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STORMWATER MANAGEMENT REPORT

FOR

Elcon Recycling
Dean Sievers Place
Falls Township
Bucks County, PA

File No. 12-07083

Original Submission: January, 2019

Resubmitted: April 18, 2019

Prepared by:

Gilmore & Associates, Inc.
Engineers ♦ Land Surveyors ♦ Planners ♦ GIS Consultants
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I. Project Description

The subject site (Tax parcel 13-51-1-5) is located in the Materials Processing and Manufacturing (MPM) zoning district. The site is bound by Phoenix Metals, Arley Wholesale, A&A Machinery, and Univar USA along Dean Sievers Place to the east, Sims Metal Management to the north, and Steel Road South to the west and south, in Falls Township. The attached USGS Quadrangle depicts the site location. The 32.30-acre site is currently undeveloped. The site is generally flat, but slopes toward the existing wetland at approximately one (1) percent. The majority of the site currently sheet flows directly to the existing wetland (POI-A), with a small portion of the site sheet flowing to an existing drainage swale along Dean Sievers Place and then to the wetland. The remaining portion of the site sheet flows to an adjacent property, TMP 13-51-1-6 (POI-B). The existing wetland system eventually discharges to the Delaware River, which is classified as WWF, MF in Chapter 93.

The project proposes a network of interconnected buildings covering approximately 107,100 square feet for the purpose of treating industrial waste. An additional ±50,000 square feet within the limit of disturbance has been reserved for future development. This future development area has been considered in the stormwater design, and is included in the calculations as impervious building area. Drive aisles capable of accommodating a WB-67 truck will be provided throughout the site, as well as a designated truck unloading area and a parking area for 73 vehicles. The truck unloading area is graded to be self-contained and will direct runoff collected in this area to the processing plant as an extra precaution against leaks or spills. The process tank farm in the large central island will also be self-contained and direct runoff to be processed. Runoff from area to be disturbed will be directed to one (1) stormwater basin.

II. Existing Conditions: Topography & Soils

Topographic information was obtained from a field survey performed by Gilmore & Associates, Inc. in March of 2014. Vertical Datum is NAVD88 and was established by Global Positioning System (GPS) with observations referenced to the TopCon TopSurv GPS Base Station Network.

Soils classification information for the project site was obtained from the Soil Survey of Bucks County, Pennsylvania, and is presented in Table 1. Urban Land (UfuB) is the only soil mapped within the area of disturbance.

Table 1: Existing Soils Classification Table

Symbol	SoilName	Rating	Slope
UfuB	Urban Land		0-8%
Na	Nanticoke-Hatboro Silt Loams	C/D	0-1%
W	Water		

III. Stormwater Management

The proposed stormwater management design for this project incorporates both structural and non-structural BMPs. The non-structural BMPs utilized in the design include minimization of the overall disturbed area to the maximum extent possible and limitation of the proposed impervious coverage to only what is needed for the proposed use. Limiting the impervious coverage and overall disturbed area reduces the composite CN value in the post-development condition and reduces runoff. Also, the existing drainage swale between the proposed development and Dean Sievers Place will be maintained to continue to direct off-site runoff to the existing wetland system. Further, a managed release basin with an impermeable liner is proposed to treat the stormwater from the disturbed area. After stormwater enters the basin through one (1) of two (2) endwalls, it will first infiltrate through two (2) feet of amended soils for water quality, then enter the perforated underdrain and slowly discharge through the hole drilled in the capped underdrain in the outlet control structure. The outlet control structure also has a rectangular orifice and grated top to mitigate peak flows in accordance with the Falls Township Stormwater Management Ordinance (Chapter 187). This basin will discharge to the existing wetland system via an endwall with a rip-rap apron sized in accordance with the 2012 PADEP Erosion and Sediment Pollution Control Program Manual. The discharge will then be dispersed over a fifty (50) foot wide level spreader to an area stabilized by existing brush in an effort to reduce the impact to the local wetland environment from a concentration of the site runoff.

PADEP has requested that infiltration not be included in the stormwater management design for this project. As such, an impermeable liner will be installed below the underdrain in the proposed basin to fully contain all runoff from the disturbed area.

The stormwater management design is based on the Soil Conservation Service (SCS) Method for runoff peak flow rates and volumes utilizing the Hydraflow Hydrographs computer software program. The proposed stormwater conveyance system design is based on the Rational Method utilizing the Hydraflow Storm Sewers computer software program. All inlets, storm sewer pipes, and the proposed stormwater basin have been designed to contain and convey the 100 year storm, exceeding standards set forth in the Falls Township Stormwater Management Ordinance (Chapter 187). Time of concentration calculations for the stormwater management design are attached. In order to comply with the ACT 167 Plan, the above stormwater management design criteria are based on the Falls Township Stormwater Management Ordinance (Chapter 187) adopted April 5, 2005.

A. Peak Flow Rate Analysis per §187-9(A)(2)

This site is located within District C, which requires post-development runoff rate control as follows:

District	Post-Development Design Storm		Pre-Development Design Storm
C	2-year	reduced to	1-year
	5-year	reduced to	2-year
	100-year	reduced to	50% of 100-year

Runoff rate will be controlled in accordance with the requirements above per the following table:

Table 2: Runoff Peak Discharge Rate Summary (cfs)

Condition	1-year	2-year	5-year	10-year	25-year	50-year	100-year
Pre-Development POI-A	4.80	8.54	15.00	21.32	28.06	33.33	40.55
Pre-Development POI-B	1.15	2.04	3.57	5.07	6.66	7.91	9.62
Post-Development POI-A	2.03	3.09	4.84	7.28	10.38	12.30	14.75
Post-Development POI-B	0.19	0.29	0.45	0.61	0.78	0.91	1.08

B. Water Quality Analysis per §187-17

The Falls Township Stormwater Management Ordinance requires that 90% of the average annual rainfall be treated over the developed portions of the site per the following equation:

$WQv = [(P) \times (Rv) \times (A)] \div 12$

Where:

WQv = water quality volume (acre-feet)

P = rainfall amount equal to 90% of events producing this rainfall (inches)

P = 2.04 inches for PennDOT Region 5

A = area of project contributing to the water quality BMP (acres)

Rv = 0.05 + [0.009 × (I)] where I is the percent of the area that is impervious surface

(impervious area ÷ A × 100%)

The required WQv for this site is:

$WQv = [(P) \times (Rv) \times (A)] \div 12$

$Rv = 0.05 + [0.009 \times (I)]$

I = impervious area ÷ A × 100%

$I = 8.09 \div 13.40 \times 100\%$

$I = 60.4$

$Rv = 0.05 + [0.009 \times 60.4]$

$Rv = 0.59$

$WQv = [(2.04 \text{ in}) \times (0.59) \times (13.40)] \div 12$

WQv = 1.34 acre-feet = 58,370 cf

The WQv provided by the managed release basin is equal to the volume that flows to the basin and stays below the lowest basin outlet invert. This volume will infiltrate through the amended soils in the managed release basin to achieve the required water quality and discharge through the orifice in the underdrain located in the outlet control structure. Since

the maximum water surface for the 2-year storm is below the lowest orifice invert, the entire runoff volume for the 2-year storm that is directed to the managed release basin will be treated to the required water quality. The runoff volume from the 2-year storm event that flows to the basin is 94,641 cubic feet per the Soil Conservation Service (SCS) Method utilized by the Hydraflow Hydrographs computer software program.

94,641 cubic feet provided > 58,370 cubic feet required

C. **Analysis of Dean Sievers Place Channel**

There are two (2) crossings proposed across the existing channel in the drainage easement adjacent to Dean Sievers Place. The existing and proposed drainage area and Rational Method coefficient were calculated for each proposed culvert crossing, see attached exhibits and Rational Method coefficient calculations. As shown in the attached Hydraflow Hydrographs computations, the proposed condition results in less runoff to the proposed headwall locations.

IV. Erosion and Sediment Control

The following measures shall be implemented to minimize erosion and sediment pollution created by site construction:

A. Stabilized Construction Entrance(s) – Temporary construction entrances will provide stable access routes to the site, and will aid in cleaning mud from vehicle tires during ingress and egress to and from the site.

B. Compost Filter Socks – Compost filter socks will be used to filter sediment from small overland (sheet) flow areas and along the toe of slope of soil stockpiles. Rock filter outlets shall be implemented by the Contractor in low points along the compost filter socks where concentrated flow can occur.

C. Inlet Protection – Installation of inlet protection devices shall be utilized to protect the existing inlets and proposed inlets from receiving increased sediment loads due to construction related activities.

D. Temporary Seeding and Mulching – Disturbed areas which will be "unworked" shall immediately receive a temporary seed mixture and mulch as shown on the plan. In addition, soil stockpile areas are to be seeded and mulched with a temporary seed

mixture to promote rapid vegetated stabilization.

E. Permanent Seeding and Mulching – Disturbed areas at final grade are to receive a permanent seed mixture and mulch to promote permanent stabilization as shown on the plan.

F. Limited Area of Disturbance – No site clearing or grading is proposed which is not essential to the construction of the project. Significant open space areas of the site will remain undisturbed.

V. Maintenance

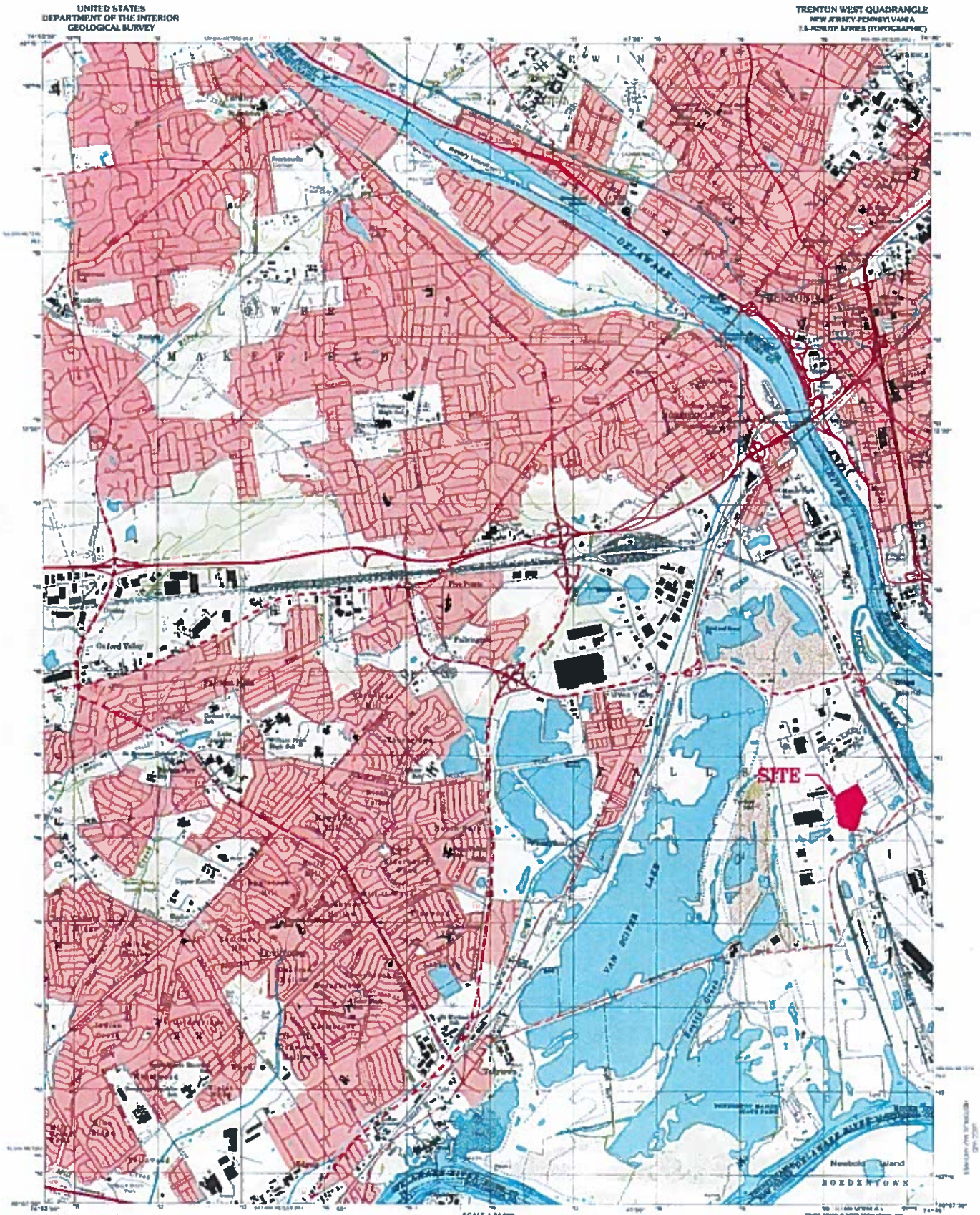
The Owner of the Dean Sievers Place site shall maintain the stormwater management system. Maintenance shall include removal of debris from all inlet locations, as well as removal of any obstructions that may enter the stormwater basin. Falls Township shall also reserve the right to enter the site for the purpose of inspection of these facilities to ensure that the Owner is maintaining the design integrity.

VI. Qualifications:

The design of the stormwater management facilities has been completed by James Hersh, P.E. of Gilmore & Associates, Inc. The firm has completed numerous stormwater management projects in Bucks County since 1973.

APPENDIX

USGS QUADRANGLE



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CN Calculations

Project Name Elcon Recycling
Project Number 12-07083
Condition Pre-Development
Area On-Site Drainage Area A (Drainage Area to POI-A)

Description	CN	SF	A	RCN x A
Impervious	98	0	0.00	0
Gravel (HSG-C)	89	0	0.00	0
Brush (HSG-C)	65	88,288	2.03	132
Meadow (HSG-C)	71	392,147	9.00	639
Grass (HSG-C)	74	0	0.00	0
Forest (HSG-C)	70	0	0.00	0
TOTAL		480,435	11.03	771

RCN 70

Time of Concentration : Use Tc = 26.81 min

Project Name Elcon Recycling
Project Number 12-07083
Condition Pre-Development
Area On-Site Drainage Area B (Drainage Area to POI-B)

Description	CN	SF	A	RCN x A
Impervious	98	0	0.00	0
Gravel (HSG-C)	89	0	0.00	0
Brush (HSG-C)	65	10,304	0.24	15
Meadow (HSG-C)	71	93,377	2.14	152
Grass (HSG-C)	74	0	0.00	0
Forest (HSG-C)	70	0	0.00	0
TOTAL		103,681	2.38	168

RCN 70

Time of Concentration : Use Tc = 23.11 min

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development
Area On-Site Drainage Area A (Drainage Area to Basin)

Description	CN	SF	A	RCN x A
Impervious	98	349,168	8.02	786
Gravel (HSG-C)	89	0	0.00	0
Brush (HSG-C)	65	0	0.00	0
Meadow (HSG-C)	71	0	0.00	0
Grass (HSG-C)	74	115,360	2.65	196
Forest (HSG-C)	70	0	0.00	0
TOTAL		464,528	10.66	982

RCN 92

Time of Concentration : Use Tc = 7.97 min

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development
Area On-Site Drainage Area A (Drainage Area to Bypass Basin)

Description	CN	SF	A	RCN x A
Impervious	98	2,873	0.07	6
Gravel (HSG-C)	89	0	0.00	0
Brush (HSG-C)	65	0	0.00	0
Meadow (HSG-C)	71	0	0.00	0
Grass (HSG-C)	74	110,071	2.53	187
Forest (HSG-C)	70	0	0.00	0
TOTAL		112,944	2.59	193

RCN 75

Time of Concentration : Use Tc = 23.77 min

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development
Area On-Site Drainage Area B (Drainage Area to POI-B)

Description	CN	SF	A	RCN x A
Impervious	98	0	0.00	0
Gravel (HSG-C)	89	0	0.00	0
Brush (HSG-C)	65	0	0.00	0
Meadow (HSG-C)	71	0	0.00	0
Grass (HSG-C)	74	6,643	0.15	11
Forest (HSG-C)	70	0	0.00	0
TOTAL		6,643	0.15	11

RCN 74

Time of Concentration : Use Tc = 5.00 min

TIME OF CONCENTRATION CALCULATIONS

TR55 Tc Worksheet

Hyd. No. 1

Pre-Dev POI-A

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.240	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.30	3.30	3.30	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	**= 18.54**	**+ 0.00**	**+ 0.00**	**= 18.54**
Shallow Concentrated Flow				
Flow length (ft)	= 800.00	0.00	0.00	
Watercourse slope (%)	= 1.00	0.00	0.00	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	= 1.61	0.00	0.00	
Travel Time (min)	**= 8.26**	**+ 0.00**	**+ 0.00**	**= 8.26**
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	
Travel Time (min)	**= 0.00**	**+ 0.00**	**+ 0.00**	**= 0.00**

Total Travel Time, Tc ..... **26.81 min**

TR55 Tc Worksheet

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.30		0.00		0.00		
Land slope (%)	= 0.80		0.00		0.00		
Travel Time (min)	**= 20.27**	**+**	**0.00**	**+**	**0.00**	**=**	**20.27**
Shallow Concentrated Flow							
Flow length (ft)	= 230.00		0.00		0.00		
Watercourse slope (%)	= 0.70		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 1.35		0.00		0.00		
Travel Time (min)	**= 2.84**	**+**	**0.00**	**+**	**0.00**	**=**	**2.84**
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		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 23.11 min

TR55 Tc Worksheet

Hyd. No. 3

Post-Dev to Basin Page 1

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 20.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.30		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 2.66**	**+**	**0.00**	**+**	**0.00**	**=**	**2.66**
Shallow Concentrated Flow							
Flow length (ft)	= 100.00		0.00		0.00		
Watercourse slope (%)	= 1.10		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 2.13		0.00		0.00		
Travel Time (min)	**= 0.78**	**+**	**0.00**	**+**	**0.00**	**=**	**0.78**
Channel Flow							
X sectional flow area (sqft)	= 1.23		1.77		3.14		
Wetted perimeter (ft)	= 3.90		4.71		6.28		
Channel slope (%)	= 0.50		0.50		0.50		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	= 3.24		3.65		4.41		
Flow length (ft)	= 286.0		317.0		139.0		
Travel Time (min)	**= 1.47**	**+**	**1.45**	**+**	**0.52**	**=**	**3.44**

Total Travel Time, Tc ..... **6.89 min**

TR55 Tc Worksheet

Hyd. No. 3

Post-Dev to Basin Page 2

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.150		0.011		0.011		
Flow length (ft)	= 0.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 0.00		0.00		0.00		
Land slope (%)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		0.00		0.00		
Watercourse slope (%)	= 0.00		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 0.00		0.00		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**
Channel Flow							
X sectional flow area (sqft)	= 4.91		7.07		0.00		
Wetted perimeter (ft)	= 7.85		9.42		0.00		
Channel slope (%)	= 0.50		0.50		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	= 5.13		5.80		0.00		
Flow length (ft)	= 80.0		286.0		0.0		
Travel Time (min)	**= 0.26**	**+**	**0.82**	**+**	**0.00**	**=**	**1.08**

Total Travel Time, Tc ..... **1.08 min**
+ 6.89 min
7.97 min

TR55 Tc Worksheet

Hyd. No. 5

Post-Dev to Bypass Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 80.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.30		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 15.51**	**+**	**0.00**	**+**	**0.00**	**=**	**15.51**
Shallow Concentrated Flow							
Flow length (ft)	= 800.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	= 1.61		0.00		0.00		
Travel Time (min)	**= 8.26**	**+**	**0.00**	**+**	**0.00**	**=**	**8.26**
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		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 23.77 min

TR55 Tc Worksheet

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 20.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.30		0.00		0.00		
Land slope (%)	= 33.00		0.00		0.00		
Travel Time (min)	**= 1.26**	**+**	**0.00**	**+**	**0.00**	**=**	**1.26**
Shallow Concentrated Flow							
Flow length (ft)	= 50.00		0.00		0.00		
Watercourse slope (%)	= 4.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	= 3.23		0.00		0.00		
Travel Time (min)	**= 0.26**	**+**	**0.00**	**+**	**0.00**	**=**	**0.26**
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		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 1.52 min

EMERGENCY SPILLWAY DESIGN

GILMORE & ASSOCIATES, INC.
ENGINEERING & CONSULTING SERVICES

Project Name: Elcon Recycling
Project Number: 12-07083

BMP Emergency Spillway Calculations

$Q = CLH^{3/2}$
$C = 3.10$

BMP	100-YR DWE	TOP OF BERM ELEVATION	EMER. SPILLWAY ELEVATION	EMER. SPILLWAY WIDTH (FT.)	EMER. SPILLWAY TOP WIDTH (FT.)	Q_{100}	H (FT.)	MAX. WSEL (FT.)	FREEBOARD (FT.)	SIDE SLOPE	
Impermeable-Lined Managed Release Basin	15.73	17.75	16.25	90	99	96.24	0.49	16.74	1.01	3	: 1

RIP-RAP APRON DESIGN

STANDARD WORKSHEET
Rip-Rap Apron Outlet Protection

PROJECT NAME: Elcon Recycling
LOCATION: Falls Township
PREPARED BY: MRZ DATE: 4/15/2019
CHECKED BY: JJH DATE: 4/15/2019

METHODOLOGY:

Utilize *PA D.E.P. Erosion and Sediment Control Manual* to construct a Rock Apron at culvert, endwall, headwall or channel outfalls. First, tailwater condition must be determined (minimum or maximum). Second, with a known discharge, determine D50 rock size and length of apron "La". Third, determine the width and thickness of the apron. Lastly, ensure the permissible velocity of the rock size chosen is not exceeded by the velocity of the discharge entering the apron.

Equations Utilized:

Minimum Tailwater Condition: W2 = 3do + La
Maximum Tailwater Condition: W2 = 3do + 0.4La
Blanket Thickness: T = 1.5*Dmax
Discharge (Q) and Velocity (V) - obtained from the 100 Year Storm
do = pipe diameter
Width 1 = initial width of apron at end of structure
Width 2 = terminal width of apron, W2

Flows from Hydraflow Computations

STRUCTURE DATA							RIP-RAP DATA			APRON DATA		
TYPE #	PIPE DIA. (in)	Tailwtr Cond. MIN/MAX	Mngs "n"	Pipe Slope (ft/ft)	Q (cfs)	V (fps)	D50 (in.)	ROCK SIZE	Rock T (in.)	La (ft)	W at pipe (ft)	W at tailwtr (ft)
EW-1	36.0	MIN	0.015	0.005	36.14	5.11	6	R-4	18	19	9	28
EW-2	18.0	MIN	0.015	0.005	7.36	4.16	3	R-3	9	9	4.5	13.5
EW-3	15.00	MIN	0.015	0.005	10.92	8.90	6	R-4	18	13	3.75	16.75
								R-7	0		0	0
								R-7	0		0	0
								R-7	0		0	0
								R-7	0		0	0
								R-7	0		0	0
								R-7	0		0	0

Note: Rock size selected has been increased from the suggested d50 values based upon flow (Q) and/or velocity parameters. Energy Dissipator shall be hand placed and dimensions adjusted to conform to the existing roadside conveyance.

Stone larger than R-4 shall have stone filter blanket installed prior to the rip-rap in lieu of non-woven geotextile. Filter stone shall meet the following requirements:

Rip-rap Gradation	Filter Blanket Requirements				
	depth	stone #	max.	d50	min.
R-5	6"	FS-2	2"	no. 4	no. 100
R-6	8"	FS-3	6.5"	2.5"	no. 16
R-7	10"	FS-3	6.5"	2.5"	no. 16

TABLE 6.6
Riprap Gradation, Filter Blanket Requirements, Maximum Velocities

Percent Passing (Square Openings)						
Class, Size NO. / Rock Size (Inches)	R-8	R-7	R-6	R-5	R-4	R-3
42	100					
30		100				
24	15-50		100			
18		15-50		100		
15	0-15					
12		0-15	15-50		100	
9				15-50		
6			0-15		15-50	100
4				0-15		
3					0-15	15-50
2						0-15
Nominal Placement Thickness (inches)	63	45	36	27	18	9
Filter Stone[1]	AASHTO #1	AASHTO #1	AASHTO #1	AASHTO #3	AASHTO #3	AASHTO #57
V_{max} (ft/sec)	17.0	14.5	13.0	11.5	9.0	6.5

Adapted from PennDOT Pub. 408, Section 703.2(c), Table C

1 This is a general standard. Soil conditions at each site should be analyzed to determine actual filter size. A suitable woven or non-woven geotextile underlayment, used according to the manufacturer's recommendations, may be substituted for the filter stone for gradients < 10%.

TABLE 6.7
Comparison of Various Gradations of Coarse Aggregates

Total Percent Passing															
AASHTO NUMBER	6 ½	4"	3 ½"	2 ½	2"	1 ½ "	1"	3/4 "	1/2"	3/8"	#4	#8	#16	#30	#100
1		100	90-100	25-60		0-15		0-5							
3				100	90-100	35-70	0-15		0-5						
5						100	90-100	20-55	0-10	0-5					
57						100	90-100		25-60		0-10	0-5			
67							100	90-100		20-55	0-10	0-5			
7								100	90-100	40-70	0-15	0-5			
8									100	85-100	10-30	0-10	0-5		
10										100	75-100				10-30

PennDOT Publication 408, Section 703.2(c), Table C

Tables 6.6 and 6.7 should be placed on the plan drawings of all sites where riprap channel linings are proposed.

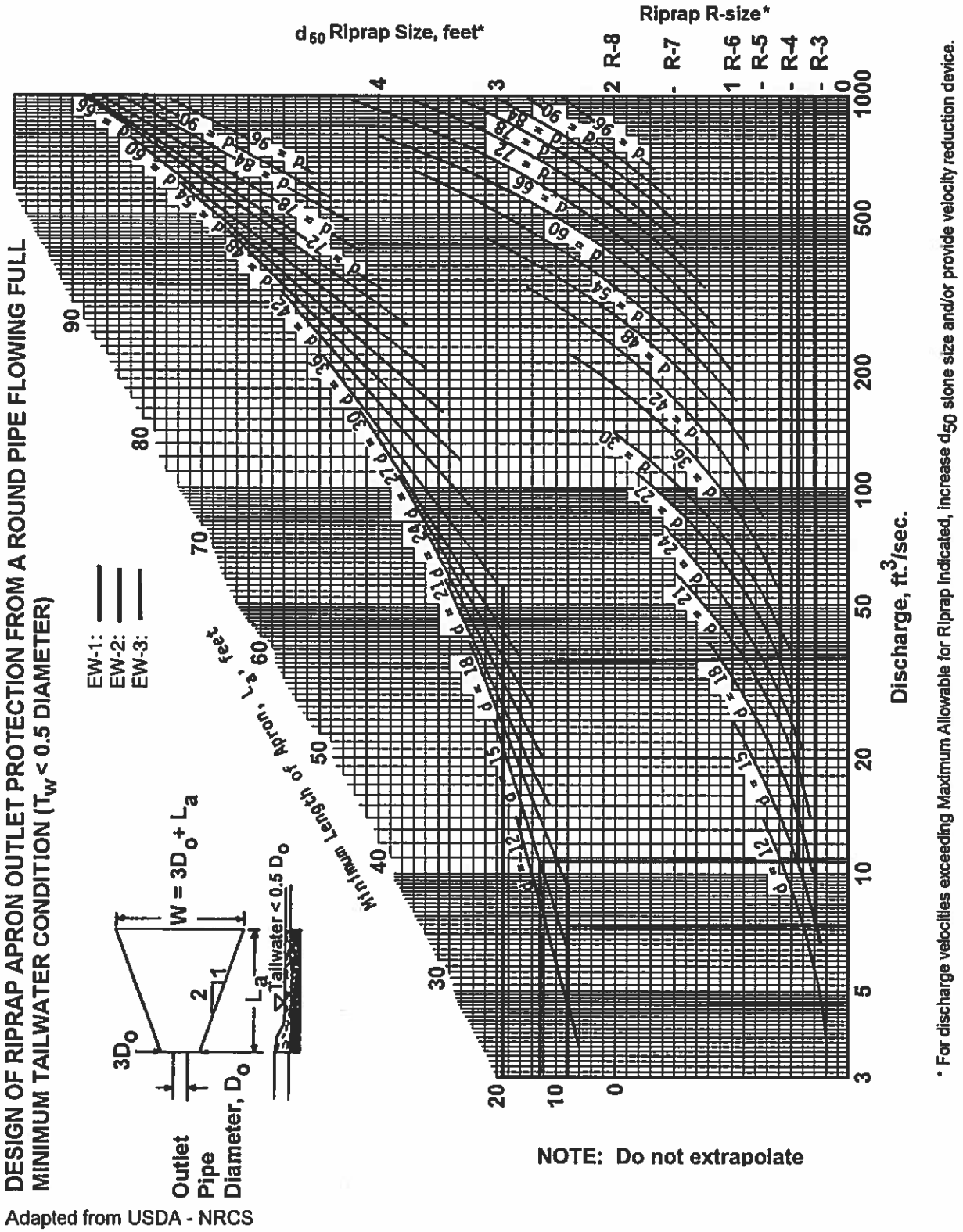
TABLE 6.9
Recommended n Values to be Used with Manning's Equation When Doing Stability Analyses of Receiving Streams

Design values should be utilized unless documentation is provided (narrative/calculations) to show that another value within the minimum and maximum range is appropriate.

Surface	Min.	Design	Max.
Asphalt Lining		0.015	
Brick in cement mortar; brick sewers	0.012	0.015	0.017
Concrete-lined channel	0.012	0.015	0.018
Cement-rubble surface	0.017		0.030
Neat cement surfaces	0.010	0.012	0.013
Plastic-lined channel	0.012		0.014
Shotcrete	0.016		0.017
Asbestos Cement Pipe		0.009	
Concrete pipe	0.012	0.015	0.016
Vitrified Clay Pipe	0.010	0.013	0.017
Common-clay drainage tile	0.011	0.012	0.017
Semi-circular metal flumes, smooth	0.011		0.015
Corrugated	0.023	0.025	0.030
Channels and ditches			
Earth, straight and uniform	0.017	0.023	0.025
Rock cuts, smooth and uniform	0.025	0.030	0.035
jagged and irregular	0.035	0.040	
Dredged earth channels	0.025	0.028	0.033
Earth bottom, rubble sides	0.028	0.030	0.035
Natural Streams			
1. Clean, straight bank, full stage no rifts or deep pools	0.025		0.033
2. Same as 1, but some weeds and stones	0.030		0.040
3. Winding, some pools and shoals, clean	0.033		0.045
4. Same as 3, lower stages, more ineffective slope and sections	0.040		0.055
5. Same as 3, same weeds and stone	0.035		0.050
6. Same as 4, stony sections	0.045		0.060
7. Sluggish river reaches, rather weedy or with very deep pools	0.050		0.080
8. Very weedy reaches	0.075		0.150

Adapted from Table 3.1 in *Applied Hydrology and Sedimentology for Disturbed Areas*

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



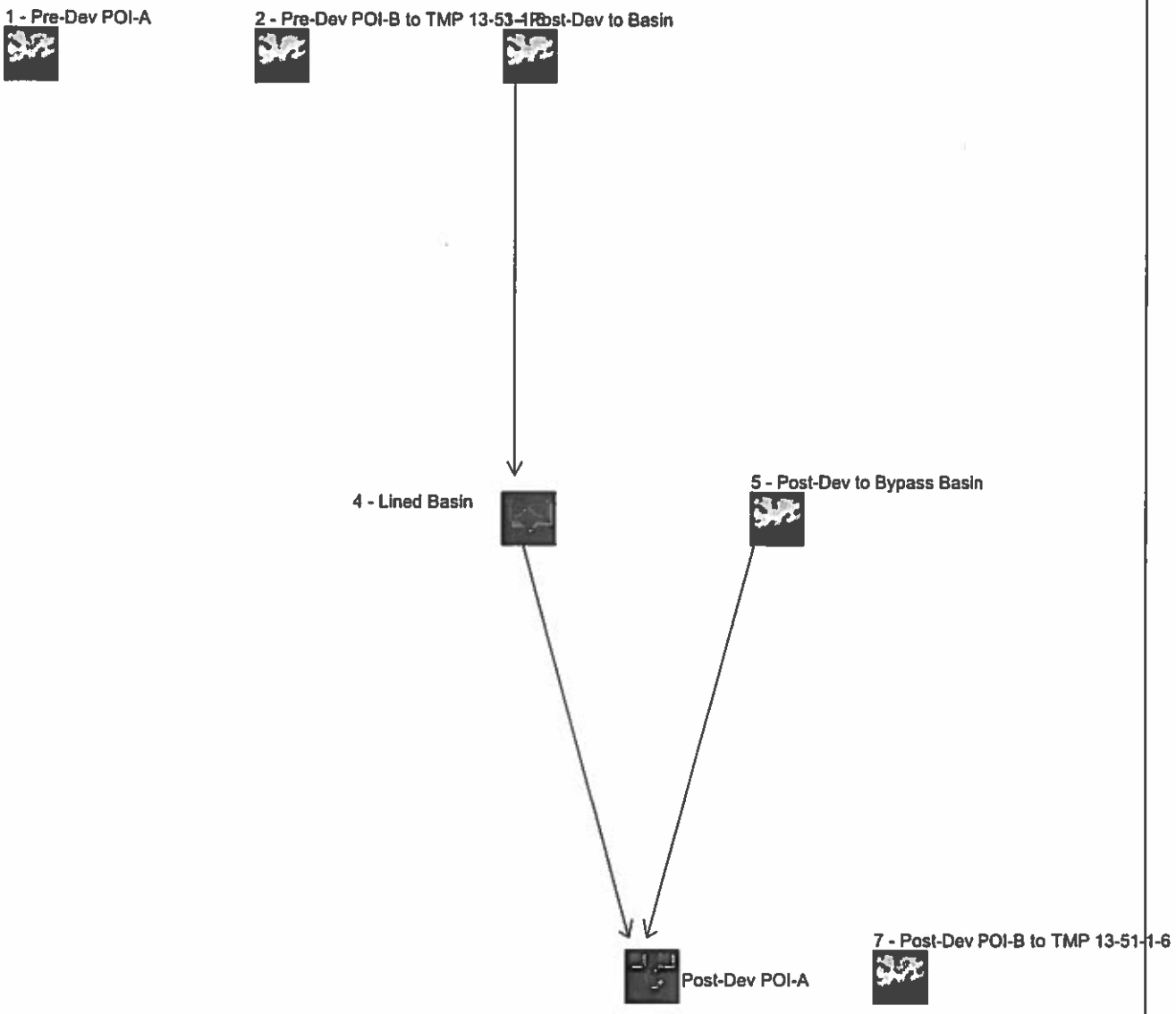
Adapted from USDA - NRCS

Not to be used for Box Culverts

PRE-DEVELOPMENT AND POST-DEVELOPMENT HYDROGRAPHS FOR SITE

Watershed Model Schematic

Hydraflow Hydrographs by Intelisolve v9.22



Project: Elcon Recycling.gpw	Wednesday, Apr 17, 2019

Hydrograph Return Period Recap

Hydraflow Hydrographs by Intelisolve v9.22

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	------	4.797	8.543	0.008	15.00	21.32	28.06	33.33	40.55	Pre-Dev POI-A
2	SCS Runoff	------	1.146	2.036	0.002	3.568	5.066	6.657	7.907	9.618	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	------	31.00	39.82	6.800	52.98	64.61	76.16	84.78	96.24	Post-Dev to Basin
4	Reservoir	3	0.301	0.368	0.000	1.148	2.255	3.129	3.663	5.810	Lined Basin
5	SCS Runoff	------	1.775	2.803	0.010	4.503	6.142	7.846	9.154	10.92	Post-Dev to Bypass Basin
6	Combine	4, 5	2.027	3.092	0.010	4.841	7.283	10.38	12.30	14.75	Post-Dev POI-A
7	SCS Runoff	------	0.186	0.287	0.000	0.453	0.610	0.777	0.905	1.078	Post-Dev POI-B to TMP 13-51-1-6

