

DRAINAGE REPORT
FOR
SITE DEVELOPMENT PLAN

Valley View Mini Storage LLC
JONESBORO, ARKANSAS

September 13, 2016



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McAlister Engineering

Jason Marshall is seeking to develop mini storage facilities at 5925 Southwest Dr., Jonesboro, AR 72404. The total area of this addition is 3.63 acres. This development will replace an open field of row crop.

This property lies within the Black Fork Ditch drainage basin. The drainage analysis method used for this analysis is the Soil Conservation Service Technical Release 55, "Urban Hydrology for Small Watersheds". The rainfall distribution is type II. Rainfall data is taken from Appendix B of TR55, and the rainfall intensities are as shown in the tables below. The area of the development is 3.63 acres

There is currently a roadside ditch running across the front of the lot which collects water from Southwest Dr. and surrounding areas. At the 100 year rain event, 197.52 cfs of water enters this ditch on the south side of the property. The new development of the mini storages will cause an increase of 16.21 cfs. Mr. Marshall will mitigate this flow by routing the water as it leaves the site in a circuitous manner through a heavily riprapped 275 foot channel designed to reduce the flow back to pre-existing conditions.

The technical data is attached.

Hydraflow Table of Contents

jmarvmini.gpw

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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Hydrograph Summary Report

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Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	13.53	2	720	35,571	-----	-----	-----	before
2	SCS Runoff	17.80	2	718	45,081	-----	-----	-----	after
3	SCS Runoff	80.00	2	732	345,610	-----	-----	-----	everything pre
4	SCS Runoff	77.25	2	734	349,958	-----	-----	-----	everything post

Hydrograph Report

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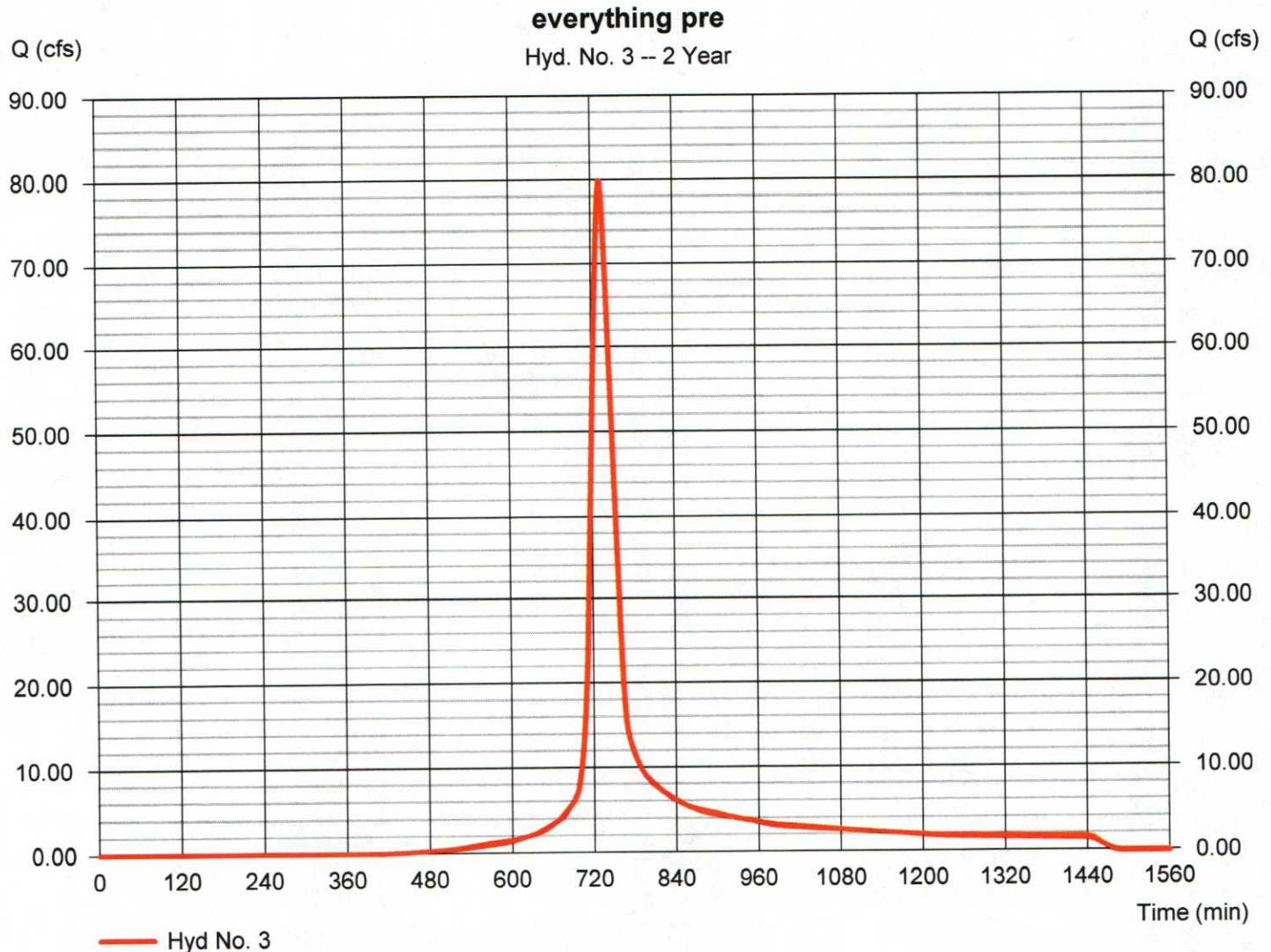
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Hyd. No. 3

everything pre

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.88 in
 Storm duration = 24 hrs

Peak discharge = 80.00 cfs
 Time to peak = 732 min
 Hyd. volume = 345,610 cuft
 Curve number = 85
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 31.50 min
 Distribution = Type II
 Shape factor = 484



TR55 Tc Worksheet

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Hyd. No. 3

everything pre

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>
Sheet Flow				
Manning's n-value	= 0.400	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 3.88	0.00	0.00	
Land slope (%)	= 9.00	0.00	0.00	
Travel Time (min)	= 10.69	+	0.00	+
			0.00	= 10.69
Shallow Concentrated Flow				
Flow length (ft)	= 305.00	800.00	534.00	
Watercourse slope (%)	= 11.00	0.62	0.75	
Surface description	= Unpaved	Unpaved	Unpaved	
Average velocity (ft/s)	=5.35	1.27	1.40	
Travel Time (min)	= 0.95	+	10.50	+
			6.37	= 17.81
Channel Flow				
X sectional flow area (sqft)	= 27.00	0.00	0.00	
Wetted perimeter (ft)	= 18.97	0.00	0.00	
Channel slope (%)	= 1.00	0.00	0.00	
Manning's n-value	= 0.030	0.015	0.015	
Velocity (ft/s)	=6.29	0.00	0.00	
Flow length (ft)	{0}1142.0	0.0	0.0	
Travel Time (min)	= 3.03	+	0.00	+
			0.00	= 3.03
Total Travel Time, Tc				31.50 min

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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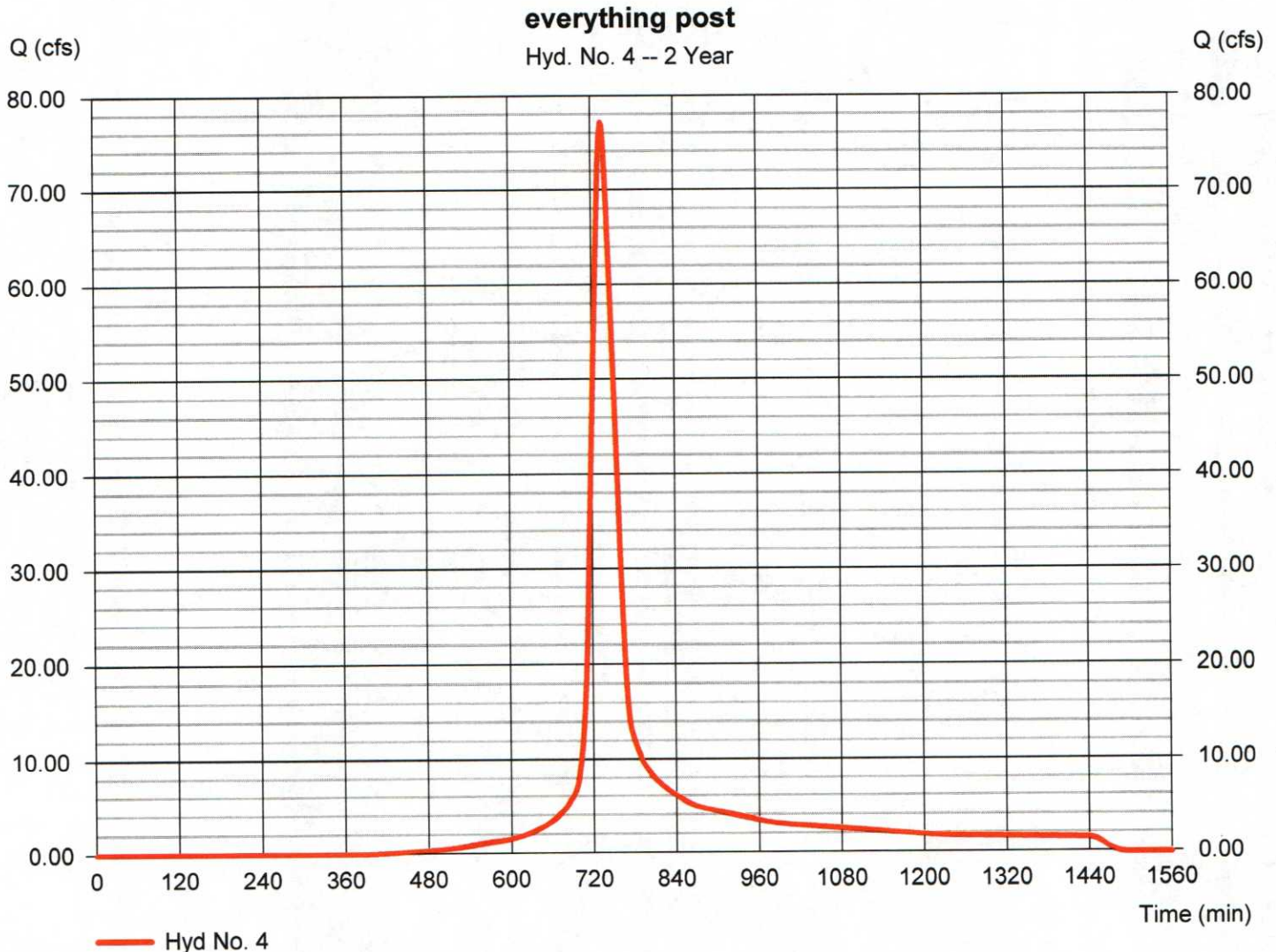
Hyd. No. 4

everything post

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 3.88 in
 Storm duration = 24 hrs

Peak discharge = 77.25 cfs
 Time to peak = 734 min
 Hyd. volume = 349,958 cuft
 Curve number = 86*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 33.80 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No. 4

everything post

<u>Description</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>Totals</u>			
Sheet Flow							
Manning's n-value	= 0.400	0.011	0.011				
Flow length (ft)	= 100.0	0.0	0.0				
Two-year 24-hr precip. (in)	= 3.88	0.00	0.00				
Land slope (%)	= 9.00	0.00	0.00				
Travel Time (min)	= 10.69	+	0.00	+	0.00	=	10.69
Shallow Concentrated Flow							
Flow length (ft)	= 305.00	800.00	534.00				
Watercourse slope (%)	= 11.00	0.62	0.75				
Surface description	= Unpaved	Unpaved	Paved				
Average velocity (ft/s)	=5.35	1.27	1.76				
Travel Time (min)	= 0.95	+	10.50	+	5.06	=	16.50
Channel Flow							
X sectional flow area (sqft)	= 27.00	3.00	0.00				
Wetted perimeter (ft)	= 18.97	6.32	0.00				
Channel slope (%)	= 1.00	0.50	0.00				
Manning's n-value	= 0.030	0.050	0.015				
Velocity (ft/s)	=6.29	1.28	0.00				
Flow length (ft)	((0})1142.0	275.0	0.0				
Travel Time (min)	= 3.03	+	3.58	+	0.00	=	6.61
Total Travel Time, Tc				33.80 min			

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	17.91	2	720	47,665	----	----	----	before
2	SCS Runoff	22.39	2	718	57,499	----	----	----	after
3	SCS Runoff	108.99	2	732	472,106	----	----	----	everything pre
4	SCS Runoff	104.39	2	734	474,958	----	----	----	everything post
jmarvvmini.gpw					Return Period: 5 Year			Wednesday, 09 / 14 / 2016	

Hydrograph Report

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Hyd. No. 3

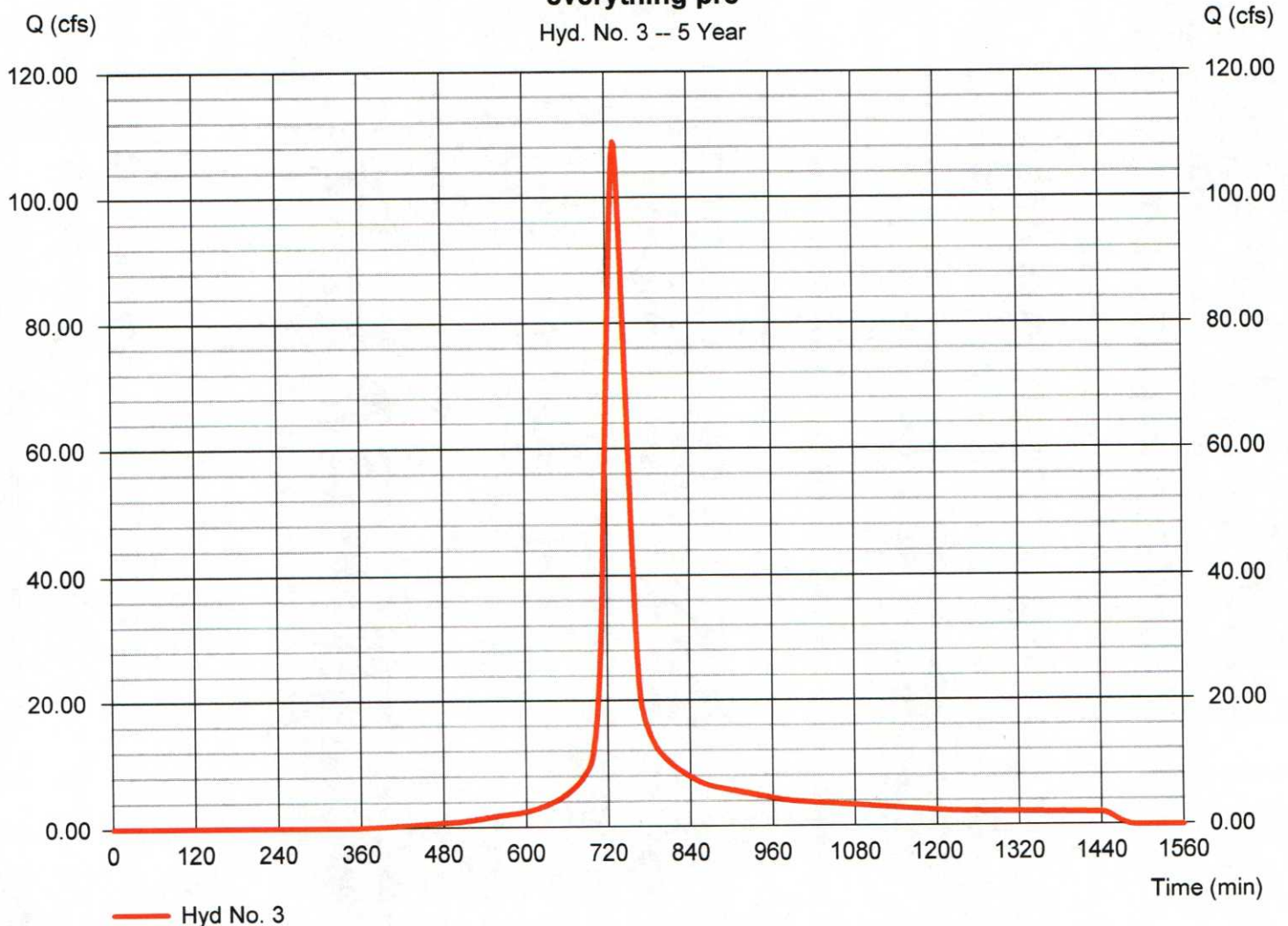
everything pre

Hydrograph type = SCS Runoff
 Storm frequency = 5 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 4.83 in
 Storm duration = 24 hrs

Peak discharge = 108.99 cfs
 Time to peak = 732 min
 Hyd. volume = 472,106 cuft
 Curve number = 85
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 31.50 min
 Distribution = Type II
 Shape factor = 484

everything pre

Hyd. No. 3 -- 5 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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Hyd. No. 4

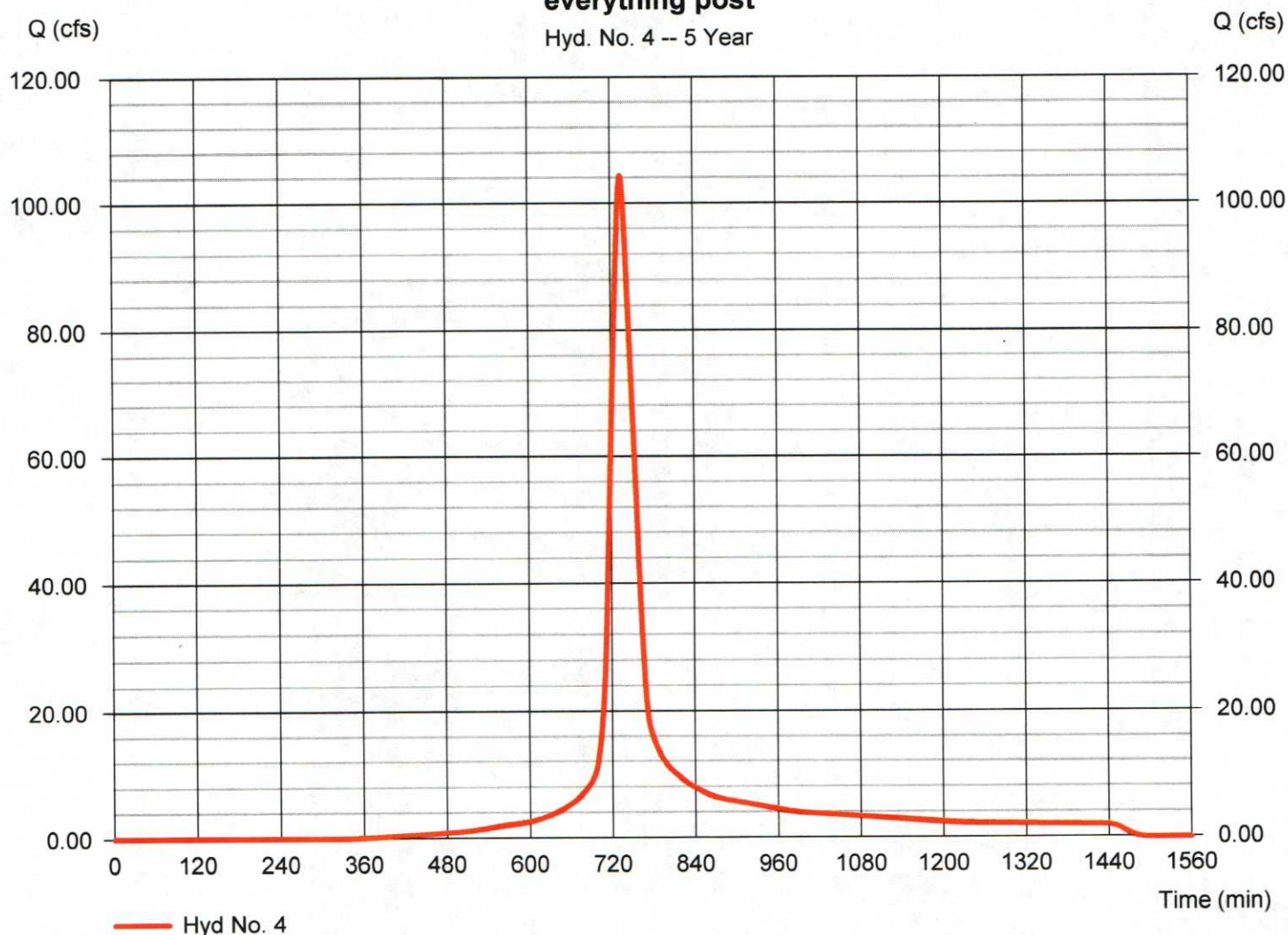
everything post

Hydrograph type	= SCS Runoff	Peak discharge	= 104.39 cfs
Storm frequency	= 5 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 474,958 cuft
Drainage area	= 40.000 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 33.80 min
Total precip.	= 4.83 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$

everything post

Hyd. No. 4 -- 5 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	21.37	2	720	57,377	----	----	----	before
2	SCS Runoff	26.00	2	718	67,325	----	----	----	after
3	SCS Runoff	132.09	2	732	574,499	----	----	----	everything pre
4	SCS Runoff	125.96	2	734	575,861	----	----	----	everything post
jmarvvmini.gpw					Return Period: 10 Year			Wednesday, 09 / 14 / 2016	

Hydrograph Report

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Hyd. No. 3

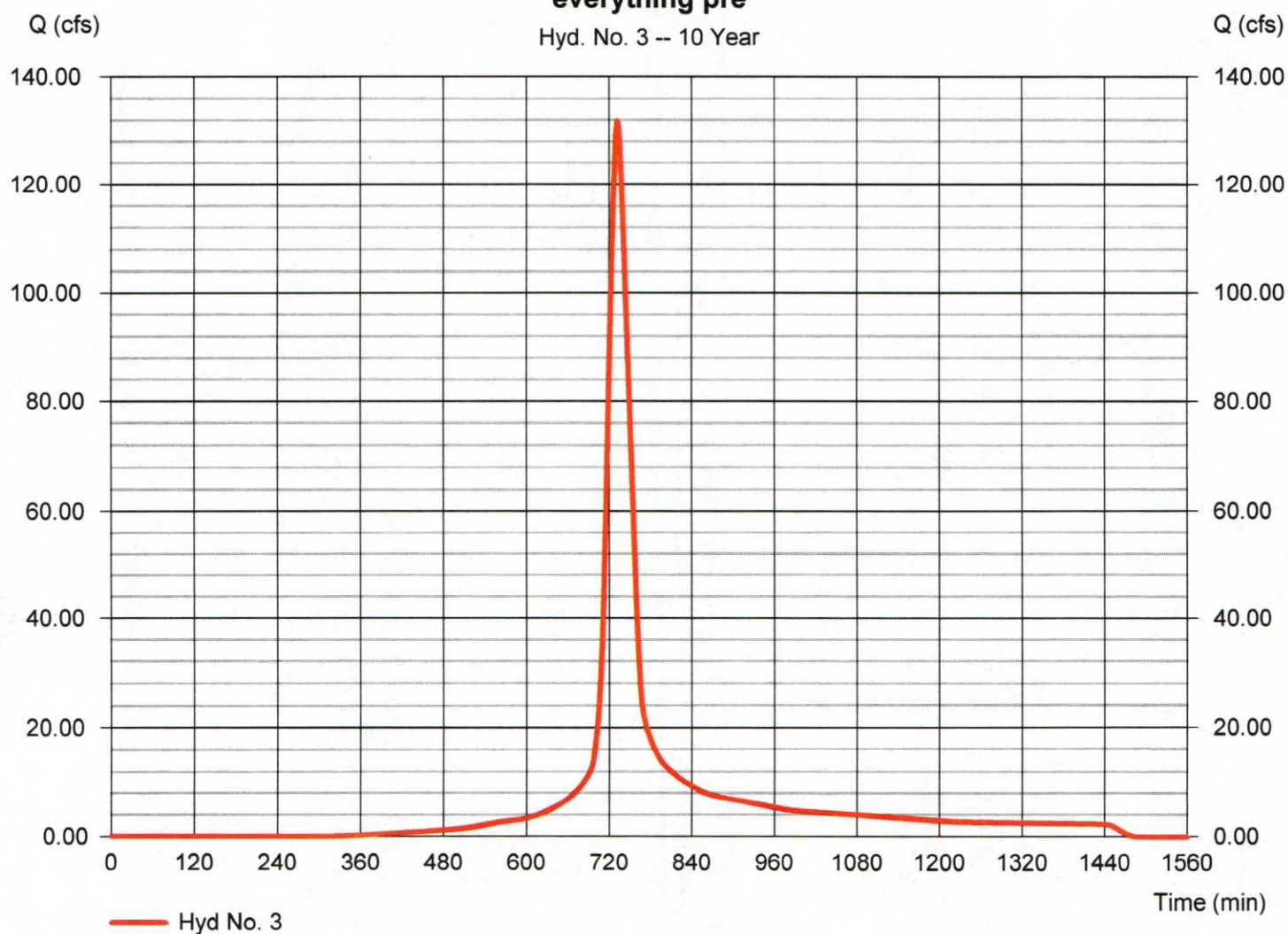
everything pre

Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.58 in
 Storm duration = 24 hrs

Peak discharge = 132.09 cfs
 Time to peak = 732 min
 Hyd. volume = 574,499 cuft
 Curve number = 85
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 31.50 min
 Distribution = Type II
 Shape factor = 484

everything pre

Hyd. No. 3 -- 10 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

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Hyd. No. 4

everything post

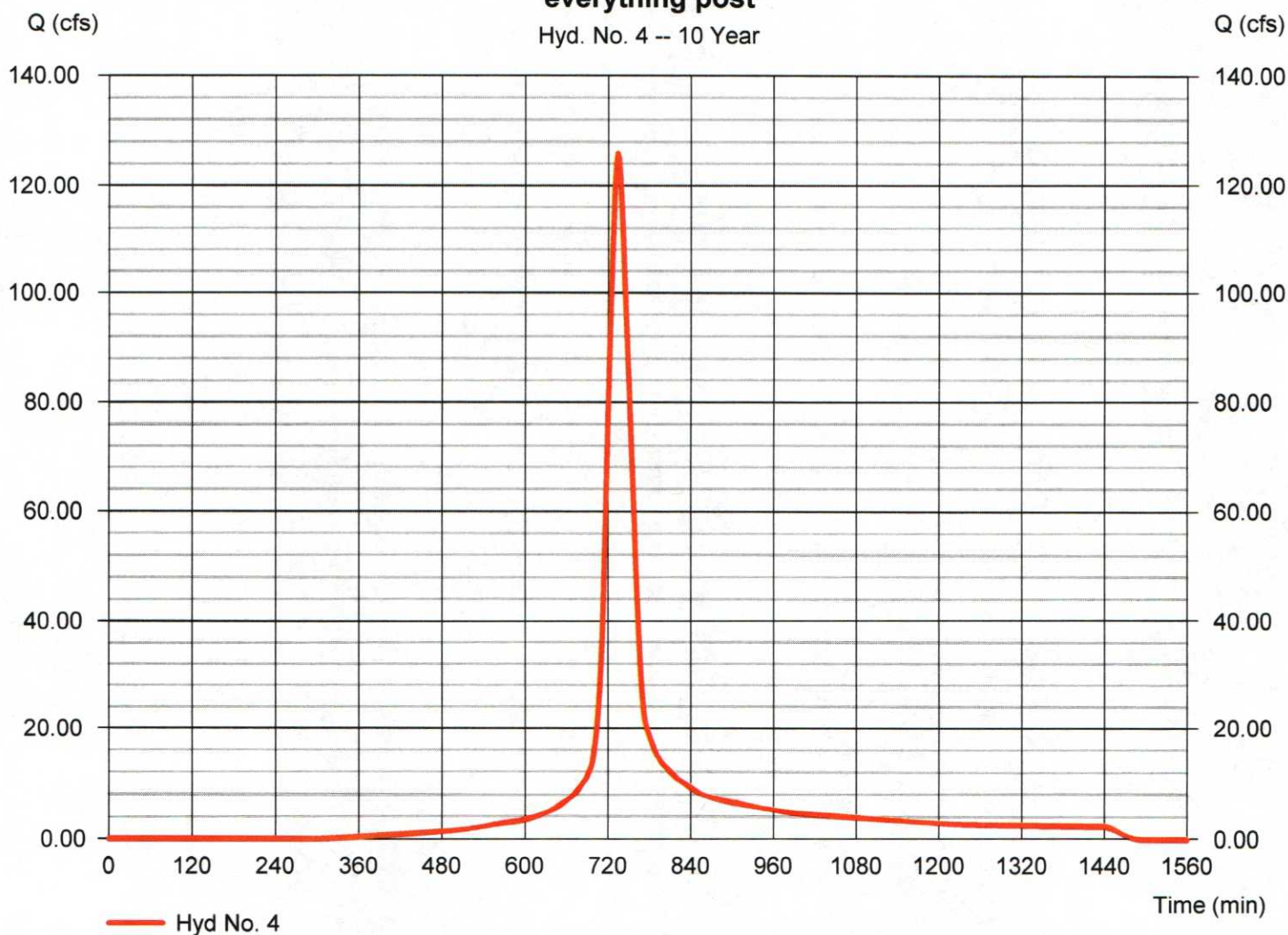
Hydrograph type = SCS Runoff
 Storm frequency = 10 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 5.58 in
 Storm duration = 24 hrs

Peak discharge = 125.96 cfs
 Time to peak = 734 min
 Hyd. volume = 575,861 cuft
 Curve number = 86*
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 33.80 min
 Distribution = Type II
 Shape factor = 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$

everything post

Hyd. No. 4 -- 10 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	24.91	2	720	67,448	-----	-----	-----	before
2	SCS Runoff	29.69	2	718	77,427	-----	-----	-----	after
3	SCS Runoff	155.86	2	732	681,205	-----	-----	-----	everything pre
4	SCS Runoff	148.12	2	734	680,832	-----	-----	-----	everything post
jmarvmini.gpw					Return Period: 25 Year			Wednesday, 09 / 14 / 2016	

Hydrograph Report

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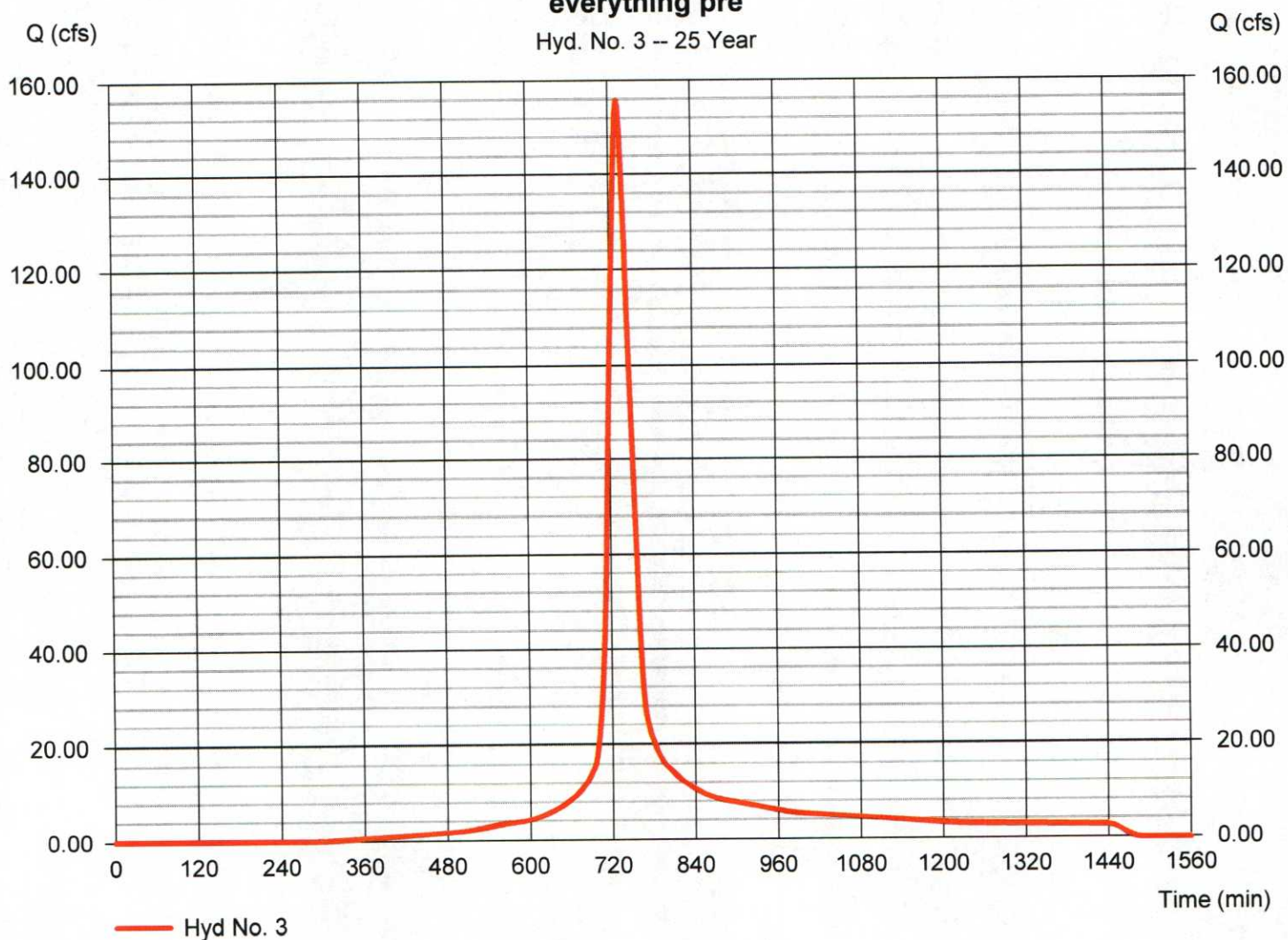
Hyd. No. 3

everything pre

Hydrograph type	= SCS Runoff	Peak discharge	= 155.86 cfs
Storm frequency	= 25 yrs	Time to peak	= 732 min
Time interval	= 2 min	Hyd. volume	= 681,205 cuft
Drainage area	= 40.000 ac	Curve number	= 85
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 31.50 min
Total precip.	= 6.35 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

everything pre

Hyd. No. 3 -- 25 Year



Hydrograph Report

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Hyd. No. 4

everything post

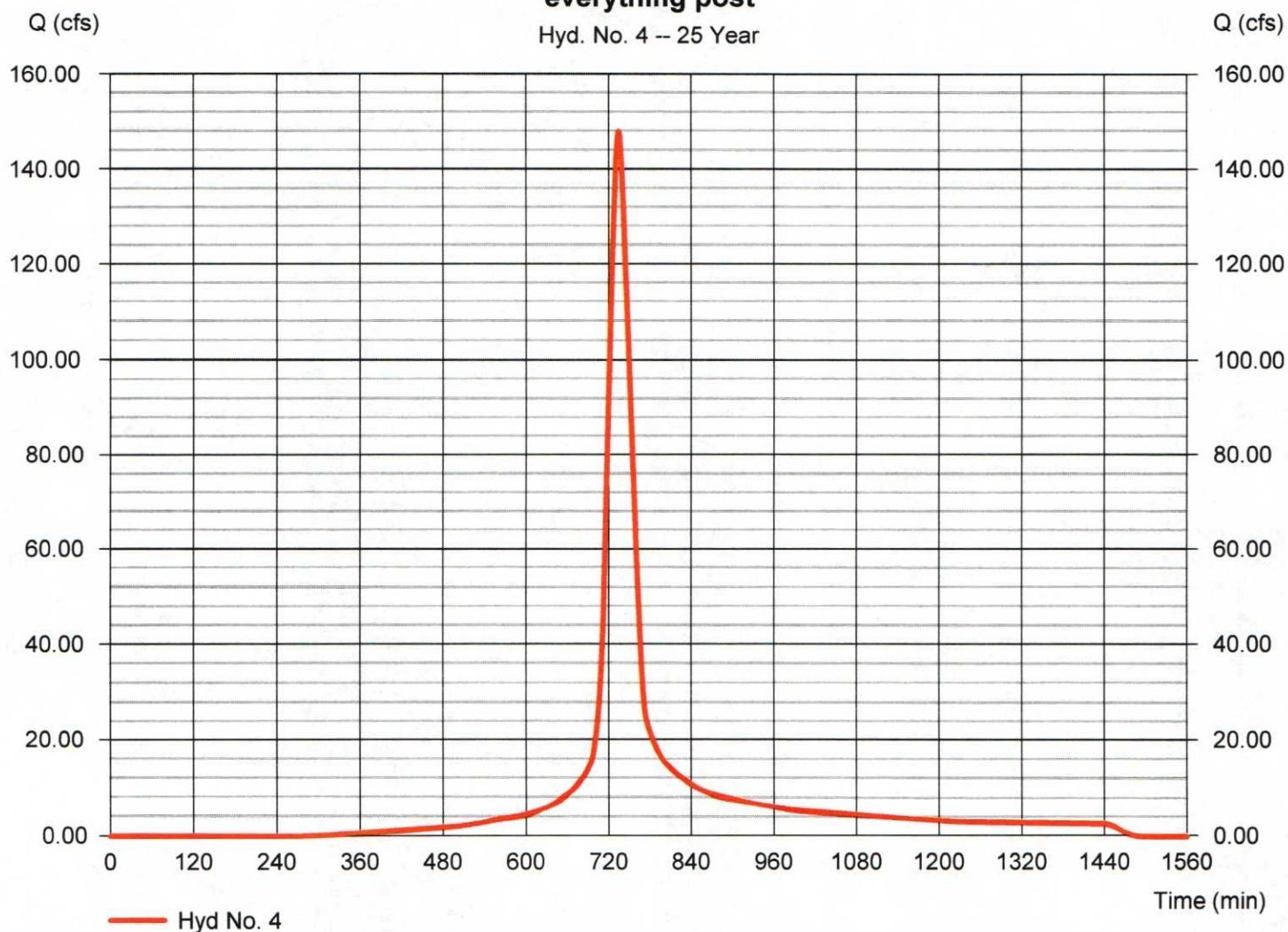
Hydrograph type = SCS Runoff
Storm frequency = 25 yrs
Time interval = 2 min
Drainage area = 40.000 ac
Basin Slope = 0.0 %
Tc method = TR55
Total precip. = 6.35 in
Storm duration = 24 hrs

Peak discharge = 148.12 cfs
Time to peak = 734 min
Hyd. volume = 680,832 cuft
Curve number = 86*
Hydraulic length = 0 ft
Time of conc. (Tc) = 33.80 min
Distribution = Type II
Shape factor = 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$

everything post

Hyd. No. 4 -- 25 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	27.84	2	720	75,876	----	----	----	before
2	SCS Runoff	32.76	2	718	85,830	----	----	----	after
3	SCS Runoff	175.62	2	732	770,801	----	----	----	everything pre
4	SCS Runoff	166.52	2	734	768,867	----	----	----	everything post
jmarvmini.gpw					Return Period: 50 Year			Wednesday, 09 / 14 / 2016	

Hydrograph Report

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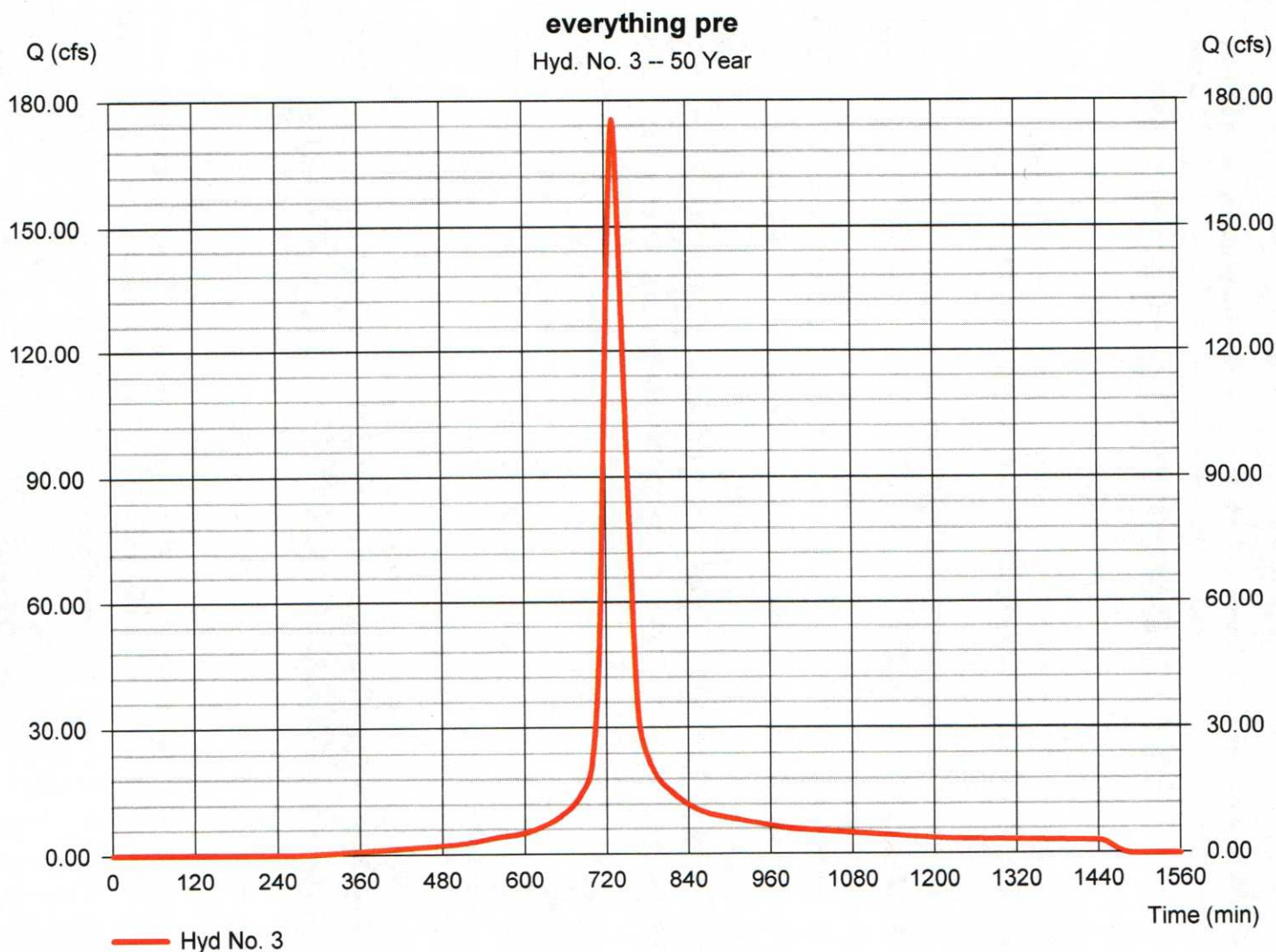
Wednesday, 09 / 14 / 2016

Hyd. No. 3

everything pre

Hydrograph type = SCS Runoff
 Storm frequency = 50 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 6.99 in
 Storm duration = 24 hrs

Peak discharge = 175.62 cfs
 Time to peak = 732 min
 Hyd. volume = 770,801 cuft
 Curve number = 85
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 31.50 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

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Hyd. No. 4

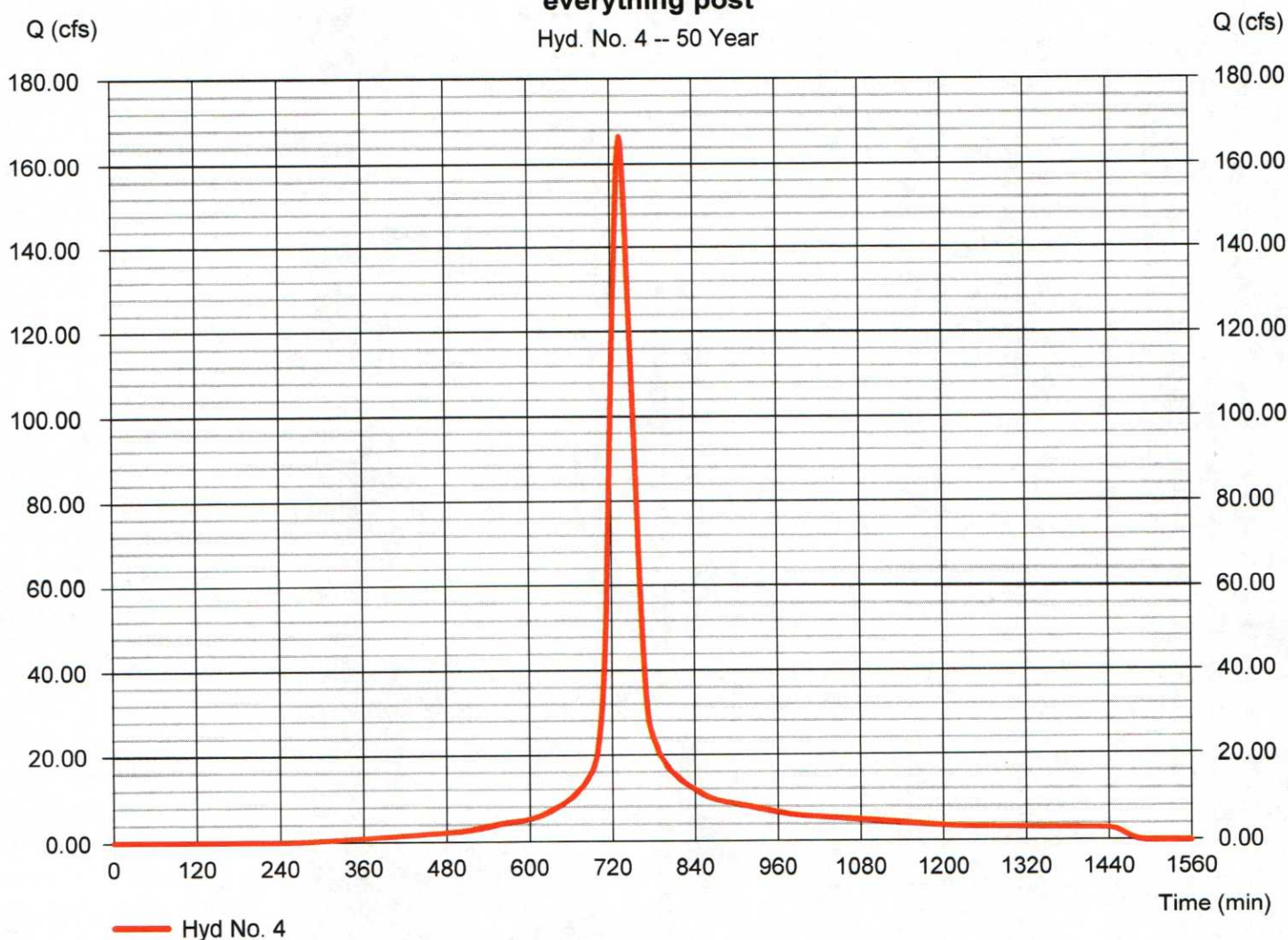
everything post

Hydrograph type	= SCS Runoff	Peak discharge	= 166.52 cfs
Storm frequency	= 50 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 768,867 cuft
Drainage area	= 40.000 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 33.80 min
Total precip.	= 6.99 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$

everything post

Hyd. No. 4 -- 50 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	31.07	2	720	85,271	-----	-----	-----	before
2	SCS Runoff	36.15	2	718	95,159	-----	-----	-----	after
3	SCS Runoff	197.52	2	732	870,936	-----	-----	-----	everything pre
4	SCS Runoff	186.90	2	734	867,169	-----	-----	-----	everything post
jmarvvmini.gpw					Return Period: 100 Year			Wednesday, 09 / 14 / 2016	

Hydrograph Report

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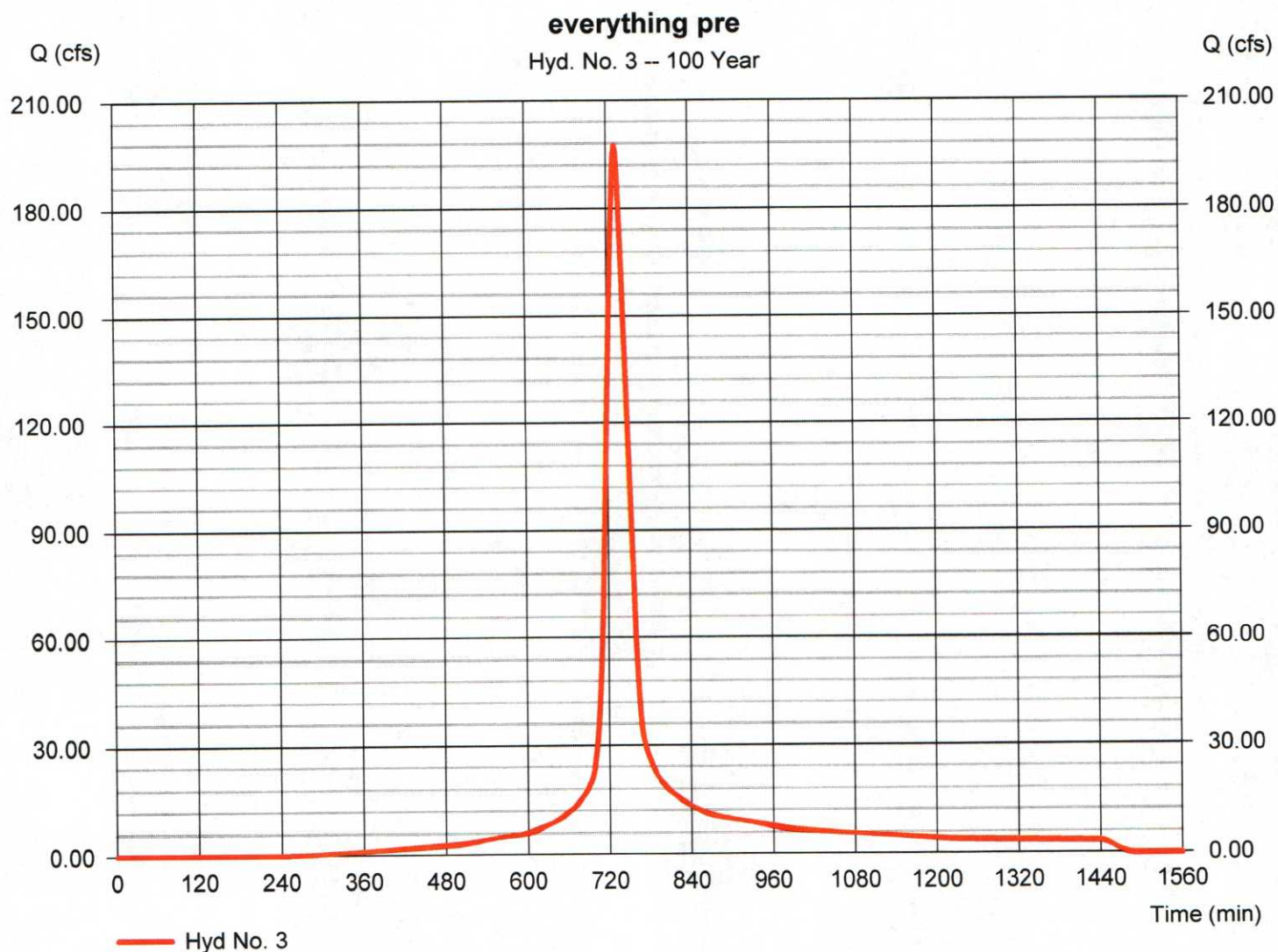
Wednesday, 09 / 14 / 2016

Hyd. No. 3

everything pre

Hydrograph type = SCS Runoff
 Storm frequency = 100 yrs
 Time interval = 2 min
 Drainage area = 40.000 ac
 Basin Slope = 0.0 %
 Tc method = TR55
 Total precip. = 7.70 in
 Storm duration = 24 hrs

Peak discharge = 197.52 cfs
 Time to peak = 732 min
 Hyd. volume = 870,936 cuft
 Curve number = 85
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 31.50 min
 Distribution = Type II
 Shape factor = 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.5

Wednesday, 09 / 14 / 2016

Hyd. No. 4

everything post

Hydrograph type	= SCS Runoff	Peak discharge	= 186.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 734 min
Time interval	= 2 min	Hyd. volume	= 867,169 cuft
Drainage area	= 40.000 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 33.80 min
Total precip.	= 7.70 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = $[(36.370 \times 85) + (3.630 \times 96)] / 40.000$

