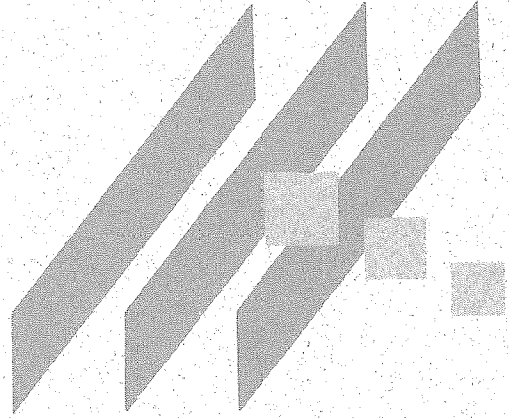


M K E C E N G I N E E R I N G C O N S U L T A N T S , I N C .

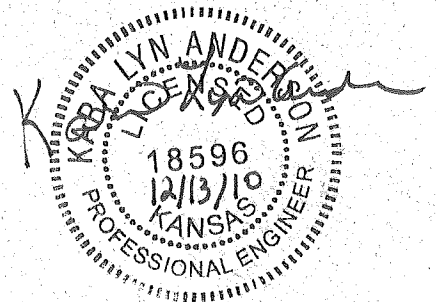


DRAINAGE REPORT

FOR

**BERKELEY SQUARE 1<sup>ST</sup> ADDITION**  
**Wichita, Kansas**

DECEMBER 2010



DRAINAGE REPORT

FOR

**BERKELEY SQUARE 1<sup>ST</sup> ADDITION**  
**Wichita, Kansas**

DECEMBER 2010



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

Reviewer: _____	Date: _____
Subdivision Name: _____	Location: _____
Total Land Area Of Ownership: _____ Acres	
Type: _____ Residential _____ Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other	
Applicant: _____	Contact: _____ Phone #: _____
Engineer: _____	Contact: _____ Phone #: _____

Please check the appropriate box:

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

<b>Tab 1. Project Narrative</b>	<b>Applicant</b>			<b>Engr</b>	
	I	NA	Explanation / Location in Plan	I	NA
A. Site Location Map, using USGS Map					
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain					
C. Discussion of offsite conditions					
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series					
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design					
F. Copy of the plat					
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.)					
H. Professional Engineer seal, signature and date on cover of report					
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover					

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



J. Location of existing utilities (e.g., water, sewer, gas, electric) and easements					
K. Location of existing conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
L. Flow paths					
M. Location and dimensions of existing channels, bridges or culvert crossings					
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					
O. Assumed pre-developed runoff curve numbers					
P. Existing time of concentrations used in calculations					
Q. Evaluate immediate downstream drainage capacity, not to exceed more than 0.25 miles downstream of site					
R. Existing structural elevations (e.g., invert of pipes, manholes, etc.)					
S. Cross-section data for open channels					
T. Ground water elevations, if applicable					

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)					
B. Proposed time of concentrations used in calculations					
C. Assumed post-developed runoff curve numbers					
D. Proposed contours for detention facilities (to equal area used in outlet rating curves)					
E. Preliminary sizing calculations for stormwater controls including contributing drainage area, storage, and outlet configuration					
F. Stage-storage-discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities					
G. Final analysis of potential upstream/downstream impact/effects of project, where necessary					
H. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc.)					
I. Design water surface elevations and normal pool elevation for ponds.					
J. Typical detail for outlet structures, embankments, spillways, grade control structures, conveyance channels, etc. To include height, width, elevation, and/or diameter.					
K. Proposed limits of clearing and grading					
L. Location of existing and proposed roads, buildings, parking lots and other impervious areas.					
M. Location of existing and proposed utilities (e.g., water, sewer) and easements					
N. Location of existing and proposed conveyance systems such as storm drains, inlets, catch basins, channels, swales, and areas of overland flow					
O. Preliminary location and dimensions of proposed channel modifications, such as bridge or culvert crossings					



P. Preliminary selection and location of stormwater controls					
Q. Emergency overflow structure's flow path					
R. Detention facility provides one-foot of freeboard above the HWL and emergency outfall shown (top of berm elevation shown)					
S. The 100-year 24-hour HWL delineated on the plan for detention pond					
T. Lowest opening elevations table on the plat for structures located adjacent to channels or ponds					
U. Stormwater Management Facilities located within a Reserve					
V. Maintenance responsibility of stormwater management facility shall be specified in the platters text. (e.g. HOA, Lot Owners Association, or lot)					
W. Off-site drainage easements or agreements required, where necessary					

Tab 4. Floodplain Submittal	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Provide source of flood profile					
B. Nearest base flood elevations					
C. Delineation of pre-developed regulatory floodplain/floodway limits					
D. Delineation of post-developed regulatory floodplain and floodway limits					
E. Floodplain boundary determination per elevation (project limits shown)					
F. Provide source of floodway data table and discharges					
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					
H. Provide regulatory floodway and four natural profile models (10,50,100, and 500-yr) for existing and future watershed conditions					
I. Location of floodplain/floodway limits and relationship of site to upstream/downstream properties (floodplain limits to be per elevation and scaled location)					
J. Flood plains and floodways located within a Reserve, where necessary					

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)					
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)					
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.					
D. Kansas Department of Transportation					
E. Sedgwick County Right-of-way Permit					

## Tab 1. Project Narrative

---

### ***Location***

The subject property is in the City of Wichita, Sedgwick County, Kansas. The proposed development is on the northwest corner of 13<sup>th</sup> Street and Greenwich Road. The site is bordered by the Waterfront Residential Addition, Greenwich Office Park Second Addition, and Unplatted land. The site lies in the northeast quarter of Section 9, Township 27 South, Range 2 East. The plat area is 23.3 acres. The site analyzed for detention includes adjacent unplatted areas. The site is shown on the USGS Map, Appendix 1.1.

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

The site will develop as four commercial lots. The proposed site is shown on the plat, Appendix 1.2. Preliminary lot grading is shown in Appendix 1.3.

### ***Drainage Summary***

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

The site drains from southwest to the east and northeast into Greenwich Road. A temporary detention pond on the site currently provides detention for the Waterfront Residential Addition. For this analysis, pre-development flow rates consider the basin as undeveloped. Pre-development flow rates are shown in Table 1.1. The site ultimately drains to West Fork Fourmile Creek as shown in the Drainage Basins drawing, Appendix 1.4.

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

The proposed development will provide detention in an East Pond and a West Pond. Portions of the site will be routed to each detention pond. An area along the East side of the site will flow into a swale and leave the site undetained. Sufficient detention is provided in the additional two ponds to allow for this. Post-project flow rates are shown in Table 1.1.

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-Project	67.2	99.7	121.3	153.9	200.5
Post-Project	67.0	90.6	113.1	144.0	176.0

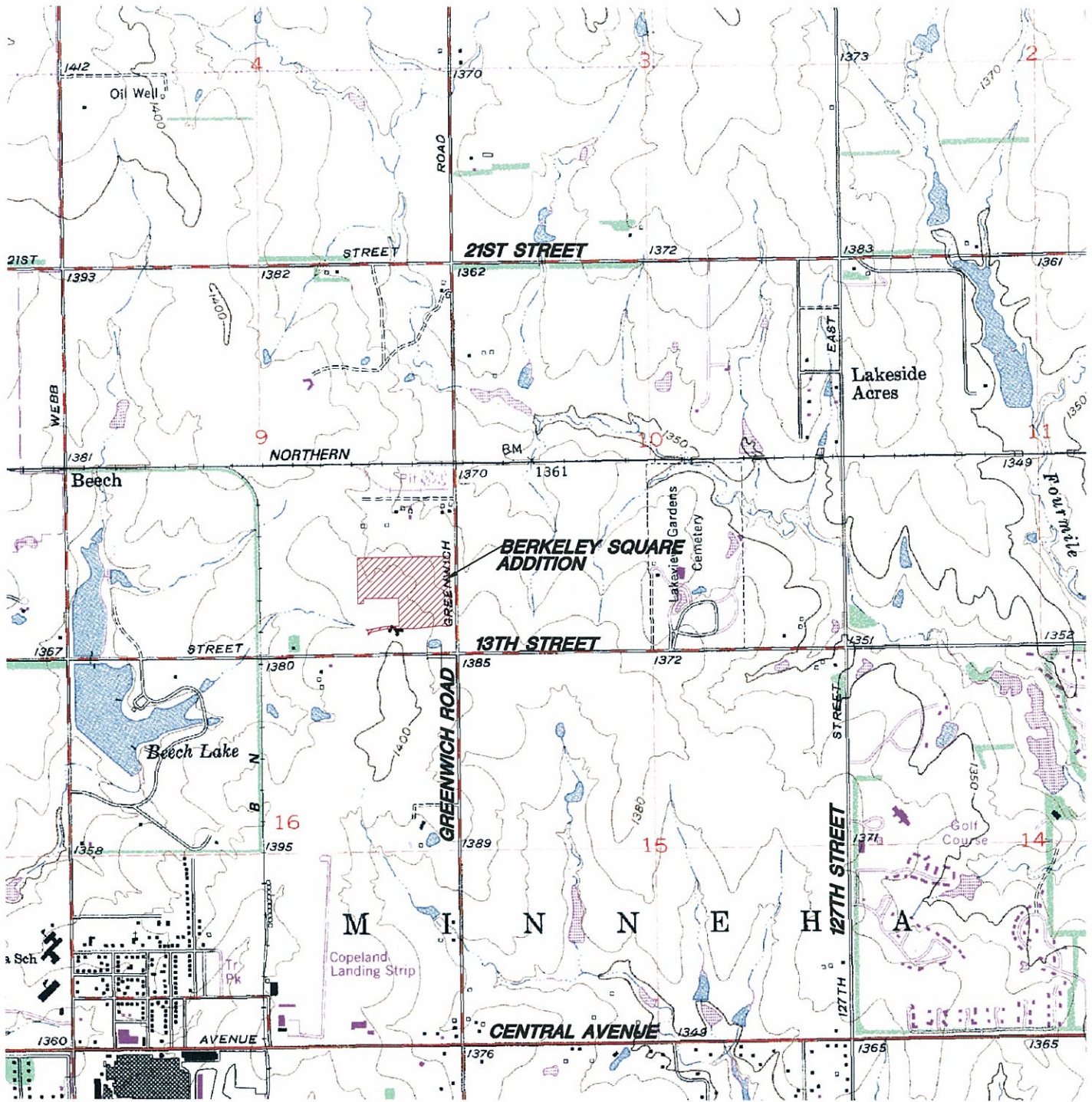
### ***Best Management Practices***

The site will be seeded or sodded after completion of the construction of grading and utilities. During construction curb protection, a construction entrance, and other erosion protection devices will be used to prevent soil from leaving the site. A storm water pollution prevention plan will be implemented prior to any soil disturbing activities.

