STORMWATER MANAGEMENT REPORT, & SOIL EROSION AND SEDIMENT CONTROL

Prepared for:

PL 611 FRONT URBAN RENEWAL, LLC
235 SOUTH HARRISON STREET, SUITE 100
EAST ORANGE, NJ 07018

Regarding the:

Mixed Use Redevelopment Project
611 West front Street
City of Plainfield
Union County, New Jersey

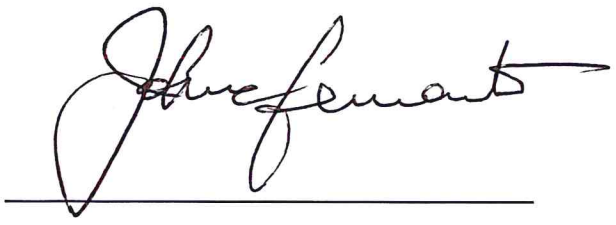
Block 233, Lots 2, 3, 7 & 12

Prepared by:

E2 Project Management, LLC
87 Hibernia Avenue
Rockaway, New Jersey 07866

E2PM Project No. P-20-33-04

May 5, 2022



John C. Ferrante, P.E.
Professional Engineer
New Jersey License No. 24GE02472000

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APPENDICES

1. INTRODUCTION

Subject Property

This report has been prepared to present the design methodology and calculations for the management of stormwater runoff associated with the proposed project. The subject property is known as Block 233, Lots 2,3, 7 & 12 as shown on the City of Plainfield tax maps. The property has a total area of approximately 5.63 acres, is located fronting onto West Front Street to the west, and is bordered by Plainfield Avenue and commercial and residential properties to the north, Conrail mainline to the east and Waynewood Park and commercial property to the south in the City of Plainfield, Union County, New Jersey (see Appendix A for a site location map).

The site is located in the Block 233 Redevelopment Plan, Marino's Tract, Redevelopment Area and has been previously disturbed, graded and filled, with existing warehouse and car dealership buildings, asphalt parking areas, lawn and wooded areas. No wetlands are present on-site and no water-courses pass through the site.

Proposed Development

The proposed development will consist of two separate buildings; The north building along West Front Street containing an 18,000 sf commercial space and 217 residential units above and the south building containing 284 residential units above. Additional site improvements include pavement parking areas, concrete sidewalks, and utility infrastructure, as well as grading, landscaping and lawn areas that are associated with the proposed development of the site.
The proposed development has the following:

Building coverage = 165,736 sf (67.6%) - 80% max. allowed
Impervious coverage = 219,627 sf (89.6%) - 90% max. allowed

Stormwater Design

The design of the stormwater collection and management system have been directed by the following guidelines:

1. New Jersey Department of Environmental Protection (NJDEP) Stormwater Management Rules (N.J.A.C. 7:8)
2. New Jersey Stormwater Best Management Practices (BMP) Manual, April 2004, last revised 2020.
3. Standards for Soil Erosion and Sediment Control in New Jersey, January 2004.
4. New Jersey Residential Site Improvement Standards (RSIS), (N.J.A.C. 5:21).
5. USDA NRCS, Web Soil Survey for Plainfield, Union County
6. Urban Hydrology for Small Watersheds, Tr-55 Manual, June 1986.
7. City of Plainfield, Municipal Code, Chapter 12 – Sewers and Water, Article 8 – Stormwater Control Program for Major Development and Chapter 17 – Land Use, Article XII – Stormwater Management.

Stormwater Analysis

The proposed development will disturb greater than 1 acre of land, therefore, is defined as a "Major Development". As such, this report and the proposed stormwater management plan have been prepared in accordance with the above referenced guidelines.

The existing drainage conditions were analyzed under current on-site conditions for the subject property. The existing site is comprised of three (3) watershed areas. The existing runoff from one watershed area (Watershed DA-1A) sheet flows into West Front Street and Waynewood Park where it is conveyed to the existing stormwater conveyance system located at the intersection of West Front Street and Waynewood Park. Watershed DA-1B sheets flows into West front Street along the curbline where it is conveyed to the existing stormwater conveyance system. The other watershed area (Watershed DA-2) sheet flows into Plainfield Avenue and into the existing stormwater drainage system. Refer to Appendix C Figure-1 for the Existing Watershed Plan.

The proposed drainage conditions were analyzed to determine the flows generated from the proposed site improvements. The following sections will evaluate the existing conditions of the site and determine the impacts of the proposed development on the existing drainage conditions and ensure compliance with N.J.A.C. 7:8 for major developments.

2. METHODOLOGY

Computations were performed Hydraflow Hydrographs Extension for Autodesk Civil 3D. According to the United States Department of Agriculture (USDA), Natural Resources Conservation Service, Web Soil Survey (WSS), the soil survey indicated the subject property consists of an Urban Land (UR) and Birdsboro-Urban Land complex (BhpBr) soil classification. UR does not have a corresponding hydrologic soil group classification while the BhpBr has a B rating. To be conservative, a hydrologic soil group grading of 'D' was designated to be used in the control of stormwater runoff generated from the proposed development since over 90% of the subject property is located in the UR soil classification. See Appendix B for the Soil Map.

One (1) underground detention system was incorporated into the proposed stormwater management system to demonstrate flow reduction under the 2-, 10- and 100-year storm events of 50%, 75% and 80% of existing flow, respectively.

As previously mentioned, a drainage area map was developed to determine and demonstrate existing stormwater runoff patterns from the subject property. Similarly, a proposed conditions

drainage area map was created to illustrate proposed stormwater runoff generated as a result of developing the site as shown on the design plans.

The existing and proposed stormwater runoff rates were compared for the 2-, 10- and 100-year storm events. A comparison of the existing and proposed flows was performed and shown to comply with the requirements of applicable review agencies. One (1) underground detention system with an outlet control structure was designed to achieve the required reductions.

Stormwater Runoff Quantity Requirements

Per N.J.A.C. 7:8-5.6b, in order to control stormwater runoff quantity impacts for a major development, the design engineer shall complete one of the following:

1. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
2. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two-, 10-, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;
3. Design stormwater management measures so that the post-construction peak runoff rates for the two-, 10-, and 100-year storm events are 50, 75, and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed; or

4. In tidal flood hazard areas, stormwater runoff quantity analysis, in accordance with (b)1, 2, and 3 above, is required unless the design engineer demonstrates through hydrologic and hydraulic analysis that the increased volume, change in timing, or increased rate of the stormwater runoff, or any combination of the three will not result in additional flood damage below the point of discharge of the major development. No analysis is required if the stormwater is discharged directly into any ocean, bay, inlet, or the reach of any watercourse between its confluence with an ocean, bay, or inlet and downstream of the first water control structure.

The project is not in a tidal flood hazard area and as a result, N.J.A.C. 7:8-5.6(b)4 does not apply. The pre- and post-construction rates of runoff have been calculated using the methodology

described in the beginning of Section 2.0 to demonstrate compliance with one of the stipulations above. Table 4 compares the pre-construction peak flow rates and the post-construction peak flow rates after routing stormwater through the stormwater system.

For Watershed Area DA-1A and DA-1B the proposed stormwater management plan reduces the proposed development peak runoff rates for the 2, 10 and 100-year storm events by the required respective 50, 75 ad 80 percent reductions of the previously existing peak runoff rates. This is achieved by using an underground stormwater detention basin. Watershed Area DA-2 will not be hydrologically impacted by the proposed improvements. As such, the 2-, 10-, and 100-year post-construction peak flow rates for Watershed Area DA-2 do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

The storm water analysis was computed utilizing the Soil Conservation Service (SCS) Technical Release 55 (TR-55) "Urban Hydrology for Small Watersheds," revised June 1986, method for the 2, 10, and 100-year storm frequencies. The rainfall distribution is based upon the SCS Type III 24-hour storm.

Stormwater Quality Requirements

Pursuant to the NJDEP Stormwater Runoff Quality Standards (N.J.A.C. 7:8-5.5), stormwater runoff quality standards are applicable when the major development results in an increase of one-quarter acre or more of regulated motor vehicle surface. Per N.J.A.C. 7:8-1.2, a motor vehicle surface means any pervious or impervious surface that is intended to be used by motor vehicles and/or aircraft, and is directly exposed to precipitation including, but not limited to, driveways, parking areas, parking garages, roads, racetracks, and runways. In existing conditions, the site is comprised of 3.30 acres of impervious area, approximately 2.5 acres of which is considered a motor vehicle surface. In proposed conditions, the site is comprised of 5.25 acres of impervious area. However, approximately 1.19 acres of this impervious area is considered a motor vehicle surface as defined by N.J.A.C. 7:8-1-2 since the other portion of the parking lot area is covered by the proposed building, it is not directly exposed to precipitation. As such, the proposed improvements are not subject to the stormwater runoff quality standards described in N.J.A.C. 7:8-5.5.

Time of Concentration

Time of concentration computations were calculated using the TR-55 Worksheet 3 for calculating time of concentration. The minimum time of concentration used was 10 minutes per the New Jersey Residential Site Improvement Standards (RSIS).

Time of Concentration

Drainage Area	Time (minutes)
Ex DA-1A	12
Ex DA-1B	16.2
Ex DA-2	10

Groundwater Recharge

This project is exempt from the NJDEP's Groundwater Recharge requirement since the site is located within an "urban redevelopment area", as shown on the NJDEP Policy Map of State Development and Redevelopment Plan.

Soil Erosion and Sediment Control

The proposed development plans to disturb greater than 5,000 square feet of land, therefore, a Soil Erosion and Sediment Control (SESC) Plan has been developed and will be submitted for certification to the Somerset-Union Soil Conservation District (SCD), pursuant to the SESC Act, Chapter 251, P.L. 1975 as amended (N.J.S.A. 4:24-39 et. seq.). The proposed SESC measures have been designed in accordance with the Standards for SESC in New Jersey. SESC Plan Certification approval will be provided to the City of Plainfield prior to the commencement of earthwork.

3. STORMWATER ANALYSIS

Analysis Parameters

The 2-, 10-, and 100-year storm events were modeled to determine the overall stormwater runoff under the existing and proposed conditions to the existing drainage system.

Rainfall Depths and Intensity

Precipitation frequency rainfall estimates for the subject property were obtained from NOAA, National Weather Service data.

Existing Conditions

The existing watershed areas were delineated as shown on the attached Existing Drainage Area Map provided in Appendix C and consists of three (3) drainage areas (DA-1A, DA-1B, DA-2). The point of analysis for each drainage area is an existing inlet in the adjacent roadways.

Watershed Area DA-1 is comprised of two (2) sub-watersheds. The first sub-watershed area (DA-1A) sheet flows off site to the south into Waynewood Park and has a total drainage area of 0.67 acres. The second sub-watershed area (DA-1B) sheet flows to the west into West Front Street and has a total drainage area of 5.40 acres. Both sub-watersheds eventually drain into the existing conveyance system located at the intersection of Waynewood Park with West Front Street. The drainage area consists of buildings, asphalt pavement, concrete, lawns and wooded areas.

Watershed Area DA-2 sheet flows to the north towards Plainfield Avenue and has a total drainage area of 0.28 acres. The drainage area consists of gravel and wooded area. Runoff Curve numbers used for the TR-55 analysis are provided in Table 1 below:

Table 1 – Runoff Curve Number

Land Use Type	Runoff Curve Number (HSG D)
Open Space/Lawn	80
Woods	77
Impervious	98
Gravel	91

No stormwater management facilities or pipe conveyance system exists in any drainage area. The soils within each existing drainage area are urban and have been classified as hydrologic soil group D (see Appendix B). The breakdown of the existing watershed area is found in Table 2 on the following page:

Table 2 – Existing Watershed Areas

Watershed Name	Existing Total Area (Acres)	Existing Total Pervious Lawn Area (Acres)	Existing Total Pervious Wood Area (Acres)	Pervious Composite CN Value	Existing Total Impervious Area (Acres)	Existing Total Impervious Gravel Area (Acres)	Impervious Composite CN Value
DA-1	6.08	0.61	1.90	78	3.30	0.27	97
DA-2	0.28	0.0	0.20	77	0.0	0.08	91

Proposed Conditions

The proposed watershed areas were delineated as shown on the attached Proposed Drainage Area Map provided in Appendix C and consists of three (3) drainage areas. The point of analysis for each drainage area is an existing inlet in the adjacent roadways.

- Watershed Area DA-1 has an area of 5.02 acres in size primarily from building roof area and is collected by the proposed stormwater management system and conveyed to the proposed subsurface detention basin. The subsurface detention basin then discharges into the outlet control structure which then discharges into a new manhole along West Front Street and then conveyed to the existing drainage manhole 300 ft away down West Front Street. The drainage area consists of buildings, asphalt pavement, concrete, lawns, and wooded areas.
- Watershed Area DA-2 has an area of 0.13 acres collects runoff going down the ramp into the basement parking area by a trench drain. The water here is collected and brought to a pump tank/pit which it is then pumped up and out to a new catch basin along West Front St and conveyed to the existing stormwater system int the street.

- Watershed Area DA-3 sheet flows to the north towards Plainfield Avenue and has a total drainage area of 0.28 acres. The drainage area consists of gravel and wooded area. Runoff Curve numbers used for the TR-55 analysis are provided in Table 1 below:

Table 3 – Proposed Watershed Areas

Watershed Name	Proposed Total Area (Acres)	Proposed Total Pervious Lawn Area (Acres)	Proposed Total Pervious Wood Area (Acres)	Pervious Composite CN Value	Proposed Total Impervious Area (Acres)	Proposed Total Impervious Gravel Area (Acres)	Impervious Composite CN Value
DA-1	5.86	0.23	0.30	78	5.02	0.27	98
DA-2	0.13	0.08	0.00	80	0.05	0.00	98
DA-3	0.28	0.0	0.20	77	0.0	0.08	91

Existing vs. Proposed Conditions

The HydraFlow Hydrographs program was used to determine the pre-construction and post-construction peak flow rates for Watershed Areas DA-1 and DA-2. Proposed Watershed Area DA-1C was routed through a subsurface detention basin to reduce the overall Watershed Area DA-1 peak flow rates by 50%, 75%, and 80% for the 2-, 10- and 100-year storm events respectively. The subsurface detention basin consists of 4 ft deep, 16,130 sf concrete tank with a volume of 64,520 cubic feet. An outlet control structure with a 12.5" diameter orifice and weir wall is proposed at the outlet of the detention basin to attenuate the peak flow rates for compliance with N.J.A.C. 7:8-5.6b. Table 4 below compares the pre-construction and post-construction peak flow rates for Watershed Area DA-1:

Table 4 – Existing and Proposed Flow Summary – Watershed DA-1 (5.86 acres)

Frequency	Q_{pre} (cfs)	Hydrograph #	Q_{post} (cfs)	Hydrograph #	Percent Q_{post}, vs. Q_{pre}	Required Reductions
2-year	10.08	9	3.38	5	66.5%	50%
10-year	16.96	9	5.17	5	69.5%	75%
100-year	30.78	9	13.87	5	55%	80%

The proposed peak flow rates for the 2-, 10-, and 100-year storm events are reduced in accordance with N.J.A.C. 7:8-5.6b(3).

Appendix D provides watershed calculations and hydrographs for the existing and proposed watershed areas.

Stormwater Quality Requirements

The proposed improvements result in over an acre of disturbance and an increase of one-quarter acre or more of regulated motor vehicle surface. As such, per N.J.A.C. 7:8-5.5(b), the project must propose stormwater management measures to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality storm by 80% TSS removal of the anticipated load for stormwater runoff from the net increase of motor vehicle surface.

The water quality design storm is 1.25 inches of rainfall in two hours with a rainfall distribution per Table 5-4 in N.J.A.C. 7:8. With the location of the proposed stormwater tank in relation to the site, two water quality units are proposed for the site. The drainage area to the water quality unit 1 is 0.33 acres all of which is considered regulated motor vehicle surface area. The drainage area to water quality unit 2 is 5.86 acres, about 20% of which is considered regulated motor vehicle surface area. A hydro-international up-flo filter manufactured treatment device is proposed to treat the runoff for 80% TSS removal. The water quality unit can treat 0.90 cubic feet per second. The NJDEP certification is attached within Appendix E -Reference Material.

4. EVACUATION OF STORMTANK

Per NJDEP BMP Manual Section 9.4 – Extended Detention Basins the stormwater detention tank is required to be fully drained within a 72 hour time period. Based on the proposed outflow from the tank from the 18" diameter RCP at 13.87 cfs (49,932 cf/hr) for the 100 year storm event ,the 64,520 cf tank will drain in 1.3 hrs.

5. PIPE CALCULATIONS

The stormwater management system consists of a series of catch basins, manholes, and piping that collects and conveys stormwater runoff generated on site. Catchment areas and respective runoff coefficients were determined for stormwater structures to appropriately size pipes to ensure they have adequate capacity to convey runoff generated from the site in accordance with governing standards. Per the City of Plainfield, Municipal Code, Chapter 17 – Land Use, Article XII – Stormwater Management, collection systems shall be designed to accommodate the intensity for a storm frequency of once in ten (10) years for storm drainage facilities located in or affecting streets of the rural, local, and minor collector classifications. A storm frequency of once in twenty-five (25) years shall be utilized for systems affecting secondary arterial and major collector streets as well as all open channels. The site collection system discharges into secondary arterial and major collector streets, so pipes have been sized for a 25-year storm event intensity using Storm Sewers design software. The intensity values used to model the conveyance system were obtained from the Residential Site Improvement Standards for a 25-year storm event with a time of concentration of ten (10) minutes.

Table 6 – RSIS Rainfall Intensities

Storm Intensities based on Figure 7.2 from the RSIS Standards.	
Time of Concentration	**Intensity (in/hour)**
5 Minutes	7.3
15 Minutes	5.5
30 Minutes	4.0

All pipes will be sized to convey the 25-year storm event without any surcharging occurring.

6. SOIL EROSION AND SEDIMENT CONTROL

The proposed demolition and construction activities will disturb greater than 5,000 square feet of land, therefore, the following soil erosion and sediment control measures will be incorporated into the design plans.

Stabilized Construction Access (SCA)

SCAs are proposed for the site accesses along South Second Street. The SCAs will reduce the tracking of sediment onto the public roadway and mitigate the potential for sediment laden runoff to enter the municipal stormwater and adjacent waterways. All SCAs should be installed and maintenance in accordance with the Somerset-Union SCD and SESC plan.

Silt Fence Perimeter Protection

Silt Fence (SF) perimeter controls shall be installed along the down gradient edge of the active construction site. Per the SESC standard, the fence posts shall be construction of a hardwood with minimum diameter of 1 ½ inches, spaced a minimum of 8-feet apart and extend a minimum of 2 feet above and below grade. The geotextile fabric hall be buried at least 6-inches below grade and extend at least 2 feet above grade. Metal fasteners and high strength reinforcement material shall be used to fasten the geotextile fabric to the posts in a manner that resists tearing away from the post. The fabric shall incorporate a drawstring in the top portion of the fence for added. The sediment barrier will intercept and detain small amounts of sediment from being discharged off-site. The silt fence perimeter controls shall be maintained in accordance with the SESC standards.

Stockpile Controls

Stockpile controls shall be placed around all stockpiles of fine materials that are inactive. See SESC notes. Stockpiles of suspect contaminated material should be placed on plastic sheeting and contained such that no potentially contaminated runoff can infiltrate the groundwater or flow off site.

Steep Slope Protection

Disturbed slopes shall be stabilized as soon as possible and slopes greater than 2:1 require steep slope stabilization per SCD. Stabilizations methods include temporary/permanent seeding, mulch, blankets and/or rolled products.

Inlet Protection

Existing and proposed inlets shall be protected per the SESC standards, which may include filter fabric with perimeter controls and/or inlet protection bags. The installation and maintenance of the inlet protection measures shall be in accordance with the SESC standards.

Dust Control

During demolition and construction activities, especially during dry conditions, a water truck shall be present on-site to mitigate the generation and release of fugitive dust and gaseous air pollutants. Areas of disturbed sediment and heavy traffic should be wetted regularly. Dust control shall be maintained, during demolition activities. The application of dust control polymers and/or perimeter screen fencing may be warranted depending on site conditions.

Concrete Truck Washout Areas

If on-site washout of the concrete trucks is proposed, a prefabricated washout container shall be delivered to the site. Per the SESC standards, the washout area shall not be located adjacent to identified surface drainage features or wetland areas. The washout container should be cleaned or changed when it is filled to 75% capacity.

Hazardous Material Storage and Spill Protection

All hazardous materials shall be properly stored and maintenance with appropriate spill protection measures.

Somerset-Union Soil Conservation District Soil Erosion and Sediment Control Notes

1. All Soil Erosion and Sediment Control practices shall be installed prior to any major soil disturbances, or in their proper sequence and maintained until permanent protection is established.

2. Any Disturbed areas that will be left exposed more than 30 Days and not subject to construction traffic, will immediately receive a temporary seeding. If the season prevents the establishment of a temporary cover, the disturbed areas will be mulched with a straw, or equivalent material, at a rate of two (2) tons per acre, according to NJ State Standards.

3. Permanent Vegetation shall be seeded or sodded on all exposed areas within ten (10) days after final grading. Mulch will be used for protection until seeding is established.

4. All work shall be done in accordance with the NJ State Standards for Soil Erosion and Sediment Control in New Jersey.

5. A sub-base course will be applied immediately following rough grading and installation of improvements in order to stabilize streets, roads, driveways and parking areas. In areas where no utilities are present, the sub-base shall be installed within 15 days or preliminary grading.

6. Immediately following initial disturbance or rough grading all critical areas subject to erosion (i.e.: steep slopes, roadway embankments) will receive a temporary seeding in combination with straw mulch or a suitable equivalent, at a rate of two (2) tons per acre, according to the NJ State Standards.

7. Any steep slopes receiving pipeline installation will be backfilled and stabilized daily, as the installation proceeds (i.e.: slopes greater than 3:1).

8. Traffic control Standards require the installation of a 50'x30'x6''pad of 1 1/2" or 2" stone, at all construction driveways, immediately after initial site disturbance.

9. The Somerset-Union Soil Conservation District shall be notified in writing 48 hours in advance of any land disturbing activity.

10. At the time when the site preparation for permanent vegetative stabilization is going to be accomplished, any soil that will not provide a suitable environment to support adequate vegetative ground cover, shall be removed or treated in such a way that will permanently adjust the soil conditions and render it suitable for vegetative ground cover. If the removal or treatment of the soil will not provide suitable conditions, non-vegetative means of permanent ground stabilization will have to be employed.

11. In that NJSA 4:24-39 et seq., requires that no Certificate of Occupancy be issued before the provisions the Certified Plan for Soil Erosion and Sediment Control have been complied with for permanent measures, all site work for site plans and all work around individual lots in subdivisions, will have to be completed prior to the District issuing a Report of Compliance for the issuance of a Certificate of Occupancy by the Municipality.

12. Conduit Outlet Protection must be installed at all required outfalls prior to the drainage system becoming operational.

13. Any changes to the Certified Soil Erosion and Sediment Control Plan will require the submission of revised Soil Erosion and Sediment Control Plans to the District for re-

certification. The revised plans must meet all NJ State Soil Erosion & Sediment Control Standards.

14. The Somerset-Union Soil Conservation District shall be notified of any changes in ownership.

15. Mulching to the NJ Standards is required for obtaining a Conditional Report of Compliance. Conditionals are only issued when the season prohibits seeding.

16. Contractor is responsible for keeping all adjacent roads clean during life of construction project.

17. The developer shall be responsible for remediating any erosion or sediment problems that arise as a result of ongoing construction at the request of the Somerset-Union Soil Conservation District.

18. Hydro seeding is a two- step process. The first step includes seed, fertilizer, lime, etc., along with minimal amounts of mulch to promote consistency, good seed to soil contact, and give a visual indication of coverage. Upon completion of seeding operation, hydro-mulch should be applied at a rate of 1500 lbs. per acre in second step. The use of hydro-mulch, as opposed to straw, is limited to optimum seeding dates as listed in the NJ Standards.

7. CONCLUSIONS

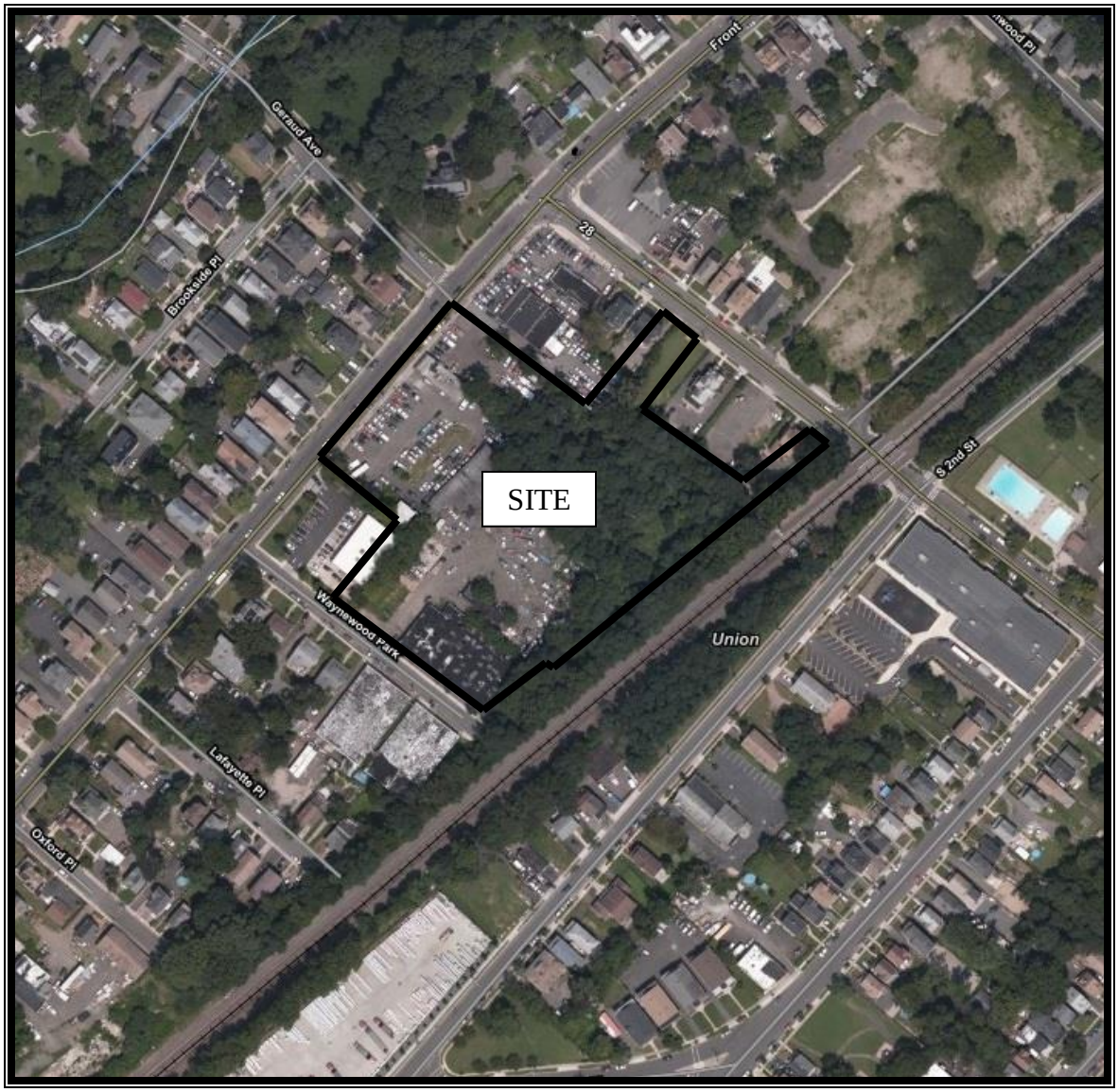
The proposed development of Block 233, Lots 2, 3, 7 & 12 will utilize one (1) 64,520 cubic foot proposed underground detention facility to accommodate runoff generated from development of the subject property. The outflow is controlled by a proposed outlet control structure with a 12.5“ orifice set at the bottom of the structure (elev. 78.5) along with a 4’ wide weir at elevation 82.50. Additionally, a pump tank with baffle will be used to drain any runoff within the basement level beneath the commercial building. A manufactured treatment device is proposed to meet the stormwater quality requirements for a major development. Additional drainage improvements, including catch basins, area inlets and conveyance piping, have been used to satisfy design parameters and requirements set forth in the stormwater management rules and regulations.

The development will reduce peak flow from the site for the 2-year, 10-year and 100-year storm at the point of analysis under the proposed conditions.

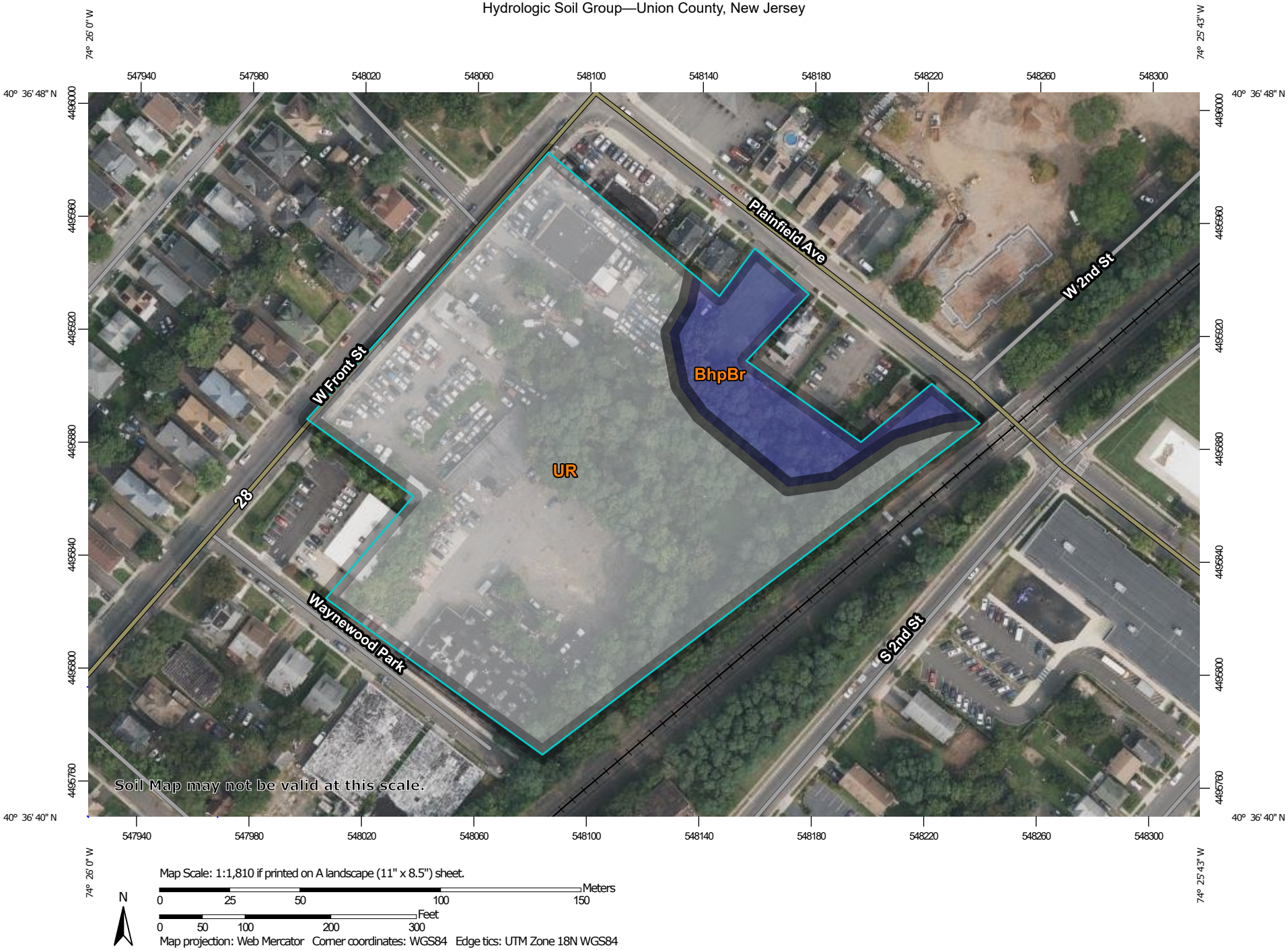
Groundwater recharge requirements for a major development are not required to be met for the project.

Appendix A: Site Location Map

SITE LOCATION MAP



Appendix B: Soil Information



Map Scale: 1:1,810 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Union County, New Jersey
Survey Area Data: Version 15, Aug 31, 2021

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

Date(s) aerial images were photographed: Sep 14, 2020—Oct 3, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BhpBr	Birdsboro-Urban land complex, 0 to 6 percent slopes, rarely flooded	B	0.8	12.4%
UR	Urban land		5.5	87.6%
Totals for Area of Interest			**6.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix C: Drainage Area Maps

FIGURE 1 - EXISTING DRAINAGE AREAS

SCALE: 1"=100'

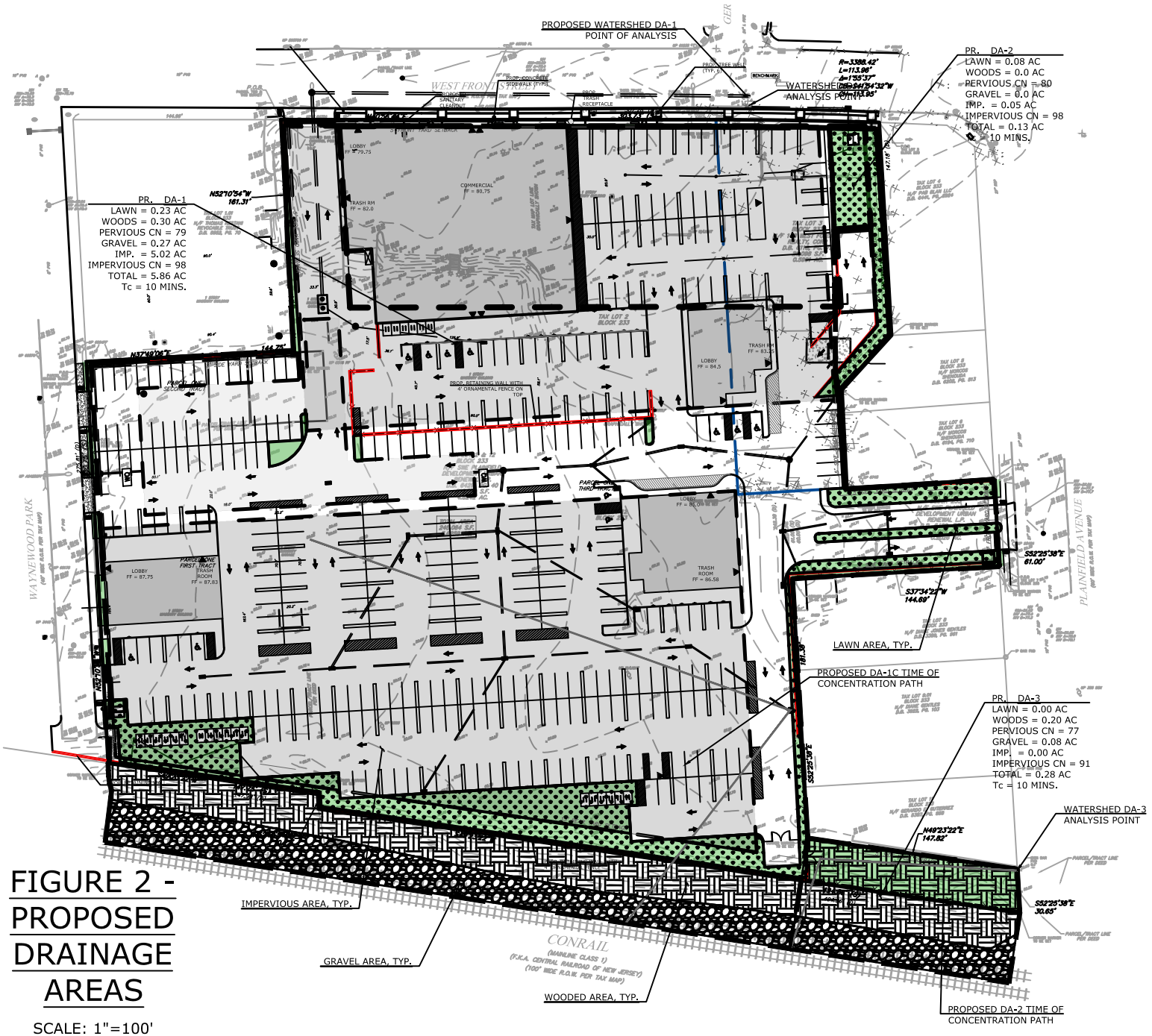


FIGURE 2 - PROPOSED DRAINAGE AREAS

SCALE: 1"=100'

Appendix D: Hydrologic Calculations

Existing Watershed Calculations

Proposed Watershed Calculations

Hydrograph Report

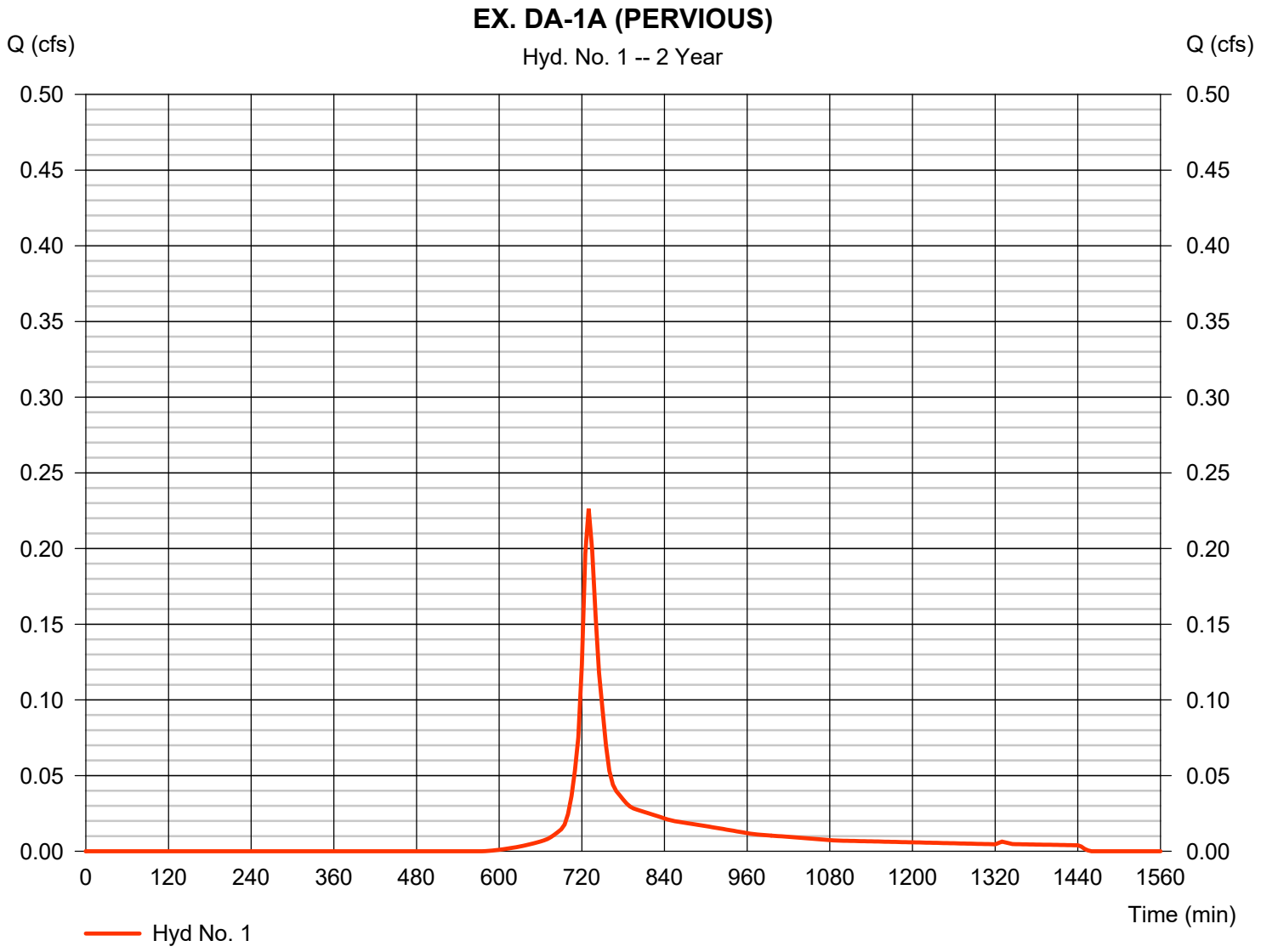
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021 Thursday, 05 / 5 / 2022

Hyd. No. 1

EX. DA-1A (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.226 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 910 cuft
Drainage area	= 0.190 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.190



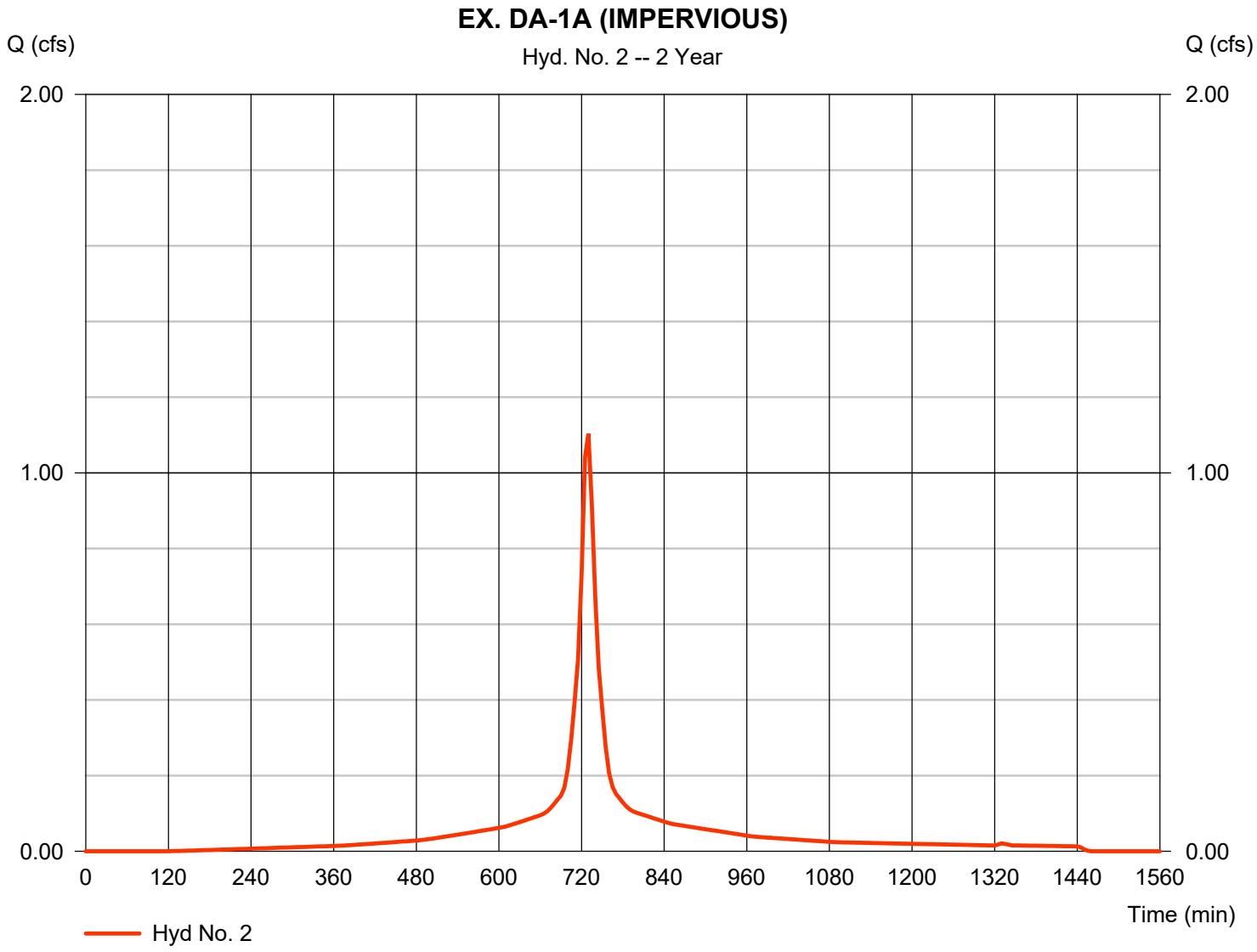
Hydrograph Report

Hyd. No. 2

EX. DA-1A (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.104 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	4,855 cuft
Drainage area	=	0.470 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	3.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.470

