RIVERSTONE
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November 11, 2015

Mary Maciejowski
Northeast Ohio Regional Sewer District
3900 Euclid Avenue
Cleveland, Ohio 44115

Re: Cedar Redevelopment Phase I – Cleveland, Ohio
Storm Water Title IV Review

Dear Mary Maciejowski:

The following letter is in response to the Northeast Ohio Regional Sewer District's (NEORSD) review of the Cedar Redevelopment Phase I plans dated July 15, 2015. The responses below correspond sequentially with your comments.

- The detail for the typical bioinfiltration cell on sheet C6.3 has been modified to model the bioretention cell from the latest edition of the Ohio Department of Natural Resources – Rainwater and Land Development (RLD). The bio soil has been adjusted to be 24" deep and the bio soil mix has been modified to use Haydite Bioblend as noted on sheet C6.3. Haydite Bioblend is a light weight material that provides filtration, 40% to 55% void space, P sorption, water retention and provides a substantial medium for vegetated growth. The fabric wrap between the stone and the Haydite Bioblend has also been removed and replaced with a filtering layer with 3" of sand and 3" of pea gravel.

- The bioinfiltration cells, as they are noted on the plans, are not meant to be bioretention cells for the treatment of the storm water quality as per the RLD. The storm water pretreatment and treatment for water quality occurs in the underground detention system. The isolator row provides the pretreatment and the infiltration of the storm water handles the water quality volume. The bioinfiltration cells are used to collect the storm water and are an additional green feature to enhance the water quality treatment. Sizing the bioinfiltration cells per the requirements as bioretention cells is not the intent of the design. These cells are just a collection point with additional filtration provided for enhanced water quality. Storm water will be filtered through the vegetation and will infiltrate through the Haydite. Storm water that exceeds the infiltration capacity of the Haydite (6 in/hr after settlement) will be collected by the elevated catch basin in each cell and discharged into the underground detention system where all of the storm water is pretreated with the isolator row and depending on the storm event 76% to 48% of the total storm water for the site, which includes the water quality volume, is infiltrated.

- A separate and site specific long term operation and maintenance manual is included.

Should you have any questions pertaining to the revised plans or this response letter please contact Riverstone.

Very truly yours,
THE RIVERSTONE COMPANY

David A. Pietrantone P.E.

DAP / jaj

11/11/15

2310 Superior Avenue Suite 110 Phone 216•491•2000 • Fax 216•491•9640
Cleveland, Ohio 44114 Internet • www.riverstonesurvey.com

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Letter of Transmittal

From: David A. Pietrantone P.E.

To: NEORSD
3900 Euclid Avenue
Cleveland OH 44115-2506

Date: August 29, 2014
Project: Cedar Redevelopment PH I
Location: E 30th & Community College
Attention: Matt Scharver

Riverstone Job # 13-286

We are sending you herewith the following items via

☐	Overnight Mail	☐	U.S. Mail	☒	Delivered by Hand	☐	
☐	Plans	☐	Shop Drawings	☐	Samples	☐	Specifications
☐	Estimates	☐	Copy of Letter	☒	Grant Application		

Copies	Date or No.	Description
1	5/19/2015	Cedar Redevelopment Phase I Improvement Plans
1	6/10/2015	Storm Water Report

These Are Transmitted as Indicated Below:

☒	For Your Use	☐	Approved as Noted	☐	Return
☒	For Approval	☐	Approved for Construction	☐	Submit
☐	As Requested	☐	Returned for Corrections	☐	Resubmit
☒	For Review and Comment	☐	Returned after Loan to Us	☐	For Bids Due
☐					

REMARKS:

Matt Scharver, please find attached a hard copy of the plans and storm water report for Cedar Redevelopment Phase I

Should you have any questions please contact Riverstone.

Please contact our office, should you have questions or comments.

IF ENCLOSURES ARE NOT AS INDICATED
PLEASE NOTIFY US AT ONCE.

Signed:

David A. Pietrantone P.E.

06/11/15

2310 Superior Avenue Suite 110
Cleveland, Ohio 44114
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Northeast Ohio Regional Sewer District
Protecting Your Health and Environment

July 15, 2015

Mr. Jeffrey A. Jardine, P.E.
The Riverstone Company
2310 Superior Avenue – Suite 110
Cleveland, Ohio 44114

Re: ***Cedar Redevelopment Phase I – Cleveland, Ohio***
Stormwater Title IV Review

Dear Mr. Jardine:

The Northeast Ohio Regional Sewer District (NEORSD) is in receipt of plans and stormwater calculations submitted by the Riverstone Company for the referenced project on June 11, 2015. The drainage area of approximately two (2) acres includes a multi-story commercial/residential building. Proposed stormwater management for the site includes an underground detention system under the parking lot to store and infiltrate stormwater with the potential to overflow directly to a local storm sewer that discharges to the NEORSD's Easterly Interceptor – E. 30th Branch. Stormwater runoff from the site is tributary to CSO-200.

The proposed stormwater management design for the site must meet the current NEORSD Title IV Combined Sewer Code requirements, detailed in the previously-sent guidance document, ***Submittal Requirements for Connections to the Combined Sewer System – Guidelines for Review and Approval.***

The following comments remain to be addressed in order for the NEORSD to complete the review at this time. Please review the following comments and submit additional information to address design requirements as indicated:

- The bio-retention cross-section shown varies from the ***Ohio Department of Natural Resources – Rainwater and Land Development Manual*** **(RLD)**. Only 1.5 foot of bio-soil is proposed in the design whereas the minimum recommended in the RLD is 2 feet. Geotextile around bottom of practice and between aggregate and bio-soil is no longer recommended. We recommend the ODNR RLD cross-section be used.

- No calculations on bio-retention sizing are provided. These are acting as a pre-filter to the underground storage, but if too small for the watershed, clogging may become an issue. Please provide supporting calculations.
- The long-term maintenance plan presented is generic. We recommend a more specific and detailed plan to meet grant requirements.

If you have any questions, please feel free to contact me at ext. 6466.

Sincerely,

Mary E. Maciejowski,
Community Discharge
Permit Program Manager

C: Elie Ramy, Cleveland WPC
Kyle Dreyfuss-Wells, NEORSD
Dave Ritter, NEORSD
Matt Scharver, NEORSD
File

I Development Plan Review Workgroup Plan Review Documents Combined Area CL-CedarExtensionPhaseI CL-CedarRedevelopmentPhaseI TuleIV 07-15-15.docx

Cedar Redevelopment Phase I
Cleveland, Ohio

Prepared for

Cedar Redevelopment Phase I, LP
429 4th Avenue
Pittsburgh, Pennsylvania 15219

Storm Water Management Report

6/10/2015

RIVERSTONE
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Introduction & Background Data

This storm water management report is prepared for the proposed Cedar Redevelopment Phase I project in Cleveland, Ohio. Cedar Redevelopment Phase I will redevelop approximately 1.9926 acres on the northeast corner of the East 30th Street and Community College Avenue in Cleveland, Ohio. The topography, boundary and utility information used for this project was completed by The Riverstone Company. Rainfall data used in this report was taken from the Northeast Ohio Regional Sewer Districts (NEORSD) requirements for connections to combination sewers, version 1.2.

Soils Condition

The Cuyahoga County GIS website identifies the soils on site as UeA – Urban Land Elnora Complex and is classified as a hydrological group B soil. Soil borings and previous work on site verify that sandy soils with higher infiltration rates are present.

Existing Conditions and Storm Water

The site was previously developed with the Cuyahoga Metropolitan Housing Authority Cedar Extension Housing Development which covered approximately 15 acres. It was a mixture of apartment buildings, concrete walks and asphalt pavement, green space was scattered throughout the site between the building and walks. All of the storm water onsite was collected by the storm sewer system and discharged to combination sewers in the public right of way. There was no detention or water quality treatment for any of the storm water. Demolition of the entire Cedar Extension Housing Development, with the exception of an apartment high rise and parking lot, was started in 2013 and completed in 2014. There are no wetlands on site and no surface waters of the state within 200' of the site.

Proposed Development and Storm Water.

The proposed development will include a multi-story commercial / residential building with a parking lot. This project is going to meet the requirements for the NEORSD and attempt to achieve the storm water credits for Green Communities and LEED. To obtain credits for the Green Communities and LEED, storm water must be retained on site and be reused or infiltrated. The soil survey of Cuyahoga County indicates that the type of soils on site have a loamy fine sand base with infiltration rates of 6" to 20" per hour. The recent demolition on this site has exposed that sandy base which demonstrates high permeability rates. Temporary sediment basins installed on site during site demolition do not use any type of outlet structure to remove the water from the site, it simply infiltrates the runoff. Sandy soils with high infiltration rates are perfect for storm water systems designed to infiltrate storm water.

The project will use an underground detention system under the parking lot to store storm water and promote infiltration. The system is designed using chambers which sit on and are encased in stone. The chambers are essentially large pipes cut in half and placed with the open side down. Storm water is discharged into the first row of chambers which is also called an isolator row. This row of chambers is wrapped in a geotextile filter fabric that filters the storm water as it passes through the system. The open bottom system allows the storm water to fill the system from the bottom up. The other benefit is that an open bottom system promotes infiltration over the entire area of the system. Infiltration is not the only outlet for storm water after it enters the system. As storm water continues to fill the system the water level rises to a row of perforated pipes set between the rows of the chambers in the stone that encases the chambers. This will allow some storm water to be discharged into a storm sewer that is directed out to the combination sewer in the public right of way. For larger storms the storm water will continue to rise and will be collected by another set of perforated pipes in the stone above the chambers. This storm water will also be discharged into the storm sewer which then goes to the combination sewer in the public right of way.

The elevated perforated pipes force the infiltration of storm water. Even after the water level rises to the perforated pipes water is continually infiltrated. For the design calculations the low end of the permeability range is used, therefore an infiltration of 6 in/hr is used, even though the onsite soils exhibit much higher infiltration rates. The table under the conclusion shows the peak flow rate and volumes being discharged into the underground system and from the underground system. Peak flows and volumes were calculated using the SCS Method and the Hydroflow Hydrograph computer program.

Storm Water Requirements

The phase I development will be designed to meet the Northeast Ohio Regional Sewer District's (NEORSD), Green Community and LEED Requirements for storm water quantity. Many of the requirements are based on the existing site conditions. Using the SCS method and the hydroflow hydrographs computer program, peak flow rates and volumes were computed for the 1, 2, 5, 10, 25, 50 and 100 year storm events. Below is table of the results

	1 Year	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Peak Flow (CFS)	2.83	3.75	5.22	6.43	8.17	9.61	11.18
Volume (CF)	7,350	9,737	13,615	16,872	21,660	25,680	30,100

Northeast Ohio Regional Sewer District Requirements

The NEORSD requires that post development peak flows shall not exceed existing condition peak flows, nor shall they result in an increase to combined sewer overflow volumes or typical year activations. Furthermore they require that the applicant shall demonstrate that storage volume shall be provided to ensure there is no increase flow to the combined sewer system for the 1, 2, and 5 year storm. For the 10 and 25 year the maximum release rate is defined as the existing conditions peak discharge of the corresponding storm frequency. In addition to maintaining pre development peak flow rates the project must also treat the required water quality volume for the site. The water quality volume for a redeveloped site is calculated using the following equation.

$$WQv = P * C * (A/12) * 20\%$$

Where

P = 0.75 inches
A = 1.9926 acres
C = 0.858(i^3) - .78(i^2) + .774(i) + 0.04
I = Impervious area / Total Area

I = 1.5217 acres/ 1.9926 acres = 0.76
C = .858(.76^3) - .78(.76^2) + .774(.76) + .04 = .55

WQv = 0.75 * 0.55 * (1.9926/12) * 20% = 0.0137 acre*ft = 597 cf.

Requirements include an additional 20% of the water quality volume for sediment storage.

597 cf * 20% = 119 cf

Total water quality volume is the water quality volume and the sediment storage volume.

TWQv = 597 cf + 119 cf = 716 cf.

This water quality volume will have to be treated before being discharged into the combined sewers in the public right of way.

Green Community Requirements

Green Community provides 2 options to obtain their post construction surface storm water management point. Option 1 requires that the project retain, infiltrate and/or harvest the first 0.5 inch of rain over the entire site in a 24 hour period. Option 2 requires that the project retain, infiltrate and/or harvest all storm water, as calculated for a one year storm event on site or on adjacent sites, so that no storm water is discharged to drains / inlets.

Option 1 retention volume is 0.5 inch x area

0.5 inch * 1 ft/12 inch * 1.9926 acres * 43560 sf/acre = 3,617 cf

LEED Requirements

LEED requirements to obtain their post construction storm water design: quantity control is based on the pre development site conditions. When the existing impervious is greater than 50% a storm water management plan must result in a 25% decrease in the volume of storm water runoff from the 2-year, 24 hour design storm. Reviewing the previous table the 2 year, 24 hour storm produces 9,737 cf of storm water runoff.

Allowable discharge volume is = 9,737 cf – (9,737 cf * 25%) = 7,303 cf

Conclusion

The use of the underground detention system will provide enough volume to detain the post developed 100 year storm and treat the required water quality volume. The table below shows the results of the storm water analysis for the site. Calculations were computed by using the SCS method and the Hydraflow Hydrographs computer program. Modeling was done for the 1, 2, 5, 10, 25, 50 and 100 year frequency storm events. Hydrographs were generated for each storm event. Discharge rates are shown in cubic feet per second (cfs) and detention volumes are shown in cubic feet.

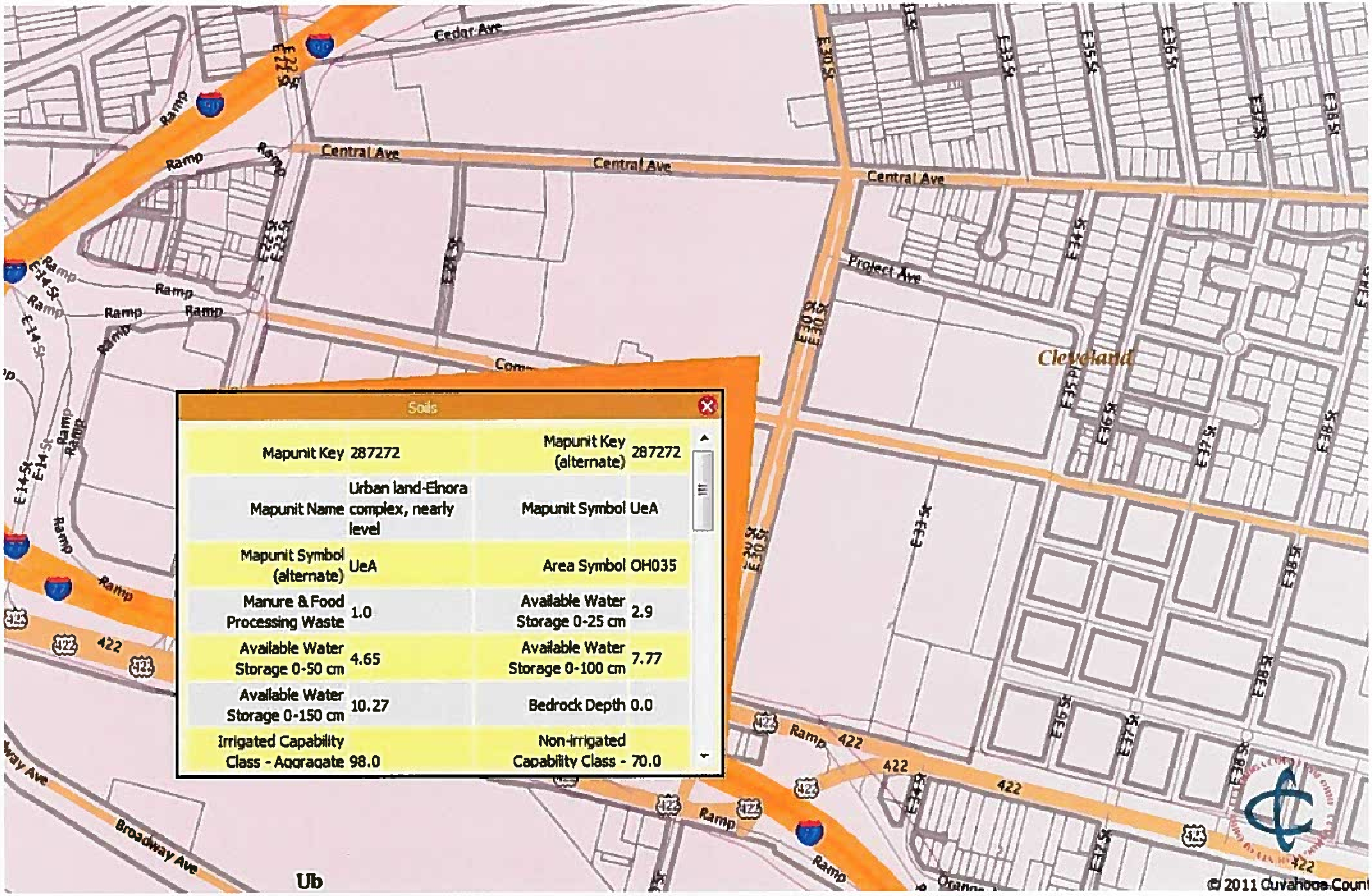
	1 year	2 year	5 year	10 year	25 year	50 year	100 year
Peak Flow to Detention System (CFS)	3.65	4.60	6.08	7.28	9.00	10.42	11.96
Volume into Detention System (CF)	9,714	12,331	16,486	19,918	24,903	29,053	33,589
Peak Flow from Detention System (CFS)	2.51	3.55	4.91	5.57	6.55	7.51	9.53
Volume from Detention System (CF)	2,242	3,669	6,097	8,222	11,466	14,301	17,524
Volume Infiltrated (CF)	7,472	8,662	10,389	11,696	13,437	14,752	16,065

Comparison of Results and Requirements

	1 year	2 year	5 year	10 year	25 year	50 year	100 year
NEORSD Requirements							
Peak Flow Allowed (CFS)	2.83	3.75	5.22	6.43	8.17	9.61	11.18
Peak Flow (CFS)	2.51	3.55	4.91	5.57	6.55	7.51	9.53
% Reduction	11.3%	7.3%	5.9%	13.4%	19.8%	21.9%	14.8%
Pre Developed Volume	7,350	9,737	13,615	16,872	21,660	25,680	30,100
Post Developed Volume	2,242	3,669	6,097	8,222	11,466	14,301	17,524
% Reduction	69.5%	62.3%	55.2%	51.3%	47.1%	44.3%	41.8%
Green Community							
Required Volume to retain or infiltrate. (CF)	3,617	3,617	3,617	3,617	3,617	3,617	3,617
Volume infiltrated (CF)	7,472	8,662	10,389	11,696	13,437	14,752	16,065
% infiltrated	206.6%	239.5%	287.2%	323.4%	371.5%	407.9%	444.2%
LEED							
Pre Developed Volume (CF)		9,737					
Discharged Volume Allowed (CF)		7,303					
Volume Discharged (CF)		3,669					
% Reduction from Predevelopment Volume		62.3%	> 25%				

Appendix

- Cuyahoga County GIS Soils Map
- Hydraflow Hydrograph Data Sheets
- Pond Report


Soils
Mapunit Key 287272
Mapunit Key (alternate) 287272
Mapunit Name Urban land-Elnora complex, nearly level
Mapunit Symbol UeA
Mapunit Symbol (alternate) UeA
Area Symbol OH035
Manure & Food Processing Waste 1.0
Available Water Storage 0-25 cm 2.9
Available Water Storage 0-50 cm 4.65
Available Water Storage 0-100 cm 7.77
Available Water Storage 0-150 cm 10.27
Bedrock Depth 0.0
Irrigated Capability Class - Aggragate 98.0
Non-irrigated Capability Class - 70.0
Cedar Ave
Central Ave
Project Ave
Broadway Ave
Cleveland
E 14 St
E 22 St
E 30 St
E 33 St
E 34 St
E 35 St
E 35 Pl
E 36 St
E 37 St
E 38 St
Ramp
422
Ub
© 2011 Cuyahoga Count

Hydraflow Hydrograph

Data Sheets

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	------	2.833	3.754	-------	5.219	6.427	8.172	9.613	11.18	Pre
3	SCS Runoff	------	2.708	3.466	-------	4.650	5.613	6.993	8.127	9.355	Post - Site
4	SCS Runoff	------	0.936	1.129	-------	1.426	1.667	2.012	2.297	2.606	Post - Bldg
5	Combine	3, 4	3.645	4.595	-------	6.076	7.280	9.005	10.42	11.96	Total to Detention
6	Reservoir	5	2.513	3.552	-------	4.908	5.566	6.552	7.512	9.529	UG Detention

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	2.833	2	720	7,350	------	------	------	Pre
3	SCS Runoff	2.708	2	720	7,052	------	------	------	Post - Site
4	SCS Runoff	0.936	2	720	2,662	------	------	------	Post - Bldg
5	Combine	3.645	2	720	9,714	3, 4	------	------	Total to Detention
6	Reservoir	2.513	2	726	2,242	5	69.04	2,338	UG Detention

Hydrograph Report

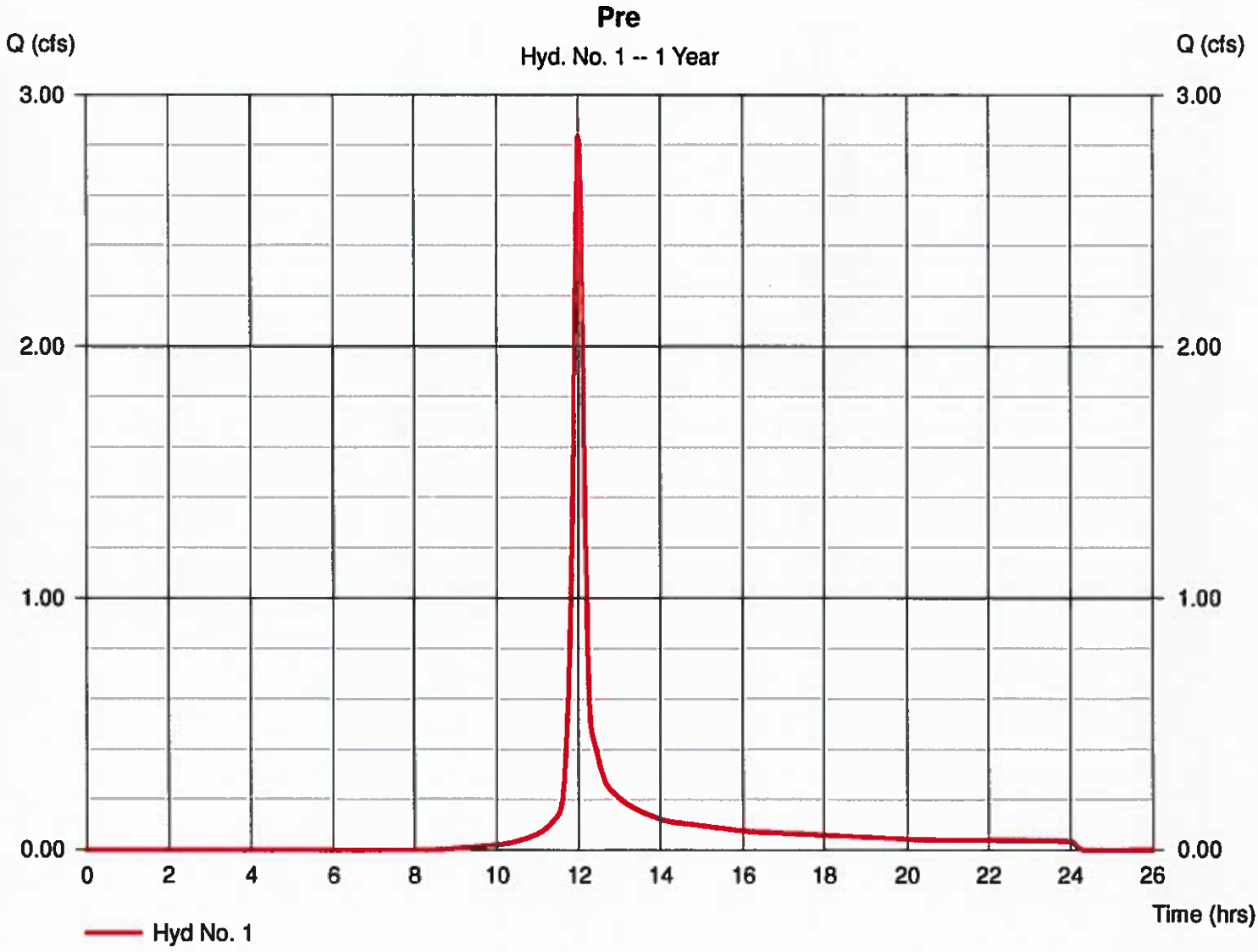
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 2.833 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 7,350 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

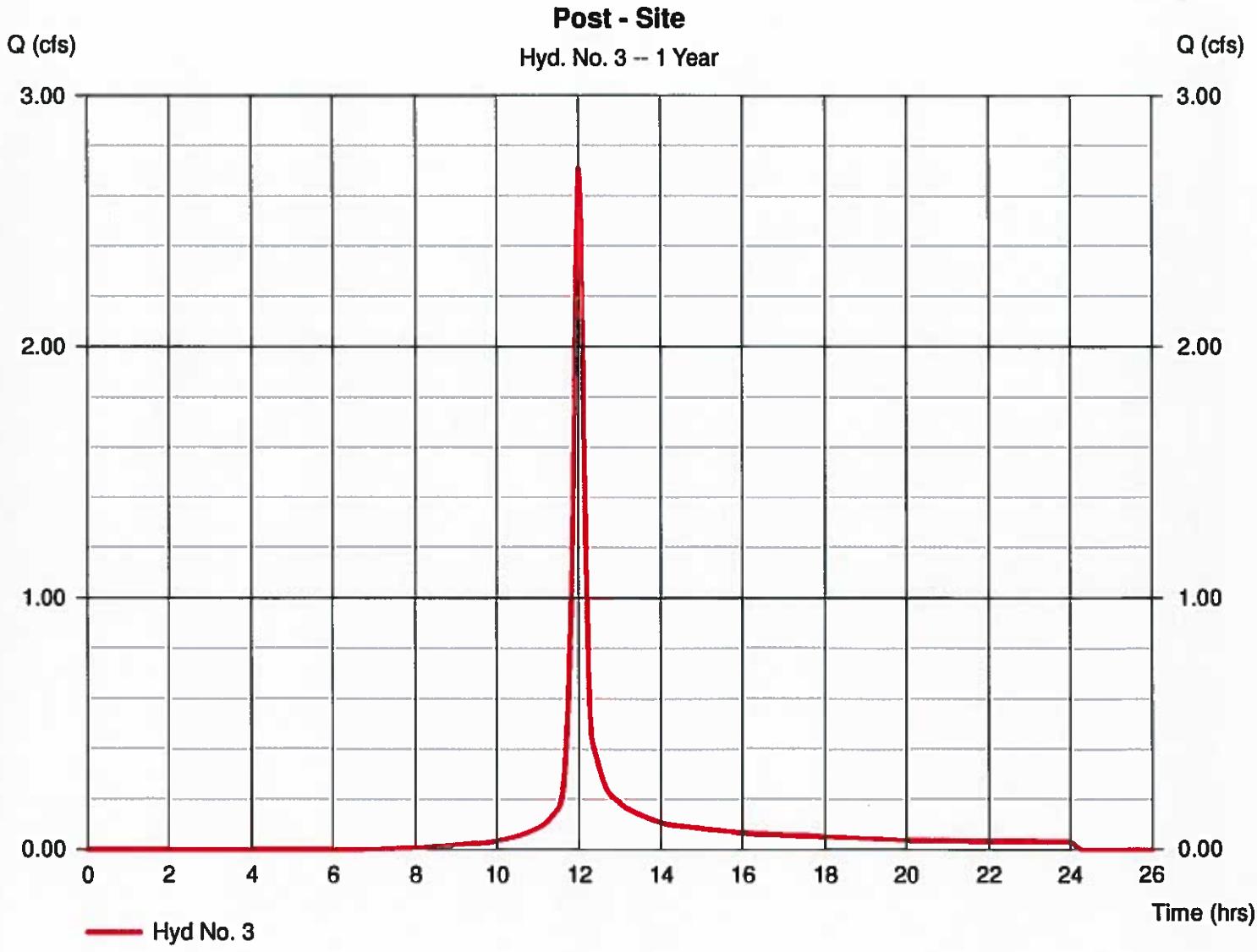
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 2.708 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 7,052 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



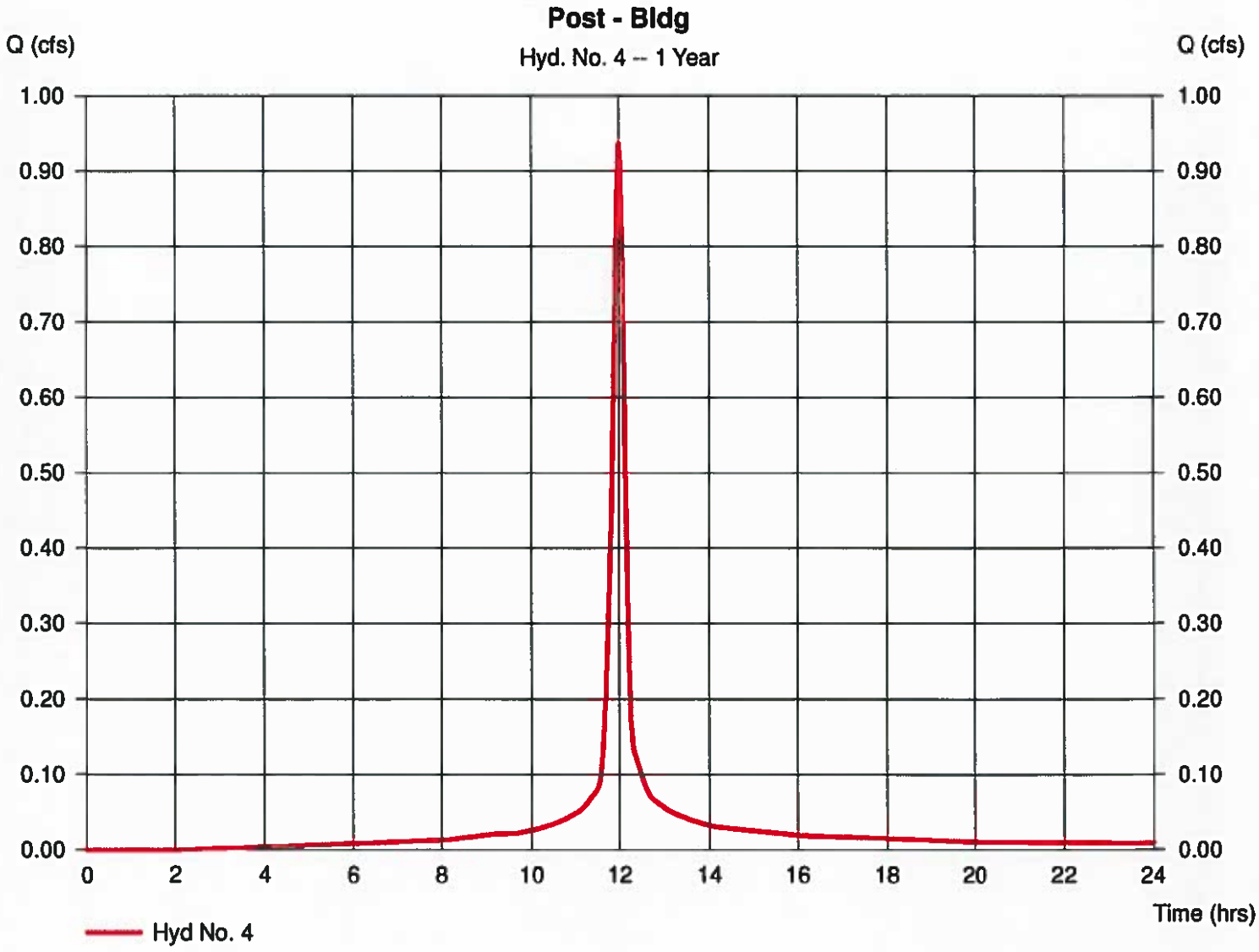
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 0.936 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 2,662 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 1.95 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



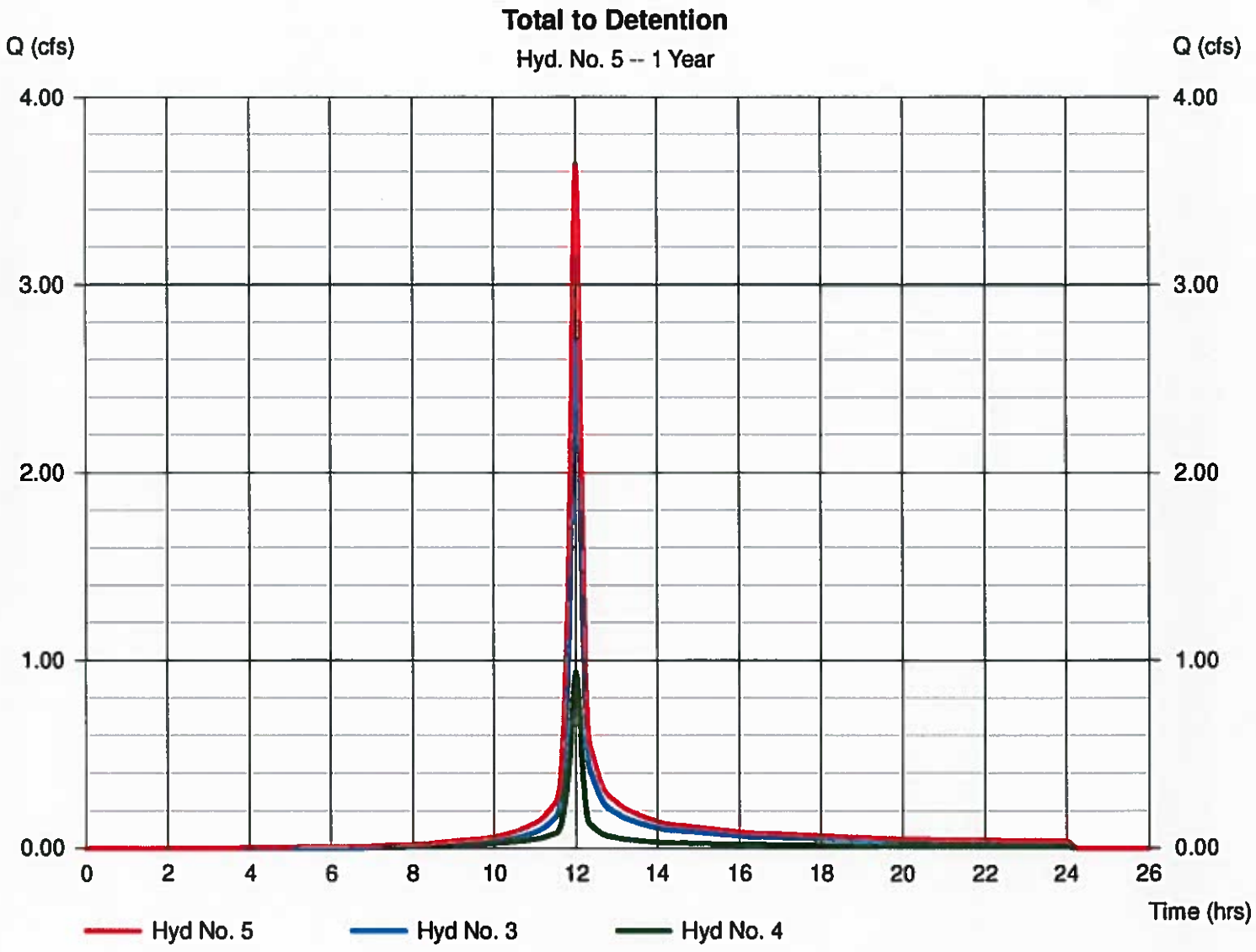
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 3.645 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 9,714 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

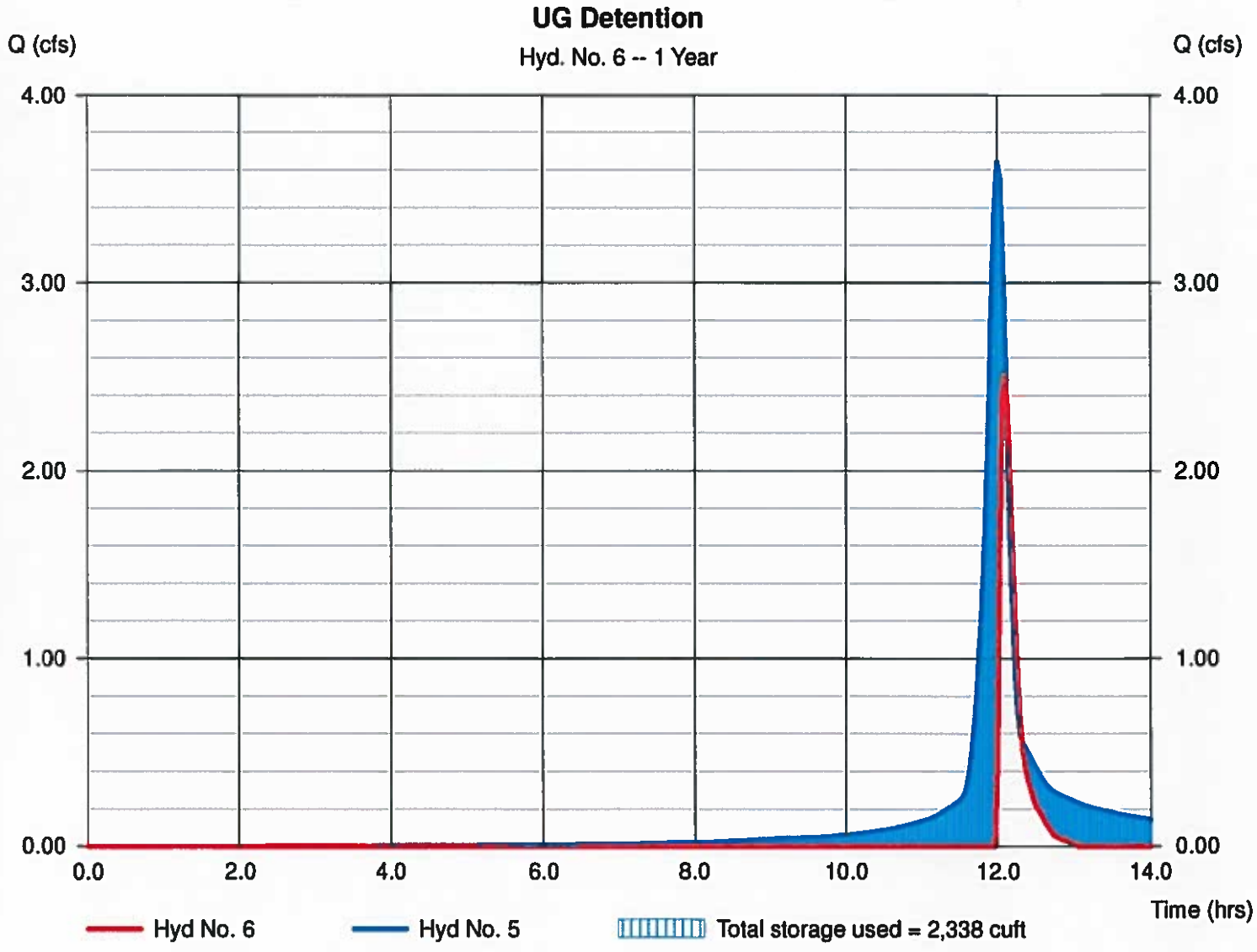
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 2.513 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 2,242 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 69.04 ft
Reservoir name	= UG	Max. Storage	= 2,338 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	3.754	2	720	9,737	------	------	------	Pre
3	SCS Runoff	3.466	2	720	9,087	------	------	------	Post - Site
4	SCS Runoff	1.129	2	720	3,244	------	------	------	Post - Bldg
5	Combine	4.595	2	720	12,331	3, 4	------	------	Total to Detention
6	Reservoir	3.552	2	724	3,669	5	69.19	2,565	UG Detention

Hydrograph Report

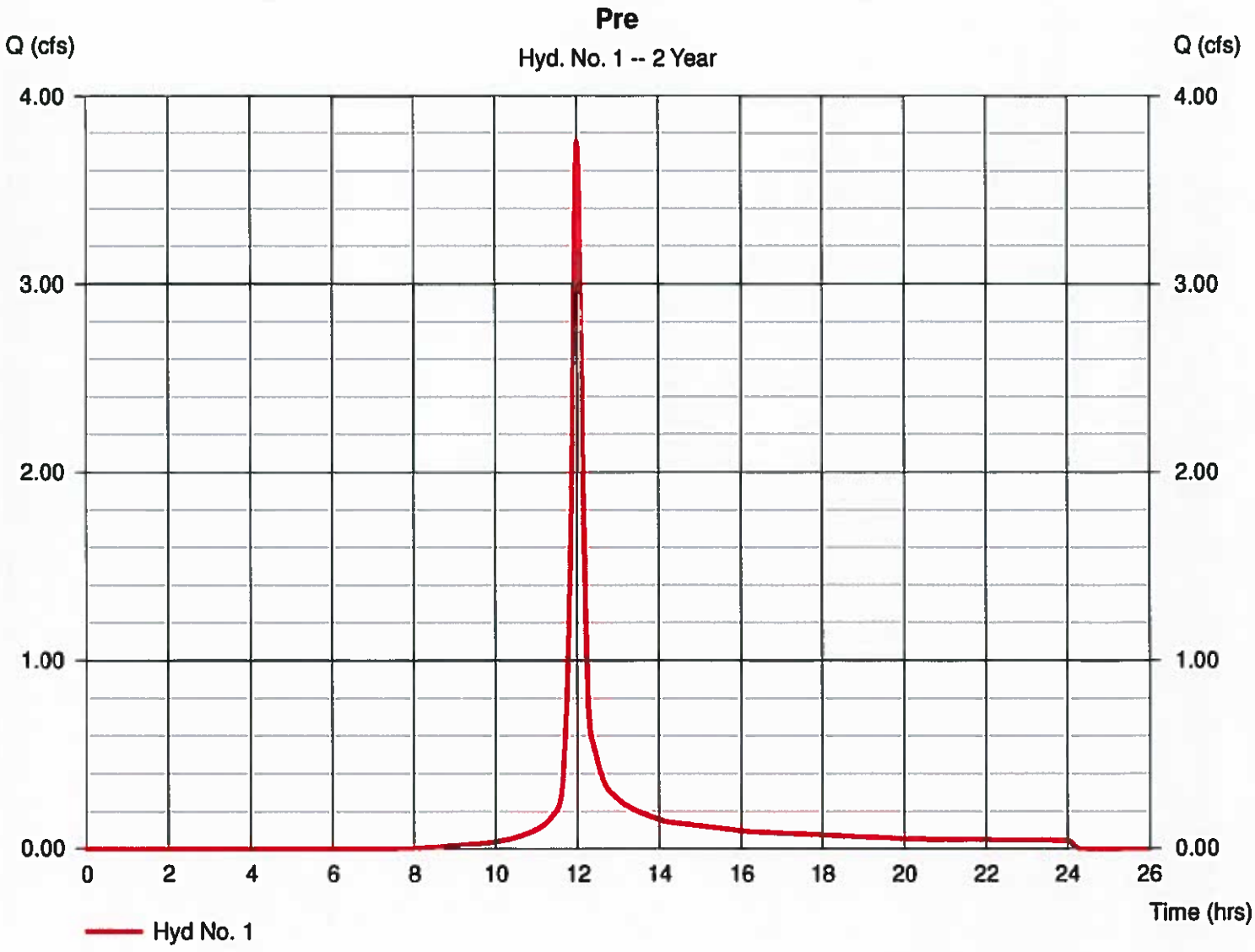
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 3.754 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 9,737 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.33 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

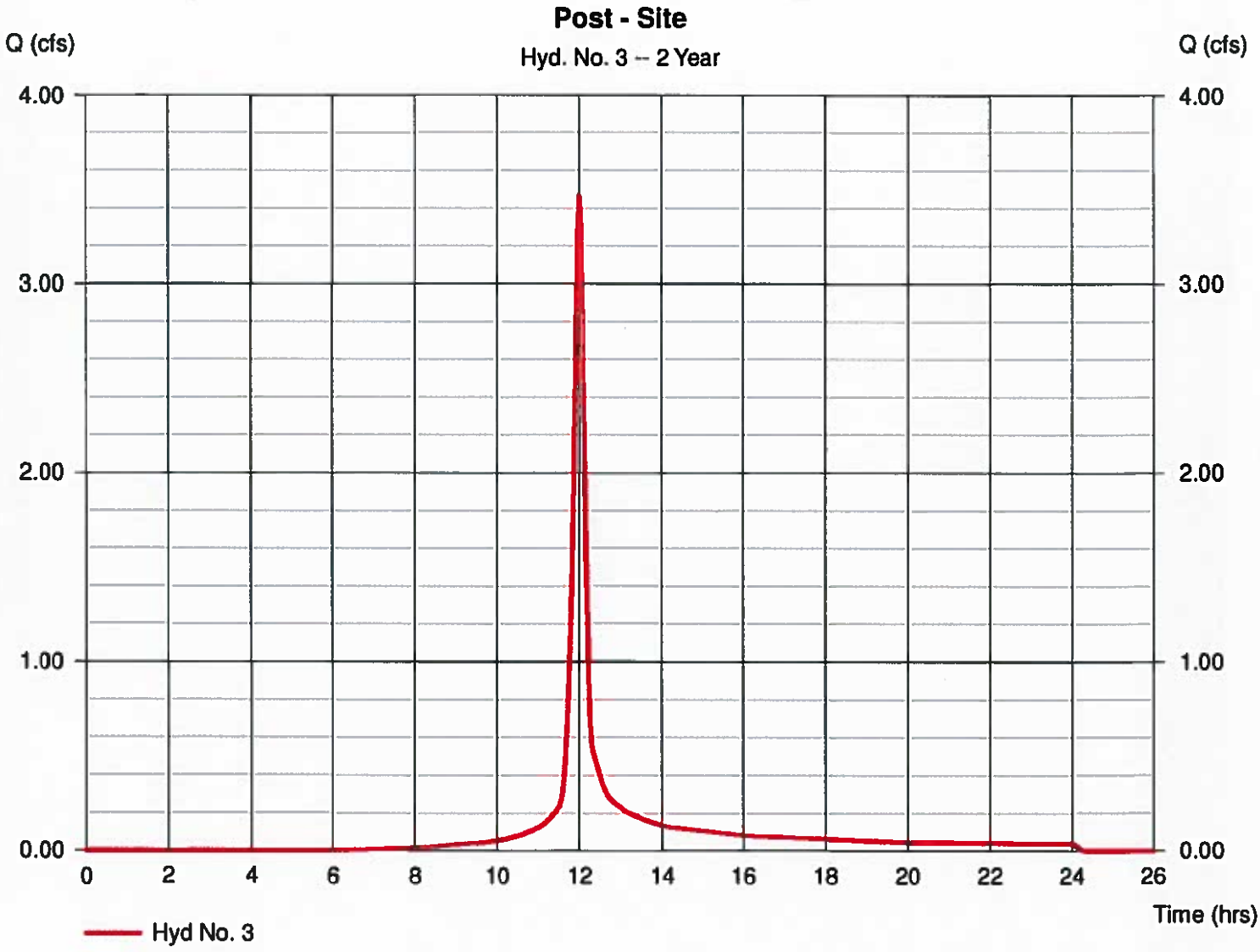
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 3.466 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 9,087 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.33 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



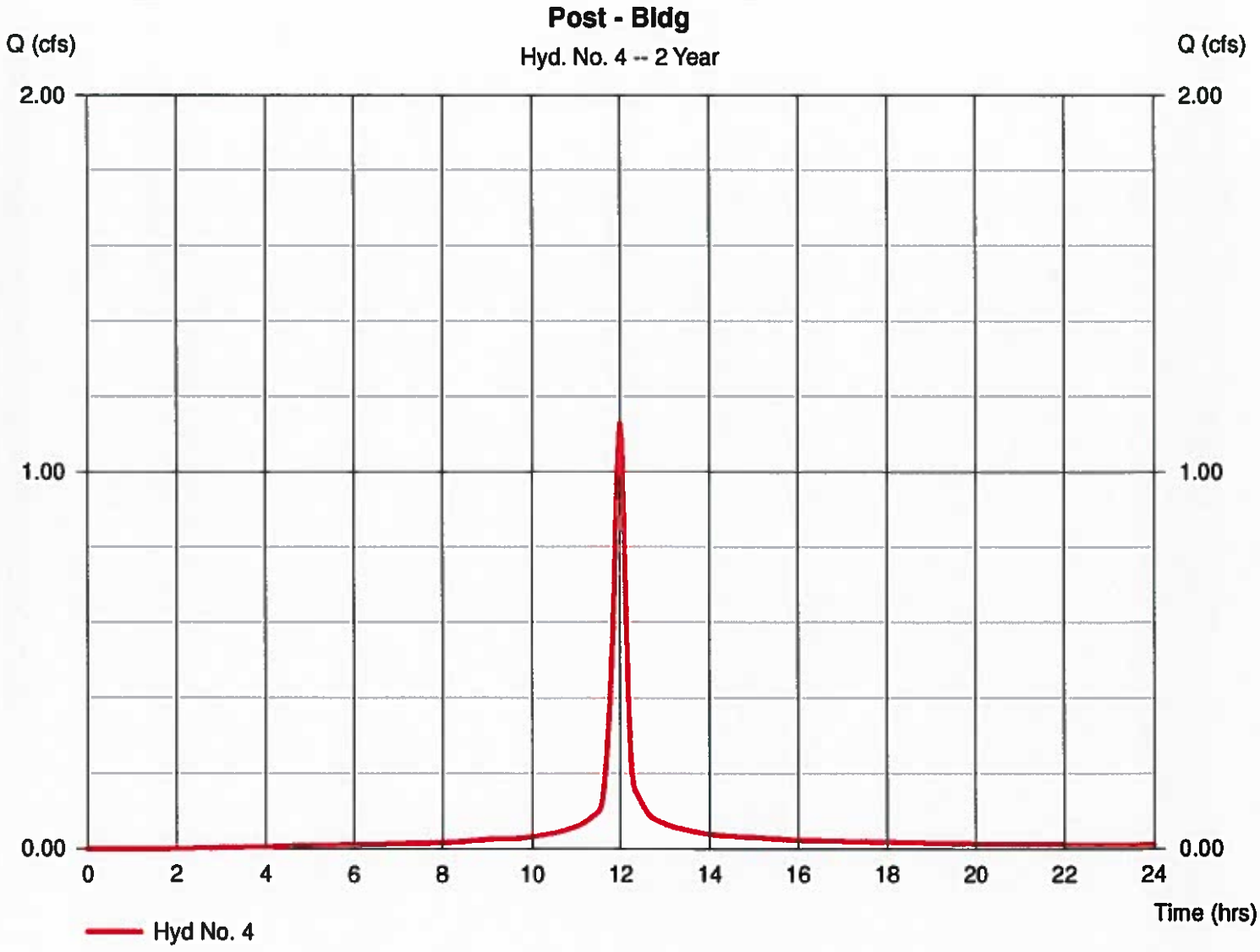
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 1.129 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 3,244 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.33 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



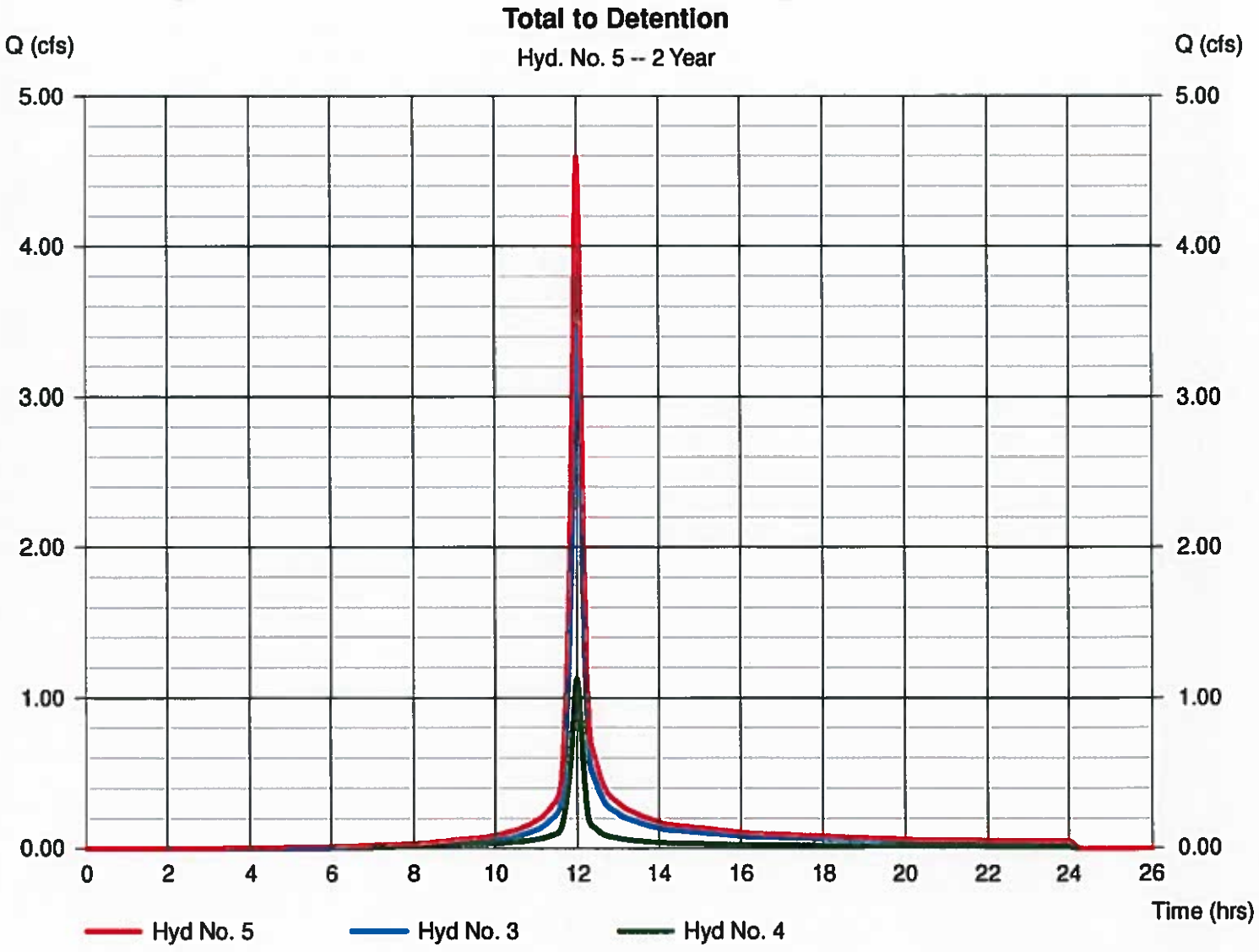
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 4.595 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 12,331 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

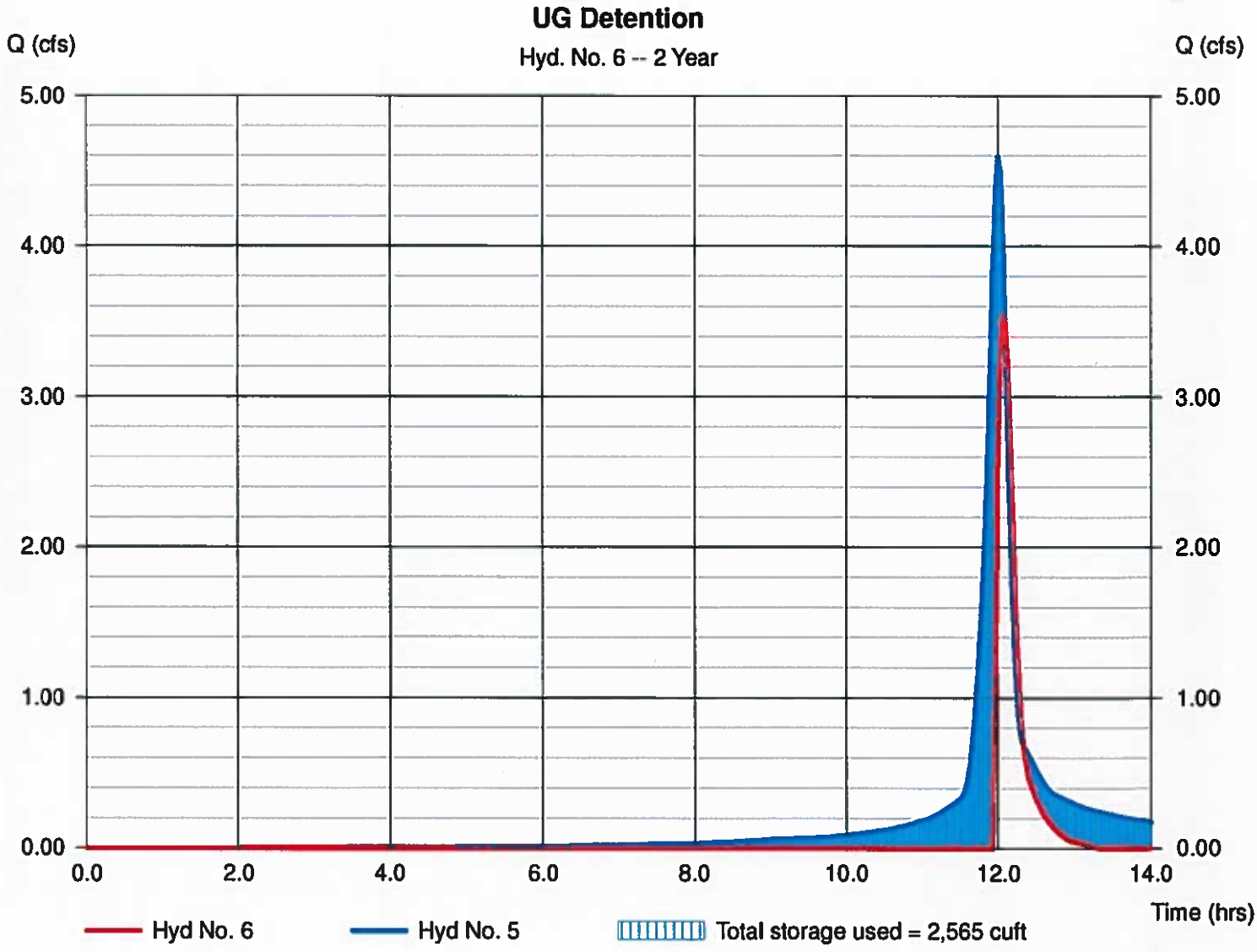
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 3.552 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,669 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 69.19 ft
Reservoir name	= UG	Max. Storage	= 2,565 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	5.219	2	720	13,615	------	------	------	Pre
3	SCS Runoff	4.650	2	720	12,336	------	------	------	Post - Site
4	SCS Runoff	1.426	2	720	4,150	------	------	------	Post - Bldg
5	Combine	6.076	2	720	16,486	3, 4	------	------	Total to Detention
6	Reservoir	4.908	2	724	6,097	5	69.44	2,965	UG Detention

Hydrograph Report

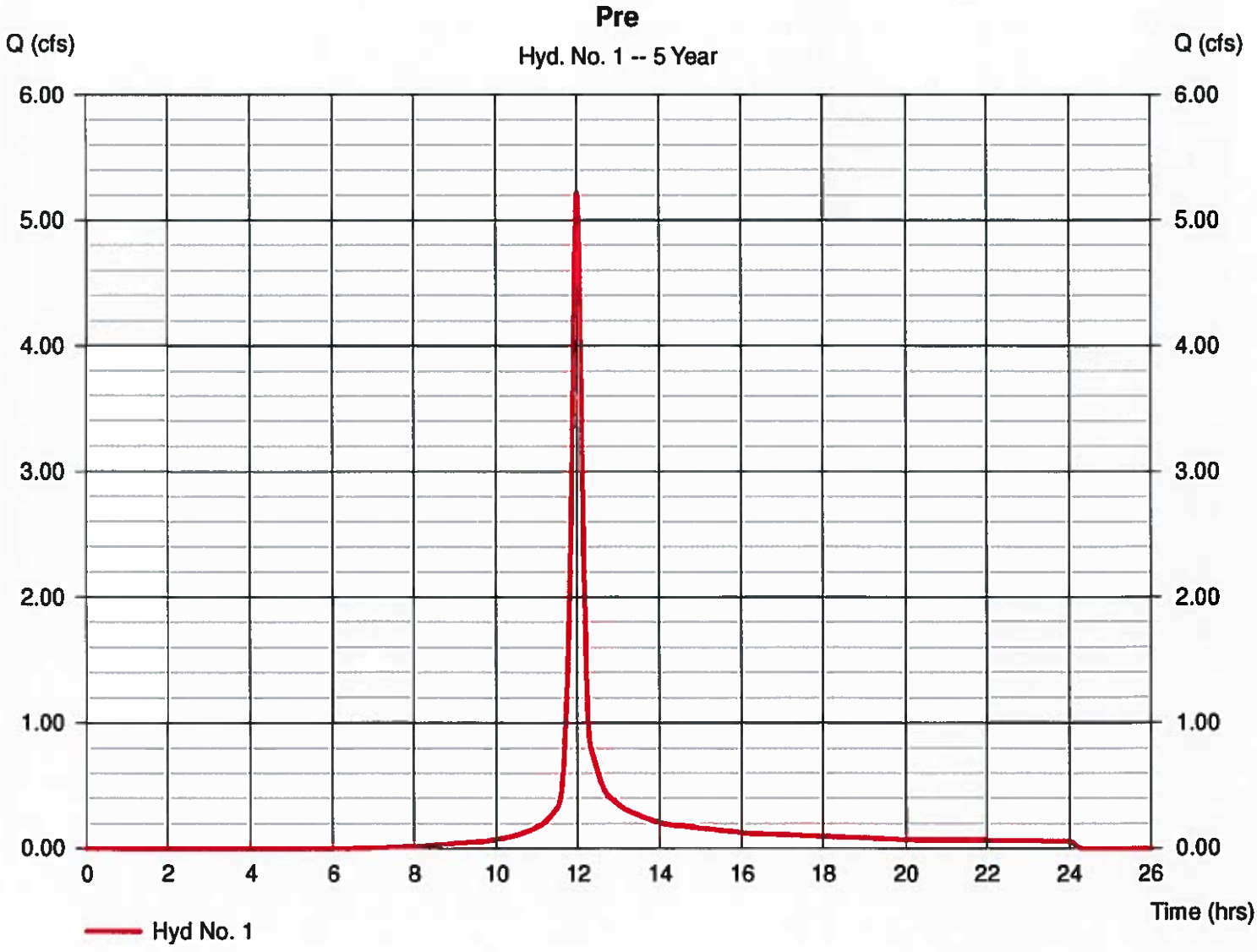
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 5.219 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 13,615 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

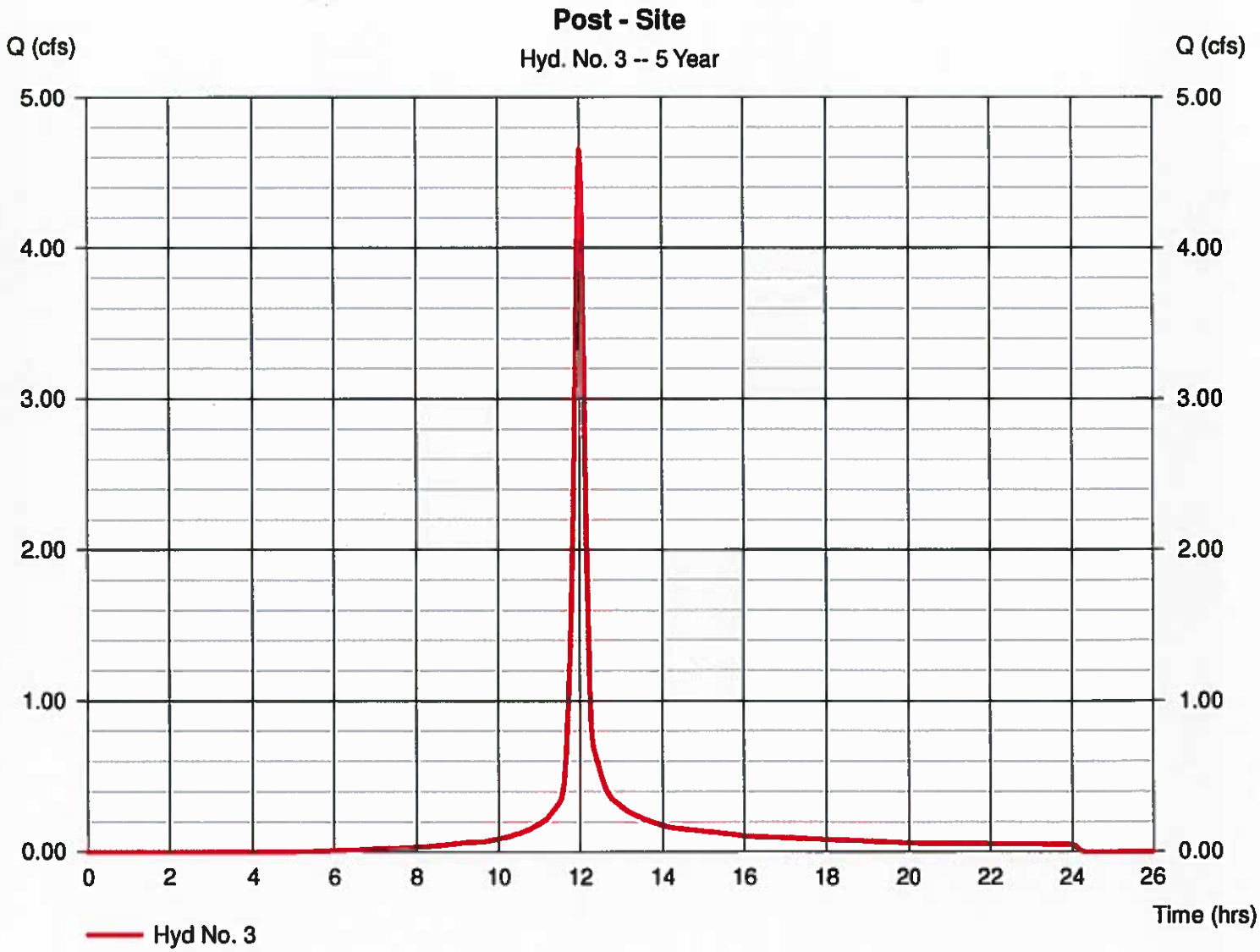
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 4.650 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 12,336 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



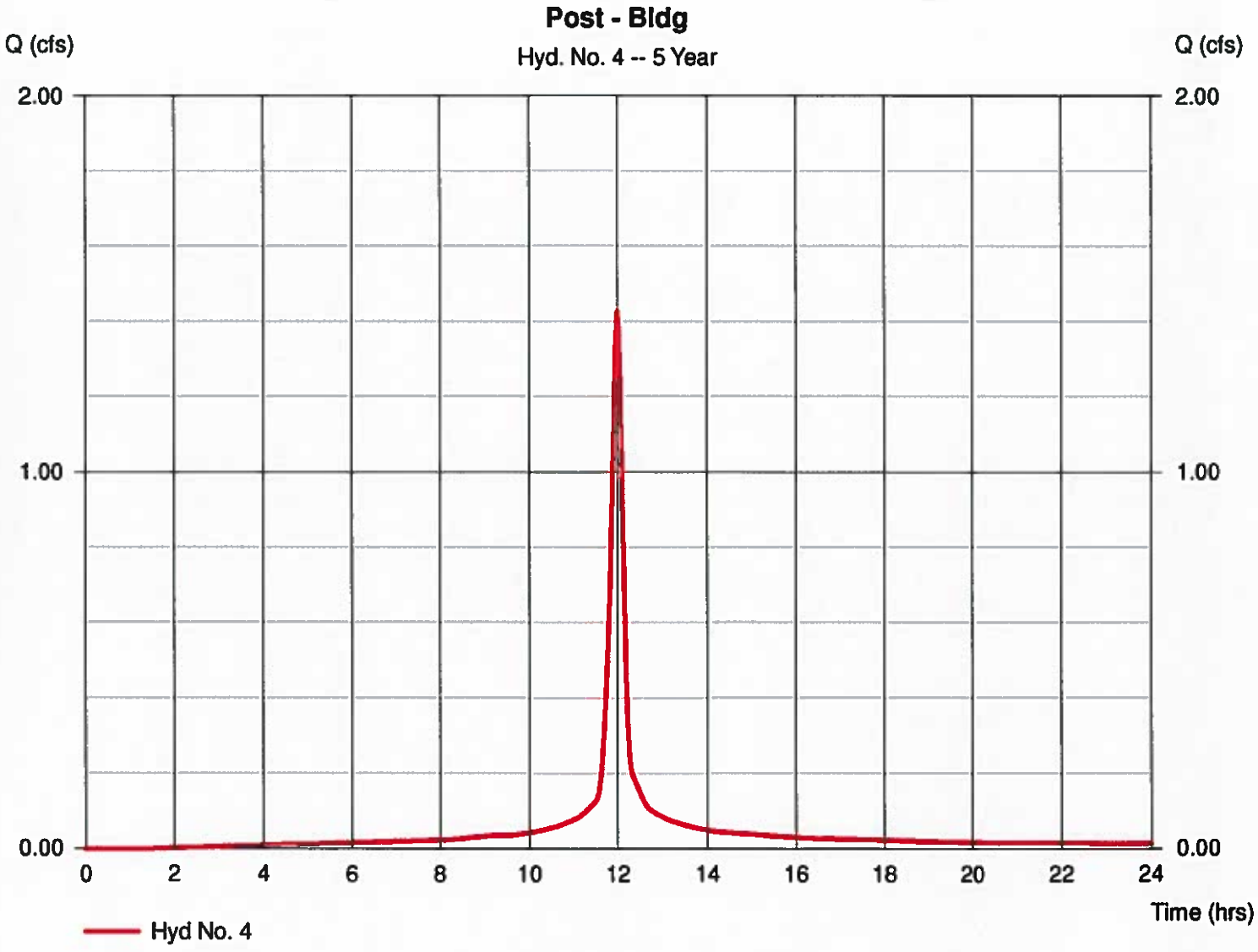
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 1.426 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,150 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 2.92 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



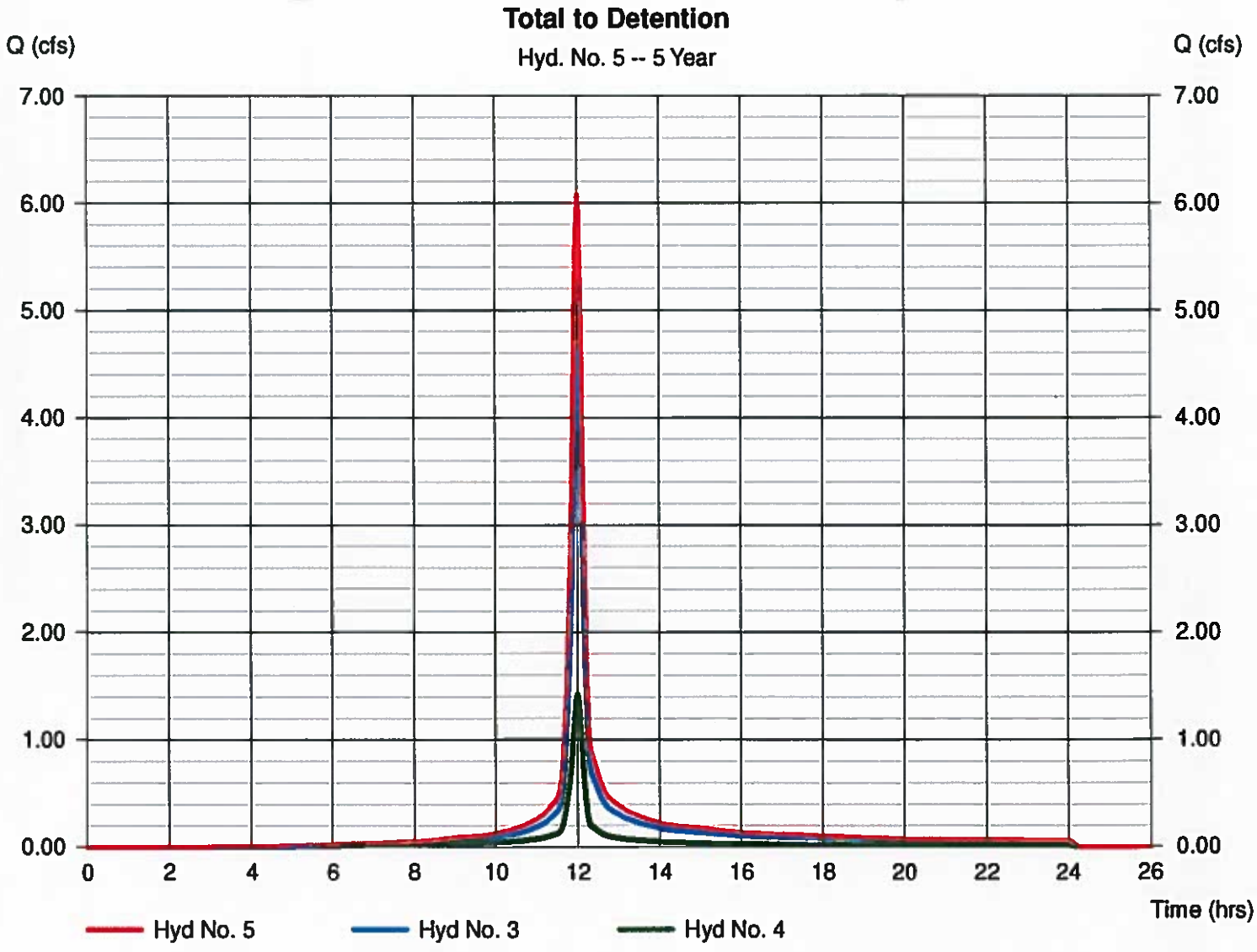
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 6.076 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 16,486 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

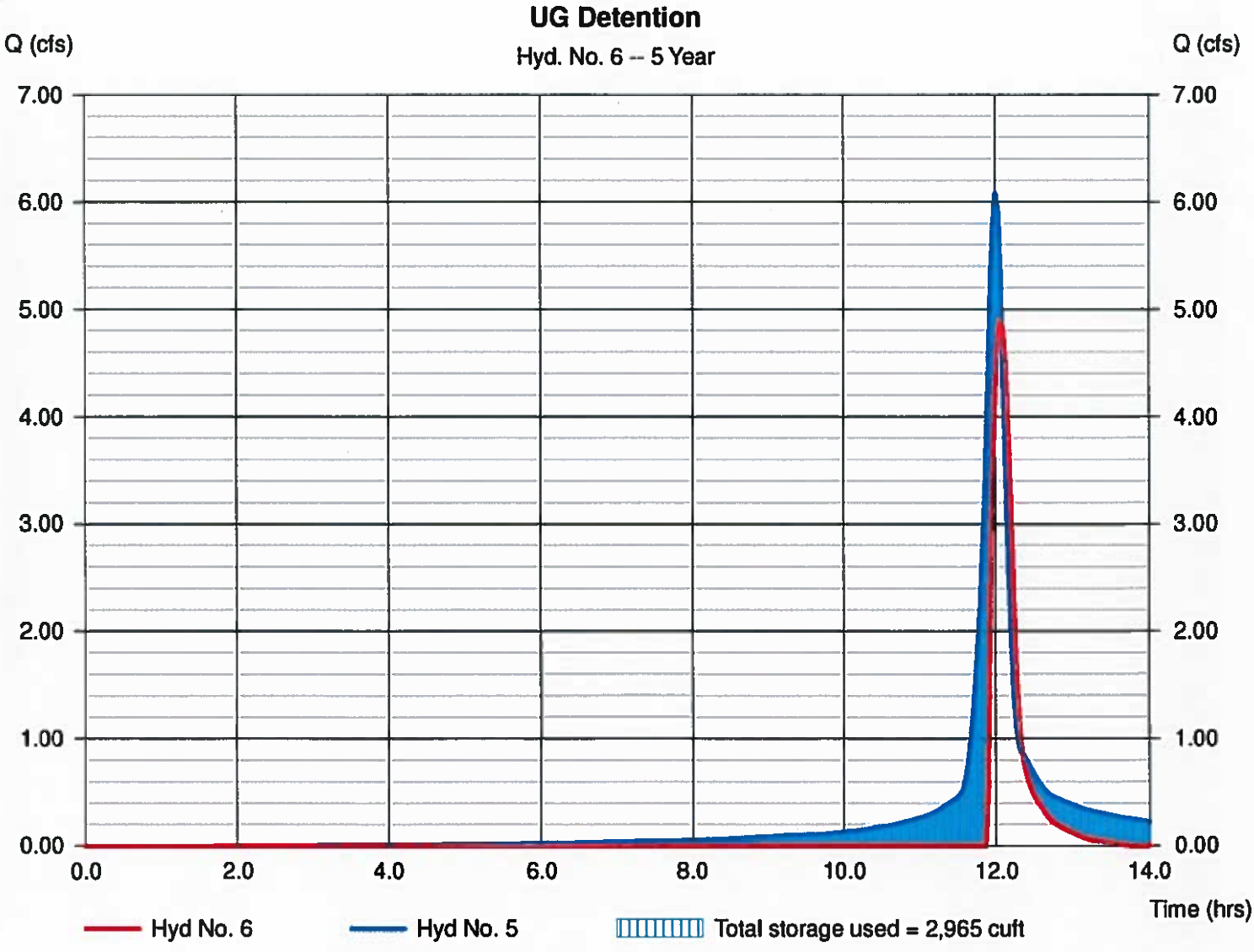
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 4.908 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,097 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 69.44 ft
Reservoir name	= UG	Max. Storage	= 2,965 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	6.427	2	720	16,872	------	------	------	Pre
3	SCS Runoff	5.613	2	720	15,030	------	------	------	Post - Site
4	SCS Runoff	1.667	2	720	4,888	------	------	------	Post - Bldg
5	Combine	7.280	2	720	19,918	3, 4	------	------	Total to Detention
6	Reservoir	5.566	2	724	8,222	5	69.74	3,379	UG Detention

Hydrograph Report

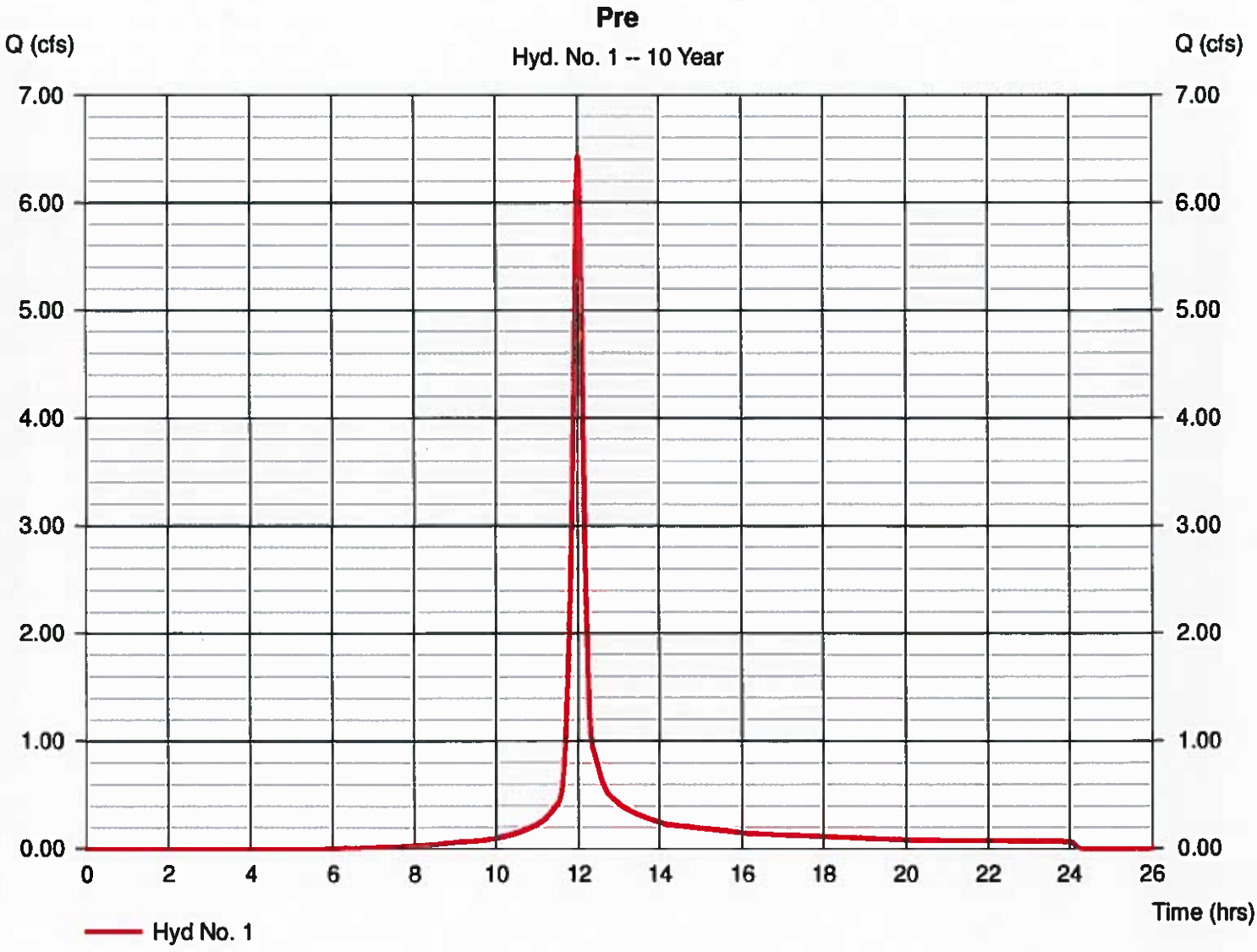
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 6.427 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 16,872 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

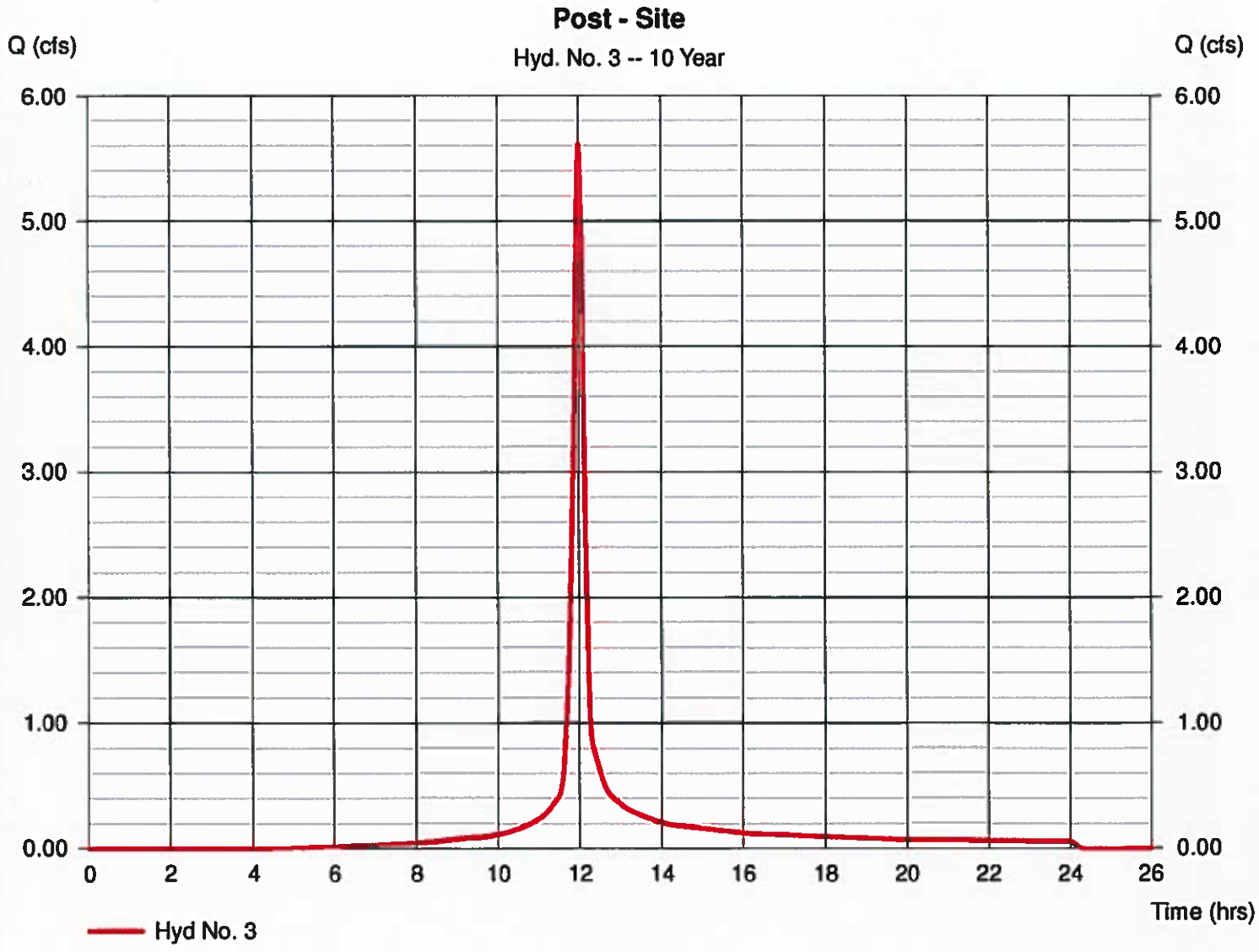
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 5.613 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 15,030 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



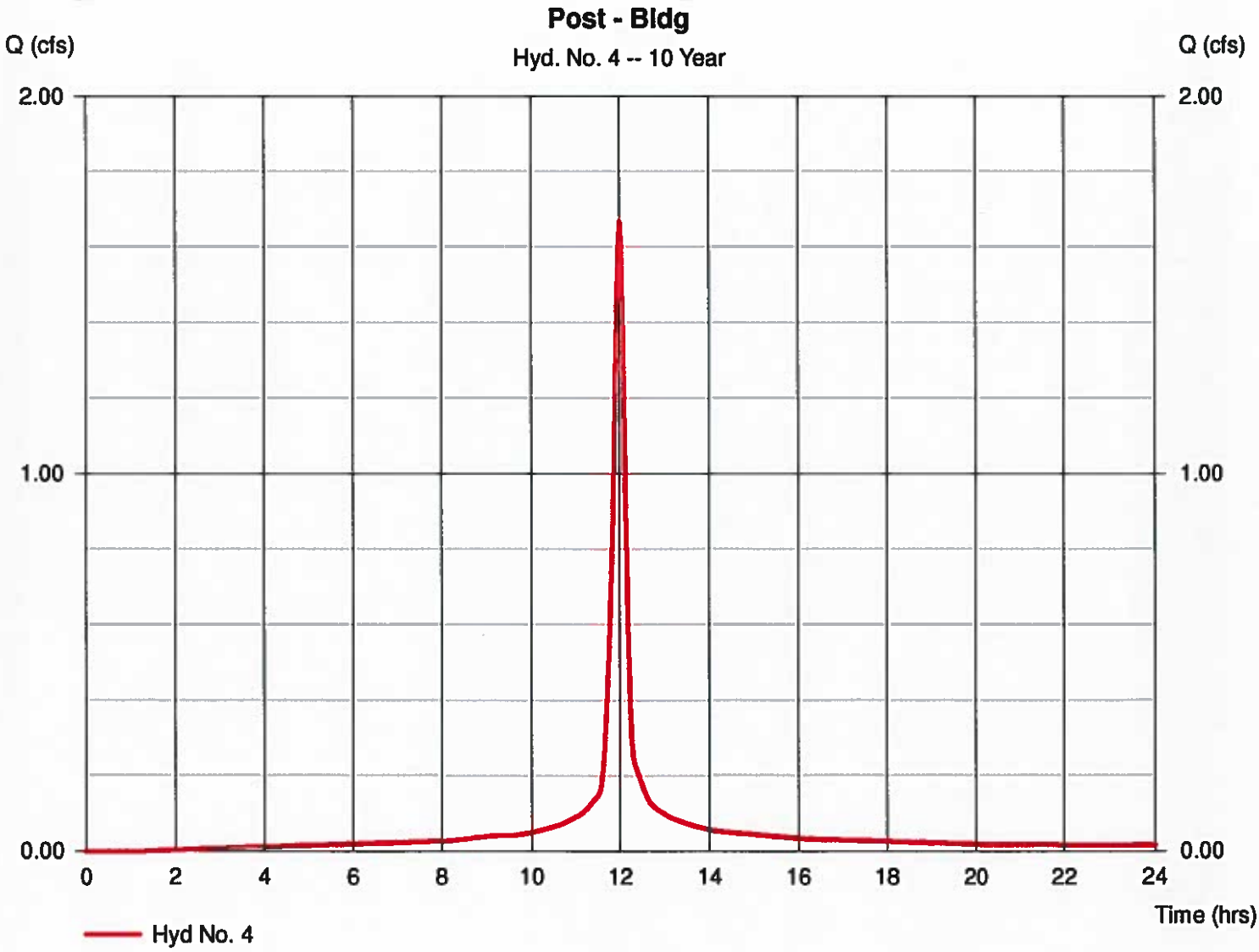
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 1.667 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 4,888 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 3.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



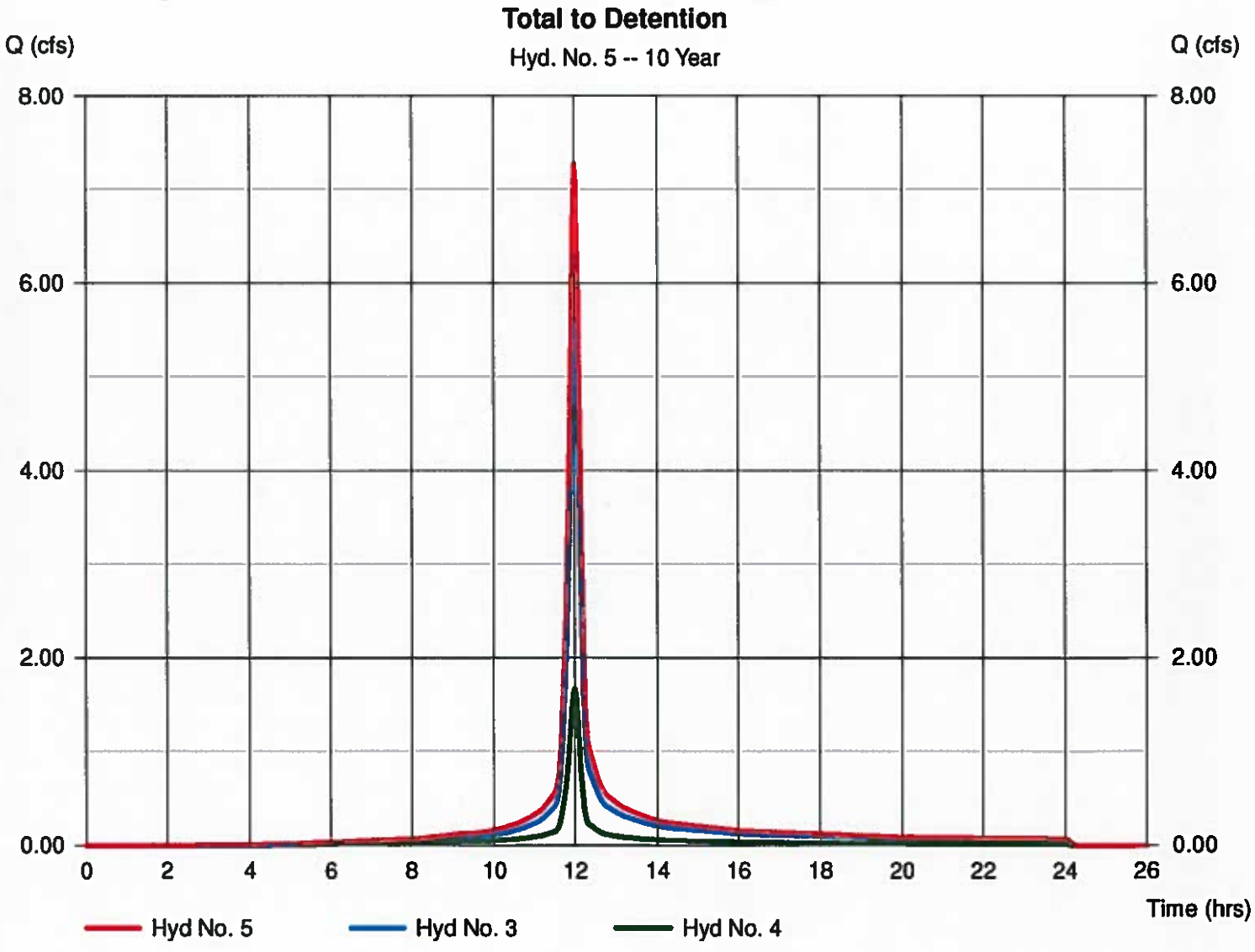
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 7.280 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 19,918 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

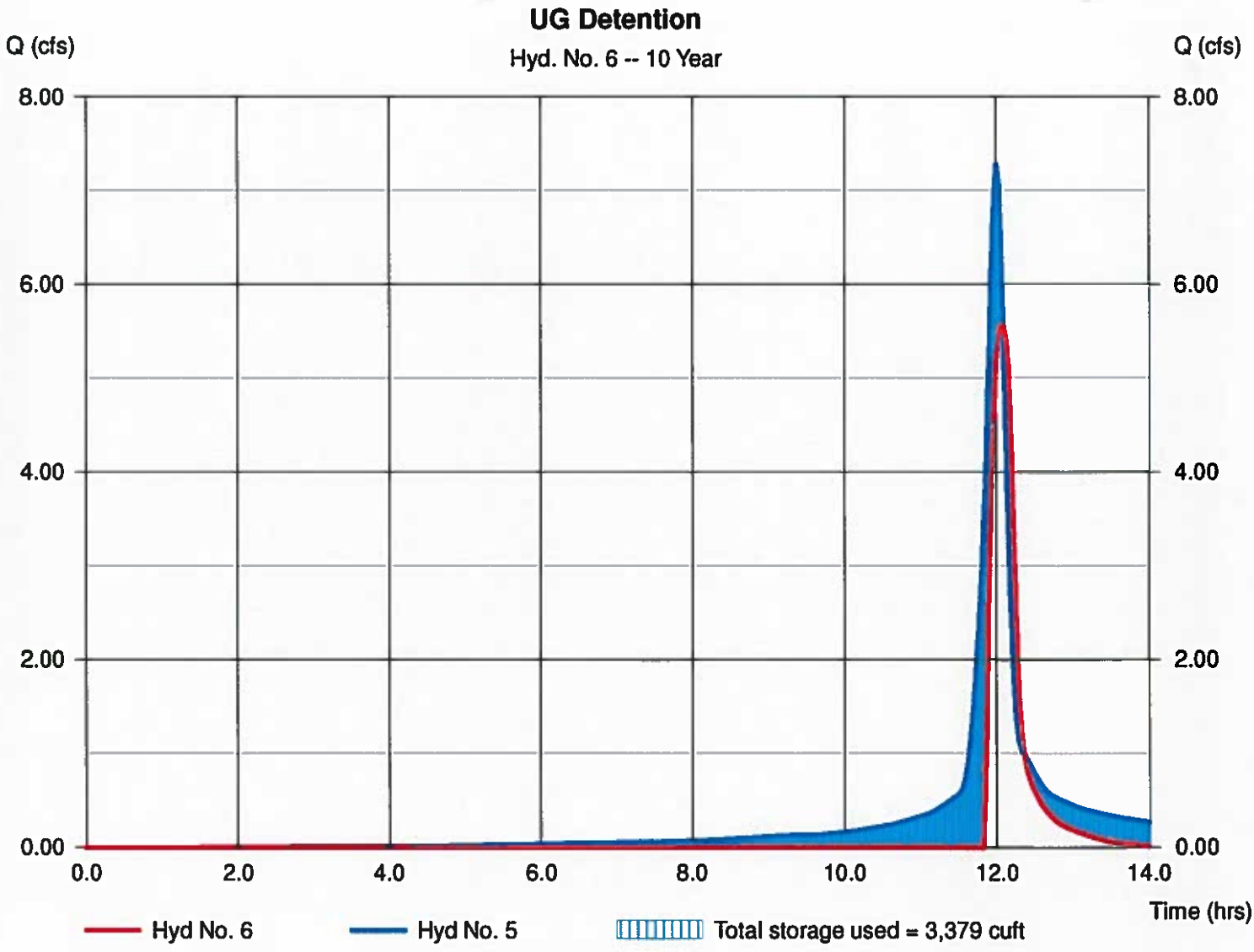
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 5.566 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 8,222 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 69.74 ft
Reservoir name	= UG	Max. Storage	= 3,379 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	8.172	2	720	21,660	------	------	------	Pre
3	SCS Runoff	6.993	2	720	18,954	------	------	------	Post - Site
4	SCS Runoff	2.012	2	720	5,950	------	------	------	Post - Bldg
5	Combine	9.005	2	720	24,903	3, 4	------	------	Total to Detention
6	Reservoir	6.552	2	726	11,466	5	70.35	4,152	UG Detention

Hydrograph Report

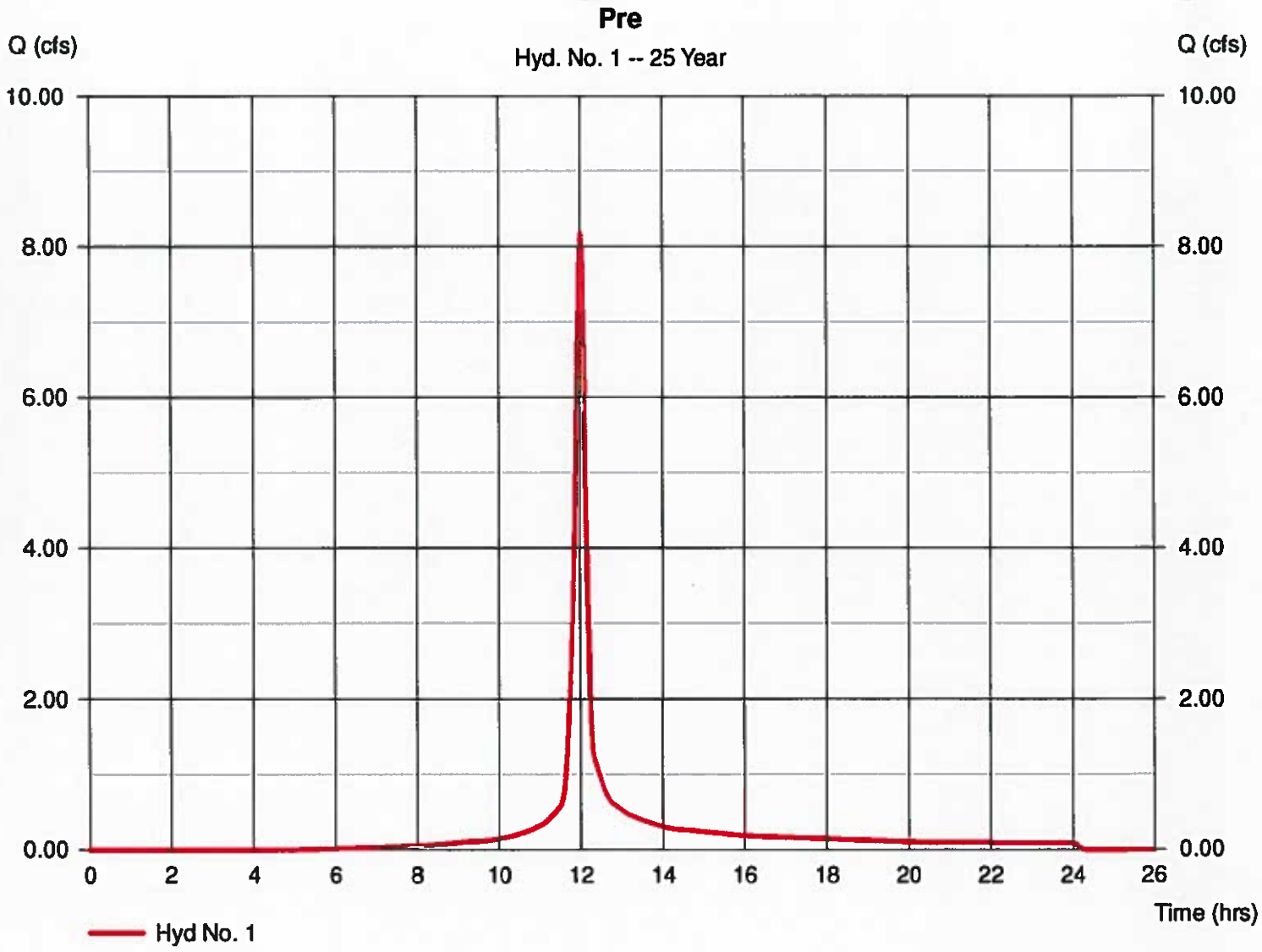
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 8.172 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 21,660 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.09 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

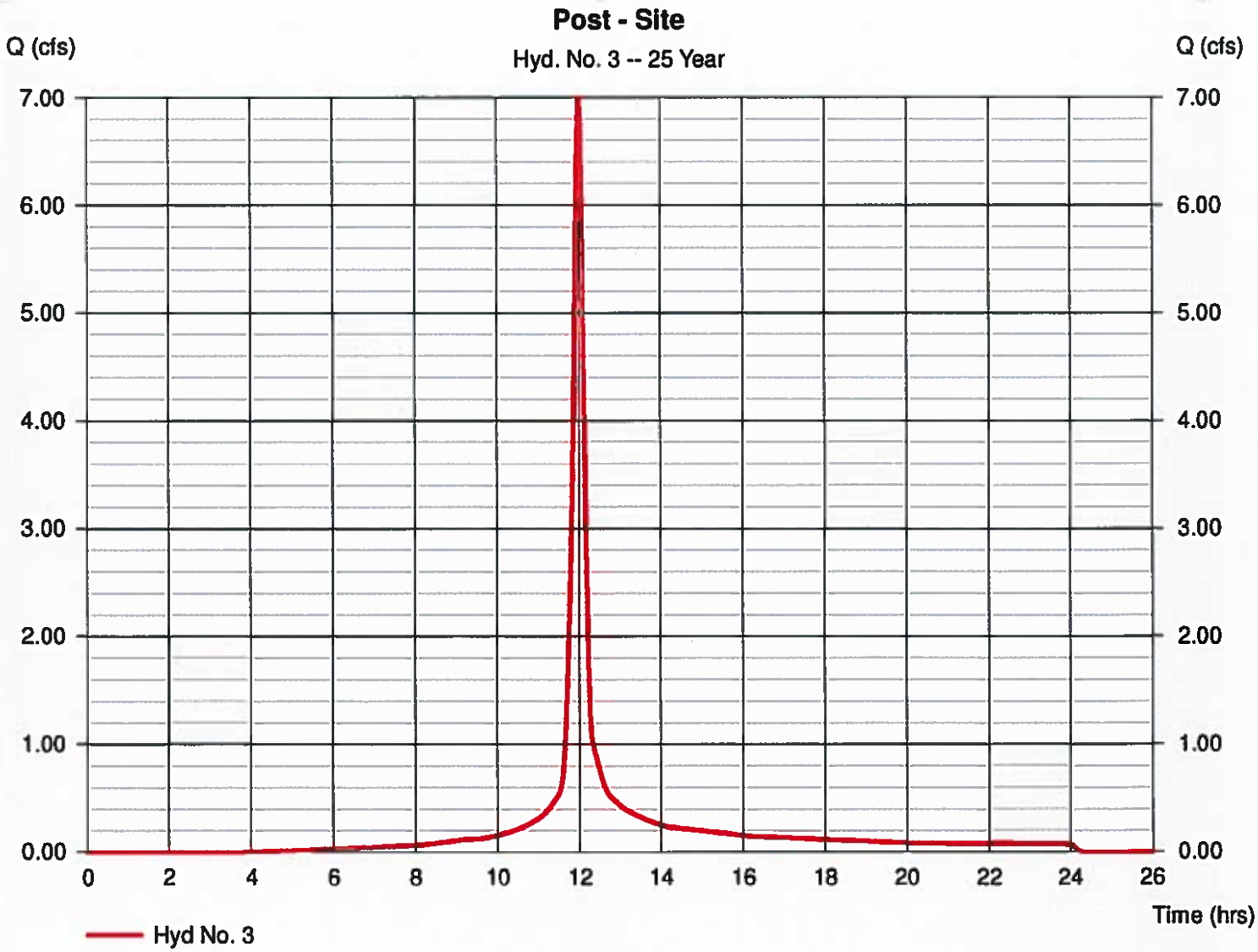
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 6.993 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 18,954 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.09 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



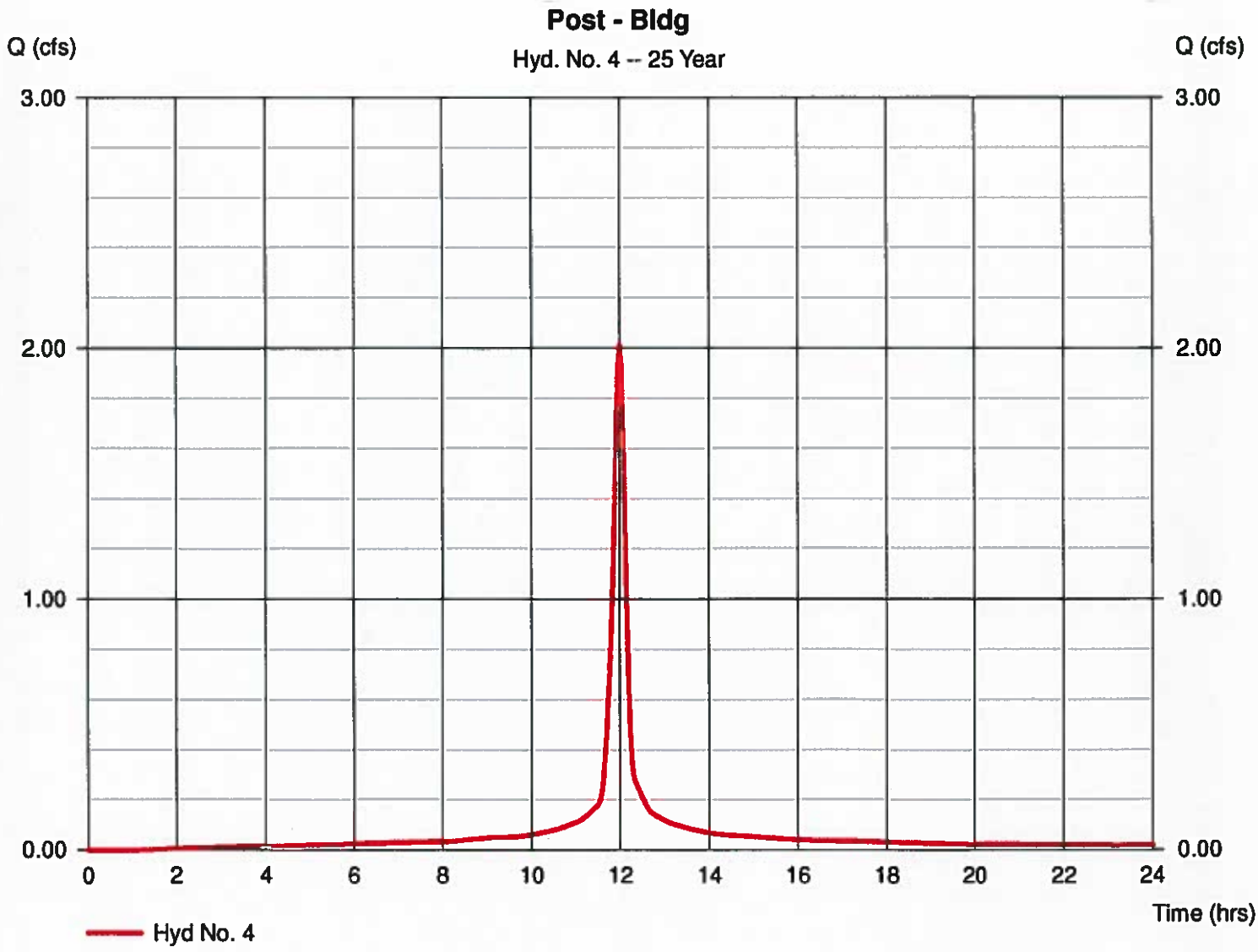
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 2.012 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 5,950 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.09 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



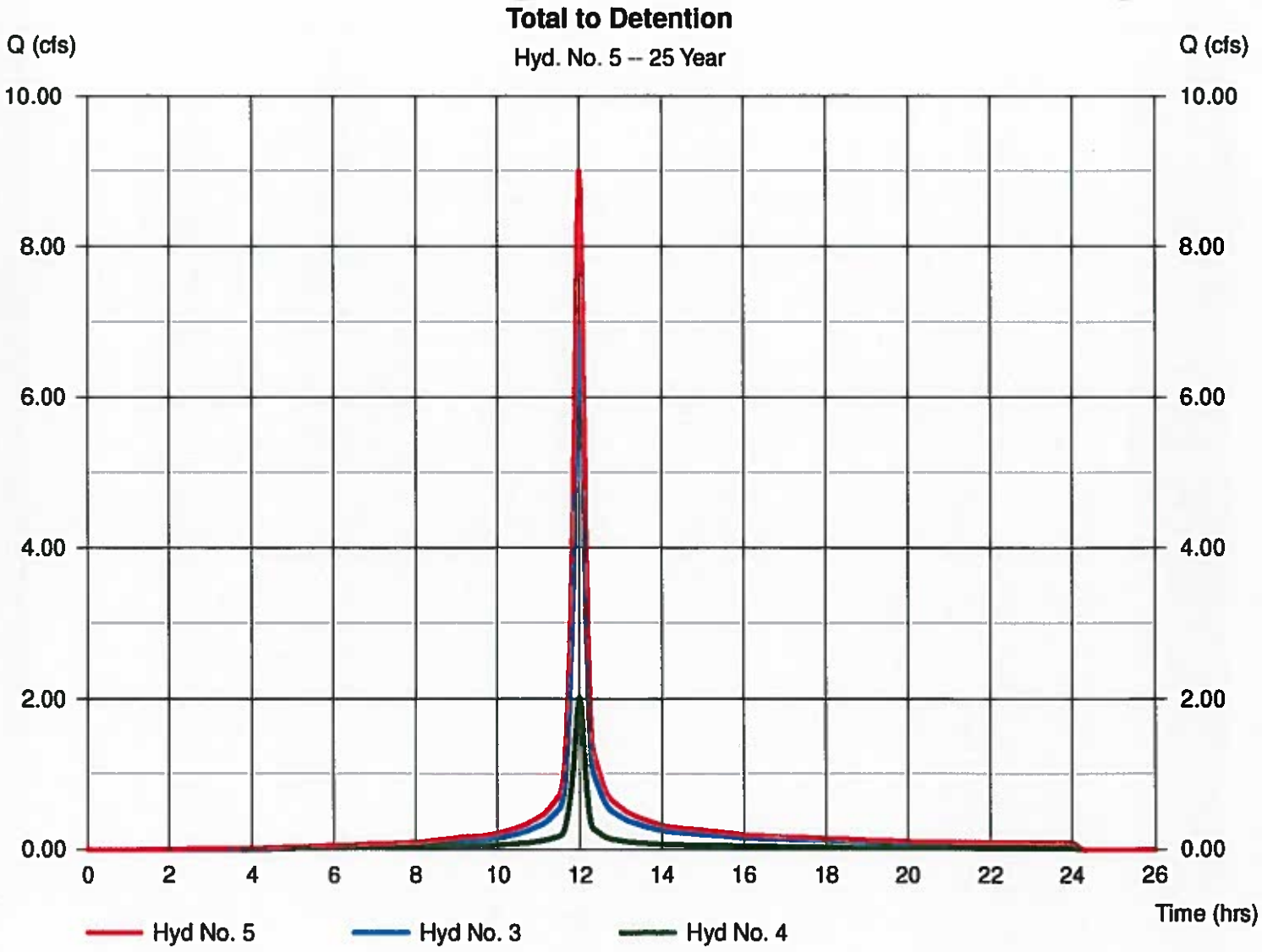
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 9.005 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 24,903 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

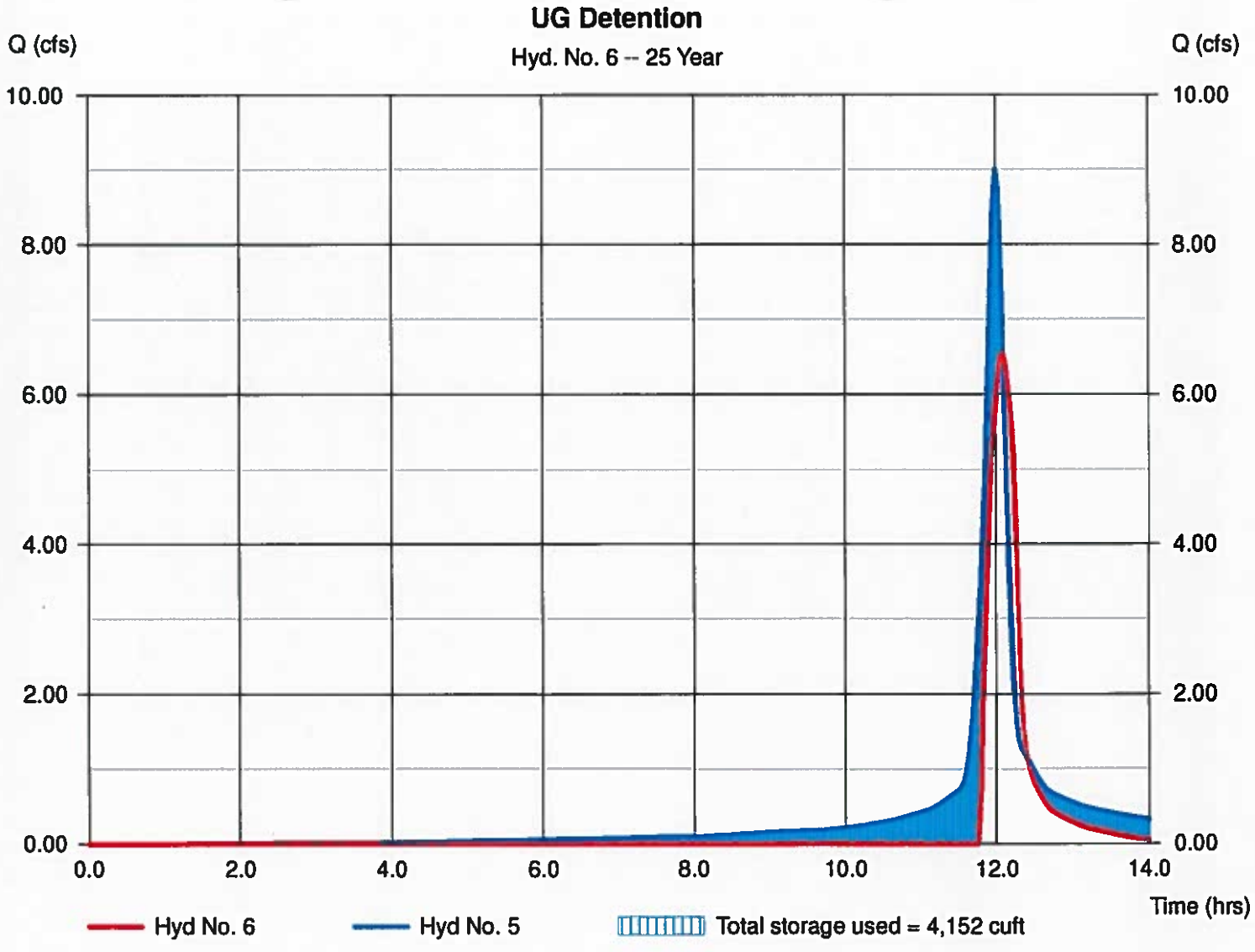
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 6.552 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 11,466 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 70.35 ft
Reservoir name	= UG	Max. Storage	= 4,152 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	9.613	2	720	25,680	------	------	------	Pre
3	SCS Runoff	8.127	2	720	22,225	------	------	------	Post - Site
4	SCS Runoff	2.297	2	720	6,828	------	------	------	Post - Bldg
5	Combine	10.42	2	720	29,053	3, 4	------	------	Total to Detention
6	Reservoir	7.512	2	726	14,301	5	71.05	4,791	UG Detention

Hydrograph Report

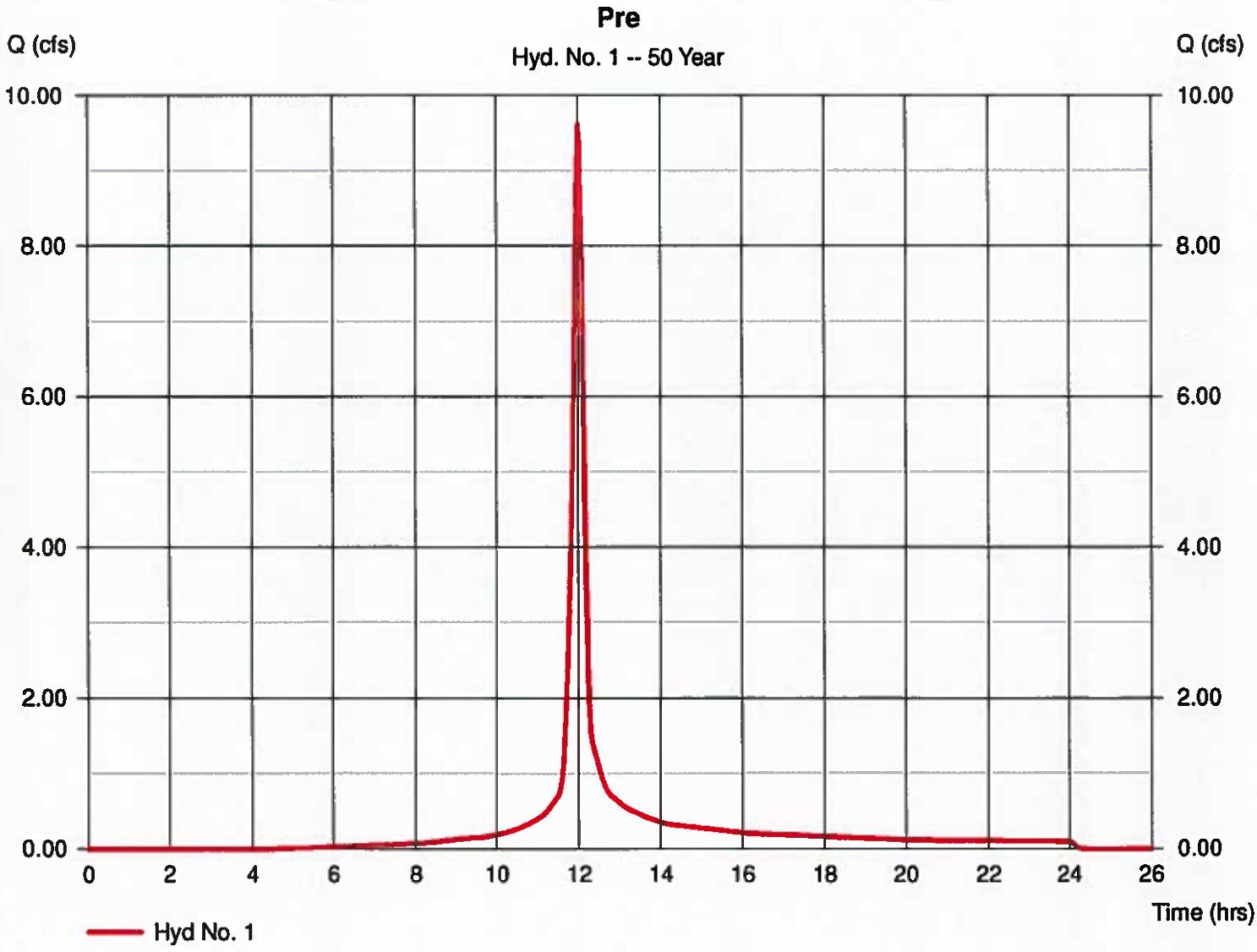
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 9.613 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 25,680 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.66 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

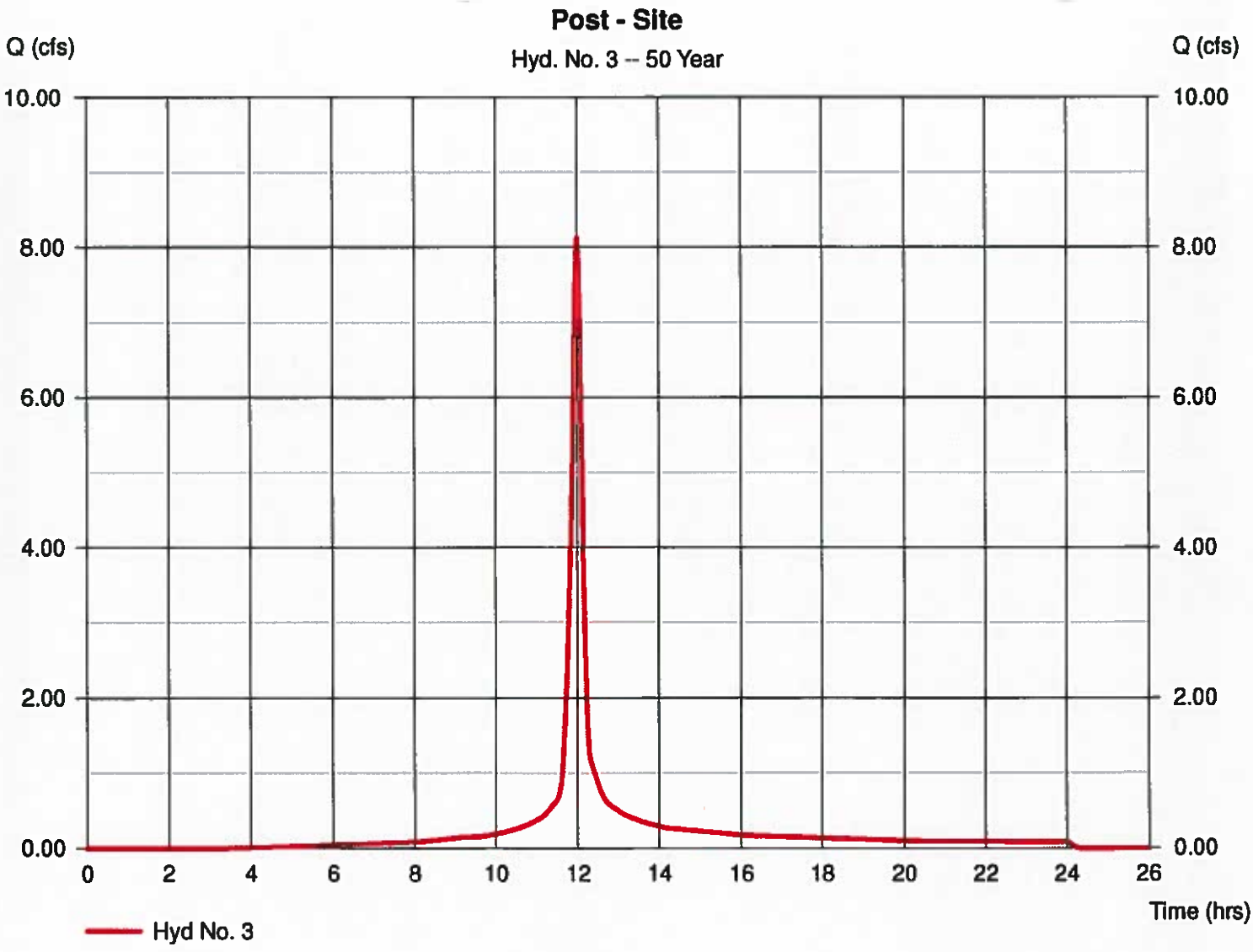
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 8.127 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 22,225 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.66 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



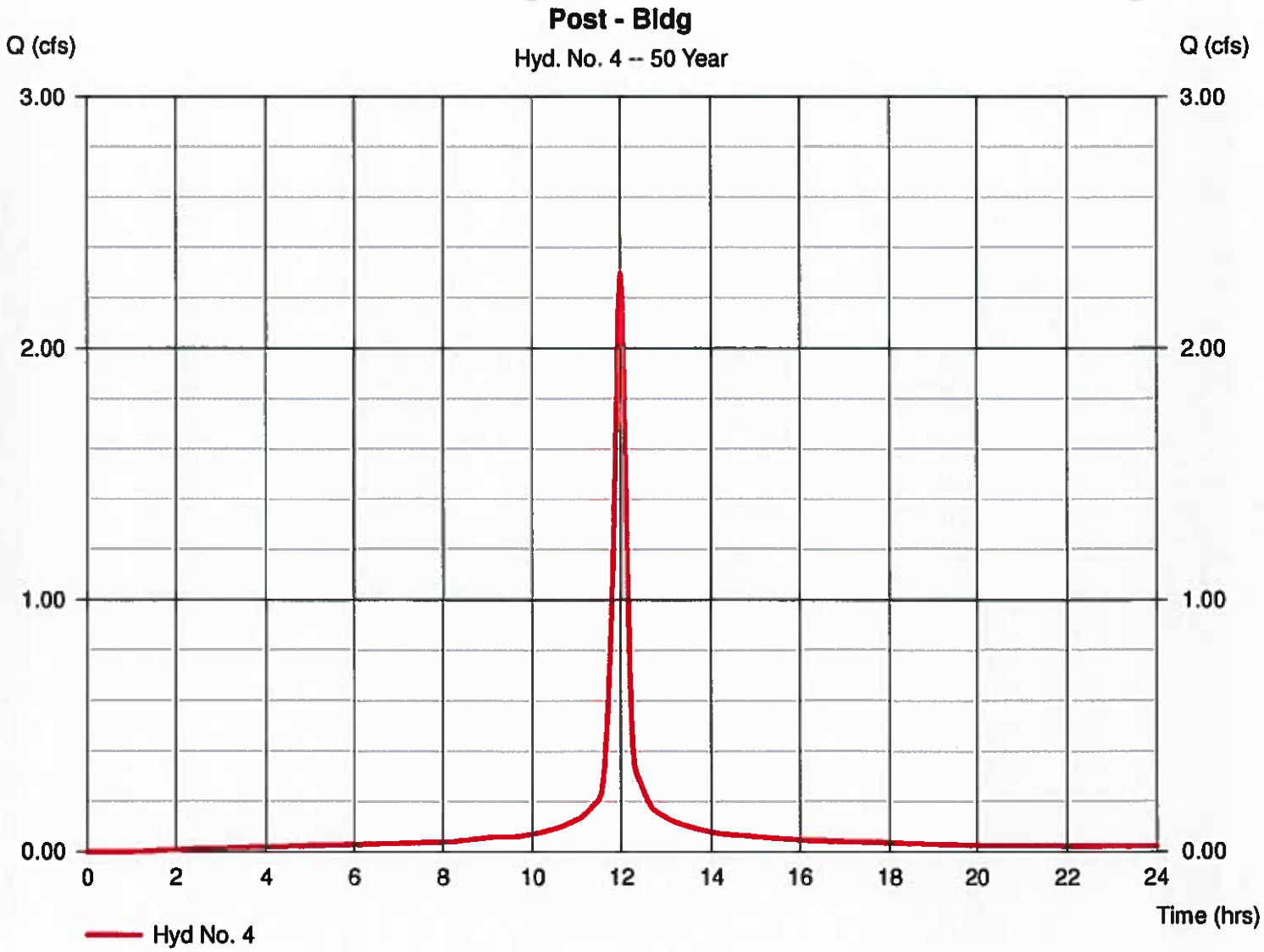
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 2.297 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 6,828 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 4.66 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



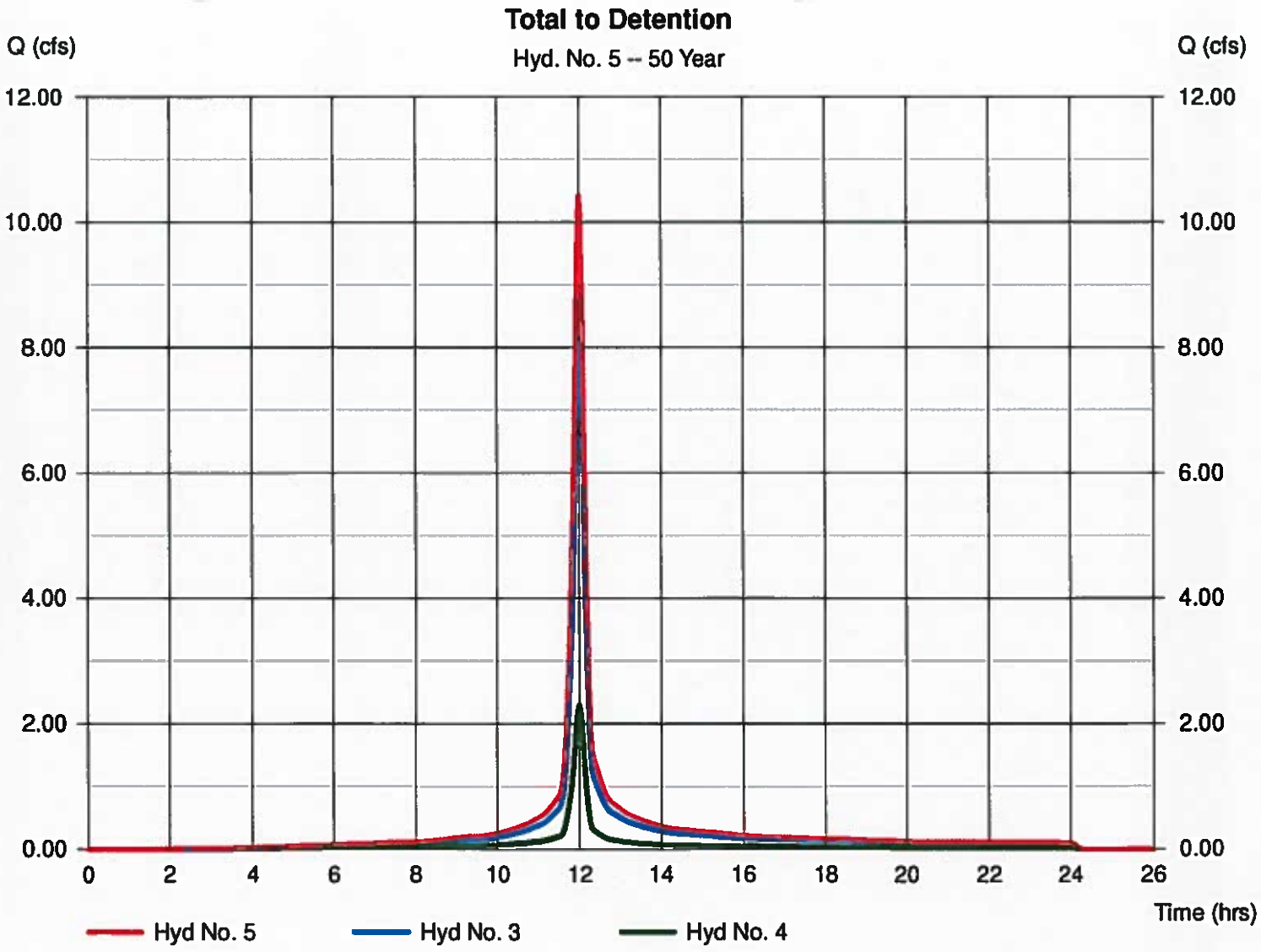
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 10.42 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 29,053 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

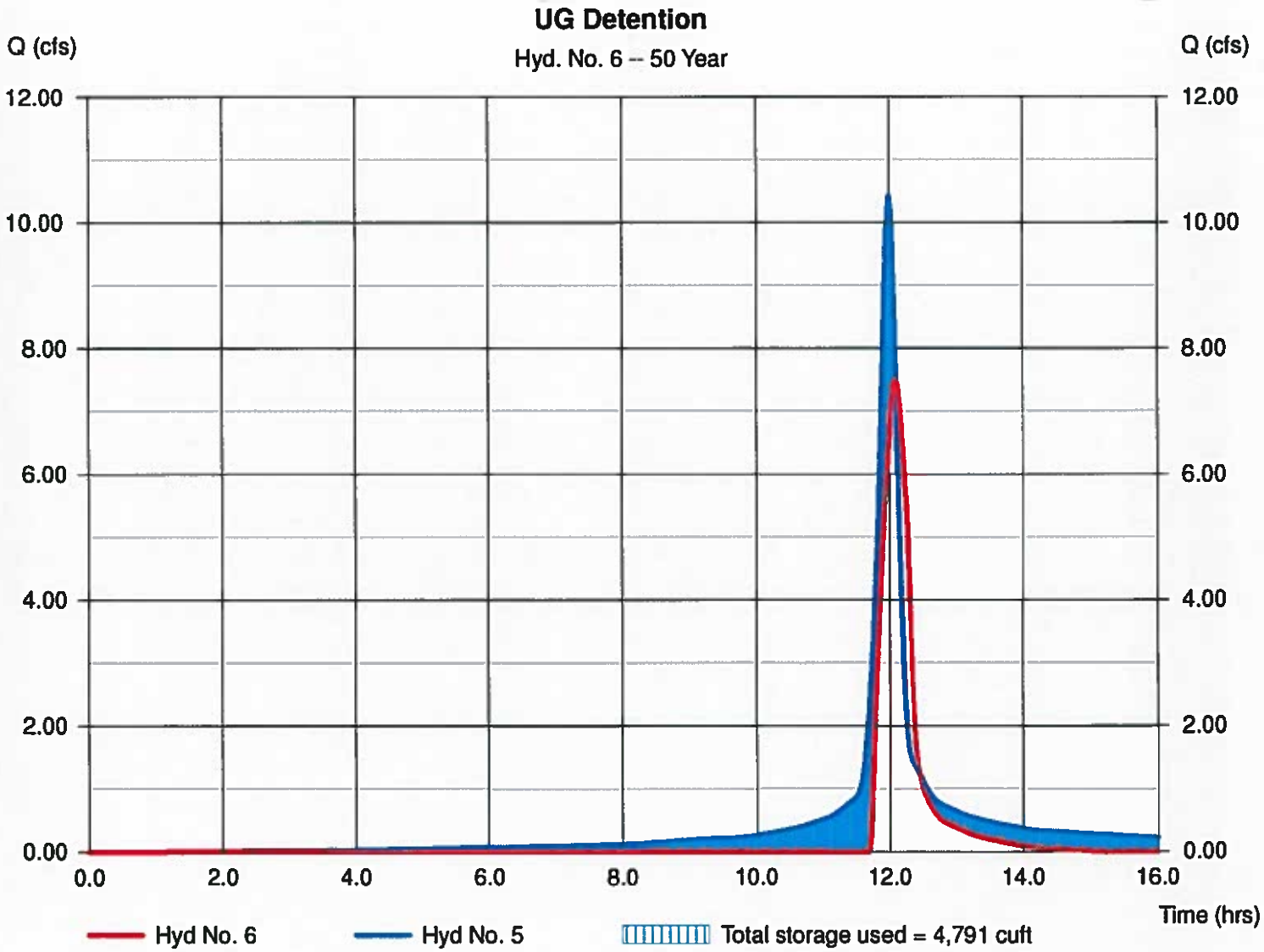
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 7.512 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 14,301 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 71.05 ft
Reservoir name	= UG	Max. Storage	= 4,791 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066

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	11.18	2	720	30,100	------	------	------	Pre
3	SCS Runoff	9.355	2	720	25,806	------	------	------	Post - Site
4	SCS Runoff	2.606	2	720	7,783	------	------	------	Post - Bldg
5	Combine	11.96	2	720	33,589	3, 4	------	------	Total to Detention
6	Reservoir	9.529	2	724	17,524	5	71.64	5,269	UG Detention

Hydrograph Report

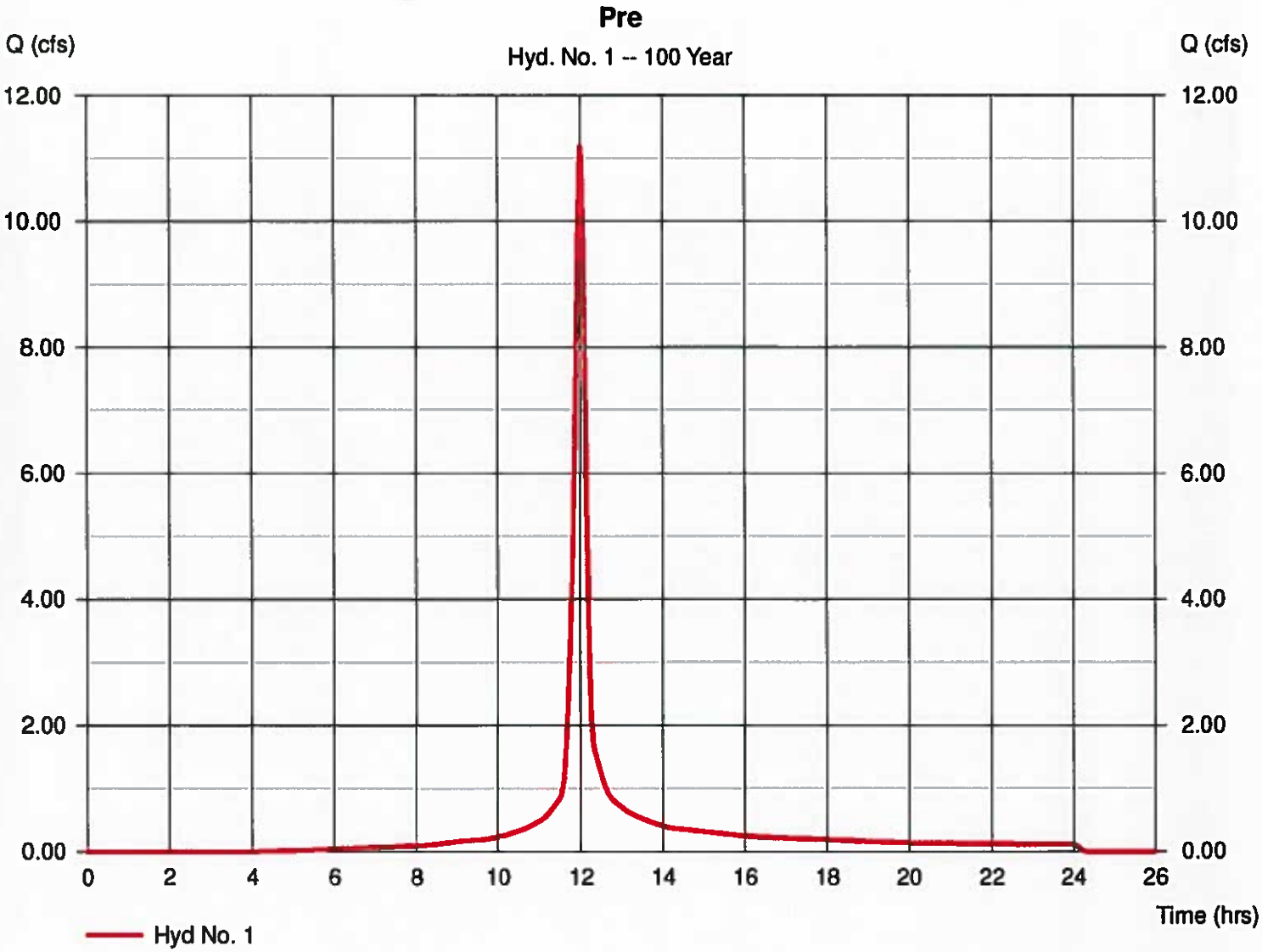
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 1

Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 11.18 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 30,100 cuft
Drainage area	= 1.990 ac	Curve number	= 89*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	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) = [(0.550 x 98) + (0.460 x 98) + (0.980 x 79)] / 1.990



Hydrograph Report

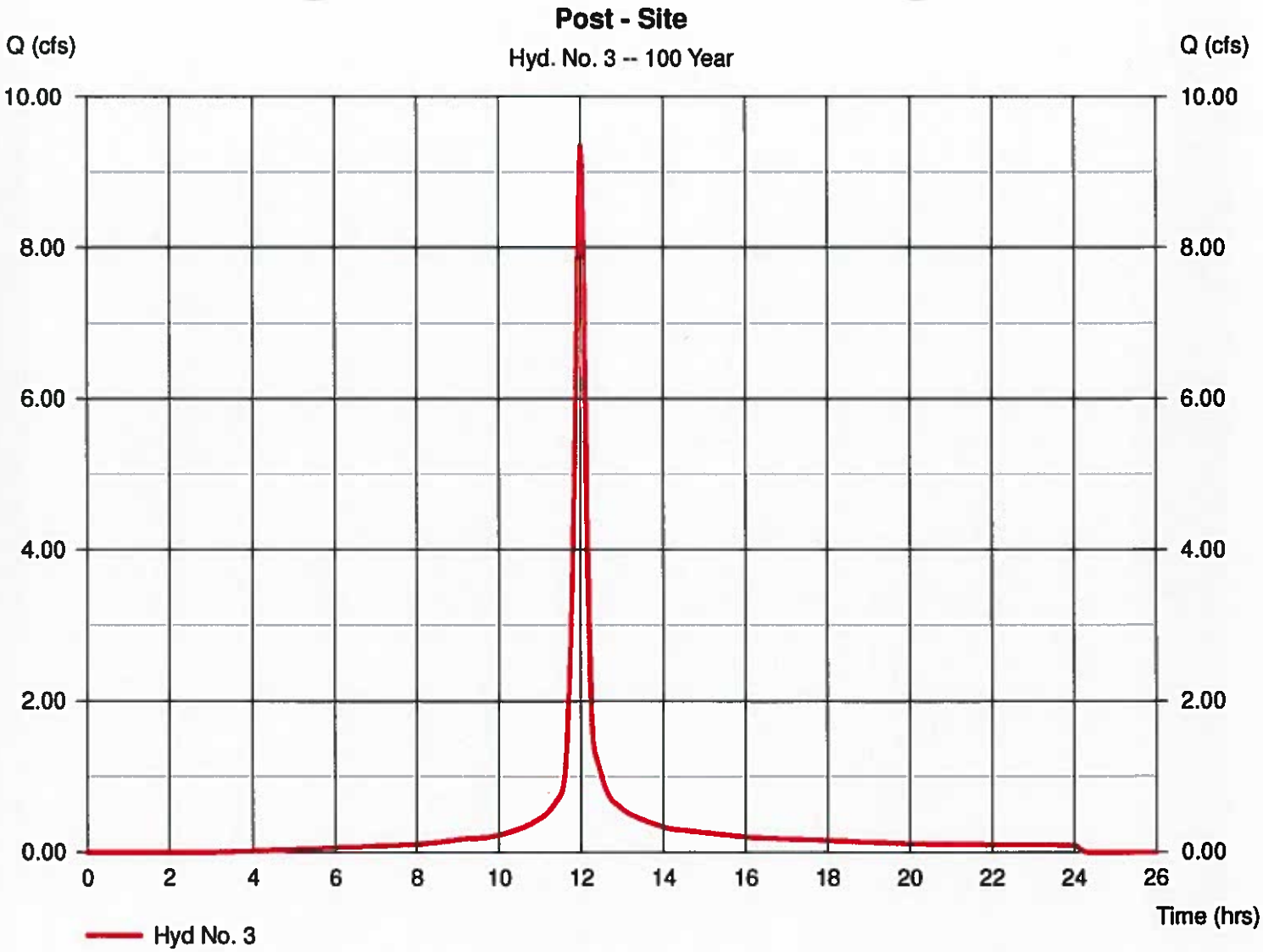
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 3

Post - Site

Hydrograph type	= SCS Runoff	Peak discharge	= 9.355 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 25,806 cuft
Drainage area	= 1.580 ac	Curve number	= 92*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	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) = [(0.250 x 98) + (0.860 x 98) + (0.470 x 79)] / 1.580



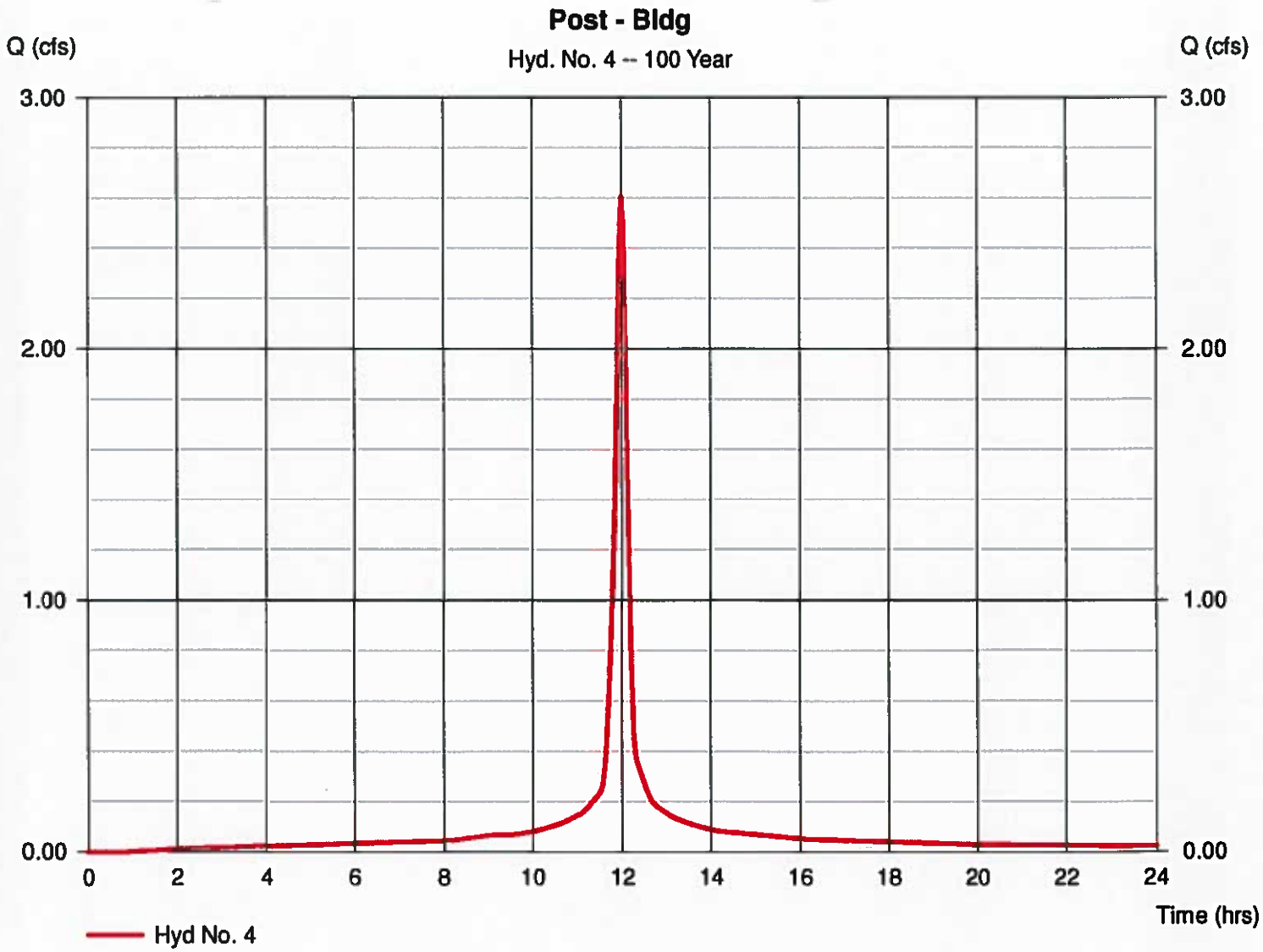
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 4

Post - Bldg

Hydrograph type	= SCS Runoff	Peak discharge	= 2.606 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 7,783 cuft
Drainage area	= 0.412 ac	Curve number	= 98
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 10.00 min
Total precip.	= 5.28 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



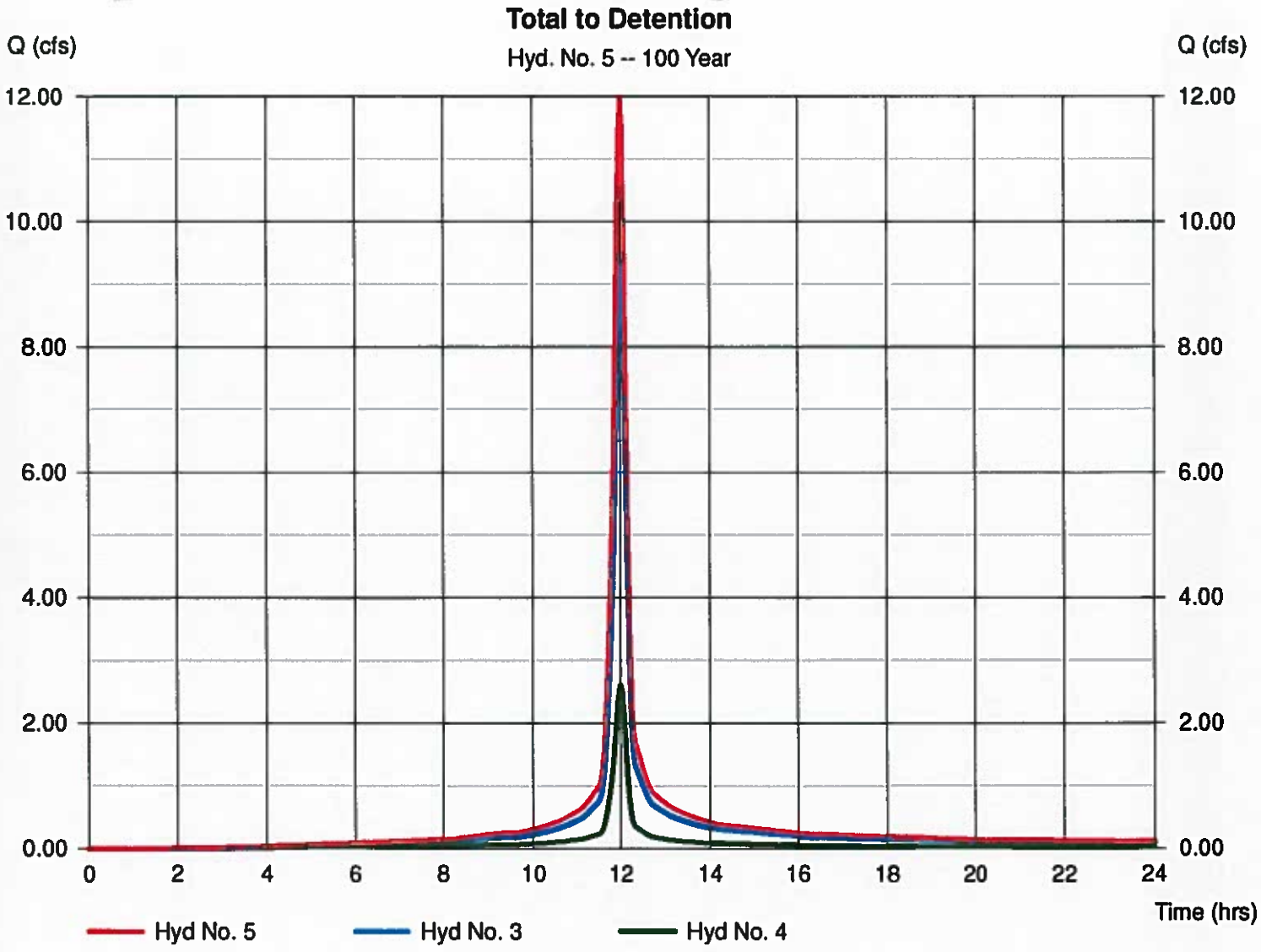
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 5

Total to Detention

Hydrograph type	= Combine	Peak discharge	= 11.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 33,589 cuft
Inflow hyds.	= 3, 4	Contrib. drain. area	= 1.992 ac



Hydrograph Report

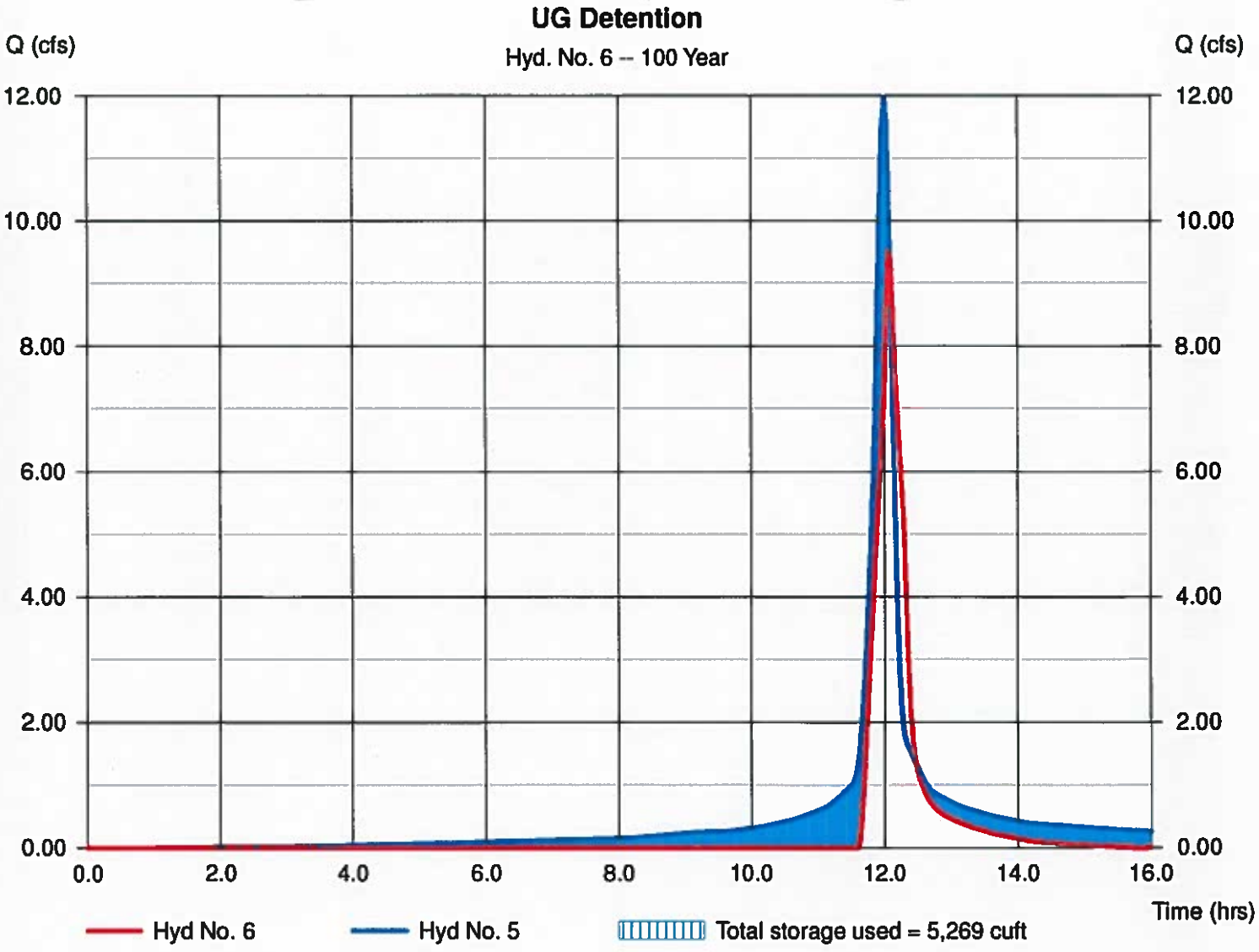
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Hyd. No. 6

UG Detention

Hydrograph type	= Reservoir	Peak discharge	= 9.529 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 17,524 cuft
Inflow hyd. No.	= 5 - Total to Detention	Max. Elevation	= 71.64 ft
Reservoir name	= UG	Max. Storage	= 5,269 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 — Wednesday, Jun 10, 2015

Pond No. 1 - UG

Pond Data

Pond storage is based on user-defined values.
Trapezoid - Bottom L x W = 52.8 x 39.5 ft, Side slope = 0.00:1, Bottom elev. = 67.14 ft, Depth = 0.50 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	67.14	2,086	0	0
0.05	67.19	2,086	42	42
0.10	67.24	2,086	42	83
0.15	67.29	2,086	42	125
0.20	67.34	2,086	42	167
0.25	67.39	2,086	42	209
0.30	67.44	2,086	42	250
0.35	67.49	2,086	42	292
0.40	67.54	2,086	42	334
0.45	67.59	2,086	42	376
0.50	67.64	2,086	42	417
0.51	67.65	n/a	1	418
1.00	68.14	n/a	417	835
1.50	68.64	n/a	853	1,688
2.00	69.14	n/a	818	2,506
2.50	69.64	n/a	764	3,270
3.00	70.14	n/a	681	3,951
3.50	70.64	n/a	514	4,465
4.00	71.14	n/a	417	4,882
4.50	71.64	n/a	418	5,300
5.00	72.14	n/a	417	5,717

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	6.00	0.00
Span (in)	= 15.00	6.00	6.00	0.00
No. Barrels	= 1	7	7	0
Invert El. (ft)	= 67.50	68.64	71.10	0.00
Length (ft)	= 92.00	0.00	0.00	0.00
Slope (%)	= 3.00	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)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= ---	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 6.000 (by Wet area)
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).