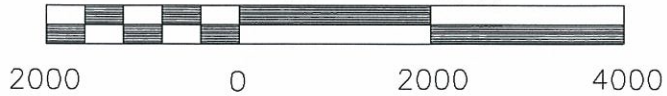
## Appendix 1.1

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USGS Quadrangle Map



SCALE: 1" = 2000'



**SECTION 9  
TOWNSHIP 27  
RANGE 2E**

**MKEC**  
ENGINEERING  
CONSULTANTS, INC.

**BEREKLEY SQUARE ADDITION**  
PROJECT NAME

**QUAD MAP**  
SHEET TITLE

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

**KLA**  
DESIGN BY:

**CMJ**  
DRAWN BY:

**GJA**  
CHECKED BY:

**DECEMBER 2010**  
DATE

**10572**  
JOB NO.

**1 / 1**  
SHEET/OF

## Appendix 1.2

---

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 "BERKELEY SQUARE FIRST ADDITION", an addition to Wichita, Sedgwick County, Kansas, into Lots, a Block, Reserves, and a Street, the same being accurately set forth in the accompanying plat and described herein:

A tract of land lying within the Southeast Quarter of the Southeast Quarter, of Section 9, Township 27 South, Range 2 East, Wichita, Sedgwick County, Kansas, said tract being more particularly described as follows:

COMMENCING at the southeast corner of said Southeast Quarter, thence along the east line of on a Kansas coordinate system on N00°48'07"W, 296.08 feet; thence S89°11'53"W, 68.09 feet the northeast corner of Lot 1, Block 1, Home Bank & Trust Addition, an addition to Wichita, Sedgwick County, Kansas, being the POINT OF BEGINNING, thence along the north line of said Lot 1, S88°53'46"W, 222.39 feet to the northwest corner of said Lot 1; thence N06°27'22"W, 78.97 feet to a point on a non-tangent curve to the right; thence along the said curve 459.61 feet to a reverse curve, said curve to the right having a central angle of 13°23'16", a radius of 1967.00 feet, and a long chord distance of 458.57 feet, bearing S86°54'17"W; thence along the said reverse curve 367.21 feet to a curve the left, said reverse curve having a central angle of 21°22'54", a radius of 984.00 feet, and a long chord distance of 365.08 feet, bearing S82°54'28"W; thence along the said curve 75.98 feet to the east right-of-way line of Chesterfield being a point on a curve to the left, said reverse curve having a central angle of 48°22'16", a radius of 90.00 feet, and a long chord distance of 73.74 feet, bearing S48°01'53"W; thence along the said right-of-way line and said curve to the left, 97.58 feet to a curve to the left, said curve to the left having a central angle of 86°40'51", a radius of 64.50 feet, and a long chord distance of 88.54 feet, bearing N19°29'41"W; thence along the said curve 71.12 feet to a point on a curve to the right, said curve to the right having a central angle of 45°16'35", a radius of 90.00 feet, and a long chord distance of 69.28 feet, bearing S85°28'23"E; thence along the said curve to the right 384.97 feet, said curve having a central angle of 21°42'36", a radius of 1016.00 feet, and a long chord distance of 382.67 feet, bearing N82°44'37"E; thence parallel with and 754.00 feet east of the east line of said Southeast Quarter, N00°48'07"W, 383.98 feet; thence parallel with and 775.00 feet north of the south line of said Southeast Quarter, S88°53'46"W, 479.32 feet; thence S00°54'24"E, 70.00 feet to the northeast corner of Greenwich Office Park Second Addition, an addition to Wichita, Sedgwick County, Kansas; thence along the north line of said Greenwich Office Park Second Addition, S88°53'46"W, 75.00 feet to the southeast corner of The Waterfront Residential Addition, an addition to Wichita, Sedgwick County, Kansas; thence along the east line of said The Waterfront Residential Addition, N00°54'24"W, 625.59 feet to the north of said Southeast Quarter of said Southeast Quarter; thence along said north line, N88°54'31"E, 1249.35 feet to the west line right-of-way line of Greenwich Road as recorded DOC.#/FLM-PG: 28739050 and 28739049; thence along said west right-of-way line, S00°48'07"E, 980.01 feet; thence continuing along said west right-of-way line, S07°43'43"W, 54.53 feet to the POINT OF BEGINNING.

CONTAINING: 1,016,659 square feet or 23.34 acres of land, more or less.

All reserves, streets, easements, rights-of-ways, building setbacks, and access controls, a Drainage Easement recorded on DOC.#FLM/PG:28739051, a Utility Easement recorded on DOC.#FLM/PG:28756001 together with, and all other public dedications 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 \_\_\_\_\_, 2011.

OWNER'S CERTIFICATE

Know all men by these presents that we the undersigned property owner of the land above set forth in the Berkeley Square First Addition, have caused the same to be surveyed and platted into Lots, a Block, Reserves, and a Street, the same being accurately set forth in the accompanying plat and described herein: to be known as "BERKELEY SQUARE FIRST ADDITION", an addition to Wichita, Sedgwick County, Kansas, 67206. 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 Greenwich Road over and across the east line of "BERKELEY SQUARE FIRST ADDITION," are hereby granted to the appropriate governing body, as indicated hereon.

Reserves "A", "B", and "C" are platted for landscaping, irrigation, berming, monuments, signs, and utilities confined by easement(s) or rights of way(s). Reserve "C" is also platted for drainage. The Reserves shall be owned and maintained by the owner(s) of Lots 1, 2, 3 and 4, Block 1, and or their successors, and or assigns, and or a Lot Owner's Association.

A drainage plan has been developed for this plat. All drainage easements, right-of-way, or 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.

Greenwich 13, L.L.C., a Kansas limited liability company

George E. Laham, II, manager  
Laham Development Company, L.L.C., a Kansas limited liability company,  
manager of Greenwich 13, L.L.C.

STATE OF KANSAS, SEDGWICK COUNTY} ss:

This instrument was acknowledged before me on \_\_\_\_\_ day of \_\_\_\_\_, 2011, by George E. Laham, II, manager of Laham Development Company, L.L.C., a Kansas limited liability company, which is the manager of Greenwich 13, L.L.C., a Kansas limited liability company.

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

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

MORTGAGE CERTIFICATE

We INTRUST Bank, N.A. holders of a mortgage on a portion of the above described property, do hereby consent to the plat of "BERKELEY SQUARE FIRST ADDITION."

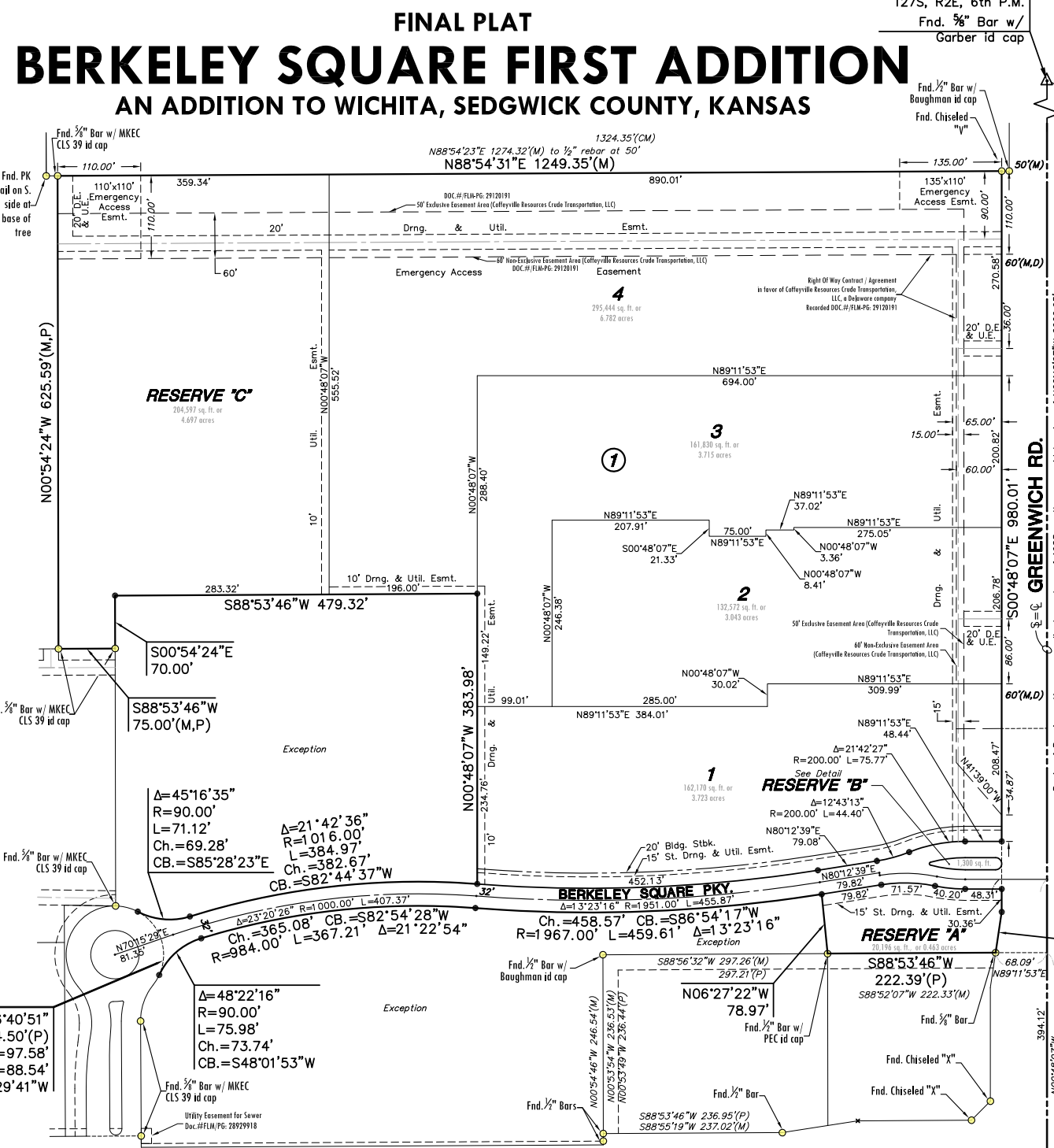
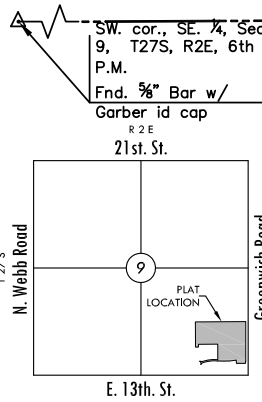
INTRUST Bank, N.A.

Gary D. Schmitt, Executive Vice President

This instrument was acknowledged before me on this \_\_\_\_\_ day of \_\_\_\_\_, 2011, by Gary D. Schmitt, Executive Vice President, INTRUST Bank, N.A.

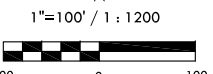
IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal, the day and year last above written.

Notary Public: \_\_\_\_\_



ACCESS CONTROLS NOTE

Greenwich Road - Access points for the Lots shall be placed accordingly: The minimum distance between full turning movement drives shall be 400'. The minimum distance between a right-in/right-out drive and either another right-in/right-out drive or a full movement drive shall be 200'.



Basis of Bearing: Kansas coordinate system of 1983 south zone grid bearing of N00°48'07"W along the E. line of the SE 1/4, Sec. 9, T27S, R2E, 6th P.M.

This plat is surveyed and platted on NAVD88-09 using Kansas state plane south zone coordinates, modified to the surface, having a combined

PLANNING COMMISSION CERTIFICATE

This plat of "BERKELEY SQUARE FIRST ADDITION" has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2011  
WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION

Debra Miller Stevens, Chair

Attest: \_\_\_\_\_  
Secretary John L. Schlegel, Secretary Affix MAPC Seal

GOVERNING BODY CERTIFICATE

The dedications shown on this plat are hereby accepted and this plat is hereby approved by the governing body of the City of Wichita, Kansas.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2011

At the direction of the City Council.

Carl Brewer, Mayor

Attest: \_\_\_\_\_  
City Clerk Karen Sublett, City Clerk Affix City Seal

TRANSFER RECORD

STATE OF KANSAS, SEDGWICK COUNTY} ss:

Entered on transfer record this \_\_\_\_\_ day of \_\_\_\_\_, 2011

Clerk Kelly B. Arnold, County Clerk Affix County Clerk Seal

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 \_\_\_\_\_, 2011, at \_\_\_\_\_ o'clock \_\_M; and is duly recorded.

