

# Berkeley Square 1<sup>st</sup> Addition

## *Supplemental Drainage Report* *January 5, 2011*

### **Water Quality**

There are 31 acres of the site and unplatted areas that are accounted for in the water quality calculations. Basin A will drain through enhanced swales. The swales are shown in concept; exact location may need to be revised once a final site plan is determined. These swales will remove 90% of the total suspended solids (TSS) in the storm water runoff. The treated runoff from these swales will drain into the West Pond extended dry detention facility. This facility will not only provide storm water detention, but will also remove 60% of the TSS. This removes 96% of the TSS in Basin A. Basin C will also drain into an extended dry detention basin that will remove 60% of the TSS. Basin B will flow into an enhanced swale that runs from north to south parallel to Greenwich Road and parallel to streets and driveways on the site. The swale will outlet into the existing storm water sewer system along Greenwich Road. The swale will be designed to provide a minimum contact time in accordance with city regulations. The water treatment facilities will remove 88.6% of the total suspended solids (TSS).

**Table 1. TSS Removal Summary.**

<b>Basin Name</b>	<b>Basin Area (ac)</b>	<b>Water Quality Control</b>	<b>TSS Removal</b>
A – 1 <sup>st</sup> Control	15.7	Enhanced Swale	90%
A – 2 <sup>nd</sup> Control	15.7	Extended Dry Detention	60%
A – Total	15.7	Swale/Extended Dry Detention	96%
B	4.6	Extended Dry Detention	60%
C	10.7	Enhanced Swale	90%
Average Removal Rate			88.6%

On the south east corner of 13<sup>th</sup> Street and Greenwich Road is the Kiser West Addition. This property is owned by this same developer. The 8.2 acres of Kiser West provides at least 47% TSS removal, the developing portion of this basin will have TSS removal of 80% or more.

### **Channel Protection Volume**

The West Pond and swales in Basin B provide extended detention for the site. The ponds have small outlet structures that slowly release the storm water several hours after the peak from the storm. The centroid of the peak outflow hydrograph is approximately 24 hours after the centroid of the peak inflow hydrograph. The peak discharge and storage volume were estimated using the Channel Protection Volume Extended Detention – Simplified Method.

The site is providing 3.9 acre-feet of storage within the bioswale and detention basin for the 1-year, 2.8" rainfall.

### ***Detention***

With the swales, the post-project peak flow rate from the site has been further decreased from pre-project conditions. A comparison of pre- and post- project flow rates is shown in Table 2. The site has decreased the peak flow rates for all storms. This additional detention provided by this site will help reduce detention needs for the Kiser West Addition.

**Table 2. Comparison of Pre and Post-Development Flow Rates.**

Description	Design Storm Flows (cfs)				
	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Pre-Project	67.2	99.7	121.3	153.9	200.5
Post-Project	14.5	78.3	108.7	139.8	173.7

***Minimum Pad Elevations***

Since the elevations of the lots vary from east to west, no minimum pads will be required. Any buildings on the back portion of Lot 4 will have a lowest opening of 1390.7 in the area of the West Detention Pond.

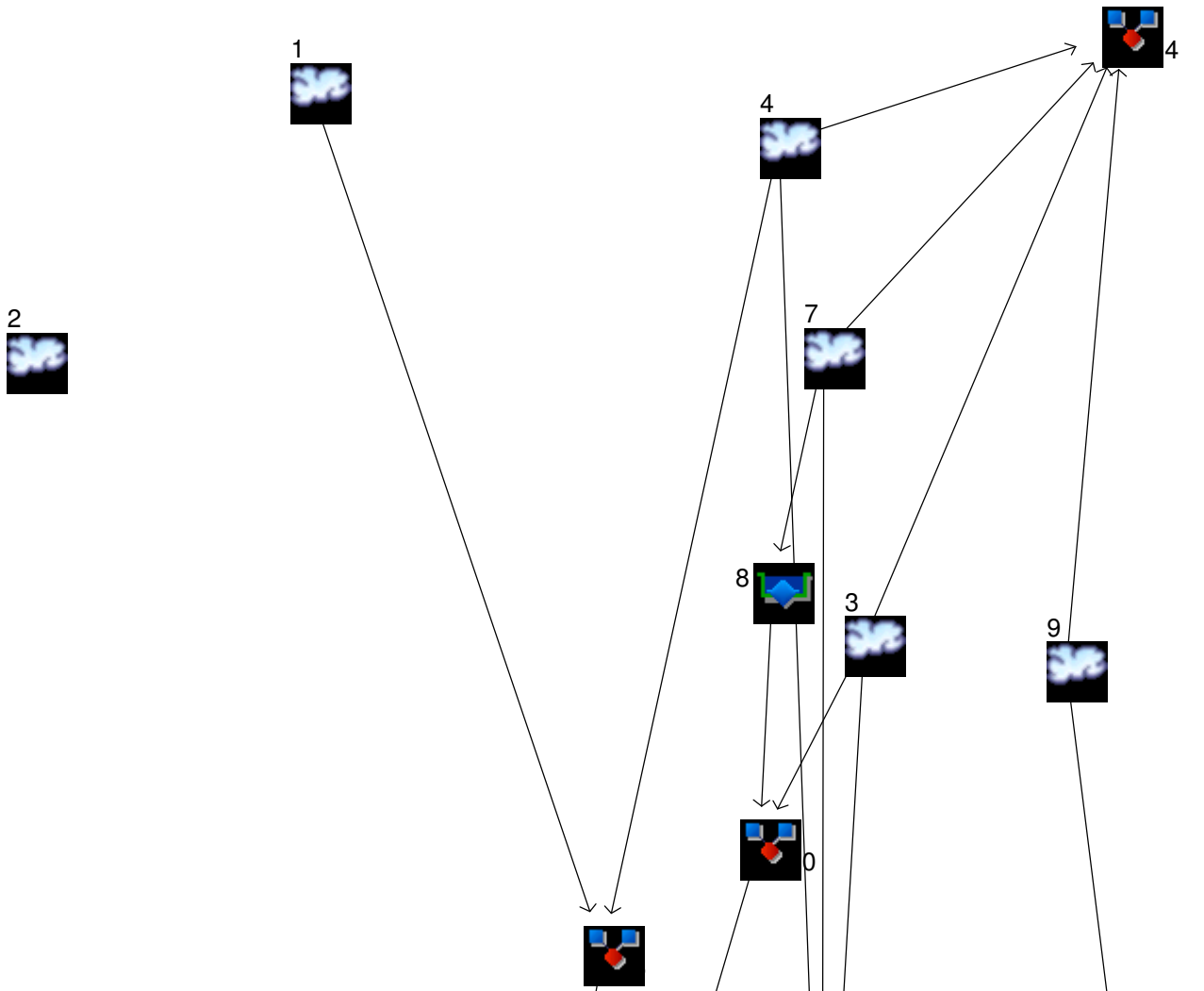
## Appendix 1

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### Hydraflow Hydrographs Output

# Watershed Model Schematic

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



## Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	WF Res
2	SCS Runoff	Pre-A (Pre-To Greenwich Rd)
3	SCS Runoff	Post-B
4	SCS Runoff	Post-A
5	Combine	Post A + WF Res
6	Reservoir	West Detention
7	SCS Runoff	Post-C
8	Reservoir	East Detention
9	SCS Runoff	Home Bank
10	Combine	To Swale
11	Reservoir	Swale
12	Combine	Post From Berkeley Square
13	Combine	Post To Greenwich Rd
14	Combine	Undetained Post-Project Flow
15	Combine	Post From Berkeley Square Undetained

# Hydrograph Return Period Recap

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

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	-----	5.540	7.805	-----	11.48	13.91	17.56	20.35	22.78	WF Res
2	SCS Runoff	-----	47.18	67.16	-----	99.70	121.32	153.92	178.77	200.48	Pre-A (Pre-To Greenwich Rd)
3	SCS Runoff	-----	41.11	52.33	-----	69.84	81.21	98.20	111.10	122.36	Post-B
4	SCS Runoff	-----	60.32	76.79	-----	102.47	119.16	144.09	163.02	179.54	Post-A
5	Combine	1, 4	63.80	81.85	-----	110.14	128.57	156.13	177.07	195.36	Post A + WF Res
6	Reservoir	5	1.268	1.377	-----	1.511	1.812	5.933	6.595	6.725	West Detention
7	SCS Runoff	-----	17.67	22.50	-----	30.02	34.91	42.22	47.76	52.60	Post-C
8	Reservoir	7	6.970	7.817	-----	19.93	27.06	35.09	37.44	38.92	East Detention
9	SCS Runoff	-----	4.994	6.358	-----	8.485	9.867	11.93	13.50	14.87	Home Bank
10	Combine	3, 8,	47.31	59.22	-----	80.70	101.81	130.66	146.54	159.50	To Swale
11	Reservoir	10	1.979	12.53	-----	70.95	98.18	127.31	144.26	157.48	Swale
12	Combine	6, 11	3.229	13.84	-----	72.29	99.57	128.78	145.76	159.02	Post From Berkeley Square
13	Combine	9, 12	6.740	14.52	-----	78.34	108.67	139.77	159.07	173.69	Post To Greenwich Rd
14	Combine	3, 4, 7, 9,	124.09	157.97	-----	210.81	245.16	296.44	335.38	369.38	Undetained Post-Project Flow
15	Combine	3, 4, 7,	119.10	151.62	-----	202.33	235.29	284.51	321.88	354.51	Post From Berkeley Square Undetain

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	5.540	1	726	0.419	-----	-----	-----	WF Res	
2	SCS Runoff	47.18	1	725	3.395	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	41.11	1	717	2.073	-----	-----	-----	Post-B	
4	SCS Runoff	60.32	1	717	3.042	-----	-----	-----	Post-A	
5	Combine	63.80	1	717	3.460	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.268	1	955	3.116	5	1383.94	2.42	West Detention	
7	SCS Runoff	17.67	1	717	0.891	-----	-----	-----	Post-C	
8	Reservoir	6.970	1	724	0.891	7	1382.35	0.226	East Detention	
9	SCS Runoff	4.994	1	717	0.252	-----	-----	-----	Home Bank	
10	Combine	47.31	1	717	2.964	3, 8,	-----	-----	To Swale	
11	Reservoir	1.979	1	818	2.557	10	1379.80	2.00	Swale	
12	Combine	3.229	1	818	5.674	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	6.740	1	717	5.926	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	124.09	1	717	6.258	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	119.10	1	717	6.006	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 1 Year			Wednesday, Jan 5, 2011		

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	7.805	1	726	0.589	-----	-----	-----	WF Res	
2	SCS Runoff	67.16	1	725	4.814	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	52.33	1	717	2.685	-----	-----	-----	Post-B	
4	SCS Runoff	76.79	1	717	3.939	-----	-----	-----	Post-A	
5	Combine	81.85	1	717	4.528	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.377	1	1018	3.719	5	1384.61	3.26	West Detention	
7	SCS Runoff	22.50	1	717	1.154	-----	-----	-----	Post-C	
8	Reservoir	7.817	1	724	1.154	7	1382.89	0.307	East Detention	
9	SCS Runoff	6.358	1	717	0.326	-----	-----	-----	Home Bank	
10	Combine	59.22	1	717	3.839	3, 8,	-----	-----	To Swale	
11	Reservoir	12.53	1	738	3.388	10	1379.83	2.05	Swale	
12	Combine	13.84	1	738	7.107	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	14.52	1	738	7.433	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	157.97	1	717	8.104	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	151.62	1	717	7.778	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 2 Year			Wednesday, Jan 5, 2011		

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	11.48	1	726	0.870	-----	-----	-----	WF Res	
2	SCS Runoff	99.70	1	725	7.178	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	69.84	1	717	3.654	-----	-----	-----	Post-B	
4	SCS Runoff	102.47	1	717	5.362	-----	-----	-----	Post-A	
5	Combine	110.14	1	717	6.232	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.511	1	1106	4.398	5	1385.51	4.67	West Detention	
7	SCS Runoff	30.02	1	717	1.571	-----	-----	-----	Post-C	
8	Reservoir	19.93	1	721	1.571	7	1383.27	0.375	East Detention	
9	SCS Runoff	8.485	1	717	0.444	-----	-----	-----	Home Bank	
10	Combine	80.70	1	718	5.225	3, 8,	-----	-----	To Swale	
11	Reservoir	70.95	1	721	4.730	10	1379.91	2.16	Swale	
12	Combine	72.29	1	721	9.128	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	78.34	1	721	9.572	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	210.81	1	717	11.031	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	202.33	1	717	10.587	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 5 Year			Wednesday, Jan 5, 2011		

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	13.91	1	726	1.060	-----	-----	-----	WF Res
2	SCS Runoff	121.32	1	725	8.779	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)
3	SCS Runoff	81.21	1	717	4.292	-----	-----	-----	Post-B
4	SCS Runoff	119.16	1	717	6.297	-----	-----	-----	Post-A
5	Combine	128.57	1	717	7.357	1, 4	-----	-----	Post A + WF Res
6	Reservoir	1.812	1	1092	4.770	5	1386.03	5.59	West Detention
7	SCS Runoff	34.91	1	717	1.845	-----	-----	-----	Post-C
8	Reservoir	27.06	1	720	1.845	7	1383.40	0.401	East Detention
9	SCS Runoff	9.867	1	717	0.521	-----	-----	-----	Home Bank
10	Combine	101.81	1	718	6.137	3, 8,	-----	-----	To Swale
11	Reservoir	98.18	1	719	5.625	10	1379.93	2.20	Swale
12	Combine	99.57	1	719	10.395	6, 11	-----	-----	Post From Berkeley Square
13	Combine	108.67	1	719	10.916	9, 12	-----	-----	Post To Greenwich Rd
14	Combine	245.16	1	717	12.955	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow
15	Combine	235.29	1	717	12.434	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain
Detention Calcs.gpw					Return Period: 10 Year			Wednesday, Jan 5, 2011	

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	17.56	1	726	1.350	-----	-----	-----	WF Res	
2	SCS Runoff	153.92	1	725	11.232	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	98.20	1	717	5.250	-----	-----	-----	Post-B	
4	SCS Runoff	144.09	1	717	7.704	-----	-----	-----	Post-A	
5	Combine	156.13	1	717	9.054	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	5.933	1	814	6.378	5	1386.30	6.10	West Detention	
7	SCS Runoff	42.22	1	717	2.257	-----	-----	-----	Post-C	
8	Reservoir	35.09	1	720	2.257	7	1383.57	0.436	East Detention	
9	SCS Runoff	11.93	1	717	0.638	-----	-----	-----	Home Bank	
10	Combine	130.66	1	718	7.507	3, 8,	-----	-----	To Swale	
11	Reservoir	127.31	1	719	6.991	10	1379.96	2.24	Swale	
12	Combine	128.78	1	719	13.369	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	139.77	1	719	14.007	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	296.44	1	717	15.849	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	284.51	1	717	15.211	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 25 Year			Wednesday, Jan 5, 2011		

