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ENGINEERING | SURVEYING | PLANNING
LANDSCAPE ARCHITECTURE

DRAINAGE PLAN
JBAR ADDITION
DECEMBER 2014

REPORT CONTENTS

EXISTING CONDITIONS

The property is located near 13th Street and Hoover Road and is surrounded by current residential homes. More precisely, it is located between Doris and Curtis just north of 11th Street North. This area is currently vacant with native grasses, trees, and low areas.

The site currently drains half of the property to the west and into the Curtis Street ROW and the other half to the east at the south east corner where it percolates/infiltrates on this property and the adjacent Lot 1, Block A of Eck 4th Addition. The west portion, along with runoff from the northwest in the Curtis ROW, appears to drain and pond near the west line of this property in the ROW and surrounding properties. The east portion drains and ponds at this property's south east corner as well as the adjacent lot. These areas most likely infiltrate in existing conditions.

The drainage patterns can be viewed on the Aerial and Lidar Exhibit (Exhibit 1).

PROPOSED CONDITIONS

This property is being developed as an infill area which is surrounded by older development. The site will be platted in 15 lots with 2 reserve areas for detention and water quality. There will be one cul de sac running east from Curtis Street which is the only entrance to the subdivision. The 15 lots will feature duplexes.

For a half-scale copy of the Plat, see Exhibit 2.

OFFSITE CONDITIONS

There is currently offsite water from the north east and north west which encroaches this site. The runoff from the north west appears to concentrate mostly in the Curtis Street ROW but ponds along this property's west edge as well in the roadway and ditches adjacent. Runoff from the north east flows onto this site primarily from the Doris Street section which ends at the north line of this property. This runoff flows to the south property line and ponds / infiltrates on this site and the adjacent lot previously platted in Eck 4th Addition.

There does not appear to be adequate drainage conditions in the area as water appears to stand in the surrounding street sections and on adjacent properties in the area. There is no storm water sewer in the general area that this site can utilize.

The adjacent Doris street does not connect along the east line of this property. Therefore, current offsite runoff that would normally be located in the street right of way encroaches and stands on this site, as well as the adjacent lot.

The Offsite Drainage Exhibit can be seen as Exhibit 3.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events
  - 2-yr Rainfall Intensity = 3.83 in
  - 10-yr Rainfall Intensity = 5.22 in
  - 100-yr Rainfall Intensity = 7.37 in

- FLOW DATA
  - Areas per LIDAR data, USGS Quadrangle Sheet, Aerial Photos, and Site Visits
  - SCS Cure Number Method (CN = 71, Pre-developed Undisturbed)
  - Time of Concentration: Lag Method (minimum 15 min)

SITE CHARACTERISTICS

The topography on the site is generally split down the middle with half draining west and the other half sheet flowing to the east. There does not appear to be any outfall at either side with ponding apparent along the west line and at the south east corner. The adjacent Doris Street does not connect along the east line of this property, therefore the ROW runoff drains onto this site instead of continuing along Doris to the south, which is the general direction of the overall basin.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

This property was analyzed based on existing conditions for peak runoff values for the entire storm series. Conditions on the site are open space with native grasses. Based on local knowledge of the area it was determined that the site was of Soil Type A and B. This is apparent in the existing conditions as the runoff from this site and offsite infiltrates readily after a storm event.

DOWNSTREAM DRAINAGE CAPACITY

There does not appear to additional capacity in the street sections for additional runoff. The adjacent property to the north discharges onto this site where it infiltrates before a potential overtopping in to the street ROW of Doris and Curtis. Based on a site visit during a recent rainfall event, there is standing water on all surrounding streets (including Doris, Curtis, 11th St, Hoover Road to the north, Clara, and Memory).

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- STORM SERIES
  - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 50-yr, 100-yr Storm Events Calculated
  - Rational Formula Method used for peak runoff
  - CN = 90 (Disturbed and/or Developed Areas)
  - Time of Concentration; Lag Method, minimum Tc = 15min
  - Rational 'C' Factor = 0.61 (10-year event – where applicable)

- GRADING CONSTRAINTS TO BE OBSERVED AT SITE PLAN
  - Match all existing perimeter grades
  - Overflows utilized is existing ROW / curb grades

DEVELOPED CONDITIONS HYDROLOGIC ANALYSIS

The site is being platted as a residential subdivision with 15 duplex lots. There will also be 2 reserves which will contain infiltration basins for detention and water quality requirements. The soils on the site are a Type B Aldeck sandy loam with an approximate infiltration rate of 8.9 in/hr.

We anticipate the site to drain similar to existing conditions in that the east half and west half will continue in their general directions as well as accepting all offsite runoff. All calculations were done using HydraFlow Hydrographs.

DETENTION FACILITY

There are two detention facilities proposed on site. Both will be built as infiltration basins with overflows to be used only in larger storm events or emergency purposes. The facilities will feature 3.5' of infiltration in the west pond and 5' of infiltration in the east pond before an overflow situation occurs. For both basins an infiltration rate of 8.9 in/hour was calculated. This was based on a sandy loam commonly found in this area. This type of sandy loam has an infiltration rate of approximately 63 micrometers per second; which calculates to approximately 8.9 in/hr. The following summaries explain each basin and their respective models in more detail.

West Basin

The west infiltration basin is located in Reserve A just south of the main entrance into the subdivision off of Curtis. This basin will accept runoff from 1.6 acres of the developed property as well as 1.6 acres of offsite runoff from the north. Curtis will be paved as part of this development which will subsequently drain the ROW runoff to this detention area. There is simply not enough grade change in the area to discharge offsite. The basin was modeled using a bottom elevation of 1312.0 with an overflow elevation at 1315.5. The overflow will occur at existing grades into the Curtis ROW. The flow along Curtis is flat but appears to slowly drain to the south to 11th Street

North. By having an infiltration basin in this area, this development will help alleviate the standing water that currently sits in Curtis during rain events.

East Basin

The east basin is also an infiltration basin with a bottom at elevation 1311 and approximate top elevation of a 1316. The overflow, where applicable, was modeled as a 10' weir section at elevation 1316.0 (the adjacent Doris street flow line elevation is at 1315.75). This basin was modeled multiple ways to show the impacts of the Doris street dedication the offsite runoff.

First, the basin was sized utilizing the entire reserve as well as the Doris street dedication. The contributing runoff in this scenario was the developed 3.0 acres of this site and the north offsite runoff of 1.9 acres. This basin portrayed no overflow in any storm event – complete retention and infiltration – and had a 100-year WSE of 1315.8. We would expect this basin to infiltrate and be dry in approximately 16 hours after the peak of the rainfall event.

Second, the basin was sized assuming the Doris Street dedication gets paved and Doris Street is constructed. If constructed, we assume that the street would be built up and act as a dam to the property to the east. In this case, the street would allow some additional detention above the current elevations since the curb and gutter and ROW elevation would be slightly elevated. Assuming that the offsite runoff stays in Doris Street, and does not enter the basin, there would not be any outflow until approximately the 50 year event. The contributing area to the basin would only be the developed property with the north offsite runoff continuing to flow to the south to 11th Street. The 100-year WSE would be approximately a 1316.3 in this case.

Lastly, the model was run using the smaller basin – with Doris Street constructed – with contributing inflow being the developed property and the offsite north runoff. In this case there would be discharge in the 10-year event with a 100-year outflow of 24 cfs and 100-year WSE at a 1317.0. This would likely cause issues to the properties to the east as well as the overflow structure required near Doris. We do not recommend this scenario as we generally don't agree that right of way runoff from offsite properties be directed into private basins. If the City prefers this scenario, we would recommend they construct a permanent inflow and outflow structure as well as perform downstream improvements to allow the safe conveyance of runoff to the south.

DISCHARGE POINTS SUMMARY

As stated earlier, the discharge points at the southern portions of the site are not well defined. The easternmost basin appears to discharge into the adjacent platted lot with no apparent outflow. This area should discharge into the Doris ROW when the lot is developed. Doris flows to the south to 11th Street and then to the east. The west basin ponds and appears to infiltrate in the roadside ditches of Curtis. During large events Curtis drainage will flow south and into 11th Street. The entire surrounding areas are flat and have ponding issues.

WATER QUALITY

Water quality will be utilized in the proposed infiltration basins. These basins are sized to infiltrate the entire water quality volume into the surrounding sandy soils. When modeled using only onsite runoff, the east basin will have no discharge even at the 100-year event. The west basin, similarly, will have no discharge until the 100-year event. The site will generate, once developed, approximately 0.3 ac-ft of needed water quality volume. The infiltration basins are sized to accommodate up to 2.0 ac-ft of storage below the outfall elevations.

Water quality calculations are included in Appendix C.

DOWNSTREAM CHANNEL PROTECTION

Since this area is less than 5 acres in total development, no downstream channel protection is required. However, the volume needed for this requirement is included in the infiltration basin. There is no discharge in the 2 year storm from either basin based on the runoff from this property, which would satisfy the downstream channel protection requirement.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

This site will accept all offsite runoff as it does today. Therefore, no upstream impacts are expected. Since Doris Street is not fully constructed the east line of the property will be located in a contingent street dedication. When the City connects Doris across this property the infiltration basin will be partially filled in. The basin will then be used for onsite runoff only whereas the north offsite flow will continue to flow south in the Doris Street ROW. The basin, at that time, will not be sized for offsite flow and we do not recommend ROW runoff to be stored in the private basin.

There are current ponding issues in street sections as well as ditch sections in this area. This is an older area that, when it was developed, did not feature storm water sewer and sufficient grades to convey runoff effectively or efficiently. When developed, this site will have infiltration ponds which will limit the amount of runoff ponding in the street ROW. This development should help alleviate downstream ponding issues due to the infiltration nature of the basins. However, this site will not alleviate all the problems in the area. Rear yards of existing lots will continue to pond water, runoff will still pool in roadside ditches and curbs, and cross lot drainage will still exist. This is an infill area and cannot solve all the areas' drainage issues.

SOURCE OF FLOODPLAIN INFORMATION

This site lies within a FEMA Zone X-Shaded per FEMA FIRM Panels 335 & 385 of 700 for Wichita, Sedgwick County, Kansas; effective February 2, 2007.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

There does not appear to be any jurisdictional waters of the US on this site.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

There does not appear to be any DWR permitting needed on the proposed site at this time. The areas of discharge do not account for more than 640 acres.

FEMA

No FEMA permitting is expected at this time.

KANSAS DEPT OF TRANSPORTATION

There is no KDOT ROW adjacent or near this property which would require a permit at this time.

SEDGWICK COUNTY PERMITTING

There does not appear to be any Sedgwick County permitting needed at this time.

EXHIBIT 1: Aerial Photo Exhibit with Lidar Topography

EXHIBIT 2: Plat – Half Scale

EXHIBIT 3: Offsite Drainage Map

EXHIBIT 4: Drainage Plan – Half Scale

EXHIBIT 5: Floodplain Location (FIRM)

JBAR ADDITION

Lidar Exhibit

0 50 100 200 Feet

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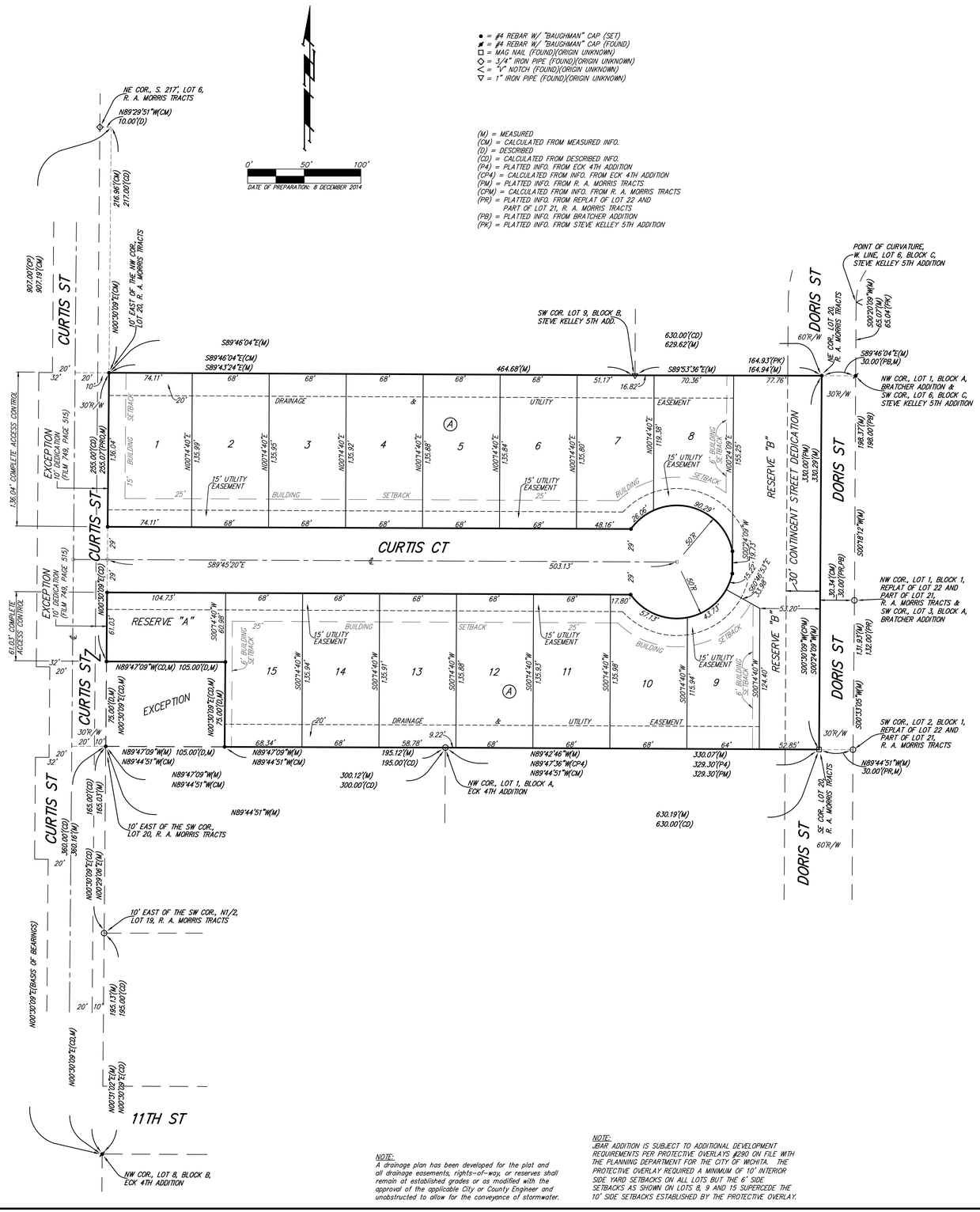
JBAR ADDITION
WICHITA, SEDGWICK COUNTY, KANSAS



NOTE:
A drainage plan has been developed for the plat and all drainage easements, rights-of-way, or reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer and unobstructed to allow for the conveyance of stormwater.

NOTE:
JBAR ADDITION IS SUBJECT TO ADDITIONAL DEVELOPMENT REQUIREMENTS PER PROTECTIVE OVERLAYS #290 ON FILE WITH THE PLANNING DEPARTMENT FOR THE CITY OF WICHITA. THE PROTECTIVE OVERLAY REQUIRED A MINIMUM OF 10' INTERIOR SIDE YARD SETBACKS ON ALL LOTS BUT THE 6' SIDE SETBACKS AS SHOWN ON LOTS 8, 9 AND 15 SUPERCEDE THE 10' SIDE SETBACKS ESTABLISHED BY THE PROTECTIVE OVERLAY.

State of Kansas)
Sedgwick County) SS

We, Baughman Company, P.A., Surveyors in aforesaid county and state do hereby certify that we have surveyed and platted "JBAR ADDITION", Wichita, Sedgwick County, Kansas and that the accompanying plat is a true and correct exhibit of the property surveyed, described as and being a replat of Lot 20, R. A. Morris Tracts, Wichita, Sedgwick County, Kansas, EXCEPT the west 10.00 feet dedicated to the public for street purposes in the document entitled dedication recorded in Film 749 at Page 515, and EXCEPT the east 105.00 feet of the west 115.00 feet of the south 75.00 feet of said Lot 20.

Existing public easements, building setbacks, access controls, and dedications, if any, being vacated by virtue of K.S.A. 12-512b, as amended.

All being situated in the Northwest Quarter of Section 14, Township 27 South, Range 1 West of the Sixth Principal Meridian, Sedgwick County, Kansas.

Baughman Company, P.A.

_____, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be platted into Lots, a Block, Streets, and Reserves to be known as "JBAR ADDITION", Wichita, Sedgwick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. The drainage and utility easements are hereby granted as indicated for drainage purposes and for the construction and maintenance of all public utilities. Reserve "A" is hereby reserved for open space, landscaping, berms, a playground, drainage purposes, and utilities as confined to easement. Reserve "B" is hereby reserved for open space, landscaping, drainage purposes, utilities as confined to easements, and a contingent street dedication. The contingent street dedication in said Reserve "B" shall become effective in the event that the City of Wichita determines a need for the right-of-way for any street related purposes. This contingent street dedication shall be a covenant running with the land and shall be binding on all heirs and subsequent owners of all parts of said Reserve "B" covered by said contingent street dedication. Reserves "A" and "B" shall be owned and maintained by the homeowners association for the addition. Access controls shall be as depicted on the face of the plat and are hereby granted to the City of Wichita, Kansas.

JABR LLC, a Kansas limited liability company

_____, Manager
Jay W. Russell

_____, Manager
Bob Armstrong

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this _____ day of _____, _____, by Jay W. Russell, Manager of JABR LLC, a Kansas limited liability company, on behalf of the limited liability company.

_____, Notary Public

My App't. Exp. _____

State of Kansas)
Sedgwick County) SS

The foregoing instrument acknowledged before me, this _____ day of _____, _____, by Bob Armstrong, Manager of JABR LLC, a Kansas limited liability company, on behalf of the limited liability company.

_____, Notary Public

My App't. Exp. _____

This plot of "JBAR ADDITION", Wichita, Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this _____ day of _____, _____.
Wichita-Sedgwick County Metropolitan Area Planning Commission

_____, Chair
Matthew J. Goolsby

_____, Secretary
John L. Schlegel

This plat approved and all dedications shown hereon accepted by the City Council of the City of Wichita, Kansas, this _____ day of _____, _____.

_____, Mayor
Carl Brewer

_____, City Clerk
Karen Sublett

Reviewed in accordance with K.S.A. 58-2005 on this _____ day of _____, _____.

_____
Tricia L. Robello, L.S. #1246
Deputy County Surveyor
Sedgwick County, Kansas

Entered on transfer record this _____ day of _____, _____.

_____, County Clerk
Kelly B. Arnold

State of Kansas)
Sedgwick County) SS

This is to certify that this plat has been filed for record in the office of the Register of Deeds, this _____ day of _____, _____ at _____ o'clock ___ M; and is duly recorded.

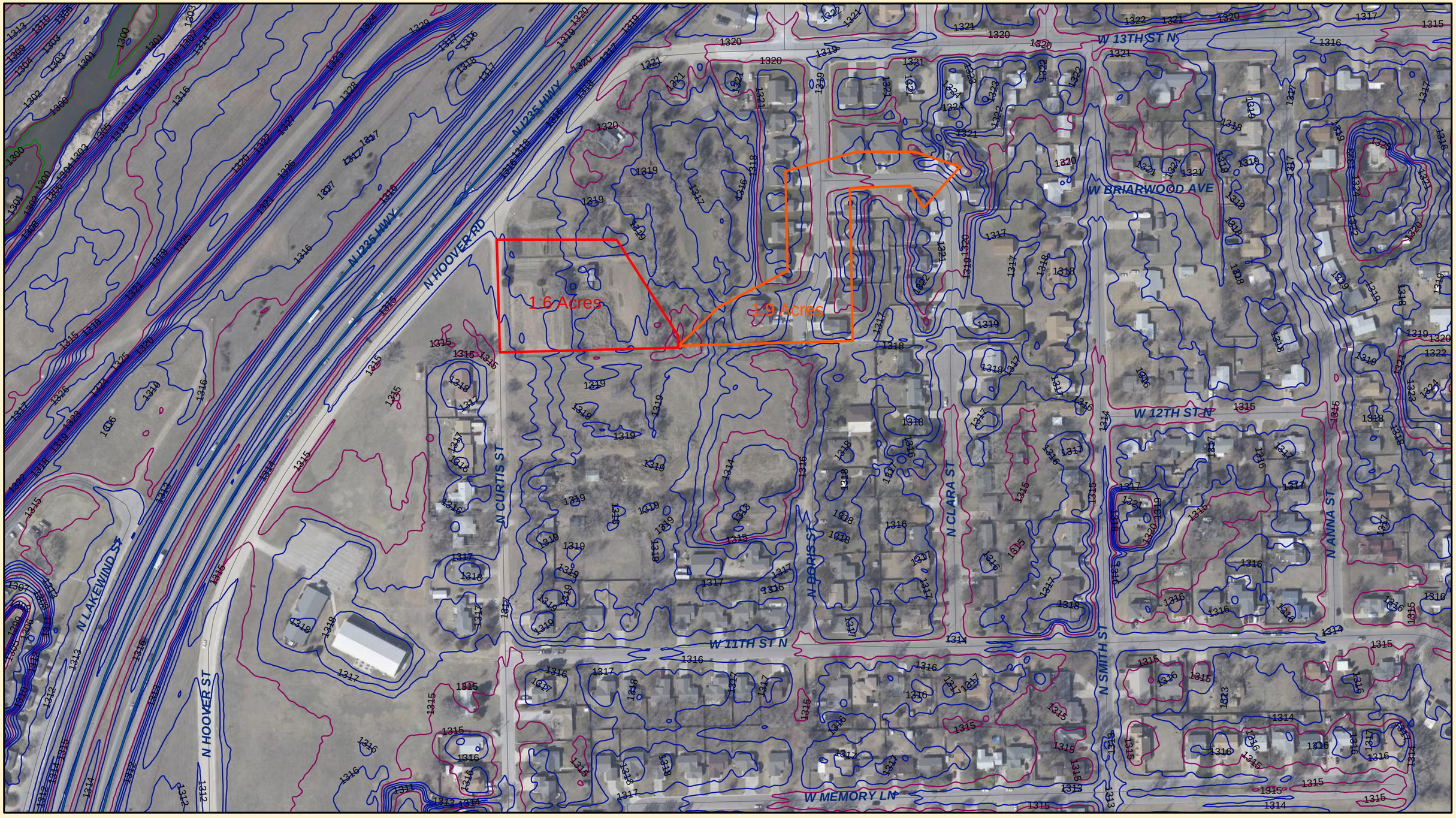
_____, Register of Deeds
Bill Meek

_____, Deputy
Tonya Buckingham

JBAR ADDITION
8 December 2014

Baughman Company, P.A.
315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
Baughman ENGINEERING | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE

E:\PROJECTS\JABR ADDITION 14-06-P052\PLAT\DRAWINGS\JABR ADDITION F.DWG-MGC



JBAR ADDITION

Offsite Drainage Areas

0 100 200 400 Feet

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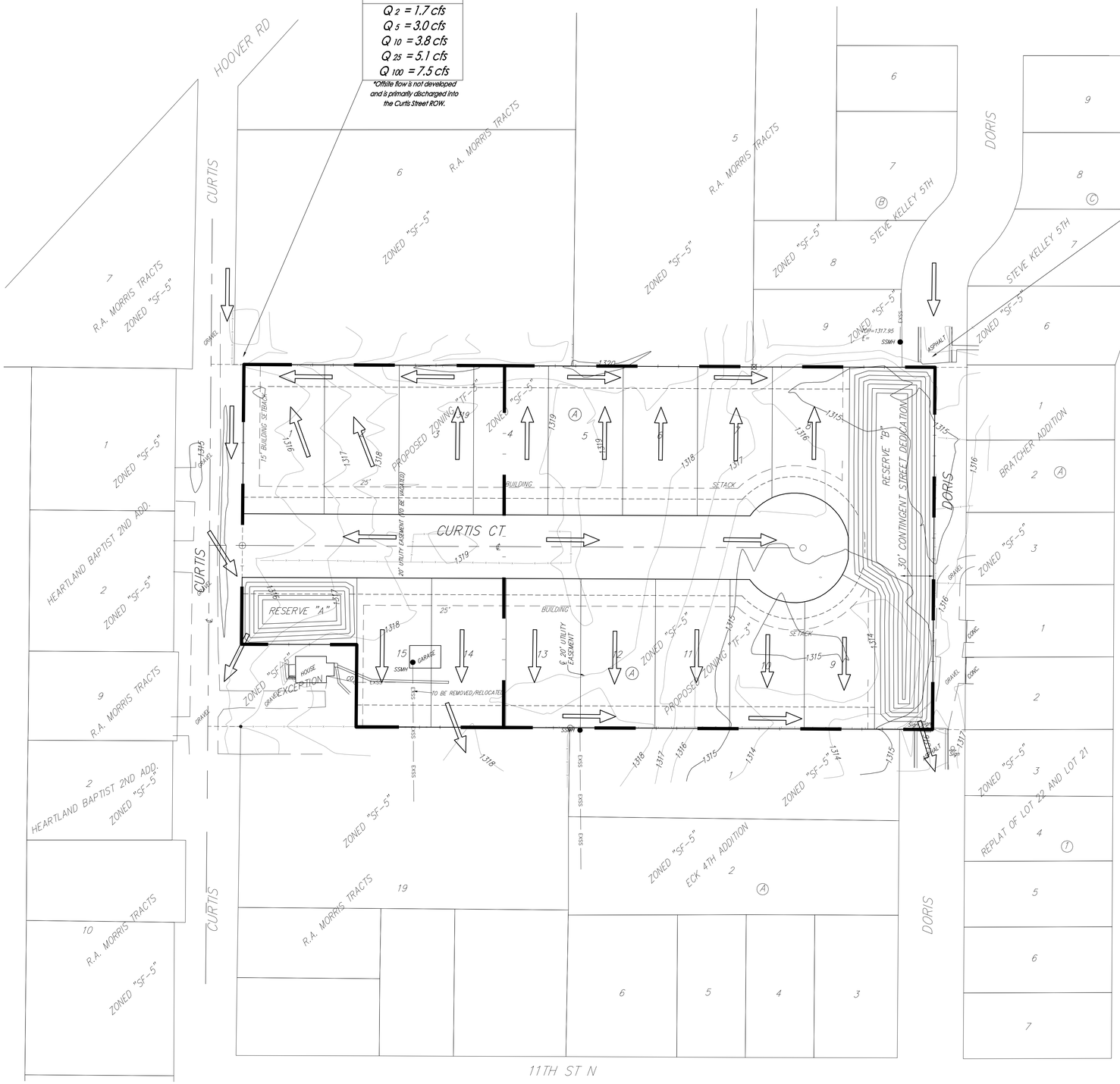
DRAINAGE PLAN

JBAR ADDITION

WICHITA, SEDGWICK COUNTY, KANSAS



Offsite from NW
Area = 1.6 acres
CN = 71*
Tc = 21 min
Q_2 = 1.7 cfs
Q_5 = 3.0 cfs
Q_{10} = 3.8 cfs
Q_{25} = 5.1 cfs
Q_{100} = 7.5 cfs

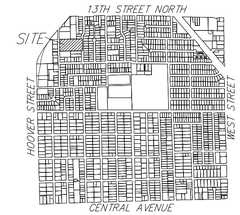
*Offsite flow is not developed and is primarily discharged into the Curtis Street ROW.

Offsite from NE
Area = 1.9 acres
CN = 90*
Tc = 20 min
Q_2 = 5.3 cfs
Q_5 = 7.3 cfs
Q_{10} = 8.7 cfs
Q_{25} = 10 cfs
Q_{100} = 14 cfs

*Developed area: this runoff flows and is concentrated in Doris Street.

0' 50' 100'

DATE OF PREPARATION: 20 OCTOBER 2014
DATE OF TOPOGRAPHY: 10 OCTOBER 2014
CONTOUR INTERVALS = 1 FOOT



VICINITY MAP
SEC. 14, T27S, R1W

● = #4 REBAR W/ "BAUGHMAN" CAP (SET)
⊠ = 1" IRON (FOUND)
○ = 1/2" IRON (FOUND)

WEST BASIN
TOTAL FLOW - OFFSITE AND ONSITE RUNOFF
Outfall - 5' Weir @1315.5
Infiltration - 8.9 in/hr

WEST INFILTRATION BASIN (Bottom = 1312.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	6.0 cfs	3.0 cfs	1315.8
10 yr	11 cfs	9.7 cfs	1316.2
100 yr	19 cfs	18 cfs	1316.5

WEST BASIN	
ELEVATION	TOTAL STORAGE (cu ft)
1312	0.0
1313	1000
1314	2800
13158	5400
1316	9000
1317	13600

WEST BASIN
FLOW - ONSITE RUNOFF ONLY
Outfall - 5' Weir @1315.5
Infiltration - 8.9 in/hr

WEST INFILTRATION BASIN (Bottom = 1312.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	5.0 cfs	0 cfs	1315.1
10 yr	7.4 cfs	3.0 cfs	1315.8
100 yr	12 cfs	9.0 cfs	1316.2

WEST BASIN	
ELEVATION	TOTAL STORAGE (cu ft)
1312	0.0
1313	1000
1314	2800
13158	5400
1316	9000
1317	13600

ONSITE ONLY FLOWS ARE FOR COMPARISON BETWEEN EXISTING AND PROPOSED SITE ONLY. DESIGN PURPOSES SHALL USE THE TOTAL BASIN CHARACTERISTICS.

EAST BASIN
TOTAL FLOW - OFFSITE AND ONSITE RUNOFF
BASIN SIZE INCLUDES DORIS ROW
Outfall - 10' Weir @1316.0
Infiltration - 8.9 in/hr

EAST INFILTRATION BASIN (Bottom = 1311.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	14 cfs	0.0 cfs	1313.3
10 yr	23 cfs	0.0 cfs	1311.4
100 yr	37 cfs	0.0 cfs	1315.8

EAST BASIN	
ELEVATION	TOTAL STORAGE (cu ft)
1311	0.0
1312	6300
1313	15200
1314	26700
1315	41000
1316	58300
1317	77500

EAST BASIN
FLOW - ONSITE RUNOFF ONLY
BASIN SIZE SMALLER ASSUMING DORIS STREET IS CONSTRUCTED
Outfall - 10' Weir @1316.0
Infiltration - 8.9 in/hr

EAST INFILTRATION BASIN (Bottom = 1311.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	9.0 cfs	0 cfs	1314.0
10 yr	15 cfs	0.0 cfs	1315.1
100 yr	23 cfs	4.0 cfs	1316.3

EAST BASIN	
ELEVATION	TOTAL STORAGE (cu ft)
1311	0.0
1312	2600
1313	6400
1314	11500
1315	19000
1316	28000
1317	39000

WEST BASIN	
EXISTING	DEVELOPED
Area = 1.6 acres	Area = 1.6 acres
C = 0.50	C = 0.61
Q_2 = 2.9 cfs	Q_2 = 3.7 cfs
Q_5 = 3.4 cfs	Q_5 = 4.5 cfs
Q_{10} = 3.9 cfs	Q_{10} = 5.1 cfs
Q_{100} = 5.5 cfs	Q_{100} = 7.2 cfs

EAST BASIN	
EXISTING	DEVELOPED
Area = 3.0 acres	Area = 3.0 acres
C = 0.50	C = 0.61
Q_2 = 5.7 cfs	Q_2 = 7.0 cfs
Q_5 = 6.8 cfs	Q_5 = 8.3 cfs
Q_{10} = 7.8 cfs	Q_{10} = 9.6 cfs
Q_{100} = 11 cfs	Q_{100} = 13 cfs

EAST BASIN
TOTAL FLOW - OFFSITE AND ONSITE RUNOFF
BASIN SIZE SMALLER ASSUMING DORIS STREET IS CONSTRUCTED
Outfall - 10' Weir @1316.0
Infiltration - 8.9 in/hr

EAST INFILTRATION BASIN (Bottom = 1311.0)			
STAGE	INFLOW	OUTFLOW	ELEVATION
2 yr	14 cfs	0 cfs	1315.1
10 yr	23 cfs	4.6 cfs	1316.3
100 yr	37 cfs	24 cfs	1317.0

EAST BASIN	
ELEVATION	TOTAL STORAGE (cu ft)
1311	0.0
1312	2600
1313	6400
1314	11500
1315	19000
1316	28000
1317	39000

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group A	B	C	D	Land Use	Hydrologic Soil Group A	B	C	D
Undisturbed	0.02	**0.03**	0.04	0.05	Undisturbed	55	**71**	80	84
Turf or Disturbed Soils	0.15	**0.20**	0.22	0.25	Turf or Disturbed Soils	71	**80**	84	88
Impervious Cover	0.95	**0.95**	0.95	0.95	Impervious Cover	98	**98**	98	98

Basin #	Undist. ft^2	Dist. ft^2	Red. Imp. ft^2	New Imp. ft^2	Total Area ft^2	U %	D %	Redev. I %	I %	R_v %	WQ_v ft^3 eq. 4-25*
	Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*)										
Total JBAR Site	*0*	*0*	*69,700*	*130,680*	200,380	0.000	0.000	0.099	0.620	**0.6196**	**12,415**

*Total JBAR site assumes a 65% impervious cover rate after final development.

Pond Volume Below Static Pool						
	At Outfall Elev		Bottom Area		Depth	Volume
Basin	Sq.Ft.	Acre	Sq. Ft.	Acre	Feet	Acre-Ft.
East Basin	18900	0.4	5200	0.1	6	1.7
West Basin	5200	0.1	1400	0.0	5	0.4
Totals:		0.6		0.0		2.0

Pond Volume > WQv		
Pond	WQv	Check
2.0	0.3	Yes

Basin volumes are the volumes of storage under the outfall elevation. This volume will be infiltrated through bottom and sides of the basin. The basins are both sized to infiltrate the water quality storm, channel protection volume, and the lower peak s

NOTES: Reserves A and B will feature infiltration basins for detention and water quality treatment. Emergency overflows will be at existing outflow locations located at the southwest and southeast corners of the property.

Since this is an infill area with very little grade change, some onsite developed runoff (rear yards) will leave the site undetained and untreated.

DRAINAGE PLAN
JBAR ADDITION

9 December 2014

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315 Ellis St. Wichita, KS 67211 P 316-262-7271 F 316-262-0149
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JBAR ADDITION

FEMA Exhibit

0 50 100 200 Feet

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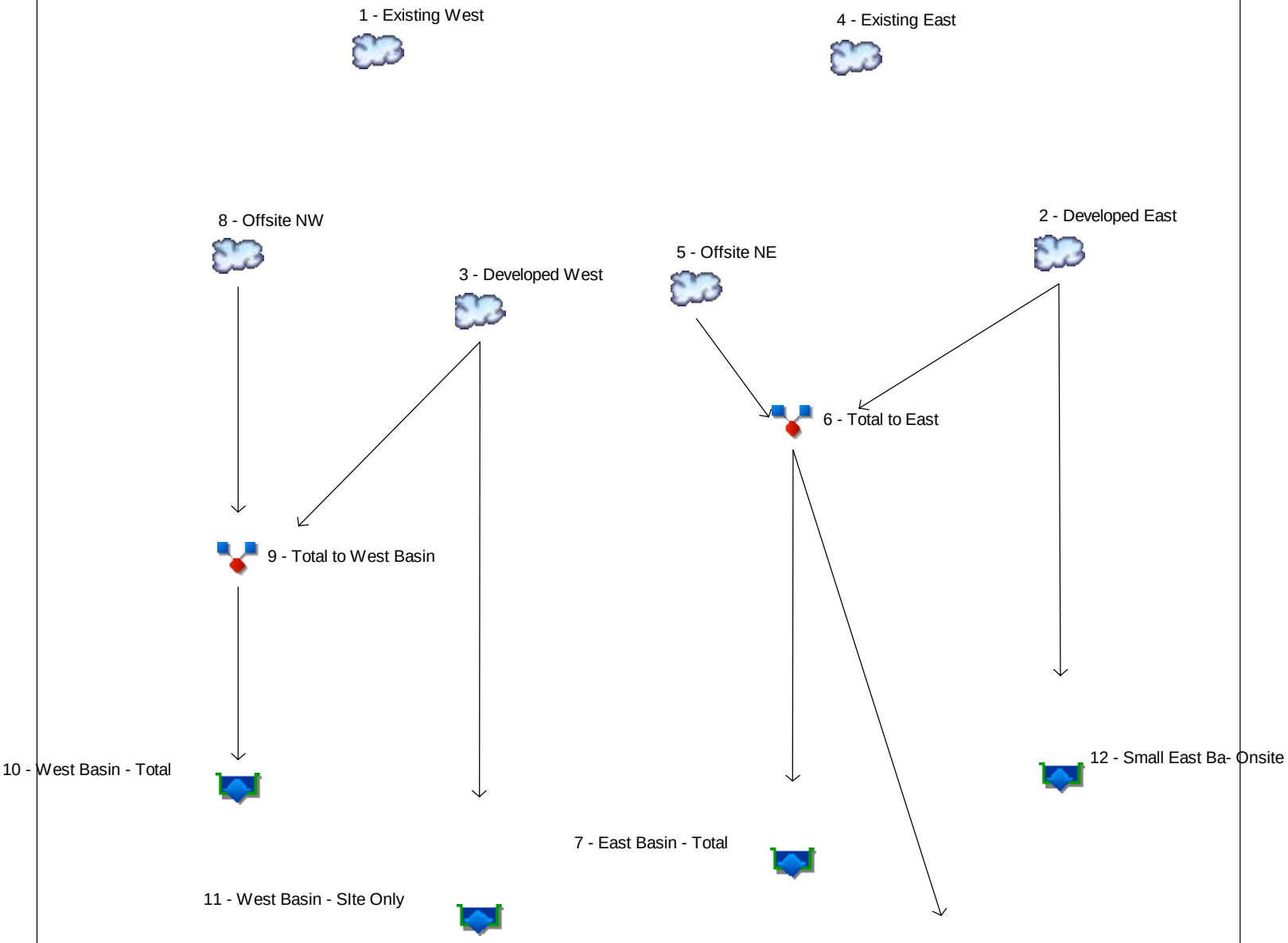
APPENDIX A: Hydraflow Hydrographs

APPENDIX B: Water Quality Worksheet

Hydraflow Hydrographs

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	SCS Runoff	Existing West
2	SCS Runoff	Developed East
3	SCS Runoff	Developed West
4	SCS Runoff	Existing East
5	SCS Runoff	Offsite NE
6	Combine	Total to East
7	Reservoir	East Basin - Total
8	SCS Runoff	Offsite NW
9	Combine	Total to West Basin
10	Reservoir	West Basin - Total
11	Reservoir	West Basin - SIte Only
12	Reservoir	Small East Ba- Onsite
13	Reservoir	Small East Ba - Total

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	1.165	2.037	0.006	3.454	4.542	6.007	7.352	8.898	Existing West
2	SCS Runoff	------	6.773	9.110	1.693	12.45	14.79	17.77	20.41	23.36	Developed East
3	SCS Runoff	------	3.386	4.555	0.847	6.227	7.393	8.885	10.20	11.68	Developed West
4	SCS Runoff	------	2.185	3.820	0.011	6.476	8.517	11.26	13.79	16.68	Existing East
5	SCS Runoff	------	3.956	5.330	0.981	7.298	8.671	10.43	11.98	13.72	Offsite NE
6	Combine	2, 5	10.60	14.29	2.669	19.57	23.26	27.97	32.14	36.81	Total to East
7	Reservoir	6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	East Basin - Total
8	SCS Runoff	------	0.950	1.696	0.006	2.905	3.820	5.067	6.218	7.543	Offsite NW
9	Combine	3, 8	4.144	5.989	0.847	8.776	10.80	13.45	15.84	18.55	Total to West Basin
10	Reservoir	9	0.000	0.931	0.000	5.248	7.851	11.07	13.65	16.54	West Basin - Total
11	Reservoir	3	0.000	0.000	0.000	0.992	2.970	5.330	7.151	9.008	West Basin - SIte Only
12	Reservoir	2	0.000	0.000	0.000	0.000	0.000	0.000	0.434	4.006	Small East Ba- Onsite
13	Reservoir	6	0.000	0.000	0.000	0.253	4.603	11.52	17.58	24.24	Small East Ba - Total

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

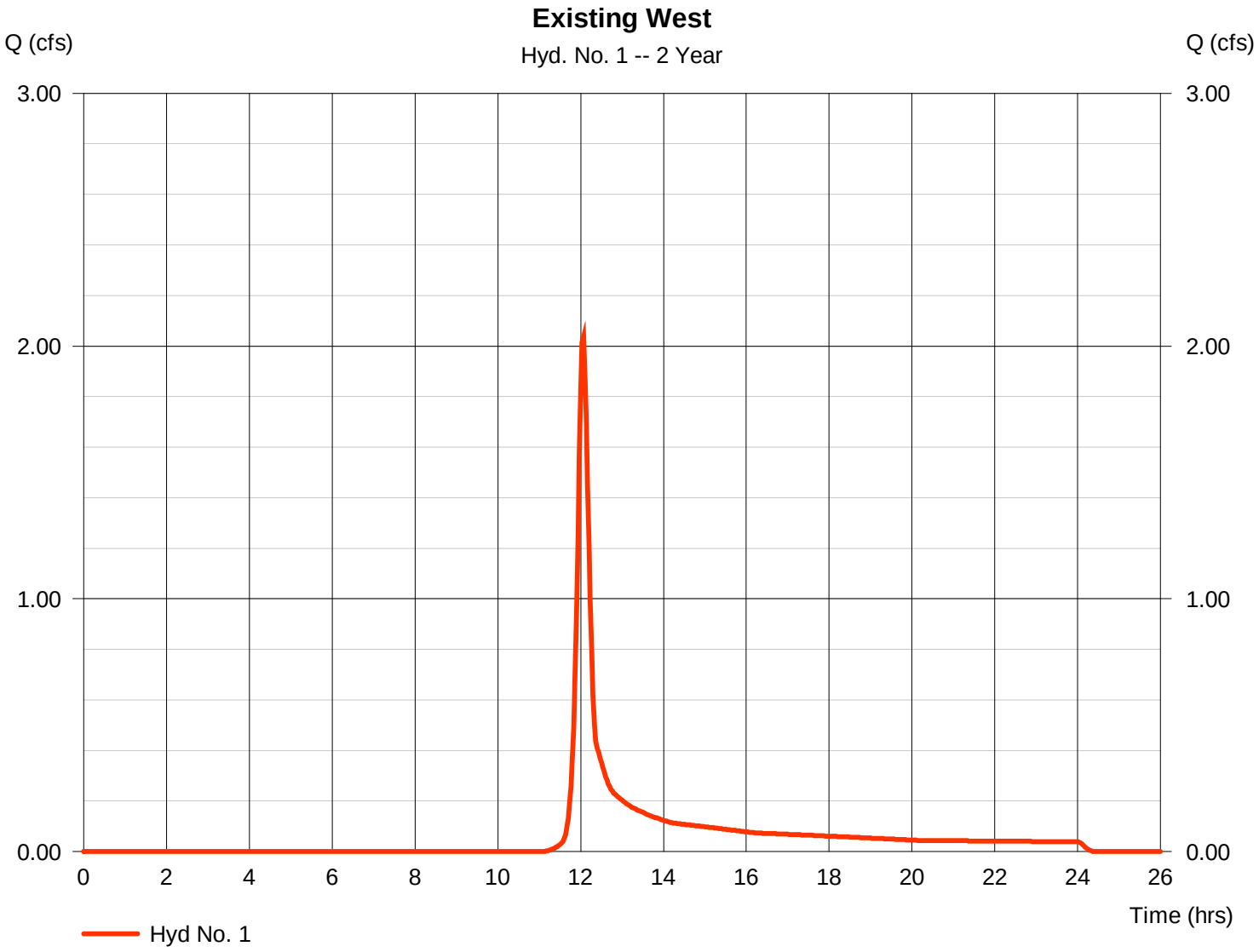
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	2.037	2	724	6,024	------	------	------	Existing West
2	SCS Runoff	9.110	2	722	25,992	------	------	------	Developed East
3	SCS Runoff	4.555	2	722	12,996	------	------	------	Developed West
4	SCS Runoff	3.820	2	724	11,295	------	------	------	Existing East
5	SCS Runoff	5.330	2	724	16,884	------	------	------	Offsite NE
6	Combine	14.29	2	722	42,875	2, 5	------	------	Total to East
7	Reservoir	0.000	2	970	0	6	1313.29	18,559	East Basin - Total
8	SCS Runoff	1.696	2	728	6,289	------	------	------	Offsite NW
9	Combine	5.989	2	724	19,284	3, 8	------	------	Total to West Basin
10	Reservoir	0.931	2	742	1,106	9	1315.64	7,683	West Basin - Total
11	Reservoir	0.000	2	720	0	3	1315.09	5,719	West Basin - SIte Only
12	Reservoir	0.000	2	722	0	2	1314.00	11,546	Small East Ba- Onsite
13	Reservoir	0.000	2	742	0	6	1315.13	19,870	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.037 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	6,024 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

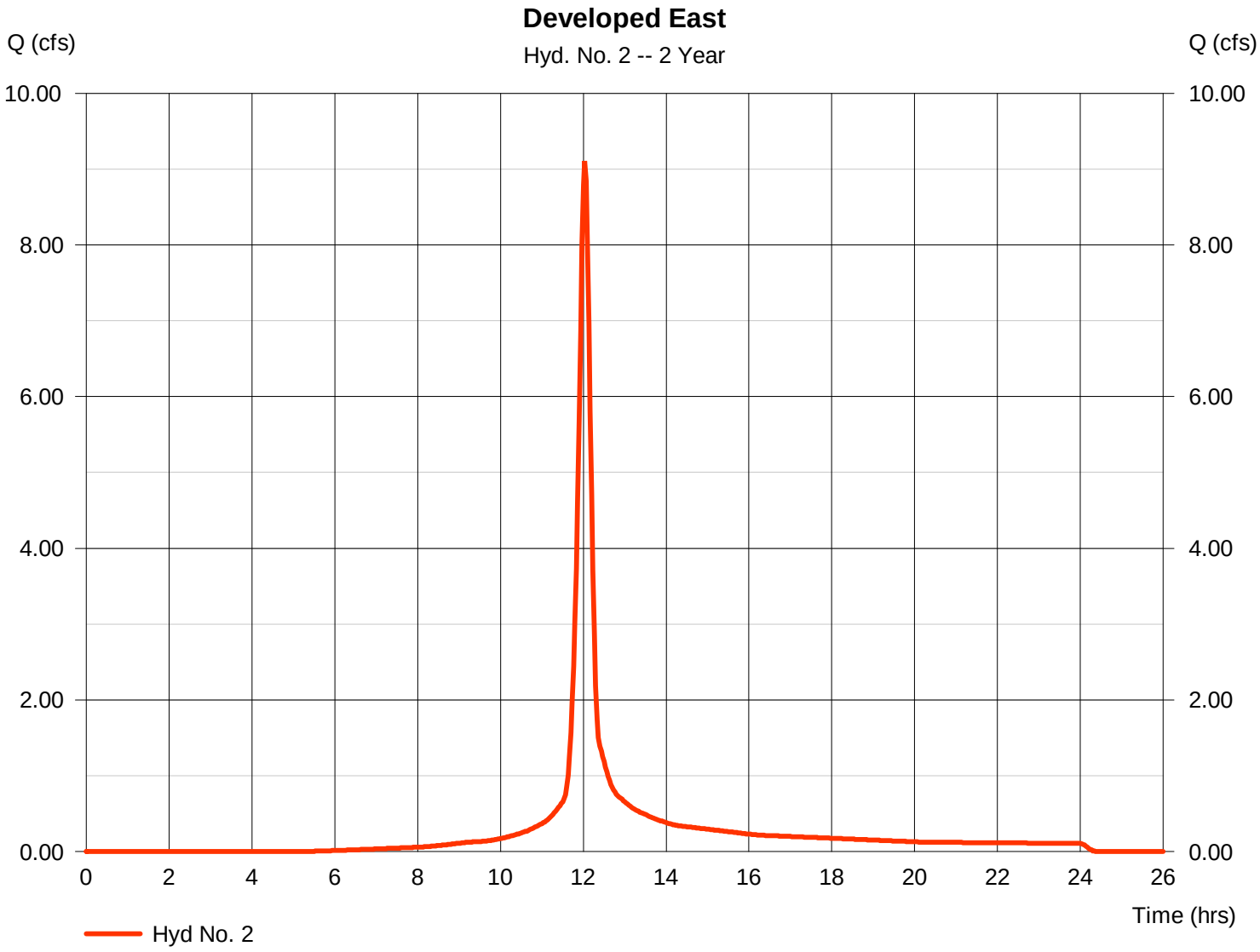


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	= SCS Runoff	Peak discharge	= 9.110 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 25,992 cuft
Drainage area	= 3.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 3.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

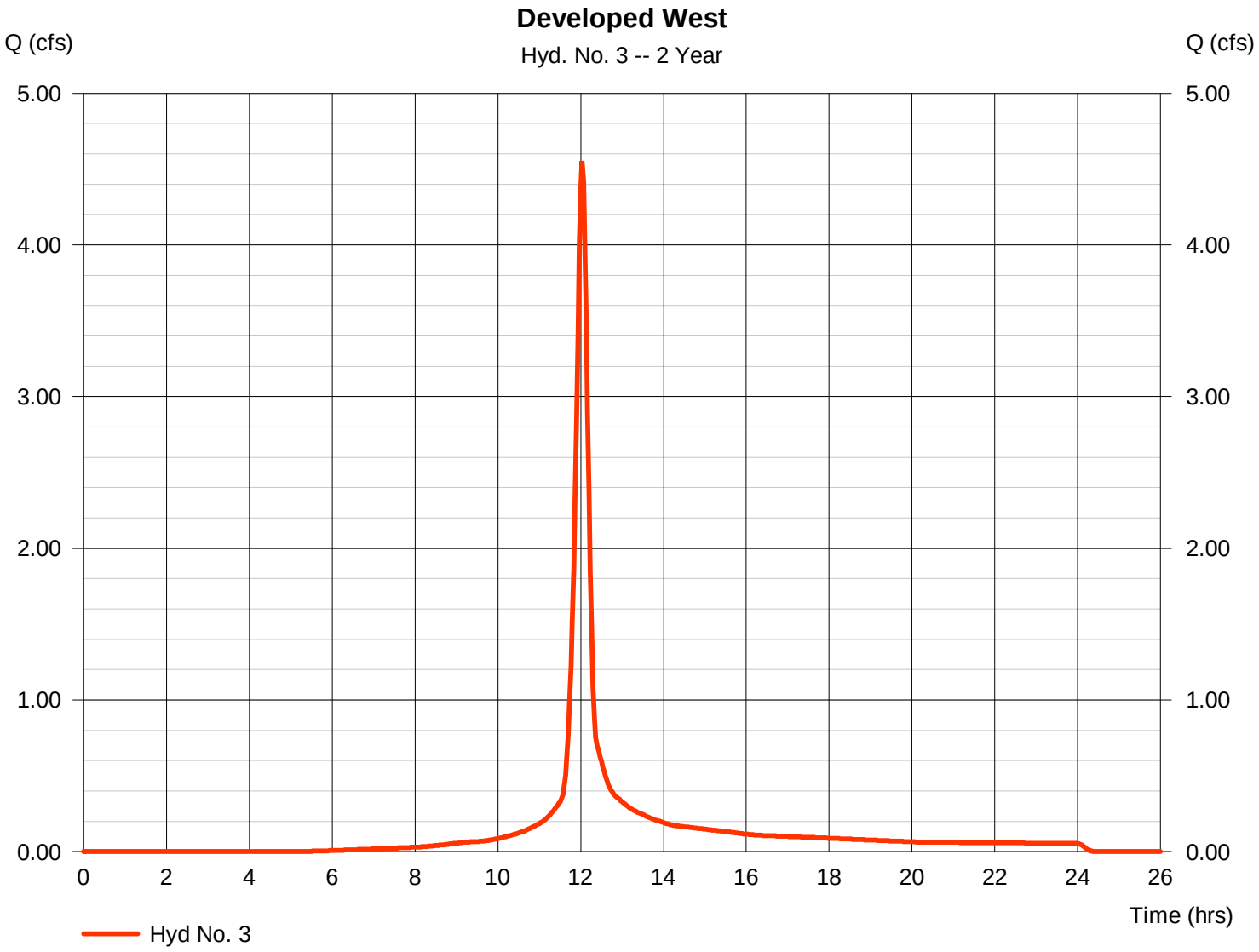


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.555 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	12,996 cuft
Drainage area	=	1.500 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

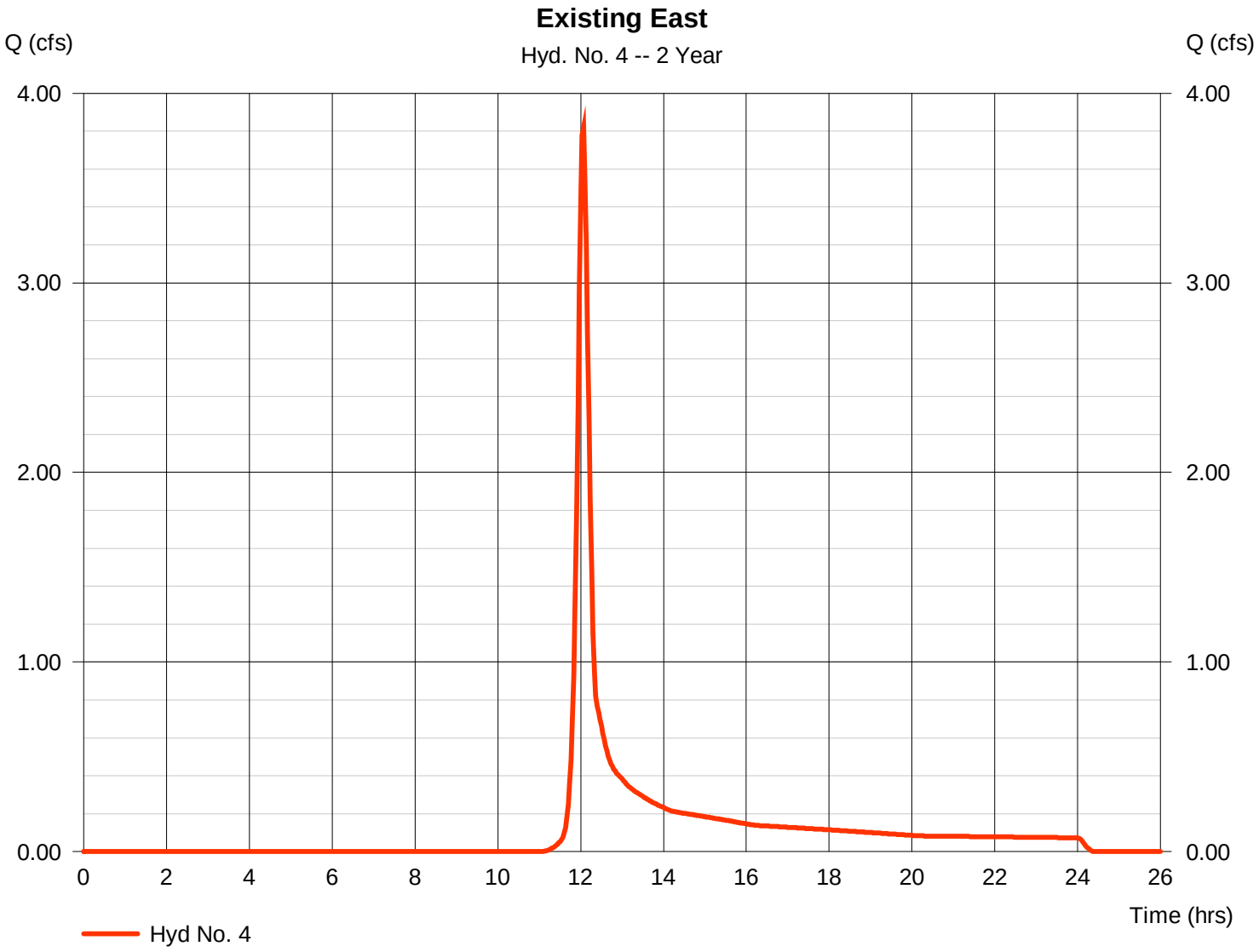


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.820 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	11,295 cuft
Drainage area	=	3.000 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

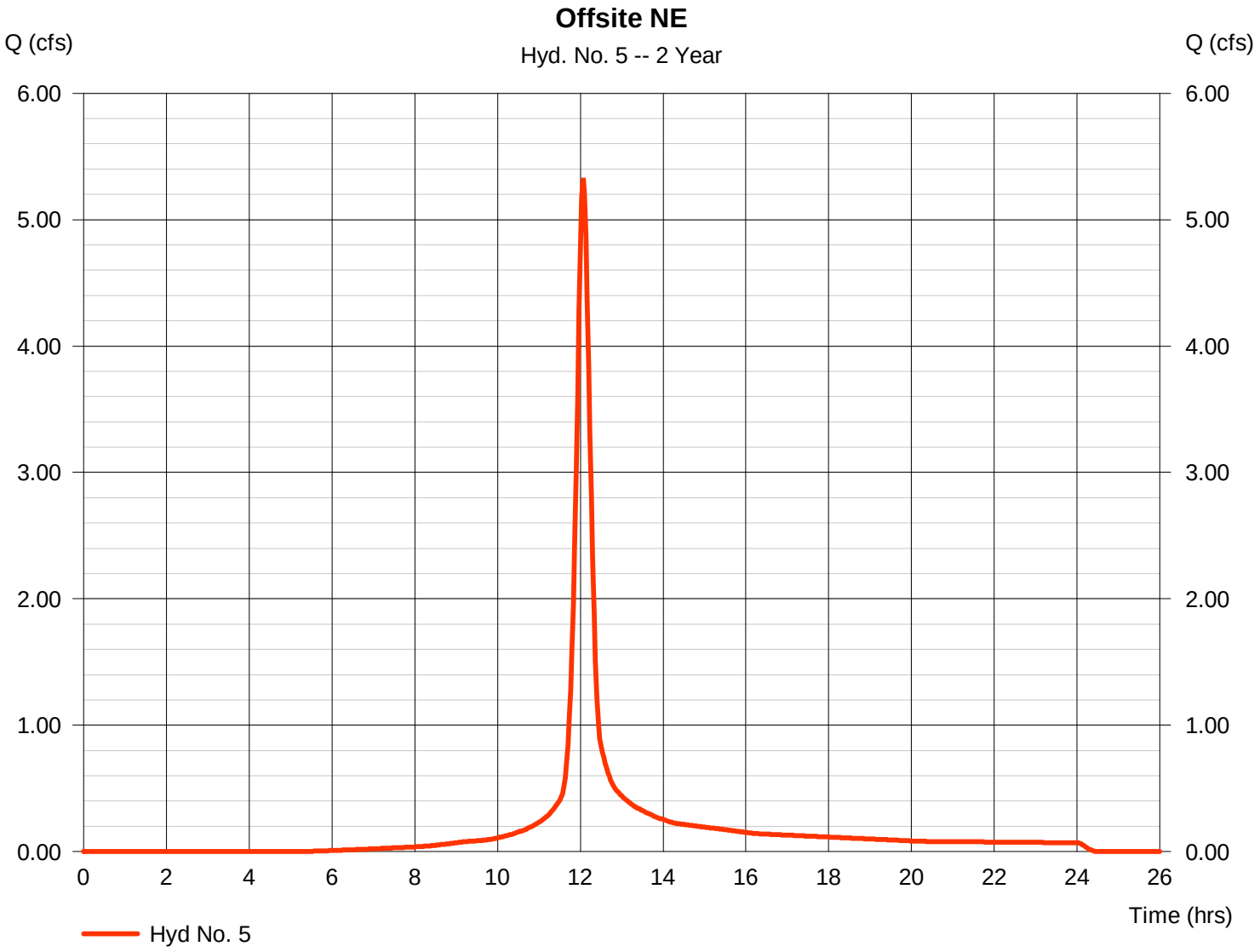


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.330 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	16,884 cuft
Drainage area	=	1.900 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

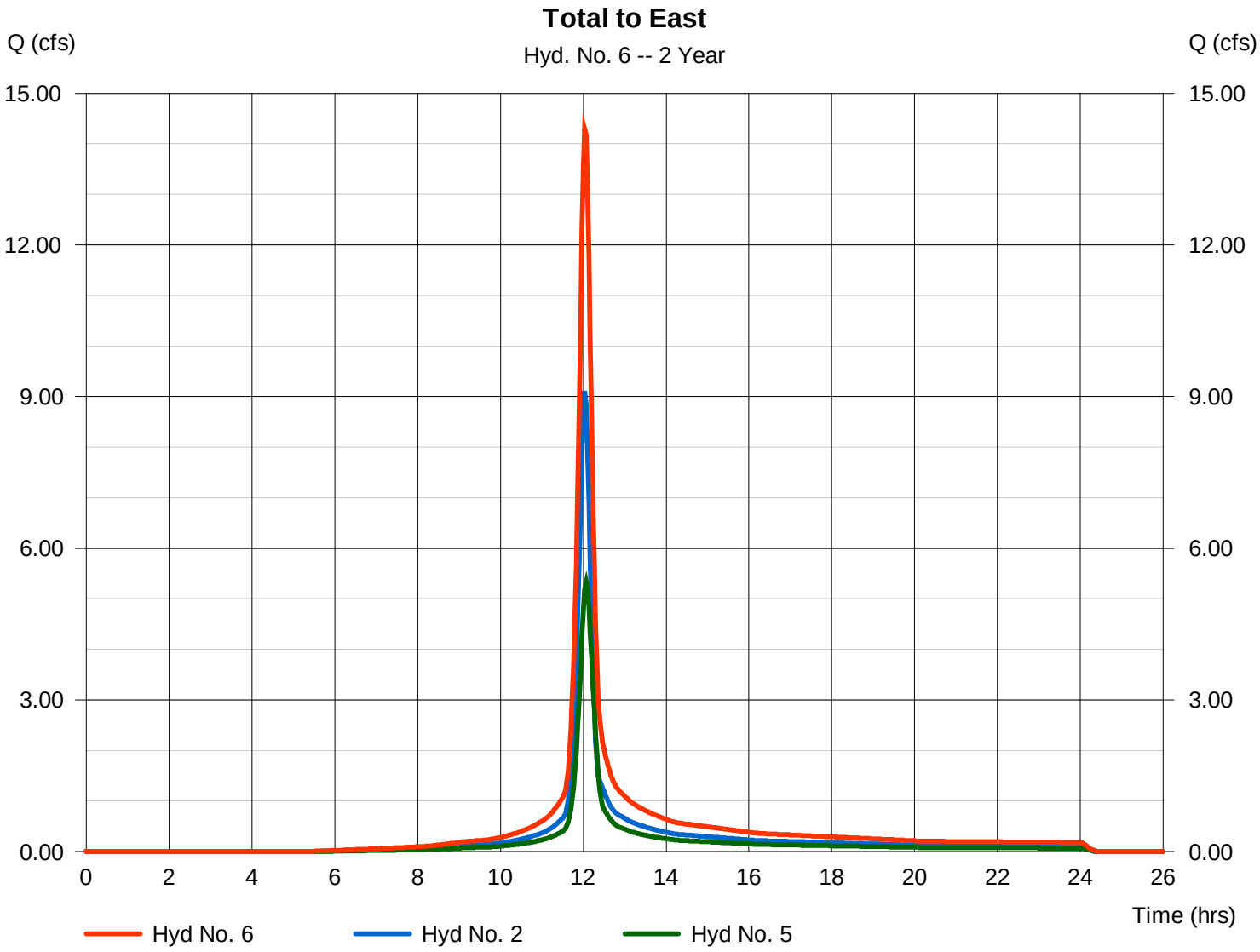


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 14.29 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 42,875 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



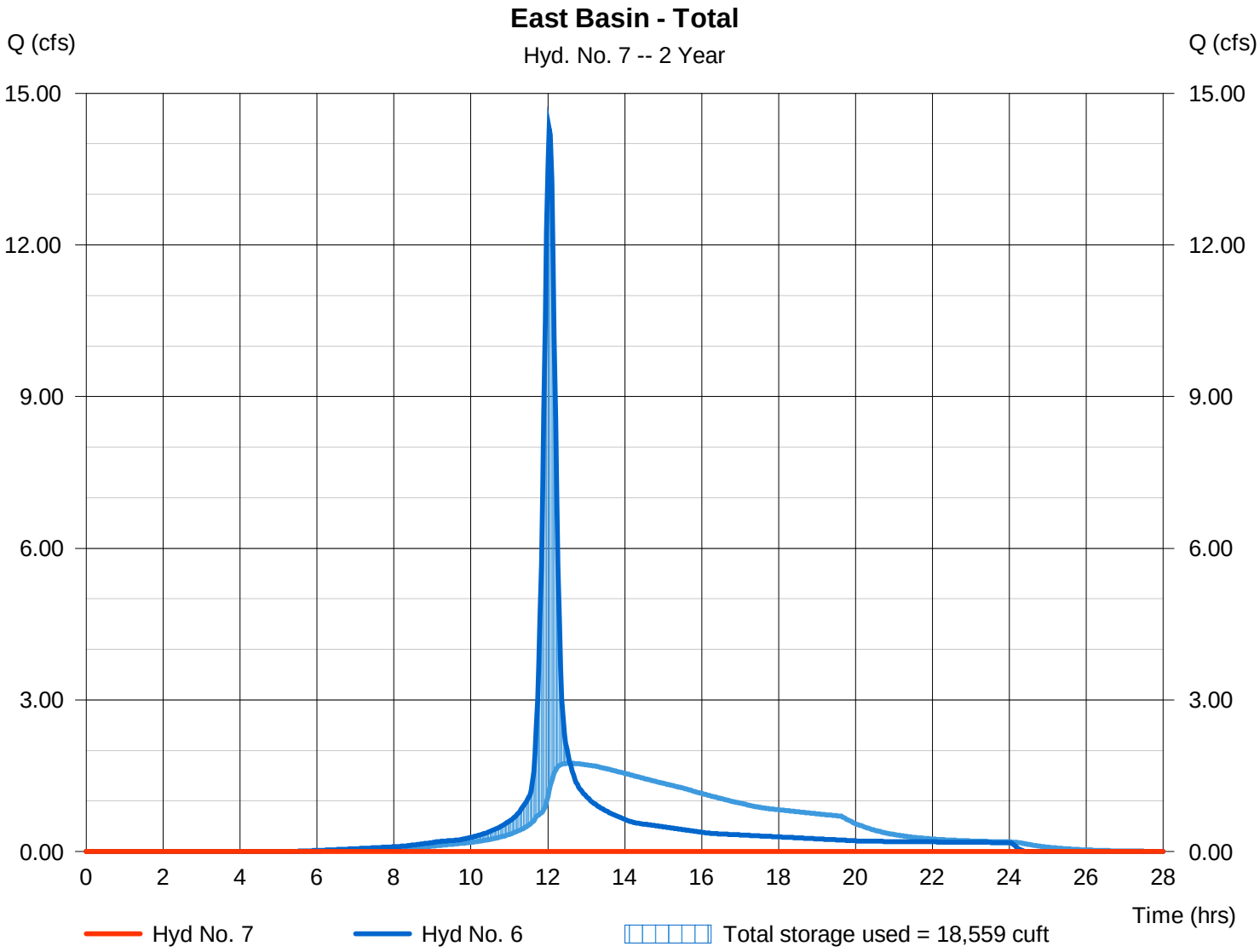
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 16.17 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1313.29 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 18,559 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 1 - Detention - Infiltration

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1311.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1311.00	5,100	0	0
1.00	1312.00	7,600	6,308	6,308
2.00	1313.00	10,200	8,867	15,175
3.00	1314.00	13,000	11,571	26,746
4.00	1315.00	15,700	14,327	41,073
5.00	1316.00	18,700	17,176	58,250
6.00	1317.00	20,000	19,344	77,594

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

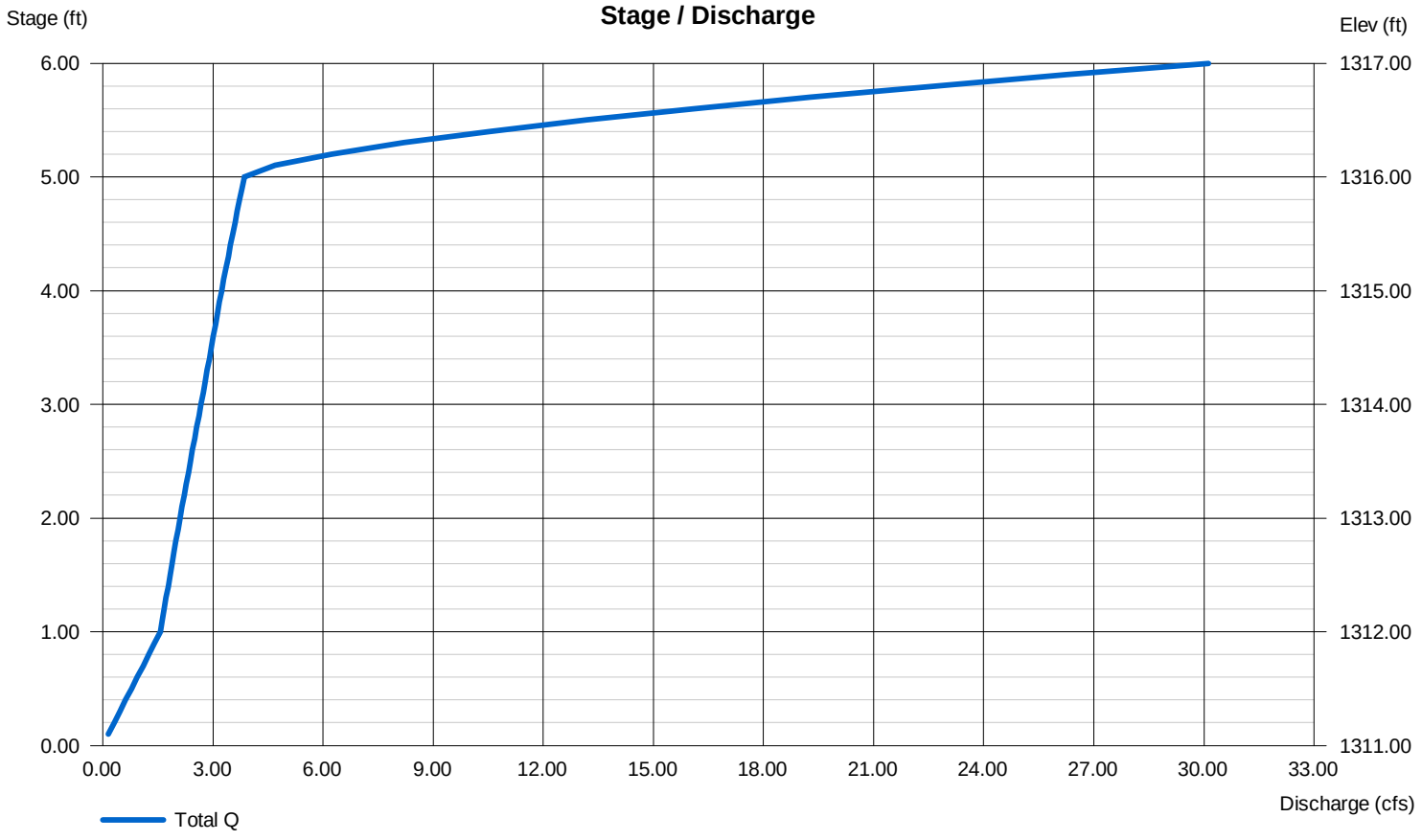
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 1316.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.900 (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).

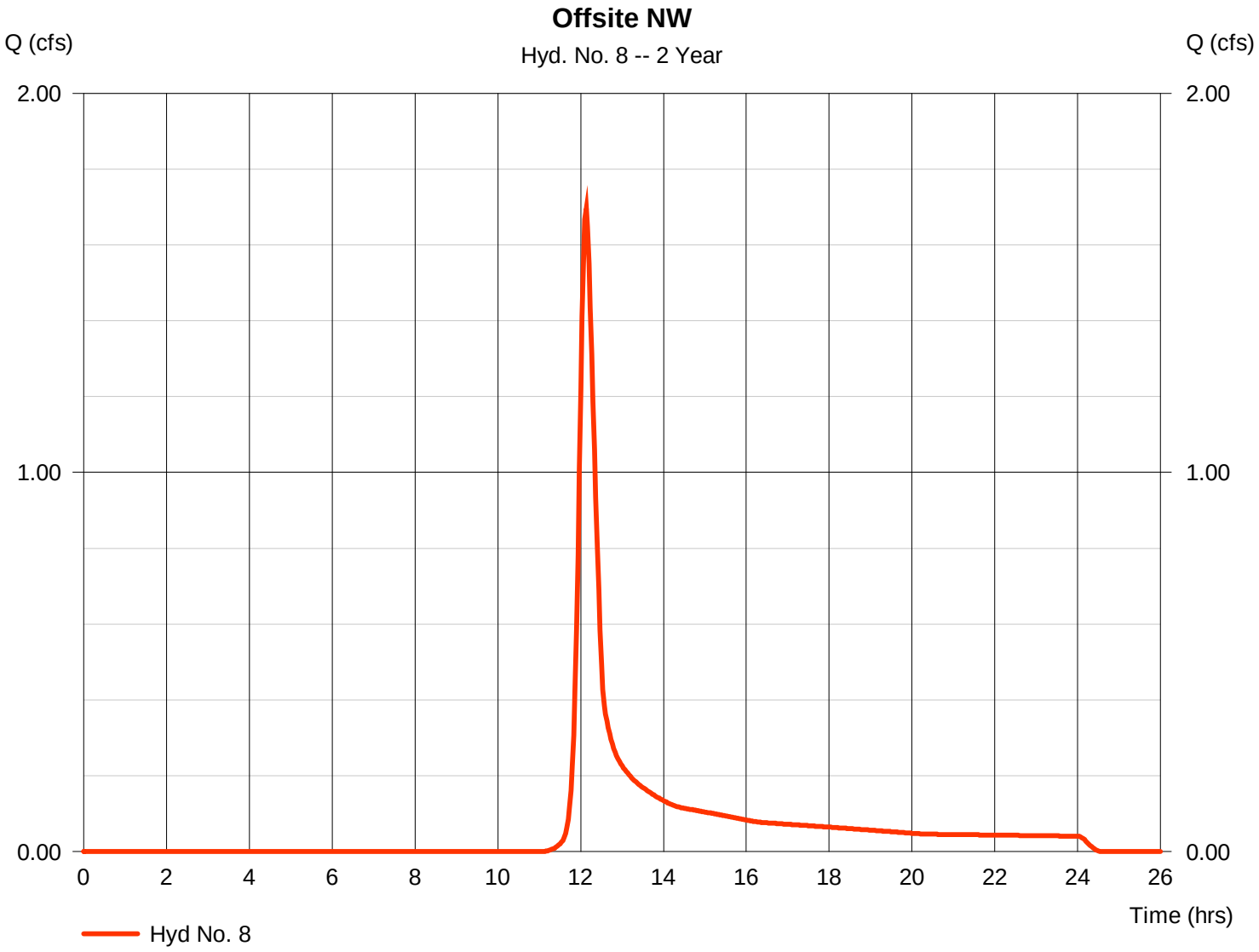


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.696 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	6,289 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	3.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

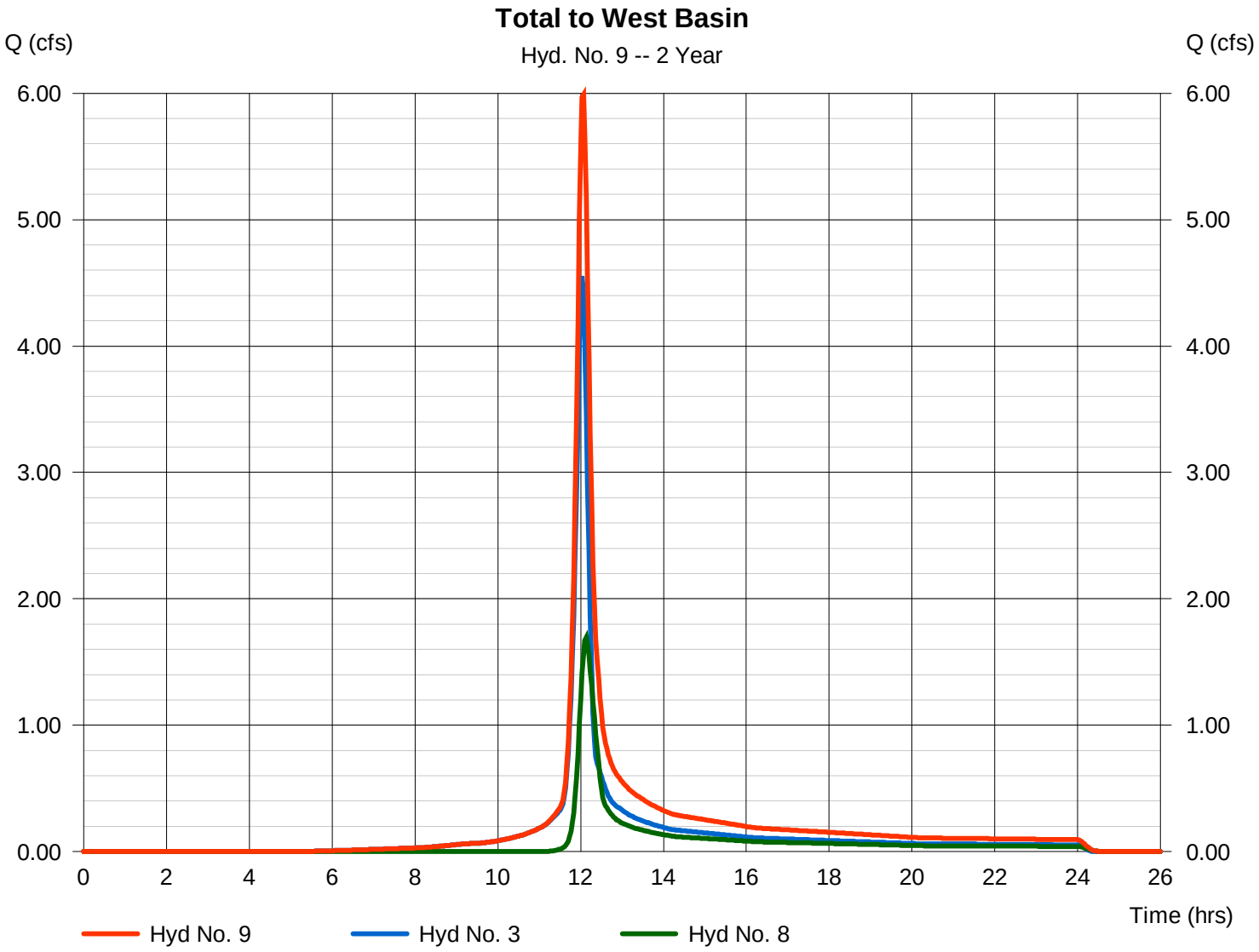


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	= Combine	Peak discharge	= 5.989 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 19,284 cuft
Inflow hyds.	= 3, 8	Contrib. drain. area	= 3.100 ac



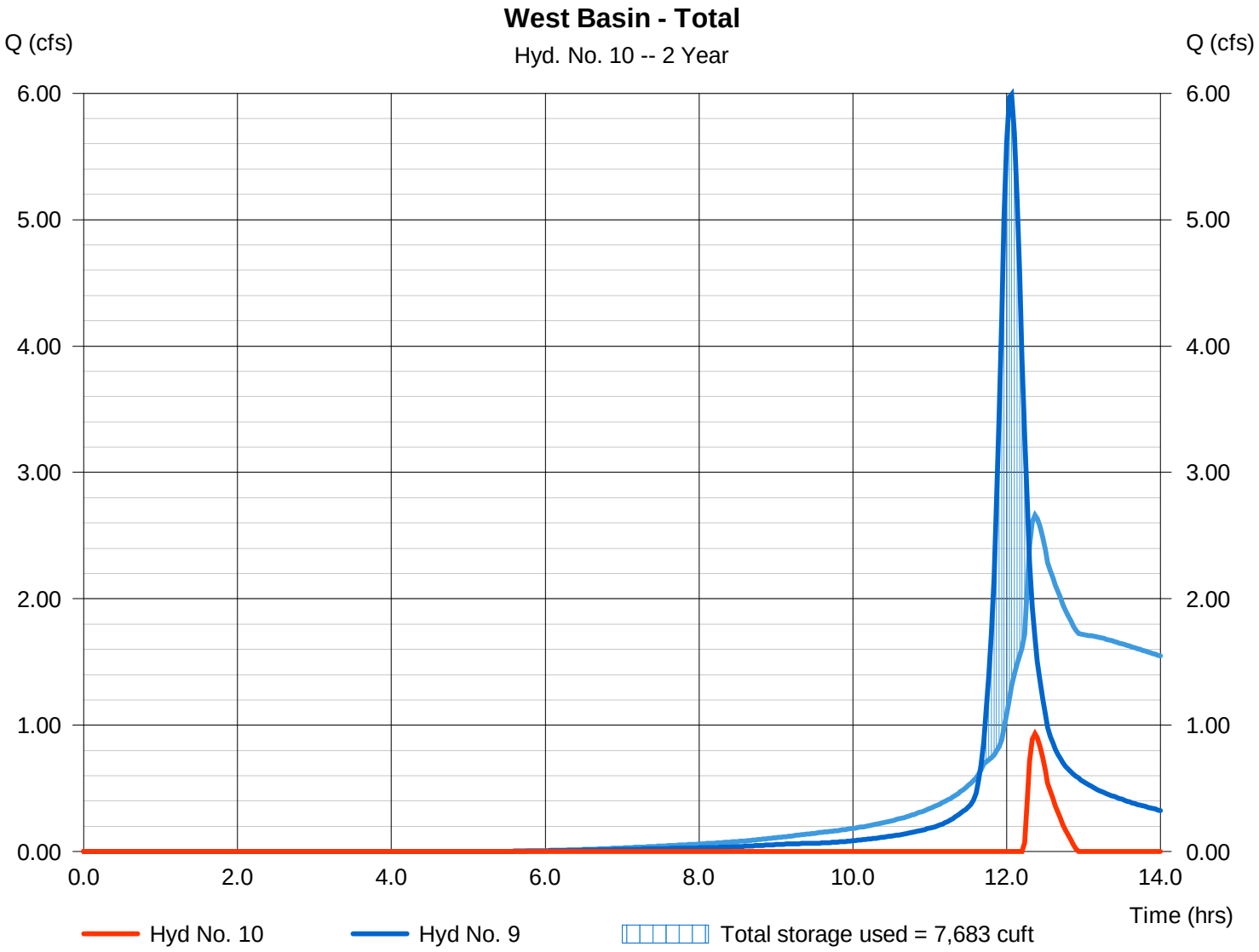
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.931 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 1,106 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1315.64 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 7,683 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 2 - West Infiltration Basin

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1312.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1312.00	750	0	0
1.00	1313.00	1,400	1,058	1,058
2.00	1314.00	2,100	1,738	2,796
3.00	1315.00	3,100	2,584	5,380
4.00	1316.00	4,100	3,588	8,968
5.00	1317.00	5,200	4,639	13,606

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

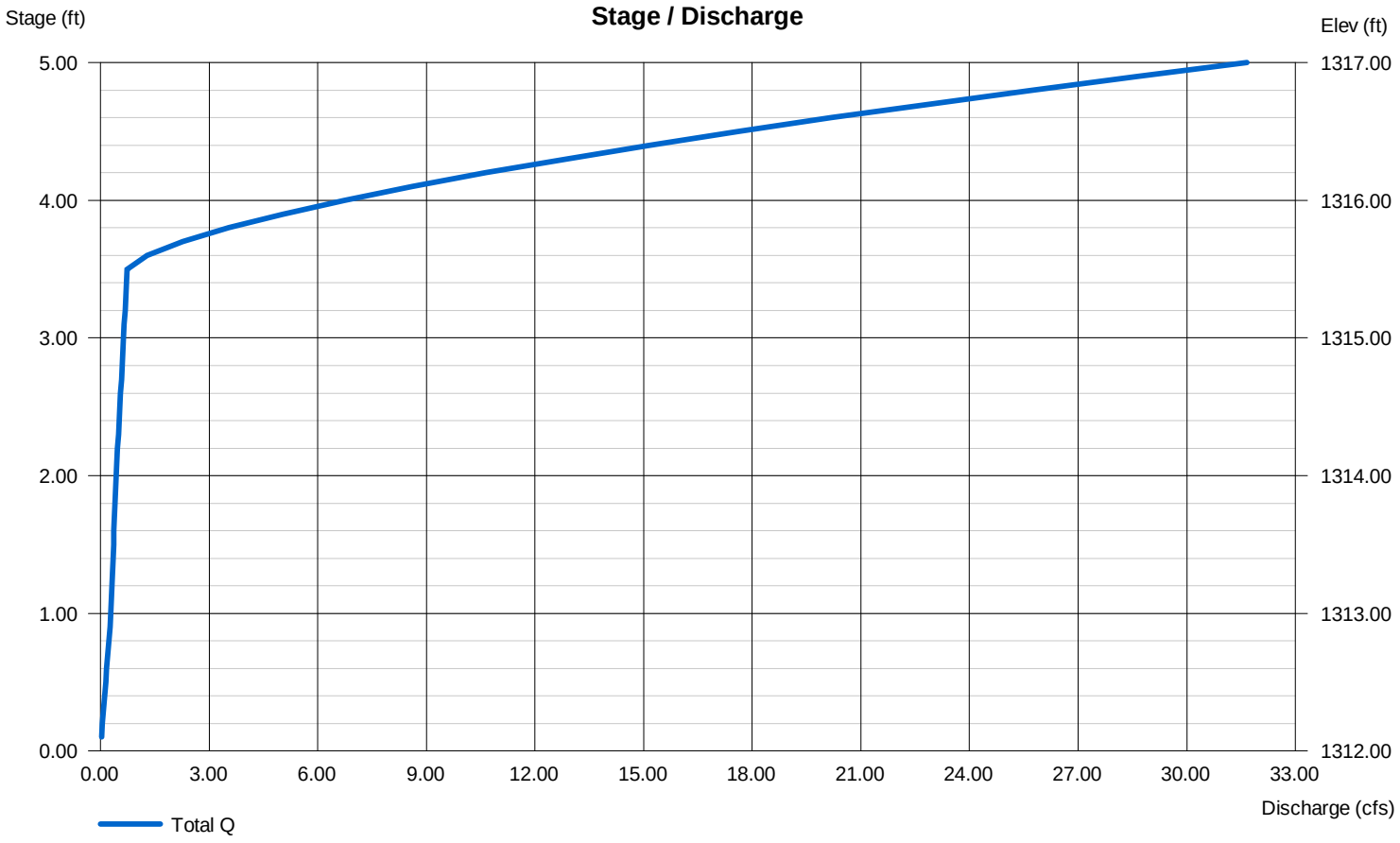
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 1315.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.900 (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).



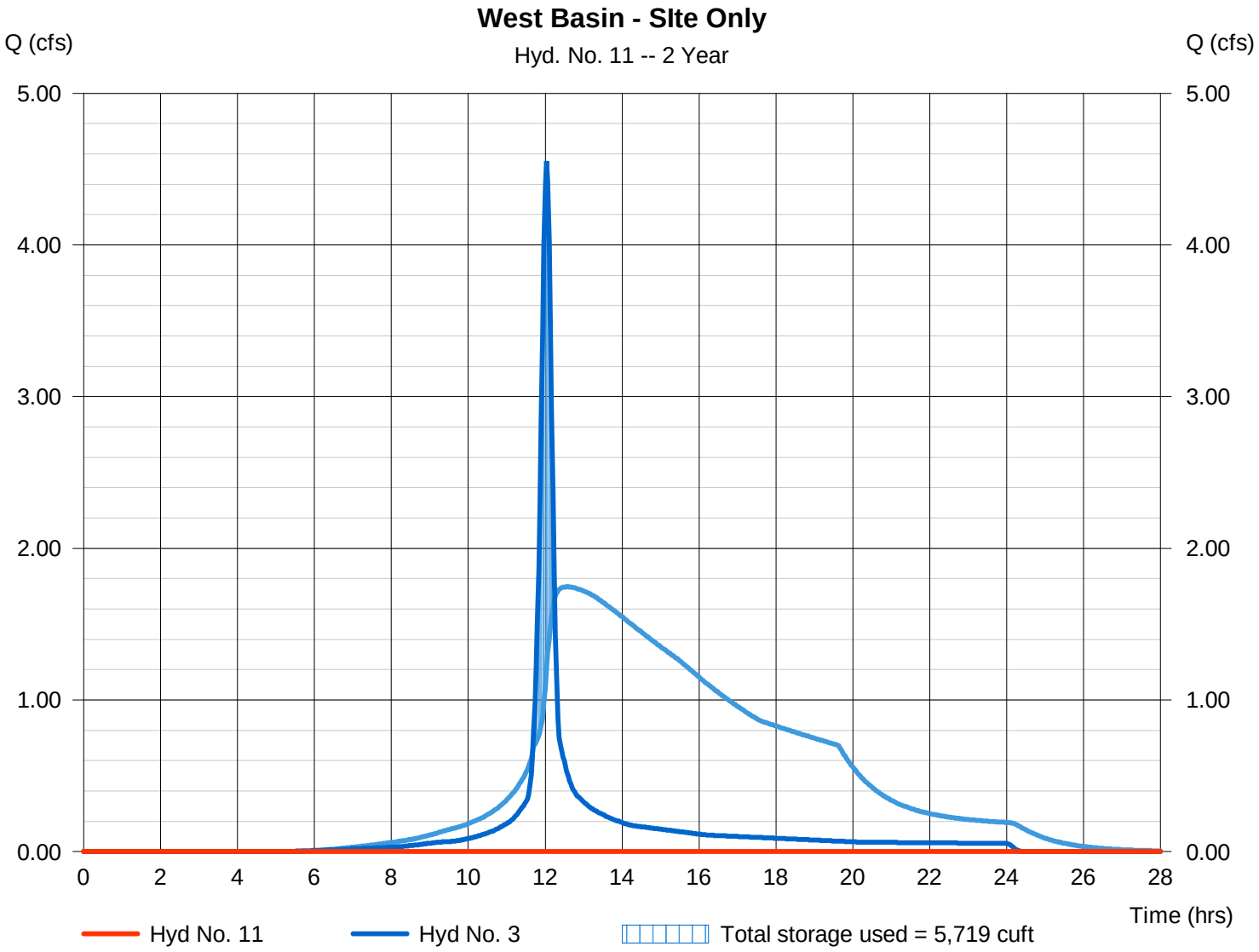
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1315.09 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 5,719 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 2 - West Infiltration Basin

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1312.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1312.00	750	0	0
1.00	1313.00	1,400	1,058	1,058
2.00	1314.00	2,100	1,738	2,796
3.00	1315.00	3,100	2,584	5,380
4.00	1316.00	4,100	3,588	8,968
5.00	1317.00	5,200	4,639	13,606

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

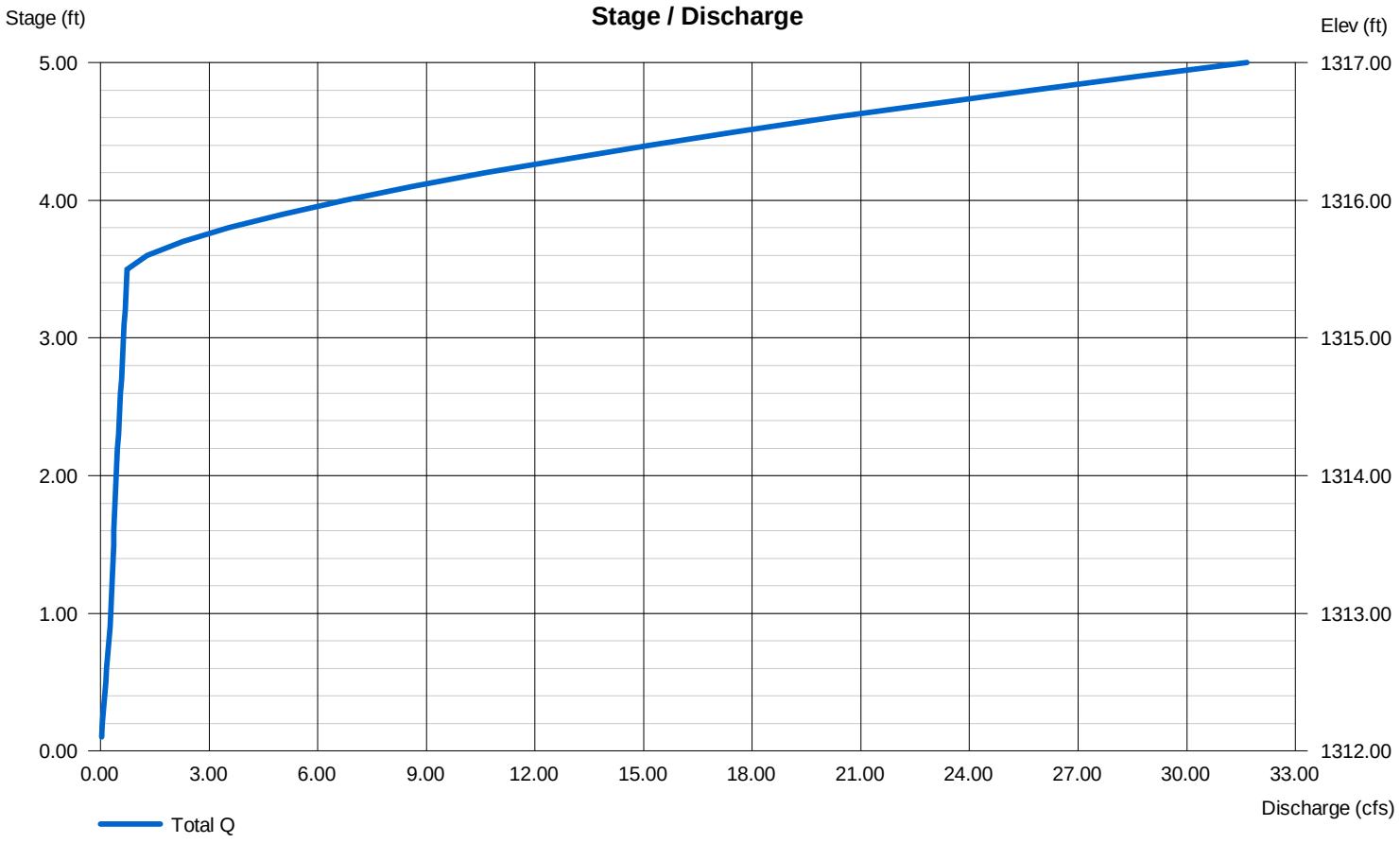
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 1315.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.900 (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).



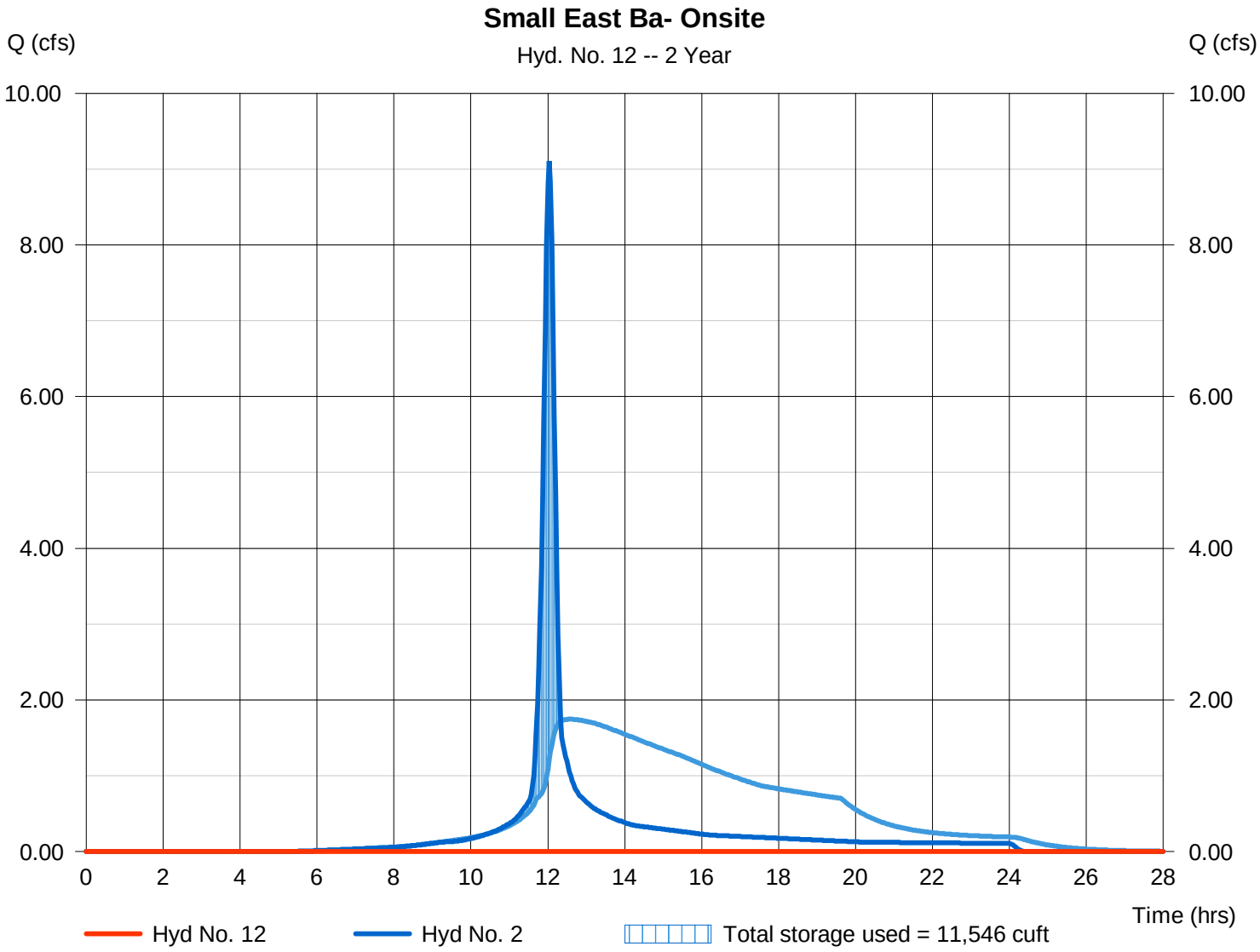
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Developed East	Max. Elevation	= 1314.00 ft
Reservoir name	= East Basin out of ROW	Max. Storage	= 11,546 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 3 - East Basin out of ROW

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1311.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1311.00	1,930	0	0
1.00	1312.00	3,400	2,630	2,630
2.00	1313.00	4,200	3,793	6,423
3.00	1314.00	6,100	5,120	11,543
4.00	1315.00	8,200	7,123	18,666
5.00	1316.00	10,300	9,229	27,895
6.00	1317.00	12,000	11,138	39,034

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

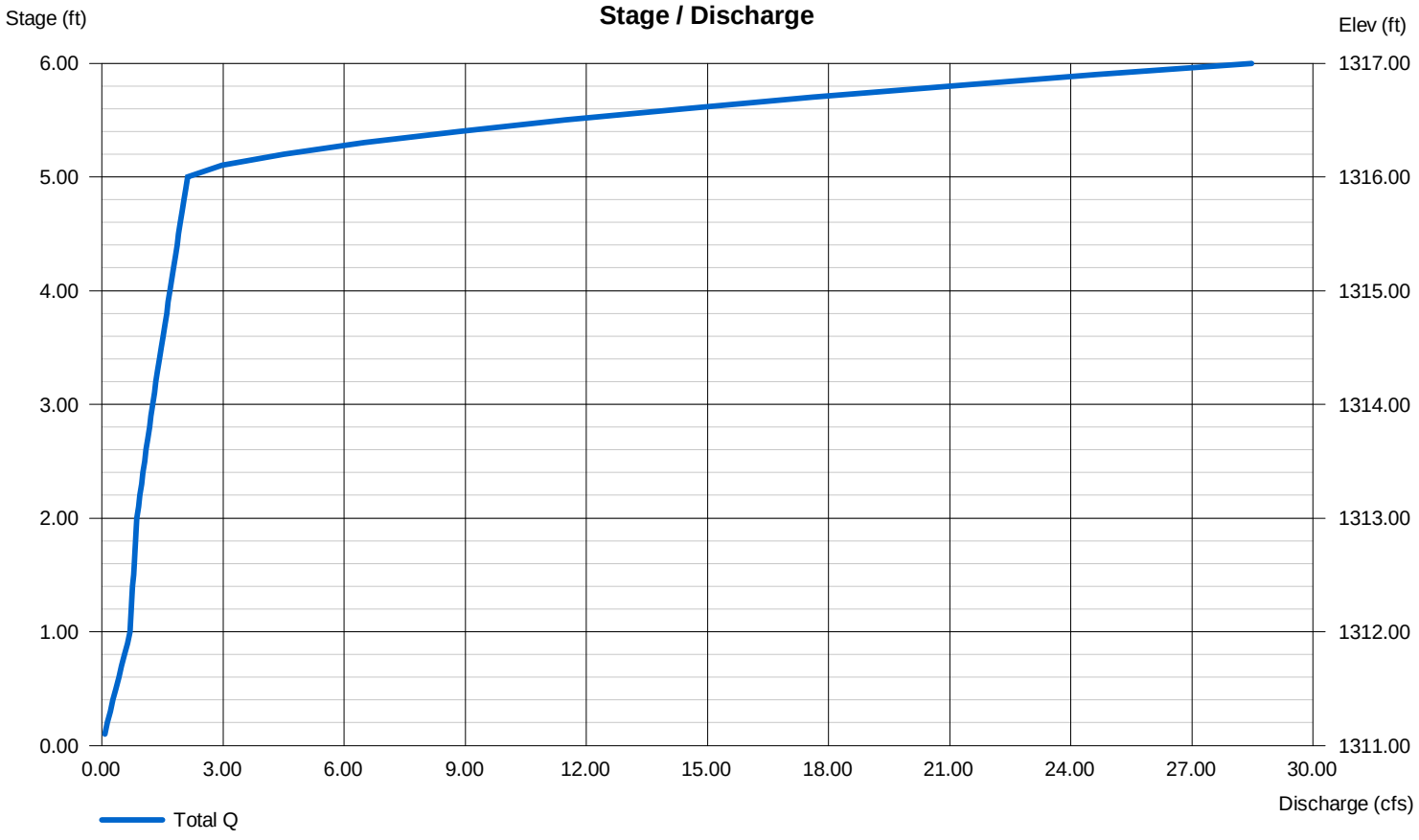
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 1316.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.900 (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).



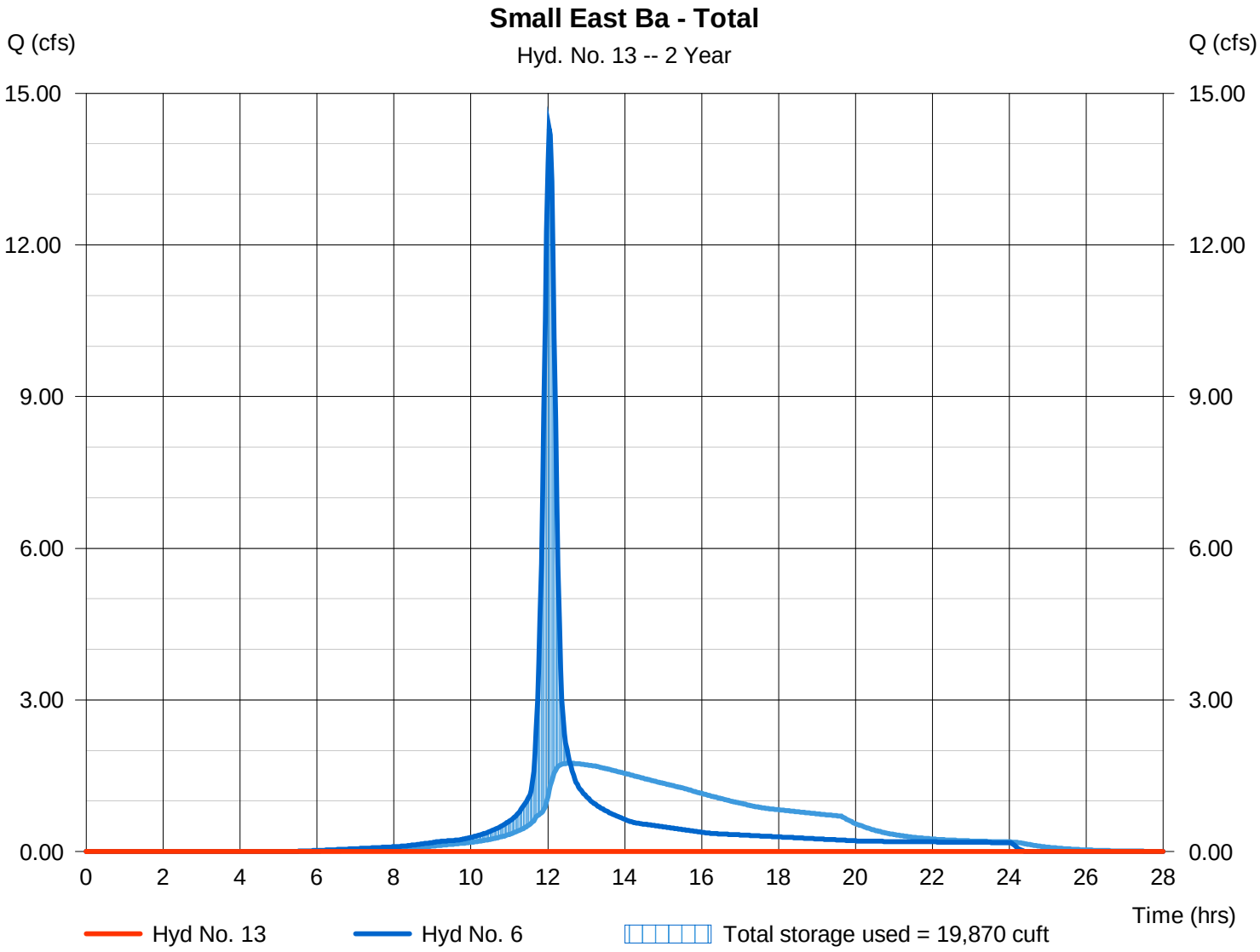
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	12.37 hrs
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1315.13 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	19,870 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Pond Report

Pond No. 3 - East Basin out of ROW

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1311.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1311.00	1,930	0	0
1.00	1312.00	3,400	2,630	2,630
2.00	1313.00	4,200	3,793	6,423
3.00	1314.00	6,100	5,120	11,543
4.00	1315.00	8,200	7,123	18,666
5.00	1316.00	10,300	9,229	27,895
6.00	1317.00	12,000	11,138	39,034

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	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	No	No	No

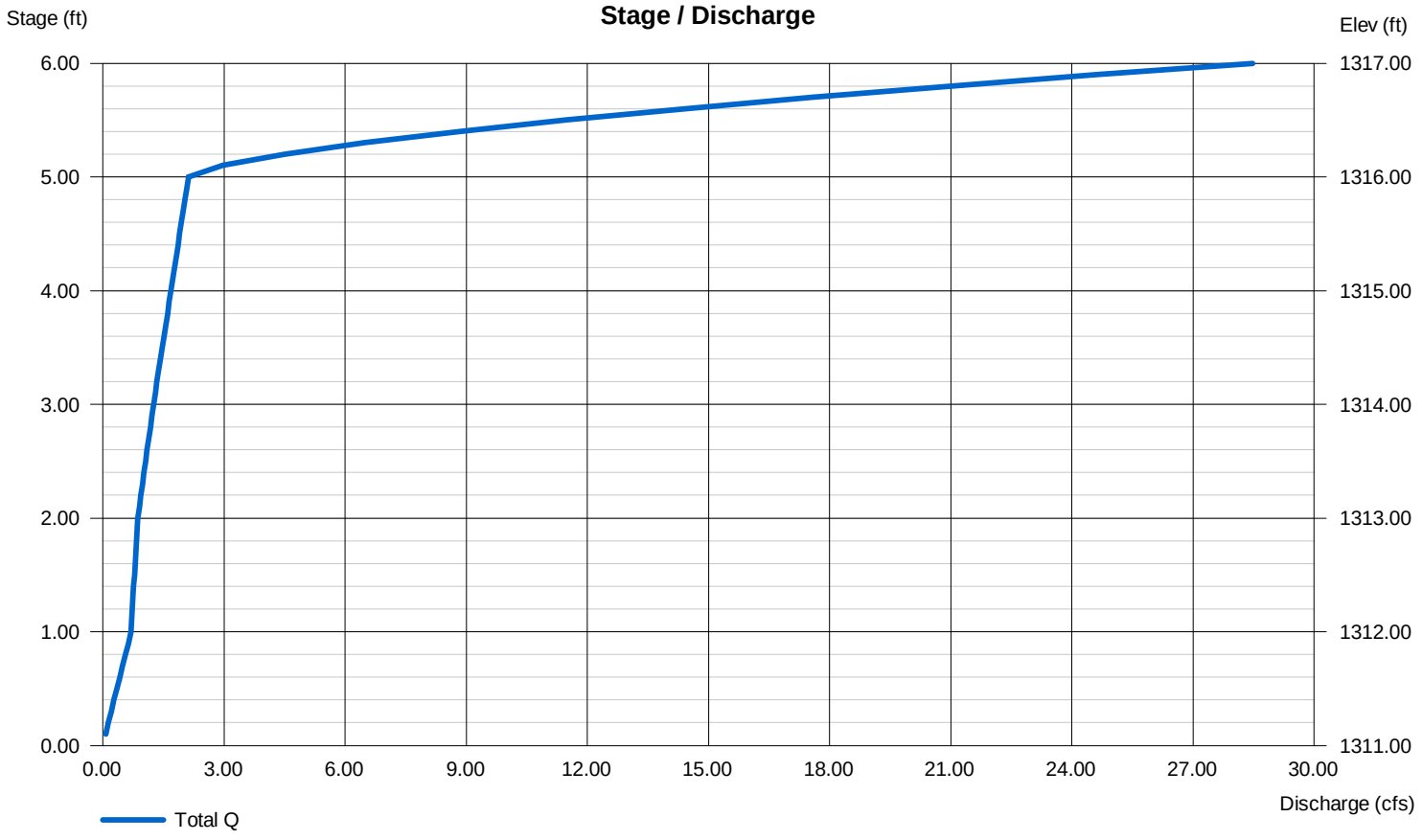
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 10.00	0.00	0.00	0.00
Crest El. (ft)	= 1316.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.900 (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 Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

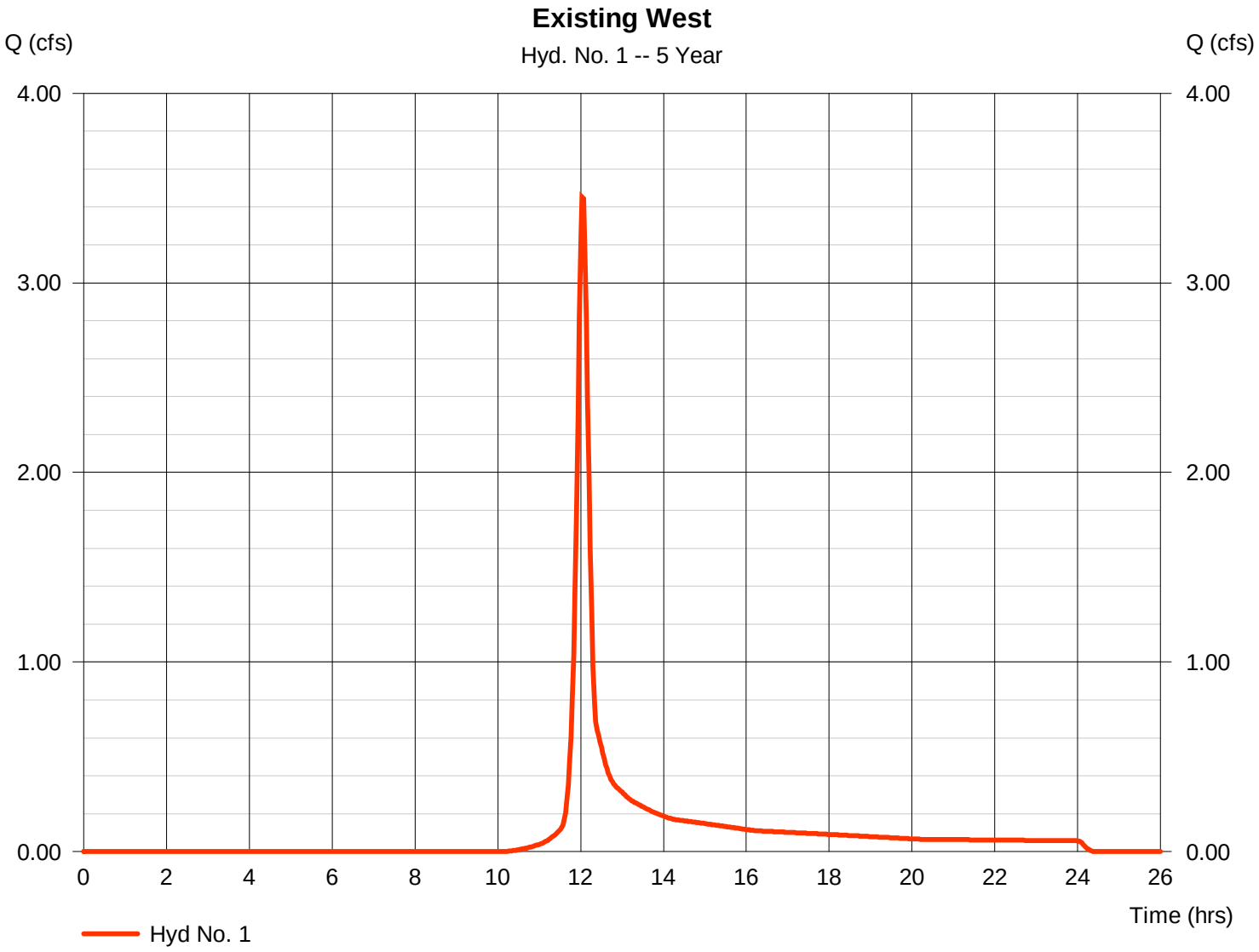
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	3.454	2	722	9,889	------	------	------	Existing West
2	SCS Runoff	12.45	2	722	36,055	------	------	------	Developed East
3	SCS Runoff	6.227	2	722	18,028	------	------	------	Developed West
4	SCS Runoff	6.476	2	722	18,543	------	------	------	Existing East
5	SCS Runoff	7.298	2	724	23,421	------	------	------	Offsite NE
6	Combine	19.57	2	722	59,476	2, 5	------	------	Total to East
7	Reservoir	0.000	2	692	0	6	1313.99	26,679	East Basin - Total
8	SCS Runoff	2.905	2	728	10,324	------	------	------	Offsite NW
9	Combine	8.776	2	724	28,352	3, 8	------	------	Total to West Basin
10	Reservoir	5.248	2	732	6,274	9	1315.97	8,831	West Basin - Total
11	Reservoir	0.992	2	736	923	3	1315.65	7,706	West Basin - SIte Only
12	Reservoir	0.000	2	948	0	2	1314.69	16,434	Small East Ba- Onsite
13	Reservoir	0.253	2	754	267	6	1316.03	28,238	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	= SCS Runoff	Peak discharge	= 3.454 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 9,889 cuft
Drainage area	= 1.600 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

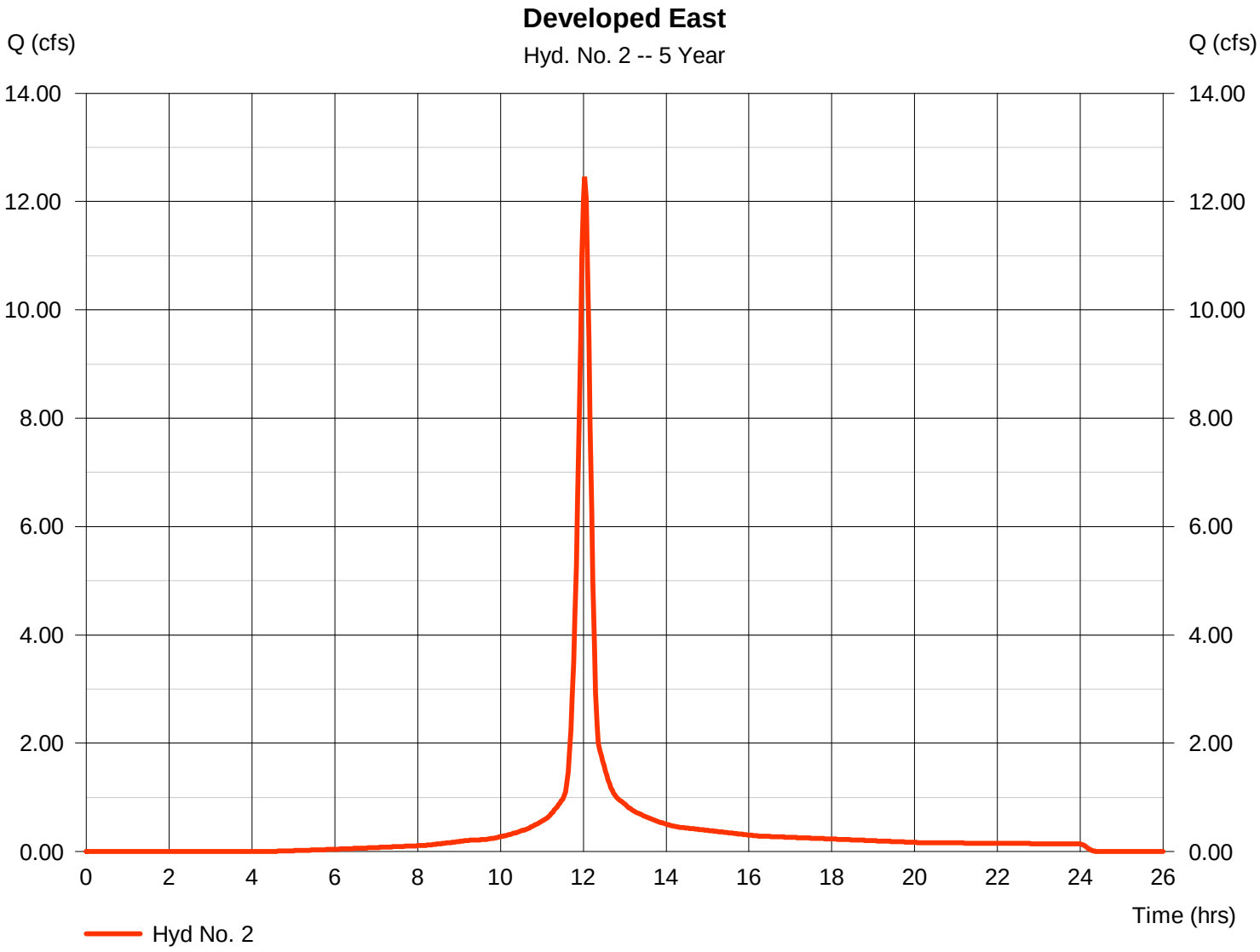


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	= SCS Runoff	Peak discharge	= 12.45 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 36,055 cuft
Drainage area	= 3.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

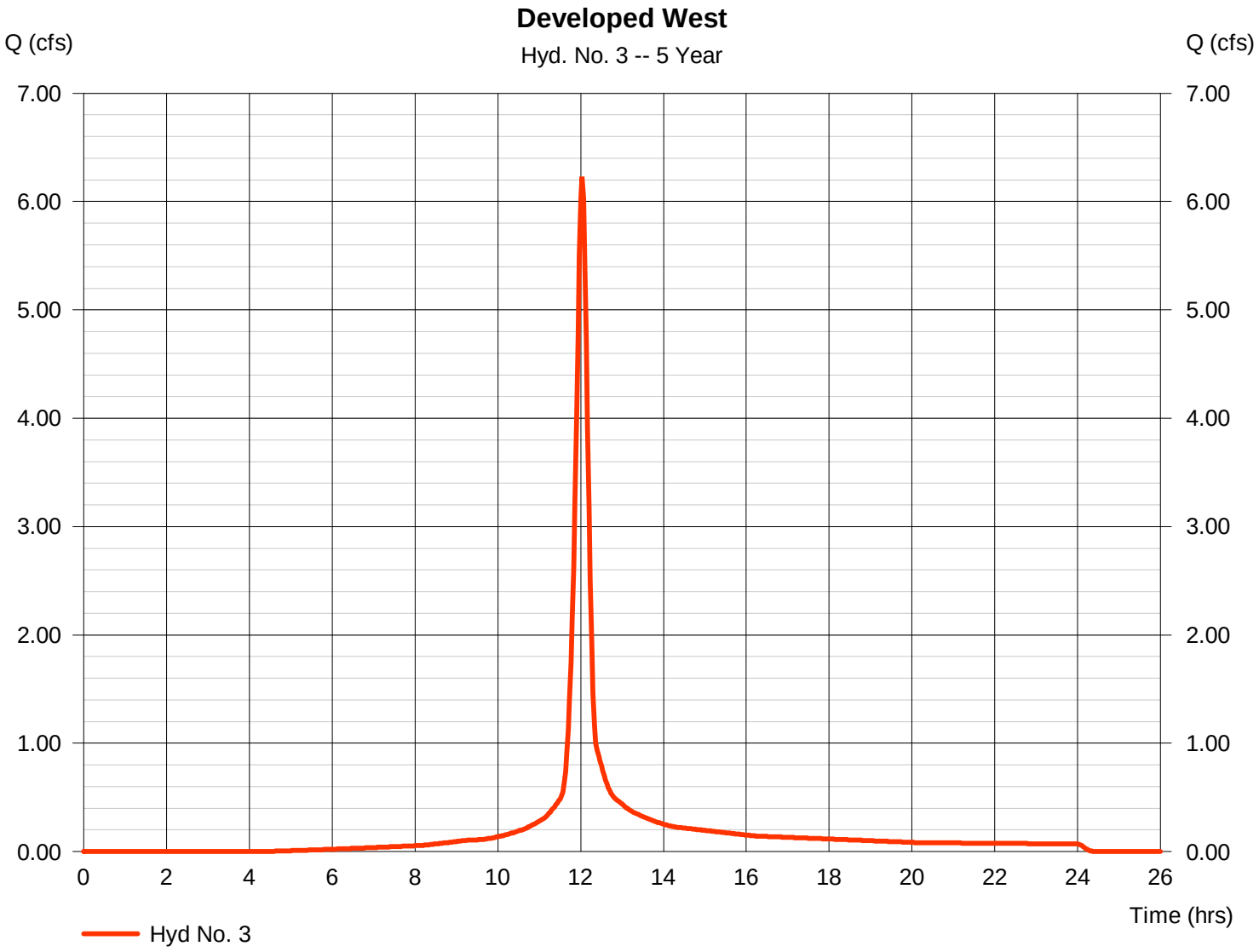


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.227 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	18,028 cuft
Drainage area	=	1.500 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

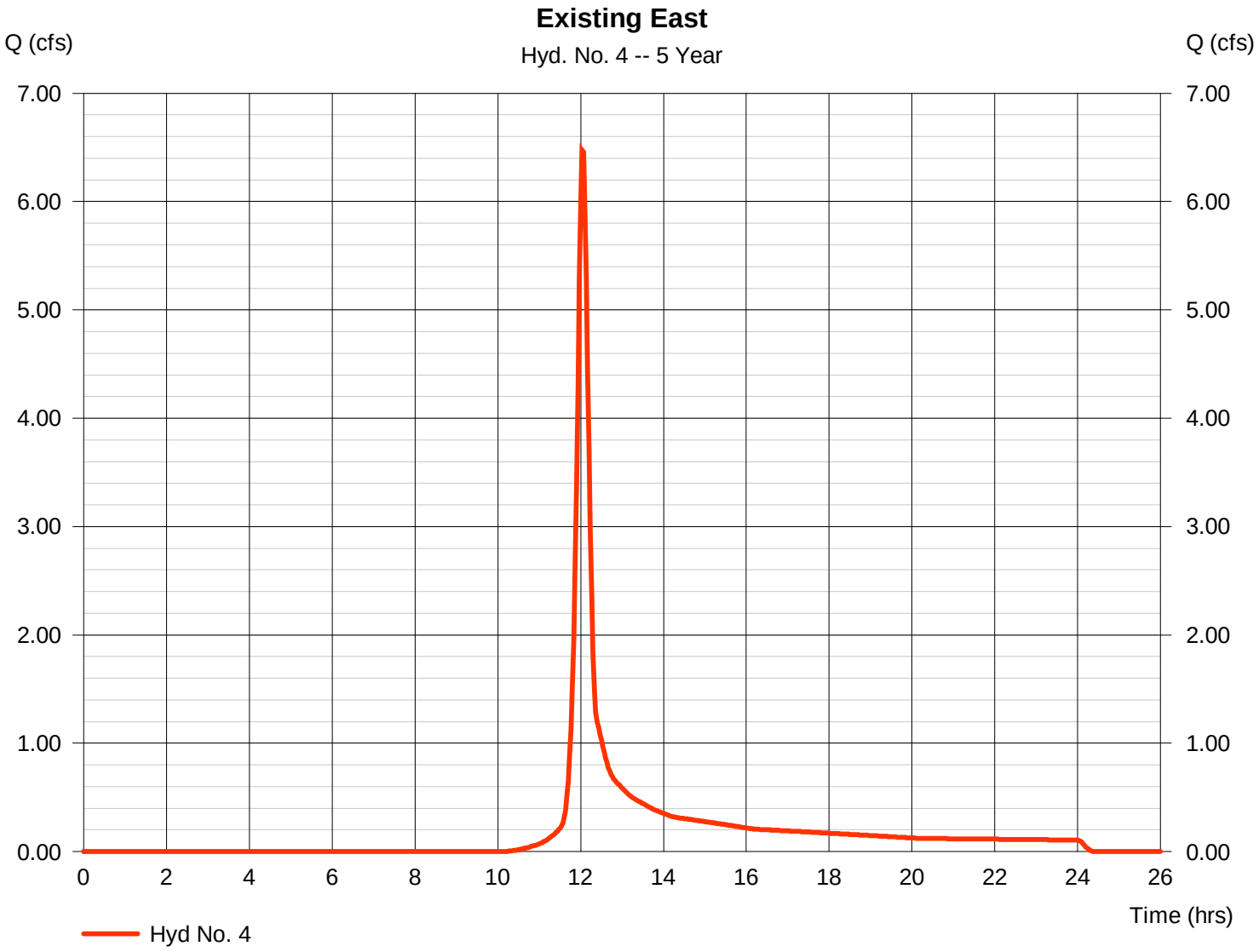


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.476 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	18,543 cuft
Drainage area	=	3.000 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

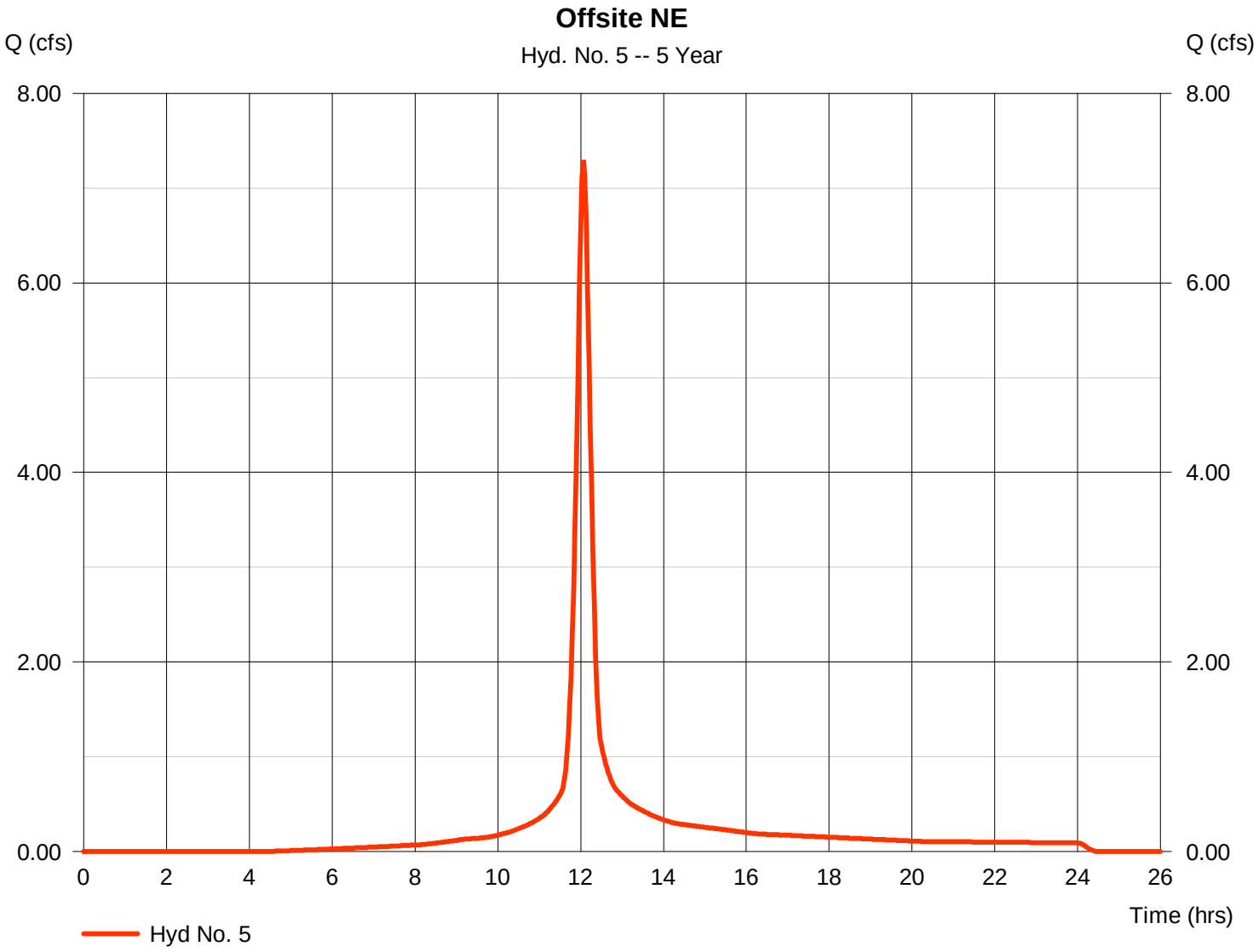


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	= SCS Runoff	Peak discharge	= 7.298 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 23,421 cuft
Drainage area	= 1.900 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

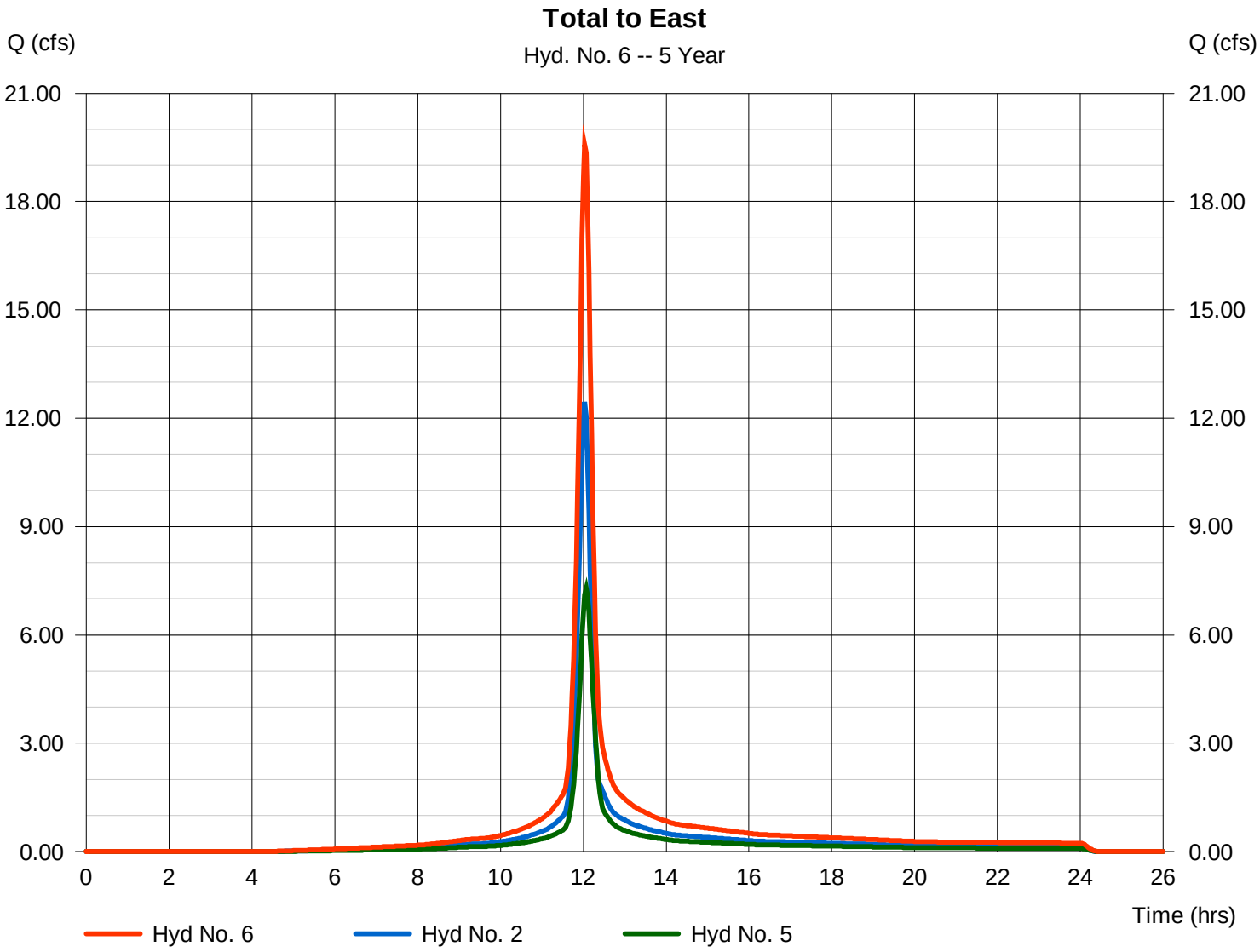


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 19.57 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 59,476 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



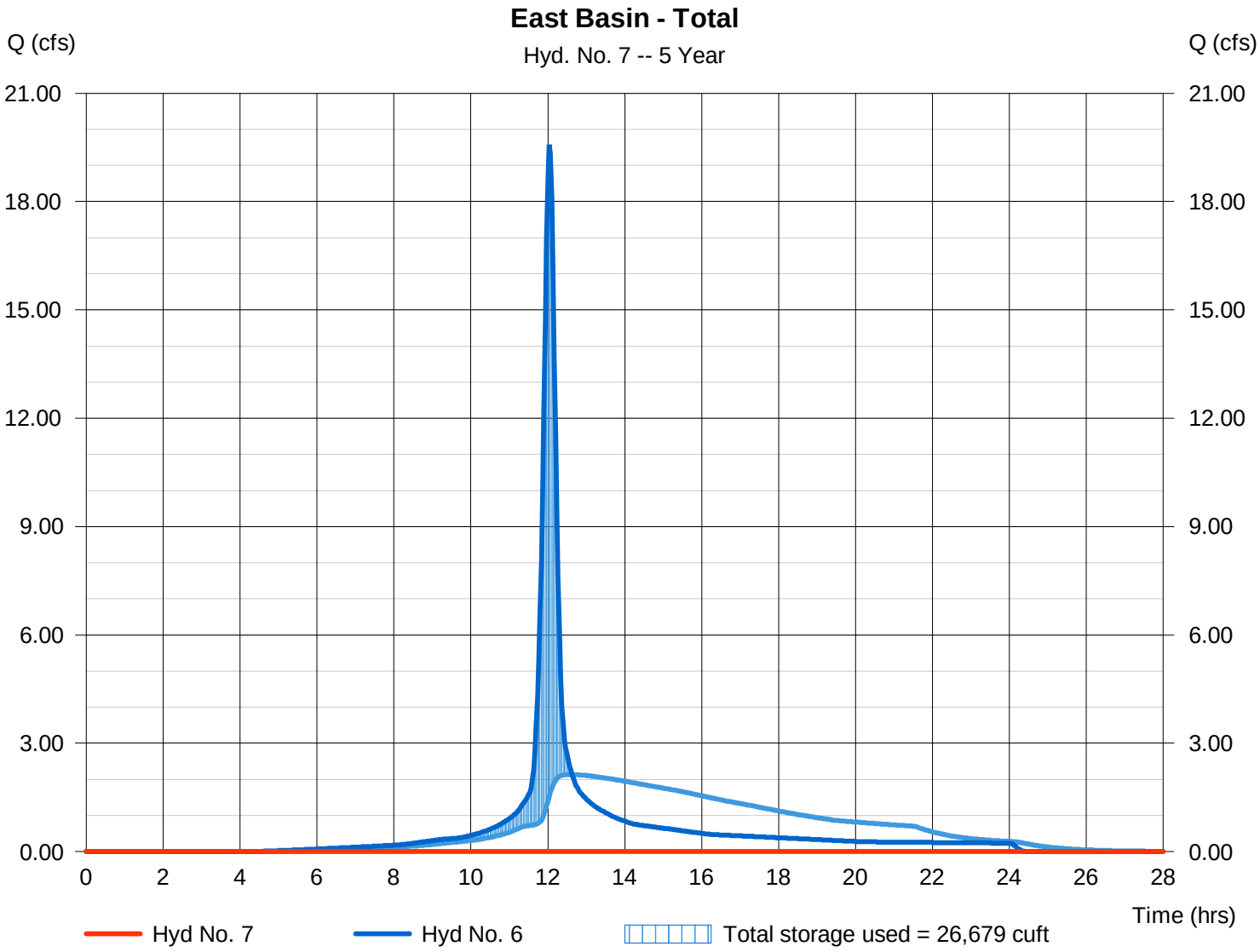
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= 11.53 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1313.99 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 26,679 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

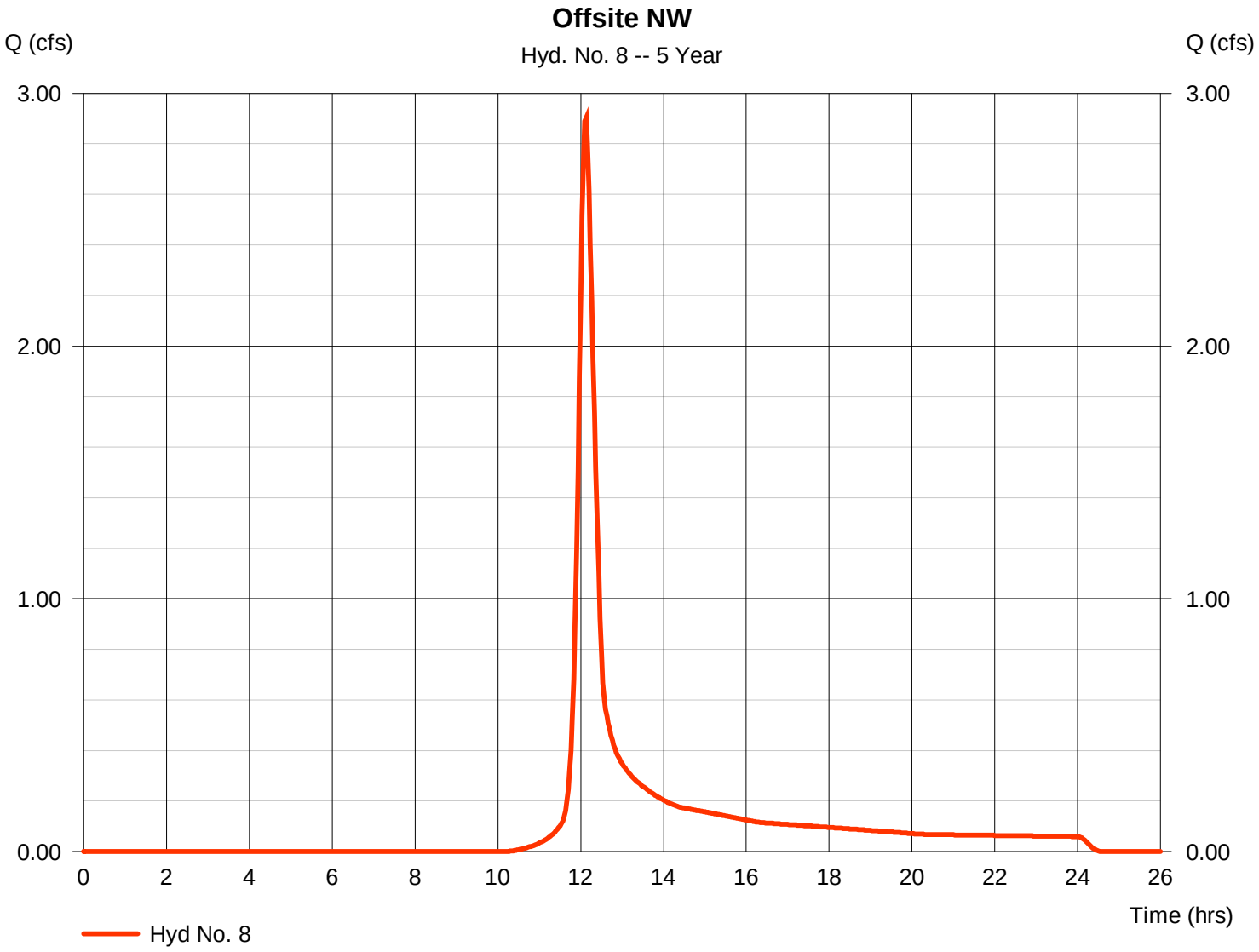


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.905 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	10,324 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	4.50 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

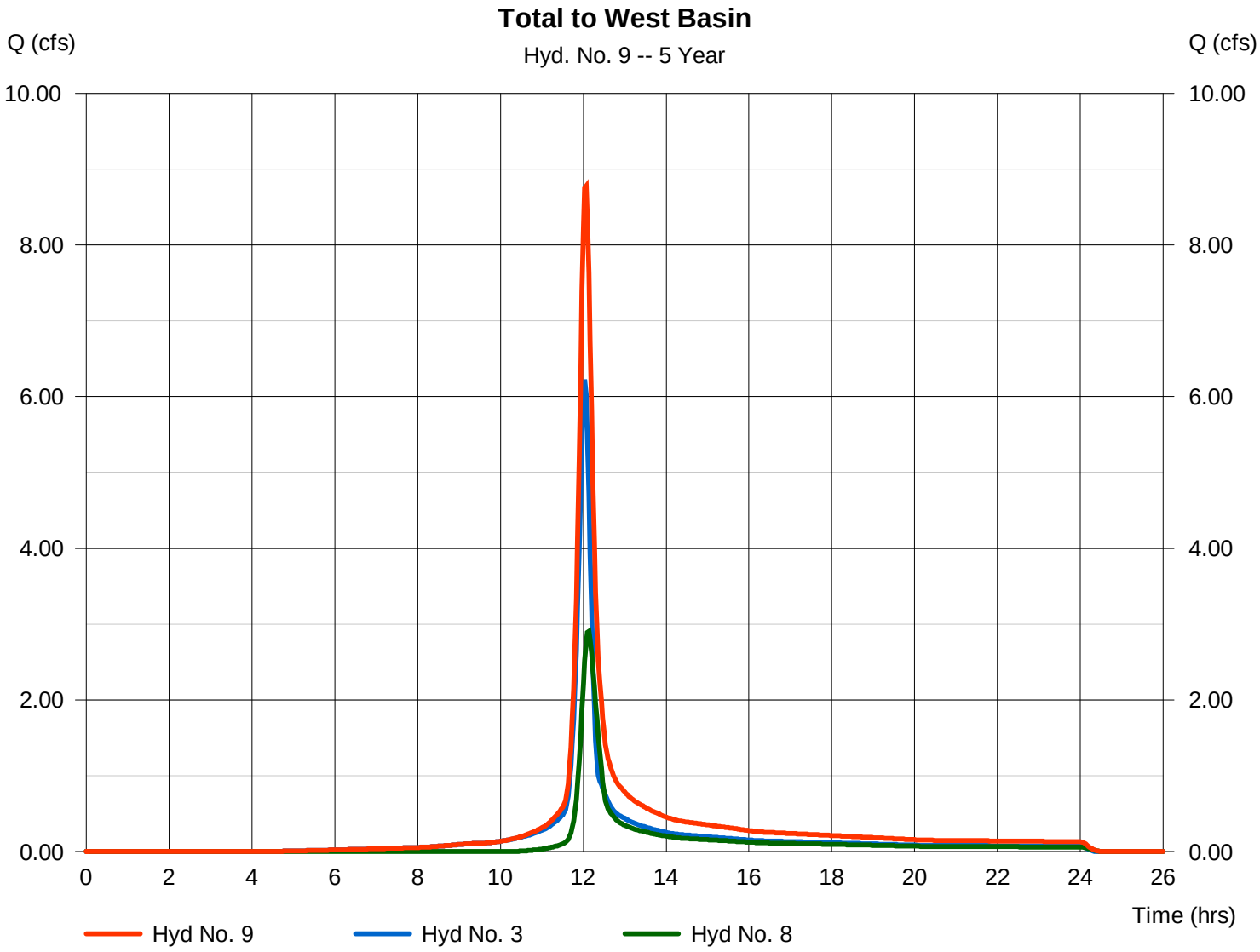


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	= Combine	Peak discharge	= 8.776 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 28,352 cuft
Inflow hyds.	= 3, 8	Contrib. drain. area	= 3.100 ac



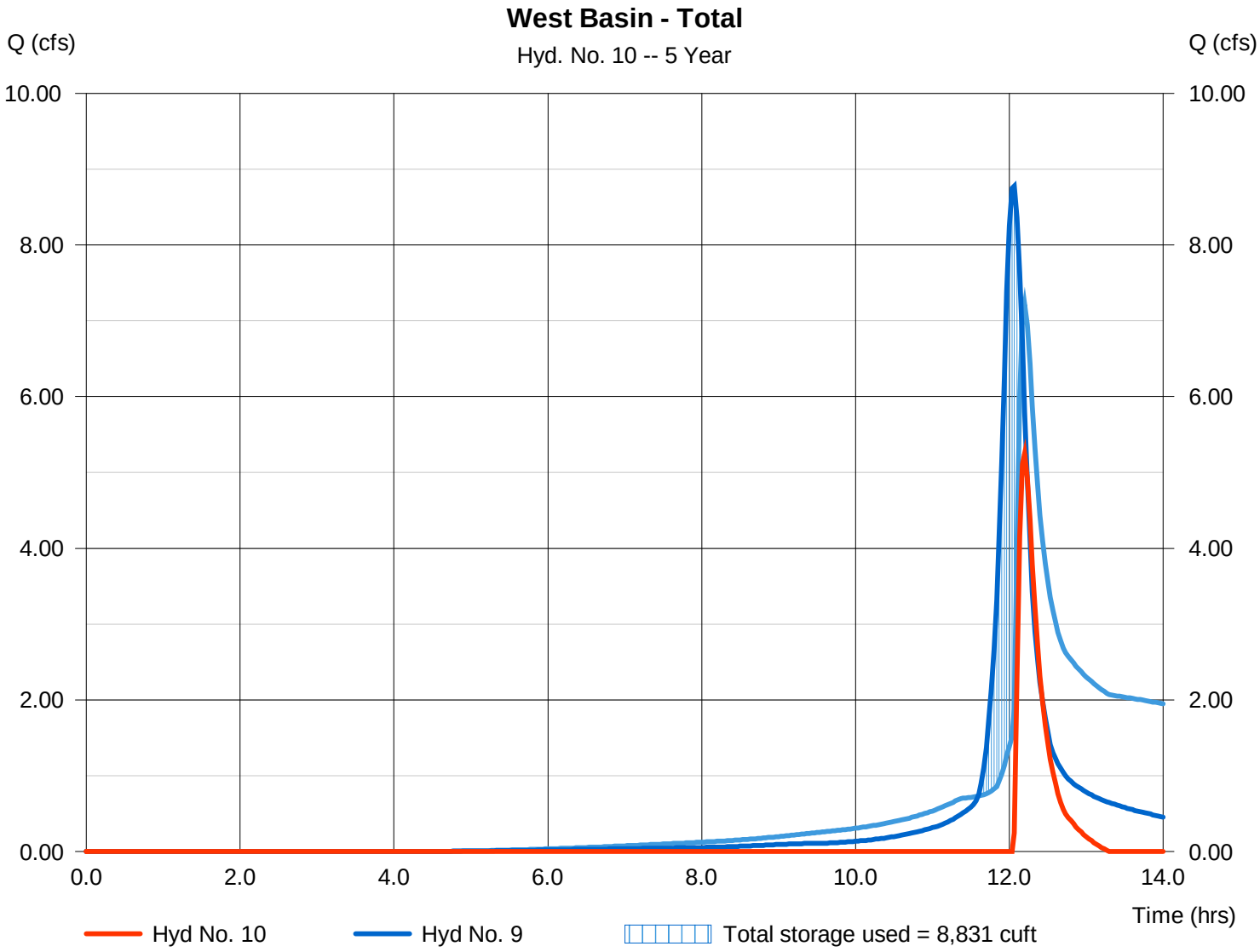
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 5.248 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 6,274 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1315.97 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 8,831 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



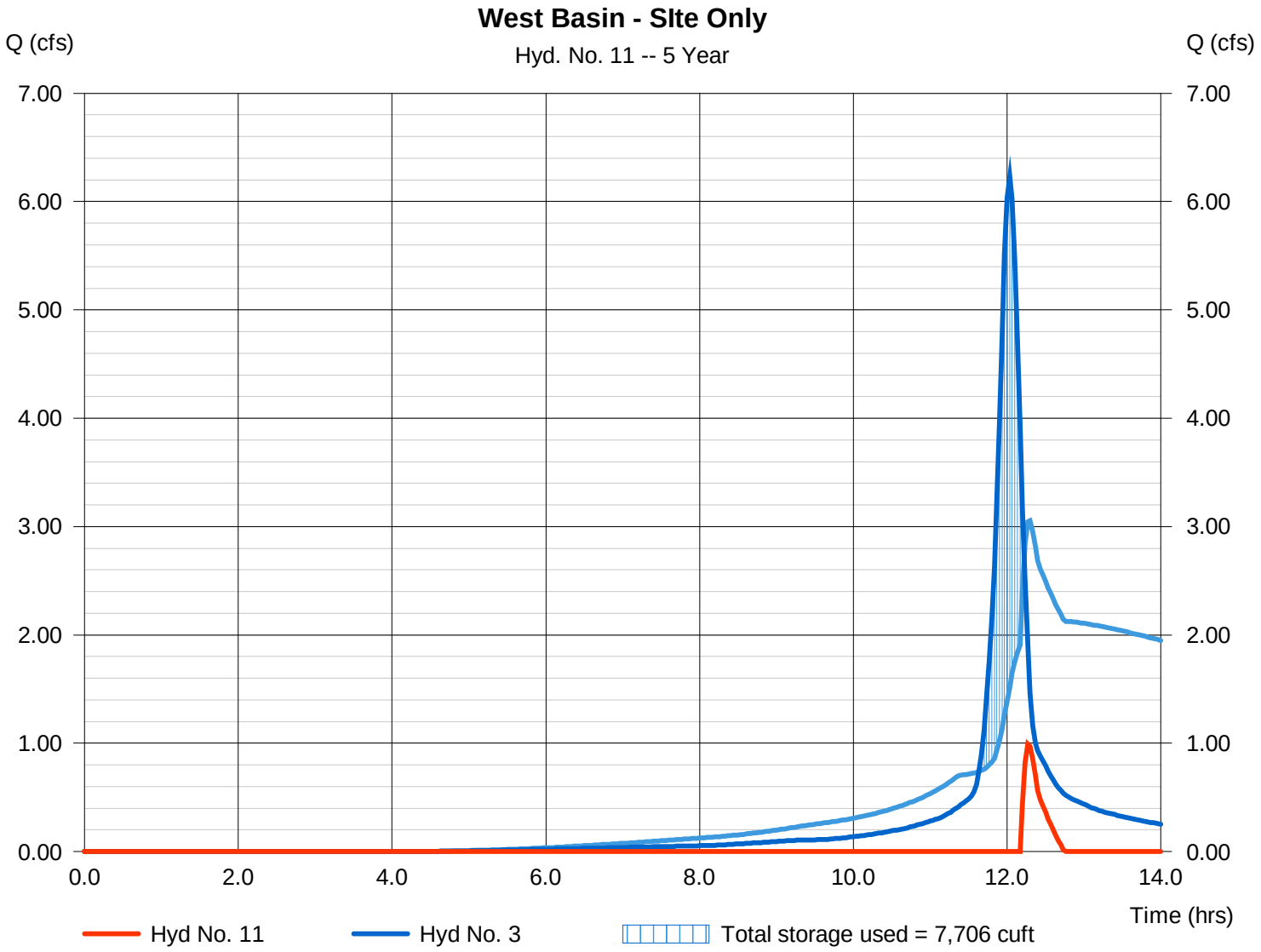
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 0.992 cfs
Storm frequency	= 5 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 923 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1315.65 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 7,706 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



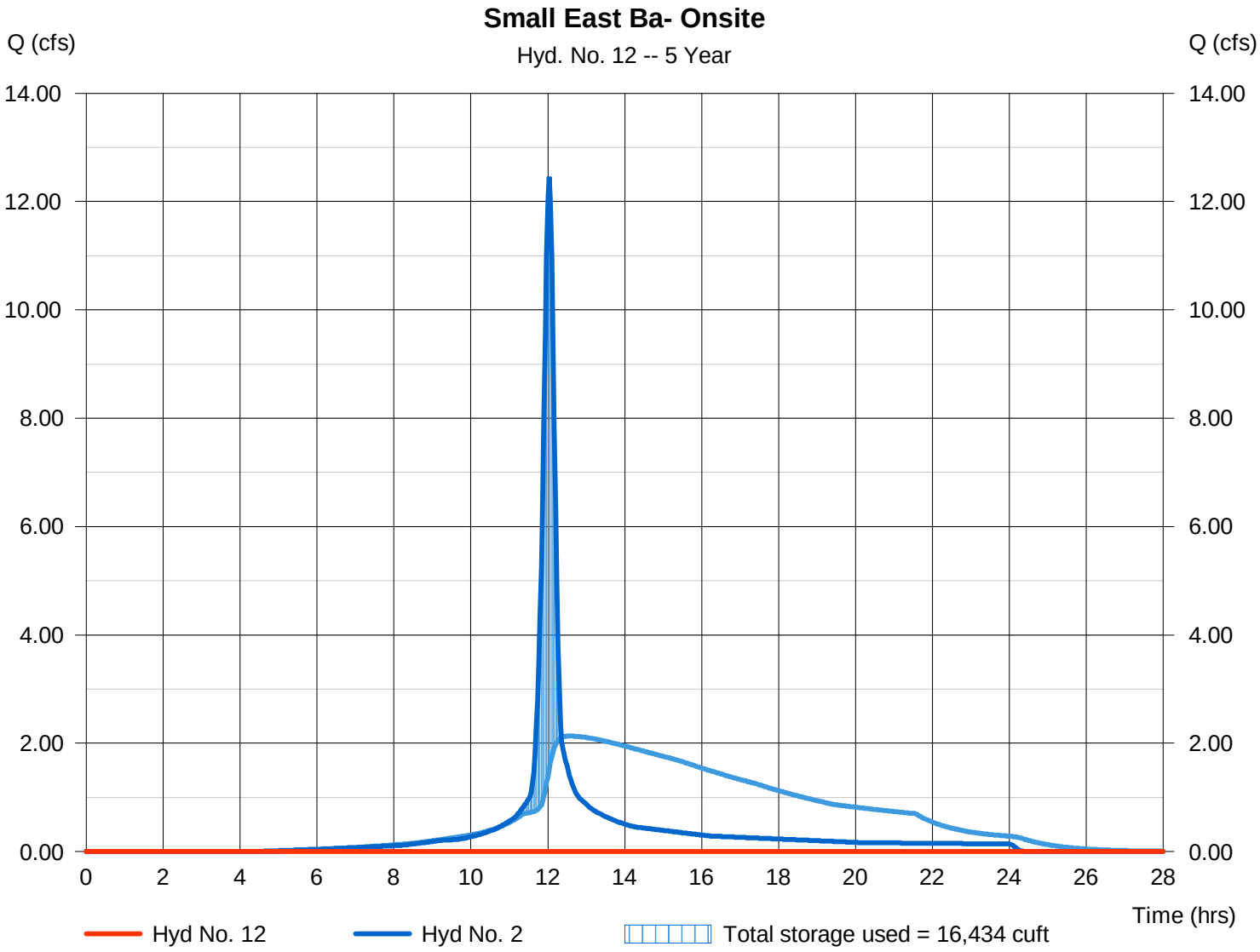
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 5 yrs	Time to peak	= 15.80 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 2 - Developed East	Max. Elevation	= 1314.69 ft
Reservoir name	= East Basin out of ROW	Max. Storage	= 16,434 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



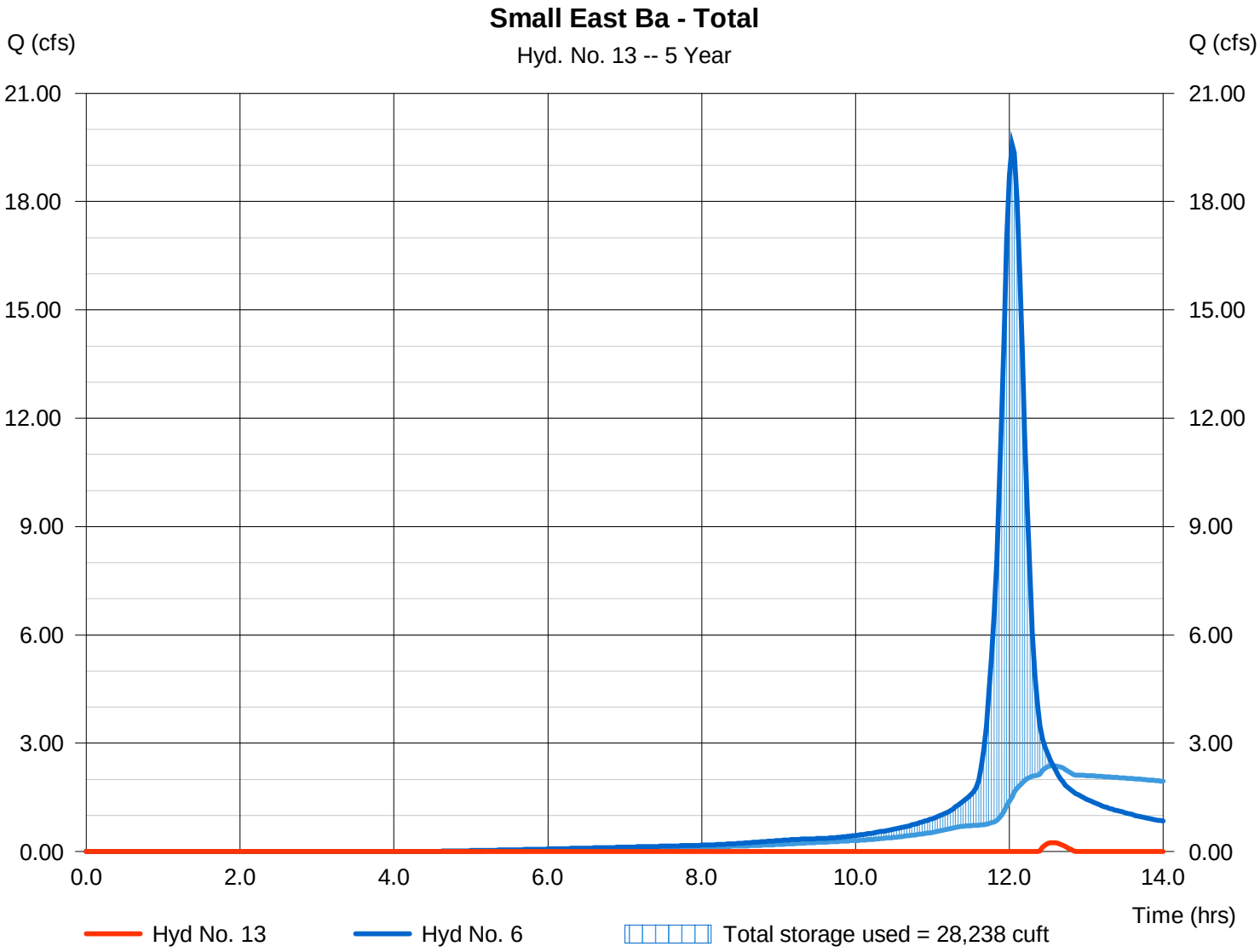
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	0.253 cfs
Storm frequency	=	5 yrs	Time to peak	=	12.57 hrs
Time interval	=	2 min	Hyd. volume	=	267 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1316.03 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	28,238 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

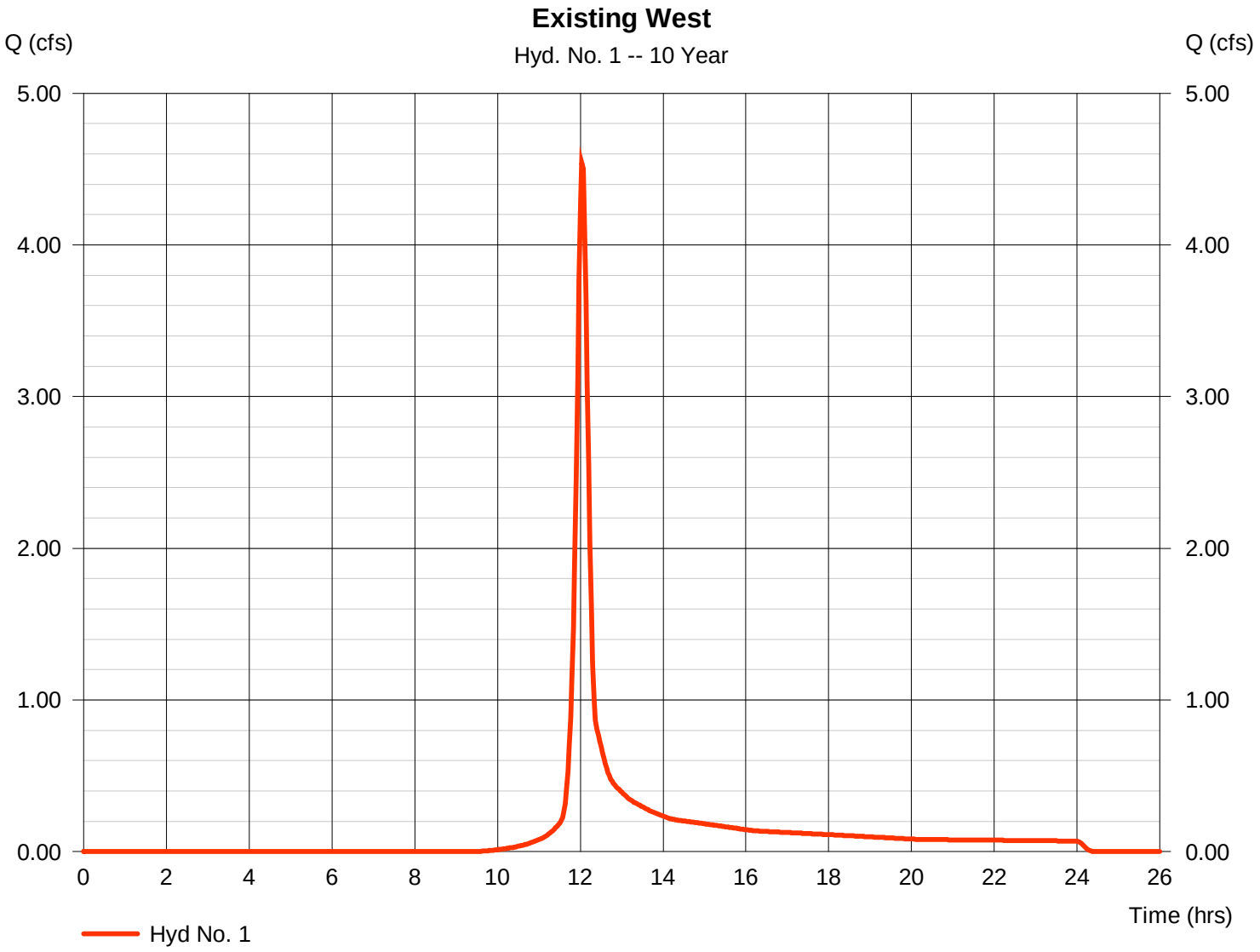
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	4.542	2	722	12,848	------	------	------	Existing West
2	SCS Runoff	14.79	2	722	43,208	------	------	------	Developed East
3	SCS Runoff	7.393	2	722	21,604	------	------	------	Developed West
4	SCS Runoff	8.517	2	722	24,090	------	------	------	Existing East
5	SCS Runoff	8.671	2	724	28,067	------	------	------	Offsite NE
6	Combine	23.26	2	722	71,275	2, 5	------	------	Total to East
7	Reservoir	0.000	2	682	0	6	1314.40	32,541	East Basin - Total
8	SCS Runoff	3.820	2	728	13,413	------	------	------	Offsite NW
9	Combine	10.80	2	724	35,017	3, 8	------	------	Total to West Basin
10	Reservoir	7.851	2	730	10,369	9	1316.11	9,458	West Basin - Total
11	Reservoir	2.970	2	732	2,806	3	1315.82	8,307	West Basin - SIte Only
12	Reservoir	0.000	2	734	0	2	1315.14	19,936	Small East Ba- Onsite
13	Reservoir	4.603	2	738	6,375	6	1316.32	31,398	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.542 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	12,848 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

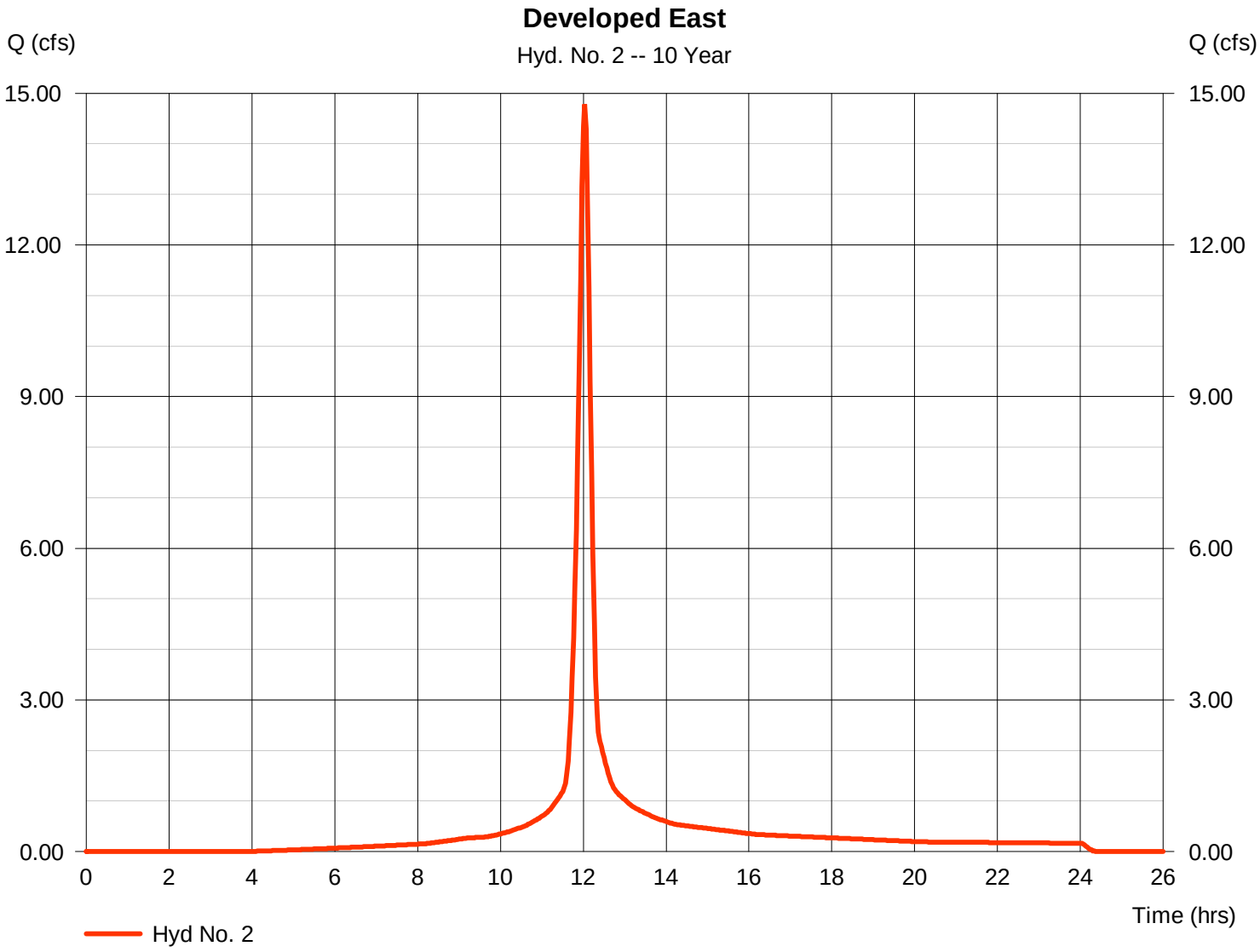


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	= SCS Runoff	Peak discharge	= 14.79 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 43,208 cuft
Drainage area	= 3.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

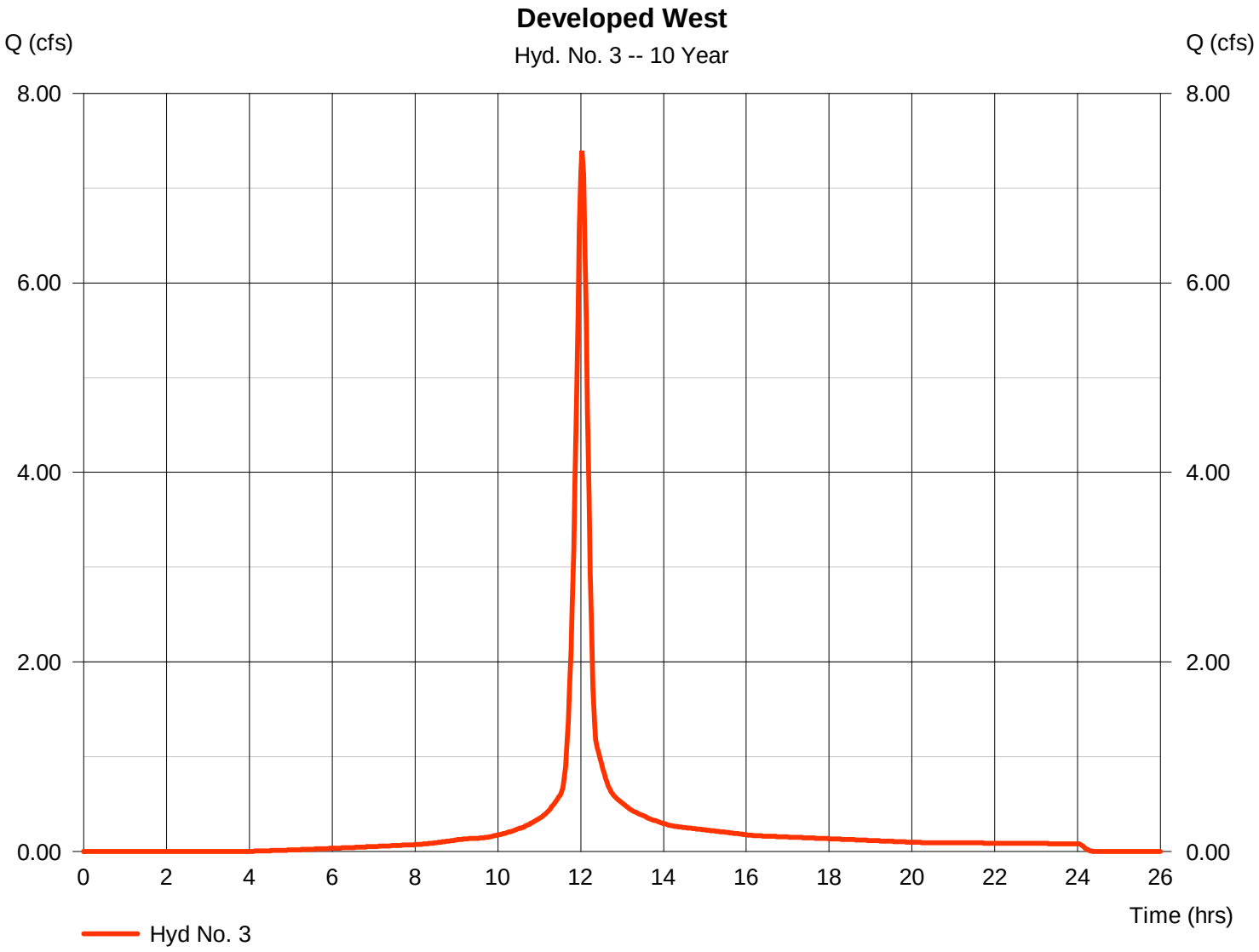


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.393 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	21,604 cuft
Drainage area	=	1.500 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

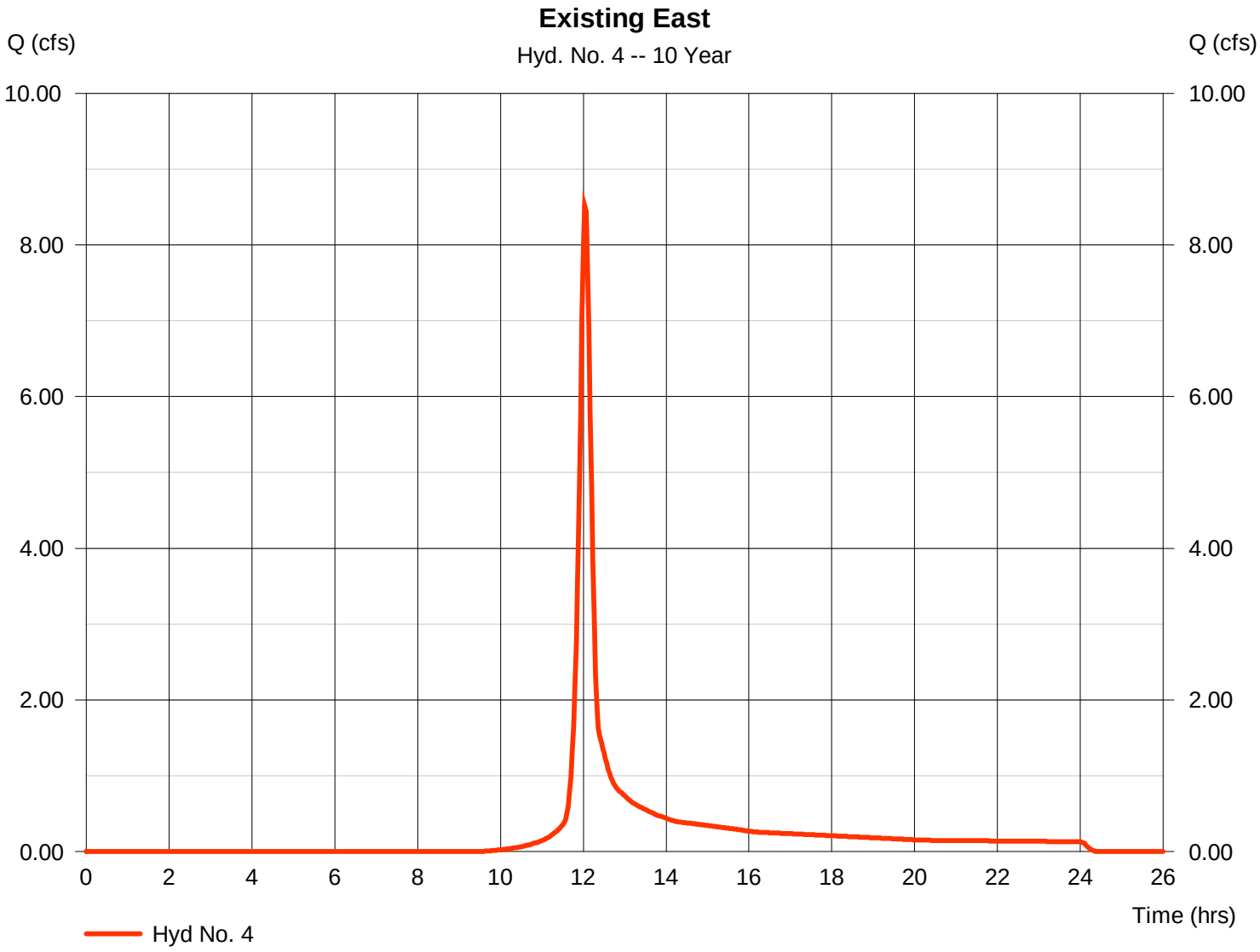


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.517 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	24,090 cuft
Drainage area	=	3.000 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

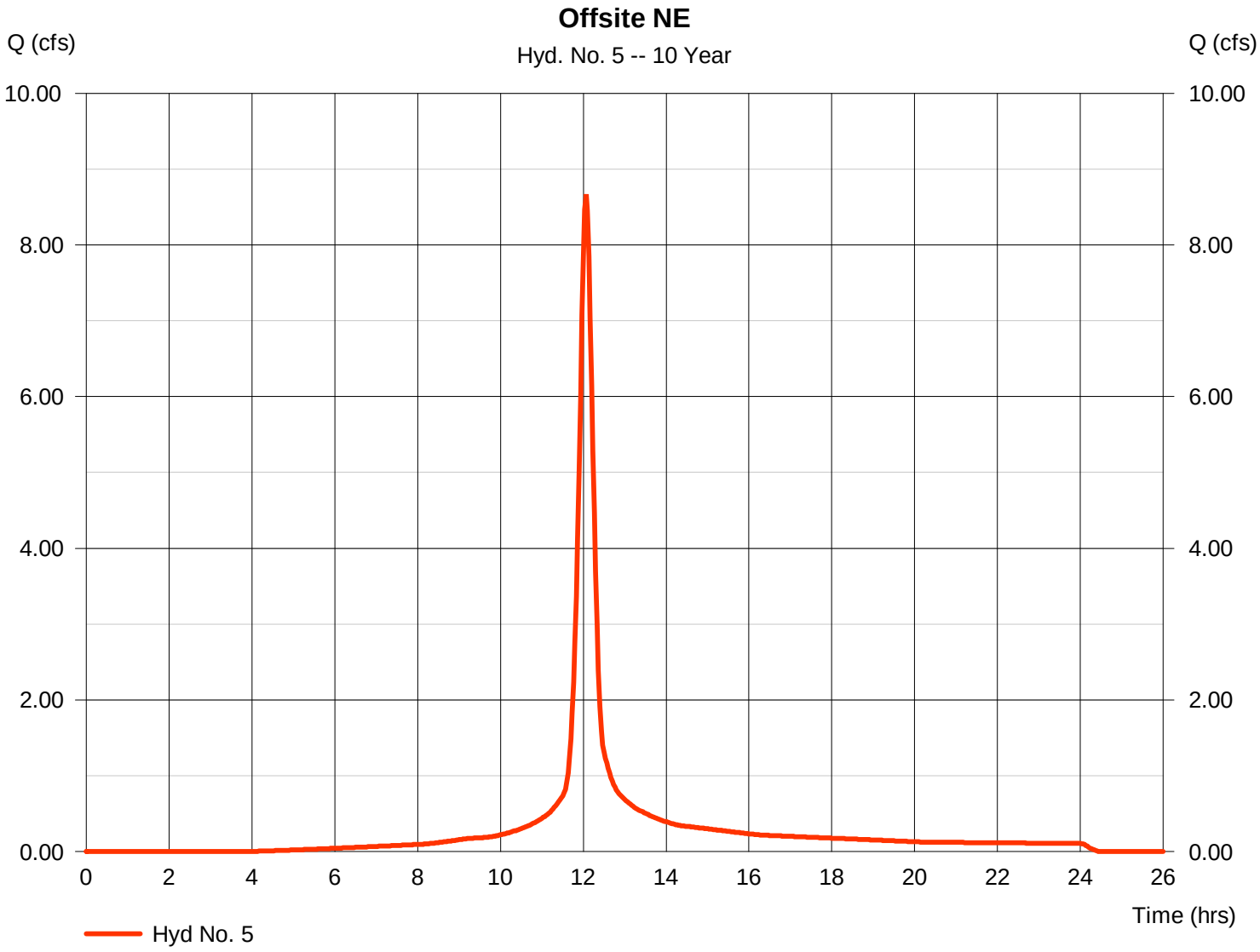


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	= SCS Runoff	Peak discharge	= 8.671 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 28,067 cuft
Drainage area	= 1.900 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 5.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

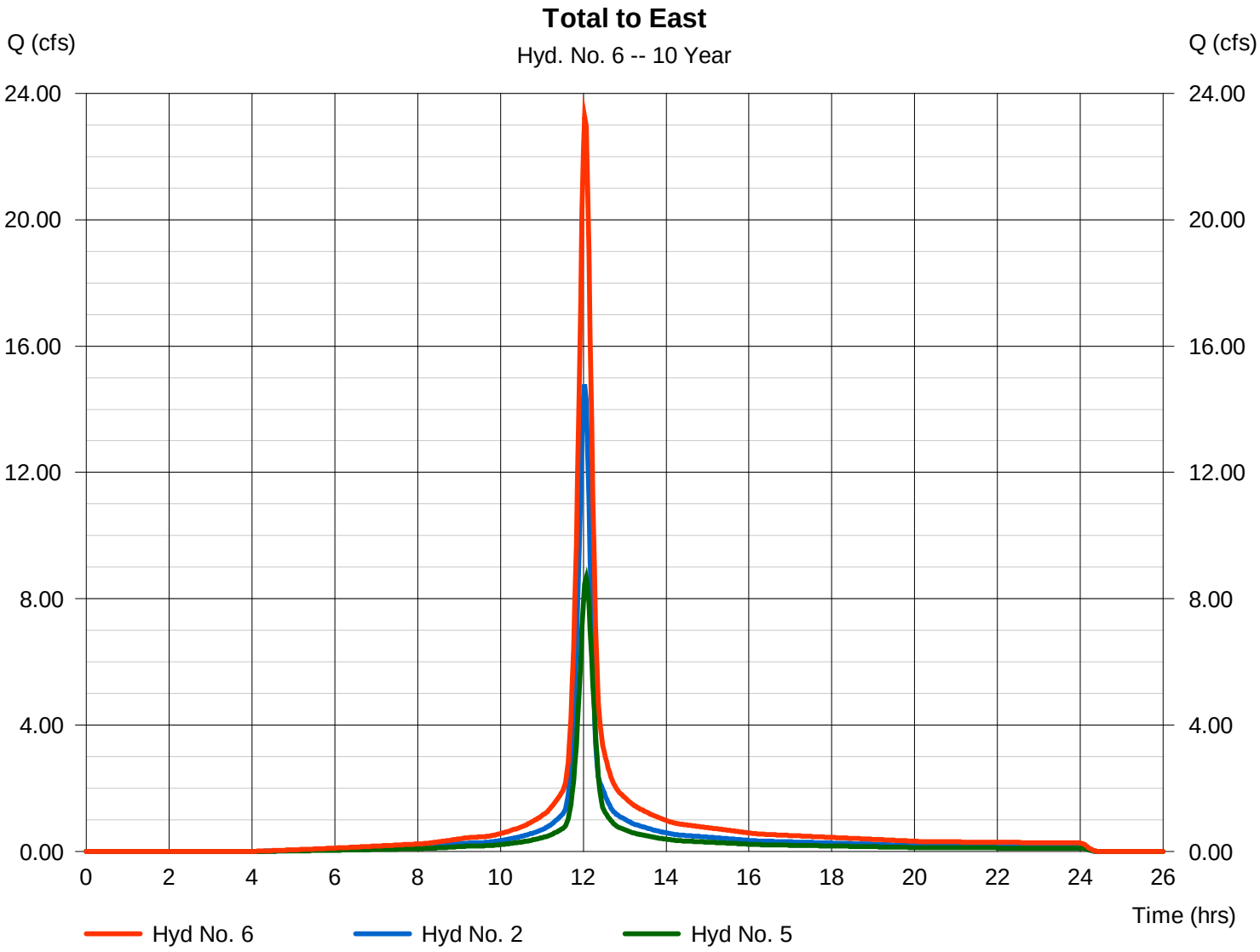


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 23.26 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 71,275 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



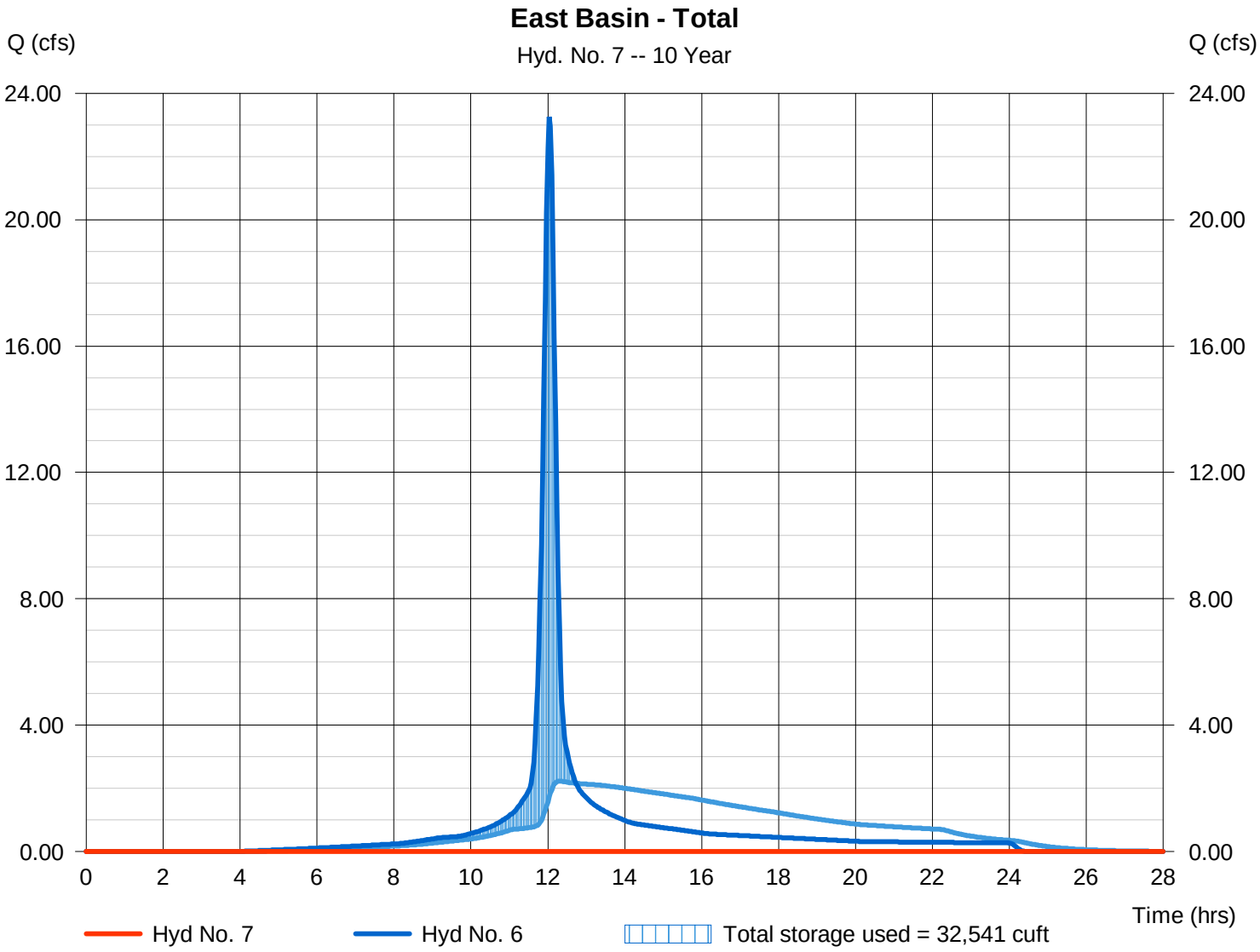
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.37 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1314.40 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 32,541 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

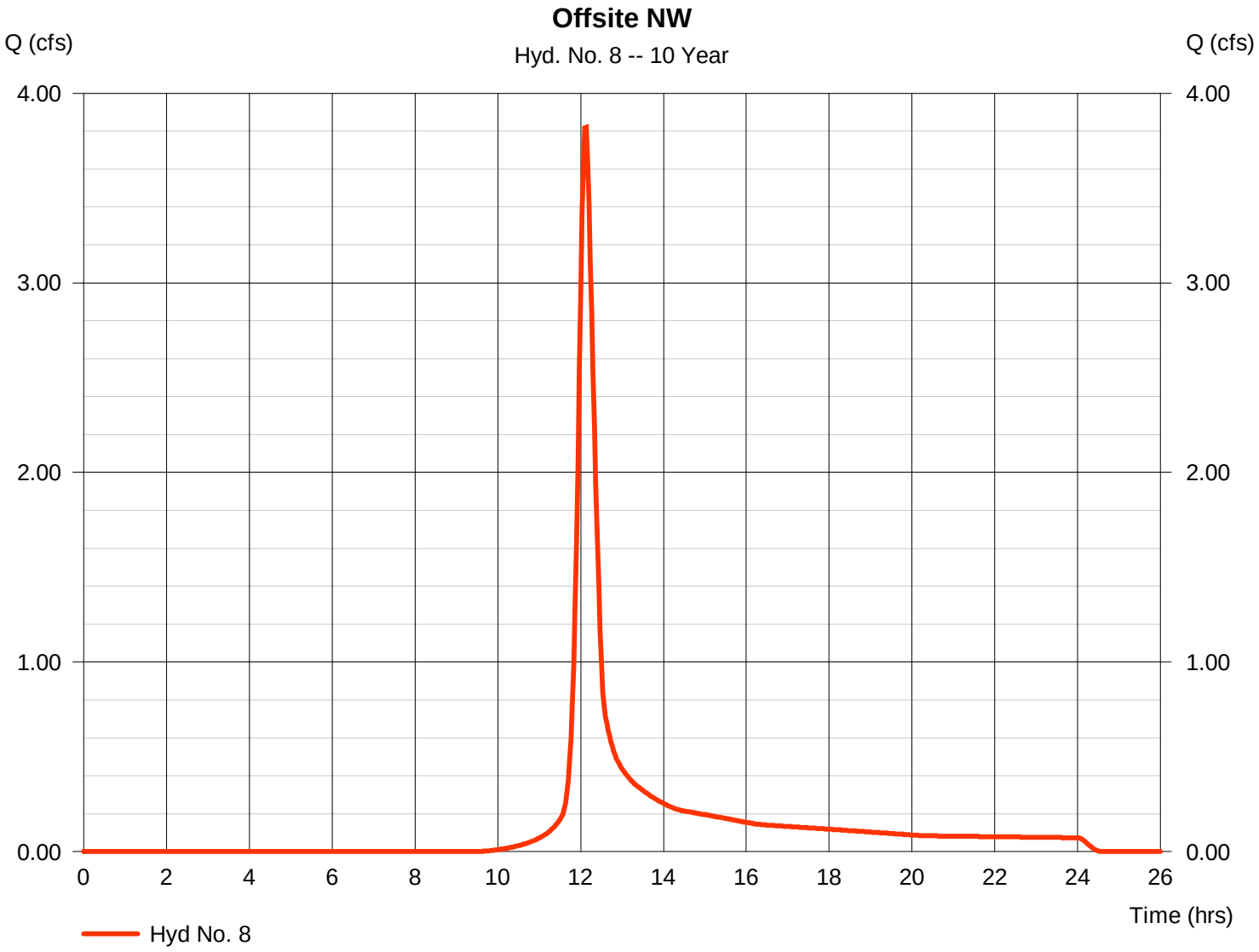


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.820 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.13 hrs
Time interval	=	2 min	Hyd. volume	=	13,413 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	5.20 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

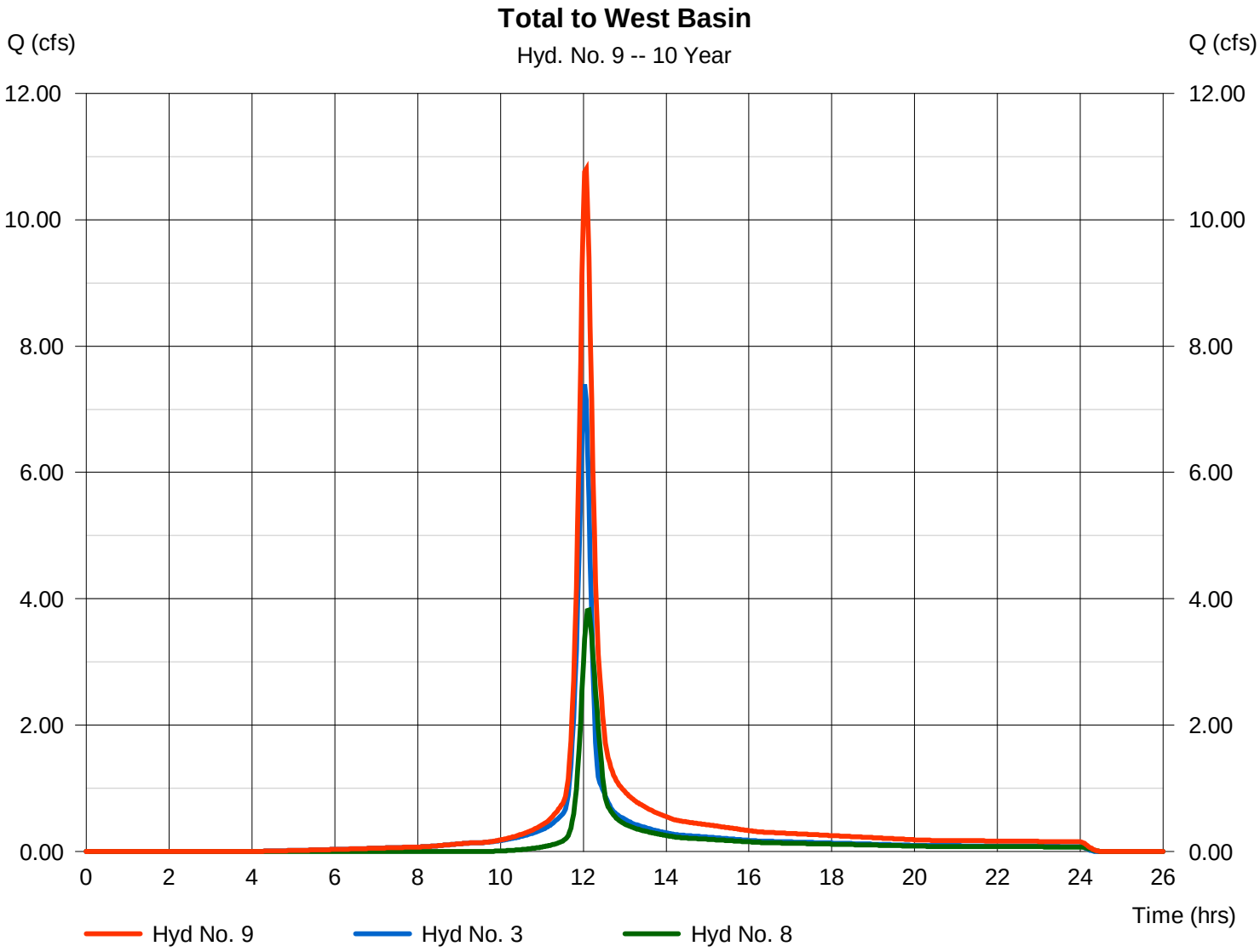


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	= Combine	Peak discharge	= 10.80 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 35,017 cuft
Inflow hyds.	= 3, 8	Contrib. drain. area	= 3.100 ac



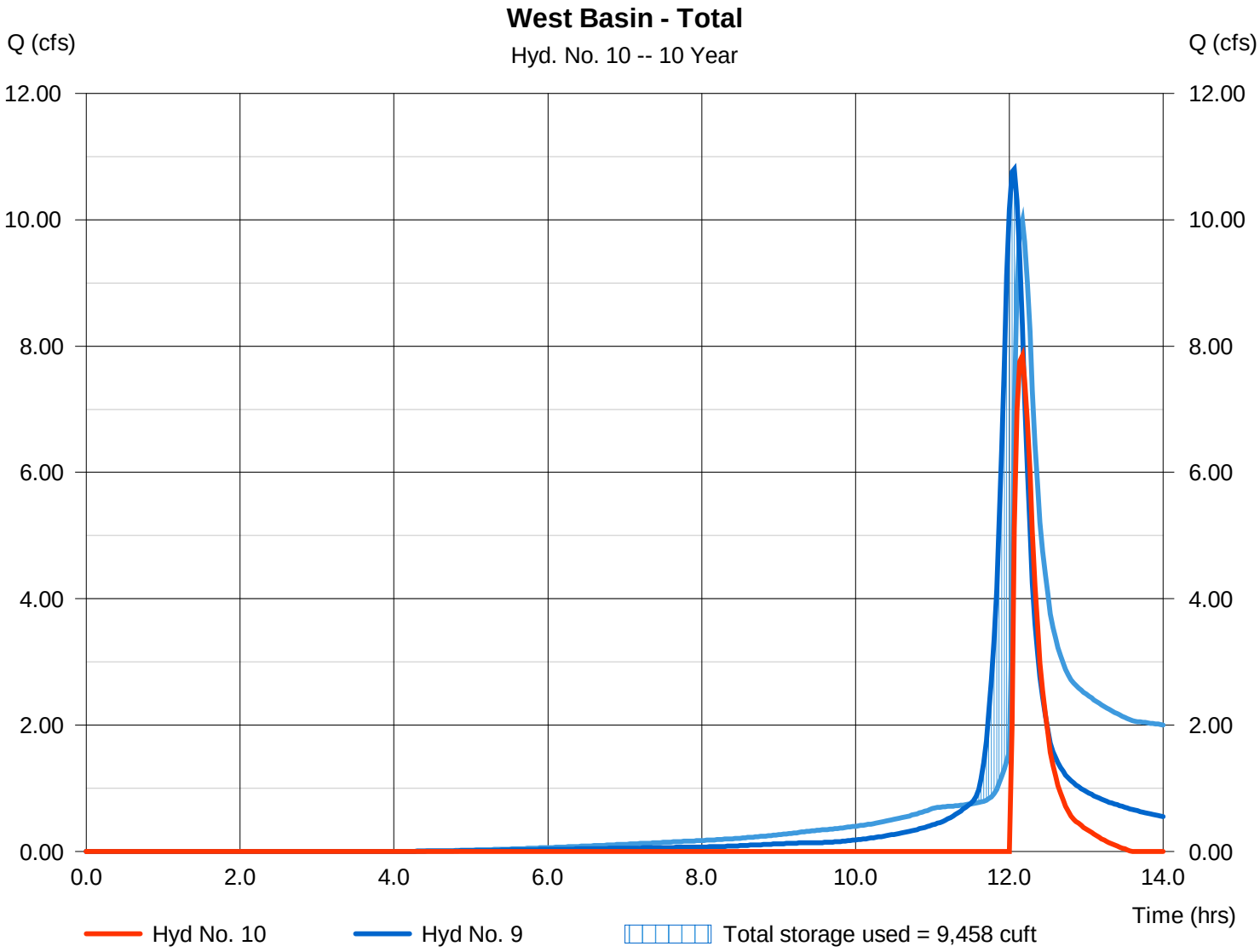
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 7.851 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 10,369 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1316.11 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 9,458 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



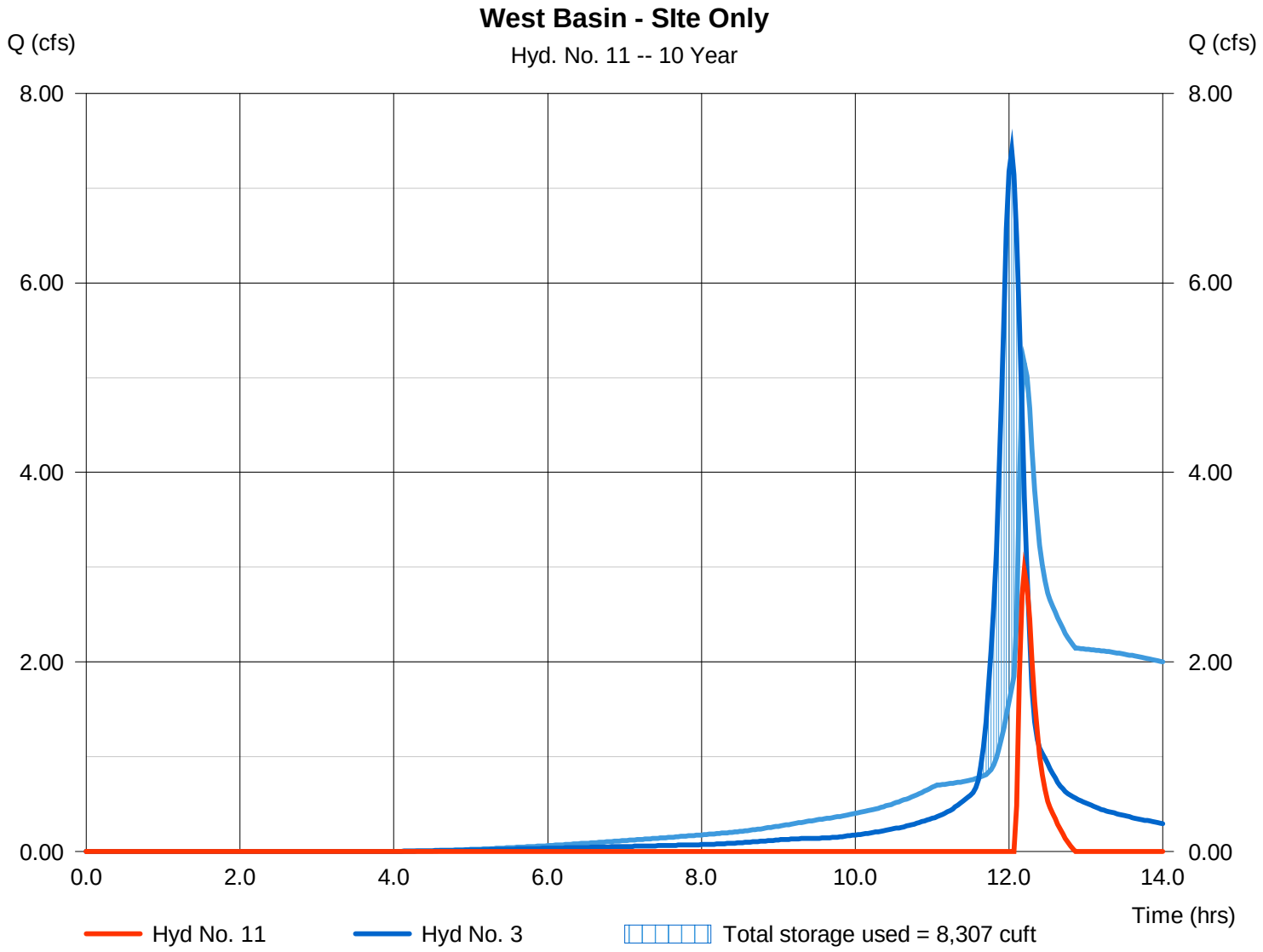
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 2.970 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.20 hrs
Time interval	= 2 min	Hyd. volume	= 2,806 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1315.82 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 8,307 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



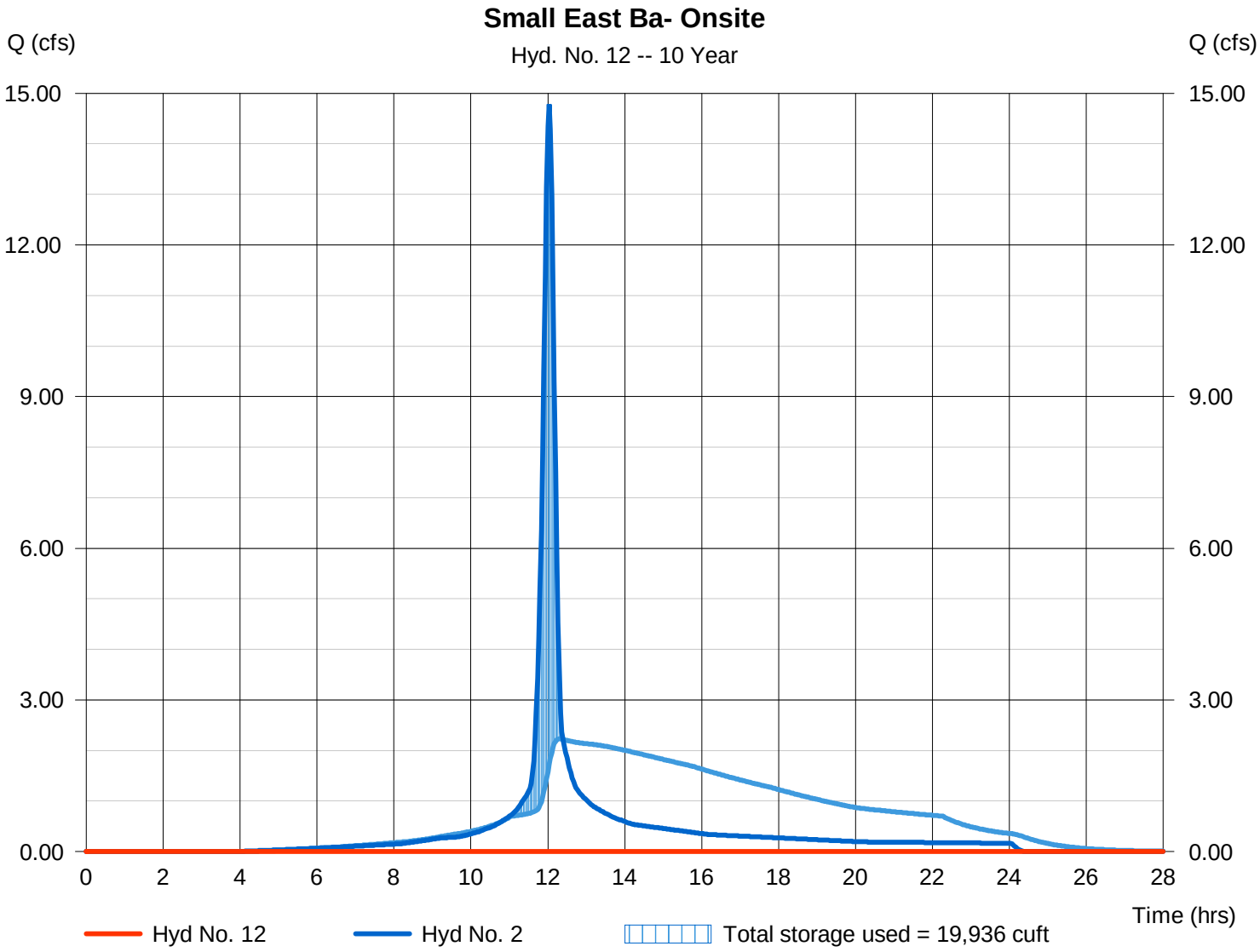
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	2 - Developed East	Max. Elevation	=	1315.14 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	19,936 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



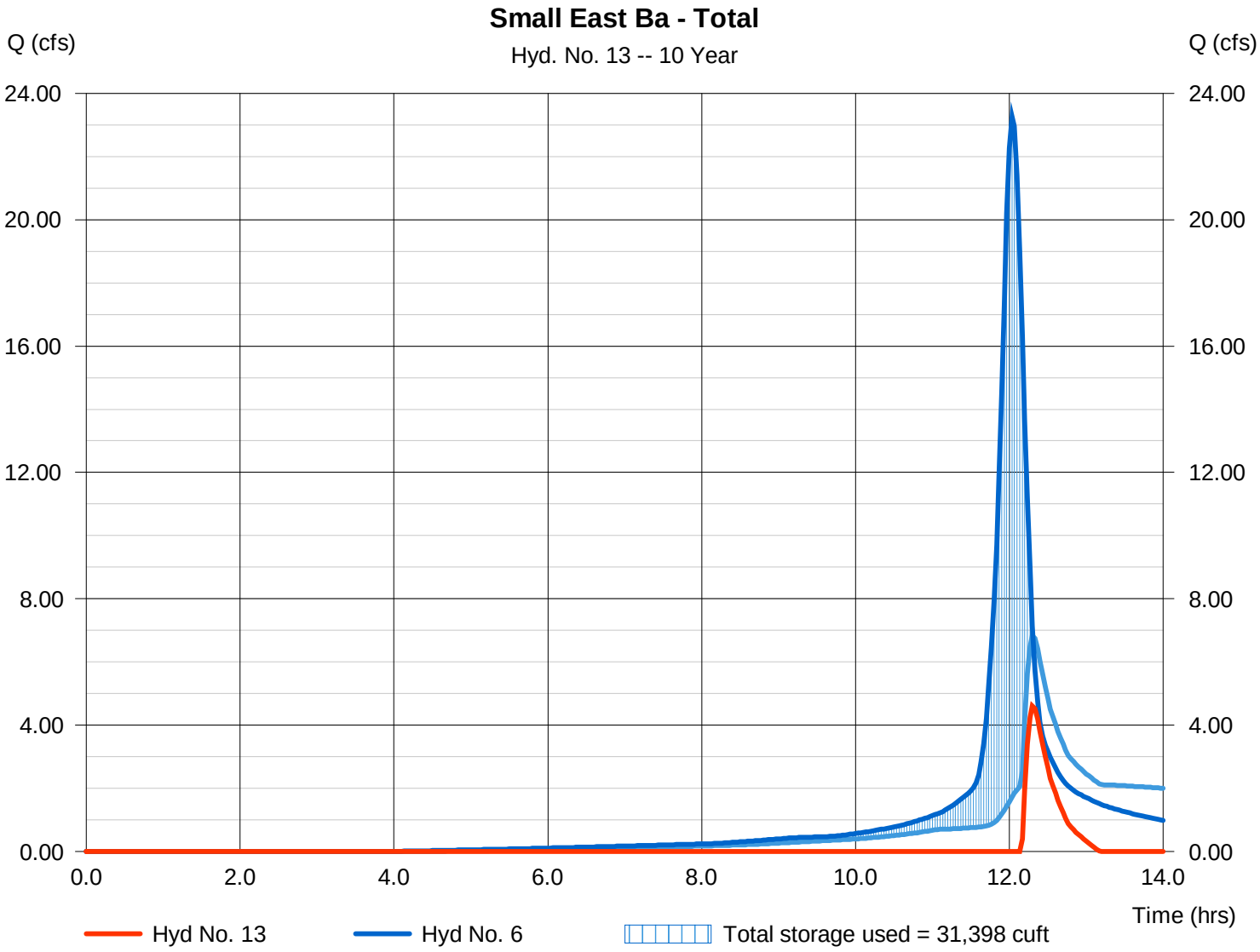
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	4.603 cfs
Storm frequency	=	10 yrs	Time to peak	=	12.30 hrs
Time interval	=	2 min	Hyd. volume	=	6,375 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1316.32 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	31,398 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

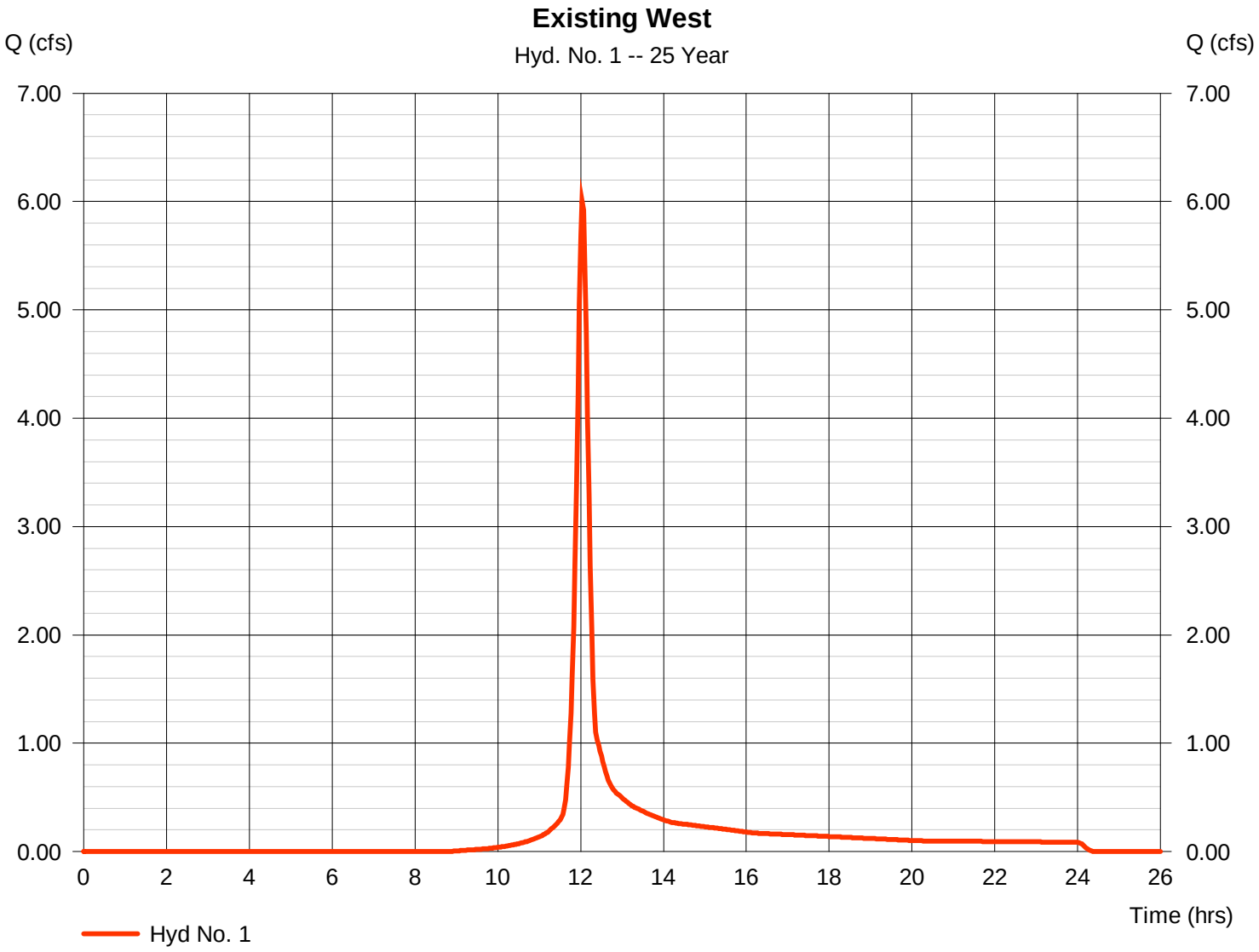
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	6.007	2	722	16,873	------	------	------	Existing West
2	SCS Runoff	17.77	2	722	52,487	------	------	------	Developed East
3	SCS Runoff	8.885	2	722	26,243	------	------	------	Developed West
4	SCS Runoff	11.26	2	722	31,636	------	------	------	Existing East
5	SCS Runoff	10.43	2	724	34,094	------	------	------	Offsite NE
6	Combine	27.97	2	722	86,581	2, 5	------	------	Total to East
7	Reservoir	0.000	2	654	0	6	1314.94	40,208	East Basin - Total
8	SCS Runoff	5.067	2	726	17,614	------	------	------	Offsite NW
9	Combine	13.45	2	724	43,858	3, 8	------	------	Total to West Basin
10	Reservoir	11.07	2	728	16,080	9	1316.26	10,179	West Basin - Total
11	Reservoir	5.330	2	728	5,369	3	1315.98	8,848	West Basin - SIte Only
12	Reservoir	0.000	2	730	0	2	1315.64	24,572	Small East Ba- Onsite
13	Reservoir	11.52	2	734	15,330	6	1316.58	34,362	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.007 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	16,873 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

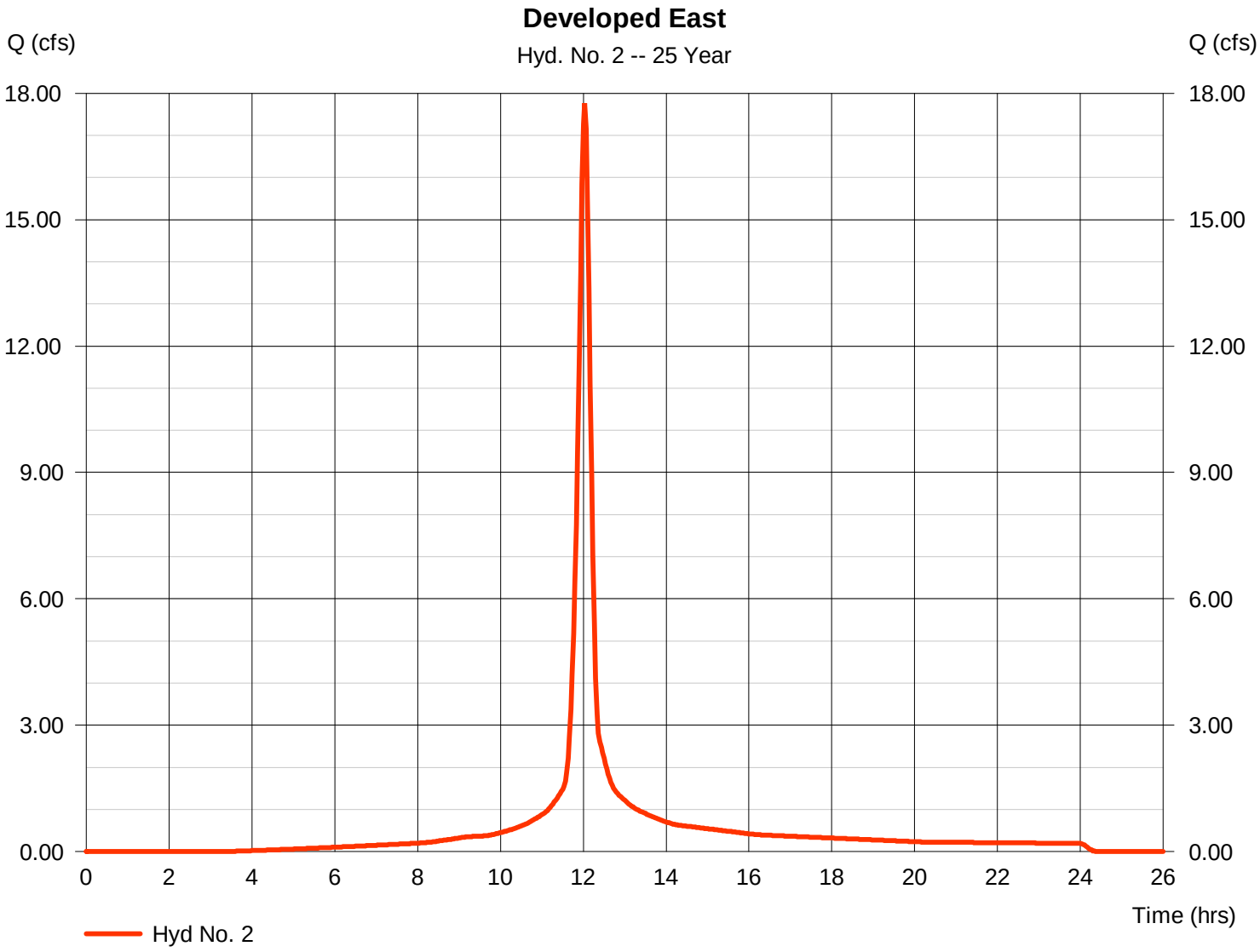


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	=	SCS Runoff	Peak discharge	=	17.77 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	52,487 cuft
Drainage area	=	3.000 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

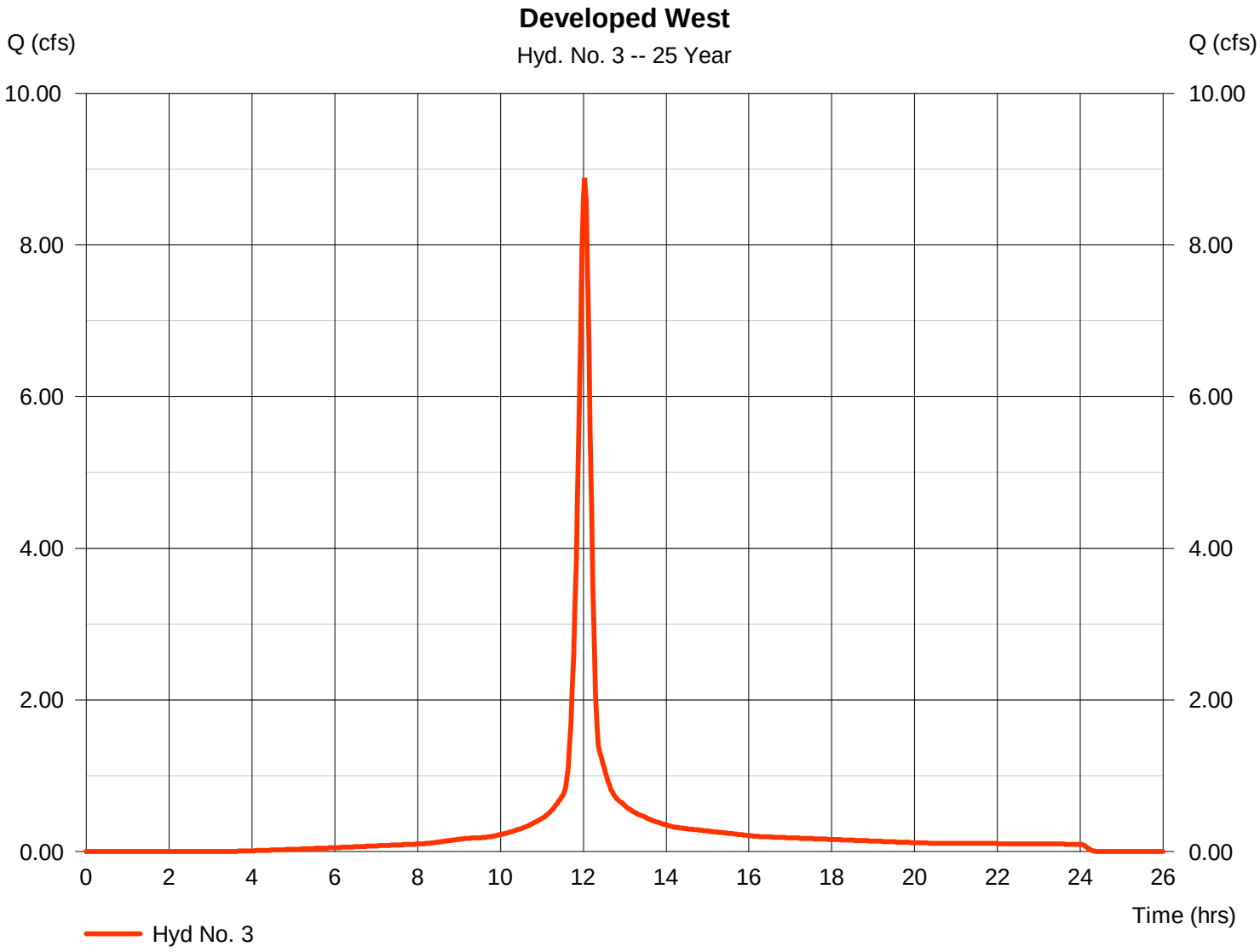


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.885 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	26,243 cuft
Drainage area	=	1.500 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

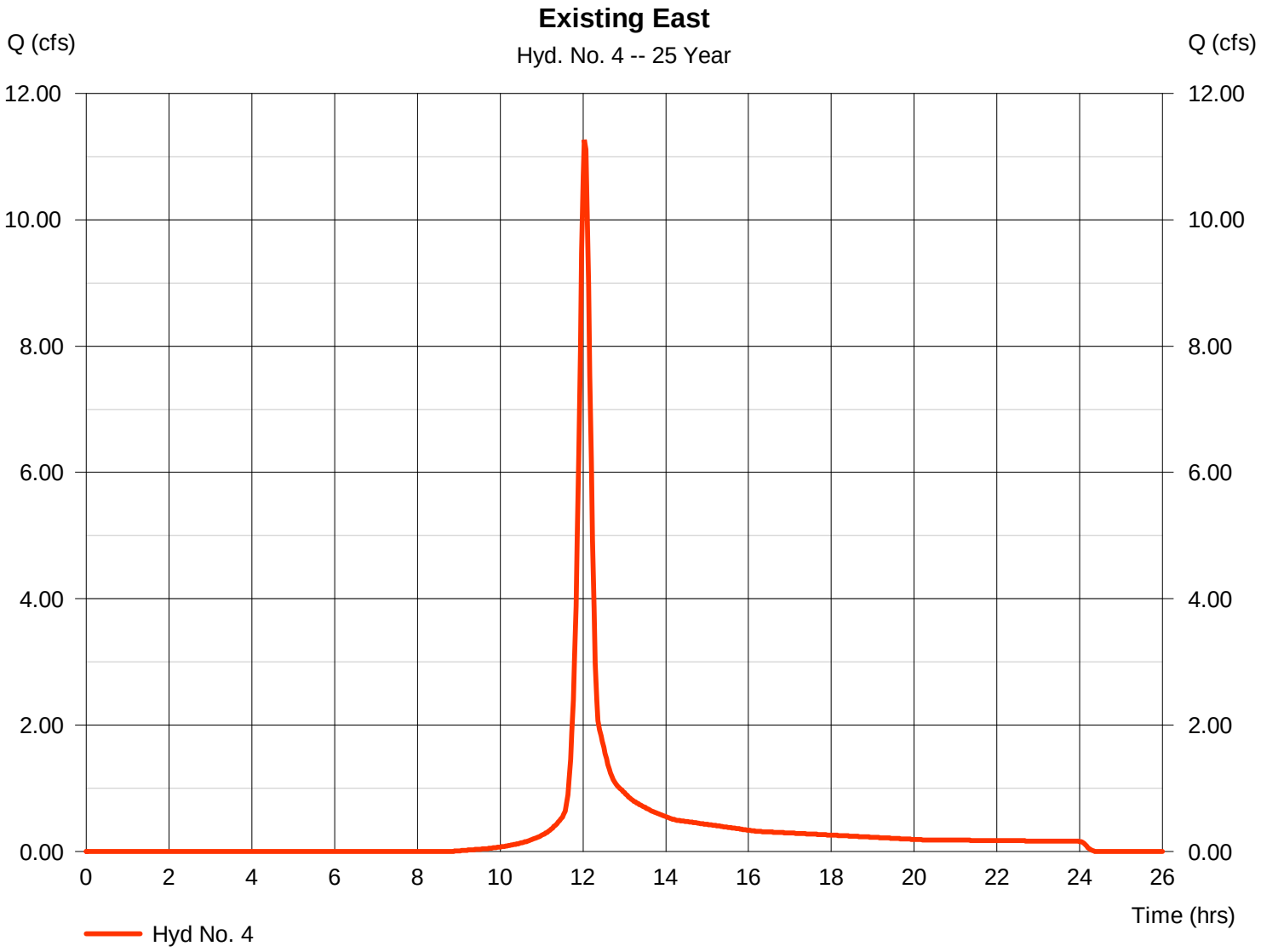


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.26 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	31,636 cuft
Drainage area	=	3.000 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

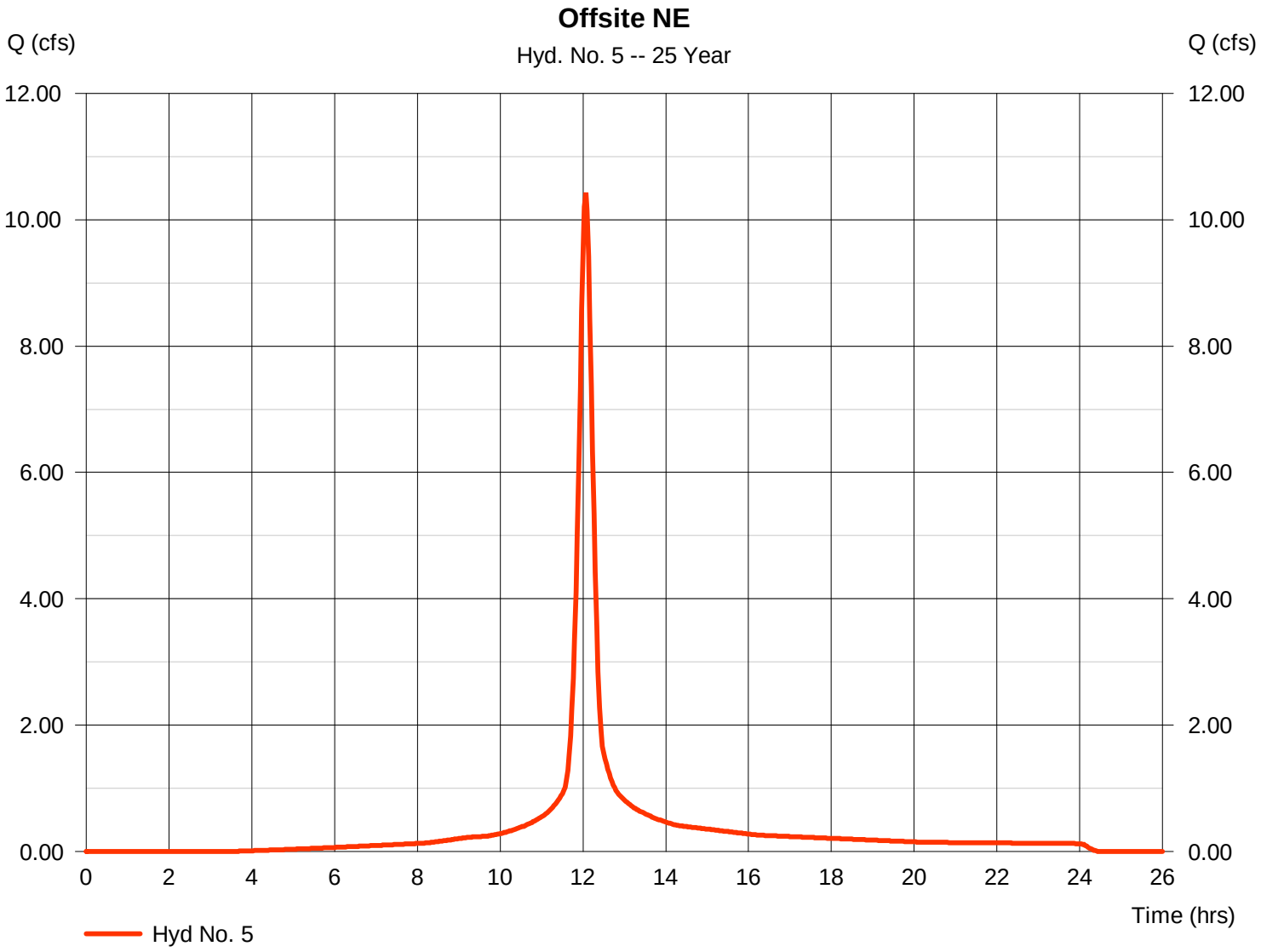


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	10.43 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	34,094 cuft
Drainage area	=	1.900 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

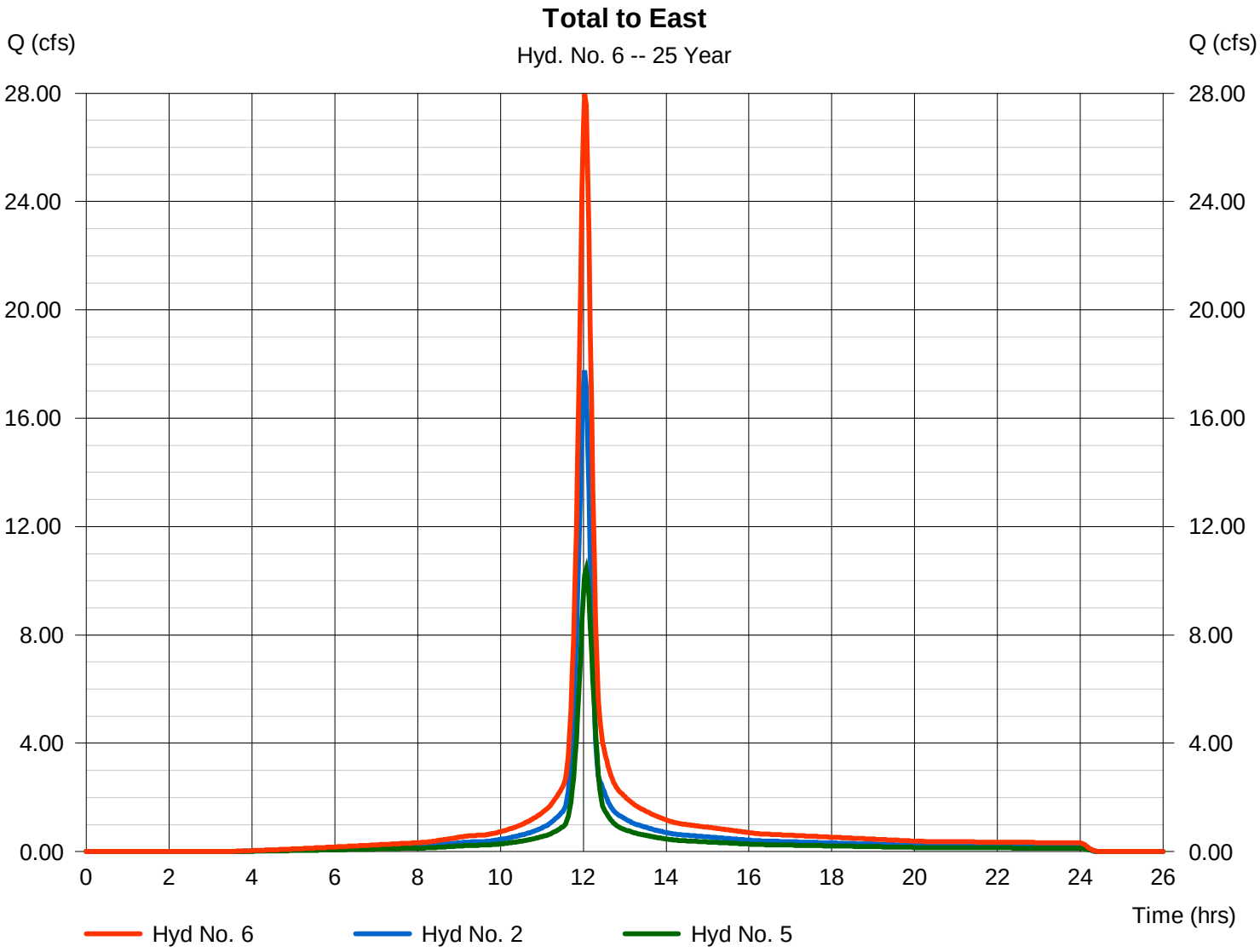


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 27.97 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 86,581 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



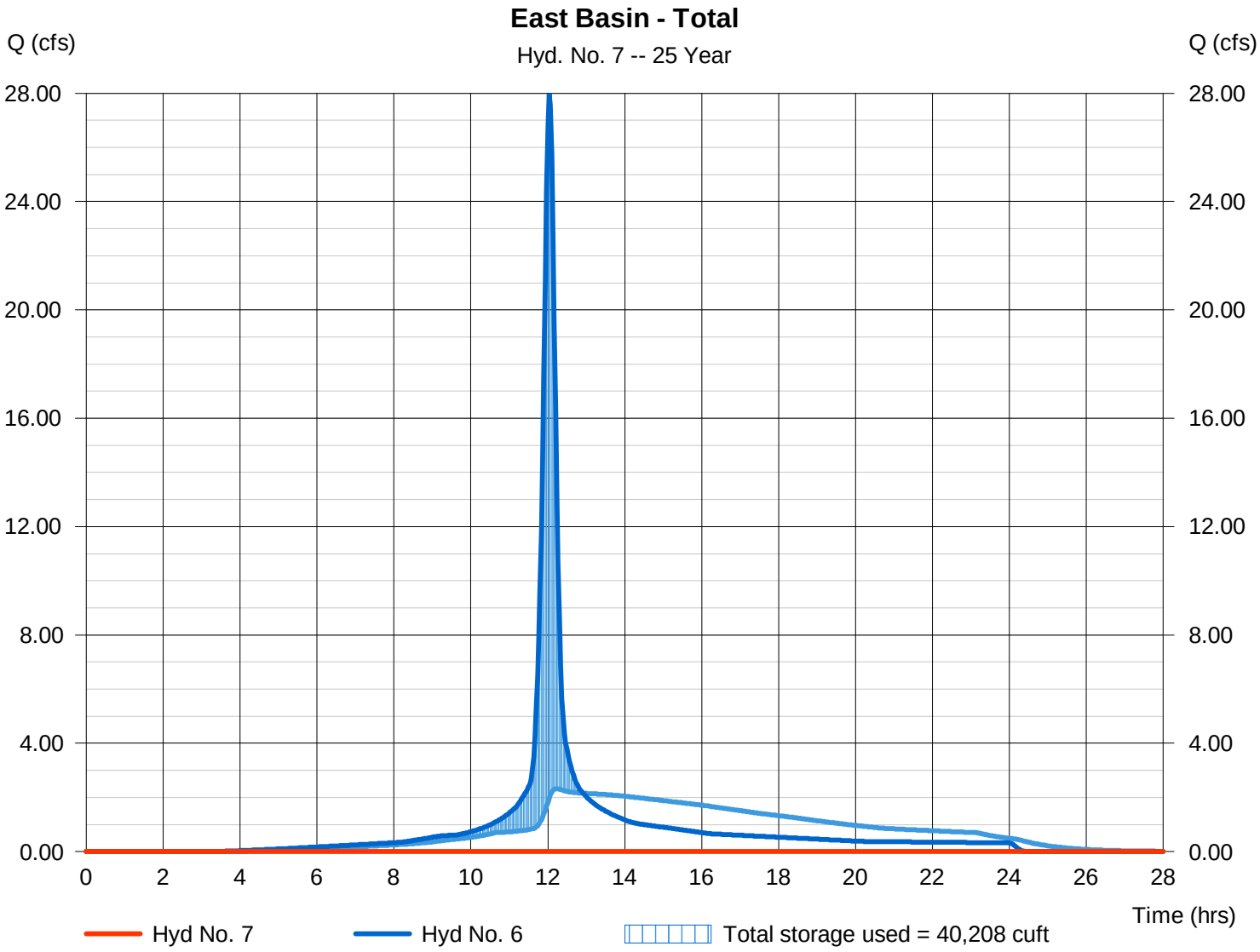
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 25 yrs	Time to peak	= 10.90 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1314.94 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 40,208 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

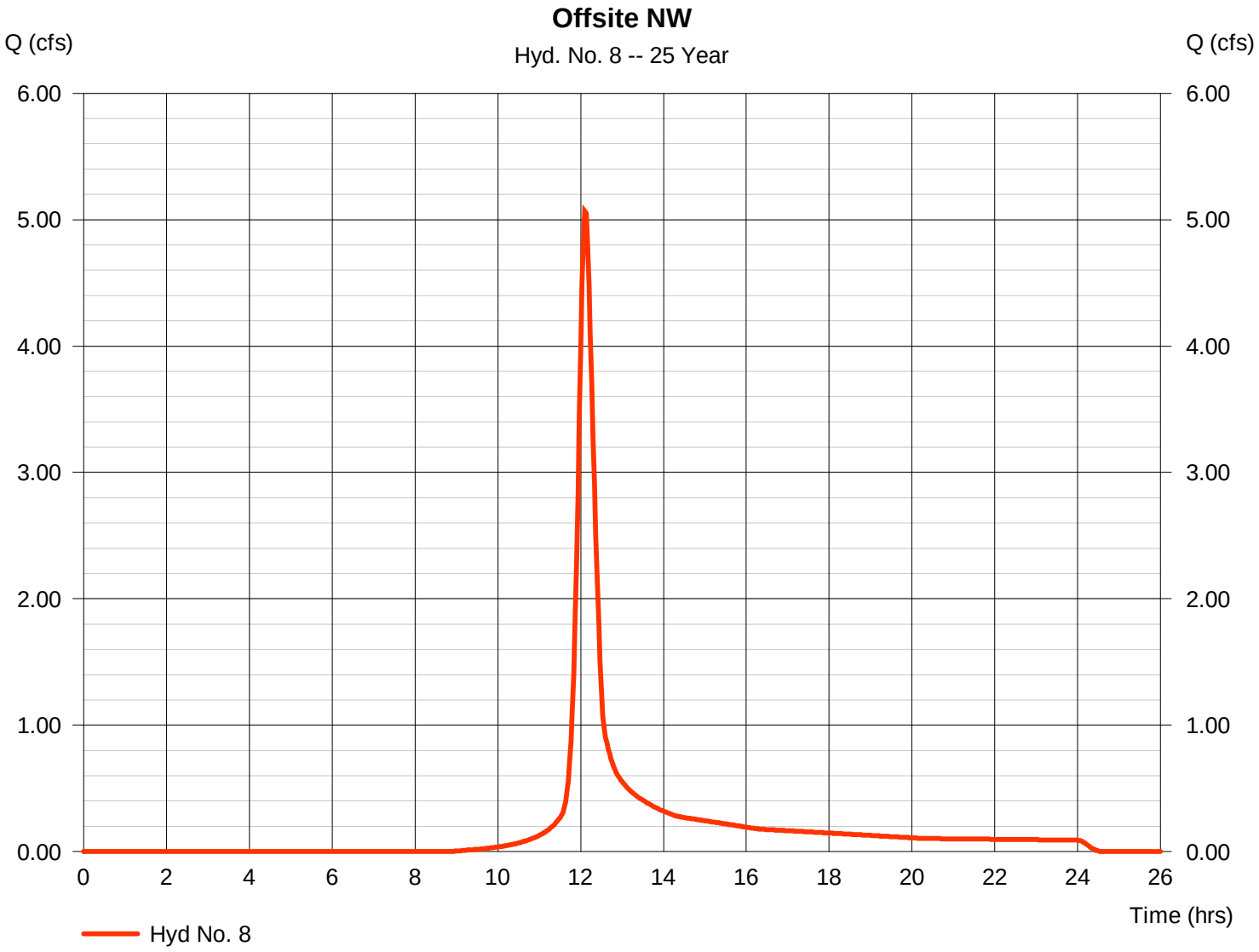


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.067 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	17,614 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	6.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

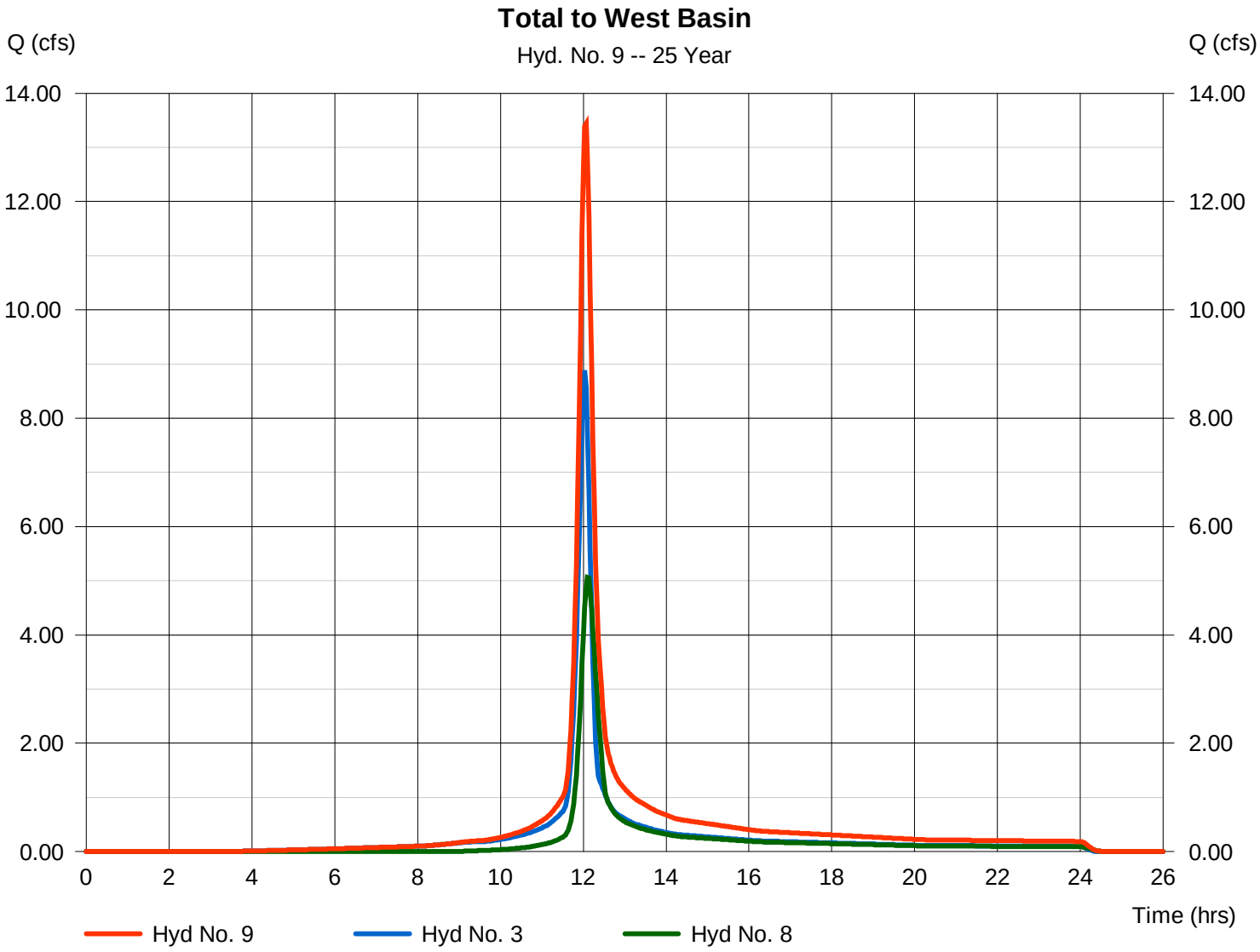


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	= Combine	Peak discharge	= 13.45 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 43,858 cuft
Inflow hyds.	= 3, 8	Contrib. drain. area	= 3.100 ac



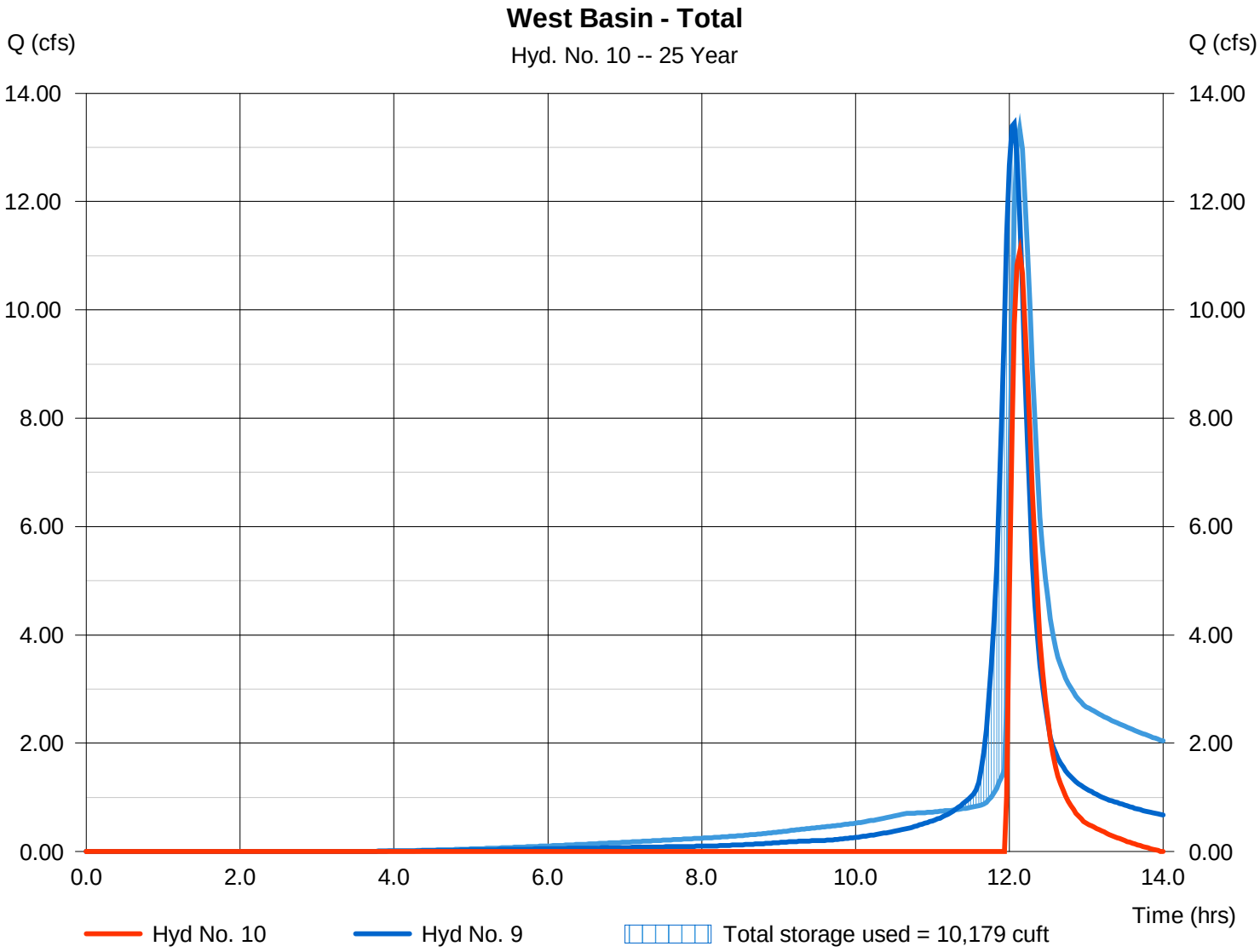
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 11.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 16,080 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1316.26 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 10,179 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



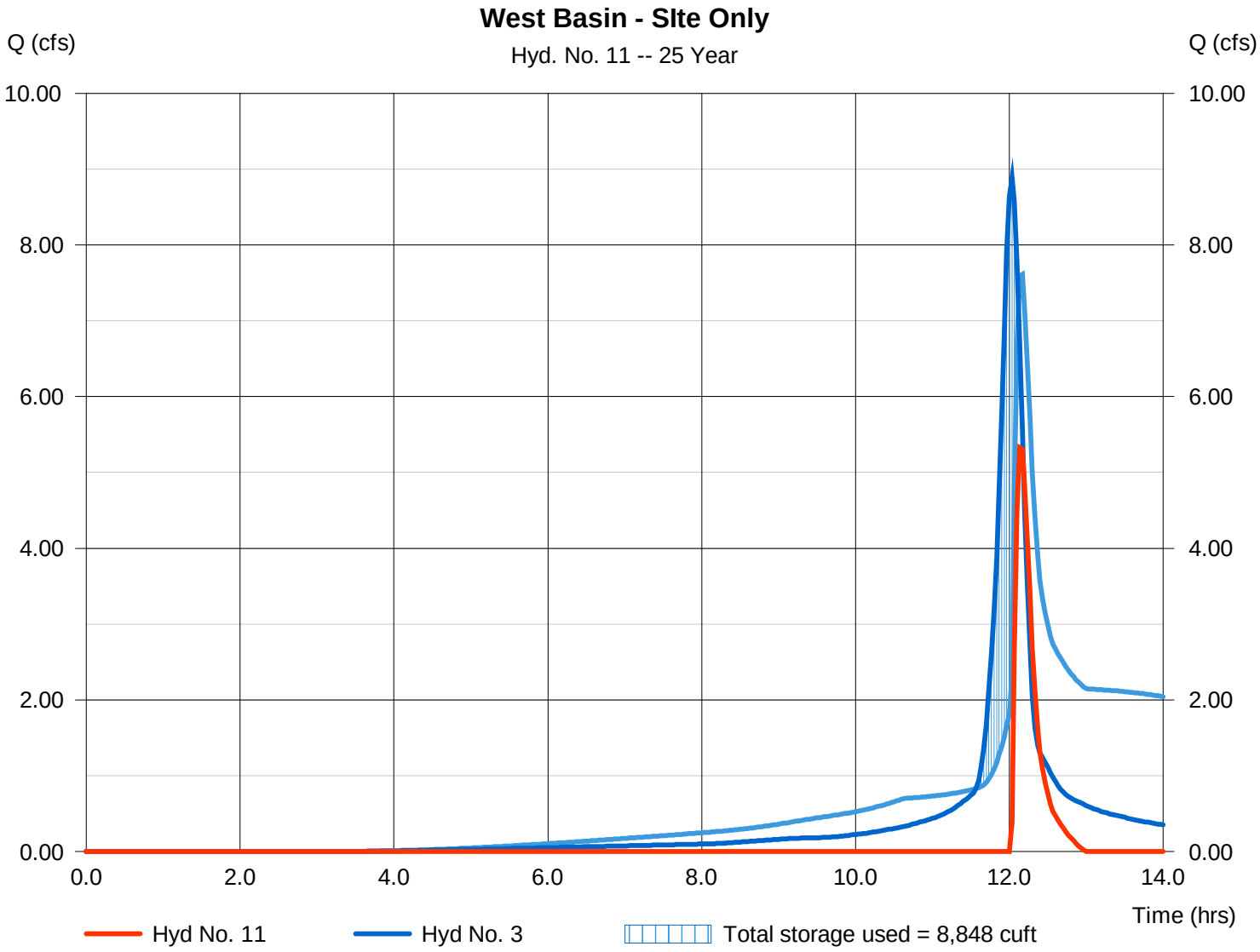
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 5.330 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 5,369 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1315.98 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 8,848 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



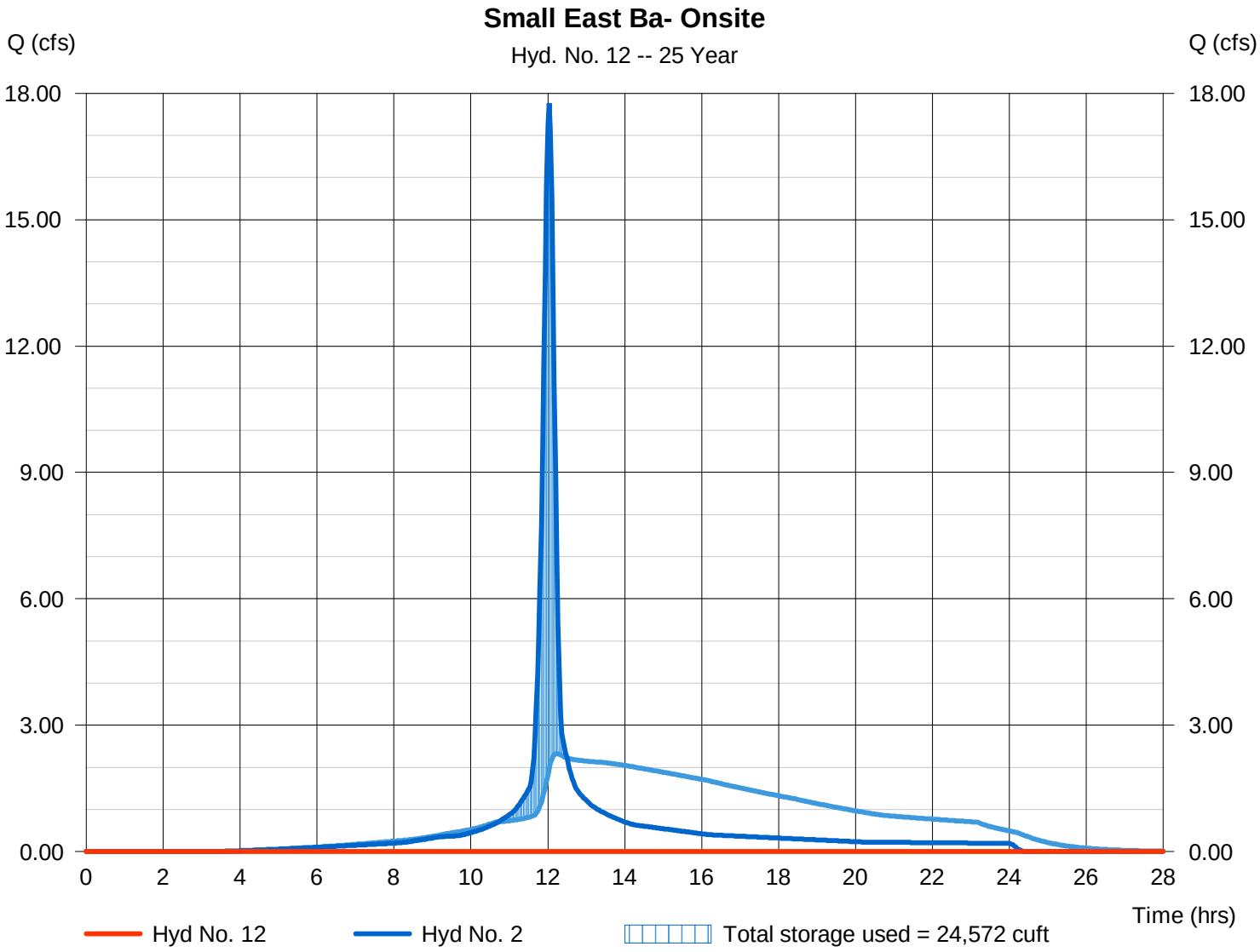
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	2 - Developed East	Max. Elevation	=	1315.64 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	24,572 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



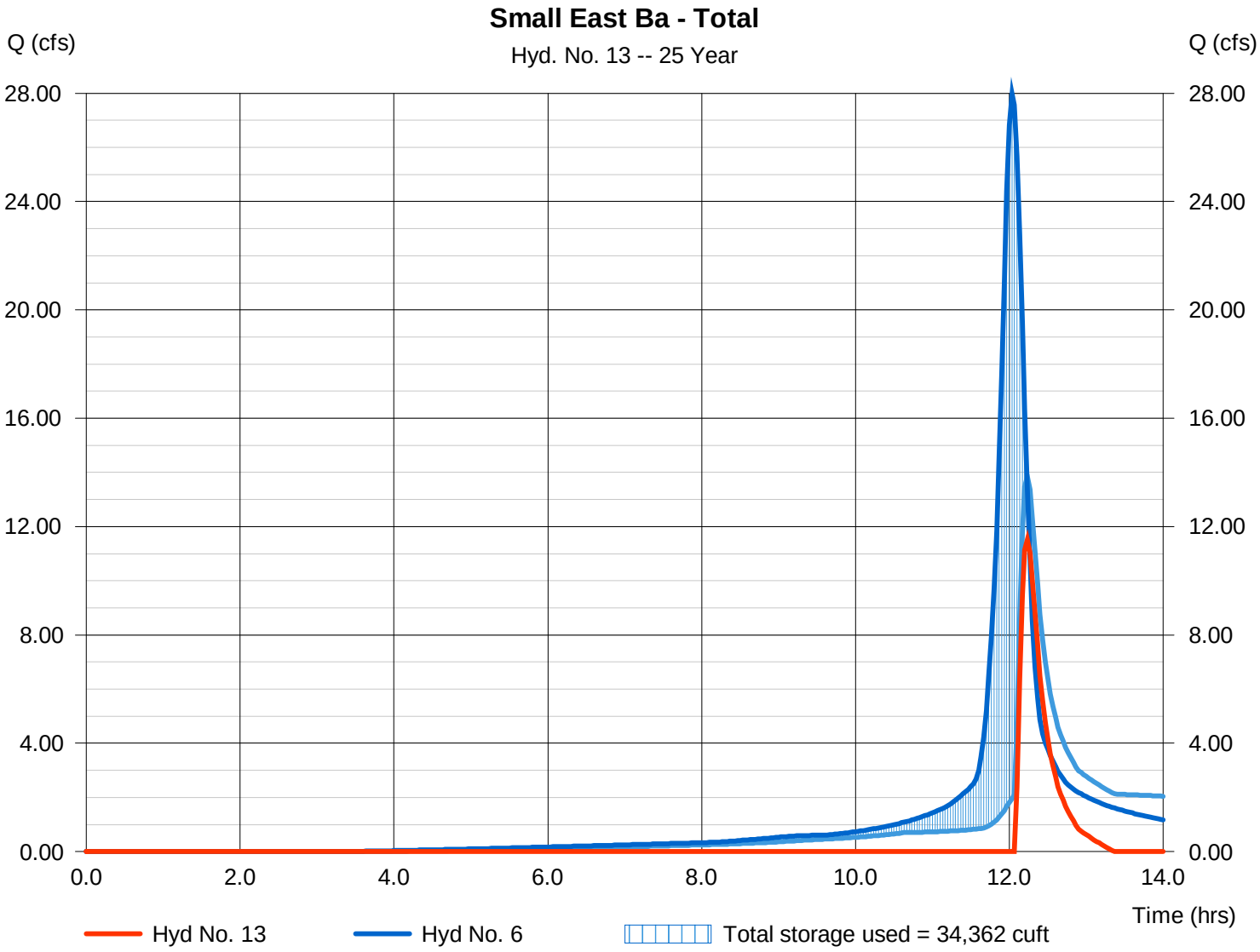
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	11.52 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.23 hrs
Time interval	=	2 min	Hyd. volume	=	15,330 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1316.58 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	34,362 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

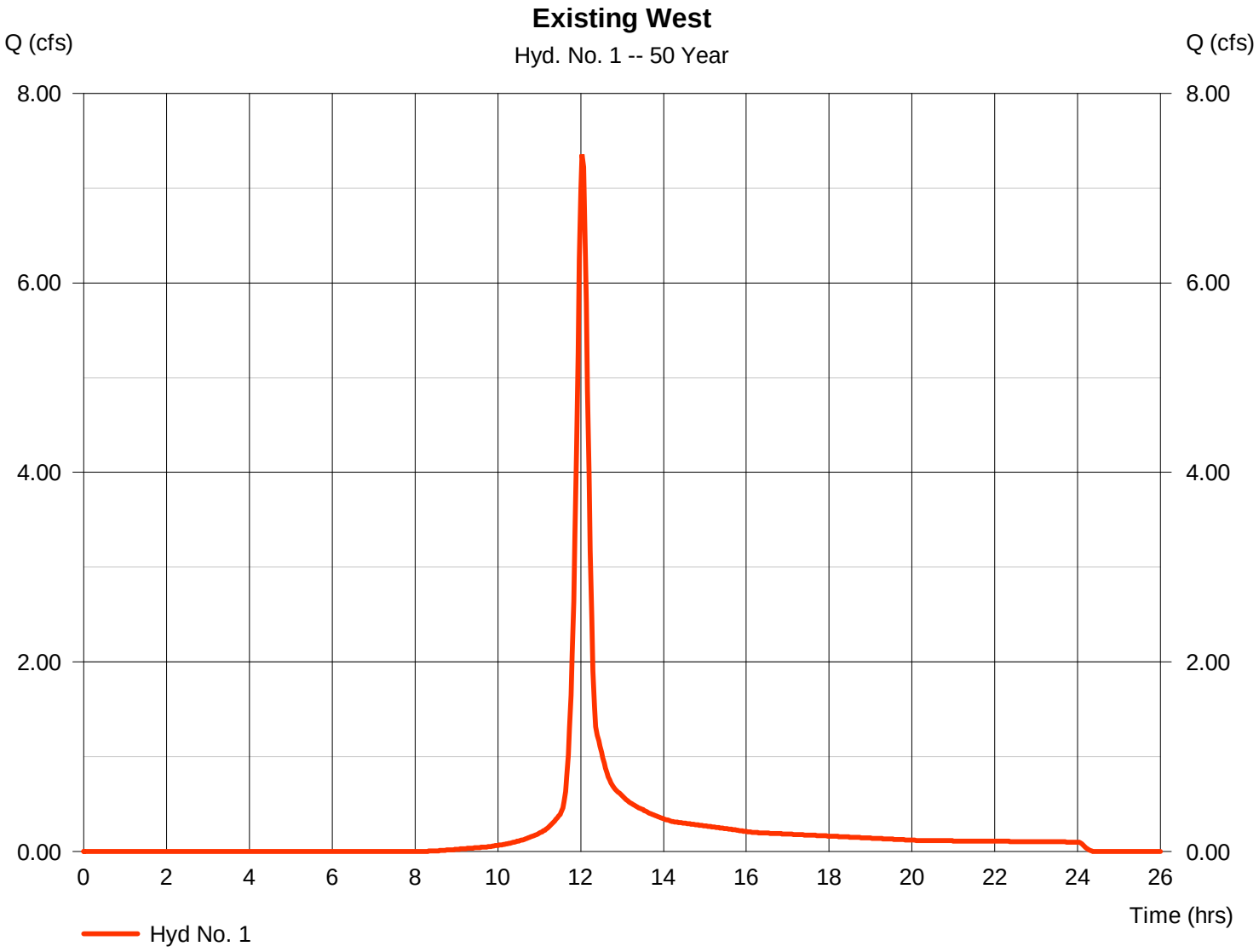
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	7.352	2	722	20,609	------	------	------	Existing West
2	SCS Runoff	20.41	2	722	60,788	------	------	------	Developed East
3	SCS Runoff	10.20	2	722	30,394	------	------	------	Developed West
4	SCS Runoff	13.79	2	722	38,642	------	------	------	Existing East
5	SCS Runoff	11.98	2	724	39,486	------	------	------	Offsite NE
6	Combine	32.14	2	722	100,275	2, 5	------	------	Total to East
7	Reservoir	0.000	2	742	0	6	1315.35	47,123	East Basin - Total
8	SCS Runoff	6.218	2	726	21,515	------	------	------	Offsite NW
9	Combine	15.84	2	724	51,909	3, 8	------	------	Total to West Basin
10	Reservoir	13.65	2	726	21,485	9	1316.38	10,709	West Basin - Total
11	Reservoir	7.151	2	728	7,743	3	1316.07	9,285	West Basin - SIte Only
12	Reservoir	0.434	2	750	572	2	1316.05	28,483	Small East Ba- Onsite
13	Reservoir	17.58	2	732	23,664	6	1316.78	36,470	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.352 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	20,609 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	6.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

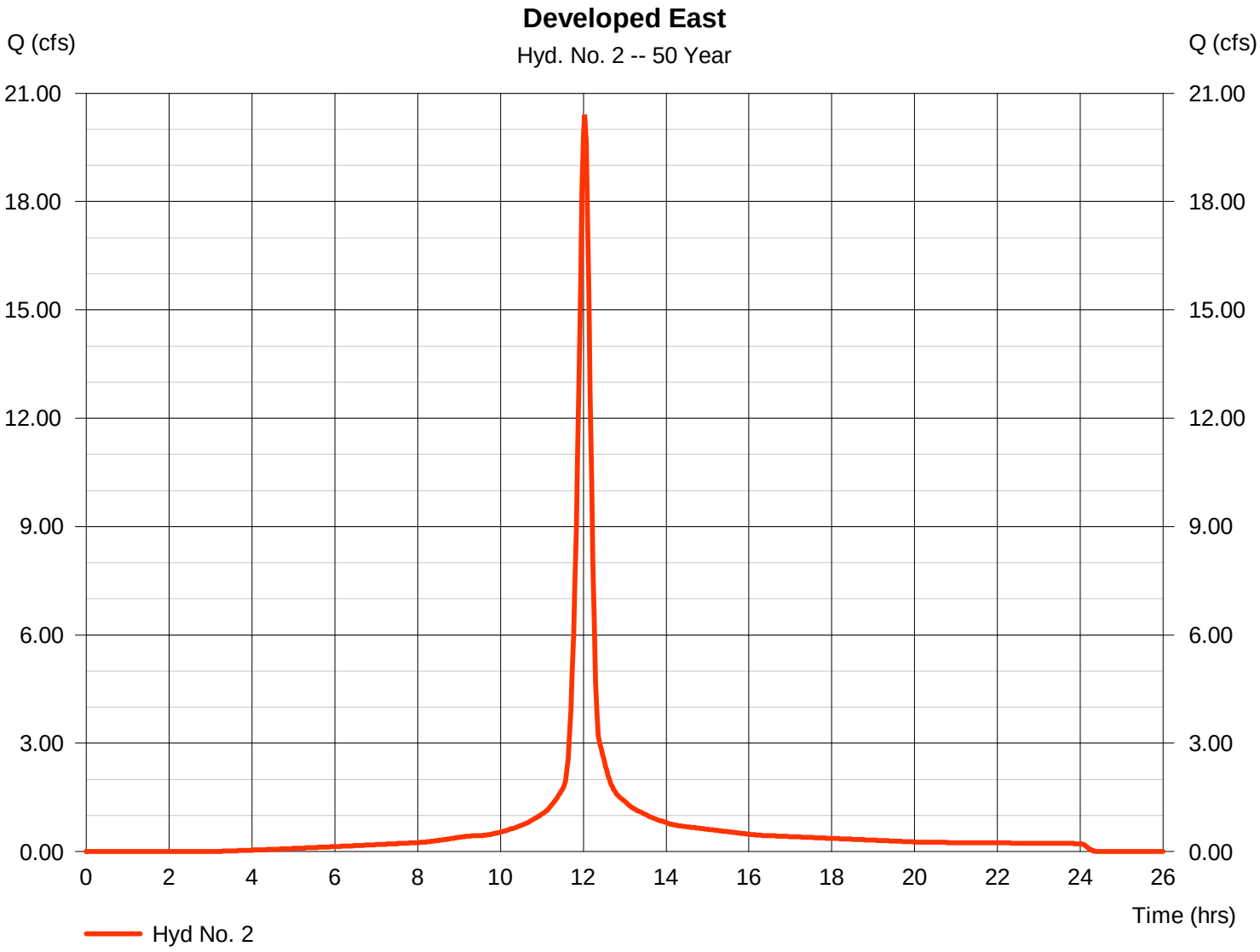


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	= SCS Runoff	Peak discharge	= 20.41 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 60,788 cuft
Drainage area	= 3.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

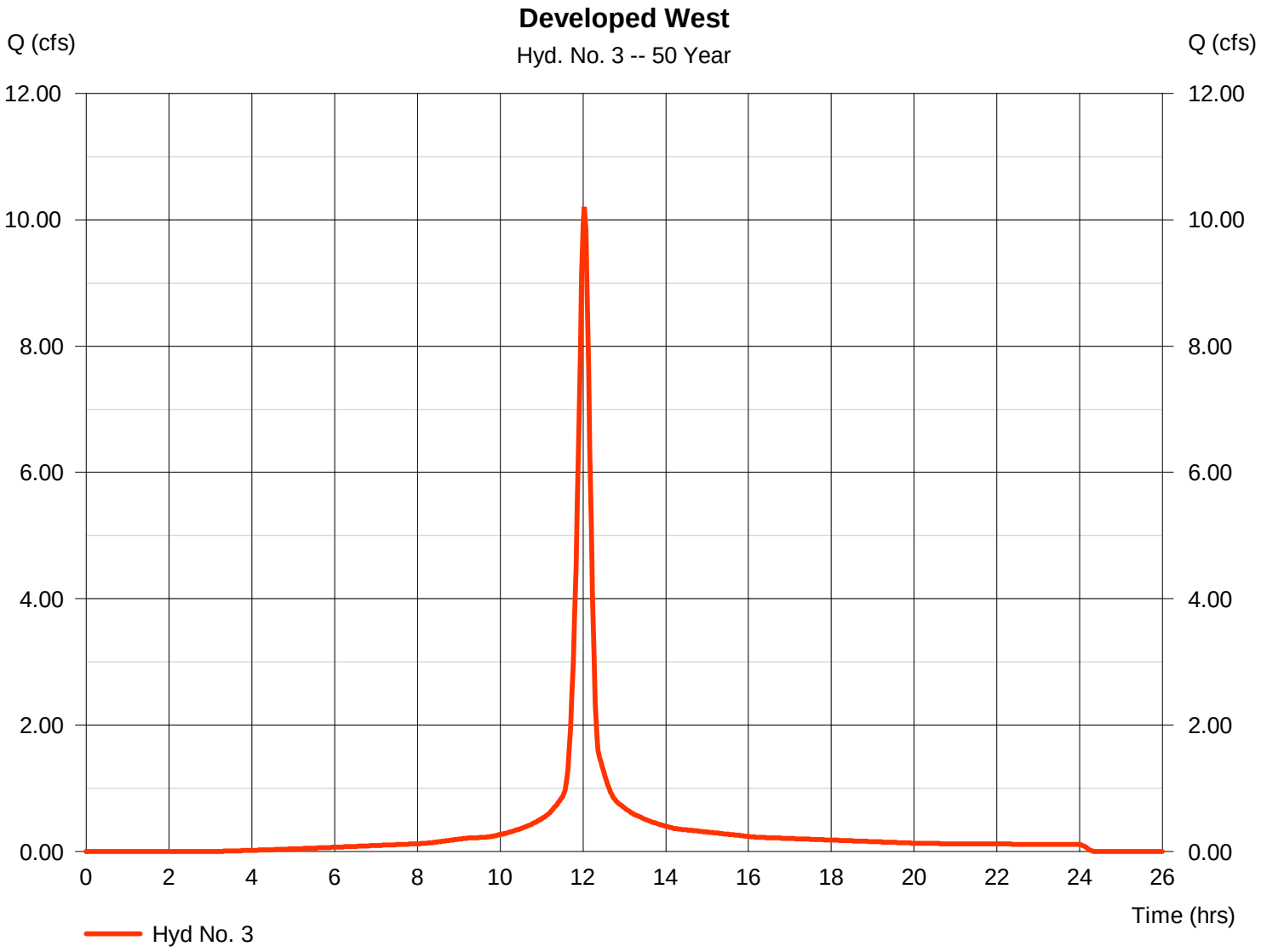


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	= SCS Runoff	Peak discharge	= 10.20 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 30,394 cuft
Drainage area	= 1.500 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

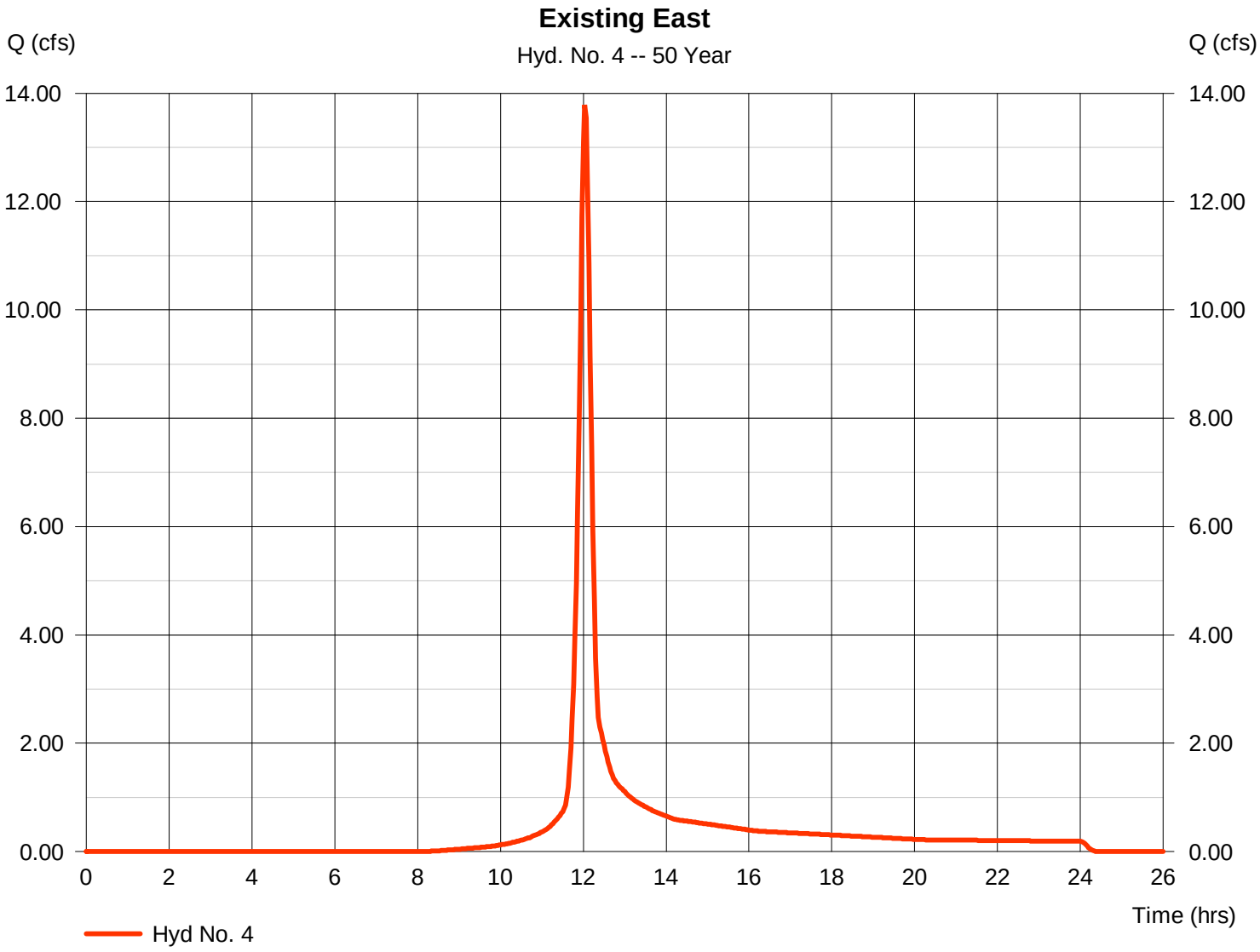


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	= SCS Runoff	Peak discharge	= 13.79 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 38,642 cuft
Drainage area	= 3.000 ac	Curve number	= 71
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 6.90 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

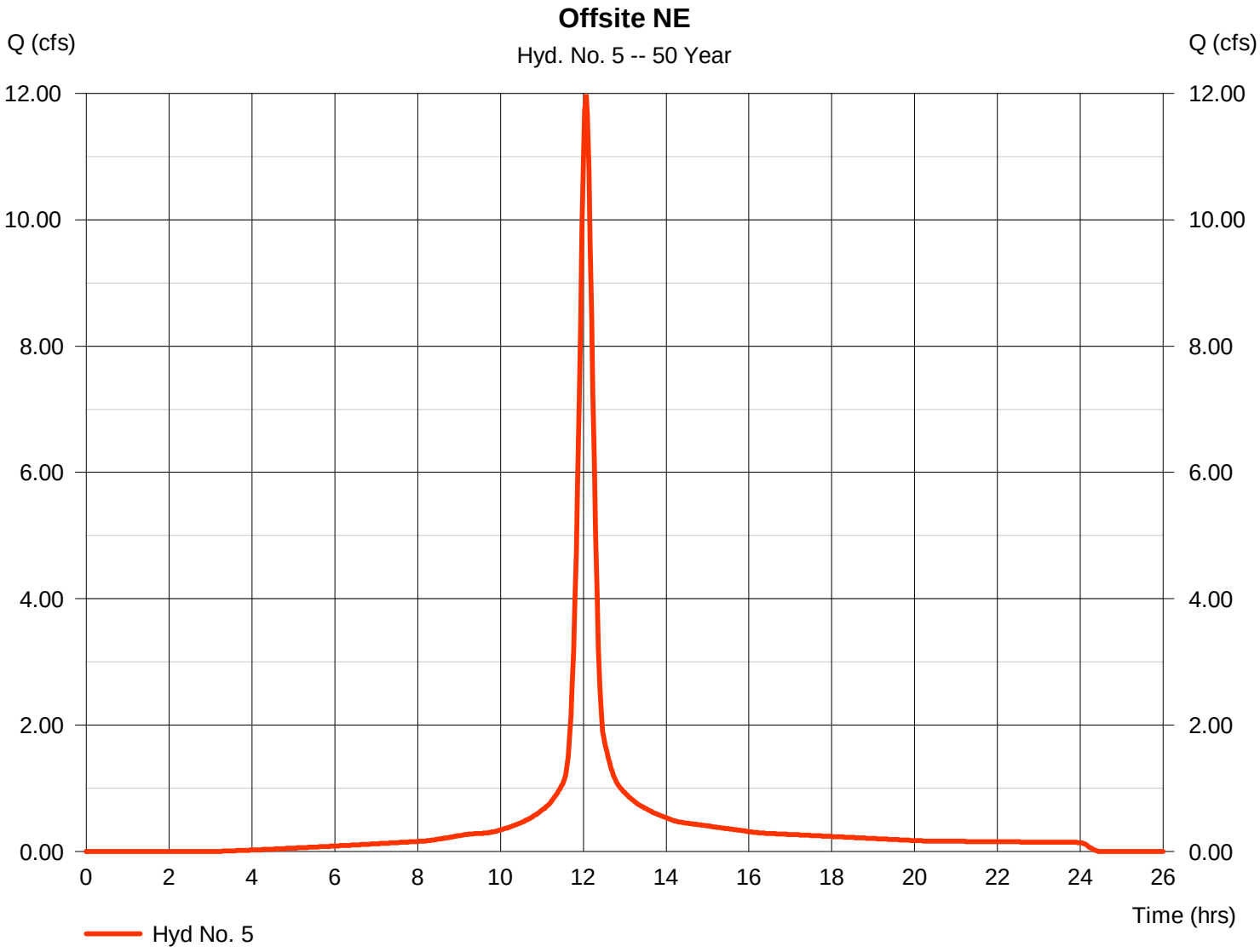


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.98 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	39,486 cuft
Drainage area	=	1.900 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	20.00 min
Total precip.	=	6.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

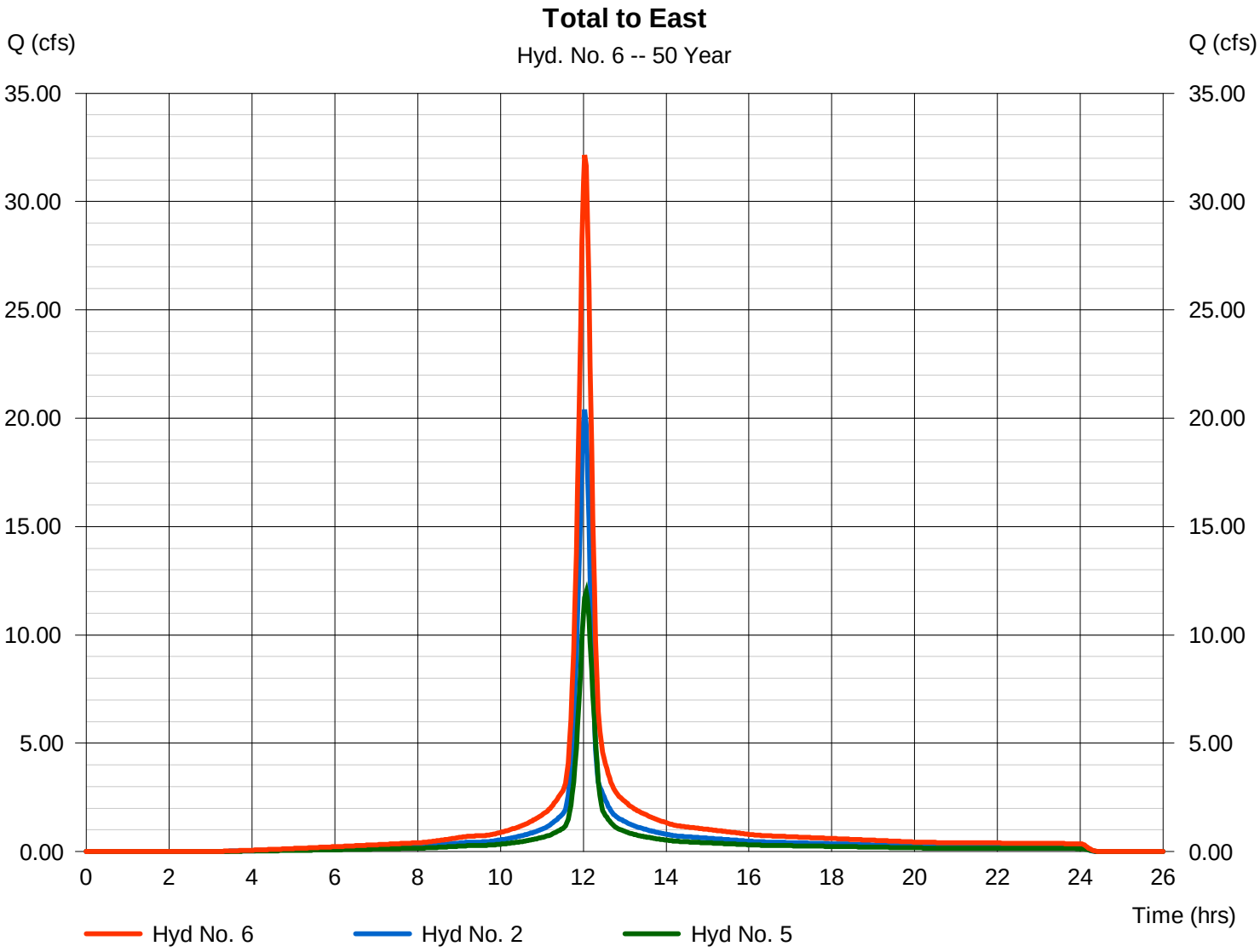


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 32.14 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 100,275 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



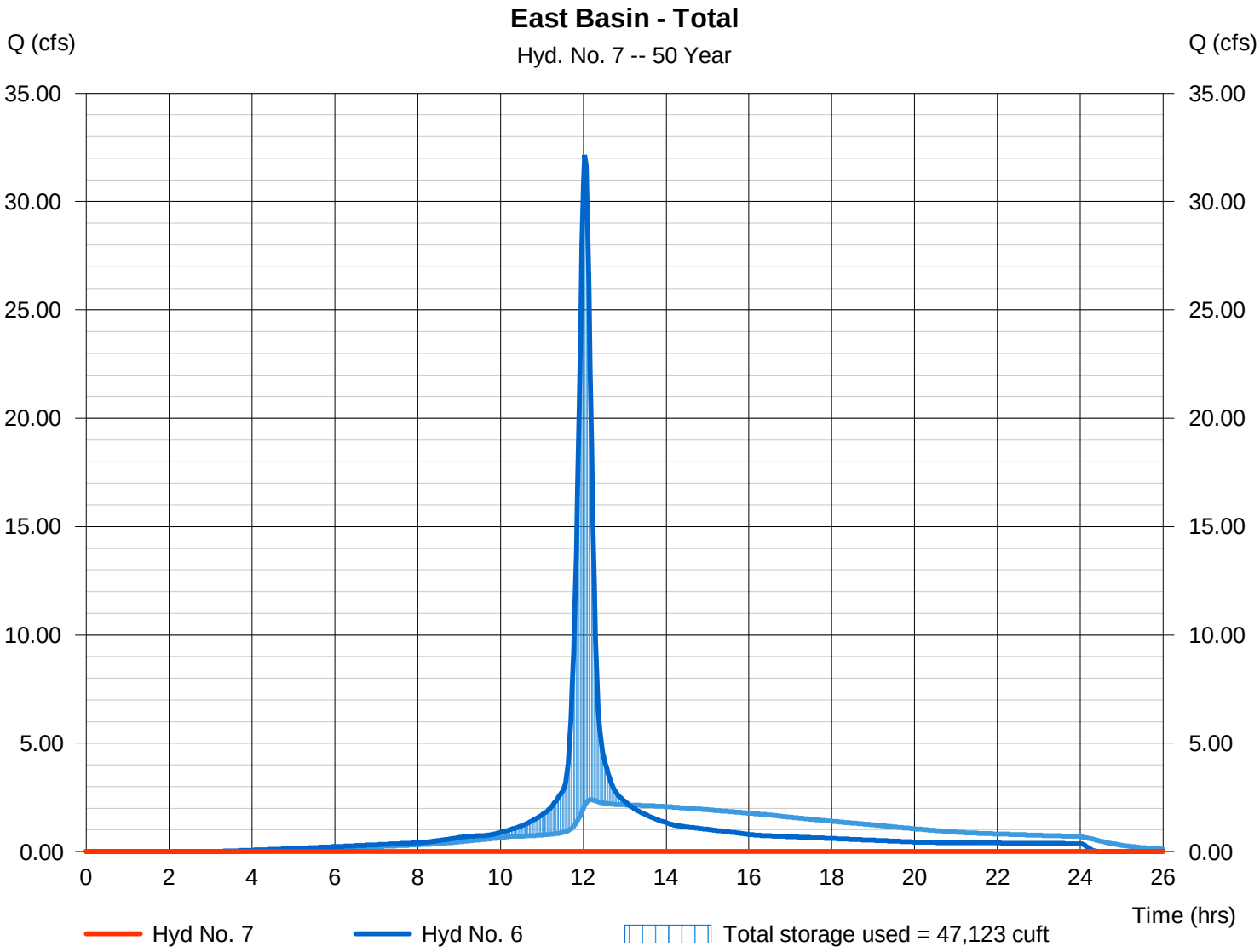
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1315.35 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 47,123 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

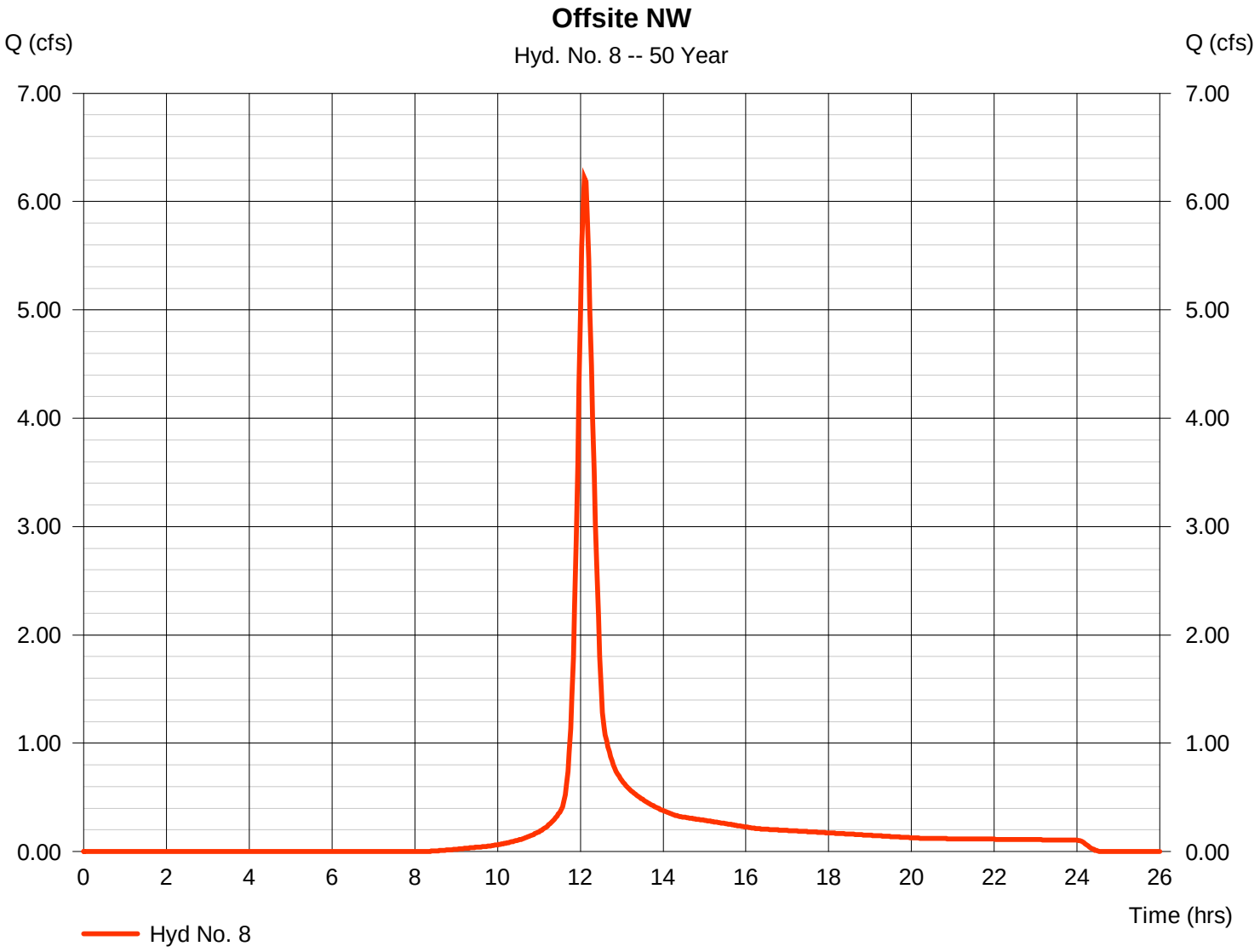


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.218 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	21,515 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	6.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

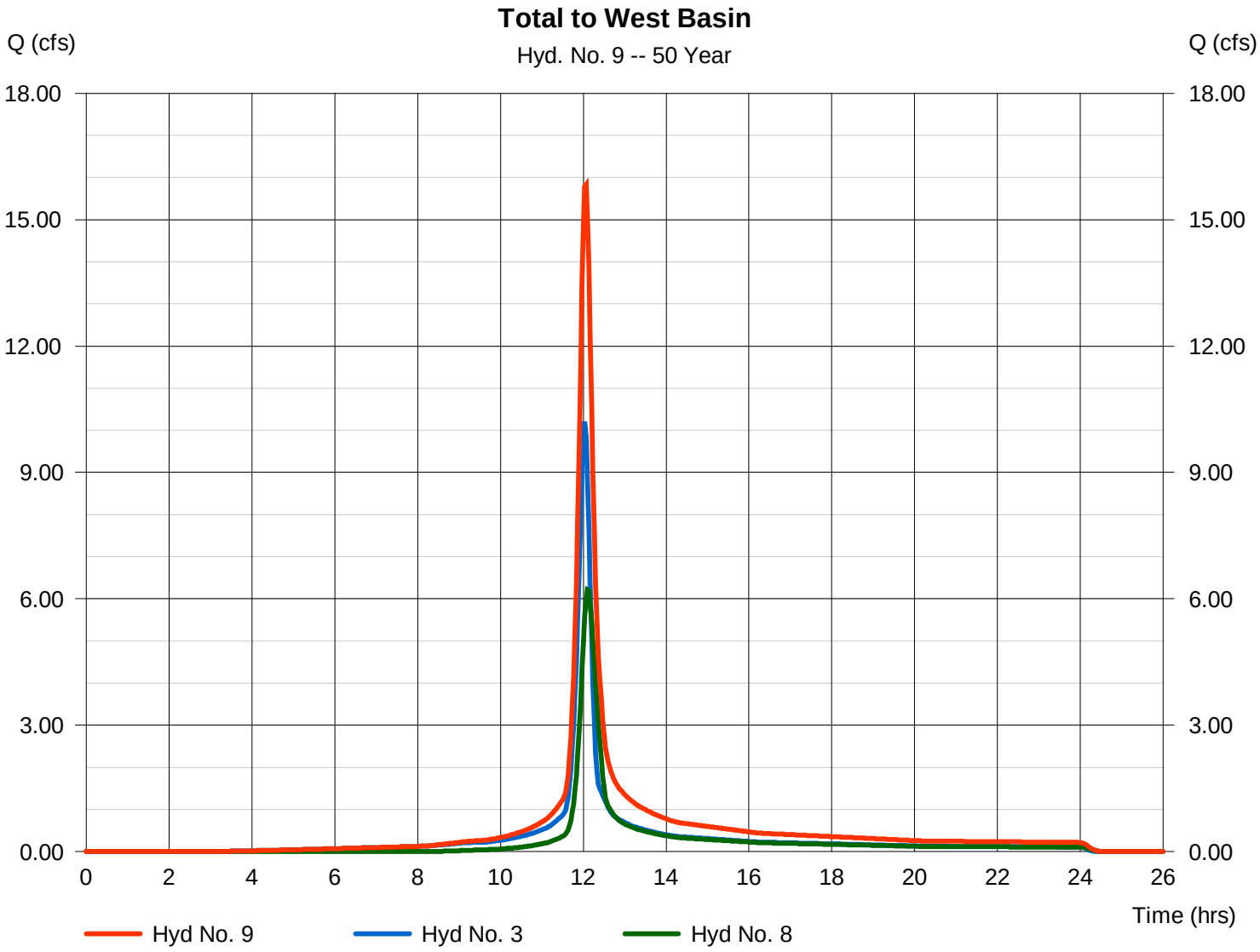


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	=	Combine	Peak discharge	=	15.84 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.07 hrs
Time interval	=	2 min	Hyd. volume	=	51,909 cuft
Inflow hyds.	=	3, 8	Contrib. drain. area	=	3.100 ac



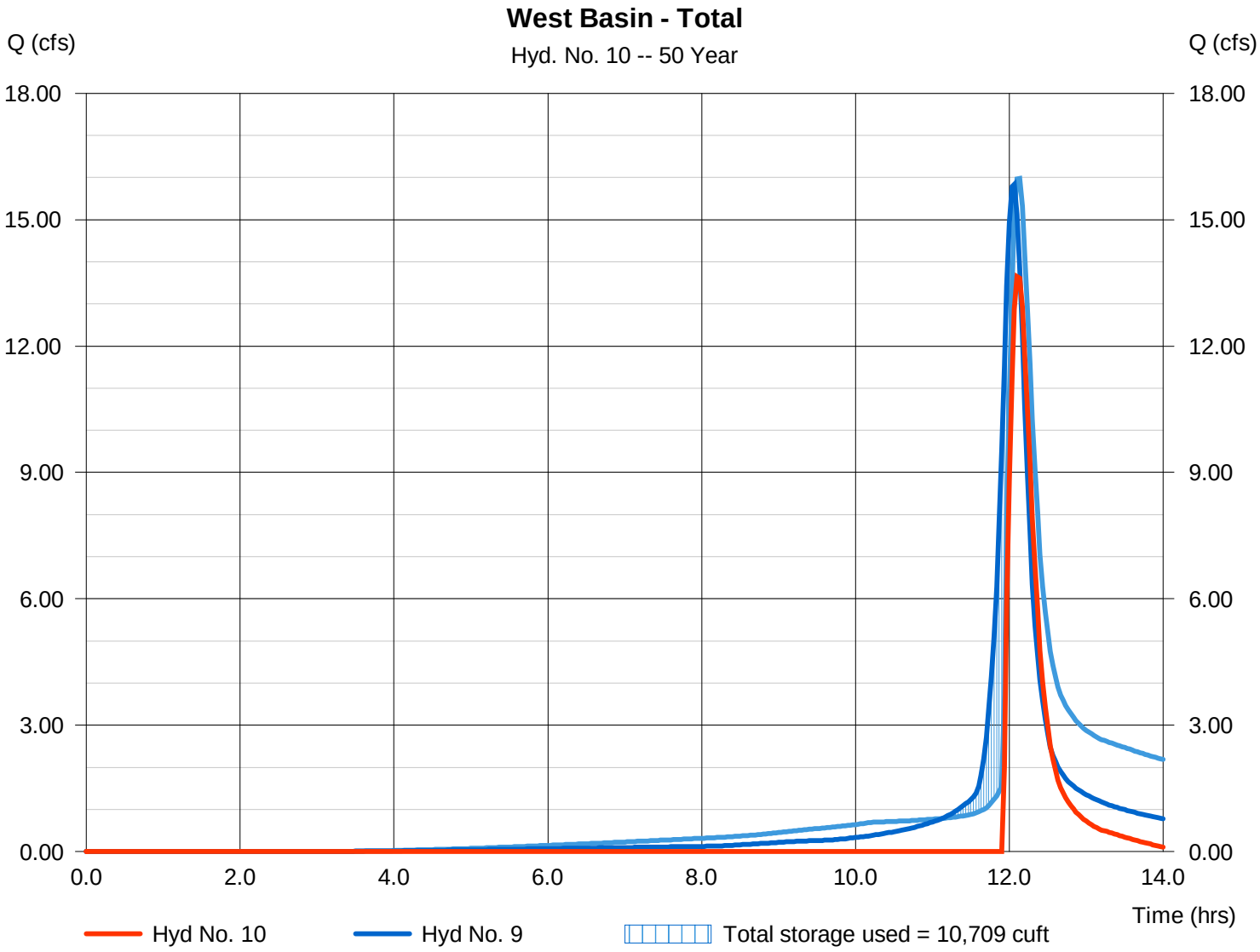
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 13.65 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 21,485 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1316.38 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 10,709 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



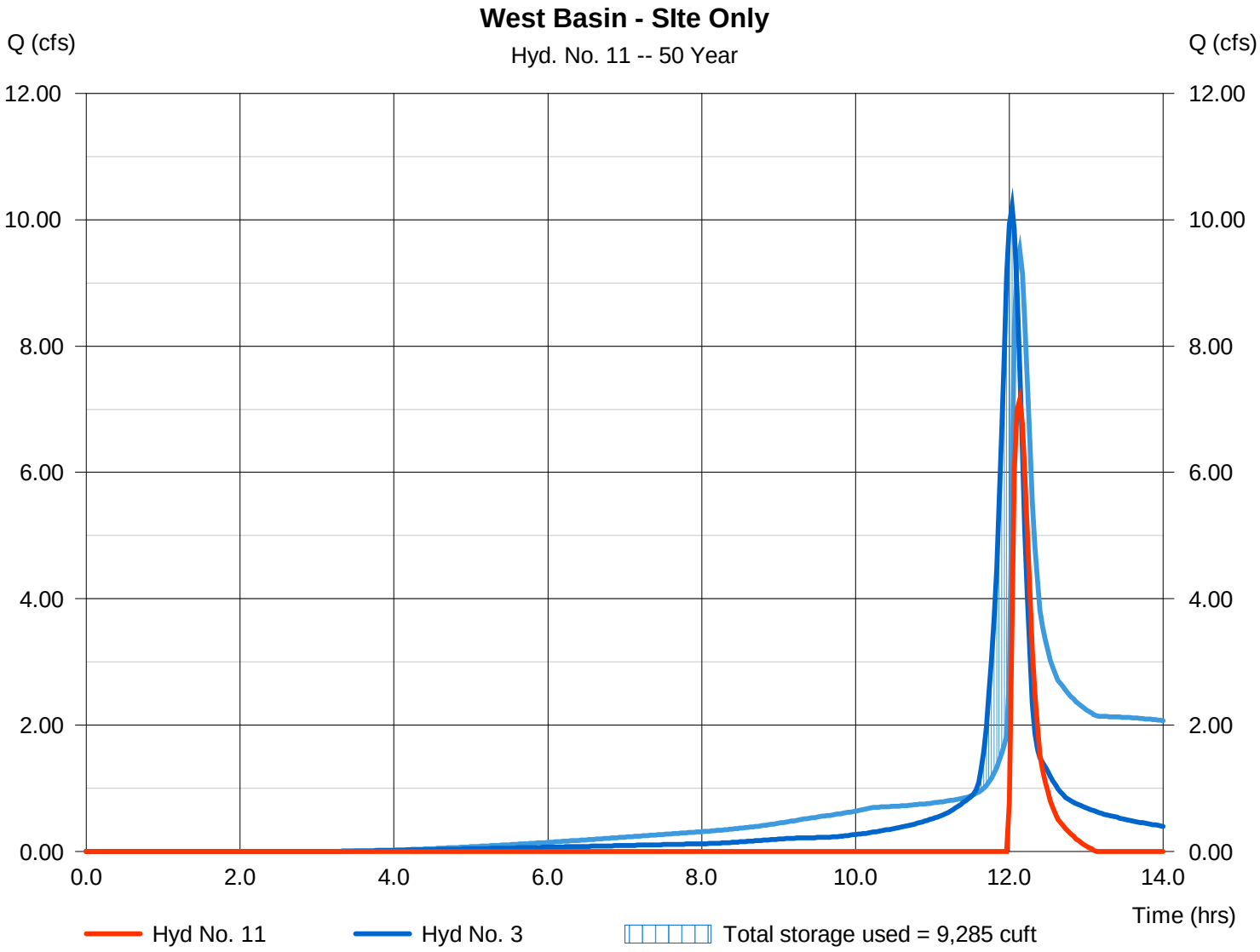
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 7.151 cfs
Storm frequency	= 50 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 7,743 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1316.07 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 9,285 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



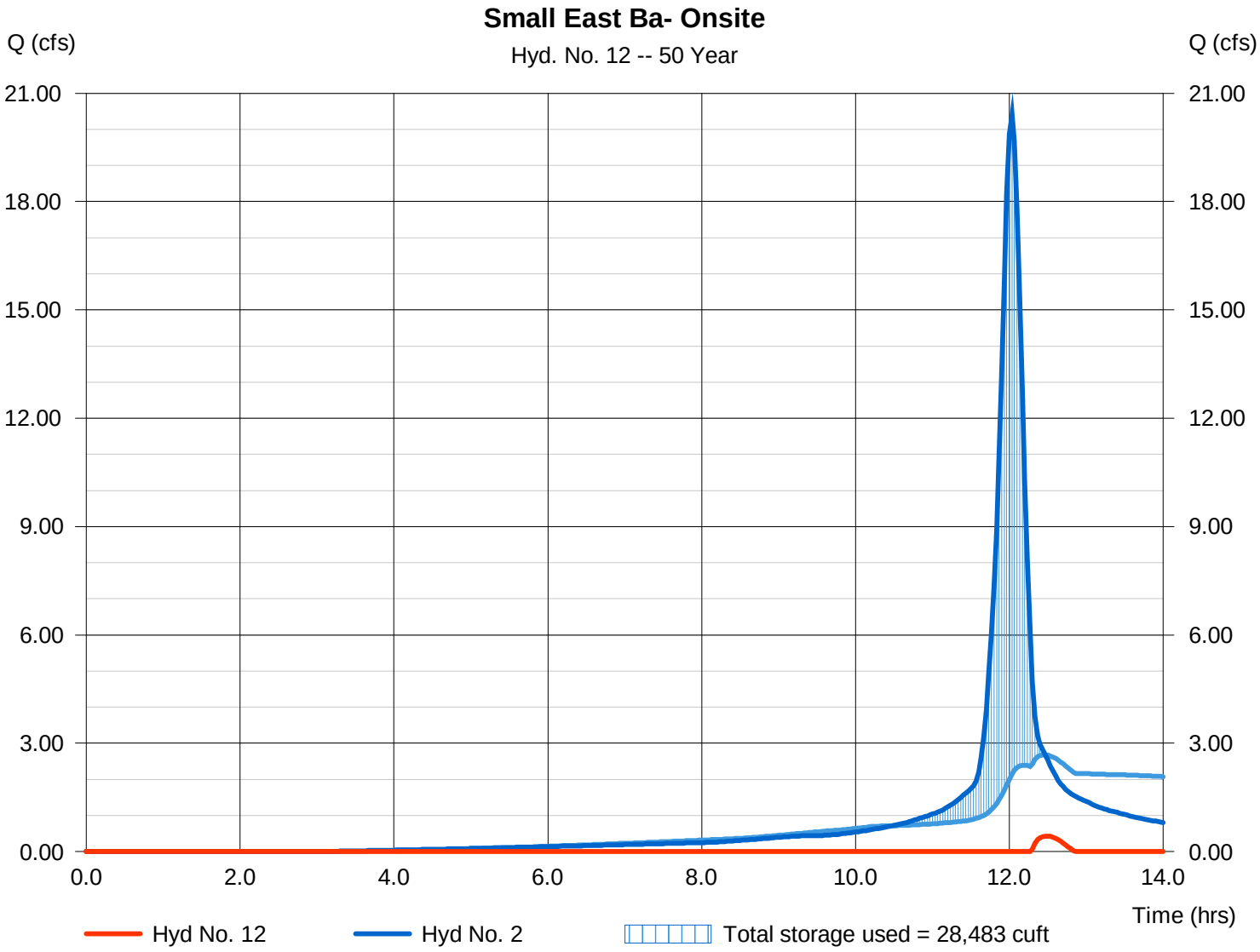
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	=	Reservoir	Peak discharge	=	0.434 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.50 hrs
Time interval	=	2 min	Hyd. volume	=	572 cuft
Inflow hyd. No.	=	2 - Developed East	Max. Elevation	=	1316.05 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	28,483 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



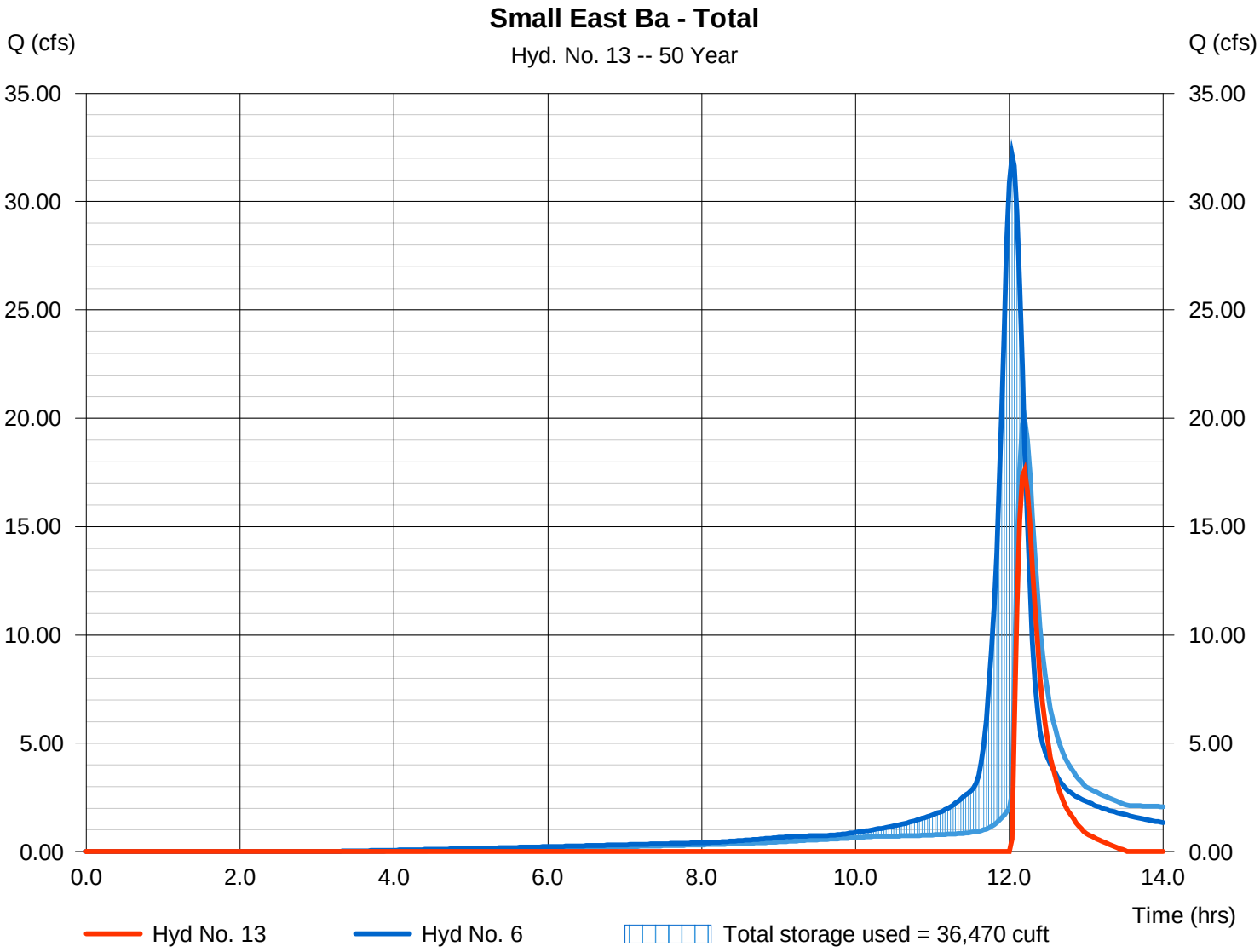
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	17.58 cfs
Storm frequency	=	50 yrs	Time to peak	=	12.20 hrs
Time interval	=	2 min	Hyd. volume	=	23,664 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1316.78 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	36,470 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

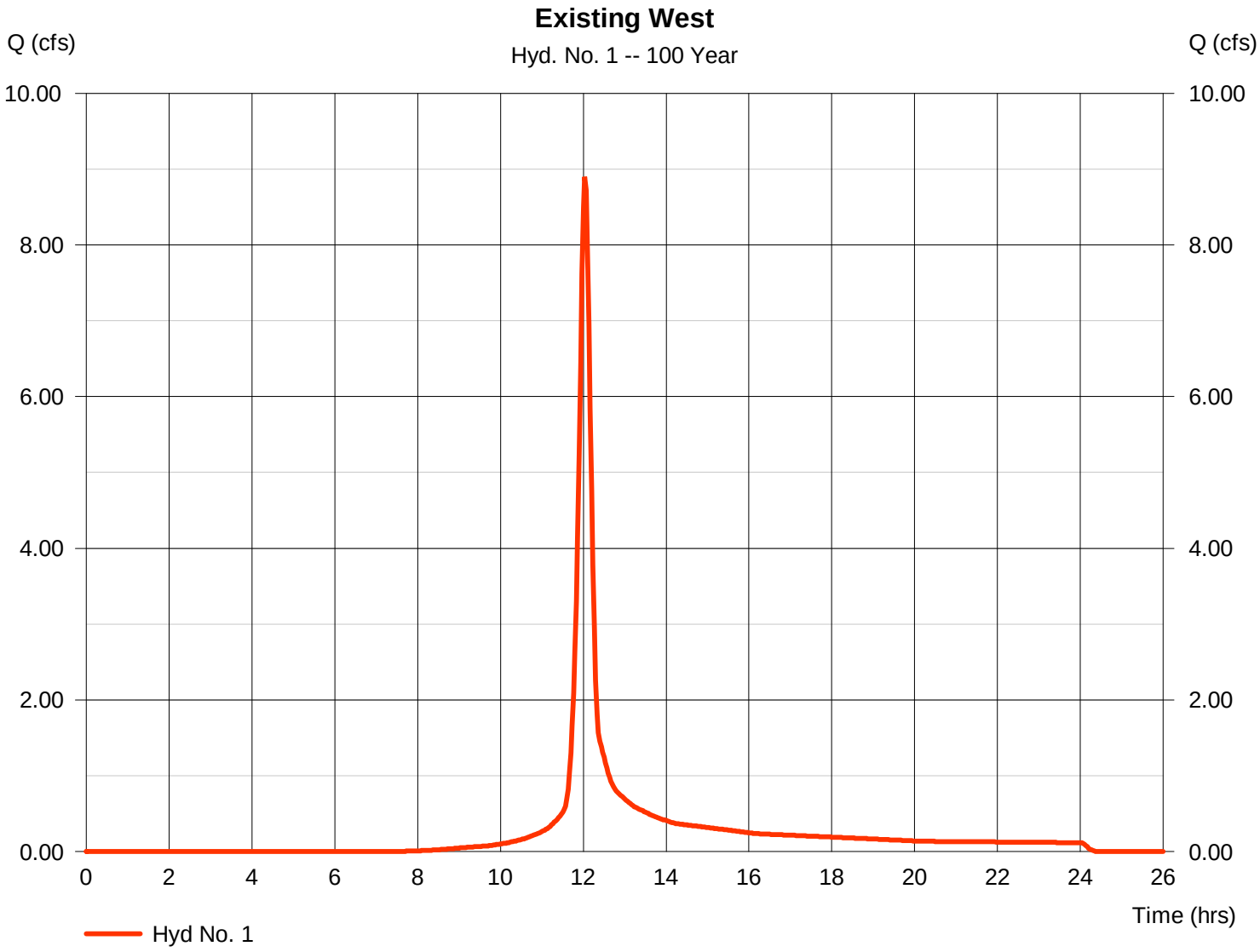
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.898	2	722	24,950	------	------	------	Existing West
2	SCS Runoff	23.36	2	722	70,170	------	------	------	Developed East
3	SCS Runoff	11.68	2	722	35,085	------	------	------	Developed West
4	SCS Runoff	16.68	2	722	46,782	------	------	------	Existing East
5	SCS Runoff	13.72	2	724	45,581	------	------	------	Offsite NE
6	Combine	36.81	2	722	115,751	2, 5	------	------	Total to East
7	Reservoir	0.000	2	756	0	6	1315.81	55,019	East Basin - Total
8	SCS Runoff	7.543	2	726	26,047	------	------	------	Offsite NW
9	Combine	18.55	2	724	61,132	3, 8	------	------	Total to West Basin
10	Reservoir	16.54	2	726	27,887	9	1316.50	11,267	West Basin - Total
11	Reservoir	9.008	2	726	10,503	3	1316.17	9,724	West Basin - SIte Only
12	Reservoir	4.006	2	736	5,330	2	1316.29	31,085	Small East Ba- Onsite
13	Reservoir	24.24	2	730	33,359	6	1316.96	38,518	Small East Ba - Total

Hydrograph Report

Hyd. No. 1

Existing West

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.898 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	24,950 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

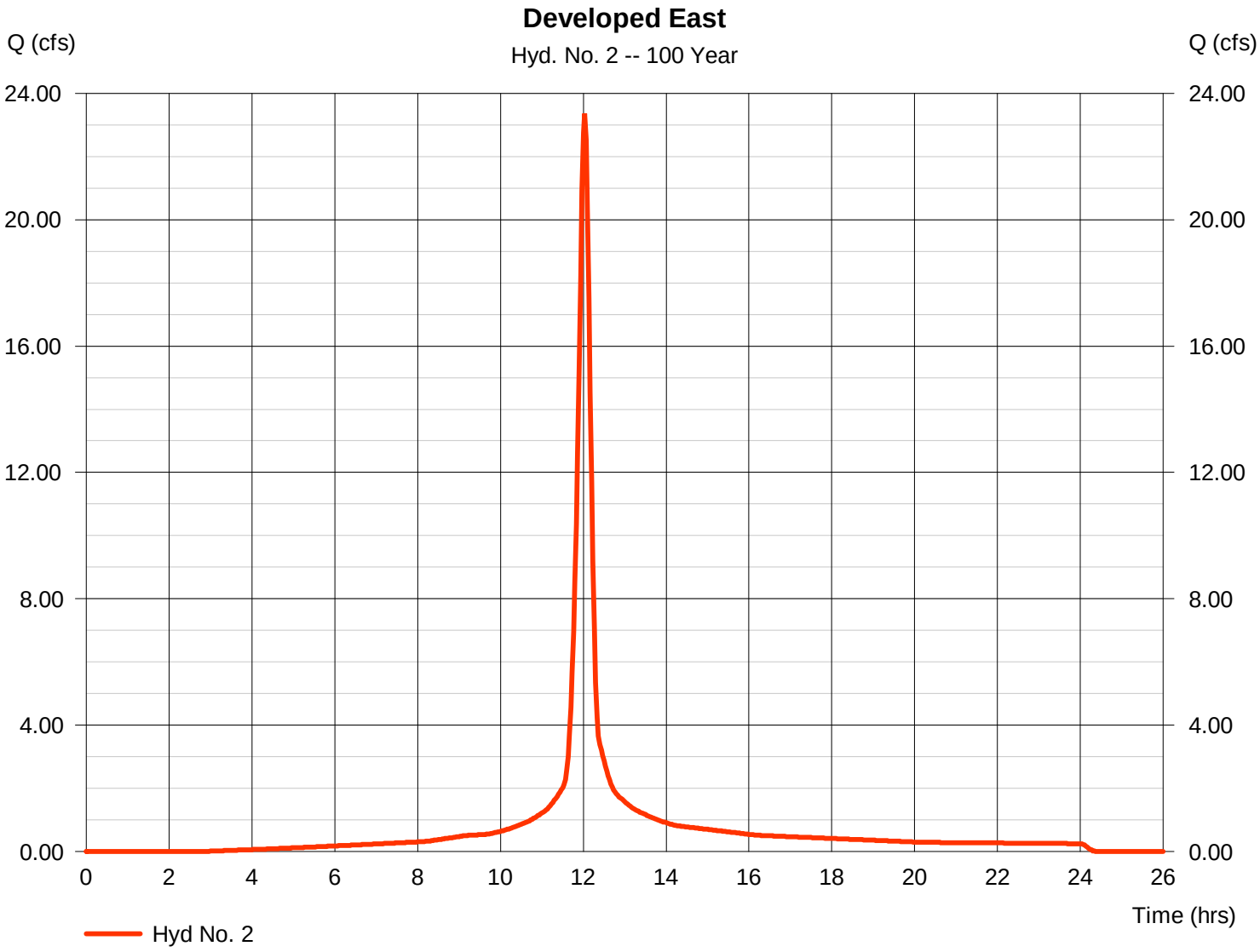


Hydrograph Report

Hyd. No. 2

Developed East

Hydrograph type	= SCS Runoff	Peak discharge	= 23.36 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 70,170 cuft
Drainage area	= 3.000 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

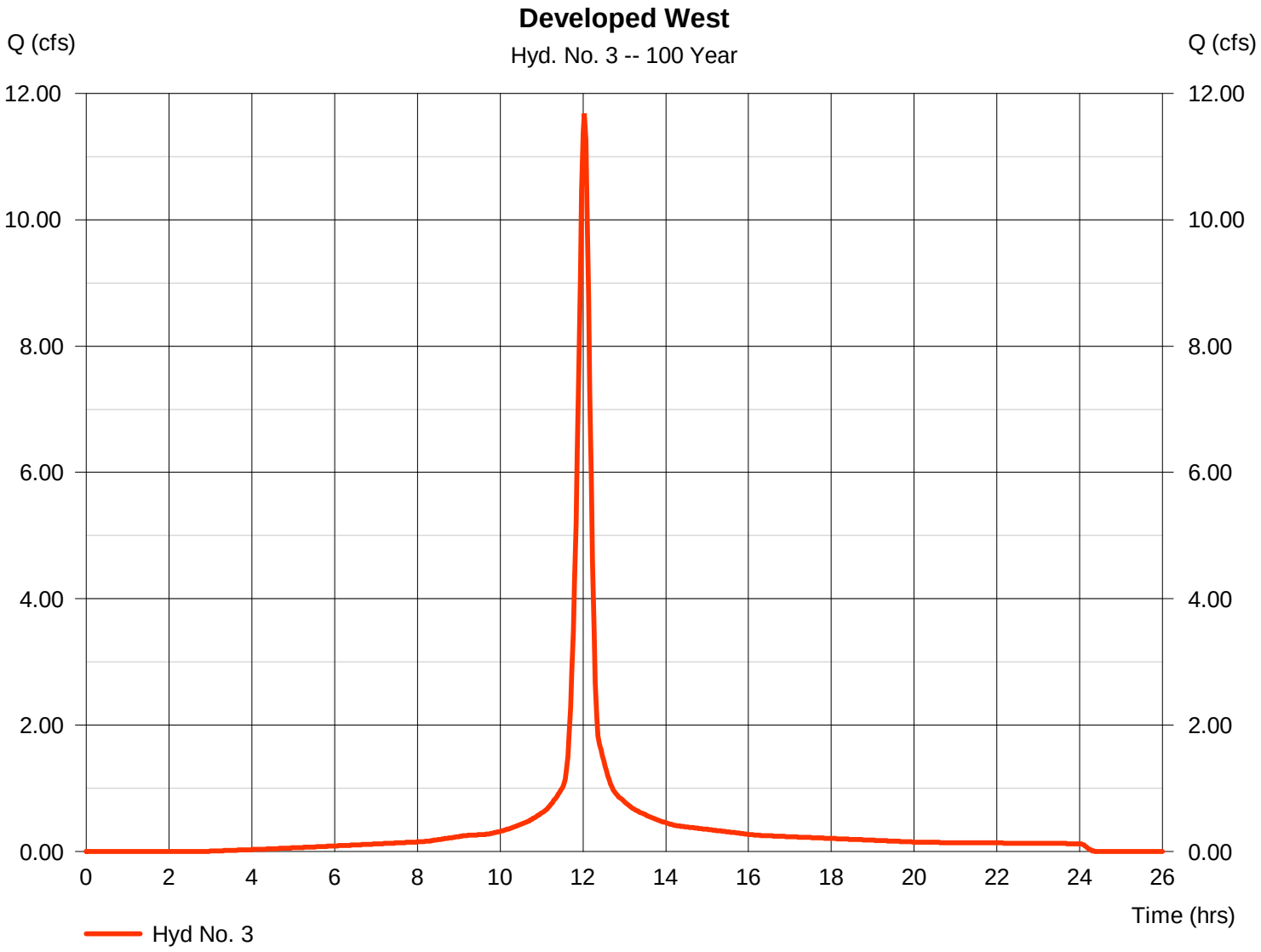


Hydrograph Report

Hyd. No. 3

Developed West

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.68 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	35,085 cuft
Drainage area	=	1.500 ac	Curve number	=	90
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

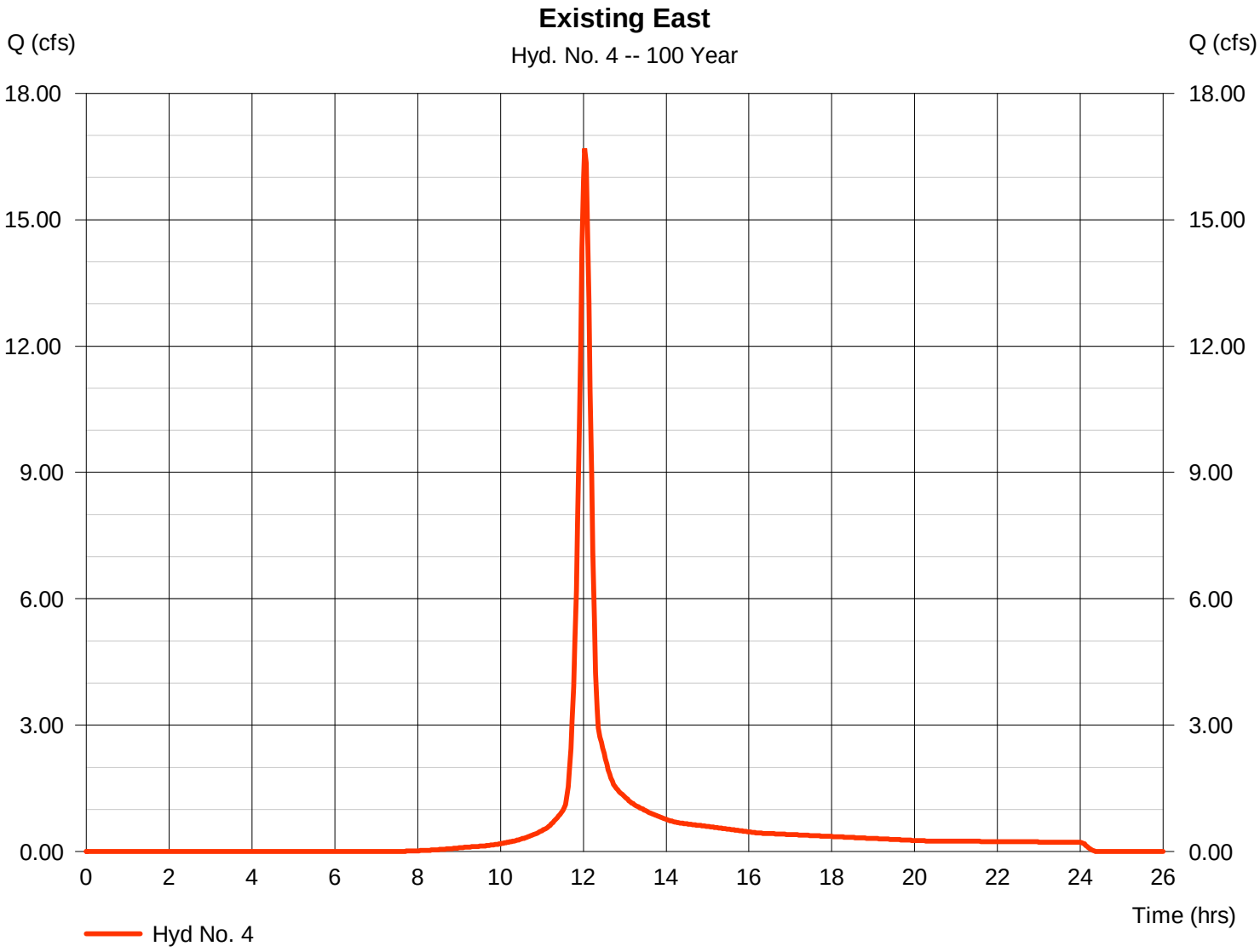


Hydrograph Report

Hyd. No. 4

Existing East

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.68 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.03 hrs
Time interval	=	2 min	Hyd. volume	=	46,782 cuft
Drainage area	=	3.000 ac	Curve number	=	71
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

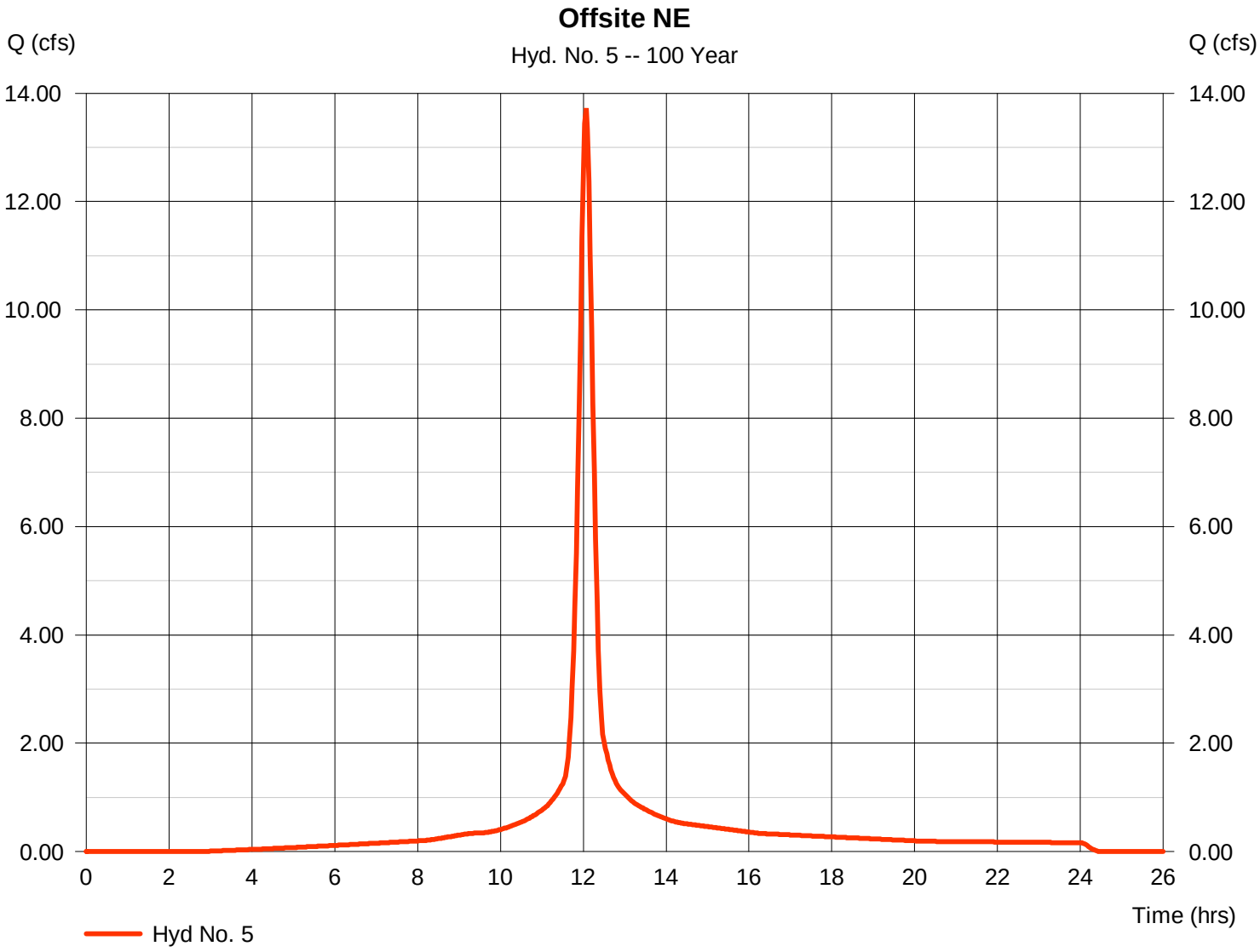


Hydrograph Report

Hyd. No. 5

Offsite NE

Hydrograph type	= SCS Runoff	Peak discharge	= 13.72 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 45,581 cuft
Drainage area	= 1.900 ac	Curve number	= 90
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

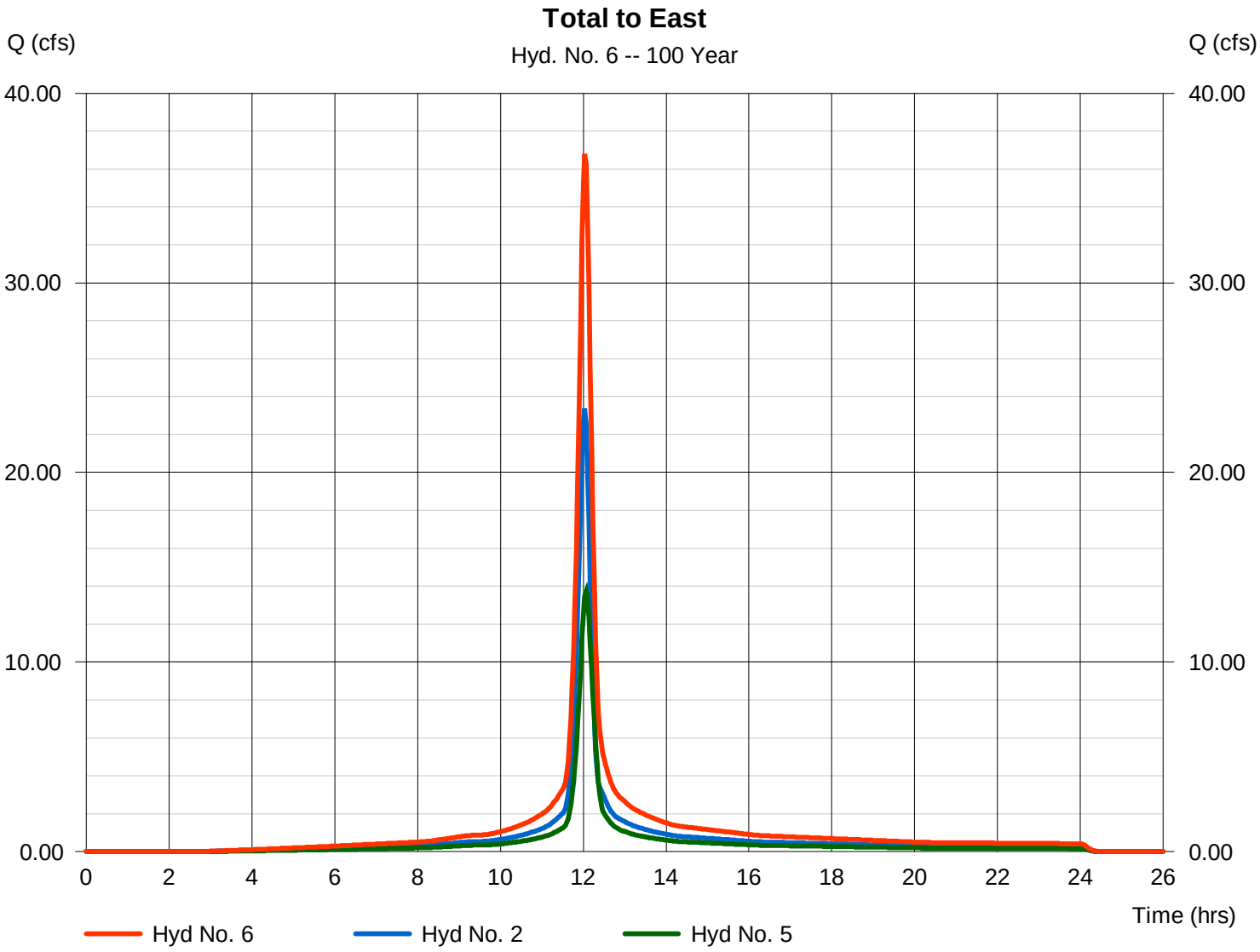


Hydrograph Report

Hyd. No. 6

Total to East

Hydrograph type	= Combine	Peak discharge	= 36.81 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 115,751 cuft
Inflow hyds.	= 2, 5	Contrib. drain. area	= 4.900 ac



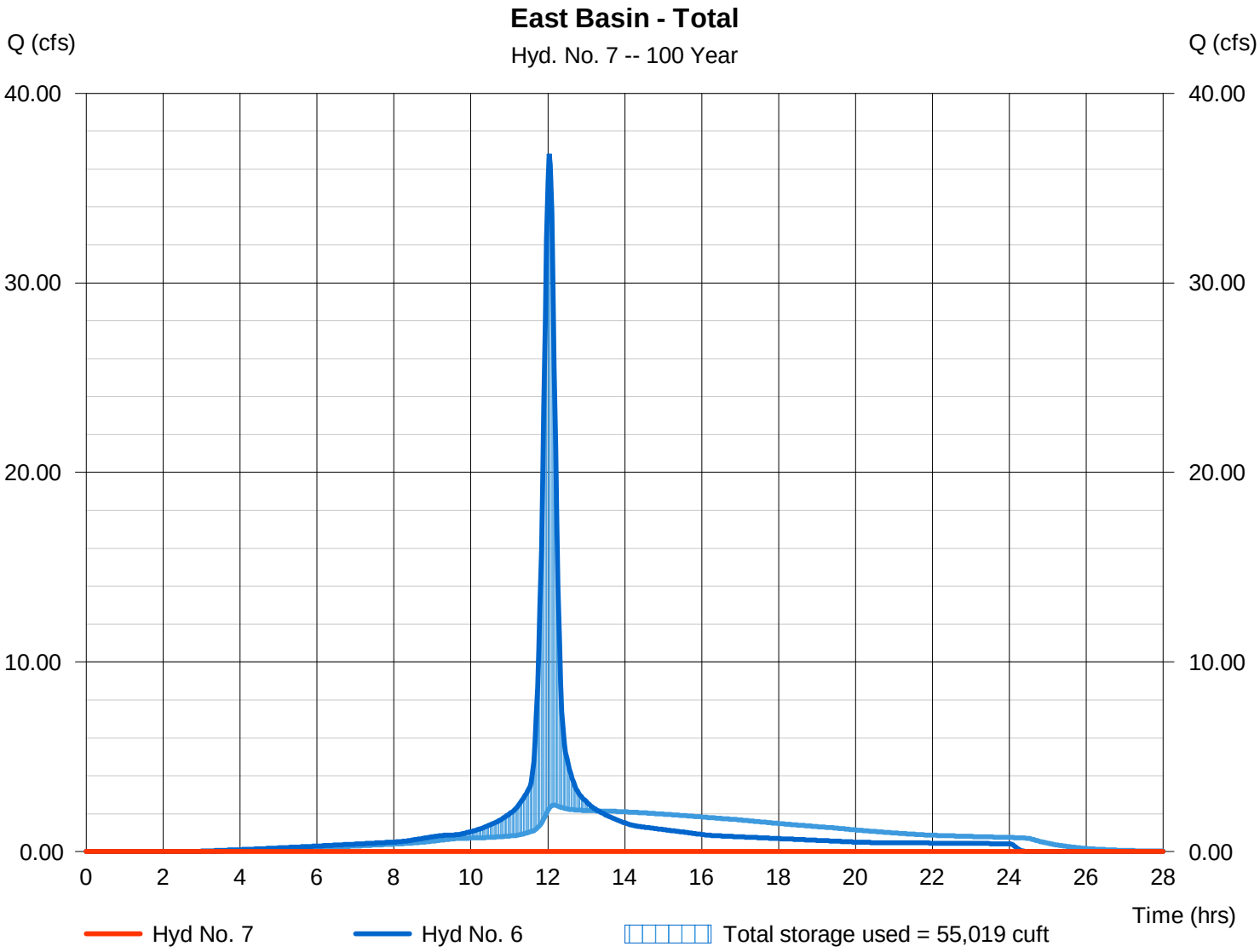
Hydrograph Report

Hyd. No. 7

East Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.60 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hyd. No.	= 6 - Total to East	Max. Elevation	= 1315.81 ft
Reservoir name	= Detention - Infiltration	Max. Storage	= 55,019 cuft

Storage Indication method used. Exfiltration extracted from Outflow.

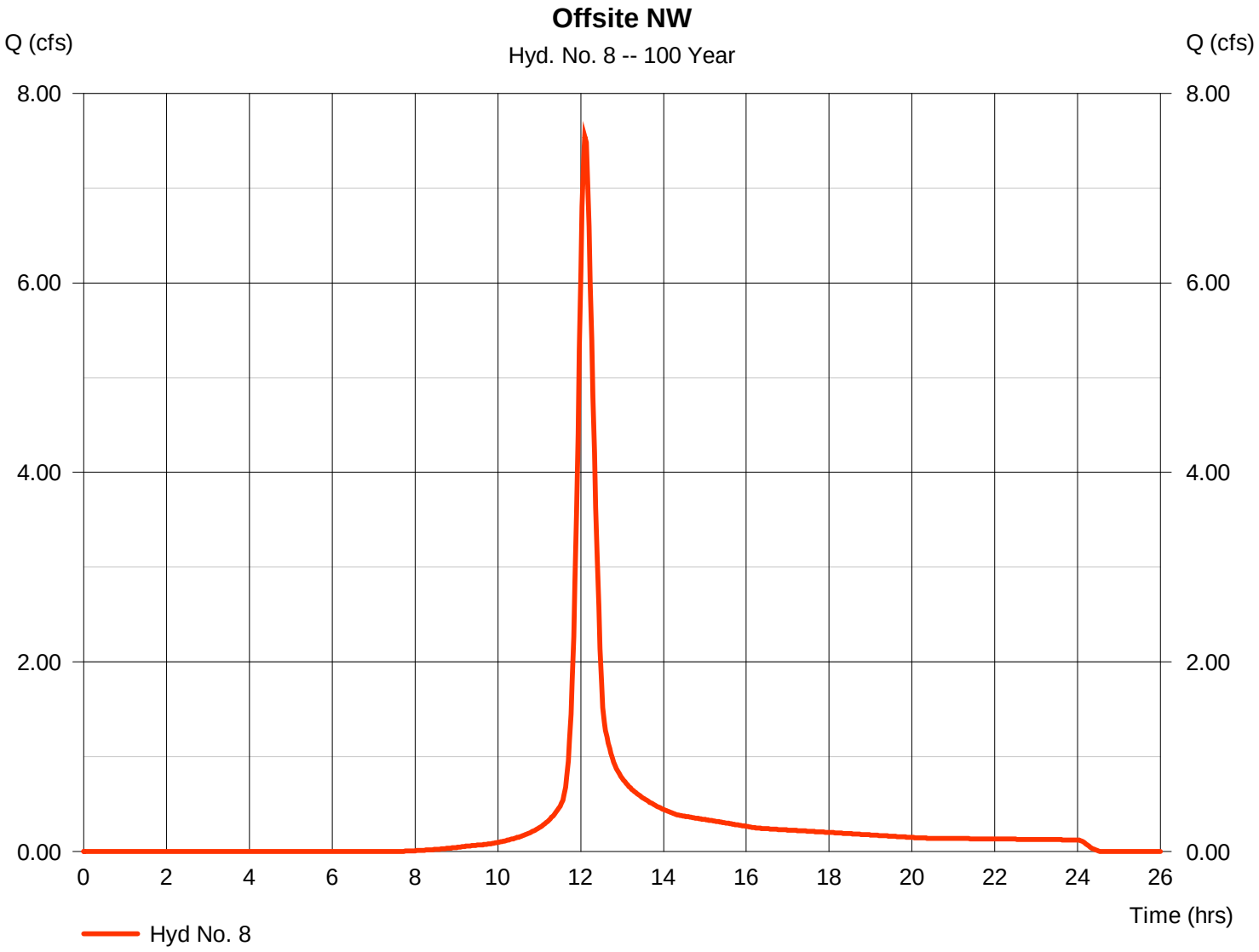


Hydrograph Report

Hyd. No. 8

Offsite NW

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.543 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.10 hrs
Time interval	=	2 min	Hyd. volume	=	26,047 cuft
Drainage area	=	1.600 ac	Curve number	=	71
Basin Slope	=	0.8 %	Hydraulic length	=	375 ft
Tc method	=	LAG	Time of conc. (Tc)	=	21.00 min
Total precip.	=	7.80 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

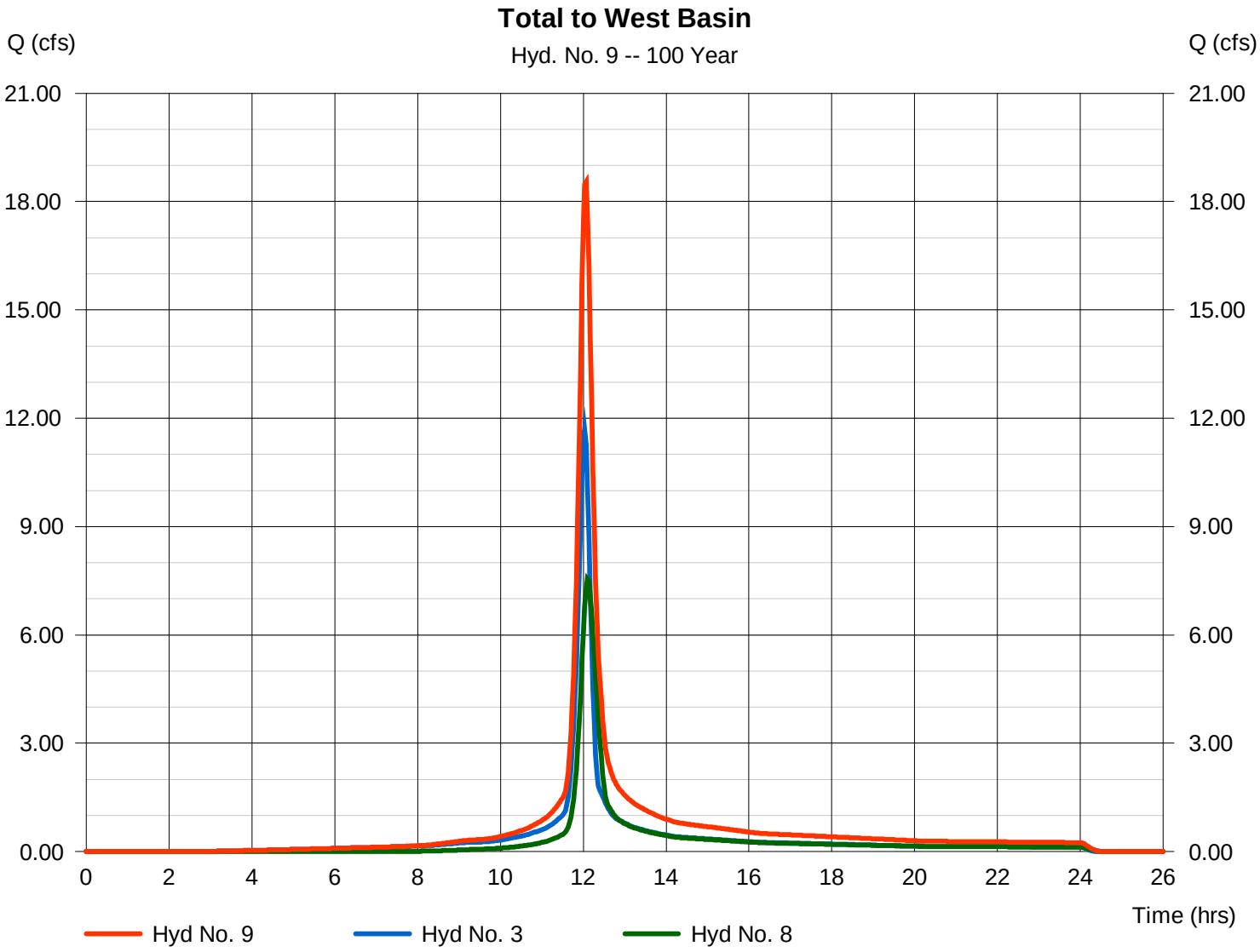


Hydrograph Report

Hyd. No. 9

Total to West Basin

Hydrograph type	= Combine	Peak discharge	= 18.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 61,132 cuft
Inflow hyds.	= 3, 8	Contrib. drain. area	= 3.100 ac



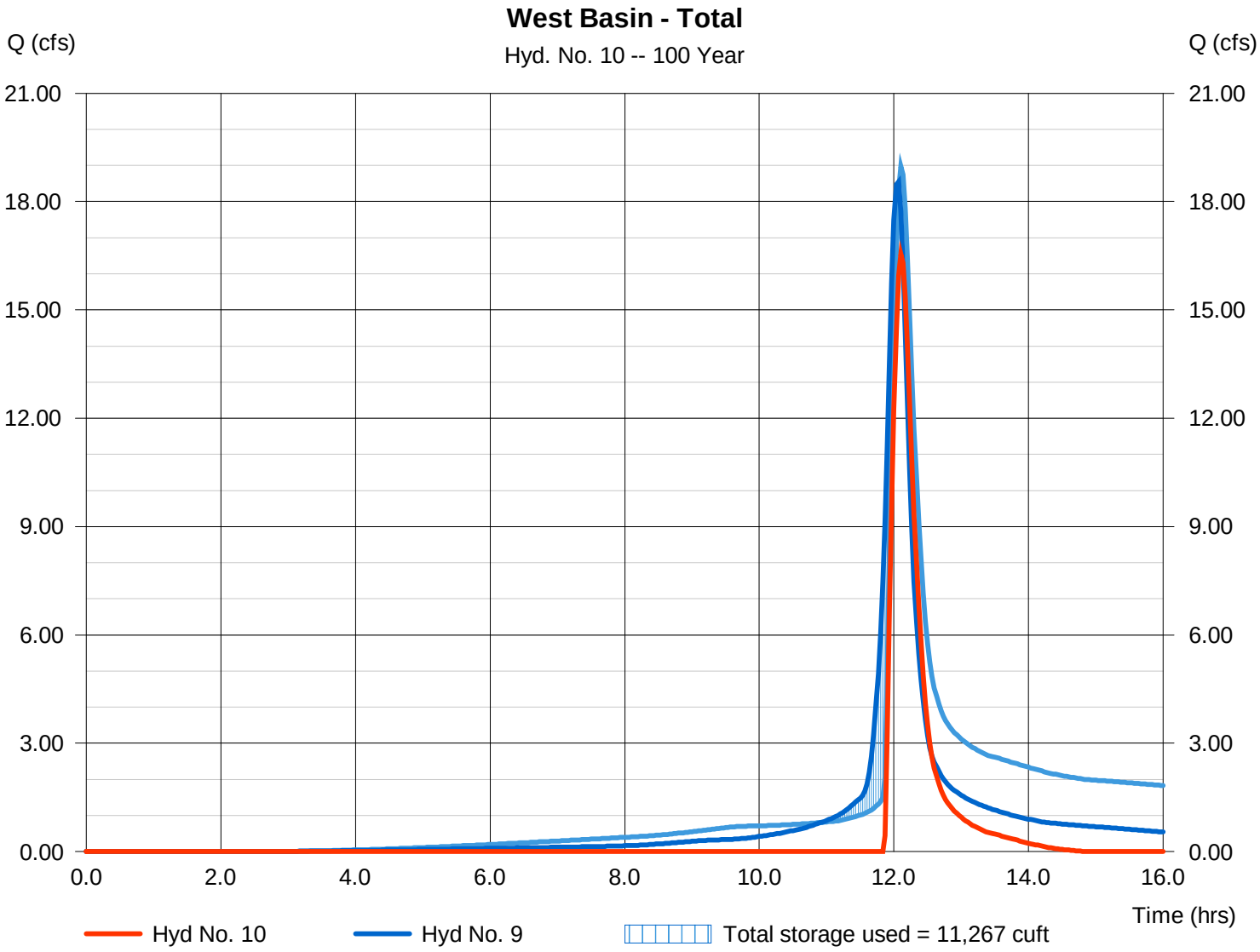
Hydrograph Report

Hyd. No. 10

West Basin - Total

Hydrograph type	= Reservoir	Peak discharge	= 16.54 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 27,887 cuft
Inflow hyd. No.	= 9 - Total to West Basin	Max. Elevation	= 1316.50 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 11,267 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



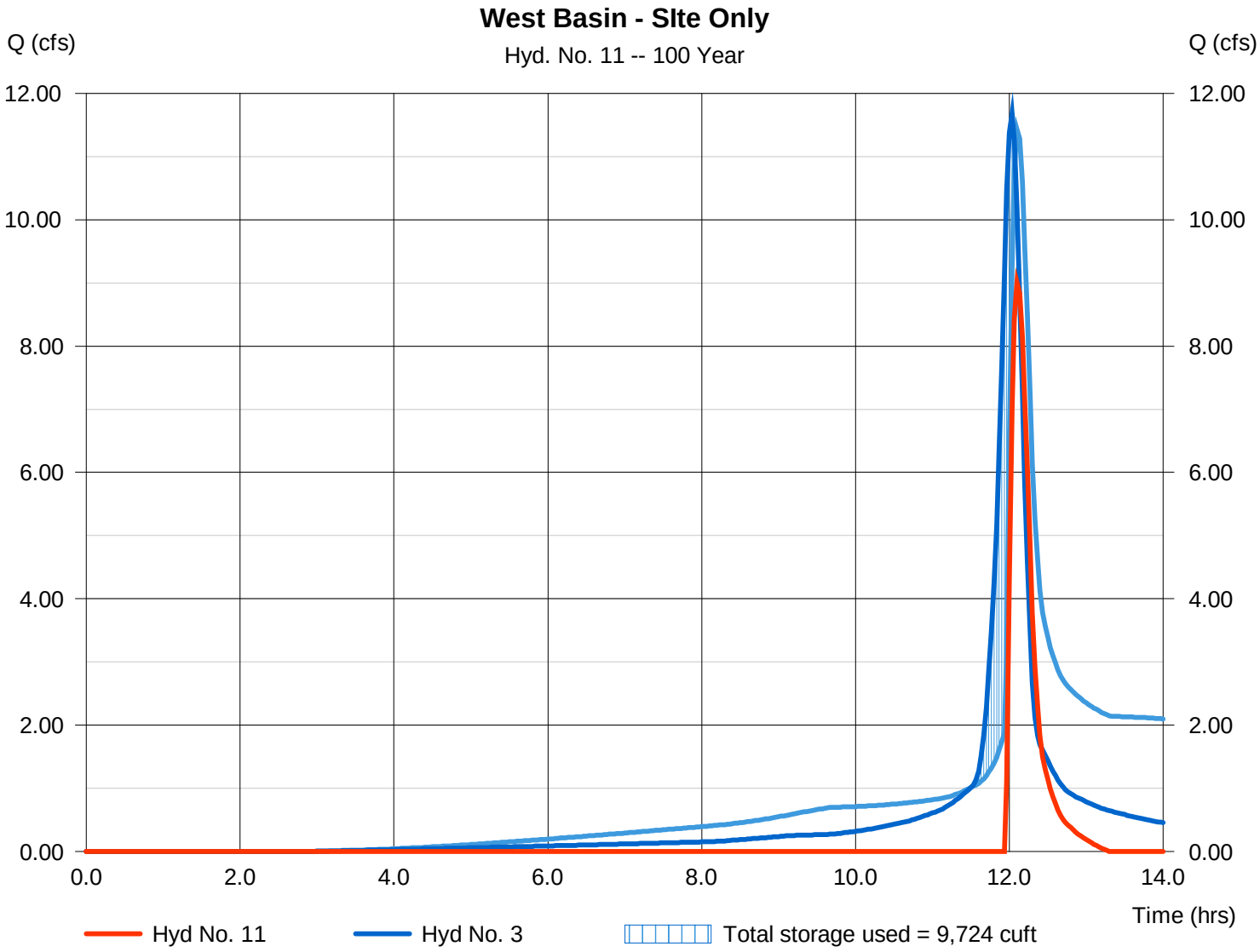
Hydrograph Report

Hyd. No. 11

West Basin - SIte Only

Hydrograph type	= Reservoir	Peak discharge	= 9.008 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 10,503 cuft
Inflow hyd. No.	= 3 - Developed West	Max. Elevation	= 1316.17 ft
Reservoir name	= West Infiltration Basin	Max. Storage	= 9,724 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



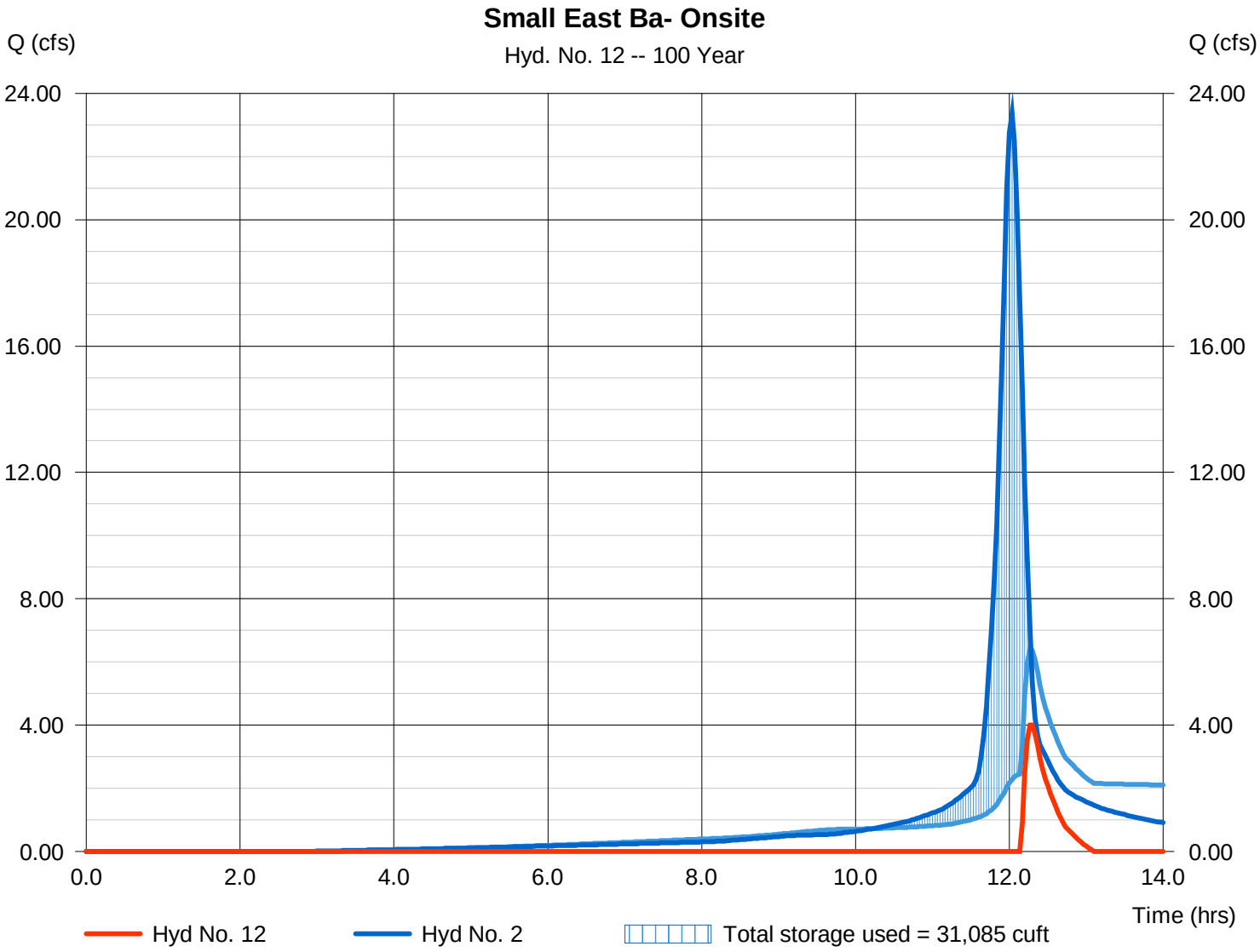
Hydrograph Report

Hyd. No. 12

Small East Ba- Onsite

Hydrograph type	= Reservoir	Peak discharge	= 4.006 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 5,330 cuft
Inflow hyd. No.	= 2 - Developed East	Max. Elevation	= 1316.29 ft
Reservoir name	= East Basin out of ROW	Max. Storage	= 31,085 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



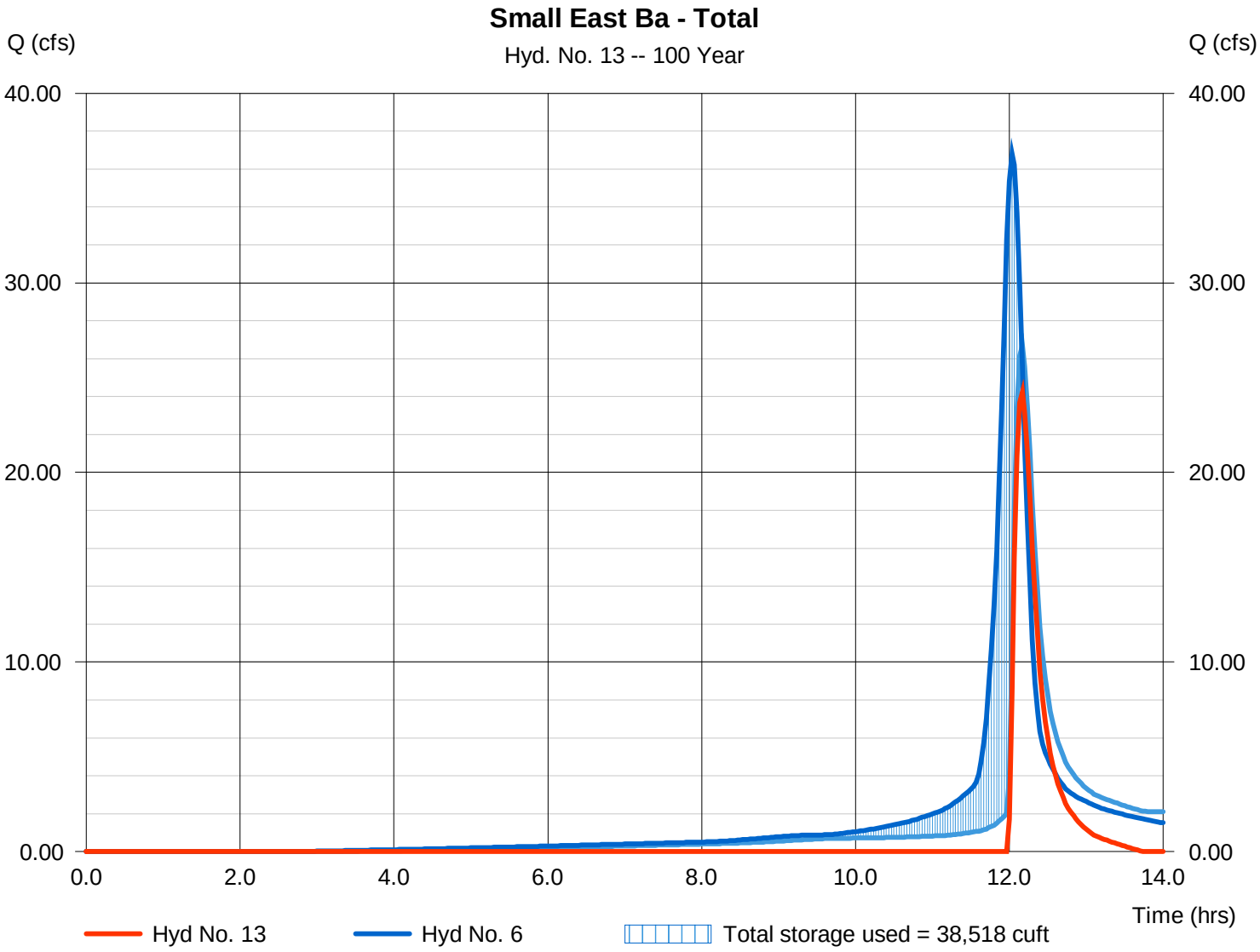
Hydrograph Report

Hyd. No. 13

Small East Ba - Total

Hydrograph type	=	Reservoir	Peak discharge	=	24.24 cfs
Storm frequency	=	100 yrs	Time to peak	=	12.17 hrs
Time interval	=	2 min	Hyd. volume	=	33,359 cuft
Inflow hyd. No.	=	6 - Total to East	Max. Elevation	=	1316.96 ft
Reservoir name	=	East Basin out of ROW	Max. Storage	=	38,518 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	27.8967	9.8000	0.7047	--------
2	76.3137	14.3000	0.8844	--------
3	1.2000	0.1000	0.0000	--------
5	52.6224	11.2000	0.7497	--------
10	55.1841	11.1000	0.7229	--------
25	60.7012	11.1000	0.7068	--------
50	66.9222	11.3000	0.7004	--------
100	62.2794	10.1000	0.6624	--------

File name: wich_IDF.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	4.18	3.40	2.90	2.55	2.29	2.08	1.91	1.78	1.66	1.56	1.48	1.40
2	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.80	1.69
3	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
5	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.27	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.67	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	3.14	2.98
50	9.47	7.86	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.55	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.66	4.37	4.13	3.92	3.73

Tc = time in minutes. Values may exceed 60.

Precip. file name: wich_24hr.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	2.80	3.50	1.20	4.50	5.20	6.10	6.90	7.80
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
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	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Hydraflow Table of Contents

Site Flows.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10 Friday, 12 / 12 / 2014

Water Quality

Table 4-13 Volumetric Runoff Coefficients by Land Use and Hydrologic Soil Group

Land Use	Hydrologic Soil Group				Land Use	Hydrologic Soil Group			
	A	B	C	**D**		A	B	C	**D**
Undisturbed	0.02	**0.03**	0.04	0.05	Undisturbed	55	**71**	80	84
Turf or Disturbed Soils	0.15	**0.20**	0.22	0.25	Turf or Disturbed Soils	71	**80**	84	88
Impervious Cover	0.95	**0.95**	0.95	0.95	Impervious Cover	98	**98**	98	98

Basin	Weighted Volumetric Runoff Coef. (R_v) (eq. 4-24*)										WQ_v
	Undist.	Dist.	Red. Imp.	New Imp.	Total	U	D	Redev. I	I	R_v	ft^3
#	ft^2	ft^2	ft^2	ft^2	Area ft^2	%	%	%	%	%	eq. 4-25*
Total JBAR Site	*0*	*0*	*69,700*	*130,680*	200,380	0.000	0.000	0.099	0.620	**0.6196**	**12,415**

*Total JBAR site assumes a 65% impervious cover rate after final development.

Pond Volume Below Static Pool						
	At Outfall Elev		Bottom Area		Depth	Volume
Basin	Sq.Ft.	Acre	Sq. Ft.	Acre	Feet	Acre-Ft.
East Basin	18900	0.4	5200	0.1	6	1.7
West Basin	5200	0.1	1400	0.0	5	0.4
Totals:		0.6		0.0		2.0

Pond Volume > WQv		
Pond	WQv	Check
2.0	0.3	**Yes**

Basin volumes are the volumes of storage under the outfall elevation. This volume will be infiltrated through bottom and sides of the basin. The basins are both sized to infiltrate the water quality storm, channel protection volume, and the lower peak storm durations.

Drainage Plan

1:100 Scale