Register of Deeds Bill Meek, Register of Deeds

Attest: \_\_\_\_\_  
Deputy Tonya E. Buckingham, Deputy Affix Register of Deeds Seal

COUNTY SURVEYOR

STATE OF KANSAS, SEDGWICK COUNTY} ss:

Reviewed in accordance with K.S.A. 58-2005 on this \_\_\_\_\_ day of \_\_\_\_\_, 2011.

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



12/1/2011 10:57:22 - Berkeley Impact Group (Prop) 102726466 12/1/2011 5:12:29 PM CST

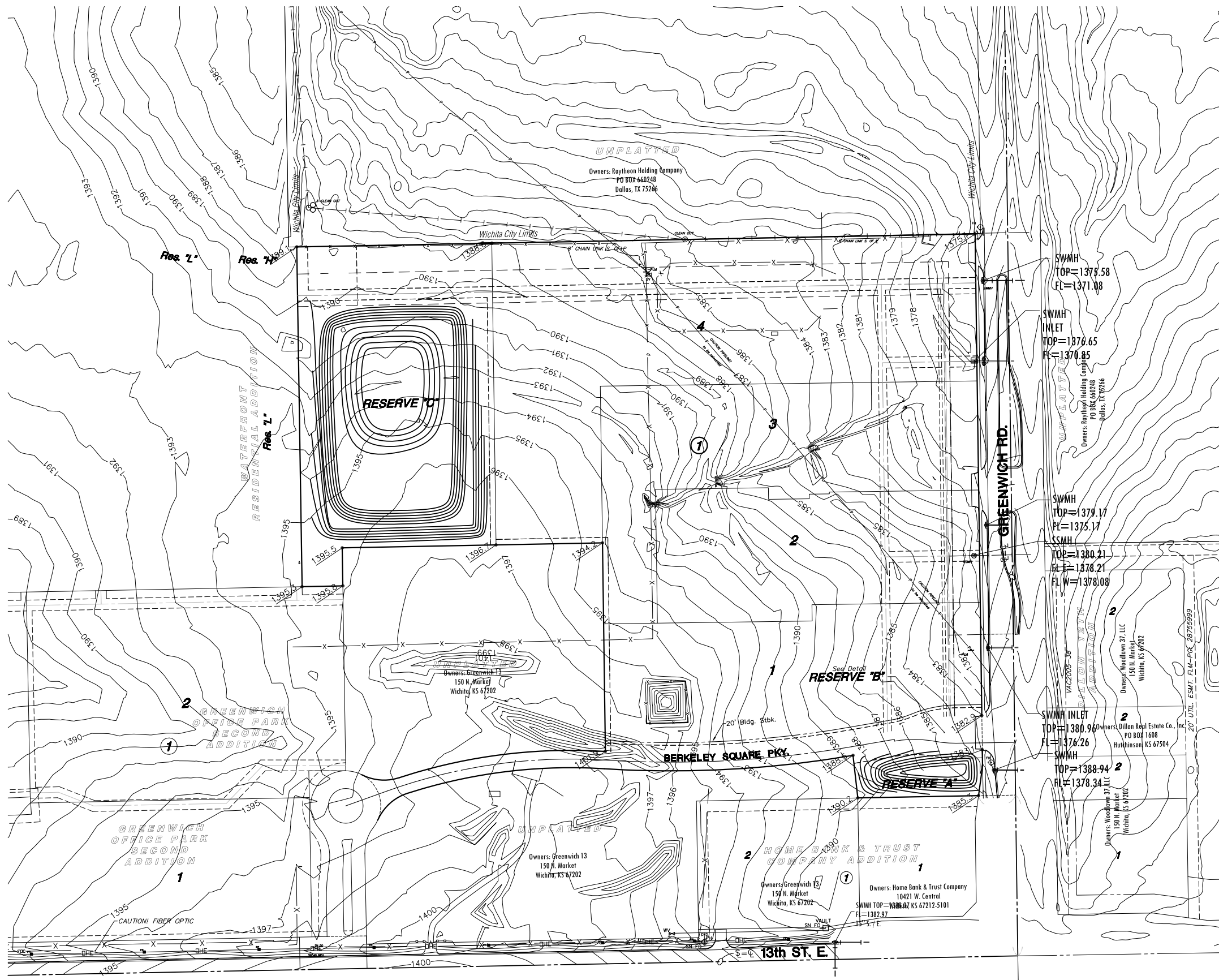
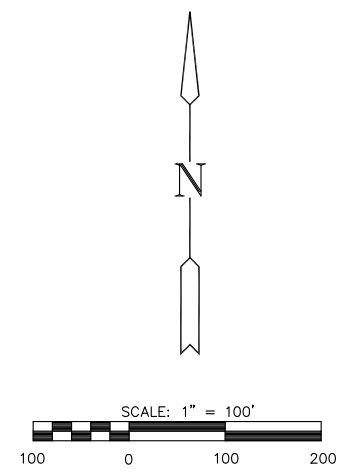
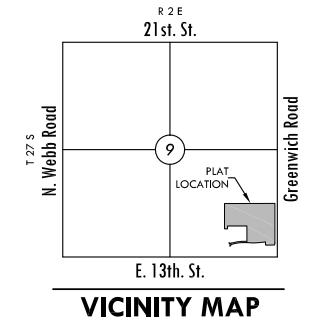
## Appendix 1.3

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### Lot Grading Plan

**BERKELEY SQUARE ADDITION**  
WICHITA, KANSAS  
**LOT GRADING PLAN**

- LEGEND**
- BT - CONIFEROUS TREE
  - DT - DECIDUOUS TREE
  - SN - SIGN
  - PP - 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
  - 98.5 - ELEVATION
  - - FLOW ARROW



rs. Hawker Beechcraft Corp.  
709 E. Central Dept. 835  
Wichita, KS 67206

UNPLATTED

Owners: Hawker Beechcraft Corp.  
9709 E. Central Dept. 835  
Wichita, KS 67206

UNPLATTED

1 1  
KISER WEST ADDITION 2

J:\Civil\10572 - Berkeley Square \Dwg\Dirng\10572\_LGP.dwg

DATE  
December 10

REVISED

DESIGN BY  
KLA

DRAWN BY  
CMJ

CHECKED BY  
GJA

SHEET NUMBER  
**1**

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**Appendix 1.4**  
Drainage Basins

**BERKELEY SQUARE ADDITION**  
WICHITA, KANSAS  
**DRAINAGE BASINS**

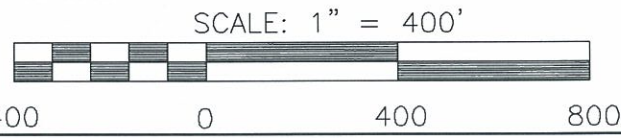
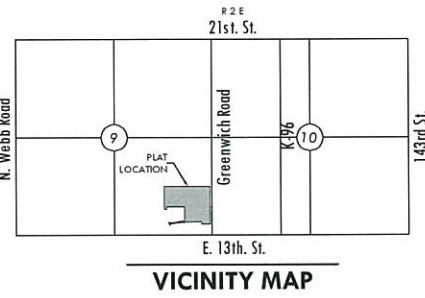
DATE  
*December 10*  
REVISED

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

SHEET NUMBER  
**1**

**LEGEND**

- CT - CONIFEROUS TREE
- DT - DECIDUOUS TREE
- SN - SIGN
- HP - POWER POLE
- EB - ELECTRIC BOX
- LP - LIGHT POLE
- FH - FIRE HYDRANT
- WV - WATER VALVE
- WM - WATER METER
- SC - SECTION CORNER
- BM - BENCHMARK
- E - EASEMENT
- BS - BUILDING SETBACK
- F - FENCE
- SSP - STORM SEWER PIPE
- WL - WATER LINE
- SSL - SANITARY SEWER LINE
- GL - GAS LINE
- GP - GAS PIPELINE
- TL - TELEPHONE LINE
- UG - UNDERGROUND ELEC.
- OE - OVERHEAD ELECTRIC
- FOC - FIBER OPTIC CABLE
- DSB - DRAINAGE SUB BASIN
- DB - DRAINAGE BASIN
- FA - FLOW ARROW
- A17 - AREA FOR SWS SIZING
- S - SITE BOUNDARY



## Tab 2. Existing Conditions

### **Description**

The site is 23.3 acres of undeveloped ground. The site is shown on the aerial photograph, Appendix 2.1. The site is shown on the Existing Conditions Map in Appendix 2.2. For this analysis, there are undeveloped areas south of the plat that were included in the existing conditions models. The site generally drains from west to east into Greenwich Road.

### **FEMA Floodplains**

The platted area is located in Zone X unshaded, areas outside of the 100-year flood, as shown on the Sedgwick County Kansas February 2, 2007 Map Number 20173C0379E, Appendix 2.3. The nearest regulated FEMA floodplain is approximately  $\frac{3}{4}$  of a mile northeast of the site.

### **Soils**

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

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

Hydraulic Soil Group "D" was used for calculations for the basin.

### **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 were done using a spreadsheet, Appendix 2.6.

#### **Curve Numbers**

The curve number used for pre-developed conditions is a weighted average based on the land use. The pre-development curve number for the undeveloped site is 84.0. Calculations for the composite curve numbers are shown in Appendix 2.7.

### ***Drainage Patterns***

The site drains from west to east and flows to Greenwich Road. A storm water sewer system along Greenwich road conveys runoff from the street to a natural channel east of the site. An existing 36" Reinforced Concrete Pipe (RCP) conveys runoff from the site and the system outlets through a 42" RCP. The runoff drains through natural channels to the northeast, under the railroad right-of-way and to the north into West Fork Fourmile Creek. The flow paths are shown on the Existing Drainage Patterns Drawing, Appendix 2.7. An overall drawing showing the site and the drainage basins to the railroad is shown in Appendix 2.8.

A temporary detention facility currently exists near the northwest corner of the site. This detention was constructed with the development of the Waterfront Residential Addition. Detention for the portion of that development draining through this site is currently provided in this detention facility.

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

<b>Description</b>	<b>Design Storm Flows (cfs)</b>				
	<b>2-Yr</b>	<b>5-Yr</b>	<b>10-Yr</b>	<b>25-Yr</b>	<b>100-Yr</b>
Pre-Project	67.2	99.7	121.3	153.9	200.5

### ***Utilities***

Existing sanitary sewer runs along the east boundary of the site. Existing water is located on the west side of the site in the Greenwich Office Park Second Addition. An existing storm water sewer system drains 13<sup>th</sup> Street and Greenwich Road.

### ***Groundwater Elevations***

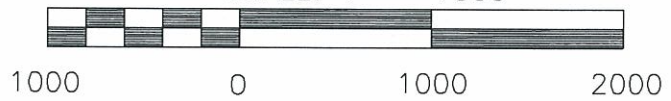
Groundwater elevations are approximately 20' deep.

