NEWPORT RD

WORKSHEET 1. GENERAL SITE INFORMATION

Date:	October 4, 2016
Project Name:	Newport Rd
Municipality:	Burrell Township
County:	Indiana
Total Area (acres):	5.44
Major River Basin:	Ohio
Watershed:	Blacklick Creek
Sub Basin:	Blacklick Creek - Conemaugh River
Nearest Surface Water to Receive Runoff:	UNT Blacklick Creek
Ch. 93 - Designated Water Use:	TSF

Impaired according to Chapter 303(d) list? YES [X] NO [ ]

List Causes of Impairment: AMD - Metals

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	5.44	3.73
Other:			
TOTAL EXISTING:	Yes	5.44	3.73

WORKSHEET 3. NONSTRUCTURAL BMP CREDITS

PROTECED AREA

1.1 Area of Protected Sensitive/Special Value Features (see WS 2) 3.73 **Ac.**

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

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

TOTAL 3.73 **Ac.**

Site Area	minus	Protected Area	=	Stormwater Management Area
5.44	-	3.73	=	1.71

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: Newport Rd
Drainage Area: 5.44 acres
2-Year Rainfall: 2.51 in

Total Site Area: 5.44 acres
Protected Site Area: 3.73 acres
Managed Site Area: 1.71 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	46174	1.06	71	4.08	0.82	0.50	1,909
Meadow	C/D	28314	0.65	78	2.82	0.56	0.79	1,874
TOTAL:		**74,488**	**1.71**					**3,784**

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	21344	0.49	71	4.08	0.82	0.50	883
Impervious Gravel	C	6970	0.16	89	1.24	0.25	1.46	850
Meadow	C/D	39640	0.91	78	2.82	0.56	0.79	2,624
Impervious Gravel	C/D	6534	0.15	91	0.99	0.20	1.62	882
TOTAL:		**74,488**	**1.71**					**5,238**

2-Year Volume Increase (ft^3):	**1,455**

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: Newport Rd
SUB-BASIN:

Required Control Volume (ft^3) - *from Worksheet 4:* 1,455

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

Structural Volume Reqmt (ft^3) 1,455
(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	7,280	2,906
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): 2,906

Structural Volume Requirement (ft^3): 1,455

DIFFERENCE: -1,451

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		

STANDARD WORKSHEET #11
Channel Design Data

PROJECT NAME: Sunoco PA Pipeline Project - PCSMP
LOCATION: Newport Road, Indiana County, PA
DONE BY: EAD DATE: 10/4/2016
CHECKED BY: LMD DATE: 10/19/2016

CHANNEL OR CHANNEL SECTION		DD-1	CD-1			
TEMPORARY OR PERMANENT?	(T OR P)	P	P			
DESIGN STORM	(2, 5, 10, OR 100 YR)	100	100			
ACRES	(AC)	2.15	0.21			
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A			
Q_r (REQUIRED CAPACITY)	(CFS)	8.30	1.50			
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	8.30	1.50			
S (BED SLOPE)[3]	(FT/FT)	0.038	0.045			
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V			
PROTECTIVE LINING[2]		NAG P300	NAG P300			
n (MANNING'S COEFFICIENT)[2]		0.070	0.126			
V_a (ALLOWABLE VELOCTY)	(FPS)	5.00	5.00			
V (CALCULATED AT FLOW DEPTH)	(FPS)	2.76	1.24			
t_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	N/A	N/A			
t_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	N/A	N/A			
CHANNEL BOTTOM WIDTH	(FT)	1	0			
CHANNEL LEFT SIDE SLOPE	(_LH:1V)	2	2			
CHANNEL RIGHT SIDE SLOPE	(_RH:1V)	2	2			
D (TOTAL DEPTH)	(FT)	1.50	1.50			
CHANNEL TOP WIDTH @ D	(FT)	7.00	6.00			
d (CALCULATED FLOW DEPTH)	(FT)	1.00	0.78			
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.00	3.12			
BOTTOM WIDTH : FLOW DEPTH RATIO	(12:1 MAX)	1.00	0.00			
d_{50} STONE SIZE	(IN)	N/A	N/A			
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	3.00	1.22			
R (HYDRAULIC RADIUS)		0.55	0.35			
S_c (CRITICAL SLOPE)	(FT/FT)	0.095	0.367			
$.7S_c$	(FT/FT)	0.067	0.257			
$1.3S_c$	(FT/FT)	0.124	0.477			
STABLE FLOW?	(Y/N)	Y	Y			
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	N/A	N/A			
FREEBOARD BASED ON STABLE FLOW	(FT)	0.50	0.72			
MINIMUM REQUIRED FREEBOARD[4]		0.5	0.5			

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft or 1/4 Total Channel Depth, whichever is greater.,
5. Permissible velocity lining design methods is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

PCSM - DESIGN CALCULATIONS
NEWPORT RD

TETRA TECH, INC.

By:	EAD	Date: 10/4/2016	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/19/2016		Newport Rd	Proj. No.: 112IC05958

Post Construction Stormwater Management Plan - Design Calculations
Newport Road

PURPOSE

The purpose of these calculations is to design a Post-Construction Stormwater Management (PCSM) Plan for the Newport Road Block Valve Site as part of the Sunoco Pipeline L.P. Pennsylvania Pipeline Project. The Newport Road Block Valve Site is located in Burrell Township, Indiana 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 project will utilize infiltration berms 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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By:	EAD	Date: 10/4/2016	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
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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	2.51
10-yr	3.53
50-yr	4.72
100-yr	5.28

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By: EAD Date: 10/4/2016 Subject: Sunoco PA Pipeline Project Sheet No.: of
Chkd. By: LMD Date: 10/19/2016 Newport Rd Proj. No.: 112IC05958

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) 2.51 in

Total Site Area : 5.44 acres
Protected Site Area: 3.73 acres
Stormwater Management Area 1.71 acres

Pre-Development Condition within LOD

Cover Type/Condition	Soil Type	Area (ac)	CN	S	Ia	Q (in)	Runoff Volume (cf)
Meadow	C	1.06	71	4.08	0.82	0.50	1,909
Meadow	C/D	0.65	78	2.82	0.56	0.79	1,874
Total		1.71					3,784

Post-Development Condition within LOD

Cover Type/Condition	Soil Type	Area (ac)	CN	S	Ia	Q (in)	Runoff Volume (cf)
Meadow	C	0.49	71	4.08	0.82	0.50	883
Impervious Gravel	C	0.16	89	1.24	0.25	1.46	850
Meadow	C/D	0.91	78	2.82	0.56	0.79	2,624
Impervious Gravel	C/D	0.15	91	0.99	0.20	1.62	882
Total		1.71					5,238

2-Year Volume Increase (cf):	**1,455**

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: 10/4/2016	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
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LOADING RATES

INFILTRATION BERM 1

IMPERVIOUS LOADING RATE

	Area (ac)	Area (sf)
Detained Impervious Area (Gravel & Pavement):	0.12	5,227
Maximum Impervious Ratio:	5	:1
Minimum Infiltration Area (sf):		1,045
Design Infiltration Area (sf):		2,260
Designed Impervious Ratio:	**2.3**	**:1**

TOTAL WATERSHED LOADING RATE

	Area (ac)	Area (sf)
Detained Watershed Area (to Infiltration BMP):	0.64	27,878
Maximum Total Watershed Ratio:	8	:1
Minimum Infiltration Area (sf):		3,485
Design Infiltration Area (sf):		2,260
Designed Total Watershed Ratio:	**12.3**	**:1**

A Diversion Channel could not be constructed on the northern side of the pad due to the presence of a protected wetland area.

INFILTRATION BERM 2

IMPERVIOUS LOADING RATE

	Area (ac)	Area (sf)
Detained Impervious Area (Gravel & Pavement):	0.07	3,049
Maximum Impervious Ratio:	5	:1
Minimum Infiltration Area (sf):		610
Design Infiltration Area (sf):		2,852
Designed Impervious Ratio:	**1.1**	**:1**

TOTAL WATERSHED LOADING RATE

	Area (ac)	Area (sf)
Detained Watershed Area (to Infiltration BMP):	1.15	50,094
Maximum Total Watershed Ratio:	8	:1
Minimum Infiltration Area (sf):		6,262
Design Infiltration Area (sf):		2,852
Designed Total Watershed Ratio:	**17.6**	**:1**

A Diversion Channel could not be constructed on the northern side of the pad due to the presence of a protected wetland area.

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INFILTRATION BERM 3

IMPERVIOUS LOADING RATE

	Area (ac)	Area (sf)
Detained Impervious Area (Gravel & Pavement):	0.10	4,356
Maximum Impervious Ratio:	5	:1
Minimum Infiltration Area (sf):		871
Design Infiltration Area (sf):		1,813
Designed Impervious Ratio:	**2.4**	**:1**

TOTAL WATERSHED LOADING RATE

	Area (ac)	Area (sf)
Detained Watershed Area (to Infiltration BMP):	0.19	8,276
Maximum Total Watershed Ratio:	8	:1
Minimum Infiltration Area (sf):		1,035
Design Infiltration Area (sf):		1,813
Designed Total Watershed Ratio:	**4.6**	**:1**

INFILTRATION BERM 4

IMPERVIOUS LOADING RATE

	Area (ac)	Area (sf)
Detained Impervious Area (Gravel & Pavement):	0.02	871
Maximum Impervious Ratio:	5	:1
Minimum Infiltration Area (sf):		174
Design Infiltration Area (sf):		355
Designed Impervious Ratio:	**2.5**	**:1**

TOTAL WATERSHED LOADING RATE

	Area (ac)	Area (sf)
Detained Watershed Area (to Infiltration BMP):	0.06	2,614
Maximum Total Watershed Ratio:	8	:1
Minimum Infiltration Area (sf):		327
Design Infiltration Area (sf):		355
Designed Total Watershed Ratio:	**7.4**	**:1**

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DISTURBED AREA

To meet Worksheet #10 guidelines, 90% of the disturbed area must be detained by BMP's. The infiltration berms for the Newport Block Valve Site will be located along the southern side of the pad and 90% 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) - ***Infiltration Berm 1***	**0.7**
Design Infiltration Rate (in/hr) - ***Infiltration Berm 2***	**1.0**
Design Infiltration Rate (in/hr) - ***Infiltration Berm 3***	**0.5**
Design Infiltration Rate (in/hr) - ***Infiltration Berm 4***	**0.5**

VOLUME CALCULATION FOR STRUCTURAL BMPs

INFILTRATION BERM 1

Storage Volume

	Length (ft)	Cross Section Area (sf)	Surface Area (sf)	Depth to Overflow (ft)	Storage Volume (cf)
	89	13.1	2,260	1.00	1166

INFILTRATION BERM 2

Storage Volume

	Length (ft)	Cross Section Area (sf)	Surface Area (sf)	Depth to Overflow (ft)	Storage Volume (cf)
	64	12.7	2,852	1.20	813

INFILTRATION BERM 3

Storage Volume

	Length (ft)	Cross Section Area (sf)	Surface Area (sf)	Depth to Overflow (ft)	Storage Volume (cf)
	60	29.1	1,813	1.70	1746

INFILTRATION BERM 4

Storage Volume

	Length (ft)	Cross Section Area (sf)	Surface Area (sf)	Depth to Overflow (ft)	Storage Volume (cf)
	26	9.2	355	1.30	239

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By: EAD Date: 10/4/2016 Subject: Sunoco PA Pipeline Project Sheet No.: of
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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 Vol. 72-hrs (cf)	Structural Vol. Credit (cf)
Infiltration Berm 1	1679	1166	1166	1166
Infiltration Berm 2	2298	813	813	813
Infiltration Berm 3	688	1746	1746	688
Infiltration Berm 4	239	239	239	239
	Total Structral Credit (cf) [Worksheet 5]			**2905.7**

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WATERSHED CHARACTERISTICS

The total watershed area for the project site is 5.44 acres. Based upon the soil survey of Indiana County, Pennsylvania (Ref. #3, Attachment B), the primary soil types within the watershed area are of the Gilpin channery silt loam (GcA), Gilpin channery silt loam (GcC), Gilpin-Weikert channery silt (GwD), Monogahela silt loam (MoA), Monogahela silt loam (MoB), and Monogahela silt loam (MoC). These primarily classify as either HCG Class C or C/D. See the project drawings for watershed mapping.

Pre-Development Condition

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C	GcA	Meadow	71	1.32
C	GcC	Meadow	71	0.84
C	GwD	Meadow	71	0.37
C/D	MoA	Meadow	78	0.19
C/D	MoB	Meadow	78	2.22
C/D	MoB	Woods	77	0.21
C/D	MoC	Meadow	78	0.27
C/D	MoC	Woods	77	0.02
			Totals	5.44

CN	75

Post-Development Condition

Undetained 1

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C	GcA	Meadow	71	0.34
C	GcC	Meadow	71	0.18
C	GwD	Meadow	71	0.17
C/D	MoB	Meadow	78	0.09
C/D	MoB	Woods	77	0.04
			Totals	0.82

CN	72

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By: EAD Date: 10/4/2016 Subject: Sunoco PA Pipeline Project Sheet No.: of
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Diversion Ditch 1

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C	GcA	Meadow	71	0.08
C	GcC	Meadow	71	0.13
C	GwD	Meadow	71	0.02
C/D	MoA	Meadow	78	0.08
C/D	MoB	Meadow	78	0.86
C/D	MoC	Meadow	78	0.003
			Totals	1.17

CN	77

Undetained 2 - Below Access Road

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	MoA	Meadow	78	0.01
C/D	MoB	Meadow	78	0.45
C/D	MoB	Woods	77	0.14
C/D	MoC	Meadow	78	0.16
C/D	MoC	Woods	77	0.02
C/D	MoC	Impervious - Gravel	91	0.02
			Totals	0.80

CN	78

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By: EAD Date: 10/4/2016 Subject: Sunoco PA Pipeline Project Sheet No.: of
Chkd. By: LMD Date: 10/19/2016 Newport Rd Proj. No.: 112IC05958

BMP (Detained) ***[Infiltration Berm 1]***

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C	GcA	Meadow	71	0.19
C	GcA	Impervious - Gravel	89	0.10
C	GcC	Meadow	71	0.19
C	GwD	Meadow	71	0.01
C/D	MoB	Meadow	78	0.46
C/D	MoB	Impervious - Gravel	91	0.03
			Totals	0.98

CN	77

BMP (Detained) ***[Infiltration Berm 2]***

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C	GcA	Meadow	71	0.57
C	GcA	Impervious - Gravel	89	0.05
C	GcC	Meadow	71	0.34
C	GwD	Meadow	71	0.16
C	GwD	Impervious - Gravel	89	0.02
C/D	MoB	Meadow	78	0.23
C/D	MoB	Woods	77	0.03
C/D	MoB	Impervious - Gravel	91	0.001
			Totals	1.40

CN	73

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Chkd. By: LMD Date: 10/19/2016 Newport Rd Proj. No.: 112IC05958

BMP (Detained) ***[Infiltration Berm 3]***

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	MoA	Meadow	78	0.080
C/D	MoA	Impervious - Gravel	91	0.003
C/D	MoB	Meadow	78	0.010
C/D	MoB	Impervious - Gravel	91	0.080
C/D	MoC	Meadow	78	0.040
			Totals	0.21

CN	83

BMP (Detained) ***[Infiltration Berm 4]***

Hydrologic Group	Soil Name	Cover Description	Curve Number	Area (acres)
C/D	MoA	Meadow	78	0.005
C/D	MoA	Impervious - Gravel	91	0.010
C/D	MoB	Meadow	78	0.002
C/D	MoB	Impervious - Gravel	91	0.004
C/D	MoC	Meadow	78	0.040
C/D	MoC	Impervious - Gravel	91	0.005
			Totals	0.07

CN	82

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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 Tc 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.

Infiltration Berm 1

Storm Event (Yr.)	Peak Flow Post-Dev. Without BMPs (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	0.61	1,166	31.9	13.4	45.3
10	1.27	1,166	15.3	13.4	28.7
50	2.13	1,166	9.1	13.4	22.5
100	2.56	1,166	7.6	13.4	21.0

Infiltration Berm 2

Storm Event (Yr.)	Peak Flow Post-Dev. Without BMPs (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	0.78	813	17.4	14.4	31.8
10	1.84	813	7.4	14.4	21.8
50	3.26	813	4.2	14.4	18.6
100	3.99	813	3.4	14.4	17.8

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Infiltration Berm 3

Storm Event (Yr.)	Peak Flow Post-Dev. Without BMPs (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	0.34	688	33.4	3.6	37.0
10	0.60	1,218	33.7	3.6	37.3
50	0.92	1,746	31.5	3.6	35.1
100	1.08	1,746	27.0	3.6	30.6

Infiltration Berm 4

Storm Event (Yr.)	Peak Flow Post-Dev. Without BMPs (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	0.14	239	28.9	2.3	31.2
10	0.24	239	16.4	2.3	18.7
50	0.37	239	10.7	2.3	13.0
100	0.44	239	9.1	2.3	11.4

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

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STORMWATER 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	5.47	4.45	13,688	3.13	-2.3
10-yr	11.50	9.30	27,100	7.91	-3.6
50-yr	19.42	15.70	45,021	14.31	-5.1
100-yr	23.37	18.87	54,145	17.87	-5.5

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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 Indiana 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 40.448 N 79.2853 W 1044.09 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: Burrell Twp, Pennsylvania, USA*
Latitude: 40.448°, Longitude: -79.2853°
Elevation: 1044.09 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	0.315 (0.285–0.348)	0.376 (0.341–0.416)	0.455 (0.412–0.502)	0.517 (0.467–0.569)	0.596 (0.537–0.656)	0.658 (0.590–0.723)	0.718 (0.641–0.787)	0.781 (0.694–0.856)	0.866 (0.765–0.949)	0.930 (0.817–1.02)
10-min	0.490 (0.443–0.540)	0.587 (0.532–0.649)	0.707 (0.640–0.781)	0.798 (0.720–0.879)	0.912 (0.821–1.00)	0.997 (0.894–1.10)	1.08 (0.965–1.19)	1.17 (1.04–1.28)	1.27 (1.12–1.39)	1.36 (1.19–1.48)
15-min	0.600 (0.543–0.662)	0.718 (0.650–0.794)	0.868 (0.786–0.959)	0.981 (0.886–1.08)	1.13 (1.01–1.24)	1.23 (1.11–1.36)	1.34 (1.20–1.47)	1.45 (1.29–1.59)	1.59 (1.40–1.74)	1.69 (1.49–1.85)
30-min	0.794 (0.719–0.876)	0.961 (0.870–1.06)	1.19 (1.08–1.31)	1.36 (1.23–1.50)	1.59 (1.43–1.75)	1.76 (1.58–1.94)	1.94 (1.73–2.13)	2.12 (1.88–2.32)	2.36 (2.08–2.58)	2.54 (2.23–2.78)
60-min	0.970 (0.878–1.07)	1.18 (1.07–1.30)	1.49 (1.35–1.65)	1.73 (1.57–1.91)	2.06 (1.86–2.27)	2.32 (2.08–2.55)	2.59 (2.31–2.84)	2.87 (2.55–3.15)	3.26 (2.88–3.57)	3.57 (3.13–3.90)
2-hr	1.13 (1.03–1.24)	1.37 (1.25–1.51)	1.73 (1.57–1.90)	2.02 (1.83–2.21)	2.42 (2.18–2.64)	2.74 (2.46–2.99)	3.08 (2.75–3.35)	3.44 (3.06–3.74)	3.94 (3.47–4.28)	4.34 (3.81–4.71)
3-hr	1.21 (1.10–1.33)	1.46 (1.33–1.61)	1.84 (1.67–2.03)	2.15 (1.95–2.36)	2.58 (2.32–2.82)	2.93 (2.63–3.20)	3.30 (2.94–3.60)	3.69 (3.27–4.02)	4.25 (3.74–4.62)	4.71 (4.10–5.11)
6-hr	1.46 (1.33–1.63)	1.76 (1.60–1.95)	2.19 (1.99–2.43)	2.55 (2.31–2.82)	3.06 (2.76–3.38)	3.48 (3.12–3.84)	3.93 (3.50–4.32)	4.41 (3.90–4.84)	5.11 (4.47–5.59)	5.68 (4.92–6.20)
12-hr	1.77 (1.61–1.97)	2.12 (1.93–2.36)	2.62 (2.38–2.91)	3.04 (2.75–3.36)	3.65 (3.28–4.02)	4.15 (3.72–4.57)	4.70 (4.17–5.15)	5.29 (4.66–5.78)	6.15 (5.36–6.71)	6.86 (5.94–7.48)
24-hr	2.10 (1.95–2.29)	2.51 (2.33–2.73)	3.07 (2.84–3.34)	3.53 (3.26–3.83)	4.18 (3.85–4.53)	4.72 (4.33–5.10)	5.28 (4.82–5.70)	5.87 (5.34–6.32)	6.71 (6.05–7.21)	7.39 (6.61–7.93)
2-day	2.45 (2.27–2.65)	2.91 (2.70–3.16)	3.53 (3.28–3.83)	4.03 (3.74–4.37)	4.74 (4.38–5.12)	5.31 (4.88–5.73)	5.90 (5.41–6.36)	6.51 (5.95–7.01)	7.36 (6.68–7.91)	8.04 (7.25–8.63)
3-day	2.63 (2.44–2.83)	3.12 (2.91–3.37)	3.75 (3.50–4.05)	4.27 (3.97–4.60)	4.99 (4.62–5.37)	5.57 (5.14–5.98)	6.17 (5.67–6.62)	6.79 (6.22–7.27)	7.64 (6.96–8.18)	8.31 (7.53–8.89)
4-day	2.81 (2.62–3.01)	3.32 (3.11–3.57)	3.98 (3.72–4.27)	4.51 (4.20–4.83)	5.24 (4.87–5.61)	5.83 (5.40–6.23)	6.44 (5.94–6.88)	7.06 (6.49–7.54)	7.91 (7.23–8.45)	8.58 (7.81–9.16)
7-day	3.37 (3.17–3.60)	3.98 (3.74–4.25)	4.70 (4.41–5.01)	5.27 (4.95–5.62)	6.05 (5.67–6.44)	6.67 (6.23–7.09)	7.29 (6.78–7.74)	7.91 (7.34–8.40)	8.75 (8.08–9.29)	9.39 (8.63–9.96)
10-day	3.91 (3.70–4.13)	4.60 (4.35–4.87)	5.38 (5.08–5.69)	6.00 (5.66–6.34)	6.83 (6.43–7.21)	7.47 (7.02–7.88)	8.11 (7.60–8.55)	8.75 (8.18–9.23)	9.59 (8.92–10.1)	10.2 (9.48–10.8)
20-day	5.50 (5.22–5.79)	6.44 (6.12–6.79)	7.42 (7.05–7.83)	8.20 (7.78–8.65)	9.21 (8.73–9.71)	9.99 (9.45–10.5)	10.7 (10.2–11.3)	11.5 (10.8–12.1)	12.4 (11.7–13.1)	13.2 (12.3–13.9)
30-day	6.93 (6.62–7.28)	8.10 (7.73–8.51)	9.25 (8.83–9.72)	10.2 (9.68–10.7)	11.3 (10.8–11.9)	12.2 (11.6–12.8)	13.1 (12.4–13.7)	13.9 (13.2–14.6)	15.0 (14.1–15.7)	15.7 (14.8–16.5)
45-day	8.90 (8.51–9.32)	10.4 (9.92–10.9)	11.7 (11.2–12.3)	12.7 (12.2–13.3)	14.0 (13.4–14.7)	15.0 (14.3–15.7)	15.9 (15.2–16.7)	16.8 (15.9–17.6)	17.8 (16.9–18.7)	18.6 (17.6–19.5)
60-day	10.7 (10.3–11.2)	12.5 (12.0–13.1)	14.0 (13.4–14.6)	15.1 (14.5–15.8)	16.6 (15.9–17.3)	17.6 (16.9–18.4)	18.6 (17.8–19.4)	19.5 (18.6–20.3)	20.5 (19.6–21.4)	21.3 (20.3–22.2)

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

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

Please refer to NOAA Atlas 14 document for more information.

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ATTACHMENT B

USDA SOILS MAP & PROPERTIES

United States Department of Agriculture

NRCS

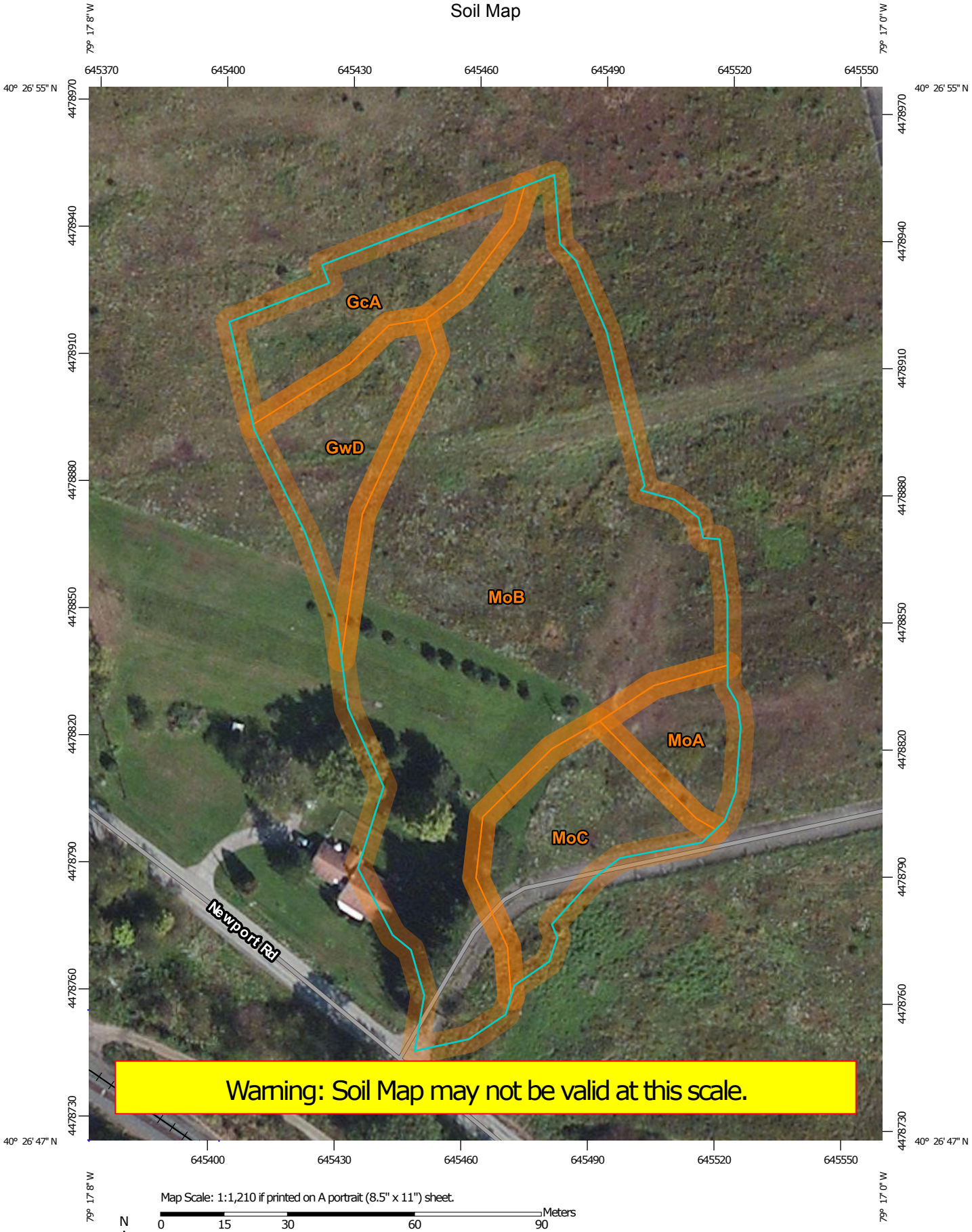
Natural Resources Conservation Service

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 Indiana County, Pennsylvania

Newport Road

October 12, 2016



Map Scale: 1:1,210 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 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 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: 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: Indiana County, Pennsylvania
Survey Area Data: Version 11, 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: Mar 27, 2011—Oct 9, 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

Indiana County, Pennsylvania (PA063)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
GcA	Gilpin channery silt loam, 0 to 3 percent slopes	0.3	9.7%
GwD	Gilpin-Weikert channery silt loams, 15 to 25 percent slopes	0.3	9.1%
MoA	Monongahela silt loam, 0 to 2 percent slopes	0.2	5.2%
MoB	Monongahela silt loam, 2 to 6 percent slopes	2.3	64.8%
MoC	Monongahela silt loam, 6 to 12 percent slopes	0.4	11.1%
Totals for Area of Interest		**3.6**	**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.

Indiana County, Pennsylvania

GcA—Gilpin channery silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2lcr0
Elevation: 800 to 1,700 feet
Mean annual precipitation: 36 to 50 inches
Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 120 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Gilpin

Setting

Landform: Hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid fine-loamy residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bt - 8 to 24 inches: channery silt loam
C - 24 to 30 inches: very channery loam
R - 30 to 35 inches: bedrock

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills

Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Weikert

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

GwD—Gilpin-Weikert channery silt loams, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 1vrrv
Elevation: 800 to 1,800 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: Not prime farmland

Map Unit Composition

Gilpin and similar soils: 45 percent
Weikert and similar soils: 45 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gilpin

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from shale and siltstone

Typical profile

Ap - 0 to 8 inches: channery silt loam
Bt - 8 to 24 inches: channery silt loam
C - 24 to 30 inches: very channery loam
R - 30 to 35 inches: bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained

Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Hydric soil rating: No

Description of Weikert

Setting
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Nose slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid loamy residuum weathered from shale and siltstone

Typical profile
A - 0 to 5 inches: channery silt loam
Bw - 5 to 15 inches: very channery silt loam
C - 15 to 18 inches: extremely channery silt loam
R - 18 to 28 inches: bedrock

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Ernest
Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: No

Wharton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

MoA—Monongahela silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1vrqt
Elevation: 700 to 1,300 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: All areas are prime farmland

Map Unit Composition

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

Description of Monongahela

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old fine-loamy alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 29 inches: loam
Btx - 29 to 63 inches: loam
C - 63 to 80 inches: cobbly sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 25 to 35 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 17 to 28 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Weinbach

Percent of map unit: 10 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Culleoka

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

MoB—Monongahela silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1vrqv
Elevation: 700 to 1,300 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: All areas are prime farmland

Map Unit Composition

Monongahela and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monongahela

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old fine-loamy alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 29 inches: loam
Btx - 29 to 63 inches: loam
C - 63 to 80 inches: cobbly sandy loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 25 to 35 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 17 to 28 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Culleoka

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Weinbach

Percent of map unit: 10 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

MoC—Monongahela silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 1vrqw
Elevation: 700 to 1,300 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

Monongahela and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Monongahela

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Old fine-loamy alluvium derived from sandstone and shale

Typical profile

Ap - 0 to 9 inches: silt loam
Bt - 9 to 29 inches: loam
Btx - 29 to 63 inches: loam
C - 63 to 80 inches: cobbly sandy loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 25 to 35 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 17 to 28 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.1 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

Weinbach

Percent of map unit: 10 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Culleoka

Percent of map unit: 10 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: No

ATTACHMENT C
NEWPORT RD
HYDRAFLOW RESULTS

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

Watershed Model Schematic

1 - Newport 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	------	-------	5.466	-------	-------	11.50	-------	19.42	23.37	Newport 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	5.466	1	720	12,962	------	------	------	Newport Rd - PRE

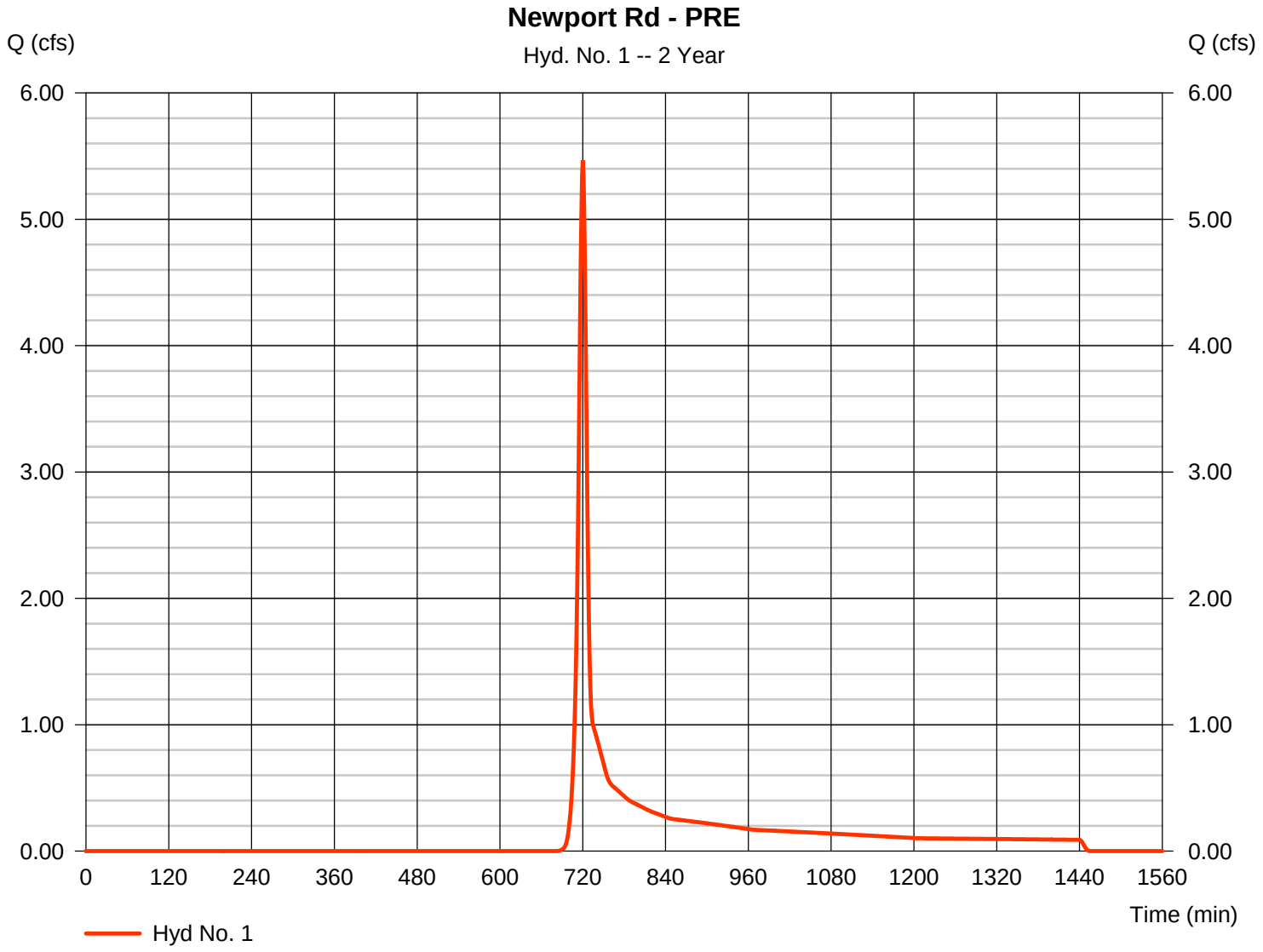
Hydrograph Report

Hyd. No. 1

Newport Rd - PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.466 cfs
Storm frequency	=	2 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	12,962 cuft
Drainage area	=	5.440 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.00 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.530 x 71) + (2.680 x 78) + (0.230 x 77)] / 5.440



TR55 Tc Worksheet

Hyd. No. 1

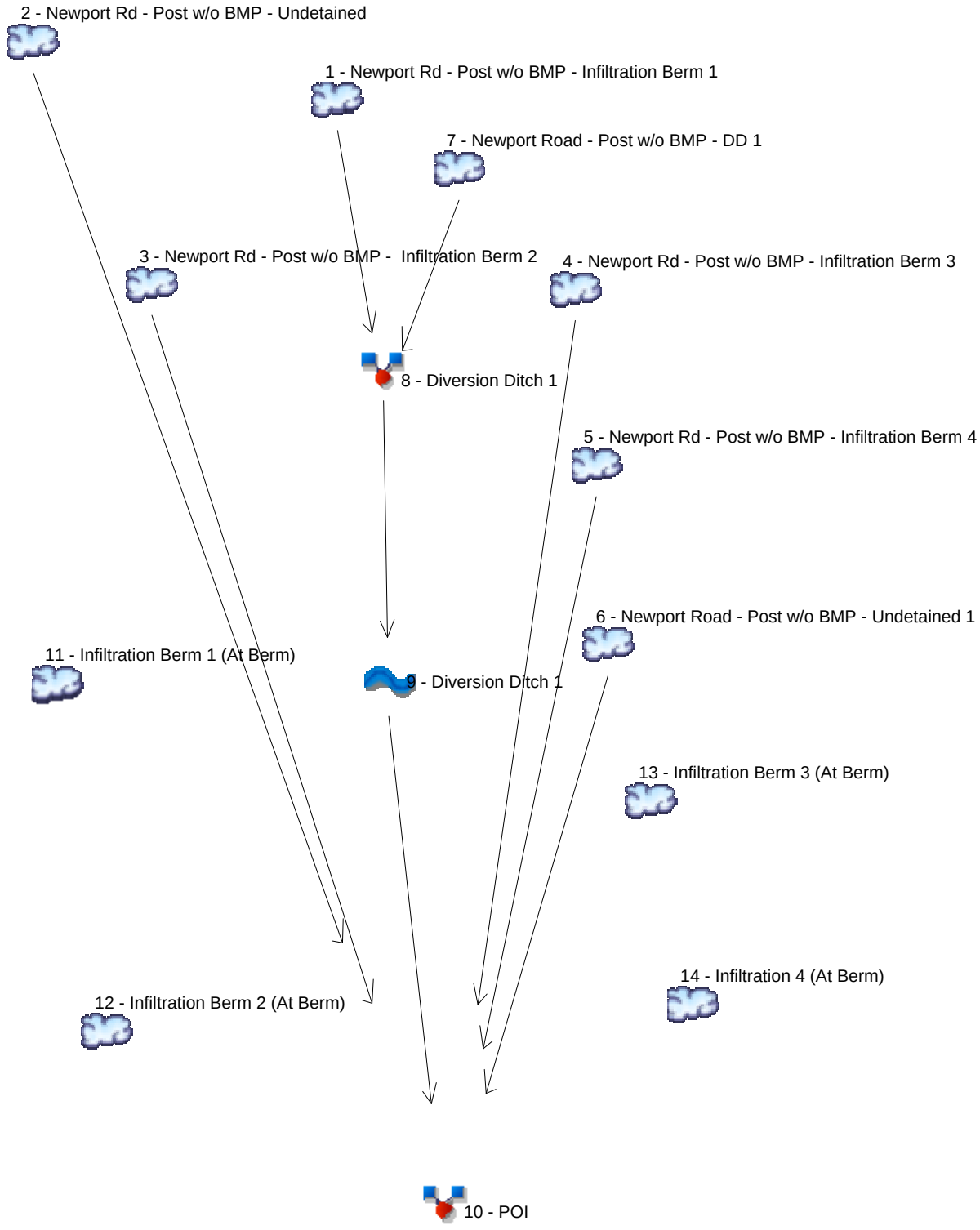
Newport Rd - PRE

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 (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 6.35**	**+**	**0.00**	**+**	**0.00**	**=**	**6.35**
Shallow Concentrated Flow							
Flow length (ft)	= 620.00		141.00		124.00		
Watercourse slope (%)	= 6.50		12.80		4.70		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.11		5.77		3.50		
Travel Time (min)	**= 2.51**	**+**	**0.41**	**+**	**0.59**	**=**	**3.51**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})63.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 10.00 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	------	-------	0.758	-------	-------	1.432	-------	2.282	2.694	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	------	-------	1.053	-------	-------	2.041	-------	3.307	3.927	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.964	-------	-------	2.202	-------	3.878	4.722	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	------	-------	0.432	-------	-------	0.754	-------	1.148	1.337	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	------	-------	0.595	-------	-------	1.394	-------	2.476	3.022	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	------	-------	1.121	-------	-------	2.272	-------	3.777	4.516	Newport Road - Post w/o BMP - DD 1
8	Combine	1, 7	-------	1.870	-------	-------	3.695	-------	6.035	7.178	Diversion Ditch 1
9	Reach	8	-------	1.859	-------	-------	3.677	-------	6.014	7.156	Diversion Ditch 1
10	Combine	2, 3, 4, 5, 6, 9	-------	4.448	-------	-------	9.297	-------	15.70	18.87	POI
11	SCS Runoff	------	-------	0.613	-------	-------	1.265	-------	2.128	2.558	Infiltration Berm 1 (At Berm)
12	SCS Runoff	------	-------	0.782	-------	-------	1.836	-------	3.263	3.993	Infiltration Berm 2 (At Berm)
13	SCS Runoff	------	-------	0.343	-------	-------	0.602	-------	0.923	1.076	Infiltration Berm 3 (At Berm)
14	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Infiltration 4 (At Berm)

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	0.758	1	722	1,953	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	1.053	1	719	2,249	------	------	------	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	0.964	1	723	2,912	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	0.432	1	717	811	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	0.138	1	716	239	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	0.595	1	721	1,617	------	------	------	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	1.121	1	723	3,171	------	------	------	Newport Road - Post w/o BMP - DD 1
8	Combine	1.870	1	722	5,123	1, 7	------	------	Diversion Ditch 1
9	Reach	1.859	1	724	5,121	8	------	------	Diversion Ditch 1
10	Combine	4.448	1	721	12,950	2, 3, 4, 5, 6, 9	------	------	POI
11	SCS Runoff	0.613	2	722	1,679	------	------	------	Infiltration Berm 1 (At Berm)
12	SCS Runoff	0.782	2	722	2,298	------	------	------	Infiltration Berm 2 (At Berm)
13	SCS Runoff	0.343	2	718	688	------	------	------	Infiltration Berm 3 (At Berm)
14	SCS Runoff	0.138	1	716	239	------	------	------	Infiltration 4 (At Berm)

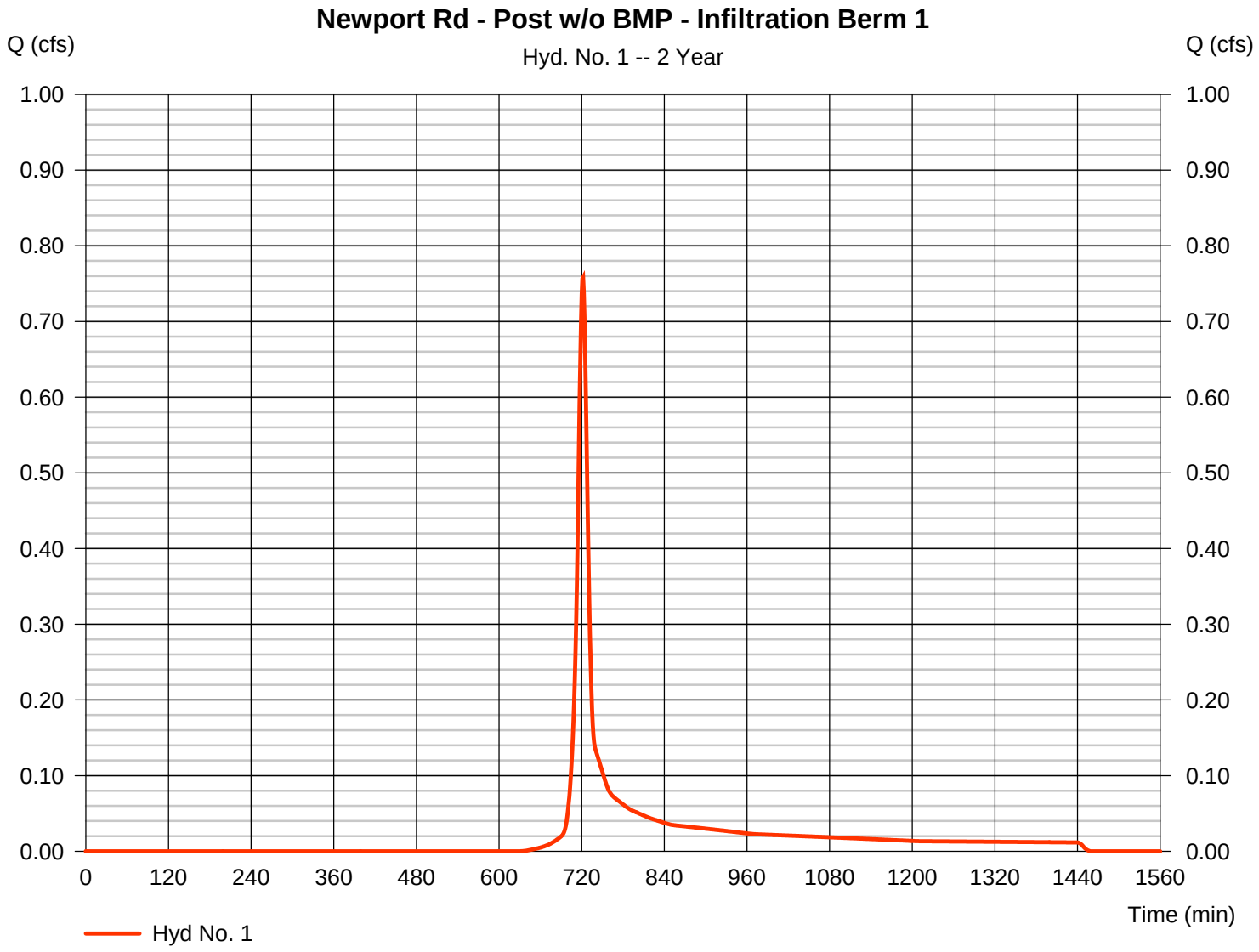
Hydrograph Report

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.758 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 1,953 cuft
Drainage area	= 0.610 ac	Curve number	= 80*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.40 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.610



TR55 Tc Worksheet

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		297.00		
Watercourse slope (%)	= 8.00		4.80		6.40		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		4.08		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**1.21**	**=**	**2.36**
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 ..... 13.40 min

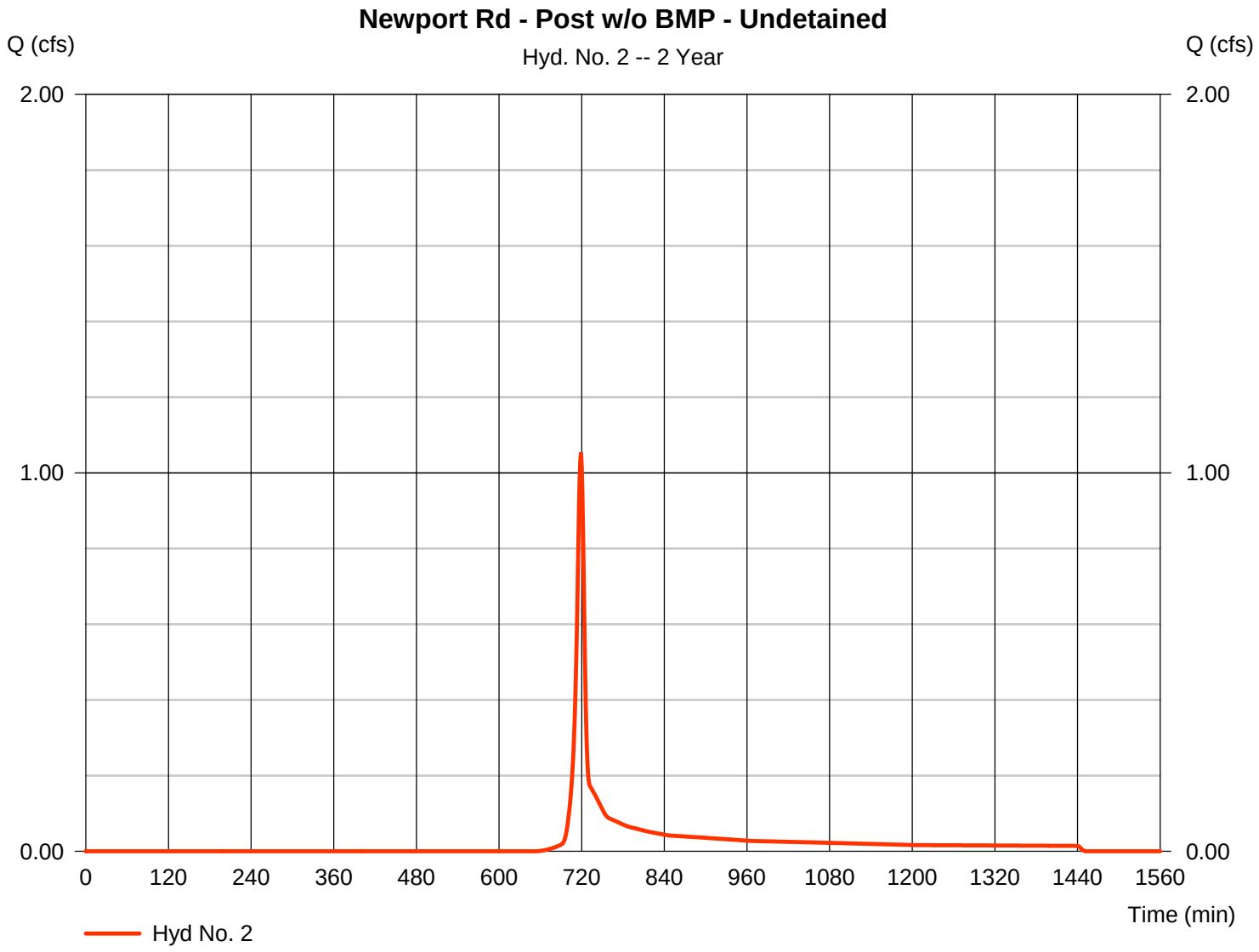
Hydrograph Report

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

Hydrograph type	= SCS Runoff	Peak discharge	= 1.053 cfs
Storm frequency	= 2 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 2,249 cuft
Drainage area	= 0.800 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 6.70 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

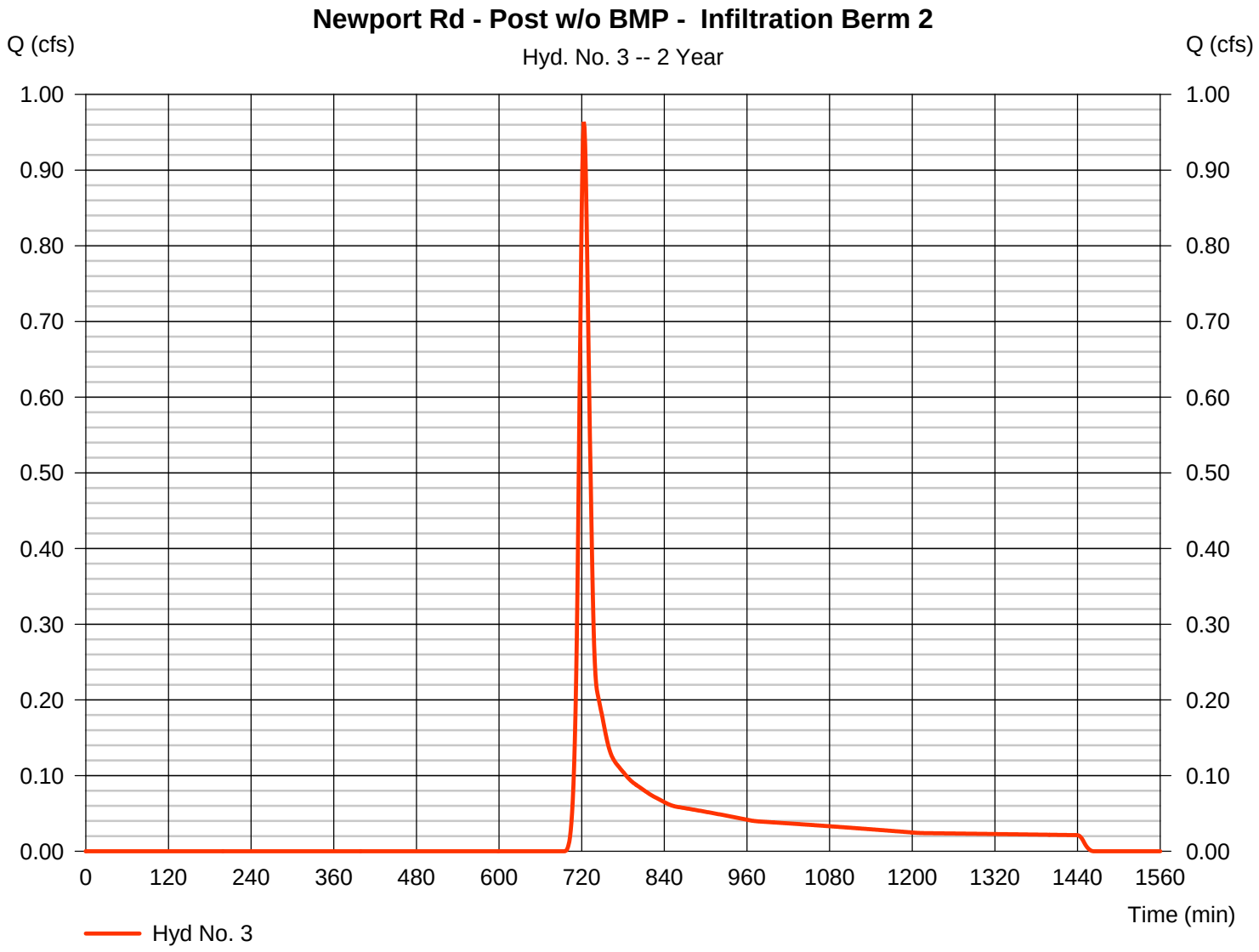
Hydrograph Report

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.964 cfs
Storm frequency	= 2 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 2,912 cuft
Drainage area	= 1.400 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 14.40 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



TR55 Tc Worksheet

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		239.00		175.00		
Watercourse slope (%)	= 6.40		11.00		6.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.08		5.35		3.95		
Travel Time (min)	**= 1.85**	**+**	**0.74**	**+**	**0.74**	**=**	**3.33**
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 ..... 14.40 min

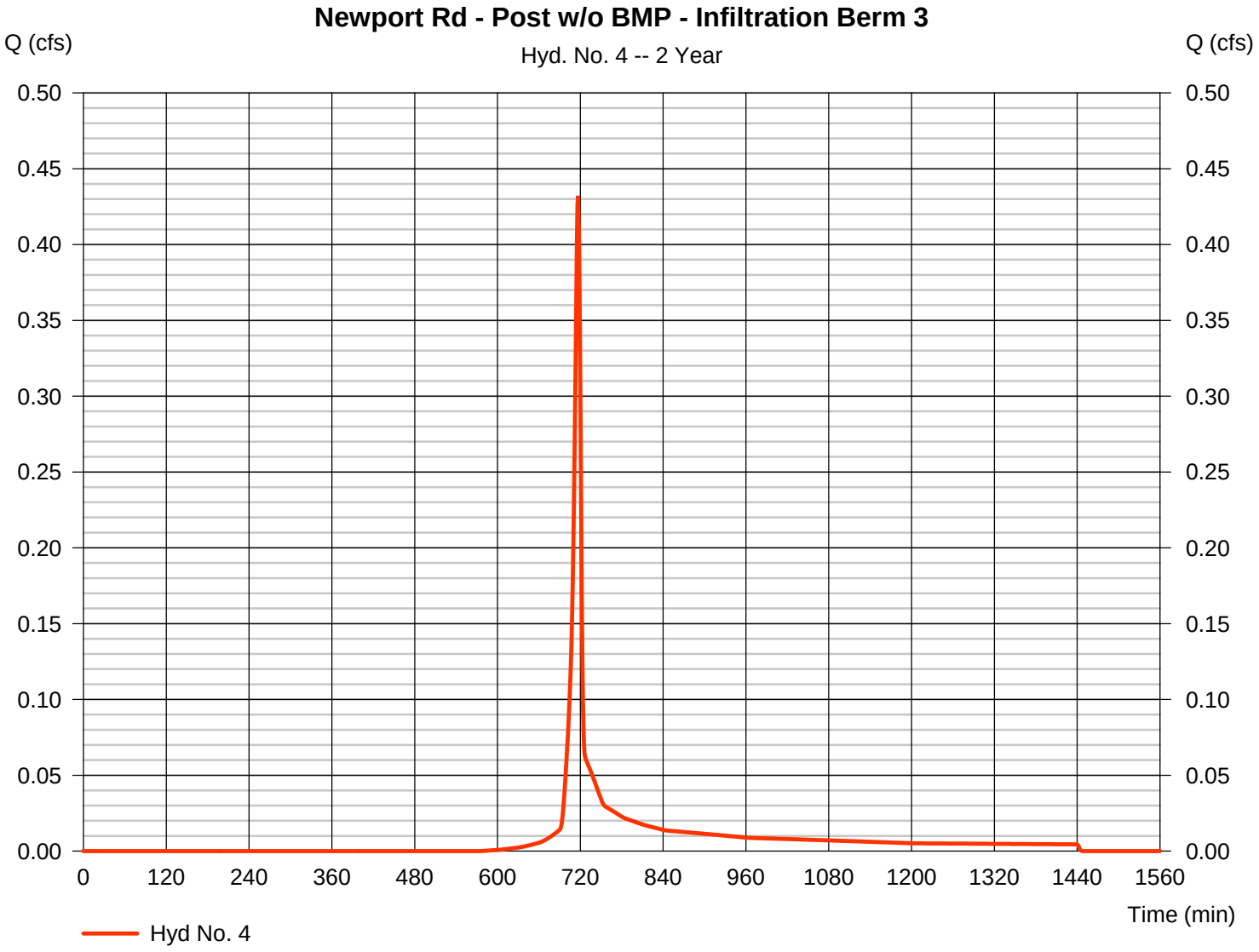
Hydrograph Report

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.432 cfs
Storm frequency	= 2 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 811 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.60 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



TR55 Tc Worksheet

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		94.00		0.00		
Watercourse slope (%)	= 5.50		8.50		0.00		
Surface description	= Paved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.77		4.70		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.33**	**+**	**0.00**	**=**	**0.90**
Channel Flow							
X sectional flow area (sqft)	= 2.00		2.00		0.00		
Wetted perimeter (ft)	= 4.47		4.47		0.00		
Channel slope (%)	= 4.49		7.51		0.00		
Manning's n-value	= 0.060		0.025		0.015		
Velocity (ft/s)	=3.07						
			9.53				
					0.00		
Flow length (ft)	({0})89.0		230.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.40**	**+**	**0.00**	**=**	**0.89**

