

**Final Initial Study**

**Chalice Unitarian Universalist Congregation  
Conditional Use Permit**

**Appendix D  
Chalice Unitarian Universalist Congregation  
Hydrology Report**



**HYDROLOGY REPORT  
FOR  
CHALICE UNITARIAN CONGREGATION**

2324 Miller Ave.  
Escondido, 92029

August 8<sup>th</sup>, 2017

**Prepared By:**

***OMEGA Engineering Consultants***

**4340 Viewridge Ave, Suite B**

**San Diego, CA 92123**

**Ph: (858) 634-8620**

I hereby declare that I am the engineer of work for this project, that I have exercised responsible charge over the design of the project as defined in section 6703 of the business and professions code, and that the design is consistent with current standards. I understand that the check of the project drawings and specifications by the City of San Diego is confined to a review only and does not relieve me, as an engineer of work, of my responsibilities for project design.

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Patric de Boer            RCE 83583  
Registration Expires        03-31-2019

### **EXISTING RUNOFF ANALYSIS:**

The existing site was modeled as two drainage basins, EX-2.1 and EX-2.2.

EX-1.1 drains via overland flow and concentrated surface flow to a swale that runs along the southeasterly boundary of the site and then to Discharge Point #1.

EX-1.2 Drains via overland flow and concentrated surface flow to the street at the corner of Hamilton Lane and Miller Avenue.

The SCS unit hydrograph method was chosen for analysis of the existing site.

See the attached calculations for details.

### **DEVELOPED RUNOFF ANALYSIS:**

The existing site was modeled as six drainage basins A-1.1, A-1.2, A-1.3, B-1.1, B-1.2, and B-1.3. Basins with the prefix 'A' drain to Discharge Point #1 and basins with the prefix 'B' drain to Discharge Point #2.

Basins B-1.2 and A-1.1 drain to bioretention basins, which have sized outlet structures that provide the proper flow mitigation and storage to reduce the flow rates generated by the tributary basins.

The result was found to be confluent peak discharge rates at each discharge point for the 100-yr 6 hour storm that were equal to or less than the existing conditions.

See the attached calculations for details.

### **RESULTS AND CONCLUSIONS**

The redevelopment of the project site shall result in a decrease or no change in runoff flowrates at the discharge points for the 100 year event. This is due to the use of storage and outlet control in the proposed bioretention areas/

It is the opinion of Omega Engineering Consultants that the project will not cause adverse effects to the downstream facilities or receiving waters. A separate Water Quality Technical Report has been prepared to discuss the water quality impacts for the proposed development.

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## **SITE AND PROJECT DESCRIPTION**

This Hydrology and Hydraulics report has been prepared as part of the grading plan for the construction of a new church building and associated site improvements at the site at 2324 Miller Ave. An existing church building will remain onsite, as well as portions of the existing hardscape. The project will construct a private storm drain system to convey runoff from onsite drainage basins to 2 bioretention basins for treatment. The runoff generated by the site is discharged from two separate discharge points, one at the corner of Hamilton Lane and Miller Avenue and the other at a 12" culvert that passes under Hamilton Lane.

## **METHODOLOGY**

This drainage report has been prepared in accordance with current city regulations and procedures. All of the proposed conduits and conveyances have been designed to intercept and convey the 100-year storm. Pipe sizing calculations will be provided in the mistrial review submittal of this report. Autodesk Hydraflow Hydrographs was used to model each of the existing and proposed drainage basins. The Soil Conservation Service (SCS) unit hydrograph method was used for the calculations.

See the attached calculations for particulars. The following references have been used in preparation of this report:

- (1) Handbook of Hydraulics, E.F. Brater & H.W. King, 6<sup>th</sup> Ed., 1976.
- (2) Modern Sewer Design, American Iron & Steel Institute, 1<sup>st</sup> Ed., 1980.
- (3) County of San Diego Hydrology Manual, 2003

## **EXISTING CONDITIONS:**

The existing 2.22 acre site consists of an existing church building, a garden area, and associated parking. The site slopes to the south at approximately 5%. The site receives stormwater from offsite areas to the north and the east. The total area included in this analysis is 4.39 acres.

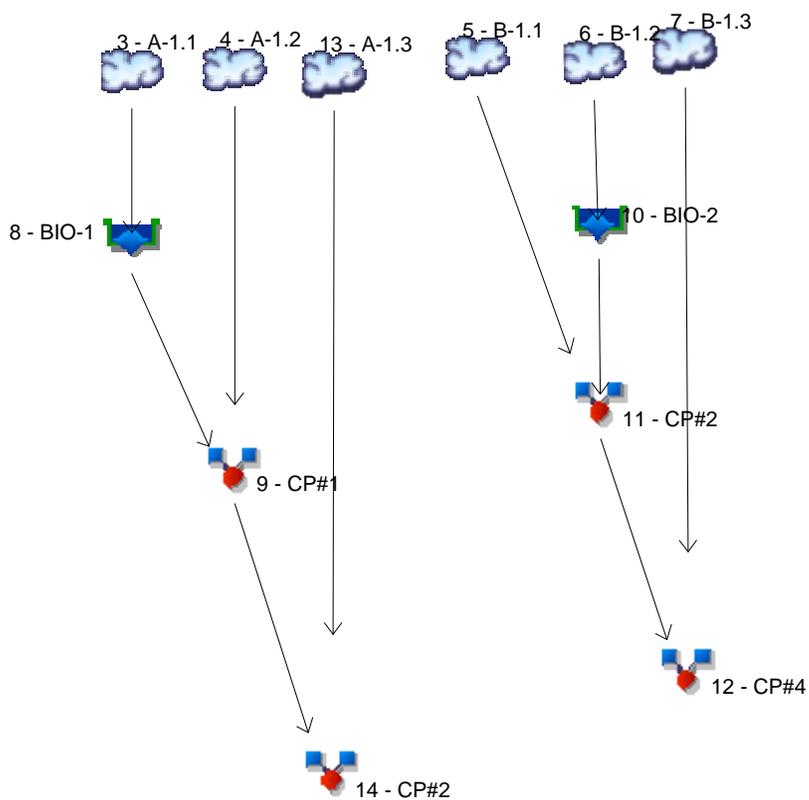
## **DEVELOPED CONDITIONS:**

This project proposes the construction of a church building with associated hardscape and the renovation and expansion of an existing building. The project will disturb most of the site and increase the impervious area of the area of analysis from 20% to 22%.

Storage and infiltration of stormwater in the two biofiltration areas will reduce the increase in flow generated by the site. The flow at the discharge points will be equal or less than the existing conditions for the 100-yr storm.

# Watershed Model Schematic

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



# Hydrograph Report

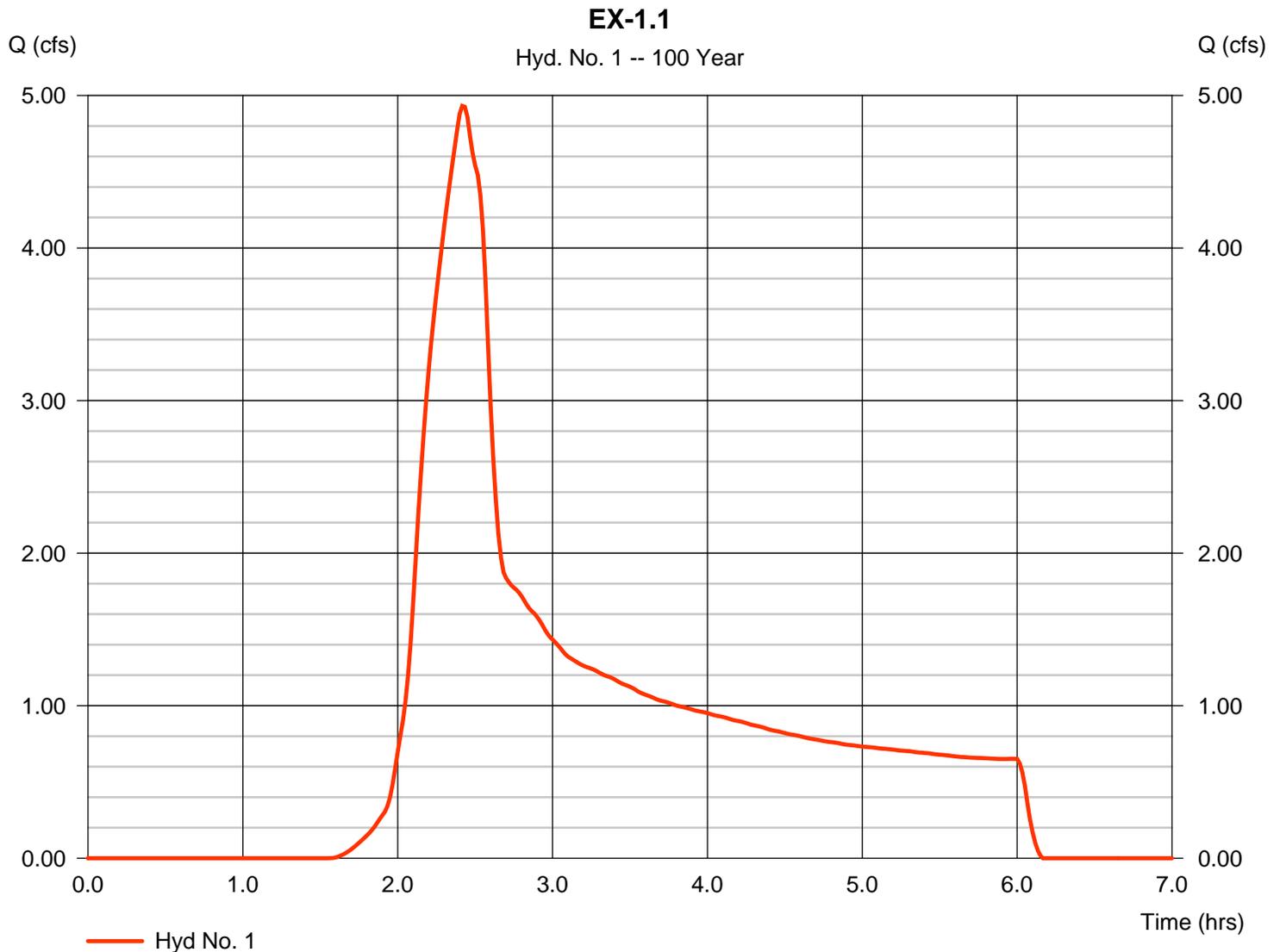
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 02 / 2 / 2017

## Hyd. No. 1

EX-1.1

Hydrograph type	= SCS Runoff	Peak discharge	= 4.932 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.42 hrs
Time interval	= 1 min	Hyd. volume	= 19,963 cuft
Drainage area	= 3.560 ac	Curve number	= 82
Basin Slope	= 6.0 %	Hydraulic length	= 450 ft
Tc method	= LAG	Time of conc. (Tc)	= 6.44 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

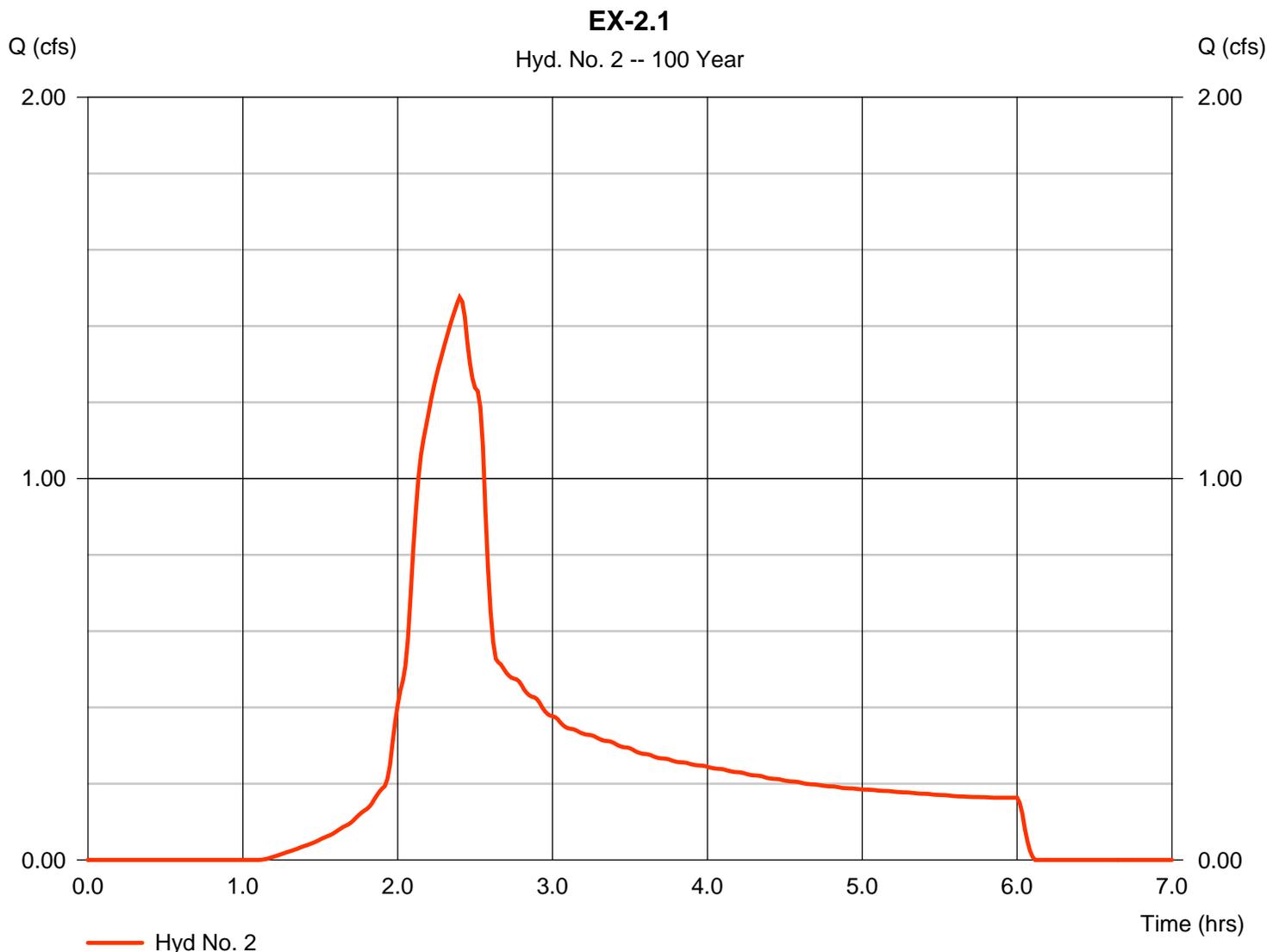


# Hydrograph Report

## Hyd. No. 2

EX-2.1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.475 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.40 hrs
Time interval	= 1 min	Hyd. volume	= 5,811 cuft
Drainage area	= 0.820 ac	Curve number	= 88
Basin Slope	= 8.0 %	Hydraulic length	= 460 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.50 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