---

**Appendix 2.1**  
Aerial Photograph



SCALE: 1" = 1000'



**SECTION 9  
TOWNSHIP 27  
RANGE 2E**

**MKEC**  
ENGINEERING  
CONSULTANTS, INC.

**BERKELEY SQUARE ADDITION**  
PROJECT NAME

**AERIAL MAP**  
SHEET TITLE

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

**KLA**  
DESIGN BY:

**CMJ**  
DRAWN BY:

**GJA**  
CHECKED BY:

**DECEMBER 2010**  
DATE

**10572**  
JOB NO.

**1 / 1**  
SHEET/OF

## Appendix 2.2

---

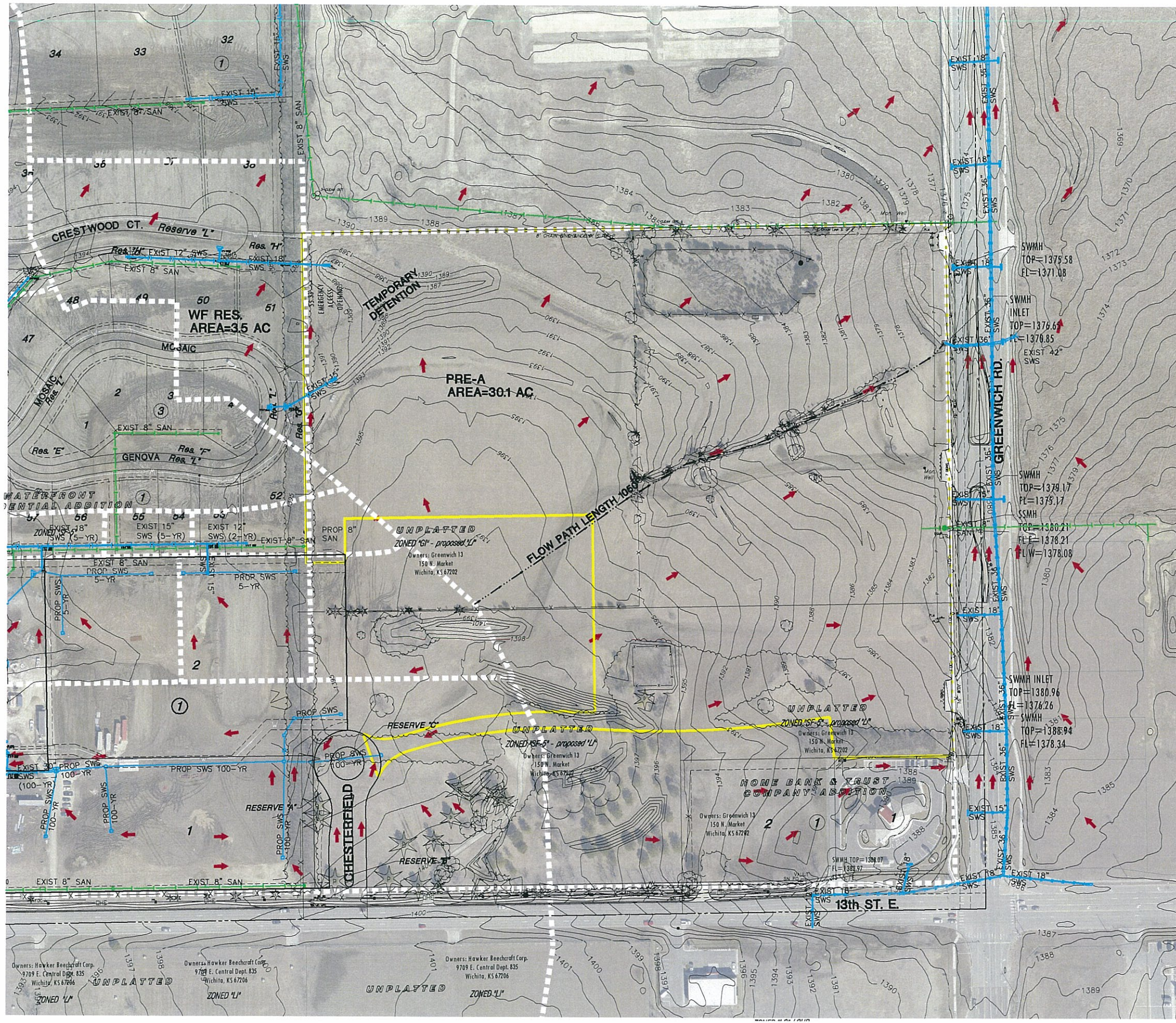
### Existing Conditions Map

**BERKELEY SQUARE ADDITION**  
WICHITA, KANSAS  
**EXISTING CONDITIONS**

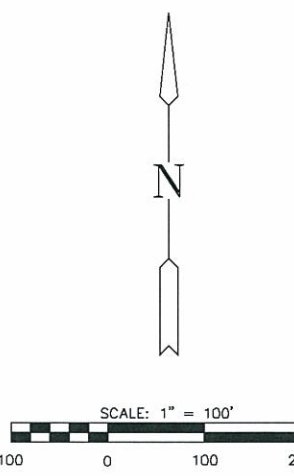
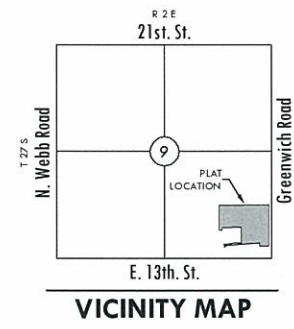
DATE  
*December 10*  
REVISED

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

SHEET NUMBER  
**1**



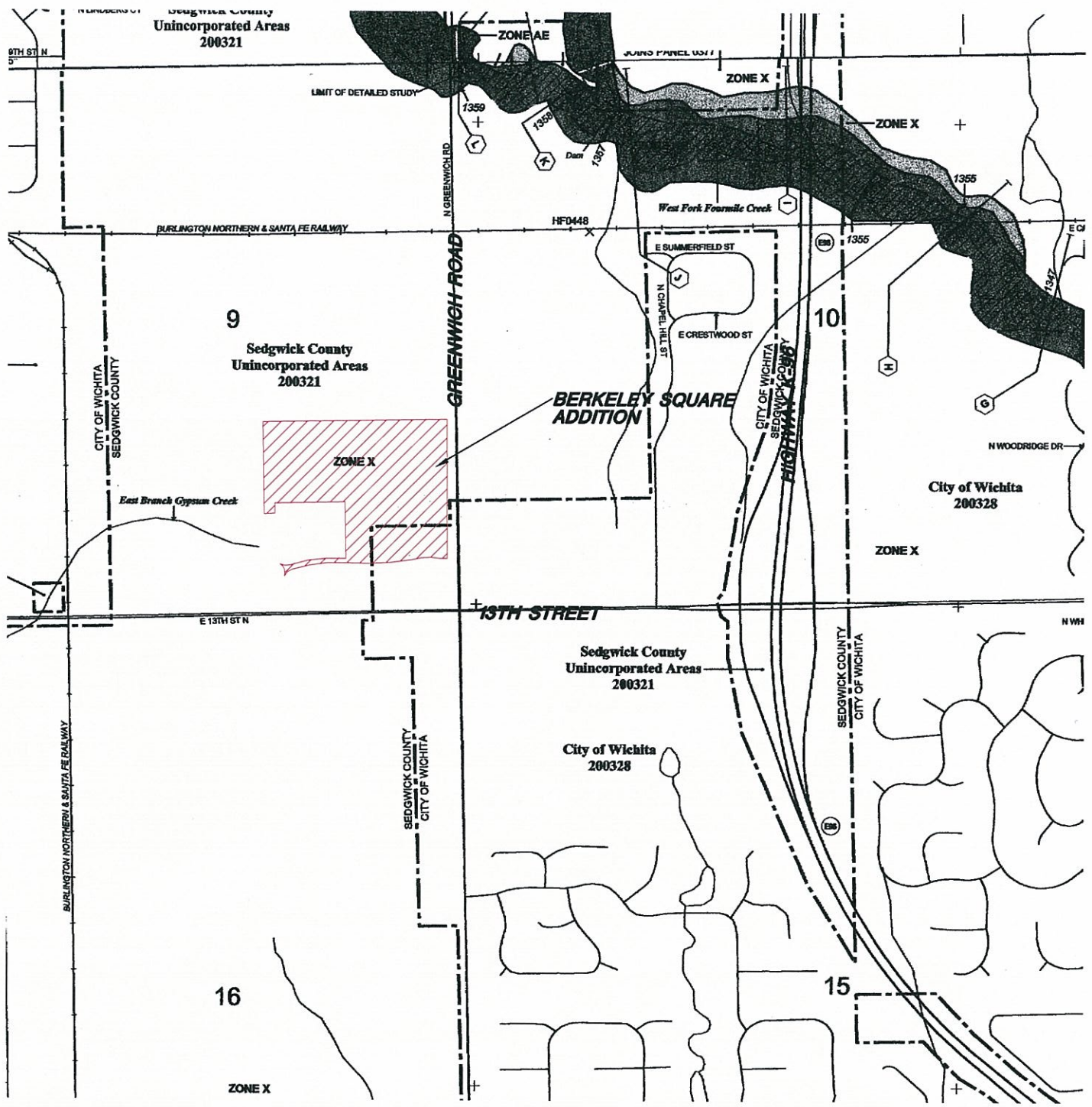
- LEGEND**
- CONIFEROUS TREE
  - DECIDUOUS TREE
  - SIGN
  - POWER POLE
  - ELECTRIC BOX
  - LIGHT POLE
  - FIRE HYDRANT
  - WATER VALVE
  - WATER METER
  - SECTION CORNER
  - BENCHMARK
  - EASEMENT
  - BUILDING SETBACK
  - FENCE
  - STORM SEWER PIPE
  - WATER LINE
  - SANITARY SEWER LINE
  - GAS LINE
  - GAS PIPELINE
  - TELEPHONE LINE
  - UNDERGROUND ELEC.
  - OVERHEAD ELECTRIC
  - FIBER OPTIC CABLE
  - ELEVATION
  - FLOW ARROW
  - FLOW PATH



## Appendix 2.3

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### Flood Insurance Rate Map (FIRM)