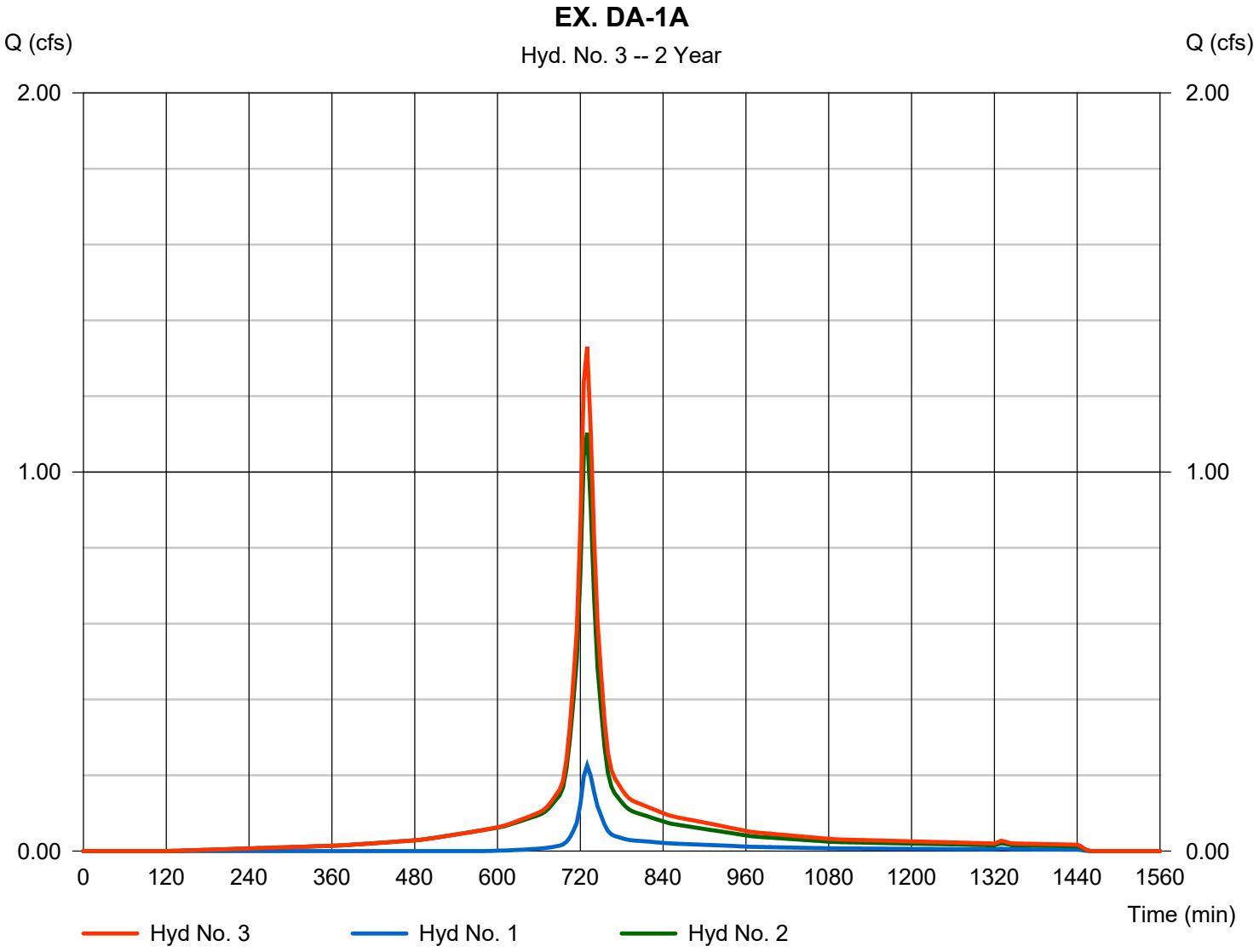


Hydrograph Report

Hyd. No. 3

EX. DA-1A

Hydrograph type	=	Combine	Peak discharge	=	1.330 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	5,764 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	0.660 ac



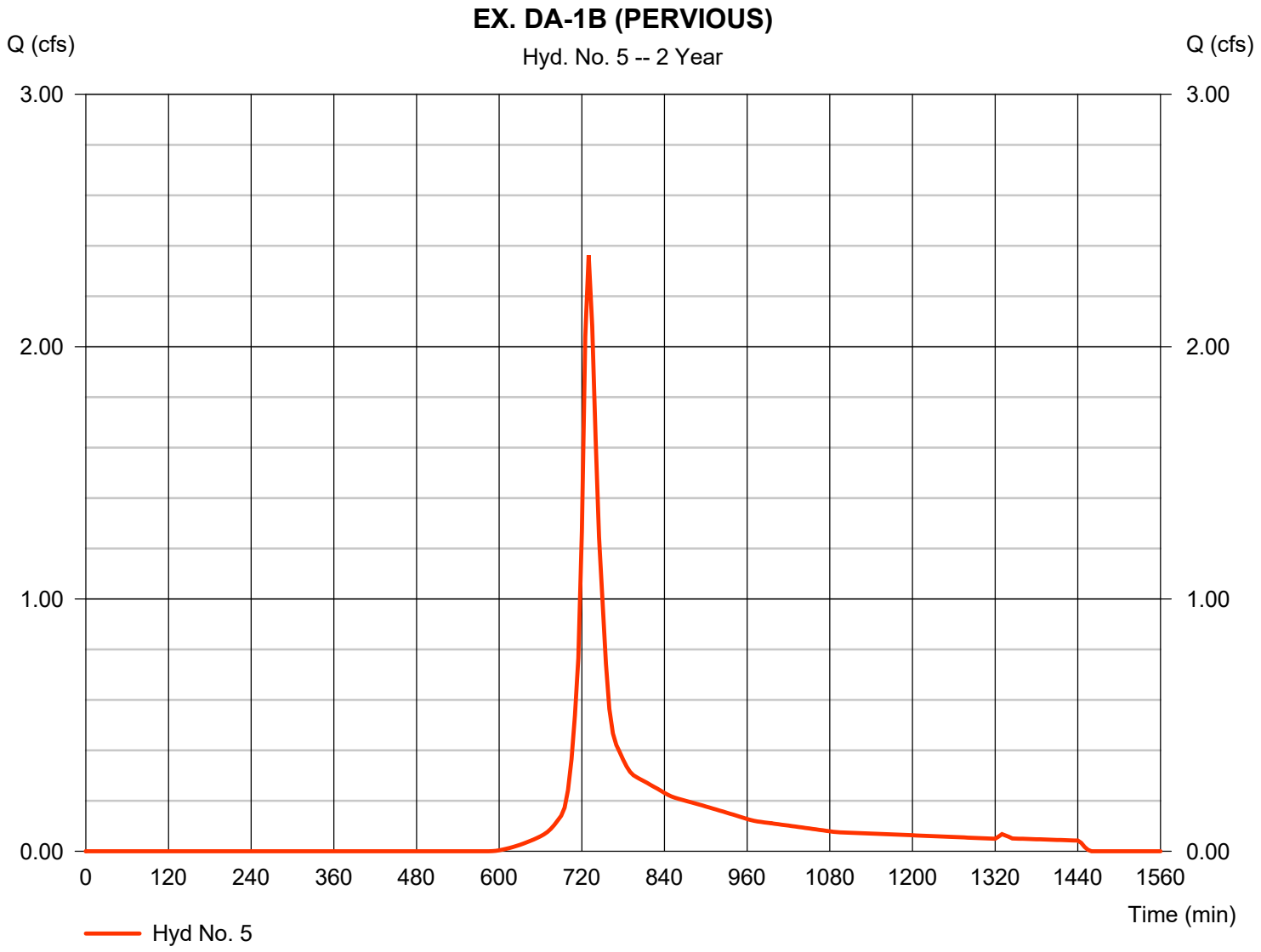
Hydrograph Report

Hyd. No. 5

EX. DA-1B (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.362 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 9,545 cuft
Drainage area	= 2.090 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 16.20 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.090



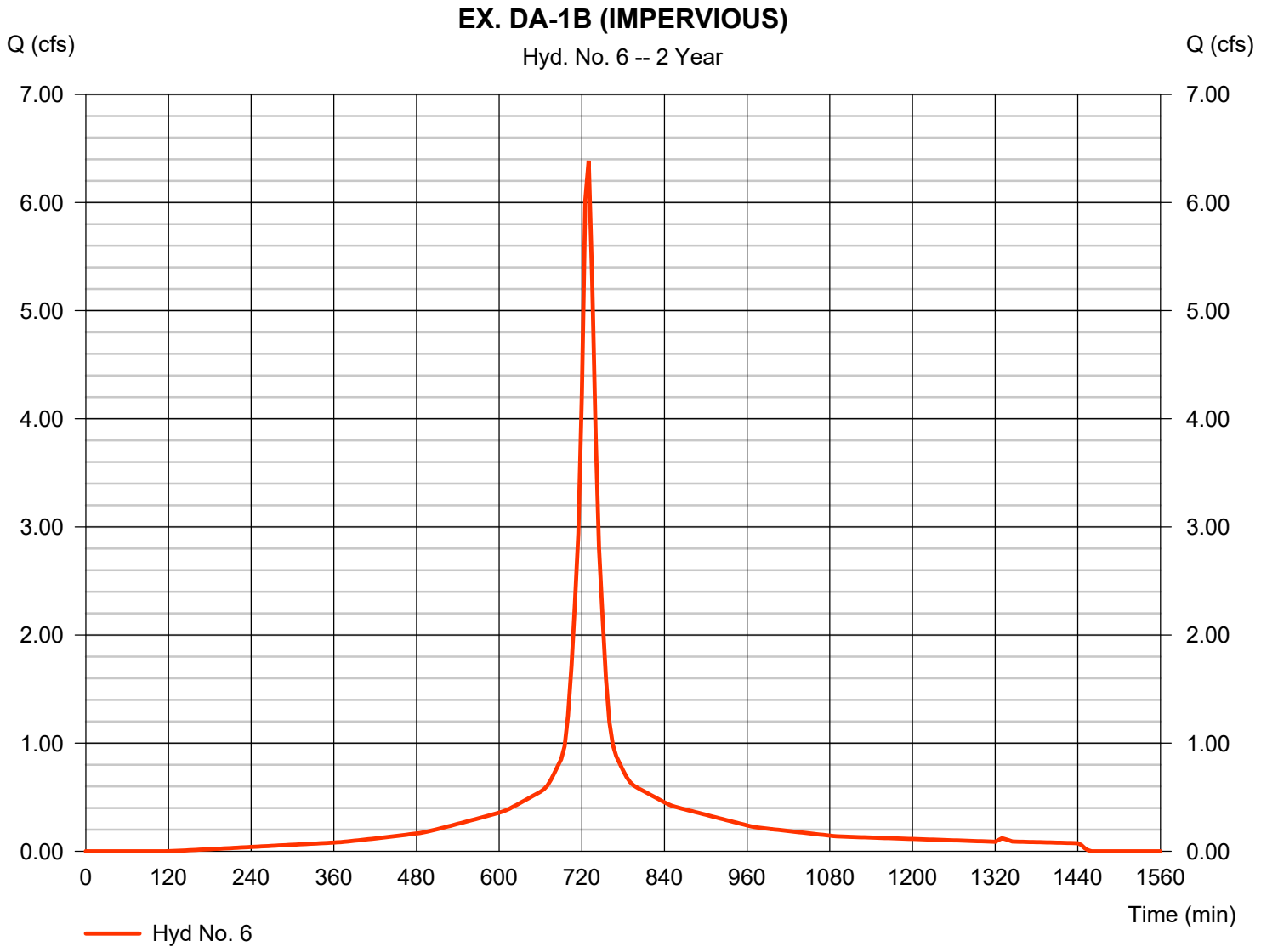
Hydrograph Report

Hyd. No. 6

EX. DA-1B (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.388 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	28,096 cuft
Drainage area	=	2.720 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	3.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.720

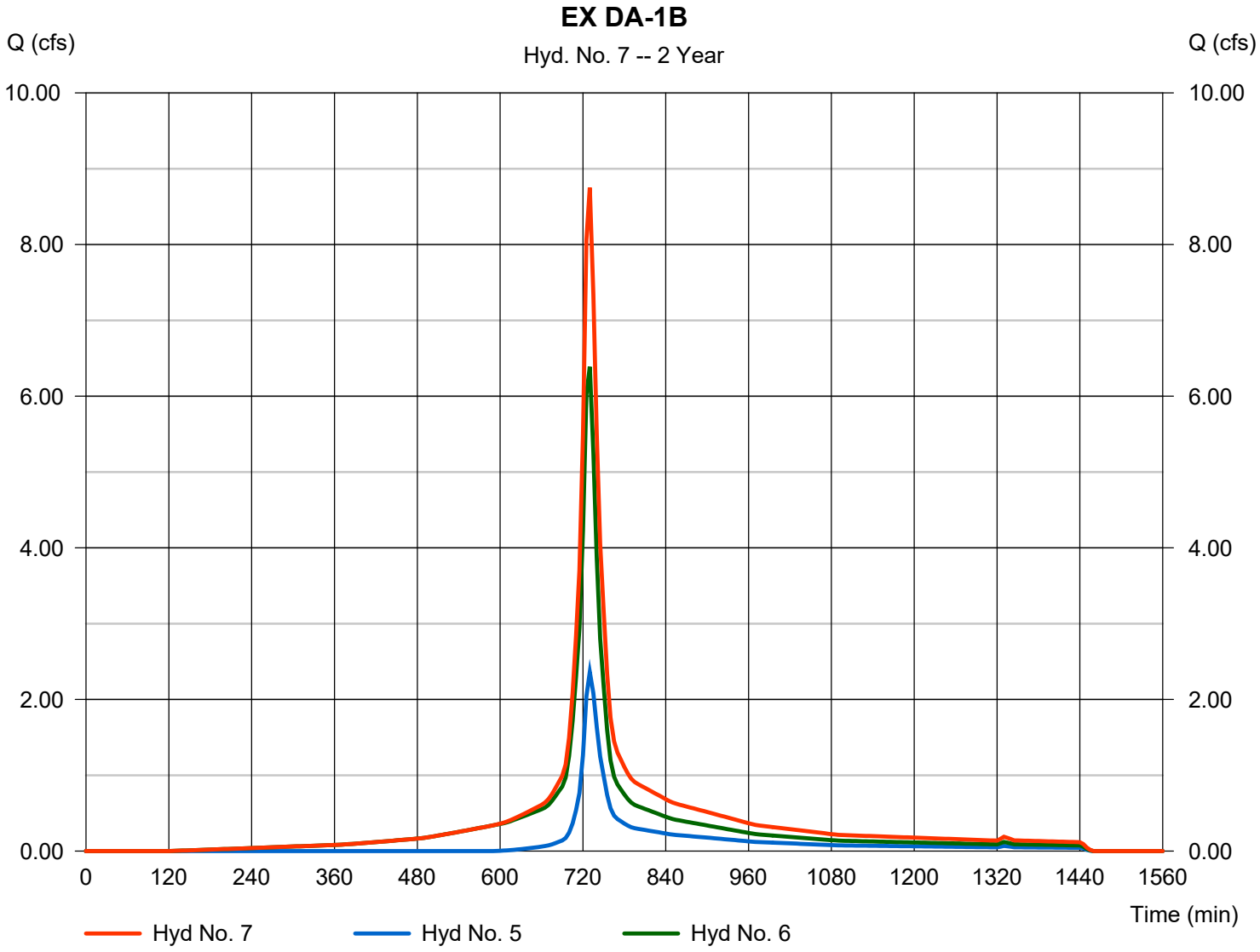


Hydrograph Report

Hyd. No. 7

EX DA-1B

Hydrograph type	=	Combine	Peak discharge	=	8.750 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	37,641 cuft
Inflow hyds.	=	5, 6	Contrib. drain. area	=	4.810 ac

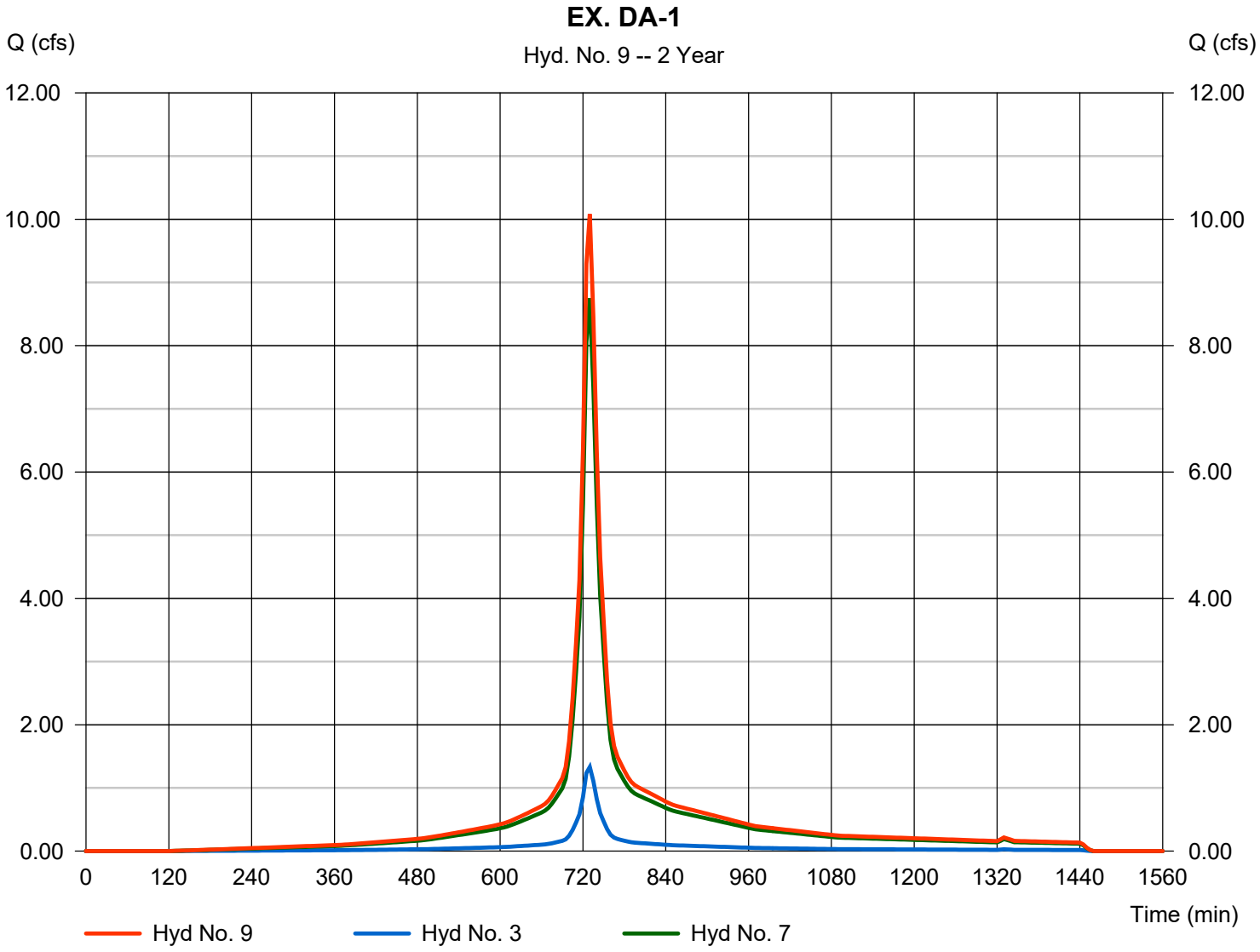


Hydrograph Report

Hyd. No. 9

EX. DA-1

Hydrograph type	= Combine	Peak discharge	= 10.08 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 43,405 cuft
Inflow hyds.	= 3, 7	Contrib. drain. area	= 0.000 ac



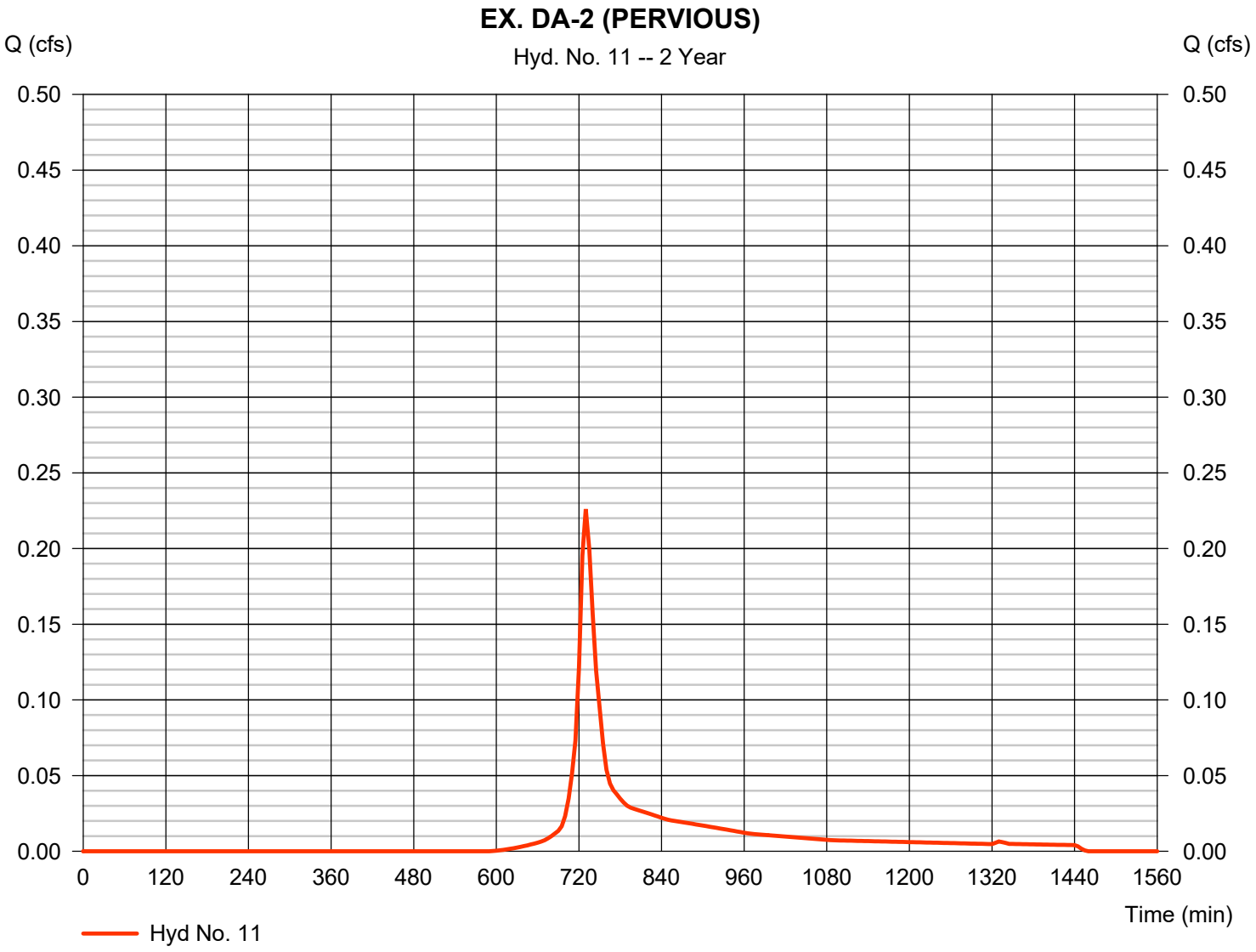
Hydrograph Report

Hyd. No. 11

EX. DA-2 (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.226 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 913 cuft
Drainage area	= 0.200 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.200



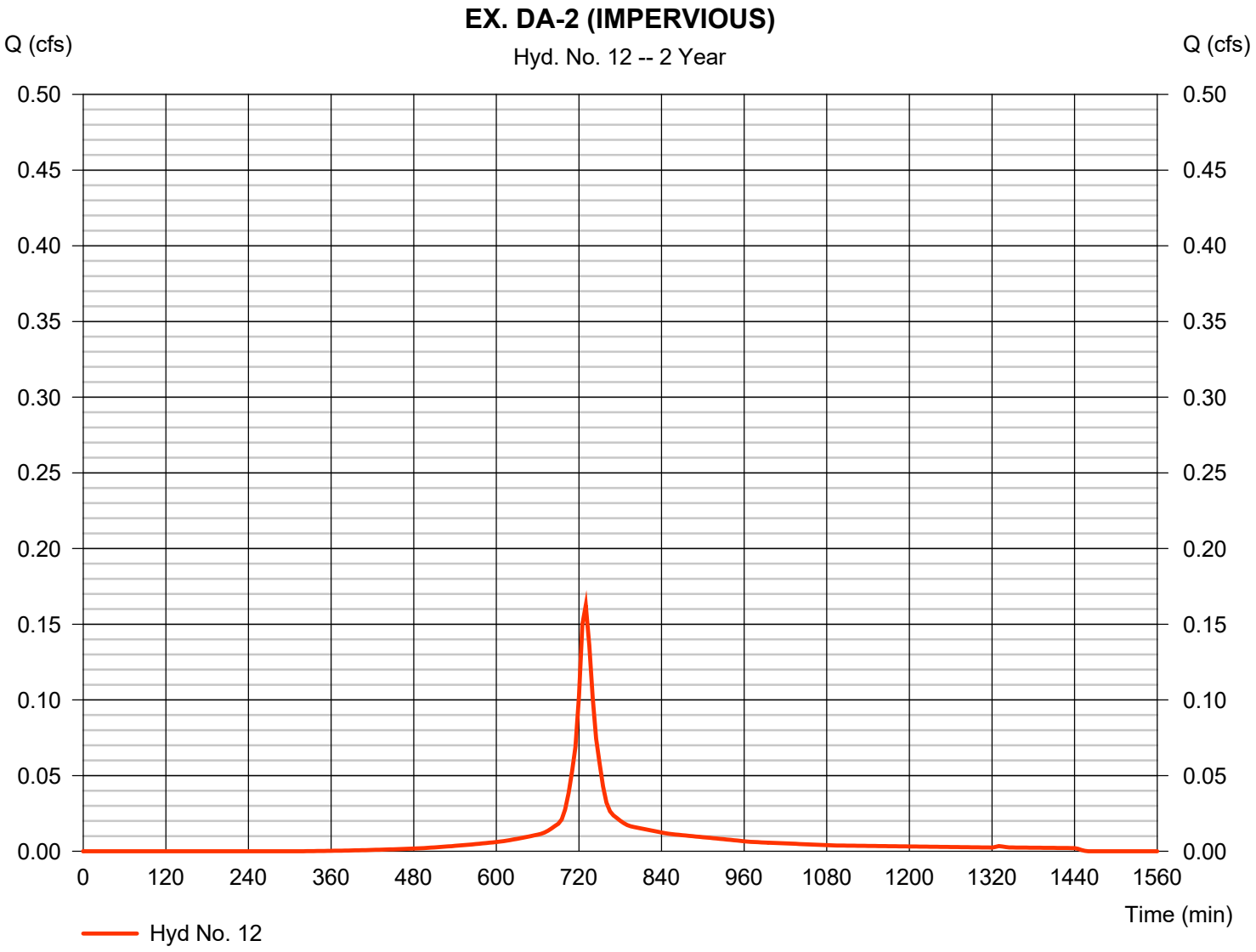
Hydrograph Report

Hyd. No. 12

EX. DA-2 (IMPERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.162 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 661 cuft
Drainage area	= 0.080 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.080

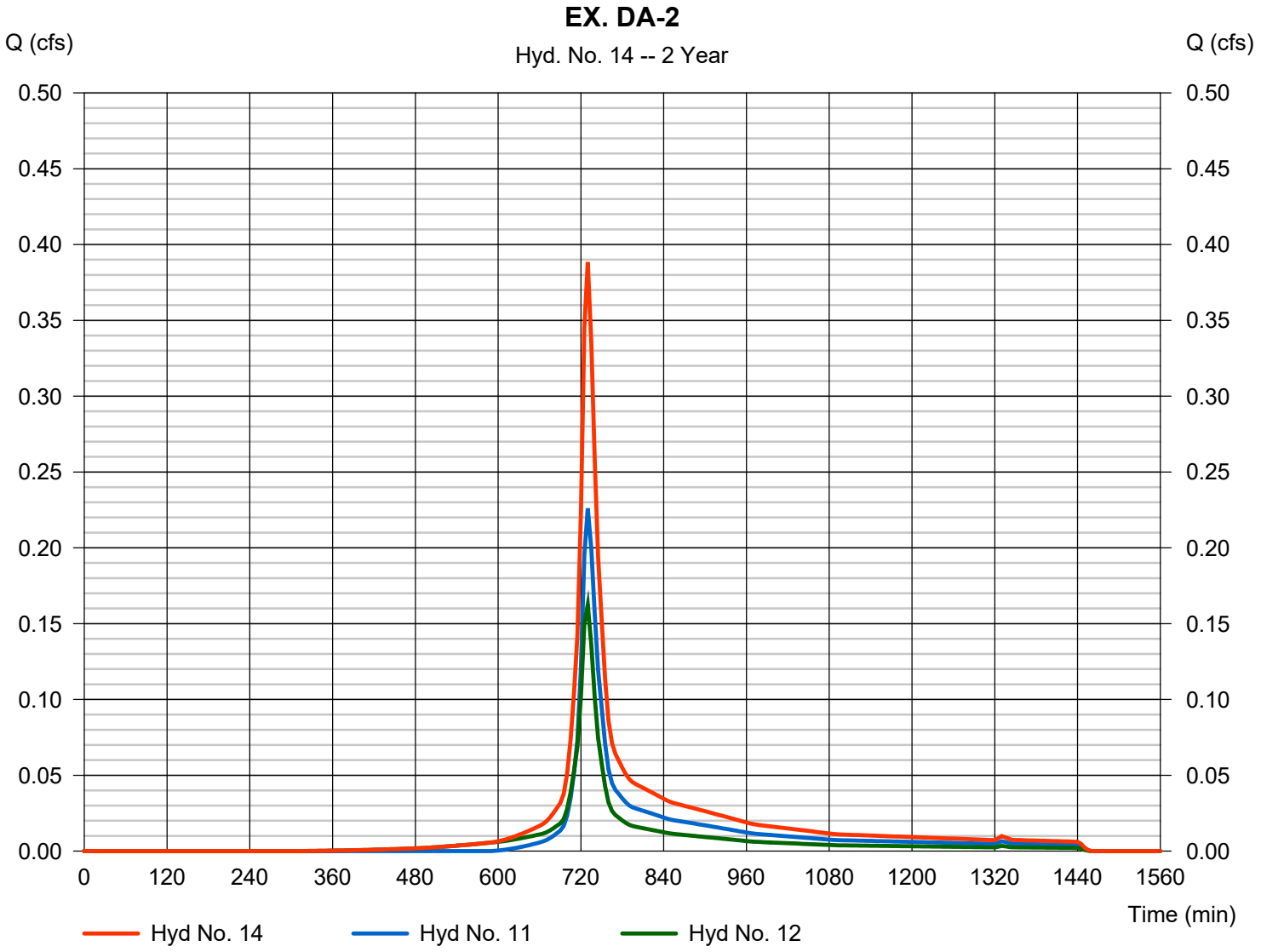


Hydrograph Report

Hyd. No. 14

EX. DA-2

Hydrograph type	=	Combine	Peak discharge	=	0.388 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,574 cuft
Inflow hyds.	=	11, 12	Contrib. drain. area	=	0.280 ac



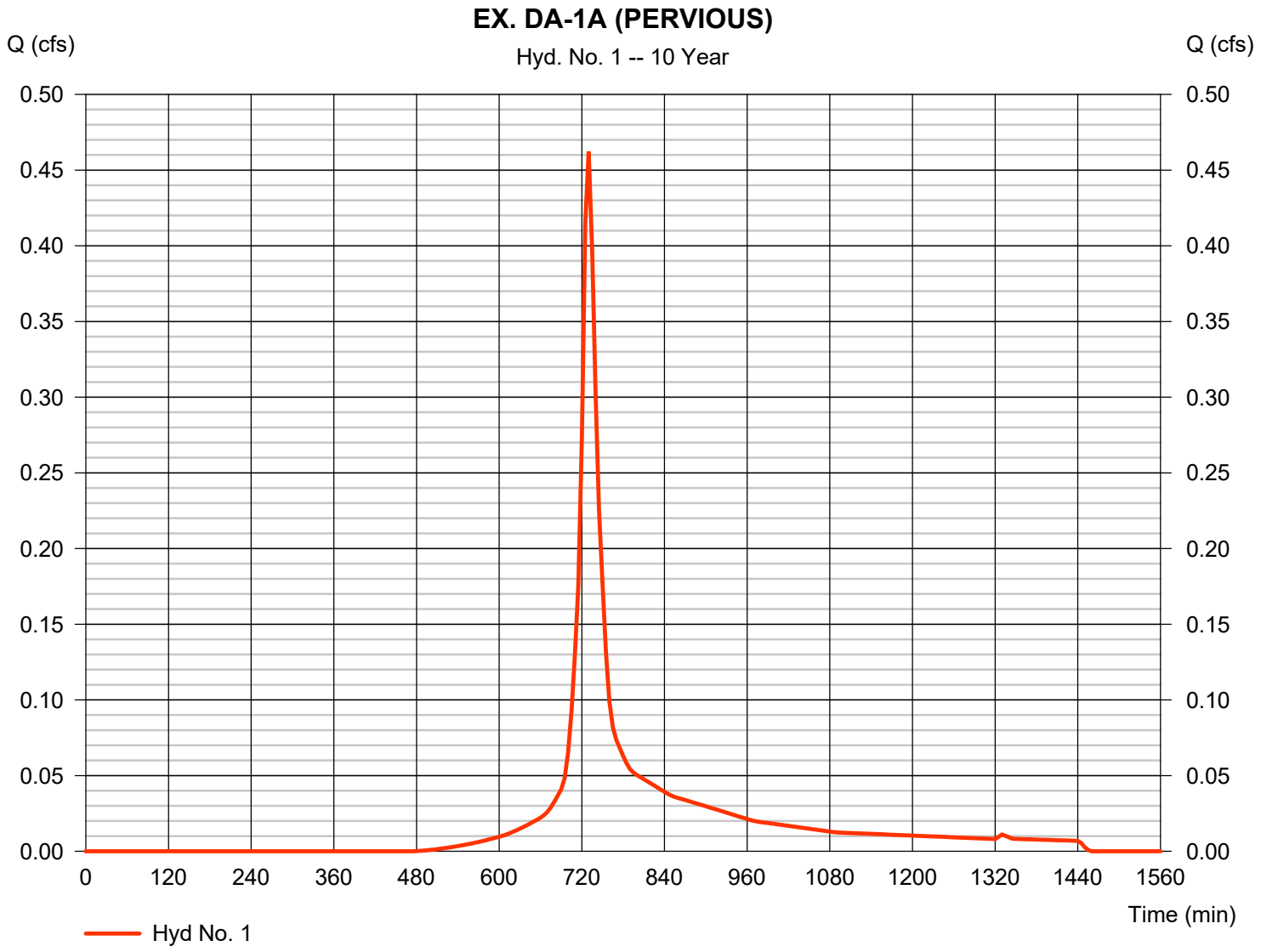
Hydrograph Report

Hyd. No. 1

EX. DA-1A (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.462 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 1,836 cuft
Drainage area	= 0.190 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 5.15 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.190



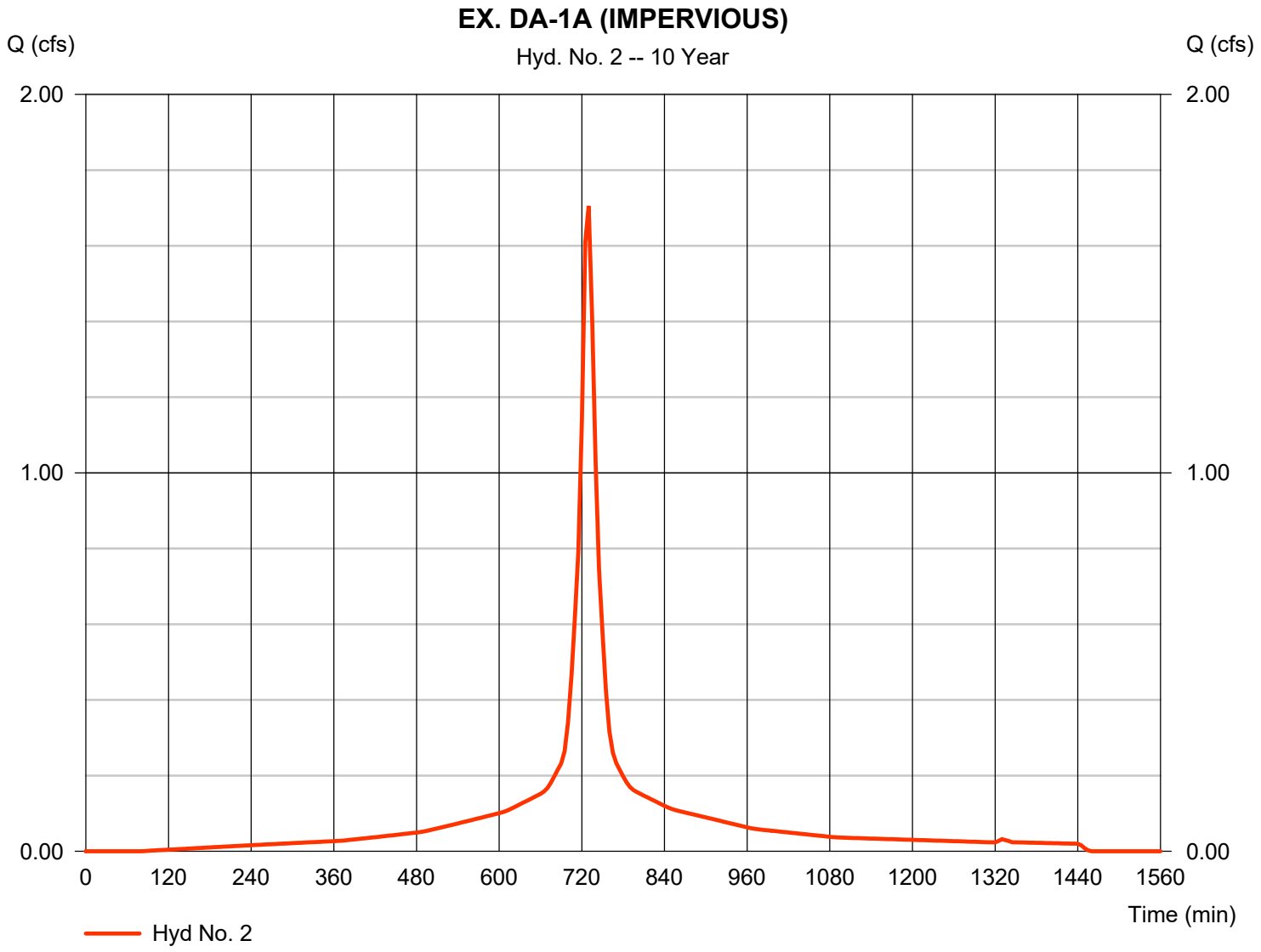
Hydrograph Report

Hyd. No. 2

EX. DA-1A (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.705 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	7,672 cuft
Drainage area	=	0.470 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.470

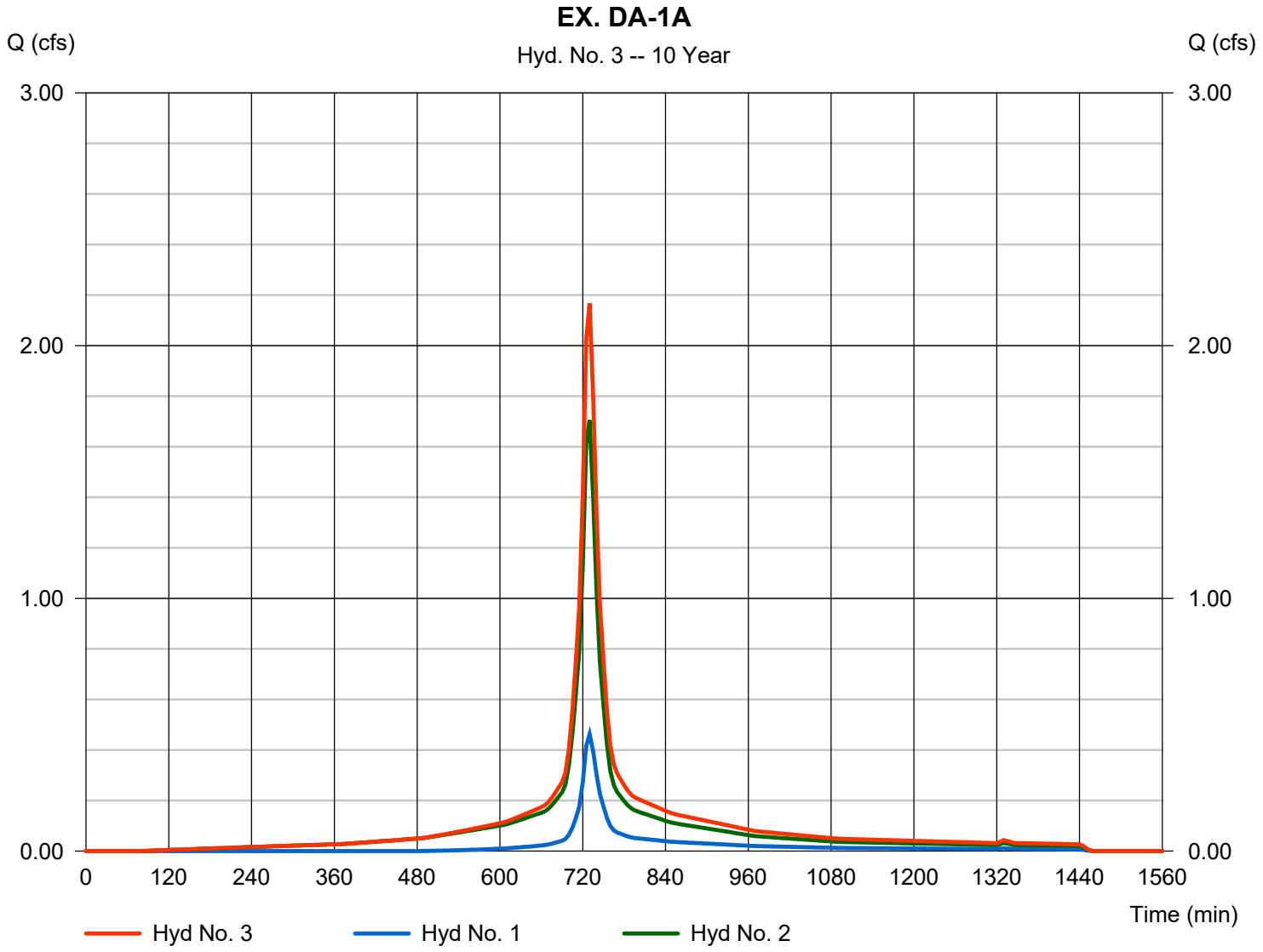


Hydrograph Report

Hyd. No. 3

EX. DA-1A

Hydrograph type	=	Combine	Peak discharge	=	2.167 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	9,508 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	0.660 ac



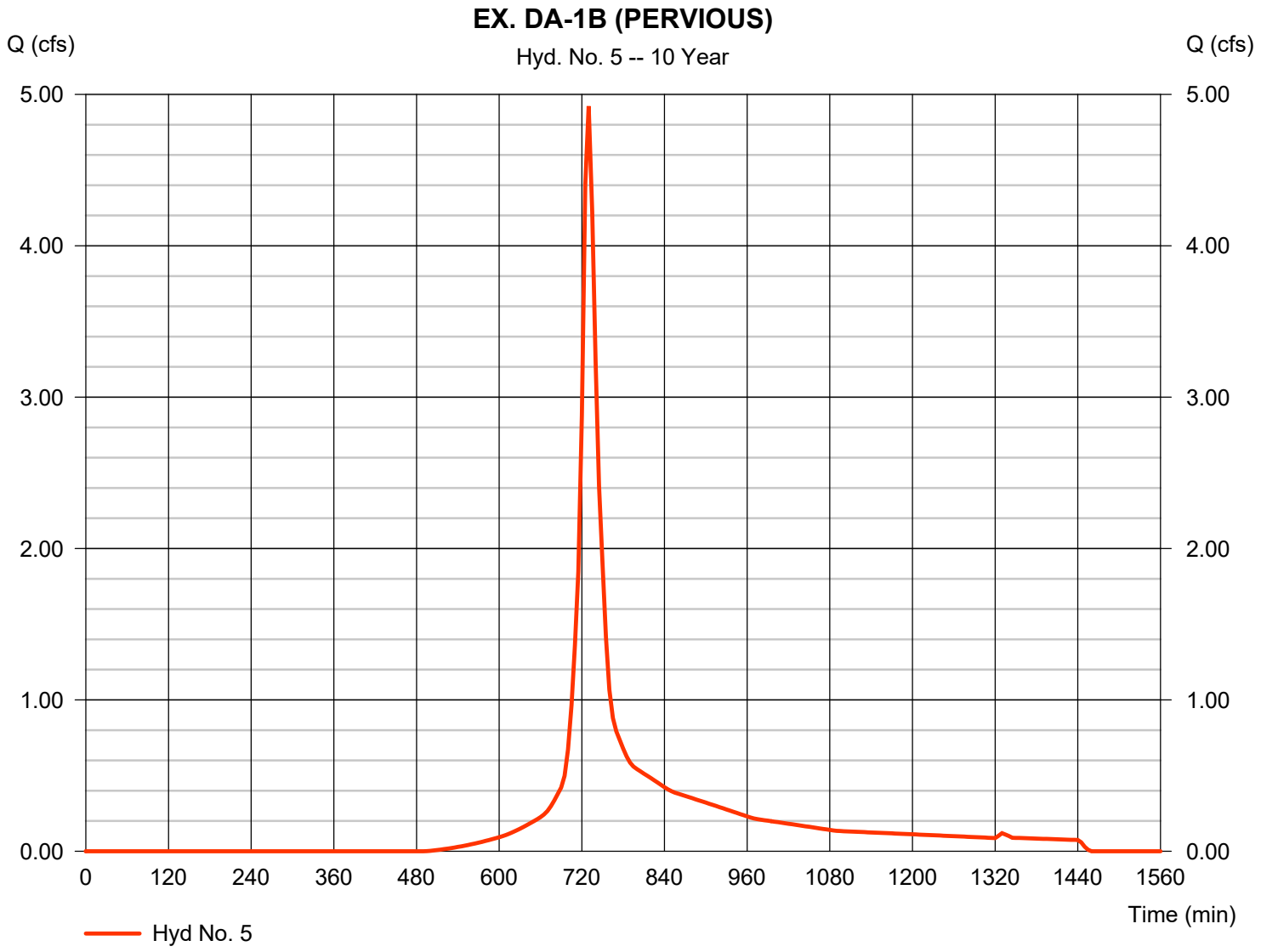
Hydrograph Report

Hyd. No. 5

EX. DA-1B (PERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.923 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	19,552 cuft
Drainage area	=	2.090 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.090