Total Travel Time, Tc ..... 3.60 min

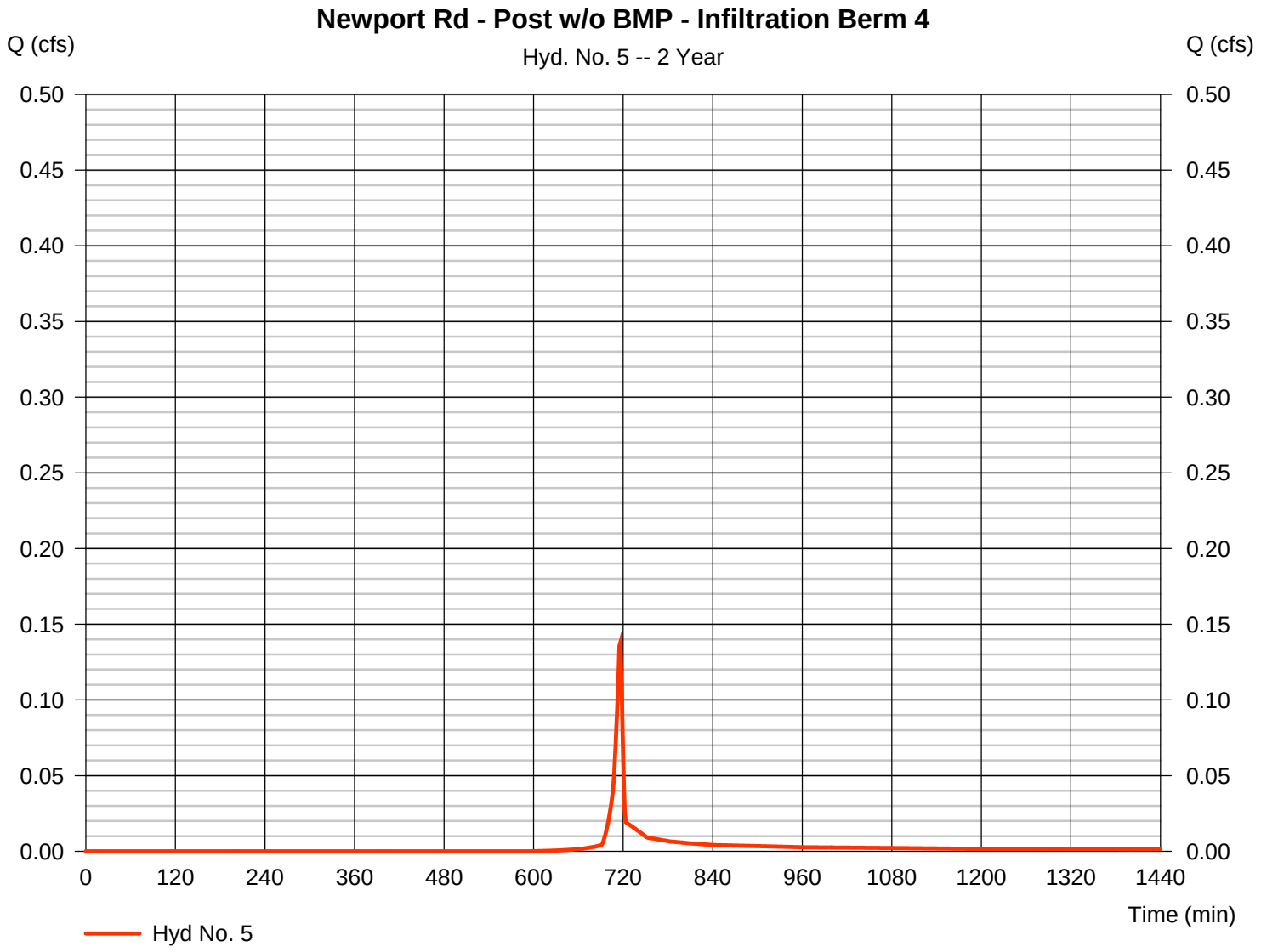
Hydrograph Report

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.138 cfs
Storm frequency	= 2 yrs	Time to peak	= 716 min
Time interval	= 1 min	Hyd. volume	= 239 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.30 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 69.00		0.00		0.00		
Watercourse slope (%)	= 5.90		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=3.92		0.00		0.00		
Travel Time (min)	**= 0.29**	**+**	**0.00**	**+**	**0.00**	**=**	**0.29**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})200.0		0.0		0.0		
Travel Time (min)	**= 0.36**	**+**	**0.00**	**+**	**0.00**	**=**	**0.36**

Total Travel Time, Tc ..... 2.30 min

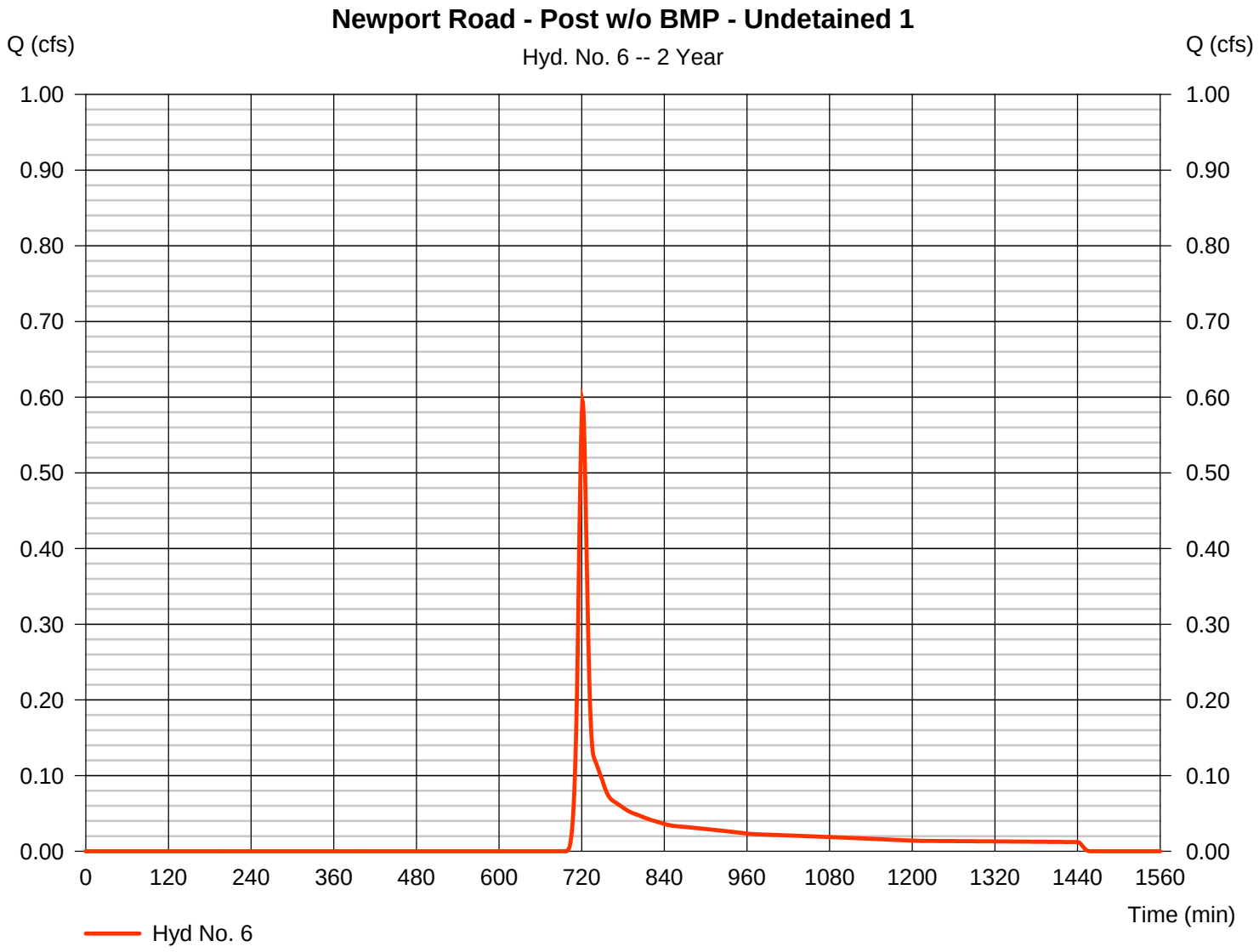
Hydrograph Report

Hyd. No. 6

Newport Road - Post w/o BMP - Undetained 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.595 cfs
Storm frequency	= 2 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 1,617 cuft
Drainage area	= 0.820 ac	Curve number	= 72*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.80 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - 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)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

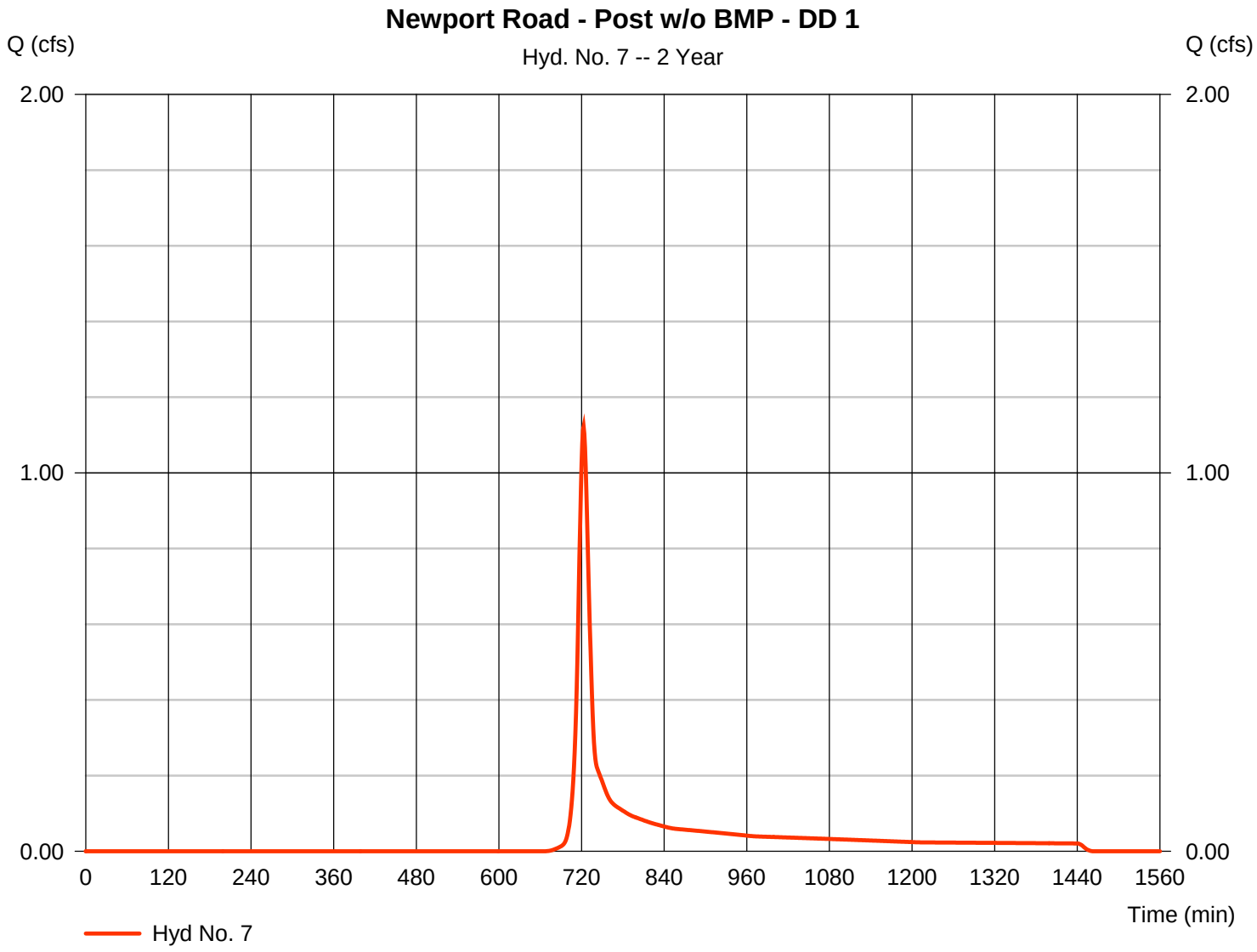
Hydrograph Report

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.121 cfs
Storm frequency	= 2 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 3,171 cuft
Drainage area	= 1.170 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.50 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

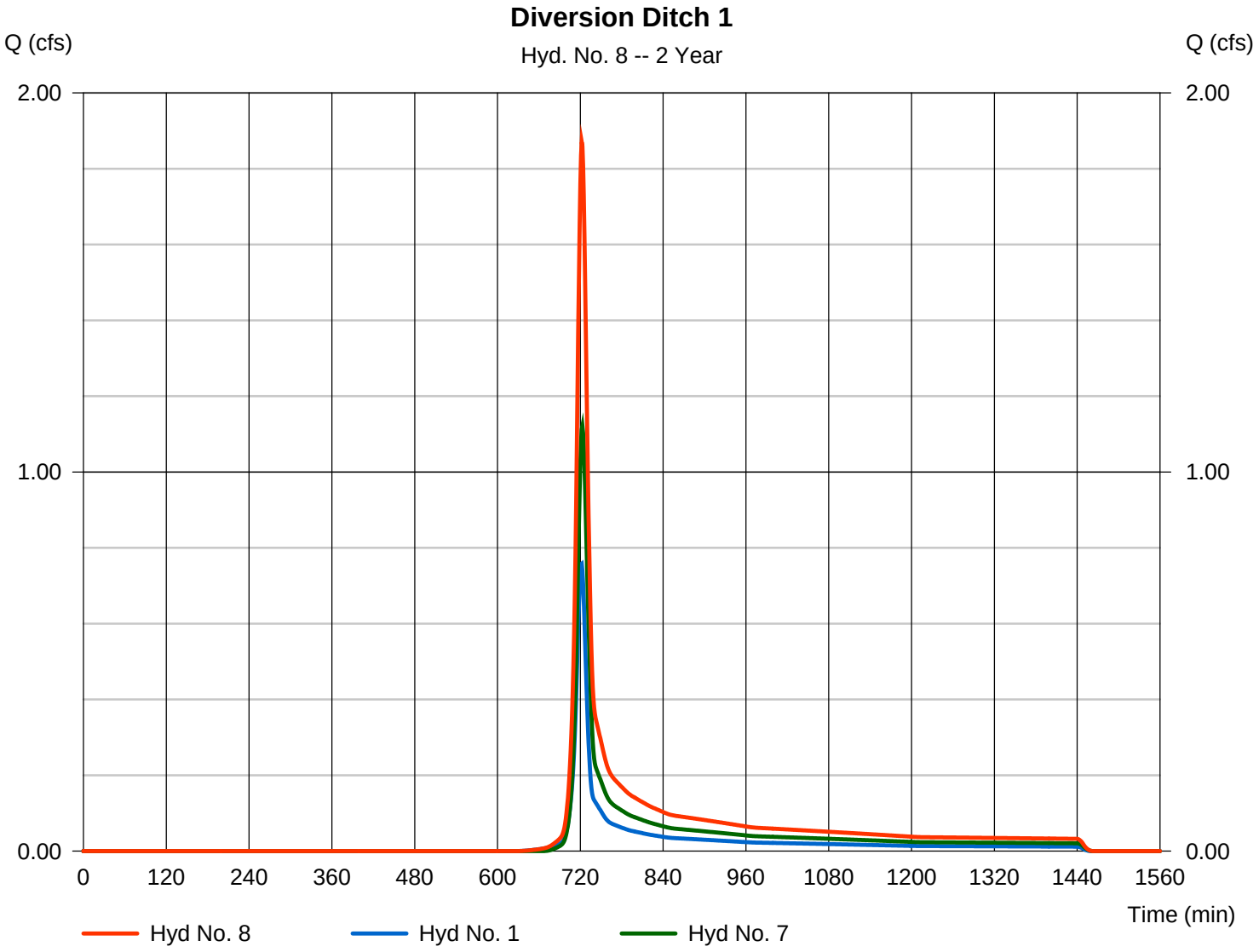
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 8

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 1.870 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 5,123 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.780 ac



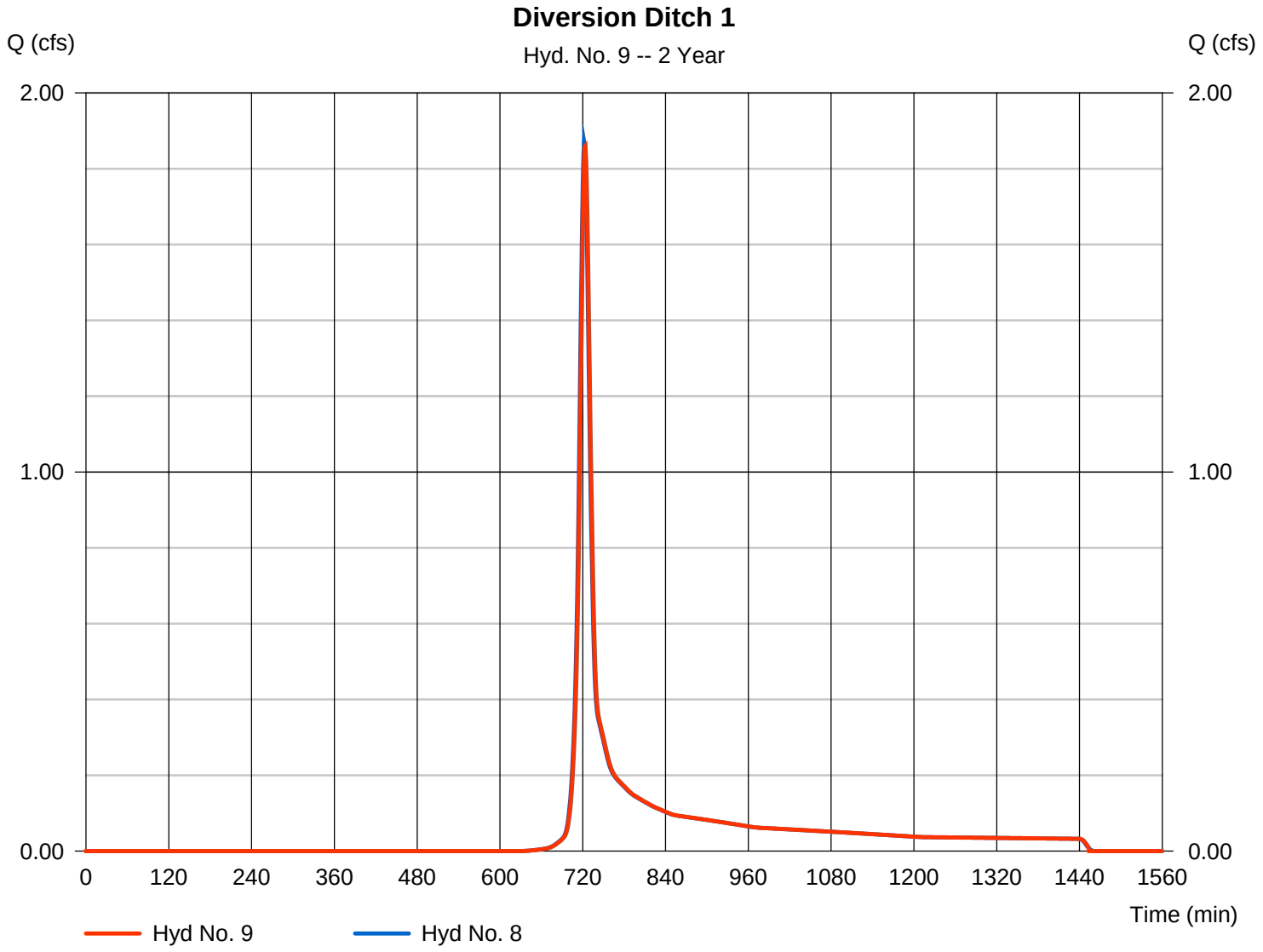
Hydrograph Report

Hyd. No. 9

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	1.859 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	5,121 cuft
Inflow hyd. No.	=	8 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7701

Modified Att-Kin routing method used.

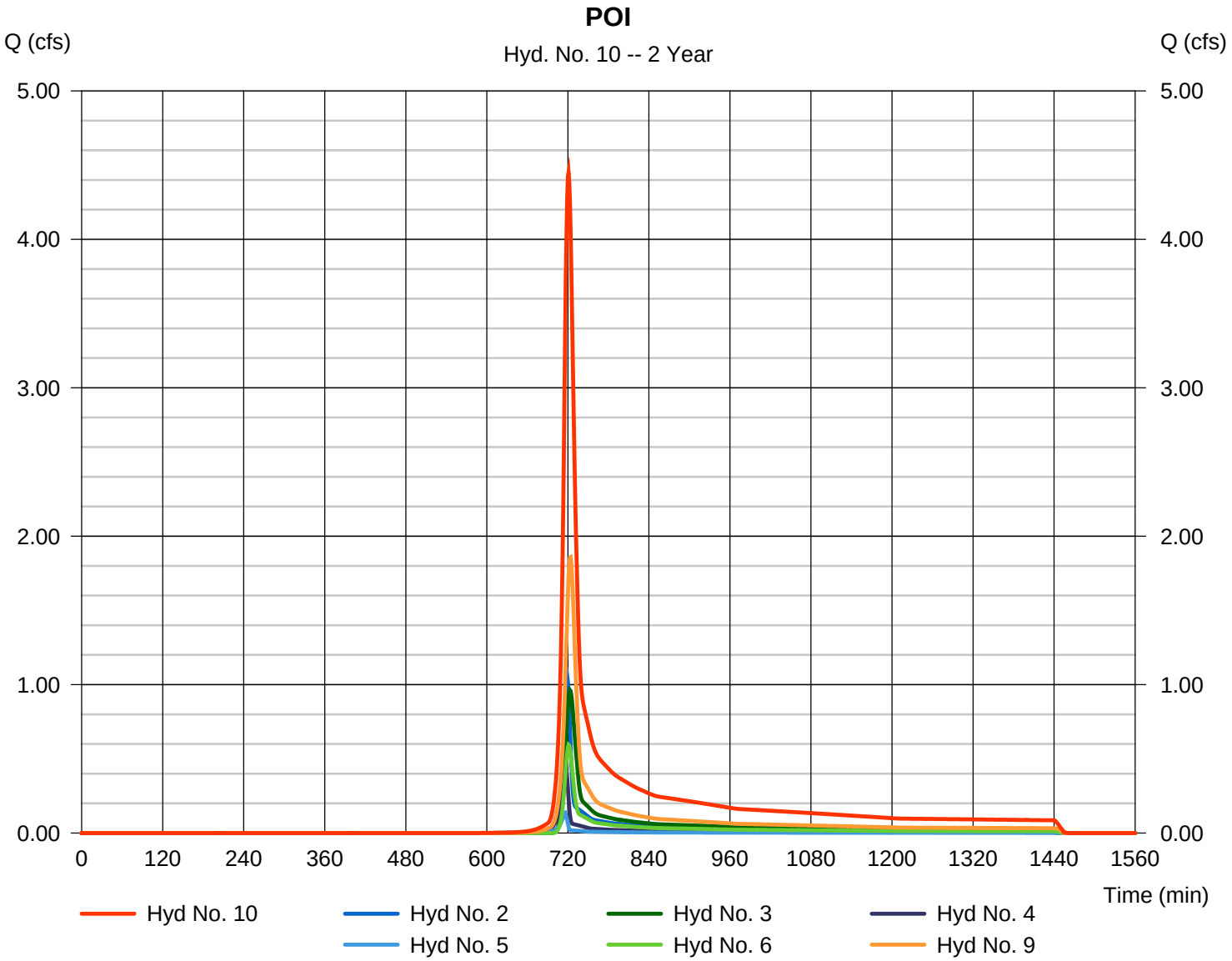


Hydrograph Report

Hyd. No. 10

POI

Hydrograph type	=	Combine	Peak discharge	=	4.448 cfs
Storm frequency	=	2 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	12,950 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 9	Contrib. drain. area	=	3.300 ac



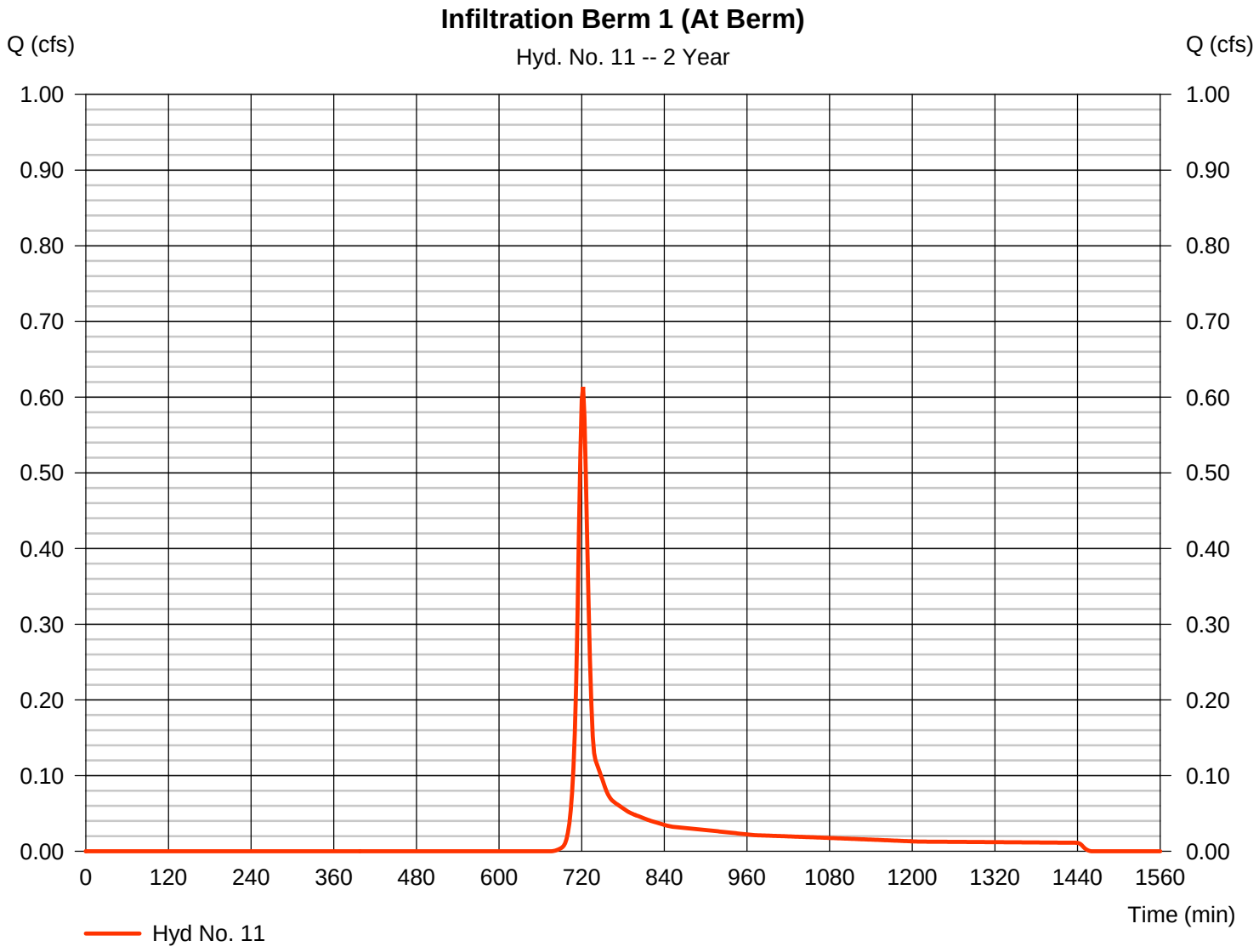
Hydrograph Report

Hyd. No. 11

Infiltration Berm 1 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.613 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	1,679 cuft
Drainage area	=	0.640 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.60 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.130 x 78) + (0.100 x 89) + (0.020 x 91)] / 0.640



TR55 Tc Worksheet

Hyd. No. 11

Infiltration Berm 1 (At 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		69.00		
Watercourse slope (%)	= 8.00		4.80		4.30		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		3.35		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**0.34**	**=**	**1.49**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.60 min

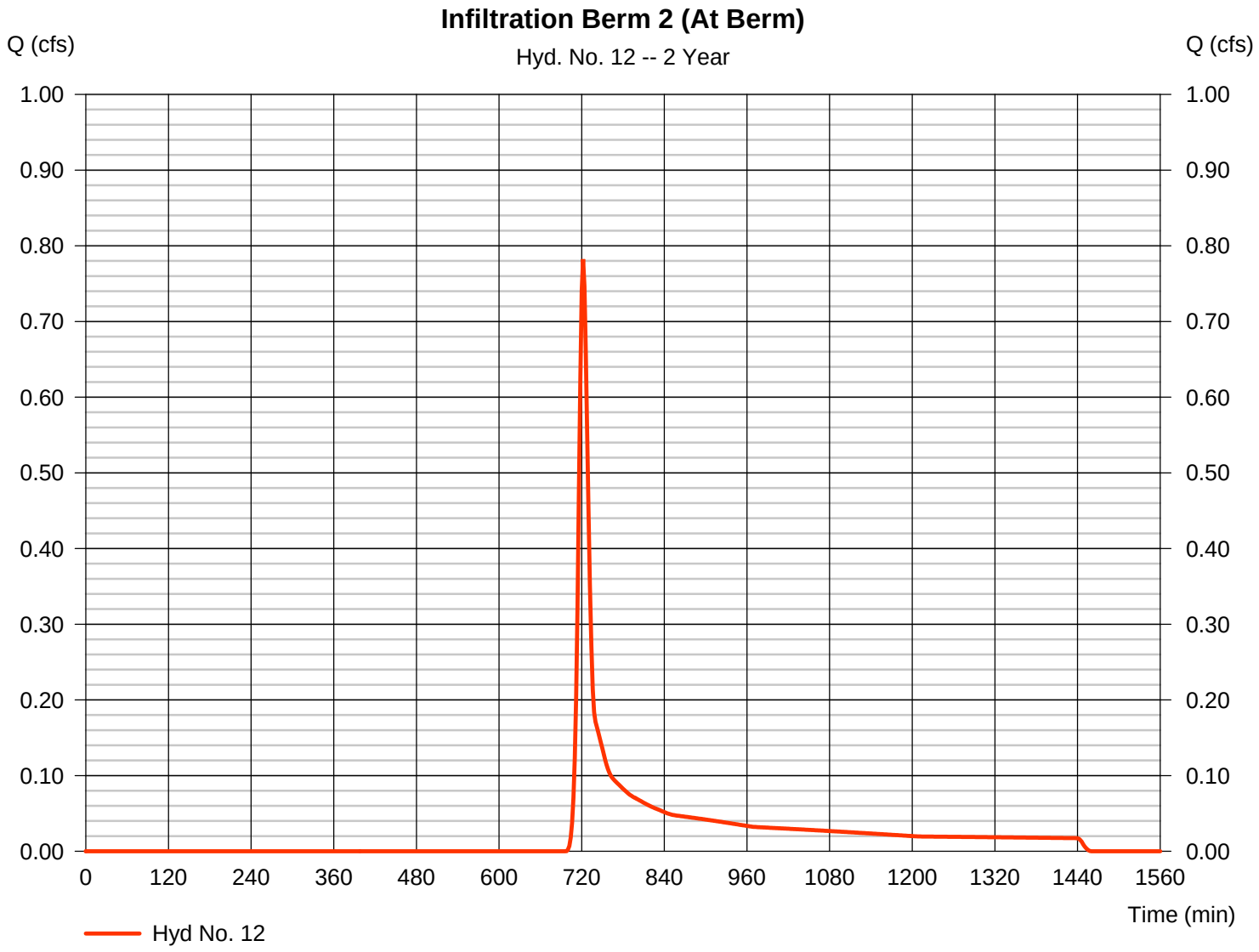
Hydrograph Report

Hyd. No. 12

Infiltration Berm 2 (At Berm)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.782 cfs
Storm frequency	= 2 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 2,298 cuft
Drainage area	= 1.150 ac	Curve number	= 72*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.90 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.030 x 71) + (0.070 x 78) + (0.050 x 89)] / 1.150



TR55 Tc Worksheet

Hyd. No. 12

Infiltration Berm 2 (At Berm)

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		2.51		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		0.00		0.00		
Watercourse slope (%)	= 6.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.08		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.90 min

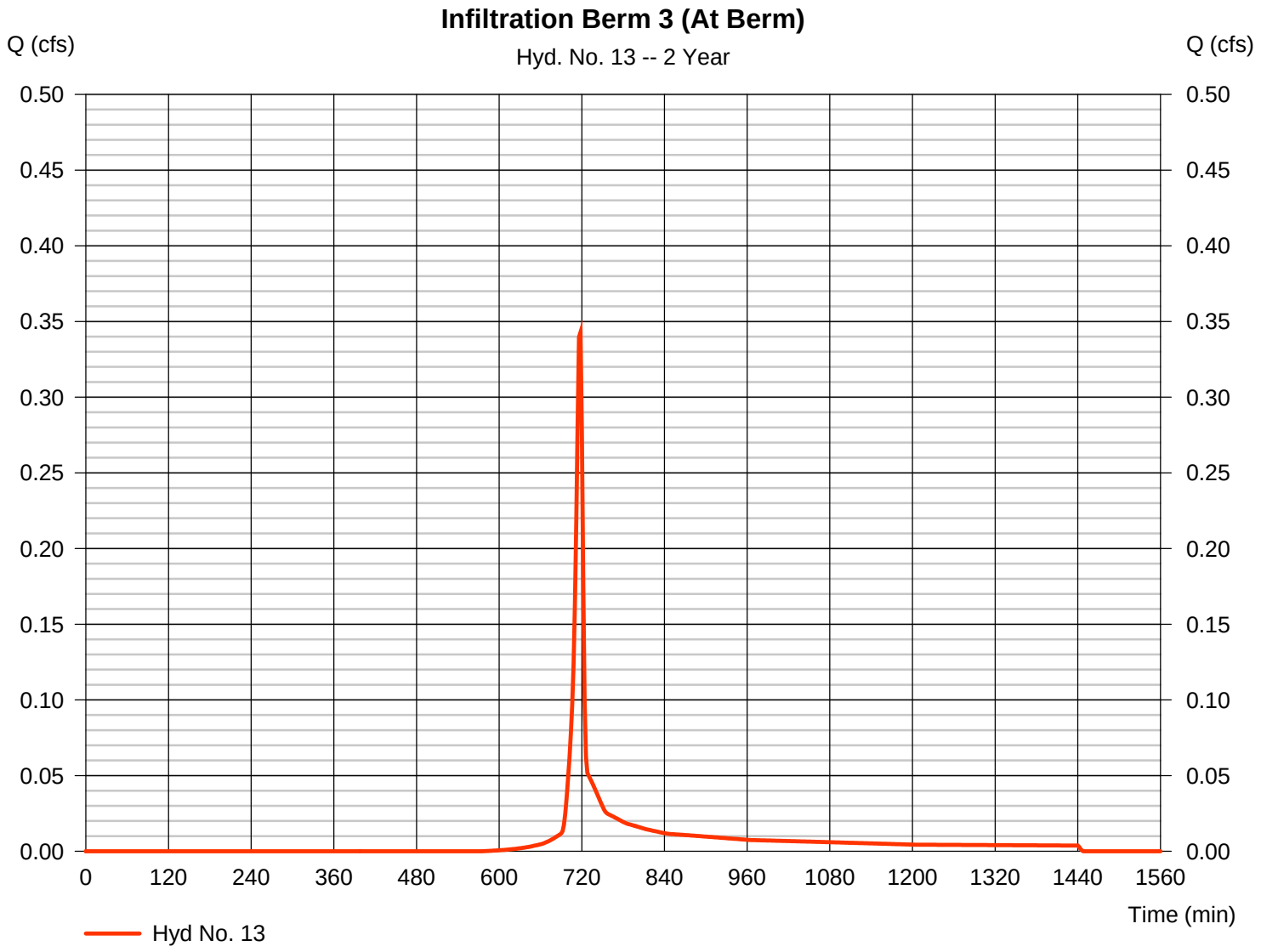
Hydrograph Report

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.343 cfs
Storm frequency	= 2 yrs	Time to peak	= 718 min
Time interval	= 2 min	Hyd. volume	= 688 cuft
Drainage area	= 0.190 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.10 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.110 x 78) + (0.080 x 91)] / 0.190



TR55 Tc Worksheet

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		46.00		0.00		
Watercourse slope (%)	= 5.50		6.50		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=4.77		4.11		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.19**	**+**	**0.00**	**=**	**0.76**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 4.49		0.00		0.00		
Manning's n-value	= 0.060		0.015		0.015		
Velocity (ft/s)	=3.07						
			0.00				
					0.00		
Flow length (ft)	({0})89.0		0.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.00**	**+**	**0.00**	**=**	**0.48**

Total Travel Time, Tc ..... 3.10 min

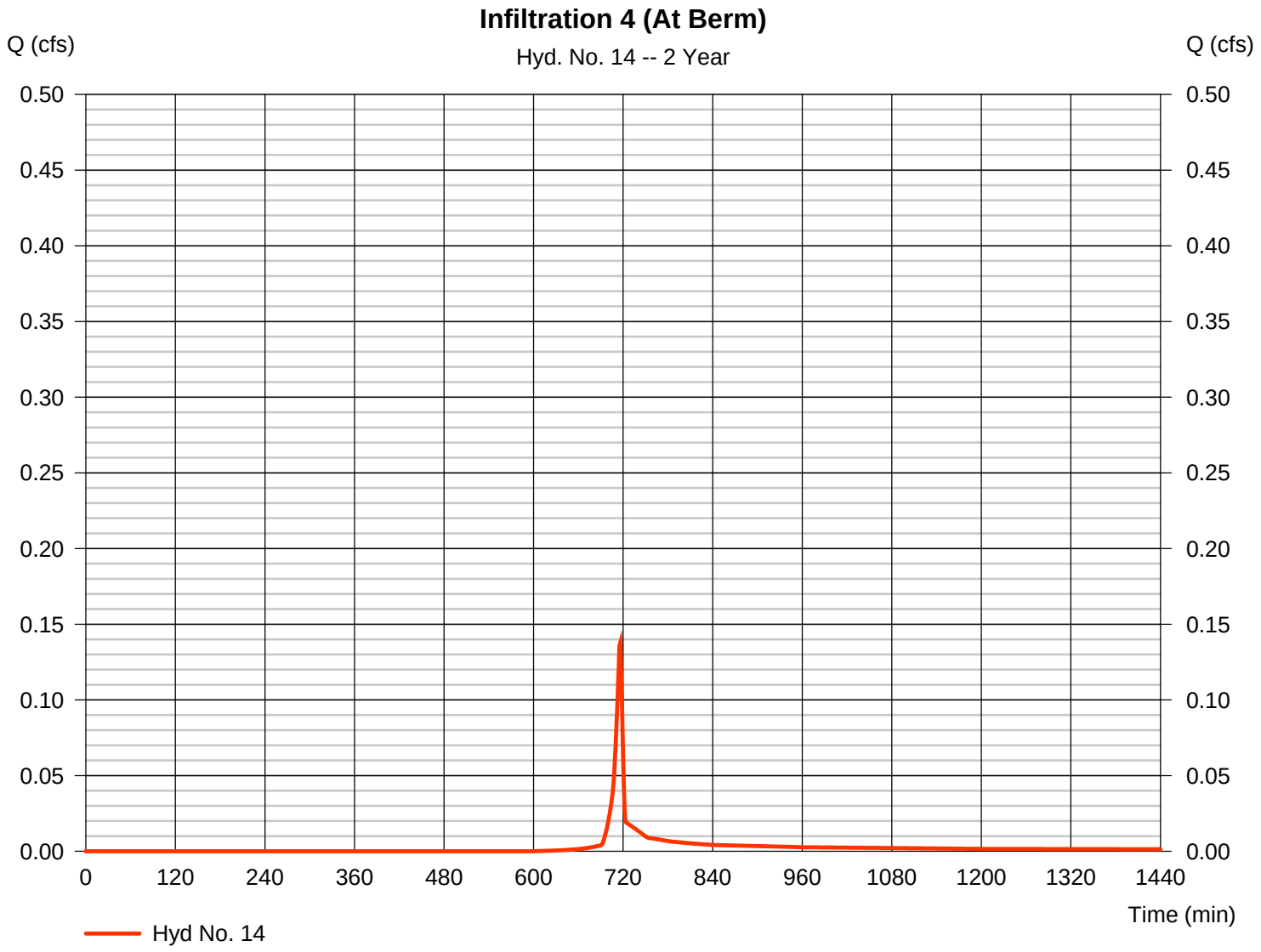
Hydrograph Report

Hyd. No. 14

Infiltration 4 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.138 cfs
Storm frequency	=	2 yrs	Time to peak	=	716 min
Time interval	=	1 min	Hyd. volume	=	239 cuft
Drainage area	=	0.070 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	1.90 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 14

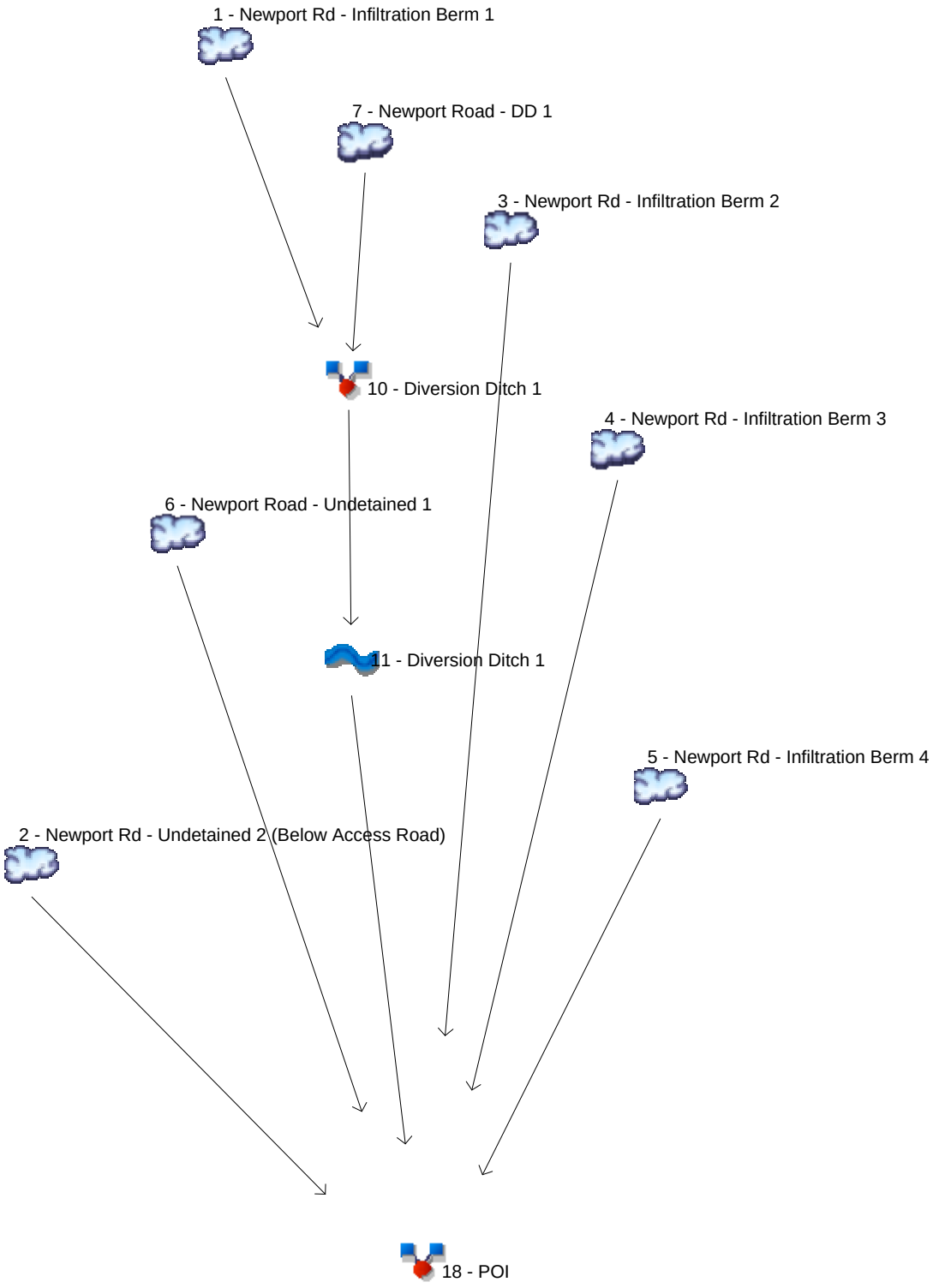
Infiltration 4 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 54.00		0.00		0.00		
Watercourse slope (%)	= 7.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.39		0.00		0.00		
Travel Time (min)	**= 0.21**	**+**	**0.00**	**+**	**0.00**	**=**	**0.21**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 1.90 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	------	-------	0.456	-------	-------	-------	-------	-------	-------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	------	-------	1.053	-------	-------	-------	-------	-------	-------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	------	-------	0.587	-------	-------	-------	-------	-------	-------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	------	-------	0.174	-------	-------	-------	-------	-------	-------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	------	-------	0.060	-------	-------	-------	-------	-------	-------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	------	-------	0.595	-------	-------	-------	-------	-------	-------	Newport Road - Undetained 1
7	SCS Runoff	------	-------	1.121	-------	-------	-------	-------	-------	-------	Newport Road - DD 1
10	Combine	1, 7,	-------	1.333	-------	-------	-------	-------	-------	-------	Diversion Ditch 1
11	Reach	10	-------	1.330	-------	-------	-------	-------	-------	-------	Diversion Ditch 1
18	Combine	2, 3, 4, 5, 6, 11,	-------	3.134	-------	-------	-------	-------	-------	-------	POI

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	0.456	1	742	2,656	------	------	------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	1.053	1	719	2,249	------	------	------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	0.587	1	734	2,931	------	------	------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	0.174	1	736	815	------	------	------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	0.060	1	733	257	------	------	------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	0.595	1	721	1,617	------	------	------	Newport Road - Undetained 1
7	SCS Runoff	1.121	1	723	3,171	------	------	------	Newport Road - DD 1
10	Combine	1.333	1	723	5,827	1, 7,	------	------	Diversion Ditch 1
11	Reach	1.330	1	725	5,818	10	------	------	Diversion Ditch 1
18	Combine	3.134	1	722	13,688	2, 3, 4, 5, 6, 11,	------	------	POI

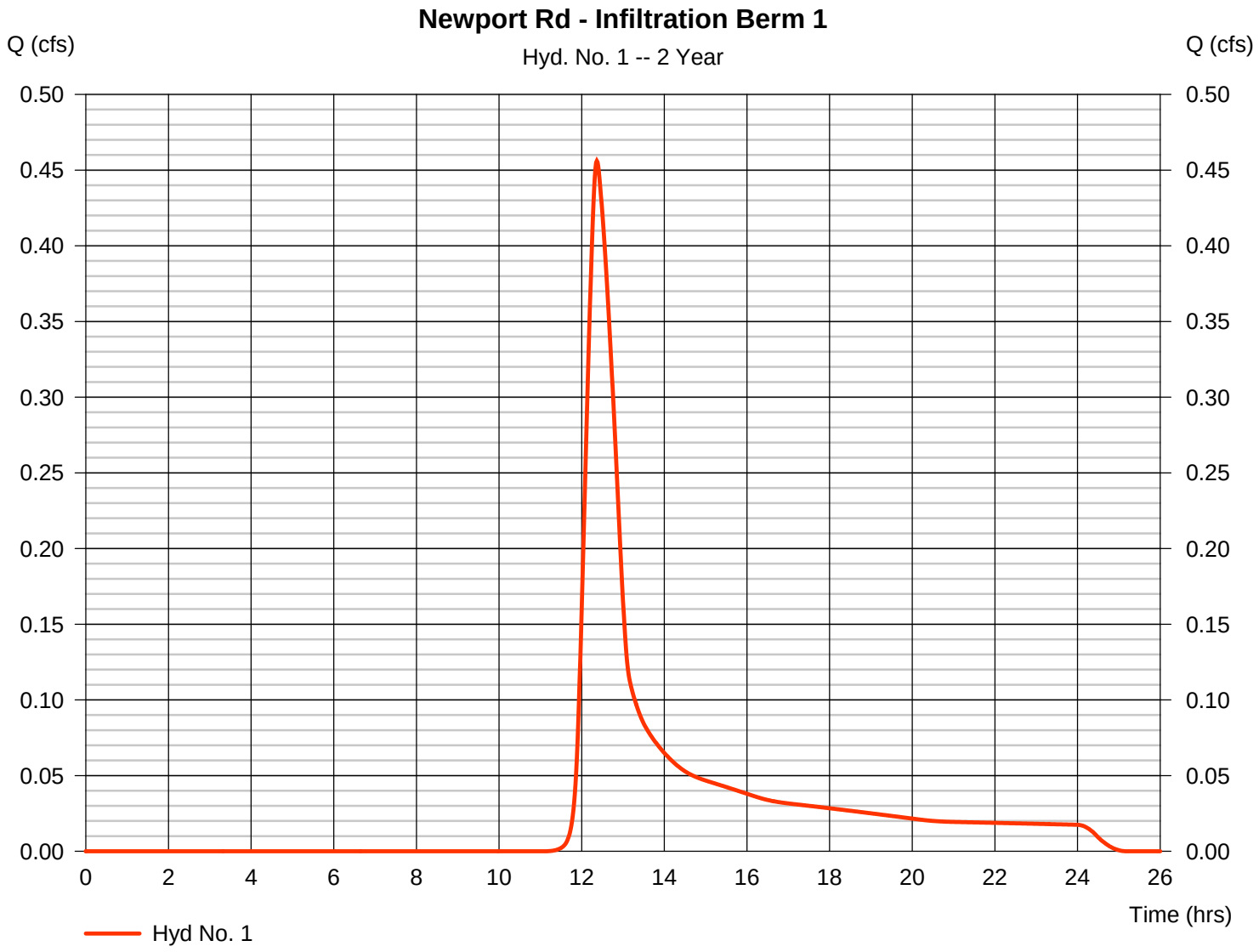
Hydrograph Report

Hyd. No. 1

Newport Rd - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.456 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.37 hrs
Time interval	=	1 min	Hyd. volume	=	2,656 cuft
Drainage area	=	0.980 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	45.30 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.980



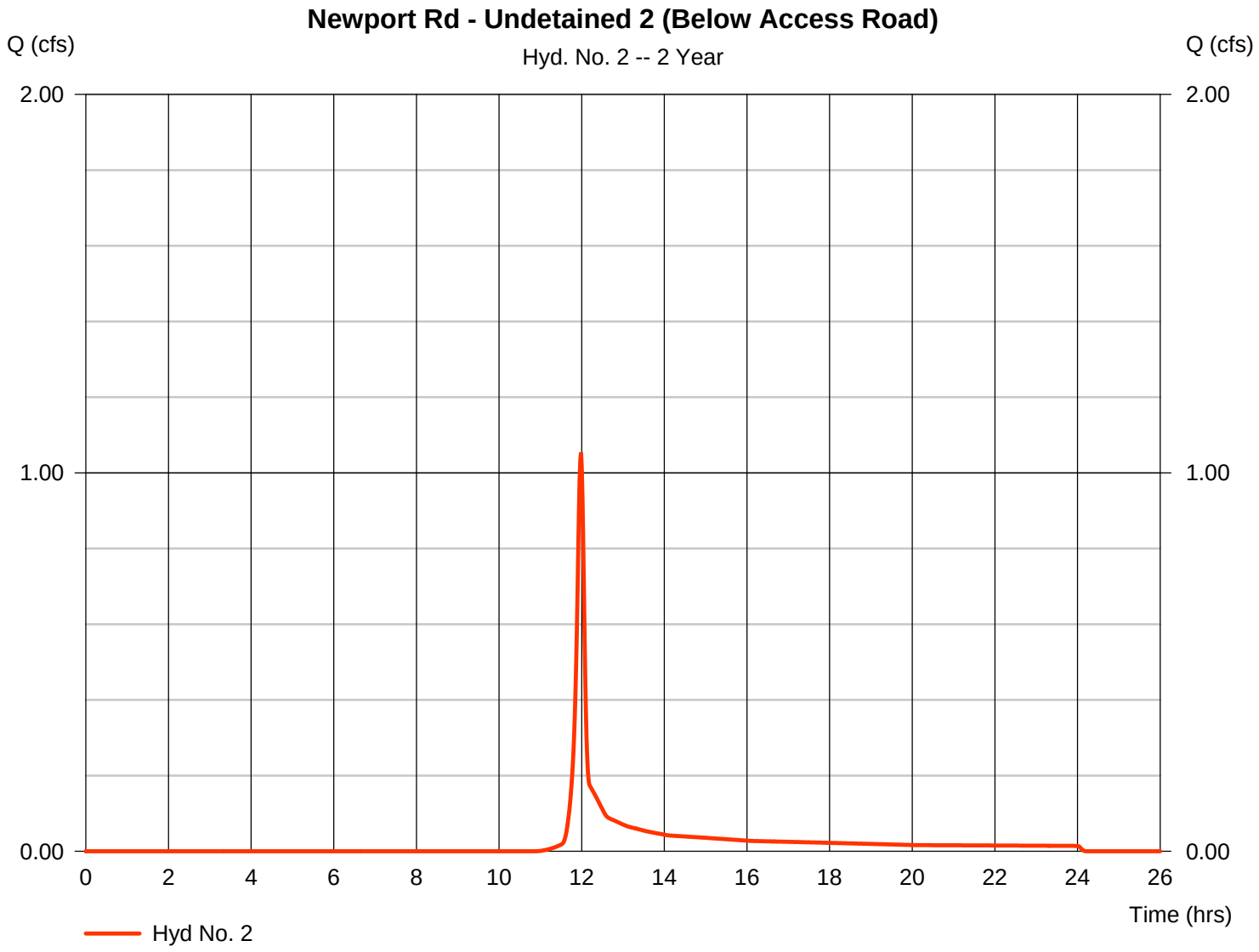
Hydrograph Report

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.053 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.98 hrs
Time interval	= 1 min	Hyd. volume	= 2,249 cuft
Drainage area	= 0.800 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 6.70 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

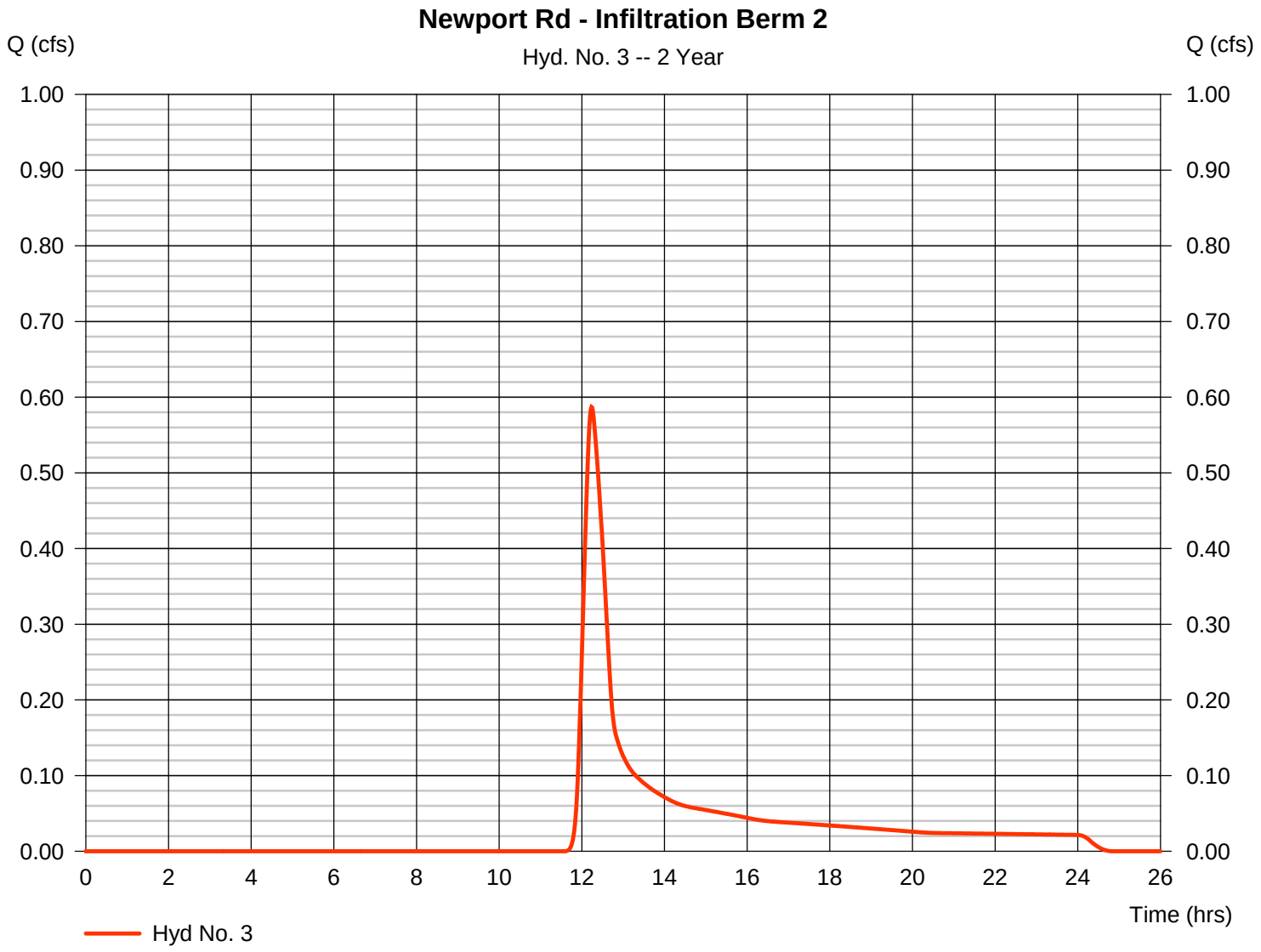
Hydrograph Report

Hyd. No. 3

Newport Rd - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.587 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.23 hrs
Time interval	=	1 min	Hyd. volume	=	2,931 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	31.80 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



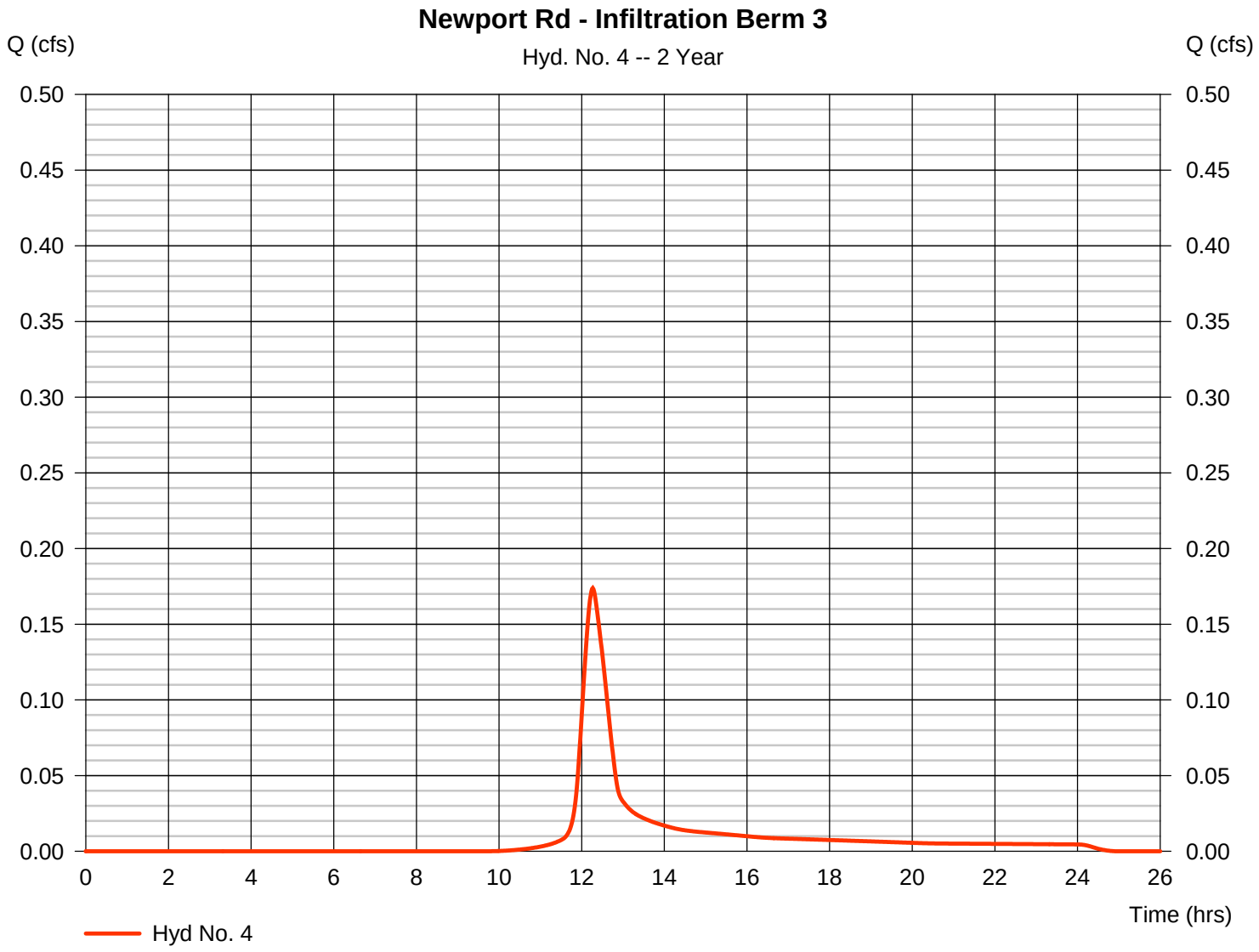
Hydrograph Report

Hyd. No. 4

Newport Rd - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.174 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.27 hrs
Time interval	= 1 min	Hyd. volume	= 815 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.00 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



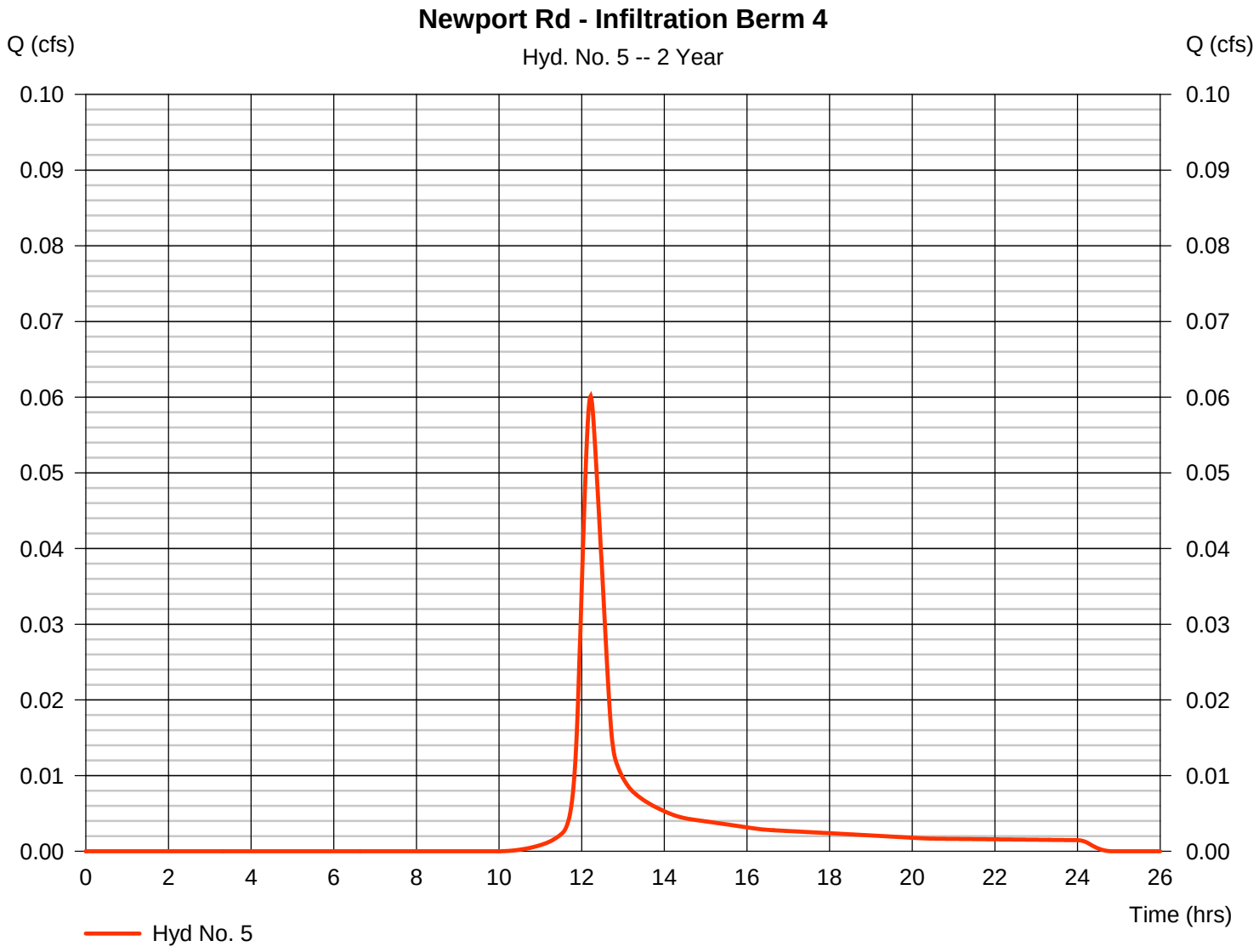
Hydrograph Report

Hyd. No. 5

Newport Rd - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.060 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.22 hrs
Time interval	= 1 min	Hyd. volume	= 257 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 31.20 min
Total precip.	= 2.51 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



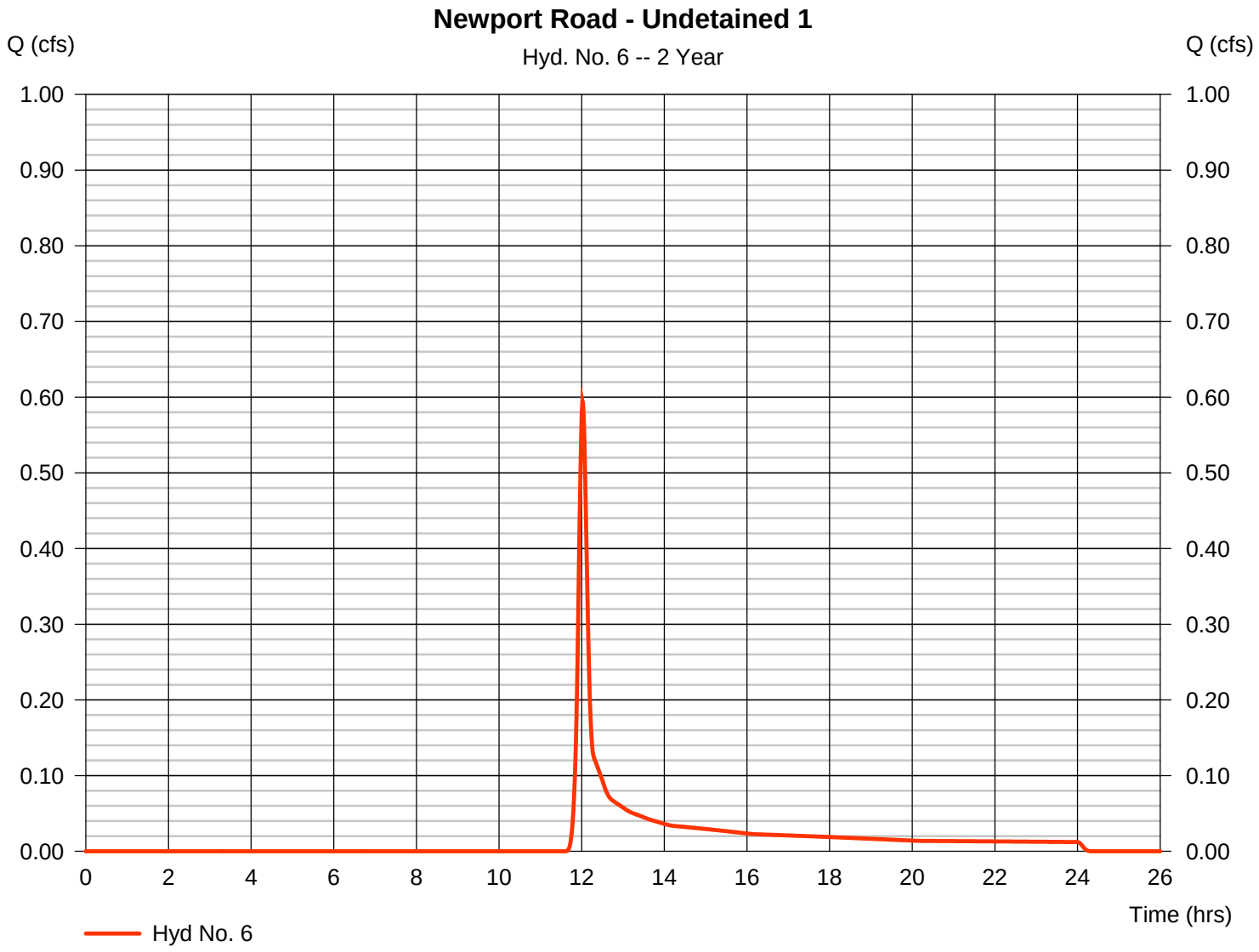
Hydrograph Report

Hyd. No. 6

Newport Road - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.595 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.02 hrs
Time interval	=	1 min	Hyd. volume	=	1,617 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - Undetained 1

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 (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

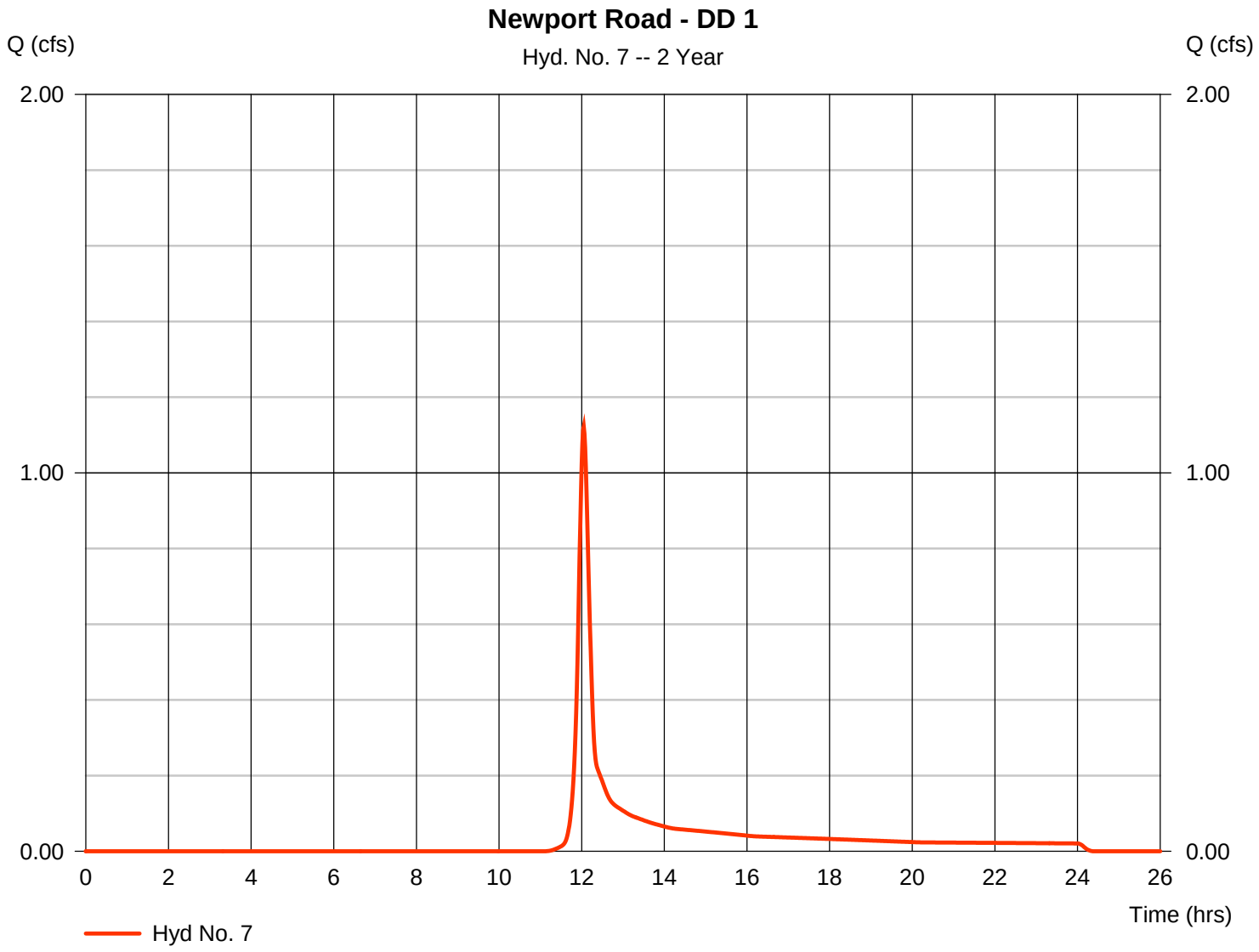
Hydrograph Report

Hyd. No. 7

Newport Road - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.121 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.05 hrs
Time interval	=	1 min	Hyd. volume	=	3,171 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	2.51 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

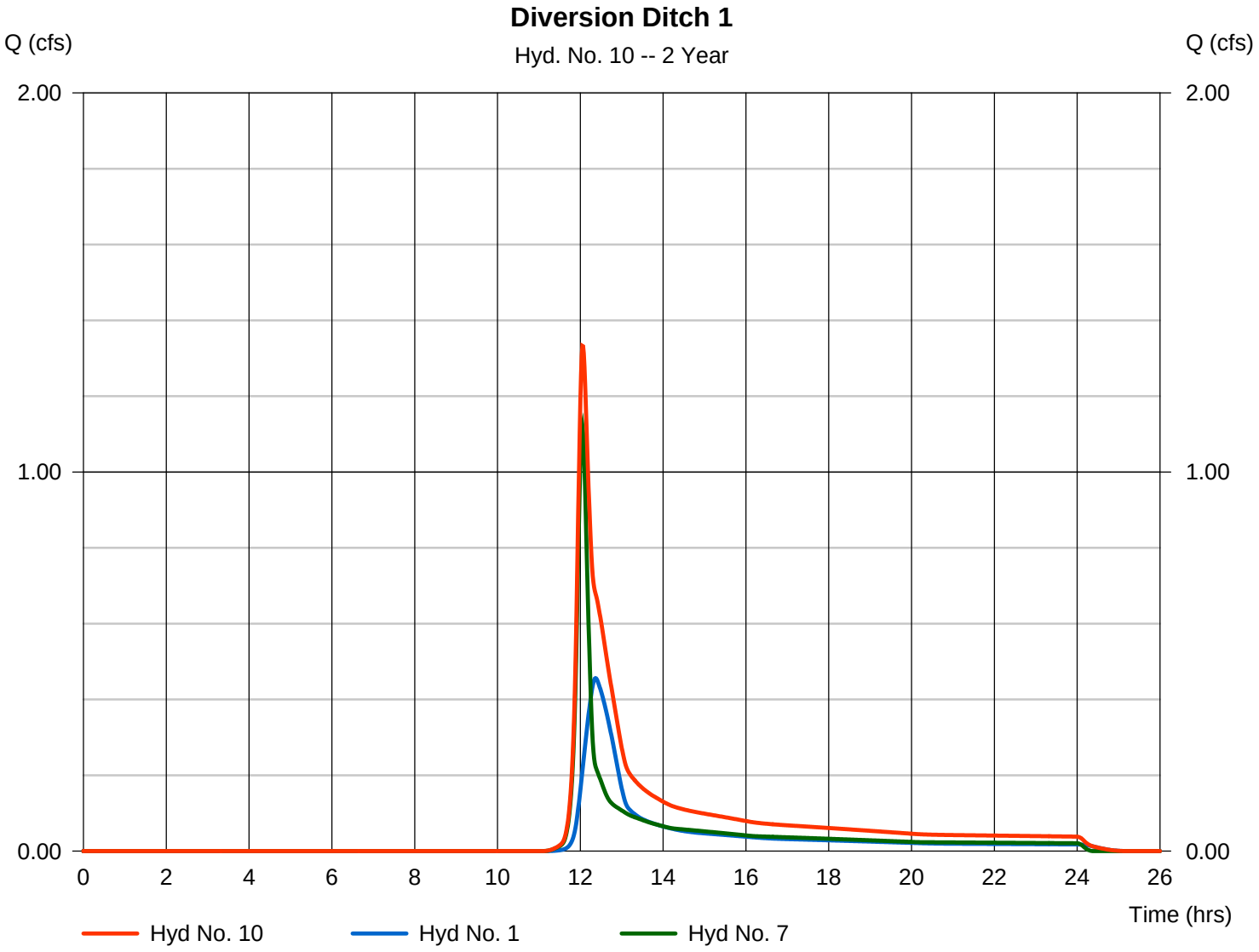
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 10

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 1.333 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.05 hrs
Time interval	= 1 min	Hyd. volume	= 5,827 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 2.150 ac



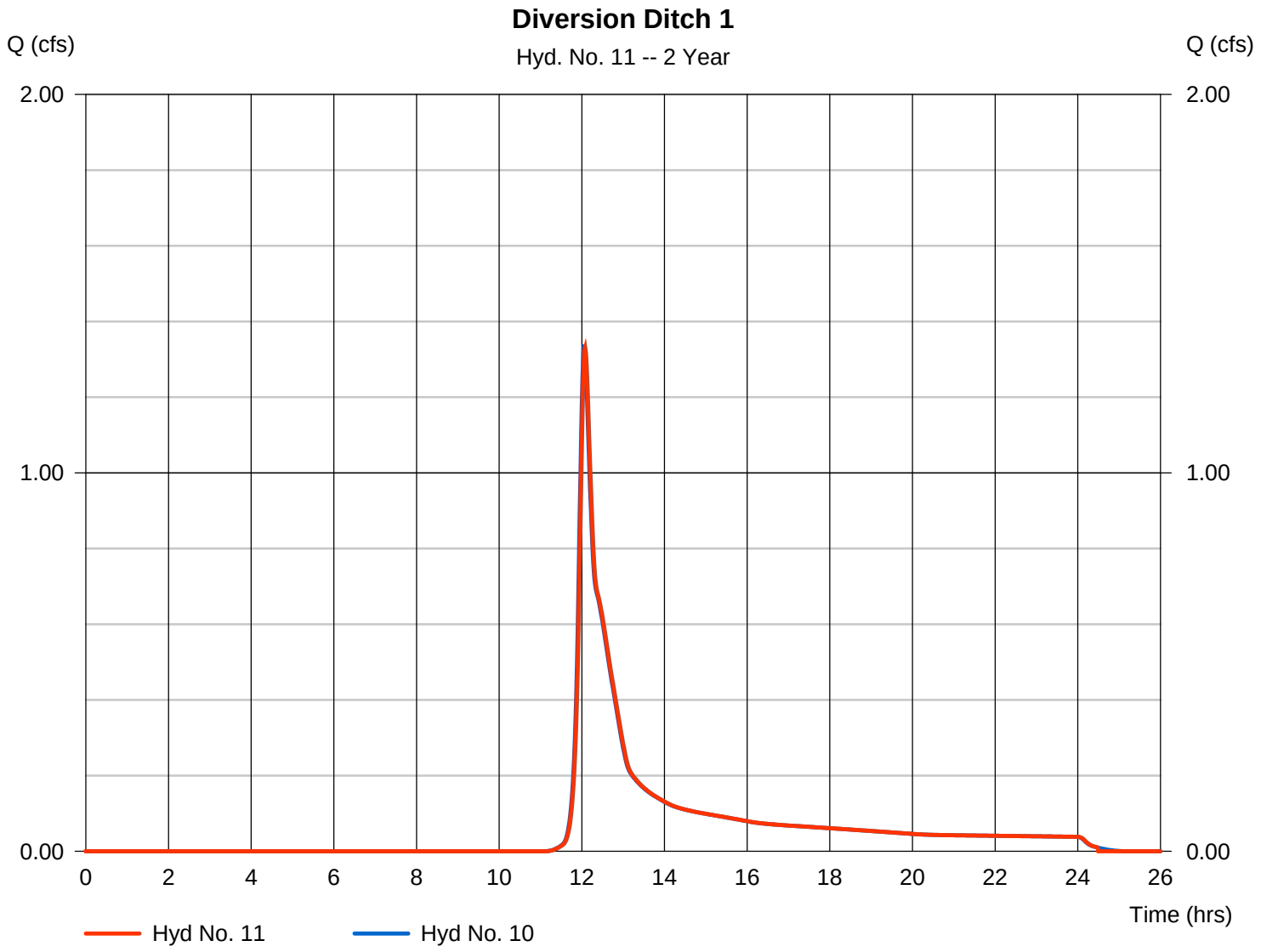
Hydrograph Report

Hyd. No. 11

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	1.330 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.08 hrs
Time interval	=	1 min	Hyd. volume	=	5,818 cuft
Inflow hyd. No.	=	10 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7755

Modified Att-Kin routing method used.

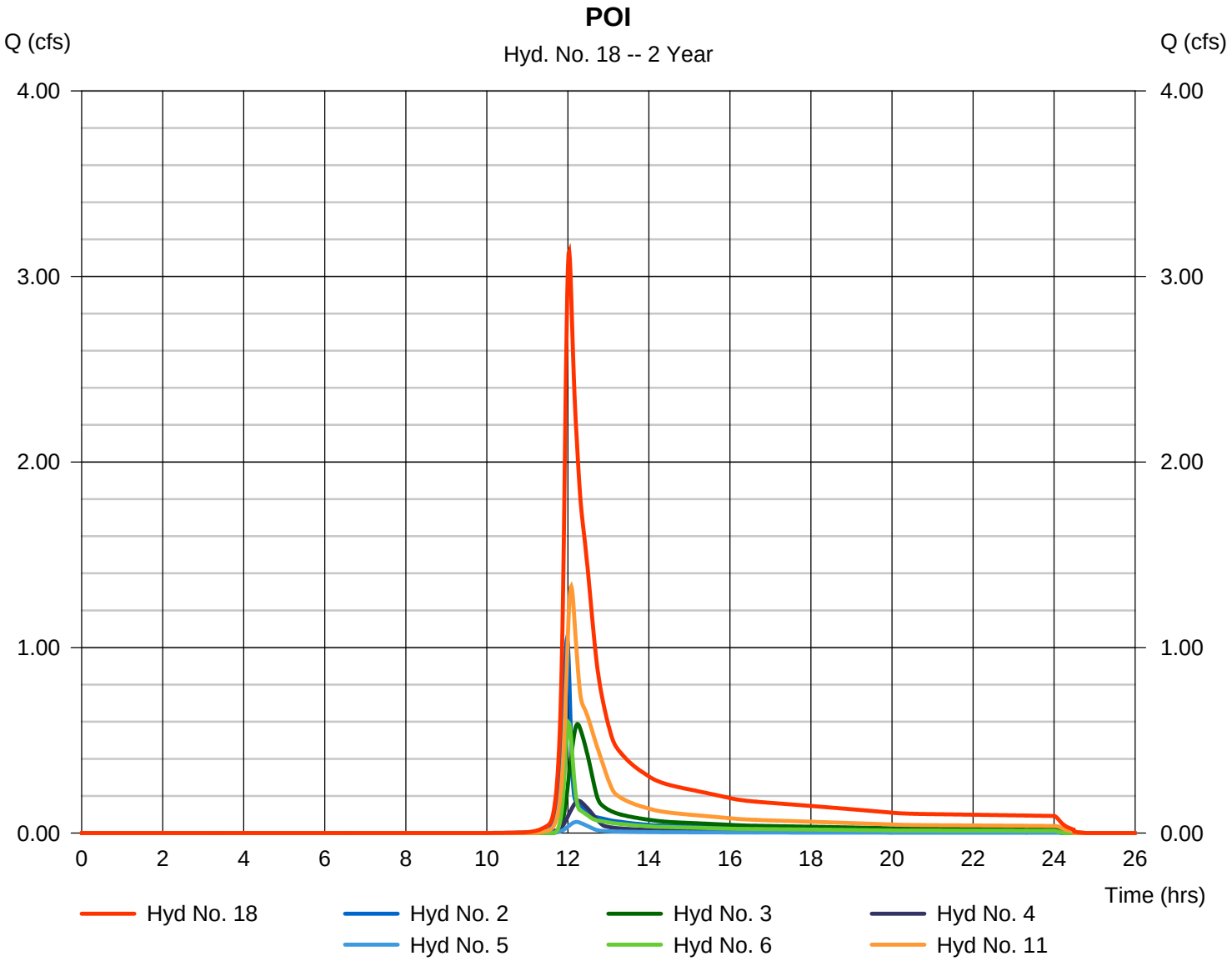


Hydrograph Report

Hyd. No. 18

POI

Hydrograph type	=	Combine	Peak discharge	=	3.134 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	1 min	Hyd. volume	=	13,688 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 11	Contrib. drain. area	=	3.300 ac



ATTACHMENT C-2
NEWPORT 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	------	-------	5.466	-------	-------	11.50	-------	19.42	23.37	Newport 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	11.50	1	720	26,127	------	------	------	Newport Rd - PRE

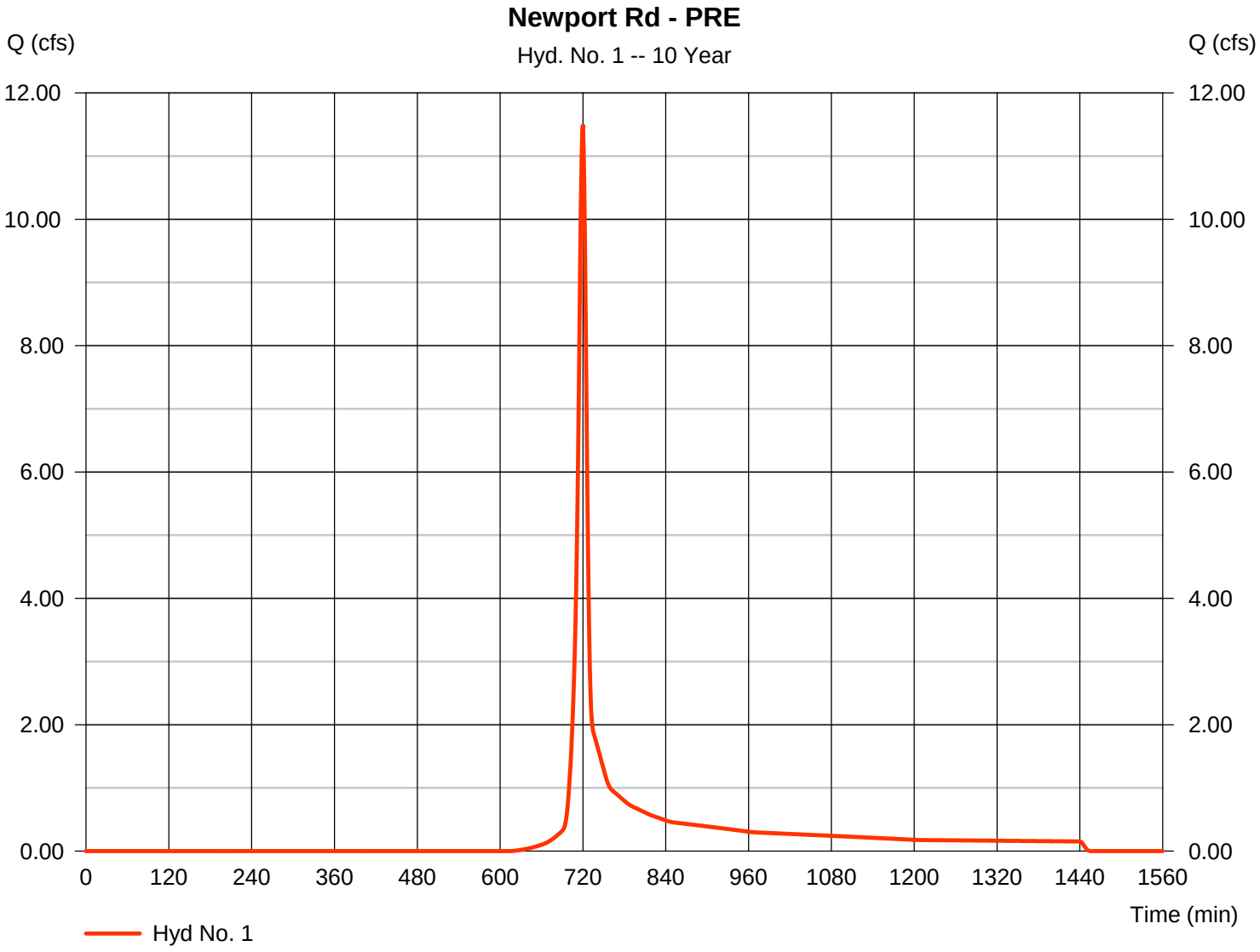
Hydrograph Report

Hyd. No. 1

Newport Rd - PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.50 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	26,127 cuft
Drainage area	=	5.440 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.00 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.530 x 71) + (2.680 x 78) + (0.230 x 77)] / 5.440



TR55 Tc Worksheet

Hyd. No. 1

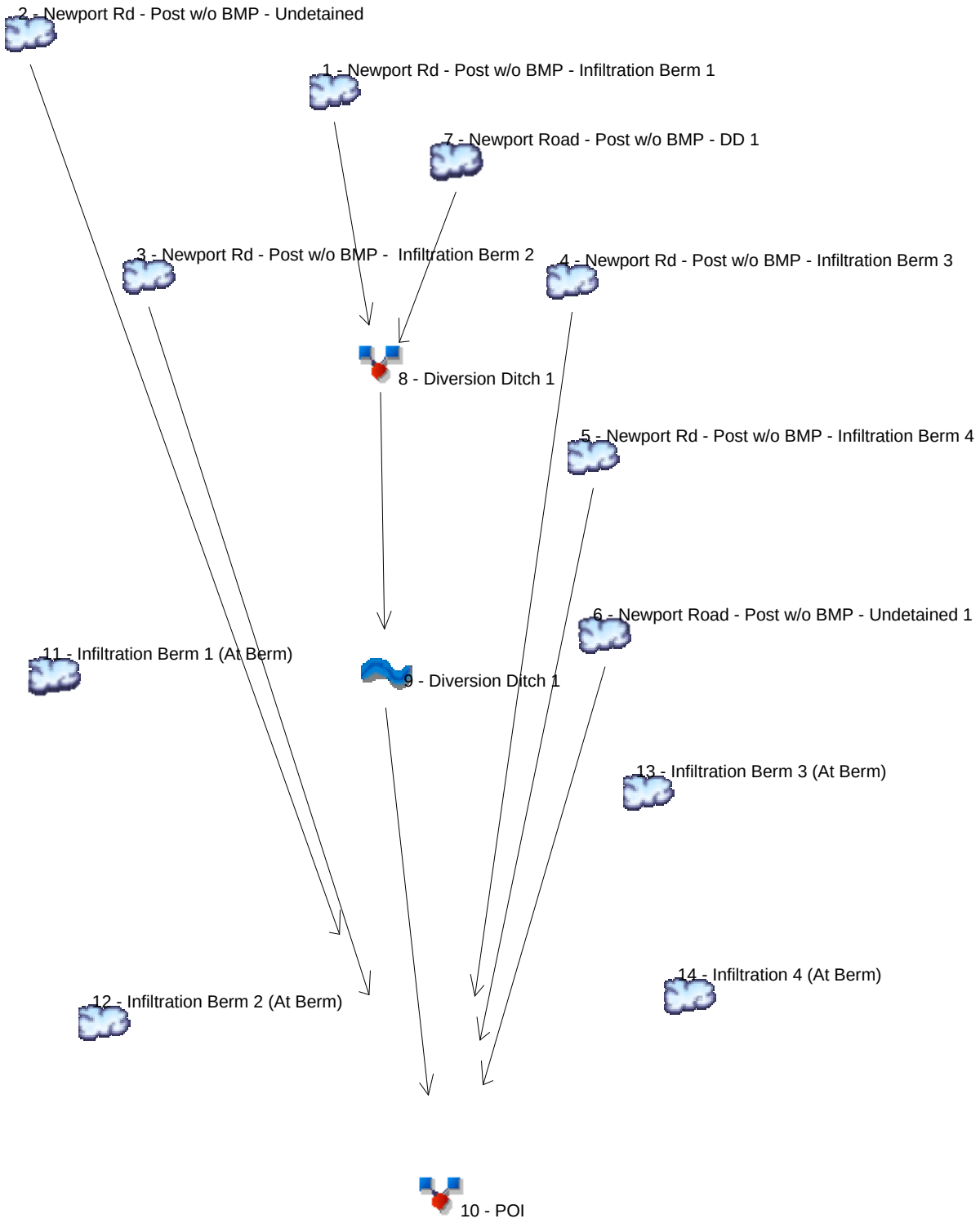
Newport Rd - PRE

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 (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 6.35**	**+**	**0.00**	**+**	**0.00**	**=**	**6.35**
Shallow Concentrated Flow							
Flow length (ft)	= 620.00		141.00		124.00		
Watercourse slope (%)	= 6.50		12.80		4.70		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.11		5.77		3.50		
Travel Time (min)	**= 2.51**	**+**	**0.41**	**+**	**0.59**	**=**	**3.51**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})63.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 10.00 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	------	-------	0.758	-------	-------	1.432	-------	2.282	2.694	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	------	-------	1.053	-------	-------	2.041	-------	3.307	3.927	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.964	-------	-------	2.202	-------	3.878	4.722	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	------	-------	0.432	-------	-------	0.754	-------	1.148	1.337	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	------	-------	0.595	-------	-------	1.394	-------	2.476	3.022	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	------	-------	1.121	-------	-------	2.272	-------	3.777	4.516	Newport Road - Post w/o BMP - DD 1
8	Combine	1, 7	-------	1.870	-------	-------	3.695	-------	6.035	7.178	Diversion Ditch 1
9	Reach	8	-------	1.859	-------	-------	3.677	-------	6.014	7.156	Diversion Ditch 1
10	Combine	2, 3, 4, 5, 6, 9	-------	4.448	-------	-------	9.297	-------	15.70	18.87	POI
11	SCS Runoff	------	-------	0.613	-------	-------	1.265	-------	2.128	2.558	Infiltration Berm 1 (At Berm)
12	SCS Runoff	------	-------	0.782	-------	-------	1.836	-------	3.263	3.993	Infiltration Berm 2 (At Berm)
13	SCS Runoff	------	-------	0.343	-------	-------	0.602	-------	0.923	1.076	Infiltration Berm 3 (At Berm)
14	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Infiltration 4 (At Berm)

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	1.432	1	721	3,619	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	2.041	1	719	4,304	------	------	------	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	2.202	1	723	6,098	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	0.754	1	717	1,436	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	0.243	1	716	431	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	1.394	1	721	3,456	------	------	------	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	2.272	1	722	6,170	------	------	------	Newport Road - Post w/o BMP - DD 1
8	Combine	3.695	1	722	9,789	1, 7	------	------	Diversion Ditch 1
9	Reach	3.677	1	723	9,787	8	------	------	Diversion Ditch 1
10	Combine	9.297	1	720	25,511	2, 3, 4, 5, 6, 9	------	------	POI
11	SCS Runoff	1.265	2	722	3,323	------	------	------	Infiltration Berm 1 (At Berm)
12	SCS Runoff	1.836	2	722	4,910	------	------	------	Infiltration Berm 2 (At Berm)
13	SCS Runoff	0.602	2	716	1,218	------	------	------	Infiltration Berm 3 (At Berm)
14	SCS Runoff	0.243	1	716	431	------	------	------	Infiltration 4 (At Berm)

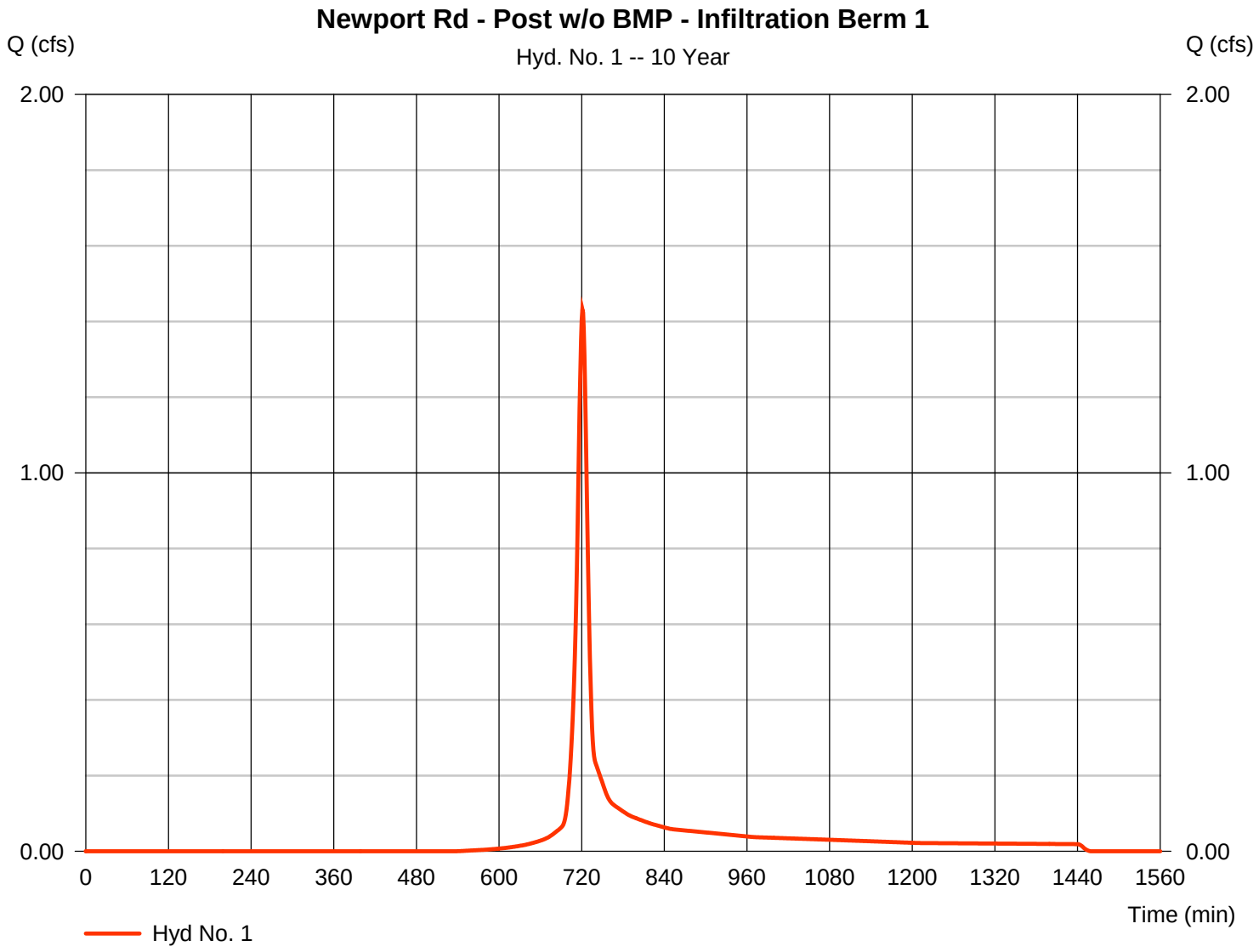
Hydrograph Report

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.432 cfs
Storm frequency	=	10 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	3,619 cuft
Drainage area	=	0.610 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.40 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.610



TR55 Tc Worksheet

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		297.00		
Watercourse slope (%)	= 8.00		4.80		6.40		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		4.08		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**1.21**	**=**	**2.36**
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 ..... 13.40 min

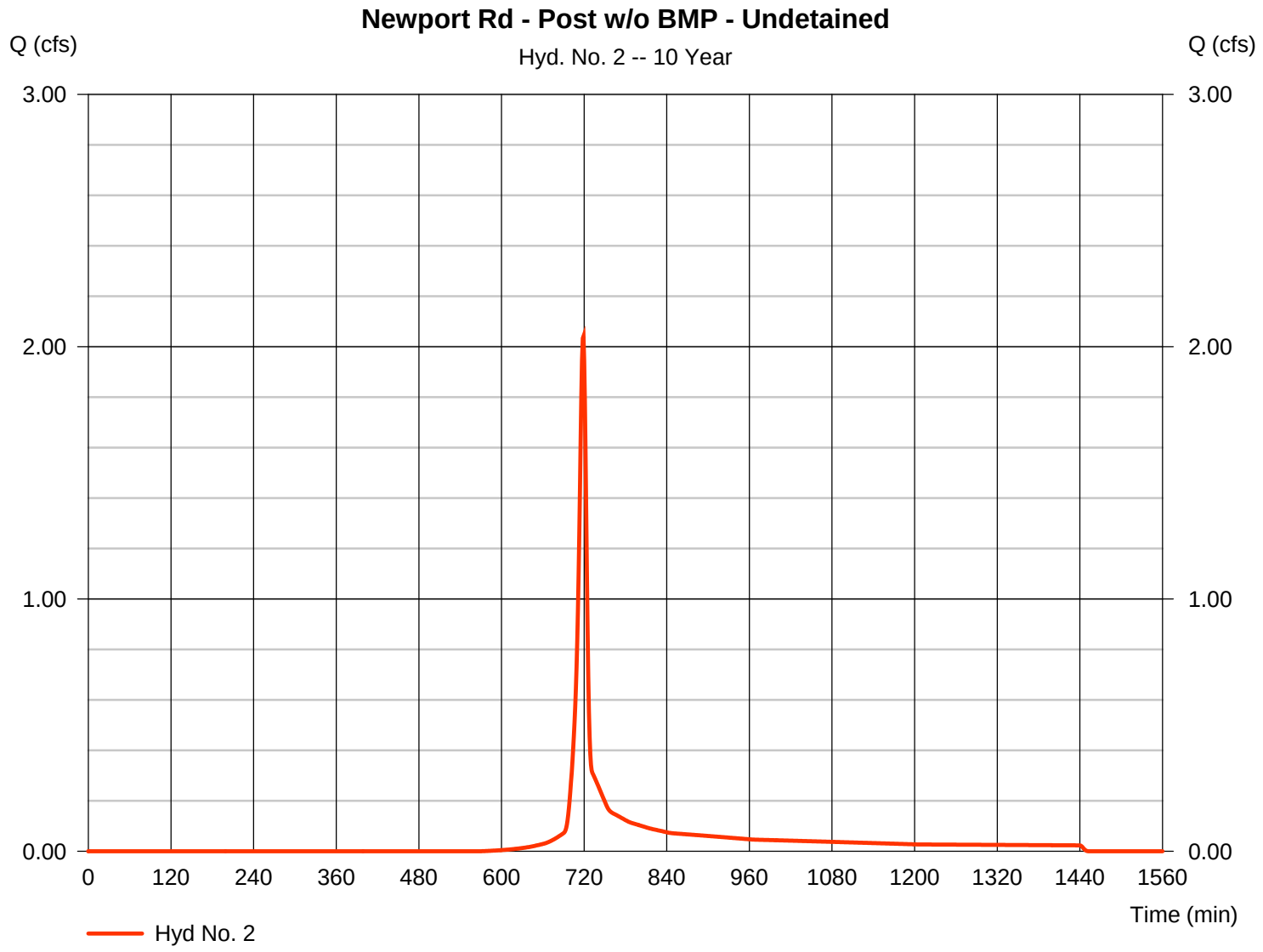
Hydrograph Report

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.041 cfs
Storm frequency	=	10 yrs	Time to peak	=	719 min
Time interval	=	1 min	Hyd. volume	=	4,304 cuft
Drainage area	=	0.800 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.70 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

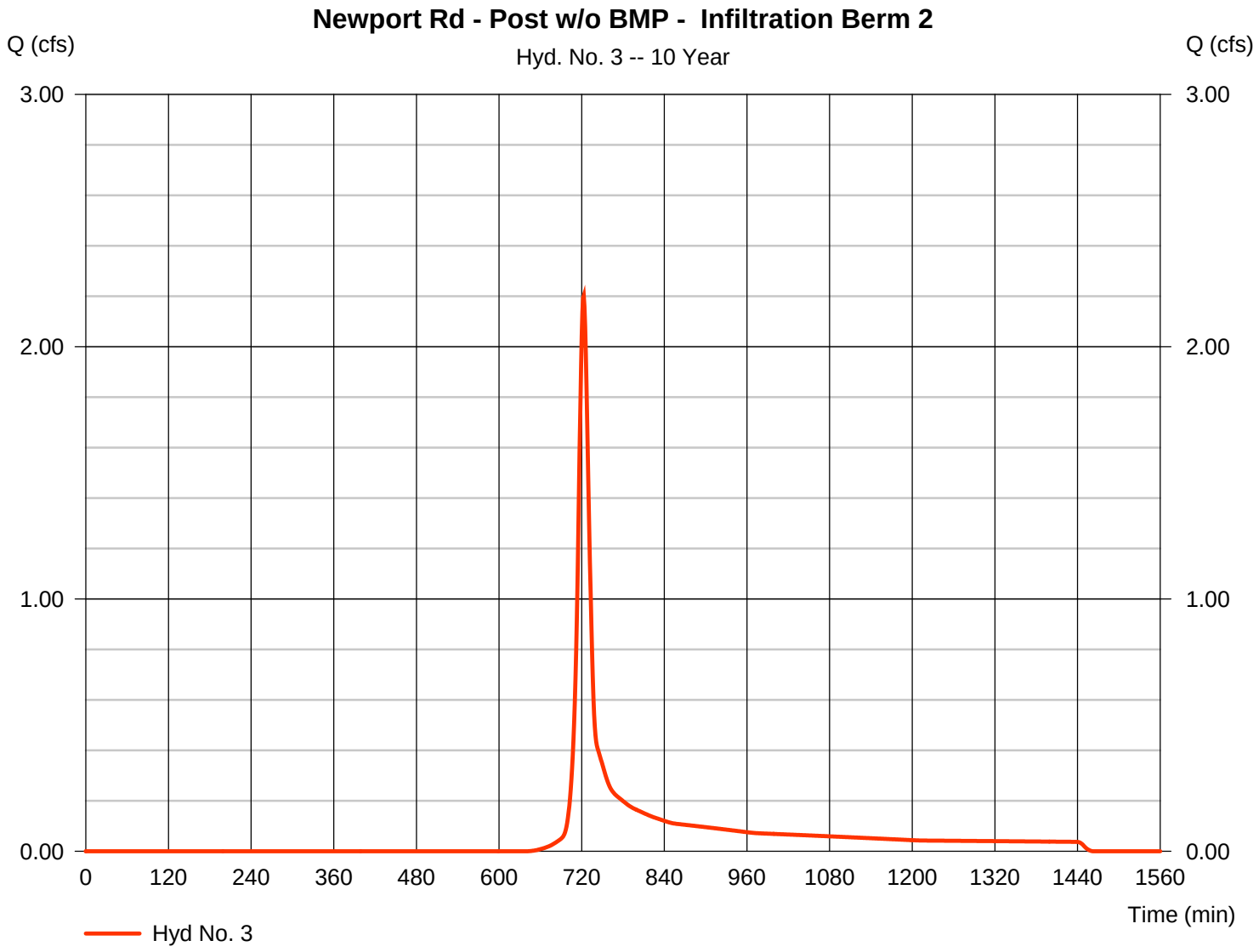
Hydrograph Report

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.202 cfs
Storm frequency	=	10 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	6,098 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



TR55 Tc Worksheet

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		239.00		175.00		
Watercourse slope (%)	= 6.40		11.00		6.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.08		5.35		3.95		
Travel Time (min)	**= 1.85**	**+**	**0.74**	**+**	**0.74**	**=**	**3.33**
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 ..... 14.40 min

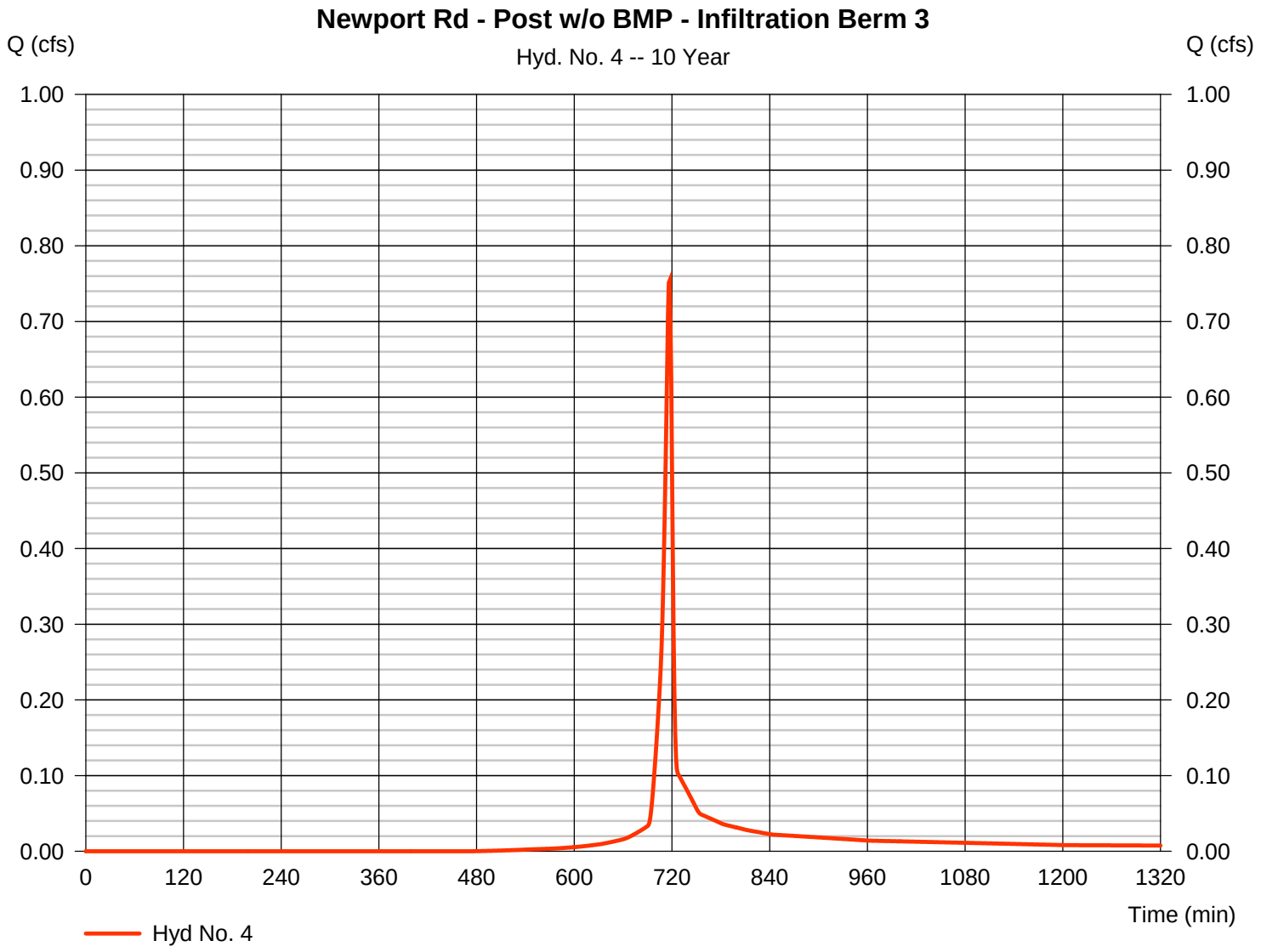
Hydrograph Report

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.754 cfs
Storm frequency	= 10 yrs	Time to peak	= 717 min
Time interval	= 1 min	Hyd. volume	= 1,436 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.60 min
Total precip.	= 3.53 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



TR55 Tc Worksheet

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		94.00		0.00		
Watercourse slope (%)	= 5.50		8.50		0.00		
Surface description	= Paved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.77		4.70		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.33**	**+**	**0.00**	**=**	**0.90**
Channel Flow							
X sectional flow area (sqft)	= 2.00		2.00		0.00		
Wetted perimeter (ft)	= 4.47		4.47		0.00		
Channel slope (%)	= 4.49		7.51		0.00		
Manning's n-value	= 0.060		0.025		0.015		
Velocity (ft/s)	=3.07						
			9.53				
					0.00		
Flow length (ft)	({0})89.0		230.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.40**	**+**	**0.00**	**=**	**0.89**

Total Travel Time, Tc ..... 3.60 min

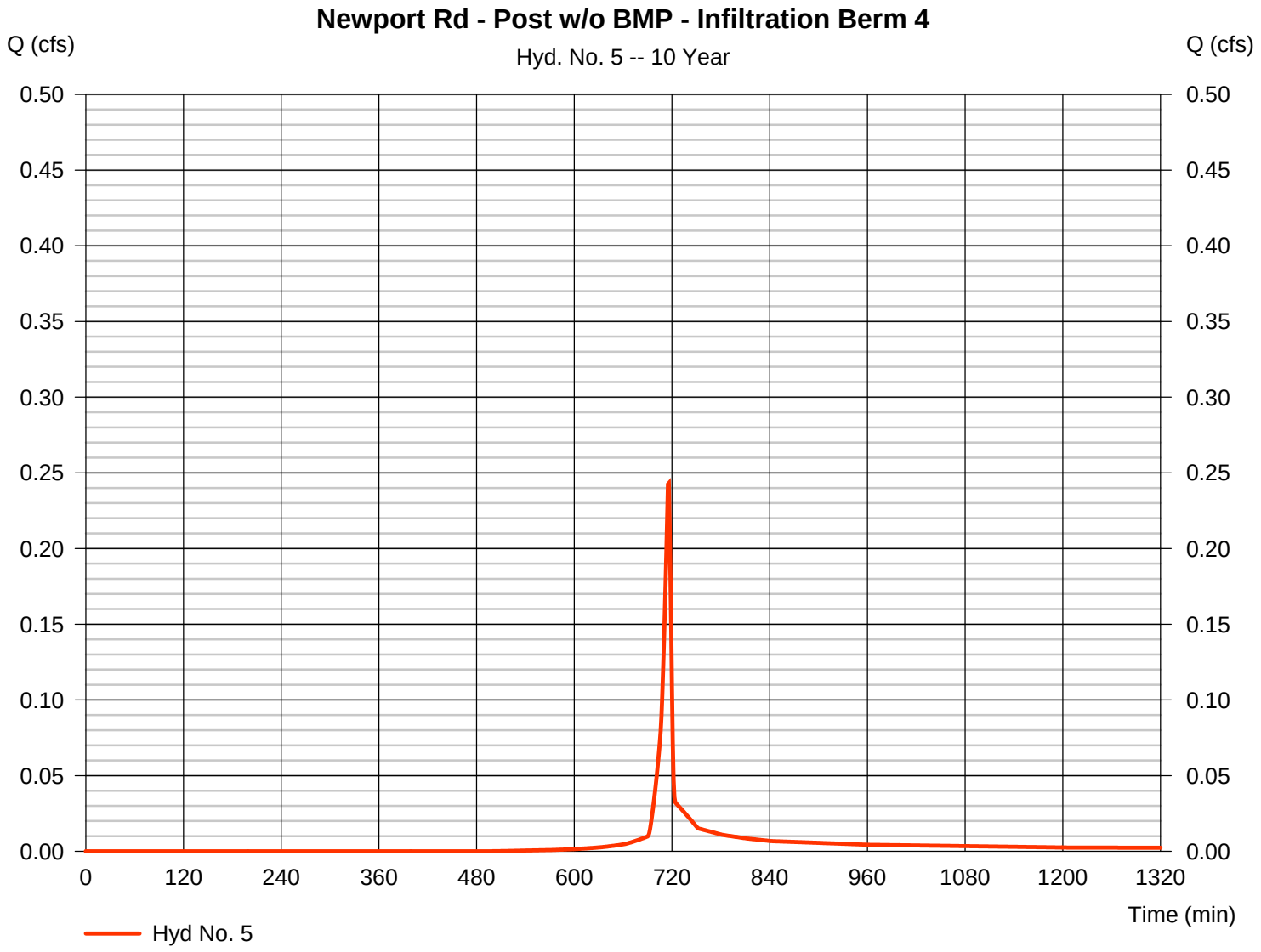
Hydrograph Report

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.243 cfs
Storm frequency	= 10 yrs	Time to peak	= 716 min
Time interval	= 1 min	Hyd. volume	= 431 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.30 min
Total precip.	= 3.53 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 69.00		0.00		0.00		
Watercourse slope (%)	= 5.90		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=3.92		0.00		0.00		
Travel Time (min)	**= 0.29**	**+**	**0.00**	**+**	**0.00**	**=**	**0.29**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})200.0		0.0		0.0		
Travel Time (min)	**= 0.36**	**+**	**0.00**	**+**	**0.00**	**=**	**0.36**

Total Travel Time, Tc ..... 2.30 min

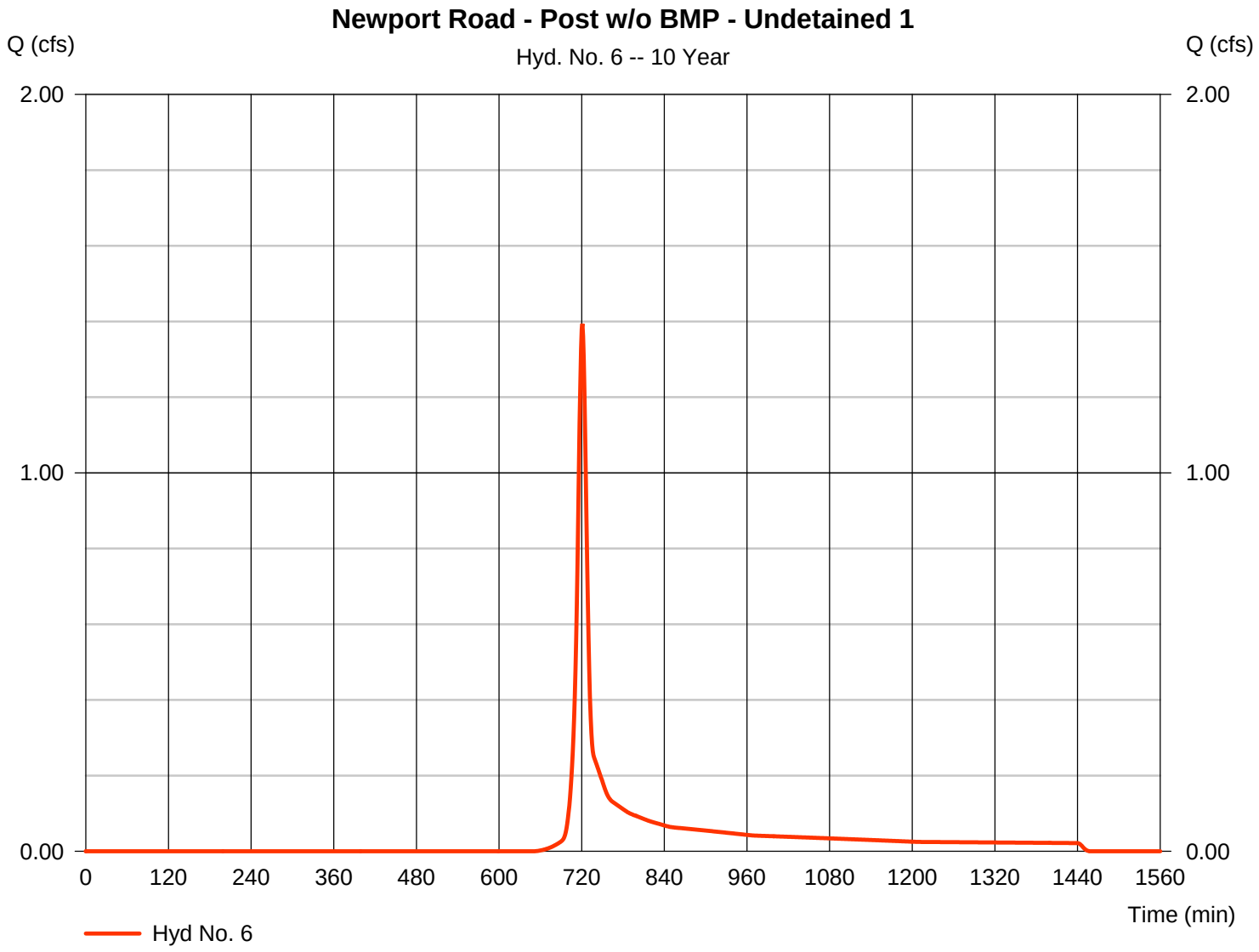
Hydrograph Report

Hyd. No. 6

Newport Road - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.394 cfs
Storm frequency	=	10 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	3,456 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - 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)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

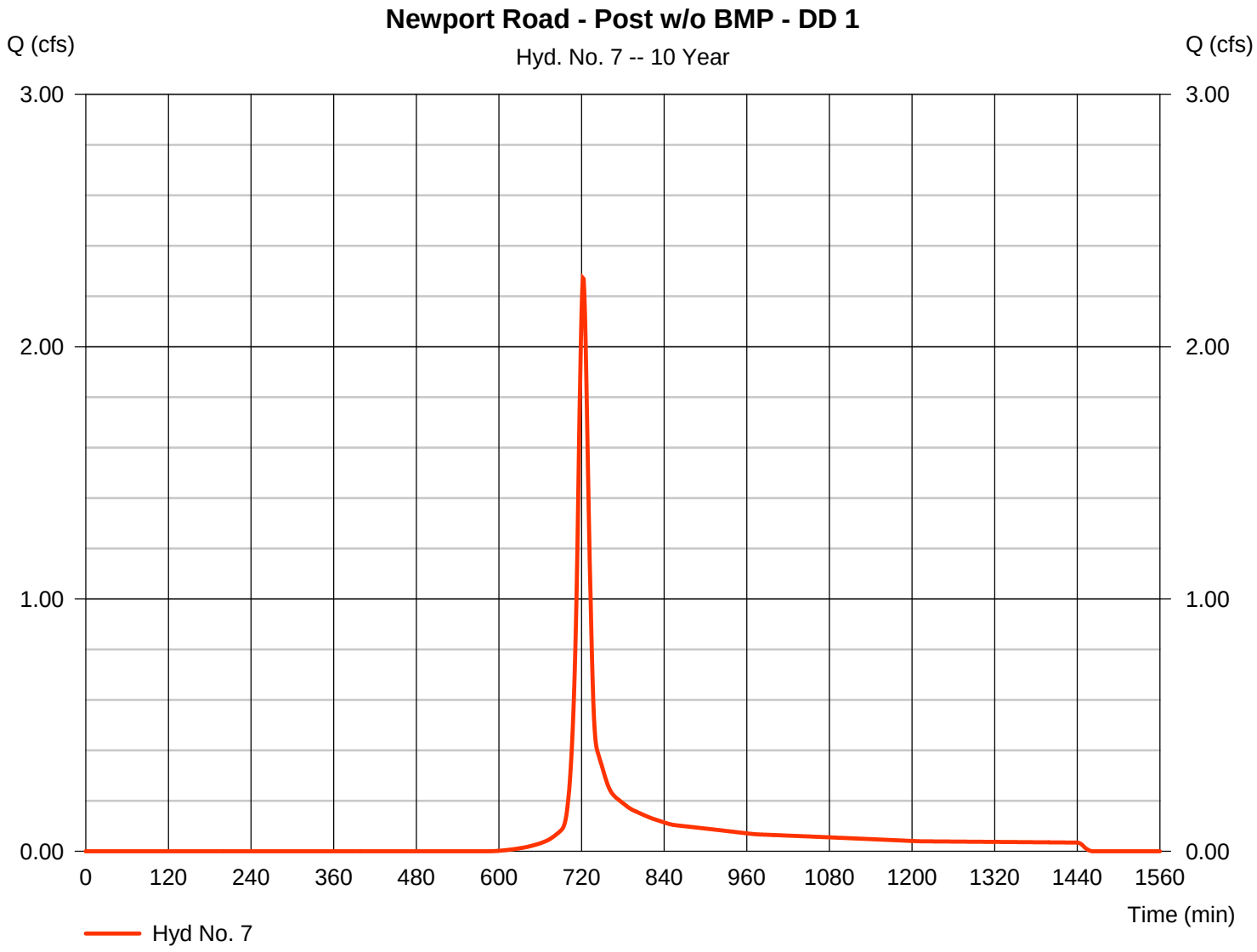
Hydrograph Report

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.272 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	6,170 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

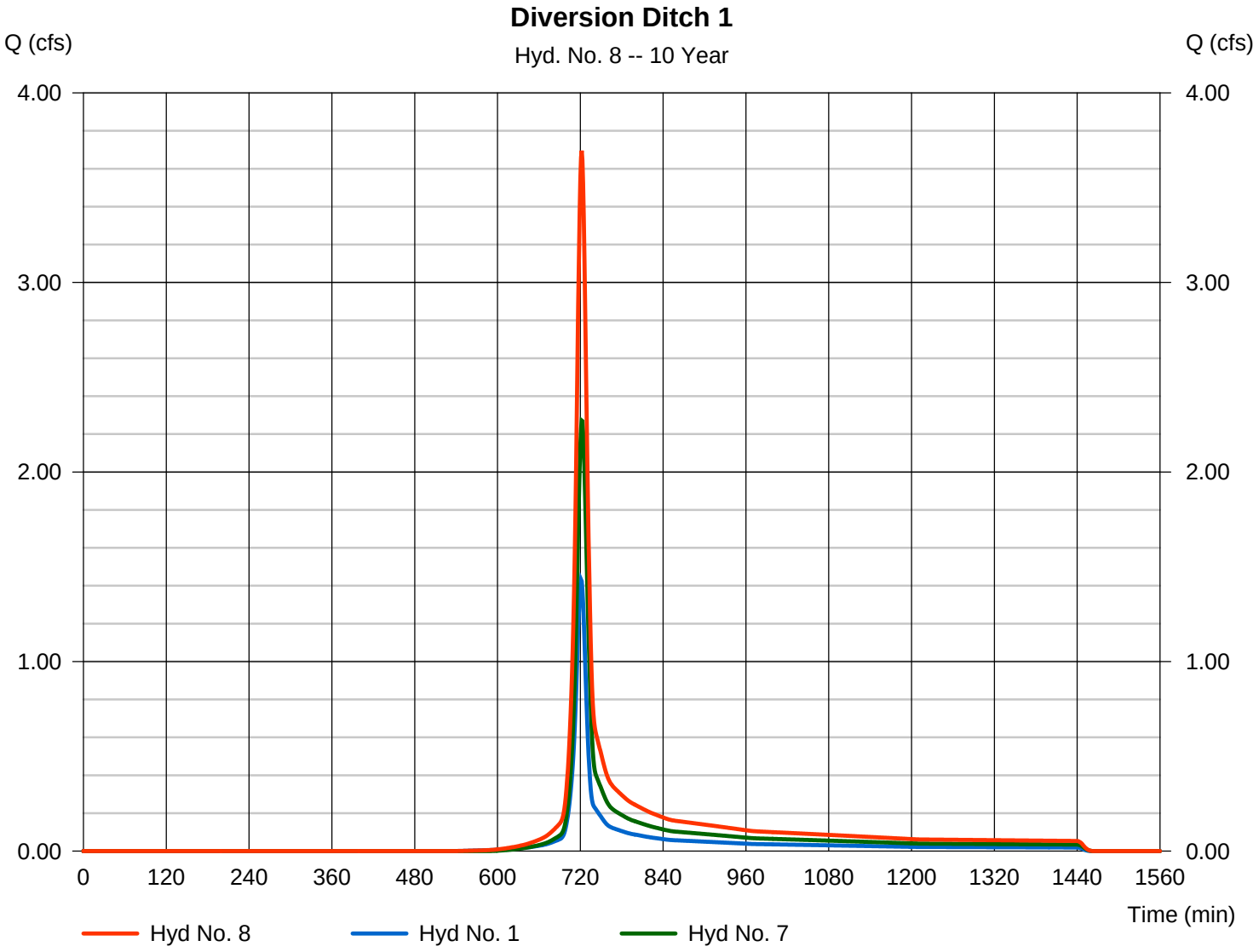
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 8

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 3.695 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 9,789 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.780 ac



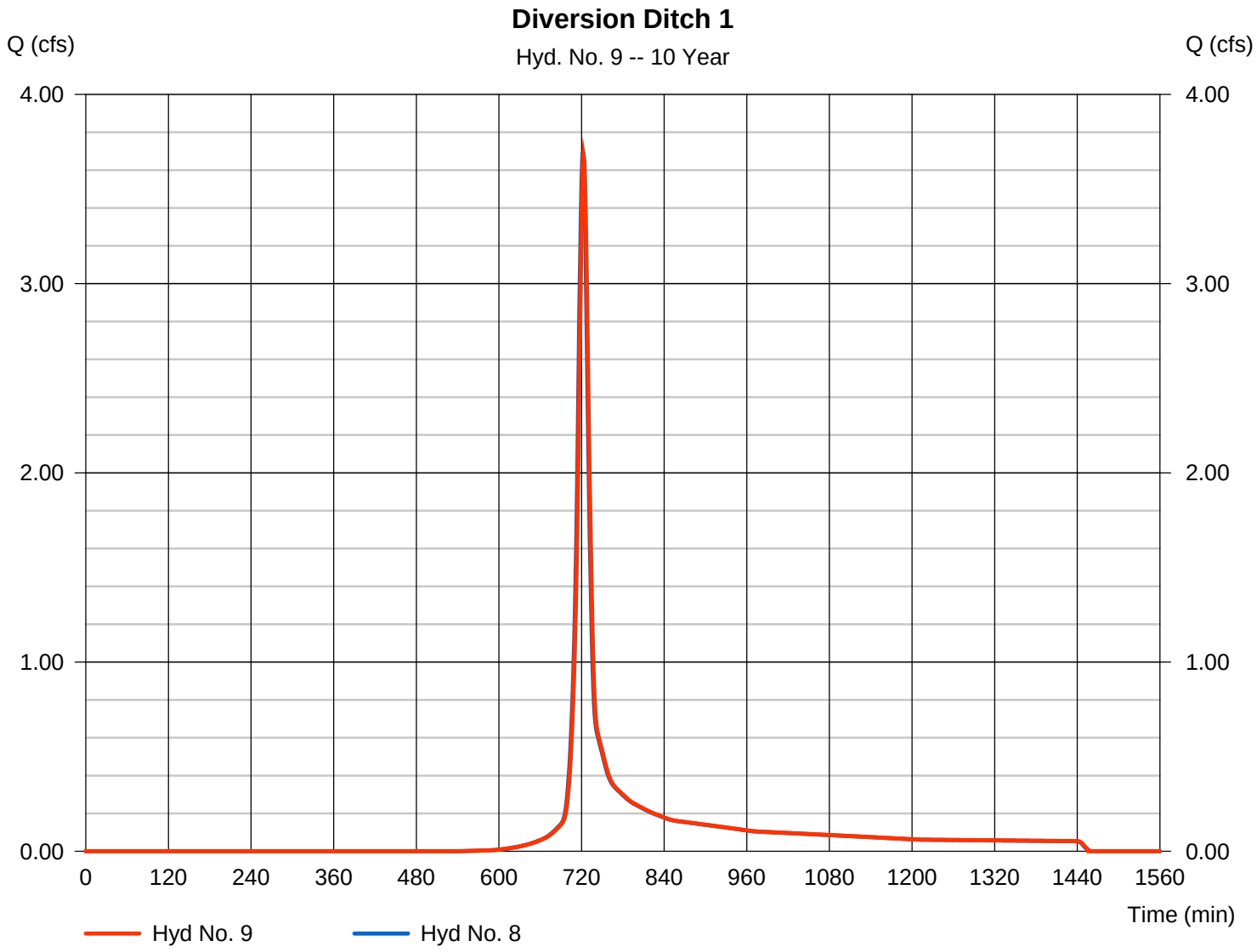
Hydrograph Report

Hyd. No. 9

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	3.677 cfs
Storm frequency	=	10 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	9,787 cuft
Inflow hyd. No.	=	8 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7594

Modified Att-Kin routing method used.

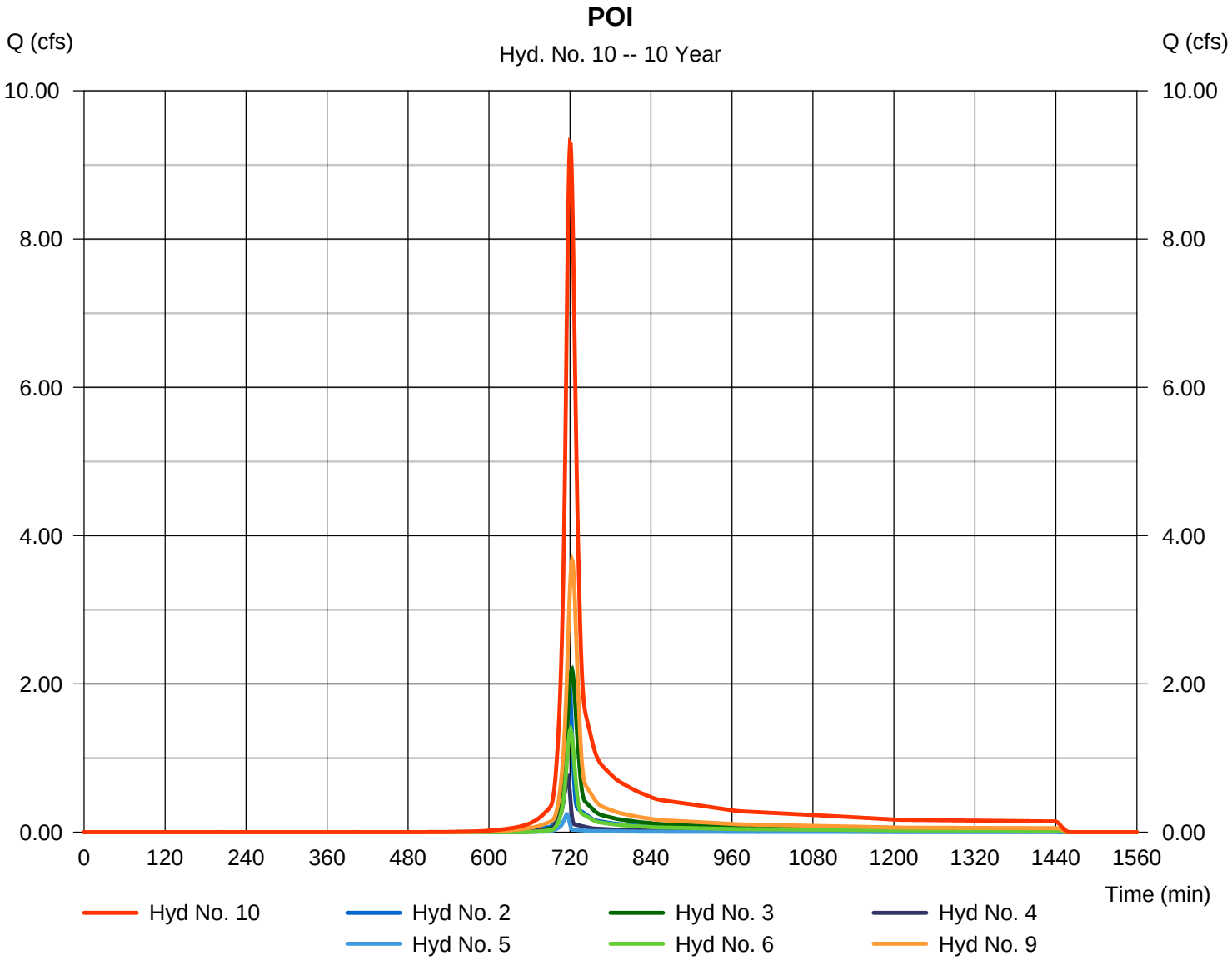


Hydrograph Report

Hyd. No. 10

POI

Hydrograph type	=	Combine	Peak discharge	=	9.297 cfs
Storm frequency	=	10 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	25,511 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 9	Contrib. drain. area	=	3.300 ac



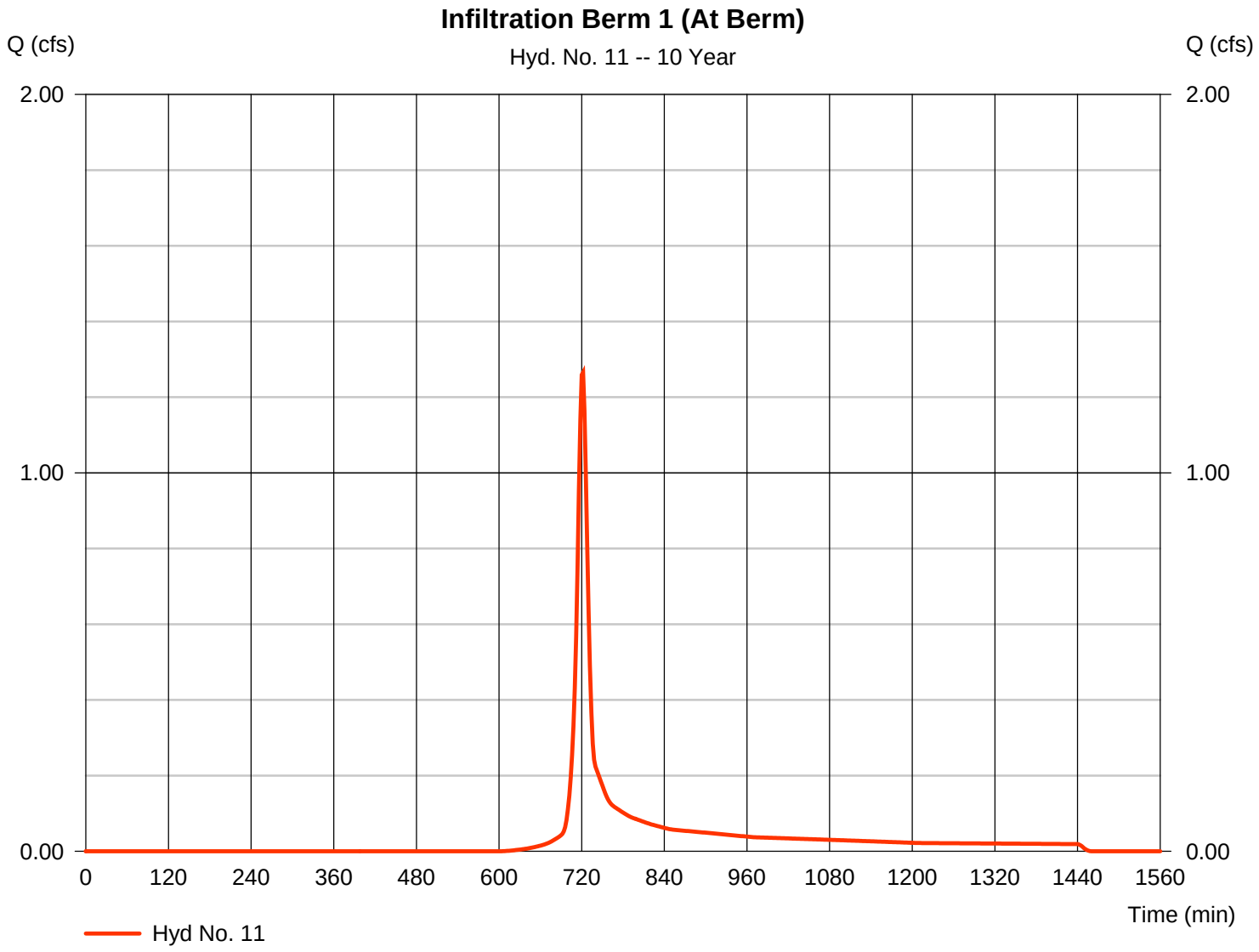
Hydrograph Report

Hyd. No. 11

Infiltration Berm 1 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.265 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	3,323 cuft
Drainage area	=	0.640 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.60 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.130 x 78) + (0.100 x 89) + (0.020 x 91)] / 0.640



TR55 Tc Worksheet

Hyd. No. 11

Infiltration Berm 1 (At 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		69.00		
Watercourse slope (%)	= 8.00		4.80		4.30		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		3.35		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**0.34**	**=**	**1.49**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.60 min

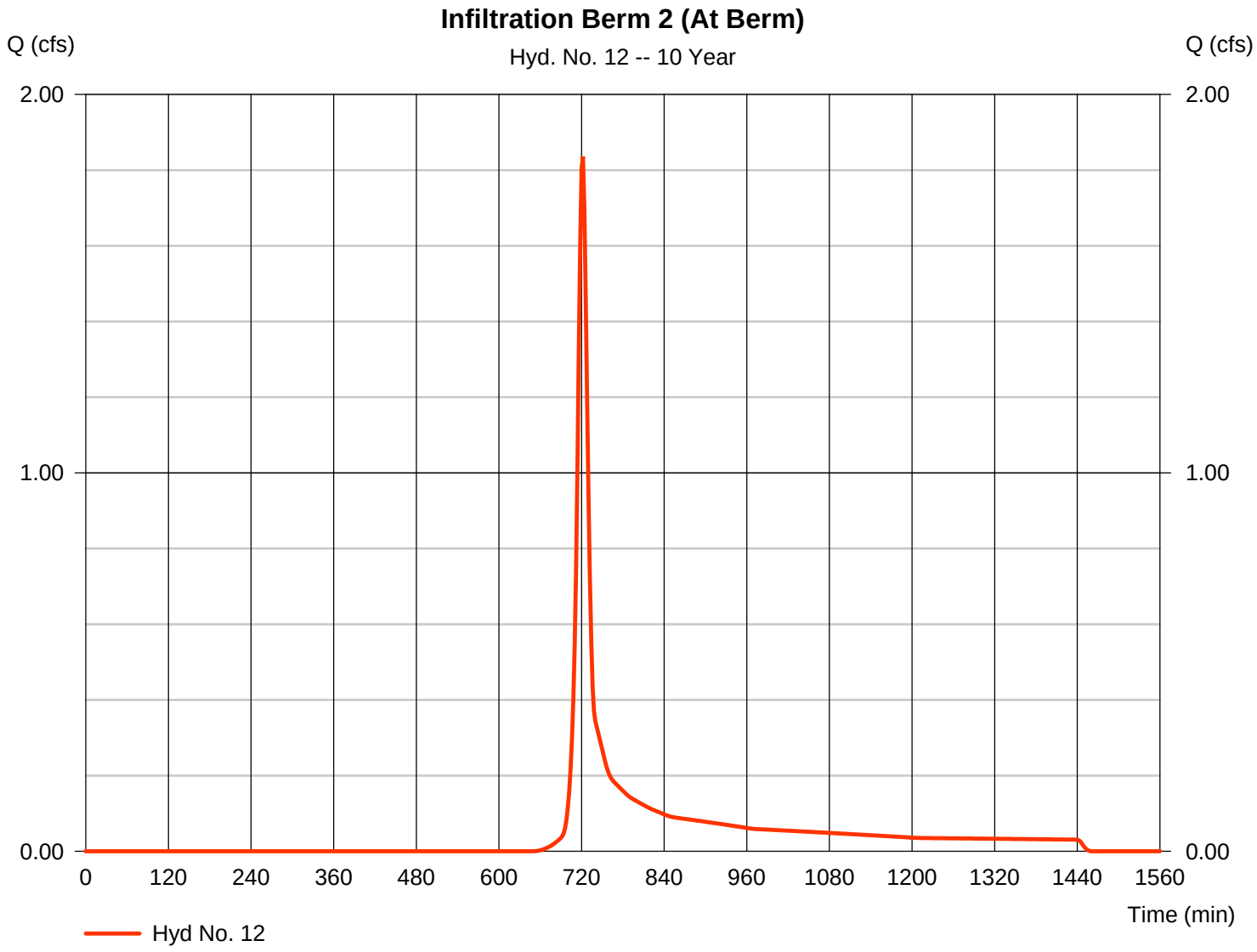
Hydrograph Report

Hyd. No. 12

Infiltration Berm 2 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.836 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	4,910 cuft
Drainage area	=	1.150 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.90 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.030 x 71) + (0.070 x 78) + (0.050 x 89)] / 1.150



TR55 Tc Worksheet

Hyd. No. 12

Infiltration Berm 2 (At Berm)

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		2.51		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		0.00		0.00		
Watercourse slope (%)	= 6.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.08		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.90 min

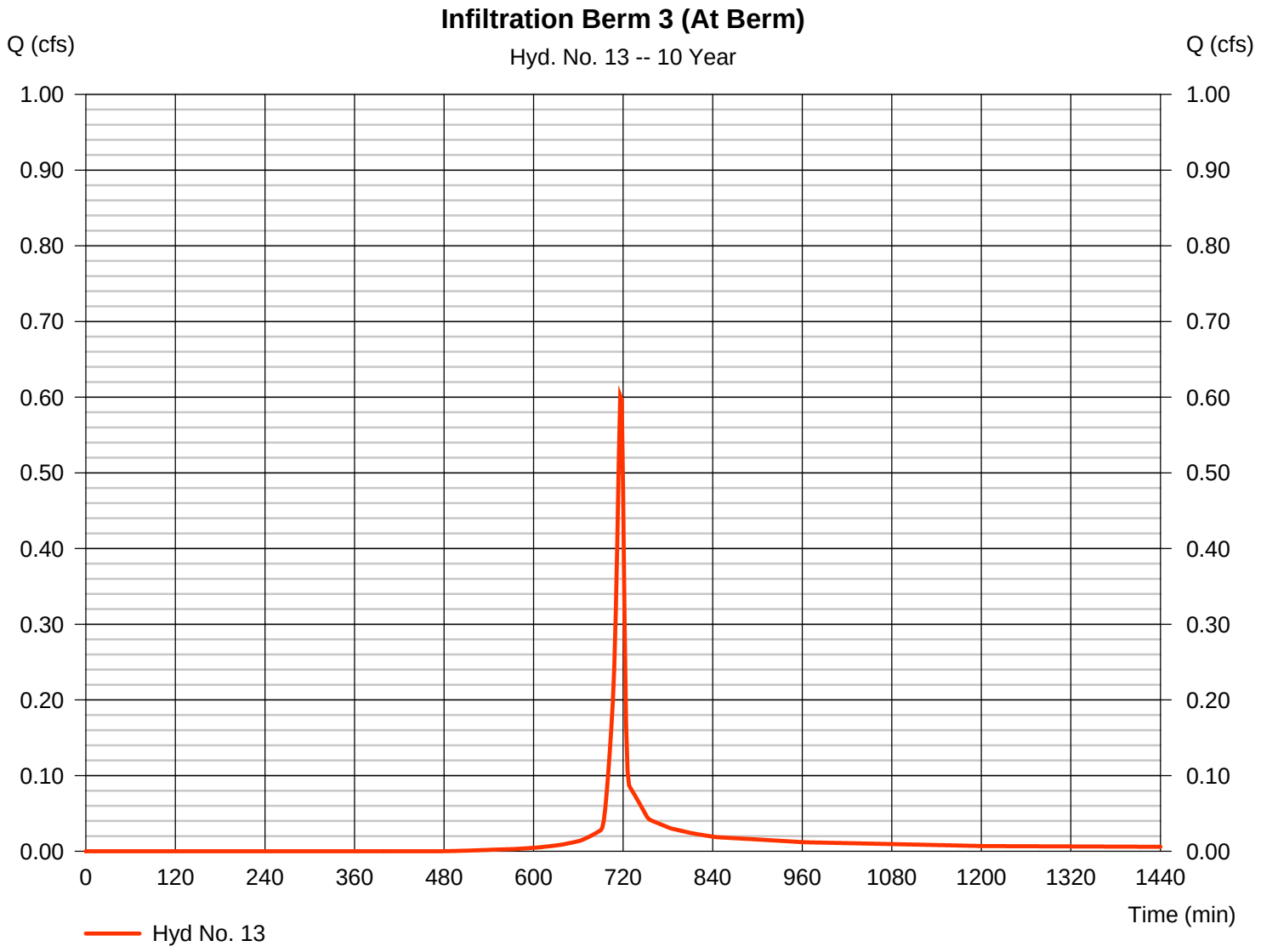
Hydrograph Report

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.602 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,218 cuft
Drainage area	=	0.190 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	3.10 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.110 x 78) + (0.080 x 91)] / 0.190



TR55 Tc Worksheet

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		46.00		0.00		
Watercourse slope (%)	= 5.50		6.50		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=4.77		4.11		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.19**	**+**	**0.00**	**=**	**0.76**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 4.49		0.00		0.00		
Manning's n-value	= 0.060		0.015		0.015		
Velocity (ft/s)	=3.07						
			0.00				
					0.00		
Flow length (ft)	({0})89.0		0.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.00**	**+**	**0.00**	**=**	**0.48**

Total Travel Time, Tc ..... 3.10 min

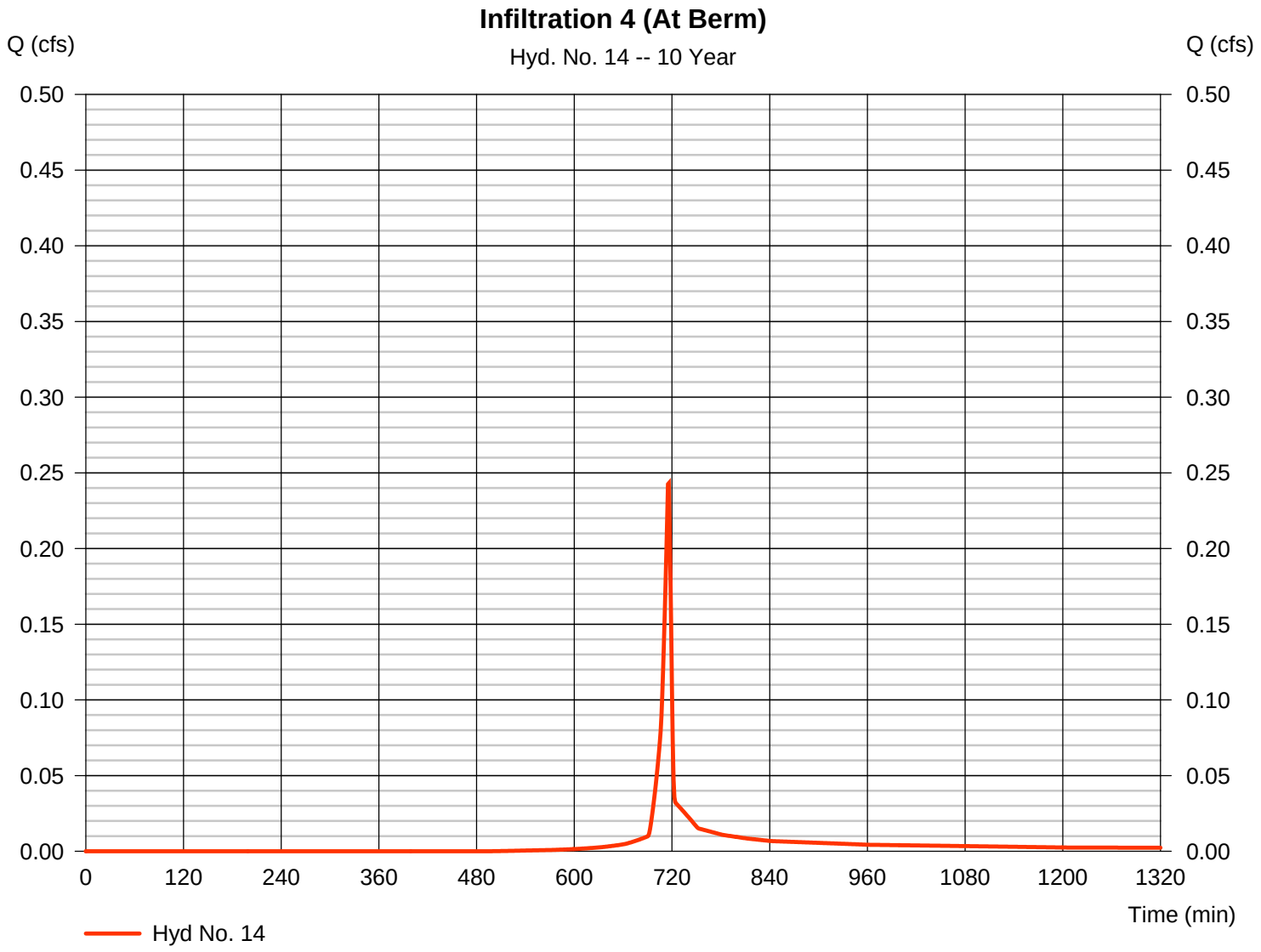
Hydrograph Report

Hyd. No. 14

Infiltration 4 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.243 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	1 min	Hyd. volume	=	431 cuft
Drainage area	=	0.070 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	1.90 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 14

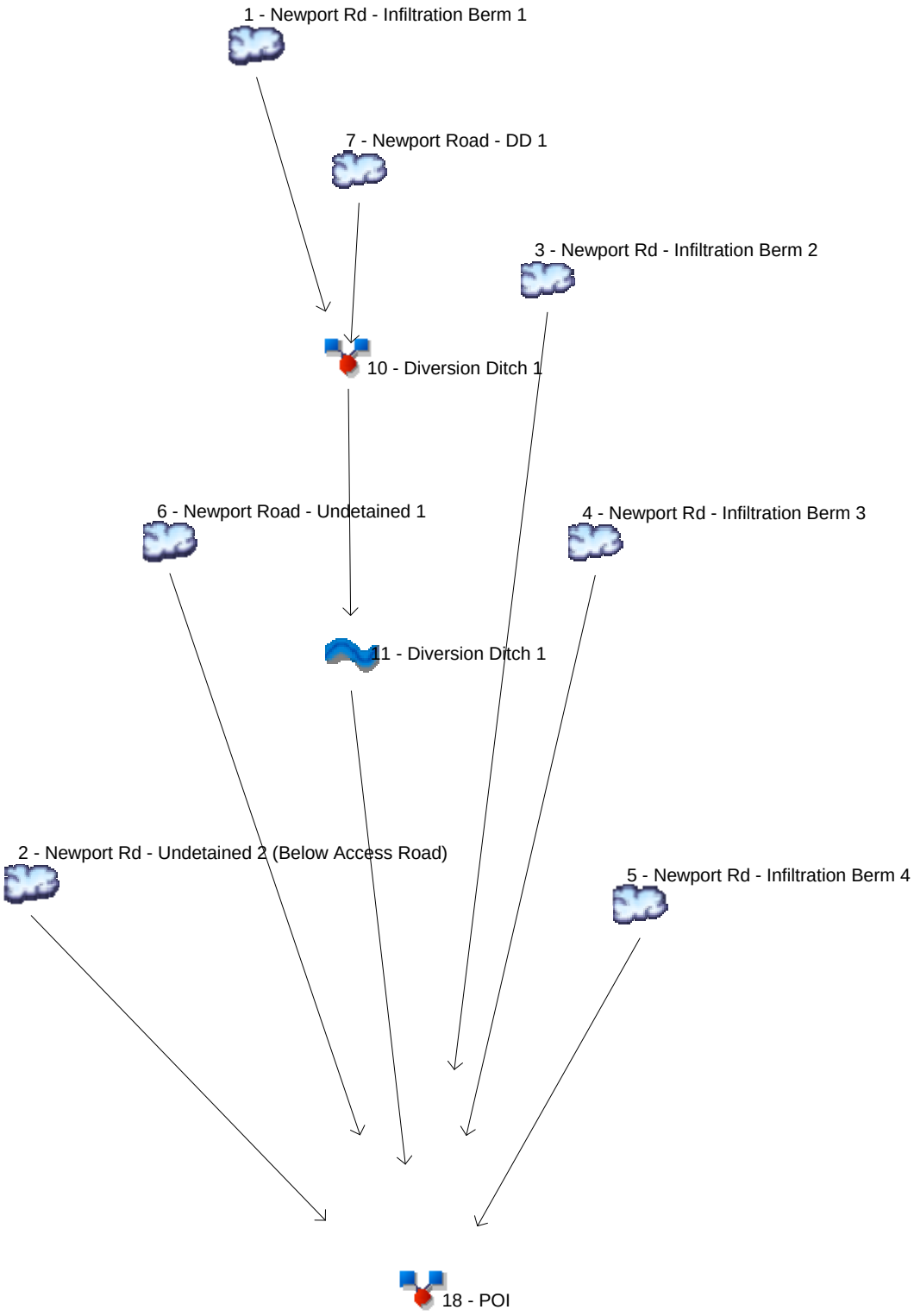
Infiltration 4 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 54.00		0.00		0.00		
Watercourse slope (%)	= 7.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.39		0.00		0.00		
Travel Time (min)	**= 0.21**	**+**	**0.00**	**+**	**0.00**	**=**	**0.21**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 1.90 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	------	-------	-------	-------	-------	1.309	-------	-------	-------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	------	-------	-------	-------	-------	2.041	-------	-------	-------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	------	-------	-------	-------	-------	1.790	-------	-------	-------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	------	-------	-------	-------	-------	0.304	-------	-------	-------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	------	-------	-------	-------	-------	0.147	-------	-------	-------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	------	-------	-------	-------	-------	1.394	-------	-------	-------	Newport Road - Undetained 1
7	SCS Runoff	------	-------	-------	-------	-------	2.272	-------	-------	-------	Newport Road - DD 1
10	Combine	1, 7,	-------	-------	-------	-------	3.307	-------	-------	-------	Diversion Ditch 1
11	Reach	10	-------	-------	-------	-------	3.301	-------	-------	-------	Diversion Ditch 1
18	Combine	2, 3, 4, 5, 6, 11,	-------	-------	-------	-------	7.906	-------	-------	-------	POI

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	1.309	1	731	5,130	------	------	------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	2.041	1	719	4,304	------	------	------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	1.790	1	727	6,156	------	------	------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	0.304	1	737	1,428	------	------	------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	0.147	1	725	459	------	------	------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	1.394	1	721	3,456	------	------	------	Newport Road - Undetained 1
7	SCS Runoff	2.272	1	722	6,170	------	------	------	Newport Road - DD 1
10	Combine	3.307	1	724	11,301	1, 7,	------	------	Diversion Ditch 1
11	Reach	3.301	1	725	11,296	10	------	------	Diversion Ditch 1
18	Combine	7.906	1	722	27,100	2, 3, 4, 5, 6, 11,	------	------	POI

Hydrograph Report

Hyd. No. 1

Newport Rd - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.309 cfs
Storm frequency	=	10 yrs	Time to peak	=	731 min
Time interval	=	1 min	Hyd. volume	=	5,130 cuft
Drainage area	=	0.980 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	28.70 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.980

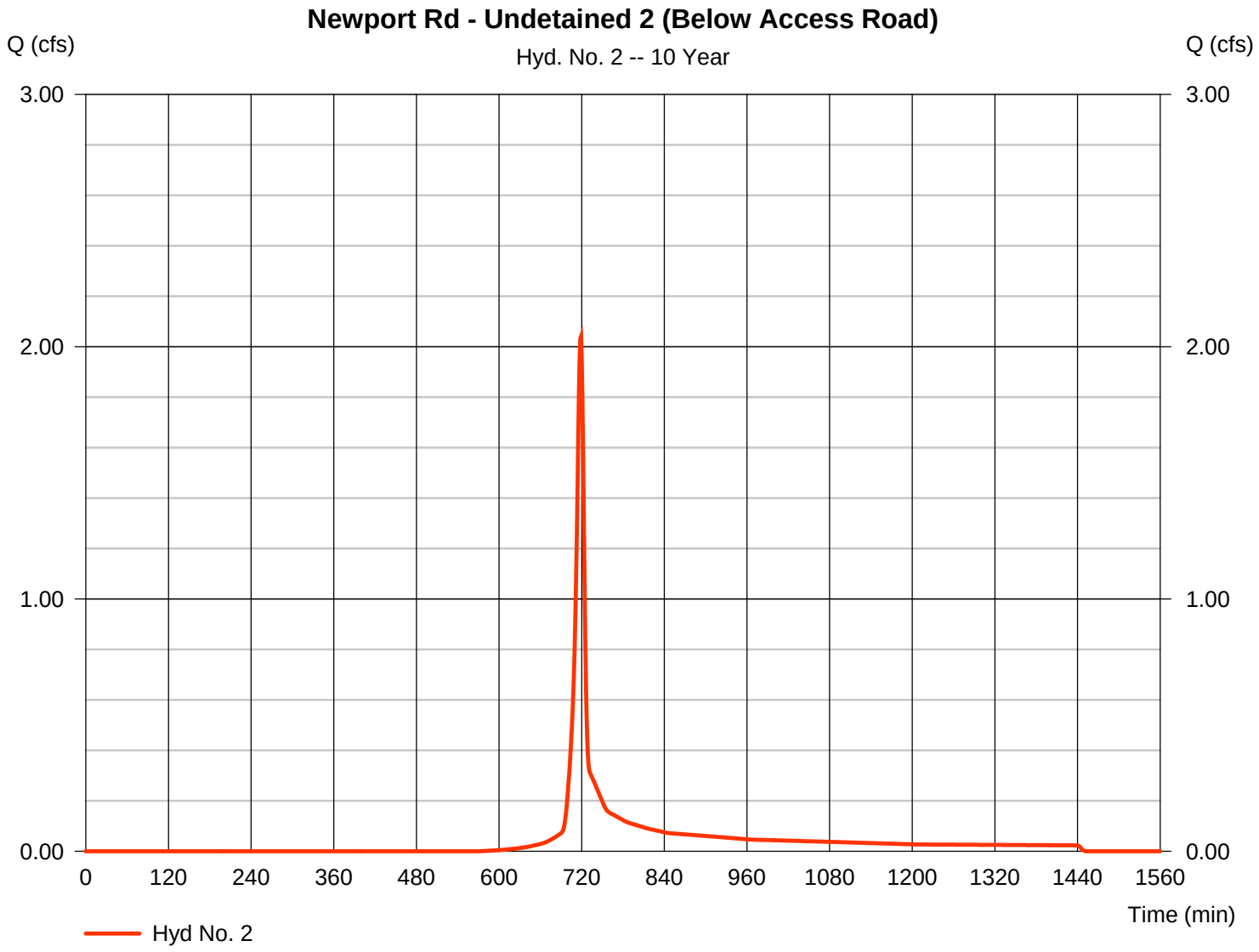
Hydrograph Report

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.041 cfs
Storm frequency	= 10 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 4,304 cuft
Drainage area	= 0.800 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 6.70 min
Total precip.	= 3.53 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

Hydrograph Report

Hyd. No. 3

Newport Rd - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.790 cfs
Storm frequency	=	10 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	6,156 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.80 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400

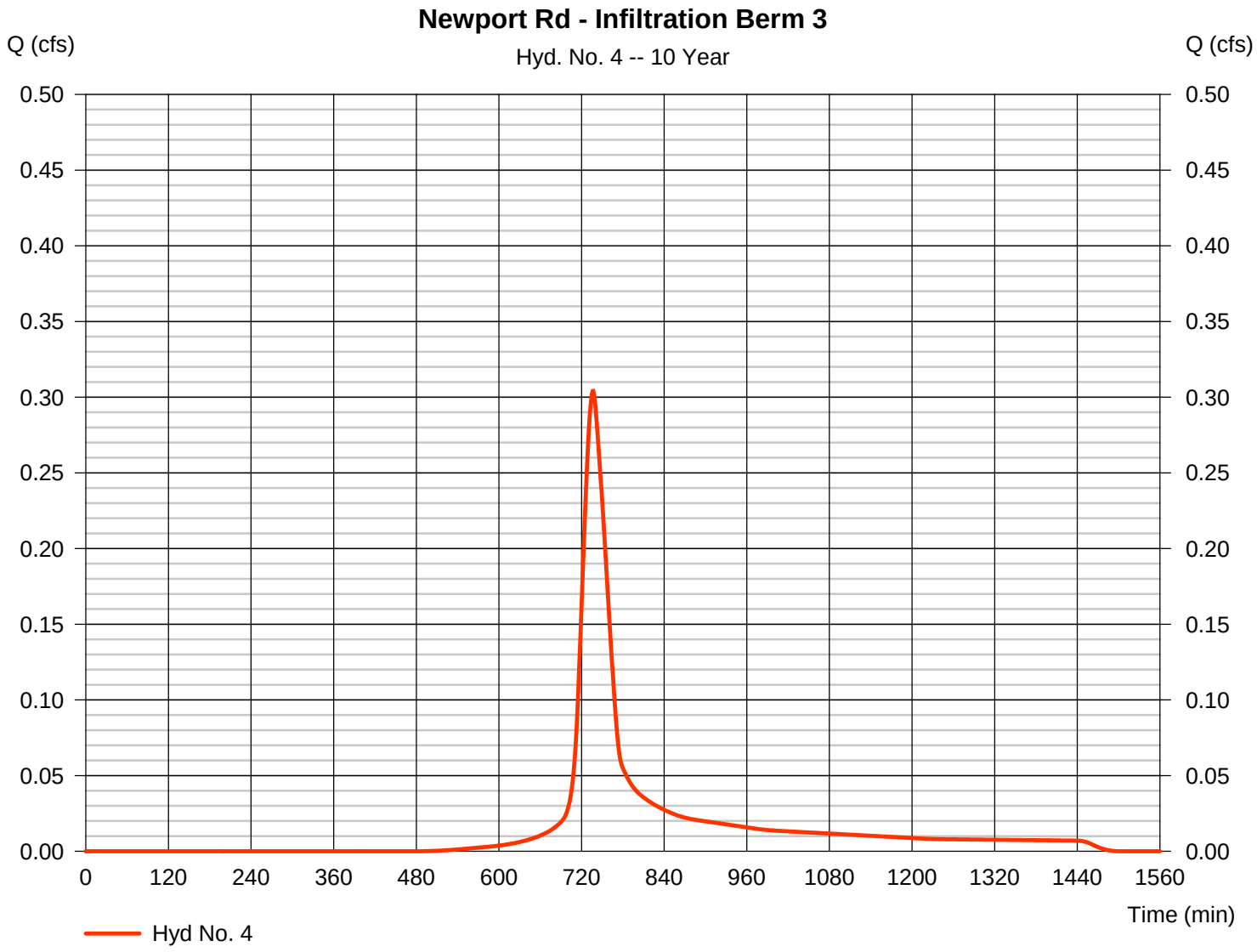
Hydrograph Report

Hyd. No. 4

Newport Rd - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.304 cfs
Storm frequency	= 10 yrs	Time to peak	= 737 min
Time interval	= 1 min	Hyd. volume	= 1,428 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 37.30 min
Total precip.	= 3.53 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



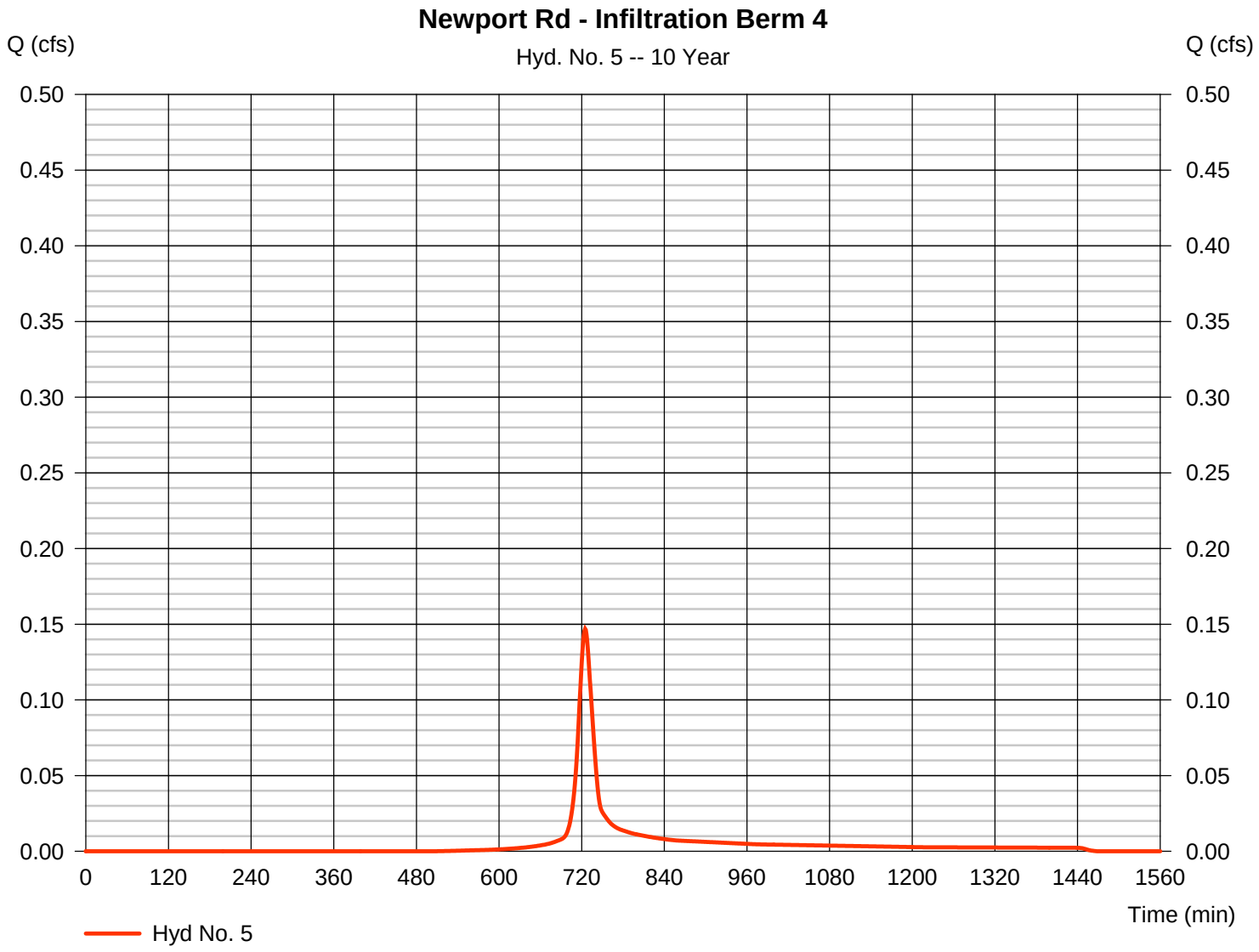
Hydrograph Report

Hyd. No. 5

Newport Rd - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.147 cfs
Storm frequency	= 10 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 459 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.70 min
Total precip.	= 3.53 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



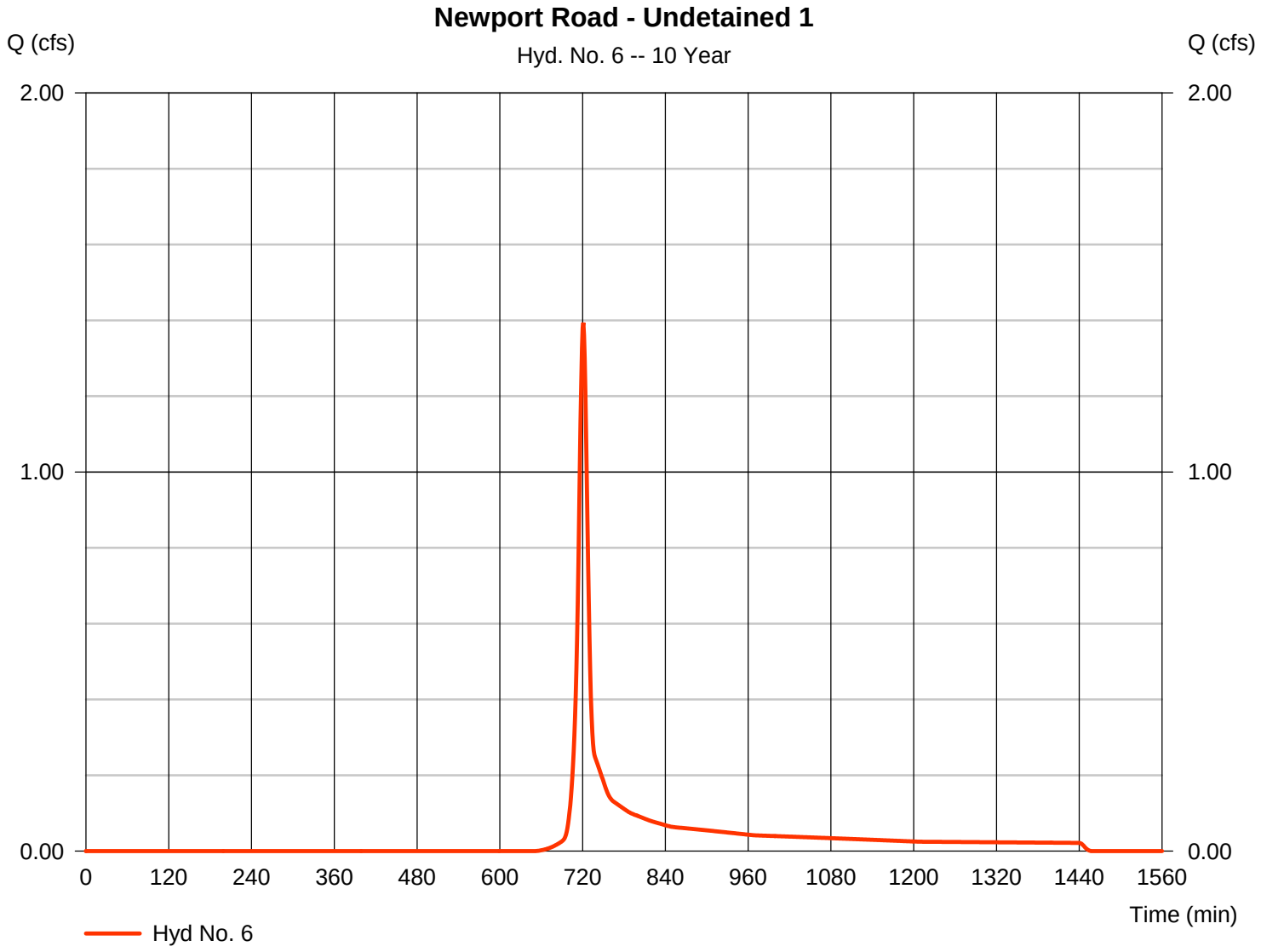
Hydrograph Report

Hyd. No. 6

Newport Road - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.394 cfs
Storm frequency	=	10 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	3,456 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - Undetained 1

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 (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

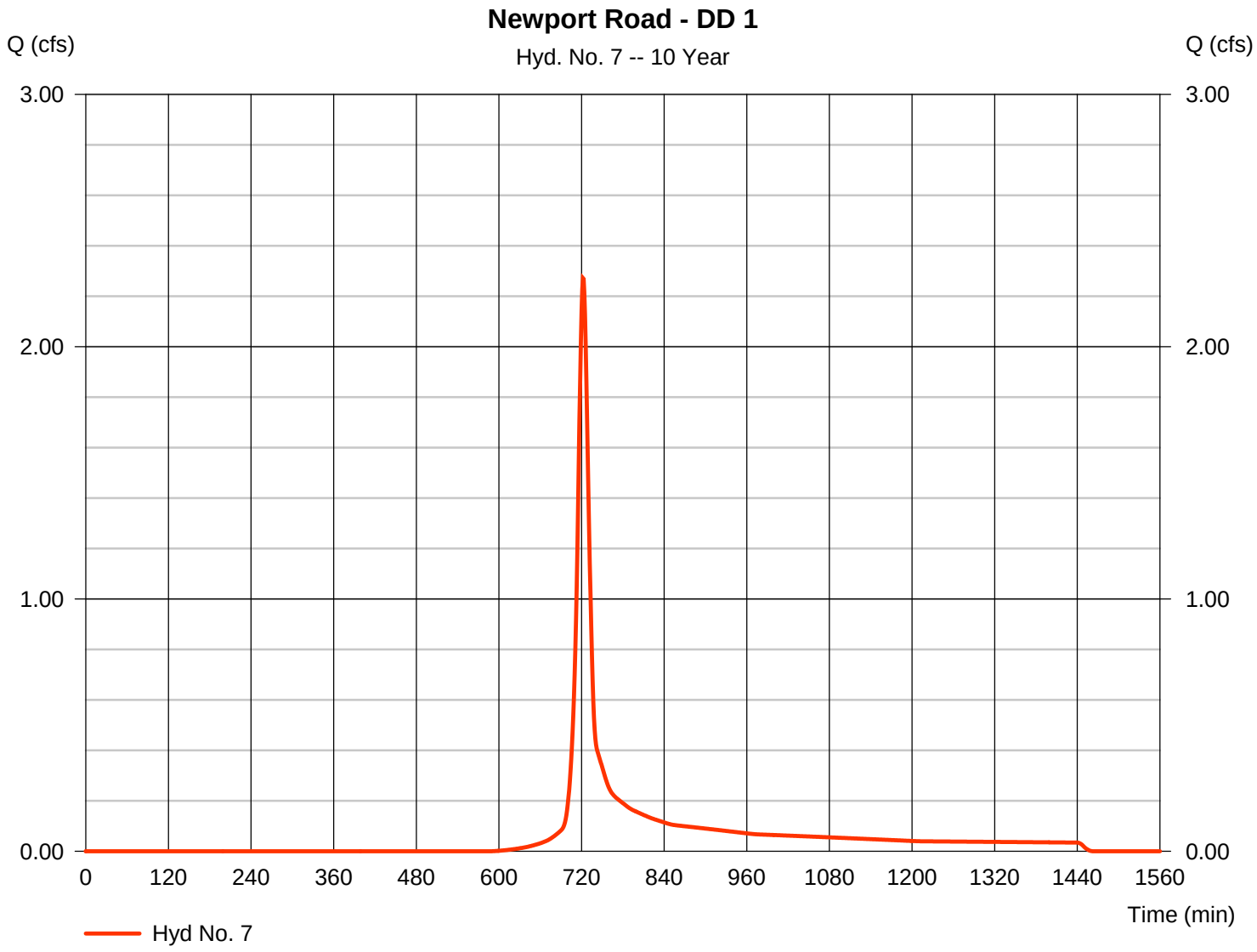
Hydrograph Report

Hyd. No. 7

Newport Road - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.272 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	6,170 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	3.53 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

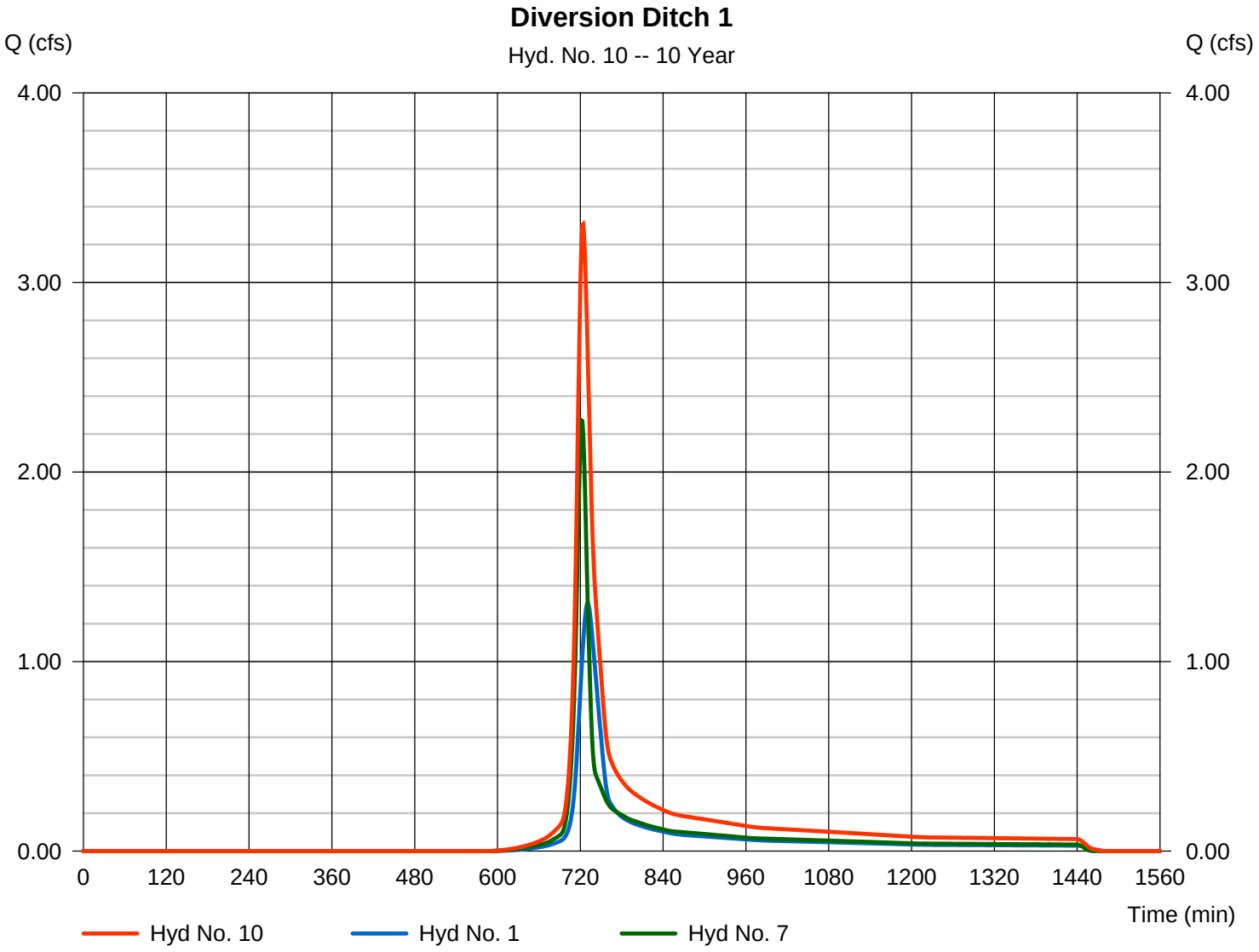
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 10

Diversion Ditch 1

Hydrograph type	=	Combine	Peak discharge	=	3.307 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	11,301 cuft
Inflow hyds.	=	1, 7	Contrib. drain. area	=	2.150 ac



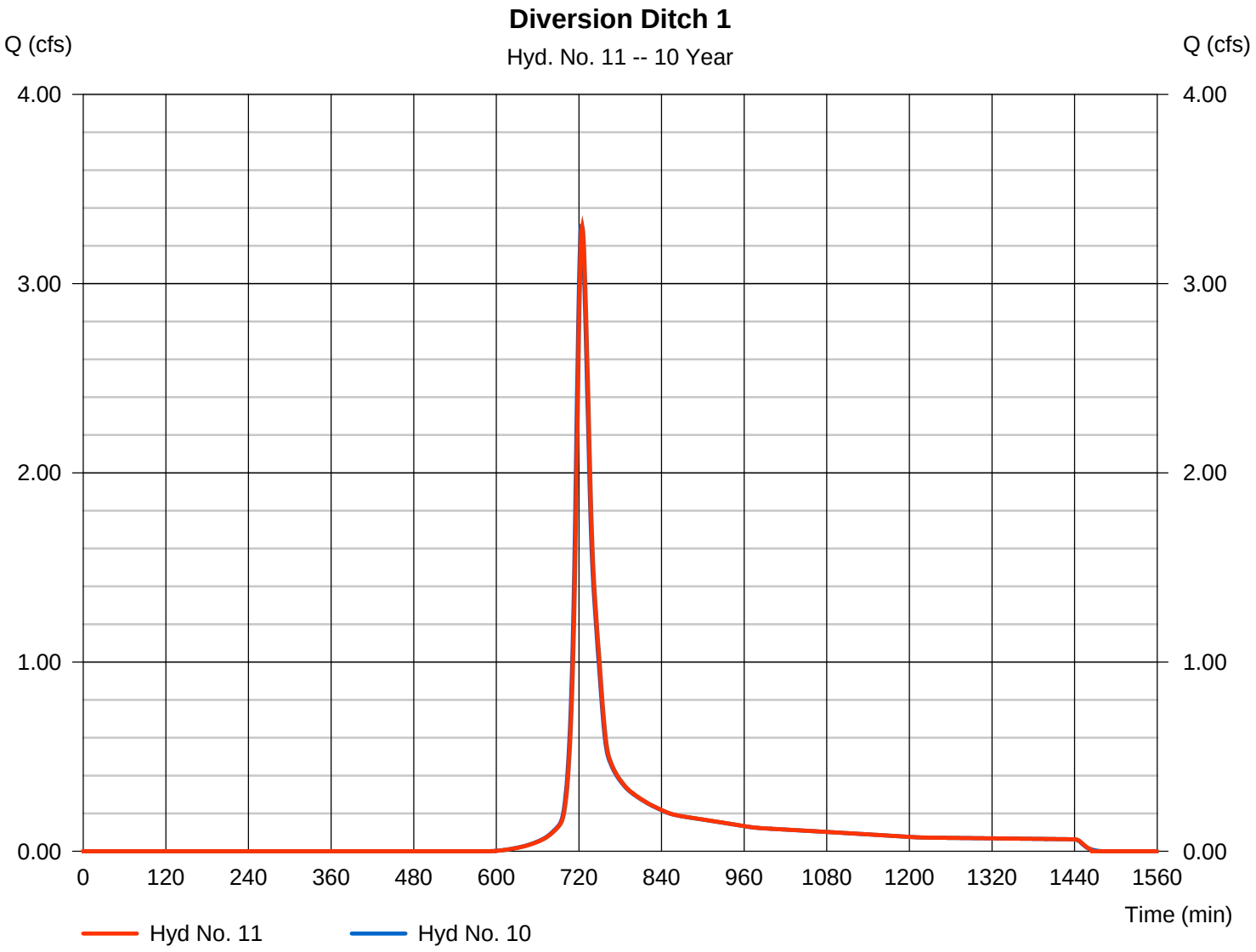
Hydrograph Report

Hyd. No. 11

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	3.301 cfs
Storm frequency	=	10 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	11,296 cuft
Inflow hyd. No.	=	10 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7611

Modified Att-Kin routing method used.