**NFIP**  
**NATIONAL FLOOD INSURANCE PROGRAM**

PANEL 6379E

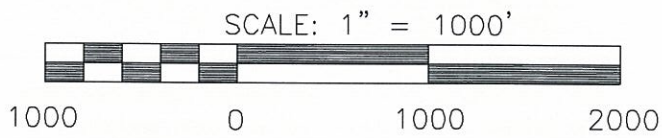
**FIRM**  
**FLOOD INSURANCE RATE MAP**

**SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS**

PANEL 379 OF 700  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

DATE: 2007 02 02  
 COMMUNITY: 2007 02 02  
 FEDERAL AGENCY: FEMA

MAP NUMBER: 20173C8379E  
 EFFECTIVE DATE: FEBRUARY 2, 2007  
 FEDERAL EMERGENCY MANAGEMENT AGENCY



**SECTION 9  
 TOWNSHIP 27  
 RANGE 2E**

**MKEC**  
 ENGINEERING CONSULTANTS, INC.

**BERKELEY SQUARE ADDITION**  
 PROJECT NAME

**FIRM MAP**  
 SHEET TITLE

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

**CLM**  
 DESIGN BY:

**CMJ**  
 DRAWN BY:

**GJA**  
 CHECKED BY:

**DECEMBER 2010**  
 DATE

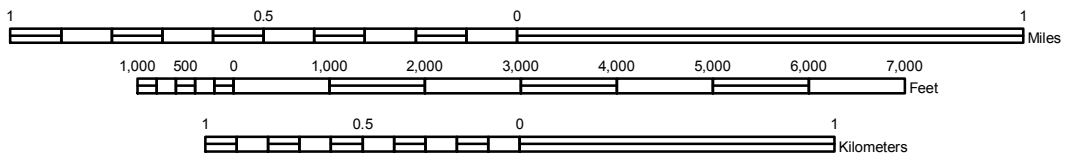
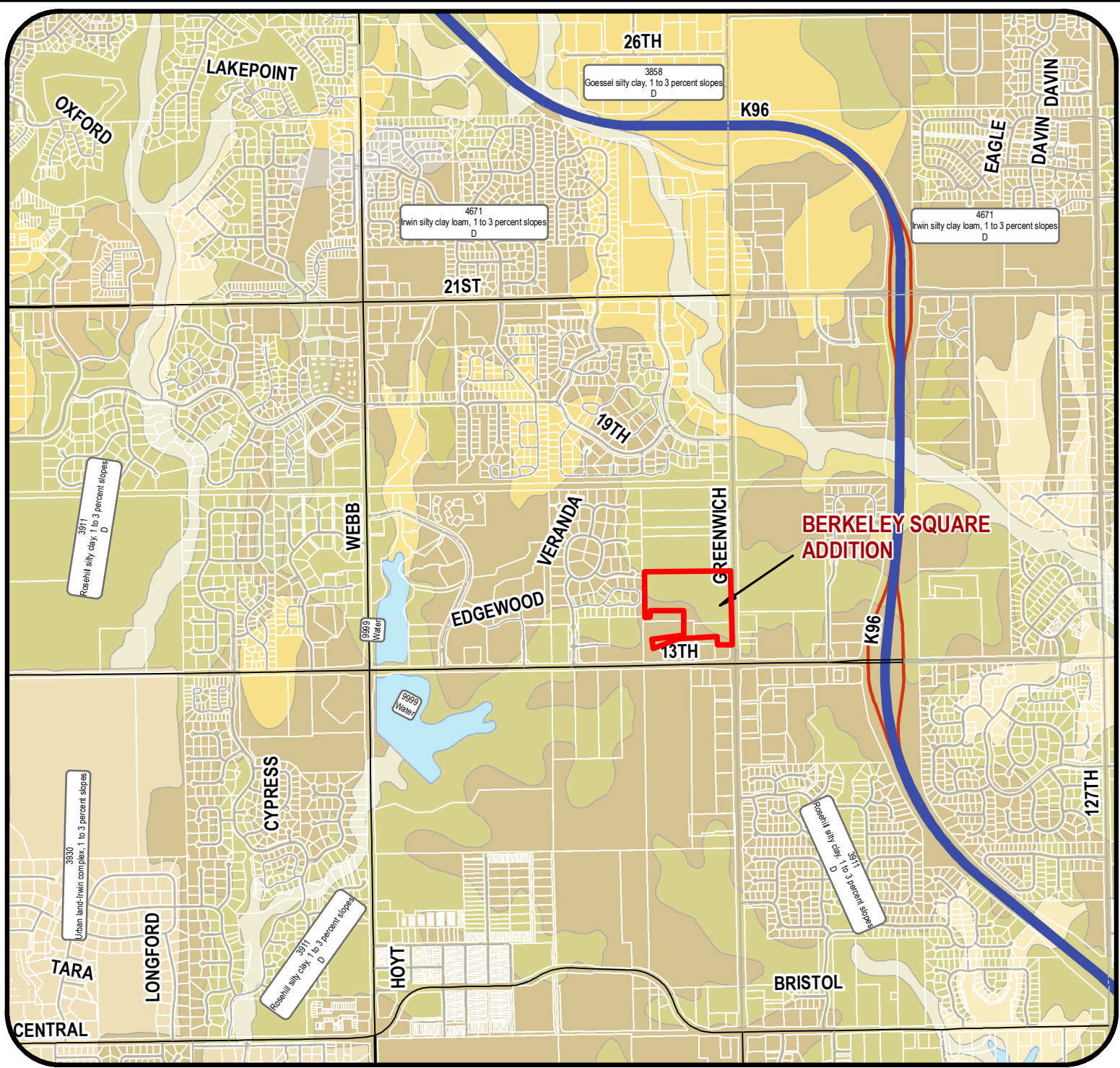
**10572**  
 JOB NO.

**1 / 1**  
 SHEET/OF

## Appendix 2.4

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### Soil Survey



**BERKELEY SQUARE ADDITION**

Project Name:

**Soil Survey - Sedgwick County, KS**

Sheet Title:



CMJ | DEC. 2010

Drawn By: | Date:

KLA/GJA | 10572

Design / Review: | Job No.:

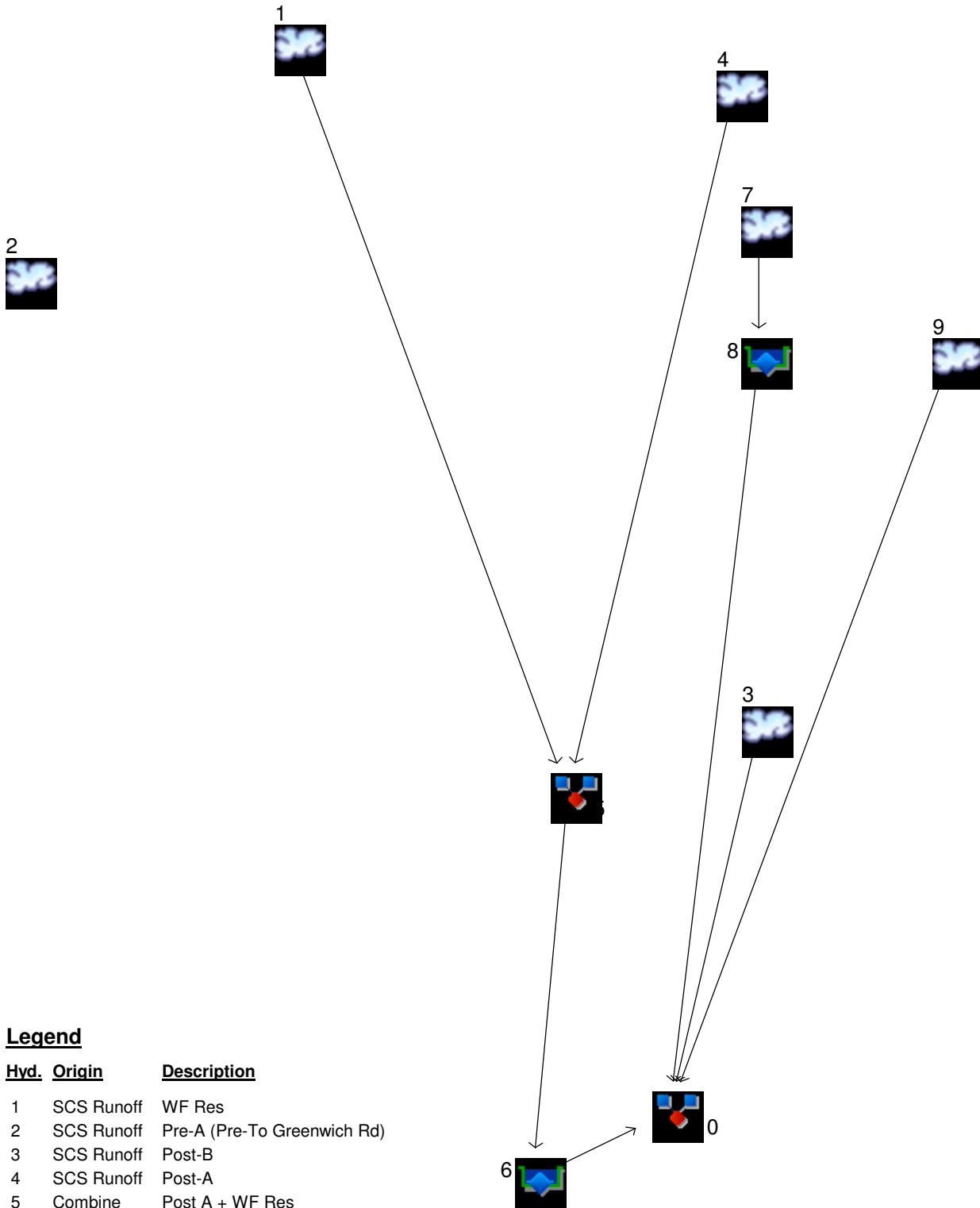
## Appendix 2.5

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### Hydraflow Hydrographs Output

# Watershed Model Schematic

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



## Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	SCS Runoff	WF Res
2	SCS Runoff	Pre-A (Pre-To Greenwich Rd)
3	SCS Runoff	Post-B
4	SCS Runoff	Post-A
5	Combine	Post A + WF Res
6	Reservoir	West Detention
7	SCS Runoff	Post-C
8	Reservoir	East Detention
9	SCS Runoff	Home Bank
10	Combine	Post To Greenwich Rd

# 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	-----	-----	7.805	-----	11.48	13.91	17.56	20.35	22.78	WF Res
2	SCS Runoff	-----	-----	67.16	-----	99.70	121.32	153.92	178.77	200.48	Pre-A (Pre-To Greenwich Rd)
3	SCS Runoff	-----	-----	52.33	-----	69.84	81.21	98.20	111.10	122.36	Post-B
4	SCS Runoff	-----	-----	76.79	-----	102.47	119.16	144.09	163.02	179.54	Post-A
5	Combine	1, 4	-----	81.85	-----	110.14	128.57	156.13	177.07	195.36	Post A + WF Res
6	Reservoir	5	-----	1.564	-----	1.629	1.665	1.716	1.753	1.785	West Detention
7	SCS Runoff	-----	-----	22.50	-----	30.02	34.91	42.22	47.76	52.60	Post-C
8	Reservoir	7	-----	7.817	-----	19.93	27.06	35.09	37.44	38.92	East Detention
9	SCS Runoff	-----	-----	6.358	-----	8.485	9.867	11.93	13.50	14.87	Home Bank
10	Combine	3, 6, 8, 9	-----	67.03	-----	90.60	113.11	144.03	161.65	176.00	Post To Greenwich Rd

# 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	7.805	1	726	0.589	-----	-----	-----	WF Res	
2	SCS Runoff	67.16	1	725	4.814	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	52.33	1	717	2.685	-----	-----	-----	Post-B	
4	SCS Runoff	76.79	1	717	3.939	-----	-----	-----	Post-A	
5	Combine	81.85	1	717	4.528	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.564	1	960	4.523	5	1384.31	2.87	West Detention	
7	SCS Runoff	22.50	1	717	1.154	-----	-----	-----	Post-C	
8	Reservoir	7.817	1	724	1.154	7	1382.89	0.307	East Detention	
9	SCS Runoff	6.358	1	717	0.326	-----	-----	-----	Home Bank	
10	Combine	67.03	1	717	8.688	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 2 Year			Monday, Dec 13, 2010		

# 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	11.48	1	726	0.870	-----	-----	-----	WF Res	
2	SCS Runoff	99.70	1	725	7.178	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	69.84	1	717	3.654	-----	-----	-----	Post-B	
4	SCS Runoff	102.47	1	717	5.362	-----	-----	-----	Post-A	
5	Combine	110.14	1	717	6.232	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.629	1	1073	5.254	5	1385.26	4.23	West Detention	
7	SCS Runoff	30.02	1	717	1.571	-----	-----	-----	Post-C	
8	Reservoir	19.93	1	721	1.571	7	1383.27	0.375	East Detention	
9	SCS Runoff	8.485	1	717	0.444	-----	-----	-----	Home Bank	
10	Combine	90.60	1	718	10.924	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 5 Year			Monday, Dec 13, 2010		

# 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	13.91	1	726	1.060	-----	-----	-----	WF Res	
2	SCS Runoff	121.32	1	725	8.779	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	81.21	1	717	4.292	-----	-----	-----	Post-B	
4	SCS Runoff	119.16	1	717	6.297	-----	-----	-----	Post-A	
5	Combine	128.57	1	717	7.357	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.665	1	1127	5.480	5	1385.80	5.18	West Detention	
7	SCS Runoff	34.91	1	717	1.845	-----	-----	-----	Post-C	
8	Reservoir	27.06	1	720	1.845	7	1383.40	0.401	East Detention	
9	SCS Runoff	9.867	1	717	0.521	-----	-----	-----	Home Bank	
10	Combine	113.11	1	718	12.138	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 10 Year			Monday, Dec 13, 2010		