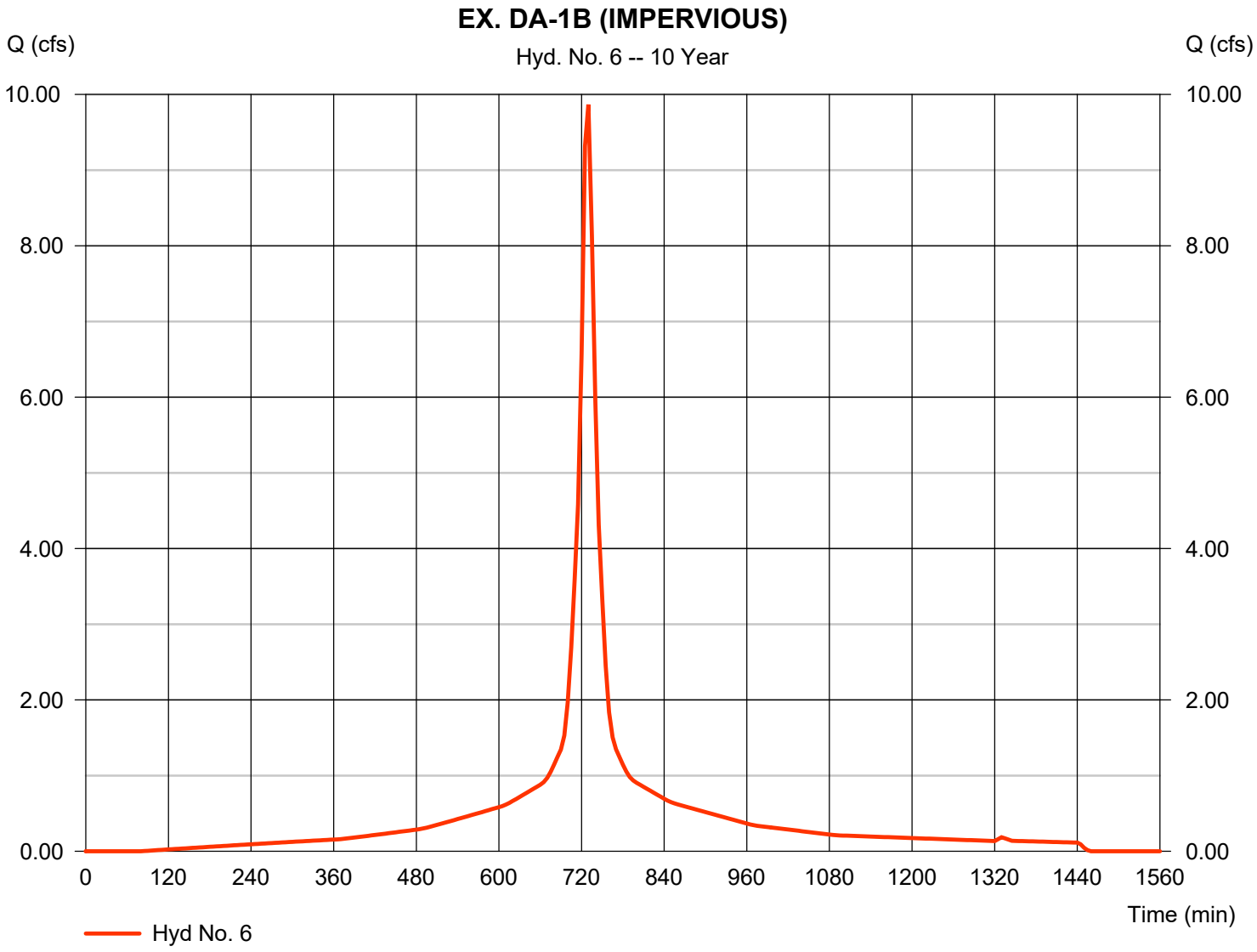
Hydrograph Report

Hyd. No. 6

EX. DA-1B (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.867 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	44,400 cuft
Drainage area	=	2.720 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.720

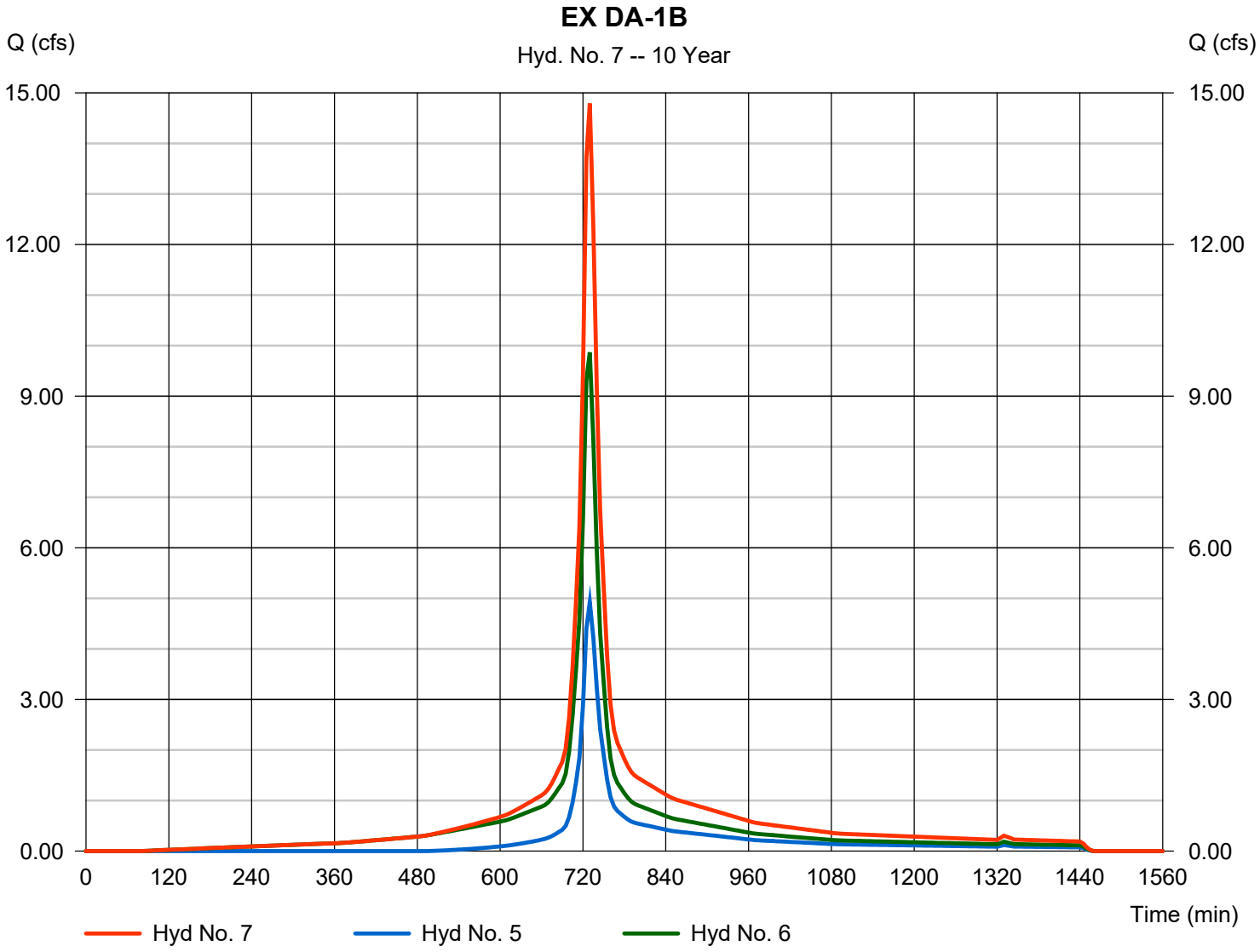


Hydrograph Report

Hyd. No. 7

EX DA-1B

Hydrograph type	= Combine	Peak discharge	= 14.79 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 63,952 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 4.810 ac

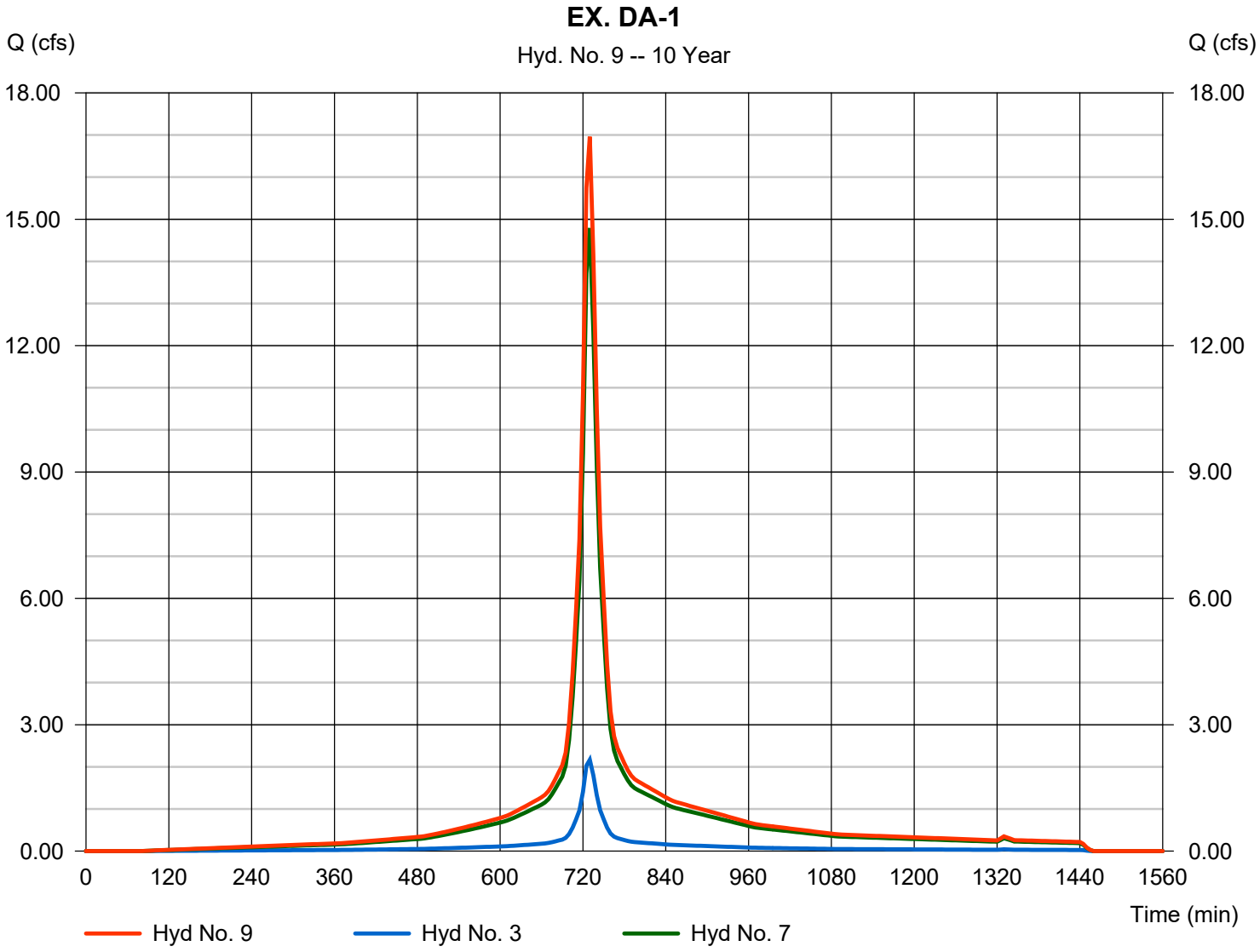


Hydrograph Report

Hyd. No. 9

EX. DA-1

Hydrograph type	=	Combine	Peak discharge	=	16.96 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	73,460 cuft
Inflow hyds.	=	3, 7	Contrib. drain. area	=	0.000 ac



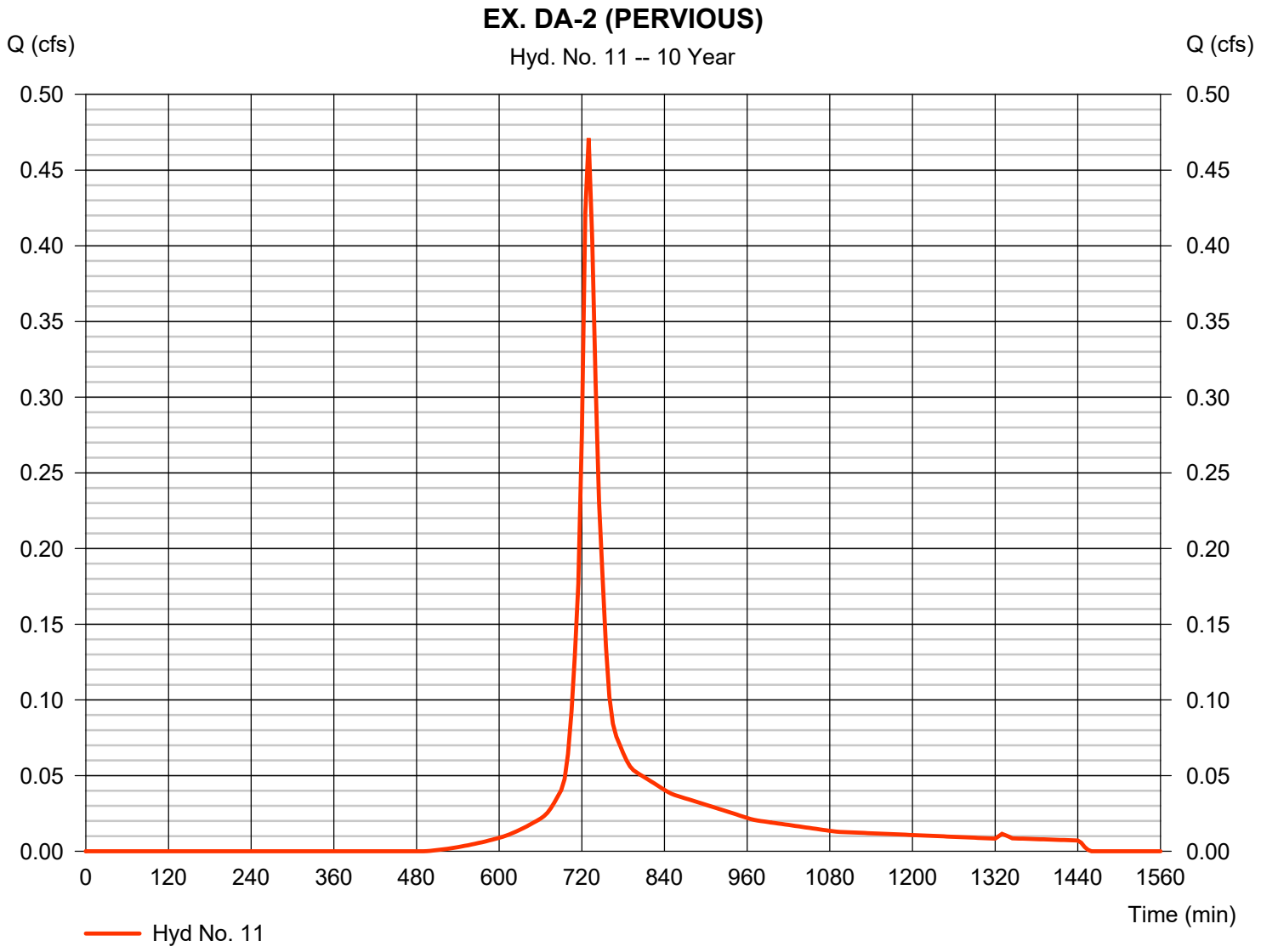
Hydrograph Report

Hyd. No. 11

EX. DA-2 (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.471 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 1,871 cuft
Drainage area	= 0.200 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.15 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.200



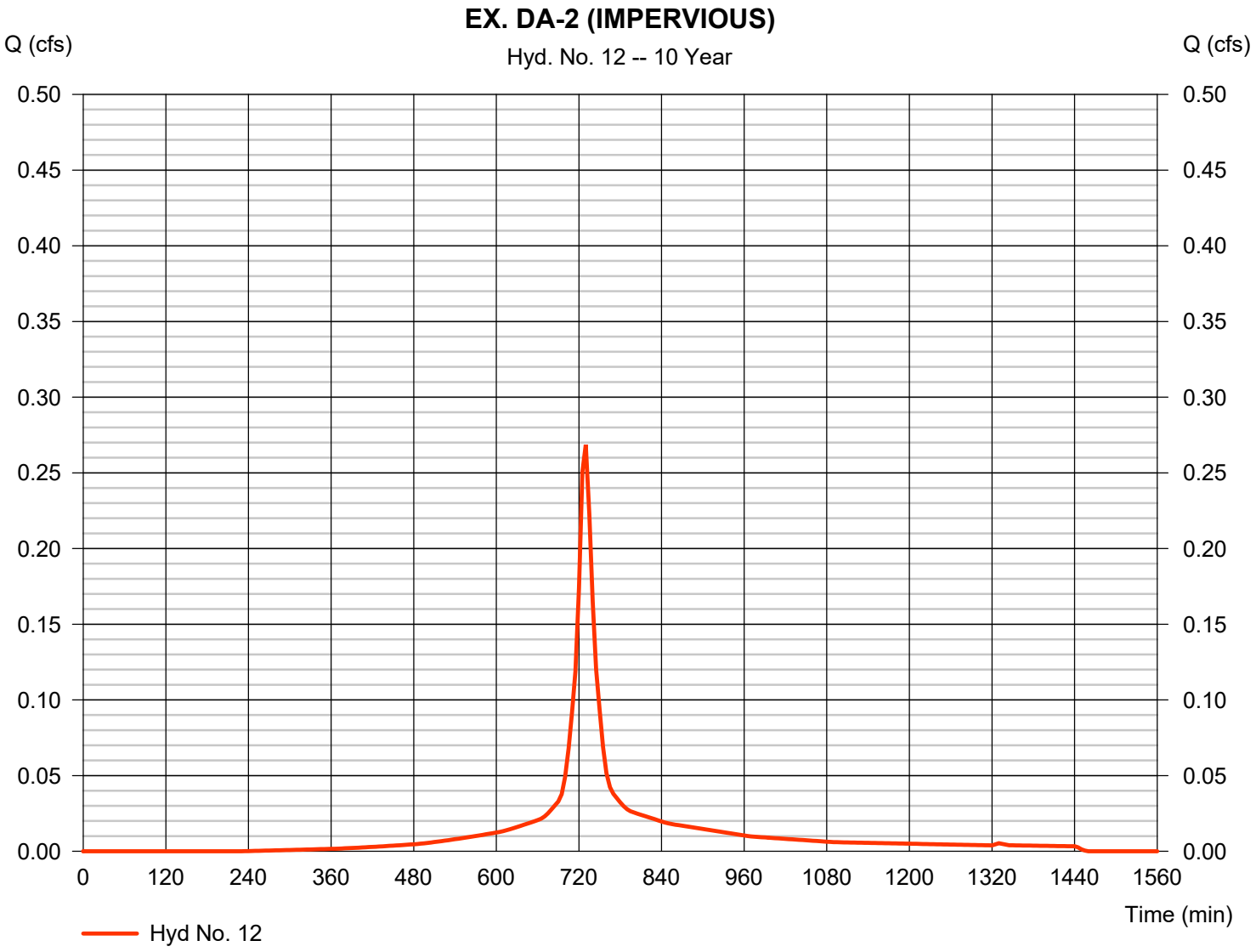
Hydrograph Report

Hyd. No. 12

EX. DA-2 (IMPERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.269 cfs
Storm frequency	= 10 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 1,124 cuft
Drainage area	= 0.080 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.15 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.080

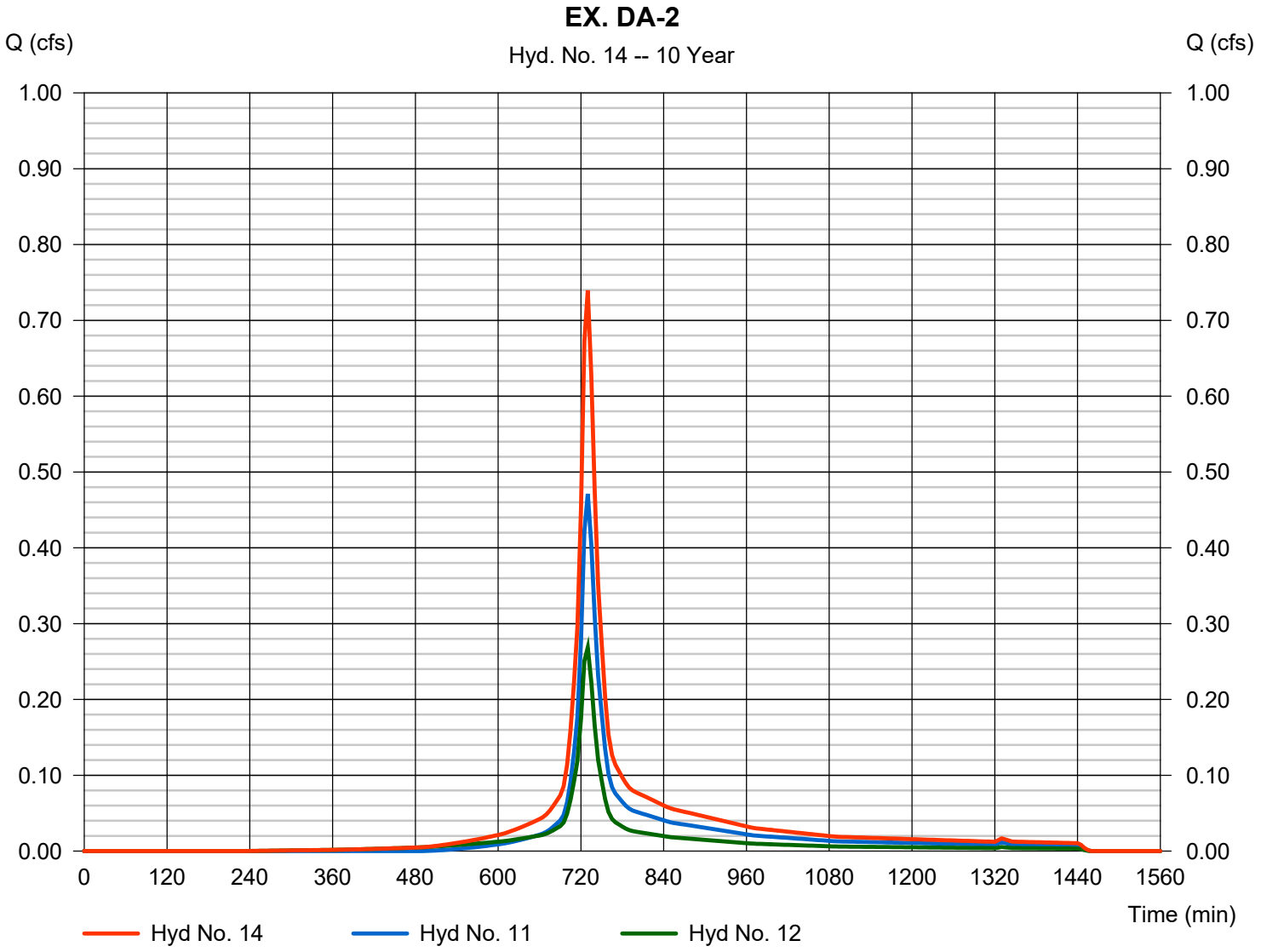


Hydrograph Report

Hyd. No. 14

EX. DA-2

Hydrograph type	=	Combine	Peak discharge	=	0.740 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	2,995 cuft
Inflow hyds.	=	11, 12	Contrib. drain. area	=	0.280 ac



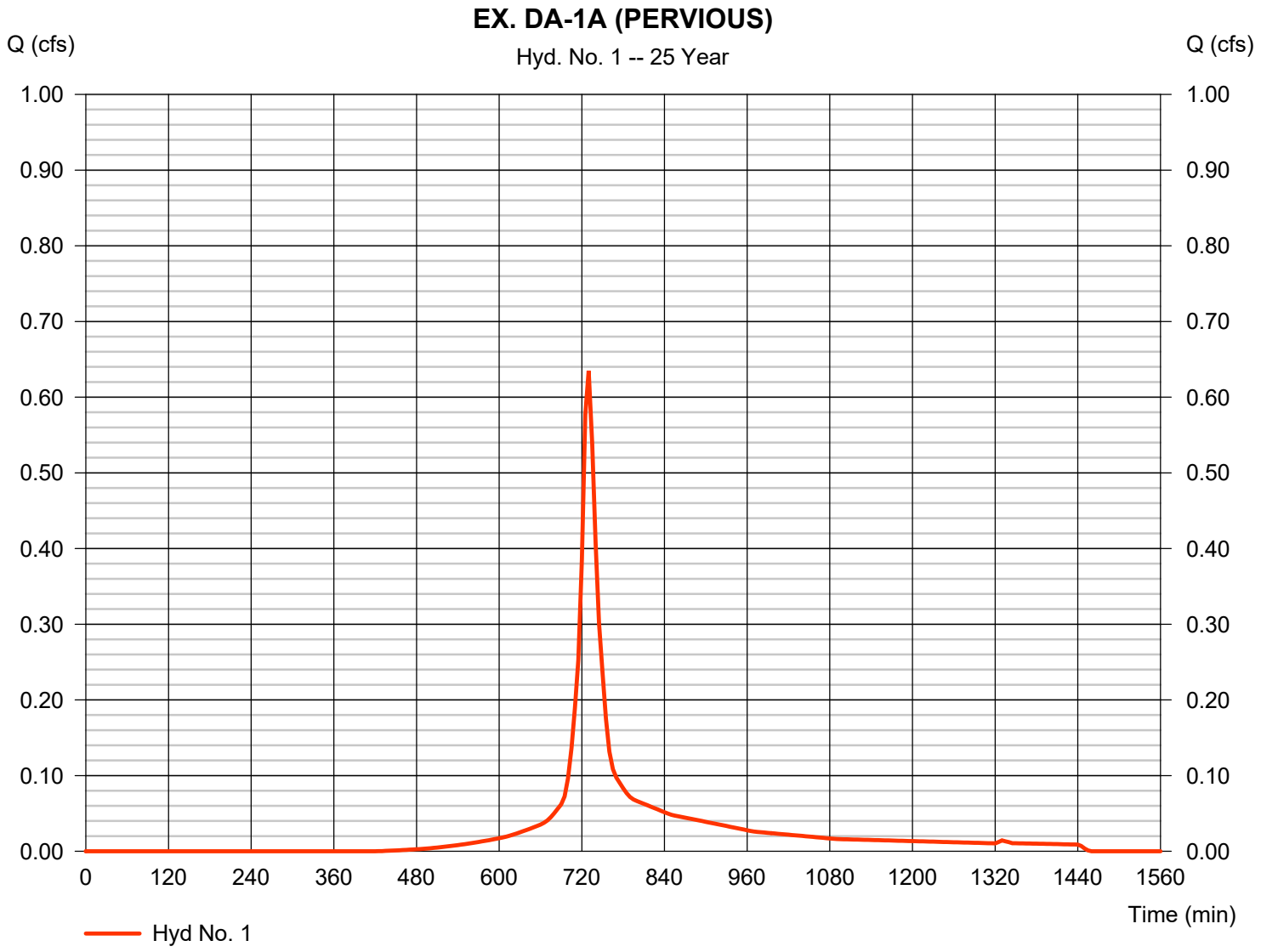
Hydrograph Report

Hyd. No. 1

EX. DA-1A (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.635 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 2,532 cuft
Drainage area	= 0.190 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 12.00 min
Total precip.	= 6.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.190



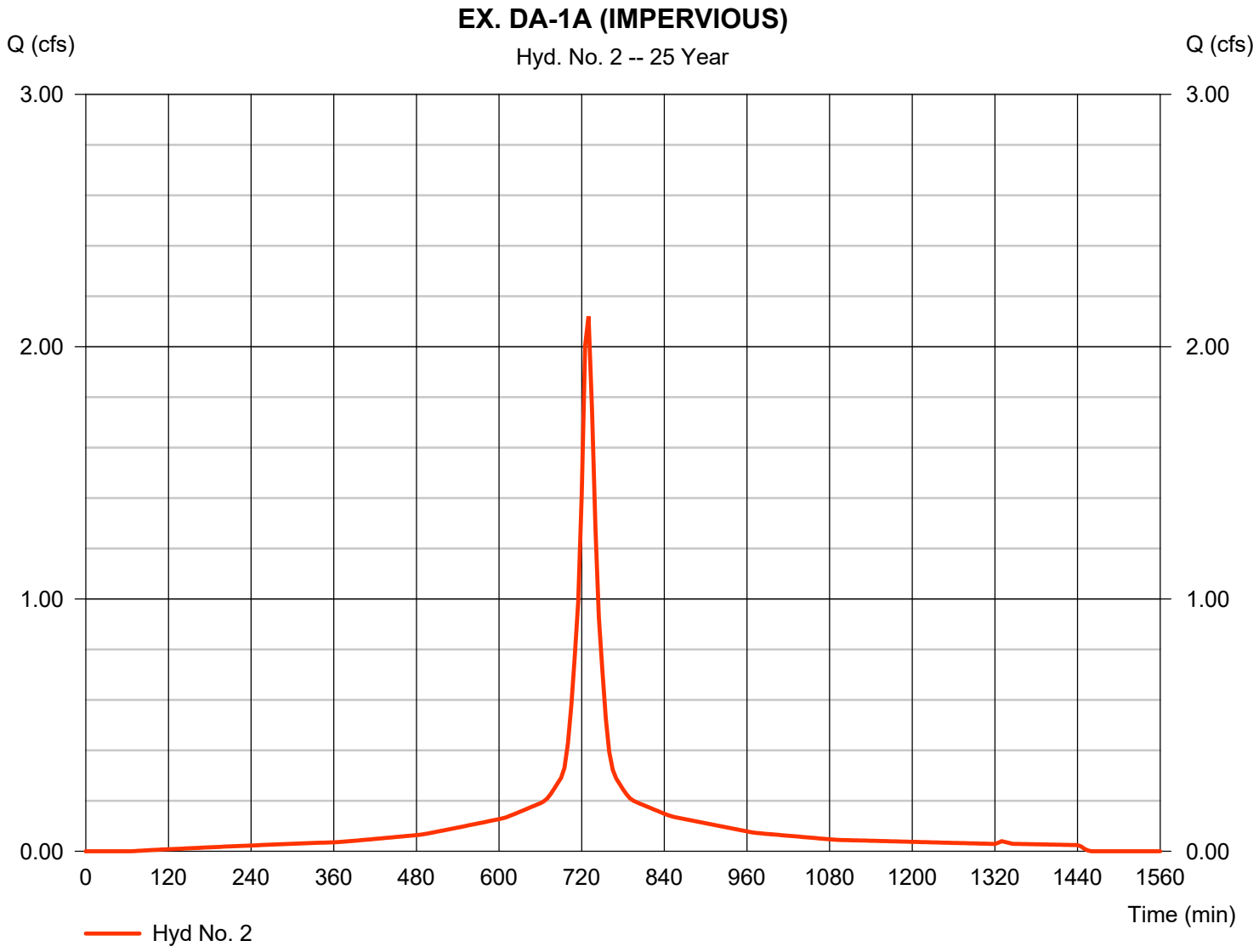
Hydrograph Report

Hyd. No. 2

EX. DA-1A (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.121 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	9,634 cuft
Drainage area	=	0.470 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.470

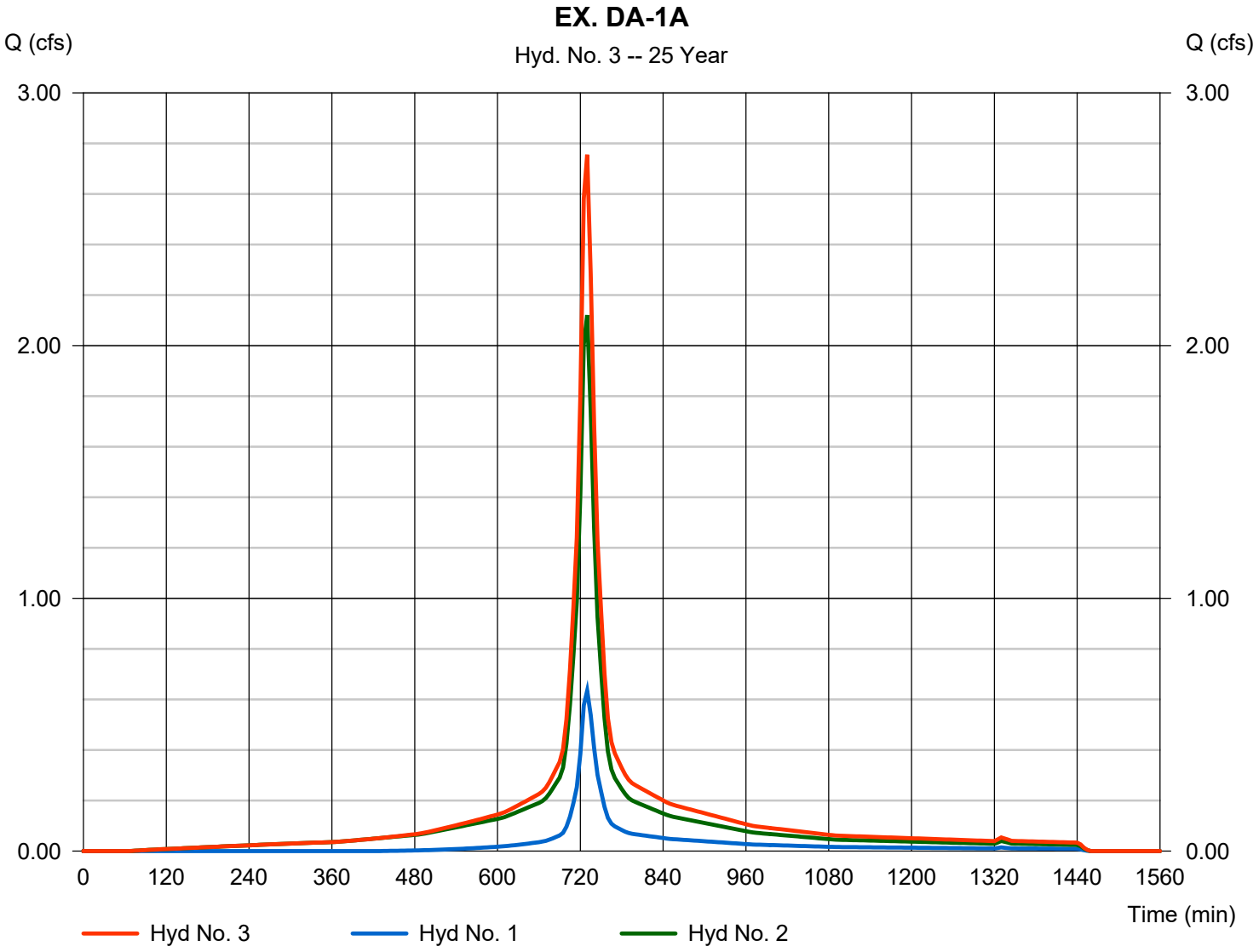


Hydrograph Report

Hyd. No. 3

EX. DA-1A

Hydrograph type	=	Combine	Peak discharge	=	2.755 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	12,166 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	0.660 ac



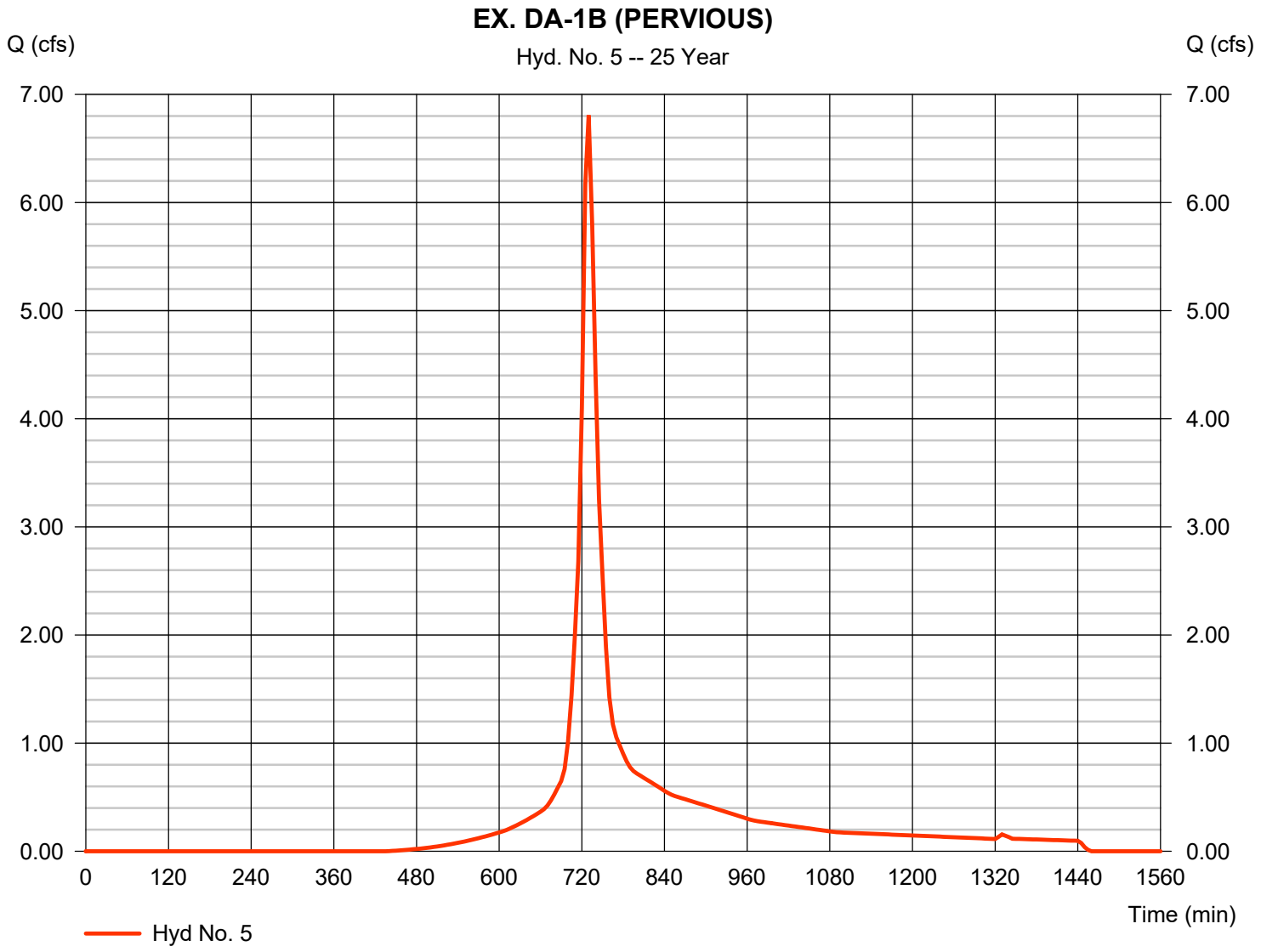
Hydrograph Report

Hyd. No. 5

EX. DA-1B (PERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.808 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	27,120 cuft
Drainage area	=	2.090 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.090



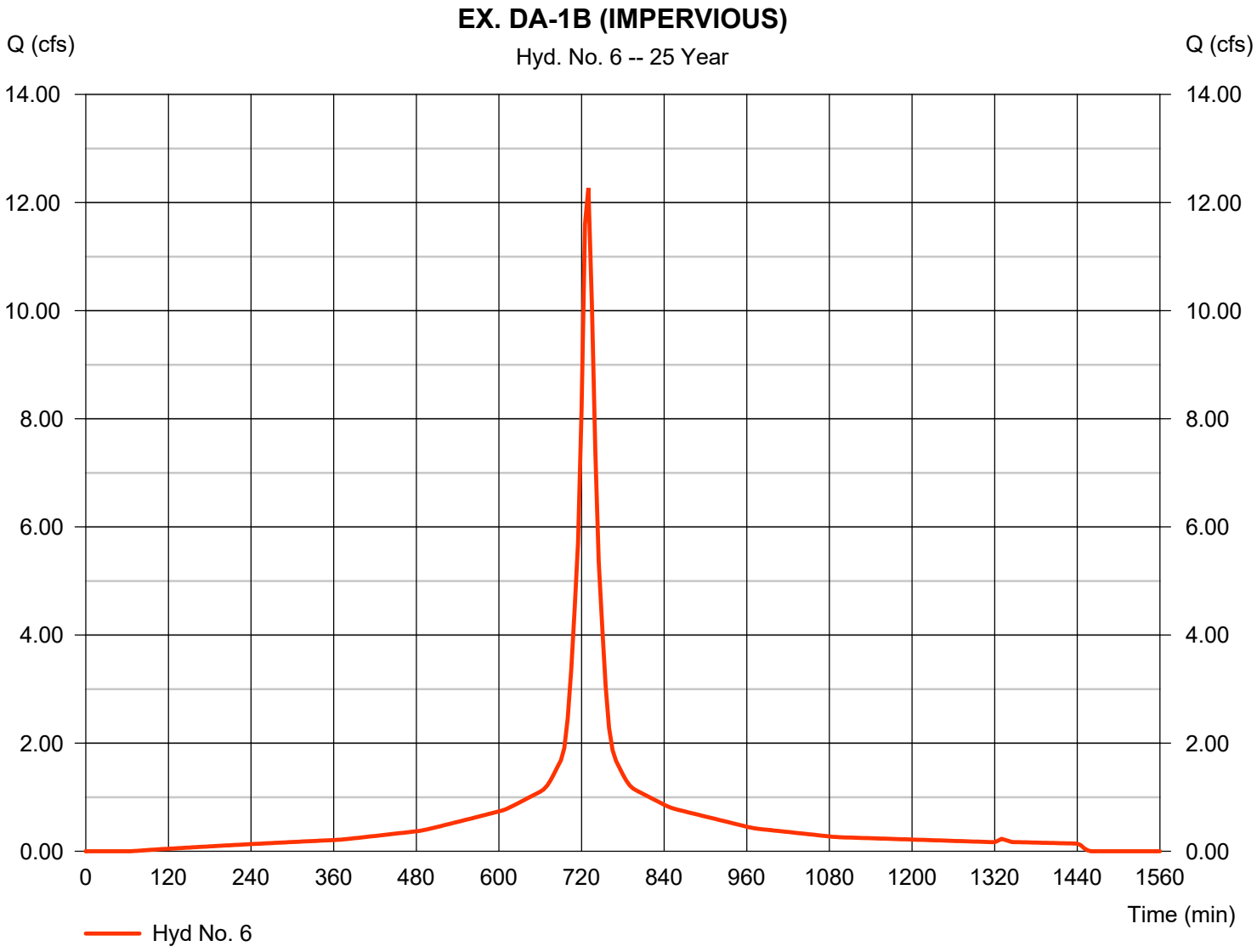
Hydrograph Report

Hyd. No. 6

EX. DA-1B (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	55,755 cuft
Drainage area	=	2.720 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.720

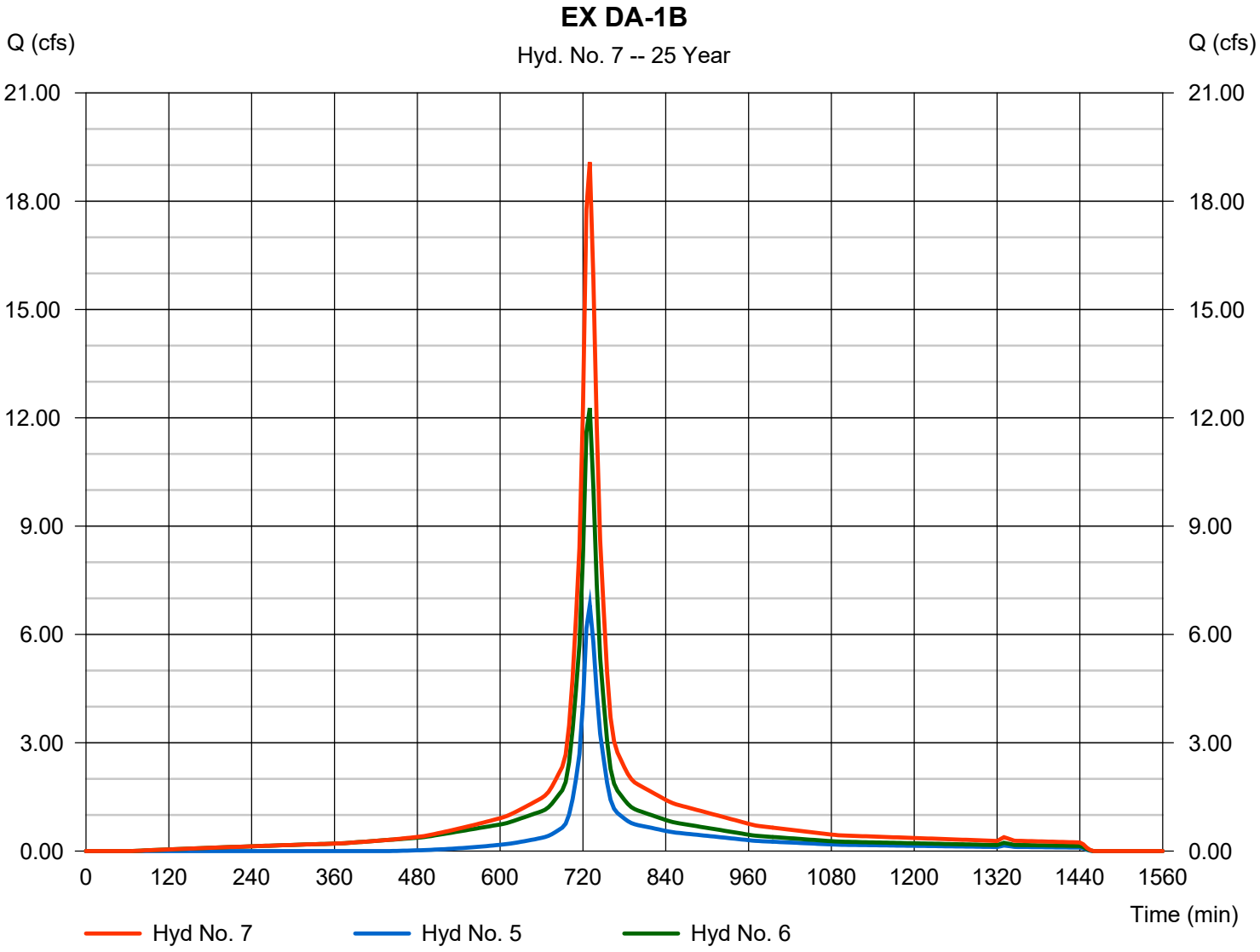


Hydrograph Report

Hyd. No. 7

EX DA-1B

Hydrograph type	= Combine	Peak discharge	= 19.08 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 82,875 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 4.810 ac