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	4.797	2	730	21,838	----	------	------	Pre-Dev POI-A
2	SCS Runoff	1.146	2	728	4,873	----	------	------	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	31.00	2	718	72,717	----	------	------	Post-Dev to Basin
4	Reservoir	0.301	2	1434	56,698	3	13.98	59,867	Lined Basin
5	SCS Runoff	1.775	2	730	7,138	----	------	------	Post-Dev to Bypass Basin
6	Combine	2.027	2	730	63,836	4, 5	------	------	Post-Dev POI-A
7	SCS Runoff	0.186	2	718	377	----	------	------	Post-Dev POI-B to TMP 13-51-1-6

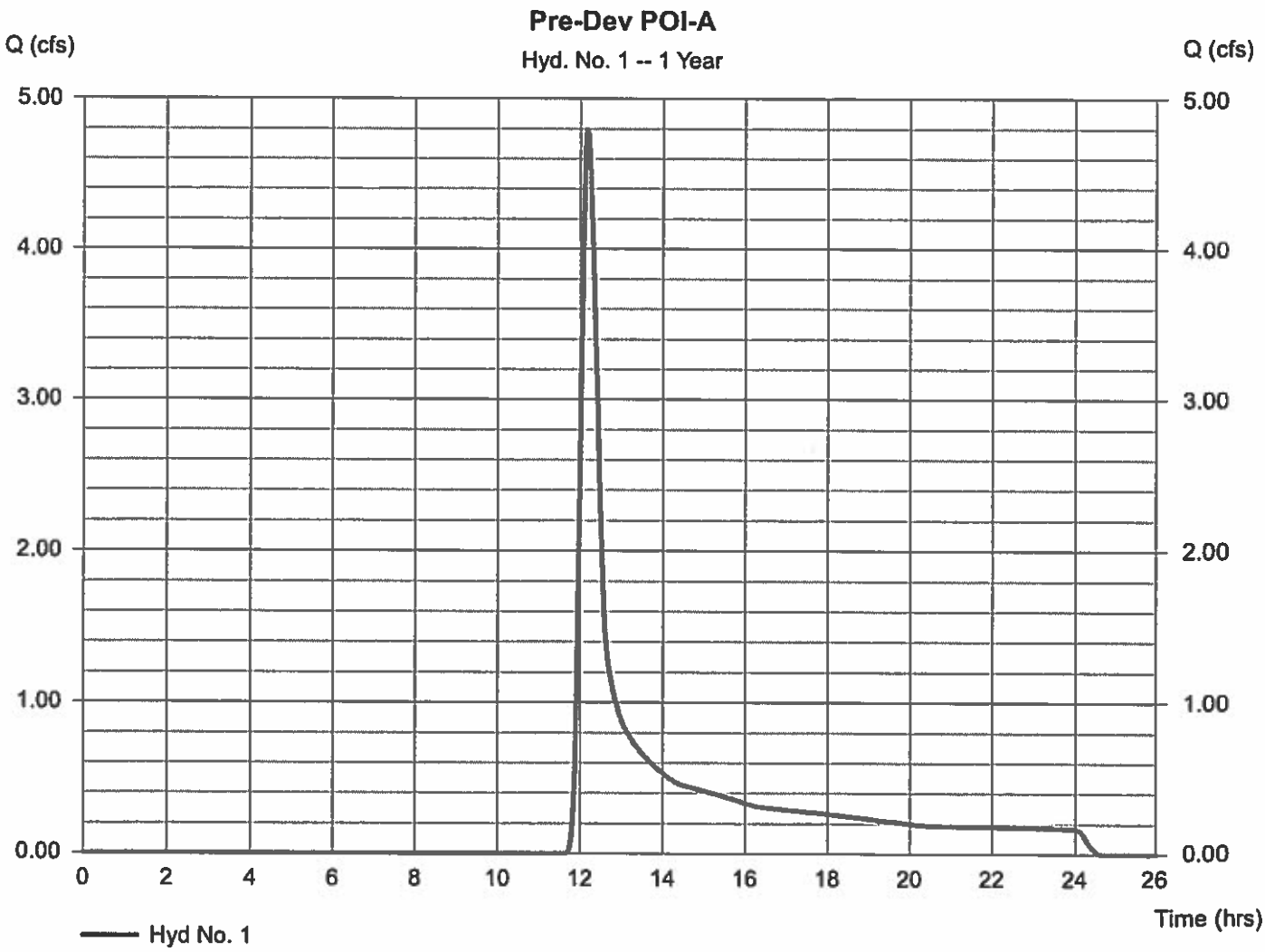
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 4.797 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 21,838 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



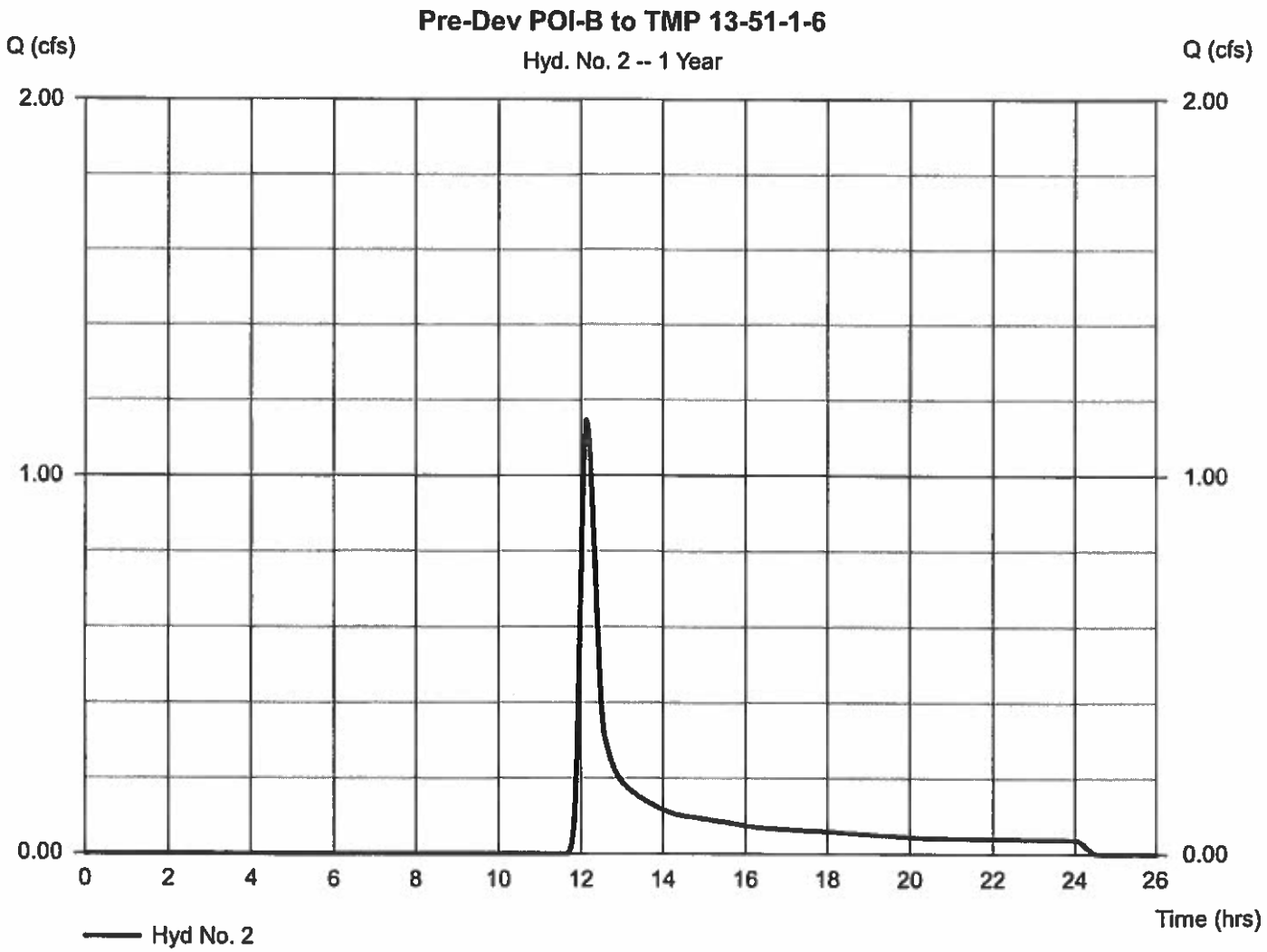
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 1.146 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 4,873 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



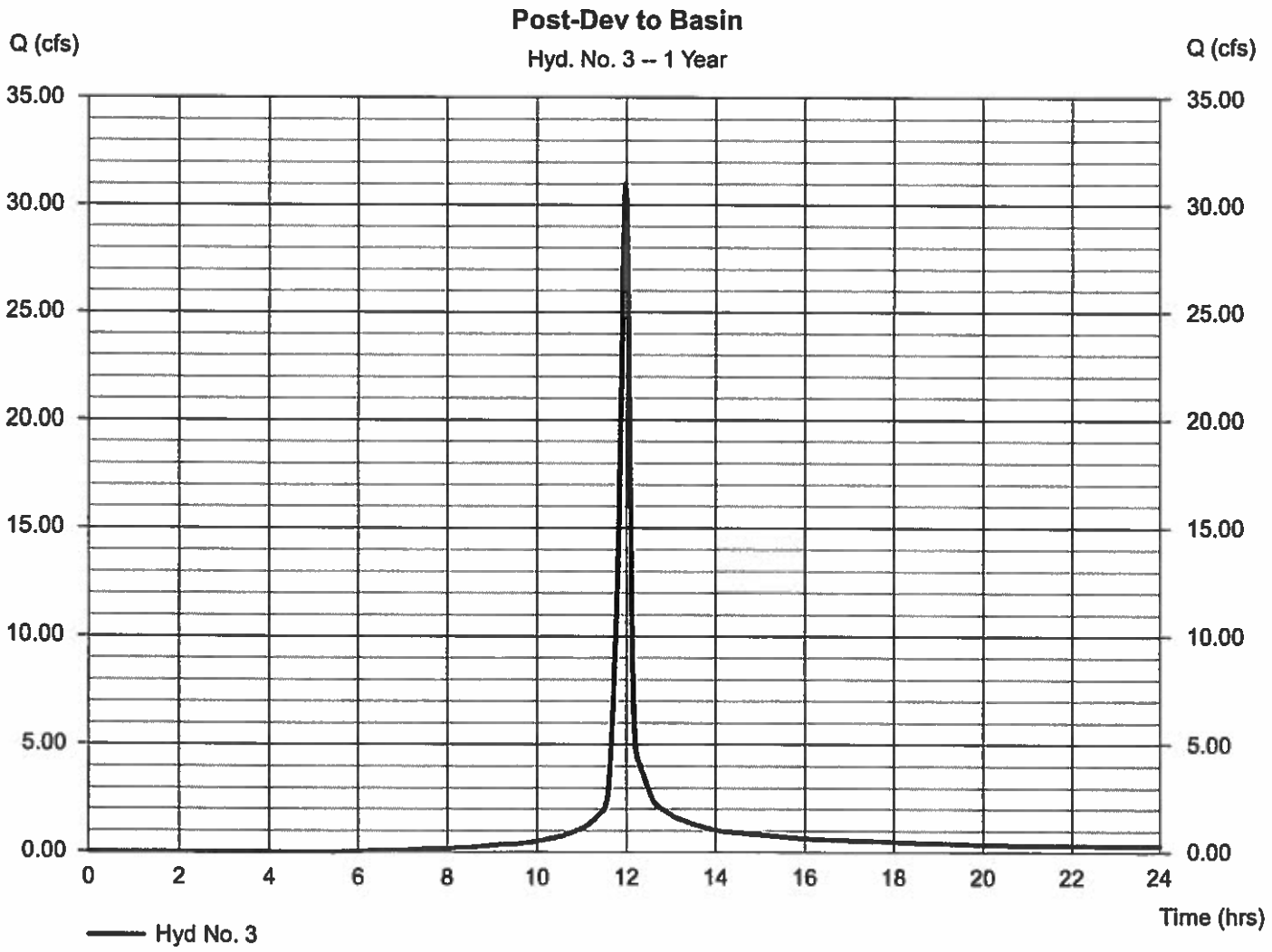
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 31.00 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 72,717 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

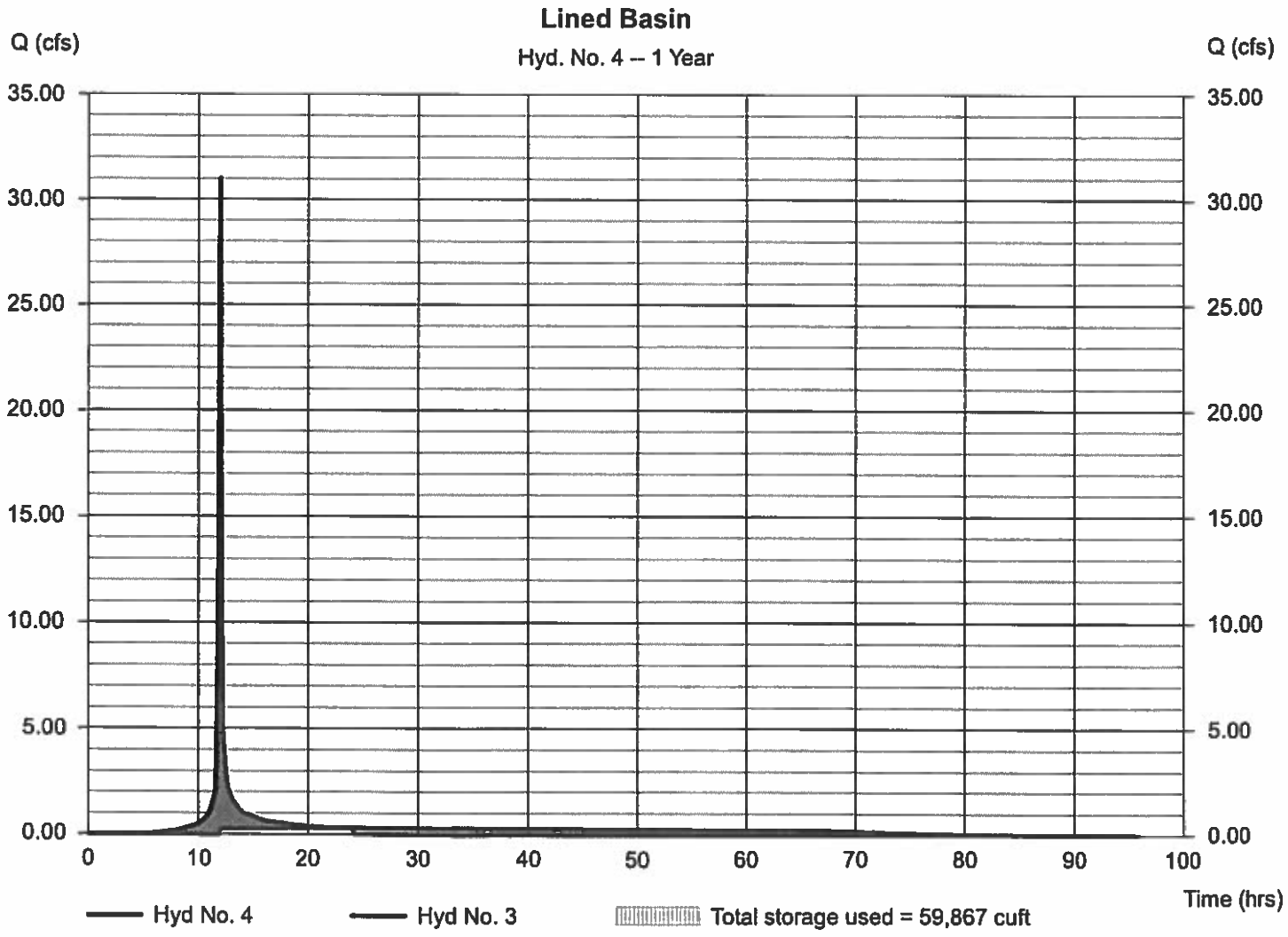
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.301 cfs
Storm frequency	= 1 yrs	Time to peak	= 23.90 hrs
Time interval	= 2 min	Hyd. volume	= 56,698 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 13.98 ft
Reservoir name	= Lined Basin	Max. Storage	= 59,867 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Pond No. 1 - Lined Basin

Pond Data

UG Chambers - Invert elev. = 11.25 ft, Rise x Span = 0.33 x 0.33 ft, Barrel Len = 200.00 ft, No. Barrels = 9, Slope = 0.00%, Headers = No
Encasement - Invert elev. = 11.25 ft, Width = 20.00 ft, Height = 2.00 ft, Voids = 30.00%
Contours - User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 13.26 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	11.25	n/a	0	0
0.20	11.45	n/a	2,229	2,229
0.40	11.65	n/a	2,200	4,429
0.60	11.85	n/a	2,160	6,589
0.80	12.05	n/a	2,160	8,750
1.00	12.25	n/a	2,160	10,910
1.20	12.45	n/a	2,160	13,070
1.40	12.65	n/a	2,160	15,231
1.60	12.85	n/a	2,160	17,391
1.80	13.05	n/a	2,160	19,552
2.00	13.25	n/a	2,160	21,712
2.01	13.26	51,348	257	21,969
2.75	14.00	53,321	38,728	60,696
3.75	15.00	56,001	54,661	115,357
4.75	16.00	58,738	57,370	172,727
5.75	17.00	61,531	60,135	232,861

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	3.25	0.00
Span (in)	= 15.00	18.00	3.25	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 12.50	14.35	12.67	0.00
Length (ft)	= 66.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.00	90.00	0.00	0.00
Crest El. (ft)	= 15.60	16.30	0.00	0.00
Weir Coeff.	= 3.33	2.60	3.33	3.33
Weir Type	= Rect	Broad	---	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)
TW Elev. (ft) = 0.00

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

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	11.25	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.20	2,229	11.45	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.40	4,429	11.65	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.60	6,589	11.85	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.80	8,750	12.05	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.00	10,910	12.25	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.20	13,070	12.45	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.40	15,231	12.65	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
1.60	17,391	12.85	0.06 ic	0.00	0.06 ic	---	0.00	0.00	---	---	---	---	0.059
1.80	19,552	13.05	0.14 ic	0.00	0.14 ic	---	0.00	0.00	---	---	---	---	0.137
2.00	21,712	13.25	0.18 ic	0.00	0.18 ic	---	0.00	0.00	---	---	---	---	0.185
2.01	21,969	13.26	0.19 ic	0.00	0.19 ic	---	0.00	0.00	---	---	---	---	0.187
2.75	60,696	14.00	0.31 ic	0.00	0.30 ic	---	0.00	0.00	---	---	---	---	0.303
3.75	115,357	15.00	2.65 oc	2.28 ic	0.35 ic	---	0.00	0.00	---	---	---	---	2.636
4.75	172,727	16.00	8.87 oc	1.31 ic	0.10 ic	---	7.45 s	0.00	---	---	---	---	8.864
5.75	232,861	17.00	10.71 oc	0.31 ic	0.02 ic	---	10.32 s	137.05	---	---	---	---	147.71

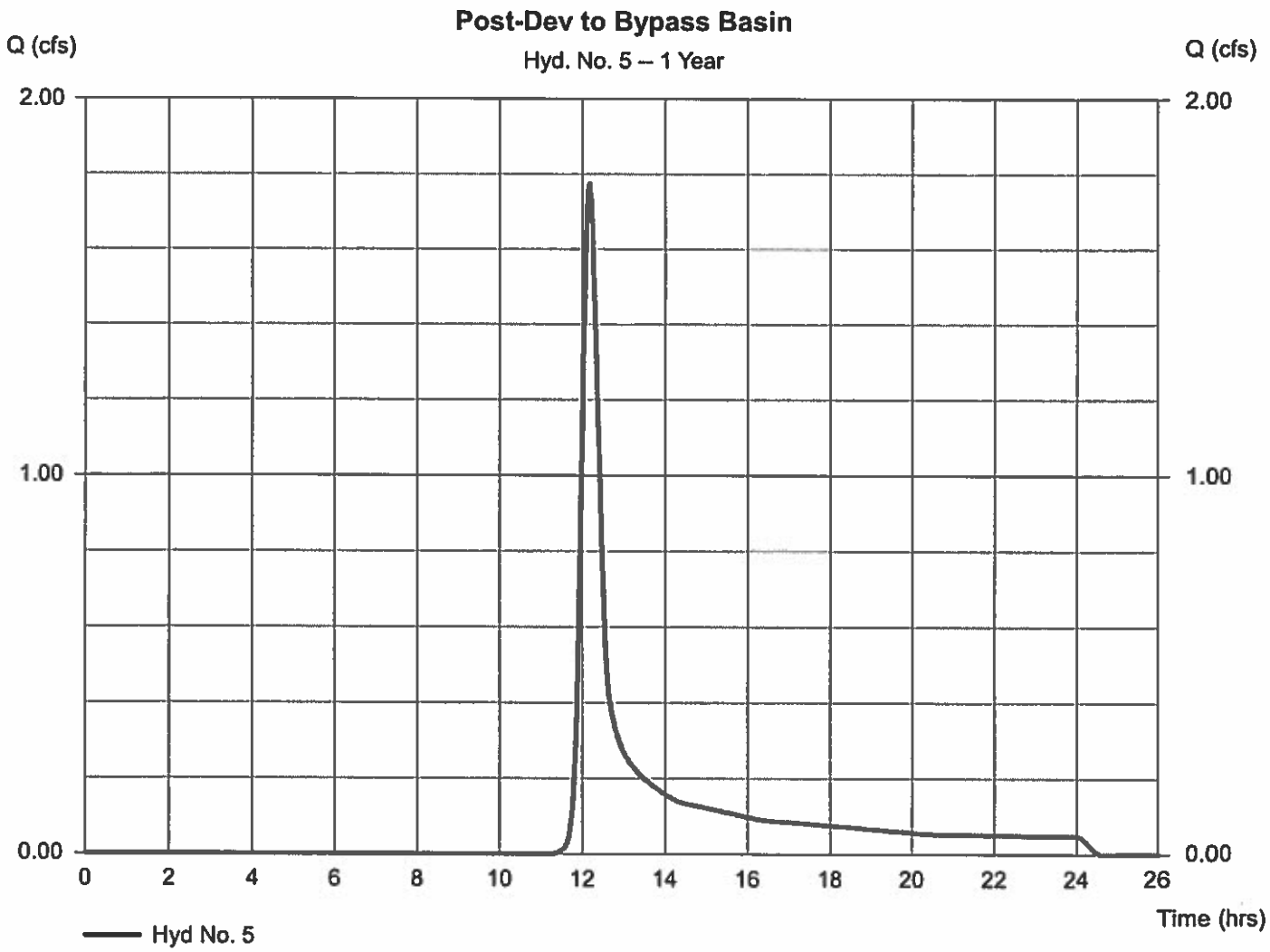
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 1.775 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 7,138 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



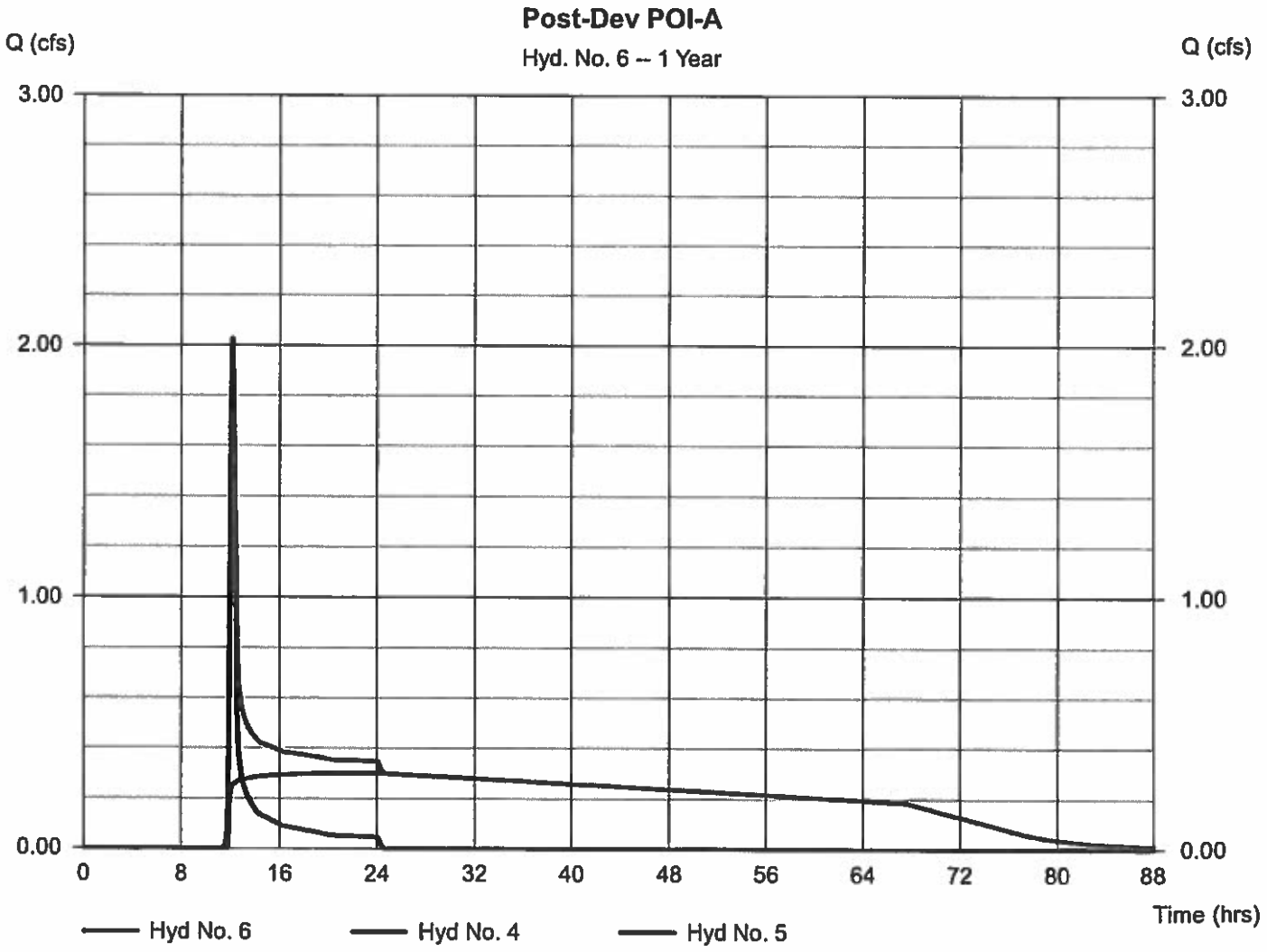
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 2.027 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 63,836 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



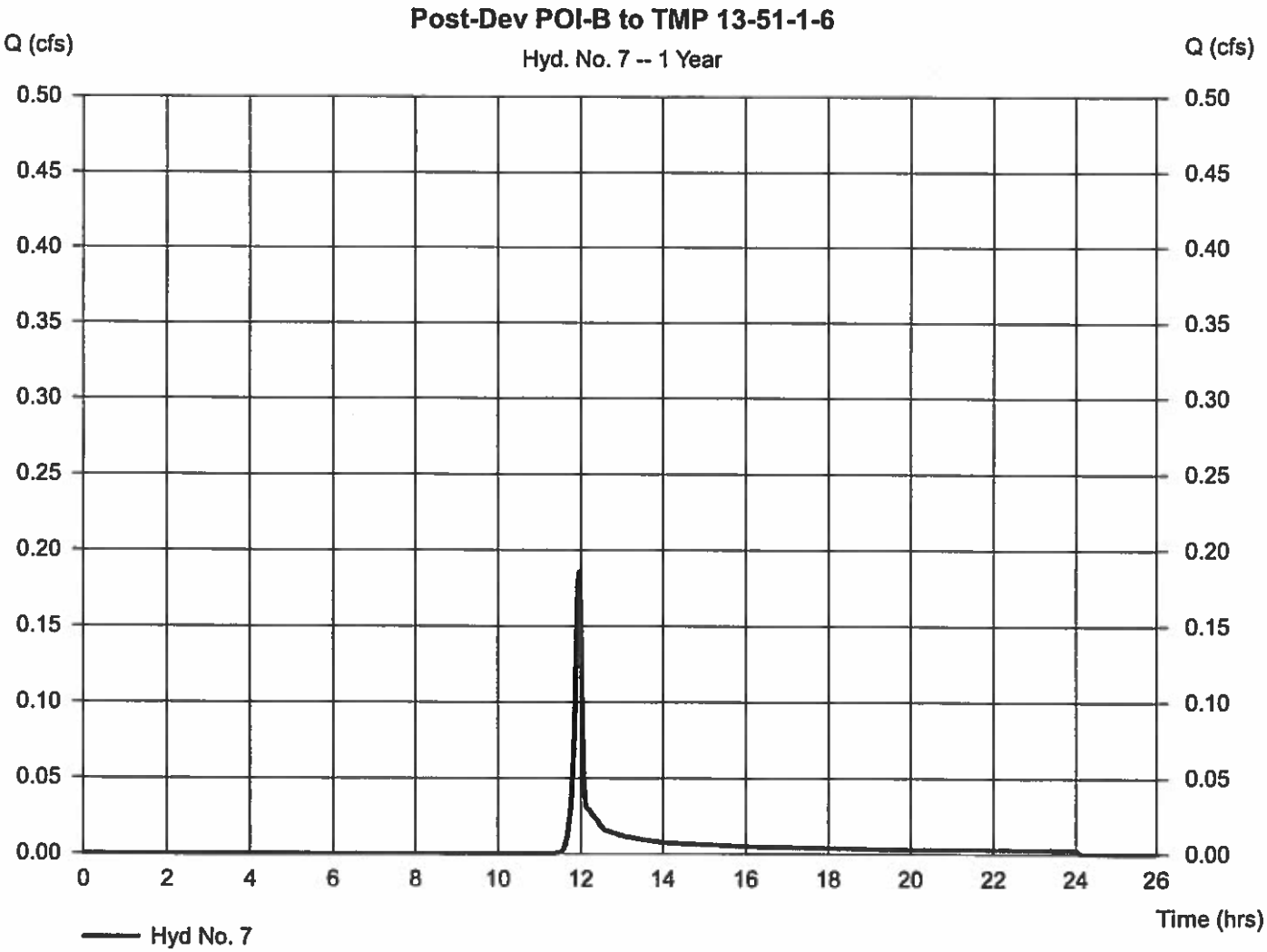
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.186 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 377 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	8.543	2	730	34,952	---	------	-----	Pre-Dev POI-A
2	SCS Runoff	2.036	2	728	7,799	---	------	-----	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	39.82	2	718	94,641	---	------	-----	Post-Dev to Basin
4	Reservoir	0.368	2	1440	77,565	3	14.34	79,450	Lined Basin
5	SCS Runoff	2.803	2	730	10,768	---	------	-----	Post-Dev to Bypass Basin
6	Combine	3.092	2	730	88,334	4, 5	------	-----	Post-Dev POI-A
7	SCS Runoff	0.287	2	718	575	---	------	-----	Post-Dev POI-B to TMP 13-51-1-6

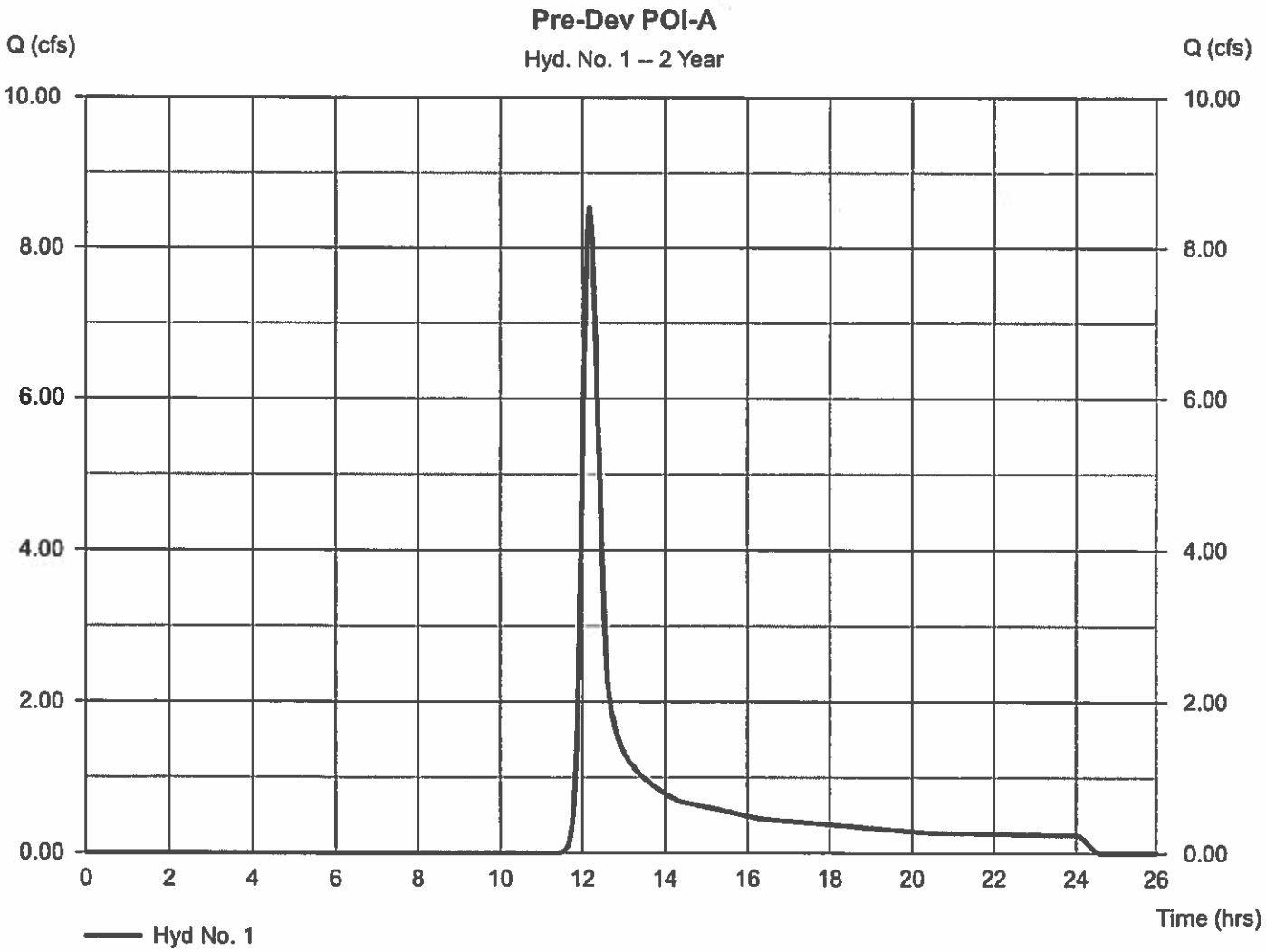
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 8.543 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 34,952 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 3.30 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



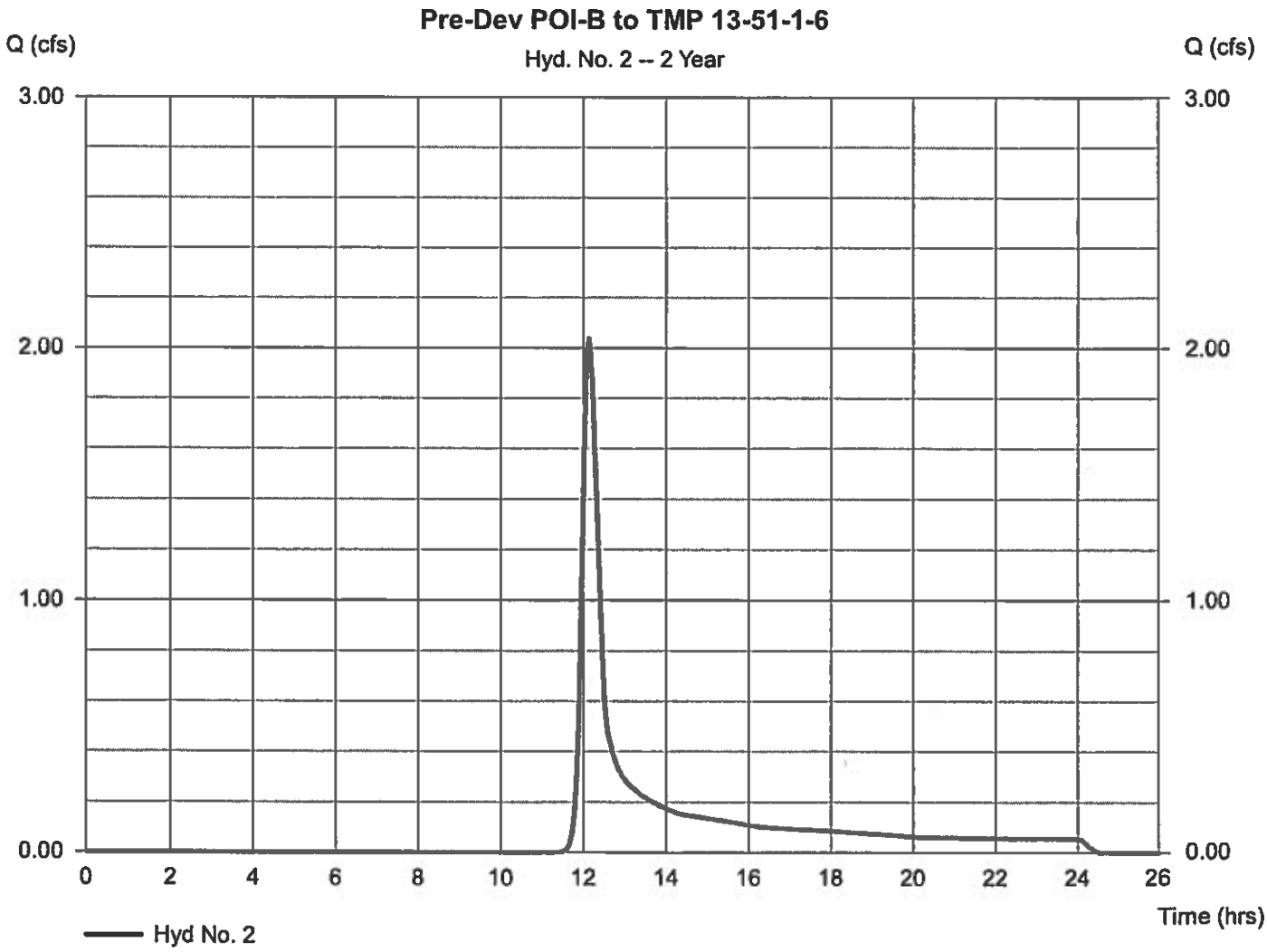
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 2.036 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 7,799 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 3.30 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



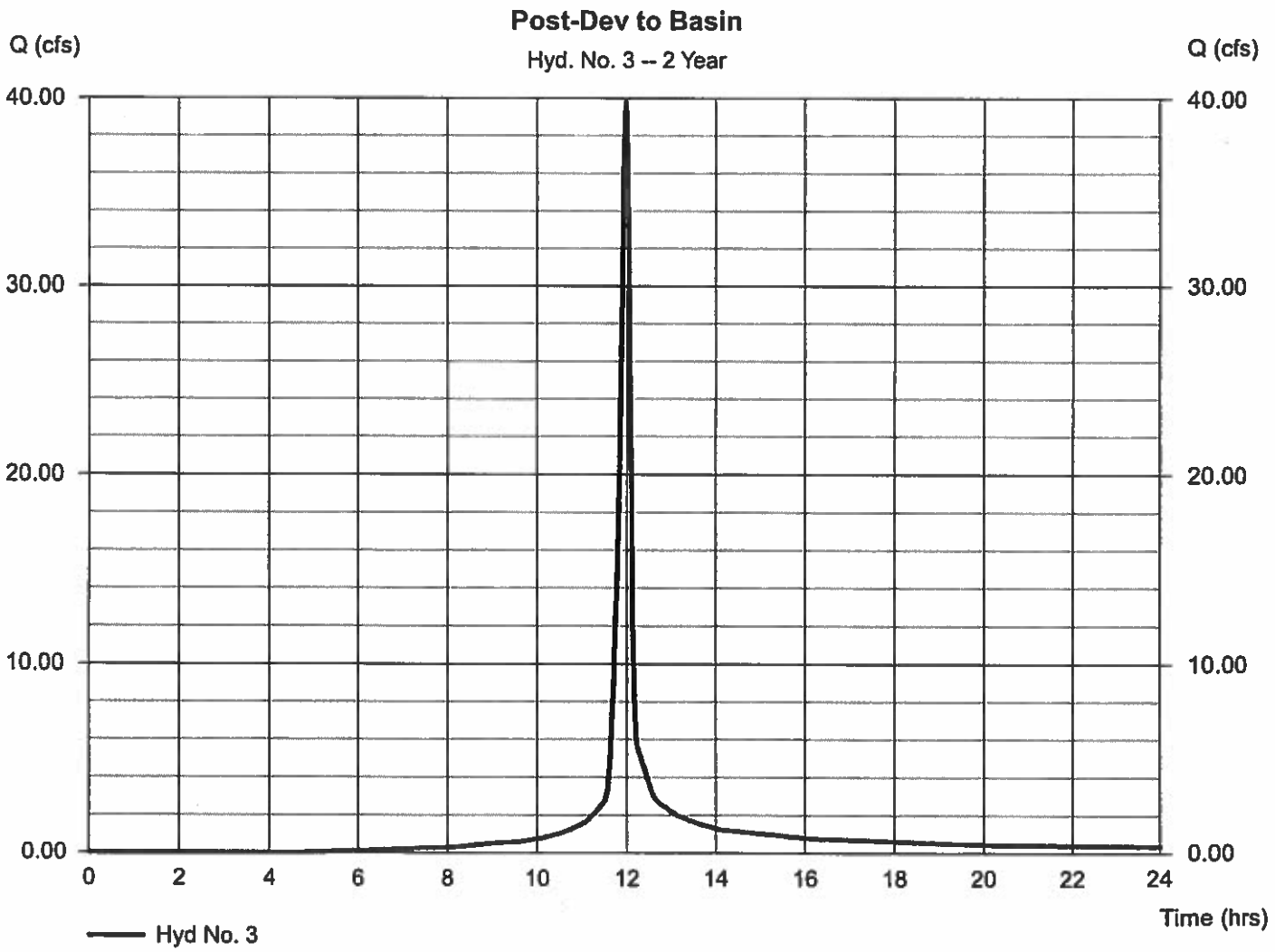
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 39.82 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 94,641 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 3.30 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

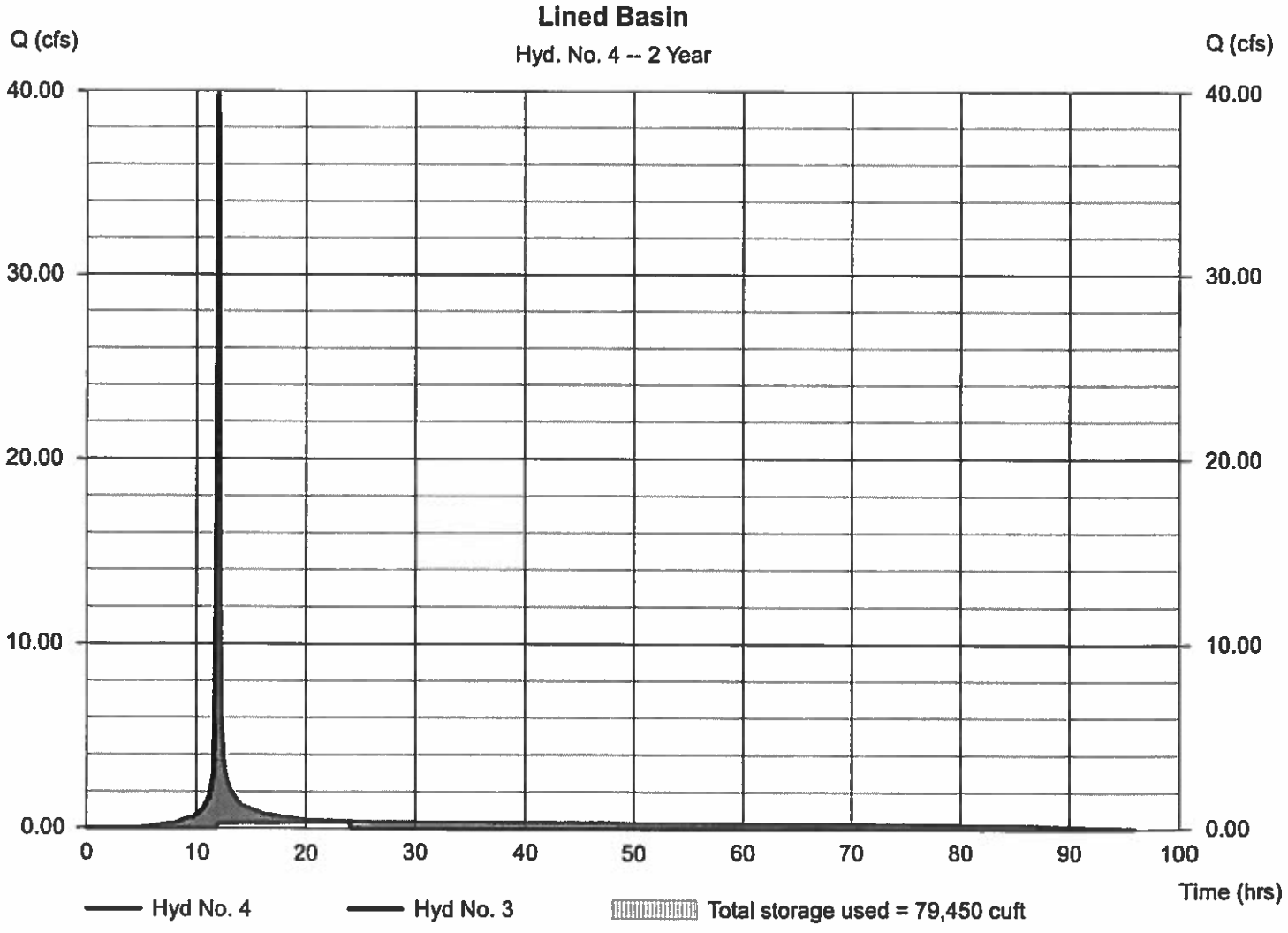
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.368 cfs
Storm frequency	= 2 yrs	Time to peak	= 24.00 hrs
Time interval	= 2 min	Hyd. volume	= 77,565 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 14.34 ft
Reservoir name	= Lined Basin	Max. Storage	= 79,450 cuft

Storage Indication method used.



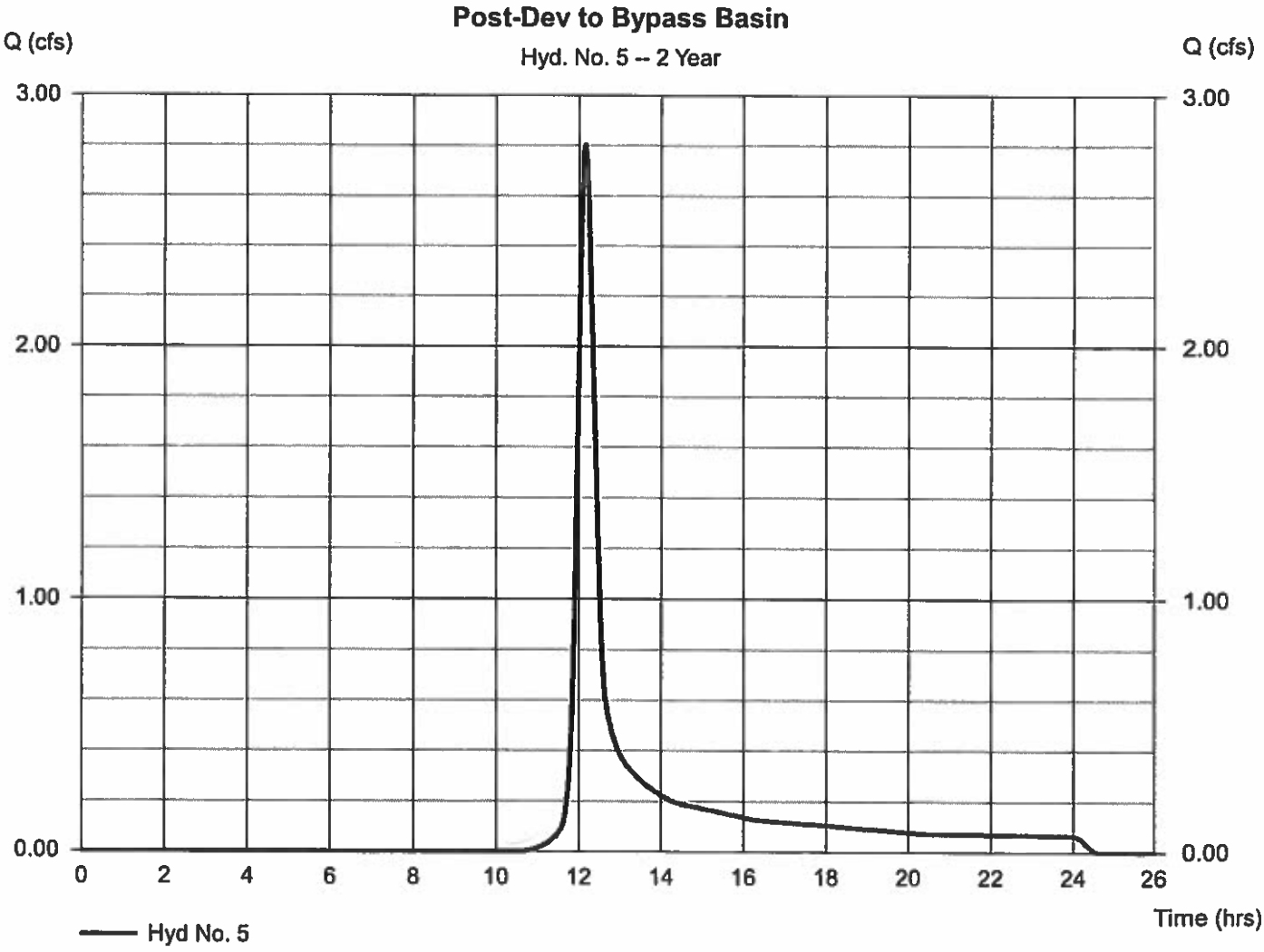
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 2.803 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 10,768 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 3.30 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



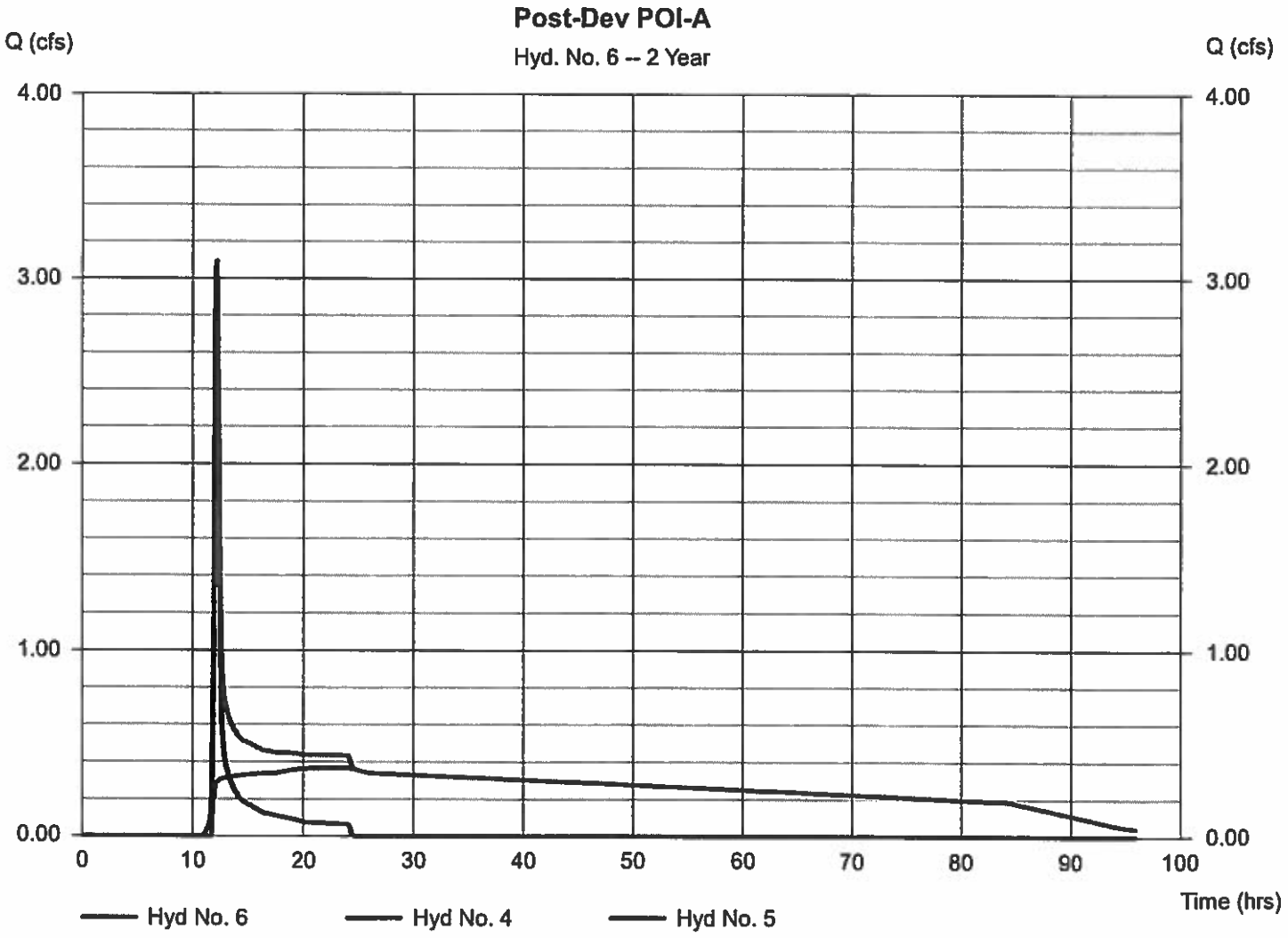
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 3.092 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 88,334 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



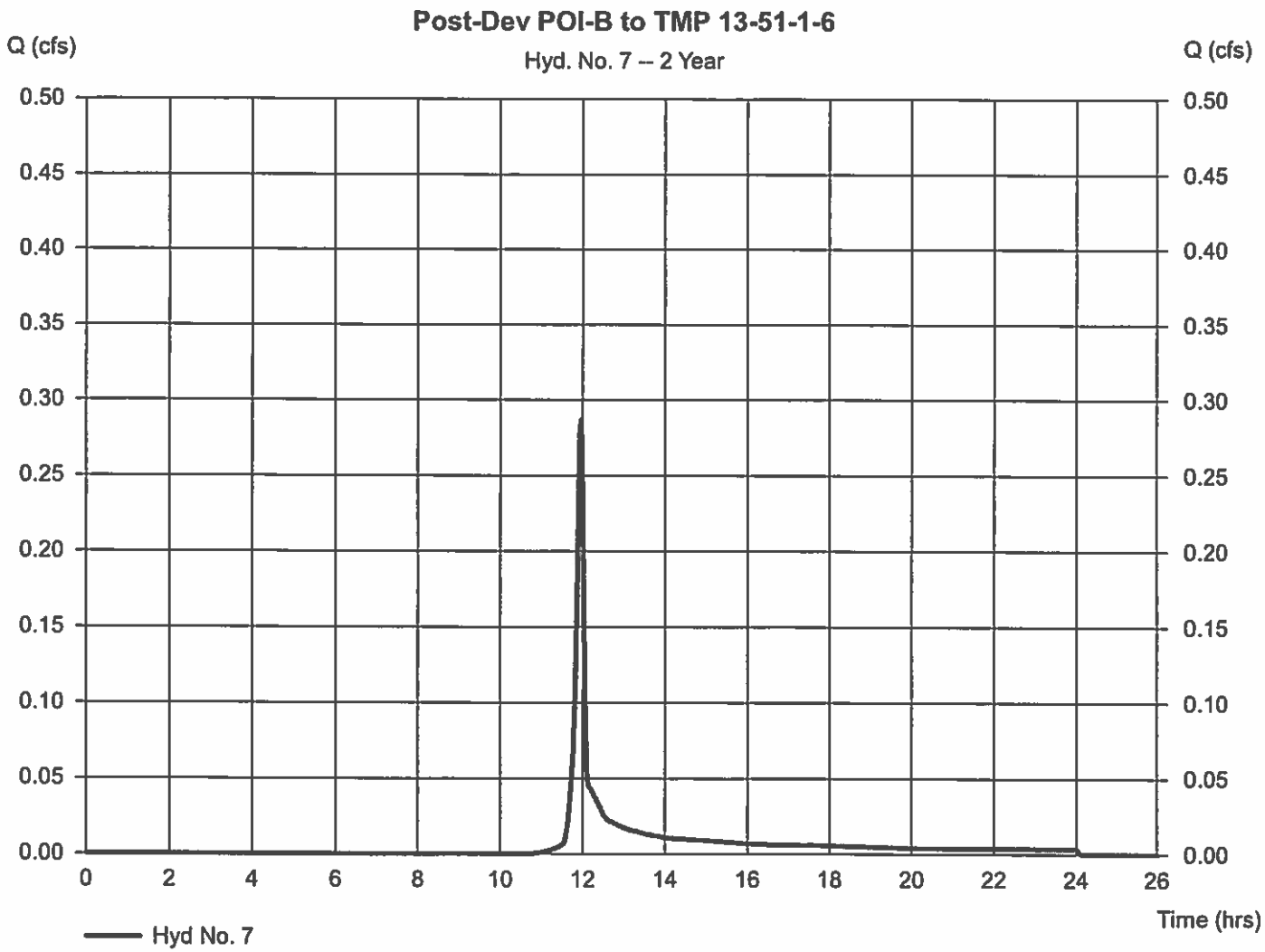
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.287 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 575 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.30 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	0.008	2	1440	182	—	-----	-----	Pre-Dev POI-A
2	SCS Runoff	0.002	2	1440	41	—	-----	-----	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	6.800	2	720	15,573	—	-----	-----	Post-Dev to Basin
4	Reservoir	0.000	2	n/a	0	3	12.68	15,573	Lined Basin
5	SCS Runoff	0.010	2	790	281	---	-----	-----	Post-Dev to Bypass Basin
6	Combine	0.010	2	790	281	4, 5	-----	-----	Post-Dev POI-A
7	SCS Runoff	0.000	2	806	12	—	-----	-----	Post-Dev POI-B to TMP 13-51-1-6

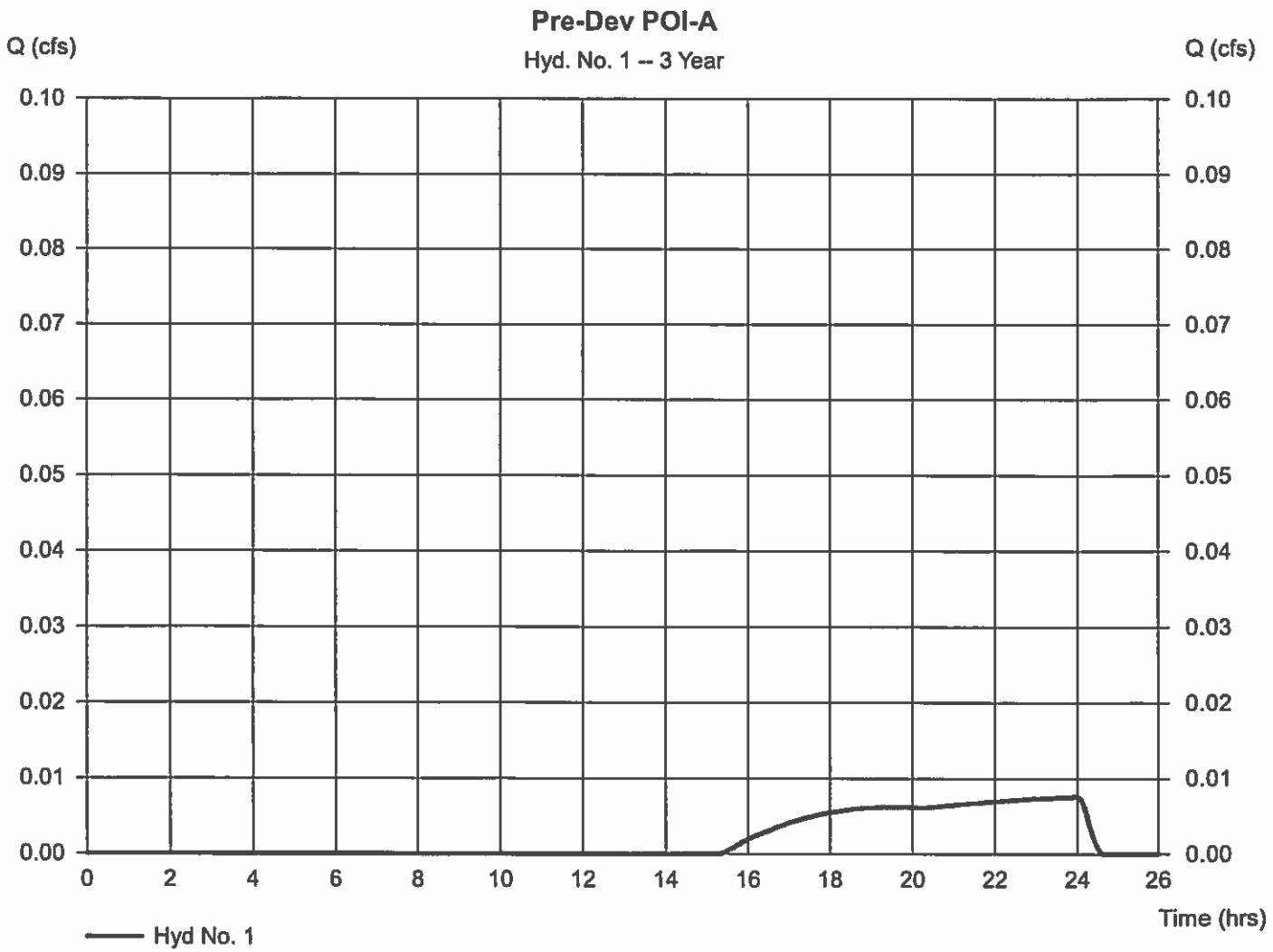
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.008 cfs
Storm frequency	= 3 yrs	Time to peak	= 24.00 hrs
Time interval	= 2 min	Hyd. volume	= 182 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



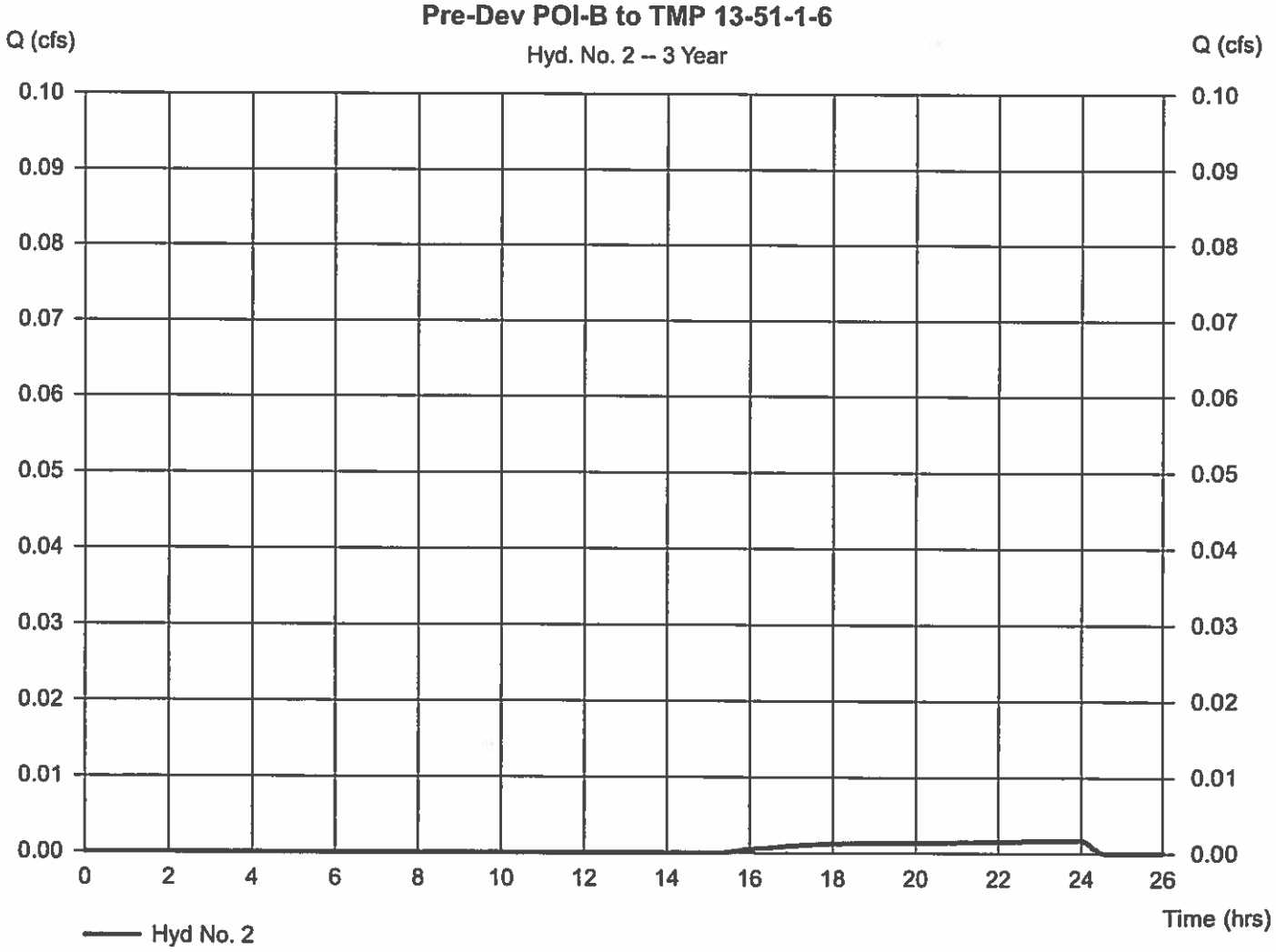
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 3 yrs	Time to peak	= 24.00 hrs
Time interval	= 2 min	Hyd. volume	= 41 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



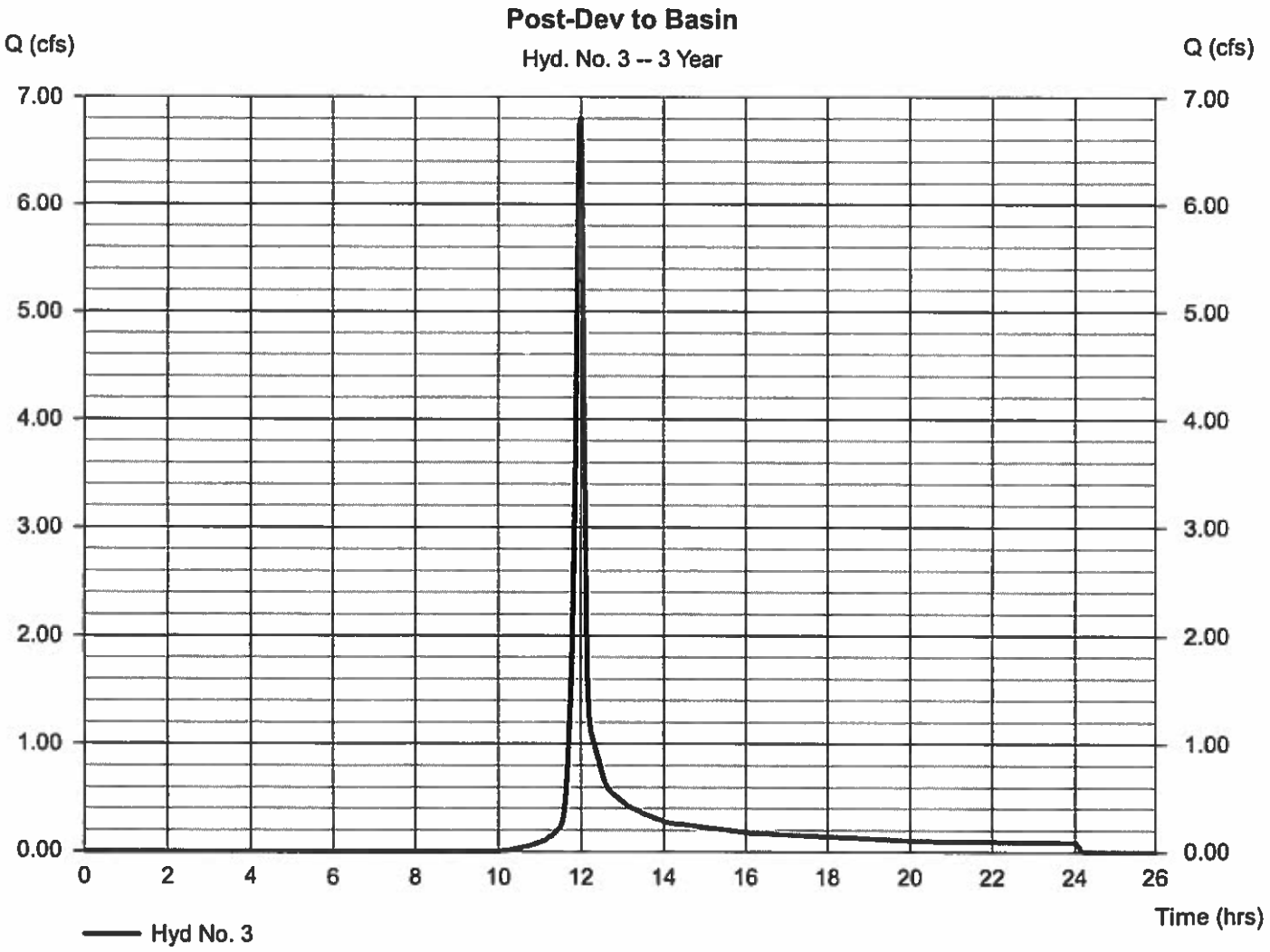
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 6.800 cfs
Storm frequency	= 3 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 15,573 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

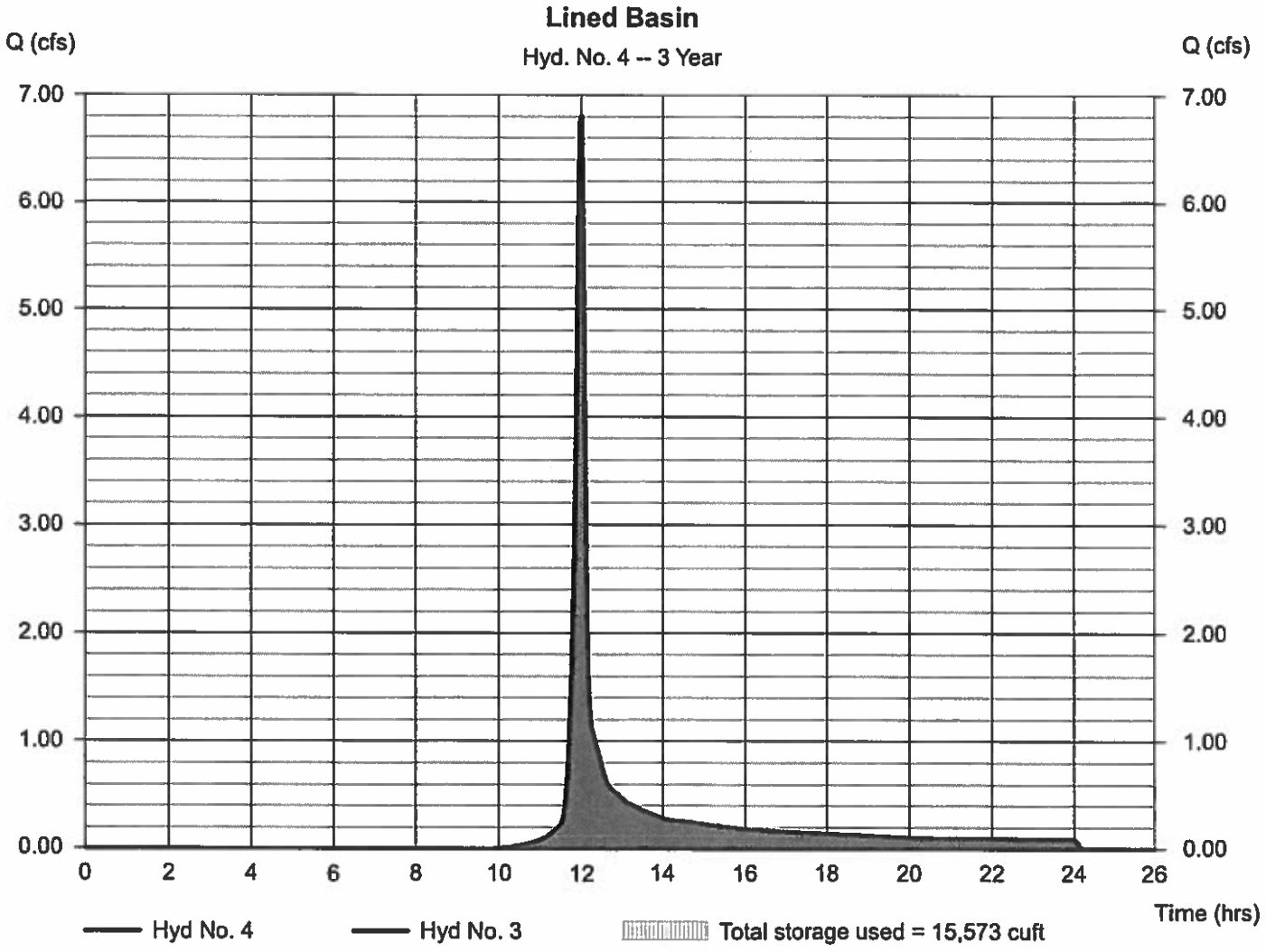
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 3 yrs	Time to peak	= n/a
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 12.68 ft
Reservoir name	= Lined Basin	Max. Storage	= 15,573 cuft

Storage Indication method used.