# 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	17.56	1	726	1.350	-----	-----	-----	WF Res	
2	SCS Runoff	153.92	1	725	11.232	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	98.20	1	717	5.250	-----	-----	-----	Post-B	
4	SCS Runoff	144.09	1	717	7.704	-----	-----	-----	Post-A	
5	Combine	156.13	1	717	9.054	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.716	1	1184	5.750	5	1386.59	6.65	West Detention	
7	SCS Runoff	42.22	1	717	2.257	-----	-----	-----	Post-C	
8	Reservoir	35.09	1	720	2.257	7	1383.57	0.436	East Detention	
9	SCS Runoff	11.93	1	717	0.638	-----	-----	-----	Home Bank	
10	Combine	144.03	1	718	13.896	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 25 Year			Monday, Dec 13, 2010		

# 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	20.35	1	726	1.575	-----	-----	-----	WF Res	
2	SCS Runoff	178.77	1	725	13.131	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	111.10	1	717	5.982	-----	-----	-----	Post-B	
4	SCS Runoff	163.02	1	717	8.777	-----	-----	-----	Post-A	
5	Combine	177.07	1	717	10.352	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.753	1	1256	5.925	5	1387.18	7.81	West Detention	
7	SCS Runoff	47.76	1	717	2.572	-----	-----	-----	Post-C	
8	Reservoir	37.44	1	720	2.572	7	1383.76	0.473	East Detention	
9	SCS Runoff	13.50	1	717	0.727	-----	-----	-----	Home Bank	
10	Combine	161.65	1	717	15.205	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 50 Year			Monday, Dec 13, 2010		

# 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	22.78	1	726	1.773	-----	-----	-----	WF Res	
2	SCS Runoff	200.48	1	725	14.808	-----	-----	-----	Pre-A (Pre-To Greenwich Rd)	
3	SCS Runoff	122.36	1	717	6.623	-----	-----	-----	Post-B	
4	SCS Runoff	179.54	1	717	9.717	-----	-----	-----	Post-A	
5	Combine	195.36	1	717	11.490	1, 4	-----	-----	Post A + WF Res	
6	Reservoir	1.785	1	1371	6.065	5	1387.70	8.85	West Detention	
7	SCS Runoff	52.60	1	717	2.847	-----	-----	-----	Post-C	
8	Reservoir	38.92	1	721	2.847	7	1383.97	0.514	East Detention	
9	SCS Runoff	14.87	1	717	0.805	-----	-----	-----	Home Bank	
10	Combine	176.00	1	717	16.339	3, 6, 8, 9	-----	-----	Post To Greenwich Rd	
Detention Calcs.gpw					Return Period: 100 Year			Monday, Dec 13, 2010		

# Hydrograph Report

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

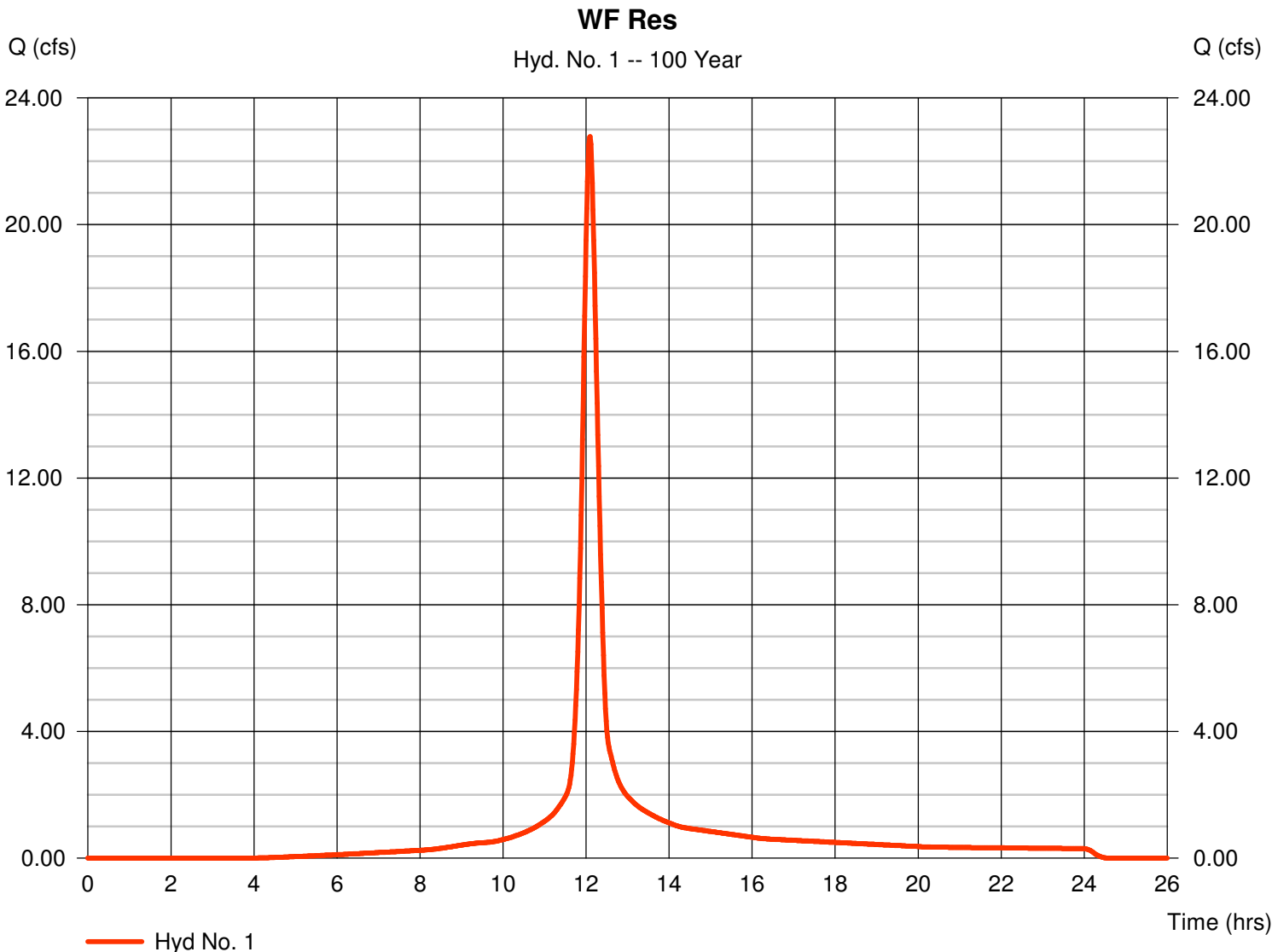
Monday, Dec 13, 2010

## Hyd. No. 1

WF Res

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 3.500 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 22.78 cfs  
 Time to peak = 12.10 hrs  
 Hyd. volume = 1.773 acft  
 Curve number = 85  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 20.50 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Report

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

Monday, Dec 13, 2010

## Hyd. No. 2

Pre-A (Pre-To Greenwich Rd)

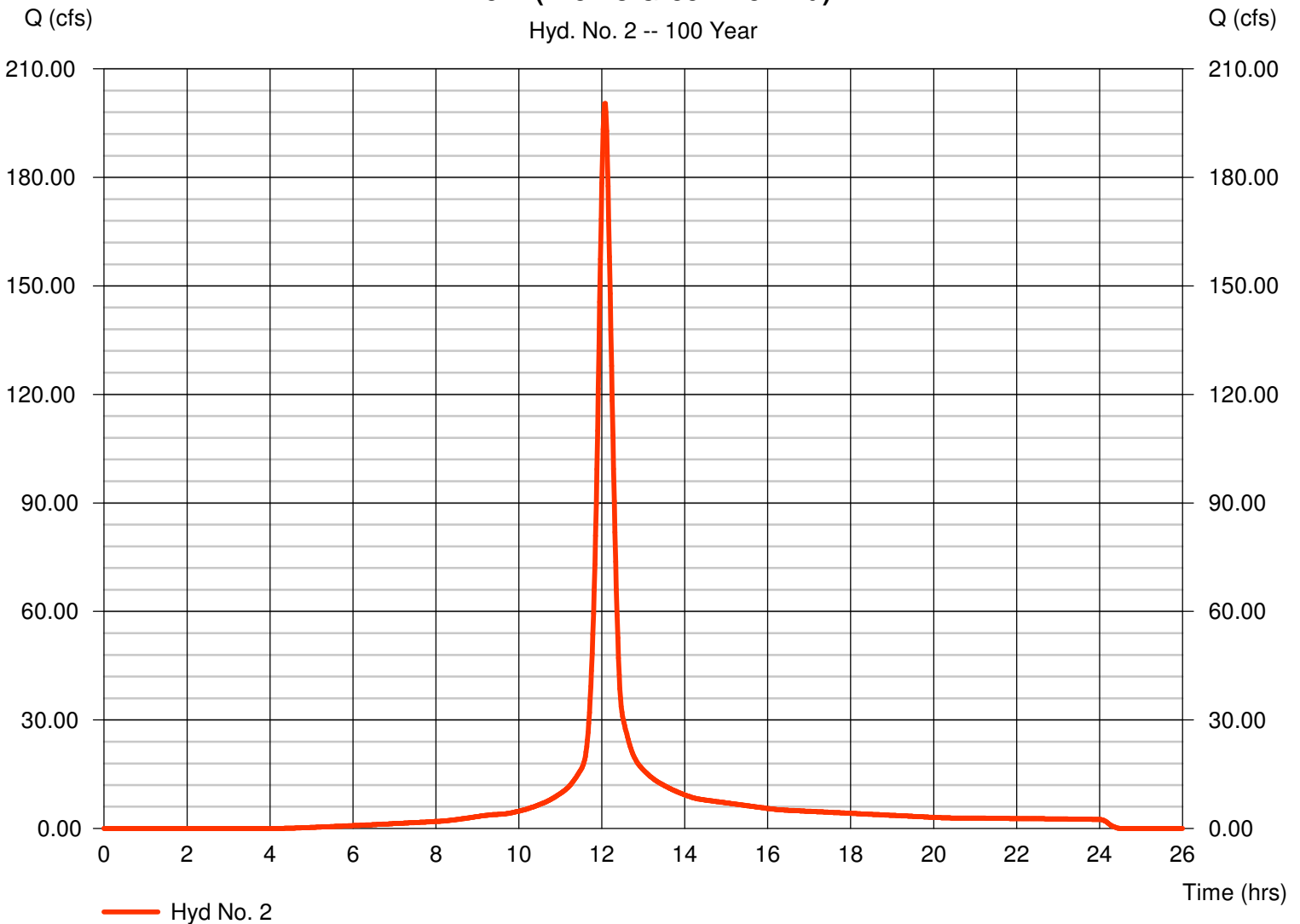
Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 30.100 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 200.48 cfs  
Time to peak = 12.08 hrs  
Hyd. volume = 14.808 acft  
Curve number = 84\*  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 19.30 min  
Distribution = Type II  
Shape factor = 484

