Introduction
This storm water memorandum will study the re-development of a 0.44-acre site located at the Northwest corner of Maple Street and NE Douglas Street, Lee's Summit, Jackson County, Missouri. The site is located in the Cedar Creek watershed and contains two distinct drainage sub-basins. Sub-basin B drains southeasterly toward an existing public storm sewer system and sub-basin A drains northwesterly via overland flow. The site will develop a parking lot and deck area and onsite storm water detention with extended 40-hour controls for the Water Quality storm event.

Purpose
This memorandum has been prepared to evaluate potential hydrologic and hydraulic issues related to the development of the proposed projects and recommend improvements if necessary to mitigate any anticipated negative downstream impacts.

Storm Study Methodology

Rational Method	
Site Impervious Area	24.1% of Site (PRE) 45.2% of Site (POST)
Rational Coefficient	0.48 Pre / 0.65 Post
Hydrologic Soil Group	C

Additional Resources

Exhibit		
D	FEMA Firmette, 29095C0417G, dated January 20, 2017	None
E	US Fish and Wildlife Wetland Inventory	None Identified
F	Soil Map	

Existing Conditions Analysis
The site contains two distinct drainage sub-basins. Sub-basin A (0.30 Acres) drains northwesterly via overland flow and Sub-basin B (0.14 Acres) drains southeasterly toward an existing public storm sewer system at the intersection of Douglas and Maple Streets. The Existing Drainage Area Map may be found in Exhibit A. Time of concentration values for each sub-basin are available on the drainage area maps. The existing runoff coefficients for each sub-basin were determined by measuring the amount of pervious and impervious area in each sub-basin. The runoff coefficient for Sub-basins A and B are 0.48 and 0.38 respectively, both below the regulatory value of 0.51 for single family residential and well below 0.81 for neighborhood commercial. Pervious verse impervious areas for each condition have been highlighted on their respective drainage map.

A complete Hydraflow Report may be found in Exhibit B which contains both existing and proposed hydrologic data. The following table summarizes the results of the Existing Conditions Analysis.

Table 1 Existing Conditions Sub-basin & Hydrologic Data at the POI

Sub-basin	POI	Area (ac.)	C	Tc (min.)	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
A	A	0.30	0.48	9.6	0.60	0.88	1.33
B	B	0.14	0.38	9.0	0.22	0.33	0.49

Proposed Conditions Analysis

The proposed site contains three distinct drainage sub-basins. Sub-basin A (0.16 Acres) drains northwesterly via overland flow and will not be detained. Sub-basin A1 (0.14 Acres) contains the majority of the proposed improvements. Runoff from Sub-basin A1 will be routed to the detention pit for attenuation. Sub-basin B (0.14 Acres) drains southeasterly toward an existing public storm sewer system at the intersection of Douglas and Maple Streets. The Proposed Drainage Area Map may be found in Exhibit C. The proposed runoff coefficients for each sub-basin were determined by measuring the amount of pervious and impervious area in each sub-basin. The runoff coefficient for Sub-basins A, A1 and B are 0.61, 0.71 and 0.41 respectively. Sub-basin B tributary area remained constant and the minor improvements proposed will keep the runoff coefficient below allowable even for a single-family residential usage therefore Sub-basin B will not create any negative downstream impacts. The Douglas Street storm sewer system is being improved and will handle runoff from existing land usages such as neighborhood commercial for this property. The following table summarizes the results of the Existing Conditions Analysis.

Table 2 Proposed Conditions Sub-basin & Hydrologic Data at the POI

Sub-basin	POI	Area (ac.)	C	Tc (min.)	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
A	A	0.16	0.61	7.7	0.43	0.64	0.96
A1	A1	0.14	0.71	5.6	0.47	0.70	1.05
B	B	0.14	0.41	8.6	0.25	0.36	0.55

Per the discussion above and as shown in the above table, increases in peak discharge rates are negligible therefore Sub-basin B will no longer be examined. The allowable peak discharge rates at POI A for the 2, 10 and 100-year events are 0.15 cfs, 0.60 cfs and 0.90 cfs respectively. Attenuation will be required in Sub-basin A1 to reduce proposed peak discharge rates to allowable levels. A detention pit will be utilized to attenuate peak discharge rates. The objective is twofold, to reduce overall runoff by infiltration while reducing peak discharge rates. An additional containment area will be provided above the detention pit to accommodate times of inundation. The additional surface volume will accommodate runoff from a consecutive 100-year storm while allowing attenuation of all storm events.

Attenuation Design

Designation: Detention Pit
Type: Earthen Basin
Basin Bottom Elevation: 1038.00
Basin Top Berm Elevation: 1043.50
Basin Volume: 2,009 cf @ 1043.50 Inc Storage = 41 cf elevation 1038 to 1042 (182 sf)
Control: Infiltration (Ksat(avg) = 0.13 in/hr) Not used in attenuation calculations

Control Structure Effluent Pipe: 6" HDPE, FL (Out) = 1042.00'
Emergency Spillway: Earthen Broad Crested Weir, Crest Elevation=1042.50, Crest Length=50'
Top of Dam: 1043.50, Q=1.99, Depth=0.22', Velocity=2.13 fps
Incremental Storage Volume of 41 cf from elev 1038 to 1042 accounts for rock and soil layer

See Table below for a summary of detention pit data.

Table 3 Detention Pit Data

	Peak Q In (cfs)	Tp In (min.)	Peak Q Out (cfs)	Tp Out (min)	Peak W.S.E.	Max. Storage Vol. (cf)
Detention Basin						
2-Year	0.47	6	0	0	1042.00	170
10-Year	0.70	6	0.013	12	1042.09	248
100-Year	1.05	6	0.037	12	1042.22	369

As shown in the above table, post detention peak discharge rates from Sub-basin A1 have been attenuated well below allowable and existing.

Hydrographs tributary to POI A have been combined to determine subsequent peak discharge rates.

Table 4 Proposed Conditions Post Attenuation Point of Interest Peak Discharge Rates

Point of Interest	Q2 (cfs)	Q10 (cfs)	Q100 (cfs)
A	0.43	0.64	0.98

As shown in the above Table all peak discharge rates attributable to POI A have been attenuated below Existing Peak Discharge Rates for all regulatory design storms.

Table 5 below provides a comparison of runoff data between Proposed, Existing and Allowable Conditions for Sub-basin A.

Table 5 Point of Interest Discharge Comparison

POI	Condition	**Q2 (cfs)**	**Q10 (cfs)**	**Q100 (cfs)**
A	Proposed	0.43	0.64	0.98
	Existing	0.60	0.88	1.33
	Difference	-0.17	-0.24	-0.35
	Allowable	0.15	0.60	0.90
	Difference	0.28	0.04	0.08

Peak discharge rates at POI A consisting of the Combined POI A Hydrograph will be reduced below Existing for all regulatory design storms. Allowable Peak Discharge Rates will not be met based on the tributary geometry and the practicality of conveying various parts of the unimproved tributary runoff to the detention pit. The majority of the improvements will be constructed in Sub-

basin A1 where runoff will be attenuated allowing for the significant reduction of peak discharge rates below existing. Infiltration was not figured in the reduction of proposed peak discharge rates but is being employed to provide water quality benefits. The detention pit design allows for any excess water not drained to percolate underground through clean rock into the surrounding soil minimizing if not eliminating any vector nuisances.

Conclusion

The development along with the proposed detention pit/infiltration basin will reduce proposed peak discharge rates well below existing peak discharge rates for all regulatory design storms. The detention pit configuration will also provide water quality benefits to the watershed. There are no known Stream Buffer setback areas required due to the size of the upstream watershed. There are no known floodplain or wetlands onsite per the exhibits provided within this report from FEMA and National Wetland Mapper.

The proposed detention pit will reduce the proposed peak discharge rates significantly below existing peak discharge rates. Therefore the proposed site development will not create a negative impact on the downstream system and will provide the required storm attenuation for the proposed development of the site. Allowable peak discharge rates will not be met for the site due to the geometry and topography of the site. The majority of Sub-basin A, which limits the ability to reduce proposed peak discharge rates below allowable, will be unimproved and is periphery to the site and proposed improvements. If the City is in agreement with our findings we will provide the following formal waiver requests to the City for approval.

Formal Waiver Requests:

1) Sub-basin A: (2-yr), (10-yr) and (100-yr) Allowable Peak Discharge Rates

Matt Schlicht, PE 2006019708

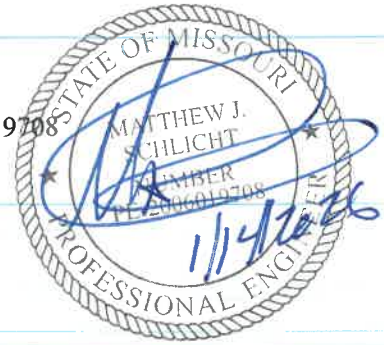
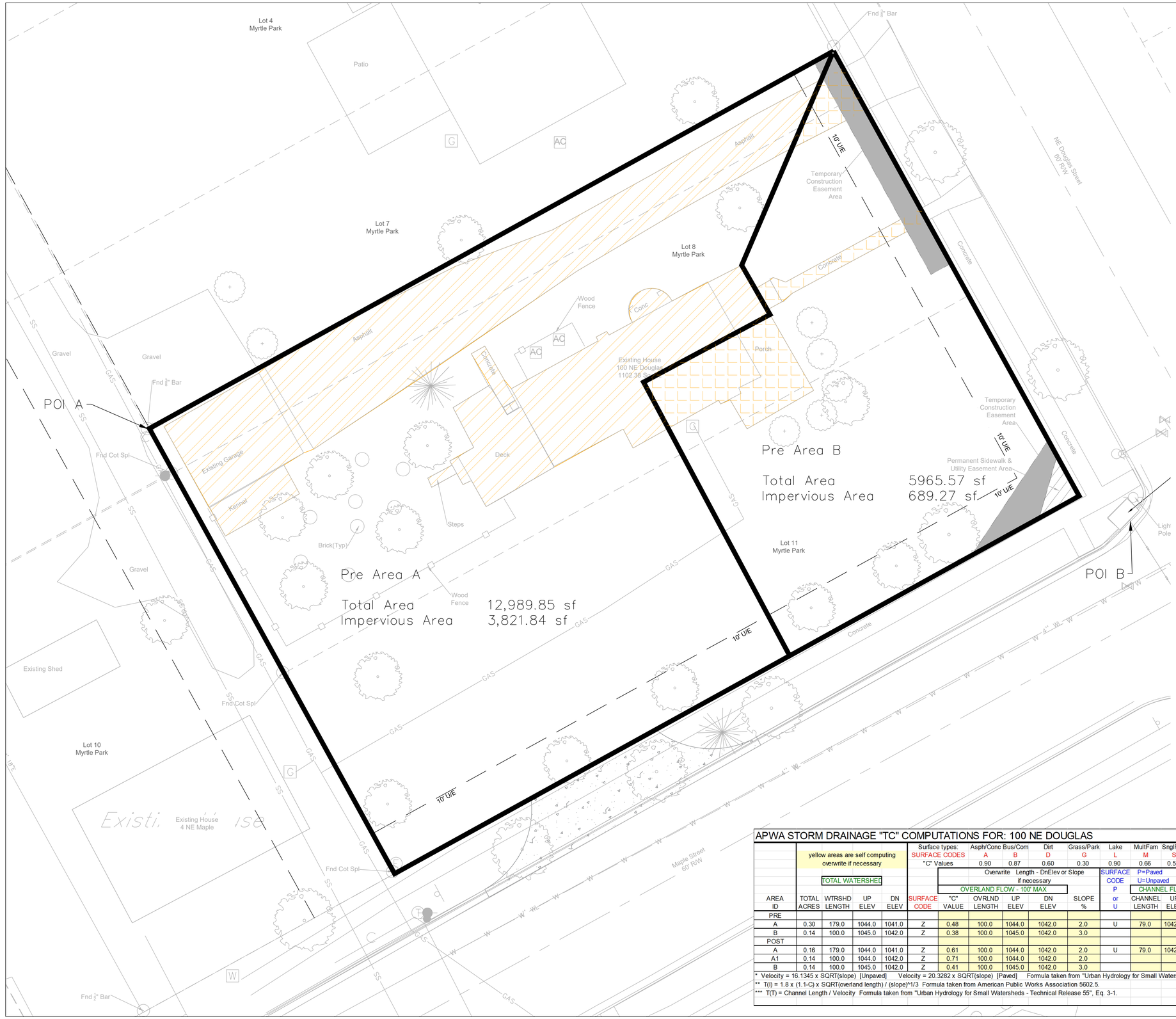


Exhibit A
Existing Drainage Area Map

50 SE 30th Street Lee's Summit, MO 64082
P: (816) 623-9888 F: (816) 623-9849 www.engineeringsolutionskc.com



PRE DEVELOPMENT DRAINAGE PLAN

SCALE: 1" = 10'

APWA STORM DRAINAGE "TC" COMPUTATIONS FOR: 100 NE DOUGLAS

Surface types: Asph/Conc A; Bus/Com B; Dirt D; Grass/Park G; Lake L; MultiFam M; SnglFam S; Undev U; Other Z

"C" Values: 0.90; 0.87; 0.60; 0.30; 0.90; 0.66; 0.51; 0.3

yellow areas are self computing overwrite if necessary

TOTAL WATERSHED

Overwrite Length - DnElev or Slope if necessary

OVERLAND FLOW - 100' MAX

SURFACE CODE: P or U

Overwrite Slope or Elevations if necessary

CHANNEL FLOW - FIRST REACH

TC COMPUTATION

AREA ID	TOTAL ACRES	WTRSHD LENGTH	UP ELEV	DN ELEV	SURFACE CODE	"C" VALUE	OVRLND LENGTH	UP ELEV	DN ELEV	SLOPE %	P or U	CHANNEL LENGTH	UP ELEV	DN ELEV	SLOPE %	VELOCITY F/S	Cal Overland Flow T(i)	Used Min 5 T(i)	Cal Channel One T(T)	Cal Channel Two T(T)	Total T@ 10	AREA ID
PRE																						PRE
A	0.30	179.0	1044.0	1041.0	Z	0.48	100.0	1044.0	1042.0	2.0	U	79.0	1042.0	1041.0	1.27	1.8	8.9	8.9	0.7	0.0	9.6	A
B	0.14	100.0	1045.0	1042.0	Z	0.38	100.0	1045.0	1042.0	3.0							9.0	9.0	0.0	0.0	9.0	B
POST																						
A	0.16	179.0	1044.0	1041.0	Z	0.61	100.0	1044.0	1042.0	2.0	U	79.0	1042.0	1041.0	1.27	1.8	7.0	7.0	0.7	0.0	7.7	A
A1	0.14	100.0	1044.0	1042.0	Z	0.71	100.0	1044.0	1042.0	2.0							5.6	5.6	0.0	0.0	5.6	A1
B	0.14	100.0	1045.0	1042.0	Z	0.41	100.0	1045.0	1042.0	3.0							8.6	8.6	0.0	0.0	8.6	B

* Velocity = 16.1345 x SQRT(slope) [Unpaved] Velocity = 20.3282 x SQRT(slope) [Paved] Formula taken from "Urban Hydrology for Small Watersheds - Technical Release 55", Appendix F, Figure 3-1.

** T(i) = 1.8 x (1.1-C) x SQRT(overland length) / (slope)^1/3 Formula taken from American Public Works Association 5602.5.

*** T(T) = Channel Length / Velocity Formula taken from "Urban Hydrology for Small Watersheds - Technical Release 55", Eq. 3-1.