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	20.35	1	726	1.575	-----	-----	-----	WF Res	
2	SCS Runoff	178.77	1	725	13.131	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	111.10	1	717	5.982	-----	-----	-----	Post-B	
4	SCS Runoff	163.02	1	717	8.777	-----	-----	-----	Post-A	
5	Combine	177.07	1	717	10.352	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	6.595	1	816	7.640	5	1386.67	6.81	West Detention	
7	SCS Runoff	47.76	1	717	2.572	-----	-----	-----	Post-C	
8	Reservoir	37.44	1	720	2.572	7	1383.76	0.473	East Detention	
9	SCS Runoff	13.50	1	717	0.727	-----	-----	-----	Home Bank	
10	Combine	146.54	1	717	8.553	3, 8,	-----	-----	To Swale	
11	Reservoir	144.26	1	718	8.035	10	1379.97	2.27	Swale	
12	Combine	145.76	1	718	15.675	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	159.07	1	718	16.402	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	335.38	1	717	18.057	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	321.88	1	717	17.330	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 50 Year			Wednesday, Jan 5, 2011		

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description	
1	SCS Runoff	22.78	1	726	1.773	-----	-----	-----	WF Res	
2	SCS Runoff	200.48	1	725	14.808	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	122.36	1	717	6.623	-----	-----	-----	Post-B	
4	SCS Runoff	179.54	1	717	9.717	-----	-----	-----	Post-A	
5	Combine	195.36	1	717	11.490	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	6.725	1	826	8.735	5	1387.09	7.62	West Detention	
7	SCS Runoff	52.60	1	717	2.847	-----	-----	-----	Post-C	
8	Reservoir	38.92	1	721	2.847	7	1383.97	0.514	East Detention	
9	SCS Runoff	14.87	1	717	0.805	-----	-----	-----	Home Bank	
10	Combine	159.50	1	717	9.470	3, 8,	-----	-----	To Swale	
11	Reservoir	157.48	1	718	8.950	10	1379.98	2.28	Swale	
12	Combine	159.02	1	718	17.685	6, 11	-----	-----	Post From Berkeley Square	
13	Combine	173.69	1	718	18.490	9, 12	-----	-----	Post To Greenwich Rd	
14	Combine	369.38	1	717	19.992	3, 4, 7, 9,	-----	-----	Undetained Post-Project Flow	
15	Combine	354.51	1	717	19.187	3, 4, 7,	-----	-----	Post From Berkeley Square Undetain	
Detention Calcs.gpw					Return Period: 100 Year			Wednesday, Jan 5, 2011		

# Hydrograph Report

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

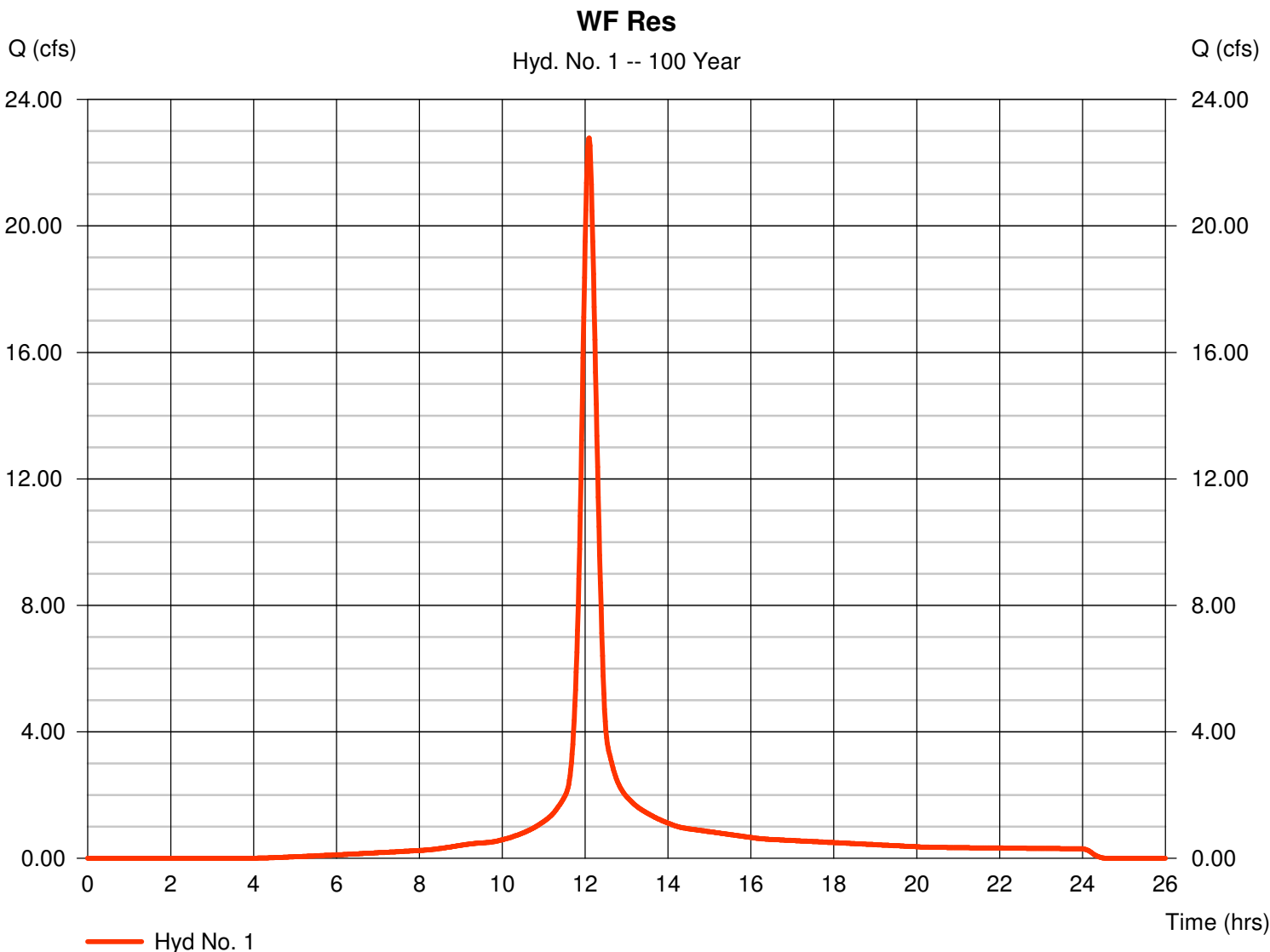
Wednesday, Jan 5, 2011

## Hyd. No. 1

WF Res

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 3.500 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 22.78 cfs  
 Time to peak = 12.10 hrs  
 Hyd. volume = 1.773 acft  
 Curve number = 85  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 20.50 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Report

## Hyd. No. 2

Pre-A (Pre-To Greenwich Rd)

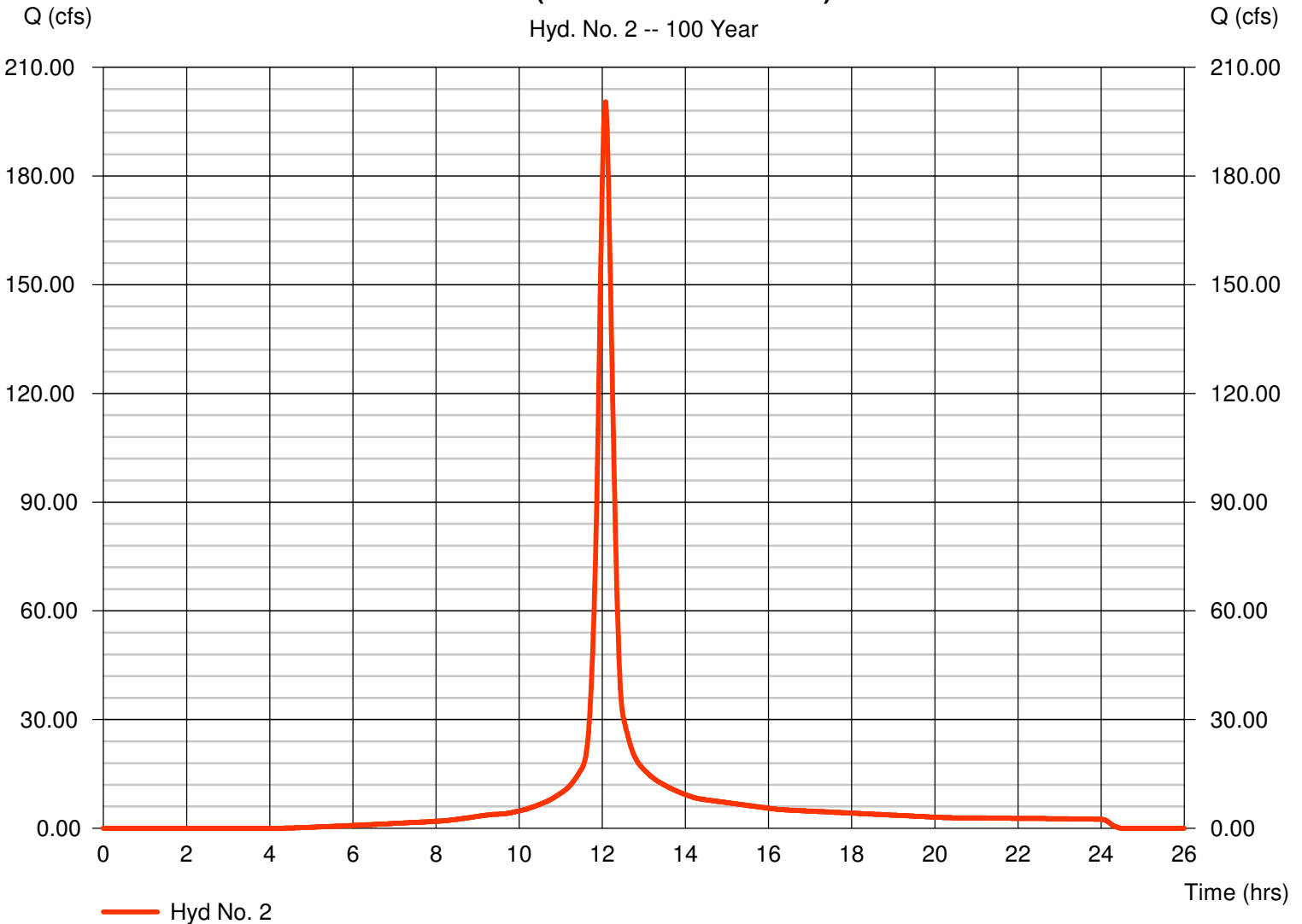
Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 30.100 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 200.48 cfs  
Time to peak = 12.08 hrs  
Hyd. volume = 14.808 acft  
Curve number = 84\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 19.30 min  
Distribution = Type II  
Shape factor = 484

\* Composite (Area/CN) = [(28.800 x 84) + (1.300 x 95)] / 30.100

### Pre-A (Pre-To Greenwich Rd)

Hyd. No. 2 -- 100 Year



# Hydrograph Report

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

Wednesday, Jan 5, 2011

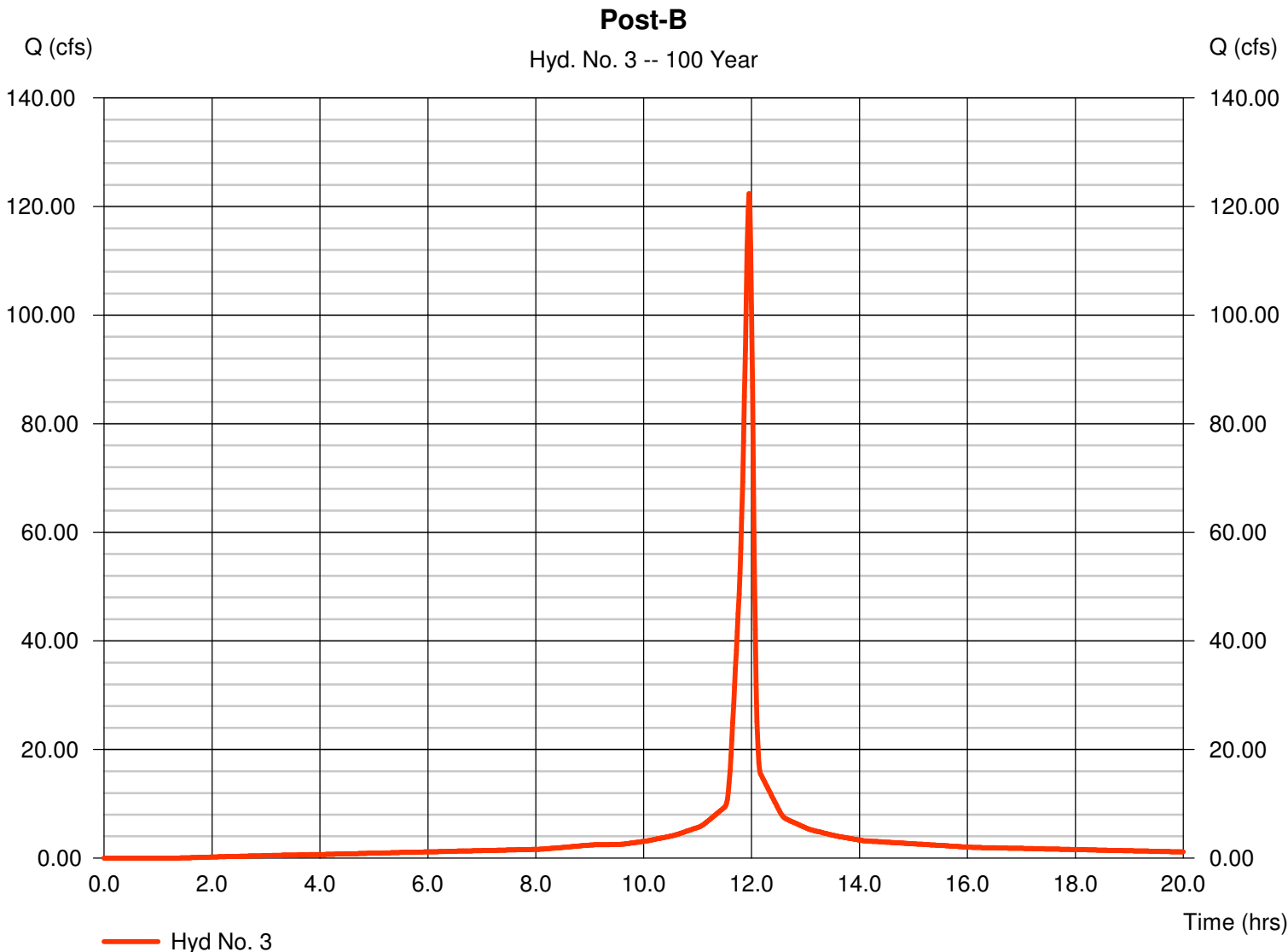
## Hyd. No. 3

Post-B

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 10.700 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 122.36 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 6.623 acft  
Curve number = 95\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 5.20 min  
Distribution = Type II  
Shape factor = 484

