

ENGINEERING SUCCESS

DRAINAGE REPORT FOR

Courtyards at Brookfield Addition
Wichita, Kansas



411 N. Webb Rd.
Wichita, KS 67206
316.684.9600

PROJECT NUMBER: 1601010317
DATE: July 2017



*Approved C.O.W.
Joe Hübke
7-20-17*

ENGINEERING SUCCESS



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General Information

Purpose

This report evaluates drainage for the proposed development of the property known as Courtyards at Brookfield Addition in Wichita, Kansas. The report reviews and documents conformance with City requirements for Stormwater management. It reviews existing drainage conditions and evaluates and recommends the proposed drainage plan for the new development.

Location

The project is located in the City of Wichita, Sedgwick County, Kansas. The site is 29.4 acres and lies south of East 37th Street North between North Greenwich Road and North 127th Street East. The site is located in Section 34, Township 26 South, Range 2 East, as shown on the USGS Quadrangle, Appendix A and the Aerial Photograph, Appendix B.

History

The site was originally platted in 2016 as Brookfield Addition by Baughman Company. The site was included in the Brookfield Addition Drainage Report prepared by Baughman Company dated August 2016 and approved by the City of Wichita. As noted in the drainage report, the site drainage system, including the detention ponds and the platted reserve within the Brookfield Addition were designed to manage Stormwater runoff from the development.

Development

Brookfield Addition was platted as a residential development and subdivided into 1/3 acre lots. Courtyards at Brookfield Addition is a re-plat of the northeast portion Brookfield Addition and includes 105 single family lots ranging from 1/8 to 1/3 acre in size. The revised lot layout and reconfiguration has been modified to accommodate 1/8 acres lots and to efficiently convey stormwater to the detention pond. The north detention pond's east boundary will be modified to conform to the proposed plat. The re-platted lots will be used for patio homes with zero lot lines as shown on the plat, as shown in Appendix C.

Datum

The project is shown in NAVD 88 Datum.

Soils

The site is comprised of the following soil types according to the NRCS (SCS) Soil Survey, Appendix D:

- Goessel silty clay, 1 to 3 percent slopes, HSG "D"
- Irwin silty clay loam, 1 to 3 percent slopes, HSG "D"

The Hydrologic Soil Group (HSG) for selection of runoff curve numbers (CN) is HSG "D".

Flood Insurance Rate Map (FIRM)

Most of the site is in Zone X, unshaded, areas determined to be outside of the 0.2% annual chance floodplain, as shown in Appendix E. The northeastern portion of the site is in Zone AE along Dry Creek East Tributary 6, with a base flood elevation for the site ranging from 1374.3 to 1372.3, according to FEMA FIRM panel 20173C0240G effective December 22, 2016. South of the site, within Brookfield Addition is Zone AE along Dry Creek East.

Drainage Patterns

Hydrologic Methods

The existing and proposed drainage basins were modeled using Hydraflow Hydrographs by AutoCAD. The Hydrographs model used for Brookfield Addition was obtained from Baughman Company, as shown in Appendix F. The outlet structure in the Hydraflow model is different than the model in the Brookfield Addition Drainage report. In coordination with Baughman, MKEC updated the model to analyze effects of the proposed site on the detention ponds, as shown in Appendix G. The outlet structure was modified in the model to match the final design provided by Baughman. The SCS method was used in calculations with rainfall depths determined from Brookfield Addition Hydraflow model, as show in Table 1. The LAG method was used in determining time of concentration.

Table 1 - Rainfall Depths (inches) for 24-Hour Design Storm.

	1-Year	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Sedgwick County	2.8	3.5	4.5	5.2	6.1	6.9	7.8

Drainage Patterns

Undeveloped

The site, along with Brookfield Addition, is currently farmland. Basin A (Existing Site-NE from Baughman Company Hydraflow) is located in the northeast portion of the property and consists of 6.2 acres, as shown in Appendix H. Basin A drains from southwest to northeast onto Four Oaks Addition. Hydrologic details for Basin A from 2016 Brookfield Addition Drainage Report are shown in Table 2.

Table 2 - Baughman August 2016 Drainage Basin Data

	Area (acres)	Tc (min)	CN	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
Existing (Pre-Plat) Basin A	6.2	22.1	80	10.7	16.3	20.4	25.6	30.4	35.7
Area to Pond	60.0	19.7	88	157.3	219.3	262.8	318.6	368.0	423.4
Total Offsite	-	-	-	26.6	37.1	44.6	54.2	62.8	72.6

2016 Brookfield Addition Drainage Report

Brookfield Addition was designed with 1/3 acre lots and a curve number of 88. The runoff drains into a detention pond located south of the proposed patio home development. In the 2016 Brookfield Addition Drainage Report, the detention pond was designed to accept 60.0 acres of stormwater runoff. Total flow rates from pond according to the Baughman Company report and Hydraflow Hydrographs model are shown in Table 2 and Appendix H. Hydrologic data for the detention pond is shown in Table 3.

Table 3 - 2016 Drainage Report Detention Pond Data

Detention Pond	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Peak Flow In (cfs)	157.3	219.3	262.8	318.6	368.0	423.4
Peak Flow Out (cfs)	16.1	23.6	27.9	40.0	58.2	81.9
Water Surface Elevation (ft)	1368.5	1369.2	1369.6	1370.1	1370.5	1371.0
Storage Volume (acre-ft)	6.5	9.2	11.2	13.7	15.6	17.6
Normal Pool (ft)	1367.0					
Outlet Structure	36" pipe at elevation 1365.5' connected to an inlet riser (26' crest length at elevation 1370.5' and a 10' crest length at 1367.0') and a 10' overflow weir at elevation 1369.8.					

Proposed Conditions

The Hydraflow Hydrographs model from Baughman Company has been modified to reflect an increased curve number for the site due to the increased density of the development. Basin A consists of 3.2 acres of 1/8 acre lots draining from west to east with elevations ranging from 1380.0' to 1374.0 as shown in Appendix I. The curve number for Basin A has been increased from 80 to 92.4 to represent 1/8 acres patio homes. Hydrologic details for Basin A are located in Table 4.

Table 4 - Proposed Conditions

	Area (acres)	Tc (min)	CN	2-Yr (cfs)	5-Yr (cfs)	10-Yr (cfs)	25-Yr (cfs)	50-Yr (cfs)	100-Yr (cfs)
Basin A	3.2	15.0	92.4	10.4	14.0	16.4	19.6	22.4	25.4
Area to Pond	59.9	19.7	89.5	162.5	224.6	268.0	323.5	372.7	427.8
Total Offsite	-	-	-	26.6	37.1	44.6	54.2	62.8	72.7

Basin B drains from north to south into the detention pond as shown in Appendix I. The western portion of the basin will have 1/3 acre lots and a curve number of 84 as previously planned and the eastern portion of the basin will have 1/8 acre lots with a curve number of 92.4. Basin B has a weighted curve number of 91.1. The majority of Basin B stormwater runoff is conveyed to the detention pond through underground stormwater sewer. Basin B is 48.6% of total area draining into the detention pond. The Baughman Hydraflow Hydrographs model was modified to increase the curve number to the Area to Pond from 88 to 89.5. Hydrologic details for the Area to Pond are shown in Table 4.

Basin C is located on the western portion of the site and drains from east to west into Brookfield Addition and ultimately ends up in the detention pond via underground stormwater sewer. This area will remain 1/3 acre lots as stated in the 2016 Brookfield Addition Drainage Report.

The total flow offsite is a combination of the proposed conditions for the Courtyards at Brookfield Addition and flow from the remaining area of Brookfield Addition. The total flow offsite is shown in Table 4. Hydrologic data for the detention with updated drainage area and curve number for the proposed site is shown in Table 5. A comparison of Basin A, elevations of the detention pond, and total flow offsite is shown in Table 6.

Table 5 - Proposed Conditions Detention Pond

Detention Pond	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Peak Flow In (cfs)	162.5	224.6	268.0	323.5	372.7	427.8
Peak Flow Out (cfs)	16.9	24.4	28.6	42.6	61.4	85.3
Water Surface Elevation (ft)	1368.6	1369.2	1369.7	1370.2	1370.6	1371.0
Storage Volume (acre-ft)	6.8	9.5	11.6	14.0	15.9	17.9
Normal Pool (ft)	1367.0					
Outlet Structure	36" pipe at elevation 1365.5' connected to an inlet riser (26' crest length at elevation 1370.5' and a 10' crest length at 1367.0') and a 10' overflow weir at elevation 1369.8.					

Table 6 - Comparison Table

	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr
Pre-Platted Basin A	10.7	16.3	20.4	25.6	30.4	35.7
Proposed Basin A	10.4	14.0	16.4	19.6	22.4	25.4
Percent Difference	2.8%	14.1%	19.6%	23.4%	26.3%	28.9%
2016 Drainage Report Detention Pond Elevation	1368.5	1369.2	1369.6	1370.1	1370.5	1371.0
Proposed Detection Pond Elevation	1368.6	1369.2	1369.7	1370.2	1370.6	1371.0
Elevation Difference	0.1	0.0	0.1	0.1	0.1	0.0
2016 Drainage Report Total Flow Offsite	26.6	37.1	44.6	54.2	62.8	72.6
Proposed Total Flow Offsite	26.6	37.1	44.6	54.2	62.8	72.7
Percent Difference	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%

The detention ponds from the 2016 Brookfield Drainage Report have the capacity for the additional storage required for the more dense development of the Courtyards at Brookfield Addition. According to the updated modeling, the 100-year water surface elevation of the detention pond and the peak offsite flow rate will not increase, therefore no additional changes to the detention system planned in the Baughman report is required.

Water Quality/Channel Protection

Water Quality and Channel Protection calculations are shown in Appendix K. The required Water Quality volume is 1.8 acre-ft and the required Channel Protection is 3.0 acre-ft. The stormwater pond designed in the 2016 Brookfield Drainage Report provided 2.1 acre-ft of storage in a 1.2 inch rainfall event to satisfy the requirements of Water Quality and 5.1 acre-ft of storage in the 1-year design event (2.8 inch) which satisfies the requirements Channel Protection.

Utilities

Water

An existing waterline is located along East 37th Street North. Proposed waterlines will connect the existing waterline along East 37th Street North and also to the waterlines in Brookfield Addition.

Sanitary Sewer

Proposed sanitary sewer lines will connect to existing sanitary sewer lines in Brookfield Addition.

Stormwater

An existing 3'x7' RCB is located in East 37th Street North, north of the entrance on Richfield Court. The proposed stormwater sewer system is designed for a minimum 2-year design event with the some downstream pipes designed for a 100-year design event. Stormwater sewer outputs are located in Appendix L and Appendix M. Emergency escape routes are shown in Appendix J.

Minimum Pad Elevation

The minimum pad elevations for the structures have been set 3' above the 100-year BFE. Lots 26-38, Block 1 minimum pad elevations are controlled by the detention pond 100-year BFE which is 1371.0', therefore the minimum pad elevation these lots is 1374.0'. Lots 4-12, Block 1 minimum pad elevation are controlled by the floodplain FEMA BFE which is 1374.3', therefore the minimum pad elevation for these lots is 1377.3.

Permitting

U.S. Army Corps of Engineers

Since there are no potential wetlands or no blue line streams on the site, permitting through the U.S. Army Corps of Engineers will not be required.

Federal Emergency Management Agency (FEMA)

Baughman Company will submit this application when appropriate. The northeast portion of the site is in a FEMA floodplain.

Kansas Department of Health and Environment (KDHE)

Since the site disturbs more than 1.0 acre, a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) will be required.

Kansas Department of Health and Management (KDWPT)

The KDWPT will be contacted during the KDHE NOI permitting process. It is not anticipated there will be any concerns.

Kansas Historical Society (KHS)

The KHS will be contacted during the KDHE NOI permitting process. Since there are no historical buildings on site, it is not anticipated there will be any concerns.

Kansas Division of Water Resources (DWR)

Water Structure, Channel Changes, and Floodplain Fill

Floodplain fill permitting will be required for fill in the northeast corner Baughman Company has obtained this permit. The permit number is NO. LSG-0541.

Water Appropriations

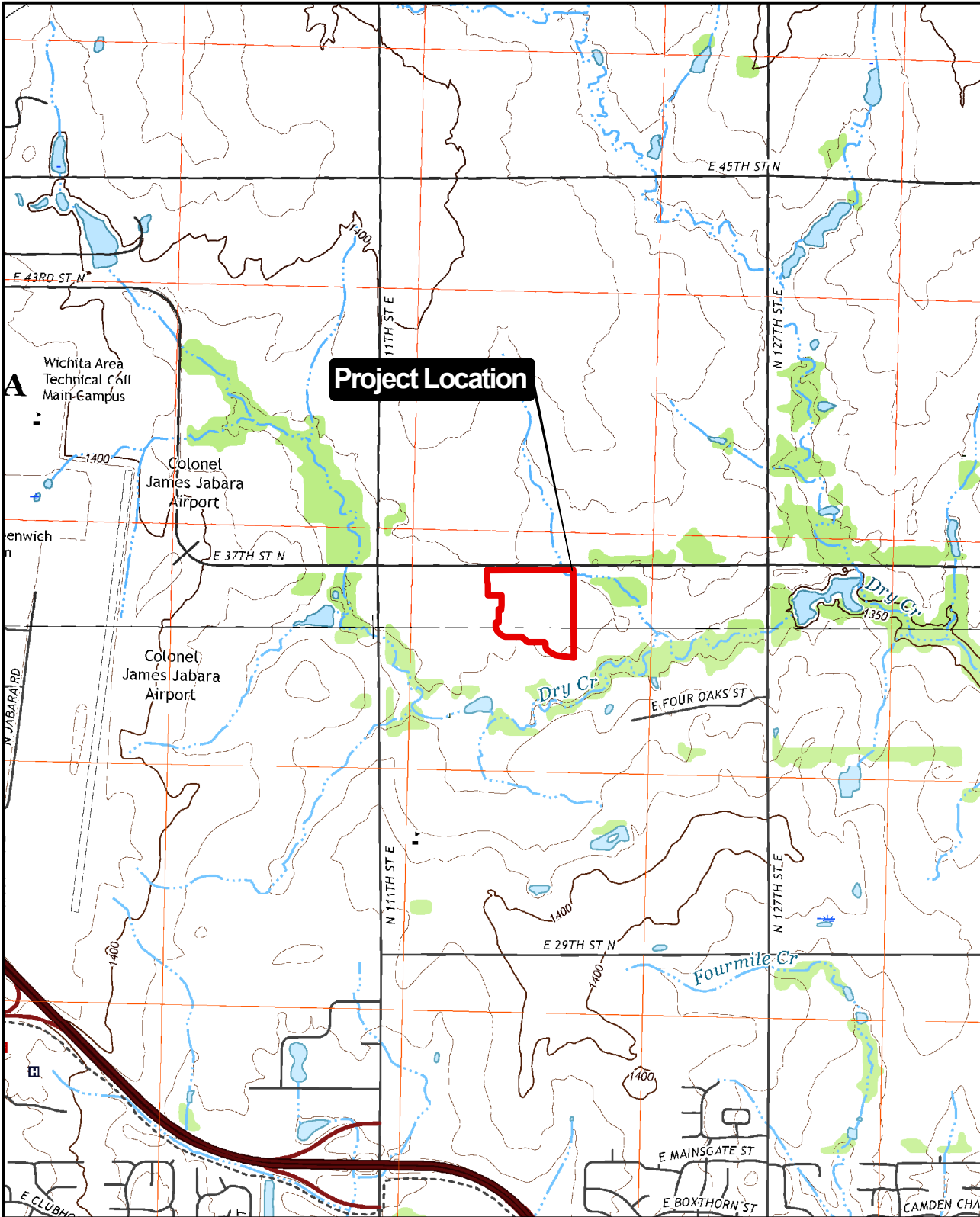
There are no ponds on site that will require Water Appropriations permitting. Any offsite Water Appropriations permits will be completed by others.

Summary

The project is located in the City of Wichita, Kansas. The site is a re-plat of the Brookfield Addition and has an area of 29.4 acres. The re-plat into Courtyards at Brookfield Addition will change the land usage from 1/3 acre lots to a portion of the site designed as more dense 1/8 acres lots. The site will drain into an existing detention pond system designed by Baughman Company. The peak flow rate of runoff leaving the site does not increase from the Brookfield Drainage Report dated August 2016. Water Quality and Channel Protection requirements for the site have been satisfied within the existing detention pond system.

The stormwater system is comprised of both underground storm sewer pipe and above ground conveyance. This conceptual system can be a combination of storm pipe designed to convey a minimum of a 2-year design event and an above ground conveyance system that will carry the remaining 100-year flow. The design will ultimately carry the 100-year flow to the ponds, although some flow may be overland.

Appendix A - USGS Quadrangle



**USGS QUAD EXHIBIT
COURTYARDS AT BROOKFIELD ADDITION
WICHITA, KANSAS**

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SEC: 34
TWP: T26S
RNG: R2E

PROJECT NO. 1601010317

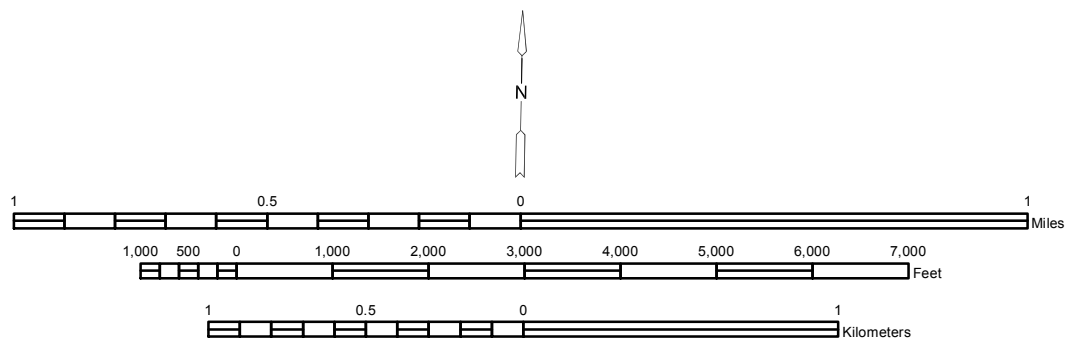
DATE 7/14/2017

SCALE 1"=2000'

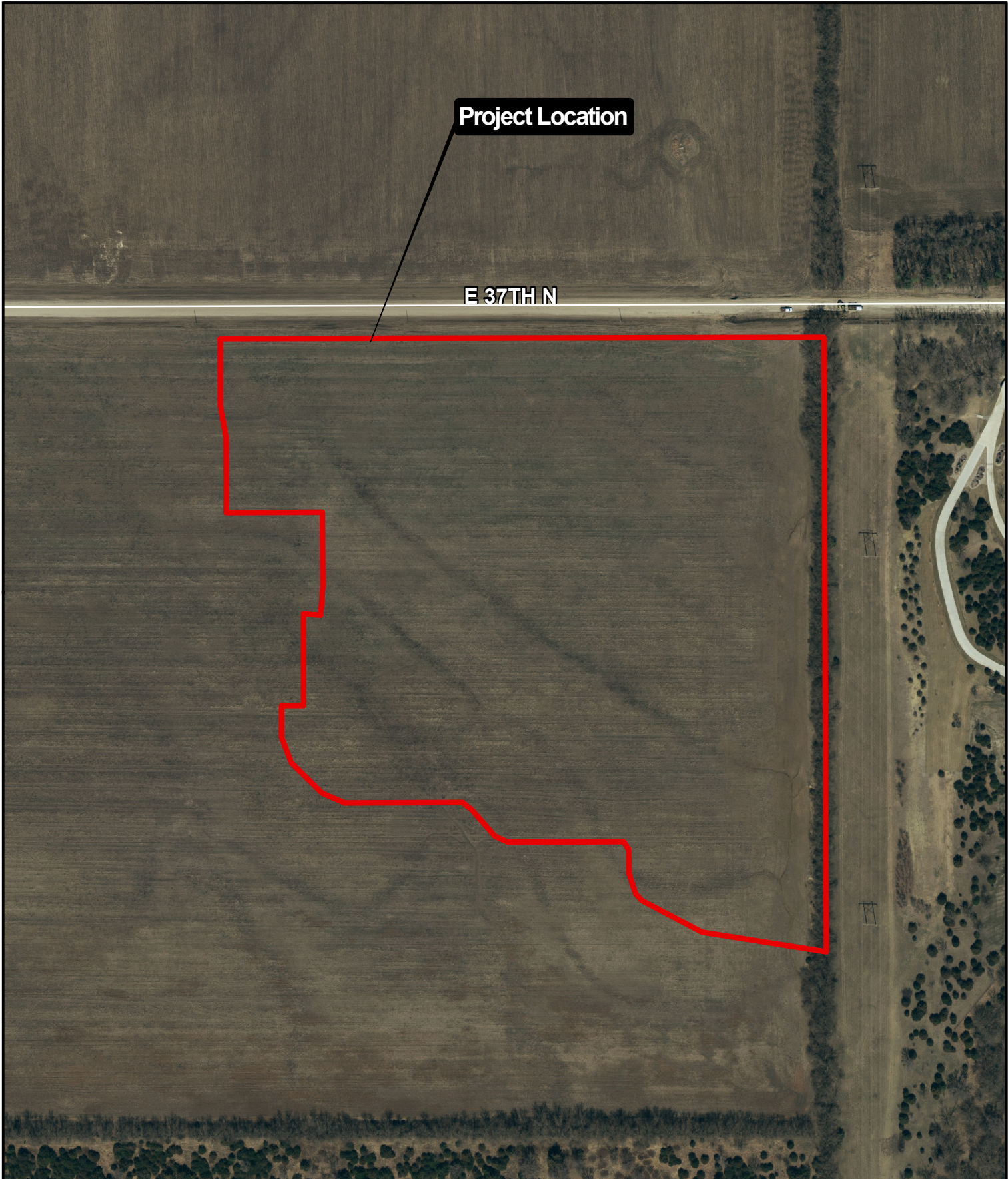
DESIGNED DRAWN CHECKED
SGA SGA KLA

NO.	REVISION	DATE

SHEET NO.



Appendix B - Aerial Photograph

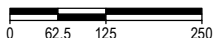


Project Location

E 37TH N

SEC: 34
TWP: T26S
RNG: R2E

1"=250' / 1:3000



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**AERIAL EXHIBIT
COURTYARDS AT BROOKFIELD ADDITION
WICHITA, KANSAS**

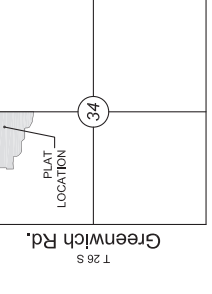
PROJECT NO. 1601010317	DATE: 7/14/2017	SHEET NO.
DRAWN BY: SAG	DESIGNED BY: SAG	APPROVED BY: KLA
		1 OF 1

Appendix C - Plat

LEGEND

- Date of Survey: 5/30/17
Section Corner Monument Found
Set 3/4" rebar w/ MKEC CLS 38 Id. cap
Benchmark
Measured
Platted
Calculated from Measurement
Calculated from Plat
Drng. = Drainage
Utility
Skewalk
St. = Street
Esmt. = Easement
Lot
Block

VICINITY MAP



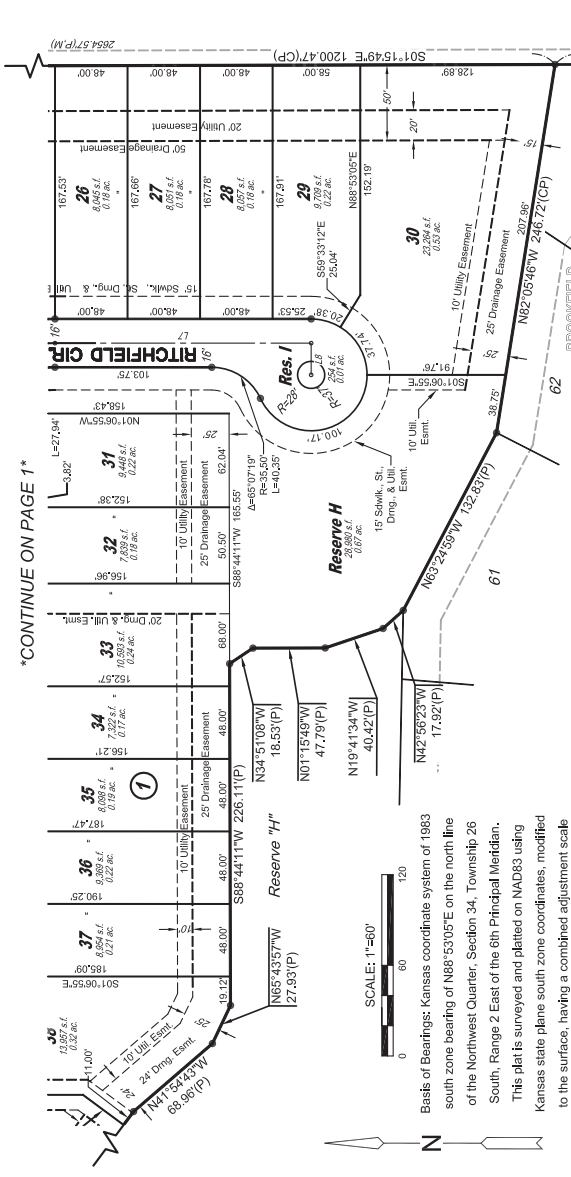
BENCHMARKS

- BM#1 Chiseled square on centerline of R.C.B.C on south side of 37th St. N., 176.9' W. & 15.8' S.
BM#2 Chiseled square on E. side of school signal pole base, W. side of Greenwch Road, 302' S. & 21.9' W. of the SW cor., NW 1/4, Sec. 34, T26S, R2E, (offfile)
BM#3 Top of 1" iron pipe at NW cor., NW 1/4, Sec. 34, T26S, R2E, (offfile)

MINIMUM PAD ELEVATION (LOWEST OPENING)

Table with 3 columns: LOTS (inclusive), BLOCK, ELEVATION. Rows include lots 4-12, 26-38, and 68-75 with elevations of 1377.3, 1374.0, and 1374.0 respectively.

COURTYARDS AT BROOKFIELD ADDITION
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS
a replat of a portion of Brookfield Addition, Wichita, Sedgwick County, Kansas



OWNER'S CERTIFICATE

I, the undersigned property owners of the land above set forth in the Professional Surveyor's Certificate, have caused the same to be surveyed and platted into Lots, Blocks, Reserves, and Streets, the same to be known as 'COURTYARDS AT BROOKFIELD ADDITION' an addition to Wichita, Sedgwick County, Kansas.

OWNERS CERTIFICATE

The streets are hereby dedicated to and for the use of the public.
Easements for the construction and maintenance of sidewalks, streets, drainage, utilities, and walls, as indicated hereon, are hereby granted to the public.
No signs, light poles, private drainage systems, masonry trash enclosures or other structures shall be located within public utility easements unless permitted by the Public Works Department of the appropriate governing body.

REGISTER OF DEEDS' CERTIFICATE

STATE OF KANSAS, SEDGWICK COUNTY) ss:
This is to certify that this instrument was filed for record in the Register of Deeds office this day of 2017, at o'clock_M, and is duly recorded.

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY) ss:
Entered on transfer record this day of 2017.

REGISTER OF DEEDS' CERTIFICATE

STATE OF KANSAS, SEDGWICK COUNTY) ss:
This is to certify that this instrument was filed for record in the Register of Deeds office this day of 2017, at o'clock_M, and is duly recorded.

REGISTER OF DEEDS' CERTIFICATE

STATE OF KANSAS, SEDGWICK COUNTY) ss:
This is to certify that this instrument was filed for record in the Register of Deeds office this day of 2017, at o'clock_M, and is duly recorded.

GOVERNING BODY CERTIFICATE

This plat approved and all dedications shown hereon, accepted by the Wichita City Council of the City of Wichita, Kansas dated this day of 2017.
At the direction of the City Council.

GOVERNING BODY CERTIFICATE

This plat approved and all dedications shown hereon, accepted by the Wichita City Council of the City of Wichita, Kansas dated this day of 2017.
At the direction of the City Council.

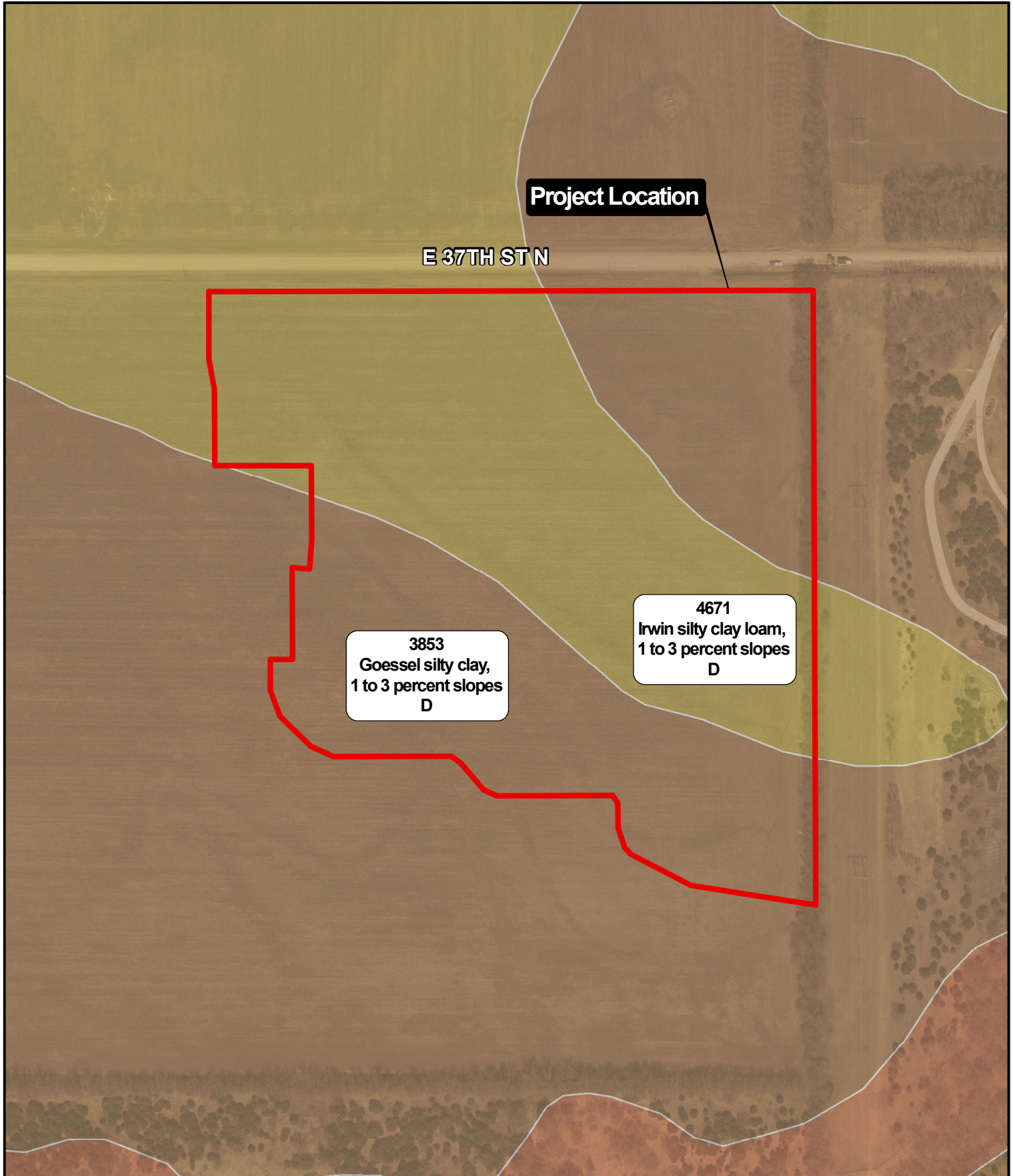
MORTGAGE CERTIFICATE

Intrust Bank, N.A., holder of a mortgage on the above described property, does hereby consent to the 'COURTYARDS AT BROOKFIELD ADDITION' final plat.
INTRUST BANK, N.A.

MORTGAGE CERTIFICATE

Intrust Bank, N.A., holder of a mortgage on the above described property, does hereby consent to the 'COURTYARDS AT BROOKFIELD ADDITION' final plat.
INTRUST BANK, N.A.

Appendix D - Soil Survey



Project Location

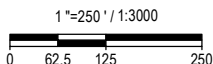
E 37TH ST N

3853
Goessel silty clay,
1 to 3 percent slopes
D

4671
Irwin silty clay loam,
1 to 3 percent slopes
D



SEC: 34
 TWP: T26S
 RNG: R2E



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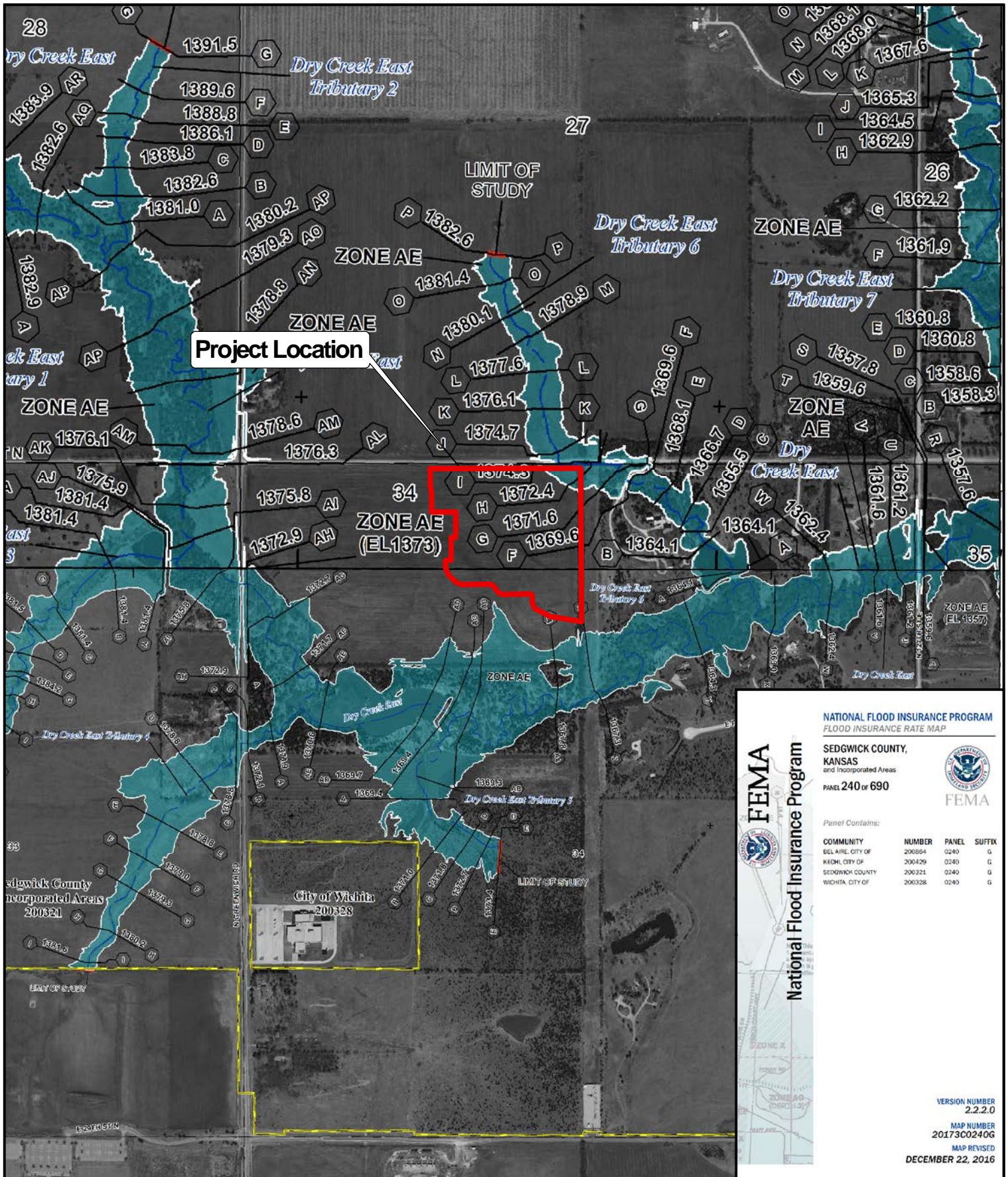
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NRCS SOIL SURVEY EXHIBIT
COURTYARDS AT BROOKFIELD ADDITION
WICHITA, KANSAS

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		1 OF 1

Path: J:\Projects\2016\1601010317_Perfection_Courtyards at Brookfield\05 Civil\GIS\NRCS Soil Survey Exhibit.mxd - Date: 7/14/2017

Appendix E - FEMA FIRM



NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

FEDERAL EMERGENCY MANAGEMENT AGENCY
FEMA

SEDGWICK COUNTY, KANSAS
and Incorporated Areas
PANEL 240 of 690

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
DELAWARE CITY OF	200884	0240	G
HECHL CITY OF	200429	0240	G
SEDGWICK COUNTY	200321	0240	G
WICHITA CITY OF	200328	0240	G

VERSION NUMBER
2.2.2.0

MAP NUMBER
20173C0240G

MAP REVISED
DECEMBER 22, 2016

SEC: 34
TWP: T26S
RNG: R2E

1" = 1,000' 1:12000

0 250 500 1,000

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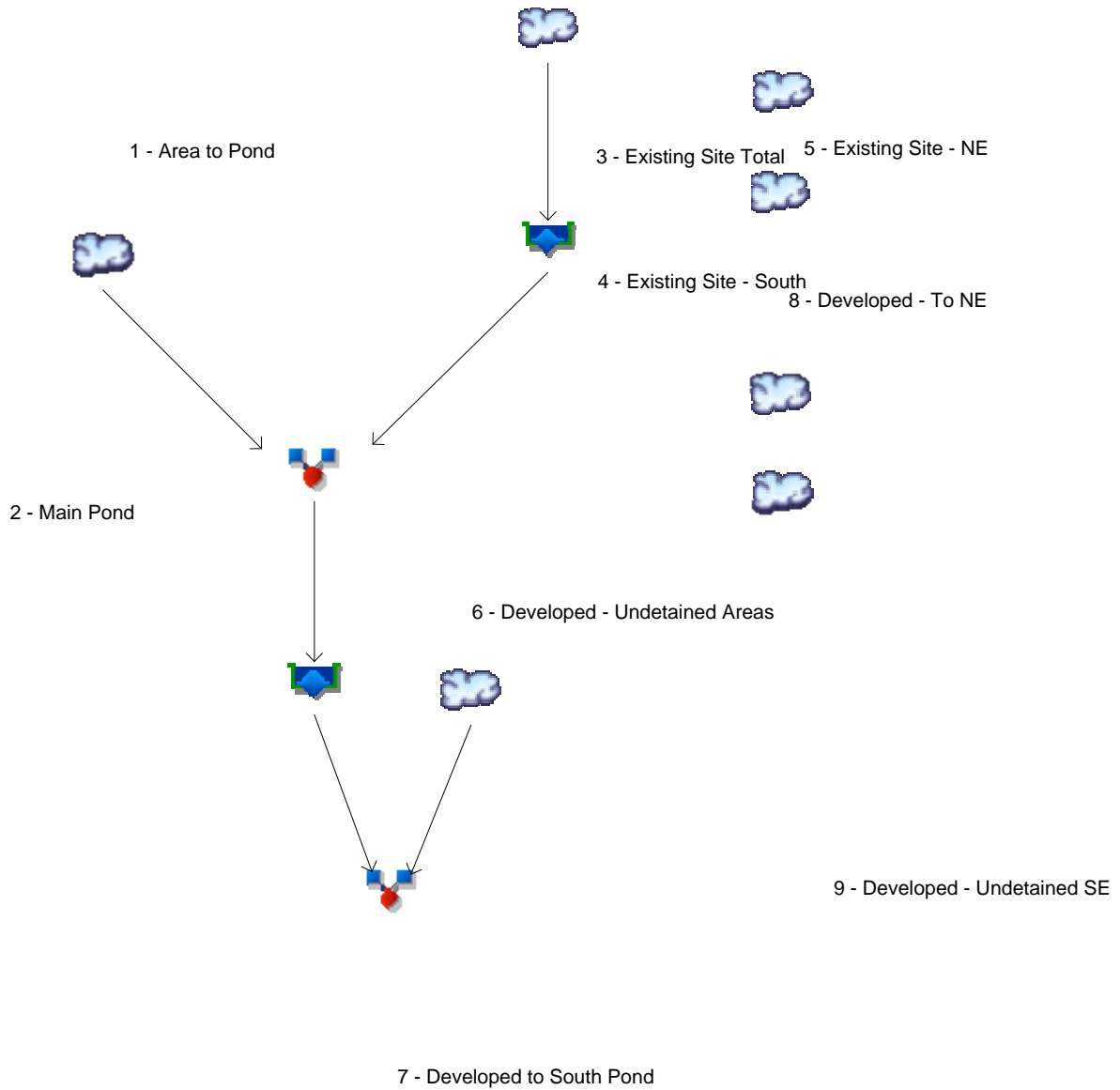
FEMA FIRM EXHIBIT
COURTYARDS AT BROOKFIELD ADDITION
WICHITA, KANSAS

PROJECT NO. 1601010317	DATE: 7/17/2017	SHEET NO.
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		1 OF 1

Appendix F - Baughman Company's Hydraflow Hydrograph Outputs

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514



Legend

Hyd.	Origin	Description
1	SCS Runoff	Area to Pond
2	Reservoir	Main Pond
3	SCS Runoff	Existing Site Total
4	SCS Runoff	Existing Site - South
5	SCS Runoff	Existing Site - NE
6	SCS Runoff	Developed - Undetained Areas
7	Combine	Developed to South Pond
8	SCS Runoff	Developed - To NE
9	SCS Runoff	Developed - Undetained SE
10	Reservoir	South Existing Pond
11	Combine	Developed - Total to Offsite SE

11 - Developed - Total to Offsite SE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	114.32	2	724	8.208	-----	-----	-----	Area to Pond	
2	Reservoir	8.966	2	790	4.088	1	1368.17	4.87	Main Pond	
3	SCS Runoff	49.41	2	754	8.214	-----	-----	-----	Existing Site Total	
4	SCS Runoff	42.82	2	754	7.119	-----	-----	-----	Existing Site - South	
5	SCS Runoff	7.116	2	728	0.580	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	32.49	2	722	2.094	-----	-----	-----	Developed - Undetained Areas	
7	Combine	32.49	2	722	6.182	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	6.830	2	722	0.440	-----	-----	-----	Developed - To NE	
9	SCS Runoff	19.25	2	722	1.240	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	2.023	2	1446	5.131	7	1366.79	4.53	South Existing Pond	
11	Combine	19.31	2	722	6.372	9, 10	-----	-----	Developed - Total to Offsite SE	
Brookfield Addition (Baughman).gpw					Return Period: 1 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	157.25	2	724	11.343	-----	-----	-----	Area to Pond
2	Reservoir	16.13	2	766	7.223	1	1368.54	6.47	Main Pond
3	SCS Runoff	75.35	2	754	12.196	-----	-----	-----	Existing Site Total
4	SCS Runoff	65.31	2	754	10.570	-----	-----	-----	Existing Site - South
5	SCS Runoff	10.74	2	726	0.861	-----	-----	-----	Existing Site - NE
6	SCS Runoff	44.61	2	722	2.894	-----	-----	-----	Developed - Undetained Areas
7	Combine	44.61	2	722	10.117	2, 6	-----	-----	Developed to South Pond
8	SCS Runoff	9.376	2	722	0.608	-----	-----	-----	Developed - To NE
9	SCS Runoff	26.42	2	722	1.714	-----	-----	-----	Developed - Undetained SE
10	Reservoir	3.957	2	1178	8.912	7	1367.24	7.17	South Existing Pond
11	Combine	26.56	2	722	10.626	9, 10	-----	-----	Developed - Total to Offsite SE
Brookfield Addition (Baughman).gpw					Return Period: 2 Year			Friday, 07 / 14 / 2017	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	219.29	2	724	15.981	-----	-----	-----	Area to Pond
2	Reservoir	23.60	2	764	11.861	1	1369.16	9.20	Main Pond
3	SCS Runoff	114.99	2	754	18.346	-----	-----	-----	Existing Site Total
4	SCS Runoff	99.66	2	754	15.900	-----	-----	-----	Existing Site - South
5	SCS Runoff	16.32	2	726	1.295	-----	-----	-----	Existing Site - NE
6	SCS Runoff	62.09	2	722	4.077	-----	-----	-----	Developed - Undetained Areas
7	Combine	73.94	2	724	15.938	2, 6	-----	-----	Developed to South Pond
8	SCS Runoff	13.05	2	722	0.857	-----	-----	-----	Developed - To NE
9	SCS Runoff	36.78	2	722	2.415	-----	-----	-----	Developed - Undetained SE
10	Reservoir	14.31	2	1036	14.708	7	1367.54	8.96	South Existing Pond
11	Combine	37.09	2	722	17.123	9, 10	-----	-----	Developed - Total to Offsite SE
Brookfield Addition (Baughman).gpw					Return Period: 5 Year			Friday, 07 / 14 / 2017	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	262.80	2	724	19.296	-----	-----	-----	Area to Pond	
2	Reservoir	27.86	2	764	15.176	1	1369.60	11.2	Main Pond	
3	SCS Runoff	143.79	2	754	22.867	-----	-----	-----	Existing Site Total	
4	SCS Runoff	124.62	2	754	19.818	-----	-----	-----	Existing Site - South	
5	SCS Runoff	20.36	2	726	1.613	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	74.35	2	722	4.923	-----	-----	-----	Developed - Undetained Areas	
7	Combine	90.42	2	722	20.099	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	15.63	2	722	1.035	-----	-----	-----	Developed - To NE	
9	SCS Runoff	44.04	2	722	2.916	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	20.16	2	998	18.859	7	1367.66	9.65	South Existing Pond	
11	Combine	44.55	2	722	21.775	9, 10	-----	-----	Developed - Total to Offsite SE	
Brookfield Addition (Baughman).gpw					Return Period: 10 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	318.61	2	724	23.611	-----	-----	-----	Area to Pond	
2	Reservoir	40.01	2	756	19.491	1	1370.13	13.7	Main Pond	
3	SCS Runoff	181.54	2	754	28.856	-----	-----	-----	Existing Site Total	
4	SCS Runoff	157.34	2	754	25.008	-----	-----	-----	Existing Site - South	
5	SCS Runoff	25.64	2	726	2.036	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	90.06	2	722	6.024	-----	-----	-----	Developed - Undetained Areas	
7	Combine	110.93	2	722	25.515	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	18.93	2	722	1.266	-----	-----	-----	Developed - To NE	
9	SCS Runoff	53.35	2	722	3.568	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	26.82	2	956	24.265	7	1367.77	10.4	South Existing Pond	
11	Combine	54.18	2	722	27.833	9, 10	-----	-----	Developed - Total to Offsite SE	
Brookfield Addition (Baughman).gpw					Return Period: 25 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description
1	SCS Runoff	368.04	2	724	27.482	-----	-----	-----	Area to Pond
2	Reservoir	58.15	2	748	23.362	1	1370.53	15.6	Main Pond
3	SCS Runoff	215.50	2	754	34.301	-----	-----	-----	Existing Site Total
4	SCS Runoff	186.76	2	754	29.728	-----	-----	-----	Existing Site - South
5	SCS Runoff	30.38	2	726	2.420	-----	-----	-----	Existing Site - NE
6	SCS Runoff	103.97	2	722	7.011	-----	-----	-----	Developed - Undetained Areas
7	Combine	128.35	2	722	30.373	2, 6	-----	-----	Developed to South Pond
8	SCS Runoff	21.85	2	722	1.474	-----	-----	-----	Developed - To NE
9	SCS Runoff	61.59	2	722	4.153	-----	-----	-----	Developed - Undetained SE
10	Reservoir	34.22	2	874	29.117	7	1367.89	11.1	South Existing Pond
11	Combine	62.81	2	722	33.270	9, 10	-----	-----	Developed - Total to Offsite SE
Brookfield Addition (Baughman).gpw					Return Period: 50 Year			Friday, 07 / 14 / 2017	

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	423.42	2	724	31.864	-----	-----	-----	Area to Pond	
2	Reservoir	81.93	2	746	27.744	1	1370.95	17.6	Main Pond	
3	SCS Runoff	254.09	2	752	40.528	-----	-----	-----	Existing Site Total	
4	SCS Runoff	220.21	2	752	35.125	-----	-----	-----	Existing Site - South	
5	SCS Runoff	35.73	2	726	2.860	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	119.55	2	722	8.129	-----	-----	-----	Developed - Undetained Areas	
7	Combine	147.16	2	722	35.873	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	25.13	2	722	1.709	-----	-----	-----	Developed - To NE	
9	SCS Runoff	70.82	2	722	4.815	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	48.11	2	838	34.610	7	1368.08	12.3	South Existing Pond	
11	Combine	72.60	2	722	39.426	9, 10	-----	-----	Developed - Total to Offsite SE	
Brookfield Addition (Baughman).gpw					Return Period: 100 Year			Friday, 07 / 14 / 2017		

Hydrograph Report

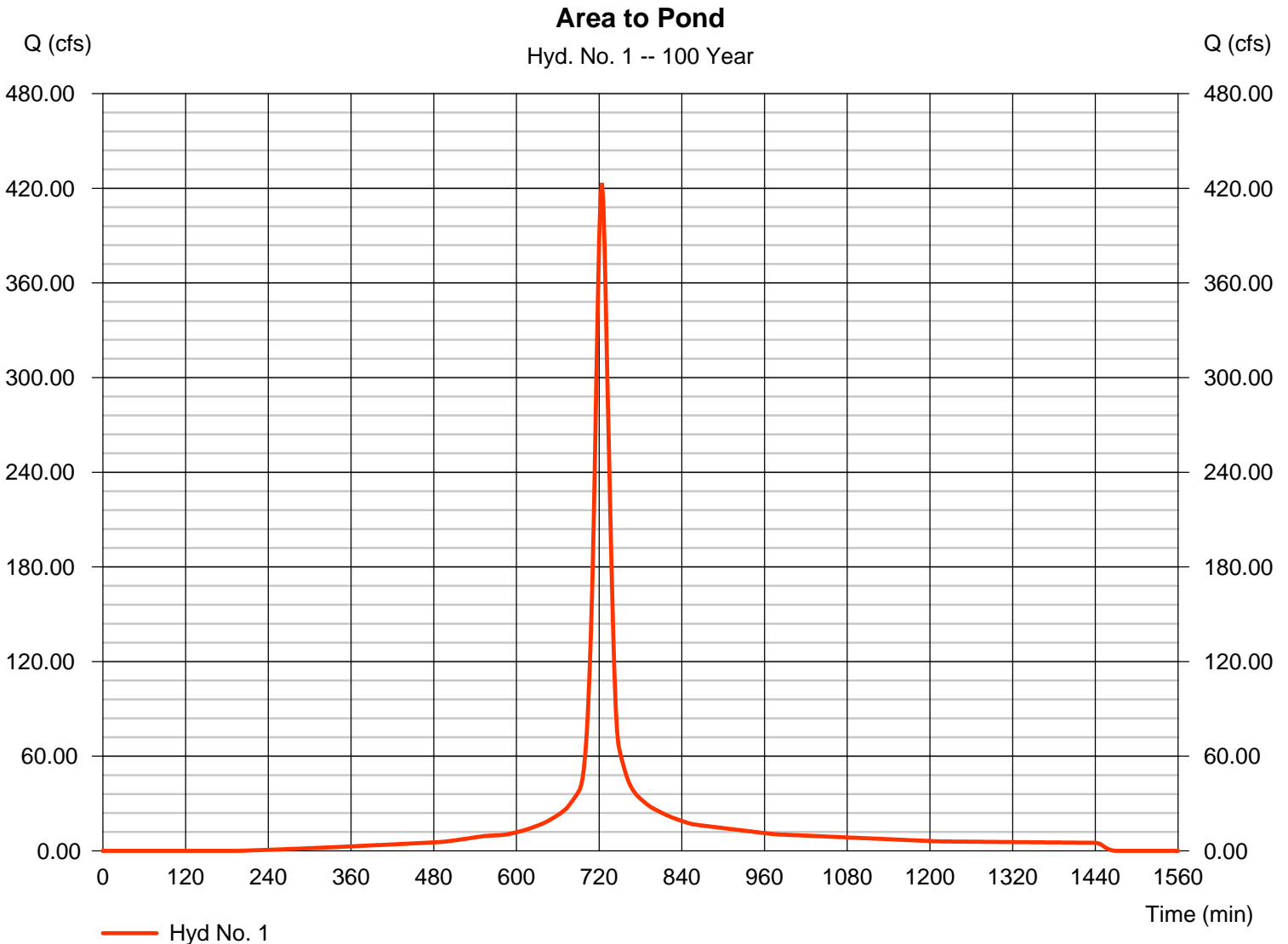
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Friday, 07 / 14 / 2017

Hyd. No. 1

Area to Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 423.42 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 31.864 acft
Drainage area	= 60.000 ac	Curve number	= 88
Basin Slope	= 2.0 %	Hydraulic length	= 1200 ft
Tc method	= LAG	Time of conc. (Tc)	= 19.70 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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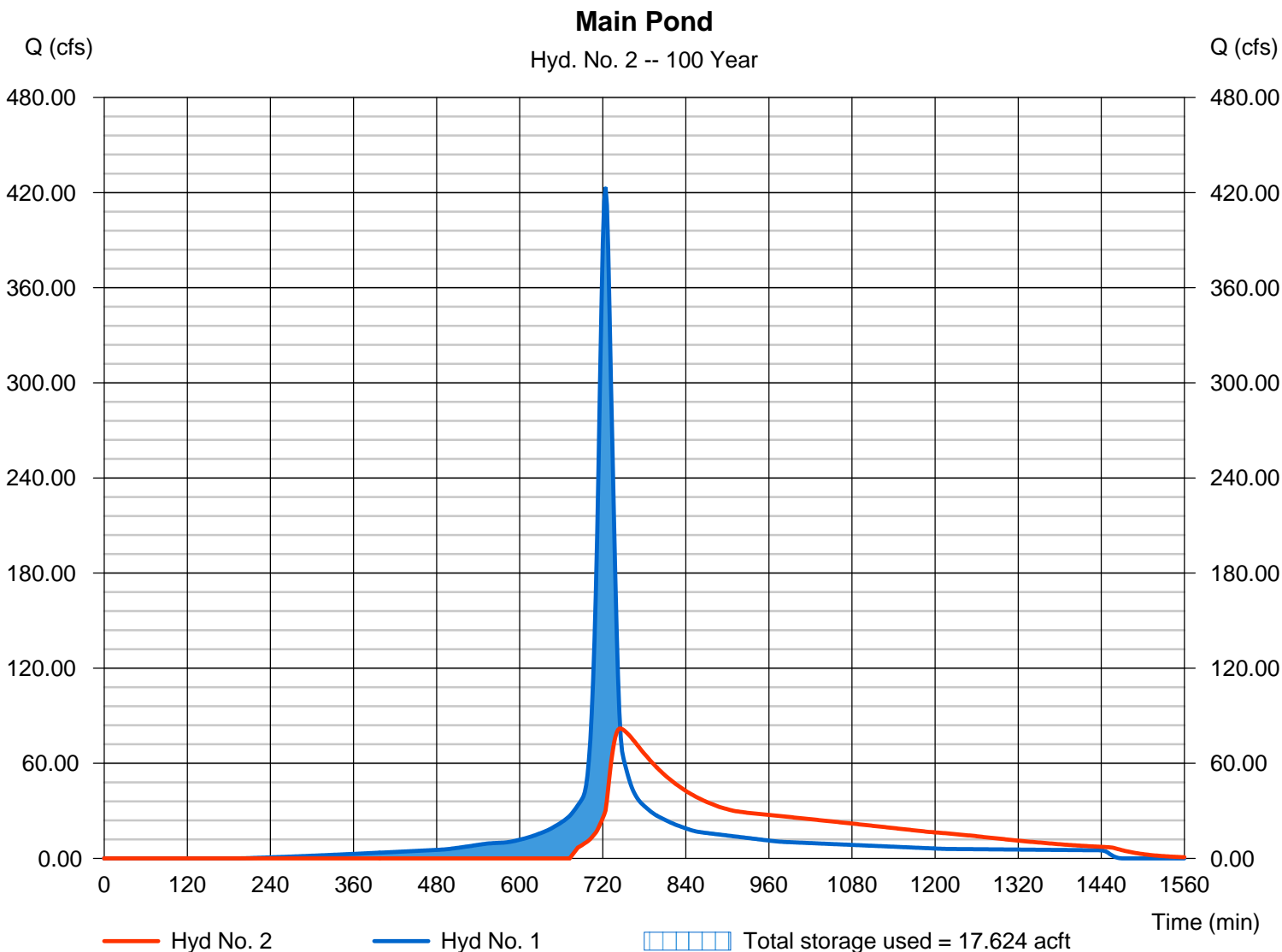
Friday, 07 / 14 / 2017

Hyd. No. 2

Main Pond

Hydrograph type	= Reservoir	Peak discharge	= 81.93 cfs
Storm frequency	= 100 yrs	Time to peak	= 746 min
Time interval	= 2 min	Hyd. volume	= 27.744 acft
Inflow hyd. No.	= 1 - Area to Pond	Max. Elevation	= 1370.95 ft
Reservoir name	= Main Pond	Max. Storage	= 17.624 acft

Storage Indication method used.



Pond No. 1 - Main Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1367.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1367.00	175,000	0.000	0.000
1.00	1368.00	184,000	4.120	4.120
2.00	1369.00	194,000	4.338	8.458
3.00	1370.00	205,000	4.579	13.037
4.00	1371.00	215,000	4.820	17.857
5.00	1372.00	225,000	5.050	22.906

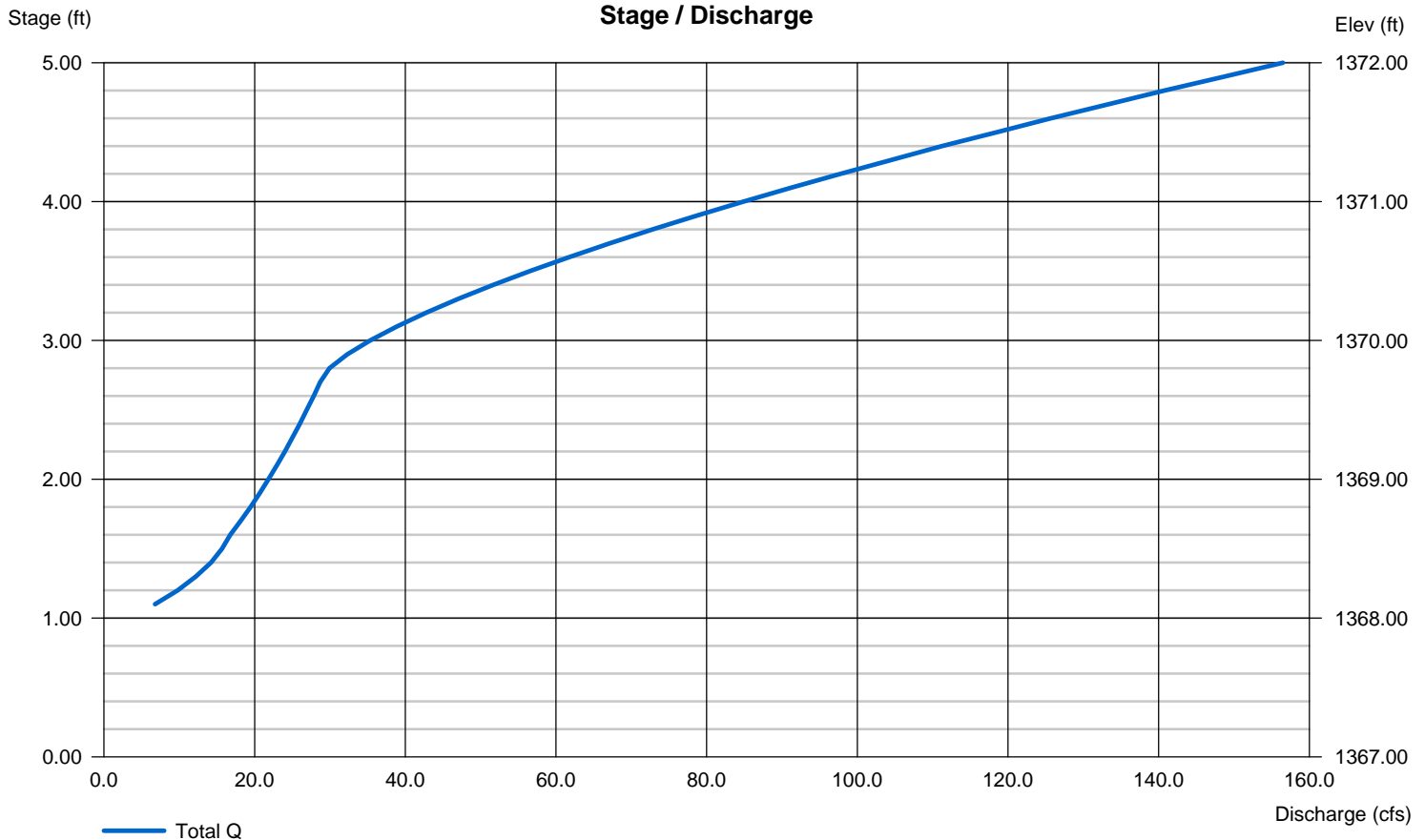
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1365.50	0.00	0.00	0.00
Length (ft)	= 700.00	0.00	0.00	0.00
Slope (%)	= 0.13	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)	= 26.00	10.00	0.00	10.00
Crest El. (ft)	= 1370.50	1367.00	1368.50	1369.75
Weir Coeff.	= 3.33	3.33	1.05	3.33
Weir Type	= 1	Rect	45 degV	Rect
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 1368.00			

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

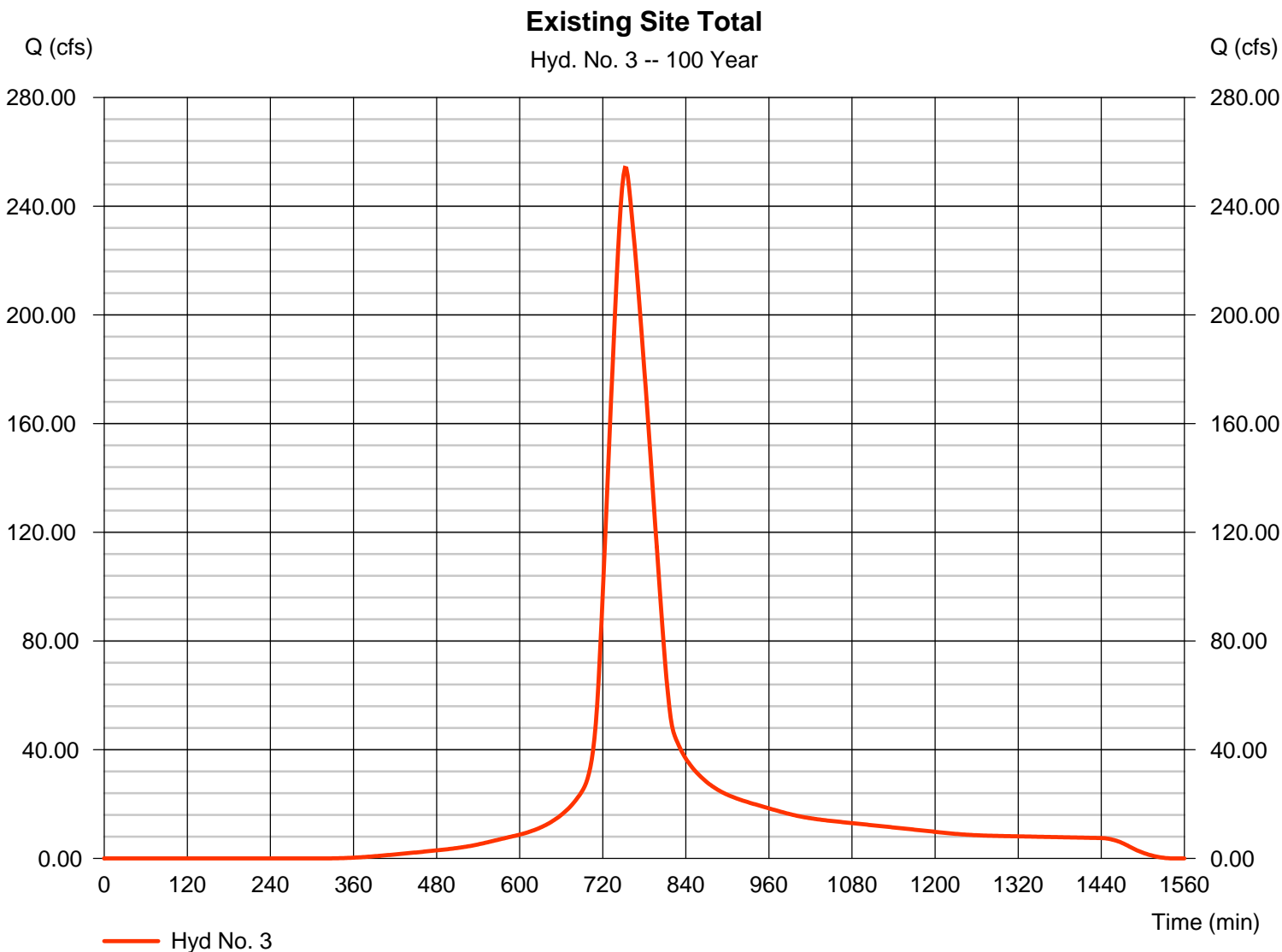
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Hyd. No. 3

Existing Site Total

Hydrograph type	= SCS Runoff	Peak discharge	= 254.09 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 40.528 acft
Drainage area	= 90.000 ac	Curve number	= 80
Basin Slope	= 0.7 %	Hydraulic length	= 1950 ft
Tc method	= LAG	Time of conc. (Tc)	= 64.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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Friday, 07 / 14 / 2017

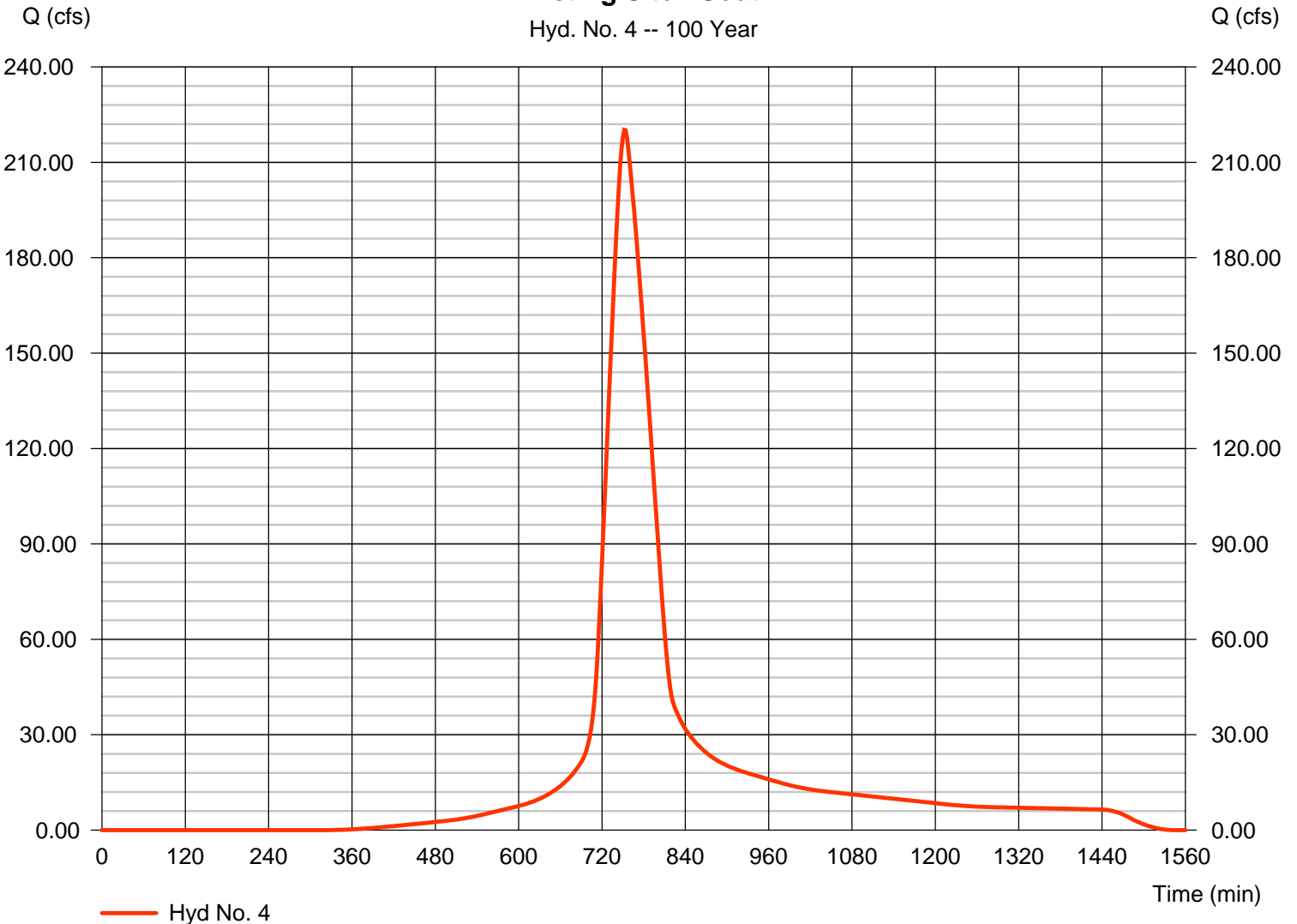
Hyd. No. 4

Existing Site - South

Hydrograph type	= SCS Runoff	Peak discharge	= 220.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 35.125 acft
Drainage area	= 78.000 ac	Curve number	= 80
Basin Slope	= 0.7 %	Hydraulic length	= 1950 ft
Tc method	= LAG	Time of conc. (Tc)	= 64.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Existing Site - South

Hyd. No. 4 -- 100 Year



Hydrograph Report

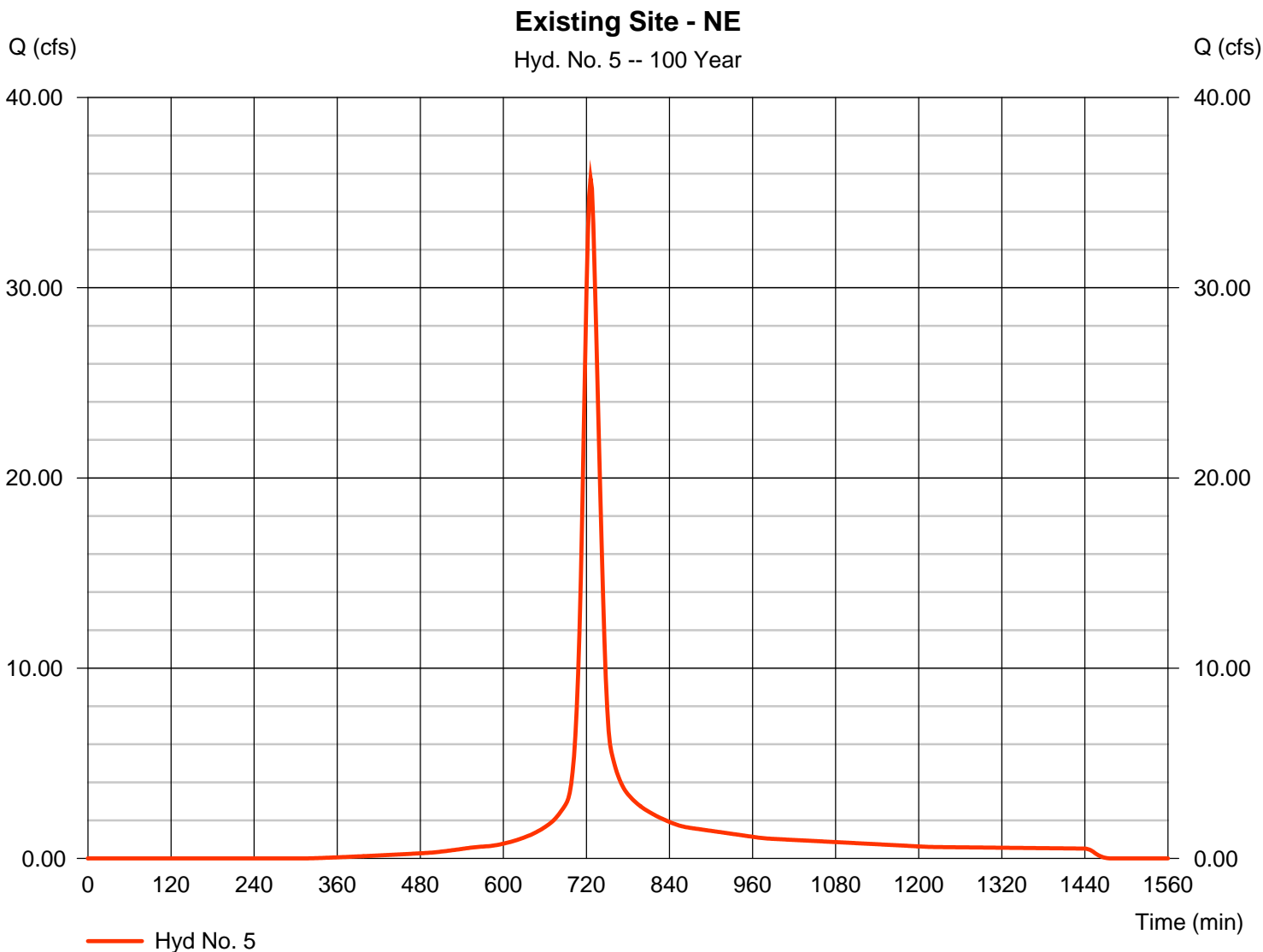
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Friday, 07 / 14 / 2017

Hyd. No. 5

Existing Site - NE

Hydrograph type	= SCS Runoff	Peak discharge	= 35.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 2.860 acft
Drainage area	= 6.200 ac	Curve number	= 80
Basin Slope	= 1.3 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 22.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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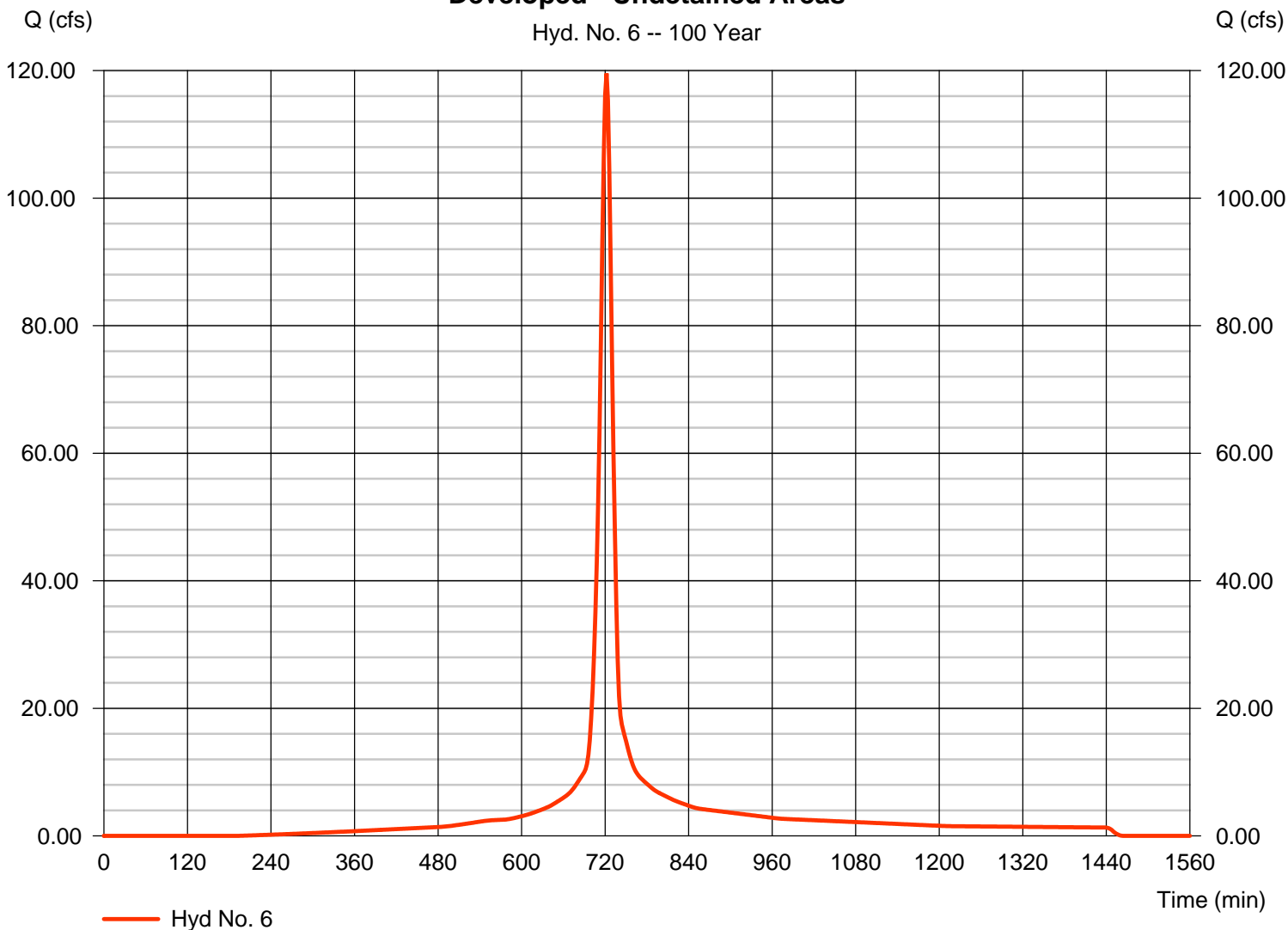
Hyd. No. 6

Developed - Undetained Areas

Hydrograph type	= SCS Runoff	Peak discharge	= 119.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 8.129 acft
Drainage area	= 15.700 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Developed - Undetained Areas

Hyd. No. 6 -- 100 Year



Hydrograph Report

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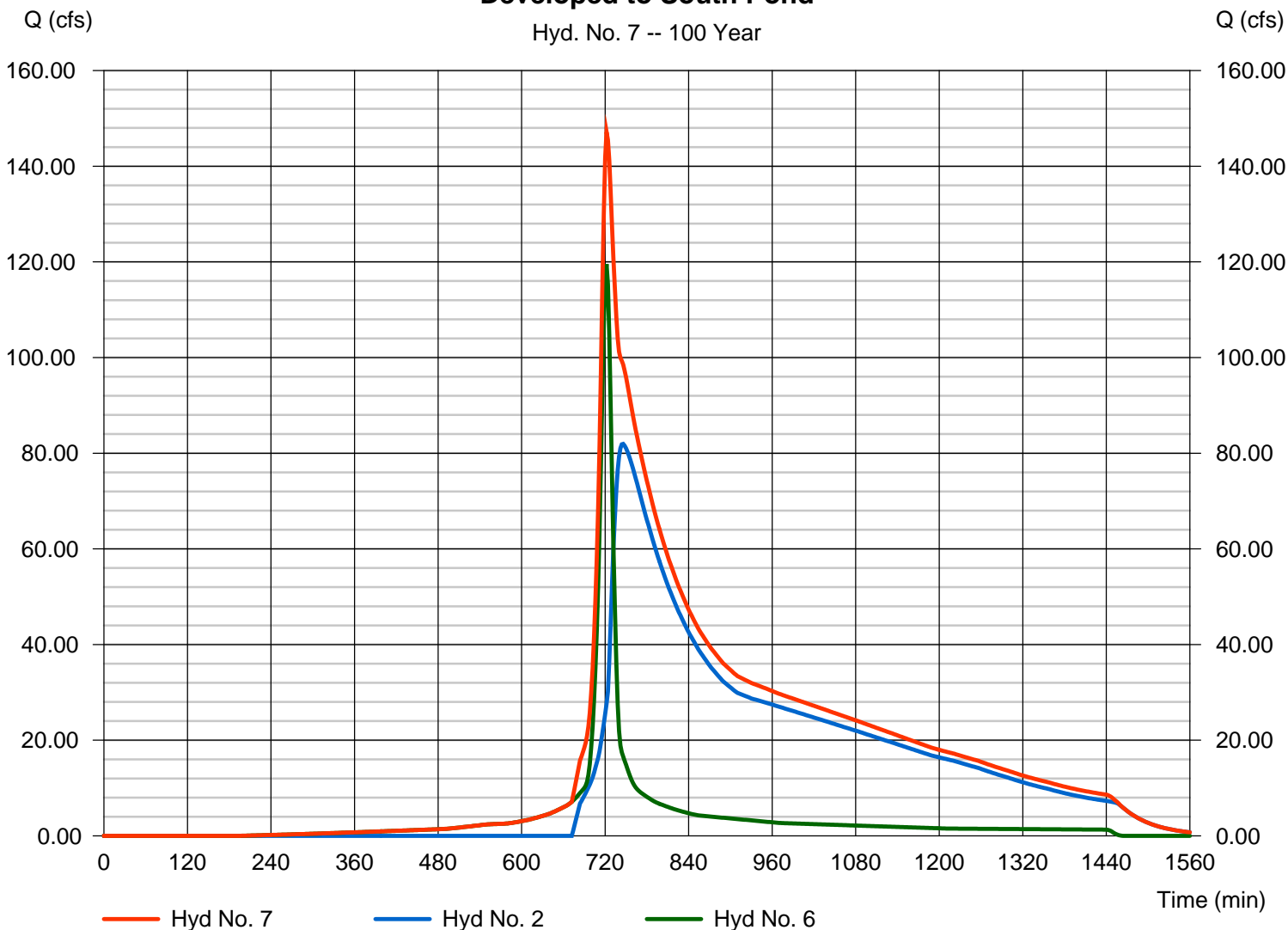
Hyd. No. 7

Developed to South Pond

Hydrograph type	= Combine	Peak discharge	= 147.16 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 35.873 acft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 15.700 ac

Developed to South Pond

Hyd. No. 7 -- 100 Year



Hydrograph Report

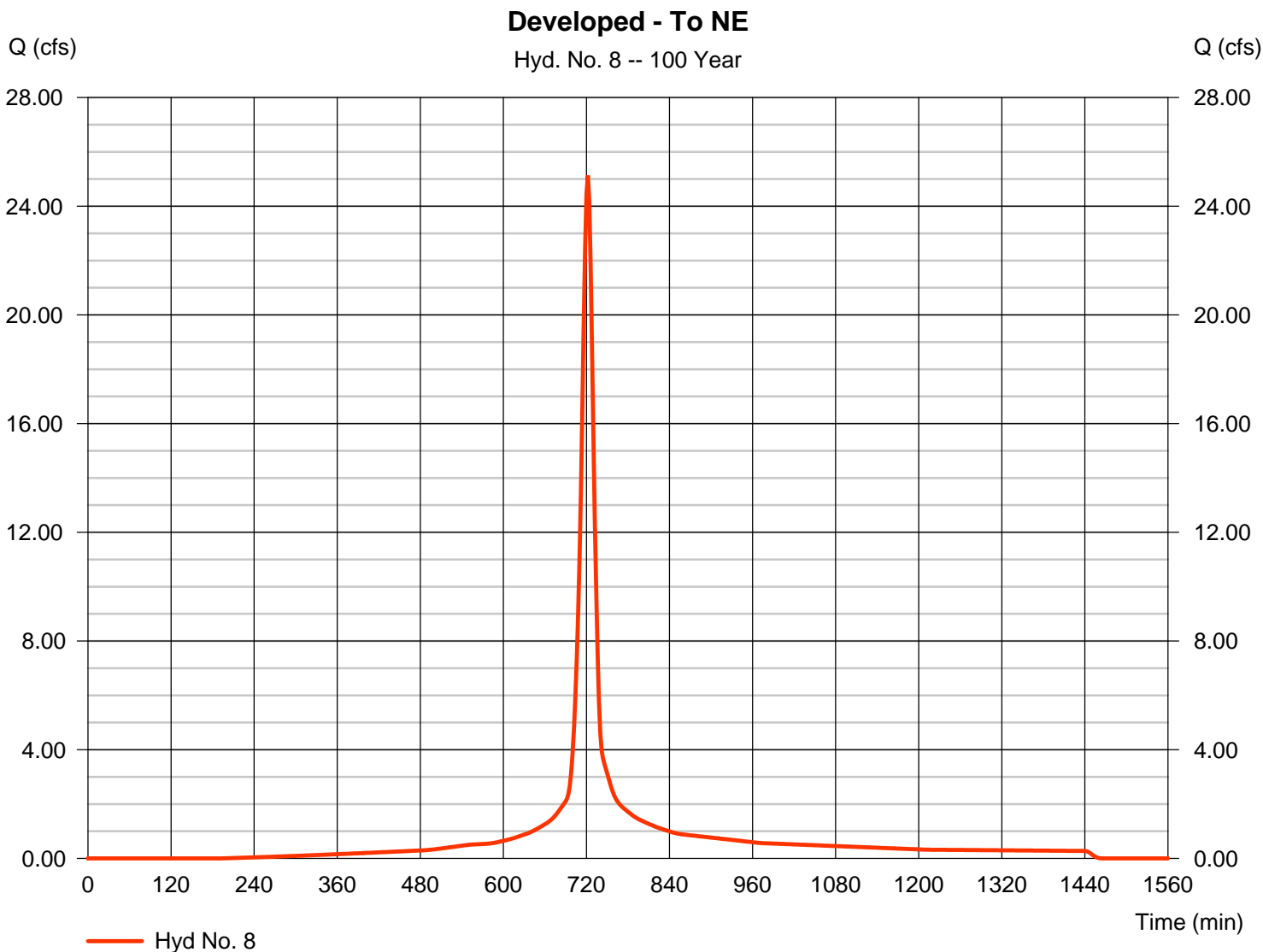
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Hyd. No. 8

Developed - To NE

Hydrograph type	= SCS Runoff	Peak discharge	= 25.13 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 1.709 acft
Drainage area	= 3.300 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

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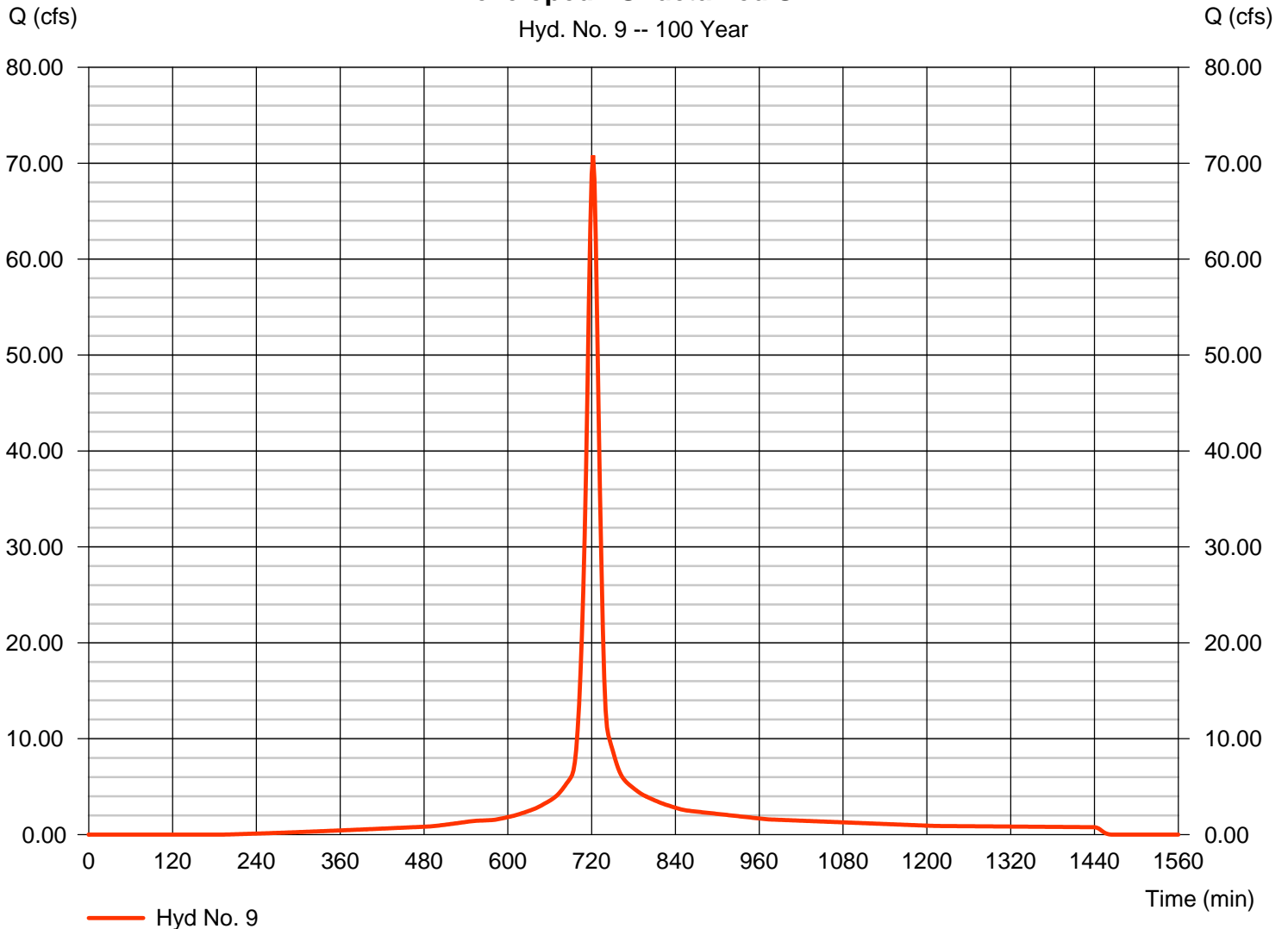
Friday, 07 / 14 / 2017

Hyd. No. 9

Developed - Undetained SE

Hydrograph type	= SCS Runoff	Peak discharge	= 70.82 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 4.815 acft
Drainage area	= 9.300 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Developed - Undetained SE



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Friday, 07 / 14 / 2017

Hyd. No. 10

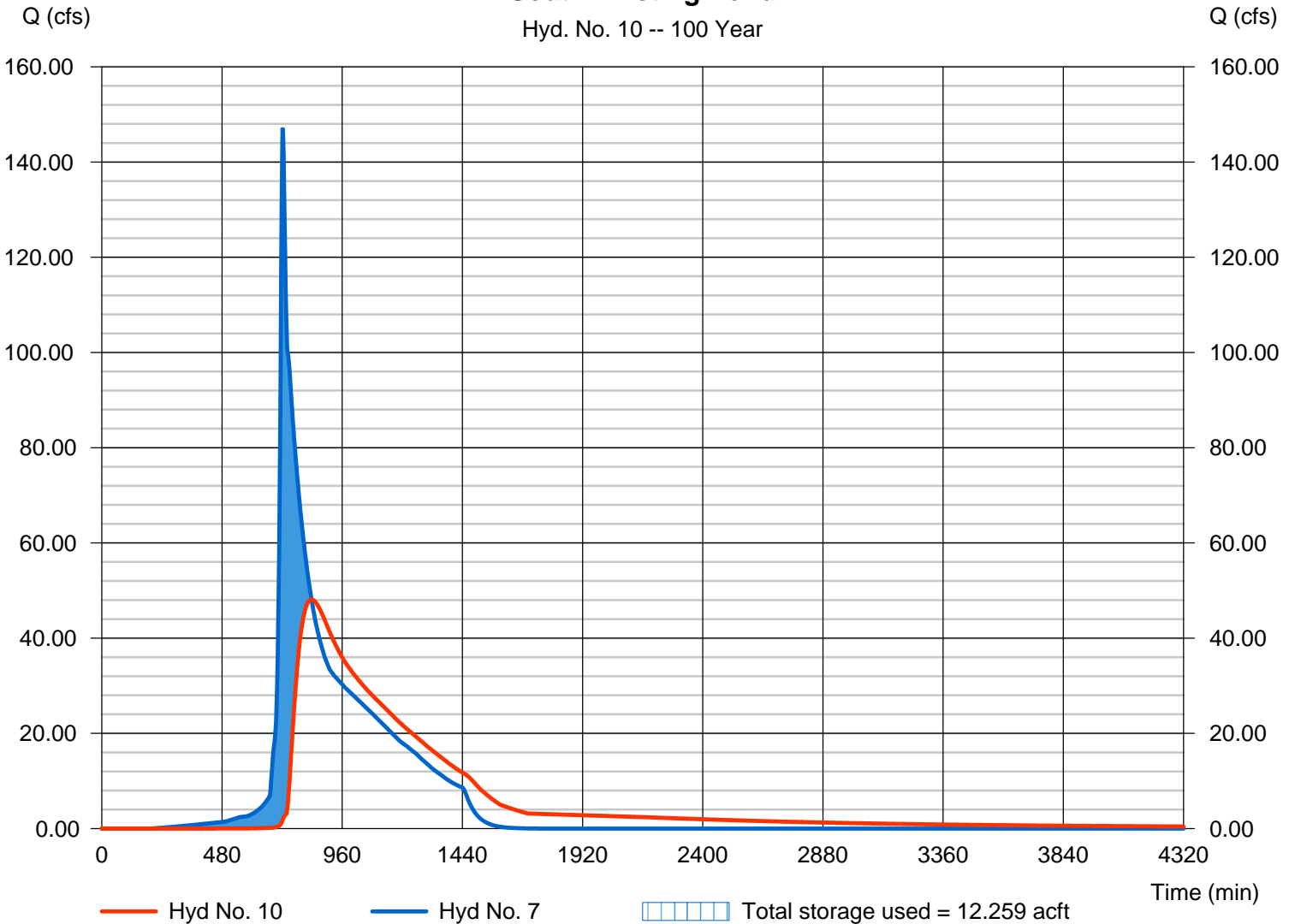
South Existing Pond

Hydrograph type	= Reservoir	Peak discharge	= 48.11 cfs
Storm frequency	= 100 yrs	Time to peak	= 838 min
Time interval	= 2 min	Hyd. volume	= 34.610 acft
Inflow hyd. No.	= 7 - Developed to South Pond	Max. Elevation	= 1368.08 ft
Reservoir name	= South Pond	Max. Storage	= 12.259 acft

Storage Indication method used.

South Existing Pond

Hyd. No. 10 -- 100 Year



Pond No. 2 - South Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1366.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1366.00	242,300	0.000	0.000
1.00	1367.00	255,300	5.710	5.710
2.00	1368.00	268,400	6.010	11.720
3.00	1369.00	281,600	6.312	18.032

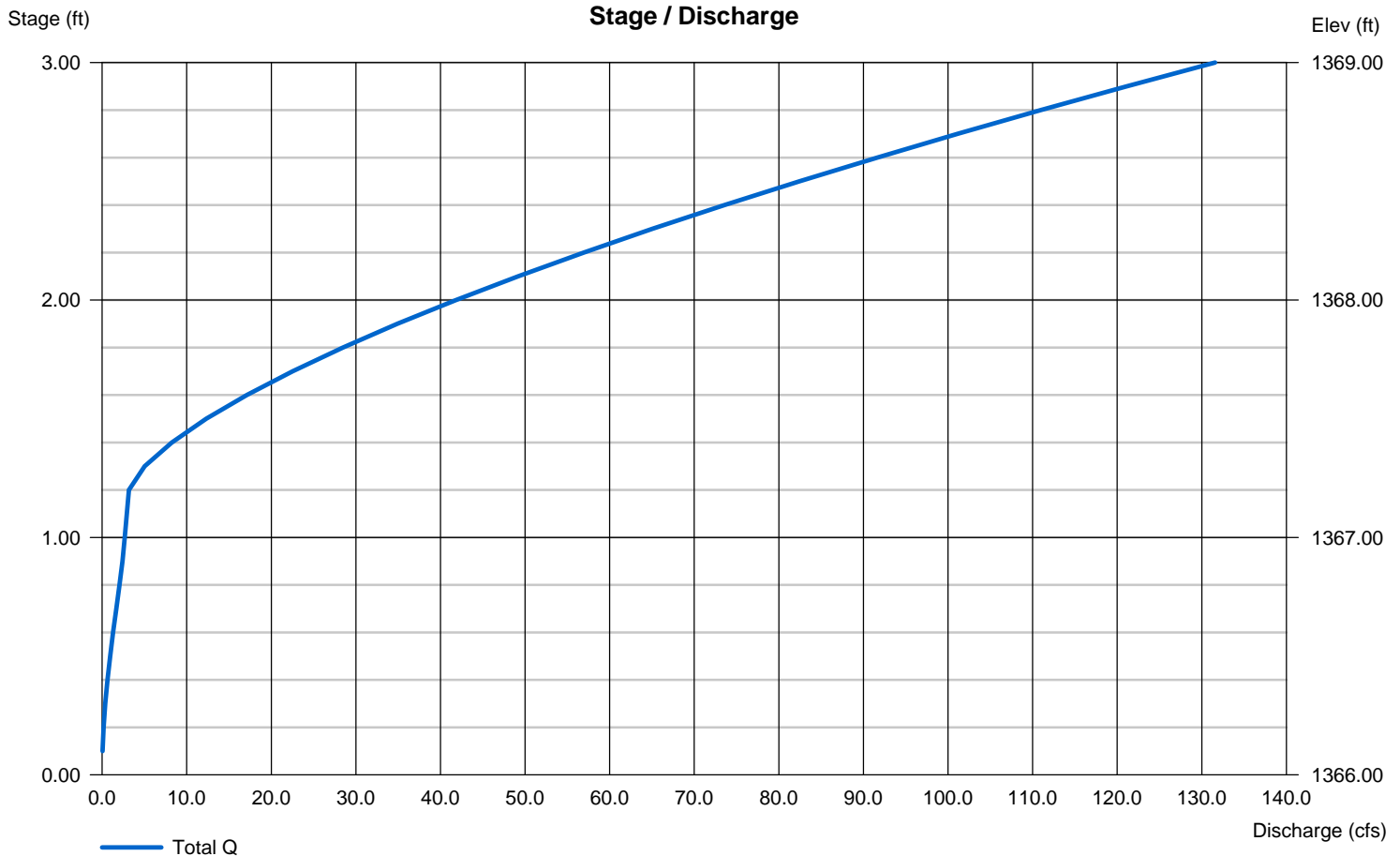
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1366.00	0.00	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 4.00	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)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 1367.20	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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



Hydrograph Report

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Hyd. No. 11

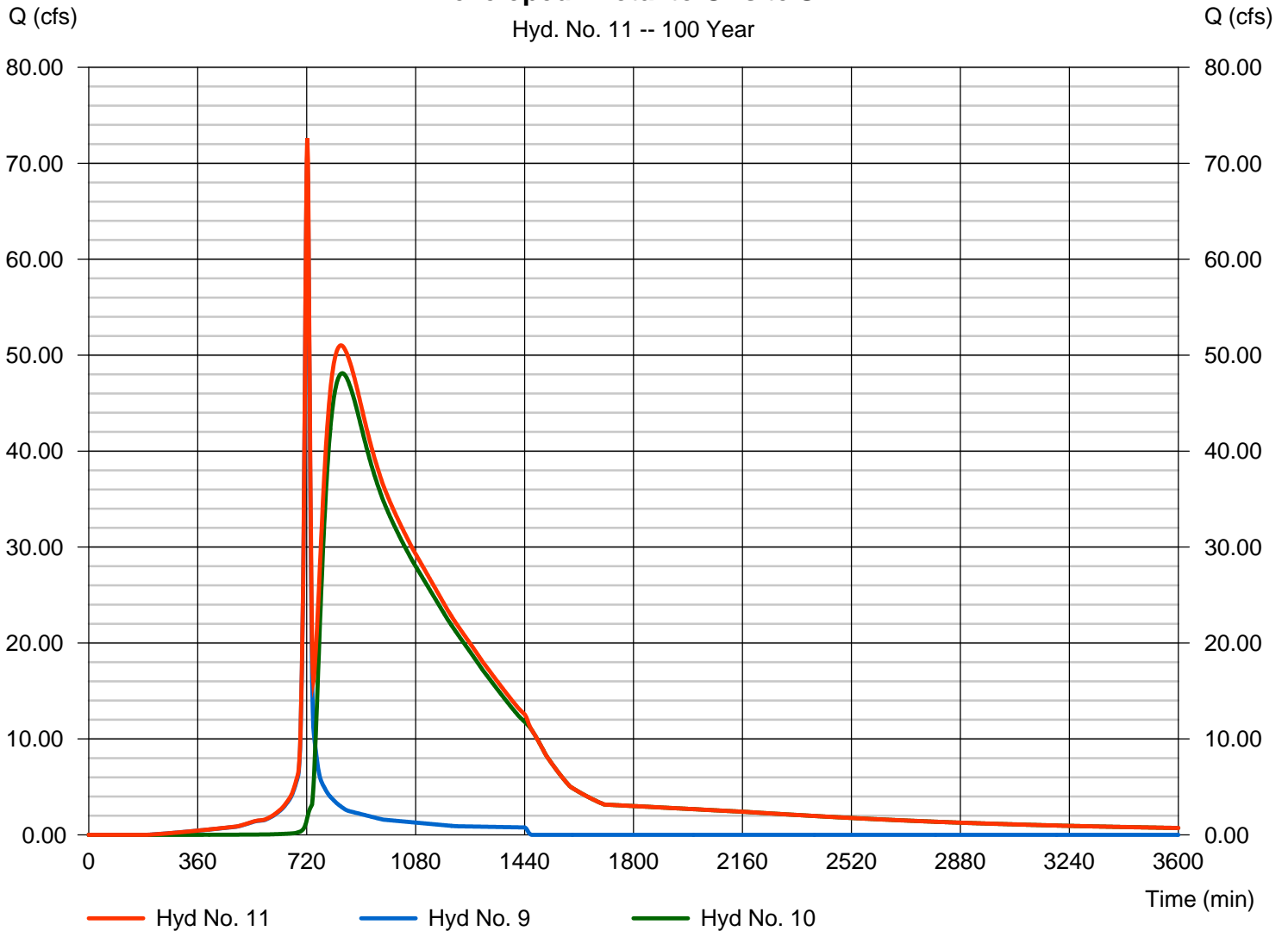
Developed - Total to Offsite SE

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 9, 10

Peak discharge = 72.60 cfs
Time to peak = 722 min
Hyd. volume = 39.426 acft
Contrib. drain. area = 9.300 ac

Developed - Total to Offsite SE

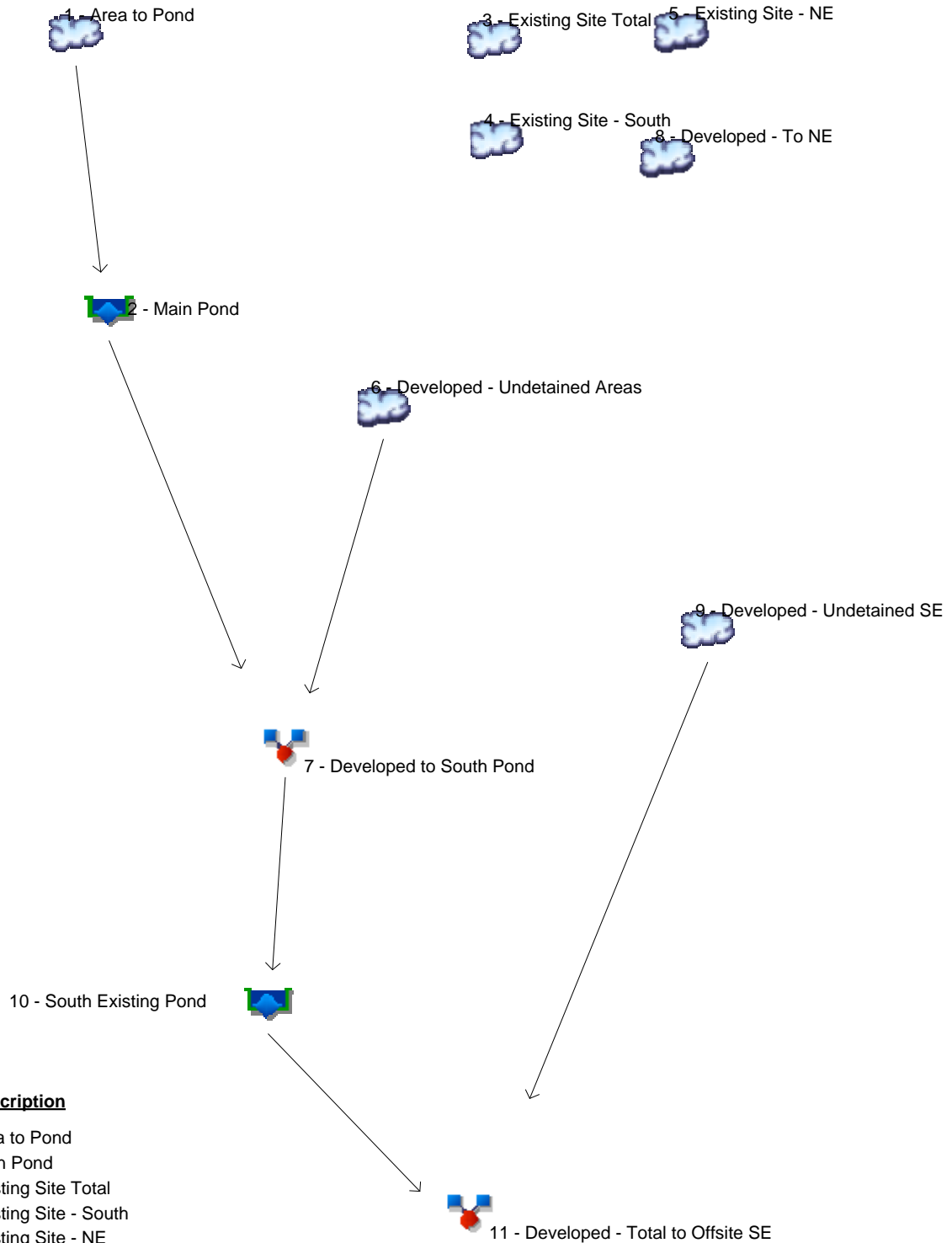
Hyd. No. 11 -- 100 Year



Appendix G - Proposed Hydraflow Hydrograph Outputs

Watershed Model Schematic

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514



Legend

Hyd.	Origin	Description
1	SCS Runoff	Area to Pond
2	Reservoir	Main Pond
3	SCS Runoff	Existing Site Total
4	SCS Runoff	Existing Site - South
5	SCS Runoff	Existing Site - NE
6	SCS Runoff	Developed - Undetained Areas
7	Combine	Developed to South Pond
8	SCS Runoff	Developed - To NE
9	SCS Runoff	Developed - Undetained SE
10	Reservoir	South Existing Pond
11	Combine	Developed - Total to Offsite SE

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	119.41	2	724	8.586	-----	-----	-----	Area to Pond	
2	Reservoir	10.19	2	782	4.466	1	1368.22	5.06	Main Pond	
3	SCS Runoff	49.41	2	754	8.214	-----	-----	-----	Existing Site Total	
4	SCS Runoff	42.82	2	754	7.119	-----	-----	-----	Existing Site - South	
5	SCS Runoff	7.116	2	728	0.580	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	32.49	2	722	2.094	-----	-----	-----	Developed - Undetained Areas	
7	Combine	32.49	2	722	6.560	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	7.940	2	722	0.522	-----	-----	-----	Developed - To NE	
9	SCS Runoff	19.25	2	722	1.240	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	2.165	2	1434	5.494	7	1366.83	4.75	South Existing Pond	
11	Combine	19.31	2	722	6.734	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 1 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	162.54	2	724	11.766	-----	-----	-----	Area to Pond	
2	Reservoir	16.91	2	766	7.646	1	1368.61	6.77	Main Pond	
3	SCS Runoff	75.35	2	754	12.196	-----	-----	-----	Existing Site Total	
4	SCS Runoff	65.31	2	754	10.570	-----	-----	-----	Existing Site - South	
5	SCS Runoff	10.74	2	726	0.861	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	44.61	2	722	2.894	-----	-----	-----	Developed - Undetained Areas	
7	Combine	46.14	2	726	10.540	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	10.43	2	722	0.696	-----	-----	-----	Developed - To NE	
9	SCS Runoff	26.42	2	722	1.714	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	4.637	2	1140	9.331	7	1367.28	7.39	South Existing Pond	
11	Combine	26.56	2	722	11.045	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 2 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	224.57	2	724	16.448	-----	-----	-----	Area to Pond	
2	Reservoir	24.38	2	762	12.328	1	1369.24	9.54	Main Pond	
3	SCS Runoff	114.99	2	754	18.346	-----	-----	-----	Existing Site Total	
4	SCS Runoff	99.66	2	754	15.900	-----	-----	-----	Existing Site - South	
5	SCS Runoff	16.32	2	726	1.295	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	62.09	2	722	4.077	-----	-----	-----	Developed - Undetained Areas	
7	Combine	75.09	2	724	16.406	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	13.98	2	722	0.947	-----	-----	-----	Developed - To NE	
9	SCS Runoff	36.78	2	722	2.415	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	15.07	2	1034	15.174	7	1367.56	9.06	South Existing Pond	
11	Combine	37.10	2	722	17.589	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 5 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	267.96	2	724	19.785	-----	-----	-----	Area to Pond	
2	Reservoir	28.56	2	762	15.665	1	1369.68	11.6	Main Pond	
3	SCS Runoff	143.79	2	754	22.867	-----	-----	-----	Existing Site Total	
4	SCS Runoff	124.62	2	754	19.818	-----	-----	-----	Existing Site - South	
5	SCS Runoff	20.36	2	726	1.613	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	74.35	2	722	4.923	-----	-----	-----	Developed - Undetained Areas	
7	Combine	91.23	2	722	20.588	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	16.44	2	722	1.125	-----	-----	-----	Developed - To NE	
9	SCS Runoff	44.04	2	722	2.916	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	20.88	2	996	19.348	7	1367.67	9.73	South Existing Pond	
11	Combine	44.56	2	722	22.264	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 10 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	323.54	2	724	24.121	-----	-----	-----	Area to Pond	
2	Reservoir	42.62	2	754	20.001	1	1370.20	14.0	Main Pond	
3	SCS Runoff	181.54	2	754	28.856	-----	-----	-----	Existing Site Total	
4	SCS Runoff	157.34	2	754	25.008	-----	-----	-----	Existing Site - South	
5	SCS Runoff	25.64	2	726	2.036	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	90.06	2	722	6.024	-----	-----	-----	Developed - Undetained Areas	
7	Combine	111.80	2	722	26.025	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	19.59	2	722	1.355	-----	-----	-----	Developed - To NE	
9	SCS Runoff	53.35	2	722	3.568	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	27.48	2	948	24.775	7	1367.78	10.4	South Existing Pond	
11	Combine	54.21	2	722	28.343	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 25 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	372.73	2	724	28.006	-----	-----	-----	Area to Pond	
2	Reservoir	61.37	2	748	23.886	1	1370.59	15.9	Main Pond	
3	SCS Runoff	215.50	2	754	34.301	-----	-----	-----	Existing Site Total	
4	SCS Runoff	186.76	2	754	29.728	-----	-----	-----	Existing Site - South	
5	SCS Runoff	30.38	2	726	2.420	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	103.97	2	722	7.011	-----	-----	-----	Developed - Undetained Areas	
7	Combine	129.04	2	722	30.897	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	22.37	2	722	1.561	-----	-----	-----	Developed - To NE	
9	SCS Runoff	61.59	2	722	4.153	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	35.62	2	868	29.640	7	1367.91	11.2	South Existing Pond	
11	Combine	62.86	2	722	33.794	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 50 Year			Friday, 07 / 14 / 2017		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph Description	
1	SCS Runoff	427.83	2	724	32.399	-----	-----	-----	Area to Pond	
2	Reservoir	85.33	2	744	28.279	1	1371.01	17.9	Main Pond	
3	SCS Runoff	254.09	2	752	40.528	-----	-----	-----	Existing Site Total	
4	SCS Runoff	220.21	2	752	35.125	-----	-----	-----	Existing Site - South	
5	SCS Runoff	35.73	2	726	2.860	-----	-----	-----	Existing Site - NE	
6	SCS Runoff	119.55	2	722	8.129	-----	-----	-----	Developed - Undetained Areas	
7	Combine	147.73	2	722	36.409	2, 6	-----	-----	Developed to South Pond	
8	SCS Runoff	25.49	2	722	1.792	-----	-----	-----	Developed - To NE	
9	SCS Runoff	70.82	2	722	4.815	-----	-----	-----	Developed - Undetained SE	
10	Reservoir	49.88	2	834	35.145	7	1368.11	12.4	South Existing Pond	
11	Combine	72.68	2	722	39.961	9, 10	-----	-----	Developed - Total to Offsite SE	
Courtyards at Brookfield Addition.gpw					Return Period: 100 Year			Friday, 07 / 14 / 2017		

Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

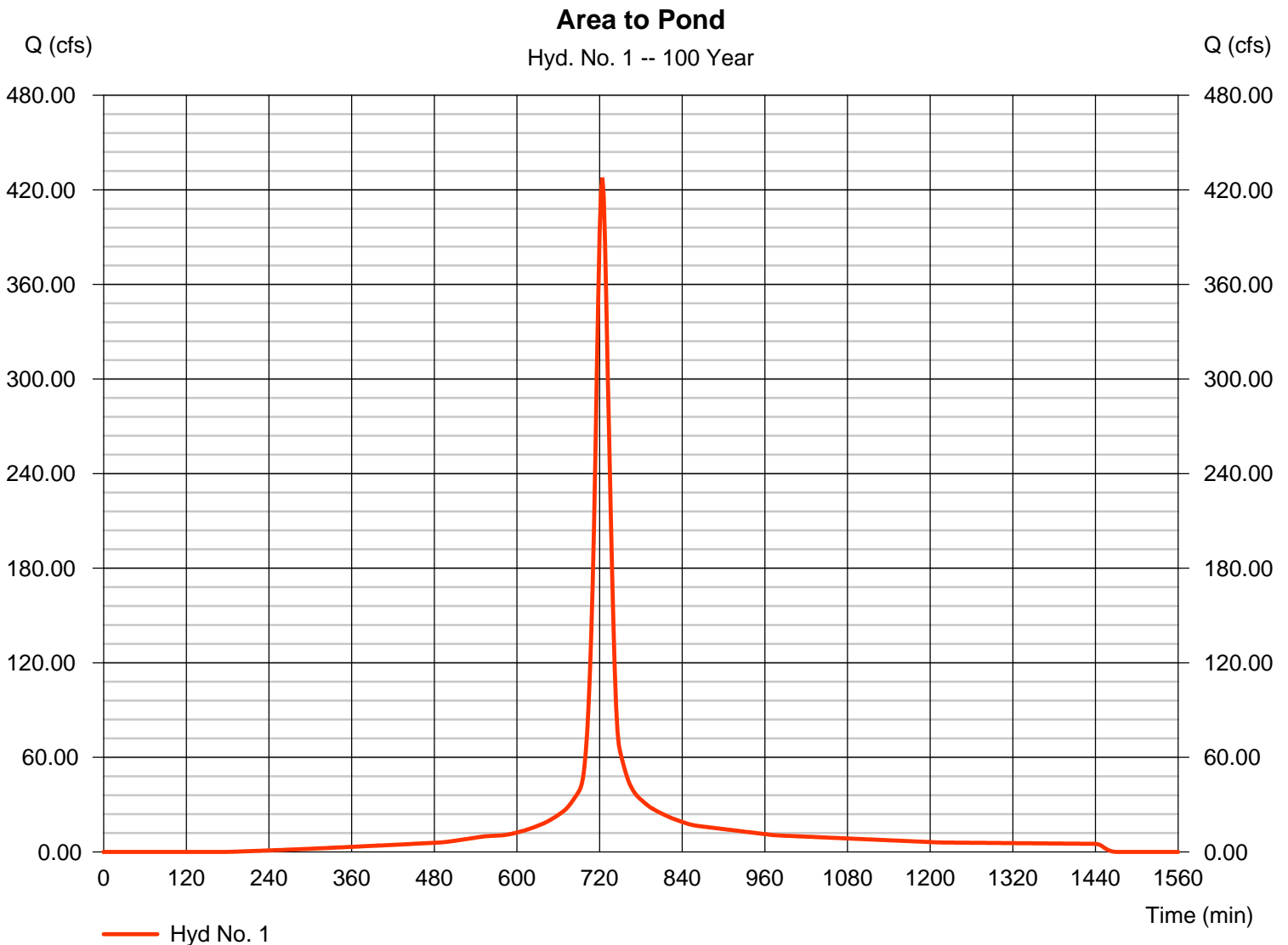
Friday, 07 / 14 / 2017

Hyd. No. 1

Area to Pond

Hydrograph type	= SCS Runoff	Peak discharge	= 427.83 cfs
Storm frequency	= 100 yrs	Time to peak	= 724 min
Time interval	= 2 min	Hyd. volume	= 32.399 acft
Drainage area	= 59.900 ac	Curve number	= 89*
Basin Slope	= 2.0 %	Hydraulic length	= 1200 ft
Tc method	= LAG	Time of conc. (Tc)	= 19.04 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(30.800 x 88) + (8.900 x 88) + (20.200 x 92)] / 59.900



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

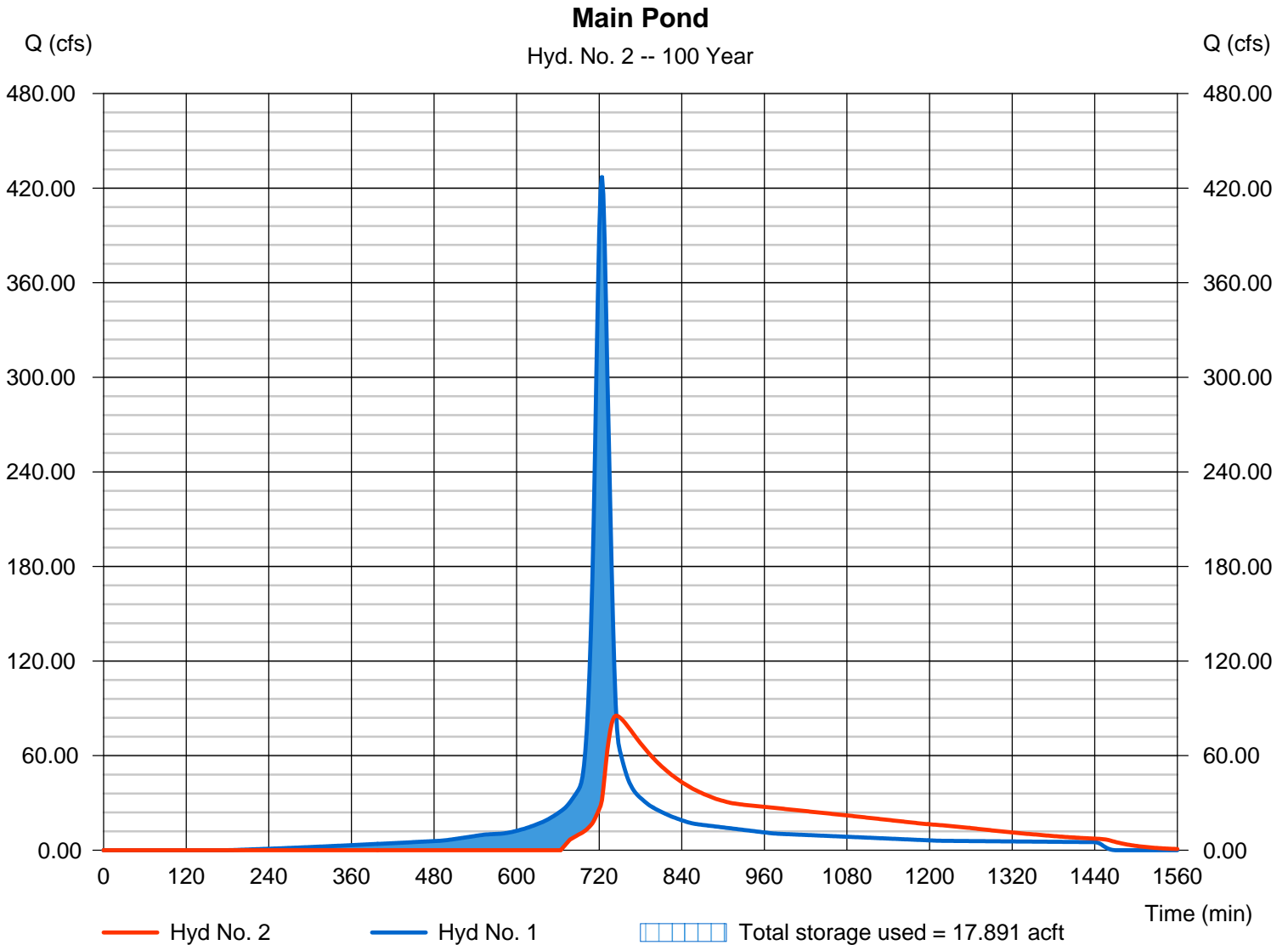
Friday, 07 / 14 / 2017

Hyd. No. 2

Main Pond

Hydrograph type	= Reservoir	Peak discharge	= 85.33 cfs
Storm frequency	= 100 yrs	Time to peak	= 744 min
Time interval	= 2 min	Hyd. volume	= 28.279 acft
Inflow hyd. No.	= 1 - Area to Pond	Max. Elevation	= 1371.01 ft
Reservoir name	= Main Pond	Max. Storage	= 17.891 acft

Storage Indication method used.



Pond No. 1 - Main Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1367.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1367.00	175,000	0.000	0.000
1.00	1368.00	184,000	4.120	4.120
2.00	1369.00	194,000	4.338	8.458
3.00	1370.00	205,000	4.579	13.037
4.00	1371.00	215,000	4.820	17.857
5.00	1372.00	225,000	5.050	22.906

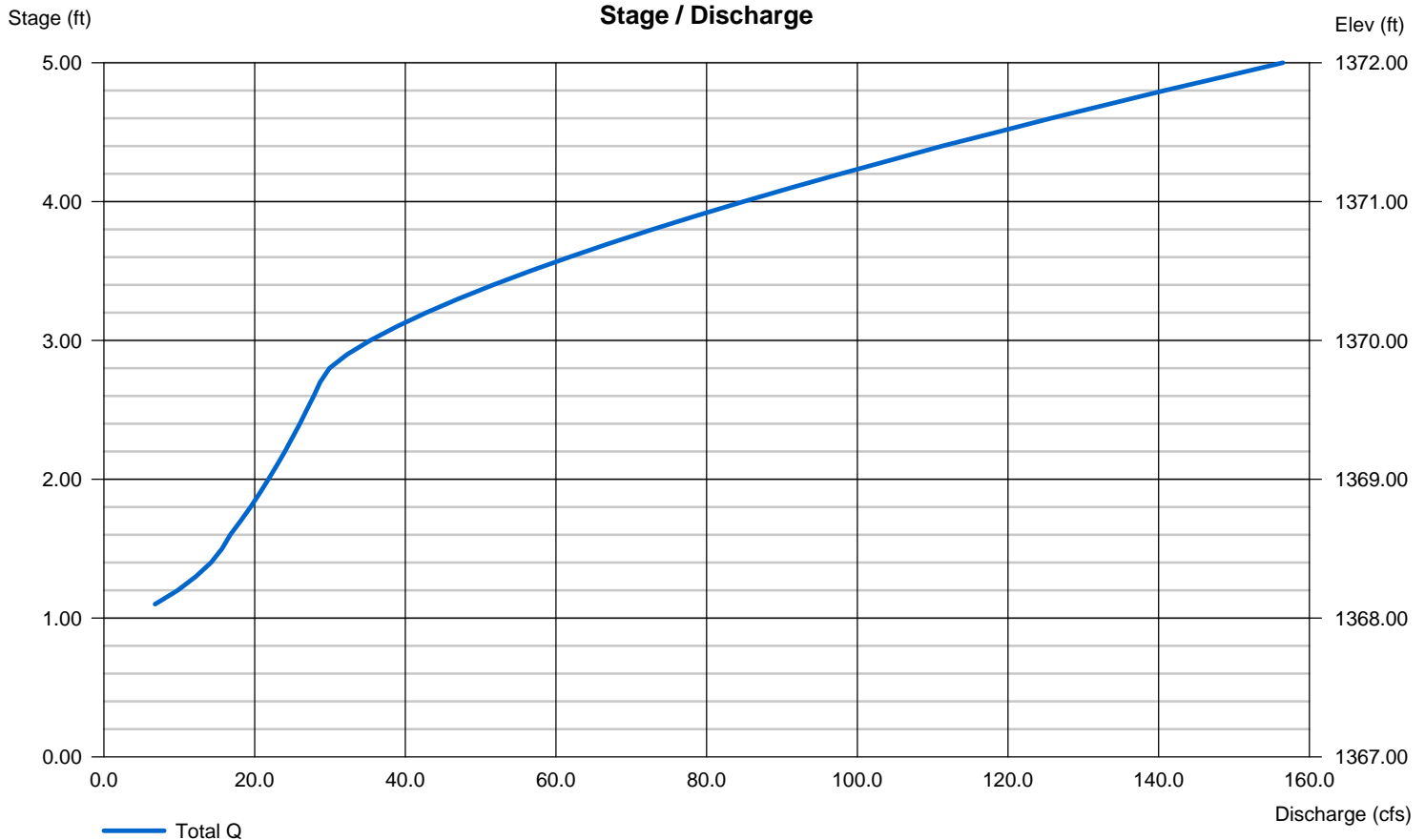
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	0.00
Span (in)	= 36.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1365.50	0.00	0.00	0.00
Length (ft)	= 700.00	0.00	0.00	0.00
Slope (%)	= 0.13	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)	= 26.00	10.00	0.00	10.00
Crest El. (ft)	= 1370.50	1367.00	1368.50	1369.75
Weir Coeff.	= 3.33	3.33	1.05	3.33
Weir Type	= 1	Rect	45 degV	Rect
Multi-Stage	= Yes	Yes	Yes	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 1368.00			

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

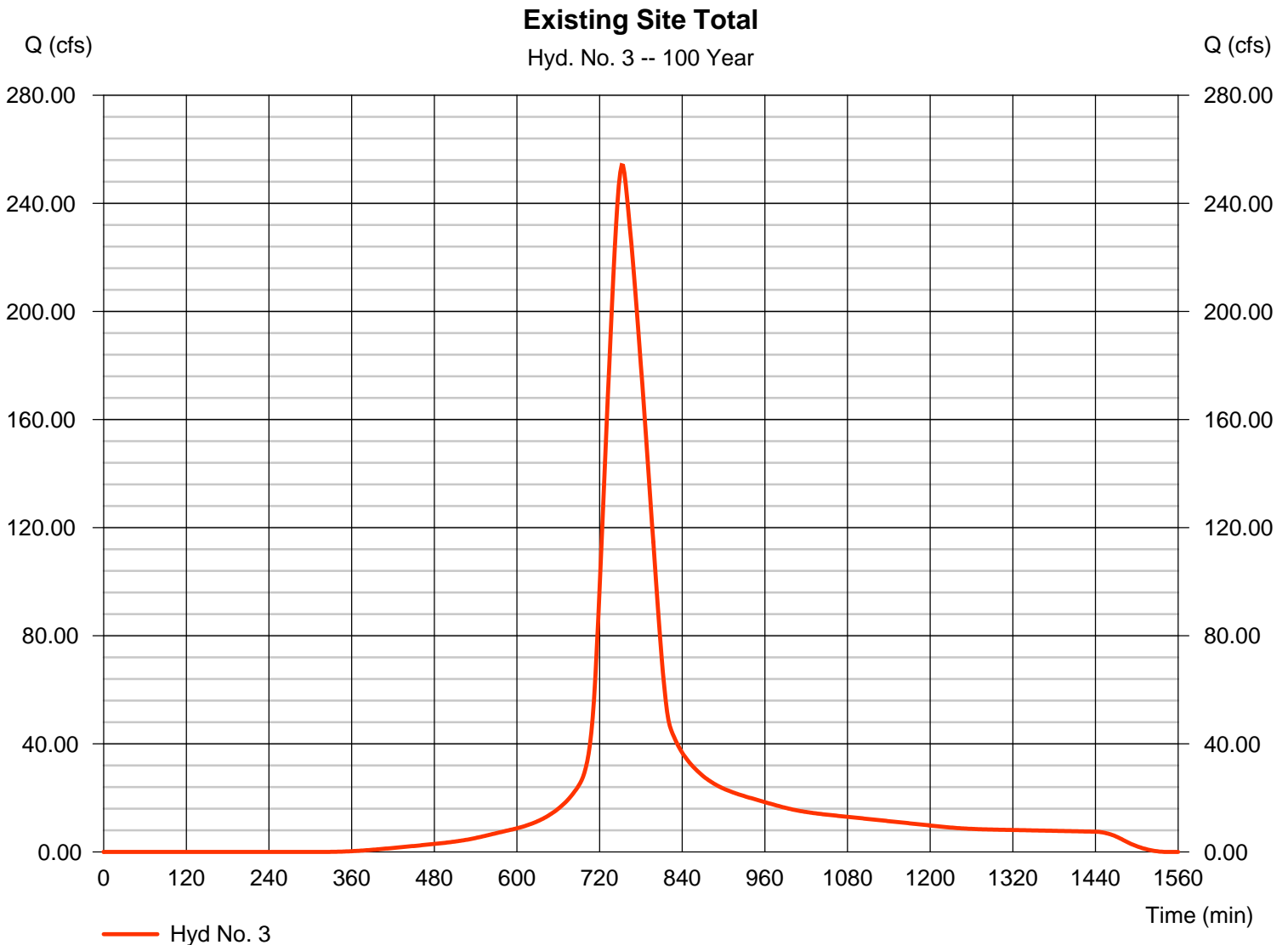
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Hyd. No. 3

Existing Site Total

Hydrograph type	= SCS Runoff	Peak discharge	= 254.09 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 40.528 acft
Drainage area	= 90.000 ac	Curve number	= 80
Basin Slope	= 0.7 %	Hydraulic length	= 1950 ft
Tc method	= LAG	Time of conc. (Tc)	= 64.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

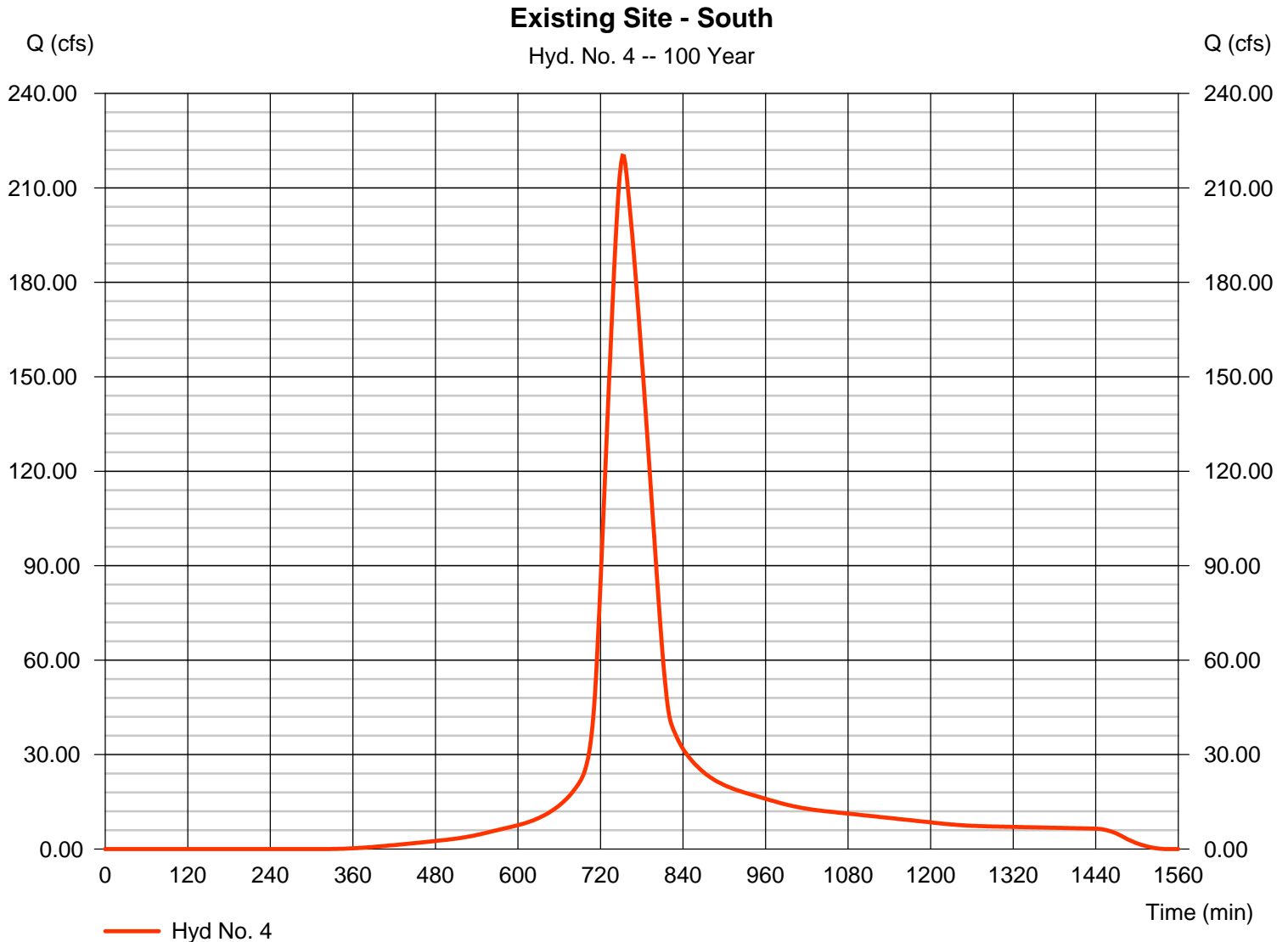
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Friday, 07 / 14 / 2017

Hyd. No. 4

Existing Site - South

Hydrograph type	= SCS Runoff	Peak discharge	= 220.21 cfs
Storm frequency	= 100 yrs	Time to peak	= 752 min
Time interval	= 2 min	Hyd. volume	= 35.125 acft
Drainage area	= 78.000 ac	Curve number	= 80
Basin Slope	= 0.7 %	Hydraulic length	= 1950 ft
Tc method	= LAG	Time of conc. (Tc)	= 64.90 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

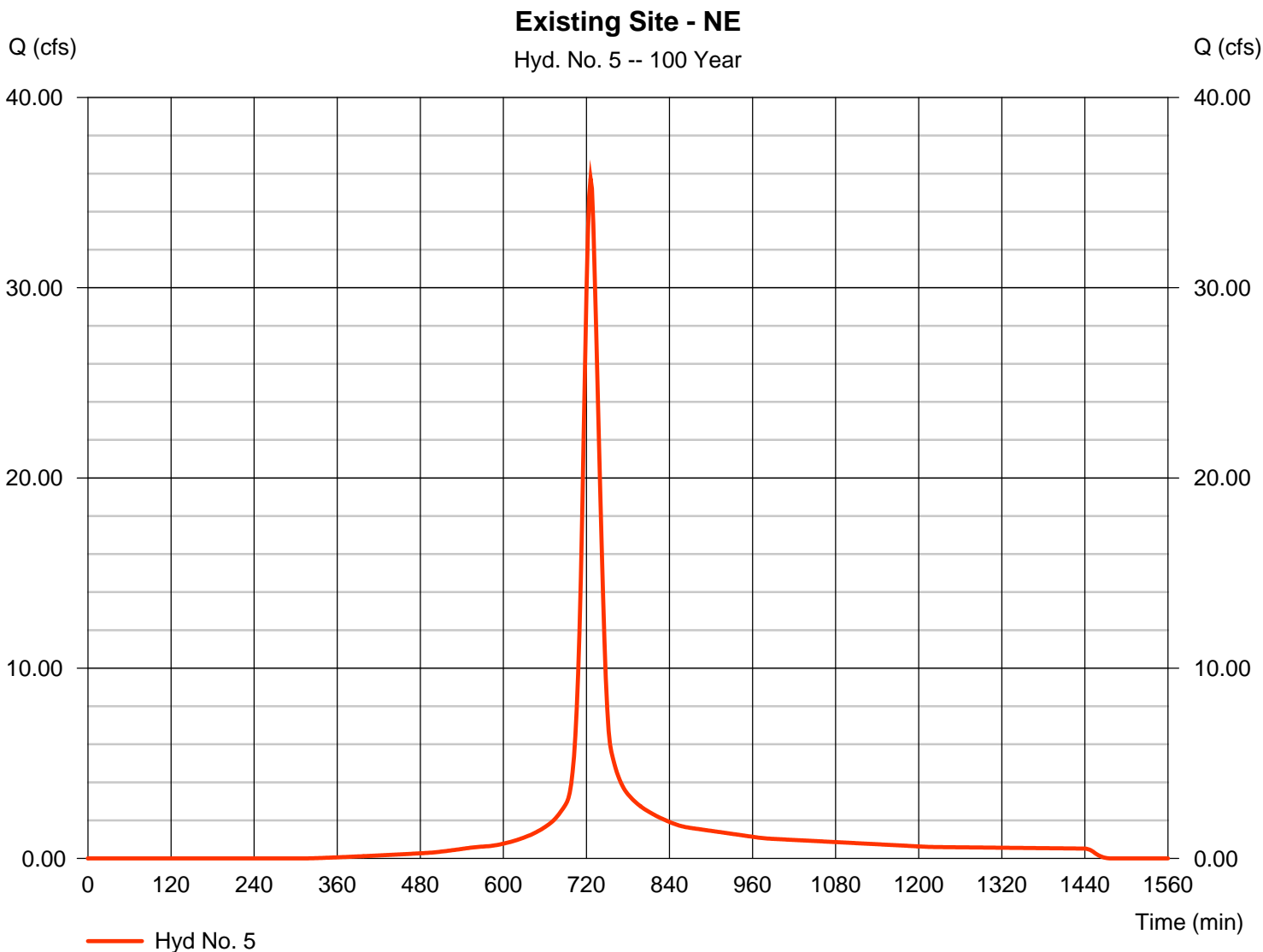
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Hyd. No. 5

Existing Site - NE

Hydrograph type	= SCS Runoff	Peak discharge	= 35.73 cfs
Storm frequency	= 100 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 2.860 acft
Drainage area	= 6.200 ac	Curve number	= 80
Basin Slope	= 1.3 %	Hydraulic length	= 750 ft
Tc method	= LAG	Time of conc. (Tc)	= 22.10 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

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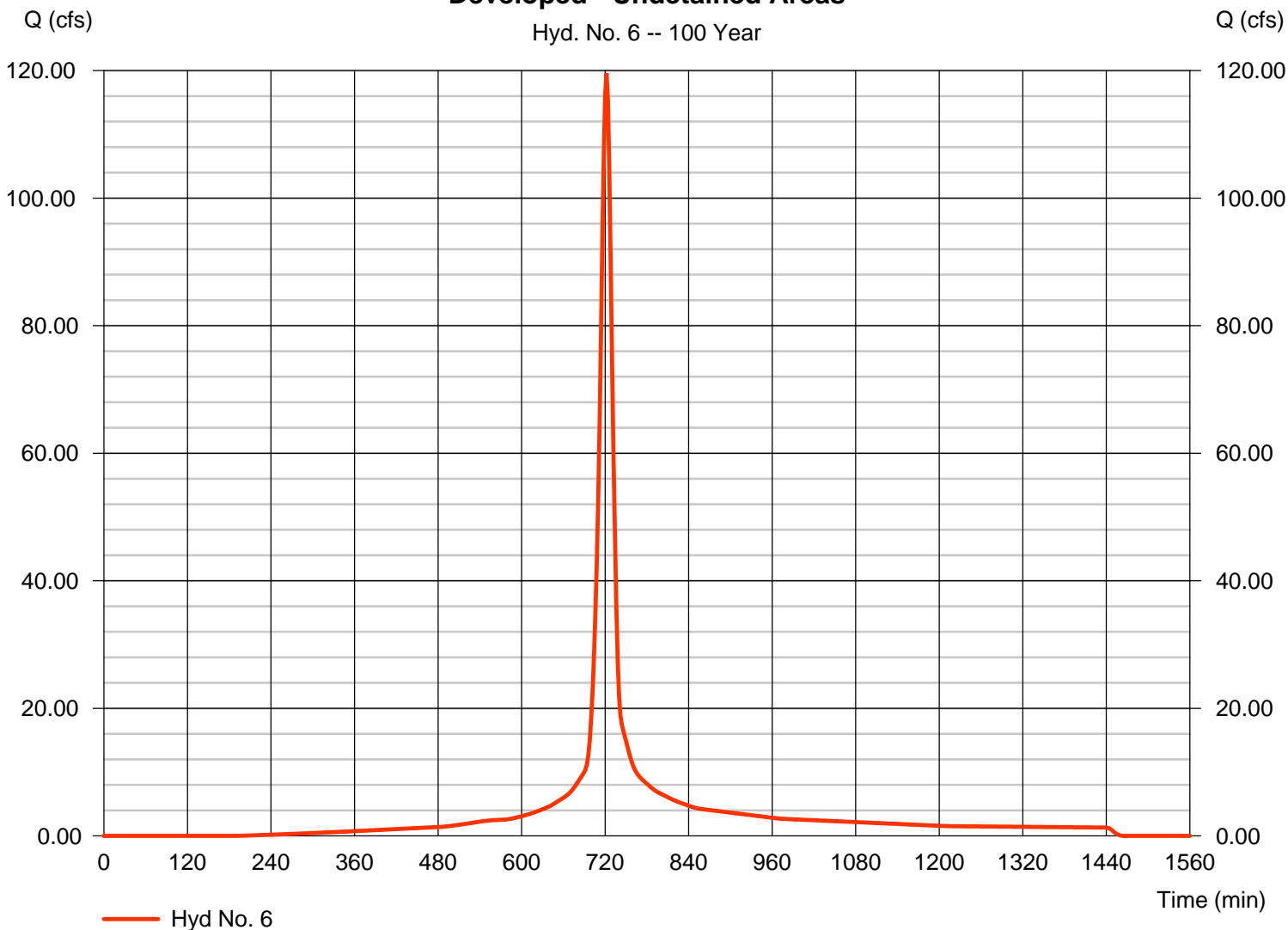
Hyd. No. 6

Developed - Undetained Areas

Hydrograph type	= SCS Runoff	Peak discharge	= 119.55 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 8.129 acft
Drainage area	= 15.700 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Developed - Undetained Areas

Hyd. No. 6 -- 100 Year



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

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Hyd. No. 7

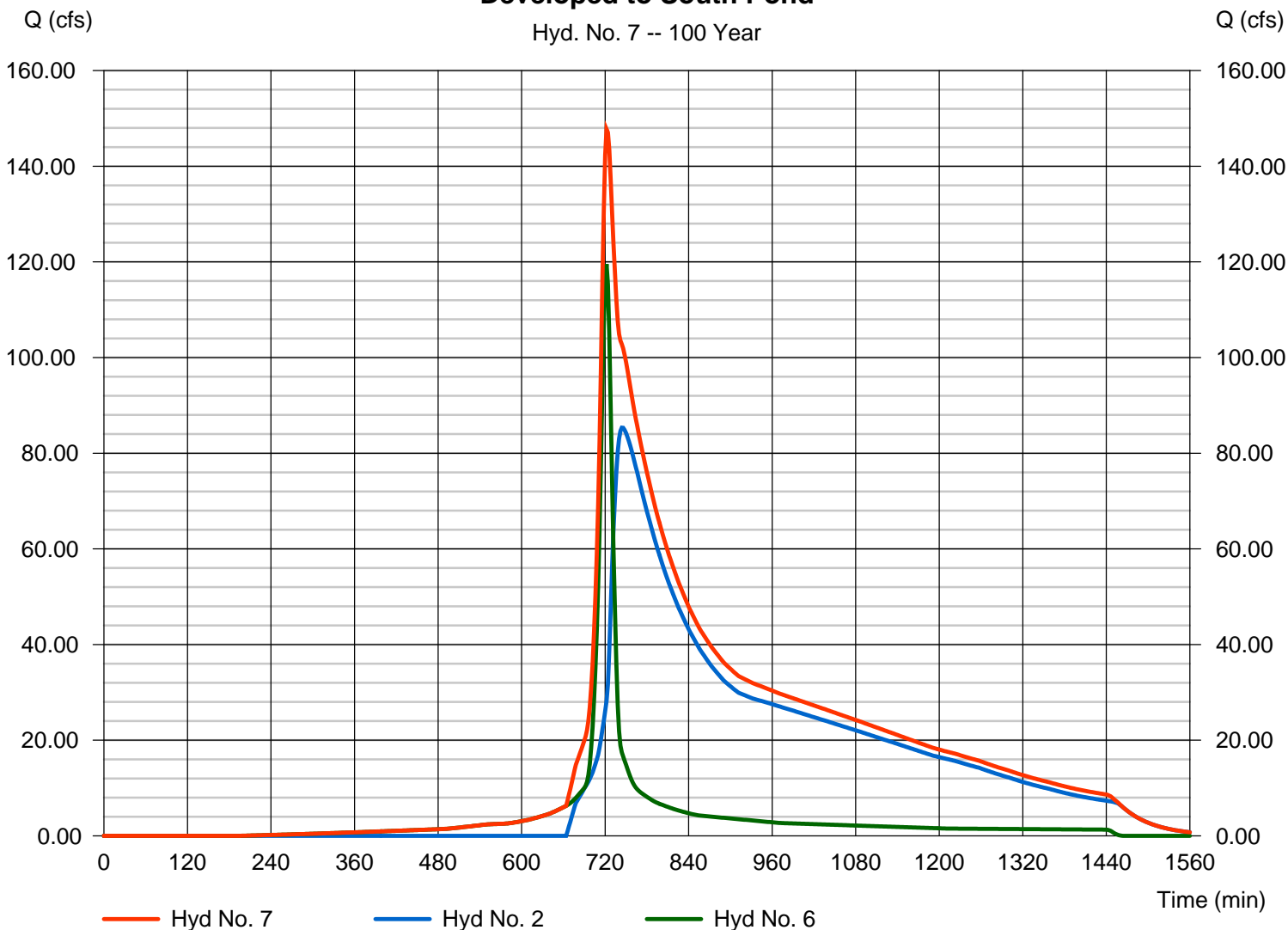
Developed to South Pond

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 2, 6

Peak discharge = 147.73 cfs
Time to peak = 722 min
Hyd. volume = 36.409 acft
Contrib. drain. area = 15.700 ac

Developed to South Pond

Hyd. No. 7 -- 100 Year



Hydrograph Report

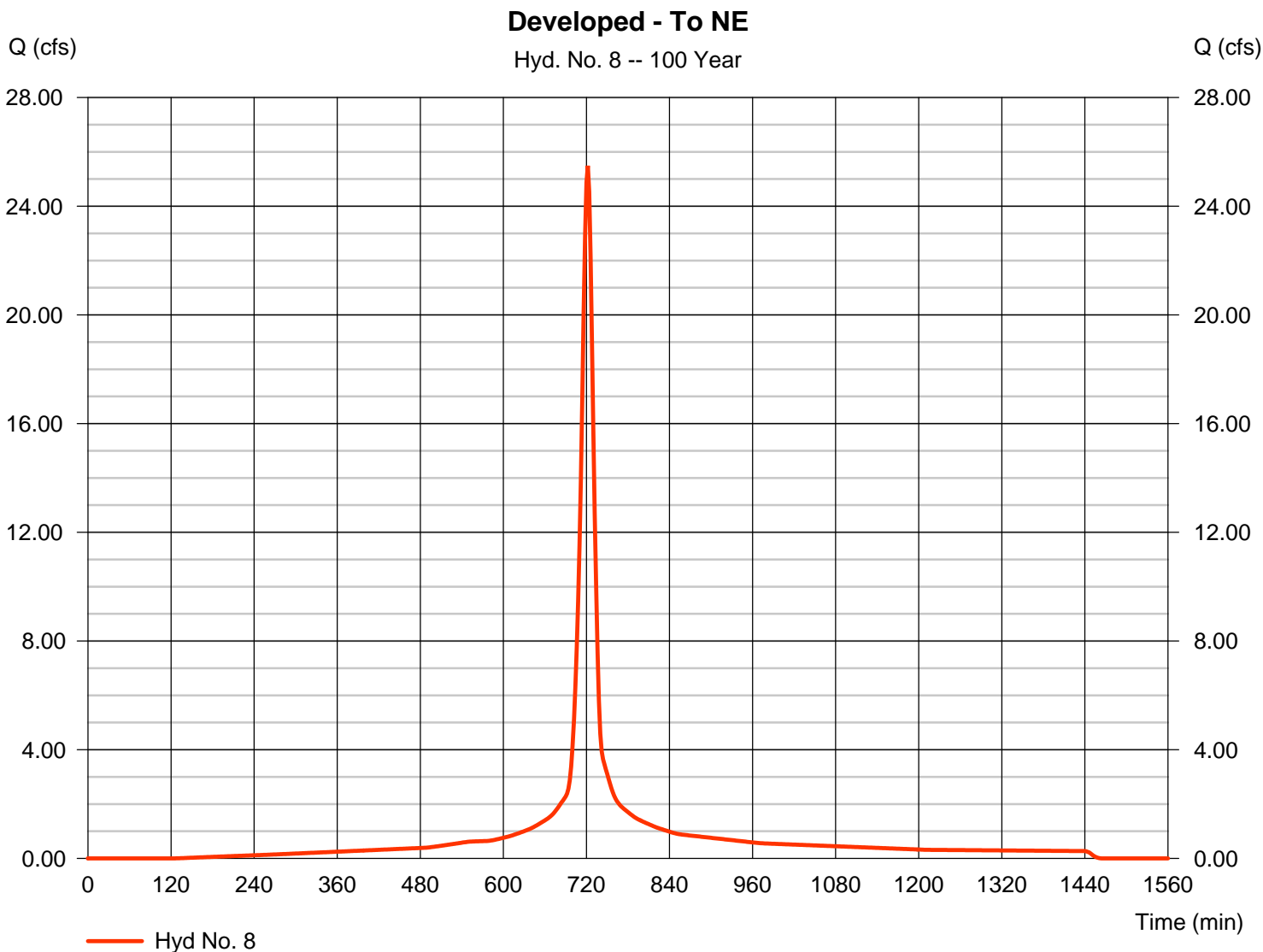
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Friday, 07 / 14 / 2017

Hyd. No. 8

Developed - To NE

Hydrograph type	= SCS Runoff	Peak discharge	= 25.49 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 1.792 acft
Drainage area	= 3.200 ac	Curve number	= 92.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

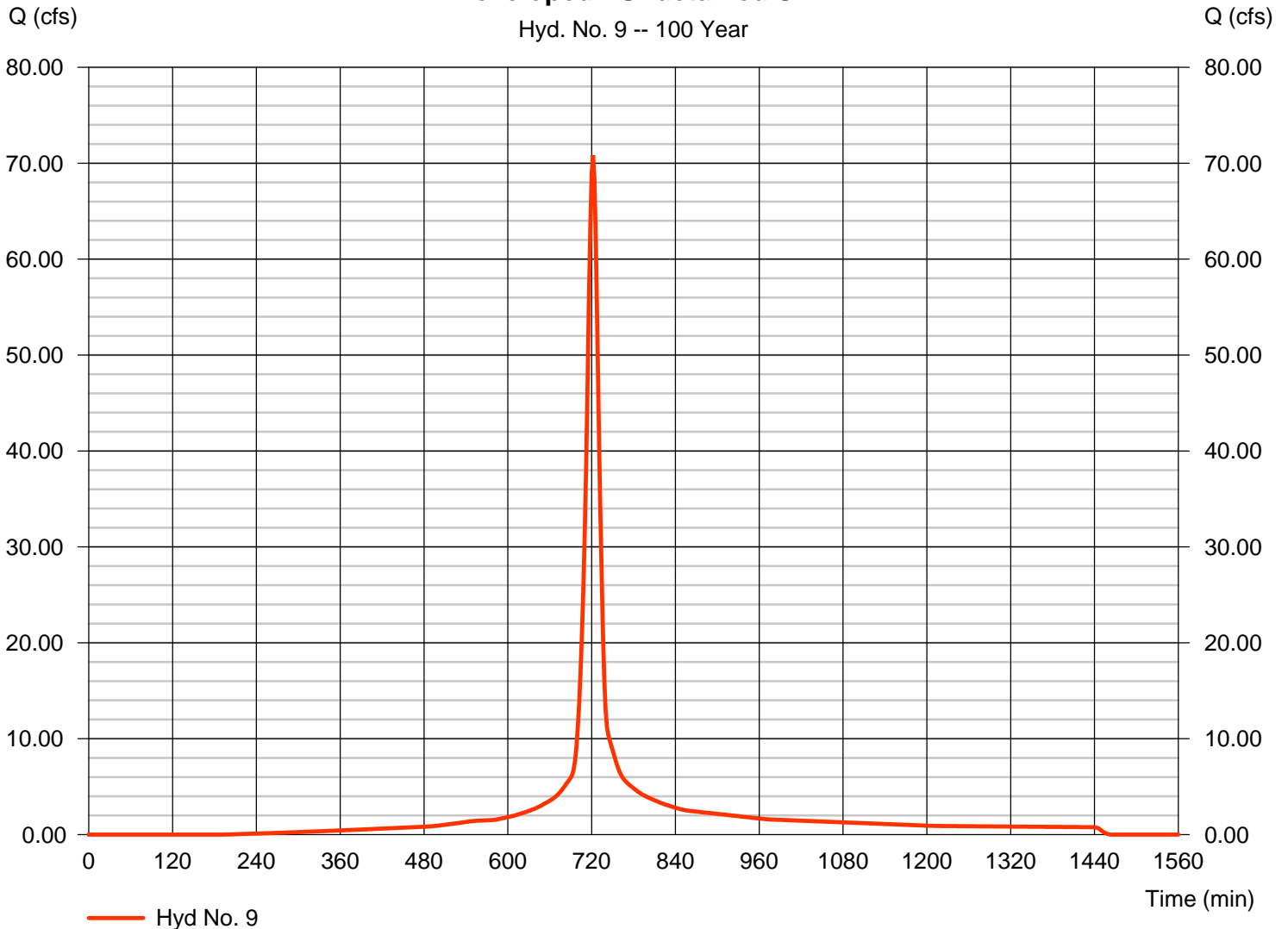
Friday, 07 / 14 / 2017

Hyd. No. 9

Developed - Undetained SE

Hydrograph type	= SCS Runoff	Peak discharge	= 70.82 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 4.815 acft
Drainage area	= 9.300 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 15.00 min
Total precip.	= 7.80 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

Developed - Undetained SE



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

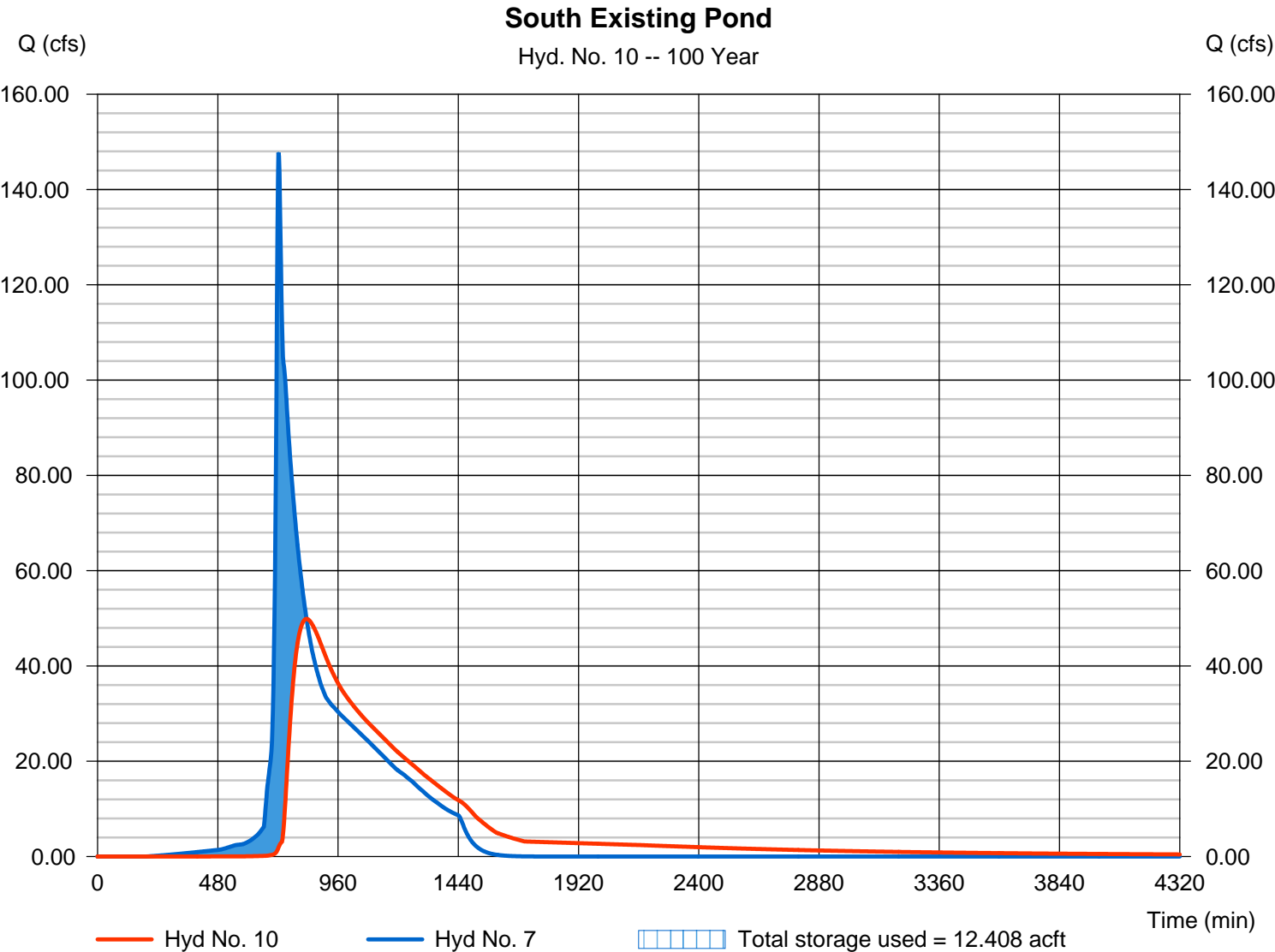
Friday, 07 / 14 / 2017

Hyd. No. 10

South Existing Pond

Hydrograph type	= Reservoir	Peak discharge	= 49.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 834 min
Time interval	= 2 min	Hyd. volume	= 35.145 acft
Inflow hyd. No.	= 7 - Developed to South Pond	Max. Elevation	= 1368.11 ft
Reservoir name	= South Pond	Max. Storage	= 12.408 acft

Storage Indication method used.



Pond No. 2 - South Pond

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 1366.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1366.00	242,300	0.000	0.000
1.00	1367.00	255,300	5.710	5.710
2.00	1368.00	268,400	6.010	11.720
3.00	1369.00	281,600	6.312	18.032

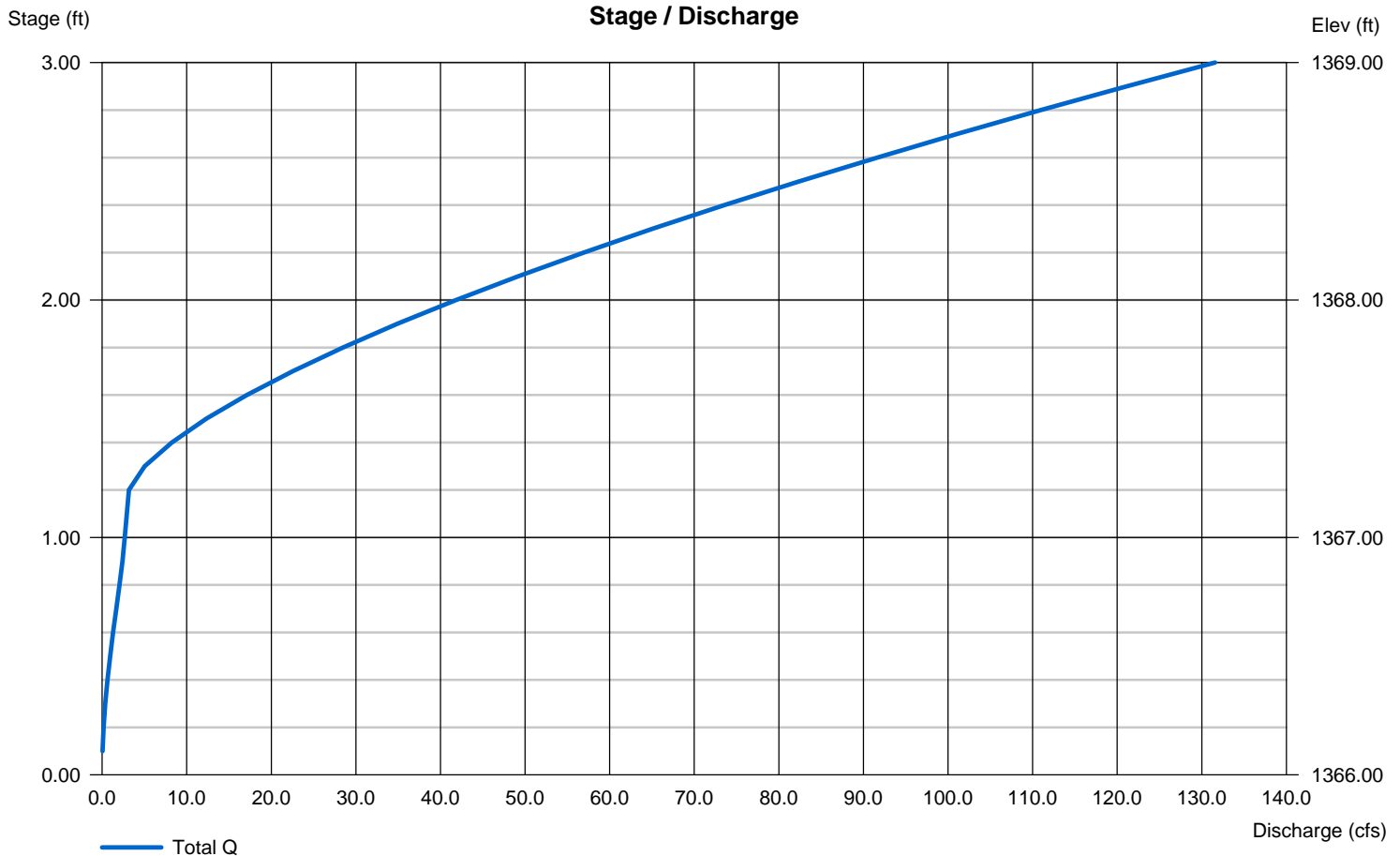
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 12.00	0.00	0.00	0.00
Span (in)	= 12.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1366.00	0.00	0.00	0.00
Length (ft)	= 65.00	0.00	0.00	0.00
Slope (%)	= 4.00	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)	= 20.00	0.00	0.00	0.00
Crest El. (ft)	= 1367.20	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 0.000 (by Wet area)			
TW Elev. (ft)	= 0.00			

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



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2016 by Autodesk, Inc. v10.514

Friday, 07 / 14 / 2017

Hyd. No. 11

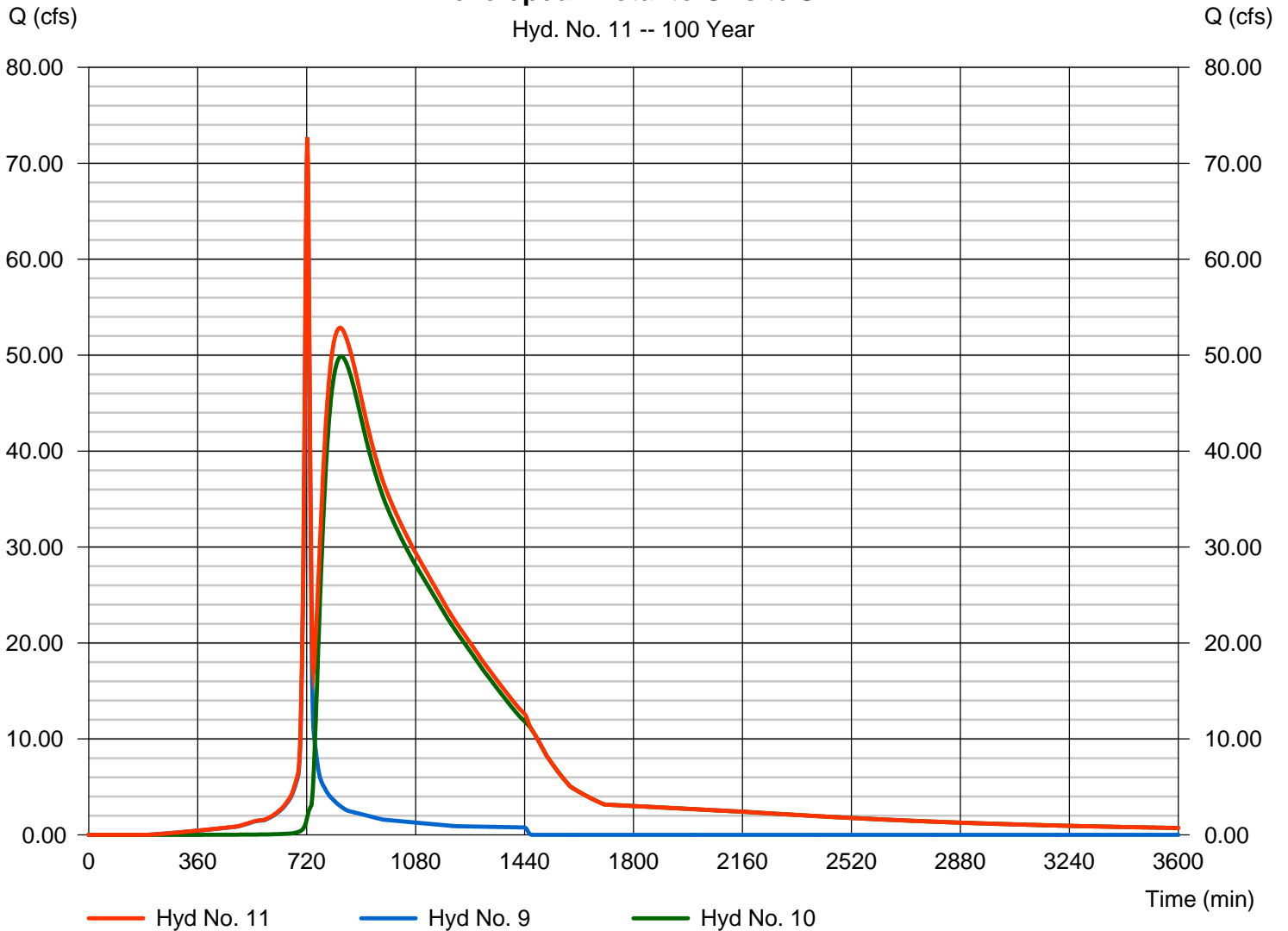
Developed - Total to Offsite SE

Hydrograph type = Combine
Storm frequency = 100 yrs
Time interval = 2 min
Inflow hyds. = 9, 10

Peak discharge = 72.68 cfs
Time to peak = 722 min
Hyd. volume = 39.961 acft
Contrib. drain. area = 9.300 ac

Developed - Total to Offsite SE

Hyd. No. 11 -- 100 Year



Appendix H - Existing Drainage Map

PLOTTED: Monday, July 17, 2017 @ 10:16AM

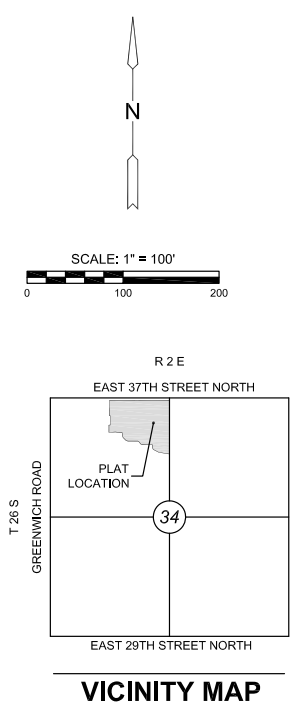
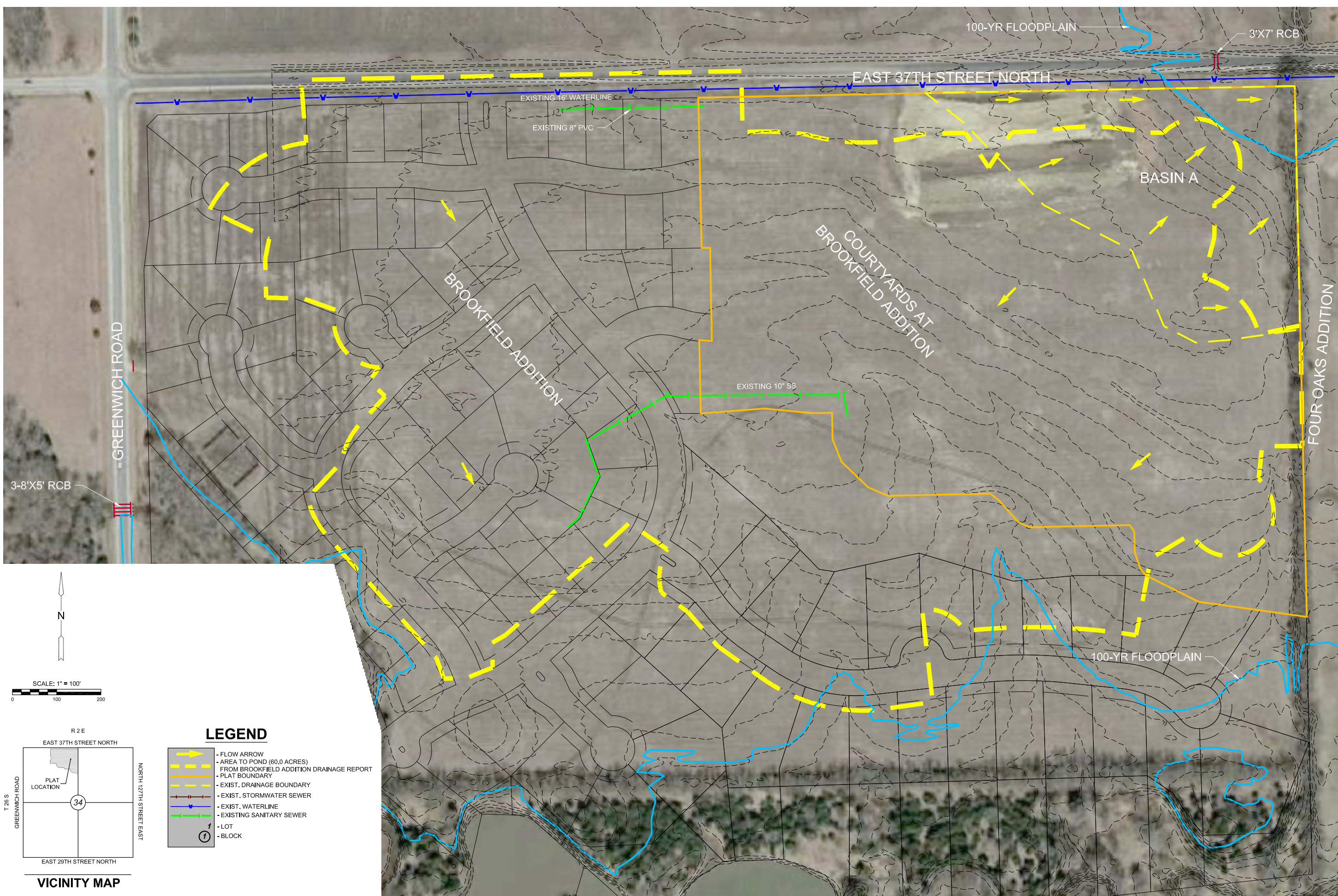
J:\PROJECTS\2016\16010317_PERFECTION_COURTYARDS AT BROOKFIELD_16317 CAD\SHS\US CIVIL\DRAWING\16317 COURTYARDS AT BROOKFIELD -DWG

EXISTING BASIN EXHIBIT FOR THE
COURTYARDS AT BROOKFIELD ADDITION
 WICHITA, KANSAS

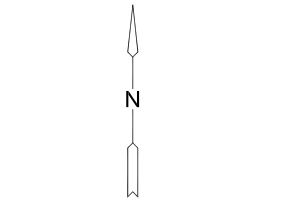
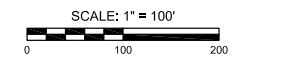
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EXISTING CONDITIONS

PROJECT NO.	16010317	
DATE	JULY 2017	
SCALE	1" = 100'	
DESIGNED	DRAWN	CHECKED
KLA	CRM	KLA
NO.	REVISION	DATE



- LEGEND**
- FLOW ARROW
 - AREA TO POND (60.0 ACRES) FROM BROOKFIELD ADDITION DRAINAGE REPORT
 - PLAT BOUNDARY
 - EXIST. DRAINAGE BOUNDARY
 - EXIST. STORMWATER SEWER
 - EXIST. WATERLINE
 - EXISTING SANITARY SEWER
 - LOT
 - BLOCK



Appendix I - Proposed Drainage Boundaries

PLT07B: Wednesday, July 19, 2017 @ 09:25AM

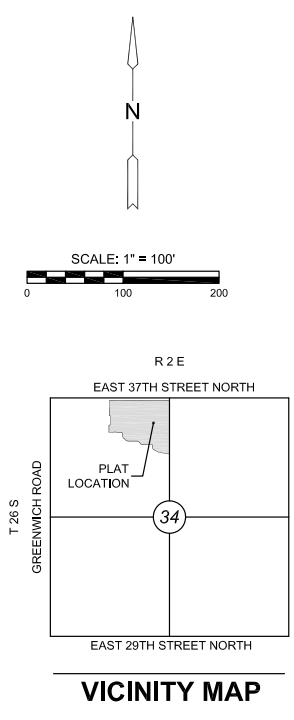
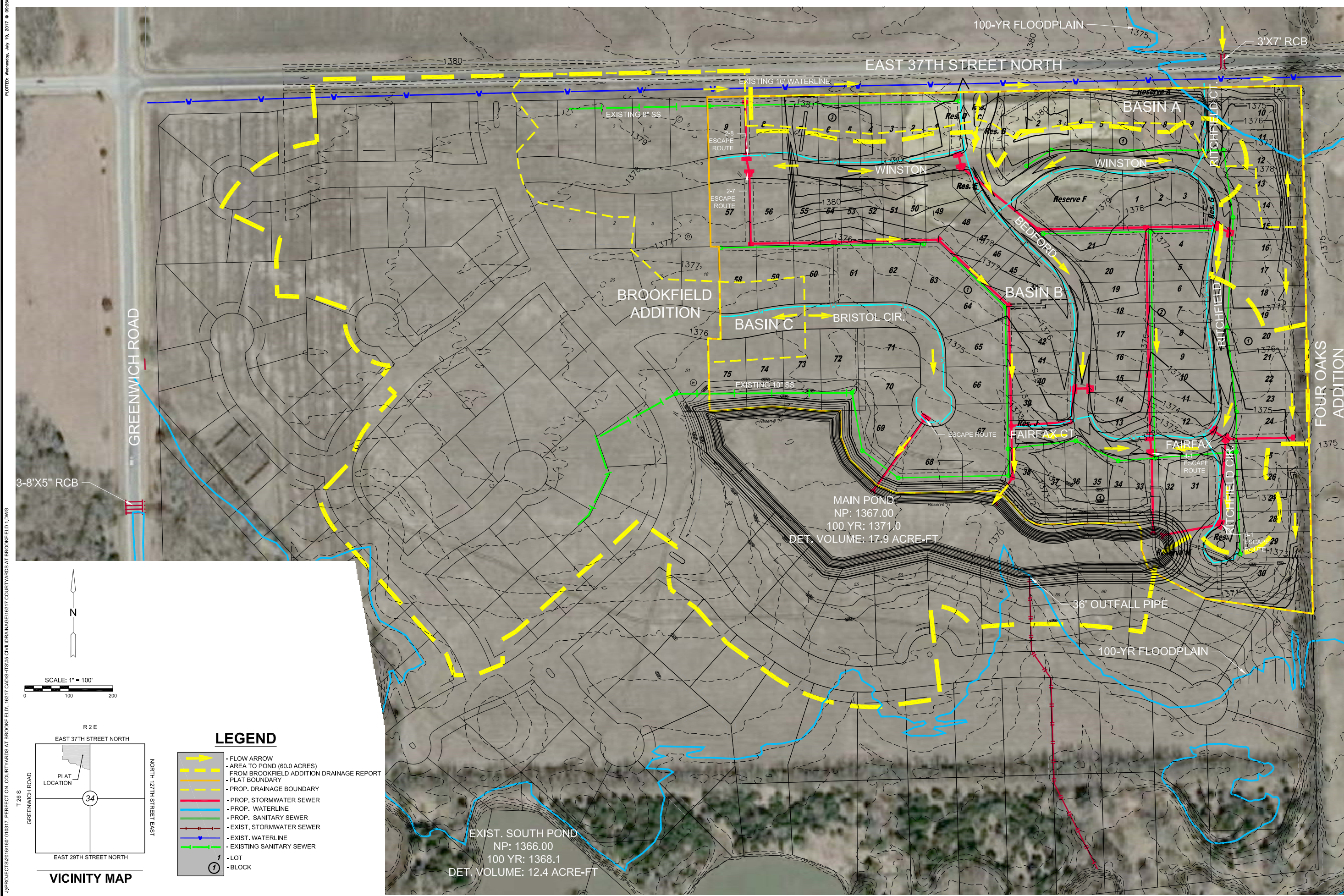
J:\PROJECTS\2016\16010317_PERFECTION_COURTYARDS AT BROOKFIELD\16010317 CAD\SHS\US CIVIL\DRAWING\16010317 COURTYARDS AT BROOKFIELD -DWG

PROPOSED DRAINAGE AND UTILITY EXHIBIT FOR THE
COURTYARDS AT BROOKFIELD ADDITION
 WICHITA, KANSAS

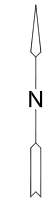
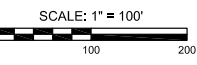
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PROPOSED CONDITIONS

PROJECT NO.	1601010317	
DATE	JULY 2017	
SCALE	1" = 100'	
DESIGNED	DRAWN	CHECKED
KLA	CRM	KLA
NO.	REVISION	DATE
SHEET NO.	1 OF 1	



- LEGEND**
- FLOW ARROW
 - AREA TO POND (60.0 ACRES) FROM BROOKFIELD ADDITION DRAINAGE REPORT
 - PLAT BOUNDARY
 - PROP. DRAINAGE BOUNDARY
 - PROP. STORMWATER SEWER
 - PROP. WATERLINE
 - PROP. SANITARY SEWER
 - EXIST. STORMWATER SEWER
 - EXIST. WATERLINE
 - EXIST. SANITARY SEWER
 - LOT
 - BLOCK



MAIN POND
 NP: 1367.00
 100 YR: 1371.0
 DET. VOLUME: 17.9 ACRE-FT

EXIST. SOUTH POND
 NP: 1366.00
 100 YR: 1368.1
 DET. VOLUME: 12.4 ACRE-FT

100-YR FLOODPLAIN

3'X7' RCB

EAST 37TH STREET NORTH

BASIN A

WINSTON

WINSTON

BROOKFIELD ADDITION

BASIN C

BRISTOL CIR.

BASIN B

BEDEFORD

FAIRFAX CT

FAIRFAX

FOUR OAKS ADDITION

36" OUTFALL PIPE

100-YR FLOODPLAIN

GREENWICH ROAD

3-8'X5" RCB

Appendix J - Proposed SWS Boundaries

PLATT: Wednesday, July 19, 2017 @ 09:24 AM

J:\PROJECTS\2016\16010317_PERFECTION_COURTYARDS AT BROOKFIELD_16317 CAD\SHS\US CIVIL\DRAWING\16317 COURTYARDS AT BROOKFIELD.dwg

PROPOSED SWS EXHIBIT FOR THE

COURTYARDS AT BROOKFIELD ADDITION

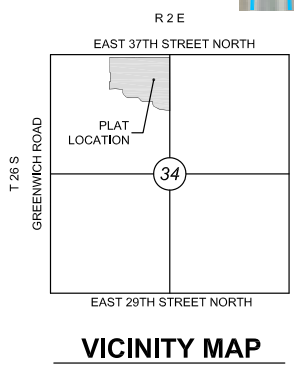
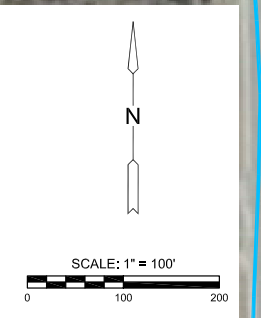
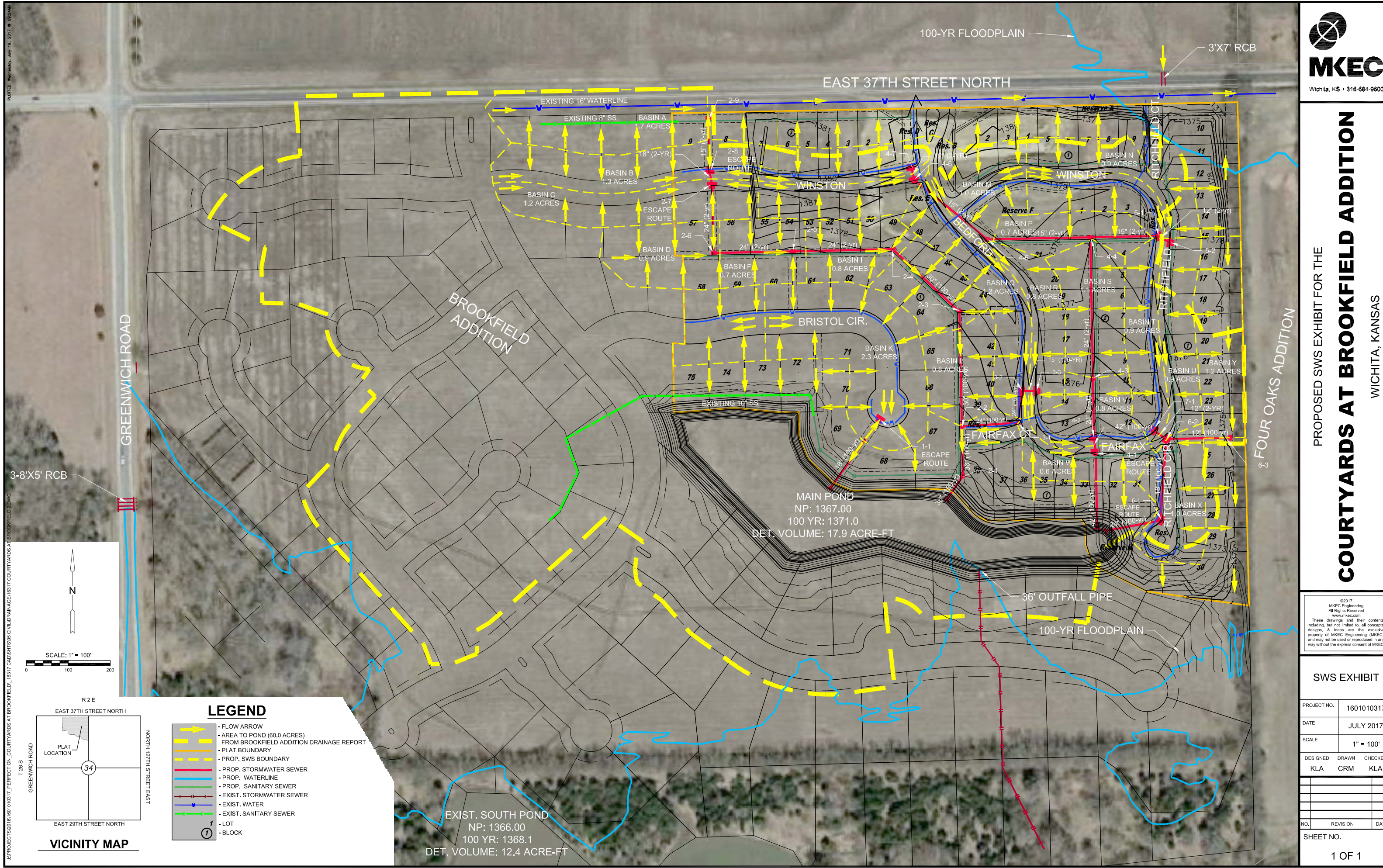
WICHITA, KANSAS













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SWS EXHIBIT

PROJECT NO.	16010317	
DATE	JULY 2017	
SCALE	1" = 100'	
DESIGNED	DRAWN	CHECKED
KLA	CRM	KLA
NO.	REVISION	DATE
SHEET NO.	1 OF 1	



- LEGEND**
-  FLOW ARROW
 -  AREA TO POND (60.0 ACRES) FROM BROOKFIELD ADDITION DRAINAGE REPORT
 -  PLAT BOUNDARY
 -  PROP. SWS BOUNDARY
 -  PROP. STORMWATER SEWER
 -  PROP. WATERLINE
 -  PROP. SANITARY SEWER
 -  EXIST. STORMWATER SEWER
 -  EXIST. WATER
 -  EXIST. SANITARY SEWER
 -  LOT
 -  BLOCK

EXIST. SOUTH POND
NP: 1366.00
100 YR: 1368.1
DET. VOLUME: 12.4 ACRE-FT

Appendix K - Water Quality and Channel Protection

Water Quality Volume Calculations Courtyards at Brookfield Addition

Volumetric Runoff Coefficients by Land Use and Hydraulic Soil Group

Land Use	Hydrologic Soil Group								Total Area (ac)
	A		B		C		D		
	Area (ac)	R _v	Area (ac)	R _v	Area (ac)	R _v	Area (ac)	R _v	
Undisturbed		0.02		0.03		0.04		0.05	0
Disturbed Pervious		0.15		0.20		0.22	14.4	0.25	14.4
Impervious Cover		0.95		0.95		0.95	15	0.95	15
Total Area (ac)	0.00		0.00		0.00		29.4		29.4
Volumetric Runoff Coefficient (R_v)	0.00		0.00		0.00		0.61		0.61

Rainfall Depth (P) (in)	1.2
Water Quality Protection Volume (WQ _v) (ac-ft)	1.79
Water Quality Protection Volume (Q _{wv}) (in)	0.73
Redevelopment	No

**Channel Protection Volume Calculations
Courtyards at Brookfield Addition**

Rainfall Depth (P) (in)	2.80
Volumetric Runoff Coefficient (R_v)	0.60
Total Area (A) (ac)	29.40
Pond and Swamp Areas (% of Drainage Area)	0.00
Pond & Swamp Adjustment Factors (F_p)	1.00
Water Quality Protection Volume (Q_{wv}) (in)	1.69
Curve Number (CN)	89.00
Potential Maximum Abstraction (S)	1.24
Initial Abstraction (I_a)	0.25
Initial Abstraction/Rainfall Depth (I_a/P)	0.09
Time of Concentration (T_c) (min)	15.00
Time of Concentration (T_c) (hr)	0.25
Unit Peak Discharge (q_u) (csm/in) (Figure 4-6)	700.00
Water Quality Peak Flow (Q_{wq})(cfs)	54.45
Rainfall Excess (Q) (in)	1.72
Peak Discharge (Q_p)	55.31
Ratio of Outflow to Inflow (q_o/q_i) (Figure 4-17)	0.03
Ratio of Storage Volume to Runoff Volume (V_s/V_r)	0.64
Channel Protection Volume (CP_v) (ac-ft)	2.70
Redevelopment	No

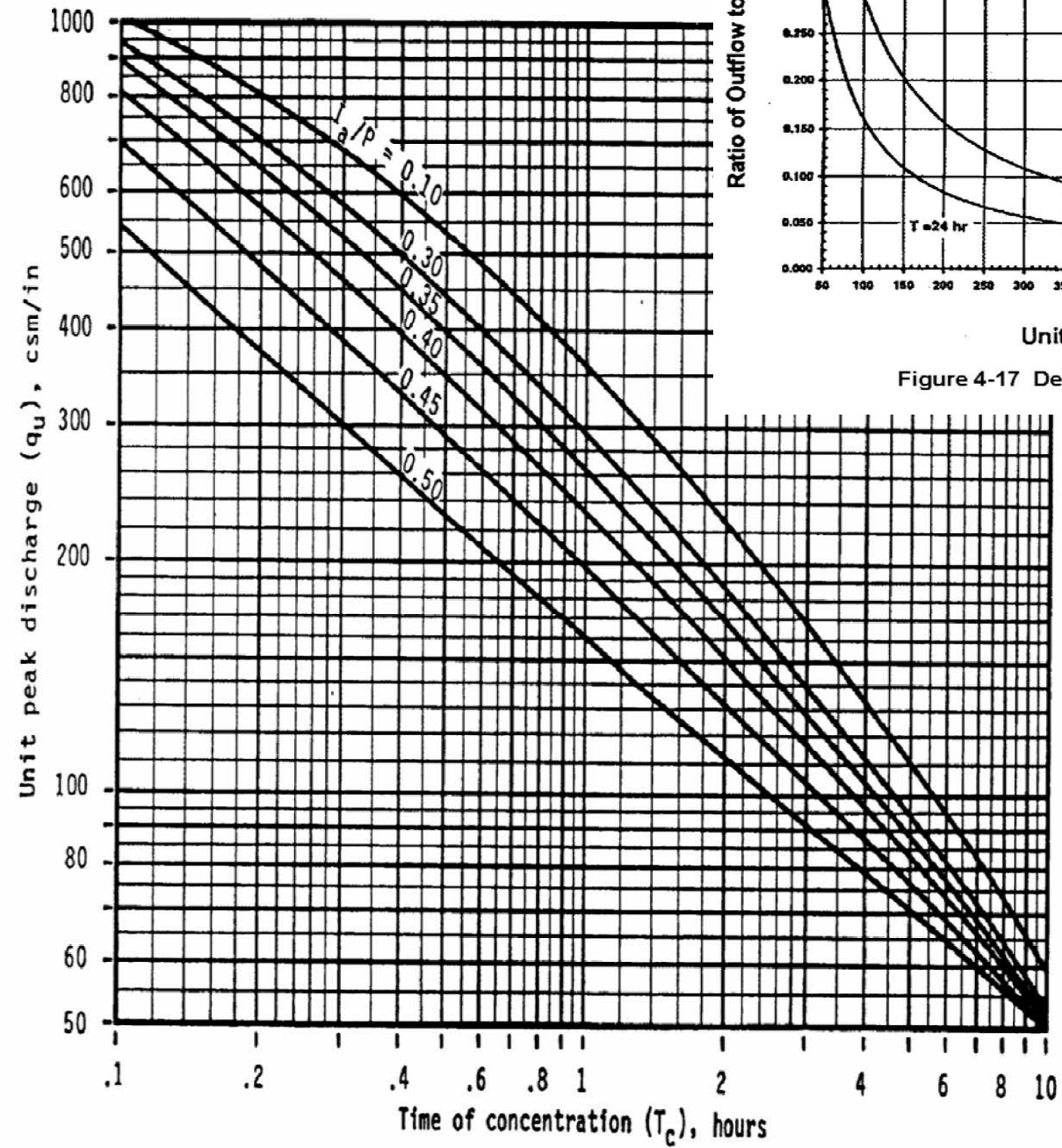


Figure 4-6 SCS Type II Unit Peak Discharge Graph
(Source: SCS, TR-55, Second Edition, June 1986)

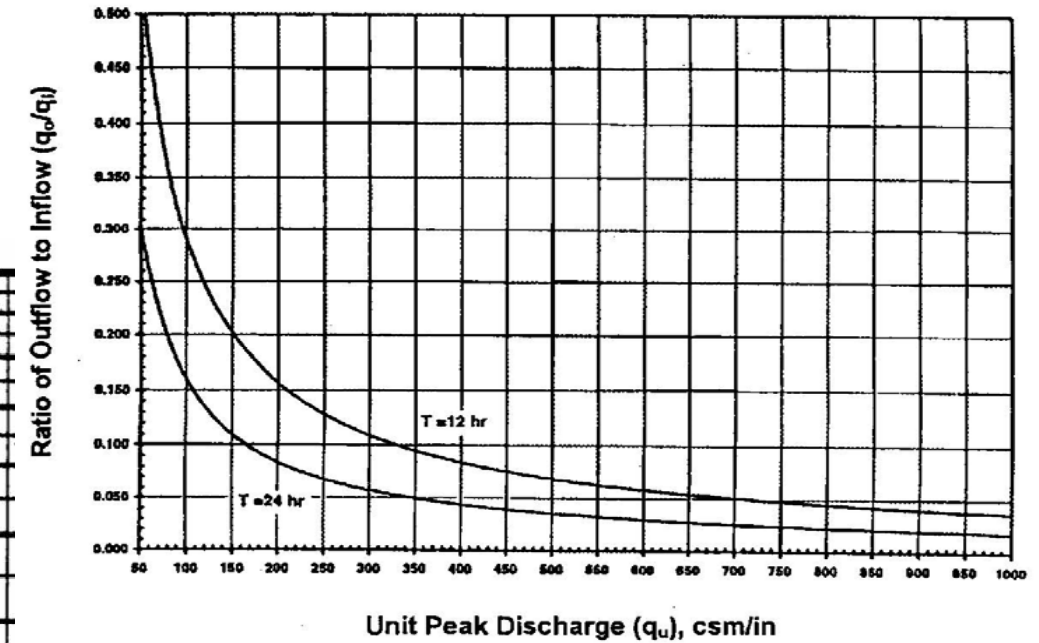
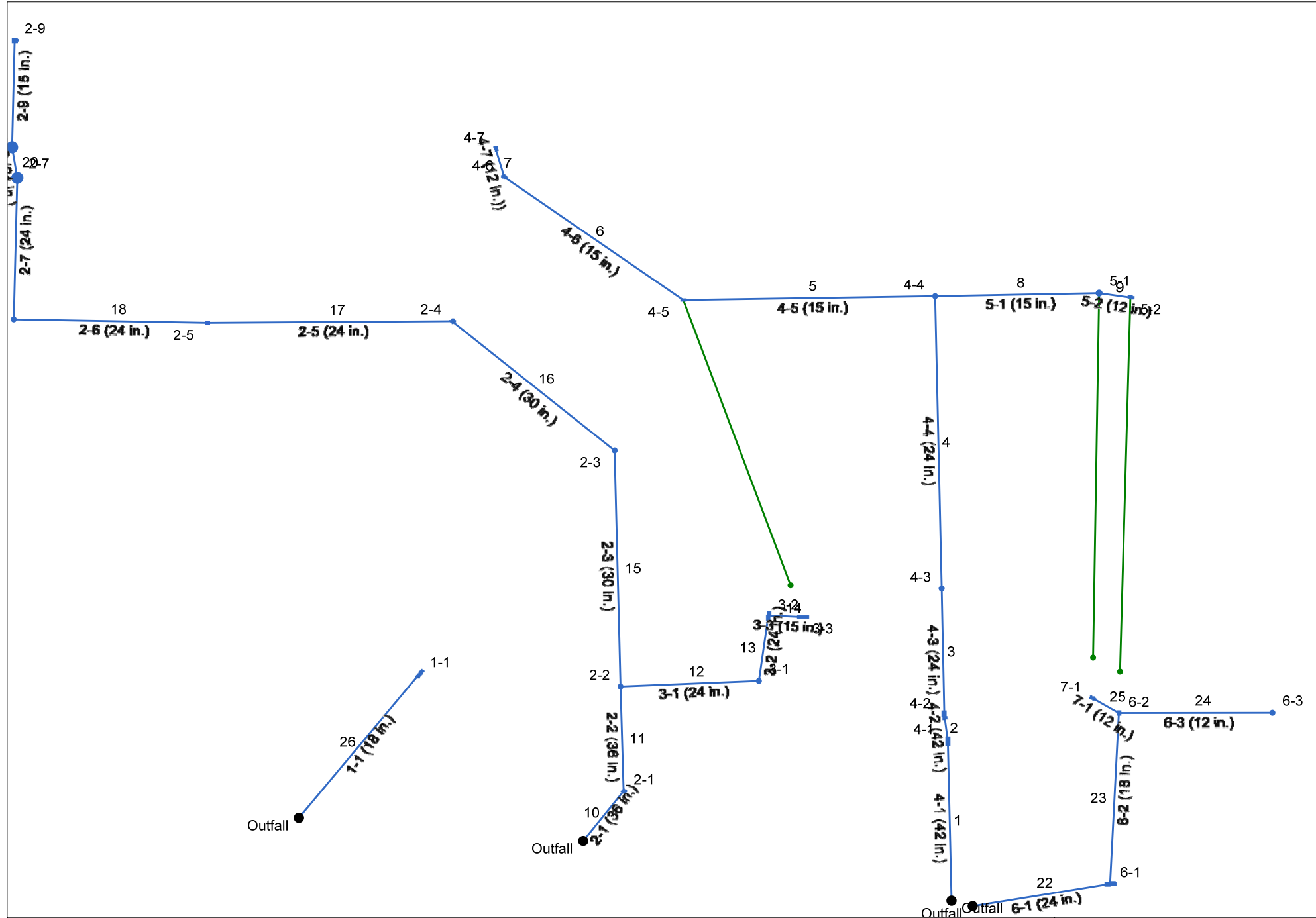


Figure 4-17 Detention Time vs Discharge Ratios
(Source: MDE, 1998)

Appendix L - Proposed Stormwater Sewer (2-year)

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Final Design.stm

Number of lines: 26

Date: 7/17/2017

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	4-1 (42 in.)	18.29	42	Cir	183.459	1361.50	1363.34	1.003	1367.00*	1367.06*	0.03	1367.09	End	Curb-
2	4-2 (42 in.)	16.90	42	Cir	29.880	1363.44	1363.74	1.004	1367.09	1367.10	0.02	1367.12	1	Curb-
3	4-3 (24 in.)	15.07	24	Cir	145.238	1365.09	1366.54	0.998	1367.12	1367.94	n/a	1367.94 j	2	DropGrate
4	4-4 (24 in.)	12.70	24	Cir	335.752	1365.89	1369.25	1.001	1367.94	1370.53	n/a	1370.53 j	3	DropGrate
5	4-5 (15 in.)	6.91	15	Cir	245.258	1369.60	1372.05	0.999	1370.74	1373.19	0.56	1373.75	4	Curb-
6	4-6 (15 in.)	4.38	15	Cir	224.220	1371.90	1374.14	0.999	1373.75	1374.99	n/a	1374.99 j	5	Curb-
7	4-7 (12 in.)	2.22	12	Cir	33.081	1374.24	1374.57	0.997	1374.99	1375.21	n/a	1375.21 j	6	Curb-
8	5-1 (15 in.)	4.33	15	Cir	159.836	1369.34	1370.94	1.001	1370.53	1371.78	n/a	1371.78 j	4	Curb-
9	5-2 (12 in.)	2.39	12	Cir	30.932	1371.04	1371.35	1.002	1371.78	1372.01	n/a	1372.01 j	8	Curb-
10	2-1 (36 in.)	24.67	36	Cir	69.429	1363.00	1364.15	1.656	1367.00	1367.07	0.12	1367.20	End	Manhole
11	2-2 (36 in.)	25.04	36	Cir	120.063	1363.75	1366.36	2.174	1367.20	1367.97	n/a	1367.97 j	10	DropGrate
12	3-1 (24 in.)	5.54	24	Cir	134.837	1365.96	1367.31	1.001	1367.97	1368.14	n/a	1368.14 j	11	Manhole
13	3-2 (24 in.)	5.65	24	Cir	75.555	1367.41	1367.98	0.754	1368.15	1368.82	n/a	1368.82	12	Curb-
14	3-3 (15 in.)	2.25	15	Cir	33.240	1368.33	1368.58	0.752	1368.88	1369.18	0.23	1369.18	13	Curb-
15	2-3 (30 in.)	18.71	30	Cir	271.125	1366.46	1369.17	1.000	1367.97	1370.64	n/a	1370.64 j	11	DropGrate
16	2-4 (30 in.)	17.14	30	Cir	217.000	1369.27	1370.90	0.751	1370.64	1372.30	0.63	1372.30	15	DropGrate
17	2-5 (24 in.)	15.50	24	Cir	238.000	1371.00	1372.79	0.752	1372.34	1374.21	0.33	1374.21	16	DropGrate
18	2-6 (24 in.)	13.83	24	Cir	189.000	1372.89	1374.31	0.751	1374.21	1375.65	0.89	1375.65	17	DropGrate
19	2-7 (24 in.)	11.54	24	Cir	162.457	1374.41	1375.63	0.751	1375.65	1376.85	n/a	1376.85 j	18	Curb-
20	2-8 (24 in.)	8.24	18	Cir	35.397	1376.23	1376.50	0.763	1377.34	1377.61	0.27	1377.88	19	Curb-
21	2-9 (15 in.)	4.66	15	Cir	122.640	1376.35	1377.27	0.750	1377.88	1378.52	0.22	1378.75	20	DropGrate
22	6-1 (24 in.)	9.31	24	Cir	136.156	1362.50	1365.22	1.998	1367.00	1367.22	0.20	1367.42	End	Curb-
23	6-2 (18 in.)	6.88	18	Cir	196.476	1364.82	1366.79	1.003	1367.42	1368.19	0.49	1368.69	22	Curb-
24	6-3 (12 in.)	2.08	12	Cir	149.464	1367.14	1369.38	1.499	1368.69	1370.00	n/a	1370.00 j	23	DropGrate

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Return period = 2 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	7-1 (12 in.)	2.42	12	Cir	30.943	1367.39	1368.01	2.004	1368.69	1368.77	0.22	1368.99	23	Curb-
26	1-1 (18 in.)	6.41	18	Cir	203.432	1362.50	1368.35	2.876	1367.00	1369.33	n/a	1369.33 j	End	Curb-

Project File: Final Design.stm	Number of lines: 26	Run Date: 7/17/2017
--------------------------------	---------------------	---------------------

NOTES: Return period = 2 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	183.459	0.61	7.33	0.73	0.45	5.35	15.0	19.2	3.4	18.29	100.8	1.90	42	1.00	1361.50	1363.34	1367.00	1367.06	0.00	1371.27	4-1 (42 in.)
2	1	29.880	0.81	6.72	0.73	0.59	4.91	15.0	18.9	3.4	16.90	100.8	1.77	42	1.00	1363.44	1363.74	1367.09	1367.10	1371.27	1371.70	4-2 (42 in.)
3	2	145.238	1.12	5.91	0.73	0.82	4.31	15.0	18.4	3.5	15.07	22.60	5.61	24	1.00	1365.09	1366.54	1367.12	1367.94	1371.70	1374.83	4-3 (24 in.)
4	3	335.752	0.69	4.79	0.73	0.50	3.50	15.0	17.0	3.6	12.70	22.63	5.01	24	1.00	1365.89	1369.25	1367.94	1370.53	1374.83	1377.55	4-4 (24 in.)
5	4	245.258	0.98	2.55	0.73	0.72	1.86	15.0	16.2	3.7	6.91	6.45	5.89	15	1.00	1369.60	1372.05	1370.74	1373.19	1377.55	1377.46	4-5 (15 in.)
6	5	224.220	0.78	1.57	0.73	0.57	1.15	15.0	15.2	3.8	4.38	6.45	4.26	15	1.00	1371.90	1374.14	1373.75	1374.99	1377.46	1378.65	4-6 (15 in.)
7	6	33.081	0.79	0.79	0.73	0.58	0.58	15.0	15.0	3.8	2.22	3.56	3.87	12	1.00	1374.24	1374.57	1374.99	1375.21	1378.65	1378.99	4-7 (12 in.)
8	4	159.836	0.70	1.55	0.73	0.51	1.13	15.0	15.2	3.8	4.33	6.46	4.26	15	1.00	1369.34	1370.94	1370.53	1371.78	1377.55	1376.89	5-1 (15 in.)
9	8	30.932	0.85	0.85	0.73	0.62	0.62	15.0	15.0	3.8	2.39	3.56	4.08	12	1.00	1371.04	1371.35	1371.78	1372.01	1376.89	1377.09	5-2 (12 in.)
10	End	69.429	0.00	10.31	0.00	0.00	7.53	0.0	20.8	3.3	24.67	92.99	3.50	36	1.66	1363.00	1364.15	1367.00	1367.07	0.00	1372.01	2-1 (36 in.)
11	10	120.063	0.82	10.31	0.73	0.60	7.53	15.0	20.2	3.3	25.04	98.33	5.00	36	2.17	1363.75	1366.36	1367.20	1367.97	1372.01	1372.62	2-2 (36 in.)
12	11	134.837	0.00	2.03	0.00	0.00	1.48	0.0	16.0	3.7	5.54	24.52	3.13	24	1.00	1365.96	1367.31	1367.97	1368.14	1372.62	1374.34	3-1 (24 in.)
13	12	75.555	1.23	2.03	0.73	0.90	1.48	15.0	15.3	3.8	5.65	19.64	4.96	24	0.75	1367.41	1367.98	1368.15	1368.82	1374.34	1375.15	3-2 (24 in.)
14	13	33.240	0.80	0.80	0.73	0.58	0.58	15.0	15.0	3.8	2.25	5.60	4.09	15	0.75	1368.33	1368.58	1368.88	1369.18	1375.15	1375.03	3-3 (15 in.)
15	11	271.125	0.82	7.46	0.73	0.60	5.45	15.0	19.0	3.4	18.71	41.00	6.14	30	1.00	1366.46	1369.17	1367.97	1370.64	1372.62	1375.77	2-3 (30 in.)
16	15	217.000	0.77	6.64	0.73	0.56	4.85	15.0	17.9	3.5	17.14	35.54	6.16	30	0.75	1369.27	1370.90	1370.64	1372.30	1375.77	1376.70	2-4 (30 in.)
17	16	238.000	0.74	5.87	0.73	0.54	4.29	15.0	17.1	3.6	15.50	19.62	6.71	24	0.75	1371.00	1372.79	1372.34	1374.21	1376.70	1376.28	2-5 (24 in.)
18	17	189.000	0.94	5.13	0.73	0.69	3.74	15.0	16.4	3.7	13.83	19.61	6.24	24	0.75	1372.89	1374.31	1374.21	1375.65	1376.28	1376.16	2-6 (24 in.)
19	18	162.457	1.21	4.19	0.73	0.88	3.06	15.0	15.7	3.8	11.54	19.60	5.70	24	0.75	1374.41	1375.63	1375.65	1376.85	1376.16	1377.99	2-7 (24 in.)
20	19	35.397	1.32	2.98	0.73	0.96	2.18	15.0	15.5	3.8	8.24	9.17	5.86	18	0.76	1376.23	1376.50	1377.34	1377.61	1377.99	1378.38	2-8 (24 in.)
21	20	122.640	1.66	1.66	0.73	1.21	1.21	15.0	15.0	3.8	4.66	5.59	3.80	15	0.75	1376.35	1377.27	1377.88	1378.52	1378.38	1379.82	2-9 (15 in.)
22	End	136.156	0.97	3.49	0.73	0.71	2.55	15.0	16.8	3.7	9.31	31.97	2.96	24	2.00	1362.50	1365.22	1367.00	1367.22	0.00	1371.98	6-1 (24 in.)

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Intensity = $76.31 / (\text{Inlet time} + 14.30) ^{0.88}$; Return period = Yrs. 2 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	196.476	0.92	2.52	0.73	0.67	1.84	15.0	15.9	3.7	6.88	10.52	3.95	18	1.00	1364.82	1366.79	1367.42	1368.19	1371.98	1373.53	6-2 (18 in.)
24	23	149.464	0.74	0.74	0.73	0.54	0.54	15.0	15.0	3.8	2.08	4.36	3.37	12	1.50	1367.14	1369.38	1368.69	1370.00	1373.53	1375.34	6-3 (12 in.)
25	23	30.943	0.86	0.86	0.73	0.63	0.63	15.0	15.0	3.8	2.42	5.04	3.44	12	2.00	1367.39	1368.01	1368.69	1368.77	1373.53	1373.27	7-1 (12 in.)
26	End	203.432	2.28	2.28	0.73	1.66	1.66	15.0	15.0	3.8	6.41	17.81	4.44	18	2.88	1362.50	1368.35	1367.00	1369.33	0.00	1372.00	1-1 (18 in.)

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Intensity = $76.31 / (\text{Inlet time} + 14.30)^{0.88}$; Return period = Yrs. 2 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet			By Line No	
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
1	4-1	1.71	0.00	1.71	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.14	4.65	0.31	4.65	2.0	Off
2	4-2	2.28	0.00	2.28	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.17	5.62	0.34	5.62	2.0	Off
3	4-3	3.15	0.00	3.15	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.20	42.36	0.20	42.36	0.0	Off
4	4-4	1.94	0.00	1.94	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.14	31.49	0.14	31.49	0.0	Off
5	4-5	2.75	0.00	1.55	1.21	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.24	7.73	0.34	5.68	2.0	14
6	4-6	2.19	0.00	2.19	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.23	7.44	0.40	7.44	2.0	Off
7	4-7	2.22	0.00	2.22	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.23	7.50	0.40	7.50	2.0	Off
8	5-1	1.97	0.00	1.27	0.70	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.21	6.82	0.31	4.62	2.0	25
9	5-2	2.39	0.00	1.42	0.97	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.23	7.33	0.33	5.22	2.0	23
10	2-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
11	2-2	2.30	0.00	2.30	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.16	34.97	0.16	34.97	0.0	Off
12	3-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
13	3-2	3.46	0.00	3.46	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.23	7.42	0.40	7.42	2.0	Off
14	3-3	2.25	1.21	3.46	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.23	7.42	0.40	7.42	2.0	Off
15	2-3	2.30	0.00	2.30	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.16	34.97	0.16	34.97	0.0	Off
16	2-4	2.16	0.00	2.16	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.15	33.65	0.15	33.65	0.0	Off
17	2-5	2.08	0.00	2.08	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.15	32.85	0.15	32.85	0.0	Off
18	2-6	2.64	0.00	2.64	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.18	38.02	0.18	38.02	0.0	Off
19	2-7	3.40	0.00	3.40	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.23	7.34	0.39	7.34	2.0	Off
20	2-8	3.71	0.00	3.71	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.24	7.78	0.41	7.78	2.0	Off
21	2-9	4.66	0.00	2.74	1.92	DrGr	0.0	0.00	0.00	3.00	3.00	0.010	3.00	0.010	0.010	0.040	0.22	47.20	0.22	47.20	0.0	Off
22	6-1	2.73	0.00	2.73	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.20	6.33	0.36	6.33	2.0	Off
23	6-2	2.58	0.97	3.55	0.00	Curb	3.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.32	10.26	0.48	10.26	2.0	Off

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Inlet N-Values = 0.016; Intensity = 76.31 / (Inlet time + 14.30) ^ 0.88; Return period = 2 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp Line No	
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
24	6-3	2.08	0.00	1.43	0.65	DrGrt	0.0	0.00	0.00	3.00	3.00	0.010	3.00	0.010	0.010	0.040	0.16	35.20	0.16	35.20	0.0	Off
25	7-1	2.42	0.70	3.11	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.29	9.40	0.46	9.40	2.0	Off
26	1-1	6.41	0.00	6.41	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.35	11.20	0.51	11.20	2.0	Off

Project File: Final Design.stm

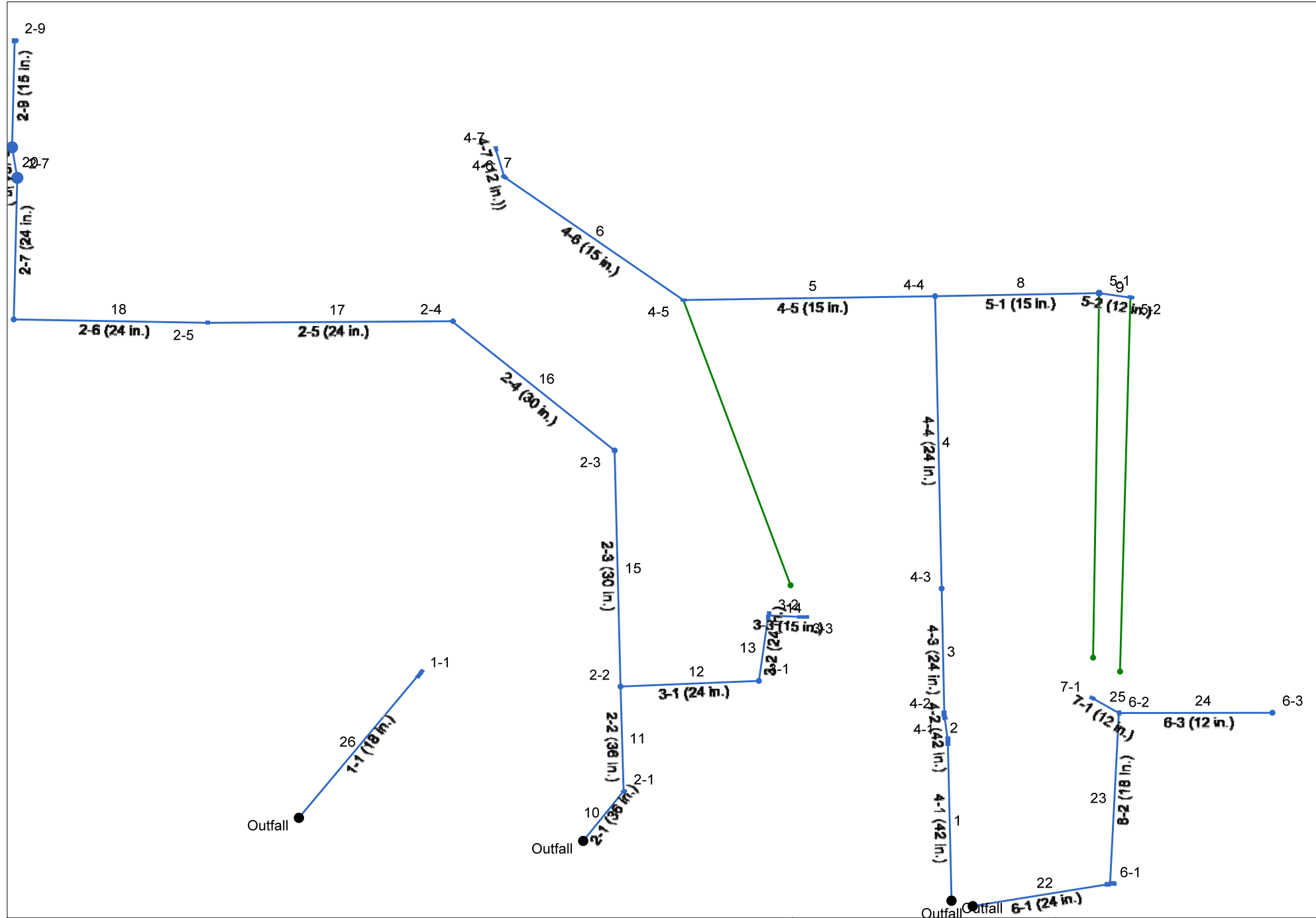
Number of lines: 26

Run Date: 7/17/2017

NOTES: Inlet N-Values = 0.016; Intensity = 76.31 / (Inlet time + 14.30) ^ 0.88; Return period = 2 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Appendix M - Proposed Stormwater Sewer (100-year)

Hydraflow Storm Sewers Extension for Autodesk® AutoCAD® Civil 3D® Plan



Project File: Final Design.stm

Number of lines: 26

Date: 7/17/2017

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	4-1 (42 in.)	37.30	42	Cir	183.459	1361.50	1363.34	1.003	1367.00*	1367.25*	0.12	1367.37	End	Curb-
2	4-2 (42 in.)	34.32	42	Cir	29.880	1363.44	1363.74	1.004	1367.37*	1367.40*	0.10	1367.50	1	Curb-
3	4-3 (24 in.)	30.38	24	Cir	145.238	1365.09	1366.54	0.998	1367.50*	1370.13*	0.73	1370.85	2	DropGrate
4	4-4 (24 in.)	25.08	24	Cir	335.752	1365.89	1369.25	1.001	1370.85*	1374.98*	2.23	1377.21	3	DropGrate
5	4-5 (15 in.)	13.48	15	Cir	245.258	1369.60	1372.05	0.999	1377.21*	1387.90*	1.95	1389.85	4	Curb-
6	4-6 (15 in.)	8.42	15	Cir	224.220	1371.90	1374.14	0.999	1389.85*	1393.67*	0.70	1394.37	5	Curb-
7	4-7 (12 in.)	4.25	12	Cir	33.081	1374.24	1374.57	0.997	1394.37*	1394.84*	0.45	1395.29	6	Curb-
8	5-1 (15 in.)	8.31	15	Cir	159.836	1369.34	1370.94	1.001	1377.21*	1379.86*	0.36	1380.22	4	Curb-
9	5-2 (12 in.)	4.57	12	Cir	30.932	1371.04	1371.35	1.002	1380.22*	1380.73*	0.53	1381.25	8	Curb-
10	2-1 (36 in.)	51.42	36	Cir	69.429	1363.00	1364.15	1.656	1367.00*	1367.35*	0.53	1367.88	End	Manhole
11	2-2 (36 in.)	51.79	36	Cir	120.063	1363.75	1366.36	2.174	1367.88	1368.70	1.79	1368.70	10	DropGrate
12	3-1 (24 in.)	10.77	24	Cir	134.837	1365.96	1367.31	1.001	1368.70	1368.90	0.25	1369.15	11	Manhole
13	3-2 (24 in.)	10.87	24	Cir	75.555	1367.41	1367.98	0.754	1369.15	1369.16	n/a	1369.16 j	12	Curb-
14	3-3 (15 in.)	4.30	15	Cir	33.240	1368.33	1368.58	0.752	1369.16	1369.42	n/a	1369.42	13	Curb-
15	2-3 (30 in.)	38.05	30	Cir	271.125	1366.46	1369.17	1.000	1368.70	1371.25	n/a	1371.25 j	11	DropGrate
16	2-4 (30 in.)	34.33	30	Cir	217.000	1369.27	1370.90	0.751	1371.25	1372.89	1.15	1372.89	15	DropGrate
17	2-5 (24 in.)	30.67	24	Cir	238.000	1371.00	1372.79	0.752	1373.00*	1377.38*	0.74	1378.12	16	DropGrate
18	2-6 (24 in.)	27.06	24	Cir	189.000	1372.89	1374.31	0.751	1378.12*	1380.83*	1.73	1382.56	17	DropGrate
19	2-7 (24 in.)	22.32	24	Cir	162.457	1374.41	1375.63	0.751	1382.56*	1384.14*	0.39	1384.53	18	Curb-
20	2-8 (24 in.)	15.90	18	Cir	35.397	1376.23	1376.50	0.763	1384.53*	1385.34*	0.63	1385.97	19	Curb-
21	2-9 (15 in.)	8.92	15	Cir	122.640	1376.35	1377.27	0.750	1385.97*	1388.32*	0.82	1389.14	20	DropGrate
22	6-1 (24 in.)	18.32	24	Cir	136.156	1362.50	1365.22	1.998	1367.00*	1367.89*	0.78	1368.67	End	Curb-
23	6-2 (18 in.)	13.38	18	Cir	196.476	1364.82	1366.79	1.003	1368.67*	1371.86*	1.76	1373.62	22	Curb-
24	6-3 (12 in.)	3.98	12	Cir	149.464	1367.14	1369.38	1.499	1373.62*	1375.49*	0.40	1375.89	23	DropGrate

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
25	7-1 (12 in.)	4.62	12	Cir	30.943	1367.39	1368.01	2.004	1373.62*	1374.15*	0.54	1374.68	23	Curb-
26	1-1 (18 in.)	12.26	18	Cir	203.432	1362.50	1368.35	2.876	1367.00	1369.67	n/a	1369.67	End	Curb-

Project File: Final Design.stm	Number of lines: 26	Run Date: 7/17/2017
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NOTES: Return period = 100 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	183.459	0.61	7.33	0.73	0.45	5.35	15.0	17.2	7.0	37.30	100.8	3.88	42	1.00	1361.50	1363.34	1367.00	1367.25	0.00	1371.27	4-1 (42 in.)
2	1	29.880	0.81	6.72	0.73	0.59	4.91	15.0	17.0	7.0	34.32	100.8	3.57	42	1.00	1363.44	1363.74	1367.37	1367.40	1371.27	1371.70	4-2 (42 in.)
3	2	145.238	1.12	5.91	0.73	0.82	4.31	15.0	16.8	7.0	30.38	22.60	9.67	24	1.00	1365.09	1366.54	1367.50	1370.13	1371.70	1374.83	4-3 (24 in.)
4	3	335.752	0.69	4.79	0.73	0.50	3.50	15.0	16.0	7.2	25.08	22.63	7.98	24	1.00	1365.89	1369.25	1370.85	1374.98	1374.83	1377.55	4-4 (24 in.)
5	4	245.258	0.98	2.55	0.73	0.72	1.86	15.0	15.6	7.2	13.48	6.45	10.99	15	1.00	1369.60	1372.05	1377.21	1387.90	1377.55	1377.46	4-5 (15 in.)
6	5	224.220	0.78	1.57	0.73	0.57	1.15	15.0	15.1	7.3	8.42	6.45	6.86	15	1.00	1371.90	1374.14	1389.85	1393.67	1377.46	1378.65	4-6 (15 in.)
7	6	33.081	0.79	0.79	0.73	0.58	0.58	15.0	15.0	7.4	4.25	3.56	5.41	12	1.00	1374.24	1374.57	1394.37	1394.84	1378.65	1378.99	4-7 (12 in.)
8	4	159.836	0.70	1.55	0.73	0.51	1.13	15.0	15.1	7.3	8.31	6.46	6.78	15	1.00	1369.34	1370.94	1377.21	1379.86	1377.55	1376.89	5-1 (15 in.)
9	8	30.932	0.85	0.85	0.73	0.62	0.62	15.0	15.0	7.4	4.57	3.56	5.82	12	1.00	1371.04	1371.35	1380.22	1380.73	1376.89	1377.09	5-2 (12 in.)
10	End	69.429	0.00	10.31	0.00	0.00	7.53	0.0	18.0	6.8	51.42	92.99	7.28	36	1.66	1363.00	1364.15	1367.00	1367.35	0.00	1372.01	2-1 (36 in.)
11	10	120.063	0.82	10.31	0.73	0.60	7.53	15.0	17.7	6.9	51.79	98.33	8.04	36	2.17	1363.75	1366.36	1367.88	1368.70	1372.01	1372.62	2-2 (36 in.)
12	11	134.837	0.00	2.03	0.00	0.00	1.48	0.0	15.5	7.3	10.77	24.52	3.73	24	1.00	1365.96	1367.31	1368.70	1368.90	1372.62	1374.34	3-1 (24 in.)
13	12	75.555	1.23	2.03	0.73	0.90	1.48	15.0	15.2	7.3	10.87	19.64	4.69	24	0.75	1367.41	1367.98	1369.15	1369.16	1374.34	1375.15	3-2 (24 in.)
14	13	33.240	0.80	0.80	0.73	0.58	0.58	15.0	15.0	7.4	4.30	5.60	4.94	15	0.75	1368.33	1368.58	1369.16	1369.42	1375.15	1375.03	3-3 (15 in.)
15	11	271.125	0.82	7.46	0.73	0.60	5.45	15.0	17.1	7.0	38.05	41.00	8.46	30	1.00	1366.46	1369.17	1368.70	1371.25	1372.62	1375.77	2-3 (30 in.)
16	15	217.000	0.77	6.64	0.73	0.56	4.85	15.0	16.5	7.1	34.33	35.54	8.21	30	0.75	1369.27	1370.90	1371.25	1372.89	1375.77	1376.70	2-4 (30 in.)
17	16	238.000	0.74	5.87	0.73	0.54	4.29	15.0	16.1	7.2	30.67	19.62	9.76	24	0.75	1371.00	1372.79	1373.00	1377.38	1376.70	1376.28	2-5 (24 in.)
18	17	189.000	0.94	5.13	0.73	0.69	3.74	15.0	15.7	7.2	27.06	19.61	8.61	24	0.75	1372.89	1374.31	1378.12	1380.83	1376.28	1376.16	2-6 (24 in.)
19	18	162.457	1.21	4.19	0.73	0.88	3.06	15.0	15.3	7.3	22.32	19.60	7.11	24	0.75	1374.41	1375.63	1382.56	1384.14	1376.16	1377.99	2-7 (24 in.)
20	19	35.397	1.32	2.98	0.73	0.96	2.18	15.0	15.3	7.3	15.90	9.17	9.00	18	0.76	1376.23	1376.50	1384.53	1385.34	1377.99	1378.38	2-8 (24 in.)
21	20	122.640	1.66	1.66	0.73	1.21	1.21	15.0	15.0	7.4	8.92	5.59	7.27	15	0.75	1376.35	1377.27	1385.97	1388.32	1378.38	1379.82	2-9 (15 in.)
22	End	136.156	0.97	3.49	0.73	0.71	2.55	15.0	15.9	7.2	18.32	31.97	5.83	24	2.00	1362.50	1365.22	1367.00	1367.89	0.00	1371.98	6-1 (24 in.)

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = Yrs. 100 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len (ft)	Drng Area		Rnoff coeff (C)	Area x C		Tc		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr (ac)	Total (ac)		Incr	Total	Inlet (min)	Syst (min)					Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	196.476	0.92	2.52	0.73	0.67	1.84	15.0	15.5	7.3	13.38	10.52	7.57	18	1.00	1364.82	1366.79	1368.67	1371.86	1371.98	1373.53	6-2 (18 in.)
24	23	149.464	0.74	0.74	0.73	0.54	0.54	15.0	15.0	7.4	3.98	4.36	5.07	12	1.50	1367.14	1369.38	1373.62	1375.49	1373.53	1375.34	6-3 (12 in.)
25	23	30.943	0.86	0.86	0.73	0.63	0.63	15.0	15.0	7.4	4.62	5.04	5.89	12	2.00	1367.39	1368.01	1373.62	1374.15	1373.53	1373.27	7-1 (12 in.)
26	End	203.432	2.28	2.28	0.73	1.66	1.66	15.0	15.0	7.4	12.26	17.81	7.18	18	2.88	1362.50	1368.35	1367.00	1369.67	0.00	1372.00	1-1 (18 in.)

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Number of lines: 26

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NOTES: Intensity = $62.28 / (\text{Inlet time} + 10.10)^{0.66}$; Return period = Yrs. 100 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet			By Line No	
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
1	4-1	3.28	0.00	3.28	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.22	7.17	0.39	7.17	2.0	Off
2	4-2	4.35	0.00	4.35	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.27	8.66	0.44	8.66	2.0	Off
3	4-3	6.02	0.00	6.02	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.30	63.68	0.30	63.68	0.0	Off
4	4-4	3.71	0.00	3.71	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.22	46.93	0.22	46.93	0.0	Off
5	4-5	5.27	0.00	2.22	3.05	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.31	9.86	0.42	8.04	2.0	14
6	4-6	4.19	0.00	4.19	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.36	11.46	0.52	11.46	2.0	Off
7	4-7	4.25	0.00	4.25	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.36	11.56	0.53	11.56	2.0	Off
8	5-1	3.76	0.00	1.84	1.92	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.27	8.69	0.38	6.75	2.0	25
9	5-2	4.57	0.00	2.05	2.52	Curb	6.0	5.00	0.00	0.00	0.00	0.008	2.00	0.031	0.031	0.013	0.29	9.35	0.40	7.48	2.0	23
10	2-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
11	2-2	4.41	0.00	4.41	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.25	52.29	0.25	52.29	0.0	Off
12	3-1	0.00	0.00	0.00	0.00	MH	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.0	Off
13	3-2	6.61	0.00	6.61	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.35	11.44	0.52	11.44	2.0	Off
14	3-3	4.30	3.05	7.35	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.38	12.28	0.55	12.28	2.0	Off
15	2-3	4.41	0.00	4.41	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.25	52.29	0.25	52.29	0.0	Off
16	2-4	4.14	0.00	4.14	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.24	50.26	0.24	50.26	0.0	Off
17	2-5	3.98	0.00	3.98	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.23	49.03	0.23	49.03	0.0	Off
18	2-6	5.05	0.00	5.05	0.00	DrGr	0.0	0.00	9.00	3.00	3.00	Sag	3.00	0.010	0.010	0.000	0.27	56.99	0.27	56.99	0.0	Off
19	2-7	6.51	0.00	6.51	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.35	11.32	0.52	11.32	2.0	Off
20	2-8	7.10	0.00	7.10	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.37	11.99	0.54	11.99	2.0	Off
21	2-9	8.92	0.00	4.45	4.47	DrGr	0.0	0.00	0.00	3.00	3.00	0.010	3.00	0.010	0.010	0.040	0.28	59.20	0.28	59.20	0.0	Off
22	6-1	5.22	0.00	5.22	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.30	9.77	0.47	9.77	2.0	Off
23	6-2	4.95	2.52	7.46	0.00	Curb	3.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.49	15.69	0.65	15.69	2.0	Off

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Number of lines: 26

Run Date: 7/17/2017

NOTES: Inlet N-Values = 0.016; Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are throat.

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter						Inlet			Byp Line No	
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)		Depr (in)
24	6-3	3.98	0.00	2.46	1.52	DrGrt	0.0	0.00	0.00	3.00	3.00	0.010	3.00	0.010	0.010	0.040	0.21	45.20	0.21	45.20	0.0	Off
25	7-1	4.62	1.92	6.54	0.00	Curb	6.0	5.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.48	15.43	0.64	15.43	2.0	Off
26	1-1	12.26	0.00	12.26	0.00	Curb	6.0	10.00	0.00	0.00	0.00	Sag	2.00	0.031	0.031	0.000	0.54	17.27	0.70	17.27	2.0	Off

Project File: Final Design.stm

Number of lines: 26

Run Date: 7/17/2017

NOTES: Inlet N-Values = 0.016; Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; * Indicates Known Q added. All curb inlets are throat.