Hopeland Road

TETRA TECH, INC.

By: RH Date: 11/17/2016 Subject: Hopeland Road
Checked By: JB Date: 11/21/2016 PCSM Design and Evaluation

PURPOSE:

The purpose of these calculations is to design a Post-Construction Stormwater Management (PCSM) Plan for the Hopeland Road block valve as part of the Sunoco Pipeline L.P. Pennsylvania Pipeline Project. The site is located within Heidelberg Township, Lebanon County, Pennsylvania. Permanent stormwater controls will be developed to satisfy PADEP requirements.

PCSM DESIGN REQUIREMENTS:

The PCSM design for this project follows the PA Department of Environmental Protection's (PADEP) Pennsylvania Stormwater Best Management Practices Manual (BMP Manual), December 2006; and the standard design criteria from PA Title 25, Chapter 102.8.(g)(2) and (3). The design criteria evaluated for the site are summarized below.

Act 167 Consistency

The Hopeland Road block valve is located in Heidelberg Township, Lebanon County, Pennsylvania. Although Lebanon County has not enacted an Act 167 plan, Heidelberg Township is within Cocalico Creek, which does have an enacted Act 167 Plan, based upon the Lebanon County Stormwater Ordinance. By designing in accordance with PADEP's Stormwater BMP Manual, the requirements outlined in the Stormwater Ordinance will be fulfilled.

Recommended Volume Control Guideline

Use of Control Guideline 1 is recommended where site conditions offer the opportunity to reduce the increase in runoff volume as follows:

- Do not increase the post-development total runoff volume for all storms equal to or less than the two-year/24-hour event;
- Existing (pre-development) non-forested pervious areas must be considered meadow (good condition) or its equivalent; and
- 20 percent of existing impervious area, when present, shall be considered meadow (good condition) or its equivalent.

This site will utilize an infiltration berm to manage the two-year/24-hour volume increase.

Recommended Peak Rate Control Guideline

The recommended control guideline for peak rate control is:

- Do not increase the peak rate of discharge for the 2-year through 100-year events (at minimum); as necessary, provide additional peak rate control as required by applicable and approved Act 167 plan.
- The Cocalico Creek Stormwater Ordinance requires detention facilities to meet 50% release rates where the post-development hydrograph peaks are greater than the pre-development.

When BMPs are accounted for, the post-development hydrograph peaks have been reduced from pre-development rates. However, if BMPs are not included, the post-development rates are not less than the pre-development rates. Therefore, the 50% release rate reduction applies.

- The Lebanon County Stormwater Ordinance has recommended specific curve numbers for rate calculations. The rate calculations for this site were determined using the NCRS recommended curve numbers, which follows the requirements set for the in the PADEP manual.

This site will utilize an infiltration berm to manage the 2-year through 100-year peak rate increases. The 50% reduction of release rates have not been met. However, PADEP requirements have been met. This BMP will also help to increase the time of concentration for the drainage area encompassing the block valve.

Recommended Water Quality Control Guideline

Control Guideline 1 will provide water quality control and stream channel protection as well as flood control protection.

Infiltration

Infiltration rates for the PCSM BMPs have been determined from site infiltration testing conducted in accordance of the PA BMP Manual. Documentation for infiltration testing and design infiltration rates can be found in Attachment 5 of the Site Restoration/Post Construction Stormwater Management Plan. Infiltration test locations and recommended design rates are also labeled on the PCSM Plan Drawings in Attachment 6.

During the onsite infiltration tests, the depth to seasonal high groundwater and shallow bedrock or another confining layer were evaluated. The post-construction stormwater management facility for the site has been designed to maintain 2 feet of separation between the ponding elevation of the facility and the seasonal high water table and bedrock.

The post-construction stormwater management design will utilize onsite infiltration to meet Volume Control Guideline 1.

Loading Ratio

Loading ratios have been considered for the design of infiltration BMPs. In general, the following Loading Ratio guidelines are recommended:

- Maximum Impervious Loading Ratio of 5:1 relating impervious drainage area to infiltration area.
- Maximum Drainage Area Loading Ratio of 8:1 relating total drainage area to infiltration area.

The maximum impervious loading ratio of 5:1 has been met. The impervious loading ratio for the site is 2.6:1.

The maximum drainage area loading ratio of 8:1 has not been met. The drainage area loading ratio for the site is 13:1. However, runoff from the site and upslope drainage area will be dispersed to a relatively long infiltration berm. The infiltration berm has been placed to maximize the loading ratio to the maximum extent practicable, and other infiltration design parameters from the PA Stormwater BMP Manual have been met.

Disturbed Area

To meet Standard Worksheet 10 guidelines, 90% of the disturbed area is contained by the proposed PCSM BMPs.

Karst Topography

The Hopeland Road block valve is not located in an area of karst terrain.

Special Protection Watershed

The Hopeland Road block valve is not located within a special protection watershed, so antidegradation requirements do not apply.

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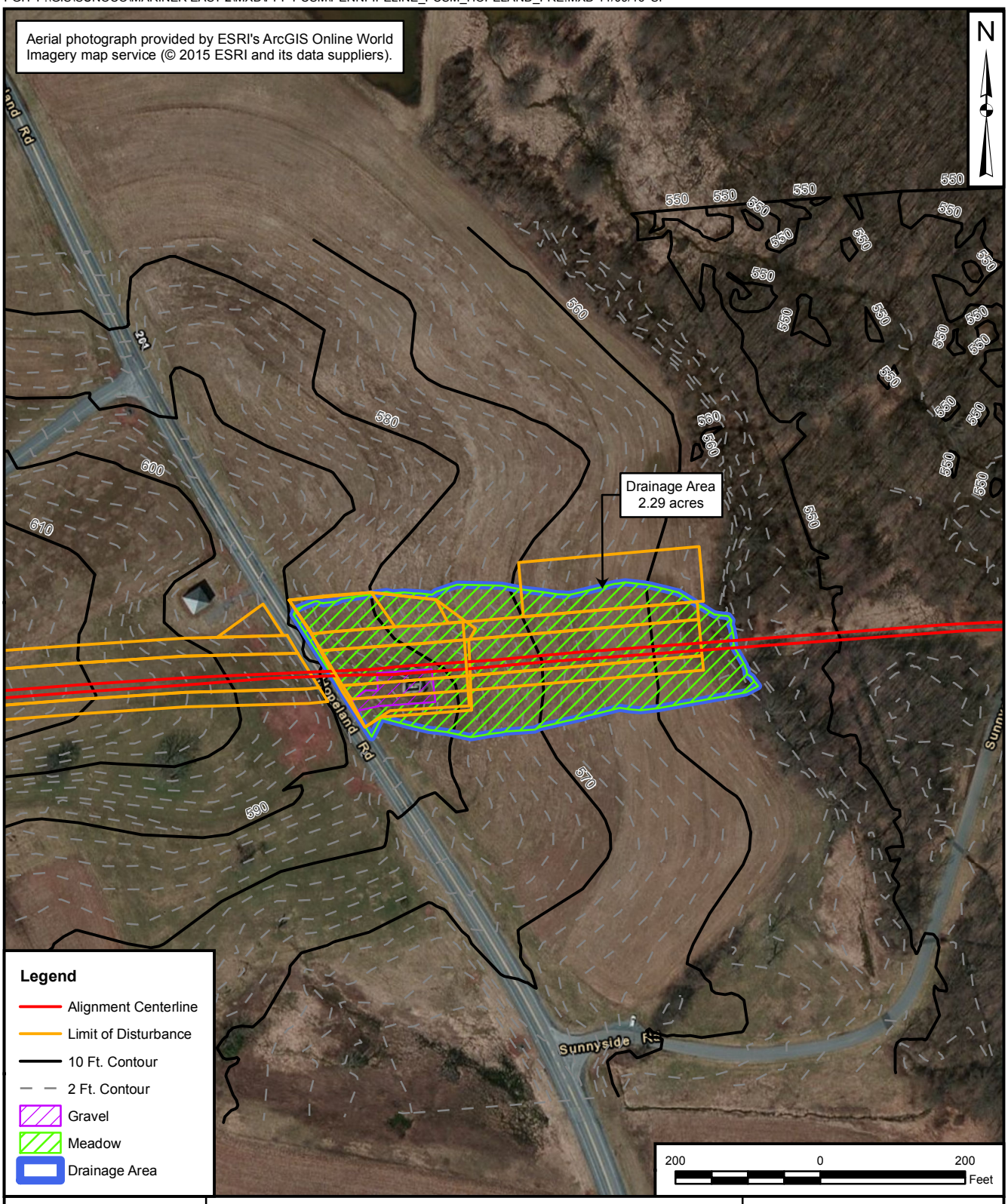

TETRA TECH

PRE-DEVELOPMENT DRAINAGE AREA MAP
HOPELAND ROAD
PENNSYLVANIA PIPELINE PROJECT
SUNOCO LOGISTICS, L.P.
LEBANON COUNTY, PENNSYLVANIA

DRAWN BY: J. HERNING 05/03/15
CHECKED BY: J. BRODY 11/09/16

APPROVED BY:

CONTRACT NUMBER: 112IC05958

FIGURE NUMBER	REV
1	0

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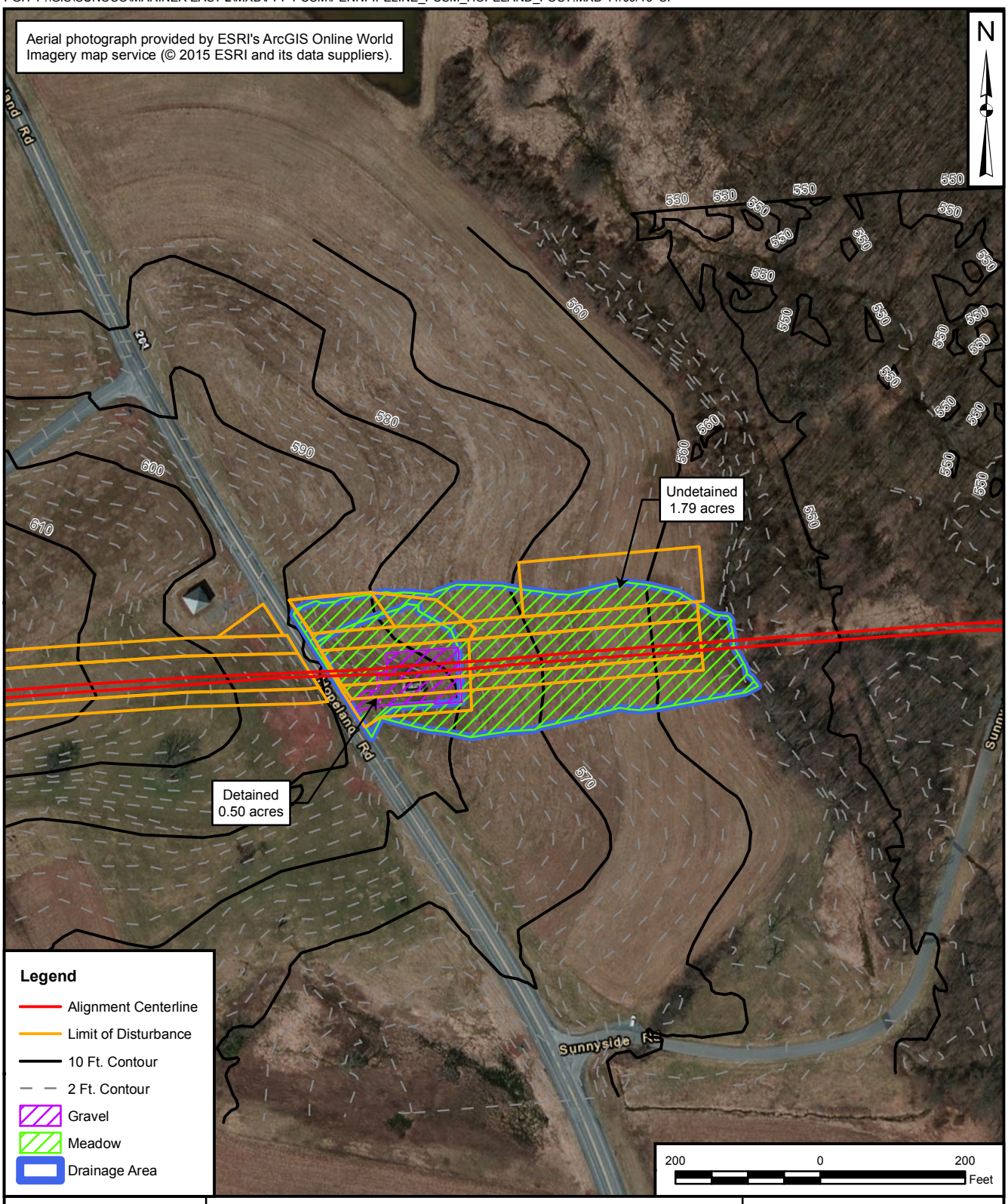

TETRA TECH

POST-DEVELOPMENT DRAINAGE AREA MAP
HOPELAND ROAD
PENNSYLVANIA PIPELINE PROJECT
SUNOCO LOGISTICS, L.P.
LEBANON COUNTY, PENNSYLVANIA

DRAWN BY: J. HERNING 05/03/15
CHECKED BY: J. BRODY 11/09/16

APPROVED BY:

CONTRACT NUMBER: 112IC05958

FIGURE NUMBER	REV
2	0

NOAA Atlas 14, Volume 2, Version 3
Location name: Heidelberg Twp, Pennsylvania, USA*
Latitude: 40.2855°, Longitude: -76.2439°
Elevation: 575.79 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	0.333 (0.301-0.368)	0.396 (0.358-0.438)	0.466 (0.420-0.515)	0.514 (0.464-0.568)	0.571 (0.514-0.631)	0.612 (0.548-0.675)	0.653 (0.582-0.719)	0.691 (0.614-0.763)	0.735 (0.648-0.812)	0.769 (0.674-0.851)
10-min	0.531 (0.480-0.587)	0.632 (0.572-0.700)	0.742 (0.670-0.821)	0.818 (0.738-0.904)	0.905 (0.814-0.999)	0.969 (0.867-1.07)	1.03 (0.919-1.14)	1.09 (0.965-1.20)	1.15 (1.02-1.27)	1.20 (1.05-1.33)
15-min	0.662 (0.598-0.732)	0.792 (0.716-0.877)	0.936 (0.846-1.04)	1.03 (0.931-1.14)	1.15 (1.03-1.26)	1.22 (1.10-1.35)	1.30 (1.16-1.44)	1.37 (1.21-1.51)	1.45 (1.28-1.60)	1.50 (1.32-1.66)
30-min	0.904 (0.817-0.999)	1.09 (0.987-1.21)	1.32 (1.20-1.47)	1.49 (1.34-1.65)	1.69 (1.52-1.86)	1.83 (1.64-2.02)	1.98 (1.76-2.18)	2.12 (1.88-2.33)	2.29 (2.02-2.53)	2.42 (2.12-2.67)
60-min	1.12 (1.02-1.24)	1.36 (1.24-1.51)	1.69 (1.53-1.87)	1.93 (1.74-2.14)	2.24 (2.01-2.47)	2.48 (2.22-2.73)	2.72 (2.42-3.00)	2.95 (2.62-3.26)	3.27 (2.88-3.61)	3.51 (3.08-3.88)
2-hr	1.33 (1.20-1.49)	1.61 (1.46-1.80)	2.02 (1.82-2.25)	2.34 (2.10-2.61)	2.79 (2.49-3.10)	3.16 (2.81-3.51)	3.54 (3.13-3.94)	3.95 (3.46-4.39)	4.53 (3.92-5.04)	4.99 (4.30-5.57)
3-hr	1.46 (1.31-1.64)	1.77 (1.59-1.98)	2.21 (1.99-2.48)	2.57 (2.30-2.88)	3.07 (2.73-3.42)	3.47 (3.07-3.87)	3.90 (3.43-4.35)	4.36 (3.81-4.85)	5.00 (4.32-5.58)	5.54 (4.73-6.18)
6-hr	1.81 (1.62-2.04)	2.19 (1.96-2.46)	2.74 (2.45-3.08)	3.19 (2.84-3.58)	3.84 (3.40-4.30)	4.39 (3.86-4.90)	4.99 (4.35-5.56)	5.63 (4.87-6.27)	6.57 (5.61-7.33)	7.36 (6.20-8.21)
12-hr	2.23 (2.00-2.52)	2.69 (2.41-3.04)	3.39 (3.03-3.82)	3.98 (3.53-4.47)	4.85 (4.28-5.43)	5.60 (4.89-6.25)	6.44 (5.57-7.17)	7.36 (6.29-8.19)	8.76 (7.35-9.73)	9.95 (8.24-11.1)
24-hr	2.57 (2.36-2.83)	3.10 (2.85-3.40)	3.91 (3.59-4.29)	4.60 (4.20-5.04)	5.62 (5.09-6.14)	6.49 (5.85-7.08)	7.45 (6.67-8.11)	8.51 (7.54-9.25)	10.1 (8.82-10.9)	11.4 (9.88-12.4)
2-day	2.99 (2.75-3.28)	3.61 (3.32-3.96)	4.56 (4.18-5.00)	5.34 (4.88-5.84)	6.49 (5.89-7.07)	7.45 (6.73-8.11)	8.49 (7.62-9.23)	9.62 (8.57-10.5)	11.3 (9.92-12.2)	12.7 (11.0-13.8)
3-day	3.16 (2.91-3.46)	3.82 (3.51-4.18)	4.80 (4.41-5.25)	5.62 (5.14-6.13)	6.80 (6.20-7.40)	7.80 (7.07-8.48)	8.88 (8.00-9.64)	10.1 (8.99-10.9)	11.8 (10.4-12.8)	13.2 (11.6-14.3)
4-day	3.34 (3.08-3.64)	4.02 (3.71-4.39)	5.04 (4.64-5.50)	5.89 (5.41-6.41)	7.12 (6.50-7.73)	8.15 (7.41-8.85)	9.27 (8.38-10.0)	10.5 (9.41-11.4)	12.3 (10.9-13.3)	13.8 (12.1-14.9)
7-day	3.92 (3.63-4.28)	4.71 (4.36-5.13)	5.84 (5.40-6.36)	6.79 (6.26-7.37)	8.16 (7.49-8.85)	9.32 (8.51-10.1)	10.6 (9.60-11.4)	11.9 (10.8-12.9)	13.9 (12.4-15.1)	15.6 (13.7-16.9)
10-day	4.50 (4.19-4.88)	5.38 (5.00-5.83)	6.59 (6.12-7.13)	7.58 (7.02-8.19)	8.98 (8.28-9.69)	10.1 (9.31-10.9)	11.3 (10.4-12.2)	12.6 (11.5-13.6)	14.5 (13.0-15.6)	16.0 (14.3-17.2)
20-day	6.11 (5.74-6.52)	7.25 (6.81-7.74)	8.66 (8.13-9.24)	9.78 (9.16-10.4)	11.3 (10.6-12.1)	12.6 (11.7-13.4)	13.8 (12.8-14.7)	15.1 (14.0-16.1)	16.9 (15.5-18.0)	18.3 (16.7-19.5)
30-day	7.60 (7.17-8.07)	8.96 (8.46-9.52)	10.5 (9.88-11.1)	11.7 (11.0-12.4)	13.3 (12.5-14.1)	14.5 (13.6-15.4)	15.8 (14.8-16.8)	17.1 (15.9-18.1)	18.8 (17.4-19.9)	20.0 (18.5-21.3)
45-day	9.59 (9.10-10.1)	11.3 (10.7-11.9)	13.0 (12.3-13.7)	14.3 (13.5-15.0)	16.0 (15.1-16.8)	17.2 (16.3-18.1)	18.5 (17.4-19.4)	19.6 (18.5-20.7)	21.2 (19.8-22.3)	22.3 (20.8-23.5)
60-day	11.5 (10.9-12.1)	13.5 (12.8-14.2)	15.4 (14.6-16.2)	16.8 (16.0-17.7)	18.7 (17.7-19.6)	20.0 (19.0-21.1)	21.3 (20.2-22.4)	22.5 (21.3-23.7)	24.1 (22.7-25.4)	25.2 (23.7-26.6)

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

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

Please refer to NOAA Atlas 14 document for more information.

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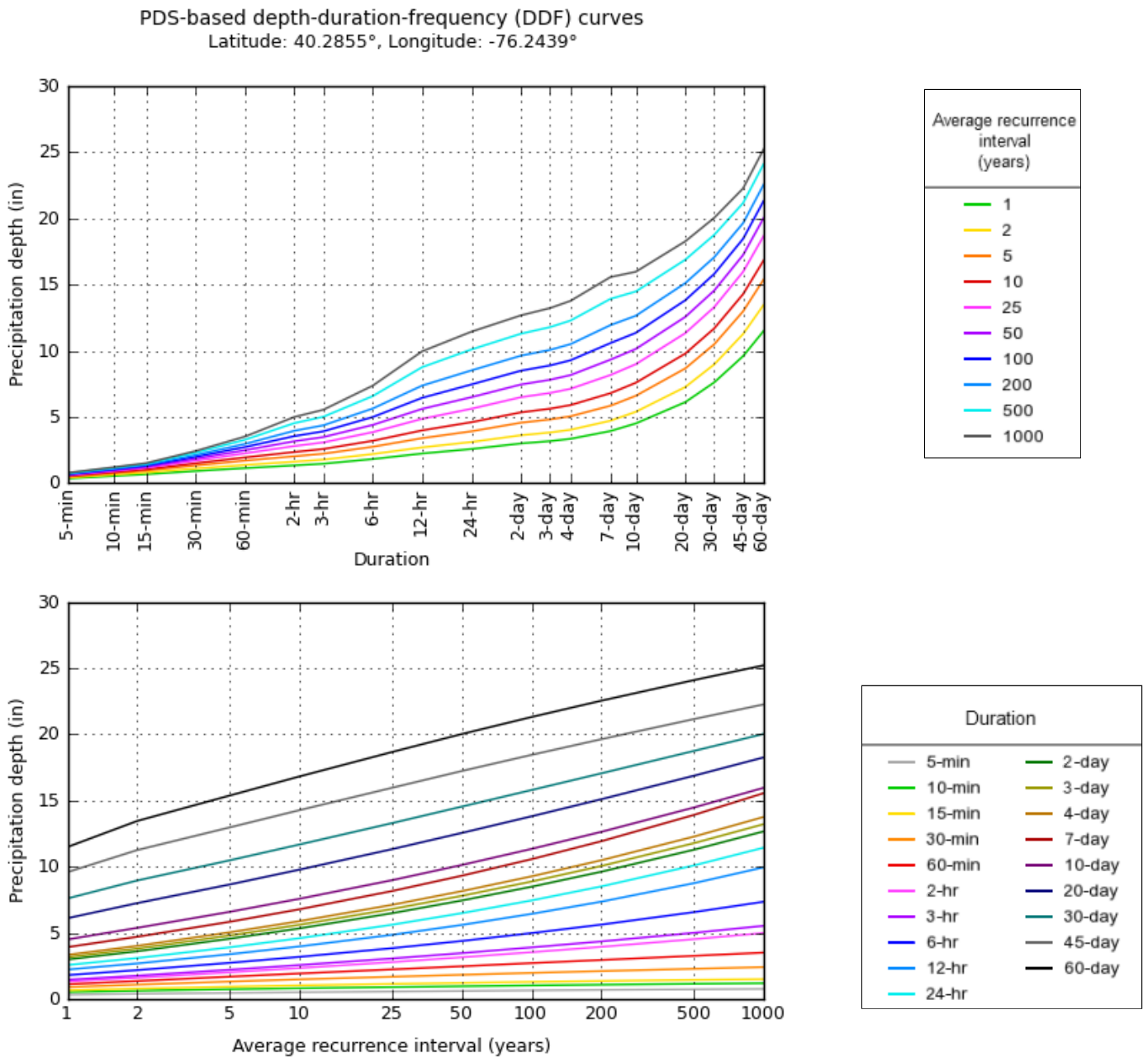
PF graphical



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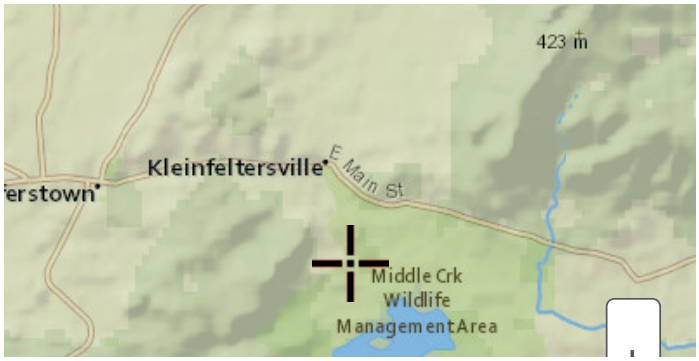
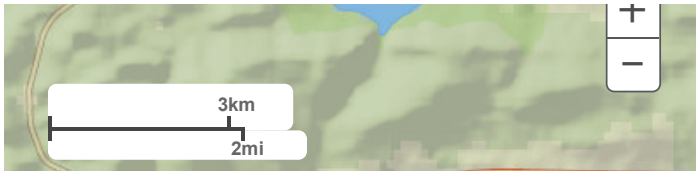
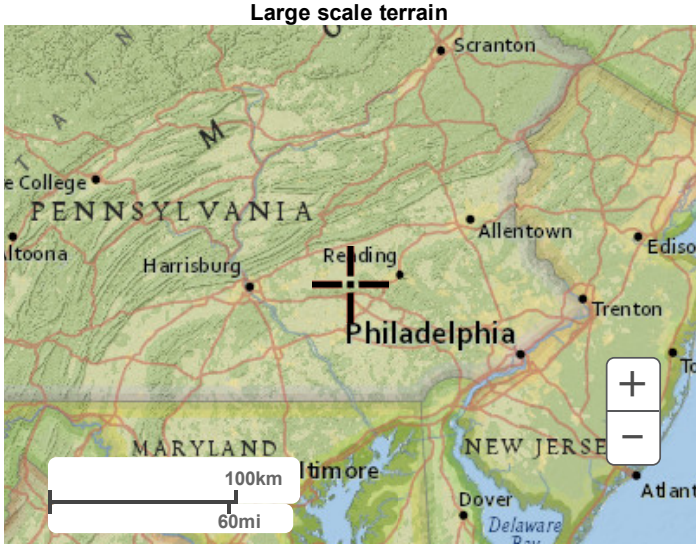
Maps & aerials

Small scale terrain

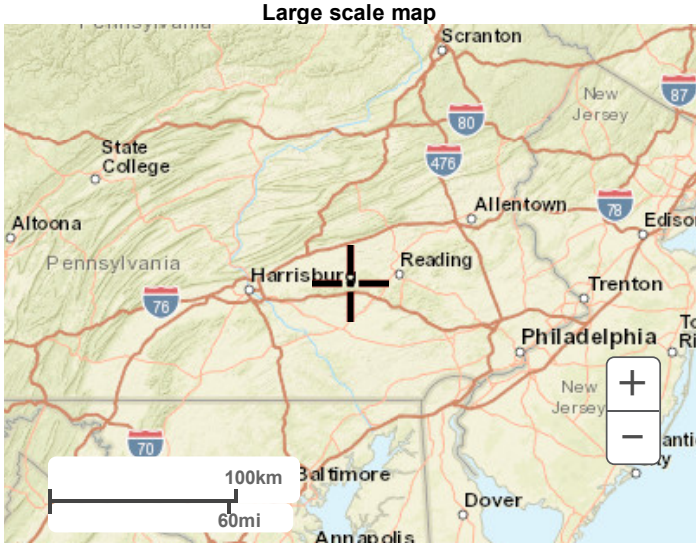




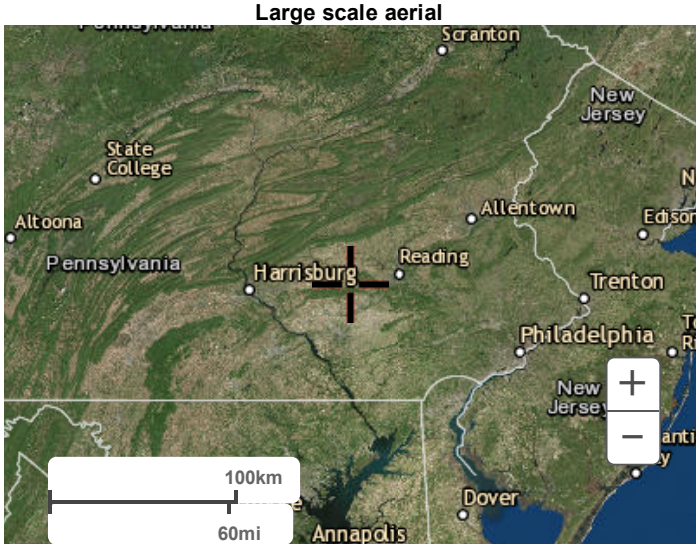
Large scale terrain



Large scale map



Large scale aerial



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WORKSHEET 1. GENERAL SITE INFORMATION

Date: November 11, 2016

Project Name: Hopeland Road

Municipality: Heidelberg

County: Lebanon

Total Area (acres): 2.28

Major River Basin: Mid Atlantic Region

Watershed: Susquehanna River

Sub Basin: Conestoga River

Nearest Surface Water to Receive Runoff: Middle Creek

Chapter 93 - Designated Water Use: Warm Water Fish (WWF)

Impaired according to Chapter 303(d) list?	YES	
List Causes of Impairment:	NO	X

Is Project Subject to, or Part of:

Municipal Separate Storm Sewer System (MS4) Requirements	YES	
	NO	X
Existing or Planned drinking water supply?	YES	
	NO	X
If yes, distance from proposed discharge (miles):		
Approved Act 167 Plan?	YES	X
	NO	
Existing River Conservation Plan?	YES	X
	NO	

Worksheet 2. Sensitive Natural Resources

INSTRUCTIONS

1. Provide Sensitive Resources Map according to non-structural BMP 5.4.1 in Chapter 5. This map should identify wetlands, woodlands, natural drainage ways, steep slopes, and other sensitive natural areas.

   See pre-development drainage area map

2. Summarize the existing extent of each sensitive resource in the Existing Sensitive Resources Table (below, using Acres). If none present, insert 0.

   0.00 acres

3. Summarize Total Protected Area as defined under BMPs in Chapter 5.

   0.00 acres

4. Do not count any area twice. For example, an area that is both a floodplain and a wetland may only be considered once.

EXISTING NATURAL SENSITIVE RESOURCE	MAPPED? Yes/no/n/a	TOTAL AREA (Ac.)	PROTECTED AREA (Ac.)
Waterbodies	N/A		
Floodplains	N/A		
Riparian Areas	N/A		
Wetlands	N/A		
Woodlands	N/A		
Natural Drainage Ways	N/A		
Steep Slopes, 15% - 25%	N/A		
Steep Slopes, over 25%	N/A		
Other:			
Other:			
TOTAL EXISTING:		**0.00**	**0.00**

Worksheet 3. Nonstructural BMP Credits

PROTECTED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 0.00 **Ac.**

1.2 Area of Riparian Forest Buffer Protection 0.00 **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading 0.00 **Ac**

TOTAL 0.00 **Ac**

Site Area	Minus	Protected Area	=	Stormwater Management Area
1.56	-	0	=	1.56

This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction (See Chapter 8, page 22 – SW BMP Manual)

Lawn _____ ft^2 x 1/4" x 1/12 = _____ ft^3

Meadow _____ ft^2 x 1/3" x 1/12 = _____ ft^3

3.3 Protect Existing Trees (See Chapter 8, page 23 – SW BMP Manual)

For Trees within 100 feet of impervious area:

Tree Canopy _____ ft^2 x 1/2" x 1/12 = _____ ft^3

5.1 Disconnect Roof Leaders to Vegetated Areas (See Chapter 8 page 25 – SW BMP Manual)

For runoff directed to areas protected under 5.8.1 and 5.8.2

Roof Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Roof Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

5.2 Disconnect Non-Roof impervious to Vegetated Areas (See Chapter 8, page 26 – SW BMP Manual)

For Runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Area _____ ft^2 x 1/3" x 1/12 = _____ ft^3

For all other disconnected roof areas

Impervious Area _____ ft^2 x 1/4" x 1/12 = _____ ft^3

TOTAL NON-STRUCTURAL VOLUME CREDIT* _____ ft^3

**For use on Worksheet 5*

WORKSHEET 4. CHANGE IN RUNOFF VOLUME FOR 2-YR STORM EVENT

PROJECT: Hopeland Road
Drainage Area: 2.28 acres
2-Year Rainfall: 3.10 in

Total Site Area: 1.56 acres
Protected Site Area: N/A acres
Managed Site Area: 1.56 acres

Existing Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[3] (ft^3)
Impervious	-	3,485	0.08	98	0.20	0.04	2.87	833
Impervious - 20% as meadow	B	871	0.02	58	7.24	1.45	0.31	22
Meadow	B	54,014	1.24	58	7.24	1.45	0.31	1,381
Meadow	D	9,583	0.22	78	2.82	0.56	1.20	959
TOTAL:		**67,953**	**1.56**					**3,195**

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff[1] (in)	Runoff Volume[3] (ft^3)
Impervious	-	4,356	0.10	98	0.20	0.04	2.87	1,041
Impervious - Gravel	B	4,356	0.10	85	1.76	0.35	1.67	607
Meadow	B	49,658	1.14	58	7.24	1.45	0.31	1,270
Meadow	D	9,583	0.22	78	2.82	0.56	1.20	959
TOTAL:		**67,953**	**1.56**					**3,876**

2-Year Volume Increase (ft^3):	**682**

2-Year Volume Increase = Developed Conditions Runoff Volume - Existing Conditions Runoff Volume

1. Runoff (in) = Q = (P - 0.2S)2 / (P+ 0.8S) where
   P = 2-Year Rainfall (in)
   S = (1000/CN)-10

2. Runoff Volume (CF) = Q x Area x 1/12
   Q = Runoff (in)
   Area = Land use area (sq. ft.)

Note: Runoff Volume must be calculated for EACH land use type/condition and HSGI.
The use of a weighted CN value for volume calculations is not acceptable.

Worksheet 5. Structural BMP Volume Credits

PROJECT: Hopeland Road
SUB-BASIN:

Required Control Volume (ft^3) - *from Worksheet 4:* 682

Non-structural Volume Credit (ft^3) - *from Worksheet 3:* N/A
(maximus is 25% of required volume)

Structural Volume Reqmt (ft^3) 682
(Required Control Volume minus Non-structural Credit)

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 6		Area (ft^2)	Volume Reduction Permanently Removed (ft^3)
6.4.1	Porous Pavement		
6.4.2	Infiltration Basin		
6.4.3	Infiltration Bed		
6.4.4	Infiltration Trench		
6.4.5	Rain Garden/Bioretention		
6.4.6	Dry Well/Seepage Pit		
6.4.7	Constructed Filter		
6.4.8	Vegetated Swale		
6.4.9	Vegetated Filter Strip		
6.4.10	Berm	1,676	1,006
6.5.1	Vegetated Roof		
6.5.2	Capture and Re-Use		
6.6.1	Constructed Wetlands		
6.6.2	Wet Pond/Retention Basin		
6.7.1	Riparian Buffer/Riparian Forest Buffer Restoration		
6.7.2	Landscape Restoration/Reforestation		
6.7.3	Soil Amendment		
6.8.1	Level Spreader		
6.8.2	Special Storage Areas		
Other:			

Total Structural Volume (ft^3): **1,006**

Structural Volume Requirement (ft^3): **682**

DIFFERENCE: **-324**

VOLUME CREDIT DETERMINATION

1 Detained area runoff volume from Hydraflow = 1,393 cf

2 Storage volume of the BMPs = 1,676 cf

3 Infiltrated volume within 72 hours after the 2-yr/24-hr event
(Infiltration Rate/12) x Infiltration Area x 72 hrs = 1,006 cf

WORKSHEET 10. WATER QUALITY COMPLIANCE FOR NITRATE

Does the site design incorporate the following BMPs to address nitrate pollution? A summary "yes" rating is achieved if at least 2 Primary BMPs for nitrate are provided across the site or 4 secondary BMPs for nitrate are provided across the site (or the

PRIMARY BMPs FOR NITRATE:

	YES	NO
NS BMP 5.4.2 - Protect / Conserve / Enhance Riparian Buffers		
NS BMP 5.5.4 - Cluster Uses at Each Site		
NS BMP 5.6.1 - Minimize Total Disturbed Area	X	
NS BMP 5.6.3 - Re-Vegetate / Re-Forest Disturbed Areas (Native Species)	X	
NS BMP 5.9.1 - Street Sweeping / Vacuuming		
Structural BMP 6.7.1 - Riparian Buffer Restoration		
Structural BMP 6.7.2 - Landscape Restoration		

SECONDARY BMPs FOR NITRATE:

NS BMP 5.4.1 - Protect Sensitive / Special Value Features		
NS BMP 5.4.3 - Protect / Utilize Natural Drainage Features		
NS BMP 5.6.2 - Minimize Soil Compaction	X	
Structural BMP 6.4.5 - Rain Garden / Bioretention		
Structural BMP 6.4.8 - Vegetated Swale		
Structural BMP 6.4.9 - Vegetated Filter Strip		
Structural BMP 6.6.1 - Constructed Wetland		
Structural BMP 6.7.1 - Riparian Buffer Restoration		
Structural BMP 6.7.2 - Landscape Restoration		
Structural BMP 6.7.3 - Soils Amendment/Restoration	X	

TIME OF CONCENTRATION ADJUSTMENT

POST CONSTRUCTION TC TO BMP (DETAINED TC) BEFORE ADJUSTMENT 6.0 MIN

STRUCTURAL VOLUME PROVIDED BY BMP 1,393 CF FOR 2-YR/24-HR STORM EVENT
1,676 CF FOR ALL REMANING STORM EVENTS

RATES OF RUNOFF TO THE BMP (FROM HYDRAFLOW REPORT)

Storm Event	Q (CFS)
2 YR/24 HR	0.349
10 YR/24 HR	1.060
50 YR/24 HR	2.148
100 YR/24 HR	2.747

ADDITIONAL RESIDENCE TIME (MIN) = (STRUCTURAL VOLUME PROVIDED BY BMP / RATE OF RUNOFF TO BMP) / 60

Storm Event	Q (CFS)	Additional Residence Time (min.)
2 YR/24 HR	0.349	66.523
10 YR/24 HR	1.060	26.352
50 YR/24 HR	2.148	13.004
100 YR/24 HR	2.747	10.169

ADJUSTED TC = POST CONSTRUCTION TC TO BMP BEFORE ADJUSTMENT + ADDITIONAL RESIDENCE TIME

Storm Event	Q (CFS)	Additional Residence Time (min.)	Adjusted Time of Concentration (min.)
2 YR/24 HR	0.349	66.52	72.52
10 YR/24 HR	1.060	26.35	32.35
50 YR/24 HR	2.148	13.00	19.00
100 YR/24 HR	2.747	10.17	16.17

INFILTRATION BERM DEWATERING CALCULATION SITE NAME: Hopeland Road

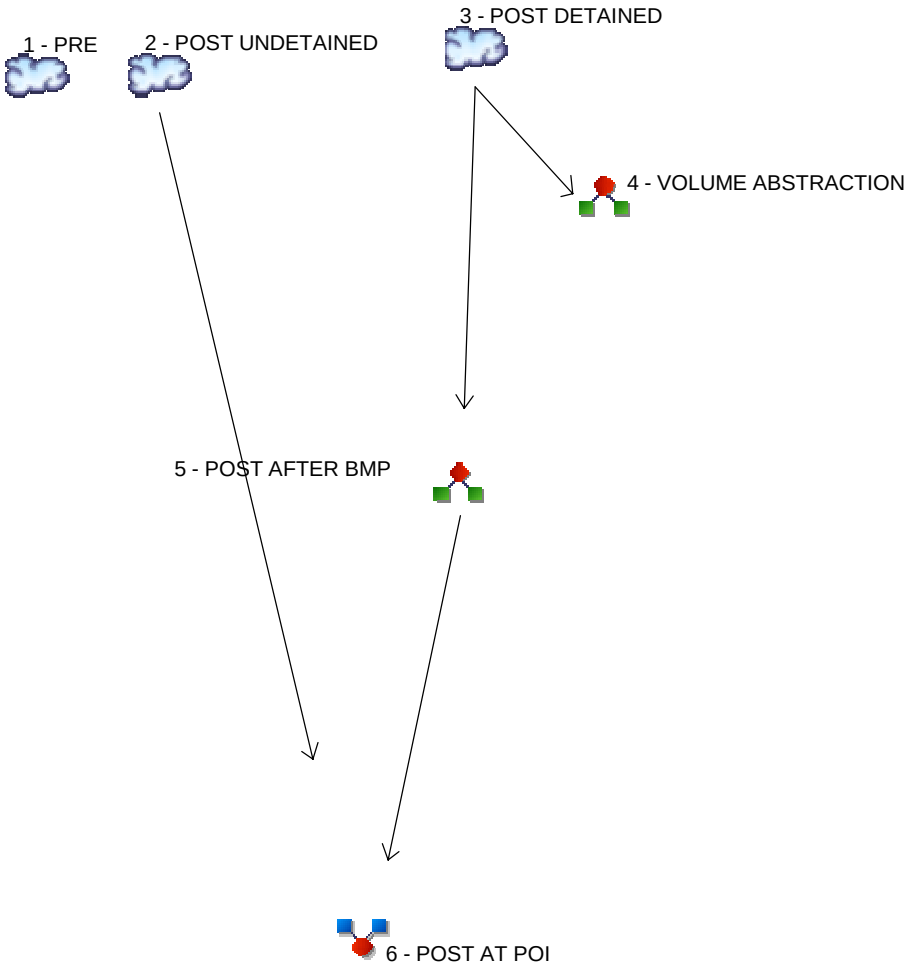
STORAGE VOLUME	1,393	CF	AFTER 2-YEAR/24-HOUR STORM
DESIGN INFILTRATION RATE	0.10	IN/HR	BASED ON IT-01, IT-02, AND A RECOMMENDED RATES
INFILTRATION AREA	1,676	SF	

DEWATERING TIME = STORAGE VOLUME / ((DESIGN INFILTRATION RATE /12) * INFILTRATION AREA)

DEWATERING TIME =	**99.7**	**HOURS**

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	POST UNDETAINED
3	SCS Runoff	POST DETAINED
4	Diversion1	VOLUME ABSTRACTION
5	Diversion2	POST AFTER BMP
6	Combine	POST AT POI

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	1.563	-------	-------	4.707	-------	9.509	12.15	PRE
2	SCS Runoff	------	-------	1.222	-------	-------	3.679	-------	7.433	9.499	POST UNDETAINED
3	SCS Runoff	------	-------	0.685	-------	-------	1.547	-------	2.778	3.446	POST DETAINED
4	Diversion1	3	-------	0.476	-------	-------	1.127	-------	2.081	2.213	VOLUME ABSTRACTION
5	Diversion2	3	-------	0.000	-------	-------	0.159	-------	2.048	2.592	POST AFTER BMP
6	Combine	2, 5	-------	1.222	-------	-------	3.679	-------	7.433	11.97	POST AT POI

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.563	2	720	4,265	------	------	------	PRE
2	SCS Runoff	1.222	2	720	3,334	------	------	------	POST UNDETAINED
3	SCS Runoff	0.685	2	718	1,393	------	------	------	POST DETAINED
4	Diversion1	0.476	2	724	1,449	3	------	------	VOLUME ABSTRACTION
5	Diversion2	0.000	2	n/a	0	3	------	------	POST AFTER BMP
6	Combine	1.222	2	720	3,334	2, 5	------	------	POST AT POI

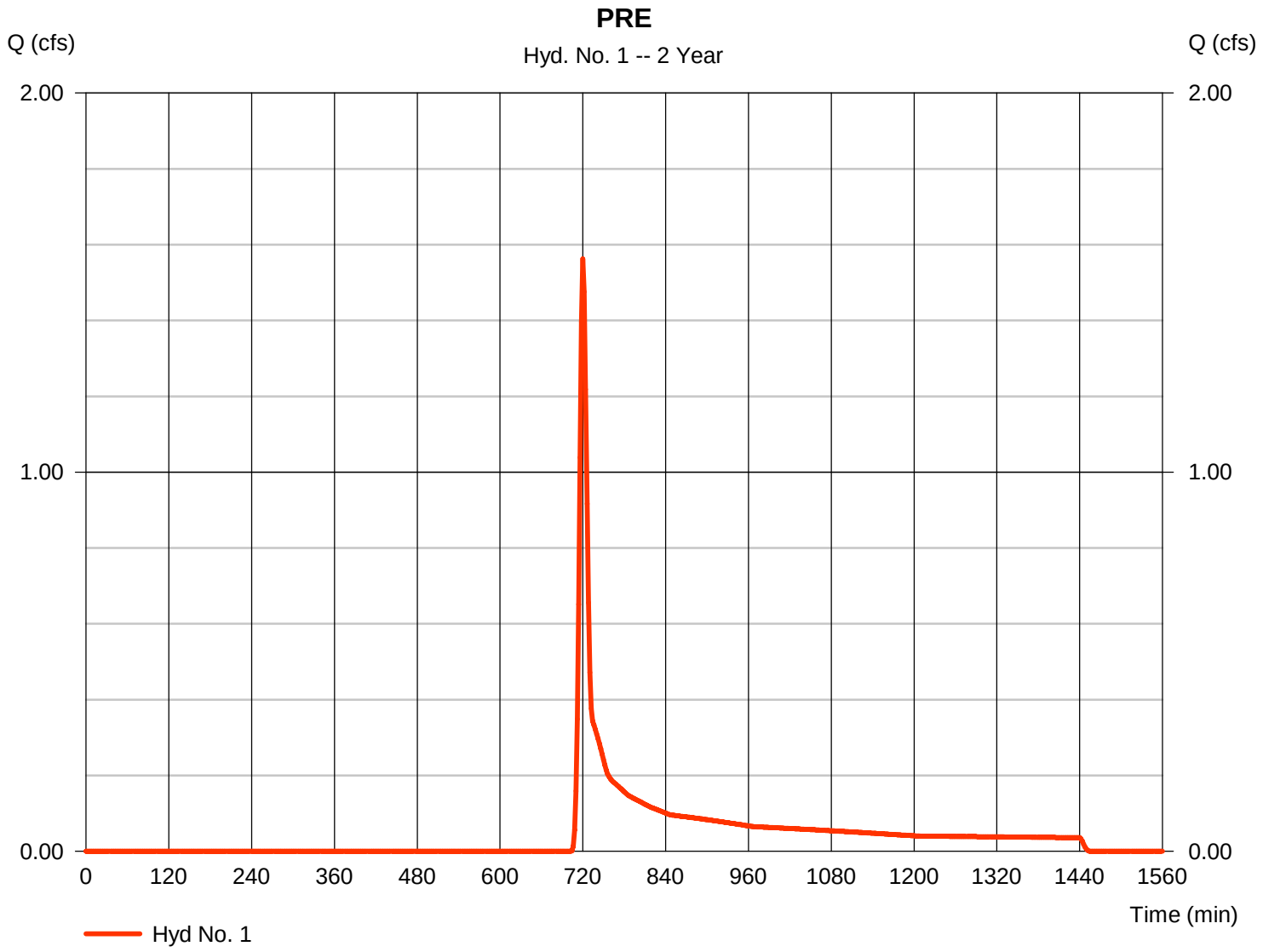
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.563 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	4,265 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

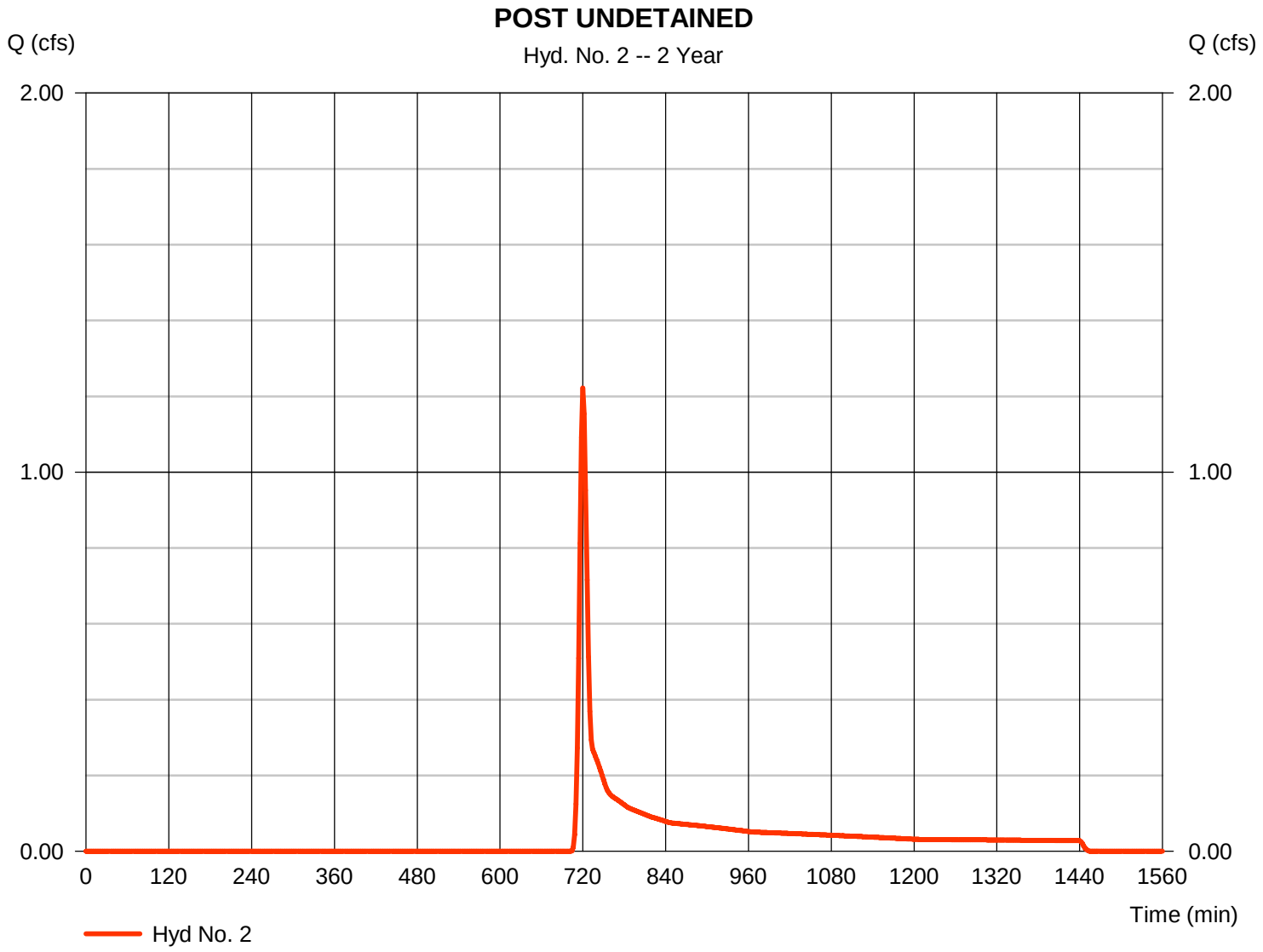
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.222 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,334 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



TR55 Tc Worksheet

Hyd. No. 2

POST UNDETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

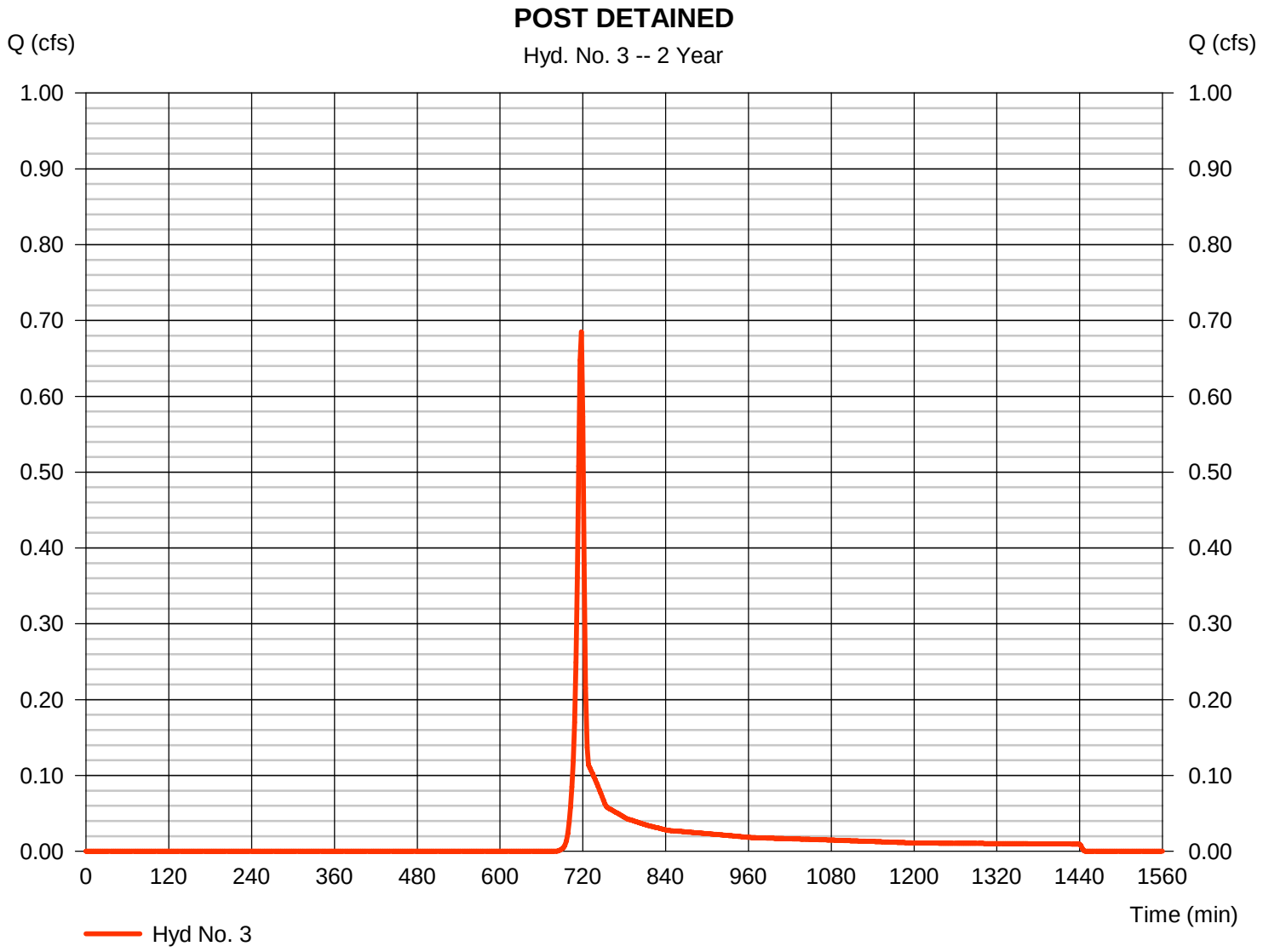
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.685 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,393 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.00 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500



TR55 Tc Worksheet

Hyd. No. 3

POST DETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 12.00		0.00		0.00		
Travel Time (min)	**= 4.07**	**+**	**0.00**	**+**	**0.00**	**=**	**4.07**
Shallow Concentrated Flow							
Flow length (ft)	= 234.00		242.00		0.00		
Watercourse slope (%)	= 5.50		4.50		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.78		4.31		0.00		
Travel Time (min)	**= 1.03**	**+**	**0.94**	**+**	**0.00**	**=**	**1.97**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

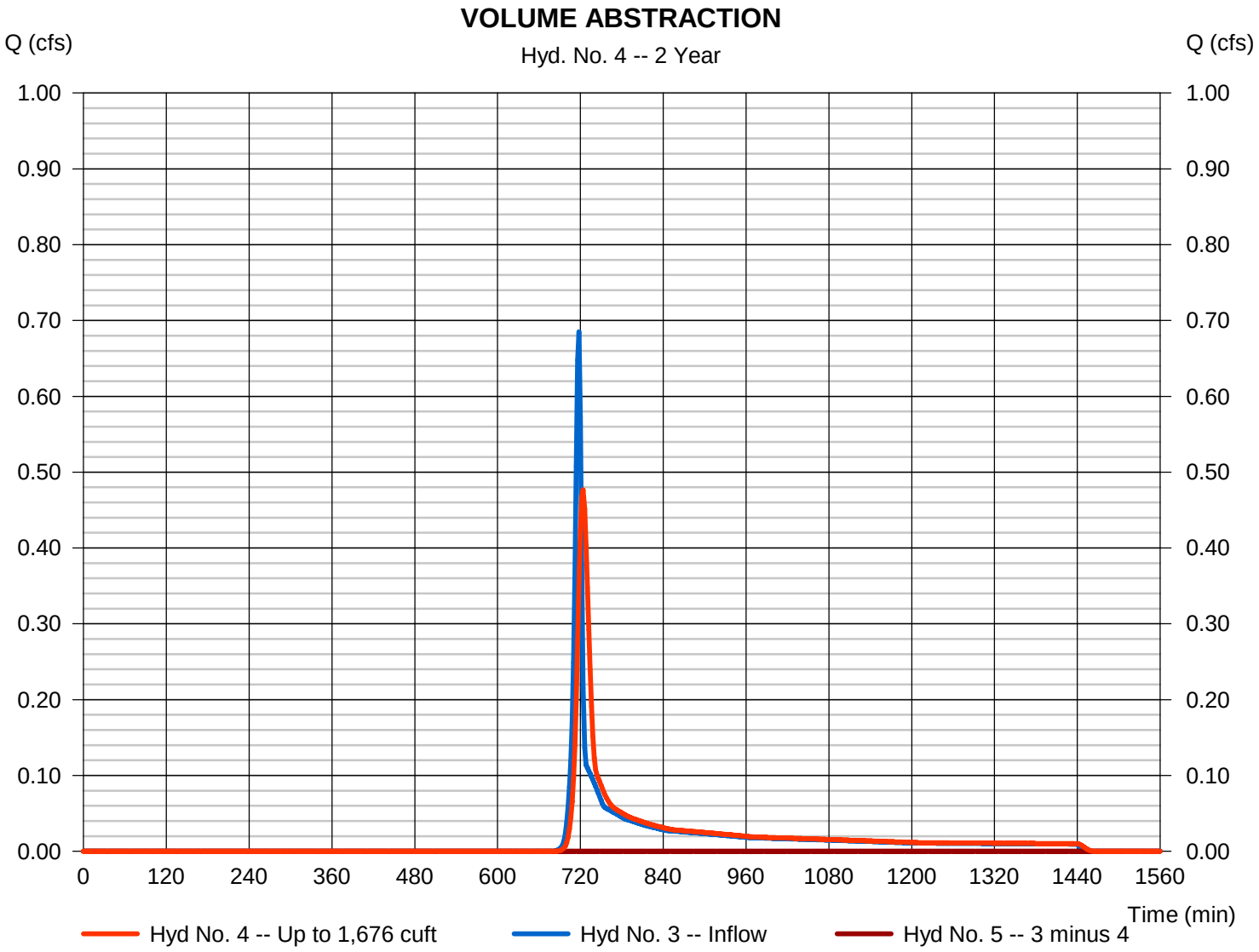
Total Travel Time, Tc ..... 6.00 min

Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 0.476 cfs
Storm frequency	= 2 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,449 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

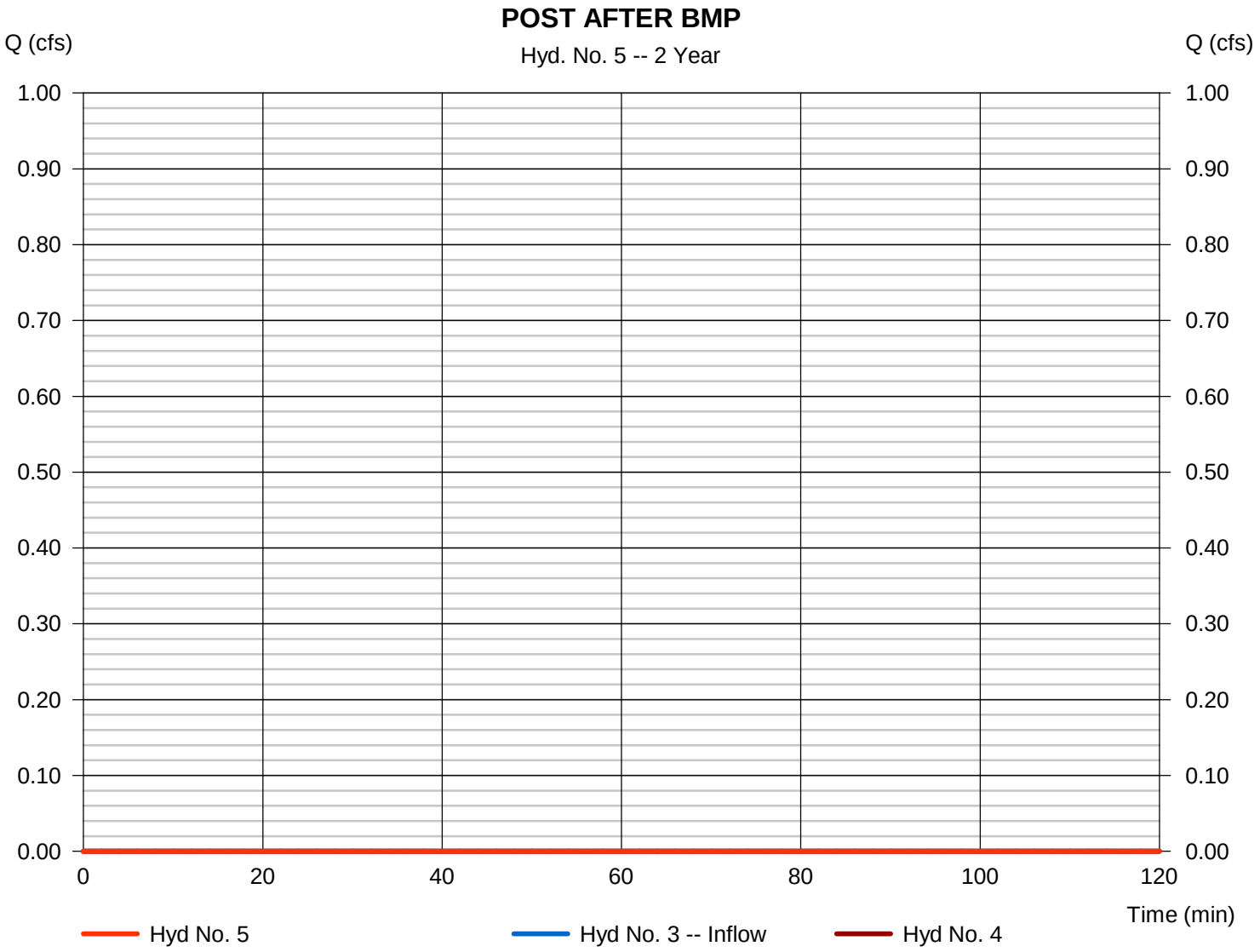


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

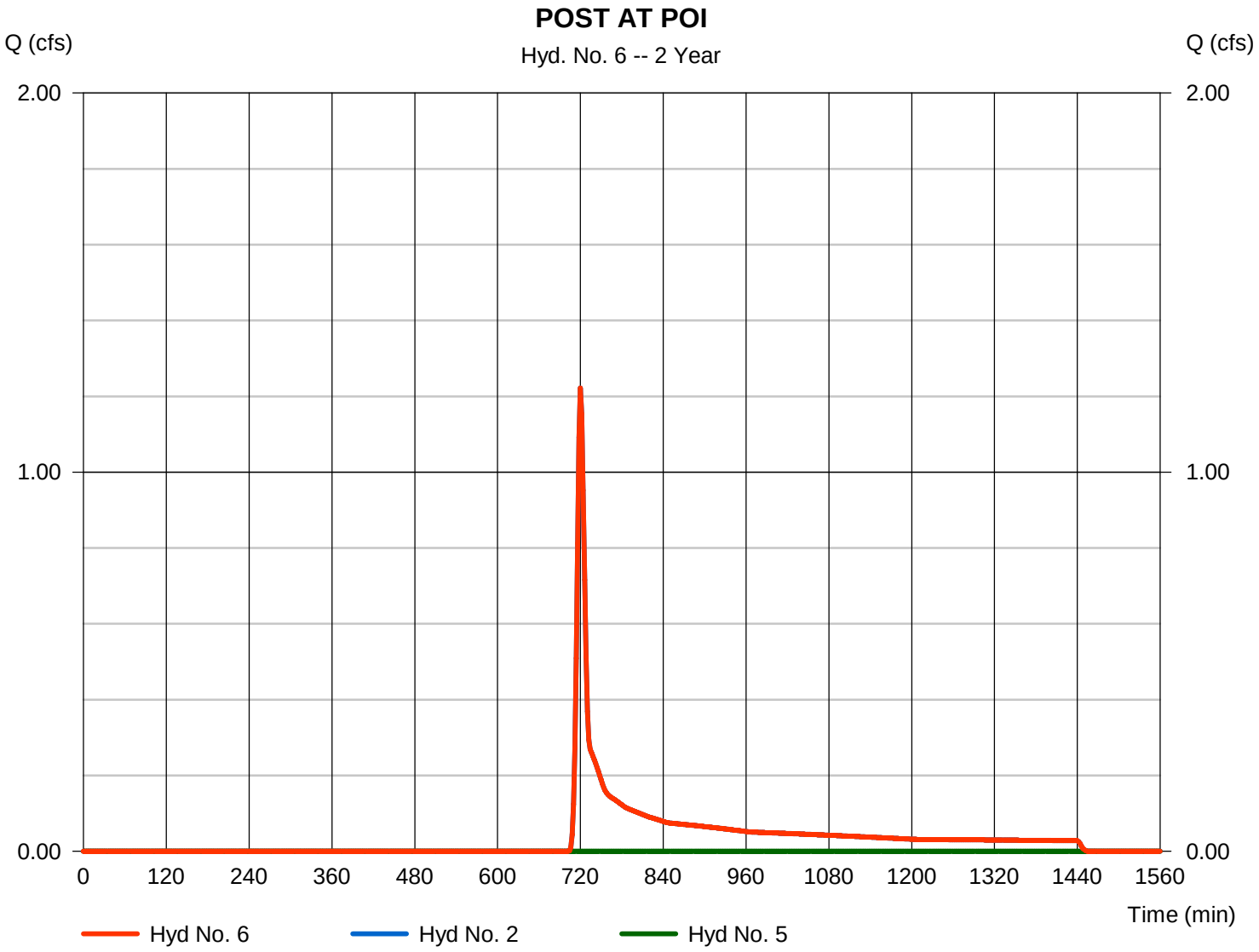


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	=	Combine	Peak discharge	=	1.222 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	3,334 cuft
Inflow hyds.	=	2, 5	Contrib. drain. area	=	1.790 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.707	2	720	11,031	------	------	------	PRE
2	SCS Runoff	3.679	2	720	8,622	------	------	------	POST UNDETAINED
3	SCS Runoff	1.547	2	718	3,095	------	------	------	POST DETAINED
4	Diversion1	1.127	2	722	1,677	3	------	------	VOLUME ABSTRACTION
5	Diversion2	0.159	2	754	1,542	3	------	------	POST AFTER BMP
6	Combine	3.679	2	720	10,164	2, 5	------	------	POST AT POI