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Professional Registration
Missouri
Engineering 2005002186-D
Surveying 2005008319-D
Kansas
Engineering E-1695
Surveying LS-218
Oklahoma
Engineering 6254
Nebraska
Engineering CA2821

100 NE DOUGLAS STREET
Lee's Summit, Jackson County, Missouri

Project: 100 NE DOUGLAS LSMO
Issue Date: June 24, 2025

Pre Development
Final Development Plans for:
100 NE DOUGLAS STREET
Lee's Summit, Jackson County, Missouri

Matthew J. Schlicht
MO PE 2006019708
KS PE 19071
OK PE 25226
NE PE E-14335

REVISIONS

⚠ REV. 12/18/2025

REV. 1/13/2026

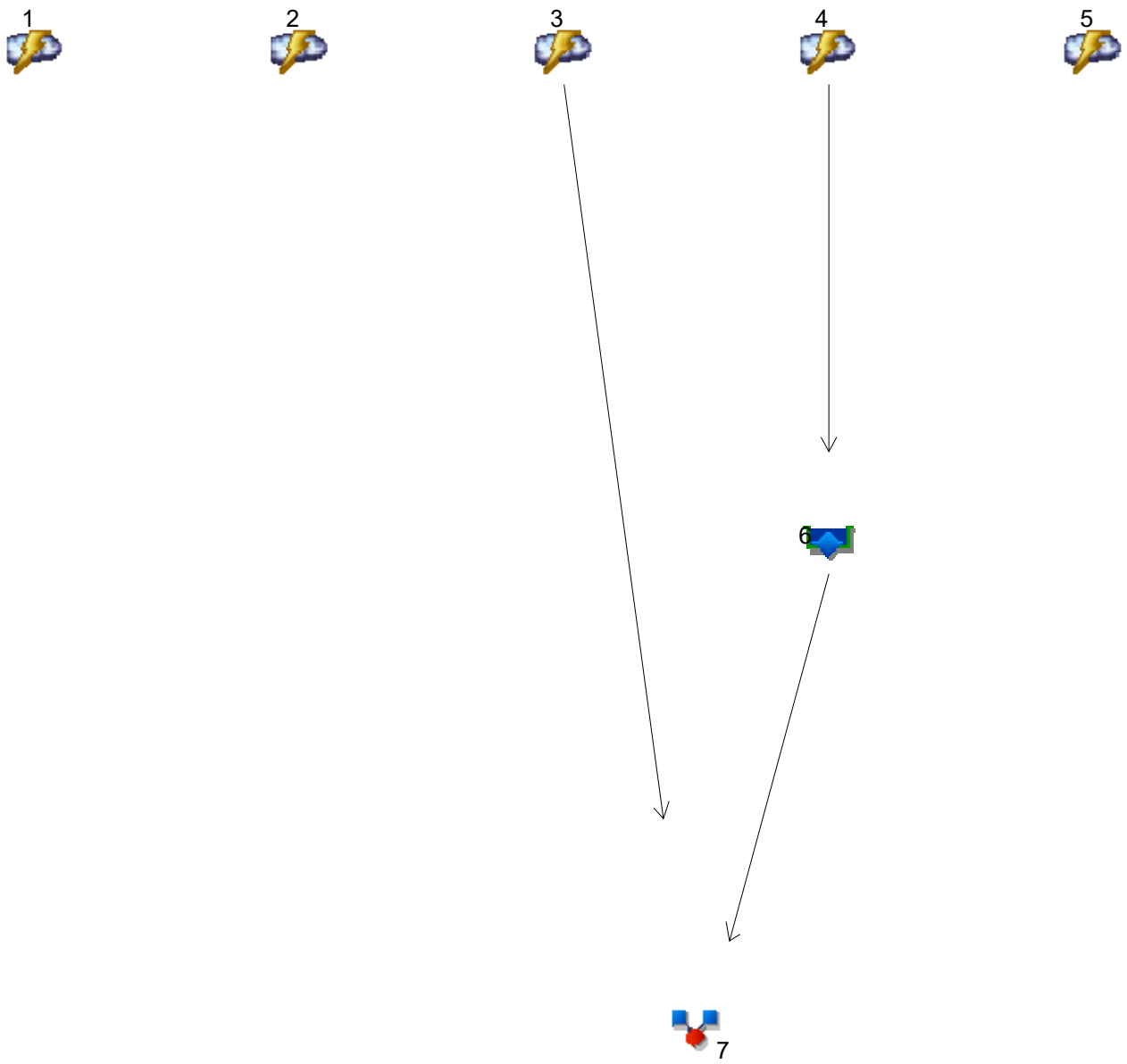
Exhibit B
Hydraflow Report

50 SE 30th Street Lee's Summit, MO 64082
P: (816) 623-9888 F: (816) 623-9849 www.engineeringsolutionskc.com

Hydraflow Table of Contents

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023 Thursday, 01 / 15 / 2026

Watershed Model Schematic



Legend

Hyd.	Origin	Description
1	Rational	Ex A
2	Rational	Ex B
3	Rational	Prop A
4	Rational	Prop A1
5	Rational	Prop B
6	Reservoir	Detained Prop A1
7	Combine	Combined POI A

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	------	-------	0.595	-------	-------	0.877	-------	-------	1.327	Ex A
2	Rational	------	-------	0.221	-------	-------	0.326	-------	-------	0.493	Ex B
3	Rational	------	-------	0.431	-------	-------	0.635	-------	-------	0.961	Prop A
4	Rational	------	-------	0.471	-------	-------	0.695	-------	-------	1.052	Prop A1
5	Rational	------	-------	0.245	-------	-------	0.361	-------	-------	0.546	Prop B
6	Reservoir	4	-------	0.000	-------	-------	0.013	-------	-------	0.037	Detained Prop A1
7	Combine	3, 6	-------	0.431	-------	-------	0.640	-------	-------	0.984	Combined POI A

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

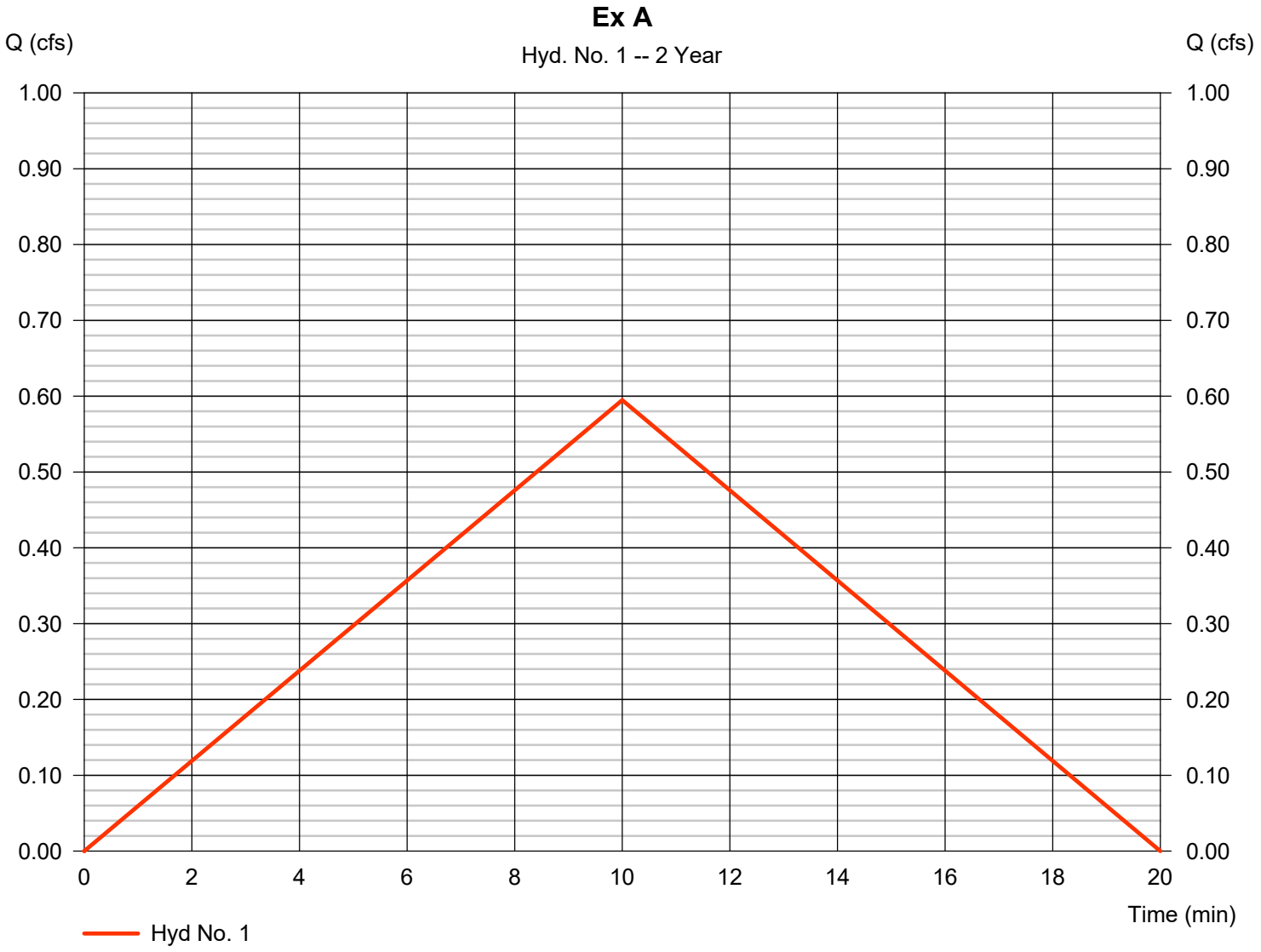
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.595	1	10	357	------	------	------	Ex A
2	Rational	0.221	1	9	119	------	------	------	Ex B
3	Rational	0.431	1	8	207	------	------	------	Prop A
4	Rational	0.471	1	6	170	------	------	------	Prop A1
5	Rational	0.245	1	9	132	------	------	------	Prop B
6	Reservoir	0.000	1	n/a	0	4	1042.00	170	Detained Prop A1
7	Combine	0.431	1	8	207	3, 6	------	------	Combined POI A

Hydrograph Report

Hyd. No. 1

Ex A

Hydrograph type	=	Rational	Peak discharge	=	0.595 cfs
Storm frequency	=	2 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	357 cuft
Drainage area	=	0.300 ac	Runoff coeff.	=	0.48
Intensity	=	4.130 in/hr	Tc by User	=	10.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

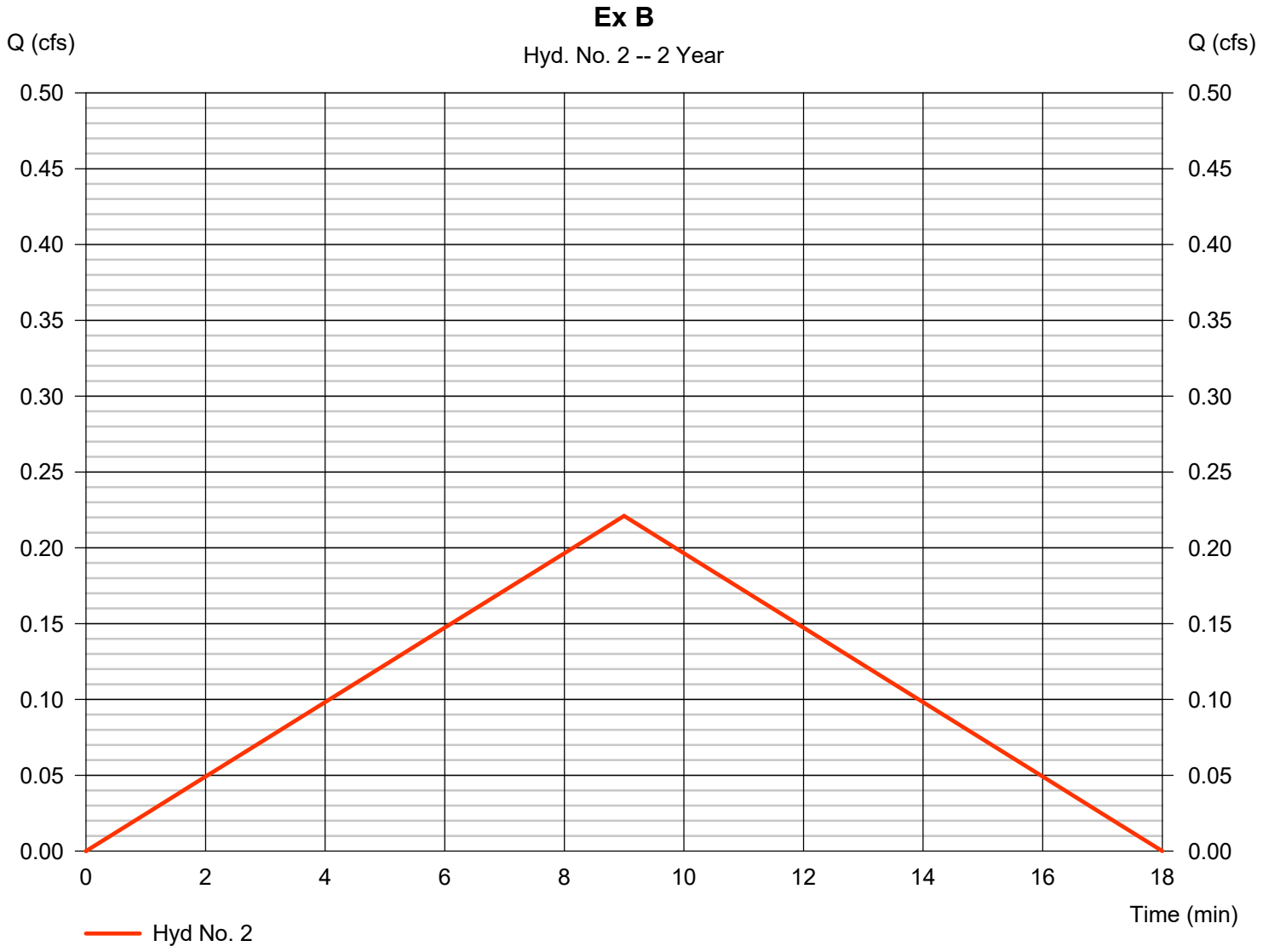


Hydrograph Report

Hyd. No. 2

Ex B

Hydrograph type	=	Rational	Peak discharge	=	0.221 cfs
Storm frequency	=	2 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	119 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.37
Intensity	=	4.266 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

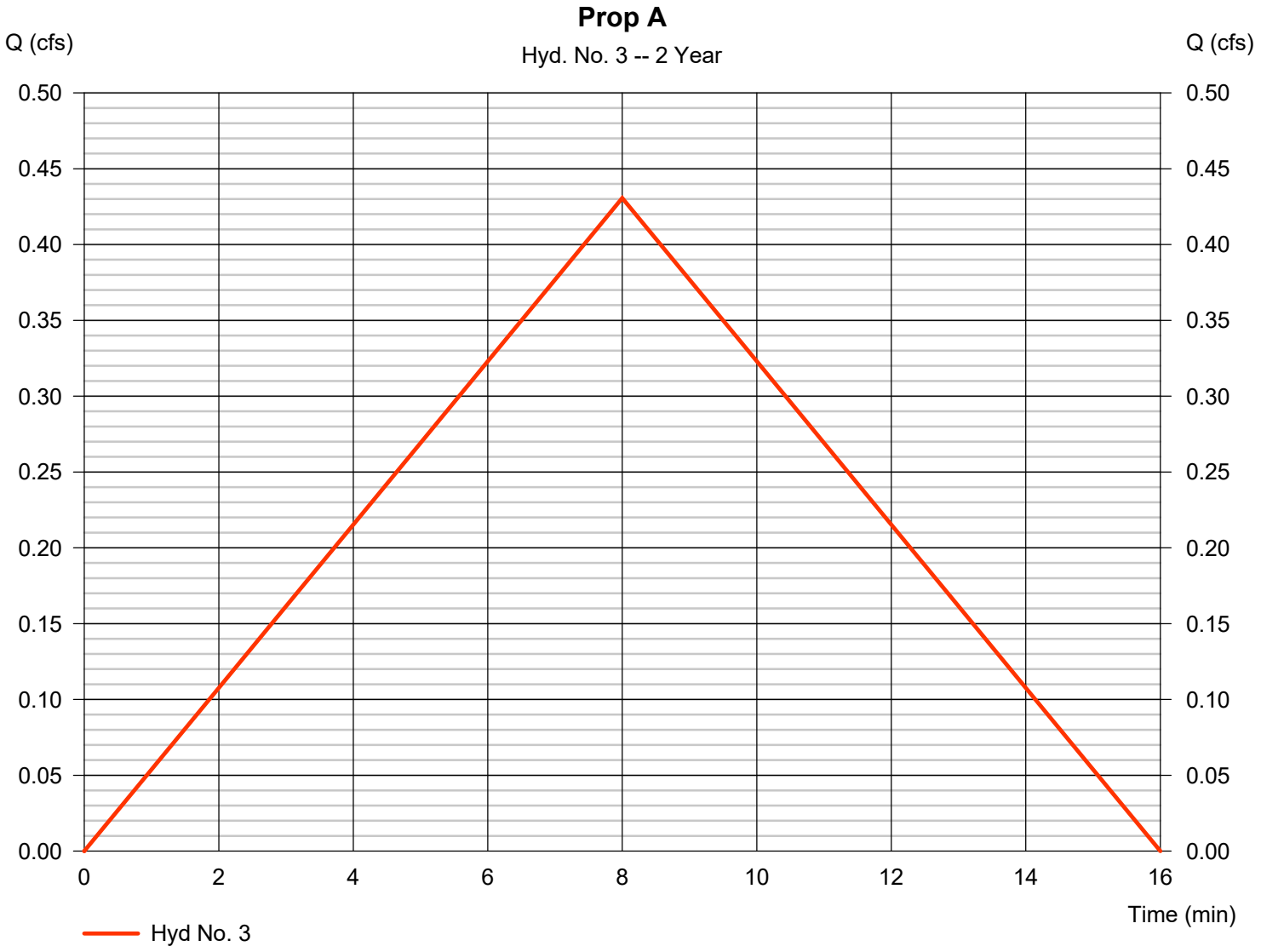


Hydrograph Report

Hyd. No. 3

Prop A

Hydrograph type	=	Rational	Peak discharge	=	0.431 cfs
Storm frequency	=	2 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	207 cuft
Drainage area	=	0.160 ac	Runoff coeff.	=	0.61
Intensity	=	4.412 in/hr	Tc by User	=	8.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