\* Composite (Area/CN) = [(10.700 x 95)] / 10.700



# Hydrograph Report

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

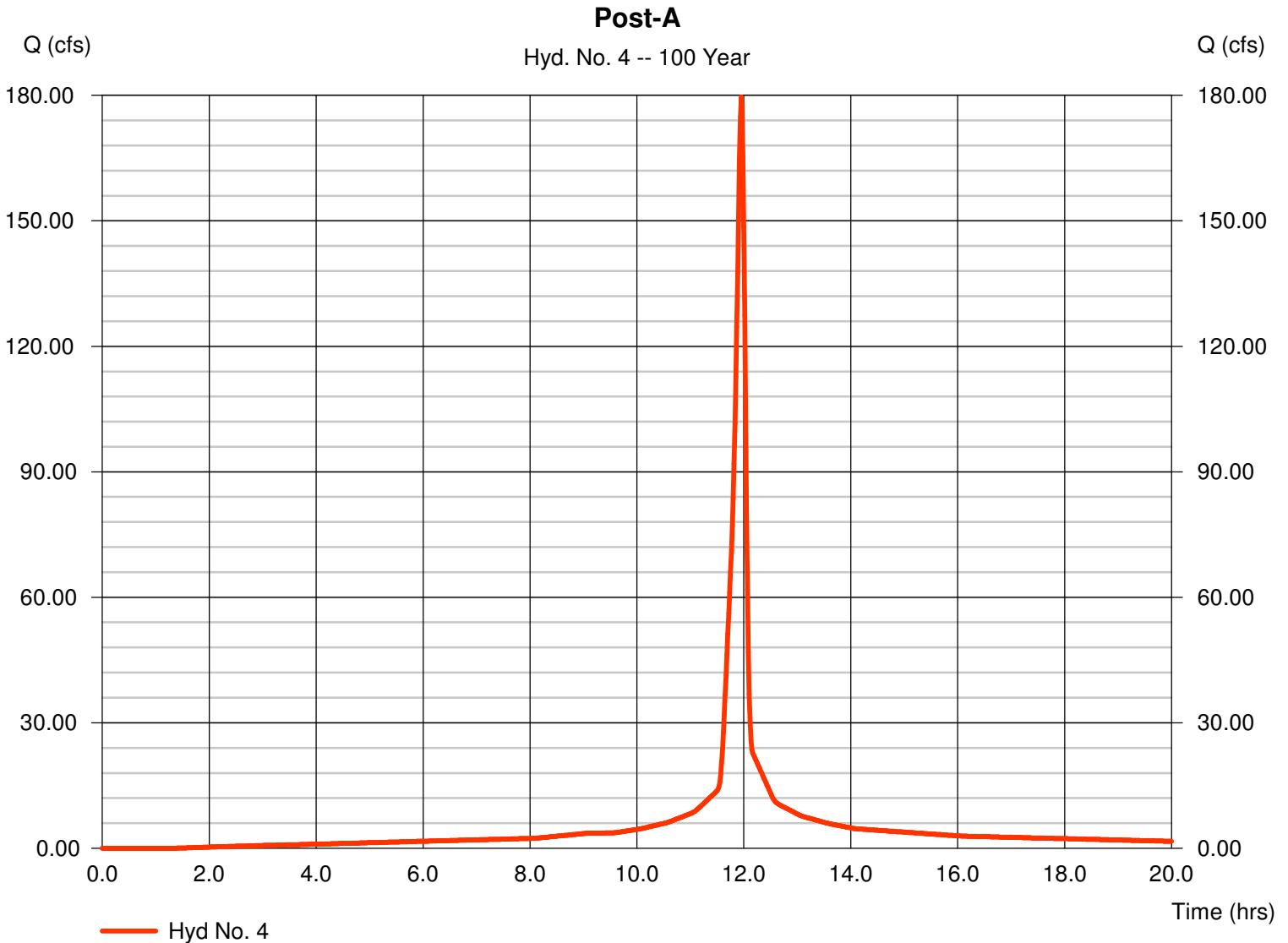
Wednesday, Jan 5, 2011

## Hyd. No. 4

Post-A

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 15.700 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 179.54 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 9.717 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 5.00 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Report

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

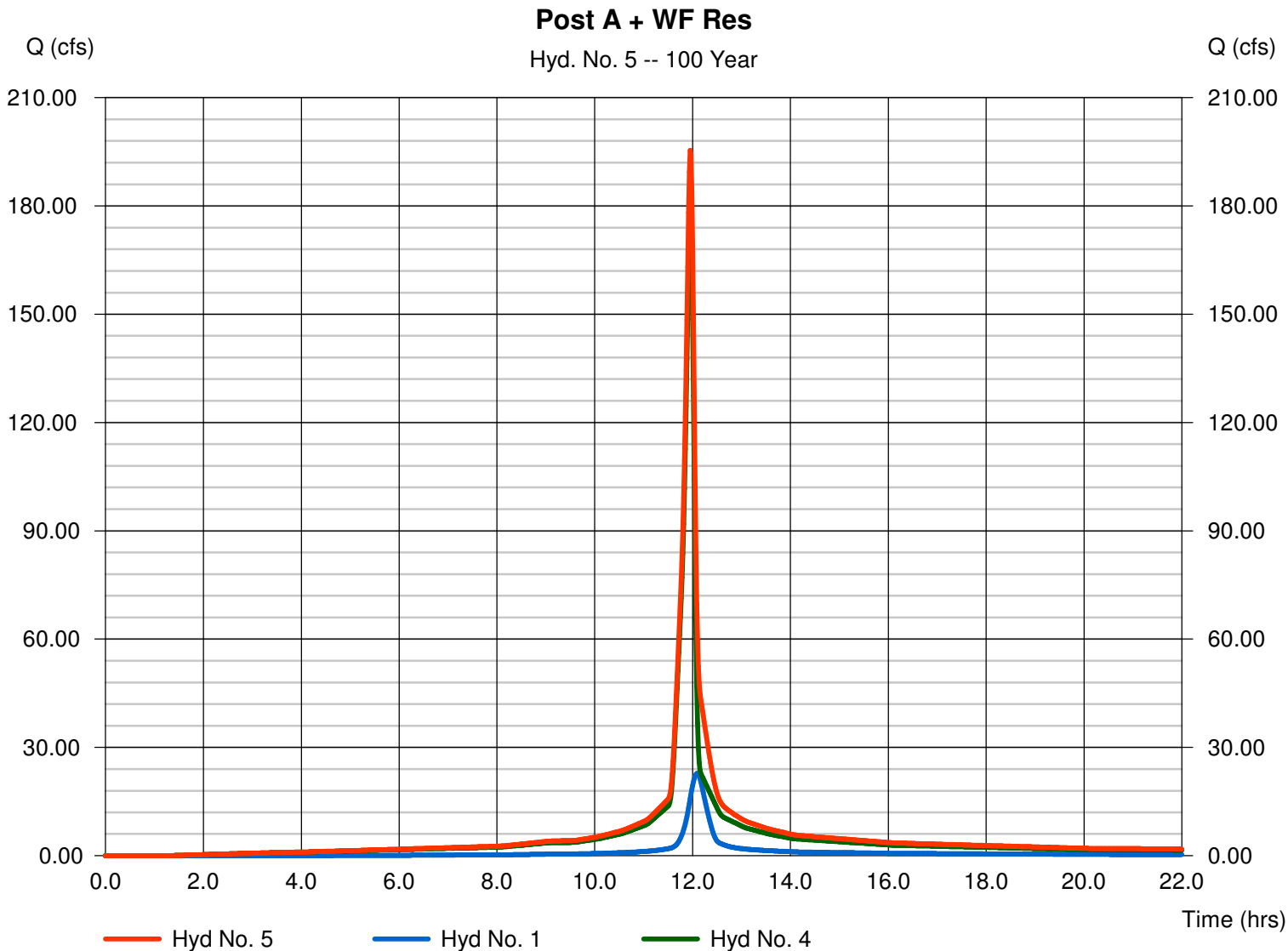
Wednesday, Jan 5, 2011

## Hyd. No. 5

Post A + WF Res

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

Peak discharge = 195.36 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 11.490 acft  
Contrib. drain. area = 19.200 ac



# Hydrograph Report

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

Wednesday, Jan 5, 2011

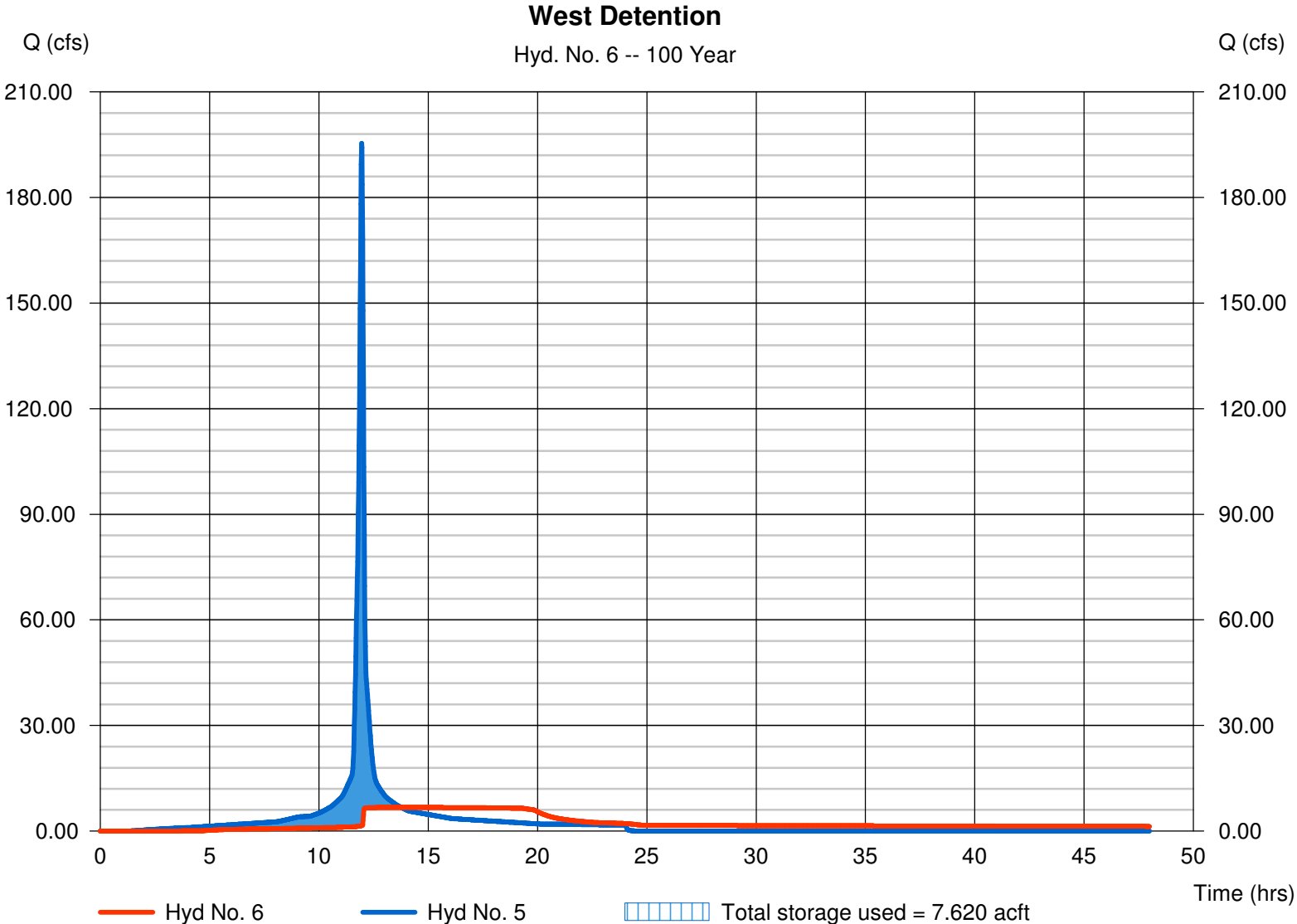
## Hyd. No. 6

West Detention

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 5 - Post A + WF Res  
Reservoir name = West Detention

Peak discharge = 6.725 cfs  
Time to peak = 13.77 hrs  
Hyd. volume = 8.735 acft  
Max. Elevation = 1387.09 ft  
Max. Storage = 7.620 acft

Storage Indication method used.