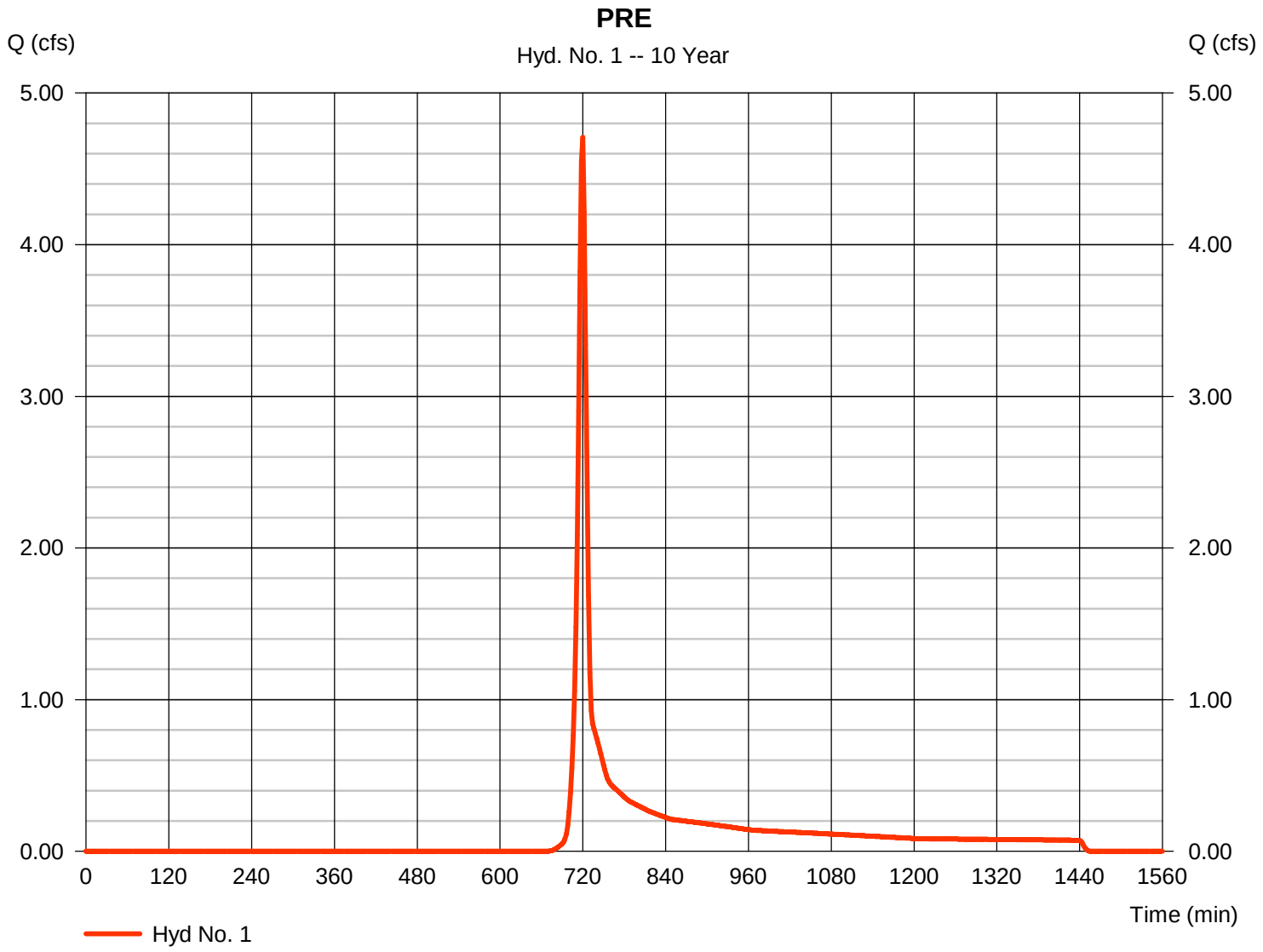
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.707 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,031 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



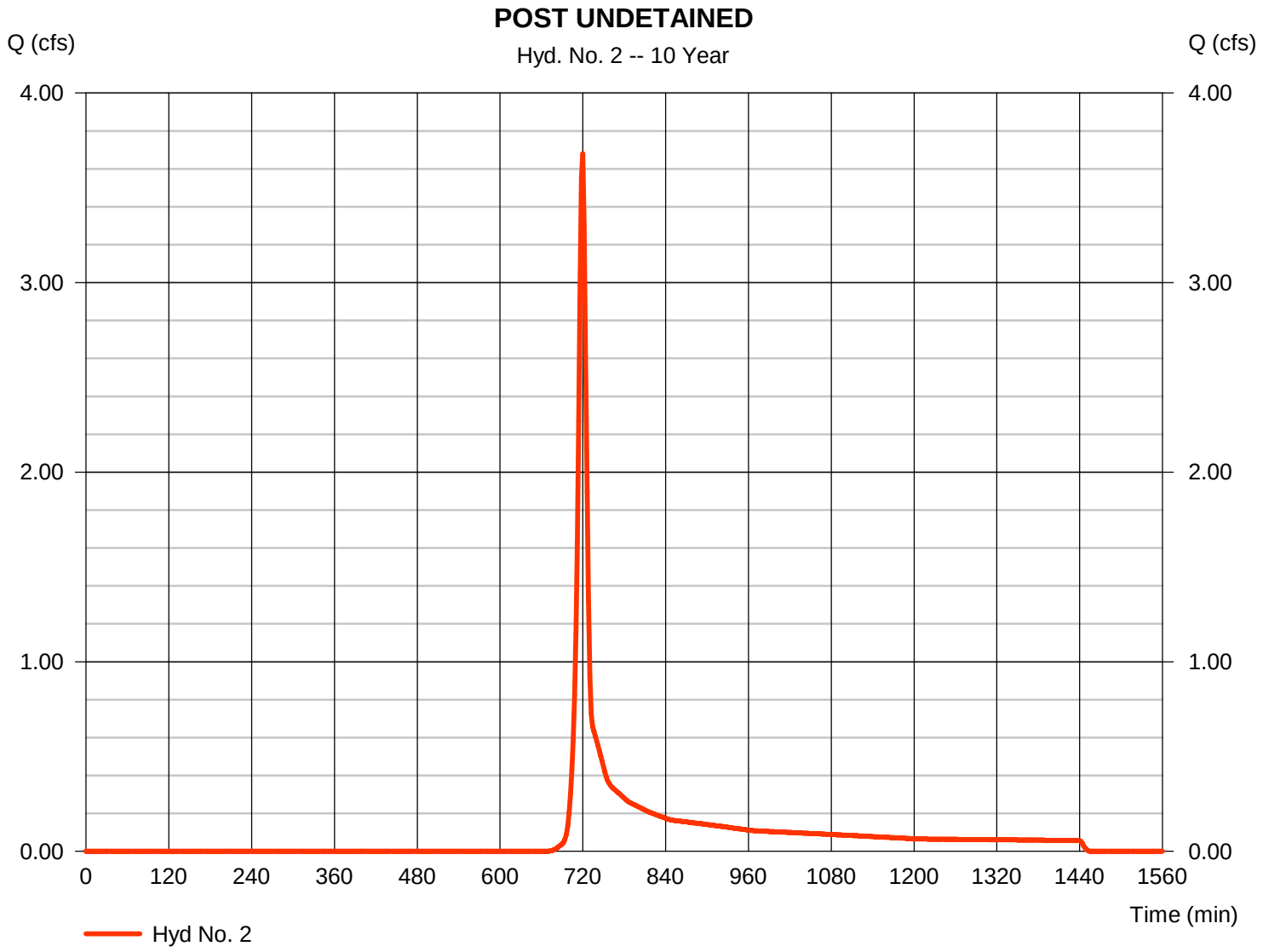
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.679 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	8,622 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



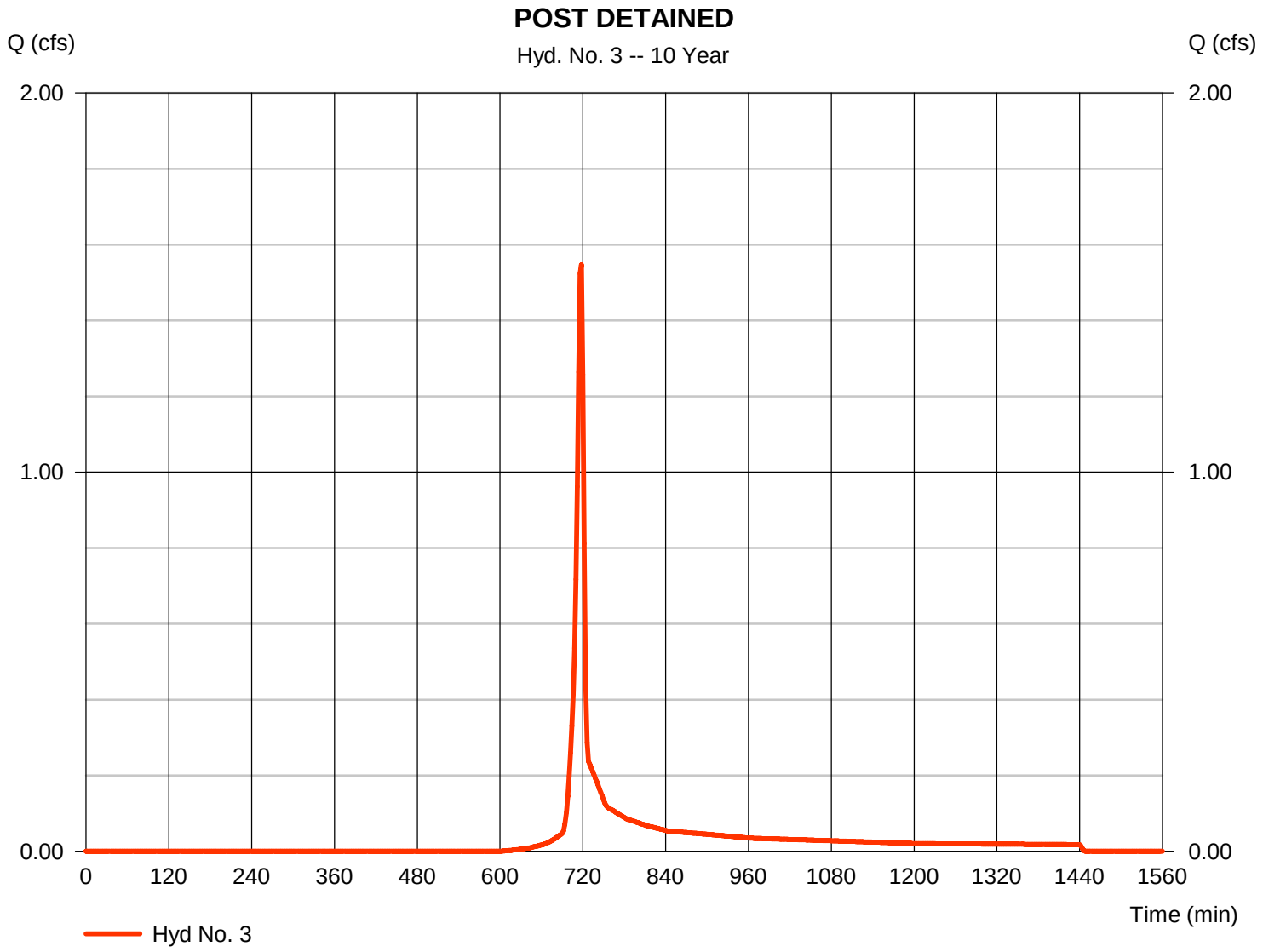
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.547 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	3,095 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.00 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

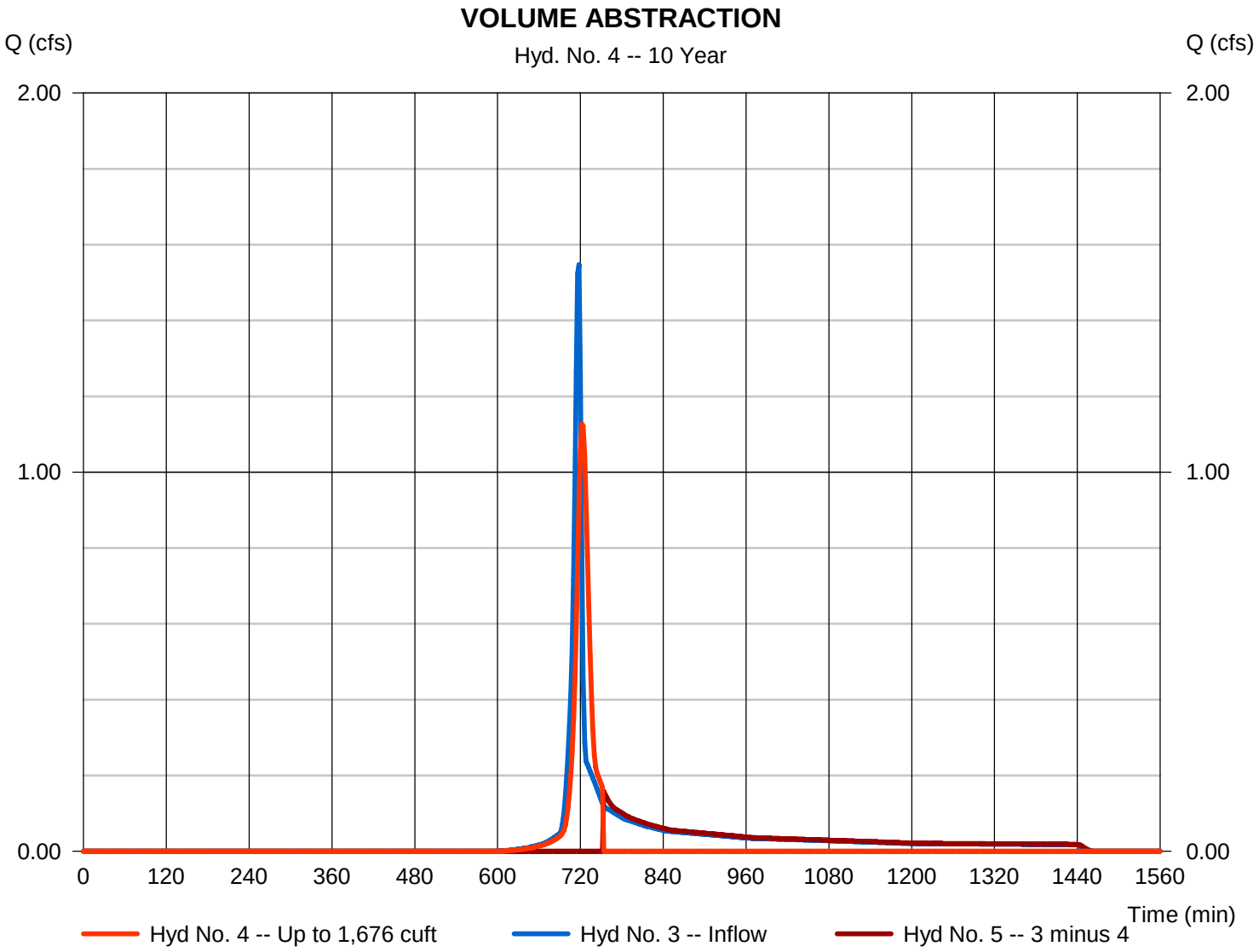


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 1.127 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 1,677 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

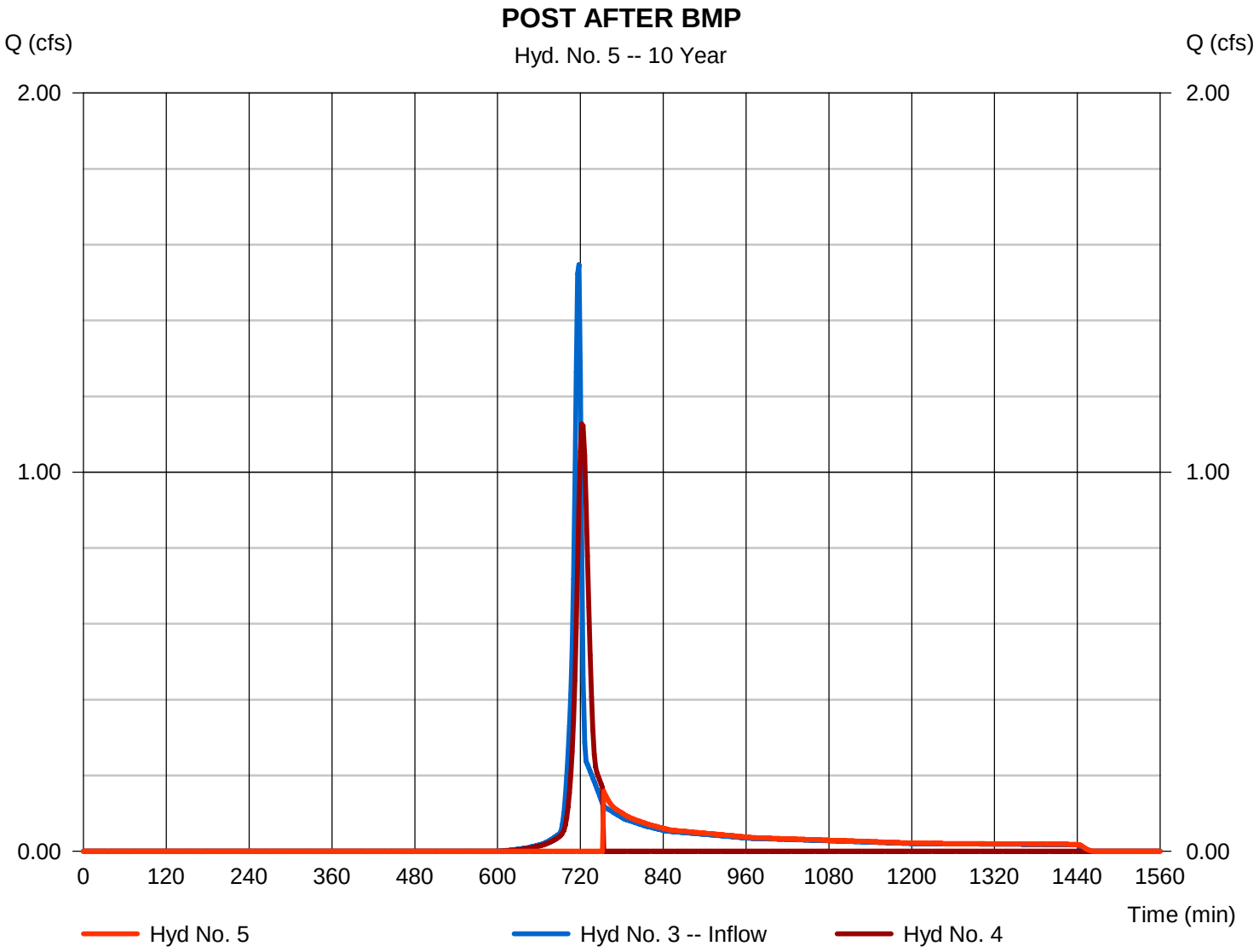


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 0.159 cfs
Storm frequency	= 10 yrs	Time to peak	= 754 min
Time interval	= 2 min	Hyd. volume	= 1,542 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

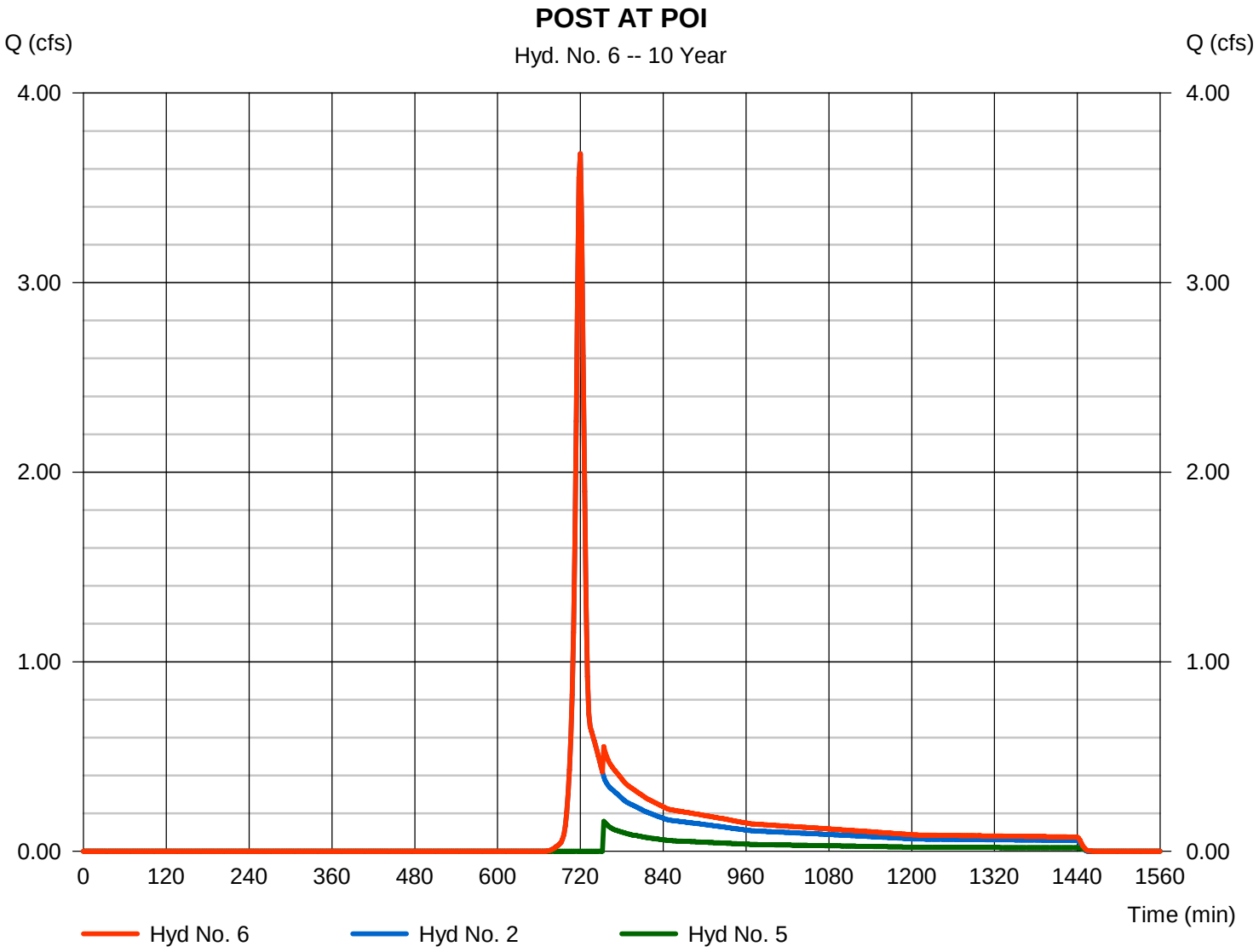


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 3.679 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 10,164 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.509	2	720	21,771	------	------	------	PRE
2	SCS Runoff	7.433	2	720	17,018	------	------	------	POST UNDETAINED
3	SCS Runoff	2.778	2	716	5,612	------	------	------	POST DETAINED
4	Diversion1	2.081	2	722	1,799	3	------	------	VOLUME ABSTRACTION
5	Diversion2	2.048	2	724	4,038	3	------	------	POST AFTER BMP
6	Combine	7.433	2	720	21,055	2, 5	------	------	POST AT POI

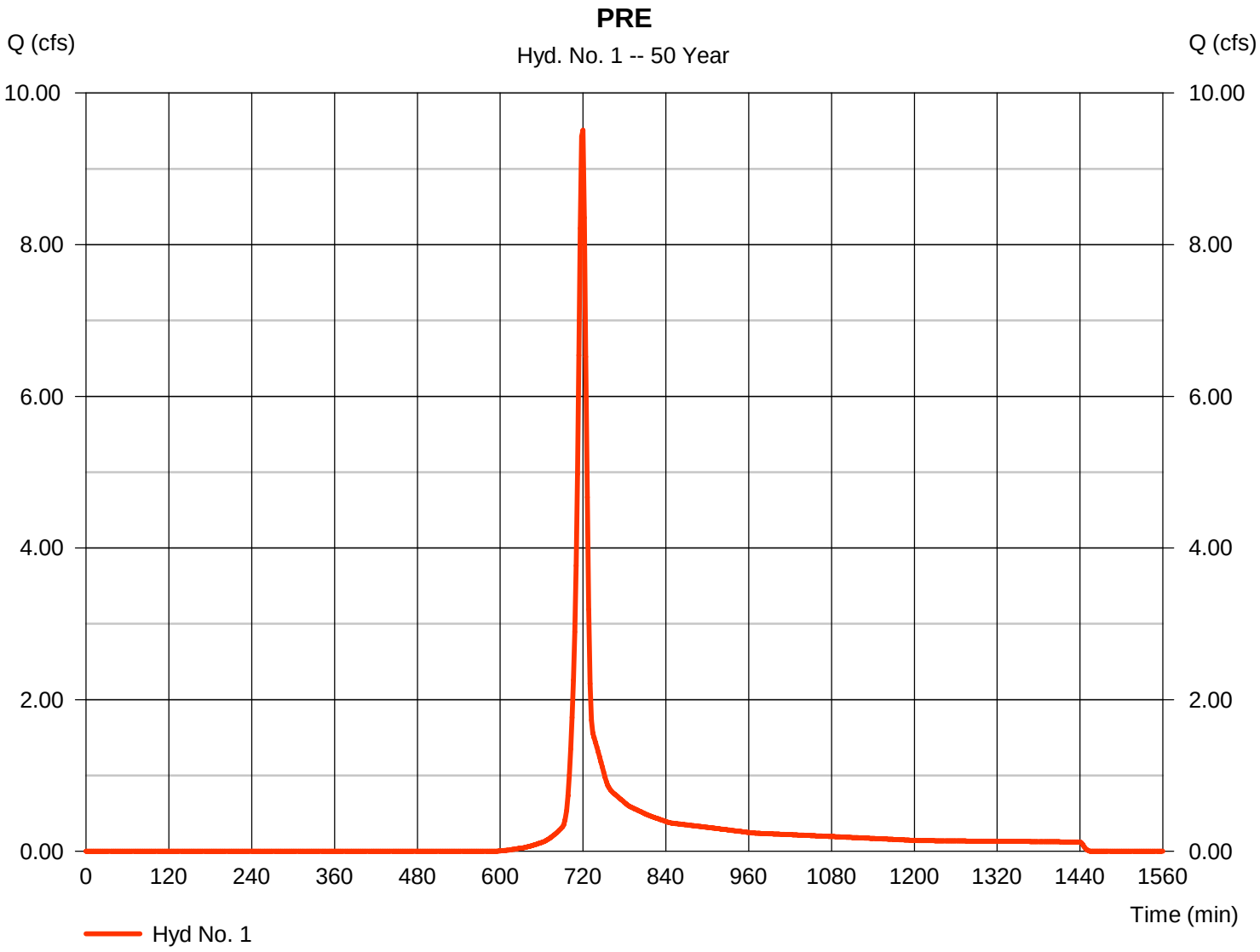
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.509 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	21,771 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	6.49 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



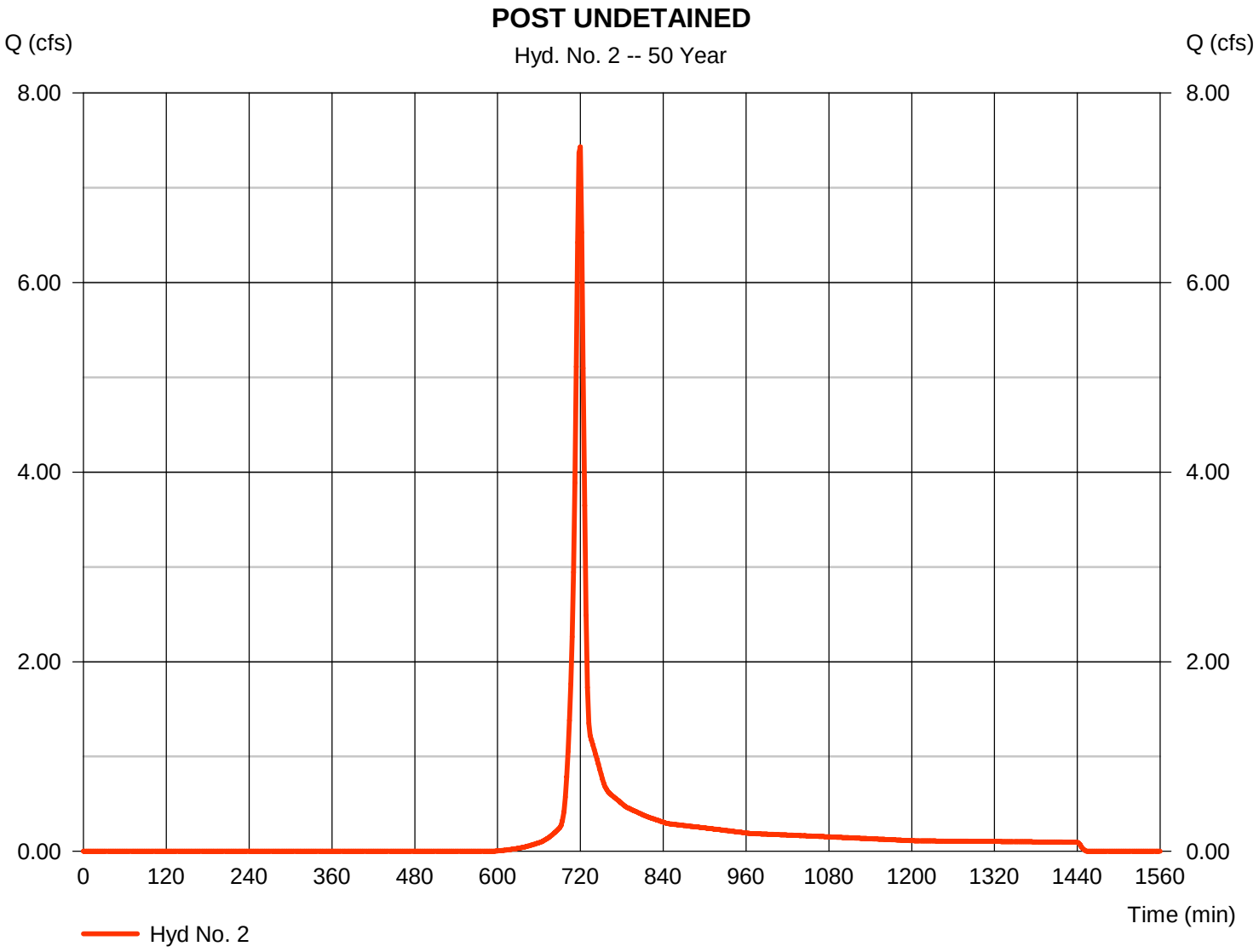
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.433 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	17,018 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	6.49 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



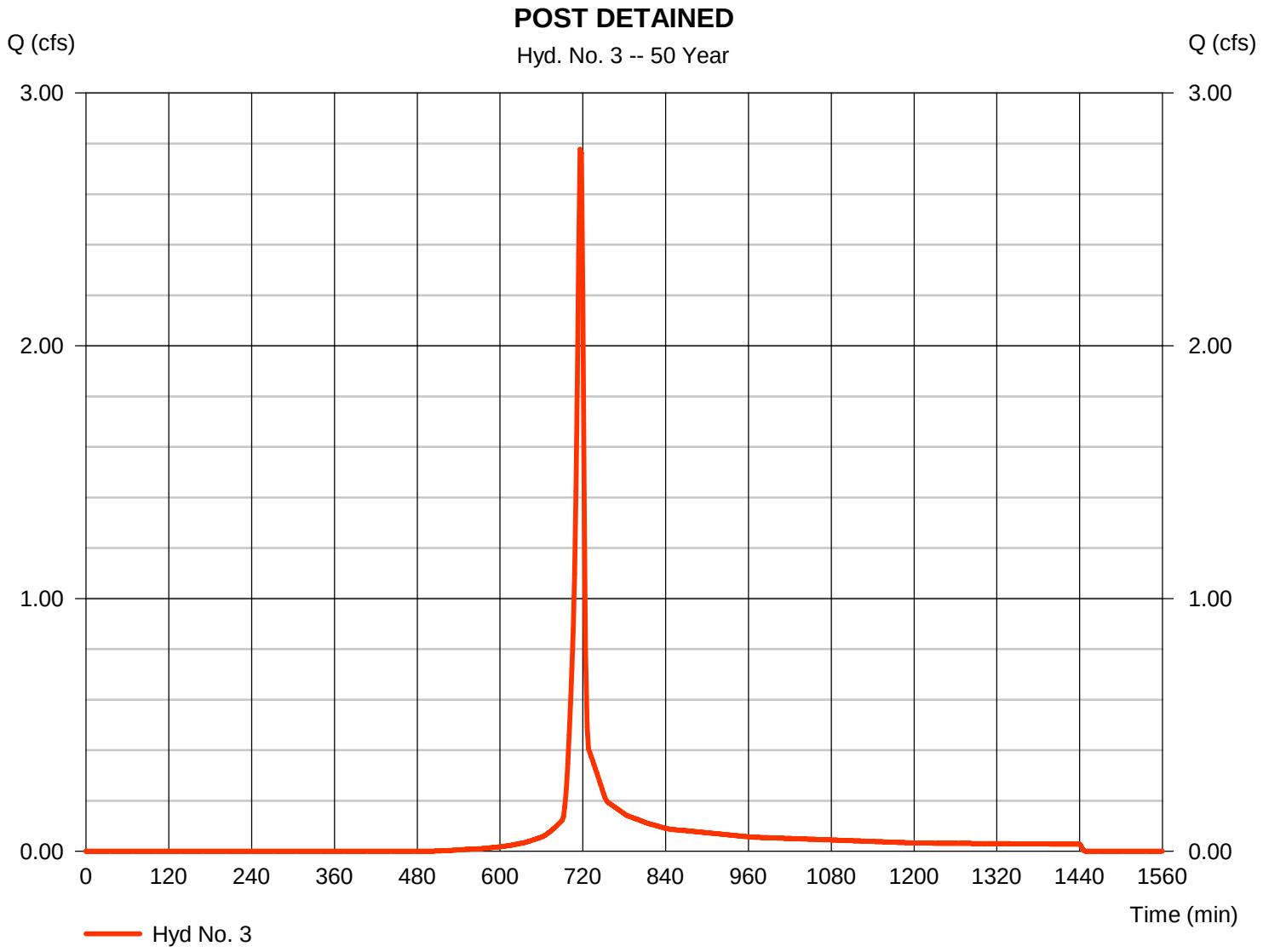
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.778 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	5,612 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.00 min
Total precip.	=	6.49 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

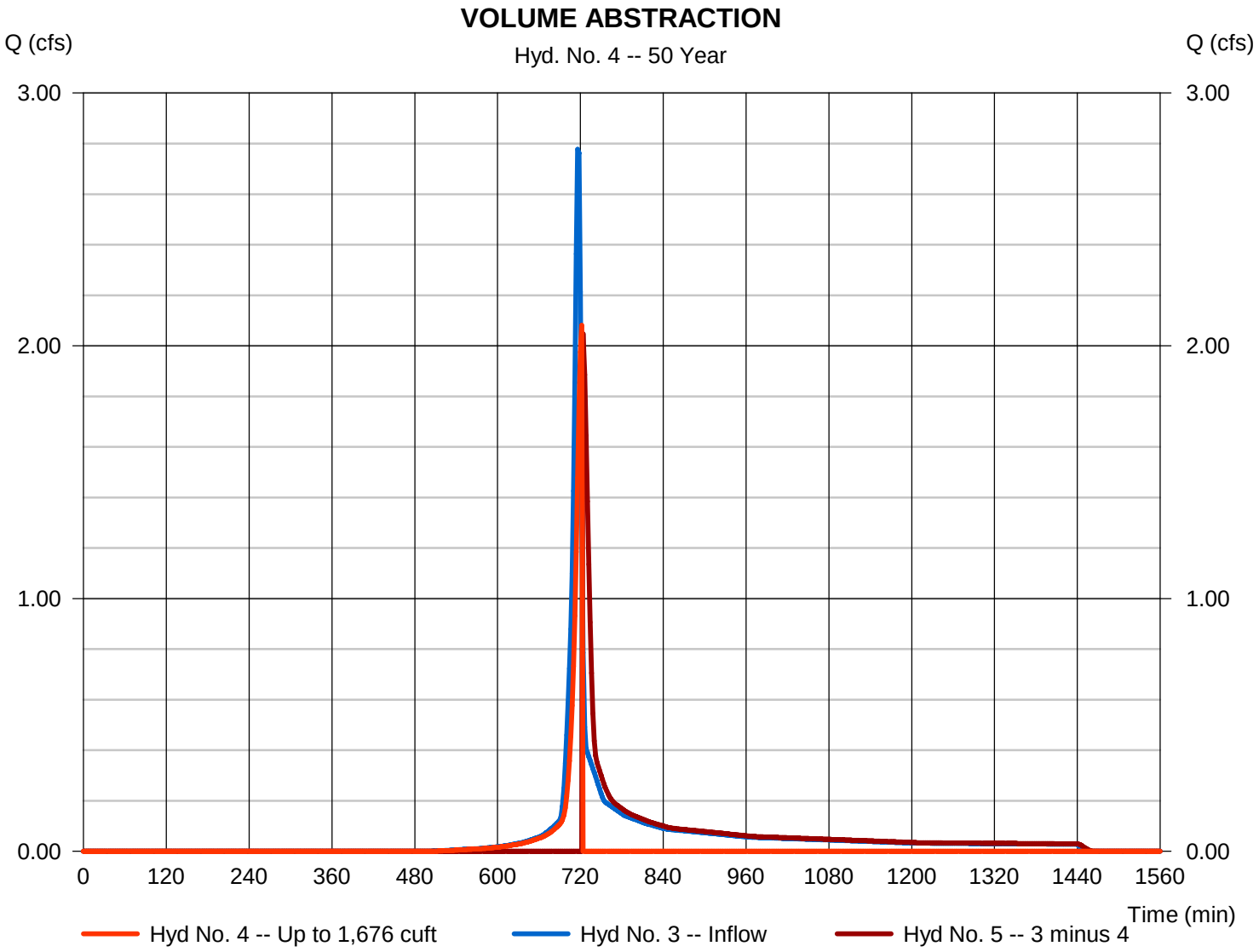


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 2.081 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 1,799 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

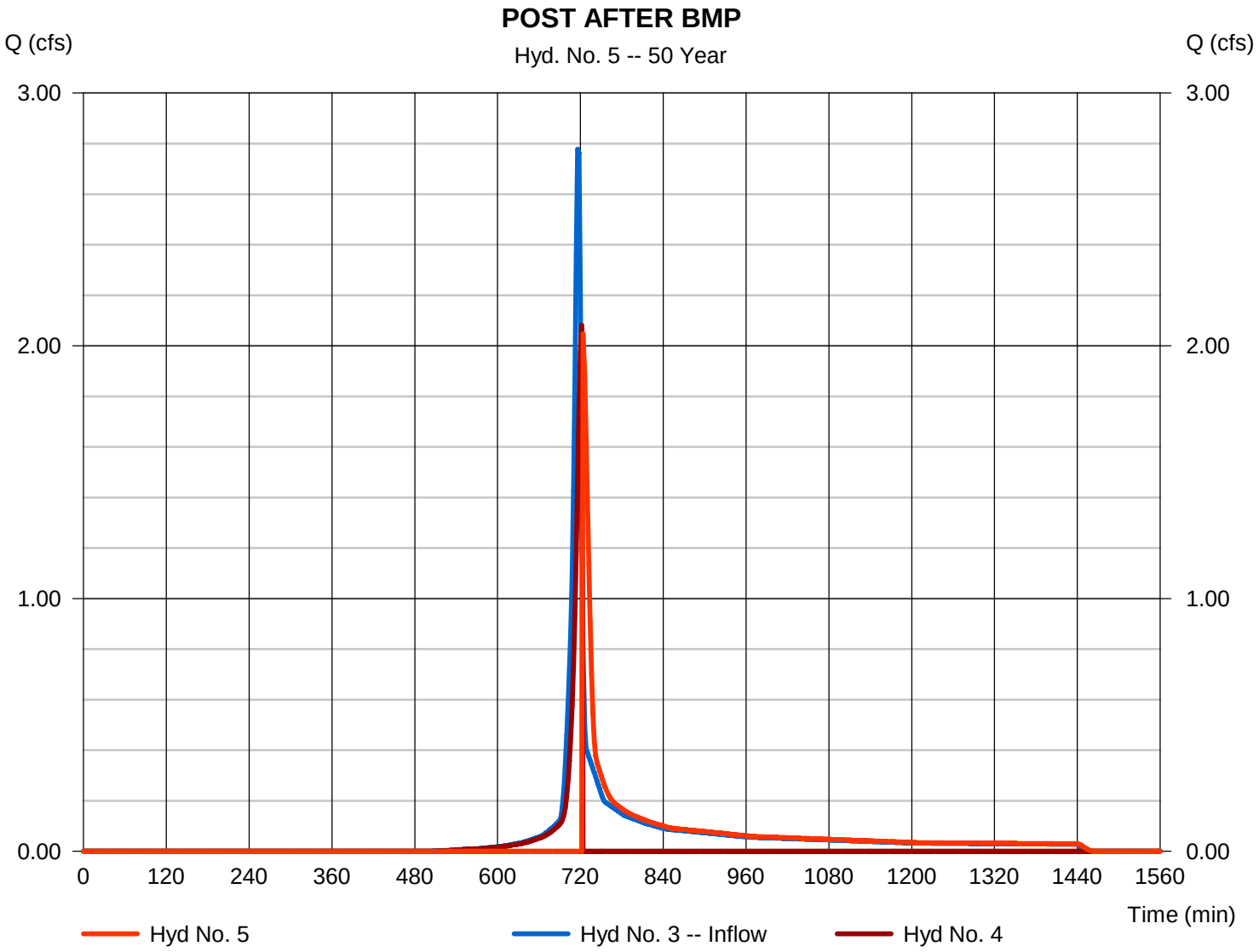


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 2.048 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 4,038 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

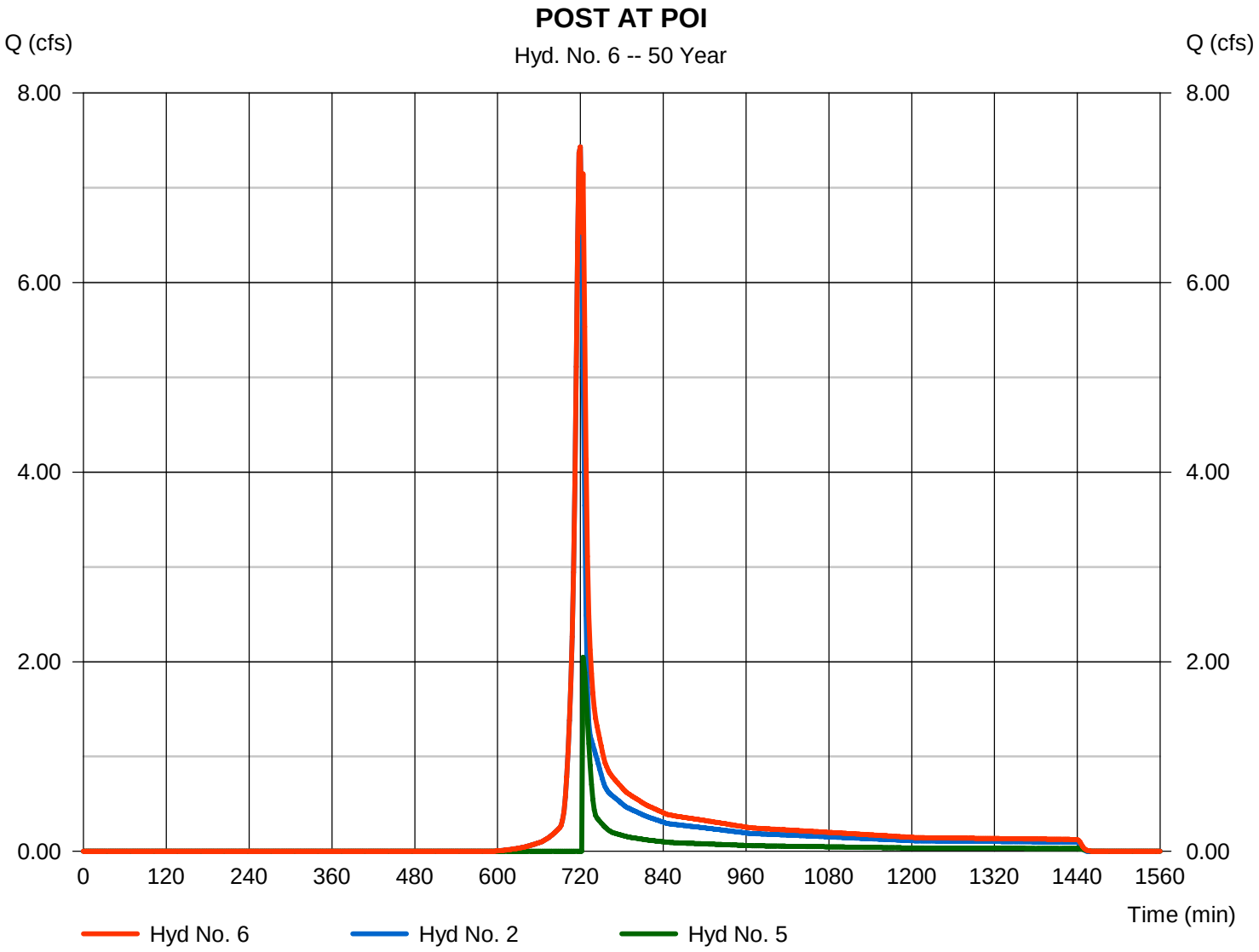


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 7.433 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 21,055 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	12.15	2	720	27,829	------	------	------	PRE
2	SCS Runoff	9.499	2	720	21,753	------	------	------	POST UNDETAINED
3	SCS Runoff	3.446	2	716	6,985	------	------	------	POST DETAINED
4	Diversion1	2.213	2	718	1,770	3	------	------	VOLUME ABSTRACTION
5	Diversion2	2.592	2	722	5,494	3	------	------	POST AFTER BMP
6	Combine	11.97	2	720	27,247	2, 5	------	------	POST AT POI

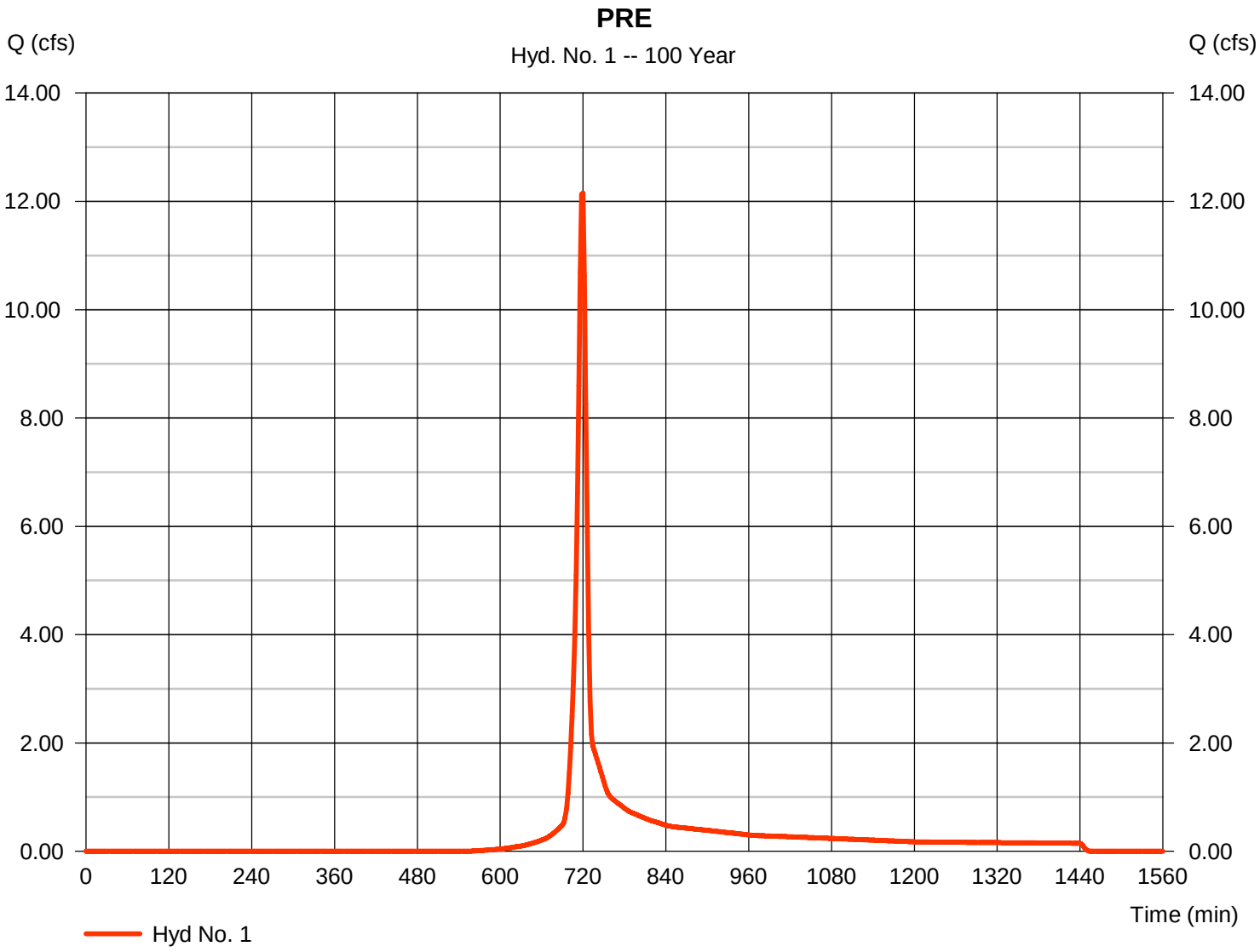
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	27,829 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



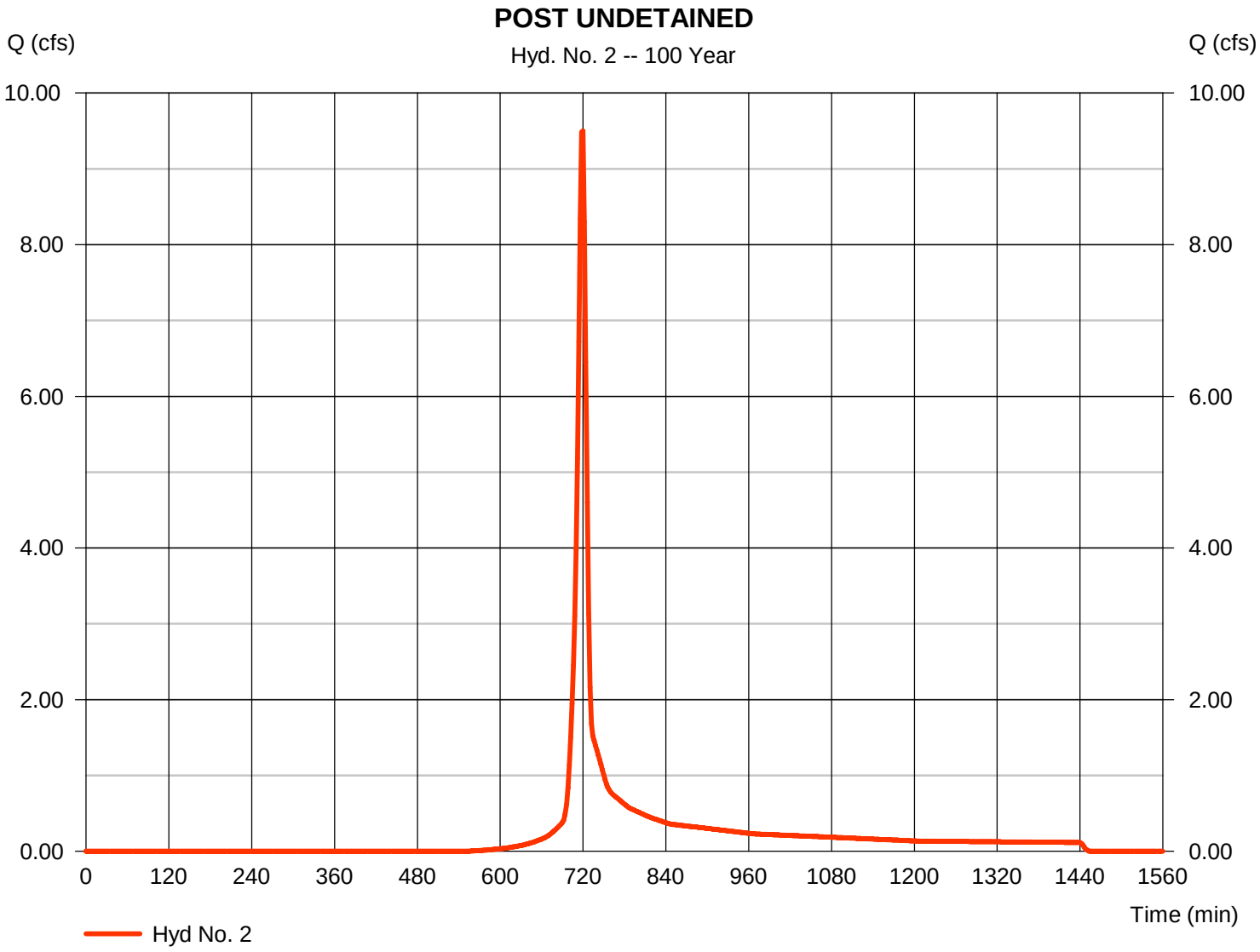
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.499 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	21,753 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



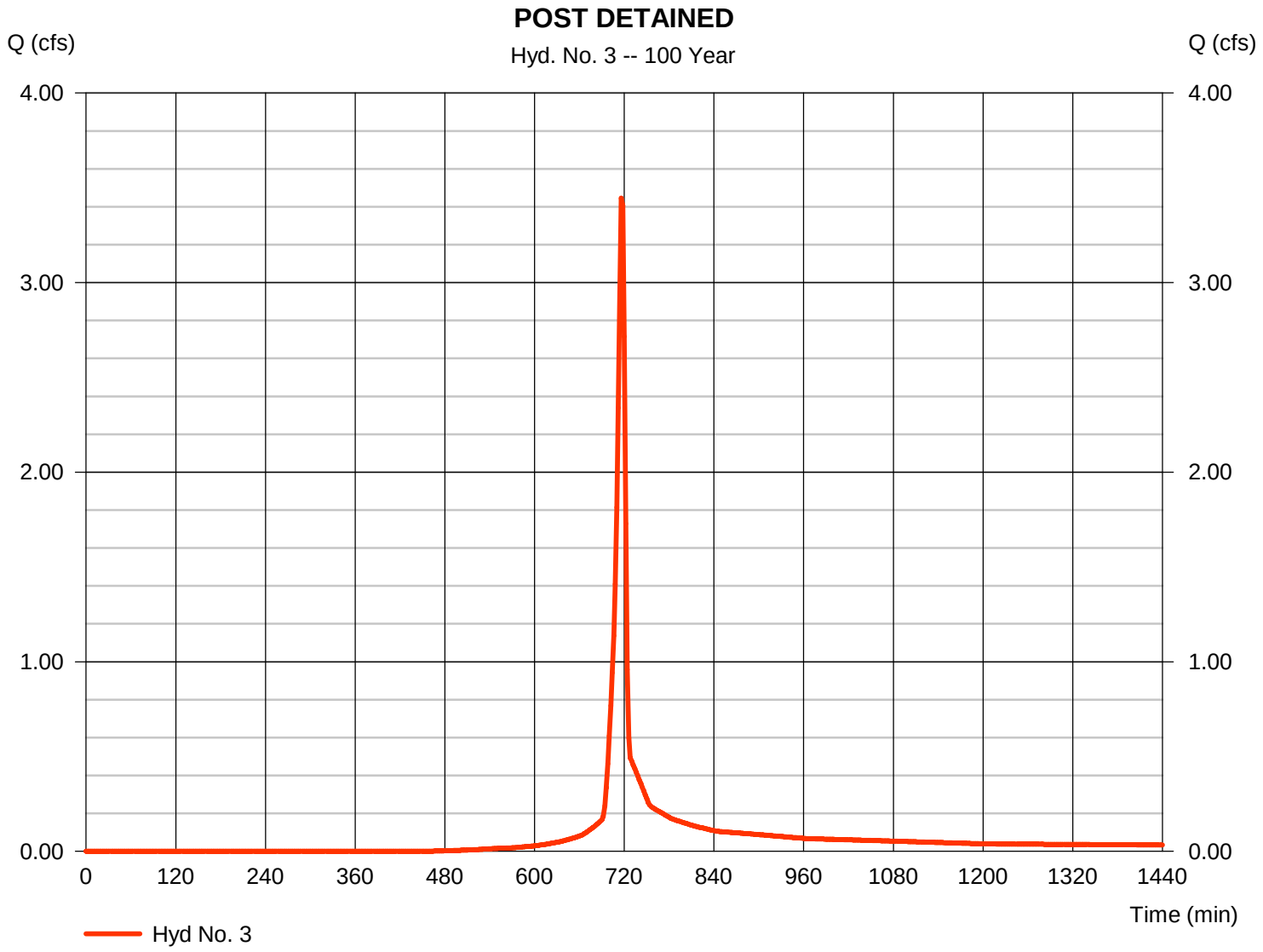
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.446 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	6,985 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.00 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

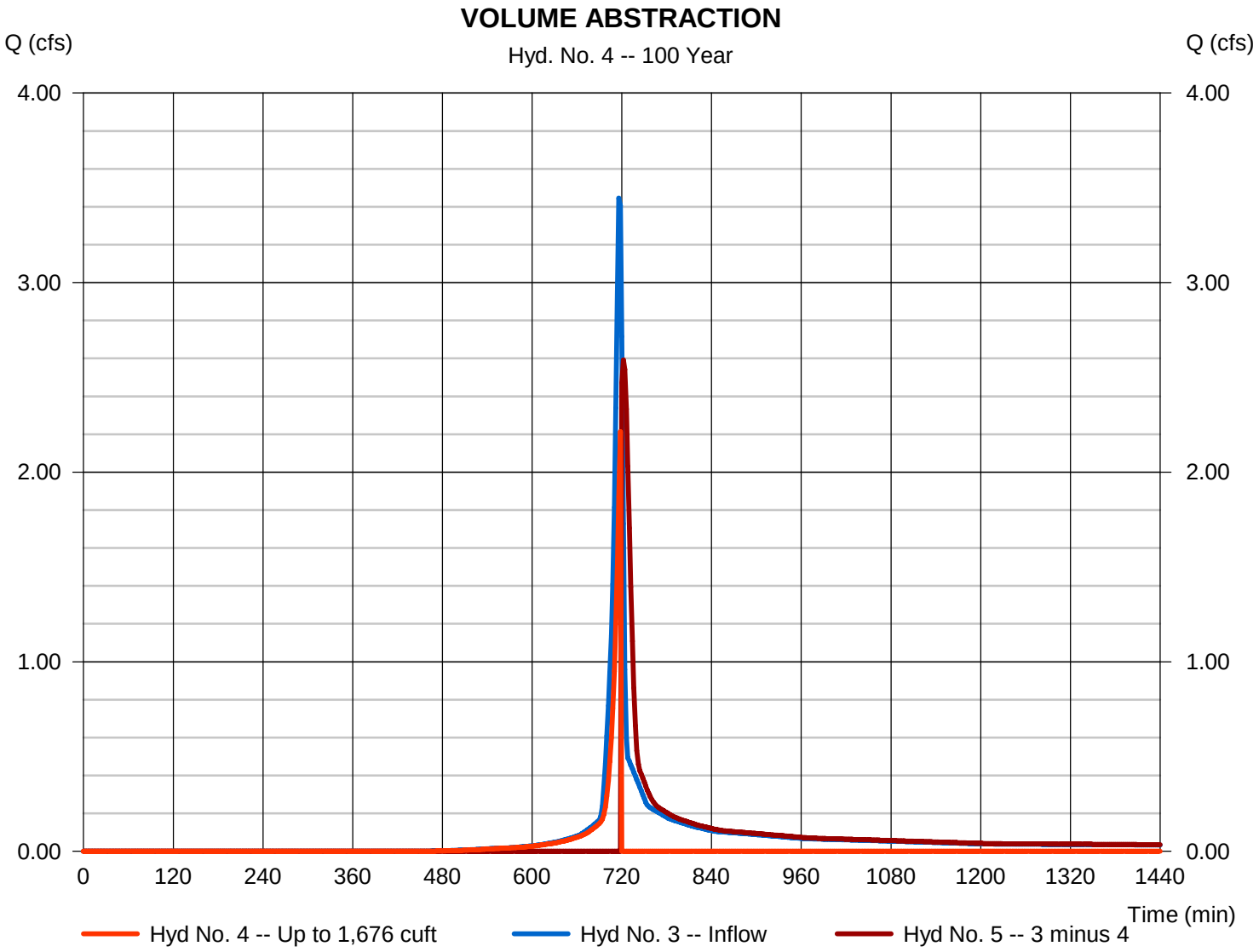


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 2.213 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,770 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