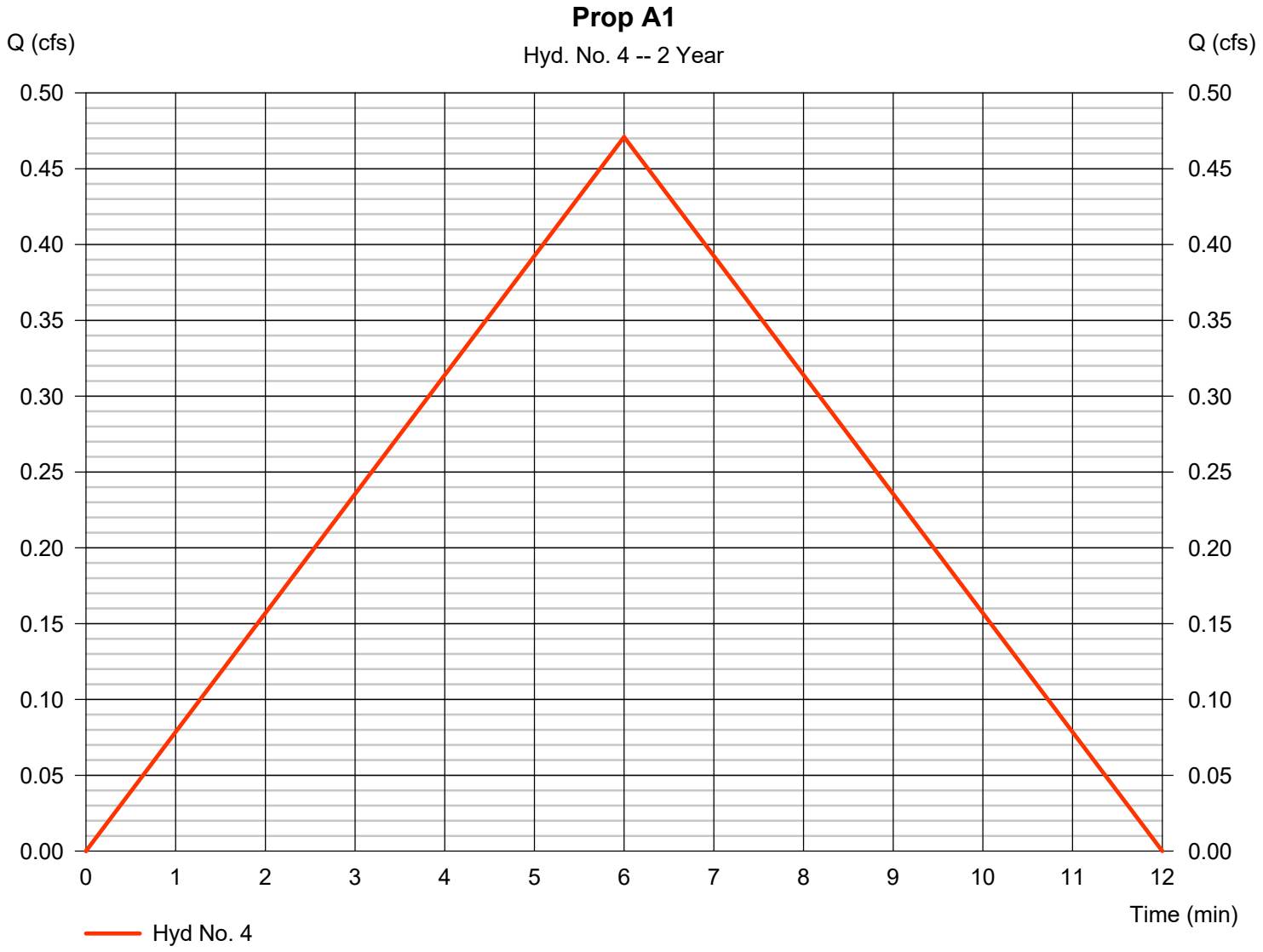


Hydrograph Report

Hyd. No. 4

Prop A1

Hydrograph type	=	Rational	Peak discharge	=	0.471 cfs
Storm frequency	=	2 yrs	Time to peak	=	6 min
Time interval	=	1 min	Hyd. volume	=	170 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.71
Intensity	=	4.738 in/hr	Tc by User	=	6.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

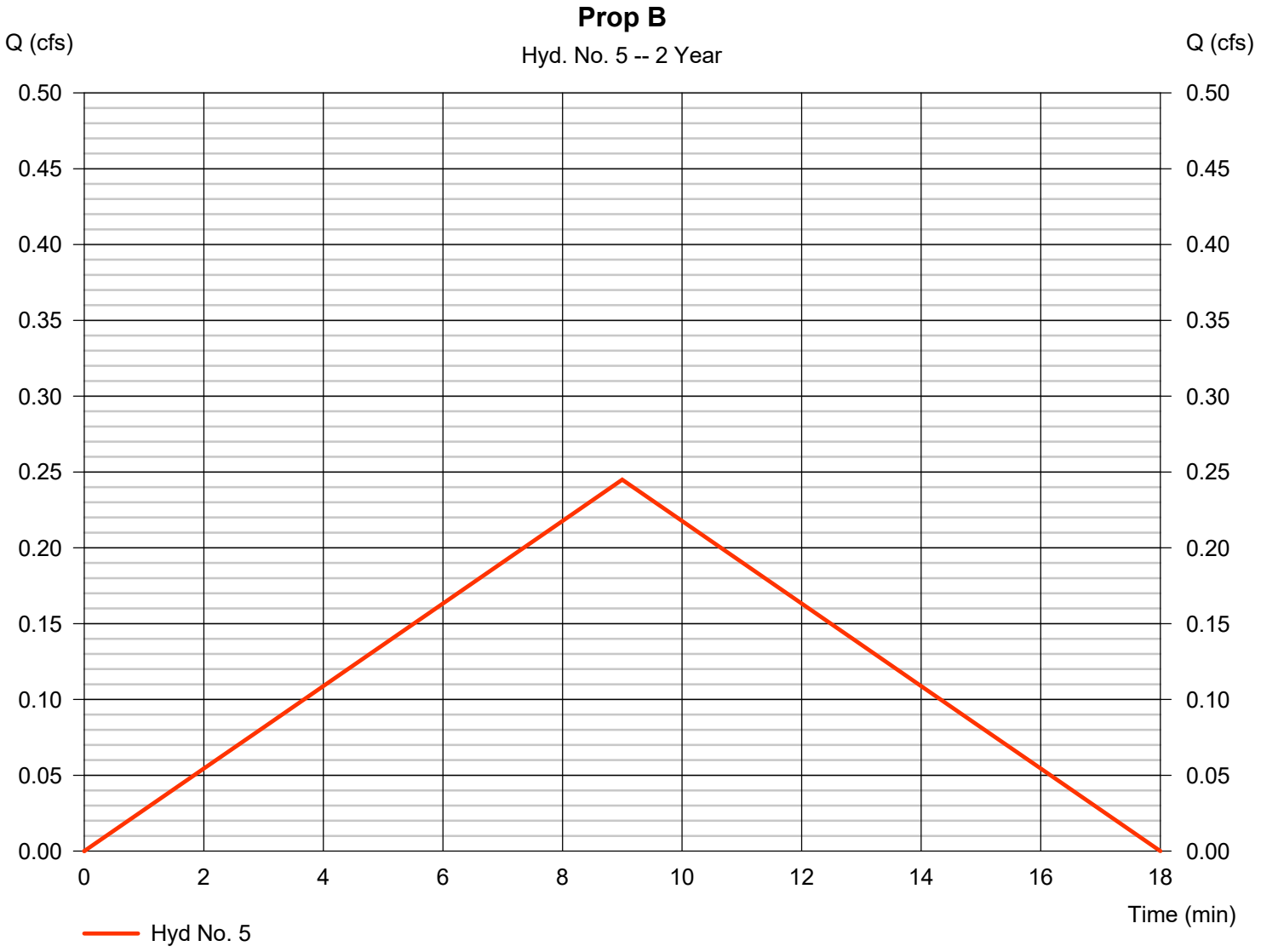


Hydrograph Report

Hyd. No. 5

Prop B

Hydrograph type	=	Rational	Peak discharge	=	0.245 cfs
Storm frequency	=	2 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	132 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.41
Intensity	=	4.266 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1



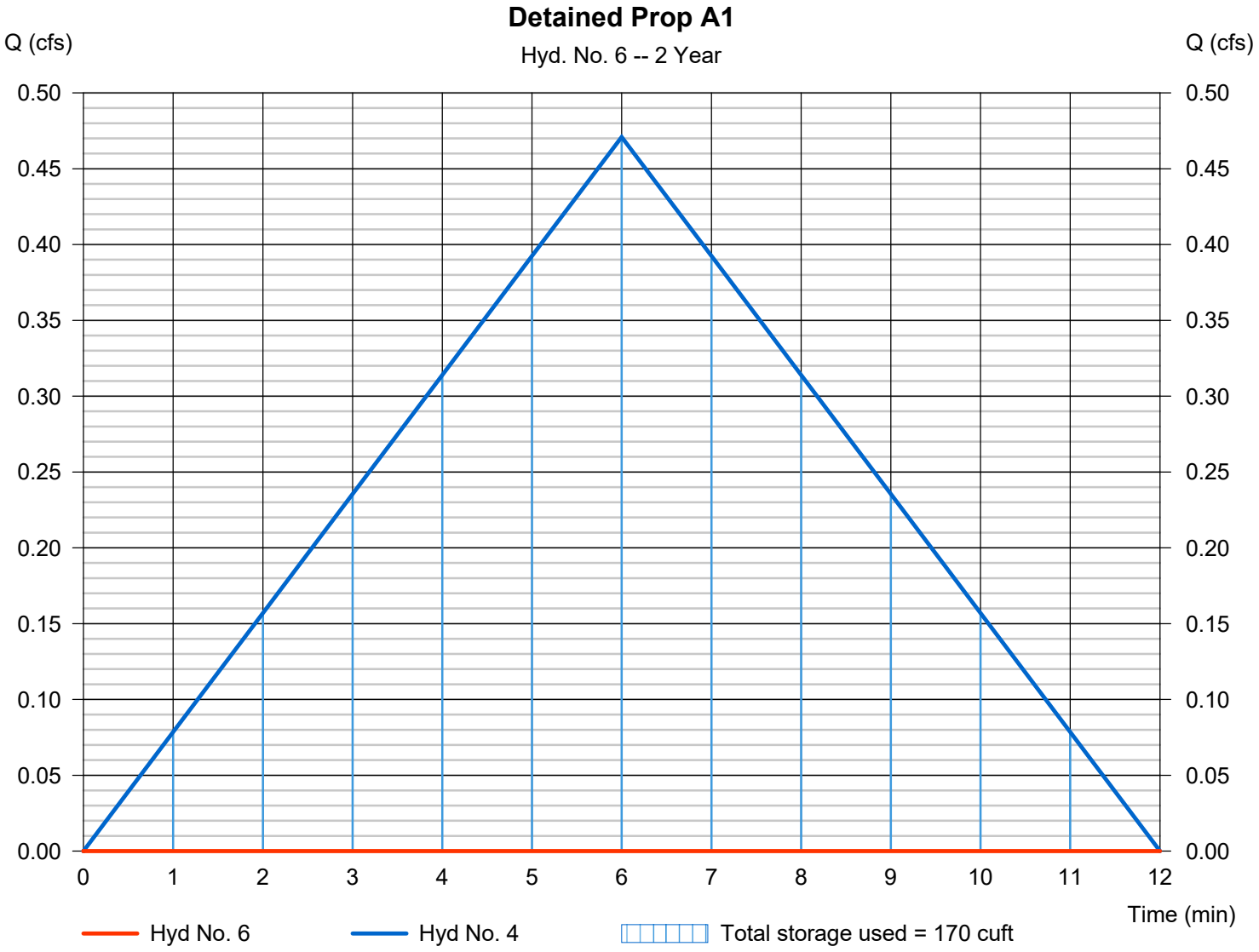
Hydrograph Report

Hyd. No. 6

Detained Prop A1

Hydrograph type	=	Reservoir	Peak discharge	=	0.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	n/a
Time interval	=	1 min	Hyd. volume	=	0 cuft
Inflow hyd. No.	=	4 - Prop A1	Max. Elevation	=	1042.00 ft
Reservoir name	=	Detention Pit	Max. Storage	=	170 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Detention Pit

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 1038.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1038.00	41	0	0
1.00	1039.00	41	41	41
2.00	1040.00	41	41	82
3.00	1041.00	41	41	123
4.00	1042.00	41	41	164
5.00	1043.00	1,795	918	1,082
5.50	1043.50	1,914	927	2,009

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 6.00	0.00	0.00	0.00
Span (in)	= 6.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1042.00	0.00	0.00	0.00
Length (ft)	= 25.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .010	.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)	= 50.00	0.00	0.00	0.00
Crest El. (ft)	= 1042.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.000 (by 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).

Stage / Storage / Discharge Table

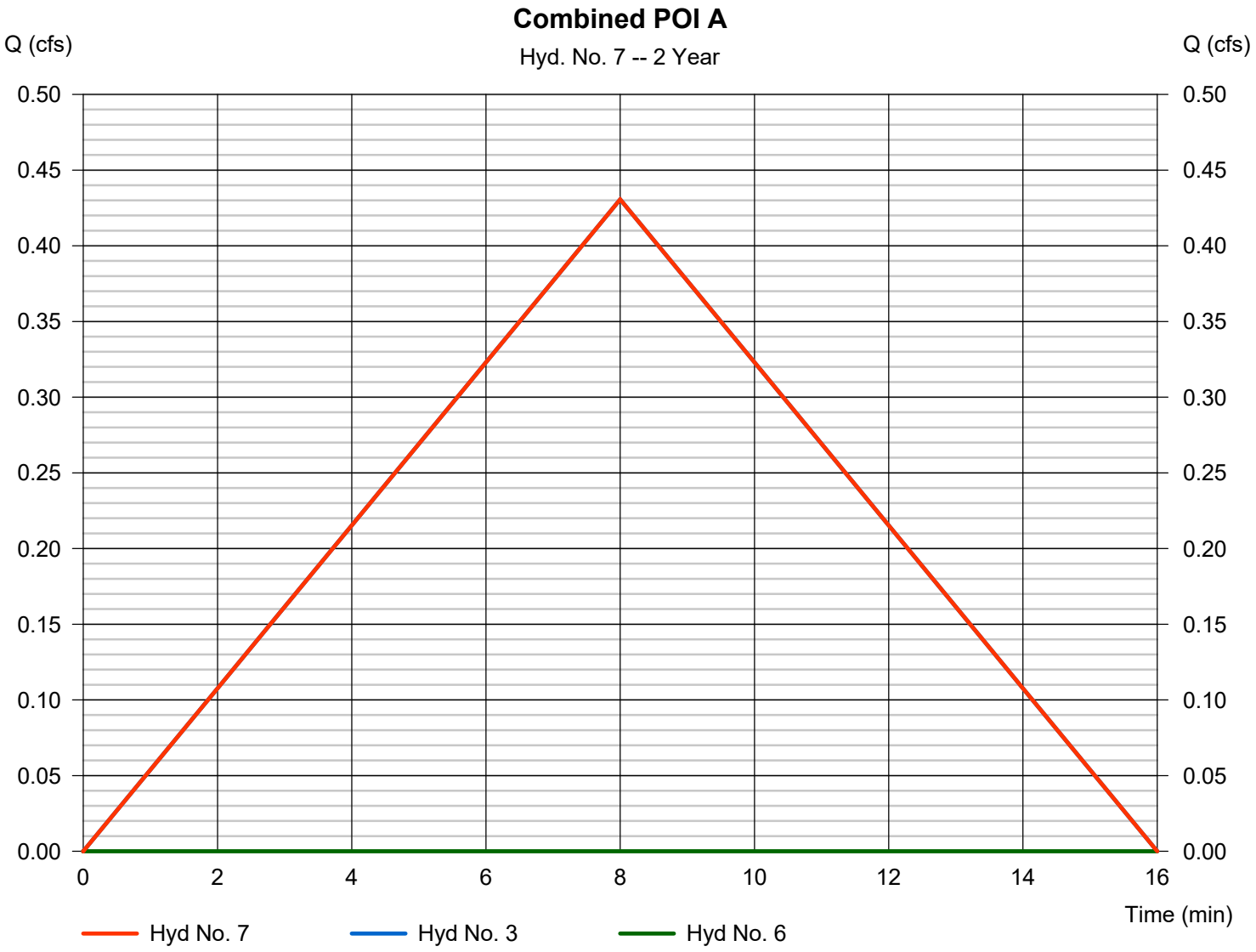
Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	1038.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
1.00	41	1039.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
2.00	82	1040.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
3.00	123	1041.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
4.00	164	1042.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
5.00	1,082	1043.00	0.07 oc	---	---	---	45.96	---	---	---	---	---	46.03
5.50	2,009	1043.50	0.09 oc	---	---	---	130.00	---	---	---	---	---	130.09

Hydrograph Report

Hyd. No. 7

Combined POI A

Hydrograph type	=	Combine	Peak discharge	=	0.431 cfs
Storm frequency	=	2 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	207 cuft
Inflow hyds.	=	3, 6	Contrib. drain. area	=	0.160 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

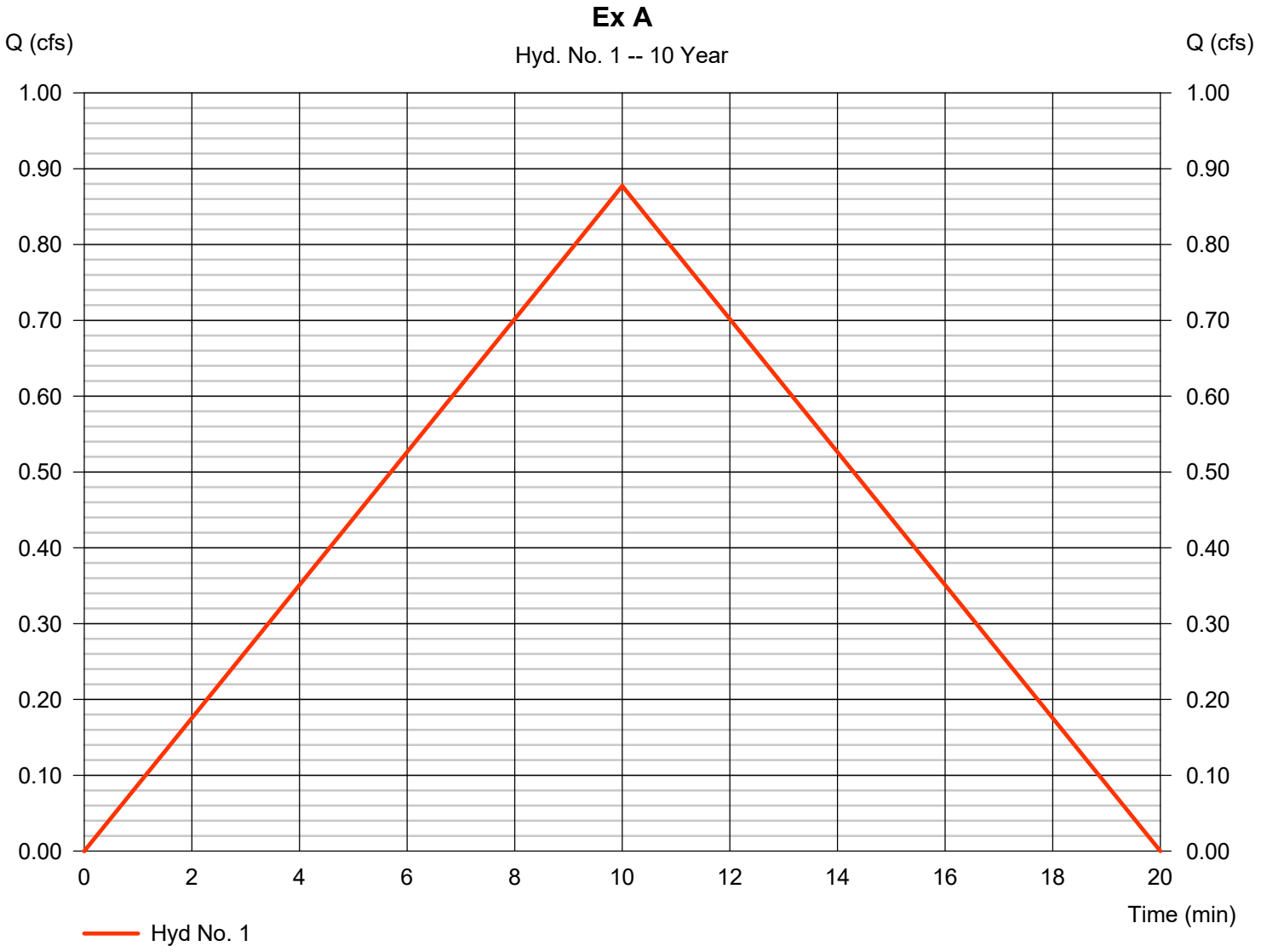
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	0.877	1	10	526	------	------	------	Ex A
2	Rational	0.326	1	9	176	------	------	------	Ex B
3	Rational	0.635	1	8	305	------	------	------	Prop A
4	Rational	0.695	1	6	250	------	------	------	Prop A1
5	Rational	0.361	1	9	195	------	------	------	Prop B
6	Reservoir	0.013	1	12	80	4	1042.09	248	Detained Prop A1
7	Combine	0.640	1	8	385	3, 6	------	------	Combined POI A

Hydrograph Report

Hyd. No. 1

Ex A

Hydrograph type	=	Rational	Peak discharge	=	0.877 cfs
Storm frequency	=	10 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	526 cuft
Drainage area	=	0.300 ac	Runoff coeff.	=	0.48
Intensity	=	6.092 in/hr	Tc by User	=	10.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

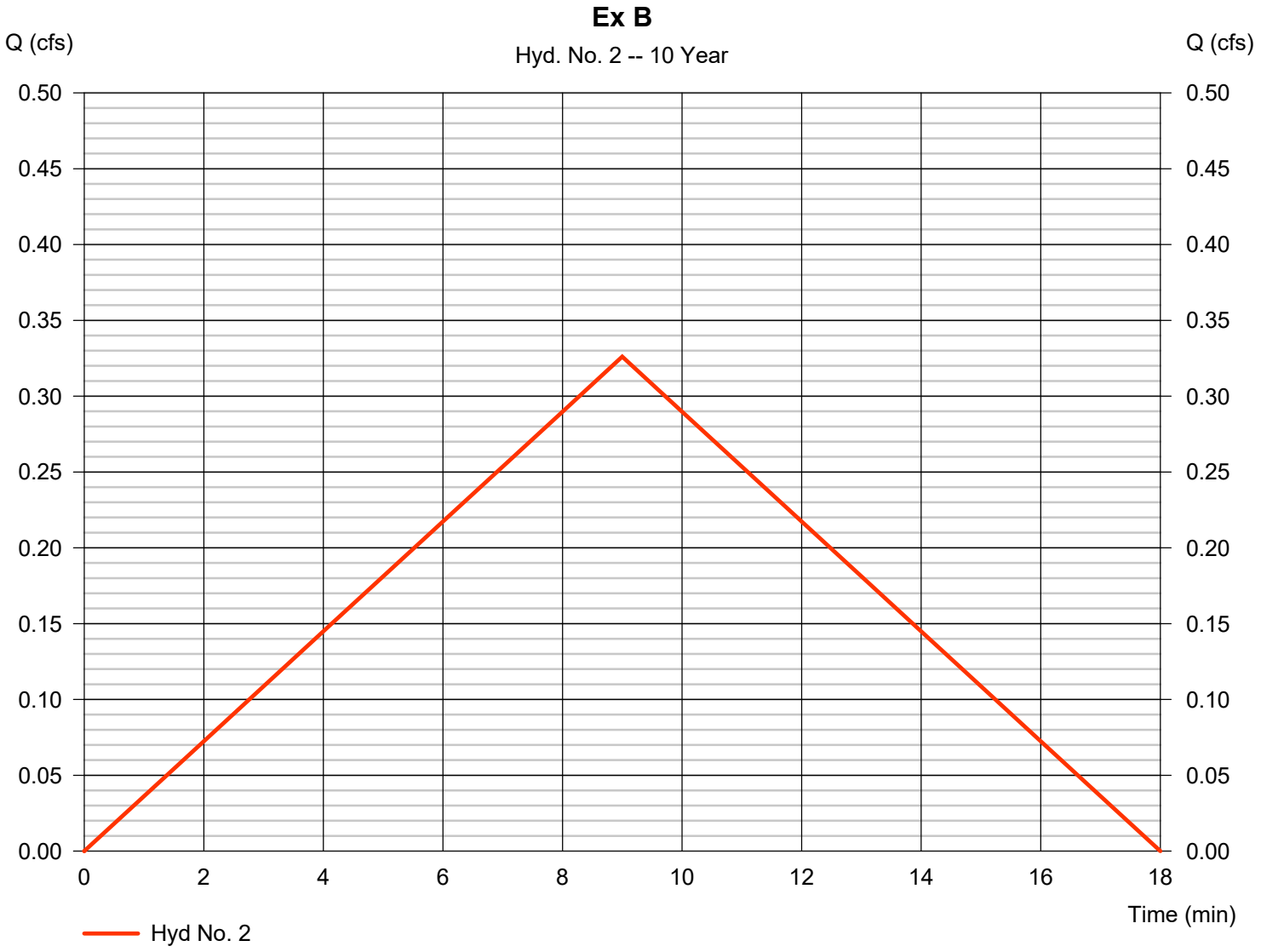


Hydrograph Report

Hyd. No. 2

Ex B

Hydrograph type	=	Rational	Peak discharge	=	0.326 cfs
Storm frequency	=	10 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	176 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.37
Intensity	=	6.294 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

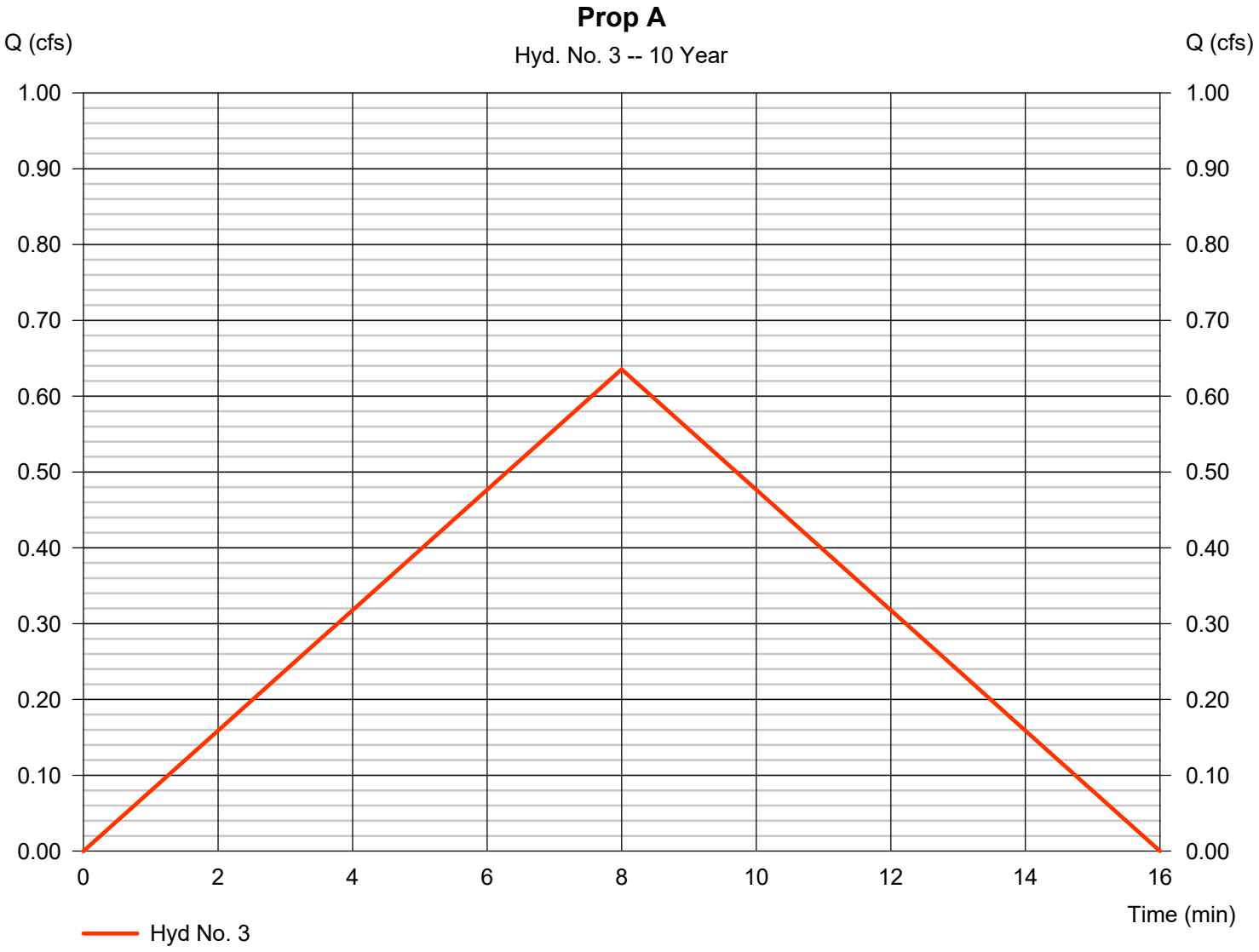


Hydrograph Report

Hyd. No. 3

Prop A

Hydrograph type	=	Rational	Peak discharge	=	0.635 cfs
Storm frequency	=	10 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	305 cuft
Drainage area	=	0.160 ac	Runoff coeff.	=	0.61
Intensity	=	6.511 in/hr	Tc by User	=	8.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

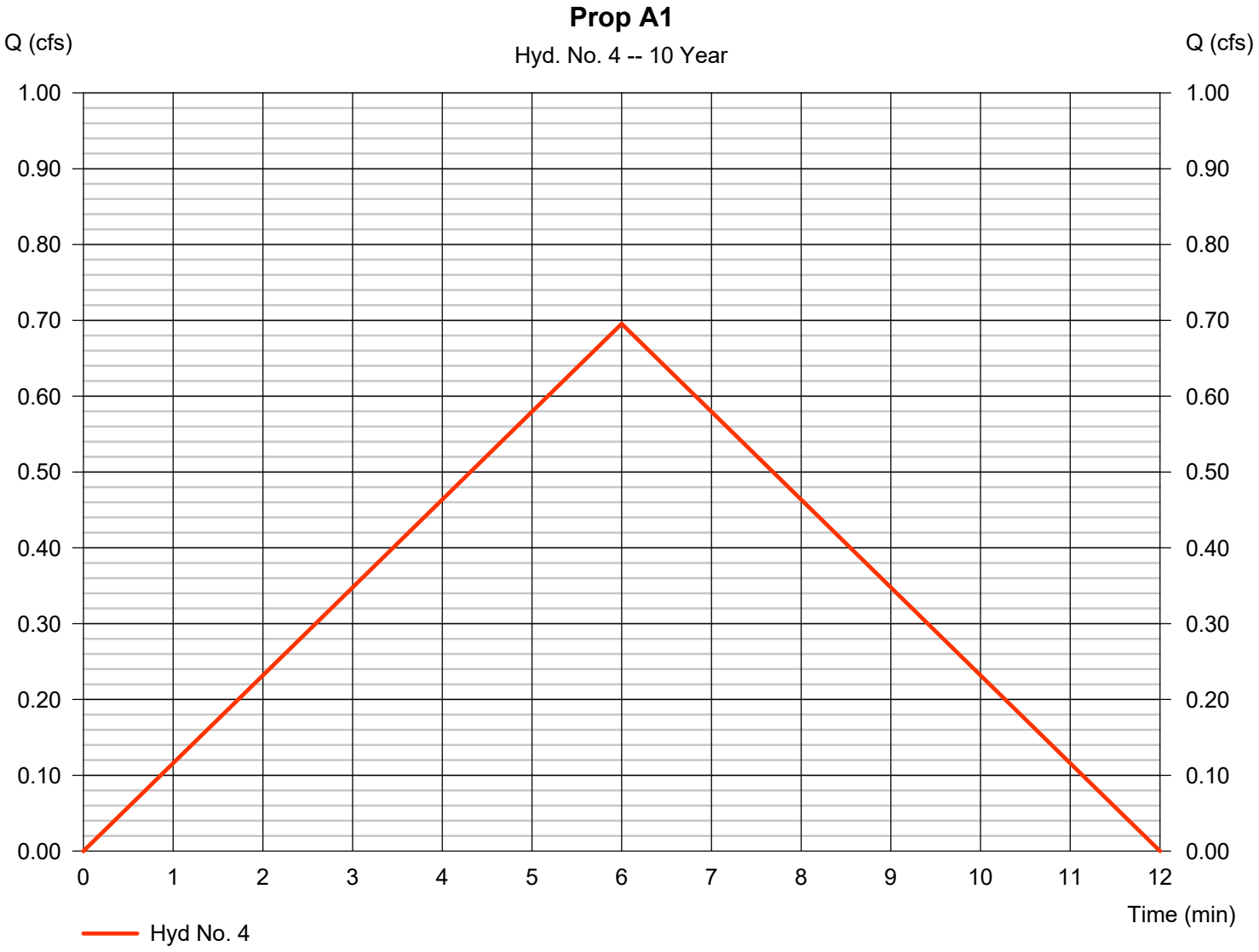


Hydrograph Report

Hyd. No. 4

Prop A1

Hydrograph type	=	Rational	Peak discharge	=	0.695 cfs
Storm frequency	=	10 yrs	Time to peak	=	6 min
Time interval	=	1 min	Hyd. volume	=	250 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.71
Intensity	=	6.996 in/hr	Tc by User	=	6.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

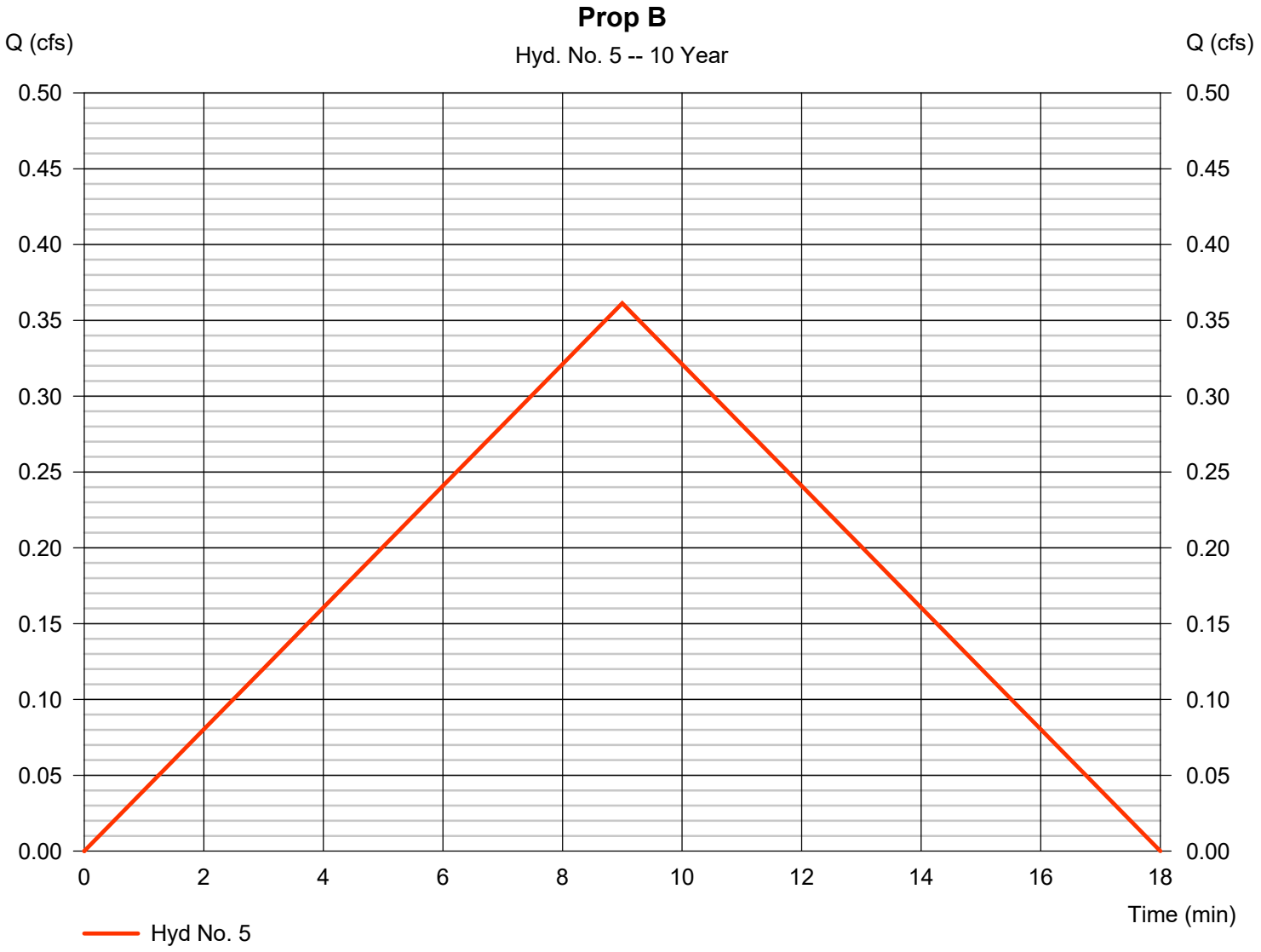


Hydrograph Report

Hyd. No. 5

Prop B

Hydrograph type	=	Rational	Peak discharge	=	0.361 cfs
Storm frequency	=	10 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	195 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.41
Intensity	=	6.294 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1



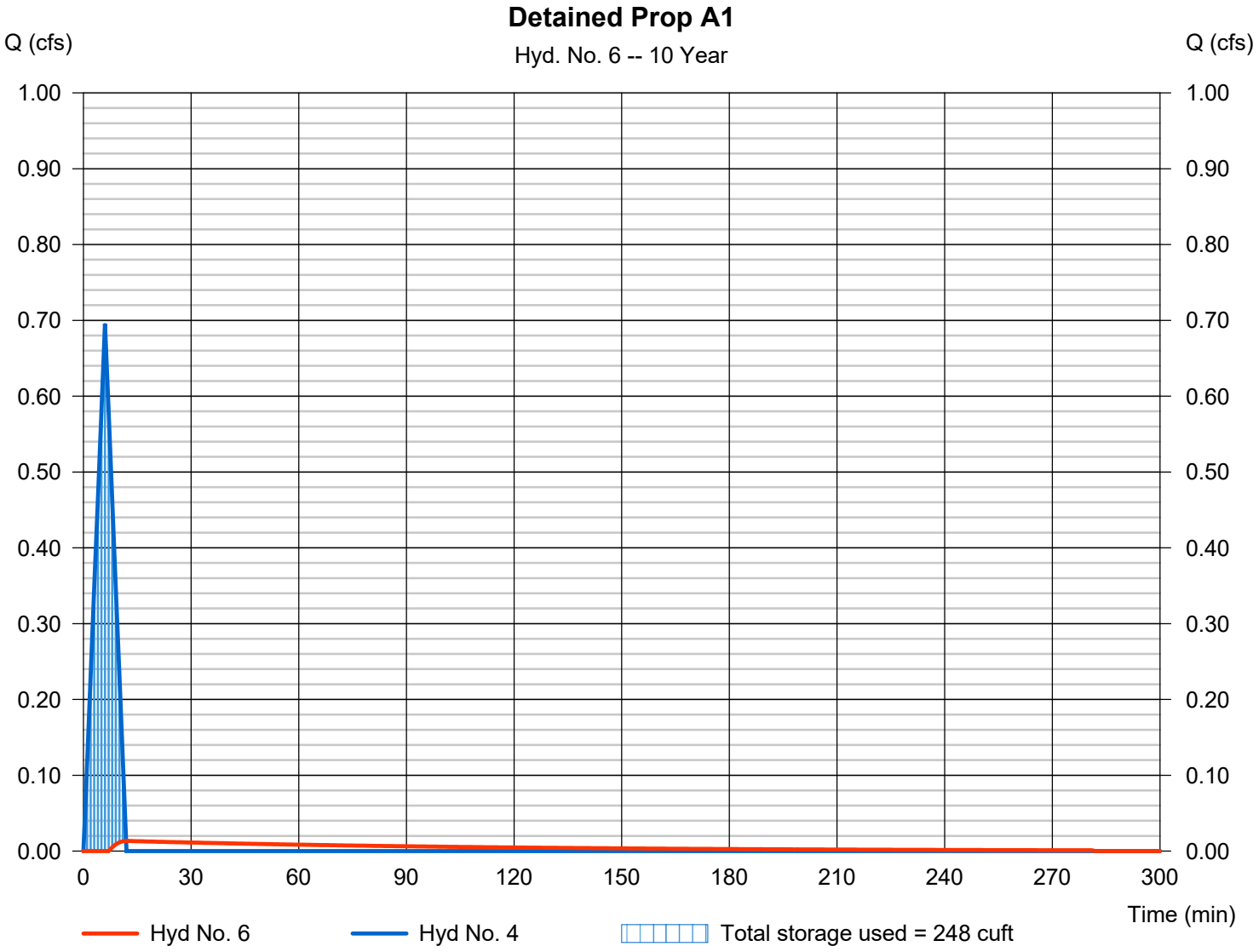
Hydrograph Report

Hyd. No. 6

Detained Prop A1

Hydrograph type	=	Reservoir	Peak discharge	=	0.013 cfs
Storm frequency	=	10 yrs	Time to peak	=	12 min
Time interval	=	1 min	Hyd. volume	=	80 cuft
Inflow hyd. No.	=	4 - Prop A1	Max. Elevation	=	1042.09 ft
Reservoir name	=	Detention Pit	Max. Storage	=	248 cuft

Storage Indication method used.

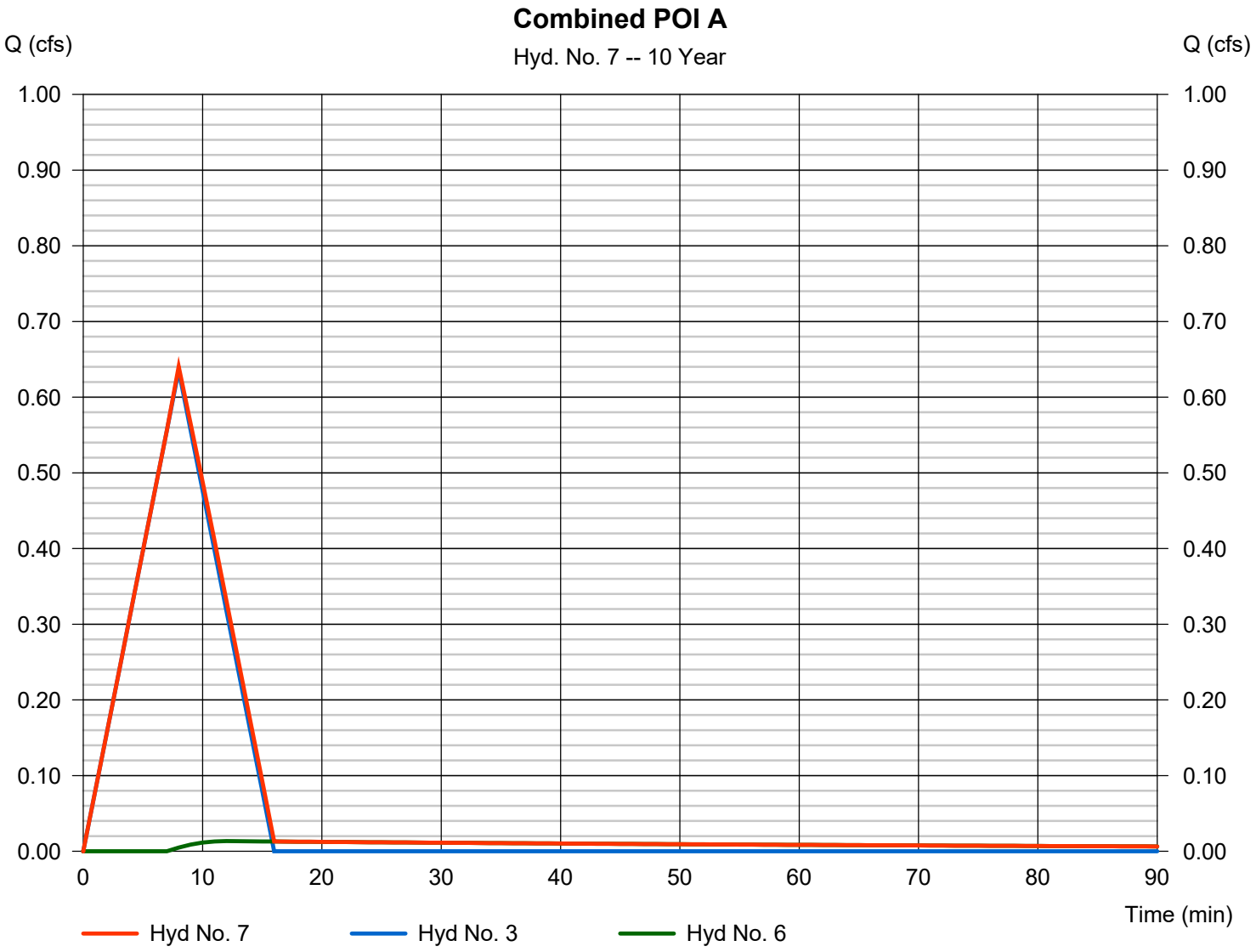


Hydrograph Report

Hyd. No. 7

Combined POI A

Hydrograph type	=	Combine	Peak discharge	=	0.640 cfs
Storm frequency	=	10 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	385 cuft
Inflow hyds.	=	3, 6	Contrib. drain. area	=	0.160 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

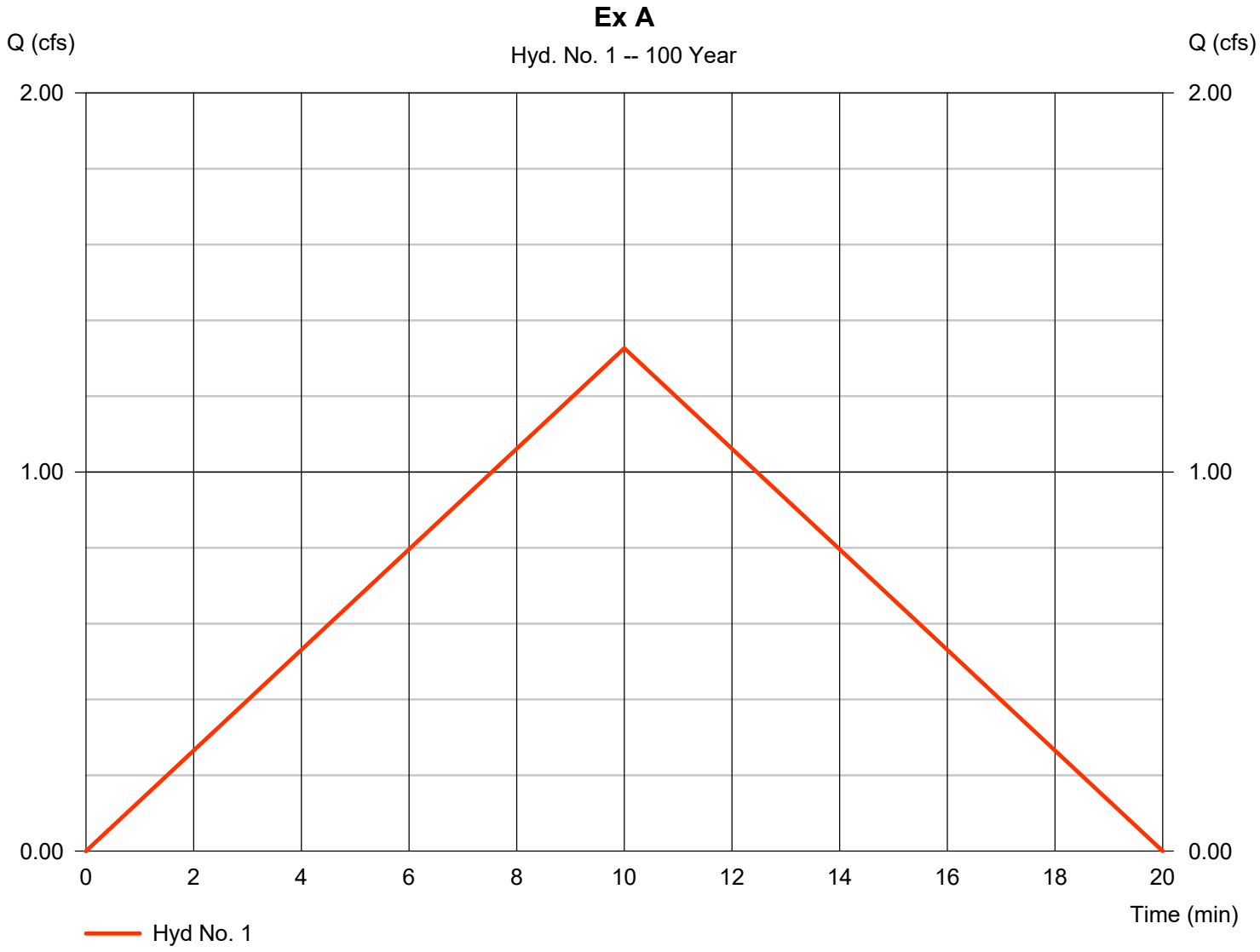
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	Rational	1.327	1	10	796	------	------	------	Ex A
2	Rational	0.493	1	9	266	------	------	------	Ex B
3	Rational	0.961	1	8	461	------	------	------	Prop A
4	Rational	1.052	1	6	379	------	------	------	Prop A1
5	Rational	0.546	1	9	295	------	------	------	Prop B
6	Reservoir	0.037	1	12	208	4	1042.22	369	Detained Prop A1
7	Combine	0.984	1	8	670	3, 6	------	------	Combined POI A

Hydrograph Report

Hyd. No. 1

Ex A

Hydrograph type	=	Rational	Peak discharge	=	1.327 cfs
Storm frequency	=	100 yrs	Time to peak	=	10 min
Time interval	=	1 min	Hyd. volume	=	796 cuft
Drainage area	=	0.300 ac	Runoff coeff.	=	0.48
Intensity	=	9.213 in/hr	Tc by User	=	10.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

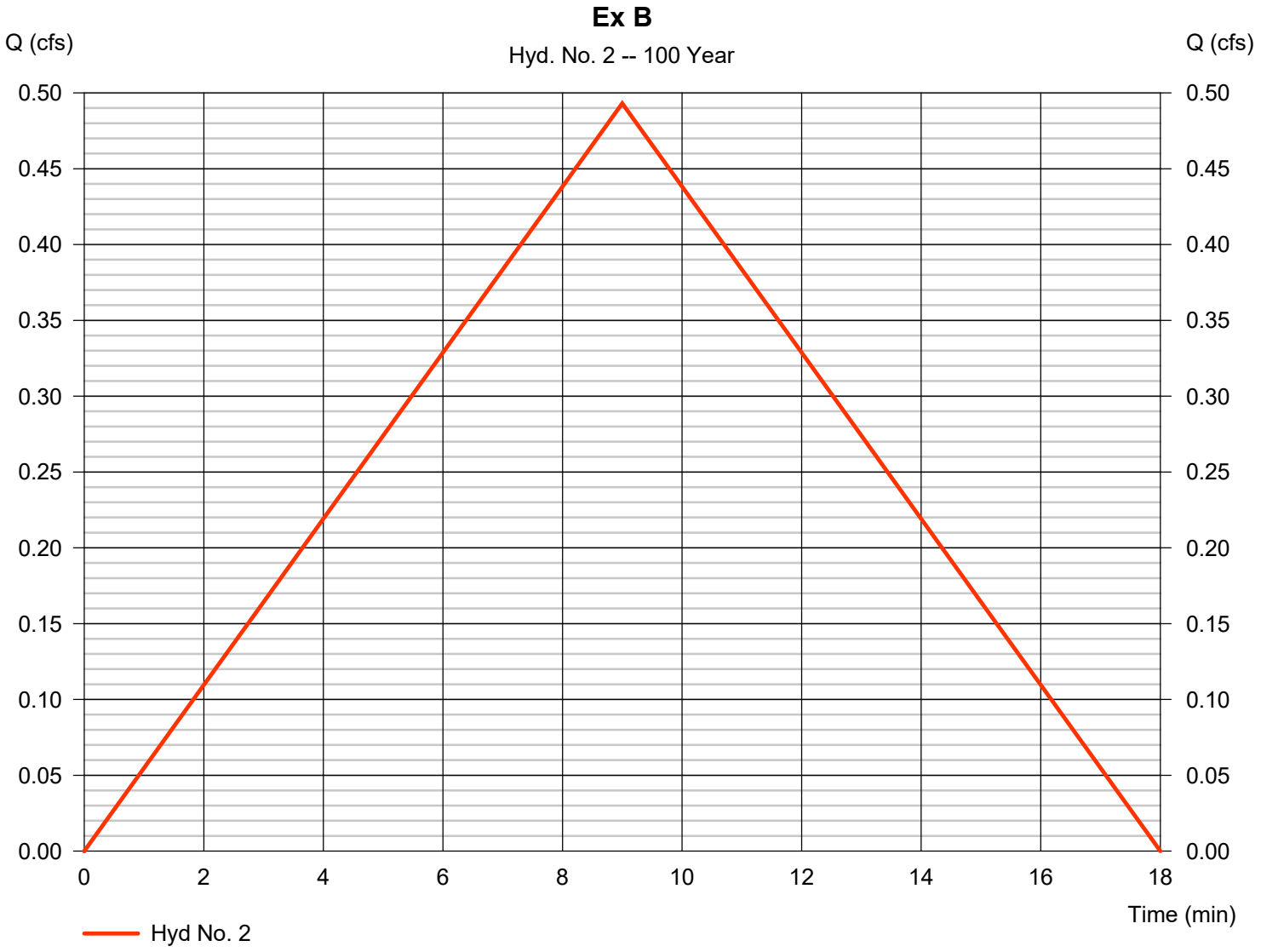


Hydrograph Report

Hyd. No. 2

Ex B

Hydrograph type	=	Rational	Peak discharge	=	0.493 cfs
Storm frequency	=	100 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	266 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.37
Intensity	=	9.519 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

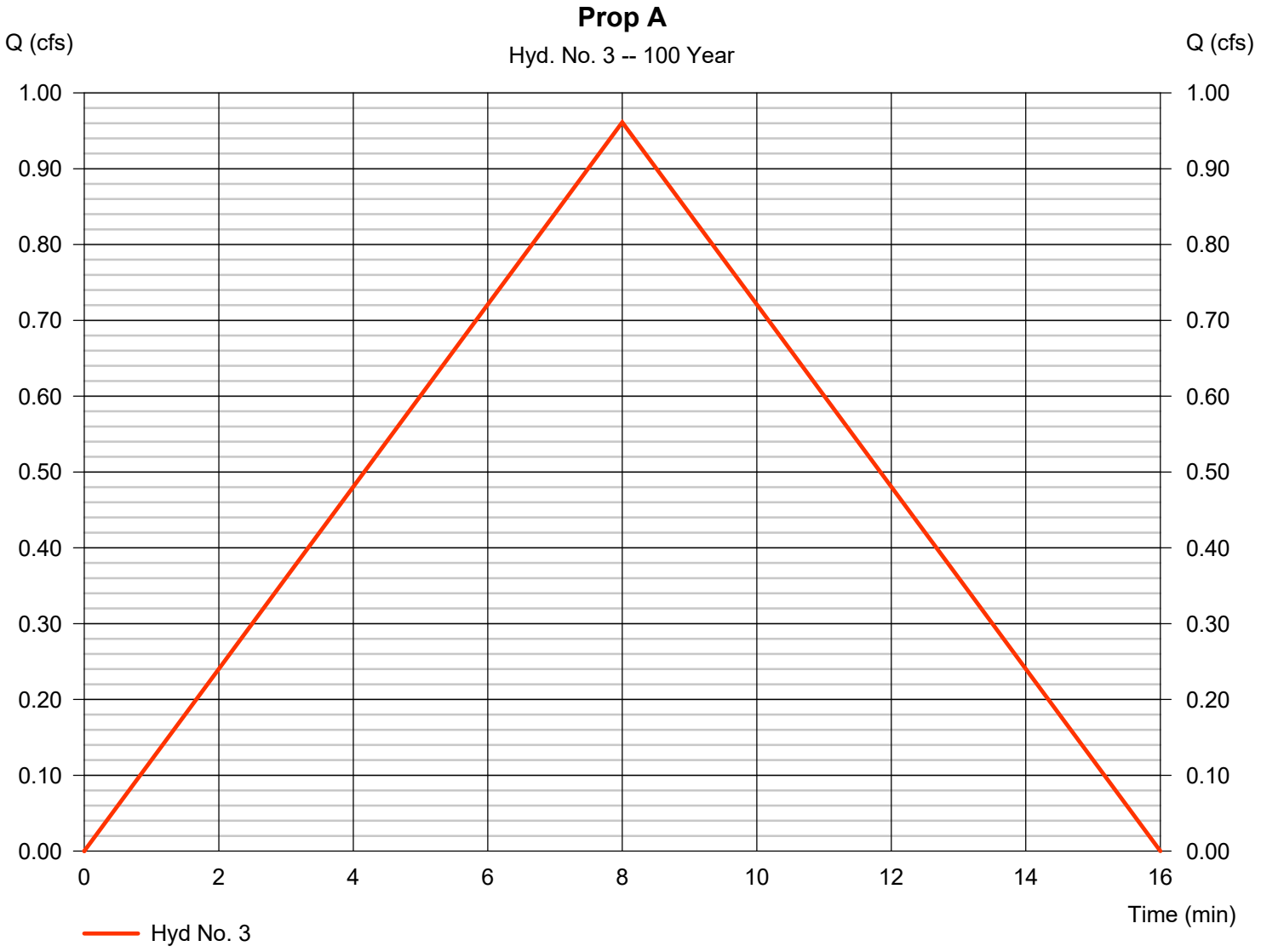


Hydrograph Report

Hyd. No. 3

Prop A

Hydrograph type	=	Rational	Peak discharge	=	0.961 cfs
Storm frequency	=	100 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	461 cuft
Drainage area	=	0.160 ac	Runoff coeff.	=	0.61
Intensity	=	9.848 in/hr	Tc by User	=	8.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

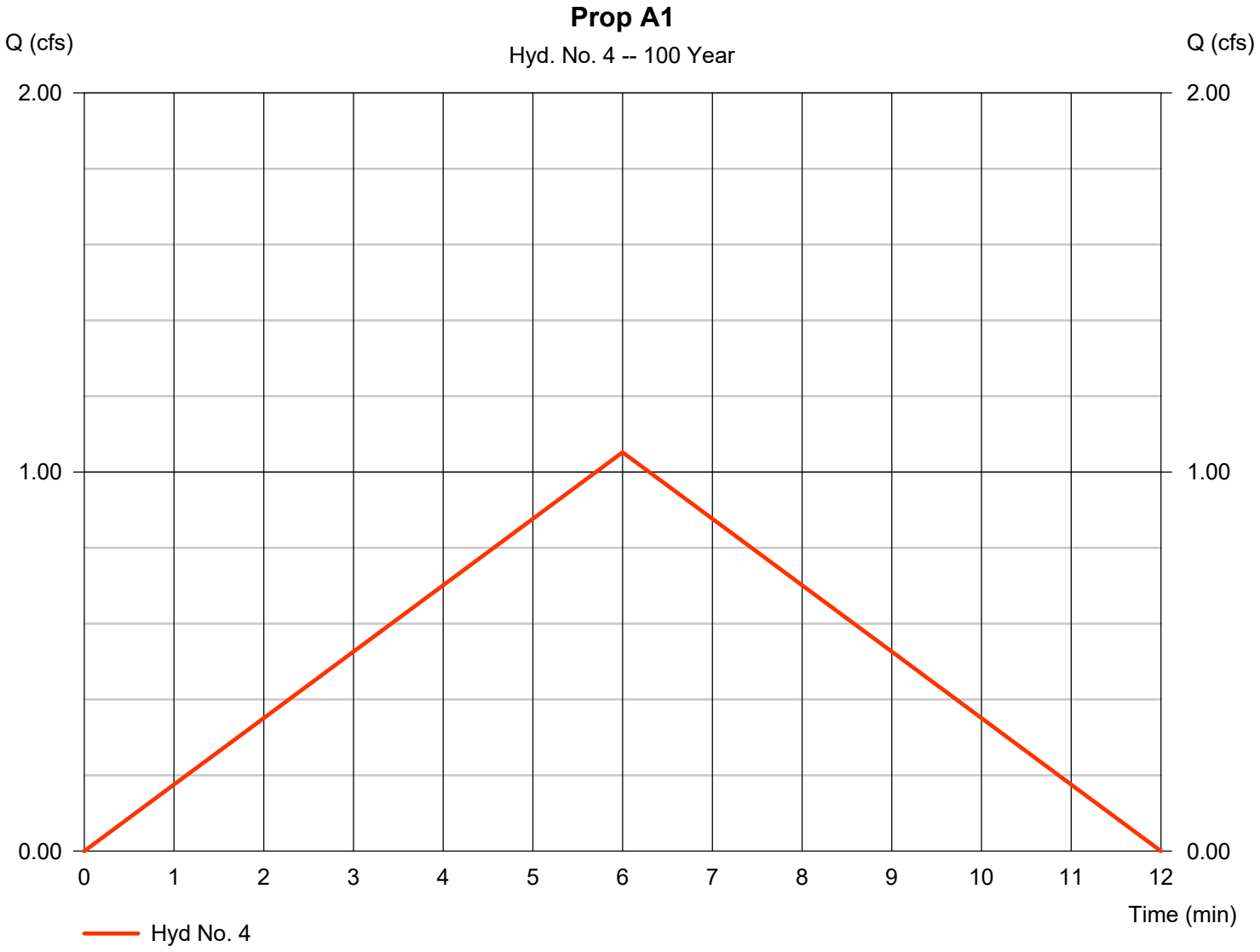


Hydrograph Report

Hyd. No. 4

Prop A1

Hydrograph type	=	Rational	Peak discharge	=	1.052 cfs
Storm frequency	=	100 yrs	Time to peak	=	6 min
Time interval	=	1 min	Hyd. volume	=	379 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.71
Intensity	=	10.583 in/hr	Tc by User	=	6.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1

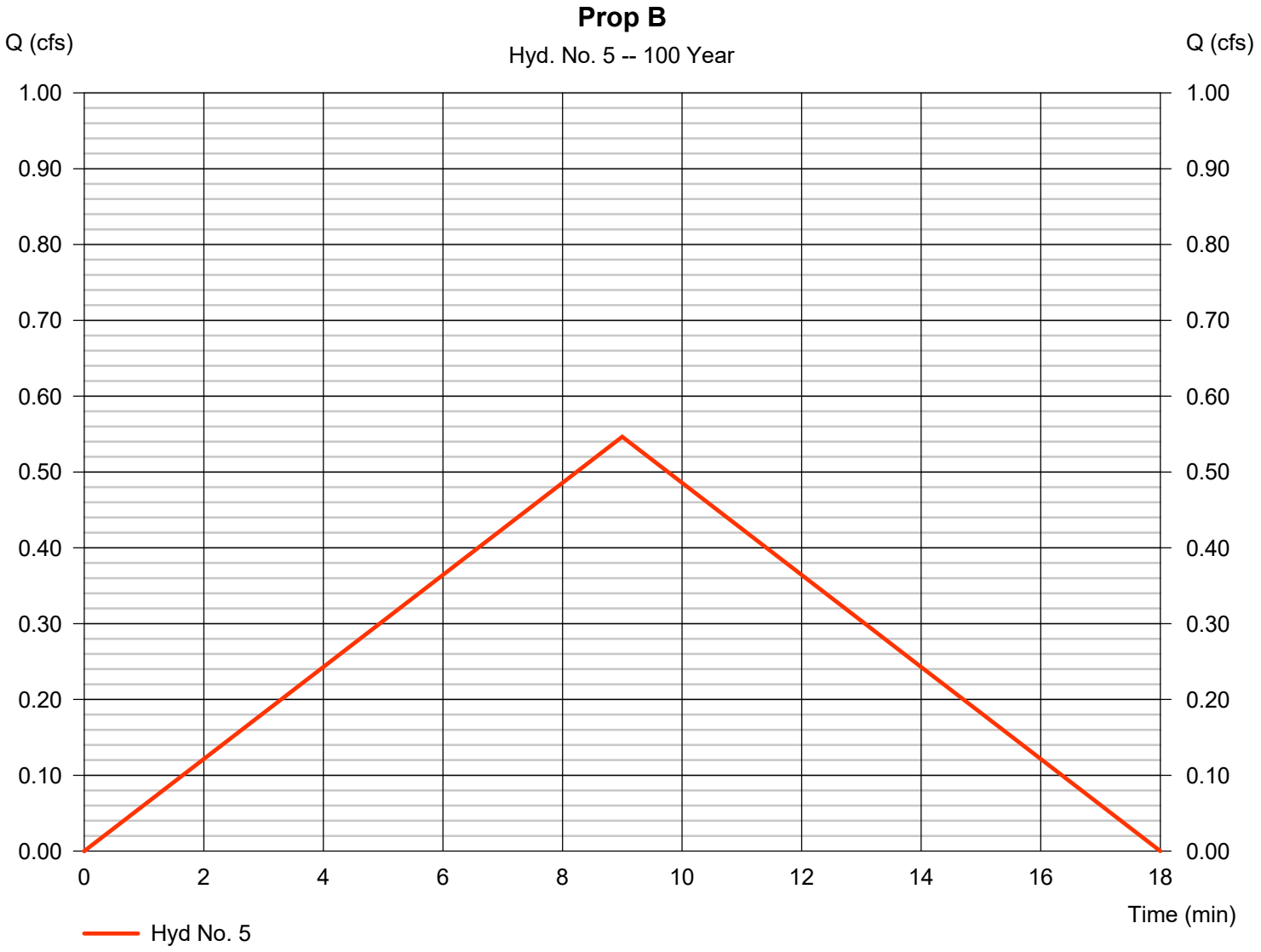


Hydrograph Report

Hyd. No. 5

Prop B

Hydrograph type	=	Rational	Peak discharge	=	0.546 cfs
Storm frequency	=	100 yrs	Time to peak	=	9 min
Time interval	=	1 min	Hyd. volume	=	295 cuft
Drainage area	=	0.140 ac	Runoff coeff.	=	0.41
Intensity	=	9.519 in/hr	Tc by User	=	9.00 min
IDF Curve	=	KCMO.IDF	Asc/Rec limb fact	=	1/1



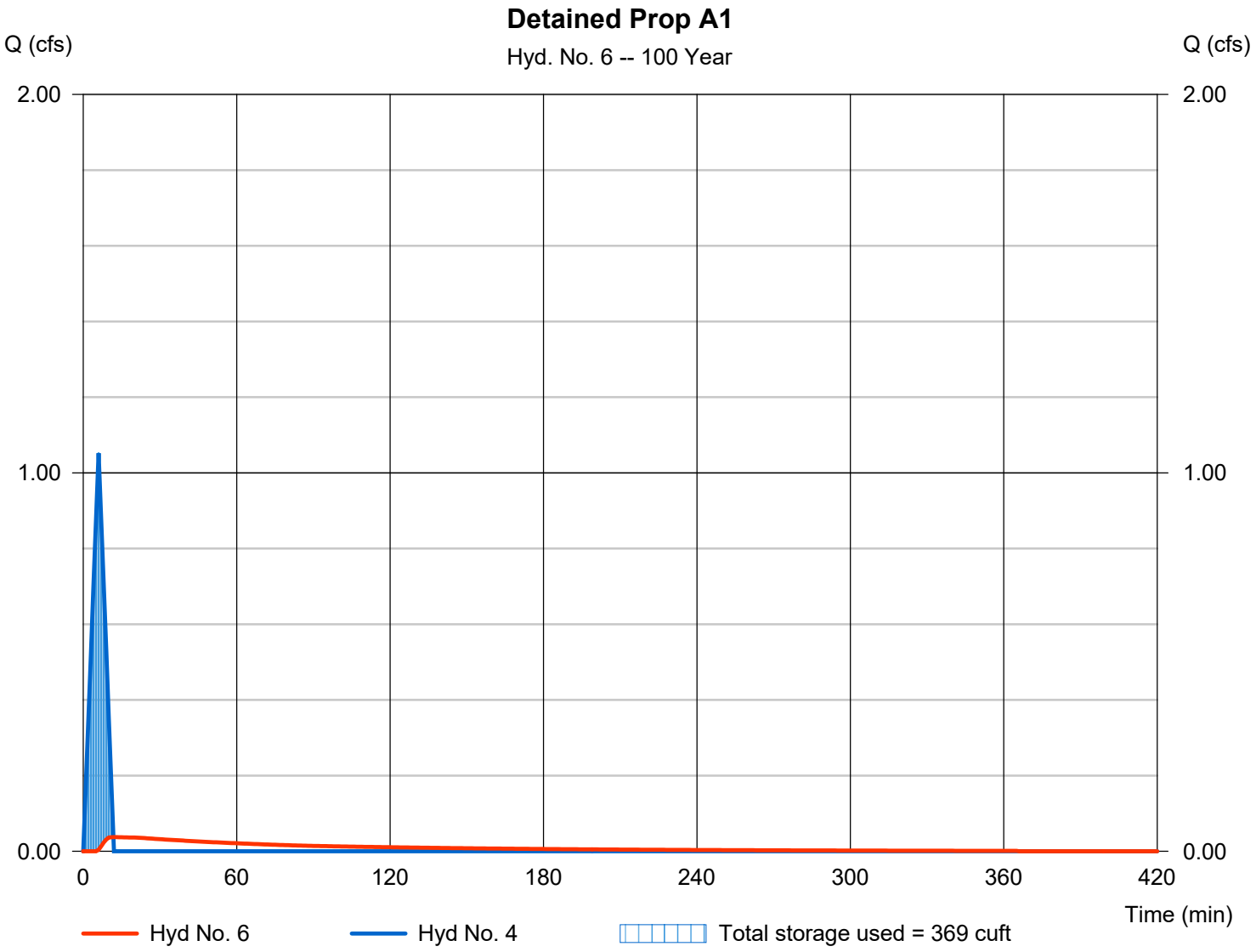
Hydrograph Report

Hyd. No. 6

Detained Prop A1

Hydrograph type	=	Reservoir	Peak discharge	=	0.037 cfs
Storm frequency	=	100 yrs	Time to peak	=	12 min
Time interval	=	1 min	Hyd. volume	=	208 cuft
Inflow hyd. No.	=	4 - Prop A1	Max. Elevation	=	1042.22 ft
Reservoir name	=	Detention Pit	Max. Storage	=	369 cuft

Storage Indication method used.

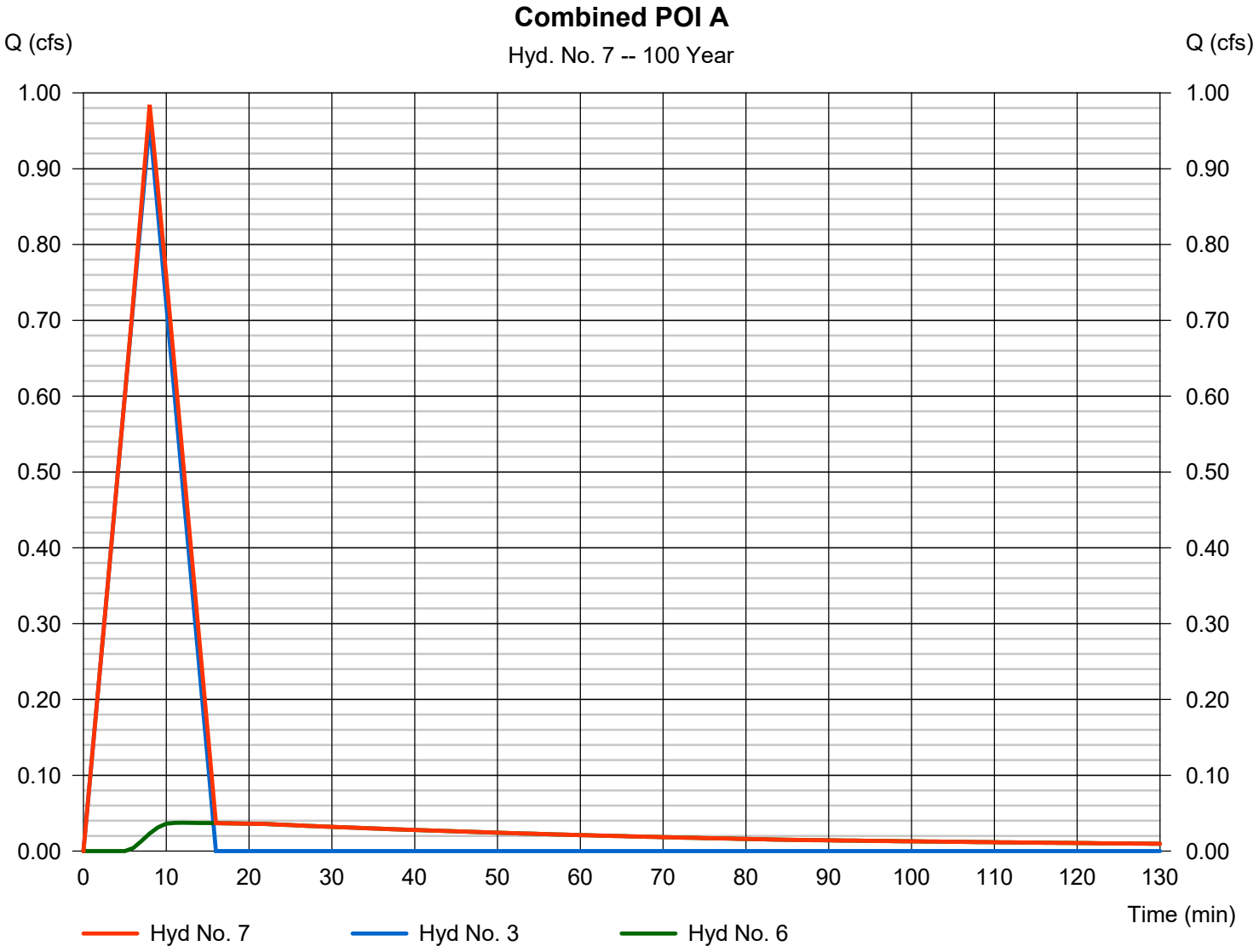


Hydrograph Report

Hyd. No. 7

Combined POI A

Hydrograph type	=	Combine	Peak discharge	=	0.984 cfs
Storm frequency	=	100 yrs	Time to peak	=	8 min
Time interval	=	1 min	Hyd. volume	=	670 cuft
Inflow hyds.	=	3, 6	Contrib. drain. area	=	0.160 ac



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	64.1474	17.7000	0.8922	--------
2	95.7859	19.2000	0.9317	--------
3	0.0000	0.0000	0.0000	--------
5	118.7799	19.1000	0.9266	--------
10	125.1300	18.2000	0.9051	--------
25	158.9867	18.7000	0.9180	--------
50	171.2459	18.3000	0.9078	--------
100	187.3624	18.1000	0.9031	--------

File name: KCMO.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	3.96	3.31	2.86	2.52	2.25	2.04	1.87	1.72	1.60	1.49	1.40	1.32
2	4.92	4.13	3.56	3.14	2.81	2.54	2.32	2.14	1.98	1.85	1.73	1.63
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.23	5.23	4.51	3.98	3.56	3.22	2.94	2.71	2.52	2.35	2.20	2.07
10	7.27	6.09	5.26	4.63	4.14	3.75	3.43	3.16	2.93	2.74	2.57	2.42
25	8.70	7.30	6.30	5.54	4.96	4.49	4.10	3.78	3.51	3.27	3.07	2.89
50	9.83	8.24	7.11	6.26	5.60	5.07	4.64	4.27	3.97	3.70	3.47	3.27
100	11.00	9.21	7.95	7.00	6.26	5.67	5.19	4.78	4.44	4.14	3.89	3.66

Tc = time in minutes. Values may exceed 60.

Precip. file name: Z:\acad\KCMO.pcp

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	1.37	3.71	0.00	3.30	5.68	6.00	6.80	9.26
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	2.49	3.10	0.00	4.01	4.64	5.52	6.21	6.90
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Exhibit C
Proposed Drainage Map

50 SE 30th Street Lee's Summit, MO 64082
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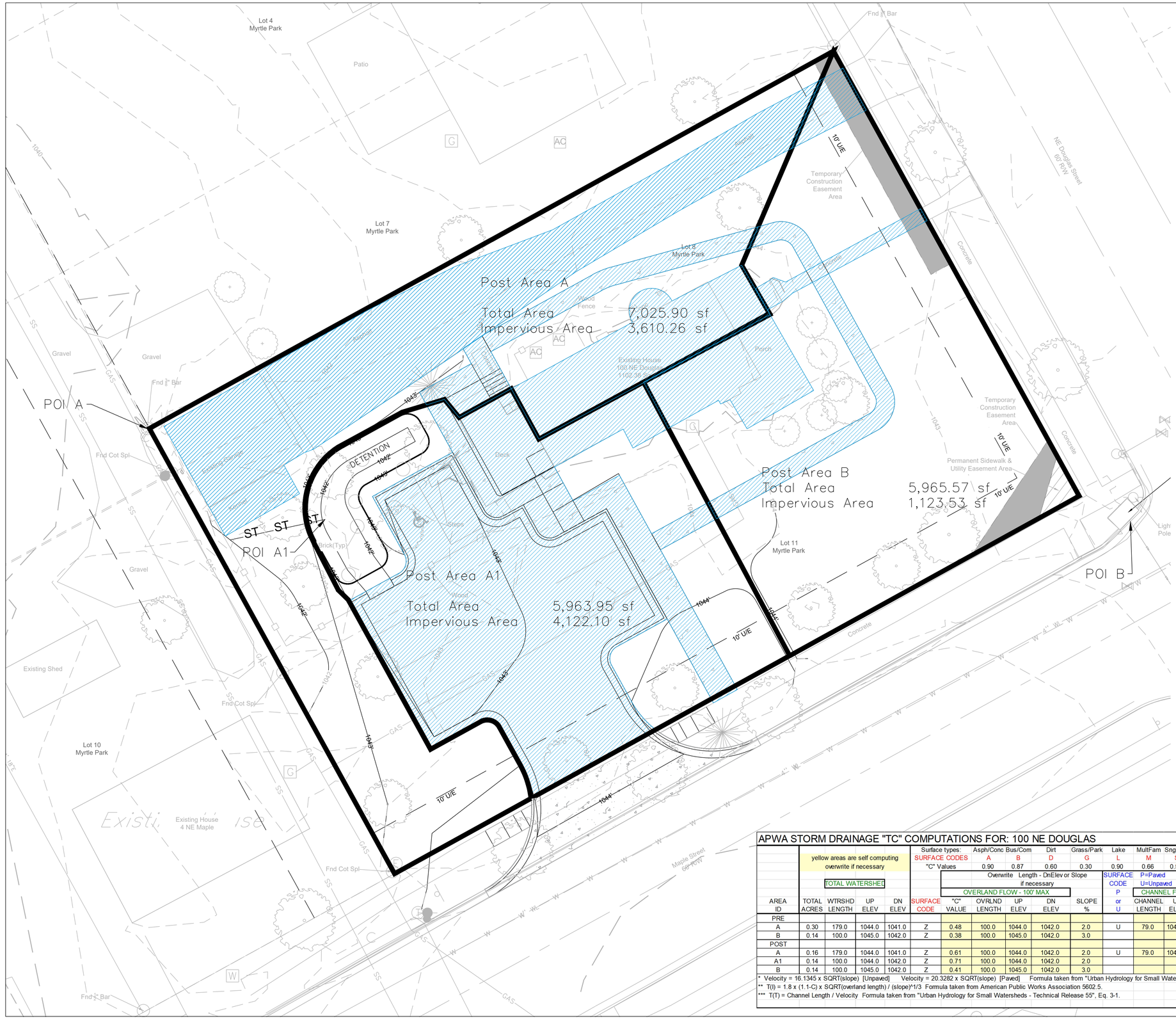

POST DEVELOPMENT DRAINAGE PLAN

APWA STORM DRAINAGE "TC" COMPUTATIONS FOR: 100 NE DOUGLAS

AREA ID	TOTAL ACRES	WTRSHD LENGTH	UP ELEV	DN ELEV	SURFACE CODE	"C" VALUE	OVRLND LENGTH	UP ELEV	DN ELEV	SLOPE %	SURFACE CODE	CHANNEL LENGTH	UP ELEV	DN ELEV	SLOPE %	VELOCITY F/S	Cal Overland Flow T(i)	Used Min 5 T(i)	Cal Channel One T(T)	Cal Channel Two T(T)	Total T@ 10	AREA ID
	yellow areas are self computing overwrite if necessary				Surface types: SURFACE CODES	Asph/Conc A	Bus/Com B	Dirt D	Grass/Park G	Lake L	MultFam M	SnglFam S	Undev U	Other Z			TC COMPUTATION					
					"C" Values	0.90	0.87	0.60	0.30	0.90	0.66	0.51	0.3									
	TOTAL WATERSHED				Overwrite if necessary	Length - DnElev or Slope if necessary				SURFACE CODE P or U	P=Paved U=Unpaved			Overwrite Slope or Elevations if necessary								
					OVERLAND FLOW - 100' MAX						CHANNEL FLOW - FIRST REACH											
PRE																						PRE
A	0.30	179.0	1044.0	1041.0	Z	0.48	100.0	1044.0	1042.0	2.0	U	79.0	1042.0	1041.0	1.27	1.8	8.9	8.9	0.7	0.0	9.6	A
B	0.14	100.0	1045.0	1042.0	Z	0.38	100.0	1045.0	1042.0	3.0							9.0	9.0	0.0	0.0	9.0	B
POST																						
A	0.16	179.0	1044.0	1041.0	Z	0.61	100.0	1044.0	1042.0	2.0	U	79.0	1042.0	1041.0	1.27	1.8	7.0	7.0	0.7	0.0	7.7	A
A1	0.14	100.0	1044.0	1042.0	Z	0.71	100.0	1044.0	1042.0	2.0							5.6	5.6	0.0	0.0	5.6	A1
B	0.14	100.0	1045.0	1042.0	Z	0.41	100.0	1045.0	1042.0	3.0							8.6	8.6	0.0	0.0	8.6	B

* Velocity = 16.1345 x SQRT(slope) [Unpaved] Velocity = 20.3282 x SQRT(slope) [Paved] Formula taken from "Urban Hydrology for Small Watersheds - Technical Release 55", Appendix F, Figure 3-1.

** T(i) = 1.8 x (1.1-C) x SQRT(overland length) / (slope)^1/3 Formula taken from American Public Works Association 5602.5.

*** T(T) = Channel Length / Velocity Formula taken from "Urban Hydrology for Small Watersheds - Technical Release 55", Eq. 3-1.

ENGINEERING SOLUTIONS
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LEE'S SUMMIT, MO 64082
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Professional Registration
Missouri
Engineering 2005002186-D
Surveying 2005008319-D
Kansas
Engineering E-1695
Surveying LS-218
Oklahoma
Engineering 6254
Nebraska
Engineering CA2821

100 NE DOUGLAS STREET
Lee's Summit, Jackson County, Missouri

Project: 100 NE DOUGLAS LSMO
Issue Date: June 24, 2025

Post Development
Final Development Plans for:
100 NE DOUGLAS STREET
Lee's Summit, Jackson County, Missouri

Matthew J. Schlicht
MO PE 2006019708
KS PE 19071
OK PE 25226
NE PE E-14335

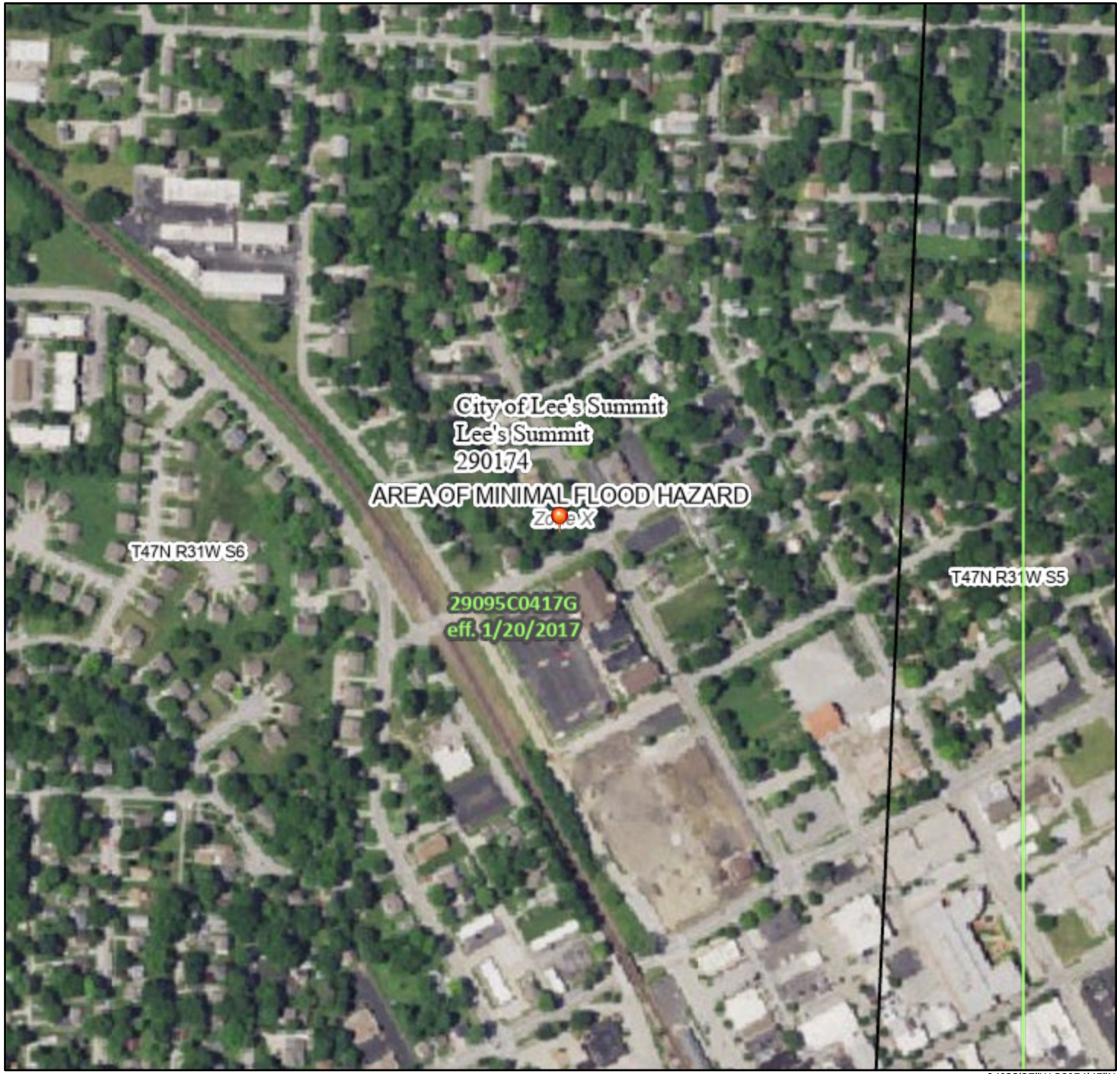
REVISIONS
REV. 12/18/2025
REV. 1/13/2026

Exhibit D
FEMA FIRMette

National Flood Hazard Layer FIRMette

FEMA

94°23'4"W 38°55'13"N



94°22'27"W 38°54'45"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/23/2025 at 9:13 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Exhibit E
Wetland Inventory Map

50 SE 30th Street Lee's Summit, MO 64082
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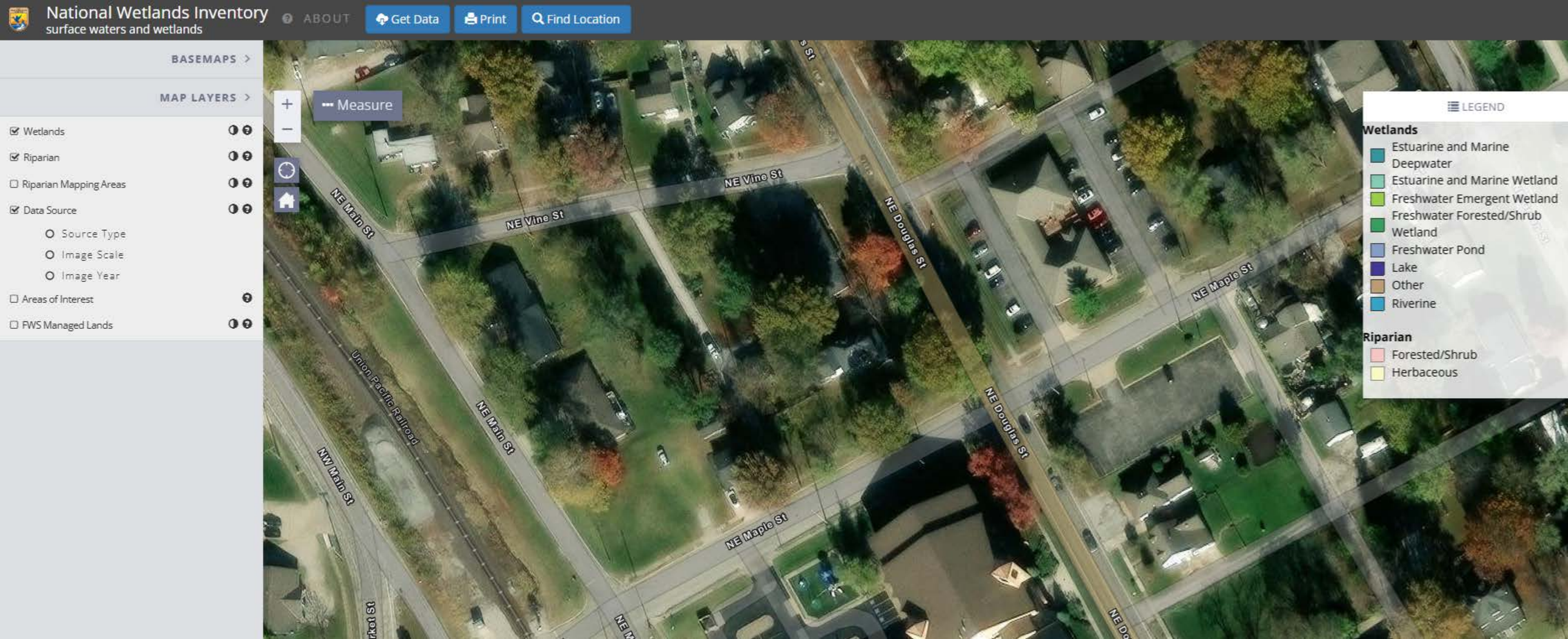
National Wetlands Inventory
surface waters and wetlands
ABOUT
Get Data
Print
Find Location
BASEMAPS
MAP LAYERS
Wetlands
Riparian
Riparian Mapping Areas
Data Source
Source Type
Image Scale
Image Year
Areas of Interest
FWS Managed Lands
Measure
NE Vine St
NE Main St
NE Douglas St
NE Maple St
Union Pacific Railroad
NW Main St
LEGEND
Wetlands
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
Riparian
Forested/Shrub
Herbaceous

Exhibit F
Soil Map

50 SE 30th Street Lee's Summit, MO 64082
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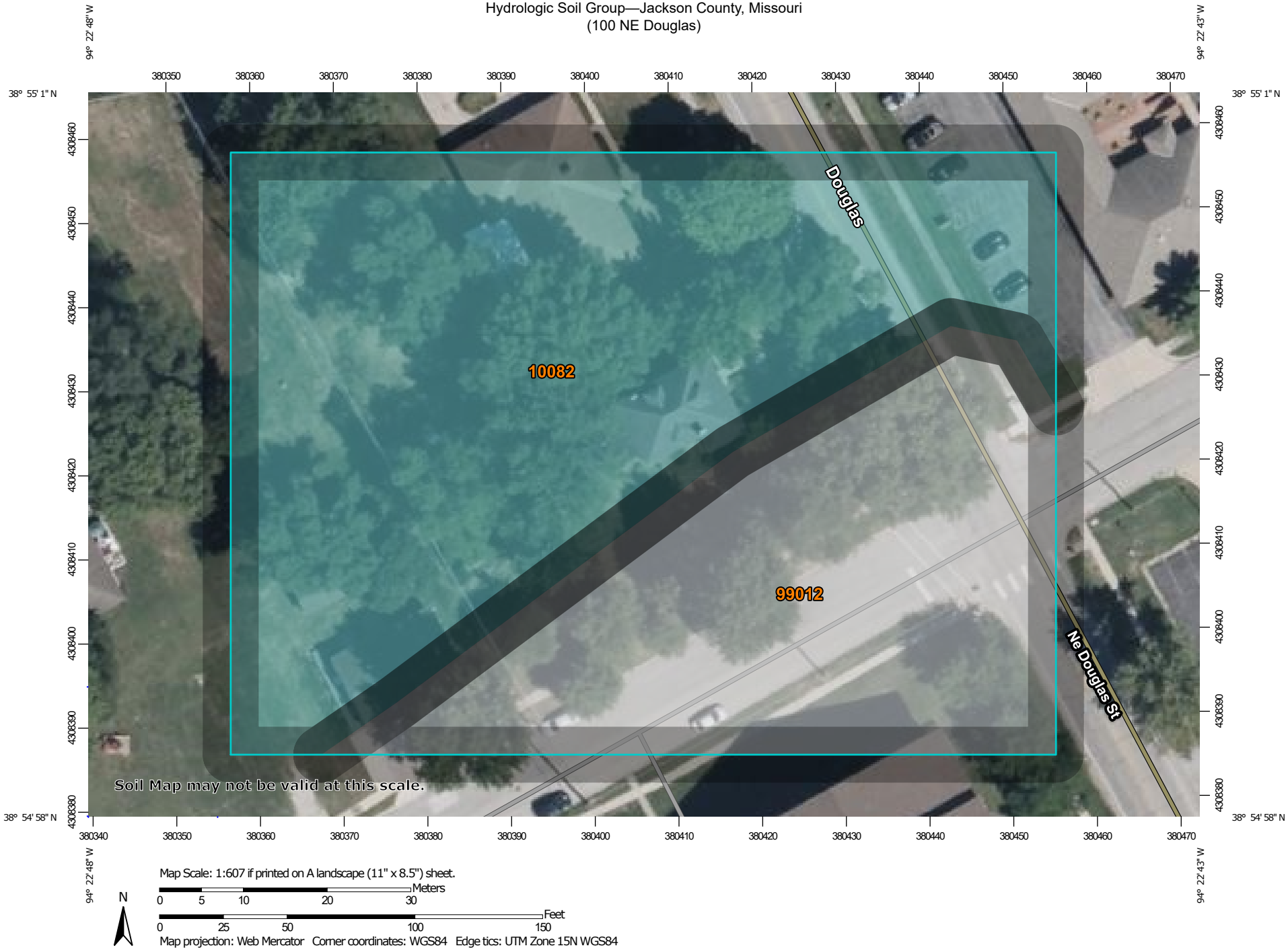
Hydrologic Soil Group—Jackson County, Missouri
(100 NE Douglas)



Map Scale: 1:607 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jackson County, Missouri
Survey Area Data: Version 27, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 30, 2022—Sep 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
10082	Arisburg-Urban land complex, 1 to 5 percent slopes	C	1.1	63.0%
99012	Urban land, upland, 5 to 9 percent slopes		0.6	37.0%
Totals for Area of Interest			**1.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher