COONEY RD

WORKSHEET 1. GENERAL SITE INFORMATION

Date: October 19, 2016

Project Name: Cooney Rd

Municipality: Munster Township/Cresson Township

County: Cambria

Total Area (acres): 1.77

Major River Basin: Ohio

Watershed: Little Conemaugh River

Sub Basin: Tributary to Bens Creek-Little Conemaugh River

Nearest Surface Water to Receive Runoff: Tributary 46127 to Little Conemaugh River

Ch. 93 - Designated Water Use: CWF

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	
	NO	X
Existing River Conservation Plan?	YES	
	NO	X

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.

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

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

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			
Floodplains			
Riparian Areas			
Wetlands			
Woodlands			
Natural Drainage Ways			
Steep Slopes, 15% - 25%			
Steep Slopes, over 25%			
Other:	Yes	1.77	0.77
Other:			
TOTAL EXISTING:	Yes	1.77	0.77

WORKSHEET 3. NONSTRUCTURAL BMP CREDITS

PROTECED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 0.77 **Ac.**

1.2 Area of Riparian Forest Buffer Protection 0 **Ac.**

3.1 Area of Minimum Disturbance/Reduced Grading 0 **Ac.**

TOTAL 0.77 **Ac.**

Site Area	minus	Protected Area	=	Stormwater Management Area
1.77	-	0.77	=	1.00
				This is the area that requires stormwater management

VOLUME CREDITS

3.1 Minimum Soil Compaction

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

Meadow _____ ft^2 x 1/3 in x 1/12 = _____ **ft^3**

3.3 Protected Existing Trees

For trees within 100 feet of impervious area:

Tree canopy _____ ft^2 x 1/2 in x 1/12 = _____ **ft^3**

5.1 Disconnect Roof Leaders to Vegetated Areas

For runoff directed to areas protected under 5.8.1 and 5.8.2

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

For all other disconnected roof areas

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

5.2 Disconnect Non-Roof impervious to Vegetated Areas

For runoff directed to areas protected under 5.8.1 and 5.8.2

Impervious Areas _____ ft^2 x 1/3 in x 1/12 = _____ **ft^3**

For all other disconnected roof areas

Impervious Areas _____ ft^2 x 1/4 in x 1/12 = _____ **ft^3**

TOTAL NON-STRUCTURAL VOLUME CREDIT* **ft^3**

** For use on Workseet 5*

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

PROJECT: Cooney Rd
Drainage Area: 1.77 acres
2-Year Rainfall: 2.62 in

Total Site Area: 1.77 acres
Protected Site Area: 0.77 acres
Managed Site Area: 1.00 acres

Existing Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff [1] (in)	Runoff Volume [2] (ft^3)
Meadow	C/D	34848	0.80	78	2.82	0.56	0.87	2,517
Woods	C/D	3920	0.09	77	2.99	0.60	0.82	267
80% Existing Gravel	C/D	3920	0.09	91	0.99	0.20	1.72	562
Meadow (20% Gravel)	C/D	871	0.02	78	2.82	0.56	0.87	63
TOTAL:		**43,560**	**1.00**					**3,409**

Developed Conditions

Cover Type/Condition	Soil Type	Area (sf)	Area (ac)	CN	S	Ia (0.2*S)	Q Runoff [1] (in)	Runoff Volume [2] (ft^3)
Meadow	C/D	35719	0.82	78	2.82	0.56	0.87	2,580
Impervious Gravel	C/D	7841	0.18	91	0.99	0.20	1.72	1,124
TOTAL:		**43,560**	**1.00**					**3,704**

2-Year Volume Increase (ft^3):	**295**

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: Cooney Rd
SUB-BASIN:

Required Control Volume (ft^3) - *from Worksheet 4:* 295

Non-structural Volume Credit (ft3) - *from Worksheet 3:* - N/A

Structural Volume Reqmt (ft^3) 295
(Required Control Volume minus Non-structural Credit)

	Proposed BMP	Area (ft^2)	Storage Volume (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	2,074	2,486
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 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 Provided (ft^3): 2,486

Structural Volume Requirement (ft^3): 295

DIFFERENCE: -2,191

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 equivalent) "provided across the site" is taken to mean the specifications for that BMP set forward in Sections 5 and 6 are satisfied.

Proposed BMPs from PA Stormwater Best Management Practices Manual Chapter 5 & 6

	Yes	No
Primary BMPs for Nitrate:		
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		

PCSM - DESIGN CALCULATIONS
COONEY RD

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By:	EAD	Date: 10/19/16	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

Post Construction Stormwater Management Plan - Design Calculations
Cooney Road

PURPOSE

The purpose of these calculations is to design a Post-Construction Stormwater Management (PCSM) Plan for the Cooney Road Block Valve Site as part of the Sunoco Pipeline L.P. Pennsylvania Pipeline Project. The Cooney Road Block Valve Site is located in Munster/Cresson Townships, Cambria County, PA. Permanent stormwater controls will be developed to satisfy PADEP and local stormwater control regulations. *(No applicable Act 167 or local regulations)*

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).

Chapter 3 of the BMP Manual, Stormwater Management Principles and Recommended Control Guidelines, outlines the recommended control guidelines referenced for this design, as follows:

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 1-year through 100-year events (at minimum); as necessary, provide additional peak rate control as required by applicable and approved Act 167 plans. *(No applicable Act 167 Plans)*

This site will utilize an infiltration berm to manage the one-year through 100-year peak rate increases. These BMPs, in conjunction with diversion channels and collection channels, will also help to increase the time of concentration.

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 PCSM Package.

Loading Ratio

In general, the following Loading Ratio guidelines are recommended:
• Maximum Impervious Loading Ratio of 5:1 relating impervious drainage area to infiltration area.

Disturbed Area

To meet PADEP PCSM Worksheet 10 guidelines, 90% of the disturbed area must be contained by BMP's.

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Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

RAINFALL DEPTHS

SCS Storms: Storm routing for all storm events will be performed using the TR-55 SCS method with a 24-hour, Type II rainfall distribution. The following depths were obtained from the NOAA Point Precipitation Frequency Estimates for the site (Reference #6, Attachment A):

Storm Frequency	Depth (Inches)
2-yr	2.62
10-yr	3.76
50-yr	5.13
100-yr	5.80

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RUNOFF VOLUME CALCULATION

2-YEAR DESIGN STORM RUNOFF VOLUME

The change in runoff volume for a 2-yr storm event will be calculated for the project area.

2-Year Rainfall (P) 2.62 in

Total Site Area : 1.77 acres
Protected Site Area: 0.77 acres
Stormwater Management Area 1.00 acres

Pre-Development Condition within LOD

Cover Type/Condition	Soil Type	Area (ac)	CN	S	Ia	Q (in)	Runoff Volume (cf)
Meadow	C/D	0.80	78	2.82	0.56	0.87	2,517
Woods	C/D	0.09	77	2.99	0.60	0.82	267
80% Existing Gravel	C/D	0.09	91	0.99	0.20	1.72	562
Meadow (20% Gravel)	C/D	0.02	78	2.82	0.56	0.87	63
Total		1.00					3,409

Post-Development Condition within LOD

Cover Type/Condition	Soil Type	Area (ac)	CN	S	Ia	Q (in)	Runoff Volume (cf)
Meadow	C/D	0.82	78	2.82	0.56	0.87	2,580
Impervious Gravel	C/D	0.18	91	0.99	0.20	1.72	1,124
Total		1.00					3,704

2-Year Volume Increase (cf):	**295**

1. Runoff (in) = $Q = (P - 0.2S)^2 / (P + 0.8S)$ where [eq. 2-3, Ref. #2]
   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.)

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By:	EAD	Date: 10/19/16	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

IMPERVIOUS LOADING RATE

	Area (ac)	Area (sf)	
Detained Impervious Area (Gravel & Pavement):	0.18	7841	
Maximum Impervious Ratio:	5	:1	
Minimum Infiltration Area (sf):		1,568	
Design Infiltration Area (sf):		2,074	
Design Impervious Ratio:	3.8	:1	OK

TOTAL WATERSHED LOADING RATE

	Area (ac)	Area (sf)
Detained Watershed Area (to Infiltration BMP):	0.65	28226
Maximum Total Watershed Ratio Ratio:	8	:1
Minimum Infiltration Area (sf):		3,528
Design Infiltration Area (sf):		2,074
Design Total Watershed Ratio:	13.6	:1

DISTURBED AREA

To meet Worksheet #10 guidelines, 90% of the disturbed area must be detained by BMP's. The infiltration berm for the Cooney Road Block Valve Site will be located on the eastern edge of the pad and 95 percent of the disturbed area will be detained by the BMP.

INFILTRATION RATE

The design infiltration rate is determined from an average of the results within the footprint and approved vicinity of the proposed infiltration berm.

Design Infiltration Rate (in/hr)	**0.4**

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Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

VOLUME CALCULATION FOR STRUCTURAL BMPs

Infiltration Berm

Storage Volume

	Length (ft)	Cross Section Area (sf)	Surface Area (sf)	Depth to Overflow (ft)	Storage Volume (cf)
	39	77	2,074	2.00	2,999

VOLUME CREDIT FOR STRUCTURAL BMPs

The Volume Credit for each structural BMP will be the minimum of the following three volumes: Runoff to BMP from a 2 year-24 hour storm event, Storage Volume of the BMP, Infiltration Volume of the BMP within 72 hours.

Infiltration BMP	2-Year Runoff Volume (cf)	Storage Volume (cf)	Infiltration Volume - 72 Hours (cf)	Structural Volume Credit (cf)
Infiltration Berm	2486	2999	2999	2486
			Total Structural Credit (cf) (Worksheet 5)	**2486**

Note: The Infiltration Volume is capped by the Storage Volume of the BMP.

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Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

WATERSHED CHARACTERISTICS

The total watershed area for the project site is 1.77 acres. Based upon the soil survey of Cambria County, Pennsylvania (Ref. #3, Attachment B), the primary soil types within the watershed area are of the Cavode siltloam (CaB) and Cavode silt loam (CaC) series which are primarily classified as HSG C/D. See the project drawings for watershed mapping.

Pre-Development Condition

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	CaB	Meadow	78	0.57
C/D	CaB	Woods	77	0.19
C/D	CaC	Meadow	78	0.77
C/D	CaC	Woods	77	0.14
C/D	CaC	Existing Gravel (80%)	91	0.08
C/D	CaC	Meadow (20% Gravel)	78	0.02
			Totals	1.77

CN	78

Post-Development Condition

Undetained Area 1

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	CaB	Meadow	78	0.39
C/D	CaB	Woods	77	0.17
C/D	CaC	Meadow	78	0.21
C/D	CaC	Woods	77	0.07
C/D	CaC	Impervious - Gravel	91	0.01
			Totals	0.85

CN	78

Undetained Area 2

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	CaB	Meadow	78	0.03
C/D	CaC	Meadow	78	0.02
			Totals	0.05

CN	78

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By:	EAD	Date: 10/19/16	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

BMP (Detained)

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	CaB	Meadow	78	0.20
C/D	CaC	Meadow	78	0.50
C/D	CaC	Impervious - Gravel	91	0.18
			Totals	0.88

CN	81

PEAK FLOW CALCULATIONS

The infiltration berms were designed using the Time of Concentration Adjustment method.

HYDRAULIC PATHS

Times of concentration and travel times were evaluated for the pre-development condition as well as post-development conditions (Ref. #2). TR55 methodology was used to determine the T_c as presented in the AutoCAD Civil 3D Hydraflow Hydrographs computer output (Attachment C).

TIME OF CONCENTRATION ADJUSTMENT

The 'Peak Flow for Post-Dev. at the BMP (cfs)' is calculated from the BMP watershed with the Point of Interest at the BMP. The 'Volume Control BMP Storage' is the minimum value of the runoff volume to the BMP or the BMP Storage Volume.

Storm Event (Yr.)	Peak Flow Post-Dev. At the BMP (cfs)	Volume Control BMP Storage (cf)	Additional Residence Time (min.)	Post Development Time of Concentration (w/o BMPs) (min.)	Adjusted Time Of Concentration (min.)
2	1.1	2,999	46.0	10.3	56.3
10	2.0	2,999	25.0	10.3	35.3
50	3.2	2,999	15.8	10.3	26.1
100	3.7	2,999	13.4	10.3	23.7

$$Additional\ Residence\ Time\ (min.) = \frac{Storage\ Volume\ (cf)}{Peak\ Flow\ {}^{W}/_{O}\ BMP} * \frac{1\ min}{60\ sec}$$

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By:	EAD	Date: 10/19/16	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/21/16		Cooney Rd	Proj. No.: 112IC05958

STORMWATER POND ROUTING

The computer programs AutoCAD Civil 3D Hydraflow Hydrographs Extension (Reference #7) was used to calculate the peak runoff during the pre-development conditions, post-development conditions without BMPs, and post-development conditions with BMPs. The peak discharge for each condition was calculated for the 2-yr, 10-yr, 50-yr, and 100-yr - 24-hr storm events. The following table summarizes the peak discharges for all conditions and the resulting changes. As demonstrated by the table, all the post-development conditions with BMPs produced discharges that were less than the peak runoffs from the pre-development conditions Hydraflow documentation is included in Attachment C.

	Pre-Development	Post-Development			
Storm Frequency	**Peak Runoff (cfs)**	**Peak Outflow (No BMP) (cfs)**	**Watershed Runoff Vol. (with BMPs) (cf)**	**Peak Outflow (with BMP) (cfs)**	**Change (cfs)**
2-yr	2.15	2.51	6,094	1.40	-0.8
10-yr	4.32	4.86	11,614	3.18	-1.1
50-yr	7.21	7.91	18,970	5.99	-1.2
100-yr	8.68	9.44	22,758	7.18	-1.5

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Chkd. By:	LMD	Date: 10/21/2016		Cooney Rd	Proj. No.: 112IC05958

REFERENCES

1) Erosion and Sediment Pollution Control Program Manual, Pennsylvania Department of Environmental Protection, Office of Water Management, March 2012.

2) Urban Hydrology for Small Watersheds, Technical Release Number 55 (TR-55), United States Department of Agriculture, Soil Conservation Service, 2nd Edition, June 1986.

3) Soil Survey of Cambria County, PA, United States Department of Agriculture, Soil Conservation Service, September 2016.

4) Handbook of Hydraulics - Sixth Edition, Brater and King, McGraw-Hill Book Company, 1976.

5) Introduction to Hydraulics and Hydrology with Applications for Stormwater Management - 2nd Edition, Gribbin, Delmar: A Division of Thomson Learning, 2002.

6) NOAA, Point Precipitation Frequency Estimates, Pennsylvania 40.4539 N 78.6205 W 2054.23 ft.

7) Hydraflow Hydrographs Extension, AutoCAD Civil 3D, Autodesk, Inc, 2007-2016.

8) Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection, December 2006.

ATTACHMENT A

NOAA PRECIPITATION FREQUENCY ESTIMATES

NOAA Atlas 14, Volume 2, Version 3
Location name: Munster Twp, Pennsylvania, USA*
Latitude: 40.4539°, Longitude: -78.6205°
Elevation: 2054.23 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	0.323 (0.292–0.358)	0.387 (0.350–0.430)	0.469 (0.423–0.521)	0.533 (0.479–0.591)	0.619 (0.553–0.684)	0.687 (0.611–0.759)	0.756 (0.669–0.833)	0.829 (0.728–0.914)	0.932 (0.811–1.03)	1.01 (0.872–1.11)
10-min	0.501 (0.453–0.557)	0.604 (0.547–0.671)	0.729 (0.658–0.809)	0.823 (0.740–0.913)	0.946 (0.846–1.05)	1.04 (0.927–1.15)	1.14 (1.01–1.26)	1.24 (1.09–1.36)	1.37 (1.19–1.51)	1.47 (1.27–1.62)
15-min	0.615 (0.556–0.683)	0.738 (0.669–0.821)	0.895 (0.808–0.993)	1.01 (0.911–1.12)	1.17 (1.05–1.29)	1.29 (1.15–1.42)	1.41 (1.25–1.56)	1.54 (1.35–1.70)	1.71 (1.49–1.88)	1.84 (1.59–2.02)
30-min	0.813 (0.735–0.903)	0.988 (0.895–1.10)	1.23 (1.11–1.36)	1.41 (1.27–1.56)	1.65 (1.48–1.83)	1.84 (1.64–2.04)	2.04 (1.81–2.25)	2.25 (1.97–2.48)	2.53 (2.20–2.79)	2.76 (2.38–3.03)
60-min	0.993 (0.898–1.10)	1.21 (1.10–1.35)	1.54 (1.39–1.71)	1.79 (1.61–1.98)	2.14 (1.91–2.37)	2.43 (2.16–2.68)	2.73 (2.41–3.01)	3.05 (2.68–3.36)	3.50 (3.05–3.86)	3.87 (3.34–4.26)
2-hr	1.16 (1.05–1.30)	1.41 (1.27–1.57)	1.80 (1.61–2.00)	2.10 (1.88–2.34)	2.54 (2.25–2.81)	2.90 (2.56–3.21)	3.29 (2.88–3.63)	3.71 (3.23–4.09)	4.33 (3.72–4.77)	4.84 (4.13–5.35)
3-hr	1.25 (1.13–1.39)	1.52 (1.37–1.69)	1.92 (1.72–2.13)	2.24 (2.01–2.48)	2.71 (2.41–2.99)	3.10 (2.74–3.41)	3.52 (3.09–3.88)	3.98 (3.47–4.37)	4.66 (4.01–5.11)	5.23 (4.46–5.73)
6-hr	1.52 (1.37–1.70)	1.84 (1.66–2.05)	2.29 (2.06–2.55)	2.67 (2.39–2.97)	3.21 (2.85–3.56)	3.66 (3.24–4.06)	4.16 (3.64–4.59)	4.69 (4.08–5.18)	5.48 (4.70–6.03)	6.14 (5.22–6.75)
12-hr	1.91 (1.73–2.14)	2.30 (2.08–2.58)	2.85 (2.58–3.19)	3.32 (2.98–3.70)	4.00 (3.57–4.45)	4.58 (4.06–5.09)	5.22 (4.59–5.78)	5.93 (5.15–6.55)	6.97 (5.98–7.70)	7.87 (6.66–8.67)
24-hr	2.19 (2.02–2.40)	2.62 (2.42–2.87)	3.25 (2.99–3.54)	3.76 (3.45–4.10)	4.51 (4.11–4.89)	5.13 (4.66–5.56)	5.80 (5.23–6.27)	6.51 (5.84–7.04)	7.55 (6.69–8.14)	8.39 (7.38–9.06)
2-day	2.55 (2.36–2.77)	3.05 (2.82–3.32)	3.76 (3.47–4.08)	4.35 (4.00–4.71)	5.19 (4.75–5.62)	5.89 (5.36–6.37)	6.64 (6.00–7.17)	7.44 (6.68–8.05)	8.59 (7.63–9.30)	9.54 (8.38–10.3)
3-day	2.73 (2.53–2.97)	3.26 (3.03–3.54)	4.00 (3.71–4.34)	4.61 (4.26–4.99)	5.49 (5.04–5.93)	6.21 (5.68–6.70)	6.98 (6.33–7.53)	7.79 (7.02–8.42)	8.96 (7.99–9.69)	9.91 (8.75–10.7)
4-day	2.92 (2.71–3.16)	3.48 (3.23–3.77)	4.25 (3.95–4.60)	4.88 (4.52–5.27)	5.79 (5.33–6.24)	6.53 (5.99–7.04)	7.31 (6.67–7.89)	8.14 (7.37–8.80)	9.32 (8.34–10.1)	10.3 (9.11–11.1)
7-day	3.52 (3.30–3.78)	4.19 (3.92–4.50)	5.06 (4.73–5.42)	5.75 (5.37–6.17)	6.72 (6.25–7.20)	7.49 (6.94–8.02)	8.28 (7.64–8.87)	9.10 (8.35–9.76)	10.2 (9.30–11.0)	11.1 (10.0–12.0)
10-day	4.29 (4.03–4.58)	5.08 (4.77–5.43)	6.05 (5.68–6.46)	6.83 (6.40–7.29)	7.89 (7.37–8.42)	8.74 (8.13–9.33)	9.60 (8.90–10.3)	10.5 (9.66–11.2)	11.7 (10.7–12.5)	12.6 (11.5–13.6)
20-day	6.09 (5.79–6.43)	7.16 (6.81–7.58)	8.34 (7.92–8.82)	9.24 (8.77–9.78)	10.4 (9.87–11.0)	11.3 (10.7–12.0)	12.2 (11.5–12.9)	13.1 (12.3–13.9)	14.2 (13.3–15.1)	15.1 (14.0–16.1)
30-day	7.75 (7.38–8.15)	9.08 (8.65–9.56)	10.4 (9.91–11.0)	11.5 (10.9–12.1)	12.8 (12.1–13.5)	13.8 (13.1–14.5)	14.7 (13.9–15.5)	15.7 (14.8–16.6)	16.9 (15.8–17.8)	17.8 (16.6–18.8)
45-day	9.46 (9.04–9.91)	11.1 (10.6–11.6)	12.5 (12.0–13.1)	13.6 (13.0–14.3)	15.0 (14.3–15.7)	16.0 (15.2–16.8)	16.9 (16.1–17.7)	17.8 (16.9–18.7)	18.8 (17.8–19.8)	19.6 (18.5–20.6)
60-day	12.2 (11.7–12.7)	14.2 (13.6–14.8)	15.9 (15.3–16.6)	17.2 (16.5–18.0)	18.8 (18.0–19.6)	19.9 (19.0–20.8)	21.0 (20.0–21.9)	21.9 (20.9–22.9)	23.1 (21.9–24.2)	23.9 (22.6–25.1)

[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.

Back to Top

ATTACHMENT B

USDA SOILS MAP & PROPERTIES

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Cambria County, Pennsylvania

Cooney Road

October 19, 2016

Custom Soil Resource Report
Soil Map

Map Scale: 1:889 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

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

MAP LEGEND

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

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 1:20,000.

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: http://websoilsurvey.nrcs.usda.gov
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: Cambria County, Pennsylvania
Survey Area Data: Version 9, Nov 16, 2015

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

Date(s) aerial images were photographed: Oct 6, 2011—Oct 17, 2011

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.

Map Unit Legend

Cambria County, Pennsylvania (PA021)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CaB	Cavode silt loam, 3 to 8 percent slopes	0.8	39.4%
CaC	Cavode silt loam, 8 to 15 percent slopes	1.2	60.6%
Totals for Area of Interest		**2.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Cambria County, Pennsylvania

CaB—Cavode silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l5wm
Elevation: 1,000 to 1,700 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cavode and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cavode

Setting

Landform: Hills
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear, concave
Across-slope shape: Concave
Parent material: Acid clayey residuum weathered from clayey shale

Typical profile

Ap - 0 to 10 inches: silt loam
Btg - 10 to 47 inches: silty clay loam
BCg - 47 to 57 inches: channery silt loam
R - 57 to 61 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 90 inches to lithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent
Landform: Hills

Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Hills, draws
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

CaC—Cavode silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: l5wn
Elevation: 1,000 to 1,700 feet
Mean annual precipitation: 36 to 46 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 130 to 160 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Cavode and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cavode

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Acid clayey residuum weathered from clayey shale

Typical profile

Ap - 0 to 10 inches: silt loam
Btg - 10 to 47 inches: silty clay loam
BCg - 47 to 57 inches: channery silt loam
R - 57 to 61 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 40 to 90 inches to lithic bedrock
Natural drainage class: Somewhat poorly drained
Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Gilpin

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Brinkerton

Percent of map unit: 5 percent
Landform: Hills, draws
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: Yes

ATTACHMENT C
COONEY RD
HYDRAFLOW RESULTS

ATTACHMENT C-1
COONEY RD
2 Year-24 Hour Storm

Watershed Model Schematic

1 - Cooney Rd - PRE

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	------	-------	2.154	-------	-------	4.315	-------	7.212	8.680	Cooney Rd - PRE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	2.154	2	722	5,743	------	------	------	Cooney Rd - PRE

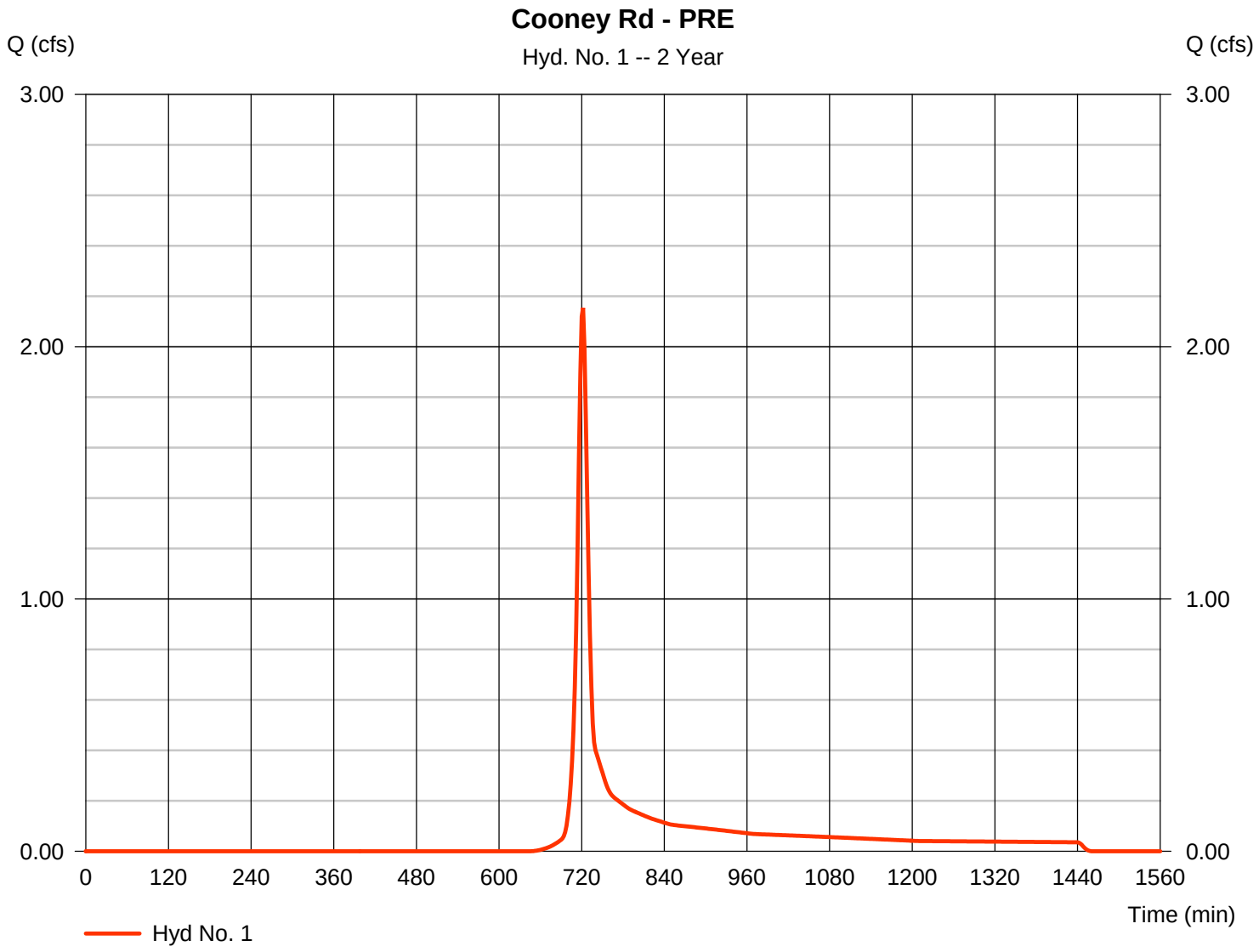
Hydrograph Report

Hyd. No. 1

Cooney Rd - PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.154 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 5,743 cuft
Drainage area	= 1.770 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.40 min
Total precip.	= 2.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.360 x 78) + (0.330 x 77) + (0.080 x 91)] / 1.770



TR55 Tc Worksheet

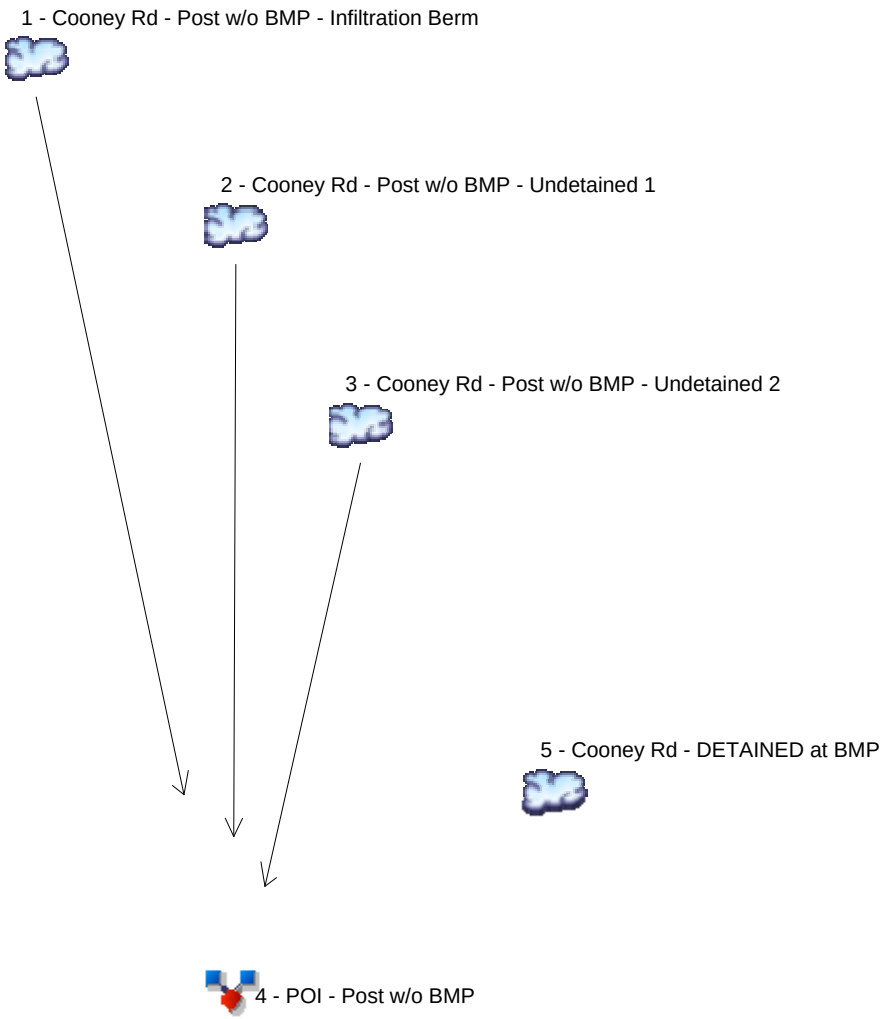
Hyd. No. 1

Cooney Rd - PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.38**	**+**	**0.00**	**+**	**0.00**	**=**	**8.38**
Shallow Concentrated Flow							
Flow length (ft)	= 91.00		351.00		0.00		
Watercourse slope (%)	= 10.90		4.60		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.33		3.46		0.00		
Travel Time (min)	**= 0.28**	**+**	**1.69**	**+**	**0.00**	**=**	**1.98**
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	= 0.025		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.40 min

Watershed Model Schematic



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	------	-------	1.290	-------	-------	2.441	-------	3.926	4.668	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	------	-------	1.157	-------	-------	2.287	-------	3.802	4.569	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.068	-------	-------	0.135	-------	0.224	0.269	Cooney Rd - Post w/o BMP - Undetai
4	Combine	1, 2, 3	-------	2.509	-------	-------	4.862	-------	7.907	9.435	POI - Post w/o BMP
5	SCS Runoff	------	-------	1.086	-------	-------	1.998	-------	3.164	3.744	Cooney Rd - DETAINED at BMP

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	1.290	2	722	3,389	------	------	------	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	1.157	2	720	2,674	------	------	------	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	0.068	2	720	157	------	------	------	Cooney Rd - Post w/o BMP - Undetai
4	Combine	2.509	2	720	6,221	1, 2, 3	------	------	POI - Post w/o BMP
5	SCS Runoff	1.086	2	720	2,486	------	------	------	Cooney Rd - DETAINED at BMP

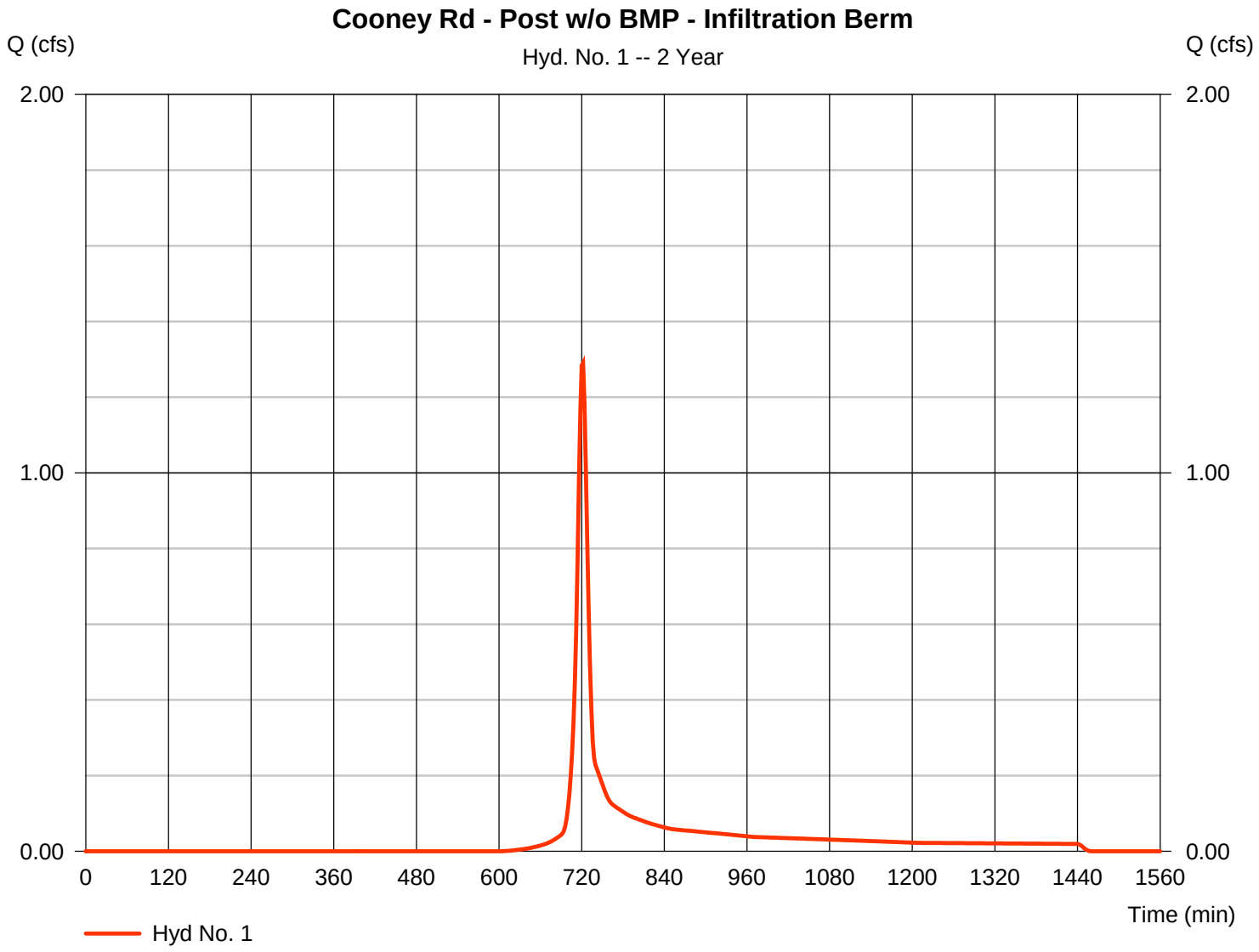
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Hydrograph type	= SCS Runoff	Peak discharge	= 1.290 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 3,389 cuft
Drainage area	= 0.880 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 2.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



TR55 Tc Worksheet

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		282.00		
Watercourse slope (%)	= 13.20		4.50		4.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.46		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**1.36**	**=**	**2.06**
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	= 0.025		0.025		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.30 min

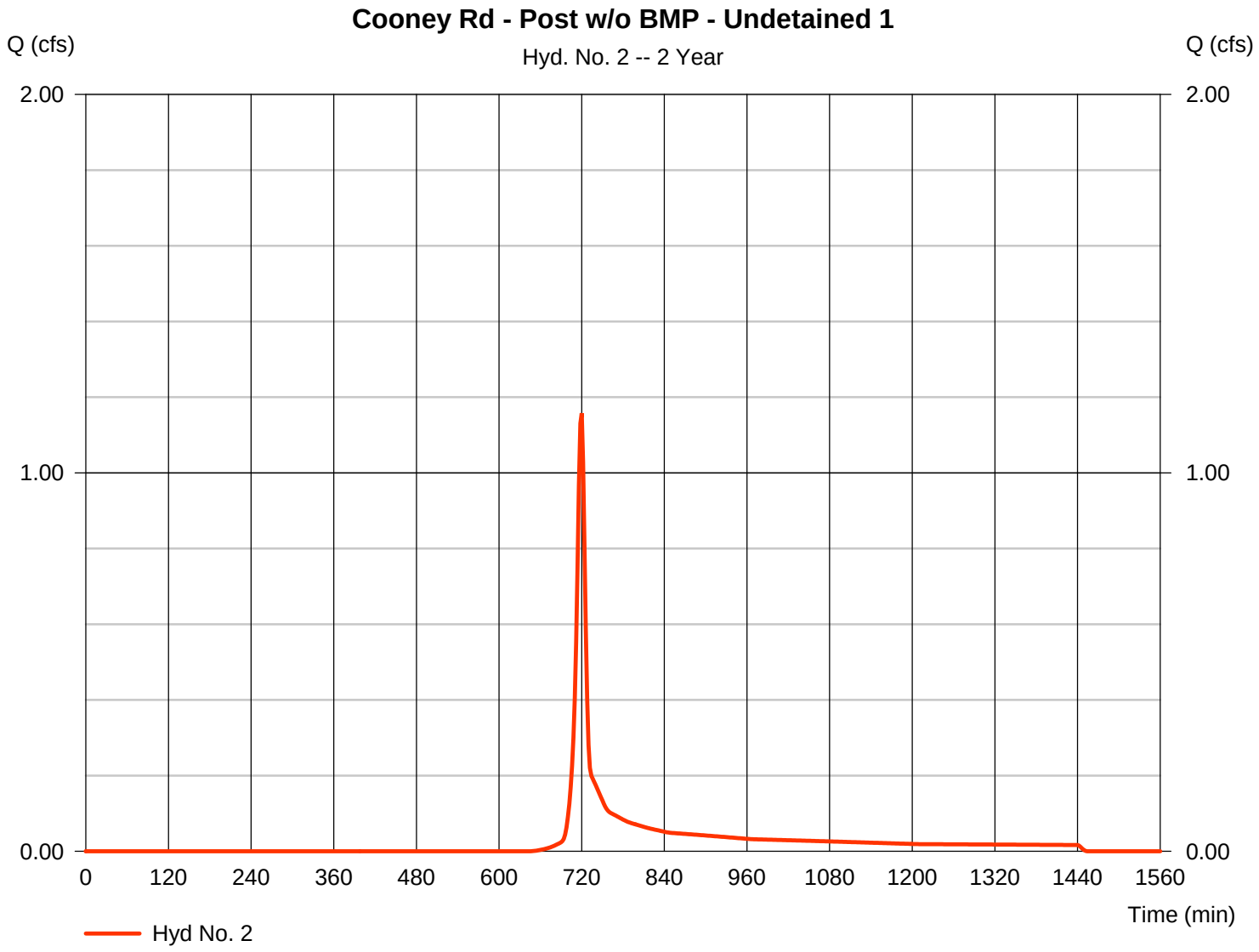
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.157 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	2,674 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	2.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

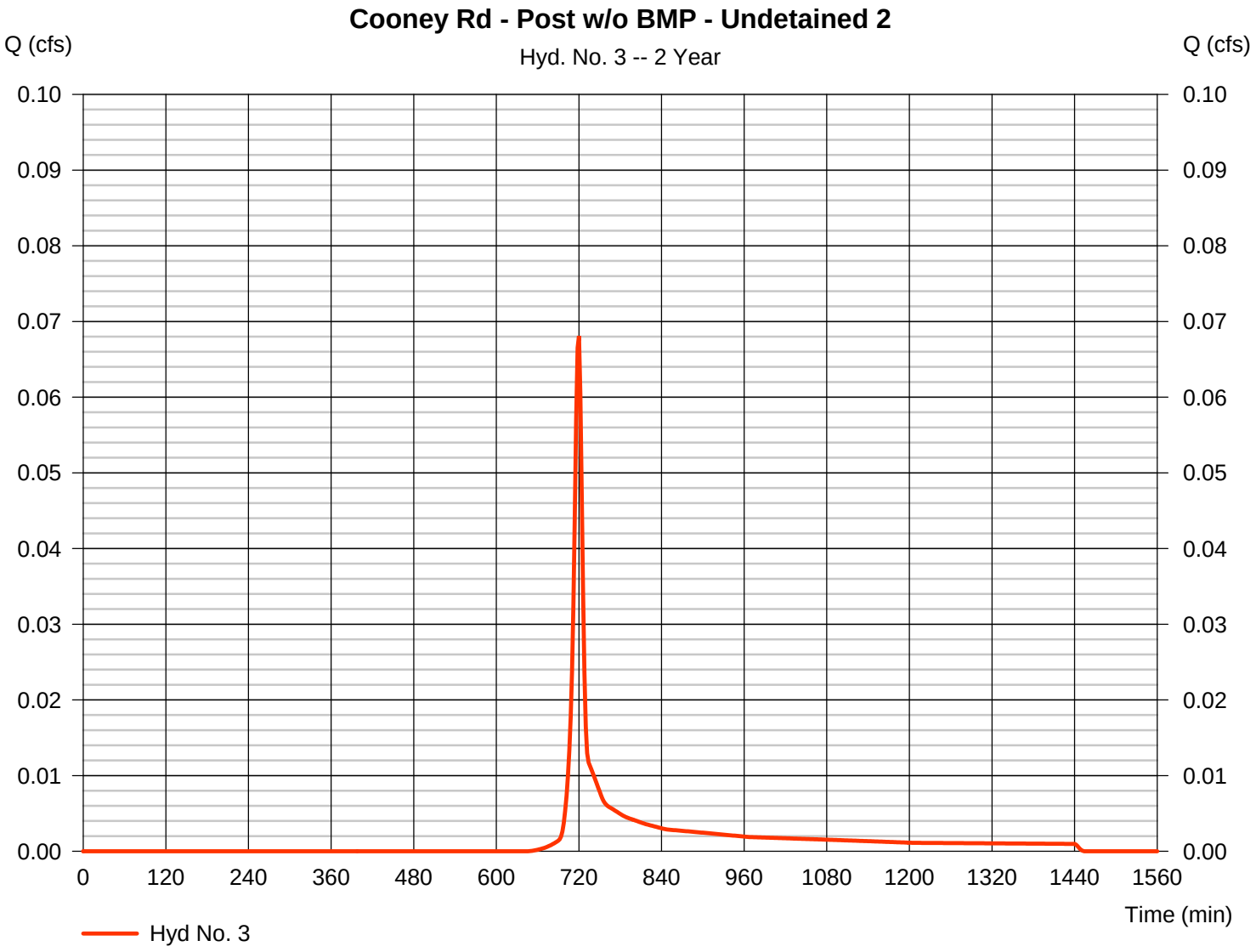
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.068 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 157 cuft
Drainage area	= 0.050 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.00 min
Total precip.	= 2.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

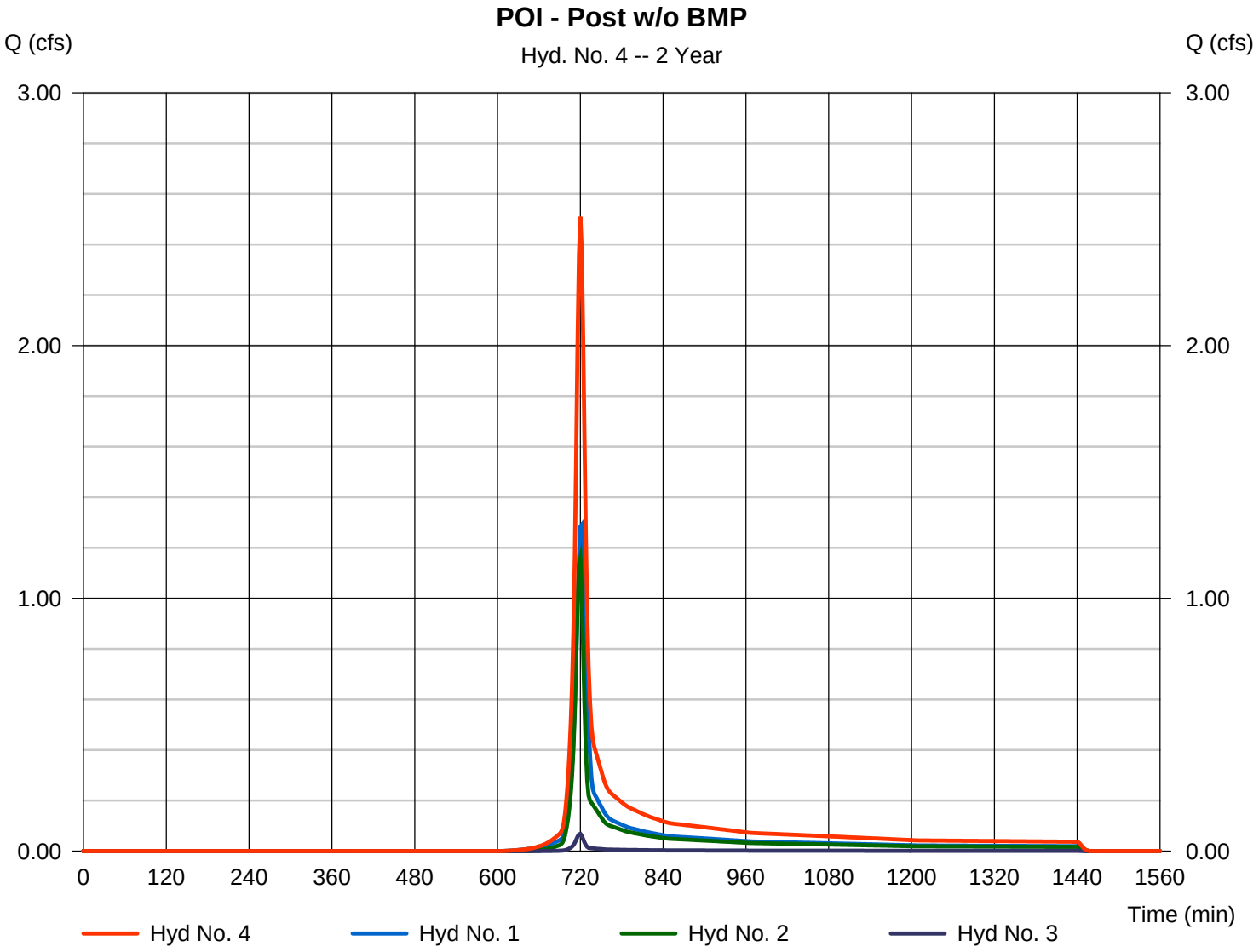
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 4

POI - Post w/o BMP

Hydrograph type	=	Combine	Peak discharge	=	2.509 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	6,221 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



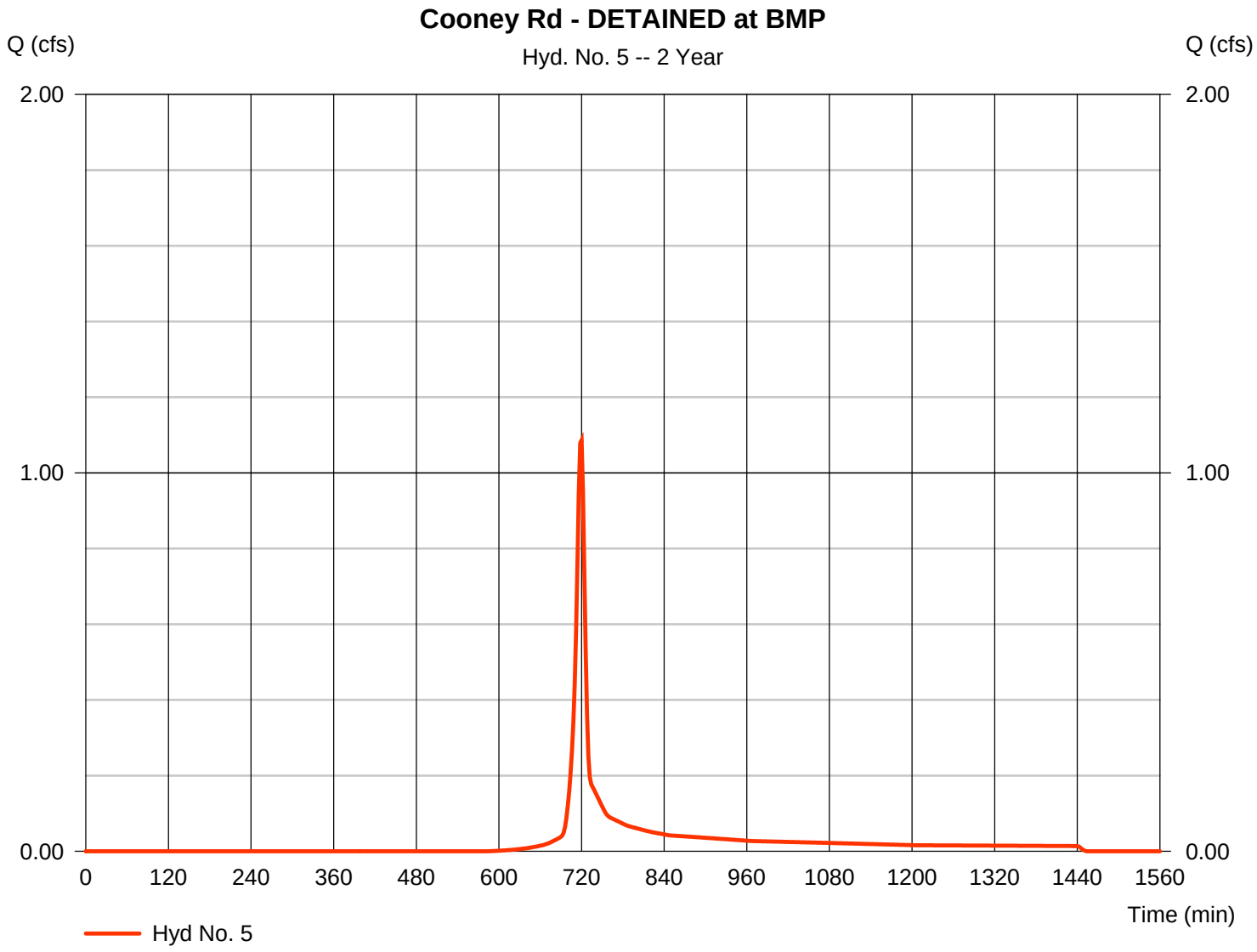
Hydrograph Report

Hyd. No. 5

Cooney Rd - DETAINED at BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 1.086 cfs
Storm frequency	= 2 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 2,486 cuft
Drainage area	= 0.630 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.20 min
Total precip.	= 2.62 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.450 x 78) + (0.180 x 91)] / 0.630