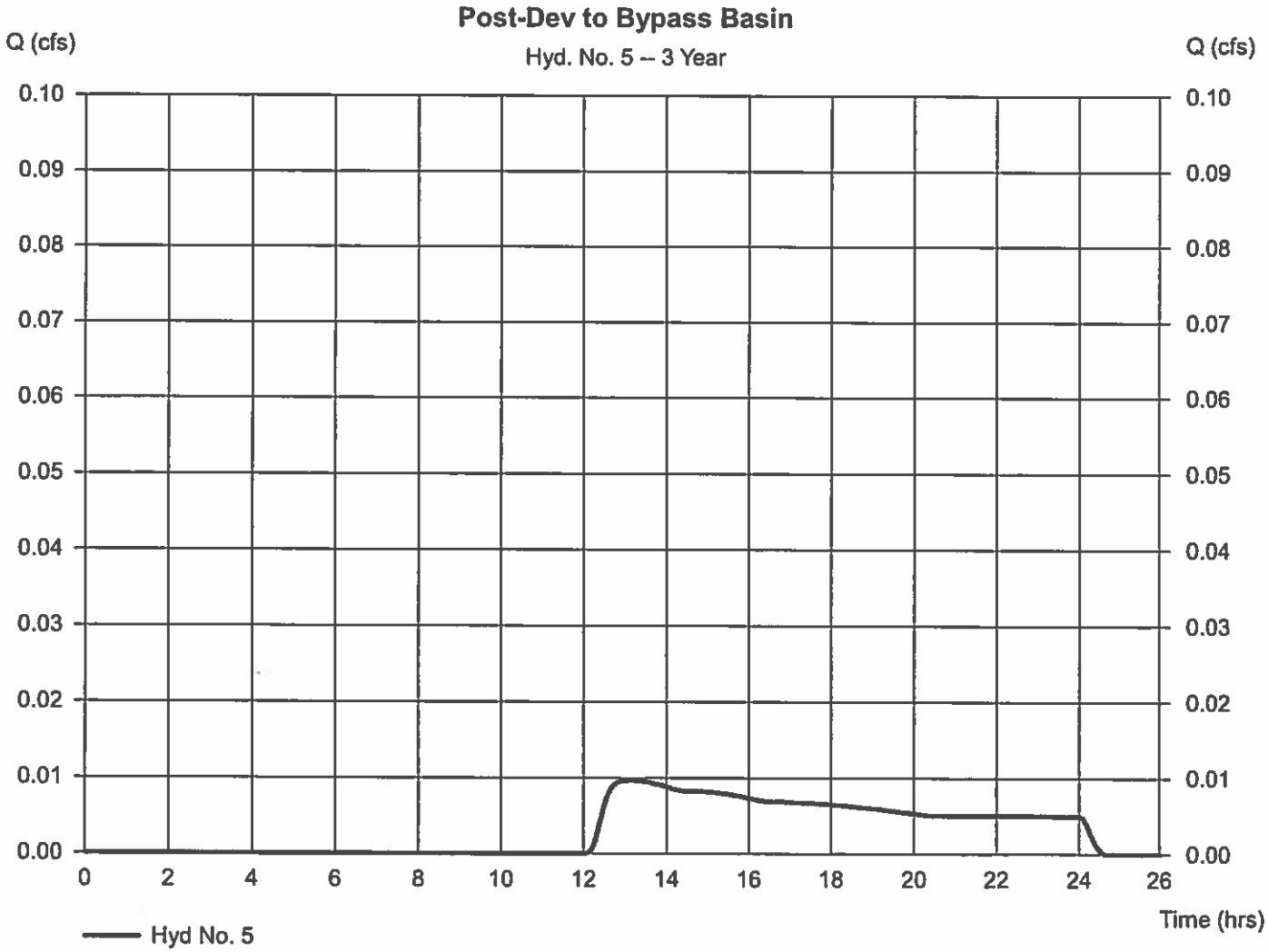
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 0.010 cfs
Storm frequency	= 3 yrs	Time to peak	= 13.17 hrs
Time interval	= 2 min	Hyd. volume	= 281 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



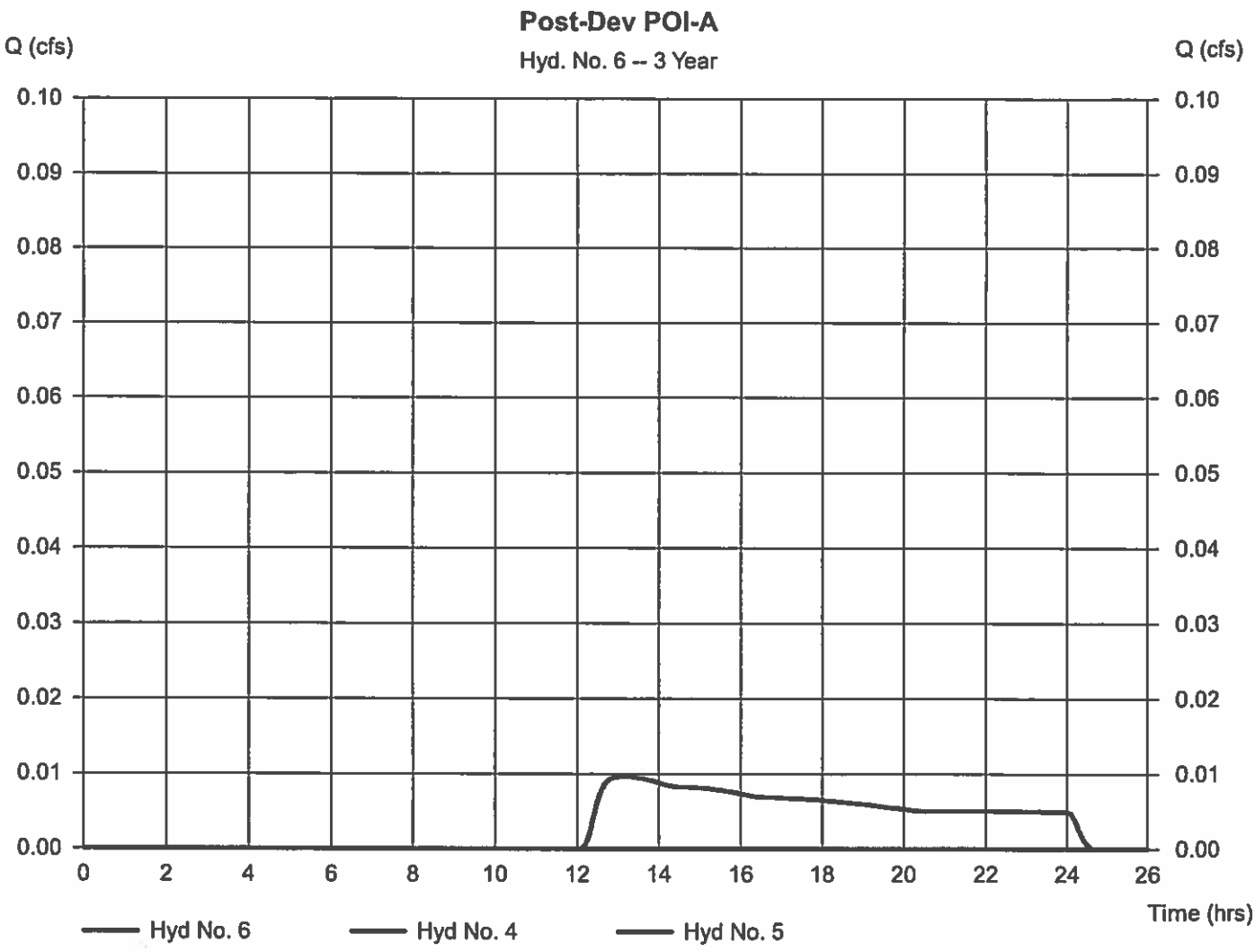
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 0.010 cfs
Storm frequency	= 3 yrs	Time to peak	= 13.17 hrs
Time interval	= 2 min	Hyd. volume	= 281 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



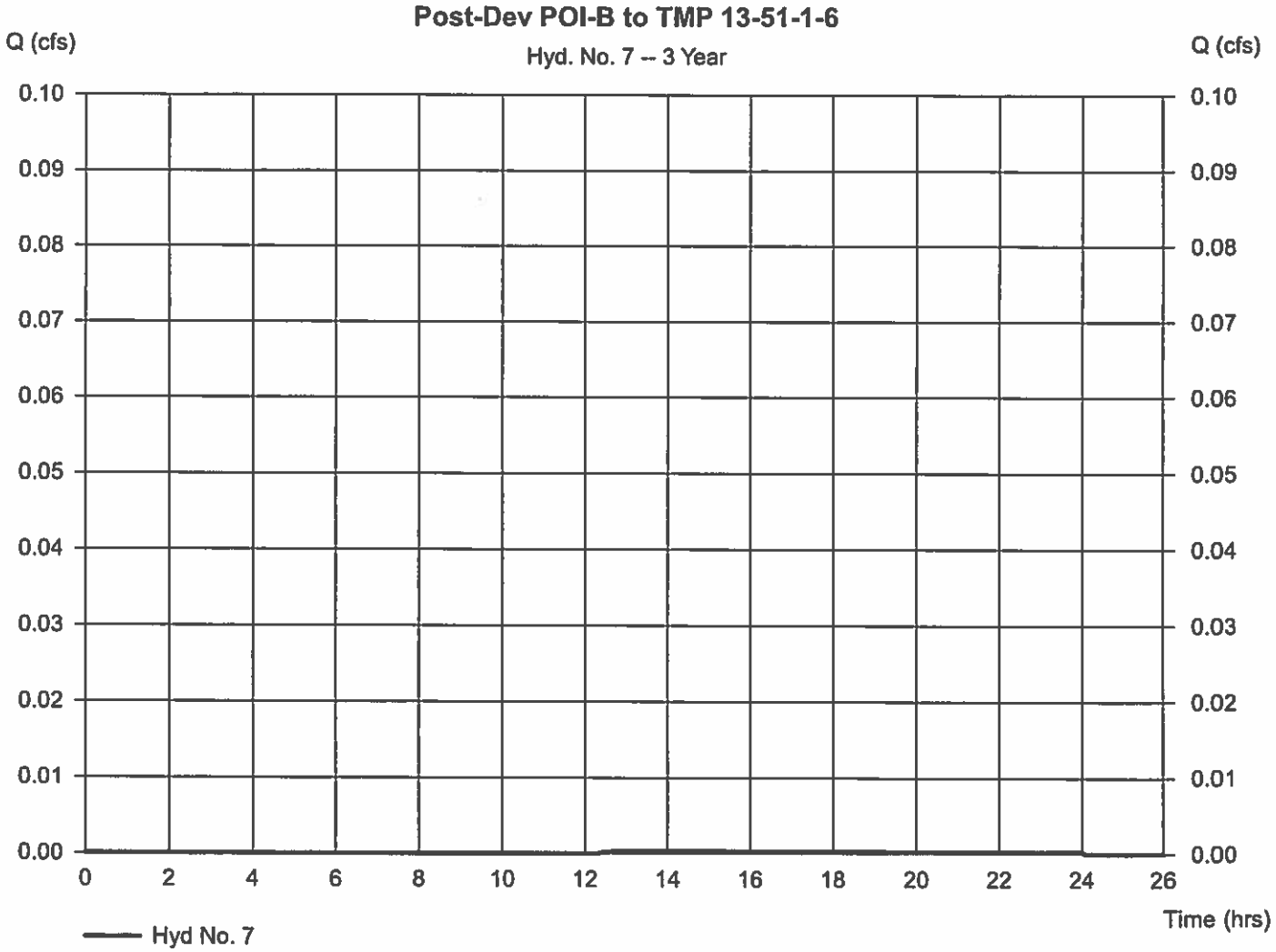
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.000 cfs
Storm frequency	= 3 yrs	Time to peak	= 13.43 hrs
Time interval	= 2 min	Hyd. volume	= 12 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 1.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	15.00	2	730	57,729	----	----	----	Pre-Dev POI-A
2	SCS Runoff	3.568	2	728	12,881	----	----	----	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	52.98	2	718	128,121	----	----	----	Post-Dev to Basin
4	Reservoir	1.148	2	936	109,686	3	14.64	95,519	Lined Basin
5	SCS Runoff	4.503	2	730	16,846	----	----	----	Post-Dev to Bypass Basin
6	Combine	4.841	2	730	126,532	4, 5	----	----	Post-Dev POI-A
7	SCS Runoff	0.453	2	718	908	----	----	----	Post-Dev POI-B to TMP 13-51-1-6

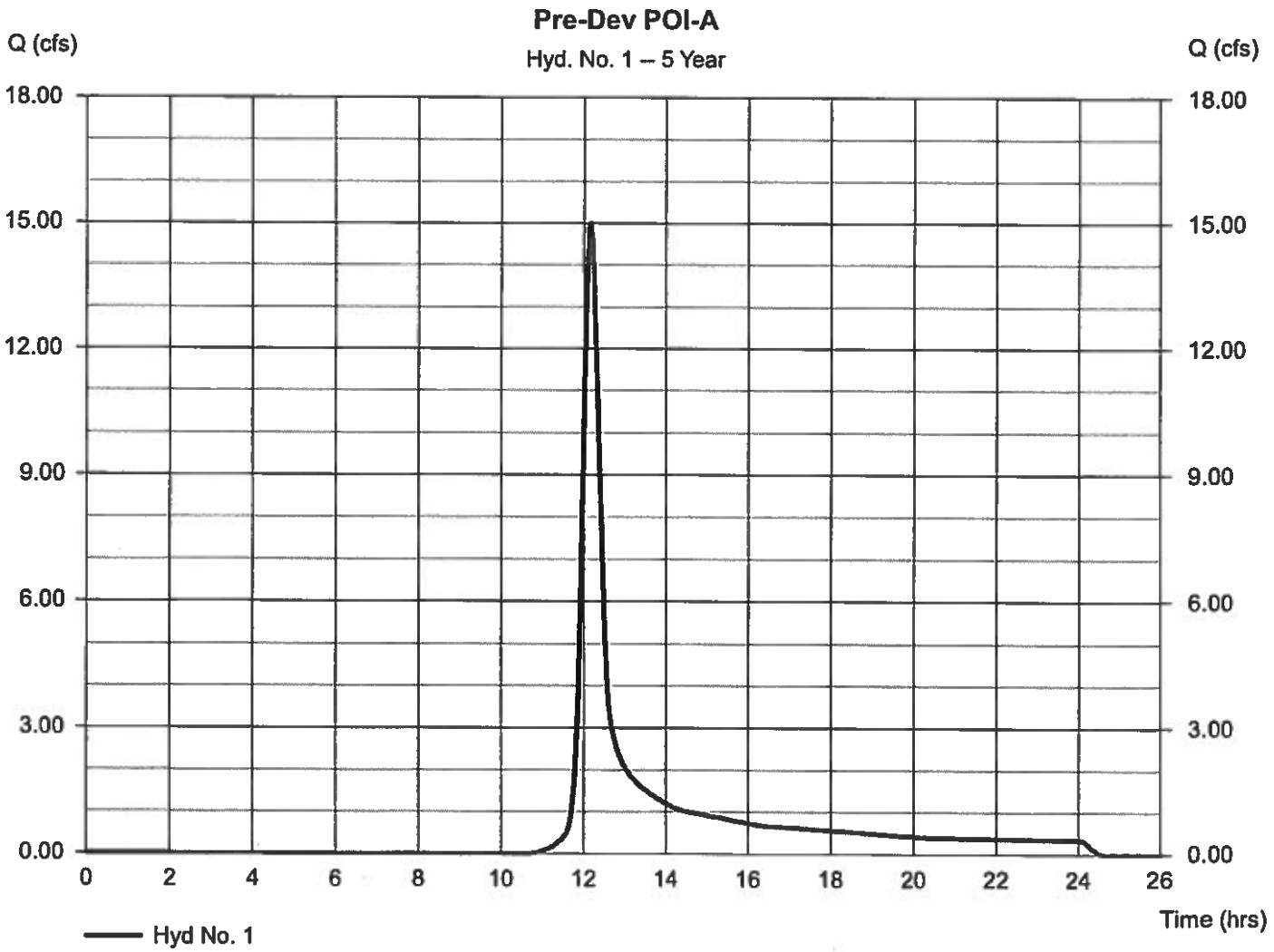
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 15.00 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 57,729 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



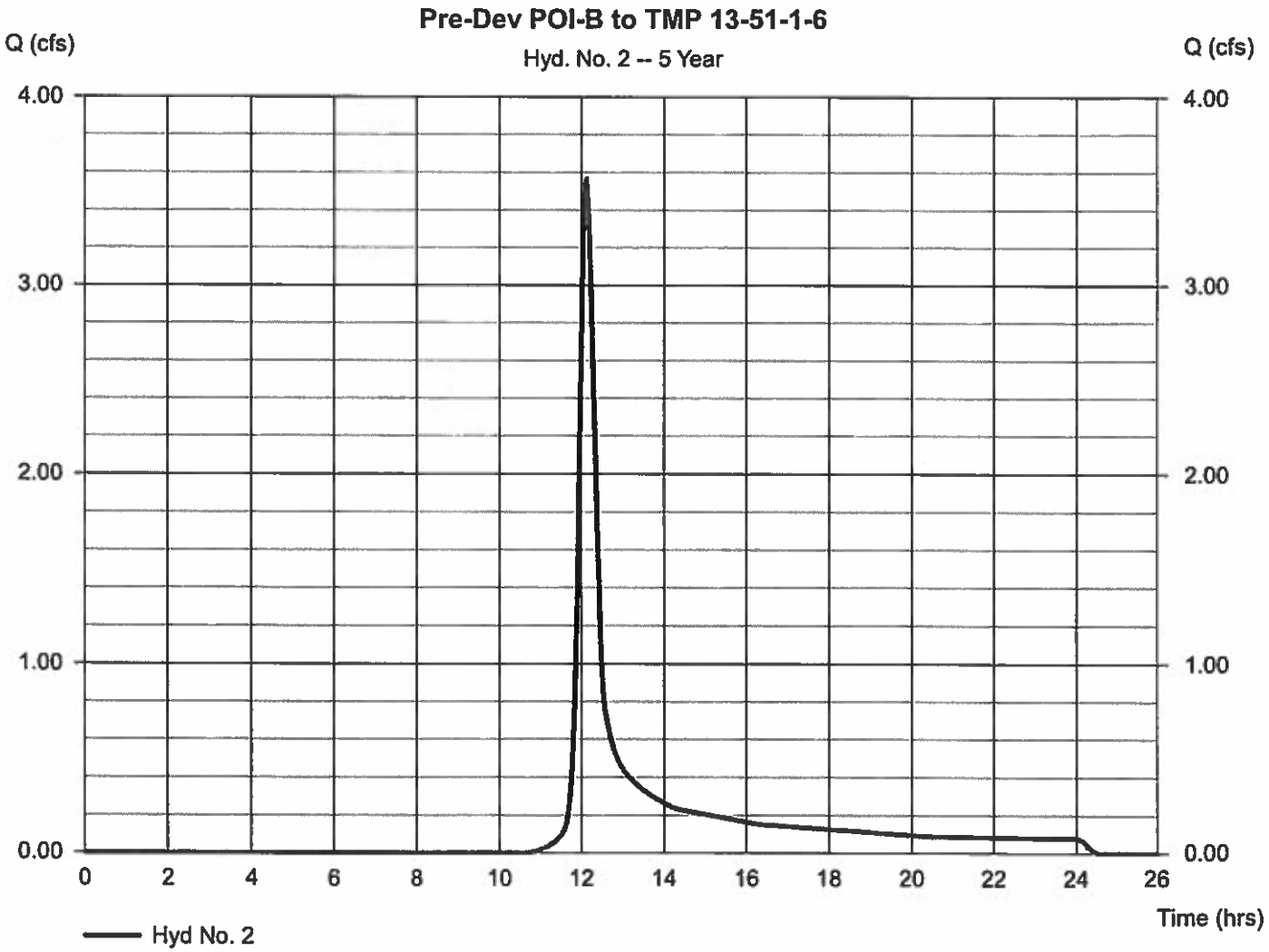
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 3.568 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 12,881 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



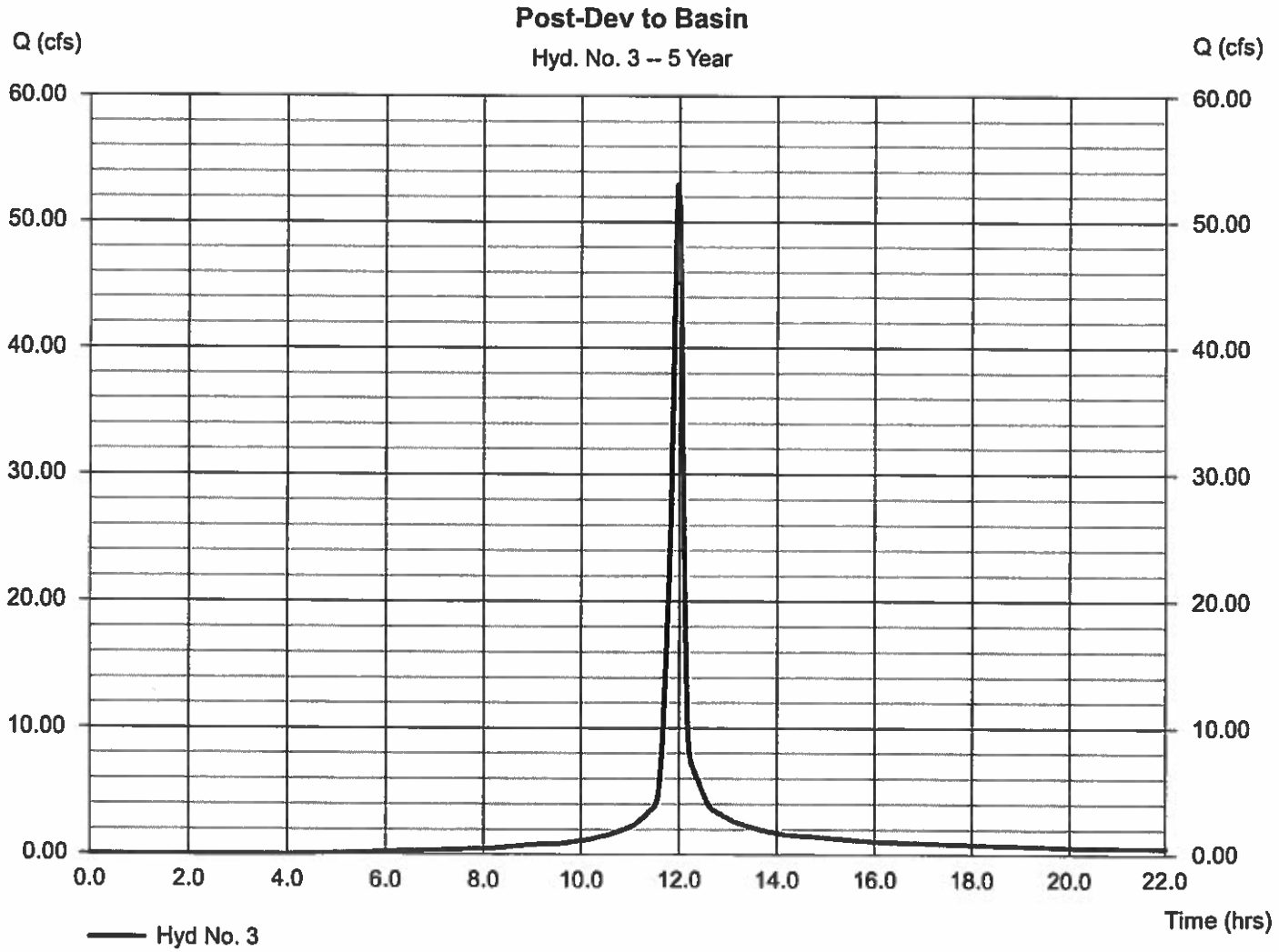
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 52.98 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 128,121 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

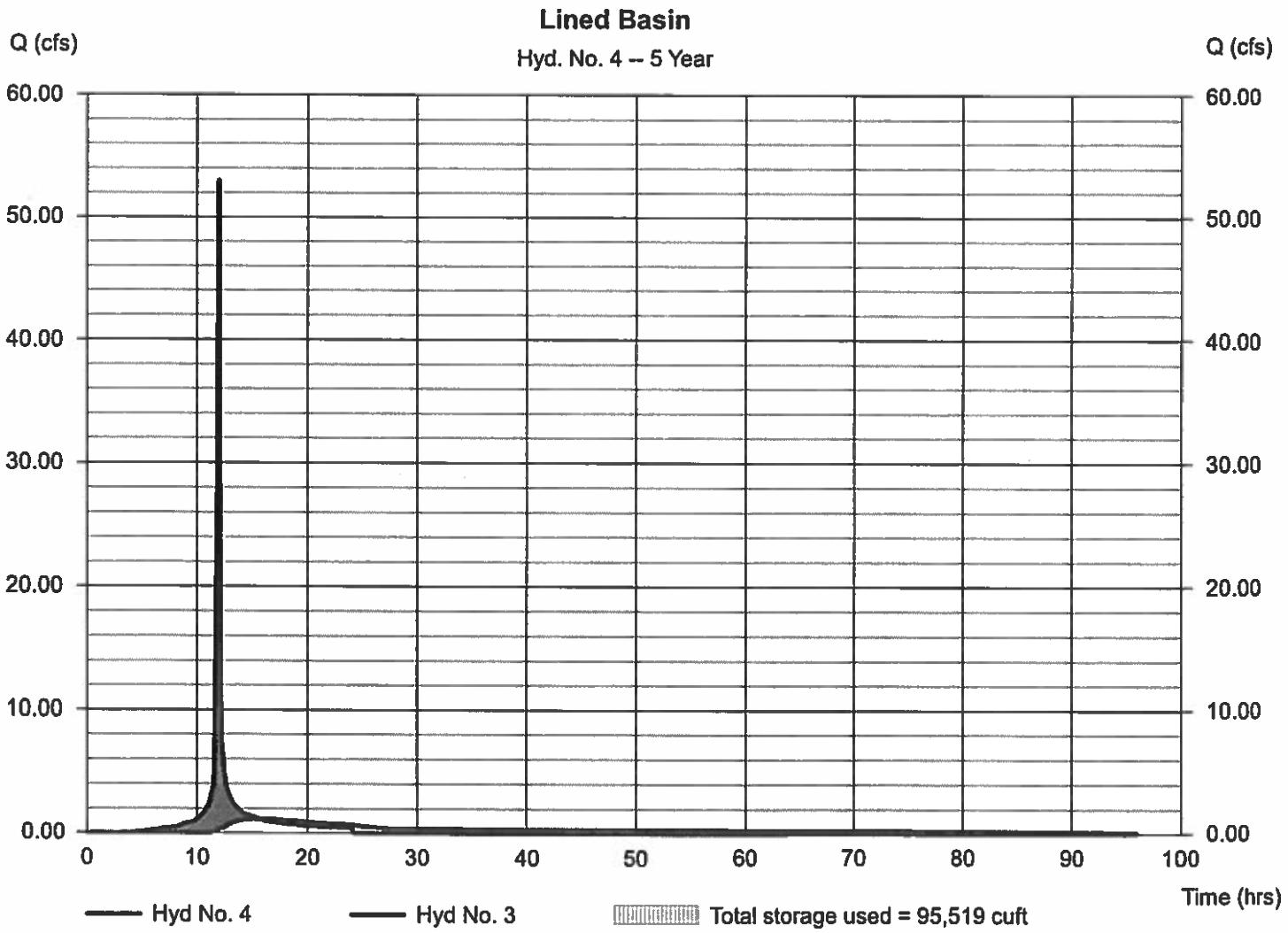
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 1.148 cfs
Storm frequency	= 5 yrs	Time to peak	= 15.60 hrs
Time interval	= 2 min	Hyd. volume	= 109,686 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 14.64 ft
Reservoir name	= Lined Basin	Max. Storage	= 95,519 cuft

Storage Indication method used.