# Pond Report

## Pond No. 1 - West Detention

### Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1380.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1380.00	15,822	0.000	0.000
1.00	1381.00	20,762	0.419	0.419
2.00	1382.00	26,361	0.540	0.958
3.00	1383.00	32,621	0.676	1.634
4.00	1384.00	40,268	0.835	2.469
5.00	1385.00	74,465	1.297	3.766
6.00	1386.00	79,858	1.771	5.537
7.00	1387.00	85,397	1.896	7.433
8.00	1388.00	91,093	2.025	9.458
9.00	1389.00	96,947	2.158	11.616
10.00	1390.00	102,959	2.294	13.910

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	5.00	0.00	0.00
Span (in)	= 12.00	5.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 1375.00	1380.00	0.00	0.00
Length (ft)	= 650.00	1.00	0.00	0.00
Slope (%)	= 0.40	0.40	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)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 1386.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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

### Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1380.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	0.042	1380.10	3.48 oc	0.01 oc	---	---	0.00	---	---	---	---	---	0.010
0.20	0.084	1380.20	3.48 oc	0.03 oc	---	---	0.00	---	---	---	---	---	0.026
0.30	0.126	1380.30	3.48 oc	0.04 oc	---	---	0.00	---	---	---	---	---	0.043
0.40	0.167	1380.40	3.48 oc	0.05 oc	---	---	0.00	---	---	---	---	---	0.054
0.50	0.209	1380.50	3.48 oc	0.26 oc	---	---	0.00	---	---	---	---	---	0.256
0.60	0.251	1380.60	3.48 oc	0.37 oc	---	---	0.00	---	---	---	---	---	0.374
0.70	0.293	1380.70	3.48 oc	0.46 ic	---	---	0.00	---	---	---	---	---	0.460
0.80	0.335	1380.80	3.48 oc	0.50 ic	---	---	0.00	---	---	---	---	---	0.505
0.90	0.377	1380.90	3.48 oc	0.55 ic	---	---	0.00	---	---	---	---	---	0.546
1.00	0.419	1381.00	3.48 oc	0.58 ic	---	---	0.00	---	---	---	---	---	0.584
1.10	0.473	1381.10	3.48 oc	0.62 ic	---	---	0.00	---	---	---	---	---	0.620
1.20	0.527	1381.20	3.48 oc	0.65 ic	---	---	0.00	---	---	---	---	---	0.654
1.30	0.580	1381.30	3.48 oc	0.69 ic	---	---	0.00	---	---	---	---	---	0.686
1.40	0.634	1381.40	3.48 oc	0.72 ic	---	---	0.00	---	---	---	---	---	0.717
1.50	0.688	1381.50	3.48 oc	0.75 ic	---	---	0.00	---	---	---	---	---	0.746
1.60	0.742	1381.60	3.48 oc	0.77 ic	---	---	0.00	---	---	---	---	---	0.774
1.70	0.796	1381.70	3.48 oc	0.80 ic	---	---	0.00	---	---	---	---	---	0.802
1.80	0.850	1381.80	3.48 oc	0.83 ic	---	---	0.00	---	---	---	---	---	0.828
1.90	0.904	1381.90	3.48 oc	0.85 ic	---	---	0.00	---	---	---	---	---	0.854
2.00	0.958	1382.00	3.48 oc	0.88 ic	---	---	0.00	---	---	---	---	---	0.879
2.10	1.026	1382.10	3.48 oc	0.90 ic	---	---	0.00	---	---	---	---	---	0.903
2.20	1.093	1382.20	3.48 oc	0.93 ic	---	---	0.00	---	---	---	---	---	0.926
2.30	1.161	1382.30	3.48 oc	0.95 ic	---	---	0.00	---	---	---	---	---	0.949
2.40	1.228	1382.40	3.48 oc	0.97 ic	---	---	0.00	---	---	---	---	---	0.972
2.50	1.296	1382.50	3.48 oc	0.99 ic	---	---	0.00	---	---	---	---	---	0.994
2.60	1.364	1382.60	3.48 oc	1.02 ic	---	---	0.00	---	---	---	---	---	1.015
2.70	1.431	1382.70	3.48 oc	1.04 ic	---	---	0.00	---	---	---	---	---	1.036
2.80	1.499	1382.80	3.48 oc	1.06 ic	---	---	0.00	---	---	---	---	---	1.057
2.90	1.566	1382.90	3.48 oc	1.08 ic	---	---	0.00	---	---	---	---	---	1.077
3.00	1.634	1383.00	3.48 oc	1.10 ic	---	---	0.00	---	---	---	---	---	1.097
3.10	1.717	1383.10	3.48 oc	1.12 ic	---	---	0.00	---	---	---	---	---	1.116
3.20	1.801	1383.20	3.48 oc	1.14 ic	---	---	0.00	---	---	---	---	---	1.135

Continues on next page...

West Detention

Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.30	1.884	1383.30	3.48 oc	1.15 ic	---	---	0.00	---	---	---	---	---	1.154
3.40	1.968	1383.40	3.48 oc	1.17 ic	---	---	0.00	---	---	---	---	---	1.173
3.50	2.051	1383.50	3.48 oc	1.19 ic	---	---	0.00	---	---	---	---	---	1.191
3.60	2.135	1383.60	3.48 oc	1.21 ic	---	---	0.00	---	---	---	---	---	1.209
3.70	2.218	1383.70	3.48 oc	1.23 ic	---	---	0.00	---	---	---	---	---	1.227
3.80	2.302	1383.80	3.48 oc	1.24 ic	---	---	0.00	---	---	---	---	---	1.244
3.90	2.385	1383.90	3.48 oc	1.26 ic	---	---	0.00	---	---	---	---	---	1.261
4.00	2.469	1384.00	3.48 oc	1.28 ic	---	---	0.00	---	---	---	---	---	1.278
4.10	2.599	1384.10	3.48 oc	1.30 ic	---	---	0.00	---	---	---	---	---	1.295
4.20	2.728	1384.20	3.48 oc	1.31 ic	---	---	0.00	---	---	---	---	---	1.312
4.30	2.858	1384.30	3.48 oc	1.33 ic	---	---	0.00	---	---	---	---	---	1.328
4.40	2.988	1384.40	3.48 oc	1.34 ic	---	---	0.00	---	---	---	---	---	1.344
4.50	3.117	1384.50	3.48 oc	1.36 ic	---	---	0.00	---	---	---	---	---	1.360
4.60	3.247	1384.60	3.48 oc	1.38 ic	---	---	0.00	---	---	---	---	---	1.376
4.70	3.377	1384.70	3.48 oc	1.39 ic	---	---	0.00	---	---	---	---	---	1.391
4.80	3.506	1384.80	3.48 oc	1.41 ic	---	---	0.00	---	---	---	---	---	1.407
4.90	3.636	1384.90	3.48 oc	1.42 ic	---	---	0.00	---	---	---	---	---	1.422
5.00	3.766	1385.00	3.48 oc	1.44 ic	---	---	0.00	---	---	---	---	---	1.437
5.10	3.943	1385.10	3.48 oc	1.45 ic	---	---	0.00	---	---	---	---	---	1.452
5.20	4.120	1385.20	3.48 oc	1.47 ic	---	---	0.00	---	---	---	---	---	1.467
5.30	4.297	1385.30	3.48 oc	1.48 ic	---	---	0.00	---	---	---	---	---	1.481
5.40	4.474	1385.40	3.48 oc	1.50 ic	---	---	0.00	---	---	---	---	---	1.496
5.50	4.651	1385.50	3.48 oc	1.51 ic	---	---	0.00	---	---	---	---	---	1.510
5.60	4.828	1385.60	3.48 oc	1.52 ic	---	---	0.00	---	---	---	---	---	1.524
5.70	5.005	1385.70	3.48 oc	1.54 ic	---	---	0.00	---	---	---	---	---	1.538
5.80	5.182	1385.80	3.48 oc	1.55 ic	---	---	0.00	---	---	---	---	---	1.552
5.90	5.360	1385.90	3.48 oc	1.57 ic	---	---	0.00	---	---	---	---	---	1.566
6.00	5.537	1386.00	3.48 oc	1.58 ic	---	---	0.00	---	---	---	---	---	1.580
6.10	5.726	1386.10	3.48 oc	1.59 ic	---	---	0.84	---	---	---	---	---	2.436
6.20	5.916	1386.20	3.48 oc	1.61 ic	---	---	2.38	---	---	---	---	---	3.989
6.30	6.105	1386.30	4.38 oc	1.62 ic	---	---	4.38	---	---	---	---	---	5.999
6.40	6.295	1386.40	4.86 oc	1.63 ic	---	---	4.86 s	---	---	---	---	---	6.494
6.50	6.485	1386.50	4.89 oc	1.65 ic	---	---	4.89 s	---	---	---	---	---	6.538
6.60	6.674	1386.60	4.92 oc	1.66 ic	---	---	4.91 s	---	---	---	---	---	6.570
6.70	6.864	1386.70	4.94 oc	1.67 ic	---	---	4.93 s	---	---	---	---	---	6.603
6.80	7.054	1386.80	4.96 oc	1.69 ic	---	---	4.95 s	---	---	---	---	---	6.640
6.90	7.243	1386.90	4.98 oc	1.70 ic	---	---	4.97 s	---	---	---	---	---	6.668
7.00	7.433	1387.00	4.99 oc	1.71 ic	---	---	4.99 s	---	---	---	---	---	6.704
7.10	7.635	1387.10	5.01 oc	1.72 ic	---	---	5.00 s	---	---	---	---	---	6.726
7.20	7.838	1387.20	5.03 oc	1.74 ic	---	---	5.00 s	---	---	---	---	---	6.736
7.30	8.040	1387.30	5.05 oc	1.75 ic	---	---	5.01 s	---	---	---	---	---	6.761
7.40	8.243	1387.40	5.07 oc	1.76 ic	---	---	5.06 s	---	---	---	---	---	6.824
7.50	8.446	1387.50	5.09 oc	1.77 ic	---	---	5.02 s	---	---	---	---	---	6.789
7.60	8.648	1387.60	5.10 oc	1.78 ic	---	---	5.07 s	---	---	---	---	---	6.853
7.70	8.851	1387.70	5.12 oc	1.80 ic	---	---	5.06 s	---	---	---	---	---	6.858
7.80	9.053	1387.80	5.14 oc	1.81 ic	---	---	5.08 s	---	---	---	---	---	6.888
7.90	9.256	1387.90	5.16 oc	1.82 ic	---	---	5.13 s	---	---	---	---	---	6.952
8.00	9.458	1388.00	5.18 oc	1.83 ic	---	---	5.17 s	---	---	---	---	---	6.999
8.10	9.674	1388.10	5.19 oc	1.84 ic	---	---	5.11 s	---	---	---	---	---	6.950
8.20	9.890	1388.20	5.21 oc	1.86 ic	---	---	5.18 s	---	---	---	---	---	7.033
8.30	10.106	1388.30	5.23 oc	1.87 ic	---	---	5.03 s	---	---	---	---	---	6.898
8.40	10.321	1388.40	5.25 oc	1.88 ic	---	---	5.01 s	---	---	---	---	---	6.884
8.50	10.537	1388.50	5.26 oc	1.89 ic	---	---	5.24 s	---	---	---	---	---	7.129
8.60	10.753	1388.60	5.28 oc	1.90 ic	---	---	5.15 s	---	---	---	---	---	7.053
8.70	10.969	1388.70	5.30 oc	1.91 ic	---	---	5.09 s	---	---	---	---	---	7.004
8.80	11.184	1388.80	5.32 oc	1.92 ic	---	---	4.97 s	---	---	---	---	---	6.899
8.90	11.400	1388.90	5.33 oc	1.94 ic	---	---	5.17 s	---	---	---	---	---	7.108
9.00	11.616	1389.00	5.35 oc	1.95 ic	---	---	4.85 s	---	---	---	---	---	6.801
9.10	11.845	1389.10	5.37 oc	1.96 ic	---	---	5.04 s	---	---	---	---	---	6.993
9.20	12.075	1389.20	5.39 oc	1.97 ic	---	---	5.22 s	---	---	---	---	---	7.185
9.30	12.304	1389.30	5.40 oc	1.98 ic	---	---	4.87 s	---	---	---	---	---	6.850
9.40	12.534	1389.40	5.42 oc	1.99 ic	---	---	5.04 s	---	---	---	---	---	7.026
9.50	12.763	1389.50	5.44 oc	2.00 ic	---	---	5.20 s	---	---	---	---	---	7.202
9.60	12.992	1389.60	5.45 oc	2.01 ic	---	---	5.37 s	---	---	---	---	---	7.379
9.70	13.222	1389.70	5.47 oc	2.02 ic	---	---	4.57 s	---	---	---	---	---	6.589
9.80	13.451	1389.80	5.49 oc	2.03 ic	---	---	0.00 s	---	---	---	---	---	7.519
9.90	13.681	1389.90	5.50 oc	2.04 ic	---	---	0.00	---	---	---	---	---	7.547
10.00	13.910	1390.00	5.52 oc	2.05 ic	---	---	0.00	---	---	---	---	---	7.574

...End

# Hydrograph Report

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

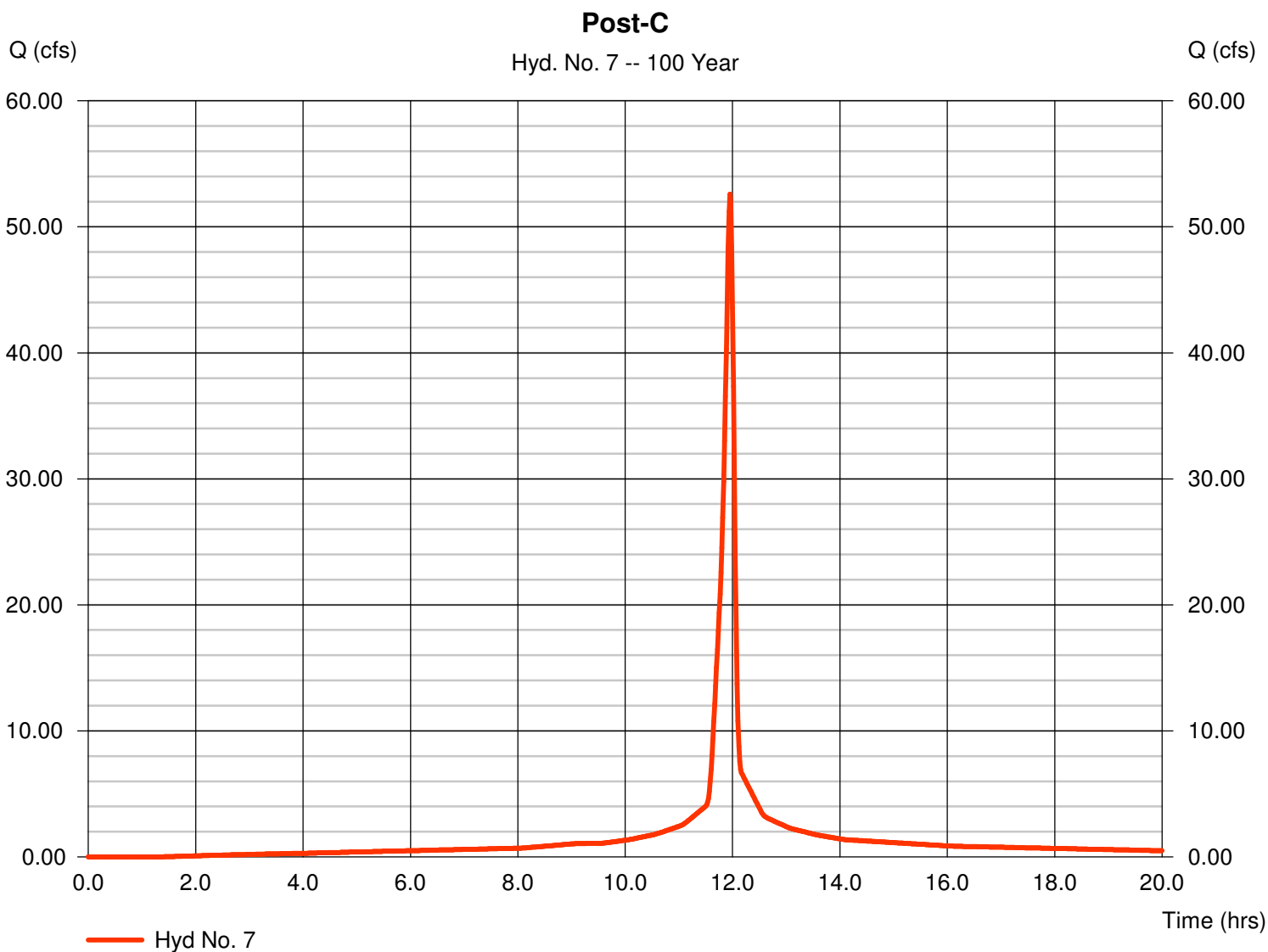
Wednesday, Jan 5, 2011

## Hyd. No. 7

Post-C

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 4.600 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 52.60 cfs  
 Time to peak = 11.95 hrs  
 Hyd. volume = 2.847 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 5.20 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Report