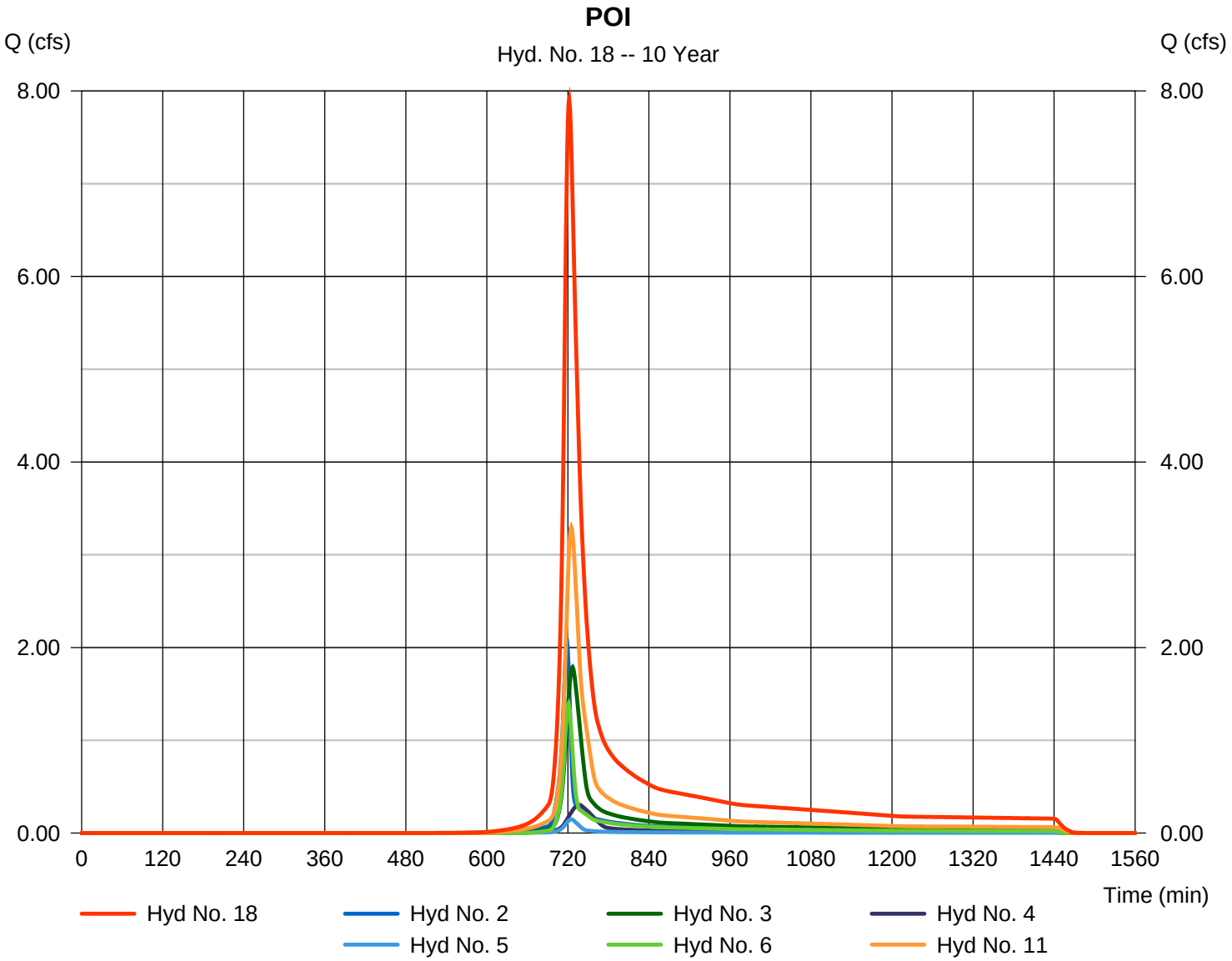


Hydrograph Report

Hyd. No. 18

POI

Hydrograph type	=	Combine	Peak discharge	=	7.906 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	27,100 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 11	Contrib. drain. area	=	3.300 ac



ATTACHMENT C-3
NEWPORT 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	------	-------	5.466	-------	-------	11.50	-------	19.42	23.37	Newport 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	19.42	1	719	43,922	------	------	------	Newport Rd - PRE

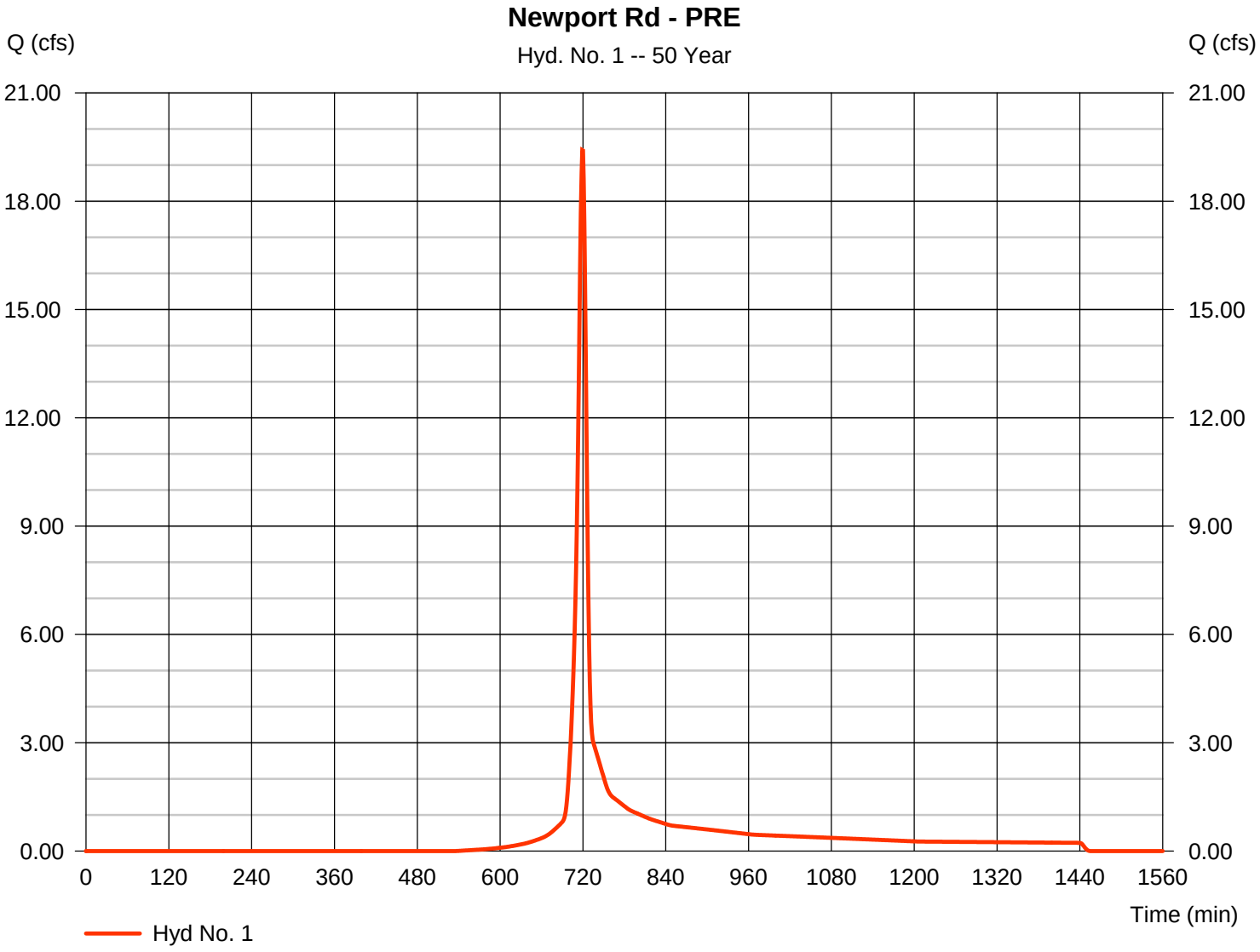
Hydrograph Report

Hyd. No. 1

Newport Rd - PRE

Hydrograph type	= SCS Runoff	Peak discharge	= 19.42 cfs
Storm frequency	= 50 yrs	Time to peak	= 719 min
Time interval	= 1 min	Hyd. volume	= 43,922 cuft
Drainage area	= 5.440 ac	Curve number	= 75*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(2.530 x 71) + (2.680 x 78) + (0.230 x 77)] / 5.440



TR55 Tc Worksheet

Hyd. No. 1

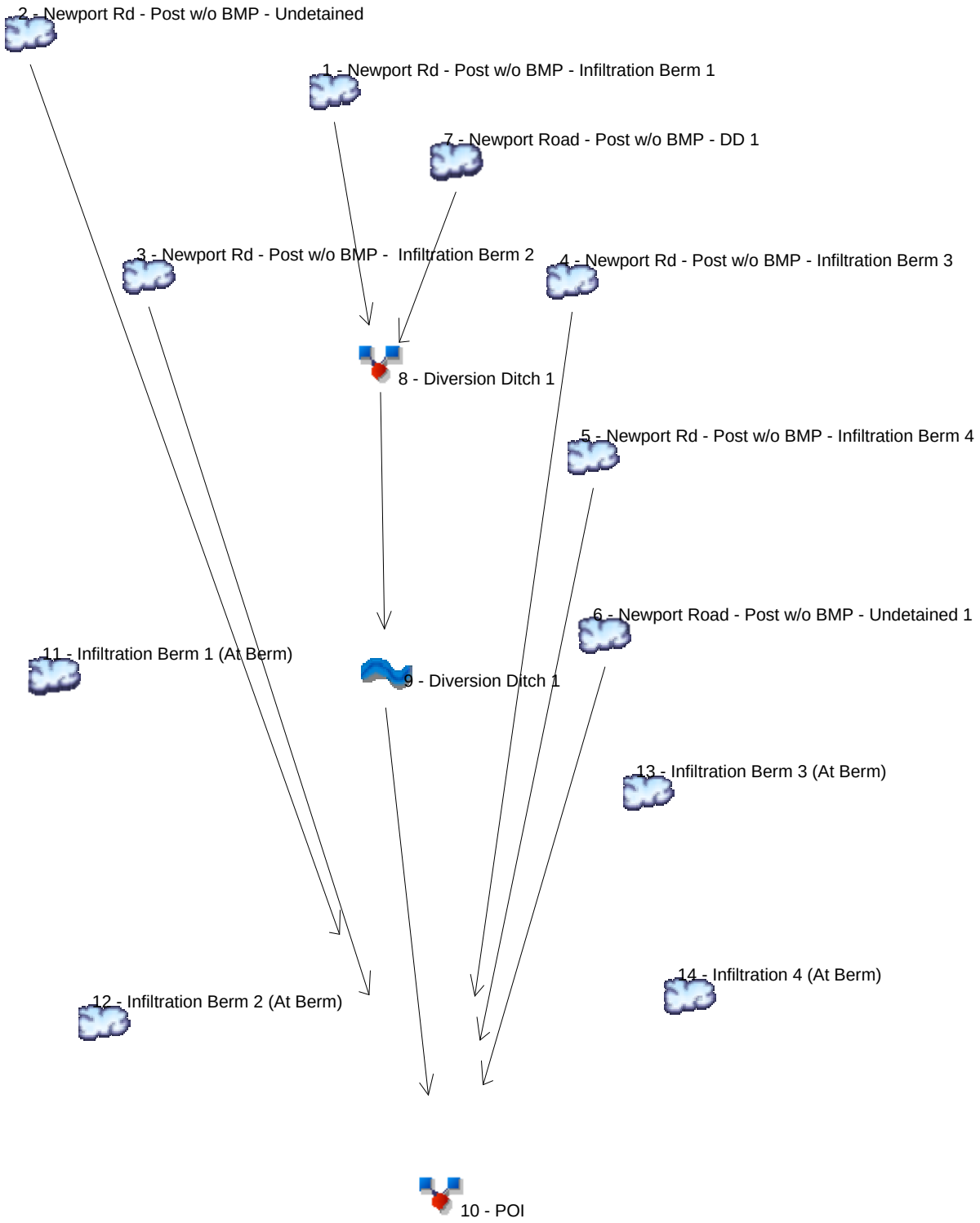
Newport Rd - PRE

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 (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 6.35**	**+**	**0.00**	**+**	**0.00**	**=**	**6.35**
Shallow Concentrated Flow							
Flow length (ft)	= 620.00		141.00		124.00		
Watercourse slope (%)	= 6.50		12.80		4.70		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.11		5.77		3.50		
Travel Time (min)	**= 2.51**	**+**	**0.41**	**+**	**0.59**	**=**	**3.51**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})63.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 10.00 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	------	-------	0.758	-------	-------	1.432	-------	2.282	2.694	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	------	-------	1.053	-------	-------	2.041	-------	3.307	3.927	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.964	-------	-------	2.202	-------	3.878	4.722	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	------	-------	0.432	-------	-------	0.754	-------	1.148	1.337	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	------	-------	0.595	-------	-------	1.394	-------	2.476	3.022	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	------	-------	1.121	-------	-------	2.272	-------	3.777	4.516	Newport Road - Post w/o BMP - DD 1
8	Combine	1, 7	-------	1.870	-------	-------	3.695	-------	6.035	7.178	Diversion Ditch 1
9	Reach	8	-------	1.859	-------	-------	3.677	-------	6.014	7.156	Diversion Ditch 1
10	Combine	2, 3, 4, 5, 6, 9	-------	4.448	-------	-------	9.297	-------	15.70	18.87	POI
11	SCS Runoff	------	-------	0.613	-------	-------	1.265	-------	2.128	2.558	Infiltration Berm 1 (At Berm)
12	SCS Runoff	------	-------	0.782	-------	-------	1.836	-------	3.263	3.993	Infiltration Berm 2 (At Berm)
13	SCS Runoff	------	-------	0.343	-------	-------	0.602	-------	0.923	1.076	Infiltration Berm 3 (At Berm)
14	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Infiltration 4 (At Berm)

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	2.282	1	721	5,776	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	3.307	1	718	7,010	------	------	------	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	3.878	1	722	10,485	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	1.148	1	716	2,227	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	0.374	1	715	674	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	2.476	1	721	6,013	------	------	------	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	3.777	1	722	10,153	------	------	------	Newport Road - Post w/o BMP - DD 1
8	Combine	6.035	1	722	15,929	1, 7	------	------	Diversion Ditch 1
9	Reach	6.014	1	723	15,928	8	------	------	Diversion Ditch 1
10	Combine	15.70	1	720	42,337	2, 3, 4, 5, 6, 9	------	------	POI
11	SCS Runoff	2.128	2	720	5,526	------	------	------	Infiltration Berm 1 (At Berm)
12	SCS Runoff	3.263	2	722	8,543	------	------	------	Infiltration Berm 2 (At Berm)
13	SCS Runoff	0.923	2	716	1,889	------	------	------	Infiltration Berm 3 (At Berm)
14	SCS Runoff	0.374	1	715	674	------	------	------	Infiltration 4 (At Berm)

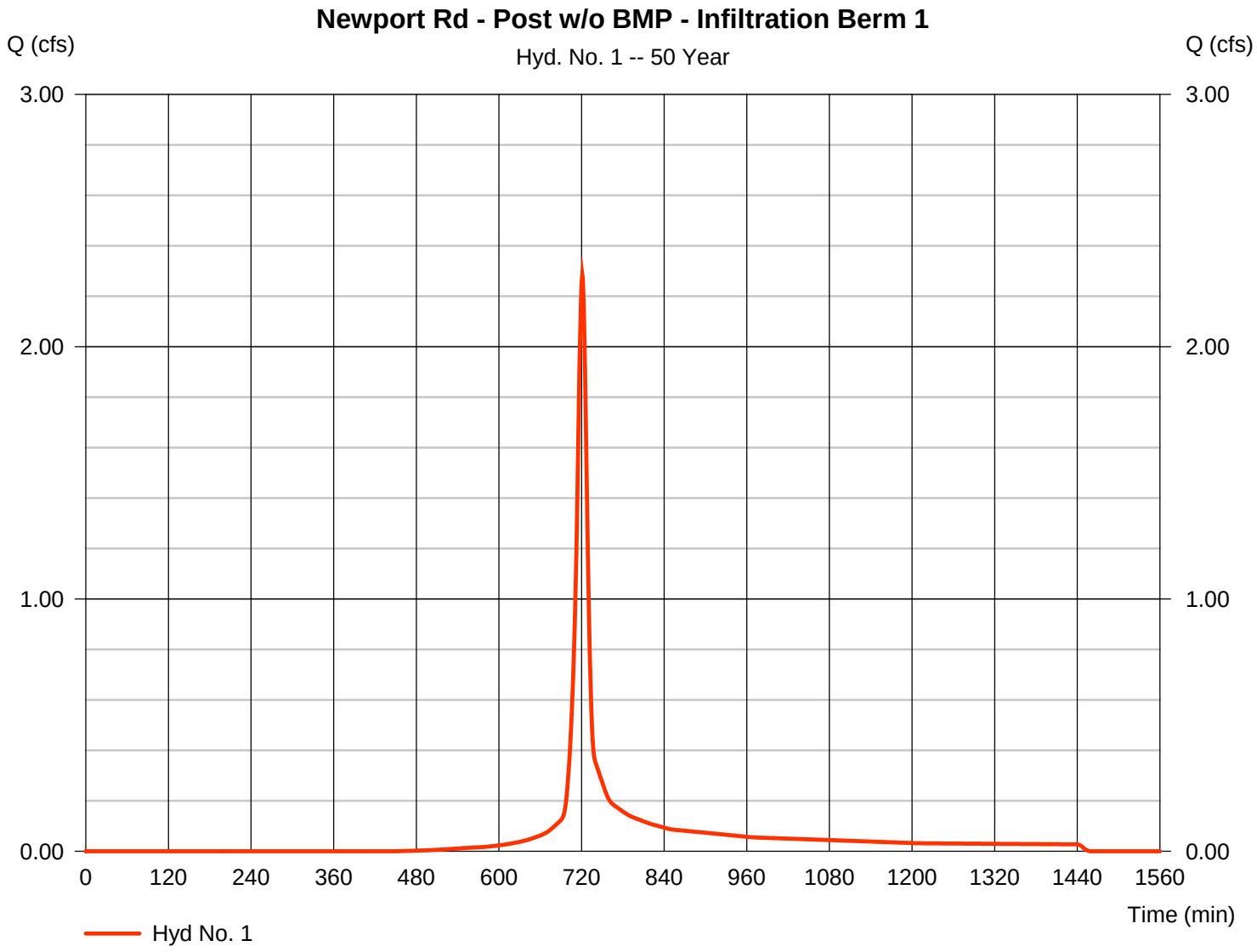
Hydrograph Report

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.282 cfs
Storm frequency	=	50 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	5,776 cuft
Drainage area	=	0.610 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.40 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.610



TR55 Tc Worksheet

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		297.00		
Watercourse slope (%)	= 8.00		4.80		6.40		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		4.08		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**1.21**	**=**	**2.36**
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 ..... 13.40 min

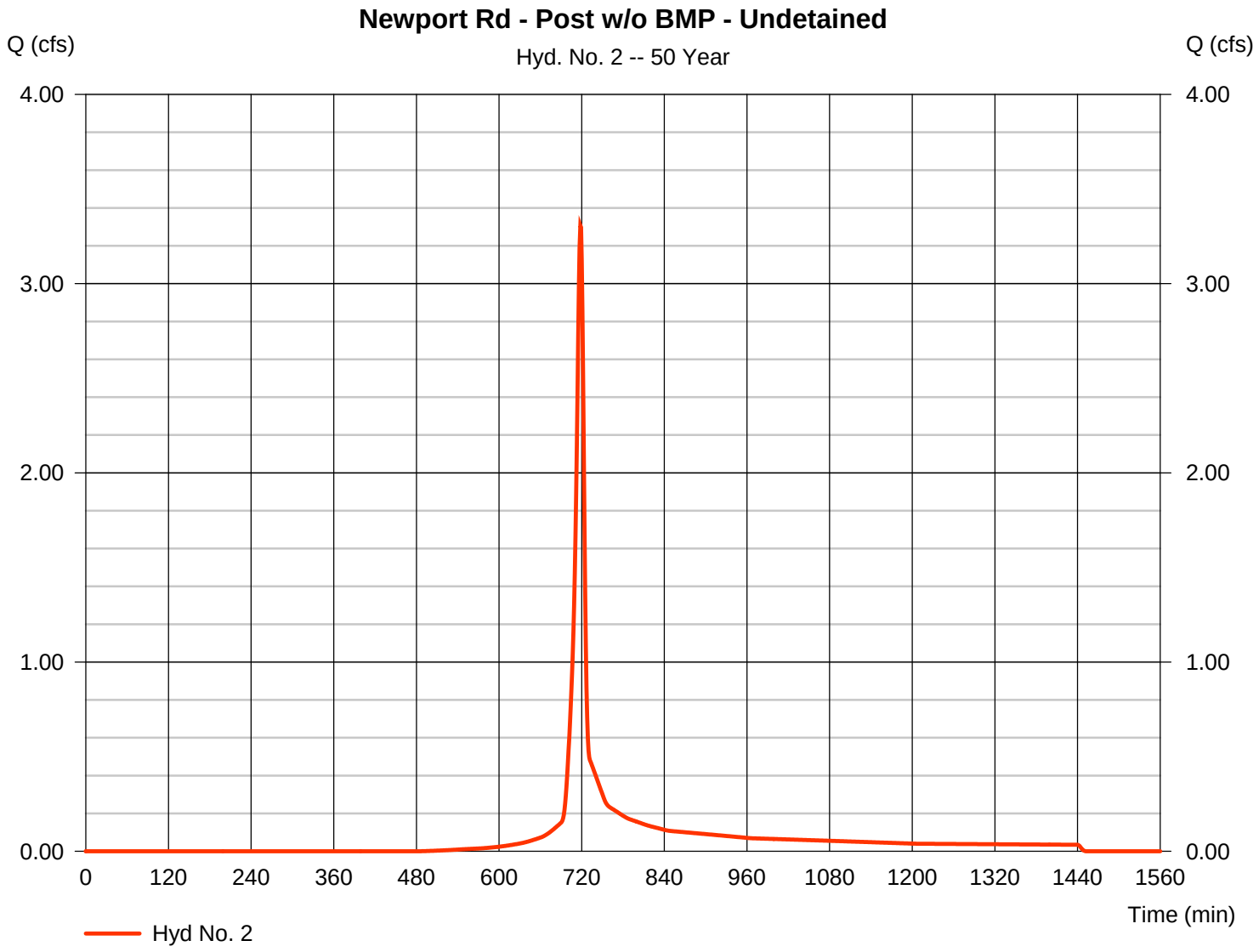
Hydrograph Report

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.307 cfs
Storm frequency	=	50 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	7,010 cuft
Drainage area	=	0.800 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.70 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

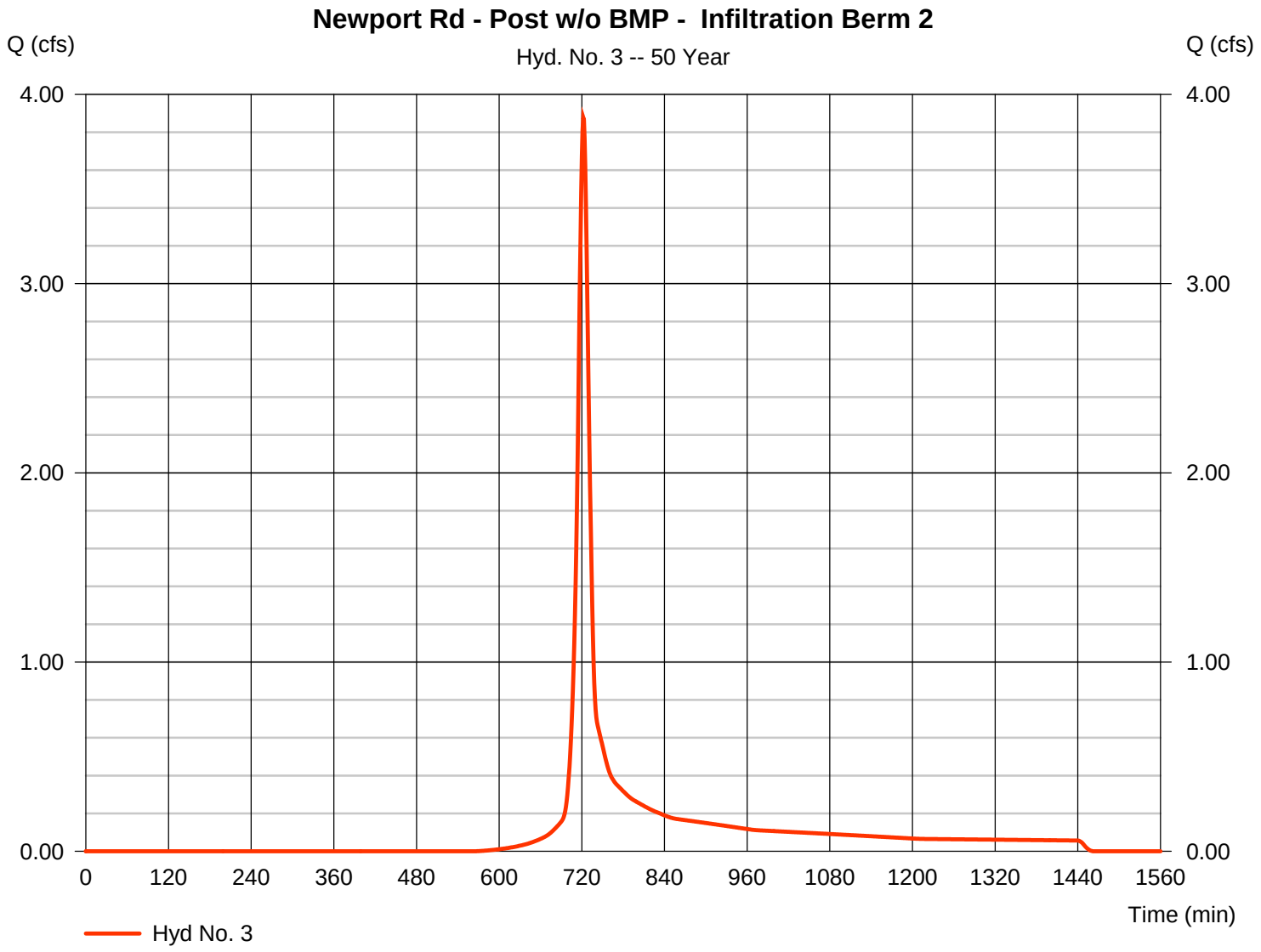
Hydrograph Report

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.878 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	10,485 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



TR55 Tc Worksheet

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		239.00		175.00		
Watercourse slope (%)	= 6.40		11.00		6.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.08		5.35		3.95		
Travel Time (min)	**= 1.85**	**+**	**0.74**	**+**	**0.74**	**=**	**3.33**
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 ..... 14.40 min

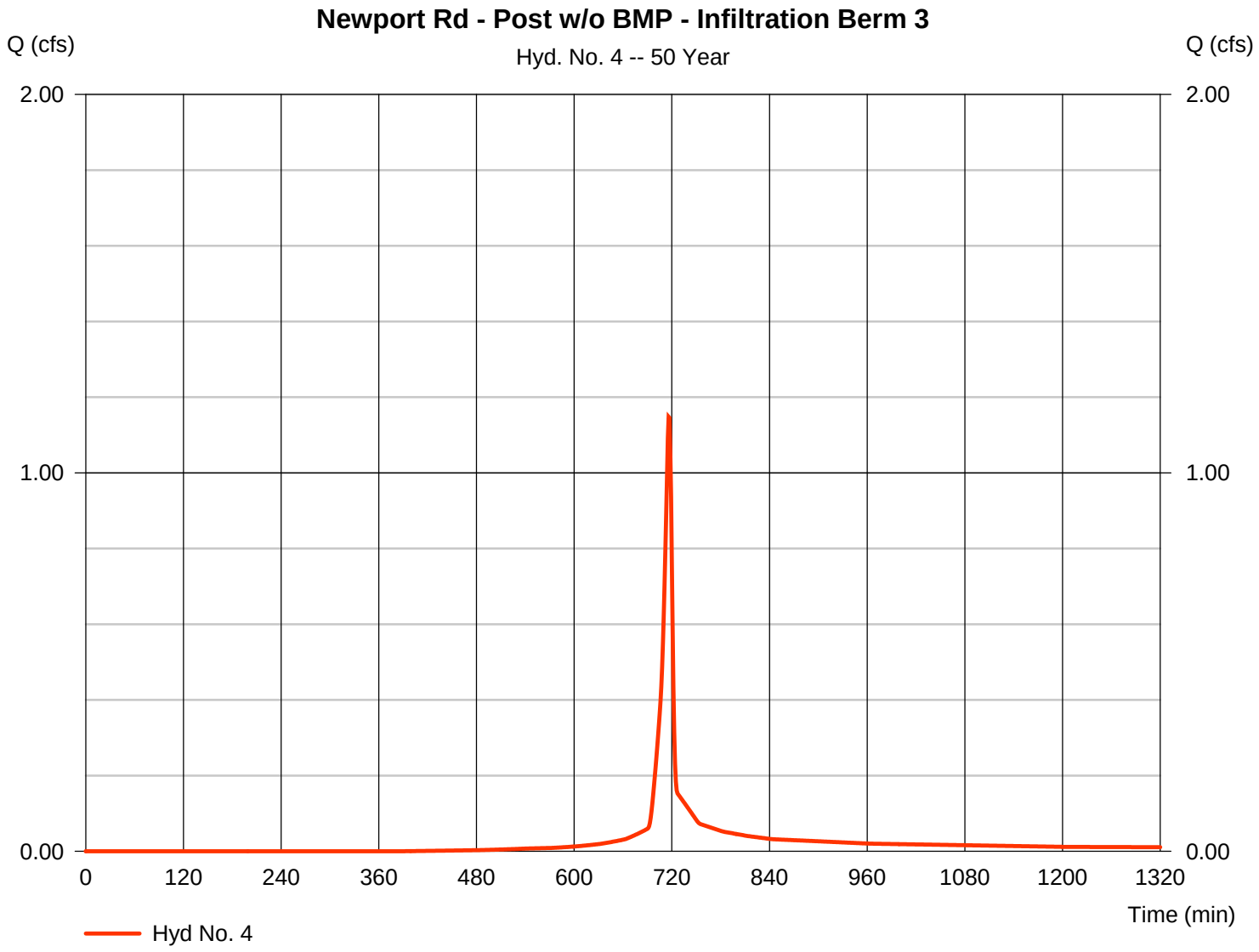
Hydrograph Report

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.148 cfs
Storm frequency	= 50 yrs	Time to peak	= 716 min
Time interval	= 1 min	Hyd. volume	= 2,227 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.60 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



TR55 Tc Worksheet

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		94.00		0.00		
Watercourse slope (%)	= 5.50		8.50		0.00		
Surface description	= Paved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.77		4.70		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.33**	**+**	**0.00**	**=**	**0.90**
Channel Flow							
X sectional flow area (sqft)	= 2.00		2.00		0.00		
Wetted perimeter (ft)	= 4.47		4.47		0.00		
Channel slope (%)	= 4.49		7.51		0.00		
Manning's n-value	= 0.060		0.025		0.015		
Velocity (ft/s)	=3.07						
			9.53				
					0.00		
Flow length (ft)	({0})89.0		230.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.40**	**+**	**0.00**	**=**	**0.89**

Total Travel Time, Tc ..... 3.60 min

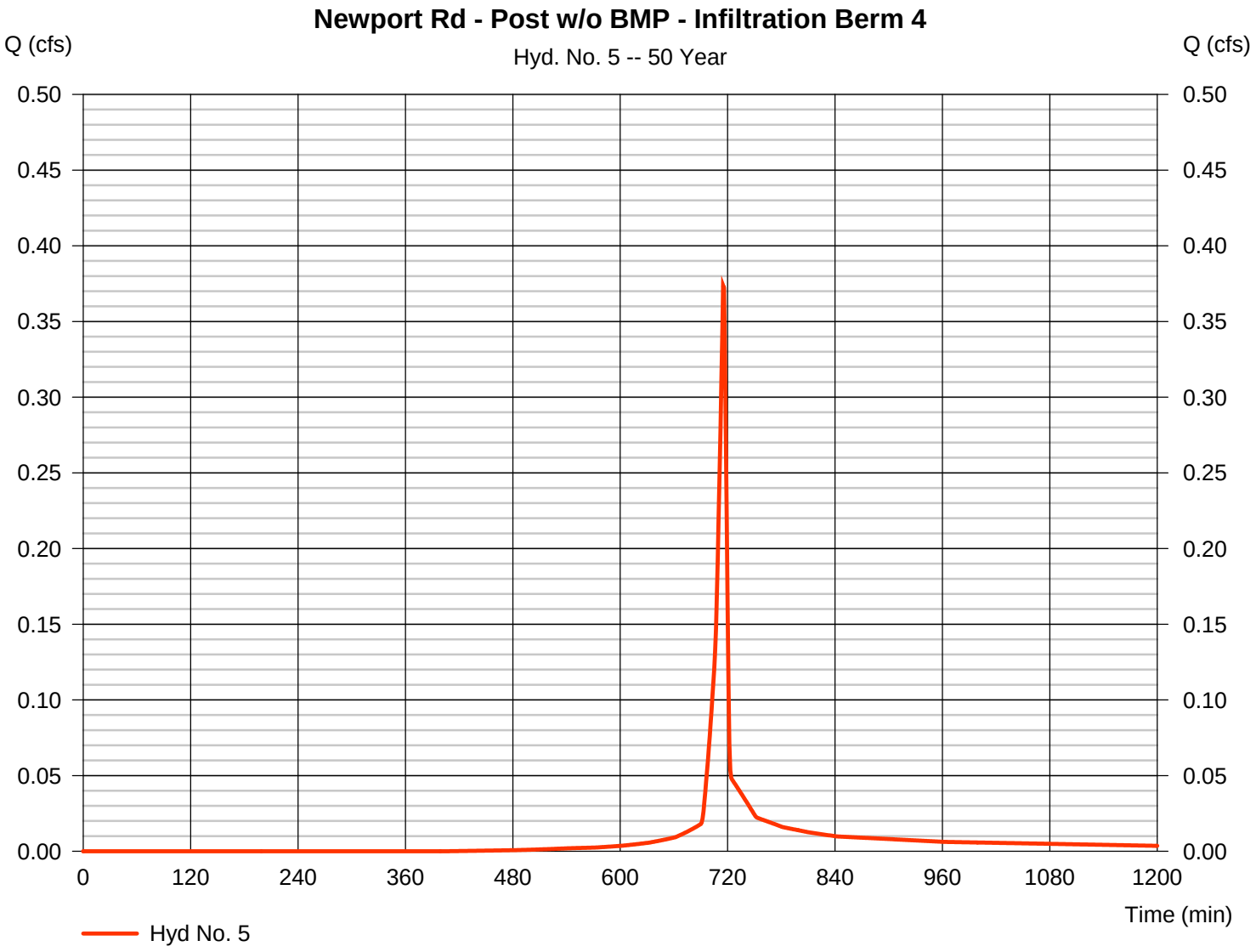
Hydrograph Report

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.374 cfs
Storm frequency	= 50 yrs	Time to peak	= 715 min
Time interval	= 1 min	Hyd. volume	= 674 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.30 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 69.00		0.00		0.00		
Watercourse slope (%)	= 5.90		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=3.92		0.00		0.00		
Travel Time (min)	**= 0.29**	**+**	**0.00**	**+**	**0.00**	**=**	**0.29**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})200.0		0.0		0.0		
Travel Time (min)	**= 0.36**	**+**	**0.00**	**+**	**0.00**	**=**	**0.36**

Total Travel Time, Tc ..... 2.30 min

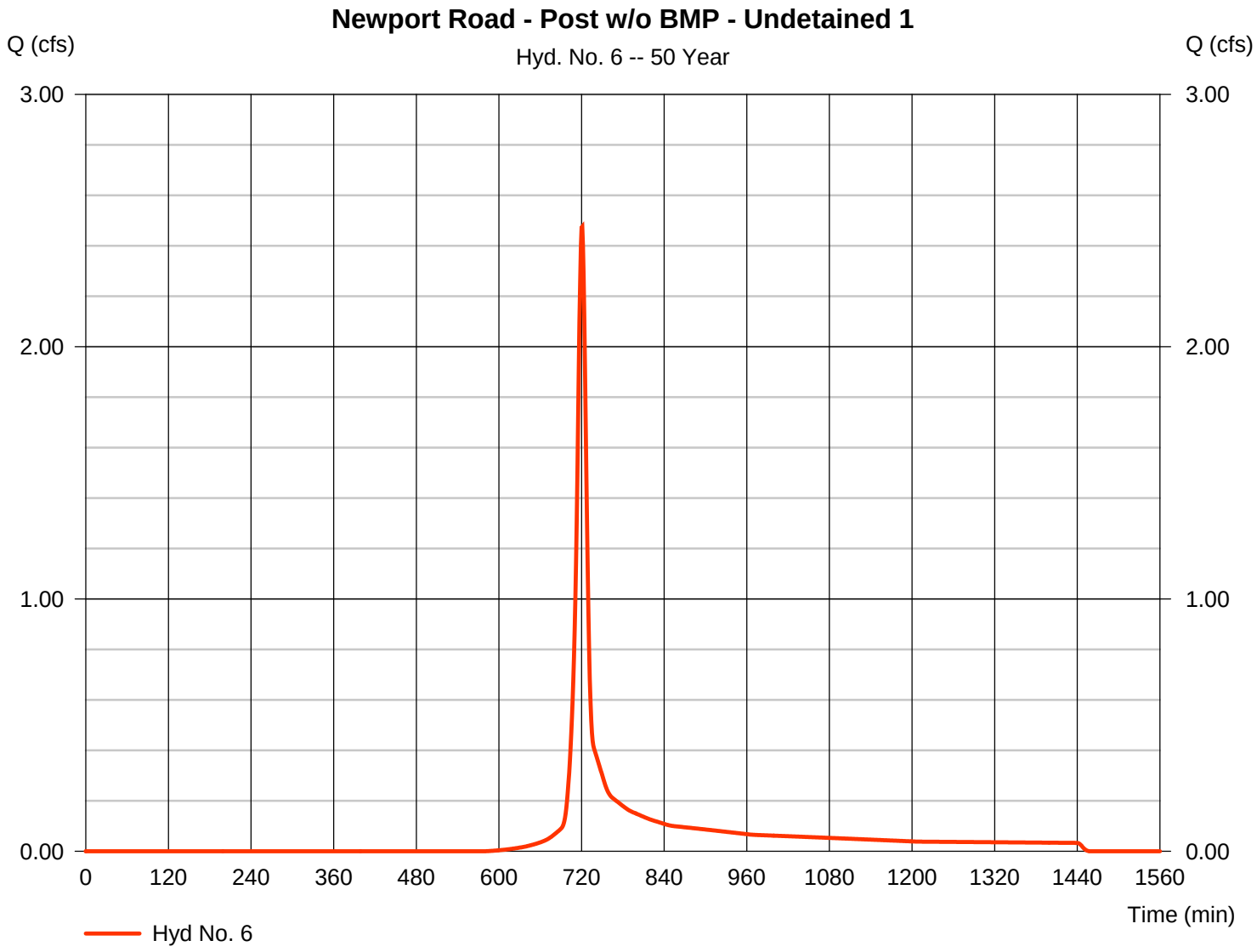
Hydrograph Report

Hyd. No. 6

Newport Road - Post w/o BMP - Undetained 1

Hydrograph type	= SCS Runoff	Peak discharge	= 2.476 cfs
Storm frequency	= 50 yrs	Time to peak	= 721 min
Time interval	= 1 min	Hyd. volume	= 6,013 cuft
Drainage area	= 0.820 ac	Curve number	= 72*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 10.80 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - 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)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

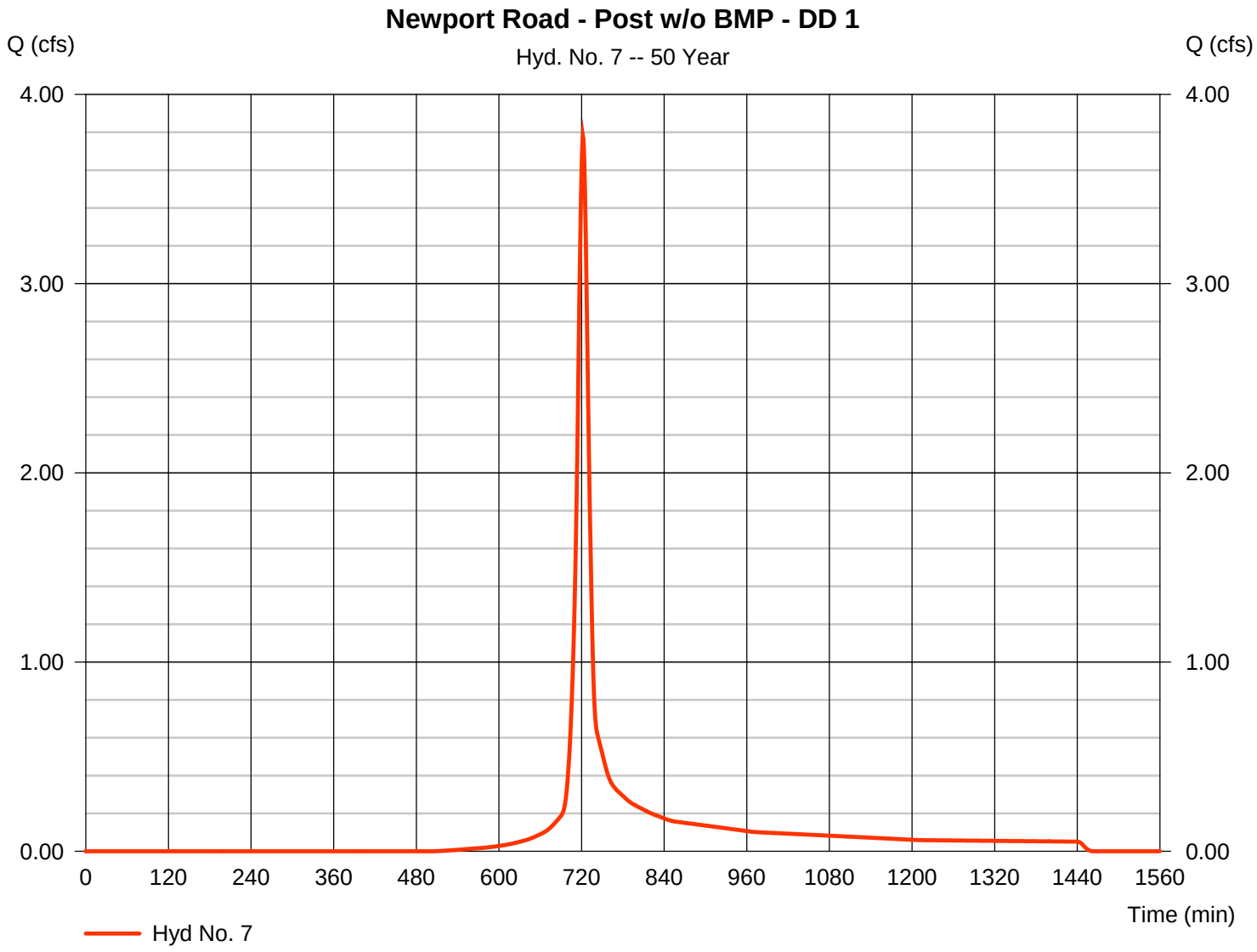
Hydrograph Report

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.777 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	10,153 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

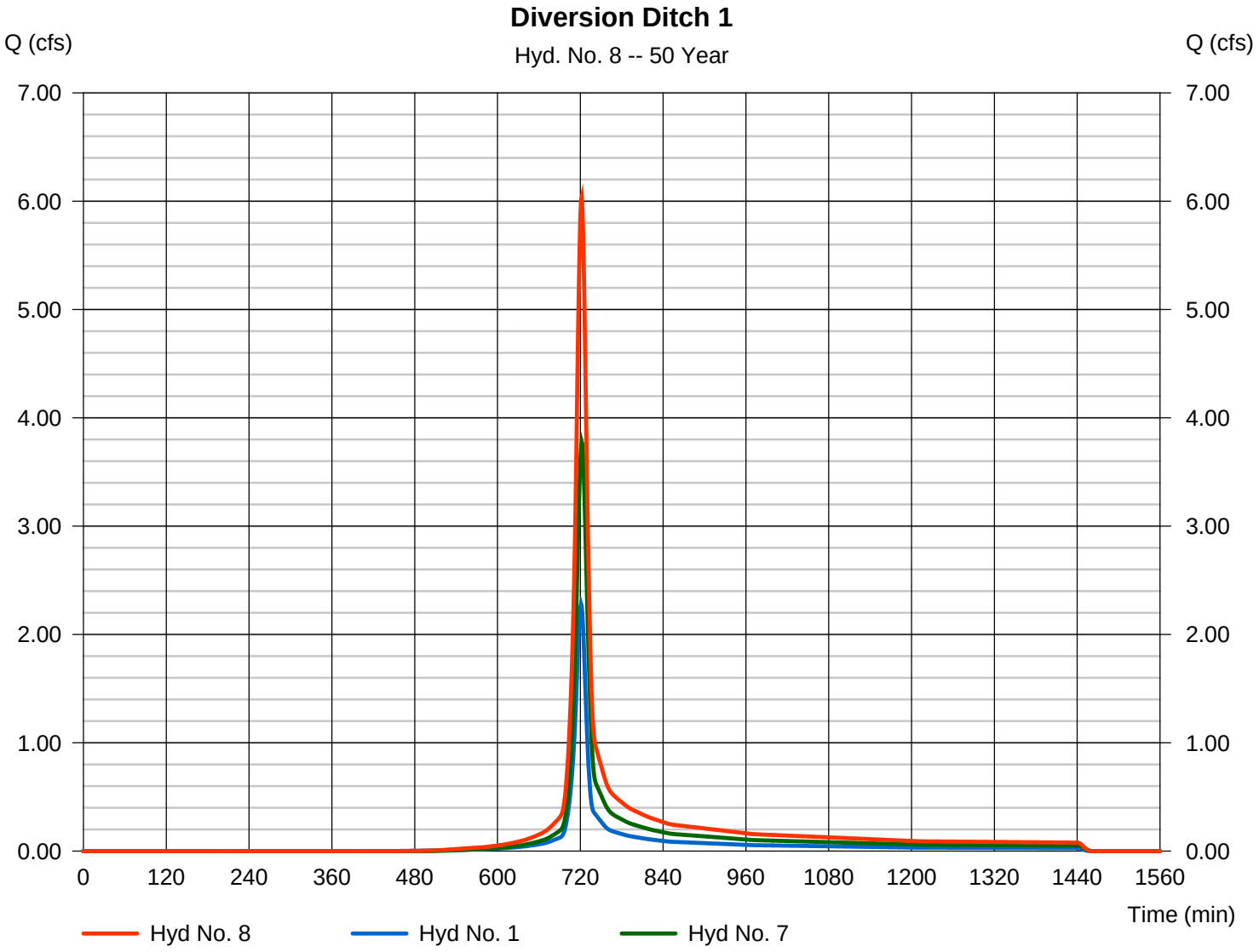
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 8

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 6.035 cfs
Storm frequency	= 50 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 15,929 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.780 ac



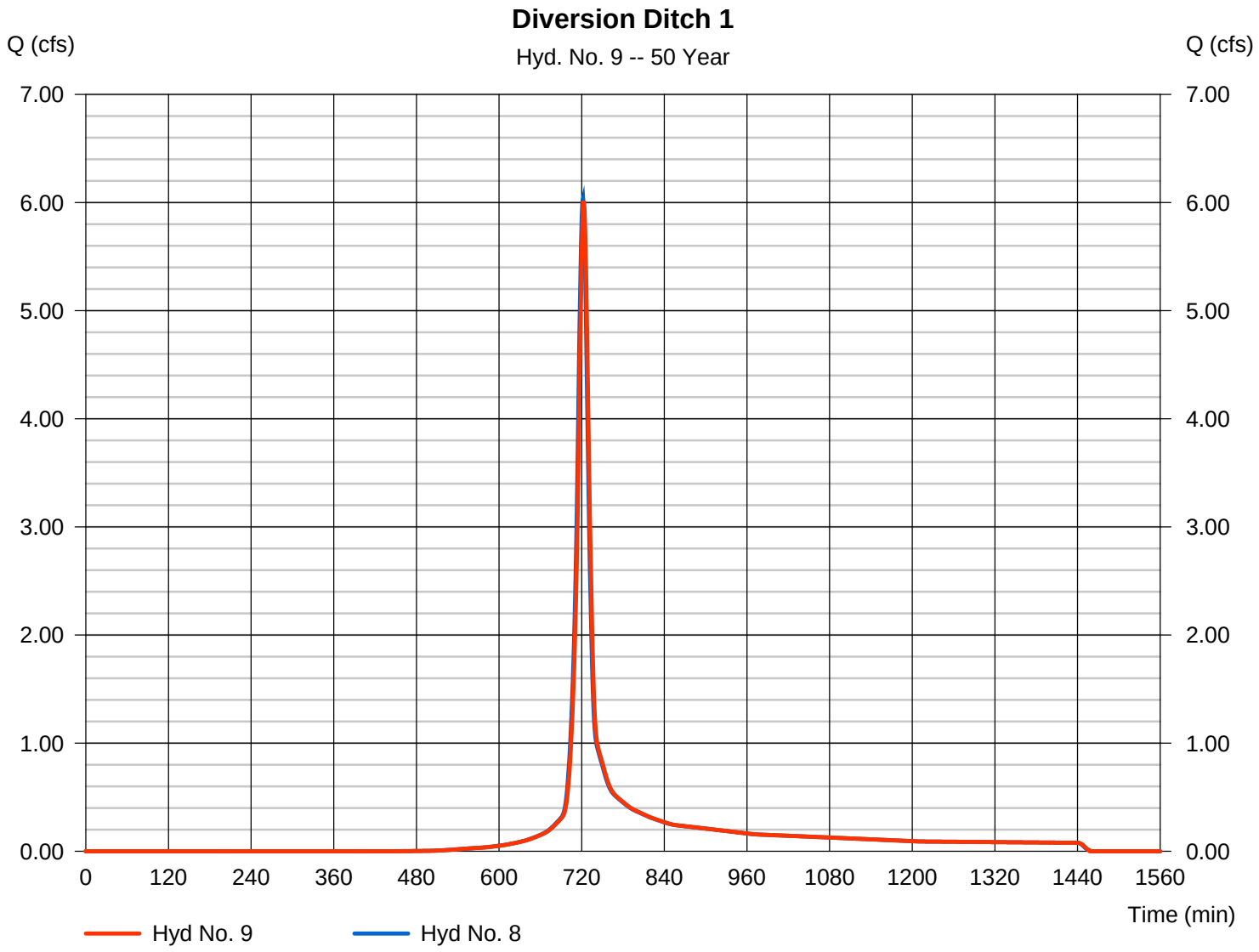
Hydrograph Report

Hyd. No. 9

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	6.014 cfs
Storm frequency	=	50 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	15,928 cuft
Inflow hyd. No.	=	8 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7517

Modified Att-Kin routing method used.

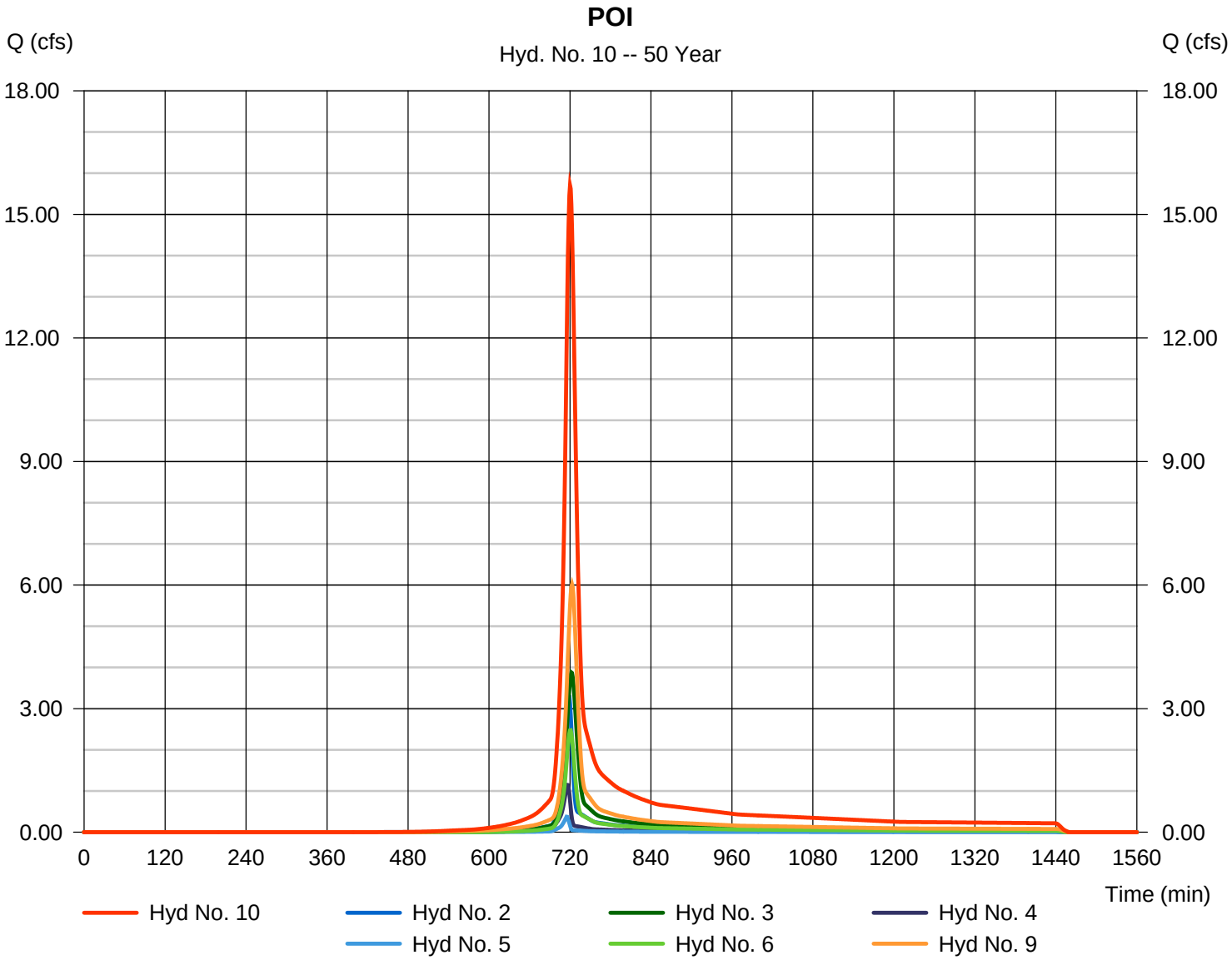


Hydrograph Report

Hyd. No. 10

POI

Hydrograph type	=	Combine	Peak discharge	=	15.70 cfs
Storm frequency	=	50 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	42,337 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 9	Contrib. drain. area	=	3.300 ac



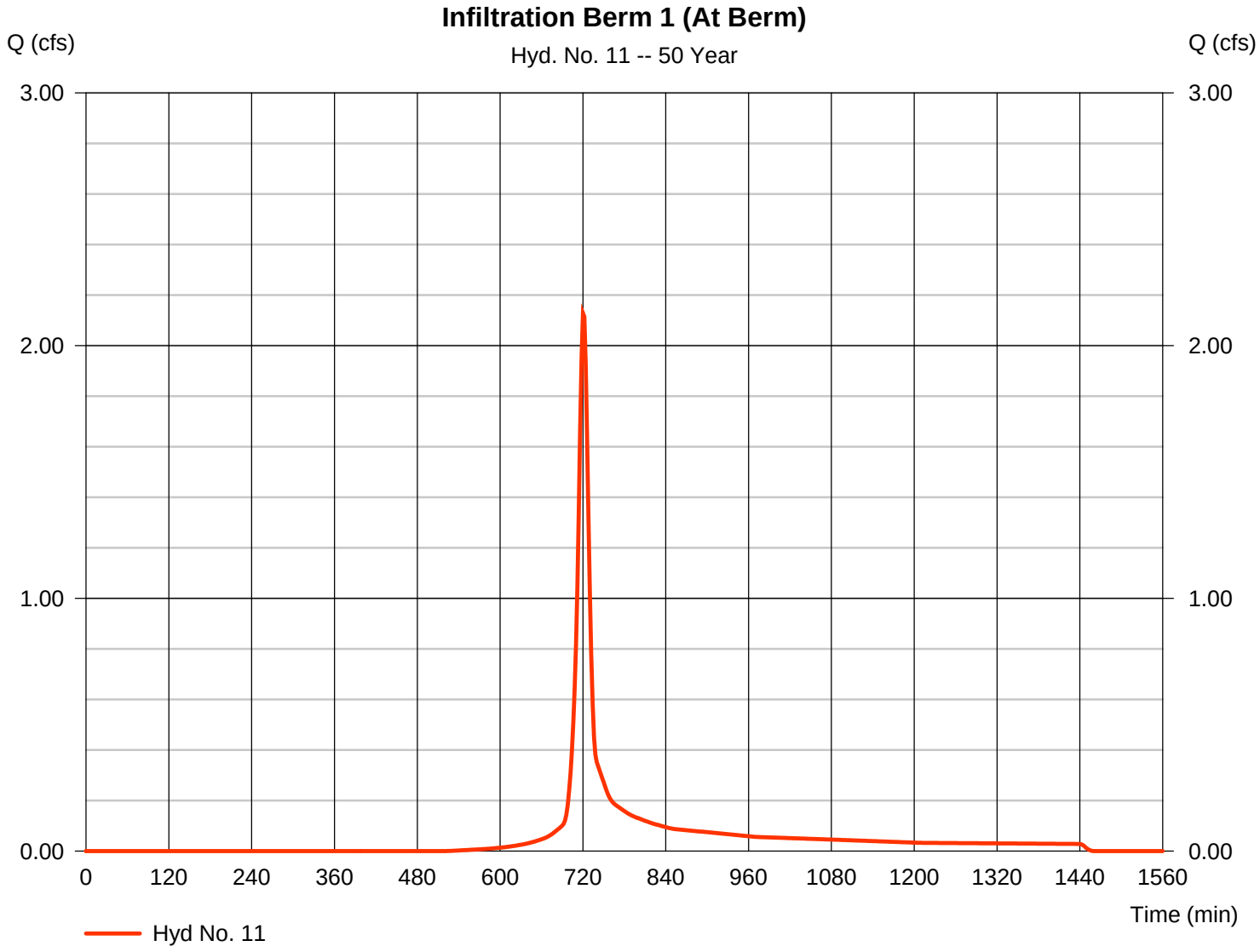
Hydrograph Report

Hyd. No. 11

Infiltration Berm 1 (At Berm)

Hydrograph type	= SCS Runoff	Peak discharge	= 2.128 cfs
Storm frequency	= 50 yrs	Time to peak	= 720 min
Time interval	= 2 min	Hyd. volume	= 5,526 cuft
Drainage area	= 0.640 ac	Curve number	= 76*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 12.60 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.390 x 71) + (0.130 x 78) + (0.100 x 89) + (0.020 x 91)] / 0.640



TR55 Tc Worksheet

Hyd. No. 11

Infiltration Berm 1 (At 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		69.00		
Watercourse slope (%)	= 8.00		4.80		4.30		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		3.35		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**0.34**	**=**	**1.49**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.60 min

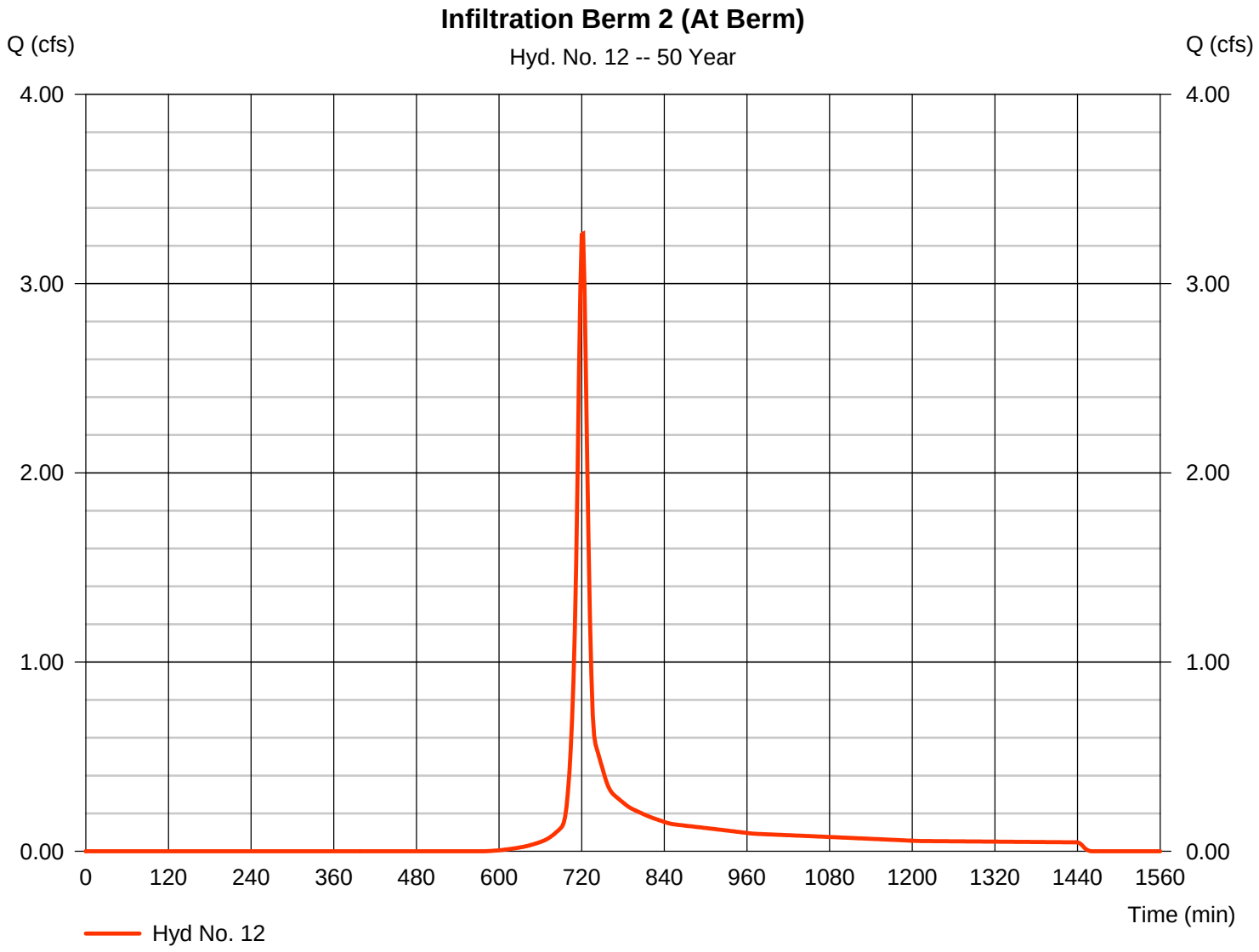
Hydrograph Report

Hyd. No. 12

Infiltration Berm 2 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.263 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	8,543 cuft
Drainage area	=	1.150 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.90 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.030 x 71) + (0.070 x 78) + (0.050 x 89)] / 1.150



TR55 Tc Worksheet

Hyd. No. 12

Infiltration Berm 2 (At Berm)

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		2.51		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		0.00		0.00		
Watercourse slope (%)	= 6.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.08		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.90 min

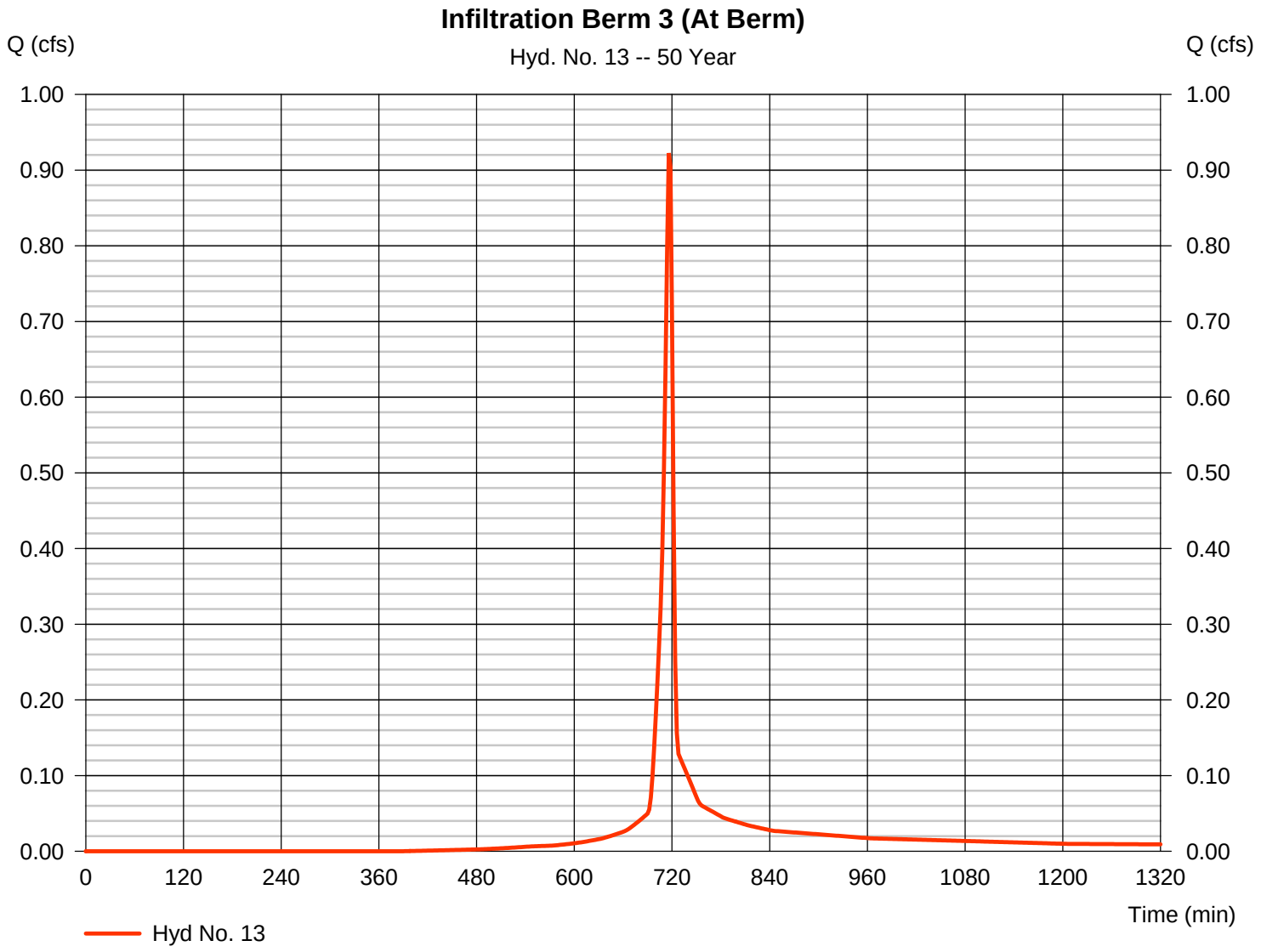
Hydrograph Report

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.923 cfs
Storm frequency	=	50 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	1,889 cuft
Drainage area	=	0.190 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	3.10 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.110 x 78) + (0.080 x 91)] / 0.190



TR55 Tc Worksheet

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		46.00		0.00		
Watercourse slope (%)	= 5.50		6.50		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=4.77		4.11		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.19**	**+**	**0.00**	**=**	**0.76**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 4.49		0.00		0.00		
Manning's n-value	= 0.060		0.015		0.015		
Velocity (ft/s)	=3.07						
			0.00				
					0.00		
Flow length (ft)	({0})89.0		0.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.00**	**+**	**0.00**	**=**	**0.48**

Total Travel Time, Tc ..... 3.10 min

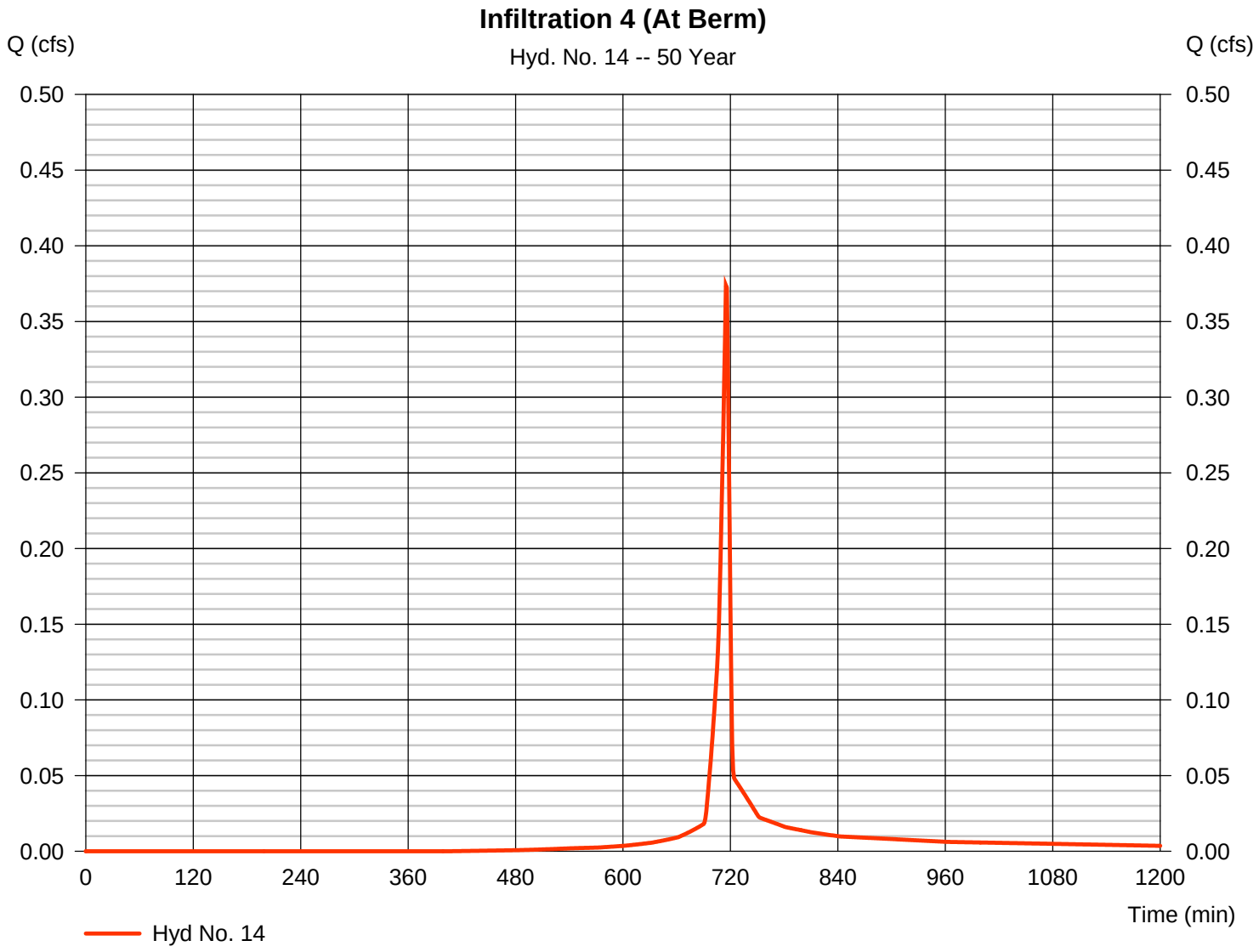
Hydrograph Report

Hyd. No. 14

Infiltration 4 (At Berm)

Hydrograph type	= SCS Runoff	Peak discharge	= 0.374 cfs
Storm frequency	= 50 yrs	Time to peak	= 715 min
Time interval	= 1 min	Hyd. volume	= 674 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 1.90 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 14

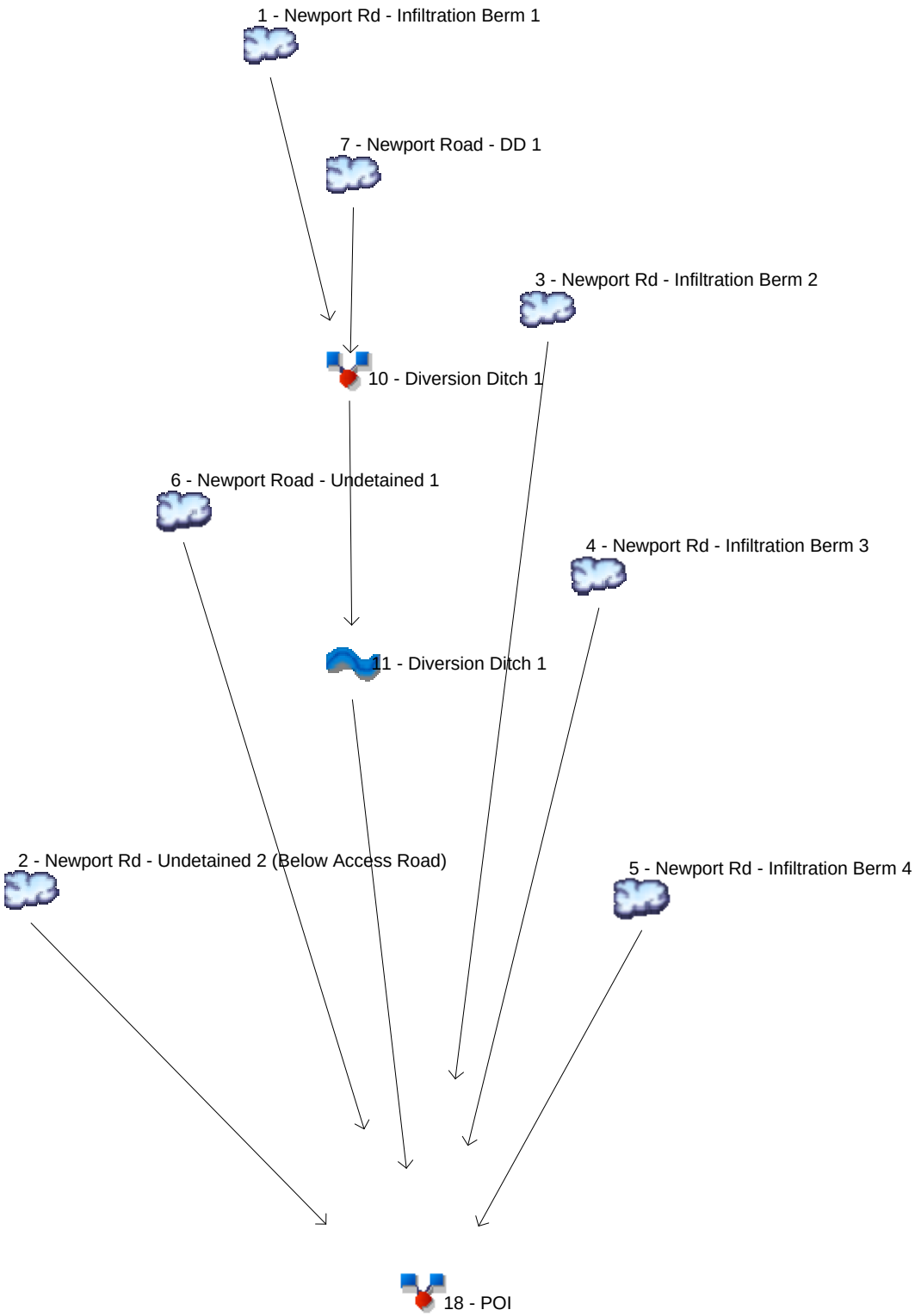
Infiltration 4 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 54.00		0.00		0.00		
Watercourse slope (%)	= 7.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.39		0.00		0.00		
Travel Time (min)	**= 0.21**	**+**	**0.00**	**+**	**0.00**	**=**	**0.21**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 1.90 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	------	-------	-------	-------	-------	-------	-------	2.477	-------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	3.307	-------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	3.321	-------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	0.504	-------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	------	-------	-------	-------	-------	-------	-------	0.279	-------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	------	-------	-------	-------	-------	-------	-------	2.476	-------	Newport Road - Undetained 1
7	SCS Runoff	------	-------	-------	-------	-------	-------	-------	3.777	-------	Newport Road - DD 1
10	Combine	1, 7,	-------	-------	-------	-------	-------	-------	6.016	-------	Diversion Ditch 1
11	Reach	10	-------	-------	-------	-------	-------	-------	5.991	-------	Diversion Ditch 1
18	Combine	2, 3, 4, 5, 6, 11,	-------	-------	-------	-------	-------	-------	14.31	-------	POI

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	2.477	1	727	8,428	------	------	------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	3.307	1	718	7,010	------	------	------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	3.321	1	725	10,485	------	------	------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	0.504	1	734	2,227	------	------	------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	0.279	1	721	708	------	------	------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	2.476	1	721	6,013	------	------	------	Newport Road - Undetained 1
7	SCS Runoff	3.777	1	722	10,153	------	------	------	Newport Road - DD 1
10	Combine	6.016	1	723	18,581	1, 7,	------	------	Diversion Ditch 1
11	Reach	5.991	1	725	18,578	10	------	------	Diversion Ditch 1
18	Combine	14.31	1	722	45,021	2, 3, 4, 5, 6, 11,	------	------	POI

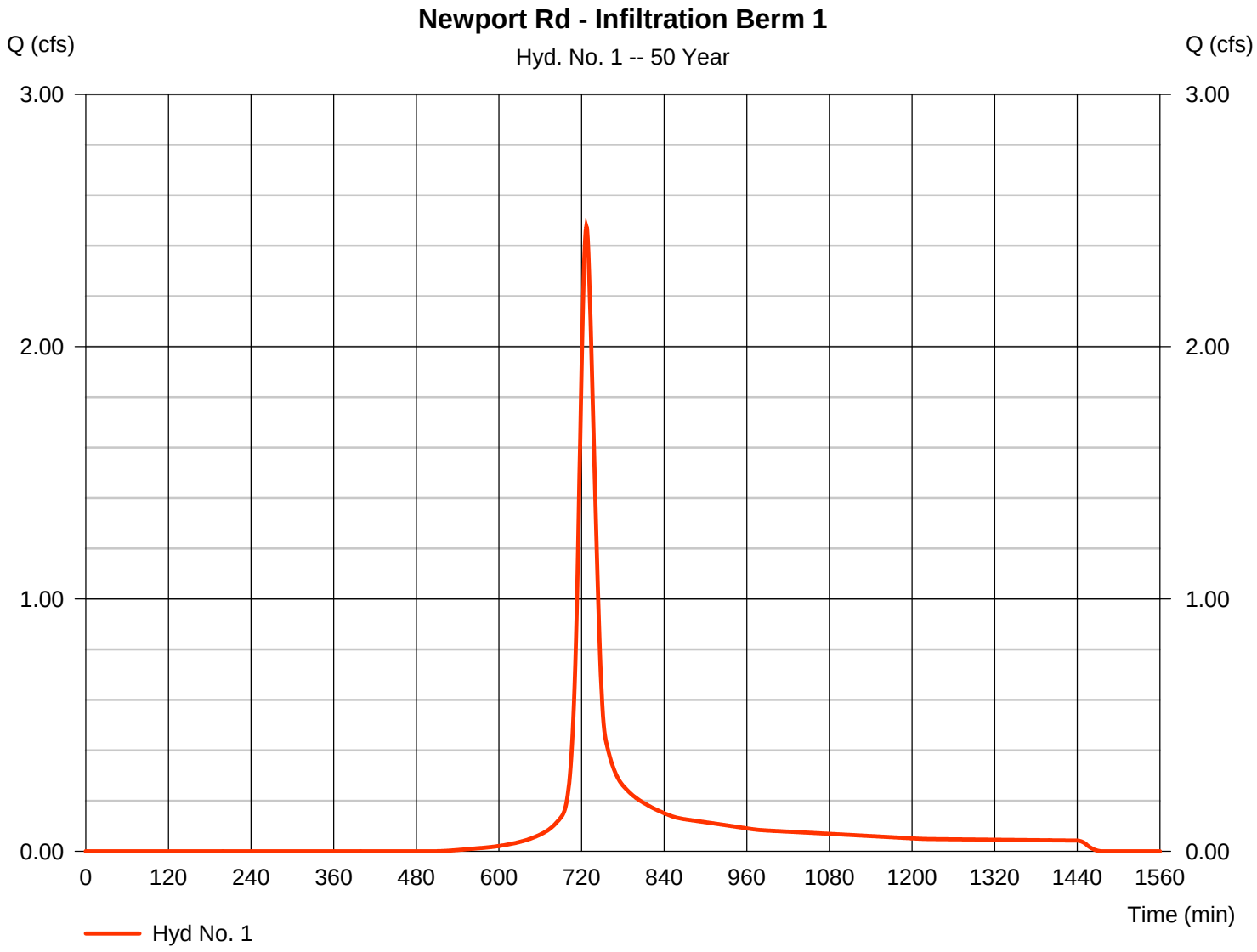
Hydrograph Report

Hyd. No. 1

Newport Rd - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.477 cfs
Storm frequency	=	50 yrs	Time to peak	=	727 min
Time interval	=	1 min	Hyd. volume	=	8,428 cuft
Drainage area	=	0.980 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	22.50 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.980



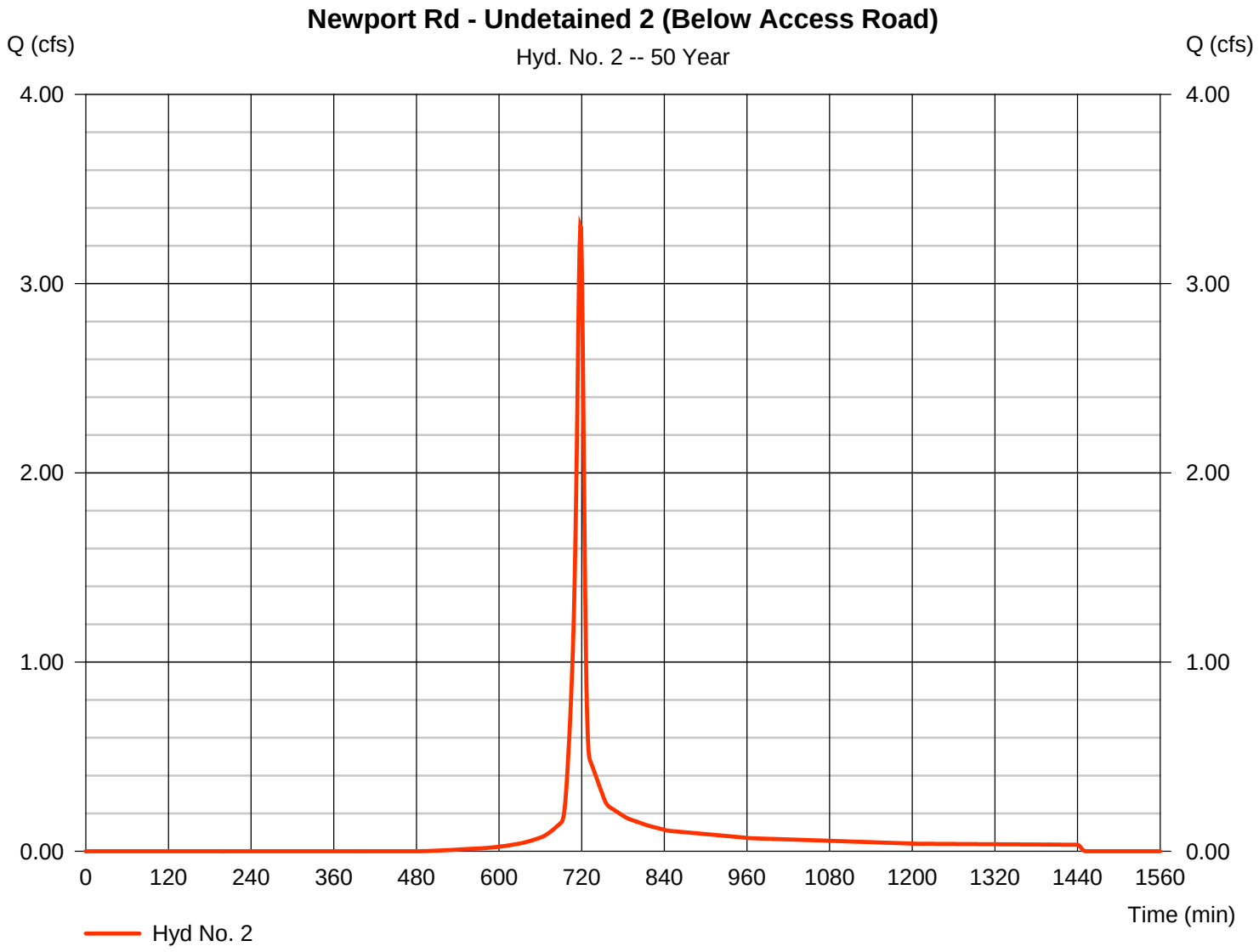
Hydrograph Report

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.307 cfs
Storm frequency	= 50 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 7,010 cuft
Drainage area	= 0.800 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 6.70 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

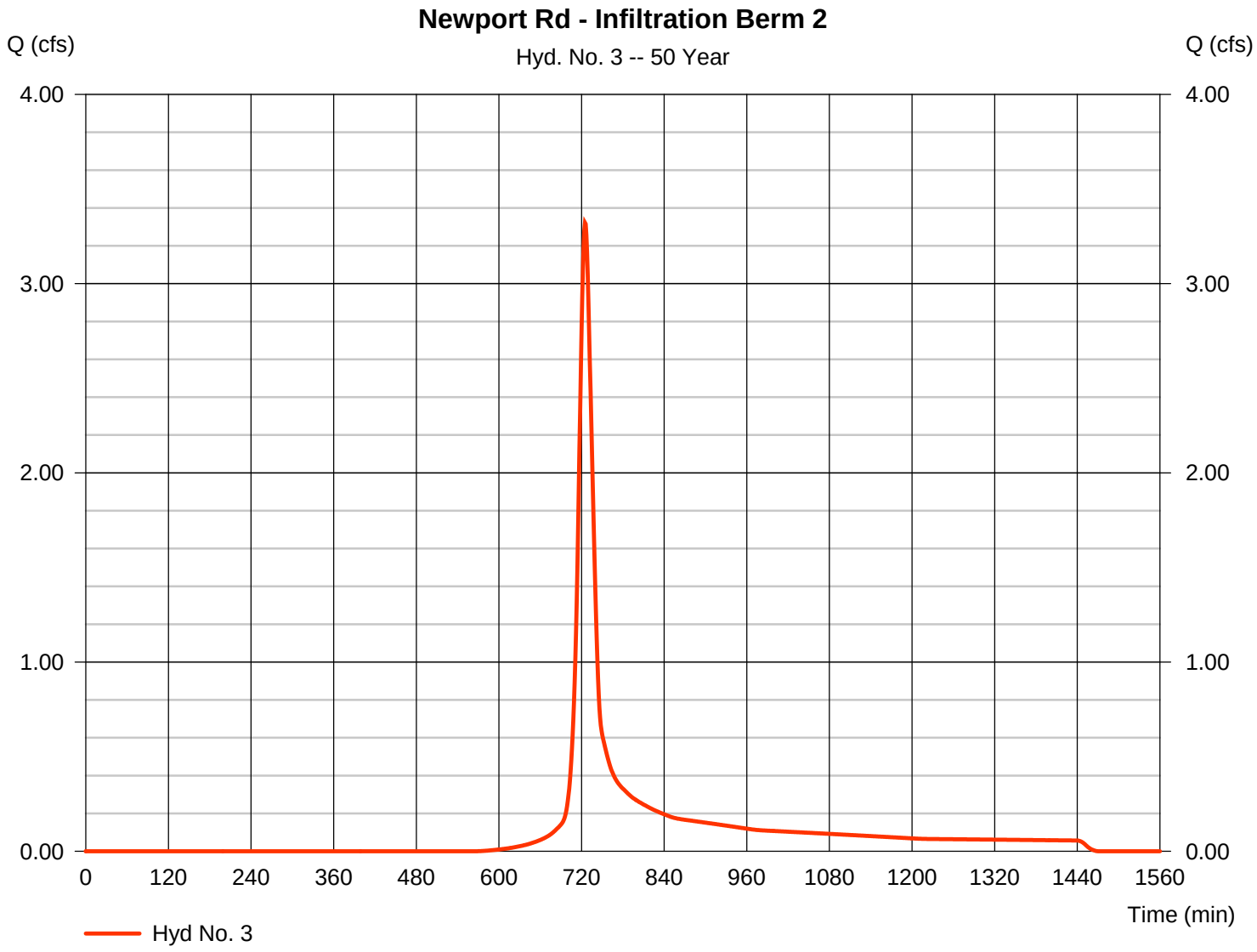
Hydrograph Report

Hyd. No. 3

Newport Rd - Infiltration Berm 2

Hydrograph type	= SCS Runoff	Peak discharge	= 3.321 cfs
Storm frequency	= 50 yrs	Time to peak	= 725 min
Time interval	= 1 min	Hyd. volume	= 10,485 cuft
Drainage area	= 1.400 ac	Curve number	= 73*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 18.60 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



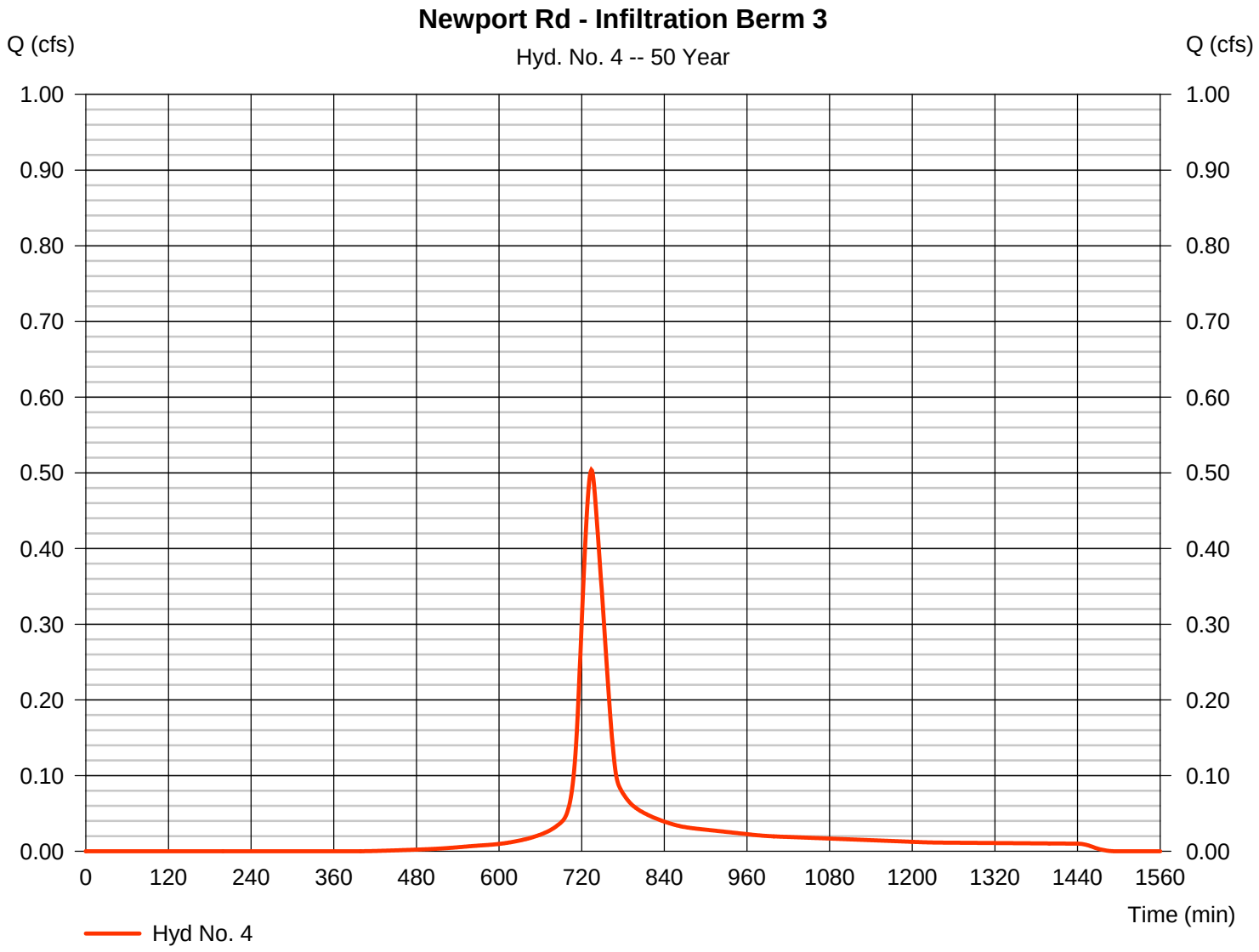
Hydrograph Report

Hyd. No. 4

Newport Rd - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.504 cfs
Storm frequency	= 50 yrs	Time to peak	= 734 min
Time interval	= 1 min	Hyd. volume	= 2,227 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 35.10 min
Total precip.	= 4.72 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



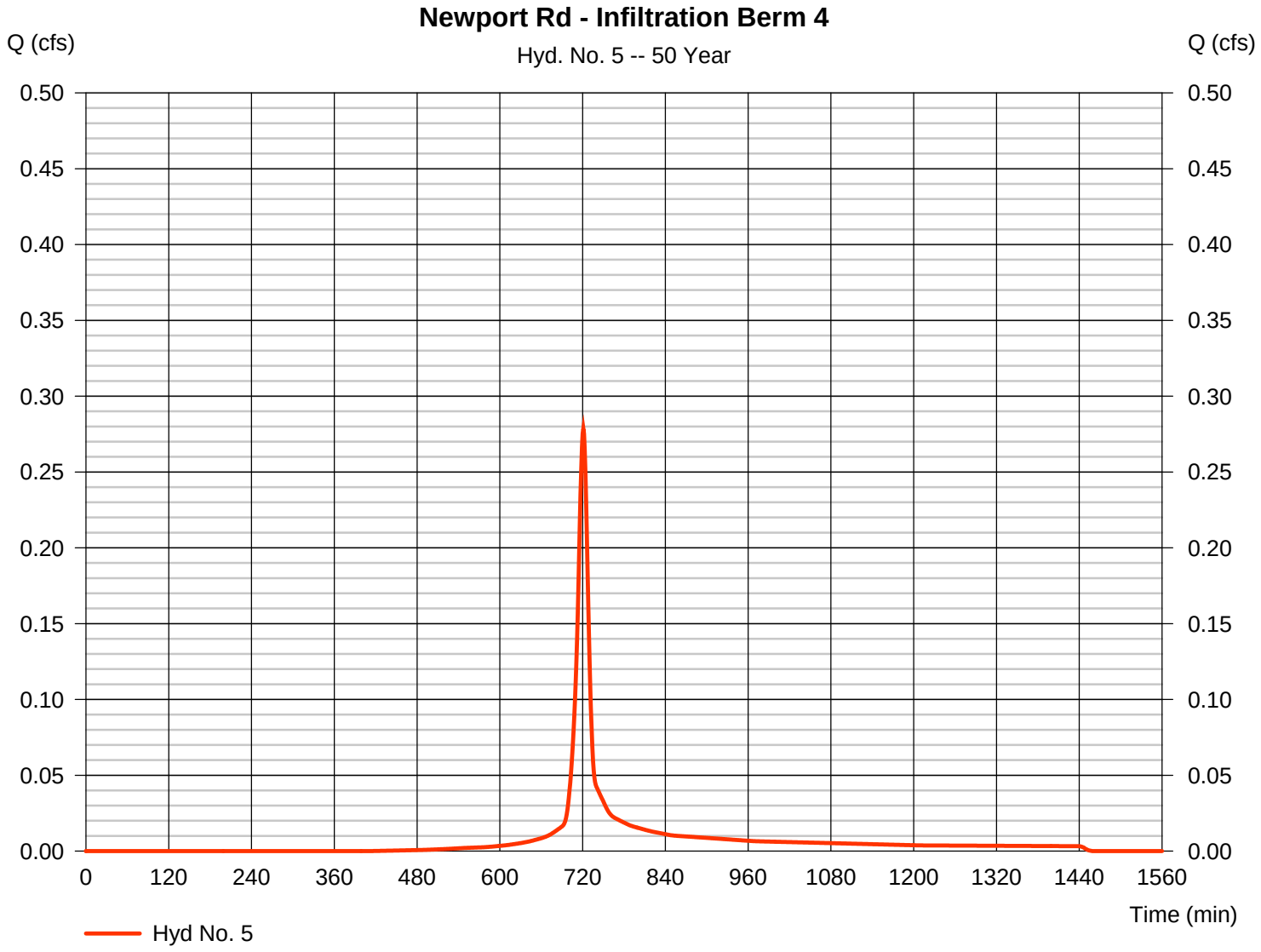
Hydrograph Report

Hyd. No. 5

Newport Rd - Infiltration Berm 4

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.279 cfs
Storm frequency	=	50 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	708 cuft
Drainage area	=	0.070 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	13.00 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



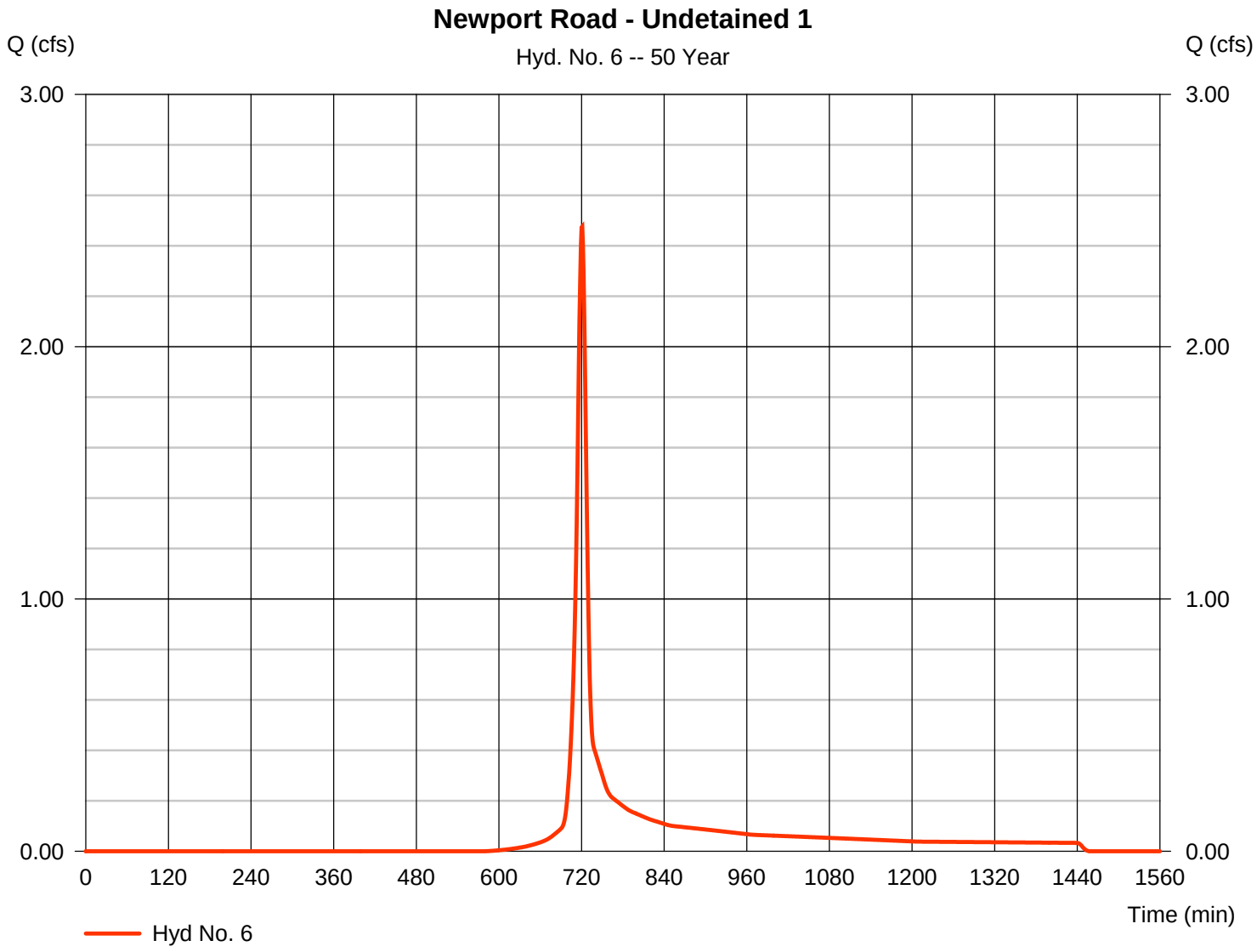
Hydrograph Report

Hyd. No. 6

Newport Road - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.476 cfs
Storm frequency	=	50 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	6,013 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - Undetained 1

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 (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

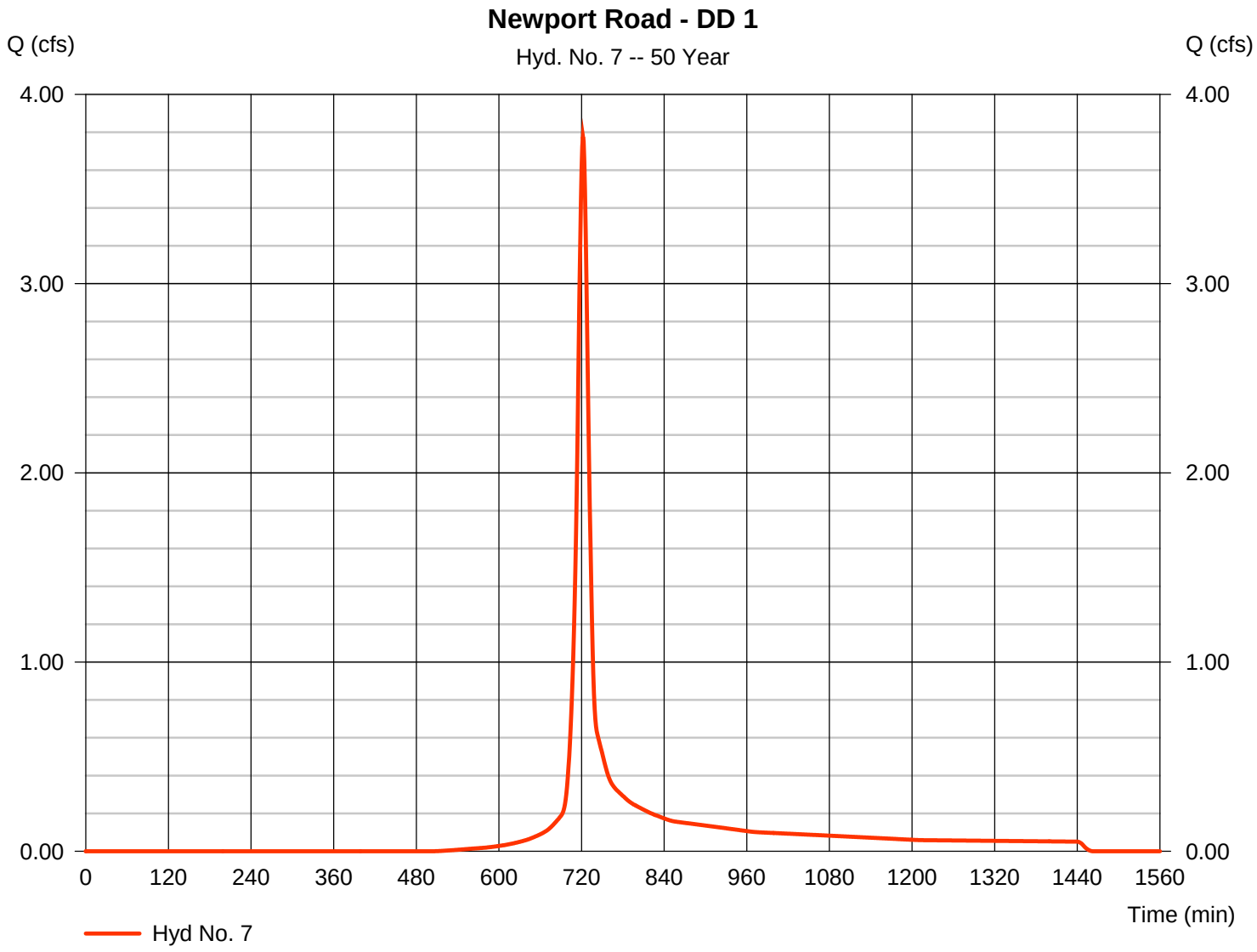
Hydrograph Report

Hyd. No. 7

Newport Road - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.777 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	10,153 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	4.72 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

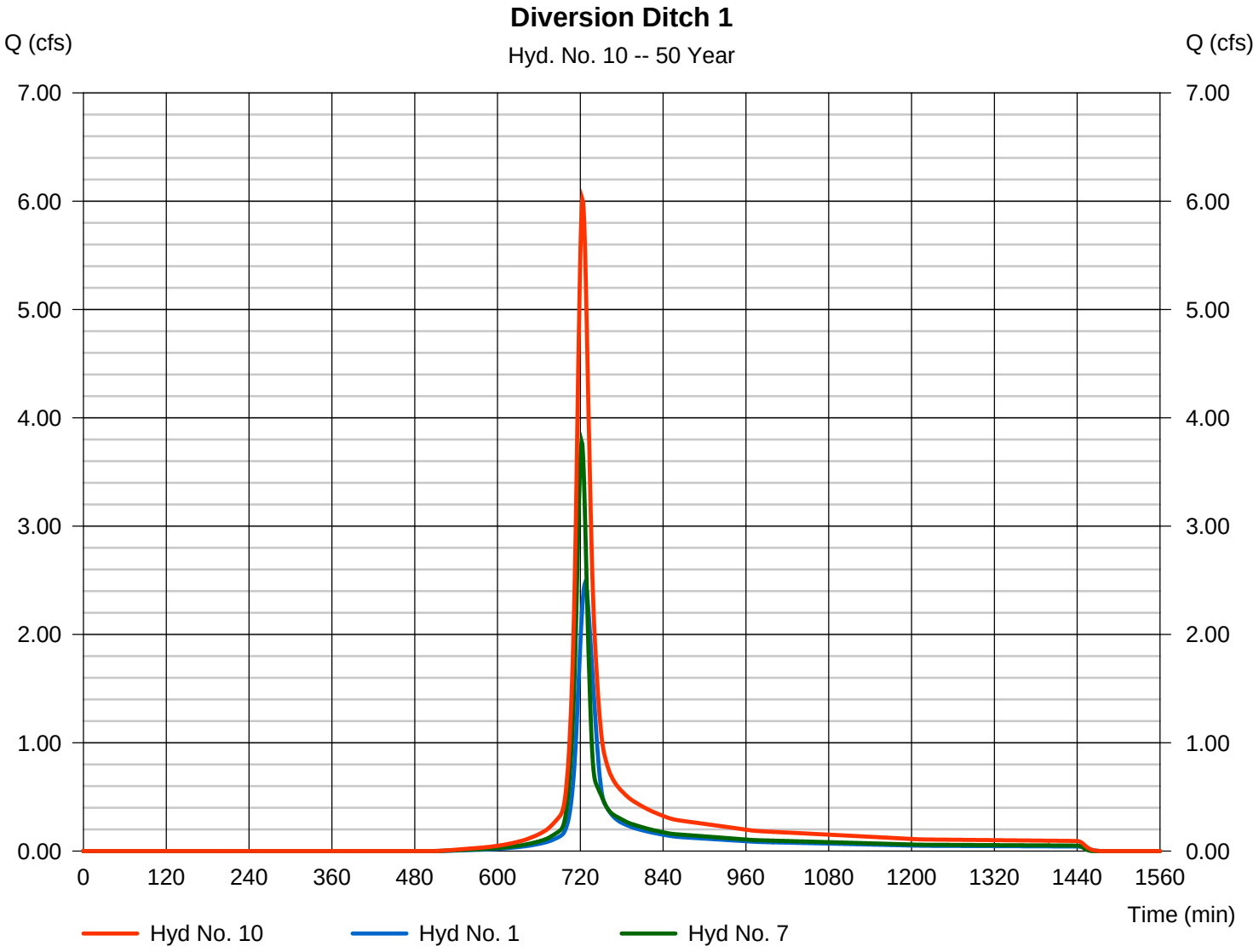
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 10

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 6.016 cfs
Storm frequency	= 50 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 18,581 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 2.150 ac



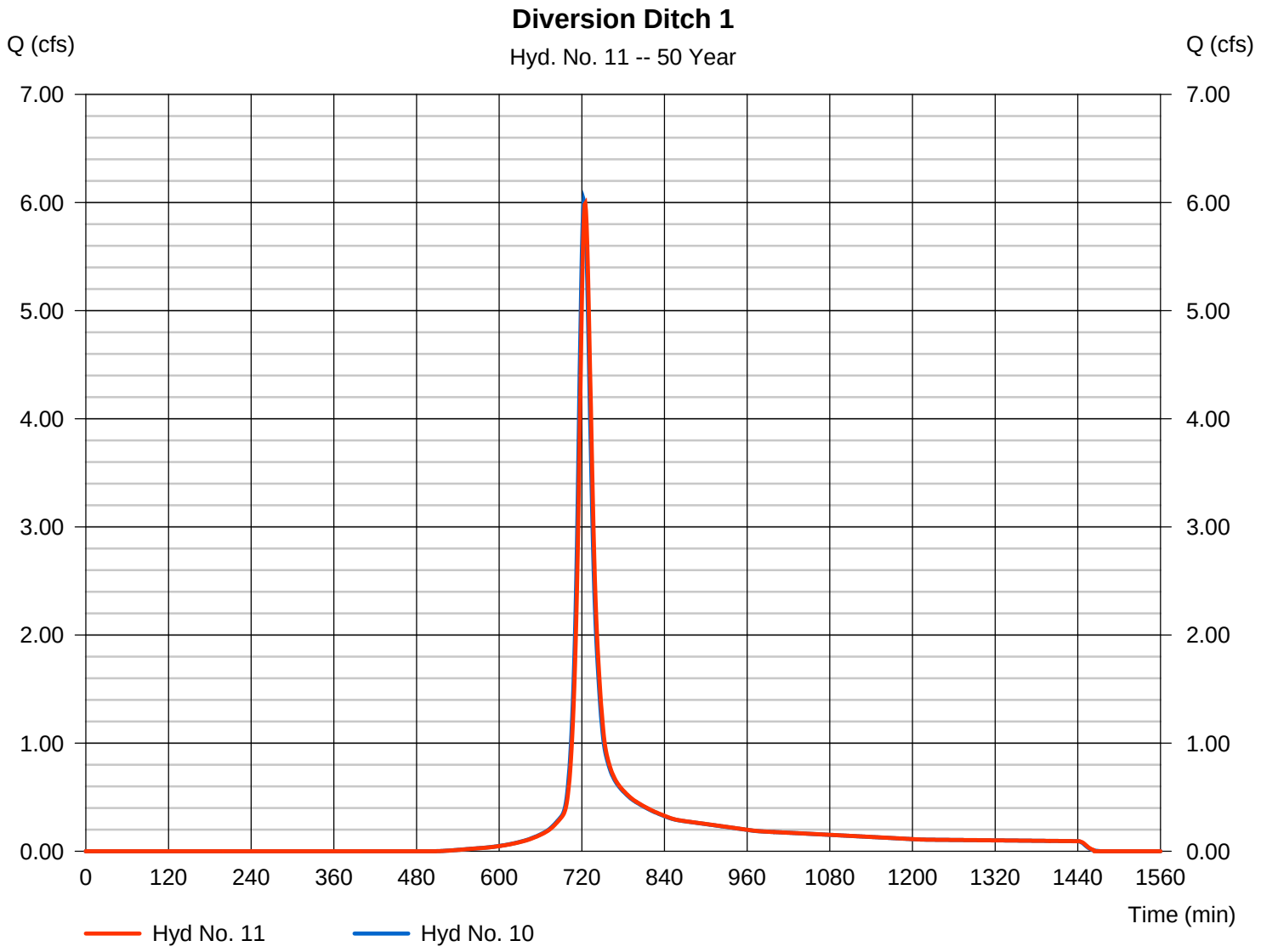
Hydrograph Report

Hyd. No. 11

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	5.991 cfs
Storm frequency	=	50 yrs	Time to peak	=	725 min
Time interval	=	1 min	Hyd. volume	=	18,578 cuft
Inflow hyd. No.	=	10 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7517

Modified Att-Kin routing method used.

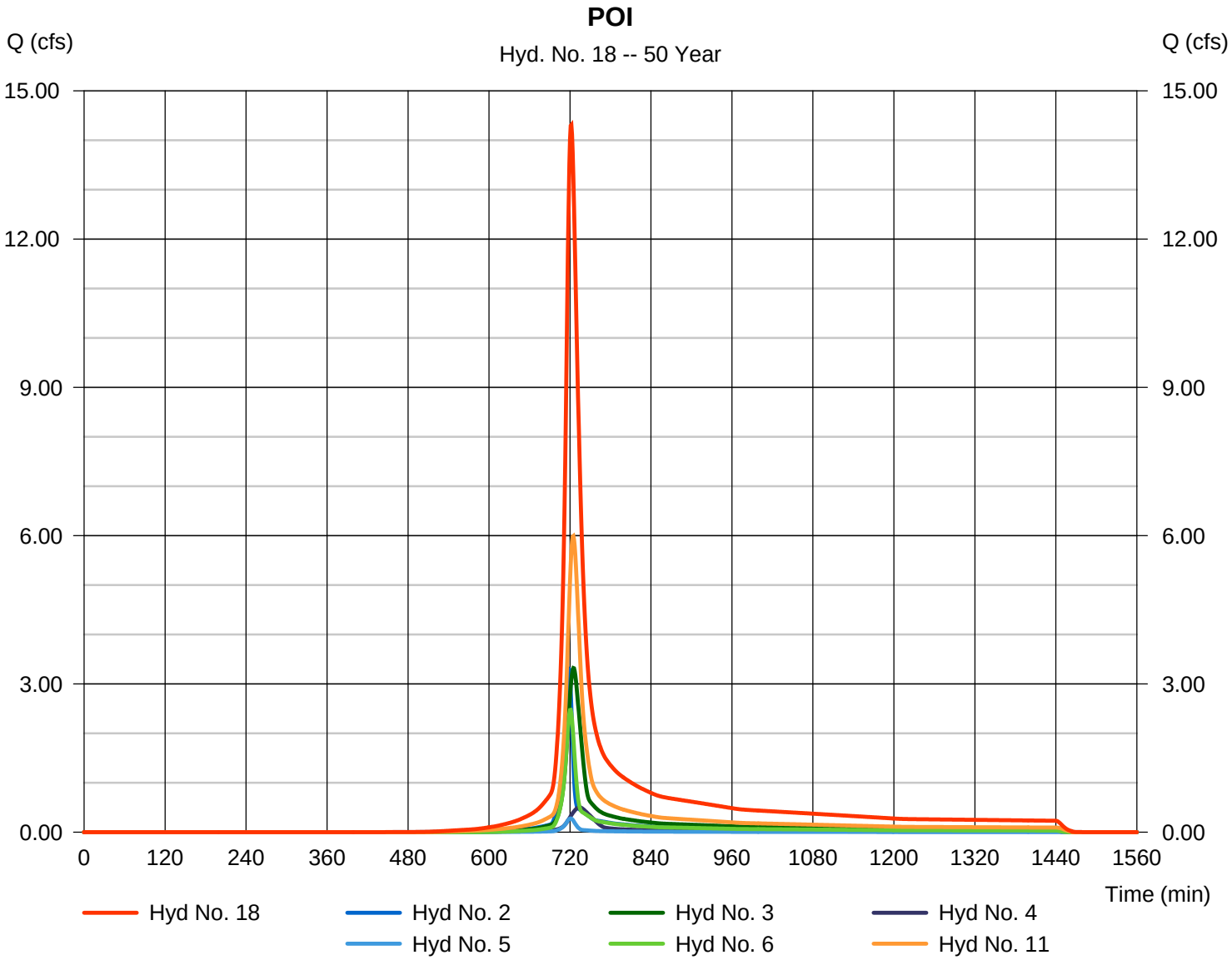


Hydrograph Report

Hyd. No. 18

POI

Hydrograph type	=	Combine	Peak discharge	=	14.31 cfs
Storm frequency	=	50 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	45,021 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 11	Contrib. drain. area	=	3.300 ac



ATTACHMENT C-4
NEWPORT 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	------	-------	5.466	-------	-------	11.50	-------	19.42	23.37	Newport 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	23.37	1	719	52,887	------	------	------	Newport Rd - PRE

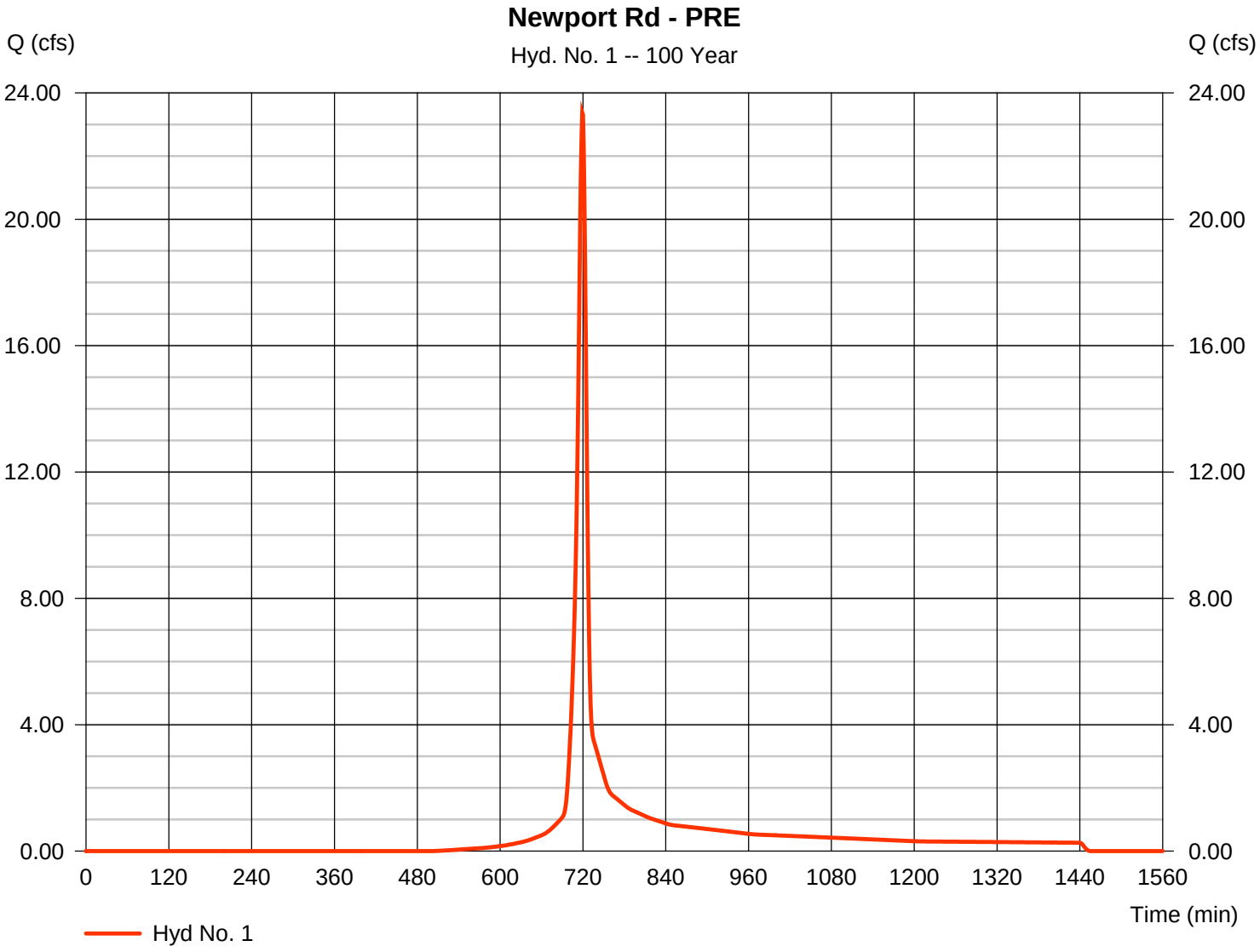
Hydrograph Report

Hyd. No. 1

Newport Rd - PRE

Hydrograph type	=	SCS Runoff	Peak discharge	=	23.37 cfs
Storm frequency	=	100 yrs	Time to peak	=	719 min
Time interval	=	1 min	Hyd. volume	=	52,887 cuft
Drainage area	=	5.440 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.00 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.530 x 71) + (2.680 x 78) + (0.230 x 77)] / 5.440



TR55 Tc Worksheet

Hyd. No. 1

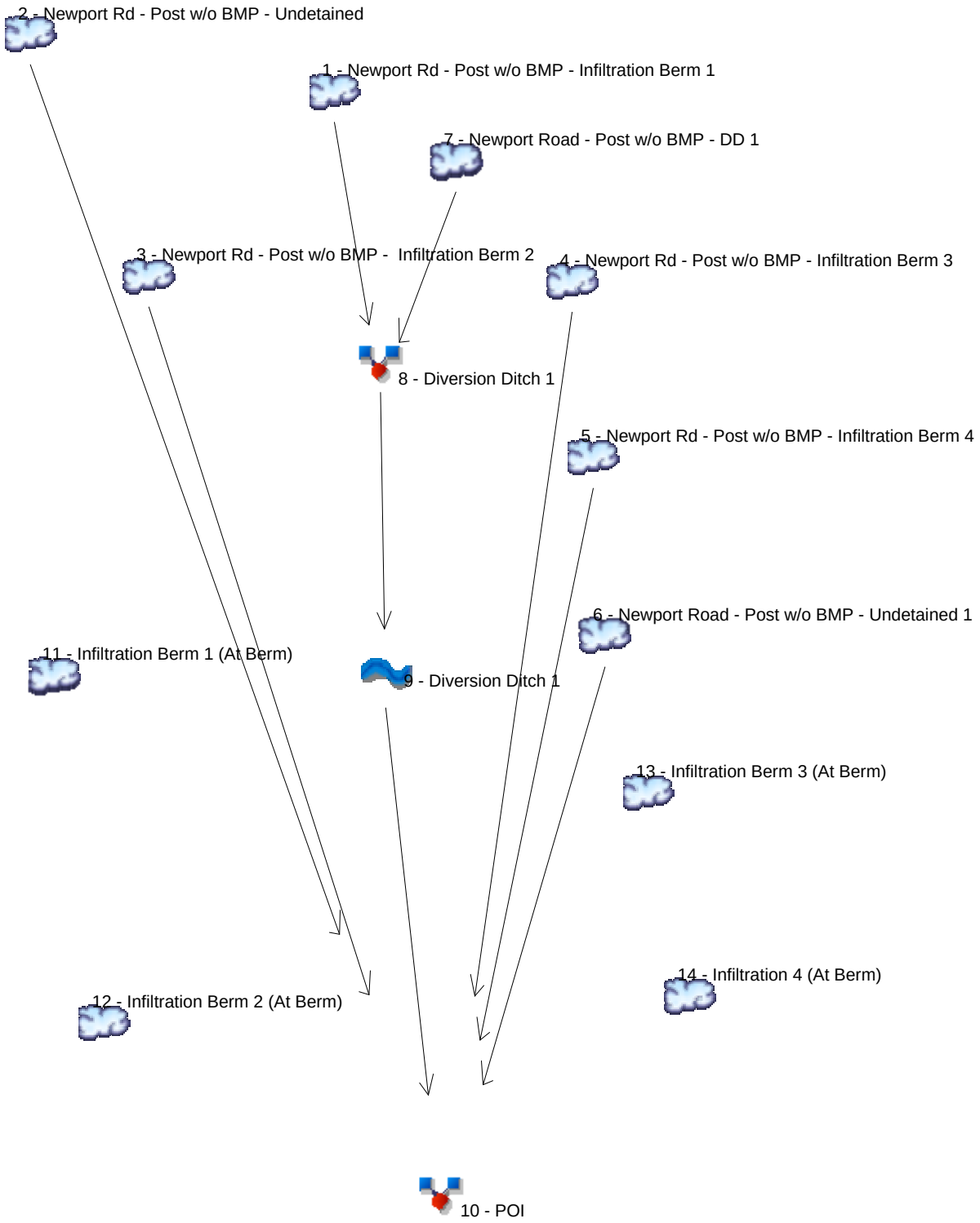
Newport Rd - PRE

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 (%)	= 8.00		0.00		0.00		
Travel Time (min)	**= 6.35**	**+**	**0.00**	**+**	**0.00**	**=**	**6.35**
Shallow Concentrated Flow							
Flow length (ft)	= 620.00		141.00		124.00		
Watercourse slope (%)	= 6.50		12.80		4.70		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.11		5.77		3.50		
Travel Time (min)	**= 2.51**	**+**	**0.41**	**+**	**0.59**	**=**	**3.51**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})63.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 10.00 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	------	-------	0.758	-------	-------	1.432	-------	2.282	2.694	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	------	-------	1.053	-------	-------	2.041	-------	3.307	3.927	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	------	-------	0.964	-------	-------	2.202	-------	3.878	4.722	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	------	-------	0.432	-------	-------	0.754	-------	1.148	1.337	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	------	-------	0.595	-------	-------	1.394	-------	2.476	3.022	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	------	-------	1.121	-------	-------	2.272	-------	3.777	4.516	Newport Road - Post w/o BMP - DD 1
8	Combine	1, 7	-------	1.870	-------	-------	3.695	-------	6.035	7.178	Diversion Ditch 1
9	Reach	8	-------	1.859	-------	-------	3.677	-------	6.014	7.156	Diversion Ditch 1
10	Combine	2, 3, 4, 5, 6, 9	-------	4.448	-------	-------	9.297	-------	15.70	18.87	POI
11	SCS Runoff	------	-------	0.613	-------	-------	1.265	-------	2.128	2.558	Infiltration Berm 1 (At Berm)
12	SCS Runoff	------	-------	0.782	-------	-------	1.836	-------	3.263	3.993	Infiltration Berm 2 (At Berm)
13	SCS Runoff	------	-------	0.343	-------	-------	0.602	-------	0.923	1.076	Infiltration Berm 3 (At Berm)
14	SCS Runoff	------	-------	0.138	-------	-------	0.243	-------	0.374	0.436	Infiltration 4 (At Berm)

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	2.694	1	721	6,841	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
2	SCS Runoff	3.927	1	718	8,355	------	------	------	Newport Rd - Post w/o BMP - Undetai
3	SCS Runoff	4.722	1	722	12,715	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
4	SCS Runoff	1.337	1	716	2,614	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
5	SCS Runoff	0.436	1	715	793	------	------	------	Newport Rd - Post w/o BMP - Infiltrati
6	SCS Runoff	3.022	1	720	7,319	------	------	------	Newport Road - Post w/o BMP - Unde
7	SCS Runoff	4.516	1	722	12,142	------	------	------	Newport Road - Post w/o BMP - DD 1
8	Combine	7.178	1	722	18,983	1, 7	------	------	Diversion Ditch 1
9	Reach	7.156	1	723	18,982	8	------	------	Diversion Ditch 1
10	Combine	18.87	1	720	50,778	2, 3, 4, 5, 6, 9	------	------	POI
11	SCS Runoff	2.558	2	720	6,632	------	------	------	Infiltration Berm 1 (At Berm)
12	SCS Runoff	3.993	2	720	10,399	------	------	------	Infiltration Berm 2 (At Berm)
13	SCS Runoff	1.076	2	716	2,217	------	------	------	Infiltration Berm 3 (At Berm)
14	SCS Runoff	0.436	1	715	793	------	------	------	Infiltration 4 (At Berm)

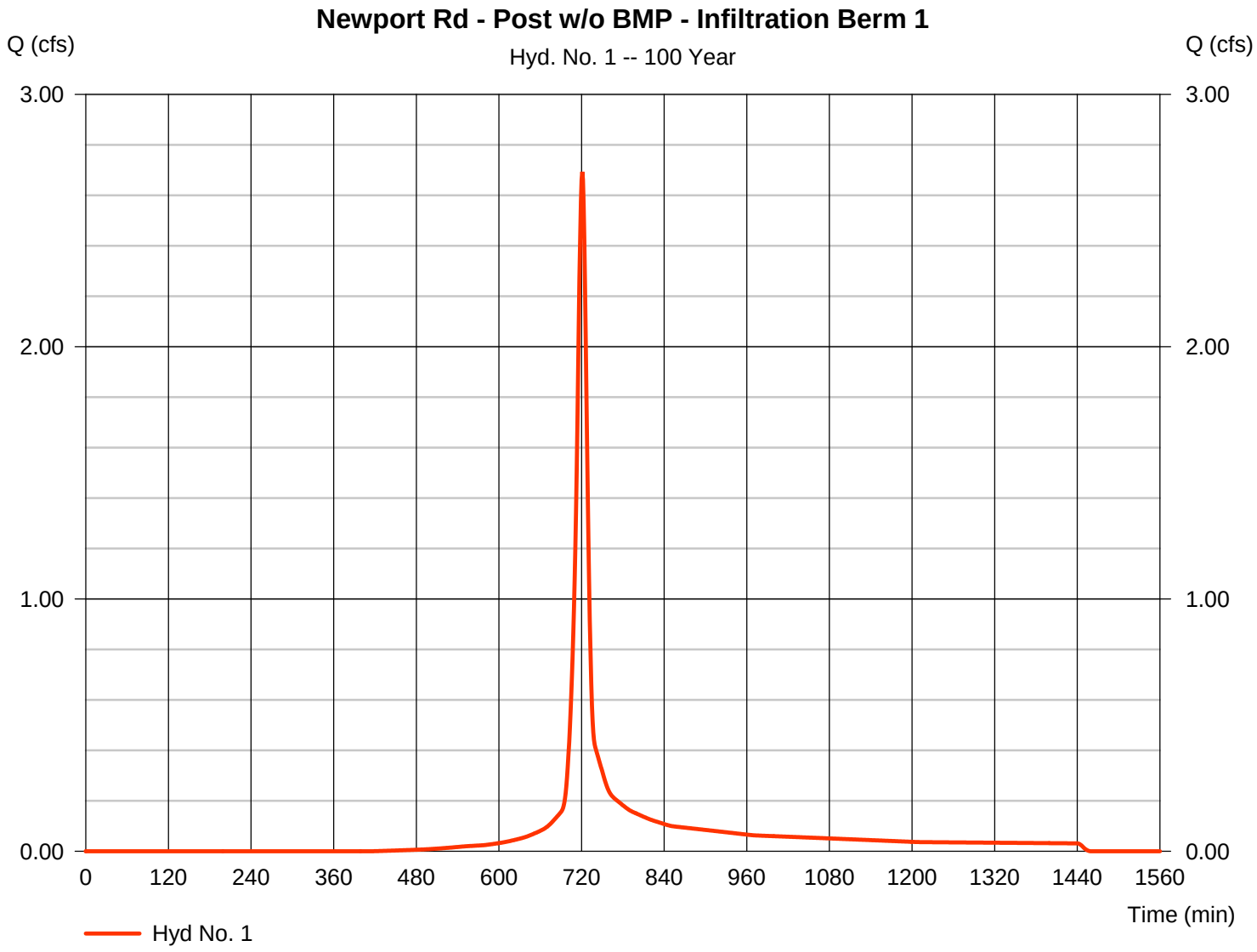
Hydrograph Report

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.694 cfs
Storm frequency	=	100 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	6,841 cuft
Drainage area	=	0.610 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.40 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.610



TR55 Tc Worksheet

Hyd. No. 1

Newport Rd - Post w/o BMP - Infiltration Berm 1

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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		297.00		
Watercourse slope (%)	= 8.00		4.80		6.40		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		4.08		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**1.21**	**=**	**2.36**
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 ..... 13.40 min

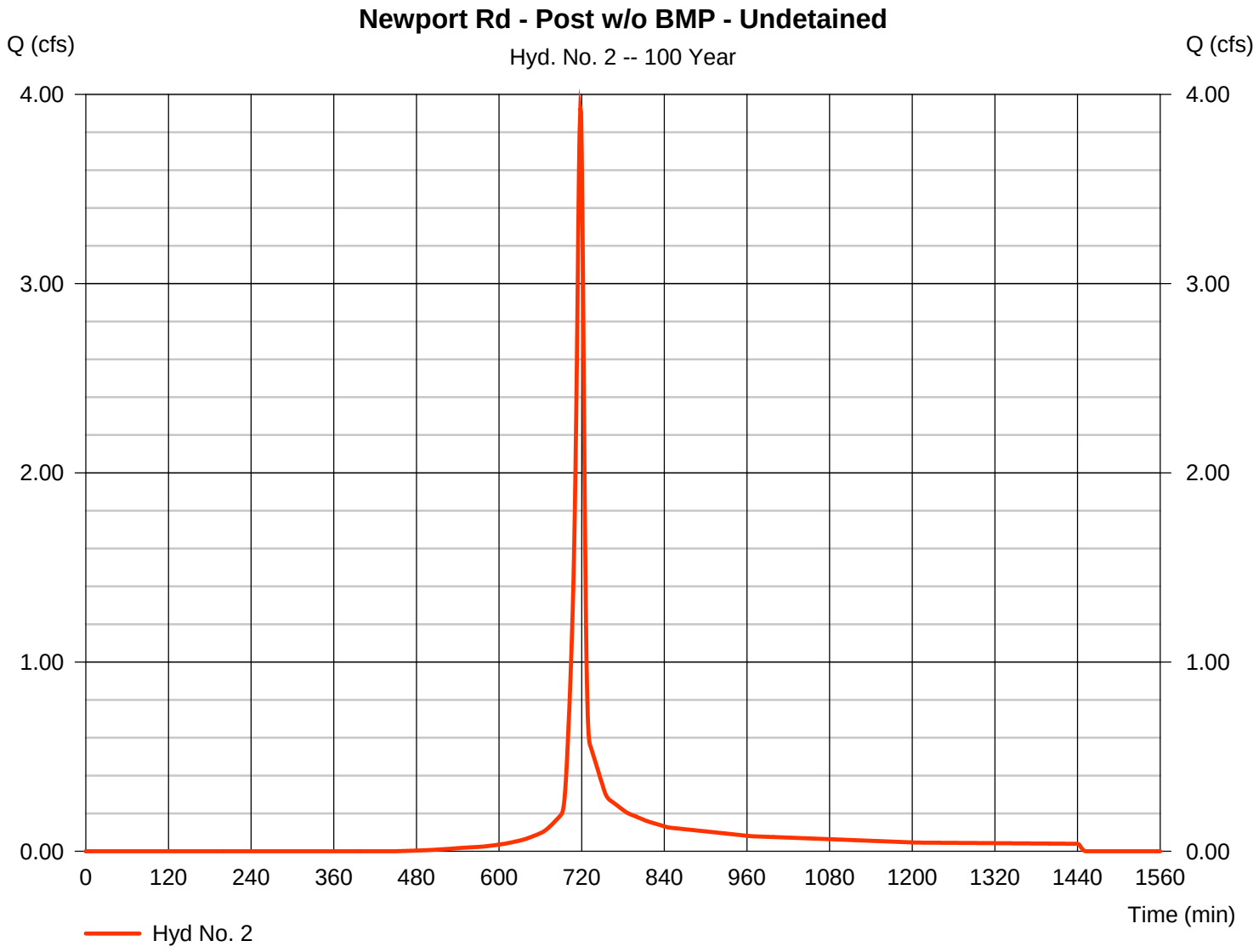
Hydrograph Report

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.927 cfs
Storm frequency	=	100 yrs	Time to peak	=	718 min
Time interval	=	1 min	Hyd. volume	=	8,355 cuft
Drainage area	=	0.800 ac	Curve number	=	78*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	6.70 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Post w/o BMP - Undetained

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

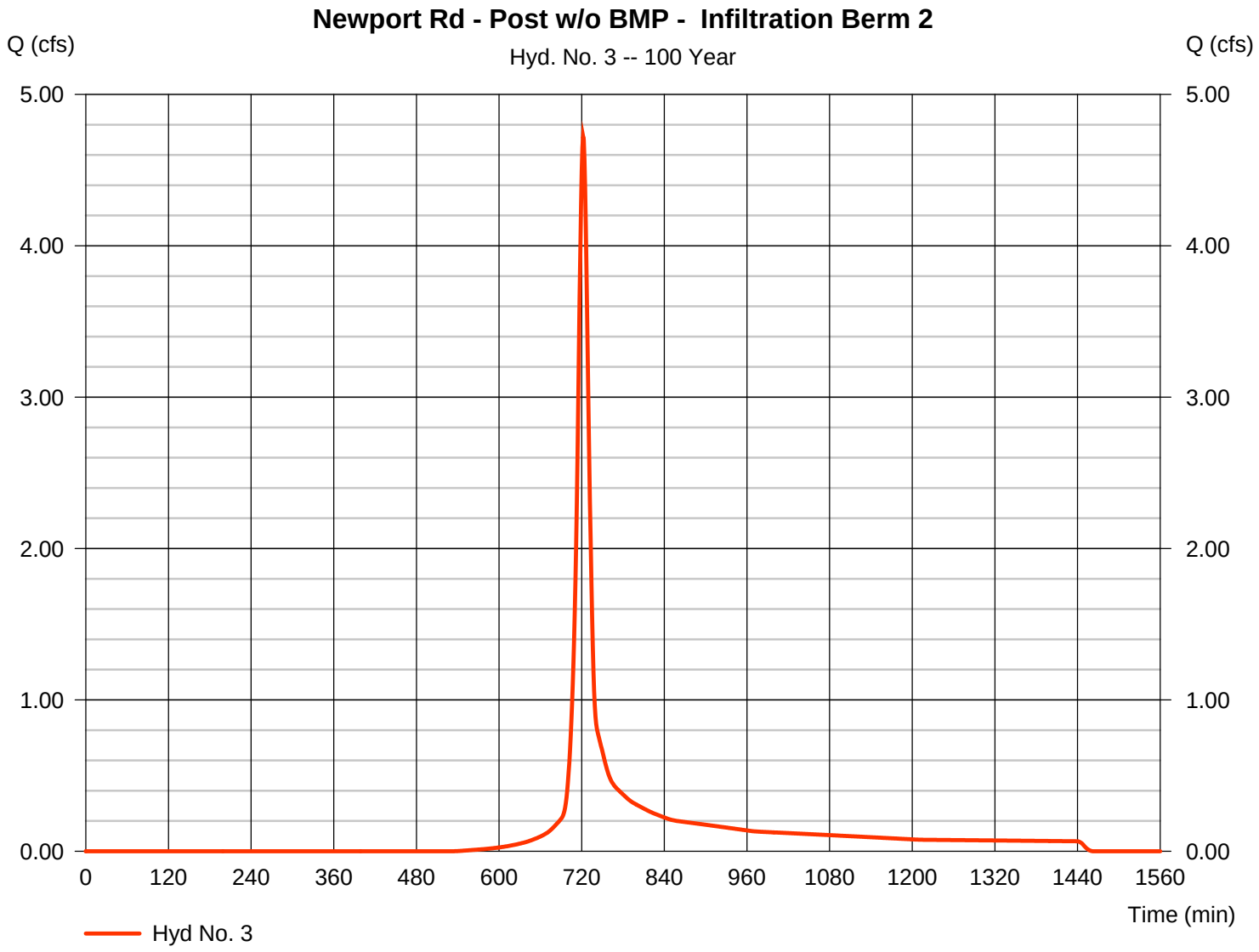
Hydrograph Report

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.722 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	12,715 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



TR55 Tc Worksheet

Hyd. No. 3

Newport Rd - Post w/o BMP - Infiltration Berm 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		239.00		175.00		
Watercourse slope (%)	= 6.40		11.00		6.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.08		5.35		3.95		
Travel Time (min)	**= 1.85**	**+**	**0.74**	**+**	**0.74**	**=**	**3.33**
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 ..... 14.40 min

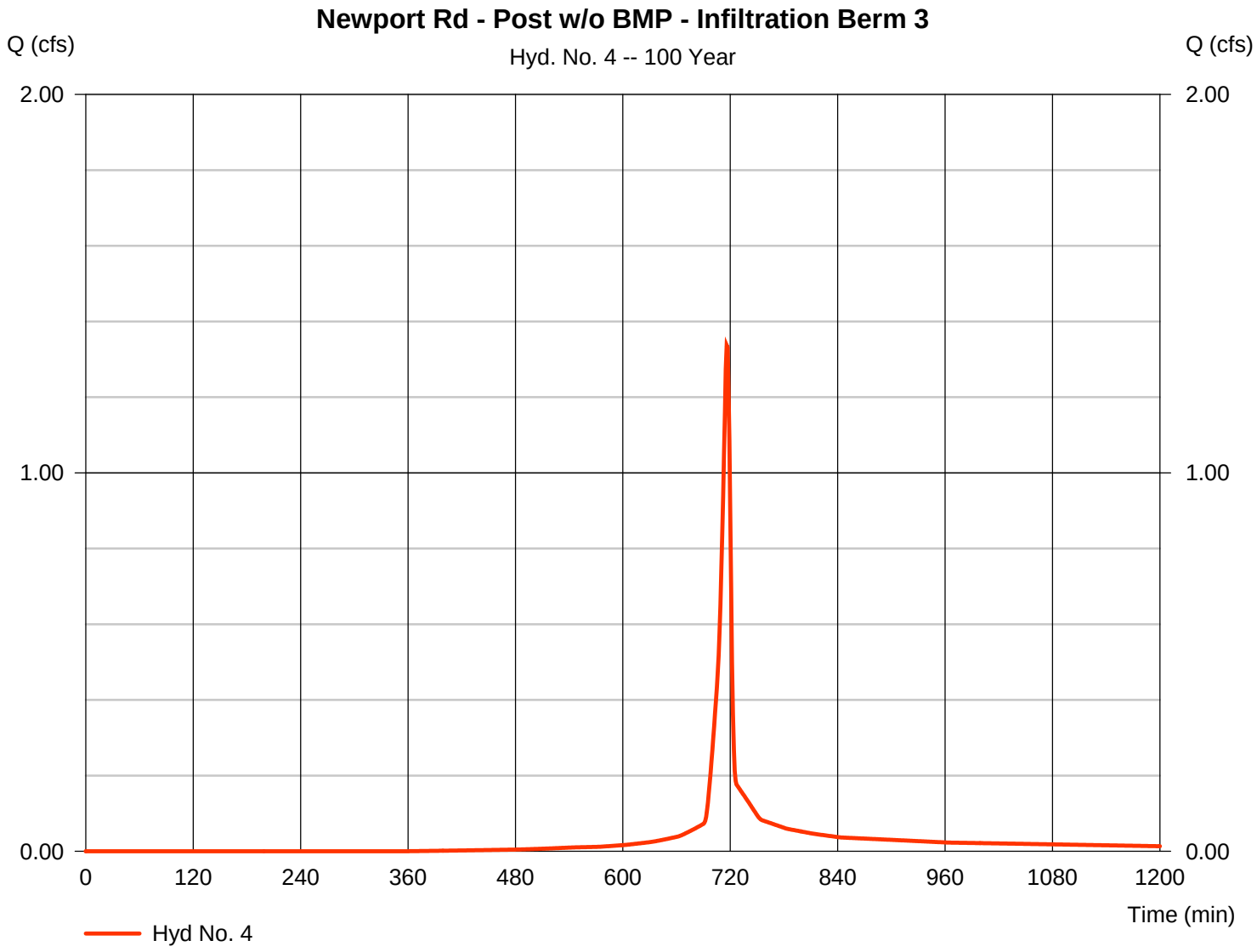
Hydrograph Report

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.337 cfs
Storm frequency	= 100 yrs	Time to peak	= 716 min
Time interval	= 1 min	Hyd. volume	= 2,614 cuft
Drainage area	= 0.210 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 3.60 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



TR55 Tc Worksheet

Hyd. No. 4

Newport Rd - Post w/o BMP - Infiltration Berm 3

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		94.00		0.00		
Watercourse slope (%)	= 5.50		8.50		0.00		
Surface description	= Paved		Unpaved		Unpaved		
Average velocity (ft/s)	=4.77		4.70		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.33**	**+**	**0.00**	**=**	**0.90**
Channel Flow							
X sectional flow area (sqft)	= 2.00		2.00		0.00		
Wetted perimeter (ft)	= 4.47		4.47		0.00		
Channel slope (%)	= 4.49		7.51		0.00		
Manning's n-value	= 0.060		0.025		0.015		
Velocity (ft/s)	=3.07						
			9.53				
					0.00		
Flow length (ft)	({0})89.0		230.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.40**	**+**	**0.00**	**=**	**0.89**

Total Travel Time, Tc ..... 3.60 min

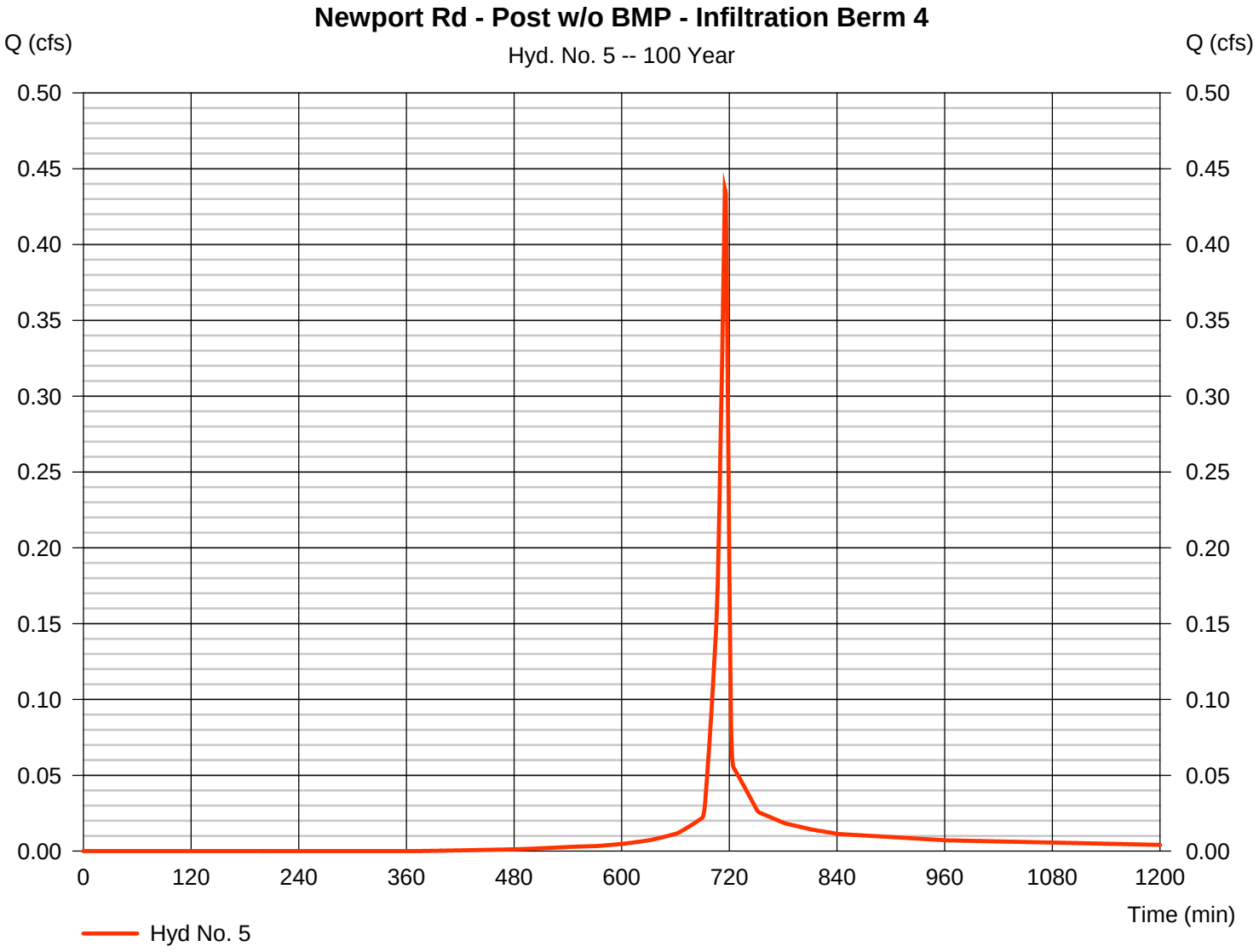
Hydrograph Report

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.436 cfs
Storm frequency	= 100 yrs	Time to peak	= 715 min
Time interval	= 1 min	Hyd. volume	= 793 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 2.30 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 5

Newport Rd - Post w/o BMP - Infiltration Berm 4

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 69.00		0.00		0.00		
Watercourse slope (%)	= 5.90		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=3.92		0.00		0.00		
Travel Time (min)	**= 0.29**	**+**	**0.00**	**+**	**0.00**	**=**	**0.29**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 7.00		0.00		0.00		
Manning's n-value	= 0.025		0.015		0.015		
Velocity (ft/s)	=9.20						
			0.00				
					0.00		
Flow length (ft)	({0})200.0		0.0		0.0		
Travel Time (min)	**= 0.36**	**+**	**0.00**	**+**	**0.00**	**=**	**0.36**

Total Travel Time, Tc ..... 2.30 min

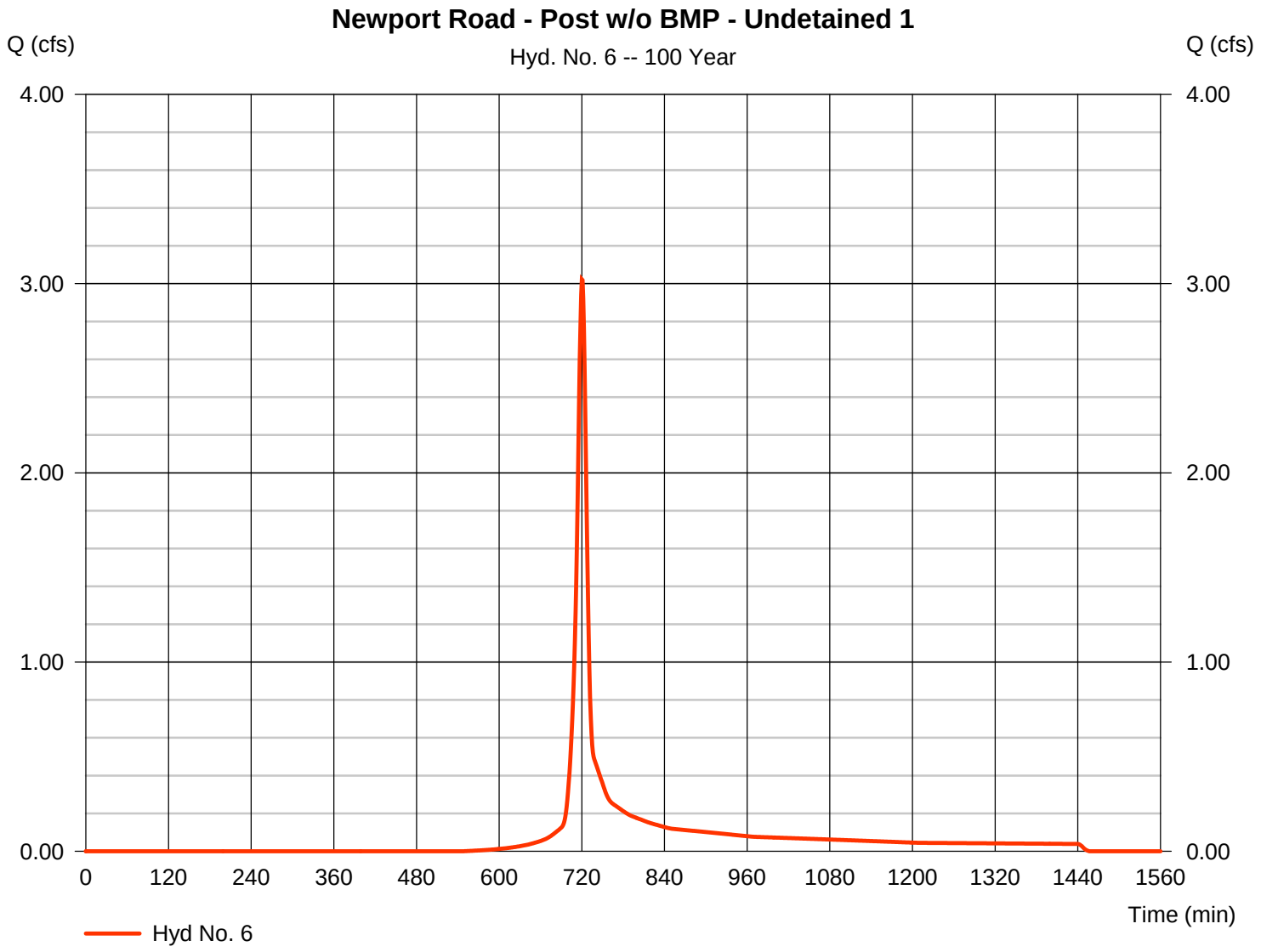
Hydrograph Report

Hyd. No. 6

Newport Road - Post w/o BMP - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.022 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	7,319 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - 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)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

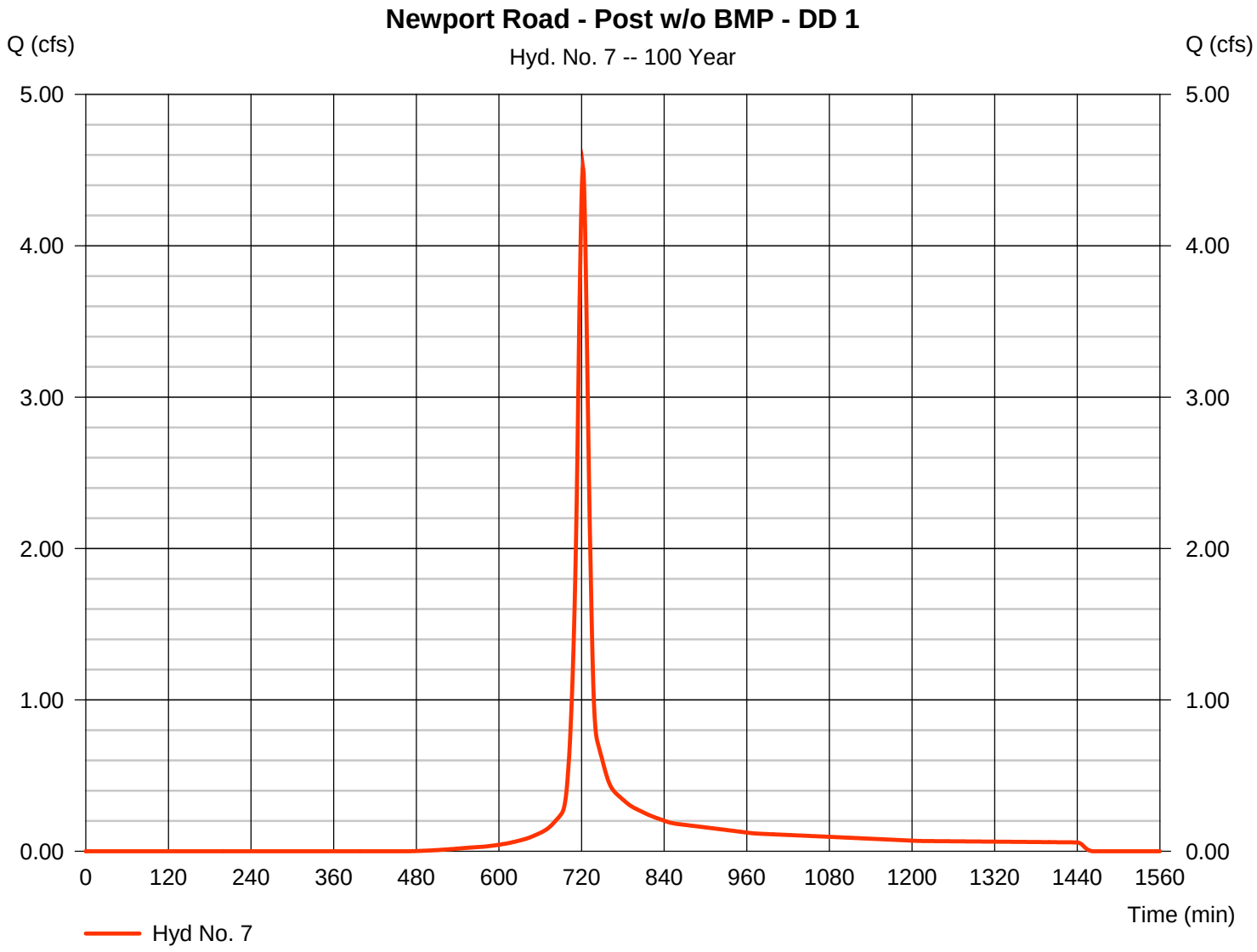
Hydrograph Report

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.516 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 12,142 cuft
Drainage area	= 1.170 ac	Curve number	= 77*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.50 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - Post w/o BMP - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

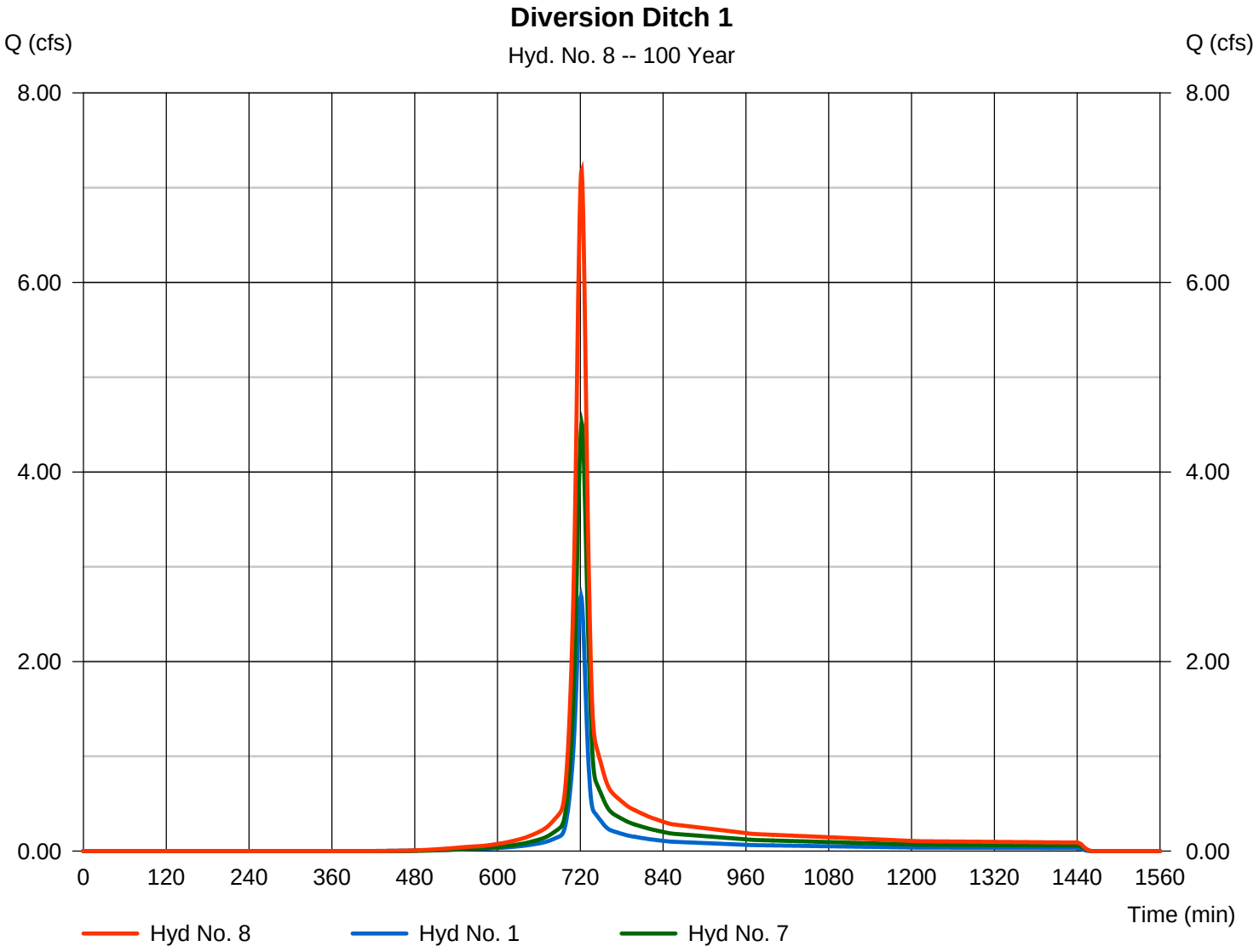
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 8

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 7.178 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 1 min	Hyd. volume	= 18,983 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 1.780 ac



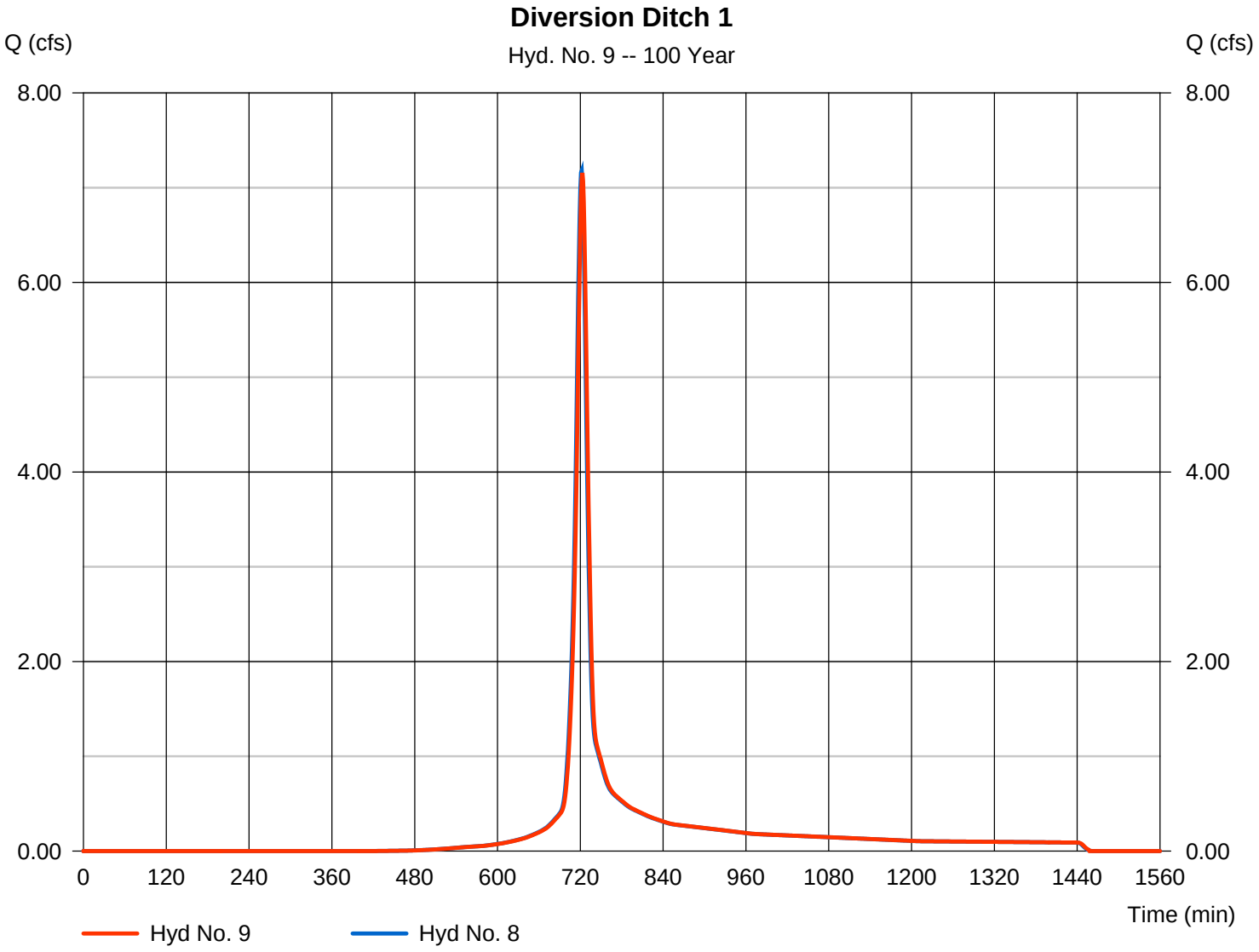
Hydrograph Report

Hyd. No. 9

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	7.156 cfs
Storm frequency	=	100 yrs	Time to peak	=	723 min
Time interval	=	1 min	Hyd. volume	=	18,982 cuft
Inflow hyd. No.	=	8 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7489

Modified Att-Kin routing method used.

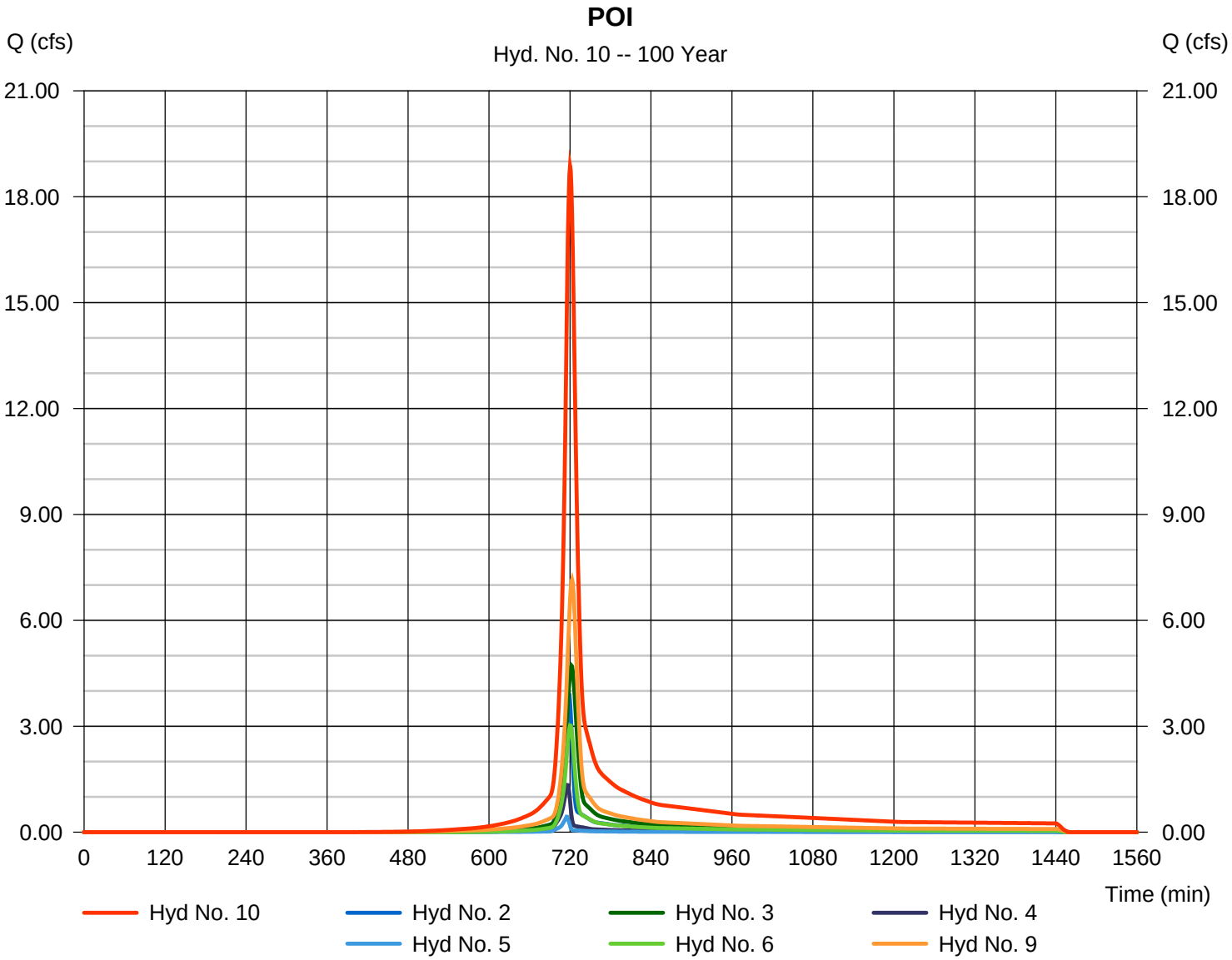


Hydrograph Report

Hyd. No. 10

POI

Hydrograph type	=	Combine	Peak discharge	=	18.87 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	50,778 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 9	Contrib. drain. area	=	3.300 ac



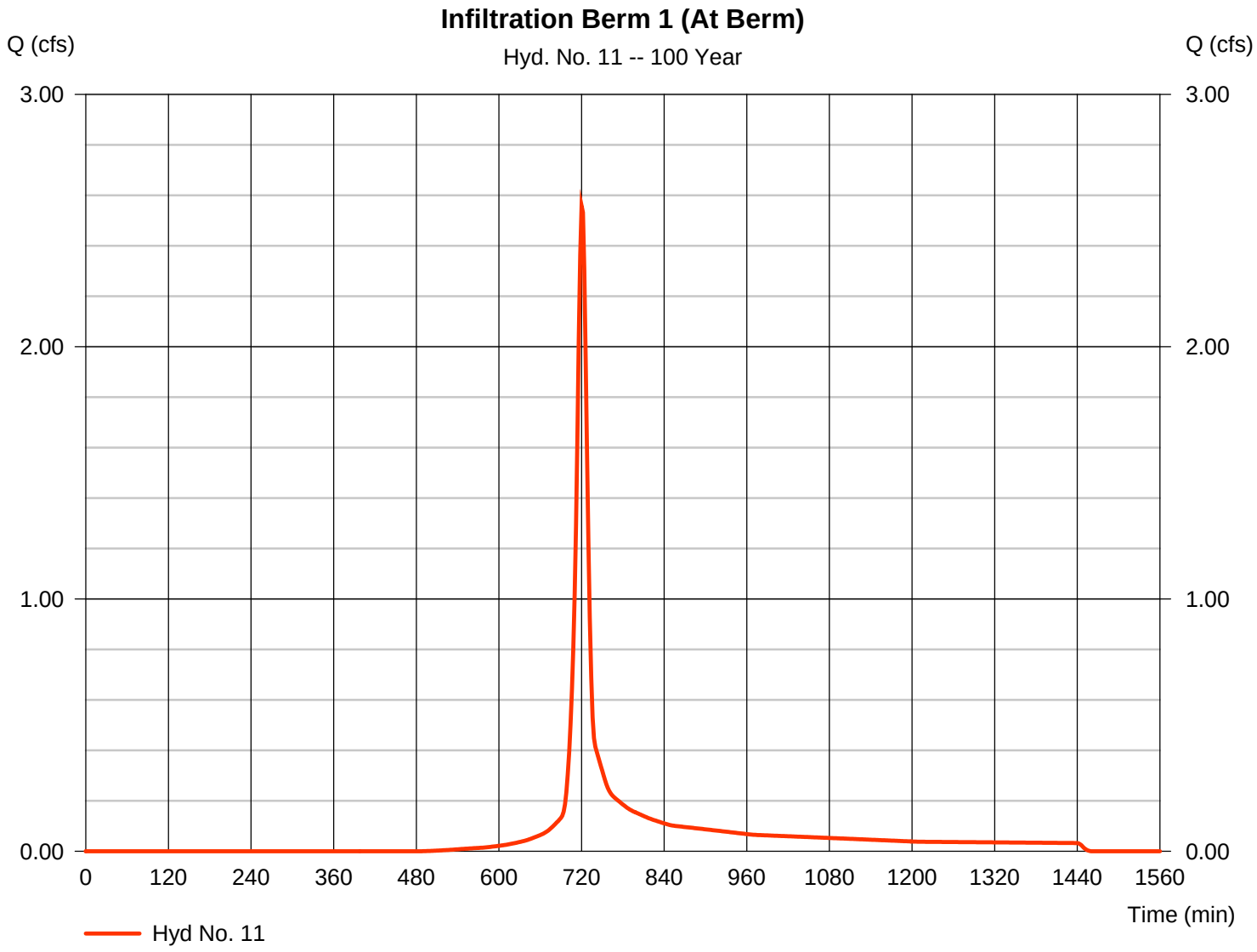
Hydrograph Report

Hyd. No. 11

Infiltration Berm 1 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.558 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	6,632 cuft
Drainage area	=	0.640 ac	Curve number	=	76*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.60 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.130 x 78) + (0.100 x 89) + (0.020 x 91)] / 0.640



TR55 Tc Worksheet

Hyd. No. 11

Infiltration Berm 1 (At 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)	= 2.51		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 251.00		62.00		69.00		
Watercourse slope (%)	= 8.00		4.80		4.30		
Surface description	= Unpaved		Paved		Unpaved		
Average velocity (ft/s)	=4.56		4.45		3.35		
Travel Time (min)	**= 0.92**	**+**	**0.23**	**+**	**0.34**	**=**	**1.49**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.60 min

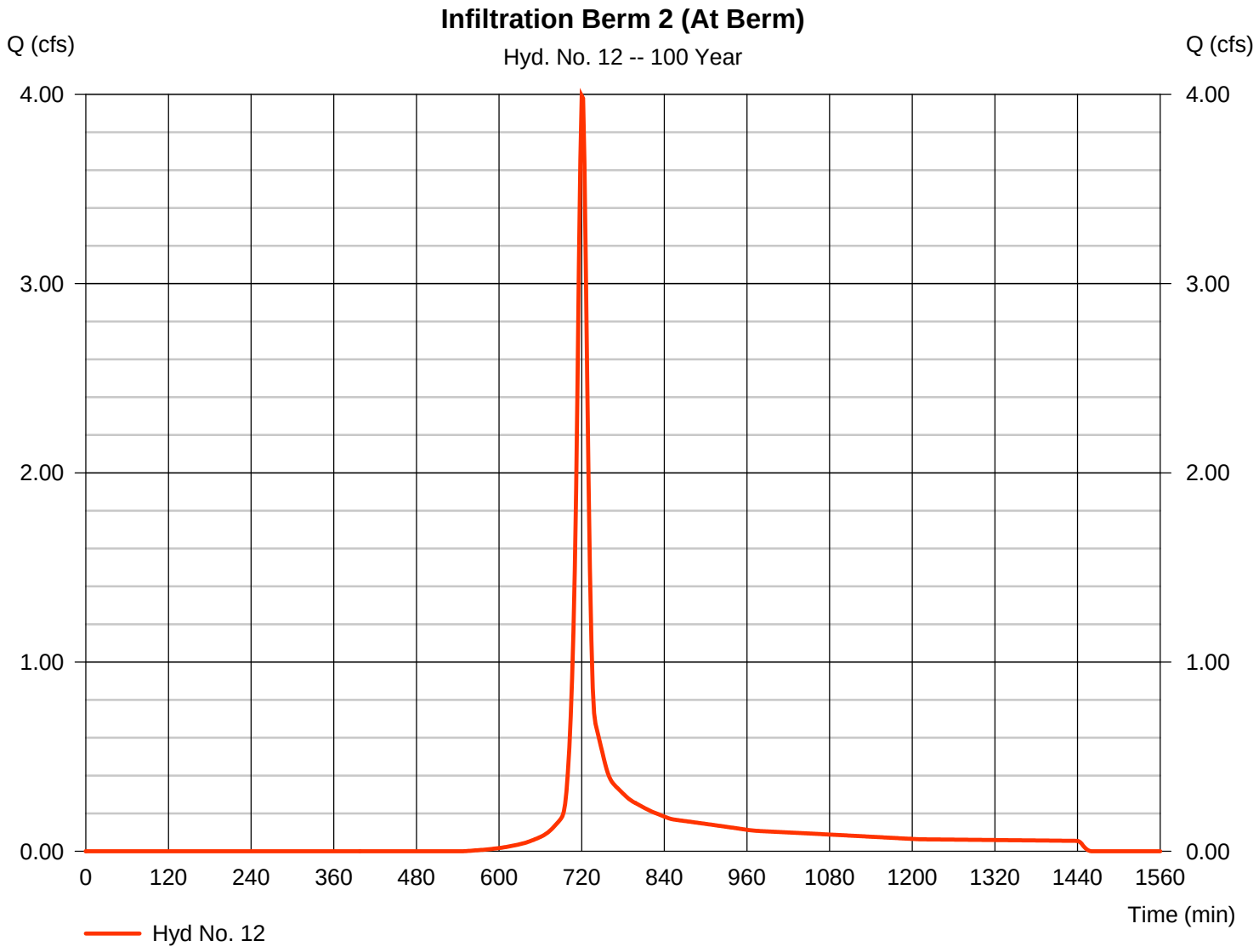
Hydrograph Report

Hyd. No. 12

Infiltration Berm 2 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.993 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	2 min	Hyd. volume	=	10,399 cuft
Drainage area	=	1.150 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	12.90 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.030 x 71) + (0.070 x 78) + (0.050 x 89)] / 1.150



TR55 Tc Worksheet

Hyd. No. 12

Infiltration Berm 2 (At Berm)

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		2.51		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 453.00		0.00		0.00		
Watercourse slope (%)	= 6.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.08		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 12.90 min

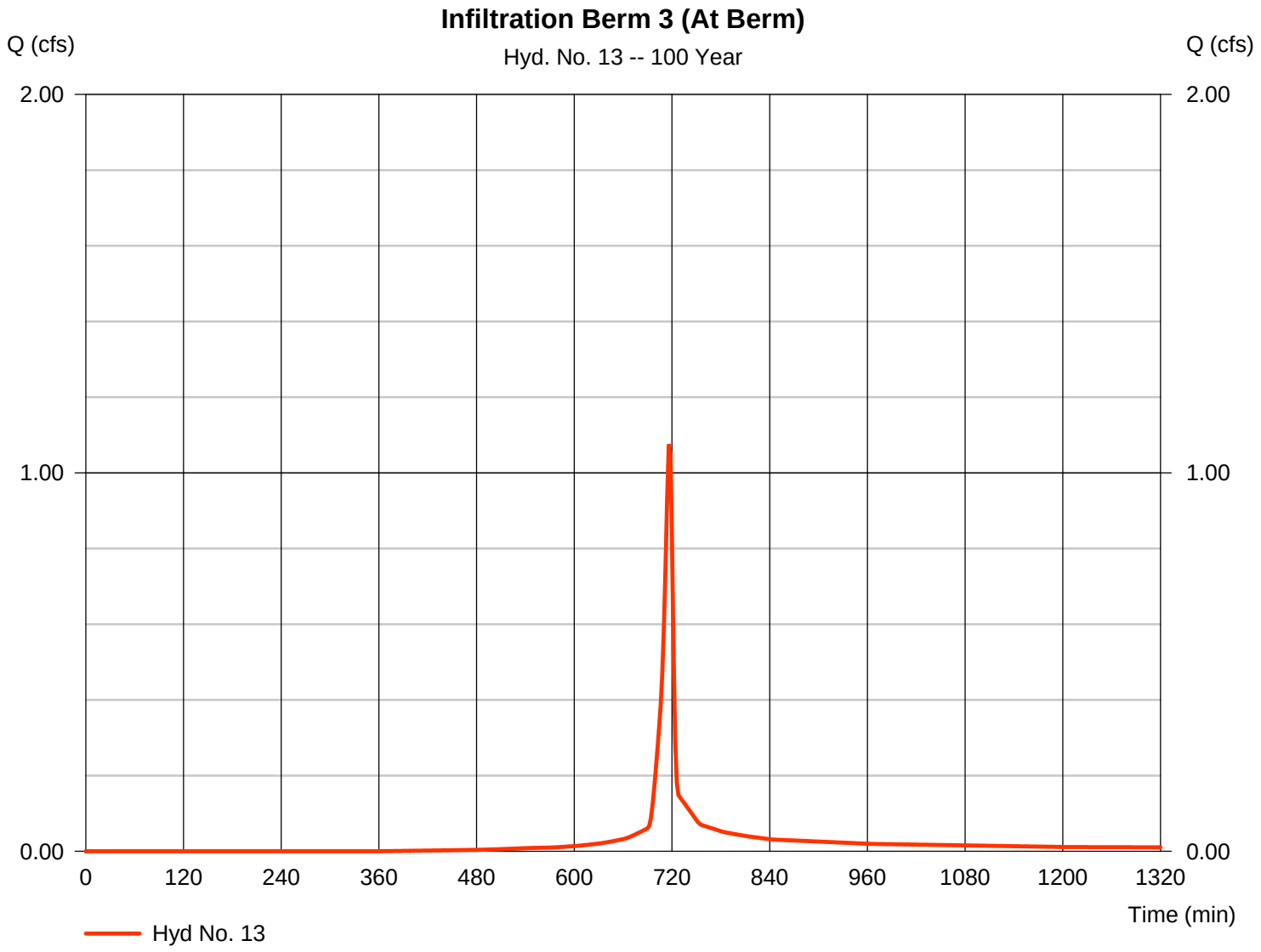
Hydrograph Report

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.076 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,217 cuft
Drainage area	=	0.190 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	3.10 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.110 x 78) + (0.080 x 91)] / 0.190



TR55 Tc Worksheet

Hyd. No. 13

Infiltration Berm 3 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		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 (%)	= 7.00		0.00		0.00		
Travel Time (min)	**= 1.85**	**+**	**0.00**	**+**	**0.00**	**=**	**1.85**
Shallow Concentrated Flow							
Flow length (ft)	= 163.00		46.00		0.00		
Watercourse slope (%)	= 5.50		6.50		0.00		
Surface description	= Paved		Unpaved		Paved		
Average velocity (ft/s)	=4.77		4.11		0.00		
Travel Time (min)	**= 0.57**	**+**	**0.19**	**+**	**0.00**	**=**	**0.76**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 4.49		0.00		0.00		
Manning's n-value	= 0.060		0.015		0.015		
Velocity (ft/s)	=3.07						
			0.00				
					0.00		
Flow length (ft)	({0})89.0		0.0		0.0		
Travel Time (min)	**= 0.48**	**+**	**0.00**	**+**	**0.00**	**=**	**0.48**

Total Travel Time, Tc ..... 3.10 min

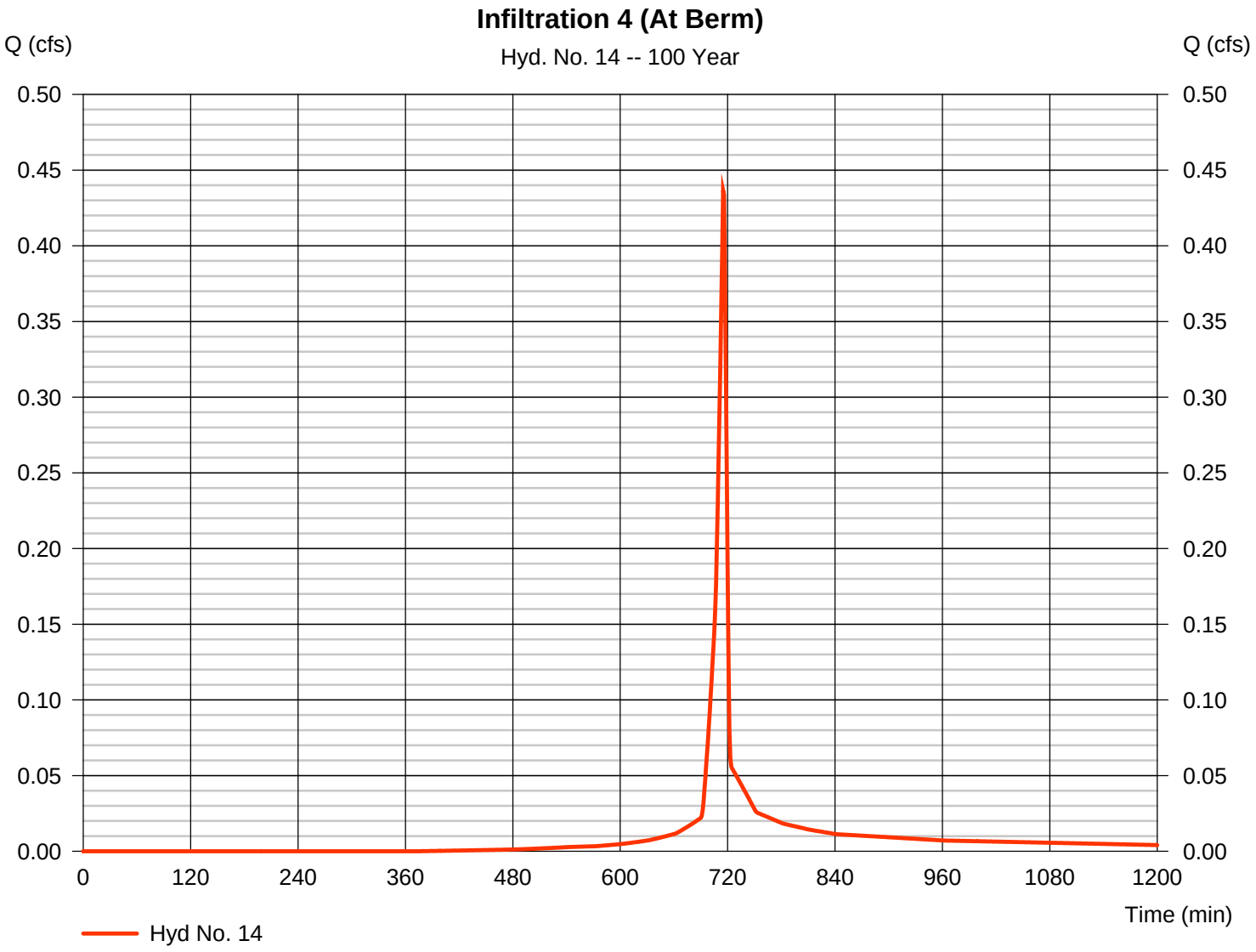
Hydrograph Report

Hyd. No. 14

Infiltration 4 (At Berm)

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.436 cfs
Storm frequency	=	100 yrs	Time to peak	=	715 min
Time interval	=	1 min	Hyd. volume	=	793 cuft
Drainage area	=	0.070 ac	Curve number	=	82*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	1.90 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



TR55 Tc Worksheet

Hyd. No. 14

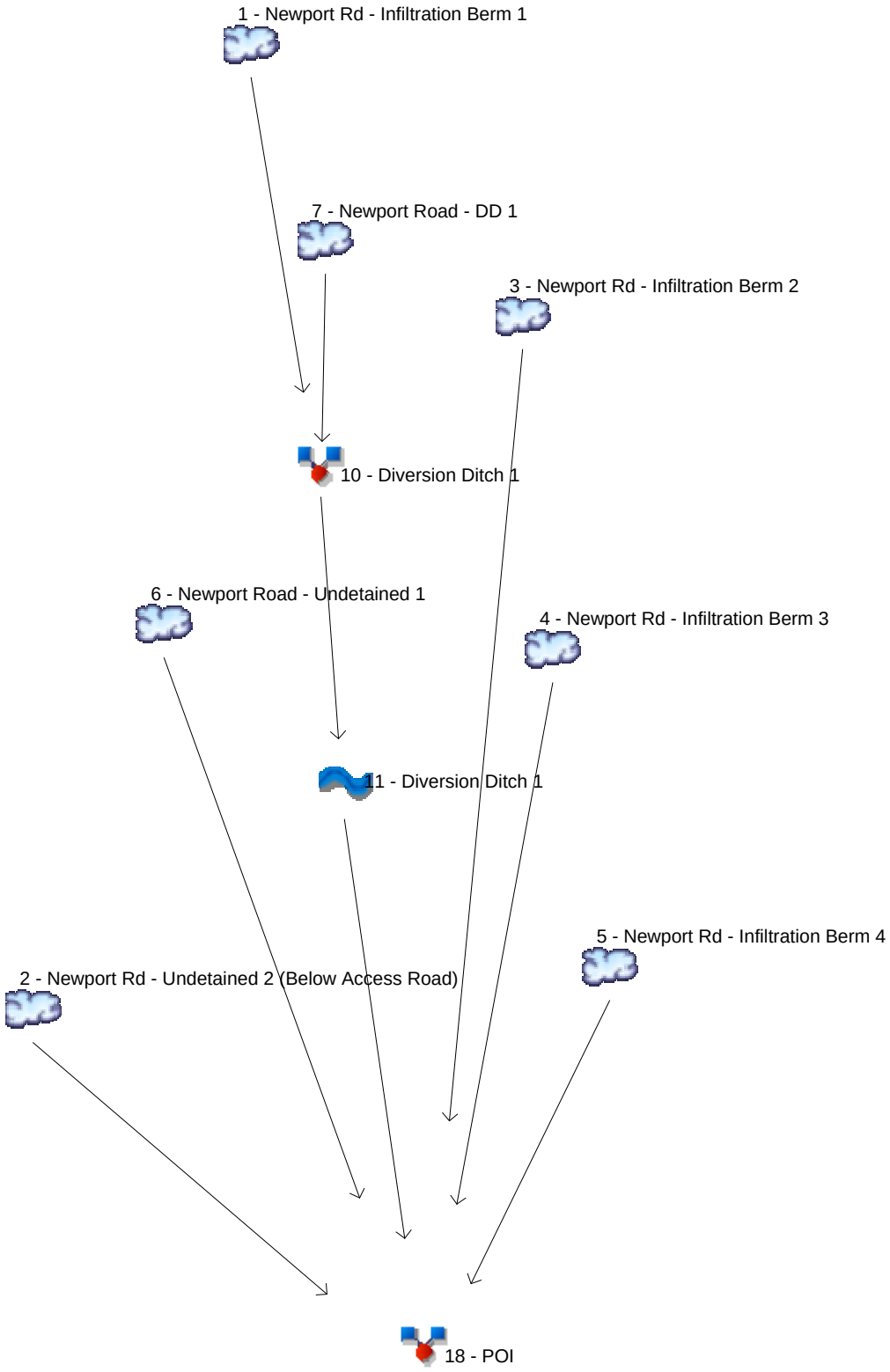
Infiltration 4 (At Berm)

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.030		0.011		0.011		
Flow length (ft)	= 96.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 2.51		0.00		0.00		
Land slope (%)	= 8.30		0.00		0.00		
Travel Time (min)	**= 1.67**	**+**	**0.00**	**+**	**0.00**	**=**	**1.67**
Shallow Concentrated Flow							
Flow length (ft)	= 54.00		0.00		0.00		
Watercourse slope (%)	= 7.40		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=4.39		0.00		0.00		
Travel Time (min)	**= 0.21**	**+**	**0.00**	**+**	**0.00**	**=**	**0.21**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 1.90 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	------	-------	-------	-------	-------	-------	-------	-------	3.125	Newport Rd - Infiltration Berm 1
2	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	3.927	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	4.232	Newport Rd - Infiltration Berm 2
4	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	0.632	Newport Rd - Infiltration Berm 3
5	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	0.352	Newport Rd - Infiltration Berm 4
6	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	3.022	Newport Road - Undetained 1
7	SCS Runoff	------	-------	-------	-------	-------	-------	-------	-------	4.516	Newport Road - DD 1
10	Combine	1, 7,	-------	-------	-------	-------	-------	-------	-------	7.438	Diversion Ditch 1
11	Reach	10	-------	-------	-------	-------	-------	-------	-------	7.400	Diversion Ditch 1
18	Combine	2, 3, 4, 5, 6, 11,	-------	-------	-------	-------	-------	-------	-------	17.87	POI

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	3.125	1	726	10,268	------	------	------	Newport Rd - Infiltration Berm 1
2	SCS Runoff	3.927	1	718	8,355	------	------	------	Newport Rd - Undetained 2 (Below A
3	SCS Runoff	4.232	1	724	12,571	------	------	------	Newport Rd - Infiltration Berm 2
4	SCS Runoff	0.632	1	732	2,631	------	------	------	Newport Rd - Infiltration Berm 3
5	SCS Runoff	0.352	1	720	861	------	------	------	Newport Rd - Infiltration Berm 4
6	SCS Runoff	3.022	1	720	7,319	------	------	------	Newport Road - Undetained 1
7	SCS Runoff	4.516	1	722	12,142	------	------	------	Newport Road - DD 1
10	Combine	7.438	1	723	22,410	1, 7,	------	------	Diversion Ditch 1
11	Reach	7.400	1	724	22,408	10	------	------	Diversion Ditch 1
18	Combine	17.87	1	721	54,145	2, 3, 4, 5, 6, 11,	------	------	POI

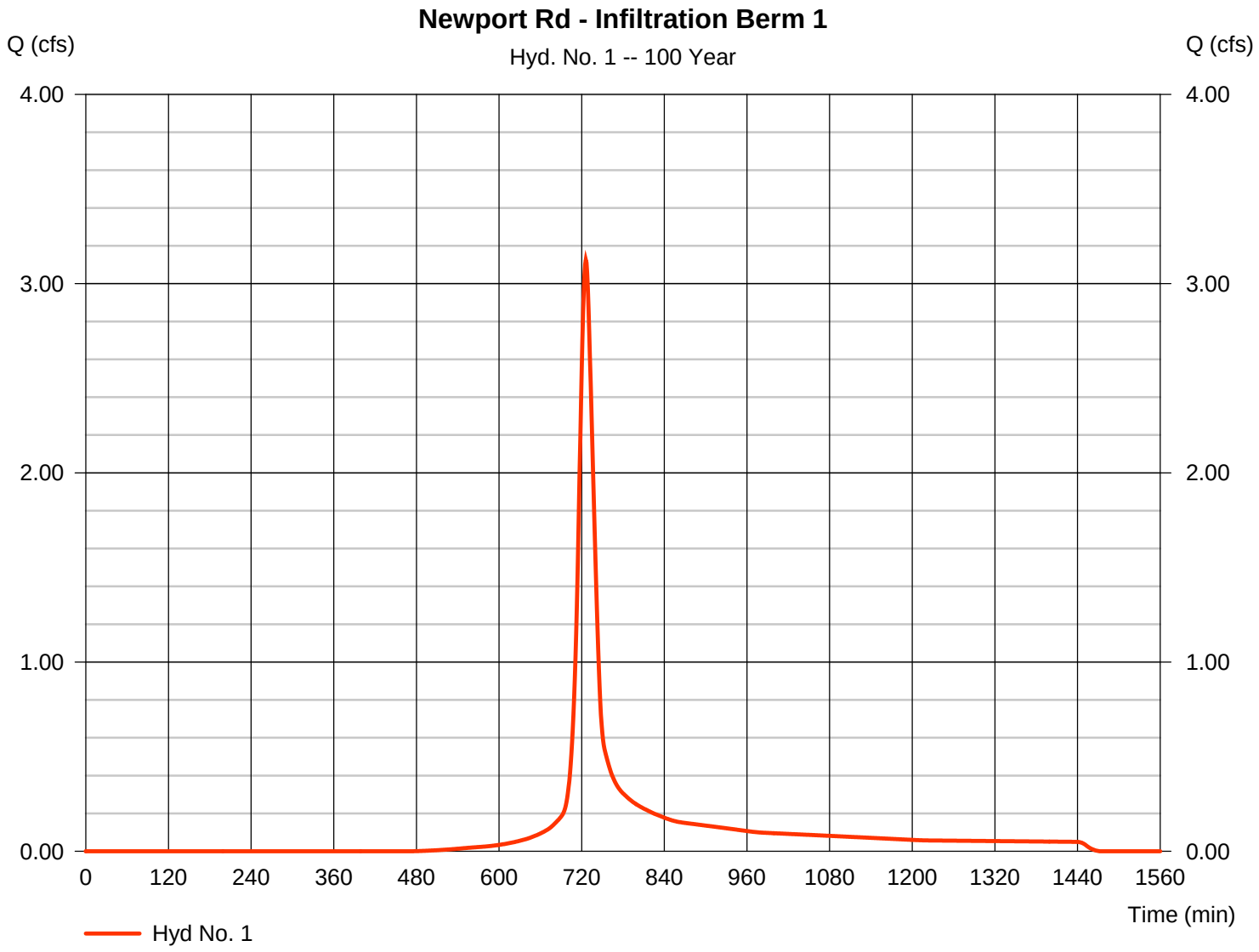
Hydrograph Report

Hyd. No. 1

Newport Rd - Infiltration Berm 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.125 cfs
Storm frequency	=	100 yrs	Time to peak	=	726 min
Time interval	=	1 min	Hyd. volume	=	10,268 cuft
Drainage area	=	0.980 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	21.00 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.390 x 71) + (0.460 x 78) + (0.100 x 89) + (0.030 x 91)] / 0.980



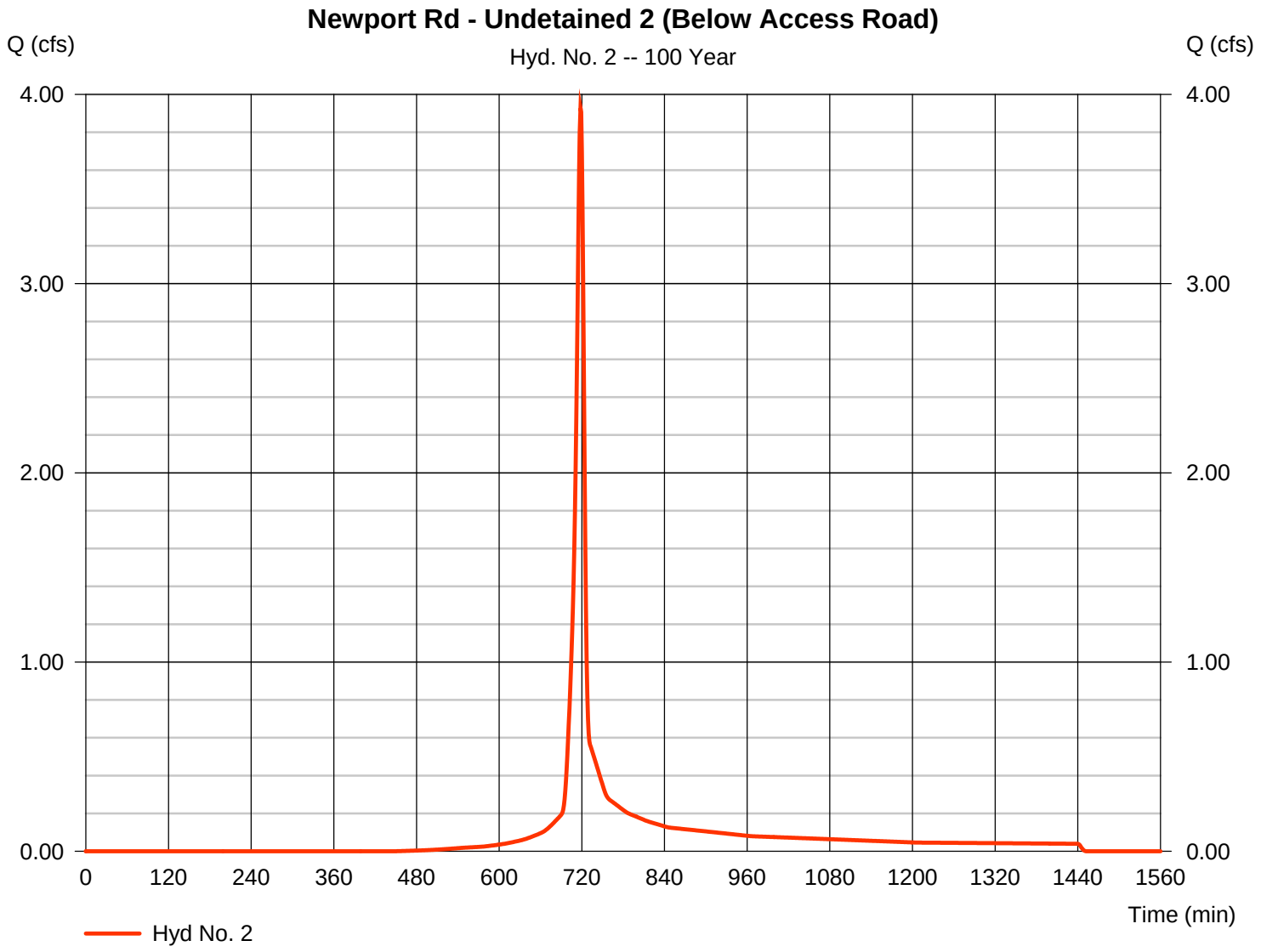
Hydrograph Report

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

Hydrograph type	= SCS Runoff	Peak discharge	= 3.927 cfs
Storm frequency	= 100 yrs	Time to peak	= 718 min
Time interval	= 1 min	Hyd. volume	= 8,355 cuft
Drainage area	= 0.800 ac	Curve number	= 78*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 6.70 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.620 x 78) + (0.160 x 77) + (0.020 x 91)] / 0.800



TR55 Tc Worksheet

Hyd. No. 2

Newport Rd - Undetained 2 (Below Access Road)

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 (%)	= 10.00		0.00		0.00		
Travel Time (min)	**= 5.81**	**+**	**0.00**	**+**	**0.00**	**=**	**5.81**
Shallow Concentrated Flow							
Flow length (ft)	= 55.00		142.00		0.00		
Watercourse slope (%)	= 15.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=6.25		3.95		0.00		
Travel Time (min)	**= 0.15**	**+**	**0.60**	**+**	**0.00**	**=**	**0.75**
Channel Flow							
X sectional flow area (sqft)	= 2.00		0.00		0.00		
Wetted perimeter (ft)	= 4.47		0.00		0.00		
Channel slope (%)	= 6.70		0.00		0.00		
Manning's n-value	= 0.025		0.025		0.015		
Velocity (ft/s)	=9.00						
			0.00				
					0.00		
Flow length (ft)	({0})58.0		0.0		0.0		
Travel Time (min)	**= 0.11**	**+**	**0.00**	**+**	**0.00**	**=**	**0.11**

Total Travel Time, Tc ..... 6.70 min

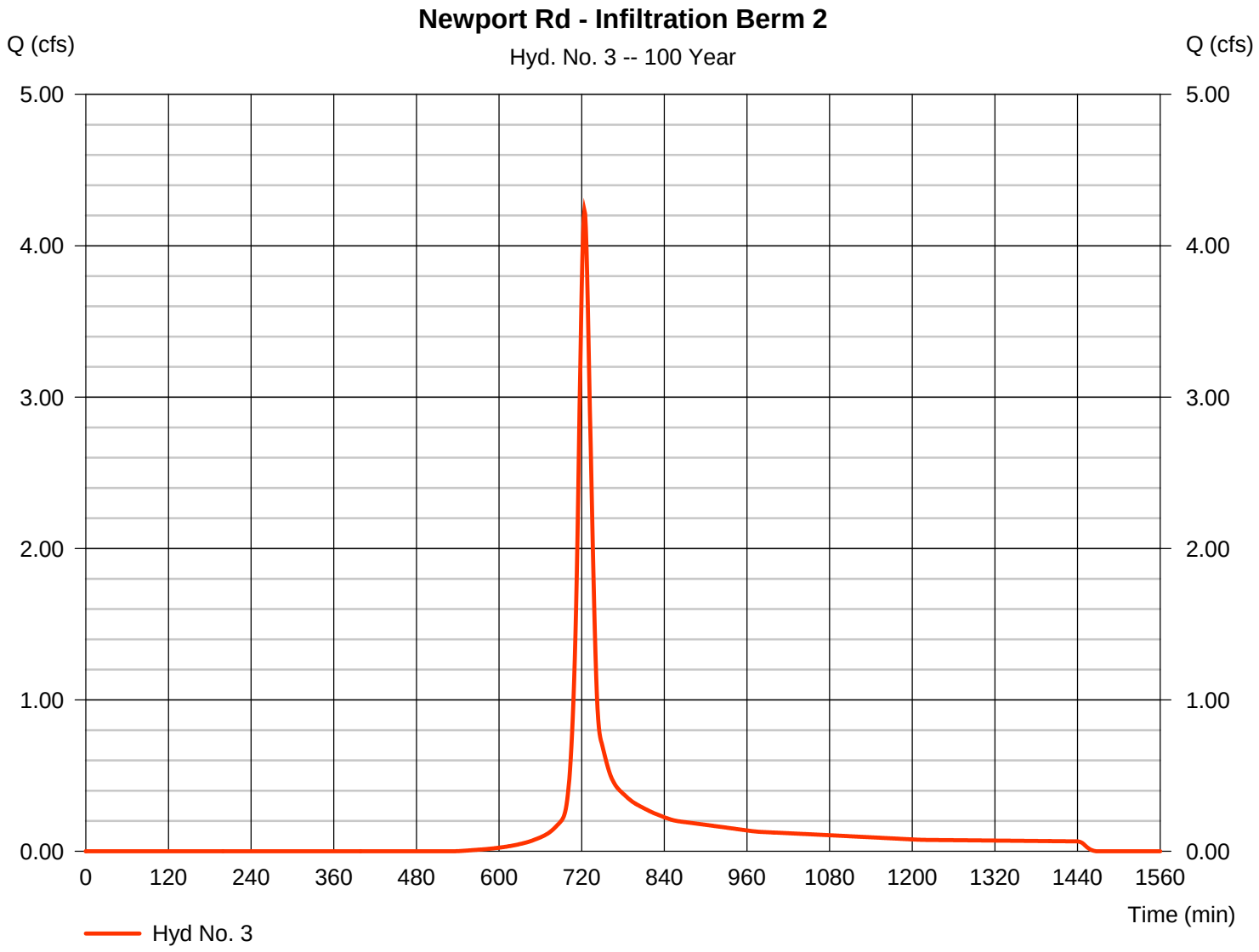
Hydrograph Report

Hyd. No. 3

Newport Rd - Infiltration Berm 2

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.232 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	12,571 cuft
Drainage area	=	1.400 ac	Curve number	=	73*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	17.80 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.070 x 71) + (0.030 x 77) + (0.230 x 78) + (0.060 x 89) + (0.010 x 91)] / 1.400



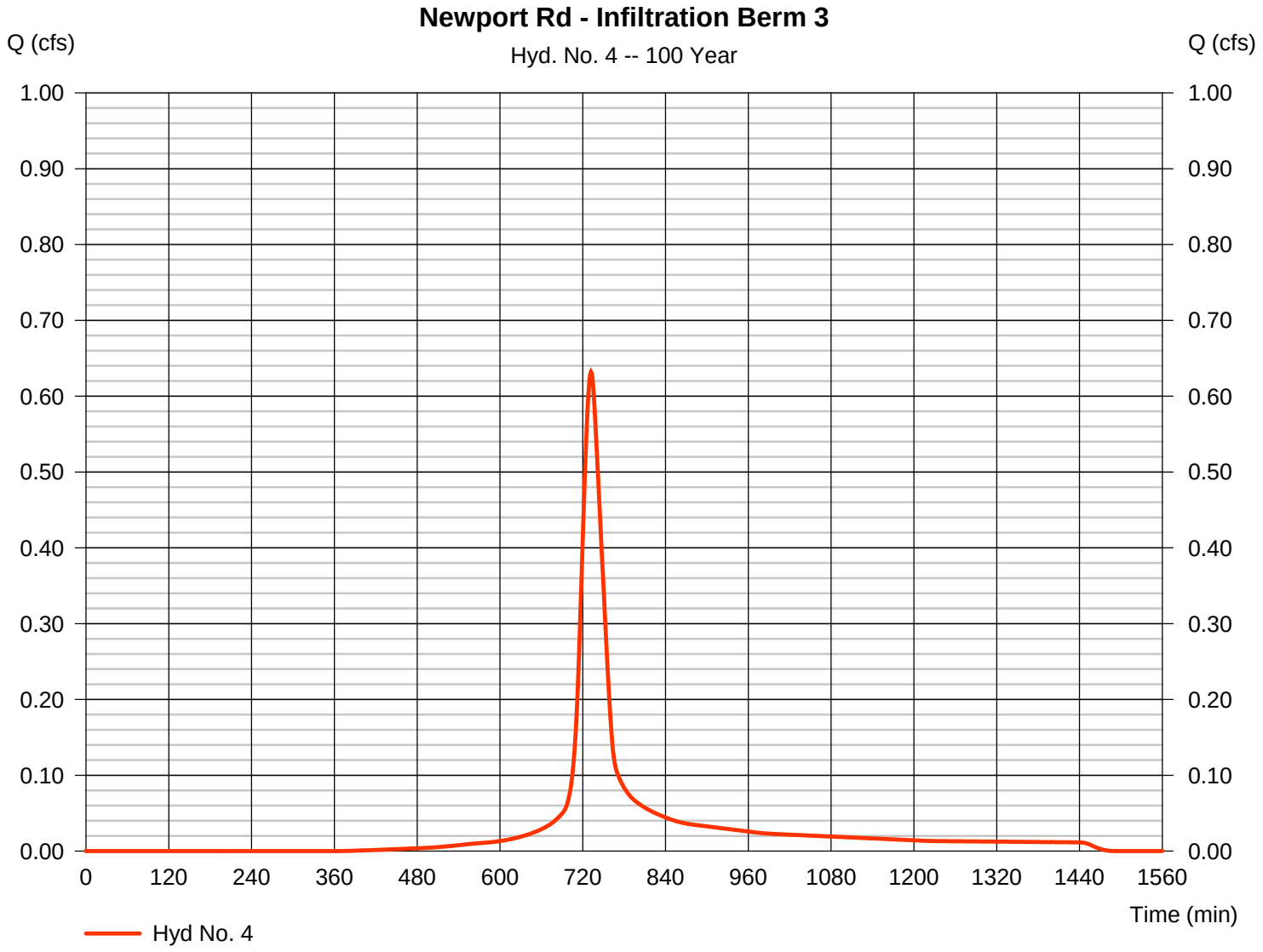
Hydrograph Report

Hyd. No. 4

Newport Rd - Infiltration Berm 3

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.632 cfs
Storm frequency	=	100 yrs	Time to peak	=	732 min
Time interval	=	1 min	Hyd. volume	=	2,631 cuft
Drainage area	=	0.210 ac	Curve number	=	83*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	30.60 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.130 x 78) + (0.080 x 91)] / 0.210



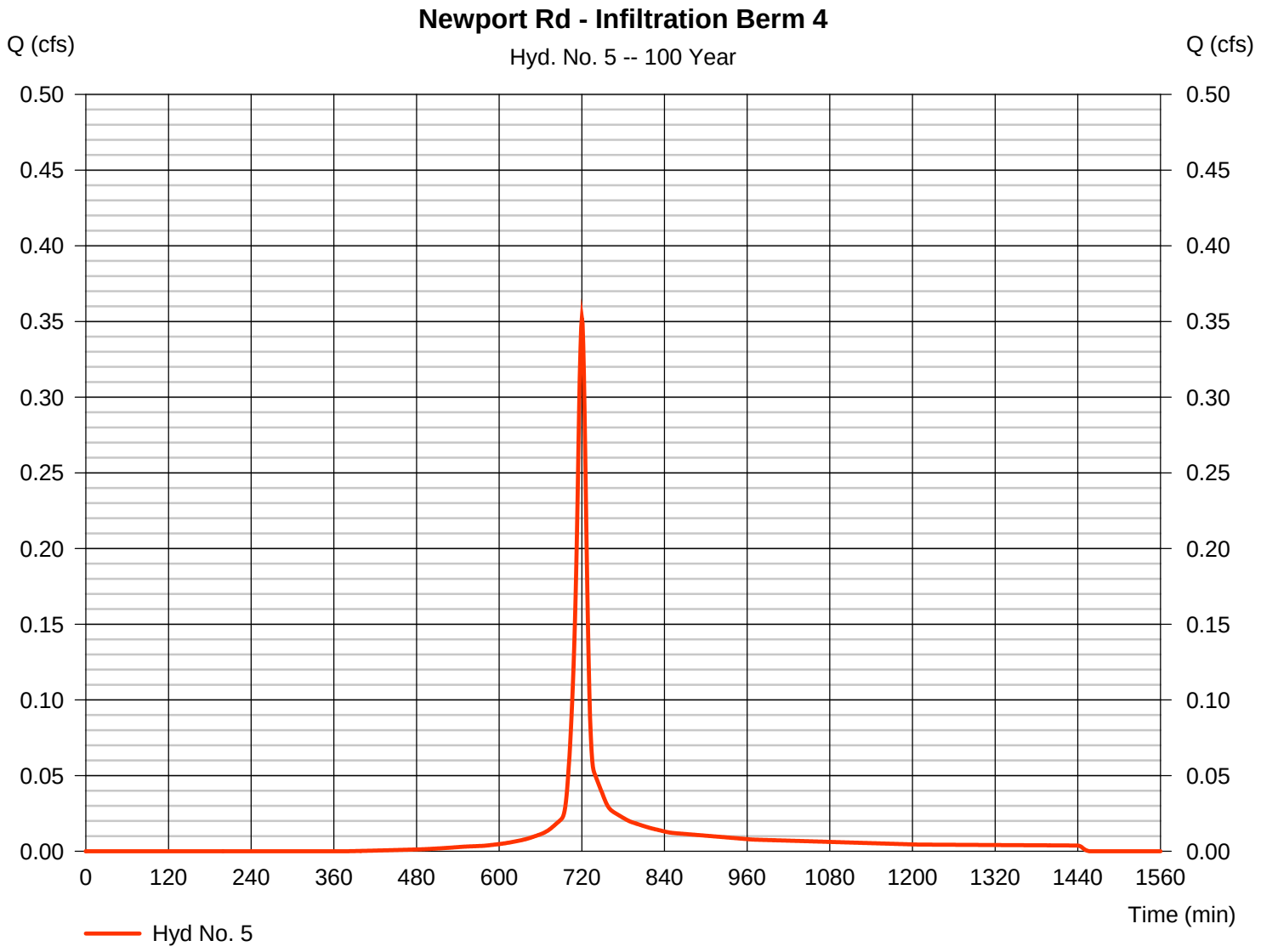
Hydrograph Report

Hyd. No. 5

Newport Rd - Infiltration Berm 4

Hydrograph type	= SCS Runoff	Peak discharge	= 0.352 cfs
Storm frequency	= 100 yrs	Time to peak	= 720 min
Time interval	= 1 min	Hyd. volume	= 861 cuft
Drainage area	= 0.070 ac	Curve number	= 82*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 11.40 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.050 x 78) + (0.020 x 91)] / 0.070



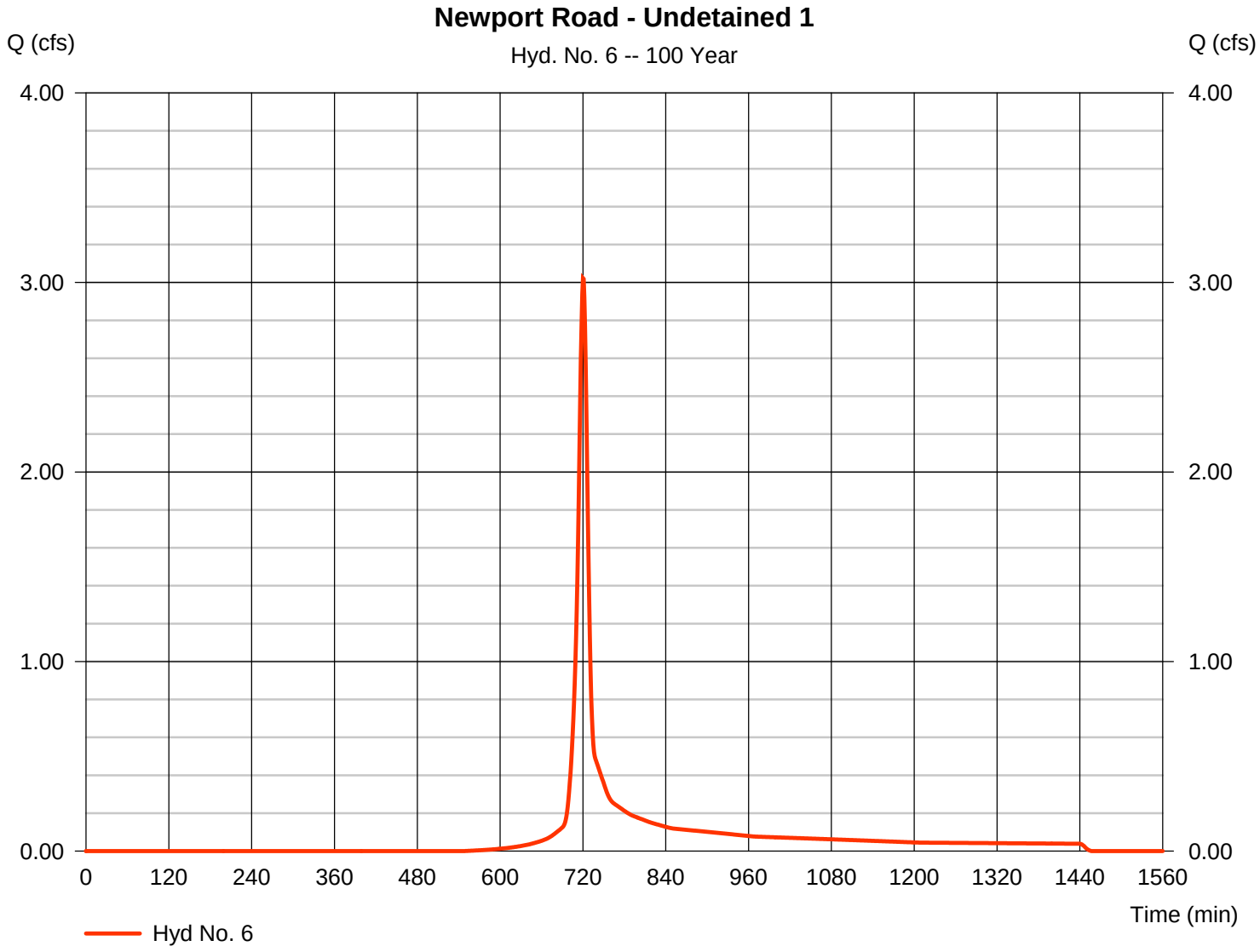
Hydrograph Report

Hyd. No. 6

Newport Road - Undetained 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.022 cfs
Storm frequency	=	100 yrs	Time to peak	=	720 min
Time interval	=	1 min	Hyd. volume	=	7,319 cuft
Drainage area	=	0.820 ac	Curve number	=	72*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	10.80 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.690 x 71) + (0.090 x 78) + (0.040 x 77)] / 0.820



TR55 Tc Worksheet

Hyd. No. 6

Newport Road - Undetained 1

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 (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.67**	**+**	**0.00**	**+**	**0.00**	**=**	**7.67**
Shallow Concentrated Flow							
Flow length (ft)	= 165.00		298.00		384.00		
Watercourse slope (%)	= 10.00		5.00		10.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=5.10		3.61		5.10		
Travel Time (min)	**= 0.54**	**+**	**1.38**	**+**	**1.25**	**=**	**3.17**
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	= 0.060		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 ..... 10.80 min

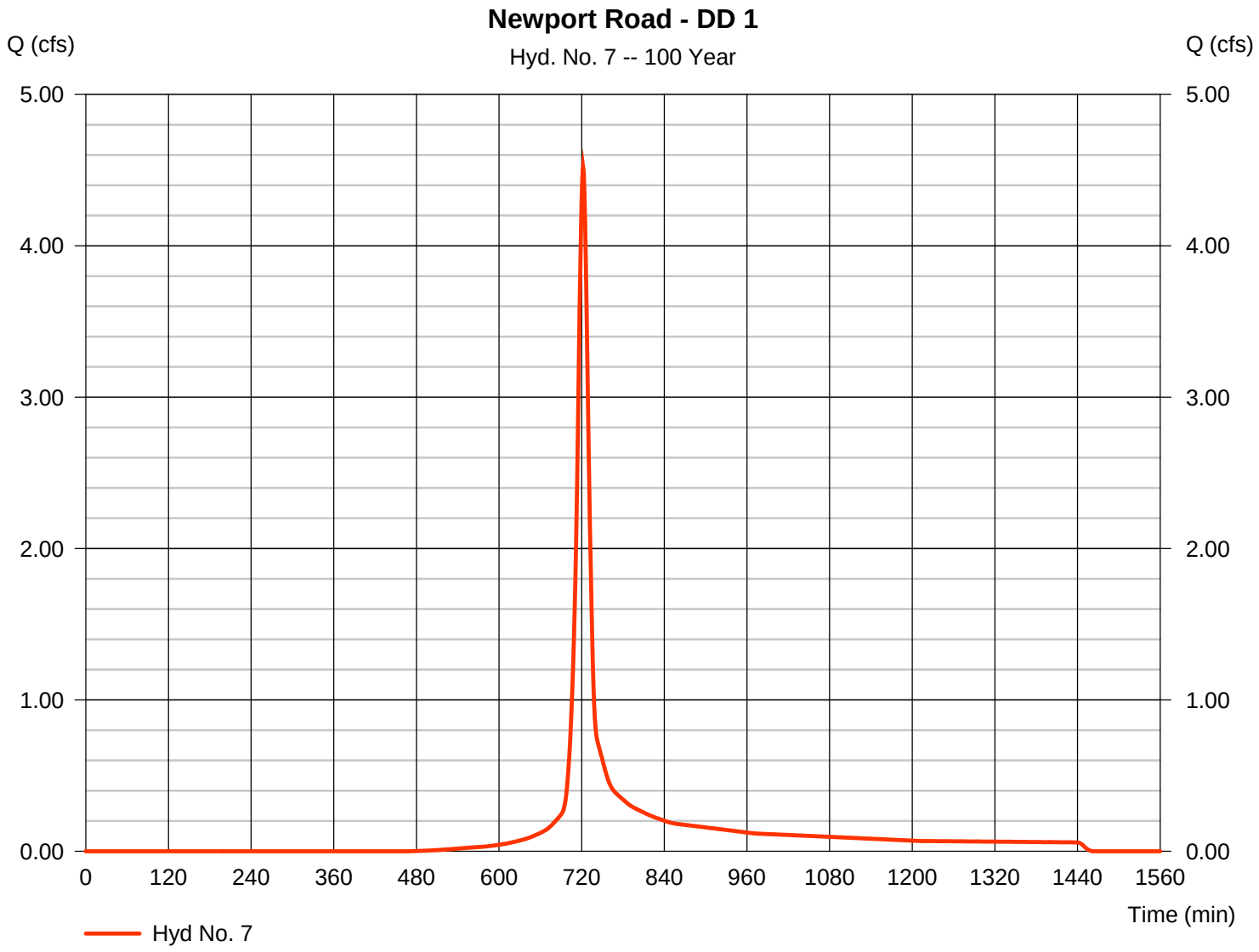
Hydrograph Report

Hyd. No. 7

Newport Road - DD 1

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.516 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	1 min	Hyd. volume	=	12,142 cuft
Drainage area	=	1.170 ac	Curve number	=	77*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.50 min
Total precip.	=	5.28 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.230 x 71) + (0.940 x 78)] / 1.170



TR55 Tc Worksheet

Hyd. No. 7

Newport Road - DD 1

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 (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.06**	**+**	**0.00**	**+**	**0.00**	**=**	**11.06**
Shallow Concentrated Flow							
Flow length (ft)	= 213.00		410.00		0.00		
Watercourse slope (%)	= 8.00		6.30		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=4.56		4.05		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.69**	**+**	**0.00**	**=**	**2.47**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

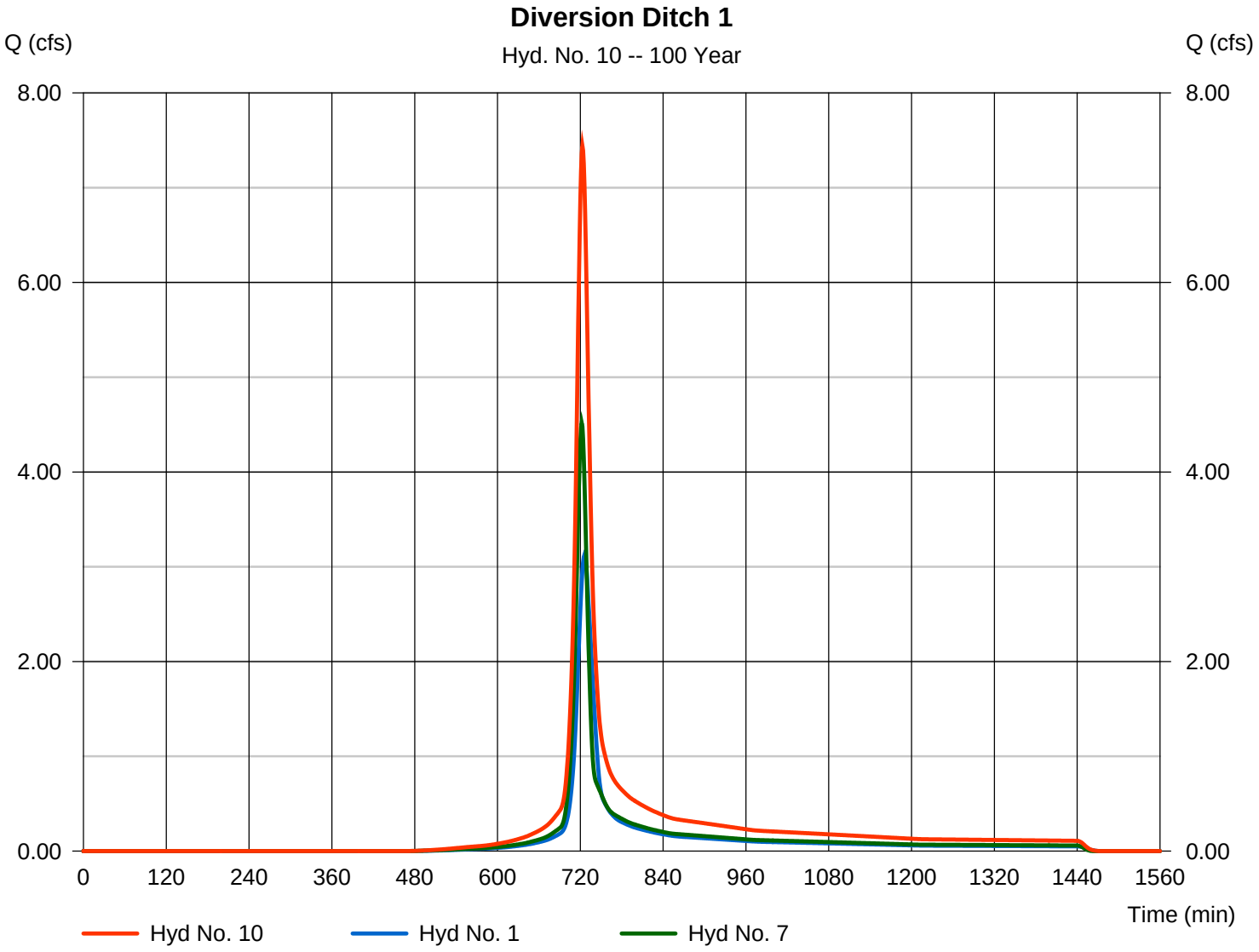
Total Travel Time, Tc ..... 13.50 min

Hydrograph Report

Hyd. No. 10

Diversion Ditch 1

Hydrograph type	= Combine	Peak discharge	= 7.438 cfs
Storm frequency	= 100 yrs	Time to peak	= 723 min
Time interval	= 1 min	Hyd. volume	= 22,410 cuft
Inflow hyds.	= 1, 7	Contrib. drain. area	= 2.150 ac



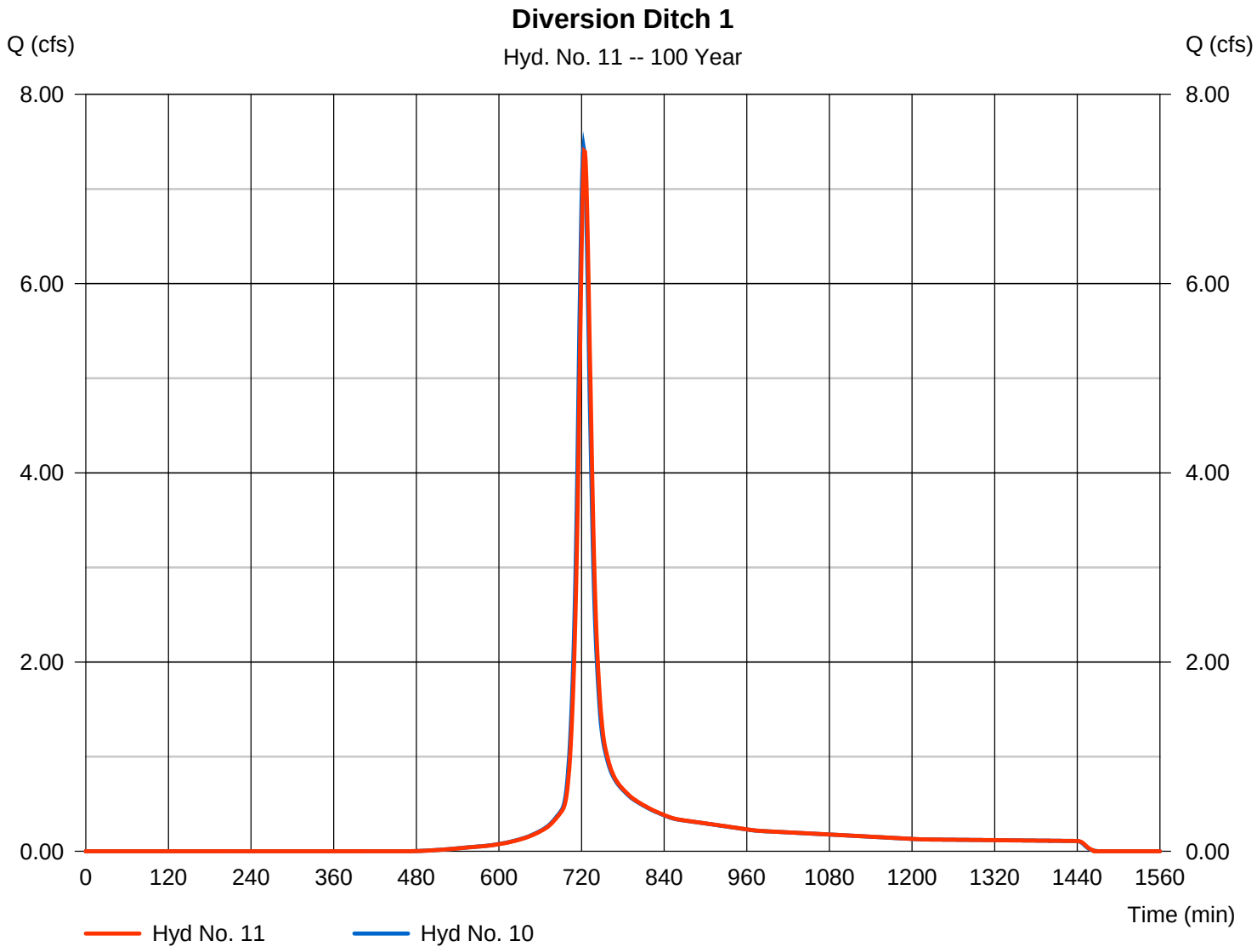
Hydrograph Report

Hyd. No. 11

Diversion Ditch 1

Hydrograph type	=	Reach	Peak discharge	=	7.400 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	1 min	Hyd. volume	=	22,408 cuft
Inflow hyd. No.	=	10 - Diversion Ditch 1	Section type	=	Trapezoidal
Reach length	=	232.0 ft	Channel slope	=	3.8 %
Manning's n	=	0.060	Bottom width	=	1.0 ft
Side slope	=	2.0:1	Max. depth	=	2.0 ft
Rating curve x	=	4.847	Rating curve m	=	0.968
Ave. velocity	=	0.00 ft/s	Routing coeff.	=	0.7484

Modified Att-Kin routing method used.

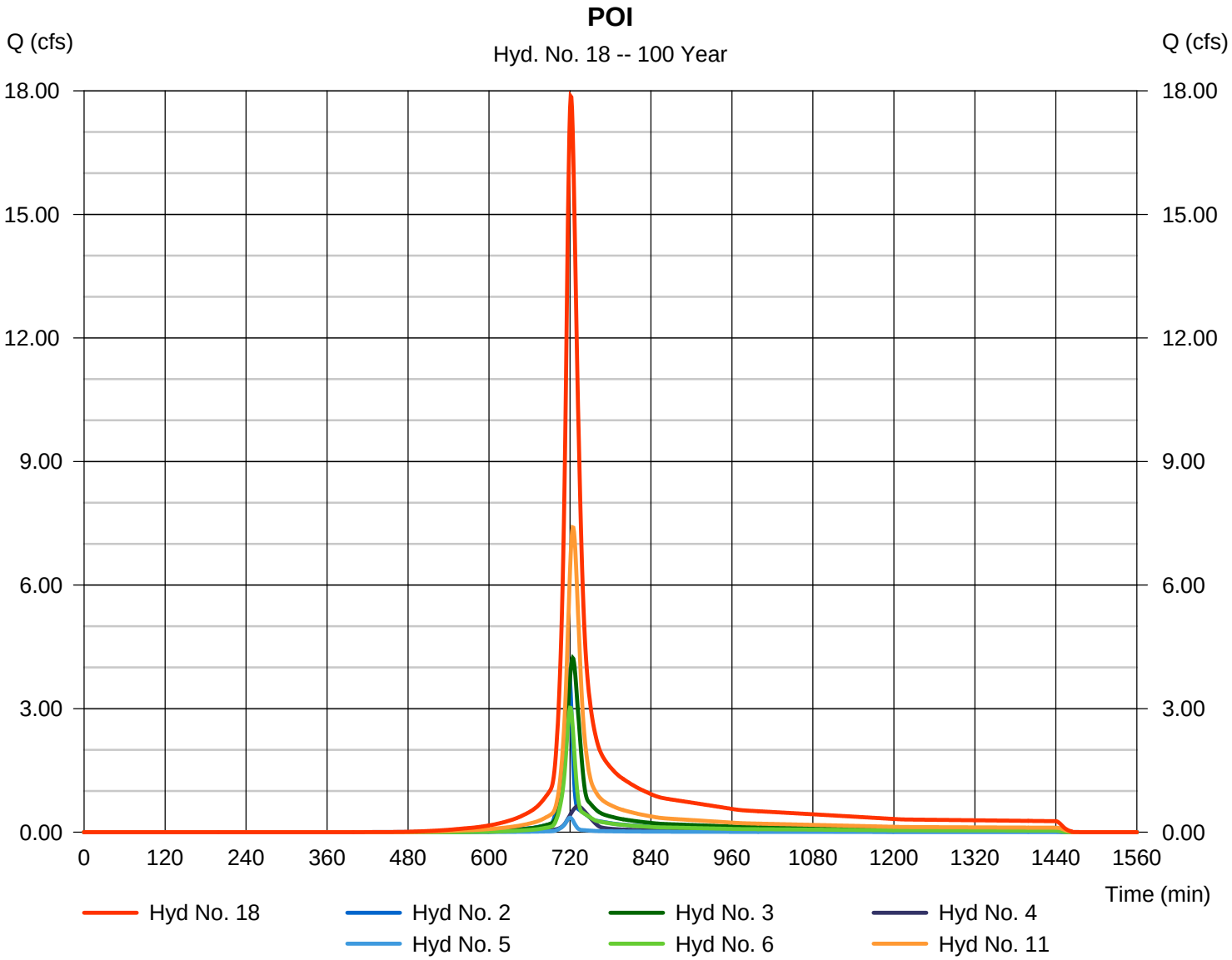


Hydrograph Report

Hyd. No. 18

POI

Hydrograph type	=	Combine	Peak discharge	=	17.87 cfs
Storm frequency	=	100 yrs	Time to peak	=	721 min
Time interval	=	1 min	Hyd. volume	=	54,145 cuft
Inflow hyds.	=	2, 3, 4, 5, 6, 11	Contrib. drain. area	=	3.300 ac



ATTACHMENT D
NEWPORT RD
DIVERSION CHANNEL DESIGN

TETRA TECH, INC.

By:	EAD	Date: 10/4/2016	Subject:	Sunoco PA Pipeline Project	Sheet No.: of
Chkd. By:	LMD	Date: 10/19/2016		Newport Rd	Proj. No.: 112IC05958

DIVERSION/COLLECTION DITCH DESIGN

DESIGN DISCHARGE

Channel	Design Discharge (cfs)
DD-1	8.30
CD-1	1.50

Diversion and collection ditches are designated as the watershed labeled as "Newport Rd No BMP" from Attachment C. The design discharge is the 100-year 24-hour storm runoff from the watershed.

CHANNEL LINING

The diversion and collection channels will be vegetated and lined with a North American Green Synthetic Lining, or approved equivalent if needed for stability. The North American Green Erosion Control Materials Design Software, Version 5.0 was used to analyze the channel lining stability and hydraulic characteristics of the channel.

FREEBOARD

Channel	Velocity (ft/s)	Depth (ft)	Minimum Required Freeboard (ft)	Minimum Required Depth (ft)
DD-1	2.76	1.00	0.50	1.50
CD-1	1.24	0.78	0.50	1.28

CHANNEL CONFIGURATION SUMMARY

Channel	Bed Slope (%)	Bottom Width (ft)	Side Slopes (_LH:1V)	Side Slopes (_RH:1V)	Channel Lining	Total Depth (ft)
DD-1	3.8%	1	2	2	NAG P300	1.50
CD-1	4.5%	0	2	2	NAG P300	1.50

Notes:

1. Channel velocities and flow depths were obtained from the included computer output .
2. The channel section characteristics resulting in the largest total depth were used.

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Poseyville, Indiana 47633
Tel. 800.772.2040
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Erosion Control Materials Design Software
Version 5.0

Project Name: Newport Road
Project Number: 104079
Channel Name: DD-1

Discharge	8.3
Peak Flow Period	0.3
Channel Slope	0.038
Channel Bottom Width	1
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Loam

P300 - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
P300 Unvegetated	Straight	8.3 cfs	4.95 ft/s	0.7 ft	0.032	3 lbs/ft2	1.66 lbs/ft2	1.81	STABLE	E
P300 Reinforced Vegetation	Straight	8.3 cfs	2.76 ft/s	1 ft	0.07	8 lbs/ft2	2.37 lbs/ft2	3.37	STABLE	E
Underlying Substrate	Straight	8.3 cfs	2.76 ft/s	1 ft	--	2 lbs/ft2	0.103 lbs/ft2	19.38	STABLE	--

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Project Name: 112IC05958 Sunoco
Project Number: 103213
Channel Name: CD-1

Discharge	1.5
Peak Flow Period	0.3
Channel Slope	0.045
Channel Bottom Width	0
Left Side Slope	2
Right Side Slope	2
Low Flow Liner	
Retardance Class	C
Vegtation Type	Mix (Sod & Bunch)
Vegetation Density	Good 75-95%
Soil Type	Loam

P300 - Class C - Mix (Sod & Bunch) - Good 75-95%

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
P300 Unvegetated	Straight	1.5 cfs	3.31 ft/s	0.48 ft	0.034	3 lbs/ft2	1.34 lbs/ft2	2.24	STABLE	E
P300 Reinforced Vegetation	Straight	1.5 cfs	1.24 ft/s	0.78 ft	0.126	8 lbs/ft2	2.19 lbs/ft2	3.66	STABLE	E
Underlying Substrate	Straight	1.5 cfs	1.24 ft/s	0.78 ft	--	2 lbs/ft2	0.034 lbs/ft2	59.2	STABLE	--