

Detention &
WQ OK 4-1-15

STORMWATER MANAGEMENT FACILITIES

REPORT FOR

CVS/pharmacy®

Store # 10546

Owner:

Missouri CVS Pharmacy, L.L.C.

A Limited Liability Company

Contact Person: Richard Smart

501 S Pennsylvania Parkway

Suite 160

Indianapolis, IN 46280

Continuing Authority:

Missouri CVS Pharmacy, L.L.C.

A Missouri Limited Liability Company



PREMIER CIVIL ENGINEERING

308 TCW COURT
LAKE SAINT LOUIS MO 63367

Date Prepared:

3-2-2015

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STORMWATER MANAGEMENT FACILITIES REPORT

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OVERVIEW

INTRODUCTION

CVS Pharmacy is proposing to construct a 13,225 sf building at the northeast corner of Feise Road and Bryan Road in the City of O'Fallon, MO. The site is 1.84 acres and will consist of the building, parking and associated infrastructure improvements as required to make this a complete and useable site. The site is currently an open field that has not been used for agriculture. The CVS/Pharmacy will be developed at the intersection and the existing open area will remain for the remainder of the property. A detention basin will be built to the north which will be temporary until the full development of the property.

Features

With all new developments, stormwater volume issues are a concern. CVS is addressing these issues with an above ground stormwater detention system. The Post-Construction permanent BMP chosen for this site will consist of providing Channel Protection Volume to ensure a reduction in stormwater runoff and by providing a hydrograph that requires almost 48 hours to drain the basin the basin will act as a water quality BMP. Silt fence will be used as a temporary BMP during construction to reduce silt leaving the site and inlet protection fabric drops will surround inlets to reduce off-site contamination due to erosion. As a private BMP, CVS will be responsible for regular maintenance and inspection. Proper maintenance will ensure that the stormwater from the site will have minimal impact on the surrounding properties as well as reduce downstream sediment issues while the site is under construction.

By providing a large basin next to the CVS development, CVS will provide the City public awareness of the responsibility of stormwater quality and quantity. Per the Vermont Stormwater Management Manual the key to providing channel protection for water quality is providing a 24 hour extended detention of the post-developed 1-year, 24 hour rainfall event in warm water fish habitats that are located downstream. The downstream creek located north of the site is a tributary to Dardenne Creek.

EXECUTIVE SUMMARY

EXISTING CONDITIONS OF ENTIRE SITE:

Grass Areas = 18.40 Acres

POST DEVELOPED CONDITIONS:

Post developed conditions have been modeled using the proposed CVS improvements and the existing site to remain as grass with a C factor of 0.24 for the grass areas and pavement and building with a C factor of 0.98.

POST DEVELOPED CONDITIONS:

Grass and landscaped areas = 17.09 ac.

Building and pavement areas at 100% impervious = 1.31 ac.

CALCULATION OF ALLOWABLE DISCHARGE

	1 Year (cfs)	2 Year (cfs)	25 Year (cfs)	100 Year (cfs)
Pre Developed Runoff (Hydrograph No. 9)	16.68	25.55	69.83	94.66
Post Developed Area Bypassing Detention Basin (Hydrograph No.	15.49	23.53	63.37	85.85
Site Runoff Routed Through Basin (Hydrograph 12)	0.16	0.402	1.972	5.077
Final Routing for Post Developed with Detention (Hydrograph 13)	15.63	23.73	65.29	90.63
Reduction in Runoff from Pre Developed to Post Developed	1.05	1.82	4.54	4.03

PEAK FLOW RATES FROM SITE TO BASIN

	Peak flow rate in cfs			
	<u>1yr</u>	<u>2 yr</u>	<u>25 yr</u>	<u>100yr</u>
Peak runoff to basin	7.005	9.38	19.94	25.52

TABLE OF VOLUME DETAINED BY STORM EVENT

	1 Year 24 Hour Storm	2 Year 24 Hour Storm	25 Year 24 Hour Storm	100 Year 24 Hour Storm
VOLUME (CU. FT.)	29,298	11,169	23,048	29,298
HIGH WATER ELEVATION	631.01	631.27	632.57	633.19

Top of Basin Elevation = 635.00

<u>WEIR FORMULA FOR DETENTION BASIN</u>			
Q TO WEIR (Q) =	25.52 CFS		
WEIR (C) =	3	(MAY VARY DEPENDING ON WEIR. 3.0 IS FOR A MANHOLE RISER OR GRATE INLET)	
LENGTH OF WEIR (L)	10 FT	2 GRATE INLET = 15.0'	
WEIR FORMULA:	$h = [q/(c*I)]^{2/3}$		
	h =	0.90 FT	
HIGHWATER IN BASIN	WEIR ELEVATION + h		
WEIR ELEVATION =	633.00 ft.		
HW IN BASIN =	633.90		
TOP OF POND =	635.00		
	denotes input cell		

EVALUATION OF PROPOSED CONDITIONS

Per the direction of the city of O'Fallon, the pre CVS development condition that establishes pre development runoff shall not increase from the existing conditions based on the overall site. Therefore, flow paths based on time of concentration have been provided to ensure that we are meeting the pre-development runoff objective. Due to the sensitive nature of the development due to the adjoining creek and residential subdivision, additional detention has been provided to ensure no long standing issues with the stand alone CVS project.

DEVELOPMENT USE

This development will construct a standalone CVS Pharmacy with a single drive thru window for prescription drop off and pickup. Construction of site components associated with

a pharmacy such as parking lots, curb and gutter, landscaped areas, sidewalk, drainage facilities and sanitary sewers are also proposed.

DISTURBED AREA

The total on and offsite area disturbed by construction of this development is 2.25 acres.

Project Name: CVS/Pharmacy NEC Feise and Bryan Road

COMPUTATIONS FOR WQ_v:

<u>Drainage Area</u>	<u>Impervious Area</u>	<u>Percent Impervious</u>
1.84 Ac.	1.31 Ac.	71.2 %

The following computational procedure follows the methodology detailed in Appendix D.10 of the Maryland Stormwater Design Manual.

1. Determine R_v (Volumetric Runoff Coefficient)

$$Q_a = (P)(R_v)$$

Where:

$$P = \text{Water quality storm event depth} = 1.14 \text{ "}$$

$$R_v = 0.05 + (0.009)(\% \text{ impervious area})$$

$$R_v = .05 + (0.009) (71.2)$$

$$R_v = 0.69$$

2. Determine WQ_v (Water Quality Volume)

$$P = 1.14 \text{ " (Rainfall)}$$

$$WQ_v = \frac{ (P) (R_v) (\text{ Ac. })}{12 \text{ "}}$$

$$WQ_v = \frac{ (1.14 \text{ " }) (0.69) (1.84 \text{ Ac. })}{12 \text{ "}} = 0.1207 \text{ Ac. Ft.} = 5259.7 \text{ Cu. Ft.}$$

PROVIDED WATER QUALITY VOLUME

The 1 year 24 hour storm provides 29,298 cu. ft. of volume. Therefore, as part of the extended detention the dry detention basin meets its purpose for 60% TSS. The existing grass swale that is the outfall for the proposed extended detention dry basin provides 40% TSS. Therefore the development will have 80% TSS removal by treatment train. The second water quality feature by treatment train reduces TSS by 50%.

MAINTENANCE AND OPERATION PLAN

The owner has recorded a "Maintenance Agreement" between themselves and the City of O'Fallon. This agreement states that the owner agrees to maintain the stormwater management facilities located on this property and sets forth penalties that may occur if this maintenance is not performed. The contact information for the responsible party is as follows:

Richard Smart, Construction Project Manager

The responsible party will maintain all private stormwater facilities in good working order. Minimum maintenance of the private facilities shall include routine inspection, maintenance and removal of sediment, debris, oil and foreign material from the storm sewers, inlets and manholes; and routine inspection, maintenance and cleaning of the outlet structure. An Inspection Checklist is also attached and should be used for regular maintenance and record keeping for reporting purposes. The party responsible for maintenance must evaluate the plan for effectiveness at least annually, and revise as necessary.

Reporting Requirements

To ensure the maintenance of privately owned stormwater management facilities, the City of O'Fallon requires an Annual BMP Maintenance Report to be submitted to the City for these facilities. The Annual Report should provide documentation that maintenance was performed in accordance with the Stormwater Management Facilities Report submitted for your development and approved by the City of O'Fallon for the above referenced project. The Annual Report typically consists of a completed inspection checklist and/or maintenance log, narrative description of corrective action measures taken, photographs, and any other documentation appropriate for demonstrating compliance with the BMP Maintenance Agreement and your Facilities Report.

The annual BMP Maintenance Report should be submitted to the City of O'Fallon before December 31st of each year. A City of O'Fallon inspector will also periodically inspect the BMP to determine if it is being maintained properly. The Annual Report should be sent to:

Attn: Engineering Department
City of O'Fallon, MO
Contact: Michelle Grimmenger

Operation and Maintenance Procedures:

1. Immediately after the wet detention basin is established, the plants on the vegetated shelf and perimeter of the basin should be watered twice weekly if necessary until the plants become established (commonly six weeks).
2. No portion of the wet detention basin should be fertilized after the initial fertilization that is required to establish the plants on the vegetated shelf.
3. Stable groundcover should be maintained in the drainage area to reduce the sediment load to the wet detention basin.
4. If the embankment meets the criteria, it shall be inspected as required by a dam safety expert.

Any deficiencies found during inspection of the wet detention pond best management practice shall be corrected, repair or replaced immediately.

I. Monthly or after every 1-inch rainfall, whichever comes first:

- a. Remove trash and debris from wet detention basin.
- b. Clear trash and debris from catch basin riser grates, bottom of catch basin, and check outlet pipe for obstructions and clogging. Check and clear orifice(s) of any obstructions.
- c. Check pond side slopes and contributing areas and repair eroded areas before next rainfall.
- d. Check pond inlet and outlet pipes, grass swales and inlet/outlet dissipaters.
- e. Replace rip rap that is choked with sediment.
- f. Check forebay for sedimentation. Remove sediment to restore original forebay design depth when 1-foot dedicated sediment storage area has reached its capacity and is full.

II. Annually

- a. Check pond depth and forebay at various locations. Remove sediment to restore original pond design depth when 1-foot dedicated sediment storage area has reached its capacity and is full.
- b. Check the condition of the dam and wall for leaks and seepage, transverse or longitudinal cracks, sinkholes, woody vegetation, signs of rodent infestation differential settling or other such problems.
- c. Check the operation of all devices and equipment for proper operation.

The tables on the next two pages contain potential problems and remedial actions to be taken.

BMP Element	Potential Problems	Remedial Action
Entire BMP	Trash/debris is present	Remove the trash/debris
Perimeter of the wet detention basin	Areas of bare soil and/or erosive gullies are present	Re-grade the soil if necessary to remove the gullies and then plant ground cover. Provide lime and fertilizer if necessary. Water if necessary until ground cover is reestablished.
Perimeter of the wet detention basin	Vegetation is too short or too long.	Maintain vegetation per BMP landscape plan.
Pipe Inlet	Pipe is clogged	Unclog the pipe and dispose of the material properly.
Pipe Inlet	Pipe is cracked or damaged	Repair or replace.
Forebay	Sediment has accumulated to a depth of equal to or greater than one foot which is the original design depth for sediment storage	Search for source of the sediment and remedy the problem. Remove the sediment and dispose of it properly at an off-site location.
Forebay	Erosion has occurred.	Provide additional erosion protection such as reinforced turf matting or additional riprap if needed to prevent future erosion problems.
Forebay	Weeds are present.	Remove the weeds. If a pesticide is used, wipe it on the plants rather than spraying it.
Vegetated Shelf	Pruning is needed to maintain plant health.	Prune according to best professional practices.
Vegetated Shelf	Plants are dead, dying, or diseased.	Determine the source of the problem. Is it soils, disease, etc.? Remedy the problem and replace the plants. If a soil test indicates it is necessary, provide a one-time fertilizer application to establish plants.
Vegetated Shelf	Weeds are present.	Remove the weeds. If a pesticide is used, wipe it on the plants rather than spraying it.

BMP Element	Potential Problems	Remedial Action
Main Treatment Area (Main Pond)	Sediment has accumulated to a depth equal to or greater than the original design sediment storage depth of one foot.	Search for the source of the sediment and remedy the problem. Remove the sediment to the original design bottom elevation of the pond and dispose of it properly at an off-site location.
Main Treatment Area (Main Pond)	Algal growth covers 50% or more of the water surface area.	Consult a professional to remove and control the algal growth.
Main Treatment Area (Main Pond)	Cattails, phragmites, or other invasive plants cover 50% or more of the basin surface.	Wipe an insecticide on the plants rather than spraying them.
Embankment	Shrubs have started to grow on the embankment.	Remove the shrubs immediately.
Embankment	A tree has started to grow on the embankment	Remove the tree immediately unless removing it adversely affects the integrity of the embankment. If so, contact a qualified professional concerning the tree removal and embankment repair.
BMP Element	Potential Problems	Remedial Action
Embankment	Evidence of muskrat or beaver activity is present	Consult a professional to trap and remove the muskrats
Embankment	An annual inspection by a qualified professional shows that the embankment needs repair.	Make all needed repairs immediately.
Outlet Device	The outlet device is	Clean out the outlet device.
Outlet Device	The outlet device is damaged.	Repair or replace the outlet device.
Outlet	Erosion at the outlet.	Repair the eroded area as necessary.

Pond#: _____ **Pond Name:** _____

Fence/Gate/Lock/Guardrail

Fence / Gate / Lock in good condition? (YES/NO/N.A.)

Is there any fence damage? (YES/NO)

_____ LF of damaged fence #of posts damaged

_____ # of corner/pull posts damaged

What type of fence/guardrail was damaged? (4' rail, guardrail)

Top Rail? (YES/NO)

Signs

No swimming, skating and no trespassing signage in place, (YES/NO)

Trash/Debris

Excessive trash/debris in pond? (YES/NO)

Pond Sediment

Sediment in bottom of the detention/retention pond is above invert pipe elevation? (YES/NO/N.A.)

Is water ponding in the infiltration pond? (YES/NO/N.A.)

Erosion

Is there any noticeable erosion along the pond berm or at the inlet/outlet/dispersal trench/ emergency overflow? (YES/NO)

Tree Growth/Dangerous Trees

Are there any noticeable dangerous trees within the fenced pond perimeter? (YES/NO)

Are there any noticeable dangerous trees outside of the pond fence, but still within P.C. property limits? (YES/NO)

Are there any trees that are growing in a location or manner that may adversely impact the facility? (YES/NO)

Catch Basins/Control Structures

Is there any evidence of pollutants such as oil/ gasoline/ or other pollutants within the catch basin/control structure?(YES/NO/N.A.)

Is the control device securely fastened to the structure? (YES/NO/N.A.) Is

the orifice(s) in the control structure clear of debris? (YES/NO/N.A.)

Is the ladder in the catch basin/control structure securely attached? (YES/NO/N.A.)

Is locking lid(s) fastened down with the appropriate number of tamper proof bolts?(YES/NO/N.A.) Is

the catch basin lid(s) located below grade?(YES/NO/N.A.)

Is the structure(s) damaged in any way?(YES/NO/N.A.)

Was excessive material found in the structure?(YES/NO/N.A.)

Is Trash Rack Clean and free of debris?

APPENDIX "A"

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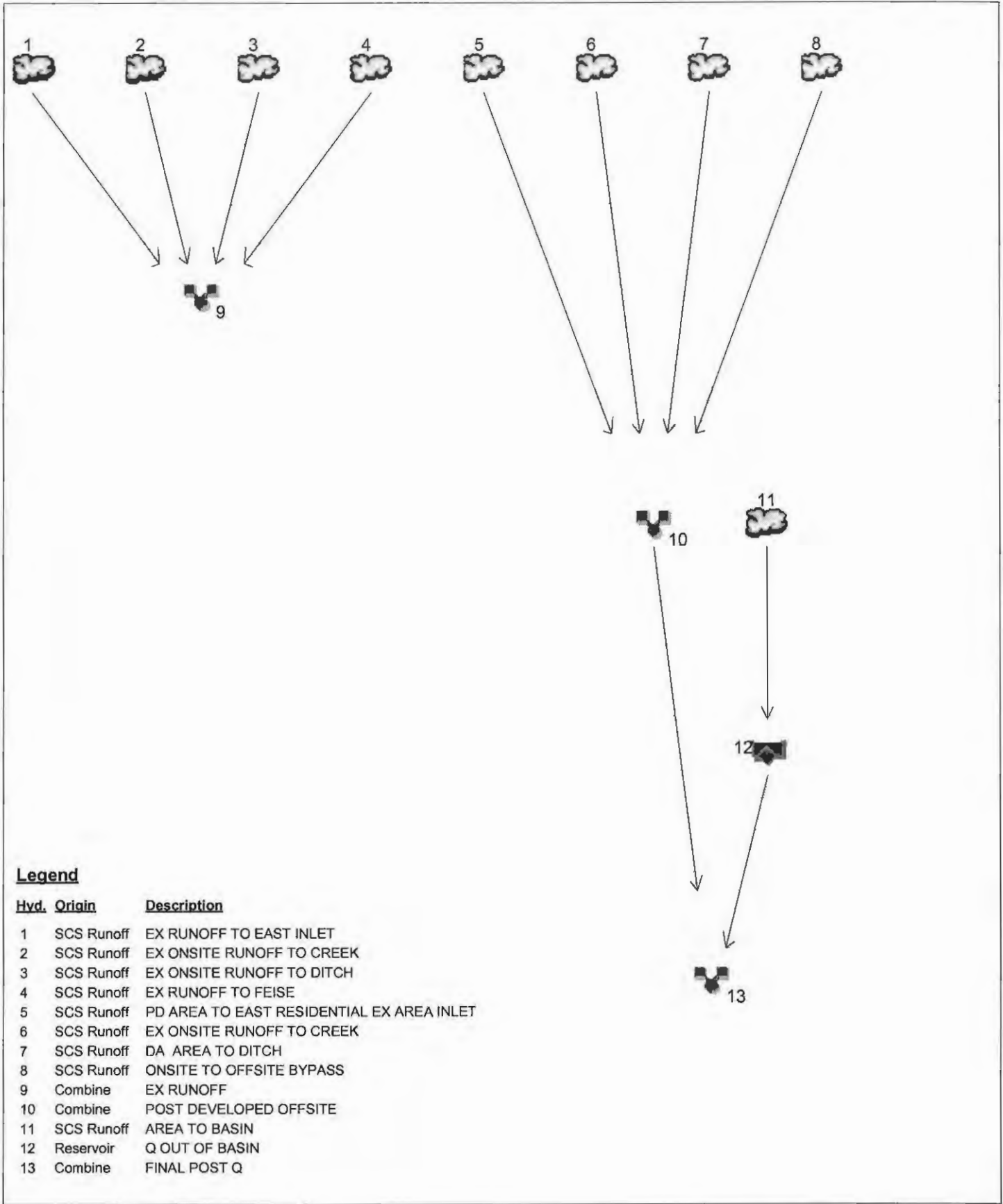
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Watershed Model Schematic

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



Legend

<u>Hvd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	EX RUNOFF TO EAST INLET
2	SCS Runoff	EX ONSITE RUNOFF TO CREEK
3	SCS Runoff	EX ONSITE RUNOFF TO DITCH
4	SCS Runoff	EX RUNOFF TO FEISE
5	SCS Runoff	PD AREA TO EAST RESIDENTIAL EX AREA INLET
6	SCS Runoff	EX ONSITE RUNOFF TO CREEK
7	SCS Runoff	DA AREA TO DITCH
8	SCS Runoff	ONSITE TO OFFSITE BYPASS
9	Combine	EX RUNOFF
10	Combine	POST DEVELOPED OFFSITE
11	SCS Runoff	AREA TO BASIN
12	Reservoir	Q OUT OF BASIN
13	Combine	FINAL POST Q

Hydrograph Return Period Recap

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

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	----	6.608	10.08	-----	-----	-----	27.67	-----	37.56	EX RUNOFF TO EAST INLET
2	SCS Runoff	-----	4.922	7.498	-----	-----	-----	20.50	-----	27.79	EX ONSITE RUNOFF TO CREEK
3	SCS Runoff	-----	4.041	6.172	-----	-----	-----	16.97	-----	23.05	EX ONSITE RUNOFF TO DITCH
4	SCS Runoff	-----	1.478	2.252	-----	-----	-----	6.111	-----	8.269	EX RUNOFF TO FEISE
5	SCS Runoff	-----	7.412	11.29	-----	-----	-----	30.64	-----	41.47	PD AREA TO EAST RESIDENTIAL E
6	SCS Runoff	-----	4.518	6.892	-----	-----	-----	18.92	-----	25.68	EX ONSITE RUNOFF TO CREEK
7	SCS Runoff	-----	3.184	4.651	-----	-----	-----	13.17	-----	17.81	DA AREA TO DITCH
8	SCS Runoff	-----	0.657	0.949	-----	-----	-----	2.326	-----	3.076	ONSITE TO OFFSITE BYPASS
9	Combine	1, 2, 3, 4,	16.68	25.55	-----	-----	-----	69.83	-----	94.66	EX RUNOFF
10	Combine	5, 6, 7, 8,	15.49	23.53	-----	-----	-----	63.37	-----	85.85	POST DEVELOPED OFFSITE
11	SCS Runoff	-----	7.005	9.380	-----	-----	-----	19.94	-----	25.52	AREA TO BASIN
12	Reservoir	11	0.160	0.402	-----	-----	-----	1.972	-----	5.077	Q OUT OF BASIN
13	Combine	10, 12	15.63	23.73	-----	-----	-----	65.29	-----	90.63	FINAL POST Q

Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.608	2	728	23,778	-----	-----	-----	EX RUNOFF TO EAST INLET
2	SCS Runoff	4.922	2	726	15,972	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
3	SCS Runoff	4.041	2	730	15,500	-----	-----	-----	EX ONSITE RUNOFF TO DITCH
4	SCS Runoff	1.478	2	724	4,279	-----	-----	-----	EX RUNOFF TO FEISE
5	SCS Runoff	7.412	2	724	21,456	-----	-----	-----	PD AREA TO EAST RESIDENTIAL E
6	SCS Runoff	4.518	2	728	16,257	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
7	SCS Runoff	3.184	2	724	9,218	-----	-----	-----	DA AREA TO DITCH
8	SCS Runoff	0.657	2	722	1,856	-----	-----	-----	ONSITE TO OFFSITE BYPASS
9	Combine	16.68	2	726	59,529	1, 2, 3, 4,	-----	-----	EX RUNOFF
10	Combine	15.49	2	724	48,787	5, 6, 7, 8,	-----	-----	POST DEVELOPED OFFSITE
11	SCS Runoff	7.005	2	716	14,328	-----	-----	-----	AREA TO BASIN
12	Reservoir	0.160	2	918	14,322	11	631.01	8,912	Q OUT OF BASIN
13	Combine	15.63	2	724	63,109	10, 12	-----	-----	FINAL POST Q
1-30-2015 DETENTION CALCS.gpw					Return Period: 1 Year			Monday, 03 / 2 / 2015	

Hydrograph Report

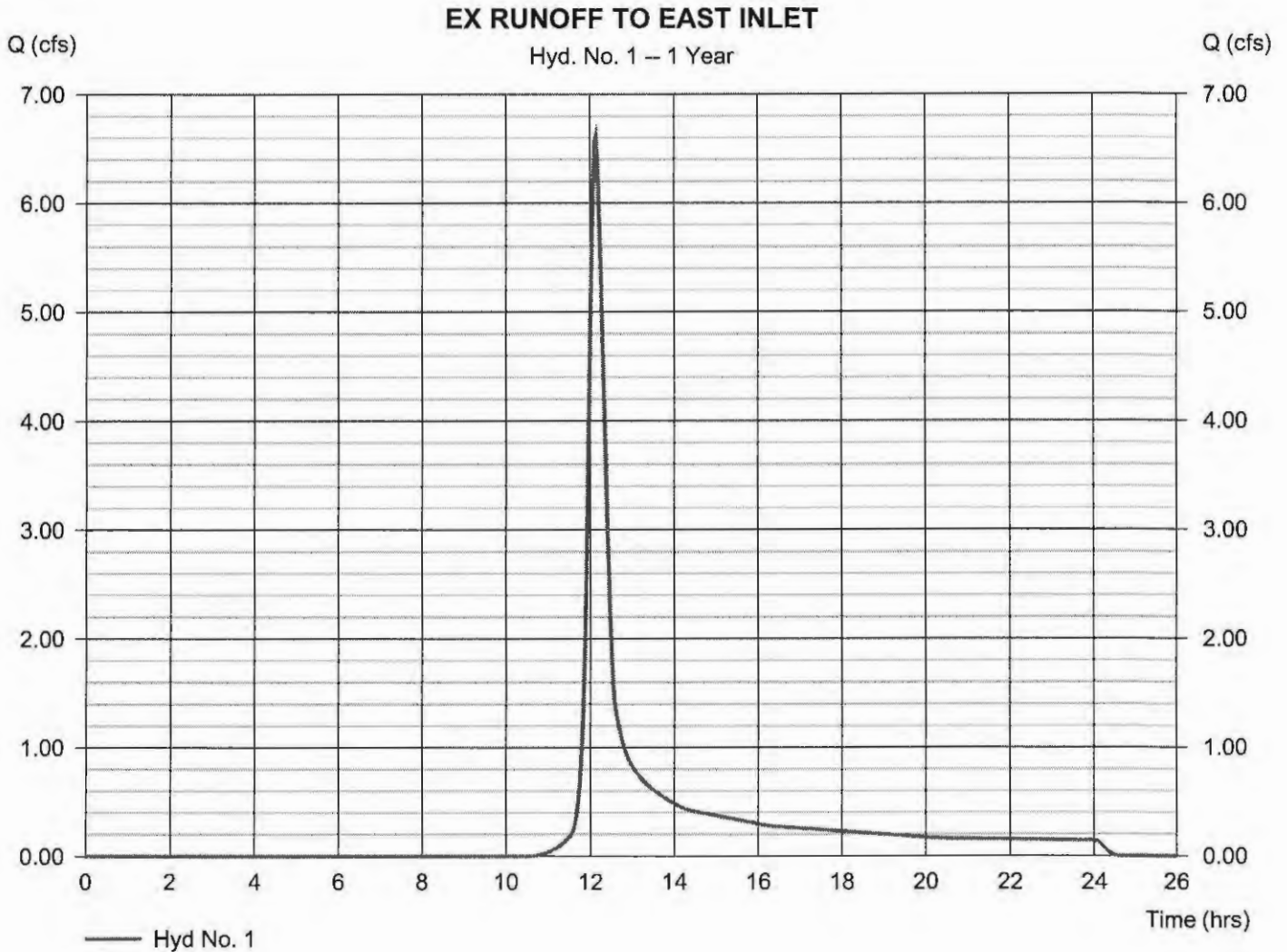
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 1

EX RUNOFF TO EAST INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 6.608 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 23,778 cuft
Drainage area	= 7.240 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hyd. No. 1

EX RUNOFF TO EAST INLET

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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)	= 3.50	0.00	0.00	
Land slope (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 18.00	+ 0.00	+ 0.00	= 18.00
Shallow Concentrated Flow				
Flow length (ft)	= 564.00	0.00	0.00	
Watercourse slope (%)	= 3.90	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.19	0.00	0.00	
Travel Time (min)	= 2.95	+ 0.00	+ 0.00	= 2.95
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	({0})0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				21.00 min

Hydrograph Report

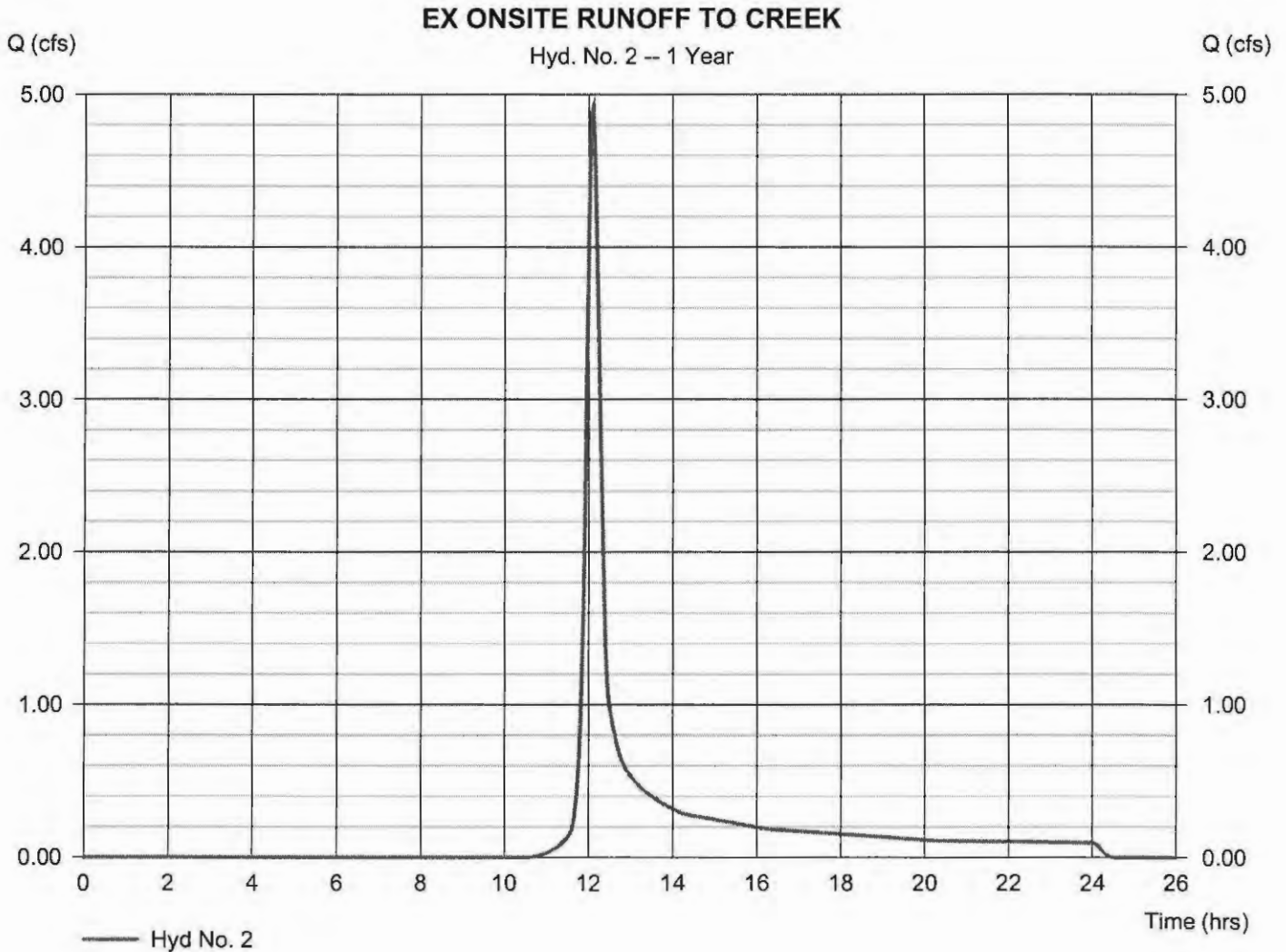
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 2

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 4.922 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 15,972 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.20 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hyd. No. 2

EX ONSITE RUNOFF TO CREEK

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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 (%)	= 1.50	0.00	0.00	
Travel Time (min)	= 15.77	+ 0.00	+ 0.00	= 15.77
Shallow Concentrated Flow				
Flow length (ft)	= 340.00	0.00	0.00	
Watercourse slope (%)	= 6.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.95	0.00	0.00	
Travel Time (min)	= 1.43	+ 0.00	+ 0.00	= 1.43
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	= 0.150	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				17.20 min

Hydrograph Report

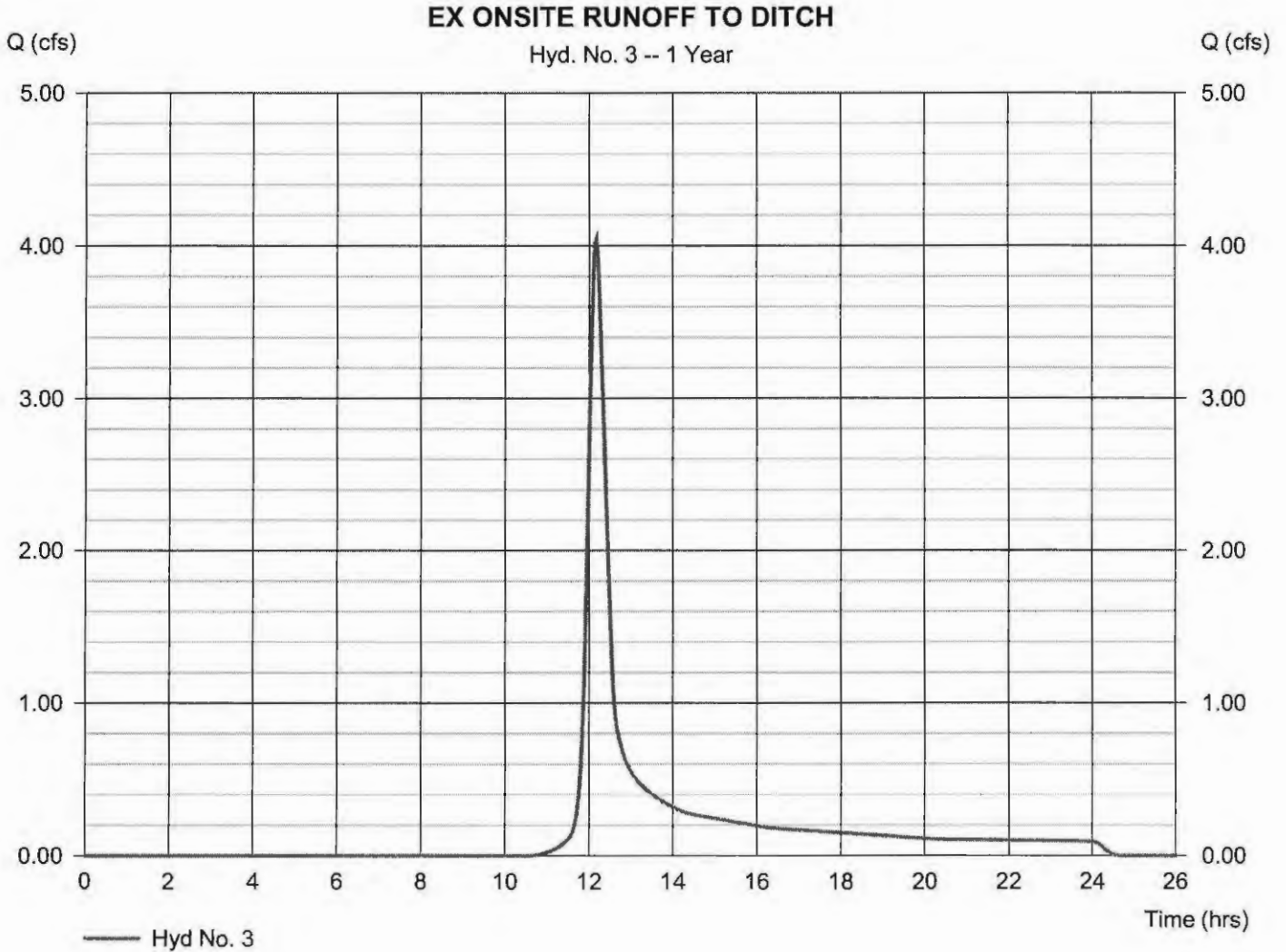
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 3

EX ONSITE RUNOFF TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 4.041 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 15,500 cuft
Drainage area	= 4.880 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.10 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

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

Hyd. No. 3

EX ONSITE RUNOFF TO DITCH

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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 (%)	= 1.00	0.00	0.00	
Travel Time (min)	= 18.54	+ 0.00	+ 0.00	= 18.54
Shallow Concentrated Flow				
Flow length (ft)	= 123.00	0.00	0.00	
Watercourse slope (%)	= 6.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.95	0.00	0.00	
Travel Time (min)	= 0.52	+ 0.00	+ 0.00	= 0.52
Channel Flow				
X sectional flow area (sqft)	= 27.00	0.00	0.00	
Wetted perimeter (ft)	= 18.97	0.00	0.00	
Channel slope (%)	= 2.70	0.00	0.00	
Manning's n-value	= 0.150	0.015	0.015	
Velocity (ft/s)	=2.07	0.00	0.00	
Flow length (ft)	{{0}}630.0	0.0	0.0	
Travel Time (min)	= 5.08	+ 0.00	+ 0.00	= 5.08
Total Travel Time, Tc				24.10 min

Hydrograph Report

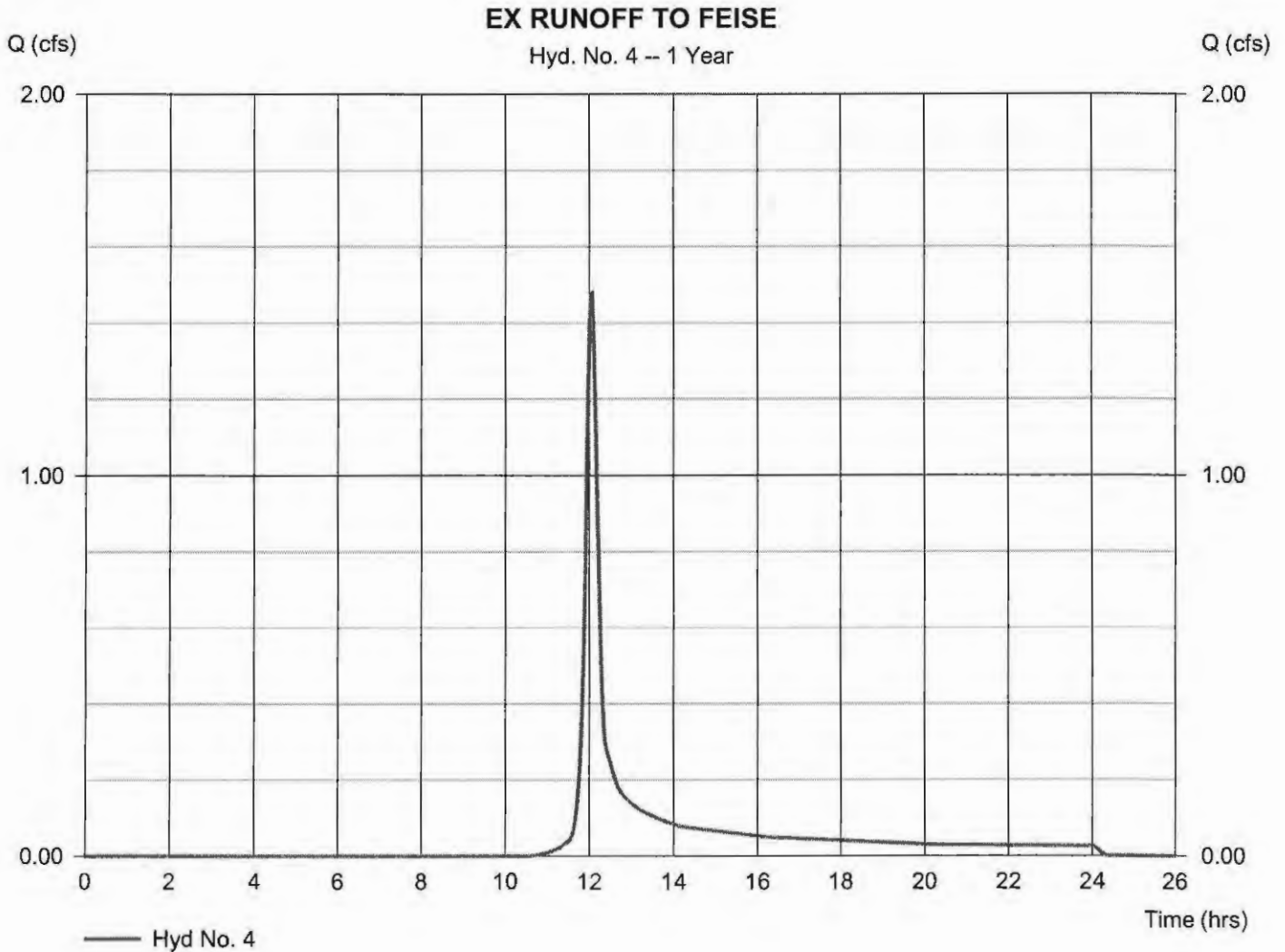
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Monday, 03 / 2 / 2015

Hyd. No. 4

EX RUNOFF TO FEISE

Hydrograph type	= SCS Runoff	Peak discharge	= 1.478 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 4,279 cuft
Drainage area	= 1.360 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

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

Hyd. No. 4

EX RUNOFF TO FEISE

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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)	= 3.50	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	= 13.64	+ 0.00	+ 0.00	= 13.64
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)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{0}0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				13.60 min

Hydrograph Report

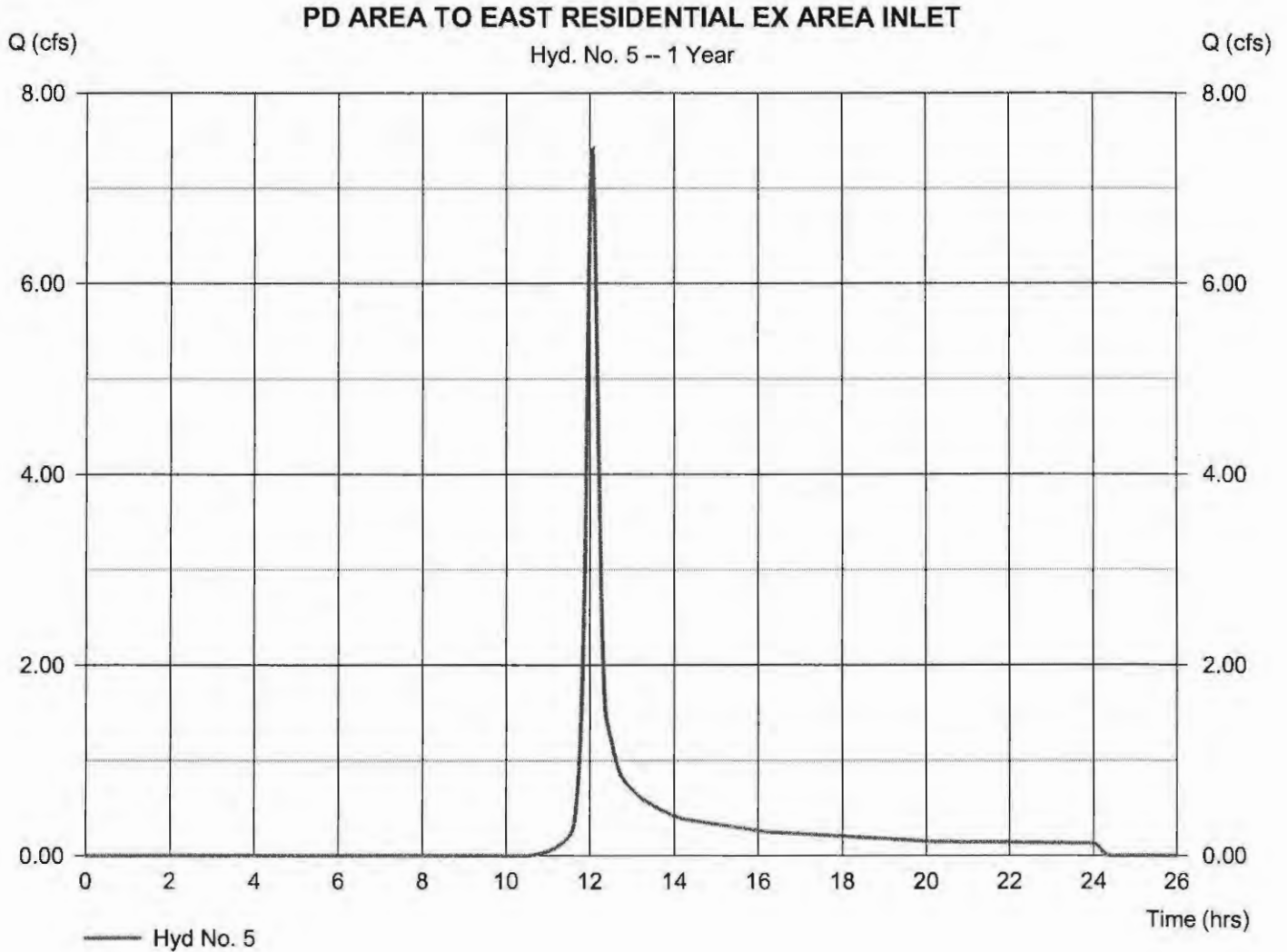
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Monday, 03 / 2 / 2015

Hyd. No. 5

PD AREA TO EAST RESIDENTIAL EX AREA INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 7.412 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 21,456 cuft
Drainage area	= 6.820 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.20 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hyd. No. 5

PD AREA TO EAST RESIDENTIAL EX AREA INLET

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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)	= 3.50	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	= 13.64	+ 0.00	+ 0.00	= 13.64
Shallow Concentrated Flow				
Flow length (ft)	= 490.00	0.00	0.00	
Watercourse slope (%)	= 3.90	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.19	0.00	0.00	
Travel Time (min)	= 2.56	+ 0.00	+ 0.00	= 2.56
Channel Flow				
X sectional flow area (sqft)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				16.20 min

Hydrograph Report

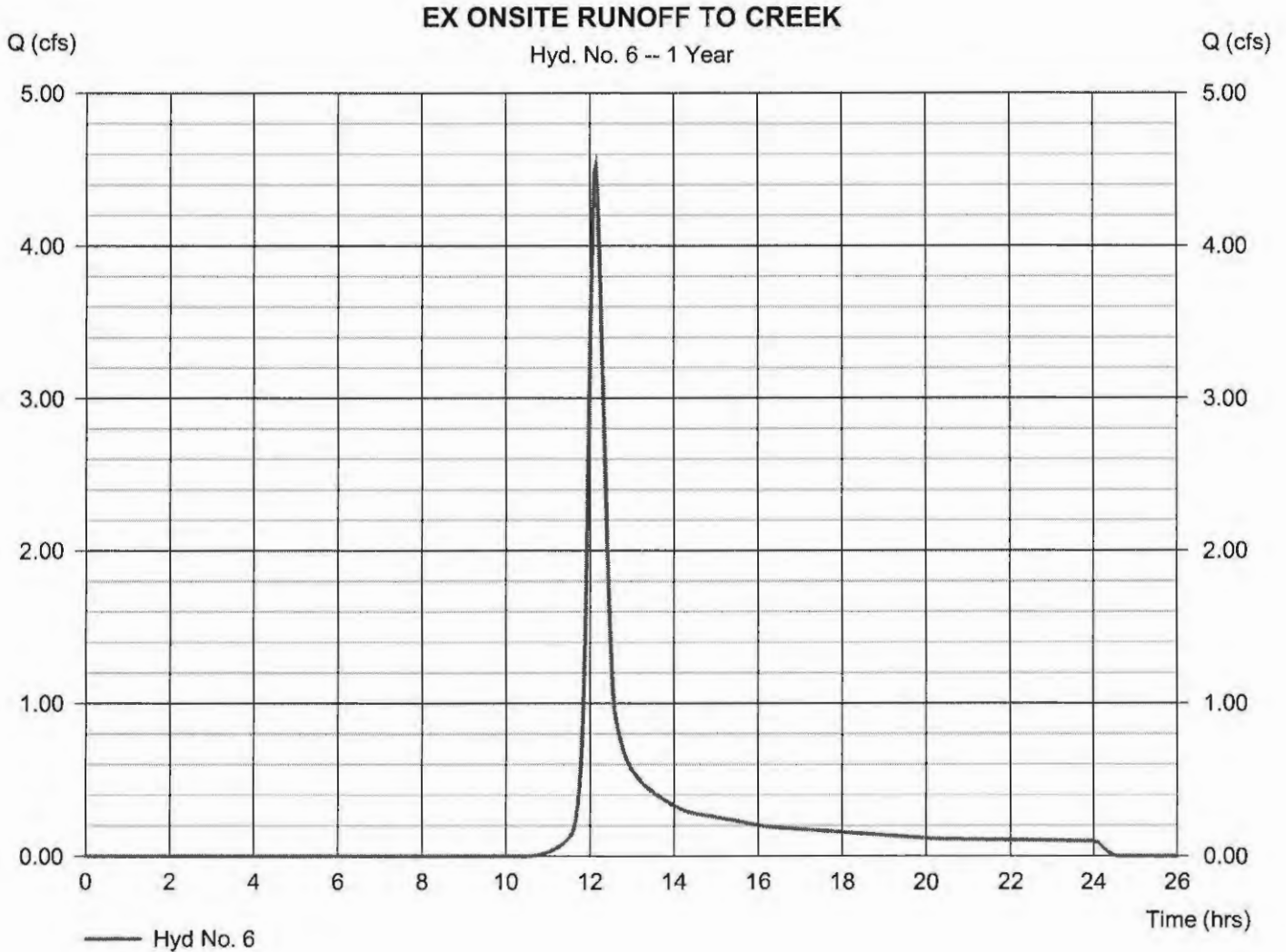
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Monday, 03 / 2 / 2015

Hyd. No. 6

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 4.518 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 16,257 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.30 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

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

Hyd. No. 6

EX ONSITE RUNOFF TO CREEK

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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 (%)	= 0.75	0.00	0.00	
Travel Time (min)	= 20.80	+ 0.00	+ 0.00	= 20.80
Shallow Concentrated Flow				
Flow length (ft)	= 340.00	0.00	0.00	
Watercourse slope (%)	= 5.50	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.78	0.00	0.00	
Travel Time (min)	= 1.50	+ 0.00	+ 0.00	= 1.50
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	= 0.150	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				22.30 min

Hydrograph Report

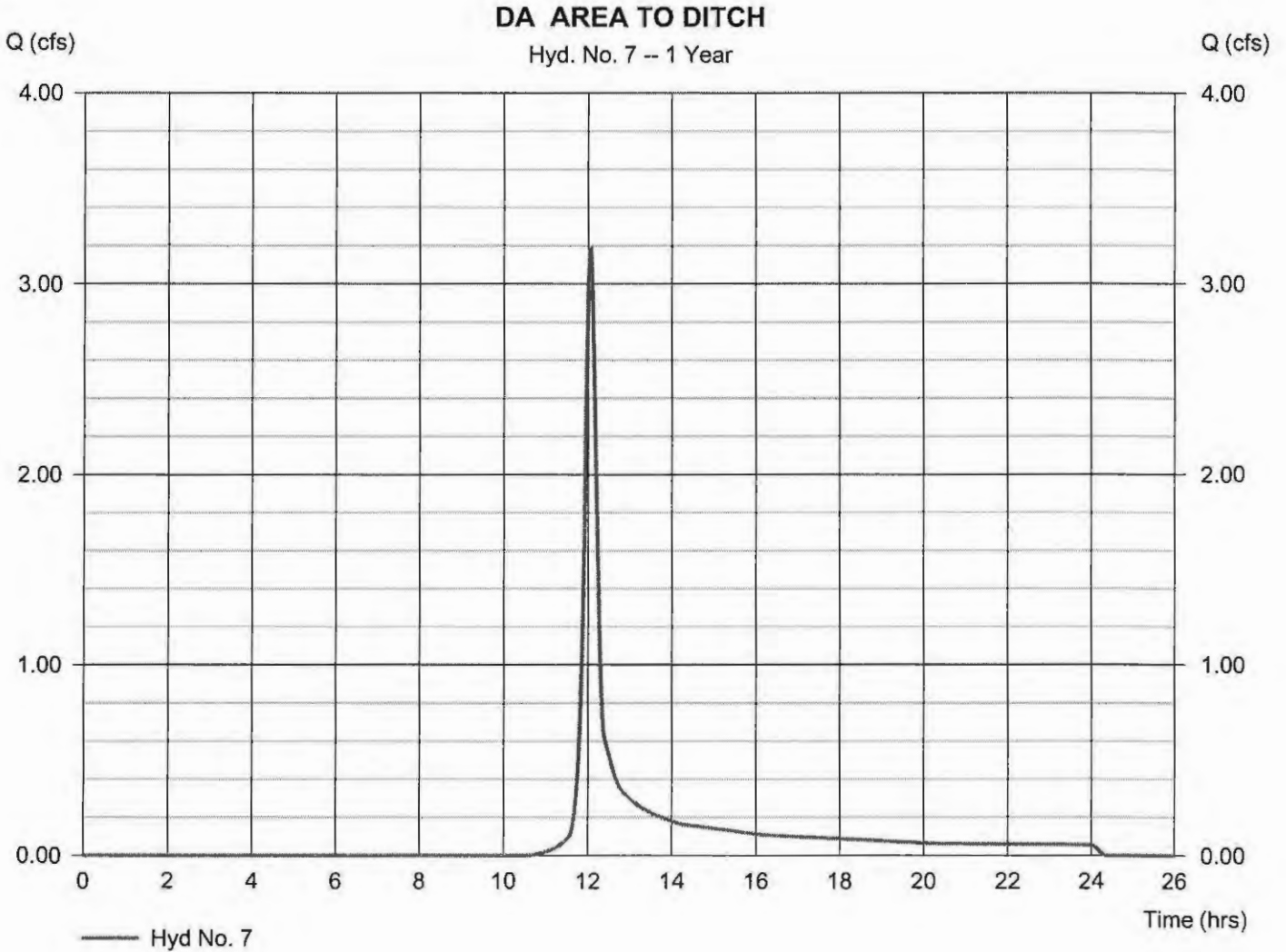
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Monday, 03 / 2 / 2015

Hyd. No. 7

DA AREA TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 3.184 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 9,218 cuft
Drainage area	= 2.930 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.50 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



TR55 Tc Worksheet

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

Hyd. No. 7

DA AREA TO DITCH

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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)	= 3.50	0.00	0.00	
Land slope (%)	= 3.30	0.00	0.00	
Travel Time (min)	= 11.17	+ 0.00	+ 0.00	= 11.17
Shallow Concentrated Flow				
Flow length (ft)	= 160.00	0.00	0.00	
Watercourse slope (%)	= 5.00	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=3.61	0.00	0.00	
Travel Time (min)	= 0.74	+ 0.00	+ 0.00	= 0.74
Channel Flow				
X sectional flow area (sqft)	= 27.00	0.00	0.00	
Wetted perimeter (ft)	= 18.97	0.00	0.00	
Channel slope (%)	= 2.70	0.00	0.00	
Manning's n-value	= 0.150	0.015	0.015	
Velocity (ft/s)	=2.07	0.00	0.00	
Flow length (ft)	{{0}}444.0	0.0	0.0	
Travel Time (min)	= 3.58	+ 0.00	+ 0.00	= 3.58
Total Travel Time, Tc				15.50 min

Hydrograph Report

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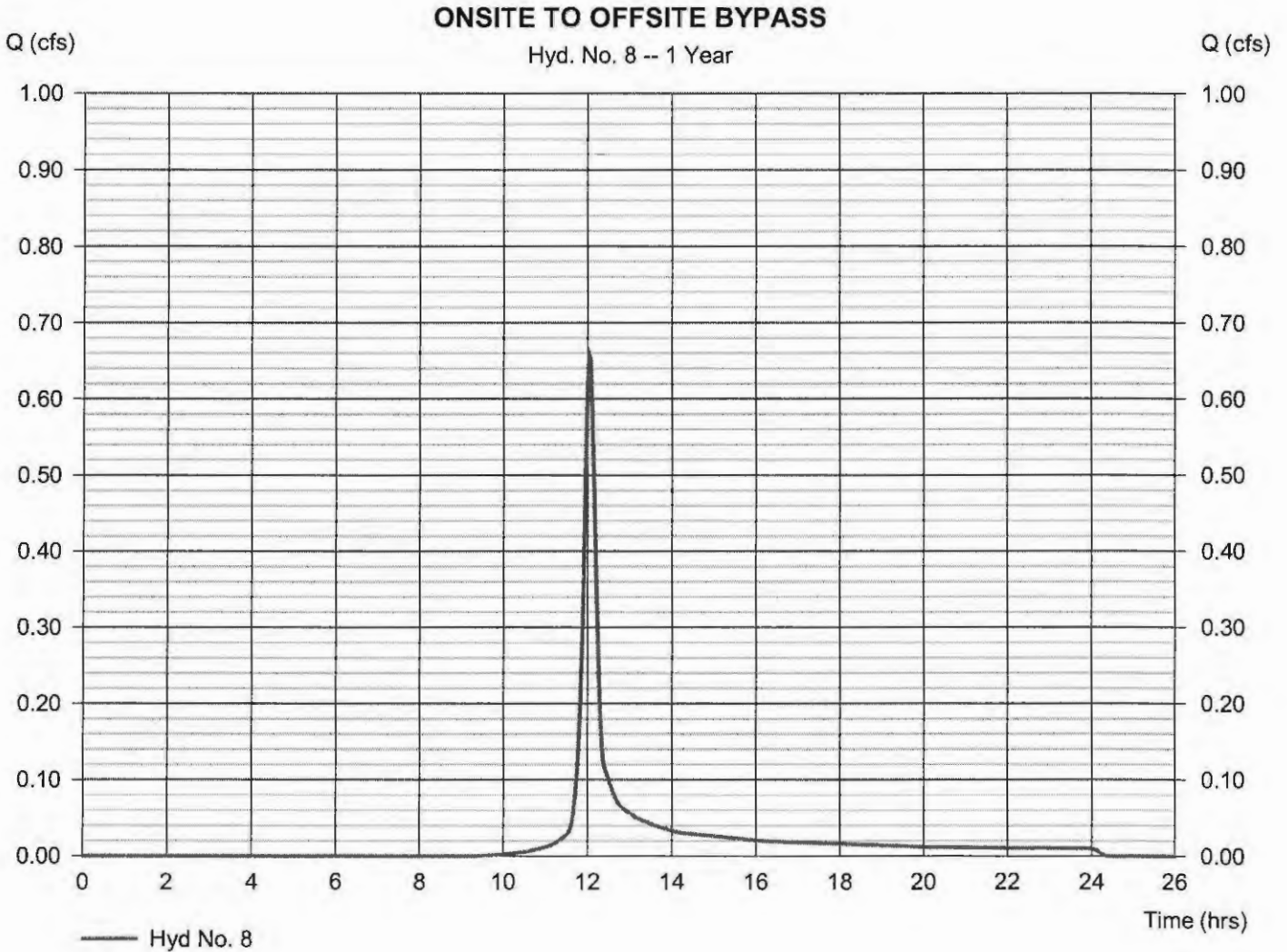
Monday, 03 / 2 / 2015

Hyd. No. 8

ONSITE TO OFFSITE BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.657 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 1,856 cuft
Drainage area	= 0.470 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.110 x 98) + (0.360 x 80)] / 0.470



Hyd. No. 8

ONSITE TO OFFSITE BYPASS

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
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)	= 3.50	0.00	0.00	
Land slope (%)	= 2.00	0.00	0.00	
Travel Time (min)	= 13.64	+ 0.00	+ 0.00	= 13.64
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)	= 0.00	0.00	0.00	
Wetted perimeter (ft)	= 0.00	0.00	0.00	
Channel slope (%)	= 0.00	0.00	0.00	
Manning's n-value	= 0.015	0.015	0.015	
Velocity (ft/s)	=0.00	0.00	0.00	
Flow length (ft)	{{0}}0.0	0.0	0.0	
Travel Time (min)	= 0.00	+ 0.00	+ 0.00	= 0.00
Total Travel Time, Tc				13.60 min

Hydrograph Report

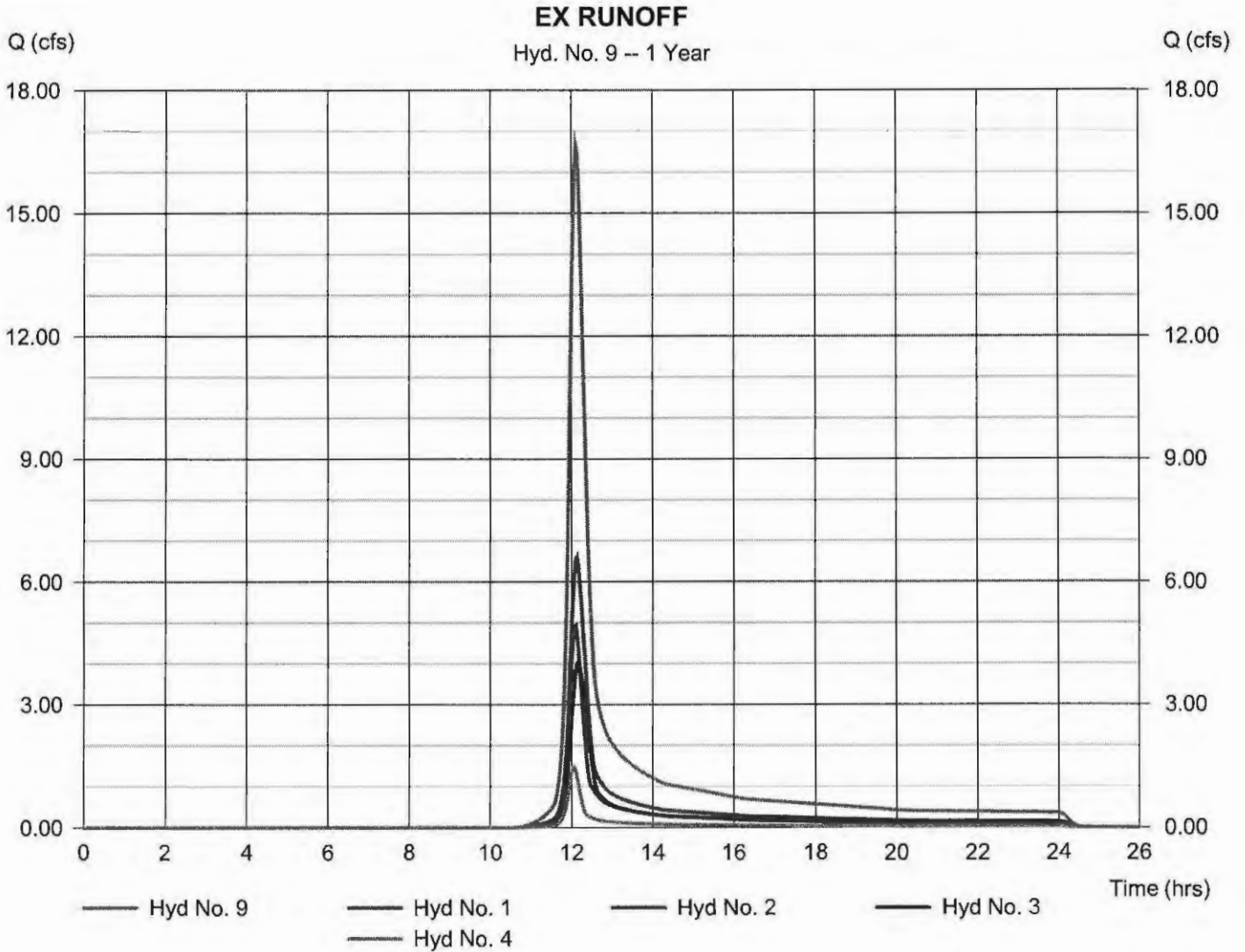
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Monday, 03 / 2 / 2015

Hyd. No. 9

EX RUNOFF

Hydrograph type	= Combine	Peak discharge	= 16.68 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 59,529 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 18.430 ac



Hydrograph Report

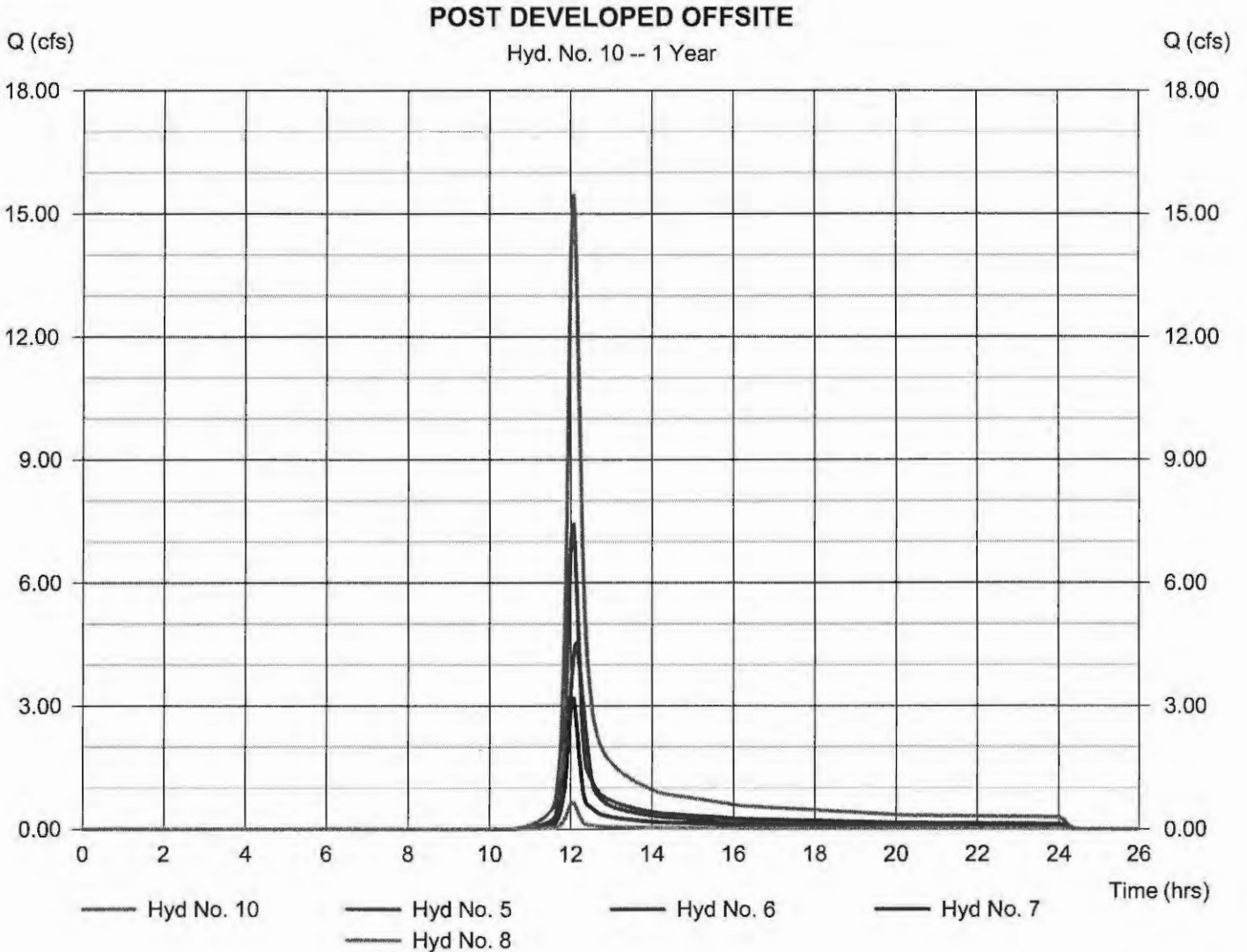
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Monday, 03 / 2 / 2015

Hyd. No. 10

POST DEVELOPED OFFSITE

Hydrograph type	= Combine	Peak discharge	= 15.49 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 48,787 cuft
Inflow hyds.	= 5, 6, 7, 8	Contrib. drain. area	= 15.170 ac



Hydrograph Report

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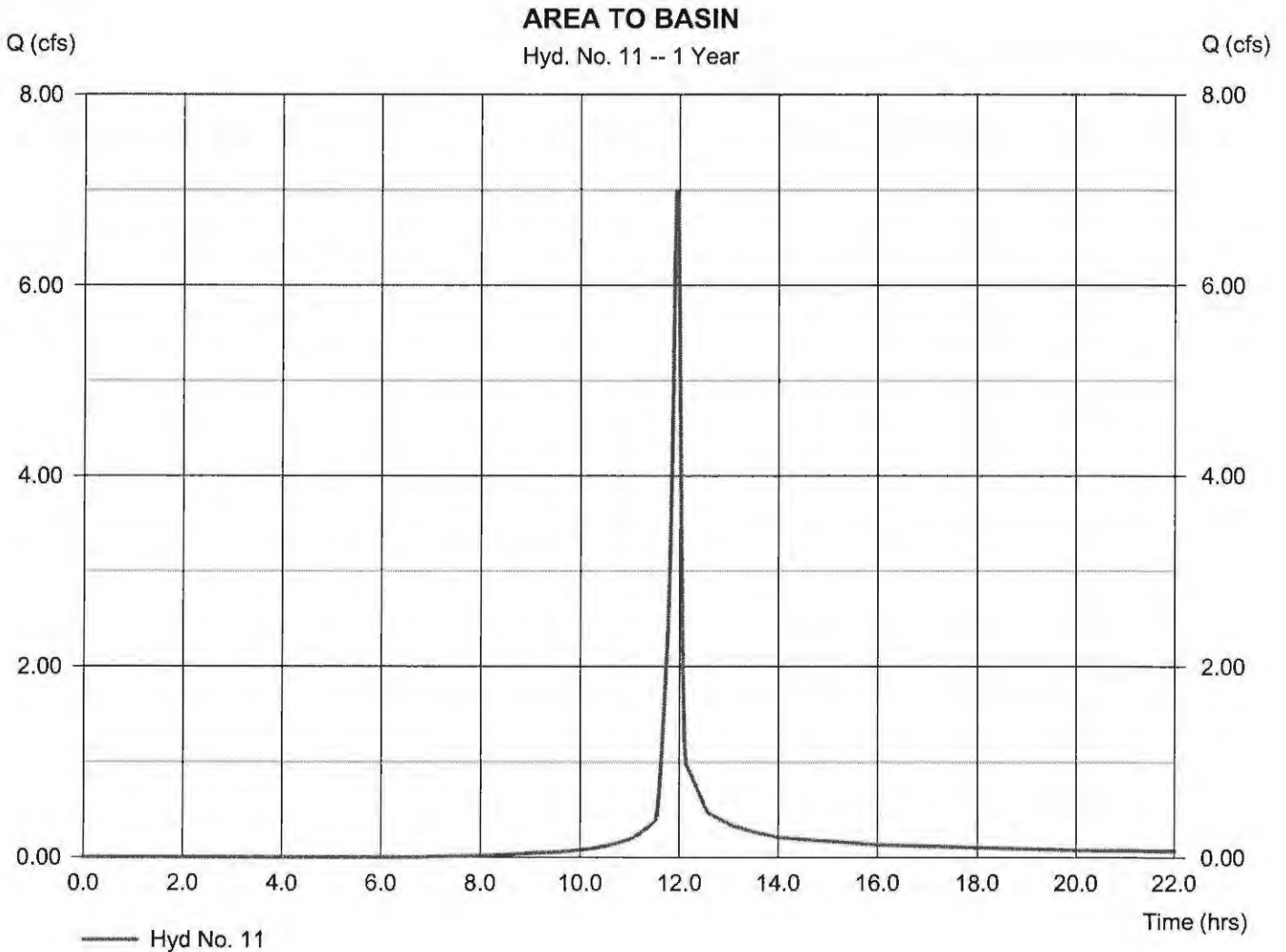
Monday, 03 / 2 / 2015

Hyd. No. 11

AREA TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 7.005 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 14,328 cuft
Drainage area	= 2.750 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.200 x 80) + (1.550 x 98)] / 2.750



Hydrograph Report

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

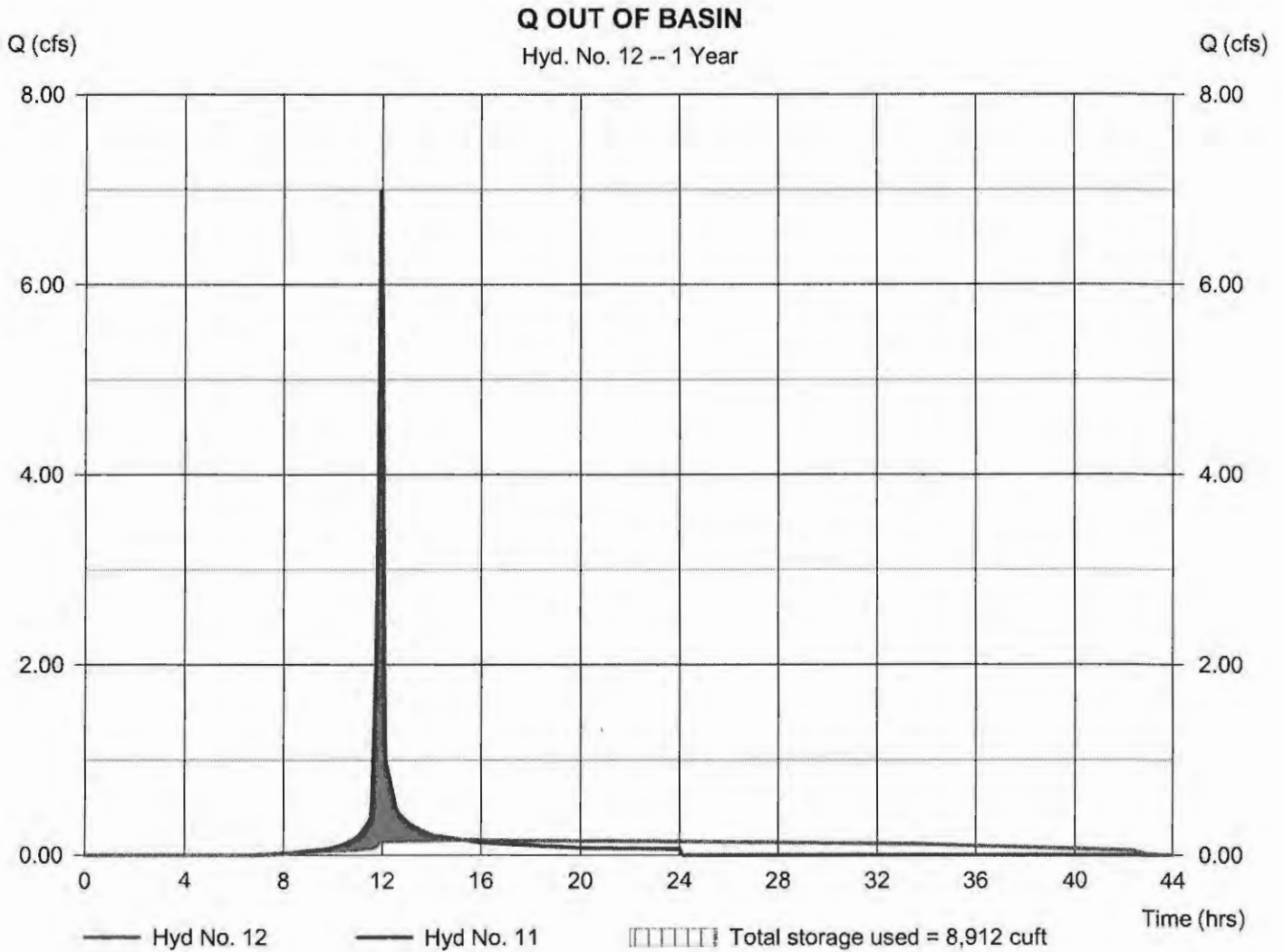
Monday, 03 / 2 / 2015

Hyd. No. 12

Q OUT OF BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.160 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.30 hrs
Time interval	= 2 min	Hyd. volume	= 14,322 cuft
Inflow hyd. No.	= 11 - AREA TO BASIN	Max. Elevation	= 631.01 ft
Reservoir name	= BASIN	Max. Storage	= 8,912 cuft

Storage Indication method used.



Pond No. 1 - BASIN

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Beginning Elevation = 628.70 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	628.70	01	0	0
0.30	629.00	553	83	83
1.30	630.00	4,391	2,472	2,555
2.30	631.00	8,131	6,261	8,816
3.30	632.00	9,211	8,671	17,487
4.30	633.00	10,348	9,780	27,267
5.30	634.00	11,541	10,945	38,212
6.30	635.00	12,791	12,166	50,378

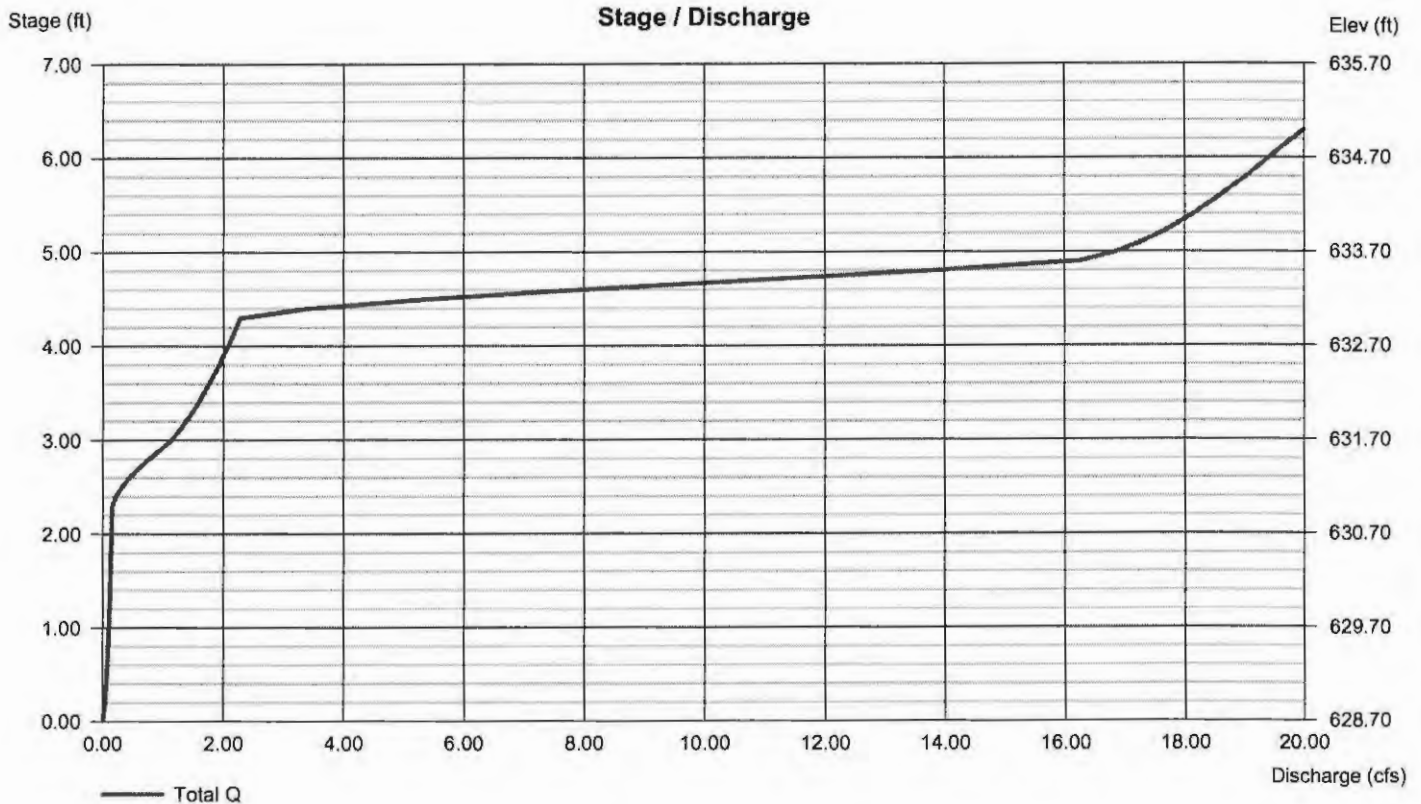
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 18.00	2.00	8.00	0.00
Span (in)	= 18.00	2.00	6.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 628.70	628.70	631.00	0.00
Length (ft)	= 58.00	0.00	0.00	0.00
Slope (%)	= 1.30	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)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 633.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	---	---	---
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).



Hydrograph Report

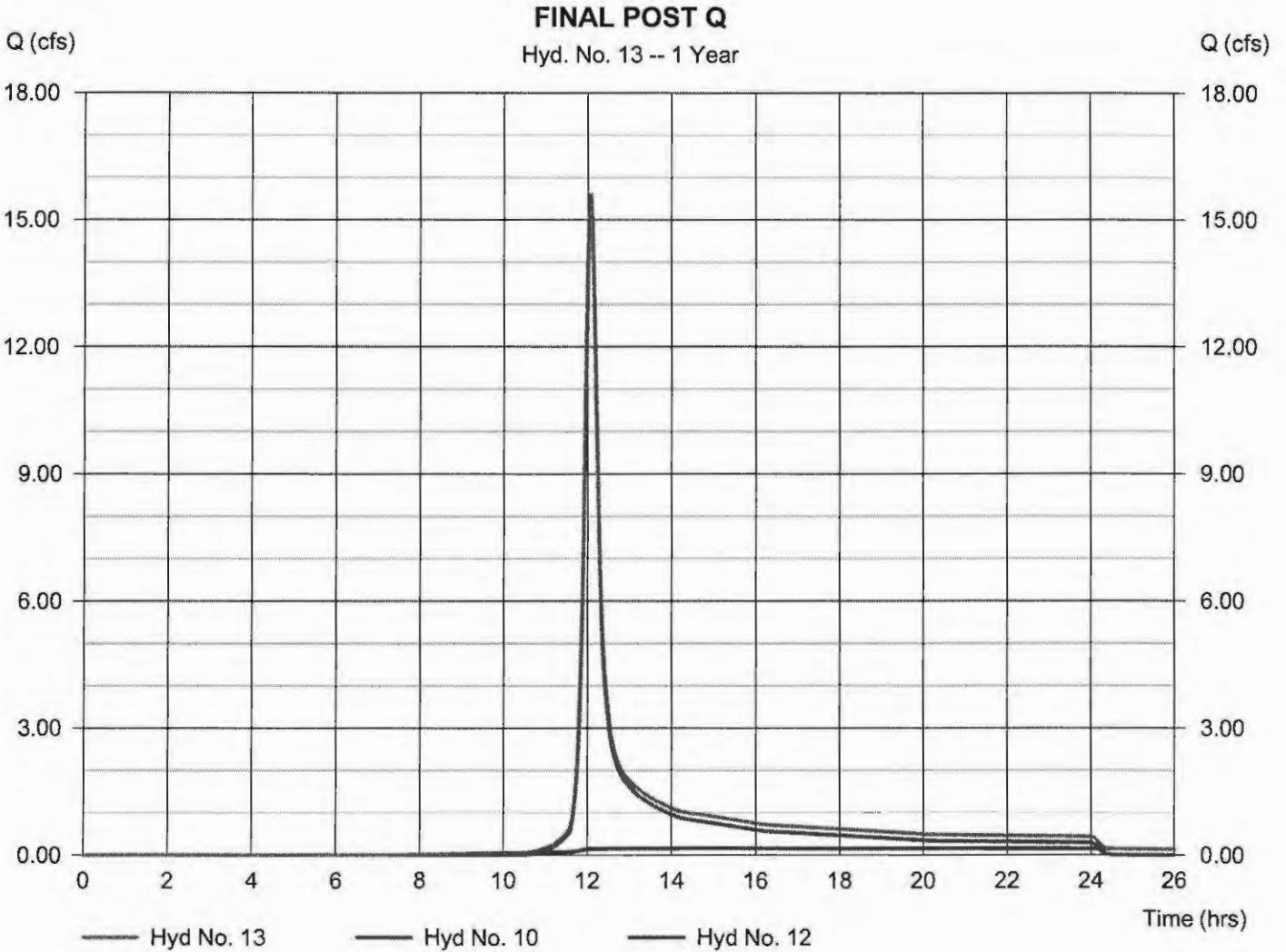
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Monday, 03 / 2 / 2015

Hyd. No. 13

FINAL POST Q

Hydrograph type	= Combine	Peak discharge	= 15.63 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 63,109 cuft
Inflow hyds.	= 10, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	10.08	2	728	35,458	-----	-----	-----	EX RUNOFF TO EAST INLET
2	SCS Runoff	7.498	2	724	23,817	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
3	SCS Runoff	6.172	2	730	23,113	-----	-----	-----	EX ONSITE RUNOFF TO DITCH
4	SCS Runoff	2.252	2	722	6,380	-----	-----	-----	EX RUNOFF TO FEISE
5	SCS Runoff	11.29	2	722	31,994	-----	-----	-----	PD AREA TO EAST RESIDENTIAL E
6	SCS Runoff	6.892	2	728	24,242	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
7	SCS Runoff	4.851	2	722	13,745	-----	-----	-----	DA AREA TO DITCH
8	SCS Runoff	0.949	2	722	2,660	-----	-----	-----	ONSITE TO OFFSITE BYPASS
9	Combine	25.55	2	726	88,768	1, 2, 3, 4,	-----	-----	EX RUNOFF
10	Combine	23.53	2	724	72,642	5, 6, 7, 8,	-----	-----	POST DEVELOPED OFFSITE
11	SCS Runoff	9.380	2	716	19,430	-----	-----	-----	AREA TO BASIN
12	Reservoir	0.402	2	794	19,425	11	631.27	11,169	Q OUT OF BASIN
13	Combine	23.73	2	724	92,066	10, 12	-----	-----	FINAL POST Q
1-30-2015 DETENTION CALCS.gpw					Return Period: 2 Year			Monday, 03 / 2 / 2015	

Hydrograph Report

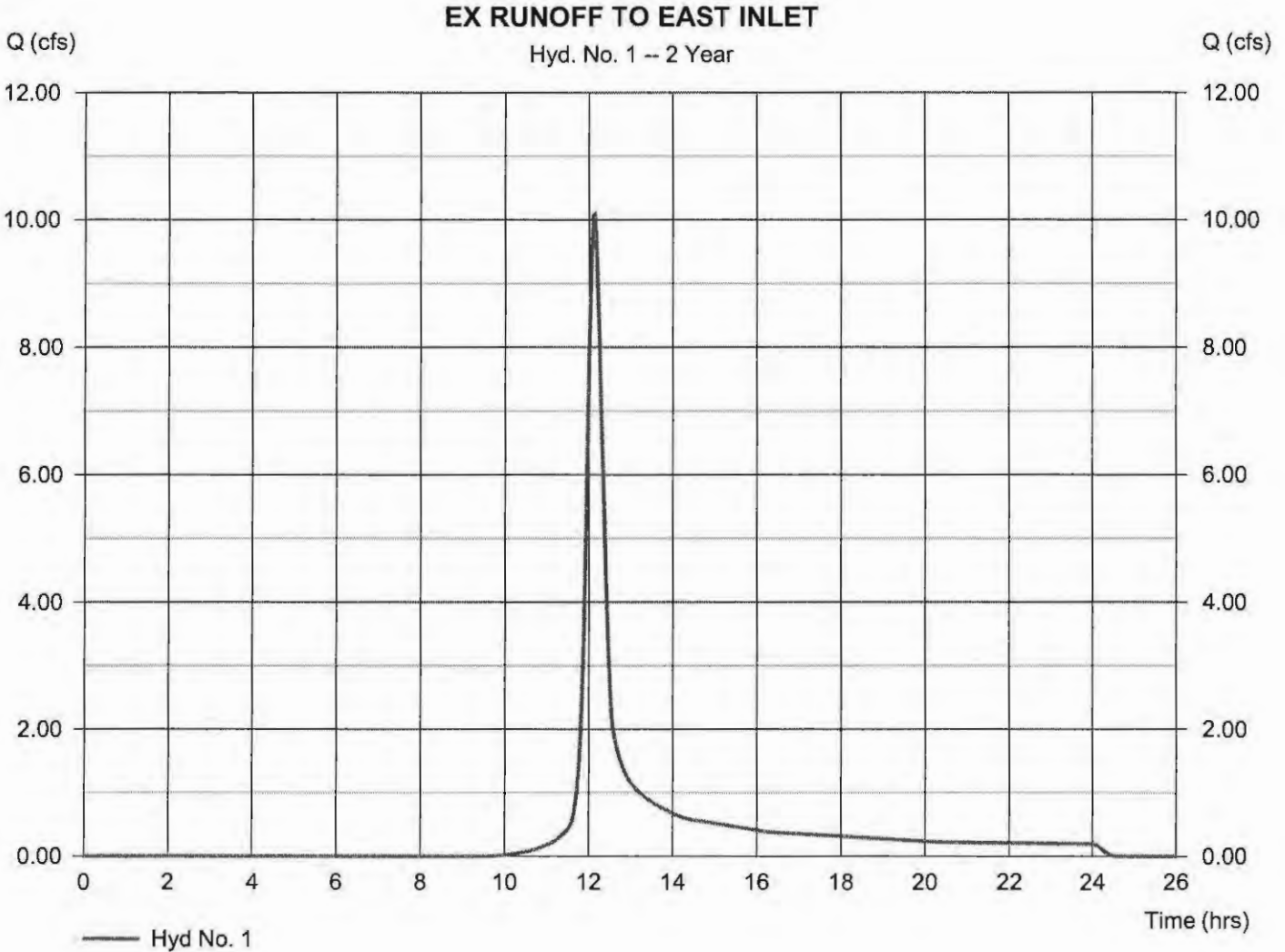
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 1

EX RUNOFF TO EAST INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 10.08 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 35,458 cuft
Drainage area	= 7.240 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

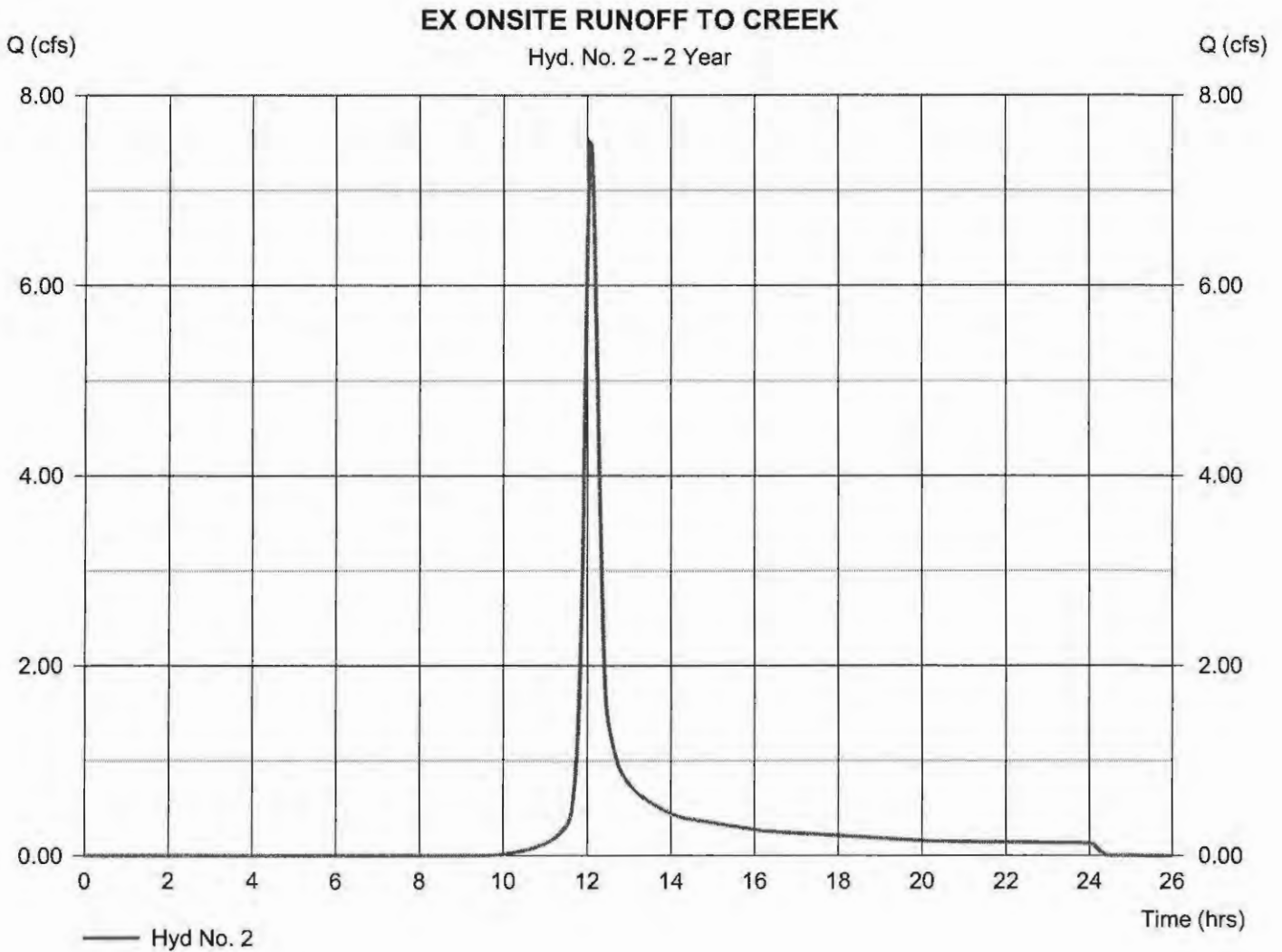
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 2

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 7.498 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 23,817 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.20 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

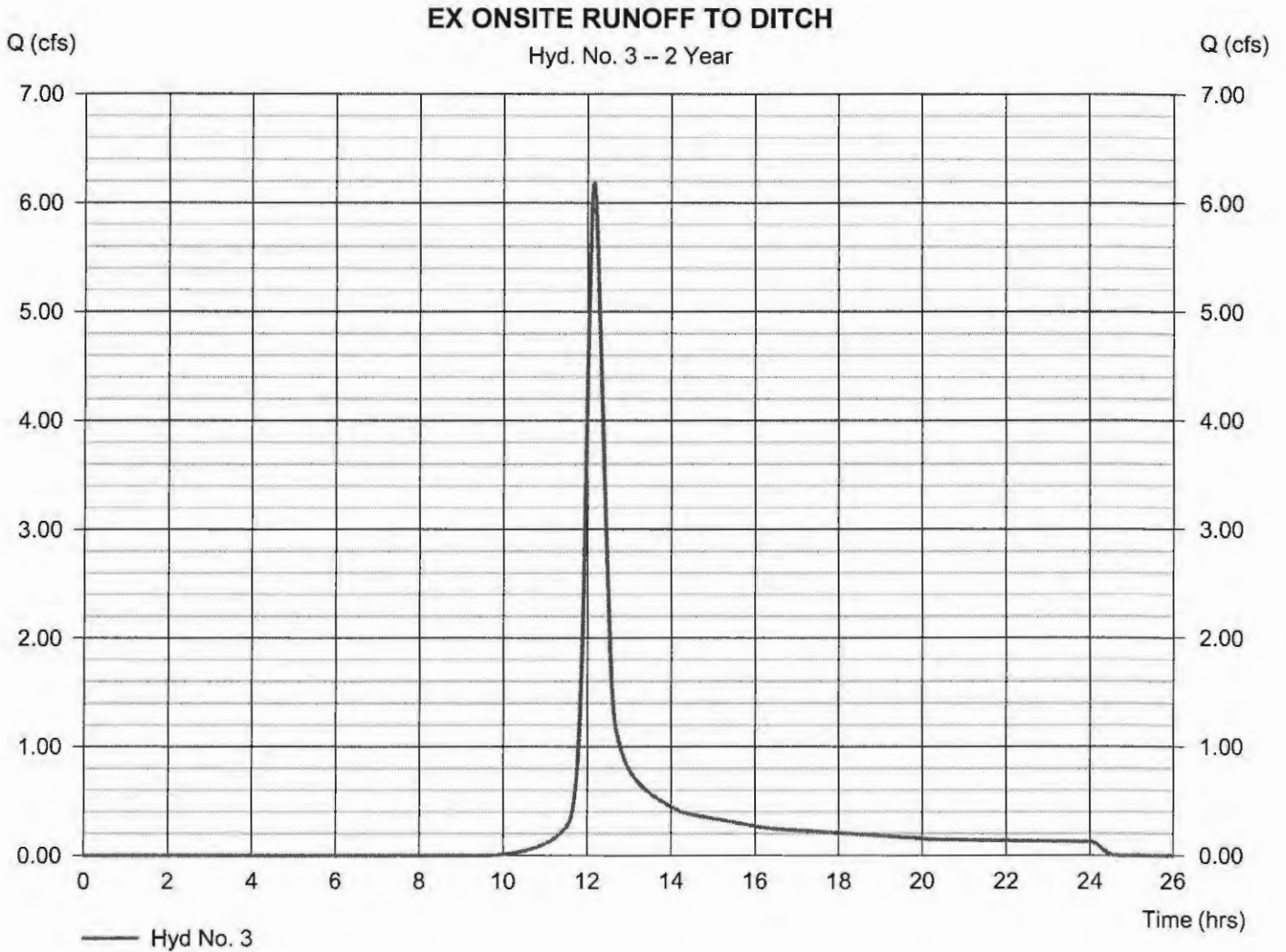
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 3

EX ONSITE RUNOFF TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 6.172 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 23,113 cuft
Drainage area	= 4.880 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.10 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

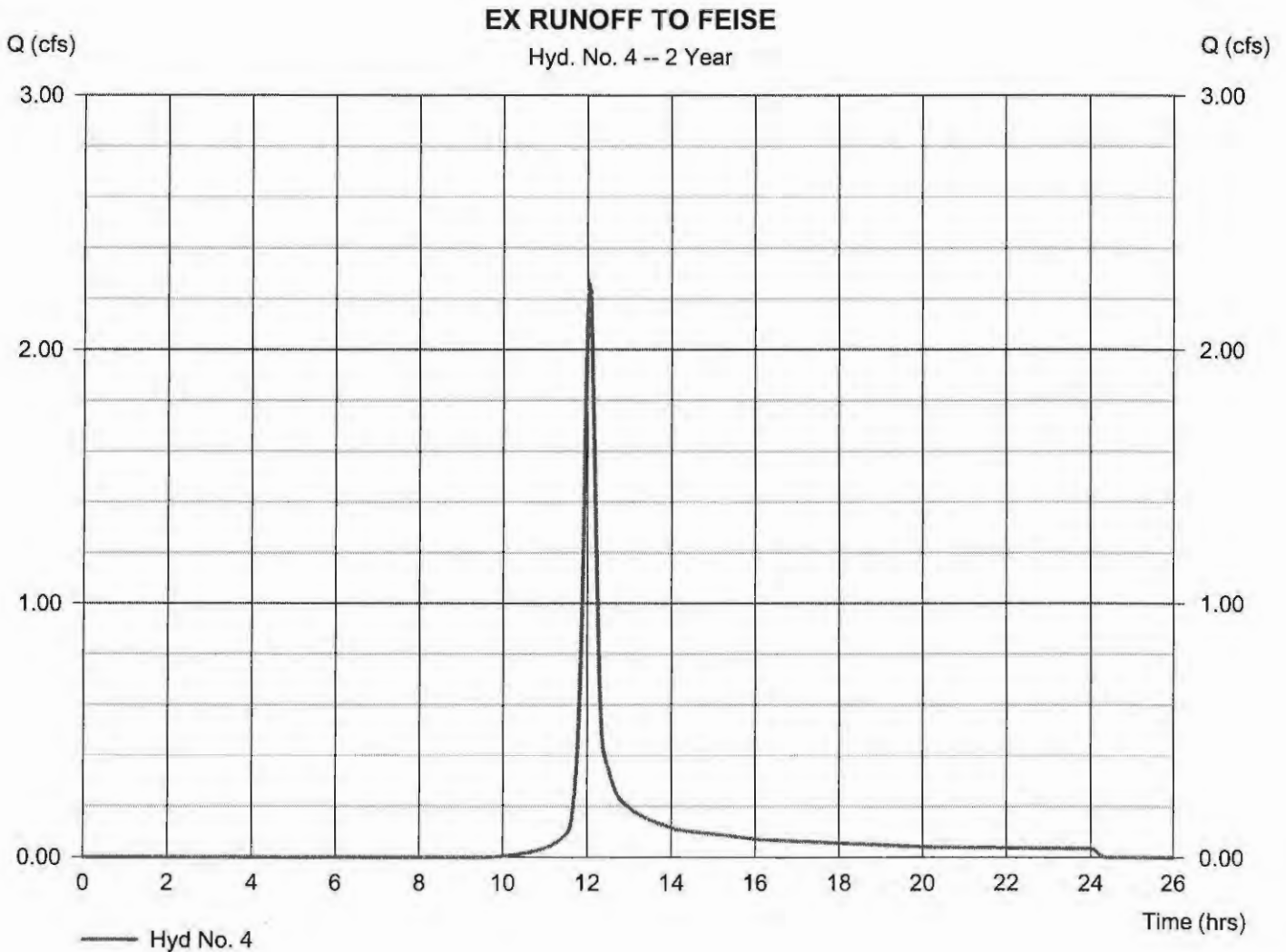
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 4

EX RUNOFF TO FEISE

Hydrograph type	= SCS Runoff	Peak discharge	= 2.252 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6,380 cuft
Drainage area	= 1.360 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

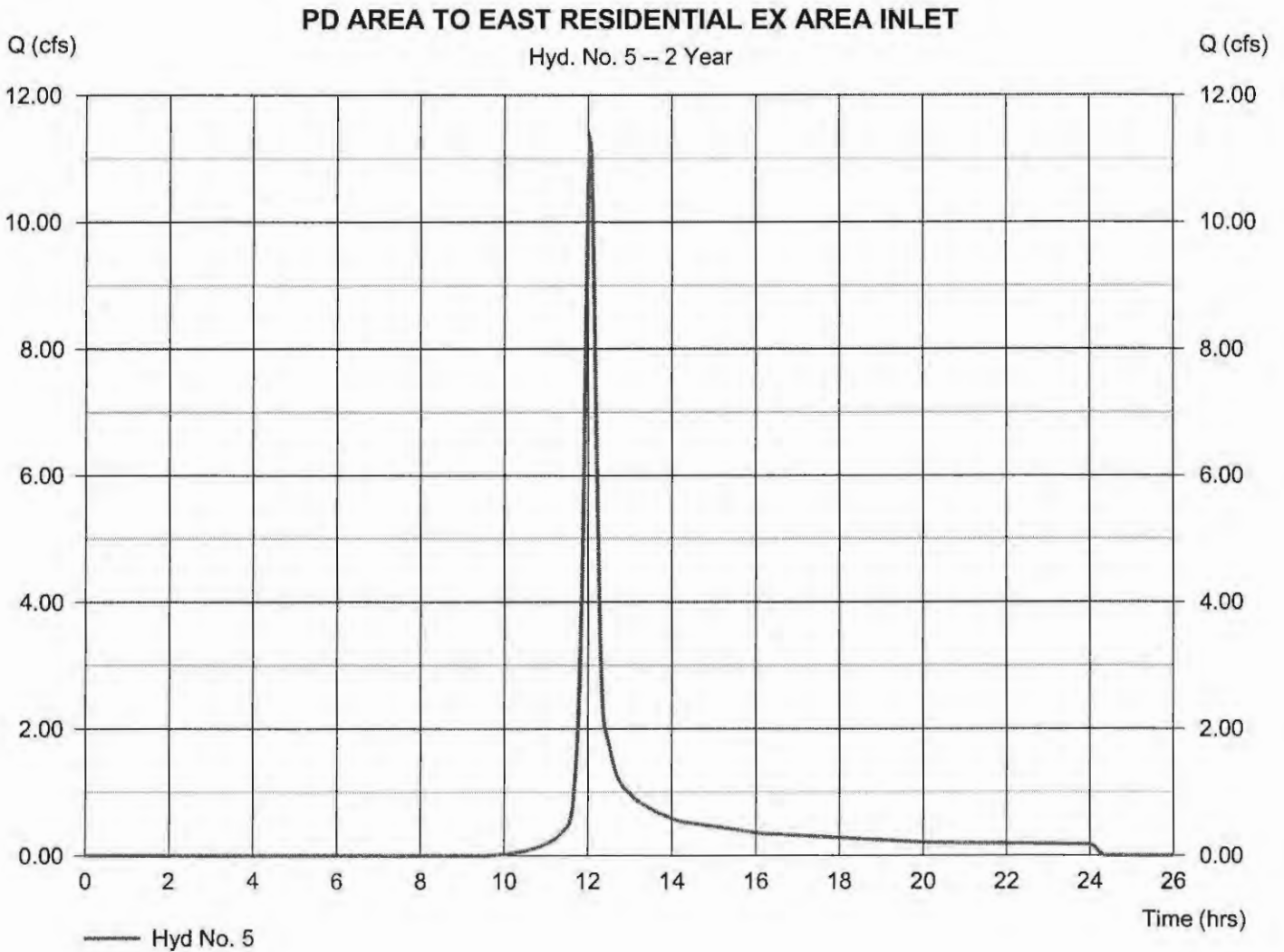
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 5

PD AREA TO EAST RESIDENTIAL EX AREA INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 11.29 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 31,994 cuft
Drainage area	= 6.820 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.20 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

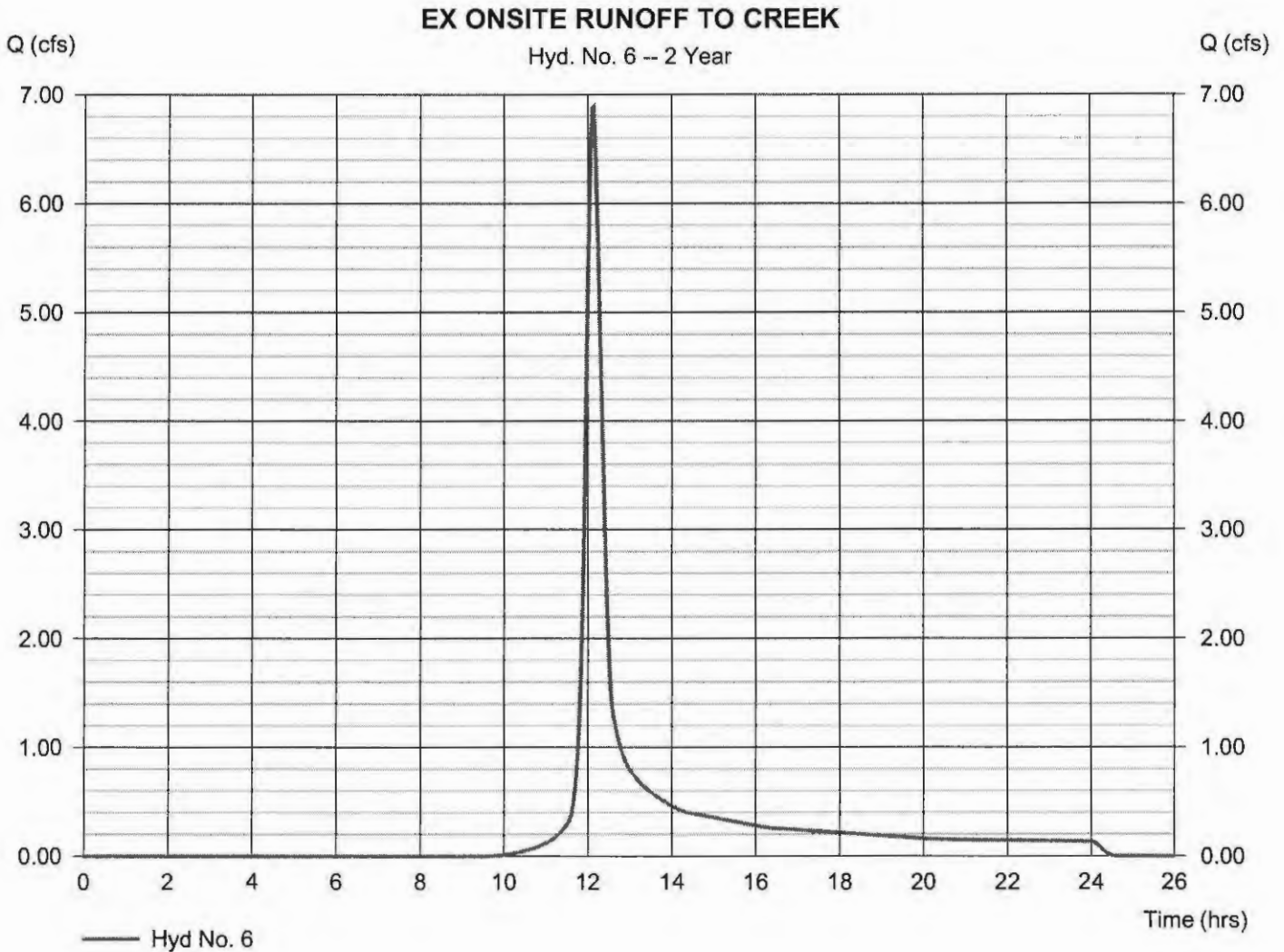
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 6

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 6.892 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 24,242 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.30 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

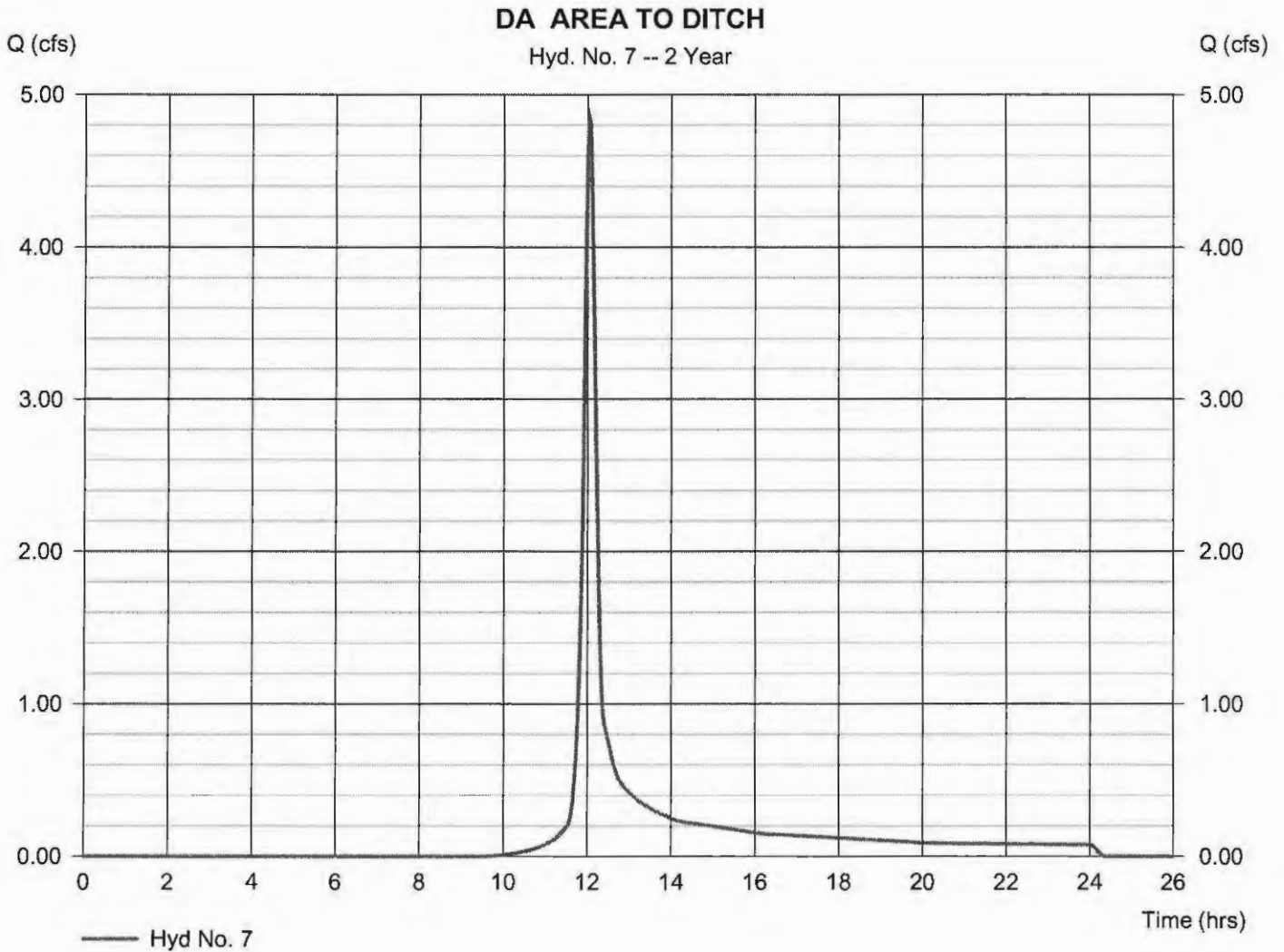
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 7

DA AREA TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 4.851 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 13,745 cuft
Drainage area	= 2.930 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.50 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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

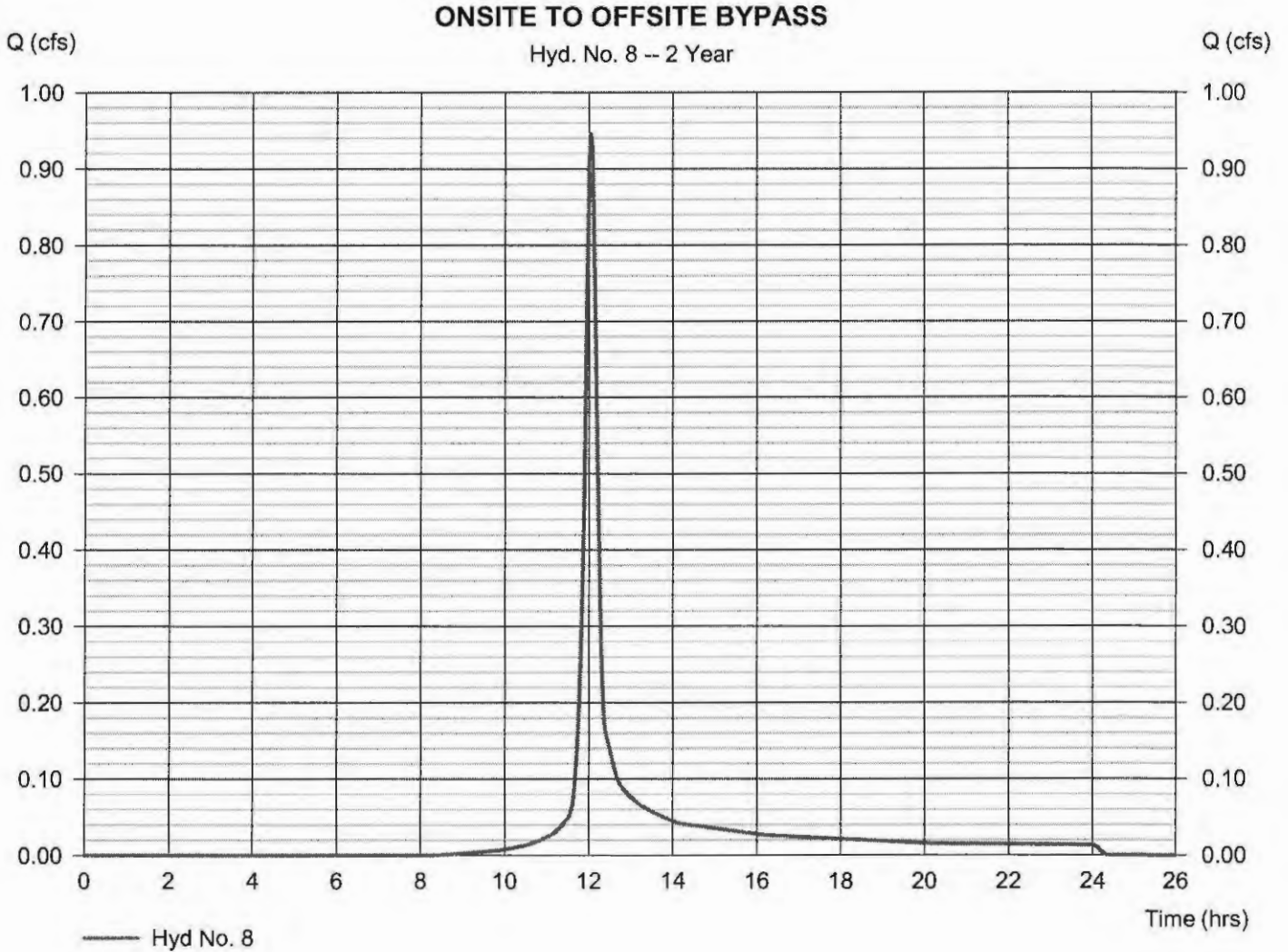
Monday, 03 / 2 / 2015

Hyd. No. 8

ONSITE TO OFFSITE BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 0.949 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 2,660 cuft
Drainage area	= 0.470 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.110 x 98) + (0.360 x 80)] / 0.470



Hydrograph Report

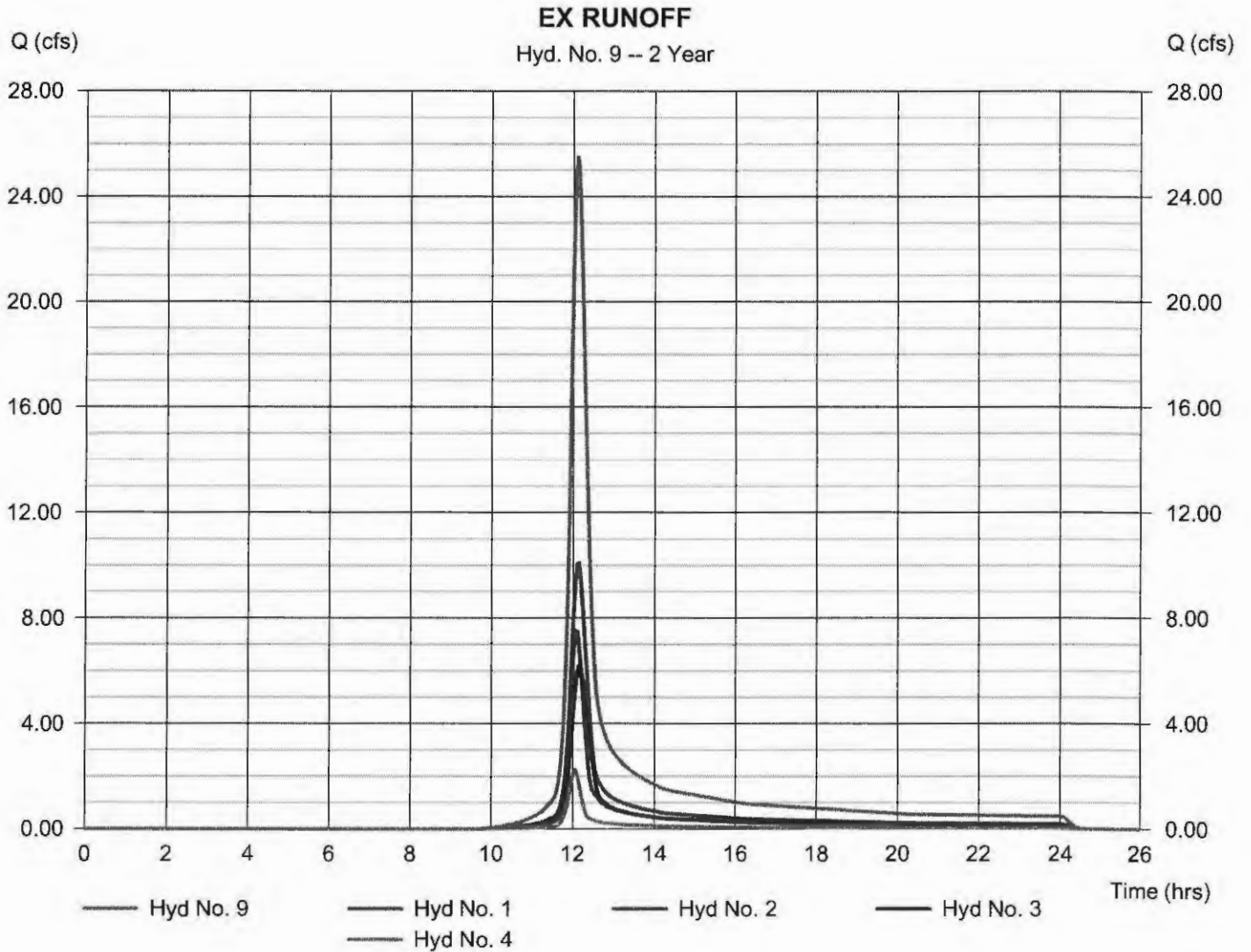
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 9

EX RUNOFF

Hydrograph type	= Combine	Peak discharge	= 25.55 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 88,768 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 18.430 ac



Hydrograph Report

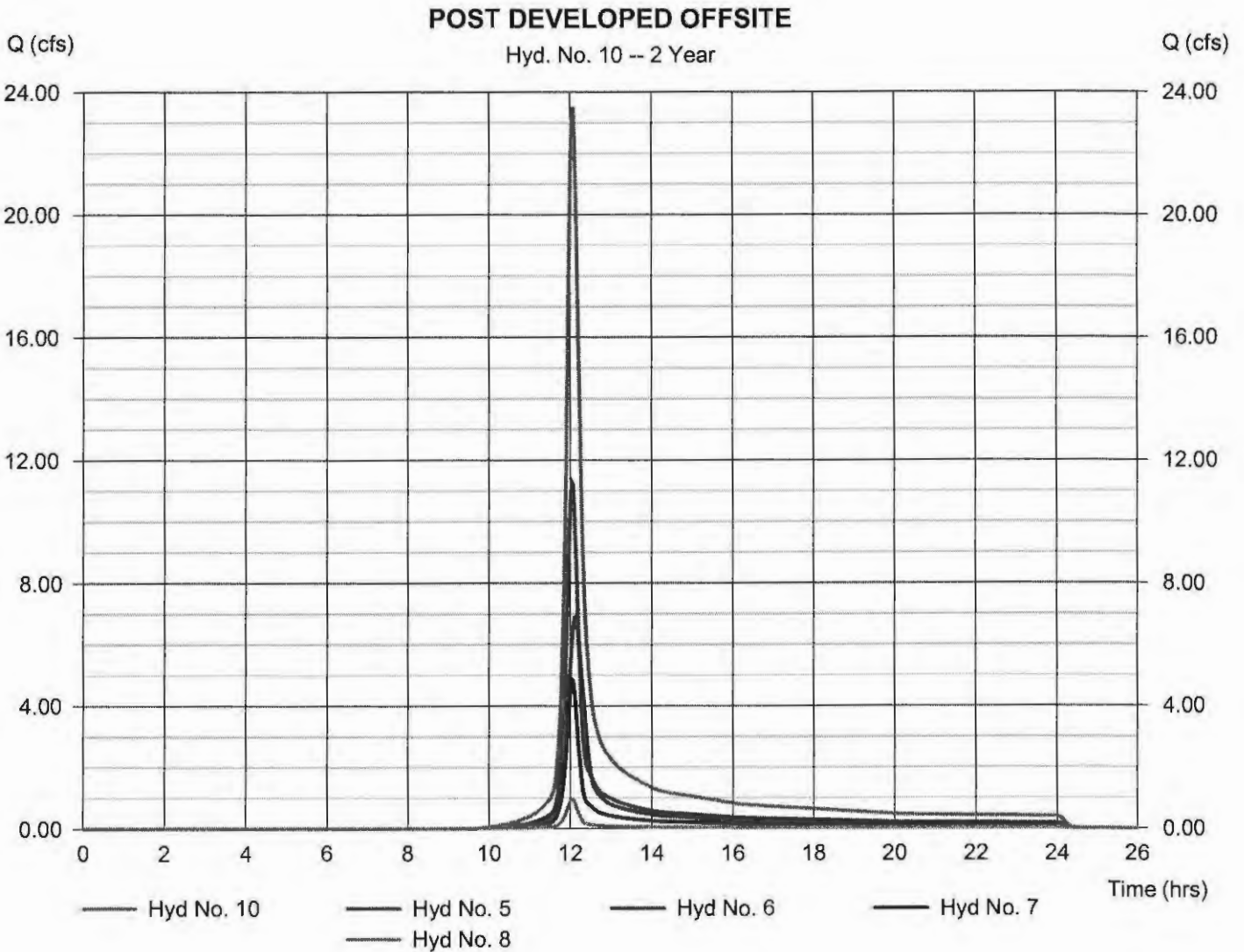
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 10

POST DEVELOPED OFFSITE

Hydrograph type	= Combine	Peak discharge	= 23.53 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 72,642 cuft
Inflow hyds.	= 5, 6, 7, 8	Contrib. drain. area	= 15.170 ac



Hydrograph Report

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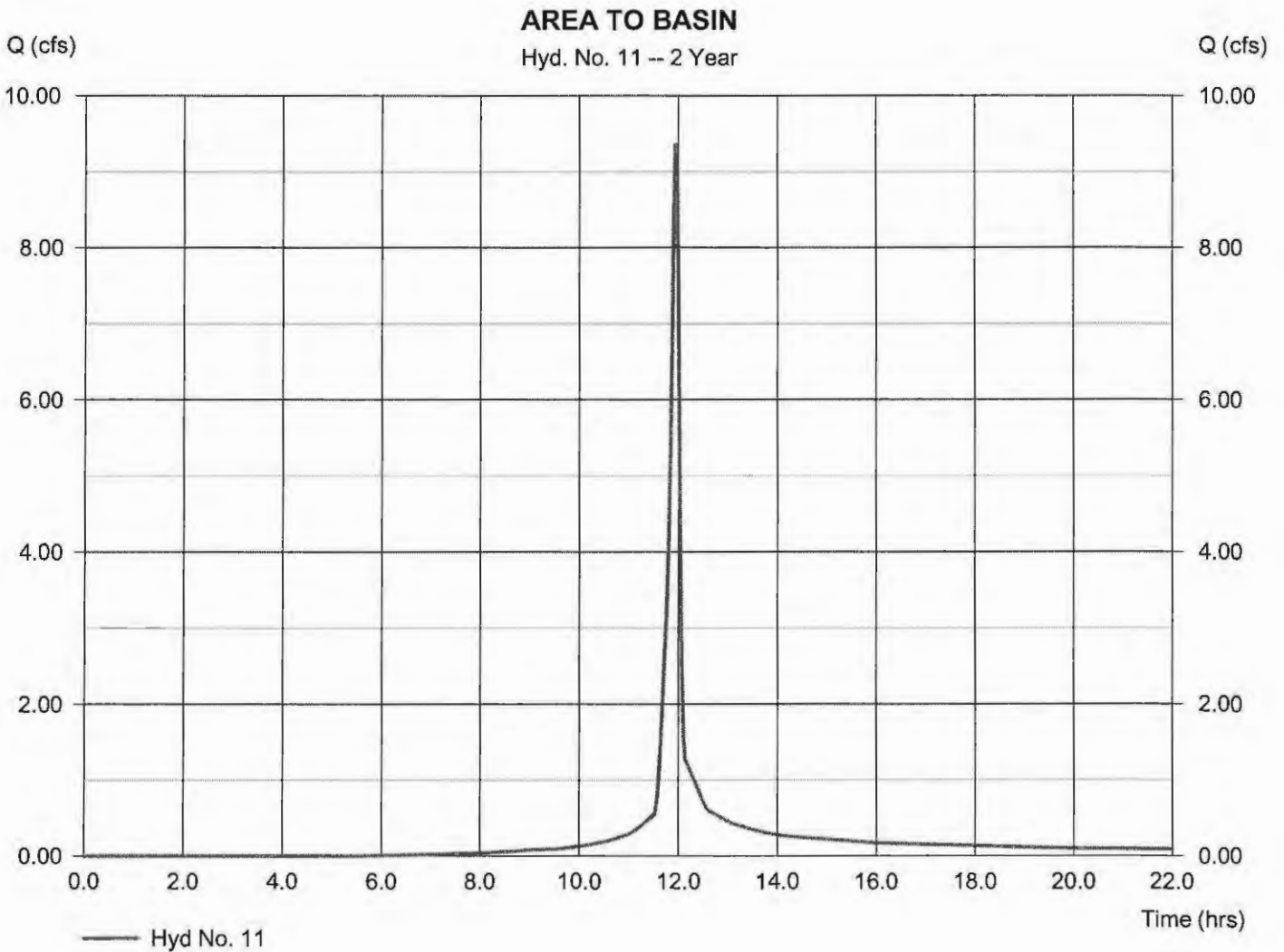
Monday, 03 / 2 / 2015

Hyd. No. 11

AREA TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 9.380 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 19,430 cuft
Drainage area	= 2.750 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.10 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(1.200 x 80) + (1.550 x 98)] / 2.750



Hydrograph Report

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

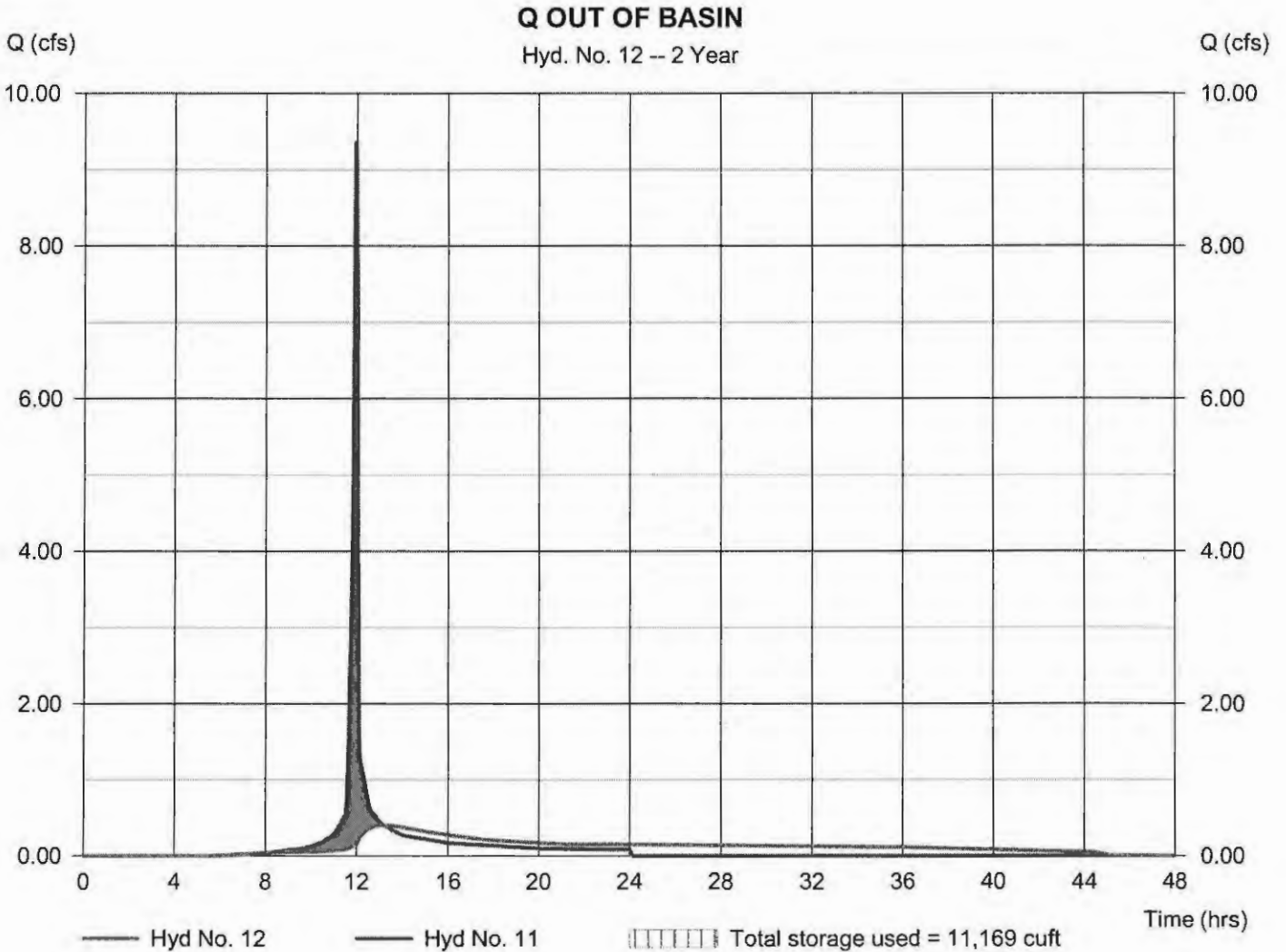
Monday, 03 / 2 / 2015

Hyd. No. 12

Q OUT OF BASIN

Hydrograph type	= Reservoir	Peak discharge	= 0.402 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.23 hrs
Time interval	= 2 min	Hyd. volume	= 19,425 cuft
Inflow hyd. No.	= 11 - AREA TO BASIN	Max. Elevation	= 631.27 ft
Reservoir name	= BASIN	Max. Storage	= 11,169 cuft

Storage Indication method used.



Hydrograph Report

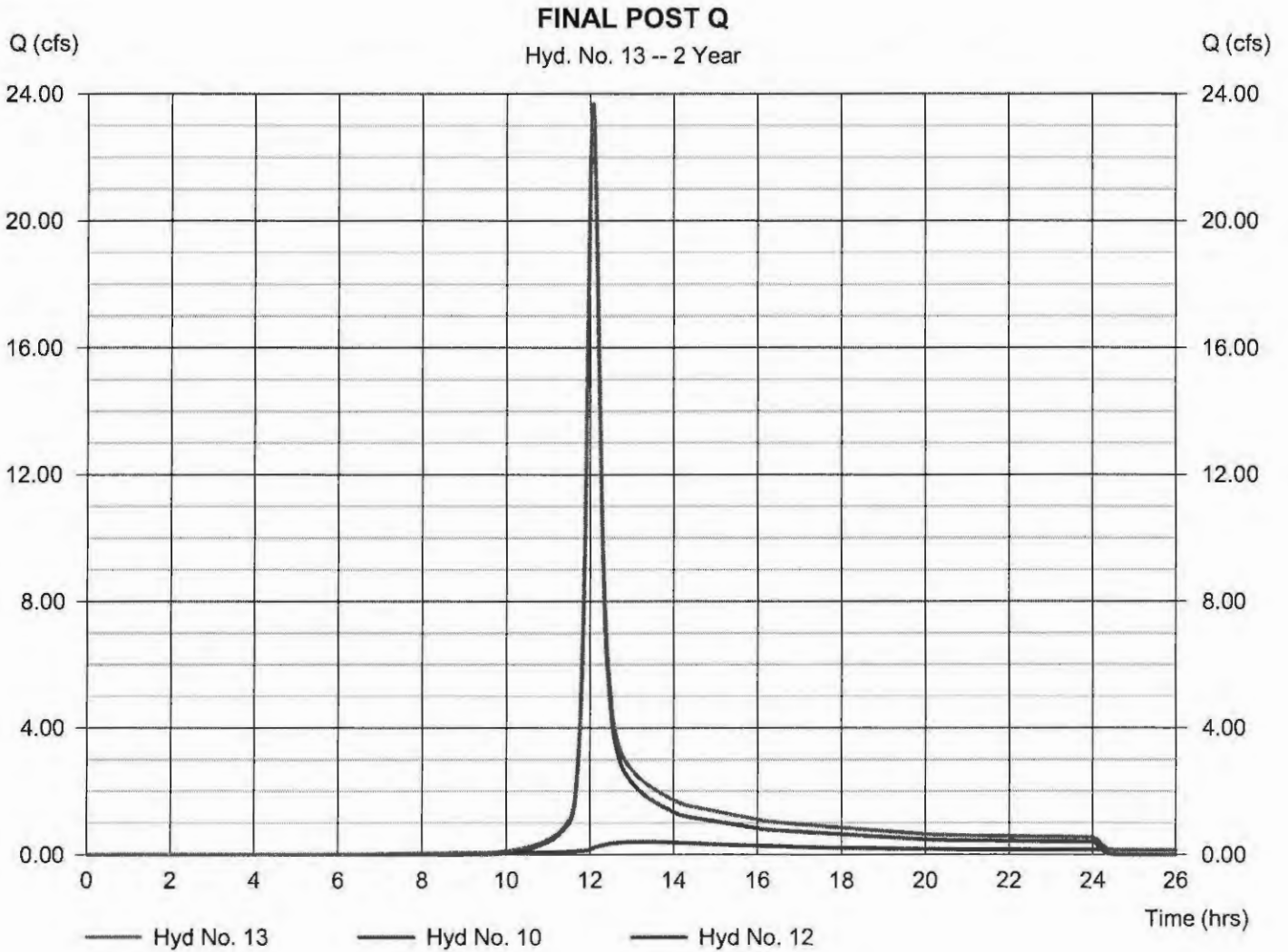
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 13

FINAL POST Q

Hydrograph type	= Combine	Peak discharge	= 23.73 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 92,066 cuft
Inflow hyds.	= 10, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time Interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	27.67	2	726	95,616	-----	-----	-----	EX RUNOFF TO EAST INLET
2	SCS Runoff	20.50	2	724	64,226	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
3	SCS Runoff	16.97	2	728	62,329	-----	-----	-----	EX ONSITE RUNOFF TO DITCH
4	SCS Runoff	6.111	2	722	17,205	-----	-----	-----	EX RUNOFF TO FEISE
5	SCS Runoff	30.64	2	722	86,277	-----	-----	-----	PD AREA TO EAST RESIDENTIAL E
6	SCS Runoff	18.92	2	726	65,373	-----	-----	-----	EX ONSITE RUNOFF TO CREEK
7	SCS Runoff	13.17	2	722	37,066	-----	-----	-----	DA AREA TO DITCH
8	SCS Runoff	2.326	2	722	6,623	-----	-----	-----	ONSITE TO OFFSITE BYPASS
9	Combine	69.83	2	726	239,376	1, 2, 3, 4,	-----	-----	EX RUNOFF
10	Combine	63.37	2	724	195,340	5, 6, 7, 8,	-----	-----	POST DEVELOPED OFFSITE
11	SCS Runoff	19.94	2	716	43,256	-----	-----	-----	AREA TO BASIN
12	Reservoir	1.972	2	740	43,251	11	632.57	23,048	Q OUT OF BASIN
13	Combine	65.29	2	724	238,591	10, 12	-----	-----	FINAL POST Q
1-30-2015 DETENTION CALCS.gpw					Return Period: 25 Year			Monday, 03 / 2 / 2015	

Hydrograph Report

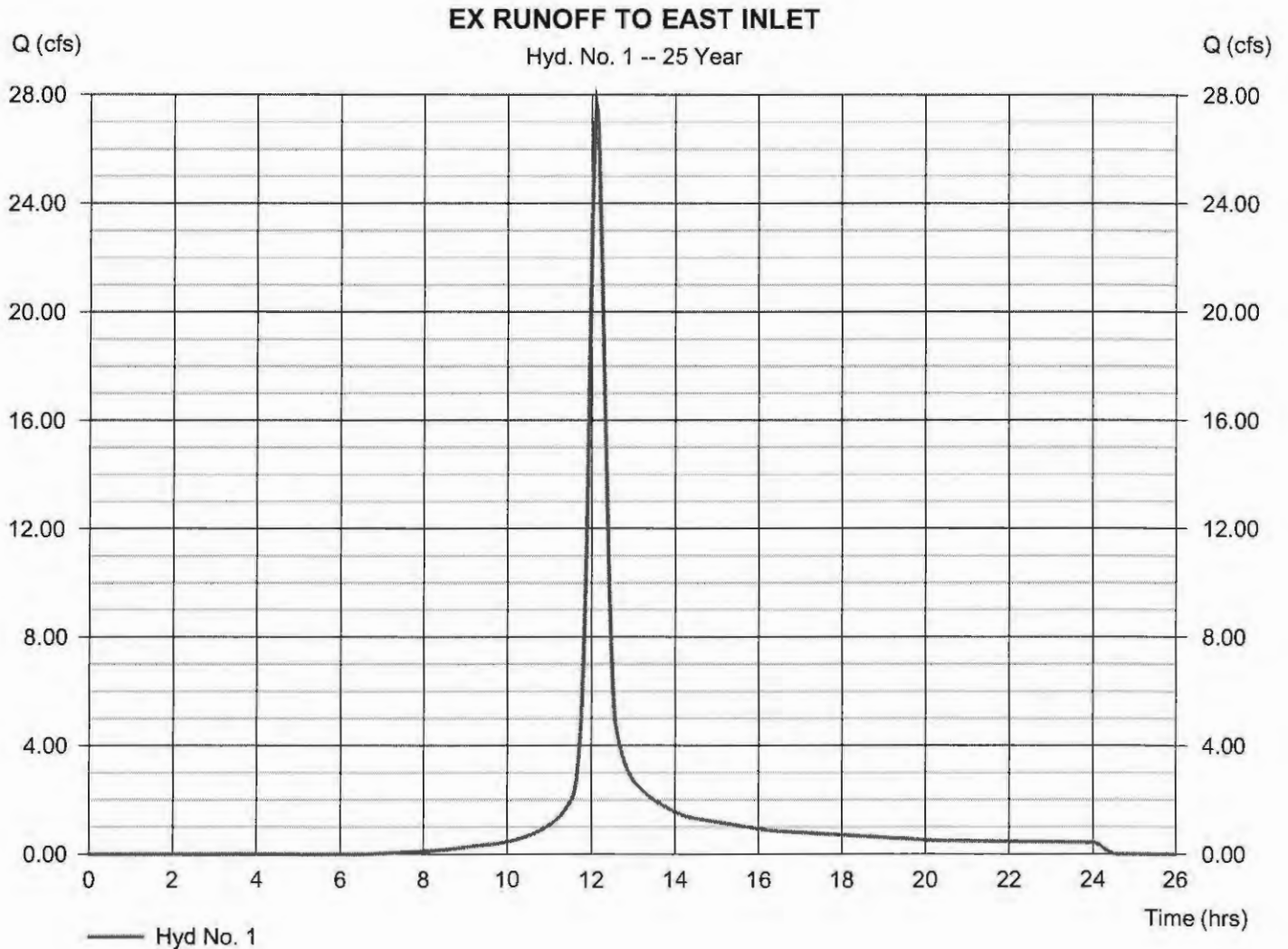
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 1

EX RUNOFF TO EAST INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 27.67 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 95,616 cuft
Drainage area	= 7.240 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

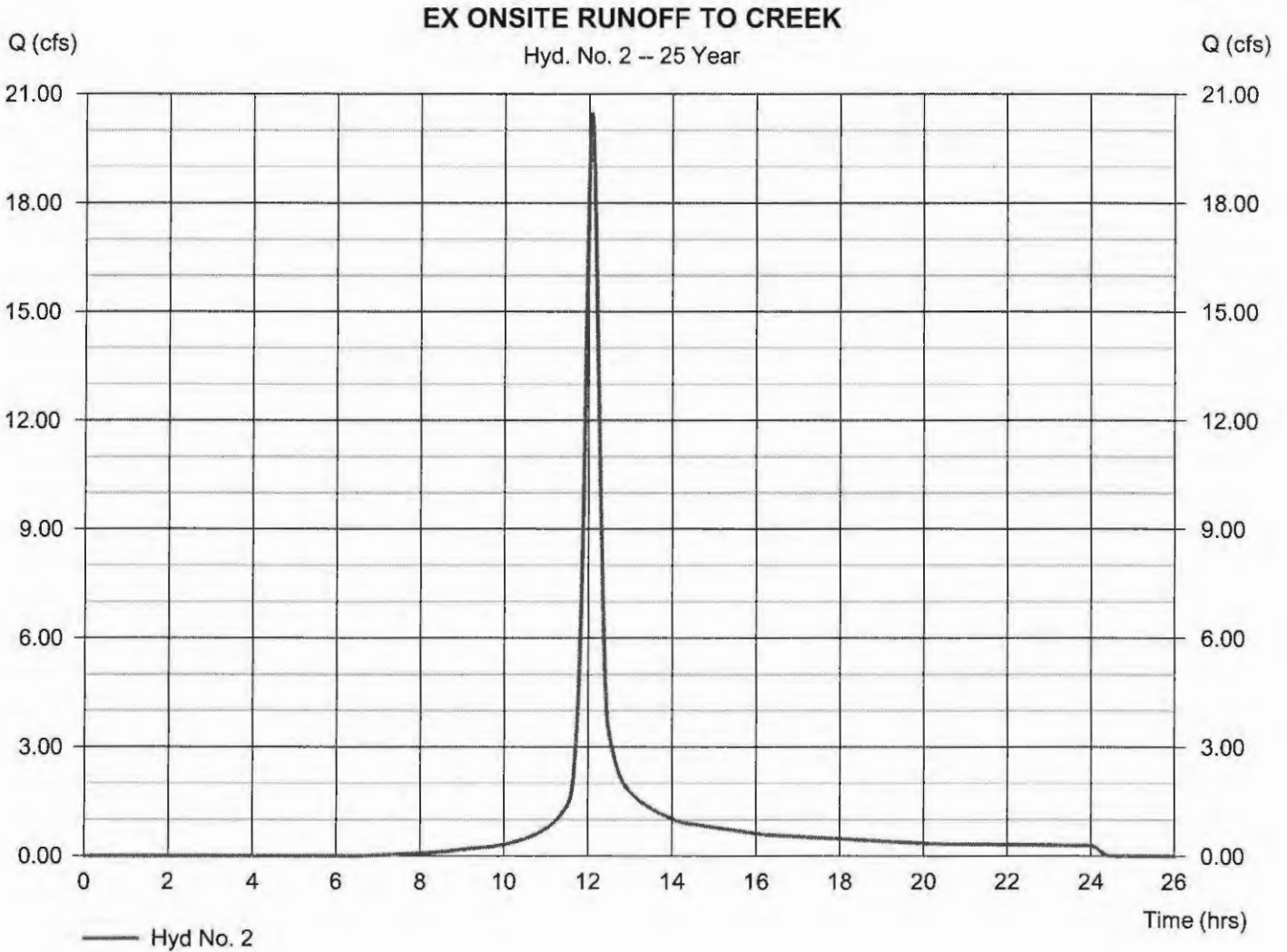
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 2

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 20.50 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 64,226 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.20 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

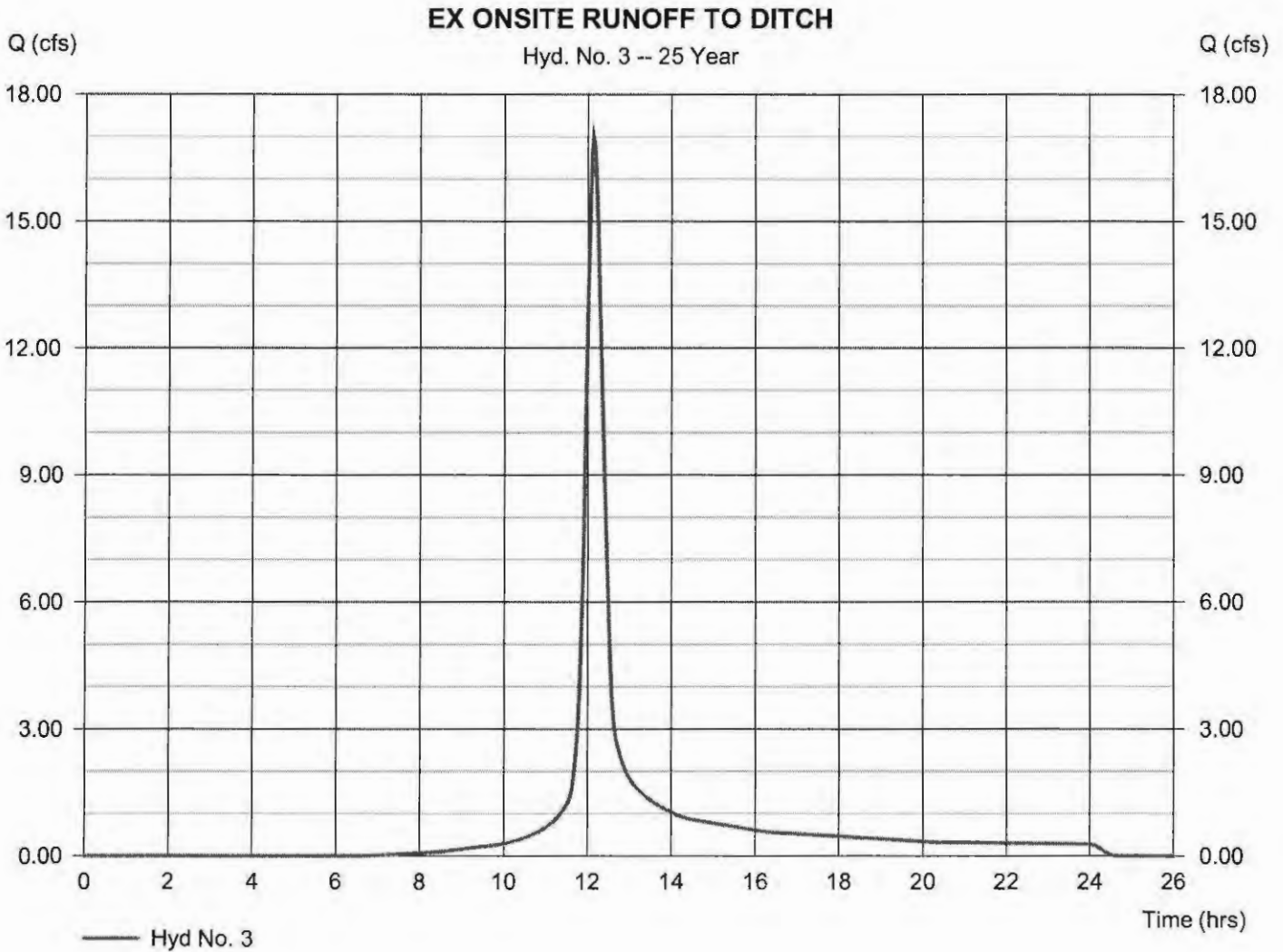
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Monday, 03 / 2 / 2015

Hyd. No. 3

EX ONSITE RUNOFF TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 16.97 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 62,329 cuft
Drainage area	= 4.880 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.10 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

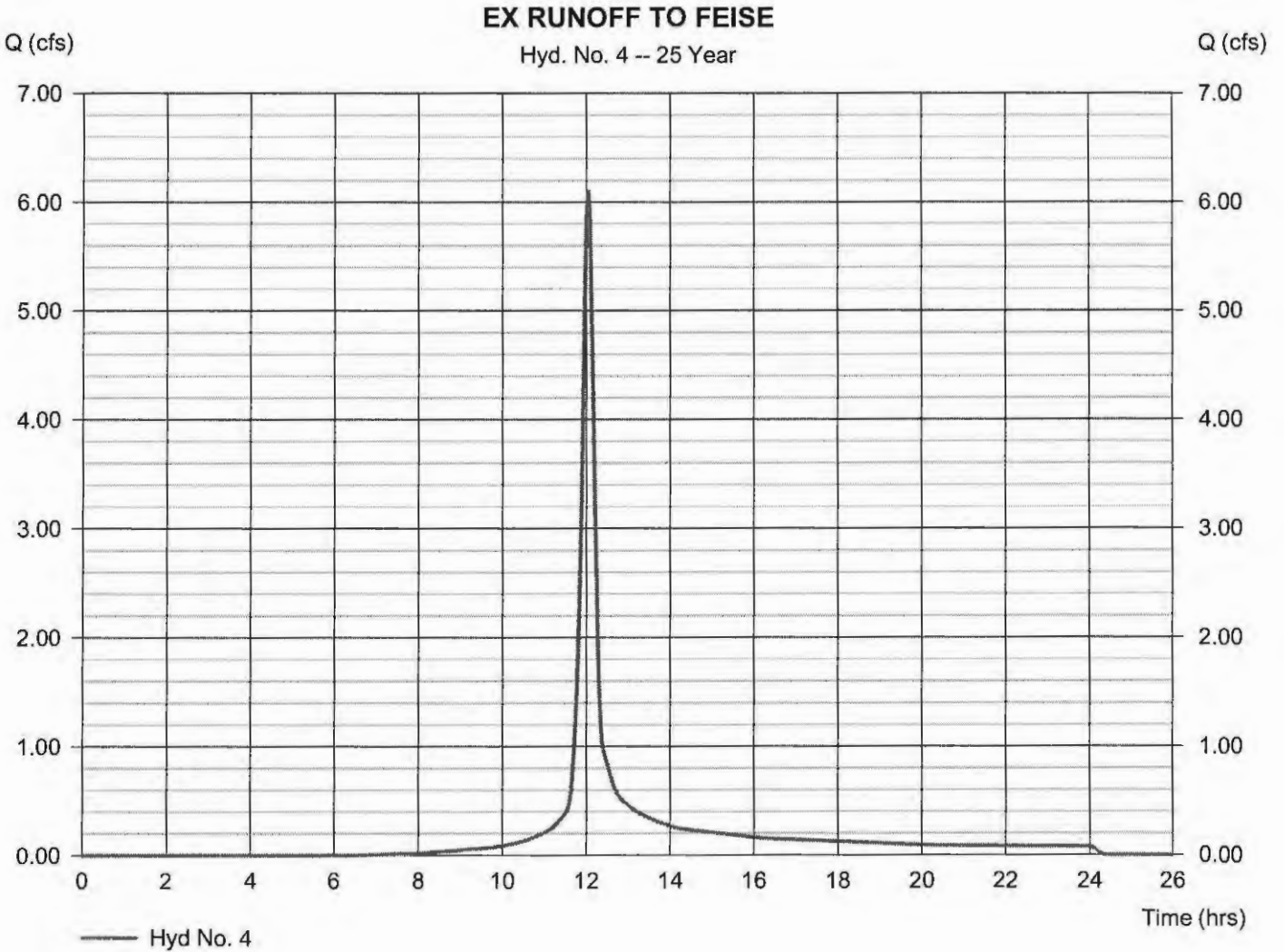
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Monday, 03 / 2 / 2015

Hyd. No. 4

EX RUNOFF TO FEISE

Hydrograph type	= SCS Runoff	Peak discharge	= 6.111 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 17,205 cuft
Drainage area	= 1.360 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

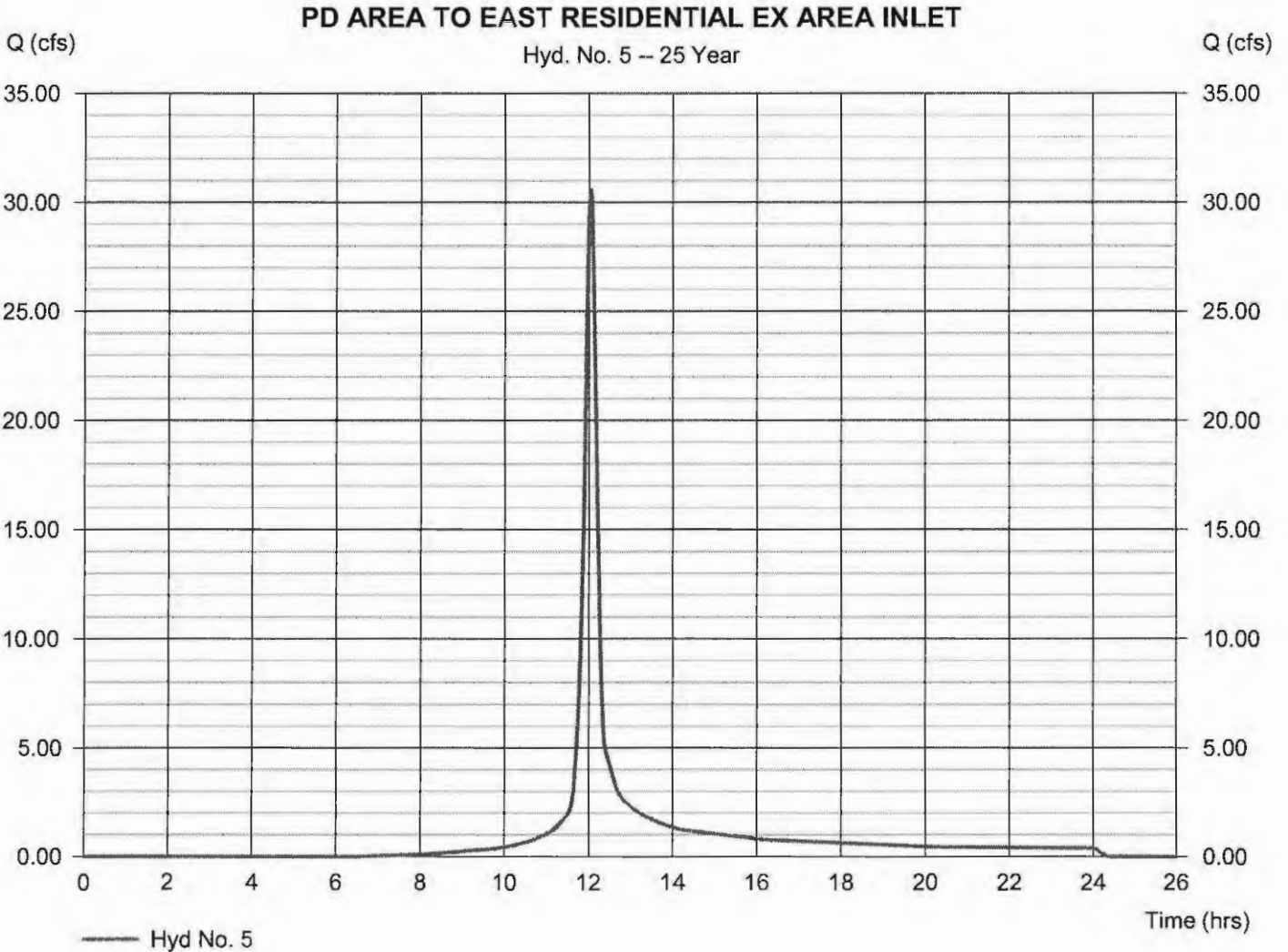
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Monday, 03 / 2 / 2015

Hyd. No. 5

PD AREA TO EAST RESIDENTIAL EX AREA INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 30.64 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 86,277 cuft
Drainage area	= 6.820 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.20 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

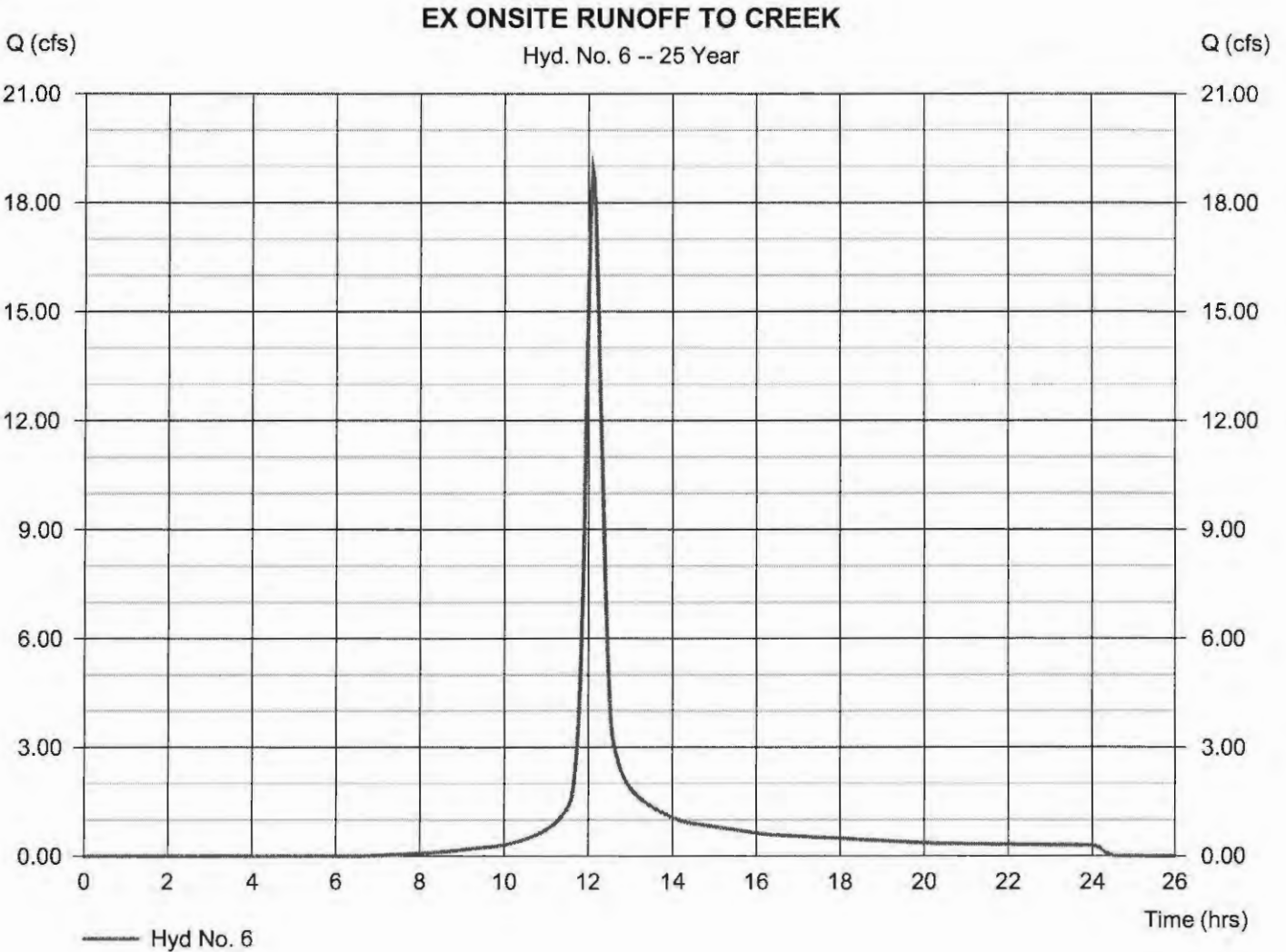
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Monday, 03 / 2 / 2015

Hyd. No. 6

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 18.92 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 65,373 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.30 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

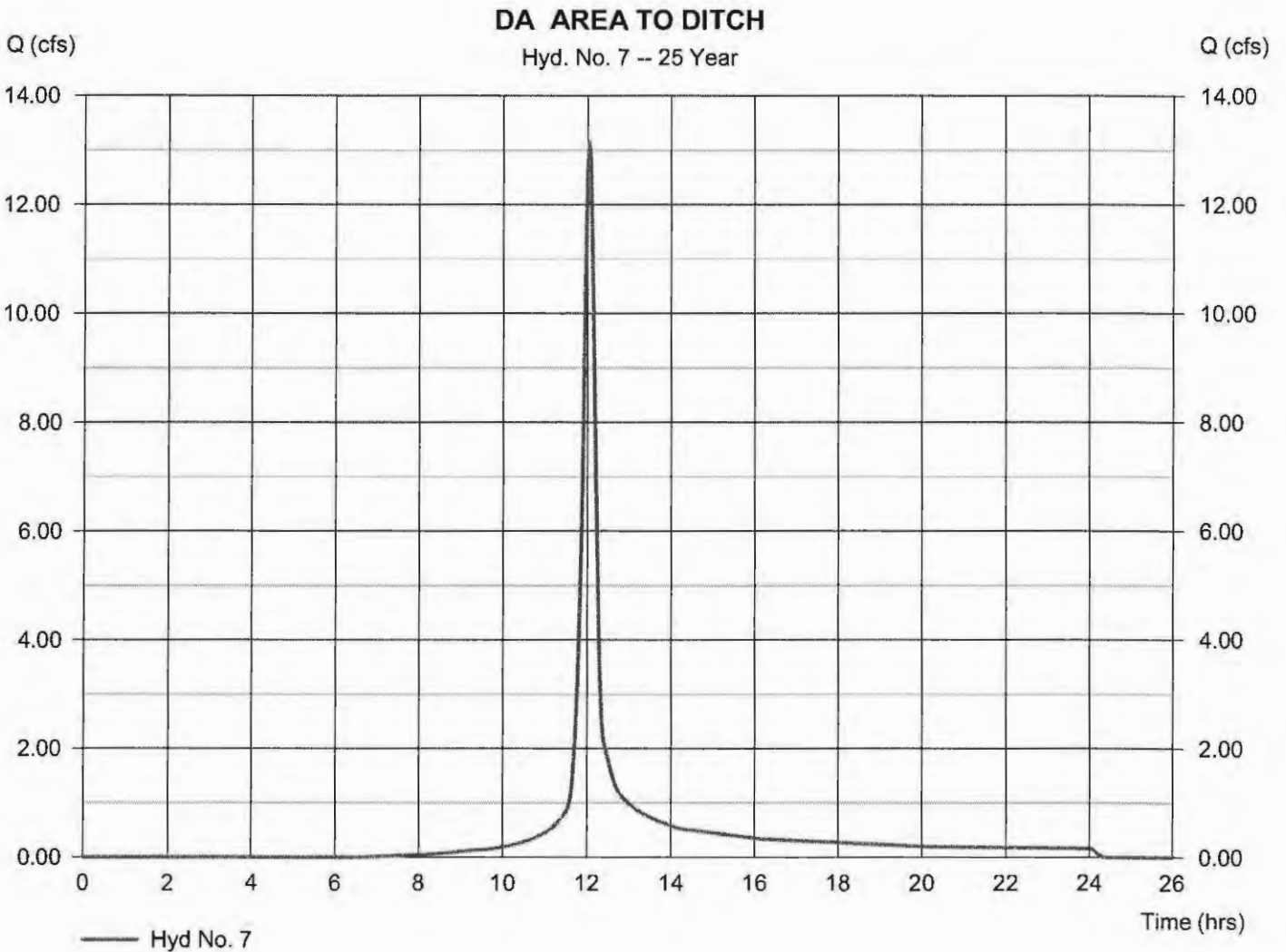
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Monday, 03 / 2 / 2015

Hyd. No. 7

DA AREA TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 13.17 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 37,066 cuft
Drainage area	= 2.930 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.50 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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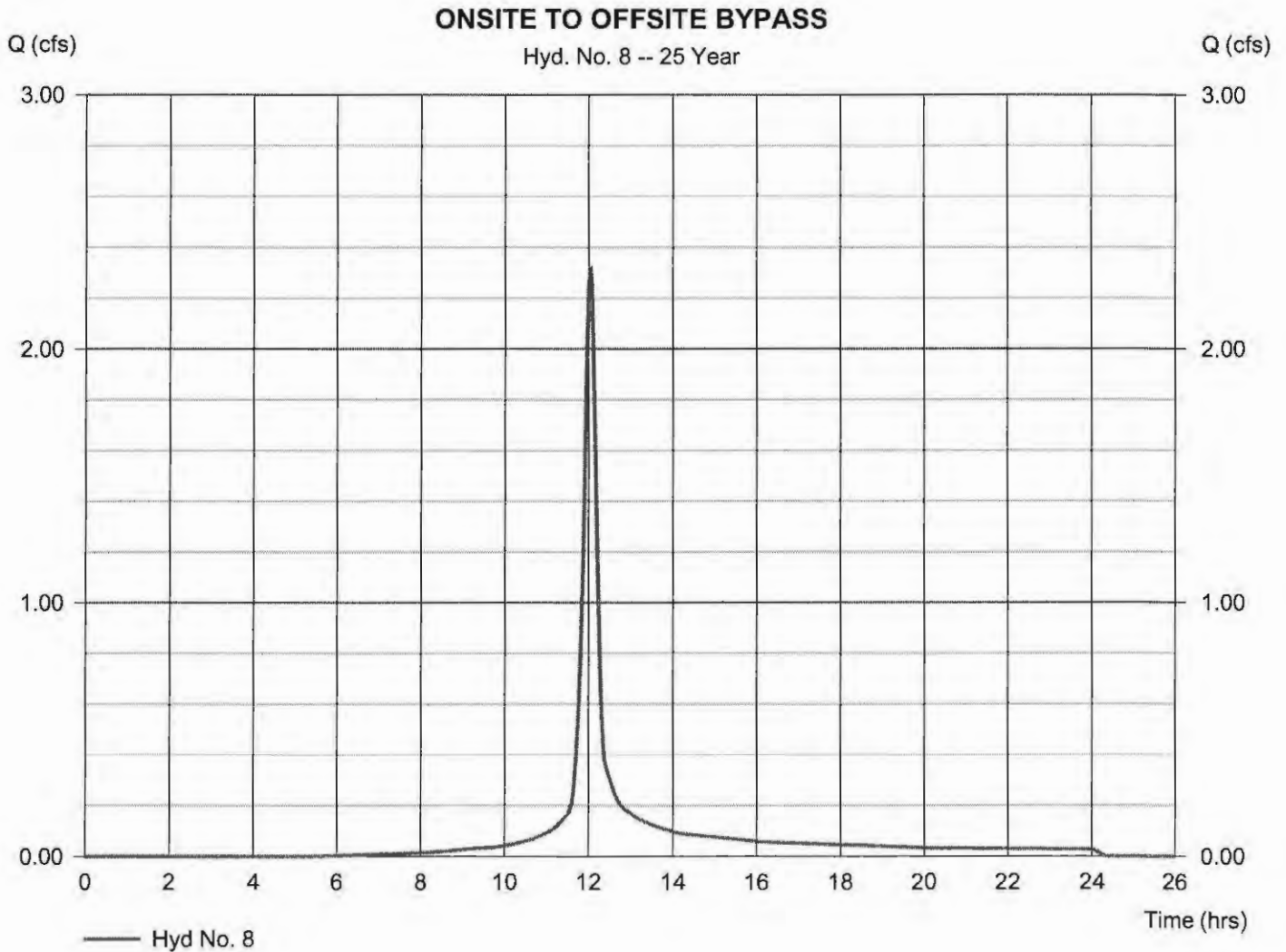
Monday, 03 / 2 / 2015

Hyd. No. 8

ONSITE TO OFFSITE BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 2.326 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 6,623 cuft
Drainage area	= 0.470 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.110 x 98) + (0.360 x 80)] / 0.470



Hydrograph Report

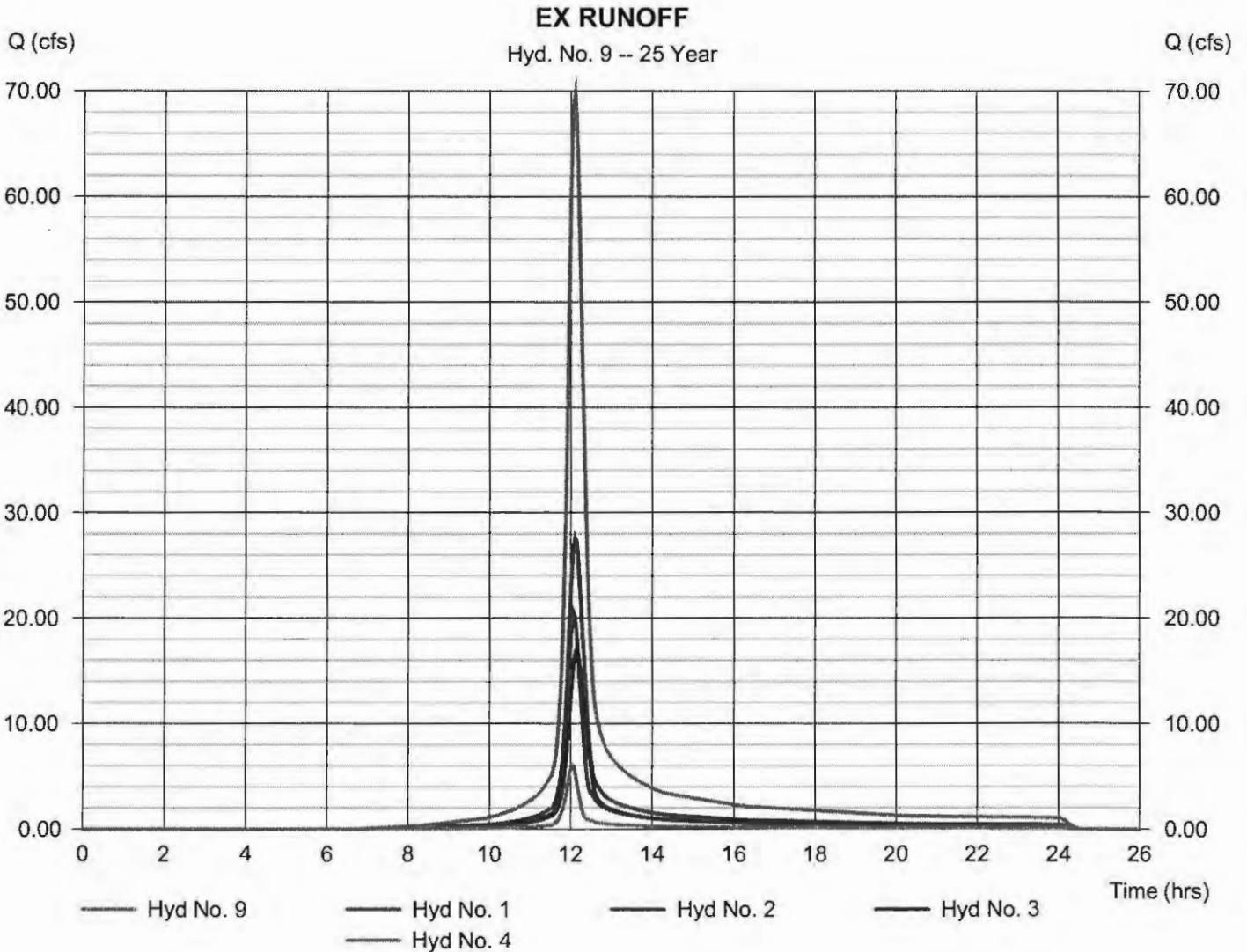
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 9

EX RUNOFF

Hydrograph type	= Combine	Peak discharge	= 69.83 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 239,376 cuft
Inflow hyds.	= 1, 2, 3, 4	Contrib. drain. area	= 18.430 ac



Hydrograph Report

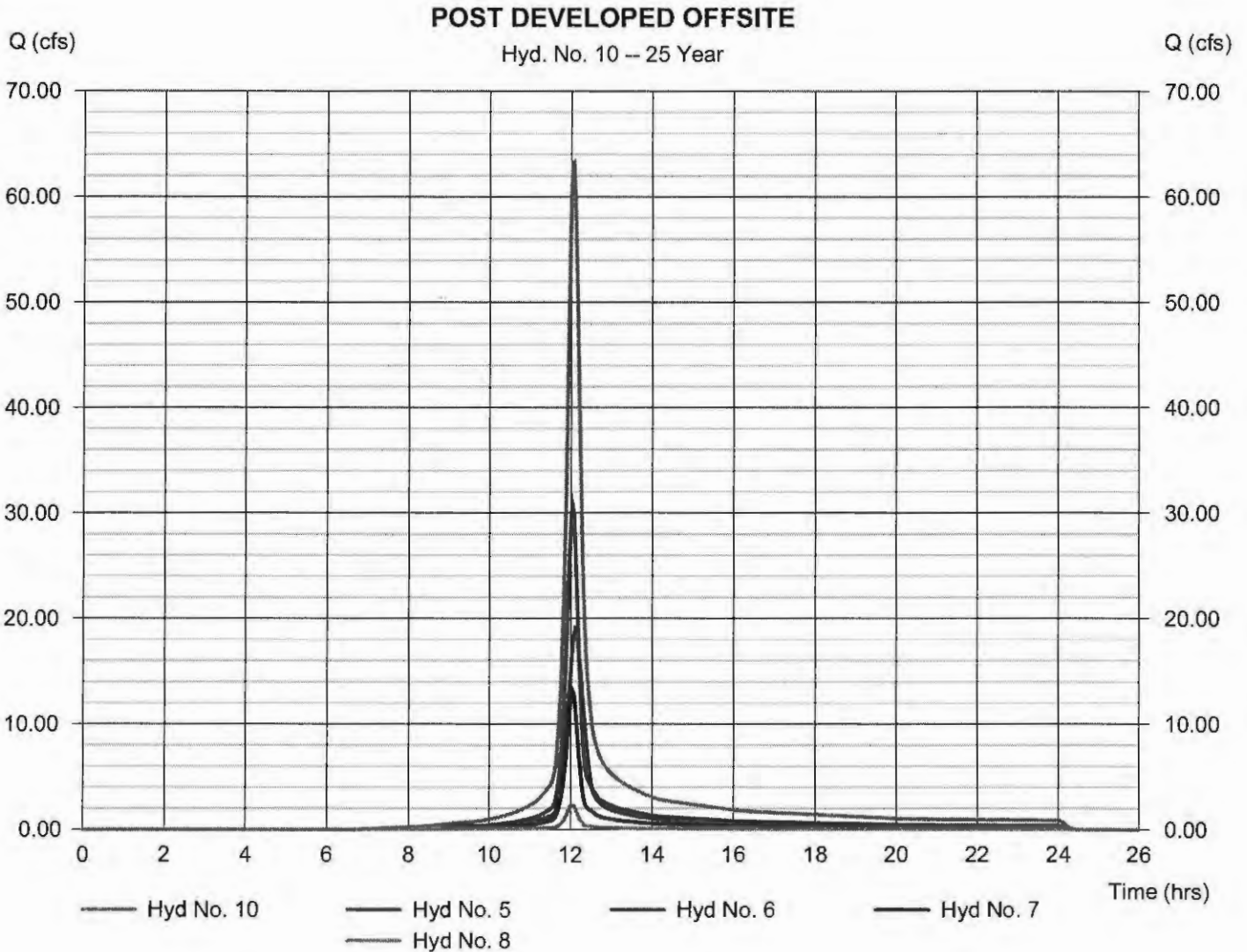
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 10

POST DEVELOPED OFFSITE

Hydrograph type	= Combine	Peak discharge	= 63.37 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 195,340 cuft
Inflow hyds.	= 5, 6, 7, 8	Contrib. drain. area	= 15.170 ac



Hydrograph Report

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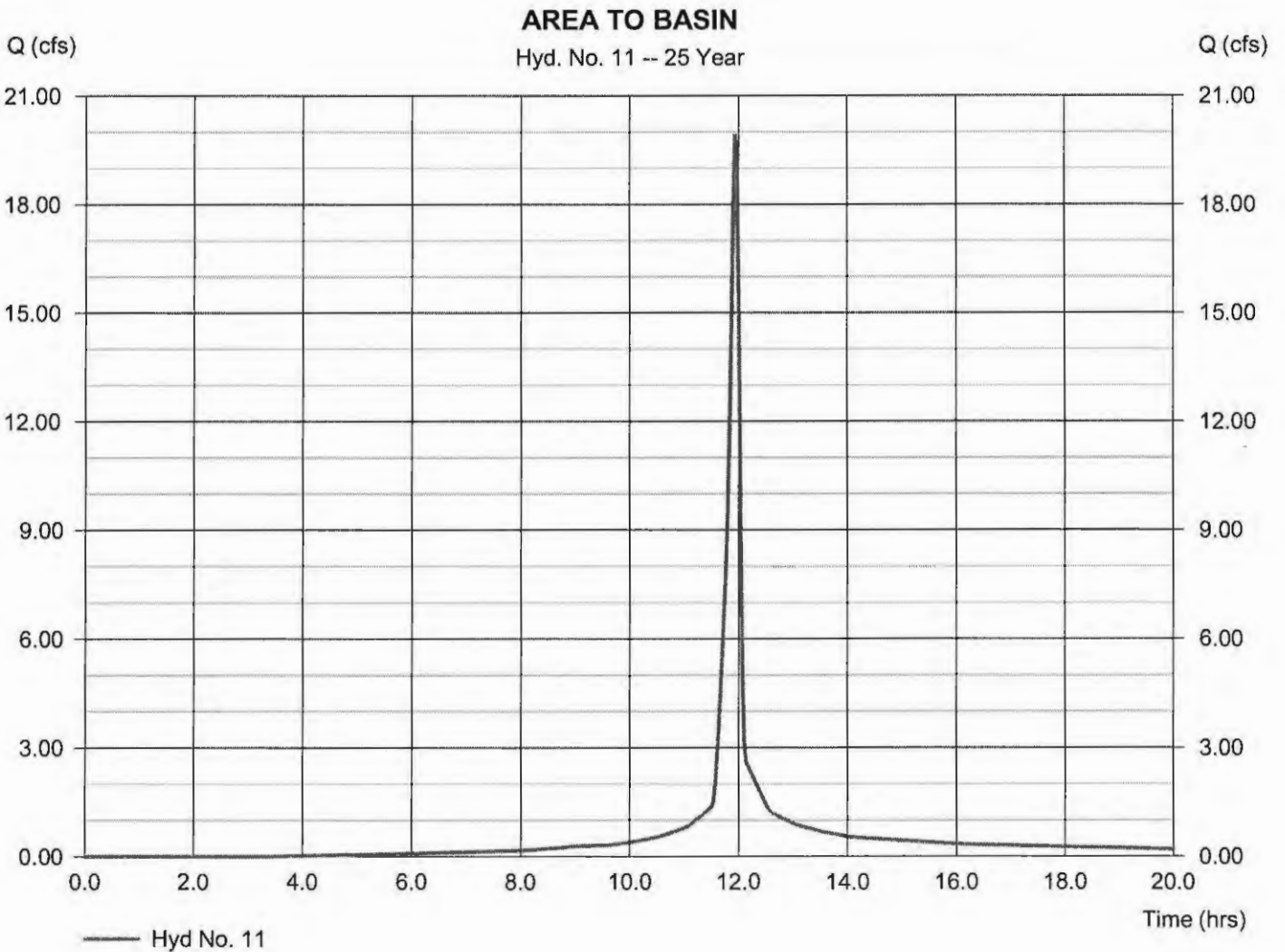
Monday, 03 / 2 / 2015

Hyd. No. 11

AREA TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 19.94 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 43,256 cuft
Drainage area	= 2.750 ac	Curve number	= 90*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.77 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(1.200 \times 80) + (1.550 \times 98)] / 2.750$



Hydrograph Report

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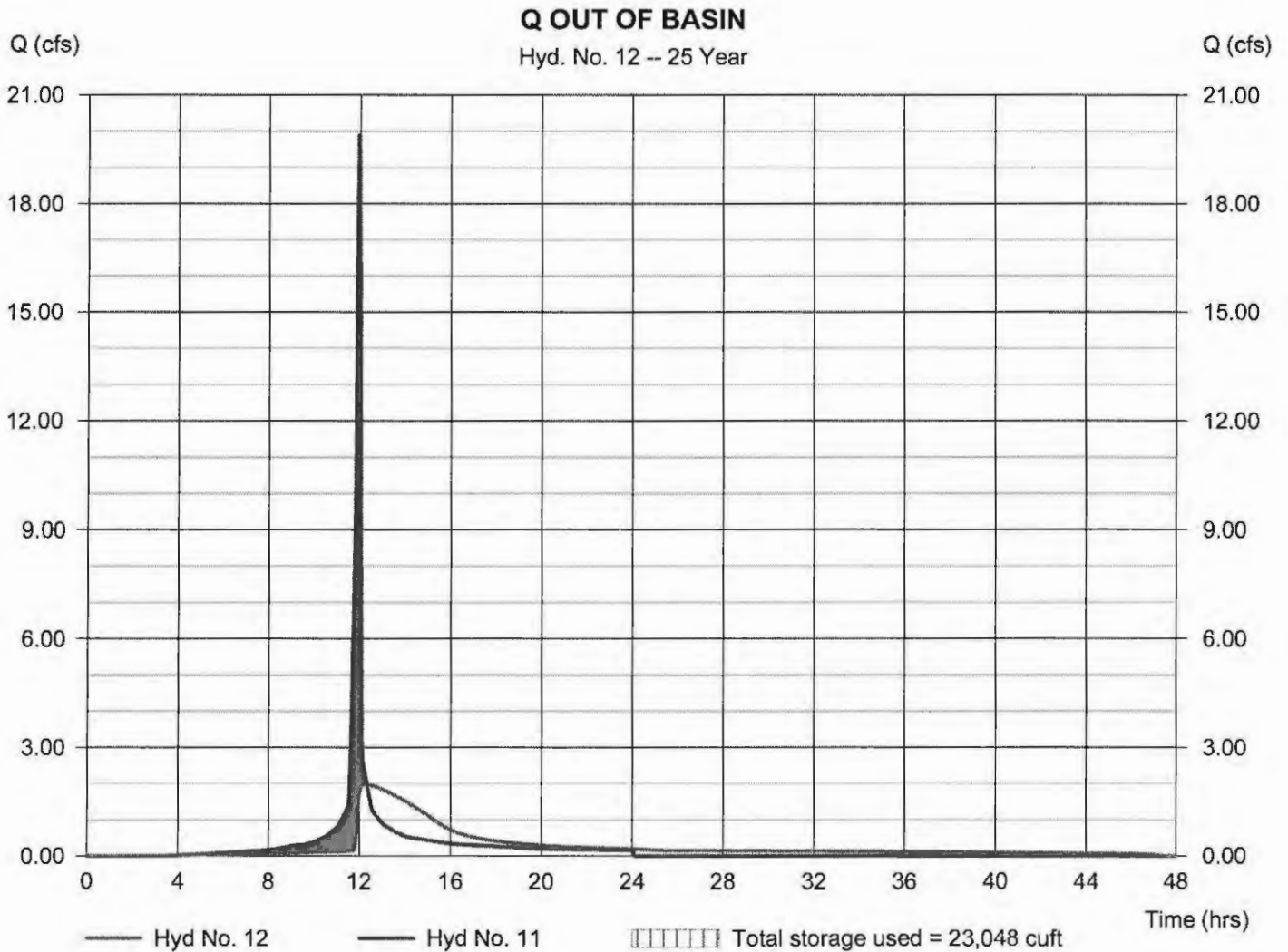
Monday, 03 / 2 / 2015

Hyd. No. 12

Q OUT OF BASIN

Hydrograph type	= Reservoir	Peak discharge	= 1.972 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.33 hrs
Time interval	= 2 min	Hyd. volume	= 43,251 cuft
Inflow hyd. No.	= 11 - AREA TO BASIN	Max. Elevation	= 632.57 ft
Reservoir name	= BASIN	Max. Storage	= 23,048 cuft

Storage Indication method used.



Hydrograph Report

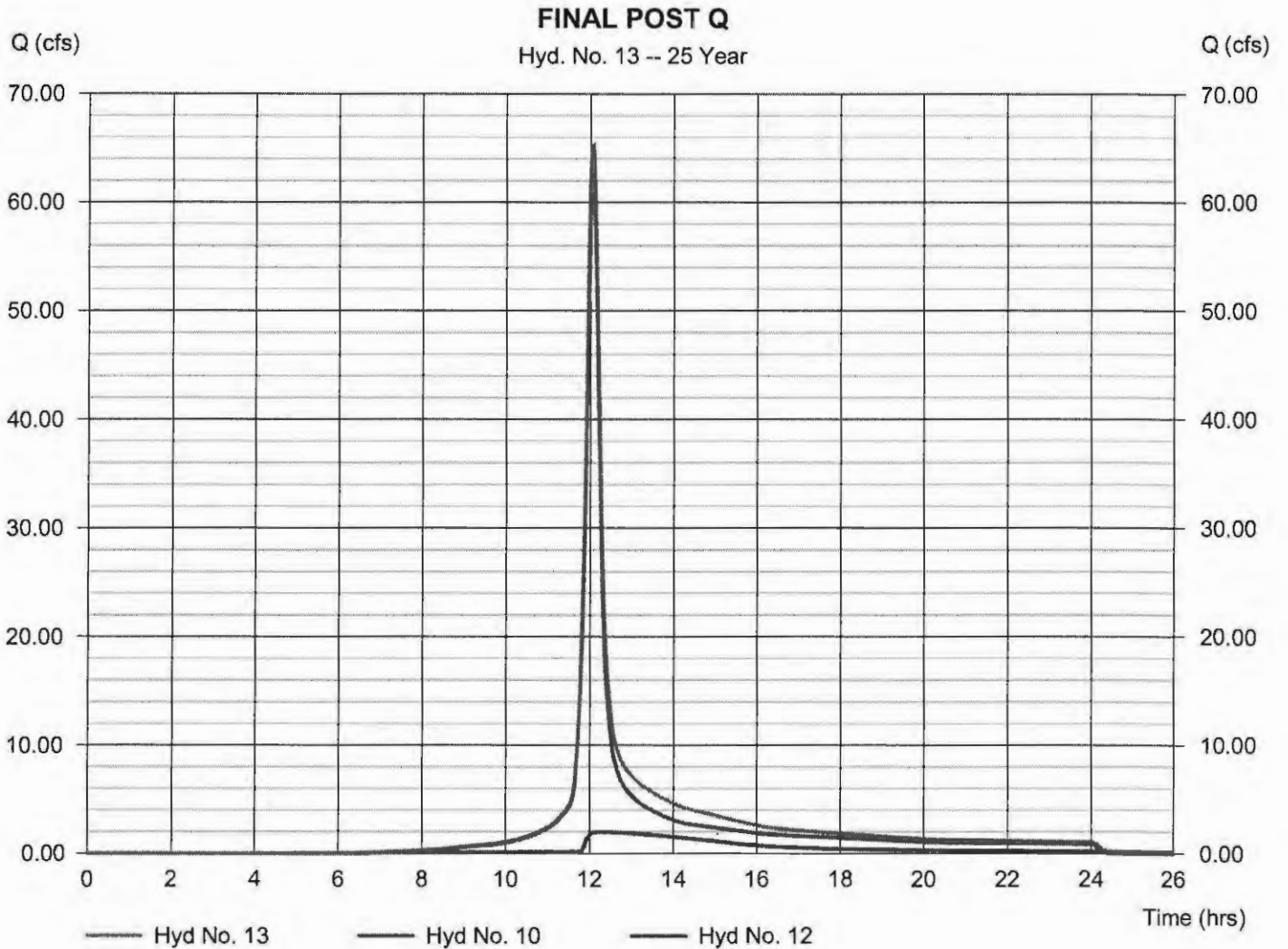
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Monday, 03 / 2 / 2015

Hyd. No. 13

FINAL POST Q

Hydrograph type	= Combine	Peak discharge	= 65.29 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 238,591 cuft
Inflow hyds.	= 10, 12	Contrib. drain. area	= 0.000 ac



Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description	
1	SCS Runoff	37.56	2	726	130,525	-----	-----	-----	EX RUNOFF TO EAST INLET	
2	SCS Runoff	27.79	2	724	87,675	-----	-----	-----	EX ONSITE RUNOFF TO CREEK	
3	SCS Runoff	23.05	2	728	85,084	-----	-----	-----	EX ONSITE RUNOFF TO DITCH	
4	SCS Runoff	8.269	2	722	23,486	-----	-----	-----	EX RUNOFF TO FEISE	
5	SCS Runoff	41.47	2	722	117,776	-----	-----	-----	PD AREA TO EAST RESIDENTIAL E	
6	SCS Runoff	25.68	2	726	89,240	-----	-----	-----	EX ONSITE RUNOFF TO CREEK	
7	SCS Runoff	17.81	2	722	50,599	-----	-----	-----	DA AREA TO DITCH	
8	SCS Runoff	3.076	2	722	8,866	-----	-----	-----	ONSITE TO OFFSITE BYPASS	
9	Combine	94.66	2	726	326,770	1, 2, 3, 4,	-----	-----	EX RUNOFF	
10	Combine	85.85	2	722	266,482	5, 6, 7, 8,	-----	-----	POST DEVELOPED OFFSITE	
11	SCS Runoff	25.52	2	716	56,332	-----	-----	-----	AREA TO BASIN	
12	Reservoir	5.077	2	726	56,327	11	633.19	29,298	Q OUT OF BASIN	
13	Combine	90.63	2	724	322,808	10, 12	-----	-----	FINAL PQST Q	
1-30-2015 DETENTION CALCS.gpw					Return Period: 100 Year			Monday, 03 / 2 / 2015		

Hydrograph Report

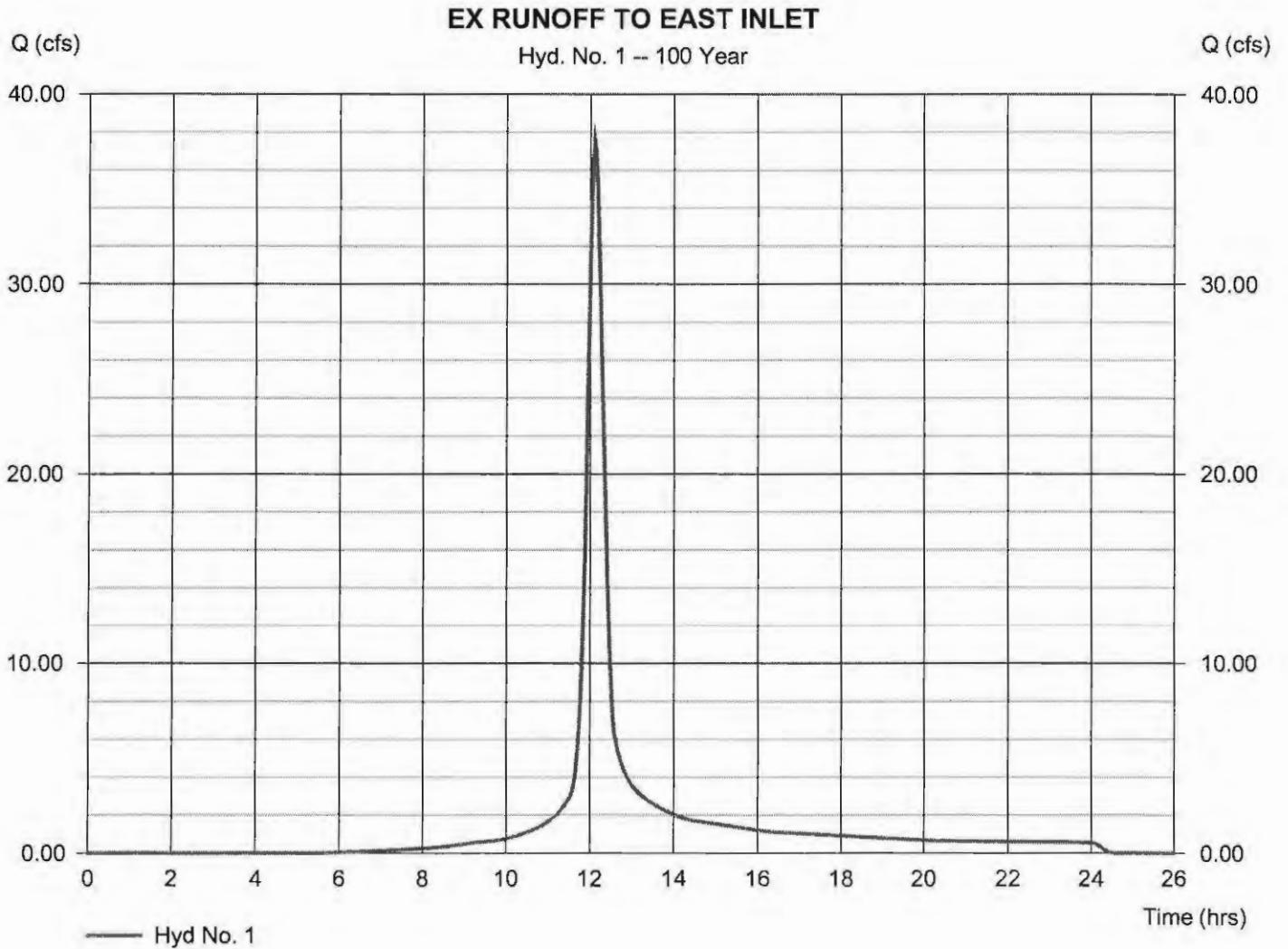
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Monday, 03 / 2 / 2015

Hyd. No. 1

EX RUNOFF TO EAST INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 37.56 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 130,525 cuft
Drainage area	= 7.240 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 21.00 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

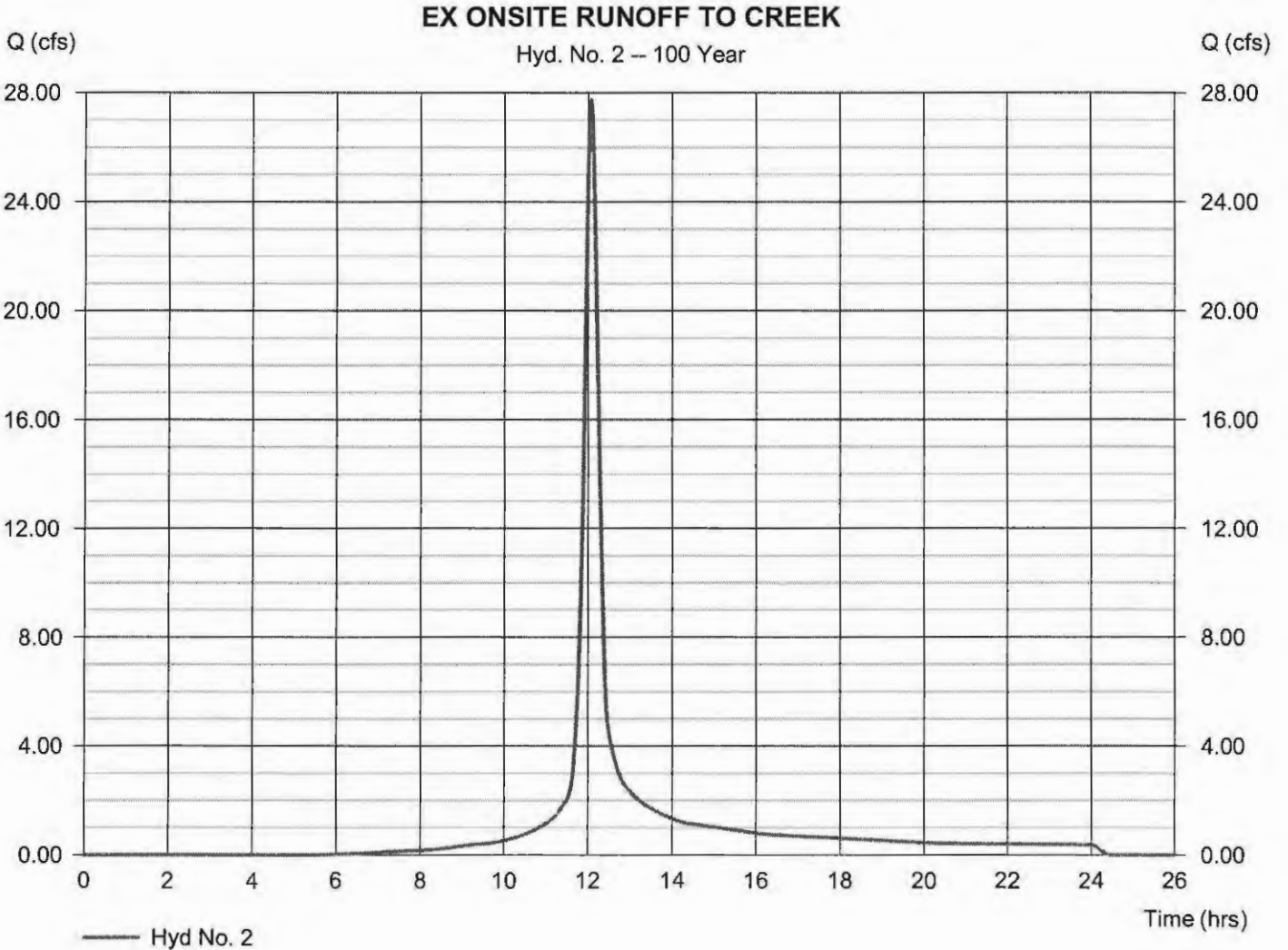
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 2

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 27.79 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 87,675 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 17.20 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

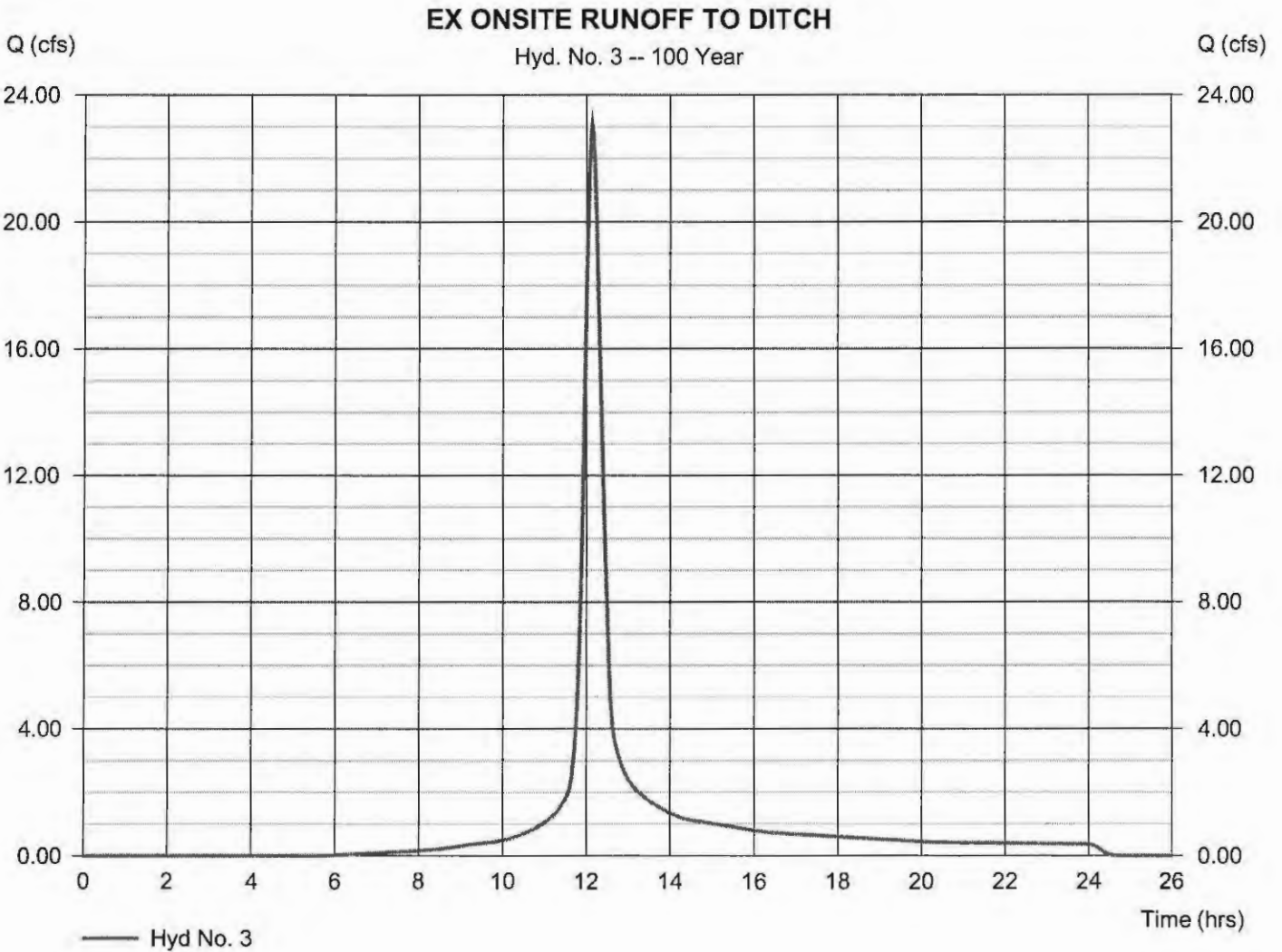
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 3

EX ONSITE RUNOFF TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 23.05 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 85,084 cuft
Drainage area	= 4.880 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 24.10 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

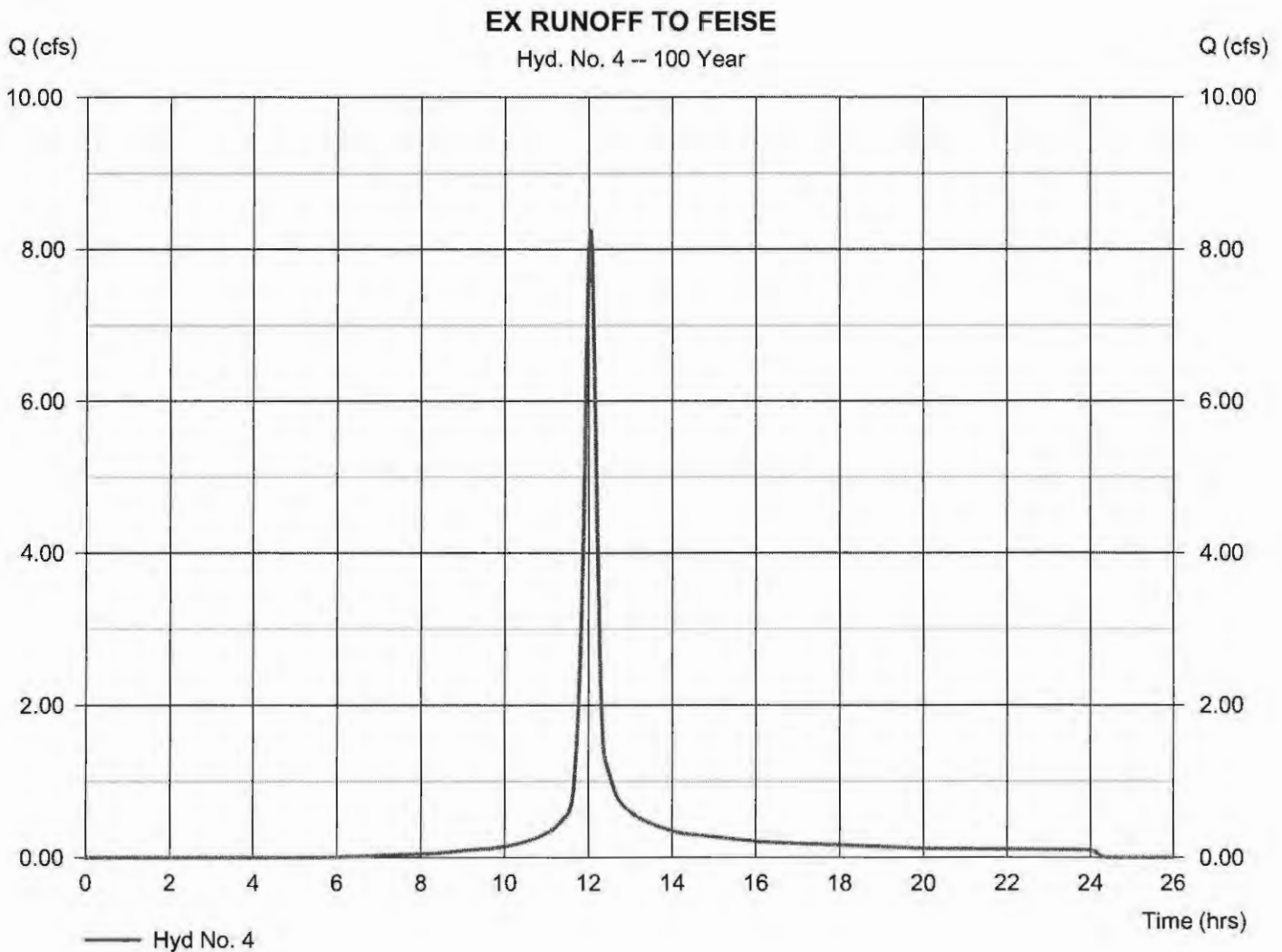
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 4

EX RUNOFF TO FEISE

Hydrograph type	= SCS Runoff	Peak discharge	= 8.269 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 23,486 cuft
Drainage area	= 1.360 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

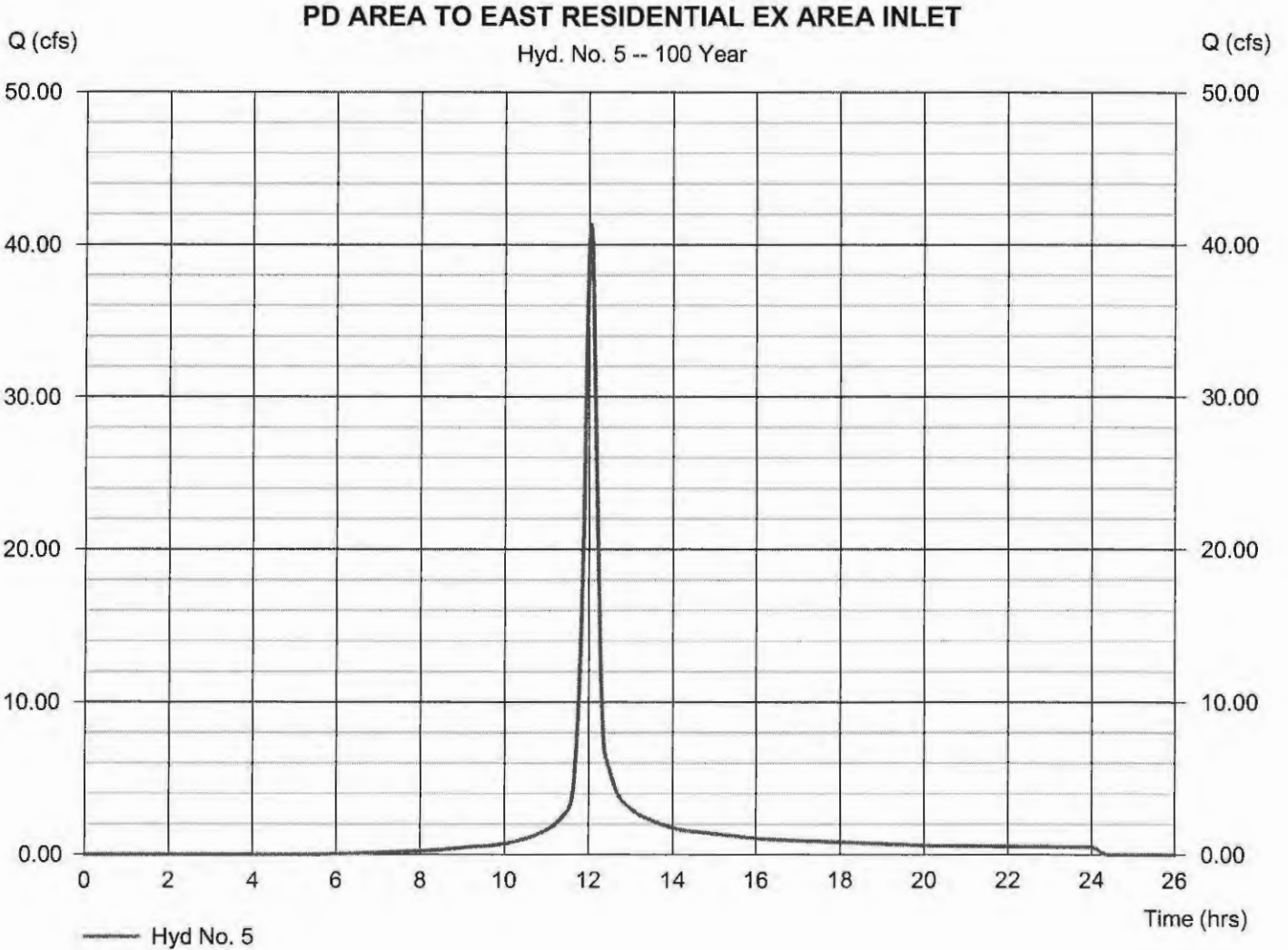
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 5

PD AREA TO EAST RESIDENTIAL EX AREA INLET

Hydrograph type	= SCS Runoff	Peak discharge	= 41.47 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 117,776 cuft
Drainage area	= 6.820 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 16.20 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

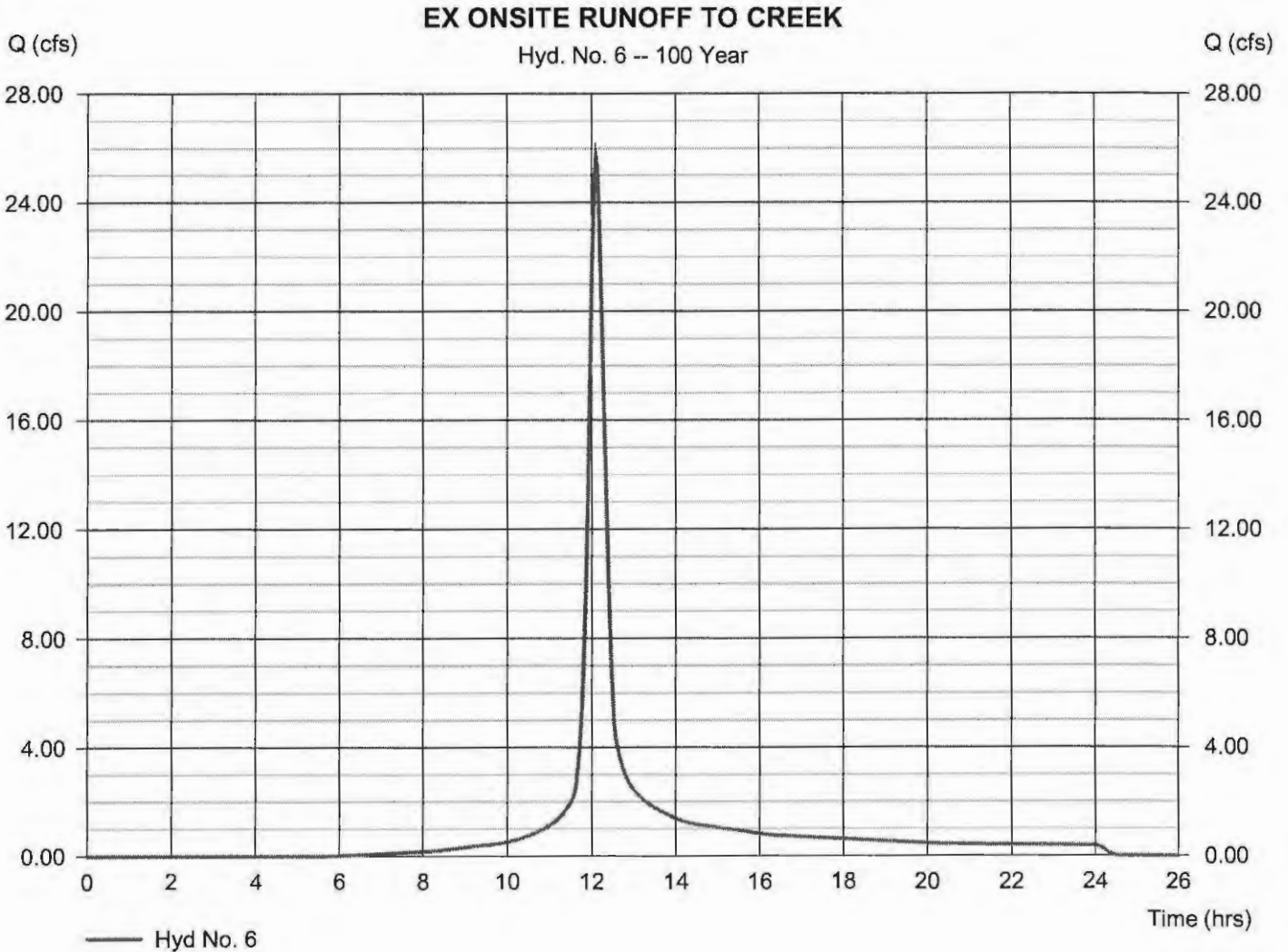
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Monday, 03 / 2 / 2015

Hyd. No. 6

EX ONSITE RUNOFF TO CREEK

Hydrograph type	= SCS Runoff	Peak discharge	= 25.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 89,240 cuft
Drainage area	= 4.950 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 22.30 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

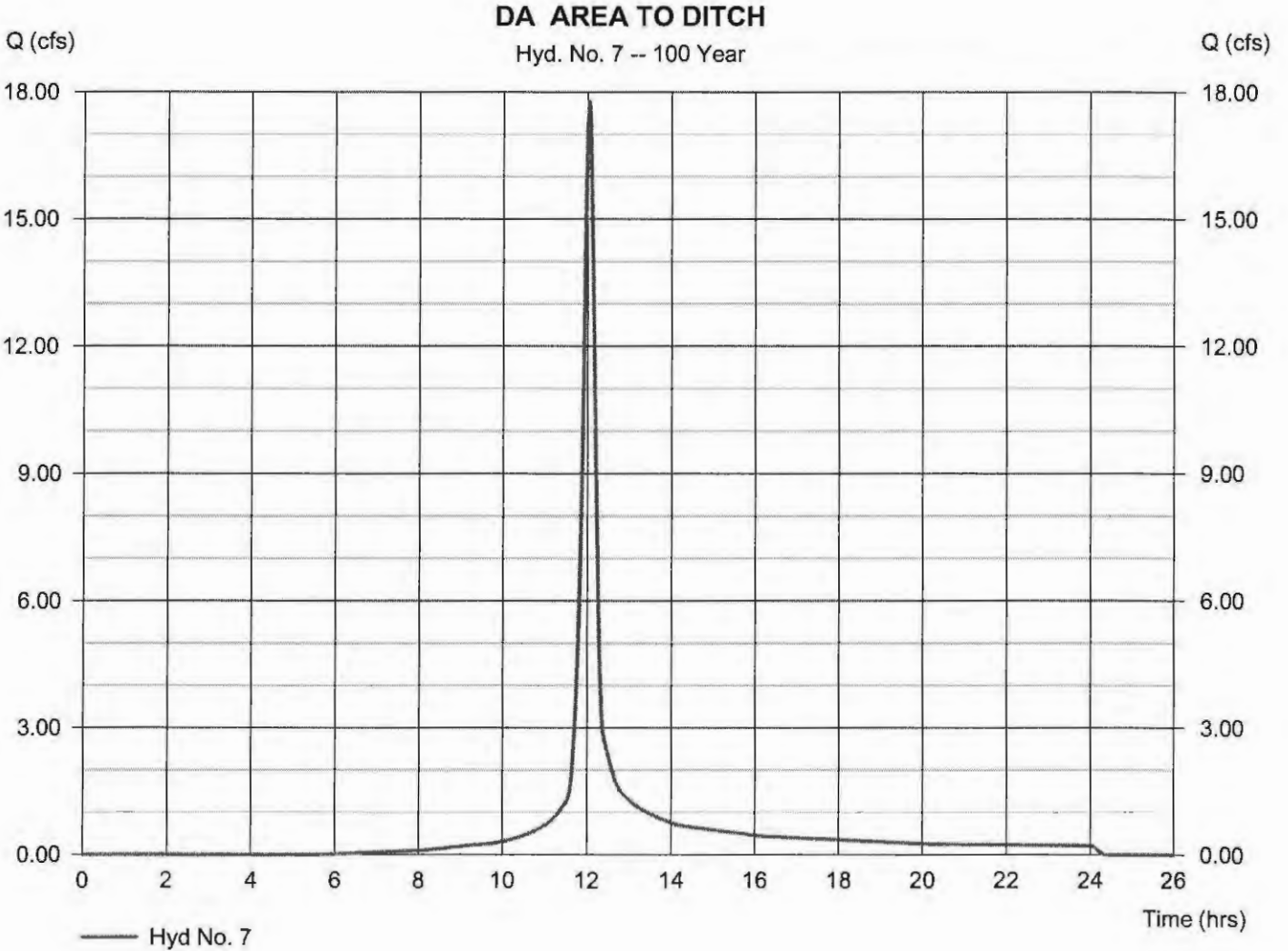
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Monday, 03 / 2 / 2015

Hyd. No. 7

DA AREA TO DITCH

Hydrograph type	= SCS Runoff	Peak discharge	= 17.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 50,599 cuft
Drainage area	= 2.930 ac	Curve number	= 80
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.50 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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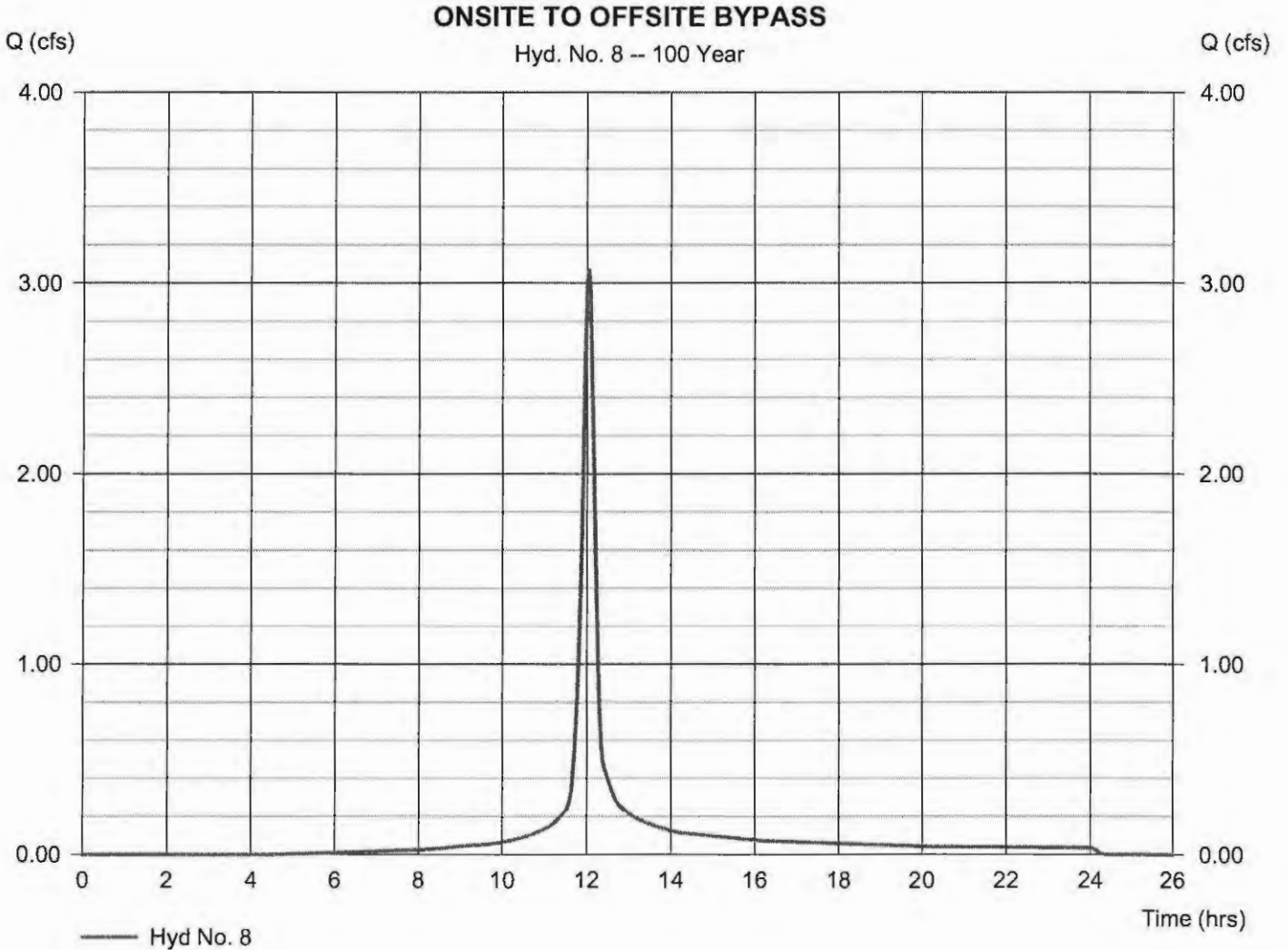
Monday, 03 / 2 / 2015

Hyd. No. 8

ONSITE TO OFFSITE BYPASS

Hydrograph type	= SCS Runoff	Peak discharge	= 3.076 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 8,866 cuft
Drainage area	= 0.470 ac	Curve number	= 84*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 13.60 min
Total precip.	= 7.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.110 x 98) + (0.360 x 80)] / 0.470



Hydrograph Report

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

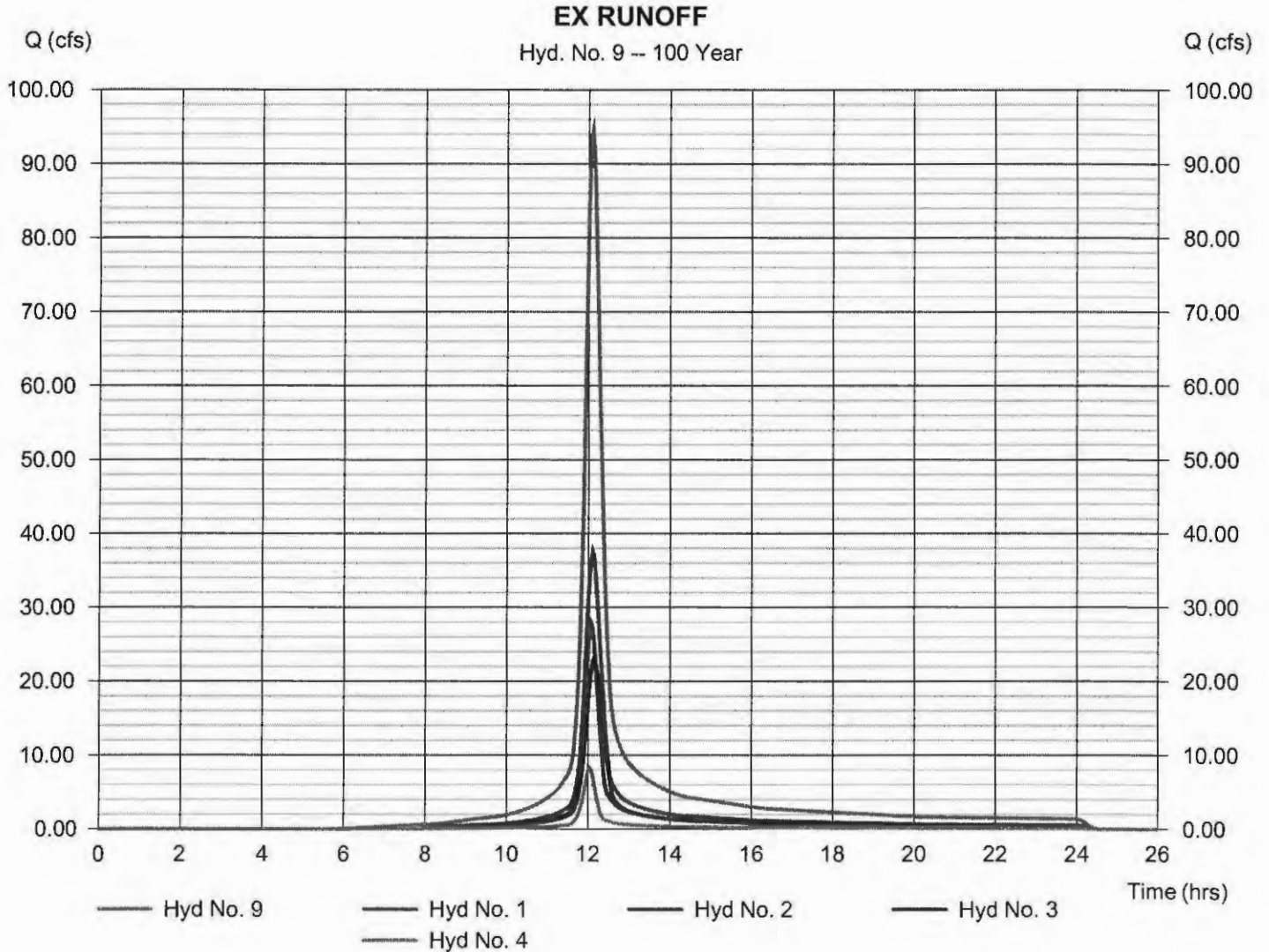
Monday, 03 / 2 / 2015

Hyd. No. 9

EX RUNOFF

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 1, 2, 3, 4

Peak discharge = 94.66 cfs
Time to peak = 12.10 hrs
Hyd. volume = 326,770 cuft
Contrib. drain. area = 18.430 ac



Hydrograph Report

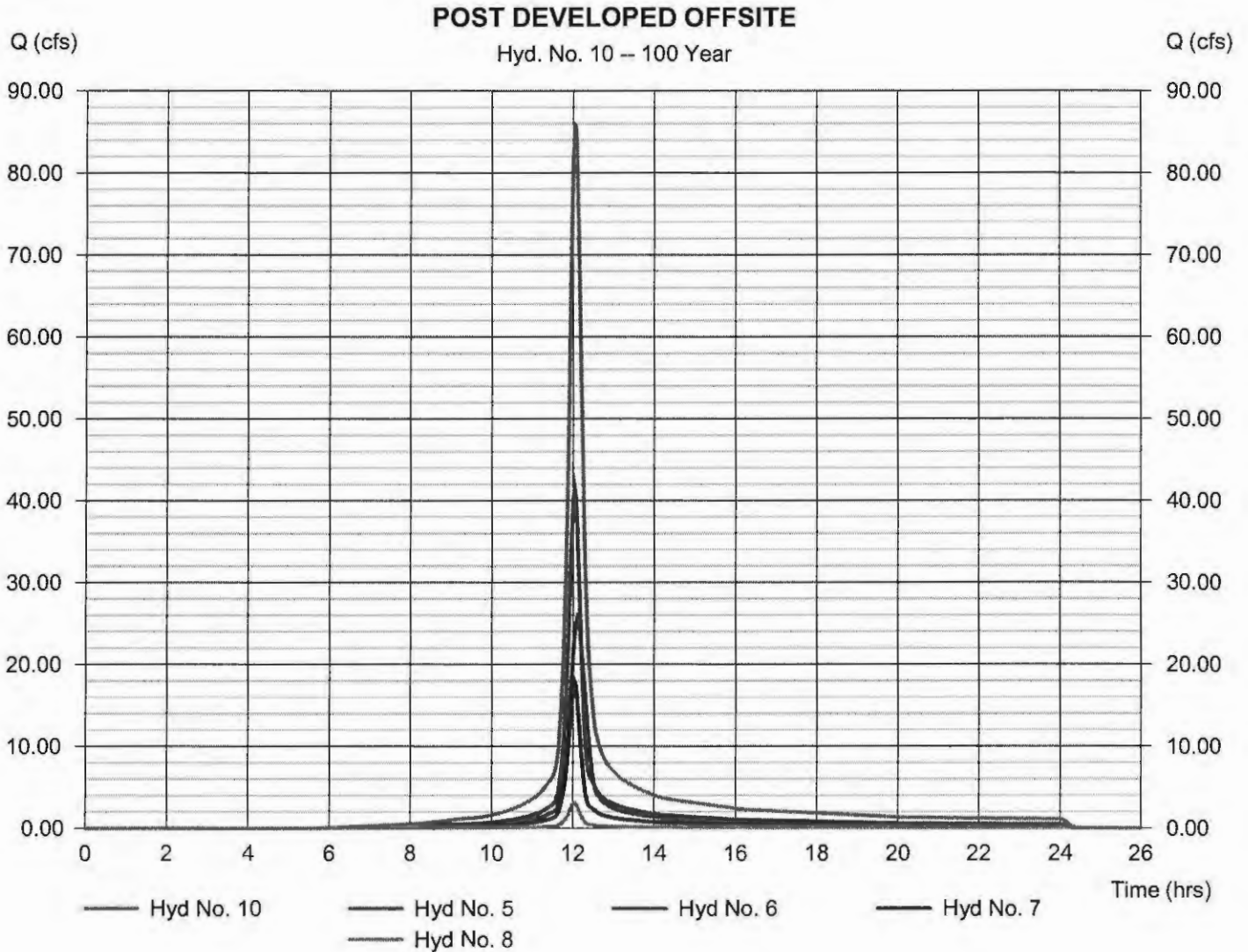
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Monday, 03 / 2 / 2015

Hyd. No. 10

POST DEVELOPED OFFSITE

Hydrograph type	= Combine	Peak discharge	= 85.85 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 266,482 cuft
Inflow hyds.	= 5, 6, 7, 8	Contrib. drain. area	= 15.170 ac



Hydrograph Report

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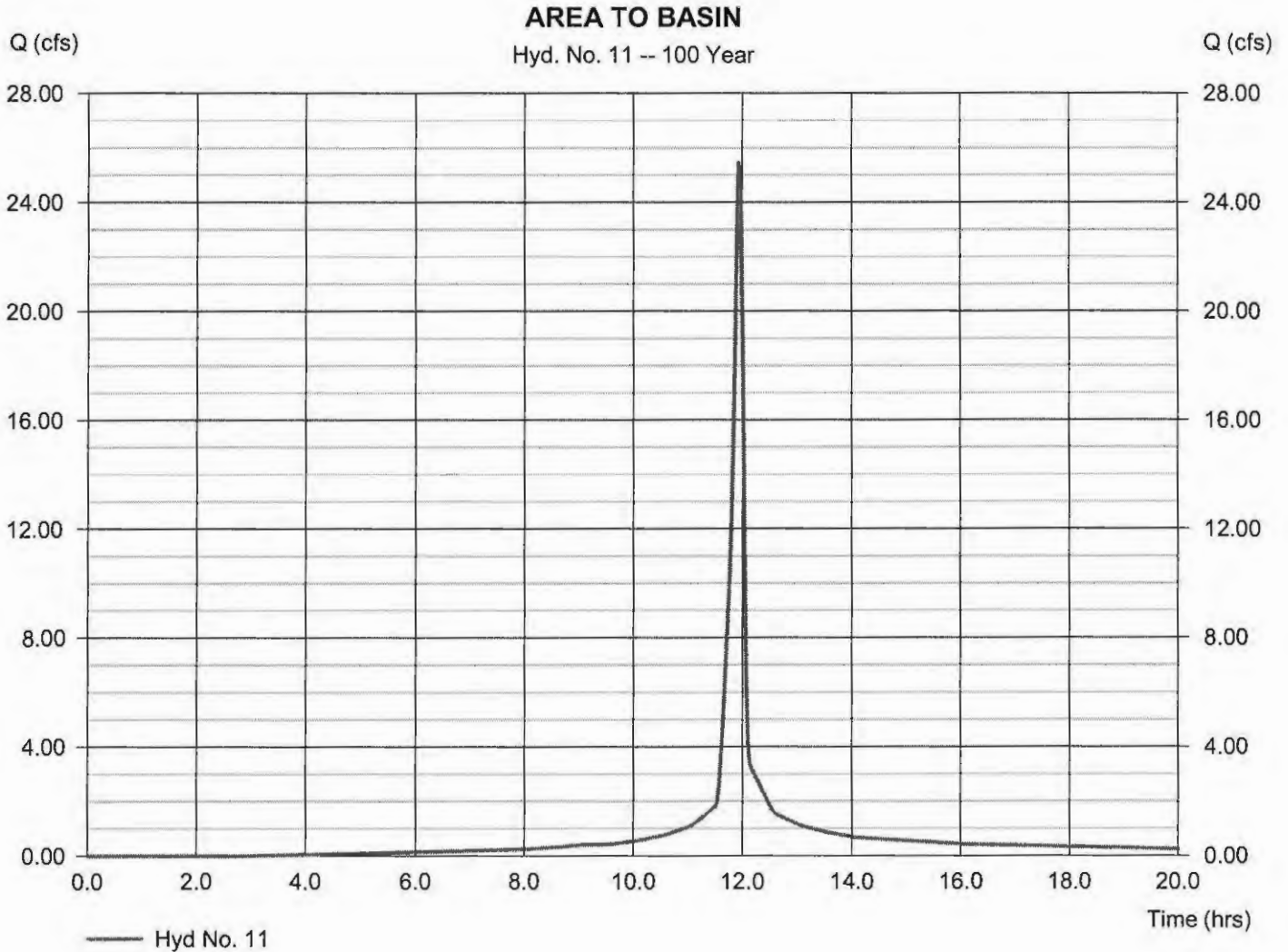
Monday, 03 / 2 / 2015

Hyd. No. 11

AREA TO BASIN

Hydrograph type	= SCS Runoff	Peak discharge	= 25.52 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 56,332 cuft
Drainage area	= 2.750 ac	Curve number	= 90*
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

* Composite (Area/CN) = [(1.200 x 80) + (1.550 x 98)] / 2.750



Hydrograph Report

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

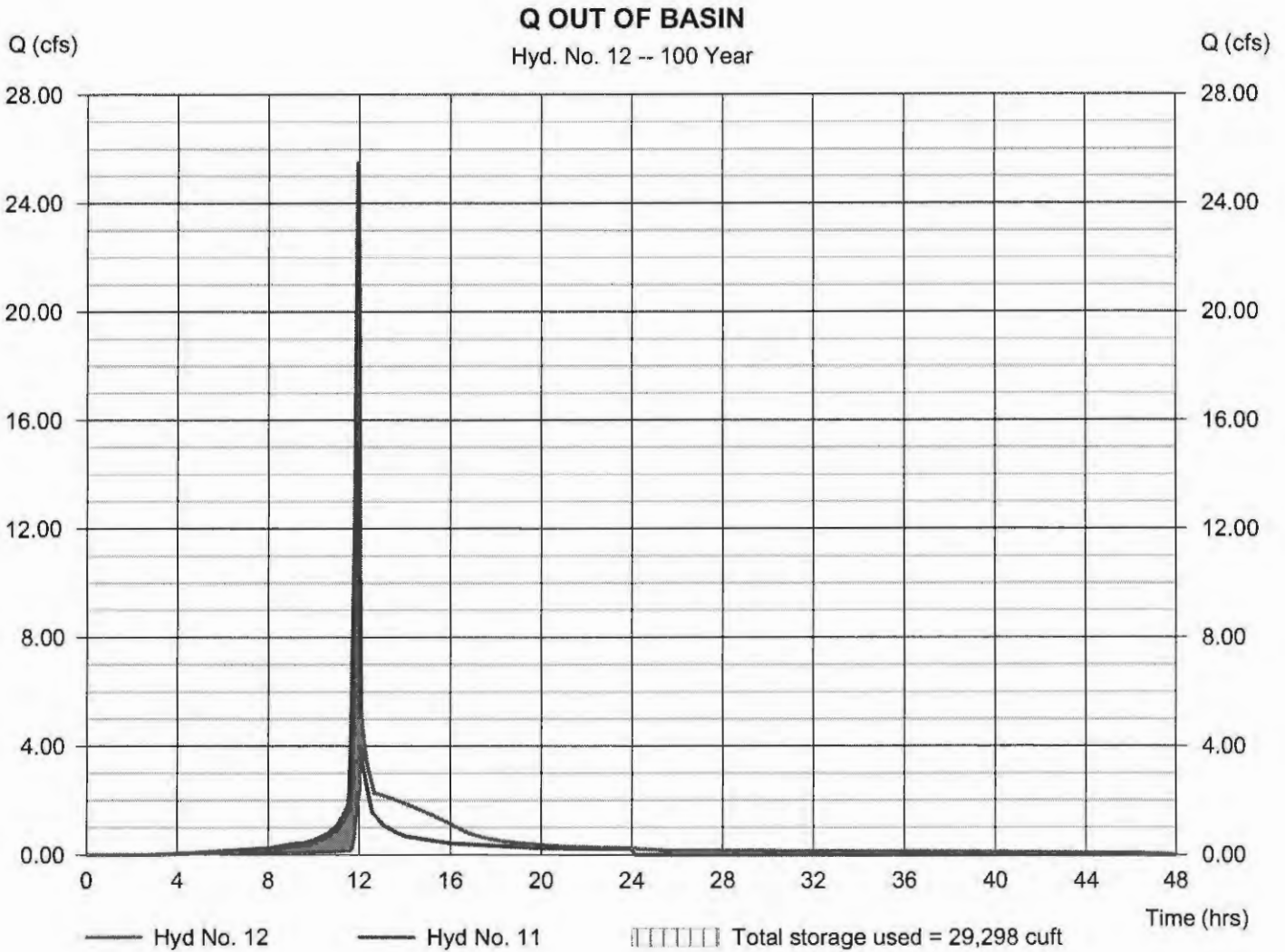
Monday, 03 / 2 / 2015

Hyd. No. 12

Q OUT OF BASIN

Hydrograph type	= Reservoir	Peak discharge	= 5.077 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 56,327 cuft
Inflow hyd. No.	= 11 - AREA TO BASIN	Max. Elevation	= 633.19 ft
Reservoir name	= BASIN	Max. Storage	= 29,298 cuft

Storage Indication method used.



Hydrograph Report

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

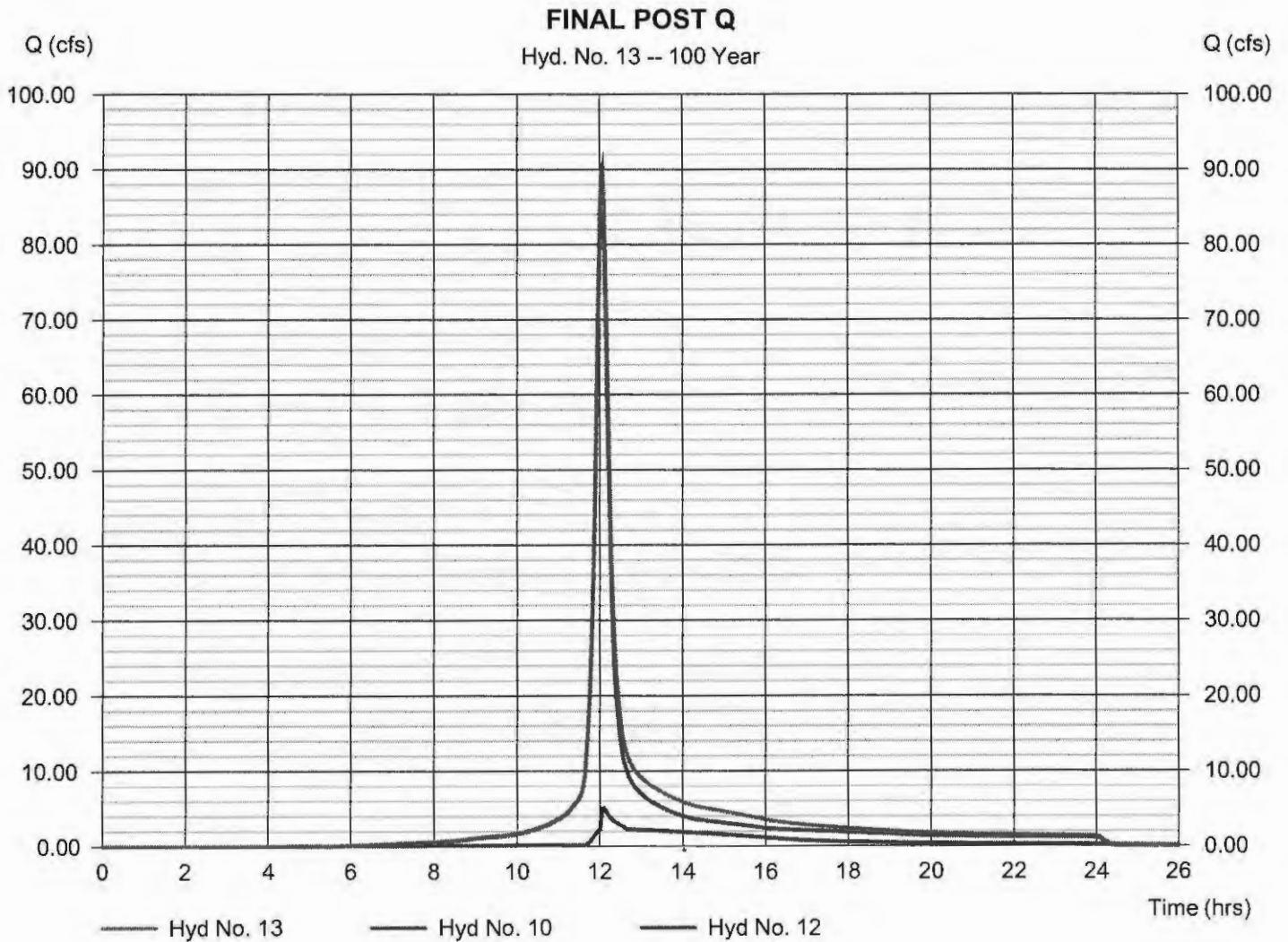
Monday, 03 / 2 / 2015

Hyd. No. 13

FINAL POST Q

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 10, 12

Peak discharge = 90.63 cfs
Time to peak = 12.07 hrs
Hyd. volume = 322,808 cuft
Contrib. drain. area = 0.000 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	69.8703	13.1000	0.8658	-----
3	0.0000	0.0000	0.0000	-----
5	79.2597	14.6000	0.8369	-----
10	88.2351	15.5000	0.8279	-----
25	102.6072	16.5000	0.8217	-----
50	114.8193	17.2000	0.8199	-----
100	127.1596	17.8000	0.8186	-----

File name: SampleFHA.idf

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.69	4.61	3.89	3.38	2.99	2.69	2.44	2.24	2.07	1.93	1.81	1.70
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.57	5.43	4.65	4.08	3.65	3.30	3.02	2.79	2.59	2.42	2.27	2.15
10	7.24	6.04	5.21	4.59	4.12	3.74	3.43	3.17	2.95	2.77	2.60	2.46
25	8.25	6.95	6.03	5.34	4.80	4.38	4.02	3.73	3.48	3.26	3.07	2.91
50	9.04	7.65	6.66	5.92	5.34	4.87	4.49	4.16	3.88	3.65	3.44	3.25
100	9.83	8.36	7.30	6.50	5.87	5.36	4.94	4.59	4.29	4.03	3.80	3.60

Tc = time in minutes. Values may exceed 60.

EPAUL7 CALC SPECS AND REPORTS\3 HYDRAULIC AND DETENTION CALCS\REPORT 4.19.2013\STL PCP.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.50	3.10	0.00	3.30	4.25	5.77	6.80	7.20
SCS 6-Hr	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	2.75	4.00	0.00	6.50	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	2.80	3.90	0.00	6.00	0.00