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

Wednesday, Jan 5, 2011

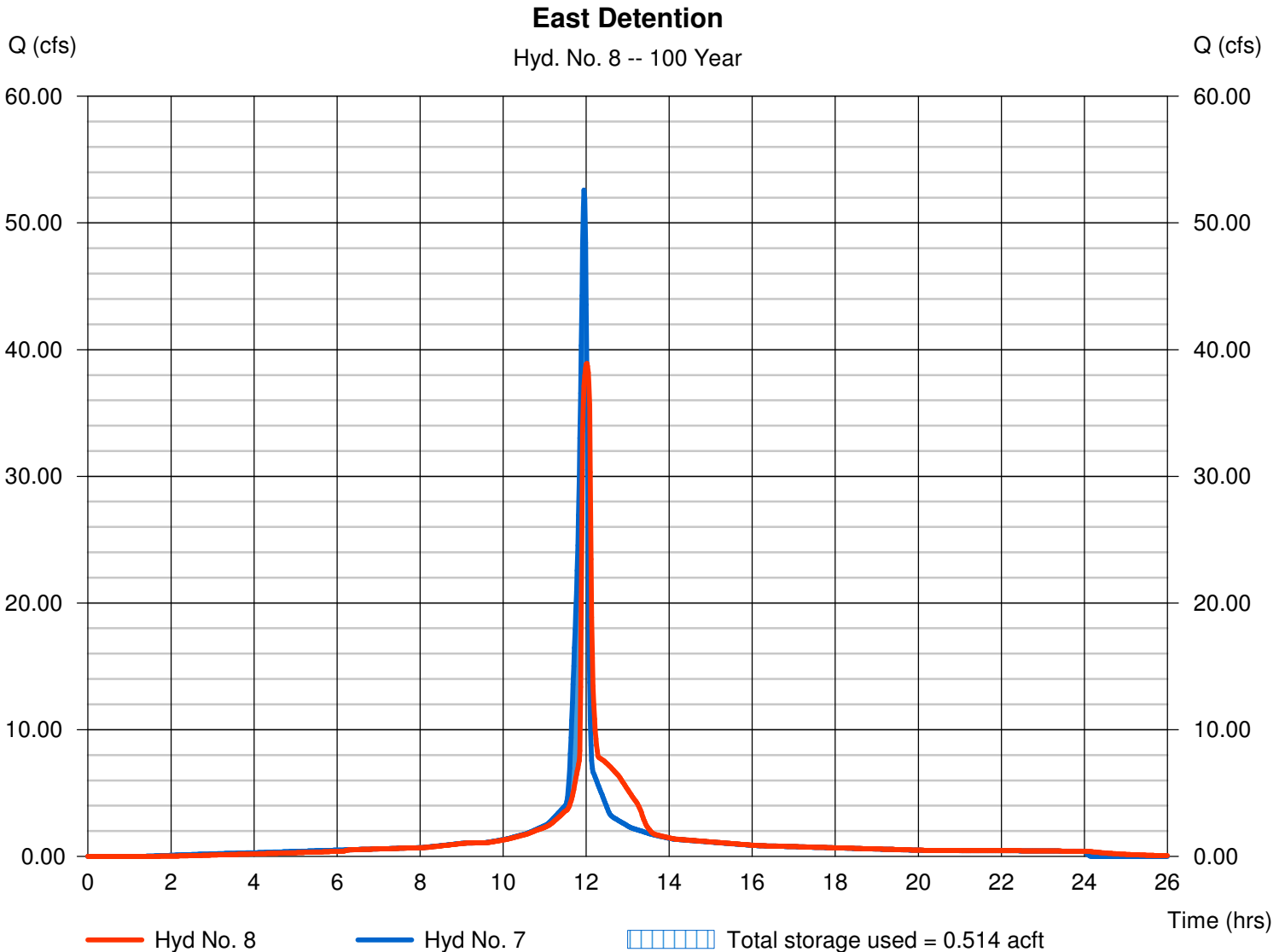
## Hyd. No. 8

East Detention

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 7 - Post-C  
Reservoir name = East Detention

Peak discharge = 38.92 cfs  
Time to peak = 12.02 hrs  
Hyd. volume = 2.847 acft  
Max. Elevation = 1383.97 ft  
Max. Storage = 0.514 acft

Storage Indication method used.



# Pond Report

## Pond No. 2 - East Detention

### Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1380.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1380.00	2,168	0.000	0.000
1.00	1381.00	3,768	0.067	0.067
2.00	1382.00	5,569	0.106	0.174
3.00	1383.00	7,538	0.150	0.324
4.00	1384.00	9,676	0.197	0.521

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	6.00	0.00	0.00
Span (in)	= 24.00	12.00	0.00	0.00
No. Barrels	= 1	2	0	0
Invert El. (ft)	= 1379.00	1380.00	0.00	0.00
Length (ft)	= 50.00	1.00	0.00	0.00
Slope (%)	= 0.40	0.40	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)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 1382.90	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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

### Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1380.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	0.007	1380.10	3.88 oc	0.08 oc	---	---	0.00	---	---	---	---	---	0.080
0.20	0.013	1380.20	3.88 oc	0.16 oc	---	---	0.00	---	---	---	---	---	0.163
0.30	0.020	1380.30	3.88 oc	0.25 oc	---	---	0.00	---	---	---	---	---	0.246
0.40	0.027	1380.40	3.88 oc	0.33 oc	---	---	0.00	---	---	---	---	---	0.329
0.50	0.034	1380.50	3.88 oc	0.41 oc	---	---	0.00	---	---	---	---	---	0.412
0.60	0.040	1380.60	3.88 oc	2.08 oc	---	---	0.00	---	---	---	---	---	2.075
0.70	0.047	1380.70	3.88 oc	2.91 oc	---	---	0.00	---	---	---	---	---	2.907
0.80	0.054	1380.80	3.88 oc	3.55 oc	---	---	0.00	---	---	---	---	---	3.549
0.90	0.061	1380.90	3.88 oc	3.88 ic	---	---	0.00	---	---	---	---	---	3.881
1.00	0.067	1381.00	3.88 oc	4.17 ic	---	---	0.00	---	---	---	---	---	4.170
1.10	0.078	1381.10	3.88 oc	4.44 ic	---	---	0.00	---	---	---	---	---	4.439
1.20	0.089	1381.20	3.88 oc	4.69 ic	---	---	0.00	---	---	---	---	---	4.693
1.30	0.099	1381.30	3.88 oc	4.93 ic	---	---	0.00	---	---	---	---	---	4.934
1.40	0.110	1381.40	3.88 oc	5.16 ic	---	---	0.00	---	---	---	---	---	5.163
1.50	0.121	1381.50	3.88 oc	5.38 ic	---	---	0.00	---	---	---	---	---	5.383
1.60	0.131	1381.60	3.88 oc	5.59 ic	---	---	0.00	---	---	---	---	---	5.594
1.70	0.142	1381.70	3.88 oc	5.80 ic	---	---	0.00	---	---	---	---	---	5.798
1.80	0.152	1381.80	3.88 oc	5.99 ic	---	---	0.00	---	---	---	---	---	5.994
1.90	0.163	1381.90	3.88 oc	6.18 ic	---	---	0.00	---	---	---	---	---	6.185
2.00	0.174	1382.00	3.88 oc	6.37 ic	---	---	0.00	---	---	---	---	---	6.370
2.10	0.189	1382.10	3.88 oc	6.55 ic	---	---	0.00	---	---	---	---	---	6.549
2.20	0.204	1382.20	3.88 oc	6.72 ic	---	---	0.00	---	---	---	---	---	6.724
2.30	0.219	1382.30	3.88 oc	6.89 ic	---	---	0.00	---	---	---	---	---	6.894
2.40	0.234	1382.40	3.88 oc	7.06 ic	---	---	0.00	---	---	---	---	---	7.060
2.50	0.249	1382.50	3.88 oc	7.22 ic	---	---	0.00	---	---	---	---	---	7.222
2.60	0.264	1382.60	3.88 oc	7.38 ic	---	---	0.00	---	---	---	---	---	7.381
2.70	0.279	1382.70	3.88 oc	7.54 ic	---	---	0.00	---	---	---	---	---	7.536
2.80	0.294	1382.80	3.88 oc	7.69 ic	---	---	0.00	---	---	---	---	---	7.689
2.90	0.309	1382.90	3.88 oc	7.84 ic	---	---	0.00	---	---	---	---	---	7.838
3.00	0.324	1383.00	3.88 oc	7.98 ic	---	---	1.68	---	---	---	---	---	9.669
3.10	0.343	1383.10	4.80 oc	8.13 ic	---	---	4.76	---	---	---	---	---	12.89
3.20	0.363	1383.20	8.75 oc	8.27 ic	---	---	8.75	---	---	---	---	---	17.02
3.30	0.383	1383.30	13.47 oc	8.41 ic	---	---	13.47	---	---	---	---	---	21.88
3.40	0.402	1383.40	18.83 oc	8.55 ic	---	---	18.83	---	---	---	---	---	27.38
3.50	0.422	1383.50	24.75 oc	8.68 ic	---	---	24.75	---	---	---	---	---	33.43
3.60	0.442	1383.60	26.98 oc	8.81 ic	---	---	26.98 s	---	---	---	---	---	35.79
3.70	0.462	1383.70	28.04 ic	8.94 ic	---	---	28.04 s	---	---	---	---	---	36.98
3.80	0.481	1383.80	28.73 ic	9.07 ic	---	---	28.72 s	---	---	---	---	---	37.79

Continues on next page...

East Detention

**Stage / Storage / Discharge Table**

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.90	0.501	1383.90	29.30 ic	9.20 ic	---	---	29.30 s	---	---	---	---	---	38.50
4.00	0.521	1384.00	29.81 ic	9.32 ic	---	---	29.81 s	---	---	---	---	---	39.13

...End

# Hydrograph Report

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

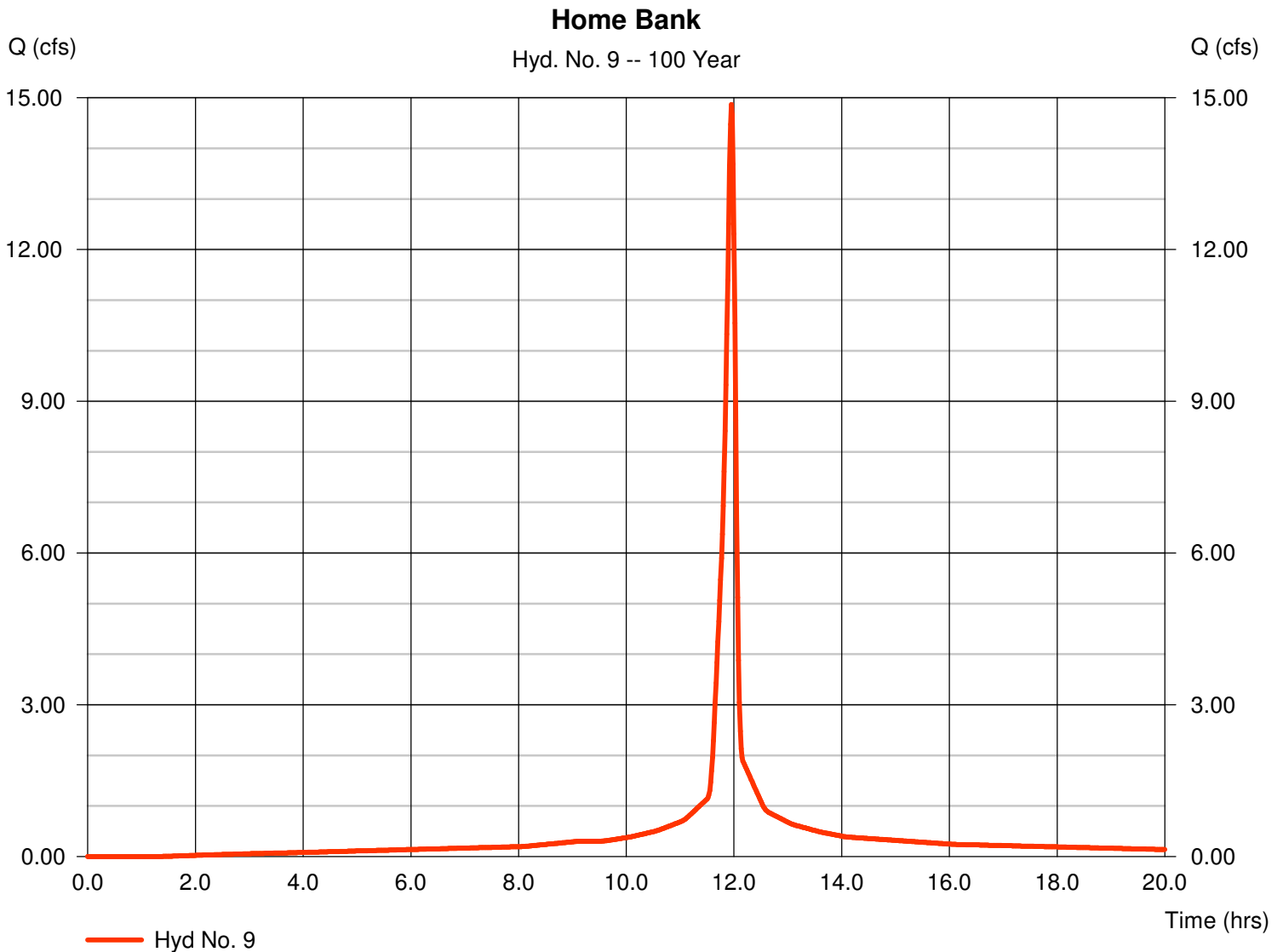
Wednesday, Jan 5, 2011

## Hyd. No. 9

Home Bank

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 1.300 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 14.87 cfs  
 Time to peak = 11.95 hrs  
 Hyd. volume = 0.805 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 5.00 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Report