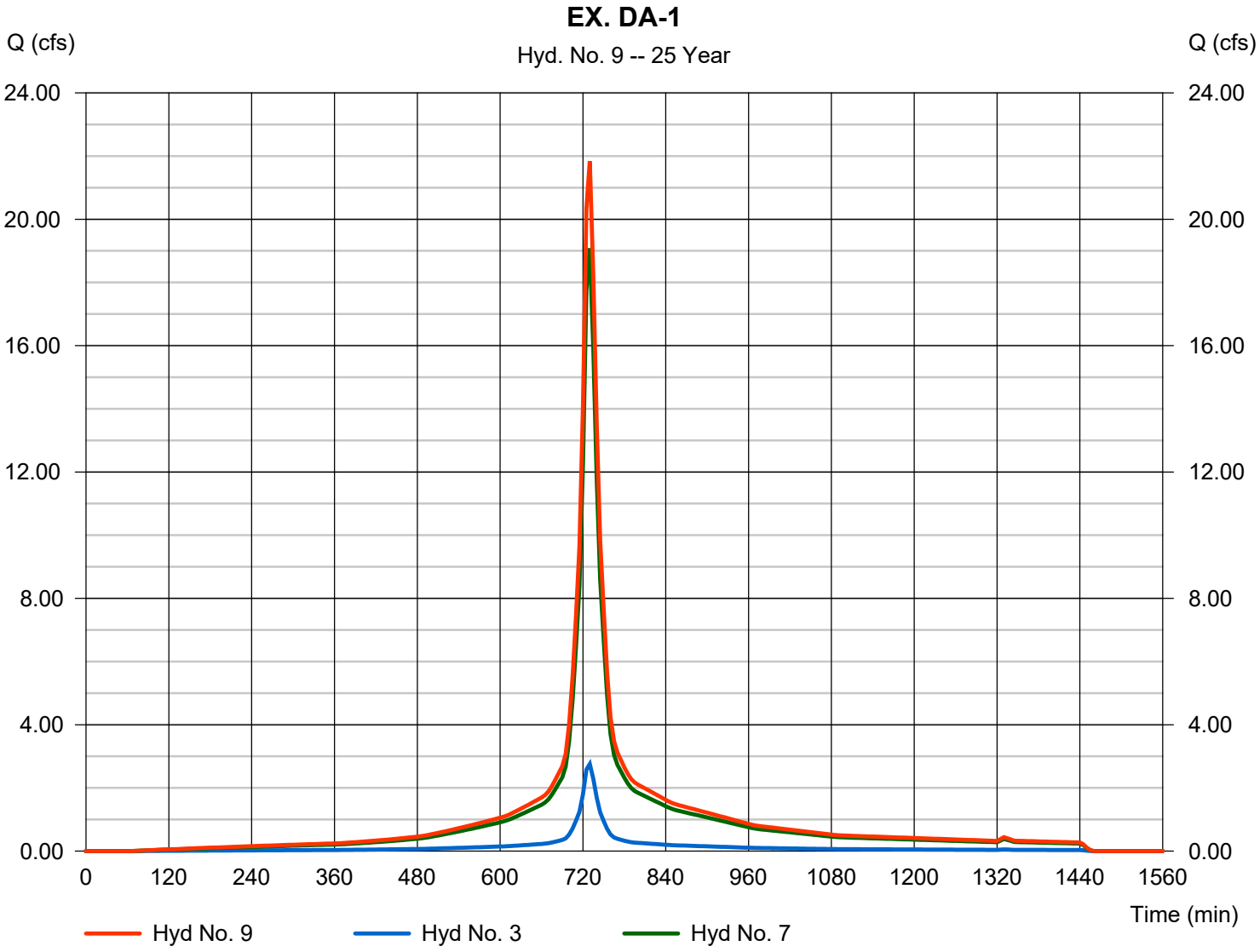


Hydrograph Report

Hyd. No. 9

EX. DA-1

Hydrograph type	=	Combine	Peak discharge	=	21.84 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	95,041 cuft
Inflow hyds.	=	3, 7	Contrib. drain. area	=	0.000 ac



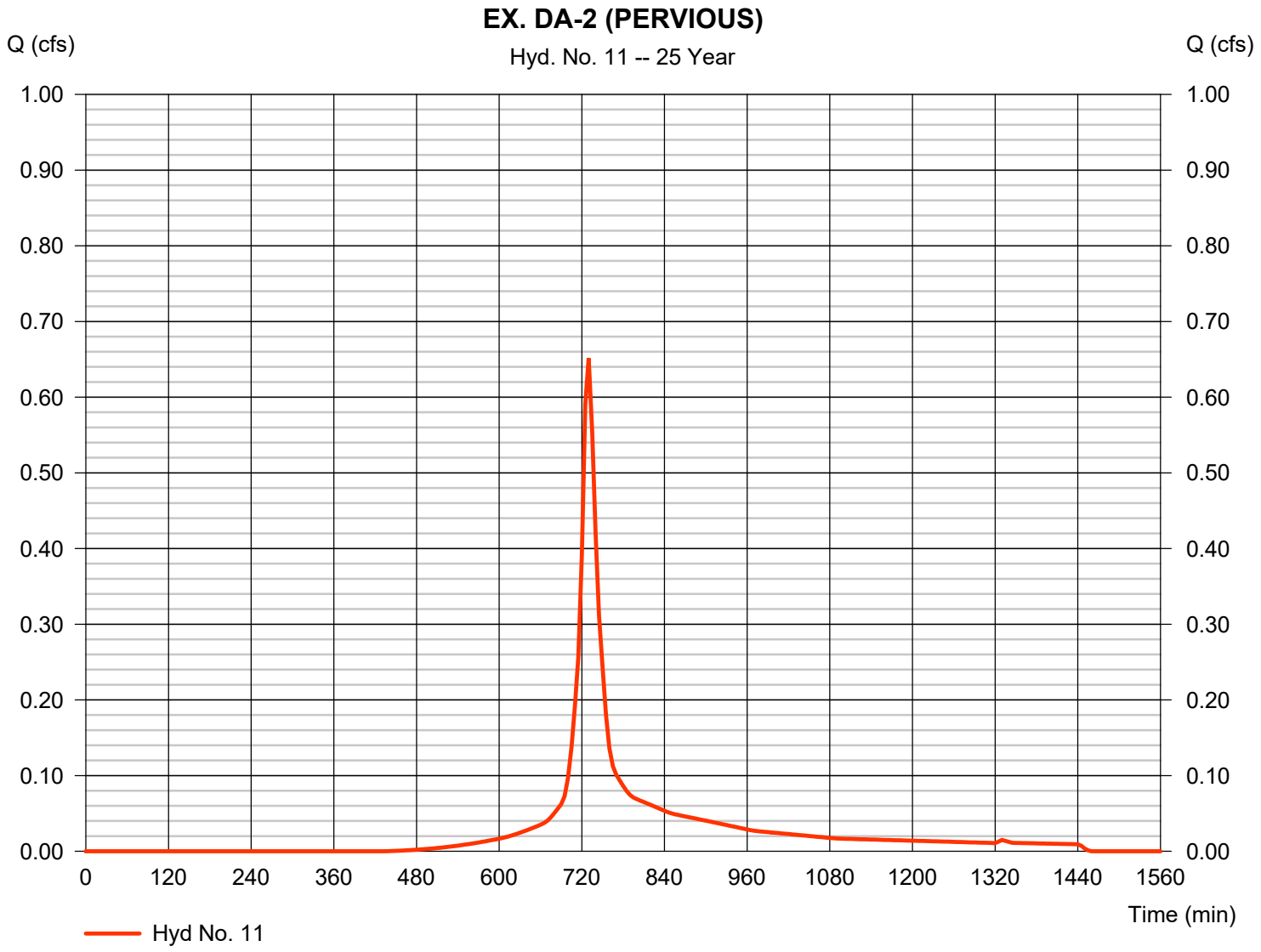
Hydrograph Report

Hyd. No. 11

EX. DA-2 (PERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.651 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 2,595 cuft
Drainage area	= 0.200 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.200



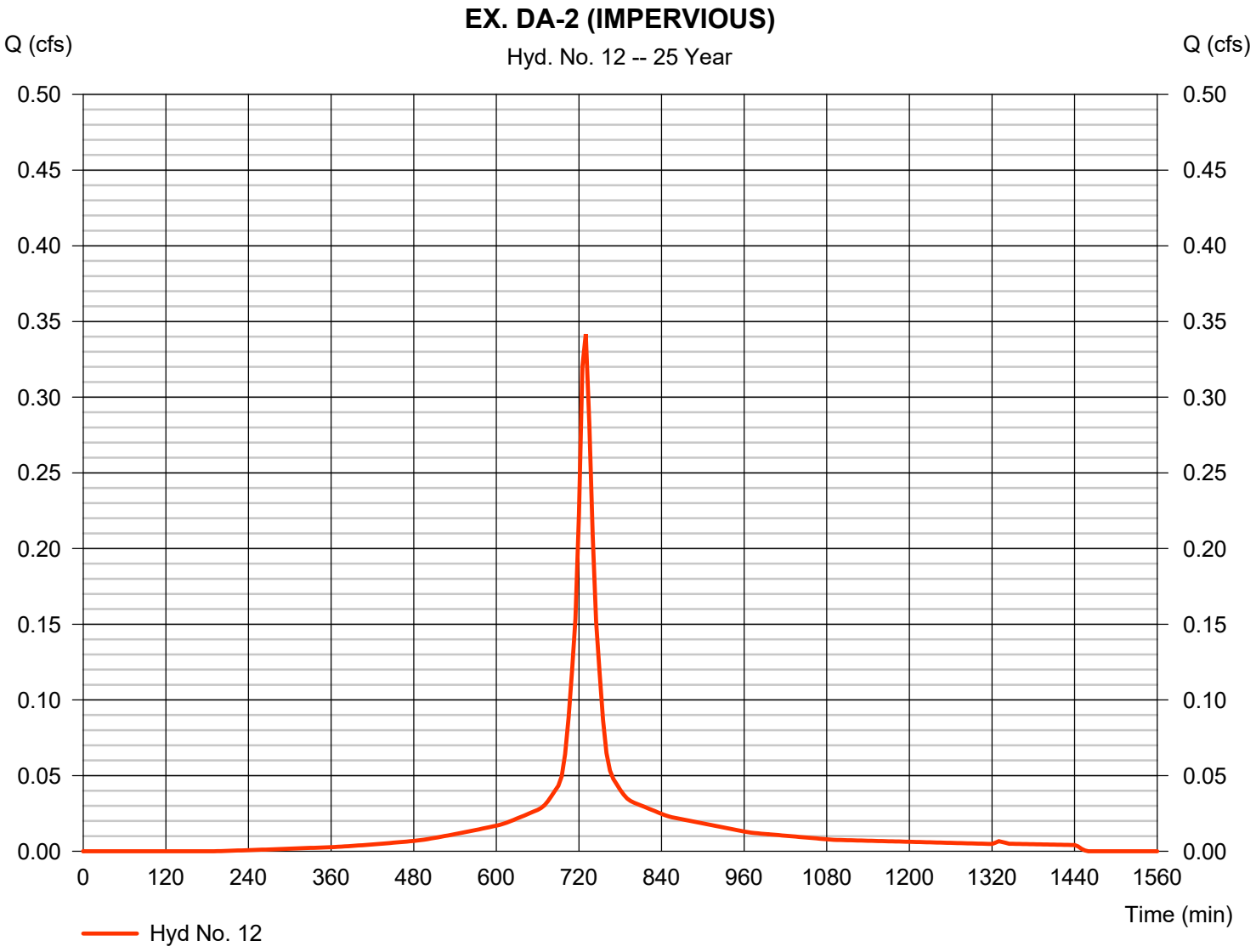
Hydrograph Report

Hyd. No. 12

EX. DA-2 (IMPERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.342 cfs
Storm frequency	= 25 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 1,451 cuft
Drainage area	= 0.080 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 6.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.080

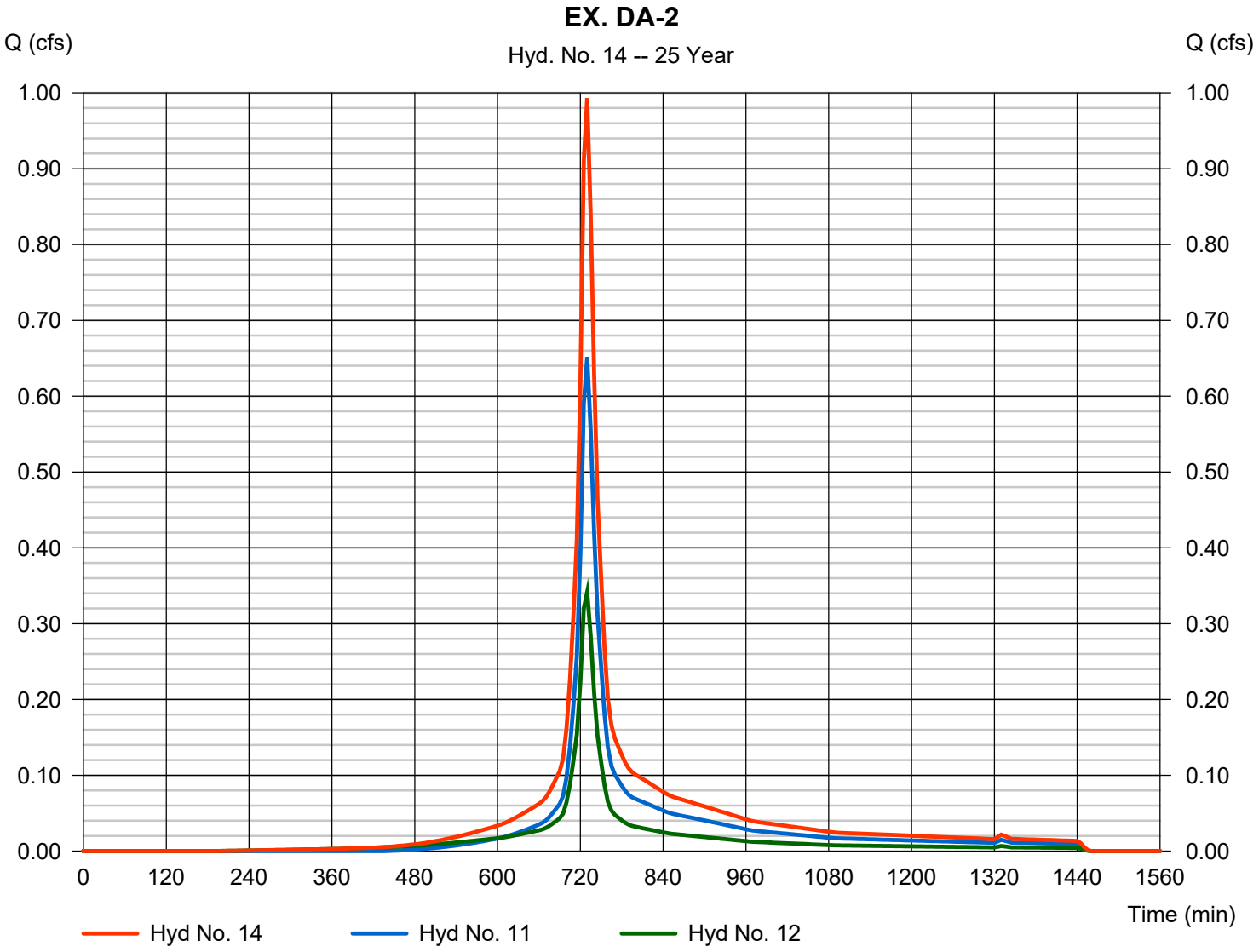


Hydrograph Report

Hyd. No. 14

EX. DA-2

Hydrograph type	=	Combine	Peak discharge	=	0.993 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	4,046 cuft
Inflow hyds.	=	11, 12	Contrib. drain. area	=	0.280 ac



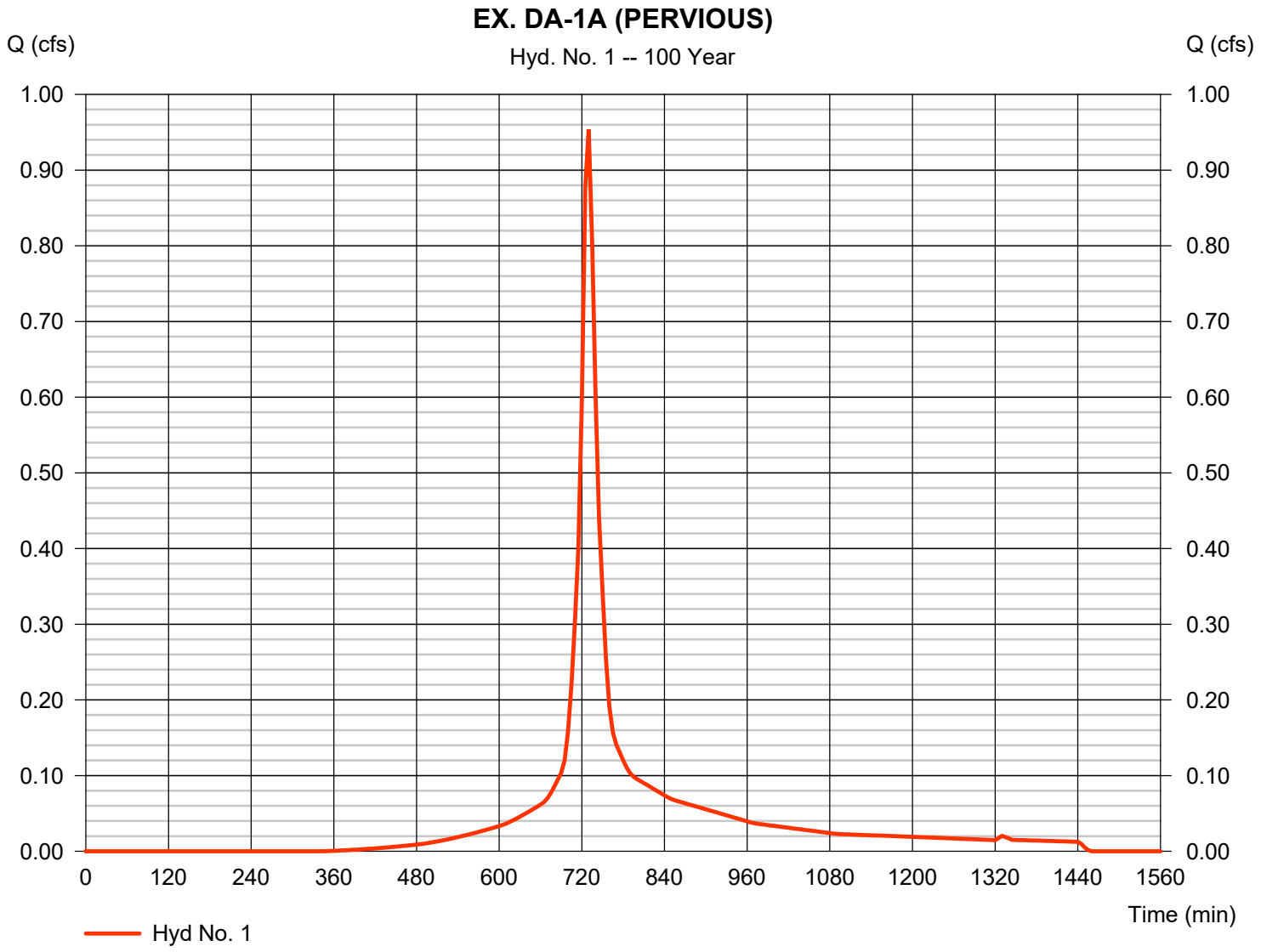
Hydrograph Report

Hyd. No. 1

EX. DA-1A (PERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.954 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	3,858 cuft
Drainage area	=	0.190 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.190



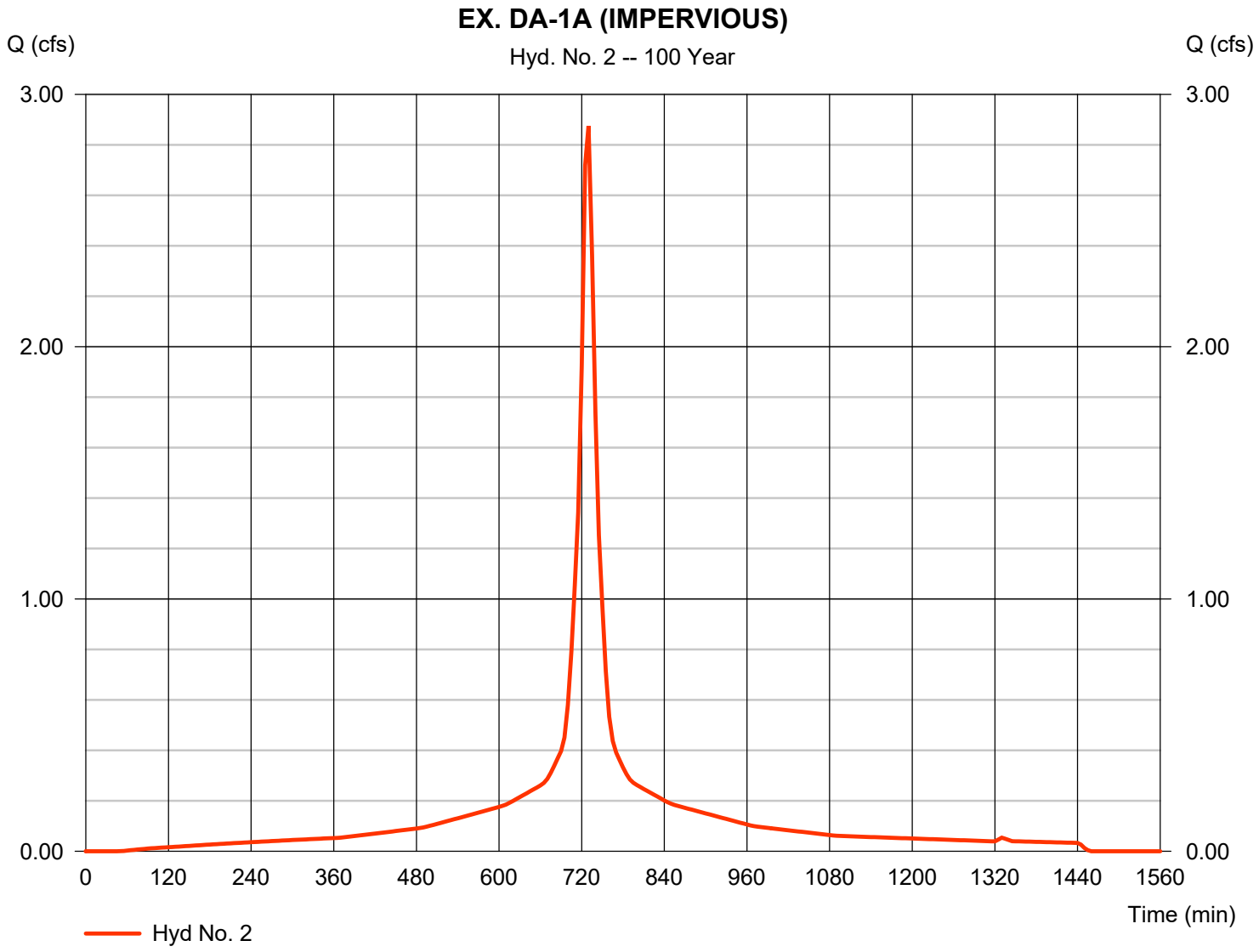
Hydrograph Report

Hyd. No. 2

EX. DA-1A (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.875 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	13,211 cuft
Drainage area	=	0.470 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	12.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.470

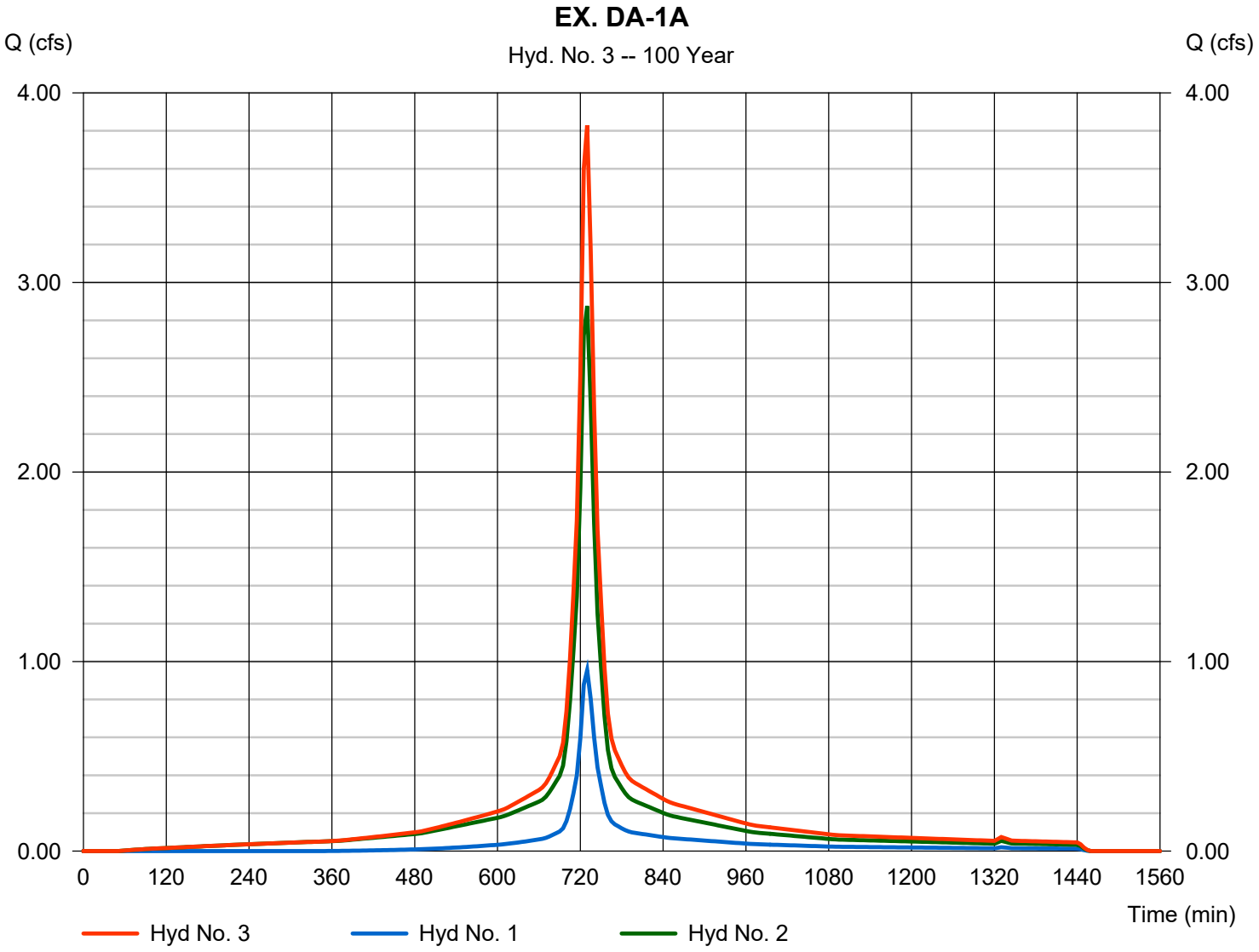


Hydrograph Report

Hyd. No. 3

EX. DA-1A

Hydrograph type	=	Combine	Peak discharge	=	3.829 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	17,069 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	0.660 ac



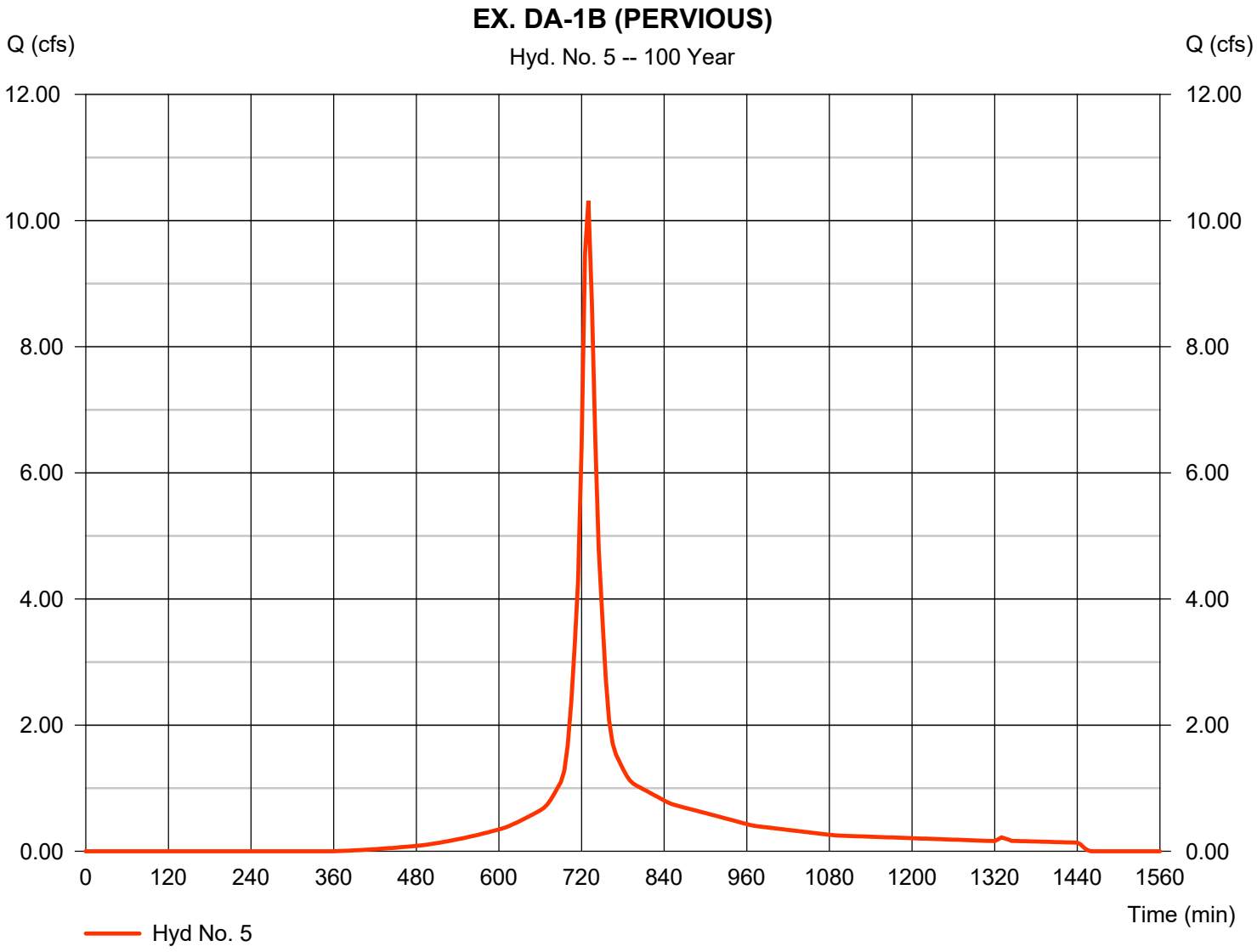
Hydrograph Report

Hyd. No. 5

EX. DA-1B (PERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.31 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	41,580 cuft
Drainage area	=	2.090 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.090



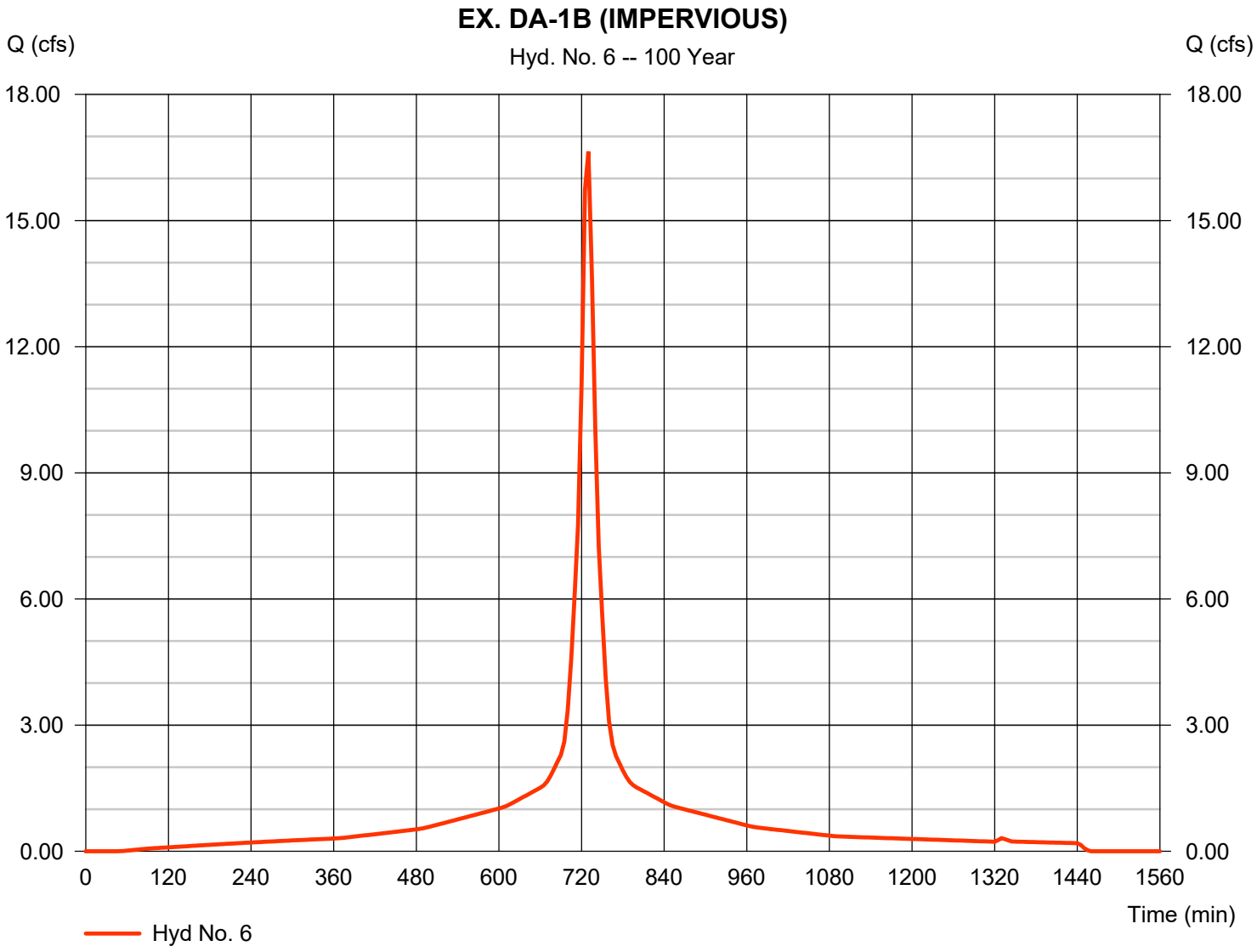
Hydrograph Report

Hyd. No. 6

EX. DA-1B (IMPERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.64 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	76,455 cuft
Drainage area	=	2.720 ac	Curve number	=	97*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.20 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 2.720

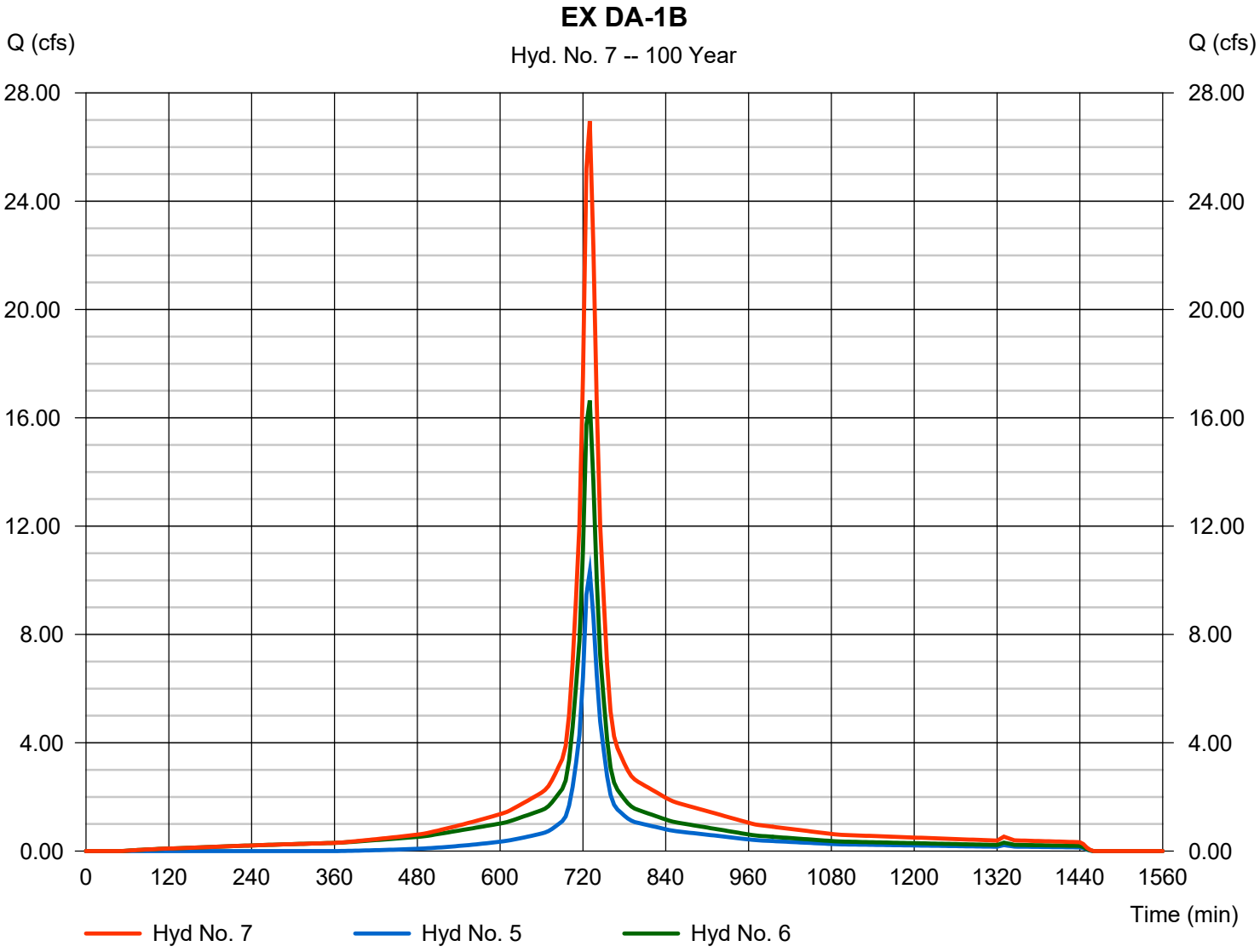


Hydrograph Report

Hyd. No. 7

EX DA-1B

Hydrograph type	= Combine	Peak discharge	= 26.95 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 118,035 cuft
Inflow hyds.	= 5, 6	Contrib. drain. area	= 4.810 ac

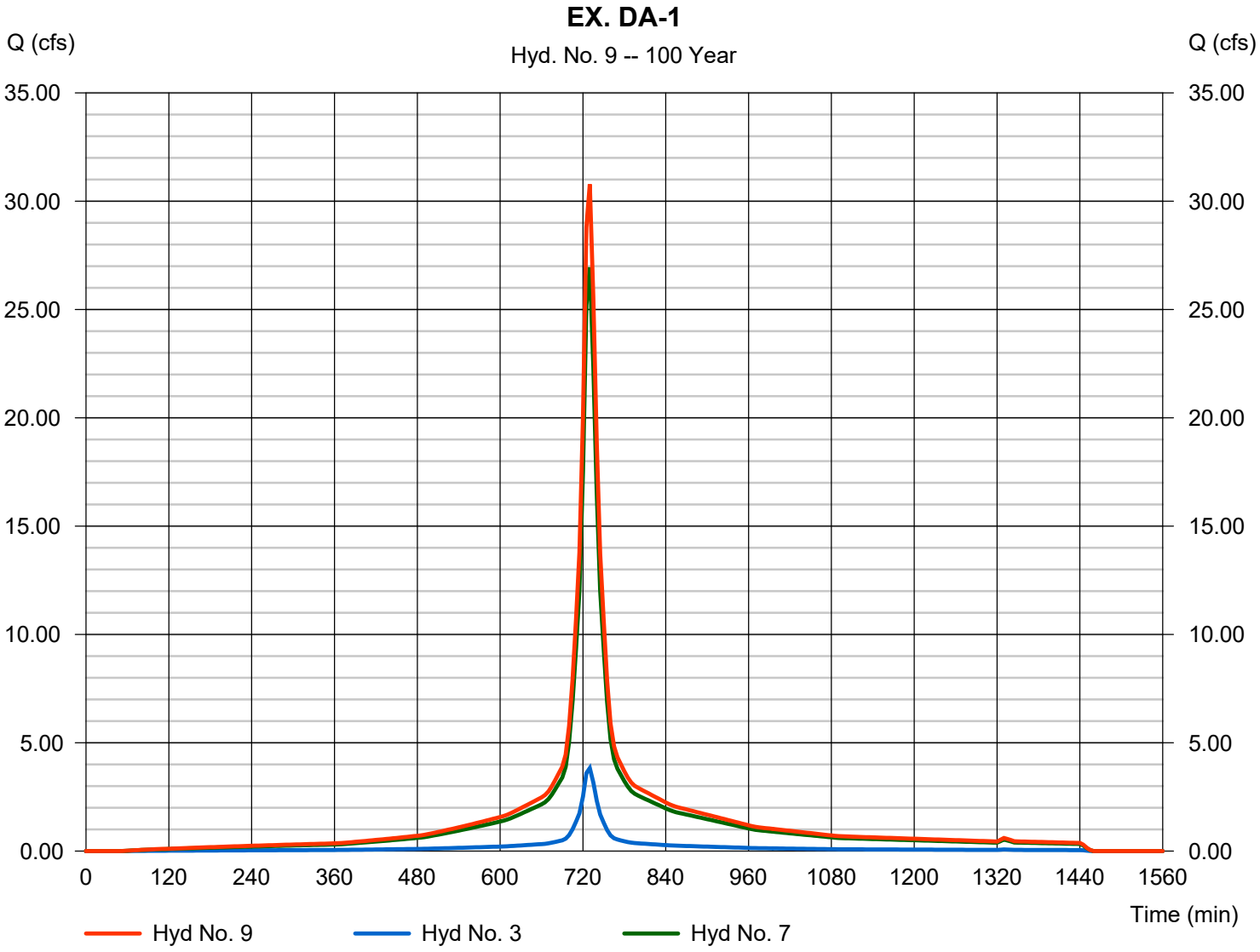


Hydrograph Report

Hyd. No. 9

EX. DA-1

Hydrograph type	=	Combine	Peak discharge	=	30.78 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	135,104 cuft
Inflow hyds.	=	3, 7	Contrib. drain. area	=	0.000 ac



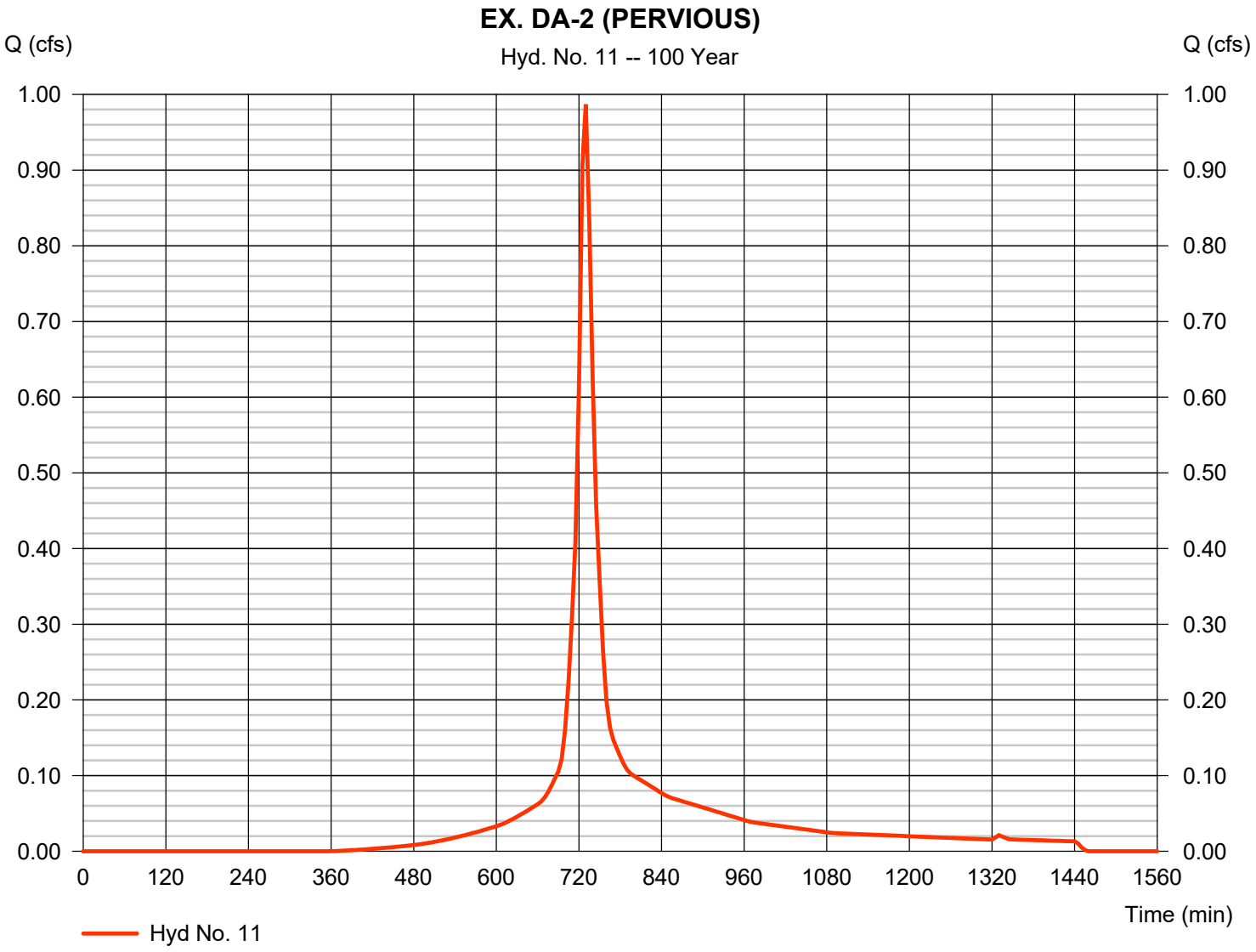
Hydrograph Report

Hyd. No. 11

EX. DA-2 (PERVIOUS)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.987 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	3,979 cuft
Drainage area	=	0.200 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.200



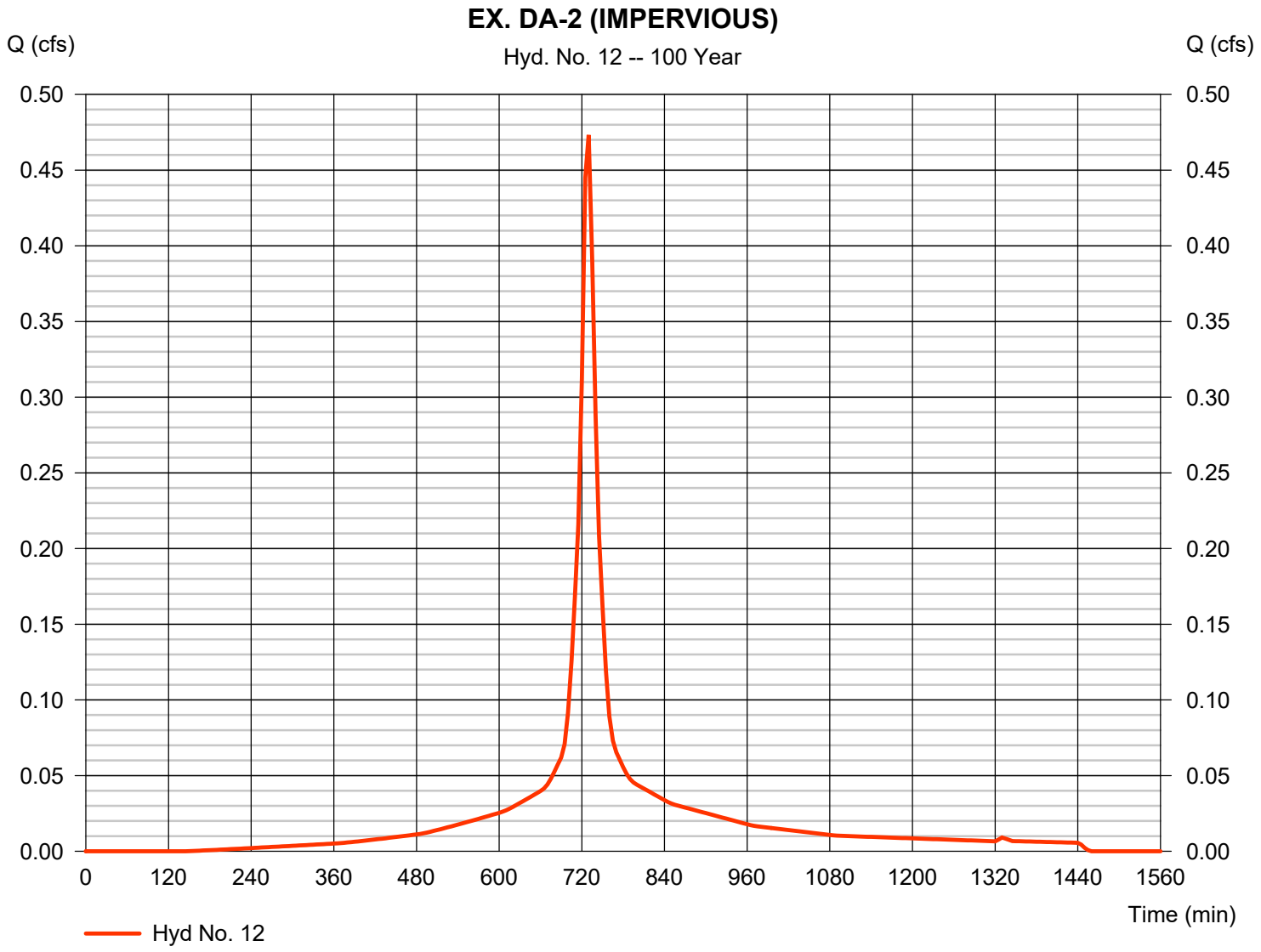
Hydrograph Report

Hyd. No. 12

EX. DA-2 (IMPERVIOUS)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.473 cfs
Storm frequency	= 100 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 2,052 cuft
Drainage area	= 0.080 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 8.62 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.120 x 77) + (0.070 x 80) + (0.070 x 91) + (0.410 x 98)] / 0.080

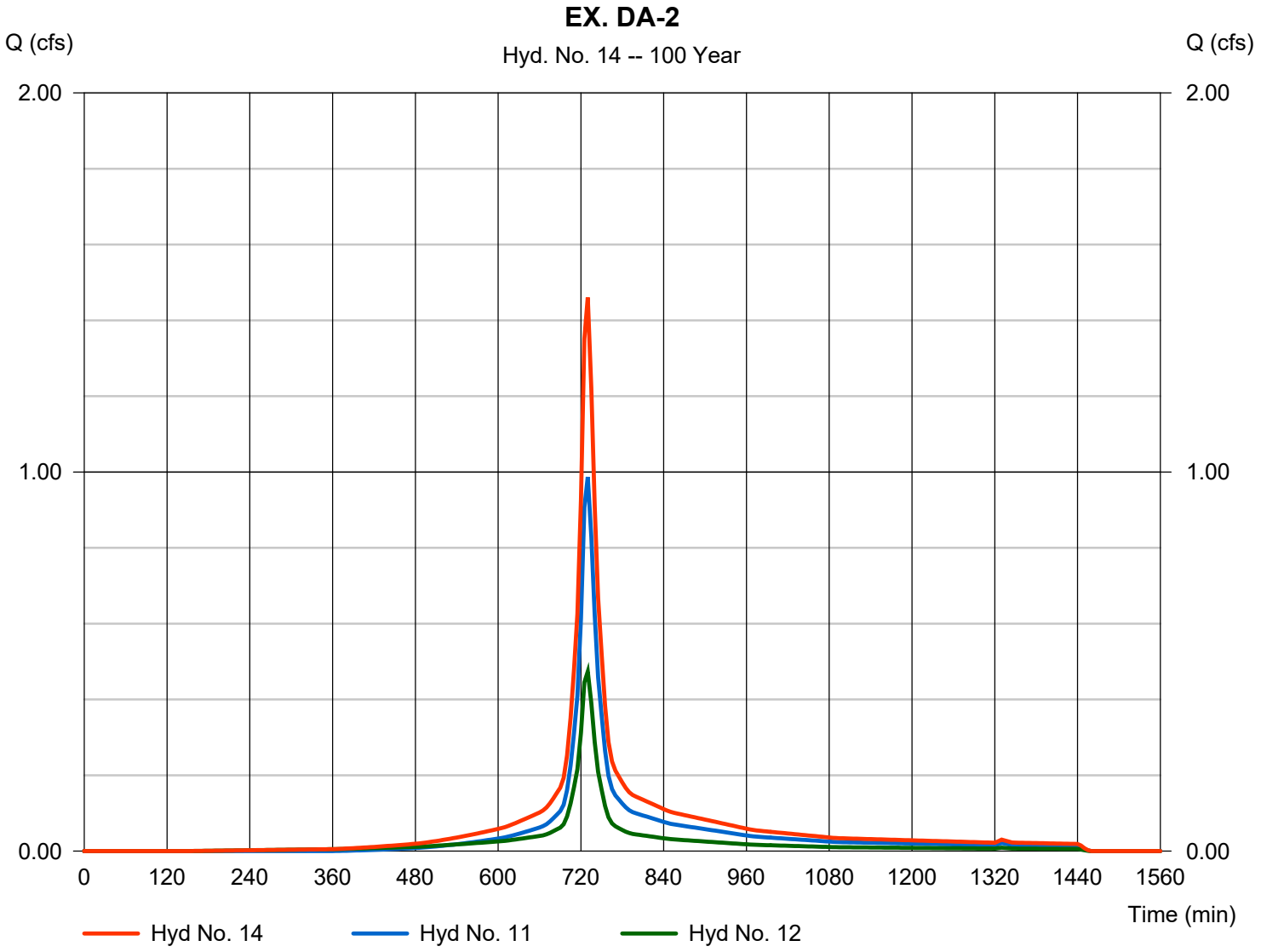


Hydrograph Report

Hyd. No. 14

EX. DA-2

Hydrograph type	=	Combine	Peak discharge	=	1.460 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	6,031 cuft
Inflow hyds.	=	11, 12	Contrib. drain. area	=	0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.479	1	727	1,658	------	------	------	PR. DA-1 (PERV)
2	SCS Runoff	15.21	1	726	58,486	------	------	------	PR. DA-1 (IMP)
3	Combine	15.68	1	726	60,144	1, 2	------	------	PR. DA-1
5	Reservoir	3.431	1	752	59,960	3	80.57	23,518	ROUTED DA-1
7	SCS Runoff	0.155	5	720	420	------	------	------	PR. DA-2 (PERV)
8	SCS Runoff	0.176	5	720	535	------	------	------	PR. DA-2 (IMP)
10	Combine	0.331	5	720	955	7, 8,	------	------	PR. DA-2
12	SCS Runoff	0.226	5	730	913	------	------	------	PR. DA-3 (PERV)
13	SCS Runoff	0.162	5	730	661	------	------	------	PR. DA-3 (IMP)
15	Combine	0.388	5	730	1,574	12, 13,	------	------	PR. DA-3

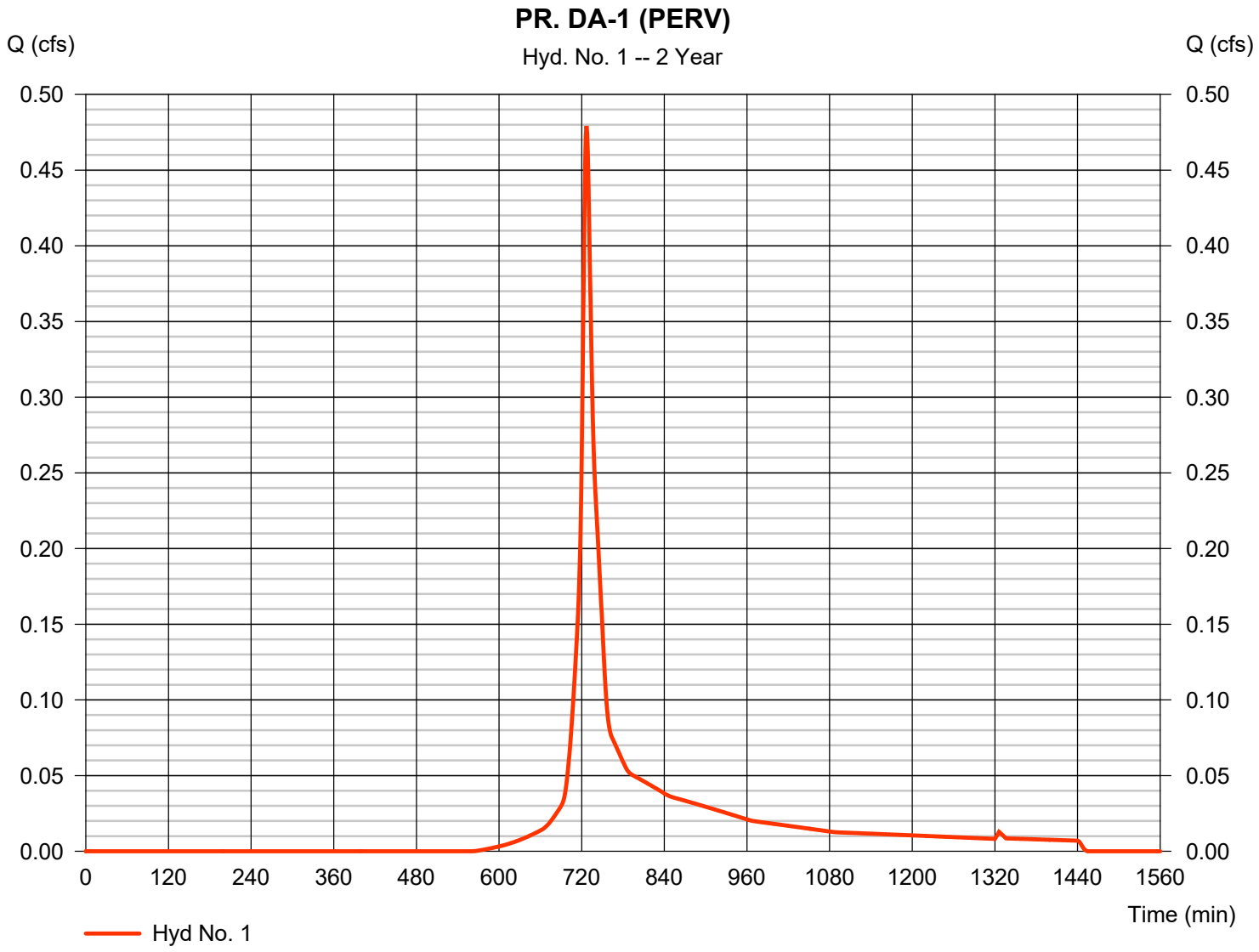
Hydrograph Report

Hyd. No. 1

PR. DA-1 (PERV)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.479 cfs
Storm frequency	= 2 yrs	Time to peak	= 727 min
Time interval	= 1 min	Hyd. volume	= 1,658 cuft
Drainage area	= 0.310 ac	Curve number	= 79*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.310



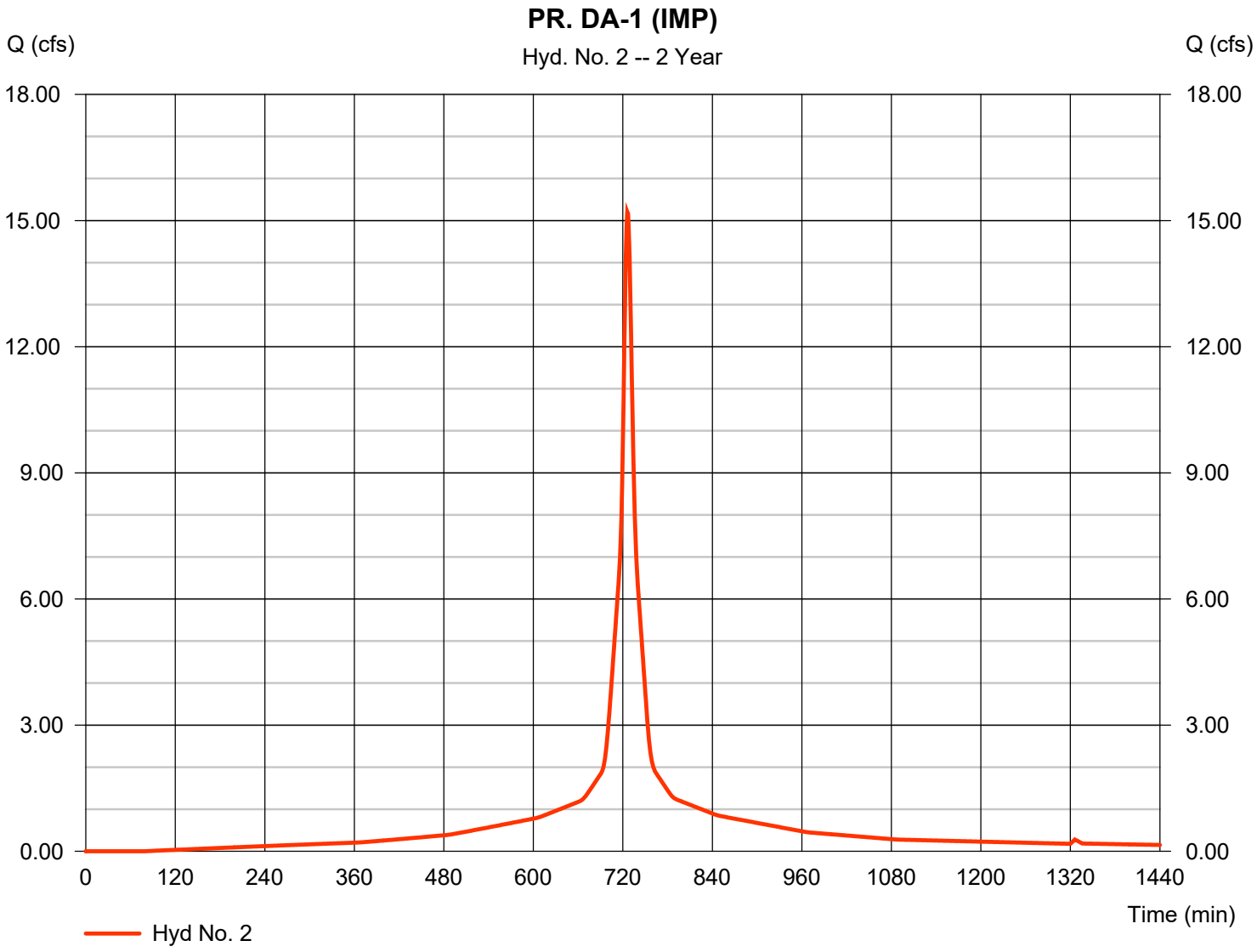
Hydrograph Report

Hyd. No. 2

PR. DA-1 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.21 cfs
Storm frequency	=	2 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	58,486 cuft
Drainage area	=	5.120 ac	Curve number	=	98*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 5.120

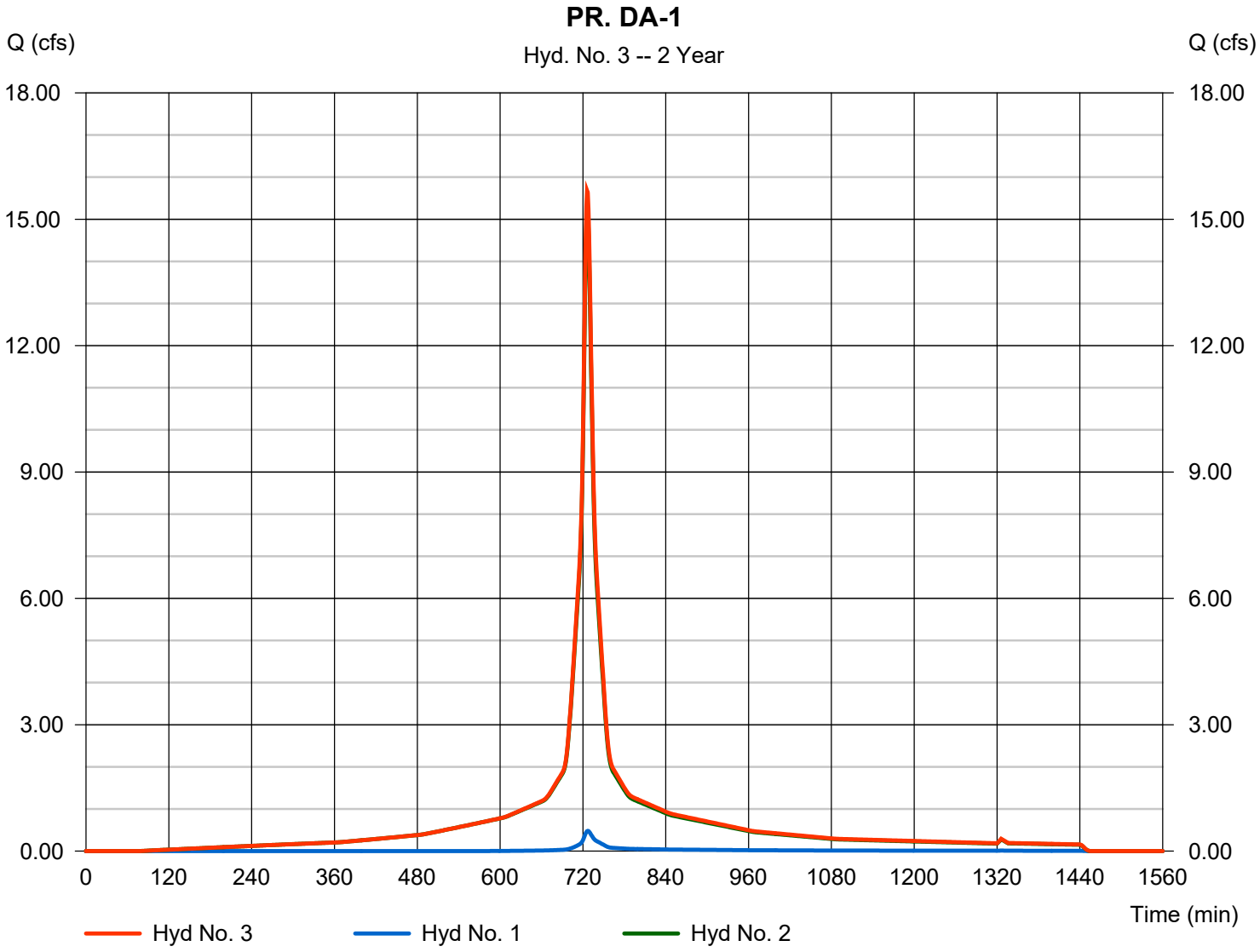


Hydrograph Report

Hyd. No. 3

PR. DA-1

Hydrograph type	= Combine	Peak discharge	= 15.68 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 1 min	Hyd. volume	= 60,144 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 5.430 ac



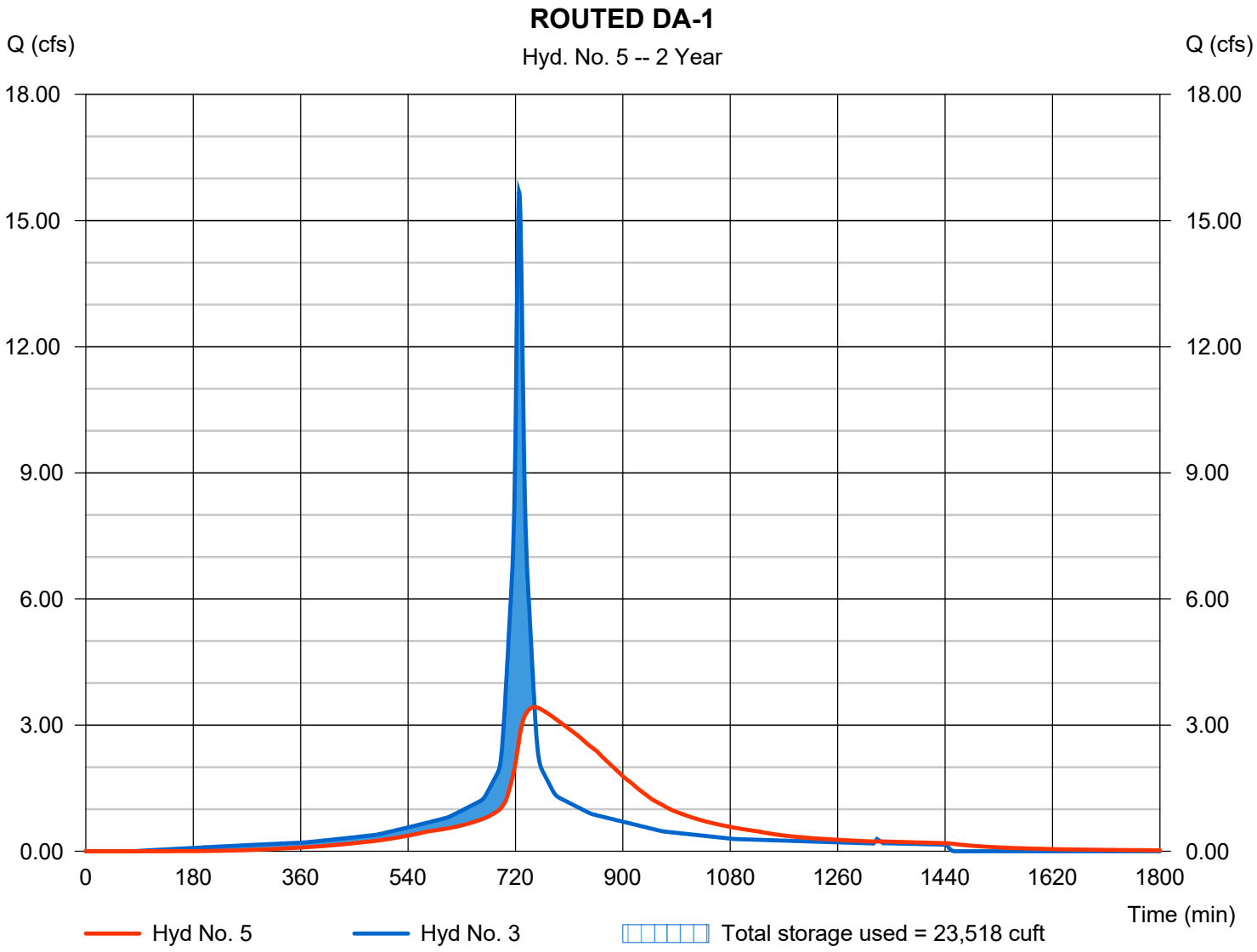
Hydrograph Report

Hyd. No. 5

ROUTED DA-1

Hydrograph type	=	Reservoir	Peak discharge	=	3.431 cfs
Storm frequency	=	2 yrs	Time to peak	=	752 min
Time interval	=	1 min	Hyd. volume	=	59,960 cuft
Inflow hyd. No.	=	3 - PR. DA-1	Max. Elevation	=	80.57 ft
Reservoir name	=	UG DETENTION	Max. Storage	=	23,518 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - UG DETENTION

Pond Data

UG Chambers -Invert elev. = 79.00 ft, Rise x Span = 4.00 x 4.00 ft, Barrel Len = 95.00 ft, No. Barrels = 48, Slope = 0.00%, Headers = Yes

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	79.00	n/a	0	0
0.40	79.40	n/a	3,364	3,364
0.80	79.80	n/a	5,825	9,189
1.20	80.20	n/a	7,093	16,283
1.60	80.60	n/a	7,813	24,096
2.00	81.00	n/a	8,163	32,258
2.40	81.40	n/a	8,162	40,421
2.80	81.80	n/a	7,811	48,232
3.20	82.20	n/a	7,090	55,322
3.60	82.60	n/a	5,828	61,150
4.00	83.00	n/a	3,352	64,502

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	12.50	0.00	0.00
Span (in)	= 18.00	12.50	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 79.00	79.00	0.00	0.00
Length (ft)	= 69.00	0.50	0.00	0.00
Slope (%)	= 0.97	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

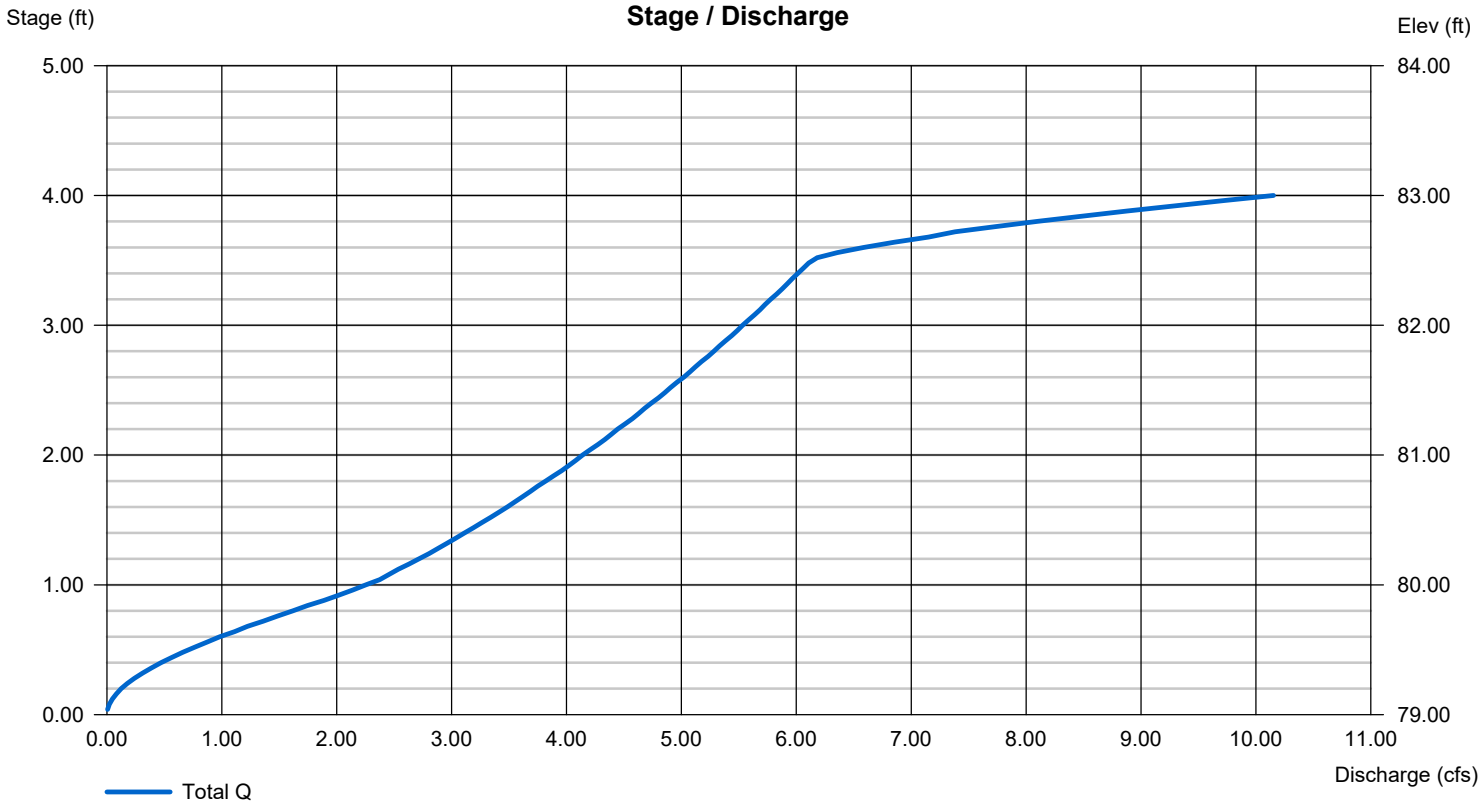
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 82.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= Yes	No	No	No

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

TW Elev. (ft) = 0.00

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

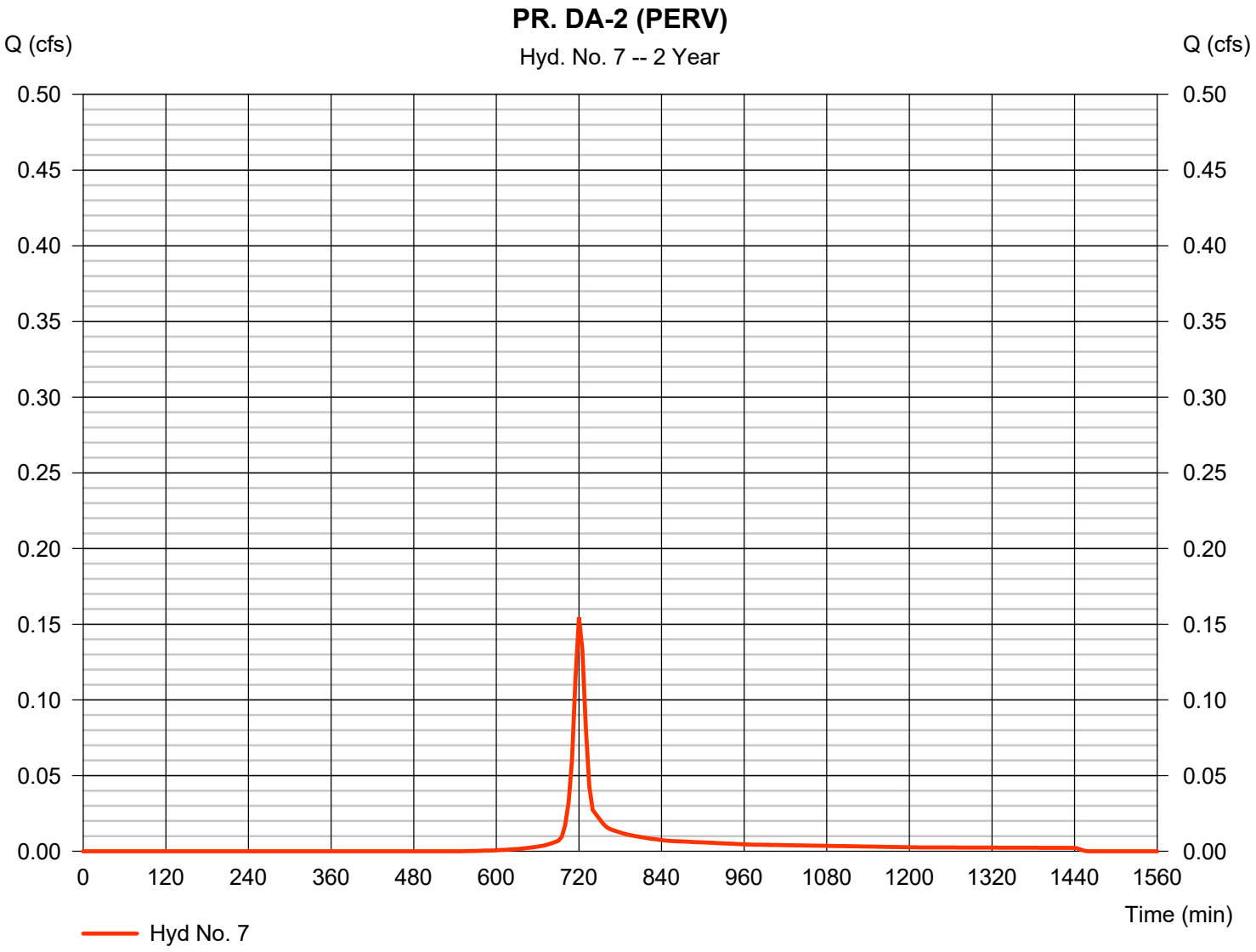


Hydrograph Report

Hyd. No. 7

PR. DA-2 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.155 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	420 cuft
Drainage area	=	0.080 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.38 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

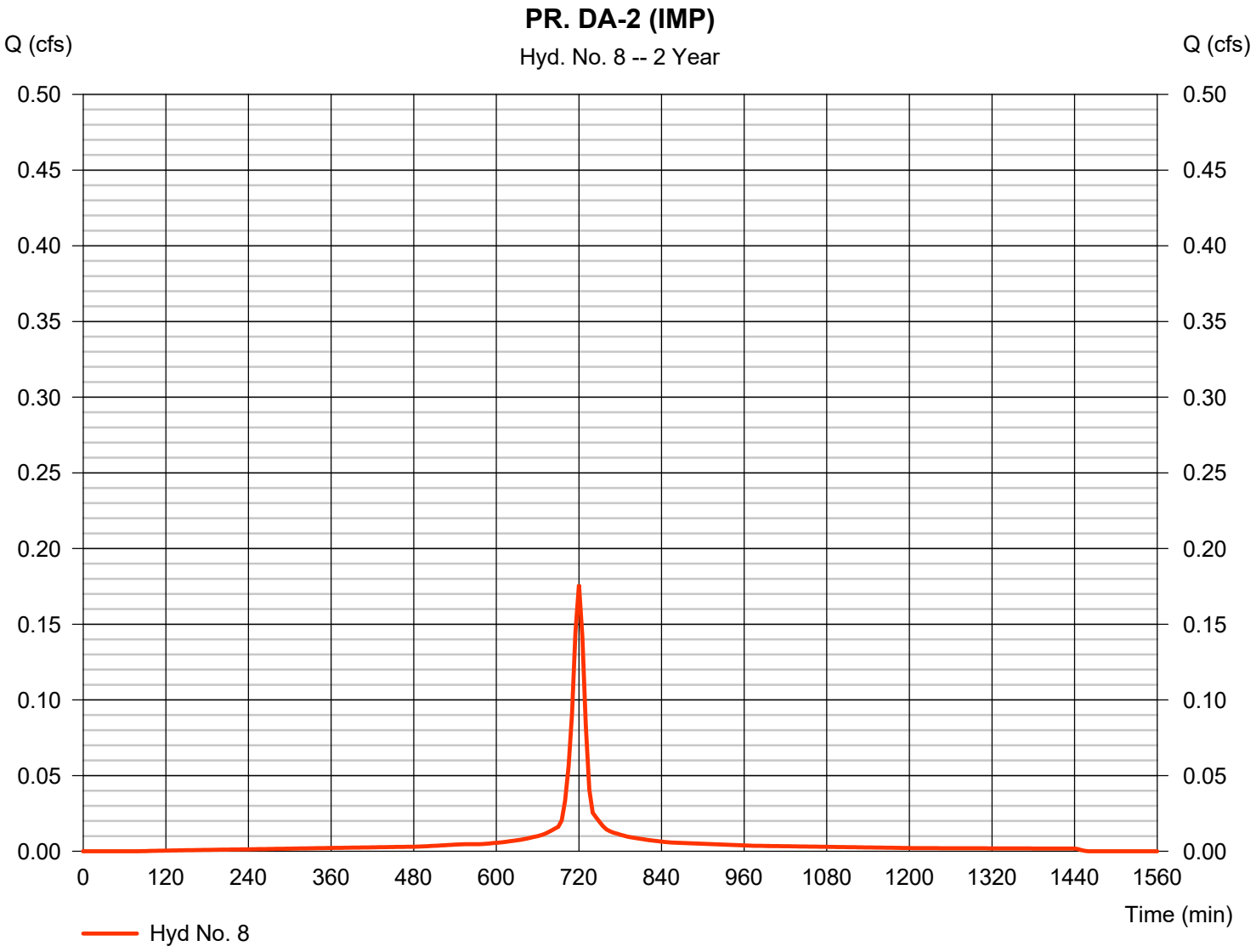


Hydrograph Report

Hyd. No. 8

PR. DA-2 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.176 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	535 cuft
Drainage area	=	0.050 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.38 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

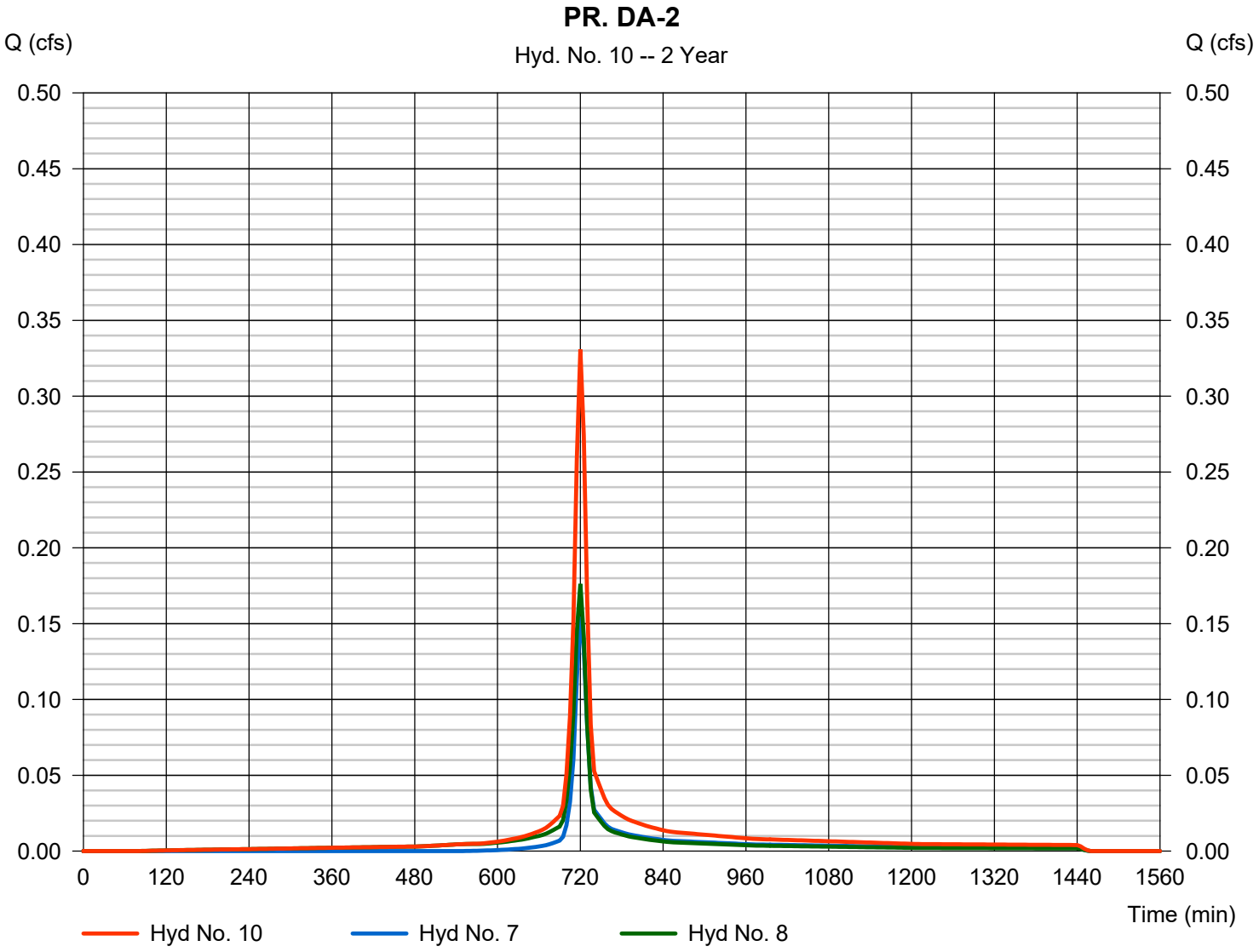


Hydrograph Report

Hyd. No. 10

PR. DA-2

Hydrograph type	=	Combine	Peak discharge	=	0.331 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	955 cuft
Inflow hyds.	=	7, 8	Contrib. drain. area	=	0.130 ac



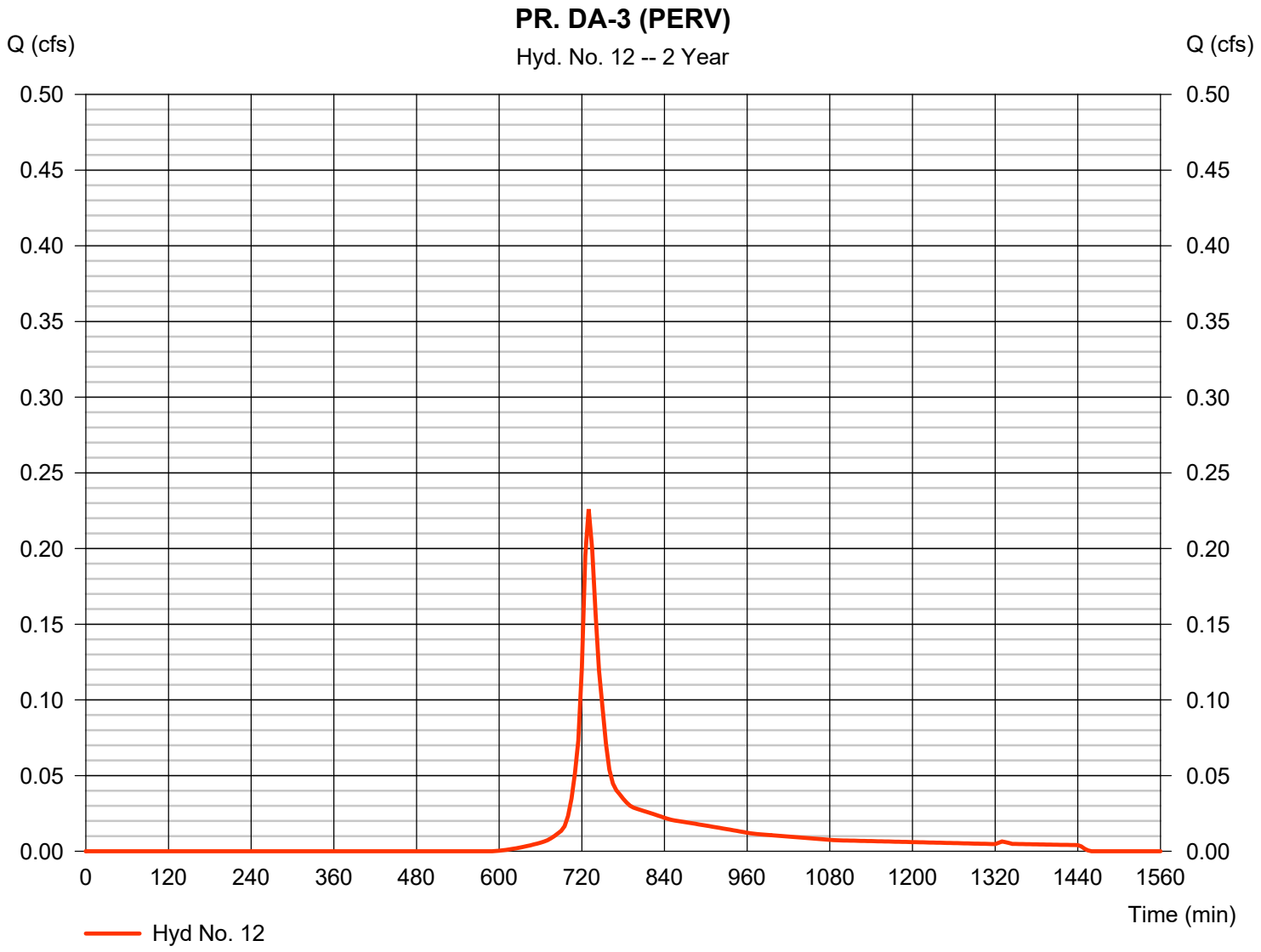
Hydrograph Report

Hyd. No. 12

PR. DA-3 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.226 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	913 cuft
Drainage area	=	0.200 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.200



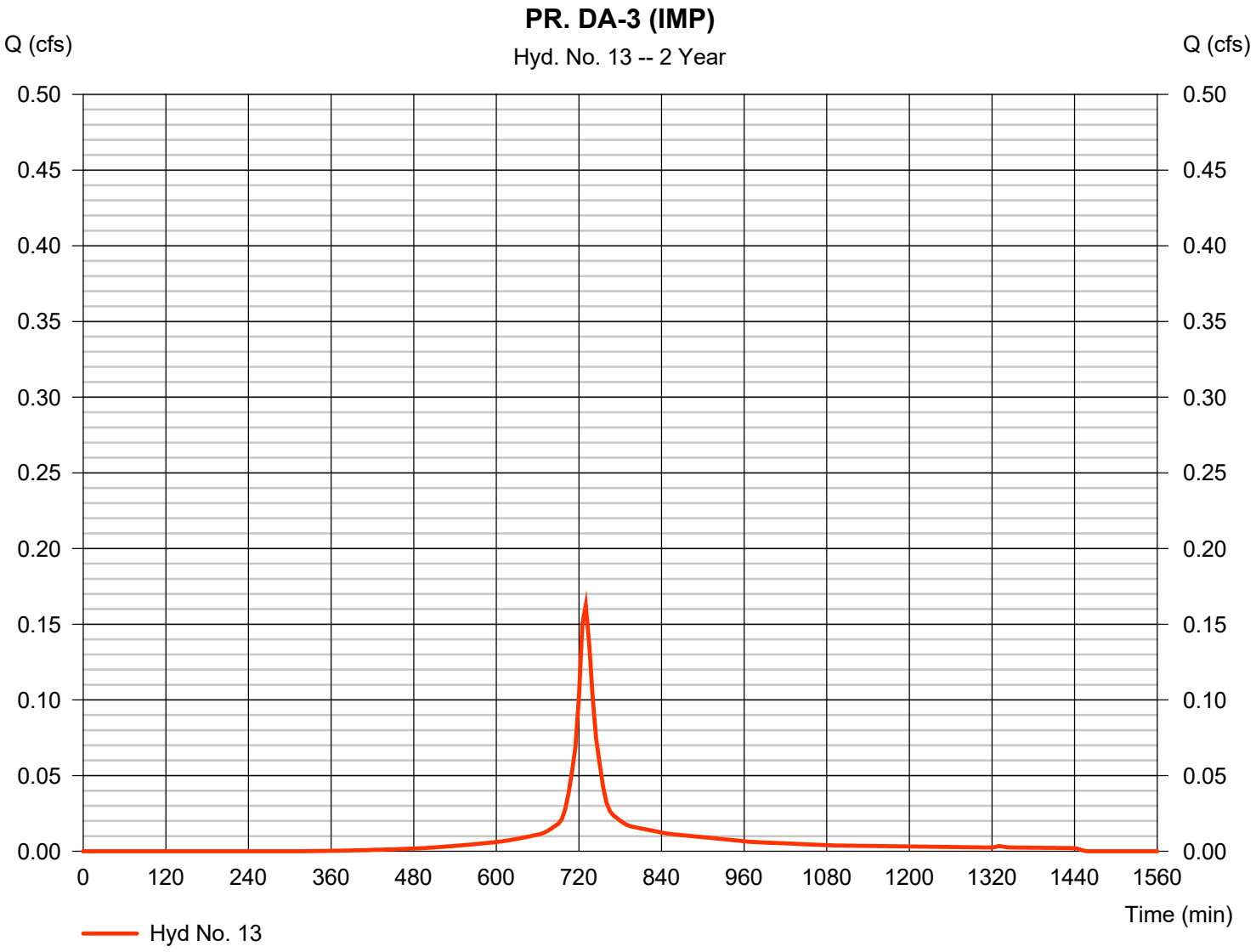
Hydrograph Report

Hyd. No. 13

PR. DA-3 (IMP)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.162 cfs
Storm frequency	= 2 yrs	Time to peak	= 730 min
Time interval	= 5 min	Hyd. volume	= 661 cuft
Drainage area	= 0.080 ac	Curve number	= 91*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.38 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.080

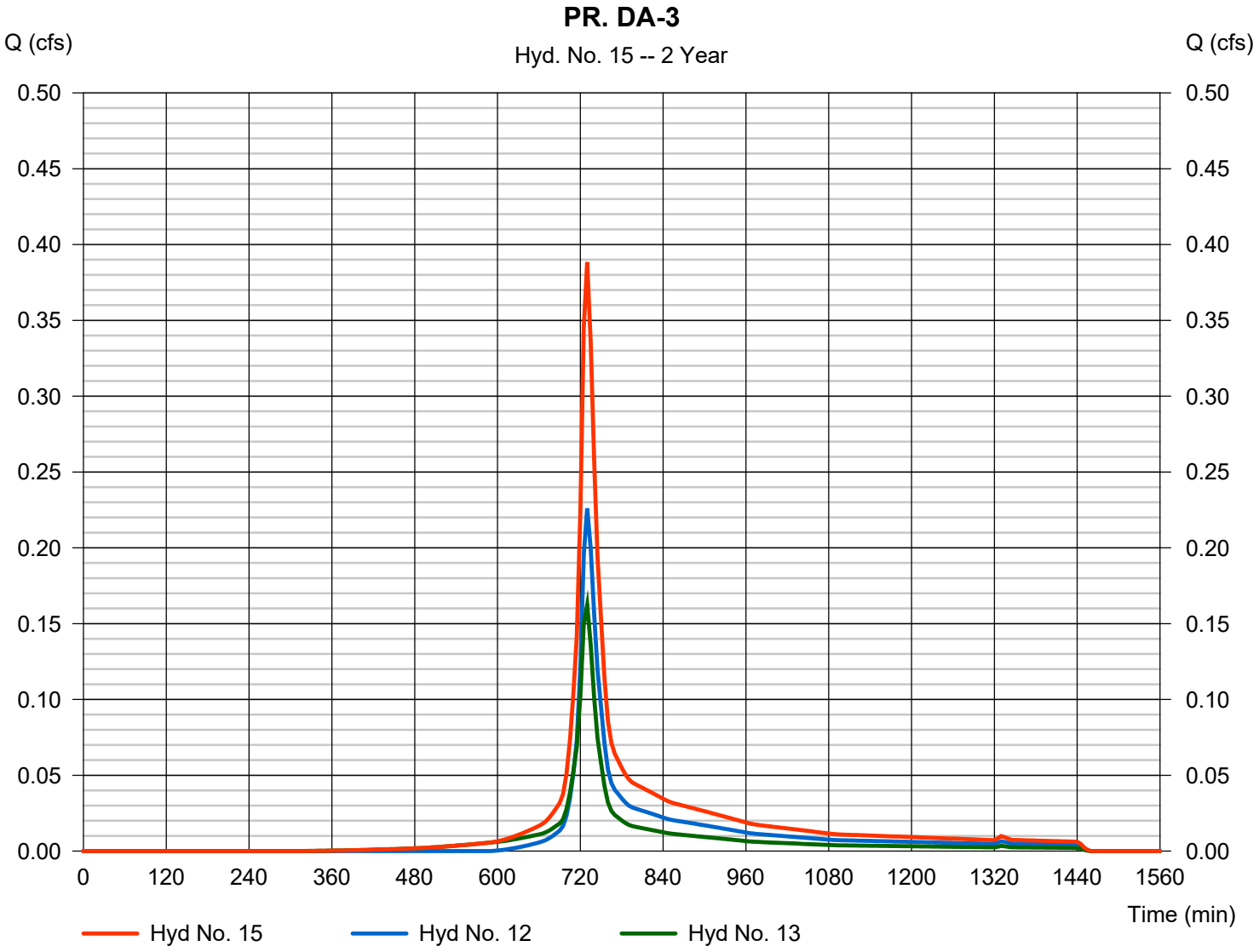


Hydrograph Report

Hyd. No. 15

PR. DA-3

Hydrograph type	=	Combine	Peak discharge	=	0.388 cfs
Storm frequency	=	2 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,574 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	0.963	1	727	3,298	------	------	------	PR. DA-1 (PERV)
2	SCS Runoff	23.33	1	726	91,310	------	------	------	PR. DA-1 (IMP)
3	Combine	24.29	1	726	94,608	1, 2	------	------	PR. DA-1
5	Reservoir	4.535	1	754	94,417	3	81.26	37,485	ROUTED DA-1
7	SCS Runoff	0.305	5	720	823	------	------	------	PR. DA-2 (PERV)
8	SCS Runoff	0.270	5	720	836	------	------	------	PR. DA-2 (IMP)
10	Combine	0.575	5	720	1,659	7, 8,	------	------	PR. DA-2
12	SCS Runoff	0.471	5	730	1,871	------	------	------	PR. DA-3 (PERV)
13	SCS Runoff	0.269	5	730	1,124	------	------	------	PR. DA-3 (IMP)
15	Combine	0.740	5	730	2,995	12, 13,	------	------	PR. DA-3

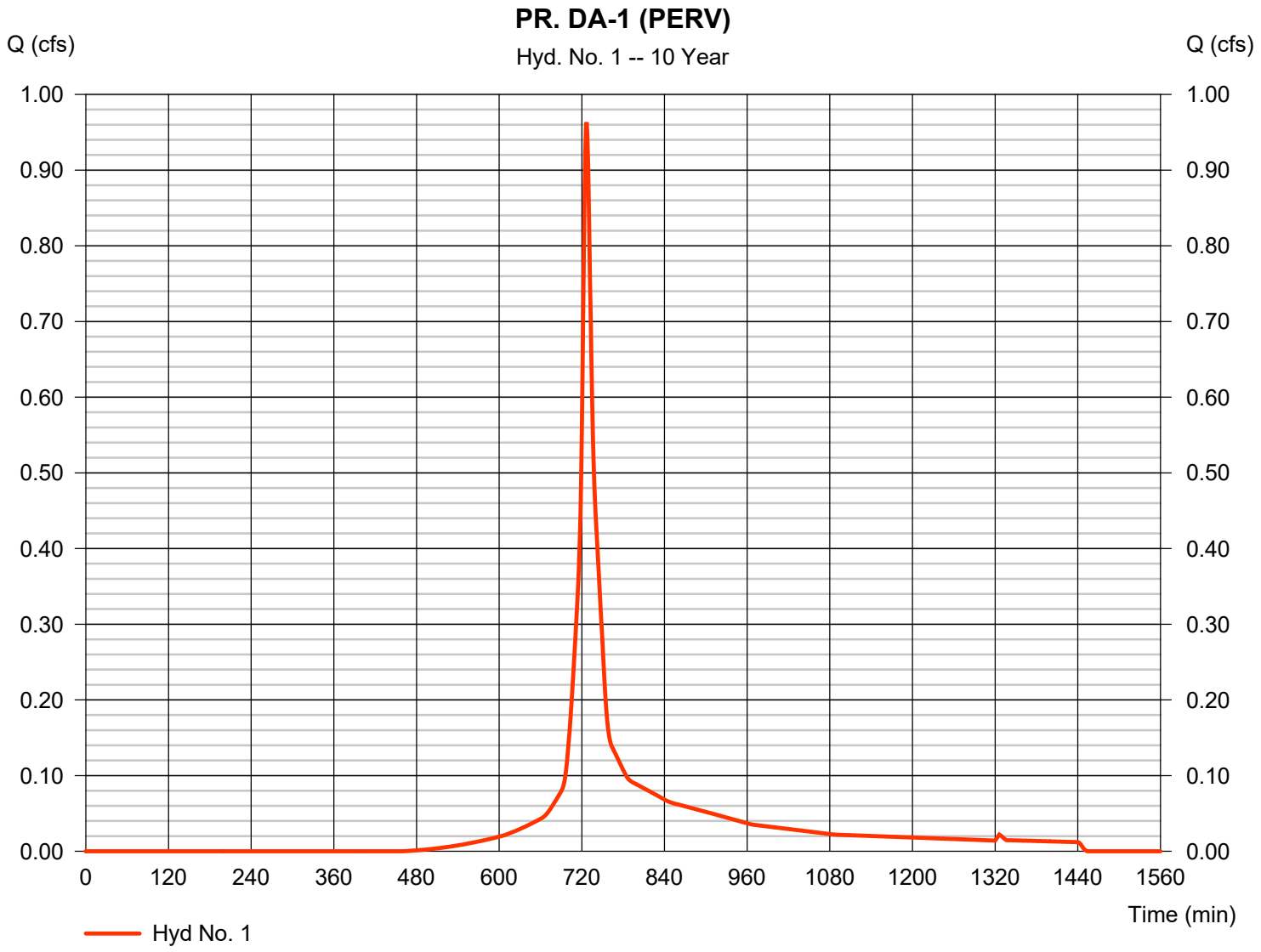
Hydrograph Report

Hyd. No. 1

PR. DA-1 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.963 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	3,298 cuft
Drainage area	=	0.310 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.310



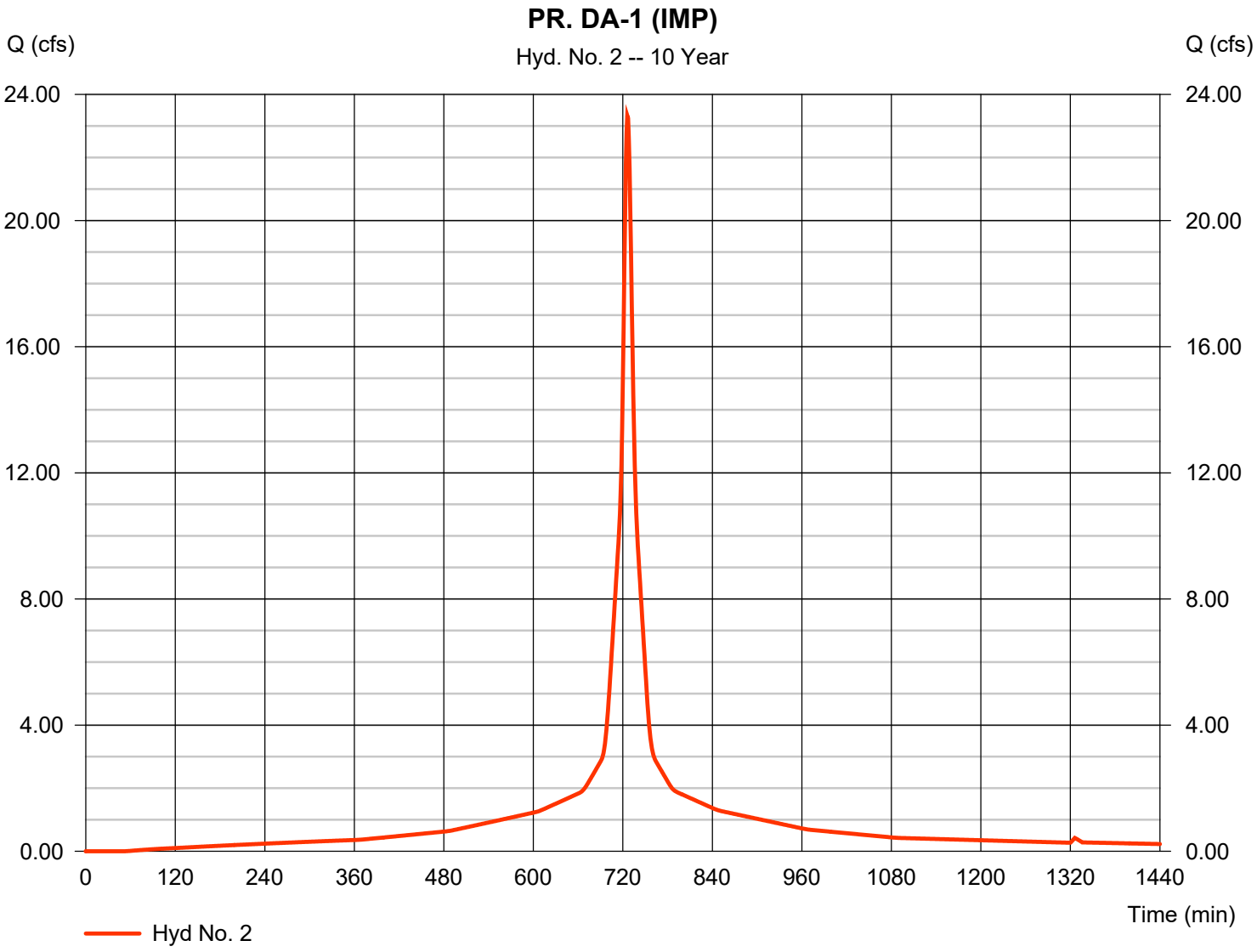
Hydrograph Report

Hyd. No. 2

PR. DA-1 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.33 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	91,310 cuft
Drainage area	=	5.120 ac	Curve number	=	98*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 5.120

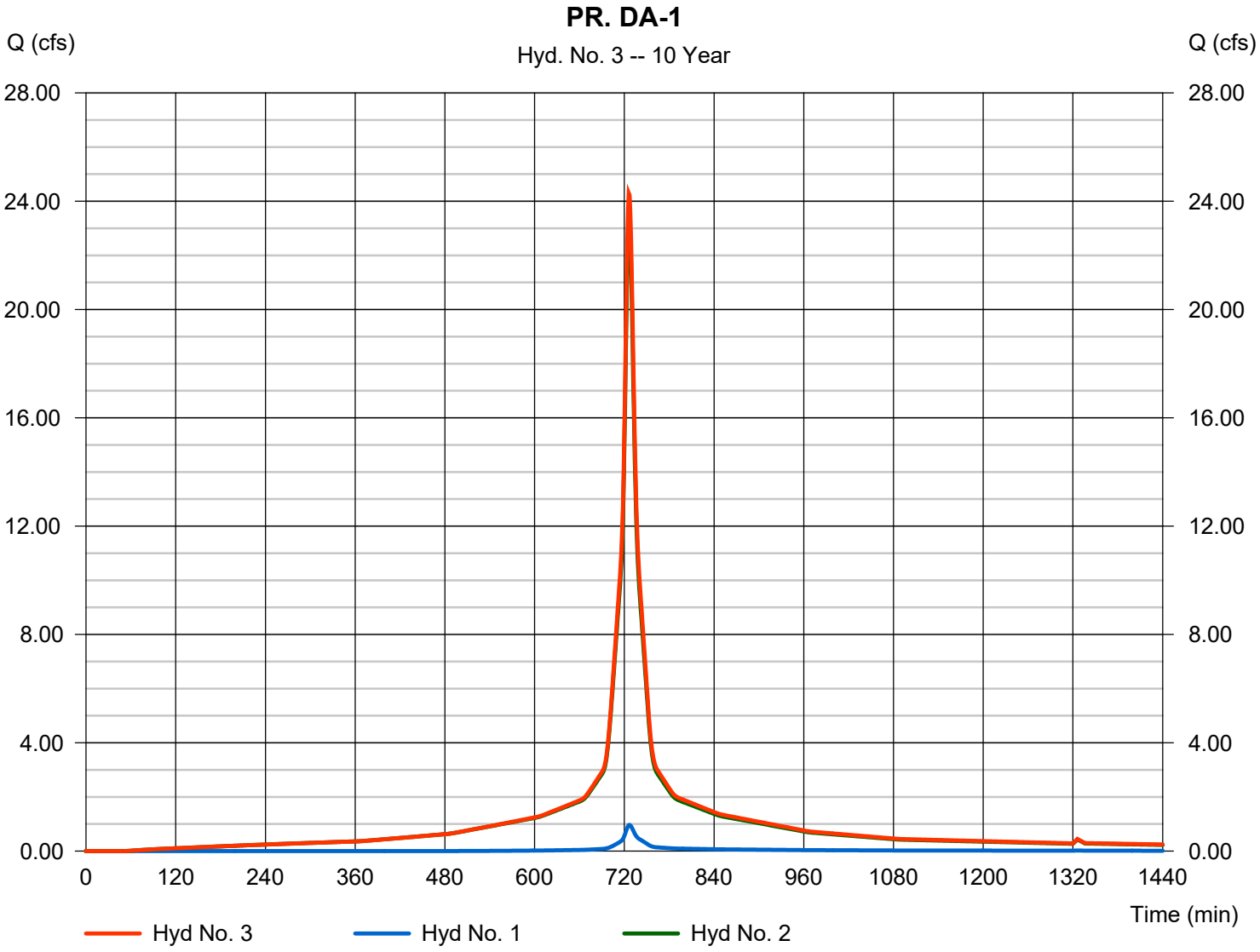


Hydrograph Report

Hyd. No. 3

PR. DA-1

Hydrograph type	=	Combine	Peak discharge	=	24.29 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	94,608 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	5.430 ac



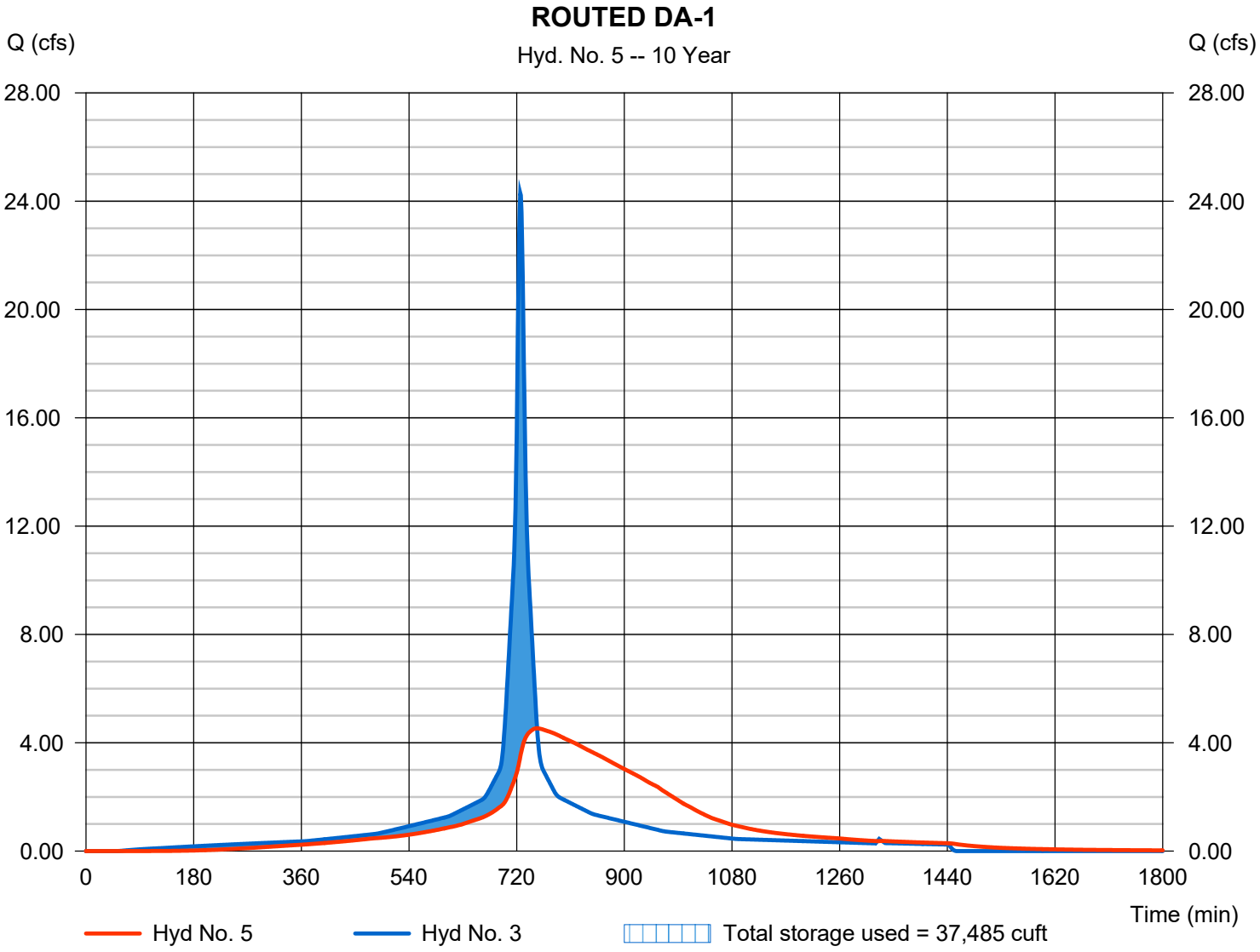
Hydrograph Report

Hyd. No. 5

ROUTED DA-1

Hydrograph type	=	Reservoir	Peak discharge	=	4.535 cfs
Storm frequency	=	10 yrs	Time to peak	=	754 min
Time interval	=	1 min	Hyd. volume	=	94,417 cuft
Inflow hyd. No.	=	3 - PR. DA-1	Max. Elevation	=	81.26 ft
Reservoir name	=	UG DETENTION	Max. Storage	=	37,485 cuft

Storage Indication method used.

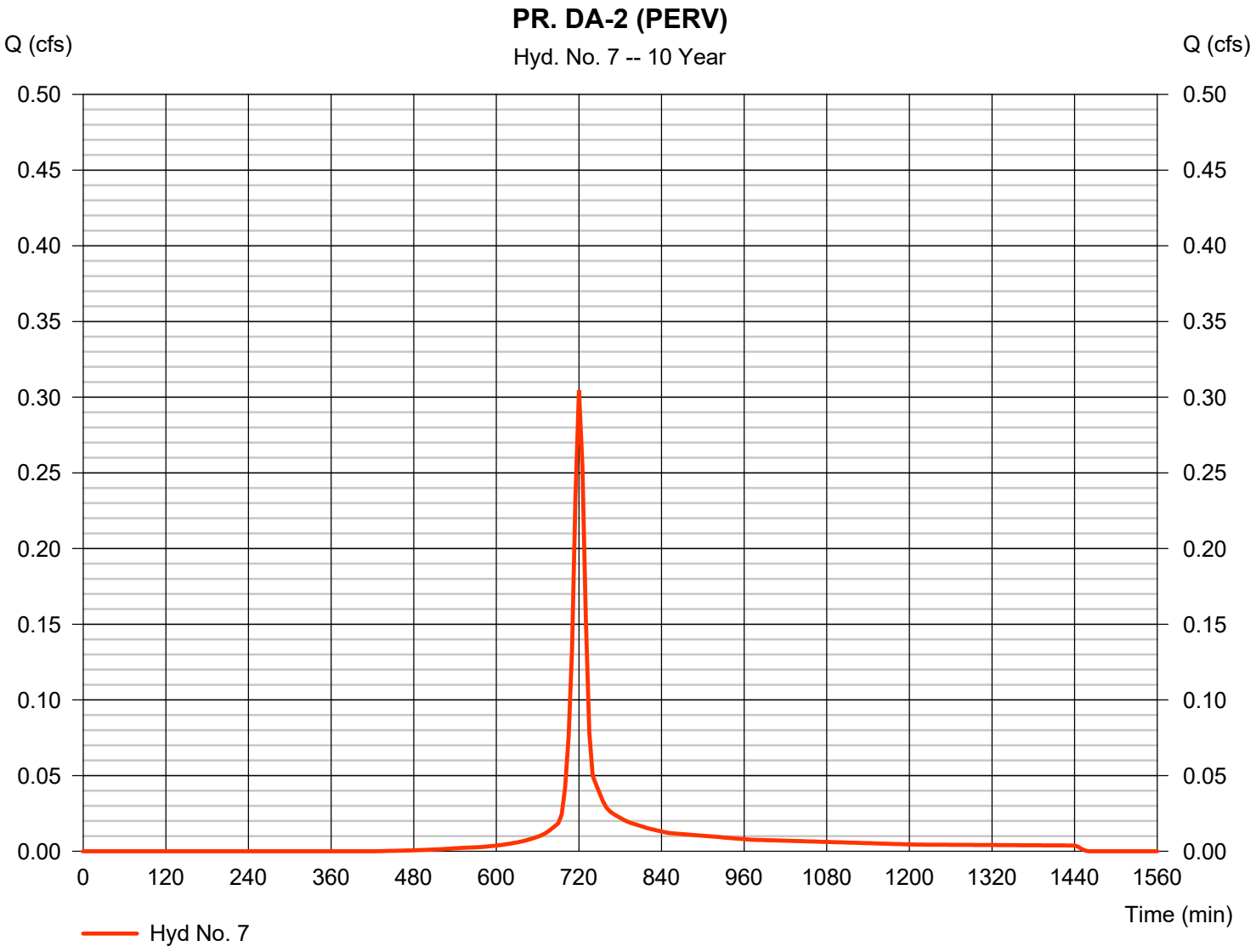


Hydrograph Report

Hyd. No. 7

PR. DA-2 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.305 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	823 cuft
Drainage area	=	0.080 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

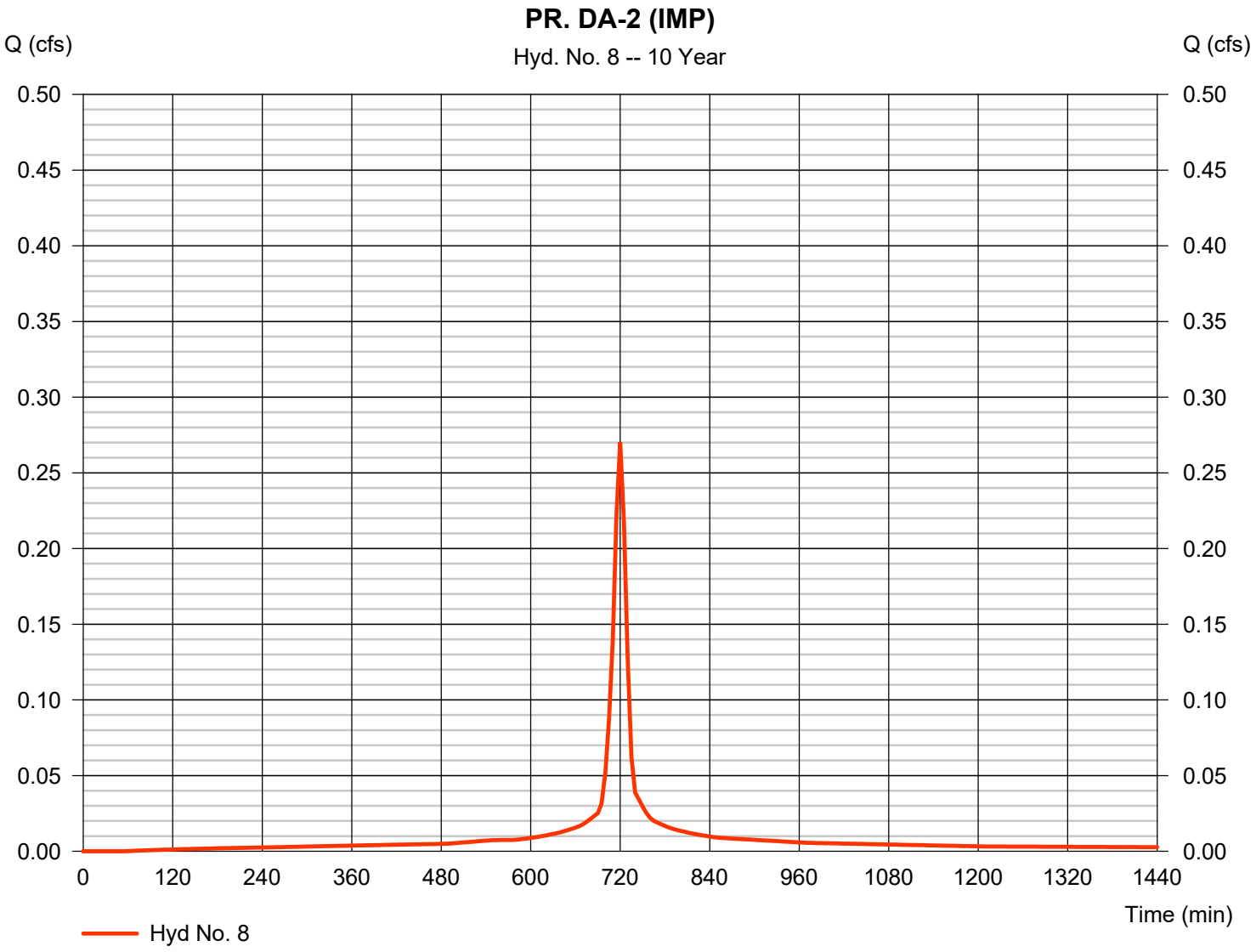


Hydrograph Report

Hyd. No. 8

PR. DA-2 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.270 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	836 cuft
Drainage area	=	0.050 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

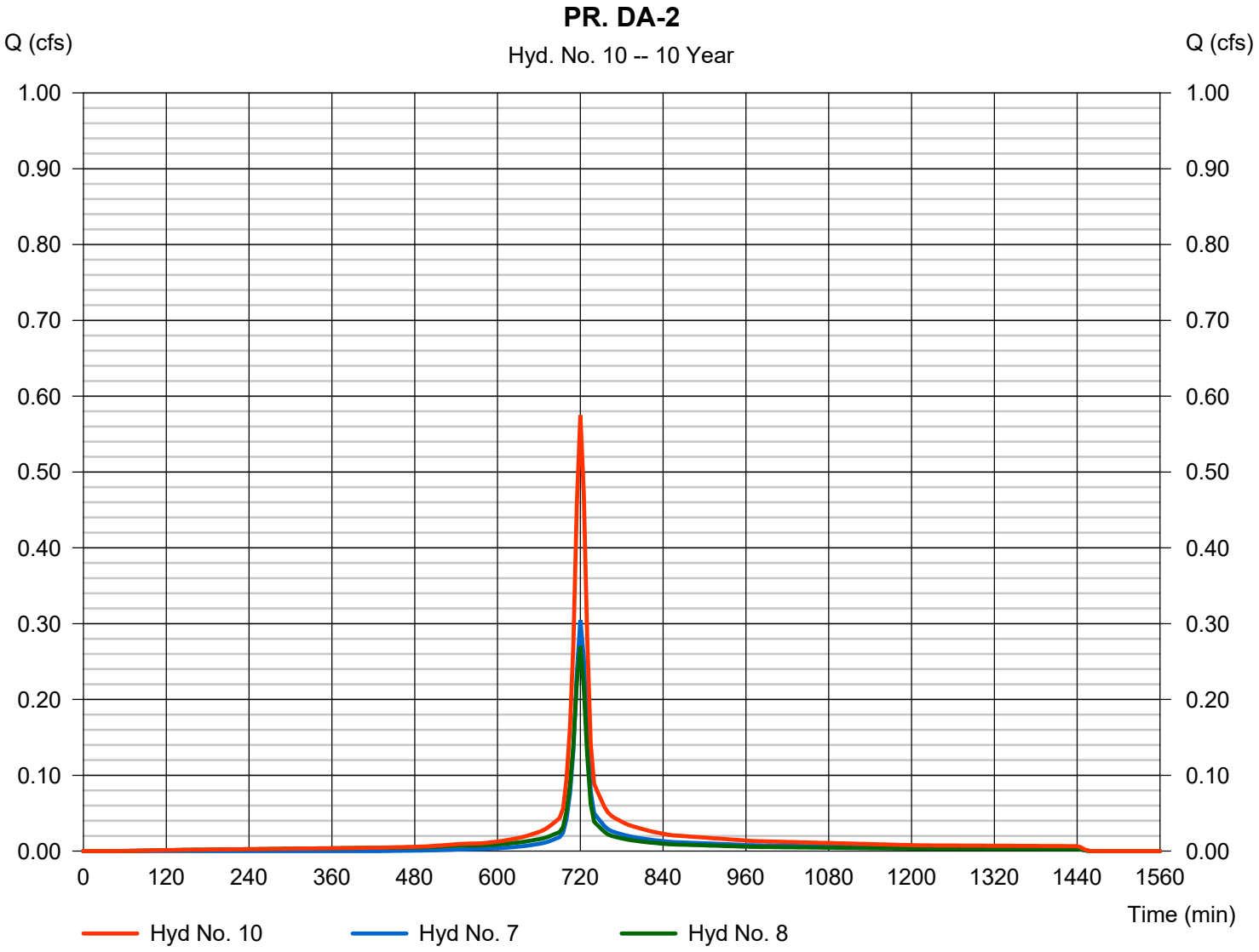


Hydrograph Report

Hyd. No. 10

PR. DA-2

Hydrograph type	= Combine	Peak discharge	= 0.575 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 5 min	Hyd. volume	= 1,659 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.130 ac



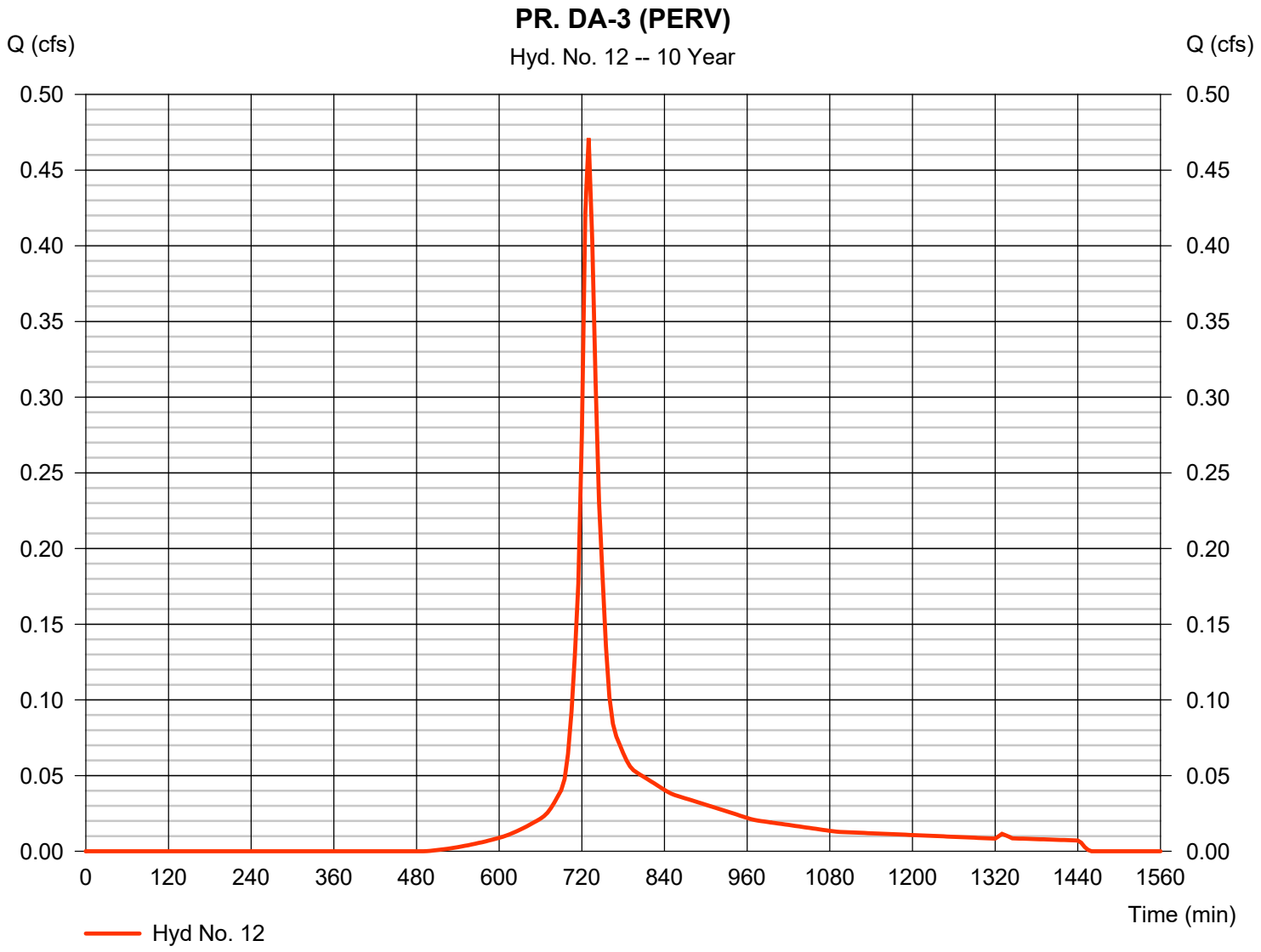
Hydrograph Report

Hyd. No. 12

PR. DA-3 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.471 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,871 cuft
Drainage area	=	0.200 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.200



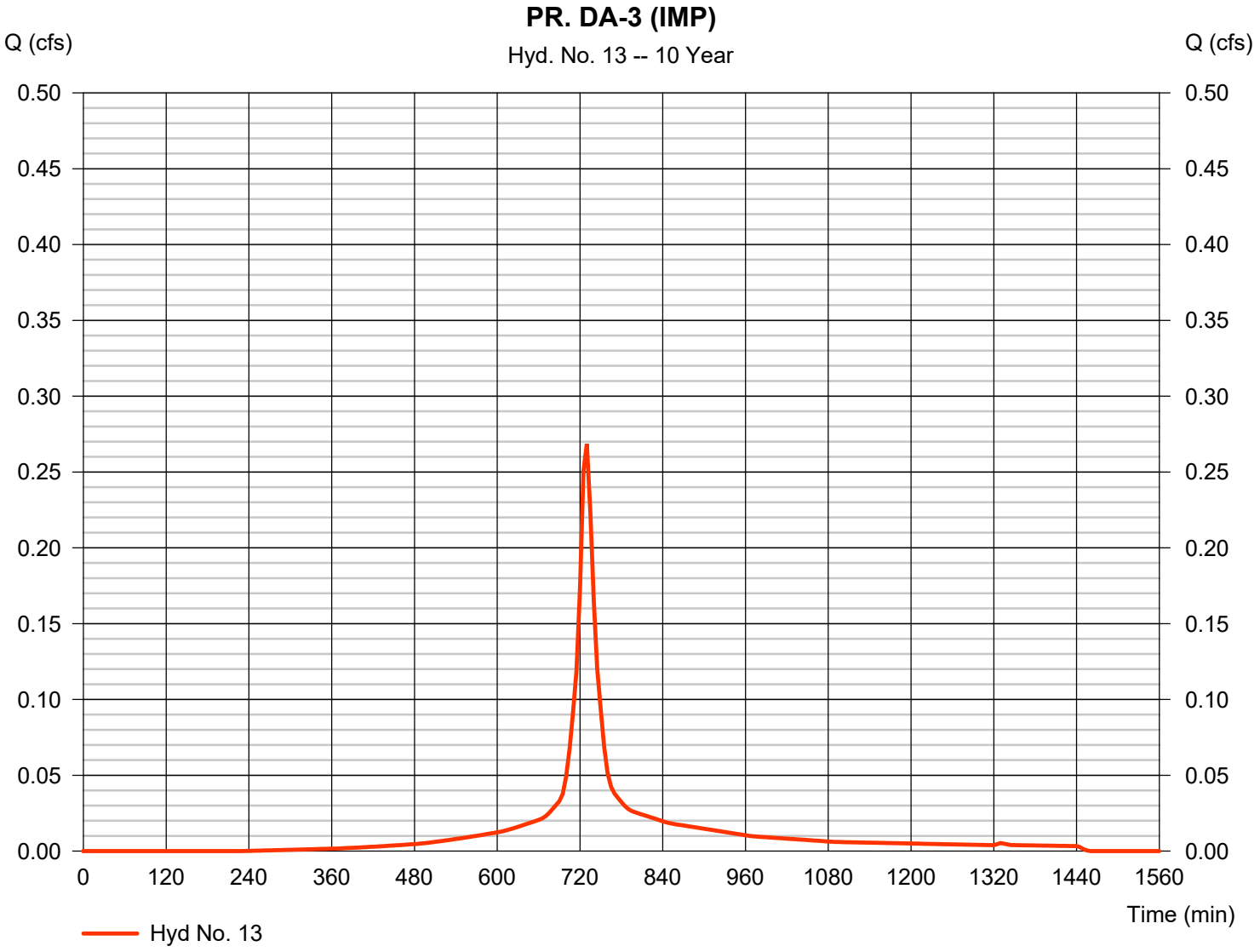
Hydrograph Report

Hyd. No. 13

PR. DA-3 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.269 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,124 cuft
Drainage area	=	0.080 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.15 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.080

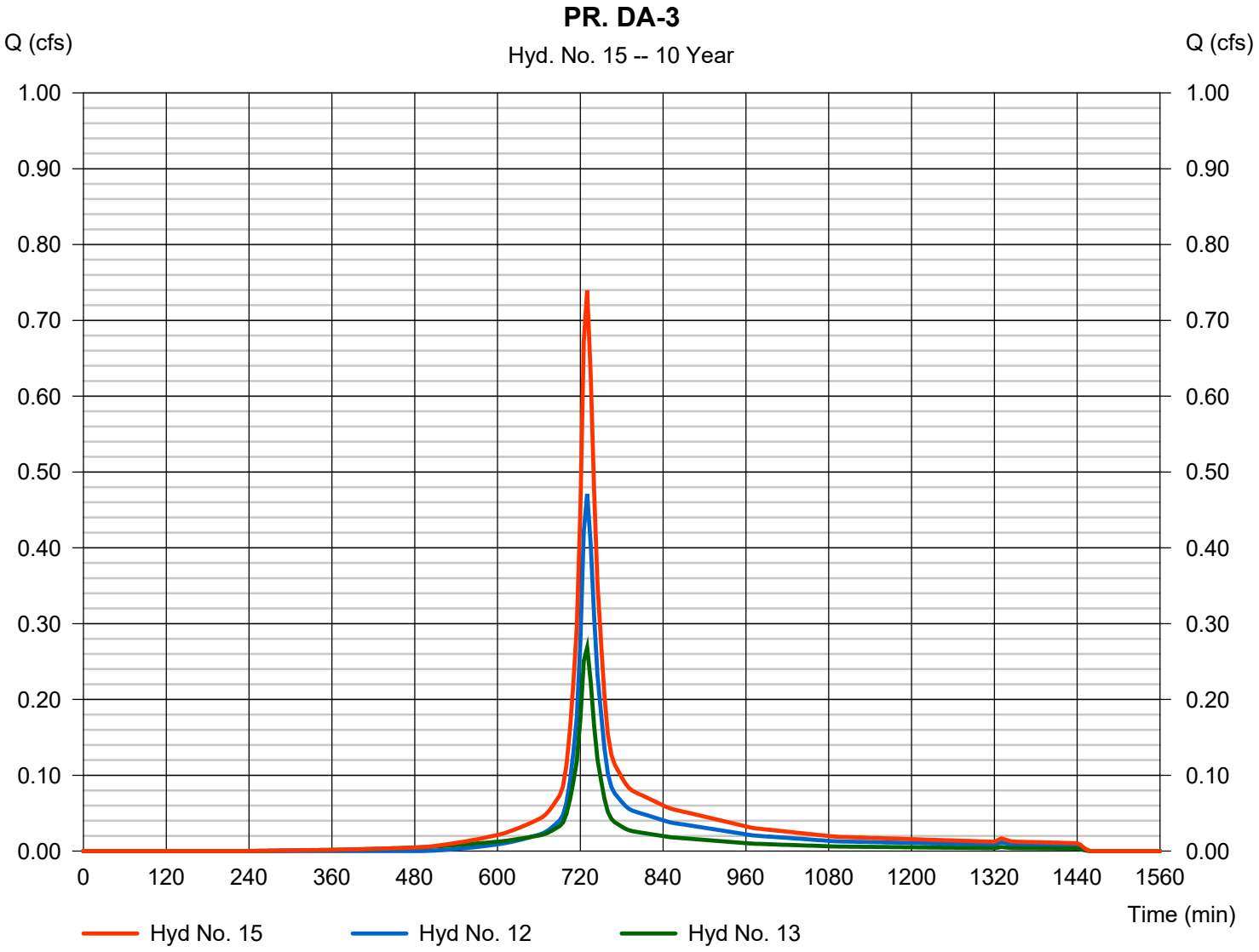


Hydrograph Report

Hyd. No. 15

PR. DA-3

Hydrograph type	=	Combine	Peak discharge	=	0.740 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	2,995 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.315	1	727	4,525	------	------	------	PR. DA-1 (PERV)
2	SCS Runoff	28.96	1	726	114,143	------	------	------	PR. DA-1 (IMP)
3	Combine	30.27	1	726	118,667	1, 2	------	------	PR. DA-1
5	Reservoir	5.237	1	755	118,473	3	81.76	47,516	ROUTED DA-1
7	SCS Runoff	0.413	5	720	1,123	------	------	------	PR. DA-2 (PERV)
8	SCS Runoff	0.335	5	720	1,045	------	------	------	PR. DA-2 (IMP)
10	Combine	0.748	5	720	2,168	7, 8,	------	------	PR. DA-2
12	SCS Runoff	0.651	5	730	2,595	------	------	------	PR. DA-3 (PERV)
13	SCS Runoff	0.342	5	730	1,451	------	------	------	PR. DA-3 (IMP)
15	Combine	0.993	5	730	4,046	12, 13,	------	------	PR. DA-3

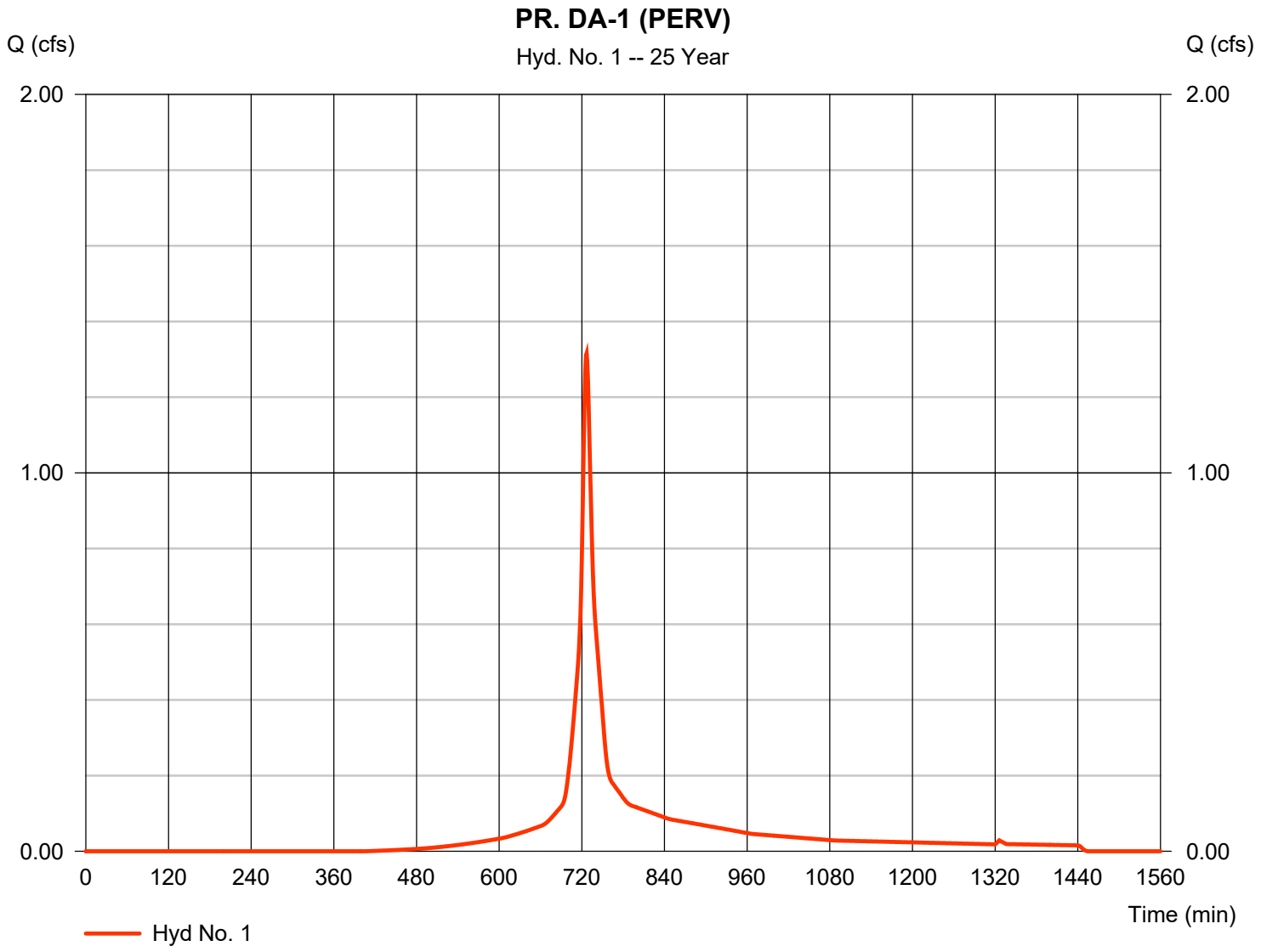
Hydrograph Report

Hyd. No. 1

PR. DA-1 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.315 cfs
Storm frequency	=	25 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	4,525 cuft
Drainage area	=	0.310 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.310



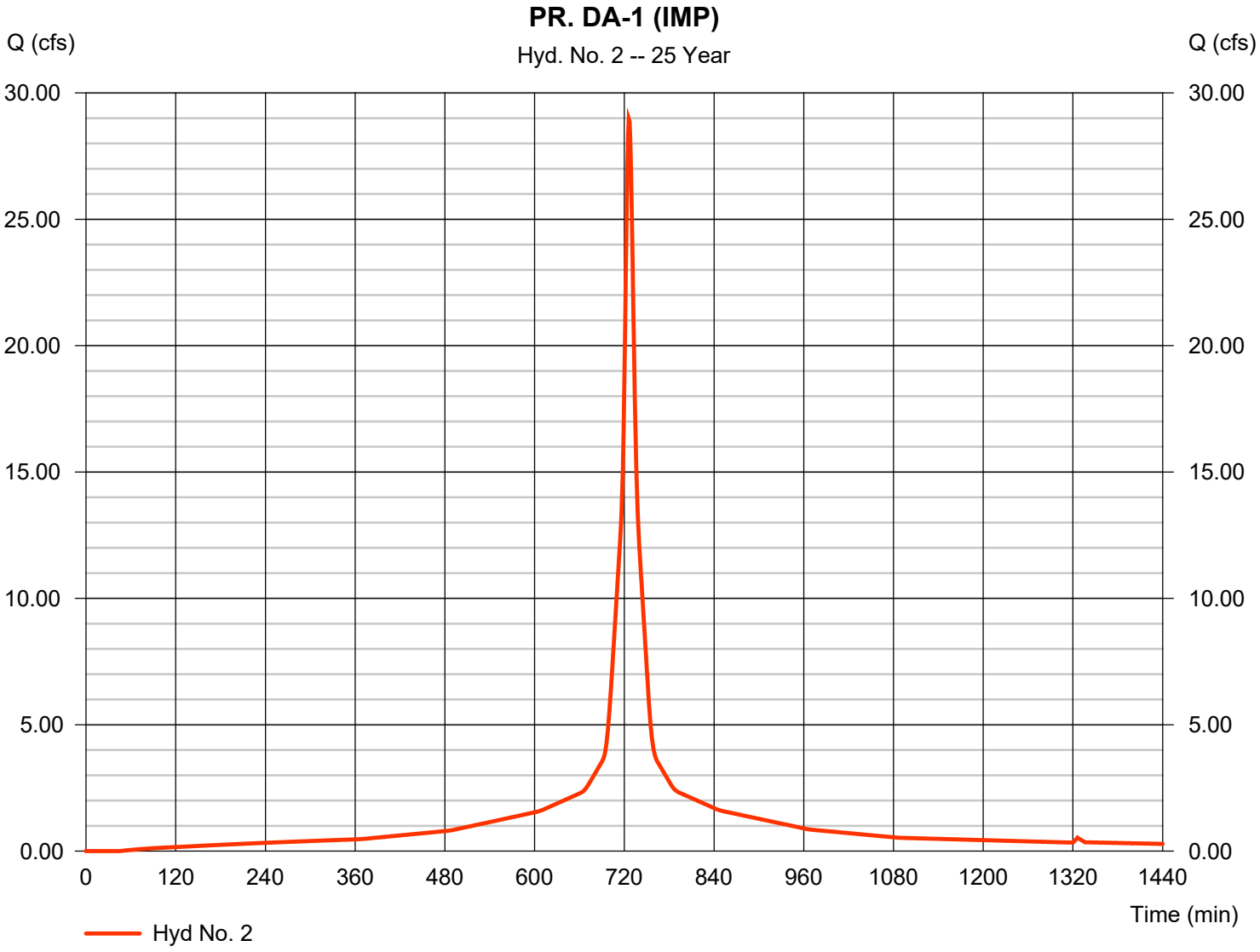
Hydrograph Report

Hyd. No. 2

PR. DA-1 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.96 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	114,143 cuft
Drainage area	=	5.120 ac	Curve number	=	98*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 5.120

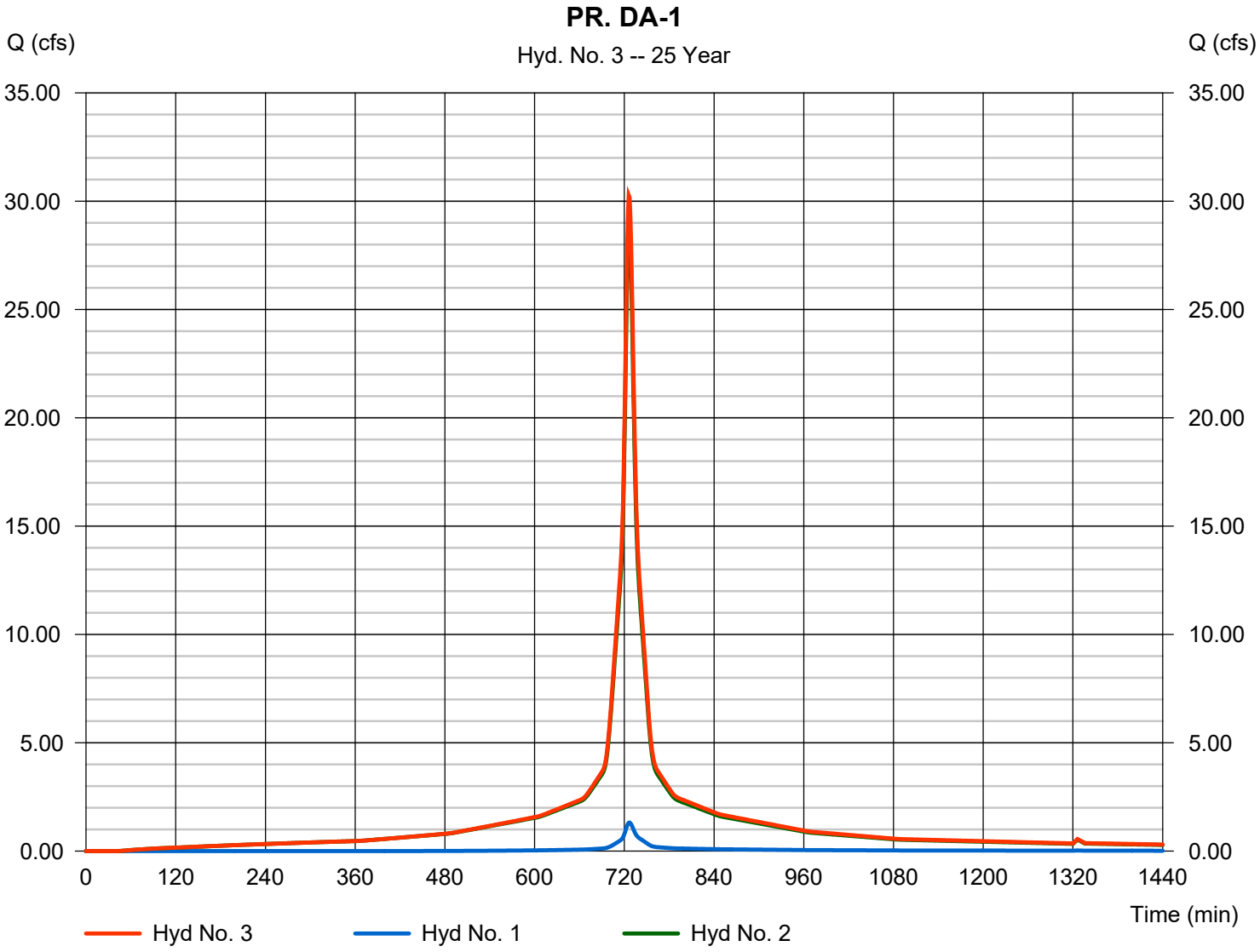


Hydrograph Report

Hyd. No. 3

PR. DA-1

Hydrograph type	=	Combine	Peak discharge	=	30.27 cfs
Storm frequency	=	25 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	118,667 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	5.430 ac



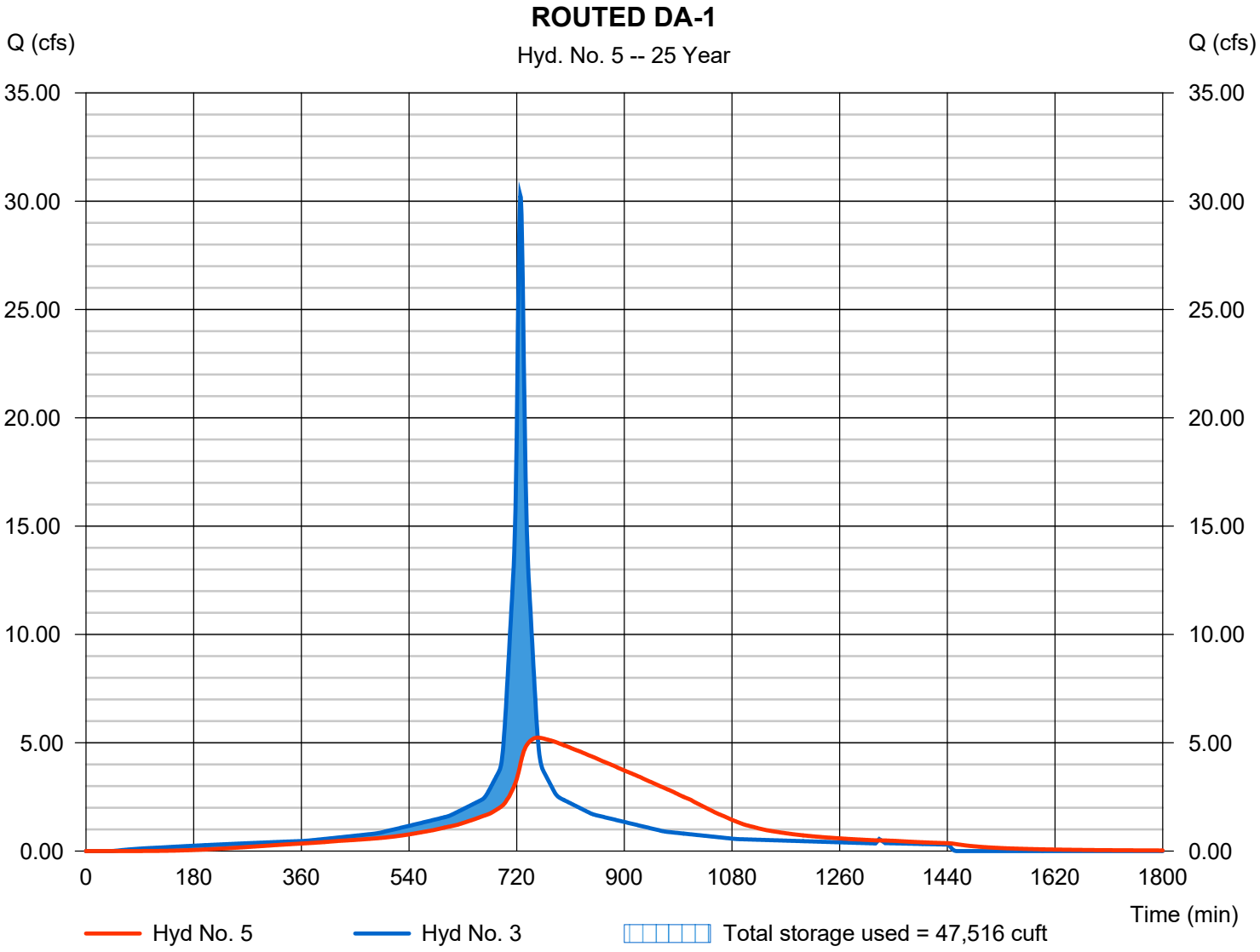
Hydrograph Report

Hyd. No. 5

ROUTED DA-1

Hydrograph type	=	Reservoir	Peak discharge	=	5.237 cfs
Storm frequency	=	25 yrs	Time to peak	=	755 min
Time interval	=	1 min	Hyd. volume	=	118,473 cuft
Inflow hyd. No.	=	3 - PR. DA-1	Max. Elevation	=	81.76 ft
Reservoir name	=	UG DETENTION	Max. Storage	=	47,516 cuft

Storage Indication method used.

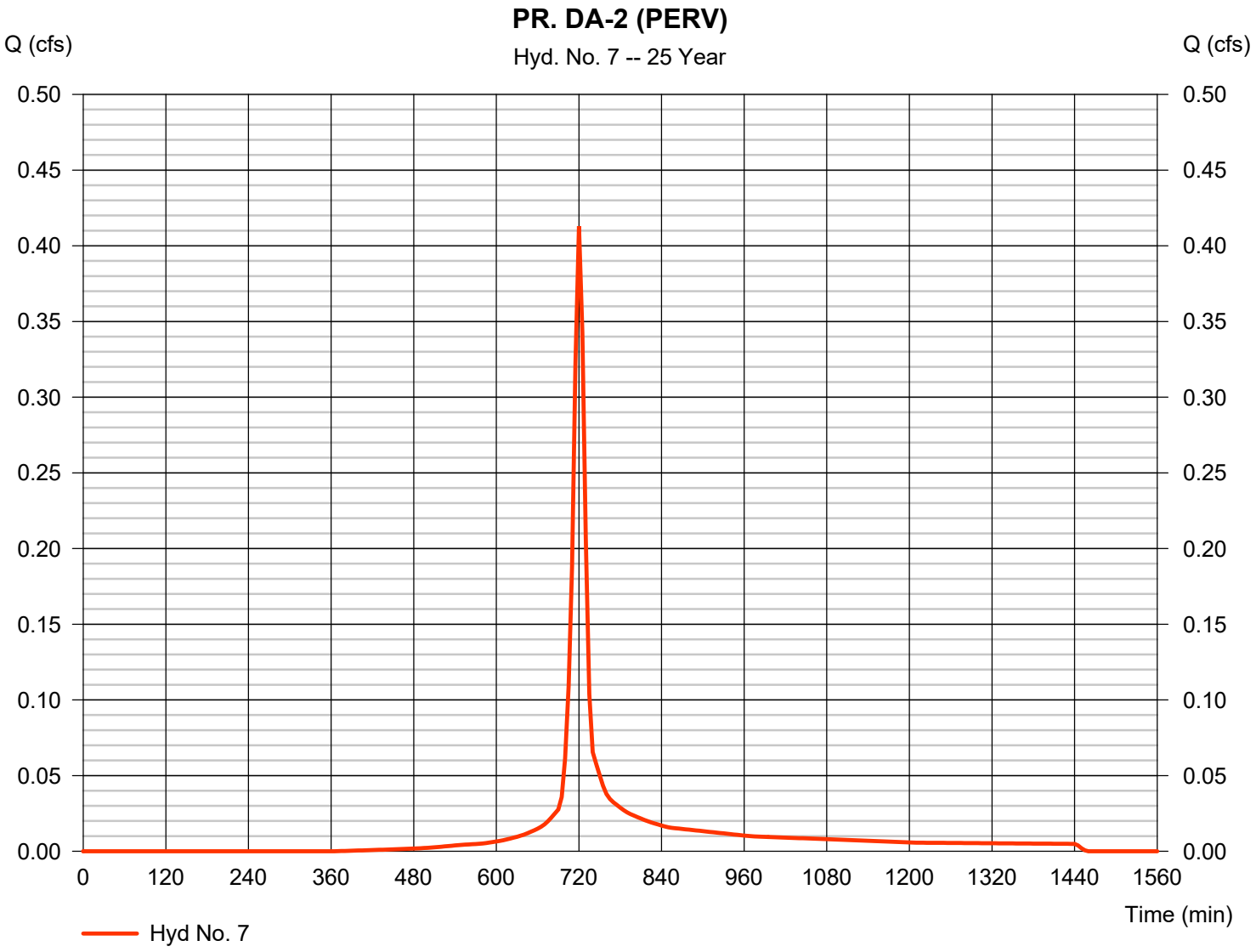


Hydrograph Report

Hyd. No. 7

PR. DA-2 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.413 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	1,123 cuft
Drainage area	=	0.080 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

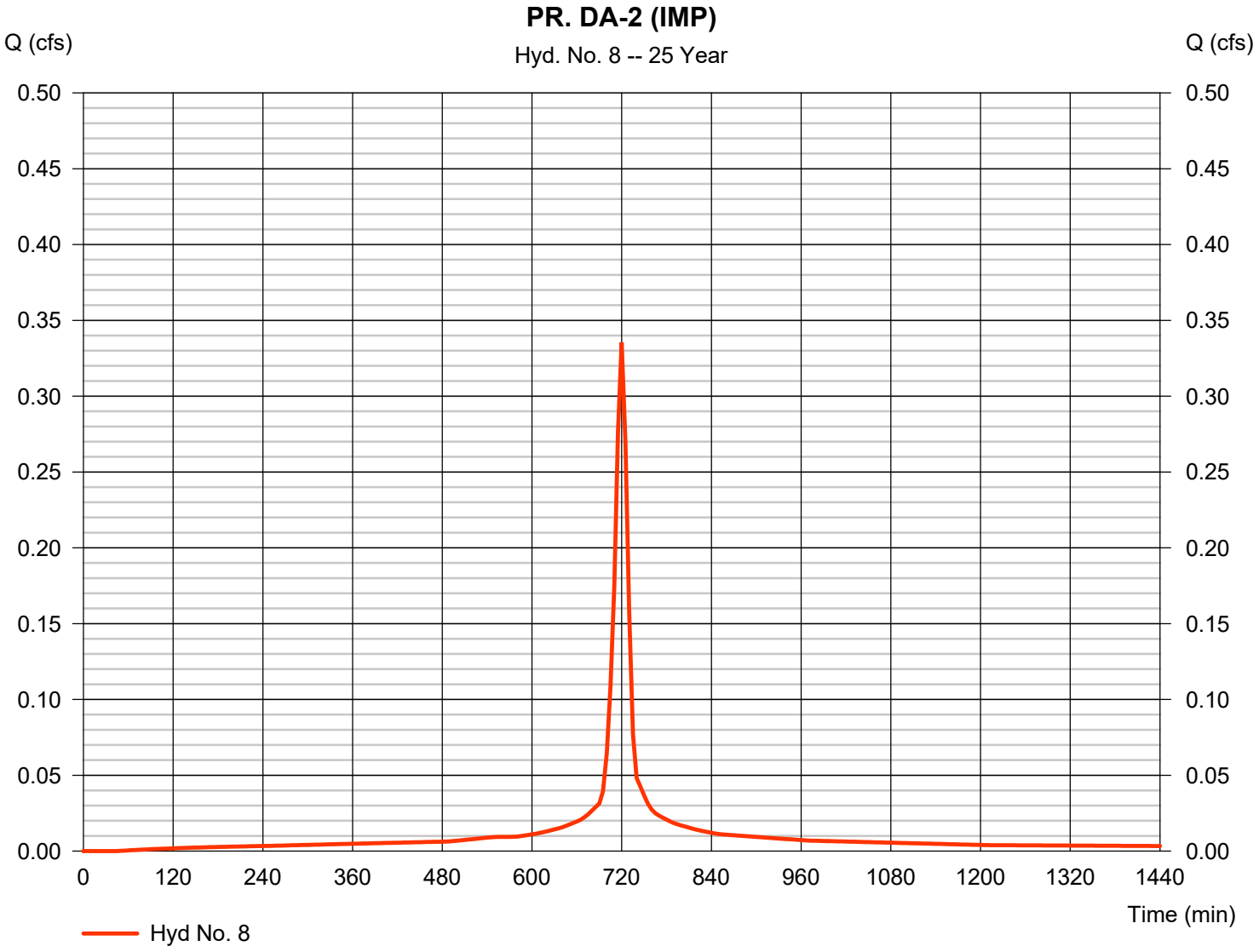


Hydrograph Report

Hyd. No. 8

PR. DA-2 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.335 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	1,045 cuft
Drainage area	=	0.050 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

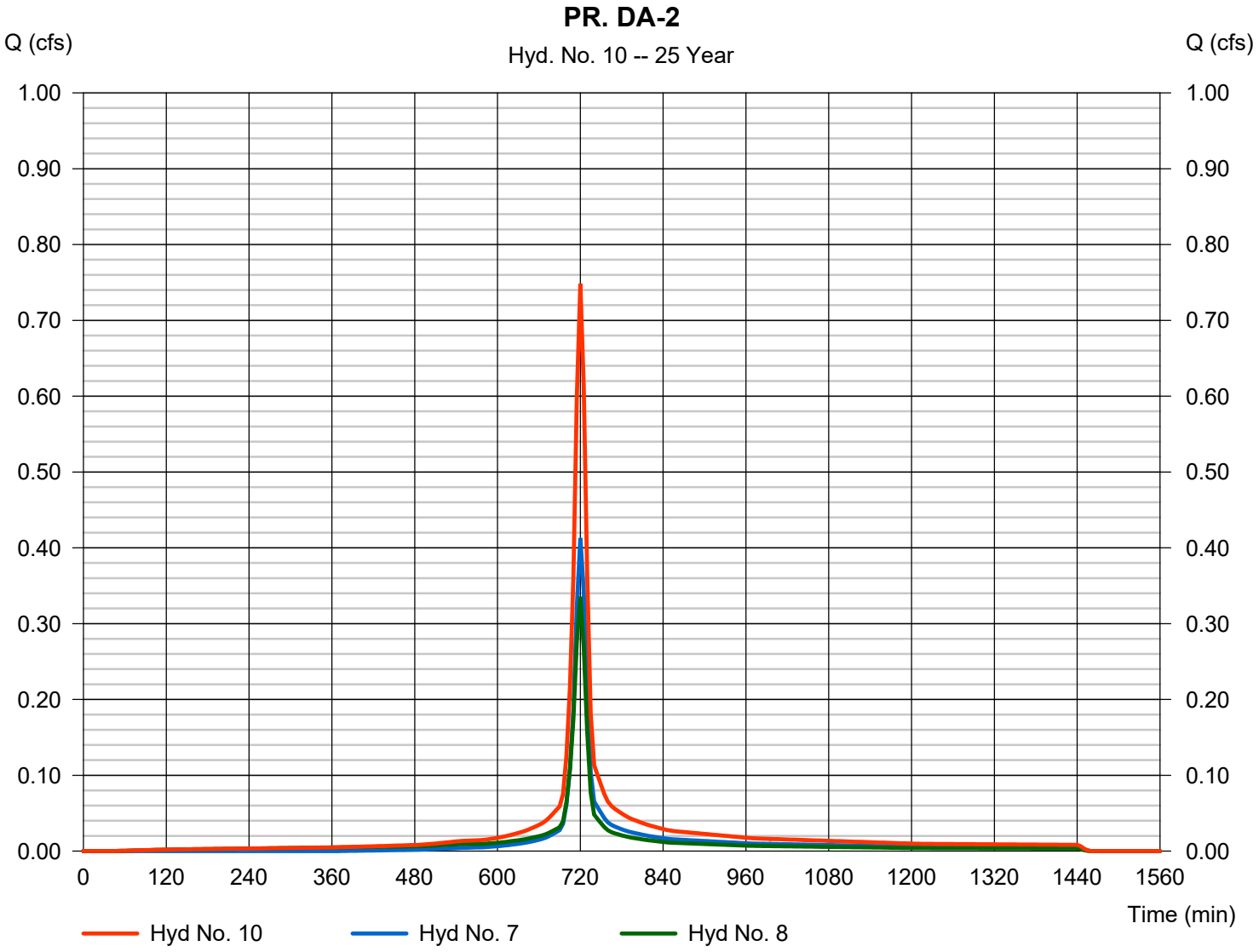


Hydrograph Report

Hyd. No. 10

PR. DA-2

Hydrograph type	=	Combine	Peak discharge	=	0.748 cfs
Storm frequency	=	25 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	2,168 cuft
Inflow hyds.	=	7, 8	Contrib. drain. area	=	0.130 ac



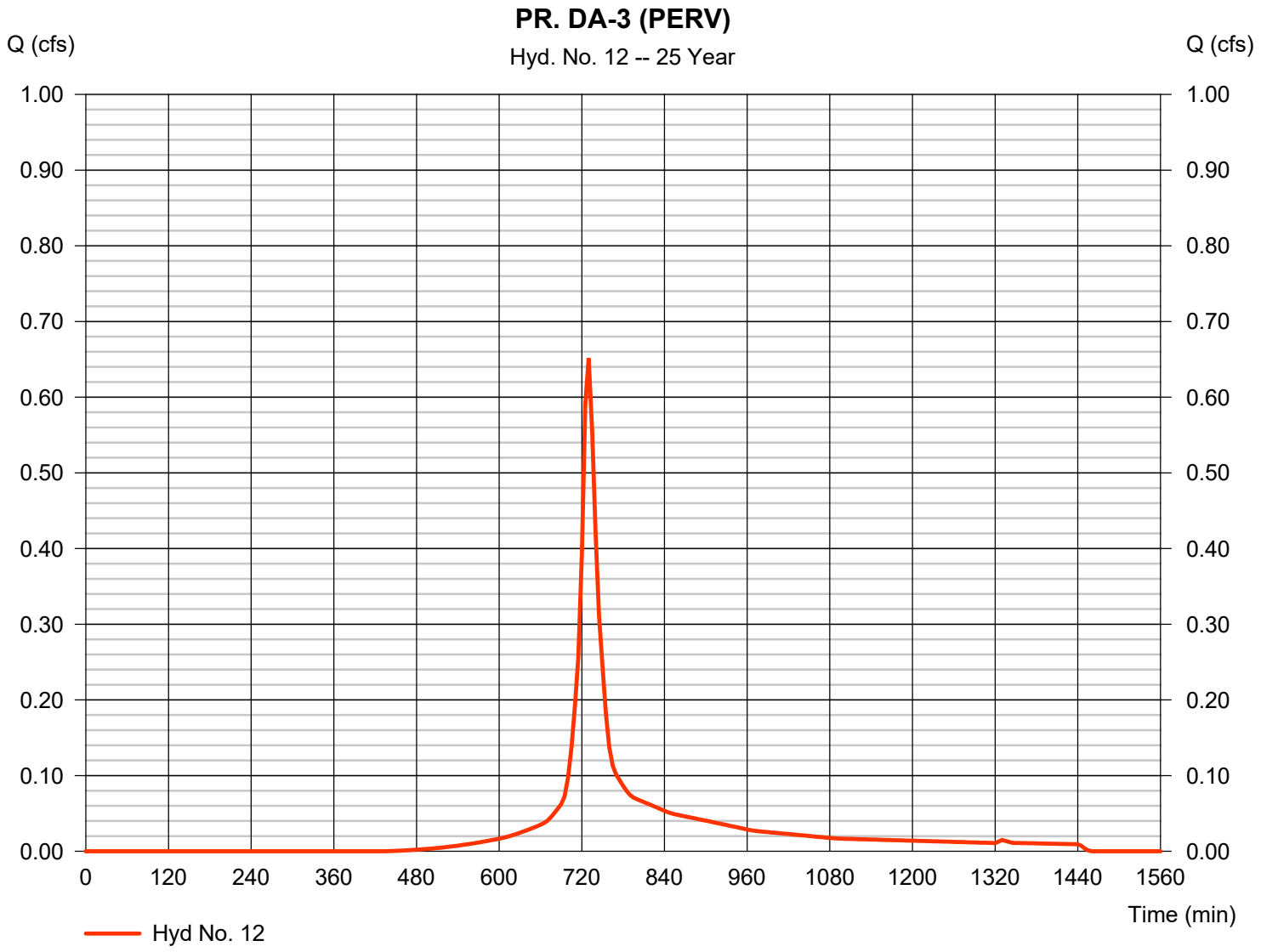
Hydrograph Report

Hyd. No. 12

PR. DA-3 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.651 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	2,595 cuft
Drainage area	=	0.200 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.200



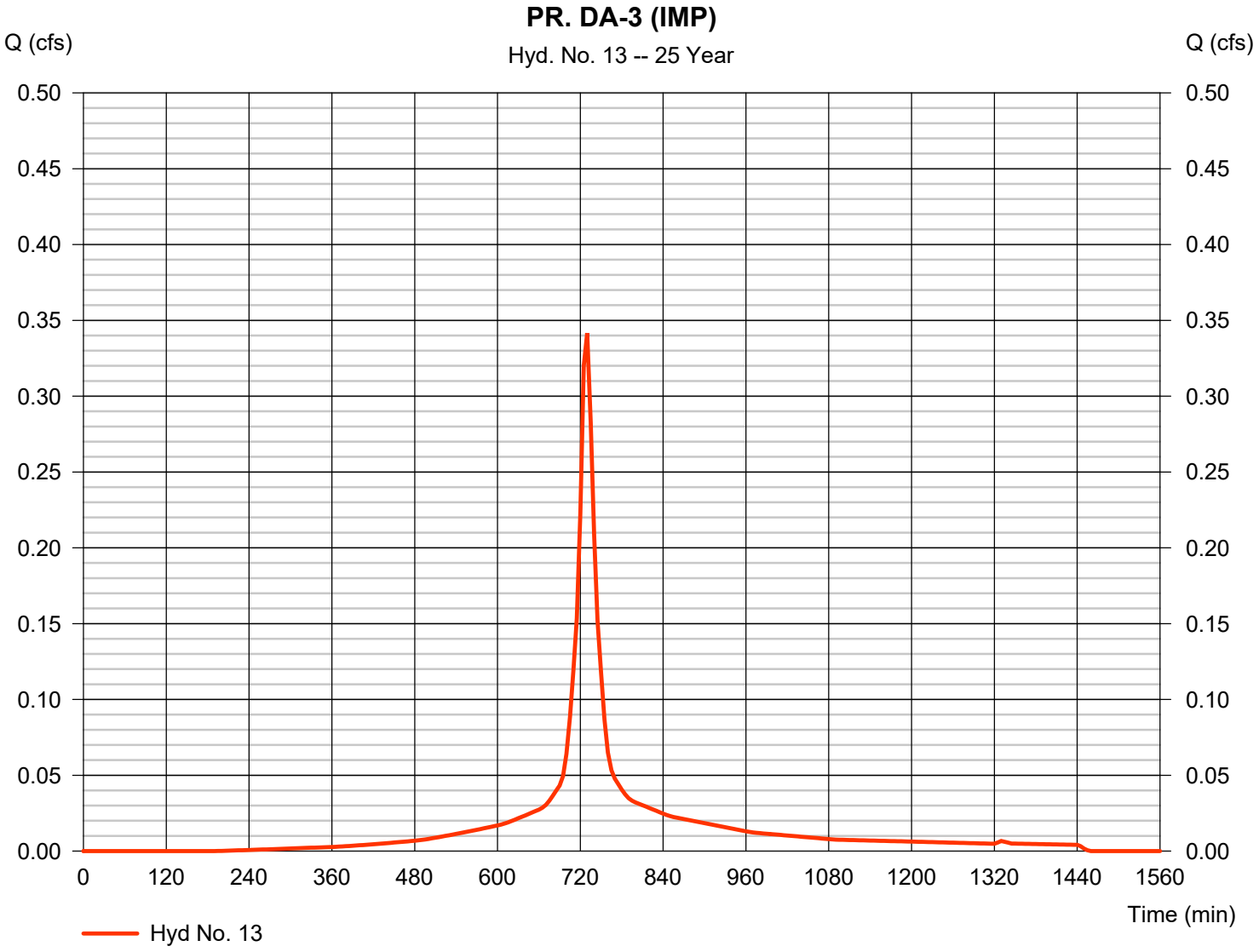
Hydrograph Report

Hyd. No. 13

PR. DA-3 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.342 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	1,451 cuft
Drainage area	=	0.080 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	6.38 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.080

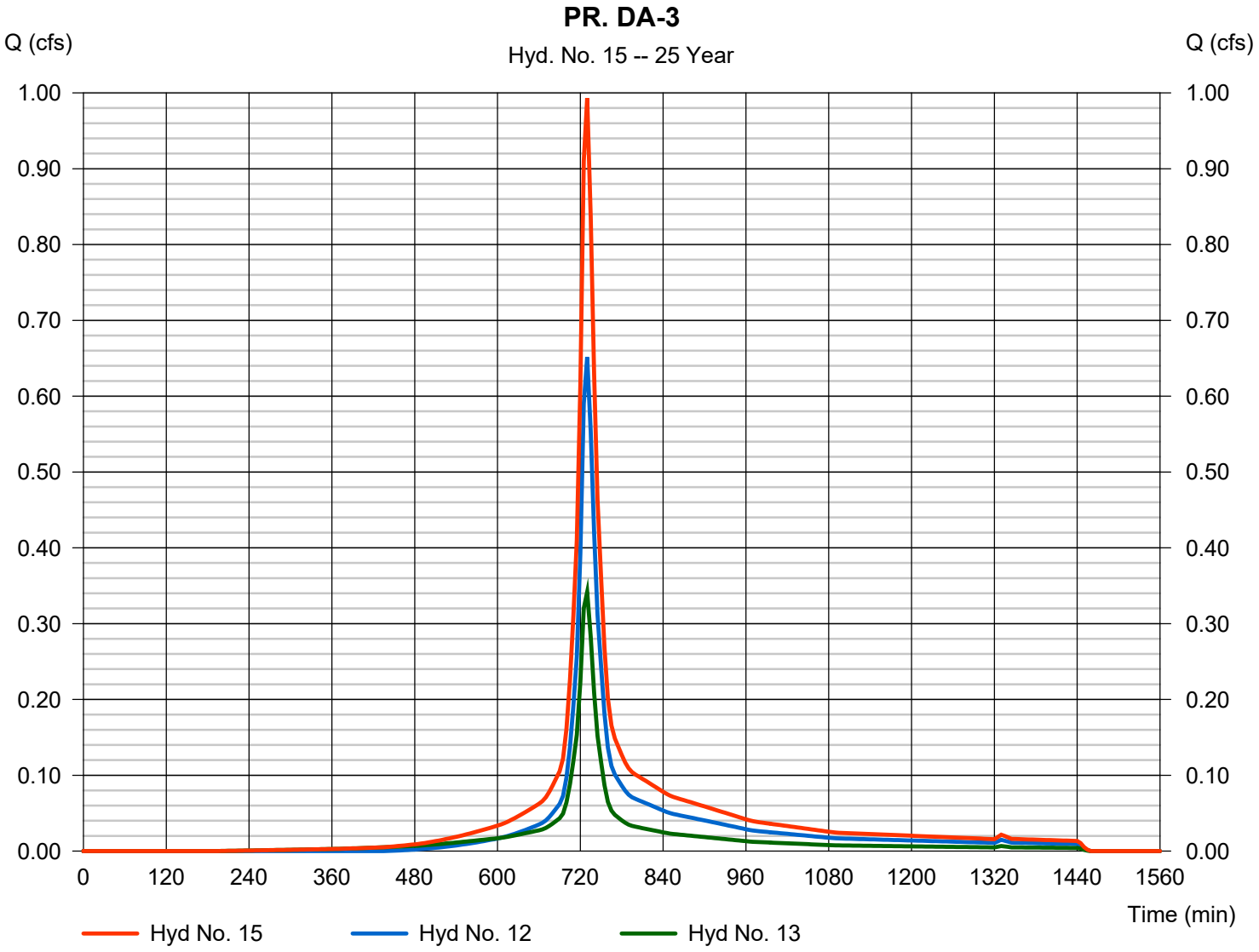


Hydrograph Report

Hyd. No. 15

PR. DA-3

Hydrograph type	=	Combine	Peak discharge	=	0.993 cfs
Storm frequency	=	25 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	4,046 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	0.280 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2021

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.965	1	727	6,850	------	------	------	PR. DA-1 (PERV)
2	SCS Runoff	39.19	1	726	155,744	------	------	------	PR. DA-1 (IMP)
3	Combine	41.15	1	726	162,595	1, 2	------	------	PR. DA-1
5	Reservoir	9.804	1	751	162,394	3	82.97	64,232	ROUTED DA-1
7	SCS Runoff	0.612	5	720	1,690	------	------	------	PR. DA-2 (PERV)
8	SCS Runoff	0.454	5	720	1,426	------	------	------	PR. DA-2 (IMP)
10	Combine	1.066	5	720	3,116	7, 8,	------	------	PR. DA-2
12	SCS Runoff	0.987	5	730	3,979	------	------	------	PR. DA-3 (PERV)
13	SCS Runoff	0.473	5	730	2,052	------	------	------	PR. DA-3 (IMP)
15	Combine	1.460	5	730	6,031	12, 13,	------	------	PR. DA-3

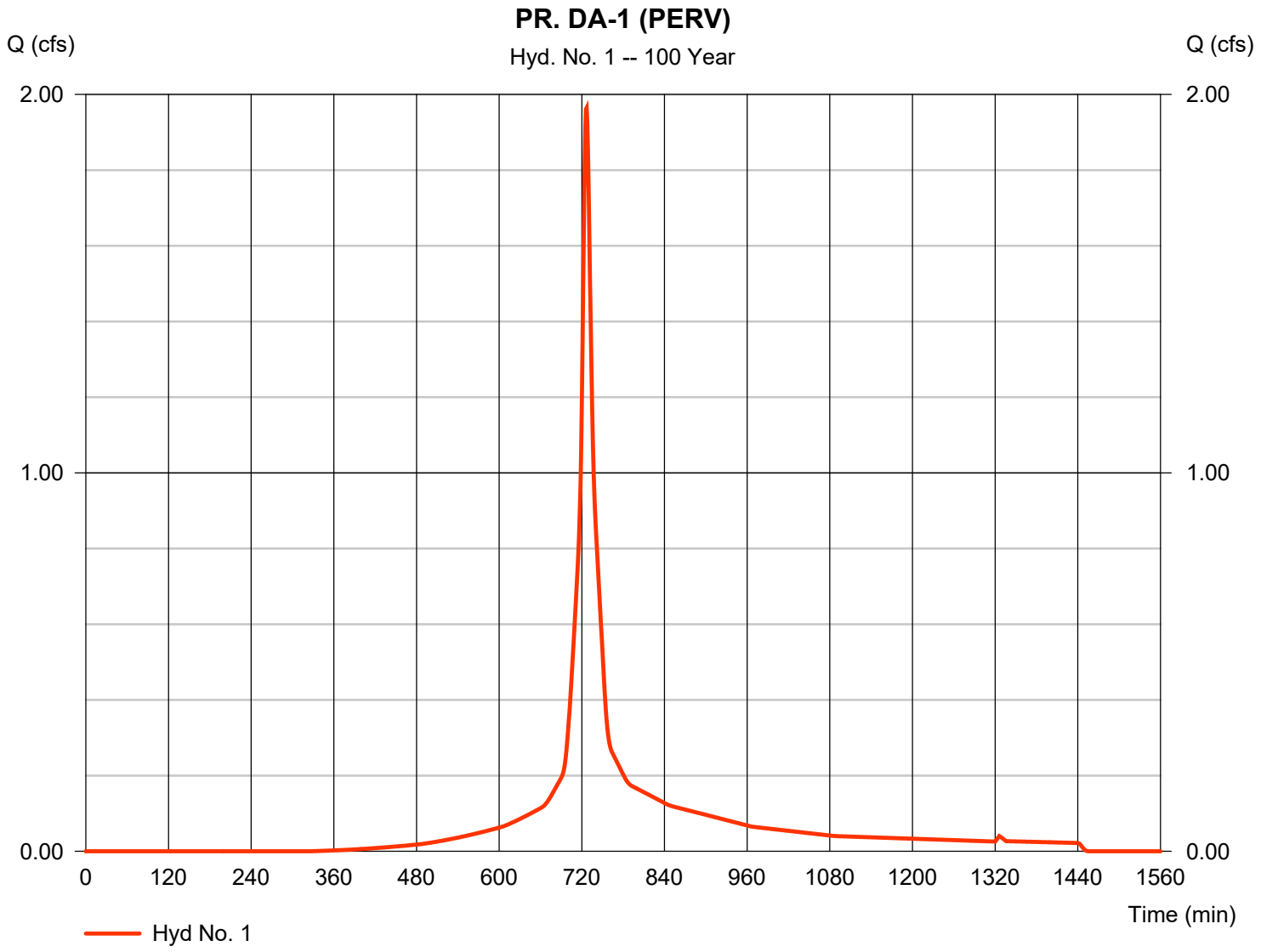
Hydrograph Report

Hyd. No. 1

PR. DA-1 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.965 cfs
Storm frequency	=	100 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	6,850 cuft
Drainage area	=	0.310 ac	Curve number	=	79*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.310



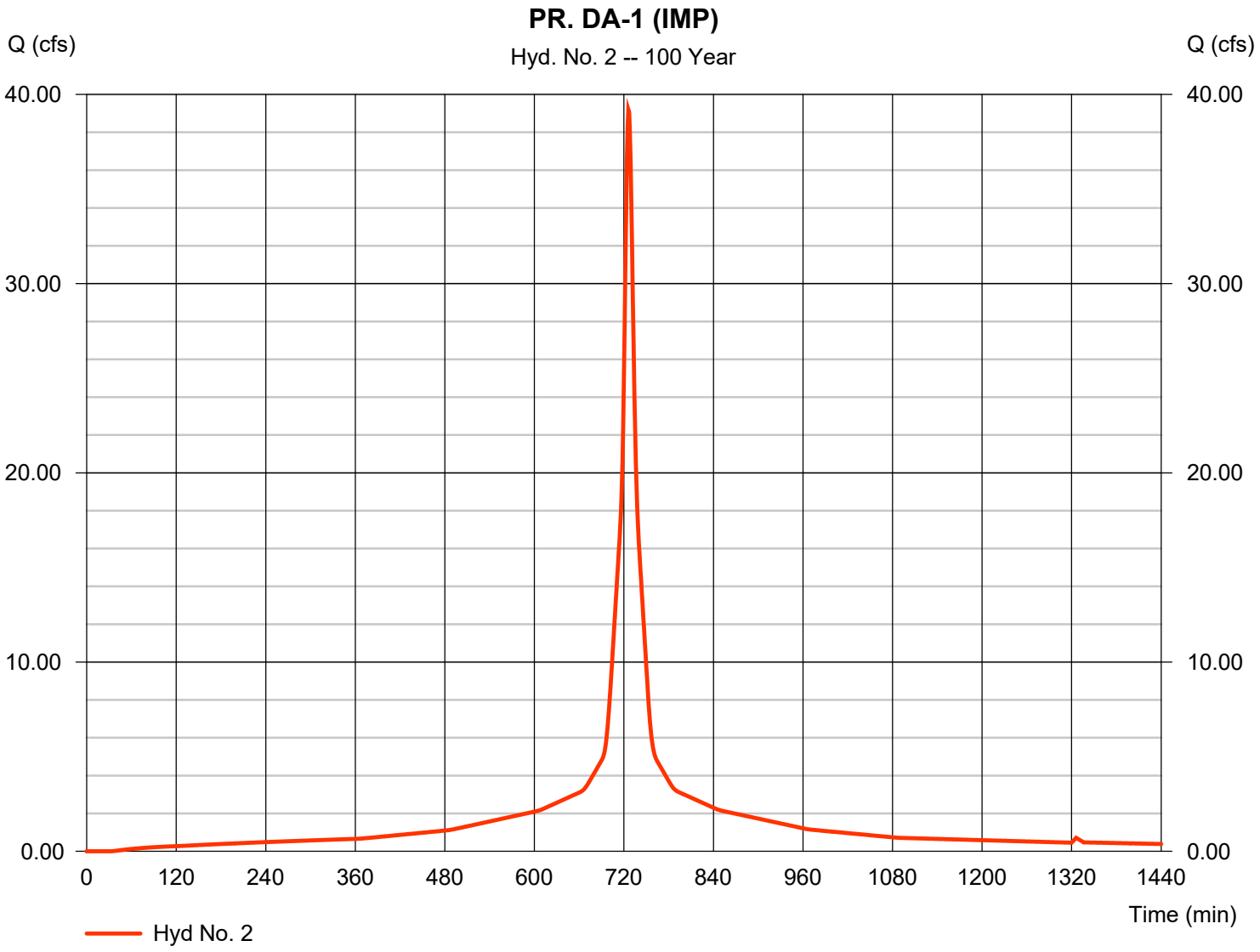
Hydrograph Report

Hyd. No. 2

PR. DA-1 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	39.19 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	155,744 cuft
Drainage area	=	5.120 ac	Curve number	=	98*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 5.120

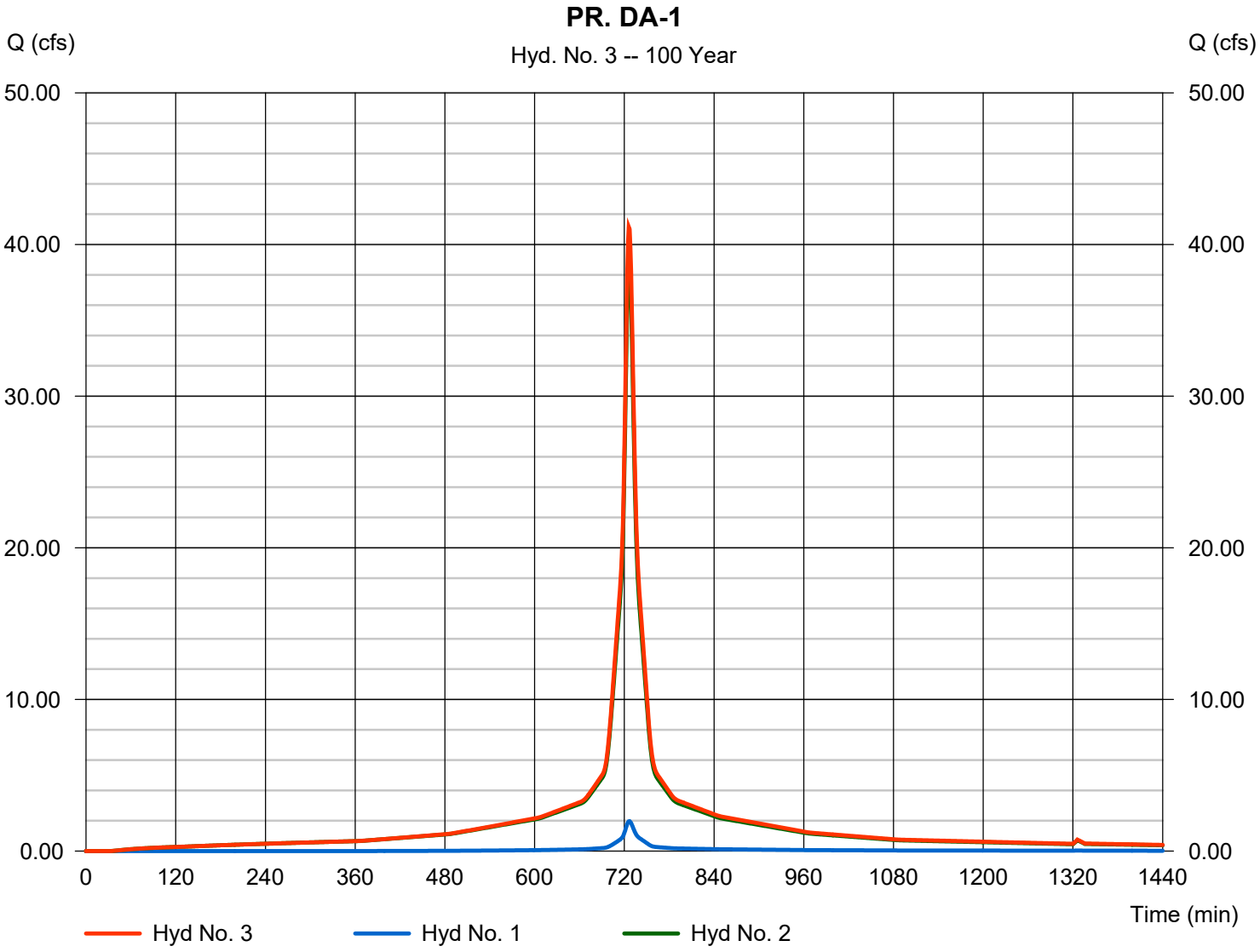


Hydrograph Report

Hyd. No. 3

PR. DA-1

Hydrograph type	=	Combine	Peak discharge	=	41.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	162,595 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	5.430 ac



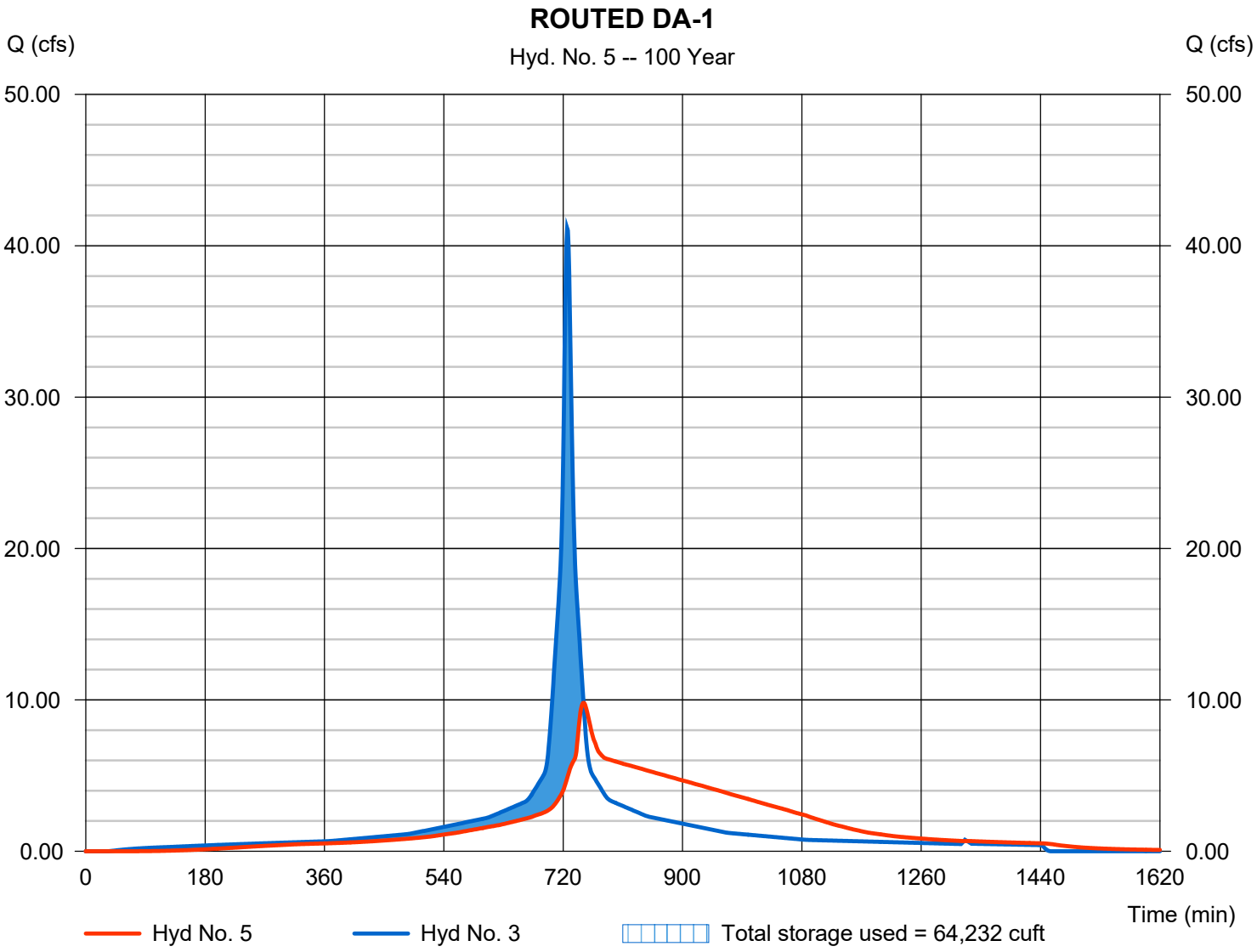
Hydrograph Report

Hyd. No. 5

ROUTED DA-1

Hydrograph type	=	Reservoir	Peak discharge	=	9.804 cfs
Storm frequency	=	100 yrs	Time to peak	=	751 min
Time interval	=	1 min	Hyd. volume	=	162,394 cuft
Inflow hyd. No.	=	3 - PR. DA-1	Max. Elevation	=	82.97 ft
Reservoir name	=	UG DETENTION	Max. Storage	=	64,232 cuft

Storage Indication method used.

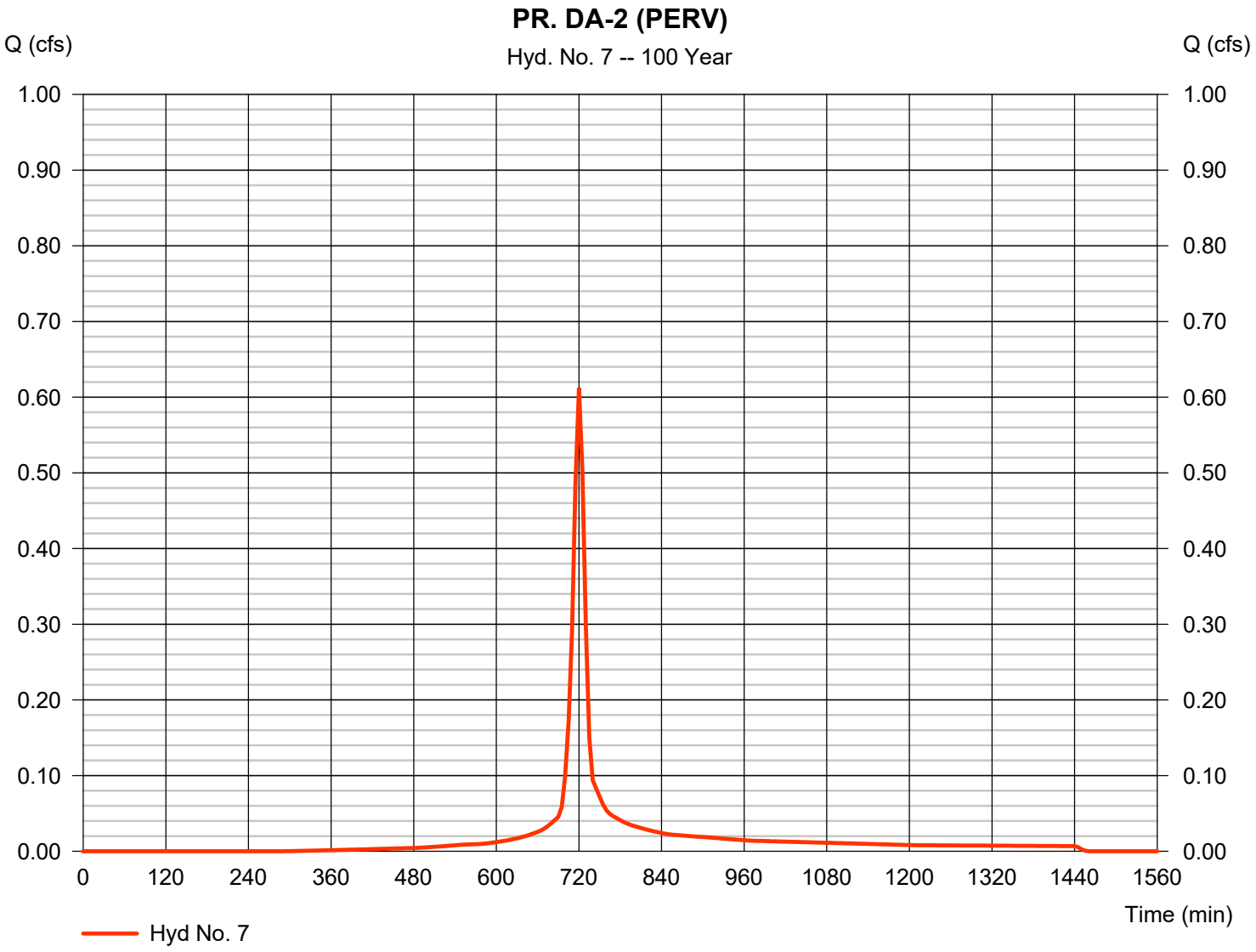


Hydrograph Report

Hyd. No. 7

PR. DA-2 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.612 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	1,690 cuft
Drainage area	=	0.080 ac	Curve number	=	80
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

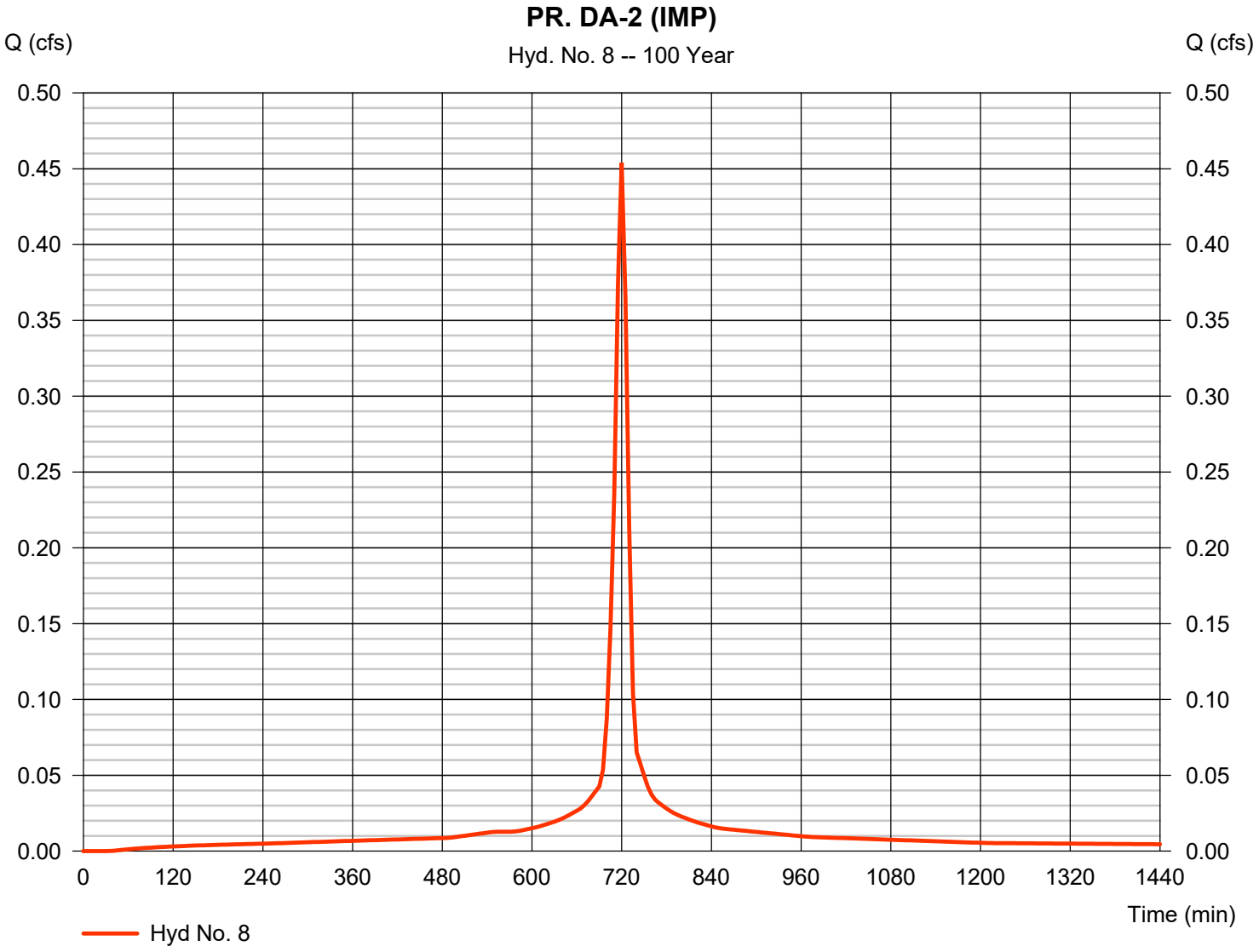


Hydrograph Report

Hyd. No. 8

PR. DA-2 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.454 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	5 min	Hyd. volume	=	1,426 cuft
Drainage area	=	0.050 ac	Curve number	=	98
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

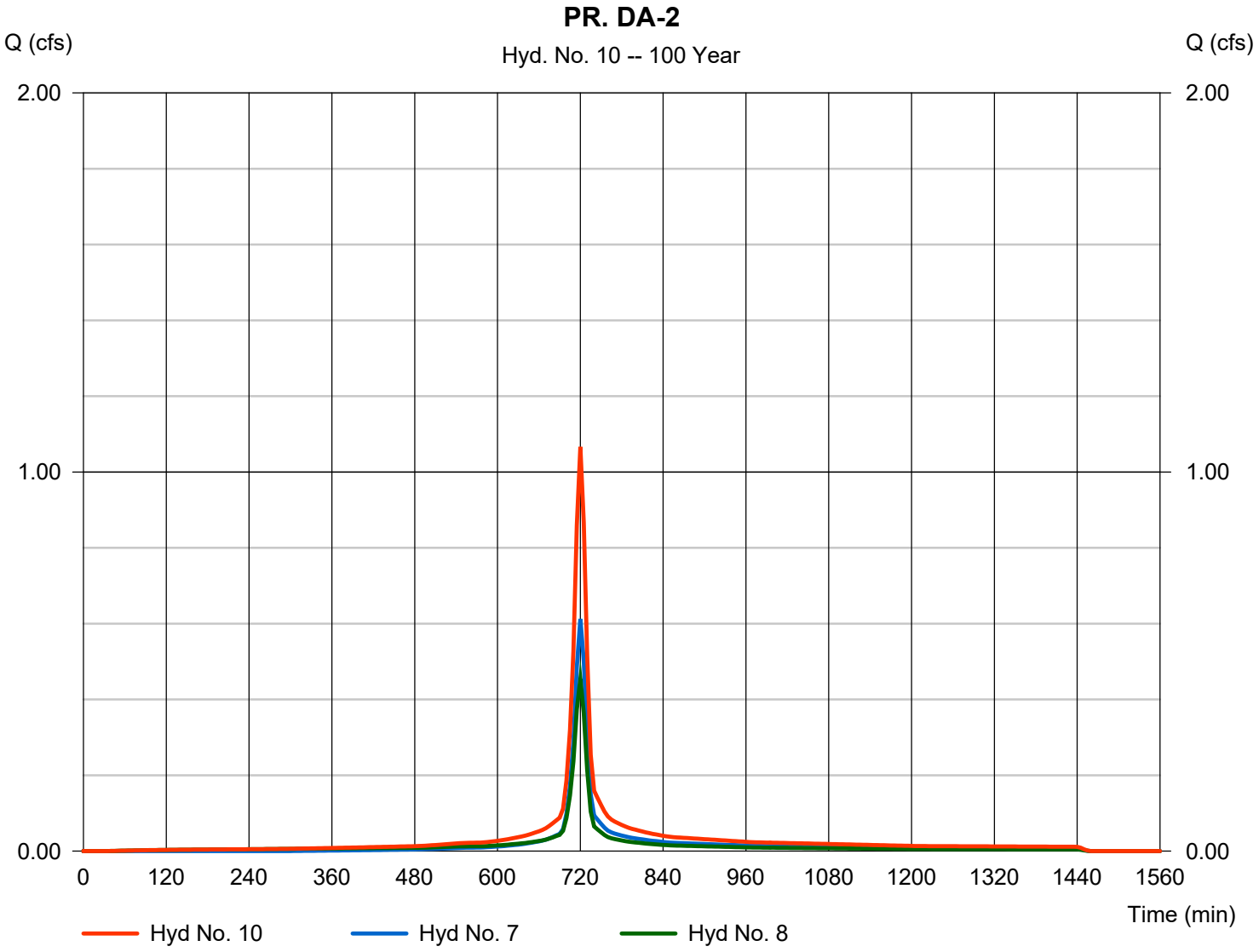


Hydrograph Report

Hyd. No. 10

PR. DA-2

Hydrograph type	= Combine	Peak discharge	= 1.066 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 5 min	Hyd. volume	= 3,116 cuft
Inflow hyds.	= 7, 8	Contrib. drain. area	= 0.130 ac



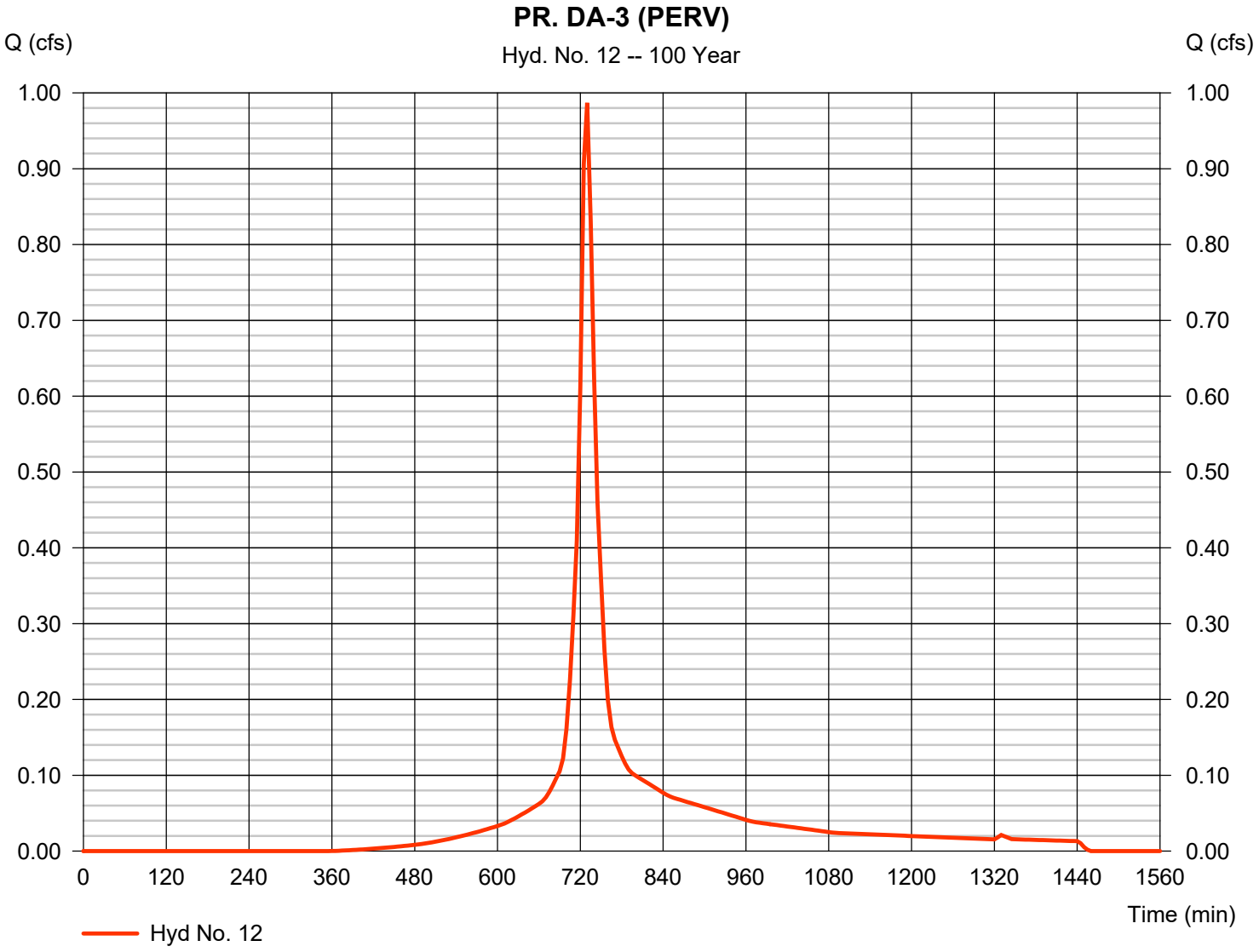
Hydrograph Report

Hyd. No. 12

PR. DA-3 (PERV)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.987 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	3,979 cuft
Drainage area	=	0.200 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.200



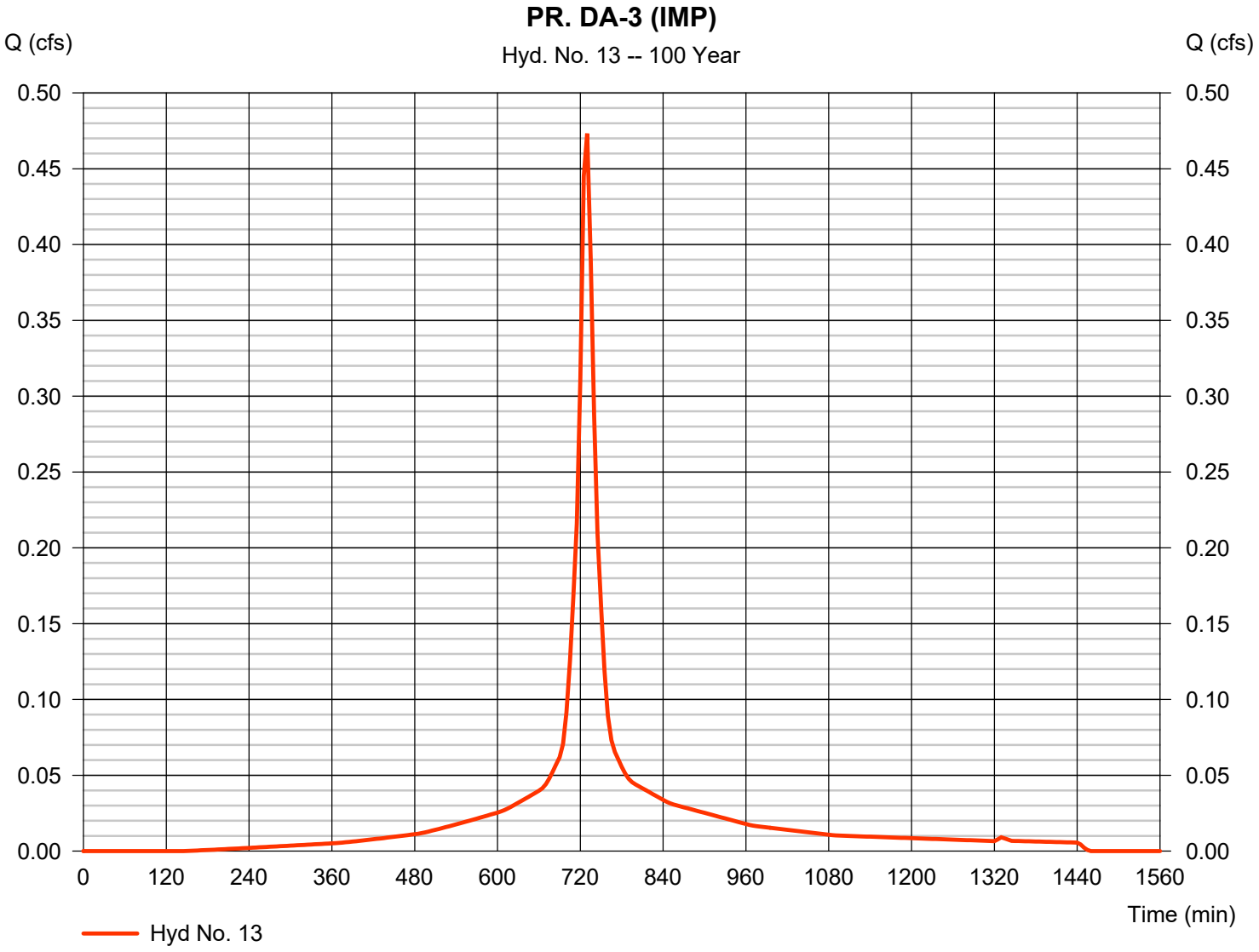
Hydrograph Report

Hyd. No. 13

PR. DA-3 (IMP)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.473 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	2,052 cuft
Drainage area	=	0.080 ac	Curve number	=	91*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	10.00 min
Total precip.	=	8.62 in	Distribution	=	Type III
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.080 x 80) + (0.090 x 98)] / 0.080

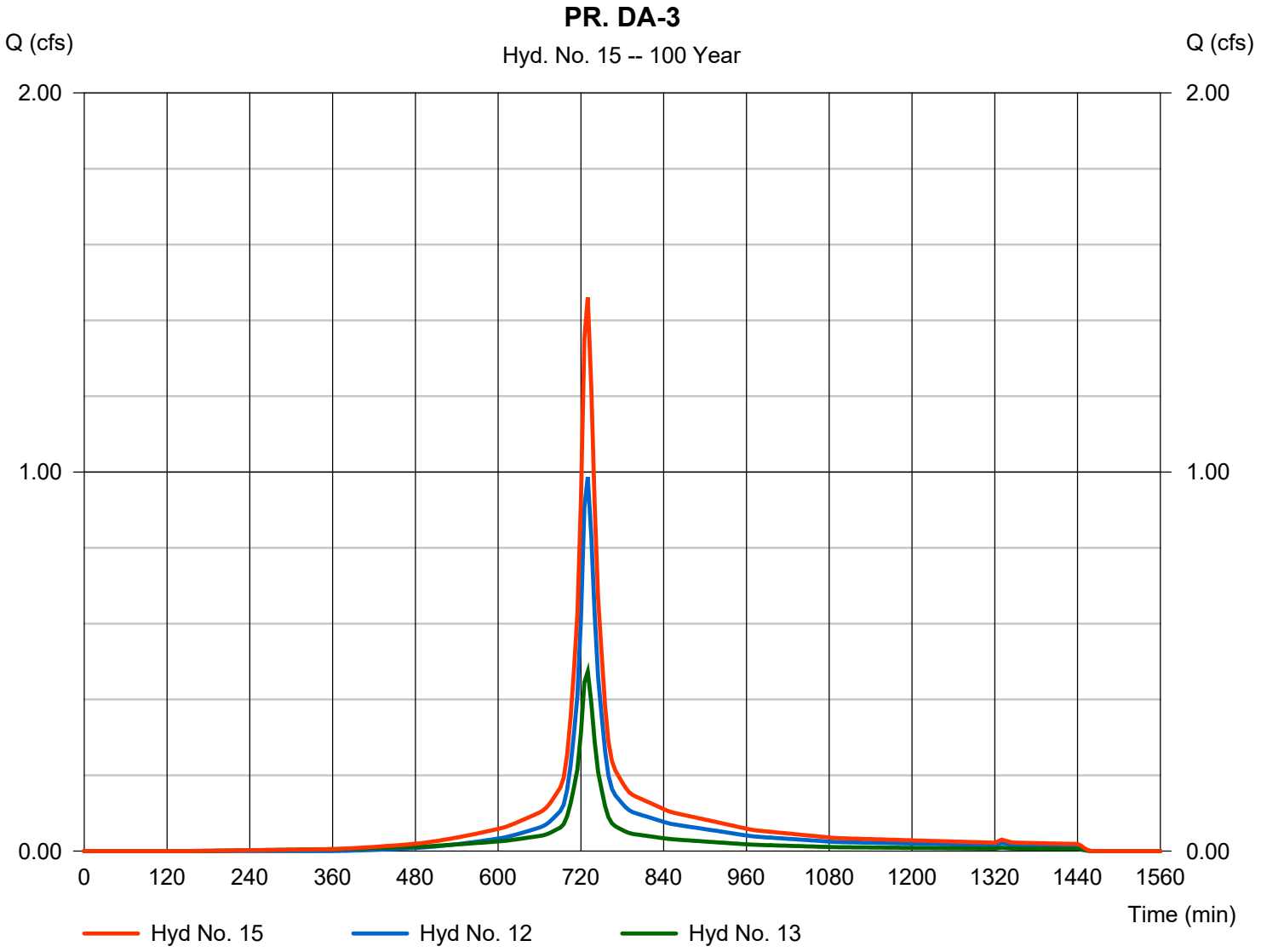


Hydrograph Report

Hyd. No. 15

PR. DA-3

Hydrograph type	=	Combine	Peak discharge	=	1.460 cfs
Storm frequency	=	100 yrs	Time to peak	=	730 min
Time interval	=	5 min	Hyd. volume	=	6,031 cuft
Inflow hyds.	=	12, 13	Contrib. drain. area	=	0.280 ac



Appendix E: Reference Material

NOAA Atlas 14, Volume 2, Version 3
Location name: Plainfield, New Jersey, USA*
Latitude: 40.6123°, Longitude: -74.4314°
Elevation: 88.61 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.334 (0.305-0.368)	0.398 (0.363-0.438)	0.472 (0.428-0.518)	0.524 (0.476-0.577)	0.589 (0.532-0.646)	0.634 (0.570-0.695)	0.679 (0.607-0.745)	0.718 (0.639-0.789)	0.768 (0.677-0.845)	0.804 (0.705-0.887)
10-min	0.534 (0.487-0.588)	0.637 (0.581-0.700)	0.755 (0.686-0.830)	0.838 (0.761-0.922)	0.938 (0.848-1.03)	1.01 (0.908-1.11)	1.08 (0.965-1.18)	1.14 (1.01-1.25)	1.22 (1.07-1.34)	1.27 (1.11-1.40)
15-min	0.667 (0.609-0.735)	0.801 (0.730-0.881)	0.955 (0.868-1.05)	1.06 (0.962-1.17)	1.19 (1.08-1.31)	1.28 (1.15-1.40)	1.36 (1.22-1.50)	1.44 (1.28-1.58)	1.53 (1.35-1.68)	1.59 (1.39-1.75)
30-min	0.915 (0.835-1.01)	1.11 (1.01-1.22)	1.36 (1.23-1.49)	1.54 (1.40-1.69)	1.76 (1.59-1.93)	1.93 (1.73-2.11)	2.09 (1.87-2.29)	2.24 (1.99-2.46)	2.43 (2.15-2.68)	2.58 (2.26-2.84)
60-min	1.14 (1.04-1.26)	1.39 (1.27-1.53)	1.74 (1.58-1.91)	2.00 (1.82-2.20)	2.35 (2.12-2.58)	2.61 (2.35-2.86)	2.88 (2.57-3.16)	3.14 (2.79-3.45)	3.49 (3.08-3.84)	3.76 (3.29-4.15)
2-hr	1.40 (1.26-1.55)	1.70 (1.54-1.88)	2.16 (1.95-2.39)	2.51 (2.26-2.78)	3.00 (2.69-3.32)	3.41 (3.04-3.77)	3.82 (3.38-4.22)	4.25 (3.74-4.70)	4.86 (4.22-5.39)	5.34 (4.60-5.93)
3-hr	1.56 (1.41-1.73)	1.89 (1.72-2.11)	2.41 (2.18-2.68)	2.81 (2.54-3.12)	3.36 (3.02-3.73)	3.81 (3.40-4.22)	4.28 (3.79-4.74)	4.76 (4.19-5.28)	5.44 (4.73-6.05)	5.98 (5.15-6.66)
6-hr	2.00 (1.81-2.23)	2.43 (2.20-2.70)	3.08 (2.78-3.41)	3.61 (3.25-3.99)	4.37 (3.89-4.81)	5.00 (4.43-5.50)	5.68 (4.98-6.24)	6.41 (5.57-7.04)	7.46 (6.39-8.21)	8.32 (7.05-9.17)
12-hr	2.47 (2.24-2.75)	3.00 (2.71-3.34)	3.82 (3.45-4.24)	4.51 (4.06-5.00)	5.54 (4.93-6.11)	6.42 (5.68-7.07)	7.38 (6.45-8.11)	8.45 (7.29-9.30)	10.0 (8.50-11.0)	11.4 (9.49-12.5)
24-hr	2.79 (2.59-3.04)	3.38 (3.13-3.68)	4.33 (4.01-4.72)	5.15 (4.74-5.60)	6.38 (5.83-6.92)	7.44 (6.74-8.06)	8.62 (7.74-9.34)	9.93 (8.82-10.8)	11.9 (10.4-13.0)	13.6 (11.7-14.9)
2-day	3.28 (3.02-3.59)	3.97 (3.65-4.34)	5.06 (4.65-5.54)	5.98 (5.47-6.53)	7.33 (6.67-8.00)	8.48 (7.66-9.25)	9.72 (8.71-10.6)	11.1 (9.83-12.2)	13.1 (11.4-14.4)	14.8 (12.7-16.4)
3-day	3.46 (3.19-3.78)	4.19 (3.86-4.57)	5.32 (4.90-5.81)	6.26 (5.74-6.83)	7.63 (6.96-8.31)	8.78 (7.96-9.57)	10.0 (9.01-10.9)	11.4 (10.1-12.5)	13.3 (11.7-14.7)	15.0 (13.0-16.6)
4-day	3.64 (3.36-3.97)	4.41 (4.07-4.81)	5.58 (5.14-6.08)	6.55 (6.01-7.13)	7.94 (7.25-8.63)	9.09 (8.26-9.90)	10.3 (9.31-11.3)	11.7 (10.4-12.8)	13.6 (12.0-14.9)	15.2 (13.2-16.8)
7-day	4.30 (4.00-4.64)	5.16 (4.79-5.58)	6.41 (5.94-6.93)	7.44 (6.88-8.04)	8.91 (8.19-9.63)	10.1 (9.26-11.0)	11.4 (10.4-12.4)	12.8 (11.5-13.9)	14.8 (13.1-16.2)	16.5 (14.4-18.1)
10-day	4.92 (4.59-5.29)	5.87 (5.48-6.32)	7.19 (6.69-7.73)	8.26 (7.67-8.89)	9.78 (9.04-10.5)	11.0 (10.1-11.9)	12.3 (11.2-13.3)	13.7 (12.4-14.8)	15.7 (14.0-17.0)	17.2 (15.2-18.8)
20-day	6.64 (6.25-7.07)	7.88 (7.41-8.40)	9.40 (8.83-10.0)	10.6 (9.94-11.3)	12.2 (11.4-13.0)	13.5 (12.5-14.4)	14.8 (13.7-15.8)	16.0 (14.8-17.2)	17.8 (16.2-19.1)	19.1 (17.3-20.6)
30-day	8.27 (7.83-8.73)	9.77 (9.26-10.3)	11.4 (10.8-12.0)	12.7 (12.0-13.4)	14.3 (13.5-15.1)	15.6 (14.6-16.4)	16.8 (15.7-17.7)	18.0 (16.8-19.0)	19.5 (18.1-20.7)	20.6 (19.0-22.0)
45-day	10.5 (10.00-11.1)	12.4 (11.8-13.0)	14.3 (13.5-15.0)	15.7 (14.9-16.5)	17.5 (16.6-18.4)	18.9 (17.8-19.9)	20.2 (19.0-21.3)	21.5 (20.2-22.7)	23.1 (21.5-24.4)	24.2 (22.5-25.7)
60-day	12.6 (12.0-13.2)	14.8 (14.1-15.5)	16.9 (16.1-17.7)	18.4 (17.6-19.3)	20.4 (19.4-21.4)	21.8 (20.7-22.9)	23.2 (21.9-24.3)	24.4 (23.0-25.7)	25.9 (24.4-27.3)	27.0 (25.3-28.5)

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

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

Please refer to NOAA Atlas 14 document for more information.

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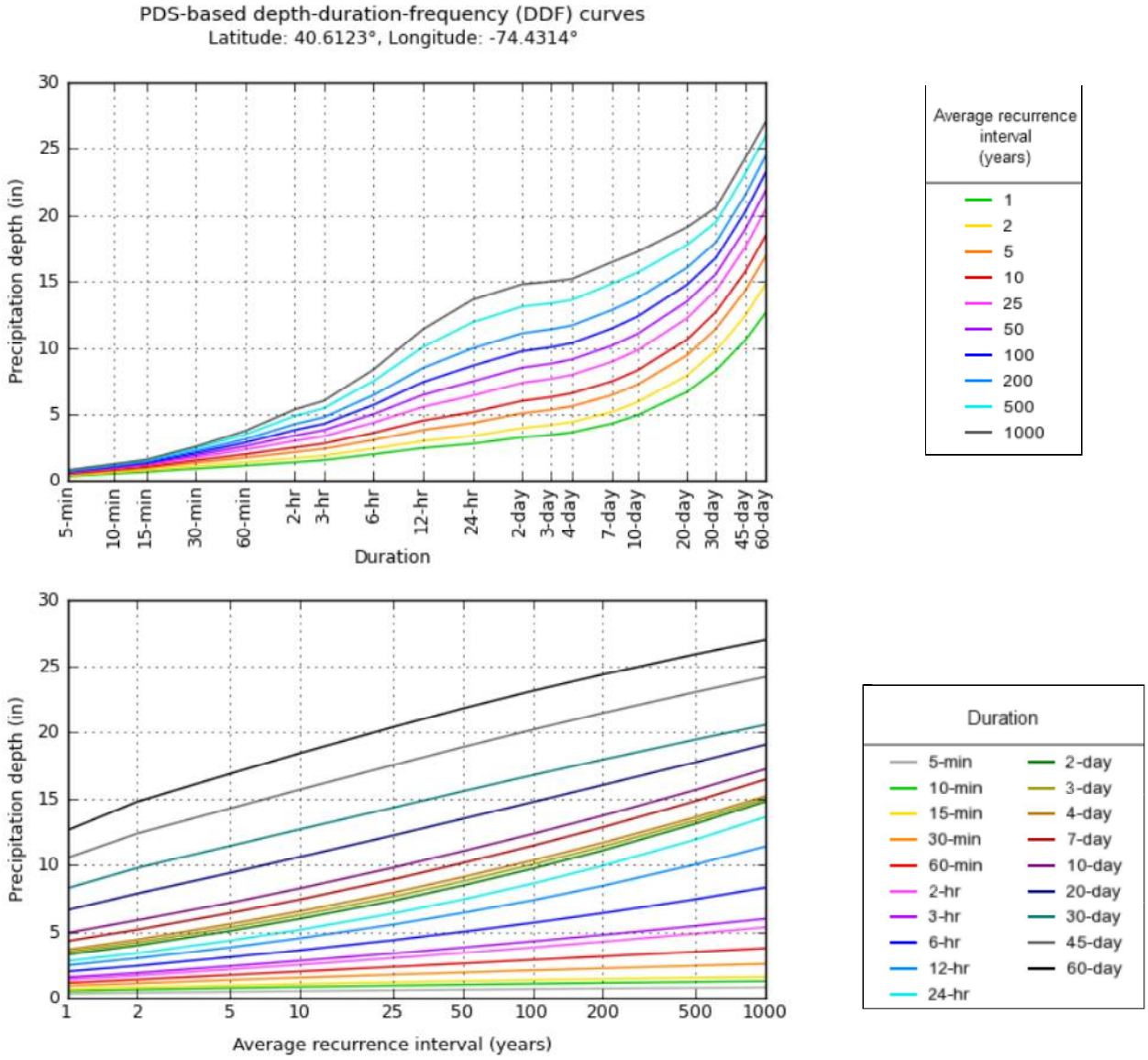
PF graphical



NOAA Atlas 14, Volume 2, Version 3

Created (GMT): Fri Jul 31 15:58:33 2020

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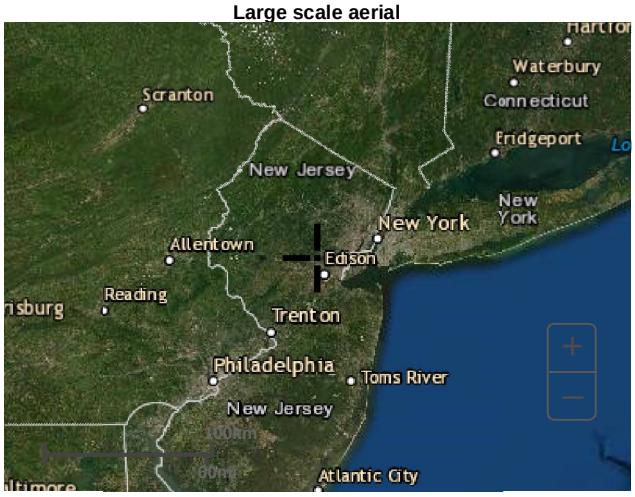
Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

Large scale aerial



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National Oceanic and Atmospheric Administration
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1325 East West Highway
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