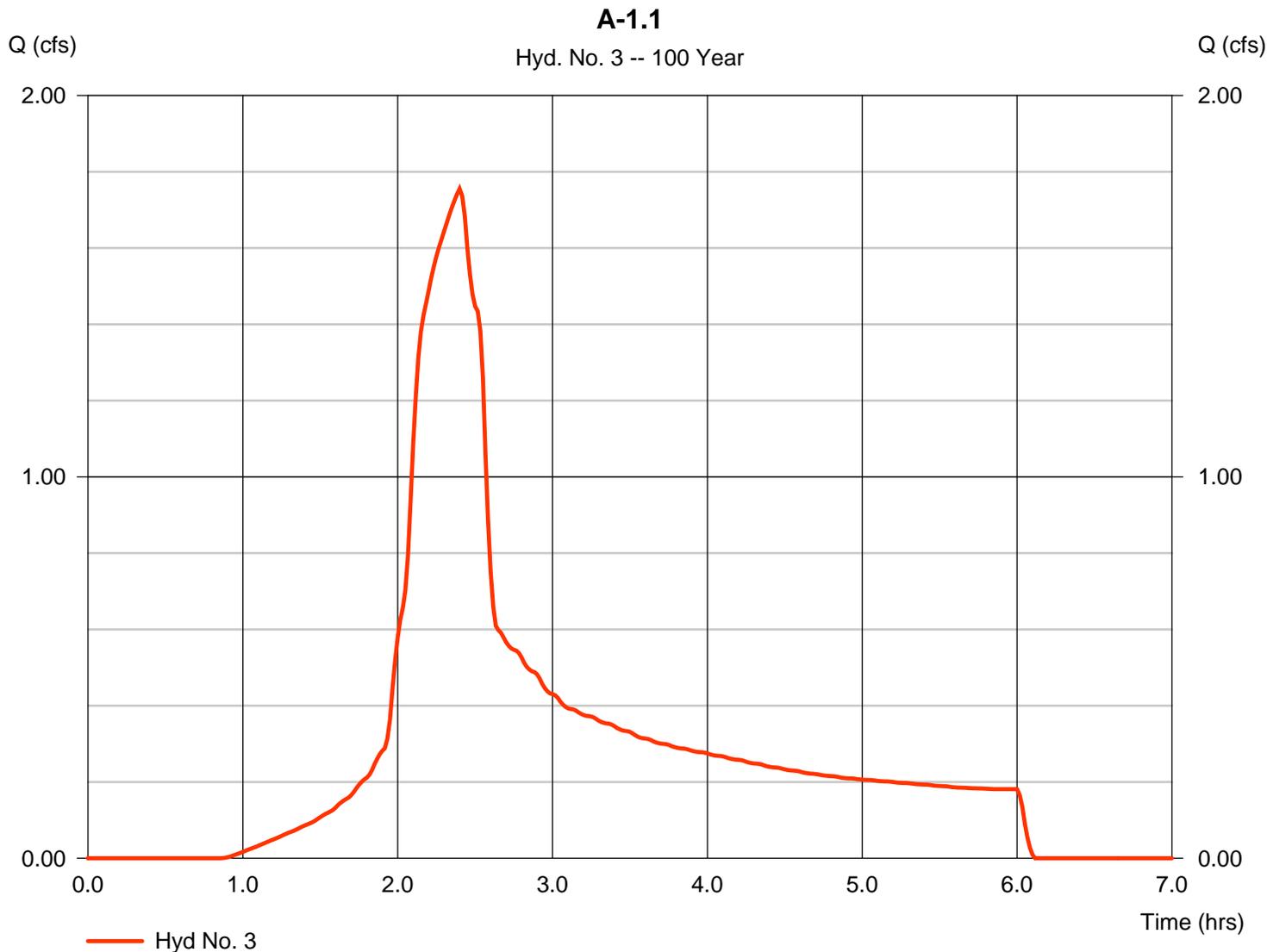


# Hydrograph Report

## Hyd. No. 3

A-1.1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.755 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.40 hrs
Time interval	= 1 min	Hyd. volume	= 6,984 cuft
Drainage area	= 0.870 ac	Curve number	= 91
Basin Slope	= 5.0 %	Hydraulic length	= 420 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.79 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484

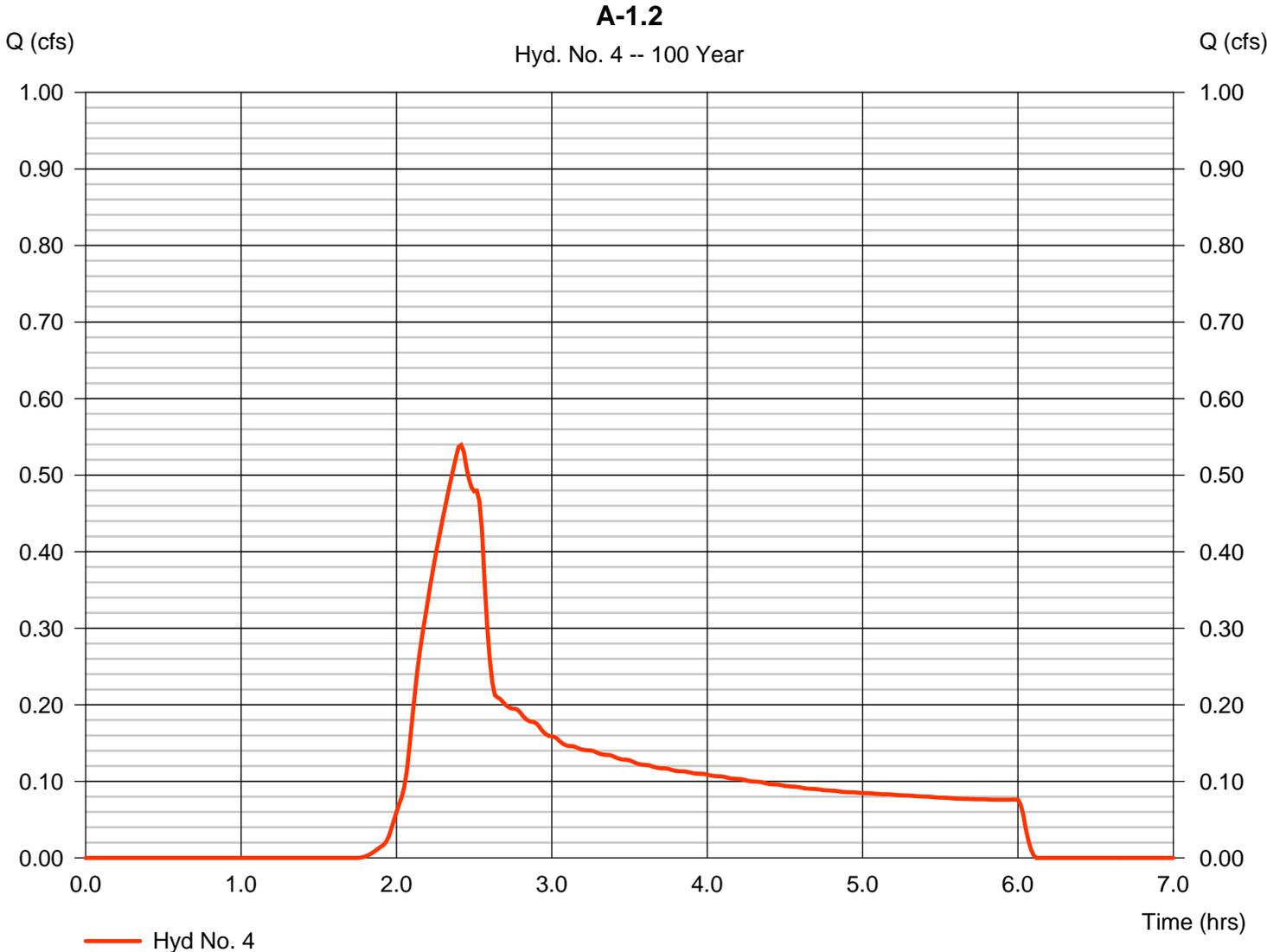


# Hydrograph Report

## Hyd. No. 4

A-1.2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.539 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.42 hrs
Time interval	= 1 min	Hyd. volume	= 2,170 cuft
Drainage area	= 0.460 ac	Curve number	= 79
Basin Slope	= 6.0 %	Hydraulic length	= 250 ft
Tc method	= LAG	Time of conc. (Tc)	= 4.40 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



# Hydrograph Report

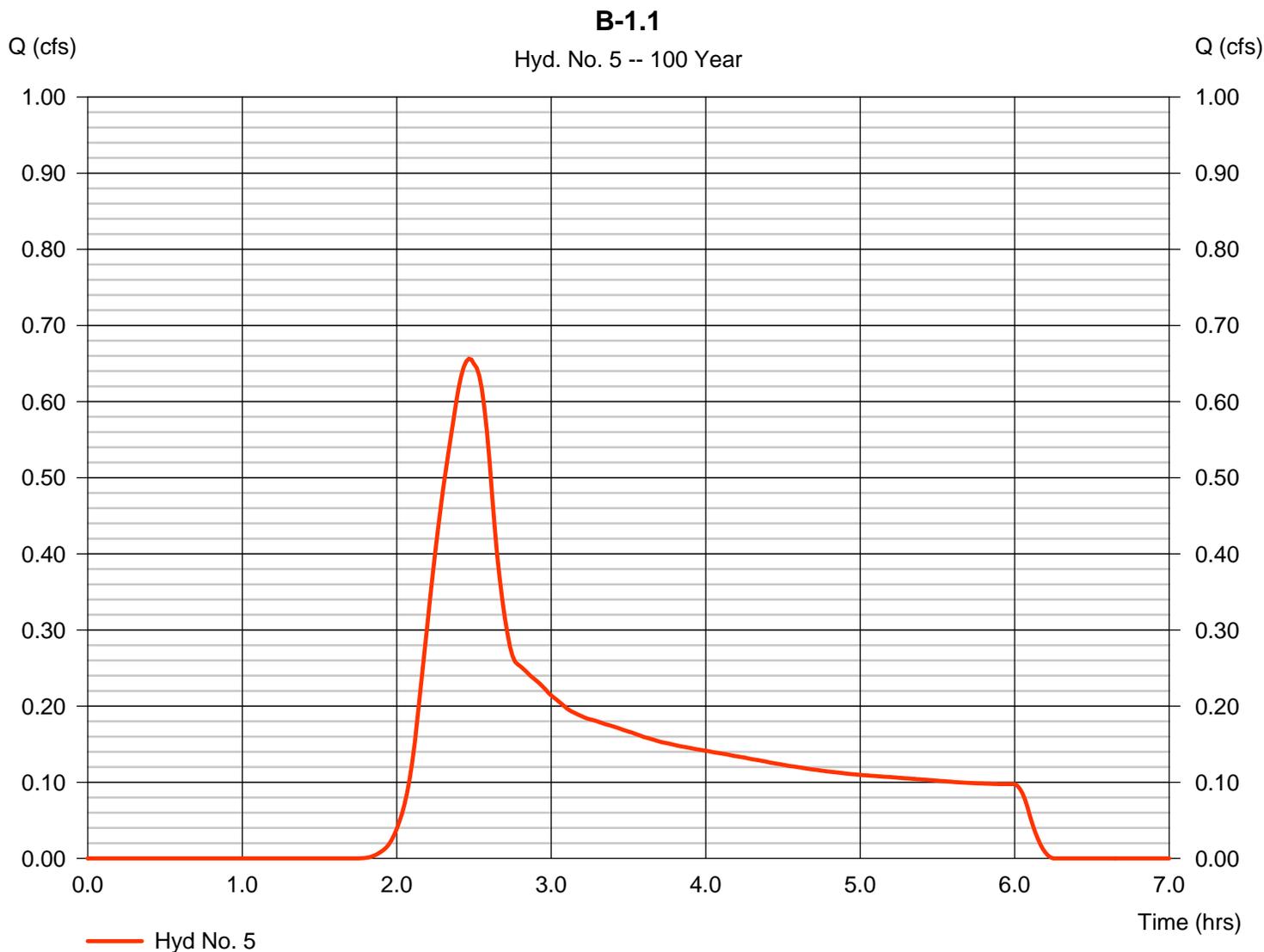
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 02 / 2 / 2017