\* Composite (Area/CN) = [(28.800 x 84) + (1.300 x 95)] / 30.100

### Pre-A (Pre-To Greenwich Rd)

Hyd. No. 2 -- 100 Year



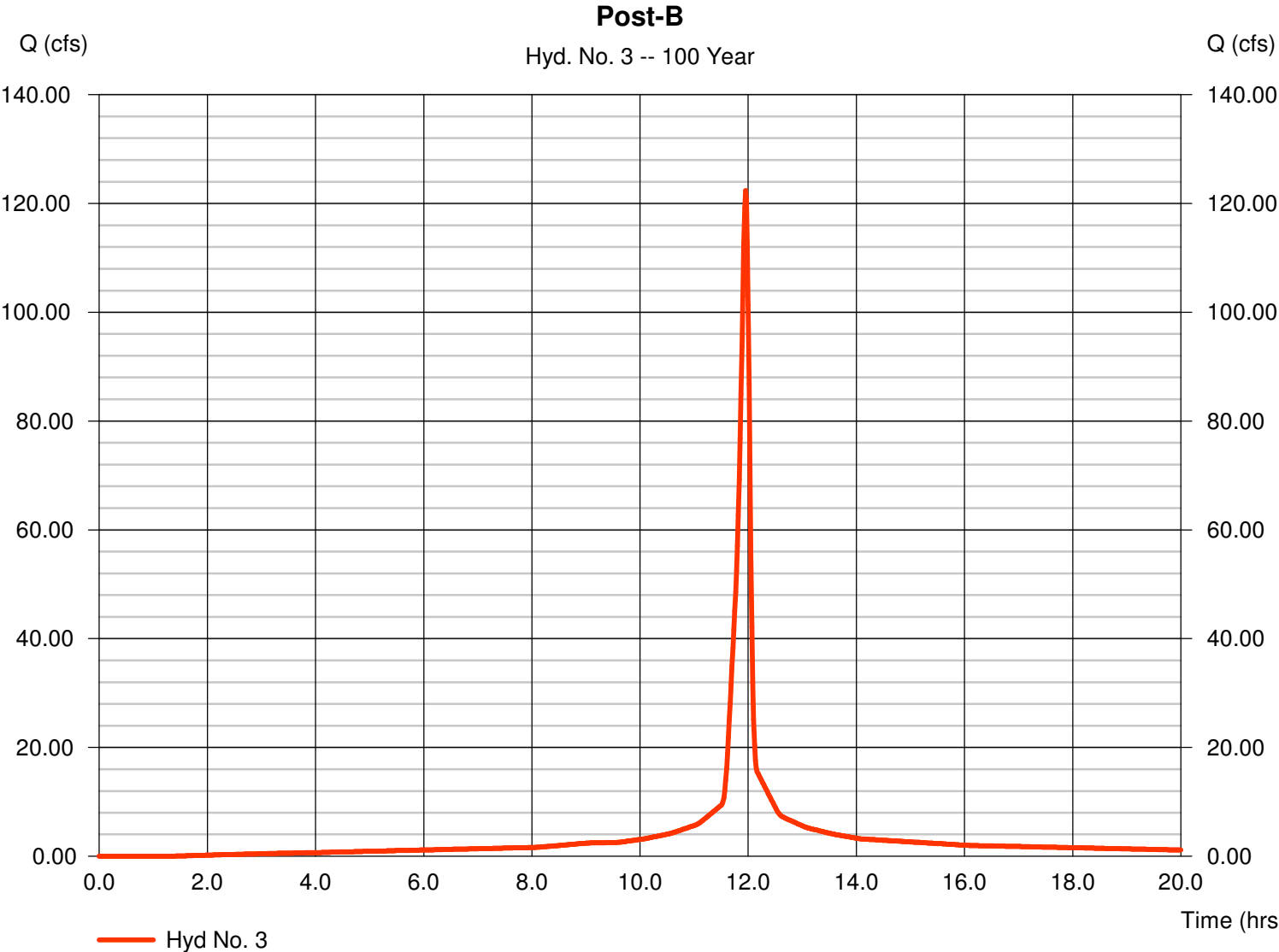
# Hydrograph Report

## Hyd. No. 3

Post-B

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 10.700 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 122.36 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 6.623 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 5.20 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Report

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

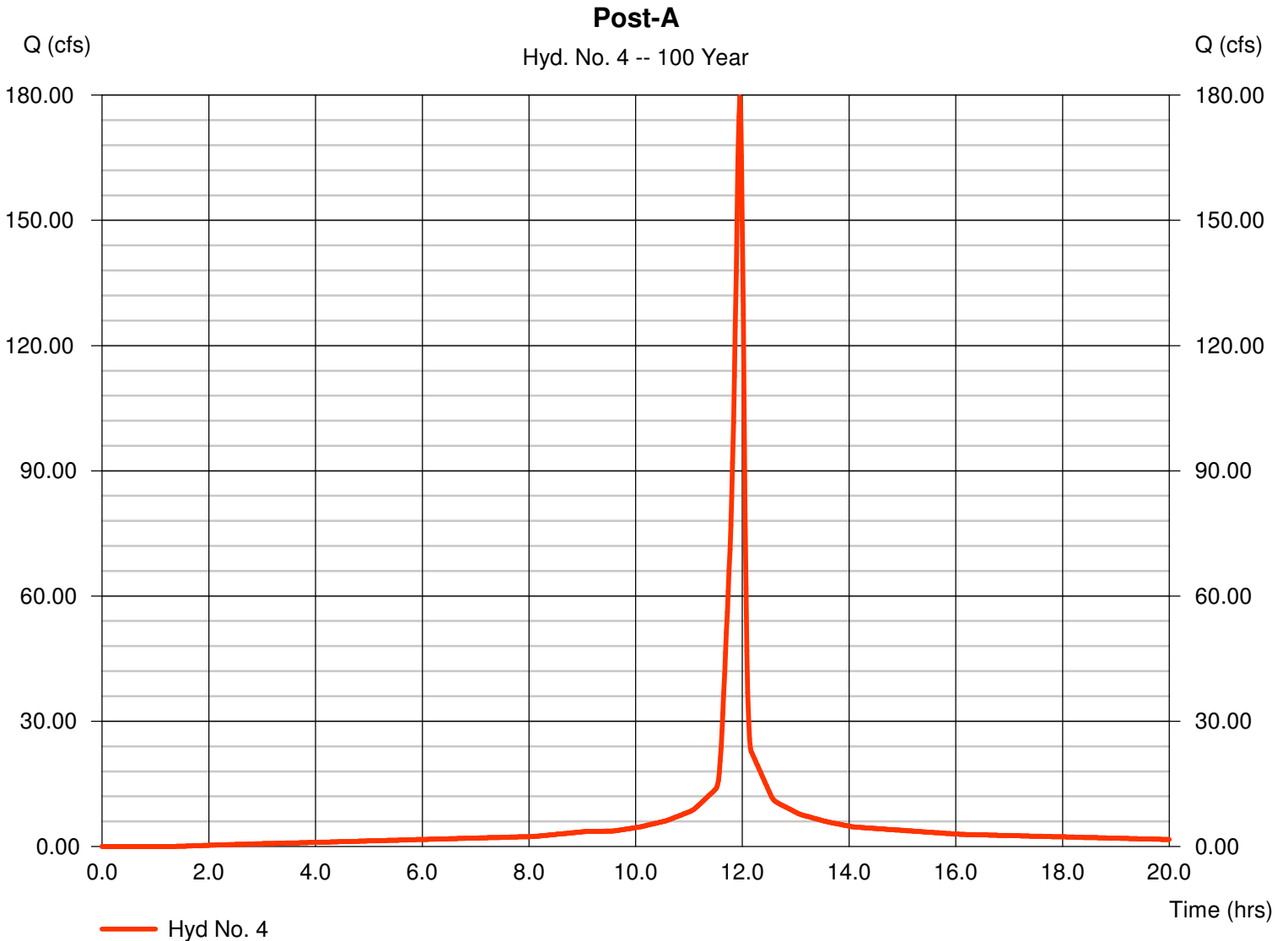
Monday, Dec 13, 2010

## Hyd. No. 4

Post-A

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 15.700 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 179.54 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 9.717 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 5.00 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Report

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

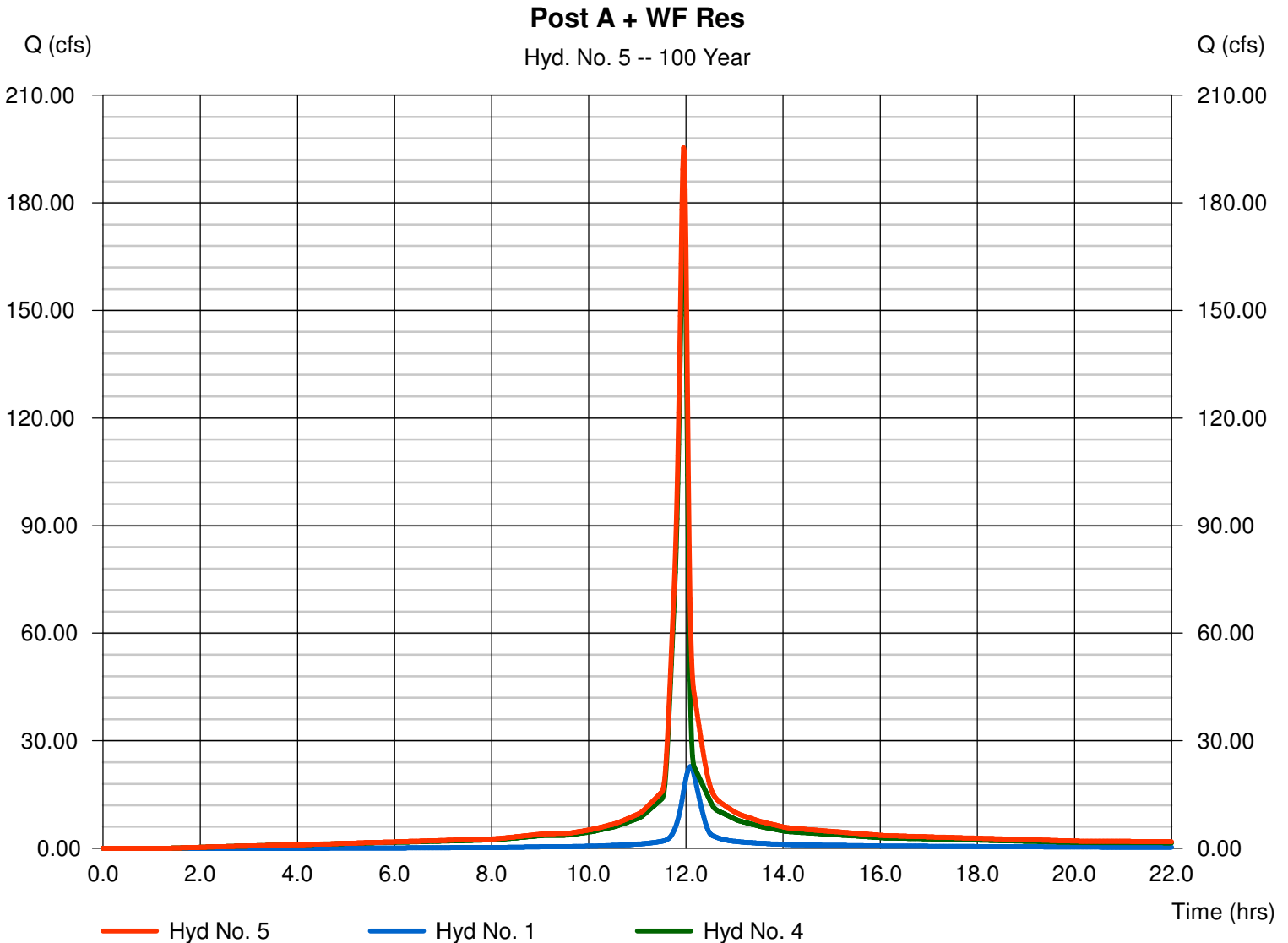
Monday, Dec 13, 2010

## Hyd. No. 5

Post A + WF Res

Hydrograph type = Combine  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Inflow hyds. = 1, 4