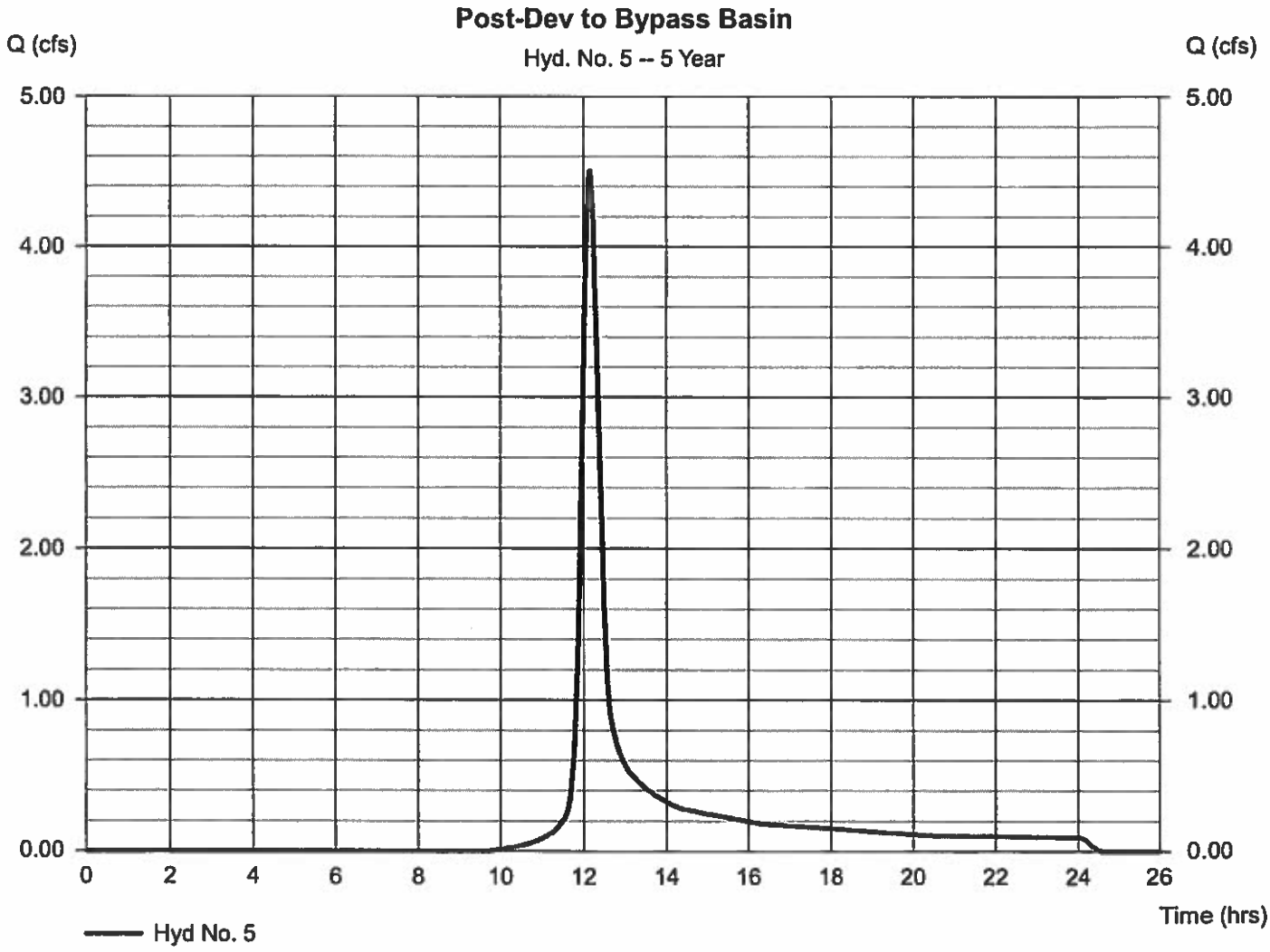
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 4.503 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 16,846 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



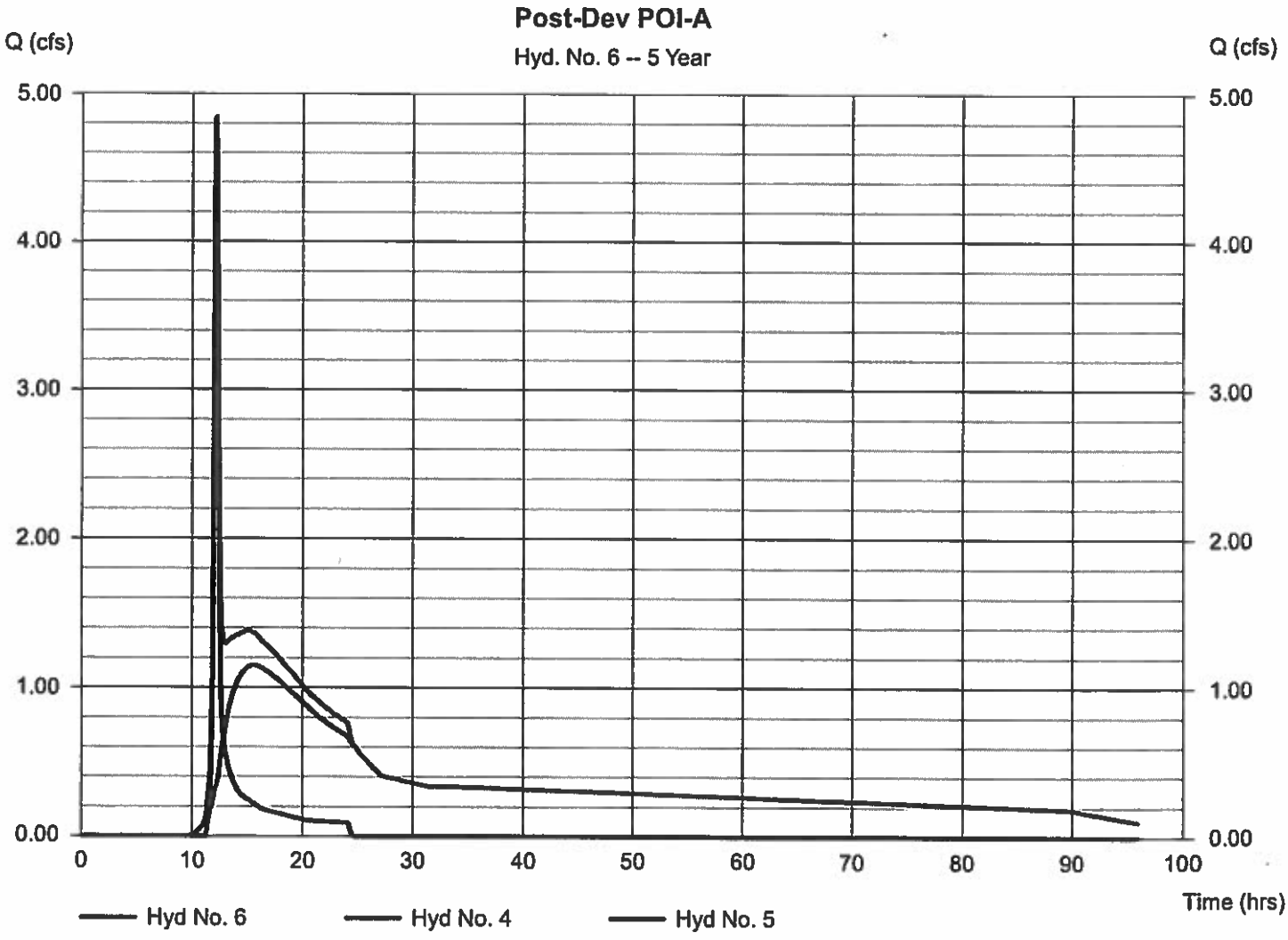
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 4.841 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 126,532 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



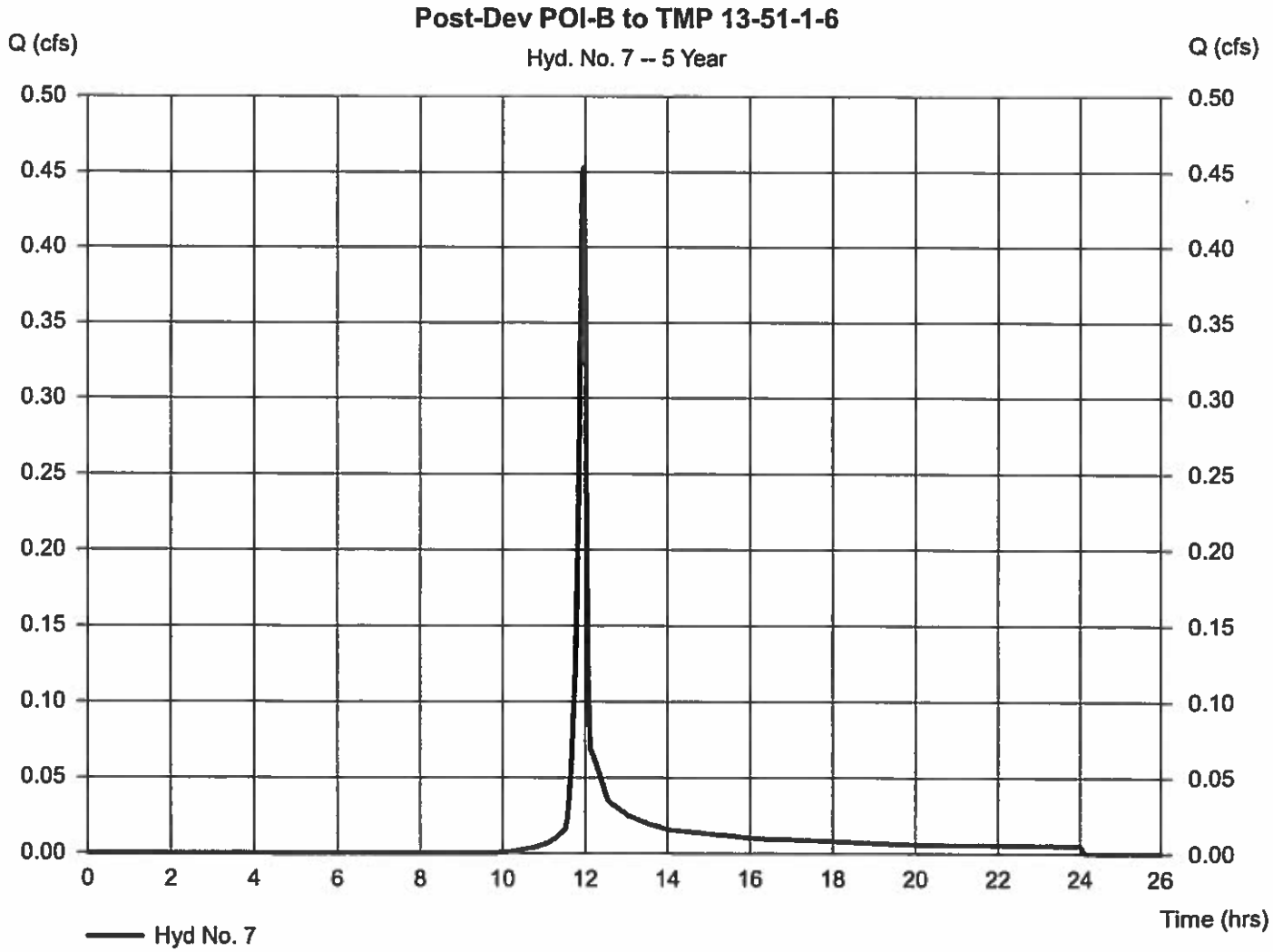
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.453 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 908 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	21.32	2	730	80,251	----	------	------	Pre-Dev POI-A
2	SCS Runoff	5.066	2	728	17,907	----	------	------	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	64.61	2	718	158,238	----	------	------	Post-Dev to Basin
4	Reservoir	2.255	2	828	139,405	3	14.88	108,966	Lined Basin
5	SCS Runoff	6.142	2	728	22,694	----	------	------	Post-Dev to Bypass Basin
6	Combine	7.283	2	730	162,098	4, 5	------	------	Post-Dev POI-A
7	SCS Runoff	0.610	2	716	1,231	----	------	------	Post-Dev POI-B to TMP 13-51-1-6

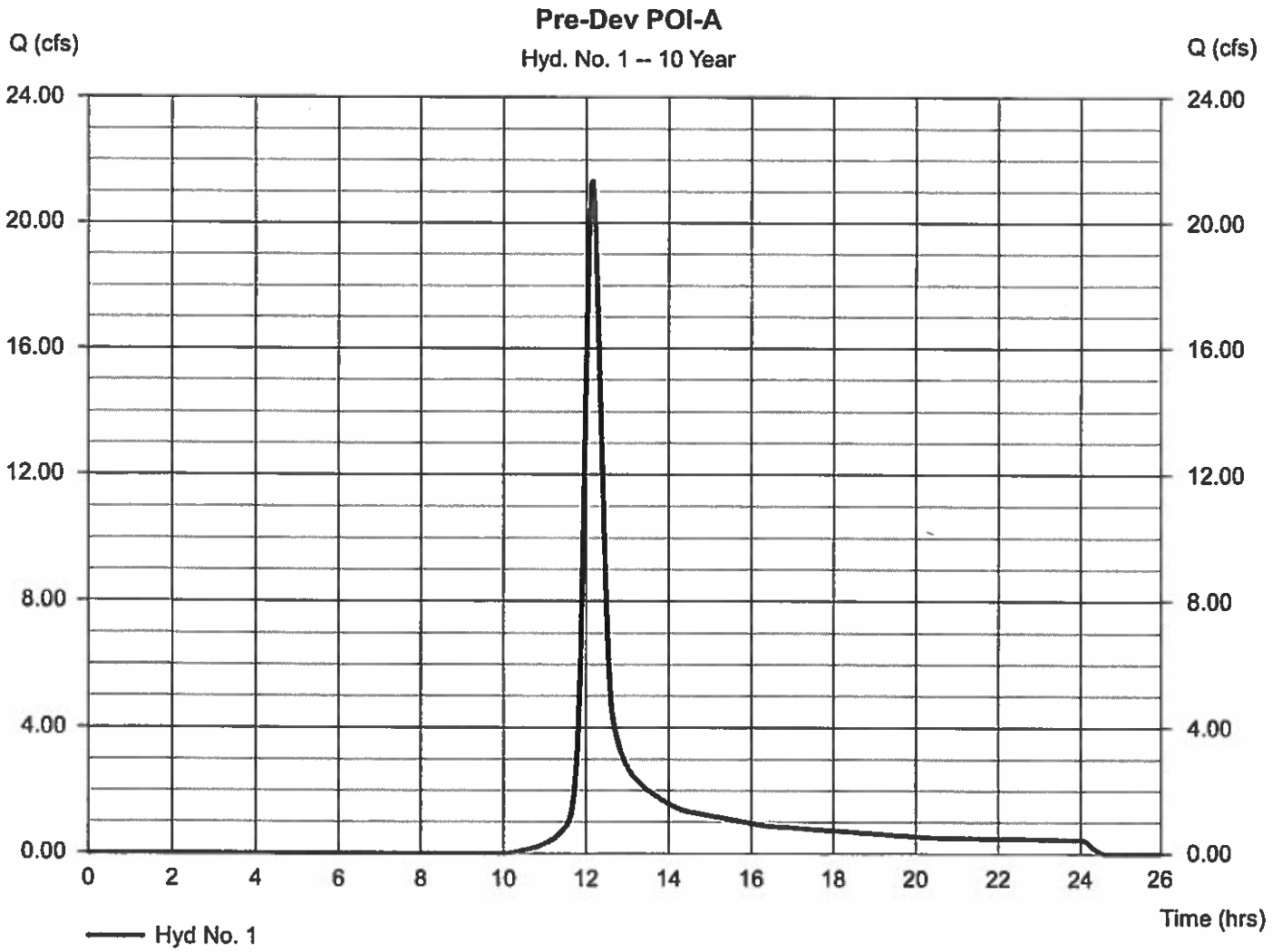
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 21.32 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 80,251 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



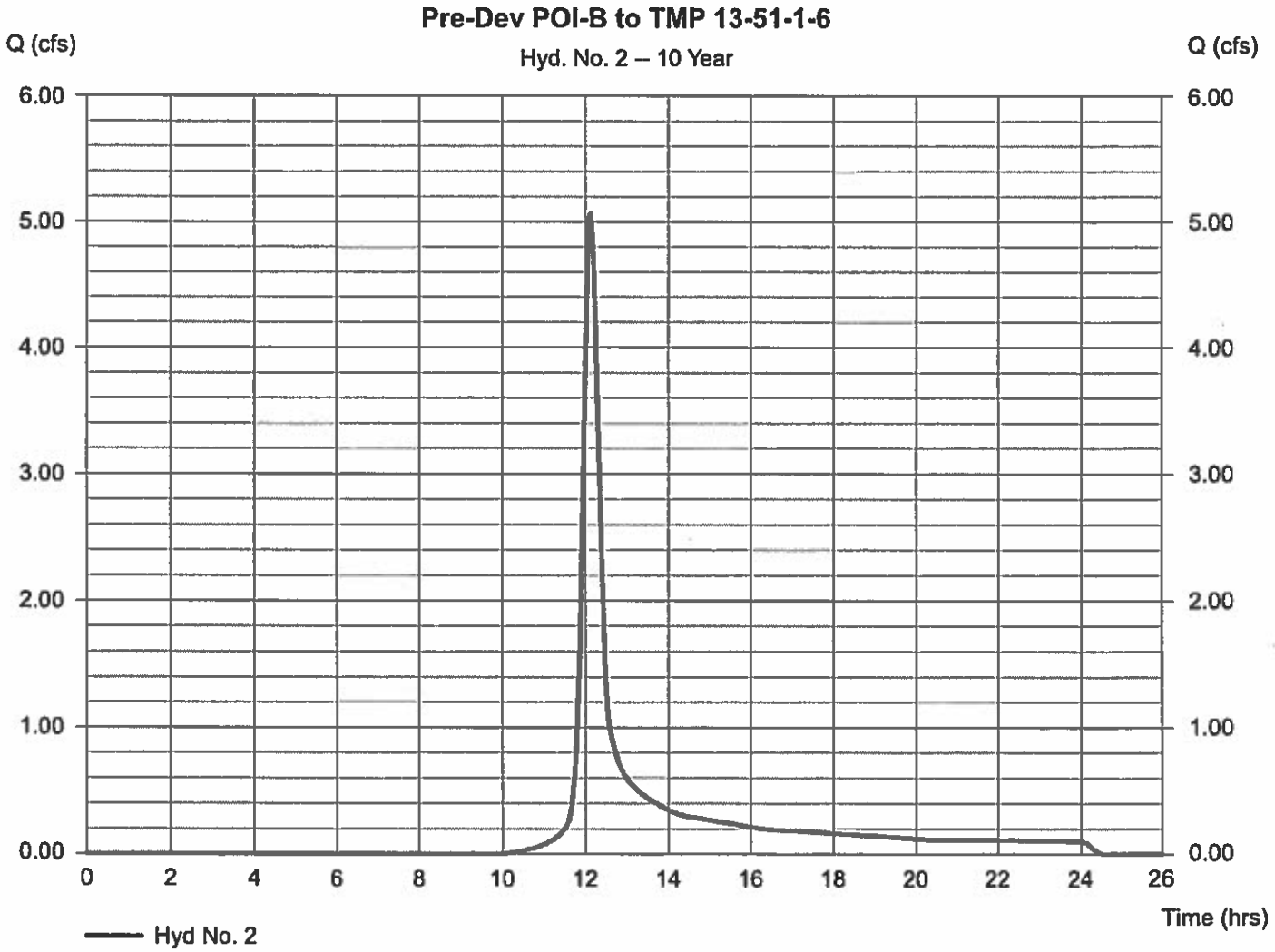
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 5.066 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 17,907 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



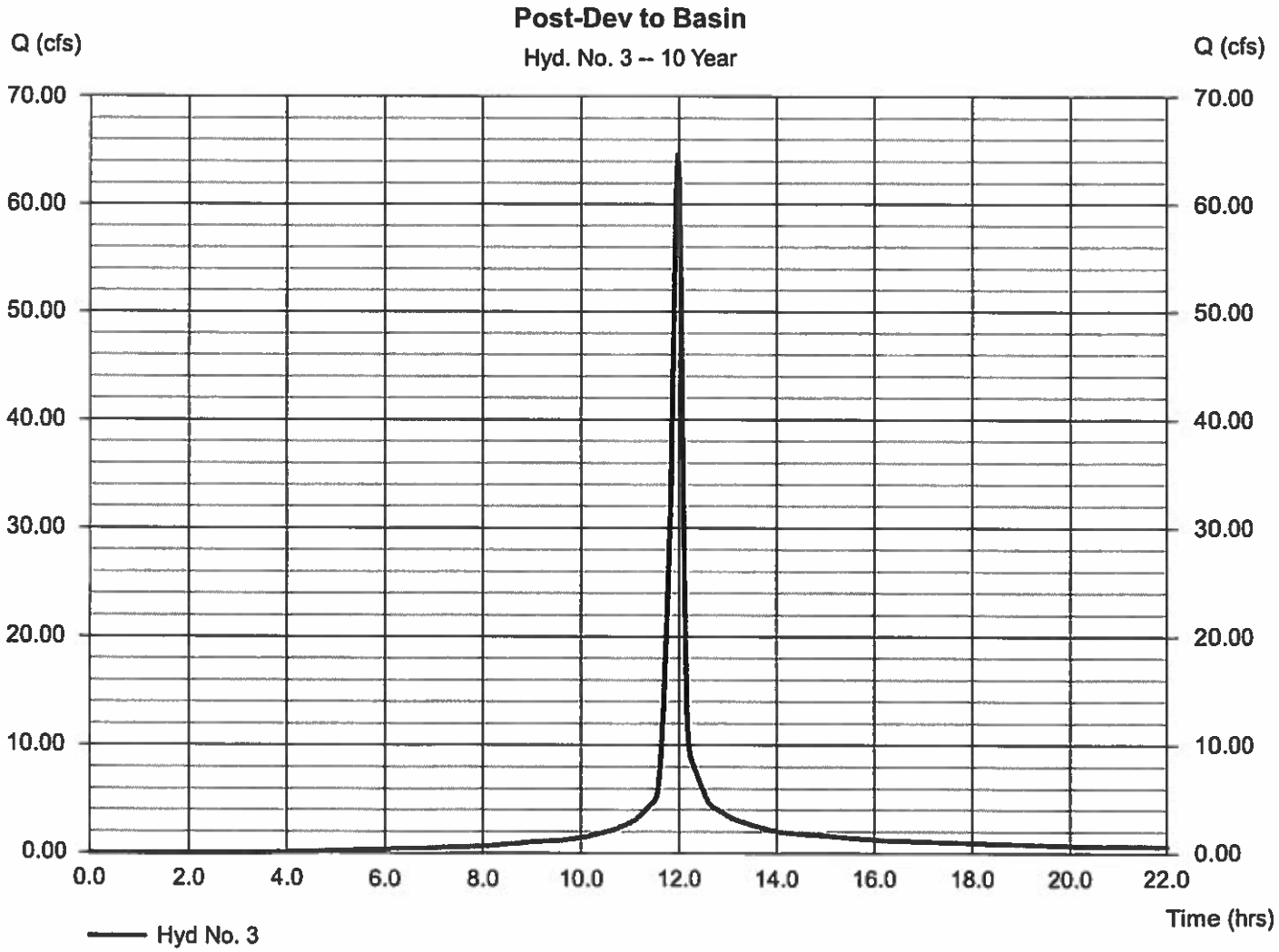
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 64.61 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 158,238 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

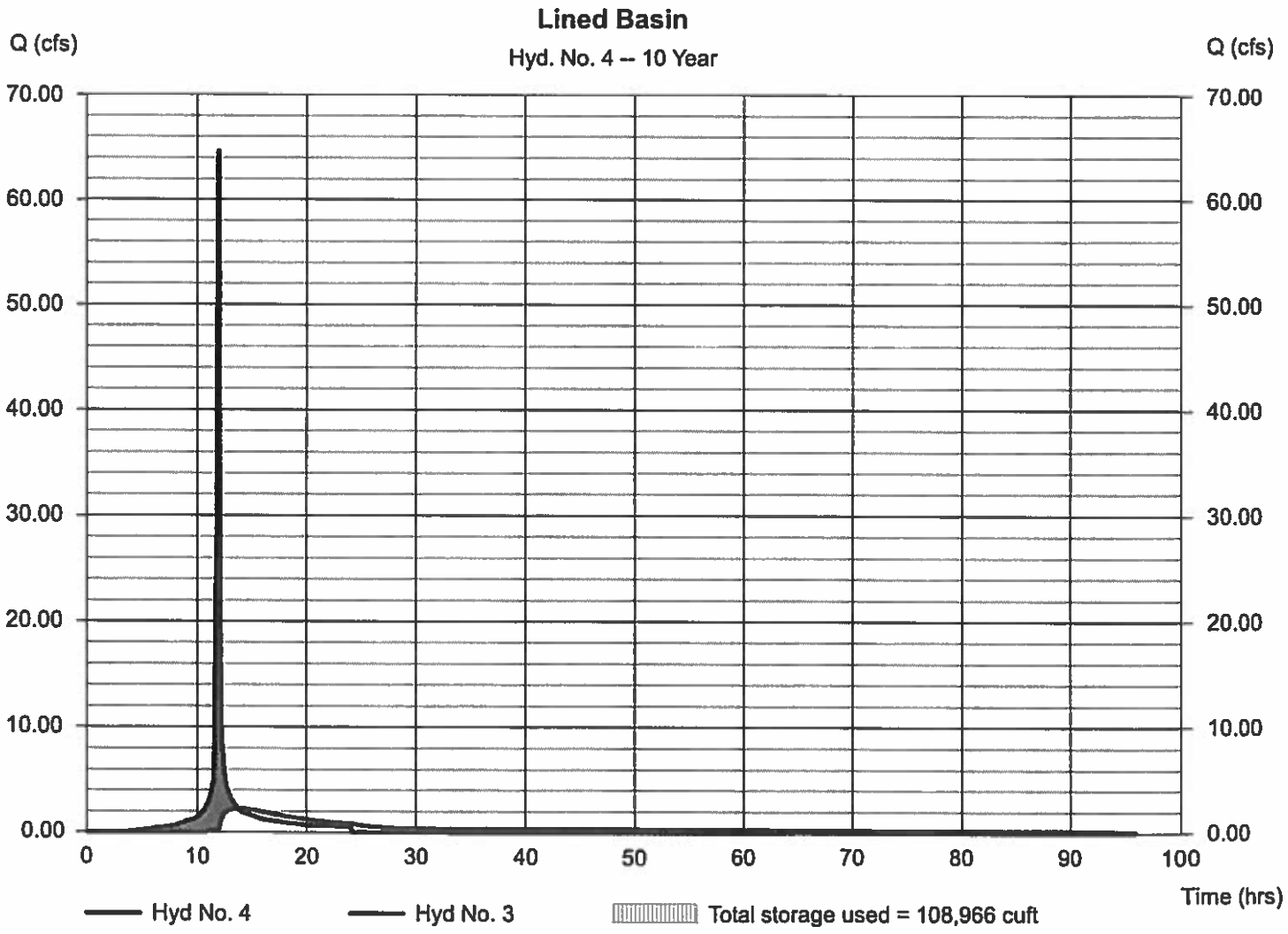
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 2.255 cfs
Storm frequency	= 10 yrs	Time to peak	= 13.80 hrs
Time interval	= 2 min	Hyd. volume	= 139,405 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 14.88 ft
Reservoir name	= Lined Basin	Max. Storage	= 108,966 cuft

Storage Indication method used.



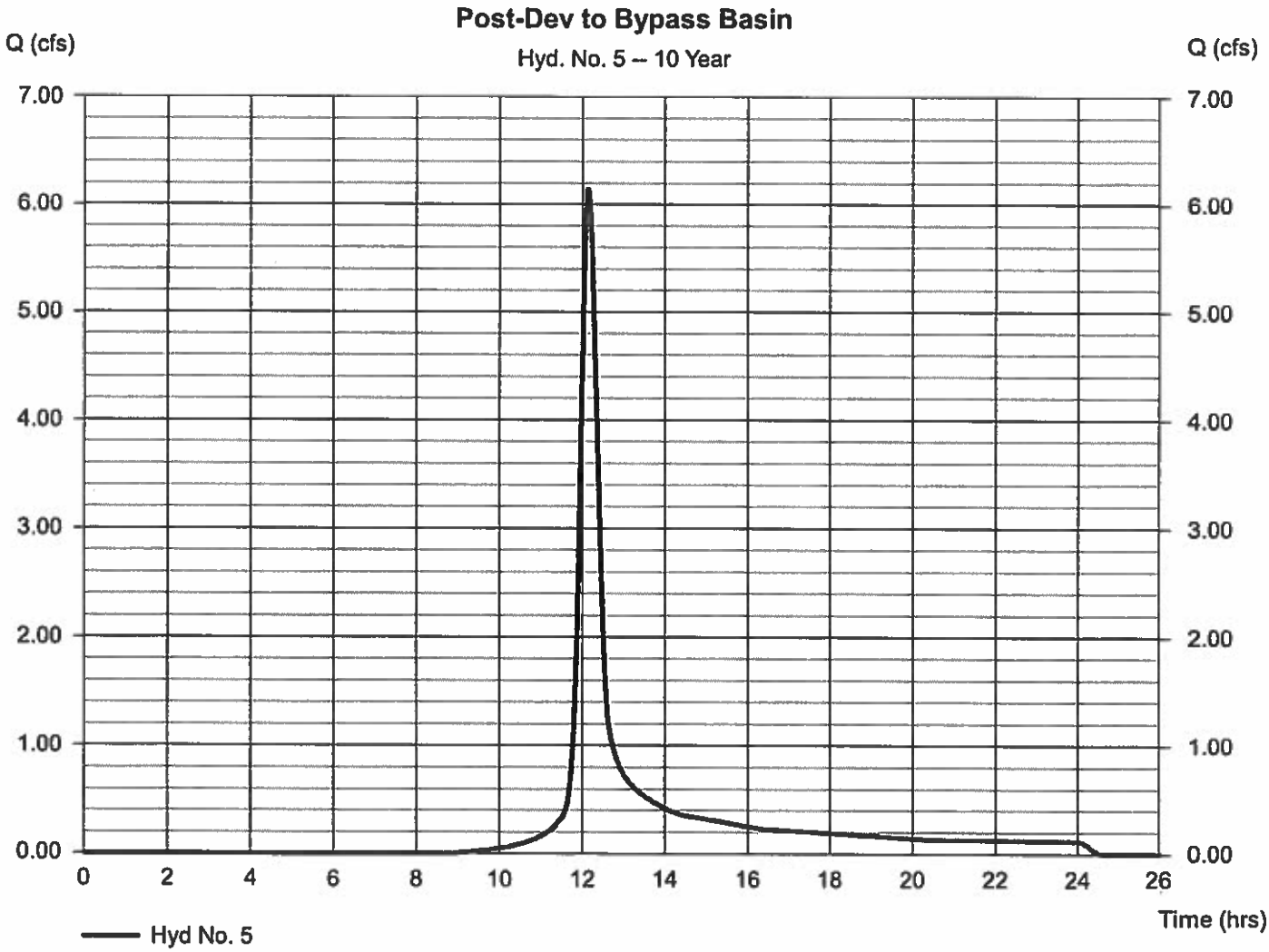
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 6.142 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 22,694 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



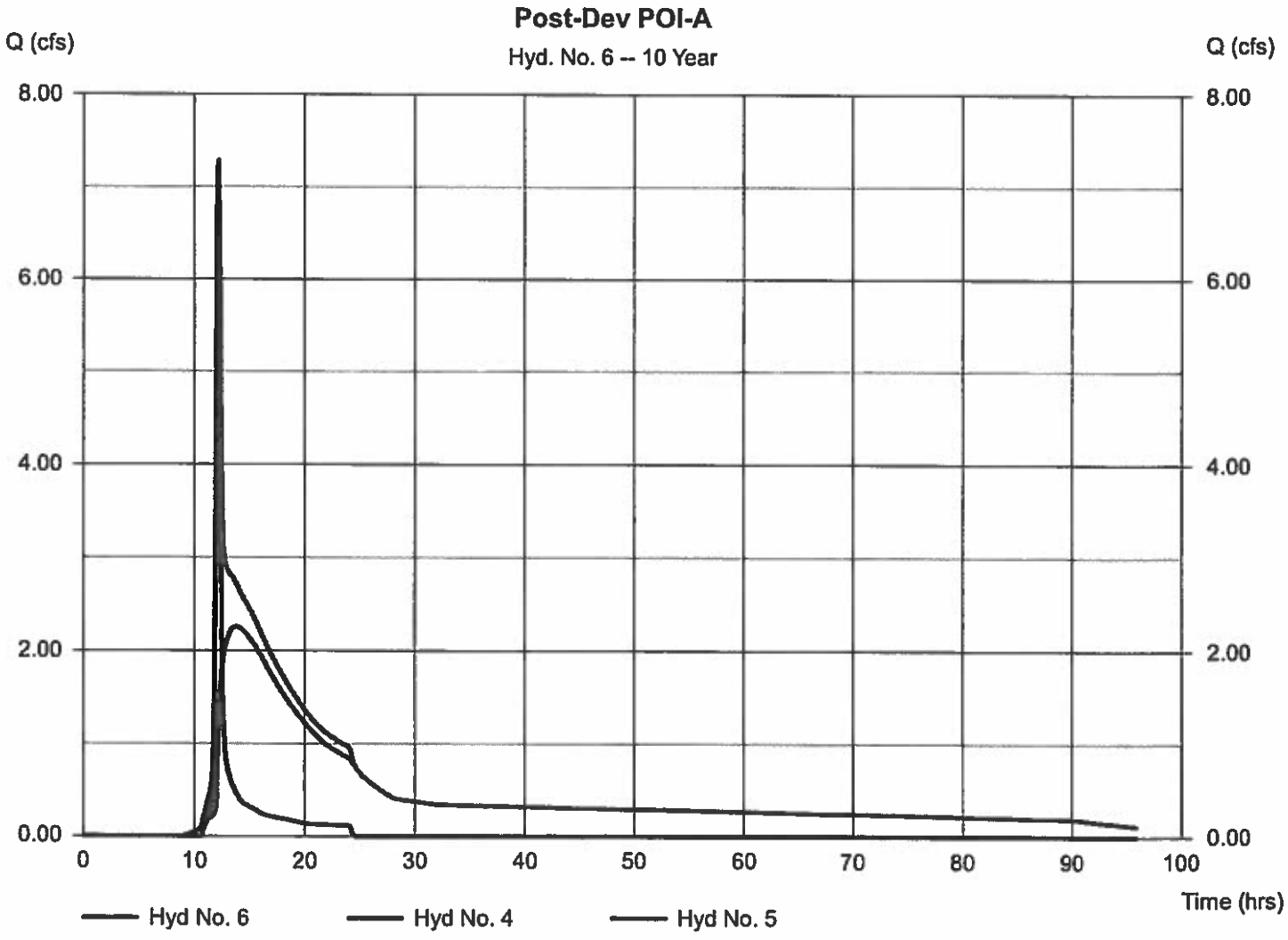
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 7.283 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 162,098 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



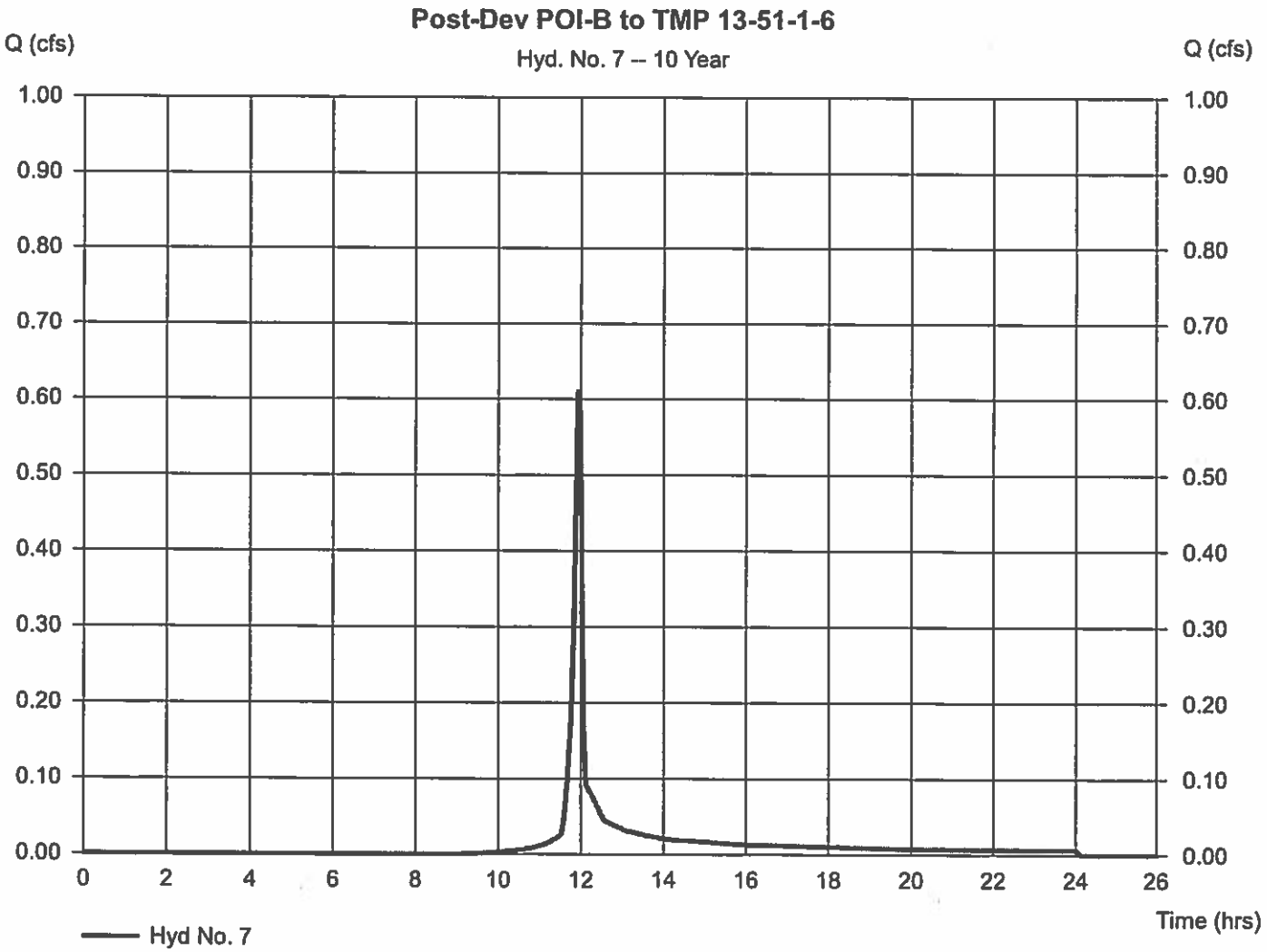
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.610 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1,231 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.00 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	28.06	2	728	104,334	---	------	------	Pre-Dev POI-A
2	SCS Runoff	6.657	2	726	23,280	---	------	------	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	76.16	2	718	188,562	---	------	------	Post-Dev to Basin
4	Reservoir	3.129	2	806	169,369	3	15.19	126,303	Lined Basin
5	SCS Runoff	7.846	2	728	28,837	---	------	------	Post-Dev to Bypass Basin
6	Combine	10.38	2	730	198,206	4, 5	------	------	Post-Dev POI-A
7	SCS Runoff	0.777	2	716	1,571	---	------	------	Post-Dev POI-B to TMP 13-51-1-6