TR55 Tc Worksheet

Hyd. No. 5

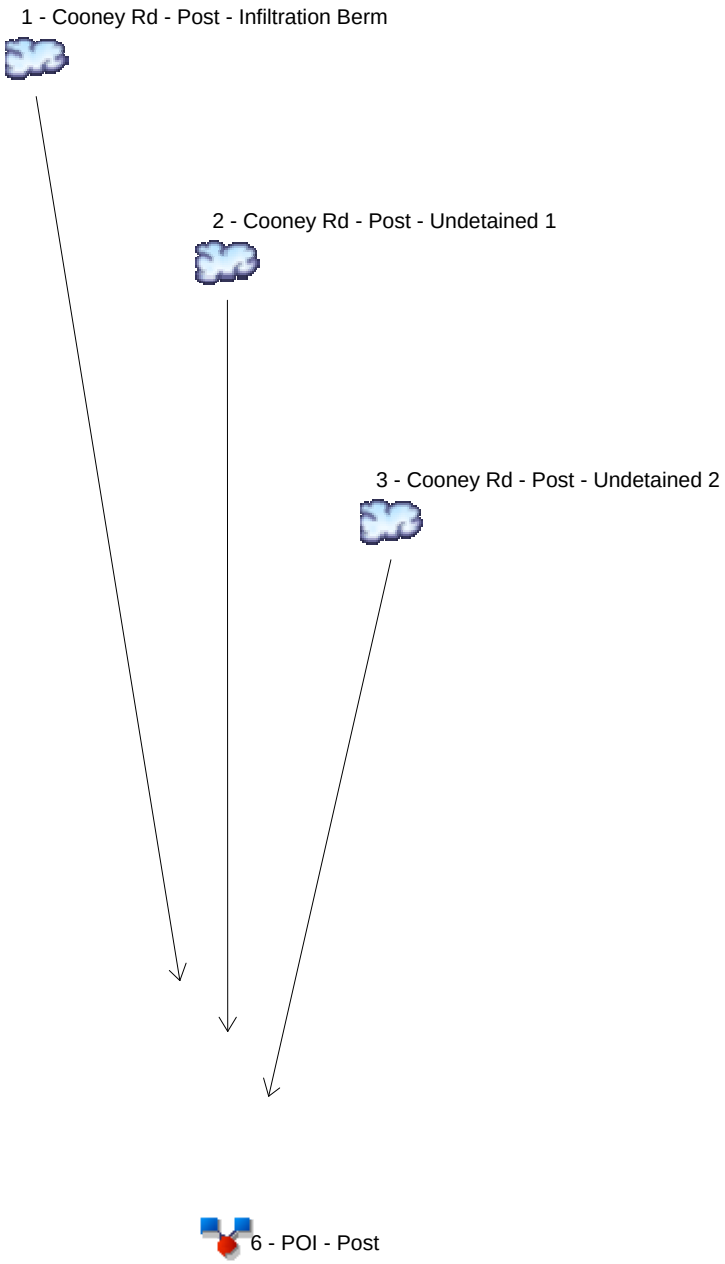
Cooney Rd - DETAINED at BMP

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		55.00		
Watercourse slope (%)	= 13.20		4.50		3.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.06		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**0.30**	**=**	**1.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.025		0.025		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 ..... 9.20 min

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	-------	0.509	-------	-------	-------	-------	-------	-------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	------	-------	1.157	-------	-------	-------	-------	-------	-------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	------	-------	0.068	-------	-------	-------	-------	-------	-------	Cooney Rd - Post - Undetained 2
6	Combine	1, 2, 3,	-------	1.399	-------	-------	-------	-------	-------	-------	POI - Post

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	0.509	2	748	3,262	------	------	------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	1.157	2	720	2,674	------	------	------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	0.068	2	720	157	------	------	------	Cooney Rd - Post - Undetained 2
6	Combine	1.399	2	720	6,094	1, 2, 3,	------	------	POI - Post

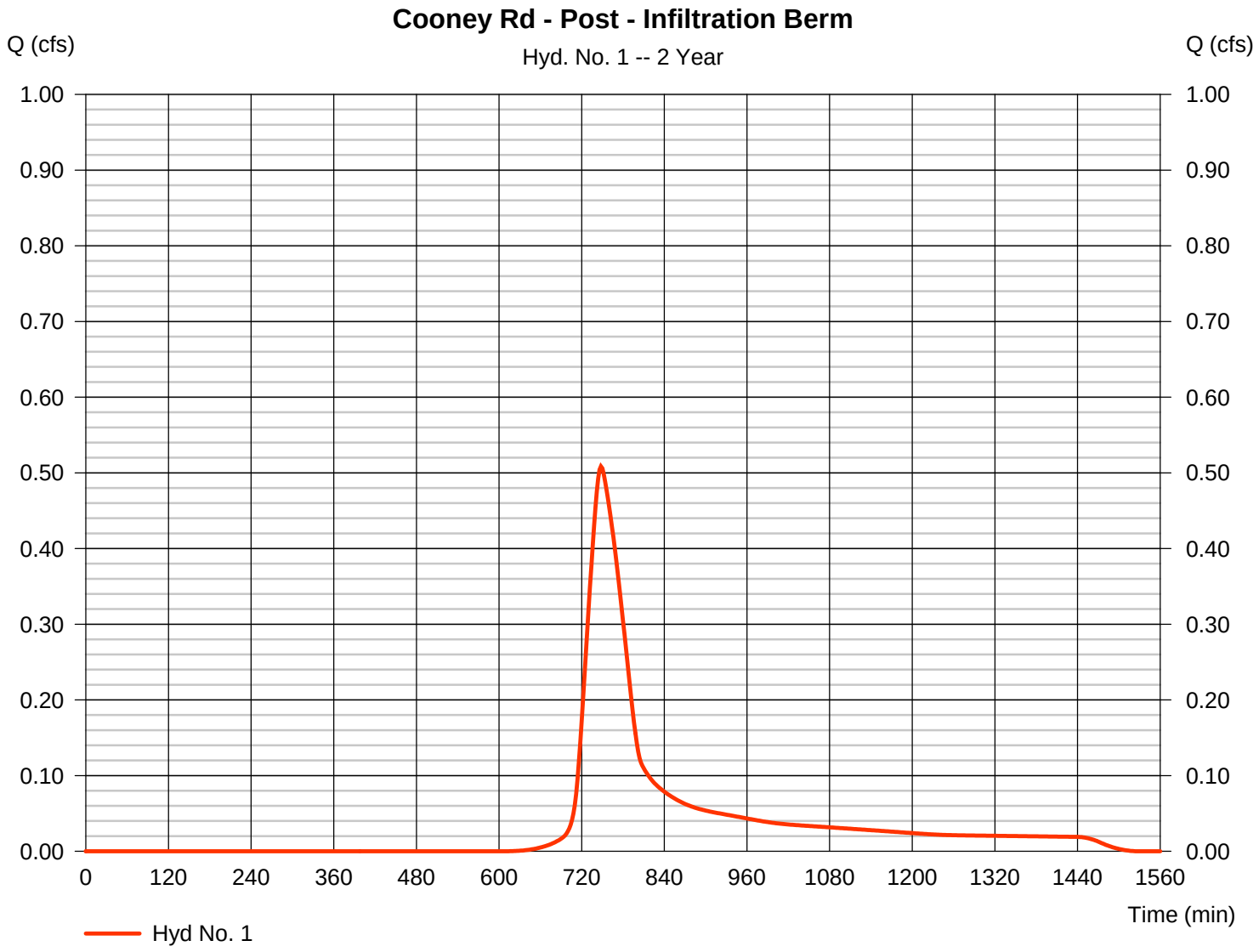
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.509 cfs
Storm frequency	=	2 yrs	Time to peak	=	748 min
Time interval	=	2 min	Hyd. volume	=	3,262 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	56.30 min
Total precip.	=	2.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



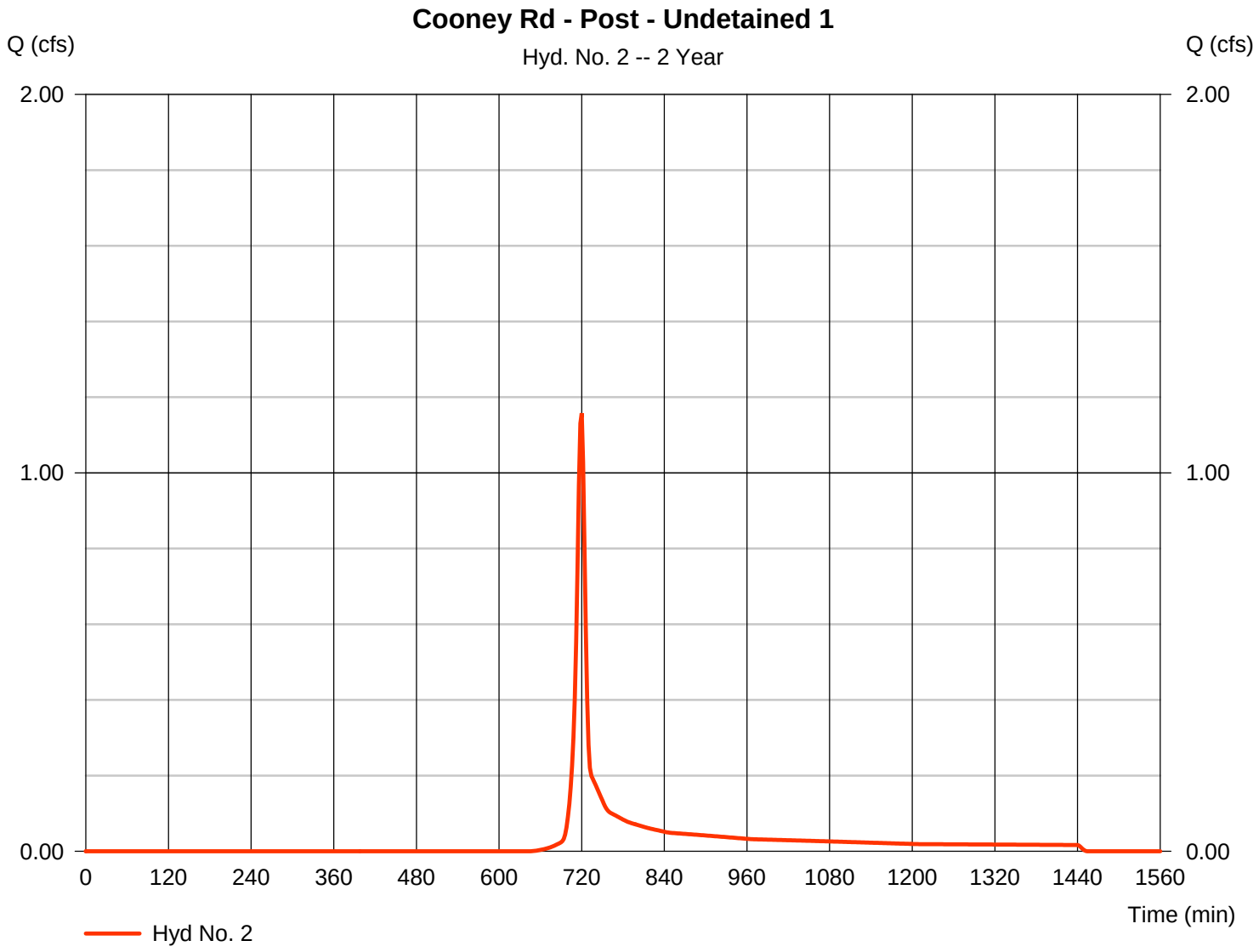
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.157 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	2,674 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	2.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

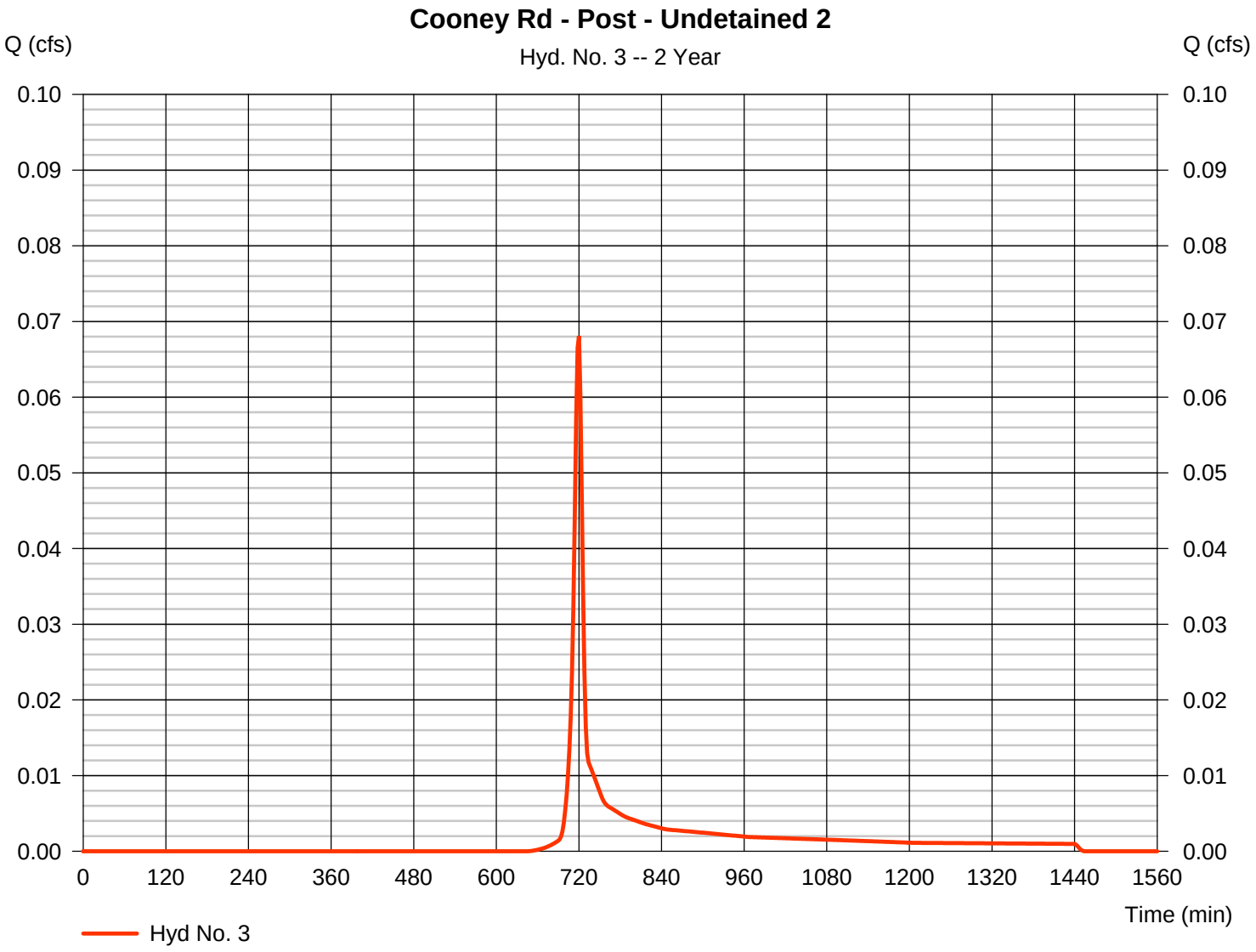
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.068 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	157 cuft
Drainage area	=	0.050 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.00 min
Total precip.	=	2.62 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

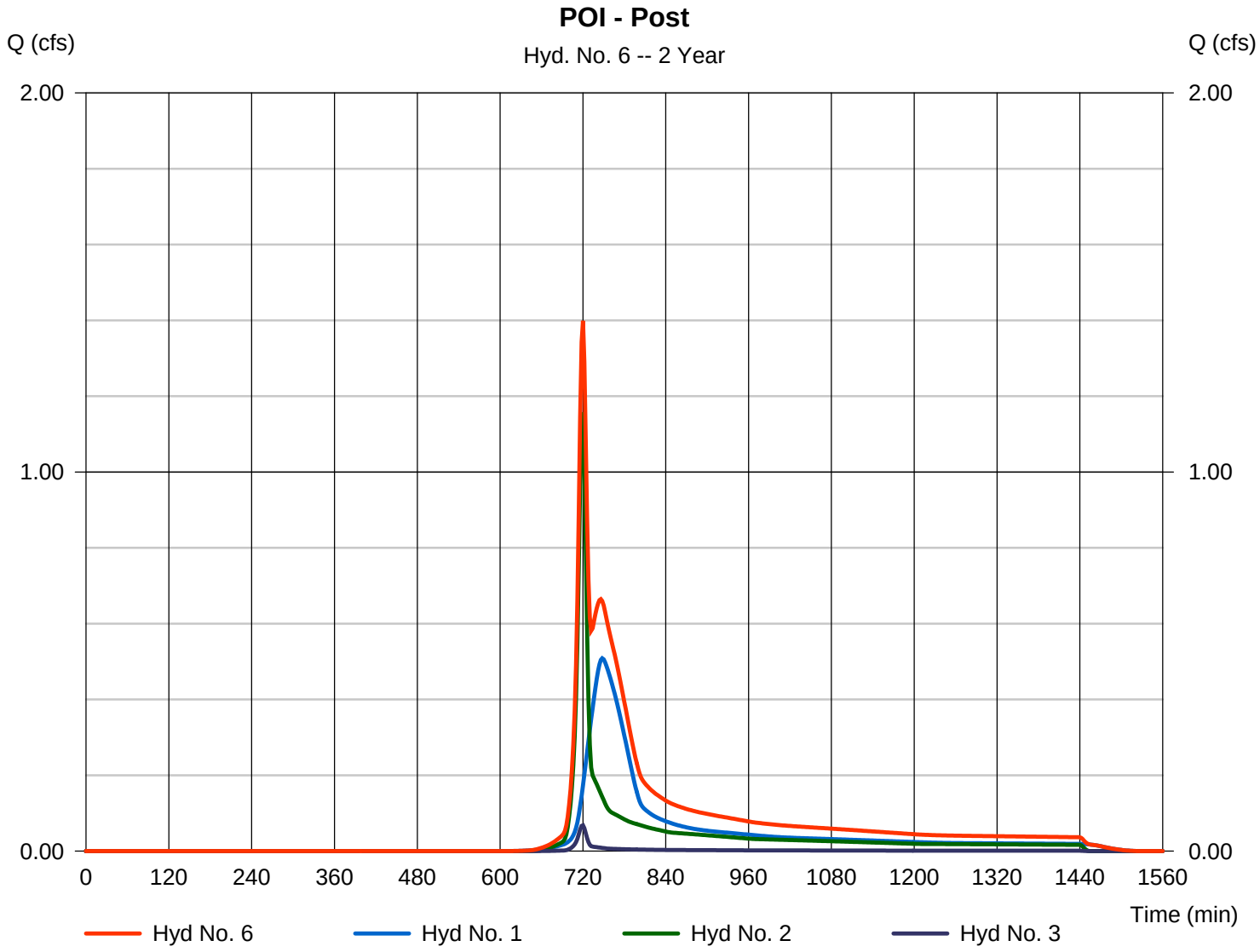
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 6

POI - Post

Hydrograph type	=	Combine	Peak discharge	=	1.399 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	6,094 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



ATTACHMENT C-2
COONEY RD
10 Year-24 Hour Storm

Watershed Model Schematic

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	------	-------	2.154	-------	-------	4.315	-------	7.212	8.680	Cooney Rd - PRE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	4.315	2	720	11,248	------	------	------	Cooney Rd - PRE

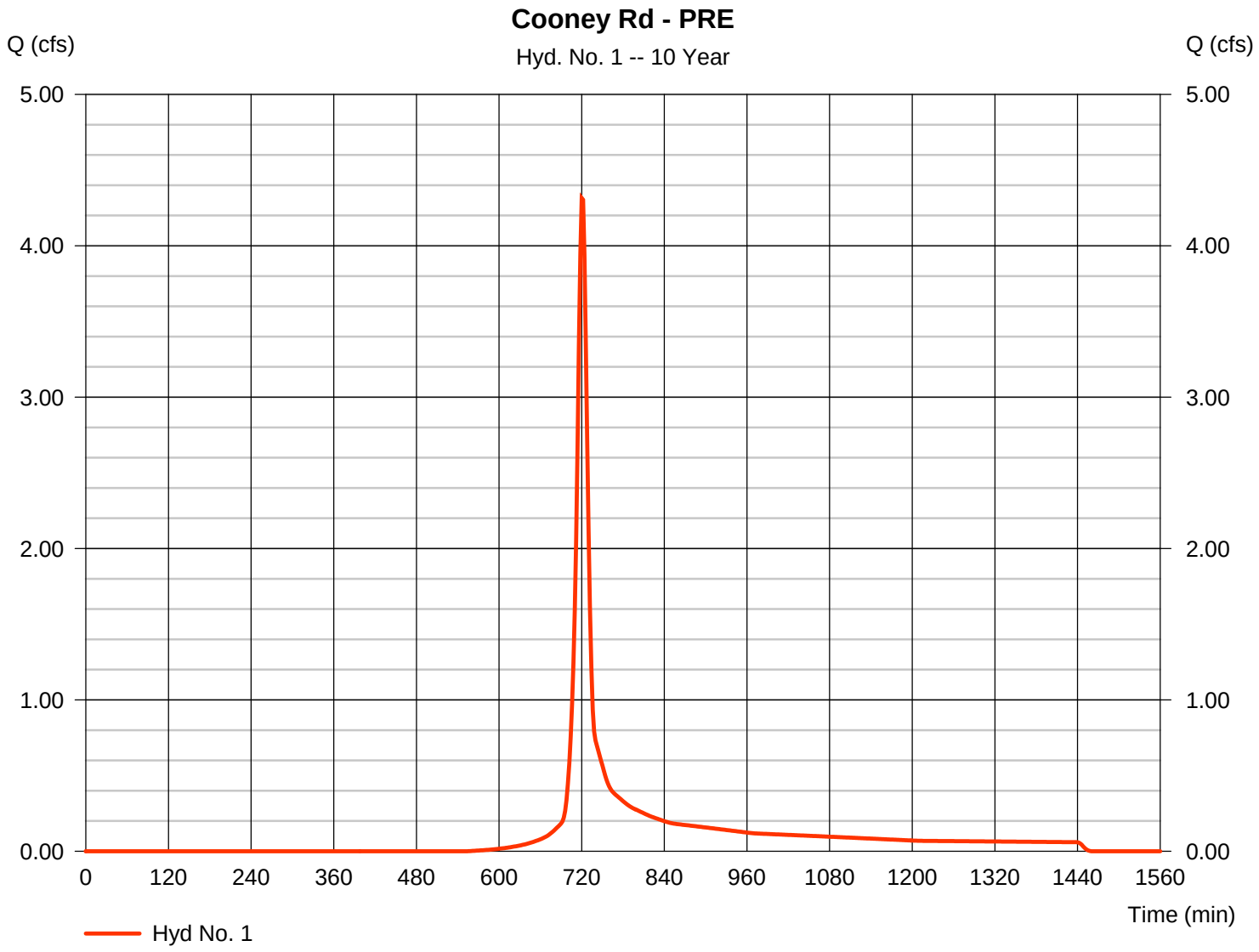
Hydrograph Report

Hyd. No. 1

Cooney Rd - PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.315 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,248 cuft
Drainage area	=	1.770 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.40 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.360 x 78) + (0.330 x 77) + (0.080 x 91)] / 1.770



TR55 Tc Worksheet

Hyd. No. 1

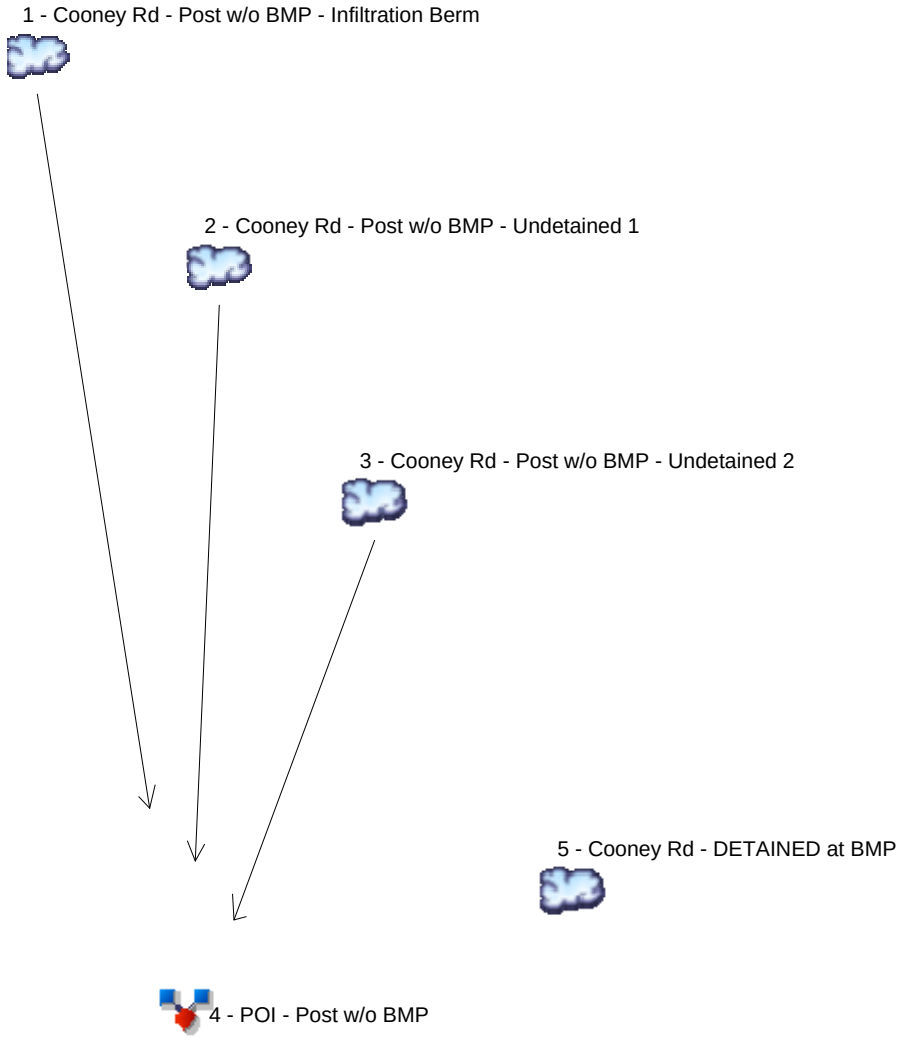
Cooney Rd - PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.38**	**+**	**0.00**	**+**	**0.00**	**=**	**8.38**
Shallow Concentrated Flow							
Flow length (ft)	= 91.00		351.00		0.00		
Watercourse slope (%)	= 10.90		4.60		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.33		3.46		0.00		
Travel Time (min)	**= 0.28**	**+**	**1.69**	**+**	**0.00**	**=**	**1.98**
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	= 0.025		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.40 min

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



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	------	-------	1.290	-------	-------	2.441	-------	3.926	4.668	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	------	-------	1.157	-------	-------	2.287	-------	3.802	4.569	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.068	-------	-------	0.135	-------	0.224	0.269	Cooney Rd - Post w/o BMP - Undetai
4	Combine	1, 2, 3	-------	2.509	-------	-------	4.862	-------	7.907	9.435	POI - Post w/o BMP
5	SCS Runoff	------	-------	1.086	-------	-------	1.998	-------	3.164	3.744	Cooney Rd - DETAINED at BMP

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	2.441	2	720	6,329	------	------	------	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	2.287	2	720	5,238	------	------	------	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	0.135	2	720	308	------	------	------	Cooney Rd - Post w/o BMP - Undetai
4	Combine	4.862	2	720	11,876	1, 2, 3	------	------	POI - Post w/o BMP
5	SCS Runoff	1.998	2	718	4,572	------	------	------	Cooney Rd - DETAINED at BMP

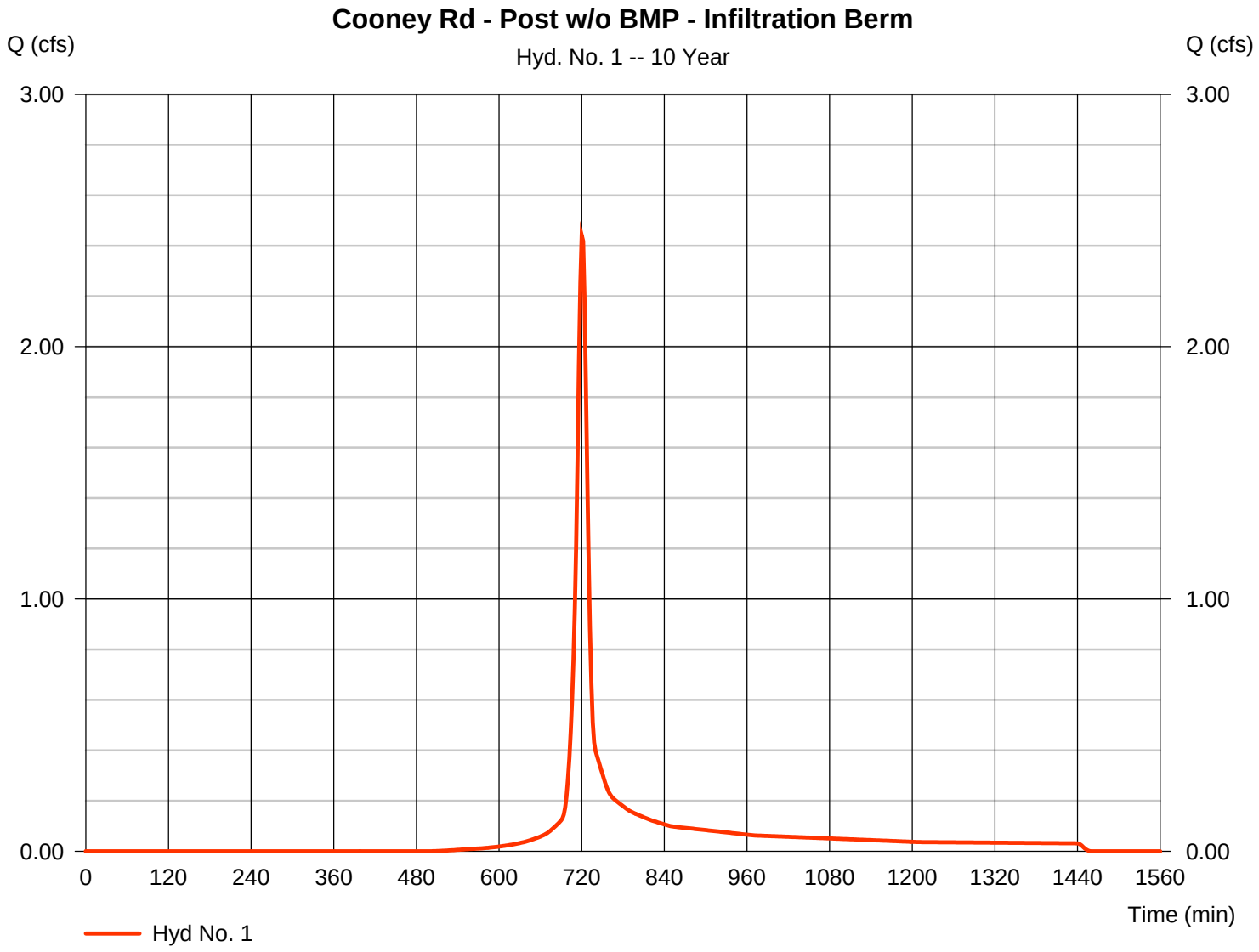
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.441 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	6,329 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.30 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



TR55 Tc Worksheet

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		282.00		
Watercourse slope (%)	= 13.20		4.50		4.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.46		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**1.36**	**=**	**2.06**
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	= 0.025		0.025		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.30 min

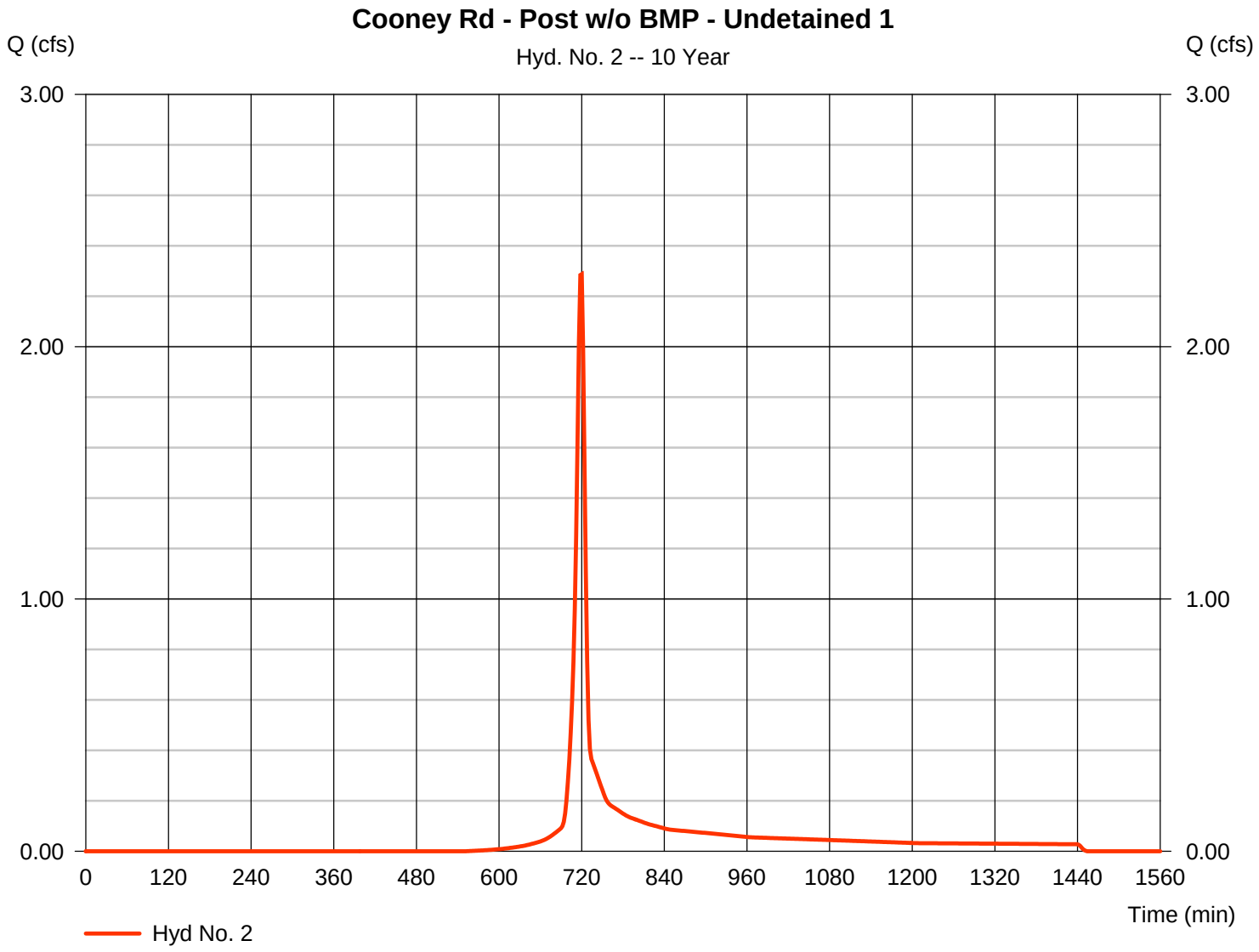
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.287 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	5,238 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

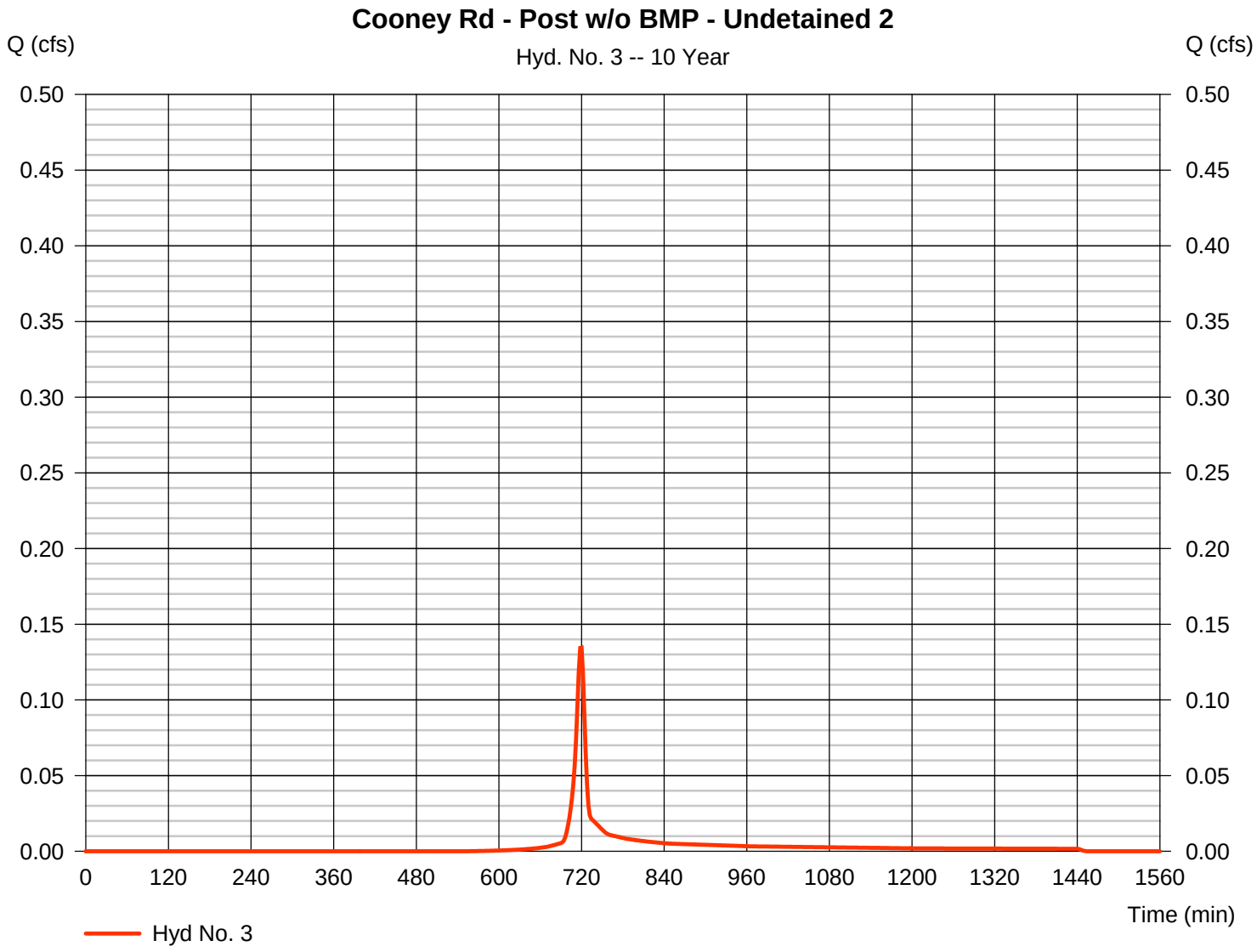
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.135 cfs
Storm frequency	= 10 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 308 cuft
Drainage area	= 0.050 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.00 min
Total precip.	= 3.76 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

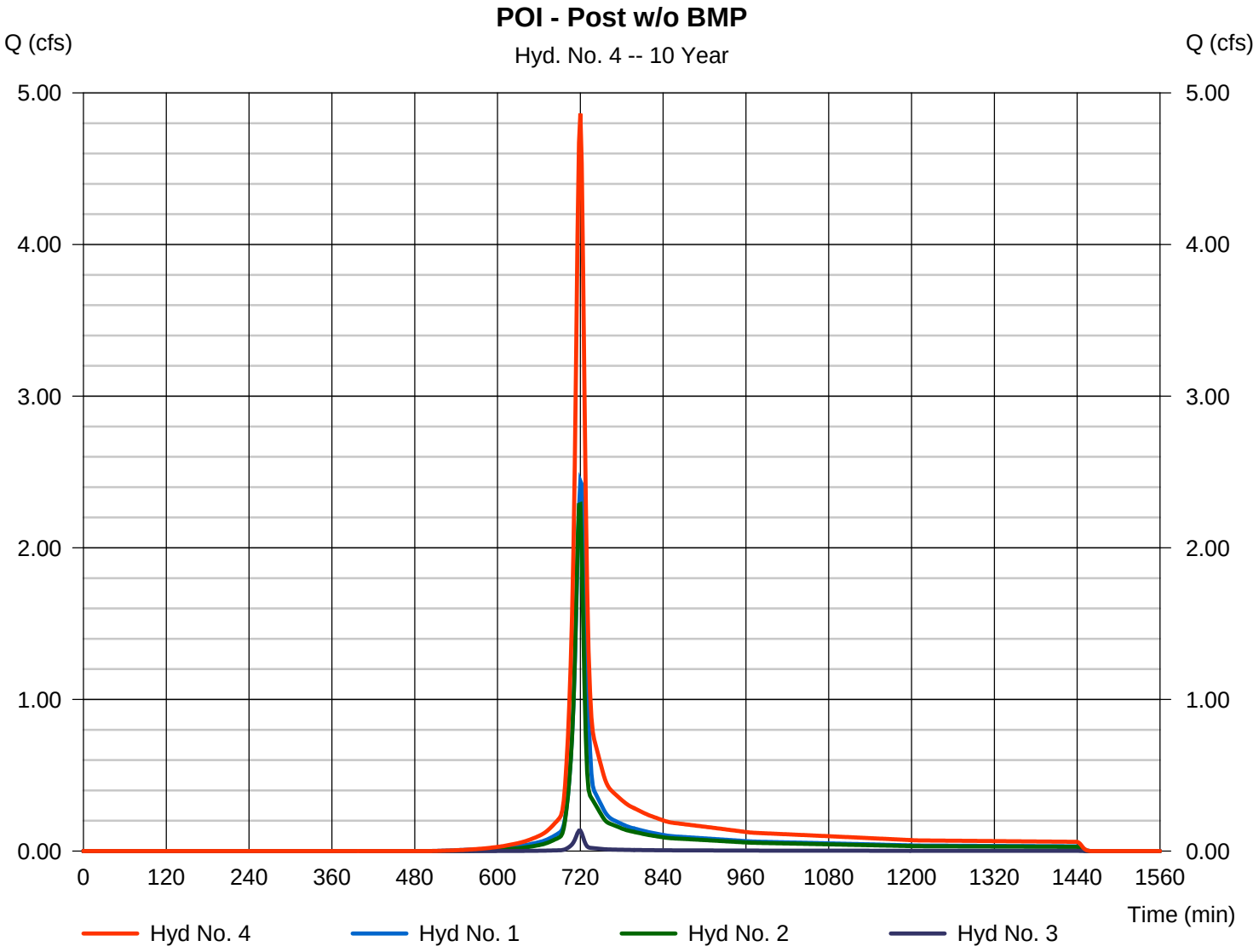
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 4

POI - Post w/o BMP

Hydrograph type	=	Combine	Peak discharge	=	4.862 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,876 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



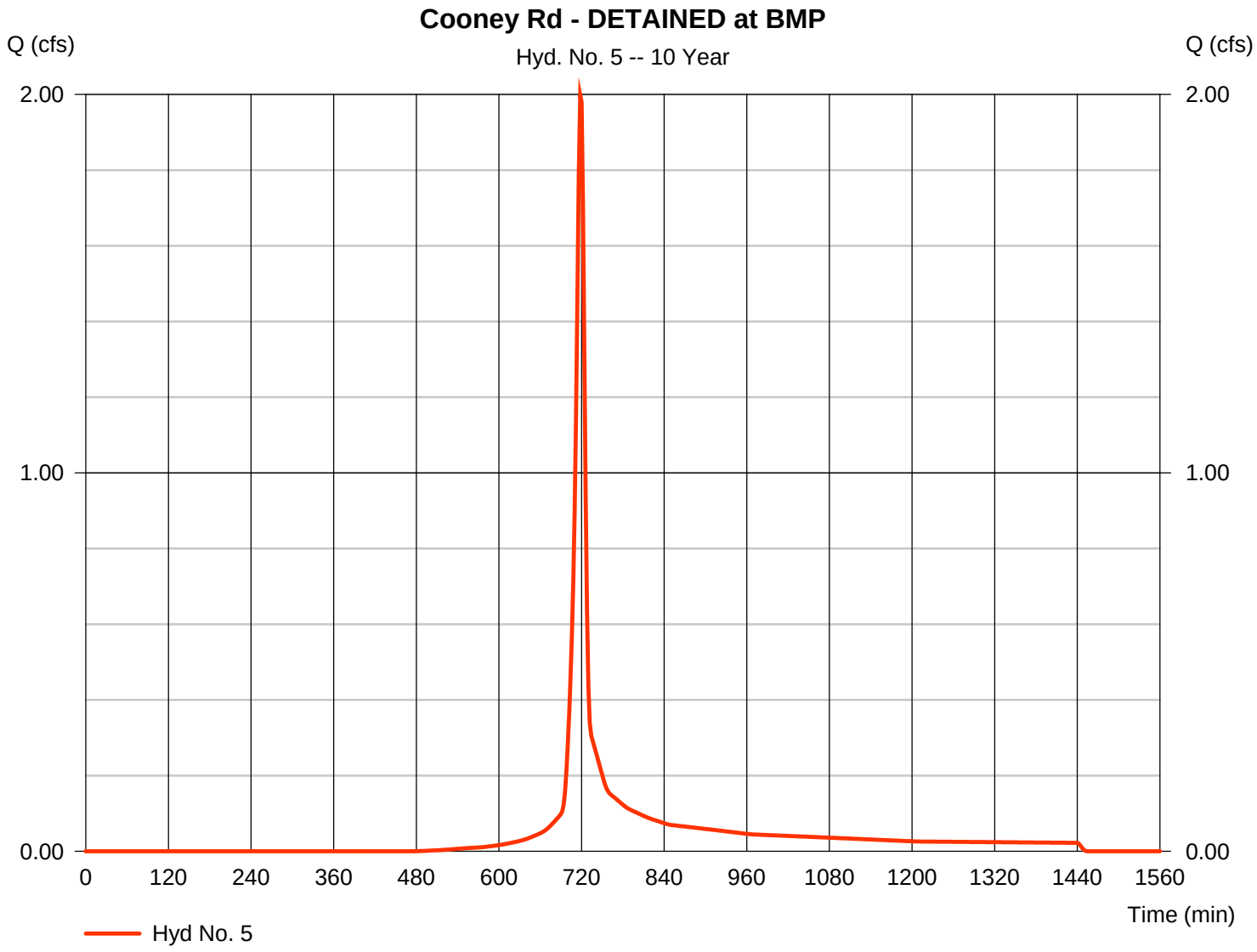
Hydrograph Report

Hyd. No. 5

Cooney Rd - DETAINED at BMP

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.998 cfs
Storm frequency	=	10 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	4,572 cuft
Drainage area	=	0.630 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.20 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.450 x 78) + (0.180 x 91)] / 0.630



TR55 Tc Worksheet

Hyd. No. 5

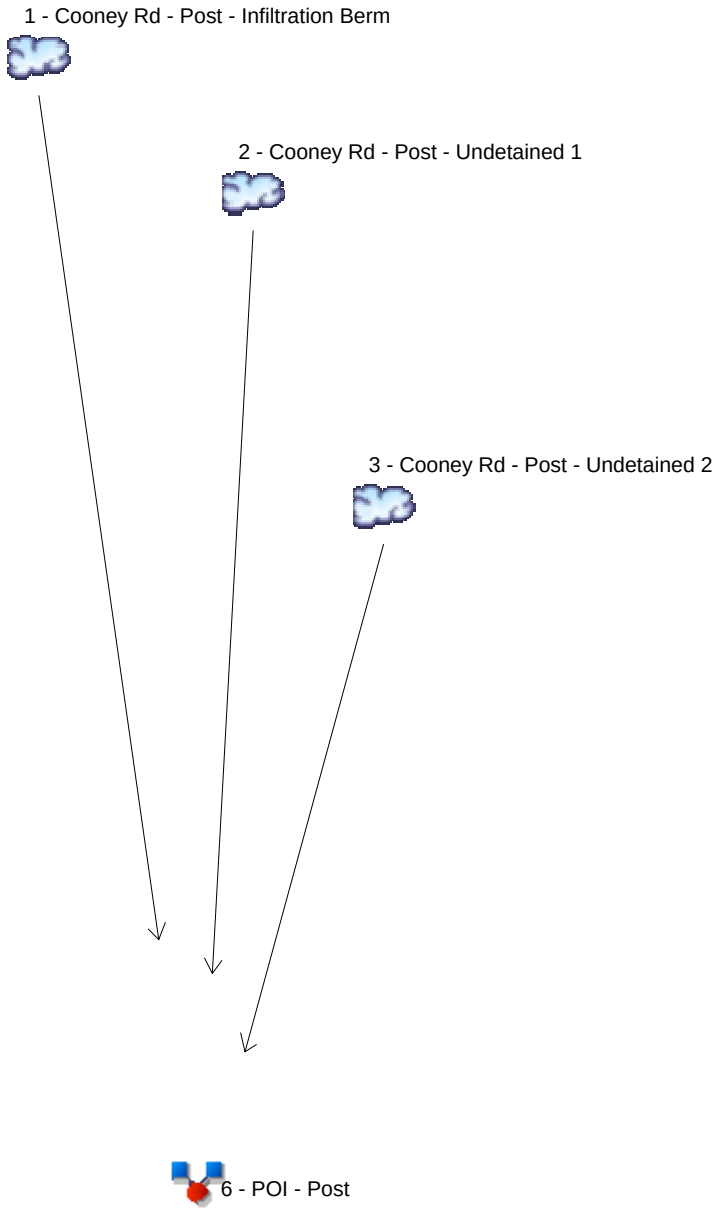
Cooney Rd - DETAINED at BMP

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		55.00		
Watercourse slope (%)	= 13.20		4.50		3.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.06		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**0.30**	**=**	**1.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.025		0.025		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 ..... 9.20 min

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



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	------	-------	-------	-------	-------	1.331	-------	-------	-------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	------	-------	-------	-------	-------	2.287	-------	-------	-------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	------	-------	-------	-------	-------	0.135	-------	-------	-------	Cooney Rd - Post - Undetained 2
6	Combine	1, 2, 3,	-------	-------	-------	-------	3.183	-------	-------	-------	POI - Post

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	1.331	2	736	6,068	------	------	------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	2.287	2	720	5,238	------	------	------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	0.135	2	720	308	------	------	------	Cooney Rd - Post - Undetained 2
6	Combine	3.183	2	720	11,614	1, 2, 3,	------	------	POI - Post

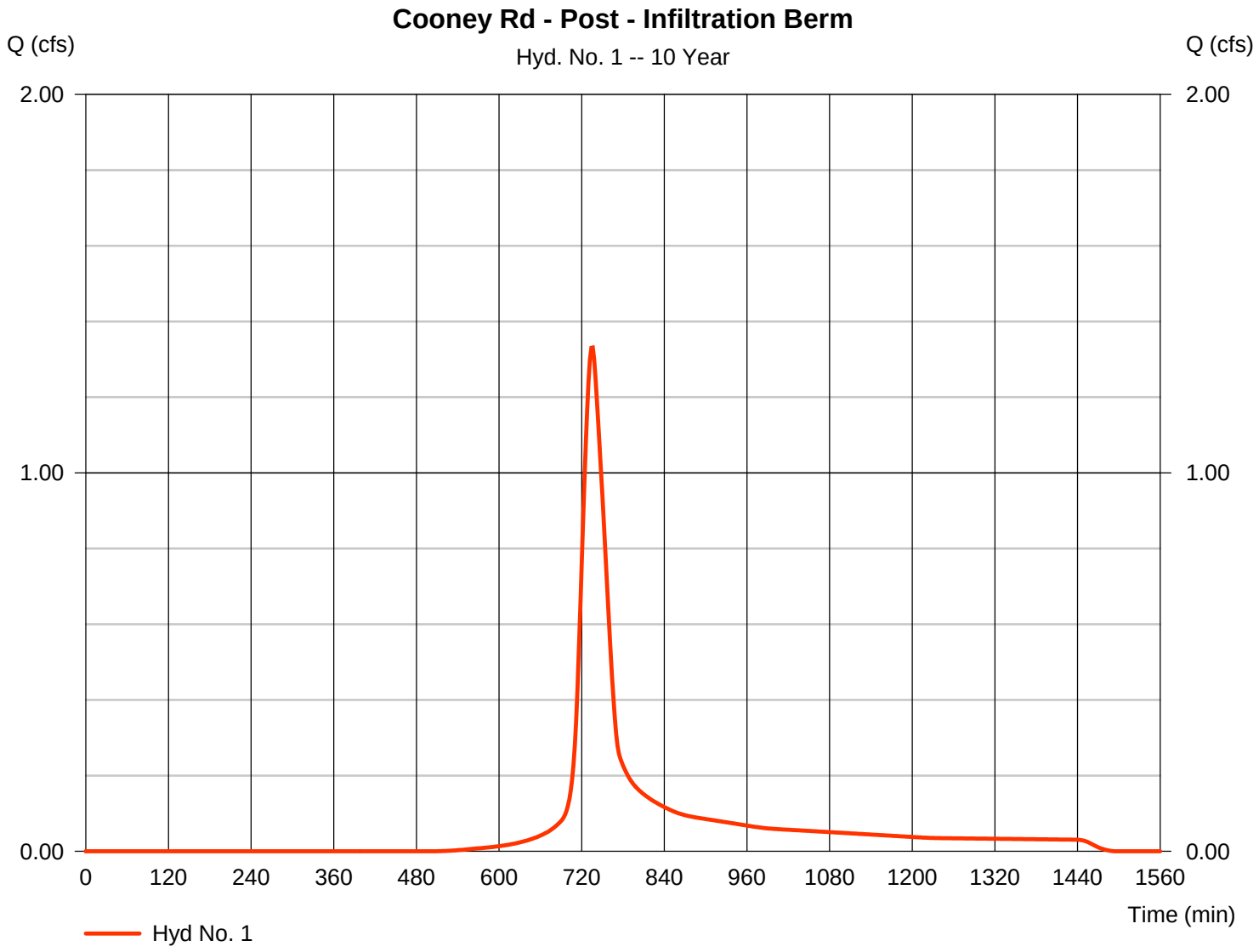
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.331 cfs
Storm frequency	=	10 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	6,068 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	35.30 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