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

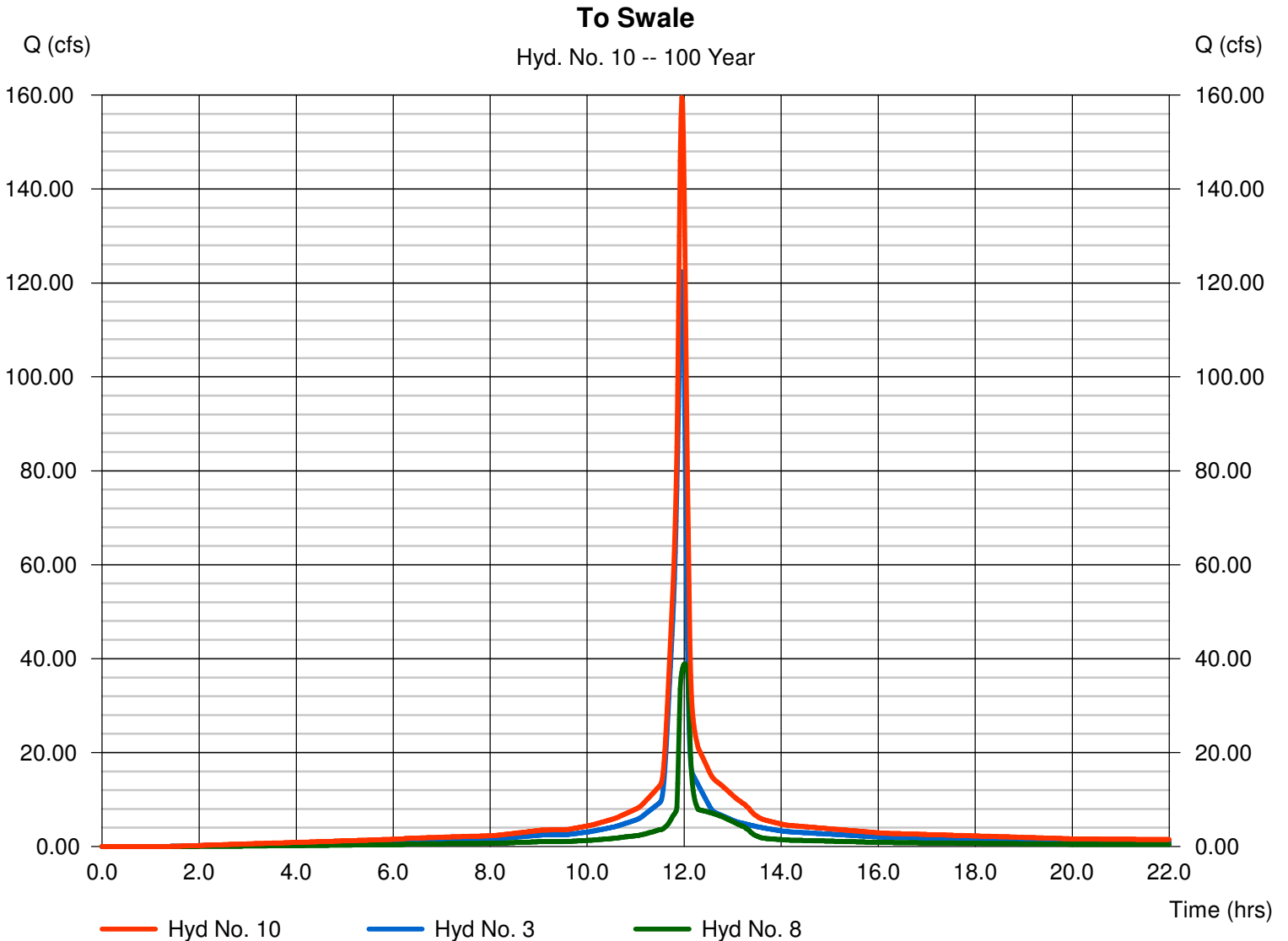
Wednesday, Jan 5, 2011

## Hyd. No. 10

To Swale

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyds. = 3, 8

Peak discharge = 159.50 cfs  
 Time to peak = 11.95 hrs  
 Hyd. volume = 9.470 acft  
 Contrib. drain. area = 10.700 ac



# Hydrograph Report

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

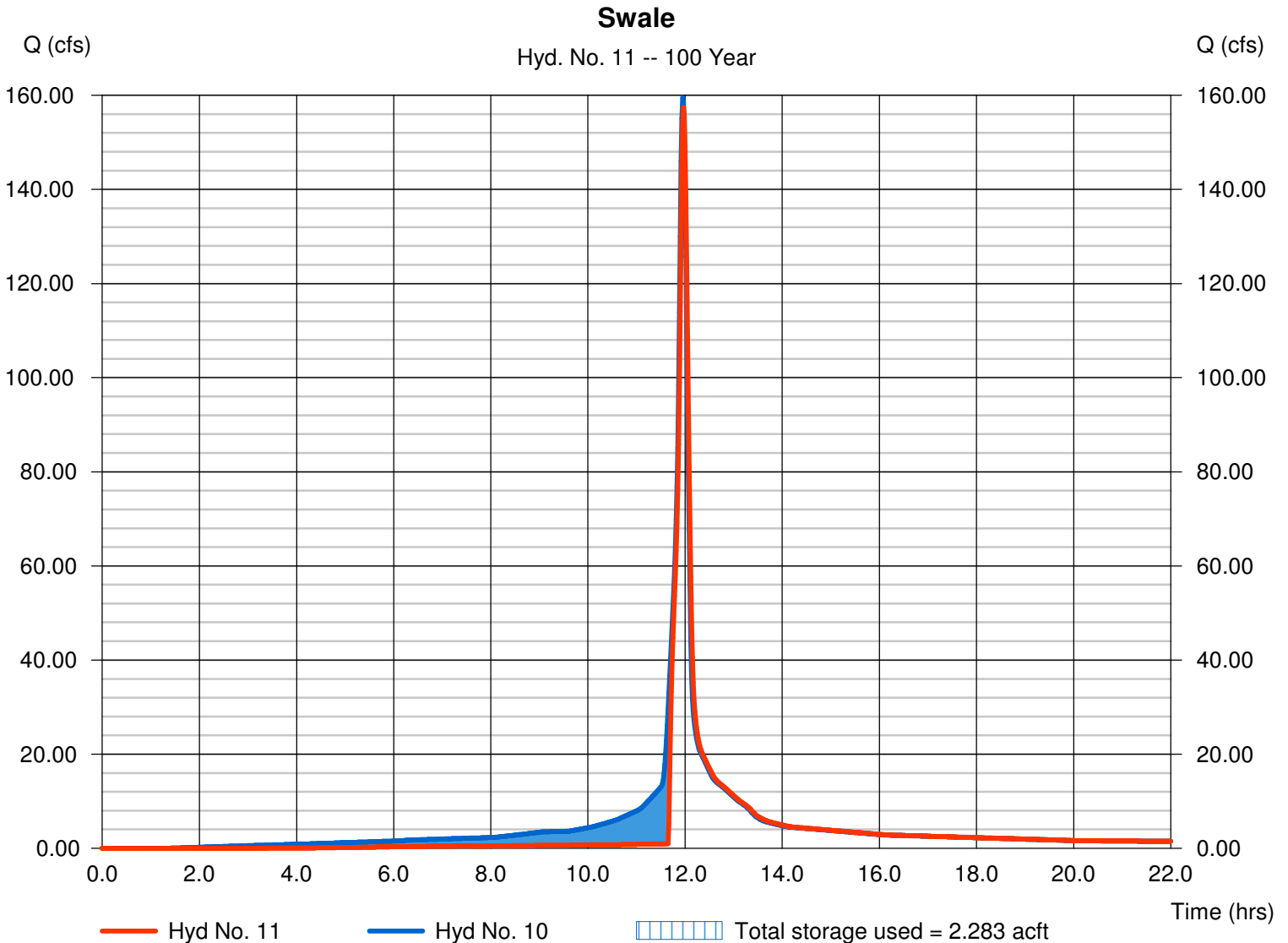
Wednesday, Jan 5, 2011

## Hyd. No. 11

Swale

Hydrograph type	= Reservoir	Peak discharge	= 157.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 1 min	Hyd. volume	= 8.950 acft
Inflow hyd. No.	= 10 - To Swale	Max. Elevation	= 1379.98 ft
Reservoir name	= Proposed Swale Volume	Max. Storage	= 2.283 acft

Storage Indication method used.



# Pond Report

## Pond No. 5 - Proposed Swale Volume

### Pond Data

Trapezoid - Bottom L x W = 3600.0 x 8.0 ft, Side slope = 3.00:1, Bottom elev. = 1378.00 ft, Depth = 2.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1378.00	28,800	0.000	0.000
0.20	1378.20	33,131	0.142	0.142
0.40	1378.40	37,465	0.162	0.304
0.60	1378.60	41,802	0.182	0.486
0.80	1378.80	46,141	0.202	0.688
1.00	1379.00	50,484	0.222	0.910
1.20	1379.20	54,829	0.242	1.152
1.40	1379.40	59,178	0.262	1.413
1.60	1379.60	63,529	0.282	1.695
1.80	1379.80	67,883	0.302	1.997
2.00	1380.00	72,240	0.322	2.318

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 7.00	0.00	0.00	0.00
Span (in)	= 7.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1378.00	0.00	0.00	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.40	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)	= 800.00	0.00	0.00	0.00
Crest El. (ft)	= 1379.80	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)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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

### Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1378.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.02	0.014	1378.02	0.00 oc	---	---	---	0.00	---	---	---	---	---	0.001
0.04	0.028	1378.04	0.01 oc	---	---	---	0.00	---	---	---	---	---	0.005
0.06	0.043	1378.06	0.01 oc	---	---	---	0.00	---	---	---	---	---	0.012
0.08	0.057	1378.08	0.02 oc	---	---	---	0.00	---	---	---	---	---	0.021
0.10	0.071	1378.10	0.03 ic	---	---	---	0.00	---	---	---	---	---	0.033
0.12	0.085	1378.12	0.05 ic	---	---	---	0.00	---	---	---	---	---	0.047
0.14	0.100	1378.14	0.06 ic	---	---	---	0.00	---	---	---	---	---	0.063
0.16	0.114	1378.16	0.08 ic	---	---	---	0.00	---	---	---	---	---	0.081
0.18	0.128	1378.18	0.10 ic	---	---	---	0.00	---	---	---	---	---	0.102
0.20	0.142	1378.20	0.12 ic	---	---	---	0.00	---	---	---	---	---	0.124
0.22	0.158	1378.22	0.15 ic	---	---	---	0.00	---	---	---	---	---	0.147
0.24	0.175	1378.24	0.17 ic	---	---	---	0.00	---	---	---	---	---	0.173
0.26	0.191	1378.26	0.20 ic	---	---	---	0.00	---	---	---	---	---	0.200
0.28	0.207	1378.28	0.23 oc	---	---	---	0.00	---	---	---	---	---	0.227
0.30	0.223	1378.30	0.25 oc	---	---	---	0.00	---	---	---	---	---	0.254
0.32	0.239	1378.32	0.28 oc	---	---	---	0.00	---	---	---	---	---	0.281
0.34	0.256	1378.34	0.31 oc	---	---	---	0.00	---	---	---	---	---	0.308
0.36	0.272	1378.36	0.33 oc	---	---	---	0.00	---	---	---	---	---	0.334
0.38	0.288	1378.38	0.36 oc	---	---	---	0.00	---	---	---	---	---	0.361
0.40	0.304	1378.40	0.39 oc	---	---	---	0.00	---	---	---	---	---	0.386
0.42	0.322	1378.42	0.41 oc	---	---	---	0.00	---	---	---	---	---	0.410
0.44	0.341	1378.44	0.43 oc	---	---	---	0.00	---	---	---	---	---	0.433
0.46	0.359	1378.46	0.45 oc	---	---	---	0.00	---	---	---	---	---	0.454
0.48	0.377	1378.48	0.47 oc	---	---	---	0.00	---	---	---	---	---	0.473
0.50	0.395	1378.50	0.49 oc	---	---	---	0.00	---	---	---	---	---	0.489
0.52	0.413	1378.52	0.50 oc	---	---	---	0.00	---	---	---	---	---	0.501
0.54	0.432	1378.54	0.51 oc	---	---	---	0.00	---	---	---	---	---	0.509
0.56	0.450	1378.56	0.51 oc	---	---	---	0.00	---	---	---	---	---	0.510
0.58	0.468	1378.58	0.50 oc	---	---	---	0.00	---	---	---	---	---	0.496
0.60	0.486	1378.60	0.49 oc	---	---	---	0.00	---	---	---	---	---	0.494
0.62	0.506	1378.62	0.51 oc	---	---	---	0.00	---	---	---	---	---	0.506
0.64	0.527	1378.64	0.52 oc	---	---	---	0.00	---	---	---	---	---	0.517

Continues on next page...