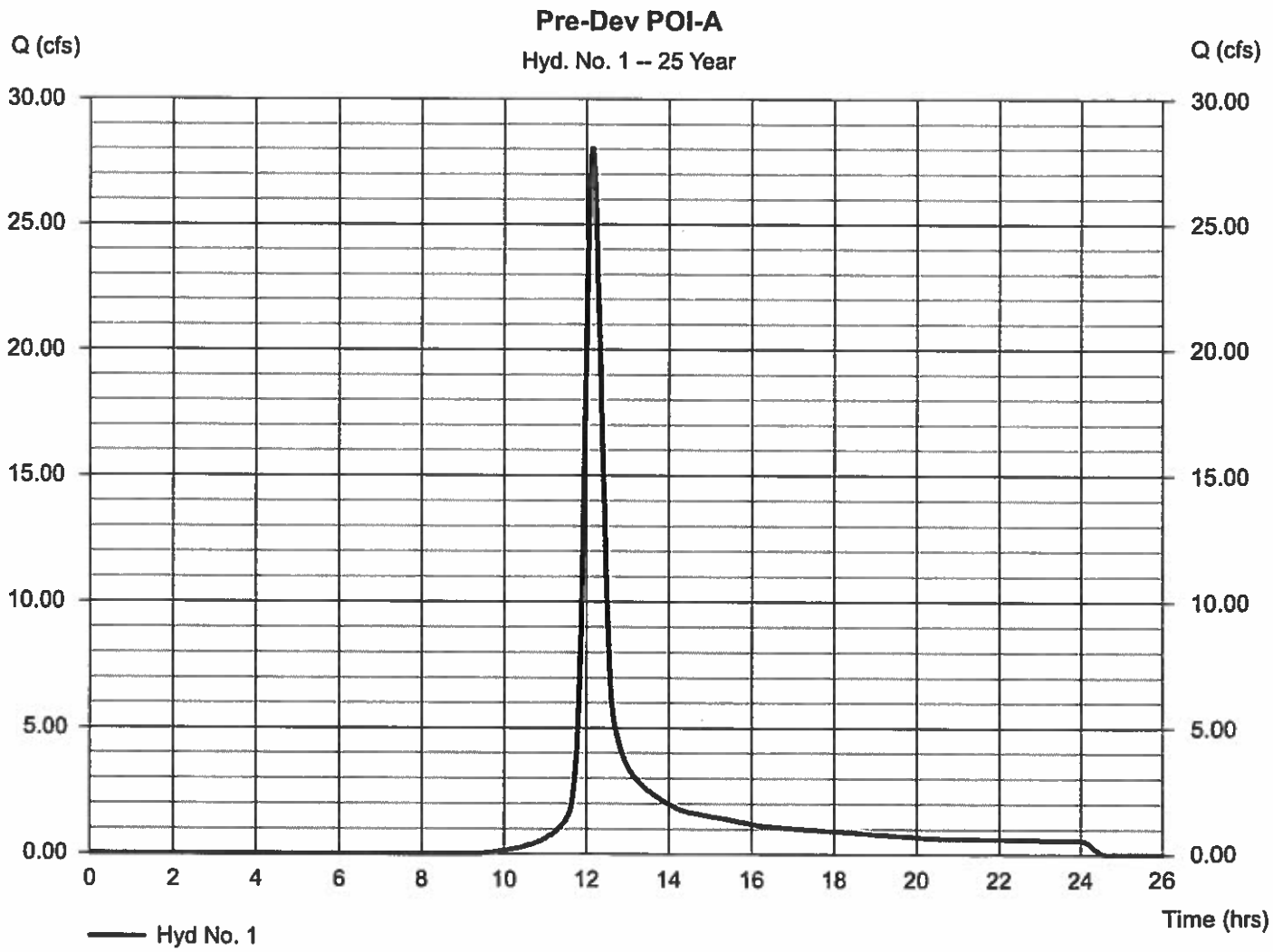
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 28.06 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 104,334 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



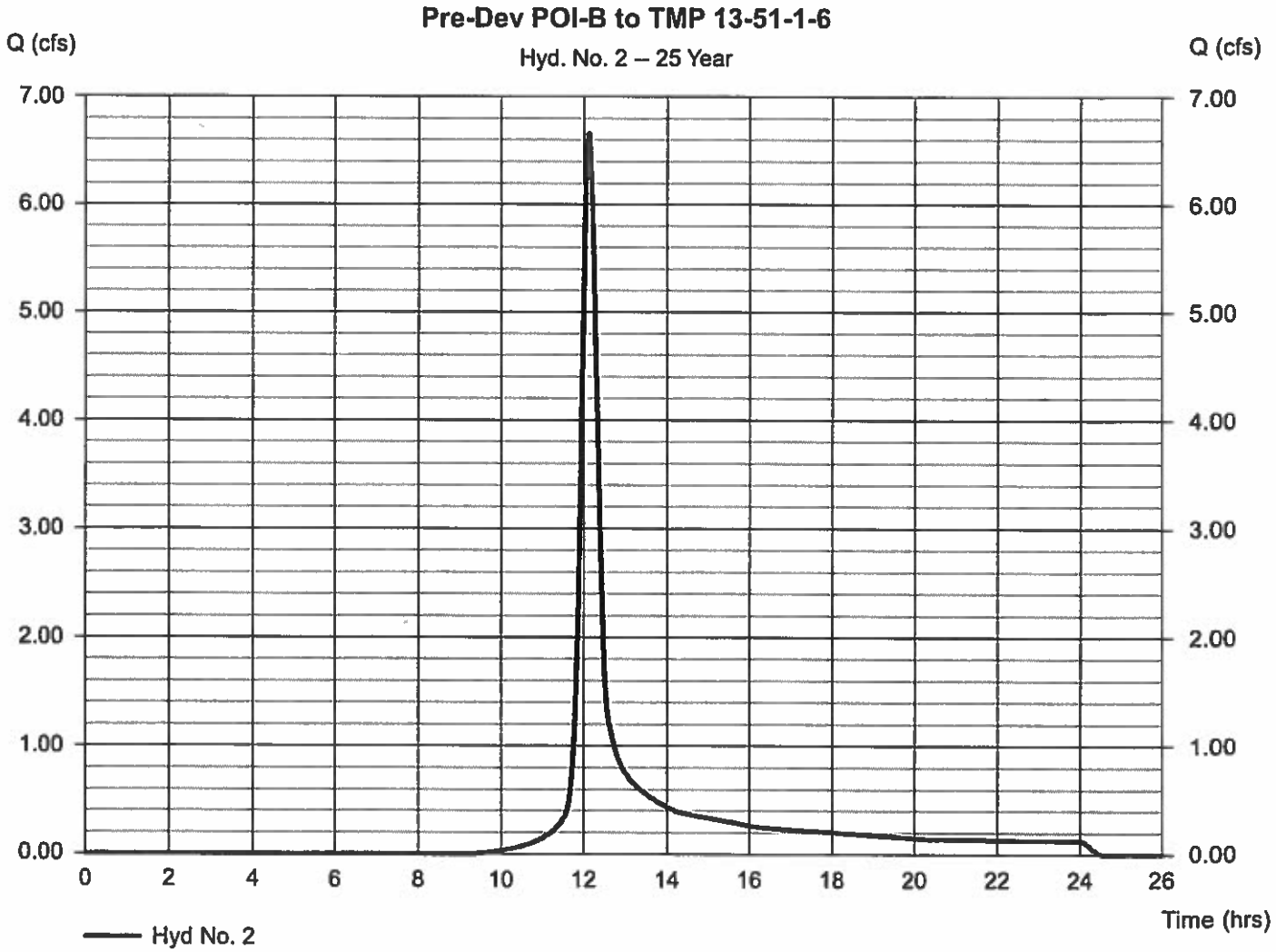
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 6.657 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 23,280 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



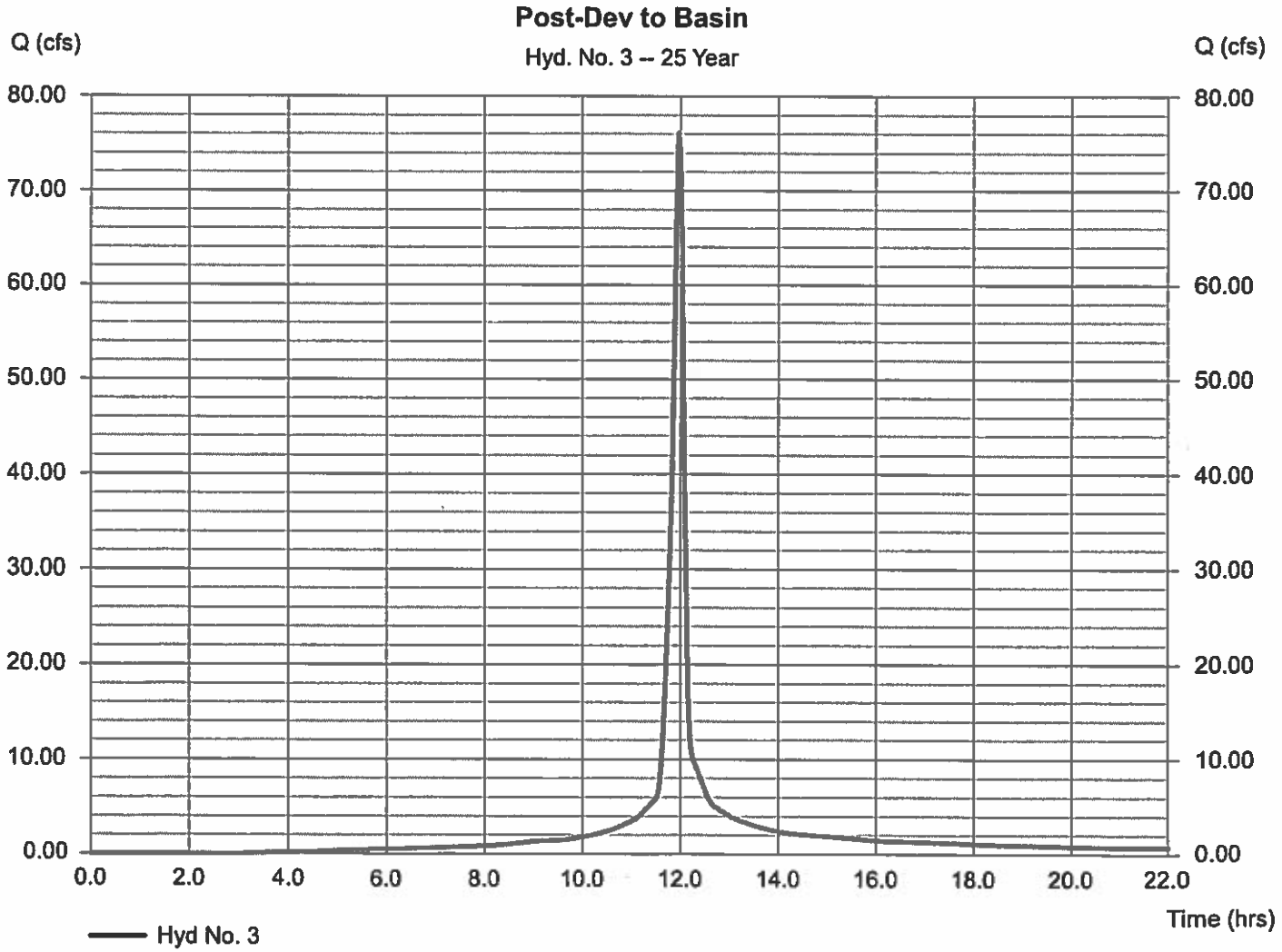
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 76.16 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 188,562 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

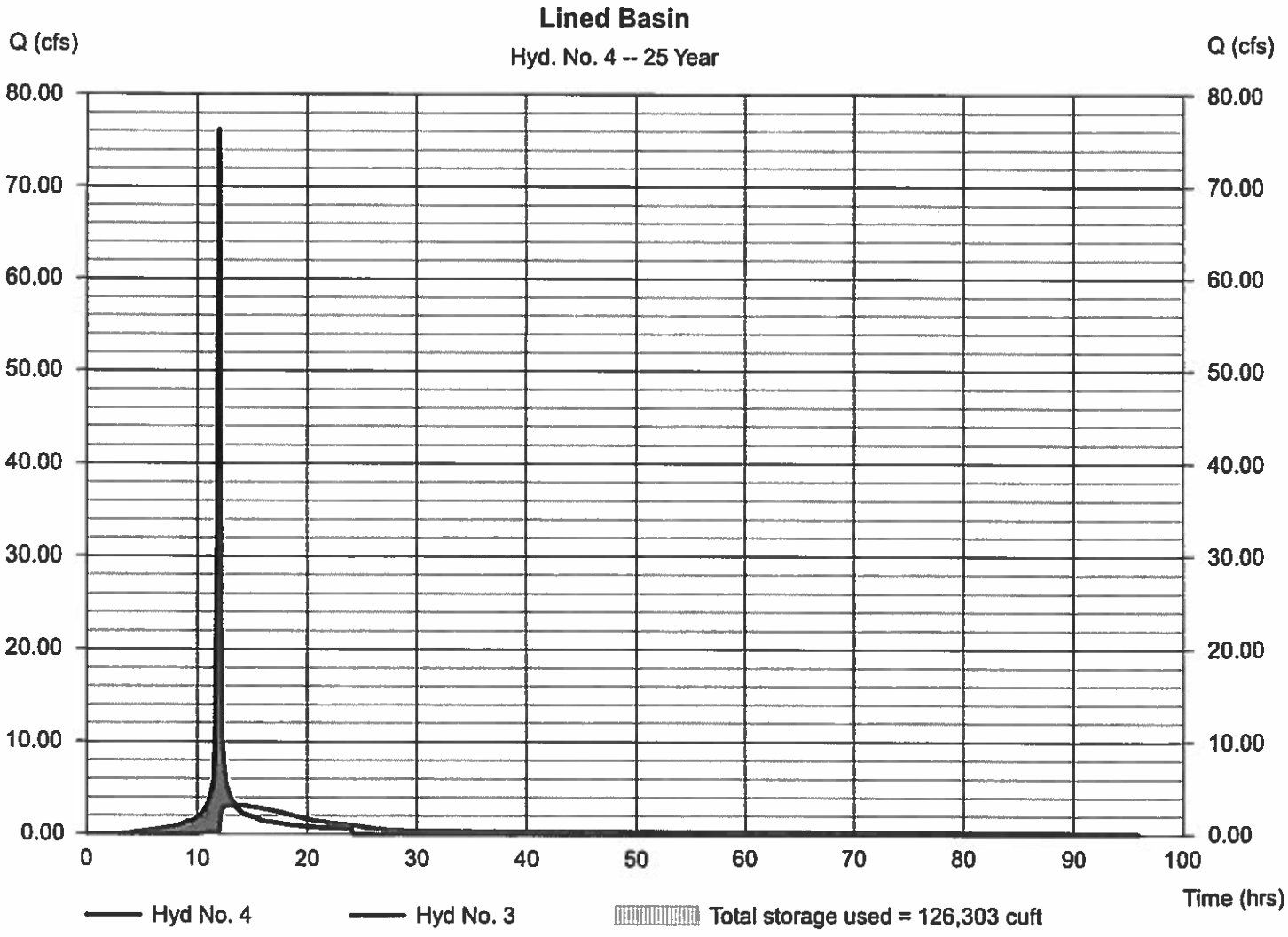
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 3.129 cfs
Storm frequency	= 25 yrs	Time to peak	= 13.43 hrs
Time interval	= 2 min	Hyd. volume	= 169,369 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 15.19 ft
Reservoir name	= Lined Basin	Max. Storage	= 126,303 cuft

Storage Indication method used.



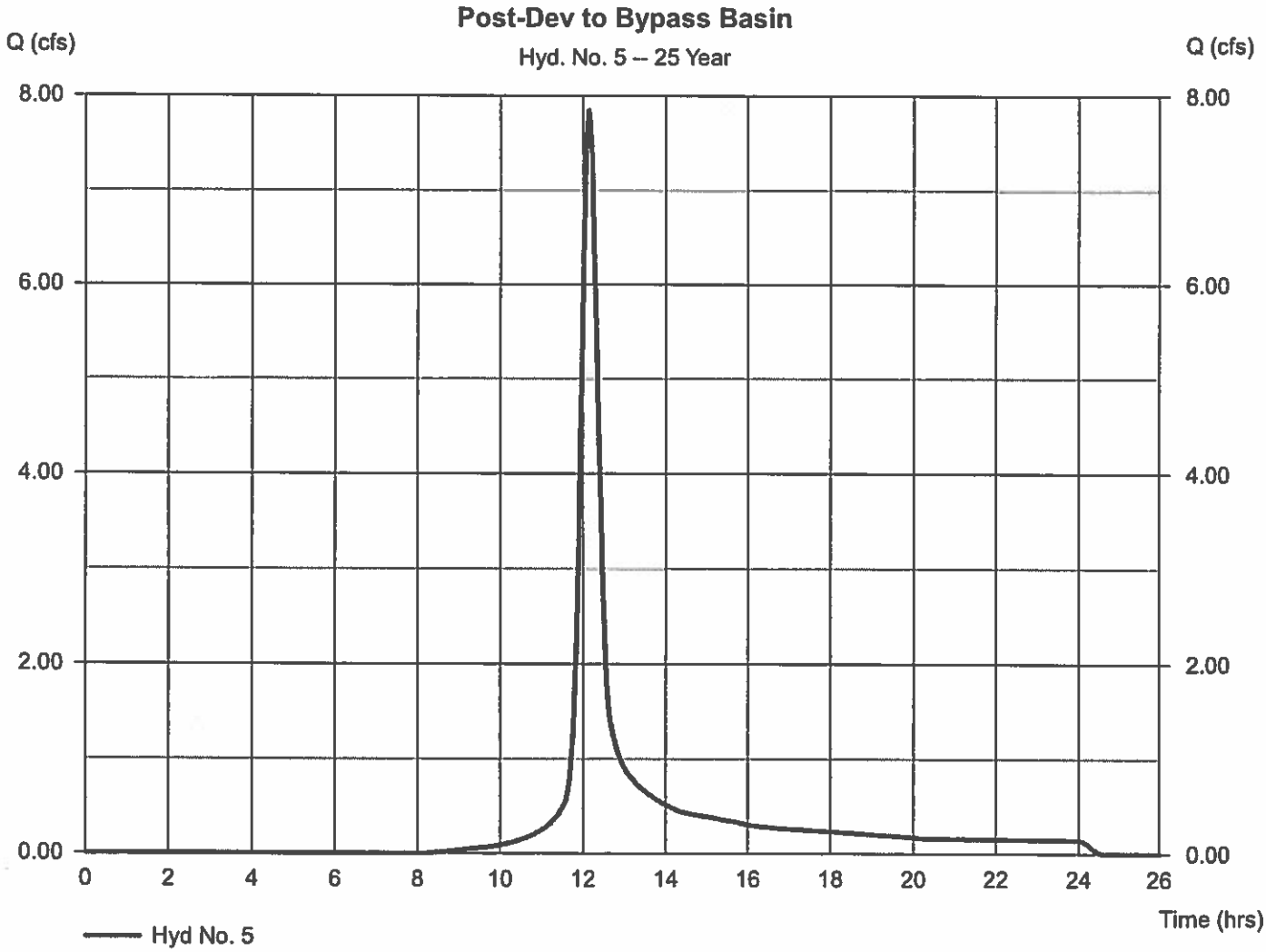
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 7.846 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 28,837 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



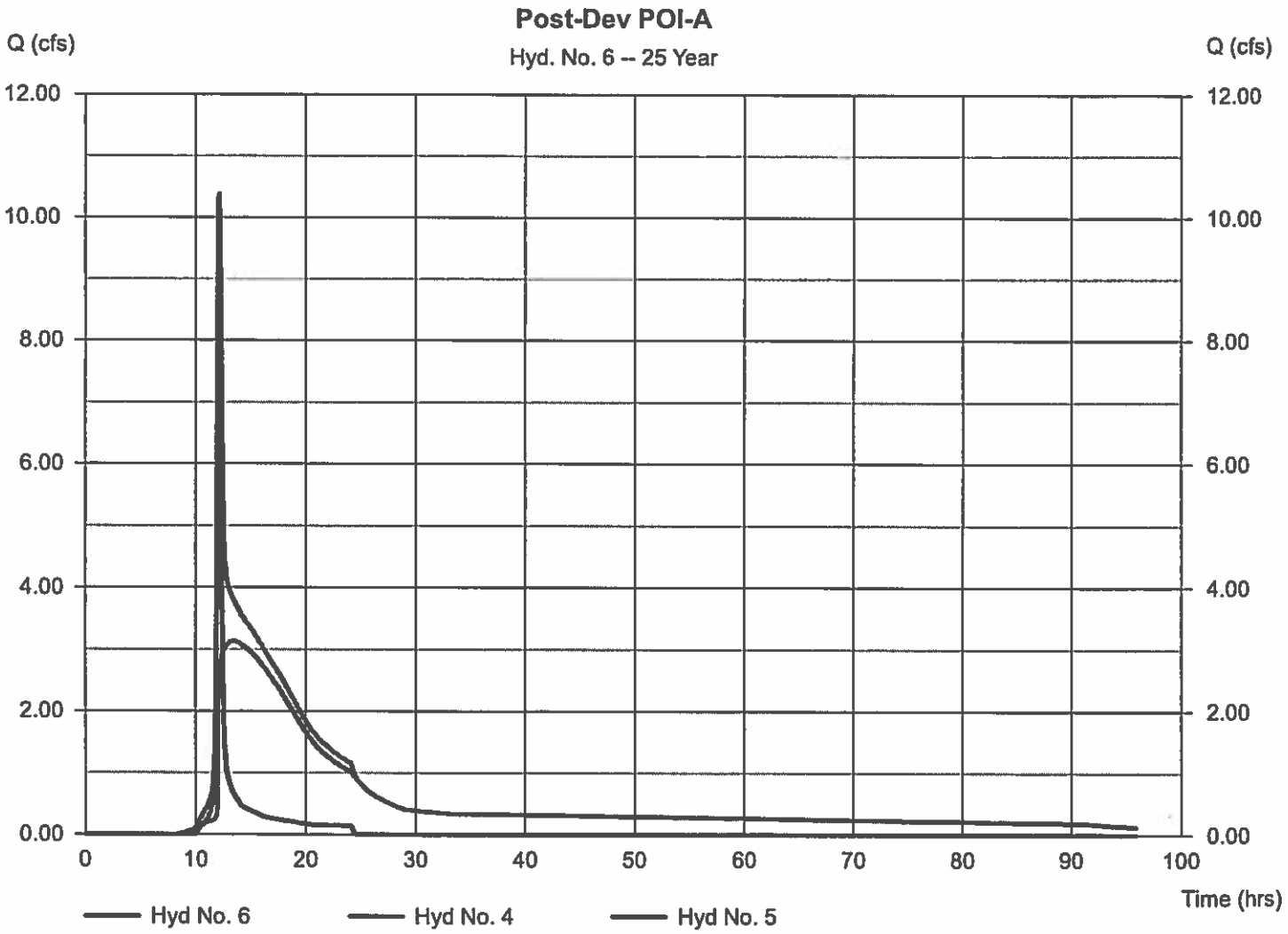
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 10.38 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 198,206 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



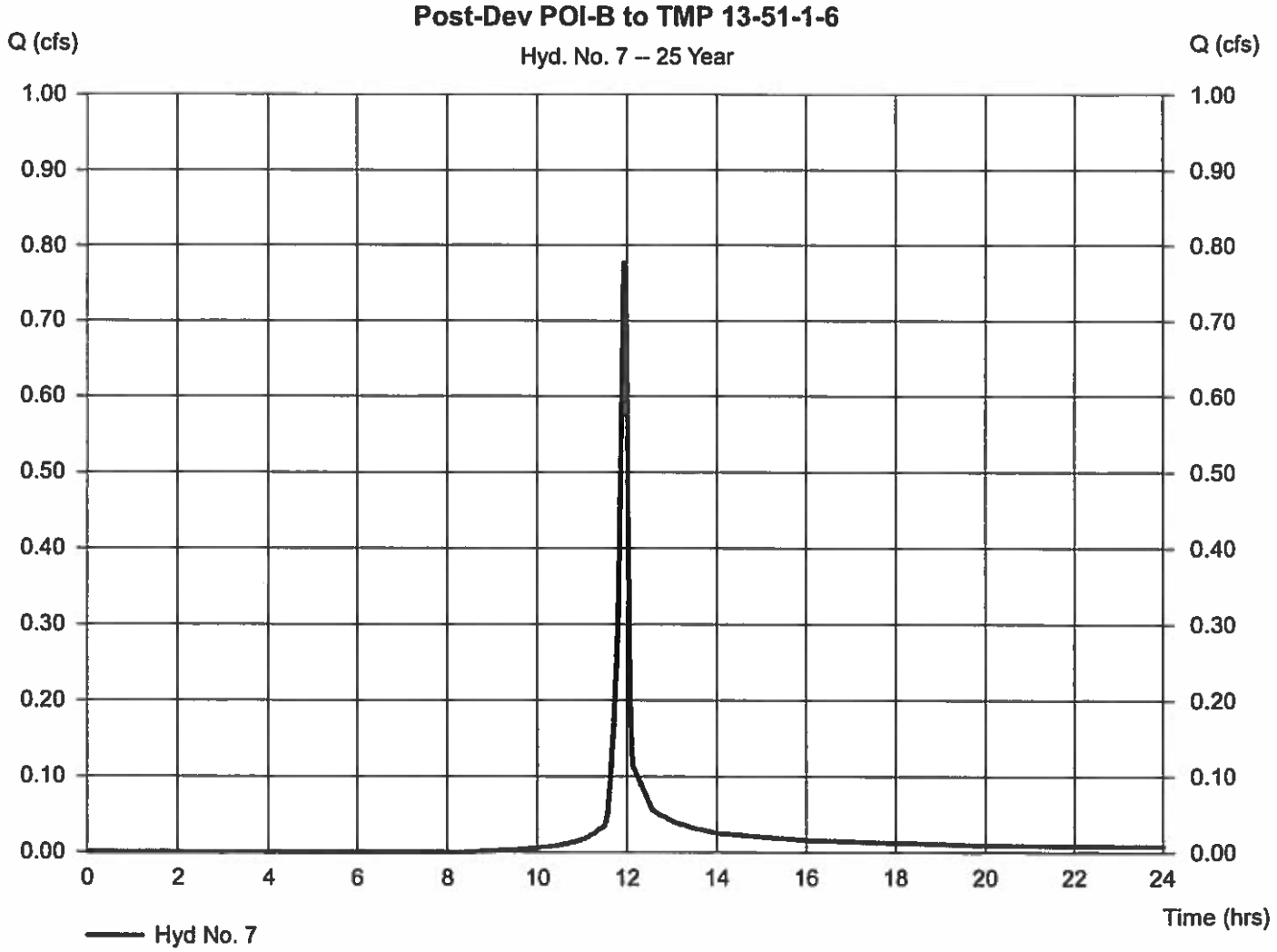
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.777 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1,571 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	33.33	2	728	123,191	---	------	------	Pre-Dev POI-A
2	SCS Runoff	7.907	2	726	27,488	---	------	------	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	84.78	2	718	211,398	---	------	------	Post-Dev to Basin
4	Reservoir	3.663	2	800	191,911	3	15.44	140,696	Lined Basin
5	SCS Runoff	9.154	2	728	33,592	---	------	------	Post-Dev to Bypass Basin
6	Combine	12.30	2	730	225,503	4, 5	------	------	Post-Dev POI-A
7	SCS Runoff	0.905	2	716	1,835	---	------	------	Post-Dev POI-B to TMP 13-51-1-6

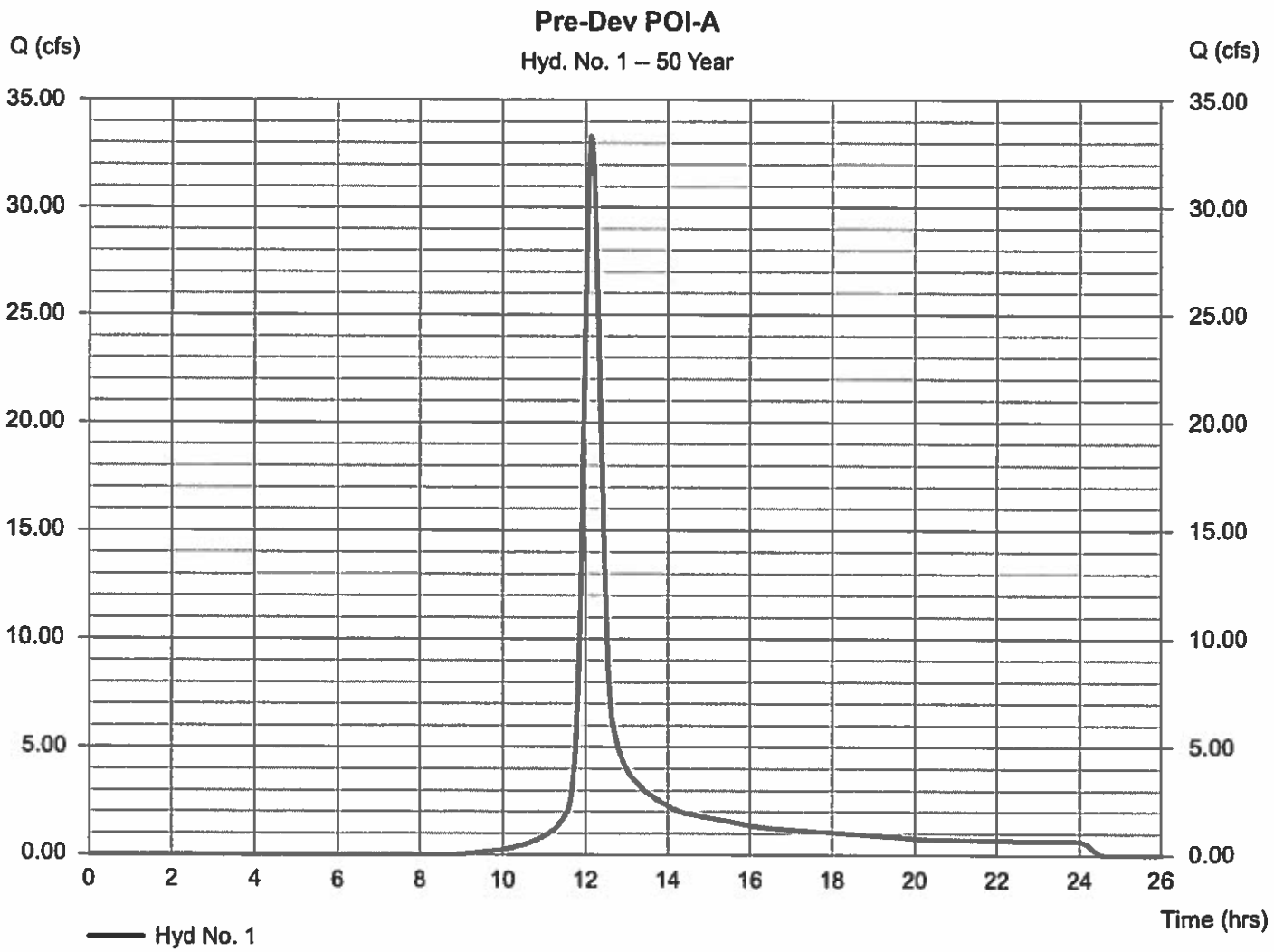
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 33.33 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 123,191 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



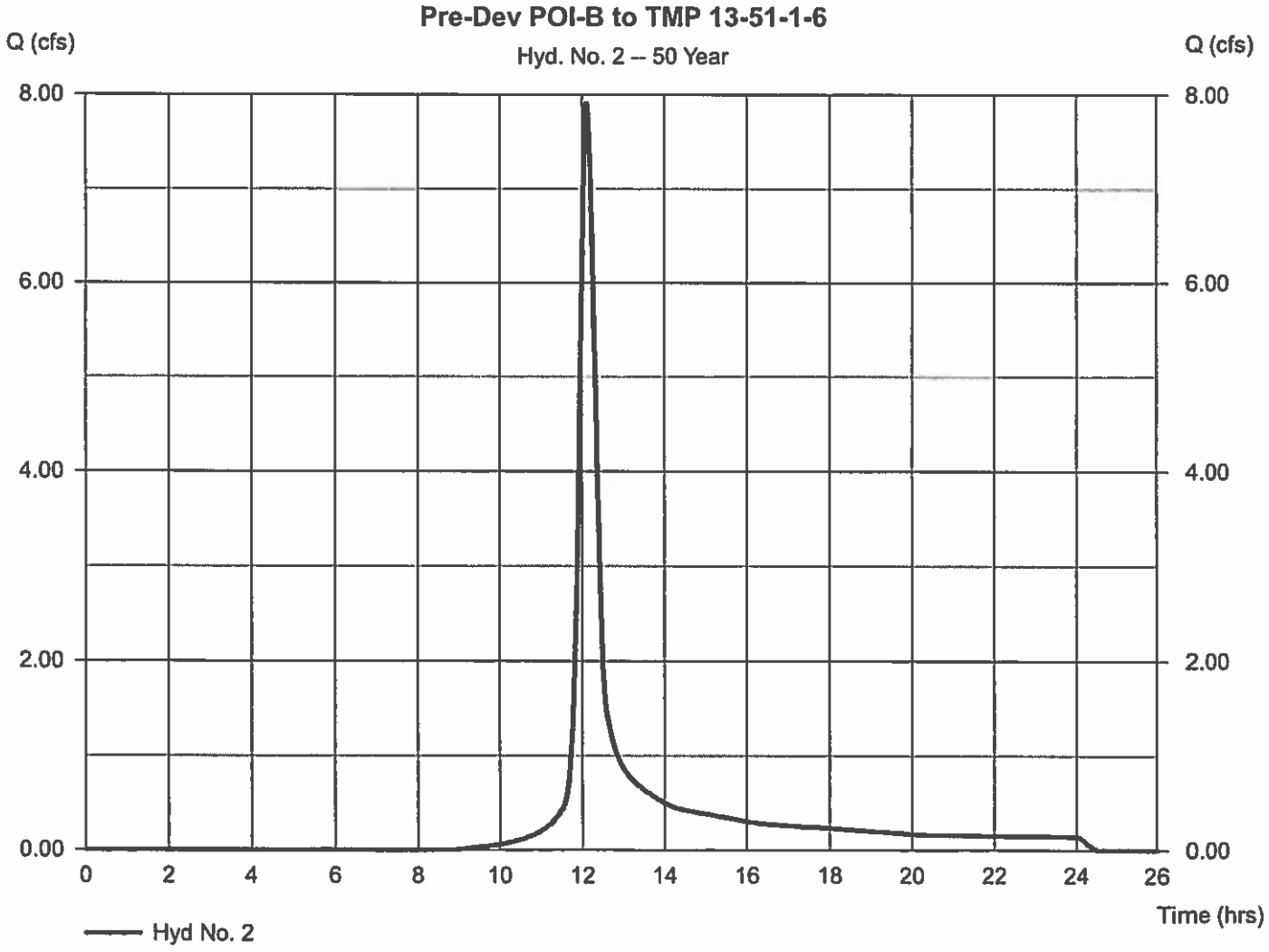
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 7.907 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 27,488 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



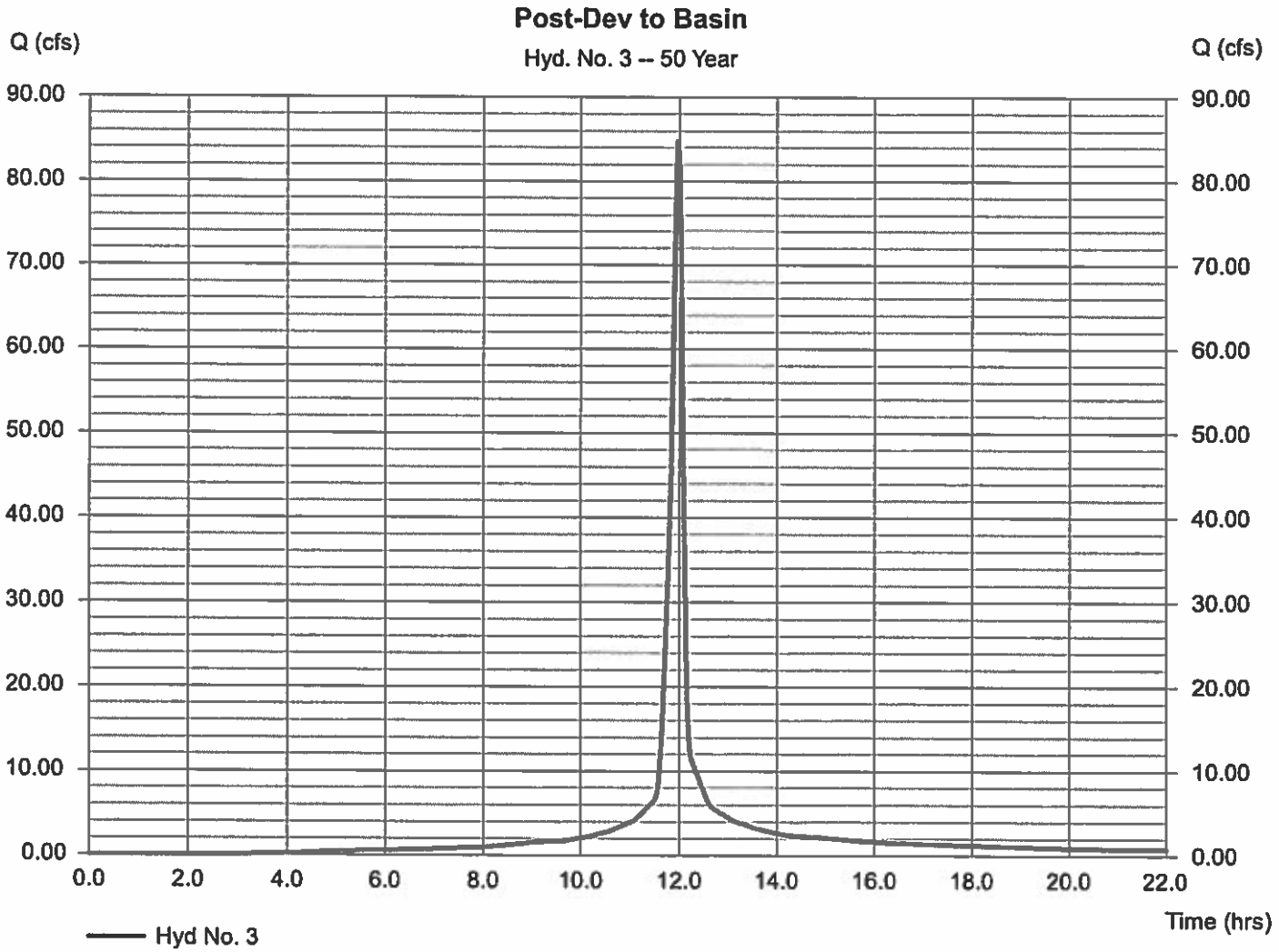
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 84.78 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 211,398 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

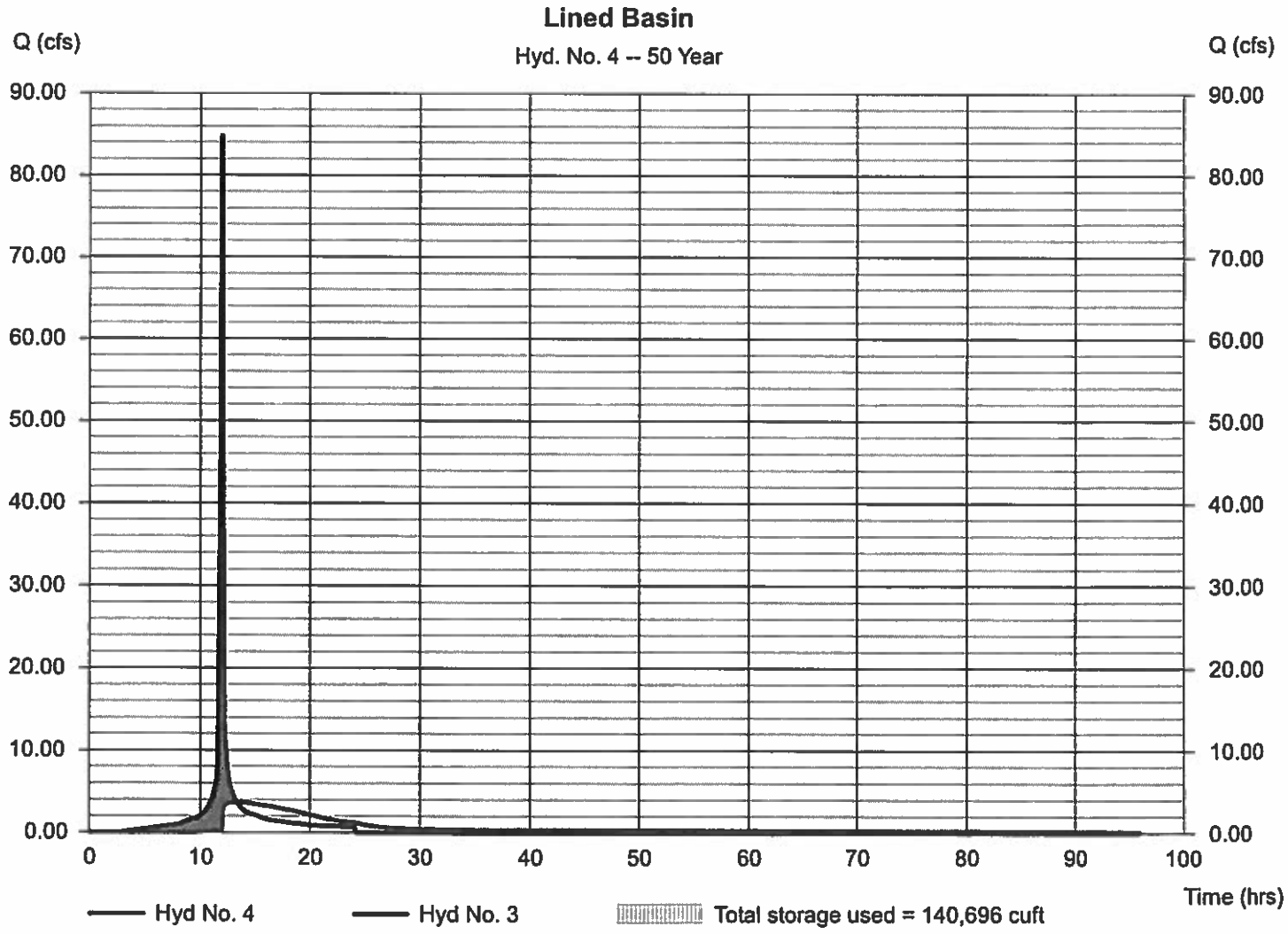
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 3.663 cfs
Storm frequency	= 50 yrs	Time to peak	= 13.33 hrs
Time interval	= 2 min	Hyd. volume	= 191,911 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 15.44 ft
Reservoir name	= Lined Basin	Max. Storage	= 140,696 cuft

Storage Indication method used.



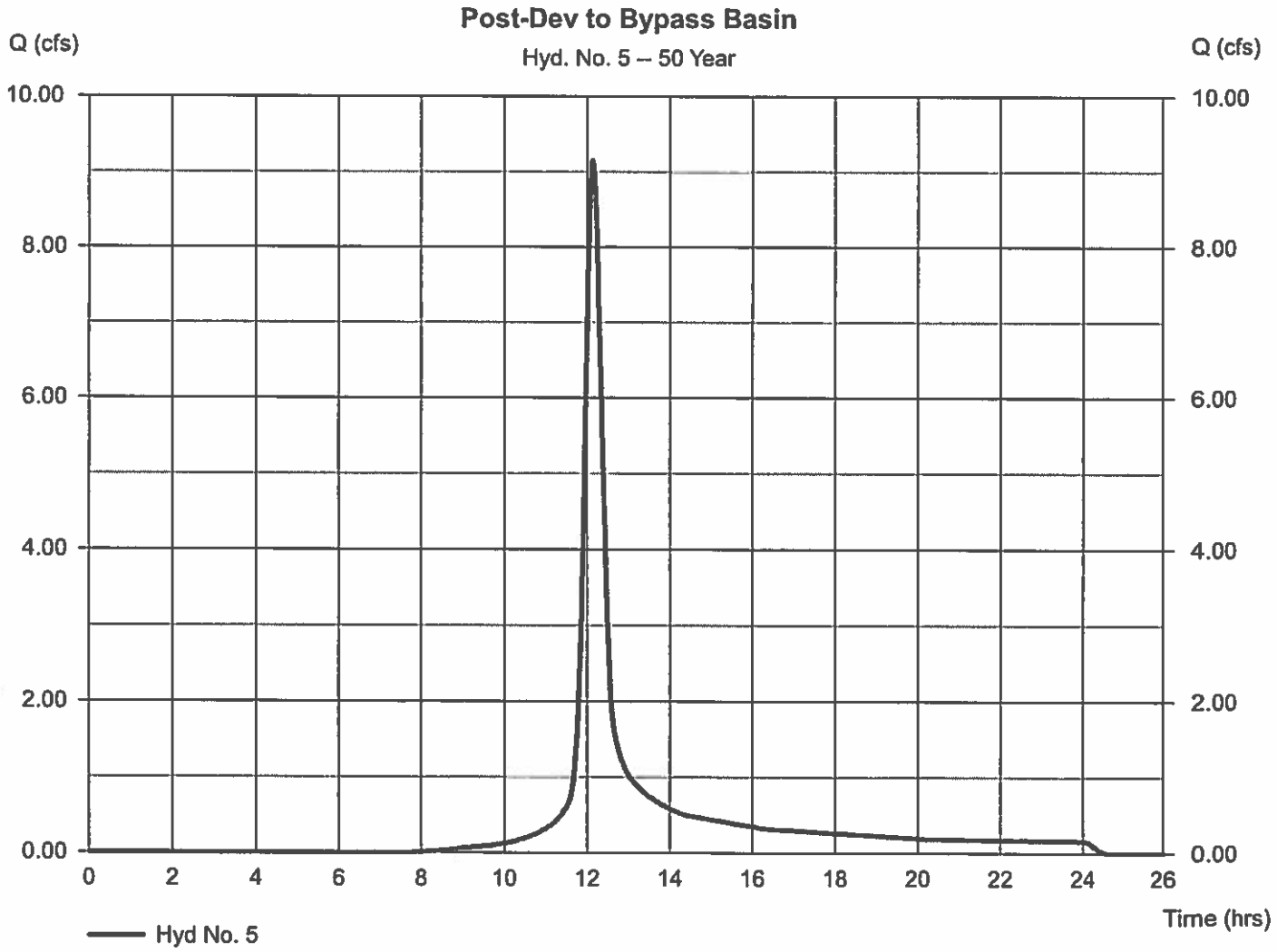
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 9.154 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 33,592 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



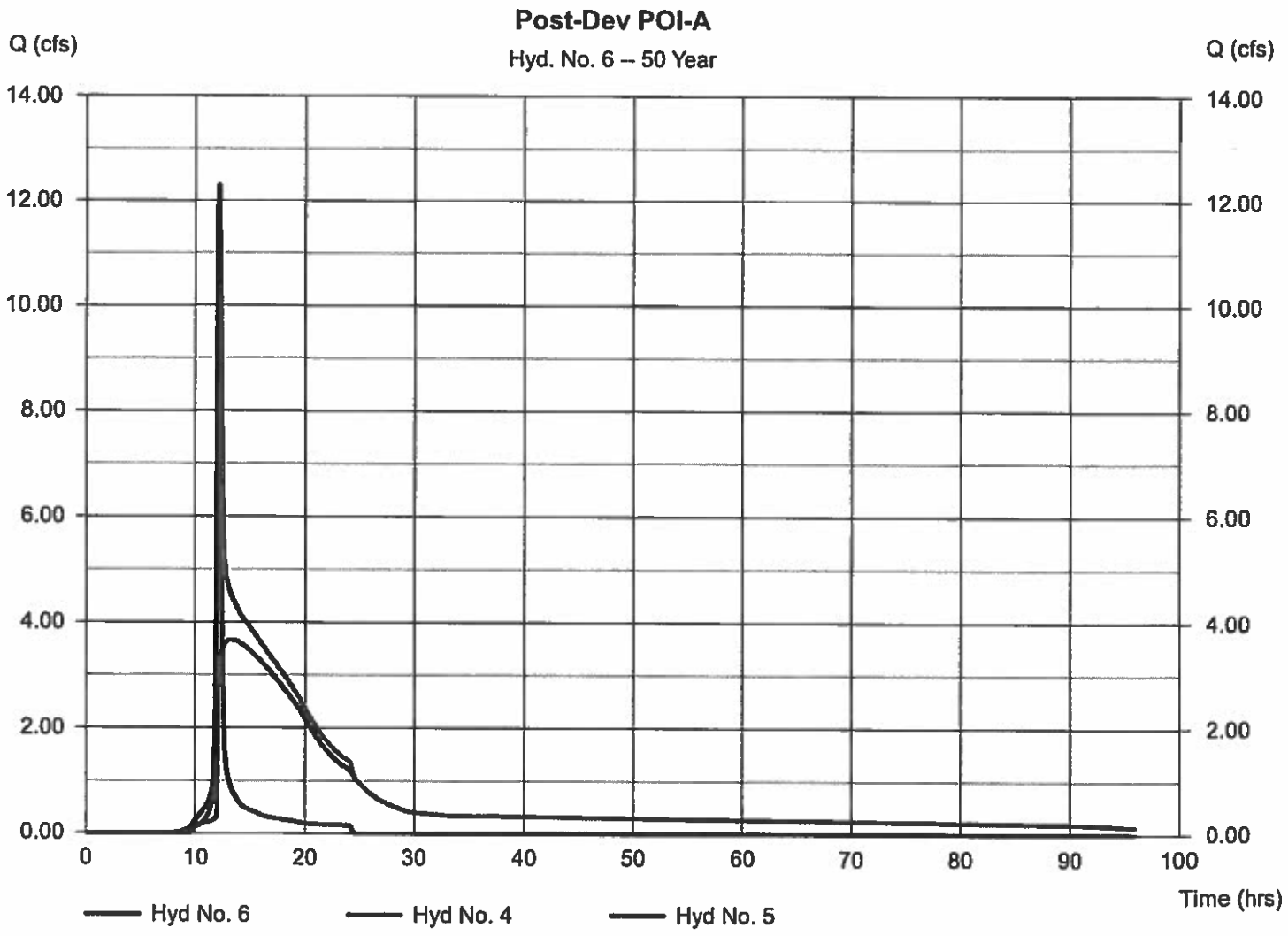
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 12.30 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 225,503 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



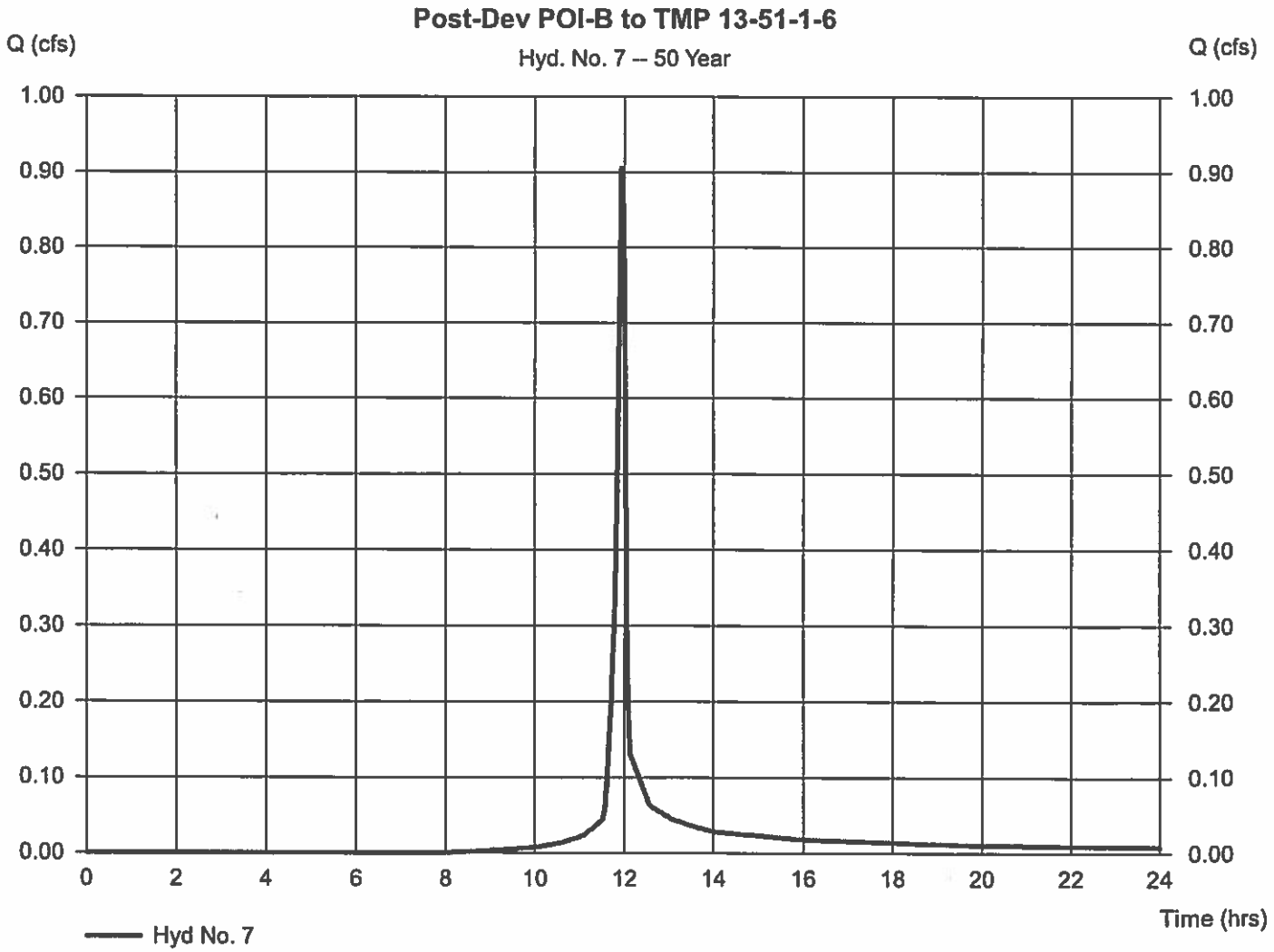
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 0.905 cfs
Storm frequency	= 50 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 1,835 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.22

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	40.55	2	728	149,176	----	----	------	Pre-Dev POI-A
2	SCS Runoff	9.618	2	726	33,286	----	----	------	Pre-Dev POI-B to TMP 13-51-1-6
3	SCS Runoff	96.24	2	718	241,937	----	----	------	Post-Dev to Basin
4	Reservoir	5.810	2	768	222,119	3	15.73	156,968	Lined Basin
5	SCS Runoff	10.92	2	728	40,084	----	----	------	Post-Dev to Bypass Basin
6	Combine	14.75	2	728	262,203	4, 5	----	------	Post-Dev POI-A
7	SCS Runoff	1.078	2	716	2,196	----	----	------	Post-Dev POI-B to TMP 13-51-1-6

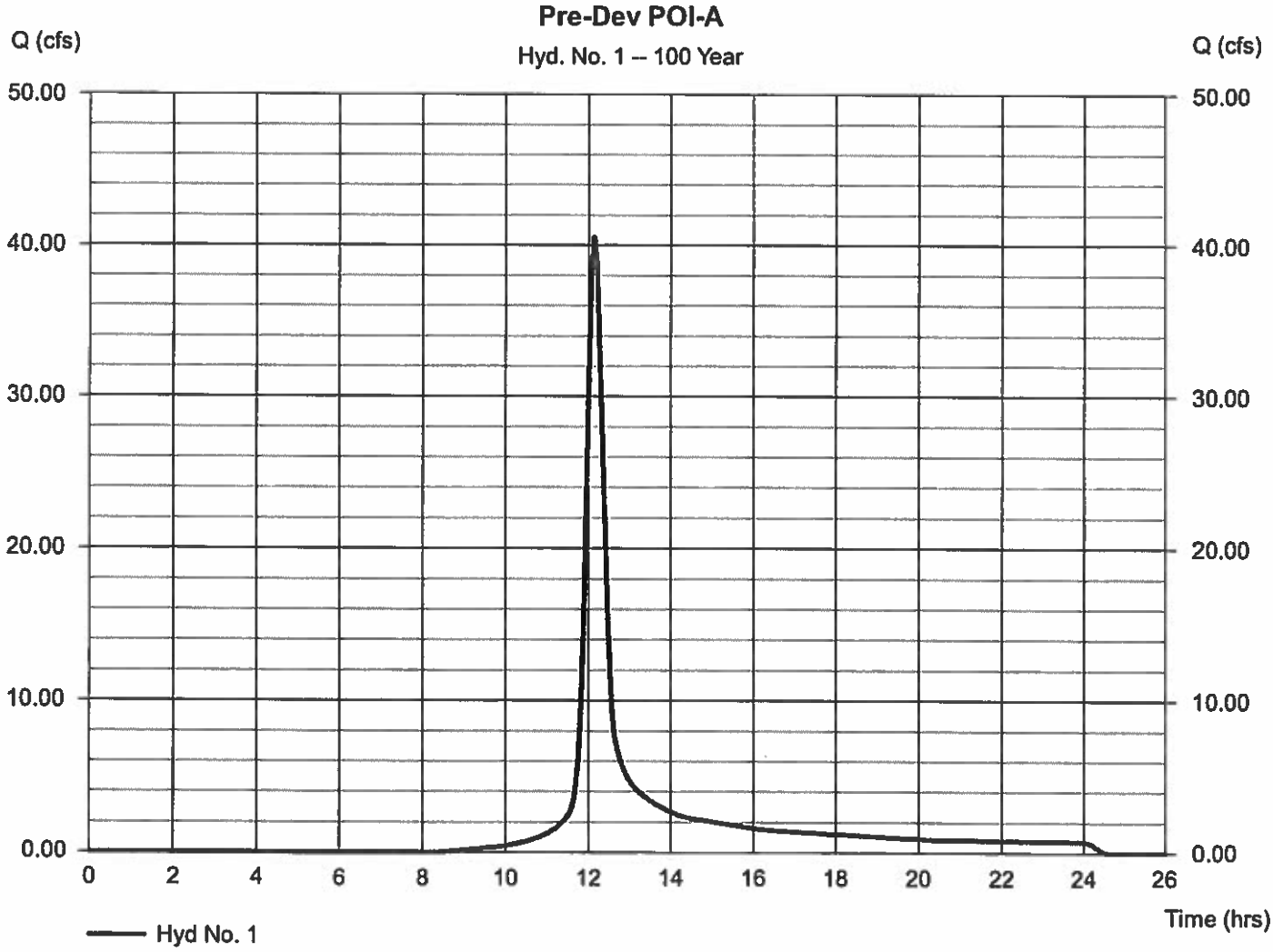
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 1

Pre-Dev POI-A

Hydrograph type	= SCS Runoff	Peak discharge	= 40.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 149,176 cuft
Drainage area	= 11.029 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 26.80 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



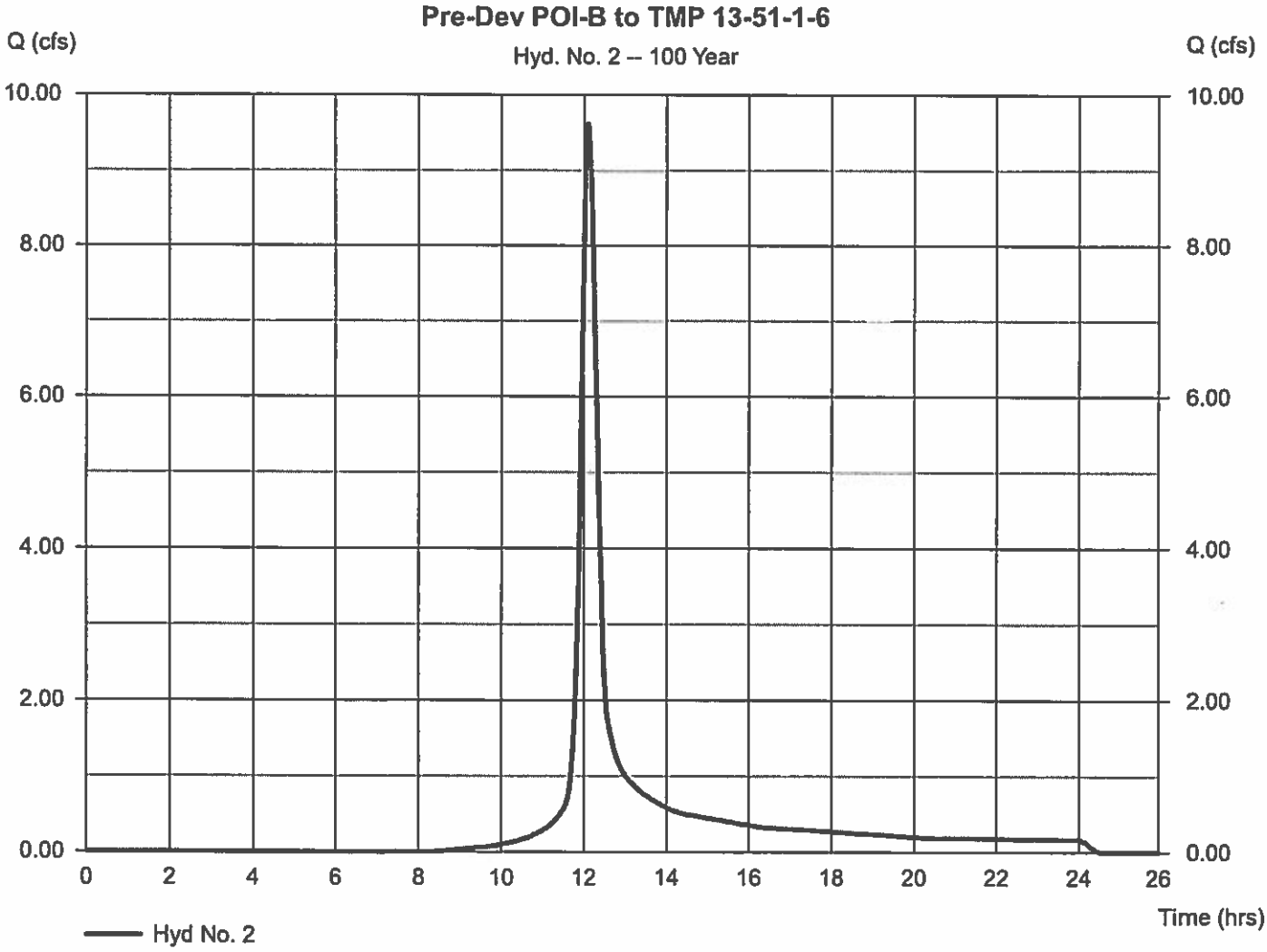
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 2

Pre-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 9.618 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 33,286 cuft
Drainage area	= 2.380 ac	Curve number	= 70
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.10 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



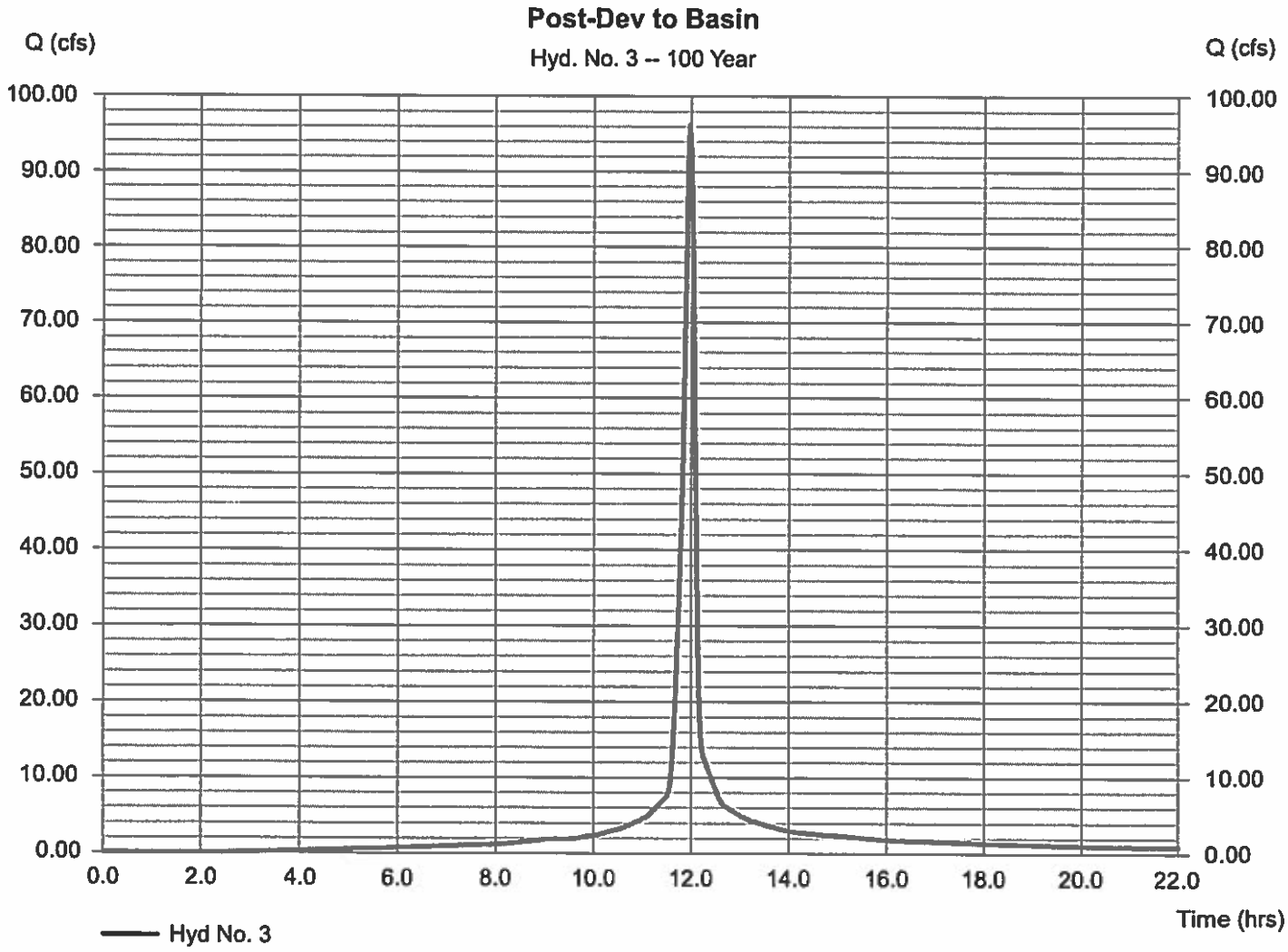
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 3

Post-Dev to Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 96.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 241,937 cuft
Drainage area	= 10.660 ac	Curve number	= 92
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 8.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

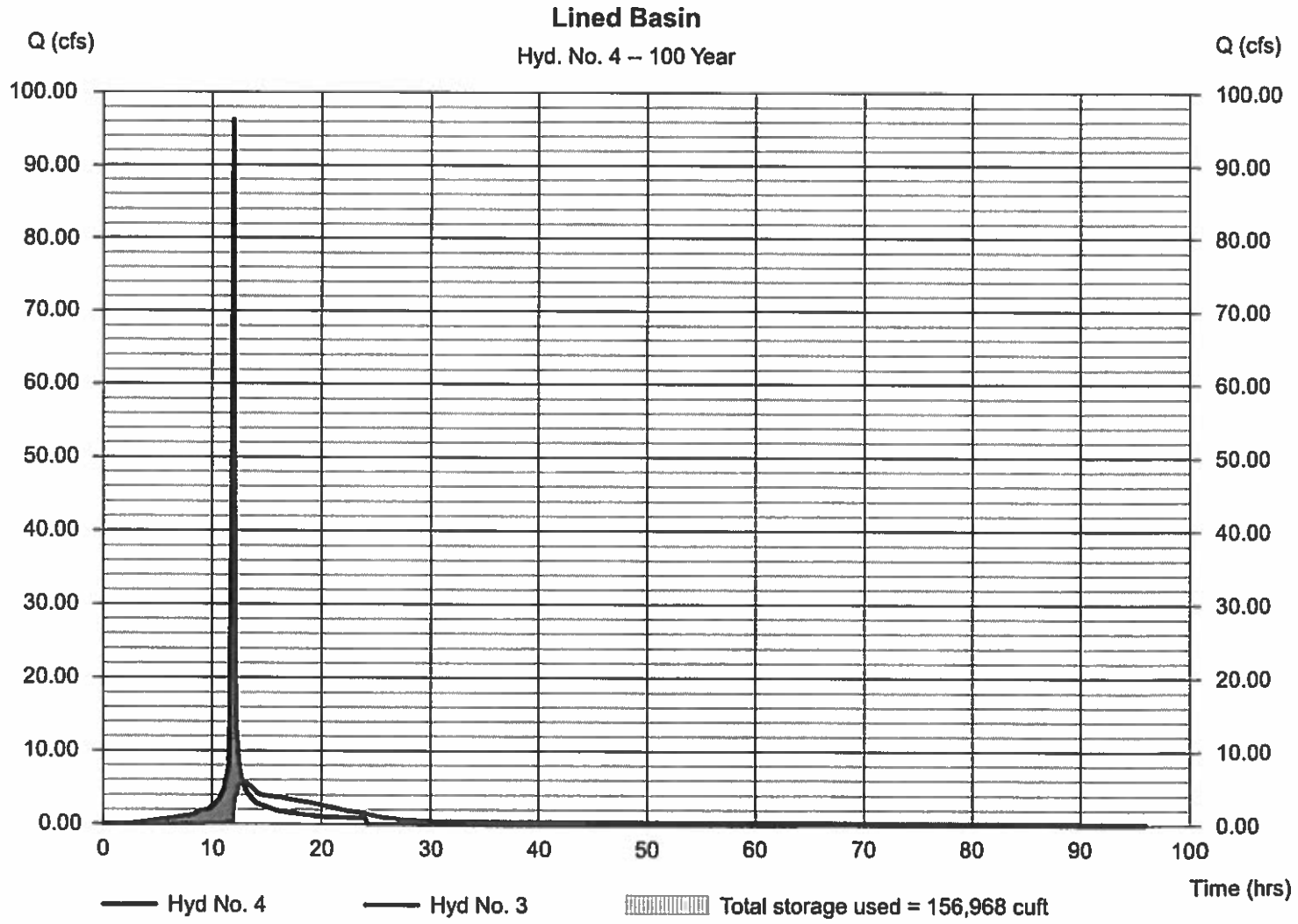
Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 4

Lined Basin

Hydrograph type	= Reservoir	Peak discharge	= 5.810 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.80 hrs
Time interval	= 2 min	Hyd. volume	= 222,119 cuft
Inflow hyd. No.	= 3 - Post-Dev to Basin	Max. Elevation	= 15.73 ft
Reservoir name	= Lined Basin	Max. Storage	= 156,968 cuft

Storage Indication method used.



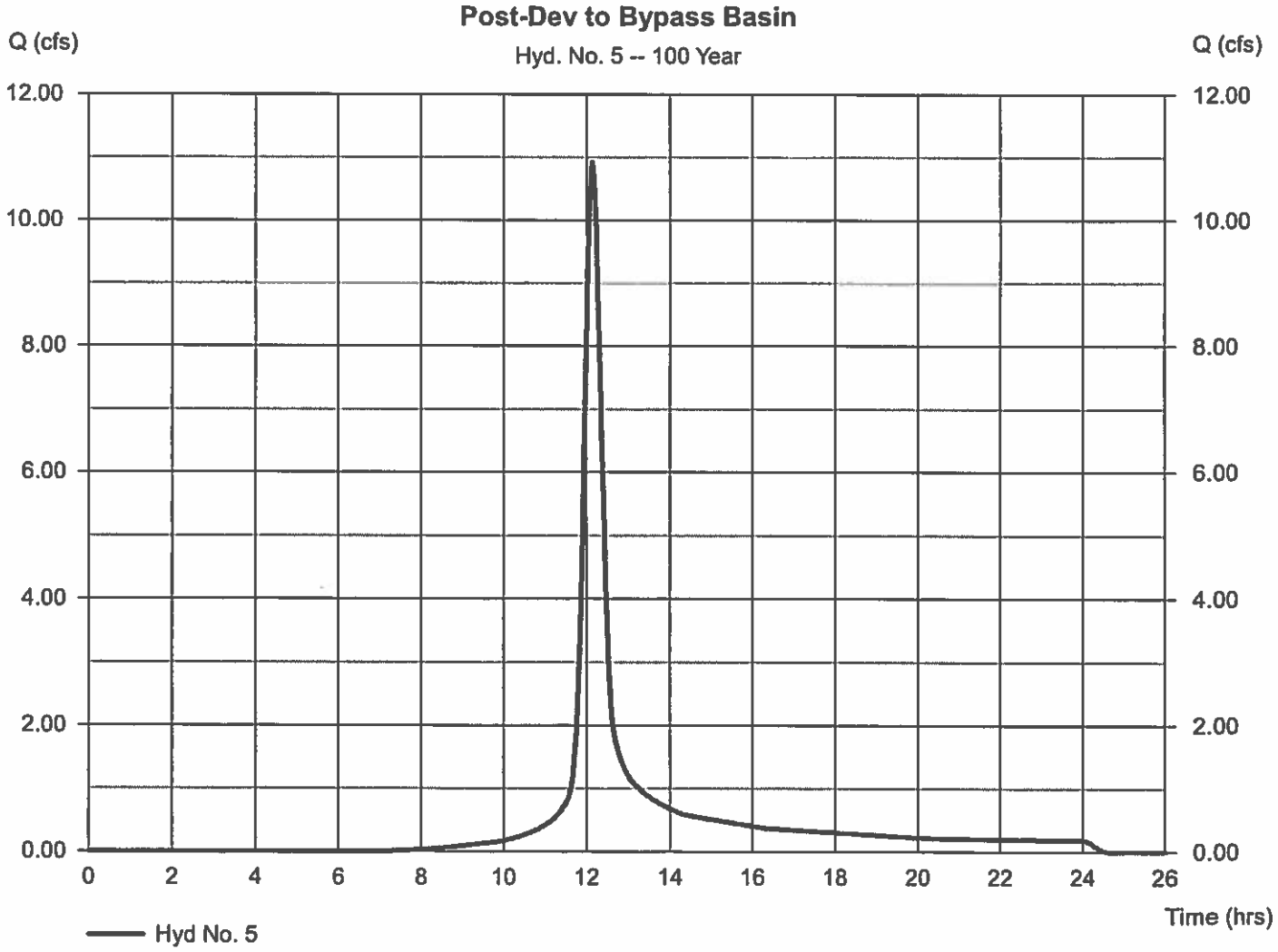
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 5

Post-Dev to Bypass Basin

Hydrograph type	= SCS Runoff	Peak discharge	= 10.92 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 40,084 cuft
Drainage area	= 2.593 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 23.77 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



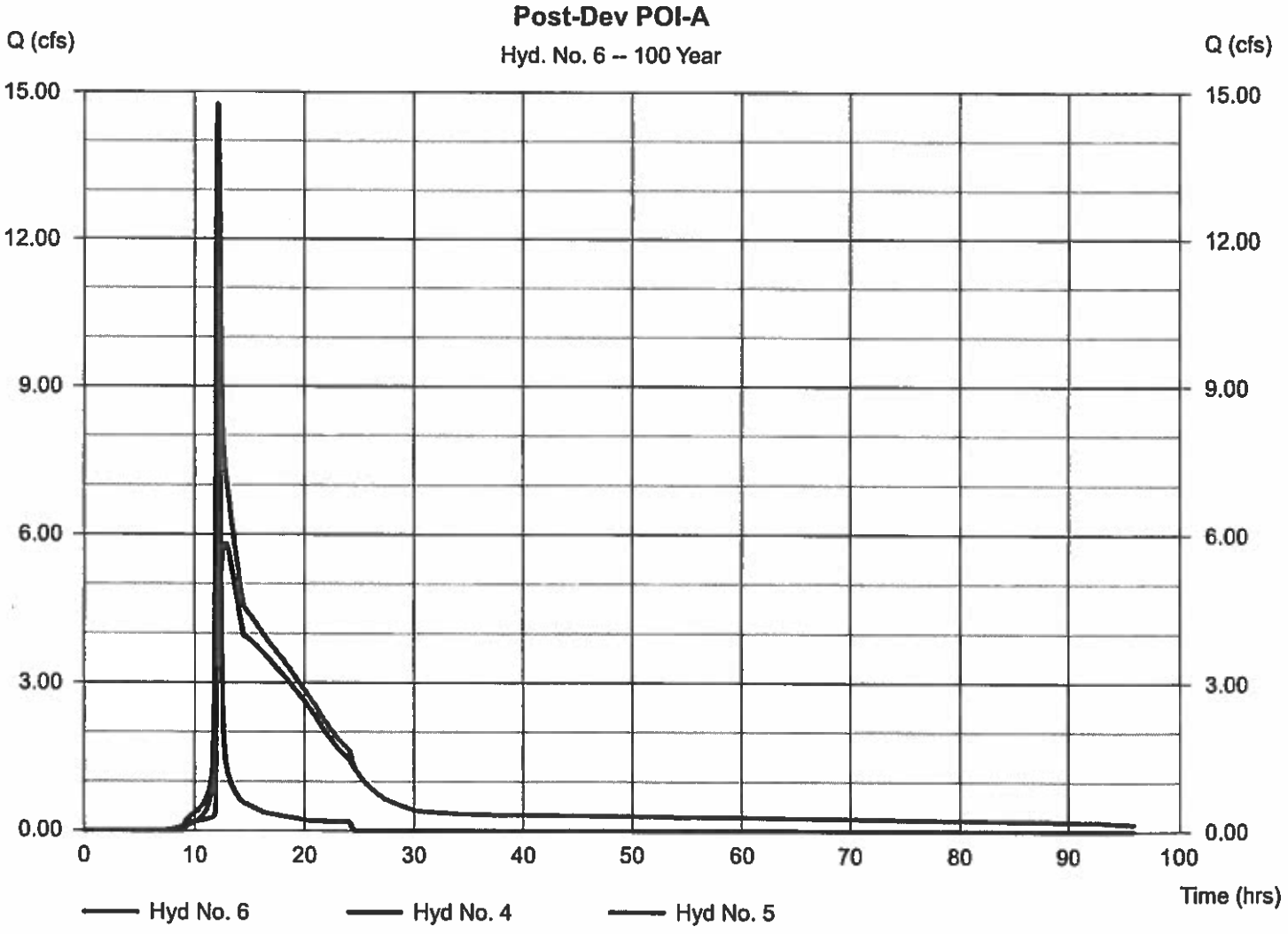
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 6

Post-Dev POI-A

Hydrograph type	= Combine	Peak discharge	= 14.75 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 262,203 cuft
Inflow hyds.	= 4, 5	Contrib. drain. area	= 2.593 ac



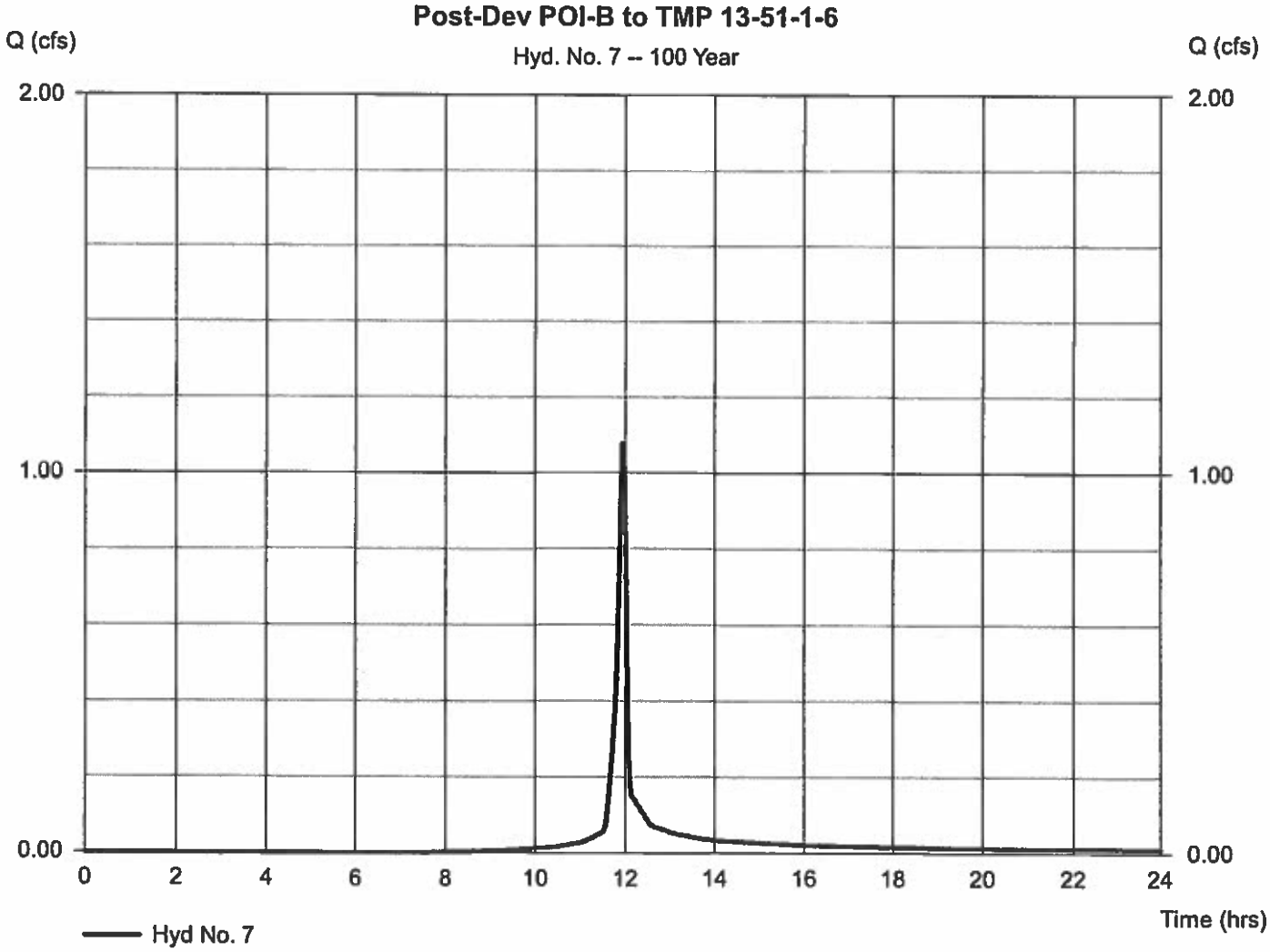
Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.22 — Wednesday, Apr 17, 2019

Hyd. No. 7

Post-Dev POI-B to TMP 13-51-1-6

Hydrograph type	= SCS Runoff	Peak discharge	= 1.078 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 2,196 cuft
Drainage area	= 0.153 ac	Curve number	= 74
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



STORM SEWER DESIGN

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development

Inlet Calculations

INL-1				
	Area =	22,097	0.51	
Description	C	SF	A	C x A
Impervious	0.95	16,290	0.37	0.36
Grass	0.35	5,807	0.13	0.05
Forest	0.25	0	0.00	0.00
TOTAL		22,097	0.51	0.40
			RC	0.79

INL-2				
	Area =	15,348	0.35	
Description	C	SF	A	C x A
Impervious	0.95	15,348	0.35	0.33
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		15,348	0.35	0.33
			RC	0.95

INL-3				
	Area =	1,324	0.03	
Description	C	SF	A	C x A
Impervious	0.95	1,324	0.03	0.03
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		1,324	0.03	0.03
			RC	0.95

INL-4				
	Area =	8,456	0.19	
Description	C	SF	A	C x A
Impervious	0.95	8,456	0.19	0.18
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		8,456	0.19	0.18
			RC	0.95

INL-5				
	Area =	27,953	0.64	
Description	C	SF	A	C x A
Impervious	0.95	23,032	0.53	0.50
Grass	0.35	4,921	0.11	0.04
Forest	0.25	0	0.00	0.00
TOTAL		27,953	0.64	0.54
			RC	0.84

INL-6				
	Area =	16,482	0.38	
Description	C	SF	A	C x A
Impervious	0.95	12,297	0.28	0.27
Grass	0.35	4,185	0.10	0.03
Forest	0.25	0	0.00	0.00
TOTAL		16,482	0.38	0.30
			RC	0.80

INL-7				
	Area =	17,695	0.41	
Description	C	SF	A	C x A
Impervious	0.95	10,482	0.24	0.23
Grass	0.35	7,213	0.17	0.06
Forest	0.25	0	0.00	0.00
TOTAL		17,695	0.41	0.29
			RC	0.71

INL-8				
	Area =	9,960	0.23	
Description	C	SF	A	C x A
Impervious	0.95	6,940	0.16	0.15
Grass	0.35	3,020	0.07	0.02
Forest	0.25	0	0.00	0.00
TOTAL		9,960	0.23	0.18
			RC	0.77

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development

Inlet Calculations

INL-9				
	Area =	8,971	0.21	
Description	C	SF	A	C x A
Impervious	0.95	6,775	0.16	0.15
Grass	0.35	2,196	0.05	0.02
Forest	0.25	0	0.00	0.00
TOTAL		8,971	0.21	0.17
			RC	0.80

INL-10				
	Area =	5,179	0.12	
Description	C	SF	A	C x A
Impervious	0.95	4,037	0.09	0.09
Grass	0.35	1,142	0.03	0.01
Forest	0.25	0	0.00	0.00
TOTAL		5,179	0.12	0.10
			RC	0.82

INL-11				
	Area =	13,064	0.30	
Description	C	SF	A	C x A
Impervious	0.95	9,666	0.22	0.21
Grass	0.35	3,398	0.08	0.03
Forest	0.25	0	0.00	0.00
TOTAL		13,064	0.30	0.24
			RC	0.79

INL-12				
	Area =	24,299	0.56	
Description	C	SF	A	C x A
Impervious	0.95	23,181	0.53	0.51
Grass	0.35	1,118	0.03	0.01
Forest	0.25	0	0.00	0.00
TOTAL		24,299	0.56	0.51
			RC	0.92

INL-13				
	Area =	15,224	0.35	
Description	C	SF	A	C x A
Impervious	0.95	15,071	0.35	0.33
Grass	0.35	153	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		15,224	0.35	0.33
			RC	0.94

TD-1				
	Area =	2,201	0.05	
Description	C	SF	A	C x A
Impervious	0.95	2,201	0.05	0.05
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		2,201	0.05	0.05
			RC	0.95

TD-2				
	Area =	9,582	0.22	
Description	C	SF	A	C x A
Impervious	0.95	9,582	0.22	0.21
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		9,582	0.22	0.21
			RC	0.95

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development

Inlet Calculations

TD-3				
	Area =	8,561	0.20	
Description	C	SF	A	C x A
Impervious	0.95	6,664	0.15	0.15
Grass	0.35	1,897	0.04	0.02
Forest	0.25	0	0.00	0.00
TOTAL		8,561	0.20	0.16
			RC	0.82

AD-1				
	Area =	13,266	0.30	
Description	C	SF	A	C x A
Impervious	0.95	13,266	0.30	0.29
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		13,266	0.30	0.29
			RC	0.95

AD-2				
	Area =	12,872	0.30	
Description	C	SF	A	C x A
Impervious	0.95	12,872	0.30	0.28
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		12,872	0.30	0.28
			RC	0.95

AD-3				
	Area =	9,176	0.21	
Description	C	SF	A	C x A
Impervious	0.95	9,176	0.21	0.20
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		9,176	0.21	0.20
			RC	0.95

AD-4				
	Area =	9,109	0.21	
Description	C	SF	A	C x A
Impervious	0.95	9,109	0.21	0.20
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		9,109	0.21	0.20
			RC	0.95

AD-5				
	Area =	23,459	0.54	
Description	C	SF	A	C x A
Impervious	0.95	23,459	0.54	0.51
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		23,459	0.54	0.51
			RC	0.95

AD-6				
	Area =	35,263	0.81	
Description	C	SF	A	C x A
Impervious	0.95	35,263	0.81	0.77
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		35,263	0.81	0.77
			RC	0.95

AD-7				
	Area =	2,637	0.06	
Description	C	SF	A	C x A
Impervious	0.95	2,637	0.06	0.06
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		2,637	0.06	0.06
			RC	0.95

Project Name Elcon Recycling
Project Number 12-07083
Condition Post-Development

Inlet Calculations

AD-8				
	Area =	8,062	0.19	
Description	C	SF	A	C x A
Impervious	0.95	8,062	0.19	0.18
Grass	0.35	0	0.00	0.00
Forest	0.25	0	0.00	0.00
TOTAL		8,062	0.19	0.18
			RC	0.95

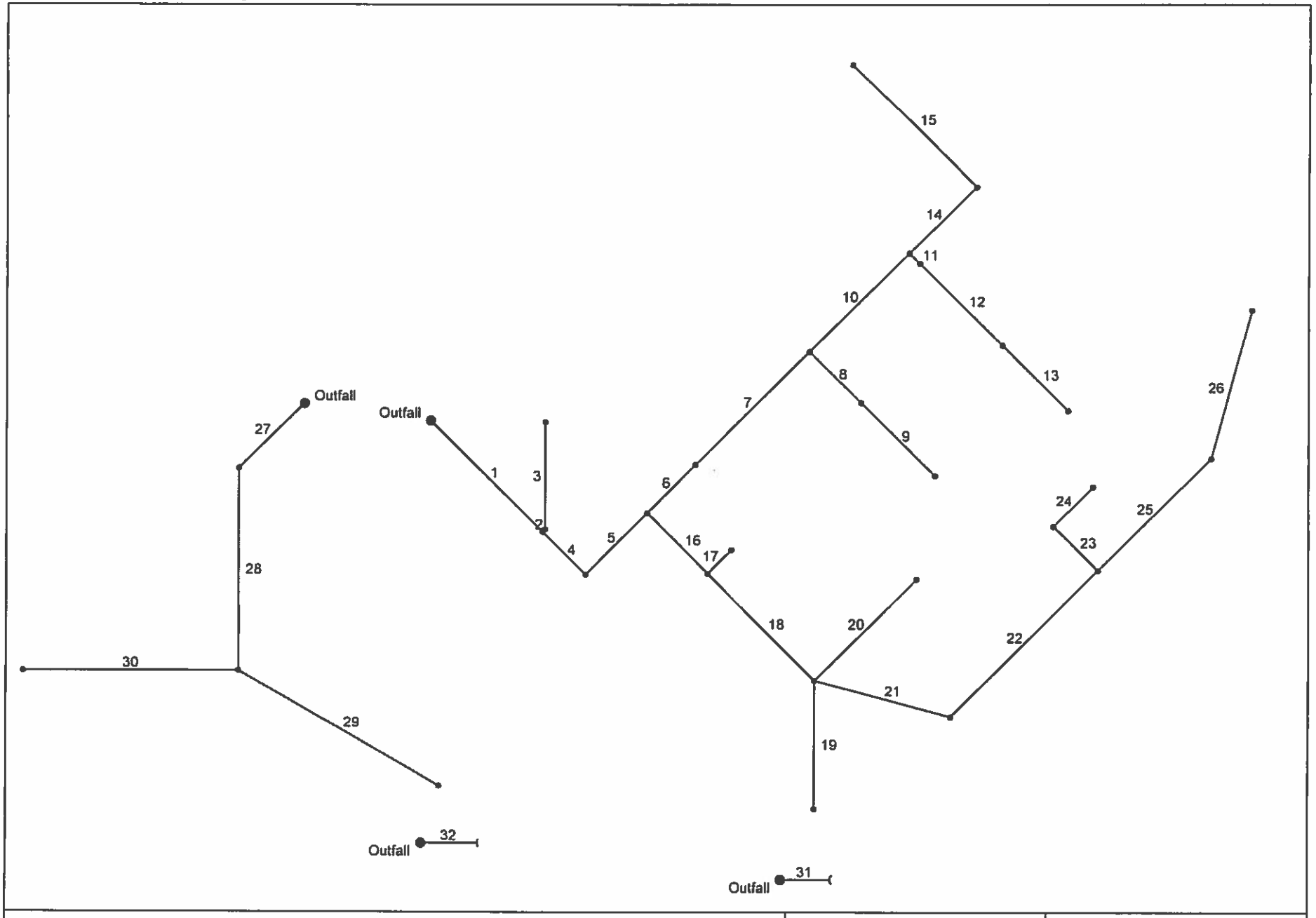
Pre-Dev HW-1				
	Area =	819	0.019	
Description	C	SF	A	C x A
Impervious	0.95	0	0.00	0.00
Grass	0.35	819	0.02	0.01
Forest	0.25	0	0.00	0.00
TOTAL		819	0.02	0.01
			RC	0.35

Pre-Dev HW-2				
	Area =	45,486	1.044	
Description	C	SF	A	C x A
Impervious	0.95	0	0.00	0.00
Grass	0.35	45,486	1.04	0.37
Forest	0.25	0	0.00	0.00
TOTAL		45,486	1.04	0.37
			RC	0.35

Post-Dev HW-1				
	Area =	613	0.014	
Description	C	SF	A	C x A
Impervious	0.95	0	0.00	0.00
Grass	0.35	613	0.01	0.00
Forest	0.25	0	0.00	0.00
TOTAL		613	0.01	0.00
			RC	0.35

Post-Dev HW-2				
	Area =	39,818	0.914	
Description	C	SF	A	C x A
Impervious	0.95	0	0.00	0.00
Grass	0.35	39,818	0.91	0.32
Forest	0.25	0	0.00	0.00
TOTAL		39,818	0.91	0.32
			RC	0.35

Elcon Recycling



Project File: Elcon Recycling.stm	Number of lines: 32	Date: 4/15/2019

Storm Sewers v2019.20

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	STMH-1 to EW-1	36.14	36	Cir	141.000	13.50	14.21	0.504	15.72	16.17	n/a	17.40 i	End	Manhole
2	STMH-2 to STMH-1	3.24	15	Cir	3.000	14.38	14.40	0.667	17.40*	17.40*	0.08	17.49	1	Manhole
3	INL-1 to STMH-2	3.30	15	Cir	96.000	14.57	15.05	0.500	17.49*	17.74*	0.11	17.85	2	Combination
4	WQ FILTER to STMH-1	33.65	36	Cir	54.000	14.38	14.65	0.500	17.40	17.51	0.36	17.88	1	Manhole
5	STMH-3 to WQ FILTER	33.87	36	Cir	78.000	15.00	15.40	0.513	17.88	17.29	n/a	18.46 i	4	Manhole
6	INL-2 to STMH-3	21.60	30	Cir	61.000	15.57	15.88	0.508	18.46*	18.63*	0.15	18.78	5	Combination
7	INL-3 to INL-2	19.45	30	Cir	144.000	16.05	16.77	0.500	18.83	19.12	0.38	19.51	6	Combination
8	AD-1 to INL-3	4.55	15	Cir	65.000	16.94	17.27	0.508	19.55*	19.87*	0.11	19.98	7	Grate
9	AD-2 to AD-1	2.34	15	Cir	93.000	17.44	17.91	0.505	20.14*	20.26*	0.06	20.32	8	Grate
10	INL-4 to INL-3	15.05	24	Cir	125.000	16.94	17.57	0.504	19.51*	20.06*	0.54	20.60	7	Combination
11	AD-3 to INL-4	7.26	18	Cir	13.000	17.74	17.81	0.538	20.69*	20.75*	0.13	20.88	10	Grate
12	AD-4 to AD-3	5.77	18	Cir	104.000	17.98	18.53	0.529	20.98*	21.29*	0.08	21.38	11	Grate
13	AD-5 to AD-4	4.21	15	Cir	83.000	18.70	19.15	0.542	21.38*	21.73*	0.18	21.91	12	Grate
14	INL-5 to INL-4	6.62	18	Cir	84.000	17.74	18.16	0.500	20.73*	21.07*	0.33	21.40	10	Combination
15	INL-6 to INL-5	2.49	15	Cir	156.000	18.33	19.11	0.500	21.55*	21.78*	0.06	21.85	14	Combination
16	INL-7 to STMH-3	15.00	30	Cir	77.000	15.57	15.96	0.506	18.46*	18.56*	0.22	18.78	5	Combination
17	AD-6 to INL-7	6.31	18	Cir	30.000	16.13	16.28	0.500	18.78*	18.89*	0.20	19.08	16	Grate
18	STMH-4 to INL-7	8.06	24	Cir	135.000	16.13	16.81	0.504	18.82*	18.99*	0.10	19.09	16	Manhole
19	TD-1 to STMH-4	0.39	15	Cir	114.000	17.33	17.90	0.500	19.19*	19.20*	0.00	19.20	18	Grate
20	TD-2 to STMH-4	1.71	15	Cir	128.000	17.33	19.15	1.422	19.17	19.67	n/a	19.92 i	18	Grate
21	INL-8 to STMH-4	6.76	18	Cir	125.000	16.98	17.61	0.504	19.09*	19.61*	0.30	19.92	18	Combination
22	INL-9 to INL-8	5.61	18	Cir	185.000	17.78	18.71	0.503	19.99*	20.51*	0.24	20.75	21	Combination
23	AD-7 to INL-9	1.90	15	Cir	56.000	18.88	19.16	0.500	20.87*	20.92*	0.06	20.97	22	Grate
24	AD-8 to AD-7	1.48	15	Cir	50.000	19.33	19.60	0.540	20.99*	21.01*	0.02	21.04	23	Grate

Elcon Recycling | Number of lines: 32 | Run Date: 4/15/2019

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; i - Inlet control.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	INL-10 to INL-9	2.63	15	Cir	142.000	18.88	19.59	0.500	20.83*	21.07*	0.06	21.13	22	Combination
26	INL-11 to INL-10	1.94	15	Cir	138.000	19.76	20.45	0.500	21.16	21.29	0.08	21.36	25	Combination
27	STMH-5 to EW-2	7.36	18	Cir	82.000	13.65	14.08	0.524	14.70	15.32	n/a	15.60 i	End	Manhole
28	INL-12 to STMH-5	7.50	18	Cir	181.000	14.25	15.25	0.552	15.60	16.42	n/a	16.87 i	27	Combination
29	TD-3 to INL-12	1.34	15	Cir	205.000	15.45	16.50	0.512	16.87	17.08	0.09	17.17	28	Grate
30	INL-13 to INL-12	2.70	15	Cir	190.000	15.45	16.40	0.500	16.87	17.23	0.15	17.38	28	Combination
31	HW-1 to EW-4	0.09	15	Cir	44.000	17.18	17.40	0.500	17.29	17.53	n/a	17.53 i	End	OpenHeadwall
32	HW-2 to EW-5	1.84	24	Cir	50.000	14.40	14.75	0.700	14.87	15.22	n/a	15.42 i	End	OpenHeadwall

Elcon Recycling | Number of lines: 32 | Run Date: 4/15/2019

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; i - Inlet control.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	141.000	0.00	6.26	0.00	0.00	5.50	0.0	12.6	6.6	36.14	47.33	6.92	36	0.50	13.50	14.21	15.72	16.17	18.00	22.90	STMH-1 to EW-1
2	1	3.000	0.00	0.51	0.00	0.00	0.40	0.0	5.6	8.0	3.24	5.27	2.64	15	0.67	14.38	14.40	17.40	17.40	22.90	22.85	STMH-2 to STMH
3	2	96.000	0.51	0.51	0.79	0.40	0.40	5.0	5.0	8.2	3.30	4.57	2.69	15	0.50	14.57	15.05	17.49	17.74	22.85	21.35	INL-1 to STMH-2
4	1	54.000	0.00	5.75	0.00	0.00	5.10	0.0	12.4	6.6	33.65	47.16	4.80	36	0.50	14.38	14.65	17.40	17.51	22.90	23.60	WQ FILTER to ST
5	4	78.000	0.00	5.75	0.00	0.00	5.10	0.0	12.2	6.6	33.87	47.76	6.04	36	0.51	15.00	15.40	17.88	17.29	23.60	21.80	STMH-3 to WQ FI
6	5	61.000	0.35	3.15	0.95	0.33	2.87	5.0	7.7	7.5	21.60	29.24	4.40	30	0.51	15.57	15.88	18.46	18.63	21.80	20.95	INL-2 to STMH-3
7	6	144.000	0.03	2.80	0.95	0.03	2.53	5.0	7.1	7.7	19.45	29.00	4.01	30	0.50	16.05	16.77	18.83	19.12	20.95	22.55	INL-3 to INL-2
8	7	65.000	0.30	0.60	0.95	0.29	0.57	5.0	5.8	8.0	4.55	4.60	3.71	15	0.51	16.94	17.27	19.55	19.87	22.55	21.00	AD-1 to INL-3
9	8	93.000	0.30	0.30	0.95	0.29	0.29	5.0	5.0	8.2	2.34	4.59	1.90	15	0.51	17.44	17.91	20.14	20.26	21.00	21.20	AD-2 to AD-1
10	7	125.000	0.19	2.17	0.95	0.18	1.93	5.0	6.6	7.8	15.05	16.06	4.79	24	0.50	16.94	17.57	19.51	20.06	22.55	21.65	INL-4 to INL-3
11	10	13.000	0.21	0.96	0.95	0.20	0.91	5.0	5.9	8.0	7.26	7.71	4.11	18	0.54	17.74	17.81	20.69	20.75	21.65	22.00	AD-3 to INL-4
12	11	104.000	0.21	0.75	0.95	0.20	0.71	5.0	5.4	8.1	5.77	7.64	3.26	18	0.53	17.98	18.53	20.98	21.29	22.00	22.50	AD-4 to AD-3
13	12	83.000	0.54	0.54	0.95	0.51	0.51	5.0	5.0	8.2	4.21	4.75	3.43	15	0.54	18.70	19.15	21.38	21.73	22.50	22.25	AD-5 to AD-4
14	10	84.000	0.64	1.02	0.84	0.54	0.84	5.0	6.3	7.9	6.62	7.43	3.75	18	0.50	17.74	18.16	20.73	21.07	21.65	22.05	INL-5 to INL-4
15	14	156.000	0.38	0.38	0.80	0.30	0.30	5.0	5.0	8.2	2.49	4.57	2.03	15	0.50	18.33	19.11	21.55	21.78	22.05	22.21	INL-6 to INL-5
16	5	77.000	0.41	2.60	0.71	0.29	2.24	5.0	11.8	6.7	15.00	29.19	3.06	30	0.51	15.57	15.96	18.46	18.56	21.80	20.70	INL-7 to STMH-3
17	16	30.000	0.81	0.81	0.95	0.77	0.77	5.0	5.0	8.2	6.31	7.43	3.57	18	0.50	16.13	16.28	18.78	18.89	20.70	19.63	AD-6 to INL-7
18	16	135.000	0.00	1.38	0.00	0.00	1.17	0.0	11.0	6.9	8.06	16.05	2.56	24	0.50	16.13	16.81	18.82	18.99	20.70	22.70	STMH-4 to INL-7
19	18	114.000	0.05	0.05	0.95	0.05	0.05	5.0	5.0	8.2	0.39	4.57	0.32	15	0.50	17.33	17.90	19.19	19.20	22.70	21.00	TD-1 to STMH-4
20	18	128.000	0.22	0.22	0.95	0.21	0.21	5.0	5.0	8.2	1.71	7.70	2.47	15	1.42	17.33	19.15	19.17	19.67	22.70	22.25	TD-2 to STMH-4
21	18	125.000	0.23	1.11	0.77	0.18	0.92	5.0	8.5	7.4	6.76	7.46	3.83	18	0.50	16.98	17.61	19.09	19.61	22.70	23.00	INL-8 to STMH-4
22	21	185.000	0.21	0.88	0.80	0.17	0.74	5.0	7.5	7.6	5.61	7.45	3.18	18	0.50	17.78	18.71	19.99	20.51	23.00	23.00	INL-9 to INL-8

Elcon Recycling | Number of lines: 32 | Run Date: 4/15/2019

NOTES:Intensity = 300.36 / (Inlet time + 27.00) ^ 1.04; Return period =Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	56.000	0.06	0.25	0.95	0.06	0.24	5.0	5.7	8.0	1.90	4.57	1.55	15	0.50	18.88	19.16	20.87	20.92	23.00	22.45	AD-7 to INL-9
24	23	50.000	0.19	0.19	0.95	0.18	0.18	5.0	5.0	8.2	1.48	4.75	1.21	15	0.54	19.33	19.60	20.99	21.01	22.45	23.00	AD-8 to AD-7
25	22	142.000	0.12	0.42	0.82	0.10	0.34	5.0	6.5	7.8	2.63	4.57	2.14	15	0.50	18.88	19.59	20.83	21.07	23.00	23.60	INL-10 to INL-9
26	25	138.000	0.30	0.30	0.79	0.24	0.24	5.0	5.0	8.2	1.94	4.57	1.90	15	0.50	19.76	20.45	21.16	21.29	23.60	23.55	INL-11 to INL-10
27	End	82.000	0.00	1.11	0.00	0.00	1.01	0.0	8.8	7.3	7.36	7.60	5.14	18	0.52	13.65	14.08	14.70	15.32	17.75	22.00	STMH-5 to EW-2
28	27	181.000	0.56	1.11	0.92	0.52	1.01	5.0	8.1	7.4	7.50	7.81	4.77	18	0.55	14.25	15.25	15.60	16.42	22.00	20.40	INL-12 to STMH-5
29	28	205.000	0.20	0.20	0.82	0.16	0.16	5.0	5.0	8.2	1.34	4.62	1.76	15	0.51	15.45	16.50	16.87	17.08	20.40	19.60	TD-3 to INL-12
30	28	190.000	0.35	0.35	0.94	0.33	0.33	5.0	5.0	8.2	2.70	4.57	2.65	15	0.50	15.45	16.40	16.87	17.23	20.40	19.50	INL-13 to INL-12
31	End	44.000	0.03	0.03	0.35	0.01	0.01	5.0	5.0	8.2	0.09	4.57	1.44	15	0.50	17.18	17.40	17.29	17.53	18.00	19.00	HW-1 to EW-4
32	End	50.000	0.64	0.64	0.35	0.22	0.22	5.0	5.0	8.2	1.84	18.92	3.27	24	0.70	14.40	14.75	14.87	15.22	17.00	17.00	HW-2 to EW-5

Elcon Recycling | Number of lines: 32 | Run Date: 4/15/2019

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PROPOSED CULVERTS ANALYSIS