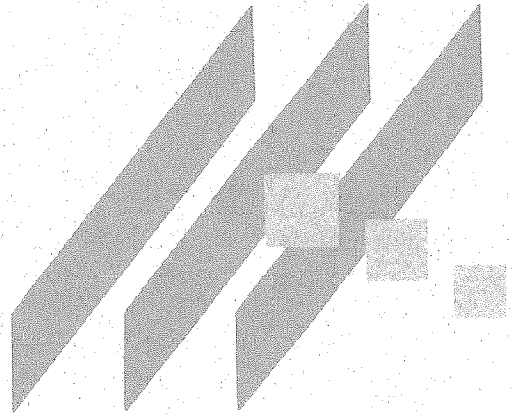


MKEC ENGINEERING CONSULTANTS, INC.

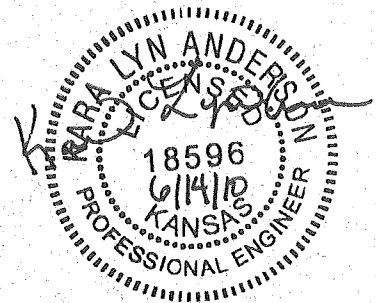


DRAINAGE REPORT

FOR

**PAWNEE AND 127<sup>th</sup> COMMERCIAL ADDITION**  
**Wichita, Kansas**

JUNE 2010





### Public Works, Engineering Division Final Drainage Plan Submittal Checklist

Reviewer: <u>City of Wichita</u>	Date: <u>June 11, 2010</u>
Subdivision Name: <u>Pawnee &amp; 127th Street Commercial</u>	Location: <u>Wichita, Kansas</u>
Total Land Area Of Ownership: <u>31.6</u> Acres	
Type: <input type="checkbox"/> Residential <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Industrial <input type="checkbox"/> Recreation <input type="checkbox"/> Municipal <input type="checkbox"/> Other	
Applicant: <u>Occidental Management, Inc.</u>	Contact: <u>Gary Oborny</u> Phone #: <u>(316) 262-3331</u>
Engineer: <u>MKEC Engineering Consultants, Inc.</u>	Contact: <u>Kara Anderson, P.E.</u> Phone #: <u>(316) 684-9600</u>

Please check the appropriate box:

I = Included; NA = Non-Applicable; R= Required prior to development  
(If "NA" is checked, an explanation must be entered)

Tab 1. Project Narrative	Applicant		Engr	
	I	NA	Explanation / Location in Plan	
A. Site Location Map, using USGS Map	✓		Appendix 1.1	
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	✓		Tab 1 Text	
C. Discussion of offsite conditions	✓		Tab 1 Text	
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	✓		Tab 1 Text	
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	✓		Tab 1 Text	
F. Copy of the plat	✓		Appendix 1.2	
G. Preliminary grading plan (The final grading plan shall be sealed, signed and dated prior to Engineering receiving the final sanitary sewer plans. One plan sheet and PDF shall be submitted to the Subdivision Engineer.)	✓		Appendix 1.4	
H. Professional Engineer seal, signature and date on cover of report	✓		Cover	
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	✓		Cover & Tab 0.	

Tab 2. Existing Conditions Runoff Calculations	Applicant		Engr	
	I	NA	Explanation / Location in Plan	
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)	✓		Appendix 2.1	
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)	✓		Tab 2 Text	
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)	✓		Appendix 2.2	
D. Total Site Area and Total Impervious Area (acres)	✓		Tab 2 Text	
E. Benchmarks used for site control	✓		Appendix 2.2	
F. Streams, creeks, and waterway labeled	✓		Appendix 2.2	
G. Predominant soils from USDA soil surveys, and/or on site soil borings	✓		Tab 2 Text and Appendix 2.4	
H. Location and boundaries of natural features such as wetlands, lakes, and ponds with the normal water elevation noted	✓		Appendix 2.2	
I. Location of existing roads, buildings, parking lots and other impervious areas.	✓		Appendix 2.2	



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements	✓		Appendix 2.2		
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✓		Appendix 2.2		
L. Flow paths	✓		Appendix 2.2		
M. Location and dimensions of existing channels, bridges or culvert crossings	✓		Appendix 2.2		
N. Existing conditions hydrologic analysis for runoff rates, volumes and velocities showing methodologies used and supporting calculations (2, 5, 10, 25 & 100 year, 24-hour storm events) or Critical Duration	✓		Tab 2 Text		
O. Assumed pre-developed runoff curve numbers	✓		Appendix 2.6		
P. Existing time of concentrations used in calculations	✓		Appendix 2.6		
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site	✓		Tab 2 Text		
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)	✓		Appendix 2.2		
S. Cross-section data for open channels	✓		Tab 2 Text		
T. Ground water elevations, if applicable	✓		Tab 2 Text		

Tab 3. Post-Development Hydrologic Analysis	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Proposed (post-development) conditions hydrologic and hydraulic analysis for runoff rates, volumes, HGL, and velocities showing the methodologies used and supporting calculations for all applicable design storms (2, 5, 10, 25 & 100 year, 24-hour storm events)	✓		Tab 3 Text and Appendix 2.5		
B. Proposed time of concentrations used in calculations	✓		Appendix 2.6		
C. Assumed post-developed runoff curve numbers	✓		Appendix 2.6		
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)	✓		Appendix 3.1		
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration	✓		Appendix 3.2		
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities	✓		Appendix 3.1		
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary	✓		Tab 3 Text		
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)	✓		Appendix 3.1		
I. Design water surface elevations and normal pool elevation for ponds.	✓		Appendix 3.1		
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.	✓		Appendix 3.1		
K. Proposed limits of clearing and grading	✓		Tab 3 Text		
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.	✓		Appendix 3.1		
M. Location of existing and proposed utilities (e.g., water, sewer) and easements	✓		Appendix 3.1		
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow	✓		Appendix 3.1		
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings	✓		Appendix 3.1		



P. Preliminary selection and location of stormwater controls	✓		Appendix 3.1		
Q. Emergency overflow structure's flow path	✓		Appendix 3.1		
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)	✓		Appendix 3.1		
S. The 100-year 24-hour HWL delineated on the plan for detention pond	✓		Appendix 3.1		
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds	✓		Tab 3 Text		
U. Stormwater Management Facilities located within a Reserve		✓	No detention pond on site		
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)	✓		Tab 3 Text		
W. Off-site drainage easements or agreements required, where necessary	✓		Tab 3 Text		

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile		✓	No FEMA floodplain		
B. Nearest base flood elevations		✓	No FEMA floodplain		
C. Delineation of pre-developed regulatory floodplain/floodway limits		✓	No FEMA floodplain		
D. Delineation of post-developed regulatory floodplain and floodway limits		✓	No FEMA floodplain		
E. Floodplain boundary determination per elevation (project limits shown)		✓	No FEMA floodplain		
F. Provide source of floodway data table and discharges		✓	No FEMA floodplain		
G. Provide all hydrologic and hydraulic study information for site-specific floodplain studies, unnumbered Zone A area elevation determinations and flood plain map revisions or required permits		✓	No FEMA floodplain		
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions		✓	No FEMA floodplain		
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)		✓	No FEMA floodplain		
J. Flood plains and floodways located within a Reserve, where necessary		✓	No FEMA floodplain		

Tab 5. Federal, State and Local Permits (to be provided prior to construction unless otherwise specified)	Applicant			Engr	
	I/R	NA	Explanation / Location in Plan	I/R	NA
A. US Army Corps of Engineers - Regulatory program permits (404 water quality certification)		✓	No wetlands or jurisdictional water ways		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)		✓	No jurisdictional waterways		
C. Federal Emergency Management Agency (FEMA) Letter of Map Changes (LOMA, LOMR, LOMR-f, CLOMR, etc.) Shall be included and approved when project modifies the limits of the floodway.		✓	No FEMA floodplain		
D. Kansas Department of Transportation		✓	No KDOT roads		
E. Sedgwick County Right-of-way Permit		✓	No county roads		

DRAINAGE REPORT

FOR

**PAWNEE AND 127<sup>th</sup> COMMERCIAL ADDITION**  
**Wichita, Kansas**

JUNE 2010

## Tab 0. Checklist

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## **Tab 1. Project Narrative**

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### ***Location***

The subject property is in the City of Wichita, Sedgwick County, Kansas. The proposed development is south of Pawnee Road and west of 127<sup>th</sup> Street North. The site lies in the northeast quarter of Section 3, Township 28 South, Range 2 East. The USD 259 4<sup>th</sup> Addition borders the site to the west and south. The plat area is 31.6 acres. The site is shown on the USGS Map, Appendix 1.1.

### ***Discussion of Development***

The site is currently undeveloped agricultural land and will develop as 11 commercial lots. Eight of the lots are approximately 1.0 acre in size, the 9<sup>th</sup> lot is 1.7 acres in size and the remaining two lots are larger commercial lots that are 7.1 acres and 11.7 acres. The USD 259 4<sup>th</sup> Addition south of the plat is also being developed for use as a school. The proposed site is shown on the plat, Appendix 1.2

### ***Drainage Summary***

#### ***Pre-Development***

The site is divided into 3 drainage basins under pre-development conditions. The southern portion of the site drains to the south into the USD 259 4<sup>th</sup> Addition. The northwestern portion drains to the west and into an existing grassed waterway on the USD 259 4<sup>th</sup> Addition. The Northeast corner of the site drains into a shallow pond that outlets to the east. The USD 259 4<sup>th</sup> Addition is currently undeveloped and in the platting process. The Drainage Report for USD 259 4<sup>th</sup> Addition dated May 7, 2010 by Ruggles and Bohm used the pre-development site conditions for this site to determine the pre-development flow rates from the USD 259 4<sup>th</sup> Addition site. The Northeast basin of this site flows into an existing pond. The pond outlets into a ditch along 127<sup>th</sup> Street North. The ditch flows through an existing 20"x28" culvert under 127<sup>th</sup> Street and to the north and the east where it crosses through a culvert under Pawnee Road. Flow from the culvert drains to the northeast to an existing 24" CMP and then flows through a field into a pond. The flow paths are shown on the Drainage Patterns Drawing, Appendix 1.3. Pre-development flow rates are shown in Table 1.1.

#### ***Post-Development***

The USD 259 4<sup>th</sup> Addition Drainage Report dated May 7, 2010 by Ruggles and Bohm accounts for developed runoff from this site and provides detention for this site in the proposed detention ponds on the school property. A portion of the drainage basin draining to 127<sup>th</sup> Street has been graded to route the runoff the school site. The basin area has been reduced from 19.6 acres to 10.0 acres. The detention ponds in the USD 259 4<sup>th</sup> Addition school site accommodate detention for the entire developed site. Preliminary lot layout and grading are shown in the Preliminary Lot Grading Plan, Appendix 1.3.

**Table 1.1. Comparison of Pre and Post-Development Flow Rates**

Description	Design Storm Flows (cfs)				
	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Pre-Development North Total*	64.6	93.1	110.4	139.4	188.7
Post-Development North Total*	61.8	81.8	94.3	113.6	146.0
Pre-Development South Total*	290.3	419.6	499.4	633.3	861.7
Post-Development South Total*	283.1	401.3	476.0	604.0	825.1
Pre-Development To 127 <sup>th</sup> Street/Occidental 4	40.2	59.9	73.0	92.8	121.1
Post-Develop. To 127 <sup>th</sup> Street/Occidental 4	39.4	52.3	61.3	74.2	92.5

\* From USD 259 4<sup>th</sup> Addition May 7, 2010 Drainage Report by Ruggles and Bohm.

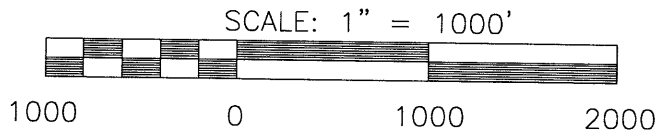
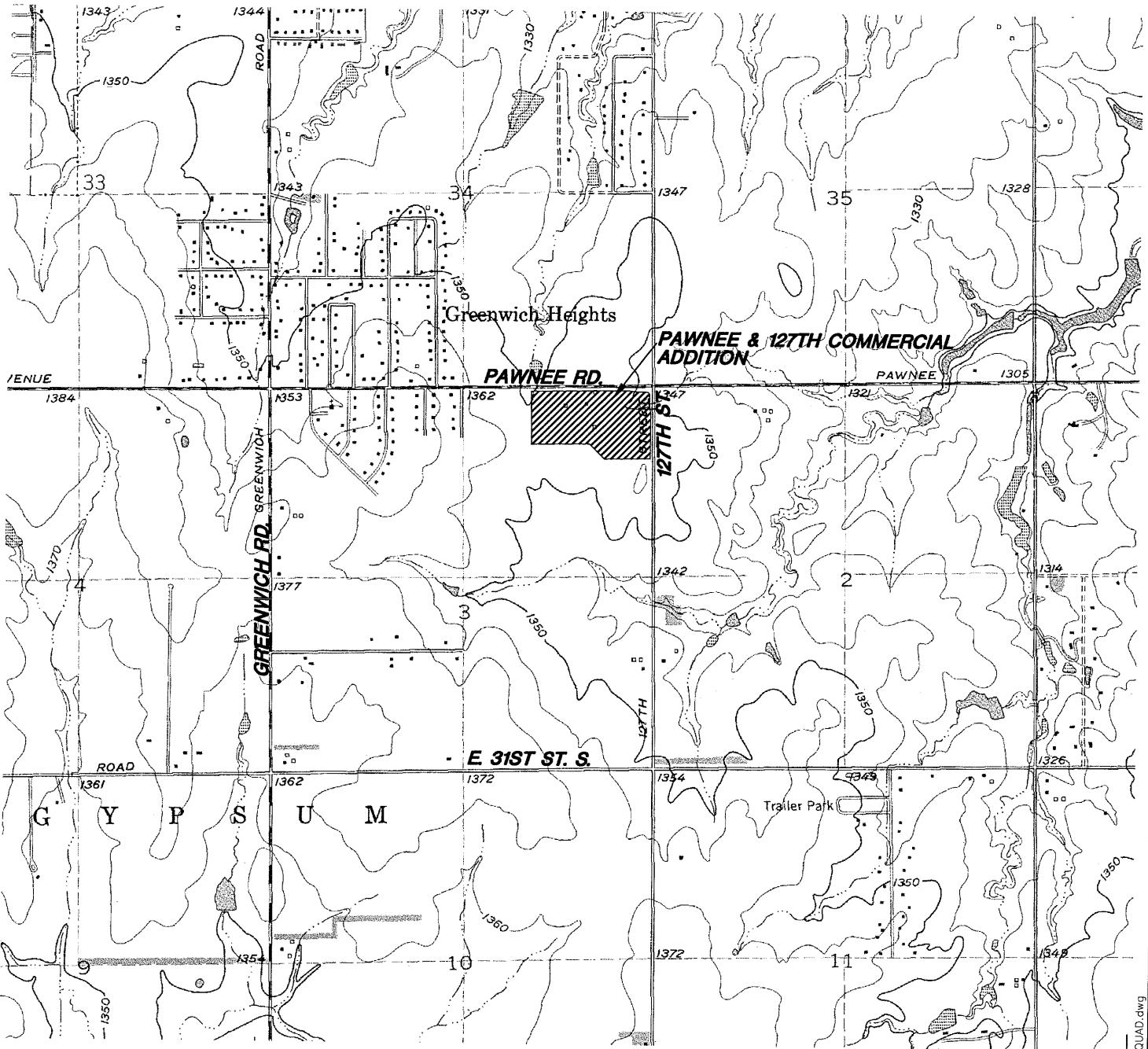
***Best Management Practices***

The site will be seeded or sodded after construction of grading and utilities are complete. During construction curb protection, inlet protection and other erosion protection devices will be used to prevent soil from leaving the site. The site will be seeded and sodded upon completion of construction. Riprap will protect storm sewer outfalls.

**Appendix 1.1**

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USGS Quadrangle Map



<b>MKEC</b> ENGINEERING CONSULTANTS, INC. 411 N. WEBB ROAD WICHITA, K.S. 67206 316-684-9600	<b>PAWNEE &amp; 127TH COMMERCIAL ADDITION</b> PROJECT NAME		
	<b>QUAD MAP</b> SHEET TITLE		
KLA DESIGN BY:	CMJ DRAWN BY:	GJA CHECKED BY:	
JUNE 2010 DATE	10162 JOB NO.	1 / 1 SHEET/OF	

J:\Civ\10162 - Occidental\dwg\DRNG\00162\_QUAD.dwg

## Appendix 1.2

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Plat

**CERTIFICATE OF SURVEY**

I, Gregory J. Allison, a registered land surveyor in Kansas, do hereby certify that I have been in responsible charge of surveying and platting of "PAWNEE AND 127TH COMMERCIAL ADDITION", an addition to Wichita, Sedgwick County, Kansas, into Lots, a Block, and Streets the same being accurately set forth in the accompanying plat and described herein:

A tract of land lying in a portion of Government Lots 1 and 2, Section 3, Township 28 South, Range 2 East, of the 6th Principal Meridian, Wichita, Sedgwick County, Kansas; said tract being more particularly described as follows: BEGINNING at the northeast corner of said Northeast Quarter, thence along the east line of said Quarter on a Kansas coordinate system of 1983 south zone grid bearing of S00°16'43"E, 960.06 feet; thence parallel with and 960.00 feet south of the north line of said Quarter, S89°05'03"W, 675.04 feet; thence N45°11'06"W, 279.30 feet to a point lying 760.00 feet south of said north line; thence S89°05'03"W, 729.45 feet; thence N00°54'57"W, 760.00 feet to said north line; thence along said north line, N89°05'03"E, 1610.13 feet to the POINT OF BEGINNING.

All public dedications, reserves, streets, easements, setbacks, access controls, together with, a Right-of-Way Easement, recorded in Book Misc. 426, Page 109, within the above described property are hereby vacated and replatted by virtue of K.S.A. 12-512(b).

I hereby certify that the details of this plat are correct to the best of my knowledge and belief this \_\_\_ day of \_\_\_\_\_, 2010.

Gregory J. Allison, PE, LS #1257  
MKEC Engineering Consultants, Inc.  
411 North Webb Road  
Wichita, Kansas 67206

**OWNER'S CERTIFICATE**

Know all men by these presents that we the undersigned property owners of the land above set forth in the Registered Land Surveyor's Certificate, have caused the same to be surveyed and platted into Lots, a Block, and Streets the same to be known as "PAWNEE AND 127TH COMMERCIAL ADDITION," an addition to Wichita, Sedgwick County, Kansas.

Easements for the construction and maintenance of public utilities and drainage, as indicated on the accompanying plat are hereby granted to the public.

The streets are hereby dedicated to and for the use of the public.

All abutters rights of access to or from E. Pawnee Road over and across the north line of "PAWNEE AND 127TH COMMERCIAL ADDITION," are hereby granted to the appropriate governing body, as indicated hereon. All abutters right to access to or from 127th Street S. over and across the east line of "PAWNEE AND 127TH COMMERCIAL ADDITION," are hereby granted to the appropriate governing body, as indicated hereon.

A drainage plan has been developed for this plat. All drainage easements, rights-of-way, and reserves shall remain at established grades or as modified with the approval of the applicable City or County Engineer, and unobstructed to allow for the conveyance of storm water.

Lots 1, 10, and 11, Block 1, are required to adhere to the minimum pad elevation as shown on the "Minimum Pad Elevations".

This plat shall adhere and conform to the recitals of C.U.P. DP-322 as approved and recorded at the Wichita-Sedgwick County Metropolitan Area Planning Department.

127 PAW, LLC, a Kansas limited liability company

Managing Member  
Gary L. Oborny, Managing Member

STATE OF KANSAS, SEDGWICK COUNTY) ss:

This Instrument was acknowledged before me on \_\_\_ day of \_\_\_\_\_, 2010, by Gary L. Oborny, Managing Member, 127 PAW, LLC, a Kansas limited liability.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

Affix Seal

Notary Public  
My Term Expires: \_\_\_\_\_

**COUNTY SURVEYOR'S CERTIFICATE**

Reviewed in accordance with K.S.A. 58-2005 on this \_\_\_ day of \_\_\_\_\_, 2010.

Deputy County Surveyor  
Tricia L. Robello, LS #1246  
Deputy County Surveyor  
Sedgwick County, Kansas

**PLANNING COMMISSION CERTIFICATE**

This plat of "PAWNEE AND 127TH COMMERCIAL ADDITION" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this \_\_\_ day of \_\_\_\_\_, 2010

WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

Affix MAPC Seal

Chair  
G. Nelson Van Fleet, Chair  
Secretary  
John L. Schlegel, Secretary

**GOVERNING BODY CERTIFICATE**

This plat approved and all dedications shown hereon, accepted by the governing body of the City of Wichita, Kansas, dated this \_\_\_ day of \_\_\_\_\_, 2010

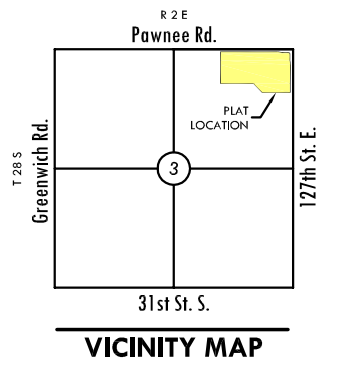
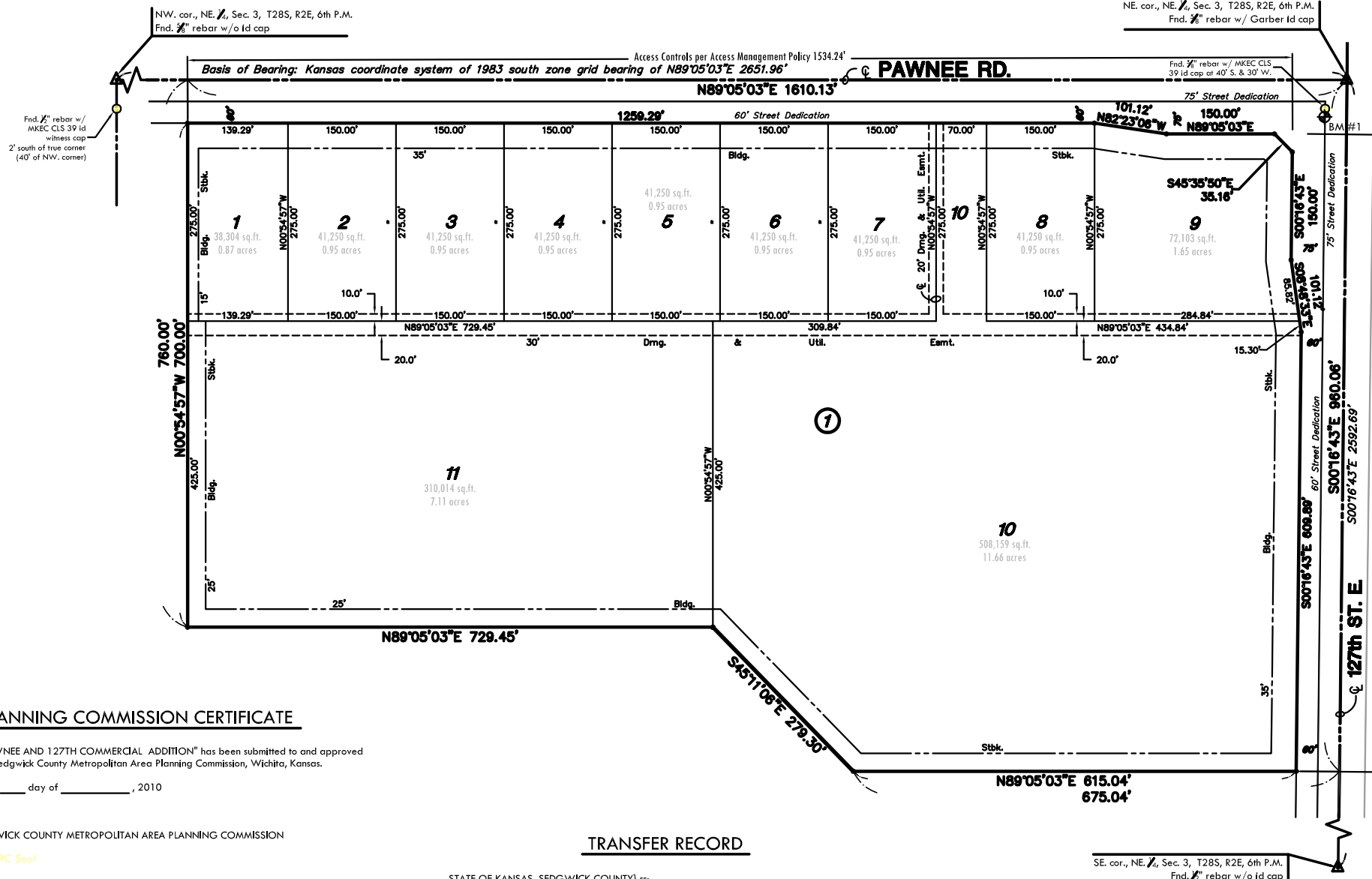
Affix City Seal

At the direction of the City Council  
Mayor  
Carl Brewer, Mayor  
City Clerk  
Karen Sublett, City Clerk

**FINAL PLAT**

**PAWNEE AND 127TH COMMERCIAL ADDITION**

**AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS**



**TRANSFER RECORD**

STATE OF KANSAS, SEDGWICK COUNTY) ss:  
Entered on transfer record this \_\_\_ day of \_\_\_\_\_, 2010  
County Clerk  
Kelly B. Arnold, County Clerk

Affix County Clerk Seal

**REGISTER OF DEEDS CERTIFICATE**

This is to certify that this Instrument was filed for record in the Register of Deeds office this \_\_\_ day of \_\_\_\_\_, 2010, at \_\_\_ o'clock \_\_\_ M, and is duly recorded.

Affix Register of Deeds Seal

Register of Deeds  
Bill Meek, Register of Deeds  
Deputy  
Tonya E. Buckingham, Deputy

**BENCH MARK**

BM #1  
Top of concrete witness monument  
30.5 feet W. centerline 127th St. E  
and 51.5 feet S. Pawnee Rd.  
Elev. = 1349.31 (NAVD 88)  
1348.81 (NGVD 29)

MINIMUM PAD ELEVATIONS LOWEST OPENINGS		
LOTS	BLOCK	ELEVATION
1	1	1354.5 (NAVD 88) 1354.0 (NAVD 29)
10	1	1357.1 (NAVD 88) 1356.6 (NAVD 29)
11	1	1356.5 (NAVD 88) 1355.0 (NAVD 29)

**LEGEND**

- ▲ = Section Corner Monument Found
- = Found 3/8" Rebar w/ MKEC CLS 39 Id. cap
- = Set 3/8" Rebar w/ MKEC CLS 39 Id. cap
- (M) = Measured
- (P) = Platted
- (D) = Deeded or Described
- (CM) = Calculated from measured
- C.A.C. = Complete Access Control

**NOTE**

Zoning:  
This plat shall adhere and conform to the recitals of CUP DP-322 as approved and recorded at the Wichita-Sedgwick County Metropolitan Planning Area Department.

**MKEC**  
ENGINEERING  
CONSULTANTS, INC.

411 N. WEBB ROAD  
WICHITA, KS. 67206  
316-684-9600

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## **Appendix 1.3**

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### **Drainage Patterns**

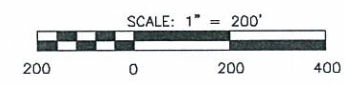


**LEGEND**

- 6IN - CONIFEROUS TREE
- 3IN - DECIDUOUS TREE
- SN - SIGN
- PH - POWER POLE
- ELEC BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SC - SECTION CORNER
- BM - BENCHMARK
- EASEMENT
- BUILDING SETBACK
- FENCE
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- GAS PIPELINE
- TELEPHONE LINE
- UNDERGROUND ELEC.
- OVERHEAD ELECTRIC
- FIBER OPTIC CABLE
- DRAINAGE SUB BASIN
- DRAINAGE BASIN
- FLOW ARROW
- A17 - AREA FOR SWS SIZING

**BENCH MARK**

BM #1 Top of concrete witness monument  
 30.5 feet W. centerline 127th St. E  
 and 51.5 feet S. Pawnee Rd.  
 Elev. = 1349.31 (NAVD 88)  
 1348.81 (NGVD 29)  
 (FROM GPS)



**PAWNEE & 127TH COMMERCIAL ADDITION**  
 WICHITA, KANSAS  
**DRAINAGE PATTERNS**

DATE	June 10
REVISED	

DESIGN BY	KLA
DRAWN BY	CMJ
CHECKED BY	GJA

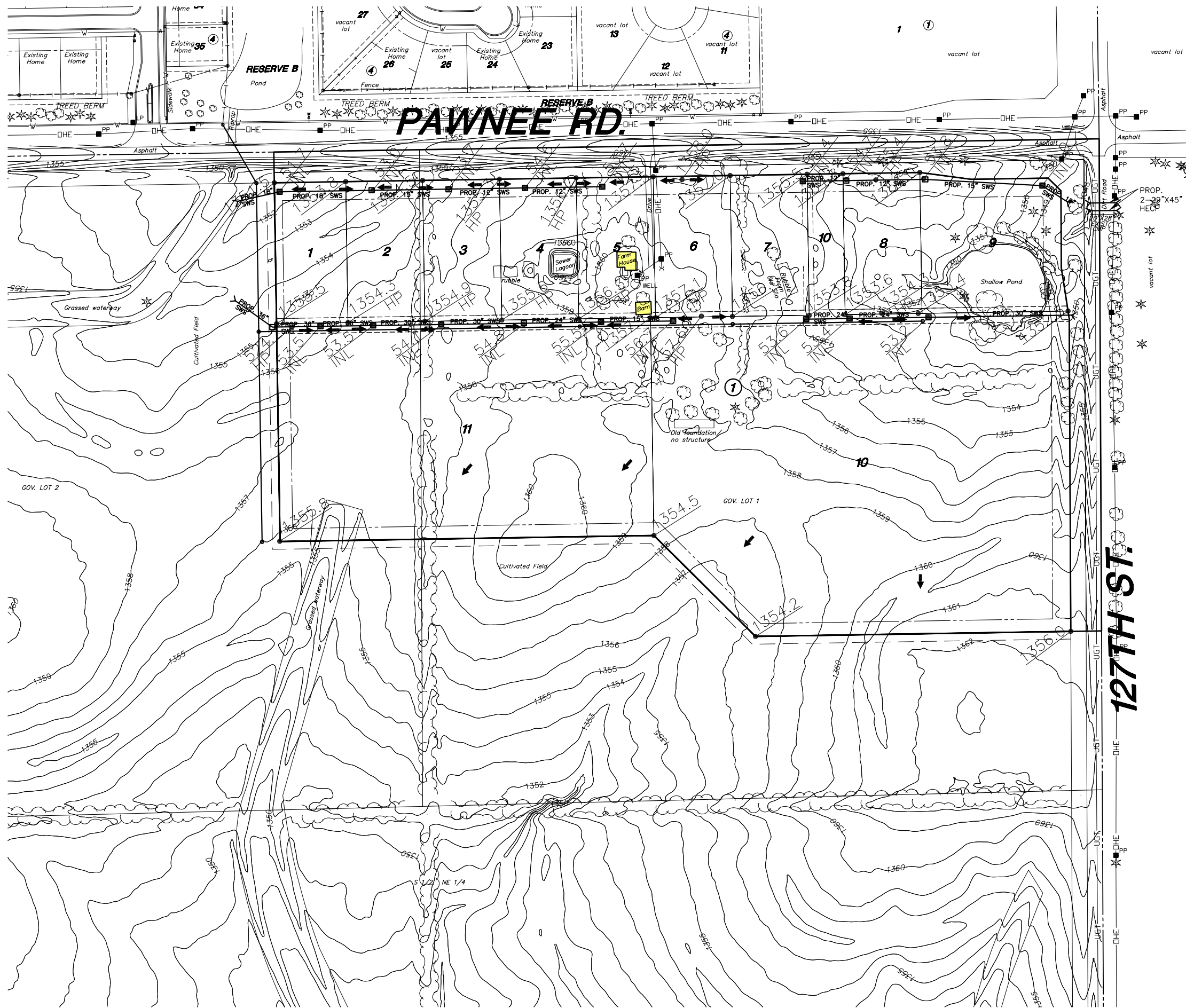
SHEET NUMBER	1
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**Appendix 1.4**

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Preliminary Grading Plan



**LEGEND**

- ⊛ 6IN - CONIFEROUS TREE
- ⊙ 3IN - DECIDUOUS TREE
- SN - SIGN
- PP - POWER POLE
- ELEC. BOX - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- △ - SECTION CORNER
- BM - BENCHMARK
- - - - - EASEMENT
- - - - - BUILDING SETBACK
- - - - - FENCE
- - - - - STORM SEWER PIPE
- - - - - WATER LINE
- - - - - SANITARY SEWER LINE
- - - - - GAS LINE
- - - - - GAS PIPELINE
- - - - - TELEPHONE LINE
- - - - - UNDERGROUND ELEC.
- - - - - OVERHEAD ELECTRIC
- - - - - FIBER OPTIC CABLE
- - - - - DRAINAGE SUB BASIN
- - - - - DRAINAGE BASIN
- - FLOW ARROW
- A17 - AREA FOR SWS SIZING

N

SCALE: 1" = 100'

**MKEC**  
ENGINEERING  
CONSULTANTS, INC.  
411 N. WEBB ROAD  
WICHITA, KS. 67206  
316-684-9600

**PAWNEE & 127TH COMMERCIAL ADDITION**  
 WICHITA, KANSAS  
**LOT GRADING PLAN**

DATE	June 10
REVISED	

DESIGN BY	KLA
DRAWN BY	CMJ
CHECKED BY	GJA

SHEET NUMBER  
**1**

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## Tab 2. Existing Conditions

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### **Description**

The site is 31.6 acres of undeveloped ground. There is currently an existing farm house and barn on the site, there is no significant impervious area. The site is shown on the aerial photograph, Appendix 2.1. The site is shown on the Existing Conditions Map in Appendix 2.2.

### **FEMA Floodplains**

The platted area is located in Zone X, areas outside of the 500-year flood, as shown on the Sedgwick County Kansas February 2, 2007 Map Number 20173C0390E, Appendix 2.3. The Arkansas River is west of the site. The nearest FEMA floodplains are approximately ½ mile southeast of the site.

### **Soils**

According to the NRCS (SCS) Sedgwick County Soil Survey, Appendix 2.4, soils on the site are:

- Irwin silty clay loam, 1 to 3 percent slopes, HSG “D”
- Clime silty clay, 3 to 7 percent slopes, HSG “C”

Hydraulic Soil Group “D” was used for calculations for the basins.

### **Drainage Calculations**

#### **Runoff Method**

The site was modeled using the SCS Hydrograph Method in Hydraflow Hydrographs, Appendix 2.5.

#### **Rainfall**

The rainfall information used is from the Kansas Department of Transportation Rainfall Depth Tables for Kansas Counties June 1997. The rainfall values used are shown in Table 2.1.

Table 2.1. 24-Hour Rainfall Depths.

	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Sedgwick	3.50	4.53	5.24	6.24	7.80

#### **Time of Concentration**

Time of concentration was calculated using the TR-55 method. Calculations are in Appendix 2.5.

#### **Curve Numbers**

The curve number used for pre-developed conditions is 84.

#### **Drainage Patterns**

Under existing conditions, the site drains in three directions. A portion of the site, Occidental 1, drains to the northwest into an existing grassed waterway to combine with flows from the school site as North Total. A small portion of the site, Occidental 2 and 3, along the southern boundary

drains to the south into existing channels on the USD 259 4<sup>th</sup> Addition to flow to the south as South Total. The northeast portion of the site and a small portion of the USD 259 property drain to the northeast into an existing pond with a surface area of 0.5 acres. The existing pond has no defined outlet structure and overtops the pond edge to flow to the east. The overtopping appears to be about 30' wide when the overtopping begins to occur. With the small surface area of this pond and the large outlet, the volume of detention in this pond is negligible. Pre-project flow rates from this basin do not consider any detention in this pond. The flow from this area flows to an existing 20"x28" CMP under 127<sup>th</sup> Street, this pipe is the equivalent of a 24" round pipe. The existing pipe overtops 127<sup>th</sup> Street with a flow rate of approximately 20 cfs. This culvert is currently not containing the 2-year design storm. The roadway is overtopped during a 2-year design event. The culvert was analyzed using Hydrflow Express by AutoCAD 2009, Appendix 2.6. Flow from the culvert flows to the northeast where it flows through an existing 24" CMP. It flows through the CMP, through a field, and into an existing pond. Any flow that the 24" CMP does not convey flows to the east and to an existing RCB under Pawnee Road and into a detention pond. The flow paths are shown on the Drainage Patterns Drawing, Appendix 1.3.

**Table 2.3. Pre-Development Flow Rates**

Description	Area (ac.)	Tc (min.)	CN	Design Storm Flows (cfs)				
				2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
North Total*	39.1	-	-	64.6	93.1	110.4	139.4	188.7
South Total*	275.2	-	-	290.3	419.6	499.4	633.3	861.7
To 127 <sup>th</sup> /Occ. 4	19.6	22.4	84.0	40.2	59.9	73.0	92.8	121.1

\* From USD 259 4<sup>th</sup> Addition May 7, 2010 Drainage Report by Ruggles and Bohm.

### ***Utilities***

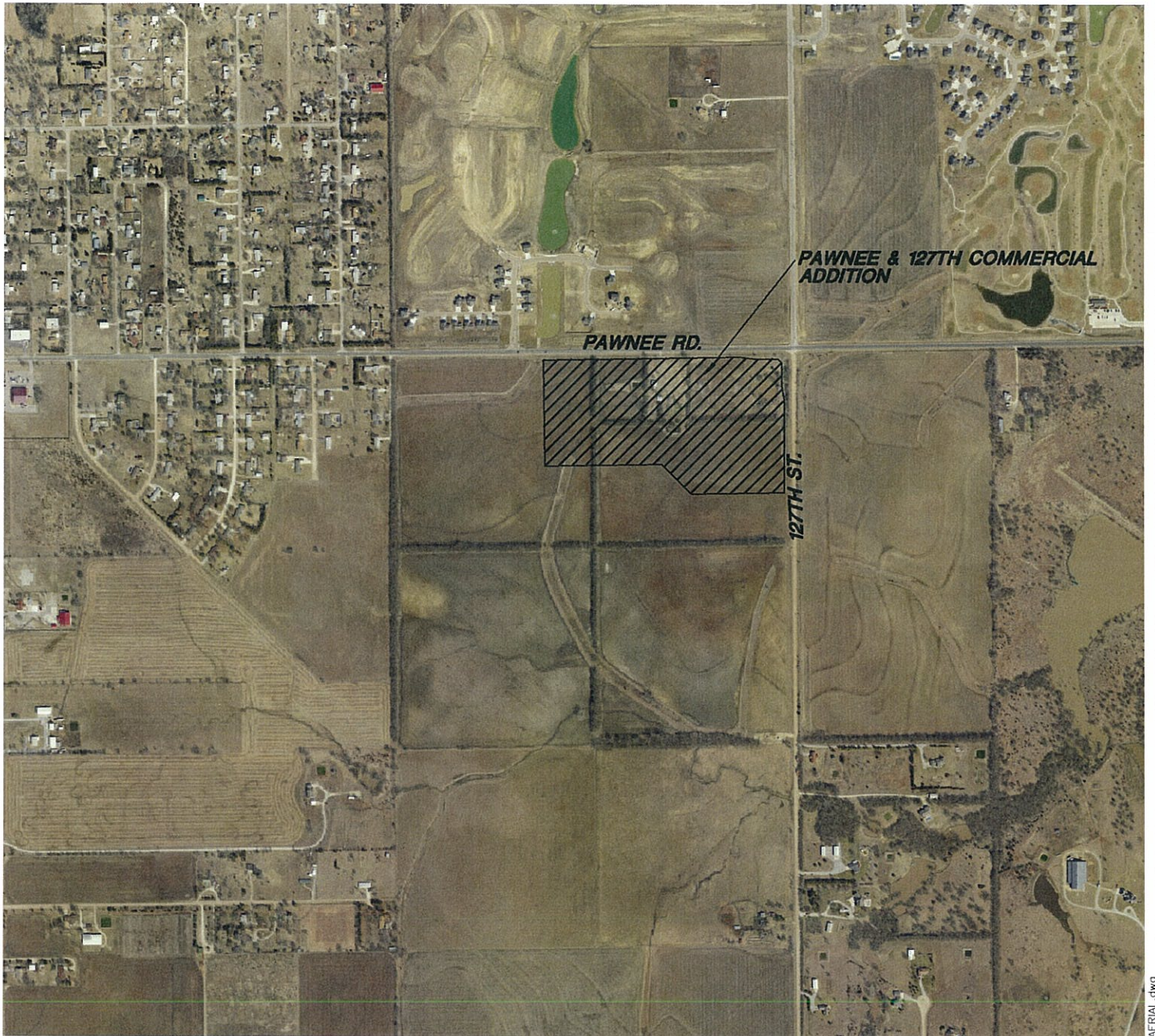
Existing sanitary sewer has been constructed north of Pawnee Road with the Casa Bella Addition.

### ***Groundwater Elevations***

According to the Kansas Geological Survey Water Well Records, the static water level in the area ranges from 19 feet to 30 feet deep.

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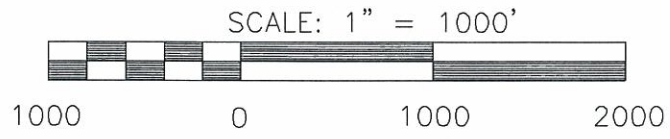
**Appendix 2.1**  
Aerial Photograph



**PAWNEE & 127TH COMMERCIAL ADDITION**

**PAWNEE RD.**

**127TH ST.**



J:\Civil\10162 - Occidental\dwg\DRNG\00162\_AERIAL.dwg

**MKEC**  
ENGINEERING  
CONSULTANTS, INC.

411 N. WEBB ROAD  
WICHITA, KS. 67206  
316 - 684 - 9600

**PAWNEE & 127TH COMMERCIAL ADDITION**  
PROJECT NAME

**AERIAL MAP**  
SHEET TITLE

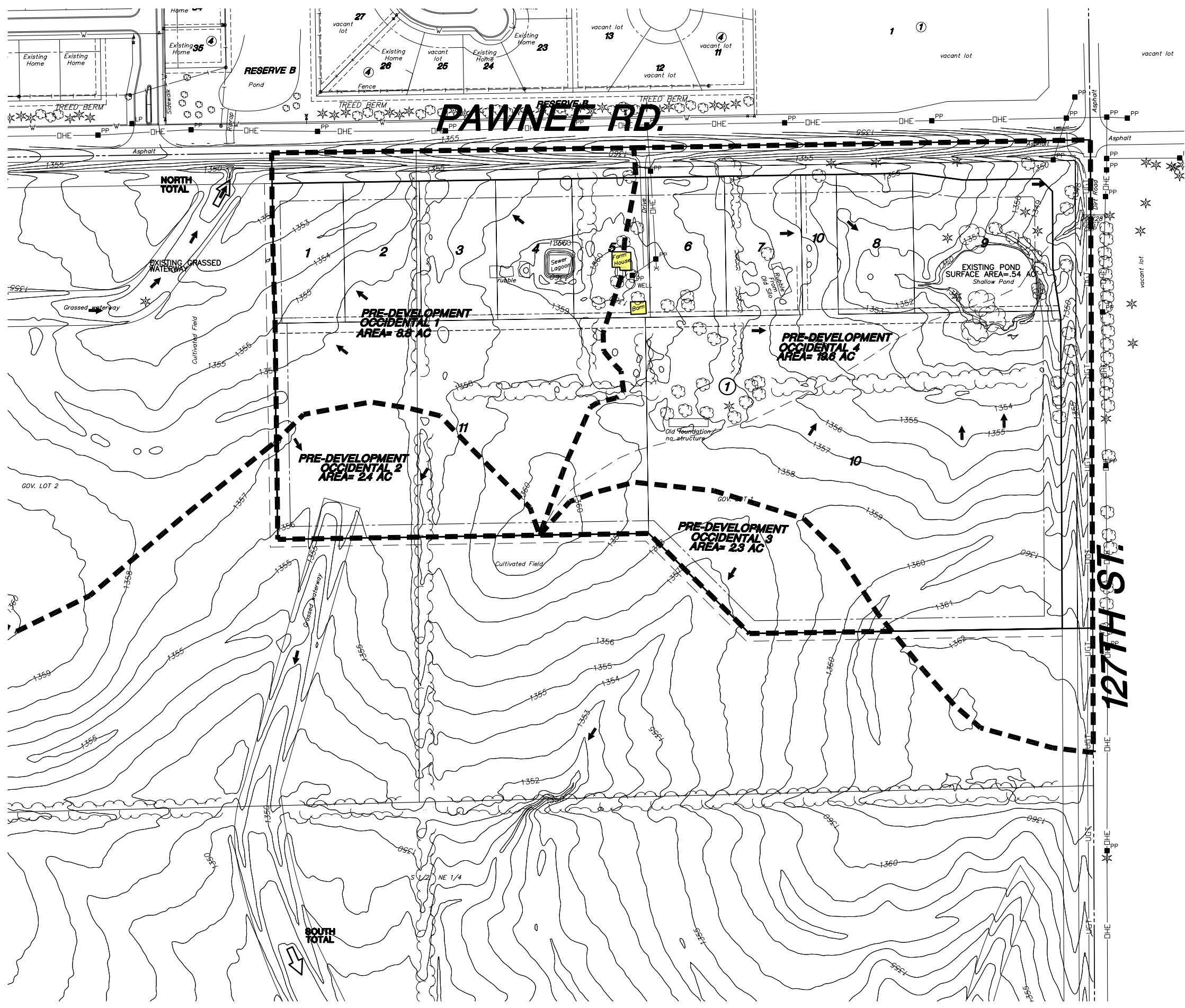
**KLA** | **CMJ** | **GJA**  
DESIGN BY: | DRAWN BY: | CHECKED BY:

**JUNE 2010** | **10162** | **1 / 1**  
DATE | JOB NO. | SHEET/OF

## Appendix 2.2

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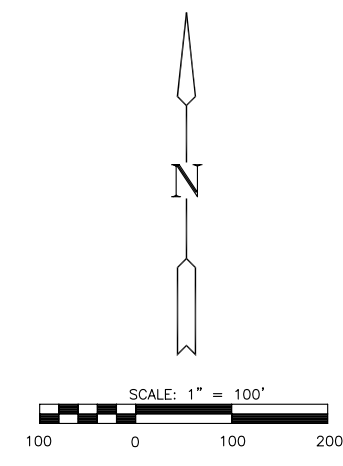
### Existing Conditions Map



- LEGEND**
- ⊛ - CONIFEROUS TREE
  - - DECIDUOUS TREE
  - SN - SIGN
  - PP - POWER POLE
  - ELEC. BOX - ELECTRIC BOX
  - LP - LIGHT POLE
  - FH - FIRE HYDRANT
  - WV - WATER VALVE
  - WM - WATER METER
  - △ - SECTION CORNER
  - BM - BENCHMARK
  - - - - - EASEMENT
  - - - - - BUILDING SETBACK
  - - - - - FENCE
  - - - - - STORM SEWER PIPE
  - - - - - WATER LINE
  - - - - - SANITARY SEWER LINE
  - - - - - GAS LINE
  - - - - - GAS PIPELINE
  - - - - - TELEPHONE LINE
  - - - - - UNDERGROUND ELEC.
  - - - - - OVERHEAD ELECTRIC
  - - - - - FIBER OPTIC CABLE
  - - - - - DRAINAGE SUB BASIN
  - - - - - DRAINAGE BASIN
  - - FLOW ARROW
  - A17 - AREA FOR SWS SIZING

**BENCH MARK**

BM #1 Top of concrete witness monument  
30.5 feet W. centerline 127th St. E  
and 51.5 feet S. Pawnee Rd.  
Elev. = 1349.31 (NAVD 88)  
1348.81 (NGVD 29)  
(FROM GPS)



**PAWNEE & 127TH COMMERCIAL ADDITION**  
WICHITA, KANSAS  
**EXISTING CONDITIONS PLAN**

DATE	June 10
REVISED	

DESIGN BY	KLA
DRAWN BY	CMJ
CHECKED BY	GJA

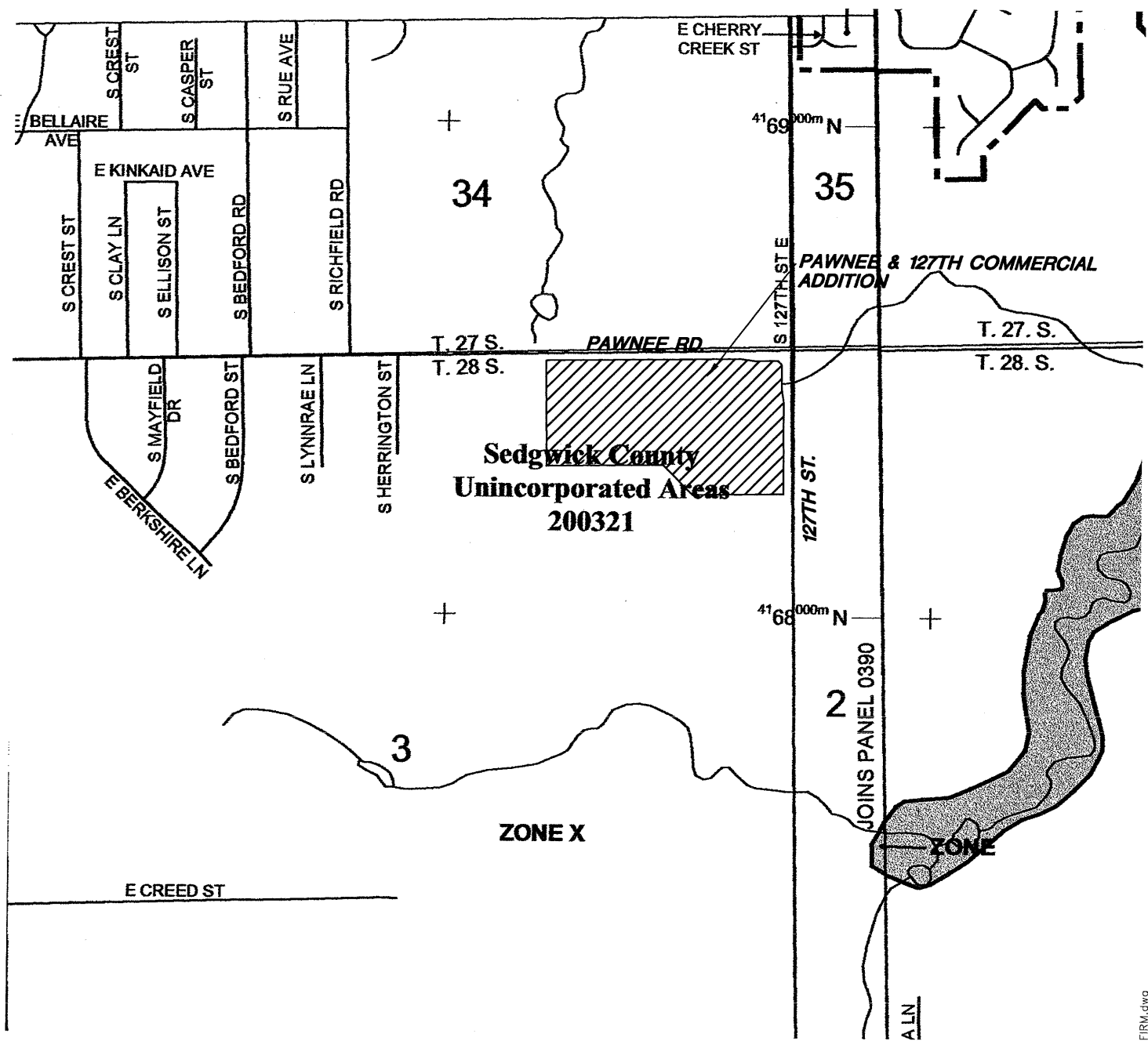
SHEET NUMBER	1
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J:\Civil\10162 - Occidental\dwg\DRNG\10162\_Existing Conditions.dwg

## Appendix 2.3

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### Flood Insurance Rate Map (FIRM)



**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0390E**

**FIRM**  
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,  
KANSAS  
AND INCORPORATED AREAS

PANEL 390 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0390	E
WICHITA, CITY OF	200328	0390	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER  
20173C0390E

EFFECTIVE DATE  
FEBRUARY 2, 2007

Federal Emergency Management Agency

**NATIONAL FLOOD INSURANCE PROGRAM**

**PANEL 0395E**

**FIRM**  
FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY,  
KANSAS  
AND INCORPORATED AREAS

PANEL 395 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

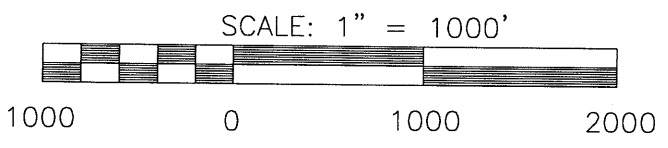
COMMUNITY	NUMBER	PANEL	SUFFIX
SEDGWICK COUNTY	200321	0395	E
WICHITA, CITY OF	200328	0395	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER  
20173C0395E

EFFECTIVE DATE  
FEBRUARY 2, 2007

Federal Emergency Management Agency



**MKEC**  
ENGINEERING  
CONSULTANTS, INC.

411 N. WEBB ROAD  
WICHITA, KS. 67206  
316 - 684 - 9600

**PAWNEE & 127TH COMMERCIAL ADDITION**  
PROJECT NAME

**FIRM MAP**  
SHEET TITLE

DESIGN BY: KLA DRAWN BY: CMJ CHECKED BY: GJA

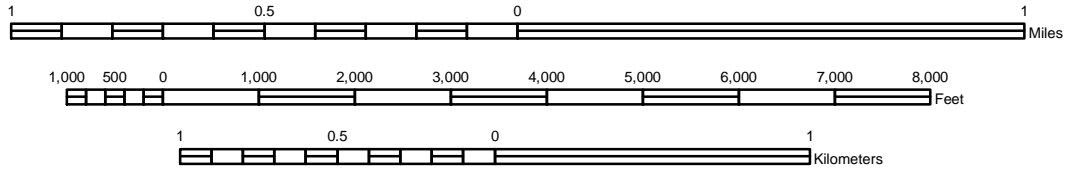
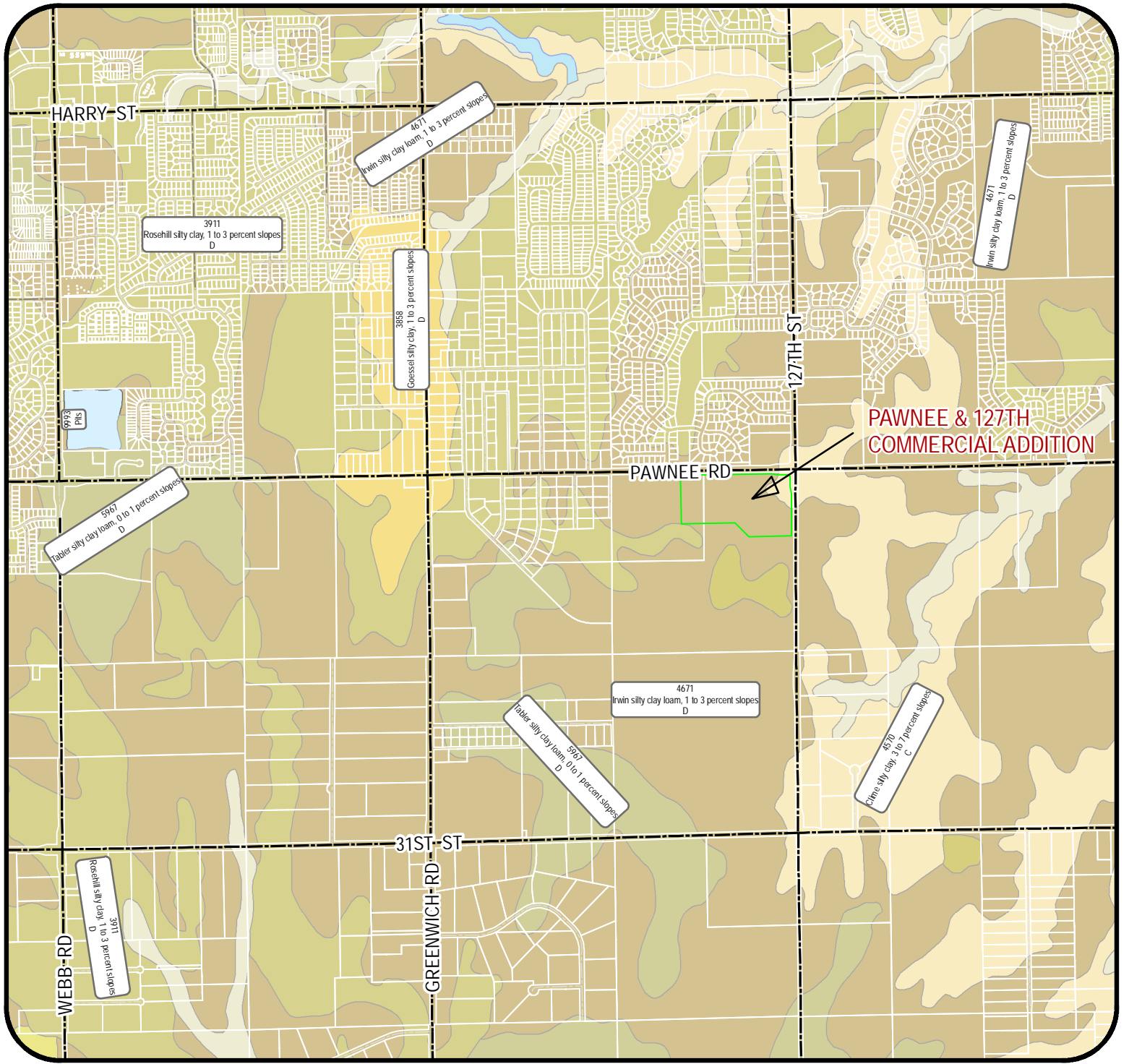
DATE: JUNE 2010 JOB NO.: 10162 SHEET/OF: 1 / 1

J:\Civil\10162 - Occidental\dwg\DRNG\00162\_FIRM.dwg

## Appendix 2.4

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### Soil Survey



J:\Civil\10162\dwg\DRNG\trcs-soil.mxd

**PAWNEE & 127TH COMMERCIAL ADDITION**

Project Name:  
Soil Survey - Sedgwick County, KS

Sheet Title:

	CMJ	JUNE 2010
	Drawn By: KLA	Date: 10162
	Design / Review:	Job No.:

## Appendix 2.5

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### Hydraflow Hydrographs Output

# Watershed Model Schematic

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

1 - Pre-Project Occidental 4



2 - Pre-Project Occidental 4



## Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	Pre-Project Occidental 4
2	SCS Runoff	Pre-Project Occidental 4

# Hydrograph Return Period Recap

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

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-----	-----	40.23	-----	59.93	73.03	92.80	-----	121.06	Pre-Project Occidental 4
2	SCS Runoff	-----	-----	39.39	-----	52.66	61.29	74.17	-----	92.48	Pre-Project Occidental 4

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	40.23	2	726	3.191	-----	-----	-----	Pre-Project Occidental 4
2	SCS Runoff	39.39	2	720	2.509	-----	-----	-----	Pre-Project Occidental 4
Northeast Drainage.gpw					Return Period: 2 Year			Friday, Jun 11, 2010	

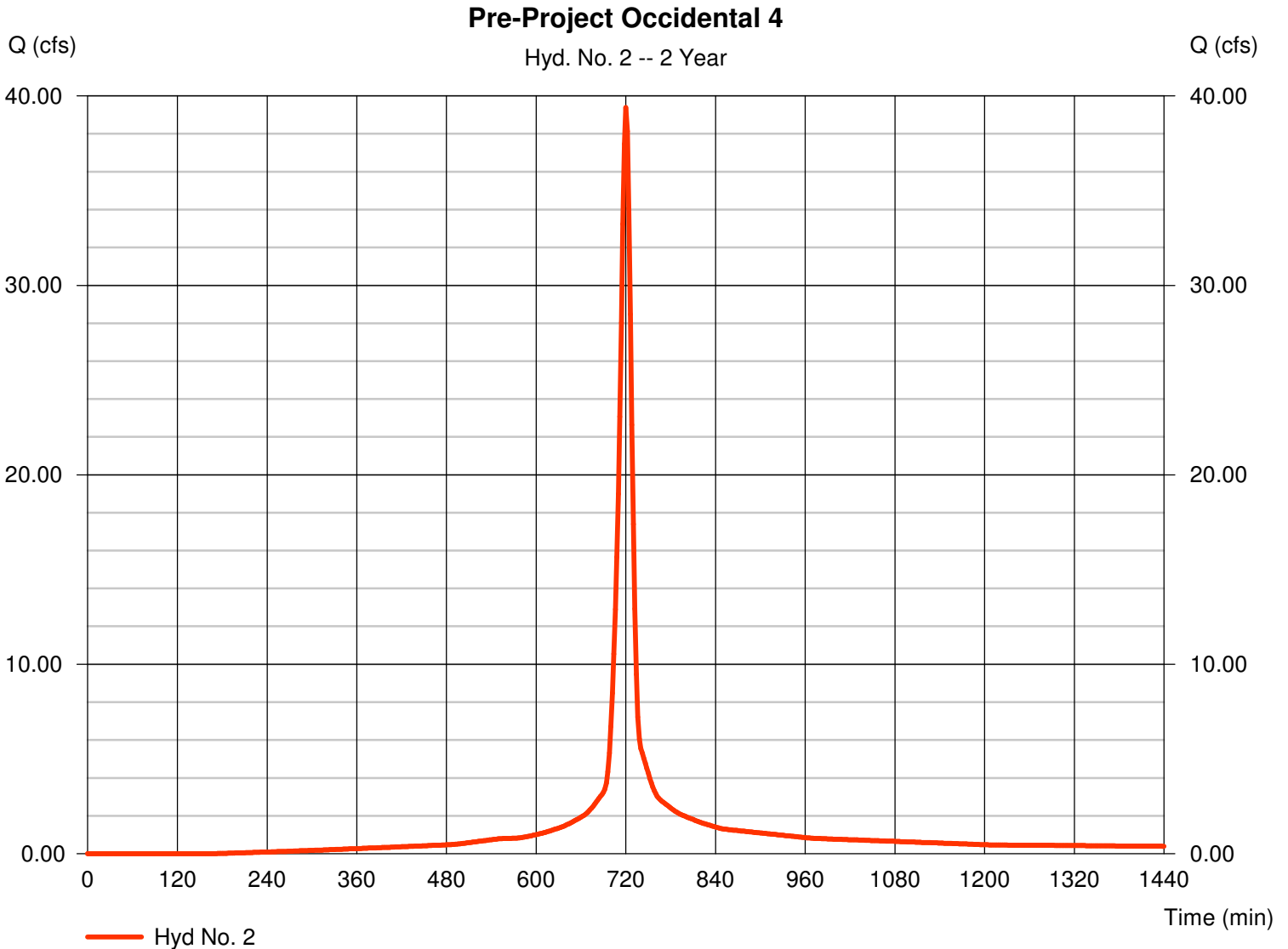
# Hydrograph Report

## Hyd. No. 2

Pre-Project Occidental 4

Hydrograph type = SCS Runoff  
Storm frequency = 2 yrs  
Time interval = 2 min  
Drainage area = 10.000 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 3.48 in  
Storm duration = 24 hrs

Peak discharge = 39.39 cfs  
Time to peak = 720 min  
Hyd. volume = 2.509 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.40 min  
Distribution = Type II  
Shape factor = 484



# TR55 Tc Worksheet

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

## Hyd. No. 2

Pre-Project Occidental 4

<u>Description</u>	<u>A</u>		<u>B</u>		<u>C</u>		<u>Totals</u>
<b>Sheet Flow</b>							
Manning's n-value	= 0.013		0.011		0.011		
Flow length (ft)	= 150.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.48		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 2.42</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>2.42</b>
<b>Shallow Concentrated Flow</b>							
Flow length (ft)	= 750.00		0.00		0.00		
Watercourse slope (%)	= 0.60		0.00		0.00		
Surface description	= Paved		Paved		Paved		
Average velocity (ft/s)	= 1.57		0.00		0.00		
<b>Travel Time (min)</b>	<b>= 7.94</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>7.94</b>
<b>Channel Flow</b>							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	= 0.00		0.00		0.00		
Flow length (ft)	= 0.0		0.0		0.0		
<b>Travel Time (min)</b>	<b>= 0.00</b>	<b>+</b>	<b>0.00</b>	<b>+</b>	<b>0.00</b>	<b>=</b>	<b>0.00</b>
<b>Total Travel Time, Tc .....</b>							<b>10.40 min</b>

# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	59.93	2	726	4.757	-----	-----	-----	Pre-Project Occidental 4
2	SCS Runoff	52.66	2	720	3.415	-----	-----	-----	Pre-Project Occidental 4
Northeast Drainage.gpw					Return Period: 5 Year			Friday, Jun 11, 2010	

# Hydrograph Report

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

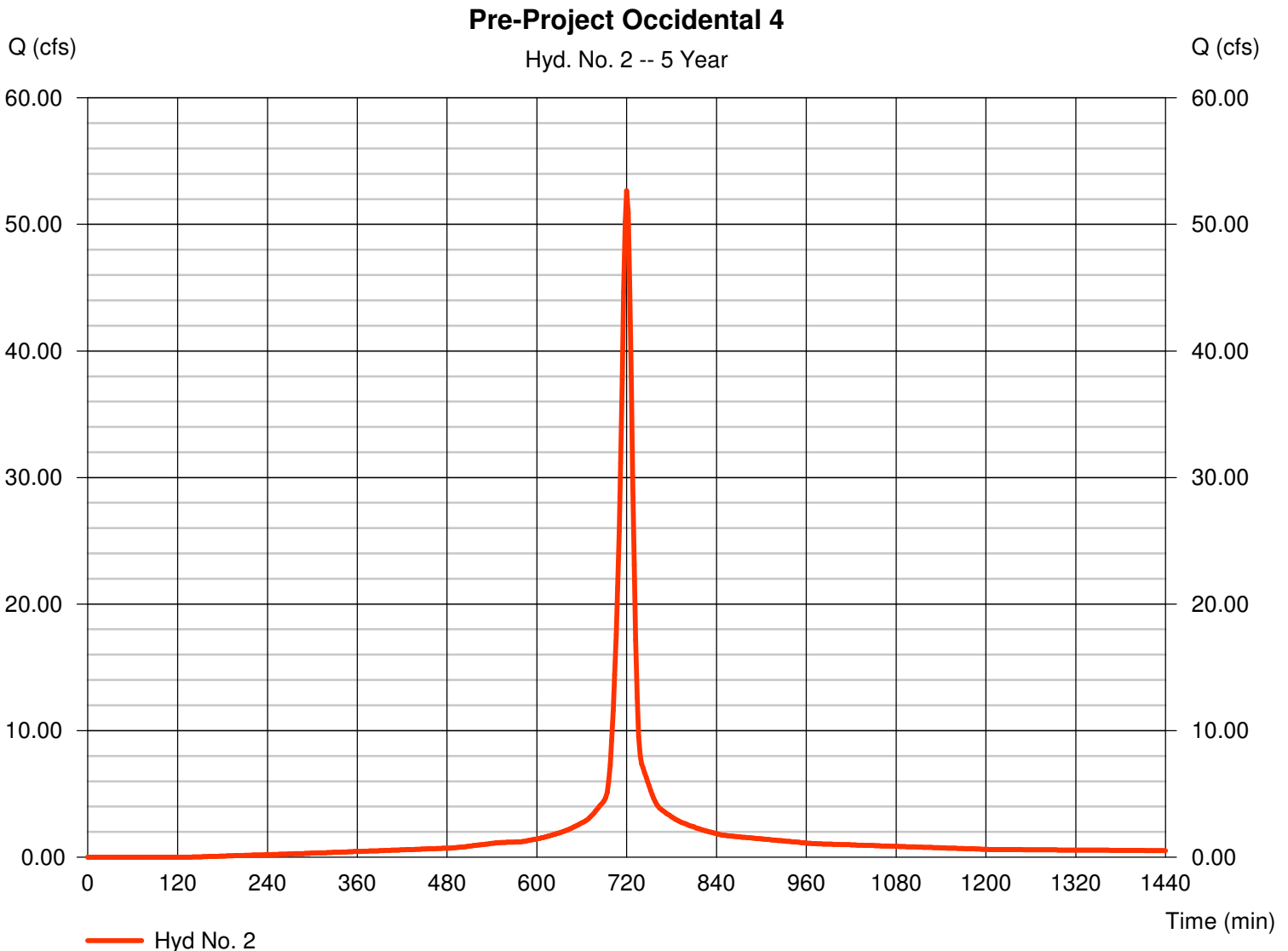
Friday, Jun 11, 2010

## Hyd. No. 2

Pre-Project Occidental 4

Hydrograph type = SCS Runoff  
 Storm frequency = 5 yrs  
 Time interval = 2 min  
 Drainage area = 10.000 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 4.55 in  
 Storm duration = 24 hrs

Peak discharge = 52.66 cfs  
 Time to peak = 720 min  
 Hyd. volume = 3.415 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.40 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	73.03	2	726	5.819	-----	-----	-----	Pre-Project Occidental 4
2	SCS Runoff	61.29	2	720	4.011	-----	-----	-----	Pre-Project Occidental 4
Northeast Drainage.gpw					Return Period: 10 Year			Friday, Jun 11, 2010	

# Hydrograph Report

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

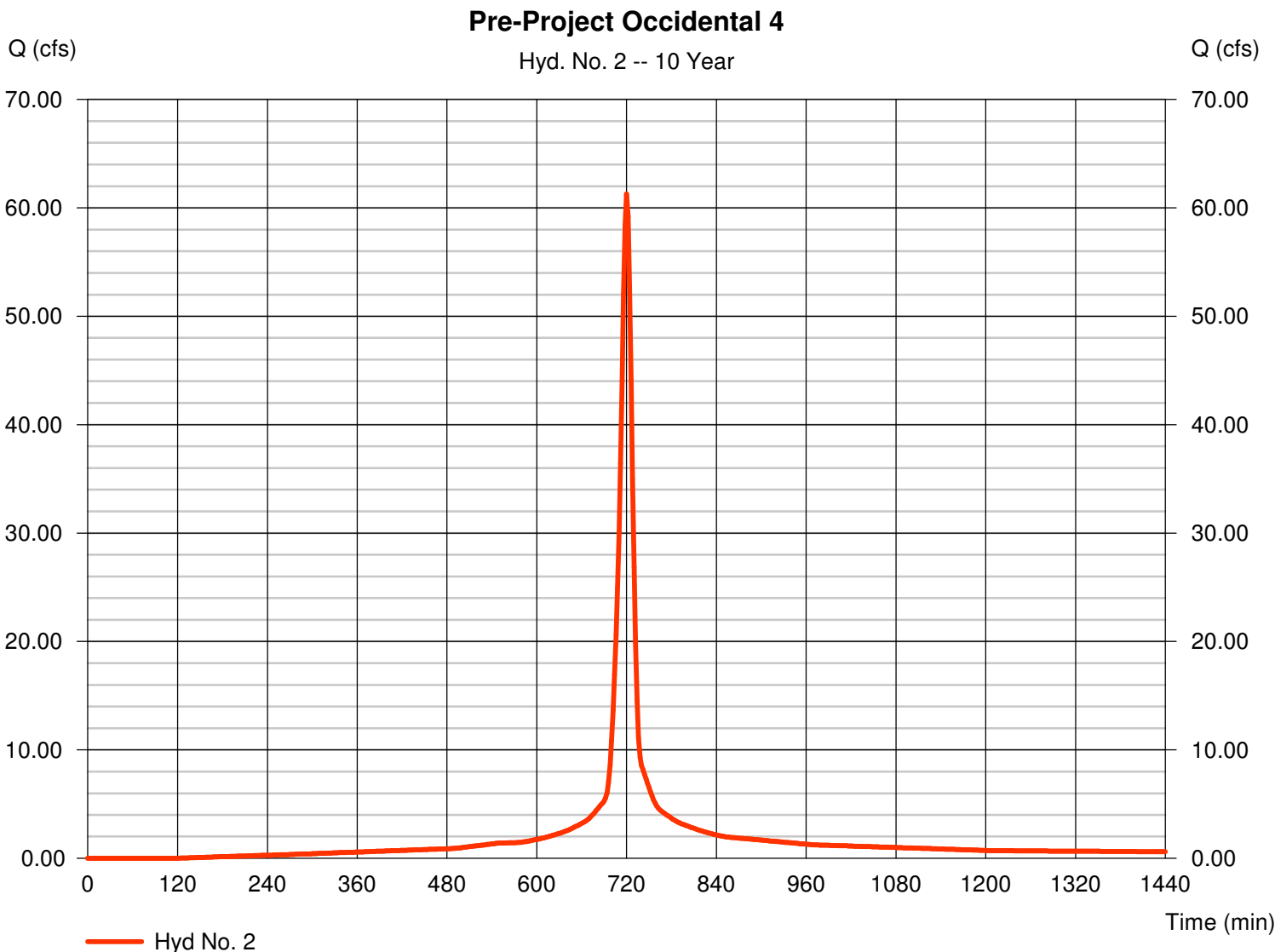
Friday, Jun 11, 2010

## Hyd. No. 2

Pre-Project Occidental 4

Hydrograph type = SCS Runoff  
 Storm frequency = 10 yrs  
 Time interval = 2 min  
 Drainage area = 10.000 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 5.25 in  
 Storm duration = 24 hrs

Peak discharge = 61.29 cfs  
 Time to peak = 720 min  
 Hyd. volume = 4.011 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.40 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	92.80	2	726	7.445	-----	-----	-----	Pre-Project Occidental 4
2	SCS Runoff	74.17	2	720	4.907	-----	-----	-----	Pre-Project Occidental 4
Northeast Drainage.gpw					Return Period: 25 Year			Friday, Jun 11, 2010	

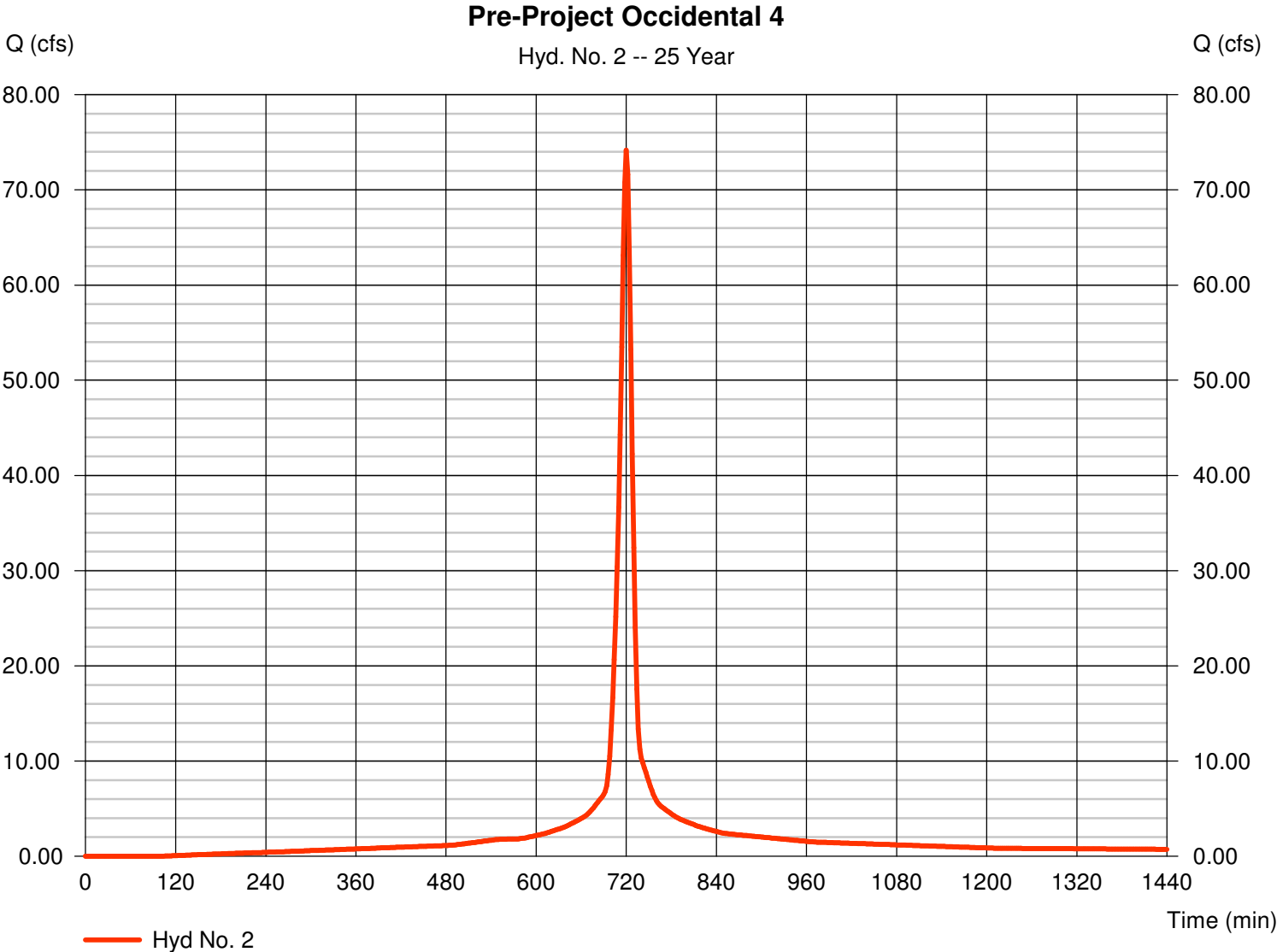
# Hydrograph Report

## Hyd. No. 2

### Pre-Project Occidental 4

Hydrograph type = SCS Runoff  
Storm frequency = 25 yrs  
Time interval = 2 min  
Drainage area = 10.000 ac  
Basin Slope = 0.0 %  
Tc method = TR55  
Total precip. = 6.30 in  
Storm duration = 24 hrs

Peak discharge = 74.17 cfs  
Time to peak = 720 min  
Hyd. volume = 4.907 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 10.40 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Summary Report

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

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (acft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (acft)	Hydrograph description
1	SCS Runoff	121.06	2	726	9.814	-----	-----	-----	Pre-Project Occidental 4
2	SCS Runoff	92.48	2	720	6.189	-----	-----	-----	Pre-Project Occidental 4
Northeast Drainage.gpw					Return Period: 100 Year			Friday, Jun 11, 2010	

# Hydrograph Report

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

Friday, Jun 11, 2010

## Hyd. No. 2

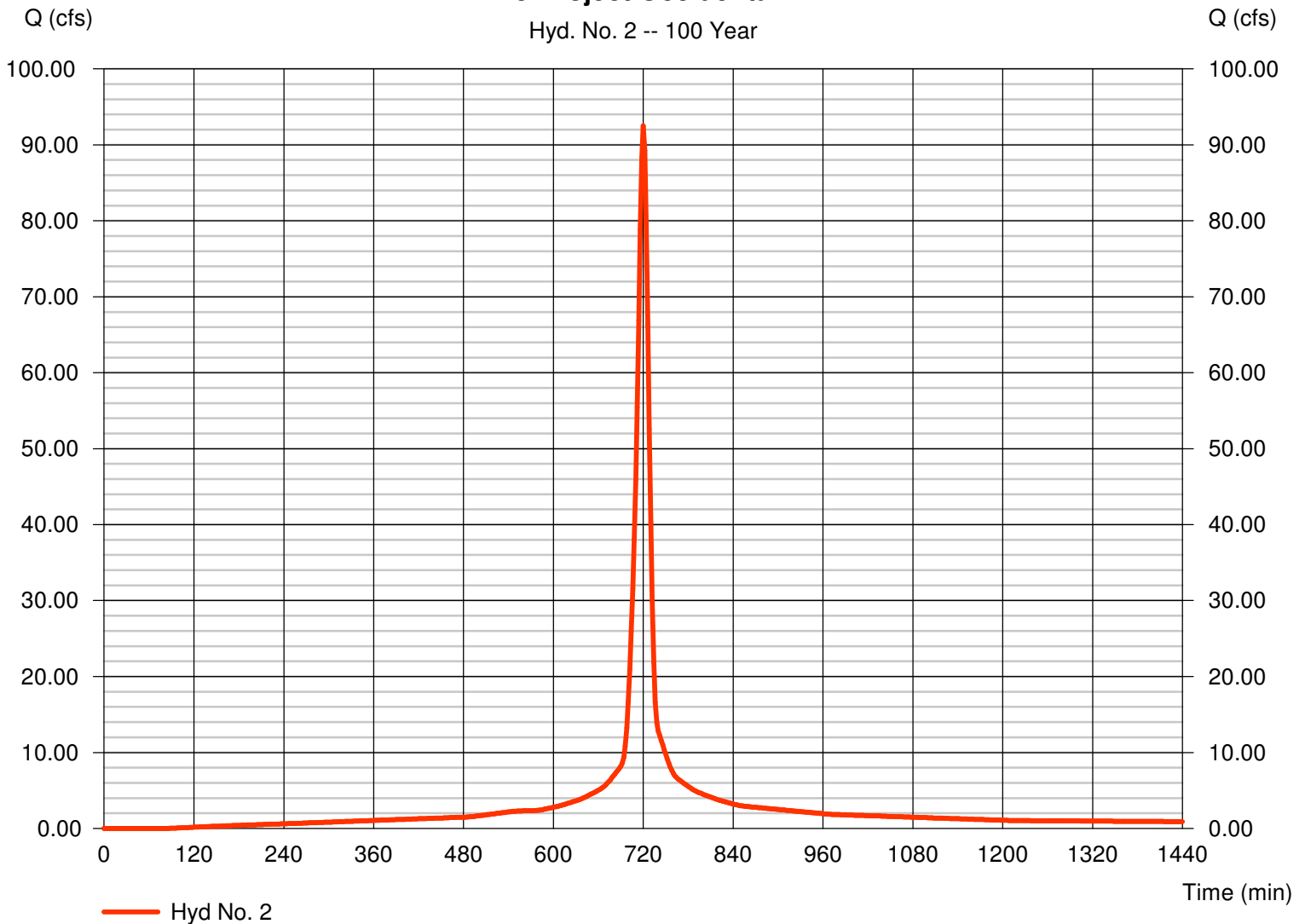
### Pre-Project Occidental 4

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 2 min  
 Drainage area = 10.000 ac  
 Basin Slope = 0.0 %  
 Tc method = TR55  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 92.48 cfs  
 Time to peak = 720 min  
 Hyd. volume = 6.189 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 10.40 min  
 Distribution = Type II  
 Shape factor = 484

### Pre-Project Occidental 4

Hyd. No. 2 -- 100 Year



## Appendix 2.6

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### 127<sup>th</sup> Street Culvert Calculations

# Culvert Report

## 127th Street Culvert

Invert Elev Dn (ft) = 1344.70  
Pipe Length (ft) = 35.00  
Slope (%) = 2.00  
Invert Elev Up (ft) = 1345.40  
Rise (in) = 28.0  
Shape = Ell  
Span (in) = 20.0  
No. Barrels = 1  
n-Value = 0.023  
Inlet Edge = Projecting  
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.5