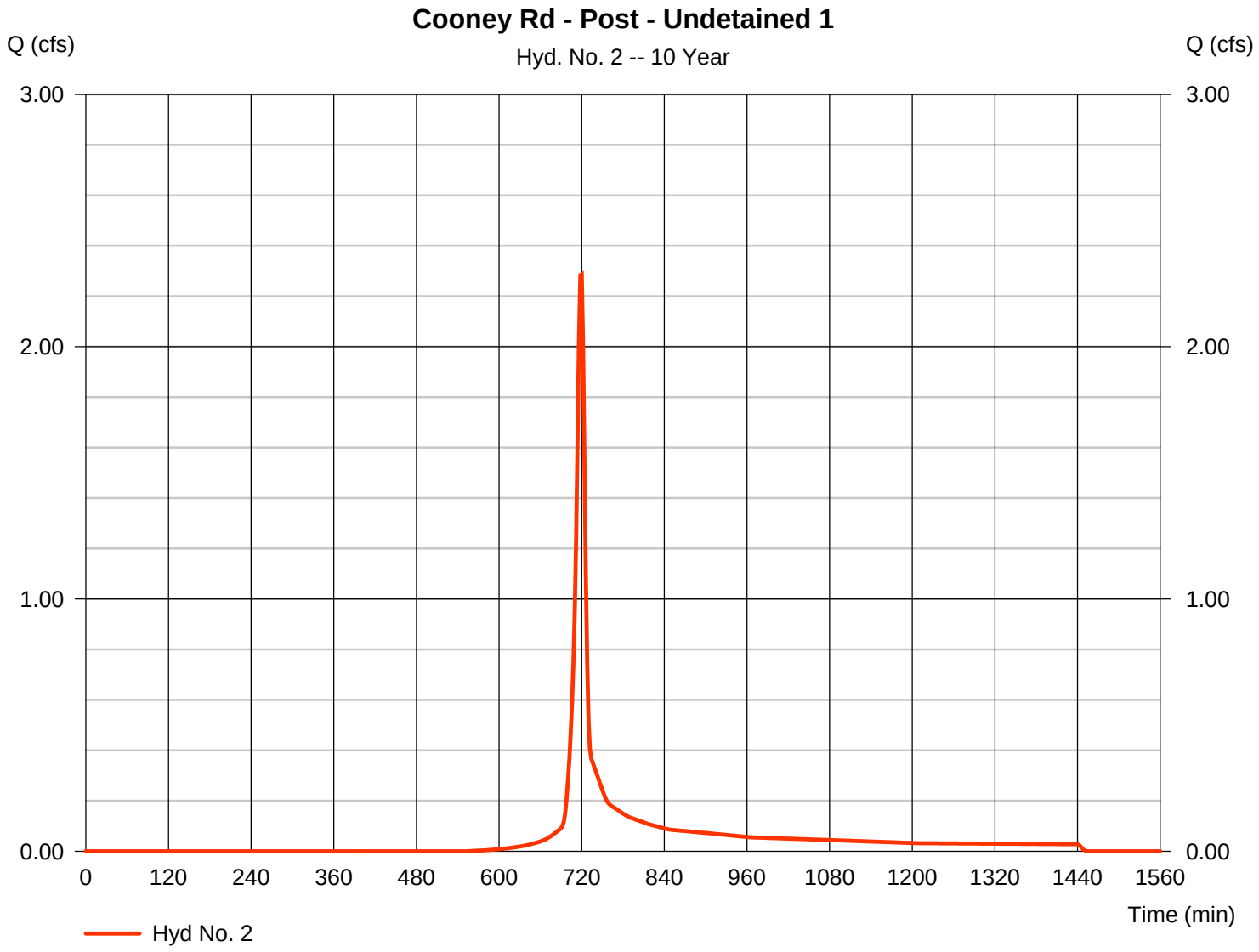
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.287 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	5,238 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

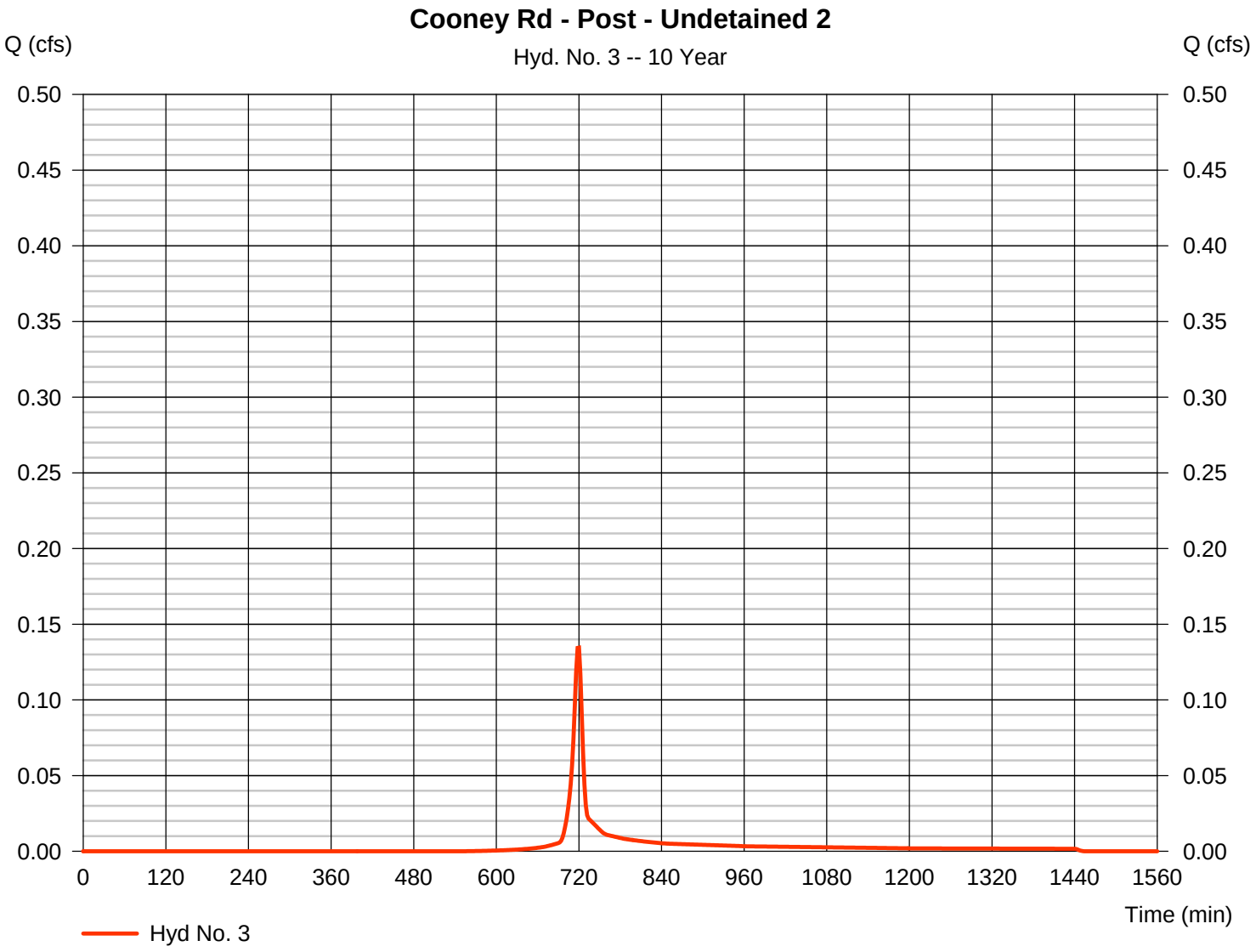
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.135 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	308 cuft
Drainage area	=	0.050 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.00 min
Total precip.	=	3.76 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

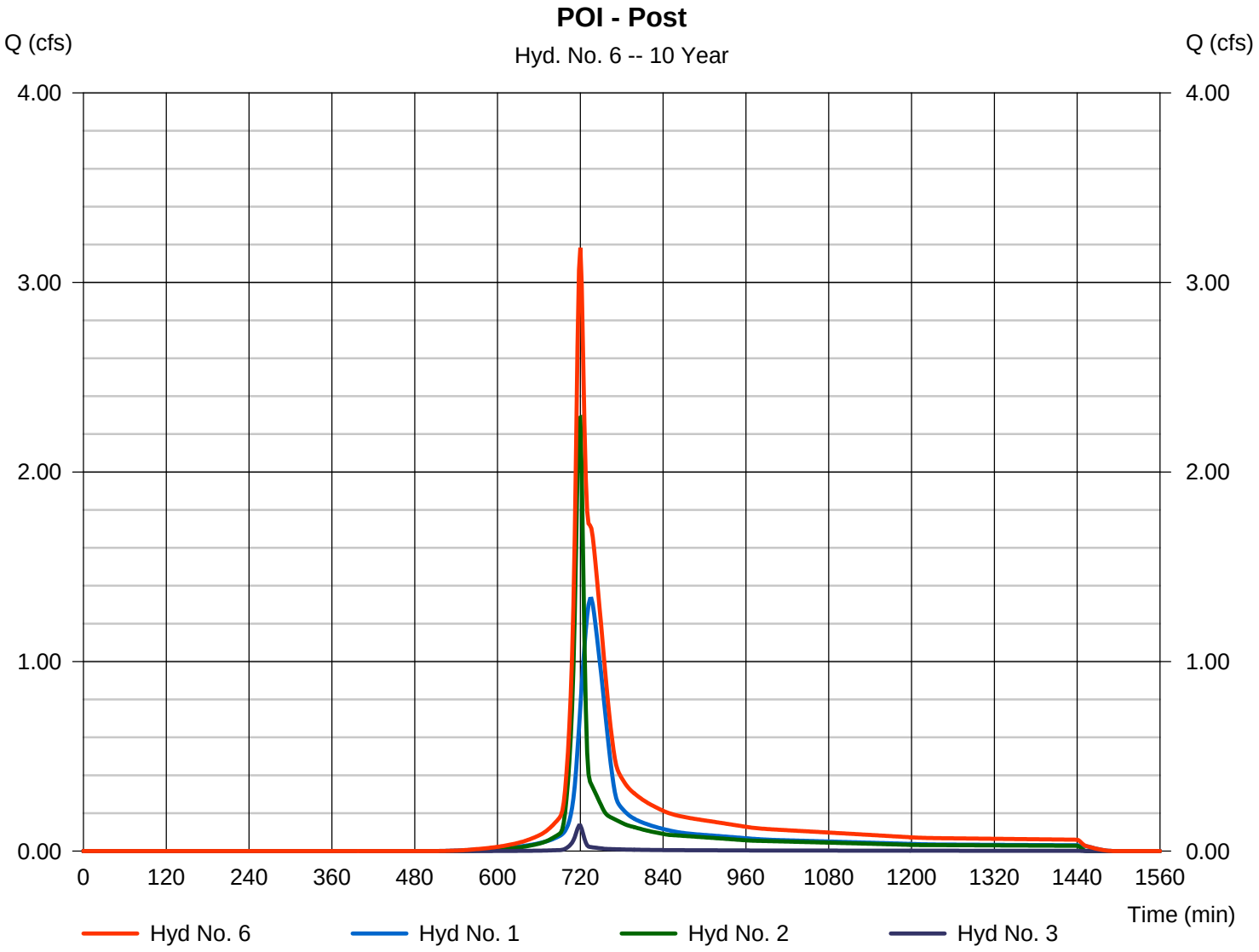
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 6

POI - Post

Hydrograph type	=	Combine	Peak discharge	=	3.183 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	11,614 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



ATTACHMENT C-3
COONEY RD
50 Year-24 Hour Storm

Watershed Model Schematic

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	------	-------	2.154	-------	-------	4.315	-------	7.212	8.680	Cooney Rd - PRE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.212	2	720	18,701	------	------	------	Cooney Rd - PRE

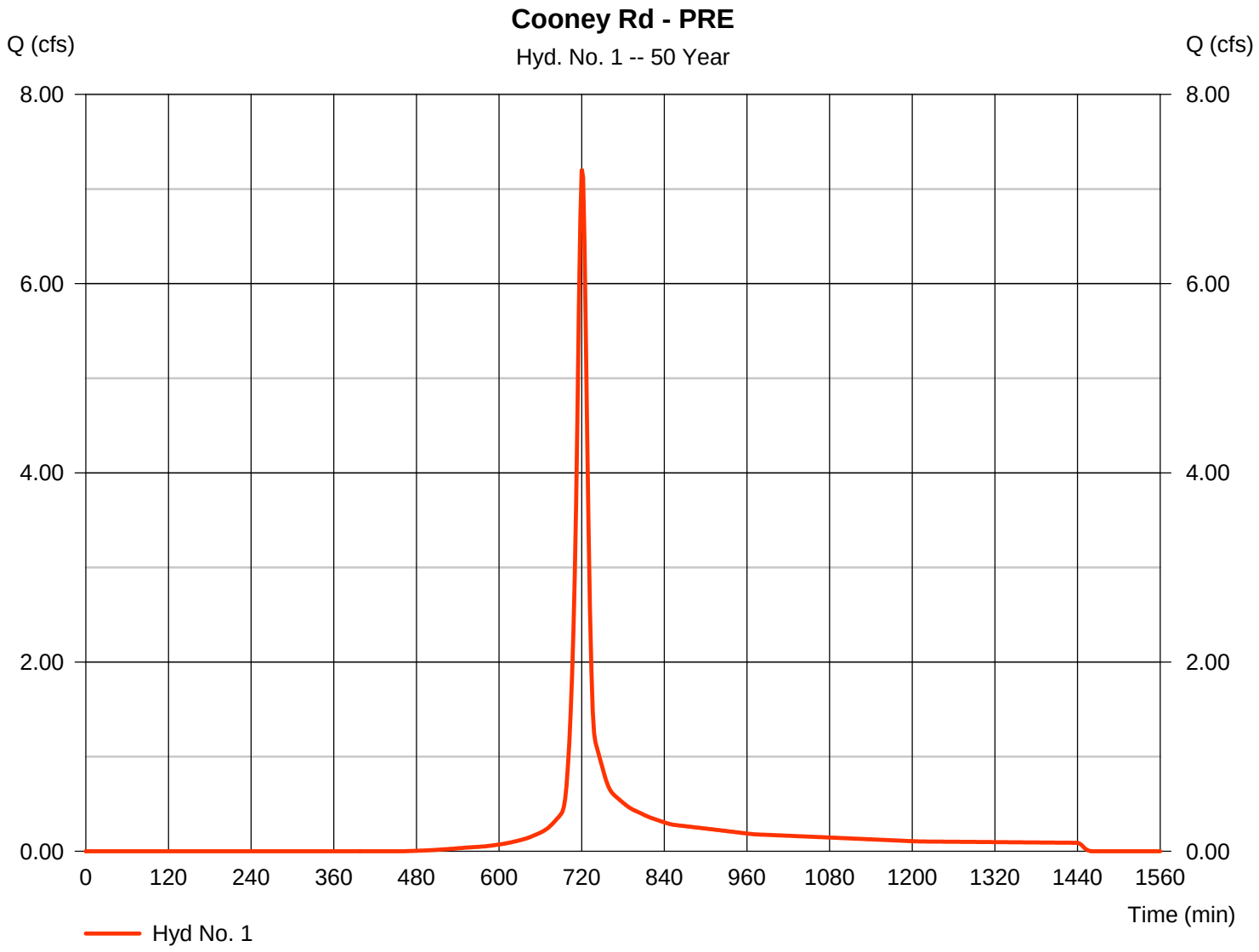
Hydrograph Report

Hyd. No. 1

Cooney Rd - PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 7.212 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 18,701 cuft
Drainage area	= 1.770 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.40 min
Total precip.	= 5.13 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.360 x 78) + (0.330 x 77) + (0.080 x 91)] / 1.770



TR55 Tc Worksheet

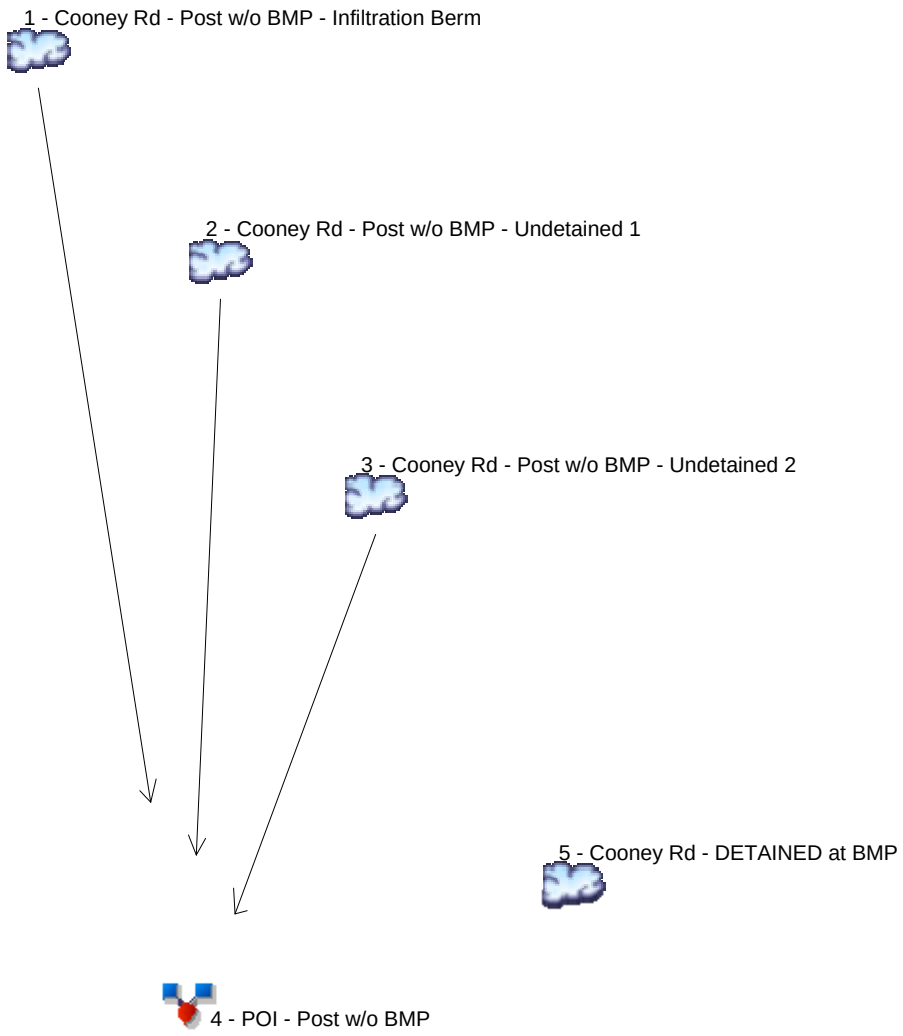
Hyd. No. 1

Cooney Rd - PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.38**	**+**	**0.00**	**+**	**0.00**	**=**	**8.38**
Shallow Concentrated Flow							
Flow length (ft)	= 91.00		351.00		0.00		
Watercourse slope (%)	= 10.90		4.60		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.33		3.46		0.00		
Travel Time (min)	**= 0.28**	**+**	**1.69**	**+**	**0.00**	**=**	**1.98**
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	= 0.025		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.40 min

Watershed Model Schematic



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	------	-------	1.290	-------	-------	2.441	-------	3.926	4.668	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	------	-------	1.157	-------	-------	2.287	-------	3.802	4.569	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.068	-------	-------	0.135	-------	0.224	0.269	Cooney Rd - Post w/o BMP - Undetai
4	Combine	1, 2, 3	-------	2.509	-------	-------	4.862	-------	7.907	9.435	POI - Post w/o BMP
5	SCS Runoff	------	-------	1.086	-------	-------	1.998	-------	3.164	3.744	Cooney Rd - DETAINED at BMP

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	3.926	2	720	10,214	------	------	------	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	3.802	2	718	8,709	------	------	------	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	0.224	2	718	512	------	------	------	Cooney Rd - Post w/o BMP - Undetai
4	Combine	7.907	2	720	19,434	1, 2, 3	------	------	POI - Post w/o BMP
5	SCS Runoff	3.164	2	718	7,308	------	------	------	Cooney Rd - DETAINED at BMP

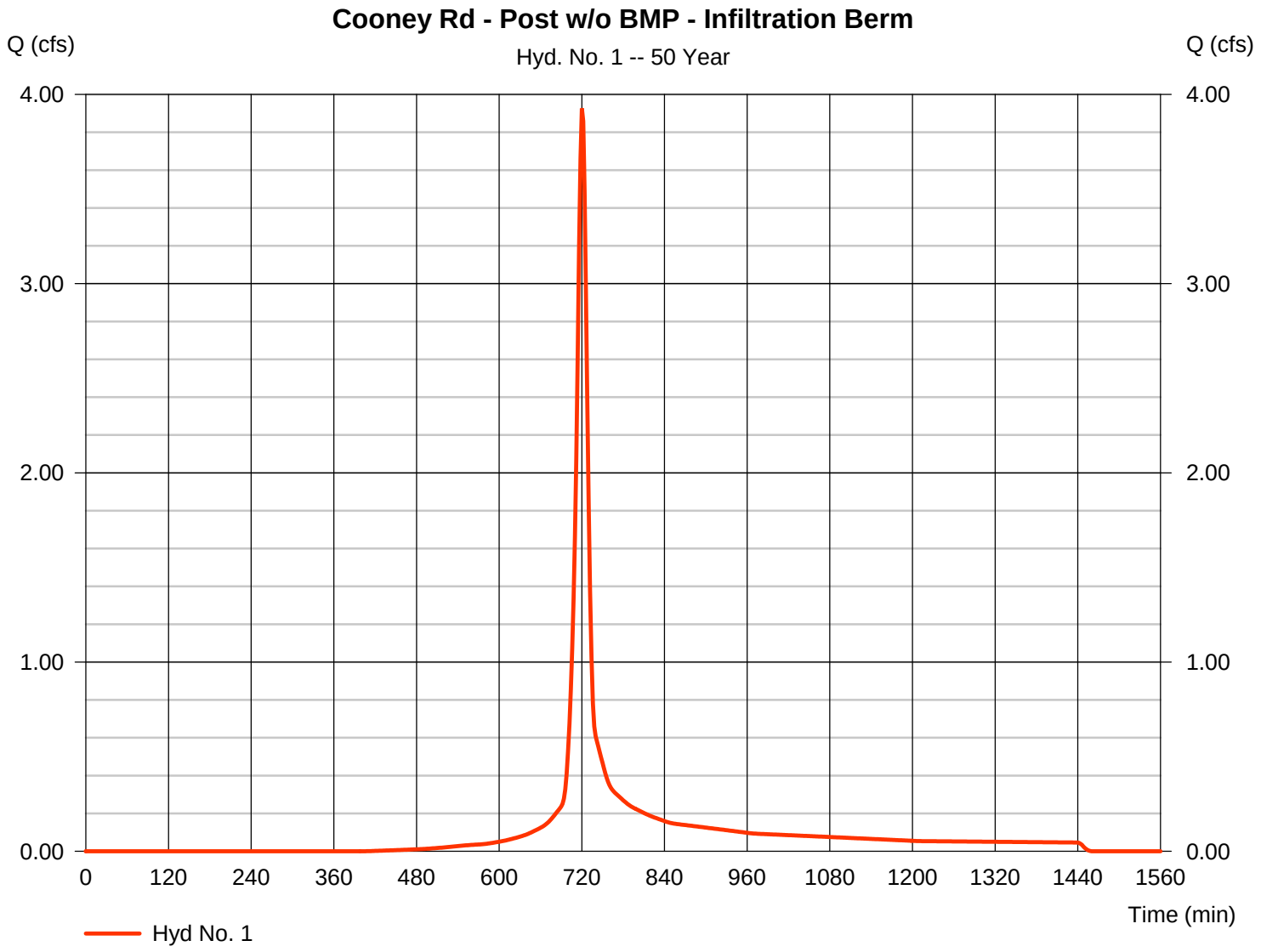
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.926 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,214 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.30 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



TR55 Tc Worksheet

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		282.00		
Watercourse slope (%)	= 13.20		4.50		4.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.46		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**1.36**	**=**	**2.06**
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	= 0.025		0.025		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.30 min

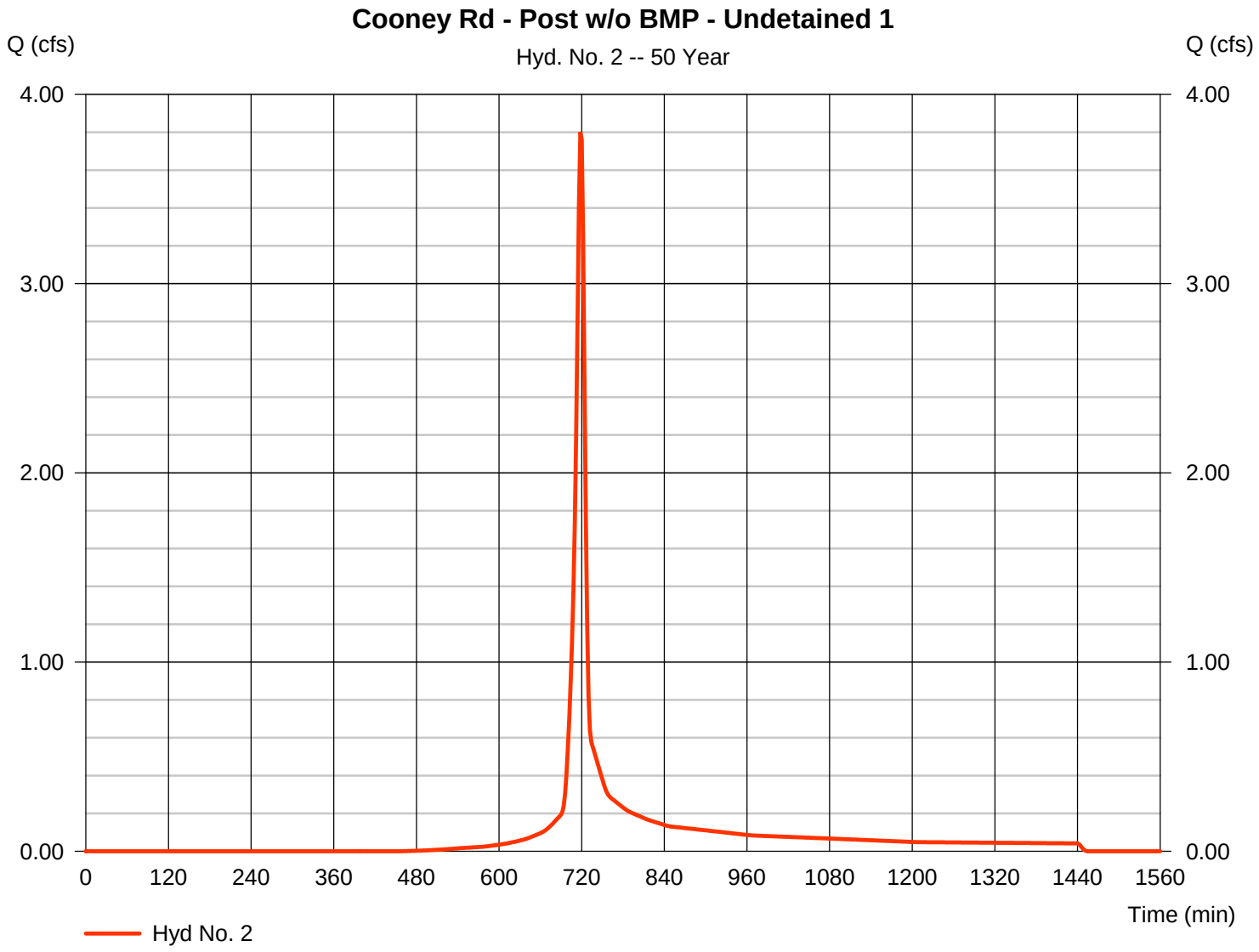
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.802 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	8,709 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

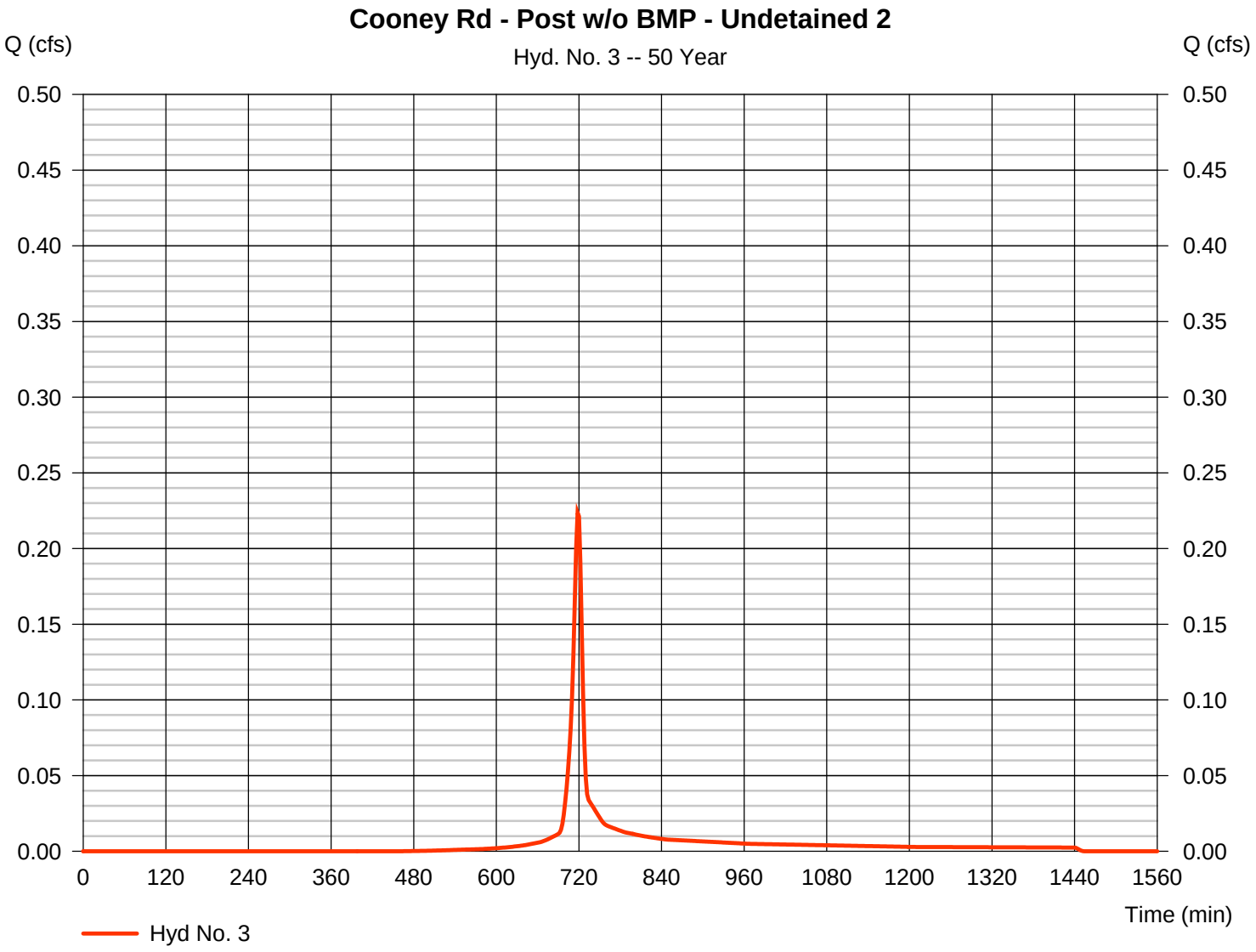
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.224 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 512 cuft
Drainage area	= 0.050 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.00 min
Total precip.	= 5.13 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

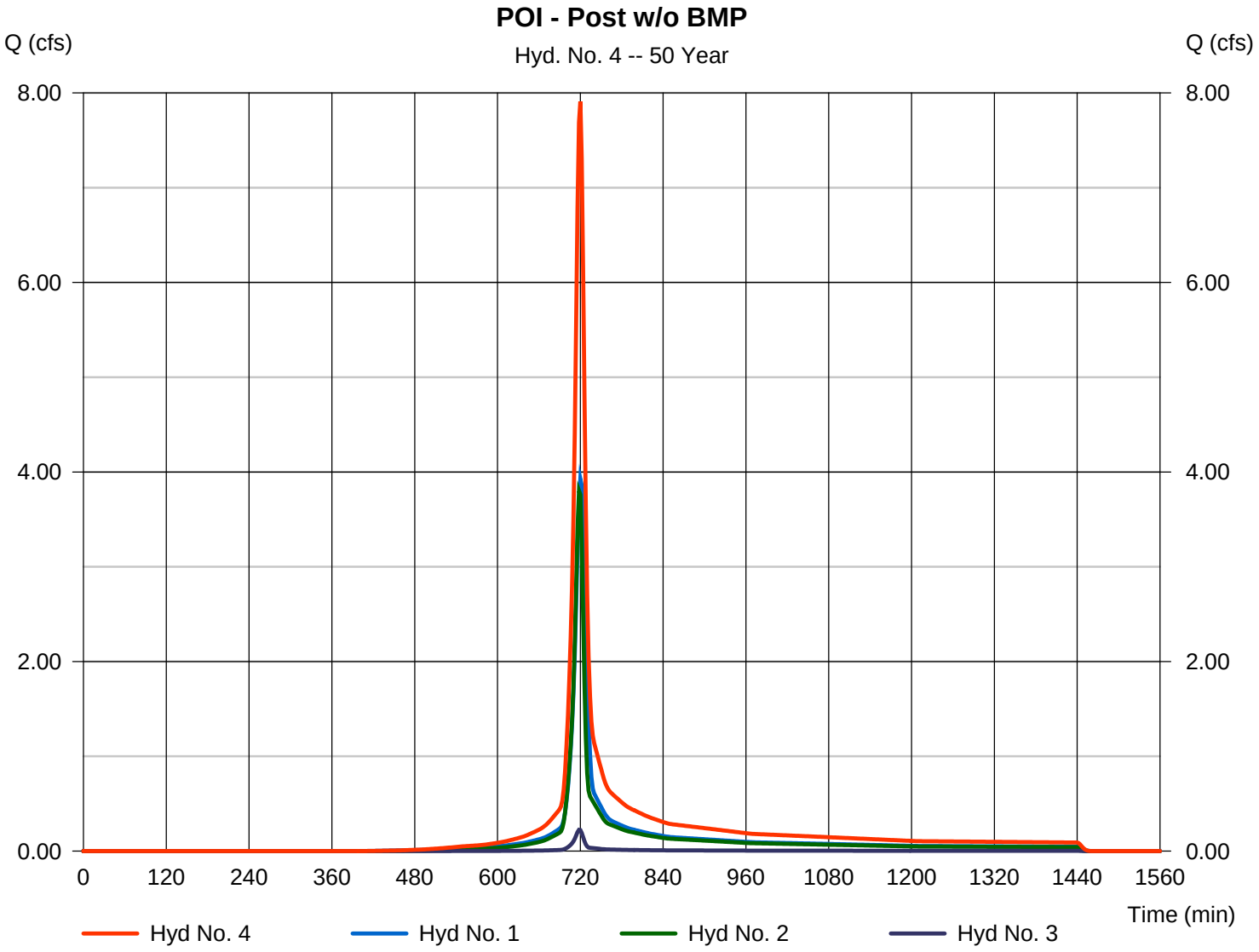
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 4

POI - Post w/o BMP

Hydrograph type	=	Combine	Peak discharge	=	7.907 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	19,434 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



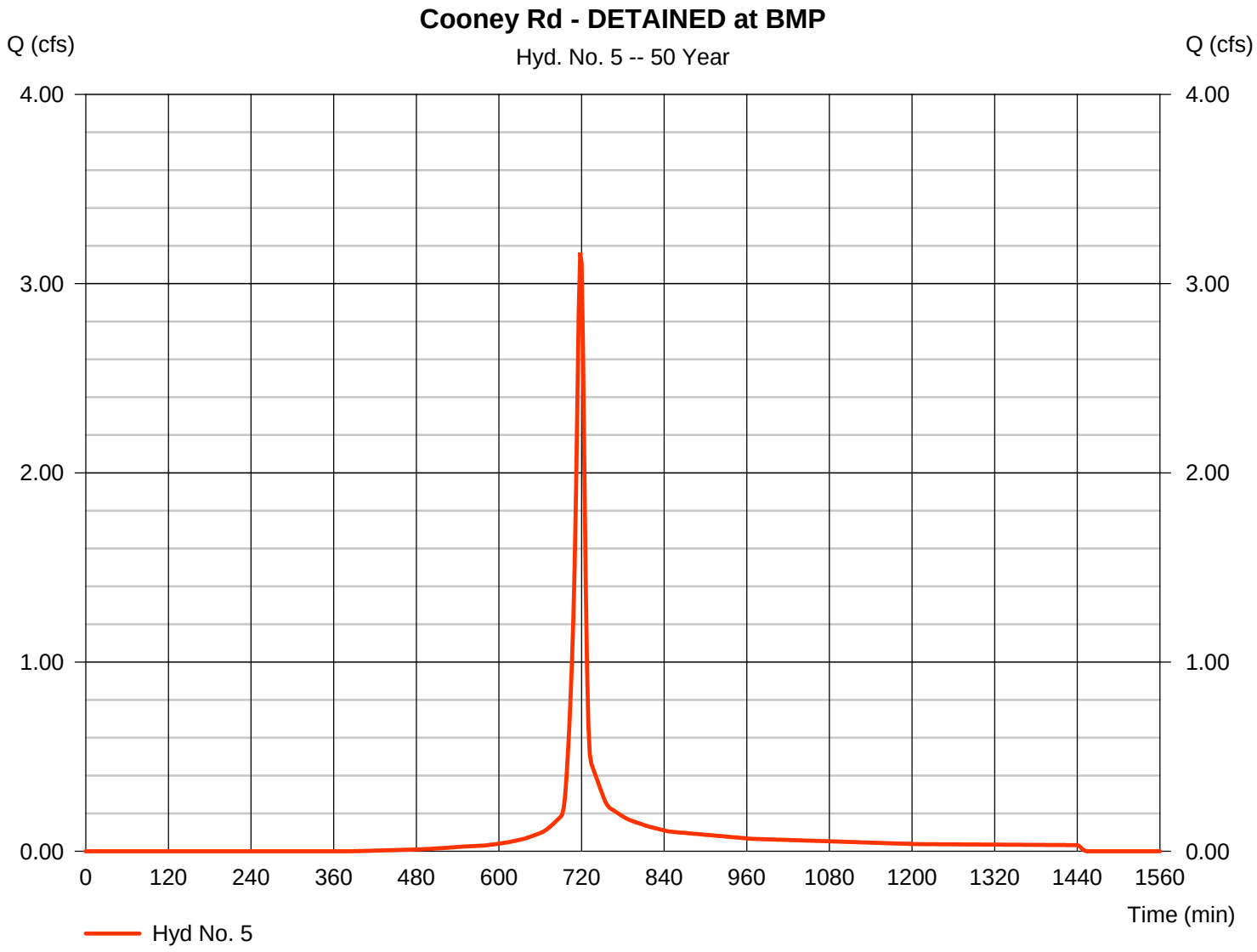
Hydrograph Report

Hyd. No. 5

Cooney Rd - DETAINED at BMP

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.164 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	7,308 cuft
Drainage area	=	0.630 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.20 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.450 x 78) + (0.180 x 91)] / 0.630



TR55 Tc Worksheet

Hyd. No. 5

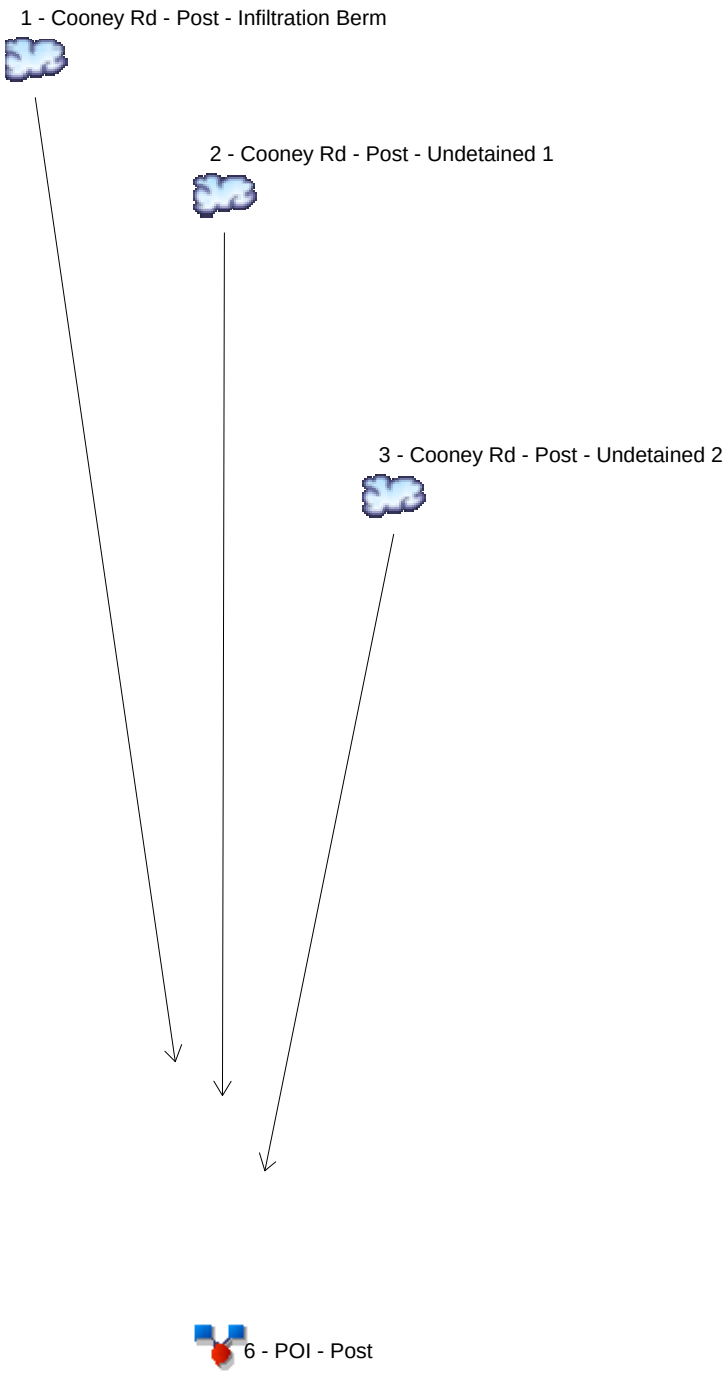
Cooney Rd - DETAINED at BMP

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		55.00		
Watercourse slope (%)	= 13.20		4.50		3.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.06		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**0.30**	**=**	**1.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.025		0.025		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 ..... 9.20 min

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3



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	------	-------	-------	-------	-------	-------	-------	2.657	-------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	3.802	-------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	0.224	-------	Cooney Rd - Post - Undetained 2
6	Combine	1, 2, 3,	-------	-------	-------	-------	-------	-------	5.989	-------	POI - Post

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	2.657	2	728	9,749	------	------	------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	3.802	2	718	8,709	------	------	------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	0.224	2	718	512	------	------	------	Cooney Rd - Post - Undetained 2
6	Combine	5.989	2	720	18,970	1, 2, 3,	------	------	POI - Post

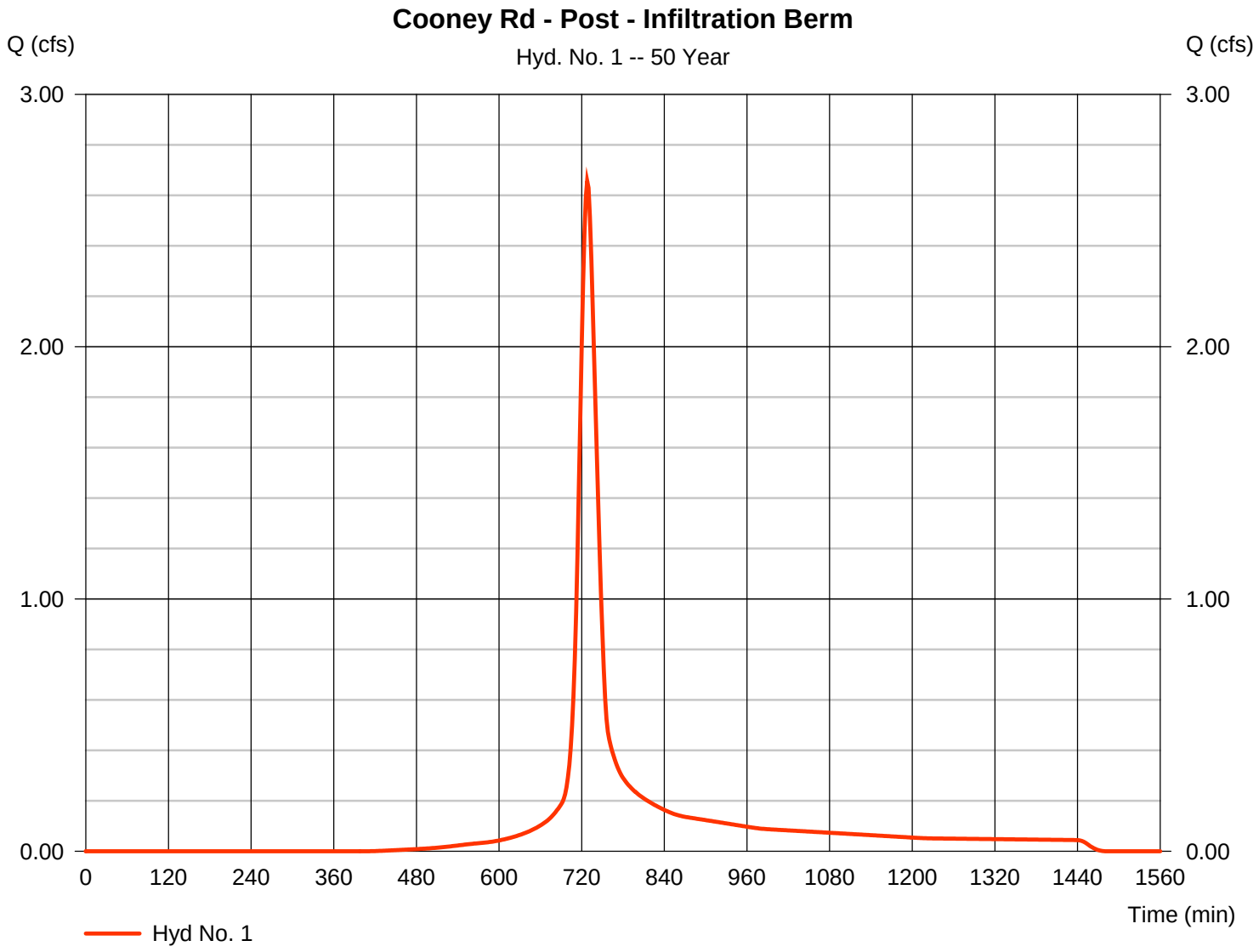
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.657 cfs
Storm frequency	=	50 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	9,749 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	26.10 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



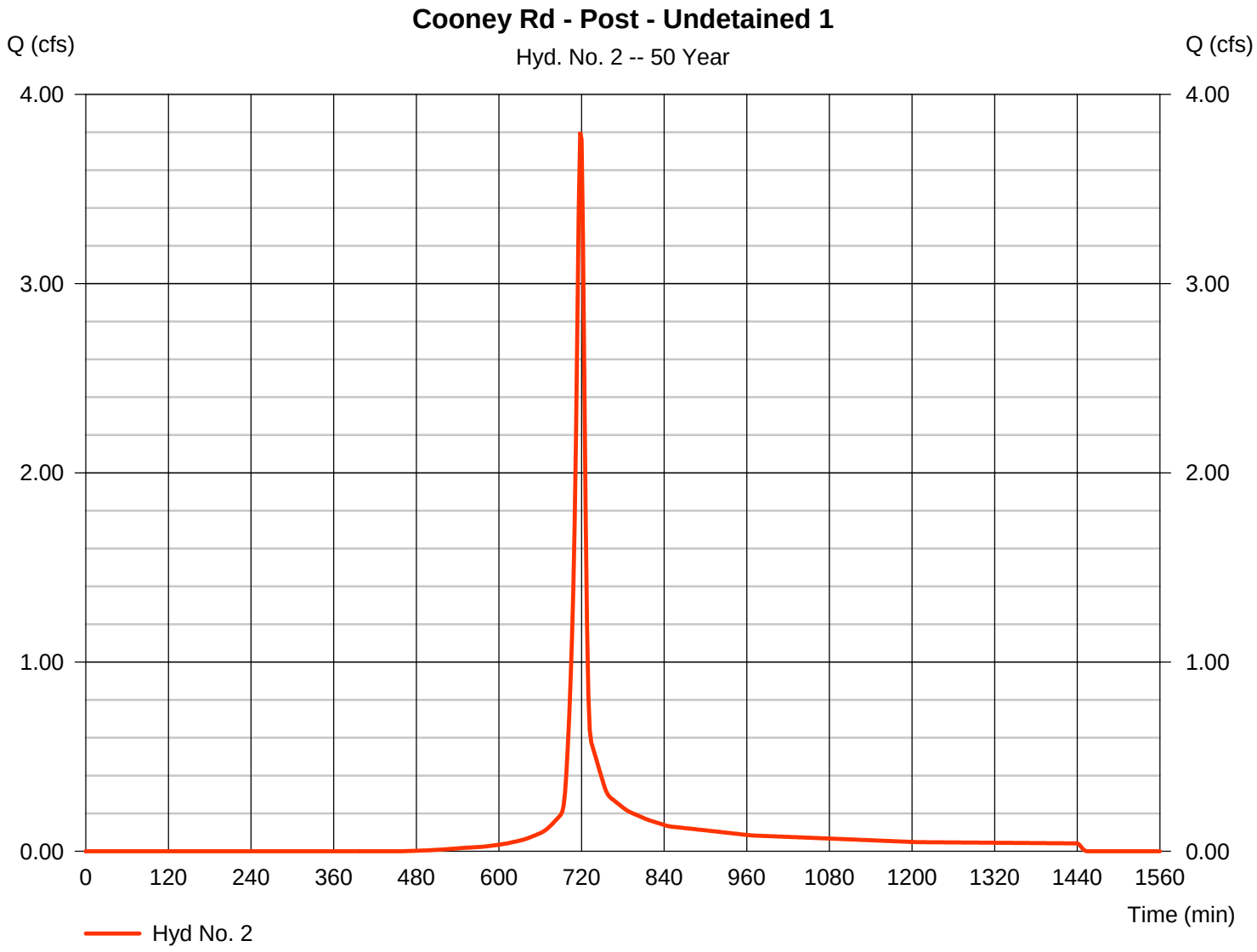
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.802 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	8,709 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

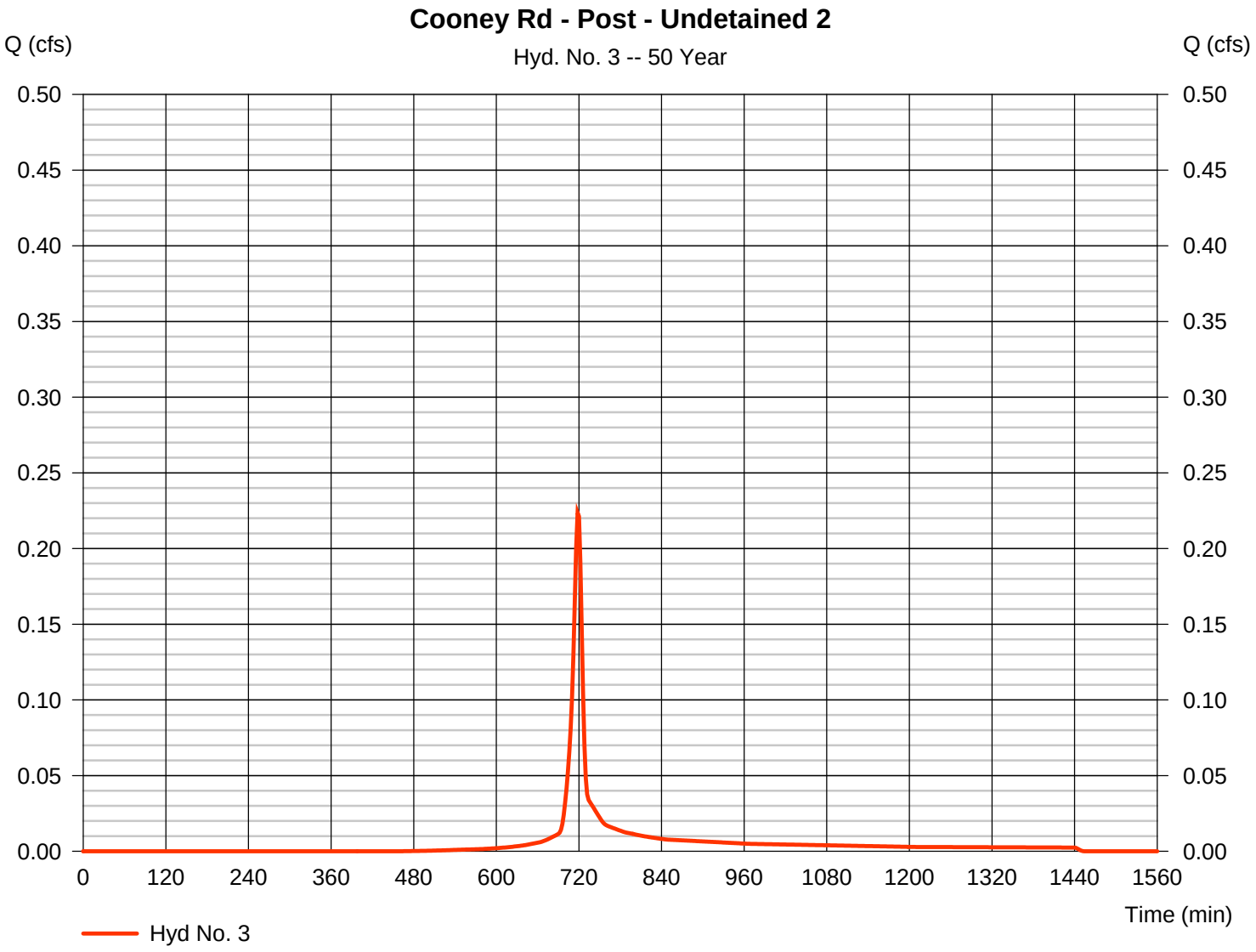
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.224 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	512 cuft
Drainage area	=	0.050 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.00 min
Total precip.	=	5.13 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

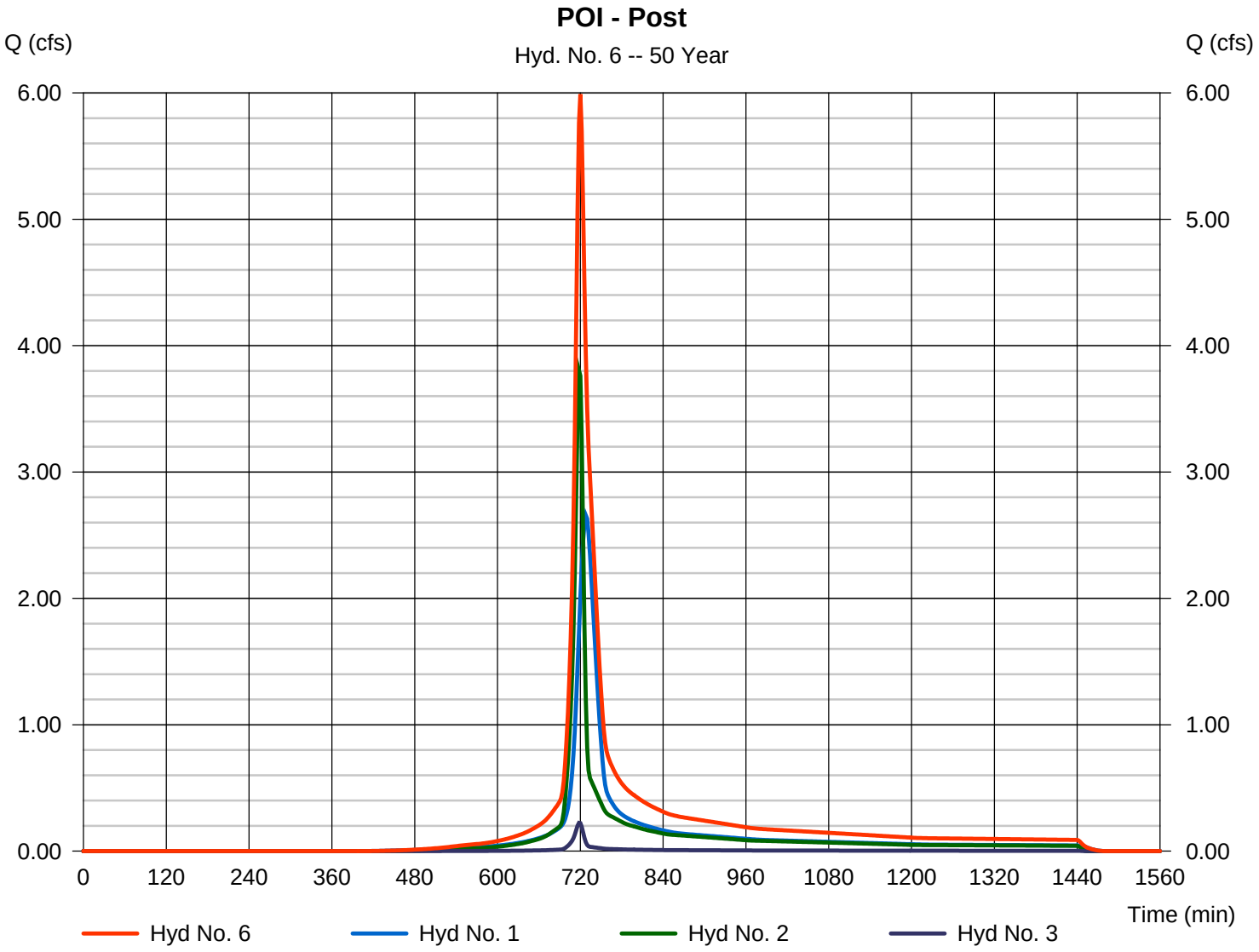
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 6

POI - Post

Hydrograph type	=	Combine	Peak discharge	=	5.989 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	18,970 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



ATTACHMENT C-4
COONEY RD
100 Year-24 Hour Storm

Watershed Model Schematic

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	------	-------	2.154	-------	-------	4.315	-------	7.212	8.680	Cooney Rd - PRE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	8.680	2	720	22,547	------	------	------	Cooney Rd - PRE

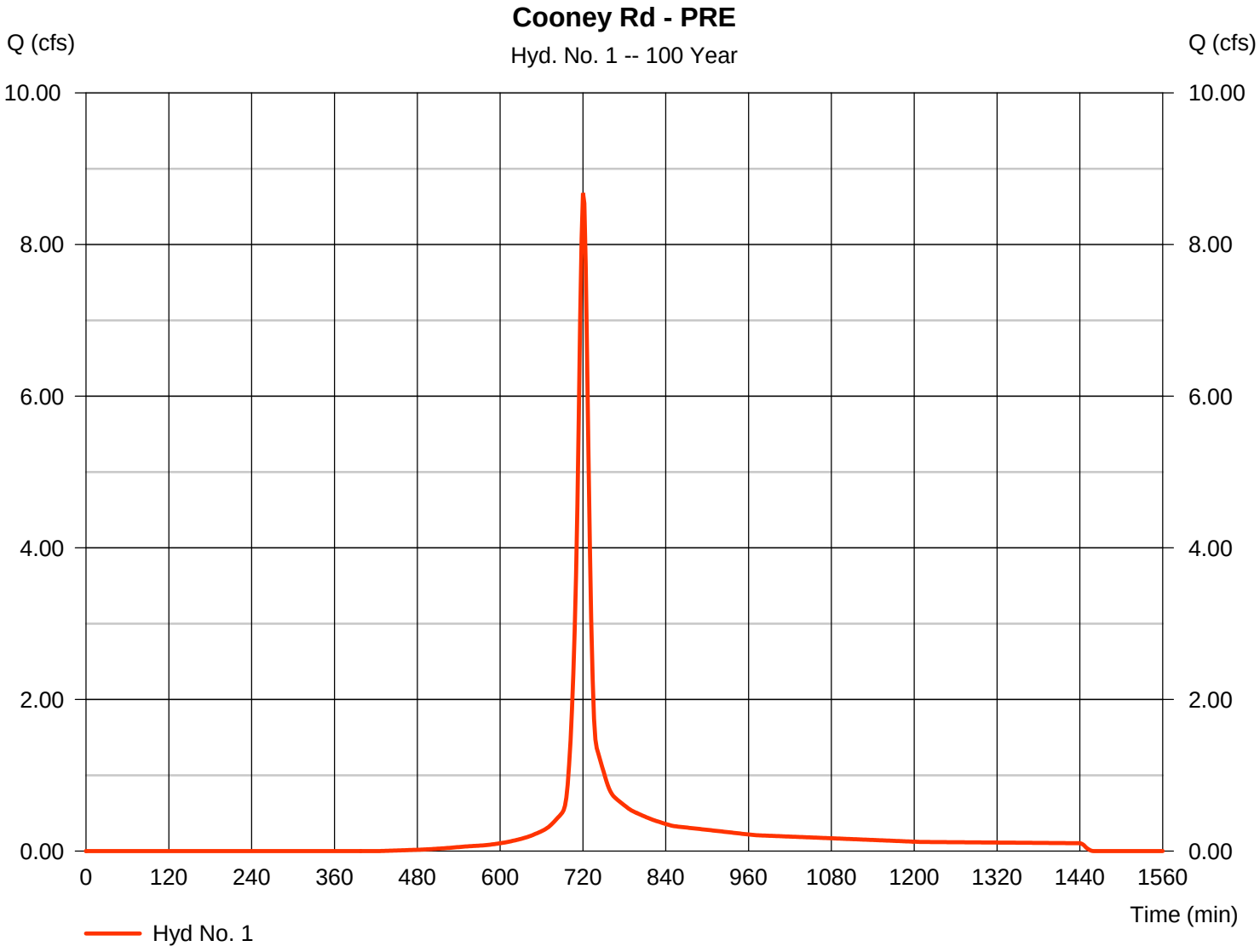
Hydrograph Report

Hyd. No. 1

Cooney Rd - PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 8.680 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 22,547 cuft
Drainage area	= 1.770 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.40 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.360 x 78) + (0.330 x 77) + (0.080 x 91)] / 1.770



TR55 Tc Worksheet

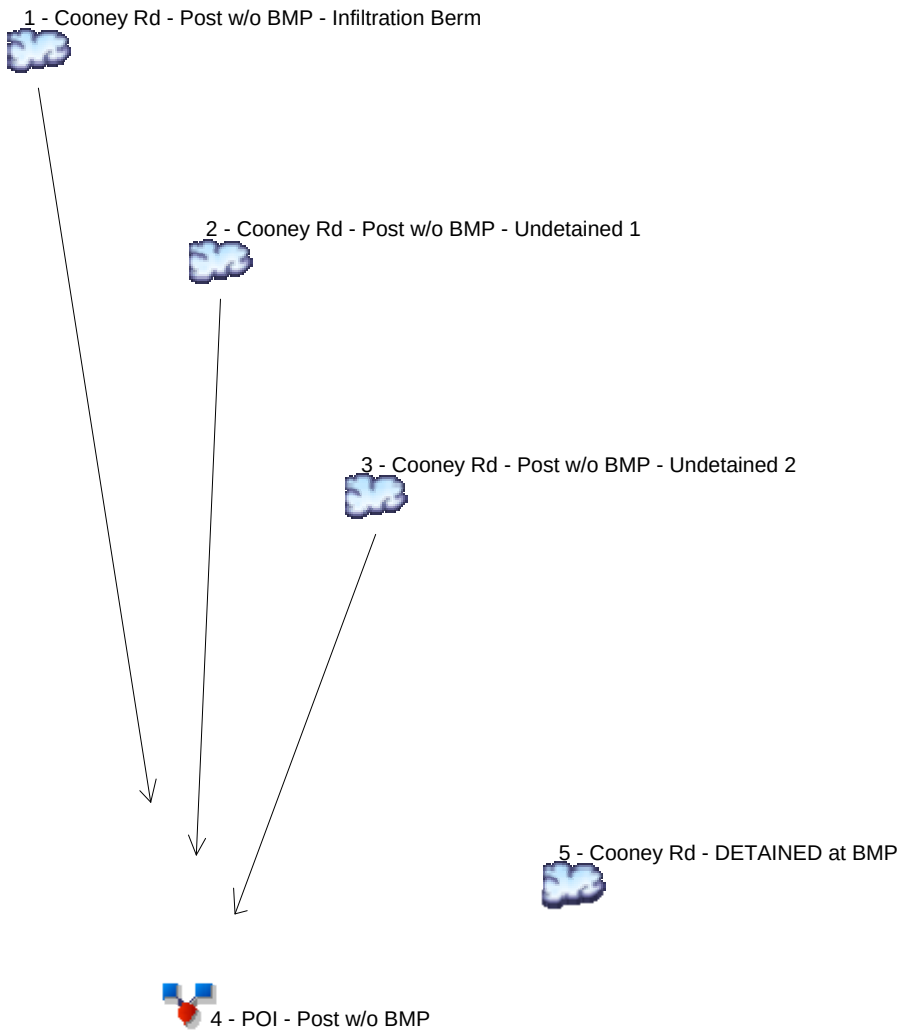
Hyd. No. 1

Cooney Rd - PRE

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.38**	**+**	**0.00**	**+**	**0.00**	**=**	**8.38**
Shallow Concentrated Flow							
Flow length (ft)	= 91.00		351.00		0.00		
Watercourse slope (%)	= 10.90		4.60		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.33		3.46		0.00		
Travel Time (min)	**= 0.28**	**+**	**1.69**	**+**	**0.00**	**=**	**1.98**
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	= 0.025		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.40 min

Watershed Model Schematic



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	------	-------	1.290	-------	-------	2.441	-------	3.926	4.668	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	------	-------	1.157	-------	-------	2.287	-------	3.802	4.569	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.068	-------	-------	0.135	-------	0.224	0.269	Cooney Rd - Post w/o BMP - Undetai
4	Combine	1, 2, 3	-------	2.509	-------	-------	4.862	-------	7.907	9.435	POI - Post w/o BMP
5	SCS Runoff	------	-------	1.086	-------	-------	1.998	-------	3.164	3.744	Cooney Rd - DETAINED at BMP

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	4.668	2	720	12,195	------	------	------	Cooney Rd - Post w/o BMP - Infiltratio
2	SCS Runoff	4.569	2	718	10,499	------	------	------	Cooney Rd - Post w/o BMP - Undetai
3	SCS Runoff	0.269	2	718	618	------	------	------	Cooney Rd - Post w/o BMP - Undetai
4	Combine	9.435	2	720	23,312	1, 2, 3	------	------	POI - Post w/o BMP
5	SCS Runoff	3.744	2	718	8,698	------	------	------	Cooney Rd - DETAINED at BMP

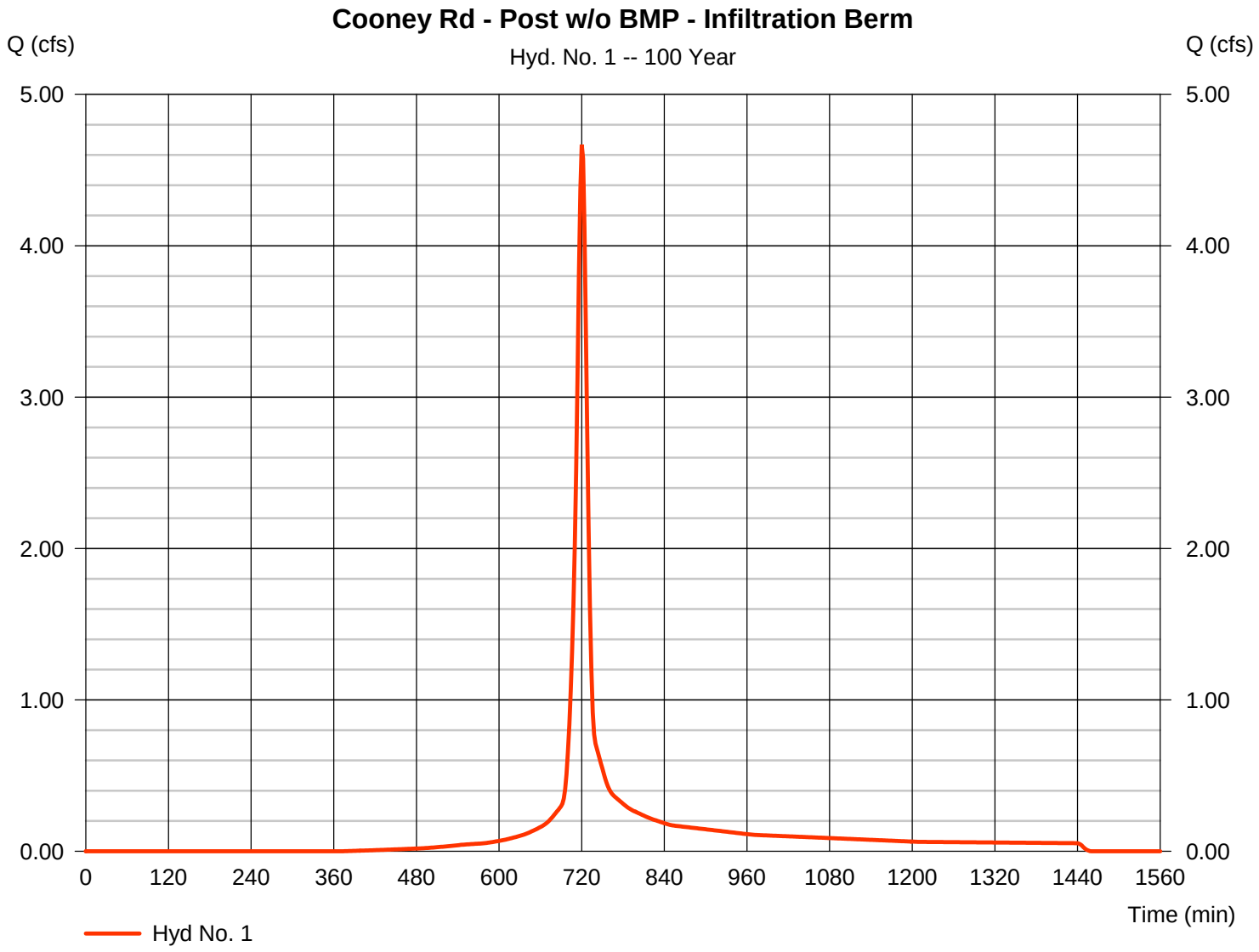
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Hydrograph type	= SCS Runoff	Peak discharge	= 4.668 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 12,195 cuft
Drainage area	= 0.880 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.30 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



TR55 Tc Worksheet

Hyd. No. 1

Cooney Rd - Post w/o BMP - Infiltration Berm

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		282.00		
Watercourse slope (%)	= 13.20		4.50		4.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.46		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**1.36**	**=**	**2.06**
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	= 0.025		0.025		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 10.30 min

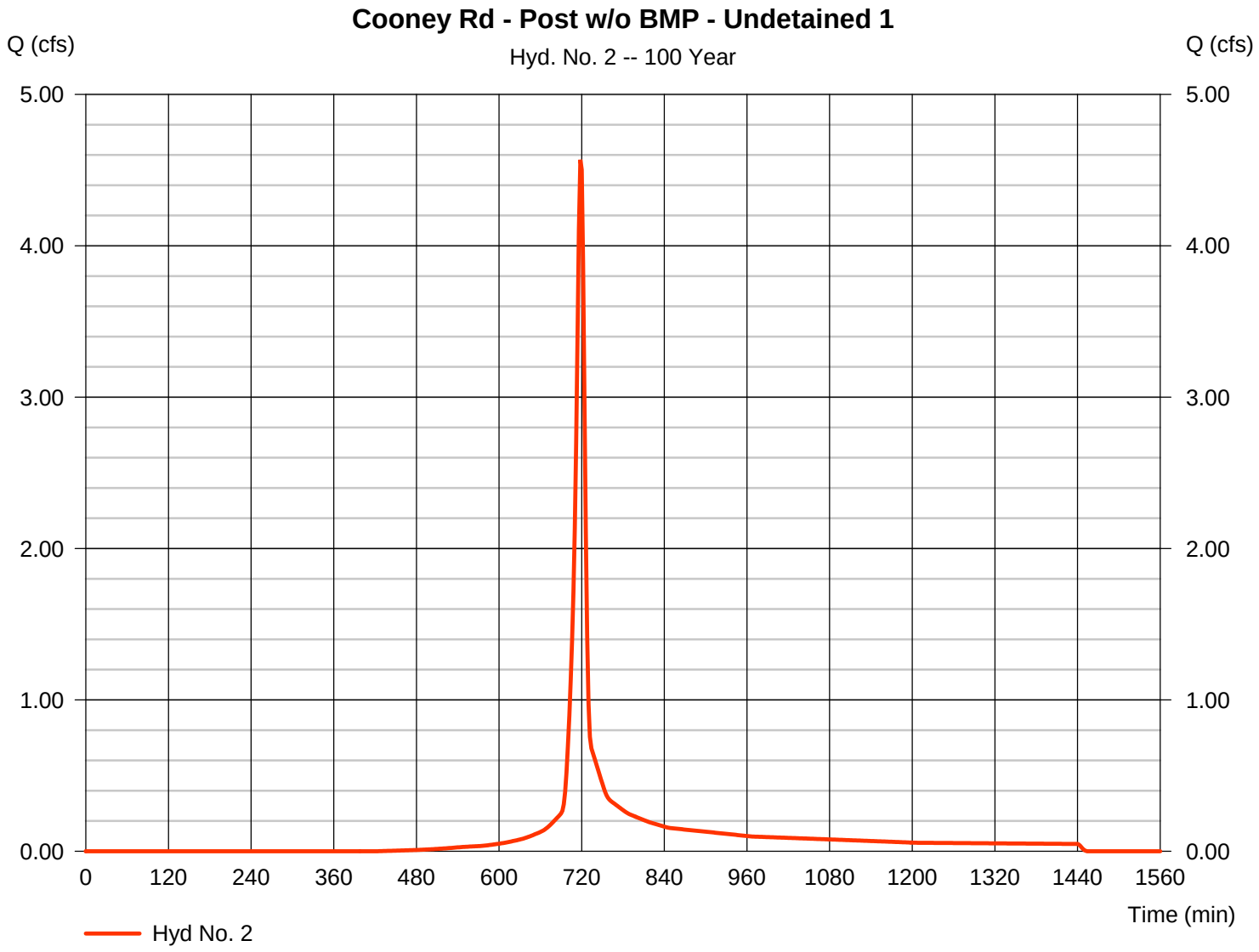
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.569 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	10,499 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post w/o BMP - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

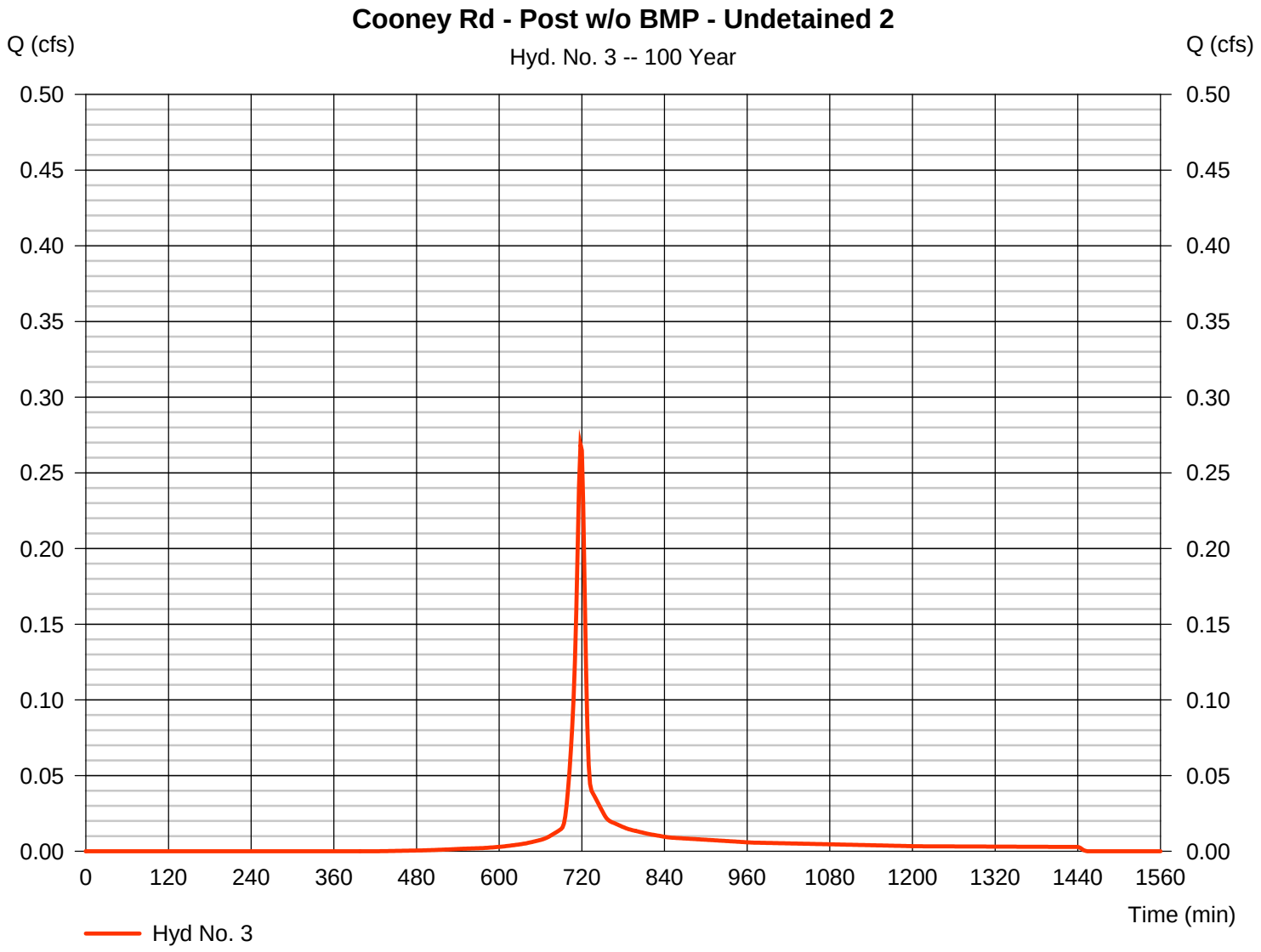
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.269 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	618 cuft
Drainage area	=	0.050 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.00 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post w/o BMP - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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**

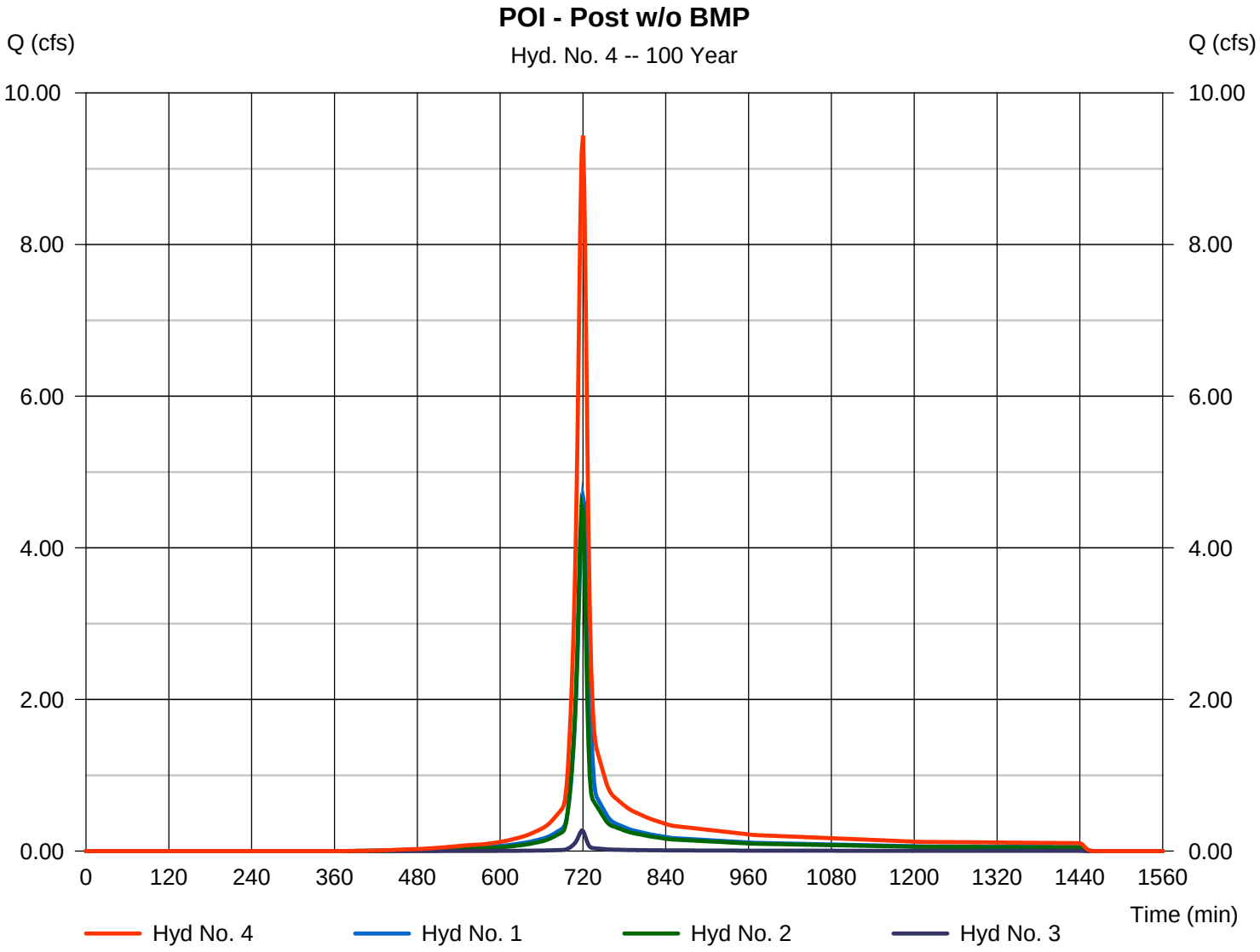
Total Travel Time, Tc ..... 9.00 min

Hydrograph Report

Hyd. No. 4

POI - Post w/o BMP

Hydrograph type	=	Combine	Peak discharge	=	9.435 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	23,312 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac



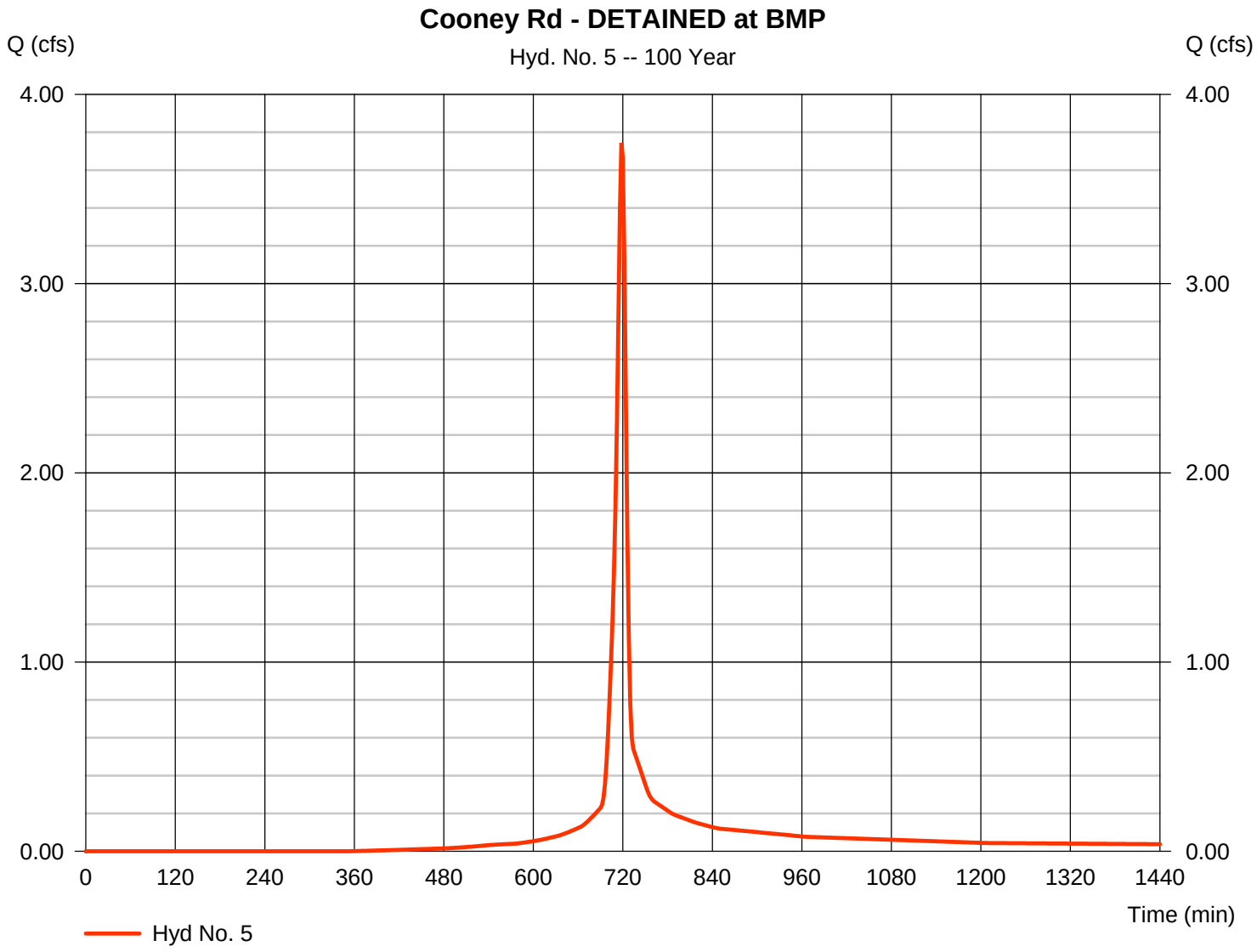
Hydrograph Report

Hyd. No. 5

Cooney Rd - DETAINED at BMP

Hydrograph type	= SCS Runoff	Peak discharge	= 3.744 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 8,698 cuft
Drainage area	= 0.630 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 9.20 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.450 x 78) + (0.180 x 91)] / 0.630



TR55 Tc Worksheet

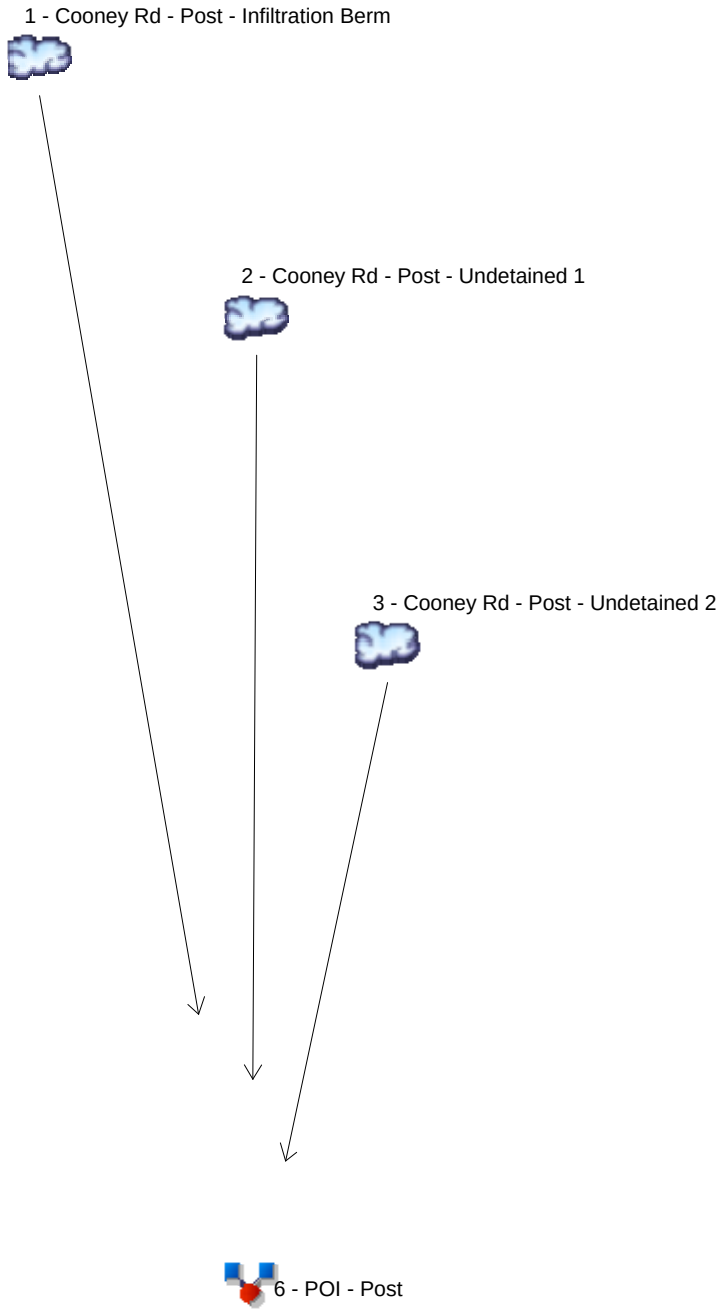
Hyd. No. 5

Cooney Rd - DETAINED at BMP

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.150		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 39.00		152.00		55.00		
Watercourse slope (%)	= 13.20		4.50		3.60		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=5.86		4.31		3.06		
Travel Time (min)	**= 0.11**	**+**	**0.59**	**+**	**0.30**	**=**	**1.00**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.025		0.025		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 ..... 9.20 min

Watershed Model Schematic



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	------	-------	-------	-------	-------	-------	-------	-------	3.166	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	4.569	Cooney Rd - Post - Undetained 1
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	0.269	Cooney Rd - Post - Undetained 2
6	Combine	1, 2, 3,	-------	-------	-------	-------	-------	-------	-------	7.181	POI - Post

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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	3.166	2	728	11,641	------	------	------	Cooney Rd - Post - Infiltration Berm
2	SCS Runoff	4.569	2	718	10,499	------	------	------	Cooney Rd - Post - Undetained 1
3	SCS Runoff	0.269	2	718	618	------	------	------	Cooney Rd - Post - Undetained 2
6	Combine	7.181	2	720	22,758	1, 2, 3,	------	------	POI - Post

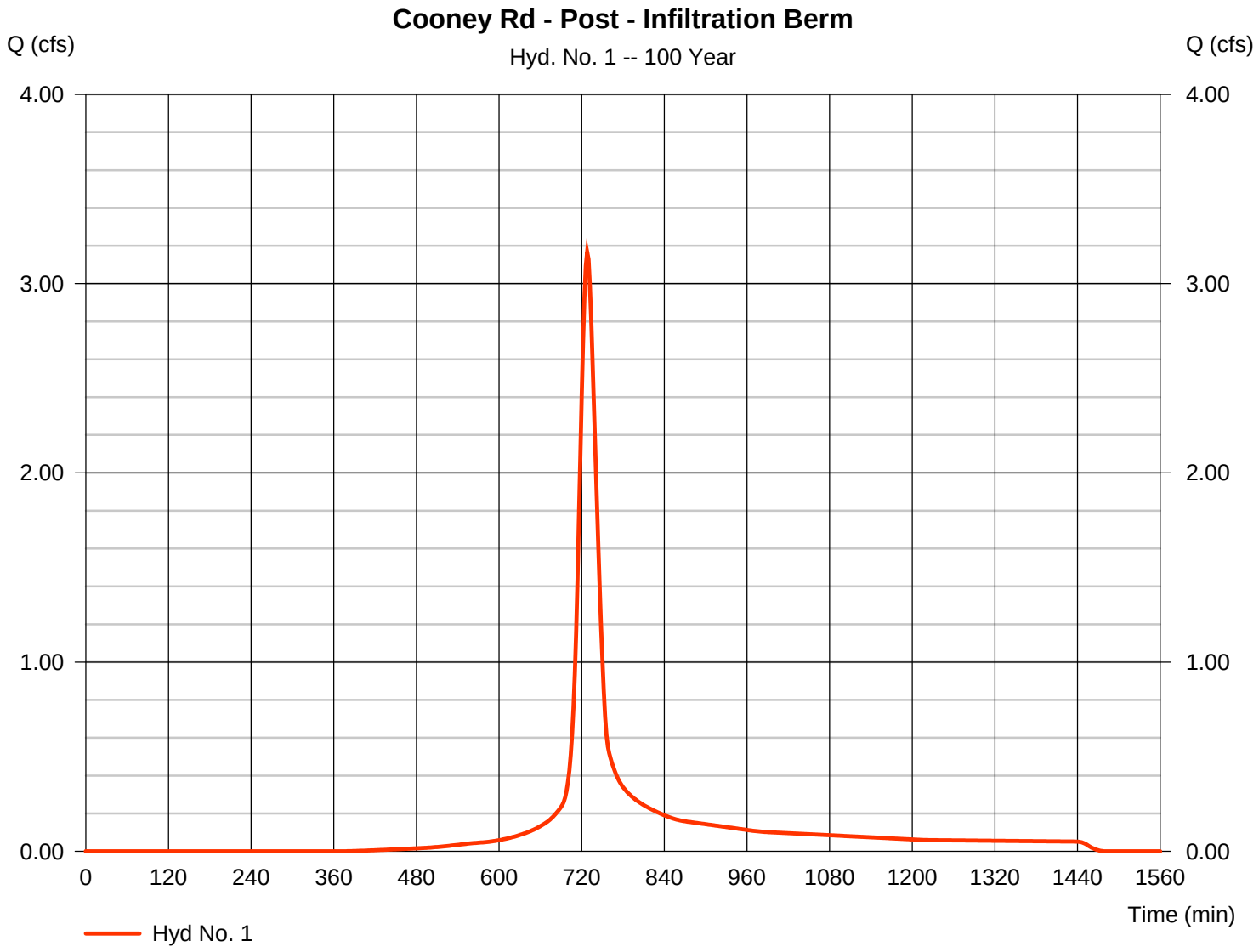
Hydrograph Report

Hyd. No. 1

Cooney Rd - Post - Infiltration Berm

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.166 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	11,641 cuft
Drainage area	=	0.880 ac	Curve number	=	81*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	23.70 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.700 x 78) + (0.180 x 91)] / 0.880



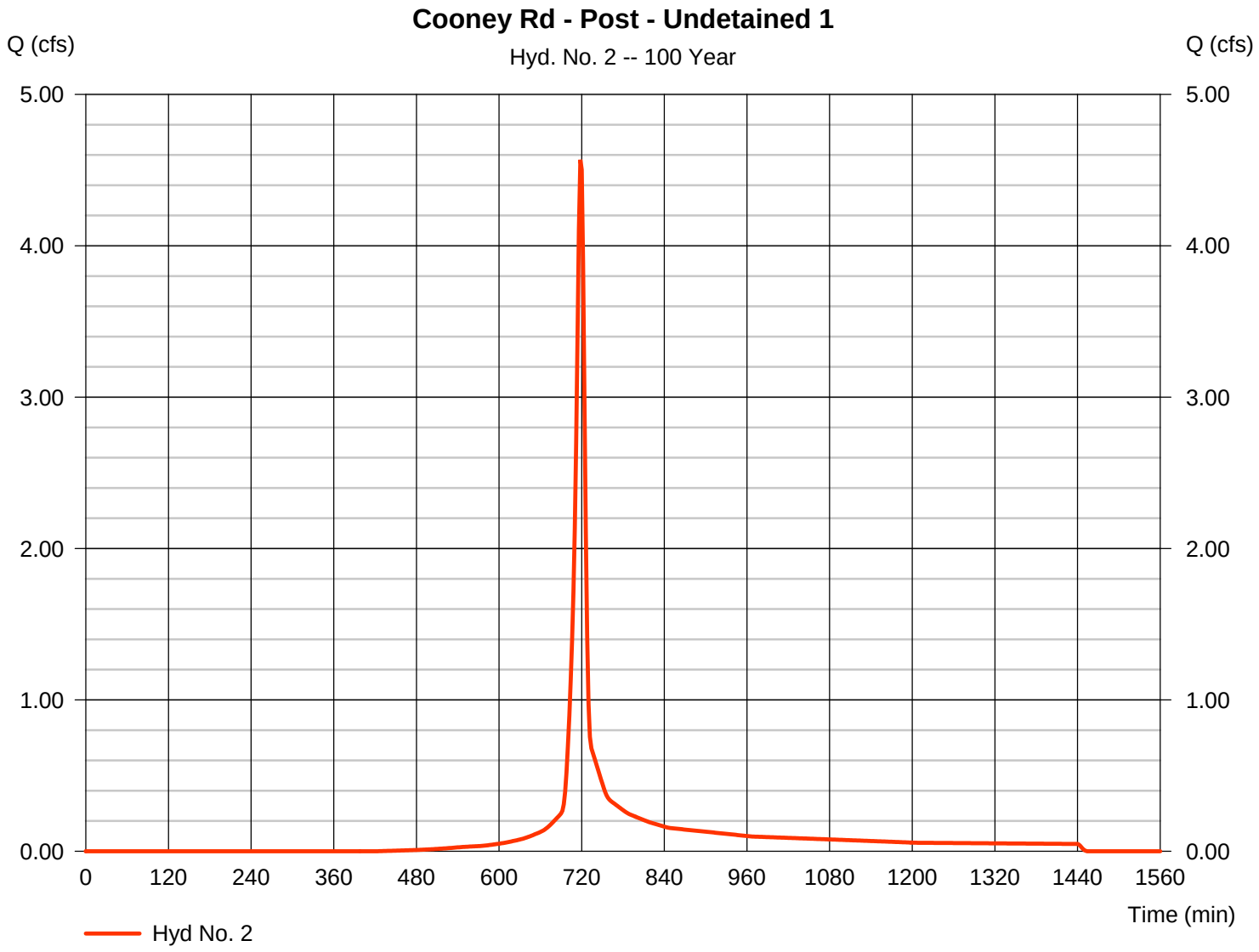
Hydrograph Report

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.569 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	10,499 cuft
Drainage area	=	0.850 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	7.80 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.600 x 78) + (0.240 x 77) + (0.010 x 91)] / 0.850



TR55 Tc Worksheet

Hyd. No. 2

Cooney Rd - Post - Undetained 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 5.20**	**+**	**0.00**	**+**	**0.00**	**=**	**5.20**
Shallow Concentrated Flow							
Flow length (ft)	= 183.00		272.00		0.00		
Watercourse slope (%)	= 2.20		4.40		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.39		3.38		0.00		
Travel Time (min)	**= 1.27**	**+**	**1.34**	**+**	**0.00**	**=**	**2.61**
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	= 0.025		0.025		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 ..... 7.80 min

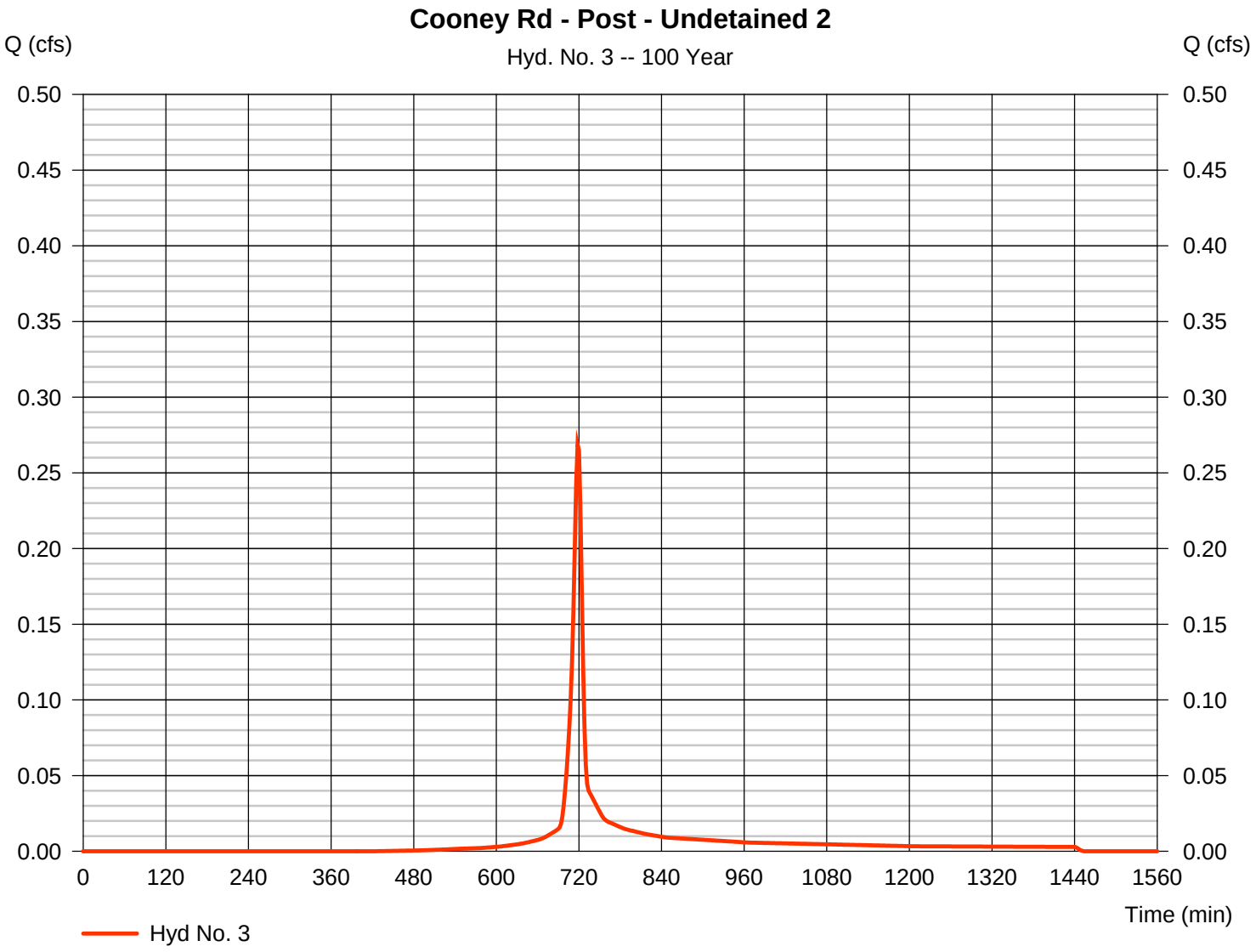
Hydrograph Report

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.269 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	618 cuft
Drainage area	=	0.050 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	9.00 min
Total precip.	=	5.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78)] / 0.050



TR55 Tc Worksheet

Hyd. No. 3

Cooney Rd - Post - Undetained 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.62		0.00		0.00		
Land slope (%)	= 4.00		0.00		0.00		
Travel Time (min)	**= 8.21**	**+**	**0.00**	**+**	**0.00**	**=**	**8.21**
Shallow Concentrated Flow							
Flow length (ft)	= 178.00		0.00		0.00		
Watercourse slope (%)	= 5.10		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=3.64		0.00		0.00		
Travel Time (min)	**= 0.81**	**+**	**0.00**	**+**	**0.00**	**=**	**0.81**
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	= 0.025		0.025		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 ..... 9.00 min

Hydrograph Report

Hyd. No. 6

POI - Post

Hydrograph type	=	Combine	Peak discharge	=	7.181 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	22,758 cuft
Inflow hyds.	=	1, 2, 3	Contrib. drain. area	=	1.780 ac