Proposed Swale Volume

**Stage / Storage / Discharge Table**

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.66	0.547	1378.66	0.53 oc	---	---	---	0.00	---	---	---	---	---	0.529
0.68	0.567	1378.68	0.54 oc	---	---	---	0.00	---	---	---	---	---	0.540
0.70	0.587	1378.70	0.55 oc	---	---	---	0.00	---	---	---	---	---	0.550
0.72	0.607	1378.72	0.56 oc	---	---	---	0.00	---	---	---	---	---	0.561
0.74	0.628	1378.74	0.57 oc	---	---	---	0.00	---	---	---	---	---	0.571
0.76	0.648	1378.76	0.58 oc	---	---	---	0.00	---	---	---	---	---	0.581
0.78	0.668	1378.78	0.59 oc	---	---	---	0.00	---	---	---	---	---	0.591
0.80	0.688	1378.80	0.60 oc	---	---	---	0.00	---	---	---	---	---	0.601
0.82	0.710	1378.82	0.61 oc	---	---	---	0.00	---	---	---	---	---	0.611
0.84	0.732	1378.84	0.62 oc	---	---	---	0.00	---	---	---	---	---	0.620
0.86	0.755	1378.86	0.63 oc	---	---	---	0.00	---	---	---	---	---	0.630
0.88	0.777	1378.88	0.64 oc	---	---	---	0.00	---	---	---	---	---	0.639
0.90	0.799	1378.90	0.65 oc	---	---	---	0.00	---	---	---	---	---	0.648
0.92	0.821	1378.92	0.66 oc	---	---	---	0.00	---	---	---	---	---	0.657
0.94	0.843	1378.94	0.67 oc	---	---	---	0.00	---	---	---	---	---	0.666
0.96	0.866	1378.96	0.67 oc	---	---	---	0.00	---	---	---	---	---	0.675
0.98	0.888	1378.98	0.68 oc	---	---	---	0.00	---	---	---	---	---	0.683
1.00	0.910	1379.00	0.69 oc	---	---	---	0.00	---	---	---	---	---	0.692
1.02	0.934	1379.02	0.70 oc	---	---	---	0.00	---	---	---	---	---	0.700
1.04	0.958	1379.04	0.71 oc	---	---	---	0.00	---	---	---	---	---	0.709
1.06	0.982	1379.06	0.72 oc	---	---	---	0.00	---	---	---	---	---	0.717
1.08	1.007	1379.08	0.73 oc	---	---	---	0.00	---	---	---	---	---	0.725
1.10	1.031	1379.10	0.73 oc	---	---	---	0.00	---	---	---	---	---	0.733
1.12	1.055	1379.12	0.74 oc	---	---	---	0.00	---	---	---	---	---	0.741
1.14	1.079	1379.14	0.75 oc	---	---	---	0.00	---	---	---	---	---	0.749
1.16	1.103	1379.16	0.76 oc	---	---	---	0.00	---	---	---	---	---	0.757
1.18	1.128	1379.18	0.76 oc	---	---	---	0.00	---	---	---	---	---	0.764
1.20	1.152	1379.20	0.77 oc	---	---	---	0.00	---	---	---	---	---	0.772
1.22	1.178	1379.22	0.78 oc	---	---	---	0.00	---	---	---	---	---	0.780
1.24	1.204	1379.24	0.79 oc	---	---	---	0.00	---	---	---	---	---	0.787
1.26	1.230	1379.26	0.79 oc	---	---	---	0.00	---	---	---	---	---	0.794
1.28	1.256	1379.28	0.80 oc	---	---	---	0.00	---	---	---	---	---	0.802
1.30	1.283	1379.30	0.81 oc	---	---	---	0.00	---	---	---	---	---	0.809
1.32	1.309	1379.32	0.82 oc	---	---	---	0.00	---	---	---	---	---	0.816
1.34	1.335	1379.34	0.82 oc	---	---	---	0.00	---	---	---	---	---	0.823
1.36	1.361	1379.36	0.83 oc	---	---	---	0.00	---	---	---	---	---	0.831
1.38	1.387	1379.38	0.84 oc	---	---	---	0.00	---	---	---	---	---	0.838
1.40	1.413	1379.40	0.84 oc	---	---	---	0.00	---	---	---	---	---	0.845
1.42	1.442	1379.42	0.85 oc	---	---	---	0.00	---	---	---	---	---	0.851
1.44	1.470	1379.44	0.86 oc	---	---	---	0.00	---	---	---	---	---	0.858
1.46	1.498	1379.46	0.87 oc	---	---	---	0.00	---	---	---	---	---	0.865
1.48	1.526	1379.48	0.87 oc	---	---	---	0.00	---	---	---	---	---	0.872
1.50	1.554	1379.50	0.88 oc	---	---	---	0.00	---	---	---	---	---	0.879
1.52	1.582	1379.52	0.89 oc	---	---	---	0.00	---	---	---	---	---	0.885
1.54	1.611	1379.54	0.89 oc	---	---	---	0.00	---	---	---	---	---	0.892
1.56	1.639	1379.56	0.90 oc	---	---	---	0.00	---	---	---	---	---	0.898
1.58	1.667	1379.58	0.90 oc	---	---	---	0.00	---	---	---	---	---	0.905
1.60	1.695	1379.60	0.91 oc	---	---	---	0.00	---	---	---	---	---	0.911
1.62	1.725	1379.62	0.92 oc	---	---	---	0.00	---	---	---	---	---	0.918
1.64	1.755	1379.64	0.92 oc	---	---	---	0.00	---	---	---	---	---	0.924
1.66	1.786	1379.66	0.93 oc	---	---	---	0.00	---	---	---	---	---	0.930
1.68	1.816	1379.68	0.94 oc	---	---	---	0.00	---	---	---	---	---	0.937
1.70	1.846	1379.70	0.94 oc	---	---	---	0.00	---	---	---	---	---	0.943
1.72	1.876	1379.72	0.95 oc	---	---	---	0.00	---	---	---	---	---	0.949
1.74	1.906	1379.74	0.96 oc	---	---	---	0.00	---	---	---	---	---	0.955
1.76	1.936	1379.76	0.96 oc	---	---	---	0.00	---	---	---	---	---	0.961
1.78	1.967	1379.78	0.97 oc	---	---	---	0.00	---	---	---	---	---	0.967
1.80	1.997	1379.80	0.97 oc	---	---	---	0.00	---	---	---	---	---	0.974
1.82	2.029	1379.82	0.98 oc	---	---	---	5.89	---	---	---	---	---	6.871
1.84	2.061	1379.84	0.99 oc	---	---	---	16.66	---	---	---	---	---	17.65
1.86	2.093	1379.86	0.99 oc	---	---	---	30.61	---	---	---	---	---	31.61
1.88	2.125	1379.88	1.00 oc	---	---	---	47.13	---	---	---	---	---	48.13
1.90	2.158	1379.90	1.00 oc	---	---	---	65.87	---	---	---	---	---	66.87
1.92	2.190	1379.92	1.01 oc	---	---	---	86.59	---	---	---	---	---	87.60
1.94	2.222	1379.94	1.01 oc	---	---	---	109.12	---	---	---	---	---	110.13
1.96	2.254	1379.96	1.02 oc	---	---	---	133.32	---	---	---	---	---	134.34
1.98	2.286	1379.98	1.03 oc	---	---	---	159.08	---	---	---	---	---	160.10
2.00	2.318	1380.00	1.03 oc	---	---	---	185.97	---	---	---	---	---	187.00

...End

# Hydrograph Report

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

Wednesday, Jan 5, 2011

## Hyd. No. 12

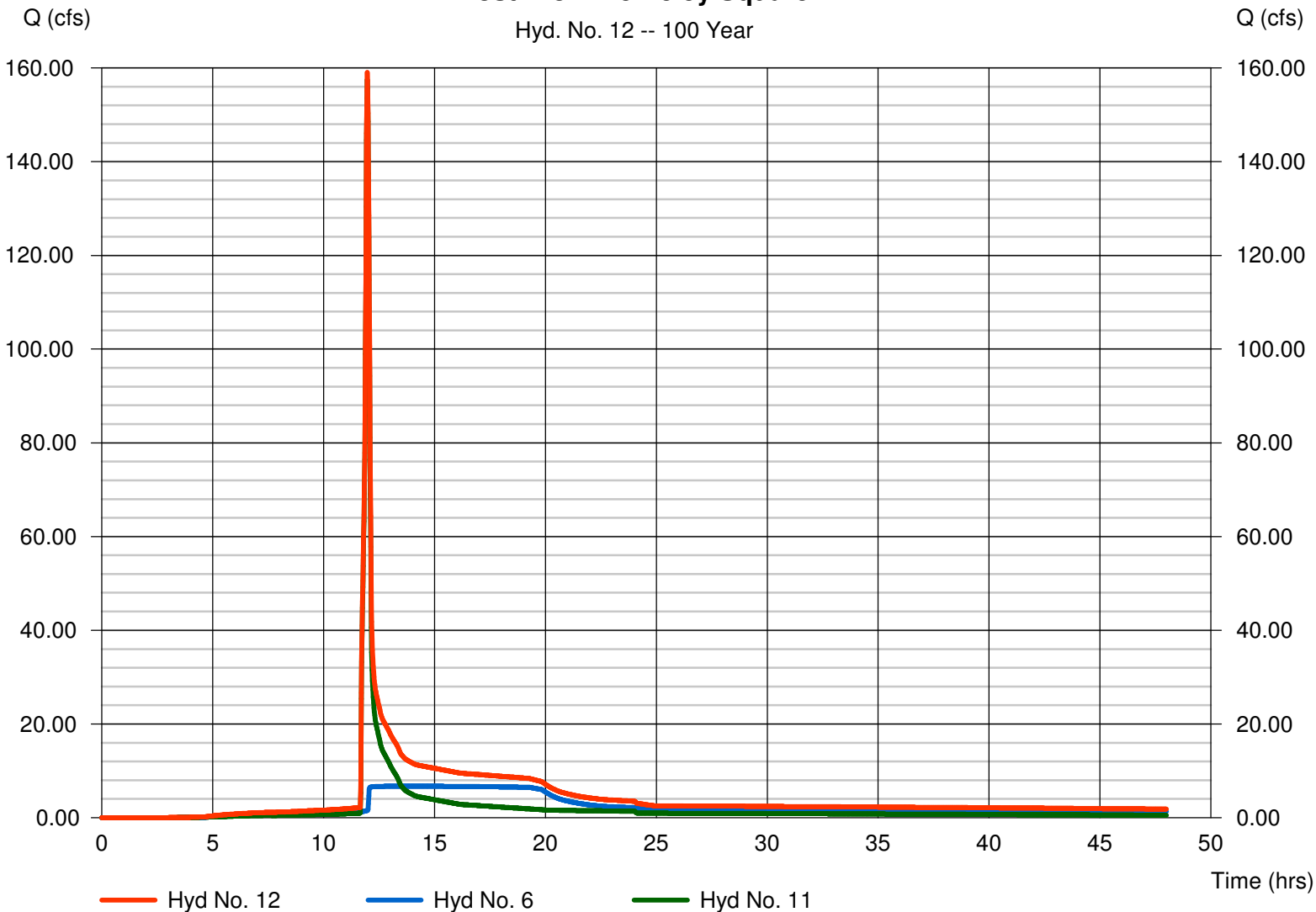
Post From Berkeley Square

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyds. = 6, 11

Peak discharge = 159.02 cfs  
 Time to peak = 11.97 hrs  
 Hyd. volume = 17.685 acft  
 Contrib. drain. area = 0.000 ac

### Post From Berkeley Square

Hyd. No. 12 -- 100 Year



# Hydrograph Report

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

Wednesday, Jan 5, 2011

## Hyd. No. 13

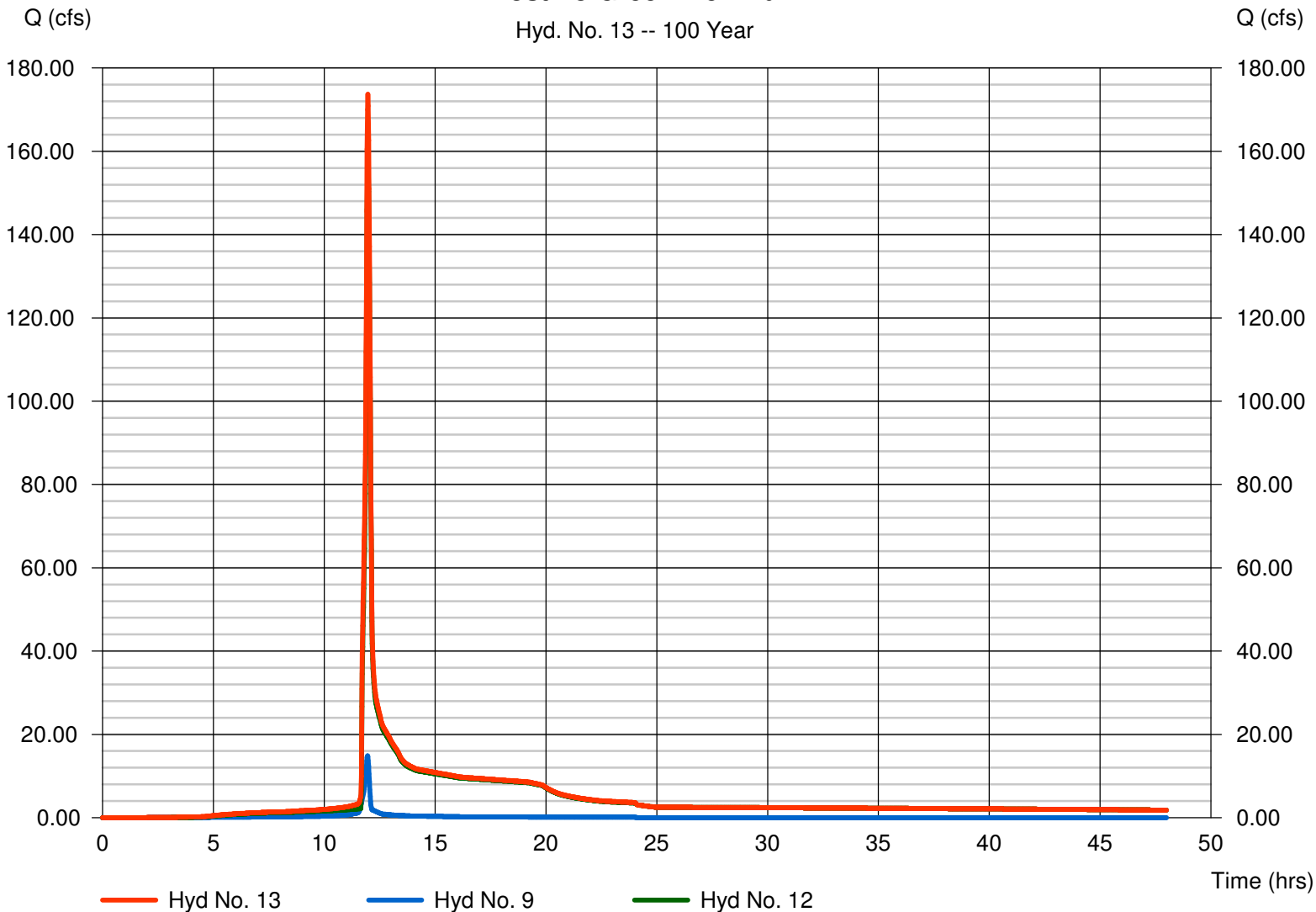
Post To Greenwich Rd

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 9, 12

Peak discharge = 173.69 cfs  
Time to peak = 11.97 hrs  
Hyd. volume = 18.490 acft  
Contrib. drain. area = 1.300 ac

### Post To Greenwich Rd

Hyd. No. 13 -- 100 Year



# Hydrograph Report

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

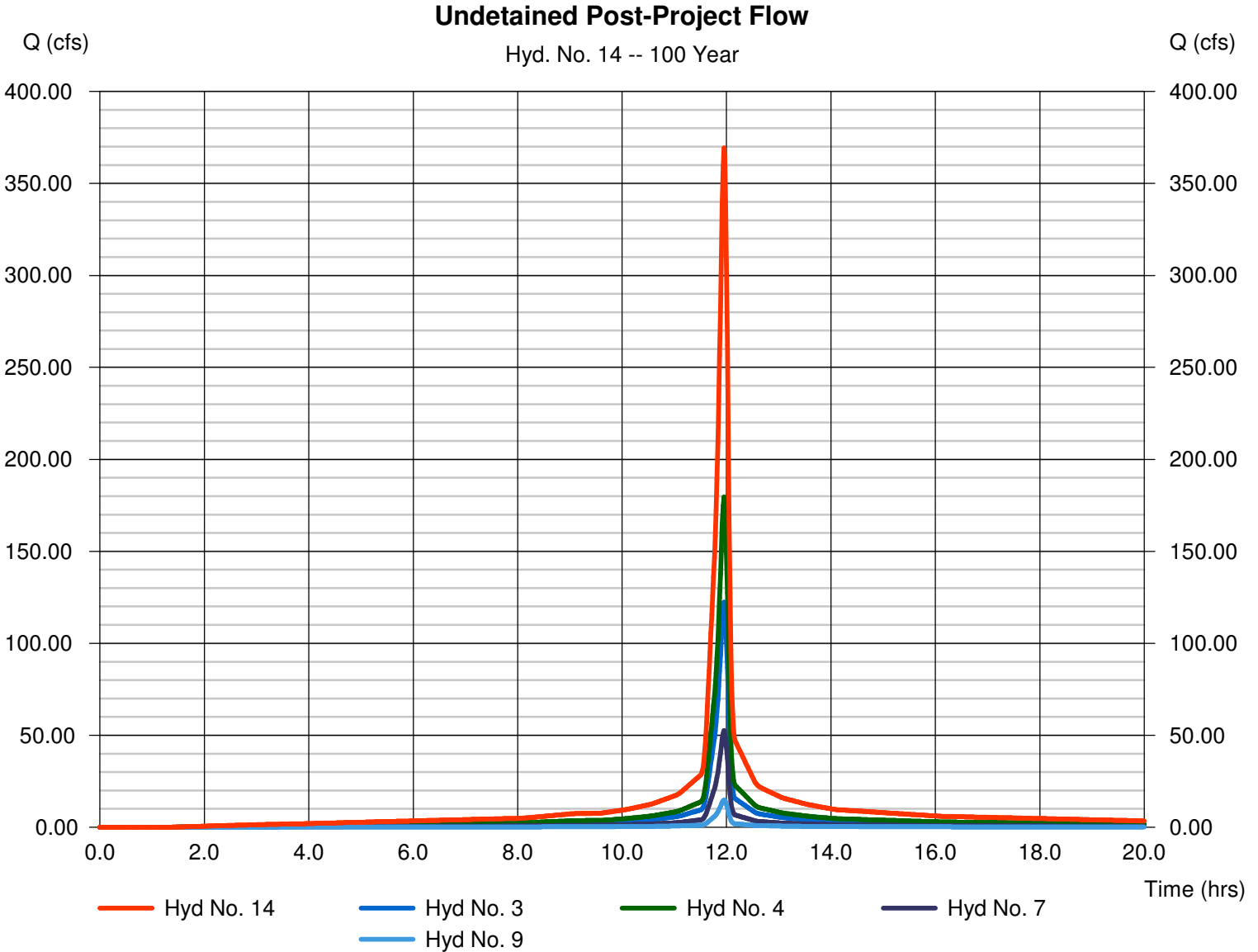
Wednesday, Jan 5, 2011

## Hyd. No. 14

### Undetained Post-Project Flow

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 3, 4, 7, 9

Peak discharge = 369.38 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 19.992 acft  
Contrib. drain. area = 32.300 ac



# Hydrograph Report

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

Wednesday, Jan 5, 2011

## Hyd. No. 15

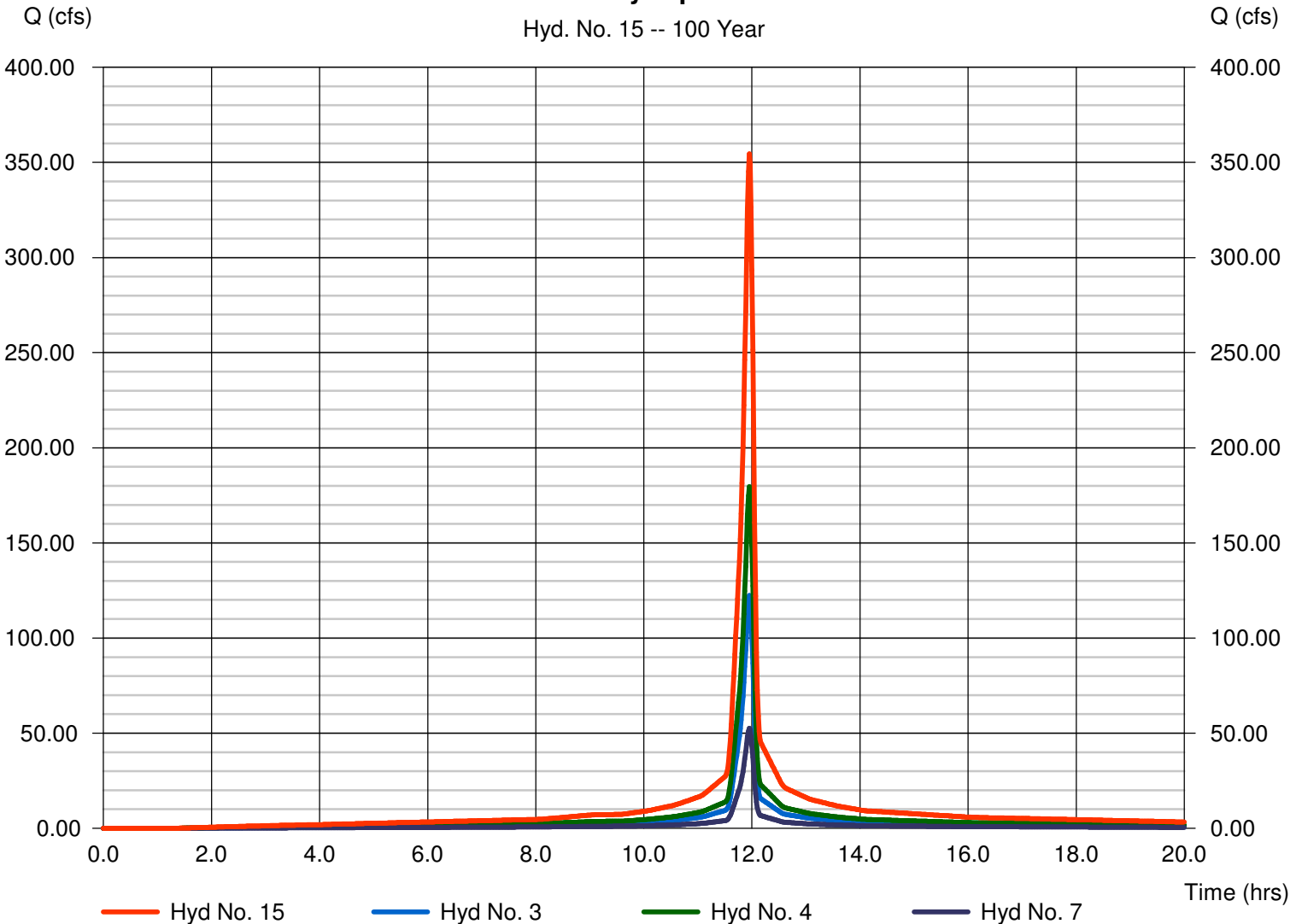
Post From Berkeley Square Undetained

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 3, 4, 7

Peak discharge = 354.51 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 19.187 acft  
Contrib. drain. area = 31.000 ac

### Post From Berkeley Square Undetained

Hyd. No. 15 -- 100 Year



## Appendix 2

---

### Channel Protection Volume Extended Detention – Simplified Method Calculations

## Simplified Channel Protection Volume Extended Detention

$$q_i = 119 \text{ cfs}$$

$$A = 31.0 \text{ acres} = 0.0484 \text{ mi}^2$$

$$q_u = q_p / AP = 119 \text{ cfs} / (0.0484 \text{ mi}^2)(2.8") = 878 \text{ csm/in}$$

$$q_u / q_i = 0.02 \text{ (Fig. 4-17)}$$

$$q_0 = (0.02)(119 \text{ cfs}) = 2.38 \text{ cfs}$$

$$V_S / V_R = 0.682 - 1.43(0.02) + 1.64(0.02)^2 - 0.804(0.02)^3 = 0.65$$

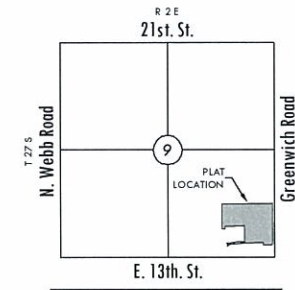
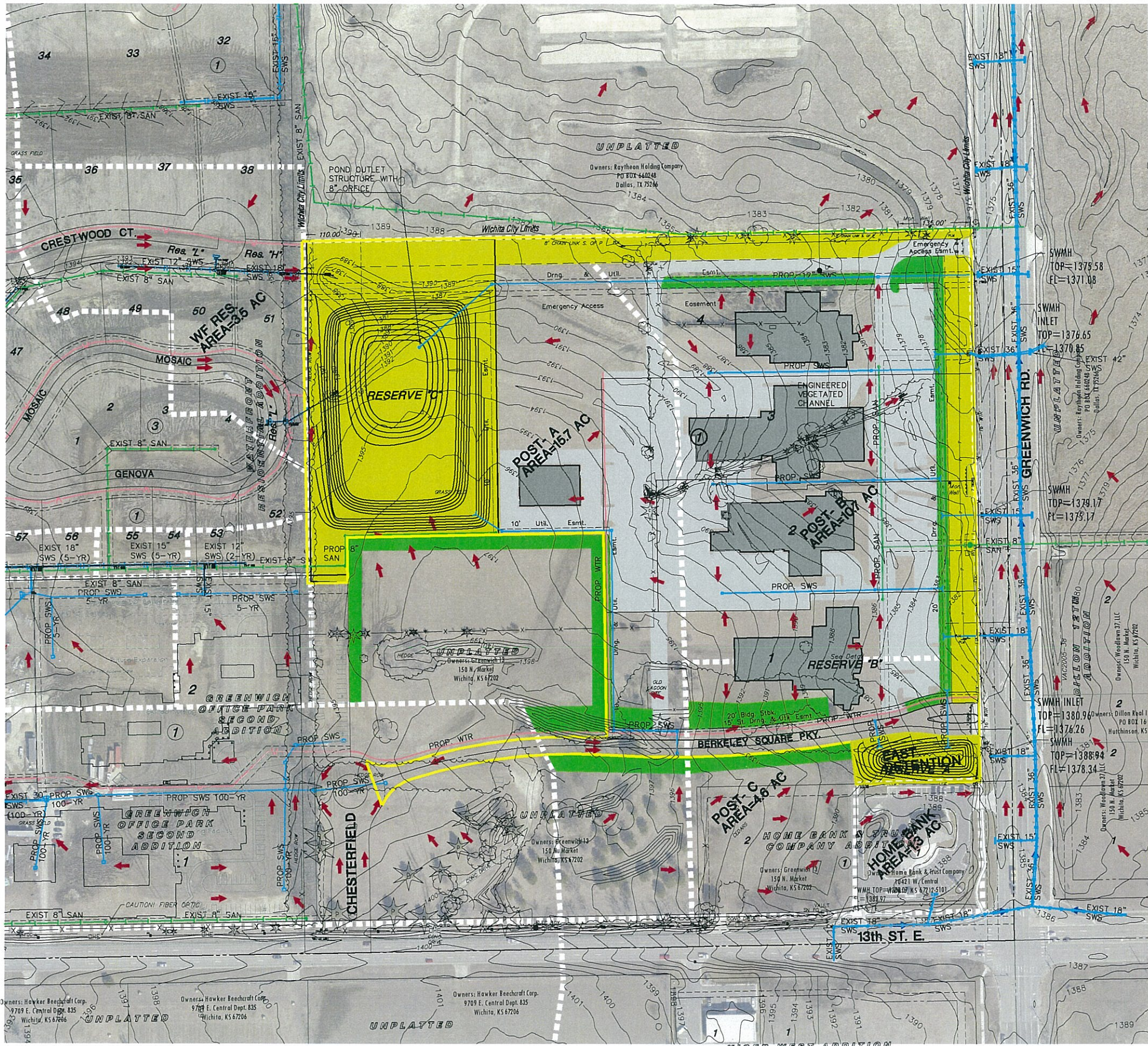
$$V_R = 6.01 \text{ ac-ft}$$

$$V_S = (0.65)(6.01) = 3.9 \text{ ac-ft}$$

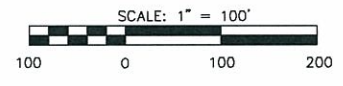
## Appendix 3

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### Drainage and Utility Plan



VICINITY MAP



**LEGEND**

- CONIFEROUS TREE
- DECIDUOUS TREE
- SIGN
- POWER POLE
- ELECTRIC BOX
- LIGHT POLE
- FIRE HYDRANT
- WATER VALVE
- WATER METER
- △ SECTION CORNER
- BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
- A17 - AREA FOR SWS SIZING
- SITE BOUNDARY
- OPEN AREA
- SWALE

**SWALES**

OUTLET: 7" CIRCULAR ORFICE AT 1378.0  
BROAD CRESTED WEIR AT 1379.8

YEARS	STORAGE AC-FT.	ELEVATION FT.
2-YEAR	2.1	1379.8
5-YEAR	2.2	1379.9
10-YEAR	2.2	1379.9
25-YEAR	2.2	1380.0
50-YEAR	2.3	1380.0
100-YEAR	2.3	1380.0

**WEST DETENTION**

OUTLET: 5" CIRCULAR ORFICE AT 1380.0  
2'X2' RISER AT 1386.0  
12" PIPE

YEARS	STORAGE AC-FT.	ELEVATION FT.
2-YEAR	3.3	1384.6
5-YEAR	4.7	1385.5
10-YEAR	5.6	1386.0
25-YEAR	6.1	1386.3
50-YEAR	6.8	1386.7
100-YEAR	7.6	1387.1

**EAST DETENTION**

OUTLET: 2-6"X12" OPENINGS AT 1380.0  
4'X4' RISER AT 1382.9  
24" RCP

YEARS	STORAGE AC-FT.	ELEVATION FT.
2-YEAR	0.3	1382.9
5-YEAR	0.4	1383.3
10-YEAR	0.4	1383.4
25-YEAR	0.4	1383.6
50-YEAR	0.5	1383.8
100-YEAR	0.5	1384.0

DATE  
December 10

REVISED

DESIGN BY  
KLA

DRAWN BY  
CMJ

CHECKED BY  
GJA

SHEET NUMBER  
**1**

J:\Civil\10572 - Berkeley Square Dwg\Drng\10572\_DUP.dwg