### Embankment

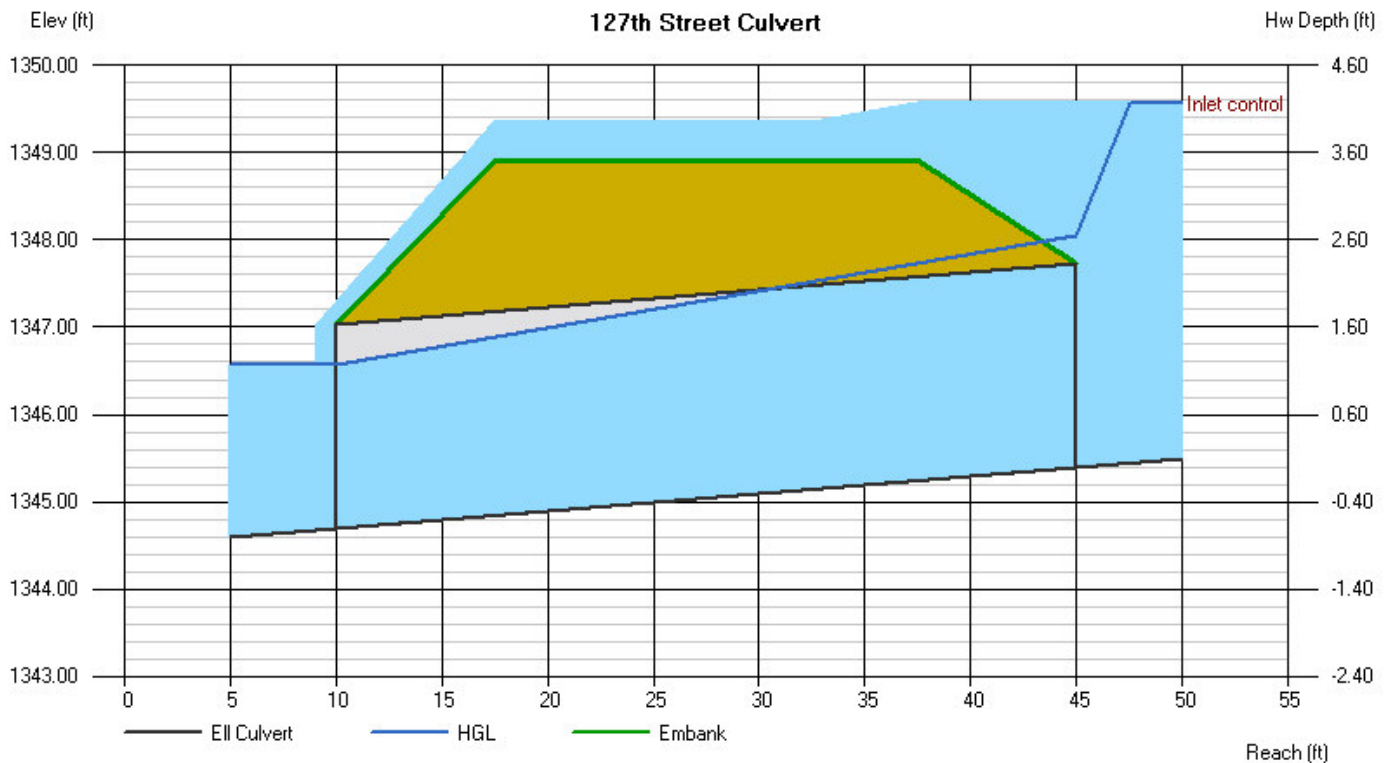
Top Elevation (ft) = 1348.90  
Top Width (ft) = 20.00  
Crest Width (ft) = 50.00

### Calculations

Qmin (cfs) = 0.00  
Qmax (cfs) = 120.00  
Tailwater Elev (ft) = Normal

### Highlighted

Qtotal (cfs) = 110.00  
Qpipe (cfs) = 22.30  
Qovertop (cfs) = 87.70  
Veloc Dn (ft/s) = 8.57  
Veloc Up (ft/s) = 7.30  
HGL Dn (ft) = 1346.57  
HGL Up (ft) = 1348.04  
Hw Elev (ft) = 1349.56  
Hw/D (ft) = 1.78  
Flow Regime = Inlet Control



Q		Veloc		Depth		HGL				
Total	Pipe	Over	Dn	Up	Dn	Up	Dn	Up	Hw	Hw/D
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)	
10.00	10.00	0.00	8.68	3.27	11.20	28.00	1345.63	1347.81	1347.89	1.07
20.00	18.23	1.77	8.74	5.97	18.20	28.00	1346.22	1347.91	1348.94	1.52
30.00	18.61	11.39	8.92	6.09	18.20	28.00	1346.22	1347.98	1349.04	1.56
40.00	20.69	19.31	8.49	6.77	21.00	28.00	1346.45	1347.93	1349.16	1.61
50.00	20.96	29.04	8.60	6.86	21.00	28.00	1346.45	1347.97	1349.22	1.64
60.00	21.14	38.86	8.67	6.92	21.00	28.00	1346.45	1348.00	1349.27	1.66
70.00	21.34	48.66	8.76	6.99	21.00	28.00	1346.45	1348.03	1349.32	1.68
80.00	21.49	58.51	8.82	7.04	21.00	28.00	1346.45	1348.05	1349.35	1.69
90.00	21.74	68.26	8.92	7.12	21.00	28.00	1346.45	1348.09	1349.41	1.72
100.00	22.22	77.78	9.12	7.28	21.00	28.00	1346.45	1348.16	1349.54	1.77
110.00	22.30	87.70	8.57	7.30	22.40	28.00	1346.57	1348.04	1349.56	1.78
120.00	22.38	97.62	8.60	7.33	22.40	28.00	1346.57	1348.05	1349.58	1.79

# Culvert Report

## 127th Street Culvert

Invert Elev Dn (ft) = 1344.70  
Pipe Length (ft) = 35.00  
Slope (%) = 2.00  
Invert Elev Up (ft) = 1345.40  
Rise (in) = 29.0  
Shape = Ell  
Span (in) = 45.0  
No. Barrels = 2  
n-Value = 0.013  
Inlet Edge = Projecting  
Coeff. K,M,c,Y,k = 0.0045, 2, 0.0317, 0.69, 0.5

### Embankment

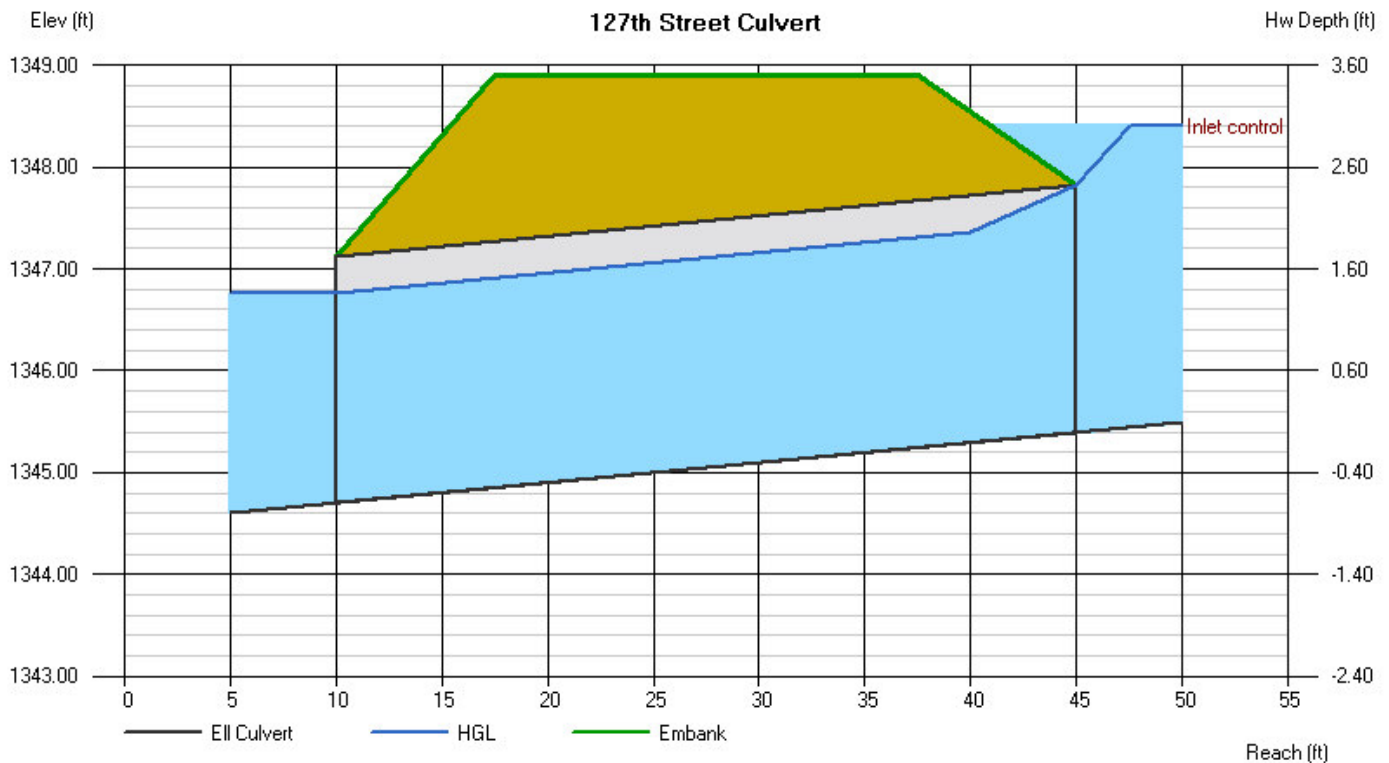
Top Elevation (ft) = 1348.90  
Top Width (ft) = 20.00  
Crest Width (ft) = 50.00

### Calculations

Qmin (cfs) = 0.00  
Qmax (cfs) = 90.00  
Tailwater Elev (ft) = Normal

### Highlighted

Qtotal (cfs) = 90.00  
Qpipe (cfs) = 90.00  
Qovertop (cfs) = 0.00  
Veloc Dn (ft/s) = 7.01  
Veloc Up (ft/s) = 7.01  
HGL Dn (ft) = 1346.75  
HGL Up (ft) = 1347.45  
Hw Elev (ft) = 1348.40  
Hw/D (ft) = 1.24  
Flow Regime = Inlet Control



Q		Veloc		Depth		HGL				
Total	Pipe	Over	Dn	Up	Dn	Up	Dn	Up	Hw	Hw/D
(cfs)	(cfs)	(cfs)	(ft/s)	(ft/s)	(in)	(in)	(ft)	(ft)	(ft)	
10.00	10.00	0.00	2.71	13.01	8.70	2.90	1345.43	1345.64	1347.06	0.69
20.00	20.00	0.00	3.73	3.73	11.60	11.60	1345.67	1346.37	1346.59	0.49
30.00	30.00	0.00	4.21	4.21	14.50	14.50	1345.91	1346.61	1346.90	0.62
40.00	40.00	0.00	4.51	4.51	17.40	17.40	1346.15	1346.85	1347.20	0.75
50.00	50.00	0.00	5.14	5.14	18.85	18.85	1346.27	1346.97	1347.44	0.84
60.00	60.00	0.00	5.69	5.69	20.30	20.30	1346.39	1347.09	1347.67	0.94
70.00	70.00	0.00	6.16	6.16	21.75	21.75	1346.51	1347.21	1347.91	1.04
80.00	80.00	0.00	6.60	6.60	23.20	23.20	1346.63	1347.33	1348.15	1.14
90.00	90.00	0.00	7.01	7.01	24.65	24.65	1346.75	1347.45	1348.40	1.24

## Tab 3. Post-Development Conditions

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### ***Description***

The site is 31.6 acres that will develop for commercial usage. Eight of the lots are approximately 1.0 acre in size, the 9<sup>th</sup> lot is 1.7 acres in size and the remaining two lots are larger commercial lots that are 7.1 acres and 11.7 acres.

### ***Drainage Calculations***

#### ***Runoff Method***

The site was modeled using Hydraflow Hydrographs by AutoCAD 2009, Appendix 2.5. The model was originally created for the *USD 259 4<sup>th</sup> Addition Drainage Report*.

#### ***Rainfall***

The rainfall information used is from the Kansas Department of Transportation Rainfall Depth Tables for Kansas Counties June 1997. The rainfall values used are shown in Table 3.1.

Table 3.1. 24-Hour Rainfall Depths.

	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Sedgwick	3.50	4.53	5.24	6.24	7.80

#### ***Time of Concentration***

Time of concentration was calculated using the TR-55 method. Calculations are in Appendix 2.5.

#### ***Curve Numbers***

Weighted curve numbers were calculated to represent the land usage of the basins. A curve number of 95 was used to represent the commercial development. The curve numbers are shown in Table 3.2.

#### ***Drainage Patterns***

The site will continue to drain in three directions. The basin draining to the north (Occidental 1) will drain to the proposed detention pond provided in the USD 259 4<sup>th</sup> Addition. The dividing line between the northeast basin (Occidental 4) and the south basin (Occidental 2 & 3) will be graded to route a portion of Occidental 4 to the south and west and into detention ponds provided with the USD 259 4<sup>th</sup> Addition. The Occidental 4 basin will be reduced from 19.6 acres to 10.0 acres. Decreasing the size of the area draining to 127<sup>th</sup> Street will reduce the peak flow rate to 127<sup>th</sup> Street below pre-development flow rates during all design storms. Even though the peak flow rate to the 127<sup>th</sup> Street culvert has been decreased from pre-development conditions the existing culvert under 127<sup>th</sup> Street still does not have the capacity to convey the flow from the development. This culvert will be replaced by 2-29"x45" Horizontal Elliptical Concrete Pipes (HECP), the equivalent to 2-36" round pipes. By increasing the pipe sizes 127<sup>th</sup> Street will not overtop during a 100-year design storm. The pipes were analyzed using Hydraflow Express, Appendix 2.6.

**Table 3.1. Post-Development Flow Rates.**

Description	Area (ac.)	Tc (min.)	CN	Design Storm Flows (cfs)				
				2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
North Total*	-	-	-	61.8	81.8	94.3	113.6	146.0
South Total*	-	-	-	283.1	401.3	476.0	604.0	825.1
To 127 <sup>th</sup> /Occ. 4	10.0	10.4	95.0	39.4	52.3	61.3	74.2	92.5

\* From USD 259 4<sup>th</sup> Addition May 7, 2010 Drainage Report by Ruggles and Bohm.

## ***Utilities***

### ***Storm Water Sewer***

Proposed storm water sewer will convey runoff from the lots to the proposed detention ponds on the USD 259 4<sup>th</sup> Addition property and to 127<sup>th</sup> Street. Storm sewer has been sized to convey the 5-year design event with overland escape routes for larger design events. The Storm Water Sewer layout is shown on the Drainage and Utility Plan, Appendix 3.1. Pipe sizing calculations were done using Hydraflow Storm Sewers by AutoCAD 2009, Appendix 3.2.

### ***Water***

The proposed water system will tie into the existing system north of Pawnee Road. The water line will run along the lot 10 and along the back of the remaining lots.

### ***Sanitary Sewer***

A sanitary sewer line serves the existing residential addition north of Pawnee Road. A proposed sanitary sewer line will connect into this existing line and will flow from south to north, west of the west property line of this development. A line will also be constructed south of Lots 1-9 Block 1 to serve the development.

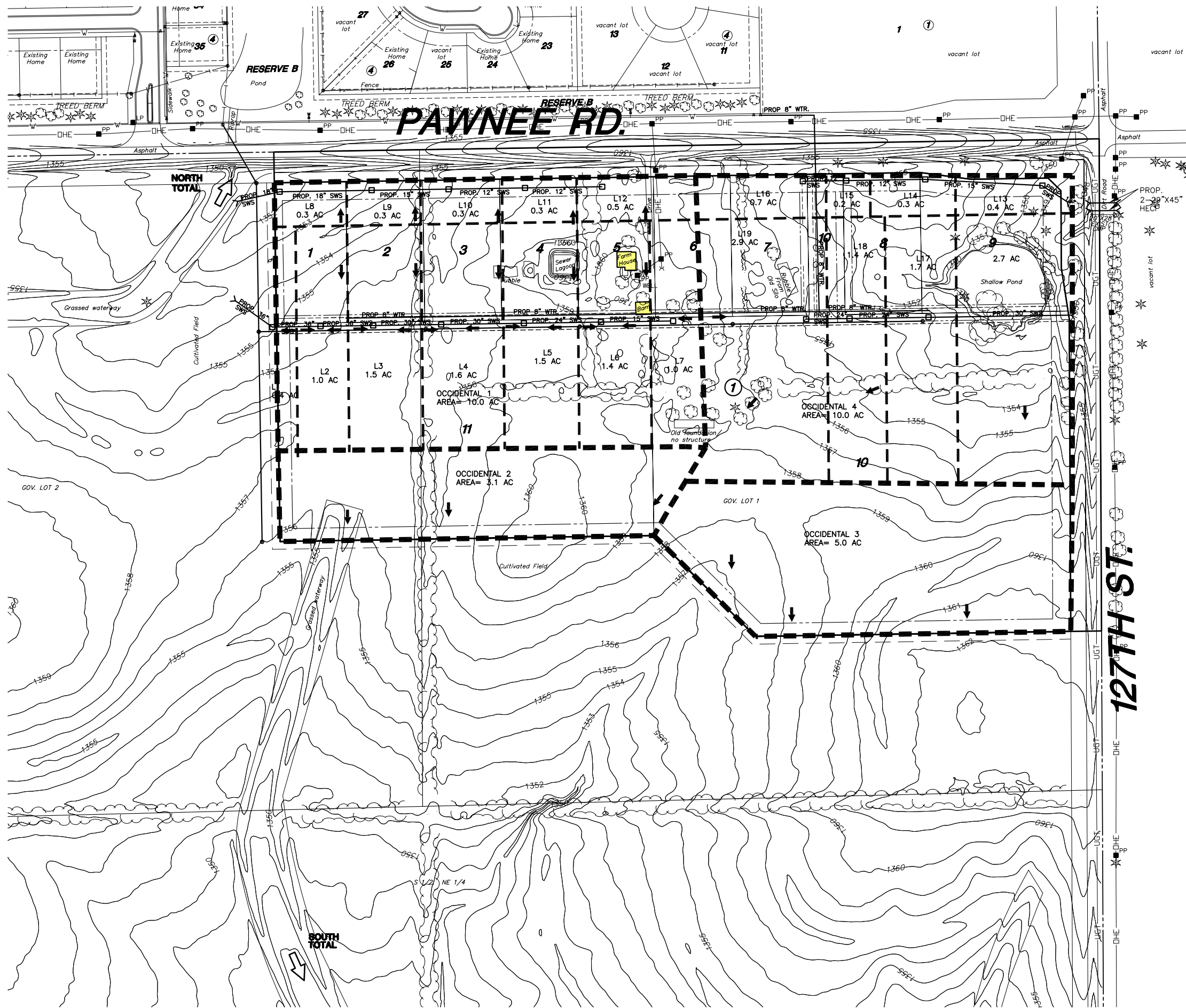
### ***Minimum Lowest Opening***

Lot 1 Block 1 will have a minimum lowest opening of 1354.5. Lot 10 Block 1 will have a minimum lowest opening of 1357.1. Lot 11 Block 1 will have a minimum lowest opening of 1356.5. These elevations are 3 feet above the 100-year water surface elevation of the adjacent detention facilities.

## Appendix 3.1

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### Drainage and Utility Plan

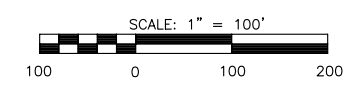


**PAWNEE & 127TH COMMERCIAL ADDITION**  
WICHITA, KANSAS  
**DRAINAGE AND UTILITY PLAN**

DATE	June 10
REVISED	

DESIGN BY	KLA
DRAWN BY	CMJ
CHECKED BY	GJA

SHEET NUMBER  
**1**

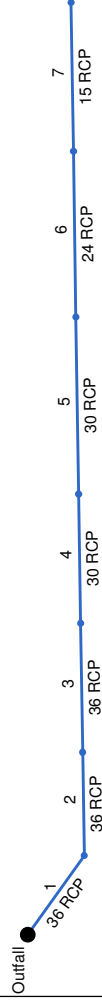


## Appendix 3.2

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### Hydraflow Storm Sewers

# Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2009 Plan



Project File: Preliminary Pipe Sizing 6-2010.stm

Number of lines: 19

Date: 06-14-2010

# Storm Sewer Tabulation

Station	Line To Line	Len (ft)	Drng Area (ac)		Rnoff coeff (C)	Area x C		Tc (min)		Rain (l) (in/hr)	Total flow (cfs)	Cap full (cfs)	Vel (ft/s)	Pipe		Invert Elev (ft)		HGL Elev (ft)		Grnd / Rim Elev (ft)		Line ID
			Incr	Total		Incr	Total	Inlet	Syst					Incr	Slope (%)	Dn	Up	Dn	Up	Dn	Up	
1	End	88.411	0.10	8.10	0.87	0.09	7.05	15.0	18.8	4.2	29.80	25.57	6.09	36	0.15	1349.50	1349.63	1351.24	1351.91	1351.50	1353.50	36 RCP
2	1	93.974	1.00	8.00	0.87	0.87	6.96	15.0	18.4	4.3	29.70	25.74	4.20	36	0.15	1349.73	1349.87	1352.73	1352.87	1353.50	1353.50	36 RCP
3	2	117.623	1.50	7.00	0.87	1.31	6.09	15.0	17.8	4.3	26.34	26.09	3.73	36	0.15	1349.97	1350.15	1353.01	1353.15	1353.50	1353.50	36 RCP
4	3	117.623	1.60	5.50	0.87	1.39	4.79	15.0	17.4	4.4	20.94	16.05	4.27	30	0.15	1350.25	1350.43	1353.26	1353.56	1353.50	1354.10	30 RCP
5	4	161.396	1.50	3.90	0.87	1.31	3.39	15.0	16.5	4.5	15.18	18.26	3.09	30	0.20	1350.53	1350.85	1353.71	1353.93	1354.10	1354.80	30 RCP
6	5	150.742	1.40	2.40	0.87	1.22	2.09	15.0	15.7	4.6	9.55	10.09	3.04	24	0.20	1350.95	1351.25	1354.00	1354.27	1354.80	1355.50	24 RCP
7	6	135.454	1.00	1.00	0.87	0.87	0.87	15.0	15.0	4.7	4.06	4.08	3.30	15	0.40	1351.35	1351.89	1354.34	1354.88	1355.50	1356.70	15 RCP
8	End	83.405	0.30	1.70	0.87	0.26	1.48	15.0	18.3	4.3	6.32	6.60	4.68	18	0.40	1350.00	1350.33	1350.96	1351.57	1352.00	1352.00	18 RCP
9	8	179.507	0.30	1.40	0.87	0.26	1.22	15.0	17.3	4.4	5.34	6.65	3.75	18	0.40	1350.43	1351.15	1351.69	1352.18	1352.00	1353.00	18 RCP
10	9	150.034	0.30	1.10	0.87	0.26	0.96	15.0	16.6	4.5	4.27	4.08	3.77	15	0.40	1351.25	1351.85	1352.34	1352.94	1353.00	1353.70	15 RCP
11	10	149.606	0.30	0.80	0.87	0.26	0.70	15.0	16.0	4.5	3.16	2.26	4.02	12	0.40	1351.95	1352.55	1353.05	1354.23	1353.70	1354.60	12 RCP
12	11	149.406	0.50	0.50	0.87	0.44	0.44	15.0	15.0	4.7	2.03	2.26	2.58	12	0.40	1352.65	1353.25	1354.35	1354.84	1354.60	1355.70	12 RCP
13	End	58.687	0.40	1.40	0.87	0.35	1.22	15.0	17.5	4.4	5.32	6.72	4.23	18	0.41	1350.52	1350.76	1351.52	1351.77	1352.00	1352.00	18 RCP
14	13	228.915	0.30	1.00	0.87	0.26	0.87	15.0	16.3	4.5	3.92	4.09	3.56	15	0.40	1350.86	1351.78	1351.99	1352.77	1352.00	1353.80	15 RCP
15	14	154.033	0.20	0.70	0.87	0.17	0.61	15.0	15.5	4.6	2.80	2.26	3.56	12	0.40	1351.88	1352.50	1352.88	1353.83	1353.80	1354.70	12 RCP
16	15	83.906	0.50	0.50	0.87	0.44	0.44	15.0	15.0	4.7	2.03	2.27	2.58	12	0.41	1352.60	1352.94	1353.93	1354.20	1354.70	1355.40	12 RCP
17	End	279.907	1.70	6.00	0.87	1.48	5.22	15.0	15.8	4.6	23.78	25.94	6.10	30	0.40	1348.50	1349.62	1350.29	1351.54	1350.00	1353.20	30 RCP
18	17	153.880	1.40	4.30	0.87	1.22	3.74	15.0	15.4	4.6	17.26	14.36	5.49	24	0.40	1349.72	1350.34	1351.81	1352.71	1353.20	1353.40	24 RCP
19	18	84.059	2.90	2.90	0.87	2.52	2.52	15.0	15.0	4.7	11.76	14.39	3.74	24	0.40	1350.34	1350.68	1352.94	1353.17	1353.40	1353.60	24 RCP

Project File: Preliminary Pipe Sizing 6-2010.stm

Number of lines: 19

Run Date: 06-14-2010

NOTES: Intensity = 64.67 / (Inlet time + 13.40) ^ 0.79; Return period = 5 Yrs. ; c = cir e = ellip b = box

# 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	36 RCP	29.80	36	Cir	88.411	1349.50	1349.63	0.147	1351.24	1351.91	0.40	1352.31	End	Curb-Horiz
2	36 RCP	29.70	36	Cir	93.974	1349.73	1349.87	0.149	1352.73	1352.87	0.14	1353.01	1	Curb-Horiz
3	36 RCP	26.34	36	Cir	117.623	1349.97	1350.15	0.153	1353.01	1353.15	0.11	1353.26	2	Curb-Horiz
4	30 RCP	20.94	30	Cir	117.623	1350.25	1350.43	0.153	1353.26*	1353.56*	0.14	1353.71	3	Curb-Horiz
5	30 RCP	15.18	30	Cir	161.396	1350.53	1350.85	0.198	1353.71*	1353.93*	0.07	1354.00	4	Curb-Horiz
6	24 RCP	9.55	24	Cir	150.742	1350.95	1351.25	0.199	1354.00*	1354.27*	0.07	1354.34	5	Curb-Horiz
7	15 RCP	4.06	15	Cir	135.454	1351.35	1351.89	0.399	1354.34*	1354.88*	0.17	1355.05	6	Curb-Horiz
8	18 RCP	6.32	18	Cir	83.405	1350.00	1350.33	0.396	1350.96	1351.57	0.13	1351.69	End	Curb-Horiz
9	18 RCP	5.34	18	Cir	179.507	1350.43	1351.15	0.401	1351.69	1352.18	0.13	1352.31	8	Curb-Horiz
10	15 RCP	4.27	15	Cir	150.034	1351.25	1351.85	0.400	1352.34	1352.94	0.11	1353.05	9	Curb-Horiz
11	12 RCP	3.16	12	Cir	149.606	1351.95	1352.55	0.401	1353.05*	1354.23*	0.13	1354.35	10	Curb-Horiz
12	12 RCP	2.03	12	Cir	149.406	1352.65	1353.25	0.402	1354.35*	1354.84*	0.10	1354.94	11	Curb-Horiz
13	18 RCP	5.32	18	Cir	58.687	1350.52	1350.76	0.409	1351.52	1351.77	0.23	1351.99	End	Curb-Horiz
14	15 RCP	3.92	15	Cir	228.915	1350.86	1351.78	0.402	1351.99	1352.77	0.11	1352.88	13	Curb-Horiz
15	12 RCP	2.80	12	Cir	154.033	1351.88	1352.50	0.403	1352.88*	1353.83*	0.10	1353.93	14	Curb-Horiz
16	12 RCP	2.03	12	Cir	83.906	1352.60	1352.94	0.405	1353.93*	1354.20*	0.10	1354.31	15	Curb-Horiz
17	30 RCP	23.78	30	Cir	279.907	1348.50	1349.62	0.400	1350.29	1351.54	0.27	1351.81	End	Curb-Horiz
18	24 RCP	17.26	24	Cir	153.880	1349.72	1350.34	0.403	1351.81*	1352.71*	0.23	1352.94	17	Curb-Horiz
19	24 RCP	11.76	24	Cir	84.059	1350.34	1350.68	0.405	1352.94*	1353.17*	0.22	1353.39	18	Curb-Horiz

Project File: Preliminary Pipe Sizing 6-2010.stm  
 Number of lines: 19  
 Run Date: 06-14-2010

NOTES: Return period = 5 Yrs. ; \*Surcharged (HGL above crown).

#### **Tab 4. Floodplain Submittal**

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There are no FEMA floodplains on this site.

## **Tab 5. Permits**

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### ***US Army Corps of Engineers***

There are blue lines on the USGS Quadrangle map on the site. Therefore no permit will be required.

### ***Kansas Department of Agriculture***

The site does not change any waterways or provide detention, therefore division of water resources permits.

### ***Federal Emergency Agency (FEMA)***

There are no FEMA floodplains on site, therefore no LOMC applications are required.

### ***Kansas Department of Transportation***

There are no state highways on site.

### ***Sedgwick County Right-of-way Permit***

Not applicable.