## Hyd. No. 5

B-1.1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.656 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.47 hrs
Time interval	= 1 min	Hyd. volume	= 2,783 cuft
Drainage area	= 0.590 ac	Curve number	= 79
Basin Slope	= 5.0 %	Hydraulic length	= 500 ft
Tc method	= LAG	Time of conc. (Tc)	= 8.40 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



# Hydrograph Report

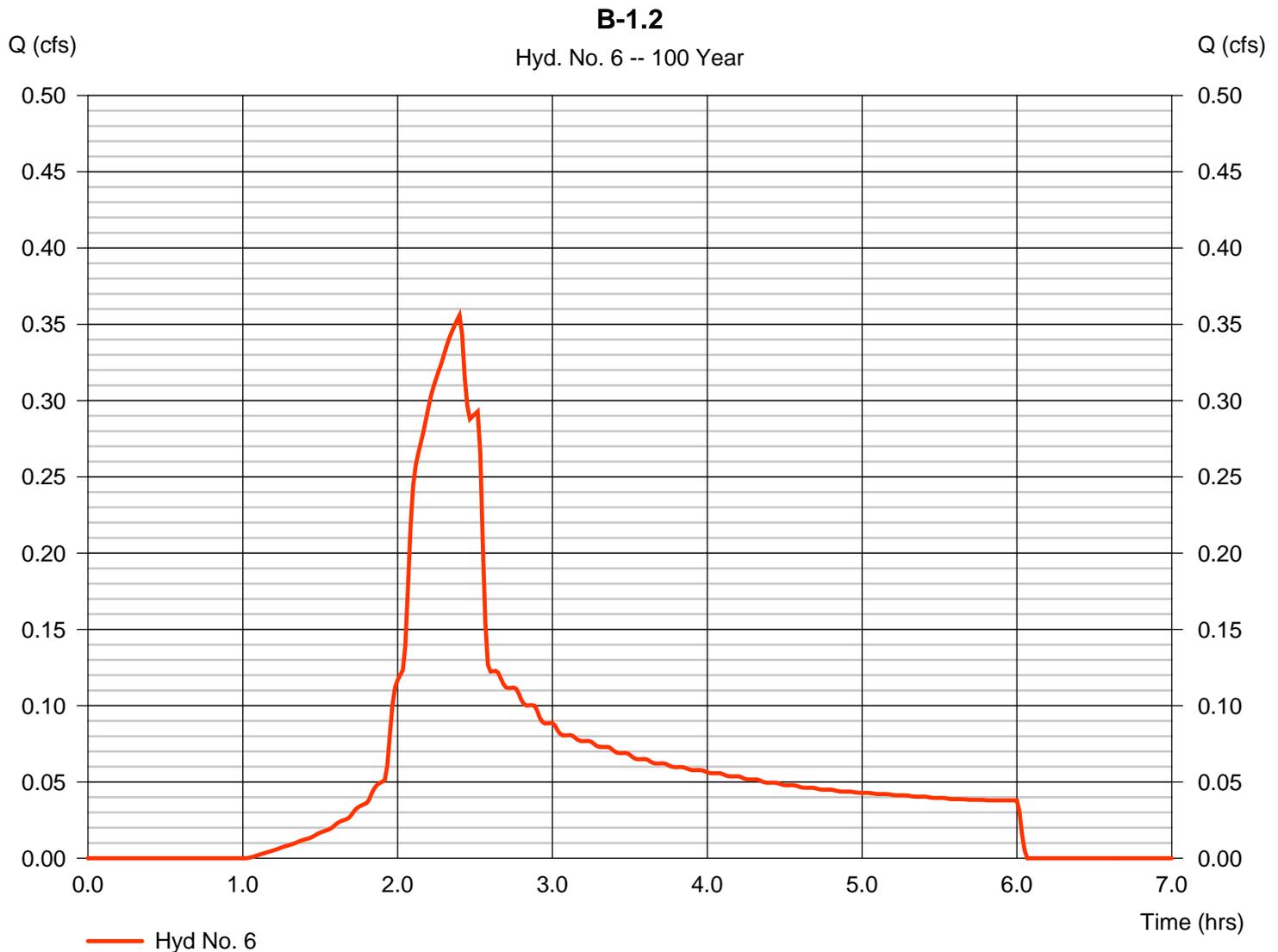
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 6

B-1.2

Hydrograph type	= SCS Runoff	Peak discharge	= 0.356 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.40 hrs
Time interval	= 1 min	Hyd. volume	= 1,386 cuft
Drainage area	= 0.200 ac	Curve number	= 89
Basin Slope	= 2.5 %	Hydraulic length	= 150 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.20 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



# Hydrograph Report

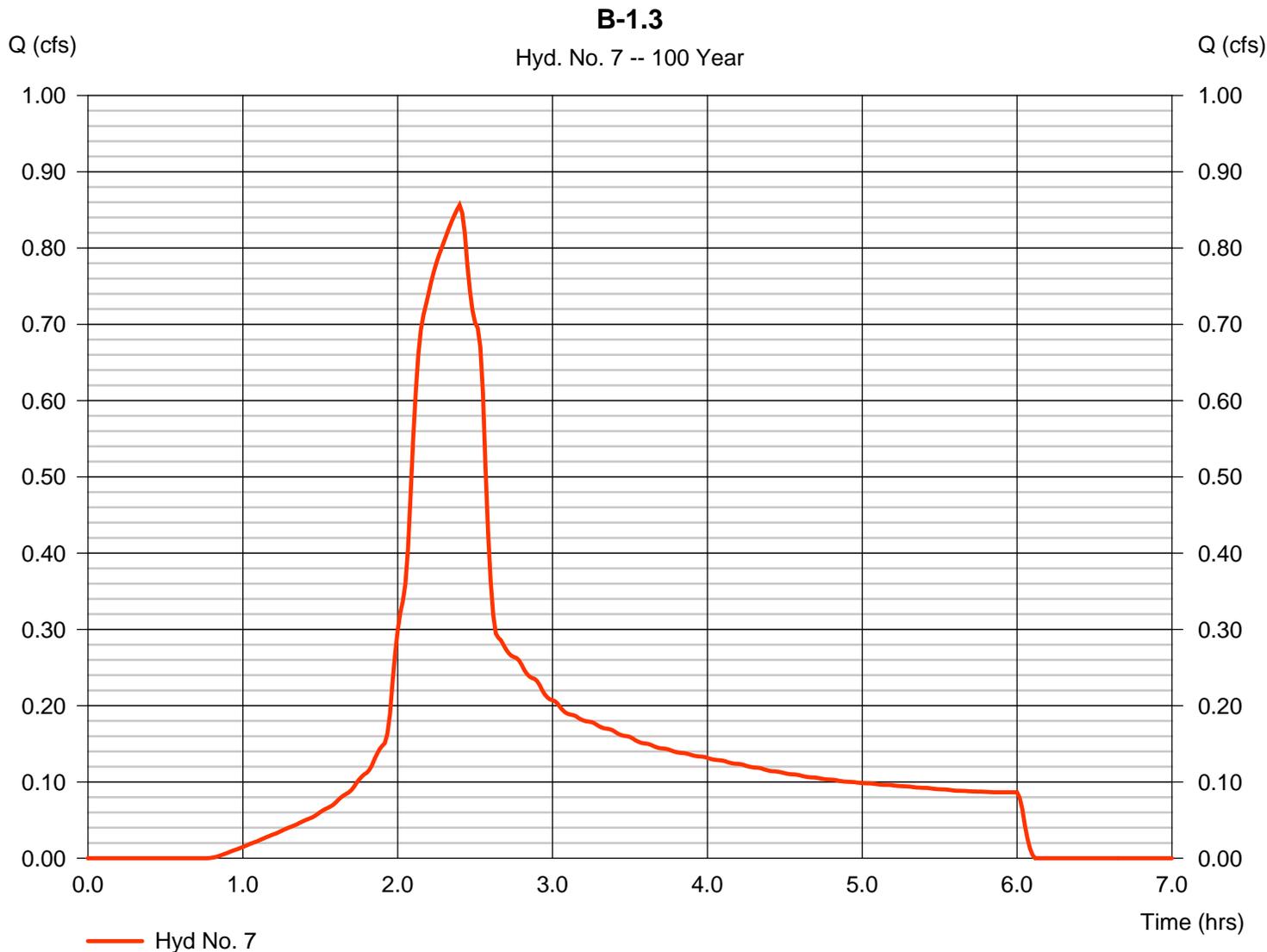
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 7

B-1.3

Hydrograph type	= SCS Runoff	Peak discharge	= 0.856 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.40 hrs
Time interval	= 1 min	Hyd. volume	= 3,428 cuft
Drainage area	= 0.410 ac	Curve number	= 92
Basin Slope	= 8.0 %	Hydraulic length	= 460 ft
Tc method	= LAG	Time of conc. (Tc)	= 3.80 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



# Hydrograph Report

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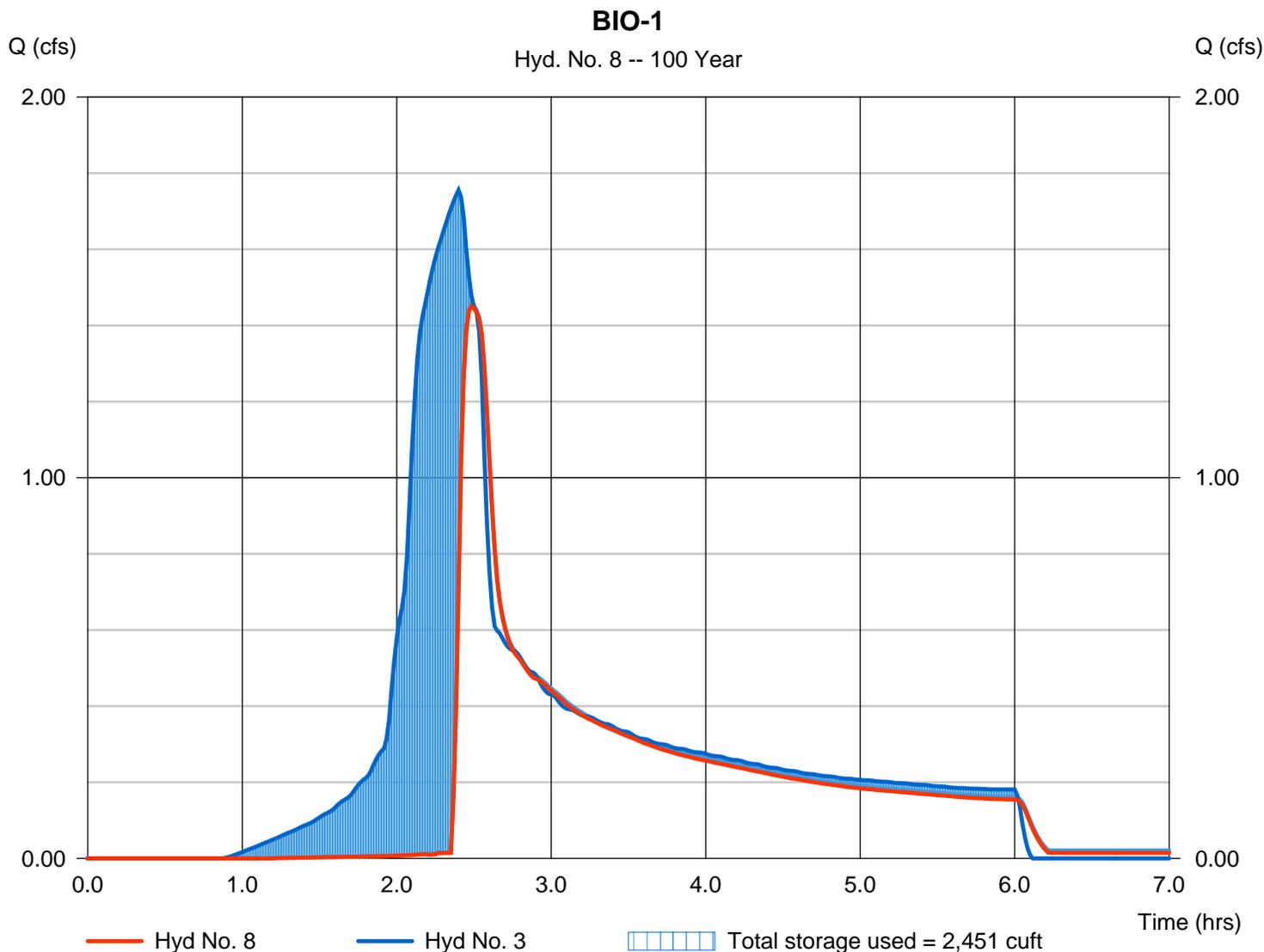
Thursday, 02 / 2 / 2017

## Hyd. No. 8

BIO-1

Hydrograph type	= Reservoir	Peak discharge	= 1.451 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.48 hrs
Time interval	= 1 min	Hyd. volume	= 5,594 cuft
Inflow hyd. No.	= 3 - A-1.1	Max. Elevation	= 6.22 ft
Reservoir name	= BIO-1	Max. Storage	= 2,451 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## Pond No. 1 - BIO-1

### Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1.00	420	0	0
3.00	2.50	420	1,260	1,260
3.01	4.01	210	3	1,263
4.50	5.50	210	313	1,576
4.51	5.51	1,050	6	1,582
6.00	7.00	1,400	1,819	3,400

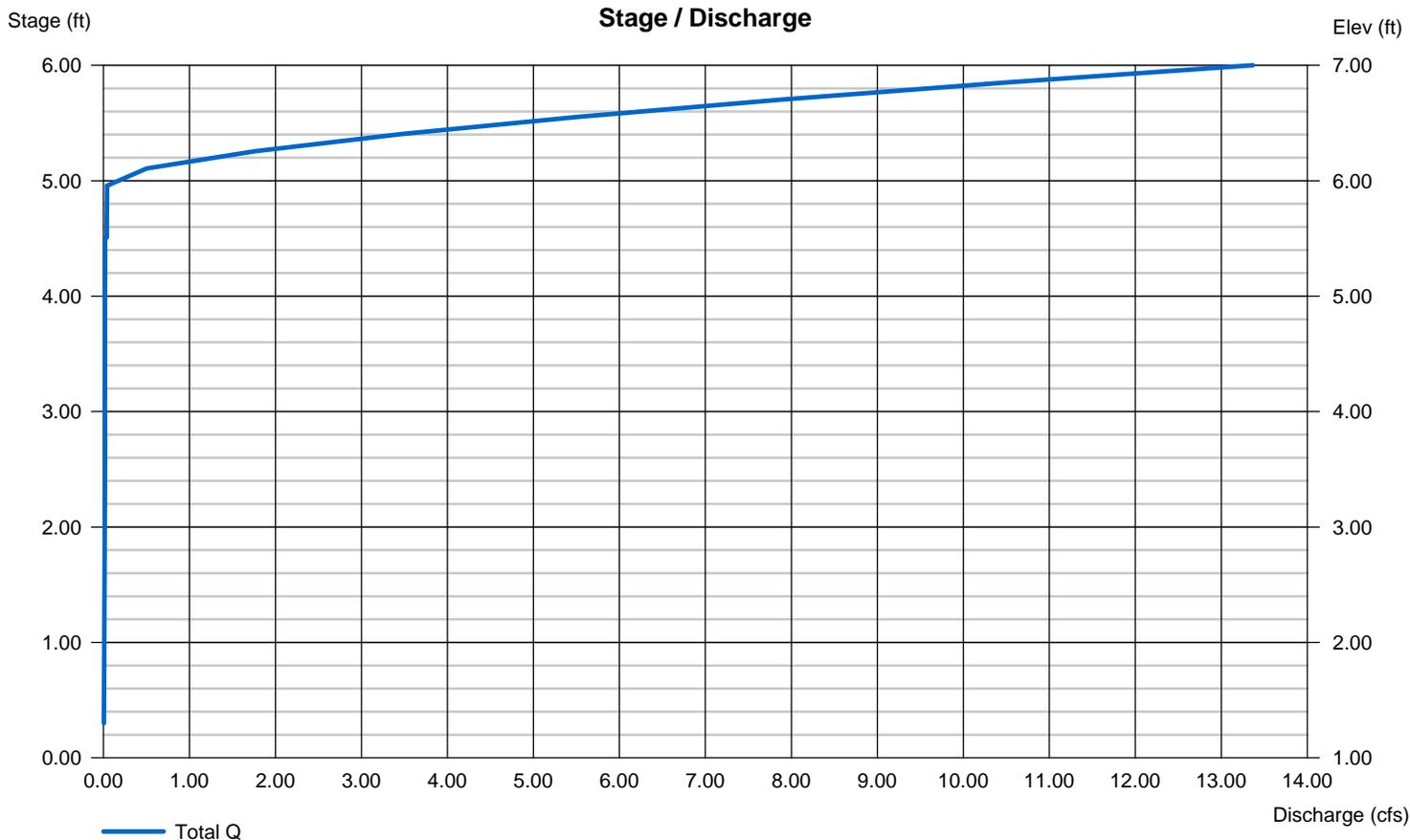
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.50	0.00	0.00	0.00
Span (in)	= 0.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1.00	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)	= 4.00	0.00	0.00	0.00
Crest El. (ft)	= 6.00	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)	= 1.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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



# Hydrograph Report

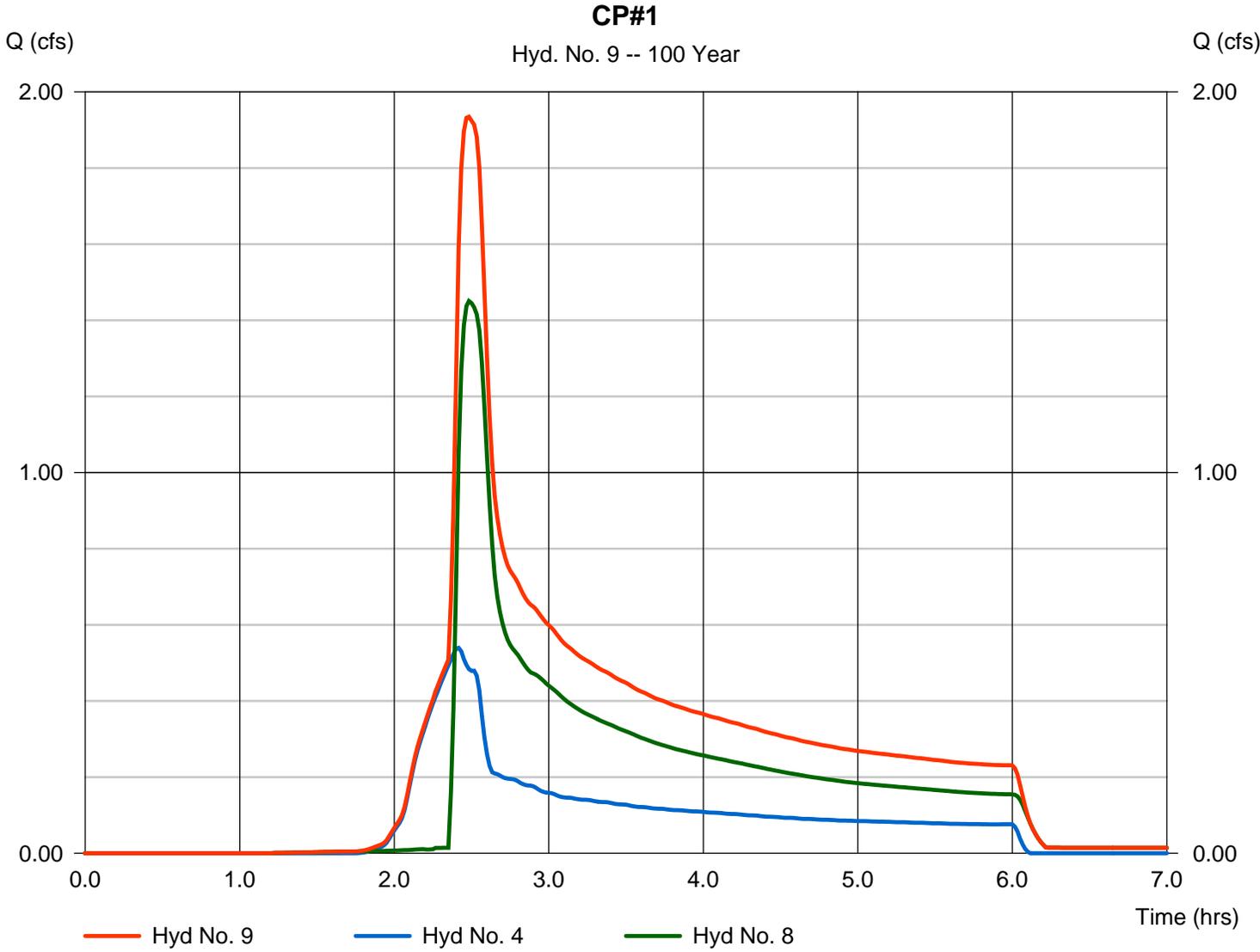
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

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## Hyd. No. 9

CP#1

Hydrograph type	= Combine	Peak discharge	= 1.934 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.48 hrs
Time interval	= 1 min	Hyd. volume	= 7,764 cuft
Inflow hyds.	= 4, 8	Contrib. drain. area	= 0.460 ac



# Hydrograph Report

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

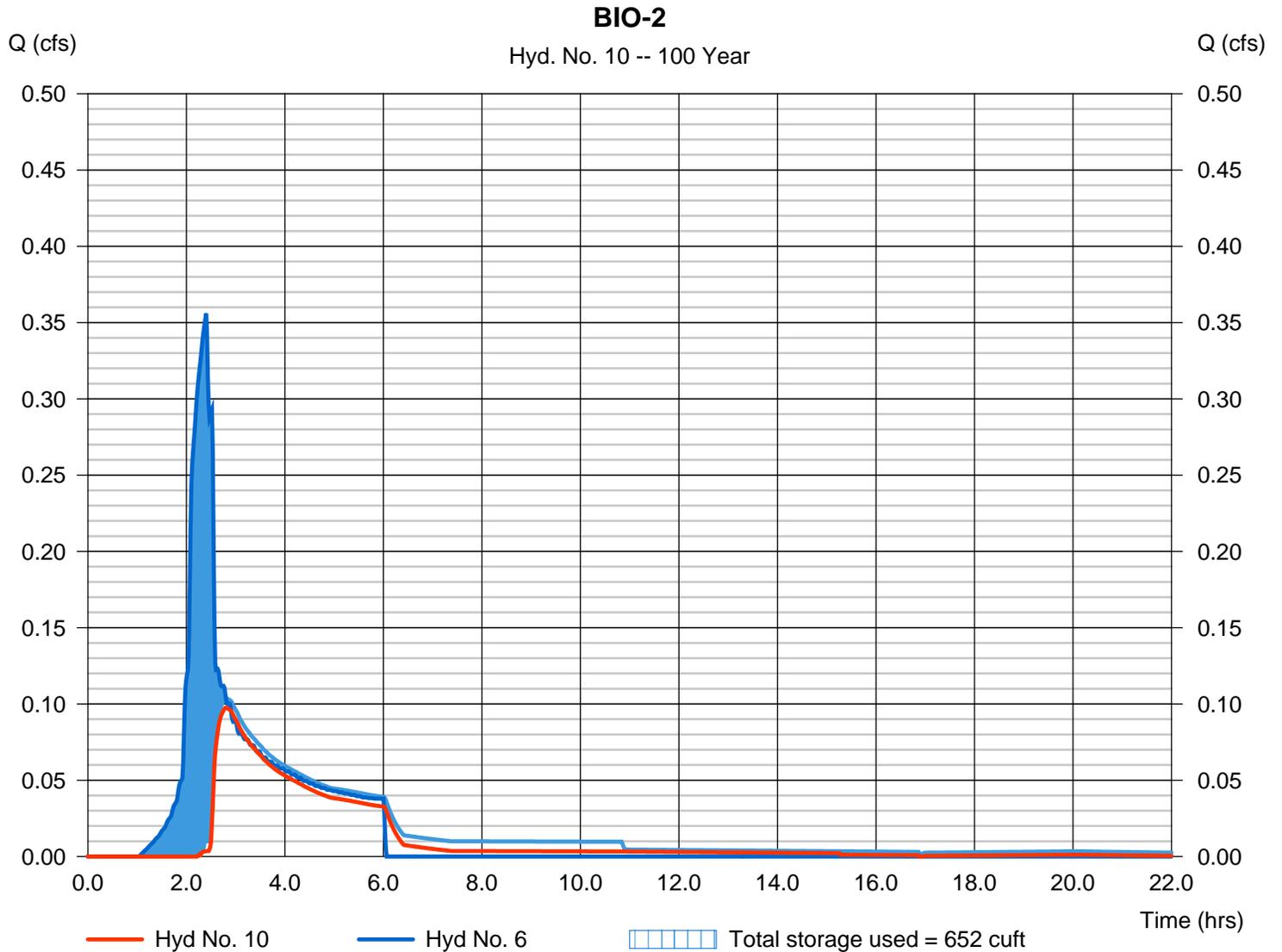
Thursday, 02 / 2 / 2017

## Hyd. No. 10

BIO-2

Hydrograph type	= Reservoir	Peak discharge	= 0.098 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.80 hrs
Time interval	= 1 min	Hyd. volume	= 840 cuft
Inflow hyd. No.	= 6 - B-1.2	Max. Elevation	= 6.37 ft
Reservoir name	= BIO-2	Max. Storage	= 652 cuft

Storage Indication method used. Exfiltration extracted from Outflow.



## Pond No. 2 - BIO-2

### Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1.00	110	0	0
3.00	2.50	110	330	330
3.01	4.01	55	1	331
4.50	5.50	55	82	413
4.51	5.51	275	2	414
6.00	7.00	275	410	824

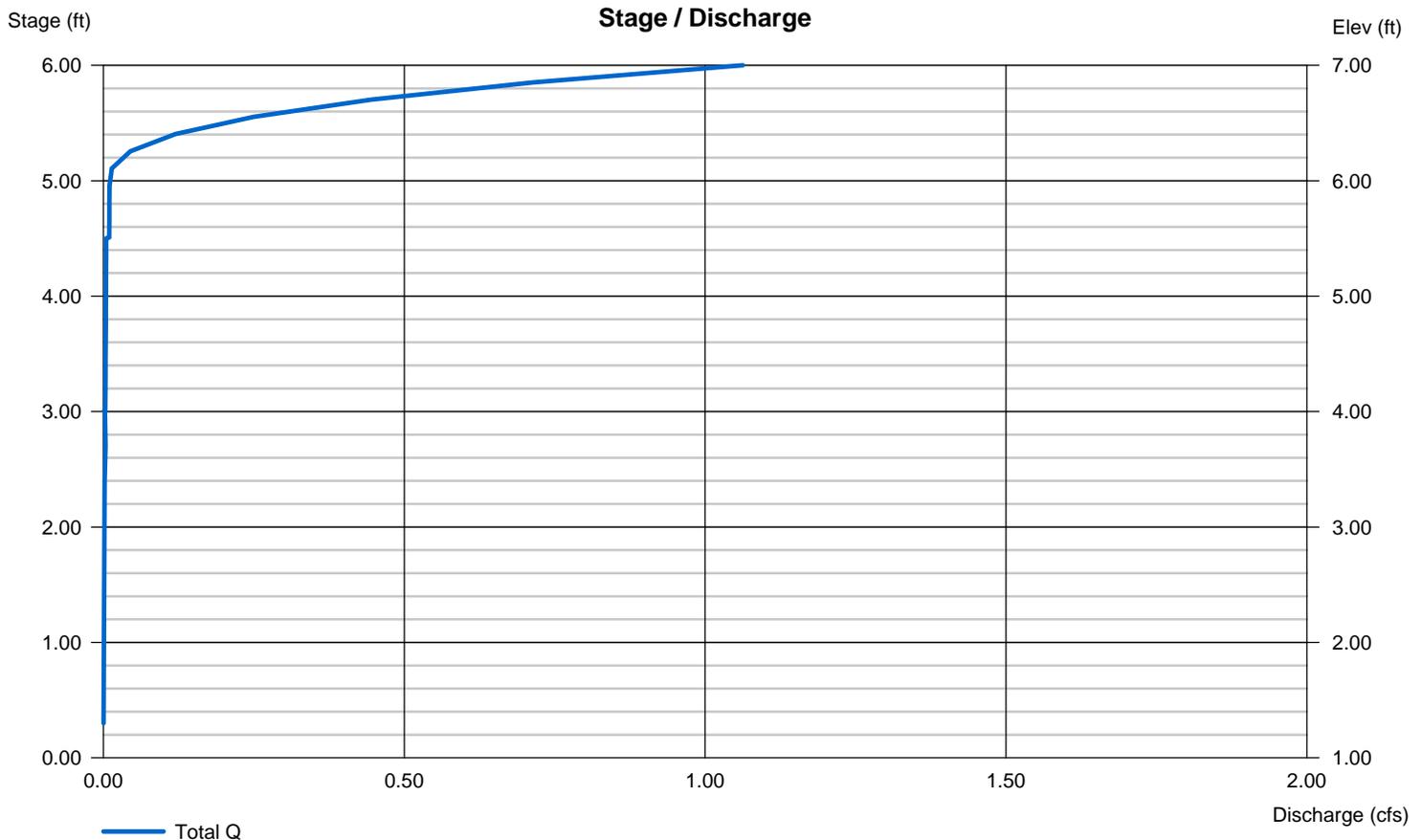
### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.50	0.00	0.00	0.00
Span (in)	= 0.50	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 3.50	0.00	0.00	0.00
Length (ft)	= 10.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.58	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 0.00	0.00	0.00	0.00
Crest El. (ft)	= 6.00	0.00	0.00	0.00
Weir Coeff.	= 1.05	3.33	3.33	3.33
Weir Type	= 45 degV	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 1.000 (by Contour)			
TW Elev. (ft)	= 0.00			

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



# Hydrograph Report

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

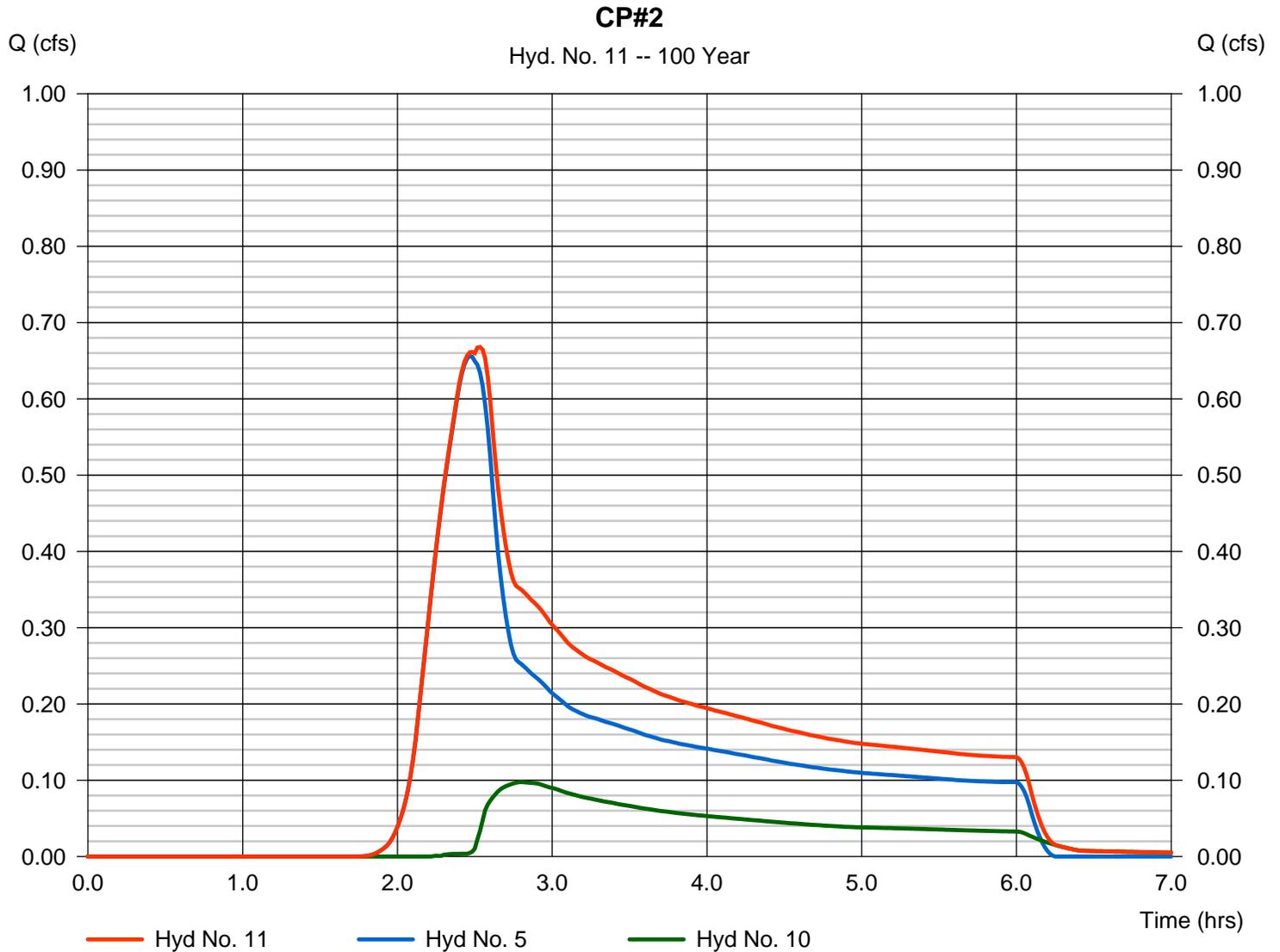
Thursday, 02 / 2 / 2017

## Hyd. No. 11

CP#2

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyds. = 5, 10

Peak discharge = 0.668 cfs  
 Time to peak = 2.53 hrs  
 Hyd. volume = 3,623 cuft  
 Contrib. drain. area = 0.590 ac



# Hydrograph Report

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

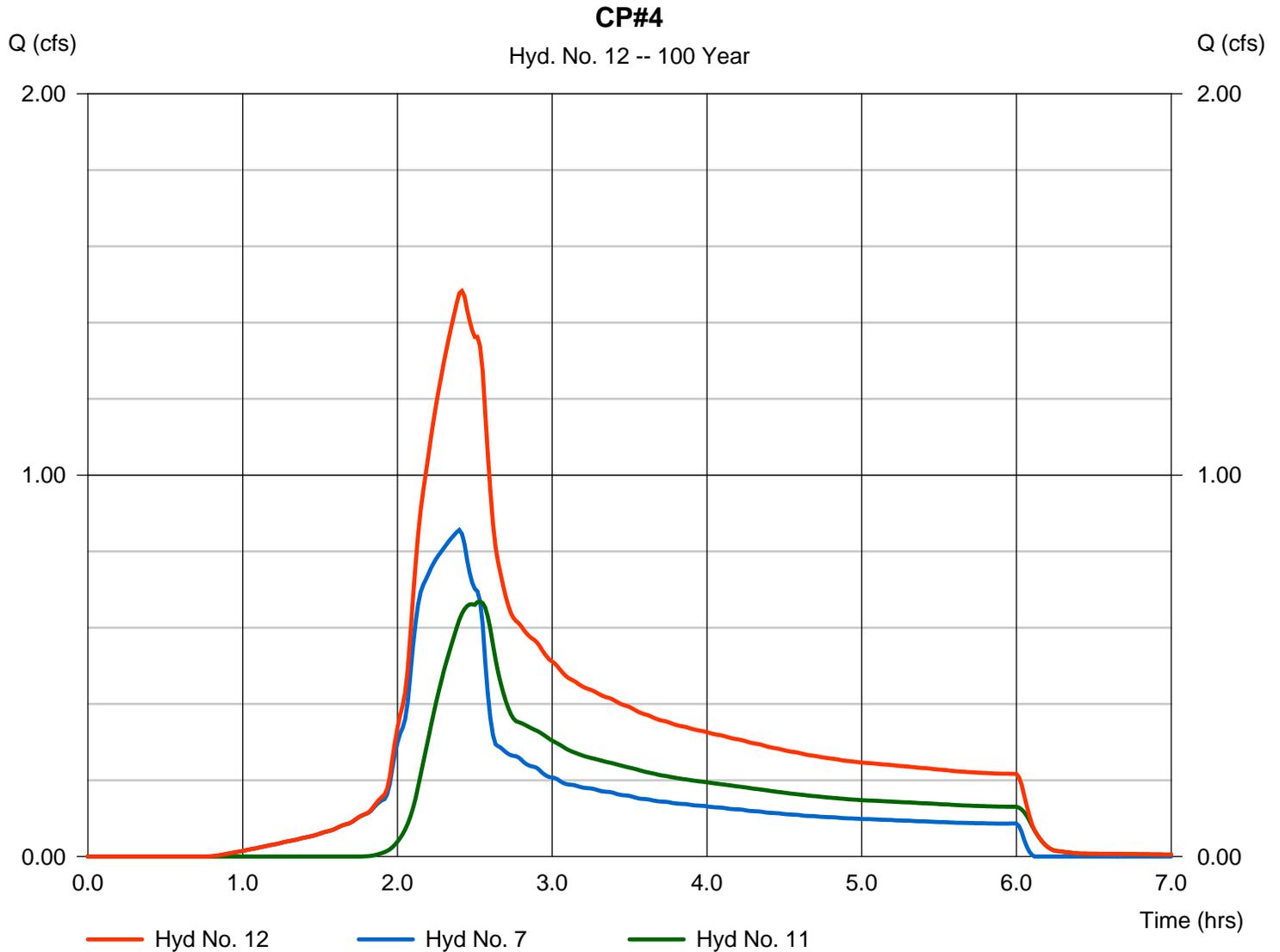
Thursday, 02 / 2 / 2017

## Hyd. No. 12

CP#4

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 7, 11

Peak discharge = 1.483 cfs  
Time to peak = 2.42 hrs  
Hyd. volume = 7,051 cuft  
Contrib. drain. area = 0.410 ac



# Hydrograph Report

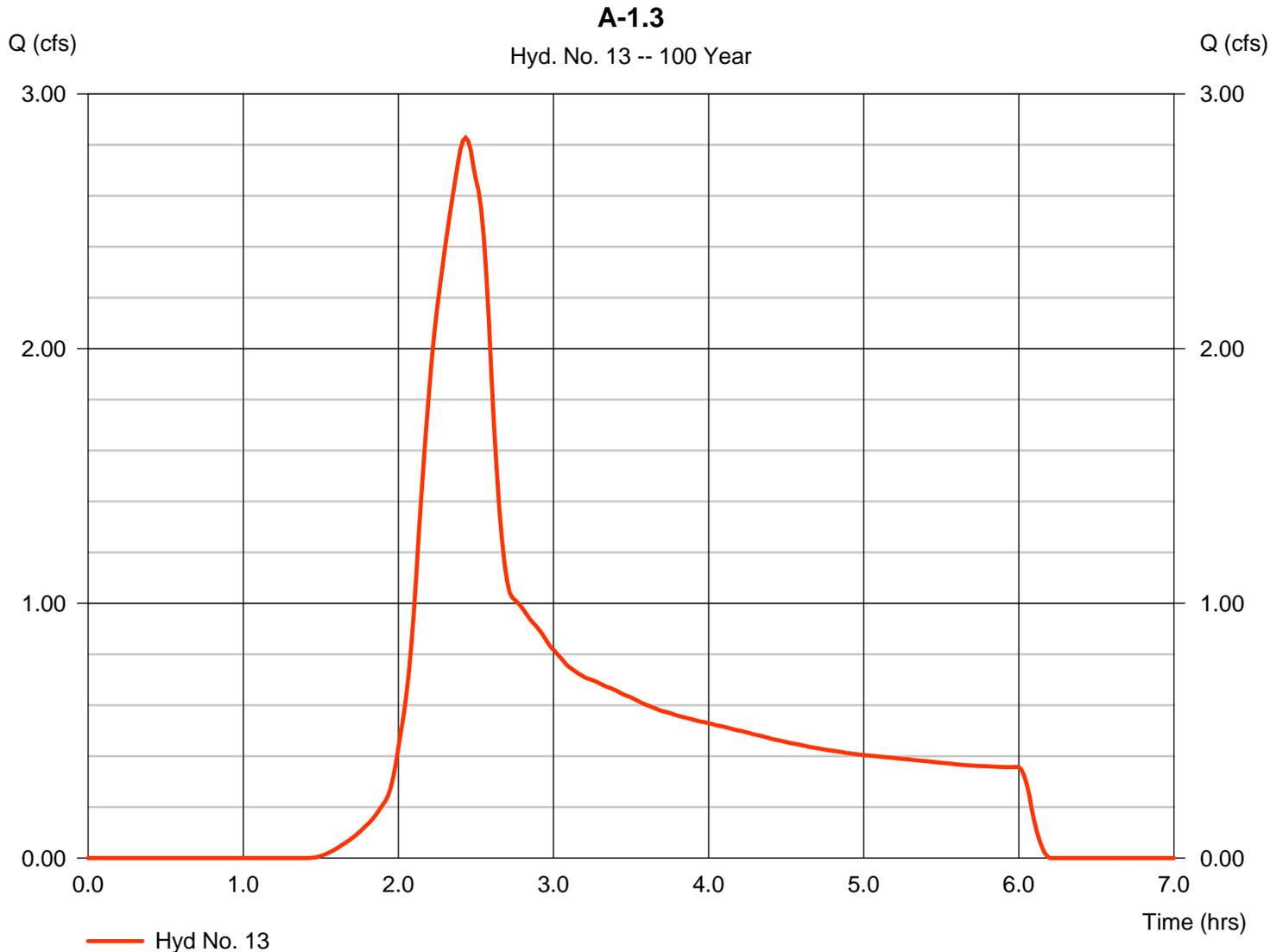
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Thursday, 02 / 2 / 2017

## Hyd. No. 13

A-1.3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.828 cfs
Storm frequency	= 100 yrs	Time to peak	= 2.43 hrs
Time interval	= 1 min	Hyd. volume	= 11,496 cuft
Drainage area	= 1.980 ac	Curve number	= 84
Basin Slope	= 5.0 %	Hydraulic length	= 550 ft
Tc method	= LAG	Time of conc. (Tc)	= 7.70 min
Total precip.	= 3.15 in	Distribution	= SCS 6-Hr
Storm duration	= 6.00 hrs	Shape factor	= 484



# Hydrograph Report

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

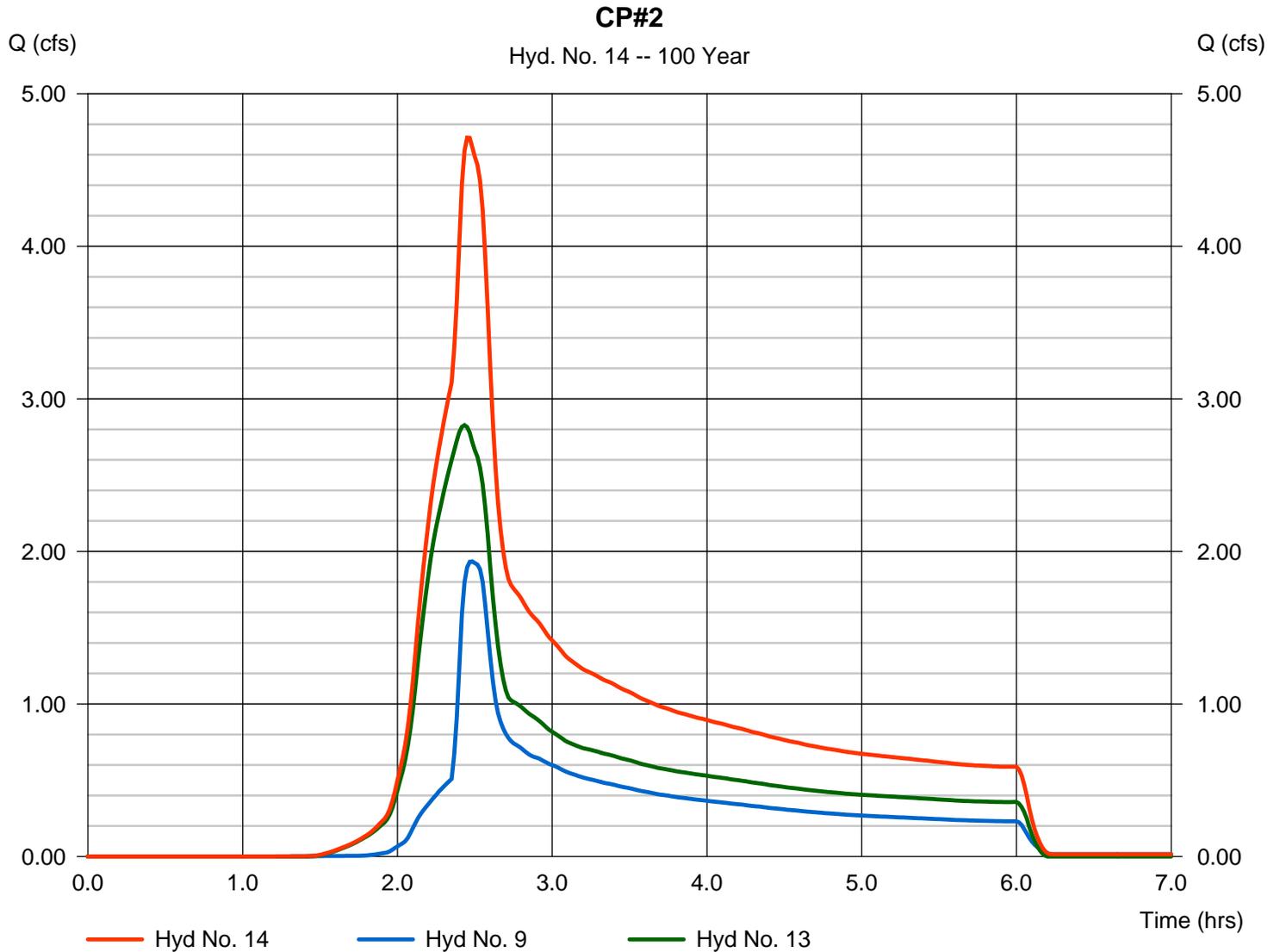
Thursday, 02 / 2 / 2017

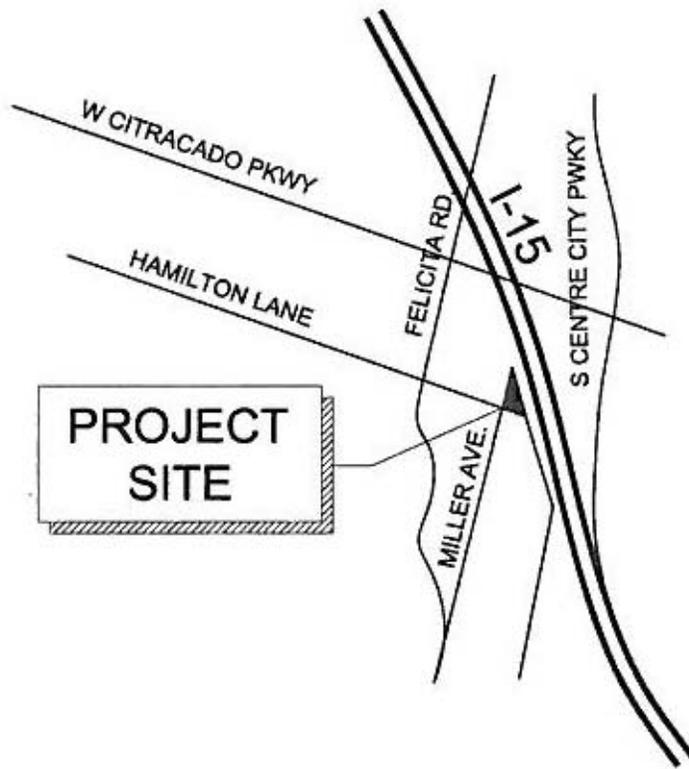
## Hyd. No. 14

CP#2

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 9, 13

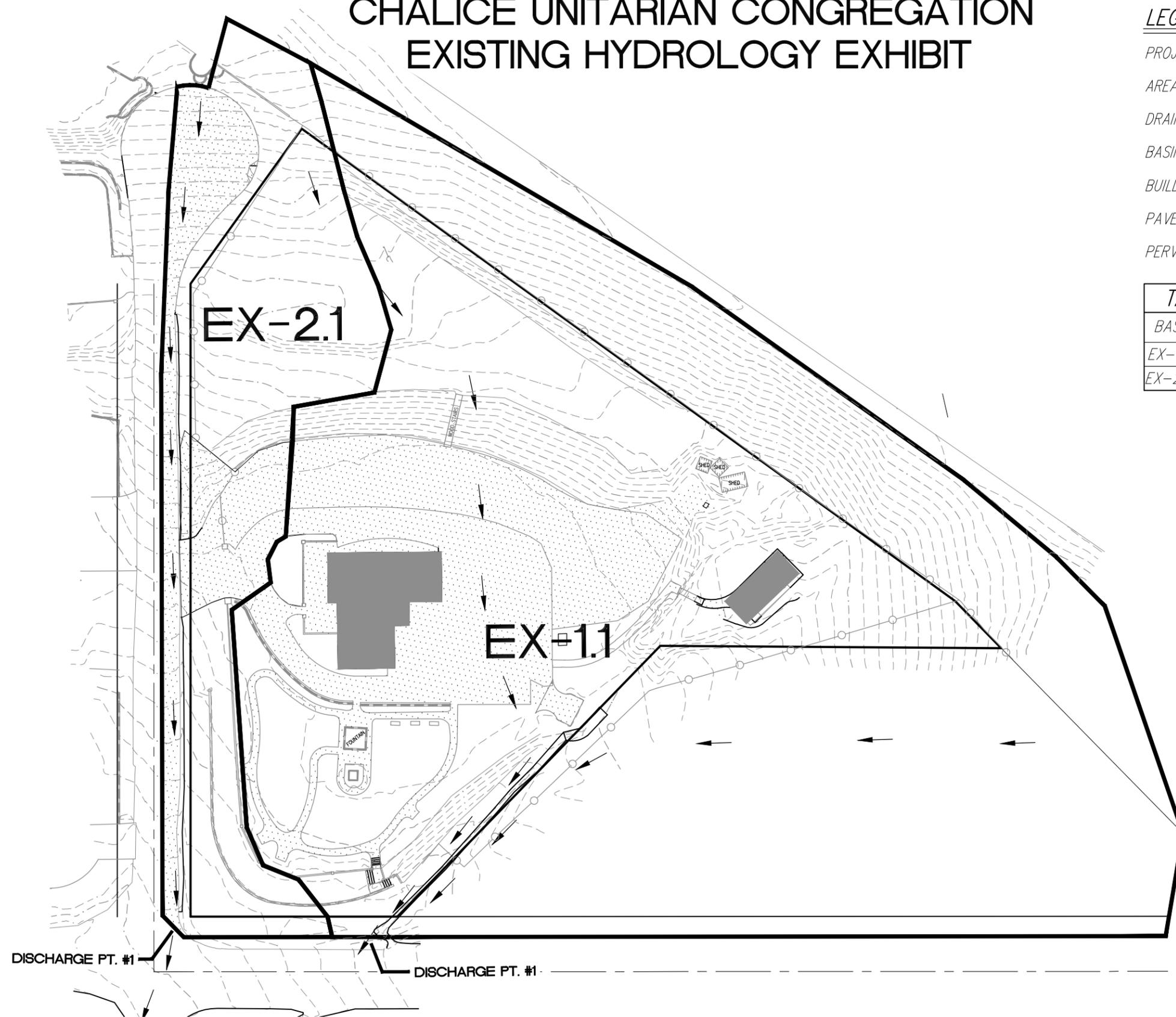
Peak discharge = 4.711 cfs  
Time to peak = 2.45 hrs  
Hyd. volume = 19,260 cuft  
Contrib. drain. area = 1.980 ac





**VICINITY MAP (N.T.S.)**

# CHALICE UNITARIAN CONGREGATION EXISTING HYDROLOGY EXHIBIT

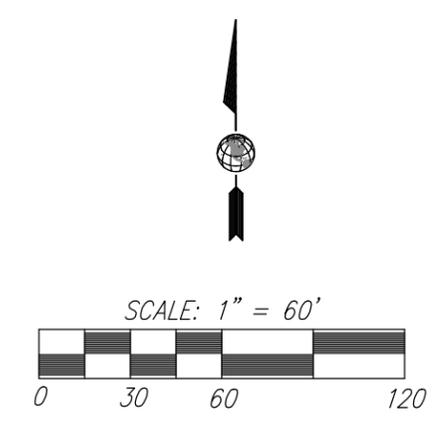


**LEGEND:**

- PROJECT BOUNDARY ..... — — — — —
- AREA LIMITS ..... —————
- DRAINAGE DIRECTION ARROW ..... → → → →
- BASIN NUMBER ..... **EX-1**
- BUILDING AREA .....
- PAVEMENT AREA .....
- PERVIOUS AREA .....

**TABLE OF BASIN DATA**

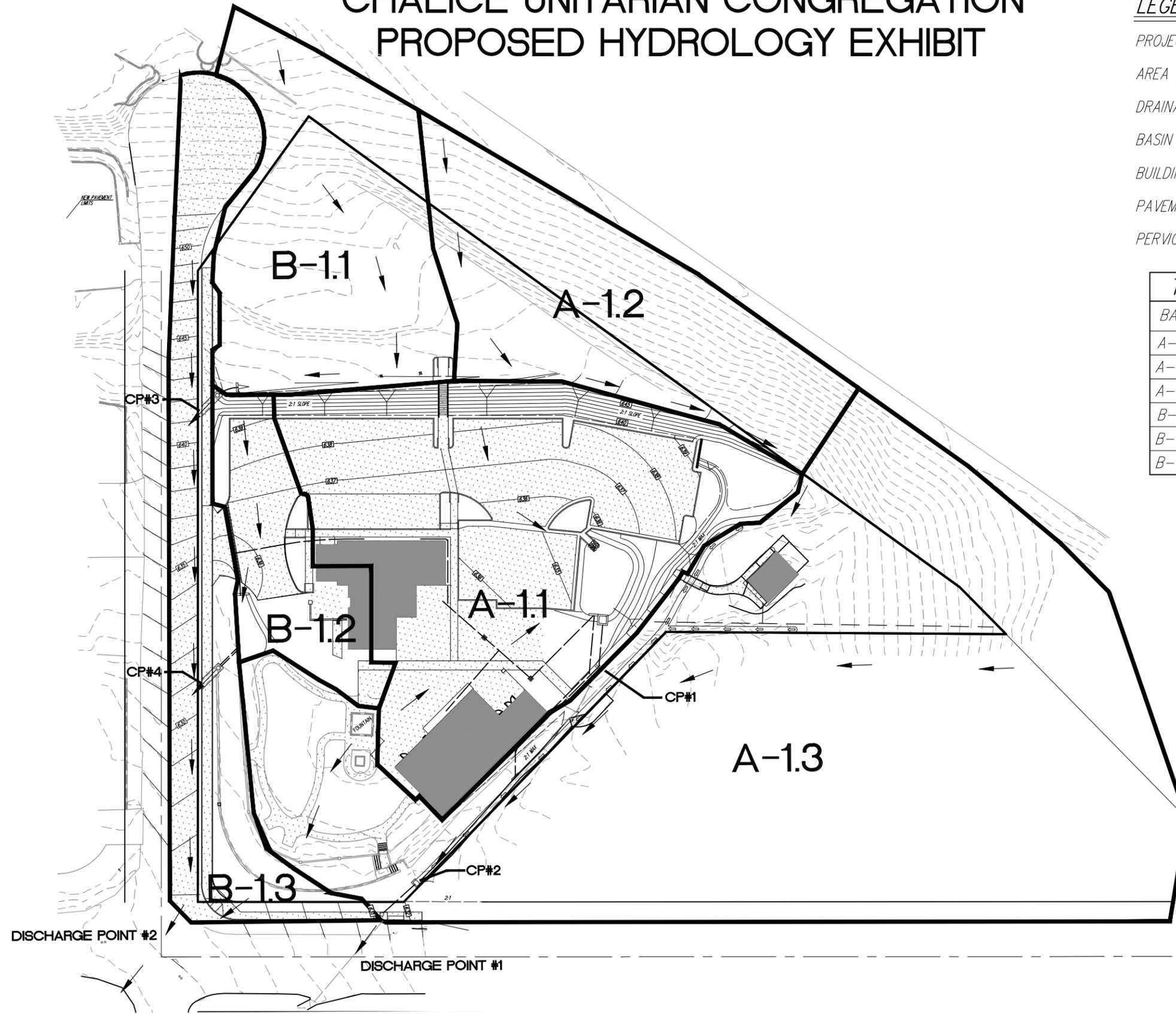
BASIN	AREA	IMPERVIOUS %	$Q_{100}$
EX-1.1	155,285 SF	18%	4.61 CFS
EX-2.2	35,830 SF	30%	1.48 CFS



**OMEGA ENGINEERING CONSULTANTS**  
 4340 VIEWRIDGE AVENUE, SUITE B  
 SAN DIEGO, CALIFORNIA 92123  
 PH: (858) 634-8620 FAX: (858) 634-8627

**FIGURE 2**

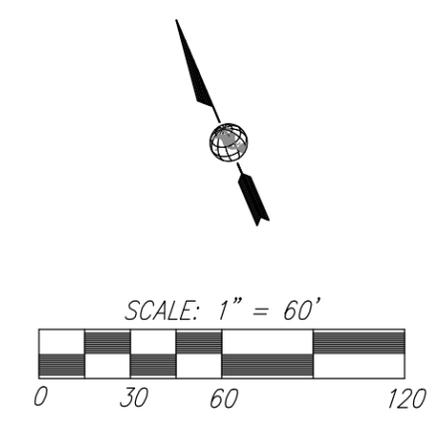
# CHALICE UNITARIAN CONGREGATION PROPOSED HYDROLOGY EXHIBIT



**LEGEND:**

- PROJECT BOUNDARY ..... ————
- AREA LIMITS ..... ————
- DRAINAGE DIRECTION ARROW ..... ————
- BASIN NUMBER ..... EX-1
- BUILDING AREA ..... [Solid Grey Box]
- PAVEMENT AREA ..... [Dotted Box]
- PERVIOUS AREA ..... [White Box]

TABLE OF BASIN DATA			
BASIN	AREA	IMPERVIOUS %	$Q_{100}$
A-1.1	37,876 SF	66%	1.75 CFS
A-1.2	20,248 SF	0%	0.54 CFS
A-1.3	86,141 SF	27%	2.83 CFS
B-1.1	20,481 SF	0%	0.66 CFS
B-1.2	8,584 SF	54%	0.10 CFS
B-1.3	17,714 SF	69%	0.86 CFS



**OMEGA ENGINEERING CONSULTANTS**  
 4340 VIEWRIDGE AVENUE, SUITE B  
 SAN DIEGO, CALIFORNIA 92123  
 PH: (858) 634-8620 FAX: (858) 634-8627

**FIGURE 3**

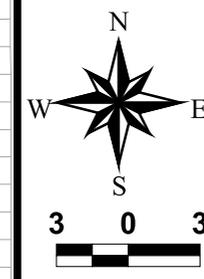
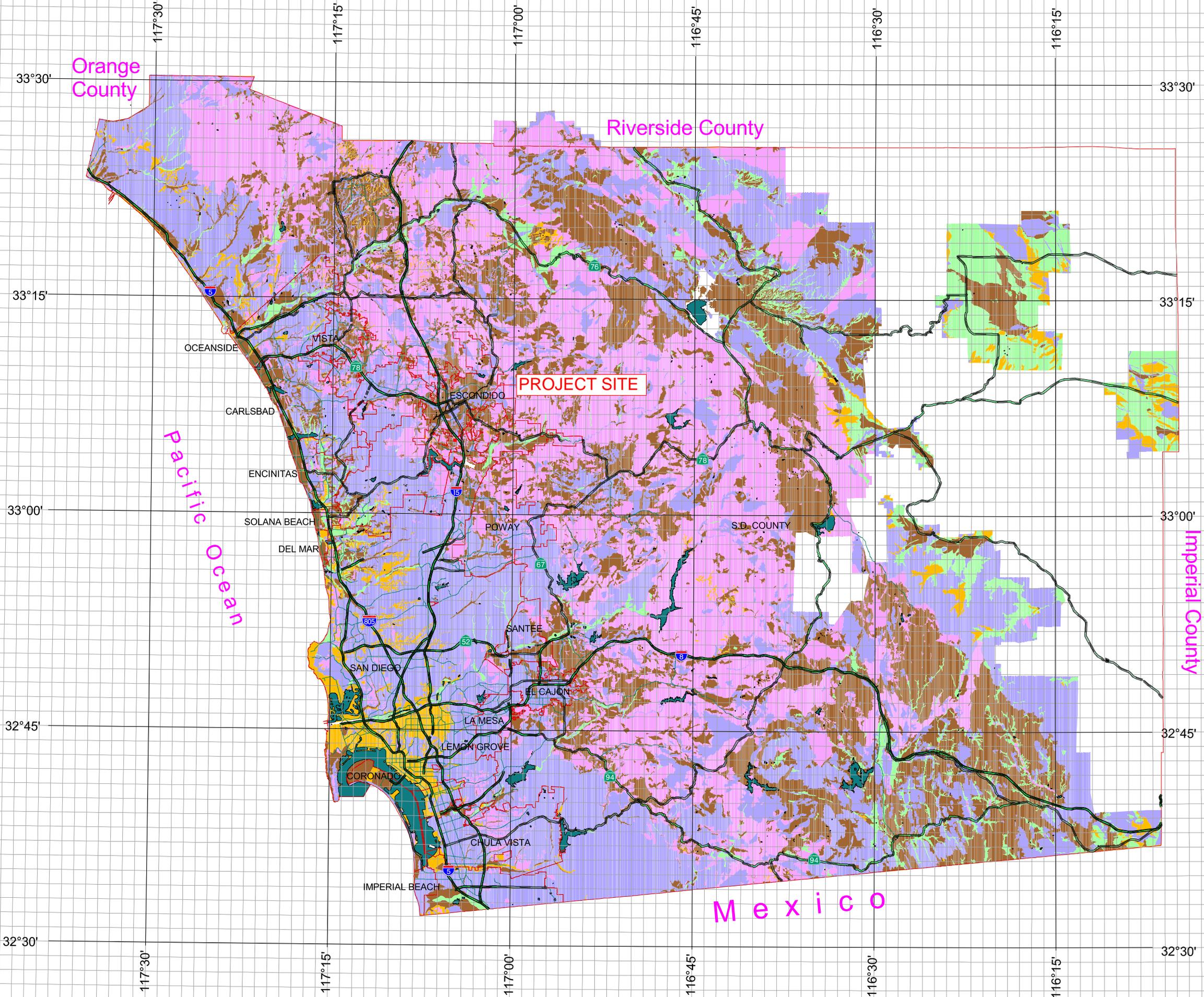
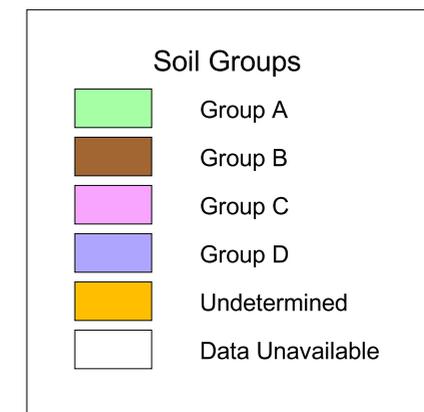
# APPENDICES

# County of San Diego Hydrology Manual



## Soil Hydrologic Groups

### Legend



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**NOAA Atlas 14, Volume 6, Version 2**  
**Location name: Escondido, California, USA\***  
**Latitude: 33.0884°, Longitude: -117.0796°**  
**Elevation: 654.41 ft\*\***



\* source: ESRI Maps  
 \*\* source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps\\_&\\_aerials](#)

**PF tabular**

<b>PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)<sup>1</sup></b>										
<b>Duration</b>	<b>Average recurrence interval (years)</b>									
	<b>1</b>	<b>2</b>	<b>5</b>	<b>10</b>	<b>25</b>	<b>50</b>	<b>100</b>	<b>200</b>	<b>500</b>	<b>1000</b>
<b>5-min</b>	<b>0.117</b> (0.098-0.140)	<b>0.146</b> (0.123-0.176)	<b>0.187</b> (0.157-0.225)	<b>0.220</b> (0.183-0.267)	<b>0.266</b> (0.214-0.335)	<b>0.303</b> (0.238-0.390)	<b>0.341</b> (0.260-0.451)	<b>0.381</b> (0.282-0.519)	<b>0.436</b> (0.309-0.621)	<b>0.480</b> (0.328-0.709)
<b>10-min</b>	<b>0.167</b> (0.141-0.200)	<b>0.210</b> (0.177-0.252)	<b>0.267</b> (0.224-0.322)	<b>0.315</b> (0.262-0.383)	<b>0.382</b> (0.306-0.481)	<b>0.434</b> (0.341-0.559)	<b>0.489</b> (0.373-0.646)	<b>0.546</b> (0.405-0.743)	<b>0.625</b> (0.443-0.890)	<b>0.688</b> (0.470-1.02)
<b>15-min</b>	<b>0.202</b> (0.170-0.242)	<b>0.254</b> (0.214-0.305)	<b>0.323</b> (0.271-0.389)	<b>0.381</b> (0.317-0.463)	<b>0.462</b> (0.370-0.581)	<b>0.525</b> (0.412-0.676)	<b>0.591</b> (0.451-0.781)	<b>0.660</b> (0.489-0.899)	<b>0.756</b> (0.536-1.08)	<b>0.832</b> (0.569-1.23)
<b>30-min</b>	<b>0.280</b> (0.236-0.336)	<b>0.352</b> (0.296-0.422)	<b>0.448</b> (0.376-0.539)	<b>0.528</b> (0.439-0.642)	<b>0.640</b> (0.513-0.805)	<b>0.728</b> (0.571-0.937)	<b>0.819</b> (0.625-1.08)	<b>0.914</b> (0.678-1.25)	<b>1.05</b> (0.743-1.49)	<b>1.15</b> (0.788-1.70)
<b>60-min</b>	<b>0.437</b> (0.368-0.524)	<b>0.548</b> (0.462-0.658)	<b>0.698</b> (0.586-0.841)	<b>0.823</b> (0.685-1.00)	<b>0.997</b> (0.800-1.25)	<b>1.13</b> (0.890-1.46)	<b>1.28</b> (0.975-1.69)	<b>1.43</b> (1.06-1.94)	<b>1.63</b> (1.16-2.33)	<b>1.80</b> (1.23-2.66)
<b>2-hr</b>	<b>0.631</b> (0.532-0.757)	<b>0.790</b> (0.665-0.948)	<b>1.00</b> (0.843-1.21)	<b>1.19</b> (0.986-1.44)	<b>1.44</b> (1.16-1.81)	<b>1.64</b> (1.29-2.12)	<b>1.86</b> (1.42-2.45)	<b>2.08</b> (1.54-2.84)	<b>2.40</b> (1.70-3.42)	<b>2.65</b> (1.81-3.92)
<b>3-hr</b>	<b>0.770</b> (0.648-0.923)	<b>0.961</b> (0.809-1.15)	<b>1.22</b> (1.03-1.47)	<b>1.44</b> (1.20-1.75)	<b>1.76</b> (1.41-2.21)	<b>2.01</b> (1.57-2.58)	<b>2.27</b> (1.74-3.00)	<b>2.55</b> (1.89-3.48)	<b>2.95</b> (2.09-4.20)	<b>3.27</b> (2.24-4.83)
<b>6-hr</b>	<b>1.06</b> (0.897-1.28)	<b>1.33</b> (1.12-1.60)	<b>1.69</b> (1.42-2.04)	<b>2.00</b> (1.66-2.43)	<b>2.43</b> (1.95-3.06)	<b>2.78</b> (2.18-3.58)	<b>3.15</b> (2.41-4.17)	<b>3.55</b> (2.63-4.83)	<b>4.11</b> (2.91-5.85)	<b>4.56</b> (3.12-6.74)
<b>12-hr</b>	<b>1.46</b> (1.23-1.75)	<b>1.83</b> (1.54-2.20)	<b>2.34</b> (1.96-2.81)	<b>2.76</b> (2.30-3.35)	<b>3.36</b> (2.69-4.23)	<b>3.83</b> (3.01-4.94)	<b>4.33</b> (3.31-5.73)	<b>4.86</b> (3.60-6.62)	<b>5.61</b> (3.98-7.98)	<b>6.20</b> (4.24-9.17)
<b>24-hr</b>	<b>1.80</b> (1.59-2.08)	<b>2.27</b> (2.00-2.62)	<b>2.90</b> (2.55-3.37)	<b>3.43</b> (2.99-4.01)	<b>4.17</b> (3.53-5.03)	<b>4.76</b> (3.95-5.86)	<b>5.37</b> (4.35-6.76)	<b>6.02</b> (4.75-7.78)	<b>6.92</b> (5.25-9.31)	<b>7.64</b> (5.61-10.6)
<b>2-day</b>	<b>2.19</b> (1.93-2.53)	<b>2.78</b> (2.45-3.22)	<b>3.60</b> (3.16-4.17)	<b>4.28</b> (3.73-5.00)	<b>5.23</b> (4.42-6.31)	<b>5.99</b> (4.96-7.37)	<b>6.78</b> (5.49-8.54)	<b>7.62</b> (6.01-9.85)	<b>8.79</b> (6.67-11.8)	<b>9.72</b> (7.14-13.5)
<b>3-day</b>	<b>2.45</b> (2.17-2.84)	<b>3.16</b> (2.79-3.66)	<b>4.12</b> (3.62-4.78)	<b>4.93</b> (4.30-5.76)	<b>6.06</b> (5.13-7.32)	<b>6.97</b> (5.78-8.57)	<b>7.92</b> (6.41-9.97)	<b>8.92</b> (7.04-11.5)	<b>10.3</b> (7.84-13.9)	<b>11.5</b> (8.42-15.9)
<b>4-day</b>	<b>2.68</b> (2.37-3.10)	<b>3.47</b> (3.06-4.02)	<b>4.55</b> (4.00-5.28)	<b>5.46</b> (4.76-6.39)	<b>6.74</b> (5.70-8.13)	<b>7.76</b> (6.43-9.55)	<b>8.83</b> (7.16-11.1)	<b>9.97</b> (7.87-12.9)	<b>11.6</b> (8.78-15.5)	<b>12.8</b> (9.44-17.8)
<b>7-day</b>	<b>3.13</b> (2.76-3.62)	<b>4.07</b> (3.59-4.71)	<b>5.35</b> (4.71-6.21)	<b>6.43</b> (5.61-7.52)	<b>7.95</b> (6.72-9.59)	<b>9.16</b> (7.59-11.3)	<b>10.4</b> (8.45-13.1)	<b>11.8</b> (9.29-15.2)	<b>13.7</b> (10.4-18.4)	<b>15.2</b> (11.1-21.1)
<b>10-day</b>	<b>3.46</b> (3.06-4.00)	<b>4.52</b> (3.98-5.24)	<b>5.96</b> (5.24-6.92)	<b>7.17</b> (6.26-8.39)	<b>8.88</b> (7.50-10.7)	<b>10.2</b> (8.48-12.6)	<b>11.7</b> (9.44-14.7)	<b>13.2</b> (10.4-17.0)	<b>15.3</b> (11.6-20.5)	<b>17.0</b> (12.5-23.6)
<b>20-day</b>	<b>4.25</b> (3.75-4.92)	<b>5.61</b> (4.94-6.49)	<b>7.45</b> (6.55-8.65)	<b>9.00</b> (7.85-10.5)	<b>11.2</b> (9.46-13.5)	<b>12.9</b> (10.7-15.9)	<b>14.8</b> (12.0-18.6)	<b>16.7</b> (13.2-21.6)	<b>19.5</b> (14.8-26.2)	<b>21.7</b> (15.9-30.1)
<b>30-day</b>	<b>5.09</b> (4.49-5.89)	<b>6.75</b> (5.95-7.82)	<b>9.02</b> (7.93-10.5)	<b>10.9</b> (9.54-12.8)	<b>13.6</b> (11.5-16.5)	<b>15.8</b> (13.1-19.5)	<b>18.1</b> (14.7-22.8)	<b>20.5</b> (16.2-26.5)	<b>23.9</b> (18.2-32.2)	<b>26.7</b> (19.6-37.1)
<b>45-day</b>	<b>6.01</b> (5.30-6.95)	<b>7.99</b> (7.04-9.25)	<b>10.7</b> (9.42-12.4)	<b>13.0</b> (11.4-15.2)	<b>16.3</b> (13.8-19.7)	<b>19.0</b> (15.7-23.3)	<b>21.8</b> (17.6-27.4)	<b>24.8</b> (19.5-32.0)	<b>29.0</b> (22.0-39.0)	<b>32.5</b> (23.9-45.1)
<b>60-day</b>	<b>6.96</b> (6.14-8.05)	<b>9.25</b> (8.16-10.7)	<b>12.4</b> (10.9-14.4)	<b>15.1</b> (13.2-17.7)	<b>19.0</b> (16.1-23.0)	<b>22.2</b> (18.4-27.3)	<b>25.5</b> (20.7-32.1)	<b>29.1</b> (23.0-37.7)	<b>34.3</b> (26.0-46.1)	<b>38.5</b> (28.3-53.5)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

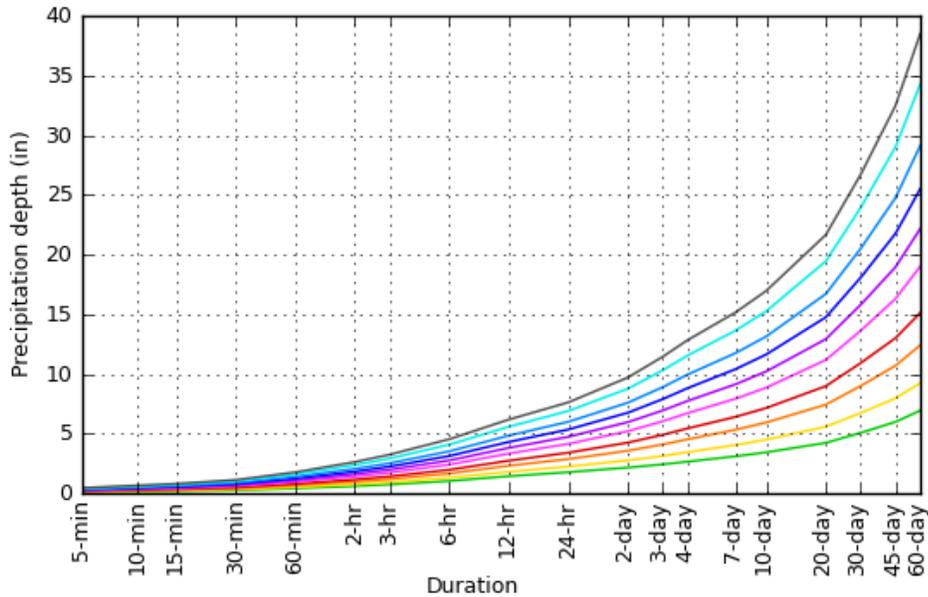
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

Please refer to NOAA Atlas 14 document for more information.

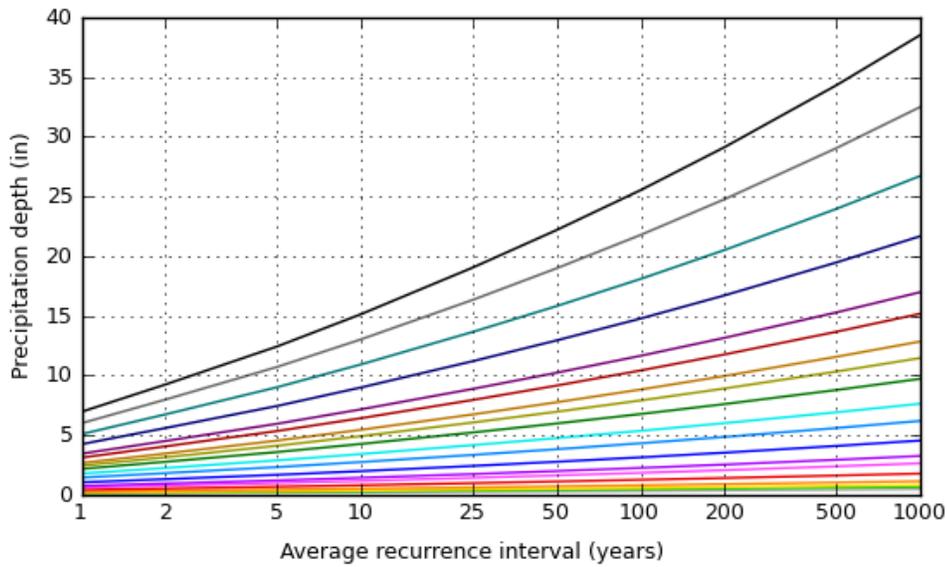
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### PF graphical

PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 33.0884°, Longitude: -117.0796°



Average recurrence interval (years)	
1	Green
2	Yellow
5	Orange
10	Red
25	Pink
50	Purple
100	Blue
200	Cyan
500	Light Blue
1000	Black

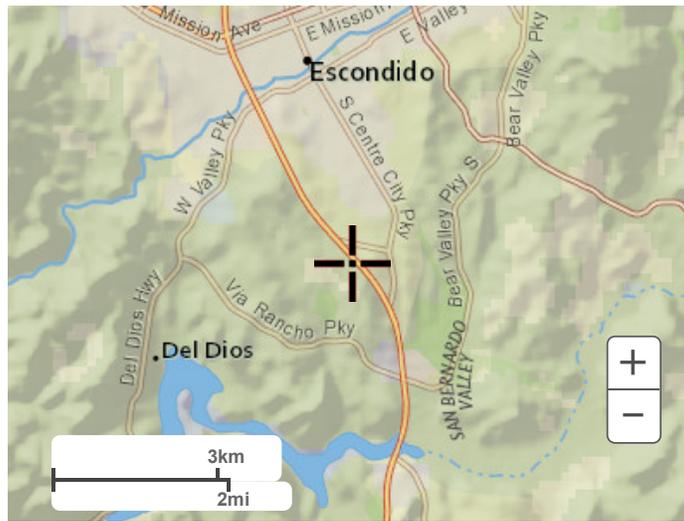


Duration	
5-min	Green
10-min	Yellow
15-min	Orange
30-min	Red
60-min	Pink
2-hr	Purple
3-hr	Blue
6-hr	Cyan
12-hr	Light Blue
24-hr	Black
2-day	Dark Green
3-day	Dark Yellow
4-day	Dark Orange
7-day	Dark Red
10-day	Dark Pink
20-day	Dark Blue
30-day	Dark Cyan
45-day	Dark Light Blue
60-day	Dark Black

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### Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial