unstable over time. Should large areas be encountered that cannot be stabilized by minimal undercuts or conventional disking and aeration techniques, it may be necessary to use a large crushed stone to stabilize the subgrade.

After stripping the surficial materials and excavating to the proposed subgrade level, the building and pavement subgrades should be proofrolled. The proofroll should be conducted prior to placement of new fill to raise site grades. The subgrade should be proofrolled with a fully-loaded tandem axle dump truck or rubber tired vehicle of similar size and weight, typically a 9 tons/axle truck where cohesive soils are present and a large vibratory steel drummed roller where granular soils are present. Soils that are observed to rut or deflect excessively under the moving load (typically > 1”), should be undercut and replaced with properly compacted engineered fill. The proofrolling and undercutting activities should be documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather. The subgrade soils should be scarified and compacted to at least 95 percent of the maximum dry density and within 3 percent of the optimum moisture content as obtained by the modified Proctor test ASTM D1557. The depth of scarification should not be less than 6 inches below the surface. Drying or wetting of the subgrade soils, typically to within 3% of the optimum moisture content, may be advised to facilitate compaction.

After subgrade preparation and observation have been completed, placement of new fill required to obtain proposed site grades may begin. The first layer of fill should be placed in a relatively uniform horizontal lift and be adequately keyed into the stripped and scarified subgrade soils. Engineered fill materials should be free of organic or other deleterious materials, have a maximum particle size less than 3 inches. Clay fills should have a liquid limit less than 45 and plasticity index less than 25 and greater than 11. If a fill soil has Atterberg limits outside of those recommended then the fill properties should be reviewed by the geotechnical engineer prior to use as an engineered fill. Engineered fill should be compacted to at least 95 percent of modified Proctor maximum dry density as determined by ASTM Designation D 1557.

Fill should be placed in maximum lifts of 8 inches of loose material and should be compacted within the range of 3 percentage points below to 3 percentage points above the optimum moisture content value. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be tested by a representative of a qualified geotechnical engineer prior to placement of subsequent lifts. The compacted engineered fill should extend 10 feet beyond the edges of building area.

Preliminary Foundation Recommendations

The following is a general overview of the subsurface conditions for the site, as it relates to foundation analysis, and can be used in preliminary site planning. It is recommended that a more in-depth investigation be conducted prior to construction for individual structures when the design details are known in order to provide site specific design recommendations.

Based on the preliminary study, buildings at the proposed site could be supported upon a conventional shallow column and continuous wall foundation system. For preliminary design considerations, if the footings are placed at normal frost depth and bearing upon suitable natural soils, foundations could be designed for a maximum net allowable soil

bearing pressures varying from 2,000 pounds per square foot (psf) to 4,000 psf, depending upon location and depth.

Exterior footings and footings in unheated areas should be located at a depth of at least 48 inches below the final exterior grade to provide adequate frost protection. If the buildings are to be constructed during the winter months or if footings will likely be subjected to freezing temperatures after foundation construction, then the footings and concrete should be adequately protected from freezing.

Engineered fill must be placed in maximum lifts of eight inches of loose material and should be compacted to within 3% of the optimum moisture content value as determined by the modified Proctor test (ASTM D1557). If water is to be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Each lift of compacted engineered fill should be observed and tested by a representative of PSI prior to placement of subsequent lifts. The lateral extent of the overexcavation of any poor soil and subsequent placement and compaction of engineered fill should be equal to or greater than the depth of overexcavation below finished floor elevation.

Preliminary Floor Slab Recommendations

The following is a general overview of the subsurface conditions for the site, as it relates to floor slab analysis, and can be used in preliminary site planning. It is recommended that a more in-depth investigation be conducted prior to construction for individual structures when the design details are known in order to provide site specific design recommendations.

Based on the building pads being prepared as recommended within the Site Preparation Section of this report, the building floor slabs could be supported upon the native non-organic lean clay soils, native sand soils or upon properly placed engineered fill. PSI recommends that a subgrade modulus (k) of 125 pounds per cubic inch (pci) be used for design considerations, based on a 12 inch diameter plate load test. However, depending on how the slab loads are applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$k_s = k\,(\frac{B+1}{2B})^2$ for cohesionless soil

where: k_s= coefficient of vertical subgrade reaction for loaded area,
k= coefficient of vertical subgrade reaction for 113 square inches area
B= width of area loaded, in feet

PSI recommends that a minimum four-inch thick free draining granular mat be placed beneath the floor slab to enhance drainage. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with tile, wood, carpet, or other moisture sensitive products or equipment, as directed by the design engineer. The

decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill must be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The floor slabs must have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage. In addition, where the slab will be supporting live loads, such as from moving vehicles like fork lifts, joints must be keyed, dowelled, or otherwise prepared to permit proper load transfer.

Seismic Site Class

The 2009 International Building Code requires a site class for the calculation of earthquake design forces. This class is a function of soils type (i.e. depth of soil and strata types). Based on the estimated density of the soils observed within the boring locations, **Site Class "C"** is recommended.

Preliminary Pavement Recommendations

PSI understands that new parking lots and driveways are planned for the proposed project. Based upon the soils observed on site, PSI anticipates that the subgrade soils within the pavement areas will consist of native lean clay soils or newly placed and compacted engineered fill. PSI recommends that the subgrade soils for the pavements be prepared in accordance with the Site Preparation section of this report.

In proposed pavement areas where undercuts are performed, the edges of the overexcavations should be feathered into the surrounding suitable soil grade so that edge failure of the overexcavated area will not occur. Due to the clayey soils, if undercuts occur within the pavement areas and they are backfilled with granular soils, the bottom of the overexcavation should be sloped to a draintile that is in kind sloped toward the nearest storm sewer. Minimum slopes of gravity type draintiles should be ½%. If drains are not inserted in undercuts, water will accumulate and likely lead to premature subgrade failure and pavement heave. The proofrolling and undercutting activities should be documented by a representative of a qualified geotechnical engineer and should be performed during a period of dry weather.

A detailed traffic analysis was not performed as part of this exploration; however, based upon the proposed construction, the light and heavy duty pavement sections shown below are based on a 20 year design life of 30,000 and 60,000 equivalent 18,000 pound single axle loads (ESAL), respectively (If these traffic loads are not indicative of the actual loads, PSI must be contacted immediately to review this data). The existing soils encountered below the surficial topsoil are determined to have an approximate CBR value of 3. Engineered fill material used to raise existing grades within parking and drive areas should meet or exceed this CBR value. The following design factors were used in developing the recommended pavement sections:

- Design Life: - 20 years
- Terminal Serviceability: - 2.0

- Reliability: - 85%
- Initial Serviceability: - 4.2
- Standard Deviation: - 0.45

If during the final design phase these values are determined to be incorrect, PSI must be contacted to provide revised pavement recommendations. Based upon the soil Borings, laboratory data and provided the subgrade soils are prepared as outlined in this report, the following flexible pavement section is recommended for parking stalls (light duty) and drive lanes for heavy garbage trucks (heavy duty).

Light Duty Asphalt Pavement Section

Granular Base Course Thickness	8 inches
HMA Thickness	3 ¼* inches

*If a front end loader is used for snow removal, this should be increased to 4 inches.

Heavy Duty Asphalt Pavement Section

Granular Base Course Thickness	9 inches
HMA Thickness	4 inches

The granular base course should consist of well-graded crushed stone meeting the requirements from Section 305 of the State of Wisconsin Standard Specifications for Construction for a 1¼" dense graded base. The granular base course material should be placed and compacted to a minimum of 95% of maximum density as determined by ASTM D 1557 (modified Proctor) and within +/-3% of the optimum moisture content value. Also, a representative of a qualified geotechnical engineer must test the base course material prior to, and during, placement.

The pavements should be sloped adequately to provide positive surface drainage. It should be noted that the natural clay soils at this site are moisture sensitive and severe decreases in subgrade strength will occur if these soils become wet or saturated. Water should not be allowed to pond on or adjacent to the pavement as this could saturate the subgrade and cause premature pavement deterioration. The granular base course should be protected from water inflow along drainage paths. Additionally, the granular base course should extend at least two feet beyond the edges of the pavement or curb, if present, to allow water that enters the base stone a path for exit.

Portland Cement Concrete pavement is recommended in the trash enclosure areas and areas where heavy trucks will turn frequently or will be parked. Based upon the anticipated heavy duty truck traffic volumes listed above over a design life of 30-years, PSI recommends a concrete pavement section consisting of 6 inches of crushed aggregate base course and 6 inches of Portland cement concrete for these areas. Based on PSI's experience and the known subsurface conditions, PSI recommends that the foundations and other structures in contact with soil be constructed using a typical type I or type II cement.

Because the pavement at this site will be subjected to freeze-thaw cycles, PSI

recommends that an air entrainment admixture be added to the concrete mix to achieve an air content in the range of 5% to 7% to provide freeze-thaw durability in the concrete. Concrete should have a minimum flexural strength of 600 psi and a minimum compressive strength of 4,000 psi at 28 days. A mixture with a maximum slump of 4 inches is acceptable. If a water reducing admixture is specified, the slump can be higher. It is recommended that admixtures are submitted in advance of use in the concrete.

Pavement for dumpster areas should be constructed of Portland cement concrete with a load transfer device installed where construction joints are required. A thickened edge is recommended on the outside of slabs subjected to wheel loads. This thickened edge usually takes the form of an integral curb. Fill material should be compacted behind the curb or thickened edge of the outside slabs. The following are recommended to enhance the quality of the pavement.

- Moisten subgrade just prior to placement of concrete.
- Cure fresh concrete with a liquid membrane-forming curing compound.
- Keep automobile traffic off the slab for 3 days and truck traffic off the slab for 7 days, unless tests are made to determine that the concrete has gained adequate strength (i.e., usually 3,000 psi)

Infiltration Characteristics of Subsurface Soils and Stormwater Pond Recommendations

Generally, the subsurface soil conditions within the borings performed for the storm water ponds consisted of Clay (C), Sandy Loam (SL) and Loamy Sand (LS) which extended to the termination depth of the borings. Field infiltration testing was not requested at the time of field exploration. However, for preliminary design purposes the following table provides estimates of design infiltration rates for different soil textures and is based on Table 2, Design Infiltration Rates for Soil Textures Receiving Storm Water, from the Site Evaluation for Storm Water Infiltration, DNR Code 1002. The infiltration rates published by the Natural Resources Conservation Service (NRCS) which are used by the DNR to determine if the soils are exempt from infiltration are also listed.

SOIL TEXTURE	DNR 1002 TABLE 2, DESIGN INFILTRATION RATE WITHOUT MEASUREMENT (IN/HOUR)	NRCS INFILTRATION RATES (IN/HOUR)
Coarse sand or coarser (COS)	3.60	>20
Loamy coarse sand (LCOS)	3.60	>20
Sand (S)	3.60	>20
Loamy sand (LS)	**1.63**	**6.3-20.0**
Sandy loam (SL)	**0.50**	**2.0-6.3**
Loam (L)	0.24	0.63-2.0
Silt loam (SIL)	0.13	0.63-2.0
Sandy clay loam (SCL)	0.11	0.63-2.0
Clay loam (CL)	0.03	0.63-2.0
Silty Clay loam (SICL)	0.04	0.63-2.0
Sandy clay (SC)	0.04	0.63-2.0
Silty clay (SIC)	0.07	0.06-0.20
Clay (C)	**0.07**	**0.06-0.20**

It should be noted that the NRCS infiltration rates for some of the soils observed on this site have infiltration rates below 0.6 inch/hour and therefore are **exempt** from infiltration according to NR 151. However, if the upper lean clay soils are removed until sand soils are observed (approximate elevations 125 to 134.5 feet (local)), the soils located at the bottom of the proposed ponds would be Sandy Loam (SL) and Loamy Sand (LS) soils. The Sandy Loam (SL) and Loamy Sand (LS) soils are **not** considered to be **exempt** from infiltration according to section NR151.12(5)(c)6.a of the Wisconsin Administration Code due to the infiltration rate of the soil being greater than 0.6 inches per hour. According to Table 2 of the DNR Code 1002, the design infiltration rate without measurement for a Sandy Loam and Loamy Sand soils are 0.50 and 1.63 inches per hour, respectively.

The seasonal high groundwater level is indicated by soil colorization and mottling in the soil. For this site, soil colorization was observed in Boring B-4 at approximately 18 feet beneath existing grade (elevation 114 feet (local)). The observed groundwater levels observed in Borings R-2 and R-4 are considered the seasonal high groundwater levels. In the borings performed in the proposed storm water ponds (R-5 and R-6), groundwater was not observed in either borings. Therefore, PSI believes the seasonal high groundwater within the vicinity of these borings is below PSI's zone of exploration.

According to NR 151, a minimum of a 3-foot thick layer of material that contains more than 20% fines or a minimum of a 5-foot thick layer that contains more than 10% fines must be in place between the bottom of the infiltration practice and seasonal high groundwater and top of bedrock for the pond to be designed as an infiltration basin. If less than 3 feet or 5 feet of the material described above is between the bottom of the pond and the seasonal high groundwater level and top of bedrock, the pond must be designed as a wet detention basin, and a liner must be installed as described in the following paragraph. The soils observed within the borings on this project have been bolded in the table. It should be noted that more accurate and possibly somewhat higher, design infiltration rates can be obtained by performing in-situ tests such as a double-ring infiltrometer test. PSI recommends that the bottom of the infiltration system be observed by a representative of a qualified geotechnical engineer at the time of construction to verify soil types.

If the ponds are designed to be detention basins, it will require a full liner in order for it to effectively hold water for an extended period of time. If a natural clay liner is used, PSI recommends that it be placed at a minimum of 2 feet in thickness and have a minimum liquid limit of 25 and plasticity index above 12. An additional 1 foot of soil should be used on top of the compacted clay liner to protect it from desiccation and plant intrusion. The fill should be placed in loose lifts not to exceed 8 inches in thickness and compacted to a minimum of 95% of the material's maximum laboratory dry density determined in accordance with ASTM D698 standard Proctor. The materials should be placed and compacted at moisture contents varying from 0 to 3% above the material's optimum moisture content determined in accordance with the above ASTM procedure.

Concerning embankment slopes, it is PSI's opinion that properly constructed slopes as

steep as 2 horizontal to 1 vertical would generally be stable, but would be susceptible to erosion and difficult to maintain or construct with rubber tired mowing or grading equipment. Therefore, embankment slopes of 3 horizontal to 1 vertical or flatter are recommended.

CONSTRUCTION CONSIDERATIONS

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork, and related activities of this project. PSI will not accept responsibility for conditions that deviated from those described in this report, nor for the performance of the foundation or pavement if we are not engaged to also provide construction observation and testing for this project.

Moisture Sensitive Soils/Weather Related Concerns

The upper clayey soils encountered at this site may be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. In addition, soils that become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather.

Water should not be allowed to collect in the foundation excavation, on floor slab or pavement areas, or on prepared subgrades during or after construction. Areas should be sloped to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of buildings, beneath floor slabs, and within pavement areas. The grades should be sloped away from buildings and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Control of surface water will also be critical during initial earthwork operations. As the site is filled to proposed grade, steps should be taken to control surface waters from rain events. This can be accomplished by providing adequate sloping of the surface so as to sheet drain any surface waters away from the construction areas. Temporary drainage trenches or swales could also be used to control surface waters. This will help prevent ponding and softening of fills that were previously placed and properly compacted.

Drainage and Groundwater Concerns

Groundwater was observed during drilling operations within two borings at depths ranging from 14 to 16 feet beneath existing ground surface. Due to the mostly granular nature of the native soils in which the groundwater was observed, it is likely that the observed groundwater level is indicative of the long-term groundwater table for this site. Based upon these observations, groundwater-related problems are not anticipated for the

proposed construction. If minor groundwater seepage is encountered during excavation, it is anticipated that it can be handled by simple means such as pumping from sumps or the use of perimeter trenches to collect and discharge the water away from the work area. Fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. The possibility of groundwater level fluctuation and perched water conditions should be considered when developing the design and construction plans for the project.

Excavations

It is mandated that excavations, whether they be for utility trenches, basement excavations or footing excavations, be constructed in accordance with current Occupational Safety and Health Administration (OSHA) guidelines to protect workers and others during construction. PSI recommends that these regulations be strictly enforced; otherwise, workers could be in danger and the owner(s) and the contractor(s) could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person", as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

PSI is providing this information solely as a service to our client. PSI does not assume responsibility for construction site safety or the contractor's or other parties' compliance with local, state, and federal safety or other regulations.

Utilities Trenching

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed to meet the project specifications for the engineered fill of this project. Unless otherwise specified, the backfill for the utility trenches should be placed in 4 to 6 inch loose lifts and compacted to a minimum of 95 percent of the maximum dry density achieved by the modified Proctor test. The backfill soil should be moisture conditioned to be within 3± percent of the optimum moisture content as determined by the modified Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 90 percent compaction criteria with respect to the modified Proctor.

Compaction testing should be performed for every 200 cubic yards of backfill placed or each lift within 200 linear feet of trench, whichever is less. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria. The geotechnical engineer can also specify a relative density specification for clean granular materials. The granular backfill material should be compacted to achieve a relative density greater than 75 percent or as specified by the geotechnical engineer for the specific material used.

GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools that geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free, and more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations, presented in the preceding section, constitute PSI's professional estimate of the necessary measures for the proposed structure to perform according to the proposed design based on the information generated and reference during this evaluation, and PSI's experience in working with these conditions.

REPORT LIMITATIONS

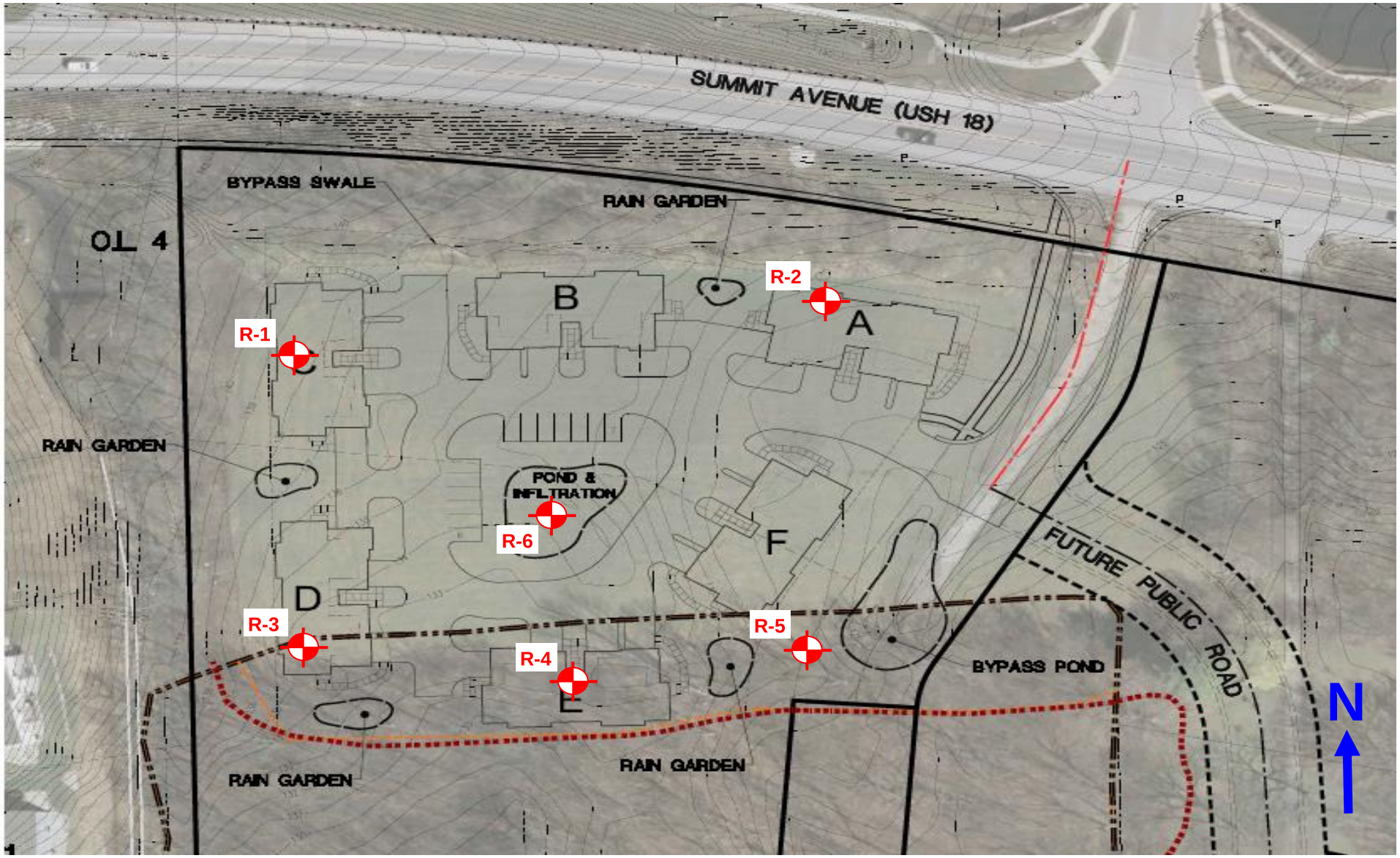
The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by others. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Bielinski Homes for the proposed Prairie Song Residential Development on the Ruppnow Property in Waukesha, Wisconsin.

APPENDIX

BORING LOCATION PLAN
LOG OF BORINGS
LABORATORY RESULTS
SOIL EVALUATION-STORM FORMS
USDA CLASSIFICATION CHARTS
GENERAL NOTES



psi Information To Build On
Engineering • Consulting • Testing
821 Corporate Court
Waukesha, Wisconsin 53189

Project Name:	Proposed Prairie Song Development
Project Location:	Ruppnow Property SWC of Koenig St. and Summit Ave. (USH 18) Waukesha, WI
PSI Project # :	00521251-1

Boring Location Plan

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-1

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: NW Portion of Site

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 139 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (8"± Thick)	OL		24	
		1	18	Brown Lean Clay, Trace Sand and Gravel, Moist, Stiff	CL	6-5-14 N=19	18	
135		2	18			3-4-7 N=11	13	
	5			Brown Silty Sand With Gravel, Moist, Medium Dense to Dense				
		3	3			5-5-6 N=11	10	
130		4	18		SM	8-12-19 N=31	5	
	10							
		5	18			7-11-15 N=26	5	
				Brown Poorly Graded Sand, Trace Silt and Gravel, Moist, Medium Dense to Dense				
125		6	18			6-7-12 N=19	3	
	15							
		7	18		SP	9-12-15 N=27	4	
120		8	18			7-12-18 N=30	2	
	20			End of Boring at 20'				
				Cave In at 11'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-2

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: NE Portion of Site

WATER LEVELS
While Drilling 16 feet
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 129 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
	0			Topsoil (8"± Thick)	OL		32
		1	18	Brown Lean Clay, Trace Sand and Gravel, Moist, Stiff	CL	6-6-5 N=11	24
125	5	2	18	Brown Silty Sand With Gravel, Moist, Medium Dense to Very Dense	SM	3-5-10 N=15	9
		3	18			12-41-42 N=83	5
120	10	4	12	Brown Silty Sand With Silt Seams, Some Gravel, Moist, Dense to Medium Dense	SM	10-17-16 N=33	9
		5	18			13-12-11 N=23	9
115	15	6	18	Yellowish Brown Silty Sand With Gravel, Moist to Wet, Dense to Very Dense	SM	11-16-18 N=34	7
		7	18			11-15-16 N=31	5
110	20	8	18			7-15-49 N=64	8
				End of Boring at 20'			
				Cave In at 12'			

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Additional Remarks

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-3

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: SW Portion of Site

WATER LEVELS

While Drilling	Not Obvd.
Upon Completion	Not Obvd.
Delay	N/A

Station: N/A
Offset: N/A

Surface Elev.: 134 ft

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0 25 50) STRENGTH, tsf ▲ Qu ✳ Qp (0 2.0 4.0)	Additional Remarks
	0					Topsoil (7"± Thick)	OL		27		
				1	18	Brown Lean Clay, Trace Sand and Gravel, Very Moist, Medium Stiff	CL	3-5-5 N=10	26		
130	5			2	18	Brown Silty Sand With Gravel, Moist, Medium Dense	SM	6-10-14 N=24	7		
				3	12			11-13-14 N=27	9		
125	10			4	12	Light Brown Poorly Graded Sand With Gravel, Moist, Dense to Very Dense		14-18-22 N=40	4		
				5	12			23-28-27 N=55	3		
120	15			6	18		SP	10-13-31 N=44	4		
				7	18			12-28-28 N=56	2		
115	20			8	18			7-20-23 N=43	4		
						End of Boring at 20'					
						Cave In at 8'					

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-4

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: South Central Portion of Site

WATER LEVELS
While Drilling 14 feet
Upon Completion Nto Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 132 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0			Topsoil (7"± Thick)	OL		37	
130		1	12	Grayish Brown Poorly Graded Sand, Some Gravel, Moist, Dense	SP	11-25-20 N=45	6	
		2	12	Light Brown Silty Sand With Gravel, Moist to Wet, Medium Dense to Dense		5-15-17 N=32	6	
125	5	3	12			7-16-19 N=35	6	
		4	18			9-14-14 N=28	8	
120	10	5	18		SM	23-16-14 N=30	6	
		6	18			11-17-15 N=32	5	
115	15	7	15			10-11-27 N=38	5	
		8	6	Gray Poorly Graded Sand, Some Gravel, Trace Silt, Moist, Very Dense	SP	N=50/5"	4	>>
	20			End of Boring at 20' Cave In at 9'				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Completion Depth: 20.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-5

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: Proposed Bypass Pond

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 128 ft

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					Topsoil (6"± Thick)	OL		22	×	
						Brown Lean Clay, Trace Sand and Gravel, Very Moist	CL				
125				1	6	Yellowish Brown Silty Sand With Gravel, Moist, Medium Dense to Dense		14-12-14 N=26	6	×	
	5			2	12			20-24-20 N=44	5	×	
							SM				
				3	18			12-20-19 N=39	4	×	
120											
	10			4	18			12-16-21 N=37	6	×	
						Boring Terminated at 11' Due to Auger Refusal					
						Cave In at 8'					

Completion Depth: 11.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
821 Corporate Court
Waukesha, WI 53189
Telephone: (262) 521-2125
Fax: (262) 521-2471

LOG OF BORING R-6

PSI Job No.: 00521251-1
Project: Proposed Prairie Song Development
Location: Ruppnow Property
Waukesha, WI

Drilling Method: Hollow Stem Auger
Sampling Method: 2-in SS
Hammer Type: Automatic
Boring Location: Proposed Infiltration Pond

WATER LEVELS
While Drilling Not Obvd.
Upon Completion Not Obvd.
Delay N/A

Station: N/A
Offset: N/A

Surface Elev.: 134 ft

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
	0			Topsoil (8"± Thick)	OL		18
		1	12	Yellowish Brown Silty Sand With Gravel, Moist, Medium Dense		17-11-8 N=19	6
130		2	12			5-9-9 N=18	6
	5				SM		
		3	18			8-15-15 N=30	8
125		4	15			11-12-14 N=26	8
	10			Brown Silty Sand With Gravel, Moist, Dense to Very Dense			
		5	15			14-20-22 N=42	6
120		6	15		SM	15-17-22 N=39	5
	15						
		7	12			32-21-45 N=66	5
				Boring Terminated at 18' Due to Auger Refusal Cave In at 13'			

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Additional Remarks

Completion Depth: 18.0 ft
Date Boring Started: 4/28/15
Date Boring Completed: 4/28/15
Logged By: DP
Drilling Contractor: PSI, Inc.

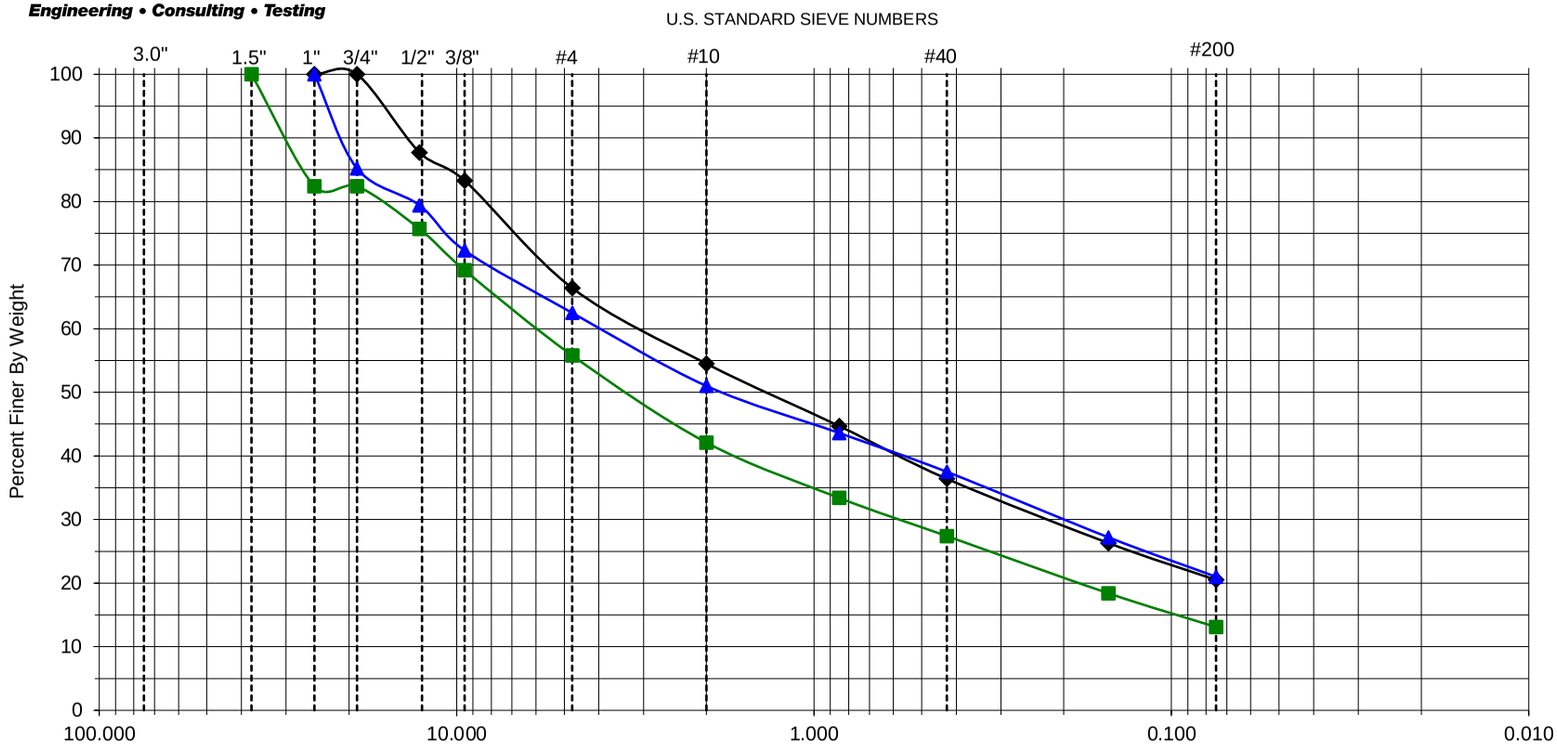
Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Calif. Sampler
Texas Cone

Latitude: 43.021378°
Longitude: 88.294937°
Drill Rig: Rental Marooka
Remarks:

The stratification lines represent approximate boundaries. The transition may be gradual.

psi Information To Build On
Engineering • Consulting • Testing

REPORT OF PARTICLE-SIZE ANALYSIS OF SOIL



ASTM Classification

Grain Size in Millimeters

Gravel	Sand	Fines (Silt and Clay)

Key	Boring No.	Depth	Classification	%Gravel	%Sand	%Fines
◆	R-5	6'-7.5'	Silty Sand with Gravel	33.6	45.9	20.5
▲	R-6	6'-7.5'	Silty Sand with Gravel	37.5	41.5	21.0
■	R-6	11'-12.5'	Silty Sand with Gravel	44.2	42.7	13.1

Prairie Song Development - Ruppnow Property | File No. | **00521251-1**

Professional Service Industries ● 821 Corporate Court ● Waukesha, WI 53189 ● 262-521-2125 ● 262-521-2471 (Fax)

Wis. Dept. of Safety and Professional Services
Division of Safety and Buildings

SOIL EVALUATION - STORM

In accordance with SPS 382.365 and 385, Wis. Adm. Code

Attach complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not be limited to: vertical and horizontal reference point (BM), direction and percent slope, scale or dimensions, north arrow, and BM referenced to nearest road.

Please print all information

Personal information you provide may be used for secondary purposes (Privacy Law, s. 15.04 (1) (m).

County	
Waukesha	
Parcel I.D.	
Reviewed by	Date

Property Owner	Property Location ____ 1/4 S ____ T ____ N R ____ E		
Property Owner's Mailing Address	Lot #	Block #	Subd. Name or CSM#
City / State / Zip Code / Phone Number	☒ City ☐ Village ☐ Town		Nearest Road
	Waukesha		Summit Avenue (USH 18)

Drainage area _____ ☐ sq. ft. ☐ acres
Optional:
Test Site Suitable for (check all that apply)

☐ Irrigation ☐ Bioretention trench ☐ Trench(es)
☐ Rain garden ☒ Infiltration Pond ☐ Reuse
☐ infiltration trench ☐ Retention Pond ☐ Other _____

Hydraulic Application Test Method:

☒ Morphological Evaluation
☐ Double-Ring Infiltrometer
☐ Other (specify) _____

R-5 Obs. # ☒ Boring ☐ Pit Ground surface elev. 128 Depth to limiting factor ___ in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate Inches/Hr
A	6	10YR3/3	NONE	C	2,F,BK	MFR	G	---	0.07
B	12	10YR3/4	NONE	C	2,F,BK	MFR	A	---	0.07
C	132	10YR5/6	NONE	SL	0,M,SG	ML	G	25	0.50

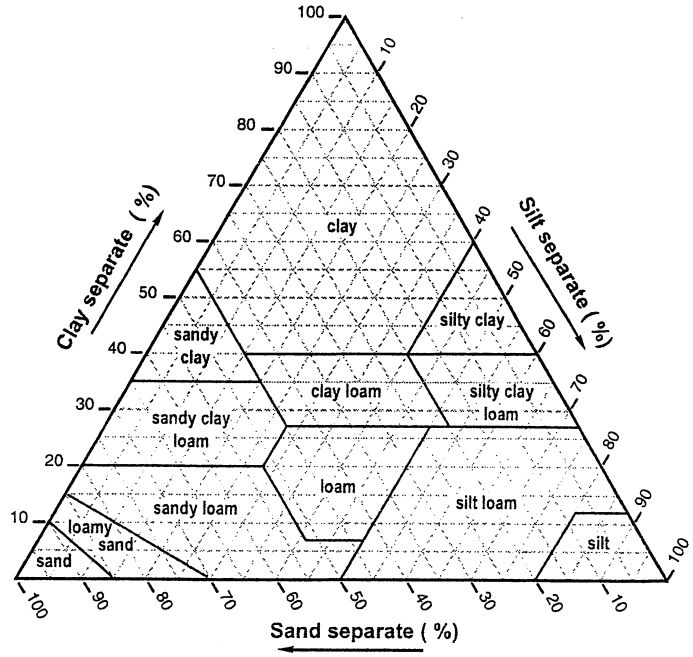
R-6 Obs. # ☒ Boring ☐ Pit Ground surface elev. 134 Depth to limiting factor ___ in.

Horizon	Depth in.	Dominant Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frag.	Hydraulic App. Rate Inches/Hr
A	8	10YR3/3	NONE	C	2,F,BK	MFR	A	---	0.07
C	126	10YR5/8	NONE	SL	0,M,SG	ML	G	35	0.50
C	216	10YR5/4	NONE	LS	0,M,SG	ML	G	40	1.63

CST/PSS Name (Please Print)	Signature	CST/PSS Number
Timothy M. Leonard, E.I.T.		1263311
Address	Date Evaluation Conducted	Telephone Number
821 Corporate Court, Waukesha, Wisconsin 53189	5/18/2015	262-521-2125

Texture Triangle:

Fine Earth Texture Classes (——)



TEXTURE MODIFIERS - Conventions for using "Rock Fragment Texture Modifiers" and for using textural adjectives that convey the "% volume" ranges for **Rock Fragments - Size and Quantity**.

Fragment Content % By Volume	Rock Fragment Modifier Usage
< 15	No texture adjective is used (noun only; e.g., *loam*).
15 to < 35	Use adjective for appropriate size; e.g., *gravelly.*
35 to < 60	Use "very" with the appropriate size adjective; e.g., *very gravelly.*
60 to < 90	Use "extremely" with the appropriate size adjective; e.g., *extremely gravelly.*
≥ 90	No adjective or modifier. If ≤ 10% fine earth, use the appropriate noun for the dominant size class; e.g., *gravel.* Use **Terms in Lieu of Texture.**

(SOIL) TEXTURE

This is the numerical proportion (percent by weight) of sand, silt, and clay in a soil. Sand, silt, and clay content is estimated in the field by hand (or quantitatively measured in the office/lab by hydrometer or pipette) and then placed within the texture triangle to determine **Texture Class**. Estimate the **Texture Class**; e.g., *sandy loam*; or **Subclass**; e.g., *fine sandy loam* of the fine earth (≤ 2 mm) fraction, or choose a **Term in Lieu of Texture**; e.g., *gravel.* If appropriate, use a **Textural Class Modifier**; e.g., *gravelly silt loam.*

NOTE: **Soil Texture** encompasses only the fine earth fraction (≤ 2 mm). **Particle Size Distribution** (PSD) encompasses the whole soil, including both the fine earth fraction (≤ 2 mm; weight %) and rock fragments (> 2 mm; volume %).

TEXTURE CLASS

Texture Class or Subclass	Code	
	Conv.	NASIS
Coarse Sand	cos	COS
Sand	s	S
Fine Sand	fs	FS
Very Fine Sand	vfs	VFS
Loamy Coarse Sand	lcos	LCOS
Loamy Sand	ls	LS
Loamy Fine Sand	lfs	LFS
Loamy Very Fine Sand	lvfs	LVFS
Coarse Sandy Loam	cosl	COSL
Sandy Loam	sl	SL
Fine Sandy Loam	fsl	FSL
Very Fine Sandy Loam	vfsl	VFSL
Loam	l	L
Silt Loam	sil	SIL
Silt	si	SI
Sandy Clay Loam	scl	SCL
Clay Loam	cl	CL
Silty Clay Loam	sicl	SICL
Sandy Clay	sc	SC
Silty Clay	sic	SIC
Clay	c	C

TEXTURE MODIFIERS - *(adjectives)*

ROCK FRAGMENTS: Size & Quantity [1]	Code		Criteria: Percent (By Volume) of Total Rock Fragments and Dominated By (*name size*): [1]
	Conv.	PDP/ NASIS	
ROCK FRAGMENTS (> 2 mm; ≥ Strongly Cemented)			
Gravelly	GR	GR	≥ 15% but < 35% gravel
Fine Gravelly	FGR	GRF	≥15% but < 35% fine gravel
Medium Gravelly	MGR	GRM	≥15% but < 35% med. gravel
Coarse Gravelly	CGR	GRC	≥ 15% but < 35% coarse gravel
Very Gravelly	VGR	GRV	≥ 35% but < 60% gravel
Extremely Gravelly	XGR	GRX	≥ 60% but < 90% gravel
Cobbly	CB	CB	≥ 15% but < 35% cobbles
Very Cobbly	VCB	CBV	≥ 35% but < 60% cobbles
Extremely Cobbly	XCB	CBX	≥ 60% but < 90% cobbles
Stony	ST	ST	≥ 15% but < 35% stones
Very Stony	VST	STV	≥ 35% but < 60% stones
Extremely Stony	XST	STX	≥ 60% but < 90% stones
Bouldery	BY	BY	≥ 15% but < 35% boulders
Very Bouldery	VBY	BYV	≥ 35% but < 60% boulders
Extremely Bouldery	XBY	BYX	≥ 60% but < 90% boulders
Channery	CN	CN	≥ 15% but < 35% channers
Very Channery	VCN	CNV	≥ 35% but < 60% channers
Extremely Channery	XCN	CNX	≥ 60% but < 90% channers
Flaggy	FL	FL	≥ 15% but < 35% flagstones
Very Flaggy	VFL	FLV	≥ 35% but < 60% flagstones
Extremely Flaggy	XFL	FLX	≥ 60% but < 90% flagstones
PARAROCK FRAGMENTS (> 2 mm; < Strongly Cemented) [2, 3]			
Parabouldery	PBY	PBY	(same criteria as bouldery)
Very Parabouldery	VPBY	PBYV	(same criteria as very bouldery)
Extr. Parabouldery	XPBY	PBYX	(same criteria as ext. bouldery)
etc.	etc.	etc.	(same criteria as non-para)

[1] The "Quantity" modifier (e.g., *very*) is based on the total rock fragment content. The "Size" modifier (e.g., *cobbly*) is independently based on the largest, dominant fragment size. For a mixture of sizes (e.g., *gravel and stones*), a smaller size–class is named only if its quantity (%) sufficiently exceeds that of a larger size–class. For field texture determination, a smaller size-class must exceed 2 times the quantity (vol. %) of a larger size class before it is named (e.g., 30% gravel and 14% stones = *very gravelly*, but 20% gravel and 14% stones = *stony*). For more explicit naming criteria see NSSH-Part 618, Exhibit 618.11(Soil Survey Staff, 2001b).

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
RC: Rock Core
TC: Texas Cone
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,⧩ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

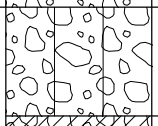
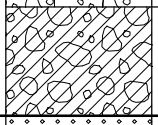
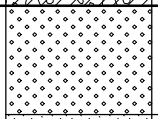
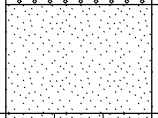
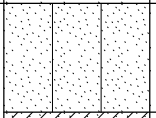
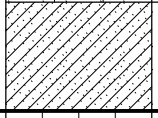
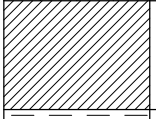
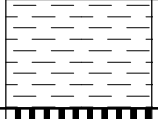
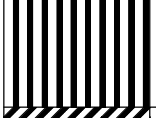
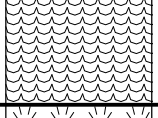
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

SOIL CLASSIFICATION CHART

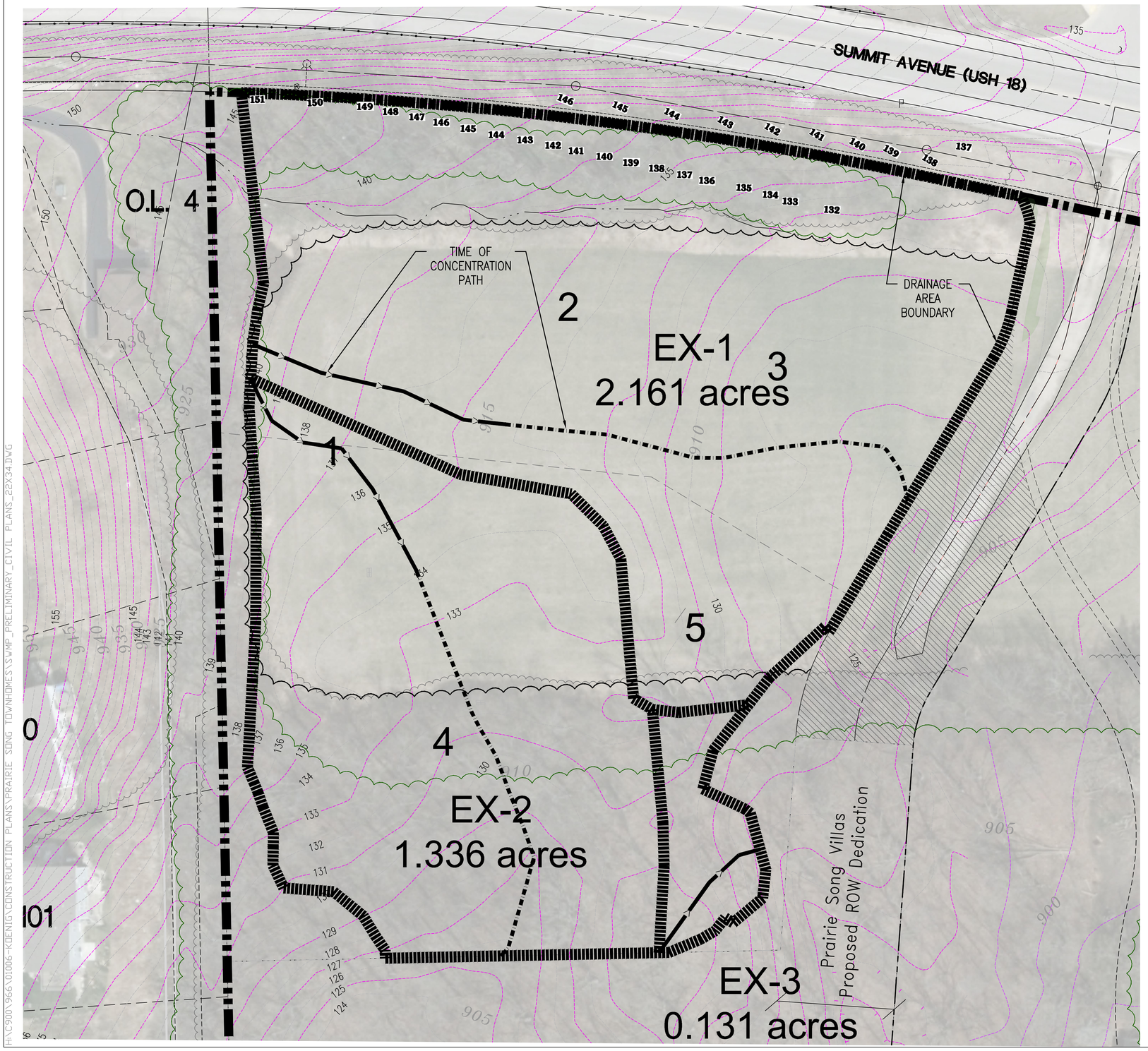
NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

psi

APPENDIX 2

Existing & Proposed Drainage Area Maps



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CITY OF WAUKESHA, WISCONSIN
BY: BIELINSKI COMMERCIAL, LLC.
1830 MEADOW LN, SUITE A
PEWAUKEE, WI 53072

REVISION HISTORY

DATE	DESCRIPTION
08/09/19	CITY SUBMITTALS

DATE:
AUGUST 9, 2019

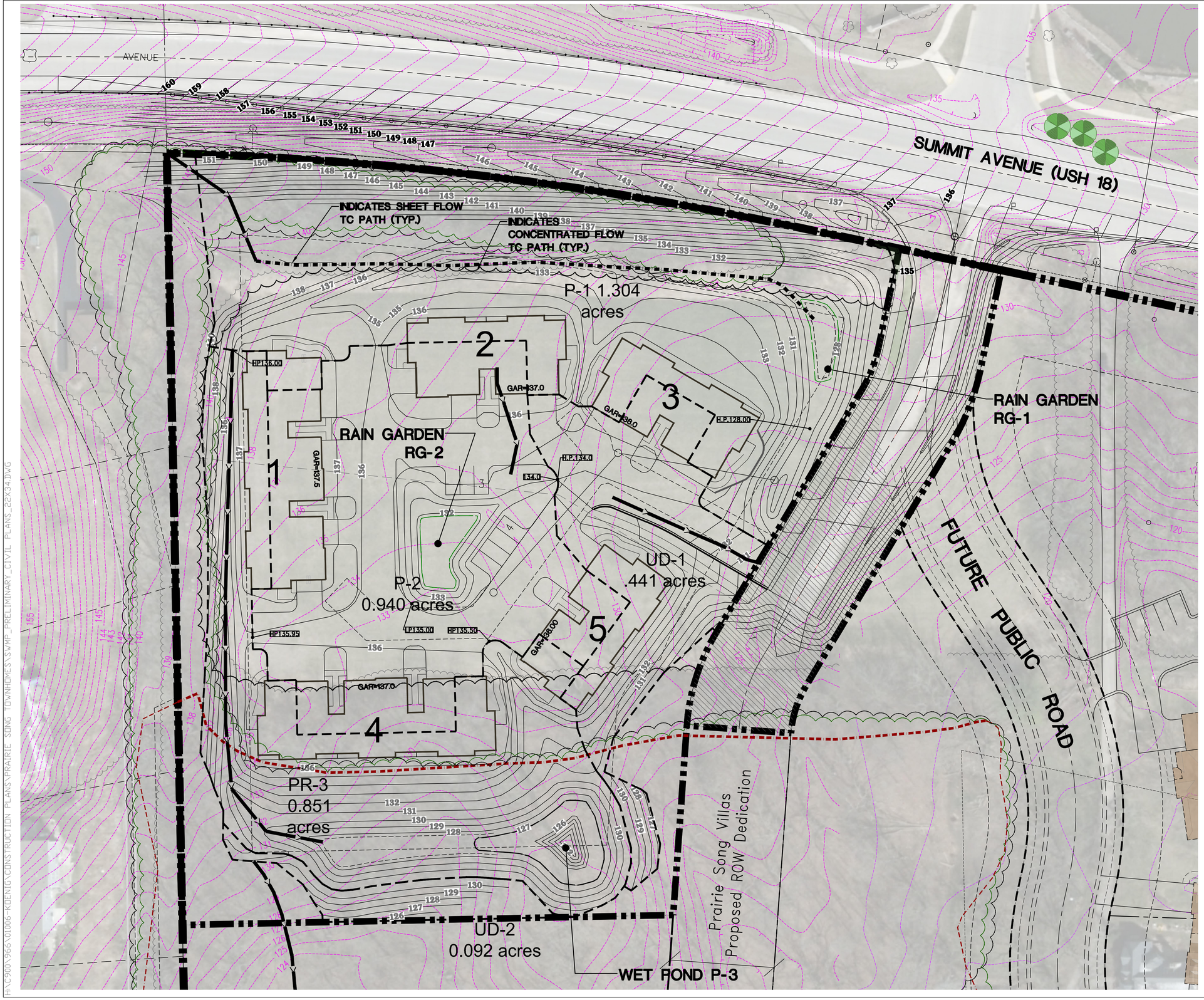
JOB NUMBER:
01006

DESCRIPTION:
EXISTING DRAINAGE MAP

SHEET
D1.0

0 15 30 60

H:\C900\966\01006-KOENIG\CONSTRUCTION PLANS\PRAIRIE SONG TOWNHOMES\SWMP_PRELIMINARY_CIVIL PLANS_22X34.DWG



H:\C900\966 01006-KUENIG\CONSTRUCTION PLANS\PRAIRIE SONG TOWNHOMES\SWMP_PRELIMINARY_CIVIL PLANS_22X34.DWG

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DATE:
AUGUST 9, 2019

JOB NUMBER:
01006

DESCRIPTION:
PROPOSED DRAINAGE MAP

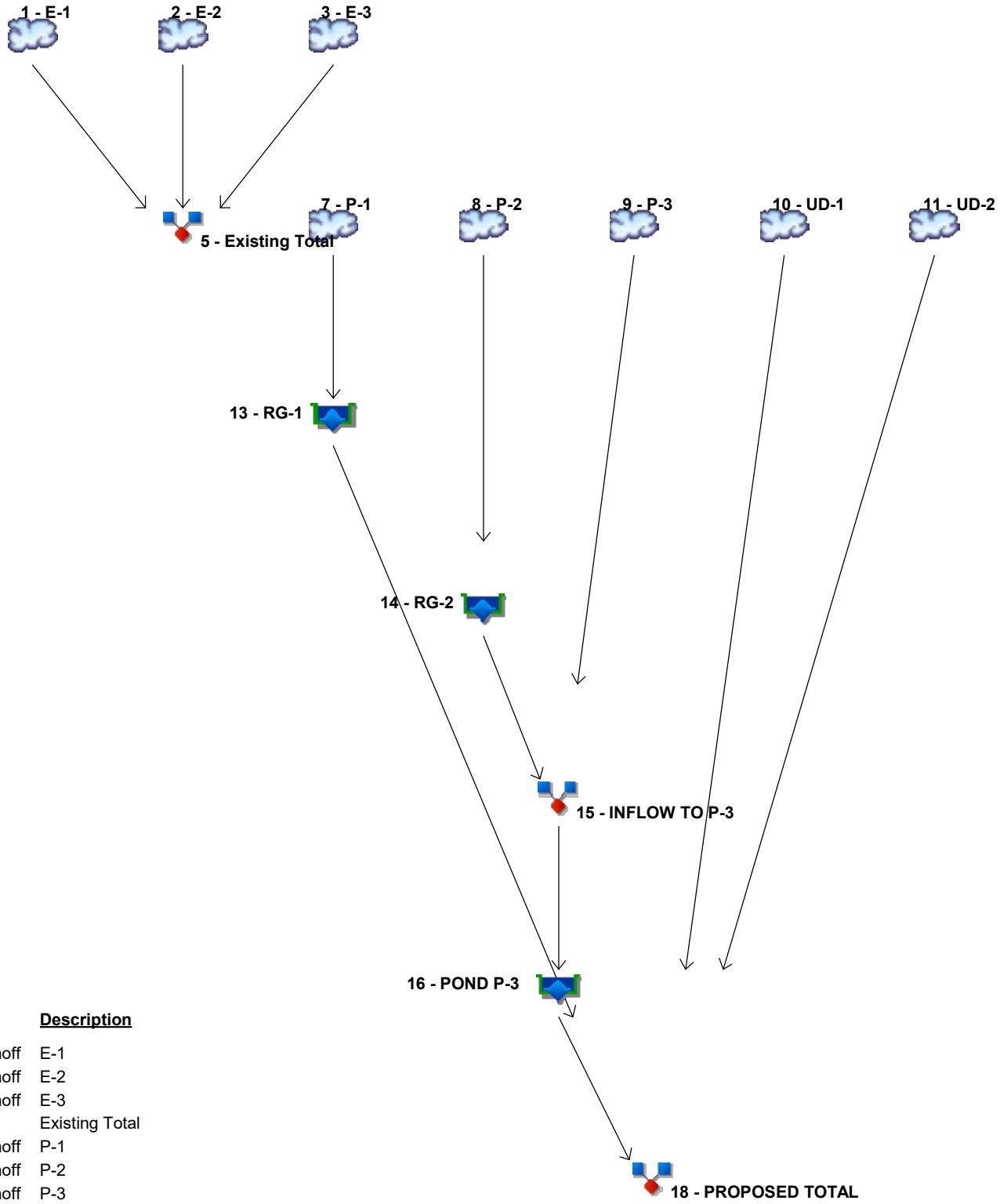
SHEET
D1.1

APPENDIX 3

Hydraflow Calculations

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020



Legend

Hyd.	Origin	Description
1	SCS Runoff	E-1
2	SCS Runoff	E-2
3	SCS Runoff	E-3
5	Combine	Existing Total
7	SCS Runoff	P-1
8	SCS Runoff	P-2
9	SCS Runoff	P-3
10	SCS Runoff	UD-1
11	SCS Runoff	UD-2
13	Reservoir	RG-1
14	Reservoir	RG-2
15	Combine	INFLOW TO P-3
16	Reservoir	POND P-3
18	Combine	PROPOSED TOTAL

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	------	1.491	1.981	-------	-------	4.014	-------	-------	8.980	E-1
2	SCS Runoff	------	0.384	0.594	-------	-------	1.606	-------	-------	4.311	E-2
3	SCS Runoff	------	0.024	0.043	-------	-------	0.150	-------	-------	0.451	E-3
5	Combine	1, 2, 3,	1.890	2.617	-------	-------	5.750	-------	-------	13.68	Existing Total
7	SCS Runoff	------	0.975	1.268	-------	-------	2.465	-------	-------	5.311	P-1
8	SCS Runoff	------	2.768	3.204	-------	-------	4.808	-------	-------	8.180	P-2
9	SCS Runoff	------	0.511	0.720	-------	-------	1.612	-------	-------	3.890	P-3
10	SCS Runoff	------	0.981	1.179	-------	-------	1.927	-------	-------	3.542	UD-1
11	SCS Runoff	------	0.003	0.008	-------	-------	0.071	-------	-------	0.287	UD-2
13	Reservoir	7	0.943	1.236	-------	-------	2.432	-------	-------	5.291	RG-1
14	Reservoir	8	0.267	0.267	-------	-------	1.684	-------	-------	6.892	RG-2
15	Combine	9, 14	0.739	0.966	-------	-------	3.290	-------	-------	10.52	INFLOW TO P-3
16	Reservoir	15	0.099	0.107	-------	-------	0.328	-------	-------	4.365	POND P-3
18	Combine	10, 11, 13, 16,	1.220	1.582	-------	-------	3.312	-------	-------	10.57	PROPOSED TOTAL

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

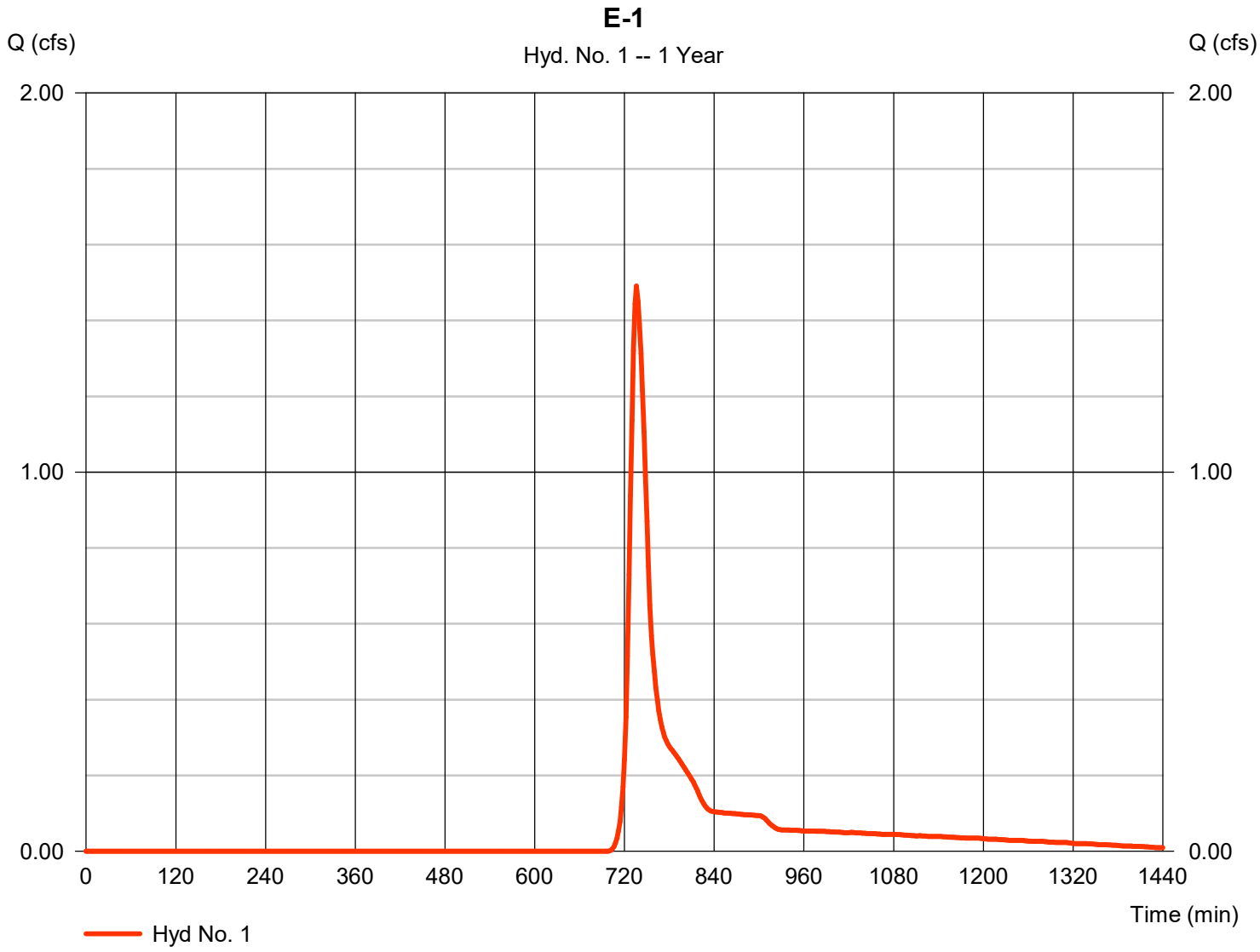
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	1.491	2	736	0.114	------	------	------	E-1
2	SCS Runoff	0.384	2	740	0.038	------	------	------	E-2
3	SCS Runoff	0.024	2	736	0.003	------	------	------	E-3
5	Combine	1.890	2	736	0.155	1, 2, 3,	------	------	Existing Total
7	SCS Runoff	0.975	2	738	0.080	------	------	------	P-1
8	SCS Runoff	2.768	2	726	0.124	------	------	------	P-2
9	SCS Runoff	0.511	2	732	0.035	------	------	------	P-3
10	SCS Runoff	0.981	2	726	0.042	------	------	------	UD-1
11	SCS Runoff	0.003	2	744	0.001	------	------	------	UD-2
13	Reservoir	0.943	2	740	0.064	7	128.12	0.011	RG-1
14	Reservoir	0.267	2	842	0.093	8	133.40	0.066	RG-2
15	Combine	0.739	2	732	0.128	9, 14	------	------	INFLOW TO P-3
16	Reservoir	0.099	2	1000	0.128	15	128.04	0.087	POND P-3
18	Combine	1.220	2	740	0.234	10, 11, 13, 16,	------	------	PROPOSED TOTAL

Hydrograph Report

Hyd. No. 1

E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.491 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.114 acft
Drainage area	=	2.161 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.70 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

Hyd. No. 1

E-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 16.28**	**+**	**0.00**	**+**	**0.00**	**=**	**16.28**
Shallow Concentrated Flow							
Flow length (ft)	= 249.00		0.00		0.00		
Watercourse slope (%)	= 3.20		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.89		0.00		0.00		
Travel Time (min)	**= 1.44**	**+**	**0.00**	**+**	**0.00**	**=**	**1.44**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

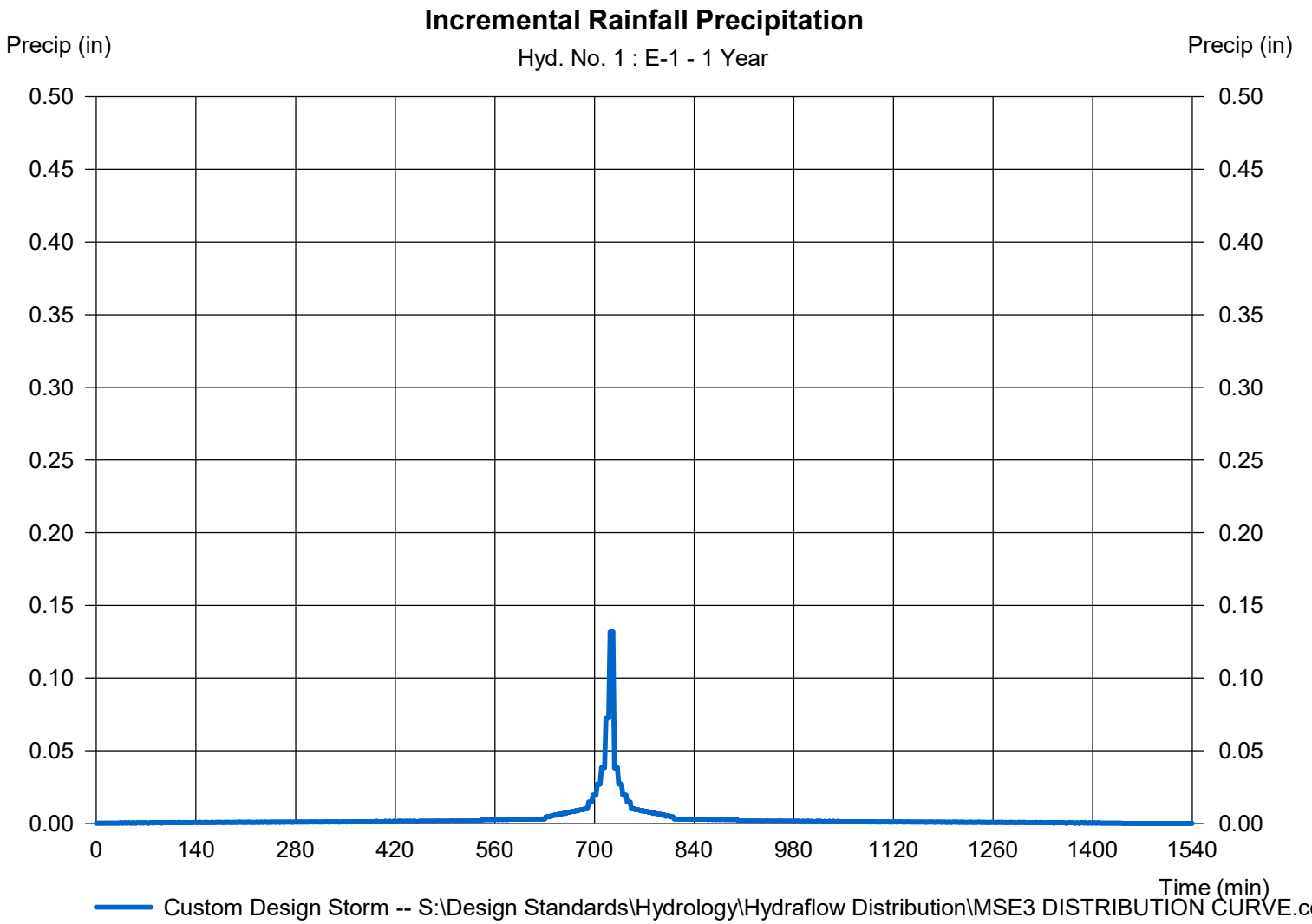
Total Travel Time, Tc ..... 17.70 min

Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

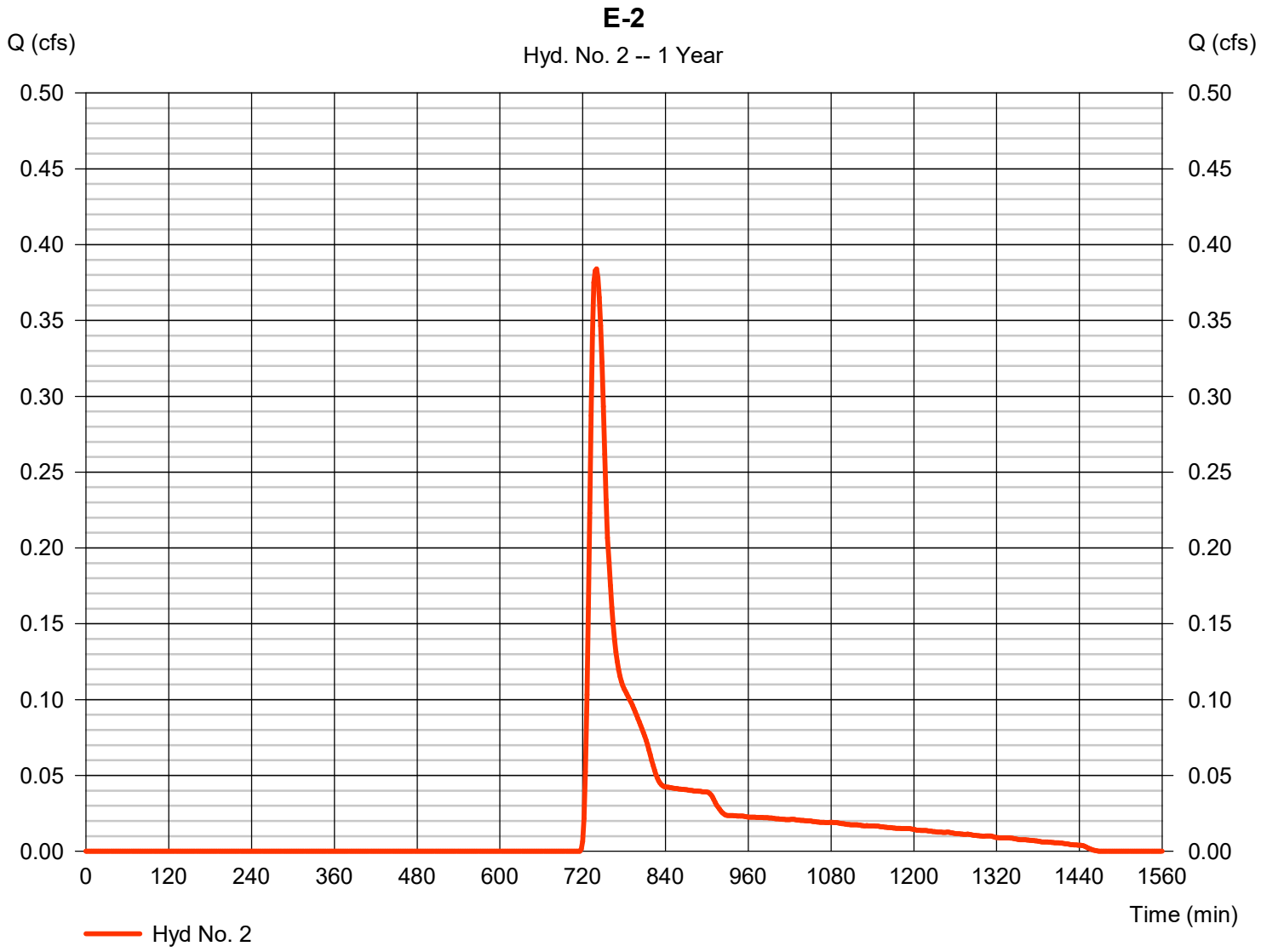


Hydrograph Report

Hyd. No. 2

E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.384 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	0.038 acft
Drainage area	=	1.336 ac	Curve number	=	68
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.50 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 2

E-2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 16.28**	**+**	**0.00**	**+**	**0.00**	**=**	**16.28**
Shallow Concentrated Flow							
Flow length (ft)	= 233.00		0.00		0.00		
Watercourse slope (%)	= 3.90		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.19		0.00		0.00		
Travel Time (min)	**= 1.22**	**+**	**0.00**	**+**	**0.00**	**=**	**1.22**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

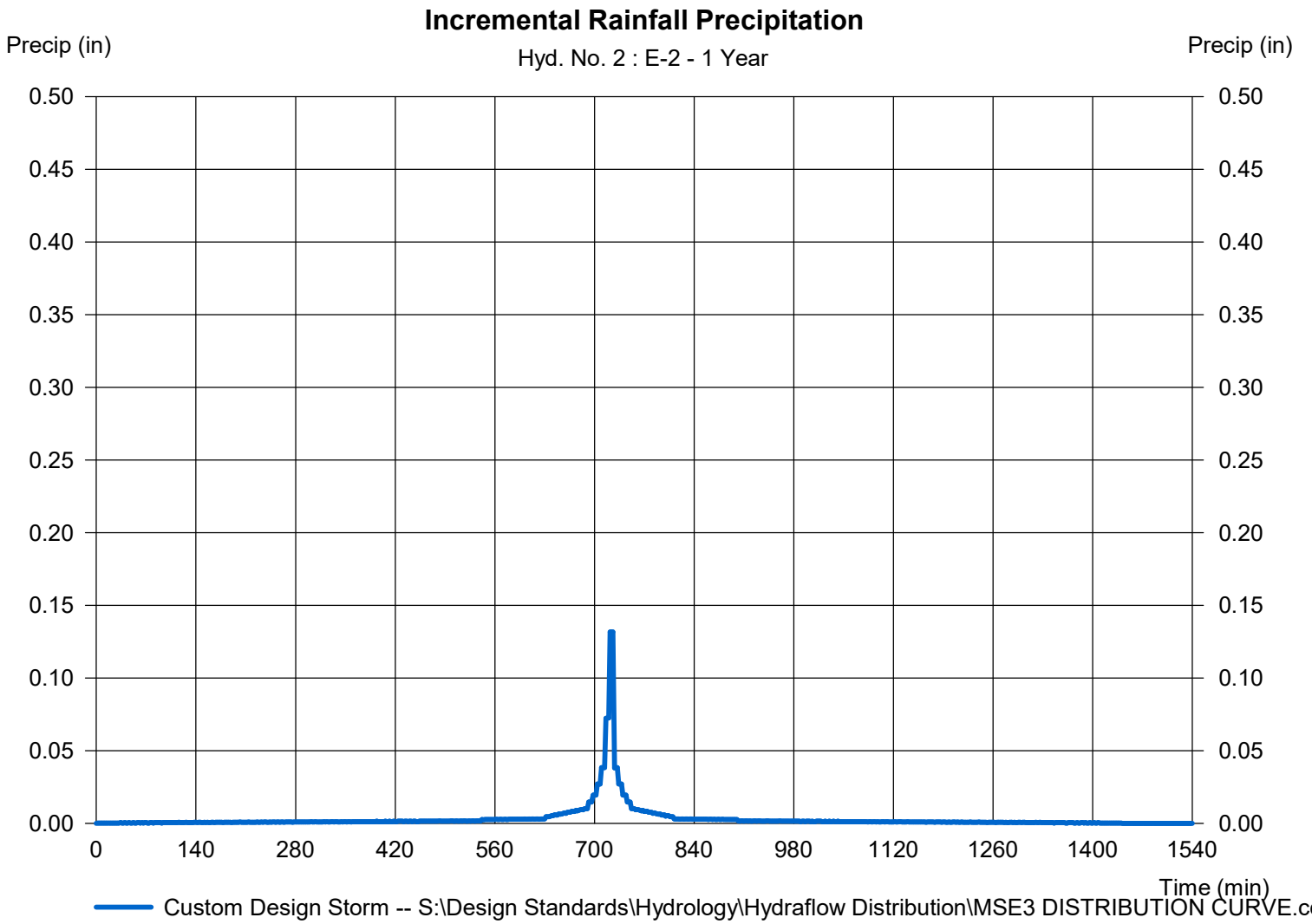
Total Travel Time, Tc ..... 17.50 min

Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

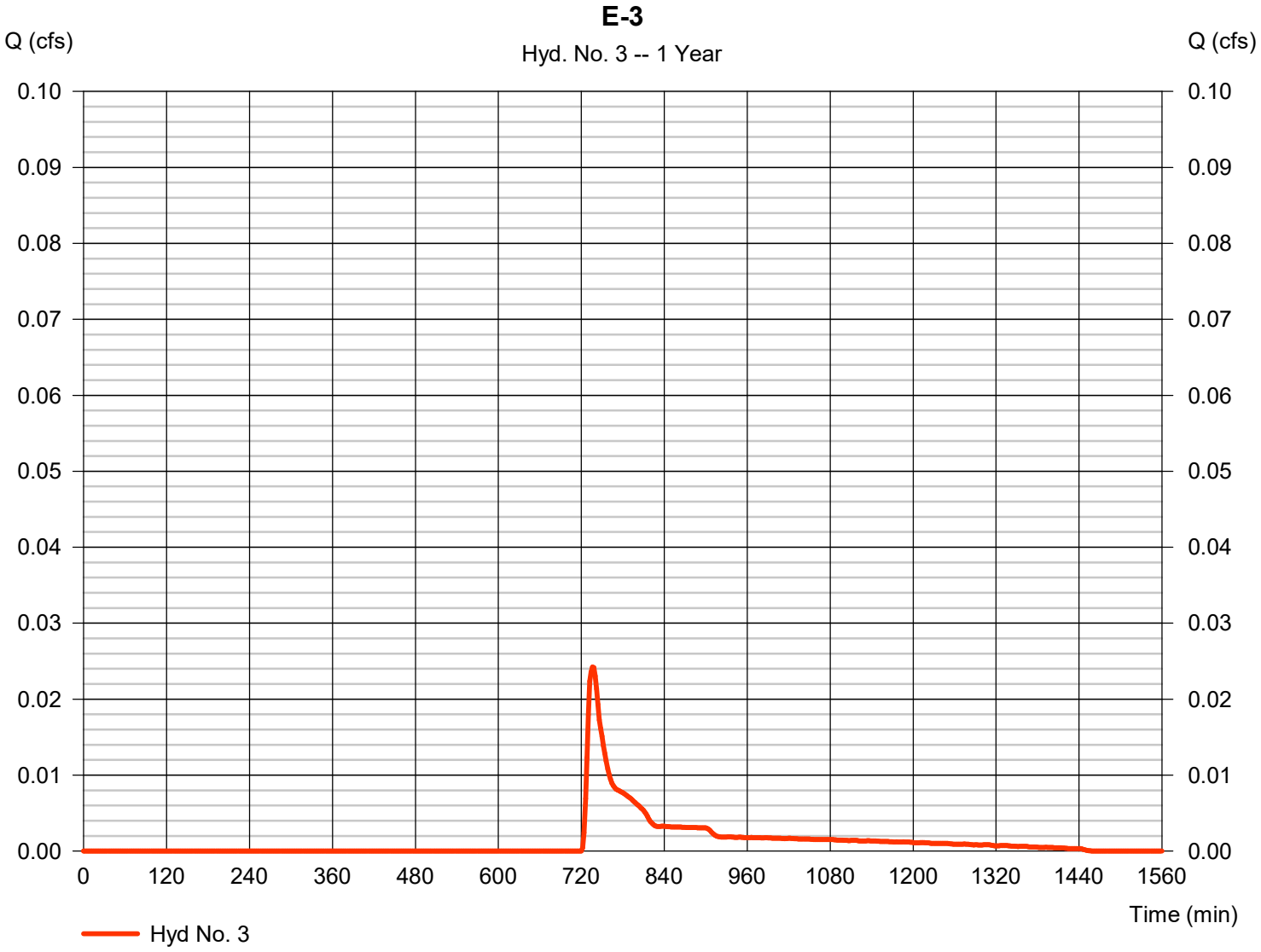


Hydrograph Report

Hyd. No. 3

E-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.024 cfs
Storm frequency	=	1 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.003 acft
Drainage area	=	0.131 ac	Curve number	=	64
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.00 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 3

E-3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.011		0.011		
Flow length (ft)	= 83.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 6.00		0.00		0.00		
Travel Time (min)	**= 12.98**	**+**	**0.00**	**+**	**0.00**	**=**	**12.98**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

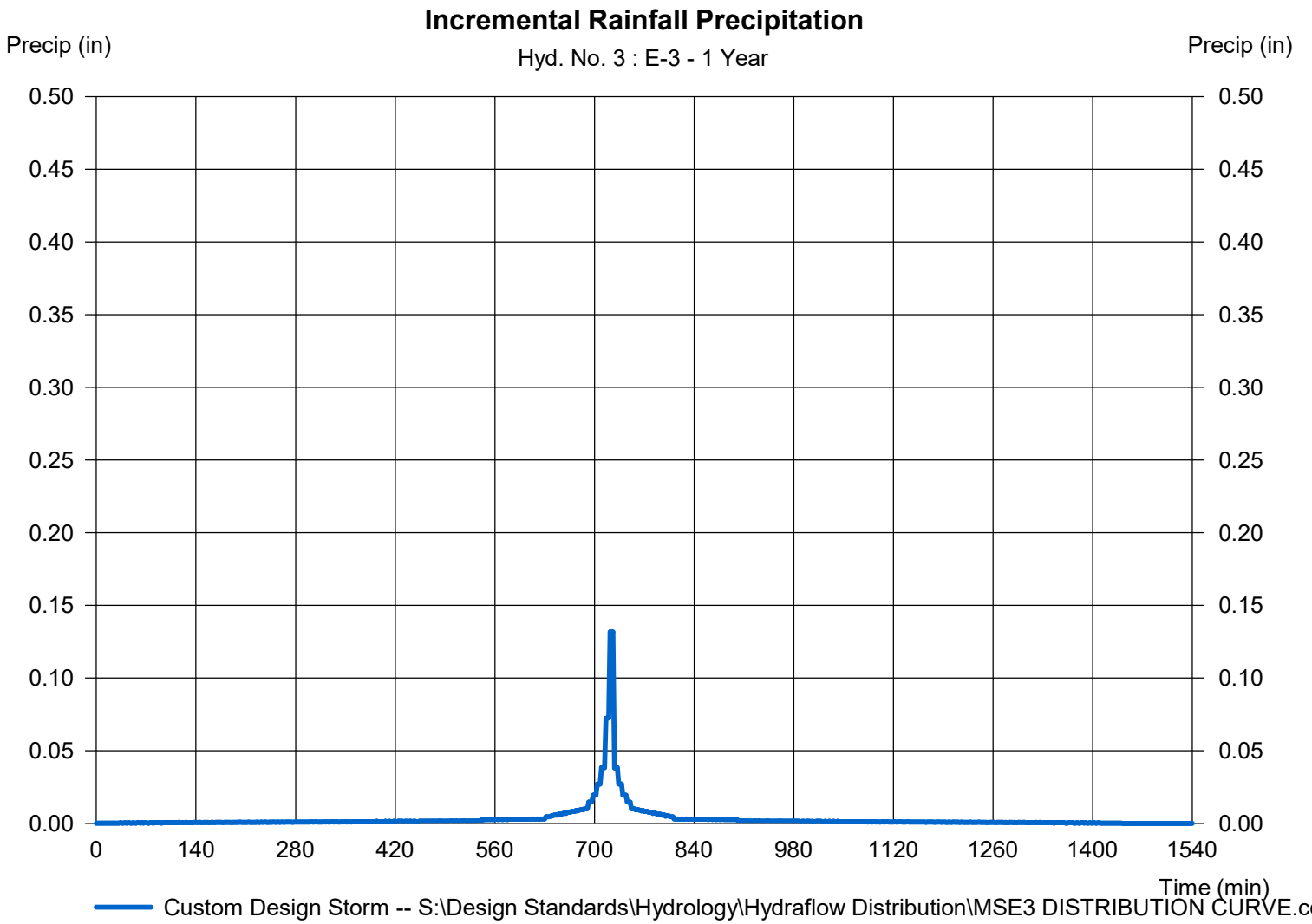
Total Travel Time, Tc ..... 13.00 min

Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

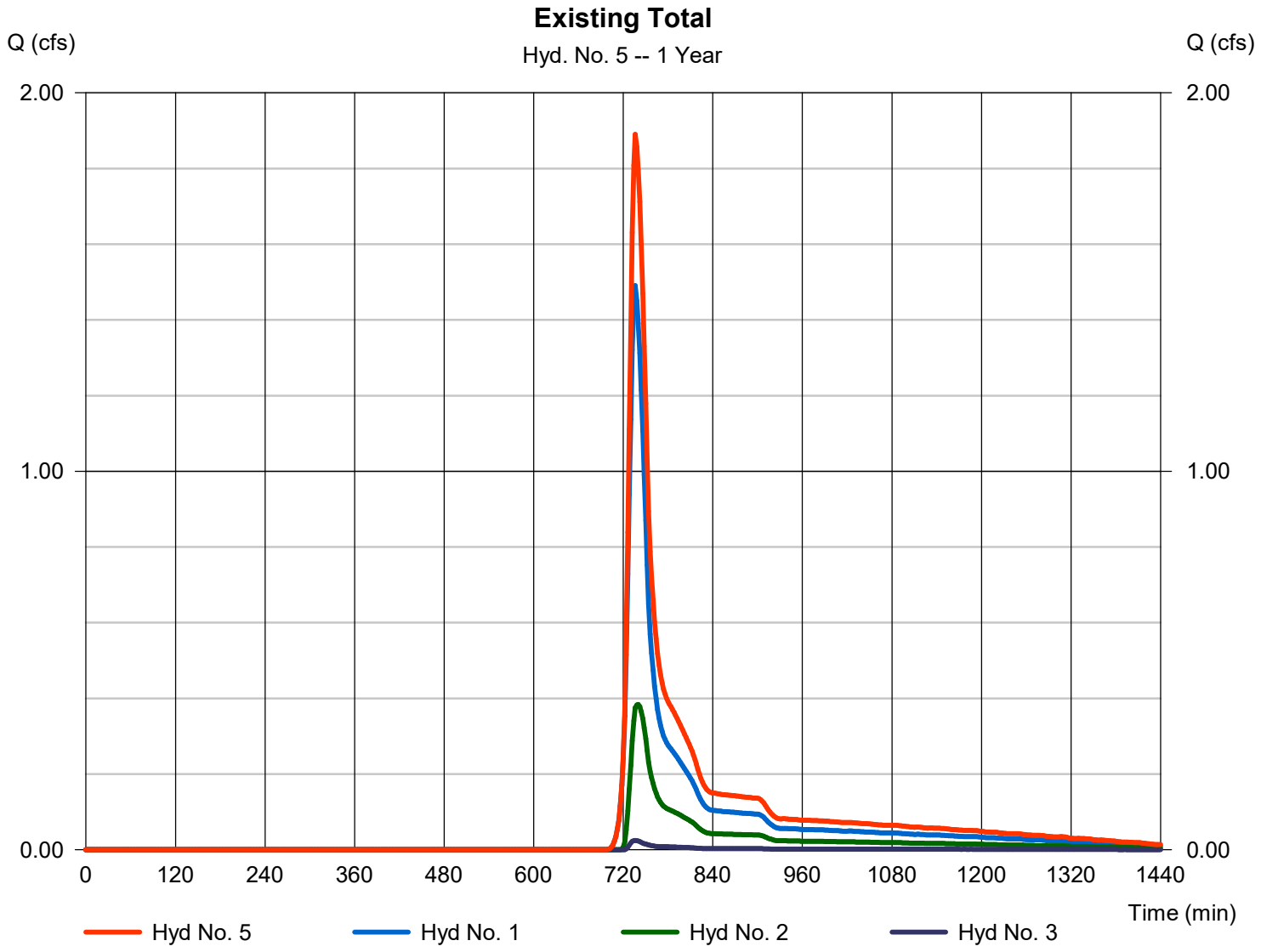


Hydrograph Report

Hyd. No. 5

Existing Total

Hydrograph type	= Combine	Peak discharge	= 1.890 cfs
Storm frequency	= 1 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 0.155 acft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.628 ac

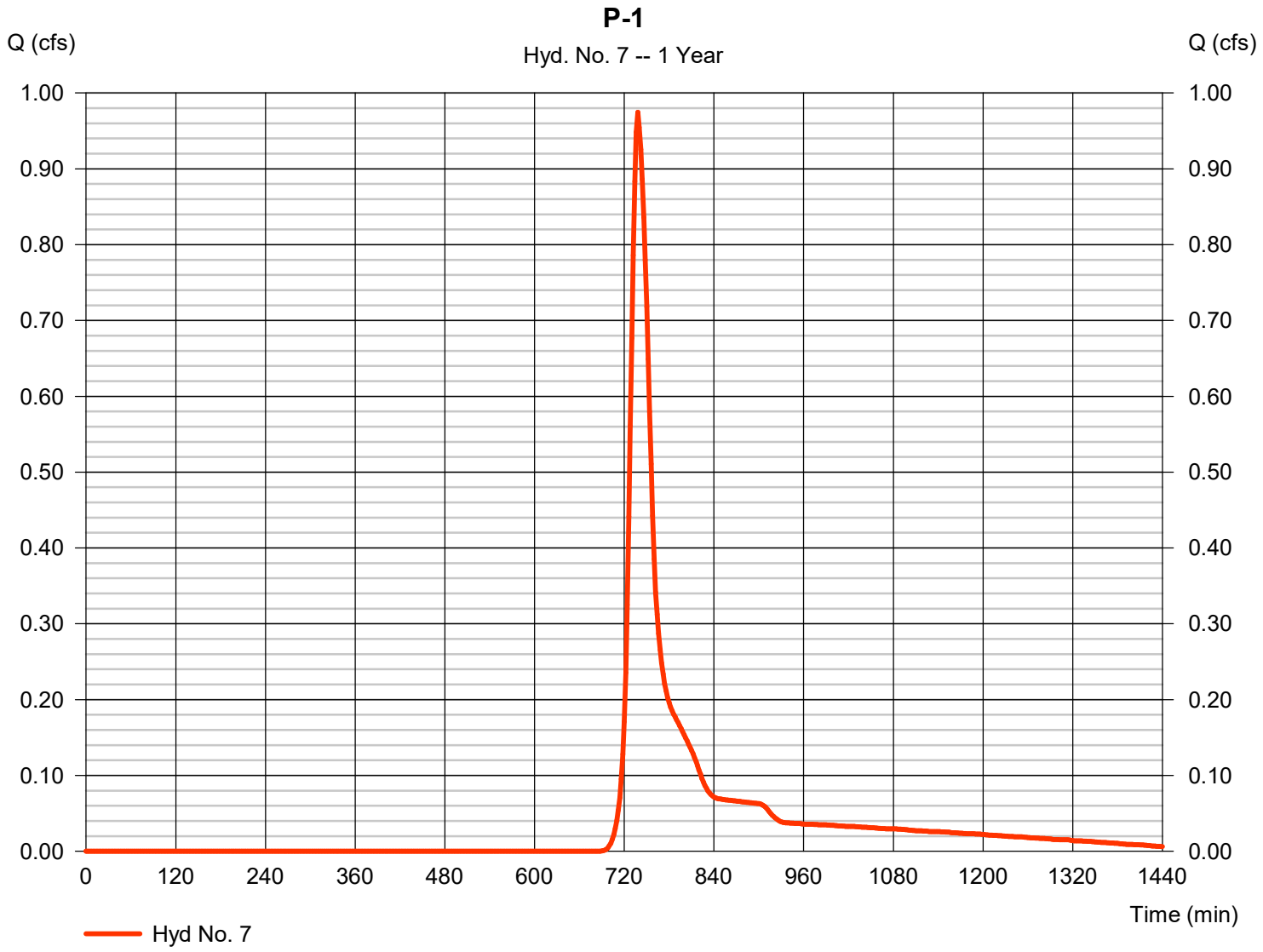


Hydrograph Report

Hyd. No. 7

P-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.975 cfs
Storm frequency	=	1 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	0.080 acft
Drainage area	=	1.304 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	22.40 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 7

P-1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.400		0.240		0.011		
Flow length (ft)	= 60.0		88.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		2.70		0.00		
Land slope (%)	= 5.80		4.50		0.00		
Travel Time (min)	**= 10.15**	**+**	**10.14**	**+**	**0.00**	**=**	**20.29**
Shallow Concentrated Flow							
Flow length (ft)	= 290.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.28		0.00		0.00		
Travel Time (min)	**= 2.12**	**+**	**0.00**	**+**	**0.00**	**=**	**2.12**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

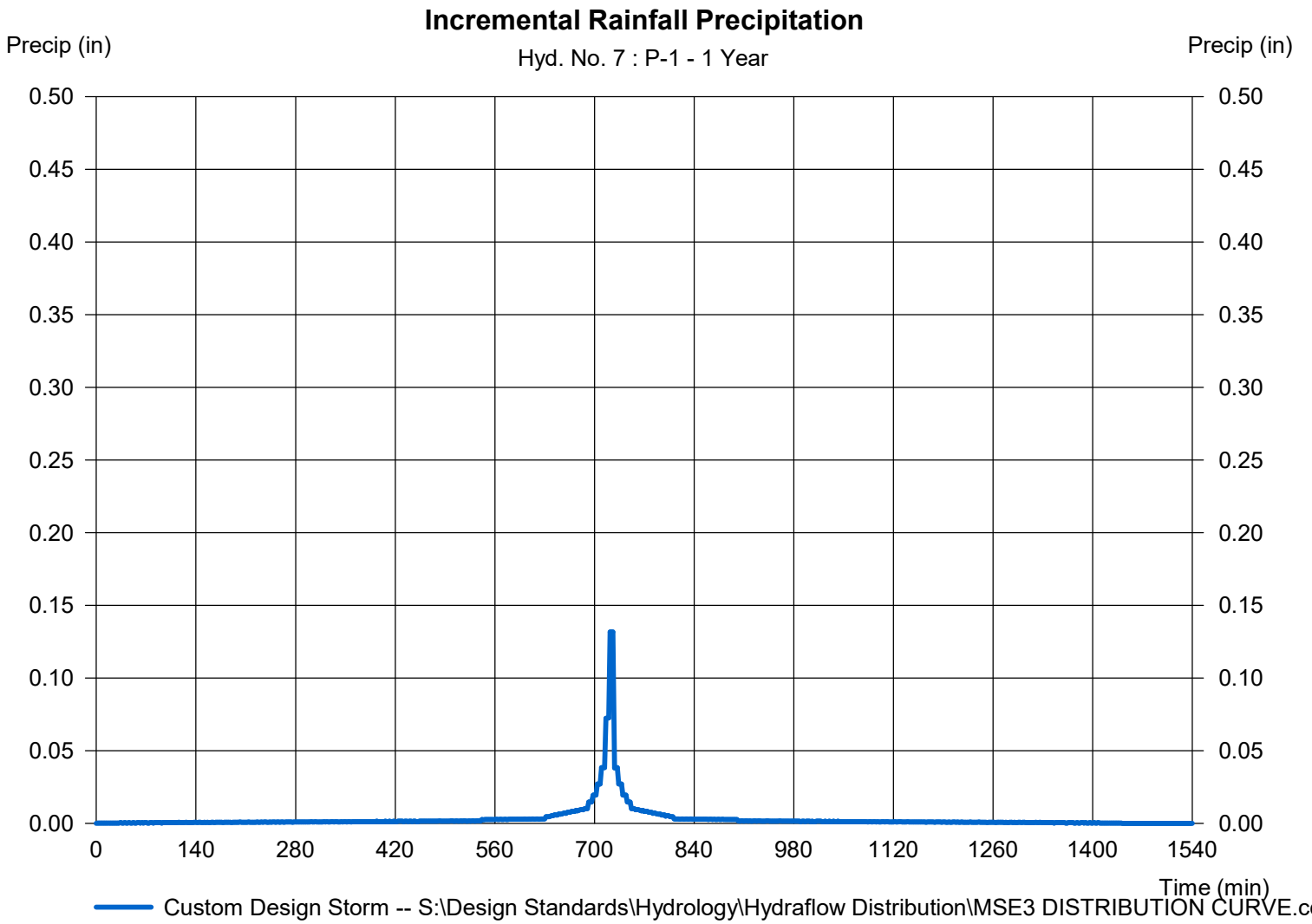
Total Travel Time, Tc ..... 22.40 min

Precipitation Report

Hyd. No. 7

P-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

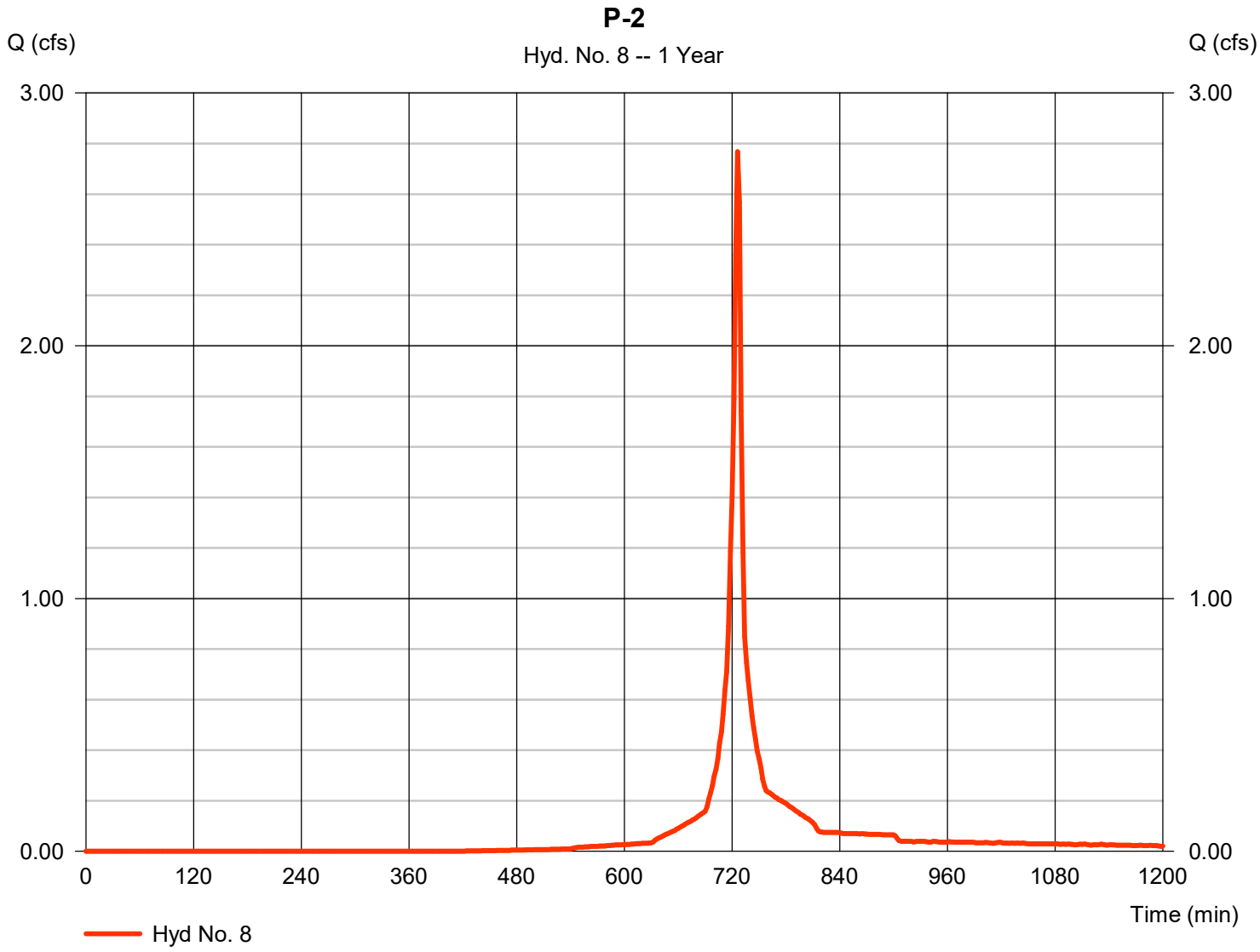


Hydrograph Report

Hyd. No. 8

P-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.768 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.124 acft
Drainage area	=	0.940 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU			

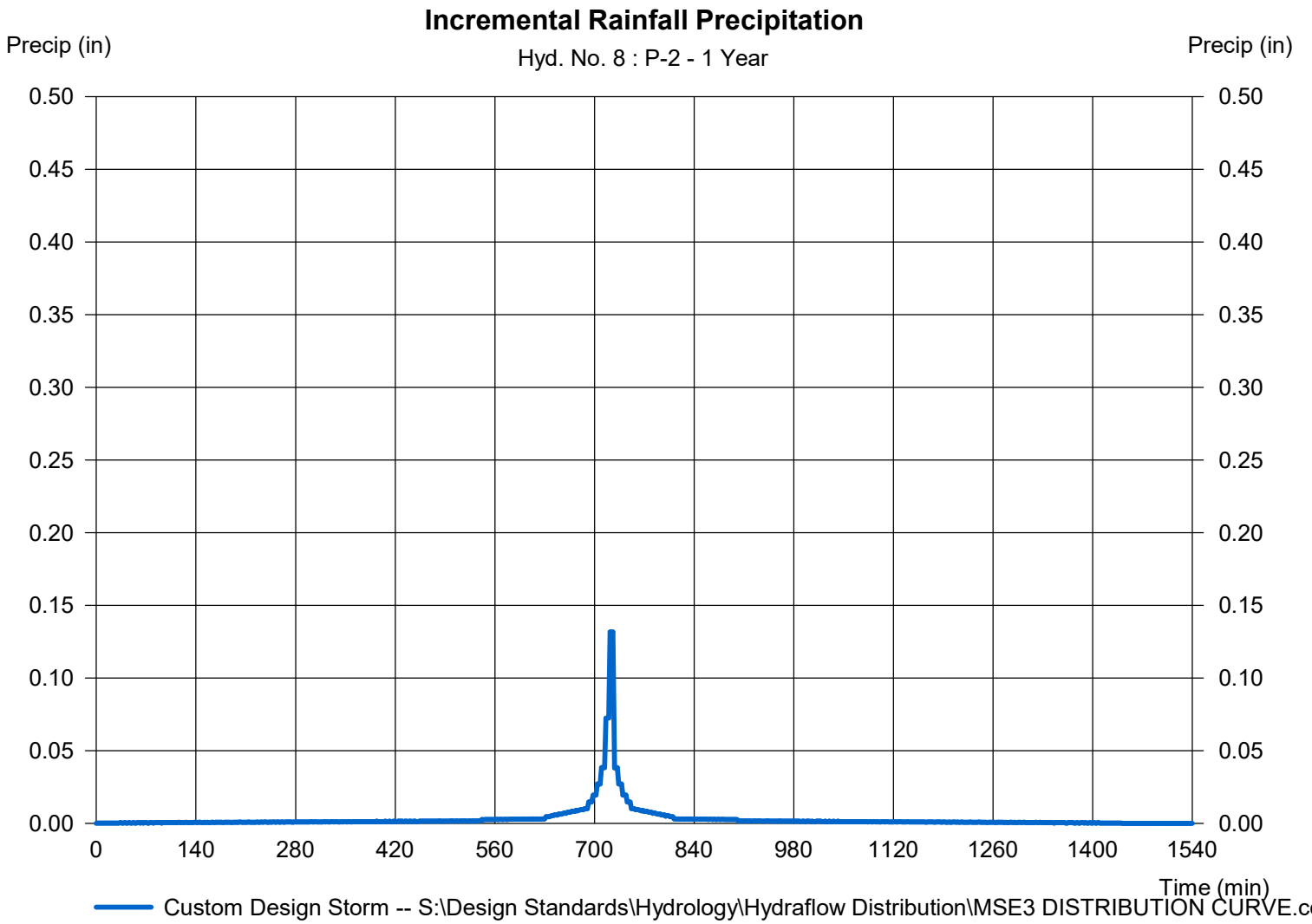


Precipitation Report

Hyd. No. 8

P-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

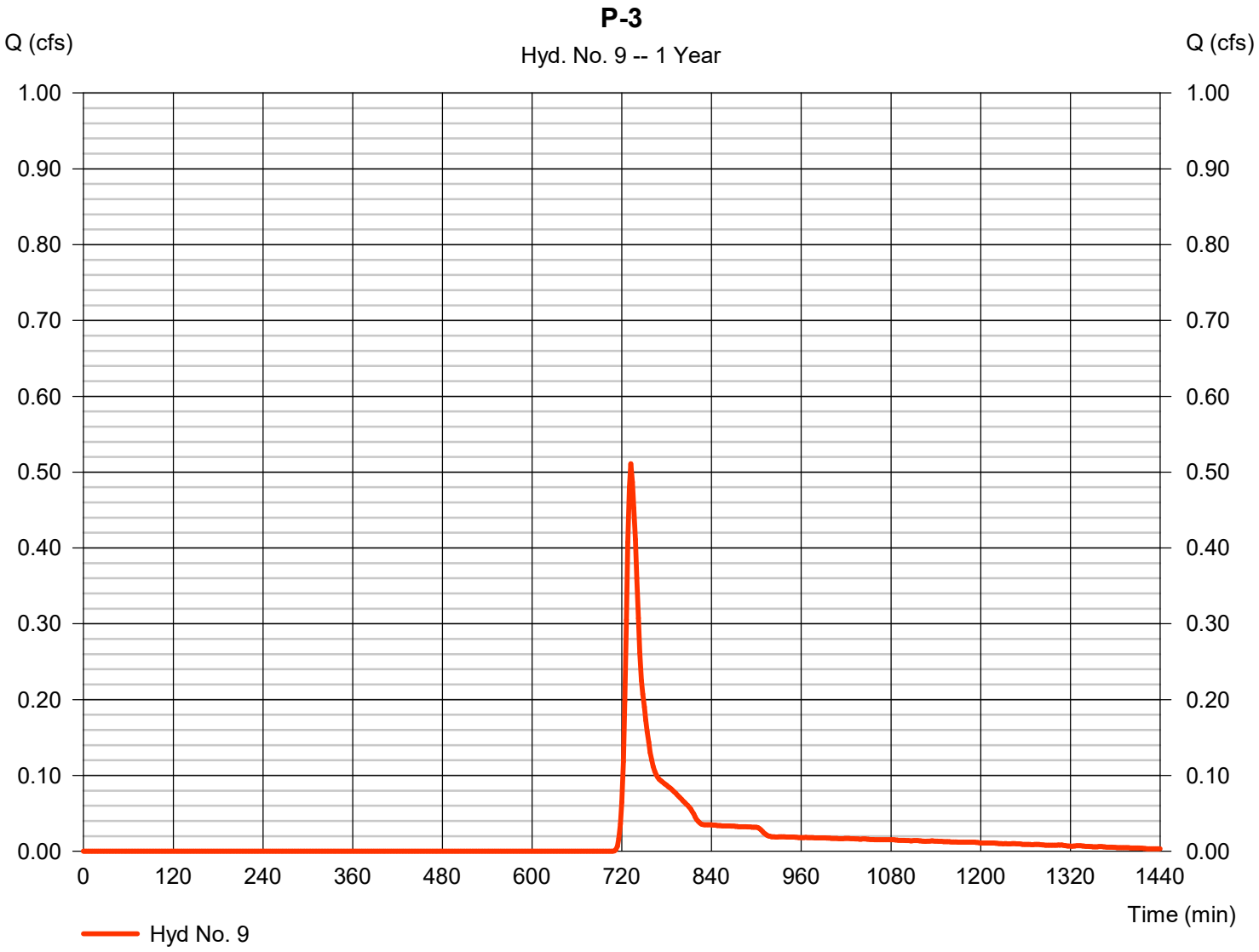


Hydrograph Report

Hyd. No. 9

P-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.511 cfs
Storm frequency	=	1 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.035 acft
Drainage area	=	0.851 ac	Curve number	=	72
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.10 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde Storm Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484



TR55 Tc Worksheet

Hyd. No. 9

P-3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 111.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.70		0.00		0.00		
Land slope (%)	= 7.20		0.00		0.00		
Travel Time (min)	**= 10.12**	**+**	**0.00**	**+**	**0.00**	**=**	**10.12**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	=0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

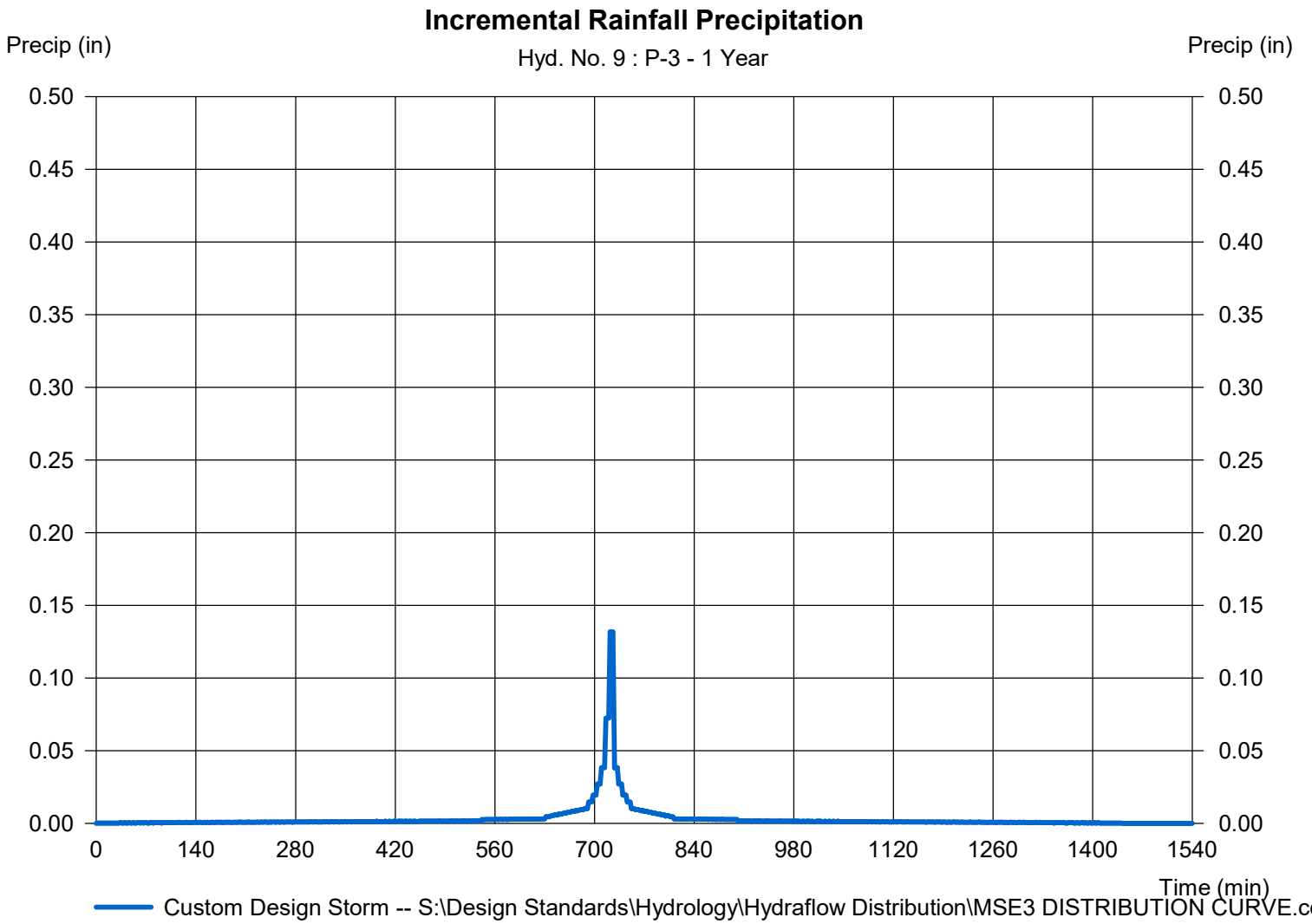
Total Travel Time, Tc ..... 10.10 min

Precipitation Report

Hyd. No. 9

P-3

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



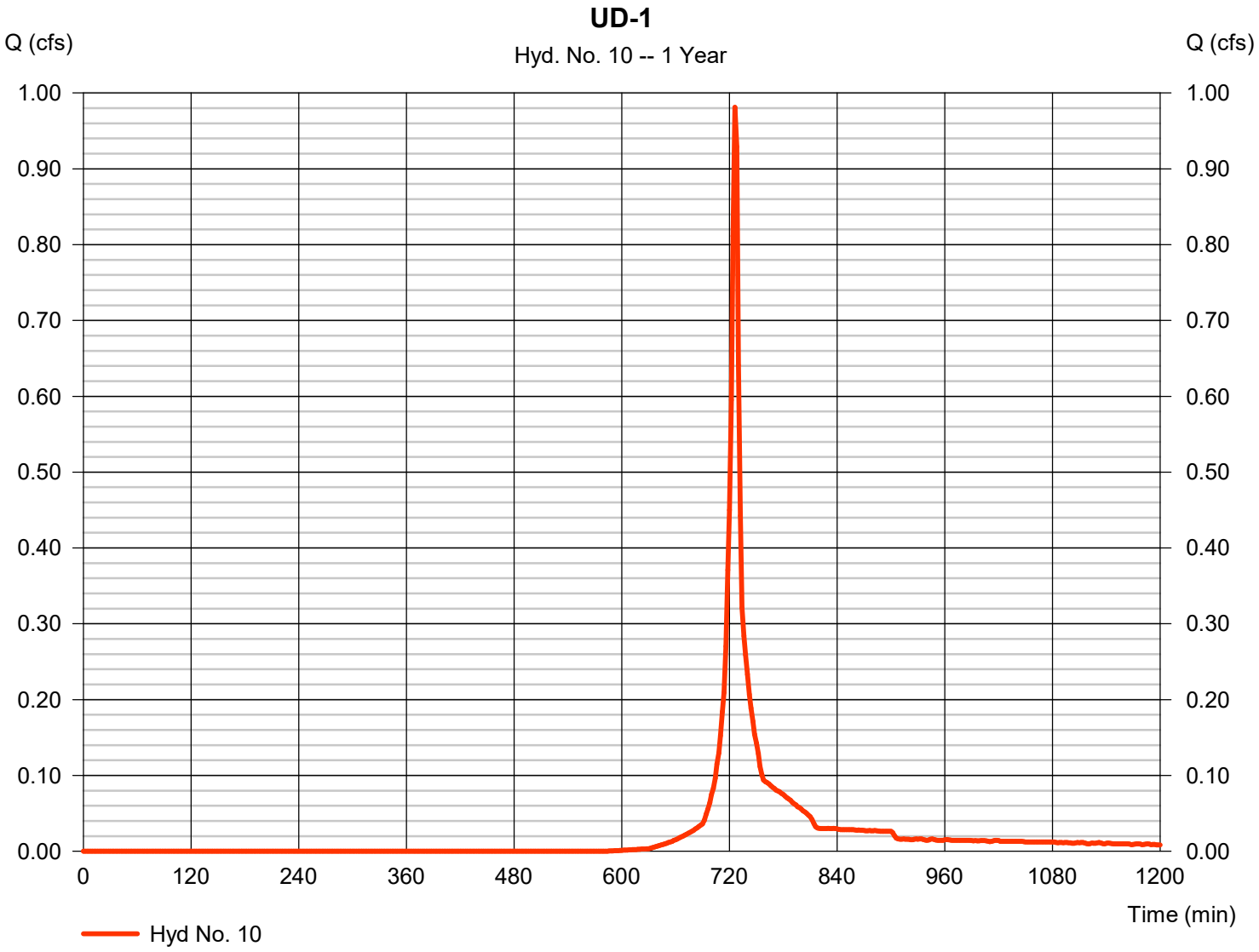
Hydrograph Report

Hyd. No. 10

UD-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.981 cfs
Storm frequency	=	1 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.042 acft
Drainage area	=	0.441 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.40 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor	Shape factor	=	484

Distribution = S:\Design Standards\Hydrology\Hyd Factor\SHAPE FACTOR DISTRIBUTION CU

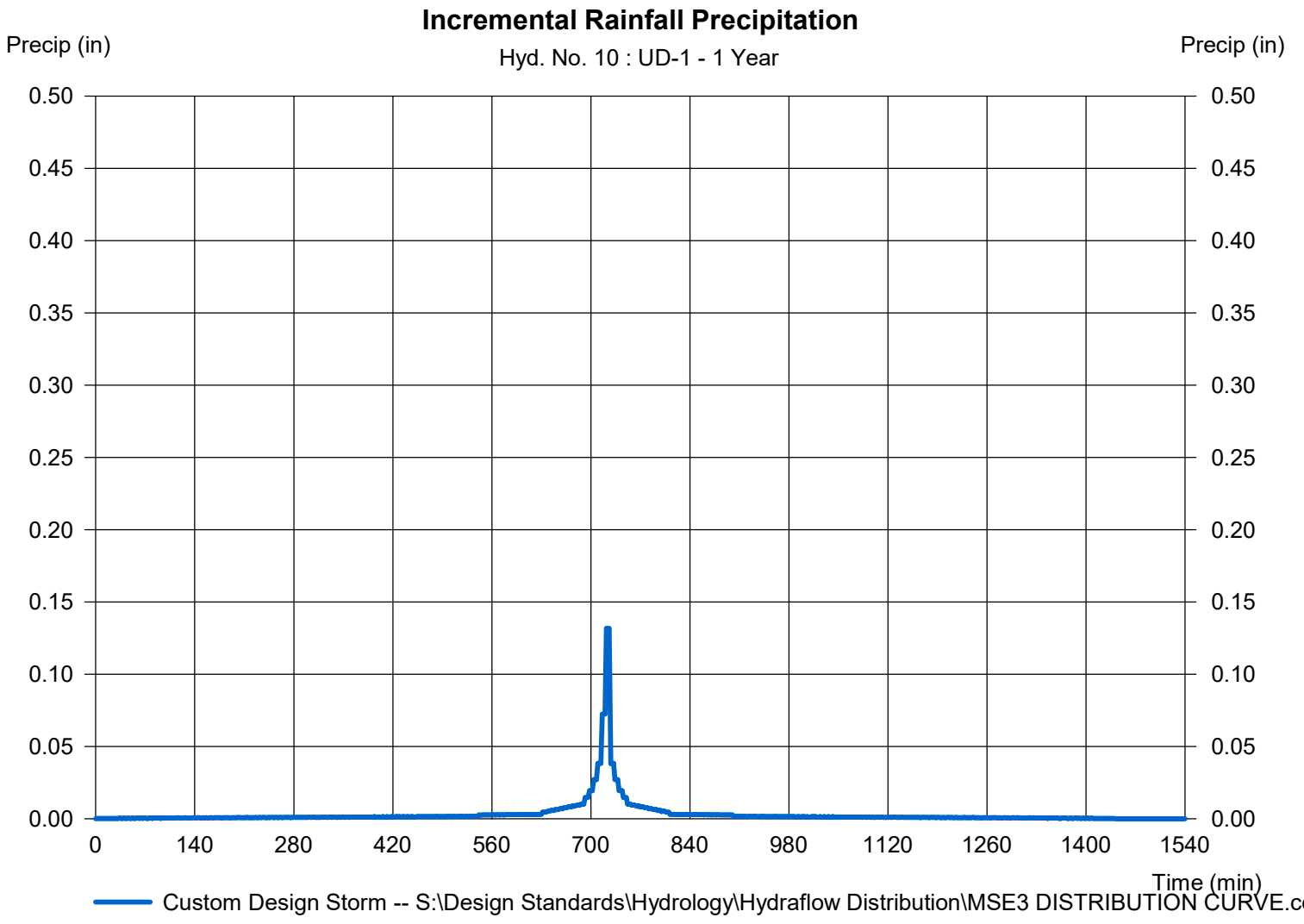


Precipitation Report

Hyd. No. 10

UD-1

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



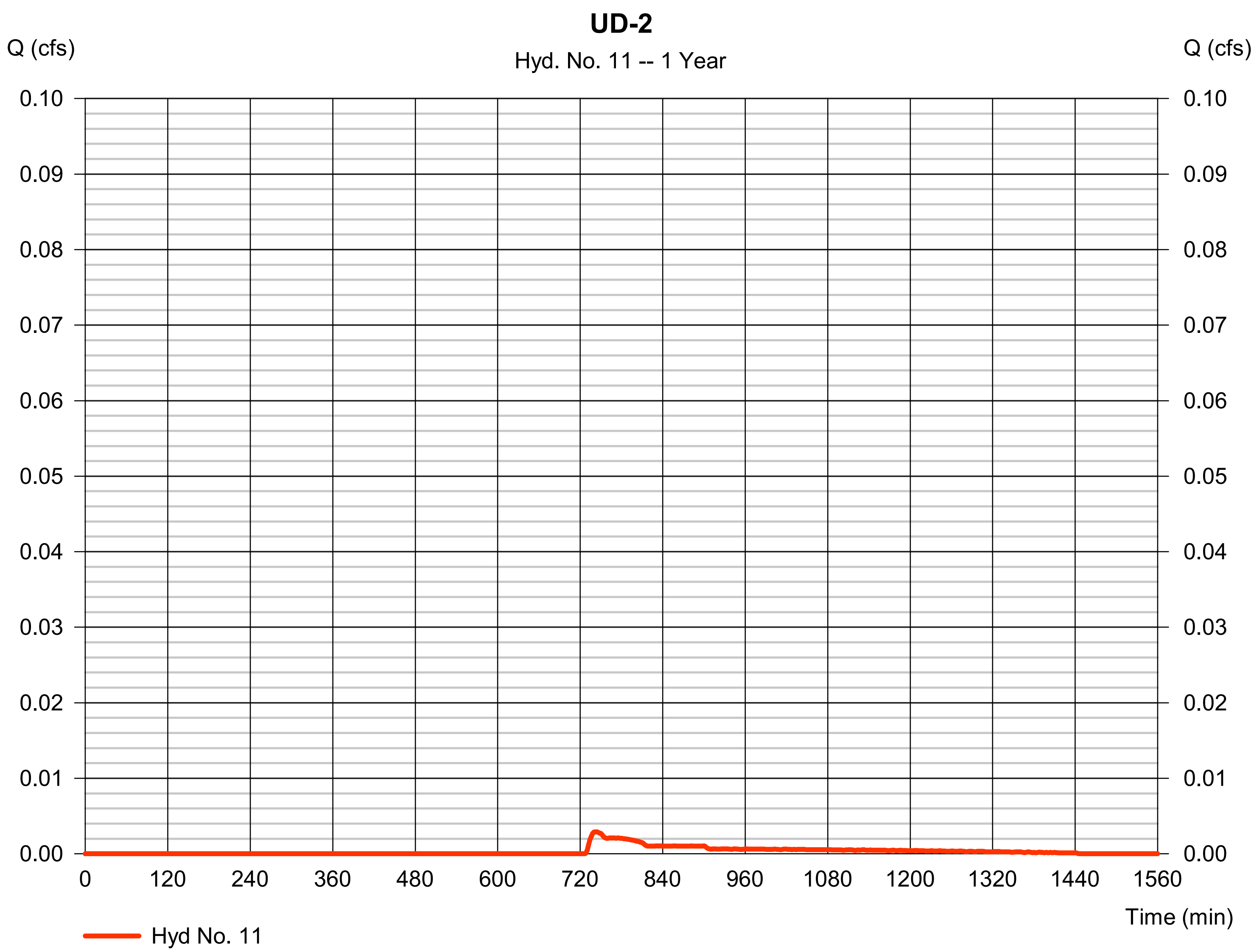
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 — Thursday, 08 / 8 / 2019

Hyd. No. 11

UD-2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.003 cfs
Storm frequency	= 1 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 0.001 acft
Drainage area	= 0.092 ac	Curve number	= 57
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 2.40 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

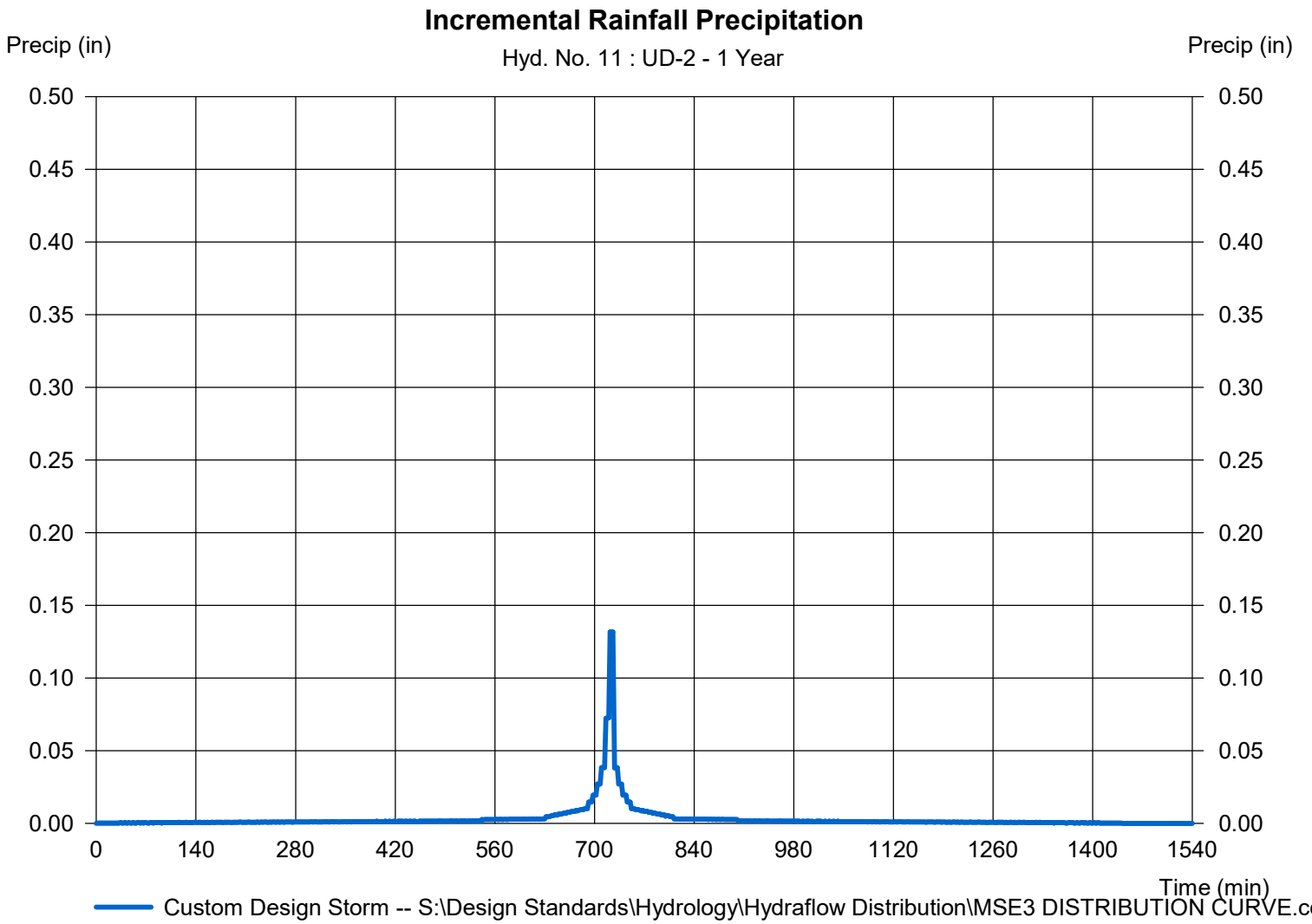


Precipitation Report

Hyd. No. 11

UD-2

Storm Frequency	= 1 yrs	Time interval	= 2 min
Total precip.	= 2.4000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



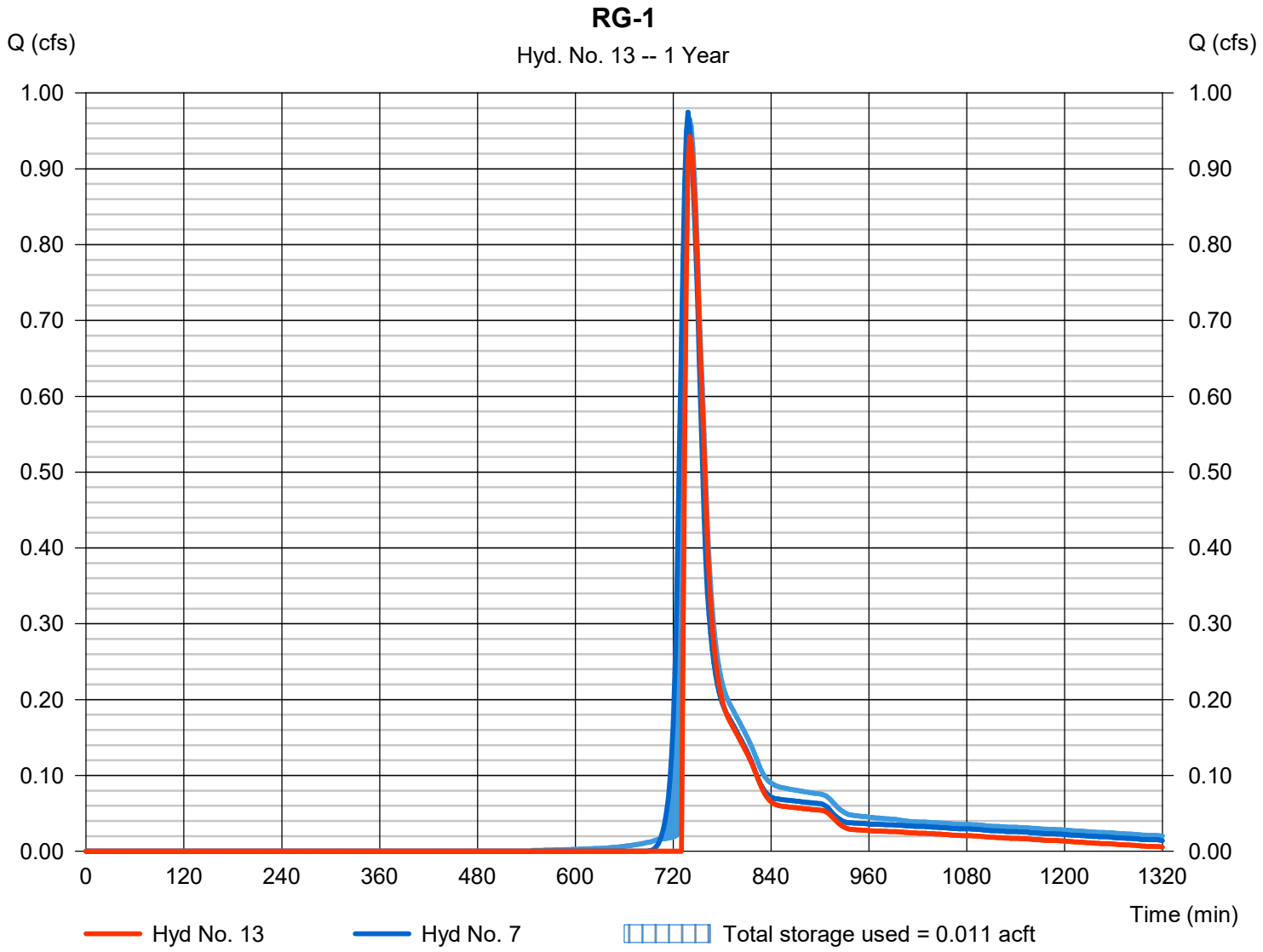
Hydrograph Report

Hyd. No. 13

RG-1

Hydrograph type	=	Reservoir	Peak discharge	=	0.943 cfs
Storm frequency	=	1 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	0.064 acft
Inflow hyd. No.	=	7 - P-1	Max. Elevation	=	128.12 ft
Reservoir name	=	RG-1	Max. Storage	=	0.011 acft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 1 - RG-1

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 127.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	127.50	527	0.000	0.000
0.50	128.00	772	0.007	0.007
1.50	129.00	1,663	0.027	0.035

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	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)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 128.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.500 (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 acft	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	0.000	127.50	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.05	0.001	127.55	---	---	---	---	0.00	---	---	---	0.001	---	0.001
0.10	0.001	127.60	---	---	---	---	0.00	---	---	---	0.002	---	0.002
0.15	0.002	127.65	---	---	---	---	0.00	---	---	---	0.003	---	0.003
0.20	0.003	127.70	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.25	0.004	127.75	---	---	---	---	0.00	---	---	---	0.004	---	0.004
0.30	0.004	127.80	---	---	---	---	0.00	---	---	---	0.005	---	0.005
0.35	0.005	127.85	---	---	---	---	0.00	---	---	---	0.006	---	0.006
0.40	0.006	127.90	---	---	---	---	0.00	---	---	---	0.007	---	0.007
0.45	0.007	127.95	---	---	---	---	0.00	---	---	---	0.008	---	0.008
0.50	0.007	128.00	---	---	---	---	0.00	---	---	---	0.009	---	0.009
0.60	0.010	128.10	---	---	---	---	0.66	---	---	---	0.010	---	0.668
0.70	0.013	128.20	---	---	---	---	1.86	---	---	---	0.011	---	1.872
0.80	0.016	128.30	---	---	---	---	3.42	---	---	---	0.012	---	3.430
0.90	0.018	128.40	---	---	---	---	5.26	---	---	---	0.013	---	5.276
1.00	0.021	128.50	---	---	---	---	7.35	---	---	---	0.014	---	7.369
1.10	0.024	128.60	---	---	---	---	9.67	---	---	---	0.015	---	9.683
1.20	0.027	128.70	---	---	---	---	12.18	---	---	---	0.016	---	12.20
1.30	0.029	128.80	---	---	---	---	14.88	---	---	---	0.017	---	14.90
1.40	0.032	128.90	---	---	---	---	17.76	---	---	---	0.018	---	17.78
1.50	0.035	129.00	---	---	---	---	20.80	---	---	---	0.019	---	20.82

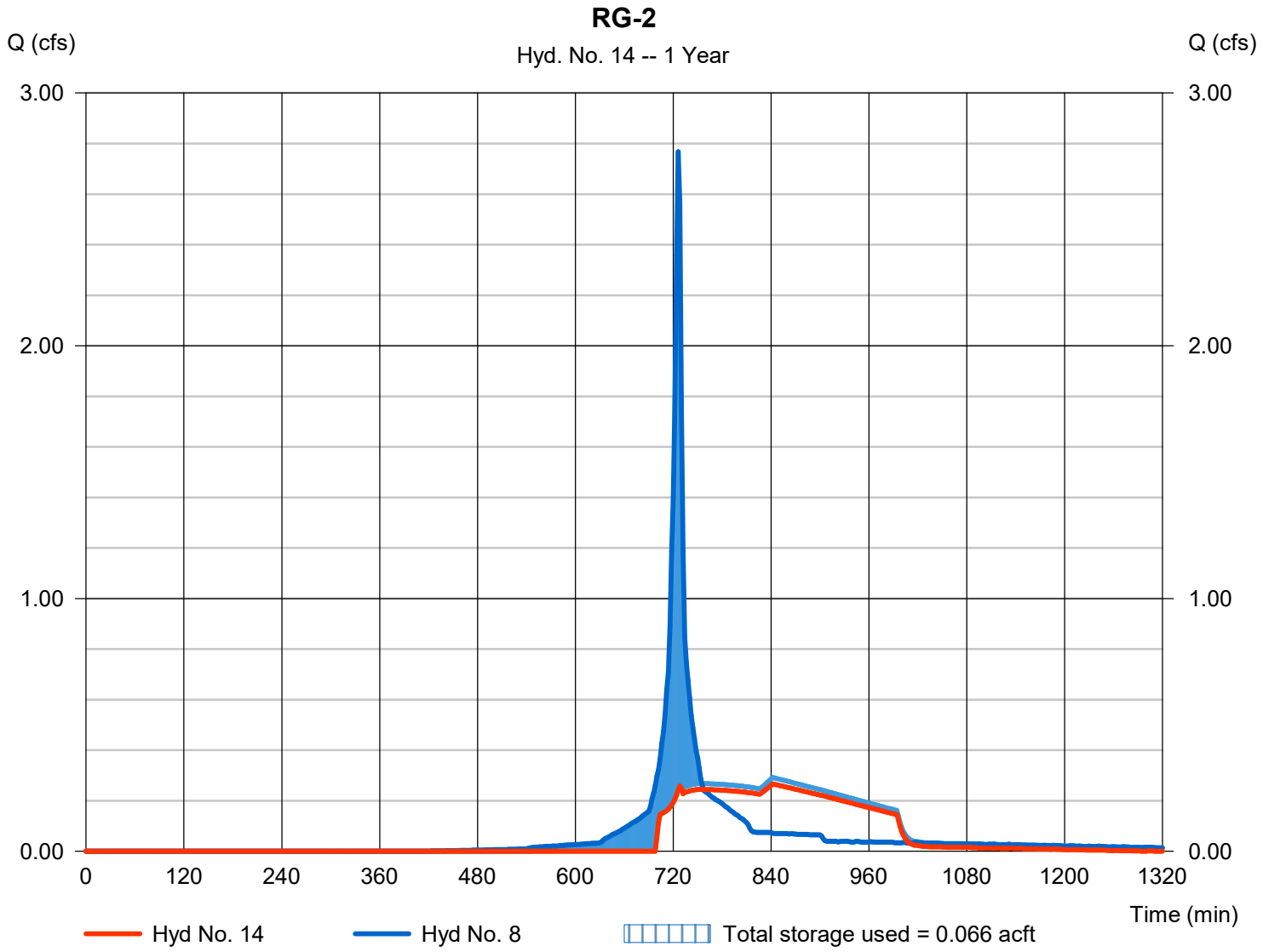
Hydrograph Report

Hyd. No. 14

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	0.267 cfs
Storm frequency	=	1 yrs	Time to peak	=	842 min
Time interval	=	2 min	Hyd. volume	=	0.093 acft
Inflow hyd. No.	=	8 - P-2	Max. Elevation	=	133.40 ft
Reservoir name	=	RG-2	Max. Storage	=	0.066 acft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond No. 2 - RG-2

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 131.50 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	131.50	1,078	0.000	0.000
0.50	132.50	1,390	0.014	0.014
1.50	133.00	2,265	0.042	0.056
2.50	134.00	3,502	0.066	0.121
3.00	134.50	4,160	0.044	0.165

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	3.00	0.00	0.00
Span (in)	= 12.00	3.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 129.50	132.00	0.00	0.00
Length (ft)	= 38.00	5.00	0.00	0.00
Slope (%)	= 1.00	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	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	10.00	0.00	0.00
Crest El. (ft)	= 133.50	134.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.500 (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 acft	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	0.000	131.50	0.00	0.00	---	---	0.00	0.00	---	---	0.000	---	0.000
0.05	0.001	131.55	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.002	---	0.002
0.10	0.003	131.60	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.003	---	0.003
0.15	0.004	131.65	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.005	---	0.005
0.20	0.006	131.70	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.006	---	0.006
0.25	0.007	131.75	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.008	---	0.008
0.30	0.008	131.80	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.010	---	0.010
0.35	0.010	131.85	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.011	---	0.011
0.40	0.011	131.90	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.013	---	0.013
0.45	0.013	131.95	4.52 oc	0.00	---	---	0.00	0.00	---	---	0.014	---	0.014
0.50	0.014	132.50	4.52 oc	0.14 ic	---	---	0.00	0.00	---	---	0.016	---	0.161
0.60	0.018	132.60	4.52 oc	0.16 ic	---	---	0.00	0.00	---	---	0.017	---	0.180
0.70	0.022	132.70	4.52 oc	0.18 ic	---	---	0.00	0.00	---	---	0.018	---	0.197
0.80	0.027	132.80	4.52 oc	0.19 ic	---	---	0.00	0.00	---	---	0.019	---	0.213
0.90	0.031	132.90	4.52 oc	0.21 ic	---	---	0.00	0.00	---	---	0.020	---	0.228
1.00	0.035	133.00	4.52 oc	0.22 ic	---	---	0.00	0.00	---	---	0.021	---	0.242
1.10	0.039	133.10	4.52 oc	0.23 ic	---	---	0.00	0.00	---	---	0.022	---	0.256
1.20	0.043	133.20	4.52 oc	0.25 ic	---	---	0.00	0.00	---	---	0.023	---	0.268
1.30	0.047	133.30	4.52 oc	0.26 ic	---	---	0.00	0.00	---	---	0.024	---	0.280
1.40	0.052	133.40	4.52 oc	0.27 ic	---	---	0.00	0.00	---	---	0.025	---	0.292
1.50	0.056	133.00	4.52 oc	0.22 ic	---	---	0.00	0.00	---	---	0.026	---	0.247
1.60	0.062	133.10	4.52 oc	0.23 ic	---	---	0.00	0.00	---	---	0.028	---	0.261
1.70	0.069	133.20	4.52 oc	0.25 ic	---	---	0.00	0.00	---	---	0.029	---	0.274
1.80	0.075	133.30	4.52 oc	0.26 ic	---	---	0.00	0.00	---	---	0.031	---	0.287
1.90	0.082	133.40	4.52 oc	0.27 ic	---	---	0.00	0.00	---	---	0.032	---	0.299
2.00	0.089	133.50	4.52 oc	0.28 ic	---	---	0.00	0.00	---	---	0.033	---	0.310
2.10	0.095	133.60	4.52 oc	0.29 ic	---	---	0.66	0.00	---	---	0.035	---	0.983
2.20	0.102	133.70	4.52 oc	0.30 ic	---	---	1.87	0.00	---	---	0.036	---	2.204
2.30	0.108	133.80	4.52 oc	0.31 ic	---	---	3.44	0.00	---	---	0.038	---	3.781
2.40	0.115	133.90	5.60 oc	0.31 ic	---	---	5.29	0.00	---	---	0.039	---	5.636
2.50	0.121	134.00	7.19 ic	0.15 ic	---	---	7.05 s	0.00	---	---	0.041	---	7.234
2.55	0.126	134.05	7.35 ic	0.12 ic	---	---	7.22 s	0.29	---	---	0.041	---	7.677
2.60	0.130	134.10	7.45 ic	0.11 ic	---	---	7.34 s	0.82	---	---	0.042	---	8.318
2.65	0.135	134.15	7.54 ic	0.10 ic	---	---	7.44 s	1.51	---	---	0.043	---	9.095
2.70	0.139	134.20	7.62 ic	0.09 ic	---	---	7.53 s	2.33	---	---	0.044	---	9.988
2.75	0.143	134.25	7.69 ic	0.08 ic	---	---	7.61 s	3.25	---	---	0.044	---	10.98
2.80	0.148	134.30	7.75 ic	0.07 ic	---	---	7.68 s	4.27	---	---	0.045	---	12.07
2.85	0.152	134.35	7.81 ic	0.07 ic	---	---	7.74 s	5.38	---	---	0.046	---	13.24

Continues on next page...

RG-2

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.90	0.156	134.40	7.87 ic	0.06 ic	---	---	7.80 s	6.58	---	---	0.047	---	14.49
2.95	0.161	134.45	7.92 ic	0.06 ic	---	---	7.86 s	7.85	---	---	0.047	---	15.82
3.00	0.165	134.50	7.97 ic	0.06 ic	---	---	7.91 s	9.19	---	---	0.048	---	17.21

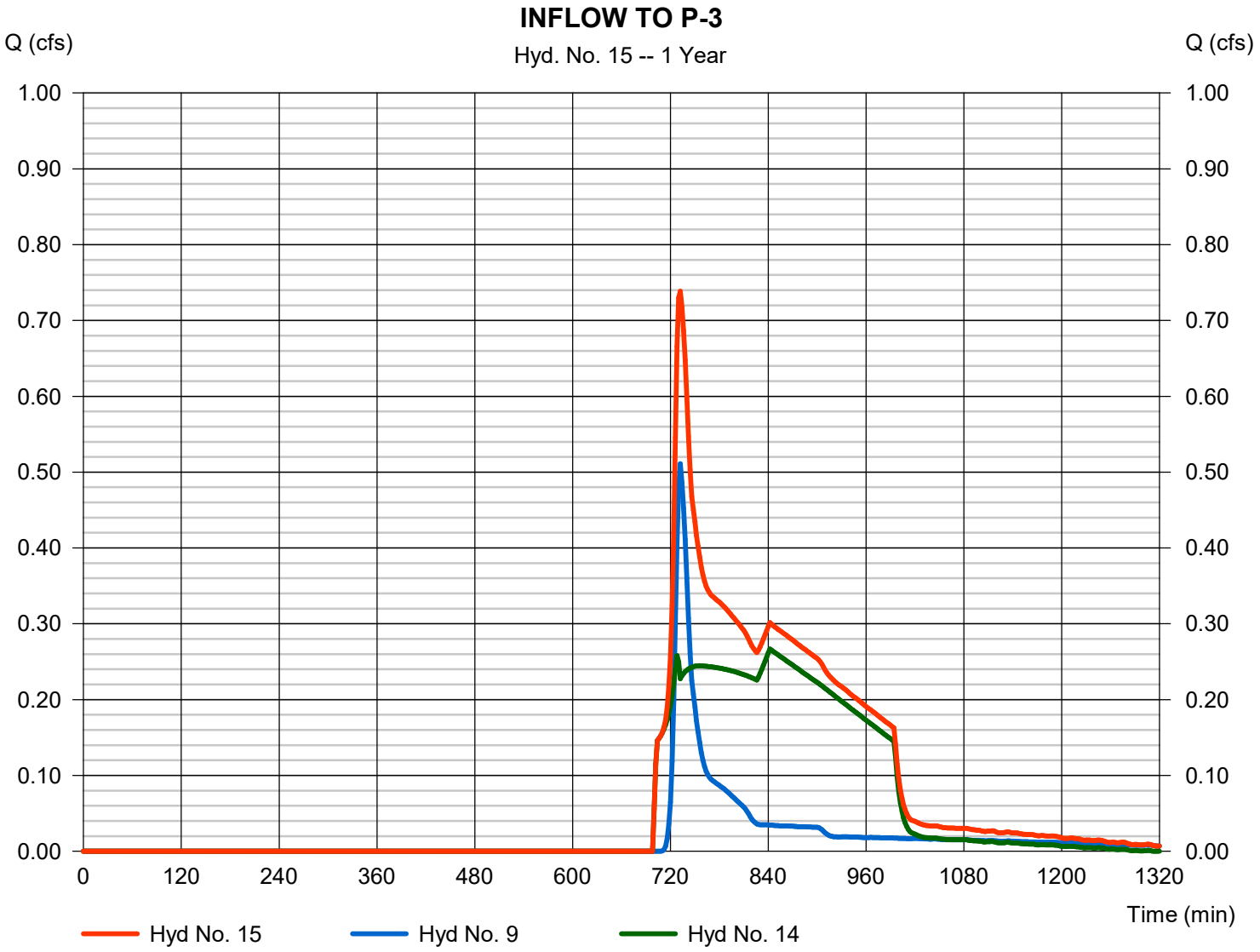
...End

Hydrograph Report

Hyd. No. 15

INFLOW TO P-3

Hydrograph type	= Combine	Peak discharge	= 0.739 cfs
Storm frequency	= 1 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 0.128 acft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 0.851 ac



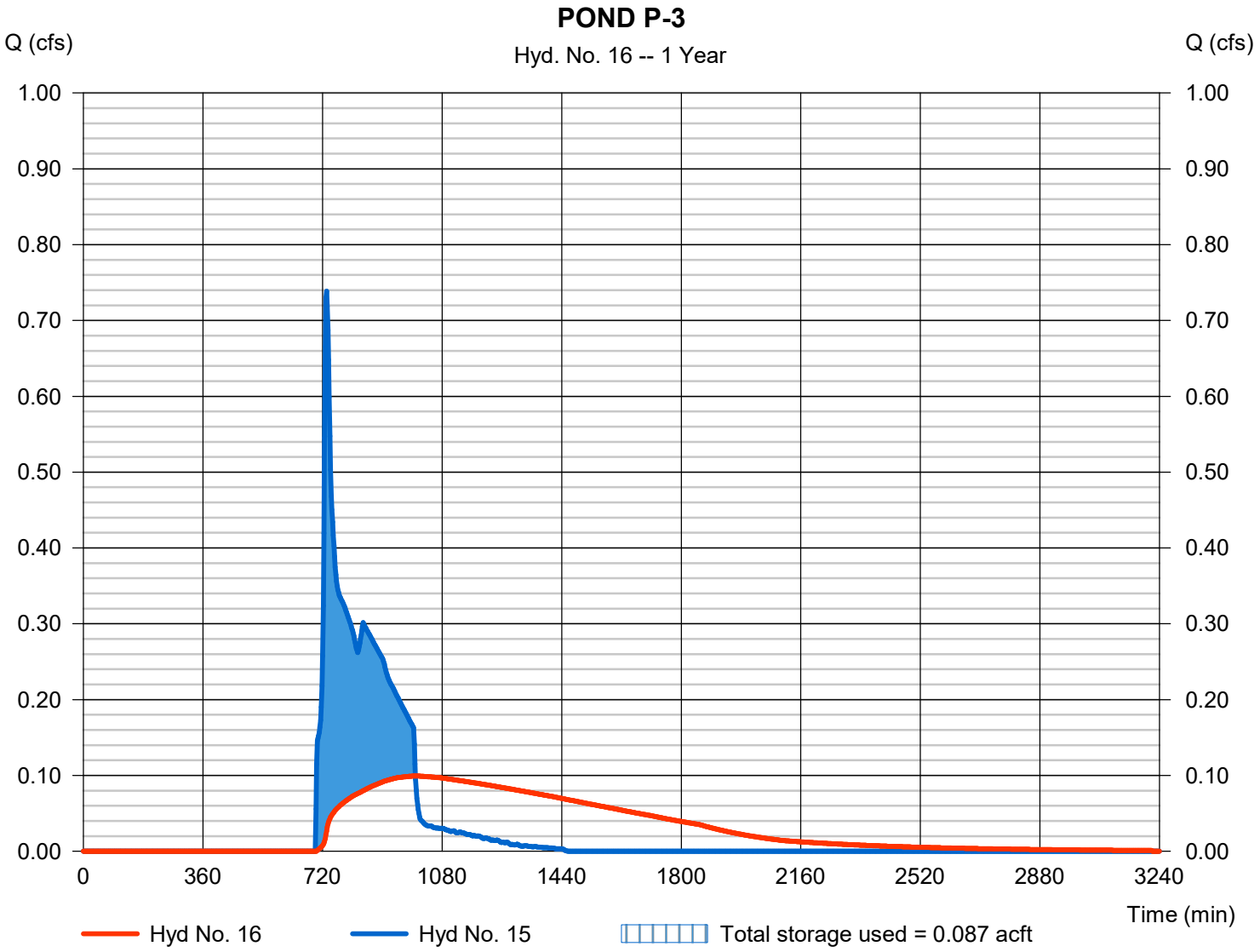
Hydrograph Report

Hyd. No. 16

POND P-3

Hydrograph type	= Reservoir	Peak discharge	= 0.099 cfs
Storm frequency	= 1 yrs	Time to peak	= 1000 min
Time interval	= 2 min	Hyd. volume	= 0.128 acft
Inflow hyd. No.	= 15 - INFLOW TO P-3	Max. Elevation	= 128.04 ft
Reservoir name	= POND P-3	Max. Storage	= 0.087 acft

Storage Indication method used.



Pond Report

Pond No. 3 - POND P-3

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 127.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	127.00	2,287	0.000	0.000
1.00	128.00	4,960	0.081	0.081
2.00	129.00	6,862	0.135	0.216
3.00	130.00	8,961	0.181	0.397

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	2.00	0.00	0.00
Span (in)	= 12.00	2.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 127.00	127.00	0.00	0.00
Length (ft)	= 37.00	0.50	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 9.42	10.00	0.00	0.00
Crest El. (ft)	= 128.50	129.00	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= 1	Broad	---	---
Multi-Stage	= Yes	No	No	No

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

TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

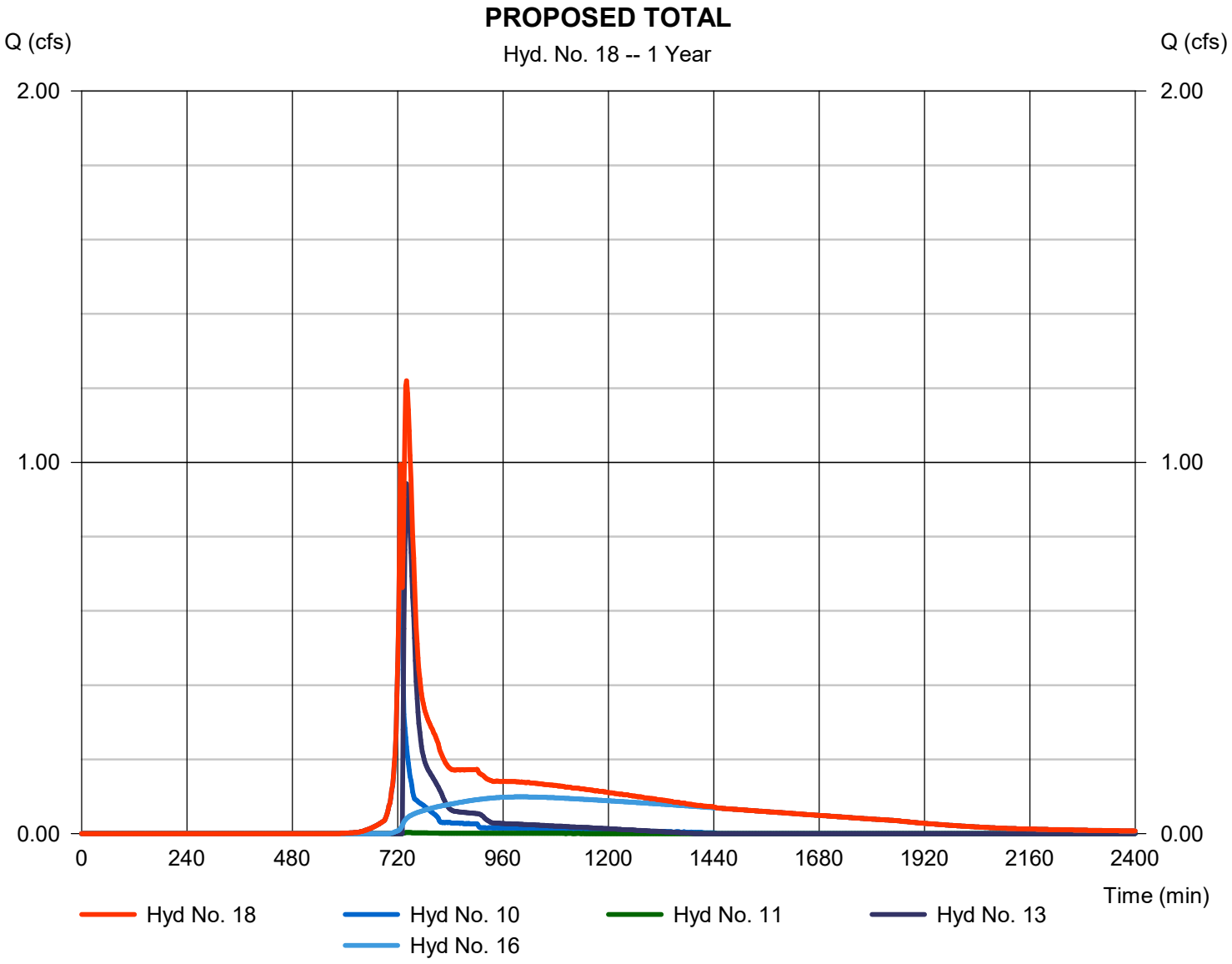
Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	127.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
0.10	0.008	127.10	0.01 ic	0.01 ic	---	---	0.00	0.00	---	---	---	---	0.014
0.20	0.016	127.20	0.04 ic	0.04 ic	---	---	0.00	0.00	---	---	---	---	0.035
0.30	0.024	127.30	0.05 ic	0.05 ic	---	---	0.00	0.00	---	---	---	---	0.047
0.40	0.032	127.40	0.06 ic	0.06 ic	---	---	0.00	0.00	---	---	---	---	0.057
0.50	0.041	127.50	0.07 ic	0.06 ic	---	---	0.00	0.00	---	---	---	---	0.065
0.60	0.049	127.60	0.07 ic	0.07 ic	---	---	0.00	0.00	---	---	---	---	0.072
0.70	0.057	127.70	0.08 ic	0.08 ic	---	---	0.00	0.00	---	---	---	---	0.079
0.80	0.065	127.80	0.09 ic	0.09 ic	---	---	0.00	0.00	---	---	---	---	0.085
0.90	0.073	127.90	0.09 ic	0.09 ic	---	---	0.00	0.00	---	---	---	---	0.091
1.00	0.081	128.00	0.10 ic	0.10 ic	---	---	0.00	0.00	---	---	---	---	0.097
1.10	0.095	128.10	0.11 ic	0.10 ic	---	---	0.00	0.00	---	---	---	---	0.102
1.20	0.108	128.20	0.11 ic	0.11 ic	---	---	0.00	0.00	---	---	---	---	0.107
1.30	0.122	128.30	0.11 ic	0.11 ic	---	---	0.00	0.00	---	---	---	---	0.112
1.40	0.135	128.40	0.12 ic	0.12 ic	---	---	0.00	0.00	---	---	---	---	0.117
1.50	0.149	128.50	0.12 ic	0.12 ic	---	---	0.00	0.00	---	---	---	---	0.121
1.60	0.162	128.60	1.10 ic	0.11 ic	---	---	0.99	0.00	---	---	---	---	1.101
1.70	0.176	128.70	2.88 oc	0.08 ic	---	---	2.81	0.00	---	---	---	---	2.885
1.80	0.189	128.80	4.10 oc	0.04 ic	---	---	4.06 s	0.00	---	---	---	---	4.101
1.90	0.203	128.90	4.38 ic	0.03 ic	---	---	4.35 s	0.00	---	---	---	---	4.377
2.00	0.216	129.00	4.58 ic	0.02 ic	---	---	4.55 s	0.00	---	---	---	---	4.574
2.10	0.234	129.10	4.75 ic	0.02 ic	---	---	4.73 s	0.82	---	---	---	---	5.570
2.20	0.253	129.20	4.91 ic	0.01 ic	---	---	4.88 s	2.33	---	---	---	---	7.222
2.30	0.271	129.30	5.06 ic	0.01 ic	---	---	5.03 s	4.27	---	---	---	---	9.318
2.40	0.289	129.40	5.20 ic	0.01 ic	---	---	5.18 s	6.58	---	---	---	---	11.76
2.50	0.307	129.50	5.34 ic	0.01 ic	---	---	5.31 s	9.19	---	---	---	---	14.51
2.60	0.325	129.60	5.47 ic	0.01 ic	---	---	5.43 s	12.08	---	---	---	---	17.52
2.70	0.343	129.70	5.60 ic	0.01 ic	---	---	5.56 s	15.23	---	---	---	---	20.80
2.80	0.361	129.80	5.73 ic	0.01 ic	---	---	5.69 s	18.61	---	---	---	---	24.30
2.90	0.379	129.90	5.85 ic	0.01 ic	---	---	5.84 s	22.20	---	---	---	---	28.05
3.00	0.397	130.00	5.98 ic	0.01 ic	---	---	5.94 s	26.00	---	---	---	---	31.94

Hydrograph Report

Hyd. No. 18

PROPOSED TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.220 cfs
Storm frequency	= 1 yrs	Time to peak	= 740 min
Time interval	= 2 min	Hyd. volume	= 0.234 acft
Inflow hyds.	= 10, 11, 13, 16	Contrib. drain. area	= 0.533 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

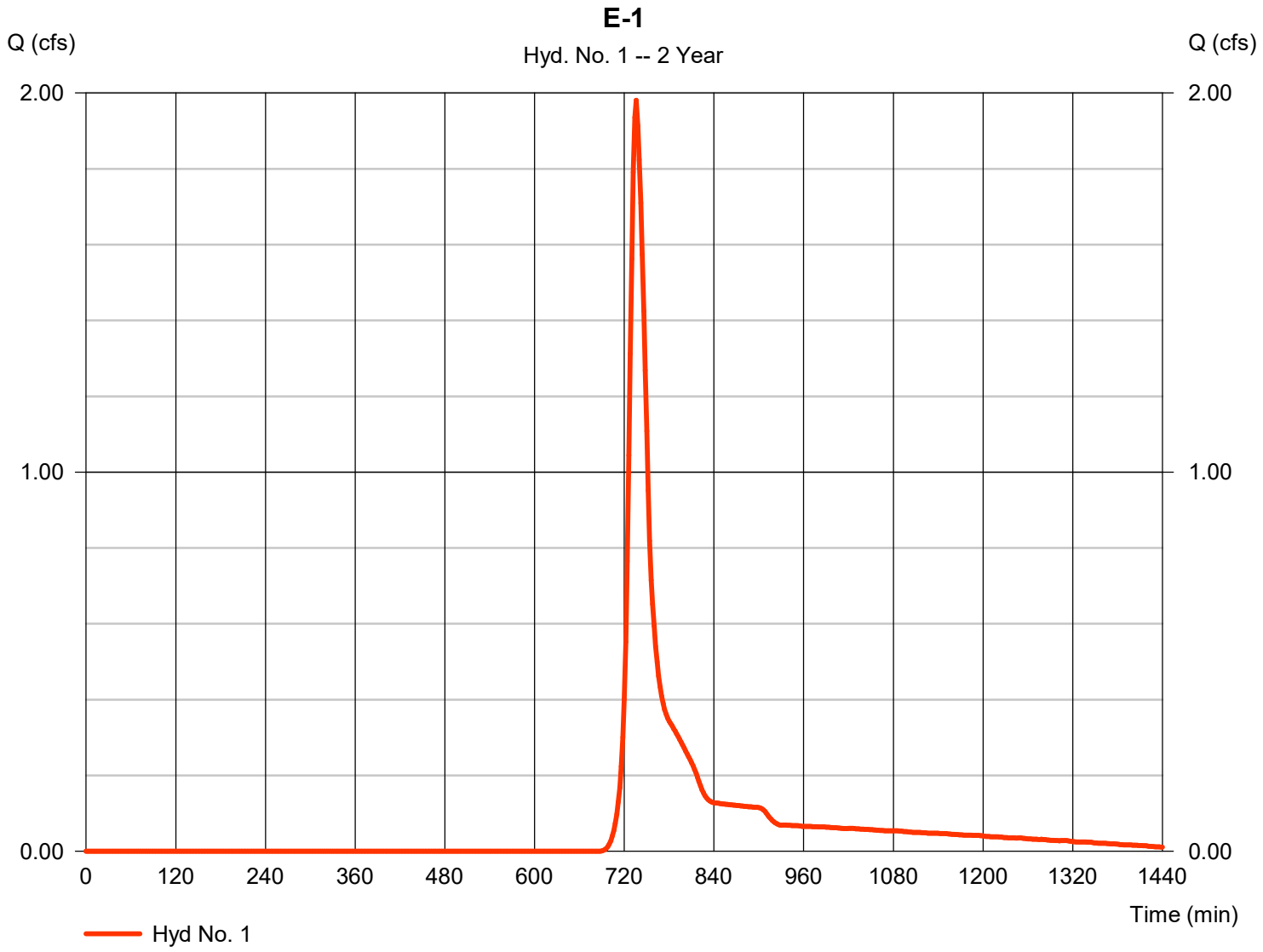
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	1.981	2	736	0.147	------	------	------	E-1
2	SCS Runoff	0.594	2	738	0.053	------	------	------	E-2
3	SCS Runoff	0.043	2	734	0.004	------	------	------	E-3
5	Combine	2.617	2	736	0.205	1, 2, 3,	------	------	Existing Total
7	SCS Runoff	1.268	2	738	0.102	------	------	------	P-1
8	SCS Runoff	3.204	2	726	0.145	------	------	------	P-2
9	SCS Runoff	0.720	2	732	0.046	------	------	------	P-3
10	SCS Runoff	1.179	2	726	0.051	------	------	------	UD-1
11	SCS Runoff	0.008	2	732	0.001	------	------	------	UD-2
13	Reservoir	1.236	2	740	0.085	7	128.15	0.011	RG-1
14	Reservoir	0.267	2	890	0.113	8	133.40	0.077	RG-2
15	Combine	0.966	2	732	0.159	9, 14	------	------	INFLOW TO P-3
16	Reservoir	0.107	2	1044	0.159	15	128.20	0.108	POND P-3
18	Combine	1.582	2	738	0.296	10, 11, 13, 16,	------	------	PROPOSED TOTAL

Hydrograph Report

Hyd. No. 1

E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.981 cfs
Storm frequency	=	2 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.147 acft
Drainage area	=	2.161 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.70 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU	Shape factor	=	484

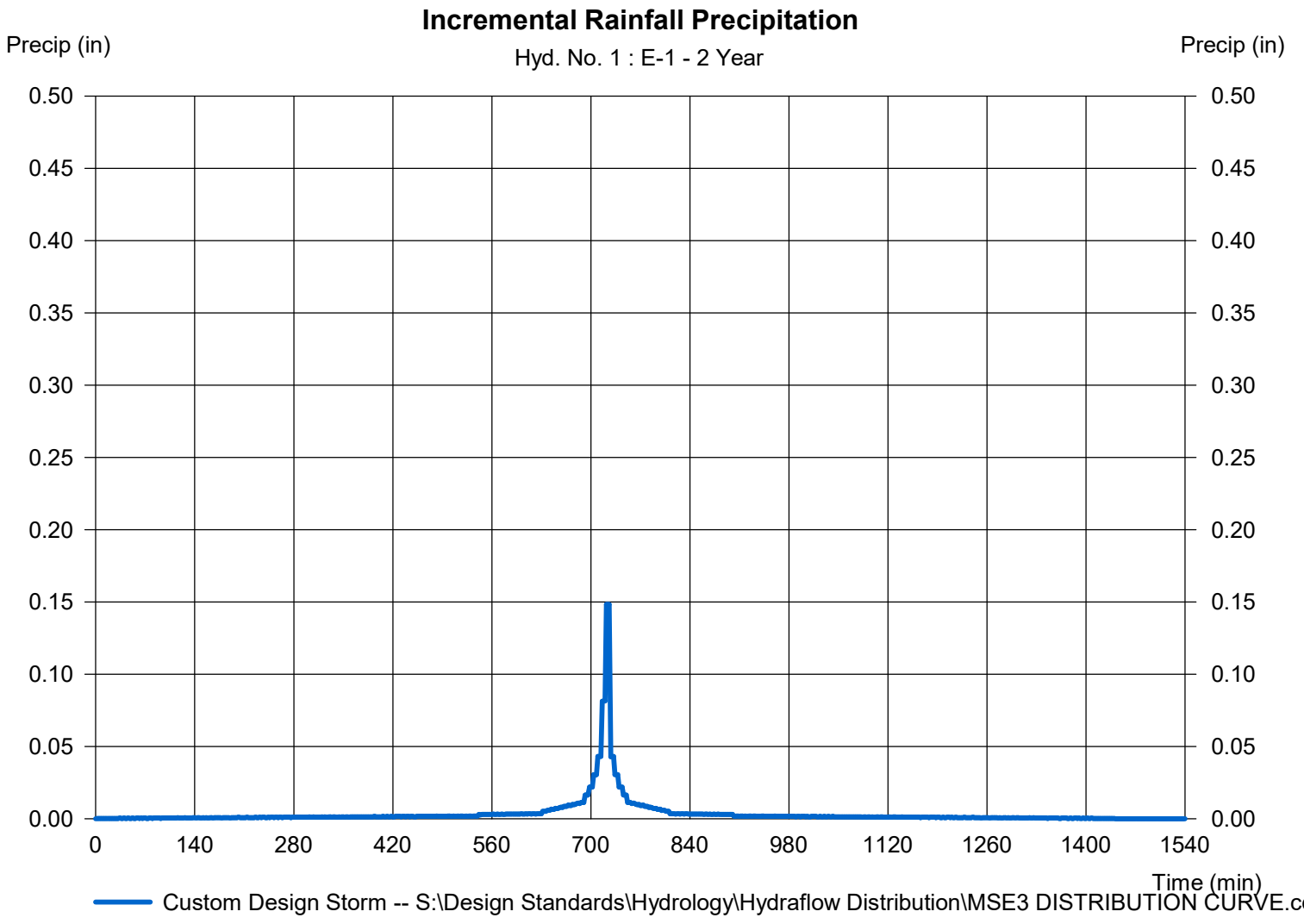


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

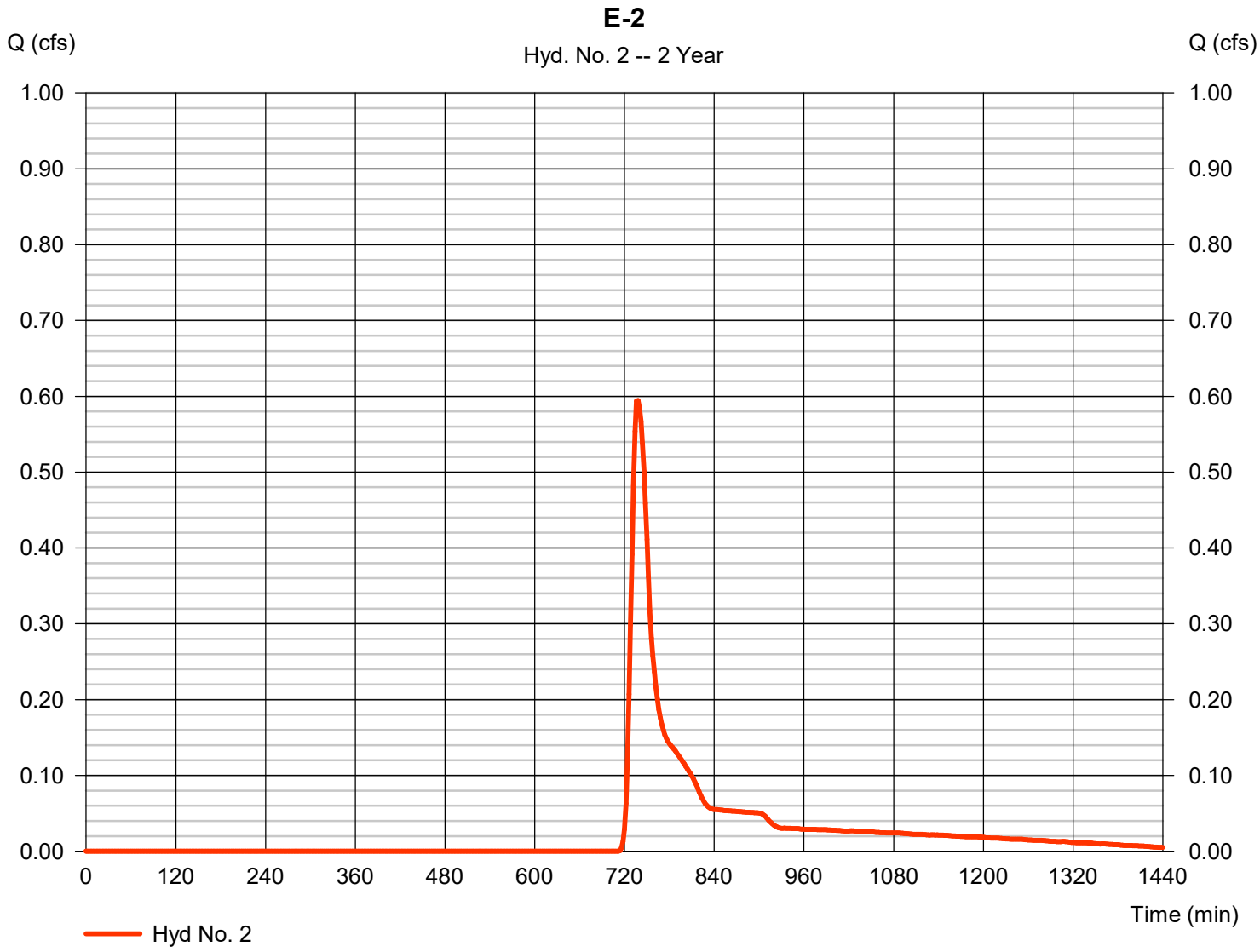


Hydrograph Report

Hyd. No. 2

E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.594 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	0.053 acft
Drainage area	=	1.336 ac	Curve number	=	68
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.50 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde flow Shape factor Distribution = MSE3 DISTRIBUTION CU			

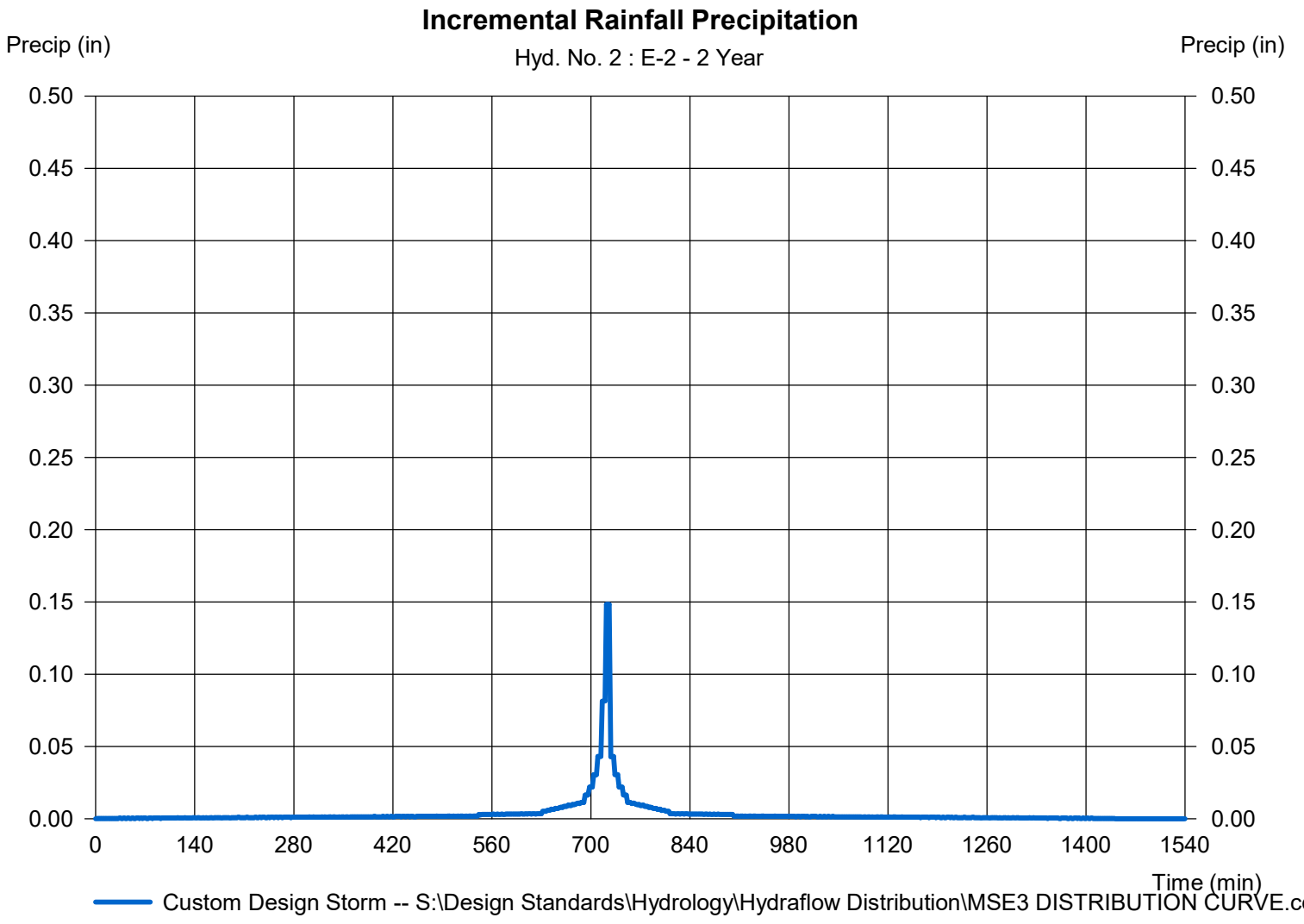


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

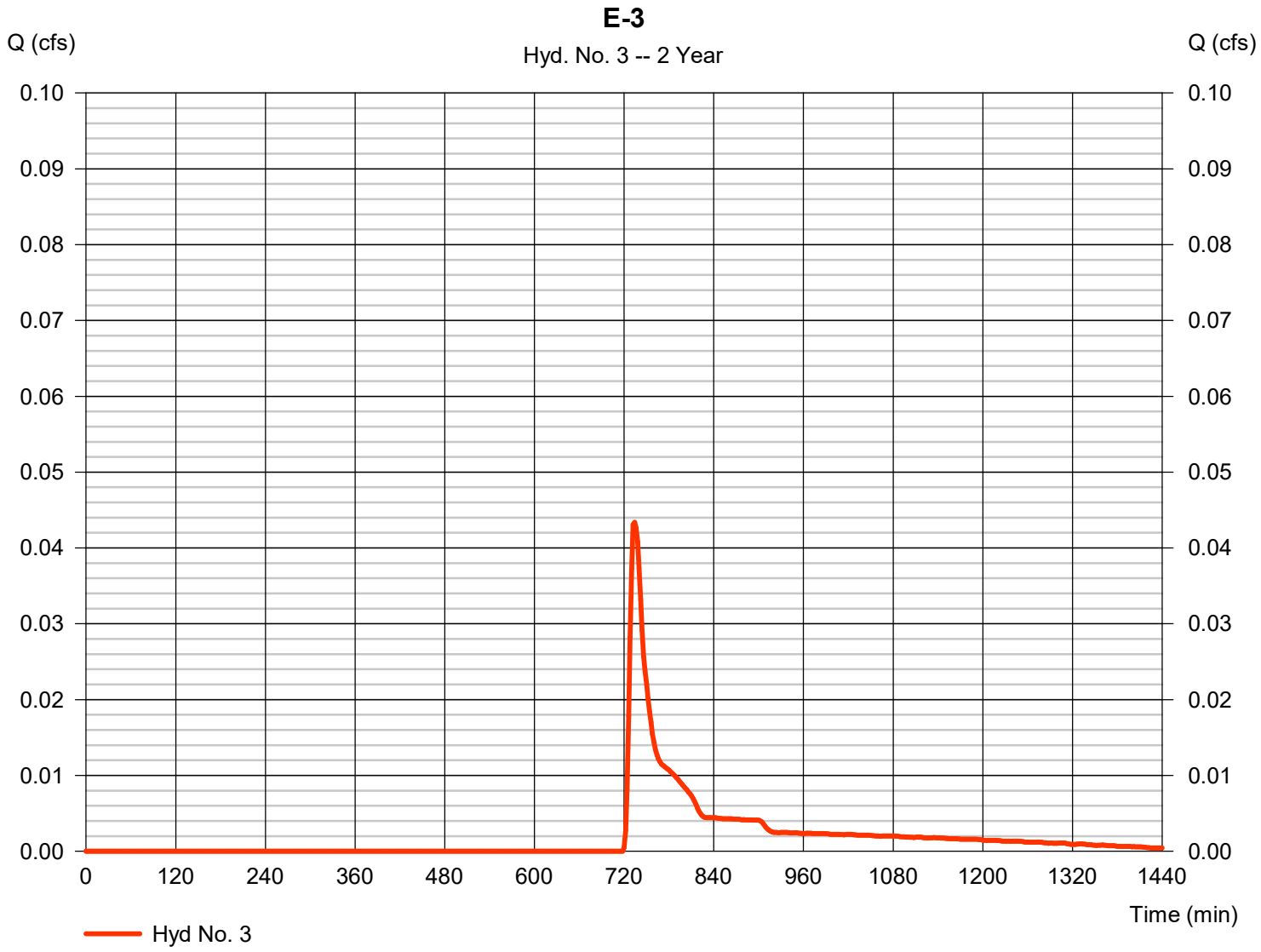


Hydrograph Report

Hyd. No. 3

E-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.043 cfs
Storm frequency	=	2 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	0.004 acft
Drainage area	=	0.131 ac	Curve number	=	64
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.00 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

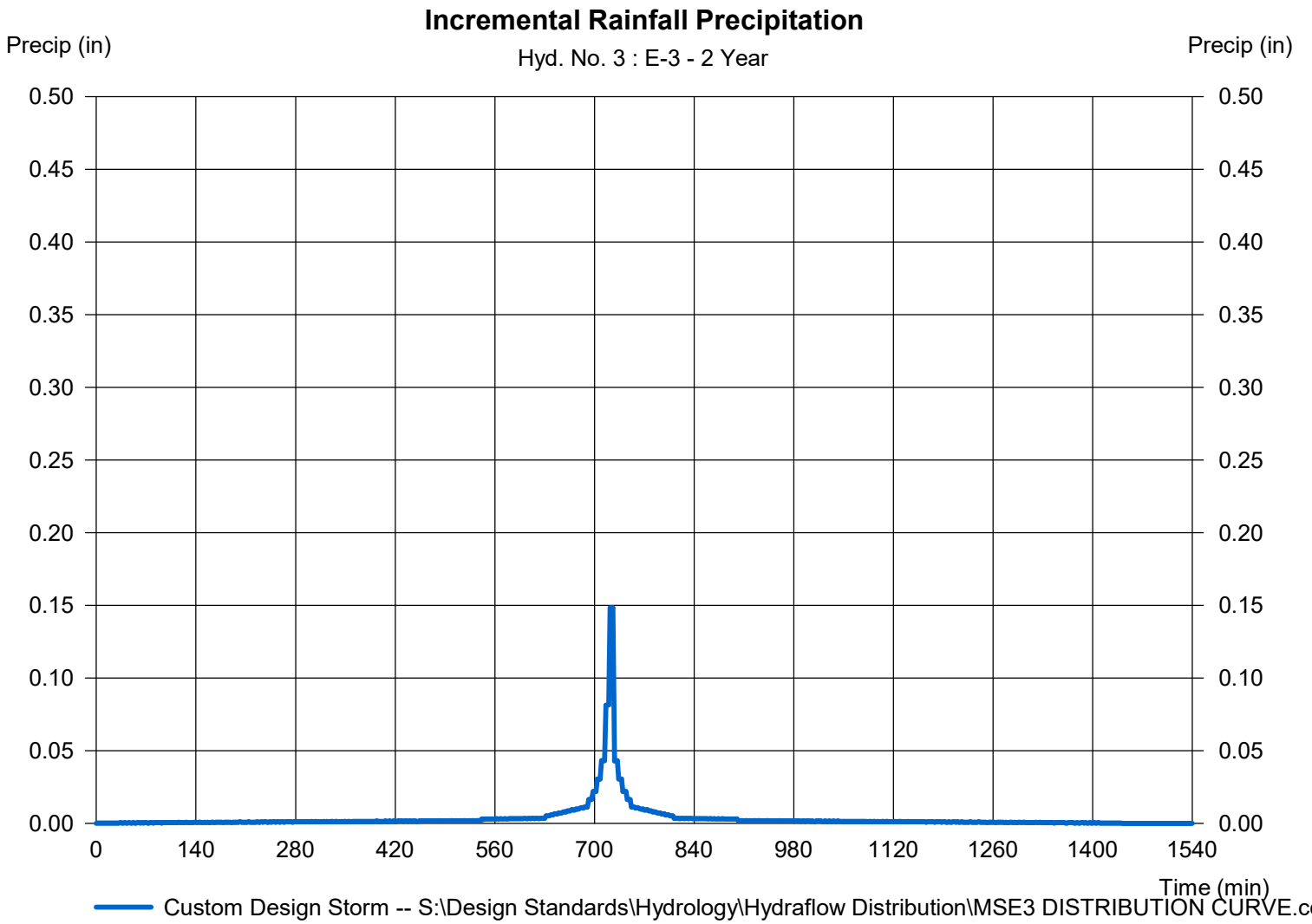


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

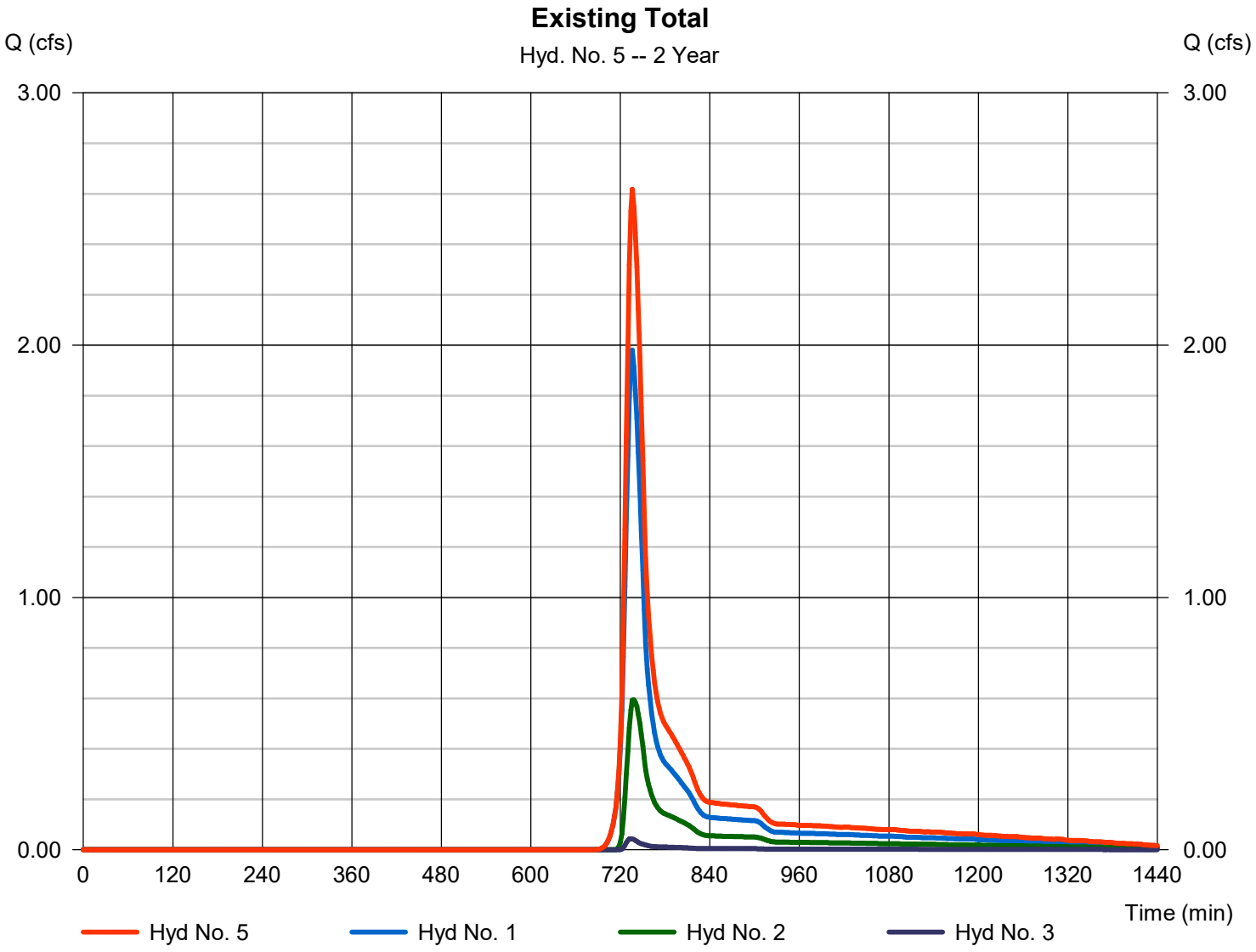


Hydrograph Report

Hyd. No. 5

Existing Total

Hydrograph type	= Combine	Peak discharge	= 2.617 cfs
Storm frequency	= 2 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 0.205 acft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.628 ac

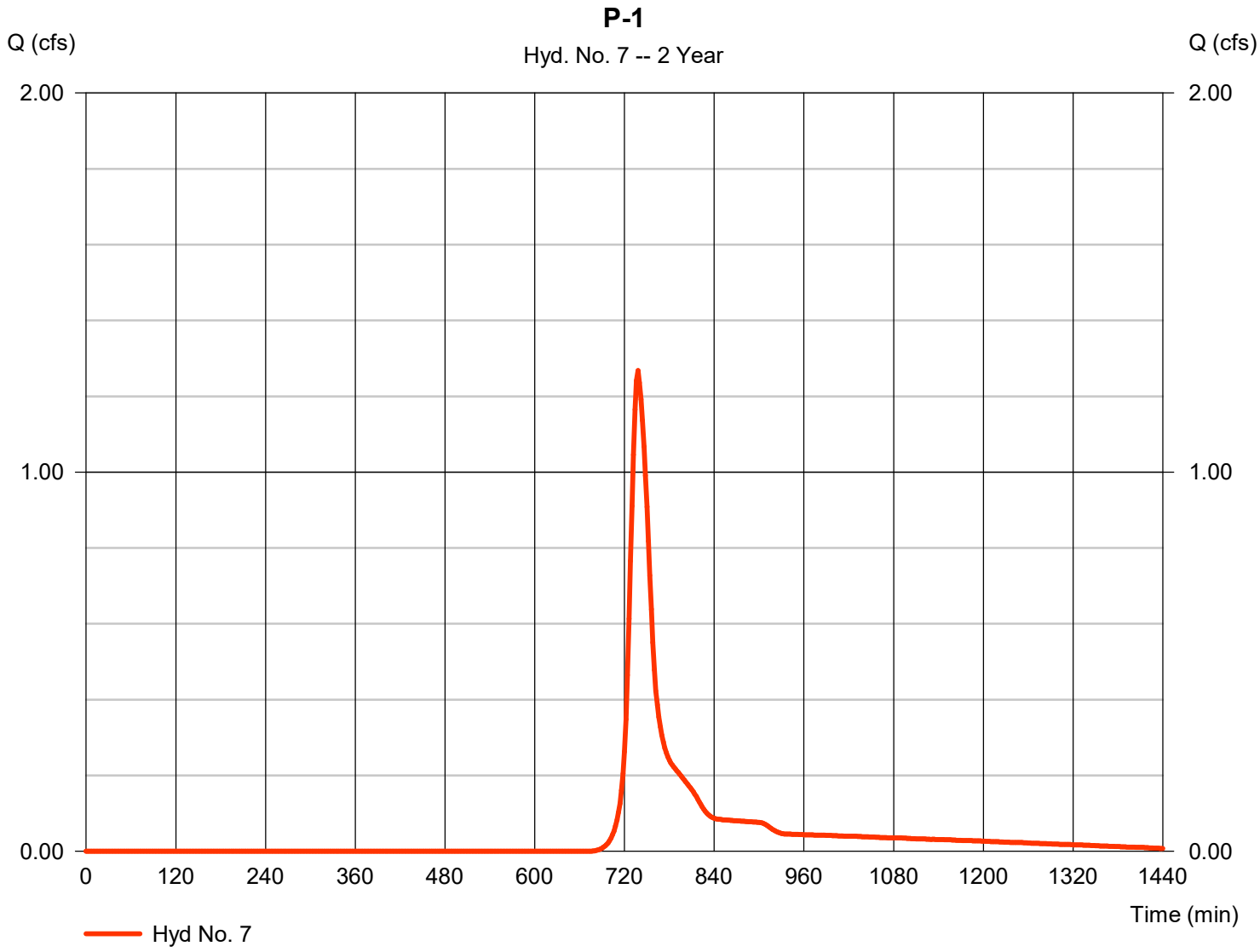


Hydrograph Report

Hyd. No. 7

P-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.268 cfs
Storm frequency	=	2 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	0.102 acft
Drainage area	=	1.304 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	22.40 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

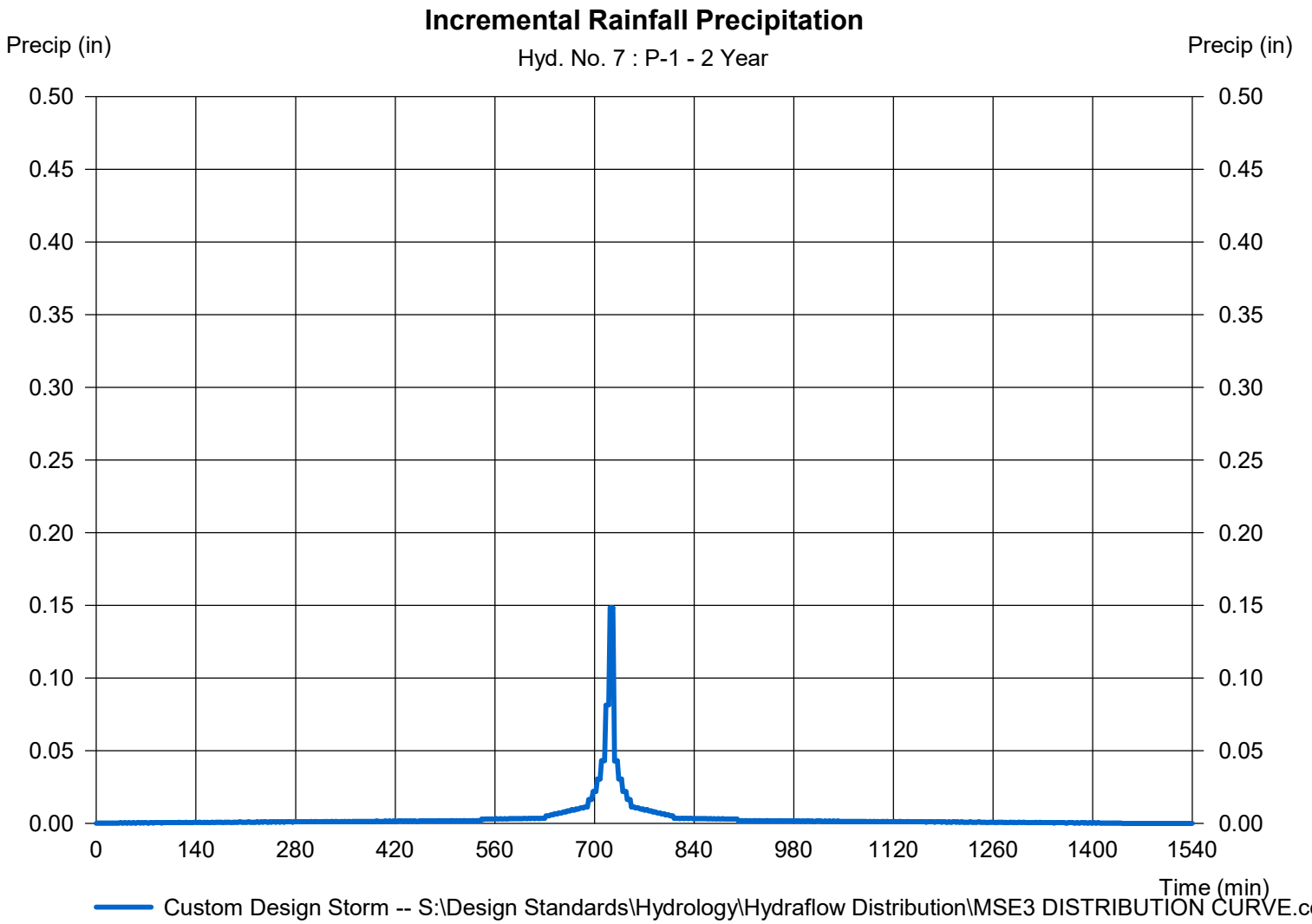


Precipitation Report

Hyd. No. 7

P-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

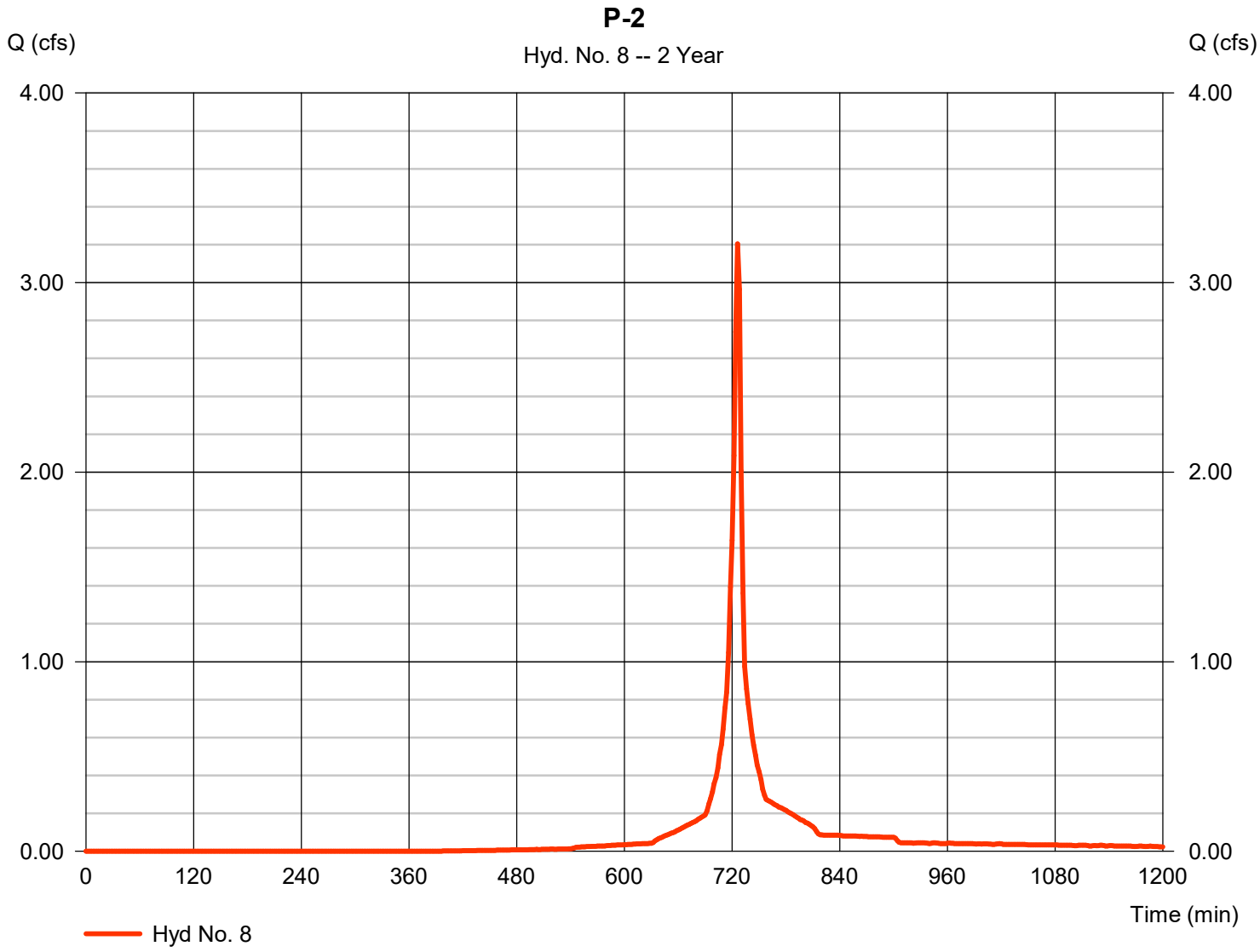


Hydrograph Report

Hyd. No. 8

P-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.204 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.145 acft
Drainage area	=	0.940 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = 483 DISTRIBUTION CU			

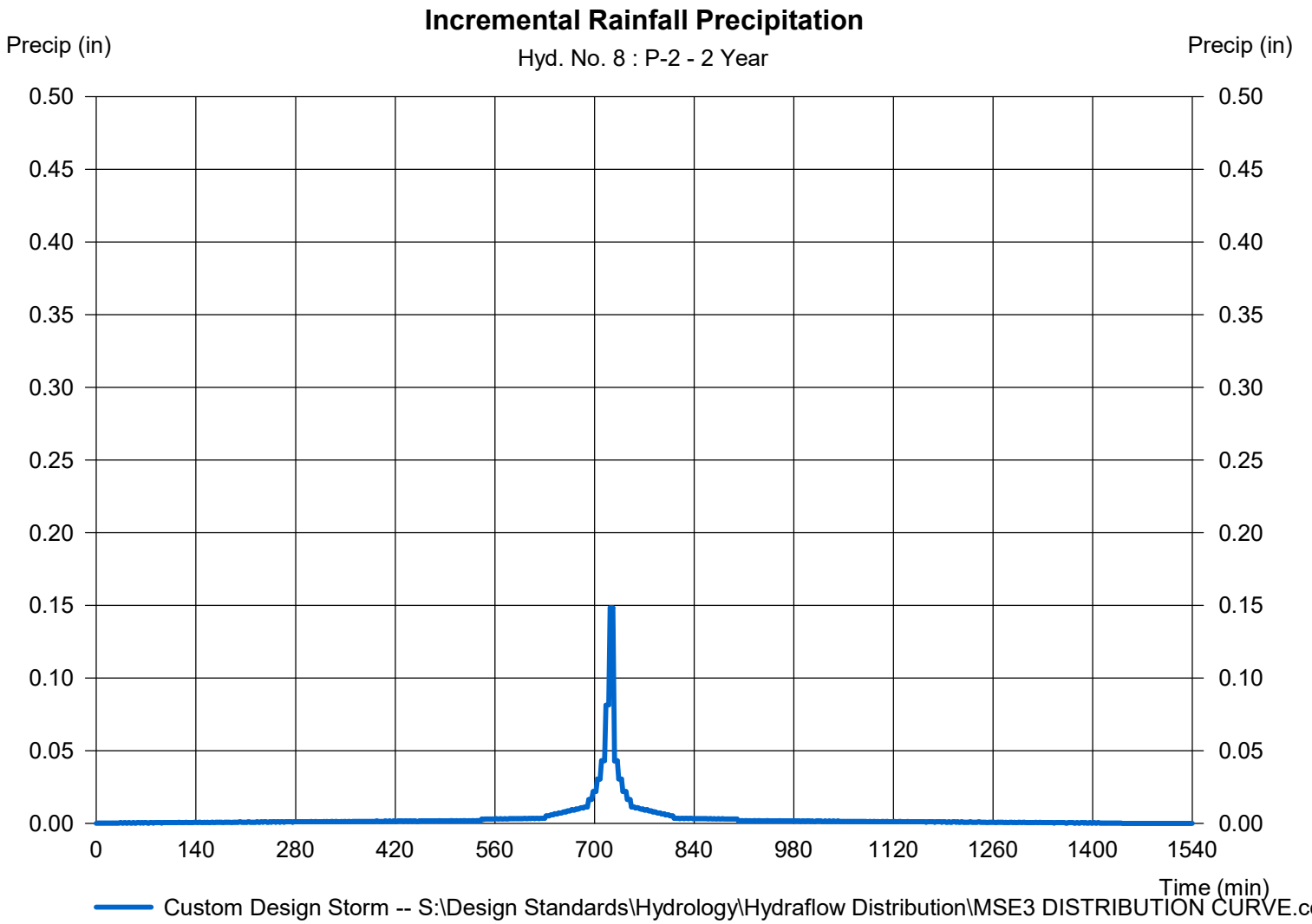


Precipitation Report

Hyd. No. 8

P-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

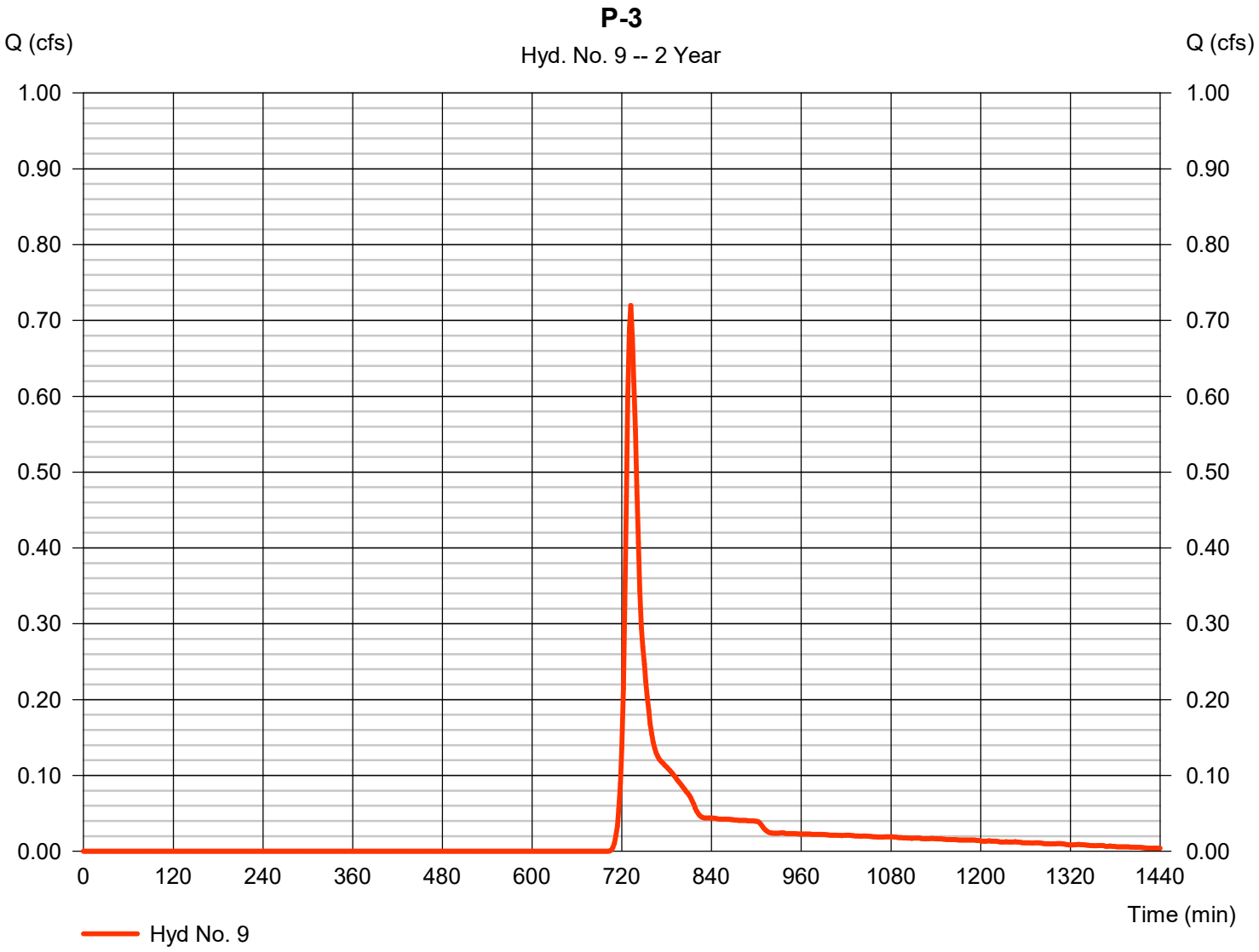


Hydrograph Report

Hyd. No. 9

P-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.720 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.046 acft
Drainage area	=	0.851 ac	Curve number	=	72
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.10 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor	Shape factor	=	484 DISTRIBUTION CU

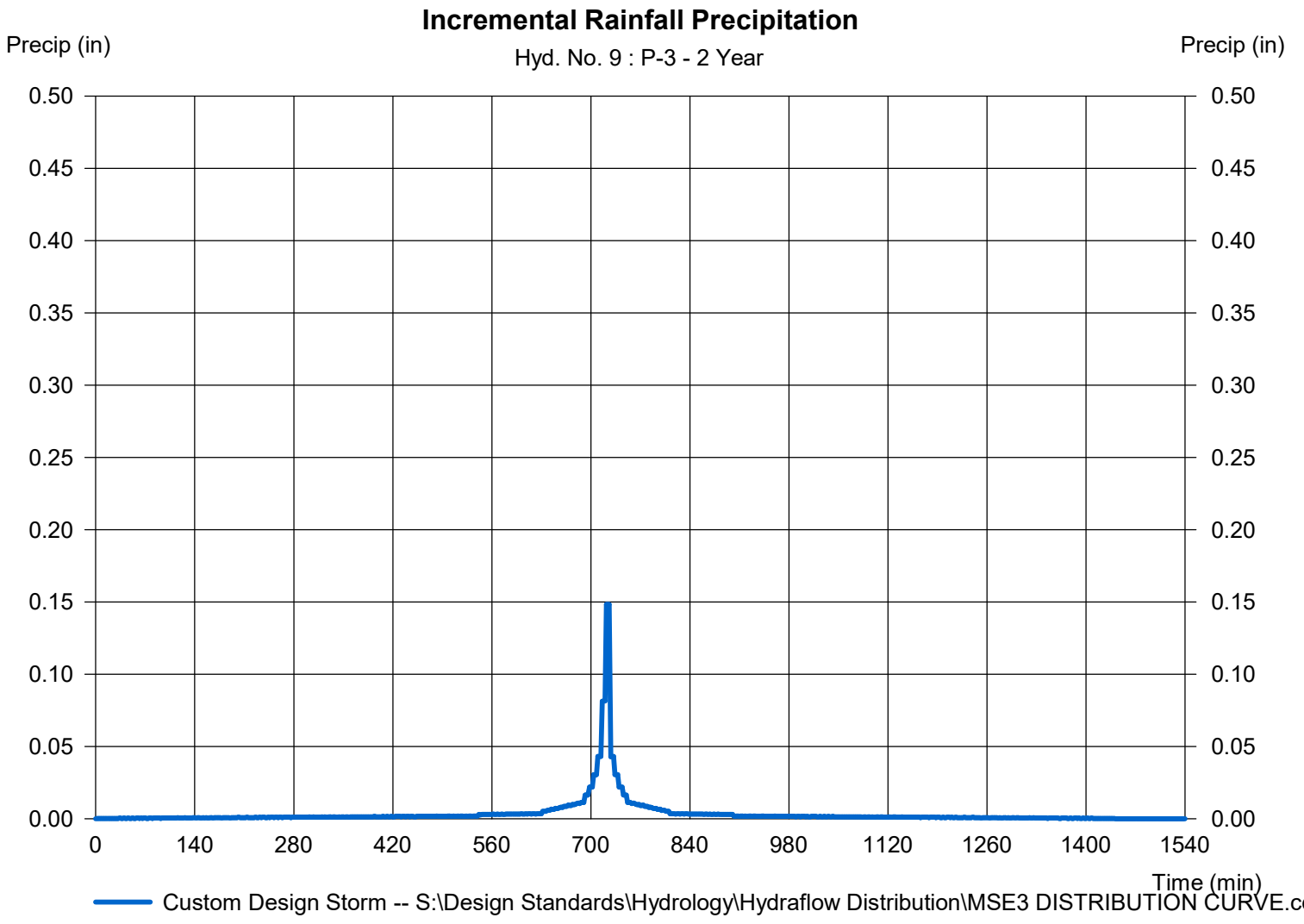


Precipitation Report

Hyd. No. 9

P-3

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



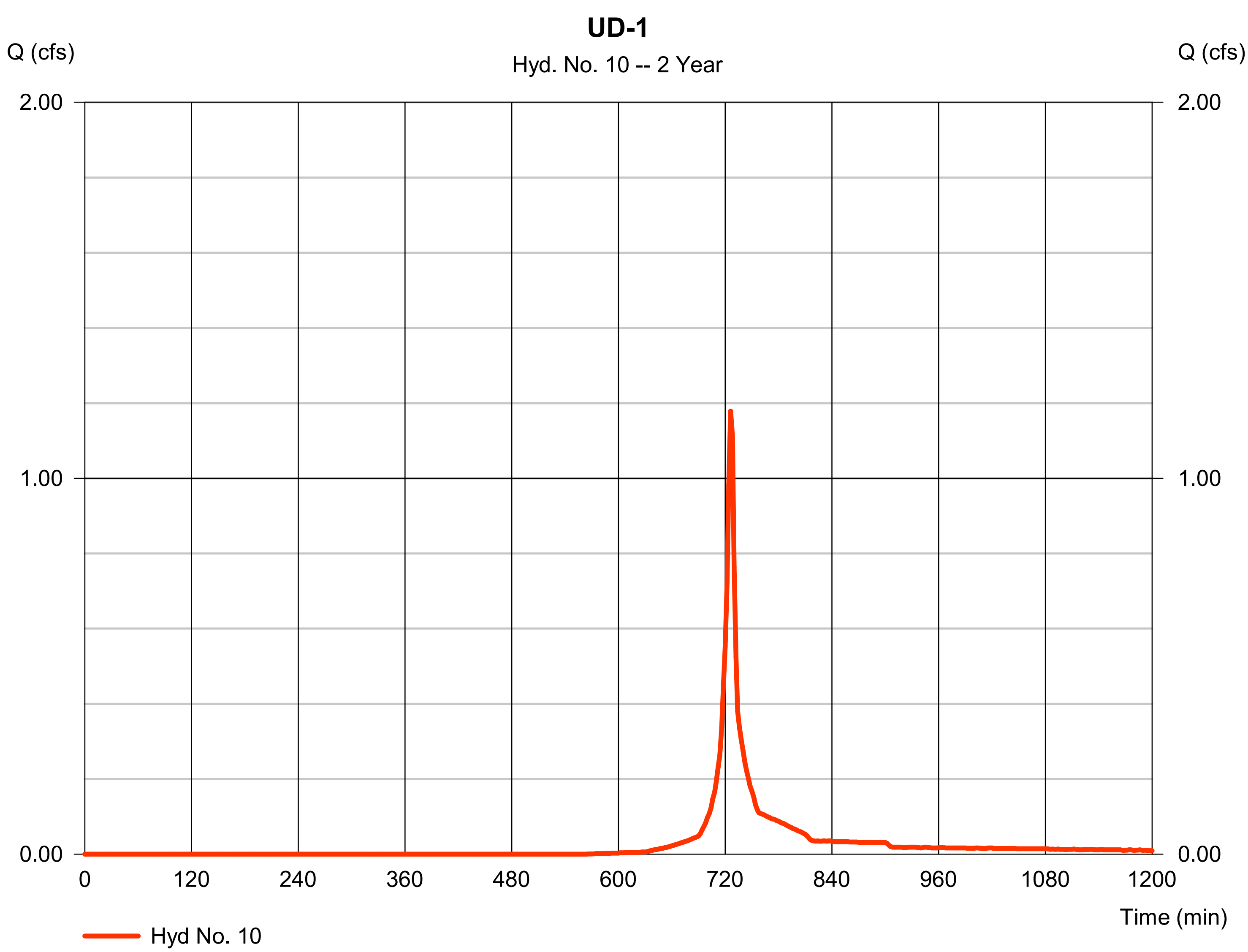
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Thursday, 08 / 8 / 2019

Hyd. No. 10

UD-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.179 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 0.051 acft
Drainage area	= 0.441 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 2.70 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

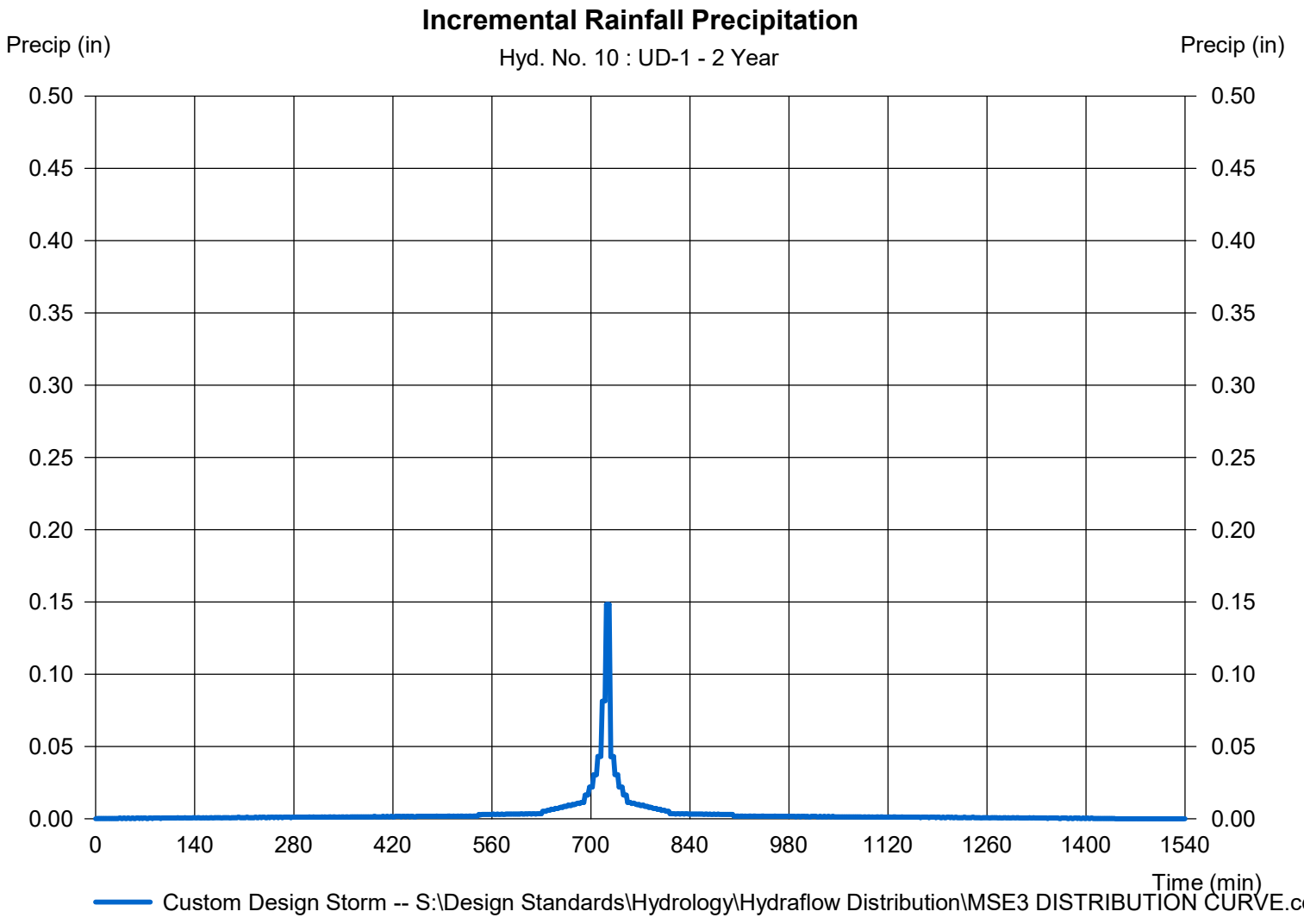


Precipitation Report

Hyd. No. 10

UD-1

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



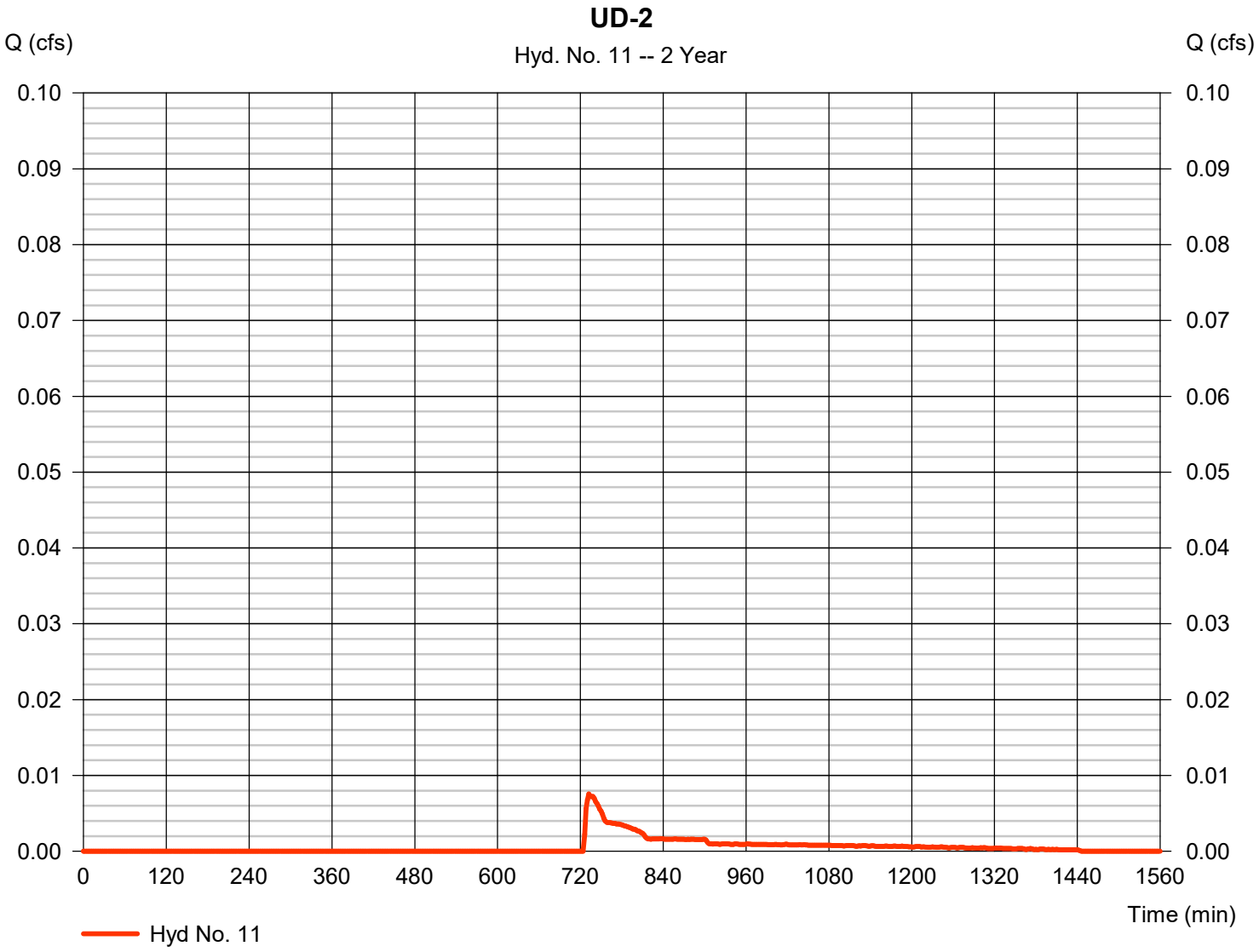
Hydrograph Report

Hyd. No. 11

UD-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.008 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.001 acft
Drainage area	=	0.092 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	2.70 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor	Shape factor	=	484

Distribution\MSE3 DISTRIBUTION CU

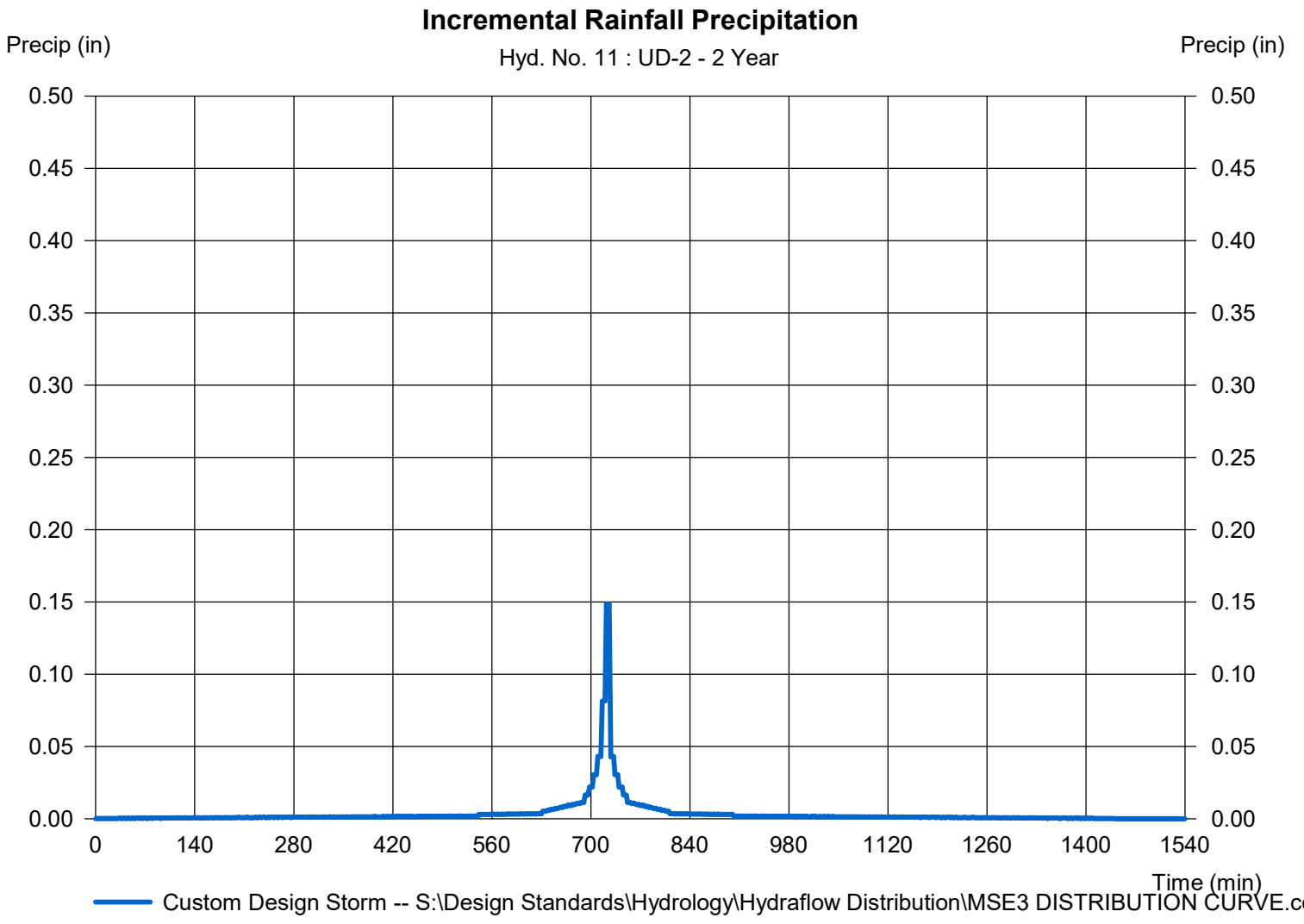


Precipitation Report

Hyd. No. 11

UD-2

Storm Frequency	= 2 yrs	Time interval	= 2 min
Total precip.	= 2.7000 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



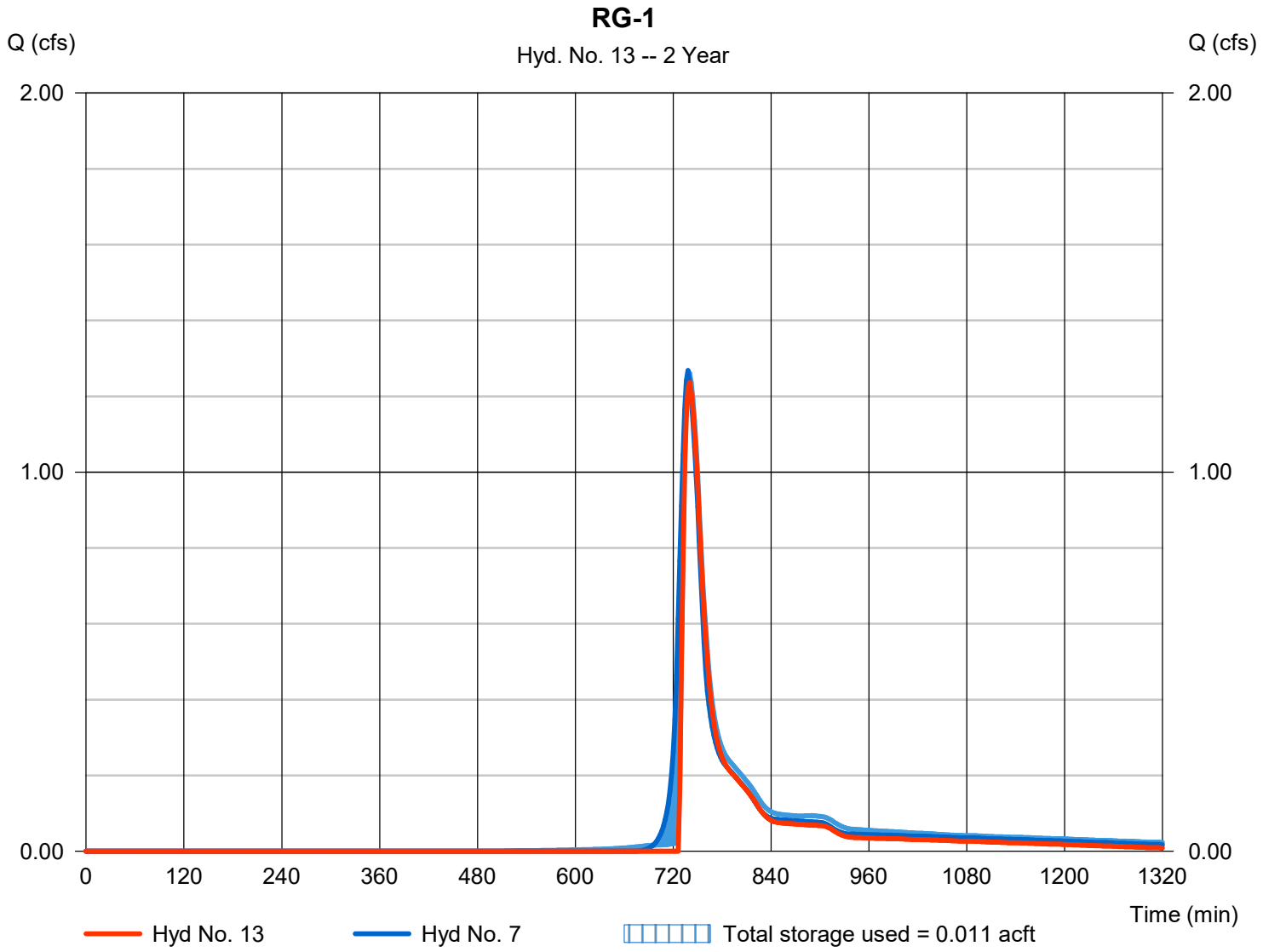
Hydrograph Report

Hyd. No. 13

RG-1

Hydrograph type	=	Reservoir	Peak discharge	=	1.236 cfs
Storm frequency	=	2 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	0.085 acft
Inflow hyd. No.	=	7 - P-1	Max. Elevation	=	128.15 ft
Reservoir name	=	RG-1	Max. Storage	=	0.011 acft

Storage Indication method used. Exfiltration extracted from Outflow.



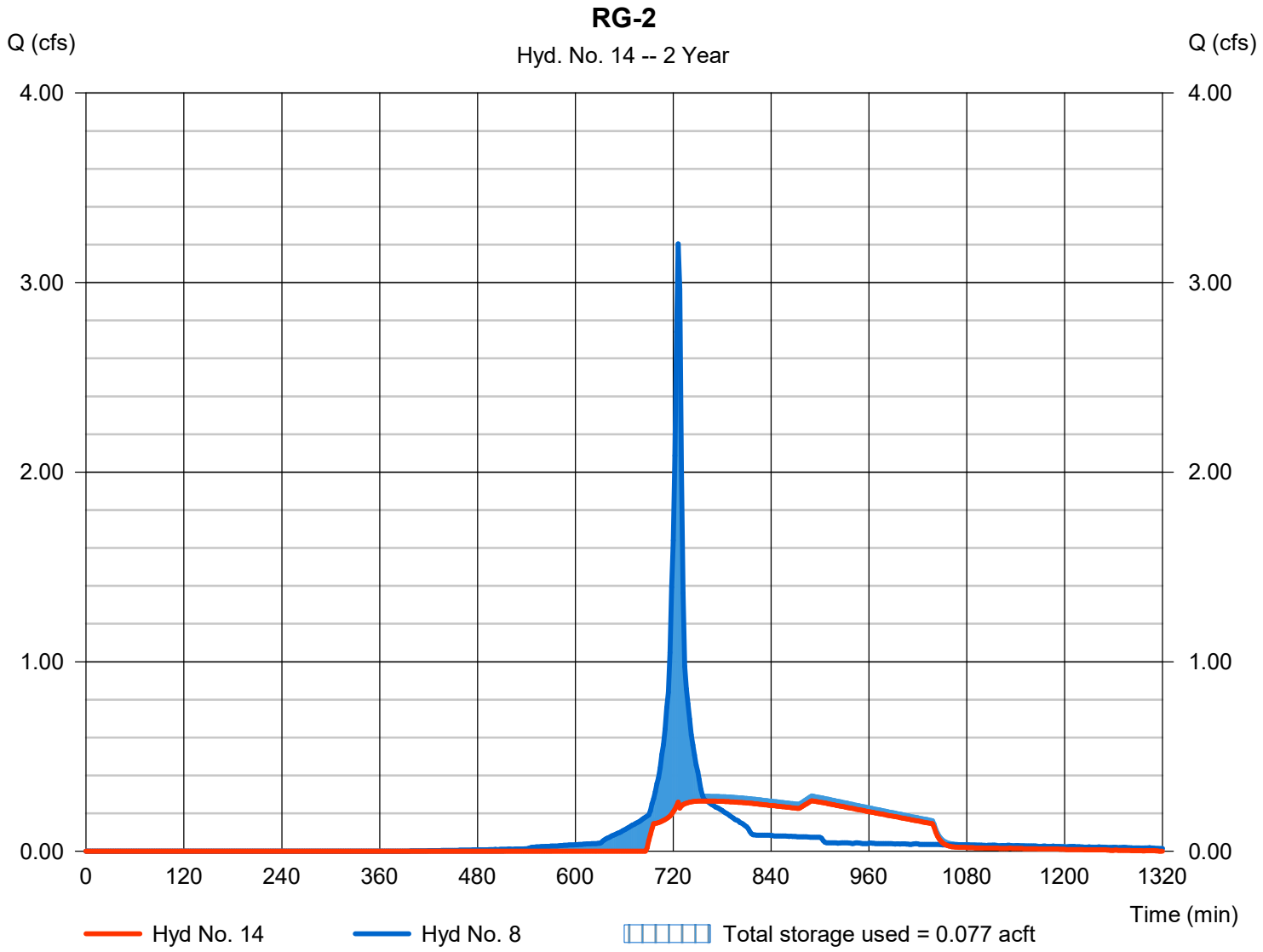
Hydrograph Report

Hyd. No. 14

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	0.267 cfs
Storm frequency	=	2 yrs	Time to peak	=	890 min
Time interval	=	2 min	Hyd. volume	=	0.113 acft
Inflow hyd. No.	=	8 - P-2	Max. Elevation	=	133.40 ft
Reservoir name	=	RG-2	Max. Storage	=	0.077 acft

Storage Indication method used. Exfiltration extracted from Outflow.

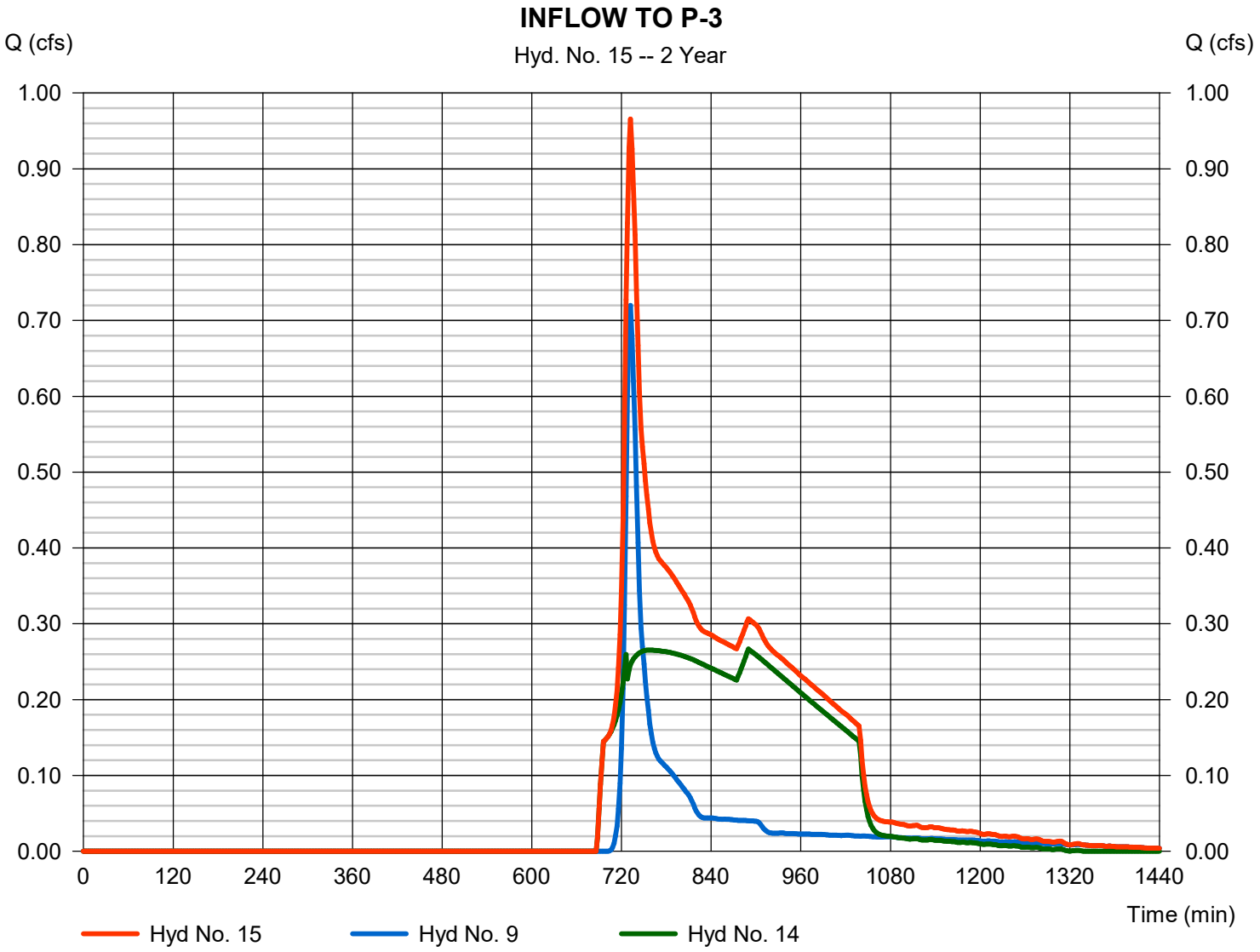


Hydrograph Report

Hyd. No. 15

INFLOW TO P-3

Hydrograph type	= Combine	Peak discharge	= 0.966 cfs
Storm frequency	= 2 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 0.159 acft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 0.851 ac



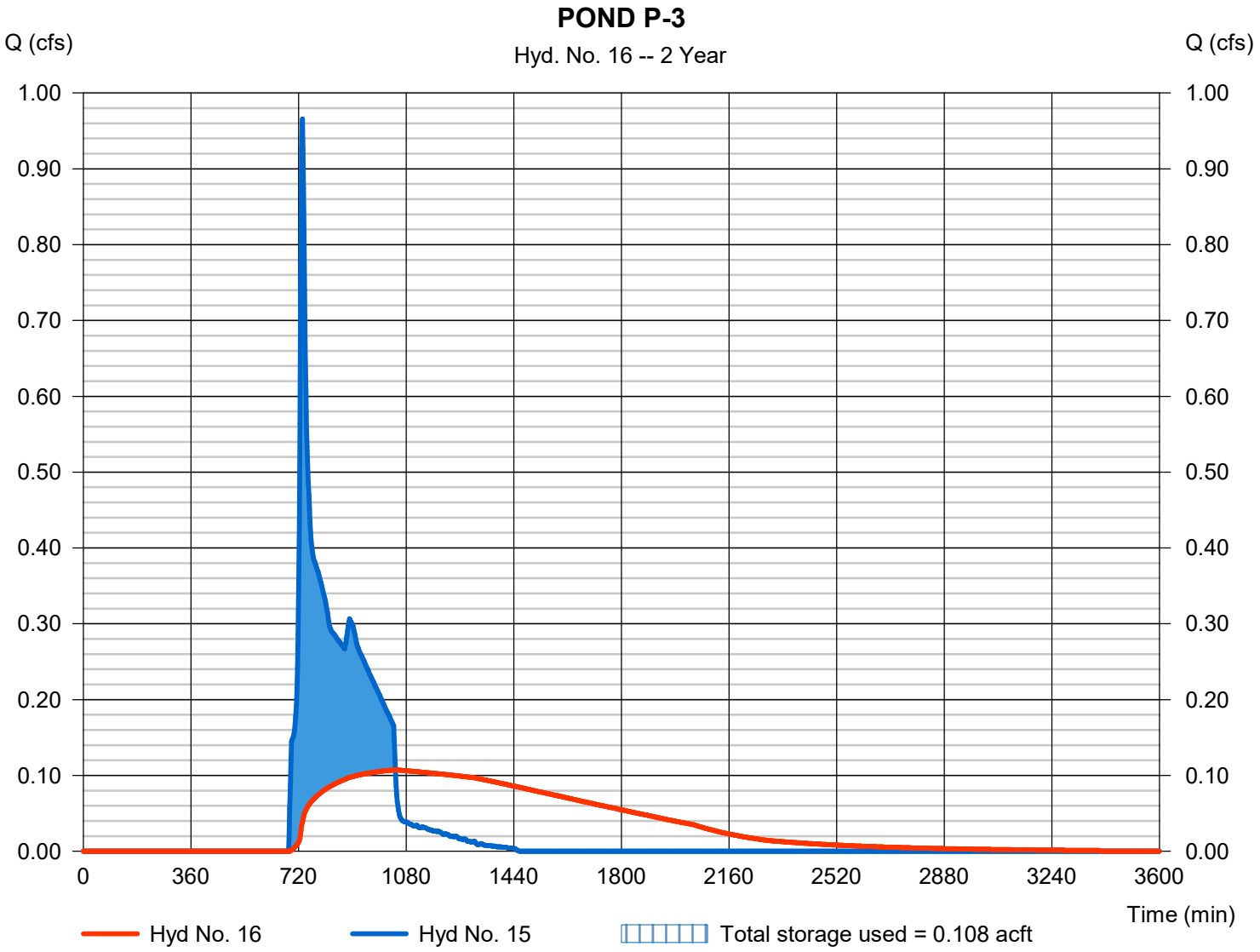
Hydrograph Report

Hyd. No. 16

POND P-3

Hydrograph type	= Reservoir	Peak discharge	= 0.107 cfs
Storm frequency	= 2 yrs	Time to peak	= 1044 min
Time interval	= 2 min	Hyd. volume	= 0.159 acft
Inflow hyd. No.	= 15 - INFLOW TO P-3	Max. Elevation	= 128.20 ft
Reservoir name	= POND P-3	Max. Storage	= 0.108 acft

Storage Indication method used.

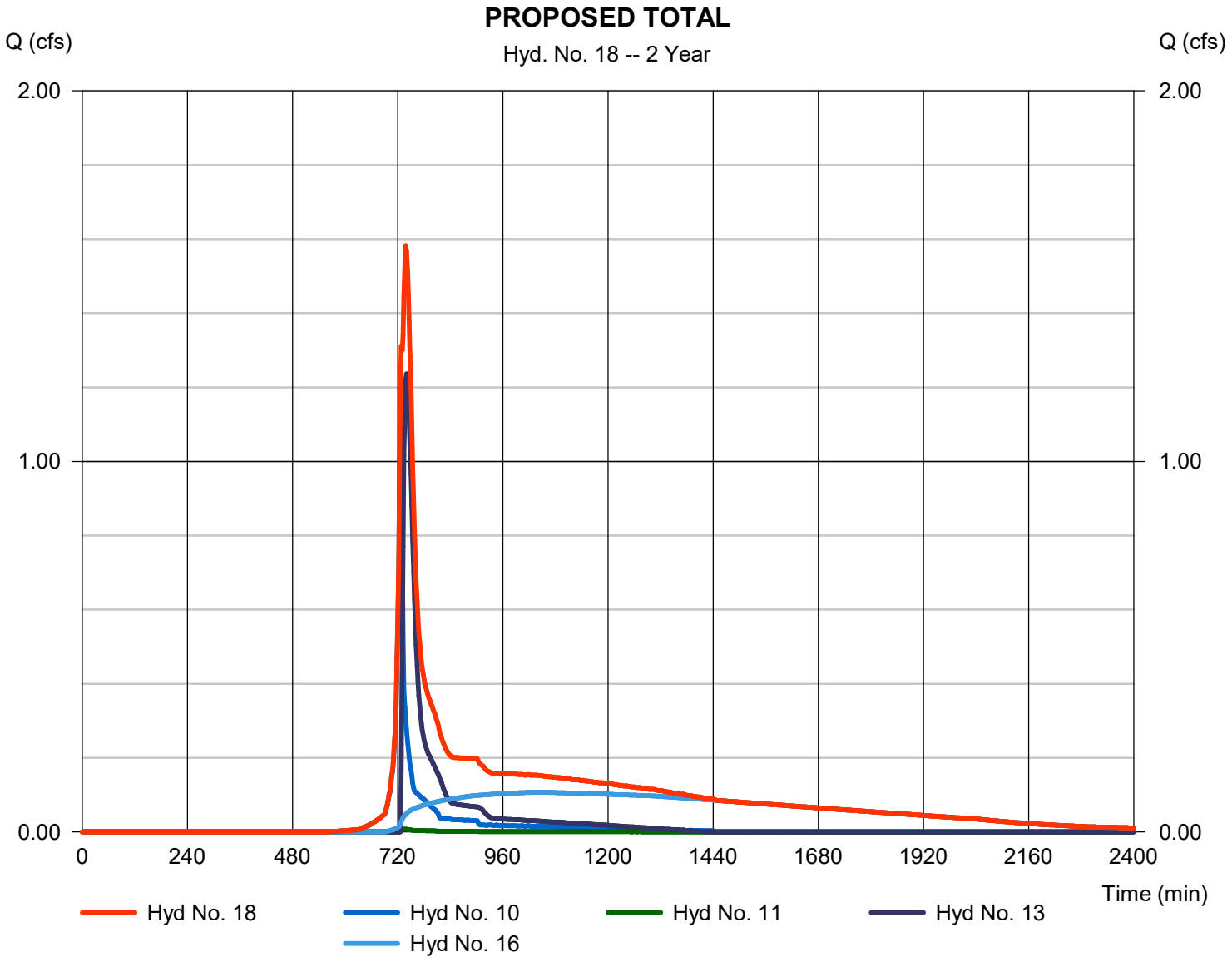


Hydrograph Report

Hyd. No. 18

PROPOSED TOTAL

Hydrograph type	= Combine	Peak discharge	= 1.582 cfs
Storm frequency	= 2 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 0.296 acft
Inflow hyds.	= 10, 11, 13, 16	Contrib. drain. area	= 0.533 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

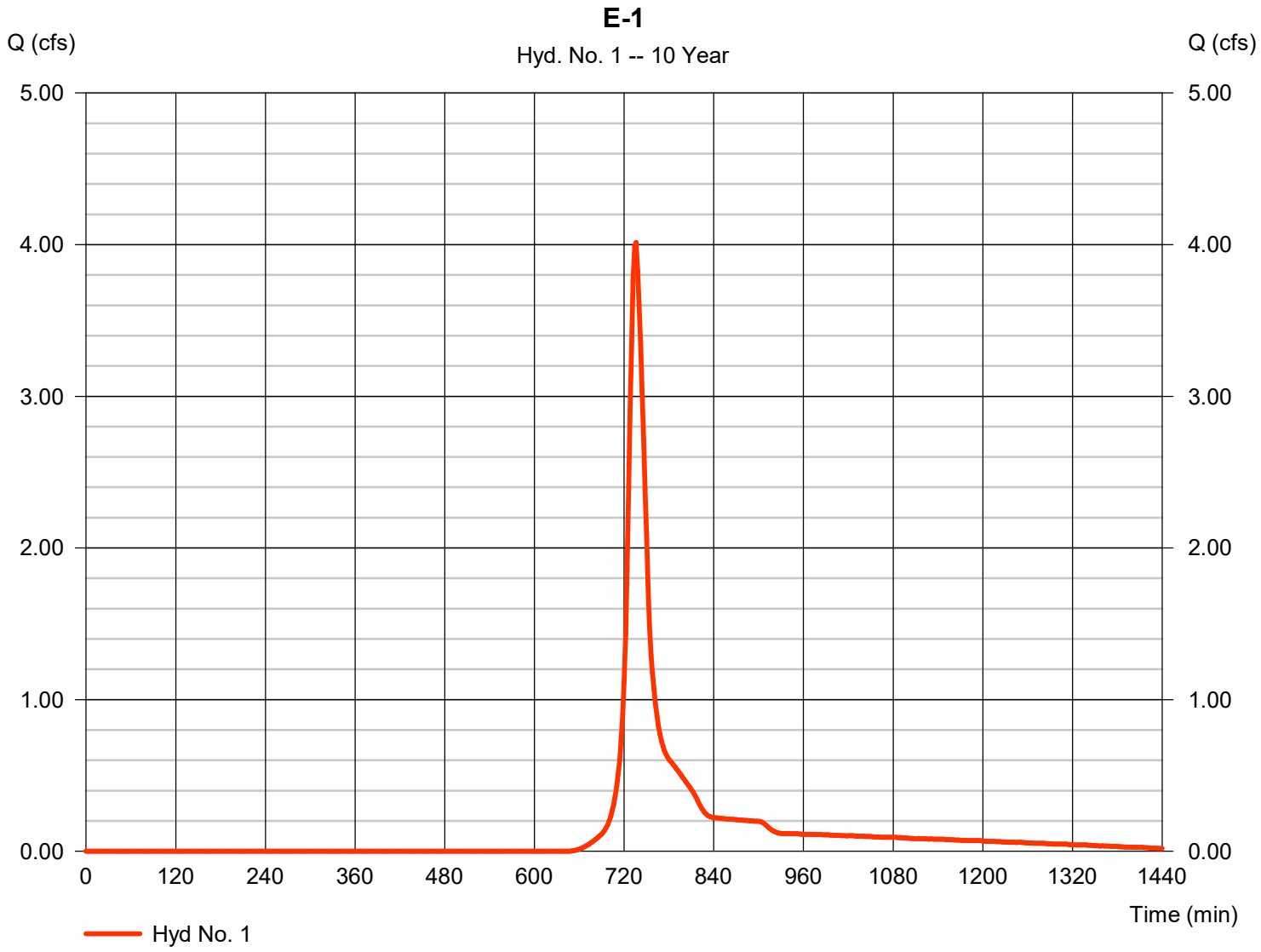
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	4.014	2	736	0.287	------	------	------	E-1
2	SCS Runoff	1.606	2	736	0.121	------	------	------	E-2
3	SCS Runoff	0.150	2	732	0.010	------	------	------	E-3
5	Combine	5.750	2	736	0.418	1, 2, 3,	------	------	Existing Total
7	SCS Runoff	2.465	2	738	0.192	------	------	------	P-1
8	SCS Runoff	4.808	2	726	0.223	------	------	------	P-2
9	SCS Runoff	1.612	2	732	0.097	------	------	------	P-3
10	SCS Runoff	1.927	2	726	0.085	------	------	------	UD-1
11	SCS Runoff	0.071	2	728	0.004	------	------	------	UD-2
13	Reservoir	2.432	2	738	0.175	7	128.24	0.014	RG-1
14	Reservoir	1.684	2	734	0.187	8	133.67	0.099	RG-2
15	Combine	3.290	2	732	0.284	9, 14	------	------	INFLOW TO P-3
16	Reservoir	0.328	2	876	0.283	15	128.52	0.152	POND P-3
18	Combine	3.312	2	728	0.547	10, 11, 13, 16,	------	------	PROPOSED TOTAL

Hydrograph Report

Hyd. No. 1

E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.014 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.287 acft
Drainage area	=	2.161 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.70 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU			

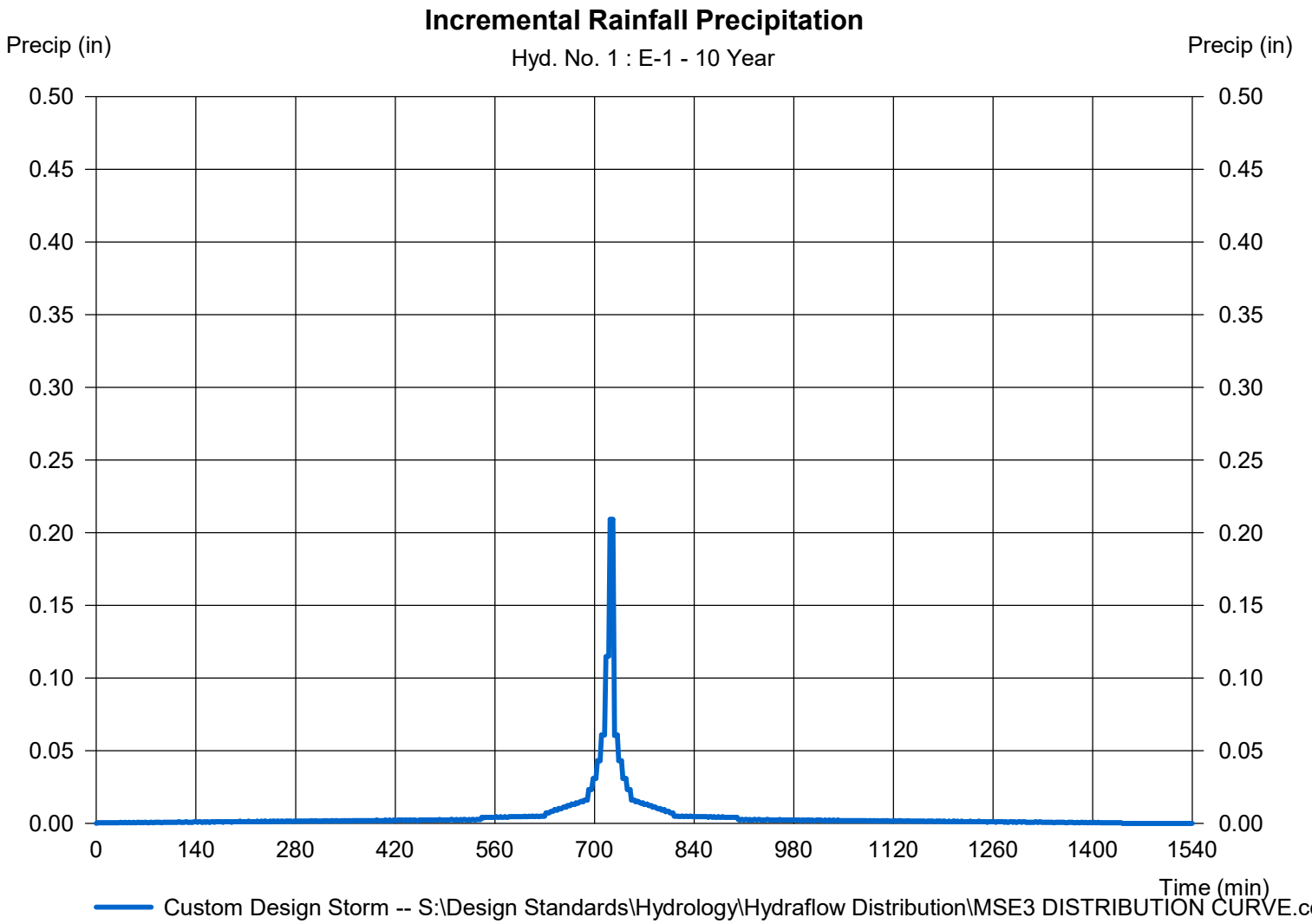


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

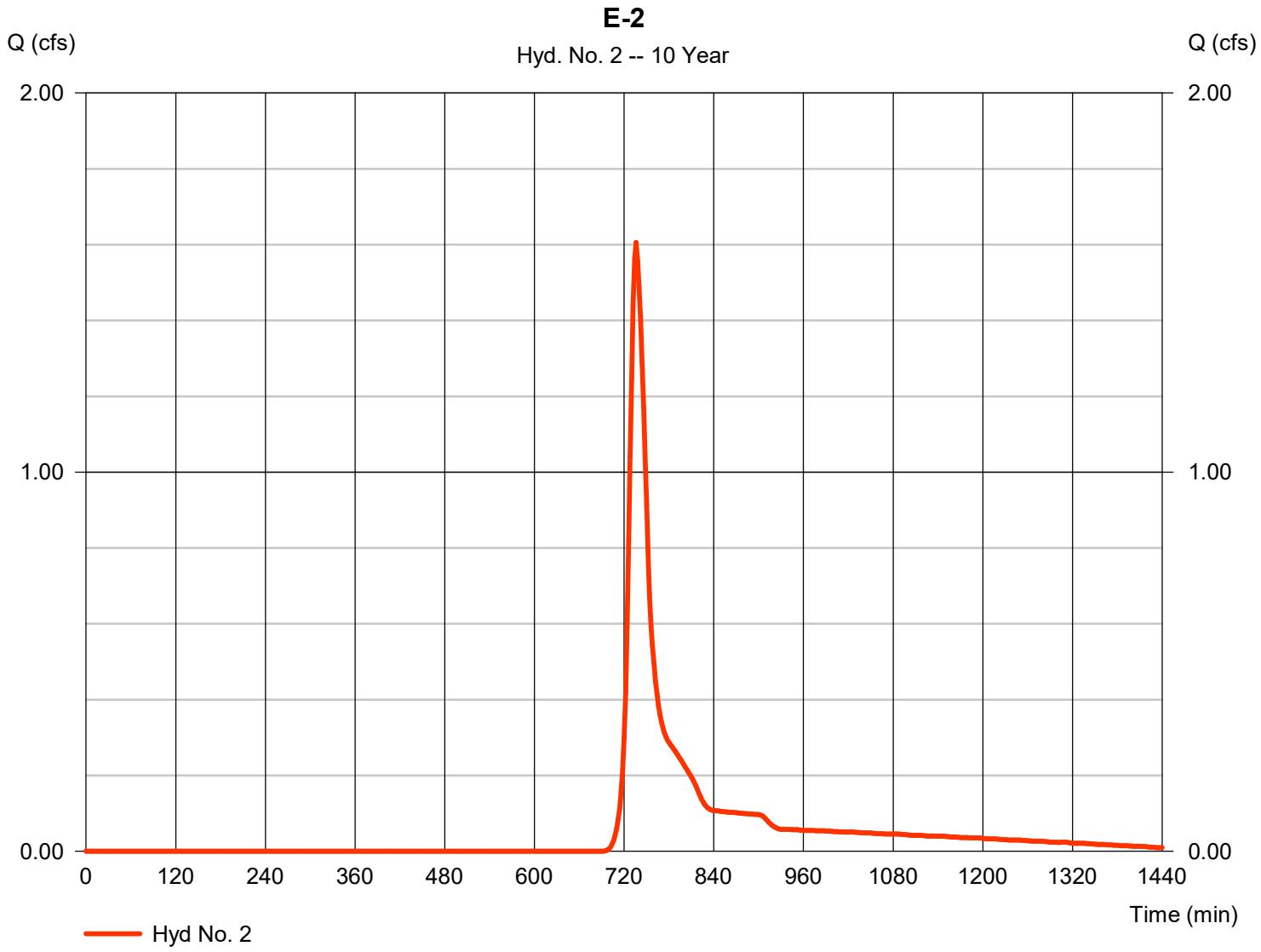


Hydrograph Report

Hyd. No. 2

E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.606 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.121 acft
Drainage area	=	1.336 ac	Curve number	=	68
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.50 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

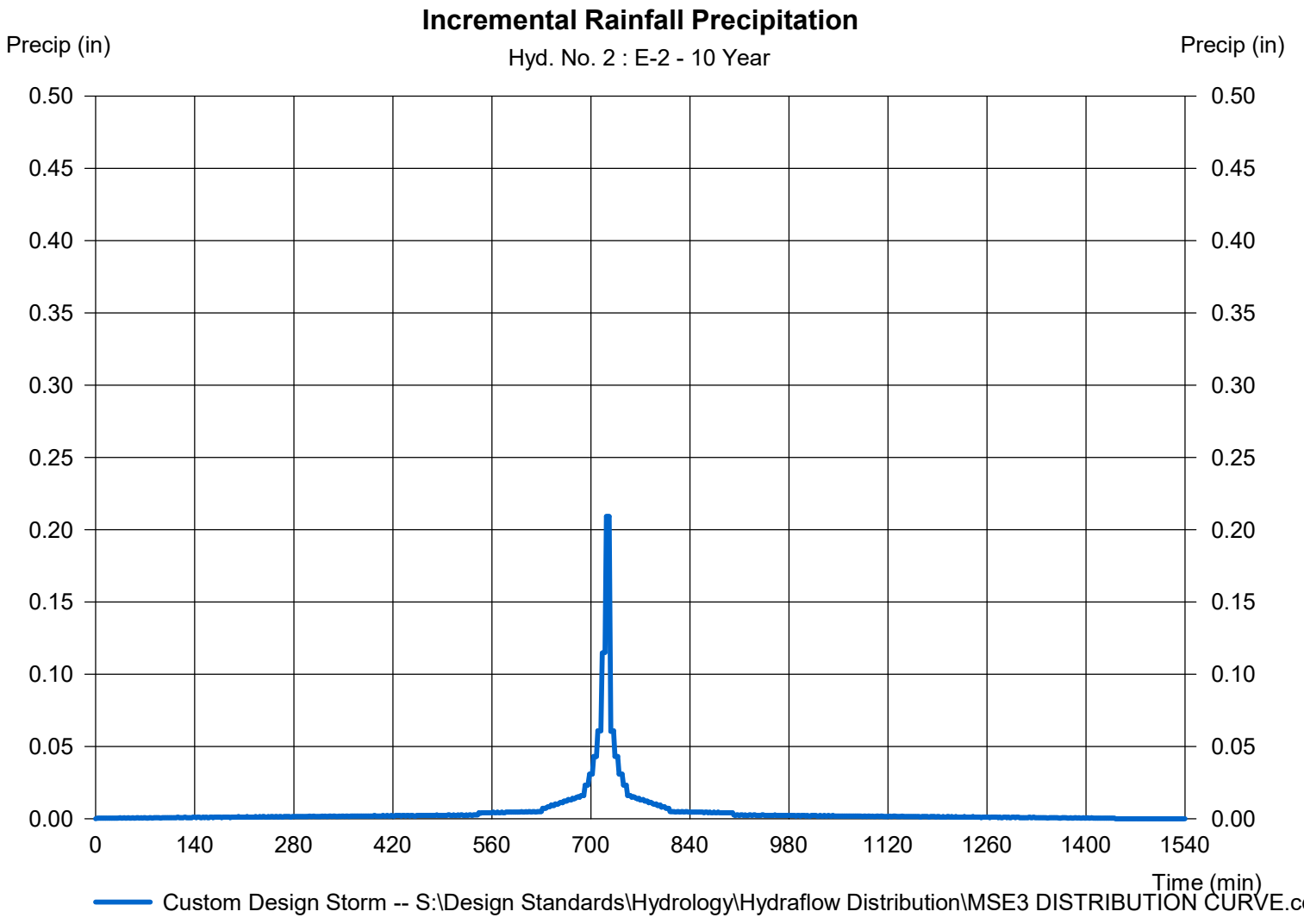


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

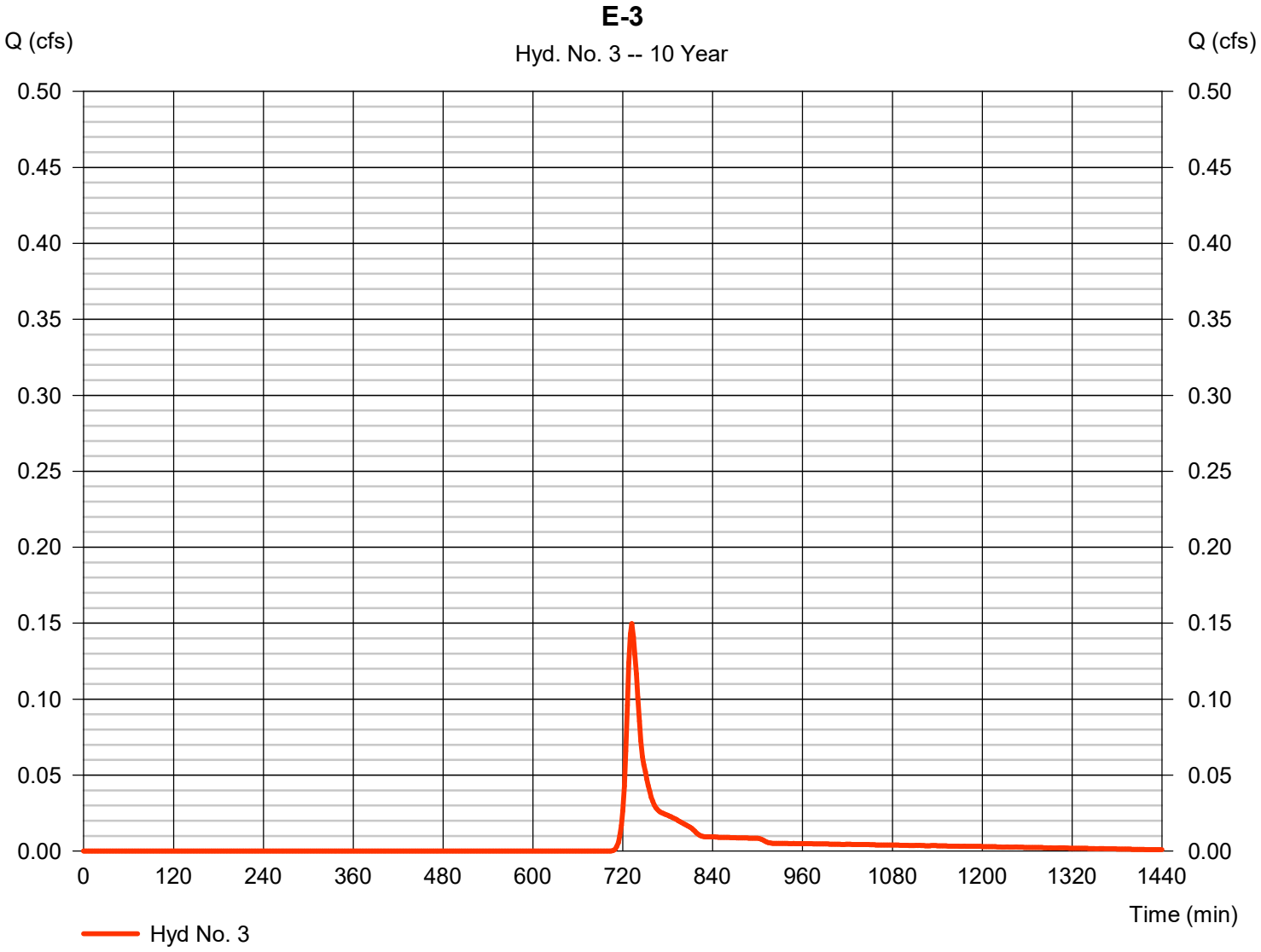


Hydrograph Report

Hyd. No. 3

E-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.150 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.010 acft
Drainage area	=	0.131 ac	Curve number	=	64
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.00 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde Storm Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

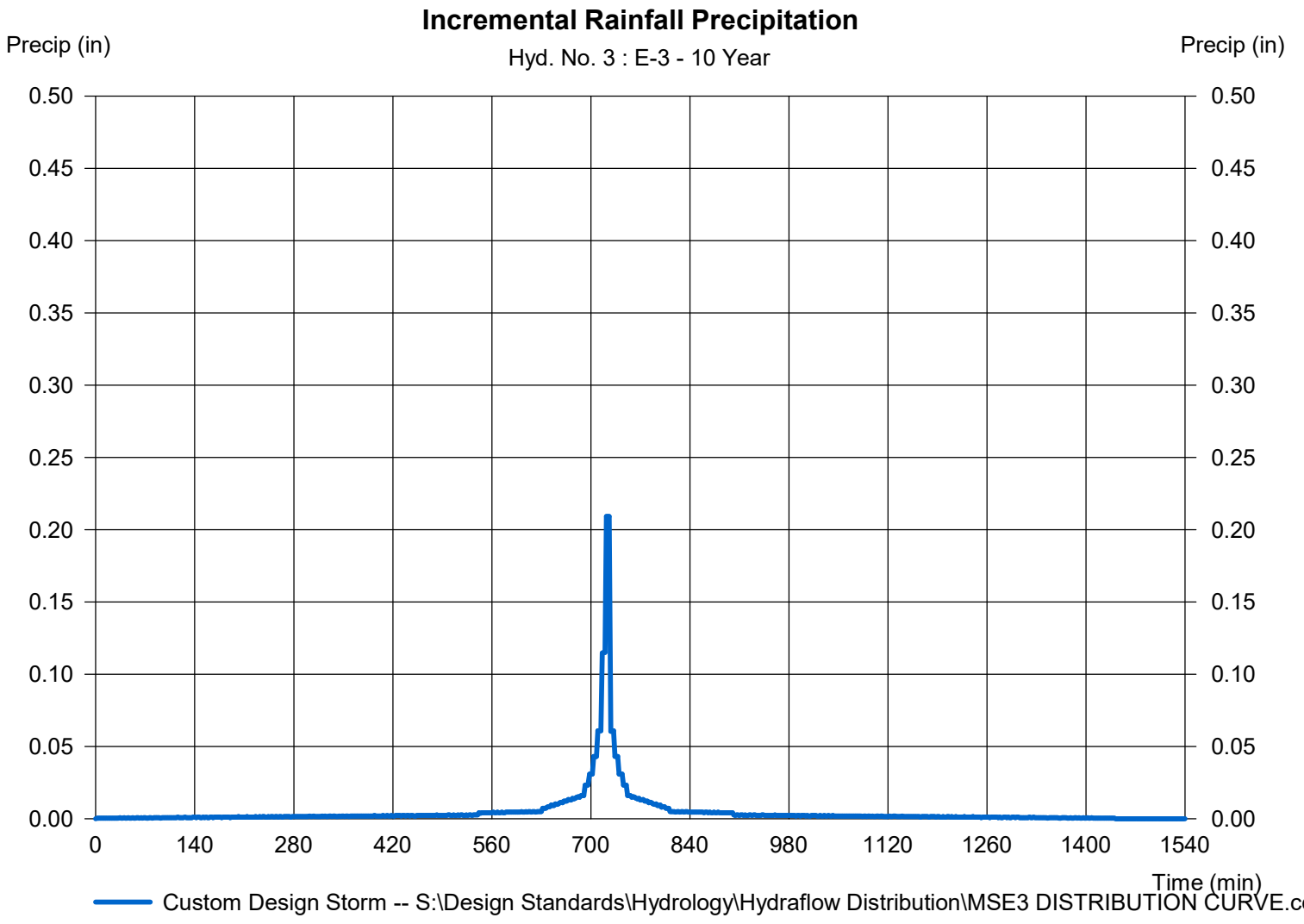


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

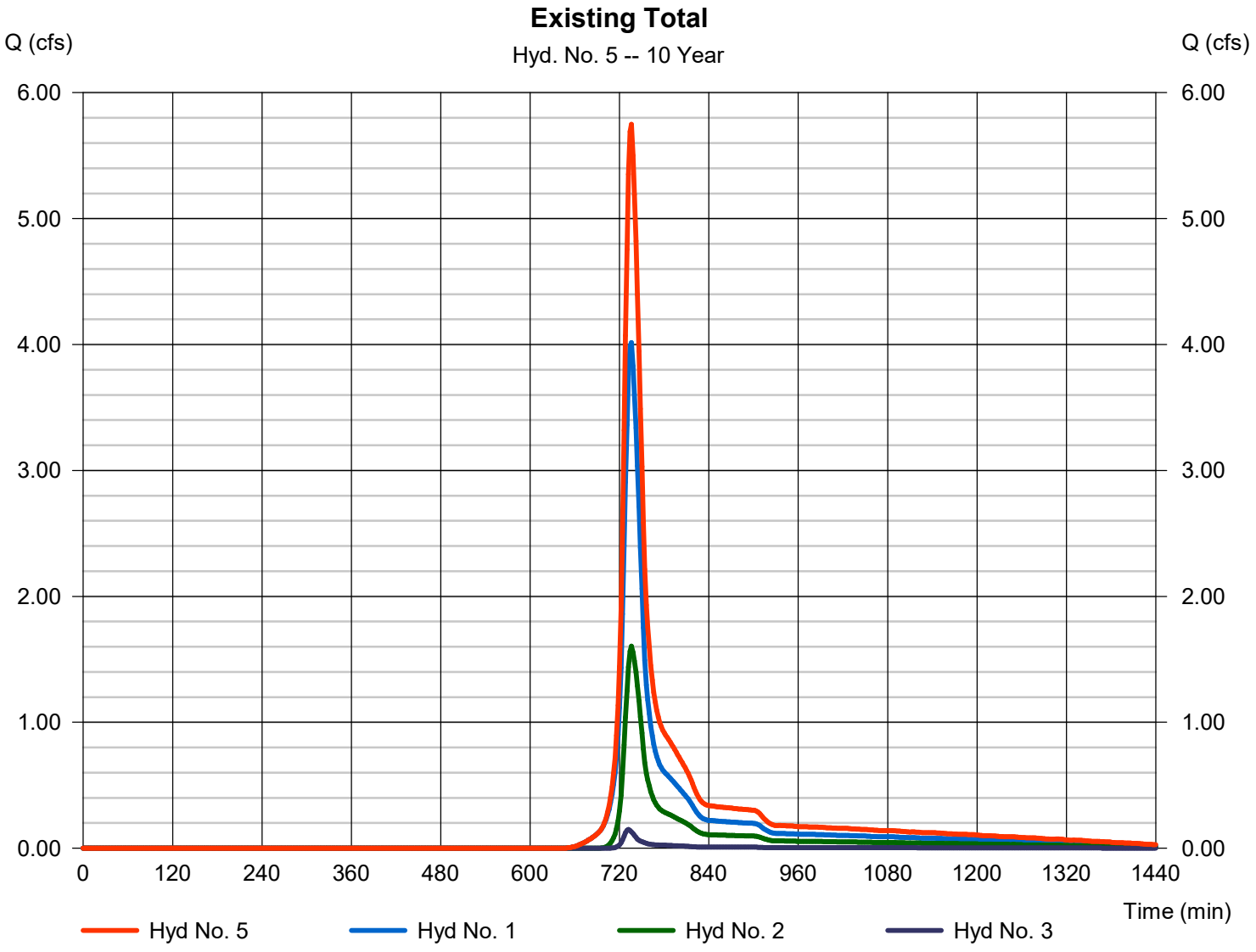


Hydrograph Report

Hyd. No. 5

Existing Total

Hydrograph type	= Combine	Peak discharge	= 5.750 cfs
Storm frequency	= 10 yrs	Time to peak	= 736 min
Time interval	= 2 min	Hyd. volume	= 0.418 acft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.628 ac



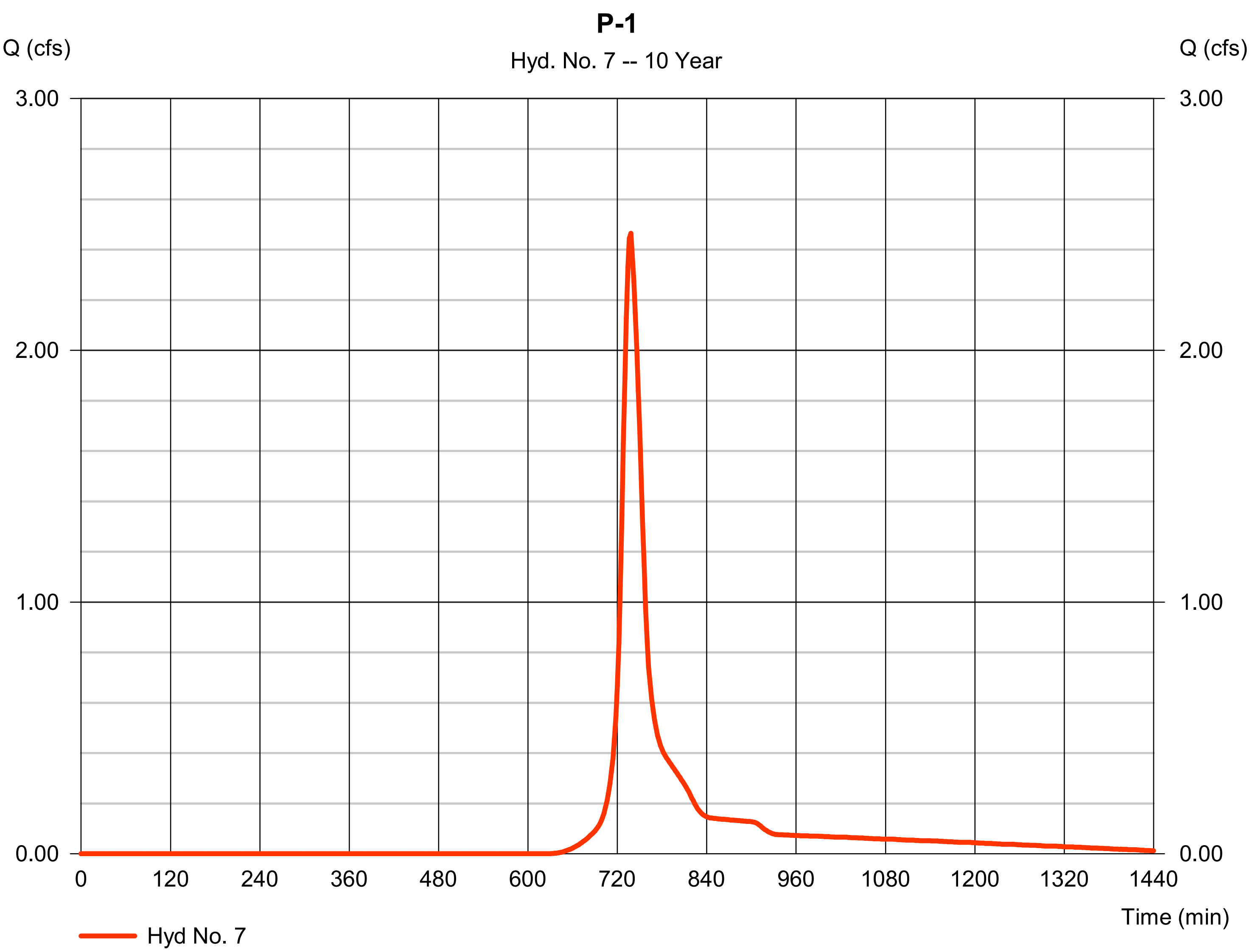
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 | Thursday, 08 / 8 / 2019

Hyd. No. 7

P-1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.465 cfs
Storm frequency	= 10 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 0.192 acft
Drainage area	= 1.304 ac	Curve number	= 78
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.40 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

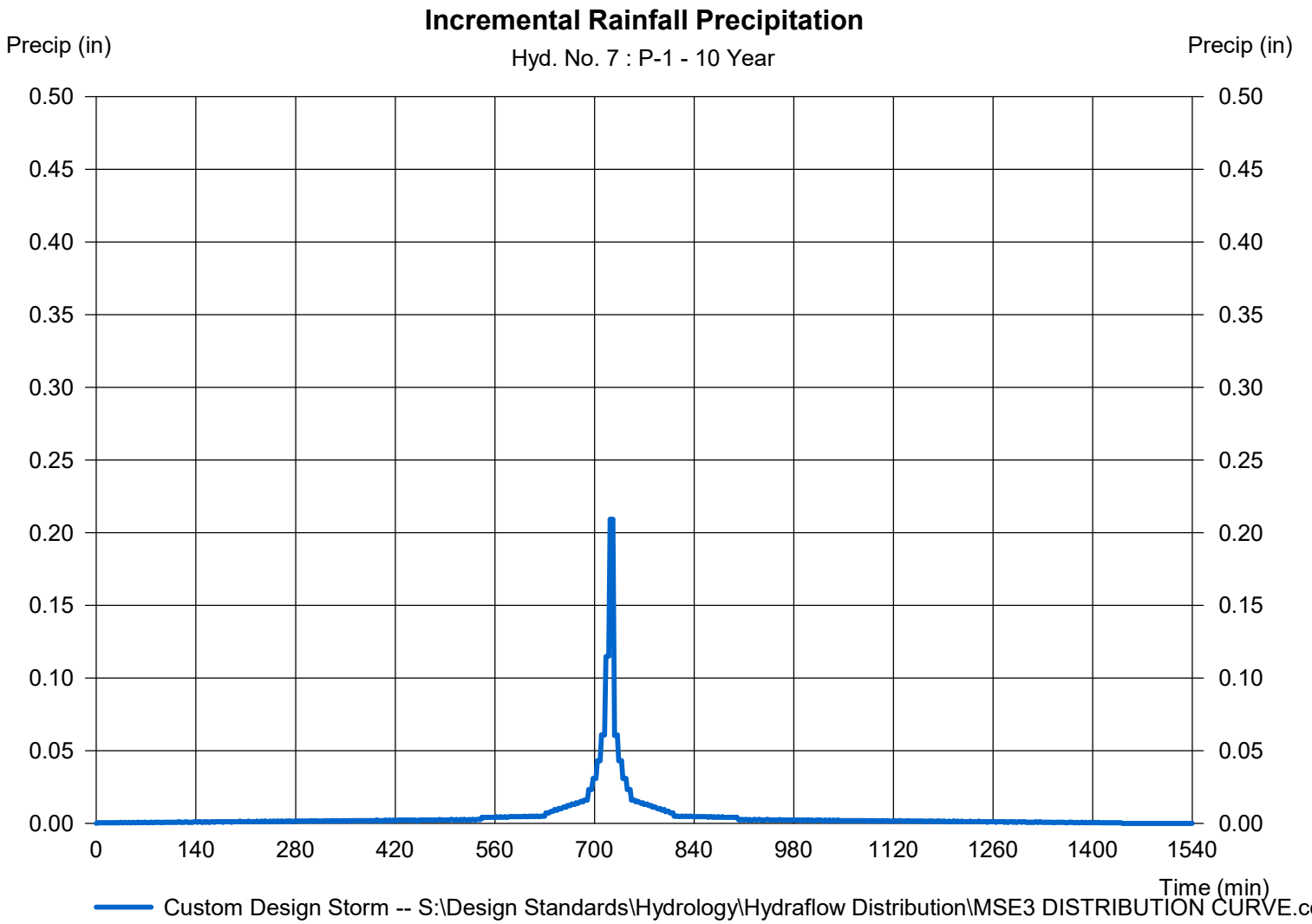


Precipitation Report

Hyd. No. 7

P-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

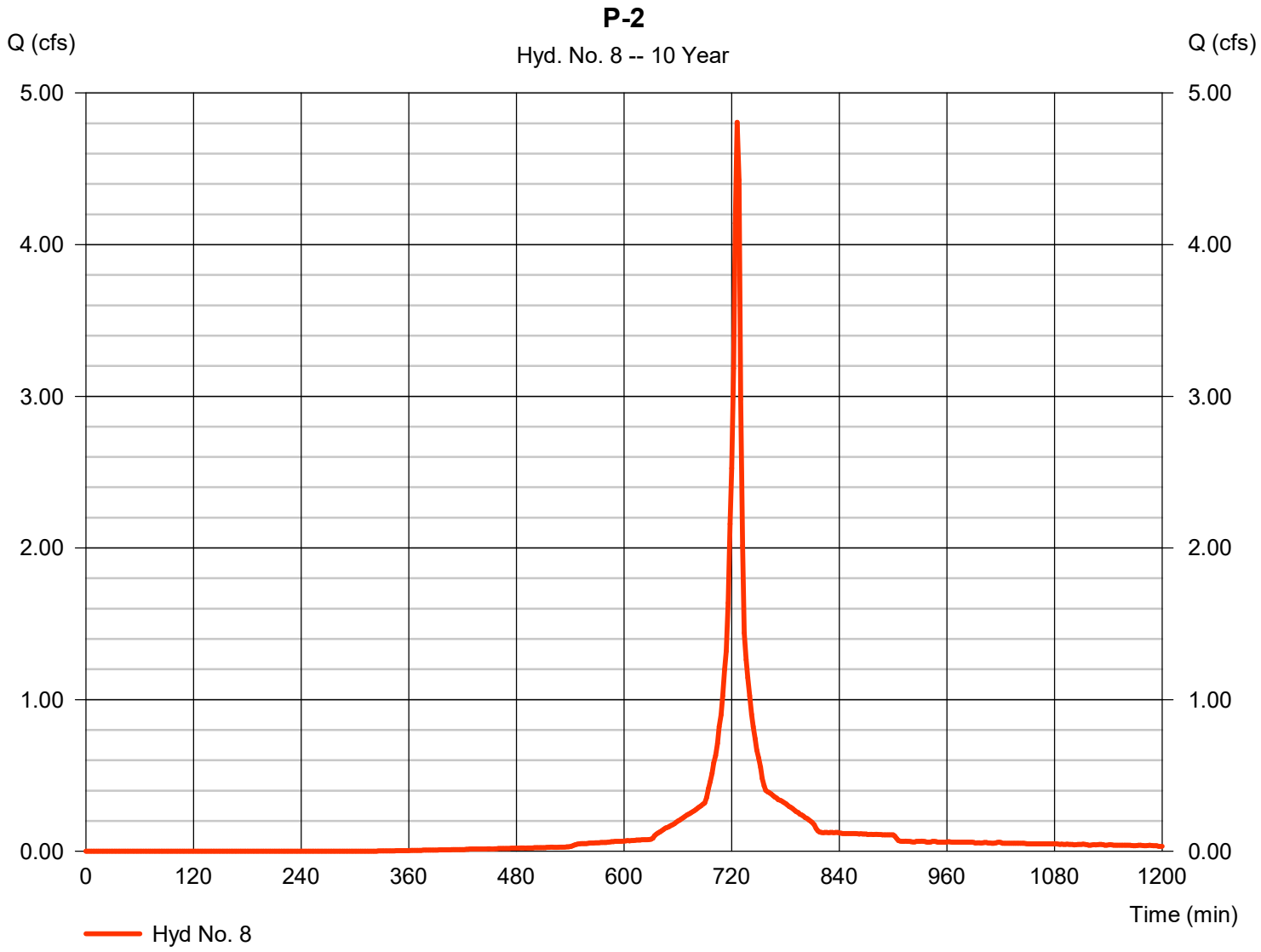


Hydrograph Report

Hyd. No. 8

P-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.808 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.223 acft
Drainage area	=	0.940 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU			

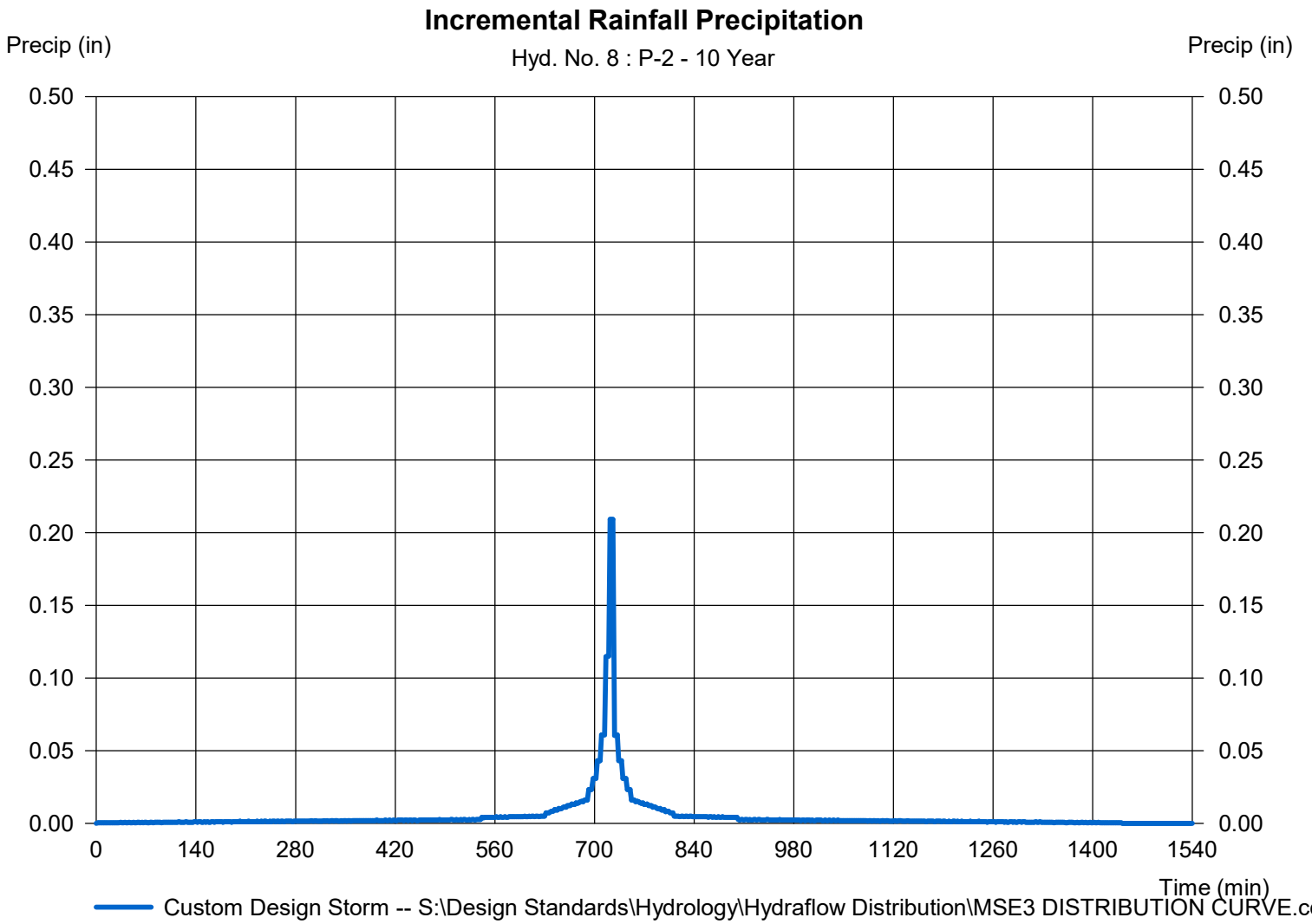


Precipitation Report

Hyd. No. 8

P-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

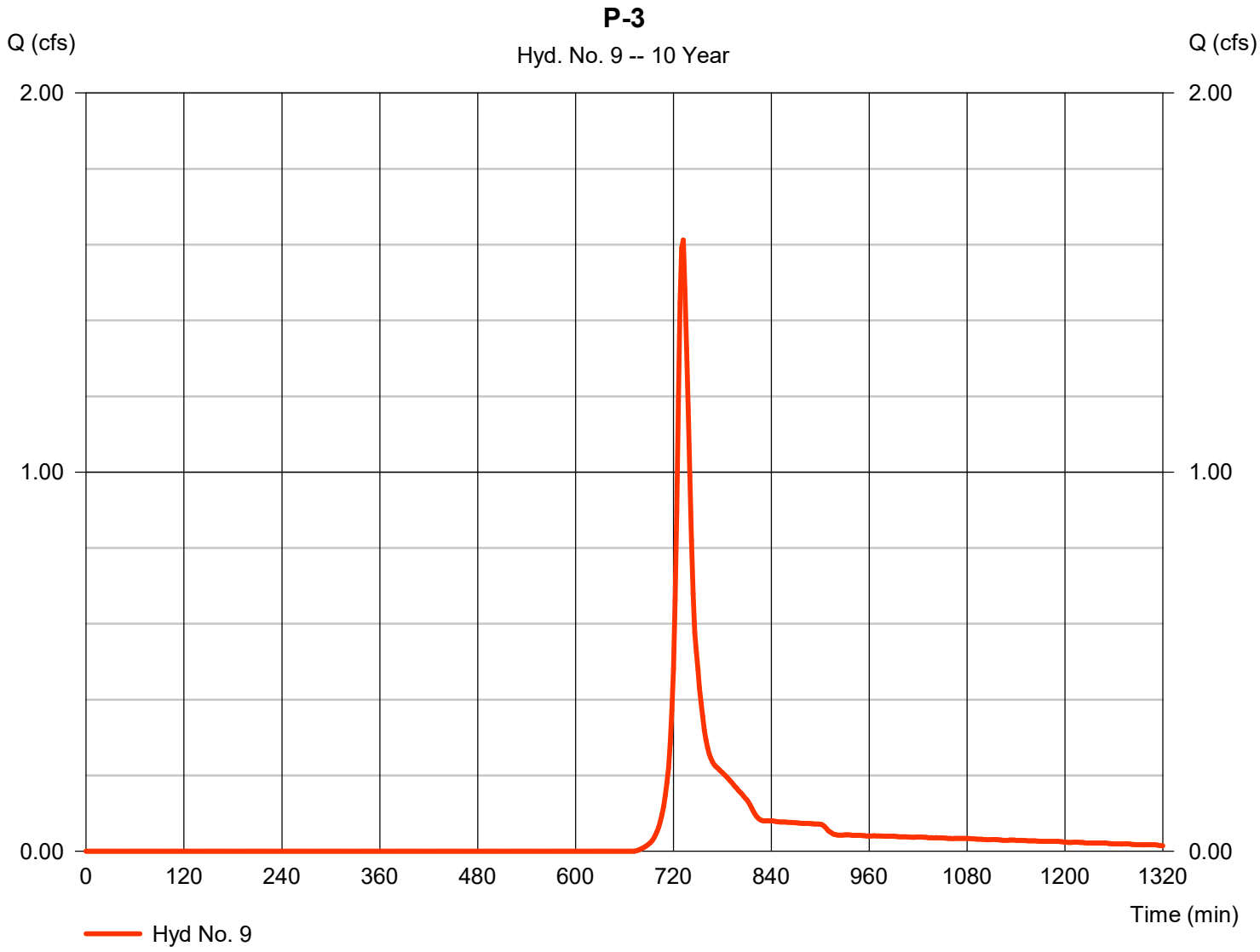


Hydrograph Report

Hyd. No. 9

P-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.612 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.097 acft
Drainage area	=	0.851 ac	Curve number	=	72
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.10 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

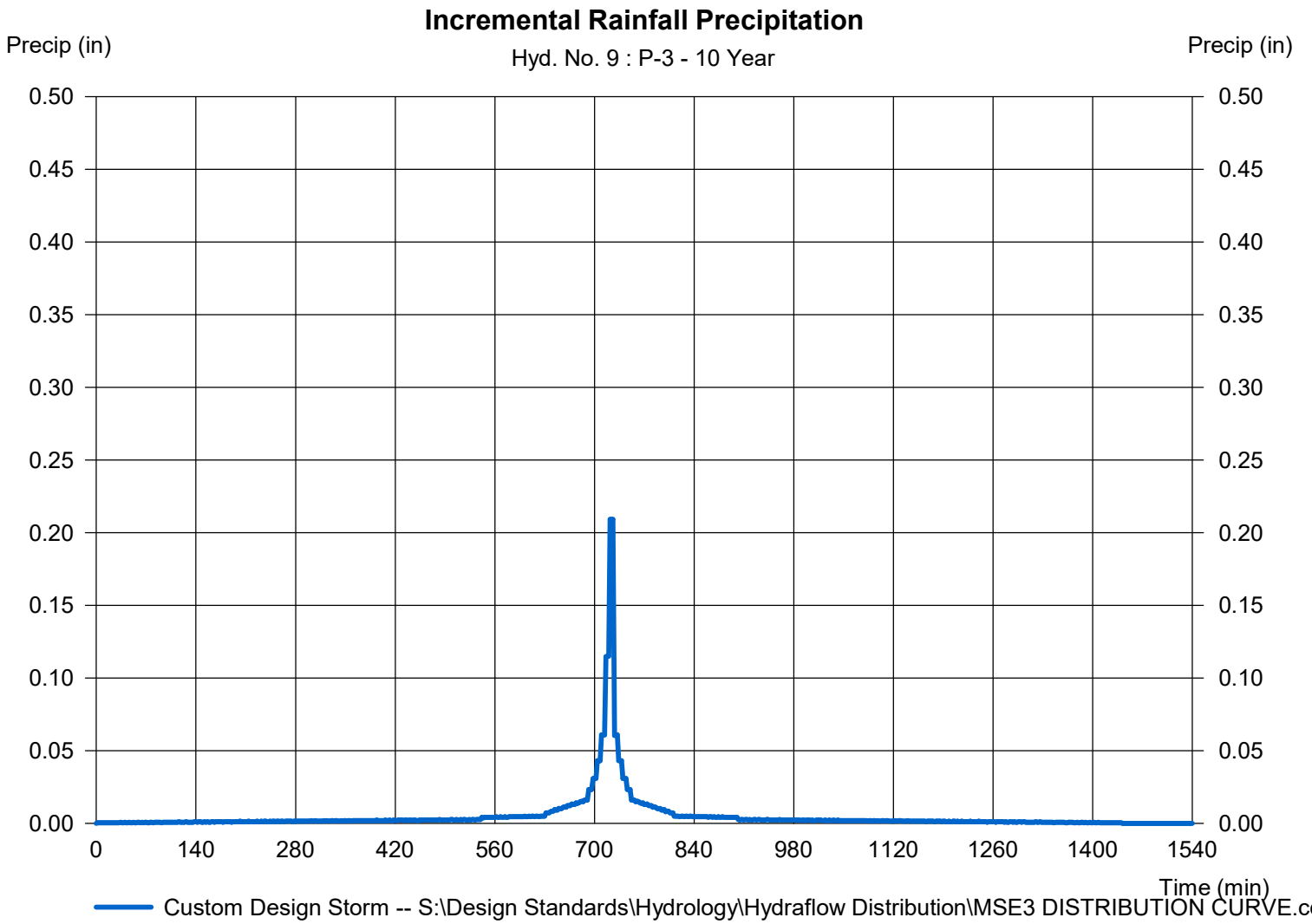


Precipitation Report

Hyd. No. 9

P-3

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



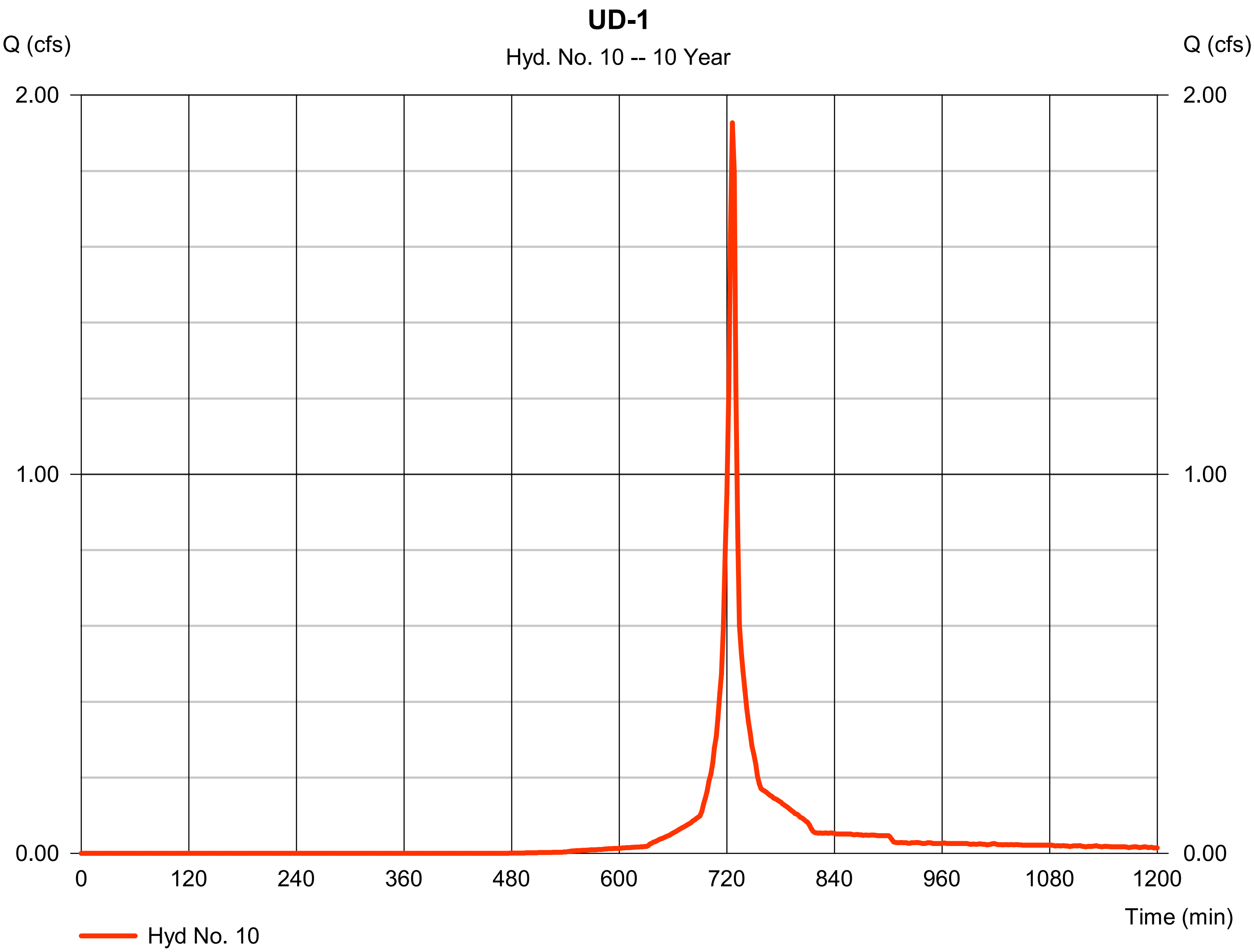
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Thursday, 08 / 8 / 2019

Hyd. No. 10

UD-1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.927 cfs
Storm frequency	= 10 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 0.085 acft
Drainage area	= 0.441 ac	Curve number	= 87
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 6.00 min
Total precip.	= 3.81 in	Distribution	= Custom
Storm duration	= S:\Design Standards\HydrologyHydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	= 484

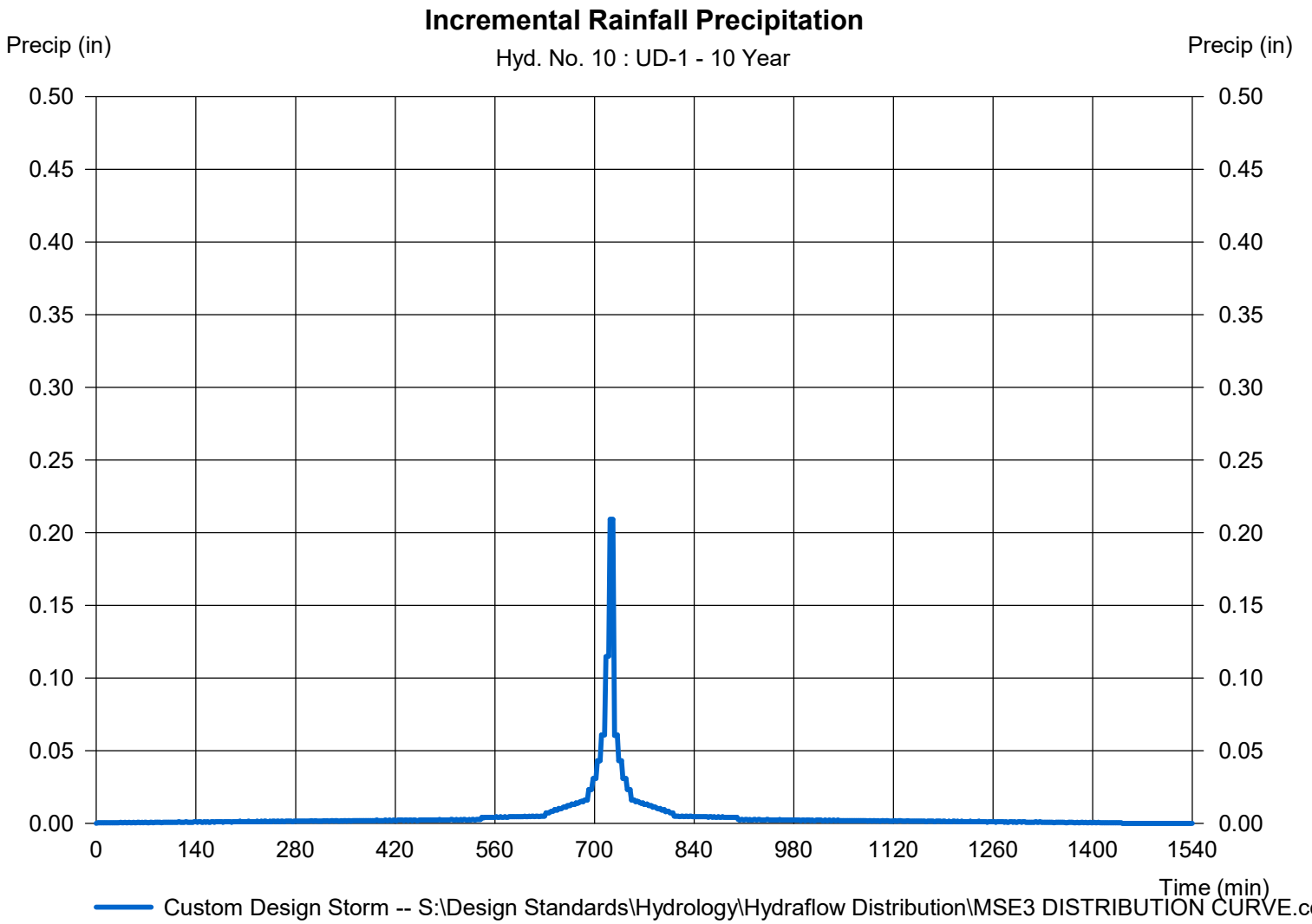


Precipitation Report

Hyd. No. 10

UD-1

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

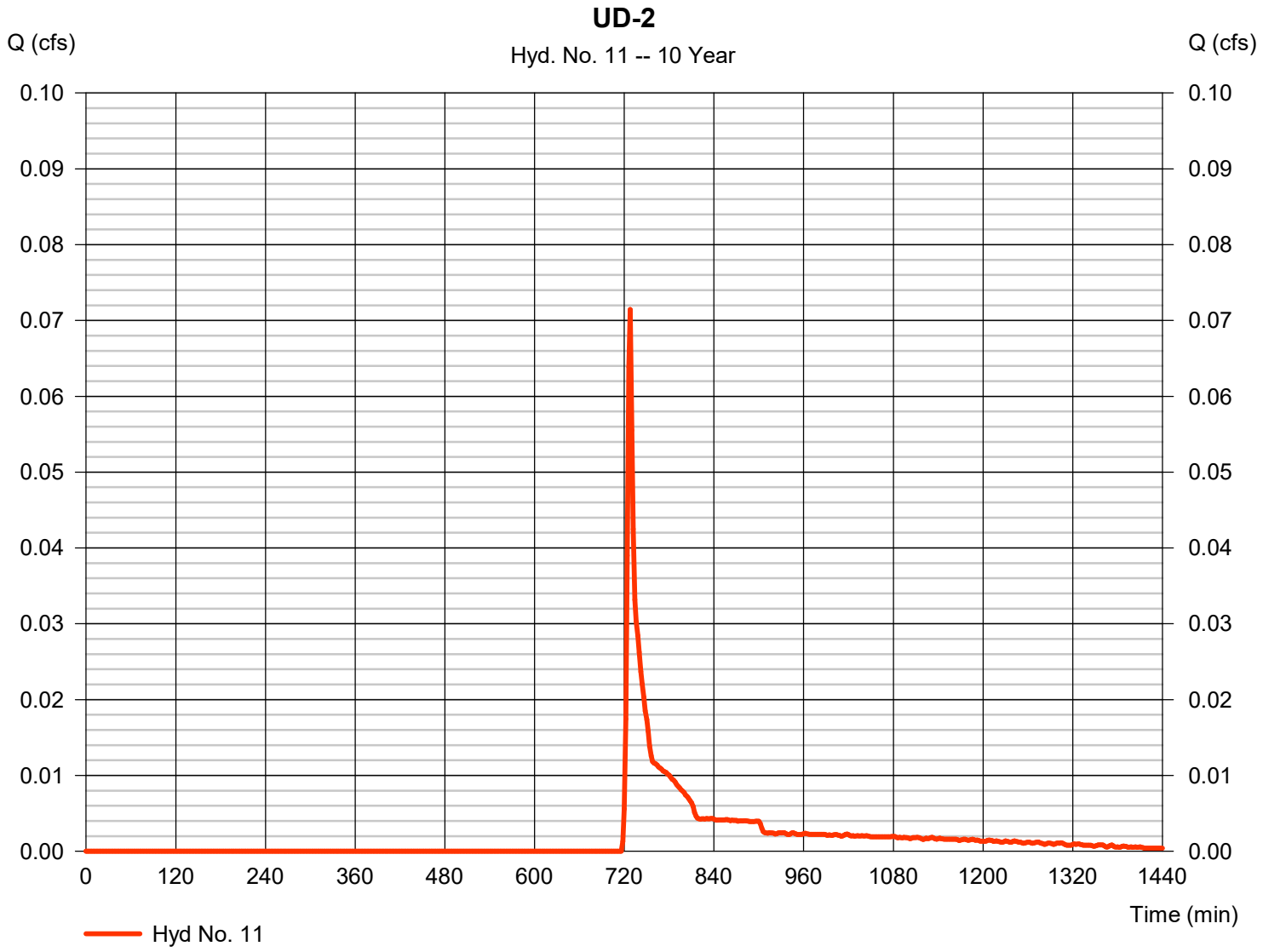


Hydrograph Report

Hyd. No. 11

UD-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.071 cfs
Storm frequency	=	10 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	0.004 acft
Drainage area	=	0.092 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.81 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde flow Shape factor Distribution = MSE3 DISTRIBUTION CU			

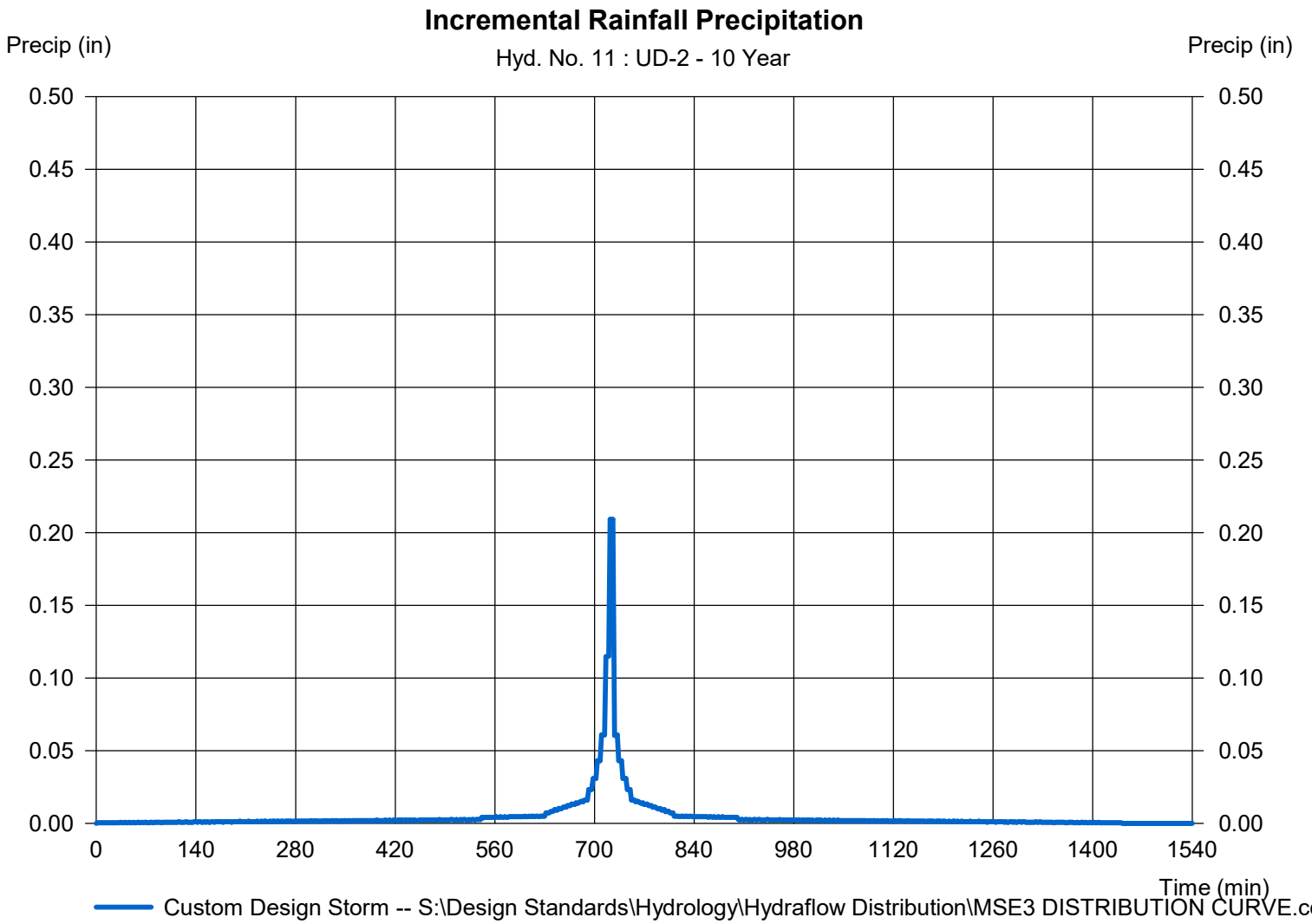


Precipitation Report

Hyd. No. 11

UD-2

Storm Frequency	= 10 yrs	Time interval	= 2 min
Total precip.	= 3.8100 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



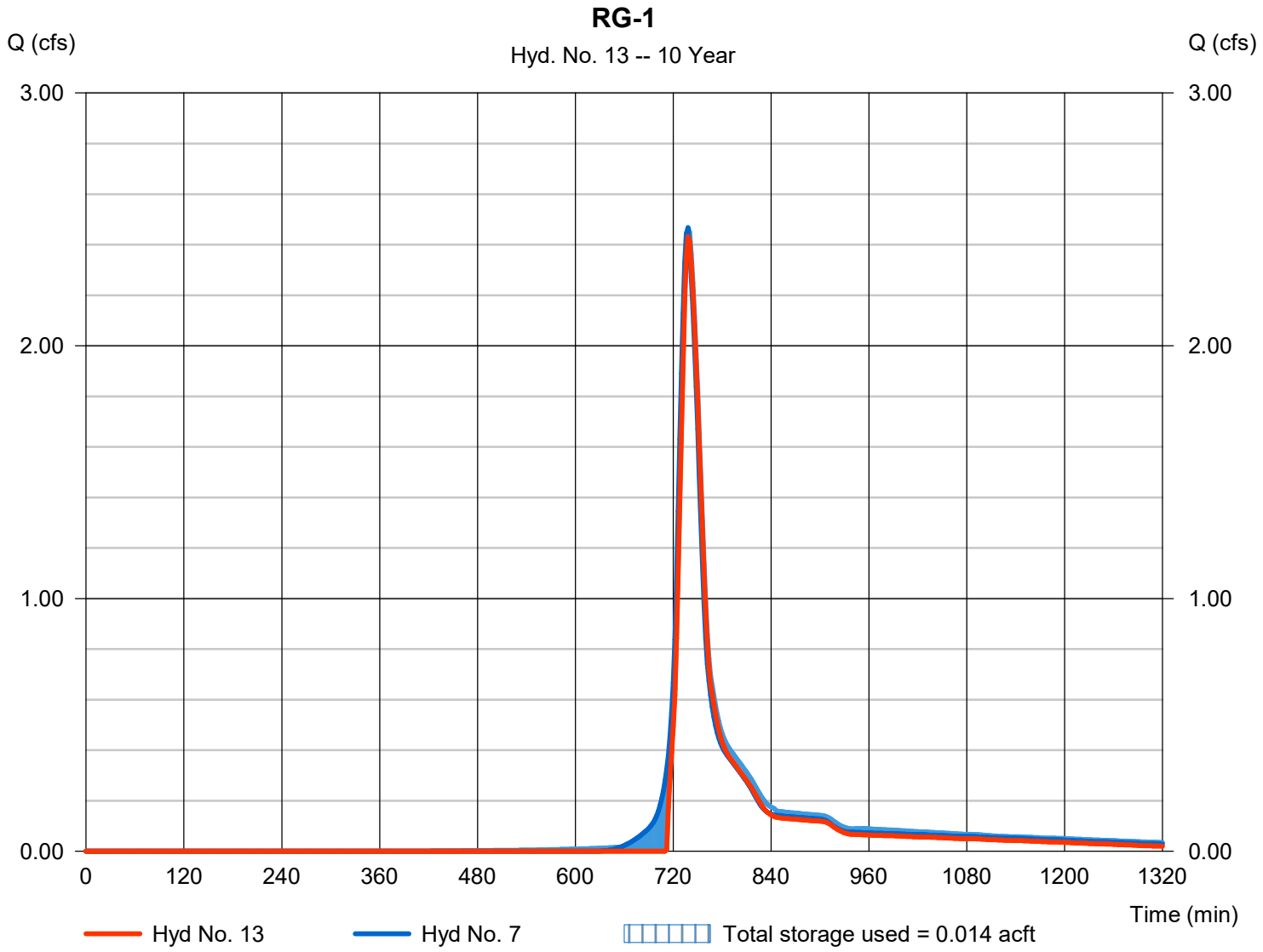
Hydrograph Report

Hyd. No. 13

RG-1

Hydrograph type	=	Reservoir	Peak discharge	=	2.432 cfs
Storm frequency	=	10 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	0.175 acft
Inflow hyd. No.	=	7 - P-1	Max. Elevation	=	128.24 ft
Reservoir name	=	RG-1	Max. Storage	=	0.014 acft

Storage Indication method used. Exfiltration extracted from Outflow.



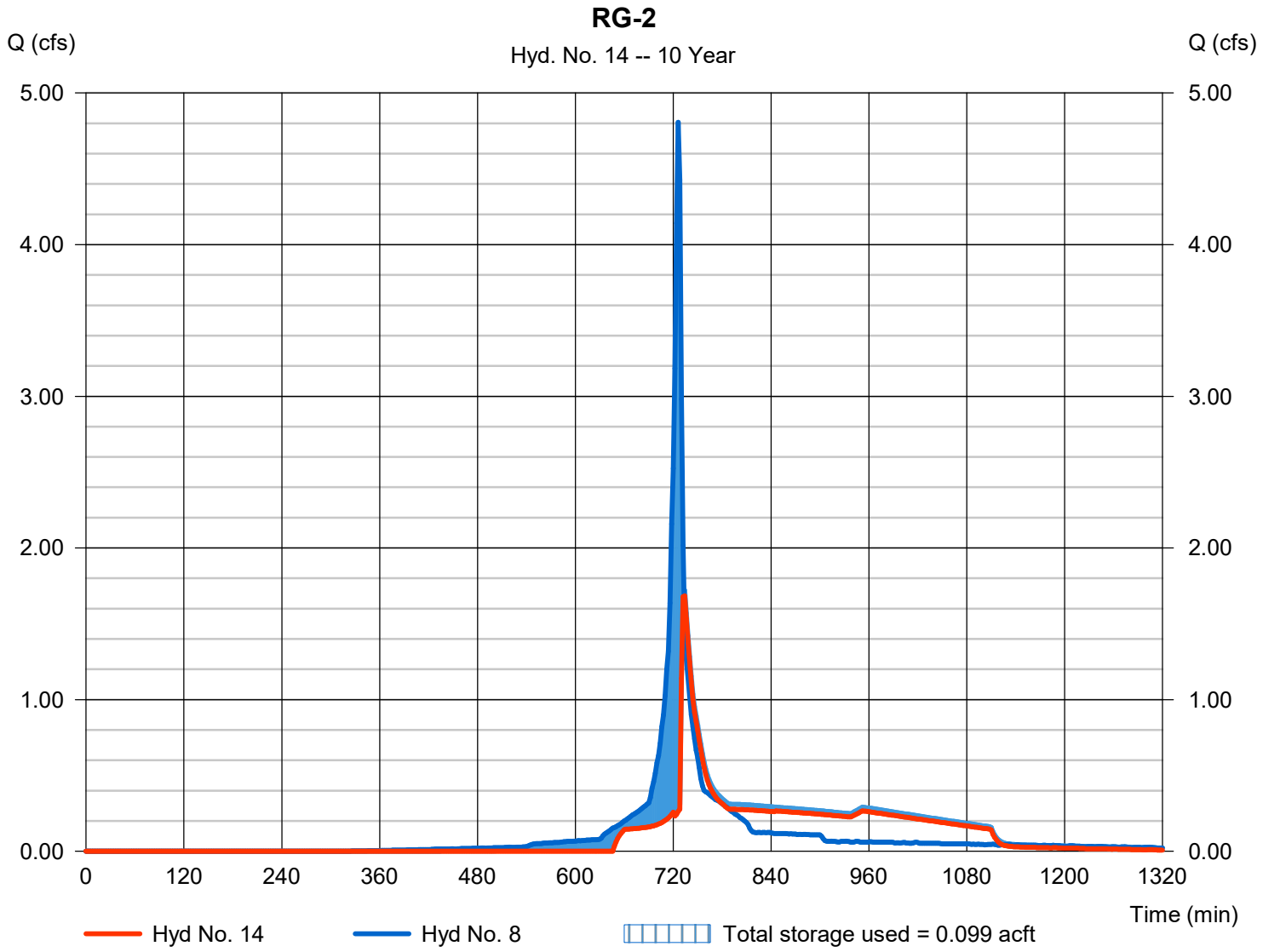
Hydrograph Report

Hyd. No. 14

RG-2

Hydrograph type	=	Reservoir	Peak discharge	=	1.684 cfs
Storm frequency	=	10 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	0.187 acft
Inflow hyd. No.	=	8 - P-2	Max. Elevation	=	133.67 ft
Reservoir name	=	RG-2	Max. Storage	=	0.099 acft

Storage Indication method used. Exfiltration extracted from Outflow.

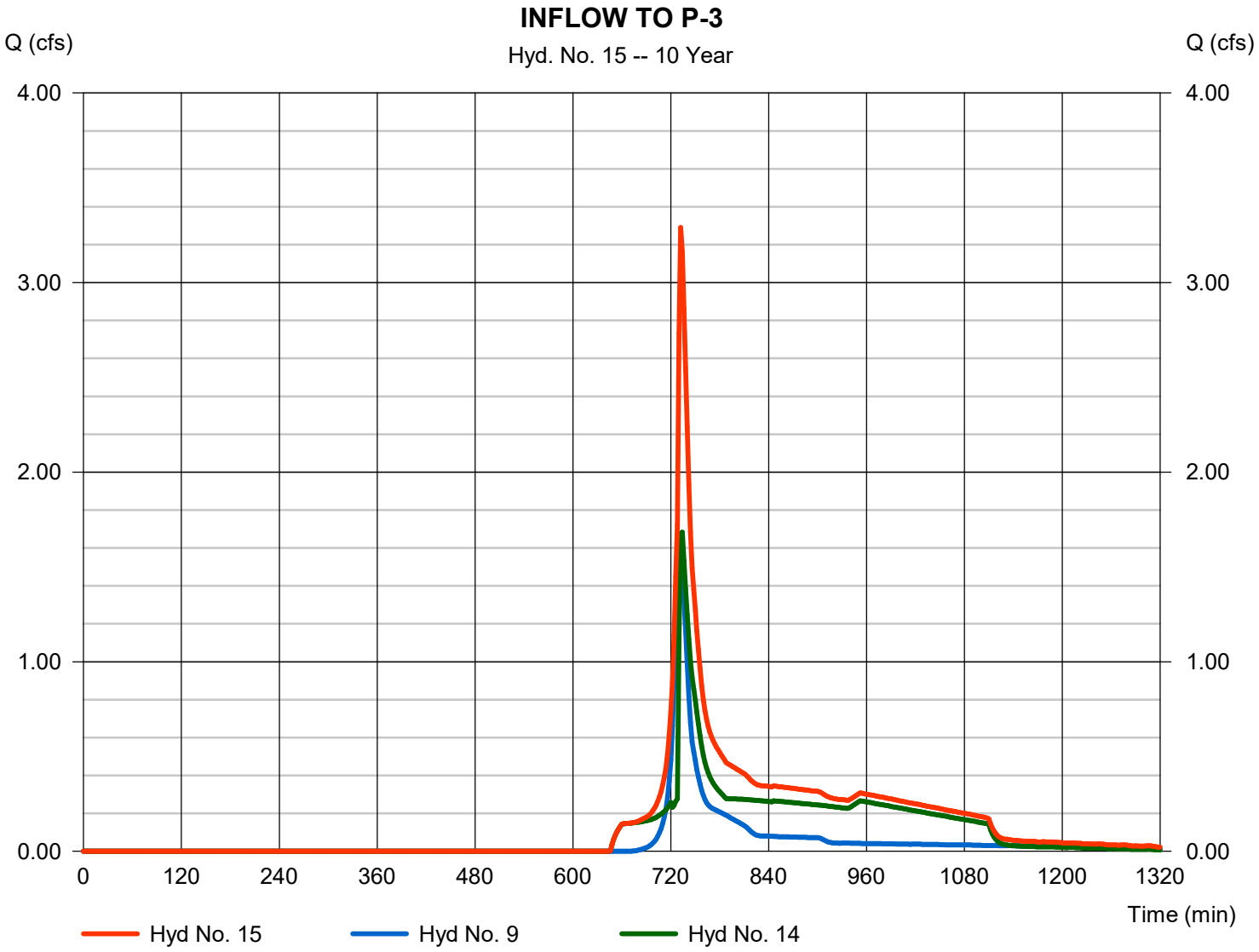


Hydrograph Report

Hyd. No. 15

INFLOW TO P-3

Hydrograph type	= Combine	Peak discharge	= 3.290 cfs
Storm frequency	= 10 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 0.284 acft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 0.851 ac



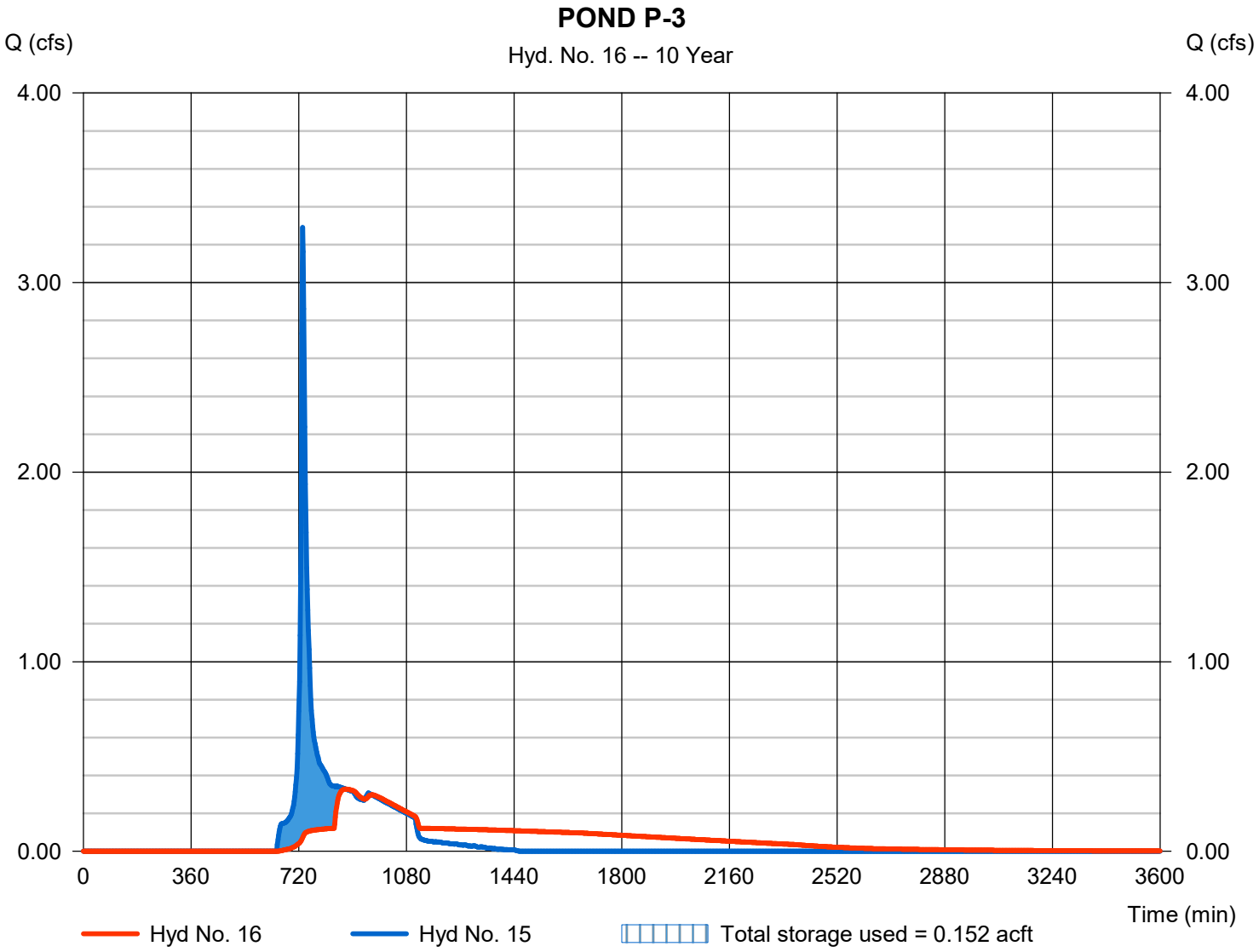
Hydrograph Report

Hyd. No. 16

POND P-3

Hydrograph type	=	Reservoir	Peak discharge	=	0.328 cfs
Storm frequency	=	10 yrs	Time to peak	=	876 min
Time interval	=	2 min	Hyd. volume	=	0.283 acft
Inflow hyd. No.	=	15 - INFLOW TO P-3	Max. Elevation	=	128.52 ft
Reservoir name	=	POND P-3	Max. Storage	=	0.152 acft

Storage Indication method used.

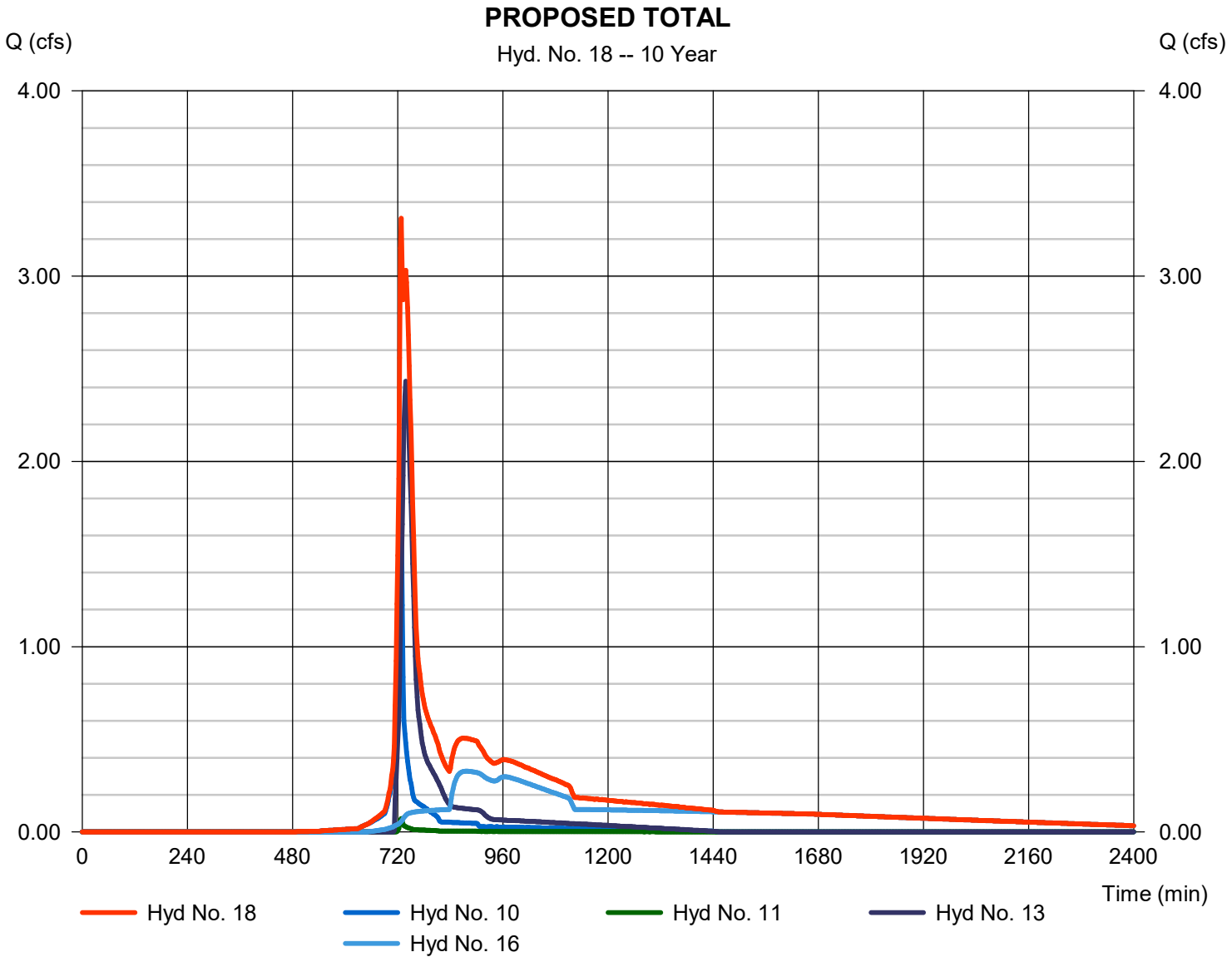


Hydrograph Report

Hyd. No. 18

PROPOSED TOTAL

Hydrograph type	= Combine	Peak discharge	= 3.312 cfs
Storm frequency	= 10 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 0.547 acft
Inflow hyds.	= 10, 11, 13, 16	Contrib. drain. area	= 0.533 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020

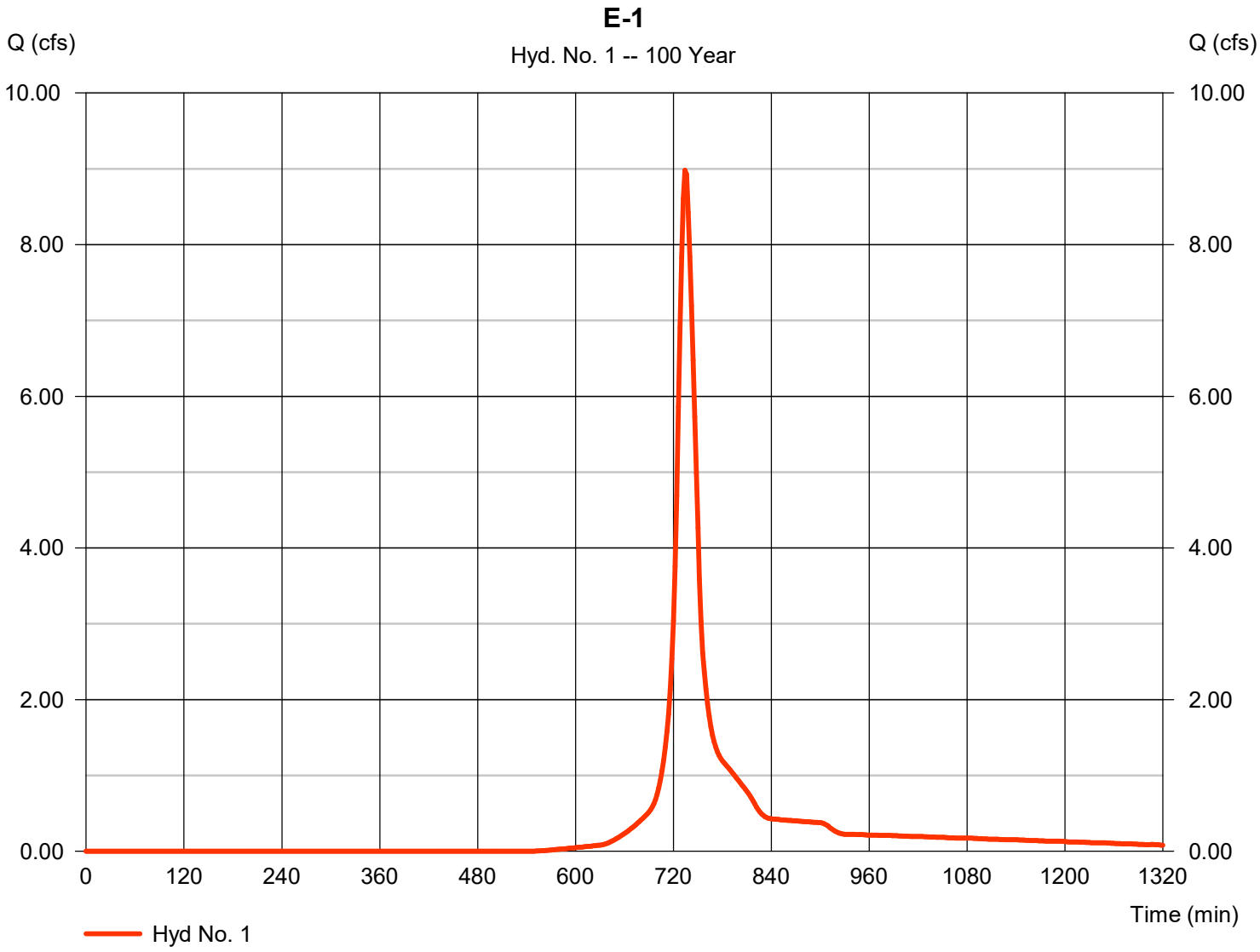
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	8.980	2	734	0.637	------	------	------	E-1
2	SCS Runoff	4.311	2	736	0.307	------	------	------	E-2
3	SCS Runoff	0.451	2	732	0.027	------	------	------	E-3
5	Combine	13.68	2	734	0.971	1, 2, 3,	------	------	Existing Total
7	SCS Runoff	5.311	2	736	0.413	------	------	------	P-1
8	SCS Runoff	8.180	2	726	0.394	------	------	------	P-2
9	SCS Runoff	3.890	2	730	0.230	------	------	------	P-3
10	SCS Runoff	3.542	2	726	0.162	------	------	------	UD-1
11	SCS Runoff	0.287	2	726	0.013	------	------	------	UD-2
13	Reservoir	5.291	2	738	0.395	7	128.40	0.018	RG-1
14	Reservoir	6.892	2	728	0.353	8	133.99	0.120	RG-2
15	Combine	10.52	2	728	0.583	9, 14	------	------	INFLOW TO P-3
16	Reservoir	4.365	2	740	0.582	15	128.90	0.202	POND P-3
18	Combine	10.57	2	738	1.152	10, 11, 13, 16,	------	------	PROPOSED TOTAL

Hydrograph Report

Hyd. No. 1

E-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.980 cfs
Storm frequency	=	100 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	0.637 acft
Drainage area	=	2.161 ac	Curve number	=	76
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.70 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyd Factor Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

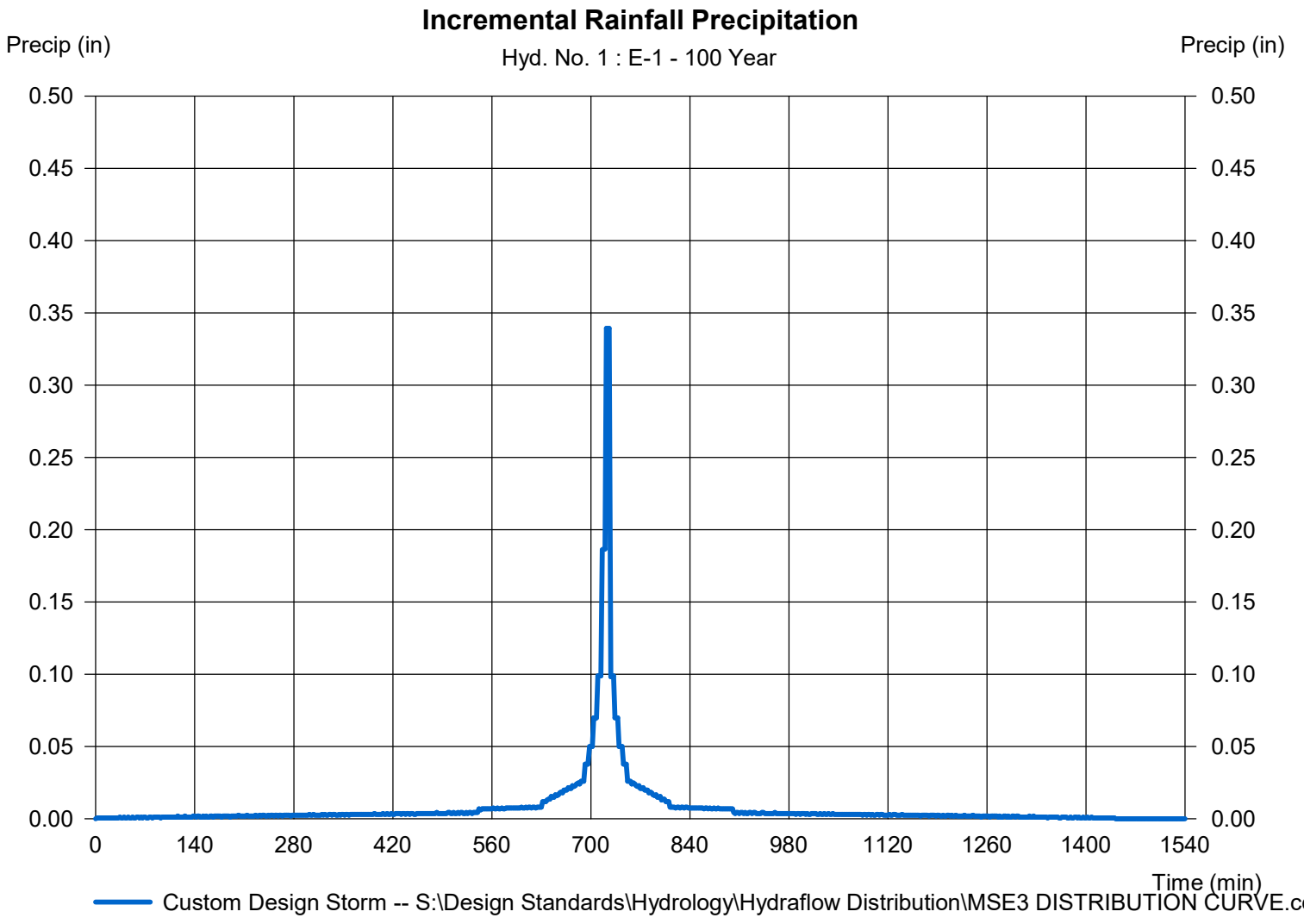


Precipitation Report

Hyd. No. 1

E-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

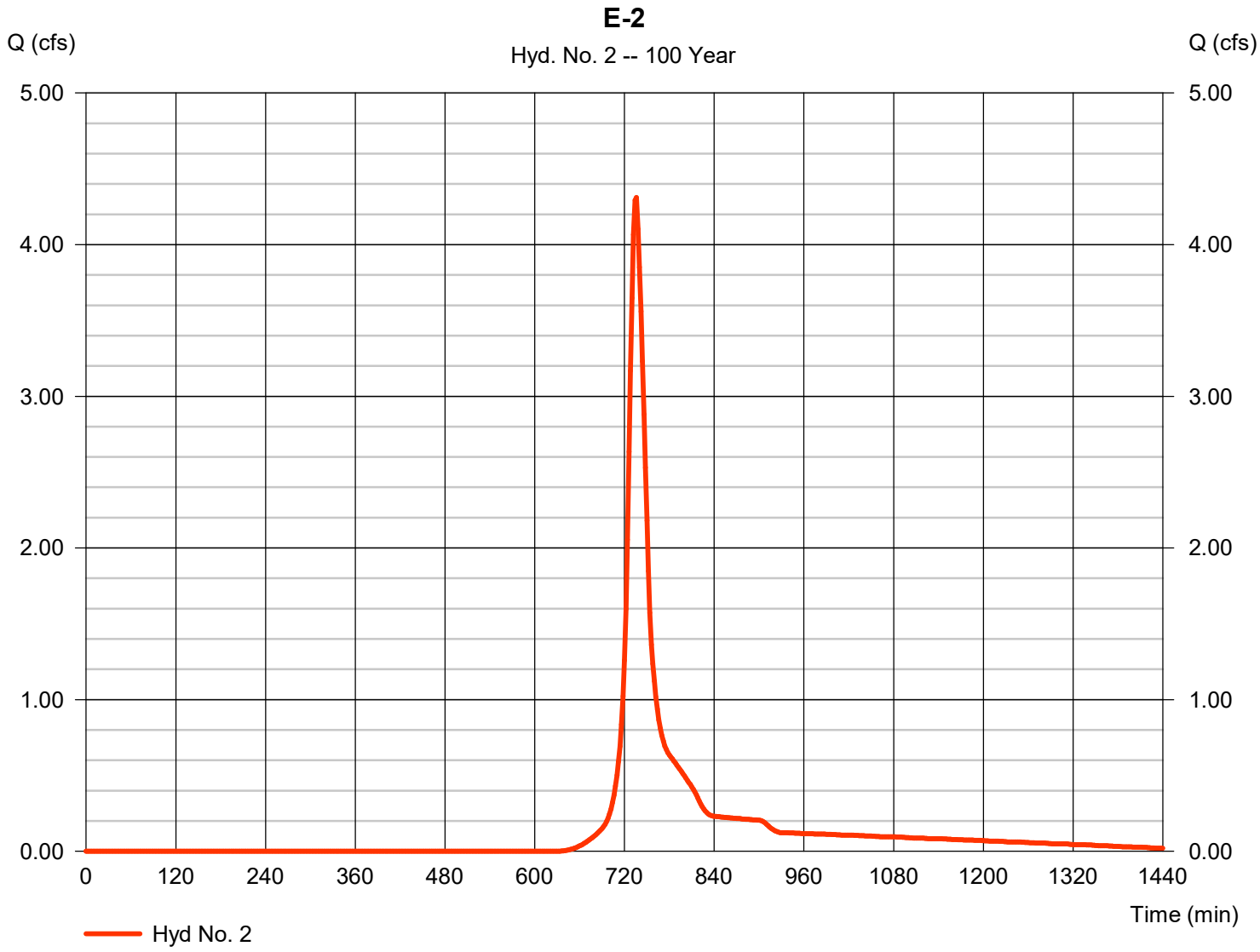


Hydrograph Report

Hyd. No. 2

E-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.311 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.307 acft
Drainage area	=	1.336 ac	Curve number	=	68
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	17.50 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = MSE3 DISTRIBUTION CU	Shape factor	=	484

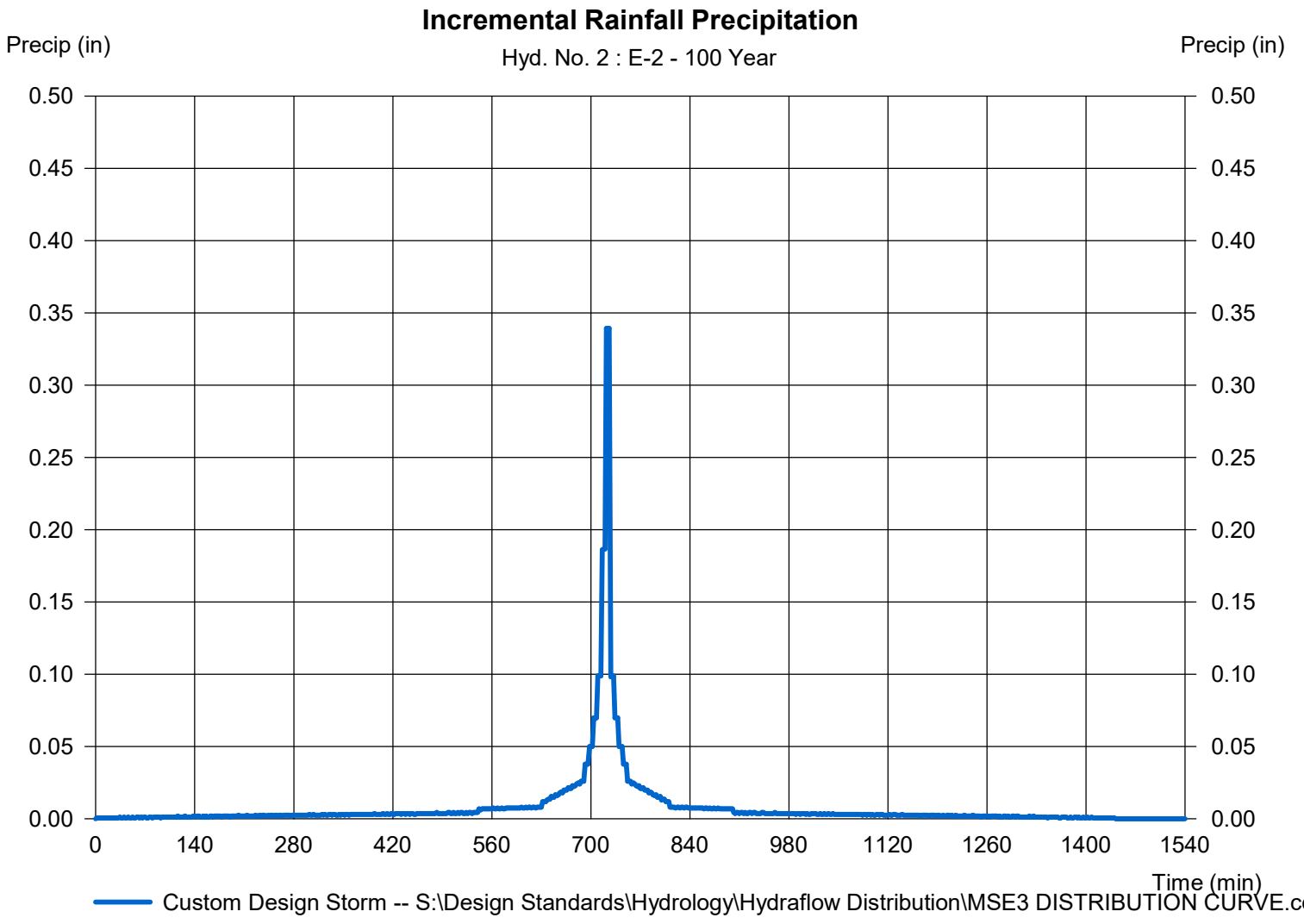


Precipitation Report

Hyd. No. 2

E-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

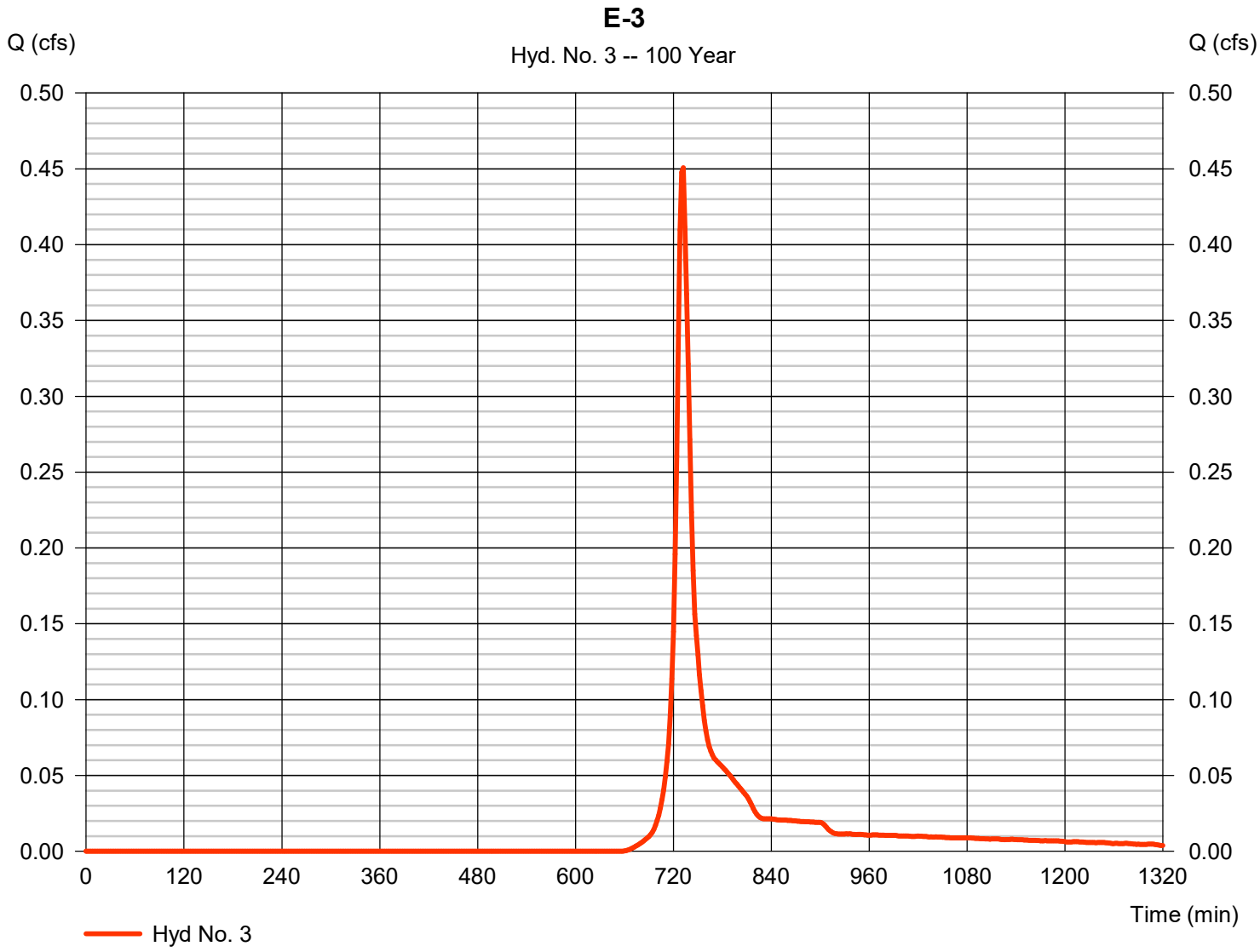


Hydrograph Report

Hyd. No. 3

E-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.451 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	0.027 acft
Drainage area	=	0.131 ac	Curve number	=	64
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.00 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

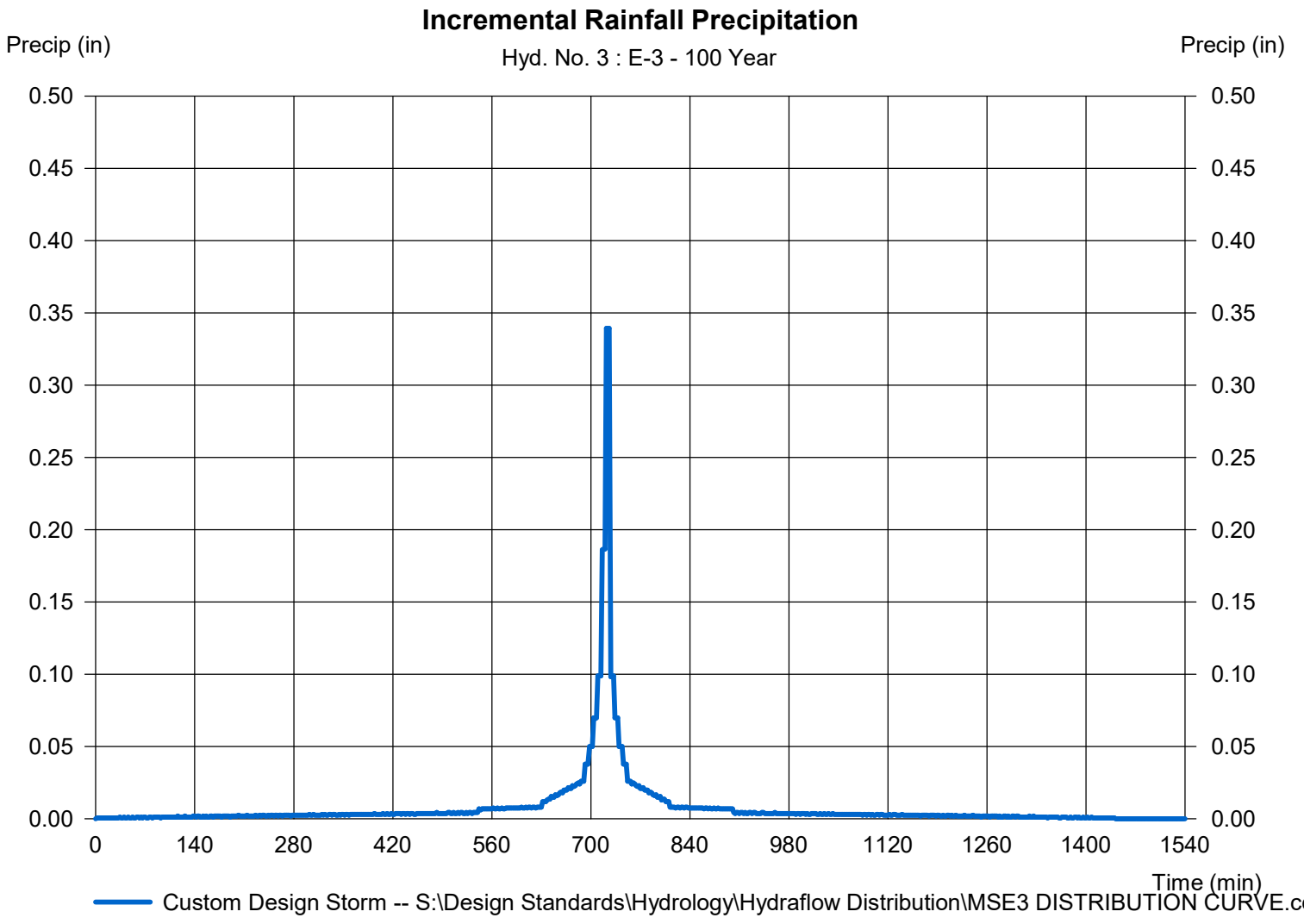


Precipitation Report

Hyd. No. 3

E-3

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

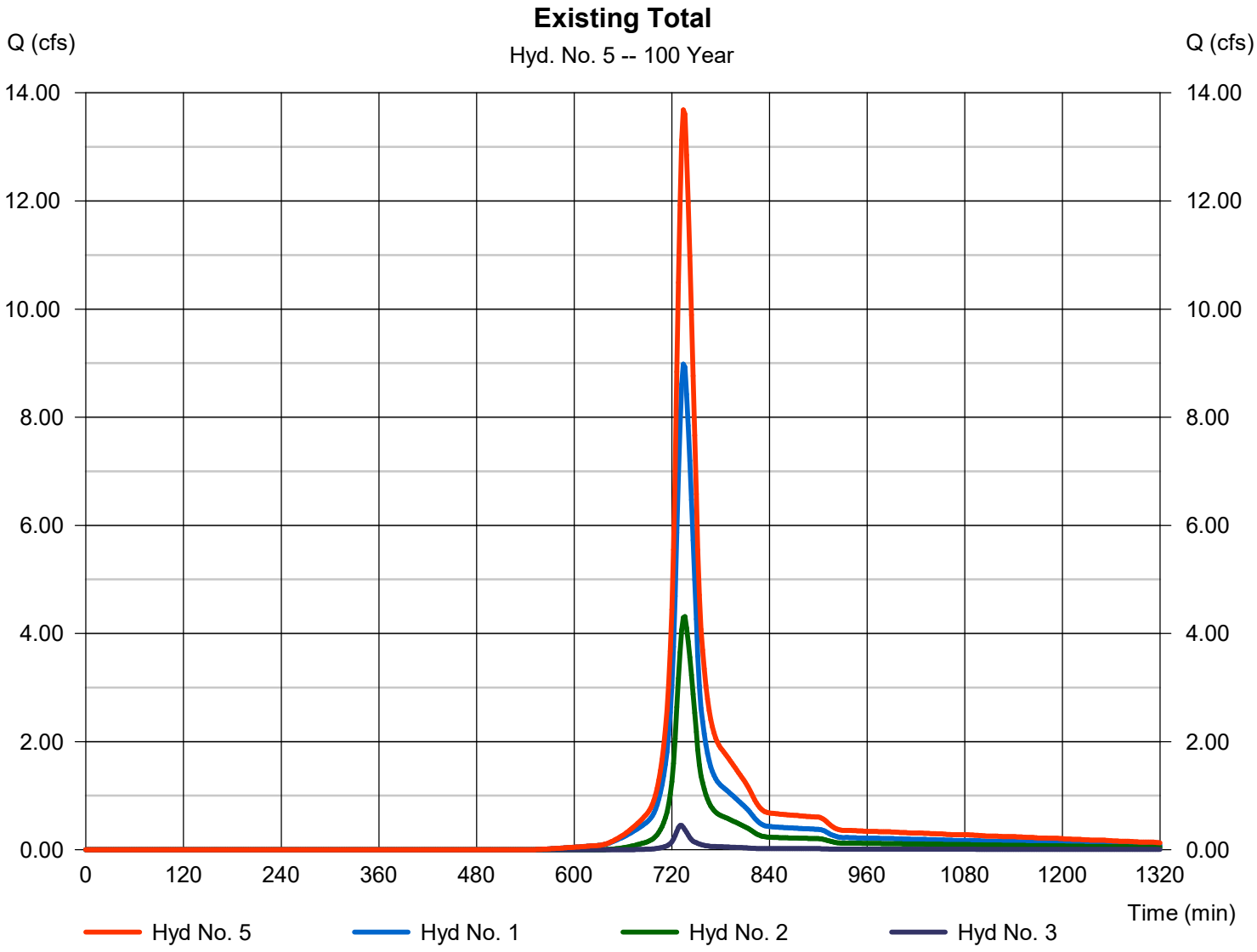


Hydrograph Report

Hyd. No. 5

Existing Total

Hydrograph type	= Combine	Peak discharge	= 13.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 0.971 acft
Inflow hyds.	= 1, 2, 3	Contrib. drain. area	= 3.628 ac

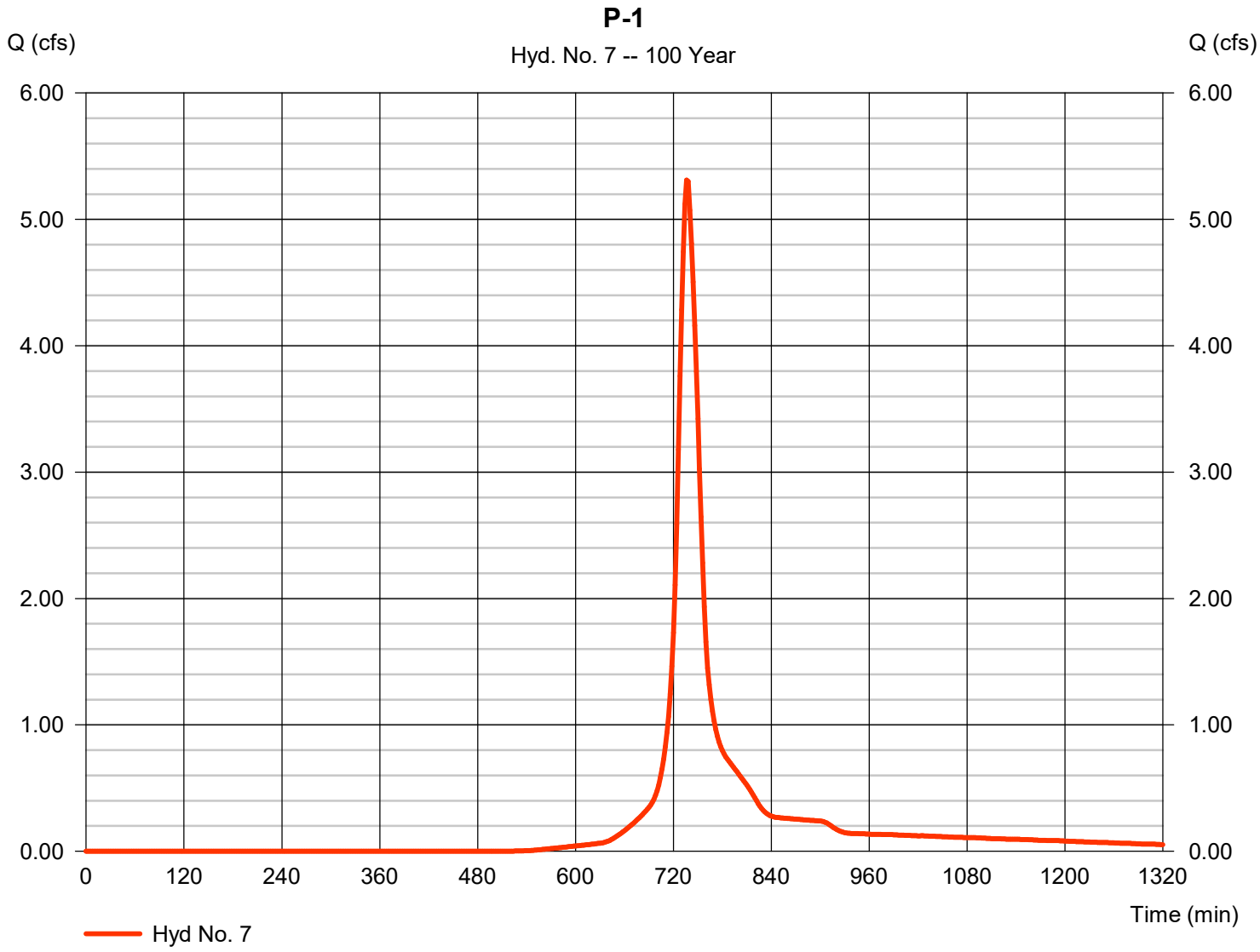


Hydrograph Report

Hyd. No. 7

P-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.311 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	0.413 acft
Drainage area	=	1.304 ac	Curve number	=	78
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	22.40 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = 484	Shape factor	=	323 DISTRIBUTION CU

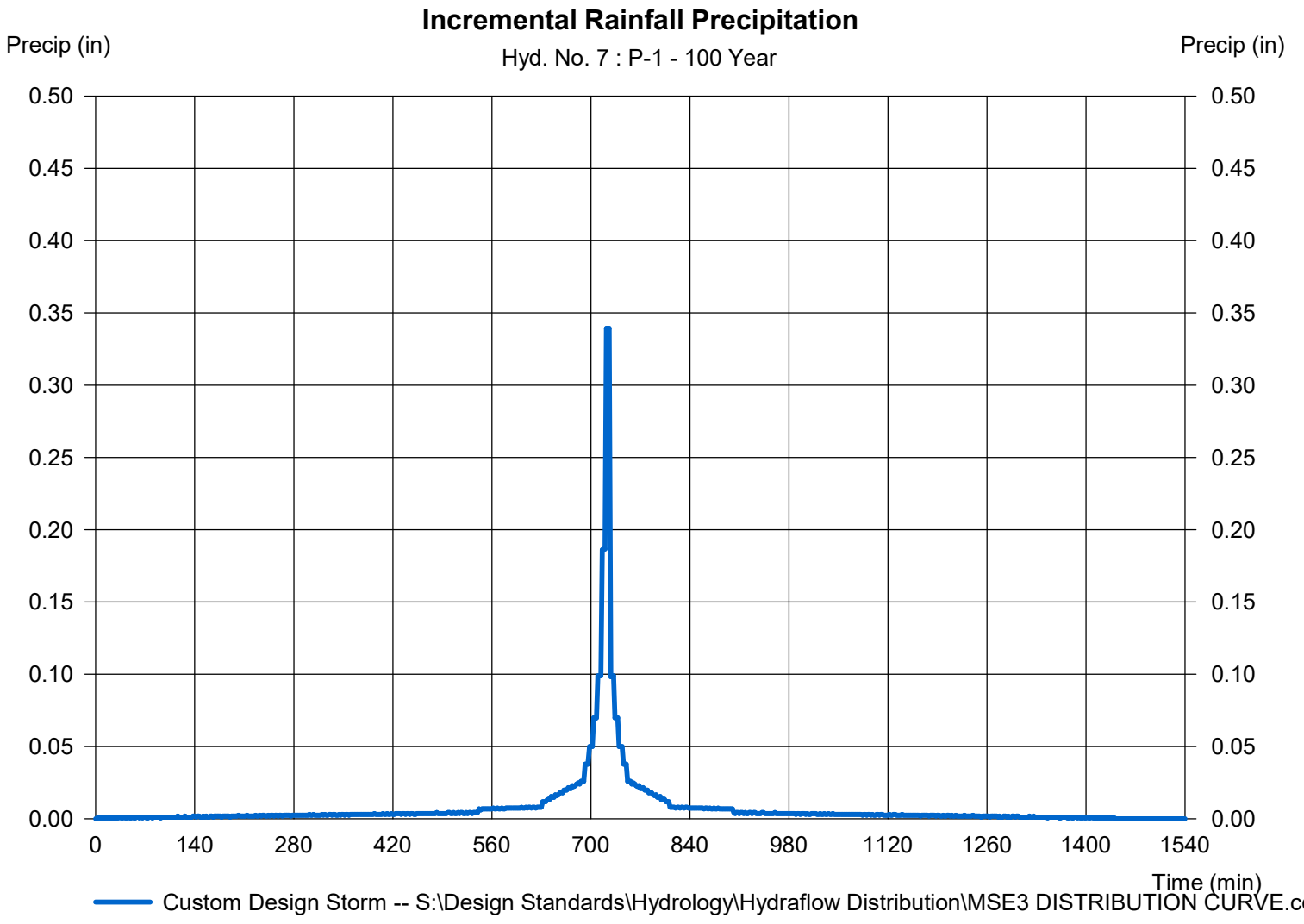


Precipitation Report

Hyd. No. 7

P-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

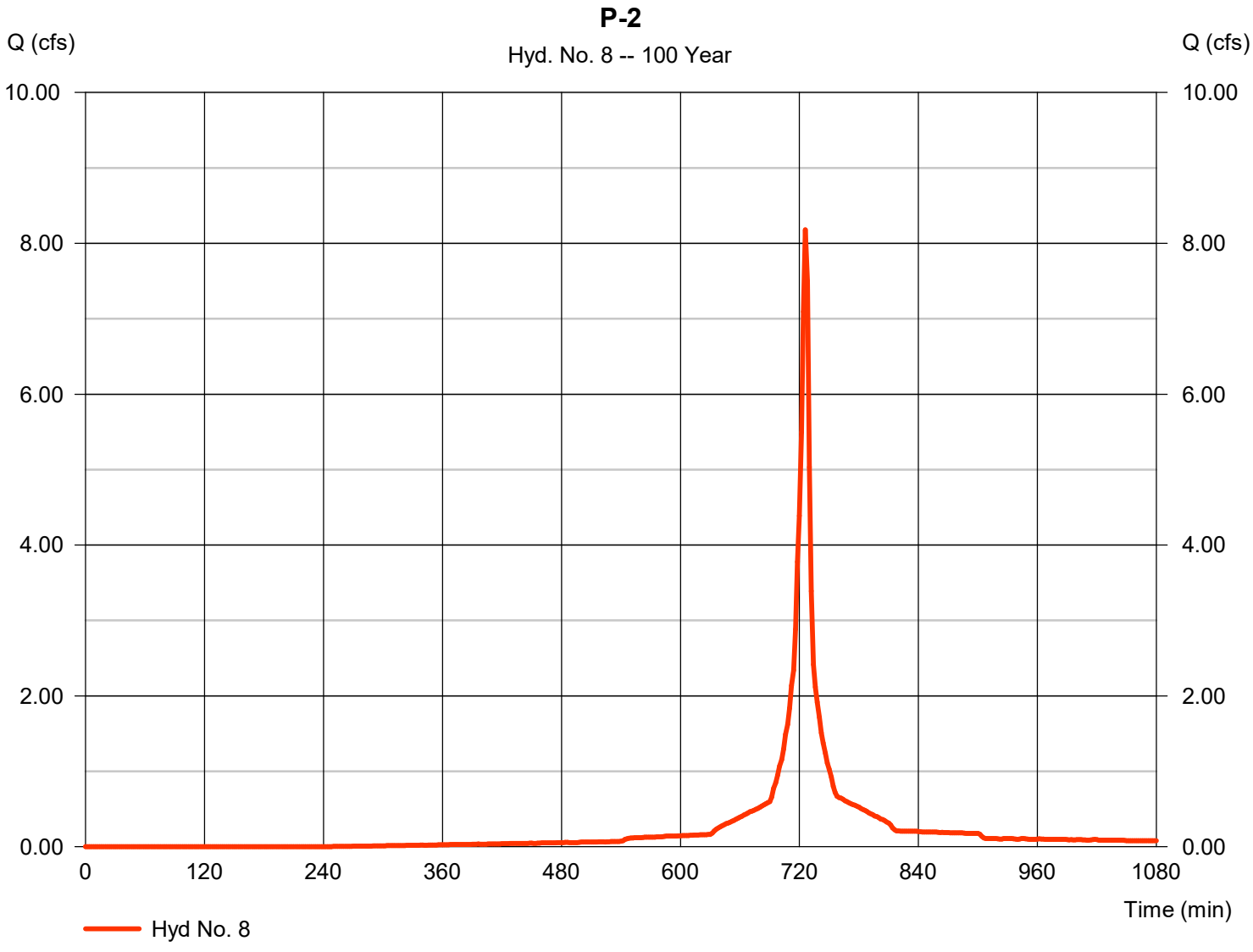


Hydrograph Report

Hyd. No. 8

P-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.180 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.394 acft
Drainage area	=	0.940 ac	Curve number	=	93
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde Storm Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

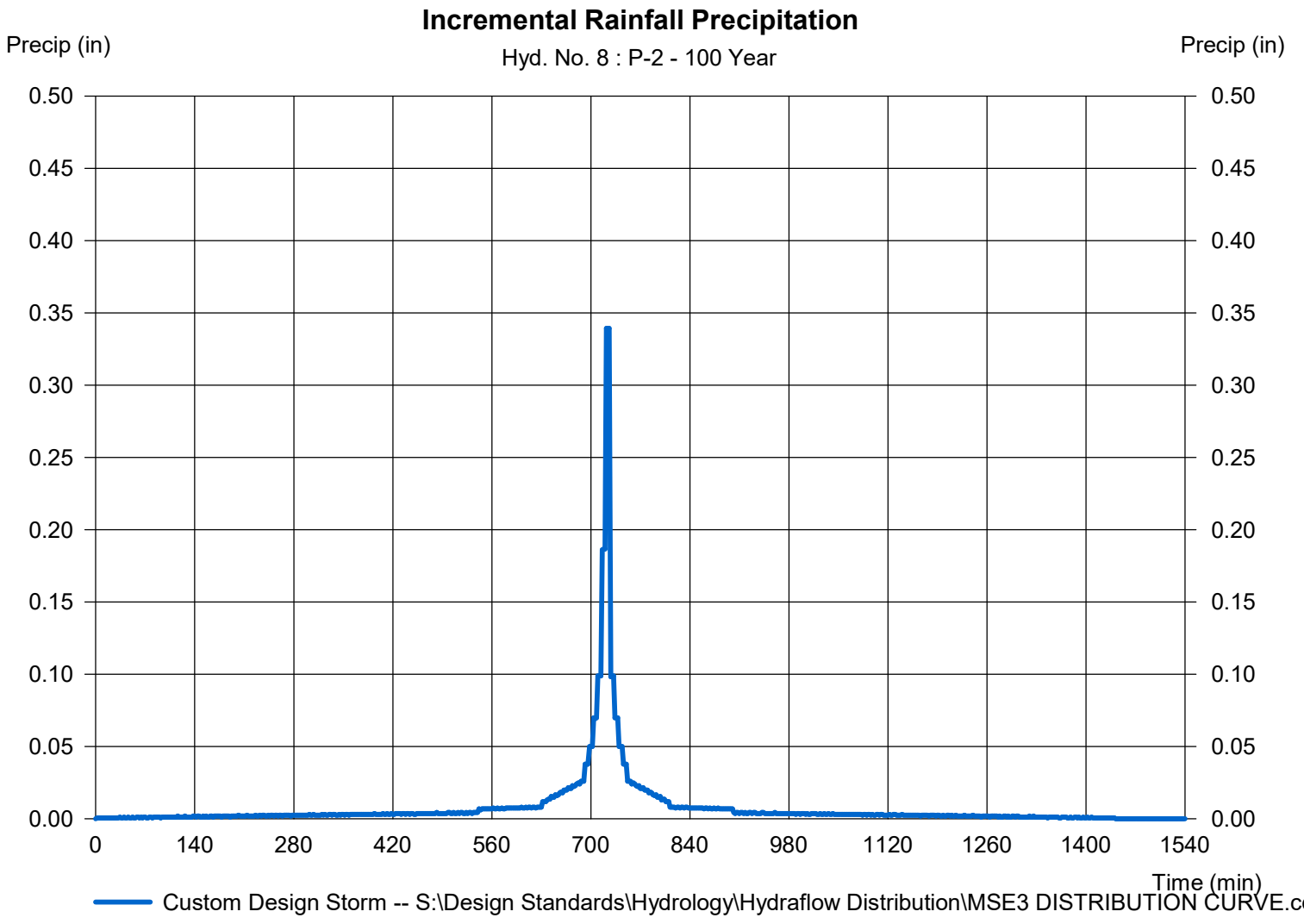


Precipitation Report

Hyd. No. 8

P-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

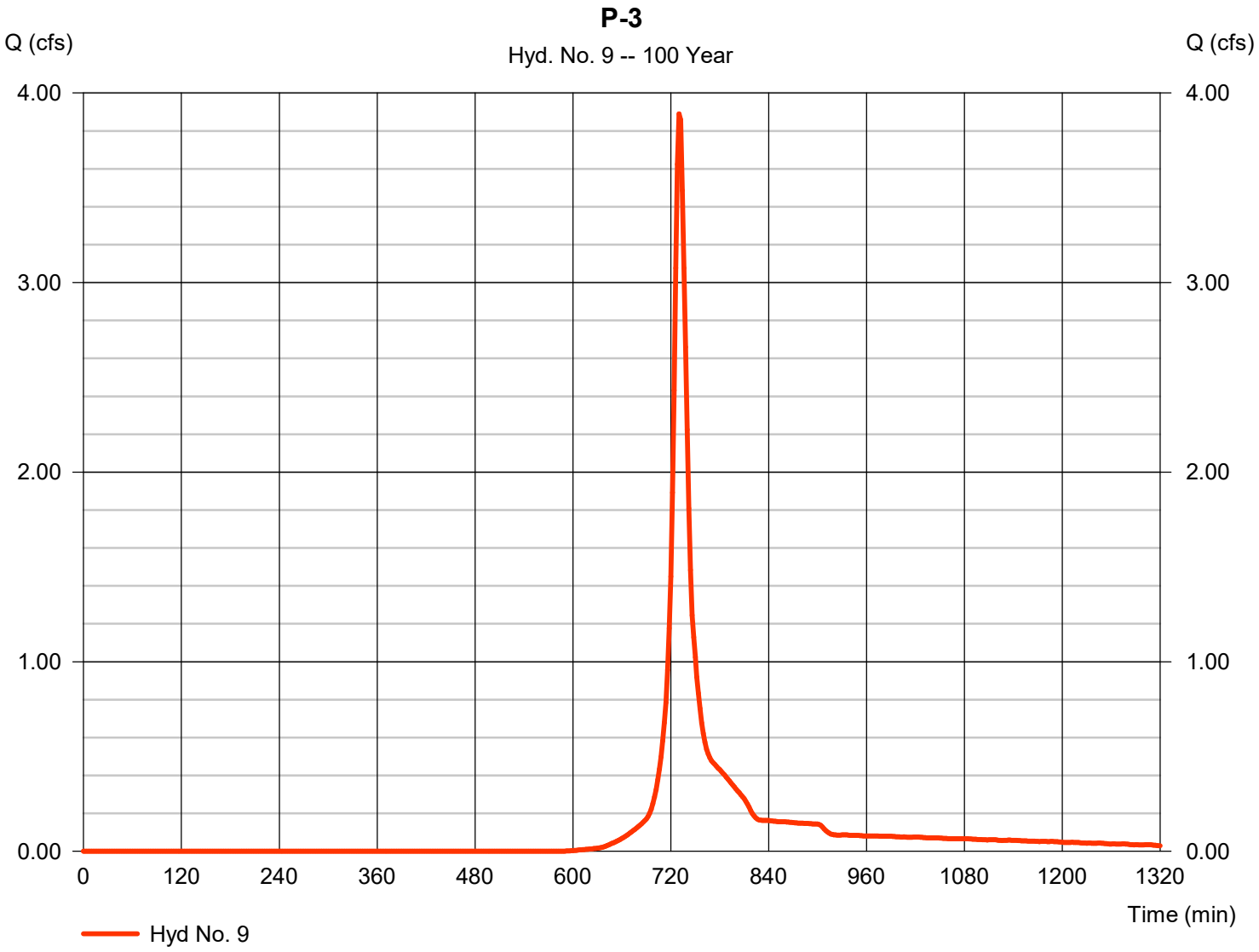


Hydrograph Report

Hyd. No. 9

P-3

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.890 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	0.230 acft
Drainage area	=	0.851 ac	Curve number	=	72
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.10 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = SE3 DISTRIBUTION CU			

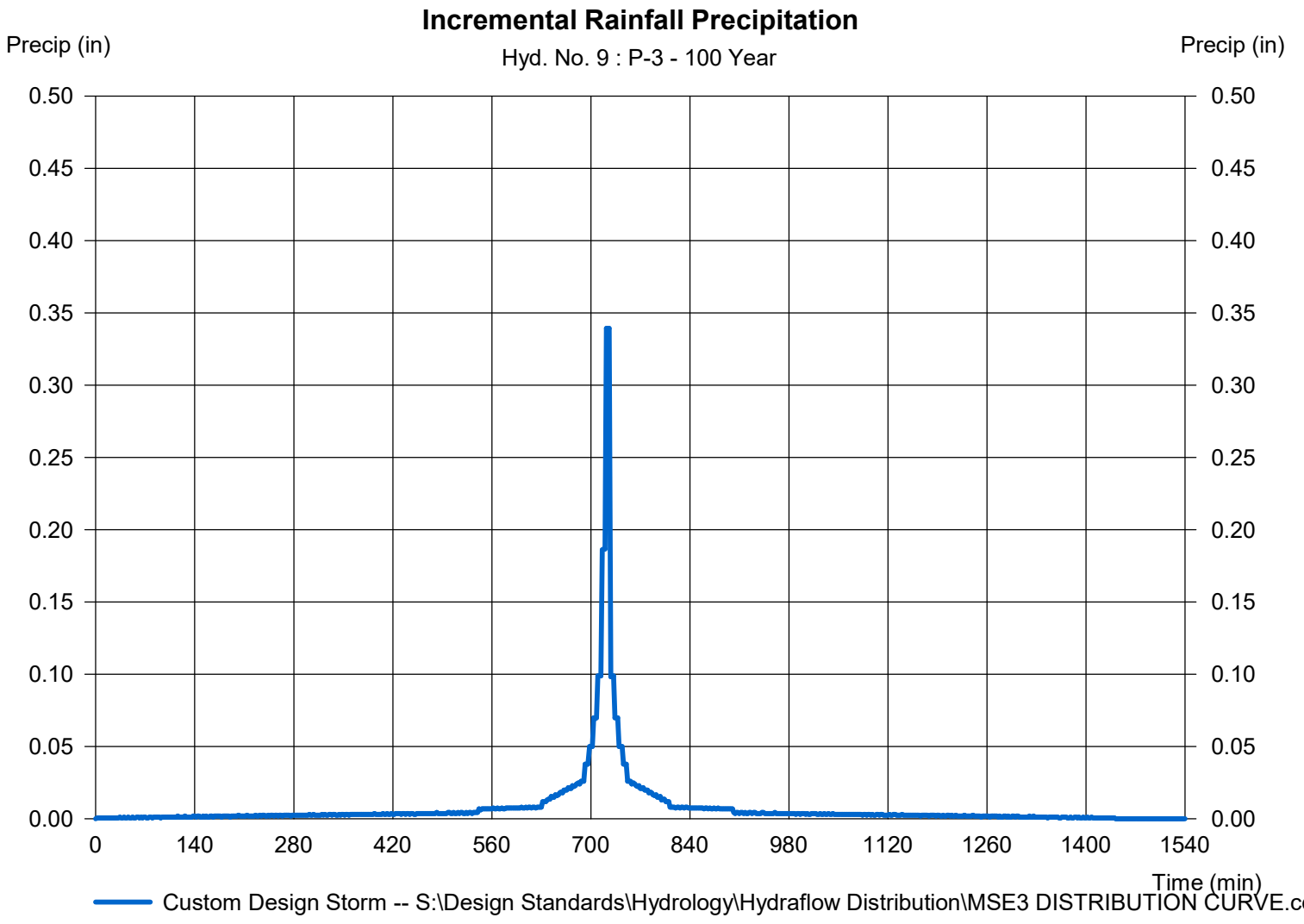


Precipitation Report

Hyd. No. 9

P-3

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

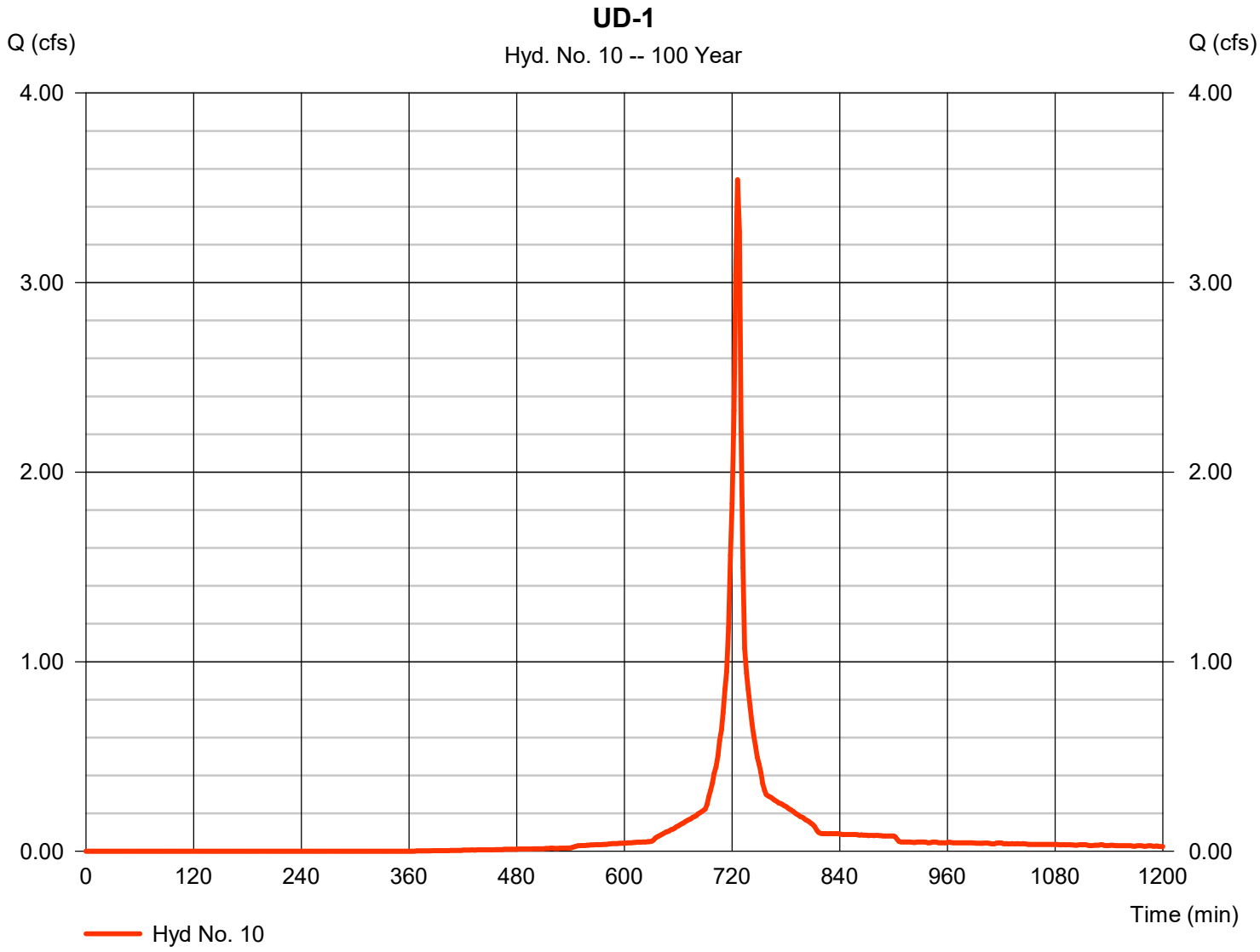


Hydrograph Report

Hyd. No. 10

UD-1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.542 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.162 acft
Drainage area	=	0.441 ac	Curve number	=	87
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hyde factor Distribution = 484	Shape factor	=	483 DISTRIBUTION CU

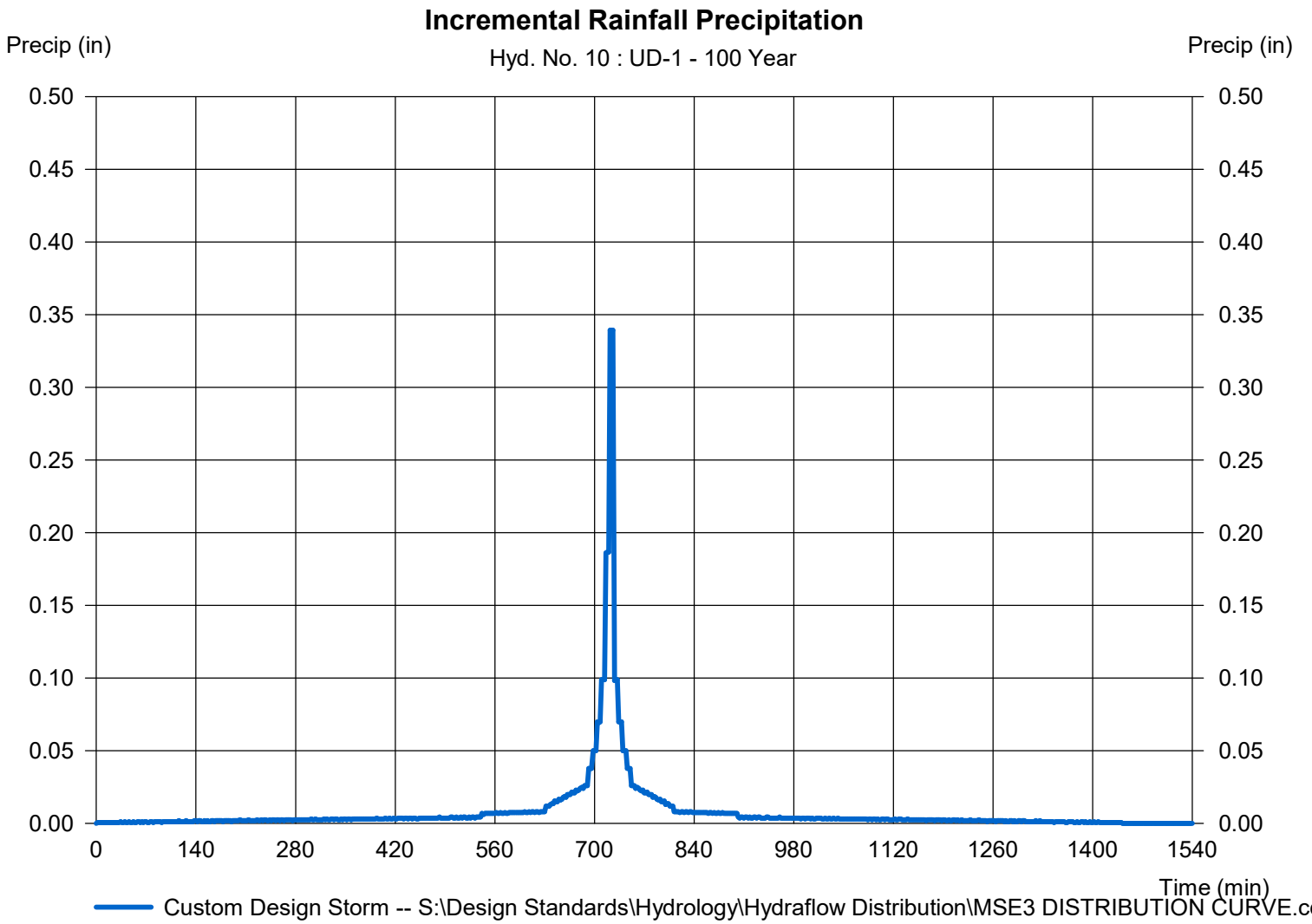


Precipitation Report

Hyd. No. 10

UD-1

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		

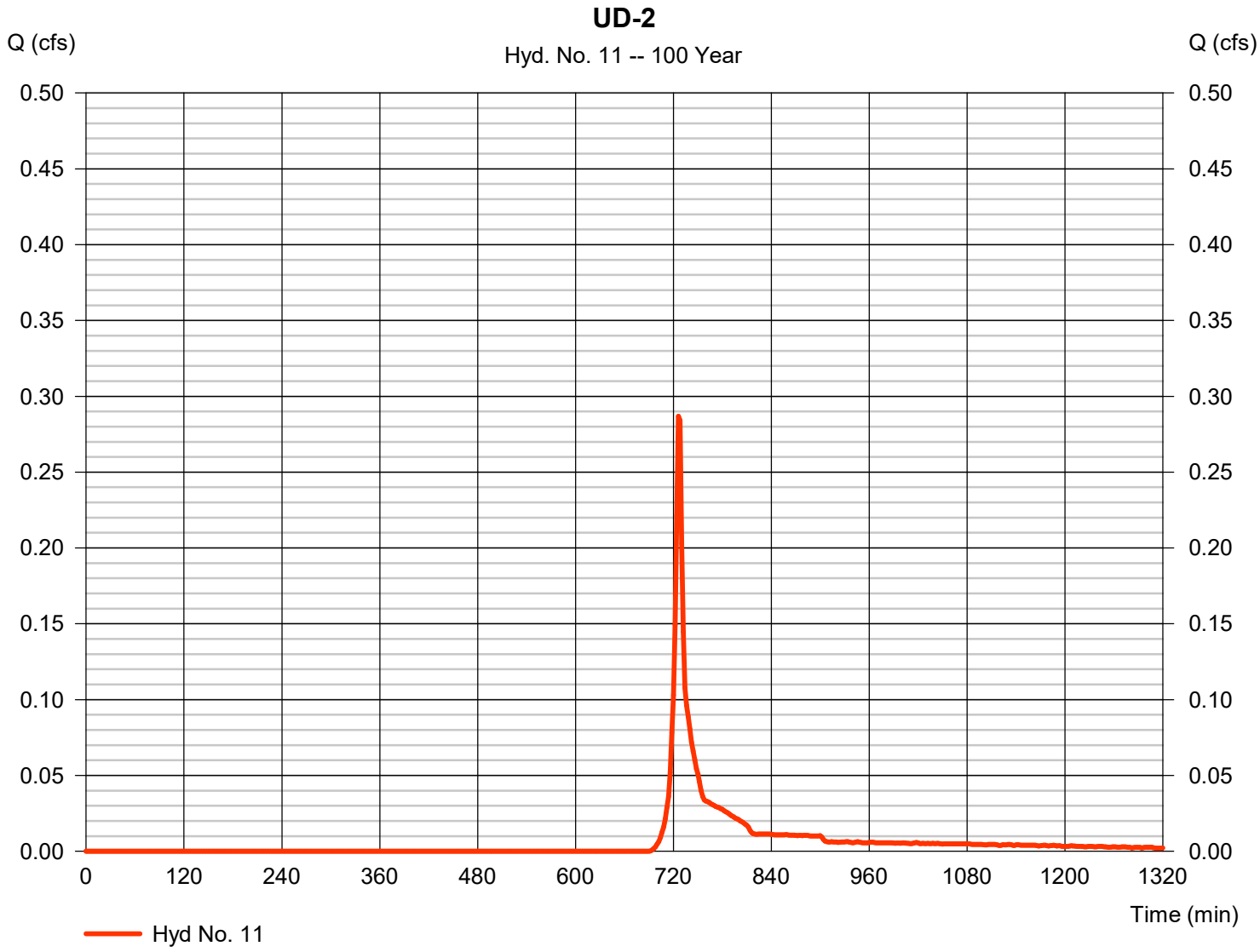


Hydrograph Report

Hyd. No. 11

UD-2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.287 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	0.013 acft
Drainage area	=	0.092 ac	Curve number	=	57
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.18 in	Distribution	=	Custom
Storm duration	=	S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION CU	Shape factor	=	484

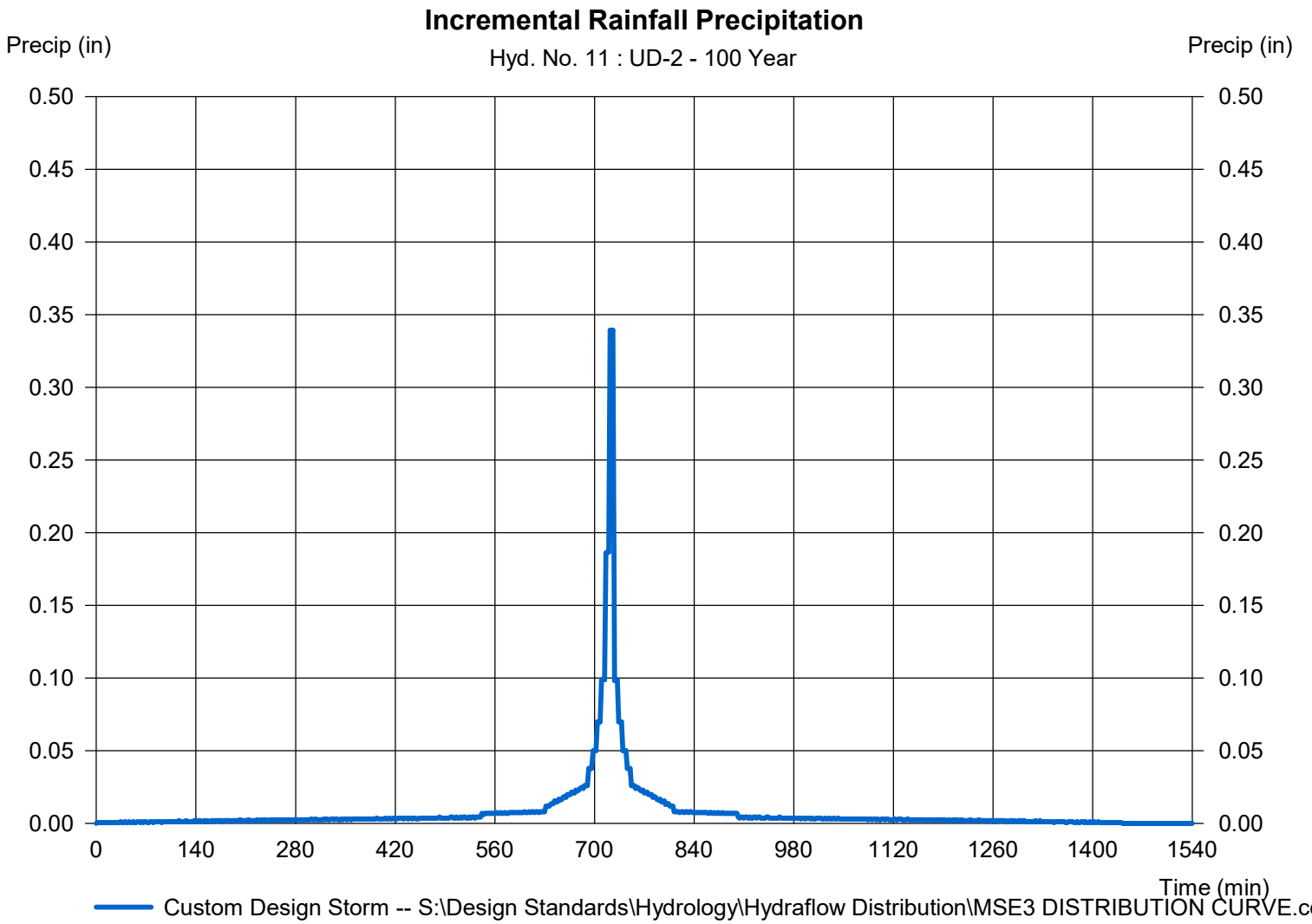


Precipitation Report

Hyd. No. 11

UD-2

Storm Frequency	= 100 yrs	Time interval	= 2 min
Total precip.	= 6.1800 in	Distribution	= Custom
Storm duration	= S:\Design Standards\Hydrology\Hydraflow Distribution\MSE3 DISTRIBUTION C		



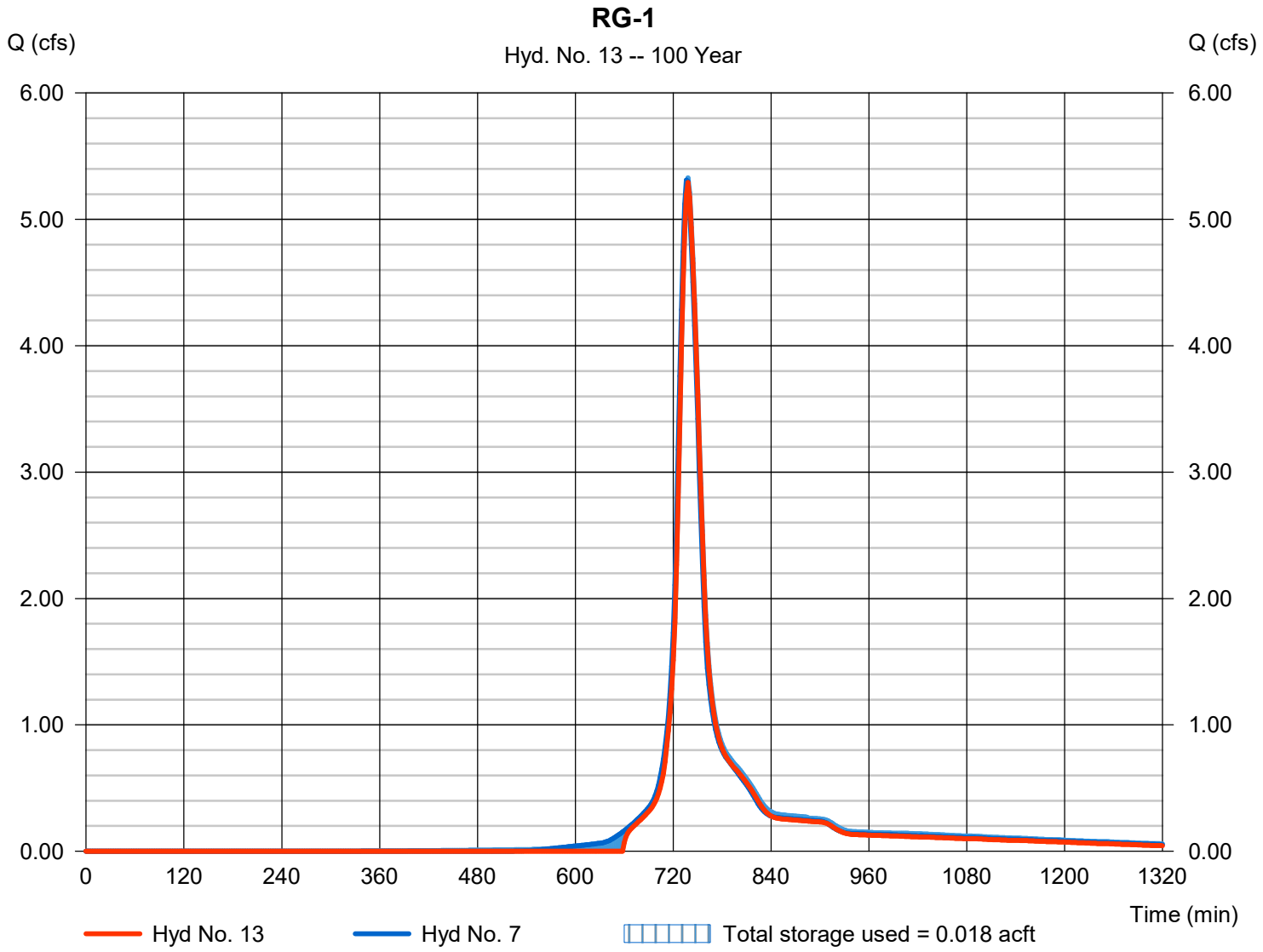
Hydrograph Report

Hyd. No. 13

RG-1

Hydrograph type	=	Reservoir	Peak discharge	=	5.291 cfs
Storm frequency	=	100 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	0.395 acft
Inflow hyd. No.	=	7 - P-1	Max. Elevation	=	128.40 ft
Reservoir name	=	RG-1	Max. Storage	=	0.018 acft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Report

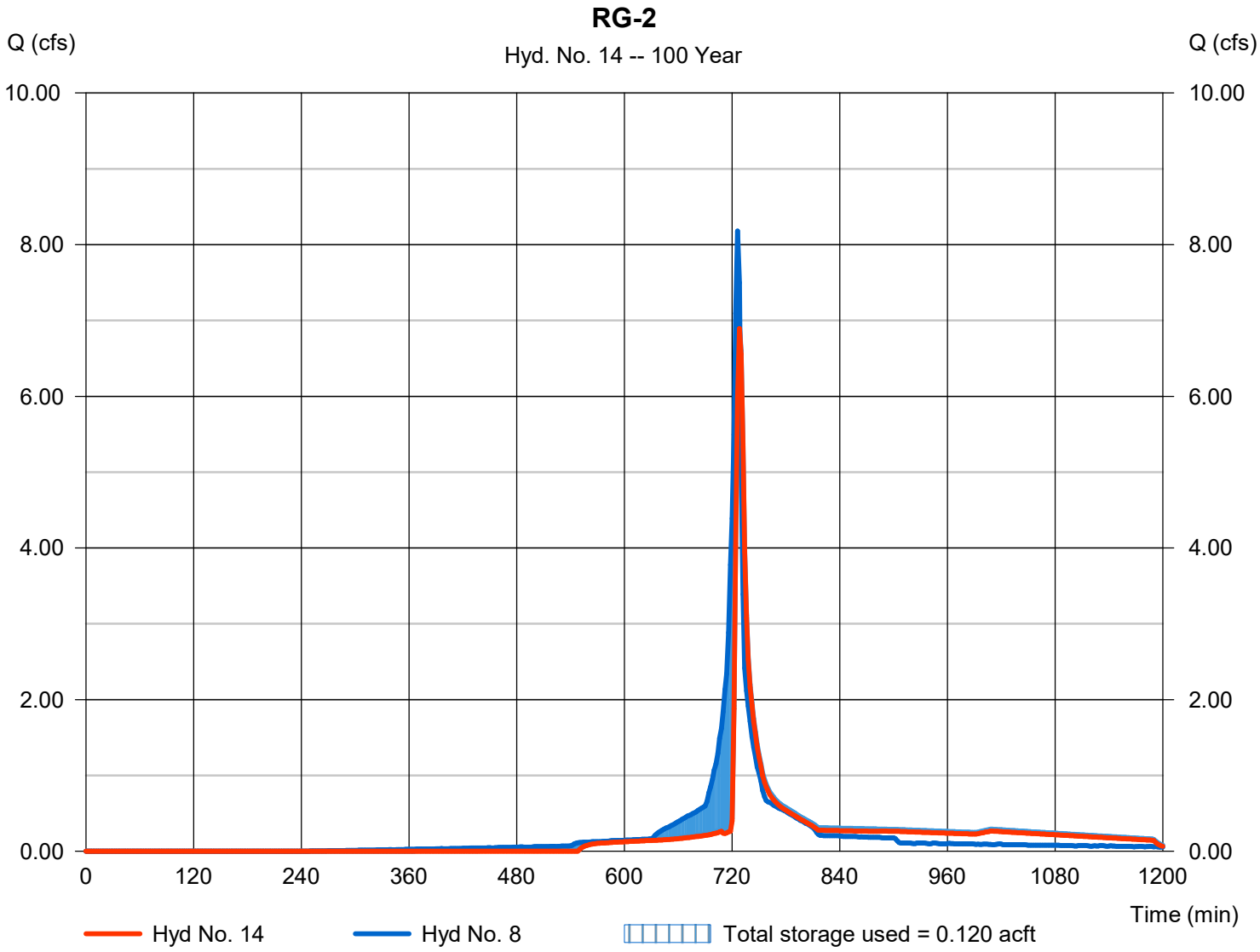
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v2020 Thursday, 08 / 8 / 2019

Hyd. No. 14

RG-2

Hydrograph type	= Reservoir	Peak discharge	= 6.892 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 0.353 acft
Inflow hyd. No.	= 8 - P-2	Max. Elevation	= 133.99 ft
Reservoir name	= RG-2	Max. Storage	= 0.120 acft

Storage Indication method used. Exfiltration extracted from Outflow.

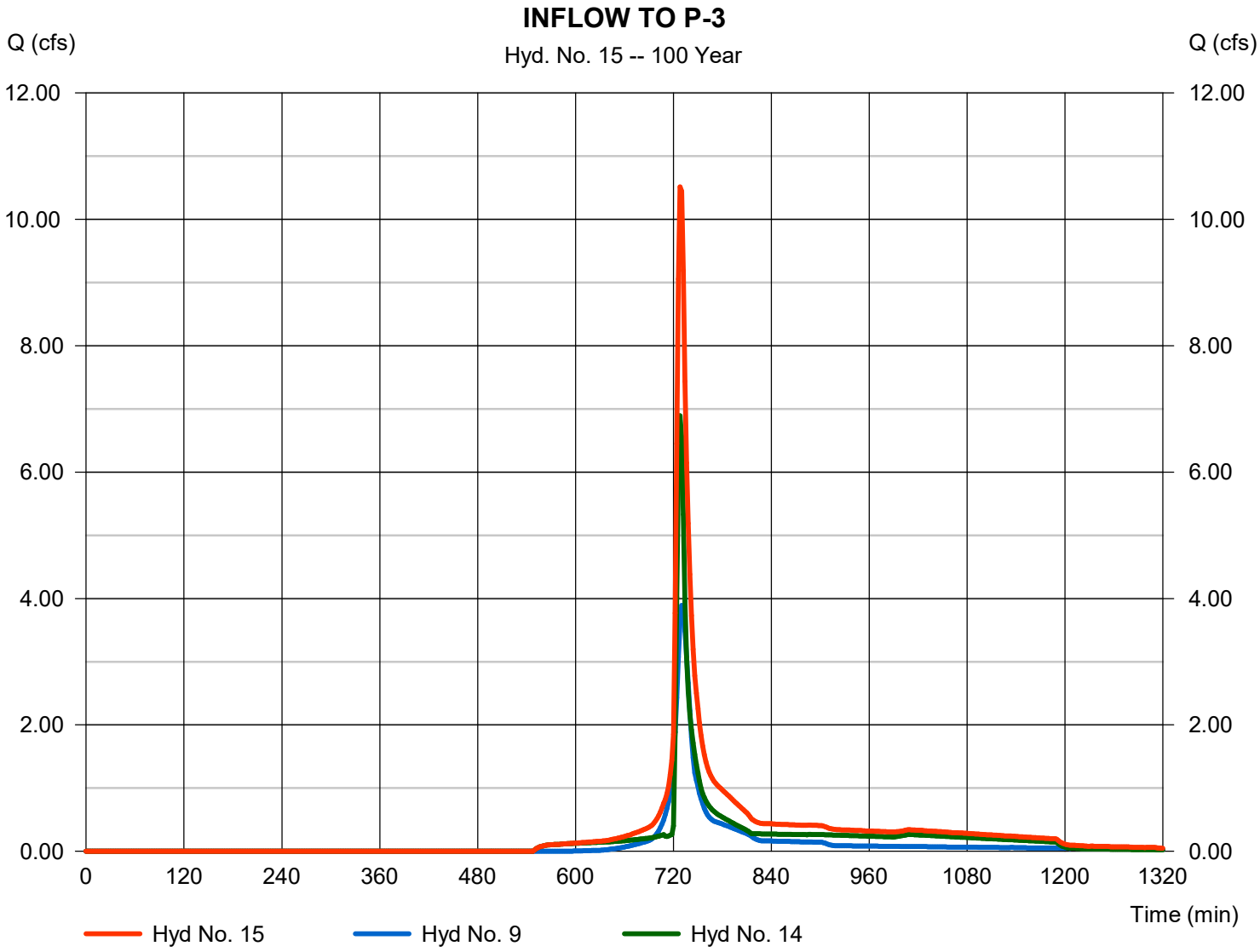


Hydrograph Report

Hyd. No. 15

INFLOW TO P-3

Hydrograph type	= Combine	Peak discharge	= 10.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 728 min
Time interval	= 2 min	Hyd. volume	= 0.583 acft
Inflow hyds.	= 9, 14	Contrib. drain. area	= 0.851 ac



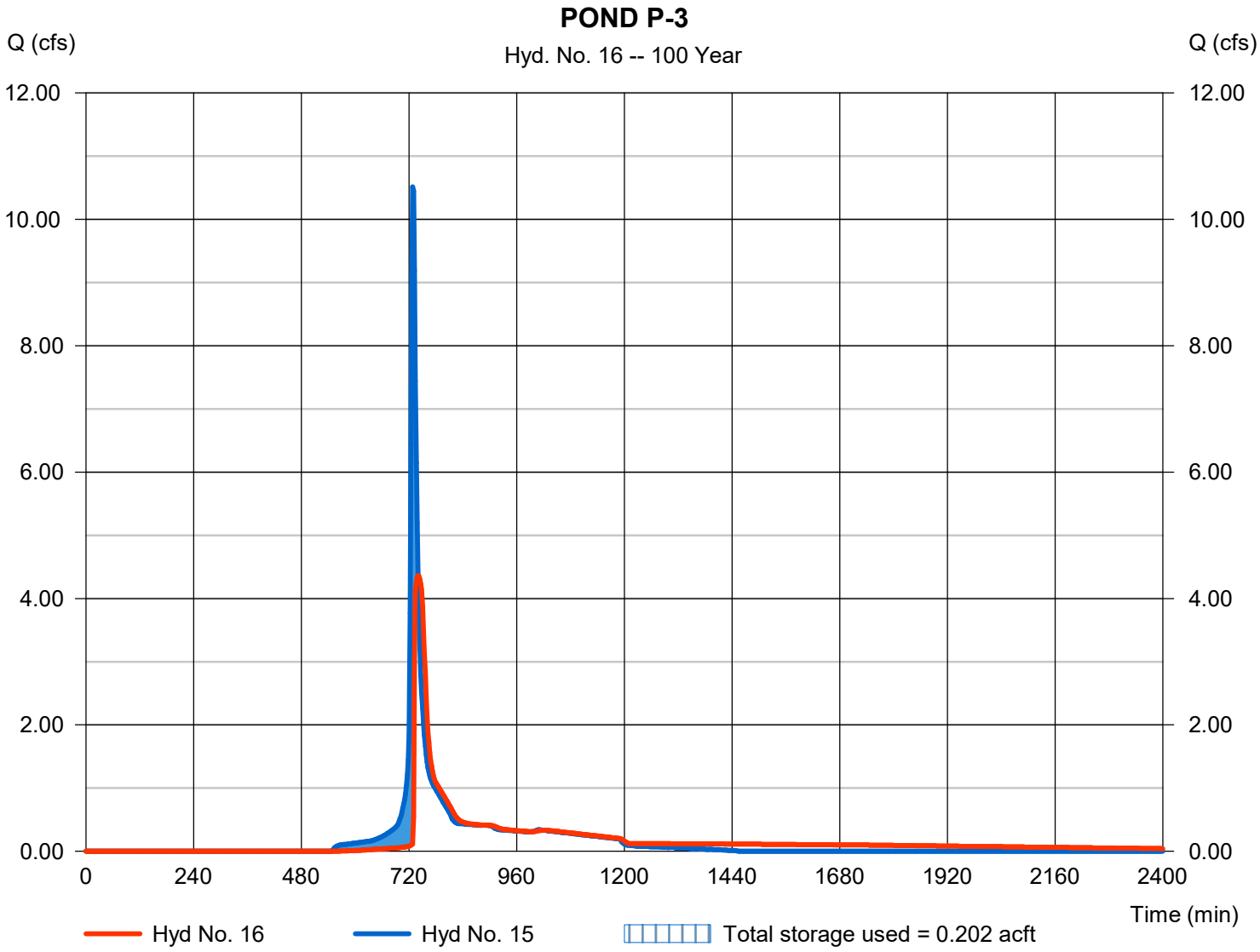
Hydrograph Report

Hyd. No. 16

POND P-3

Hydrograph type	=	Reservoir	Peak discharge	=	4.365 cfs
Storm frequency	=	100 yrs	Time to peak	=	740 min
Time interval	=	2 min	Hyd. volume	=	0.582 acft
Inflow hyd. No.	=	15 - INFLOW TO P-3	Max. Elevation	=	128.90 ft
Reservoir name	=	POND P-3	Max. Storage	=	0.202 acft

Storage Indication method used.

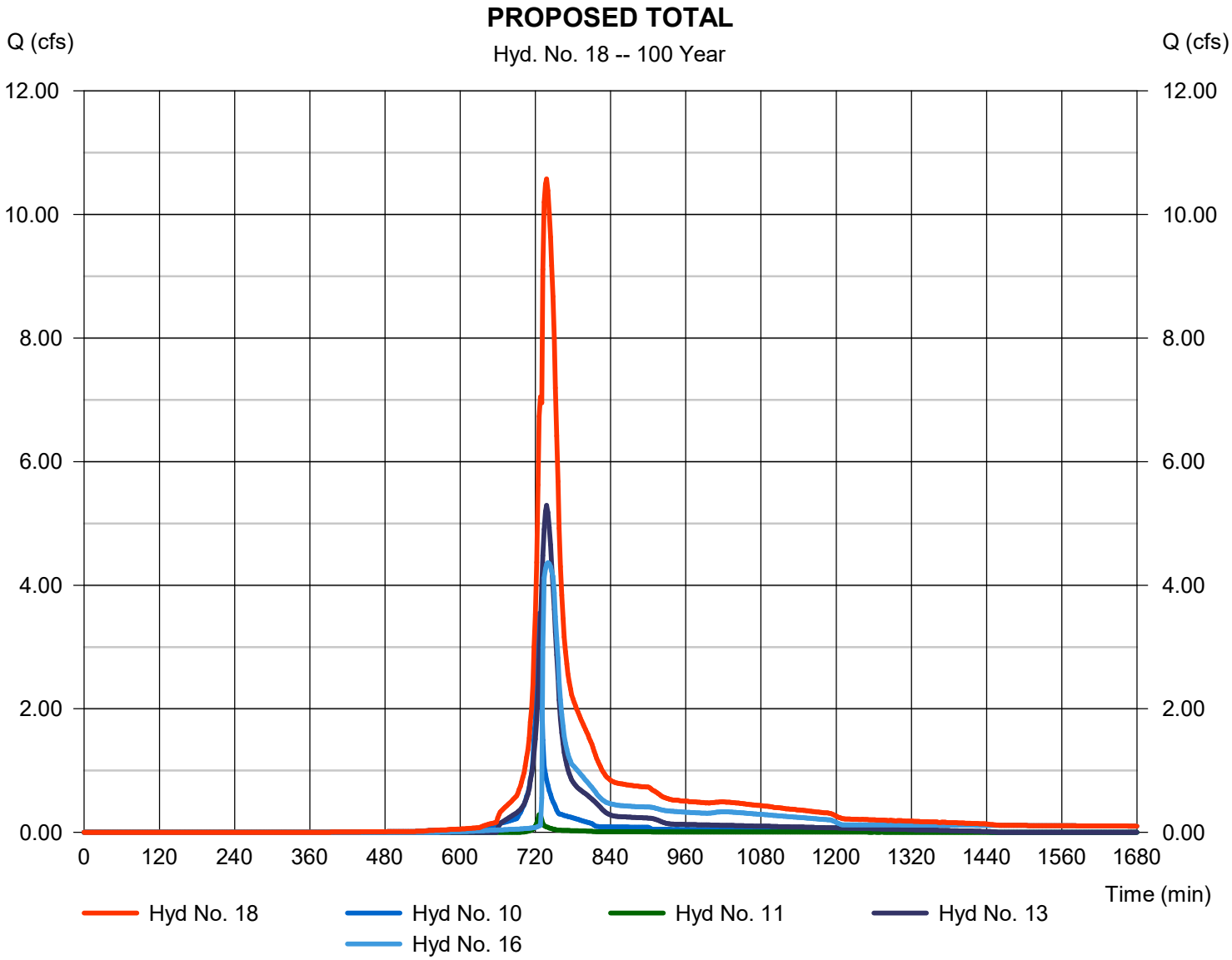


Hydrograph Report

Hyd. No. 18

PROPOSED TOTAL

Hydrograph type	= Combine	Peak discharge	= 10.57 cfs
Storm frequency	= 100 yrs	Time to peak	= 738 min
Time interval	= 2 min	Hyd. volume	= 1.152 acft
Inflow hyds.	= 10, 11, 13, 16	Contrib. drain. area	= 0.533 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	22.8367	5.6000	0.7338	--------
2	25.4674	5.2000	0.7159	--------
3	0.0000	0.0000	0.0000	--------
5	30.5439	4.9000	0.7023	--------
10	33.5363	4.6000	0.6850	--------
25	36.2566	4.0000	0.6589	--------
50	35.2584	3.1000	0.6226	--------
100	34.0002	2.2000	0.5870	--------

File name: WAUKESHA ATLAS 14 IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	4.04	3.04	2.48	2.11	1.85	1.66	1.51	1.38	1.28	1.20	1.12	1.06
2	4.83	3.63	2.96	2.53	2.22	1.99	1.81	1.66	1.54	1.44	1.36	1.28
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.11	4.58	3.74	3.19	2.81	2.52	2.29	2.11	1.96	1.83	1.72	1.63
10	7.12	5.35	4.37	3.74	3.29	2.96	2.70	2.49	2.31	2.17	2.04	1.93
25	8.52	6.37	5.21	4.47	3.94	3.55	3.24	3.00	2.79	2.62	2.47	2.34
50	9.59	7.11	5.81	4.99	4.42	3.99	3.66	3.39	3.16	2.97	2.81	2.67
100	10.67	7.83	6.40	5.51	4.89	4.43	4.07	3.78	3.54	3.34	3.16	3.01

Tc = time in minutes. Values may exceed 60.

ign Standards\Hydrology\Hydraflow UPDATED ATLAS 14\STATIONS\WAUKESHA\WAUKESHA ATLAS 14 Precip.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCS 6-Hr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	2.40	2.70	0.00	0.00	3.81	0.00	0.00	6.18

Hydraflow Table of Contents