DRAINAGE REPORT
FOR:

HOMESTEADS AT DEERCREEK
City of Johnson City, Blanco County, Texas

PREPARED BY :

BETON ENGINEERING INC.
106 NORTH EAST ST.
BELTON, TEXAS, 76513
Firm Registration No. F-13392

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The purpose of this report is to develop a master preliminary drainage plan for the Homesteads at Deercreek land development in Johnson City, Texas. This report details the drainage analysis and design that was performed to develop the Post Drainage Plan.

Methodology

In accordance to the City of Plano Drainage Criteria and Design Manual, the Modified Rational Method was used to determine the rainfall runoff and peak flows for the watershed. Analysis was performed and hydrographs produced using Hydroflow Hydrographs 2019 software.

Travel time and time of concentration for each drainage area were calculated in accordance with Plano Drainage Criteria and Design Manual. Three types of flow were considered, sheet flow, shallow concentrated flow and channel flow. For the sheet flow of a distance of less than 300 feet for the undeveloped conditions and less than 100 feet for the developed conditions, the Kinematic Equation was used to determine the overland flow or the sheet flow. To determine the shallow concentrated flow segment, refer to the equation shown on pg. 2-4 of the city of Plano Drainage Manual. Finally the time travel for the channel flow was calculated using Manning Equation. Once travel time for each type of flow was determined for the drainage areas, the time of concentration could be determined for each watershed.

EXISTING DRAINAGE CONDITIONS

The upstream property (OS1) of approximately 2.58 acres (open pasture) flows onto the subject tract from the east. The upstream property (OS2) of approximately 1.95 acres of undeveloped pasture flows onto the subject tract from the southeast. The upstream property (OS3) of approximately 3.42 acres (open pasture) flows onto the subject tract from the south (*refer to the Pre-Drainage Plan*).

The subject tract has been divided into 3 areas DA1, DA2 and DA3 all consisting of undeveloped open pasture. Areas DA1 and DA2 flow to the west directly into FEMA Flood Hazard Zone "AE". Runoff from Area DA3 flows in an easterly direction and ultimately discharges into the Pedernales River.

PROPOSED DRAINAGE CONDITIONS

The proposed subdivision shall be designed to route the existing offsite runoff and the post development runoff thru a series of roadside channels and culverts into two detention ponds: Pond (DA2) to the west and Pond (DA3) to the east (*refer to the Pre-Drainage Plan*). The detention ponds shall reduce the runoff rates to pre-developed conditions.

Runoff from Areas OS2+DA2b will be routed thru a series of roadside channels and culverts into Pond DA2 to the northwest (*refer to the Post Drainage Plan*). Areas OS1+DA1, DA2a, and DA2c are not routed into pond (DA2). The sum of discharge from Areas (OS1+DA1)+DA2a+DA2c+(Pond DA2) is less than runoff from pre development areas (OS1+DA1)+(OS2+DA2).

Runoff from Areas OS3a+DA3a will be routed thru a series of roadside channels and culverts into Pond DA3 to the northeast (*refer to the Post Drainage Plan*). Runoff from Area OS3b+DA3b is not routed into pond (DA3). The sum of discharge from Area (OS3b+DA3b) +(Pond DA3) is less than runoff from pre development area (OS3+DA3).

All runoff from subject tract will ultimately discharge into the Pedernales River. Below is a summary of the proposed detention ponds, please note that the total discharge from the detention ponds shall not exceed the total runoff at the existing conditions.

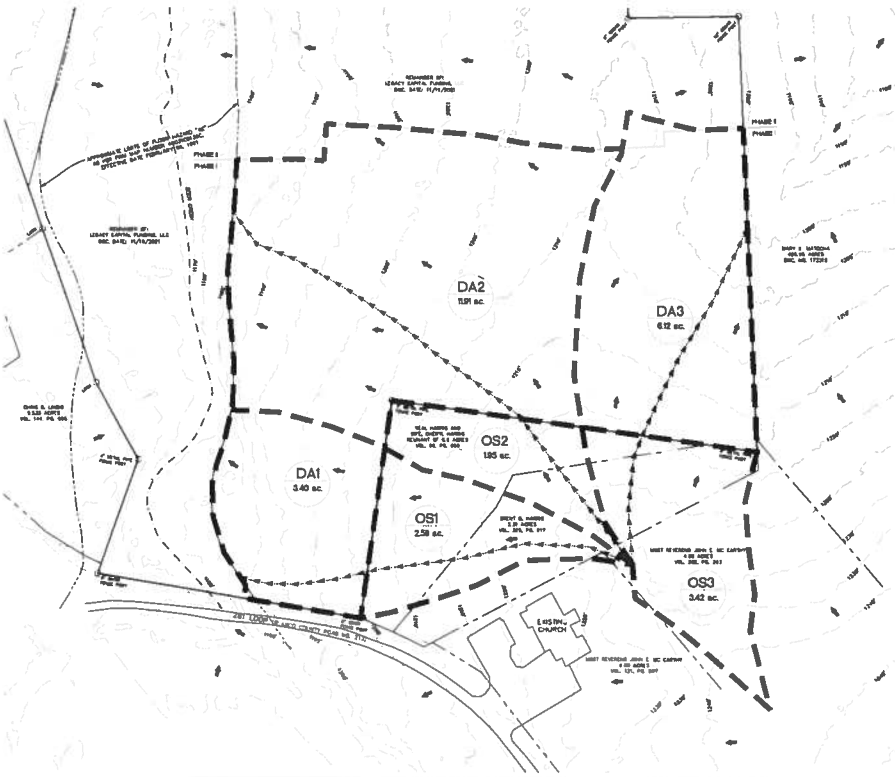
DETENTION POND -DA2

STORM EVENT	Q PRE (OS1+DA1)+(OS2+DA2) (cfs)	Q POST (OS1+DA1)+DA2a+DA2c+ (POND DA2) (cfs)	Q DISCHARGE POND DA2 (cfs)	MAX. ELEV. (ft)	MAX STORAGE (cf)
2-YEAR EVENT	32.76	32.72	15.53	1185.57	2,470
10-YEAR EVENT	48.47	45.77	22.97	1185.88	5,610
25-YEAR EVENT	58.80	54.52	27.35	1186.11	7,957
100-YEAR EVENT	75.82	69.46	34.39	1186.62	13,664

DETENTION POND -DA3

STORM EVENT	Q PRE OS3+DA3 (cfs)	Q POST (OS3b+DA3b)+POND DA3 (cfs)	Q POST POND DA3 (cfs)	MAX. ELEV. (ft)	MAX STORAGE (cf)
2-YEAR EVENT	15.53	13.20	8.71	1201.73	3,969
10-YEAR EVENT	23.31	19.11	13.08	1201.96	6,051
25-YEAR EVENT	28.27	23.17	15.90	1202.09	7,373
100-YEAR EVENT	36.46	30.11	20.65	1202.30	9,524

APPENDIX A



TIME OF CONENTRATION - PRE DEVELOPMENT

POST DA	Area	n	L	S	Tc	L	S	V	Tc	Coef	n						Total Tc	Calc. Tc
OS1	2.58	0.13	300	0.033	2.432	308.5	0.030	3.10	1.824								4.0	15.0
OS2	1.95	0.13	300	0.033	2.402	118.7	0.042	3.30	0.600								3.0	15.0
OS3	3.42	0.13	300	0.037	2.312												2.3	15.0
OS1+DA1	5.98	0.13	300	0.033	2.402	832.84	0.052	3.09	2.815								5.2	15.0
OS2+DA2	13.86	0.13	300	0.033	2.402	848.45	0.042	3.31	4.775								7.2	15.0
OS3+DA3	9.54	0.13	300	0.037	2.312	532.57	0.038	3.13	2.830								5.2	15.0

Drainage Calculations, Existing Conditions

DA	AREA (acres)	Tc (min)	C	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OS1	2.58	15.0	0.40	4.30	4.27	8.1	8.36	[illegible]	[illegible]	9.67	[illegible]
OS2	1.95	15.0	0.40	4.30	3.19	8.11	4.76	7.48	5.91	9.67	7.53
OS3	3.42	15.0	0.40	4.30	[illegible]	8.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
OS1+DA1	5.98	15.0	0.40	4.30	9.81	6.11	14.61	7.48	17.84	9.67	[illegible]
OS2+DA2	13.86	15.0	0.40	4.30	22.73	6.11	33.87	7.48	41.26	9.67	[illegible]
OS3+DA3	9.54	15.0	0.40	4.30	[illegible]	6.11	[illegible]	7.48	[illegible]	[illegible]	[illegible]

REVISIONS

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PRE DRAINAGE PLAN OF
HOMESTEADS AT DEER CREEK
217 LOOP 281
JOHNSON CITY TX 78636, BLANCO COUNTY
MEHUL DARBAR

06/10/22

SCALE: 1"=100'
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JOB NO.: 21032
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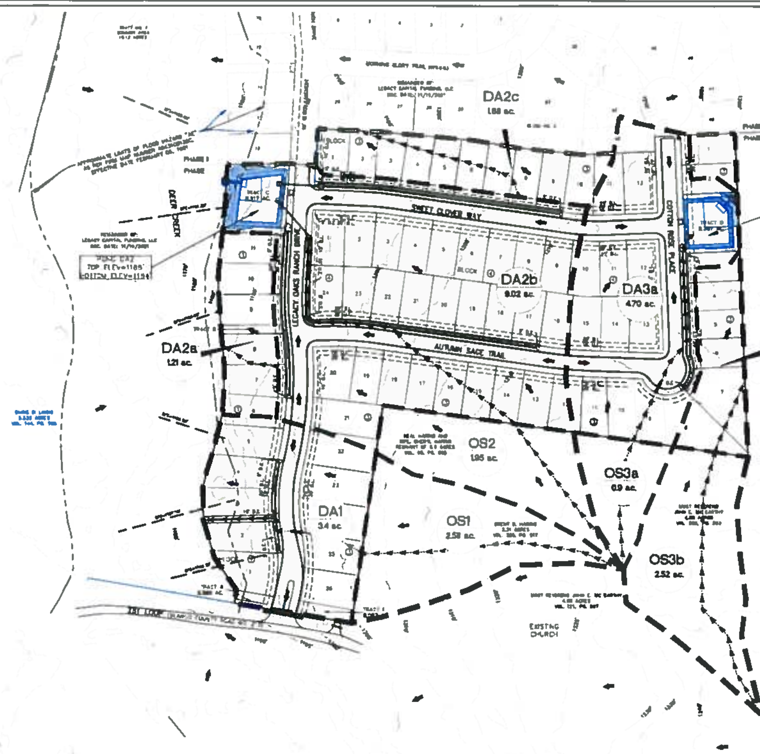
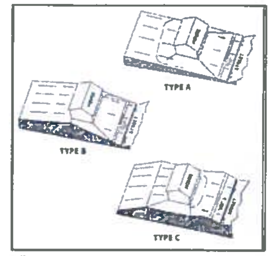




NOTE:
1. THE ENGINEER OF RECORD MUST BE NOTIFIED IMMEDIATELY IF ANY DISCREPANCIES IN THE PLANS EXIST
2. THE HOMEBUILDER IS TO MAINTAIN DRAINAGE BETWEEN LOTS AS SHOWN ON THIS DRAINAGE PLAN

DETENTION POND DA2

STORM EVENT	Q PRE (OS1+DA1)+(OS2+DA2) (cfs)	Q POST (OS1+DA1)+DA2a+DA2c+(POND DA2) (cfs)	Q DISCHARGE POND DA2 (cfs)	MAX. ELEV (ft)	MAX STORAGE (ft3)
2-YEAR EVENT	32.76	32.72	15.53	1185.57	2,470
10-YEAR EVENT	48.47	45.77	22.87	1185.88	5,610
25-YEAR EVENT	56.80	54.52	27.36	1186.11	7,857
100-YEAR EVENT	75.82	69.46	34.38	1186.62	13,064

DETENTION POND DA3

STORM EVENT	Q PRE OS3+DA3 (cfs)	Q POST (OS3b+DA3b)+POND DA3 (cfs)	Q POST POND DA3 (cfs)	MAX. ELEV (ft)	MAX STORAGE (ft3)
2-YEAR EVENT	15.53	13.20	6.71	1201.73	3,909
10-YEAR EVENT	23.31	18.11	13.08	1201.98	6,061
25-YEAR EVENT	26.27	23.17	15.80	1202.08	7,373
100-YEAR EVENT	30.46	30.11	20.65	1202.30	8,524

C-COMPOSITE CALCULATIONS

AREA	C PASTURE	PASTURE AREA (ac.)	C SF-7 (ac.)	SF-7 AREA (ac.)	TOTAL AREA (ac.)	C COMPOSITE
OS1+DA1	0.40	2.58	0.60	3.40	5.98	0.51
DA2a	0.40	0.00	0.80	1.21	1.21	0.80
OS2+DA2b	0.40	1.95	0.60	8.92	10.87	0.58
DA2c	0.40	0.00	0.80	1.68	1.68	0.80
OS3a+DA3a	0.40	0.90	0.60	4.70	5.60	0.57
OS3b+DA3b	0.40	2.53	0.60	1.43	3.94	0.47

DETENTION POND DA2

STORM EVENT	Q PRE (OS1+DA1)+(OS2+DA2) (cfs)	Q POST (OS1+DA1)+DA2a+DA2c+(POND DA2) (cfs)	Q DISCHARGE POND DA2 (cfs)	MAX. ELEV (ft)	MAX STORAGE (ft3)
2-YEAR EVENT	32.76	32.72	15.53	1186.57	2,470
10-YEAR EVENT	48.47	45.77	22.87	1185.88	5,610
25-YEAR EVENT	56.80	54.52	27.36	1186.11	7,857
100-YEAR EVENT	75.82	69.46	34.38	1186.62	13,064

DETENTION POND DA3

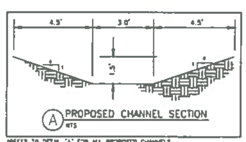
STORM EVENT	Q PRE OS3+DA3 (cfs)	Q POST (OS3b+DA3b)+POND DA3 (cfs)	Q POST POND DA3 (cfs)	MAX. ELEV (ft)	MAX STORAGE (ft3)
2-YEAR EVENT	15.53	13.20	6.71	1201.73	3,909
10-YEAR EVENT	23.31	18.11	13.08	1201.98	6,061
25-YEAR EVENT	26.27	23.17	15.80	1202.08	7,373
100-YEAR EVENT	30.46	30.11	20.65	1202.30	8,524

Drainage Calculations, Proposed Conditions

DA	AREA (acres)	T_c (min)	C	i_2 (in/hr)	Q_2 (cfs)	i_{10} (in/hr)	Q_{10} (cfs)	i_{25} (in/hr)	Q_{25} (cfs)	i_{100} (in/hr)	Q_{100} (cfs)
OS1+DA1	5.98	15.0	0.51	4.10	12.50	6.11	18.77	7.46	0.51	9.67	29.71
DA2a	1.21	15.0	0.80	4.10	3.99	6.11	4.45	7.46	0.80	9.67	7.08
OS2+DA2b	10.87	15.0	0.58	4.10	25.38	6.11	37.84	7.46	0.58	9.67	58.88
DA2c	1.68	15.0	0.80	4.10	4.12	6.11	8.14	7.46	0.80	9.67	9.72
OS3a+DA3a	5.60	15.0	0.57	4.10	13.03	6.11	19.42	7.46	0.57	9.67	30.74
OS3b+DA3b	3.94	15.0	0.47	4.10	7.84	6.11	11.38	7.46	0.47	9.67	18.01

TIME OF CONCENTRATION - POST DEVELOPMENT

POST DA	Area	Sheet n	Sheet L	Sheet s	Sheet Tt	Shallow L	Shallow s	Shallow V	Shallow Tt	Channel	n	L	s	Vel	A	Tt	Total Tc	Calc. Tc
OS1+DA1	5.98	0.13	300	0.033	2.400	358.42	0.046	3.24	1.54	A1	0.035	200	0.04	8.36	12.6	0.062	4.8	15.0
						167	0.088	3.85	0.795									
						33	0.036	3.51	0.156									
DA2a	1.21	0.24	141.87	0.053	1.818												1.8	15.0
OS2+DA2b	10.87	0.13	300	0.033	2.402	119.7	0.013	[illegible]	0.870	A3	0.035	400	0.03	10.50	6.15	0.804	9.8	15.0
						296.3	0.044	[illegible]	1.479									
						42.78	0.023	3.11	0.229									
DA2c	1.68	0.24	150	0.017	2.873	256.14	0.043	3.34	1.277								4.2	15.0
OS3a+DA3a	5.60	0.13	300	0.042	2.233	136.43	0.041	[illegible]	0.694	A6	0.036	250.7	0.024	11.08	6.78	0.308	4.1	15.0
						108.94	0.017	[illegible]	0.679									
OS3b+DA3b	3.94	0.13	300	0.040	2.233	348.43	0.036	3.11	1.830								5.0	15.0
						180.96	0.041	[illegible]	0.818									



*REFER TO DETAIL "A" FOR ALL PROPOSED CHANNELS

REVISIONS

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DRAINAGE PLAN OF
HOMESTEADS AT DEER CREEK
2_7 LOOP 281
JOHNSON CITY TX 78636 BLANCO COUN
MEHUL DARBAR

06/10/22

SCALE	1"=100'
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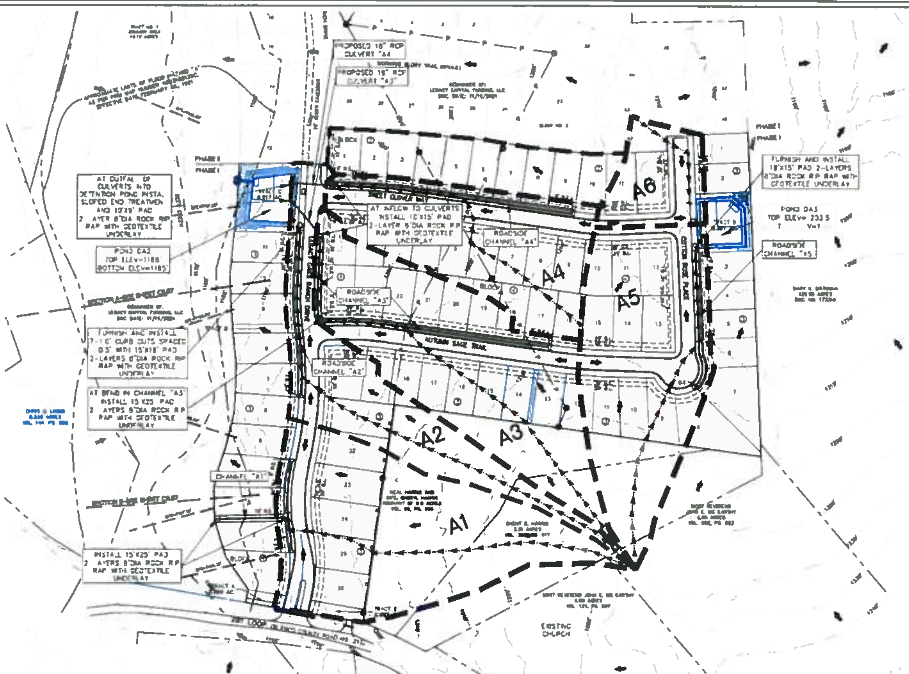

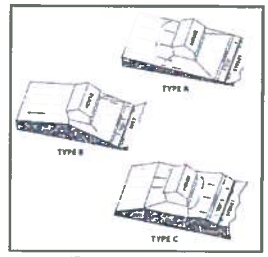

NOTE:
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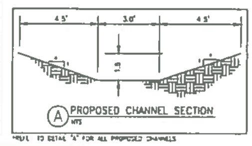
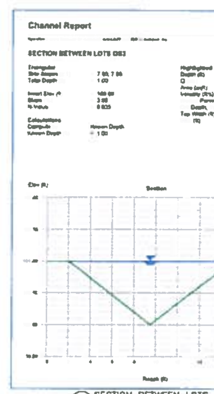
CULVERT TABLE

PIPE SIZE	BLOCK	LOTS
18"	1	1, 4–7
18"	2	5–13
18"	3	1, 2, 6–8
18"	4	10–19
2-18"	1	2, 3, 8–11
2-18"	2	1–4
2-18"	3	3–5
2-18"	4	20–24



(A) PROPOSED CHANNEL SECTION
NTS

REFER TO DETAIL "A" FOR ALL PROPOSED CHANNELS



(B) SECTION BETWEEN LOTS
NTS

NOTE:
1. IT IS THE DEVELOPERS RESPONSIBILITY TO BUILD A SWALE SECTION AS SHOWN ON DETAIL B TO ACCEPT ALL OFFSITE RUNOFF. THIS SECTION MUST BE BUILT BETWEEN LOTS 1-28 BLOCK 3

RATION - POST DEVELOPMENT

DA	Area									Chan							Total	Calc
A1	4.74	0.13	300	0.023	2.402	309.42	0.046	3.24	1.59	A1	0.036	84.73	0.005	0.36	12.9	0.888	4.8	15.0
						167	0.064	3.19	0.705									
						33	0.036	3.14	0.195									
A2	2.86	0.13	300	0.033	2.402	350.64	0.045	3.24	1.751	A2	0.035	373.8	0.024	9.18	4.5	1.182	6.6	15.0
						167.49	0.046	3.21	0.900									
						80	0.033	3.7	0.268									
A3	4.69	0.13	300	0.033	2.402	119.7	0.033	2.18	0.878	A3	0.035	400	0.034	10.98	8.15	0.751	5.5	15.0
						298.5	0.044	3.37	1.478									
						42.78	0.023	2.11	0.229									
A4	3.15	0.24	100	0.030	1.669	270	0.031	2.8	1.572	A4	0.035	321.2	0.028	8.35	4.662	0.908	4.4	15.0
						55	0.036	3.06	0.230									
A5	4.06	0.13	300	0.040	2.233	138.43	0.041	3.21	0.804	A5	0.036	250.7	0.03	11.08	6.75	0.456	4.1	15.0
						108.84	0.017	2.44	0.678									
A6	1.07	0.24	117.34	[illegible]	1.835	154	0.016	2.0	0.961								2.8	15.0

Drainage Calculations, Proposed Conditions

DA	AREA	T_c	C	i_2	Q_2	i_{10}	Q_{10}	i_{25}	Q_{25}	i_{100}	Q_{100}
	(acres)	(min)		(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)	(in/hr)	(cfs)
A1	4.74	15.0	0.49	4.10	9.50	6.11	14.23	7.40	0.49	8.67	22.81
A2	2.86	15.0	0.53	4.10	5.75	6.11	8.57	7.40	0.53	8.67	13.58
A3	4.66	15.0	0.56	4.10	10.63	6.11	15.85	7.40	0.56	8.67	21.06
A4	3.15	15.0	0.60	4.10	7.75	6.11	11.54	7.40	0.60	8.67	18.27
A5	4.06	15.0	0.56	4.10	9.28	6.11	13.79	7.40	0.56	8.67	21.83
A6	1.07	15.0	0.60	4.10	2.64	6.11	3.94	7.40	0.60	8.67	6.24

C-COMPOSITE CALCULATIONS

AREA	C PASTURE	PASTURE AREA (AC)	C SF-7	SF-7 AREA (AC)	TOTAL AREA (AC)	C COMPOSITE
A1	0.43	2.58	0.60	2.16	4.74	0.49
A2	0.40	0.00	0.60	1.70	2.86	0.53
A3	0.40	0.80	0.60	3.86	4.66	0.56
A4	0.43	0.00	0.60	3.15	3.15	0.60
A5	0.40	0.90	0.60	3.16	4.06	0.56
A6	0.40	0.00	0.60	1.07	1.07	0.60

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08 OF 29

C3.05

NOTE:
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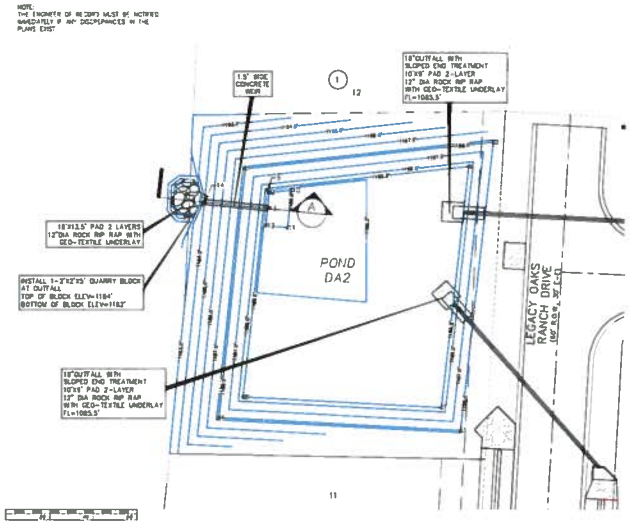
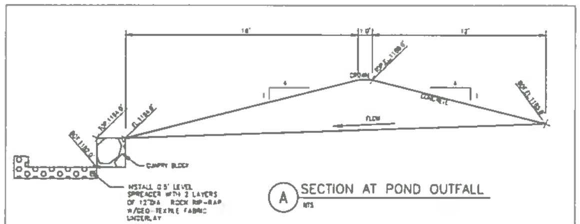
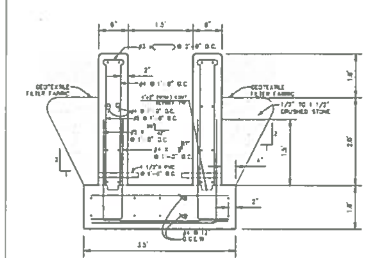




A SECTION AT POND OUTFALL
NTS



** THE SELECT FILL MATERIAL SHALL BE A NON-EXPANSIVE, WELL-GRADED SOIL OR CRUSHED STONE WITH SUFFICIENT BINDER MATERIAL FOR COMPACTION PURPOSES. THE FILL SHALL CONFORM TO THE FOLLOWING:

MAXIMUM AGGREGATE	2"
LIQUID LIMIT	40 MAXIMUM
PLASTICITY INDEX	5-20

** SELECT FILL SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM LABORATORY DENSITY DETERMINED IN ACCORDANCE WITH AMERICAN SOCIETY OF TESTING MATERIALS METHOD ASTM D 1557. MOISTURE CONTENT OF THE COMPACTED MATERIAL SHALL BE WITHIN 2% POINTS OF OPTIMUM MOISTURE AT TIME OF COMPACTION. THE DESIGN ENGINEER SHALL APPROVE SELECT FILL UTILIZED AT THIS SITE.

CAST IN PLACE CONCRETE NOTES -

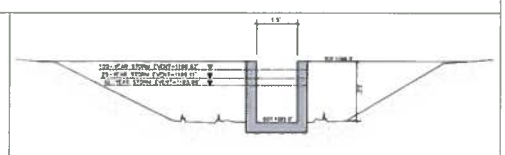
1) CONCRETE SHALL CURE A MINIMUM OF 10 DAYS. IMMEDIATELY REMOVE CURING COMPOUND RESIDUE AND INSTALL SEALER PER MFR RECOMMENDATIONS

2) CONCRETE SHALL NOT BE CAST AGAINST SAND

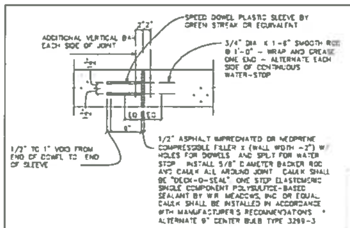
3) PLACE AN EXPANSION JOINT EVERY 22'

4) CONCRETE COMPRESSIVE STRENGTH TO BE 3500 PSI

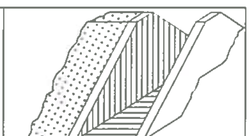
1 OUTFALL REINFORCEMENT DETAIL
NTS



2 OUTFALL STRUCTURE-ELEV. VIEW
NTS



3 EXPANSION JOINT DETAIL @ CONC. WALL FOOTING
NTS



4 OUTFALL SCHEMATIC ISO-VIEW
NTS

Point Table

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4	TOP	[illegible]	[illegible]	[illegible]
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14	[illegible]	[illegible]	[illegible]	[illegible]

REVISIONS

FIRM # F-13332

BELTON ENGINEERING INC.

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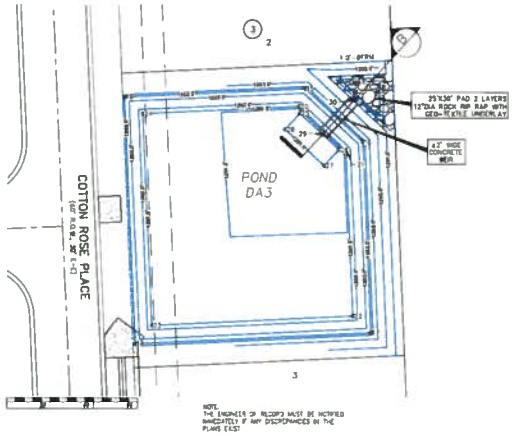
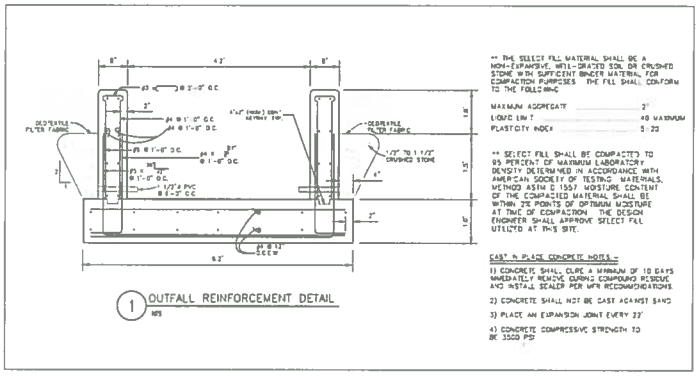
Engineering
Design/Build
Planning

POND "DA2" DETAIL SHEET OF:
HOMESTEADS AT DEER CREEK
217 LOOP 281
JOHNSON CITY TX 78636, BLANCO COUNTY
MEHUL DARBAR

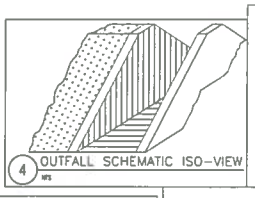
06/10/22

SCALE: NTS
DRAWN: AM
ELEC. DRAWING FILE C:\21037-DR.DWG
DATE: 06/10/22
JOB NO.: 21037
11 OF 29
C3.08

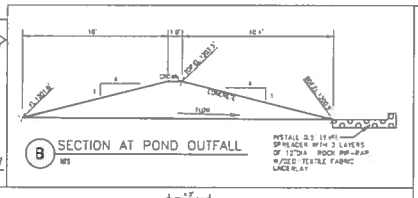




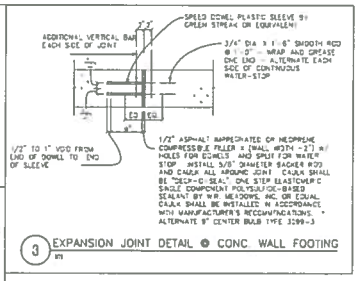
1 OUTFALL REINFORCEMENT DETAIL
NTS



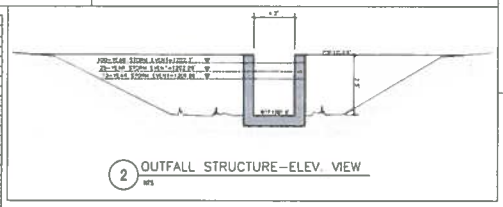
4 OUTFALL SCHEMATIC ISO-VIEW
NTS



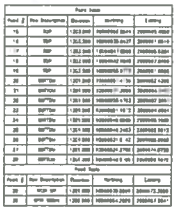
3 SECTION AT POND OUTFALL
NTS



3 EXPANSION JOINT DETAIL @ CONC. WALL FOOTING
NTS



2 OUTFALL STRUCTURE-ELEV. VIEW
NTS



REVISIONS

TBPE # F-13392

BELTON ENGINEERING INC.

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Engineering
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POND "DA3" DETAIL SHEET OF:
HOMESTEADS AT DEER CREEK
217 LOOP 281
JOHNSON CITY TX 78636, BLANCO COUNTY
MEHUL DARBAR

06/10/22

SCALE: NTS
DRAWN: AM
ELEC. DRAWING FILE
C:\21037-DRLDWG
DATE: 06/10/22
JOB NO.: 21037
12 OF 29

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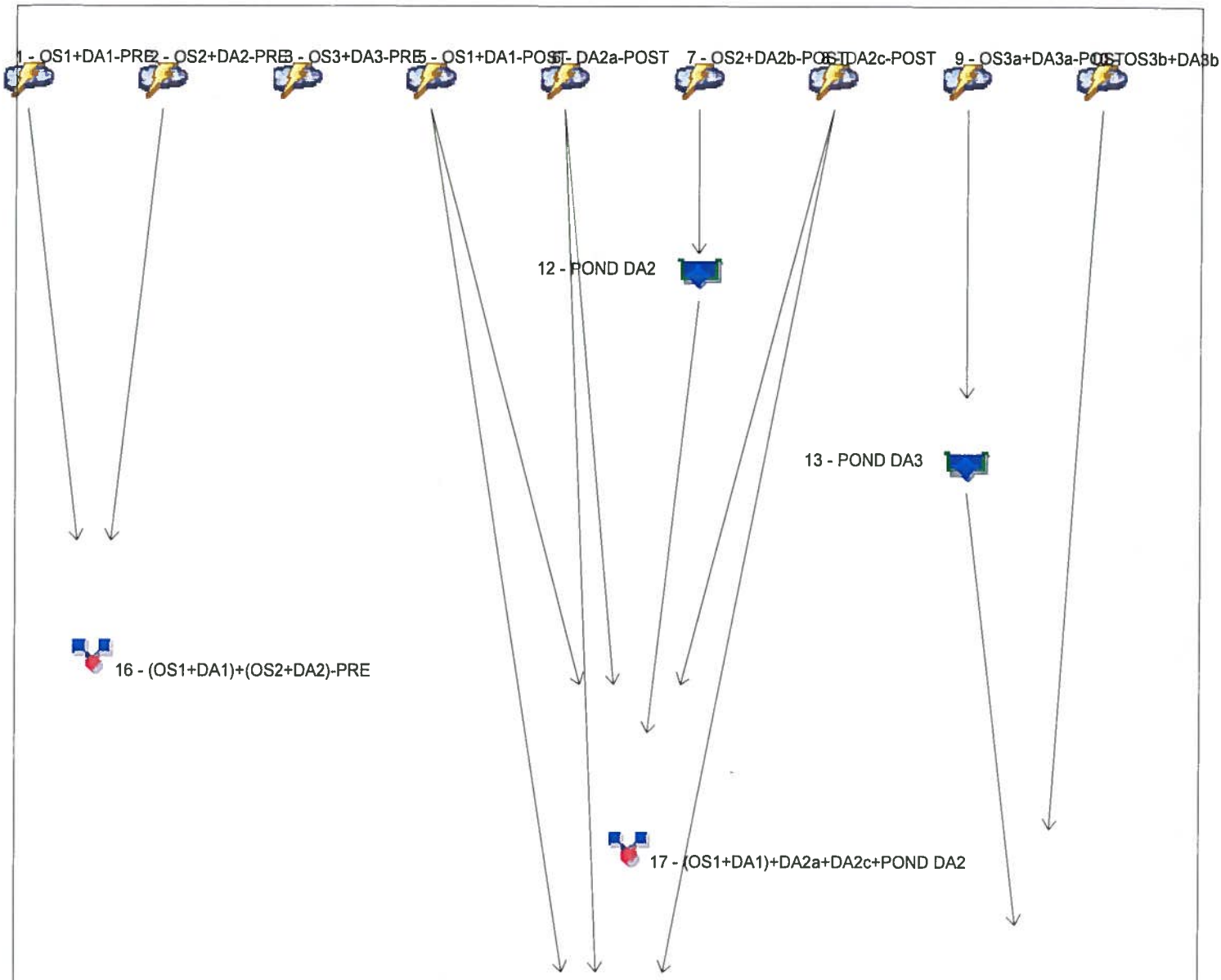
APPENDIX B

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12



Legend

Hyd.	Origin	Description
1	Rational	OS1+DA1-PRE
2	Rational	OS2+DA2-PRE
3	Rational	OS3+DA3-PRE
5	Rational	OS1+DA1-POST
6	Rational	DA2a-POST
7	Mod. Rational	OS2+DA2b-POST
8	Rational	DA2c-POST
9	Mod. Rational	OS3a+DA3a-POST
10	Rational	OS3b+DA3b
12	Reservoir	POND DA2
13	Reservoir	POND DA3
16	Combine	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	(OS1+DA1)+DA2a+DA2c+POND DA2
18	Combine	(OS3b+DA3b)+POND DA3
20	Combine	(OS1+DA1)+DA2a+DA2c

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

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	Rational	-----	-----	9.875	-----	-----	-----	-----	-----	-----	OS1+DA1-PRE
2	Rational	-----	-----	22.89	-----	-----	-----	-----	-----	-----	OS2+DA2-PRE
3	Rational	-----	-----	15.75	-----	-----	-----	-----	-----	-----	OS3+DA3-PRE
5	Rational	-----	-----	12.59	-----	-----	-----	-----	-----	-----	OS1+DA1-POST
6	Rational	-----	-----	2.997	-----	-----	-----	-----	-----	-----	DA2a-POST
7	Mod. Rational	-----	-----	15.63	-----	-----	-----	-----	-----	-----	OS2+DA2b-POST
8	Rational	-----	-----	4.161	-----	-----	-----	-----	-----	-----	DA2c-POST
9	Mod. Rational	-----	-----	9.727	-----	-----	-----	-----	-----	-----	OS3a+DA3a-POST
10	Rational	-----	-----	7.645	-----	-----	-----	-----	-----	-----	OS3b+DA3b
12	Reservoir	7	-----	15.53	-----	-----	-----	-----	-----	-----	POND DA2
13	Reservoir	9	-----	8.714	-----	-----	-----	-----	-----	-----	POND DA3
16	Combine	1, 2,	-----	32.76	-----	-----	-----	-----	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	5, 6, 8,	-----	32.72	-----	-----	-----	-----	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	12, 10, 13,	-----	13.20	-----	-----	-----	-----	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	5, 6, 8,	-----	19.75	-----	-----	-----	-----	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

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	Rational	9.875	1	15	8,887	-----	-----	-----	OS1+DA1-PRE
2	Rational	22.89	1	15	20,599	-----	-----	-----	OS2+DA2-PRE
3	Rational	15.75	1	15	14,178	-----	-----	-----	OS3+DA3-PRE
5	Rational	12.59	1	15	11,331	-----	-----	-----	OS1+DA1-POST
6	Rational	2.997	1	15	2,697	-----	-----	-----	DA2a-POST
7	Mod. Rational	15.63	1	15	34,746	-----	-----	-----	OS2+DA2b-POST
8	Rational	4.161	1	15	3,745	-----	-----	-----	DA2c-POST
9	Mod. Rational	9.727	1	15	15,846	-----	-----	-----	OS3a+DA3a-POST
10	Rational	7.645	1	15	6,880	-----	-----	-----	OS3b+DA3b
12	Reservoir	15.53	1	37	34,699	7	1185.57	2,470	POND DA2
13	Reservoir	8.714	1	29	15,757	9	1201.73	3,969	POND DA3
16	Combine	32.76	1	15	29,486	1, 2,	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	32.72	1	15	52,473	5, 6, 8, 12,	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	13.20	1	15	22,638	10, 13,	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	19.75	1	15	17,774	5, 6, 8,	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Report

Hyd. No. 1

OS1+DA1-PRE

Hydrograph type	= Rational	Peak discharge	= 9.875 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,887 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.4
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Report

Hyd. No. 2

OS2+DA2-PRE

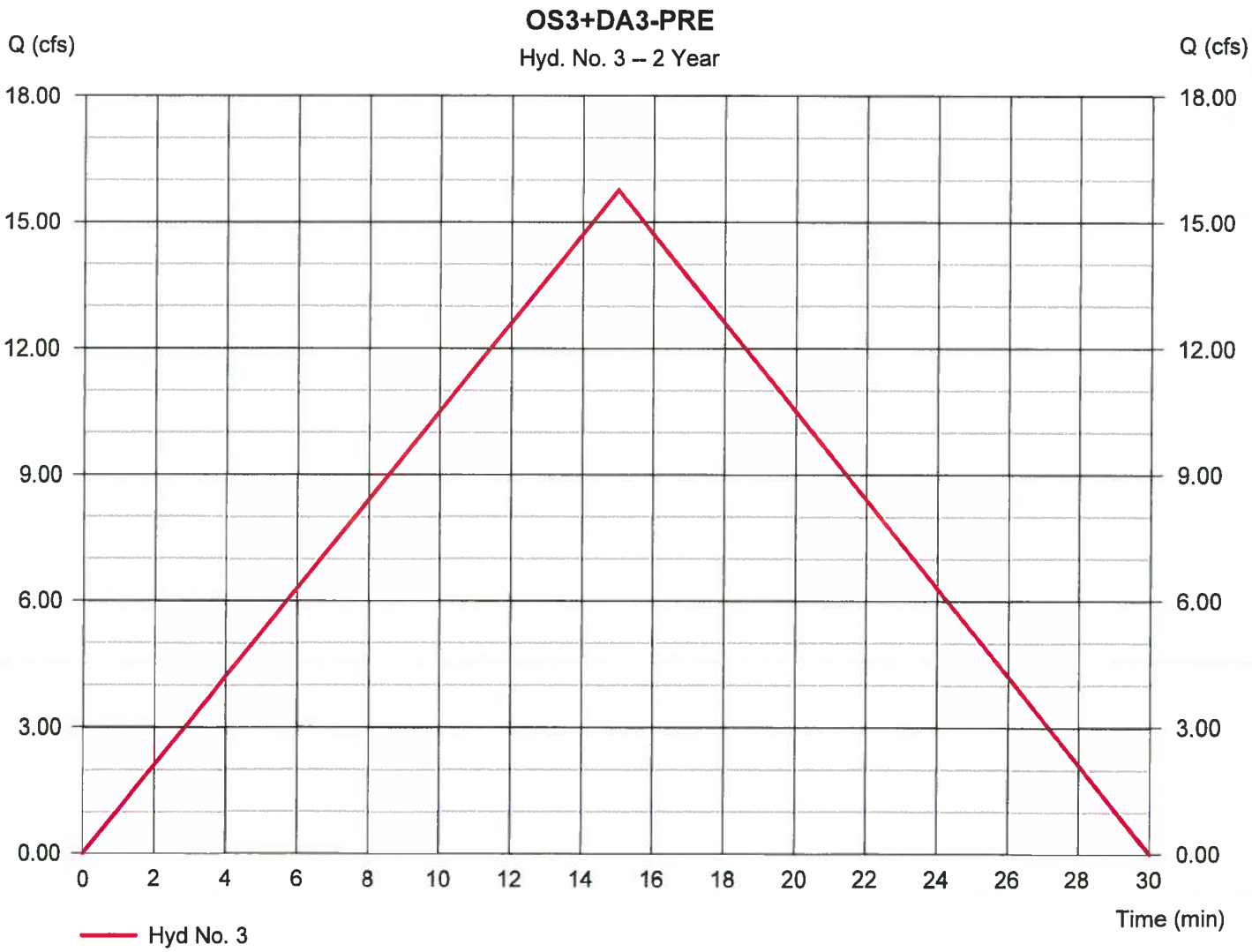
Hydrograph type	= Rational	Peak discharge	= 22.89 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 20,599 cuft
Drainage area	= 13.860 ac	Runoff coeff.	= 0.4
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Report

Hyd. No. 3

OS3+DA3-PRE

Hydrograph type	= Rational	Peak discharge	= 15.75 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 14,178 cuft
Drainage area	= 9.540 ac	Runoff coeff.	= 0.4
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

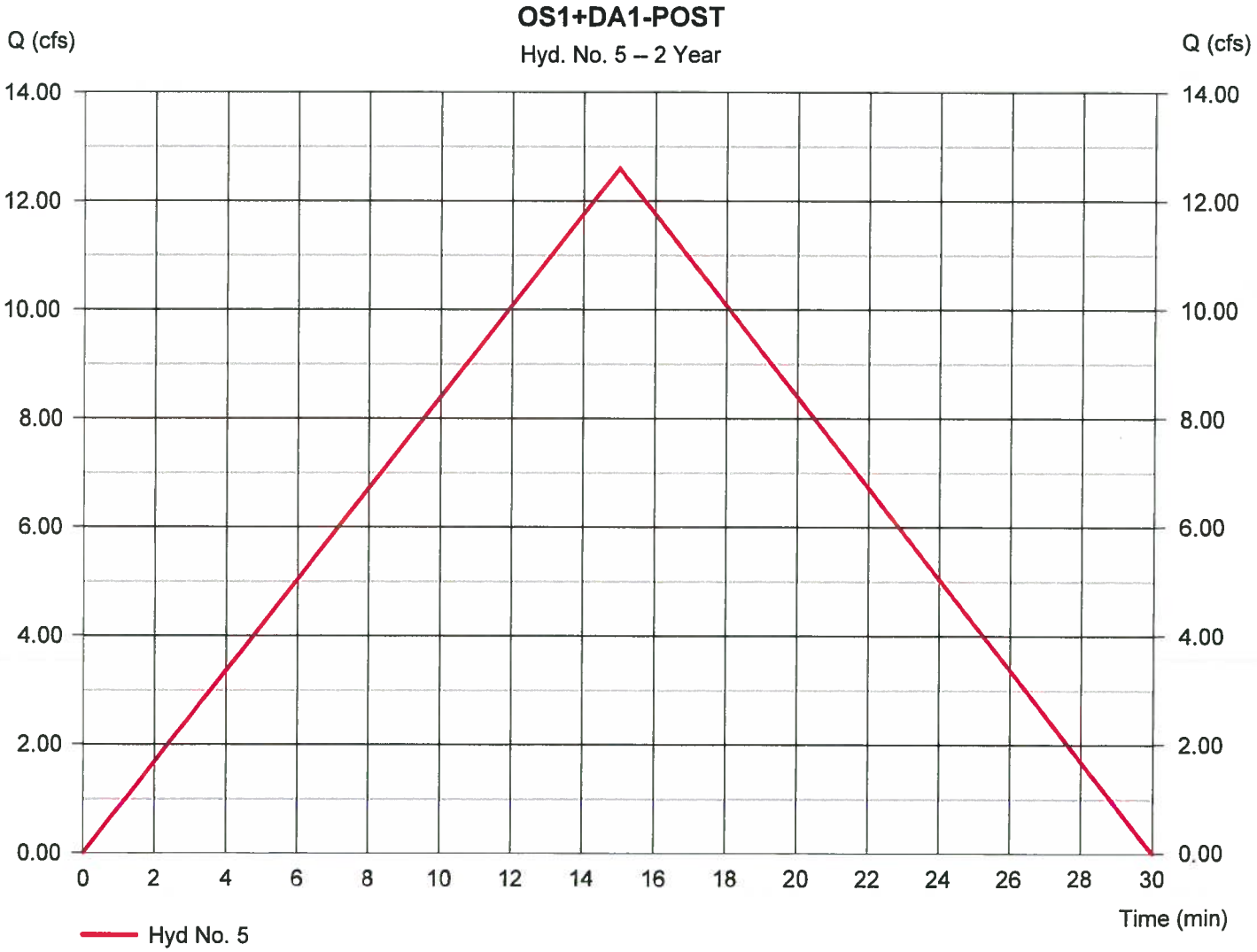


Hydrograph Report

Hyd. No. 5

OS1+DA1-POST

Hydrograph type	= Rational	Peak discharge	= 12.59 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 11,331 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.51
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

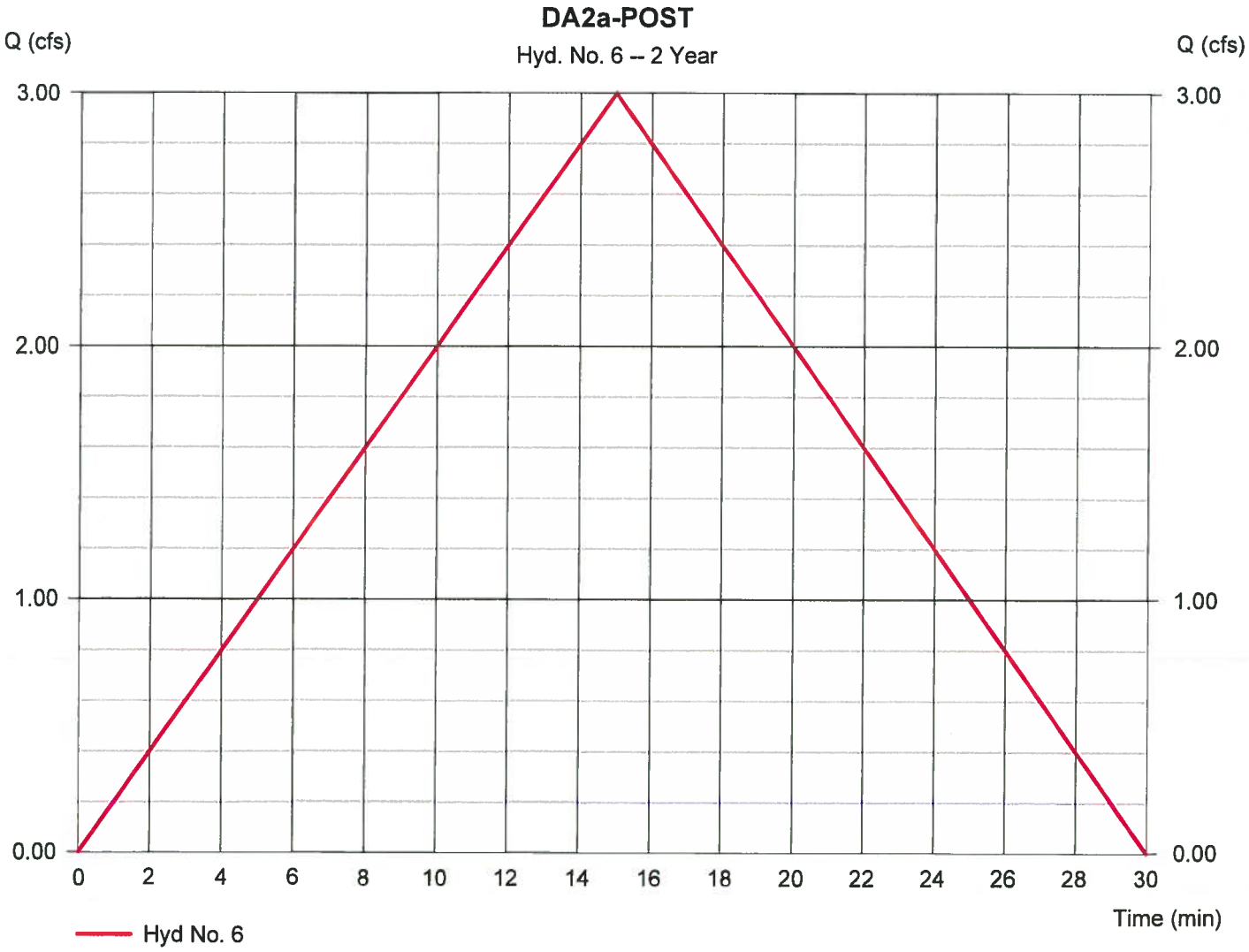


Hydrograph Report

Hyd. No. 6

DA2a-POST

Hydrograph type	= Rational	Peak discharge	= 2.997 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 2,697 cuft
Drainage area	= 1.210 ac	Runoff coeff.	= 0.6
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

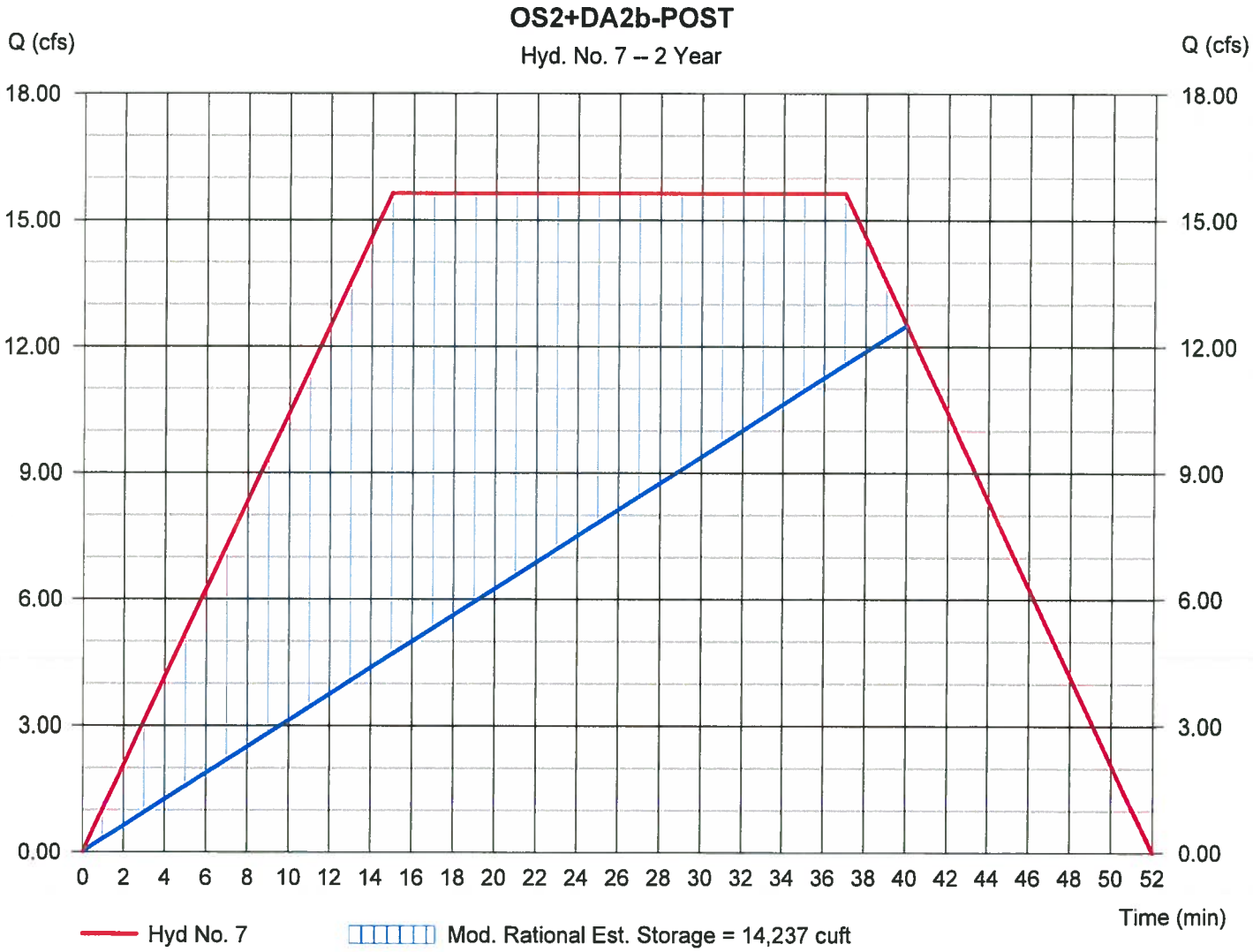


Hydrograph Report

Hyd. No. 7

OS2+DA2b-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 15.63 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 34,746 cuft
Drainage area	= 10.970 ac	Runoff coeff.	= 0.56
Intensity	= 2.544 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 2.5 x Tc
Target Q	=13.01 cfs	Est. Req'd Storage	=14,237 cuft

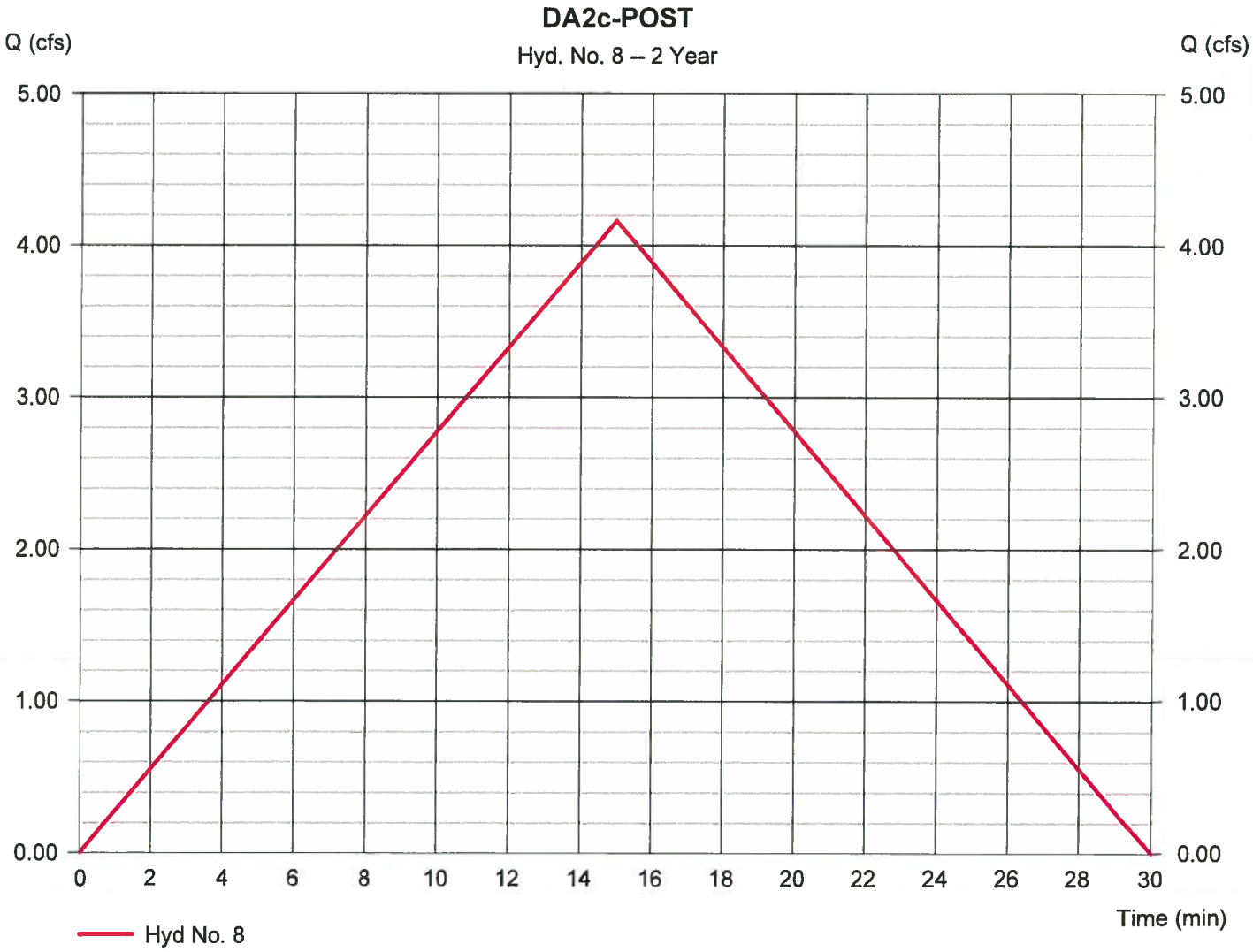


Hydrograph Report

Hyd. No. 8

DA2c-POST

Hydrograph type	= Rational	Peak discharge	= 4.161 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 3,745 cuft
Drainage area	= 1.680 ac	Runoff coeff.	= 0.6
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

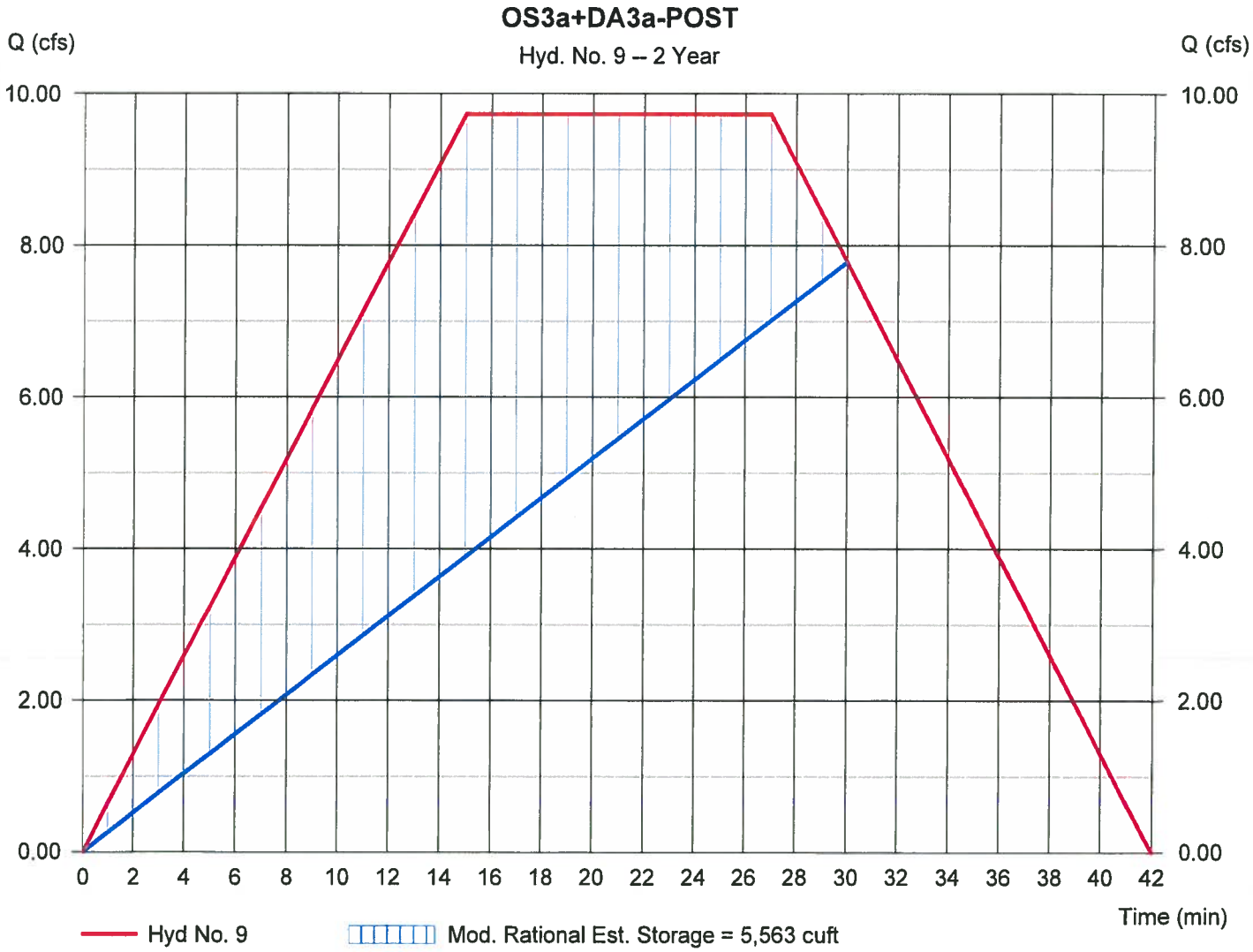


Hydrograph Report

Hyd. No. 9

OS3a+DA3a-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 9.727 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 15,846 cuft
Drainage area	= 5.600 ac	Runoff coeff.	= 0.57
Intensity	= 3.047 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 1.8 x Tc
Target Q	=8.100 cfs	Est. Req'd Storage	=5,563 cuft

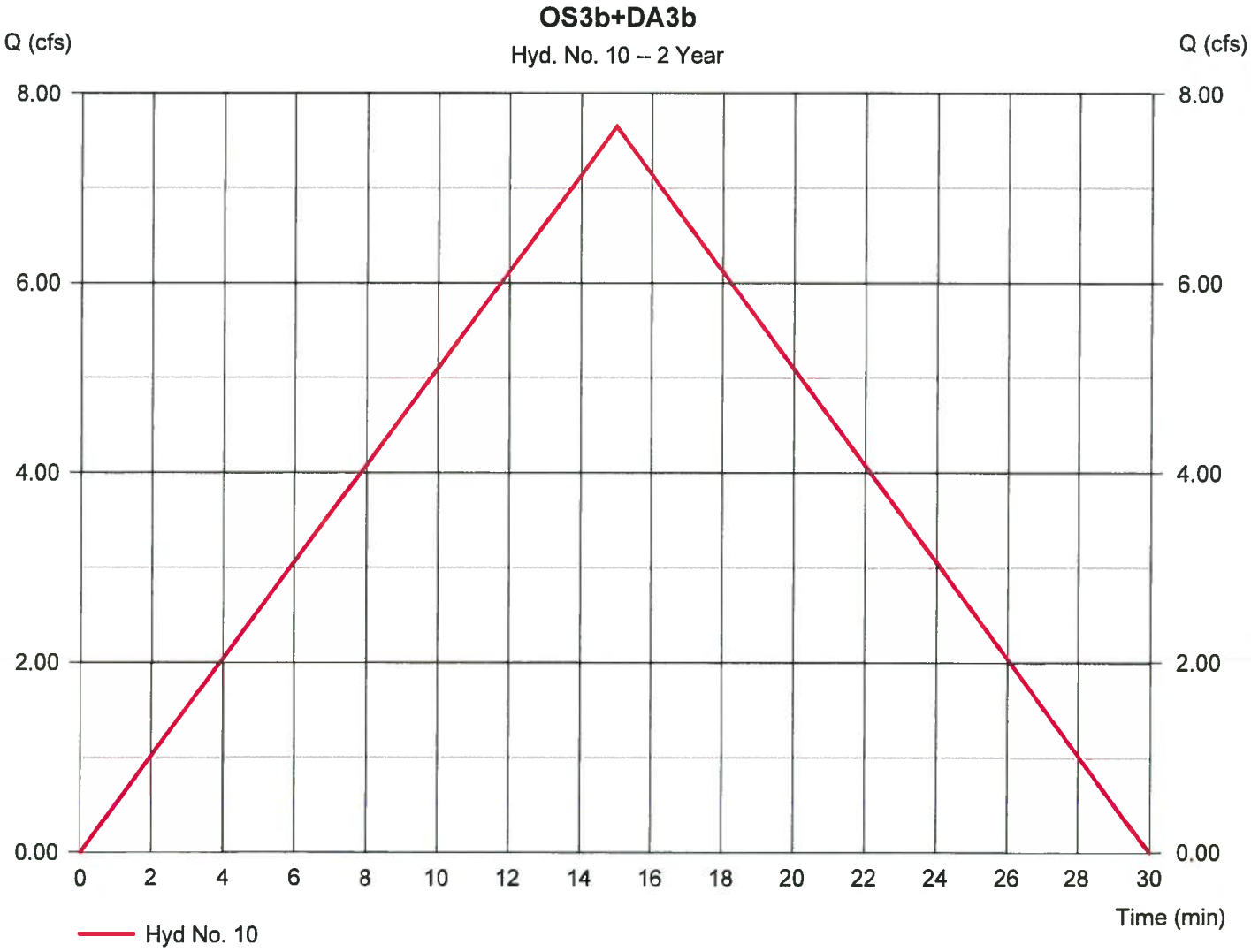


Hydrograph Report

Hyd. No. 10

OS3b+DA3b

Hydrograph type	= Rational	Peak discharge	= 7.645 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,880 cuft
Drainage area	= 3.940 ac	Runoff coeff.	= 0.47
Intensity	= 4.128 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



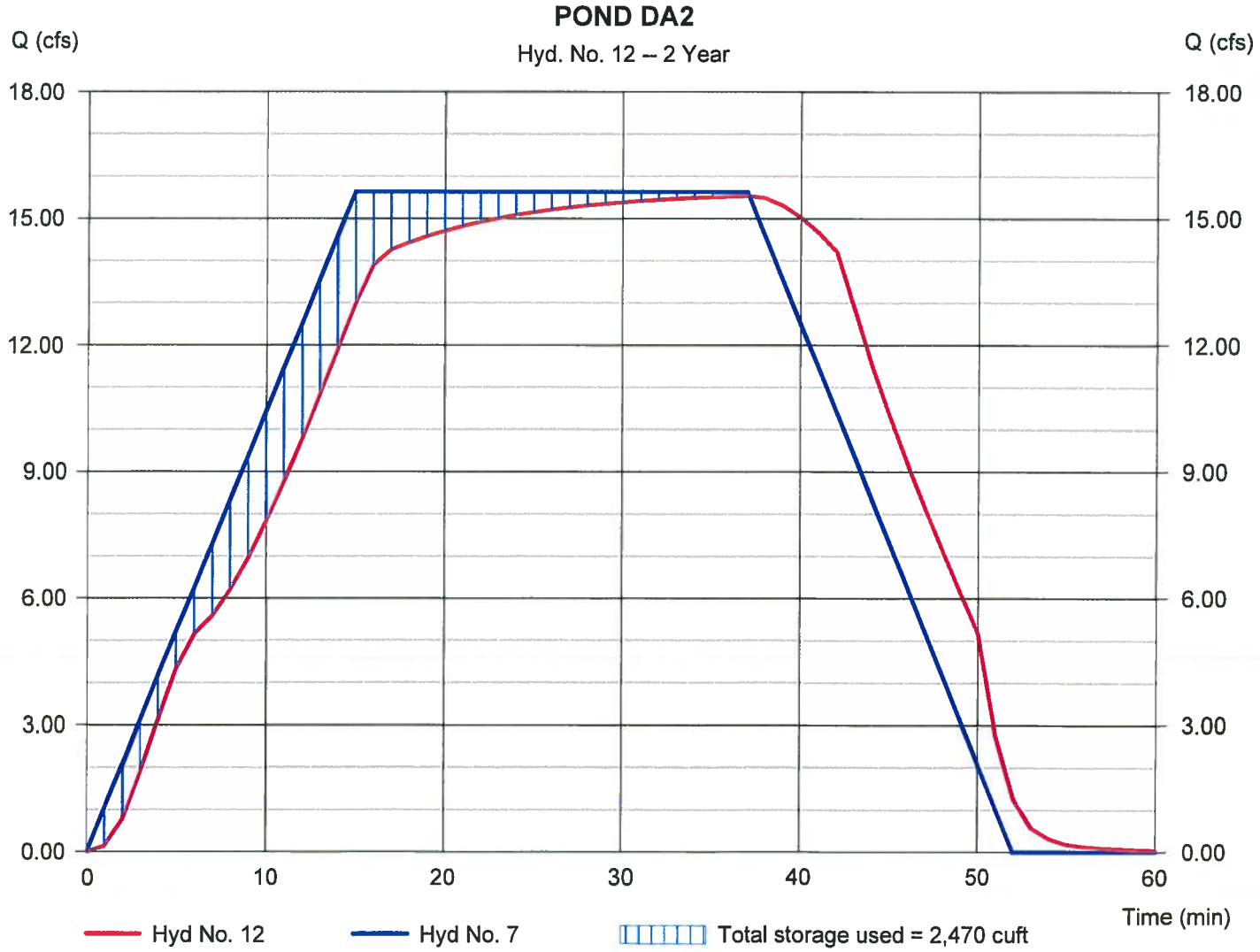
Hydrograph Report

Hyd. No. 12

POND DA2

Hydrograph type	= Reservoir	Peak discharge	= 15.53 cfs
Storm frequency	= 2 yrs	Time to peak	= 37 min
Time interval	= 1 min	Hyd. volume	= 34,699 cuft
Inflow hyd. No.	= 7 - OS2+DA2b-POST	Max. Elevation	= 1185.57 ft
Reservoir name	= POND DA2	Max. Storage	= 2,470 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 1 - POND DA2

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1185.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1185.00	161	0	0
0.25	1185.25	2,477	330	330
0.50	1185.50	9,489	1,496	1,826
1.00	1186.00	10,291	4,945	6,771
2.00	1187.00	11,991	11,141	17,912
3.00	1188.00	13,821	12,906	30,817

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

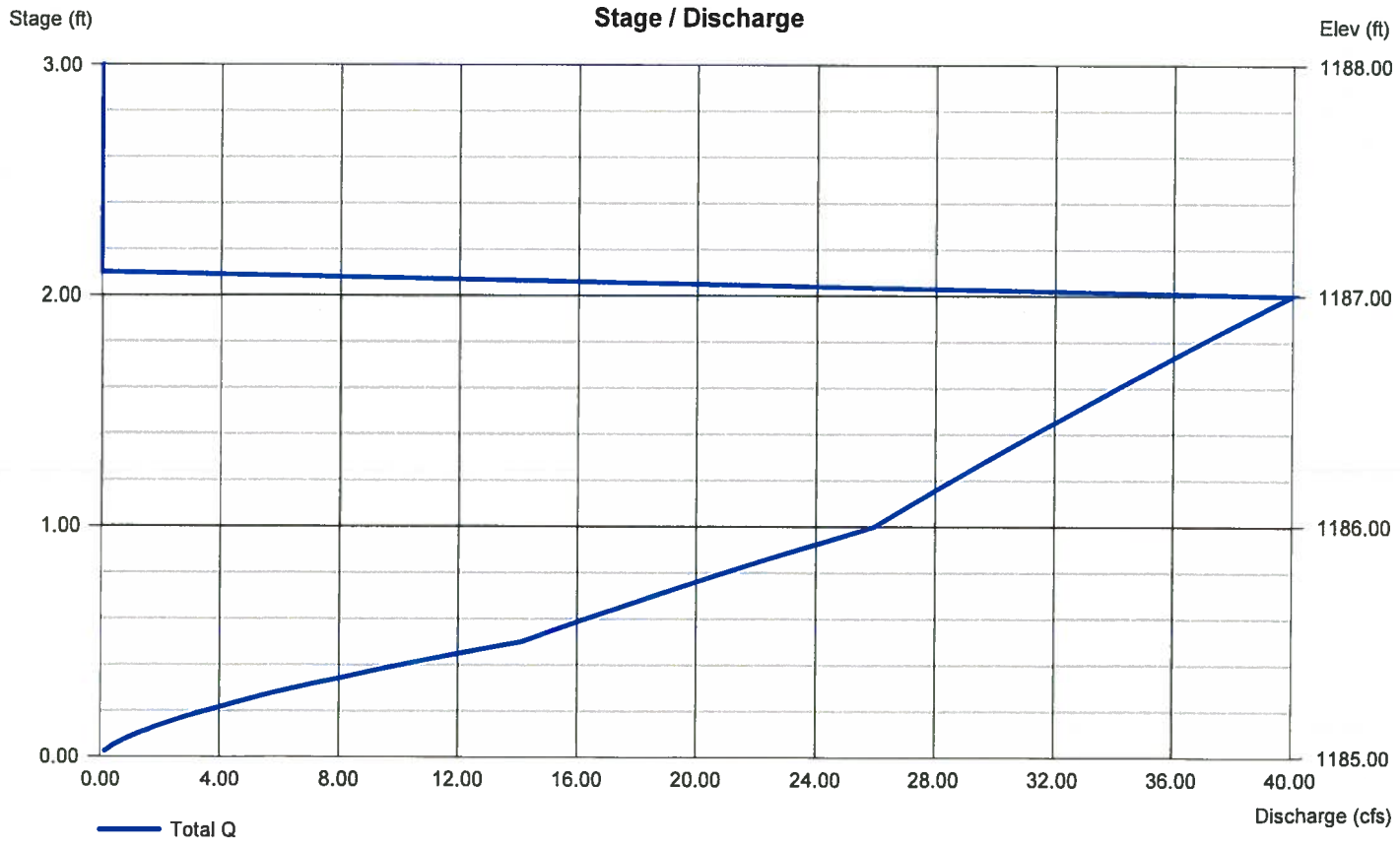
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.50	0.00	0.00	0.00
Crest El. (ft)	= 1184.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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



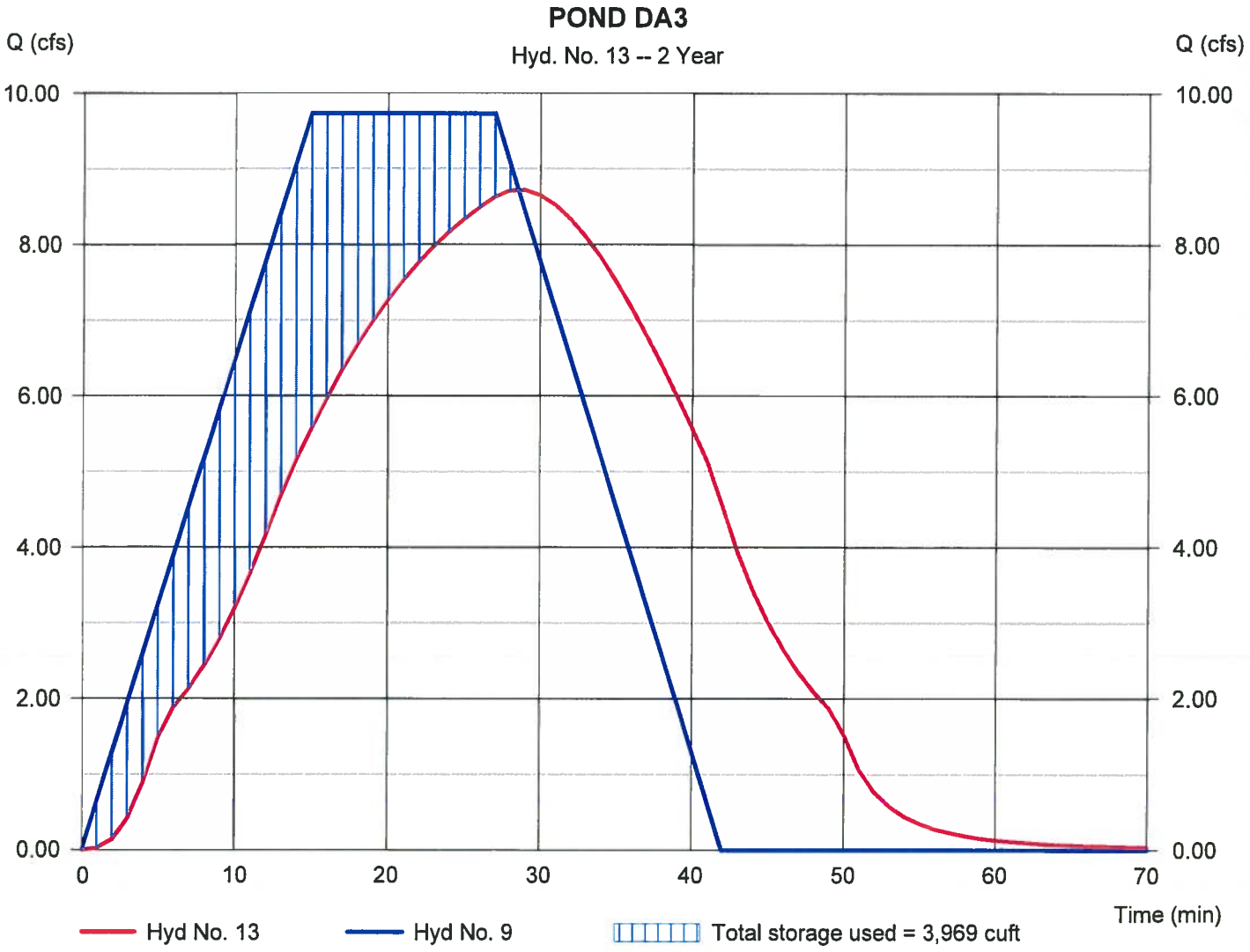
Hydrograph Report

Hyd. No. 13

POND DA3

Hydrograph type	= Reservoir	Peak discharge	= 8.714 cfs
Storm frequency	= 2 yrs	Time to peak	= 29 min
Time interval	= 1 min	Hyd. volume	= 15,757 cuft
Inflow hyd. No.	= 9 - OS3a+DA3a-POST	Max. Elevation	= 1201.73 ft
Reservoir name	= POND DA3	Max. Storage	= 3,969 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 2 - POND DA3

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1201.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1201.00	245	0	0
0.25	1201.25	2,933	397	397
0.50	1201.50	8,803	1,467	1,864
1.00	1202.00	9,554	4,589	6,454
2.00	1203.00	11,148	10,351	16,805
2.50	1203.50	11,990	5,785	22,589

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

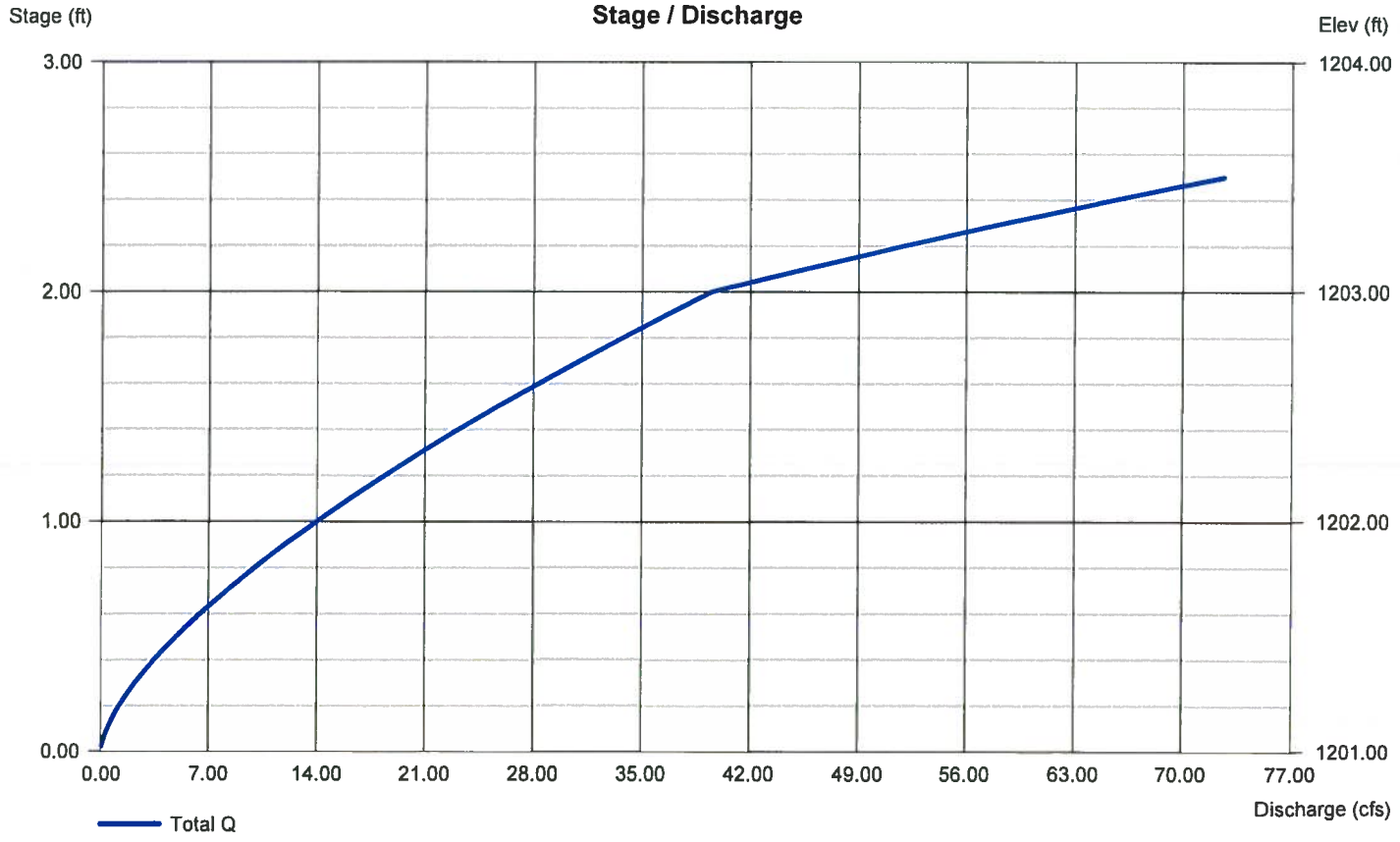
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.20	0.00	0.00	0.00
Crest El. (ft)	= 1201.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

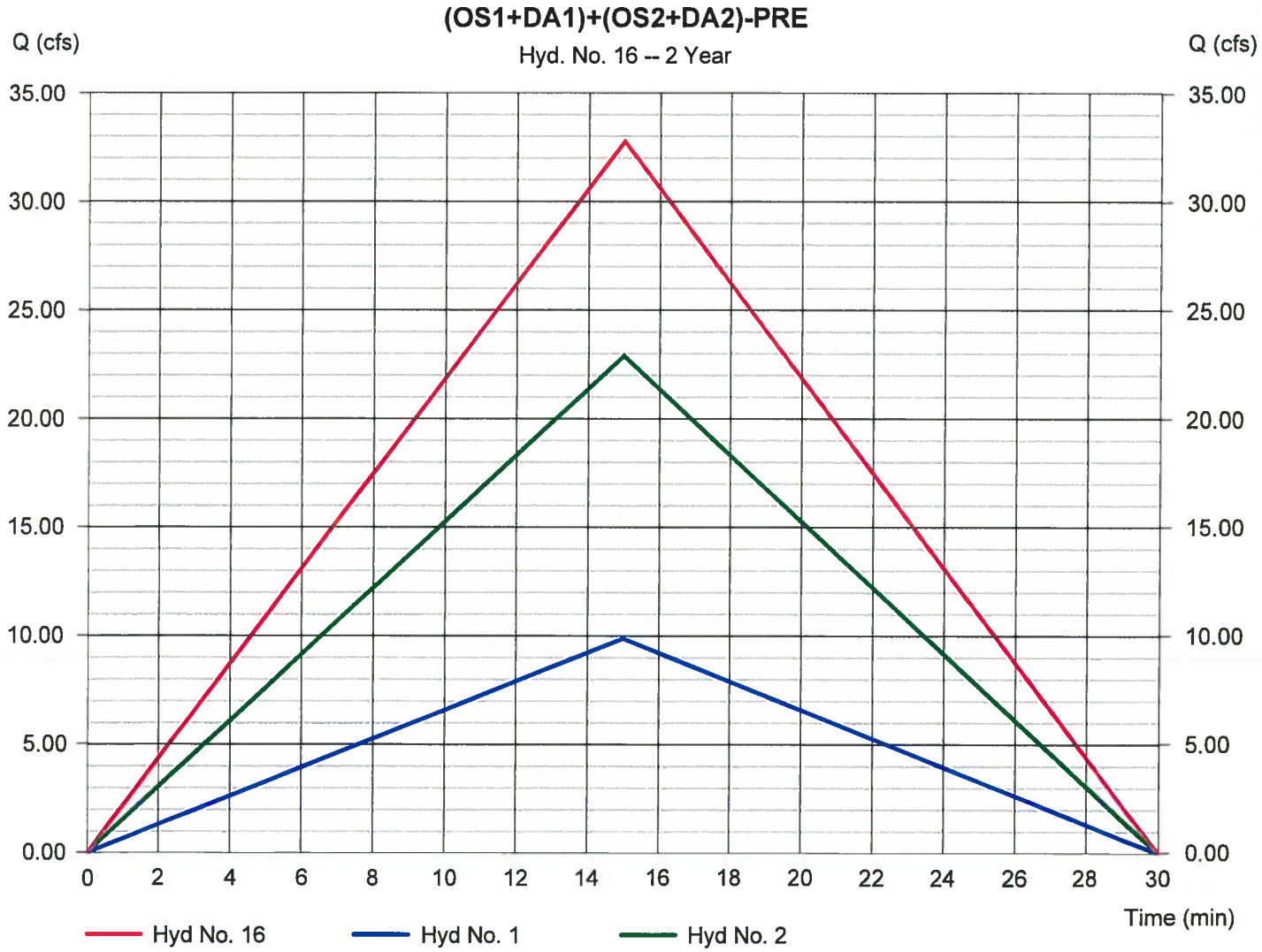


Hydrograph Report

Hyd. No. 16

(OS1+DA1)+(OS2+DA2)-PRE

Hydrograph type	= Combine	Peak discharge	= 32.76 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 29,486 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.840 ac

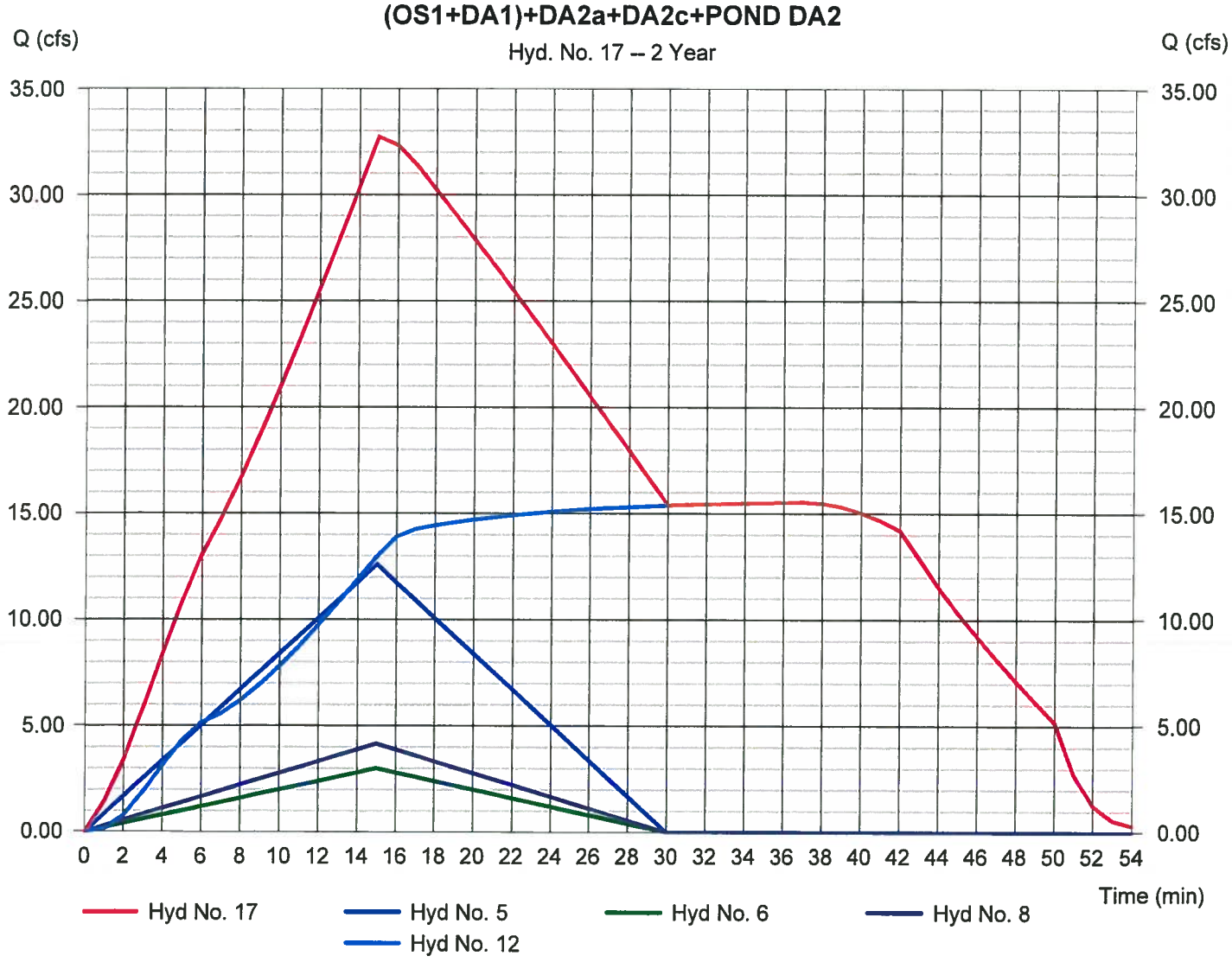


Hydrograph Report

Hyd. No. 17

(OS1+DA1)+DA2a+DA2c+POND DA2

Hydrograph type	= Combine	Peak discharge	= 32.72 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 52,473 cuft
Inflow hyds.	= 5, 6, 8, 12	Contrib. drain. area	= 8.870 ac

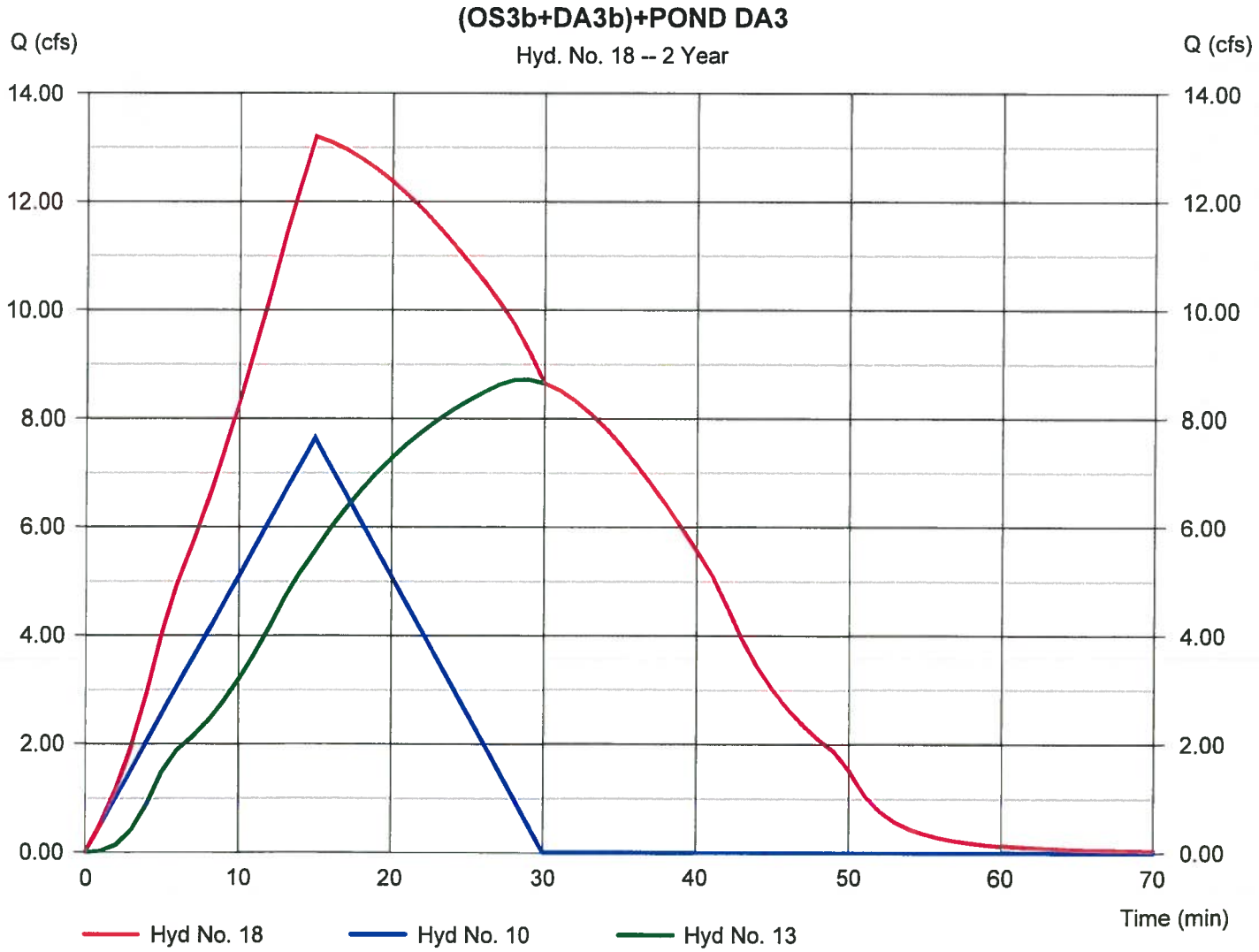


Hydrograph Report

Hyd. No. 18

(OS3b+DA3b)+POND DA3

Hydrograph type	= Combine	Peak discharge	= 13.20 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 22,638 cuft
Inflow hyds.	= 10, 13	Contrib. drain. area	= 3.940 ac

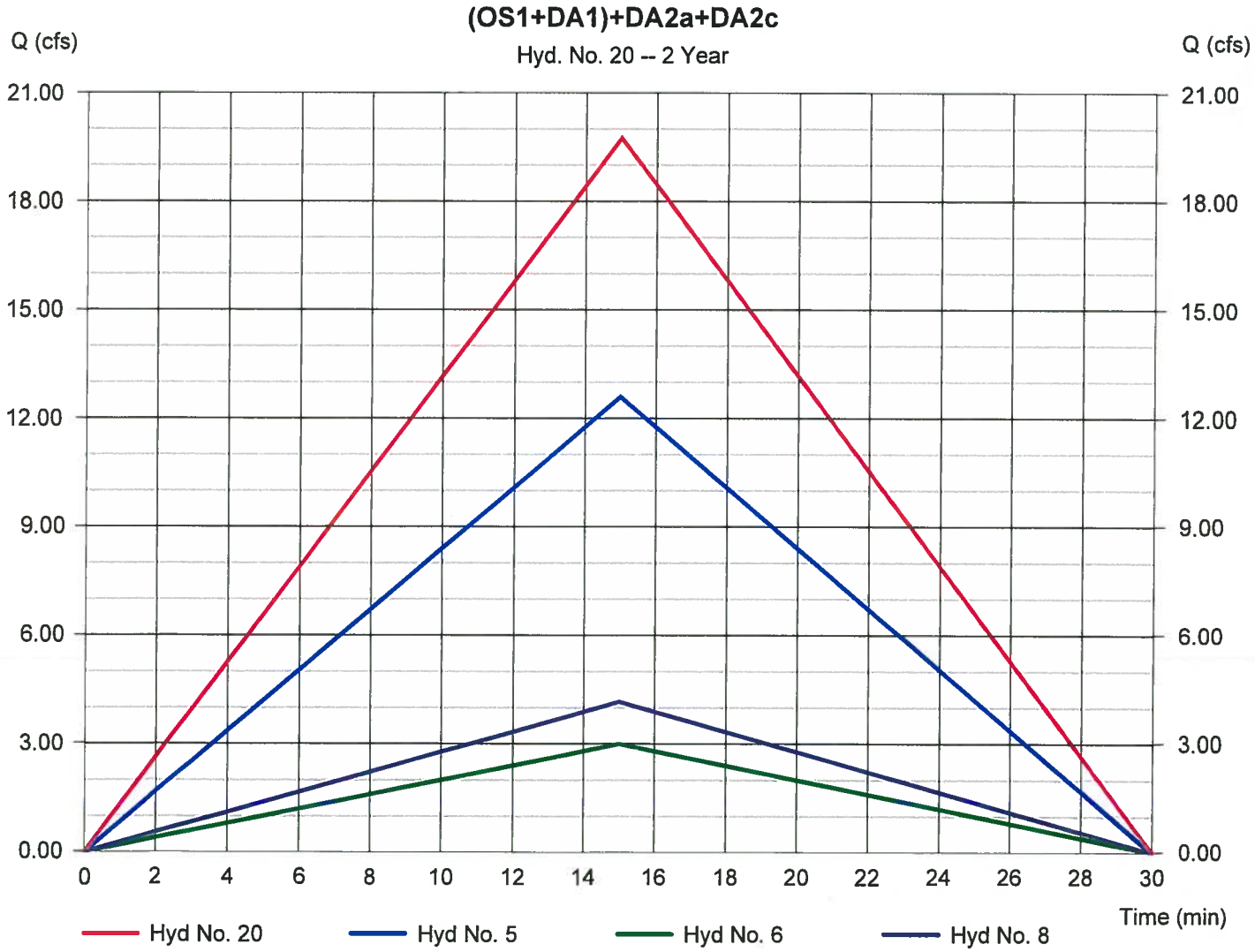


Hydrograph Report

Hyd. No. 20

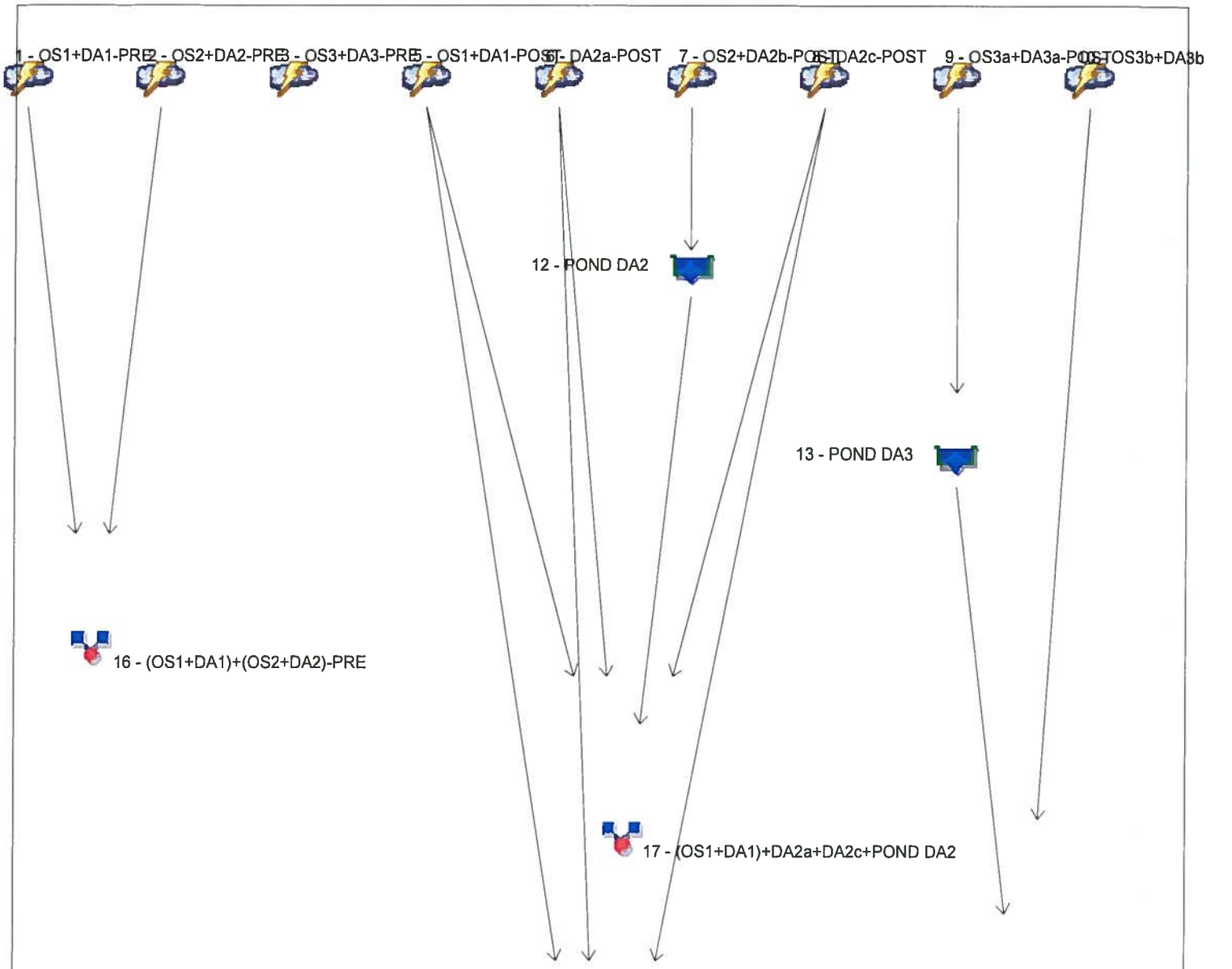
(OS1+DA1)+DA2a+DA2c

Hydrograph type	= Combine	Peak discharge	= 19.75 cfs
Storm frequency	= 2 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 17,774 cuft
Inflow hyds.	= 5, 6, 8	Contrib. drain. area	= 8.870 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12



Legend

Hyd.	Origin	Description
1	Rational	OS1+DA1-PRE
2	Rational	OS2+DA2-PRE
3	Rational	OS3+DA3-PRE
5	Rational	OS1+DA1-POST
6	Rational	DA2a-POST
7	Mod. Rational	OS2+DA2b-POST
8	Rational	DA2c-POST
9	Mod. Rational	OS3a+DA3a-POST
10	Rational	OS3b+DA3b
12	Reservoir	POND DA2
13	Reservoir	POND DA3
16	Combine	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	(OS1+DA1)+DA2a+DA2c+POND DA2
18	Combine	(OS3b+DA3b)+POND DA3
20	Combine	(OS1+DA1)+DA2a+DA2c

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

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	Rational	-----	-----	-----	-----	-----	14.61	-----	-----	-----	OS1+DA1-PRE
2	Rational	-----	-----	-----	-----	-----	33.86	-----	-----	-----	OS2+DA2-PRE
3	Rational	-----	-----	-----	-----	-----	23.31	-----	-----	-----	OS3+DA3-PRE
5	Rational	-----	-----	-----	-----	-----	18.63	-----	-----	-----	OS1+DA1-POST
6	Rational	-----	-----	-----	-----	-----	4.434	-----	-----	-----	DA2a-POST
7	Mod. Rational	-----	-----	-----	-----	-----	23.23	-----	-----	-----	OS2+DA2b-POST
8	Rational	-----	-----	-----	-----	-----	6.157	-----	-----	-----	DA2c-POST
9	Mod. Rational	-----	-----	-----	-----	-----	14.41	-----	-----	-----	OS3a+DA3a-POST
10	Rational	-----	-----	-----	-----	-----	11.31	-----	-----	-----	OS3b+DA3b
12	Reservoir	7	-----	-----	-----	-----	22.97	-----	-----	-----	POND DA2
13	Reservoir	9	-----	-----	-----	-----	13.08	-----	-----	-----	POND DA3
16	Combine	1, 2,	-----	-----	-----	-----	48.47	-----	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	5, 6, 8, 12,	-----	-----	-----	-----	45.77	-----	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	10, 13,	-----	-----	-----	-----	19.11	-----	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	5, 6, 8,	-----	-----	-----	-----	29.22	-----	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

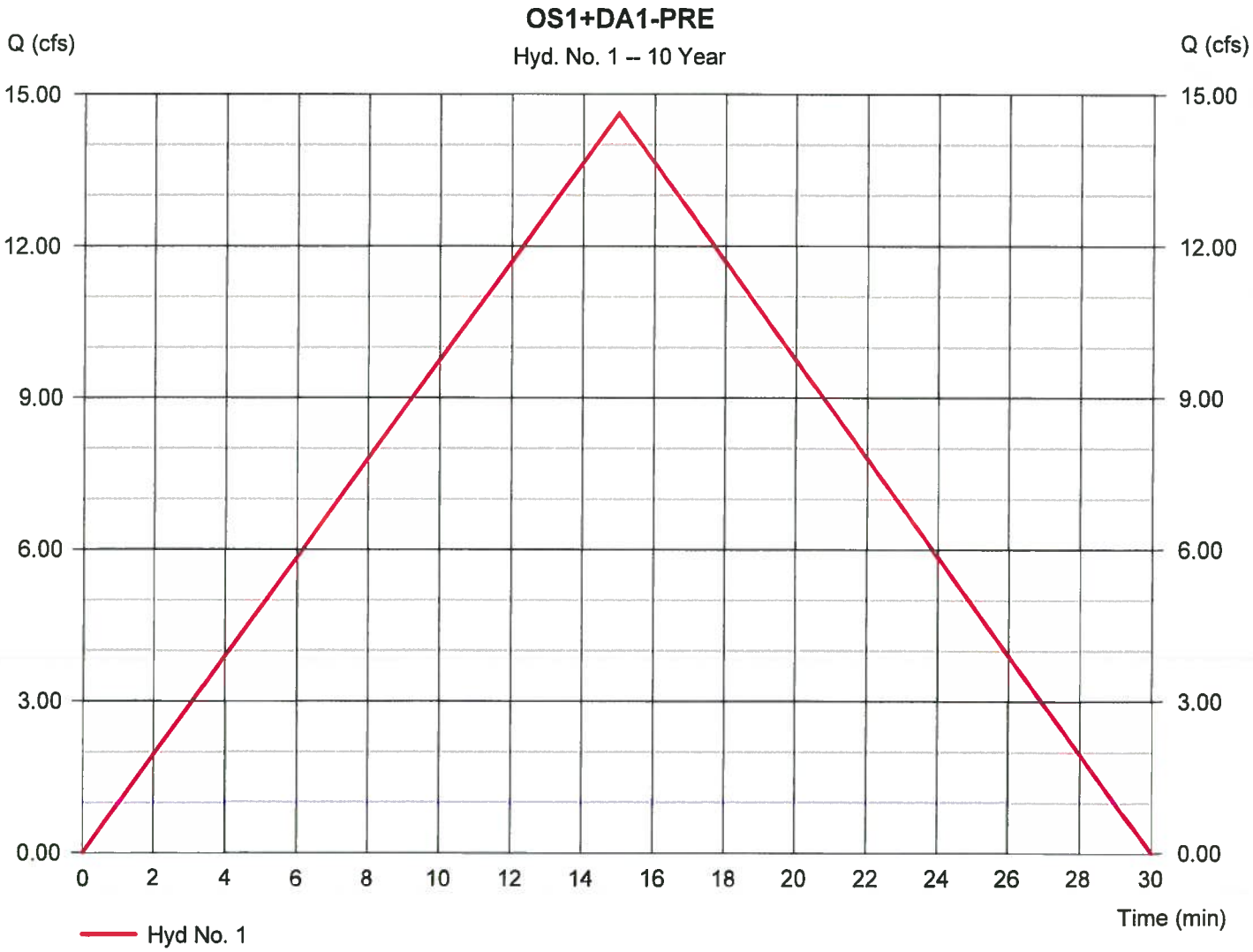
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	14.61	1	15	13,149	-----	-----	-----	OS1+DA1-PRE
2	Rational	33.86	1	15	30,476	-----	-----	-----	OS2+DA2-PRE
3	Rational	23.31	1	15	20,977	-----	-----	-----	OS3+DA3-PRE
5	Rational	18.63	1	15	16,765	-----	-----	-----	OS1+DA1-POST
6	Rational	4.434	1	15	3,991	-----	-----	-----	DA2a-POST
7	Mod. Rational	23.23	1	15	51,650	-----	-----	-----	OS2+DA2b-POST
8	Rational	6.157	1	15	5,541	-----	-----	-----	DA2c-POST
9	Mod. Rational	14.41	1	15	23,472	-----	-----	-----	OS3a+DA3a-POST
10	Rational	11.31	1	15	10,179	-----	-----	-----	OS3b+DA3b
12	Reservoir	22.97	1	37	51,580	7	1185.88	5,610	POND DA2
13	Reservoir	13.08	1	28	23,342	9	1201.96	6,051	POND DA3
16	Combine	48.47	1	15	43,625	1, 2,	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	45.77	1	15	77,877	5, 6, 8, 12,	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	19.11	1	15	33,521	10, 13,	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	29.22	1	15	26,297	5, 6, 8,	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Report

Hyd. No. 1

OS1+DA1-PRE

Hydrograph type	= Rational	Peak discharge	= 14.61 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 13,149 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.4
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

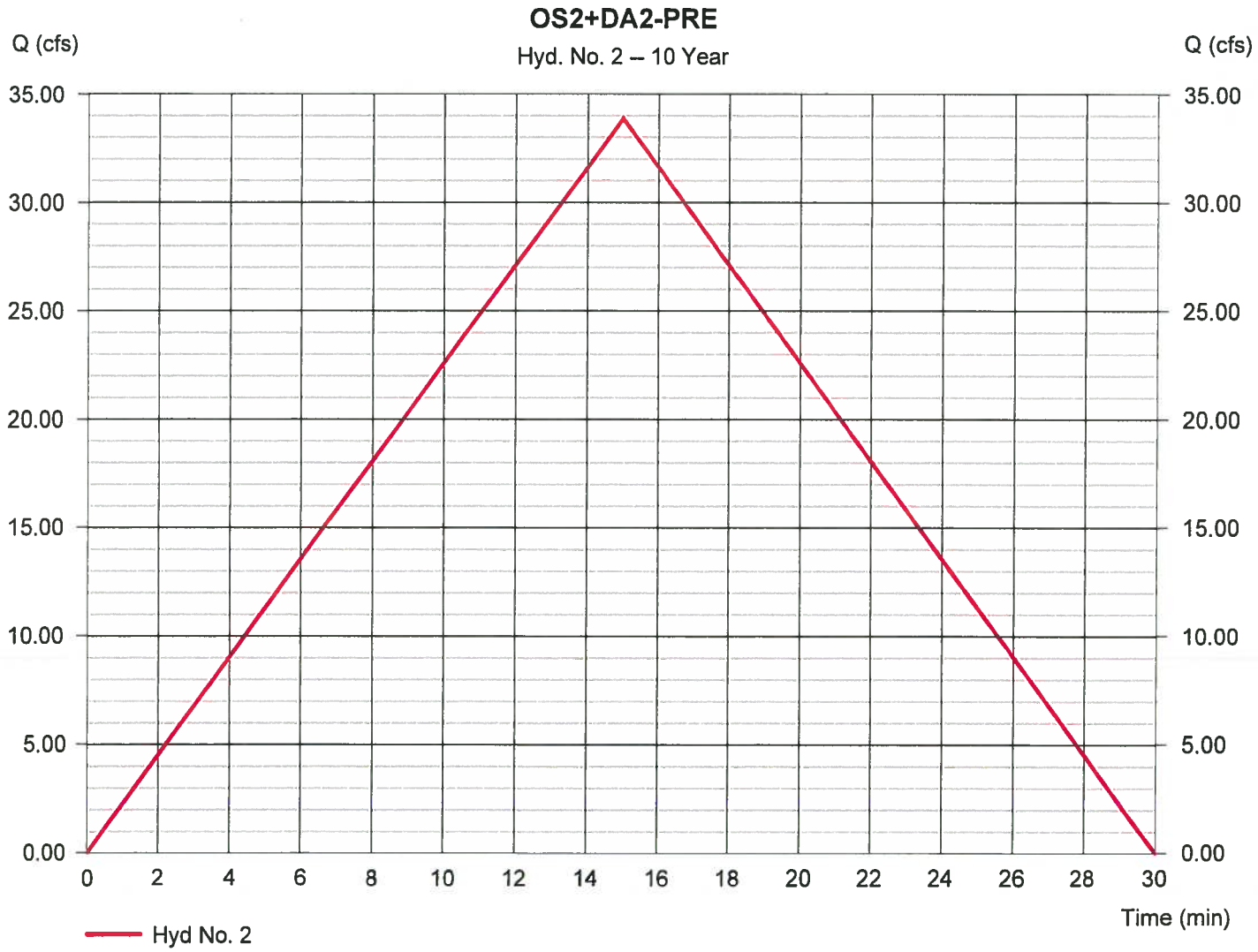


Hydrograph Report

Hyd. No. 2

OS2+DA2-PRE

Hydrograph type	= Rational	Peak discharge	= 33.86 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 30,476 cuft
Drainage area	= 13.860 ac	Runoff coeff.	= 0.4
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

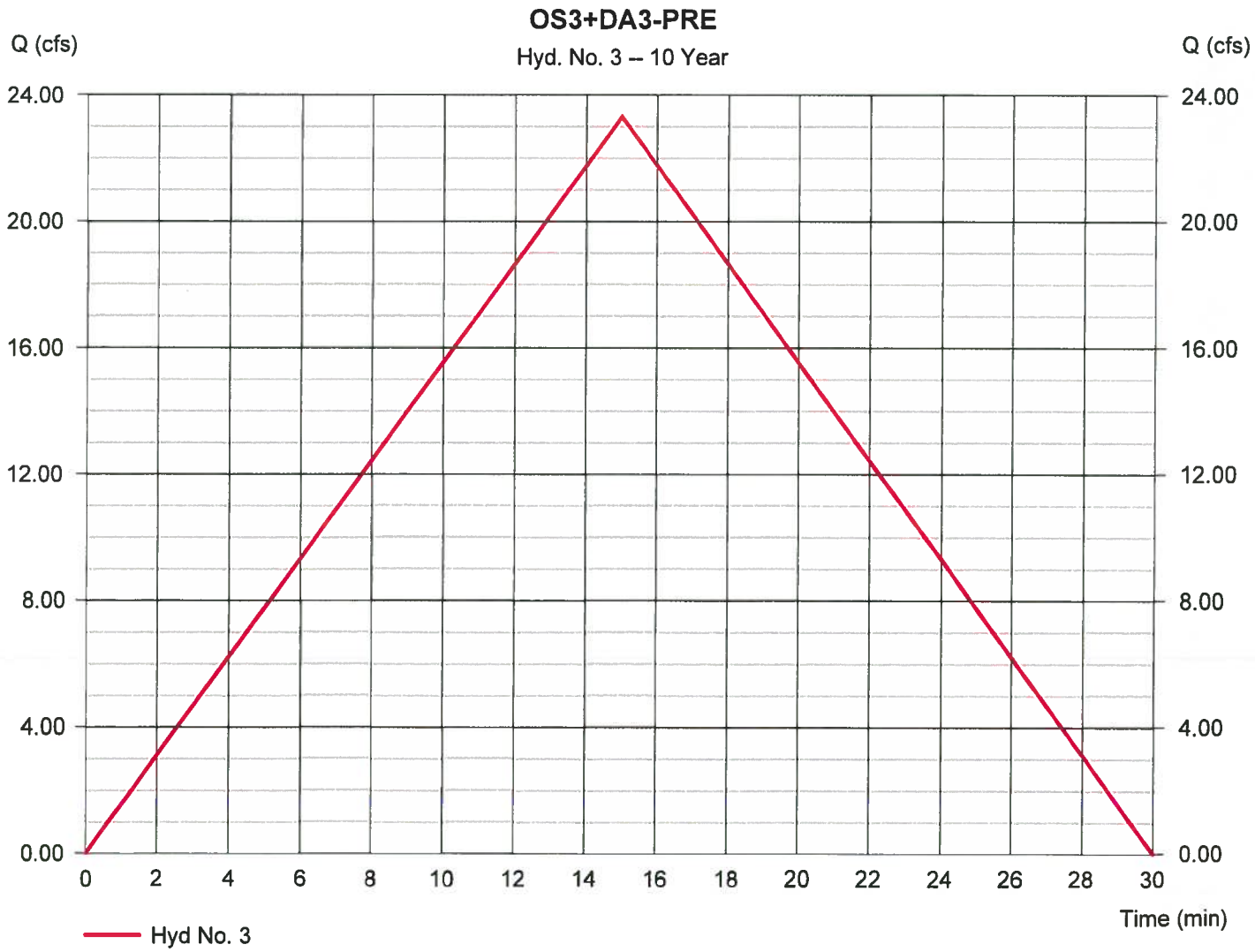


Hydrograph Report

Hyd. No. 3

OS3+DA3-PRE

Hydrograph type	= Rational	Peak discharge	= 23.31 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 20,977 cuft
Drainage area	= 9.540 ac	Runoff coeff.	= 0.4
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

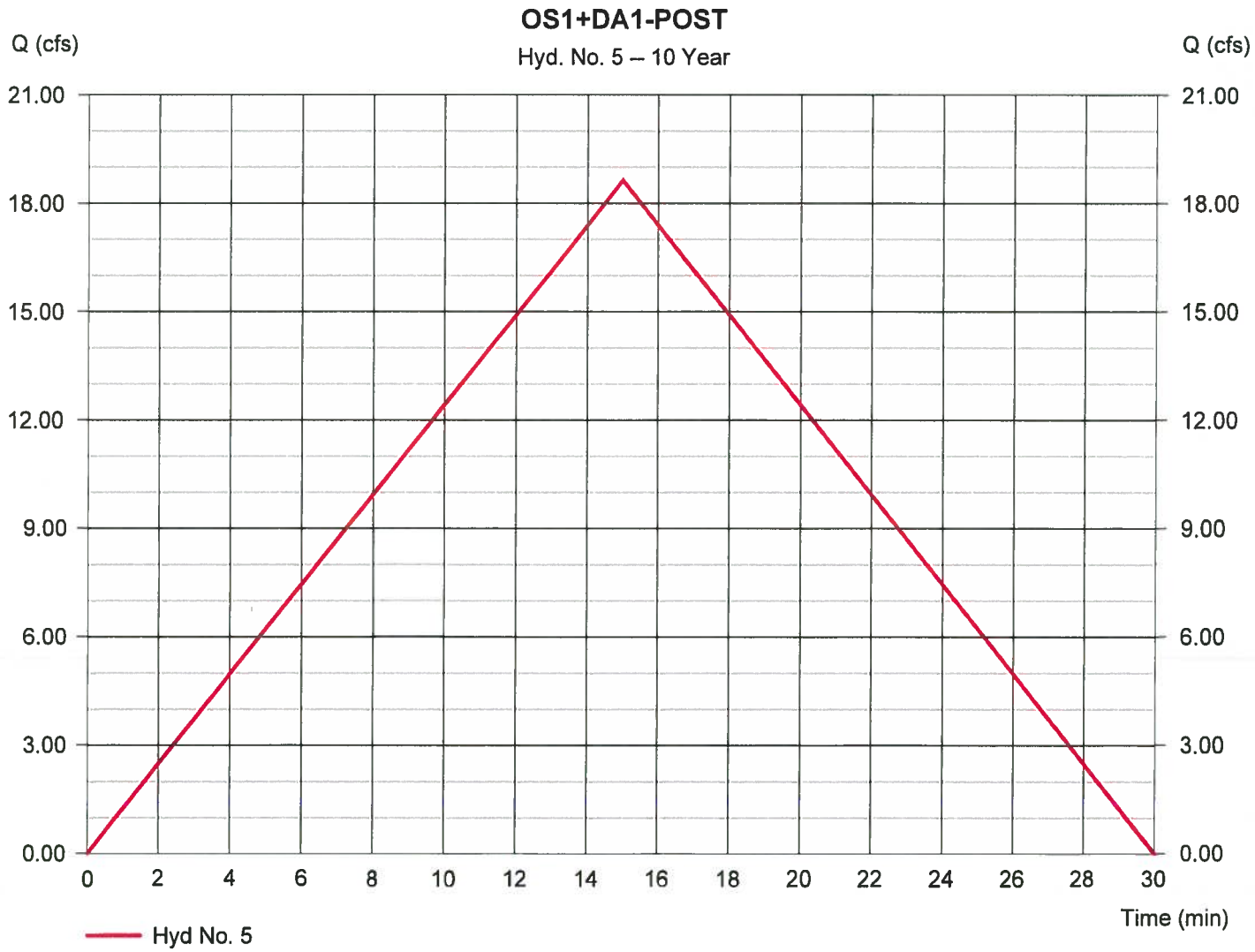


Hydrograph Report

Hyd. No. 5

OS1+DA1-POST

Hydrograph type	= Rational	Peak discharge	= 18.63 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 16,765 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.51
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

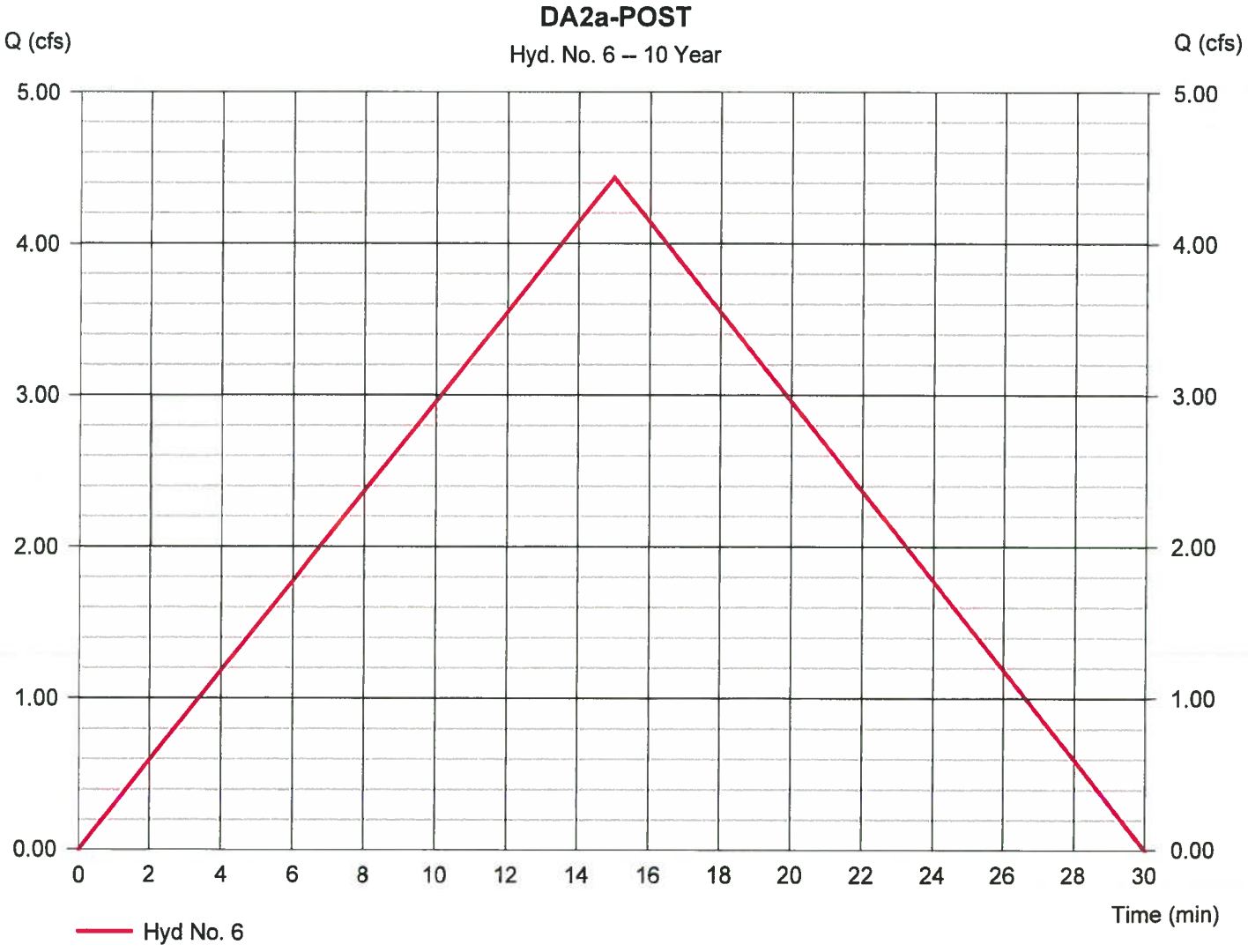


Hydrograph Report

Hyd. No. 6

DA2a-POST

Hydrograph type	= Rational	Peak discharge	= 4.434 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 3,991 cuft
Drainage area	= 1.210 ac	Runoff coeff.	= 0.6
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



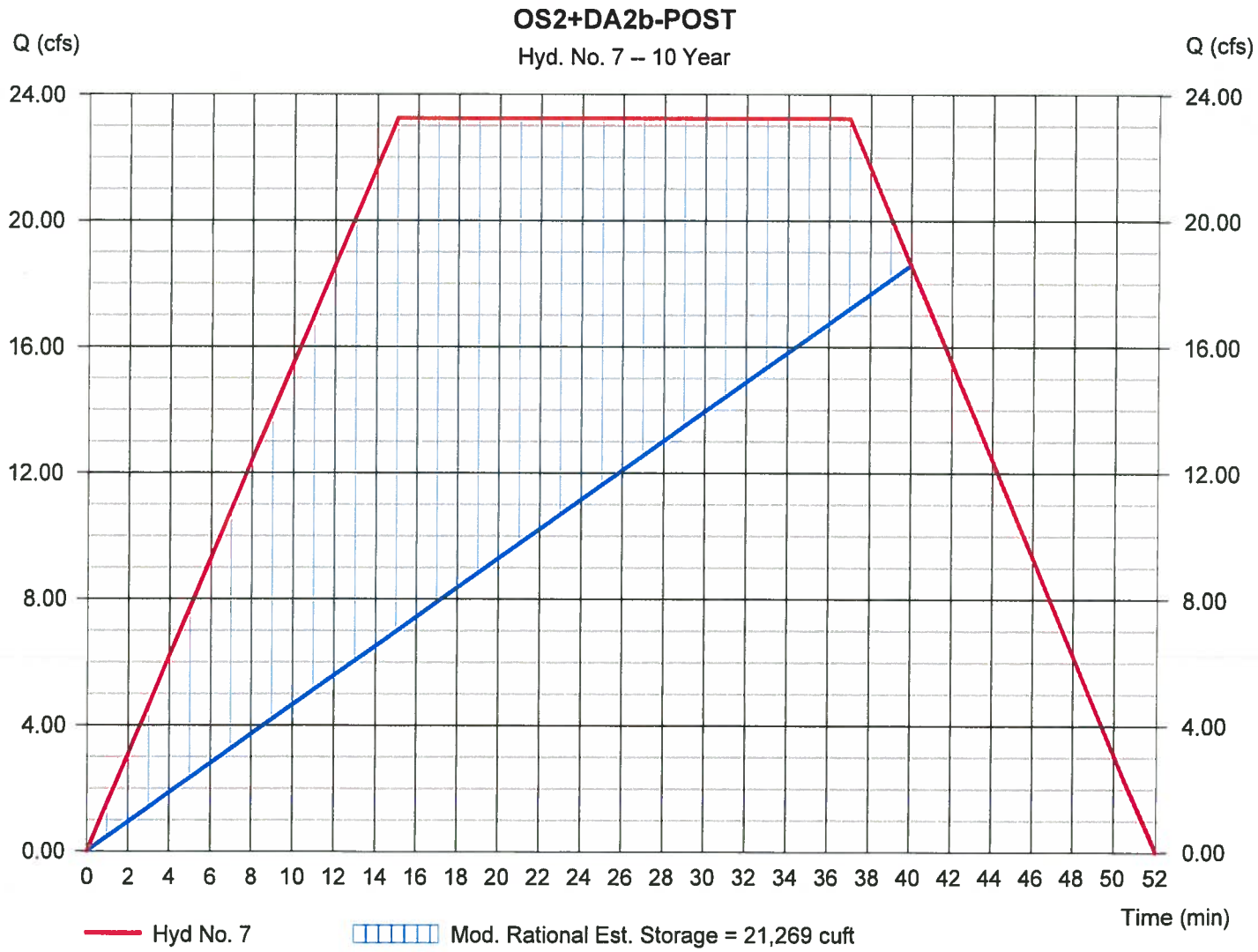
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 7

OS2+DA2b-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 23.23 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 51,650 cuft
Drainage area	= 10.970 ac	Runoff coeff.	= 0.56
Intensity	= 3.782 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 2.5 x Tc
Target Q	=19.25 cfs	Est. Req'd Storage	=21,269 cuft



Hydrograph Report

Hyd. No. 8

DA2c-POST

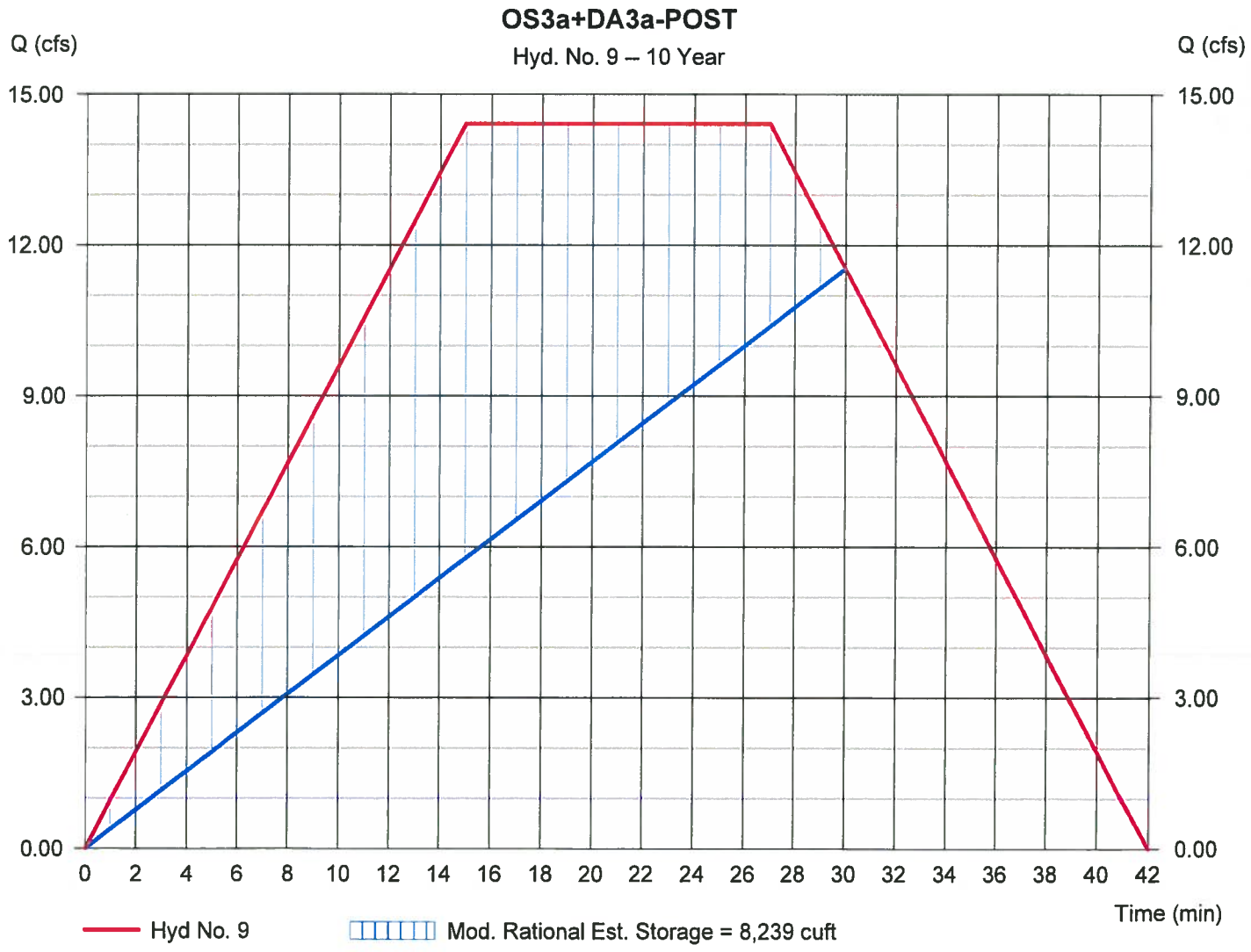
Hydrograph type	= Rational	Peak discharge	= 6.157 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 5,541 cuft
Drainage area	= 1.680 ac	Runoff coeff.	= 0.6
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Report

Hyd. No. 9

OS3a+DA3a-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 14.41 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 23,472 cuft
Drainage area	= 5.600 ac	Runoff coeff.	= 0.57
Intensity	= 4.514 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 1.8 x Tc
Target Q	=12.00 cfs	Est. Req'd Storage	=8,239 cuft



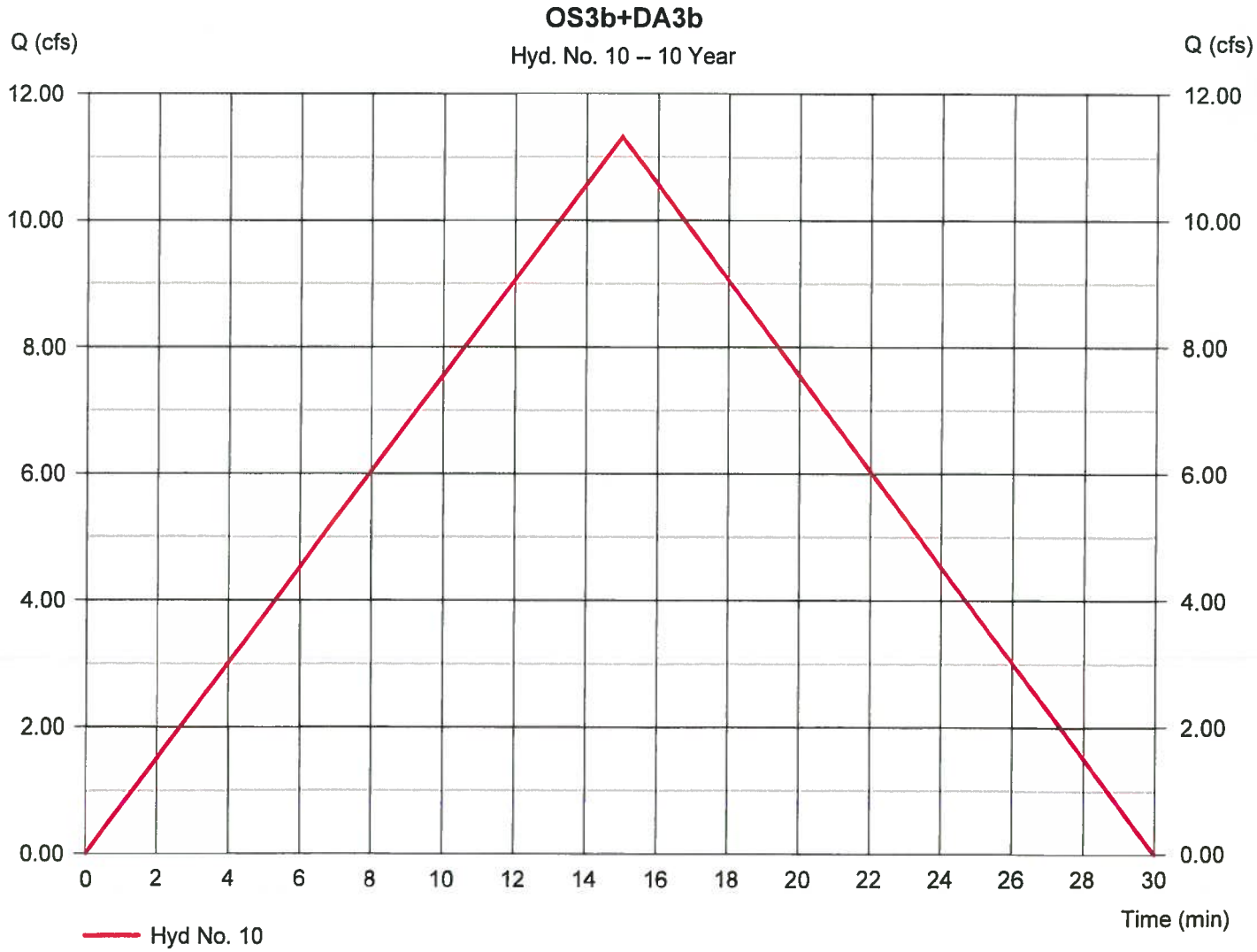
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 10

OS3b+DA3b

Hydrograph type	= Rational	Peak discharge	= 11.31 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 10,179 cuft
Drainage area	= 3.940 ac	Runoff coeff.	= 0.47
Intensity	= 6.108 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



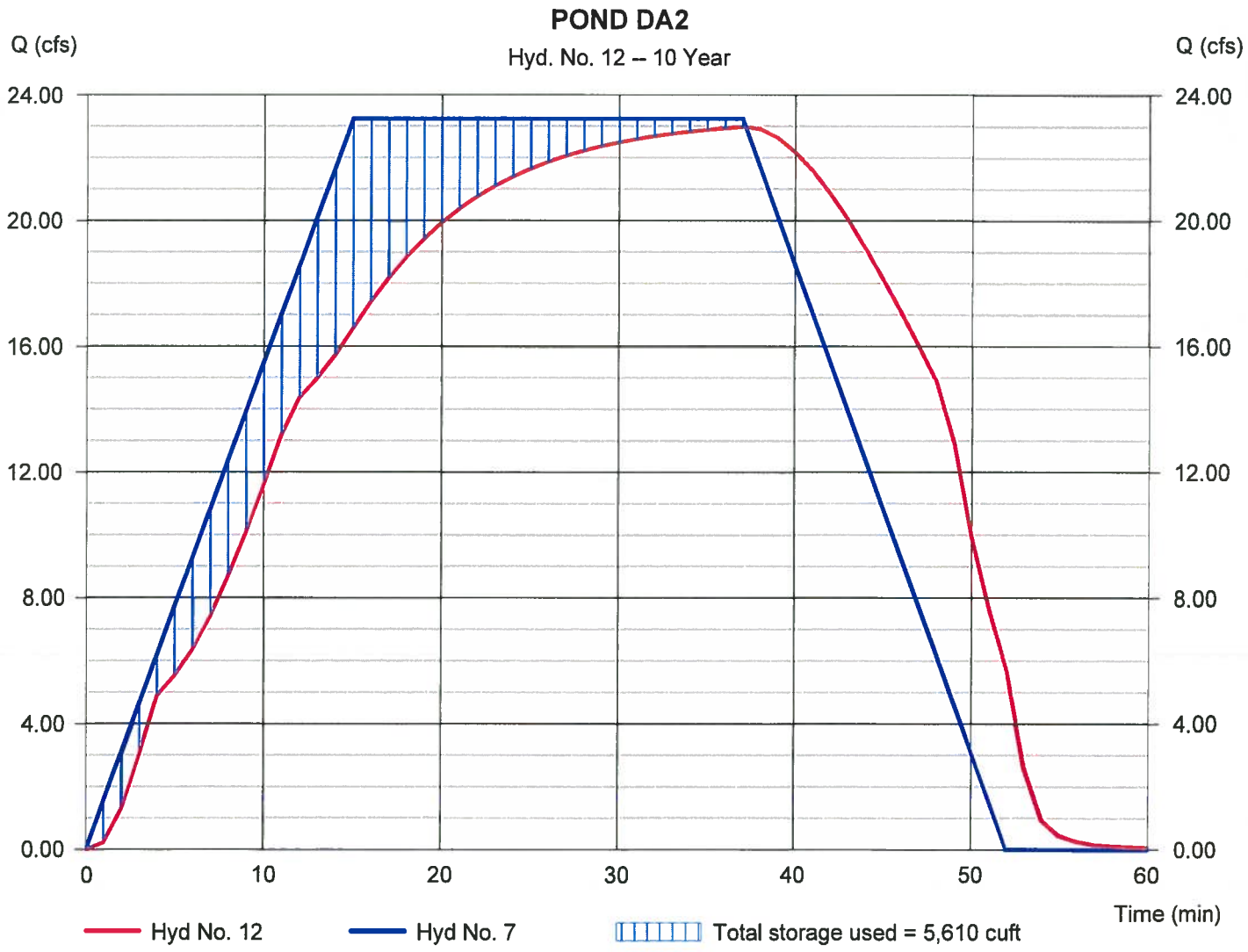
Hydrograph Report

Hyd. No. 12

POND DA2

Hydrograph type	= Reservoir	Peak discharge	= 22.97 cfs
Storm frequency	= 10 yrs	Time to peak	= 37 min
Time interval	= 1 min	Hyd. volume	= 51,580 cuft
Inflow hyd. No.	= 7 - OS2+DA2b-POST	Max. Elevation	= 1185.88 ft
Reservoir name	= POND DA2	Max. Storage	= 5,610 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 1 - POND DA2

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1185.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1185.00	161	0	0
0.25	1185.25	2,477	330	330
0.50	1185.50	9,489	1,496	1,826
1.00	1186.00	10,291	4,945	6,771
2.00	1187.00	11,991	11,141	17,912
3.00	1188.00	13,821	12,906	30,817

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

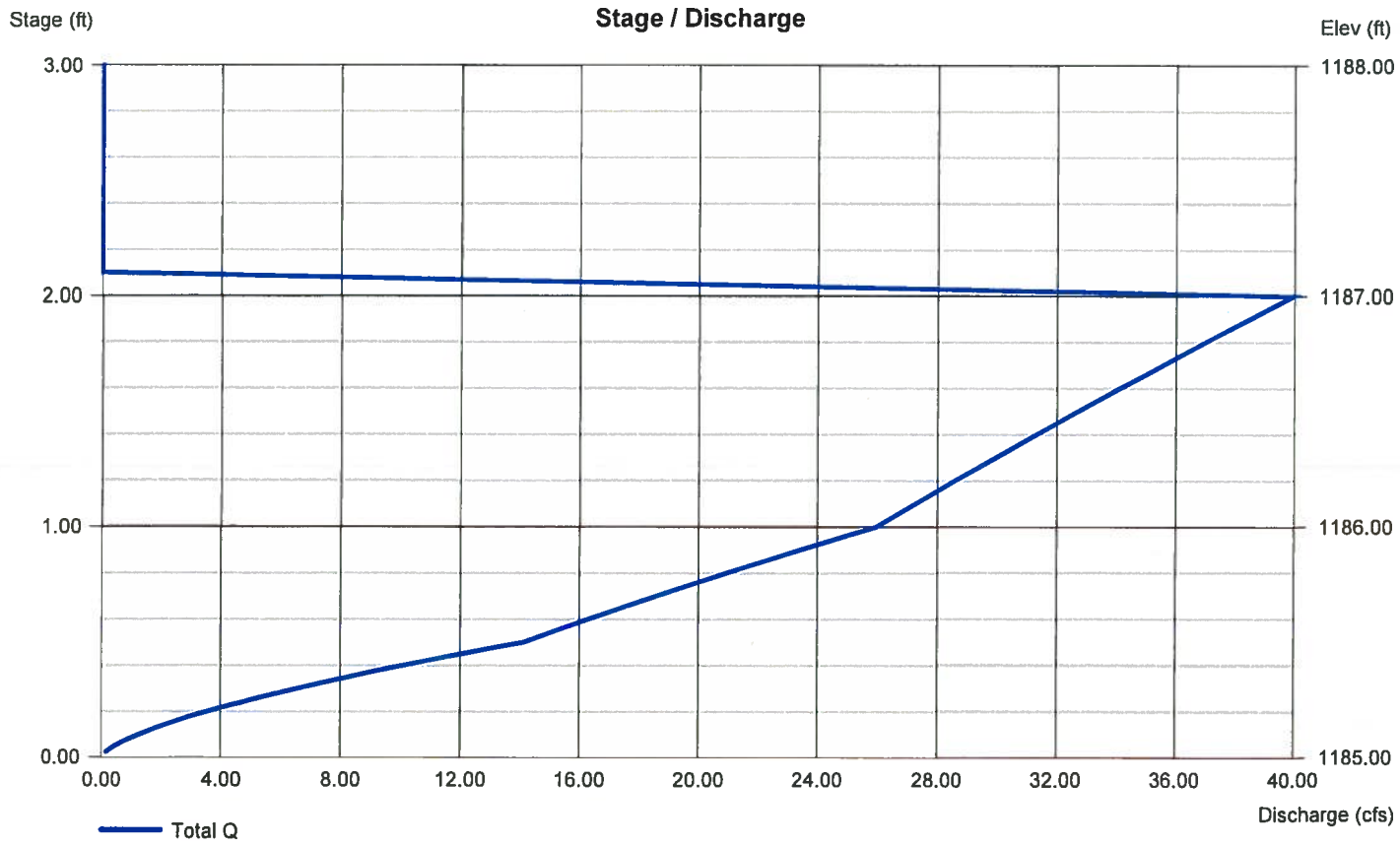
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.50	0.00	0.00	0.00
Crest El. (ft)	= 1184.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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



Hydrograph Report

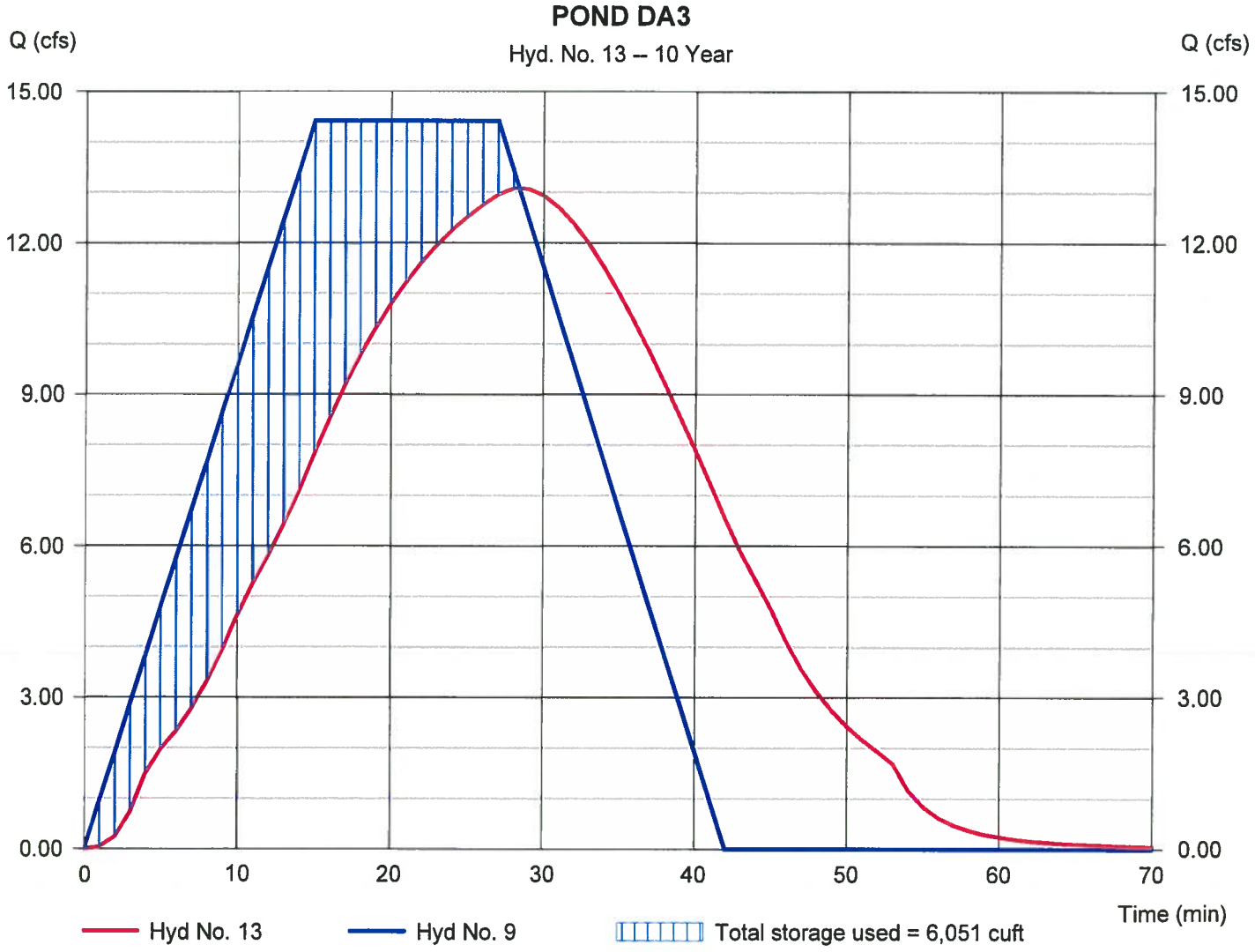
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 13

POND DA3

Hydrograph type	= Reservoir	Peak discharge	= 13.08 cfs
Storm frequency	= 10 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 23,342 cuft
Inflow hyd. No.	= 9 - OS3a+DA3a-POST	Max. Elevation	= 1201.96 ft
Reservoir name	= POND DA3	Max. Storage	= 6,051 cuft

Storage Indication method used.



Pond Report

Pond No. 2 - POND DA3

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1201.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1201.00	245	0	0
0.25	1201.25	2,933	397	397
0.50	1201.50	8,803	1,467	1,864
1.00	1202.00	9,554	4,589	6,454
2.00	1203.00	11,148	10,351	16,805
2.50	1203.50	11,990	5,785	22,589

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

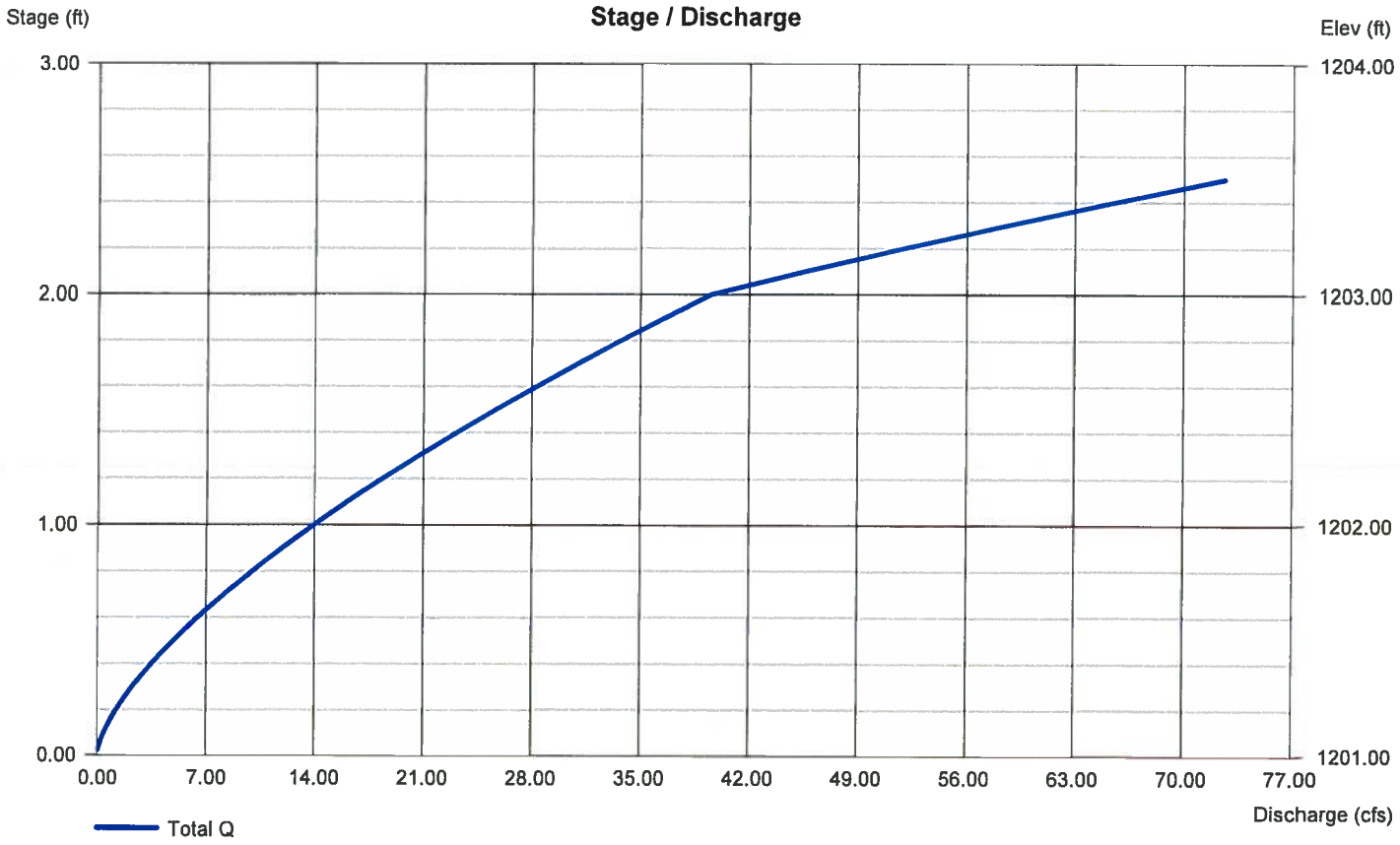
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.20	0.00	0.00	0.00
Crest El. (ft)	= 1201.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

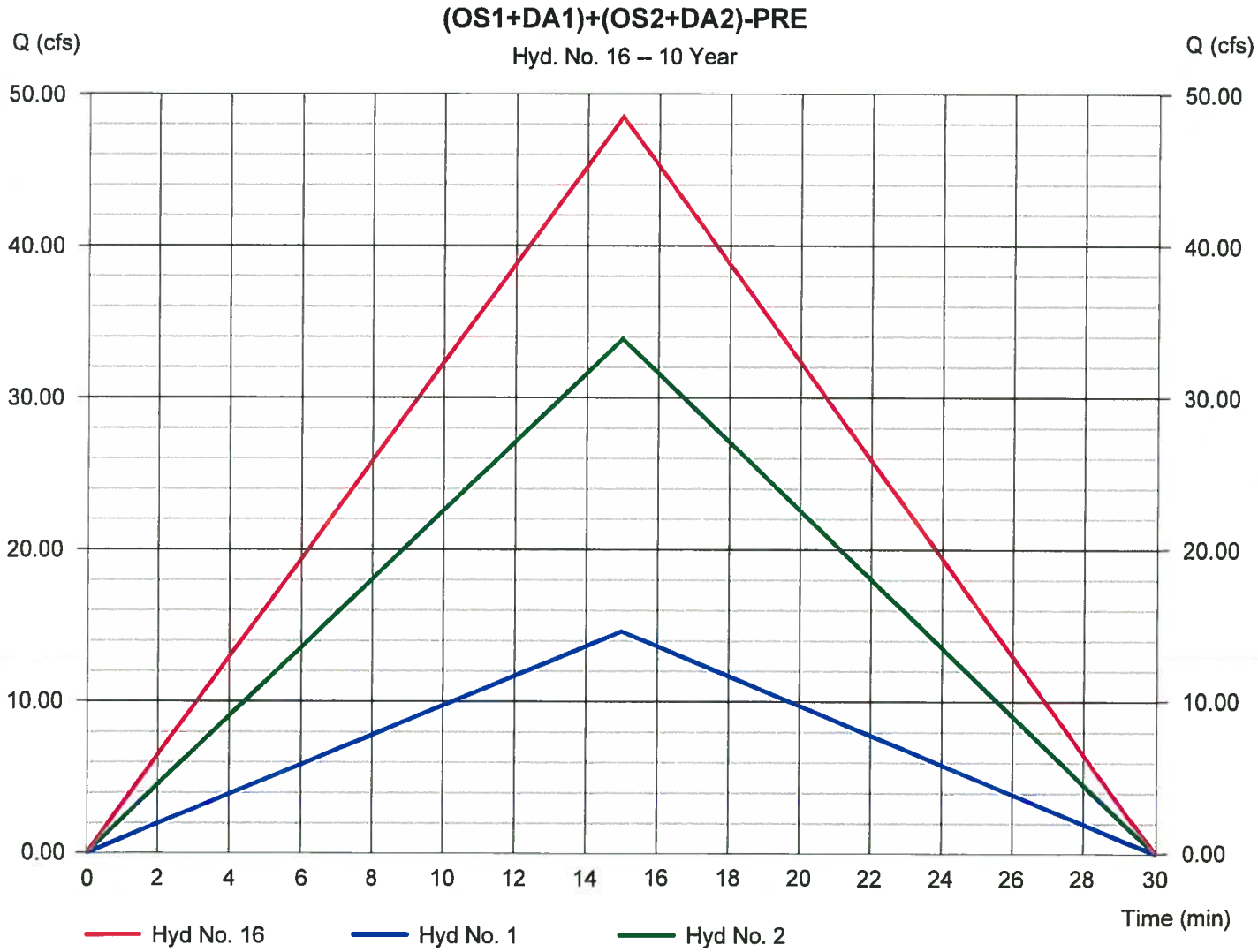


Hydrograph Report

Hyd. No. 16

(OS1+DA1)+(OS2+DA2)-PRE

Hydrograph type	= Combine	Peak discharge	= 48.47 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 43,625 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.840 ac

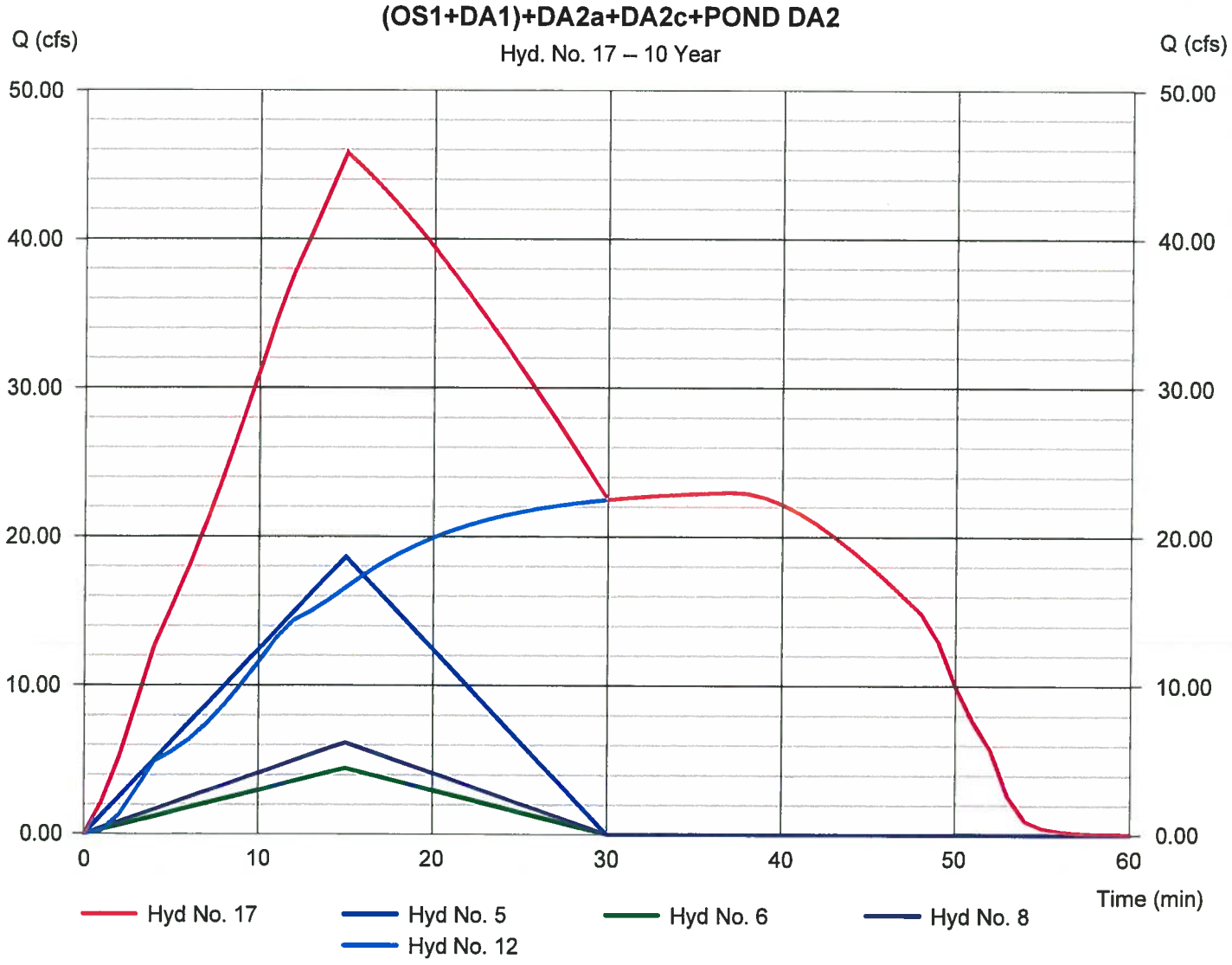


Hydrograph Report

Hyd. No. 17

(OS1+DA1)+DA2a+DA2c+POND DA2

Hydrograph type	= Combine	Peak discharge	= 45.77 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 77,877 cuft
Inflow hyds.	= 5, 6, 8, 12	Contrib. drain. area	= 8.870 ac

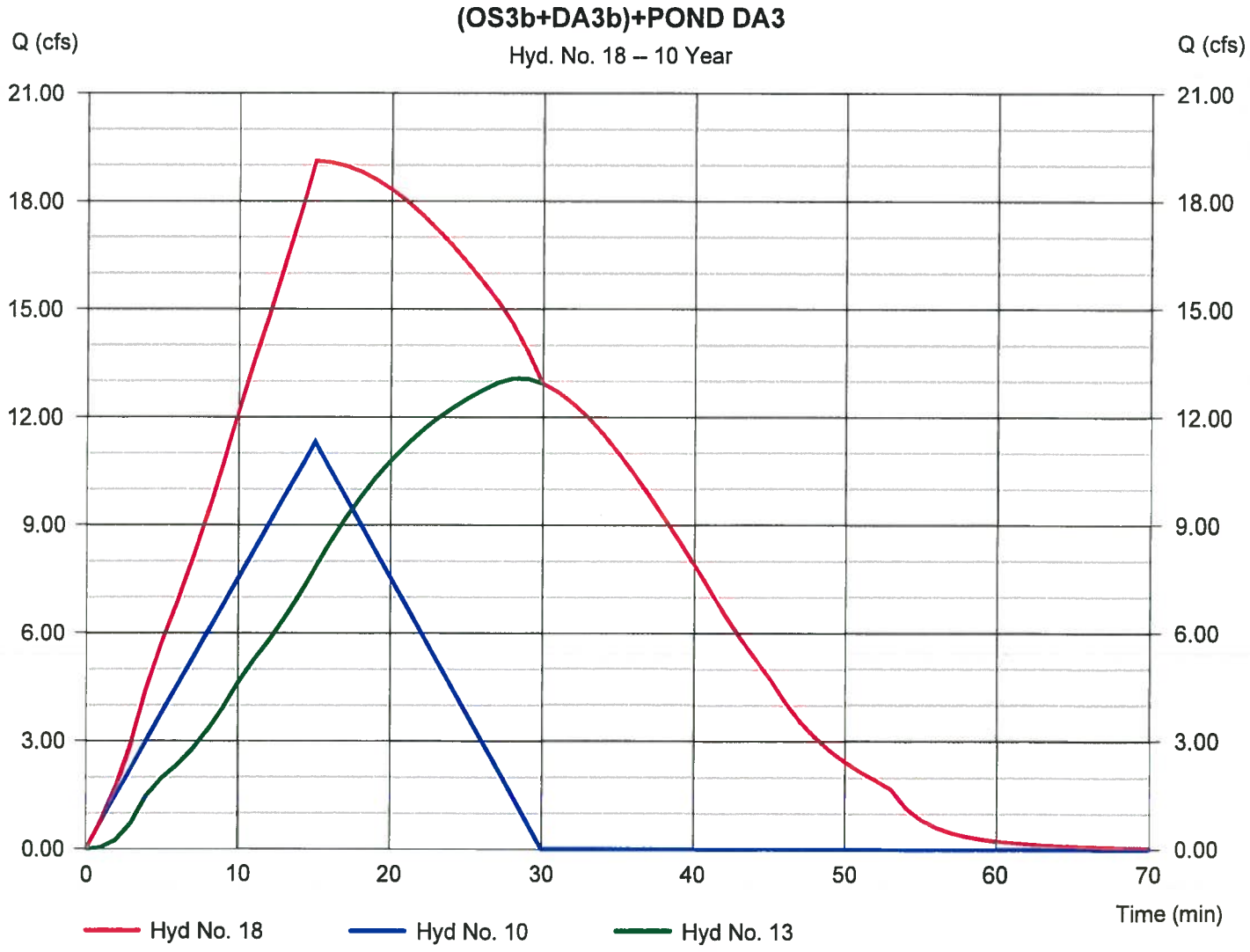


Hydrograph Report

Hyd. No. 18

(OS3b+DA3b)+POND DA3

Hydrograph type	= Combine	Peak discharge	= 19.11 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 33,521 cuft
Inflow hyds.	= 10, 13	Contrib. drain. area	= 3.940 ac



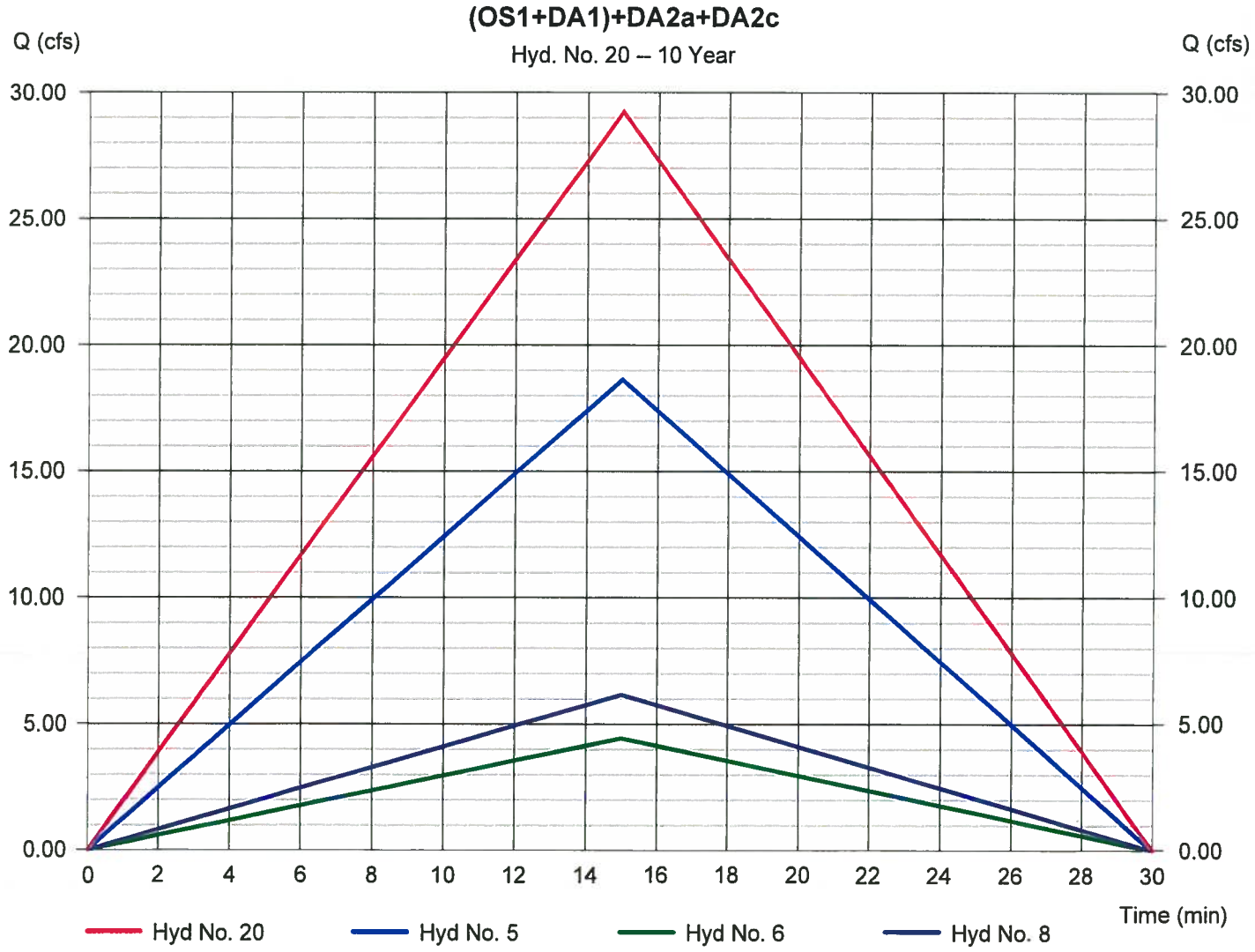
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 20

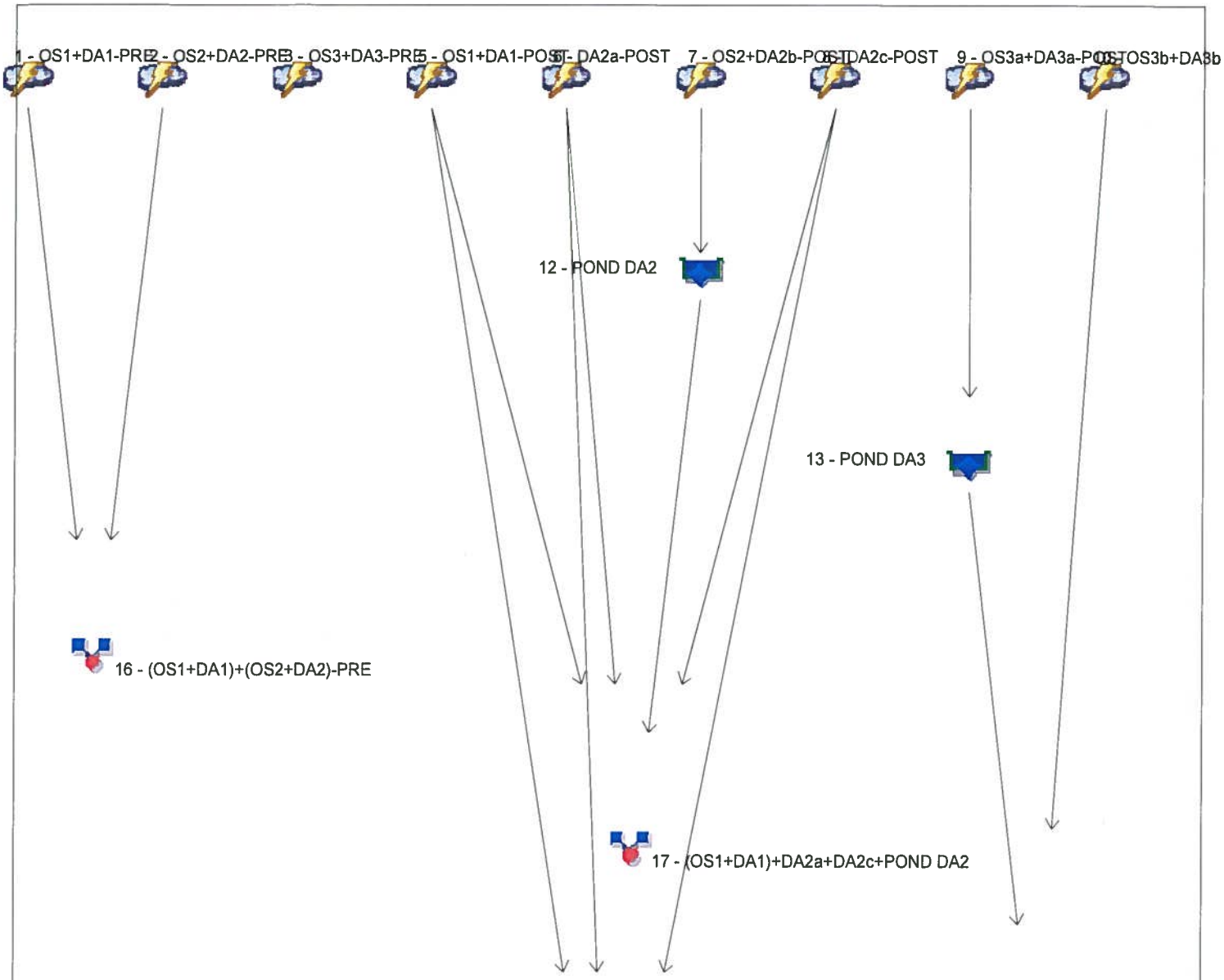
(OS1+DA1)+DA2a+DA2c

Hydrograph type	= Combine	Peak discharge	= 29.22 cfs
Storm frequency	= 10 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 26,297 cuft
Inflow hyds.	= 5, 6, 8	Contrib. drain. area	= 8.870 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12



Legend

Hyd.	Origin	Description
1	Rational	OS1+DA1-PRE
2	Rational	OS2+DA2-PRE
3	Rational	OS3+DA3-PRE
5	Rational	OS1+DA1-POST
6	Rational	DA2a-POST
7	Mod. Rational	OS2+DA2b-POST
8	Rational	DA2c-POST
9	Mod. Rational	OS3a+DA3a-POST
10	Rational	OS3b+DA3b
12	Reservoir	POND DA2
13	Reservoir	POND DA3
16	Combine	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	(OS1+DA1)+DA2a+DA2c+POND DA2
18	Combine	(OS3b+DA3b)+POND DA3
20	Combine	(OS1+DA1)+DA2a+DA2c

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

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	Rational	-----	-----	-----	-----	-----	-----	17.72	-----	-----	OS1+DA1-PRE
2	Rational	-----	-----	-----	-----	-----	-----	41.07	-----	-----	OS2+DA2-PRE
3	Rational	-----	-----	-----	-----	-----	-----	28.27	-----	-----	OS3+DA3-PRE
5	Rational	-----	-----	-----	-----	-----	-----	22.60	-----	-----	OS1+DA1-POST
6	Rational	-----	-----	-----	-----	-----	-----	5.379	-----	-----	DA2a-POST
7	Mod. Rational	-----	-----	-----	-----	-----	-----	28.28	-----	-----	OS2+DA2b-POST
8	Rational	-----	-----	-----	-----	-----	-----	7.468	-----	-----	DA2c-POST
9	Mod. Rational	-----	-----	-----	-----	-----	-----	17.50	-----	-----	OS3a+DA3a-POST
10	Rational	-----	-----	-----	-----	-----	-----	13.72	-----	-----	OS3b+DA3b
12	Reservoir	7	-----	-----	-----	-----	-----	27.35	-----	-----	POND DA2
13	Reservoir	9	-----	-----	-----	-----	-----	15.90	-----	-----	POND DA3
16	Combine	1, 2,	-----	-----	-----	-----	-----	58.80	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	5, 6, 8, 12,	-----	-----	-----	-----	-----	54.52	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	10, 13,	-----	-----	-----	-----	-----	23.17	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	5, 6, 8,	-----	-----	-----	-----	-----	35.44	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

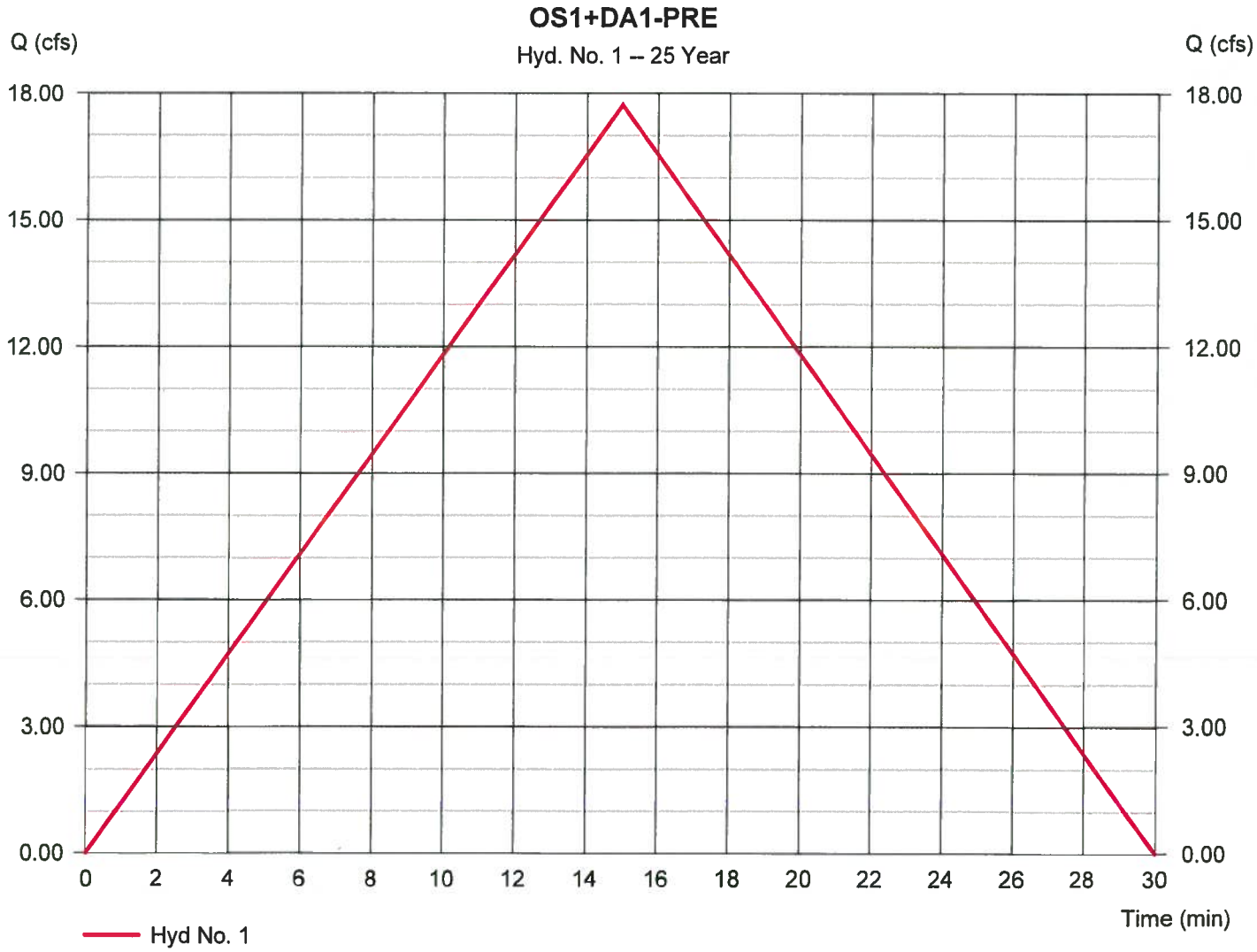
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	17.72	1	15	15,950	-----	-----	-----	OS1+DA1-PRE
2	Rational	41.07	1	15	36,967	-----	-----	-----	OS2+DA2-PRE
3	Rational	28.27	1	15	25,445	-----	-----	-----	OS3+DA3-PRE
5	Rational	22.60	1	15	20,336	-----	-----	-----	OS1+DA1-POST
6	Rational	5.379	1	15	4,841	-----	-----	-----	DA2a-POST
7	Mod. Rational	28.28	1	15	62,875	-----	-----	-----	OS2+DA2b-POST
8	Rational	7.468	1	15	6,721	-----	-----	-----	DA2c-POST
9	Mod. Rational	17.50	1	15	28,513	-----	-----	-----	OS3a+DA3a-POST
10	Rational	13.72	1	15	12,348	-----	-----	-----	OS3b+DA3b
12	Reservoir	27.35	1	37	62,790	7	1186.11	7,957	POND DA2
13	Reservoir	15.90	1	28	28,354	9	1202.09	7,373	POND DA3
16	Combine	58.80	1	15	52,917	1, 2,	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	54.52	1	15	94,688	5, 6, 8, 12,	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	23.17	1	16	40,702	10, 13,	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	35.44	1	15	31,898	5, 6, 8,	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Report

Hyd. No. 1

OS1+DA1-PRE

Hydrograph type	= Rational	Peak discharge	= 17.72 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 15,950 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.4
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

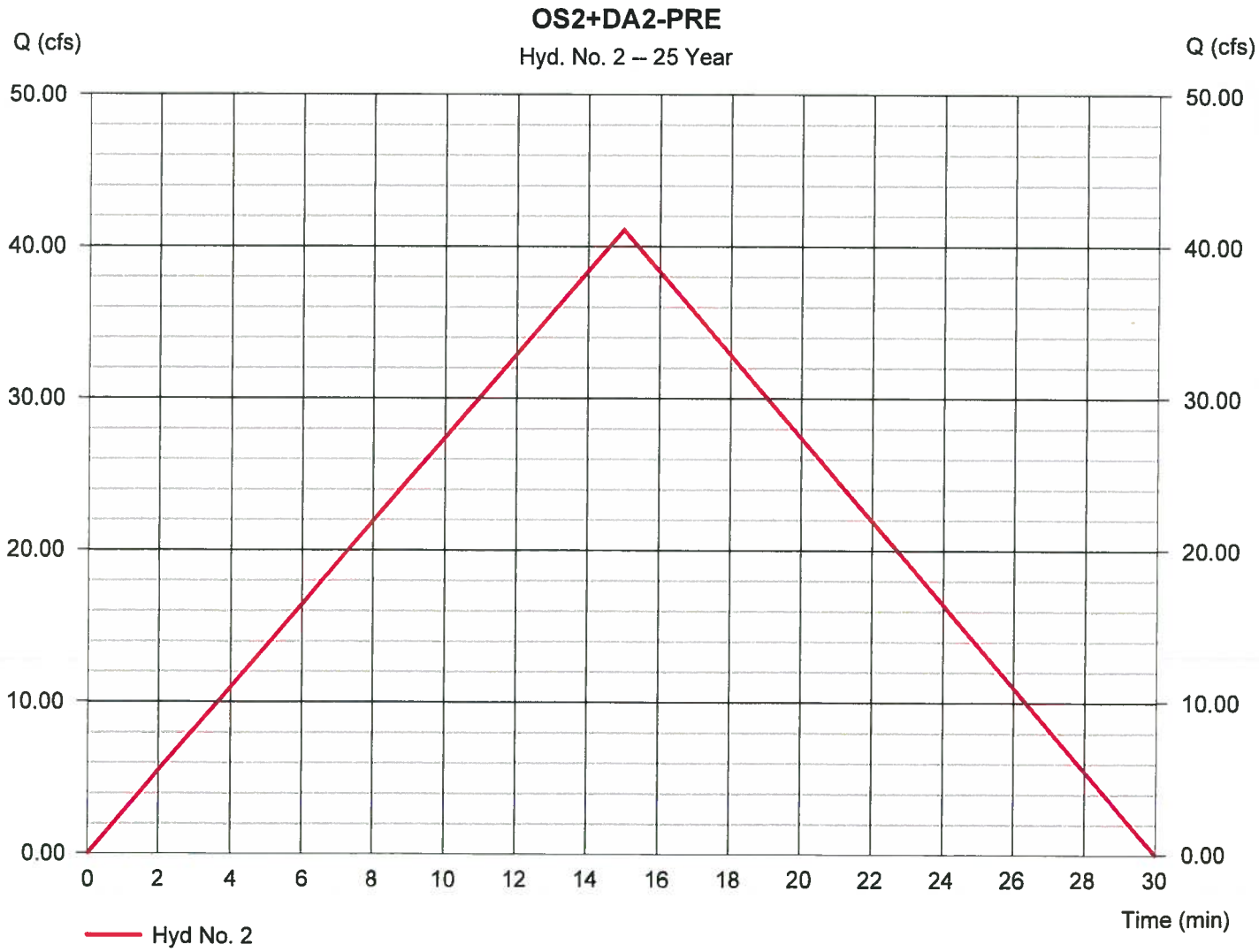


Hydrograph Report

Hyd. No. 2

OS2+DA2-PRE

Hydrograph type	= Rational	Peak discharge	= 41.07 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 36,967 cuft
Drainage area	= 13.860 ac	Runoff coeff.	= 0.4
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

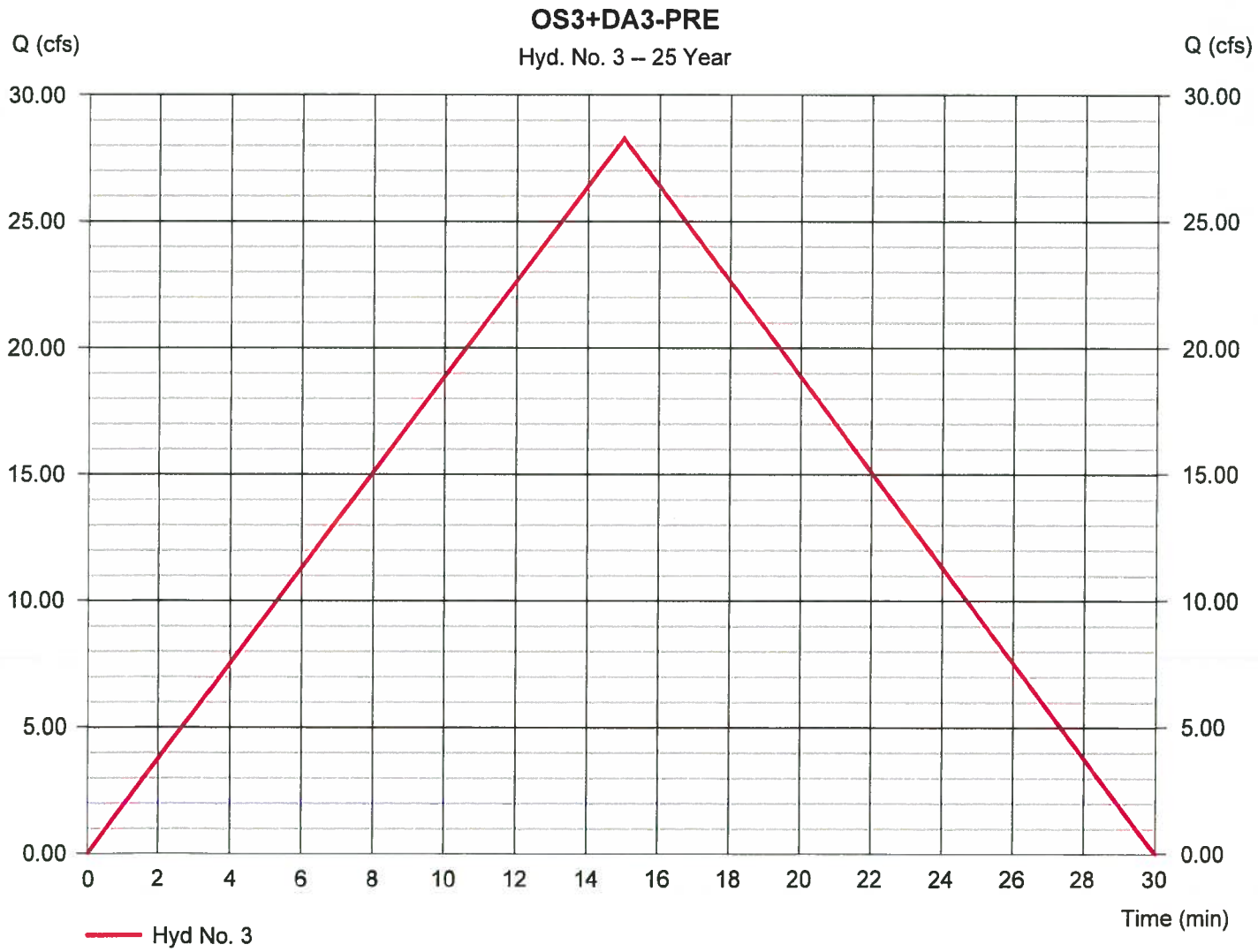


Hydrograph Report

Hyd. No. 3

OS3+DA3-PRE

Hydrograph type	= Rational	Peak discharge	= 28.27 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 25,445 cuft
Drainage area	= 9.540 ac	Runoff coeff.	= 0.4
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

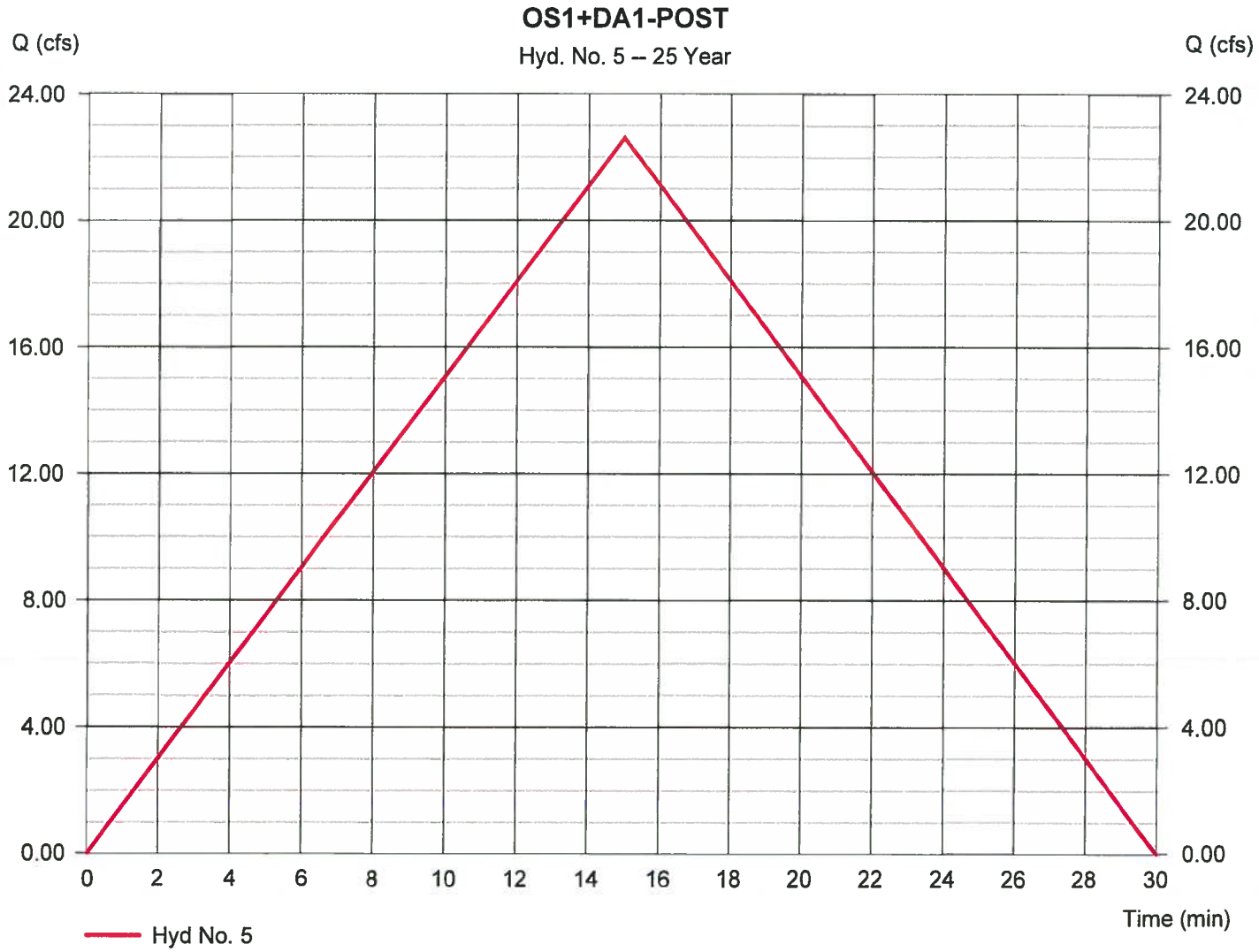


Hydrograph Report

Hyd. No. 5

OS1+DA1-POST

Hydrograph type	= Rational	Peak discharge	= 22.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 20,336 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.51
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

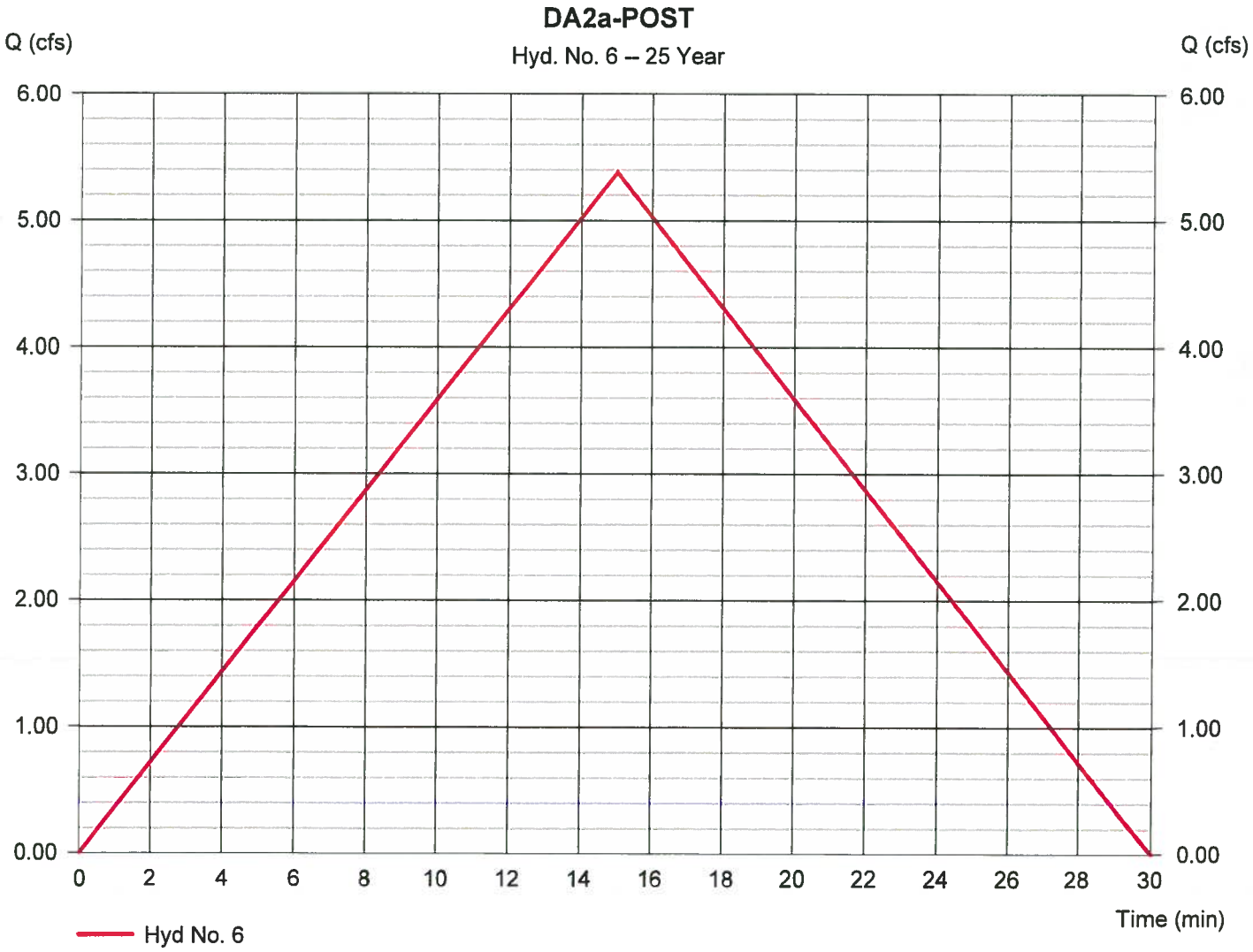


Hydrograph Report

Hyd. No. 6

DA2a-POST

Hydrograph type	= Rational	Peak discharge	= 5.379 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 4,841 cuft
Drainage area	= 1.210 ac	Runoff coeff.	= 0.6
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

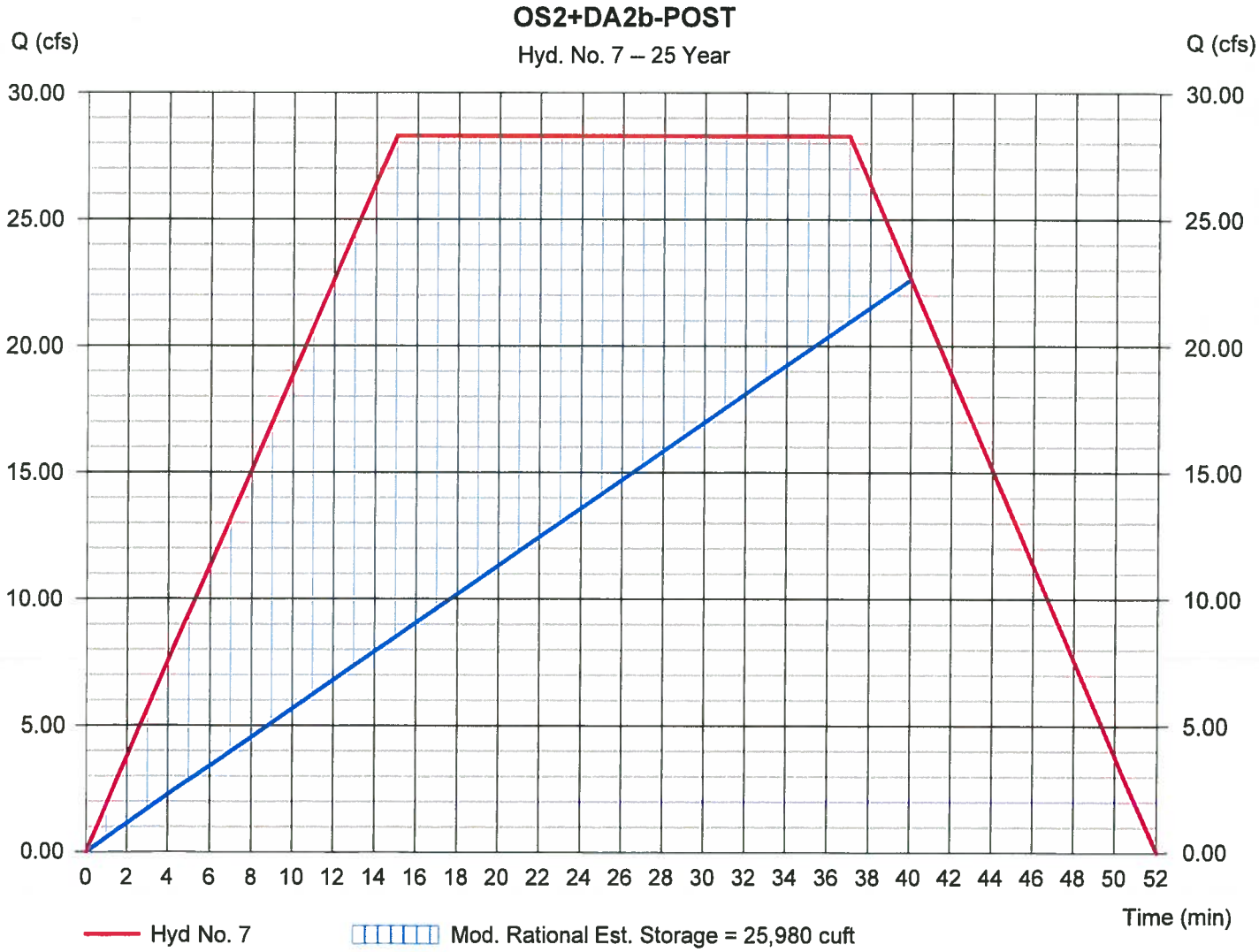


Hydrograph Report

Hyd. No. 7

OS2+DA2b-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 28.28 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 62,875 cuft
Drainage area	= 10.970 ac	Runoff coeff.	= 0.56
Intensity	= 4.604 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 2.5 x Tc
Target Q	=23.36 cfs	Est. Req'd Storage	=25,980 cuft

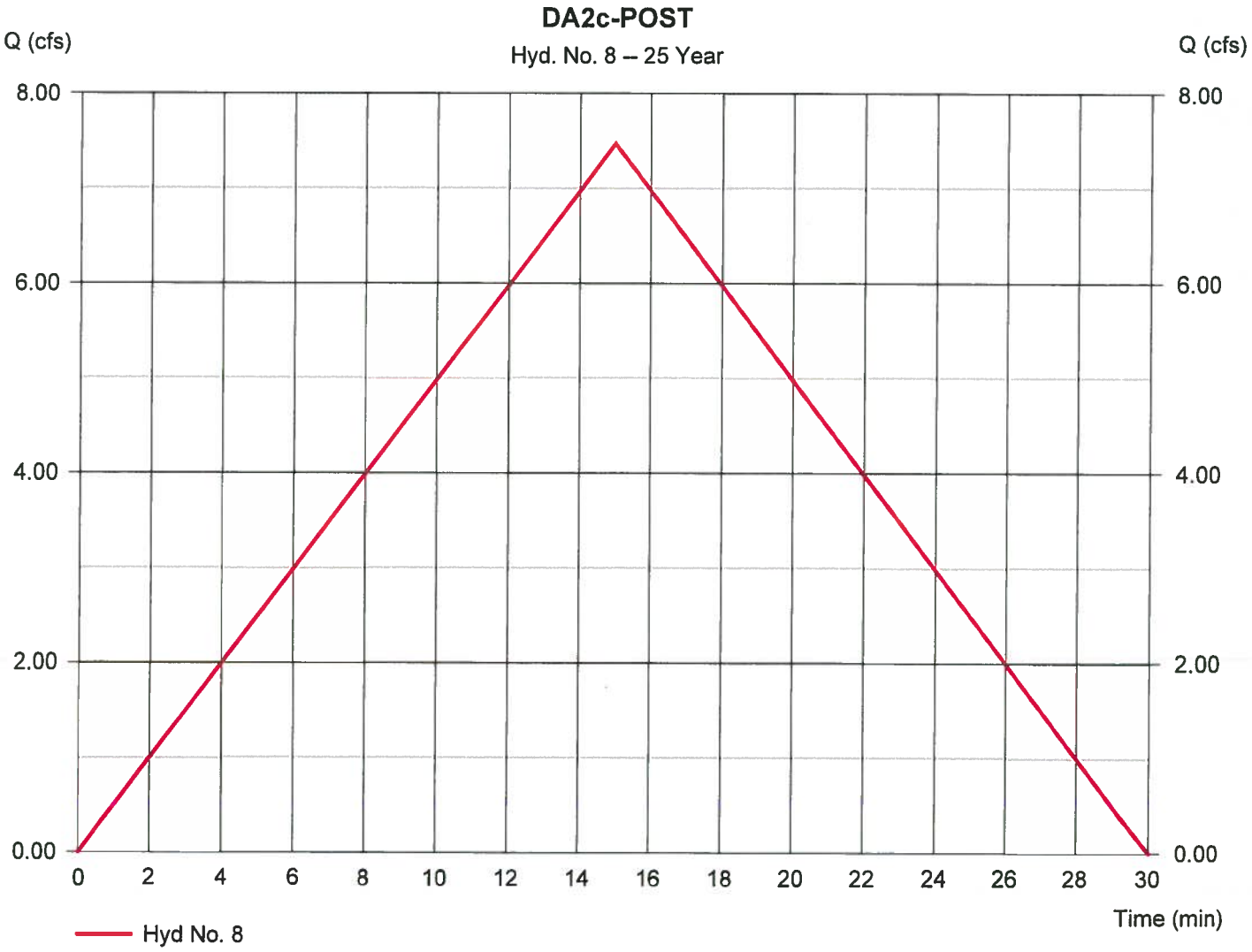


Hydrograph Report

Hyd. No. 8

DA2c-POST

Hydrograph type	= Rational	Peak discharge	= 7.468 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,721 cuft
Drainage area	= 1.680 ac	Runoff coeff.	= 0.6
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

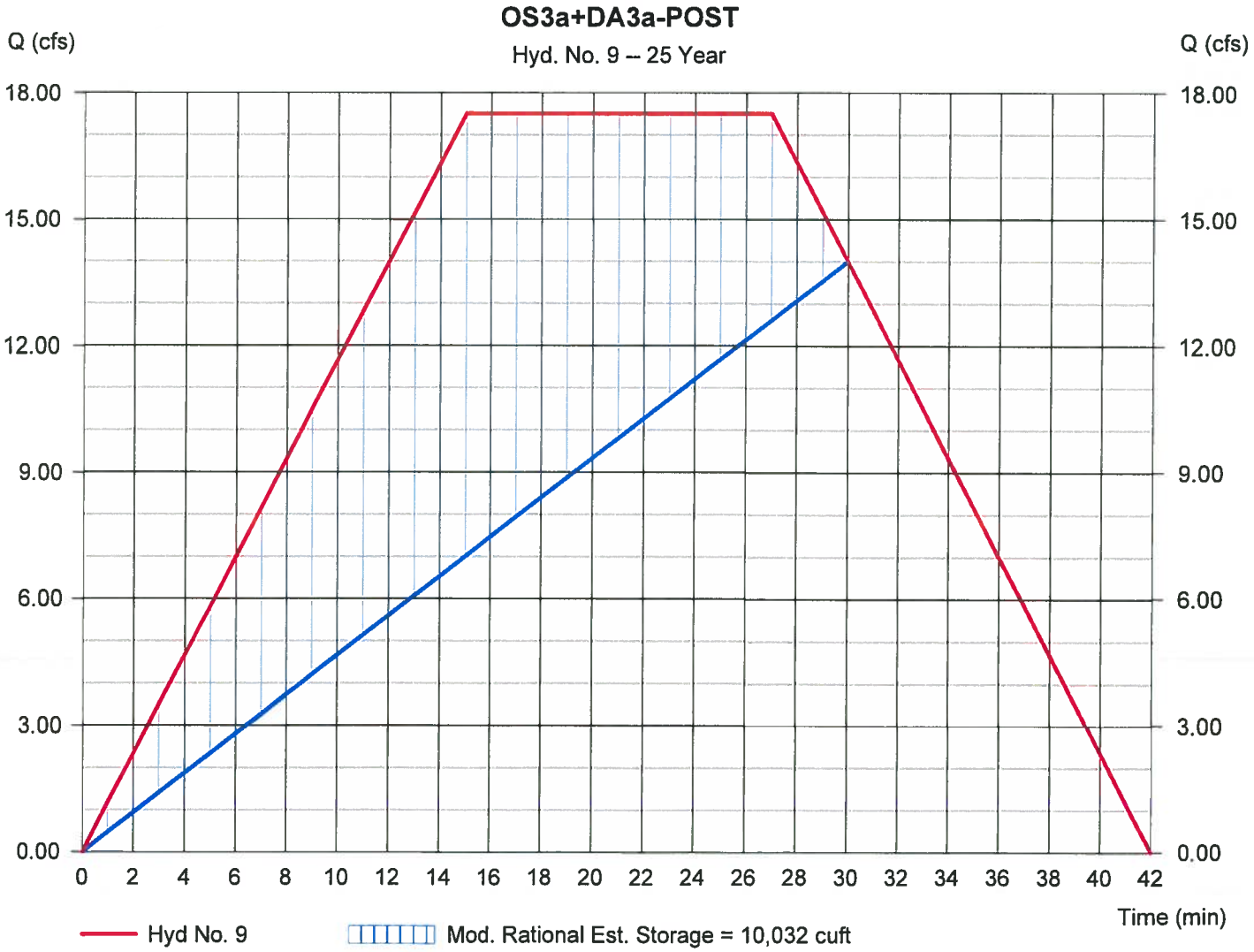


Hydrograph Report

Hyd. No. 9

OS3a+DA3a-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 17.50 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 28,513 cuft
Drainage area	= 5.600 ac	Runoff coeff.	= 0.57
Intensity	= 5.483 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 1.8 x Tc
Target Q	=14.55 cfs	Est. Req'd Storage	=10,032 cuft



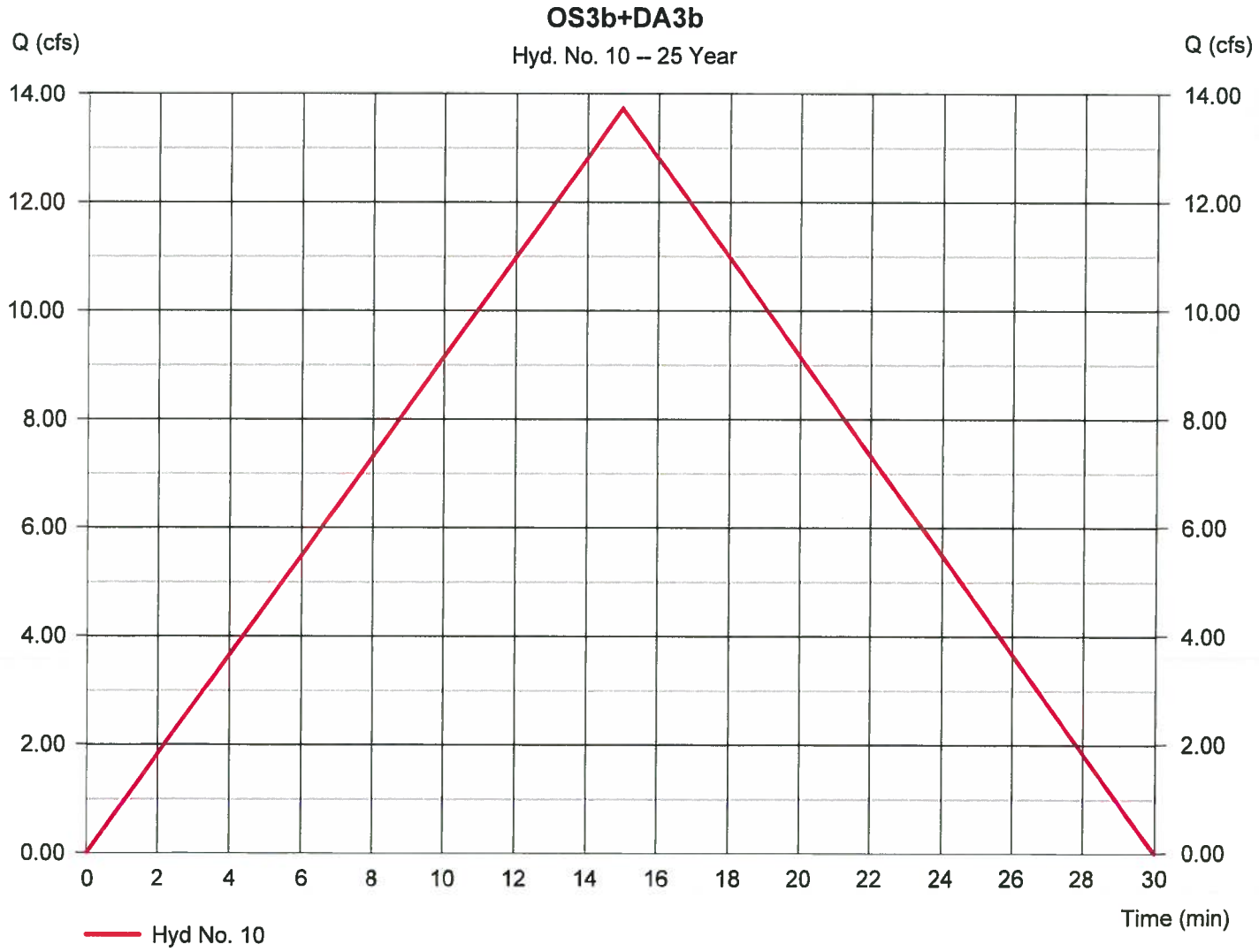
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 10

OS3b+DA3b

Hydrograph type	= Rational	Peak discharge	= 13.72 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 12,348 cuft
Drainage area	= 3.940 ac	Runoff coeff.	= 0.47
Intensity	= 7.409 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



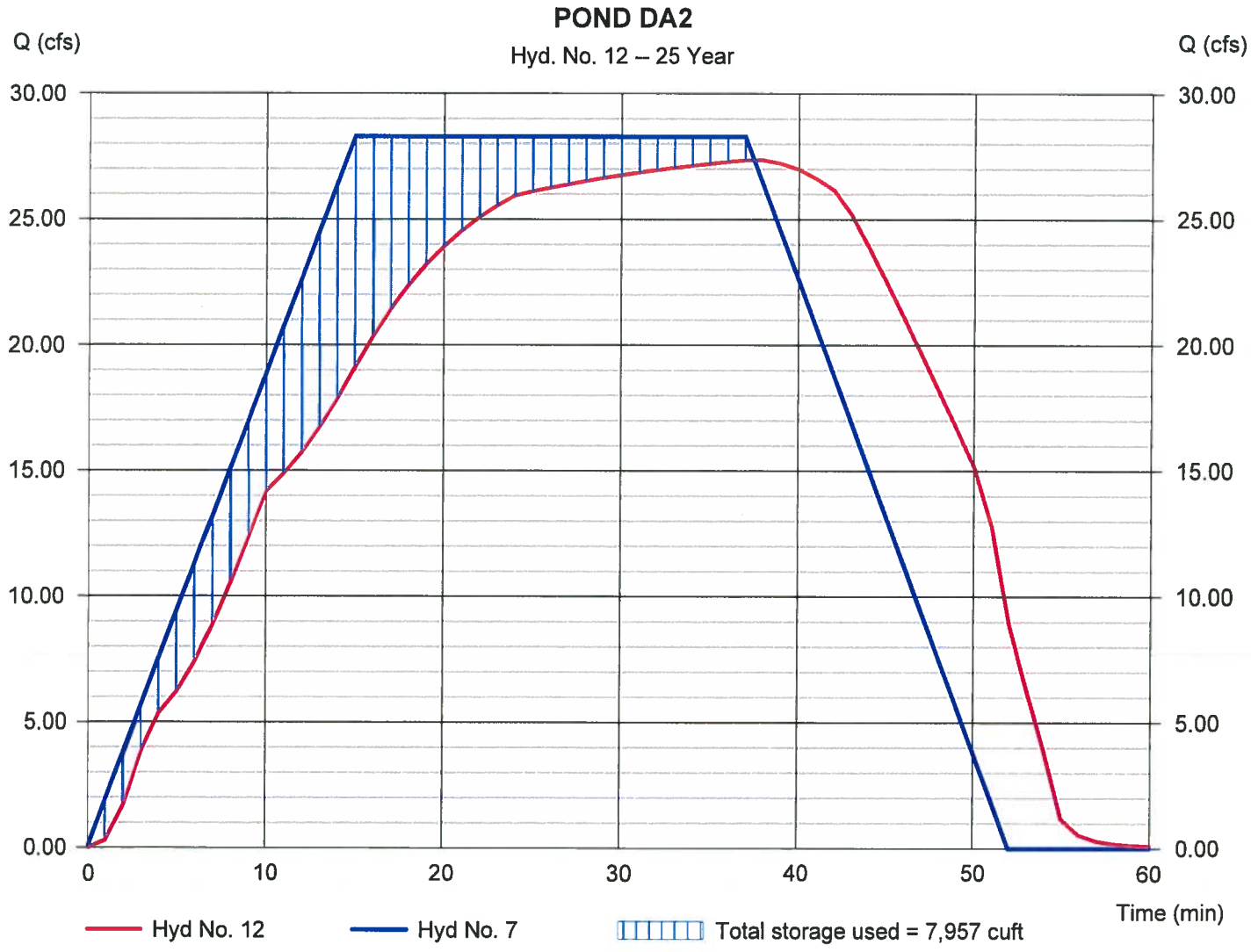
Hydrograph Report

Hyd. No. 12

POND DA2

Hydrograph type	= Reservoir	Peak discharge	= 27.35 cfs
Storm frequency	= 25 yrs	Time to peak	= 37 min
Time interval	= 1 min	Hyd. volume	= 62,790 cuft
Inflow hyd. No.	= 7 - OS2+DA2b-POST	Max. Elevation	= 1186.11 ft
Reservoir name	= POND DA2	Max. Storage	= 7,957 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 1 - POND DA2

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1185.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1185.00	161	0	0
0.25	1185.25	2,477	330	330
0.50	1185.50	9,489	1,496	1,826
1.00	1186.00	10,291	4,945	6,771
2.00	1187.00	11,991	11,141	17,912
3.00	1188.00	13,821	12,906	30,817

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

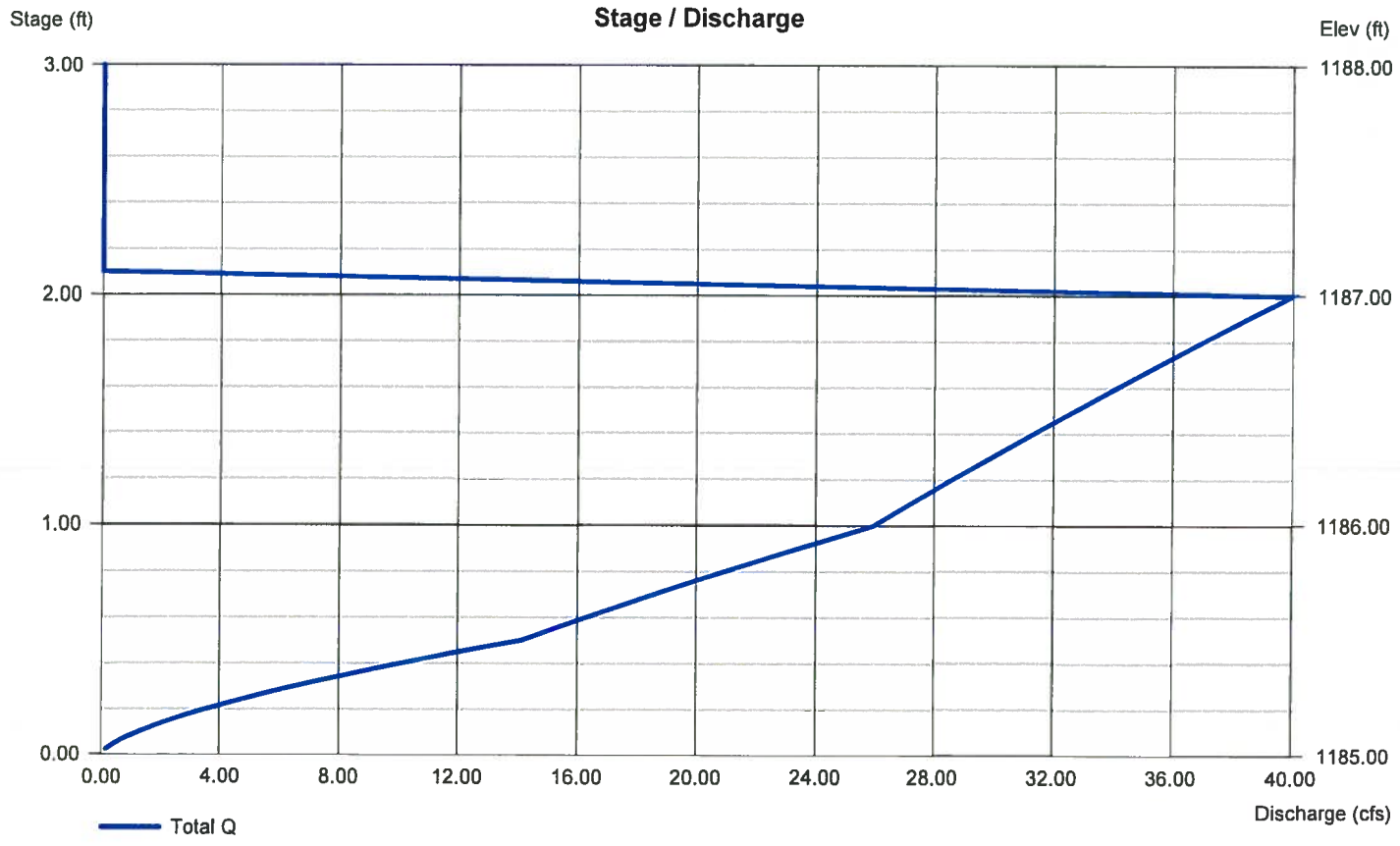
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.50	0.00	0.00	0.00
Crest El. (ft)	= 1184.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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



Hydrograph Report

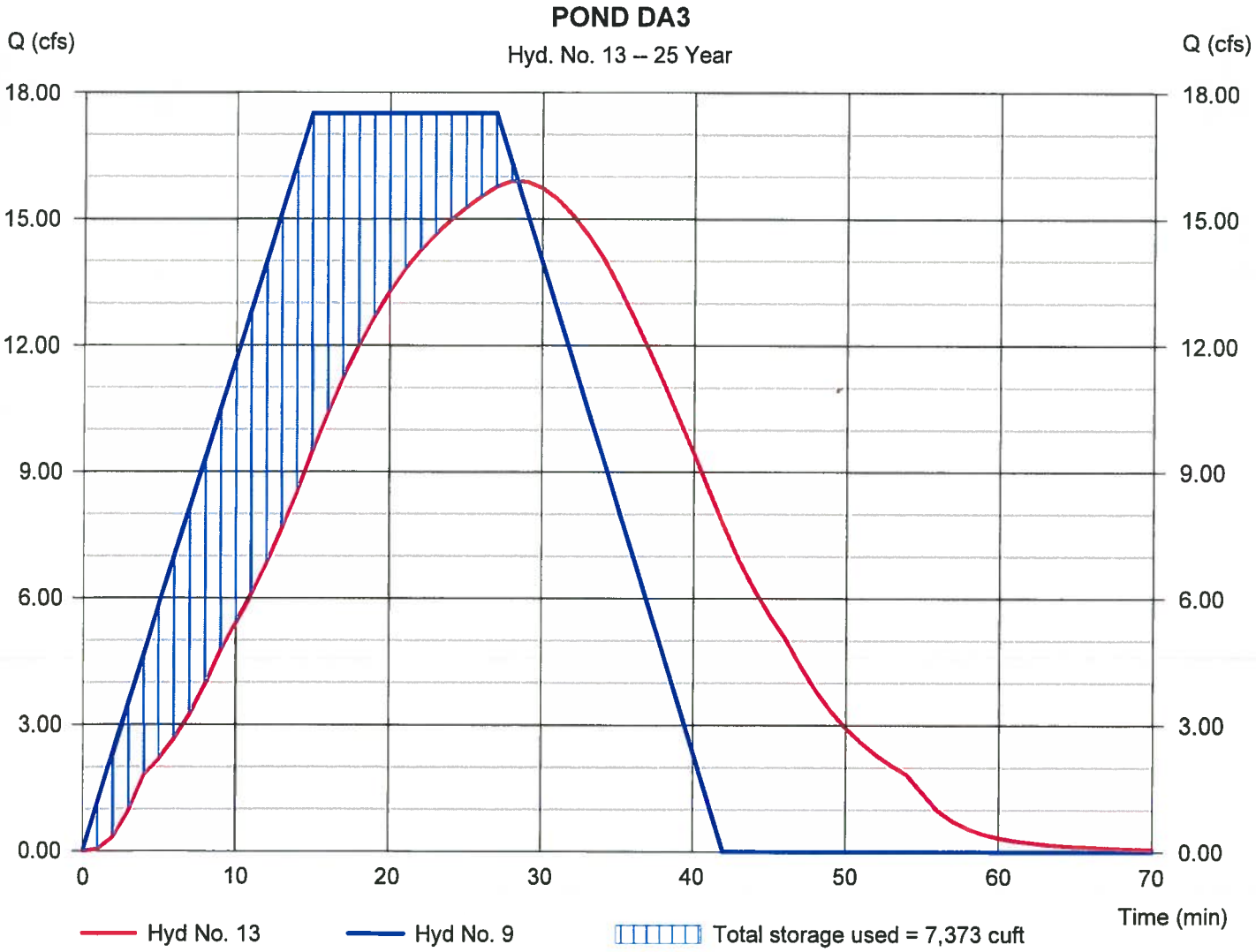
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 13

POND DA3

Hydrograph type	= Reservoir	Peak discharge	= 15.90 cfs
Storm frequency	= 25 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 28,354 cuft
Inflow hyd. No.	= 9 - OS3a+DA3a-POST	Max. Elevation	= 1202.09 ft
Reservoir name	= POND DA3	Max. Storage	= 7,373 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 — Friday, 06 / 10 / 2022

Pond No. 2 - POND DA3

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1201.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1201.00	245	0	0
0.25	1201.25	2,933	397	397
0.50	1201.50	8,803	1,467	1,864
1.00	1202.00	9,554	4,589	6,454
2.00	1203.00	11,148	10,351	16,805
2.50	1203.50	11,990	5,785	22,589

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

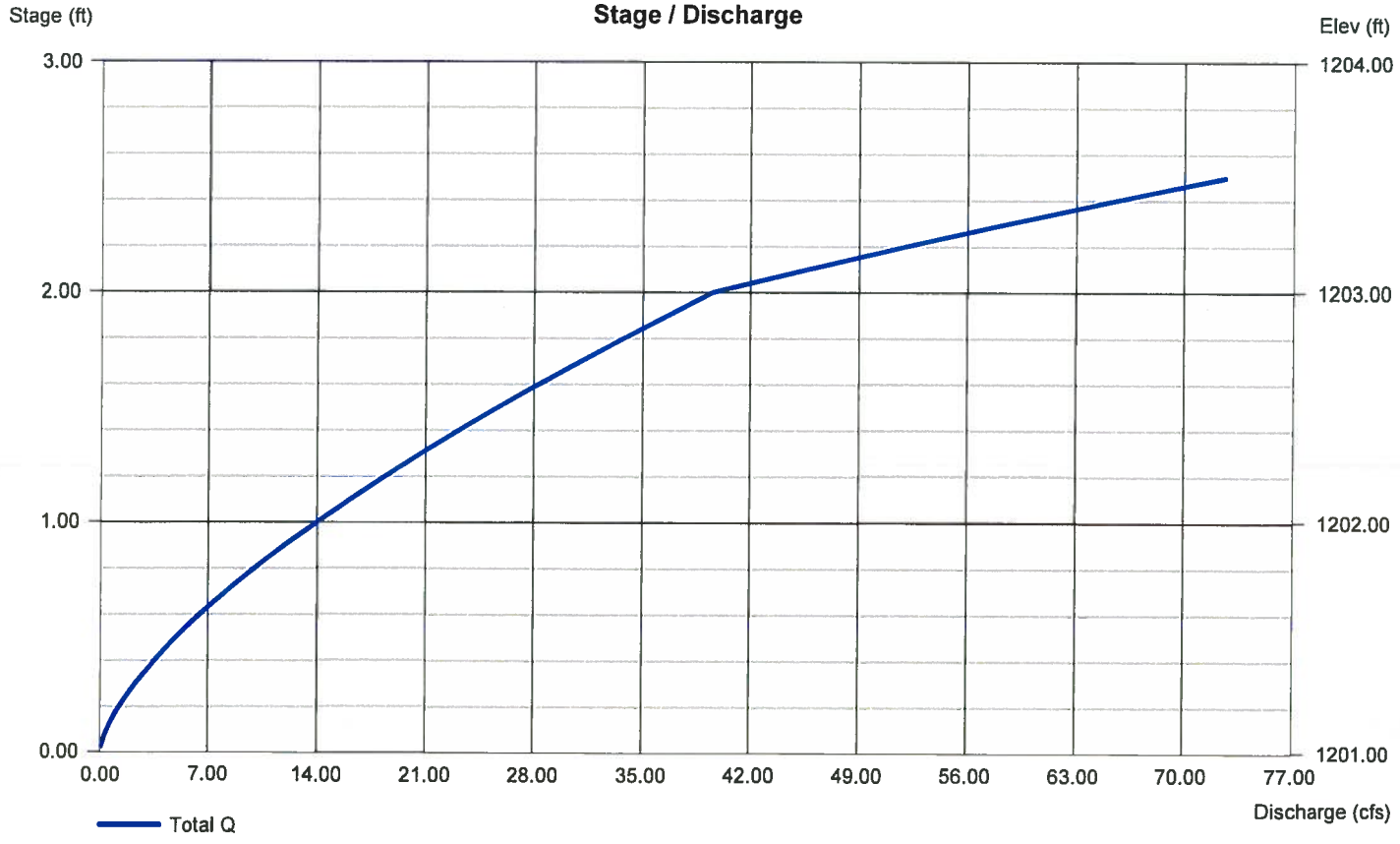
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.20	0.00	0.00	0.00
Crest El. (ft)	= 1201.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

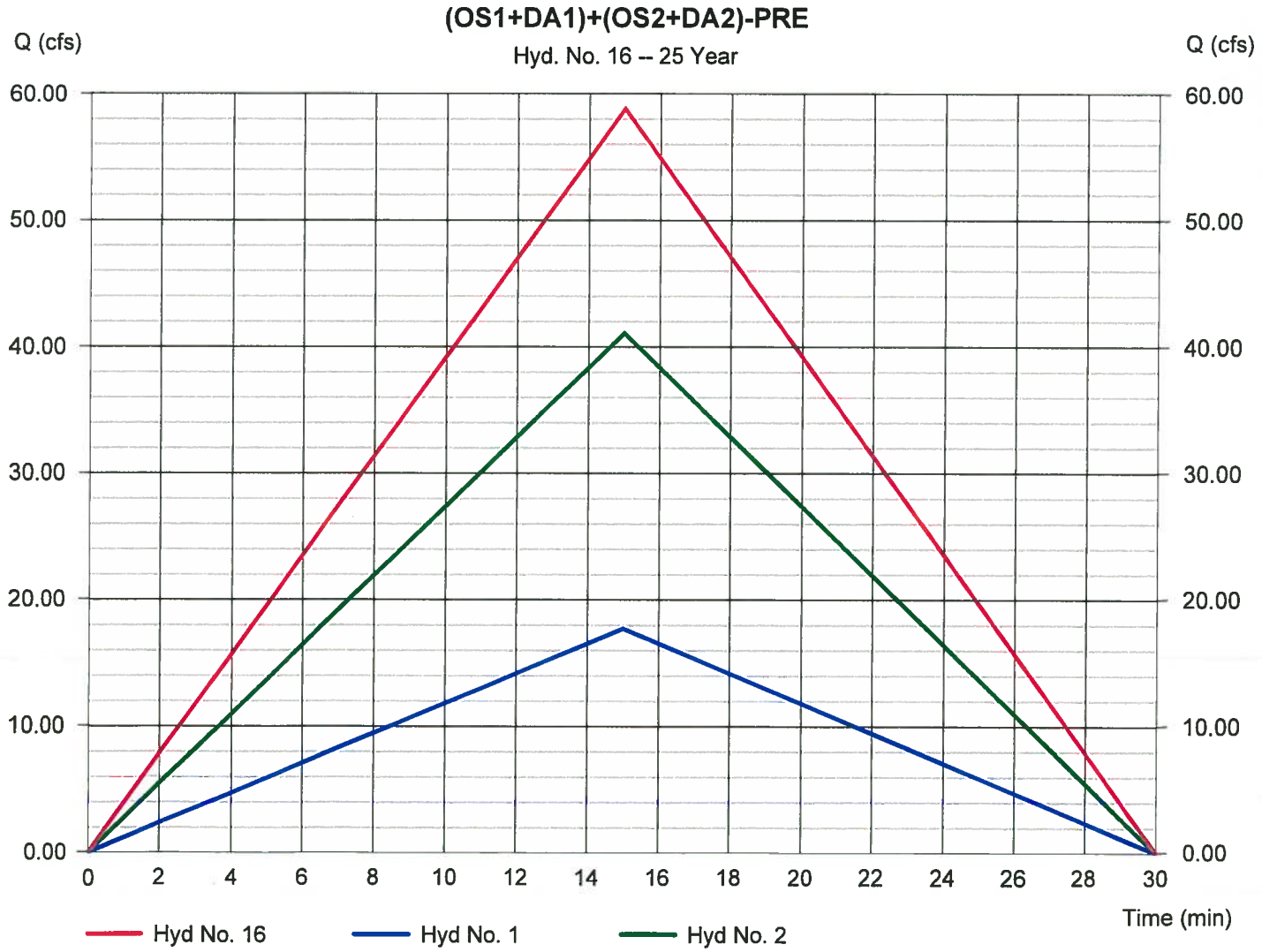


Hydrograph Report

Hyd. No. 16

(OS1+DA1)+(OS2+DA2)-PRE

Hydrograph type	= Combine	Peak discharge	= 58.80 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 52,917 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.840 ac

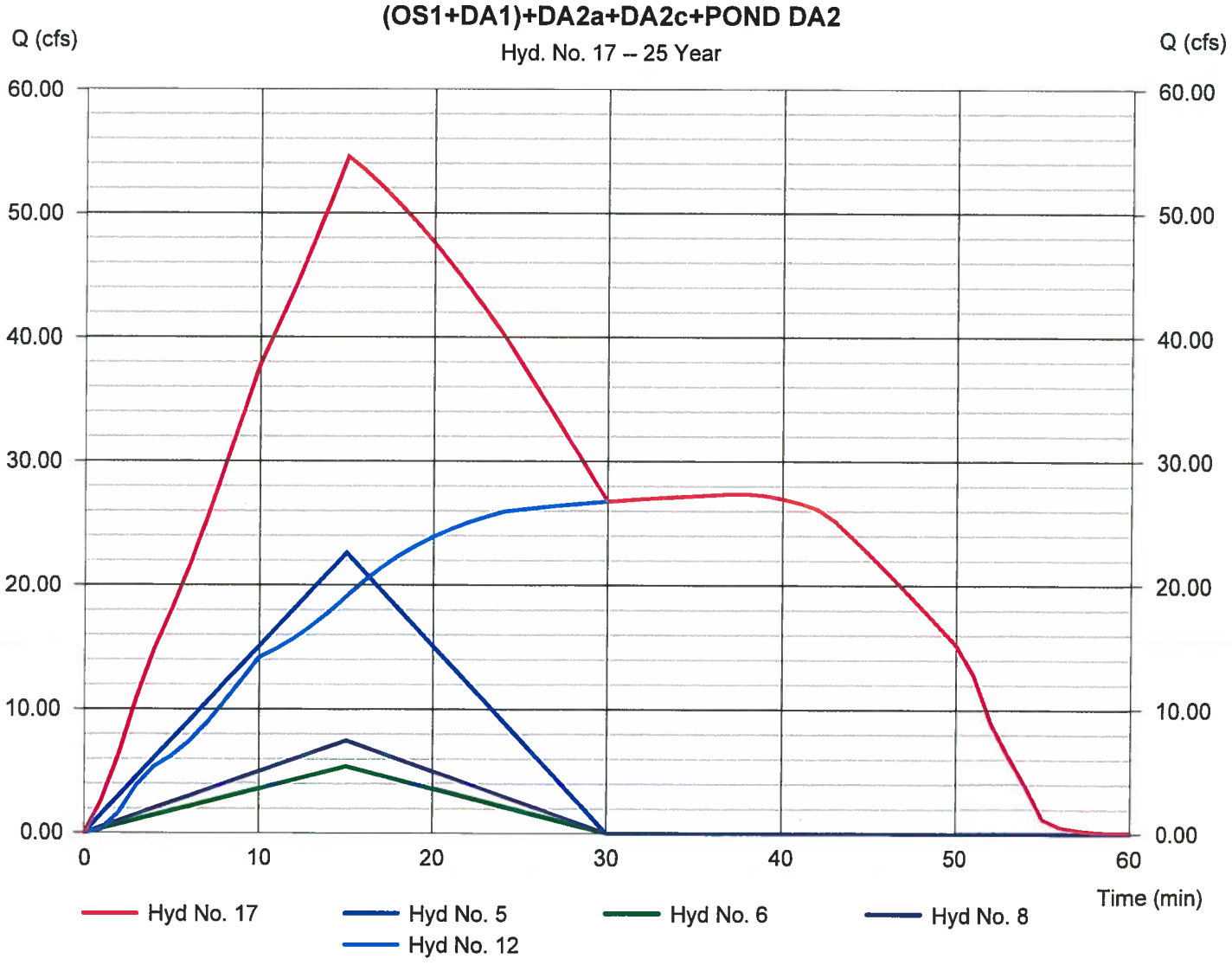


Hydrograph Report

Hyd. No. 17

(OS1+DA1)+DA2a+DA2c+POND DA2

Hydrograph type	= Combine	Peak discharge	= 54.52 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 94,688 cuft
Inflow hyds.	= 5, 6, 8, 12	Contrib. drain. area	= 8.870 ac

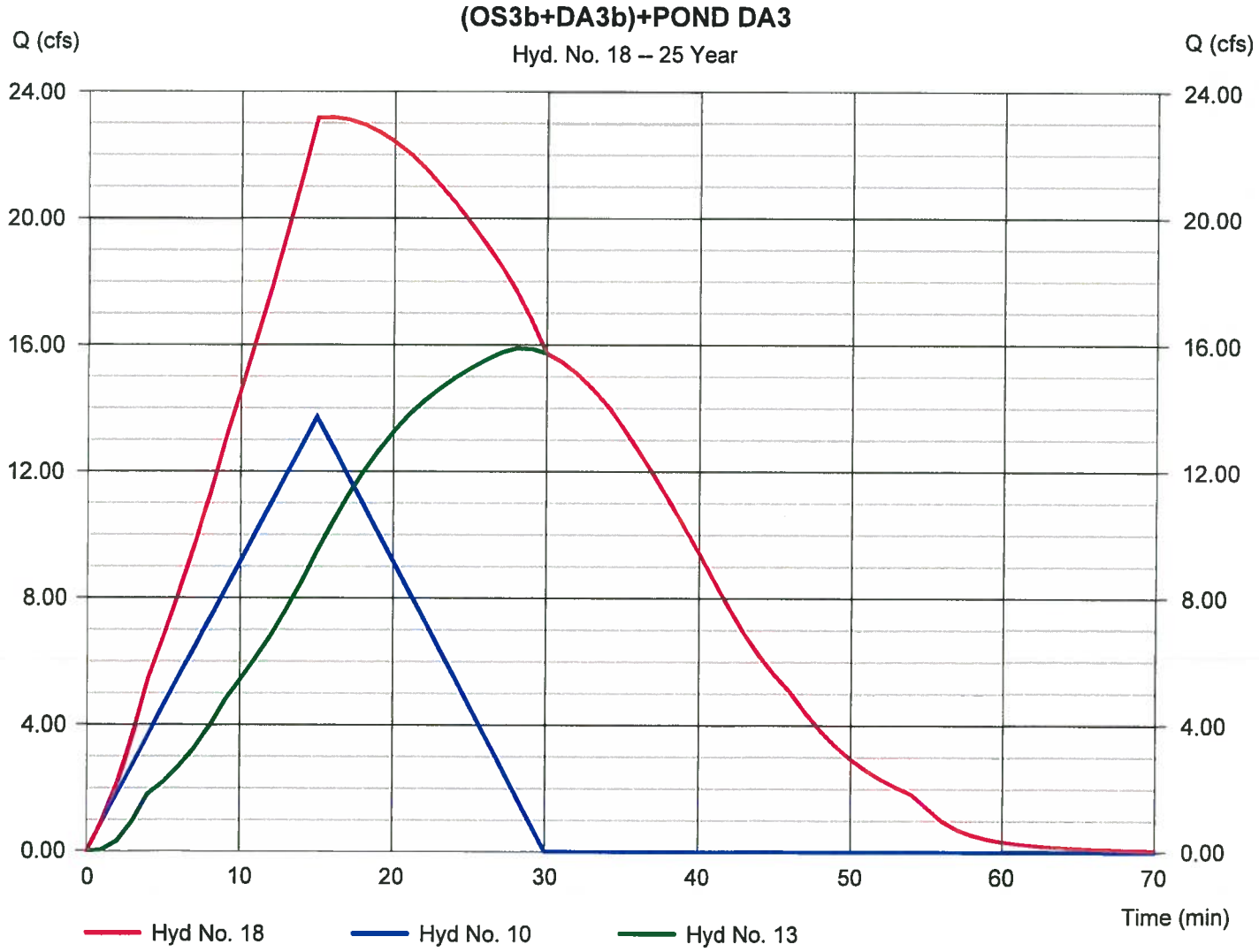


Hydrograph Report

Hyd. No. 18

(OS3b+DA3b)+POND DA3

Hydrograph type	= Combine	Peak discharge	= 23.17 cfs
Storm frequency	= 25 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 40,702 cuft
Inflow hyds.	= 10, 13	Contrib. drain. area	= 3.940 ac

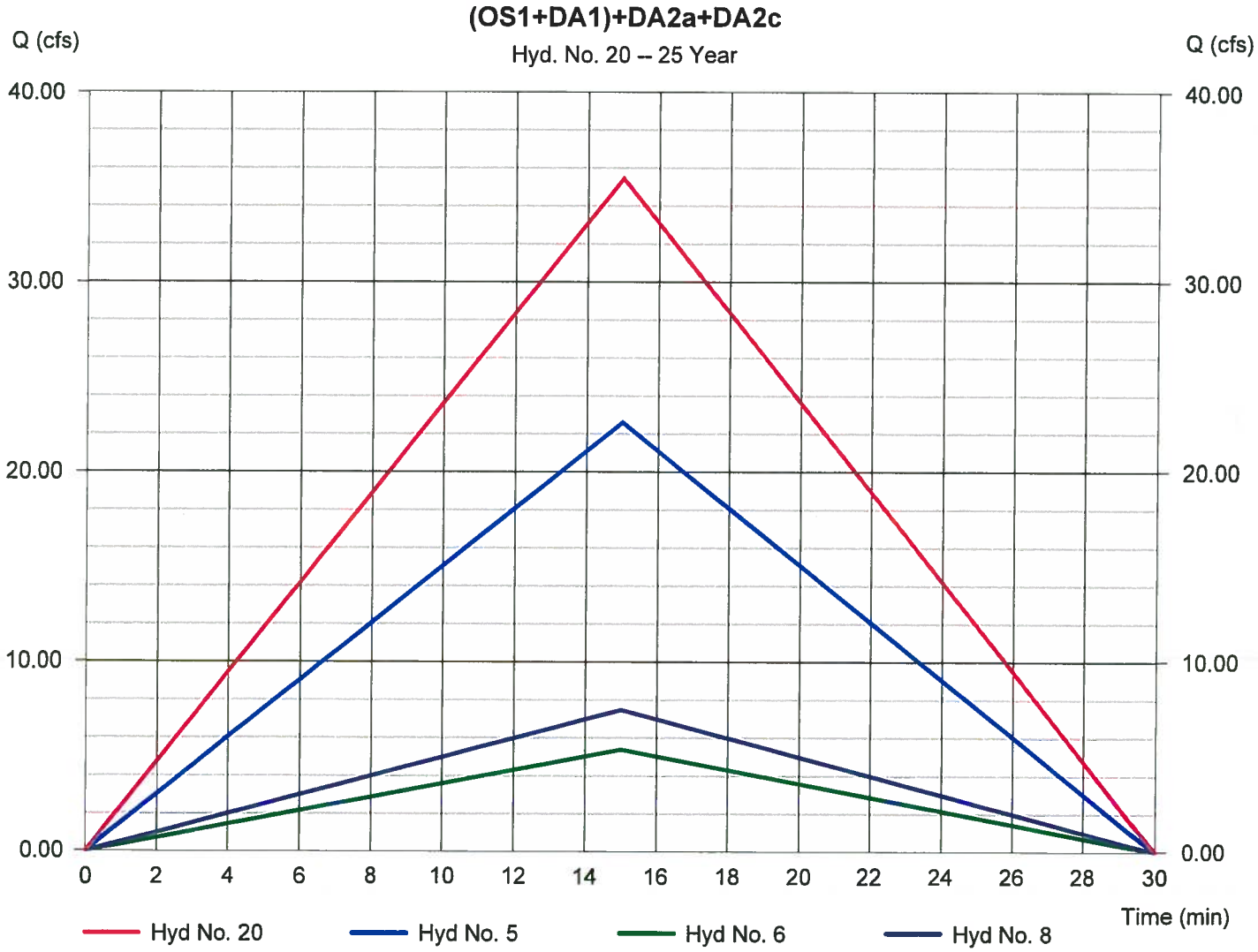


Hydrograph Report

Hyd. No. 20

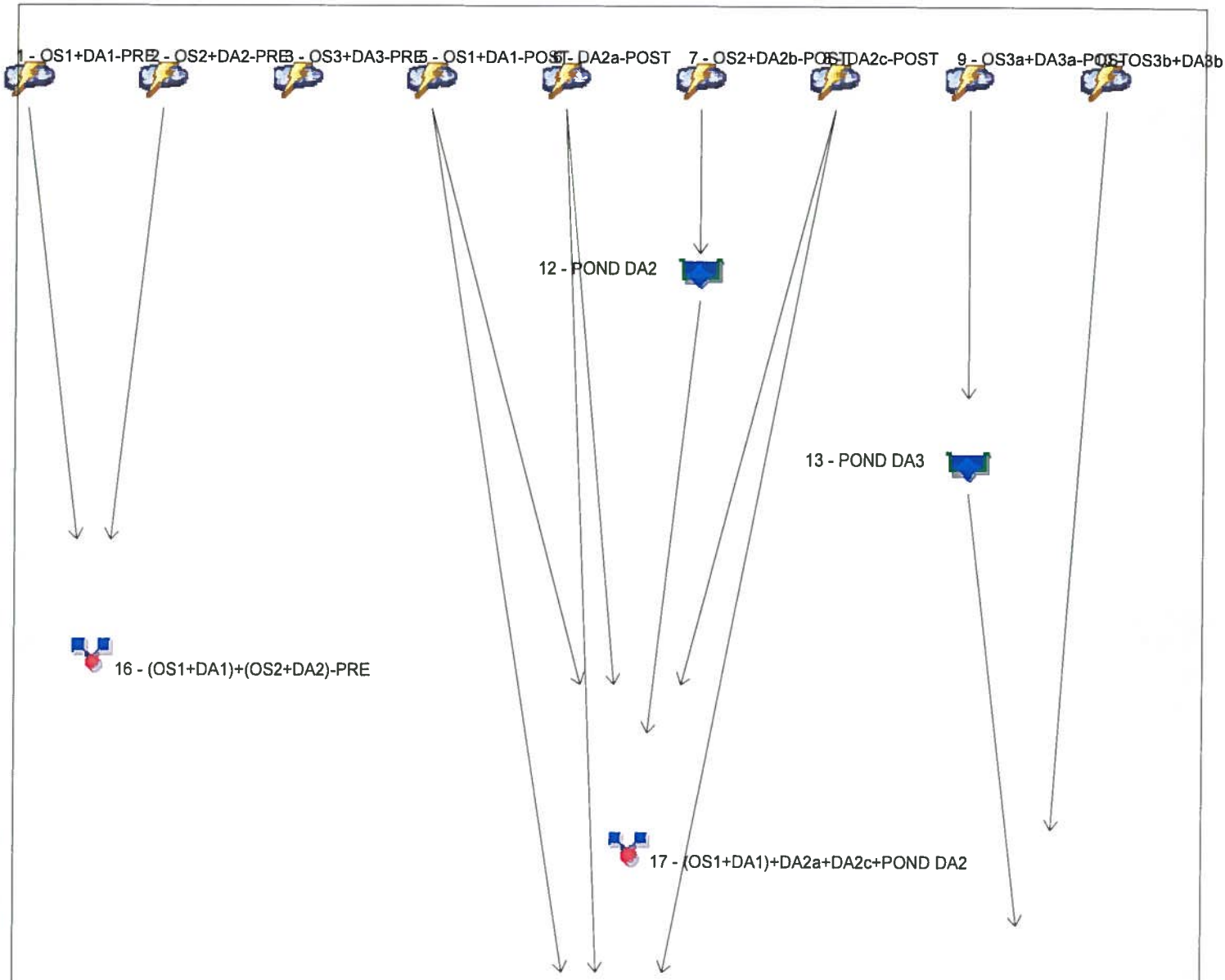
(OS1+DA1)+DA2a+DA2c

Hydrograph type	= Combine	Peak discharge	= 35.44 cfs
Storm frequency	= 25 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 31,898 cuft
Inflow hyds.	= 5, 6, 8	Contrib. drain. area	= 8.870 ac



Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12



Legend

Hyd.	Origin	Description
1	Rational	OS1+DA1-PRE
2	Rational	OS2+DA2-PRE
3	Rational	OS3+DA3-PRE
5	Rational	OS1+DA1-POST
6	Rational	DA2a-POST
7	Mod. Rational	OS2+DA2b-POST
8	Rational	DA2c-POST
9	Mod. Rational	OS3a+DA3a-POST
10	Rational	OS3b+DA3b
12	Reservoir	POND DA2
13	Reservoir	POND DA3
16	Combine	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	(OS1+DA1)+DA2a+DA2c+POND DA2
18	Combine	(OS3b+DA3b)+POND DA3
20	Combine	(OS1+DA1)+DA2a+DA2c

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

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	Rational	-----	-----	-----	-----	-----	-----	-----	-----	22.85	OS1+DA1-PRE
2	Rational	-----	-----	-----	-----	-----	-----	-----	-----	52.96	OS2+DA2-PRE
3	Rational	-----	-----	-----	-----	-----	-----	-----	-----	36.46	OS3+DA3-PRE
5	Rational	-----	-----	-----	-----	-----	-----	-----	-----	29.14	OS1+DA1-POST
6	Rational	-----	-----	-----	-----	-----	-----	-----	-----	6.936	DA2a-POST
7	Mod. Rational	-----	-----	-----	-----	-----	-----	-----	-----	36.58	OS2+DA2b-POST
8	Rational	-----	-----	-----	-----	-----	-----	-----	-----	9.630	DA2c-POST
9	Mod. Rational	-----	-----	-----	-----	-----	-----	-----	-----	22.58	OS3a+DA3a-POST
10	Rational	-----	-----	-----	-----	-----	-----	-----	-----	17.69	OS3b+DA3b
12	Reservoir	7	-----	-----	-----	-----	-----	-----	-----	34.39	POND DA2
13	Reservoir	9	-----	-----	-----	-----	-----	-----	-----	20.65	POND DA3
16	Combine	1, 2,	-----	-----	-----	-----	-----	-----	-----	75.82	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	5, 6, 8,	-----	-----	-----	-----	-----	-----	-----	69.46	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	12, 10, 13,	-----	-----	-----	-----	-----	-----	-----	30.11	(OS3b+DA3b)+POND DA3
20	Combine	5, 6, 8,	-----	-----	-----	-----	-----	-----	-----	45.70	(OS1+DA1)+DA2a+DA2c

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12

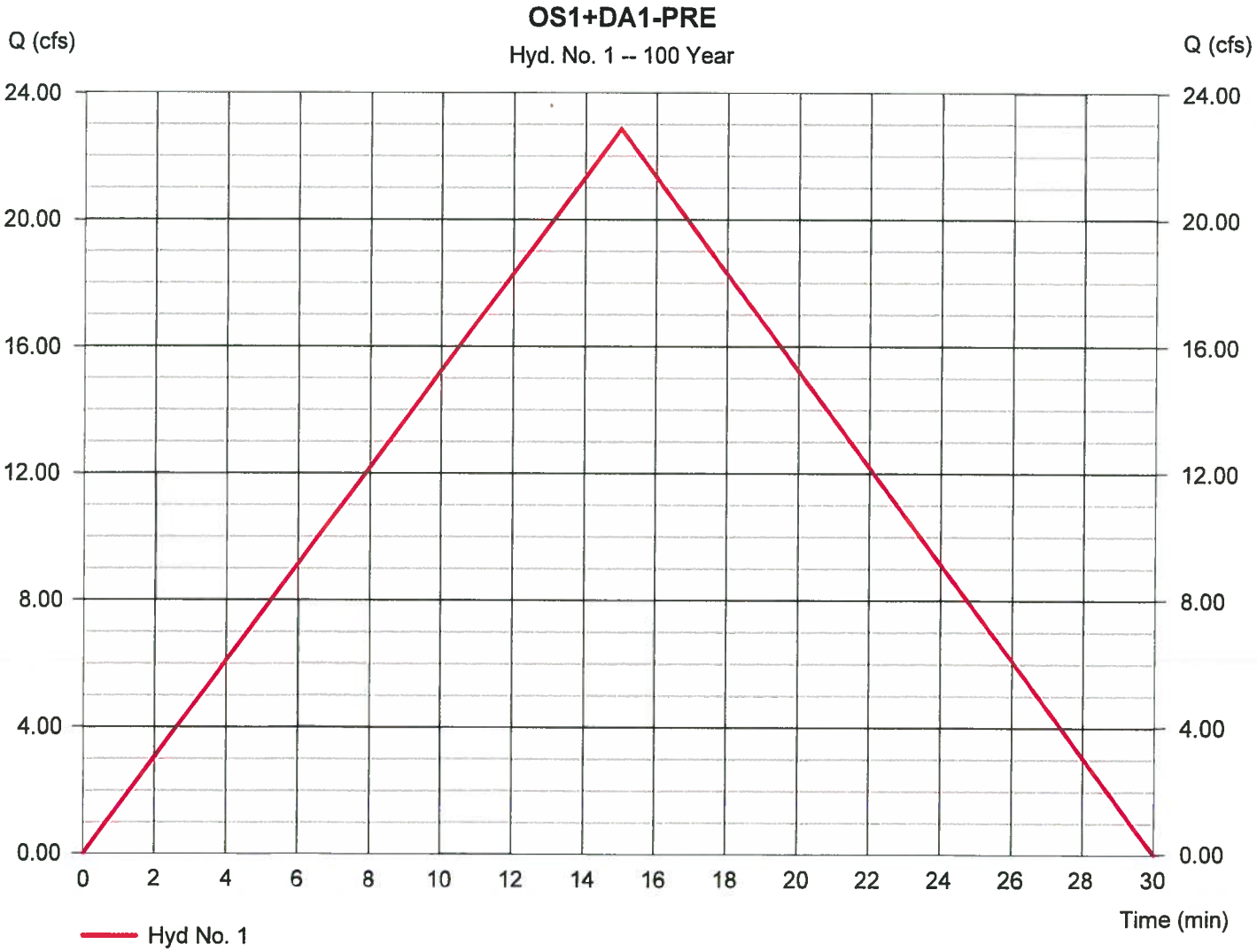
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	22.85	1	15	20,567	-----	-----	-----	OS1+DA1-PRE
2	Rational	52.96	1	15	47,668	-----	-----	-----	OS2+DA2-PRE
3	Rational	36.46	1	15	32,810	-----	-----	-----	OS3+DA3-PRE
5	Rational	29.14	1	15	26,222	-----	-----	-----	OS1+DA1-POST
6	Rational	6.936	1	15	6,242	-----	-----	-----	DA2a-POST
7	Mod. Rational	36.58	1	15	81,314	-----	-----	-----	OS2+DA2b-POST
8	Rational	9.630	1	15	8,667	-----	-----	-----	DA2c-POST
9	Mod. Rational	22.58	1	15	36,785	-----	-----	-----	OS3a+DA3a-POST
10	Rational	17.69	1	15	15,922	-----	-----	-----	OS3b+DA3b
12	Reservoir	34.39	1	38	81,204	7	1186.62	13,664	POND DA2
13	Reservoir	20.65	1	28	36,581	9	1202.30	9,524	POND DA3
16	Combine	75.82	1	15	68,234	1, 2,	-----	-----	(OS1+DA1)+(OS2+DA2)-PRE
17	Combine	69.46	1	15	122,336	5, 6, 8, 12,	-----	-----	(OS1+DA1)+DA2a+DA2c+POND DA
18	Combine	30.11	1	16	52,503	10, 13,	-----	-----	(OS3b+DA3b)+POND DA3
20	Combine	45.70	1	15	41,131	5, 6, 8,	-----	-----	(OS1+DA1)+DA2a+DA2c

Hydrograph Report

Hyd. No. 1

OS1+DA1-PRE

Hydrograph type	= Rational	Peak discharge	= 22.85 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 20,567 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.4
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

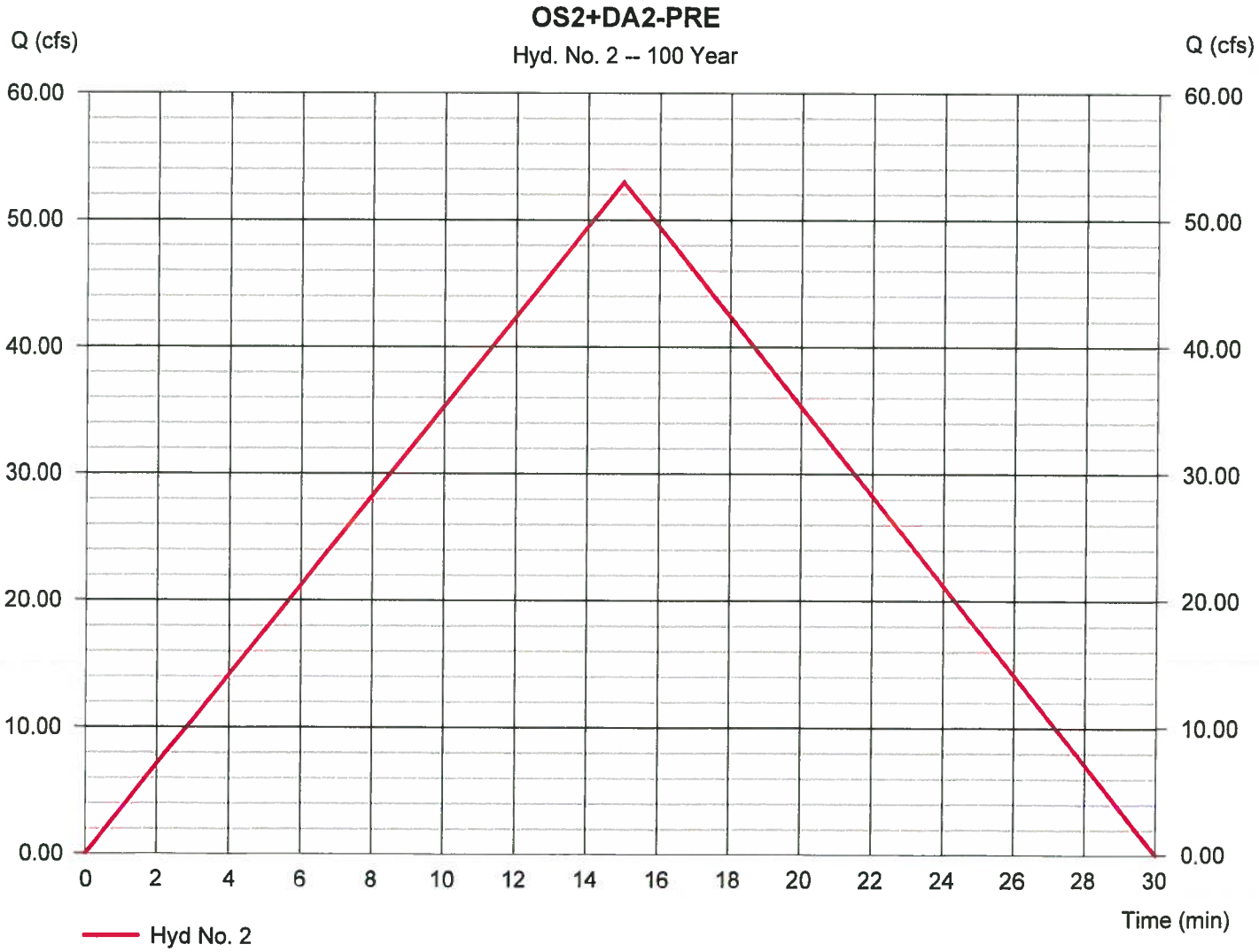


Hydrograph Report

Hyd. No. 2

OS2+DA2-PRE

Hydrograph type	= Rational	Peak discharge	= 52.96 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 47,668 cuft
Drainage area	= 13.860 ac	Runoff coeff.	= 0.4
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hyd. No. 3

OS3+DA3-PRE

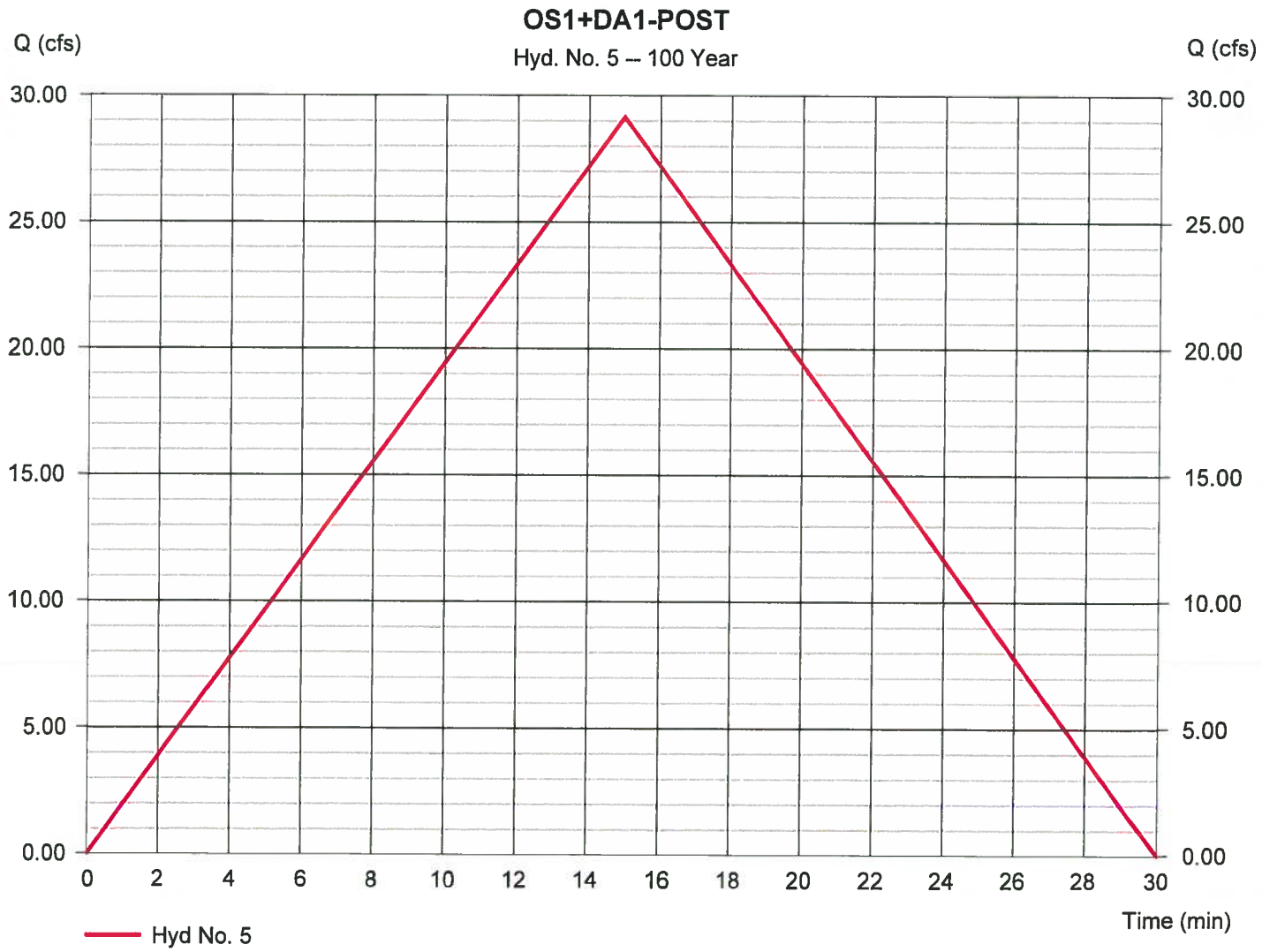
Hydrograph type	= Rational	Peak discharge	= 36.46 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 32,810 cuft
Drainage area	= 9.540 ac	Runoff coeff.	= 0.4
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Report

Hyd. No. 5

OS1+DA1-POST

Hydrograph type	= Rational	Peak discharge	= 29.14 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 26,222 cuft
Drainage area	= 5.980 ac	Runoff coeff.	= 0.51
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

Hyd. No. 6

DA2a-POST

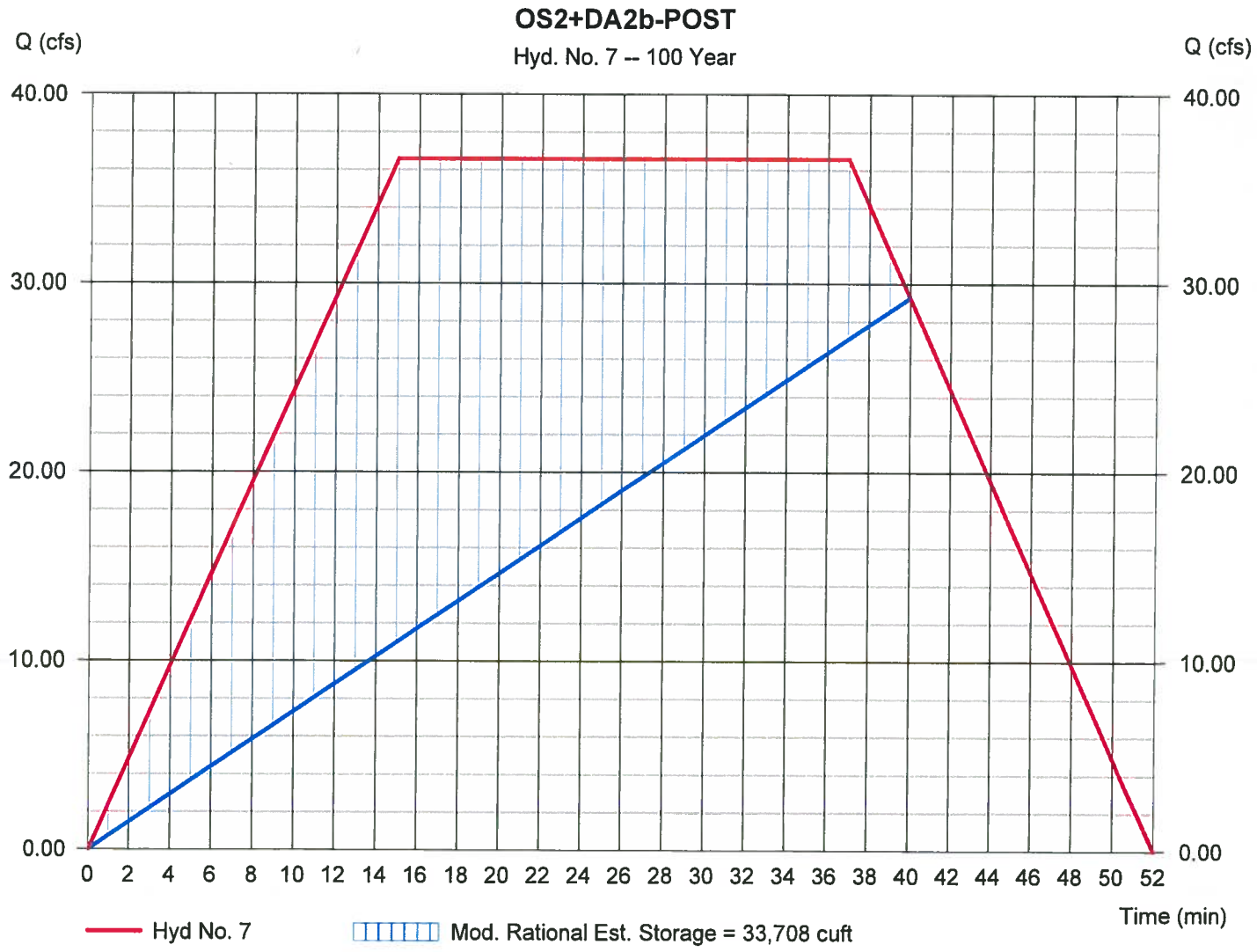
Hydrograph type	= Rational	Peak discharge	= 6.936 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 6,242 cuft
Drainage area	= 1.210 ac	Runoff coeff.	= 0.6
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

Hydrograph Report

Hyd. No. 7

OS2+DA2b-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 36.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 81,314 cuft
Drainage area	= 10.970 ac	Runoff coeff.	= 0.56
Intensity	= 5.954 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 2.5 x Tc
Target Q	=30.12 cfs	Est. Req'd Storage	=33,708 cuft

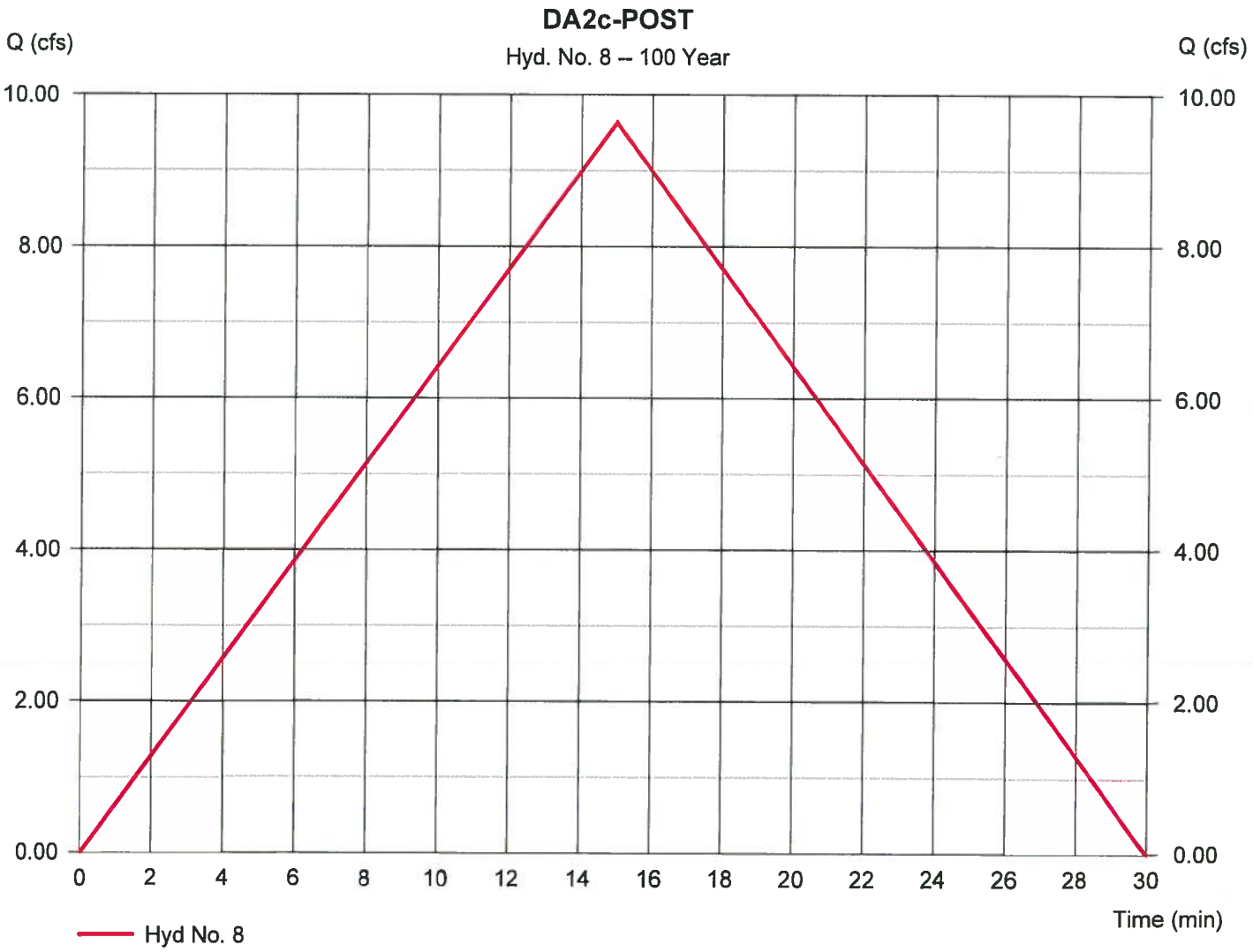


Hydrograph Report

Hyd. No. 8

DA2c-POST

Hydrograph type	= Rational	Peak discharge	= 9.630 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 8,667 cuft
Drainage area	= 1.680 ac	Runoff coeff.	= 0.6
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1

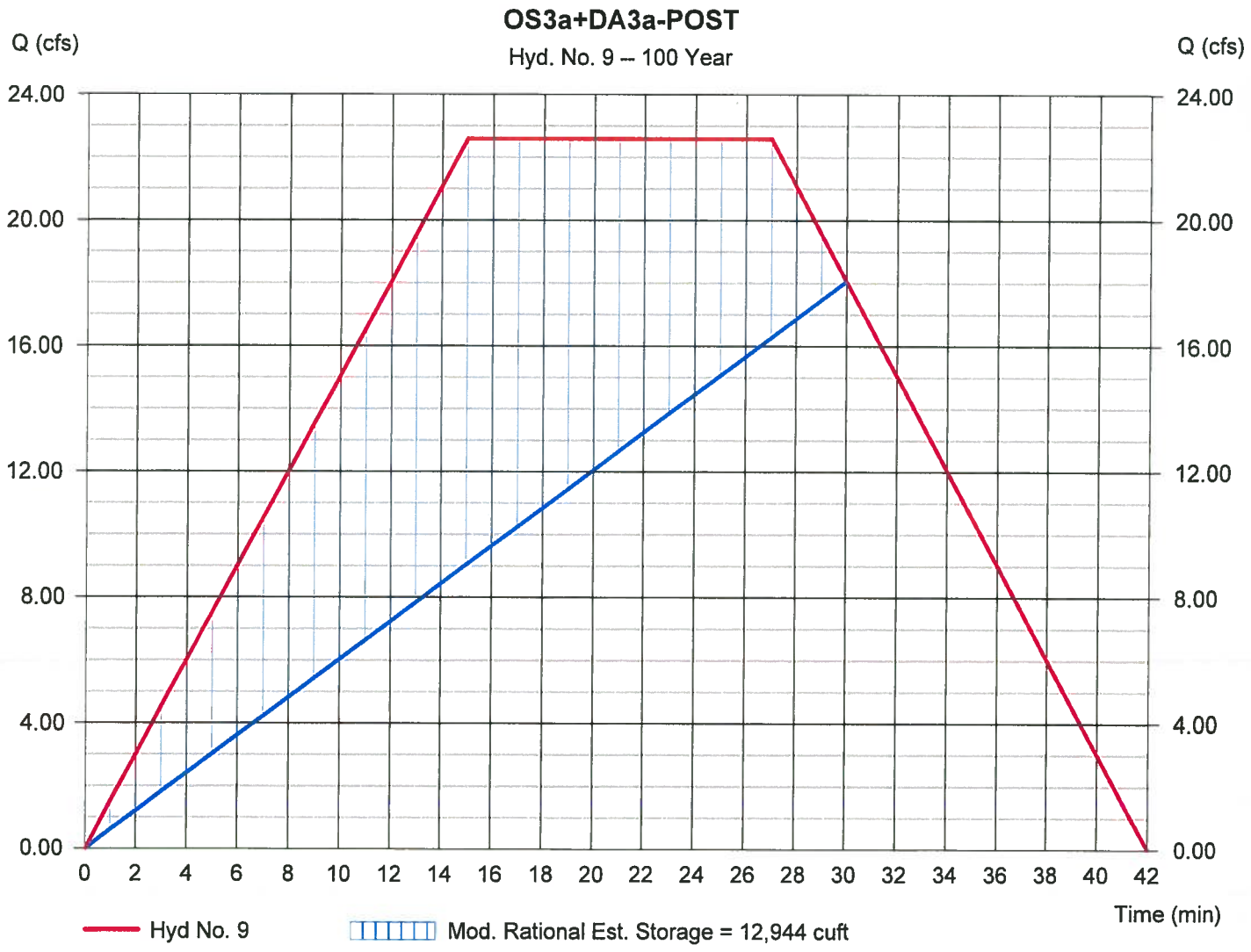


Hydrograph Report

Hyd. No. 9

OS3a+DA3a-POST

Hydrograph type	= Mod. Rational	Peak discharge	= 22.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 36,785 cuft
Drainage area	= 5.600 ac	Runoff coeff.	= 0.57
Intensity	= 7.074 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Storm duration	= 1.8 x Tc
Target Q	=18.77 cfs	Est. Req'd Storage	=12,944 cuft

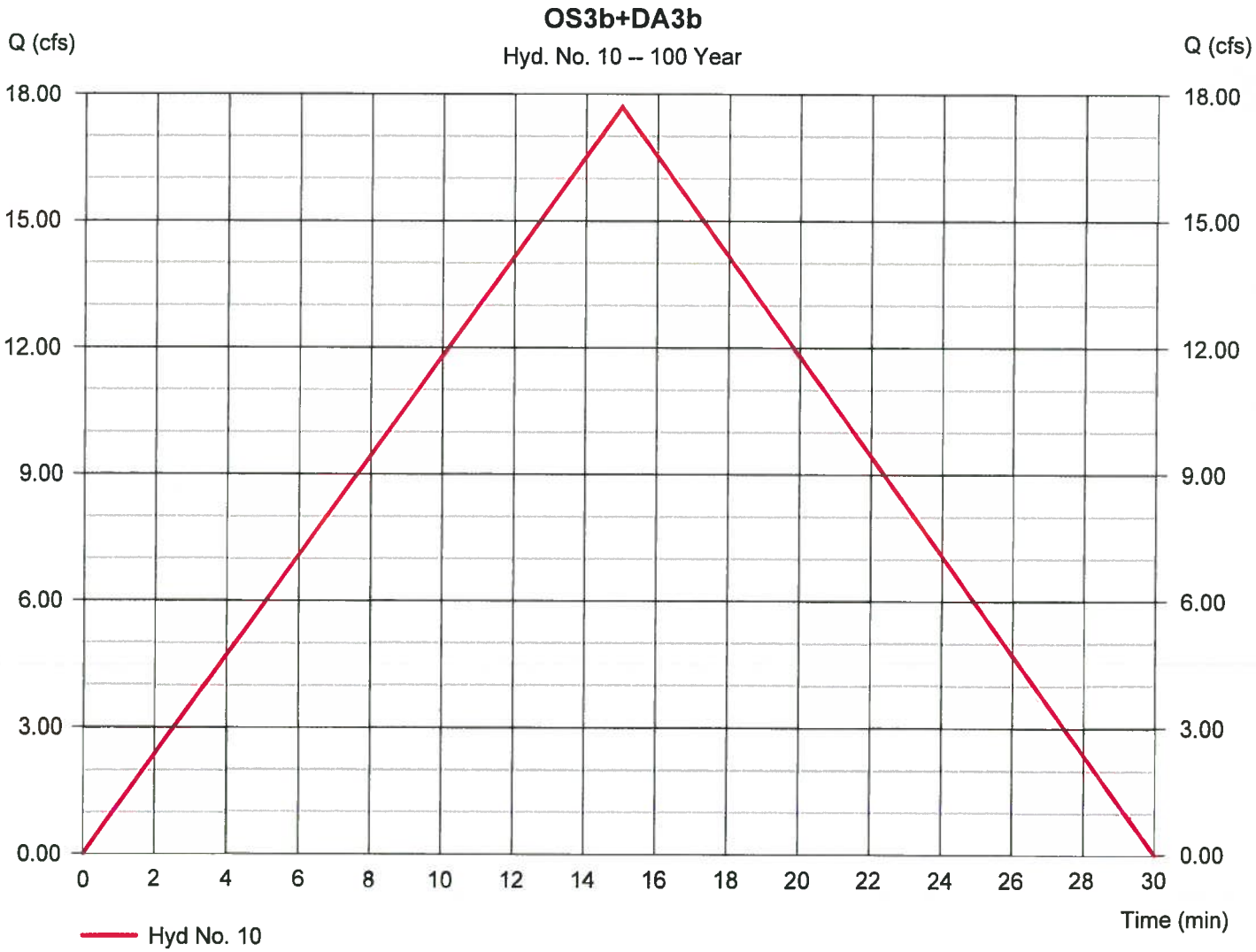


Hydrograph Report

Hyd. No. 10

OS3b+DA3b

Hydrograph type	= Rational	Peak discharge	= 17.69 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 15,922 cuft
Drainage area	= 3.940 ac	Runoff coeff.	= 0.47
Intensity	= 9.553 in/hr	Tc by User	= 15.00 min
IDF Curve	= Johnson City.IDF	Asc/Rec limb fact	= 1/1



Hydrograph Report

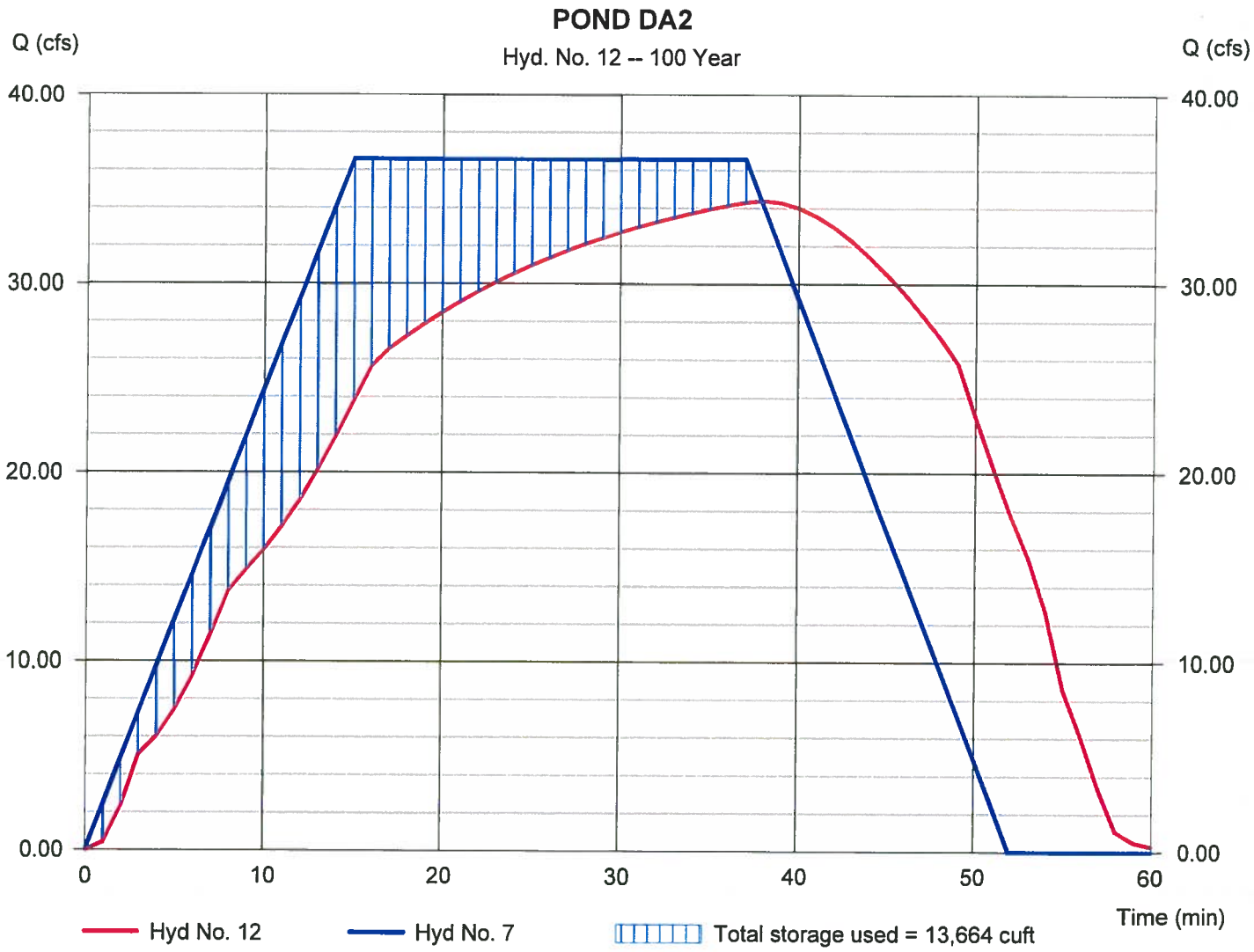
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Hyd. No. 12

POND DA2

Hydrograph type	= Reservoir	Peak discharge	= 34.39 cfs
Storm frequency	= 100 yrs	Time to peak	= 38 min
Time interval	= 1 min	Hyd. volume	= 81,204 cuft
Inflow hyd. No.	= 7 - OS2+DA2b-POST	Max. Elevation	= 1186.62 ft
Reservoir name	= POND DA2	Max. Storage	= 13,664 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 1 - POND DA2

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1185.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1185.00	161	0	0
0.25	1185.25	2,477	330	330
0.50	1185.50	9,489	1,496	1,826
1.00	1186.00	10,291	4,945	6,771
2.00	1187.00	11,991	11,141	17,912
3.00	1188.00	13,821	12,906	30,817

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

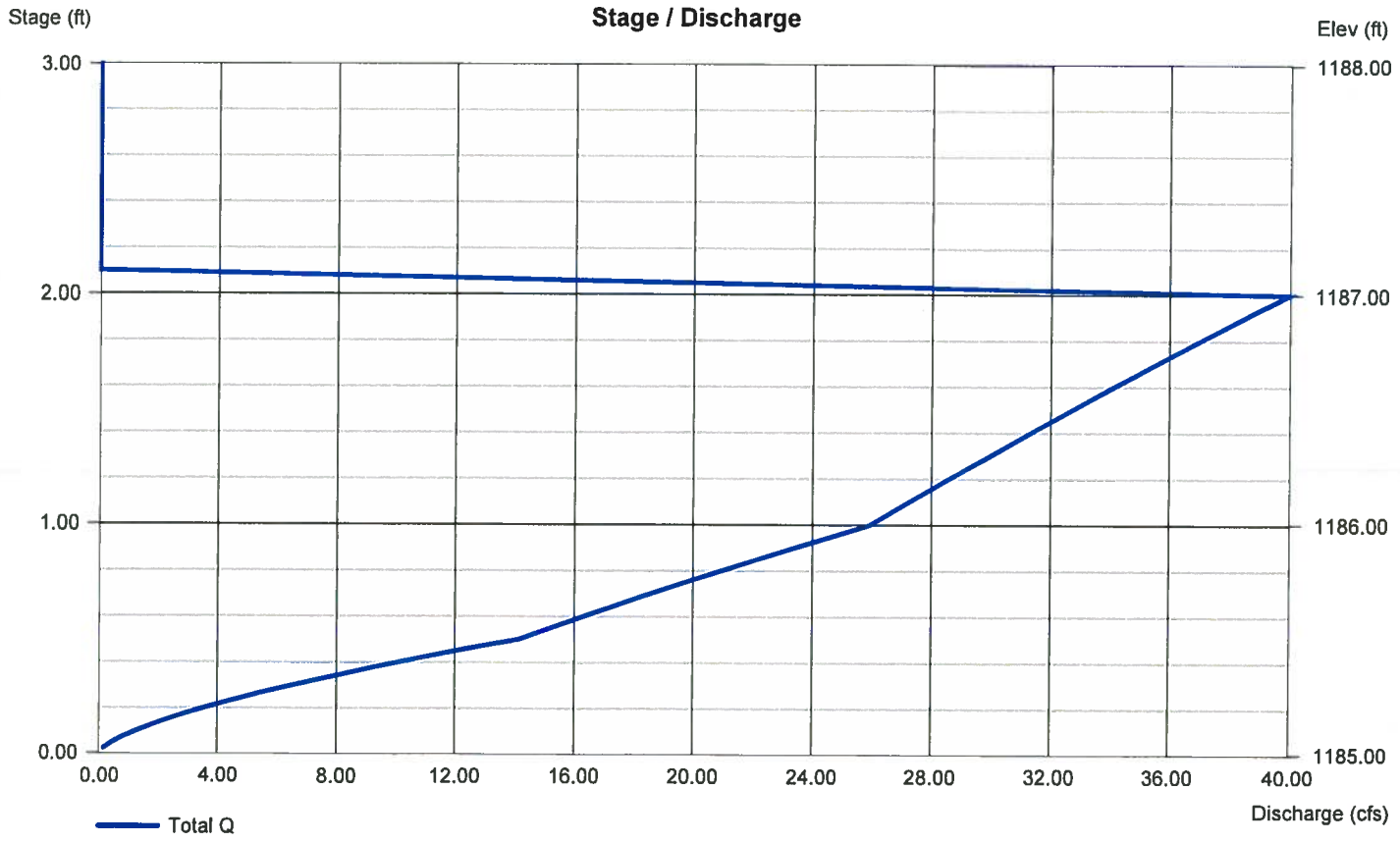
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 1.50	0.00	0.00	0.00
Crest El. (ft)	= 1184.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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



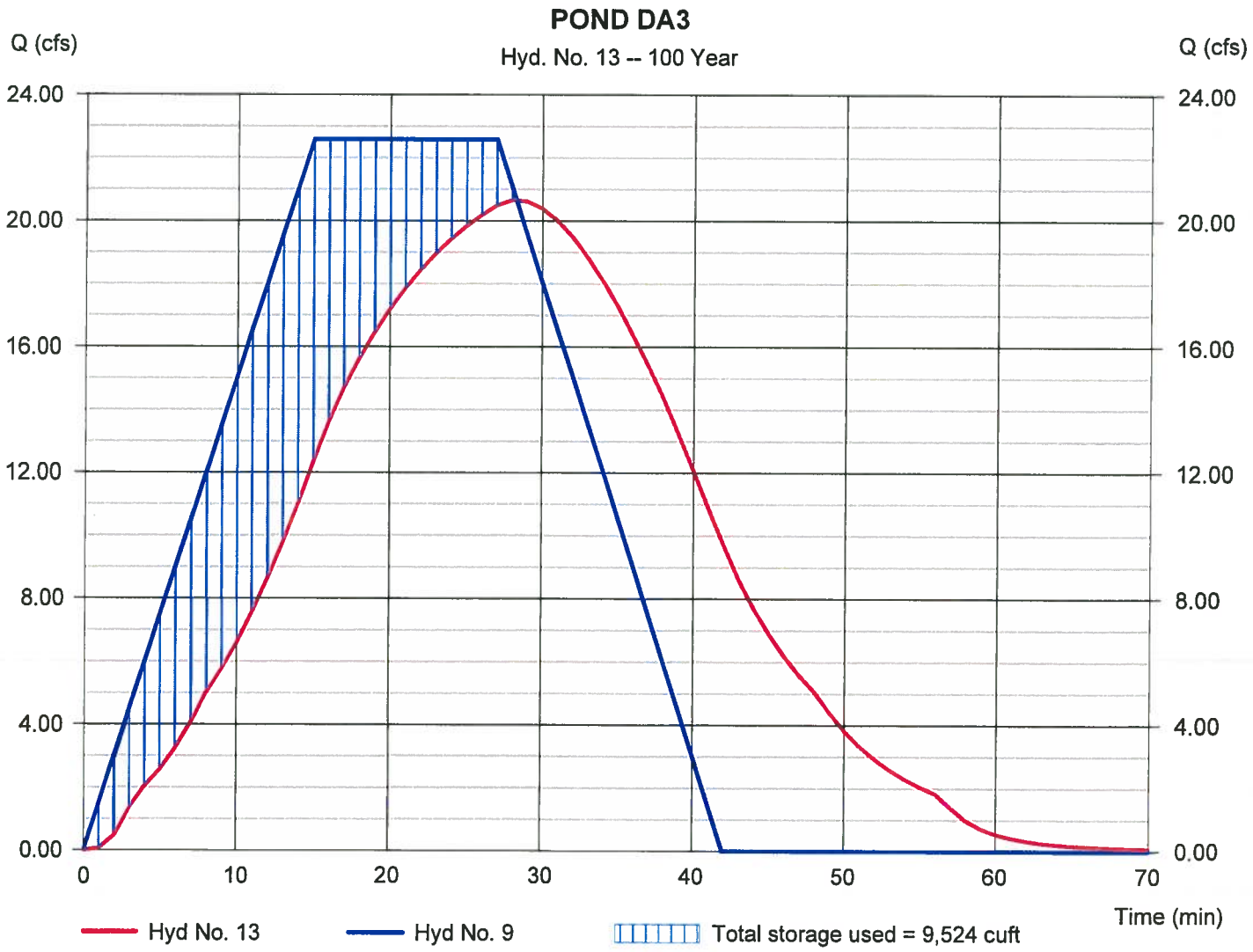
Hydrograph Report

Hyd. No. 13

POND DA3

Hydrograph type	= Reservoir	Peak discharge	= 20.65 cfs
Storm frequency	= 100 yrs	Time to peak	= 28 min
Time interval	= 1 min	Hyd. volume	= 36,581 cuft
Inflow hyd. No.	= 9 - OS3a+DA3a-POST	Max. Elevation	= 1202.30 ft
Reservoir name	= POND DA3	Max. Storage	= 9,524 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® 2019 by Autodesk, Inc. v12 Friday, 06 / 10 / 2022

Pond No. 2 - POND DA3

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1201.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1201.00	245	0	0
0.25	1201.25	2,933	397	397
0.50	1201.50	8,803	1,467	1,864
1.00	1202.00	9,554	4,589	6,454
2.00	1203.00	11,148	10,351	16,805
2.50	1203.50	11,990	5,785	22,589

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

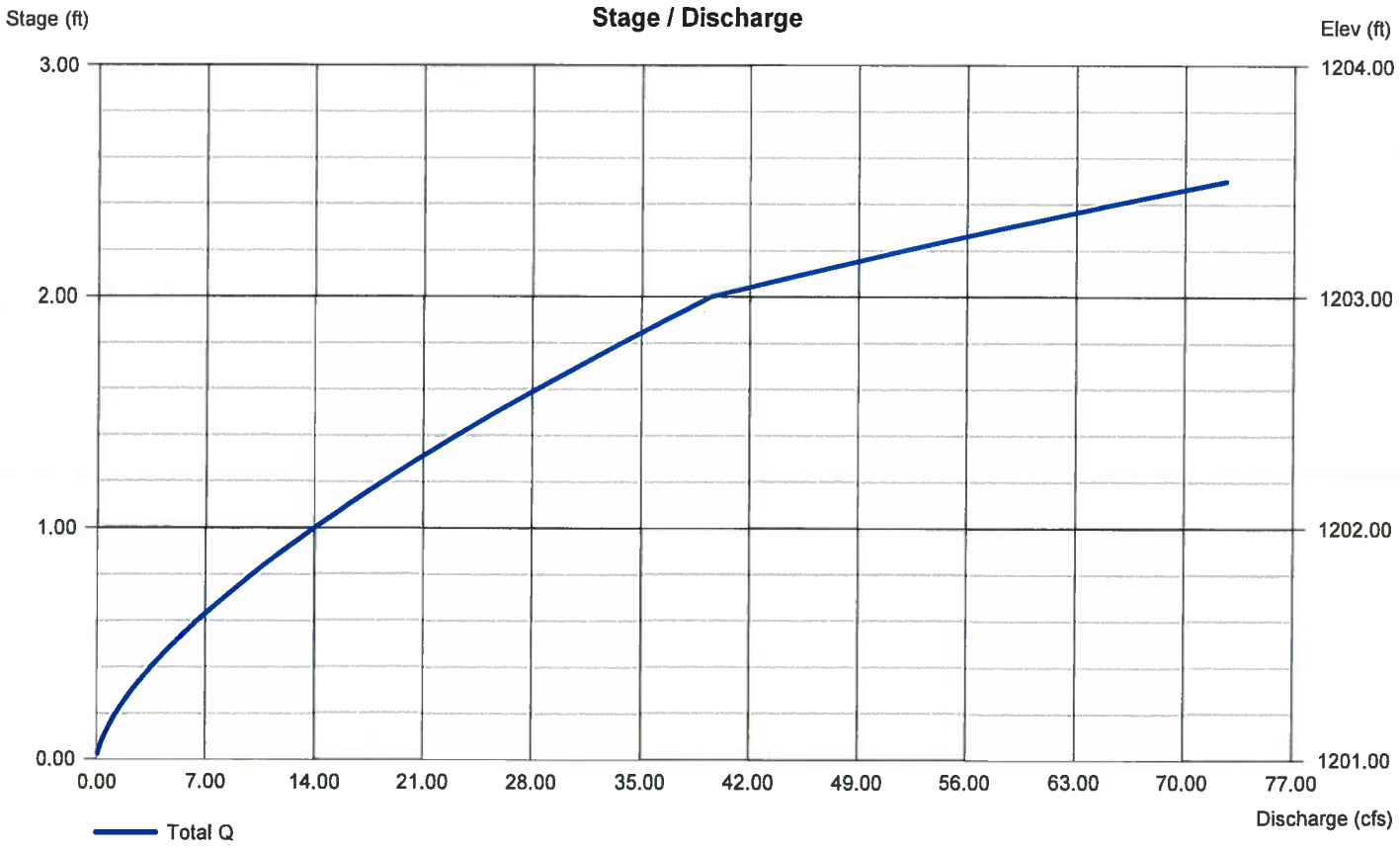
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 4.20	0.00	0.00	0.00
Crest El. (ft)	= 1201.00	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) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

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

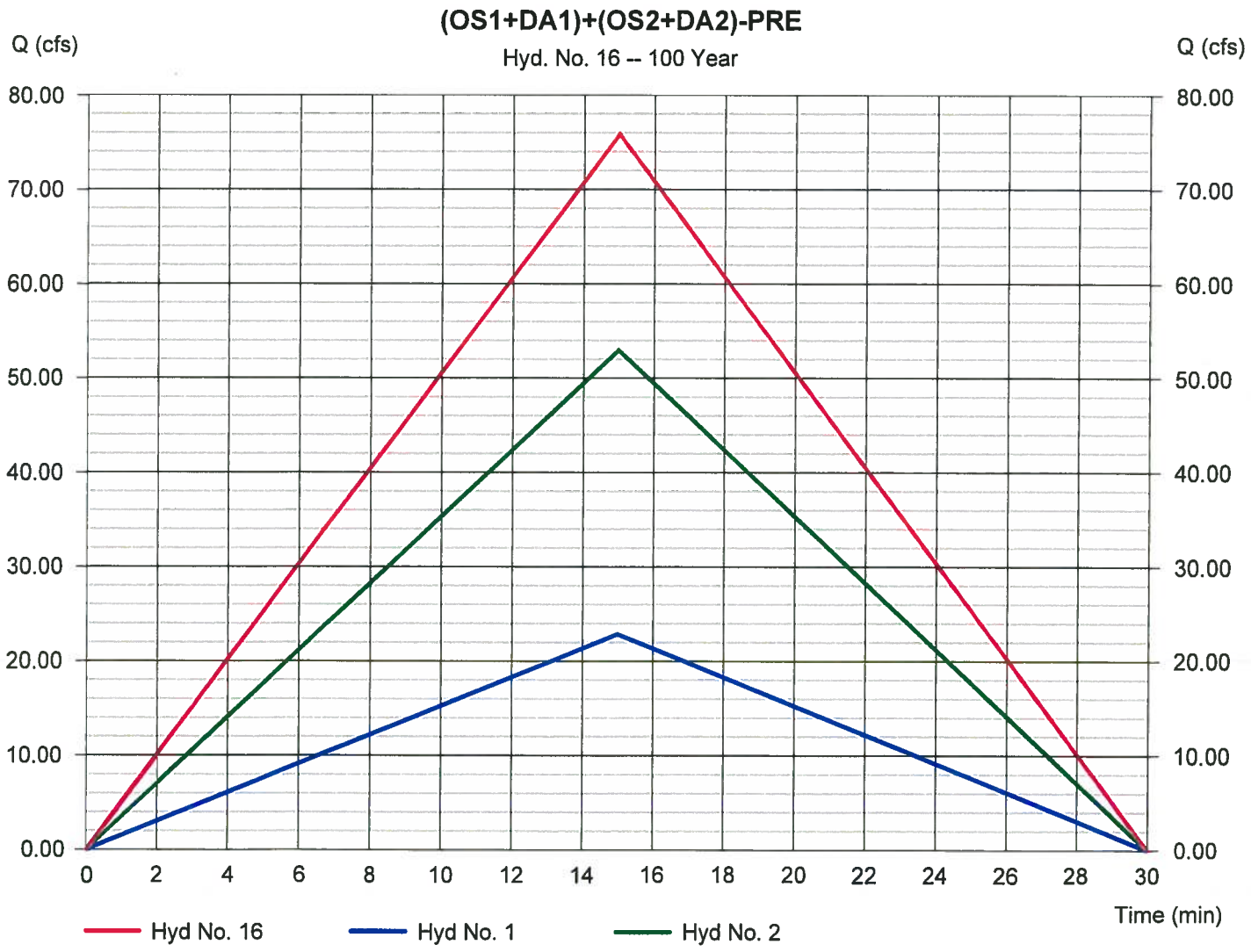


Hydrograph Report

Hyd. No. 16

(OS1+DA1)+(OS2+DA2)-PRE

Hydrograph type	= Combine	Peak discharge	= 75.82 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 68,234 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 19.840 ac

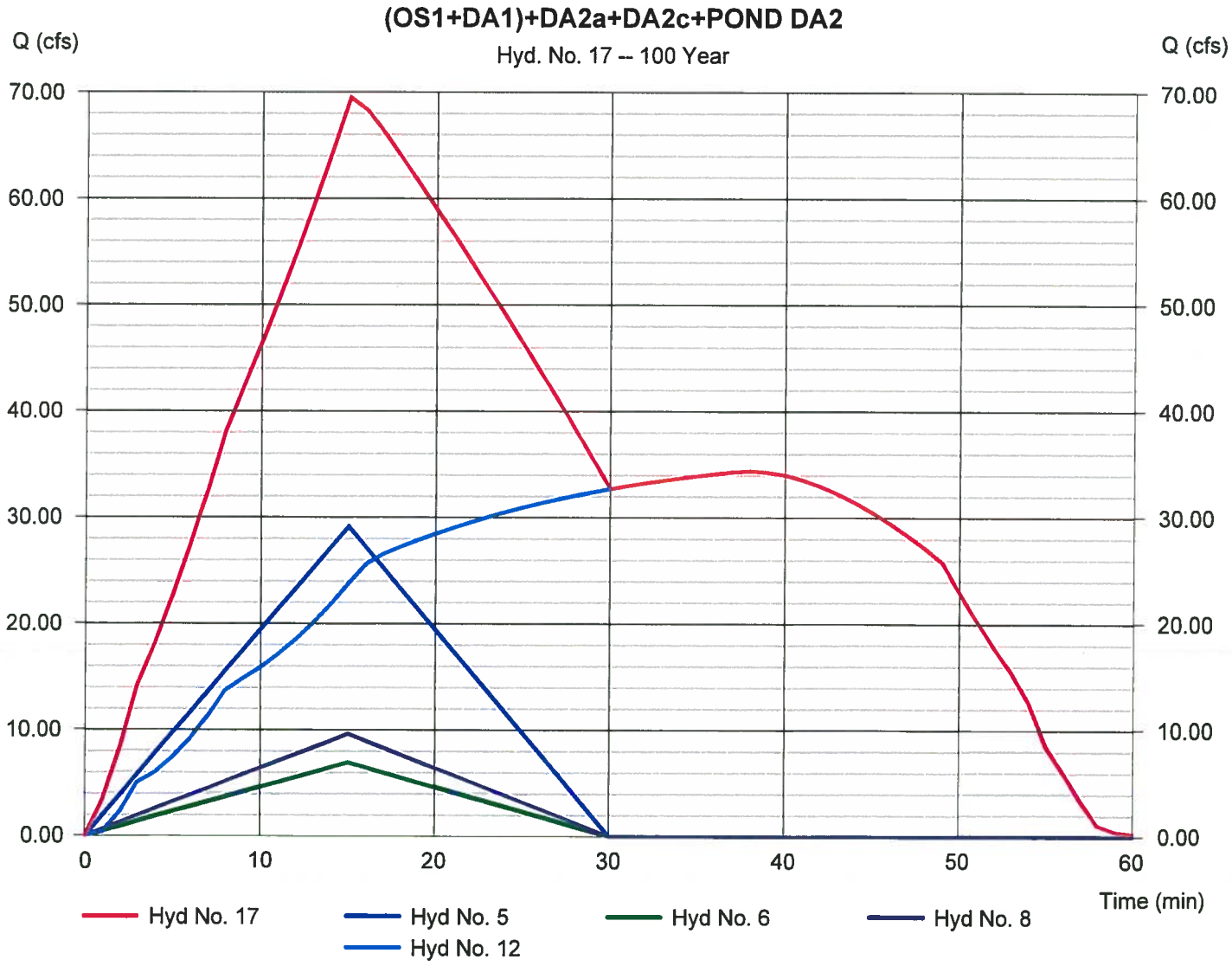


Hydrograph Report

Hyd. No. 17

(OS1+DA1)+DA2a+DA2c+POND DA2

Hydrograph type	= Combine	Peak discharge	= 69.46 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 122,336 cuft
Inflow hyds.	= 5, 6, 8, 12	Contrib. drain. area	= 8.870 ac

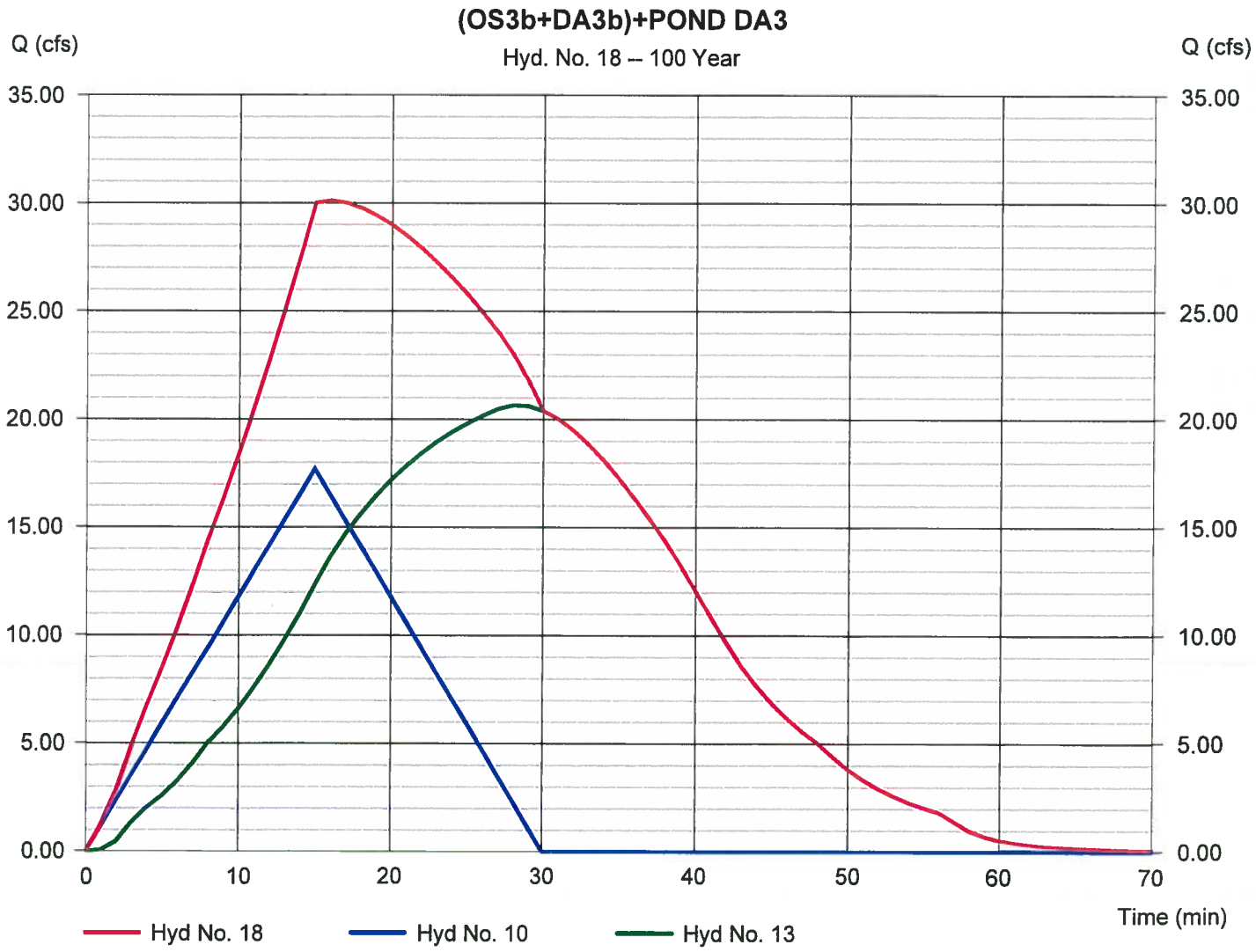


Hydrograph Report

Hyd. No. 18

(OS3b+DA3b)+POND DA3

Hydrograph type	= Combine	Peak discharge	= 30.11 cfs
Storm frequency	= 100 yrs	Time to peak	= 16 min
Time interval	= 1 min	Hyd. volume	= 52,503 cuft
Inflow hyds.	= 10, 13	Contrib. drain. area	= 3.940 ac

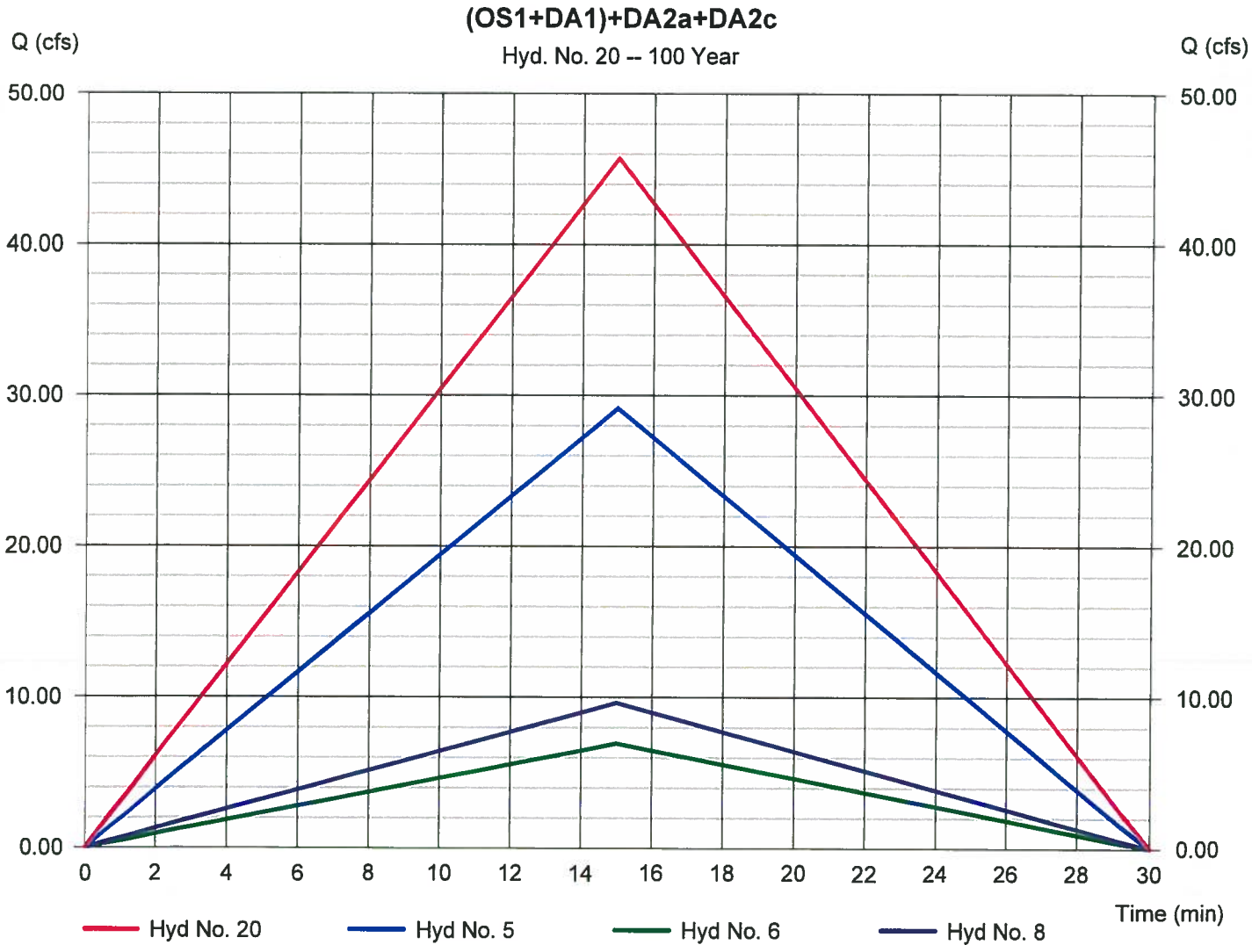


Hydrograph Report

Hyd. No. 20

(OS1+DA1)+DA2a+DA2c

Hydrograph type	= Combine	Peak discharge	= 45.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 15 min
Time interval	= 1 min	Hyd. volume	= 41,131 cuft
Inflow hyds.	= 5, 6, 8	Contrib. drain. area	= 8.870 ac



APPENDIX C

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

ROADSIDE CHANNEL - A1 - 100YR

Trapezoidal

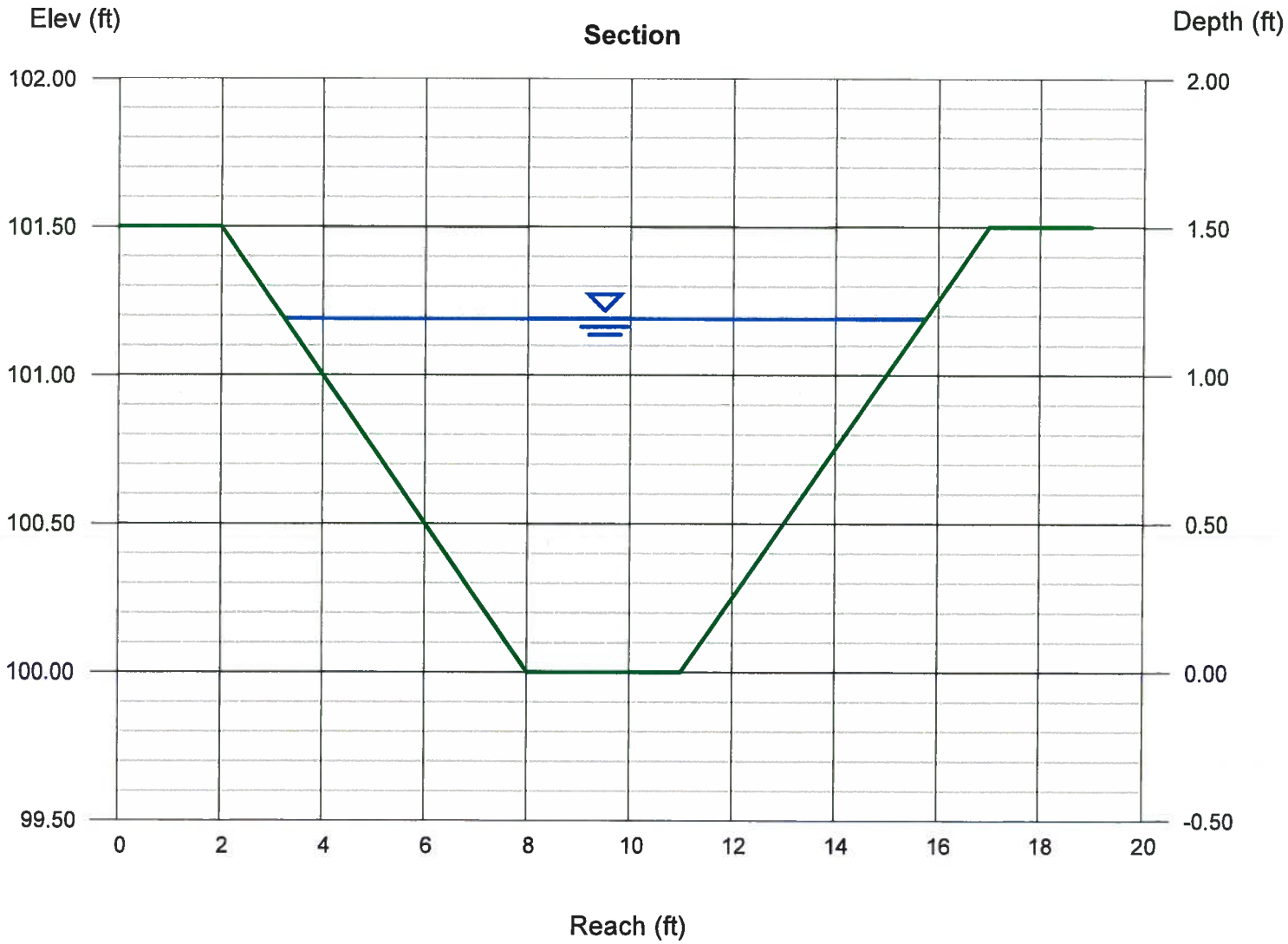
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 0.52
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 22.51

Highlighted

Depth (ft)	= 1.19
Q (cfs)	= 22.51
Area (sqft)	= 9.23
Velocity (ft/s)	= 2.44
Wetted Perim (ft)	= 12.81
Crit Depth, Yc (ft)	= 0.85
Top Width (ft)	= 12.52
EGL (ft)	= 1.28



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

ROADSIDE CHANNEL - A2 - 100YR

Trapezoidal

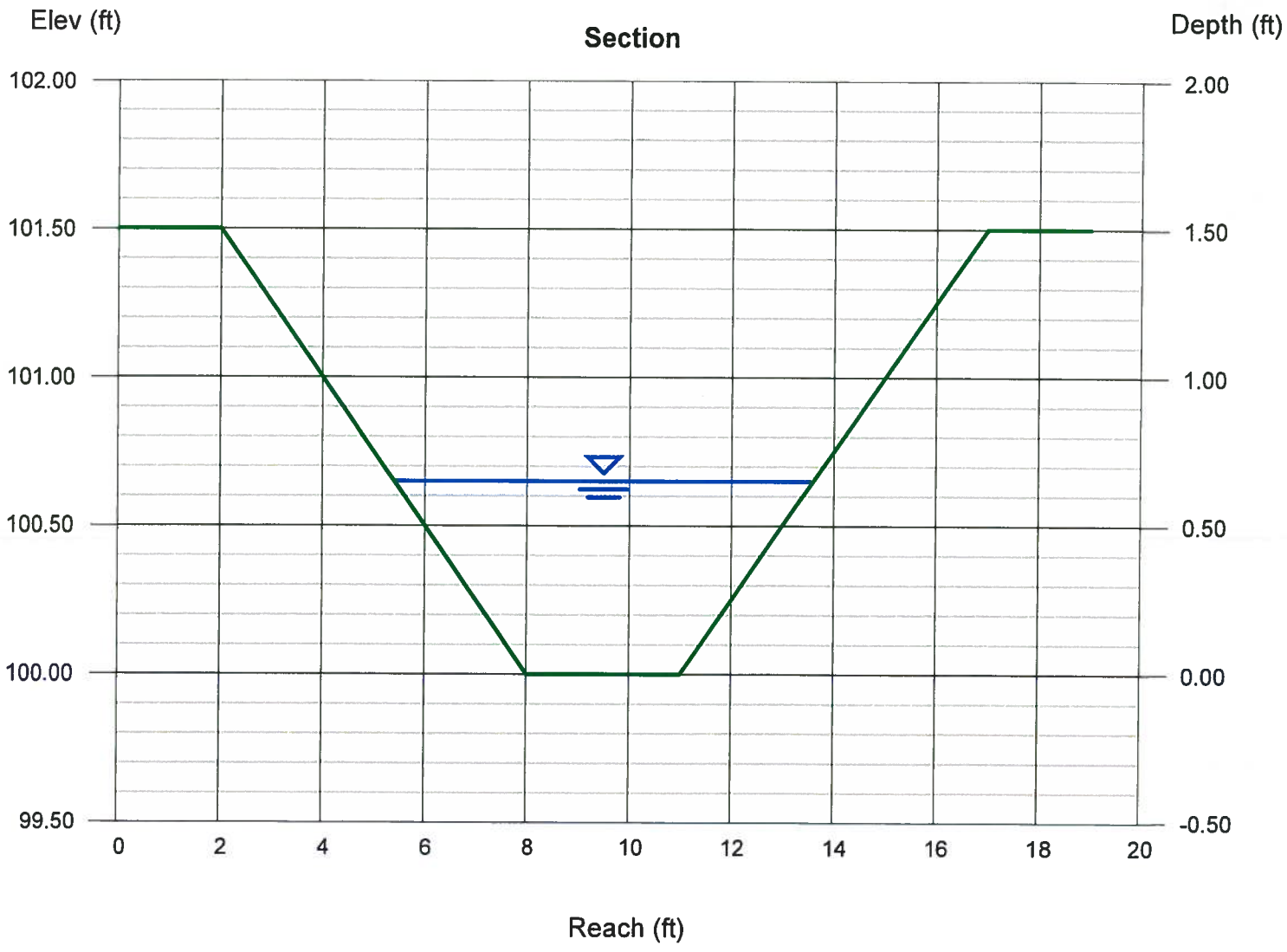
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 2.35
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 13.56

Highlighted

Depth (ft)	= 0.65
Q (cfs)	= 13.56
Area (sqft)	= 3.64
Velocity (ft/s)	= 3.73
Wetted Perim (ft)	= 8.36
Crit Depth, Yc (ft)	= 0.65
Top Width (ft)	= 8.20
EGL (ft)	= 0.87



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

ROADSIDE CHANNEL - A3 - 100YR

Trapezoidal

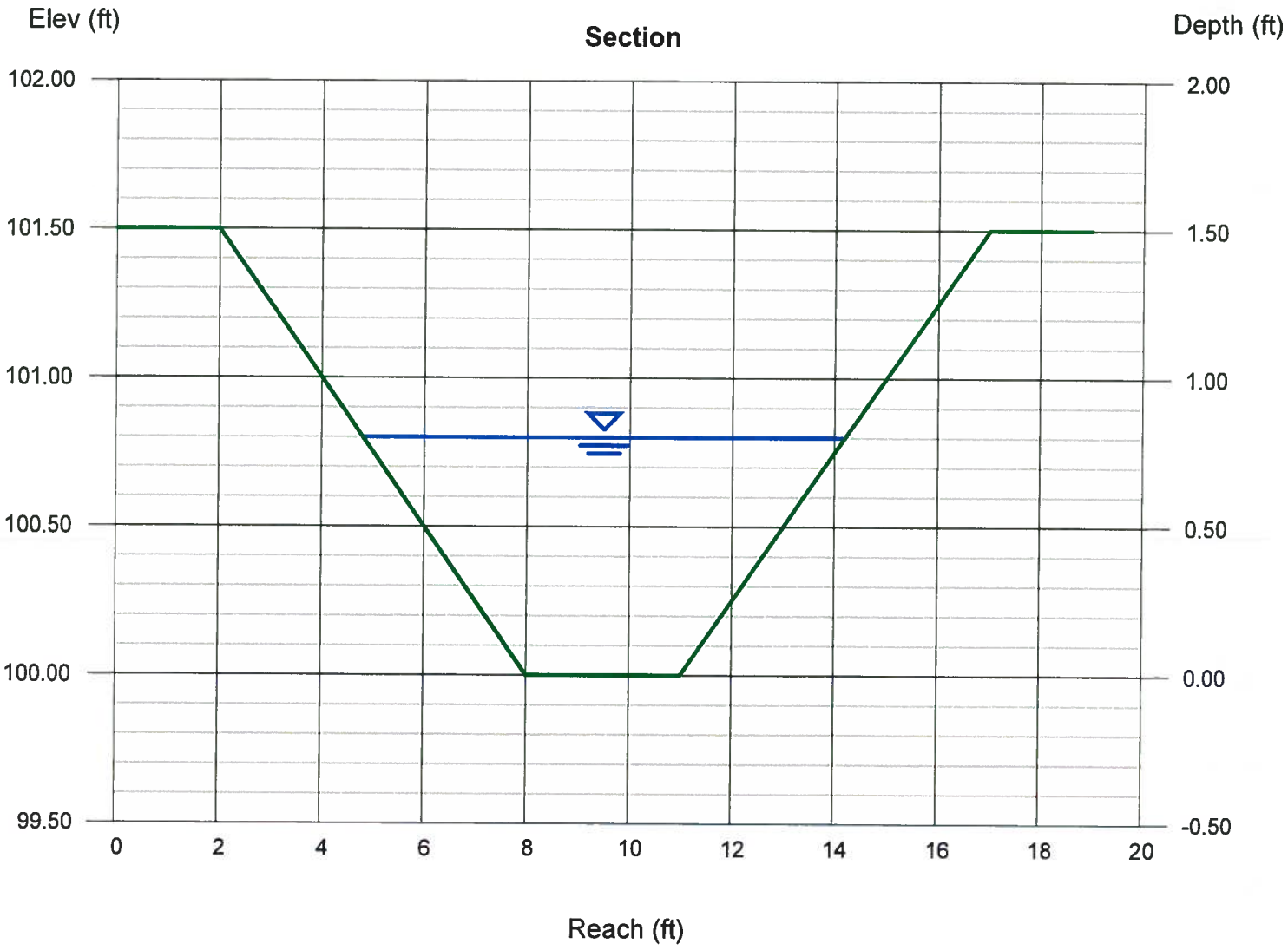
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 3.44
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 25.08

Highlighted

Depth (ft)	= 0.80
Q (cfs)	= 25.08
Area (sqft)	= 4.96
Velocity (ft/s)	= 5.06
Wetted Perim (ft)	= 9.60
Crit Depth, Yc (ft)	= 0.89
Top Width (ft)	= 9.40
EGL (ft)	= 1.20



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

ROADSIDE CHANNEL - A4 - 100YR

Trapezoidal

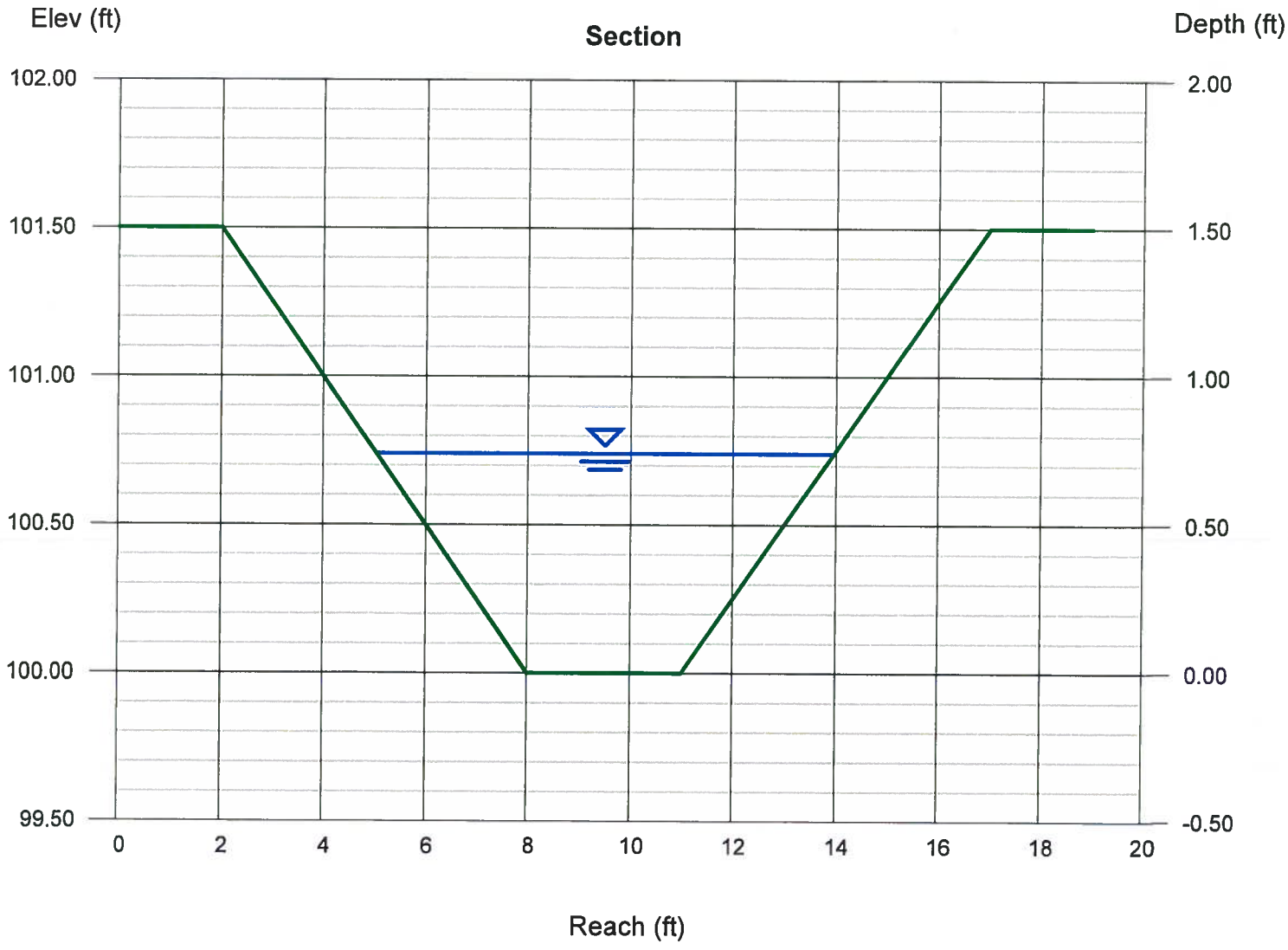
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 2.55
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 18.27

Highlighted

Depth (ft)	= 0.74
Q (cfs)	= 18.27
Area (sqft)	= 4.41
Velocity (ft/s)	= 4.14
Wetted Perim (ft)	= 9.10
Crit Depth, Yc (ft)	= 0.76
Top Width (ft)	= 8.92
EGL (ft)	= 1.01



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

ROADSIDE CHANNEL - A5 - 100YR

Trapezoidal

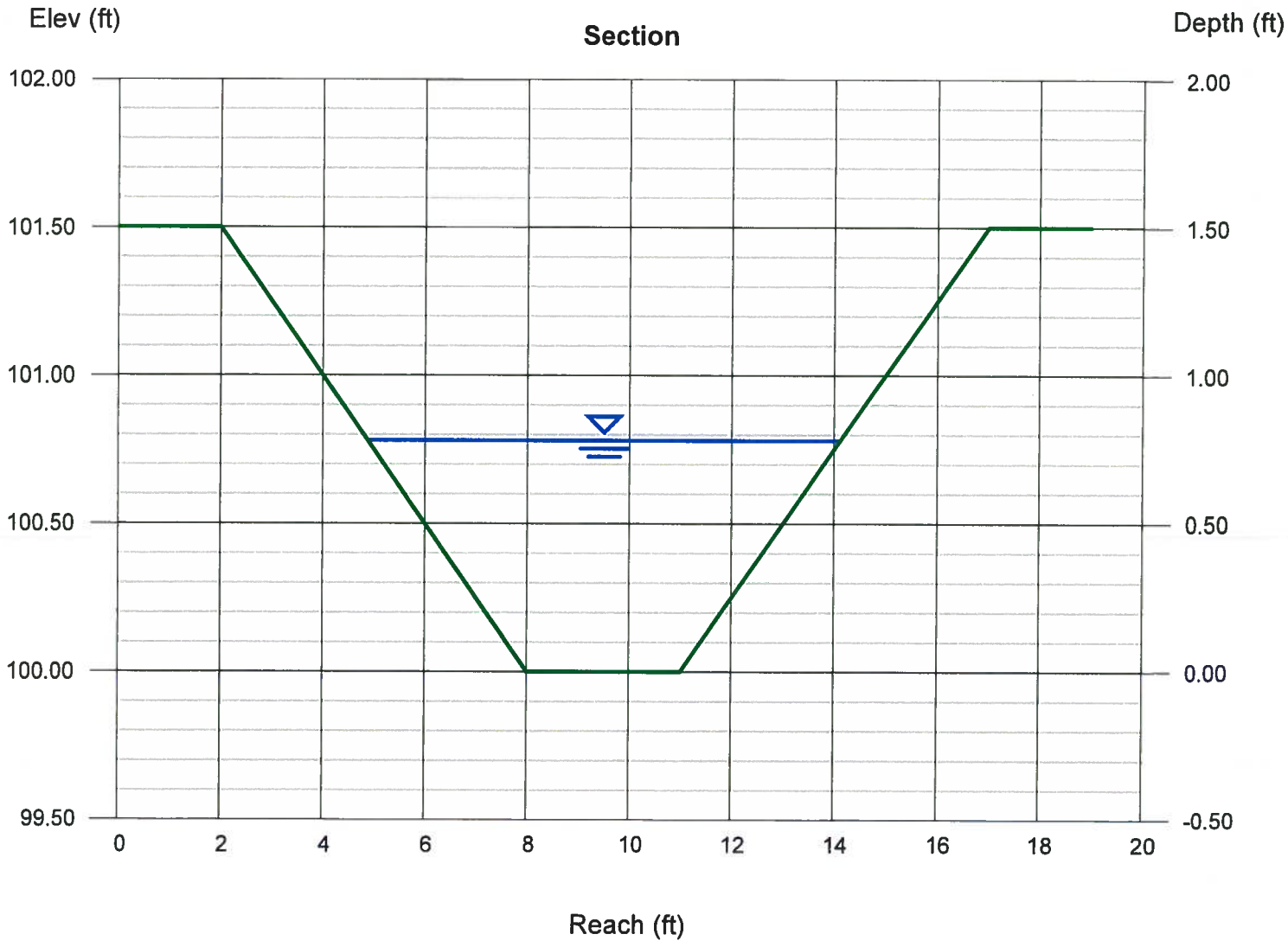
Bottom Width (ft)	= 3.00
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 1.50
Invert Elev (ft)	= 100.00
Slope (%)	= 2.97
N-Value	= 0.035

Calculations

Compute by:	Known Q
Known Q (cfs)	= 21.83

Highlighted

Depth (ft)	= 0.78
Q (cfs)	= 21.83
Area (sqft)	= 4.77
Velocity (ft/s)	= 4.57
Wetted Perim (ft)	= 9.43
Crit Depth, Yc (ft)	= 0.83
Top Width (ft)	= 9.24
EGL (ft)	= 1.11



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 6 2022

SECTION A - PHASE I - 100 YR

User-defined

Invert Elev (ft)	= 1175.00
Slope (%)	= 0.80
N-Value	= 0.035

Calculations

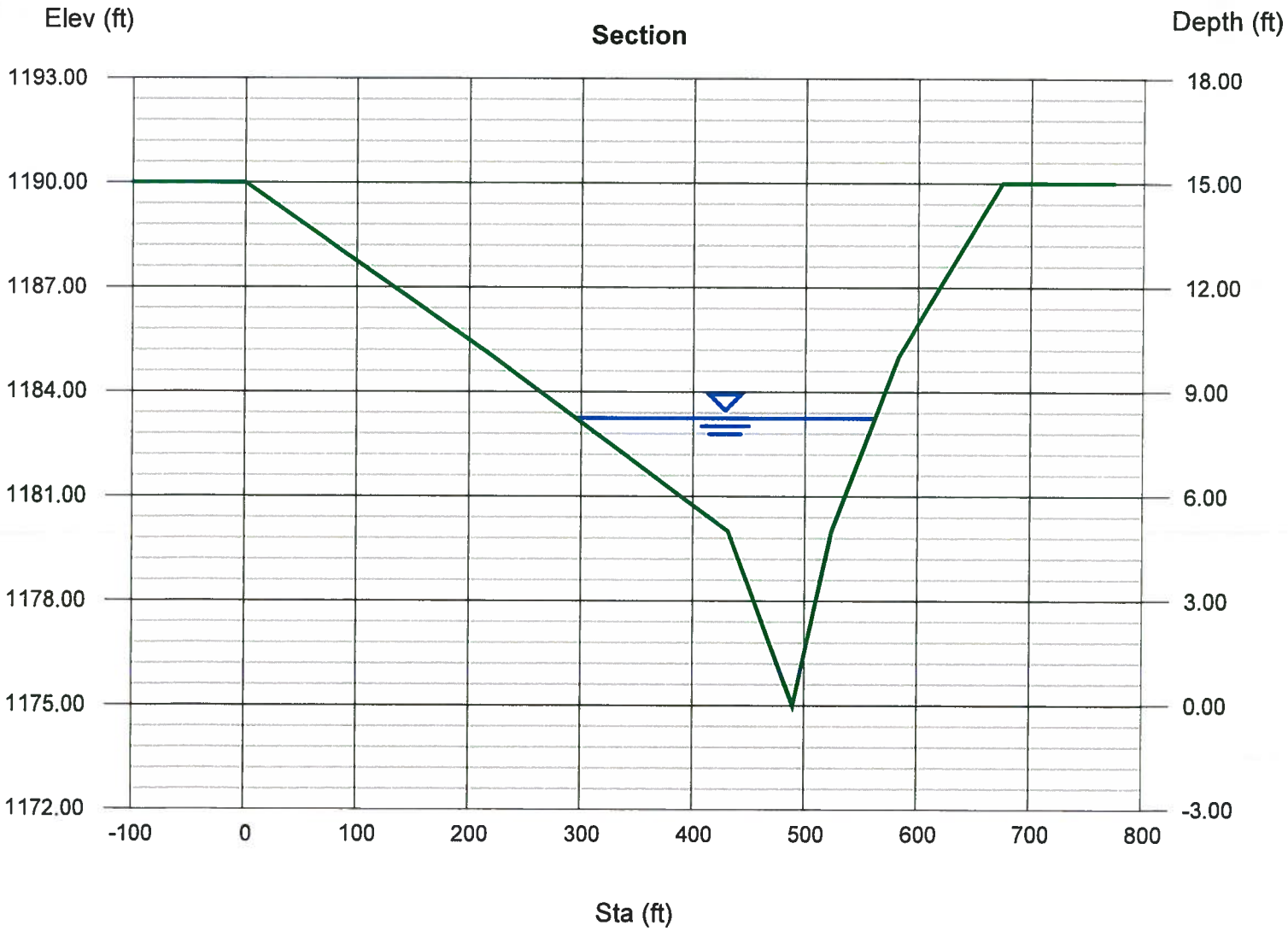
Compute by:	Known Q
Known Q (cfs)	= 6470.00

Highlighted

Depth (ft)	= 8.24
Q (cfs)	= 6,470
Area (sqft)	= 812.37
Velocity (ft/s)	= 7.96
Wetted Perim (ft)	= 267.22
Crit Depth, Yc (ft)	= 7.70
Top Width (ft)	= 266.46
EGL (ft)	= 9.23

(Sta, El, n)-(Sta, El, n)...

(0.00, 1190.00)-(221.40, 1185.00, 0.035)-(431.20, 1180.00, 0.035)-(489.80, 1175.00, 0.035)-(523.60, 1180.00, 0.035)-(582.40, 1185.00, 0.035)-(674.30, 1190.00, 0.0



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 6 2022

SECTION B - PHASE I - 100YR

User-defined

Invert Elev (ft)	= 1180.00
Slope (%)	= 0.80
N-Value	= 0.035

Calculations

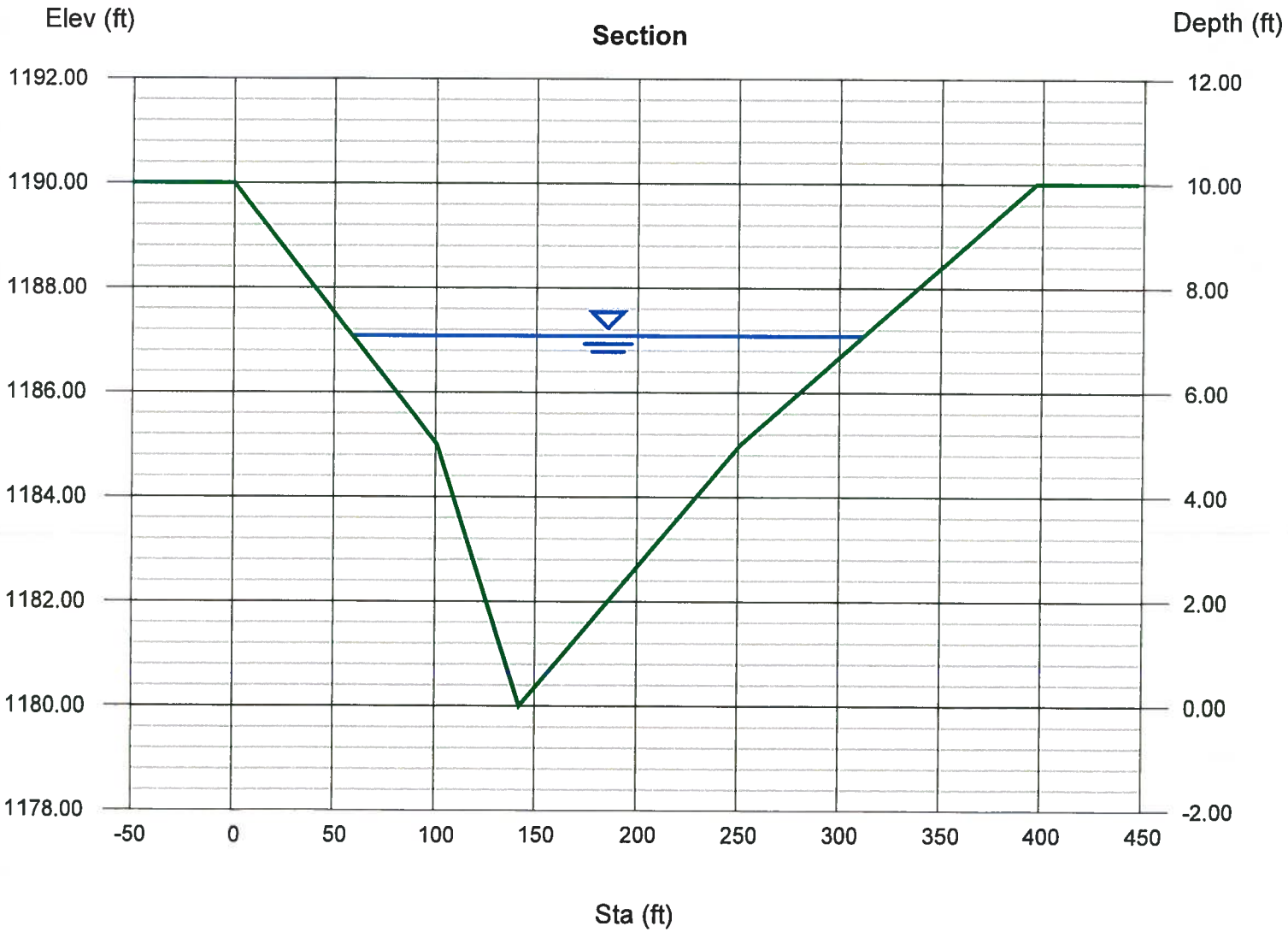
Compute by:	Known Q
Known Q (cfs)	= 6470.00

Highlighted

Depth (ft)	= 7.08
Q (cfs)	= 6,470
Area (sqft)	= 795.54
Velocity (ft/s)	= 8.13
Wetted Perim (ft)	= 253.49
Crit Depth, Yc (ft)	= 6.54
Top Width (ft)	= 252.99
EGL (ft)	= 8.11

(Sta, El, n)-(Sta, El, n)...

(0.00, 1190.00)-(100.80, 1185.00, 0.035)-(142.30, 1180.00, 0.035)-(251.20, 1185.00, 0.035)-(397.00, 1190.00, 0.035)



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

SECTION BETWEEN LOTS OS3

Triangular

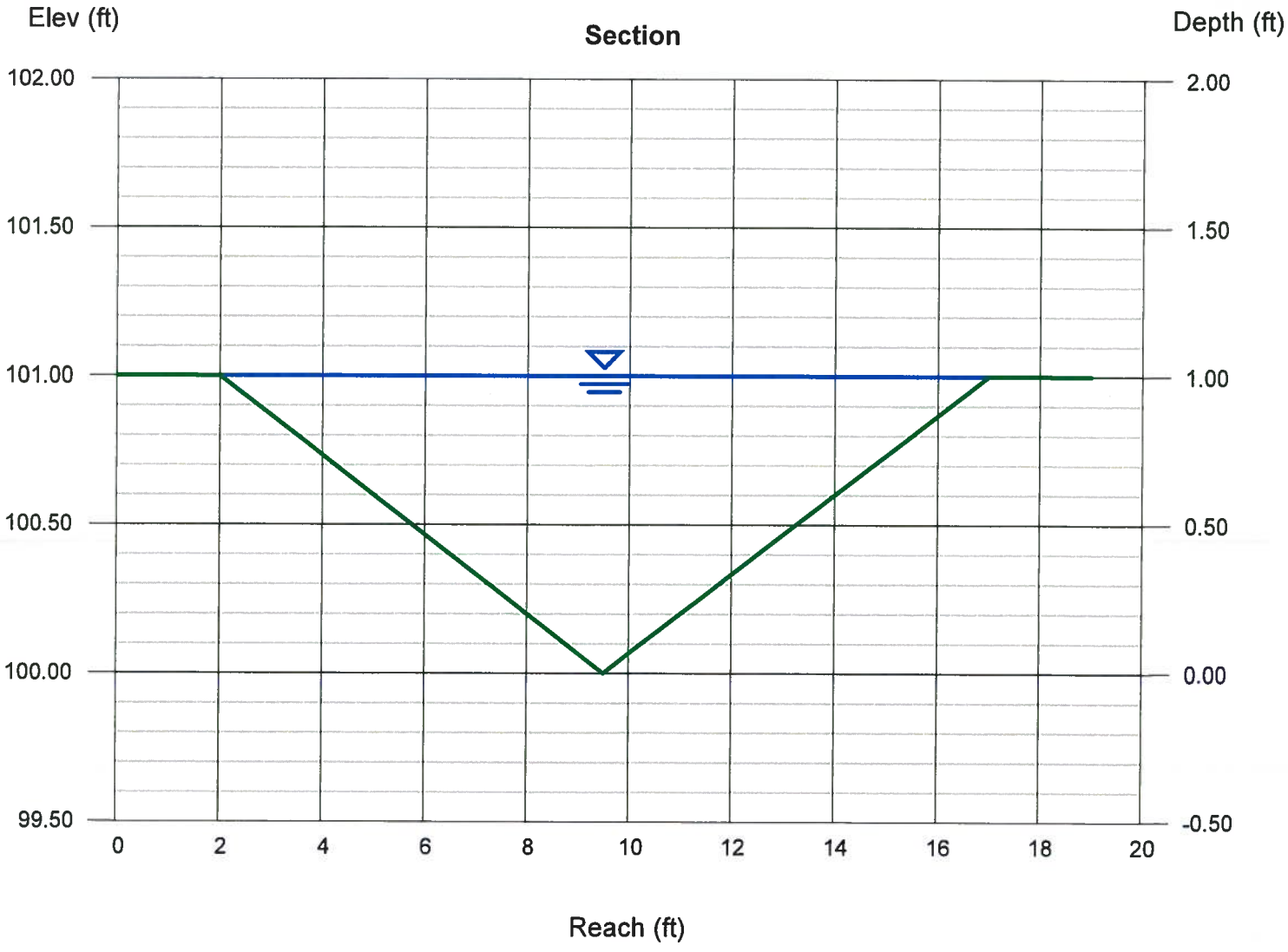
Side Slopes (z:1)	= 7.50, 7.50
Total Depth (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 3.50
N-Value	= 0.035

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.00

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 37.30
Area (sqft)	= 7.50
Velocity (ft/s)	= 4.97
Wetted Perim (ft)	= 15.13
Crit Depth, Yc (ft)	= 1.00
Top Width (ft)	= 15.00
EGL (ft)	= 1.38



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 6 2022

SECTION OVER DUCTILE IRON PIPE - 100 YR

User-defined

Invert Elev (ft)	= 1160.00
Slope (%)	= 0.80
N-Value	= 0.035

Calculations

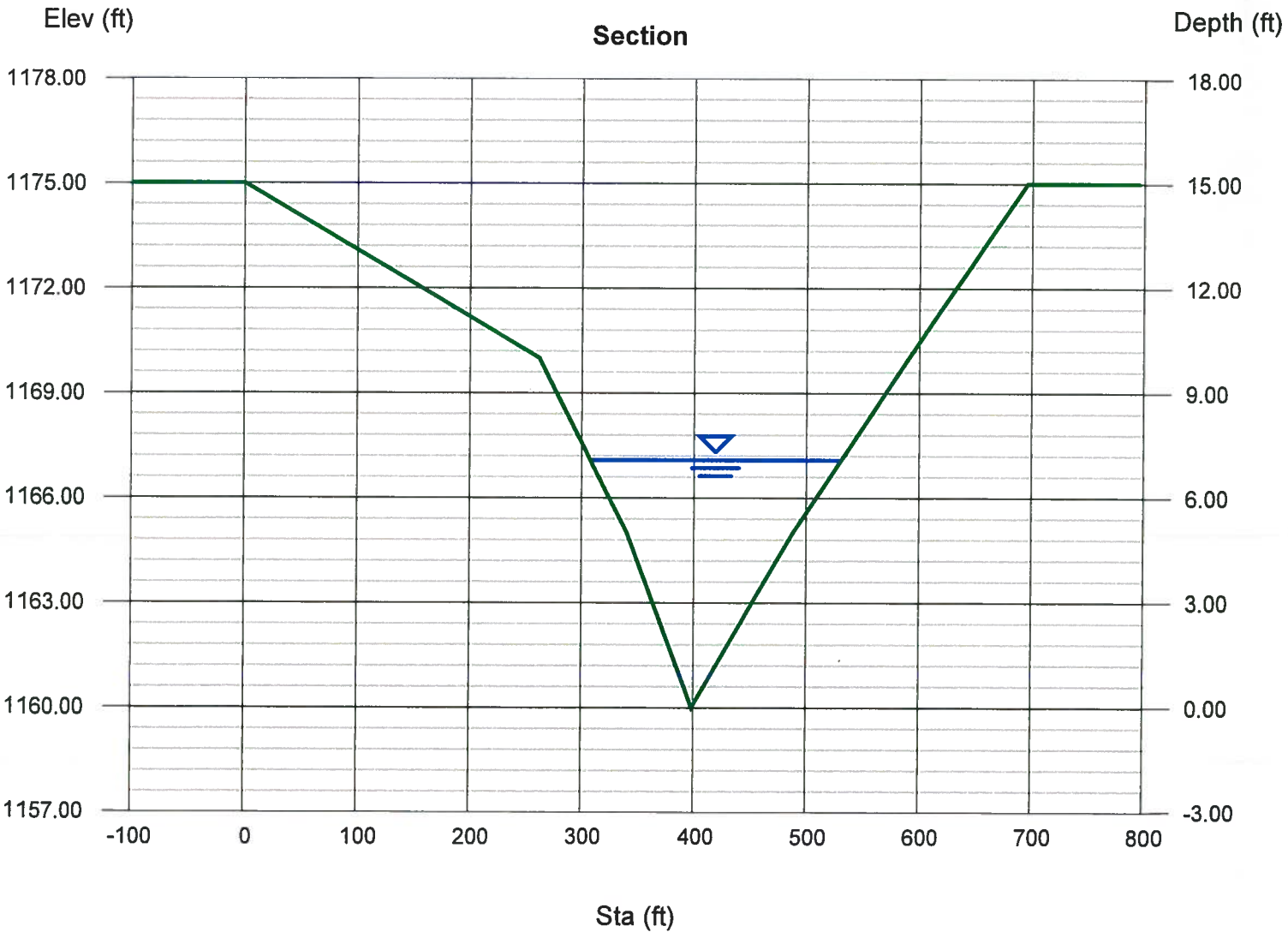
Compute by:	Known Q
Known Q (cfs)	= 6470.00

Highlighted

Depth (ft)	= 7.08
Q (cfs)	= 6,470
Area (sqft)	= 755.03
Velocity (ft/s)	= 8.57
Wetted Perim (ft)	= 223.36
Crit Depth, Yc (ft)	= 6.56
Top Width (ft)	= 222.89
EGL (ft)	= 8.22

(Sta, El, n)-(Sta, El, n)...

(0.00, 1175.00)-(262.00, 1170.00, 0.035)-(340.20, 1165.00, 0.035)-(398.50, 1160.00, 0.035)-(488.00, 1165.00, 0.035)-(590.30, 1170.00, 0.035)-(695.70, 1175.00, 0.0



APPENDIX D

Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

AREA-A3-CULVERT-100YR

Invert Elev Dn (ft)	= 1185.50
Pipe Length (ft)	= 100.80
Slope (%)	= 1.98
Invert Elev Up (ft)	= 1187.50
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

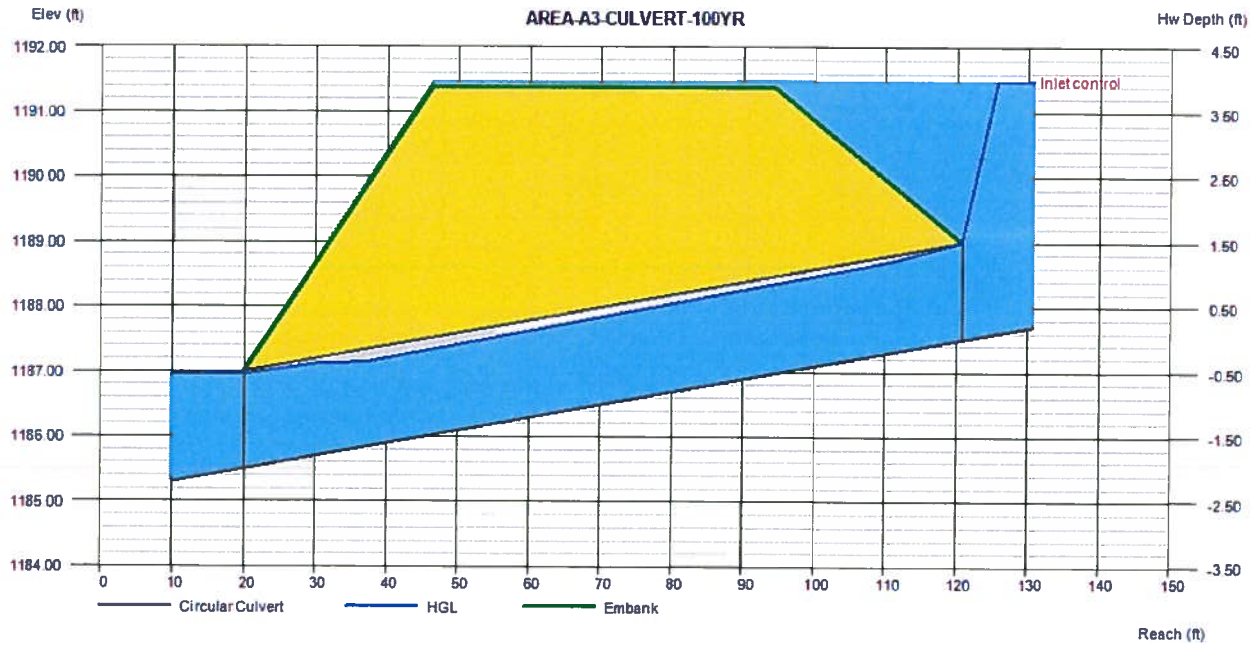
Top Elevation (ft)	= 1191.39
Top Width (ft)	= 48.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 25.08
Qmax (cfs)	= 25.08
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 25.08
Qpipe (cfs)	= 15.35
Qovertop (cfs)	= 9.73
Veloc Dn (ft/s)	= 8.76
Veloc Up (ft/s)	= 8.90
HGL Dn (ft)	= 1186.96
HGL Up (ft)	= 1188.91
Hw Elev (ft)	= 1191.49
Hw/D (ft)	= 2.66
Flow Regime	= Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

AREA-A4-CULVERT-100YR

Invert Elev Dn (ft)	= 1185.50
Pipe Length (ft)	= 86.60
Slope (%)	= 2.89
Invert Elev Up (ft)	= 1188.00
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 1
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

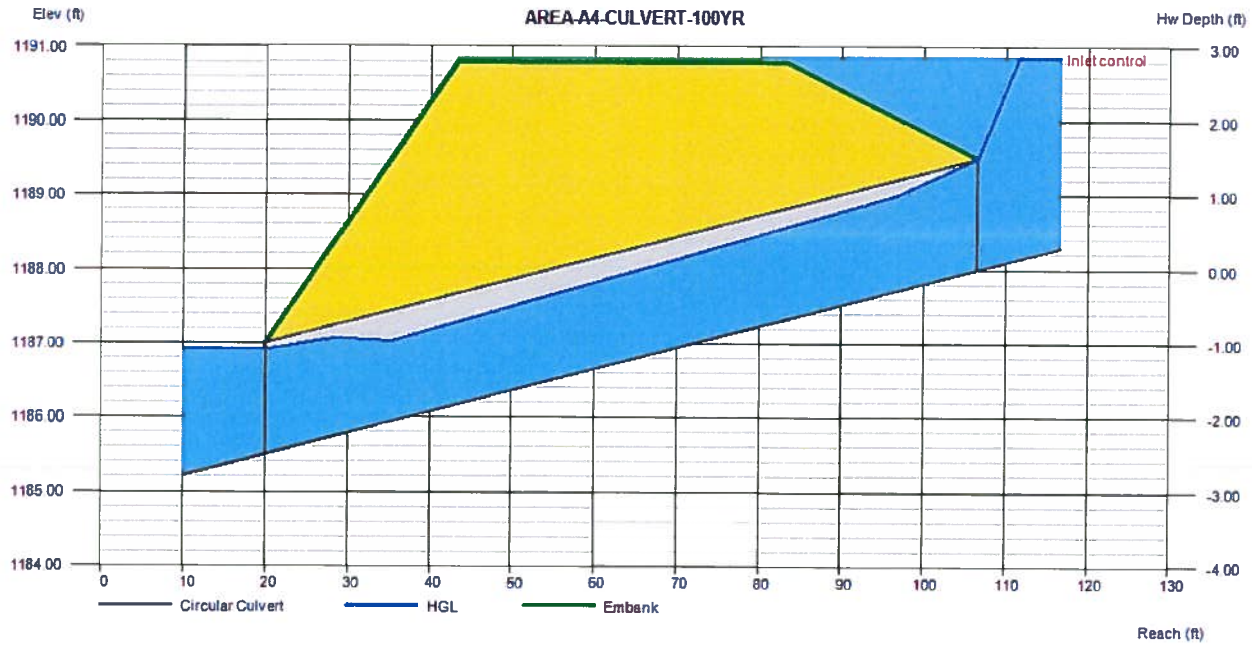
Top Elevation (ft)	= 1190.79
Top Width (ft)	= 40.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 18.27
Qmax (cfs)	= 18.27
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 18.27
Qpipe (cfs)	= 12.11
Qovertop (cfs)	= 6.16
Veloc Dn (ft/s)	= 7.03
Veloc Up (ft/s)	= 7.36
HGL Dn (ft)	= 1186.91
HGL Up (ft)	= 1189.32
Hw Elev (ft)	= 1190.85
Hw/D (ft)	= 1.90
Flow Regime	= Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jun 10 2022

PROPOSED LOOP 281 CULVERT - 100YR

Invert Elev Dn (ft)	= 1192.50
Pipe Length (ft)	= 93.00
Slope (%)	= 2.15
Invert Elev Up (ft)	= 1194.50
Rise (in)	= 30.0
Shape	= Circular
Span (in)	= 30.0
No. Barrels	= 2
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

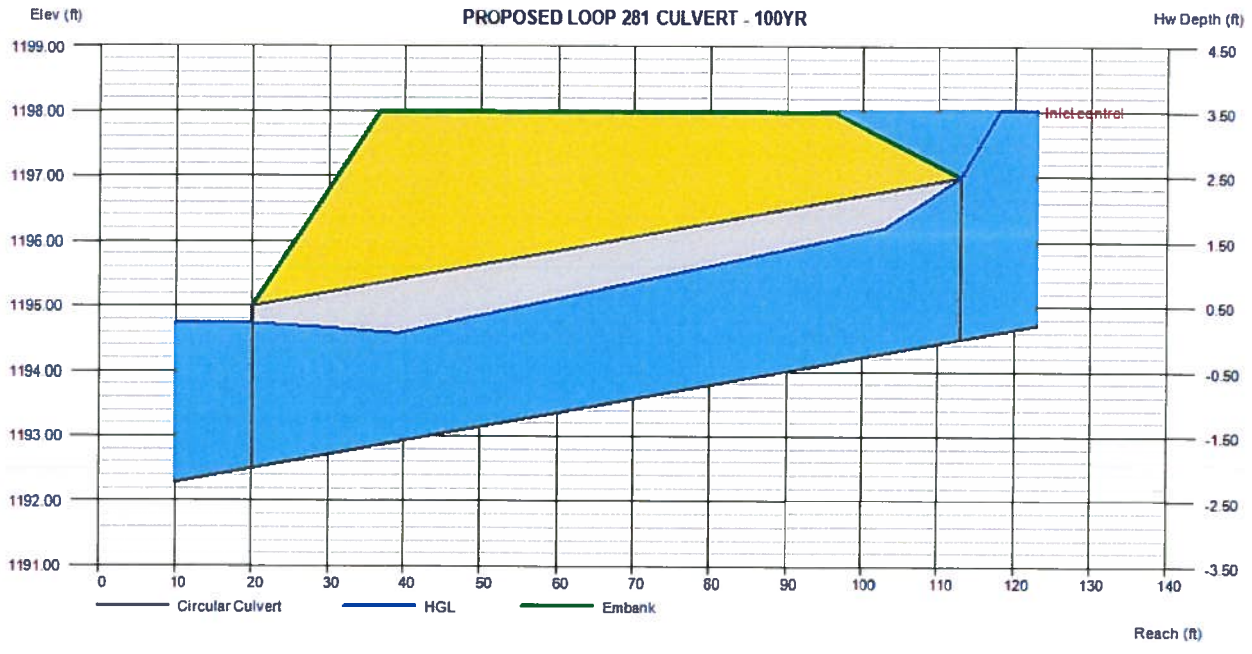
Top Elevation (ft)	= 1198.00
Top Width (ft)	= 59.50
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 68.40
Qmax (cfs)	= 68.40
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 68.40
Qpipe (cfs)	= 67.34
Qovertop (cfs)	= 1.06
Veloc Dn (ft/s)	= 7.27
Veloc Up (ft/s)	= 8.11
HGL Dn (ft)	= 1194.74
HGL Up (ft)	= 1196.47
Hw Elev (ft)	= 1198.02
Hw/D (ft)	= 1.41
Flow Regime	= Inlet Control



Culvert Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Monday, Jun 13 2022

A3 - DRIVEWAY CULVERTS - 100 YR

Invert Elev Dn (ft)	= 100.00
Pipe Length (ft)	= 20.00
Slope (%)	= 2.95
Invert Elev Up (ft)	= 100.59
Rise (in)	= 18.0
Shape	= Circular
Span (in)	= 18.0
No. Barrels	= 2
n-Value	= 0.012
Culvert Type	= Circular Concrete
Culvert Entrance	= Square edge w/headwall (C)
Coeff. K,M,c,Y,k	= 0.0098, 2, 0.0398, 0.67, 0.5

Embankment

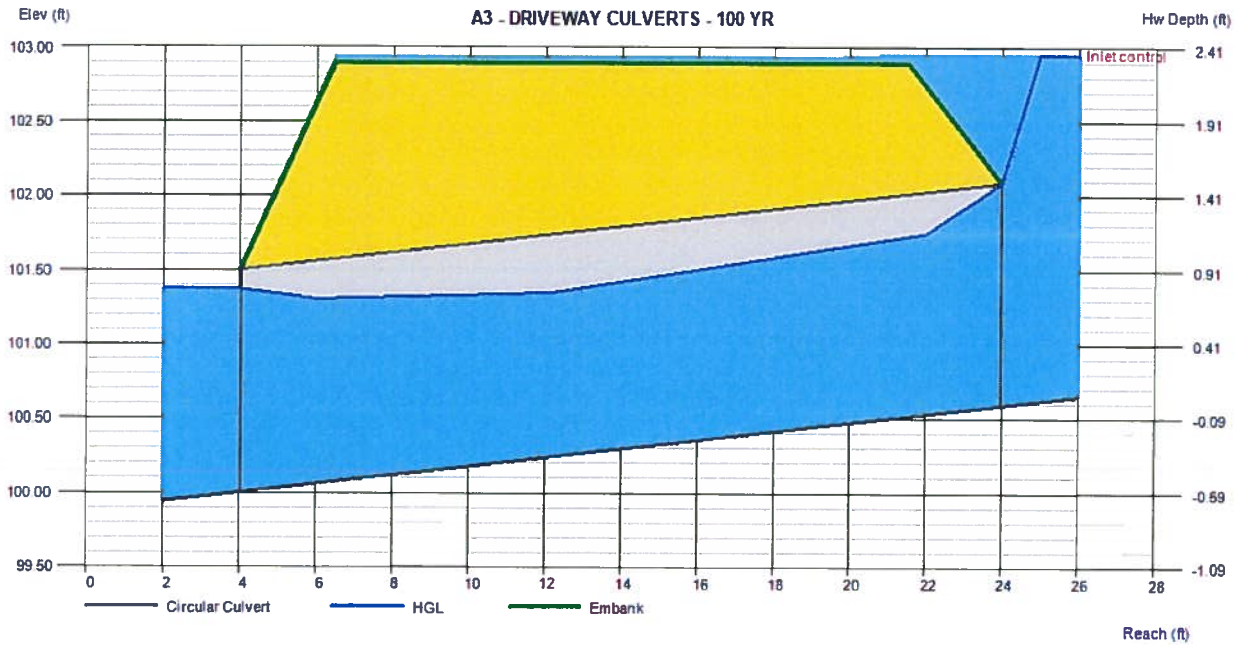
Top Elevation (ft)	= 102.90
Top Width (ft)	= 15.00
Crest Width (ft)	= 100.00

Calculations

Qmin (cfs)	= 25.08
Qmax (cfs)	= 25.08
Tailwater Elev (ft)	= (dc+D)/2

Highlighted

Qtotal (cfs)	= 25.08
Qpipe (cfs)	= 20.85
Qovertop (cfs)	= 4.23
Veloc Dn (ft/s)	= 6.16
Veloc Up (ft/s)	= 6.67
HGL Dn (ft)	= 101.37
HGL Up (ft)	= 101.83
Hw Elev (ft)	= 102.96
Hw/D (ft)	= 1.58
Flow Regime	= Inlet Control



QUIDDITY

3100 Alvin Devane Boulevard
Suite 150
Austin, TX 78741
Tel: 512.441.9493
www.jonescarter.com

March 9, 2022

Rick A. Schroder
Chief Administrative Officer, City Secretary
303 E. Pecan Dr., Johnson City, TX 78636

Re: The Homestead at Deer Creek Subdivision
Wastewater Treatment Plant Capacity

Mr. Schroder,

Quiddity performed an evaluation of the existing wastewater treatment plant (WWTP) as requested by the City to determine available capacity for the proposed 91.57-acre Homestead at Deer Creek single family Subdivision. The evaluation was made based on the following WWTP flow and capacity information provided by the City:

- WWTP Current Average Daily Flow: 160K-170K gallons per day (average per month)
- WWTP Maximum Average Daily Flow: 303K gallons per day.
    - Permitted flow developed based on Chapter 317 (Design Criteria Prior to 2008) of the Texas Administrative Code (TAC)
- Calculated Existing Used Capacity: 53-56%

To determine the subdivision's expected demand, calculations were performed applying criteria outlined in the City of Johnson City Design Standards (CoJCDS) and TAC's Chapter 317 to the following conditions:

1. The subdivision's ultimate 91.57 acre build out including 201 lots
2. Approximately 21.3 acres in Phase 1 including 73 lots

Below is a summary of the criteria implemented and results:

- Average Daily Flow (ADF) per lot: 350 gallons per day (CoJCDS Table 6.2 and TAC Chapter 317.4)
- Infiltration (wet weather flow): 1,500 gallons per day per acre (Common in the area)
- Ultimate 201 lot area: 91.57 acres

QUIDDITY

Summary of Results		
	Ultimate	**Phase 1**
Maximum Dry Weather Flow (gal/day)	70,350	25,550
Maximum Wet Weather Flow (gal/day)*	207,705	162,905
WWTP Capacity Dry Weather Flow	76%	61%
	79%	64%
WWTP Capacity Wet Weather Flow	122%	107%
	125%	110%

**Includes entire subdivision area for Ultimate and Phase 1*

Under TAC rule 305.126, whenever a domestic wastewater treatment plant reaches 75% of the permitted ADF for three consecutive months, the permittee is required to initiate engineering and financial planning for expansion and/or upgrading of the treatment plant and/or collection facilities. Whenever flows at a domestic wastewater treatment plant reach 90% of the permitted ADF for three consecutive months, the permittee is required to obtain authorization from TCEQ to commence construction of the necessary additional treatment.

For City planning purposes and based on design criteria outlined in chapter 6 of CoJCDS and Chapter 317 of TAC, it is our understanding that wet weather conditions should be accounted for when estimating design flow. Section 6 of the CoJCDS also indicates that "All facilities shall be of sufficient size to provide adequate capacity for the ultimate development. The wastewater lines shall be sized to meet the peak-day dry weather flow plus an appropriate allowance for infiltration of storm water". Therefore, the results summarized above indicate that the WWTP's capacity **would be exceeded once Phase 1 is built**.

Phase 1 demand calculations were also provided by the developer's engineer, Belton Engineering (Attachment 1). Their calculations are for dry weather flow conditions only and don't include infiltration or an adjustment factor. Therefore, their calculations indicate that the WWTP would be at less than 64% capacity after Phase 1 is built.

If the City desires to approve platting of Phase 1 based on Belton's calculations, we recommend the following:

1. Determine and document actual wet weather flow based on historical data and investigate if other adjustments to the design parameters summarized above are possible based on current TAC Rules (E.g. ADF).
2. Begin plans to expand the WWTP immediately.
3. Ensure that future phases of the subdivision are not built until the WWTP is expanded unless other measures are implemented.

QUIDDITY

4. Carefully evaluate demand requirements of any other potential development in the WWTP's service area.

Please note that the existing organic load capacity of the WWTP was not evaluated in this analysis.

Feel free to contact me with any questions you may have.

Sincerely,

Odalys C. Johnson, P.E.