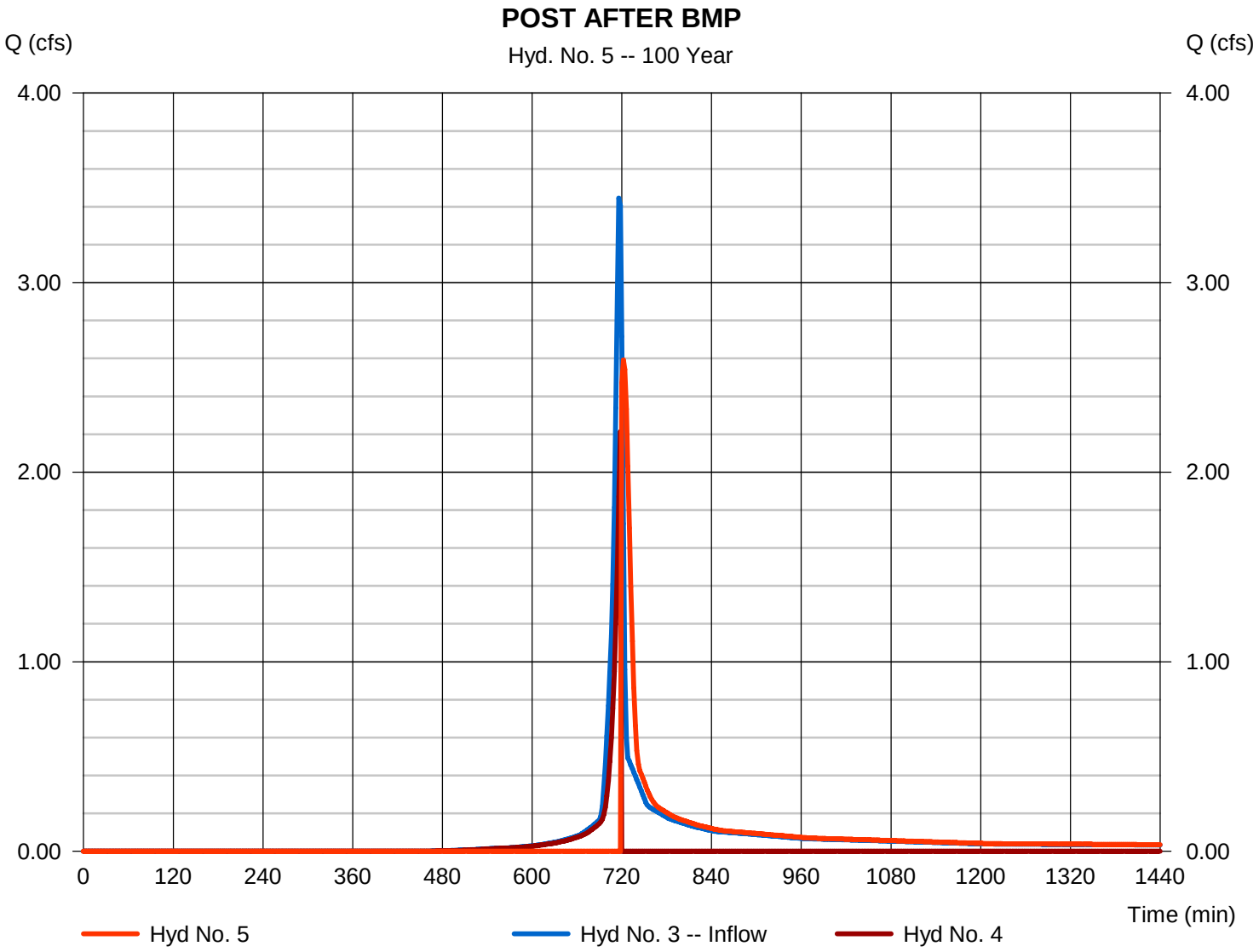


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 2.592 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 5,494 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

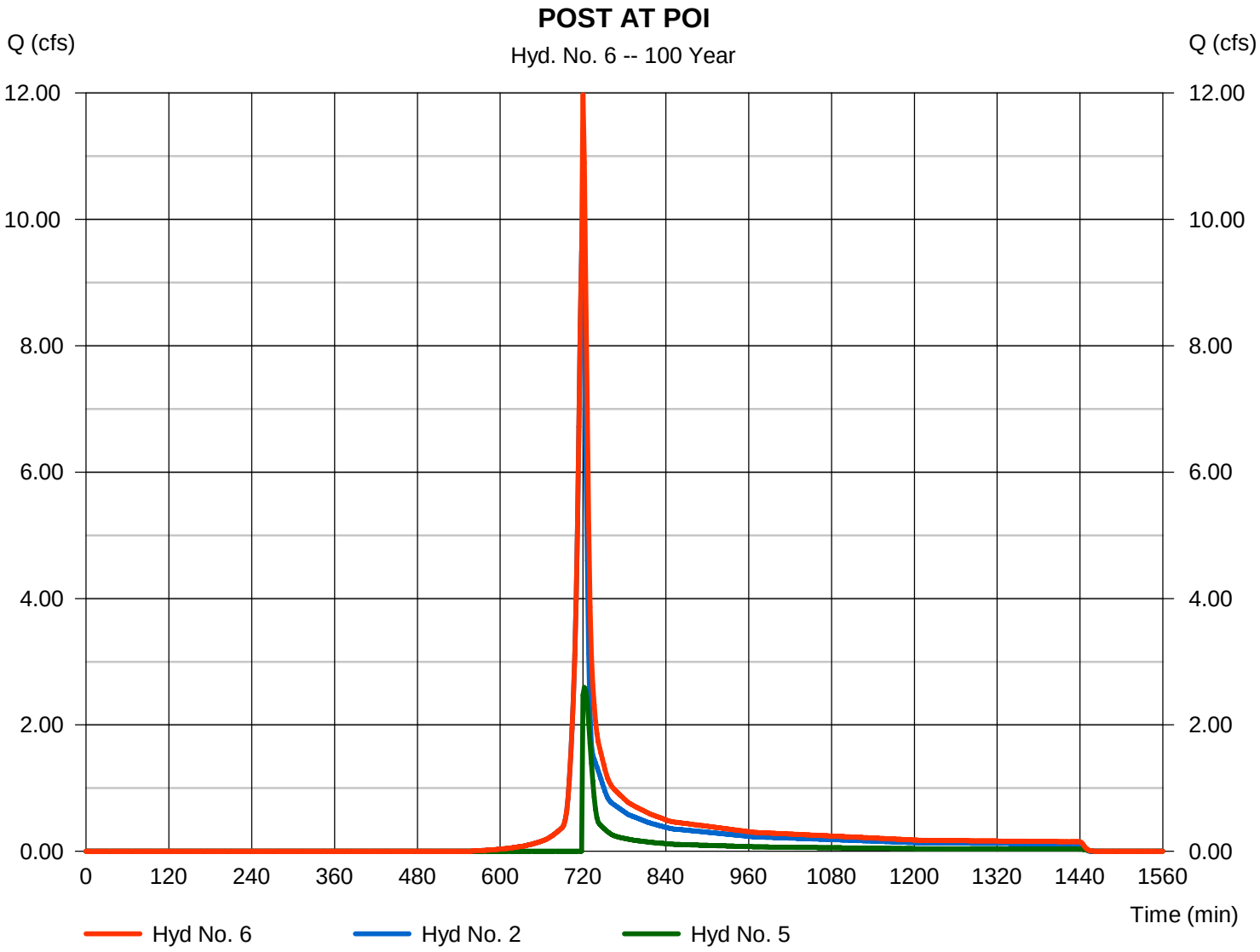


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 11.97 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 27,247 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	54.3902	12.9000	0.9053	--------
2	61.8275	12.9000	0.8899	--------
3	0.0000	0.0000	0.0000	--------
5	57.7575	11.9000	0.8260	--------
10	61.5114	12.2000	0.8089	--------
25	54.2223	10.9000	0.7478	--------
50	45.1449	9.2000	0.6848	--------
100	43.0569	8.6000	0.6532	--------

File name: Hopeland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.99	3.20	2.67	2.30	2.02	1.81	1.64	1.50	1.38	1.28	1.19	1.12
2	4.75	3.81	3.20	2.76	2.43	2.18	1.98	1.81	1.67	1.55	1.45	1.36
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.59	4.51	3.81	3.31	2.93	2.64	2.41	2.21	2.05	1.91	1.79	1.69
10	6.16	5.01	4.25	3.71	3.30	2.98	2.72	2.51	2.33	2.18	2.05	1.93
25	6.85	5.58	4.76	4.17	3.73	3.38	3.10	2.87	2.68	2.51	2.37	2.24
50	7.34	5.97	5.09	4.48	4.02	3.66	3.37	3.13	2.93	2.76	2.61	2.48
100	7.83	6.38	5.46	4.82	4.34	3.96	3.66	3.41	3.20	3.01	2.86	2.72

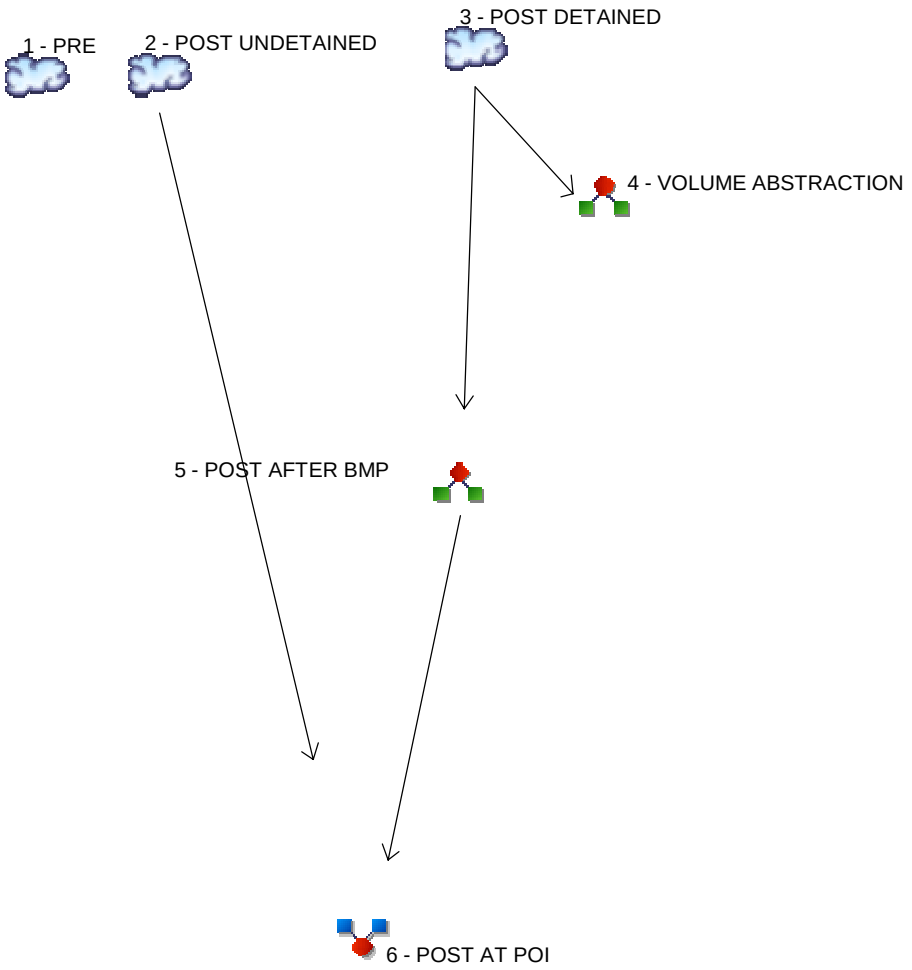
Tc = time in minutes. Values may exceed 60.

Mariner East Phase 2)\ESCGP-2\PPP\02 SCRO\07 PCSM\Attach 4 Stormwater Calcs\Hopeland\Hopeland Precip.p

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.57	3.10	0.00	3.91	4.60	5.62	6.49	7.45
SCS 6-Hr	1.81	2.19	0.00	2.74	3.19	3.84	4.39	4.99
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	POST UNDETAINED
3	SCS Runoff	POST DETAINED
4	Diversion1	VOLUME ABSTRACTION
5	Diversion2	POST AFTER BMP
6	Combine	POST AT POI

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	1.563	-------	-------	-------	-------	-------	-------	PRE
2	SCS Runoff	------	-------	1.222	-------	-------	-------	-------	-------	-------	POST UNDETAINED
3	SCS Runoff	------	-------	0.170	-------	-------	-------	-------	-------	-------	POST DETAINED
4	Diversion1	3	-------	0.170	-------	-------	-------	-------	-------	-------	VOLUME ABSTRACTION
5	Diversion2	3	-------	0.000	-------	-------	-------	-------	-------	-------	POST AFTER BMP
6	Combine	2, 5	-------	1.222	-------	-------	-------	-------	-------	-------	POST AT POI

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	1.563	2	720	4,265	------	------	------	PRE
2	SCS Runoff	1.222	2	720	3,334	------	------	------	POST UNDETAINED
3	SCS Runoff	0.170	2	760	1,494	------	------	------	POST DETAINED
4	Diversion1	0.170	2	760	1,494	3	------	------	VOLUME ABSTRACTION
5	Diversion2	0.000	2	n/a	0	3	------	------	POST AFTER BMP
6	Combine	1.222	2	720	3,334	2, 5	------	------	POST AT POI

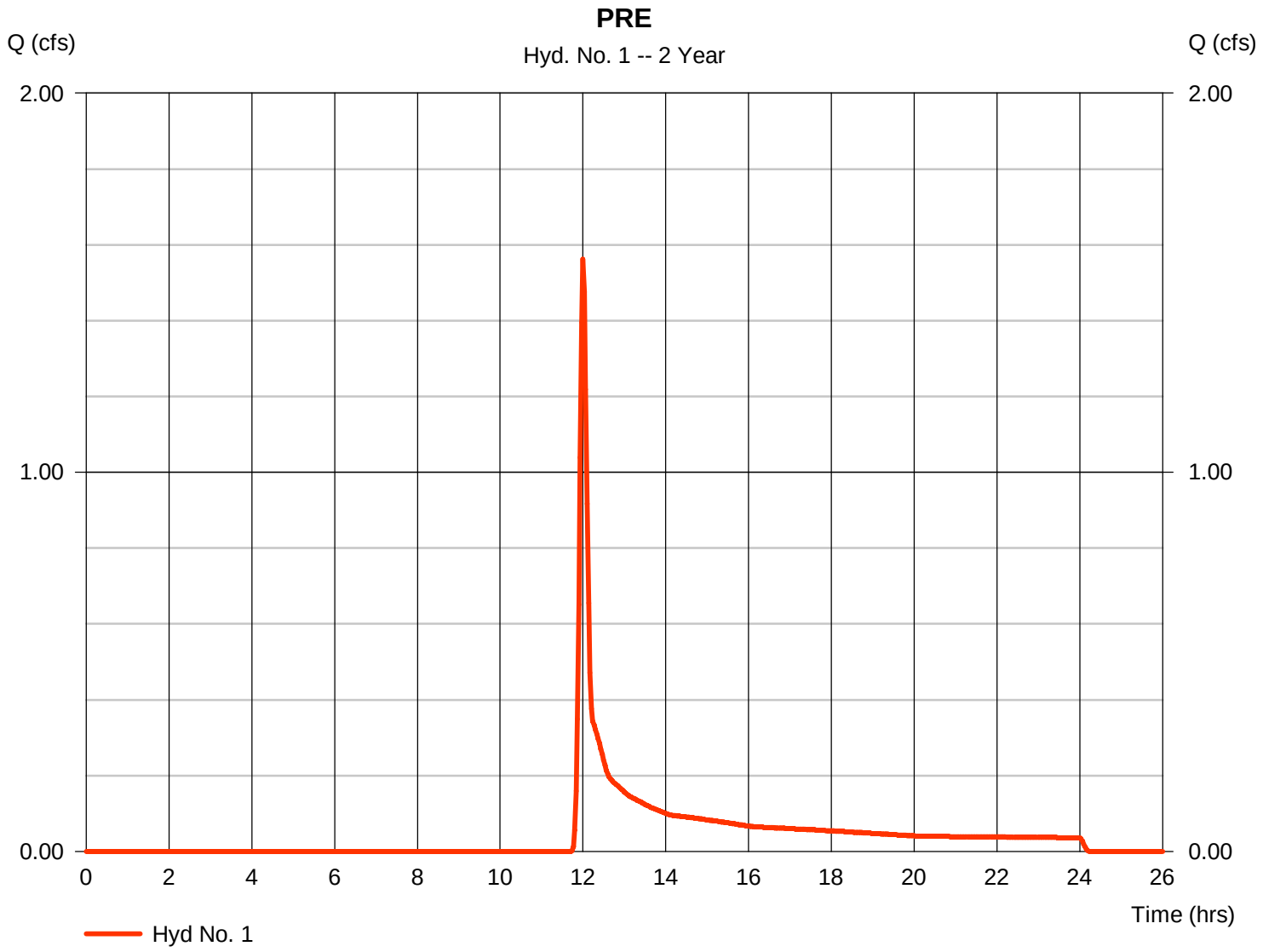
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.563 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.00 hrs
Time interval	=	2 min	Hyd. volume	=	4,265 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

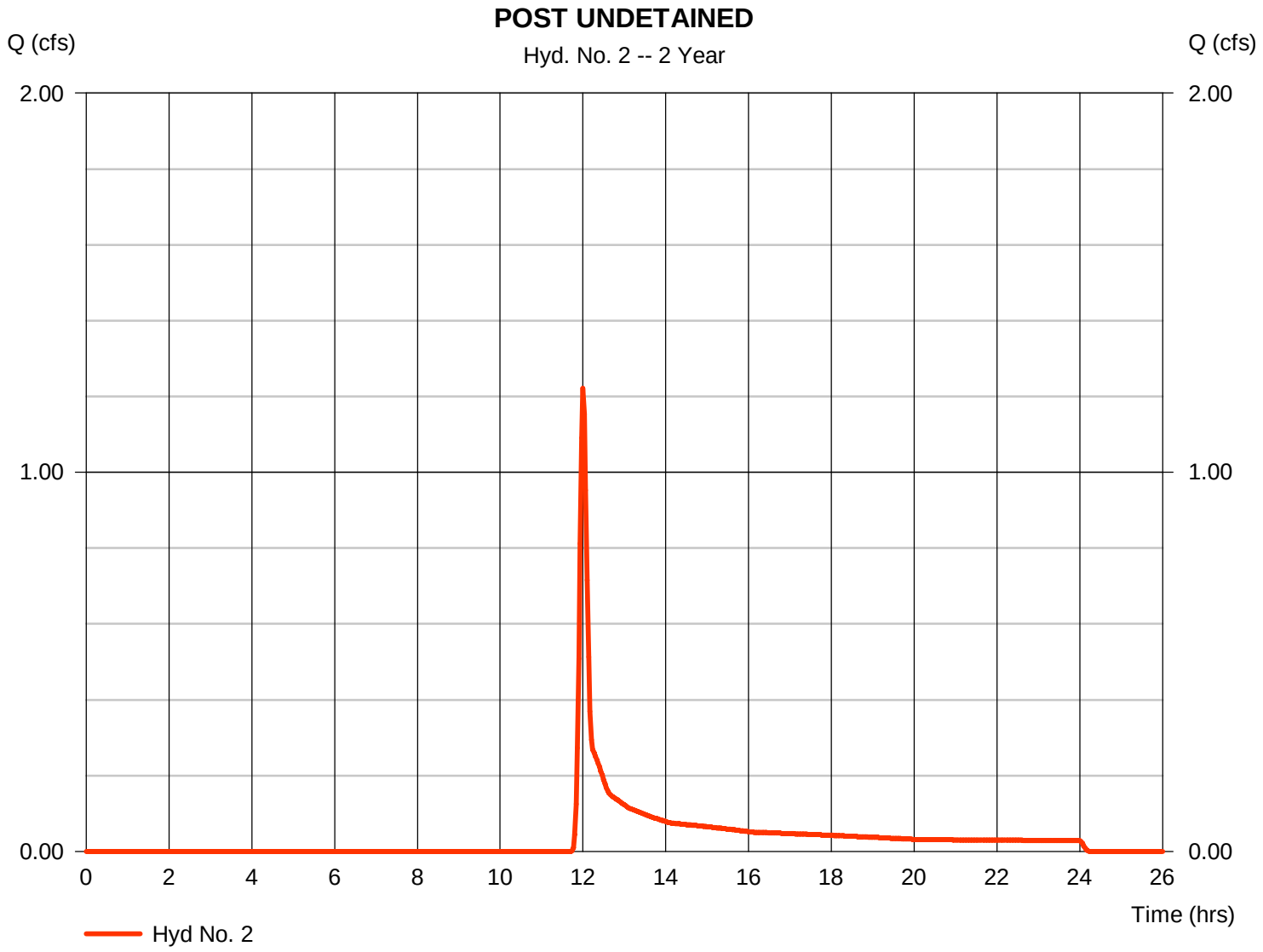
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	= SCS Runoff	Peak discharge	= 1.222 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 3,334 cuft
Drainage area	= 1.790 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.20 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



TR55 Tc Worksheet

Hyd. No. 2

POST UNDETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

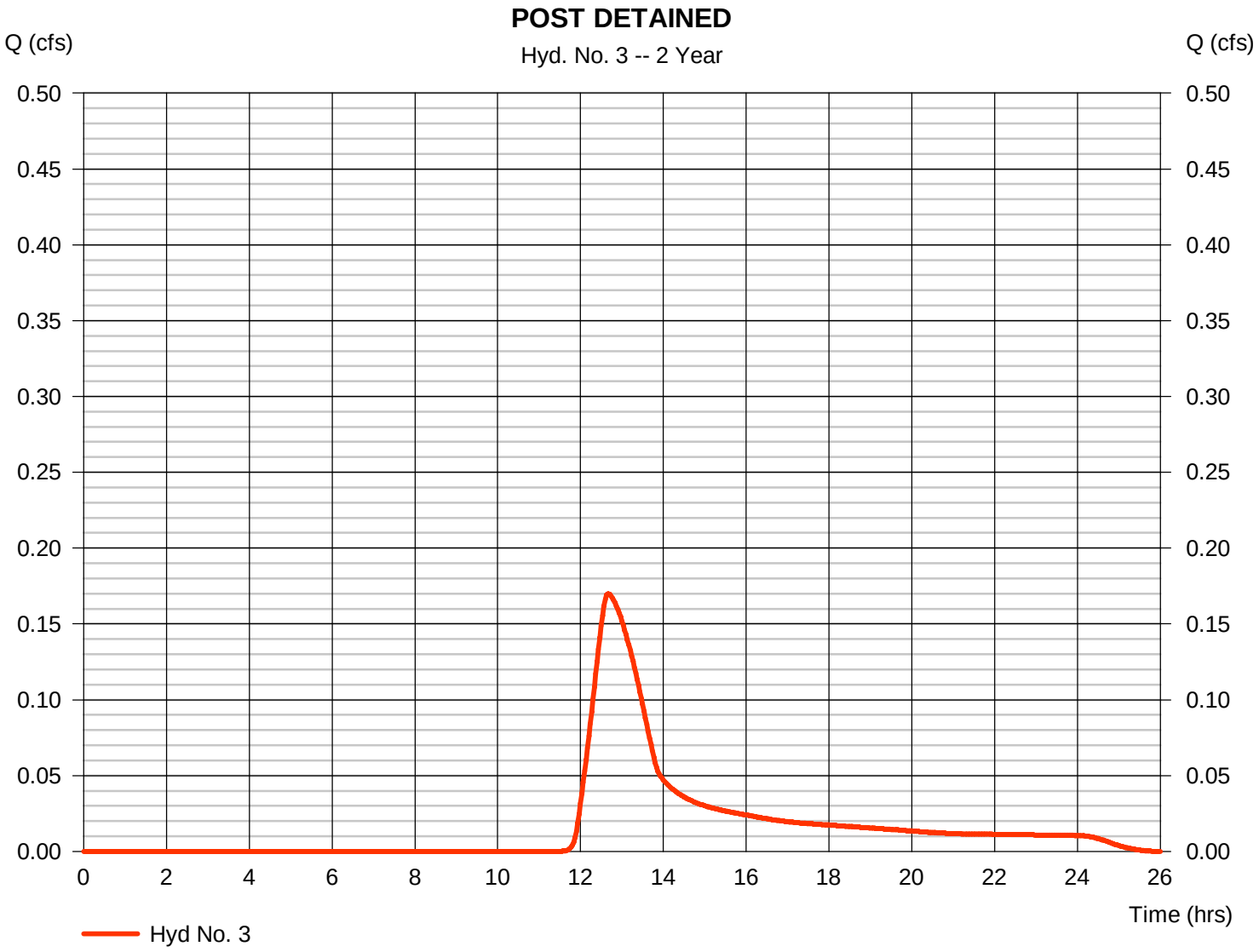
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.170 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.67 hrs
Time interval	=	2 min	Hyd. volume	=	1,494 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	72.52 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

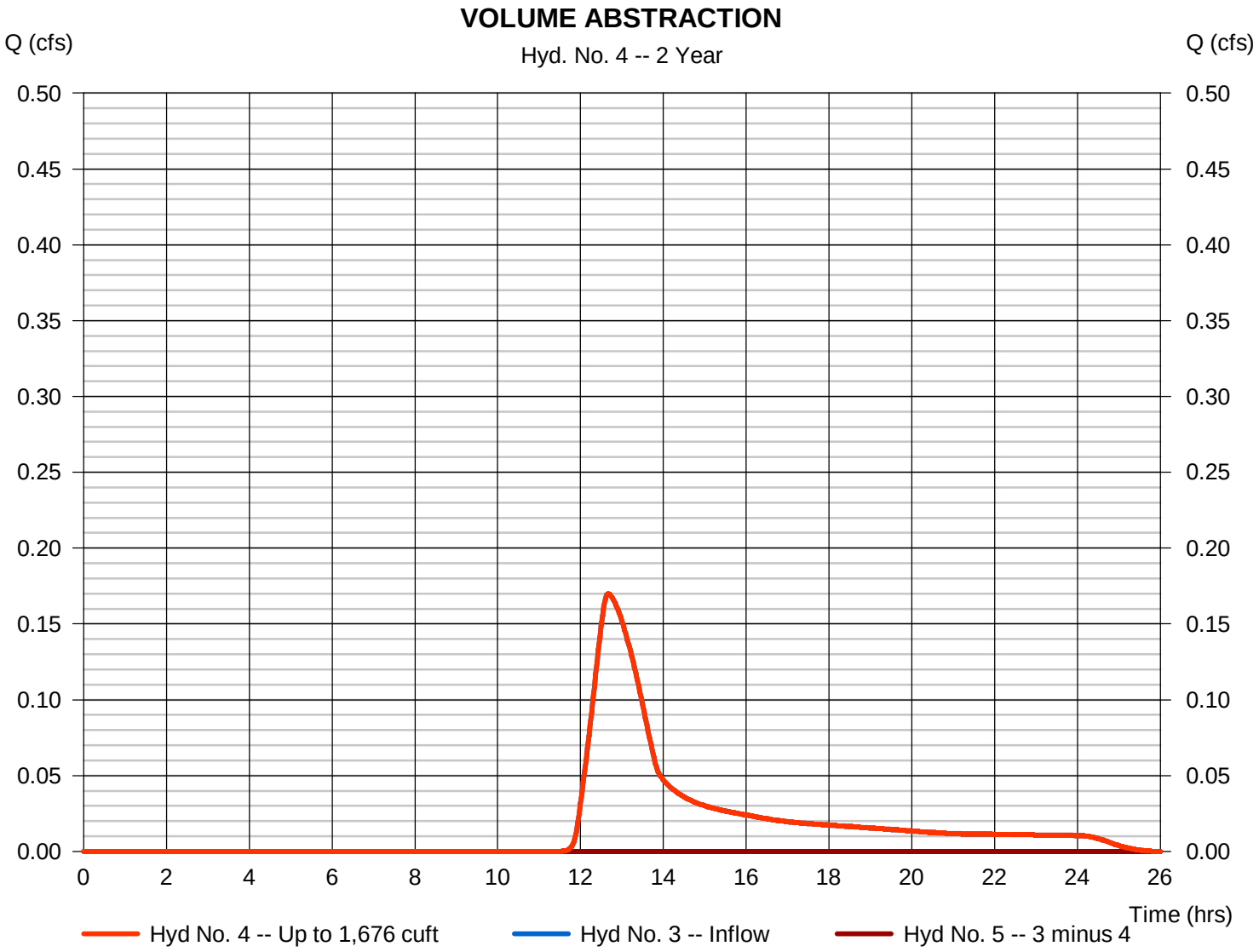


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 0.170 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.67 hrs
Time interval	= 2 min	Hyd. volume	= 1,494 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

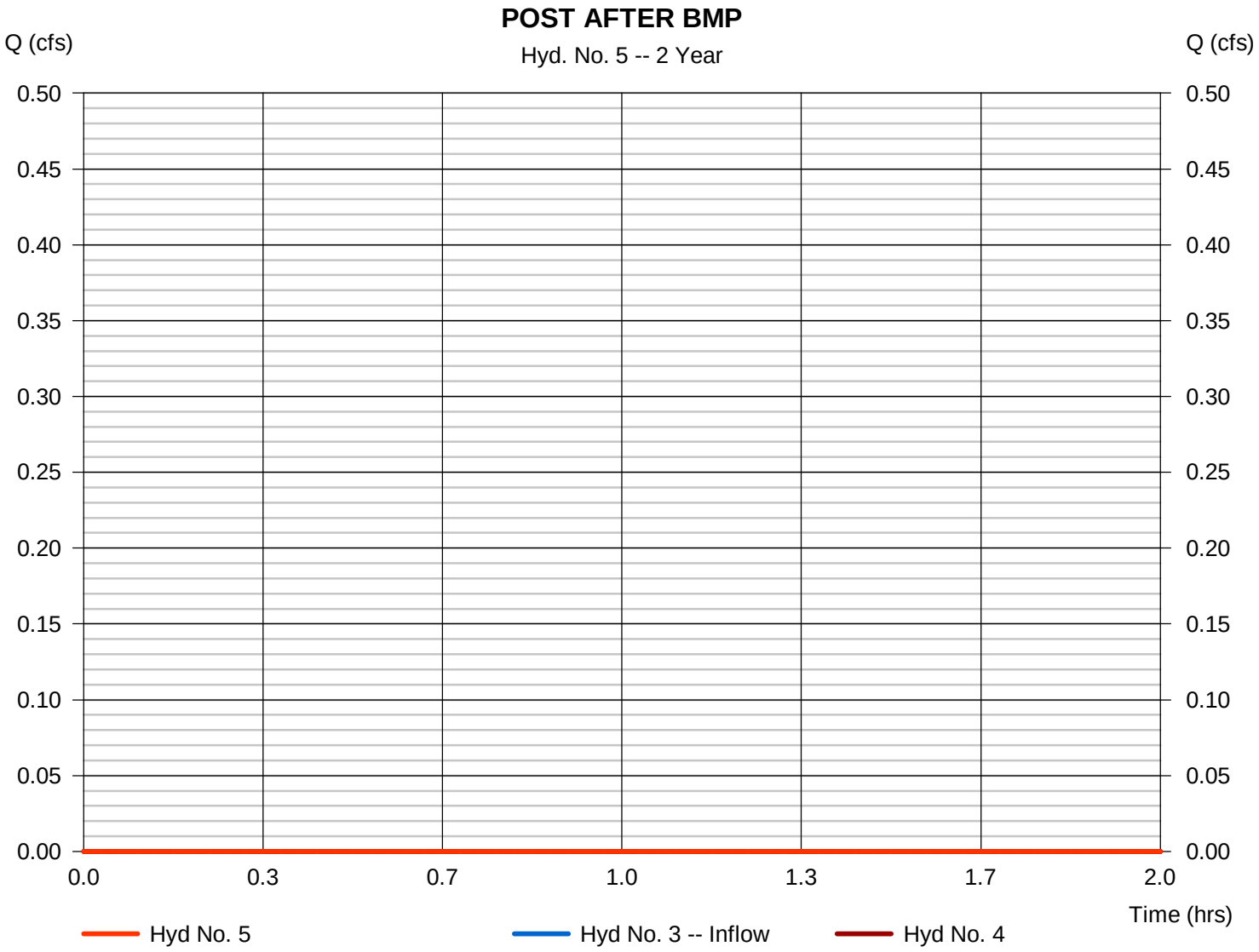


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

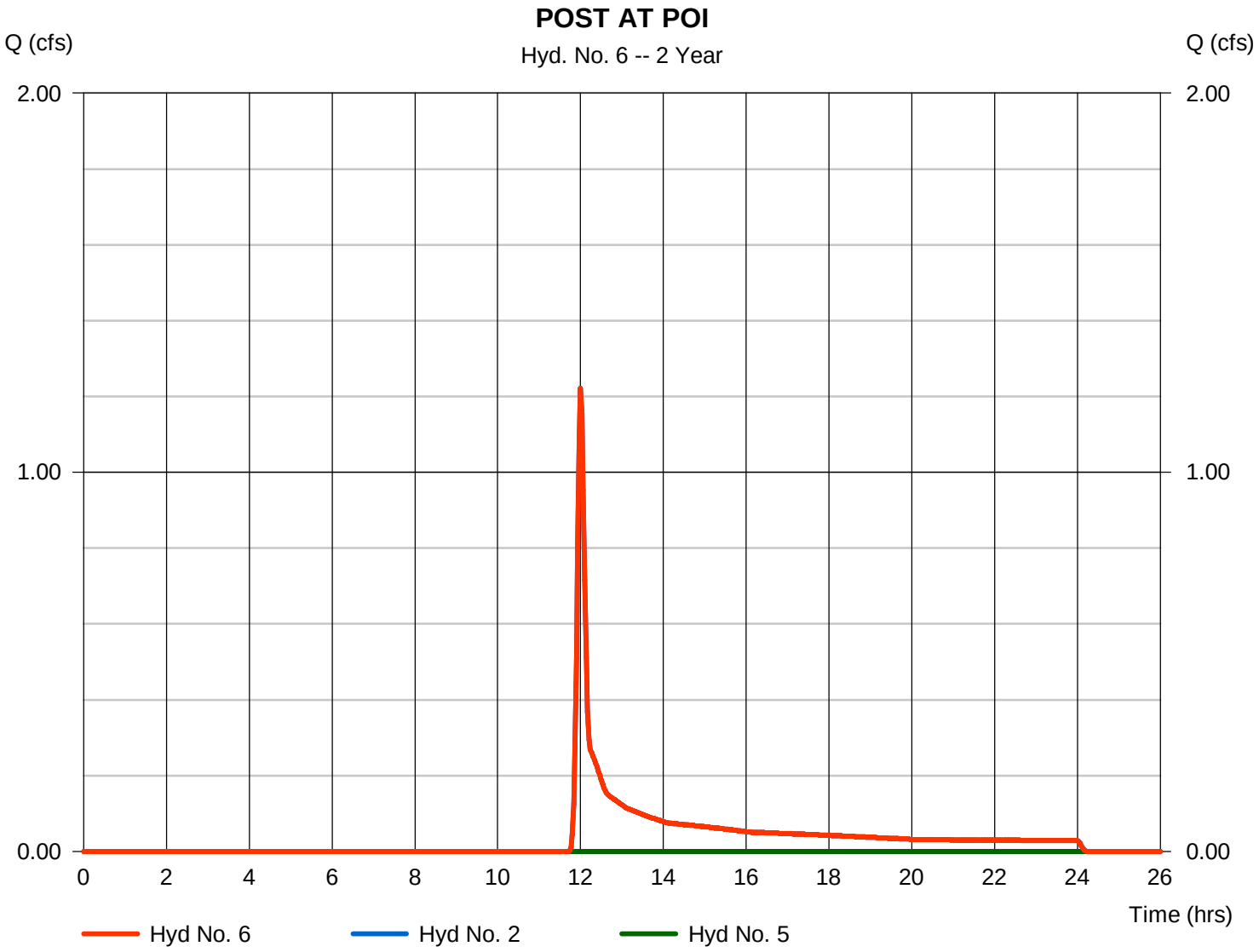


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 1.222 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 3,334 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	54.3902	12.9000	0.9053	--------
2	61.8275	12.9000	0.8899	--------
3	0.0000	0.0000	0.0000	--------
5	57.7575	11.9000	0.8260	--------
10	61.5114	12.2000	0.8089	--------
25	54.2223	10.9000	0.7478	--------
50	45.1449	9.2000	0.6848	--------
100	43.0569	8.6000	0.6532	--------

File name: Hopeland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.99	3.20	2.67	2.30	2.02	1.81	1.64	1.50	1.38	1.28	1.19	1.12
2	4.75	3.81	3.20	2.76	2.43	2.18	1.98	1.81	1.67	1.55	1.45	1.36
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.59	4.51	3.81	3.31	2.93	2.64	2.41	2.21	2.05	1.91	1.79	1.69
10	6.16	5.01	4.25	3.71	3.30	2.98	2.72	2.51	2.33	2.18	2.05	1.93
25	6.85	5.58	4.76	4.17	3.73	3.38	3.10	2.87	2.68	2.51	2.37	2.24
50	7.34	5.97	5.09	4.48	4.02	3.66	3.37	3.13	2.93	2.76	2.61	2.48
100	7.83	6.38	5.46	4.82	4.34	3.96	3.66	3.41	3.20	3.01	2.86	2.72

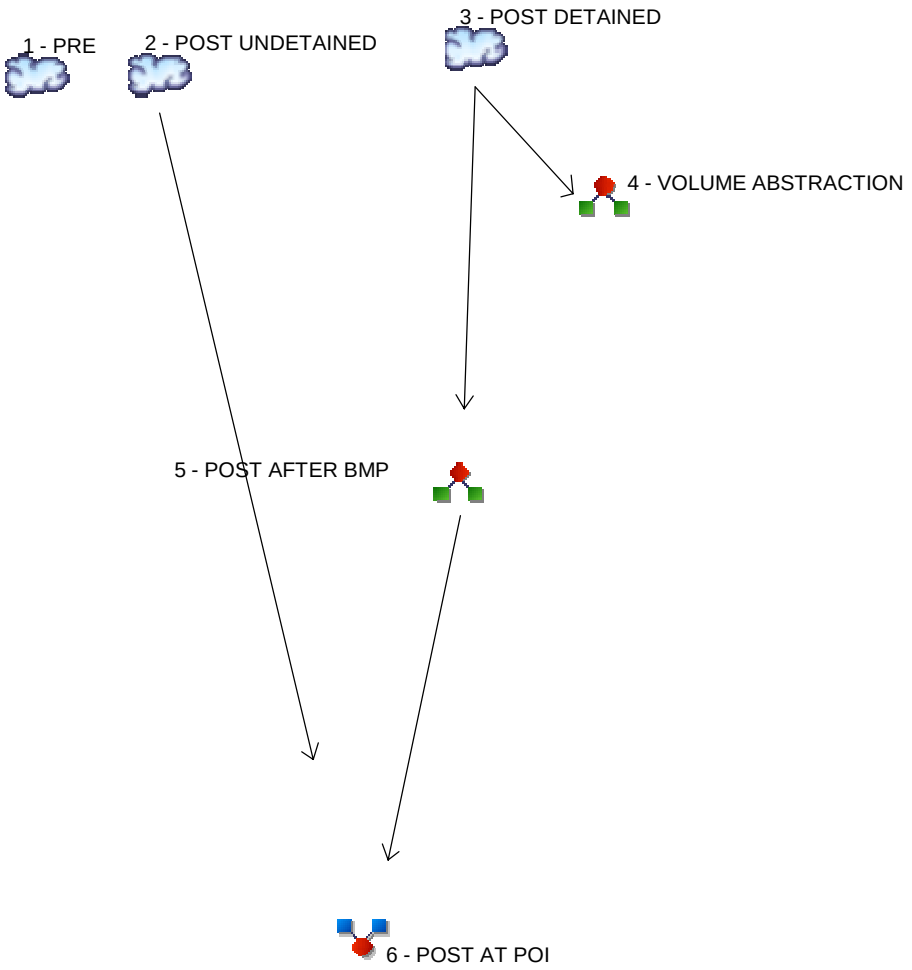
Tc = time in minutes. Values may exceed 60.

Mariner East Phase 2)\ESCGP-2\PPP\02 SCRO\07 PCSM\Attach 4 Stormwater Calcs\Hopeland\Hopeland Precip.pc

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.57	3.10	0.00	3.91	4.60	5.62	6.49	7.45
SCS 6-Hr	1.81	2.19	0.00	2.74	3.19	3.84	4.39	4.99
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	POST UNDETAINED
3	SCS Runoff	POST DETAINED
4	Diversion1	VOLUME ABSTRACTION
5	Diversion2	POST AFTER BMP
6	Combine	POST AT POI

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	4.707	-------	-------	-------	PRE
2	SCS Runoff	------	-------	-------	-------	-------	3.679	-------	-------	-------	POST UNDETAINED
3	SCS Runoff	------	-------	-------	-------	-------	0.750	-------	-------	-------	POST DETAINED
4	Diversion1	3	-------	-------	-------	-------	0.750	-------	-------	-------	VOLUME ABSTRACTION
5	Diversion2	3	-------	-------	-------	-------	0.219	-------	-------	-------	POST AFTER BMP
6	Combine	2, 5	-------	-------	-------	-------	3.679	-------	-------	-------	POST AT POI

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.707	2	720	11,031	------	------	------	PRE
2	SCS Runoff	3.679	2	720	8,622	------	------	------	POST UNDETAINED
3	SCS Runoff	0.750	2	734	3,343	------	------	------	POST DETAINED
4	Diversion1	0.750	2	734	1,692	3	------	------	VOLUME ABSTRACTION
5	Diversion2	0.219	2	764	1,651	3	------	------	POST AFTER BMP
6	Combine	3.679	2	720	10,274	2, 5	------	------	POST AT POI

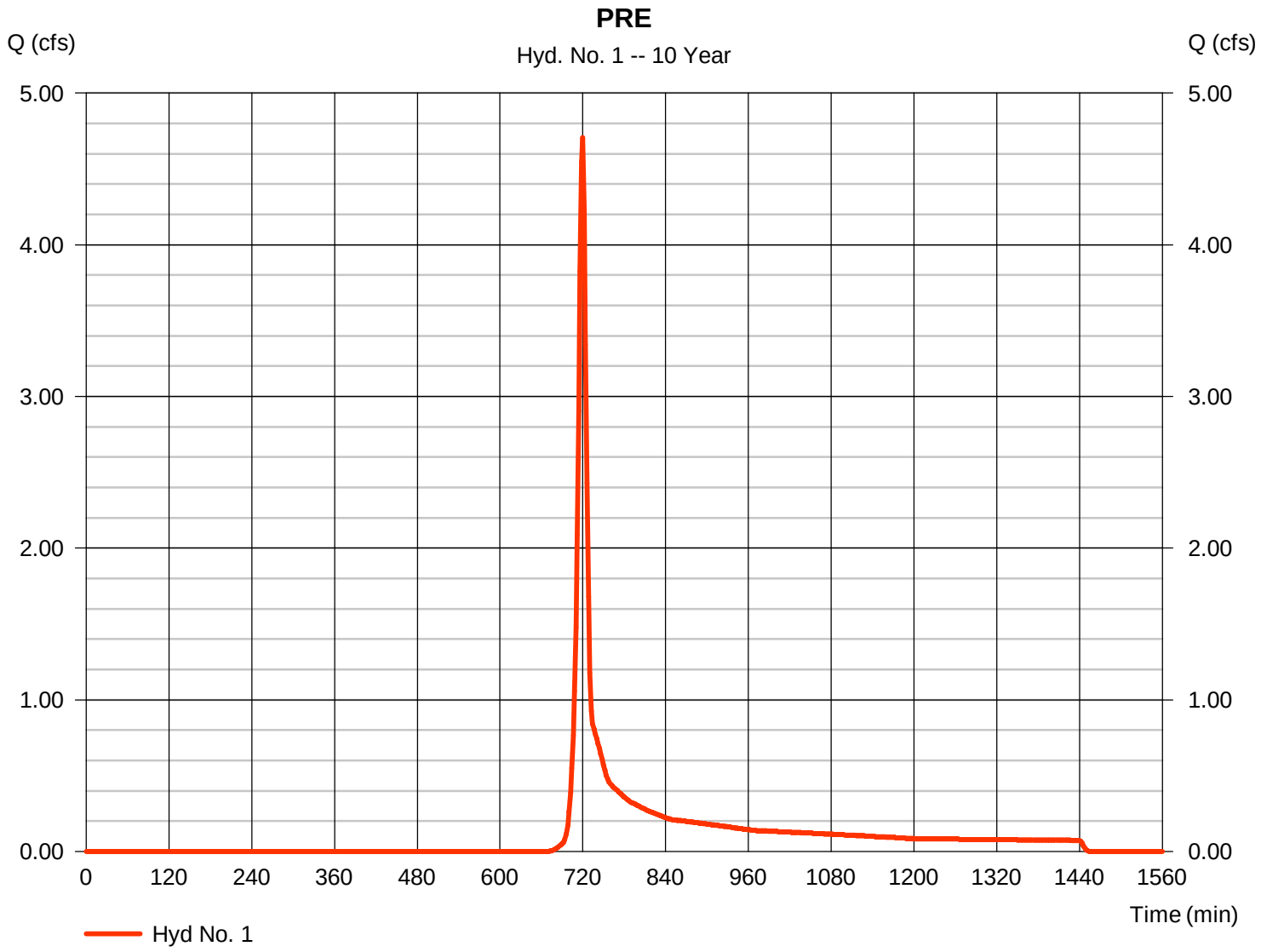
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.707 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,031 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

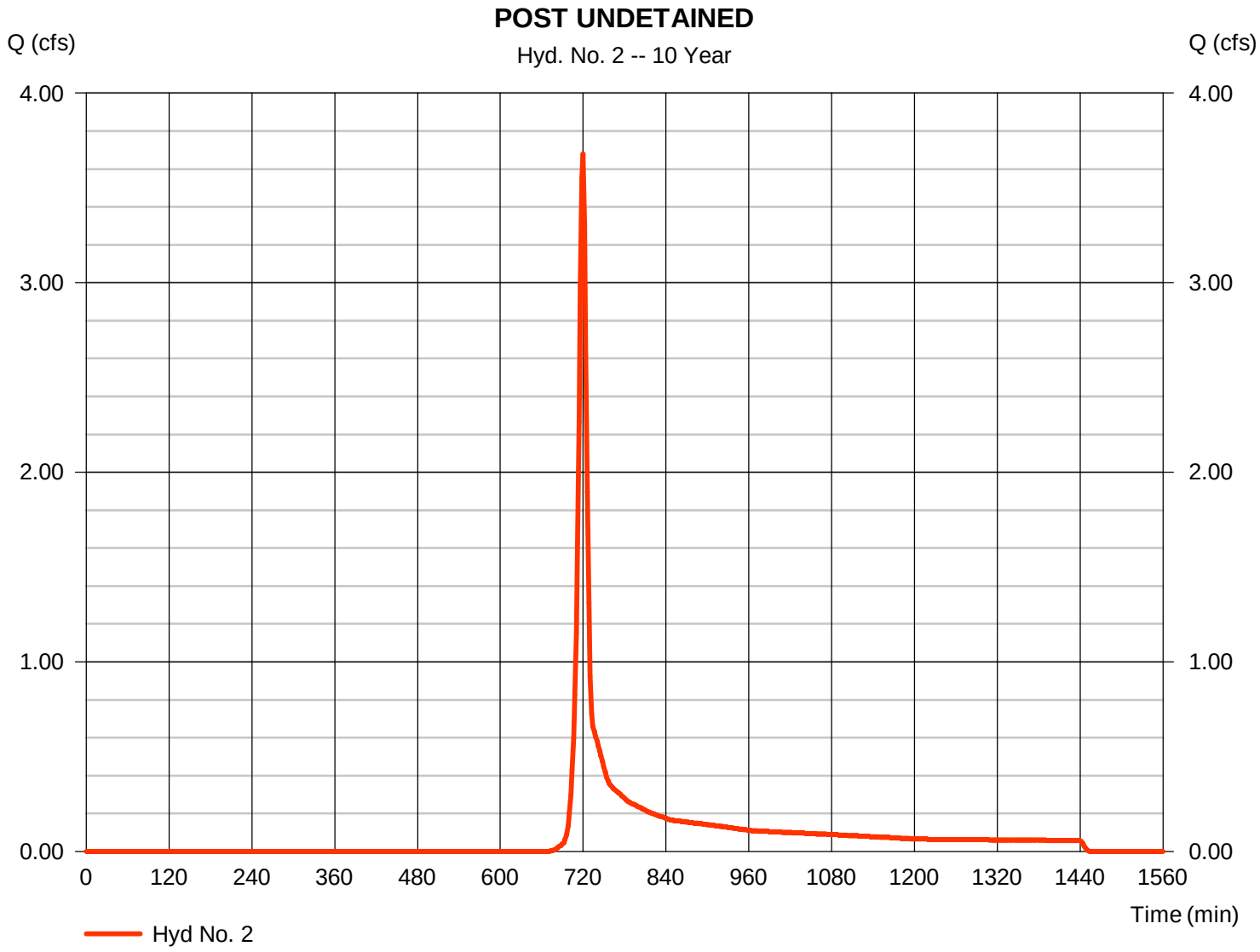
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.679 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	8,622 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



TR55 Tc Worksheet

Hyd. No. 2

POST UNDETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

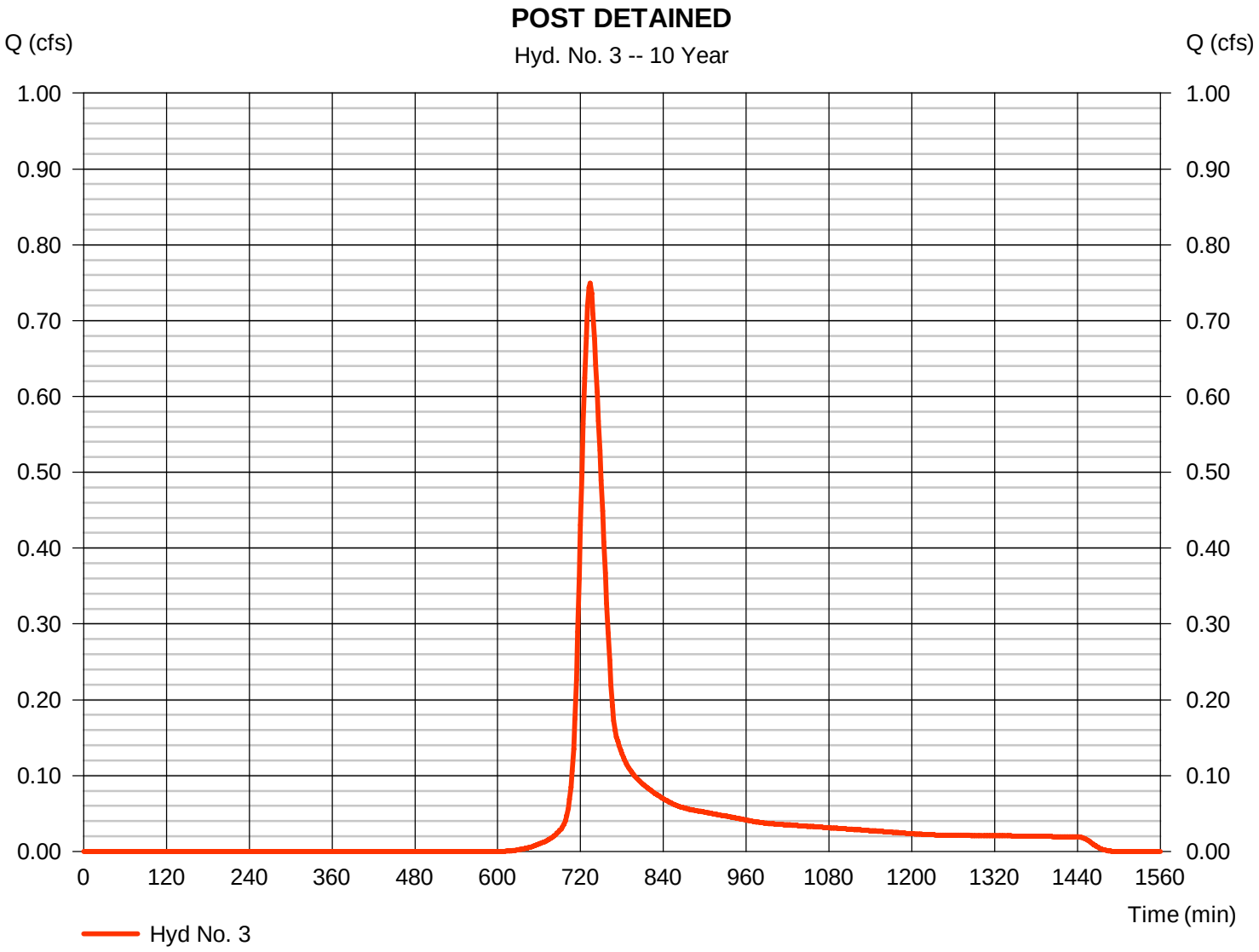
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.750 cfs
Storm frequency	=	10 yrs	Time to peak	=	734 min
Time interval	=	2 min	Hyd. volume	=	3,343 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	32.35 min
Total precip.	=	4.60 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

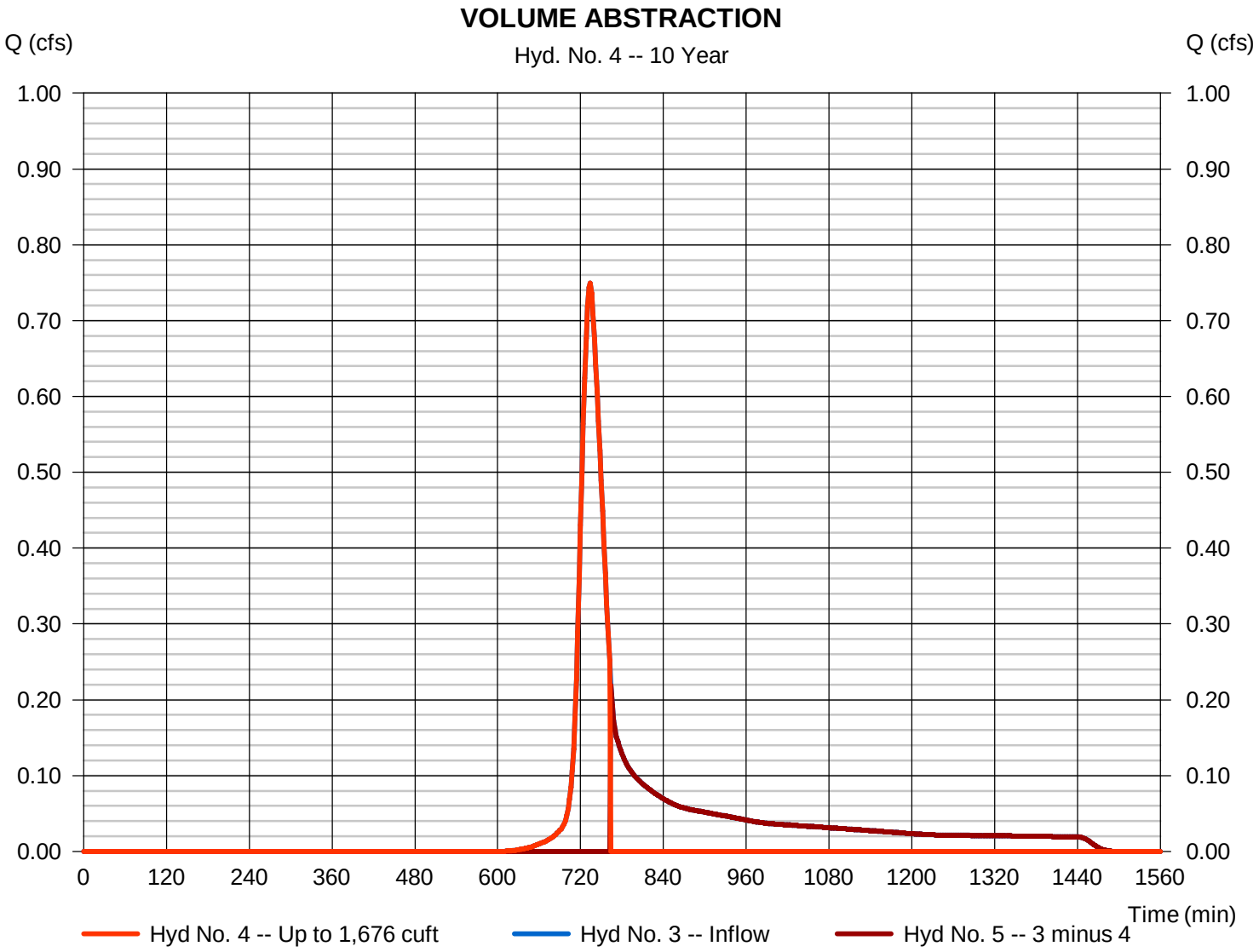


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 0.750 cfs
Storm frequency	= 10 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 1,692 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

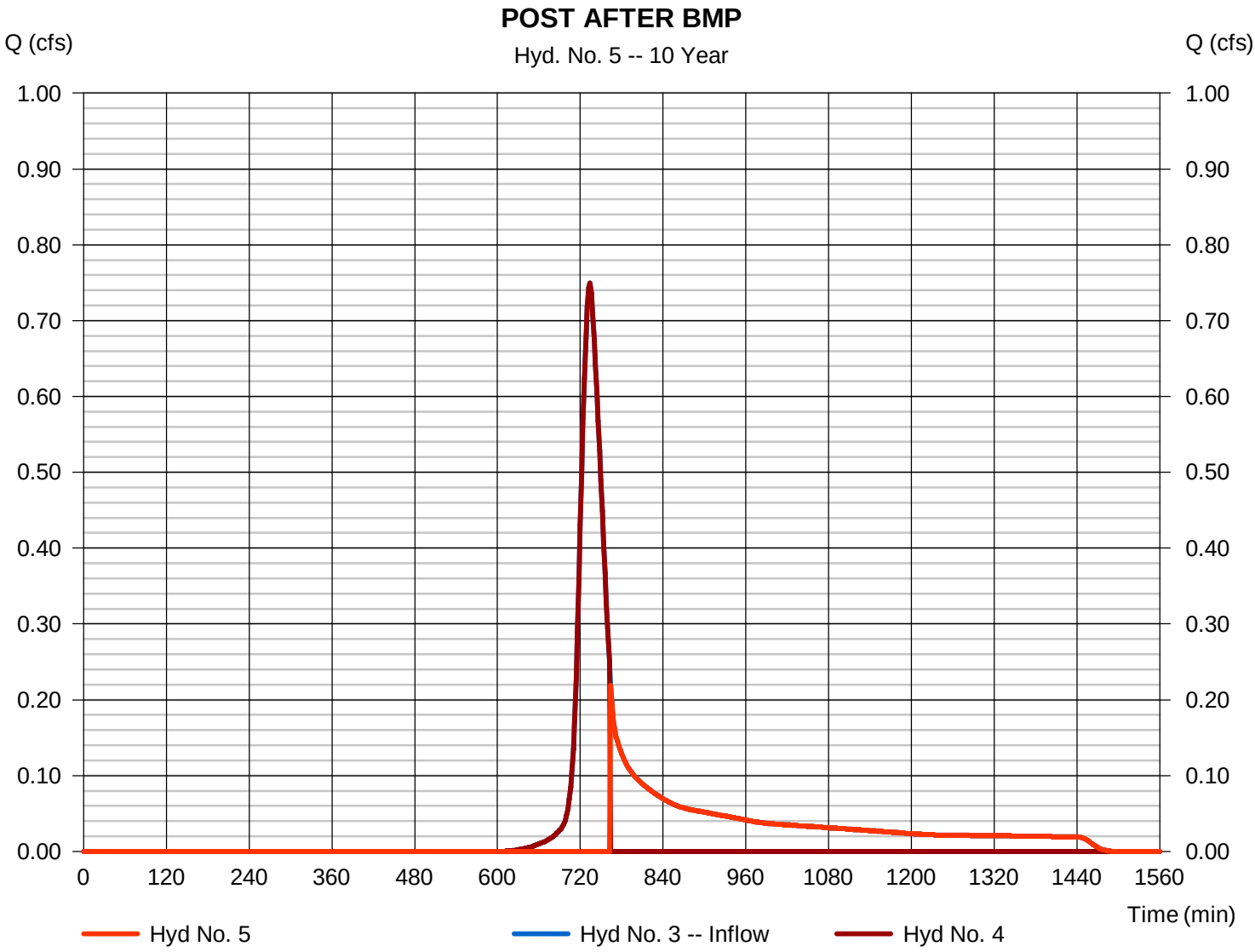


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 0.219 cfs
Storm frequency	= 10 yrs	Time to peak	= 764 min
Time interval	= 2 min	Hyd. volume	= 1,651 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

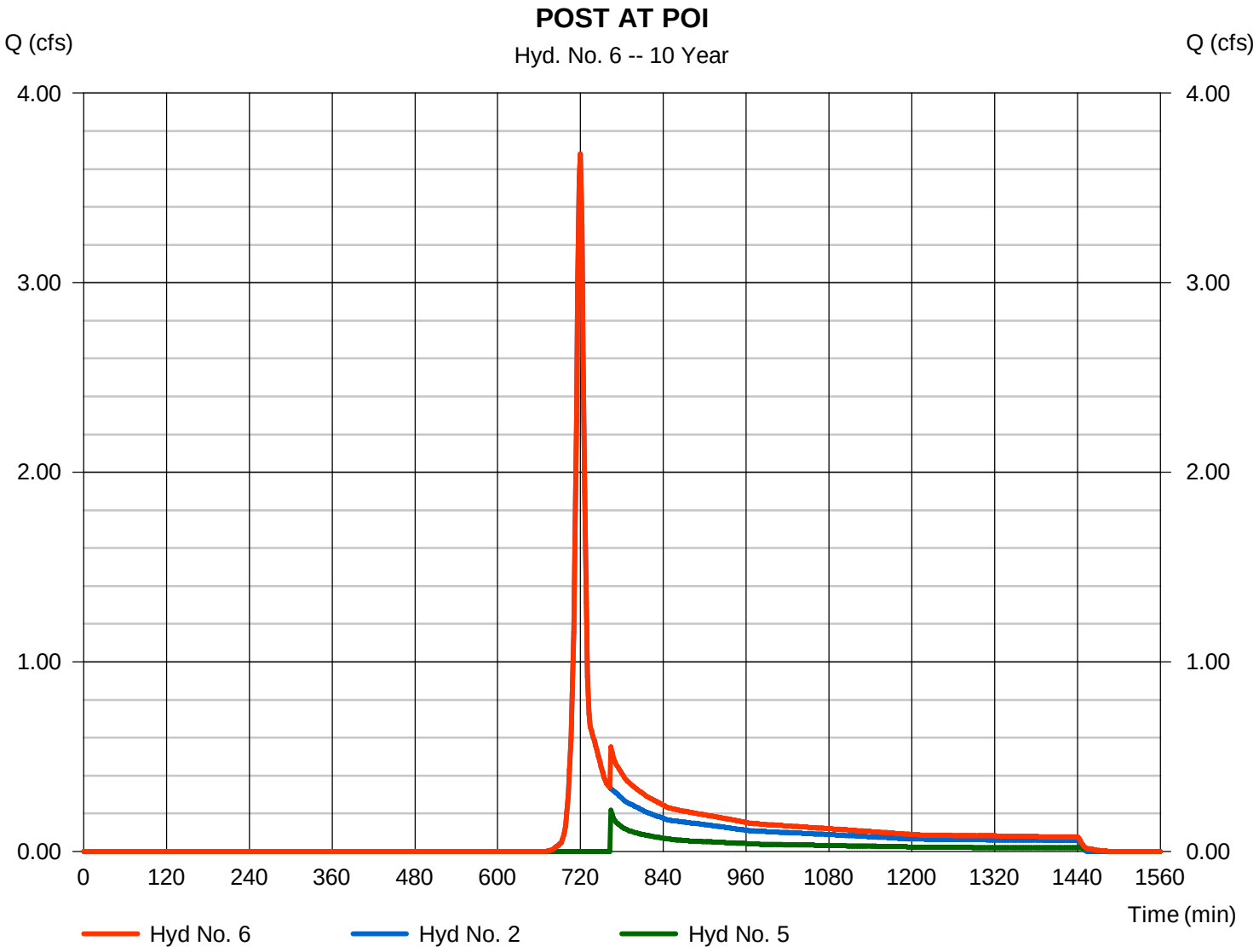


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	=	Combine	Peak discharge	=	3.679 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,274 cuft
Inflow hyds.	=	2, 5	Contrib. drain. area	=	1.790 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	54.3902	12.9000	0.9053	--------
2	61.8275	12.9000	0.8899	--------
3	0.0000	0.0000	0.0000	--------
5	57.7575	11.9000	0.8260	--------
10	61.5114	12.2000	0.8089	--------
25	54.2223	10.9000	0.7478	--------
50	45.1449	9.2000	0.6848	--------
100	43.0569	8.6000	0.6532	--------

File name: Hopeland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.99	3.20	2.67	2.30	2.02	1.81	1.64	1.50	1.38	1.28	1.19	1.12
2	4.75	3.81	3.20	2.76	2.43	2.18	1.98	1.81	1.67	1.55	1.45	1.36
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.59	4.51	3.81	3.31	2.93	2.64	2.41	2.21	2.05	1.91	1.79	1.69
10	6.16	5.01	4.25	3.71	3.30	2.98	2.72	2.51	2.33	2.18	2.05	1.93
25	6.85	5.58	4.76	4.17	3.73	3.38	3.10	2.87	2.68	2.51	2.37	2.24
50	7.34	5.97	5.09	4.48	4.02	3.66	3.37	3.13	2.93	2.76	2.61	2.48
100	7.83	6.38	5.46	4.82	4.34	3.96	3.66	3.41	3.20	3.01	2.86	2.72

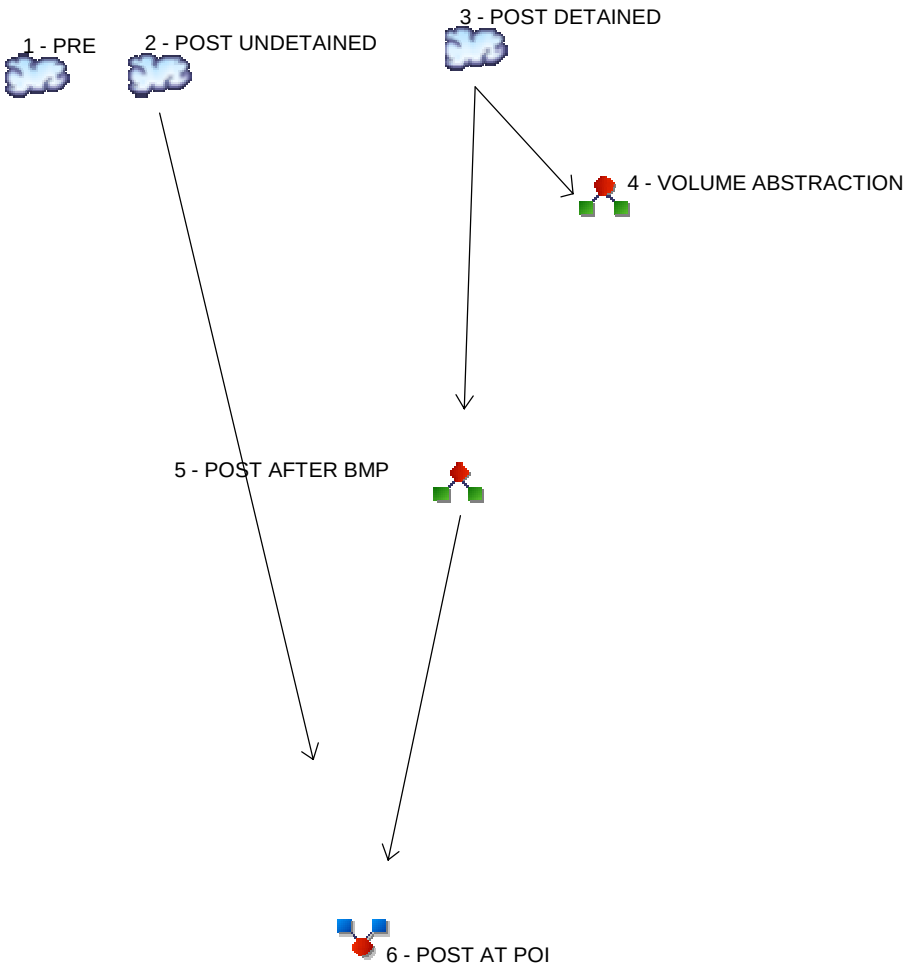
Tc = time in minutes. Values may exceed 60.

Mariner East Phase 2)\ESCGP-2\PPP\02 SCRO\07 PCSM\Attach 4 Stormwater Calcs\Hopeland\Hopeland Precip.pc

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.57	3.10	0.00	3.91	4.60	5.62	6.49	7.45
SCS 6-Hr	1.81	2.19	0.00	2.74	3.19	3.84	4.39	4.99
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	POST UNDETAINED
3	SCS Runoff	POST DETAINED
4	Diversion1	VOLUME ABSTRACTION
5	Diversion2	POST AFTER BMP
6	Combine	POST AT POI

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	-------	-------	9.509	-------	PRE
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	7.433	-------	POST UNDETAINED
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	1.910	-------	POST DETAINED
4	Diversion1	3	-------	-------	-------	-------	-------	-------	1.910	-------	VOLUME ABSTRACTION
5	Diversion2	3	-------	-------	-------	-------	-------	-------	1.892	-------	POST AFTER BMP
6	Combine	2, 5	-------	-------	-------	-------	-------	-------	7.433	-------	POST AT POI

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.509	2	720	21,771	------	------	------	PRE
2	SCS Runoff	7.433	2	720	17,018	------	------	------	POST UNDETAINED
3	SCS Runoff	1.910	2	724	5,987	------	------	------	POST DETAINED
4	Diversion1	1.910	2	724	1,779	3	------	------	VOLUME ABSTRACTION
5	Diversion2	1.892	2	726	4,207	3	------	------	POST AFTER BMP
6	Combine	7.433	2	720	21,225	2, 5	------	------	POST AT POI

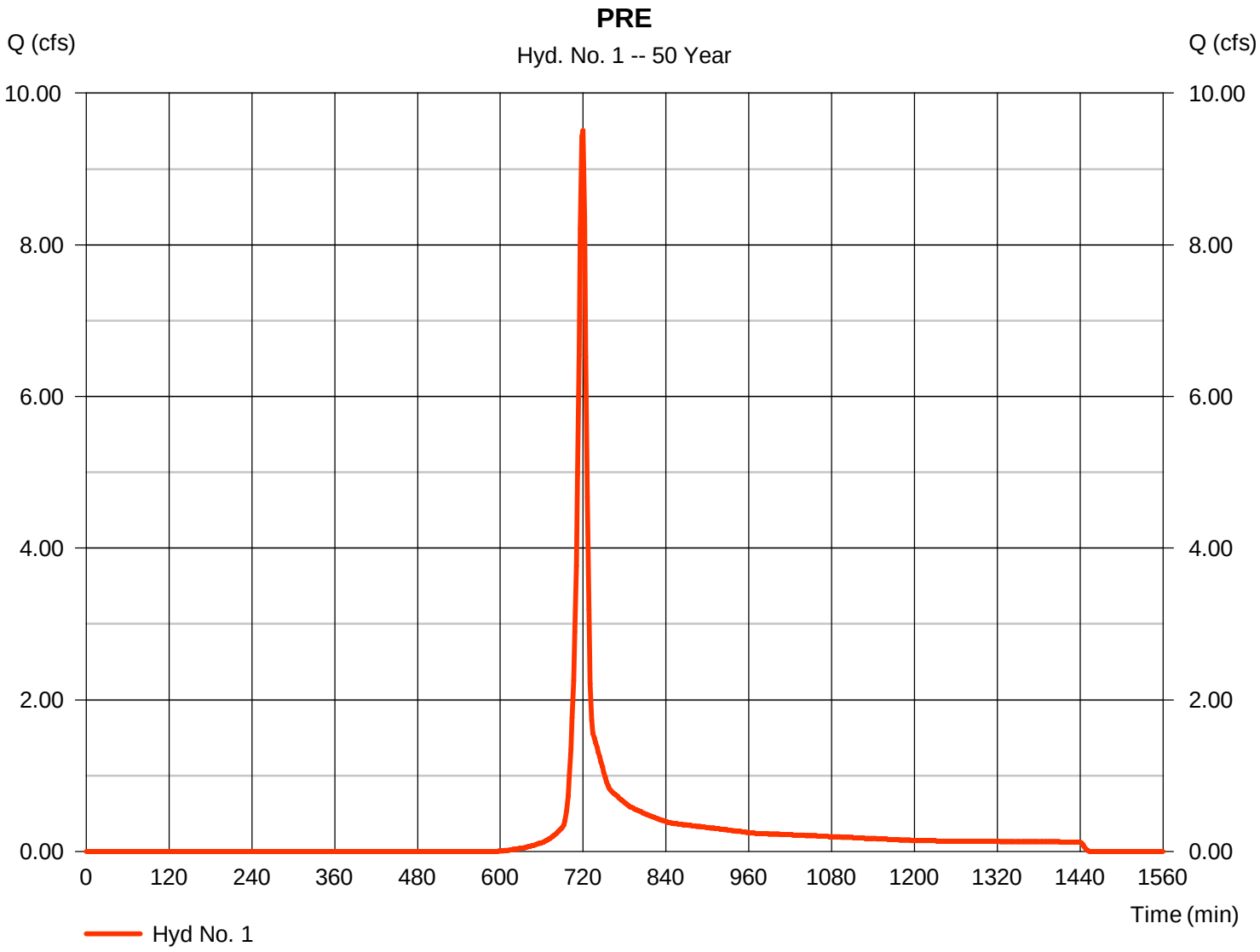
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.509 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	21,771 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	6.49 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

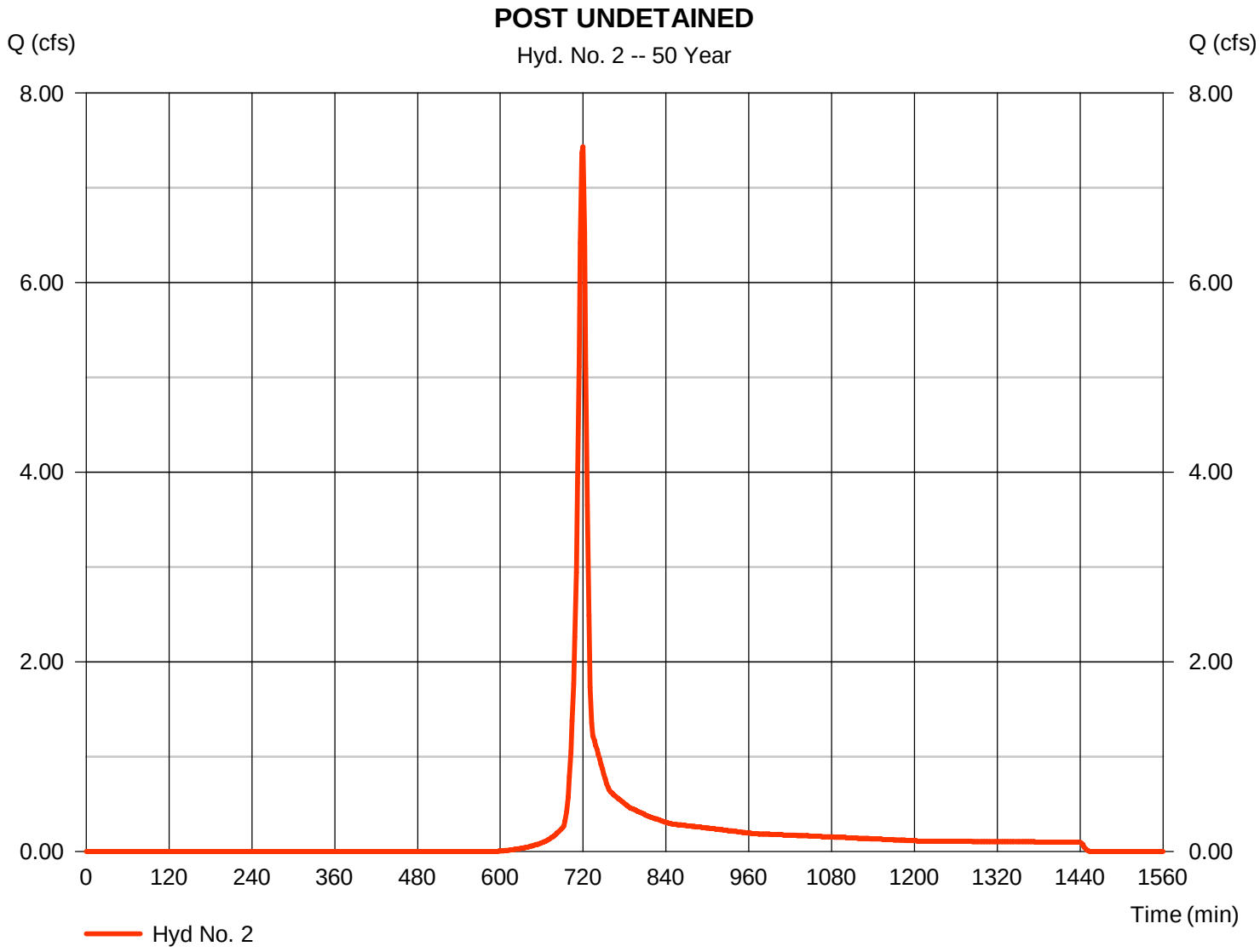
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	= SCS Runoff	Peak discharge	= 7.433 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 17,018 cuft
Drainage area	= 1.790 ac	Curve number	= 64*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 7.20 min
Total precip.	= 6.49 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



TR55 Tc Worksheet

Hyd. No. 2

POST UNDETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

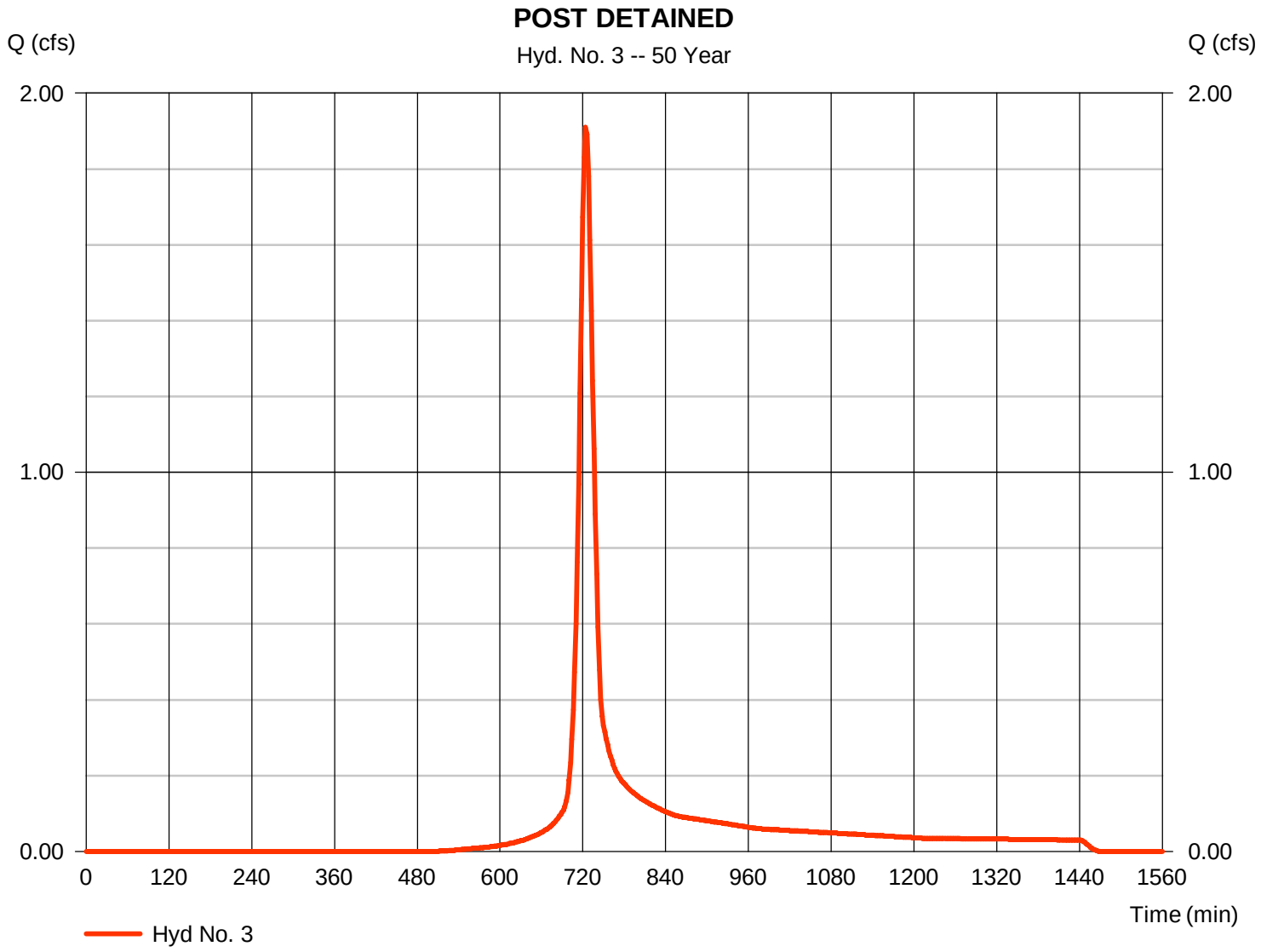
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	= SCS Runoff	Peak discharge	= 1.910 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 5,987 cuft
Drainage area	= 0.500 ac	Curve number	= 71*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 19.00 min
Total precip.	= 6.49 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

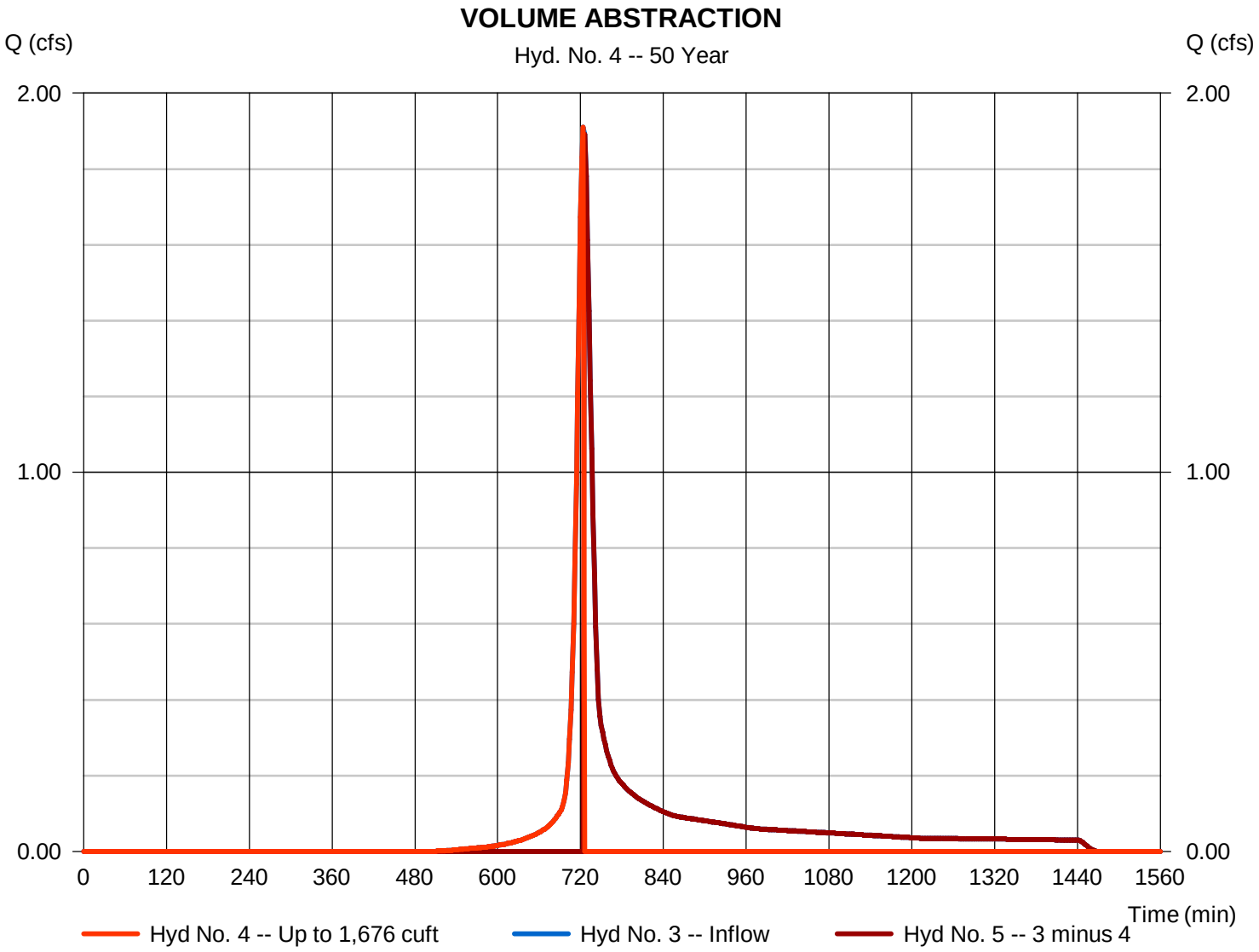


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 1.910 cfs
Storm frequency	= 50 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 1,779 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

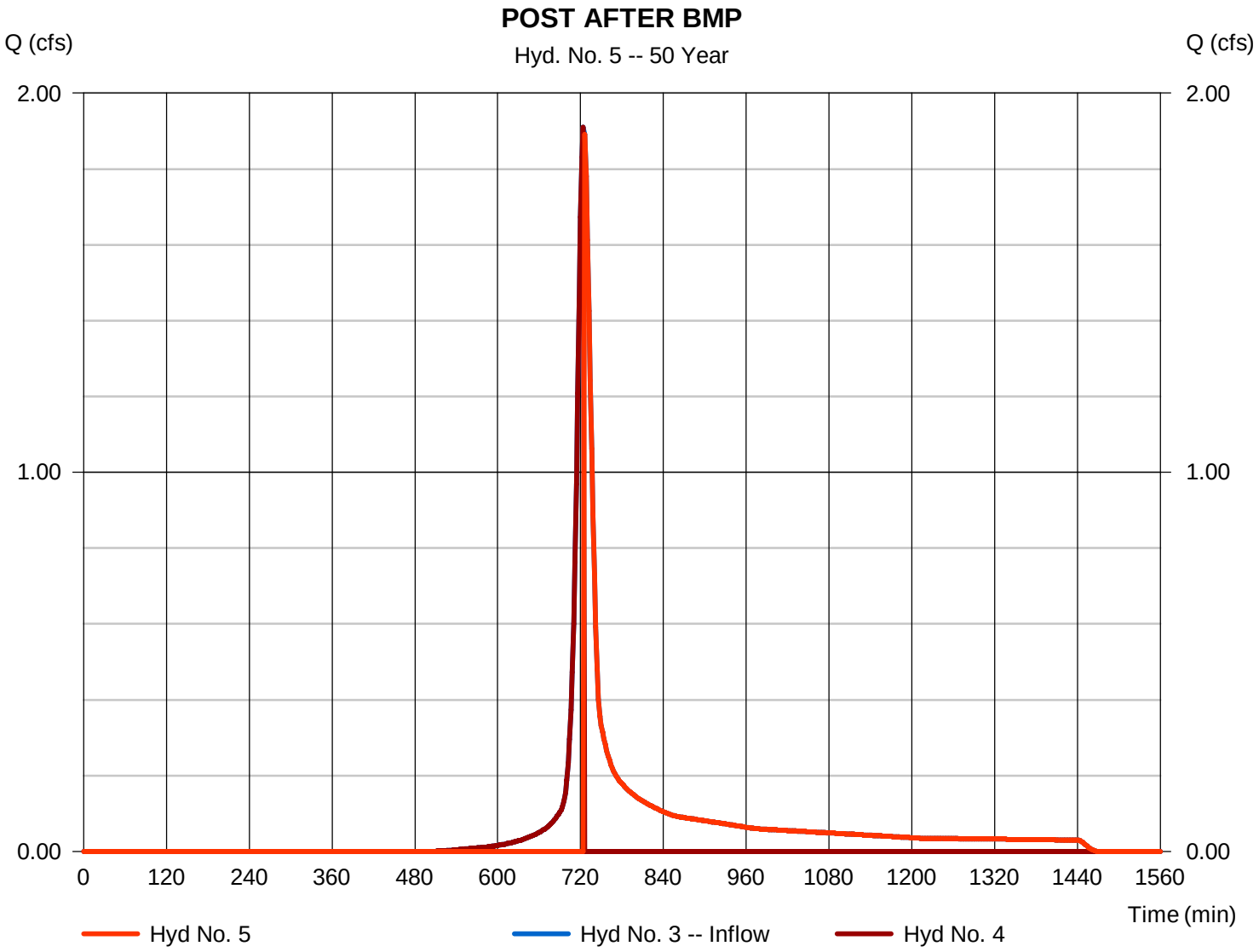


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 1.892 cfs
Storm frequency	= 50 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 4,207 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

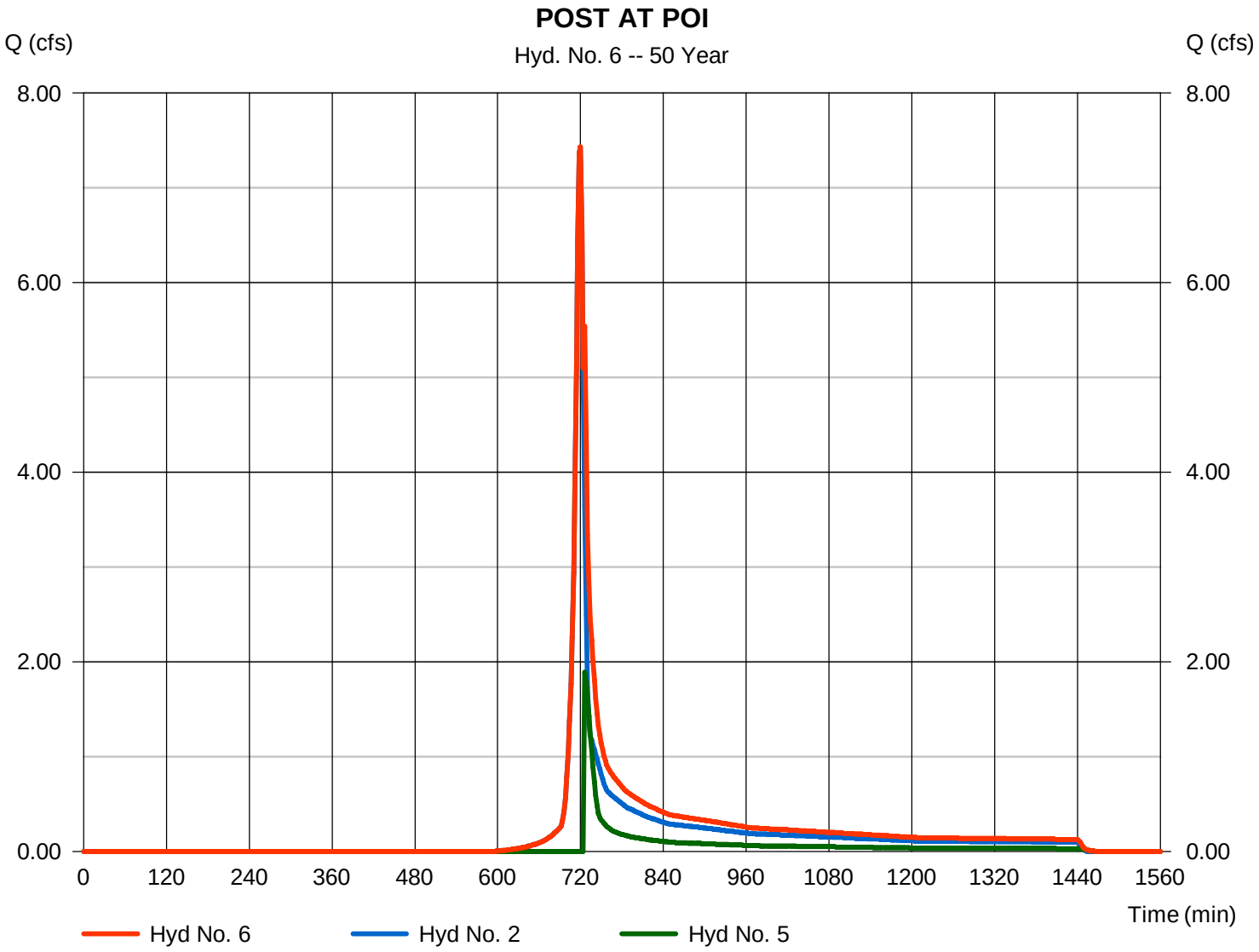


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 7.433 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 21,225 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	54.3902	12.9000	0.9053	--------
2	61.8275	12.9000	0.8899	--------
3	0.0000	0.0000	0.0000	--------
5	57.7575	11.9000	0.8260	--------
10	61.5114	12.2000	0.8089	--------
25	54.2223	10.9000	0.7478	--------
50	45.1449	9.2000	0.6848	--------
100	43.0569	8.6000	0.6532	--------

File name: Hopeland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.99	3.20	2.67	2.30	2.02	1.81	1.64	1.50	1.38	1.28	1.19	1.12
2	4.75	3.81	3.20	2.76	2.43	2.18	1.98	1.81	1.67	1.55	1.45	1.36
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.59	4.51	3.81	3.31	2.93	2.64	2.41	2.21	2.05	1.91	1.79	1.69
10	6.16	5.01	4.25	3.71	3.30	2.98	2.72	2.51	2.33	2.18	2.05	1.93
25	6.85	5.58	4.76	4.17	3.73	3.38	3.10	2.87	2.68	2.51	2.37	2.24
50	7.34	5.97	5.09	4.48	4.02	3.66	3.37	3.13	2.93	2.76	2.61	2.48
100	7.83	6.38	5.46	4.82	4.34	3.96	3.66	3.41	3.20	3.01	2.86	2.72

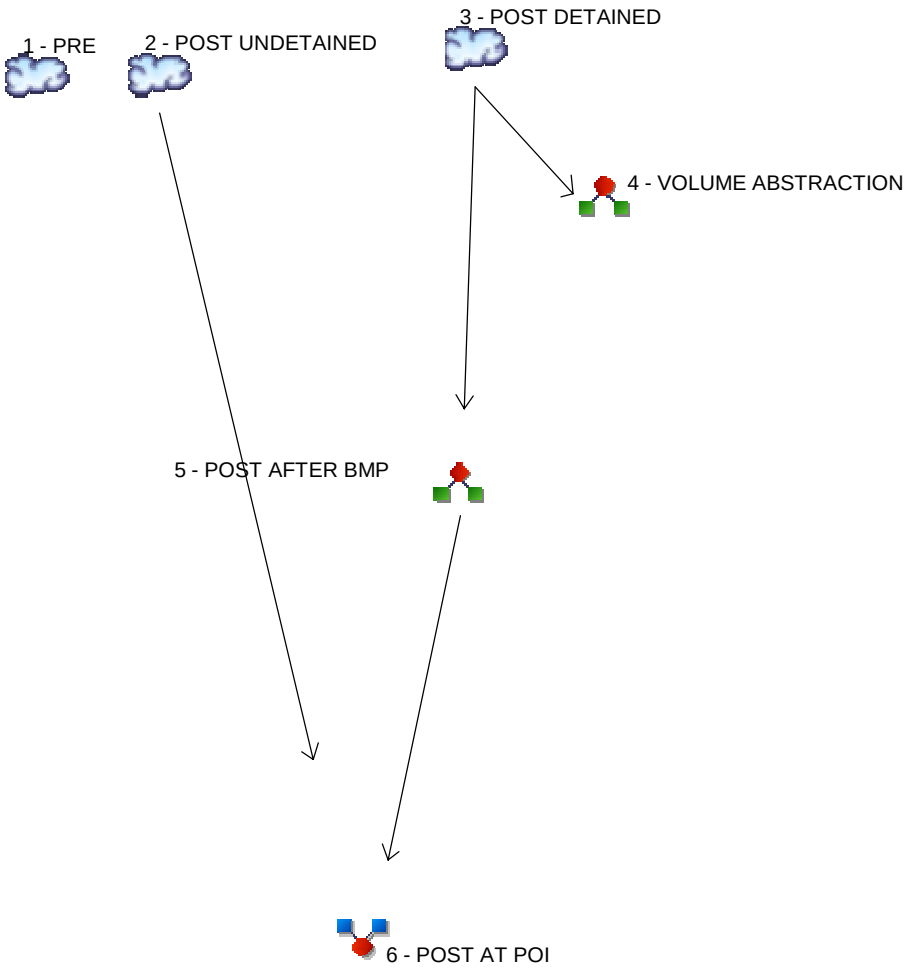
Tc = time in minutes. Values may exceed 60.

Mariner East Phase 2)\ESCGP-2\PPP\02 SCRO\07 PCSM\Attach 4 Stormwater Calcs\Hopeland\Hopeland Precip.pc

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.57	3.10	0.00	3.91	4.60	5.62	6.49	7.45
SCS 6-Hr	1.81	2.19	0.00	2.74	3.19	3.84	4.39	4.99
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4



Legend

Hyd.	Origin	Description
1	SCS Runoff	PRE
2	SCS Runoff	POST UNDETAINED
3	SCS Runoff	POST DETAINED
4	Diversion1	VOLUME ABSTRACTION
5	Diversion2	POST AFTER BMP
6	Combine	POST AT POI

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	12.15	PRE
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	9.499	POST UNDETAINED
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	2.592	POST DETAINED
4	Diversion1	3	-------	-------	-------	-------	-------	-------	-------	2.213	VOLUME ABSTRACTION
5	Diversion2	3	-------	-------	-------	-------	-------	-------	-------	2.592	POST AFTER BMP
6	Combine	2, 5	-------	-------	-------	-------	-------	-------	-------	11.97	POST AT POI

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	12.15	2	720	27,829	------	------	------	PRE
2	SCS Runoff	9.499	2	720	21,753	------	------	------	POST UNDETAINED
3	SCS Runoff	2.592	2	722	7,265	------	------	------	POST DETAINED
4	Diversion1	2.213	2	718	1,770	3	------	------	VOLUME ABSTRACTION
5	Diversion2	2.592	2	722	5,494	3	------	------	POST AFTER BMP
6	Combine	11.97	2	720	27,247	2, 5	------	------	POST AT POI

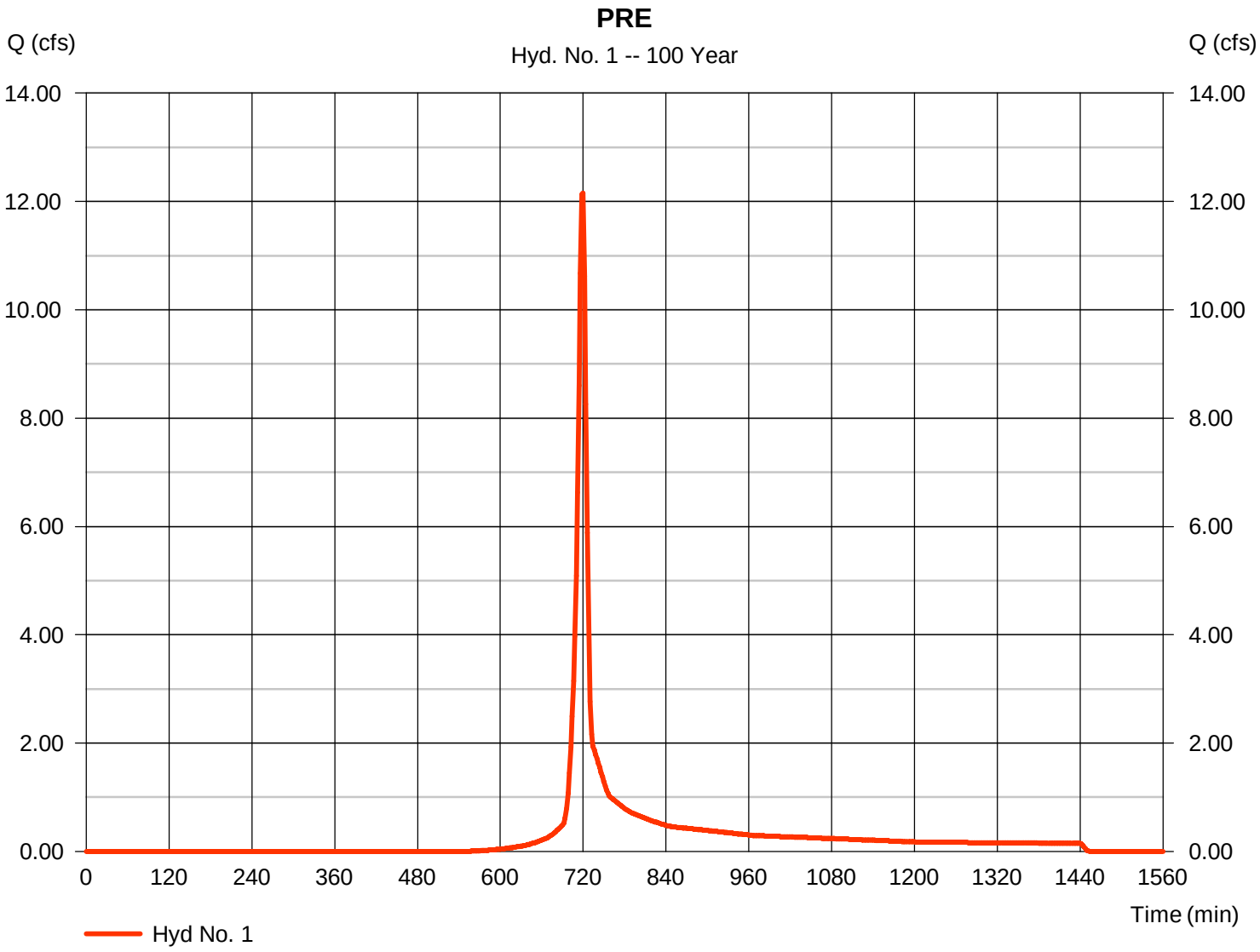
Hydrograph Report

Hyd. No. 1

PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	12.15 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	27,829 cuft
Drainage area	=	2.290 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.500 x 78) + (1.690 x 58)] / 2.290



TR55 Tc Worksheet

Hyd. No. 1

PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

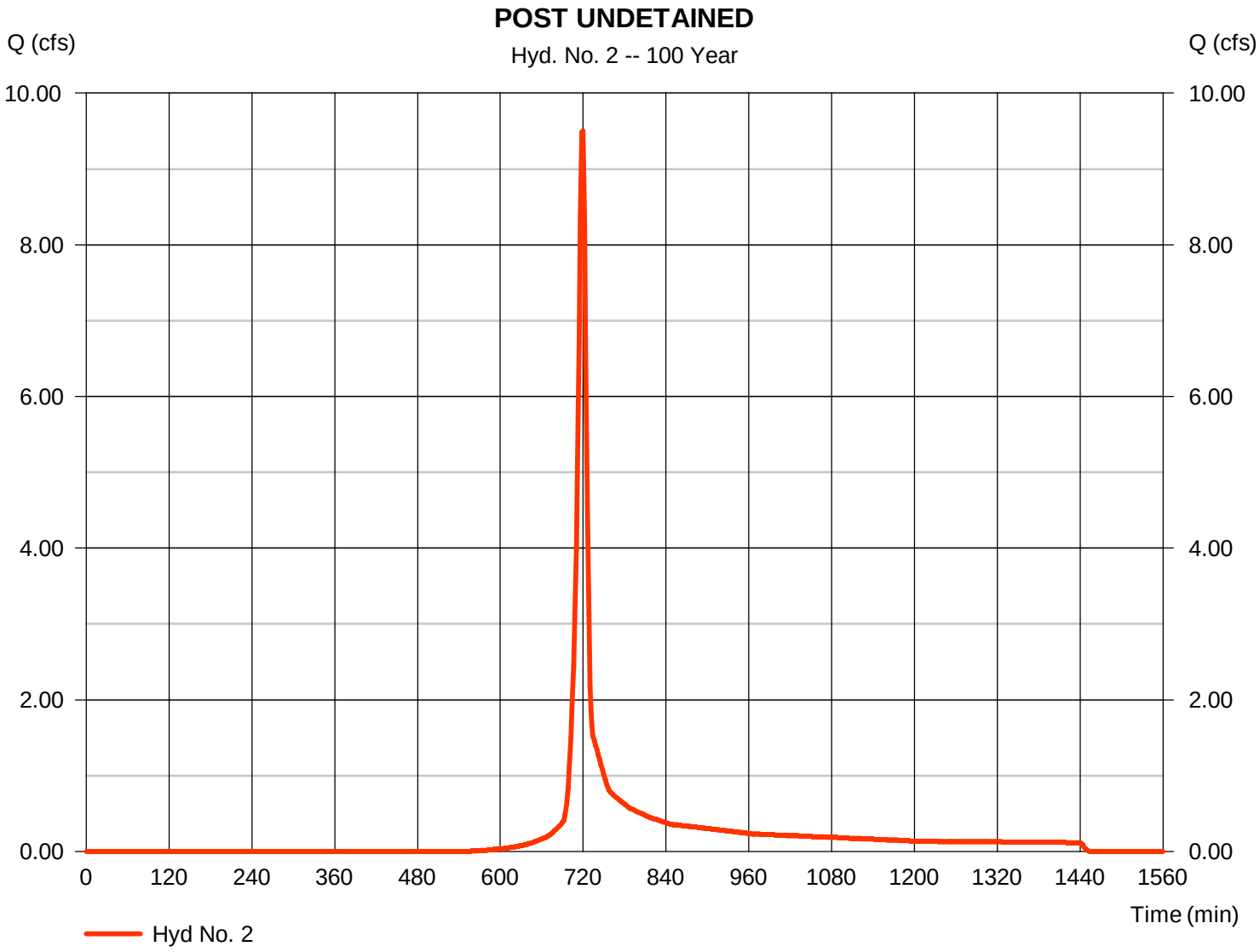
Hydrograph Report

Hyd. No. 2

POST UNDETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	9.499 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	21,753 cuft
Drainage area	=	1.790 ac	Curve number	=	64*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.20 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.290 x 58) + (0.500 x 78)] / 1.790



TR55 Tc Worksheet

Hyd. No. 2

POST UNDETAINED

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 50.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 8.85		0.00		0.00		
Travel Time (min)	**= 4.59**	**+**	**0.00**	**+**	**0.00**	**=**	**4.59**
Shallow Concentrated Flow							
Flow length (ft)	= 541.00		0.00		0.00		
Watercourse slope (%)	= 5.39		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=3.75		0.00		0.00		
Travel Time (min)	**= 2.41**	**+**	**0.00**	**+**	**0.00**	**=**	**2.41**
Channel Flow							
X sectional flow area (sqft)	= 16.00		0.00		0.00		
Wetted perimeter (ft)	= 28.00		0.00		0.00		
Channel slope (%)	= 1.35		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=7.93						
			0.00				
					0.00		
Flow length (ft)	({0})109.0		0.0		0.0		
Travel Time (min)	**= 0.23**	**+**	**0.00**	**+**	**0.00**	**=**	**0.23**

Total Travel Time, Tc ..... 7.20 min

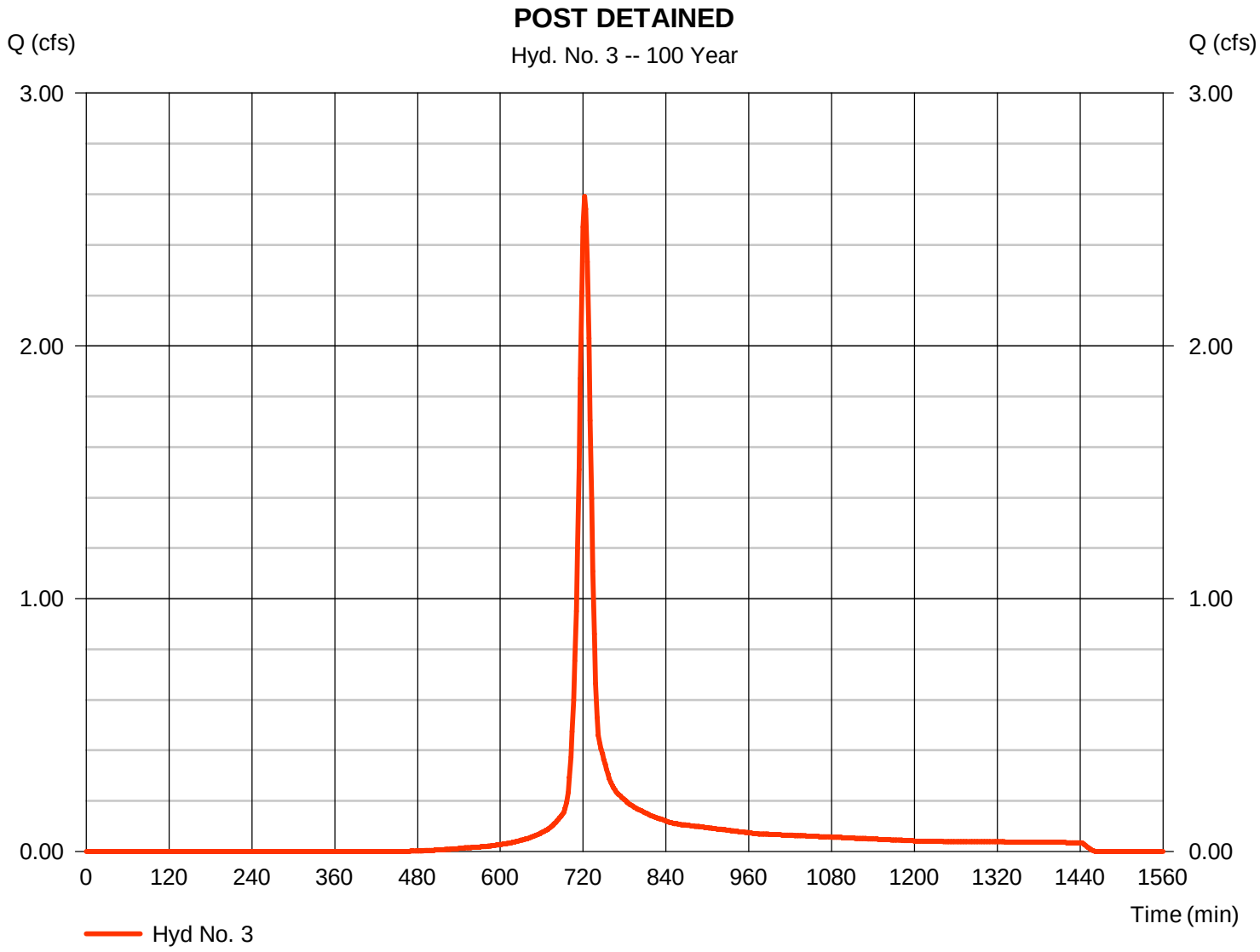
Hydrograph Report

Hyd. No. 3

POST DETAINED

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.592 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	7,265 cuft
Drainage area	=	0.500 ac	Curve number	=	71*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	16.17 min
Total precip.	=	7.45 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.100 x 98) + (0.100 x 85) + (0.300 x 58)] / 0.500

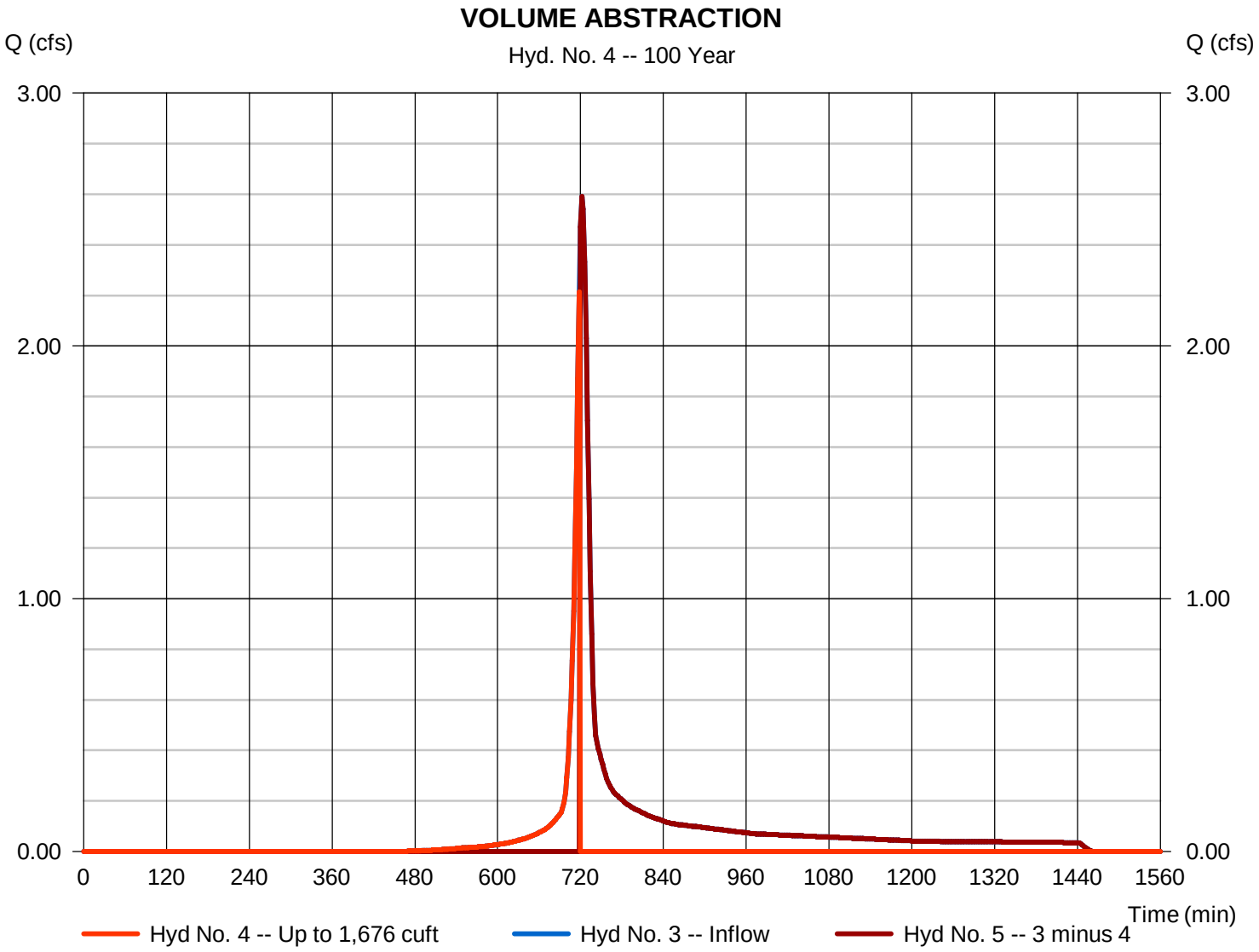


Hydrograph Report

Hyd. No. 4

VOLUME ABSTRACTION

Hydrograph type	= Diversion1	Peak discharge	= 2.213 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 1,770 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 5
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

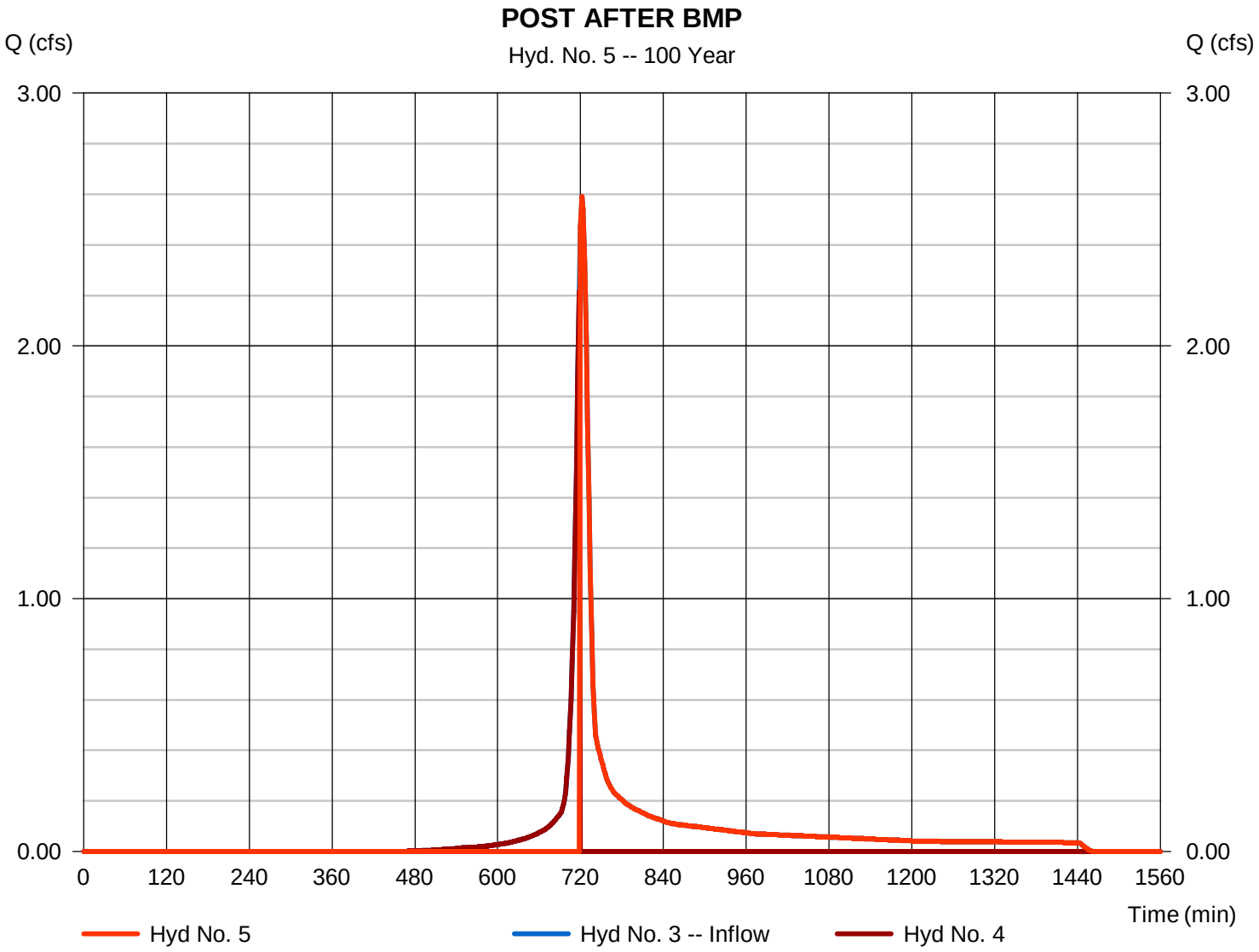


Hydrograph Report

Hyd. No. 5

POST AFTER BMP

Hydrograph type	= Diversion2	Peak discharge	= 2.592 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 5,494 cuft
Inflow hydrograph	= 3 - POST DETAINED	2nd diverted hyd.	= 4
Diversion method	= First Flush Volume	Volume Up To	= 1,676 cuft

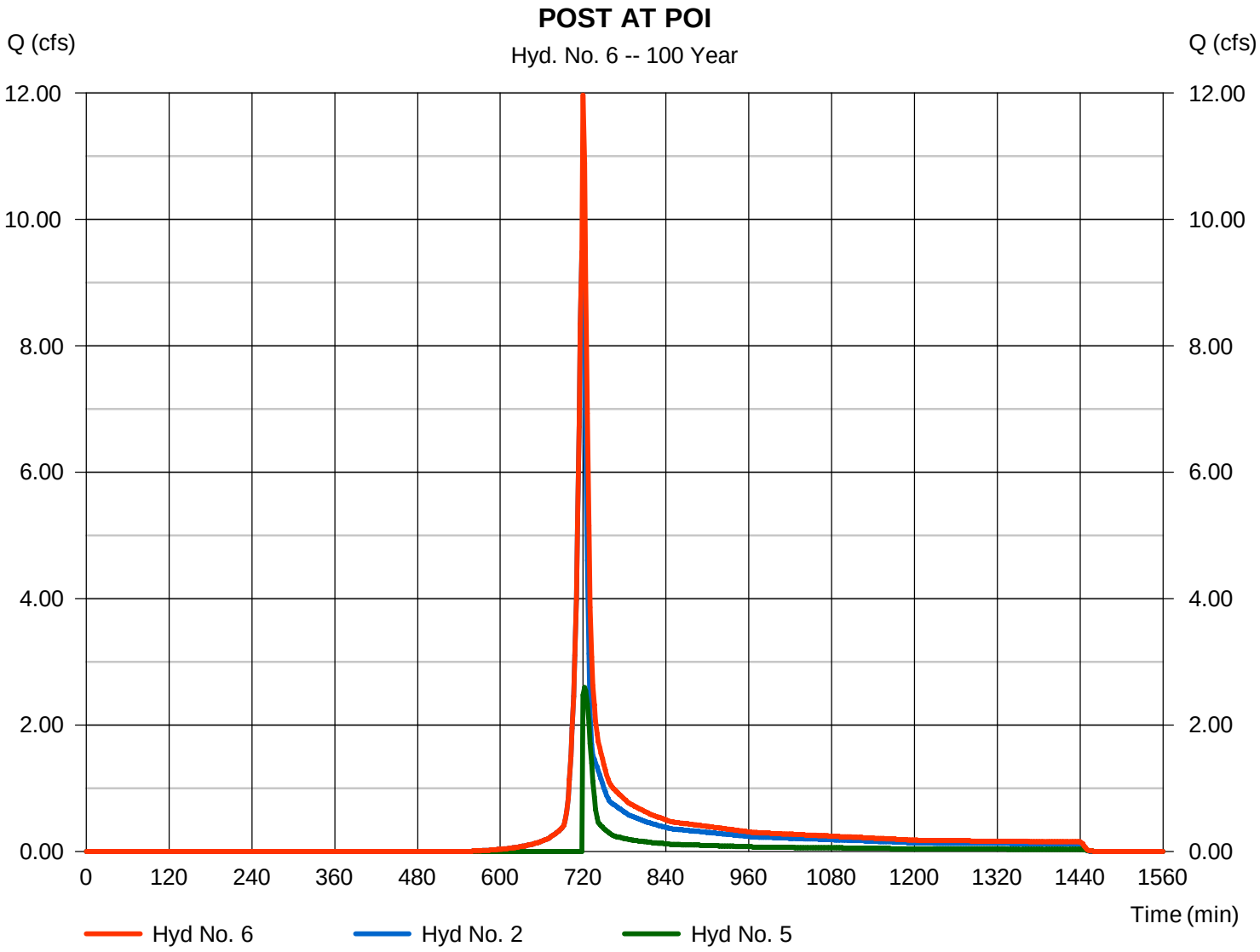


Hydrograph Report

Hyd. No. 6

POST AT POI

Hydrograph type	= Combine	Peak discharge	= 11.97 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 27,247 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 1.790 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	54.3902	12.9000	0.9053	--------
2	61.8275	12.9000	0.8899	--------
3	0.0000	0.0000	0.0000	--------
5	57.7575	11.9000	0.8260	--------
10	61.5114	12.2000	0.8089	--------
25	54.2223	10.9000	0.7478	--------
50	45.1449	9.2000	0.6848	--------
100	43.0569	8.6000	0.6532	--------

File name: Hopeland IDF.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.99	3.20	2.67	2.30	2.02	1.81	1.64	1.50	1.38	1.28	1.19	1.12
2	4.75	3.81	3.20	2.76	2.43	2.18	1.98	1.81	1.67	1.55	1.45	1.36
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.59	4.51	3.81	3.31	2.93	2.64	2.41	2.21	2.05	1.91	1.79	1.69
10	6.16	5.01	4.25	3.71	3.30	2.98	2.72	2.51	2.33	2.18	2.05	1.93
25	6.85	5.58	4.76	4.17	3.73	3.38	3.10	2.87	2.68	2.51	2.37	2.24
50	7.34	5.97	5.09	4.48	4.02	3.66	3.37	3.13	2.93	2.76	2.61	2.48
100	7.83	6.38	5.46	4.82	4.34	3.96	3.66	3.41	3.20	3.01	2.86	2.72

Tc = time in minutes. Values may exceed 60.

Mariner East Phase 2)\ESCGP-2\PPP\02 SCRO\07 PCSM\Attach 4 Stormwater Calcs\Hopeland\Hopeland Precip.pc

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.57	3.10	0.00	3.91	4.60	5.62	6.49	7.45
SCS 6-Hr	1.81	2.19	0.00	2.74	3.19	3.84	4.39	4.99
Huff-1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00