Peak discharge = 195.36 cfs  
 Time to peak = 11.95 hrs  
 Hyd. volume = 11.490 acft  
 Contrib. drain. area = 19.200 ac



# Hydrograph Report

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

Monday, Dec 13, 2010

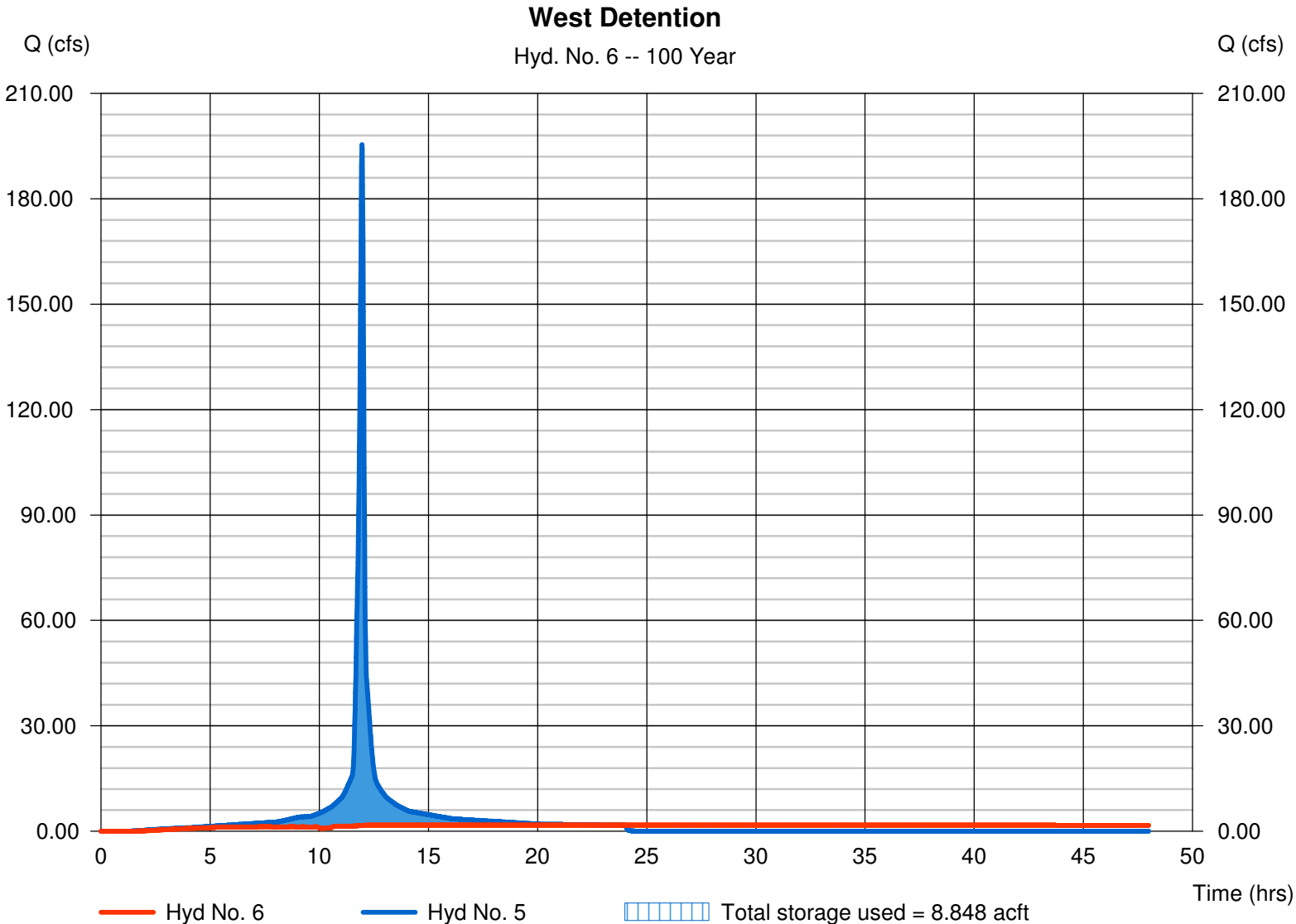
## Hyd. No. 6

West Detention

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 5 - Post A + WF Res  
Reservoir name = West Detention

Peak discharge = 1.785 cfs  
Time to peak = 22.85 hrs  
Hyd. volume = 6.065 acft  
Max. Elevation = 1387.70 ft  
Max. Storage = 8.848 acft

Storage Indication method used.



# Pond Report

## Pond No. 1 - West Detention

### Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1380.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1380.00	15,822	0.000	0.000
1.00	1381.00	20,762	0.419	0.419
2.00	1382.00	26,361	0.540	0.958
3.00	1383.00	32,621	0.676	1.634
4.00	1384.00	40,268	0.835	2.469
5.00	1385.00	74,465	1.297	3.766
6.00	1386.00	79,858	1.771	5.537
7.00	1387.00	85,397	1.896	7.433
8.00	1388.00	91,093	2.025	9.458
9.00	1389.00	96,947	2.158	11.616
10.00	1390.00	102,959	2.294	13.910

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 8.00	0.00	0.00	0.00
Span (in)	= 8.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 1375.00	0.00	0.00	0.00
Length (ft)	= 650.00	0.00	0.00	0.00
Slope (%)	= 0.40	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)	= 8.00	0.00	0.00	0.00
Crest El. (ft)	= 1380.00	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	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).

### Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1380.00	0.00	---	---	---	0.00	---	---	---	---	---	0.000
0.10	0.042	1380.10	1.23 oc	---	---	---	0.84	---	---	---	---	---	0.842
0.20	0.084	1380.20	1.24 oc	---	---	---	1.24 s	---	---	---	---	---	1.244
0.30	0.126	1380.30	1.25 oc	---	---	---	1.25 s	---	---	---	---	---	1.253
0.40	0.167	1380.40	1.26 oc	---	---	---	1.25 s	---	---	---	---	---	1.253
0.50	0.209	1380.50	1.27 oc	---	---	---	1.26 s	---	---	---	---	---	1.263
0.60	0.251	1380.60	1.28 oc	---	---	---	1.25 s	---	---	---	---	---	1.247
0.70	0.293	1380.70	1.29 oc	---	---	---	1.24 s	---	---	---	---	---	1.243
0.80	0.335	1380.80	1.30 oc	---	---	---	1.25 s	---	---	---	---	---	1.254
0.90	0.377	1380.90	1.31 oc	---	---	---	1.30 s	---	---	---	---	---	1.299
1.00	0.419	1381.00	1.31 oc	---	---	---	1.17 s	---	---	---	---	---	1.170
1.10	0.473	1381.10	1.32 oc	---	---	---	1.30 s	---	---	---	---	---	1.301
1.20	0.527	1381.20	1.33 oc	---	---	---	1.09 s	---	---	---	---	---	1.094
1.30	0.580	1381.30	1.34 oc	---	---	---	1.20 s	---	---	---	---	---	1.197
1.40	0.634	1381.40	1.35 oc	---	---	---	1.30 s	---	---	---	---	---	1.300
1.50	0.688	1381.50	1.36 oc	---	---	---	0.79 s	---	---	---	---	---	0.789
1.60	0.742	1381.60	1.36 oc	---	---	---	0.85 s	---	---	---	---	---	0.847
1.70	0.796	1381.70	1.37 oc	---	---	---	0.91 s	---	---	---	---	---	0.907
1.80	0.850	1381.80	1.38 oc	---	---	---	0.97 s	---	---	---	---	---	0.966
1.90	0.904	1381.90	1.39 oc	---	---	---	1.03 s	---	---	---	---	---	1.026
2.00	0.958	1382.00	1.39 oc	---	---	---	0.00 s	---	---	---	---	---	1.395
2.10	1.026	1382.10	1.40 oc	---	---	---	0.00	---	---	---	---	---	1.402
2.20	1.093	1382.20	1.41 oc	---	---	---	0.00	---	---	---	---	---	1.410
2.30	1.161	1382.30	1.42 oc	---	---	---	0.00	---	---	---	---	---	1.418
2.40	1.228	1382.40	1.43 oc	---	---	---	0.00	---	---	---	---	---	1.426
2.50	1.296	1382.50	1.43 oc	---	---	---	0.00	---	---	---	---	---	1.433
2.60	1.364	1382.60	1.44 oc	---	---	---	0.00	---	---	---	---	---	1.441
2.70	1.431	1382.70	1.45 oc	---	---	---	0.00	---	---	---	---	---	1.448
2.80	1.499	1382.80	1.46 oc	---	---	---	0.00	---	---	---	---	---	1.456
2.90	1.566	1382.90	1.46 oc	---	---	---	0.00	---	---	---	---	---	1.463
3.00	1.634	1383.00	1.47 oc	---	---	---	0.00	---	---	---	---	---	1.471
3.10	1.717	1383.10	1.48 oc	---	---	---	0.00	---	---	---	---	---	1.478
3.20	1.801	1383.20	1.49 oc	---	---	---	0.00	---	---	---	---	---	1.485

Continues on next page...

West Detention

**Stage / Storage / Discharge Table**

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.30	1.884	1383.30	1.49 oc	---	---	---	0.00	---	---	---	---	---	1.493
3.40	1.968	1383.40	1.50 oc	---	---	---	0.00	---	---	---	---	---	1.500
3.50	2.051	1383.50	1.51 oc	---	---	---	0.00	---	---	---	---	---	1.507
3.60	2.135	1383.60	1.51 oc	---	---	---	0.00	---	---	---	---	---	1.514
3.70	2.218	1383.70	1.52 oc	---	---	---	0.00	---	---	---	---	---	1.522
3.80	2.302	1383.80	1.53 oc	---	---	---	0.00	---	---	---	---	---	1.529
3.90	2.385	1383.90	1.54 oc	---	---	---	0.00	---	---	---	---	---	1.536
4.00	2.469	1384.00	1.54 oc	---	---	---	0.00	---	---	---	---	---	1.543
4.10	2.599	1384.10	1.55 oc	---	---	---	0.00	---	---	---	---	---	1.550
4.20	2.728	1384.20	1.56 oc	---	---	---	0.00	---	---	---	---	---	1.557
4.30	2.858	1384.30	1.56 oc	---	---	---	0.00	---	---	---	---	---	1.564
4.40	2.988	1384.40	1.57 oc	---	---	---	0.00	---	---	---	---	---	1.571
4.50	3.117	1384.50	1.58 oc	---	---	---	0.00	---	---	---	---	---	1.578
4.60	3.247	1384.60	1.58 oc	---	---	---	0.00	---	---	---	---	---	1.585
4.70	3.377	1384.70	1.59 oc	---	---	---	0.00	---	---	---	---	---	1.591
4.80	3.506	1384.80	1.60 oc	---	---	---	0.00	---	---	---	---	---	1.598
4.90	3.636	1384.90	1.61 oc	---	---	---	0.00	---	---	---	---	---	1.605
5.00	3.766	1385.00	1.61 oc	---	---	---	0.00	---	---	---	---	---	1.612
5.10	3.943	1385.10	1.62 oc	---	---	---	0.00	---	---	---	---	---	1.619
5.20	4.120	1385.20	1.63 oc	---	---	---	0.00	---	---	---	---	---	1.625
5.30	4.297	1385.30	1.63 oc	---	---	---	0.00	---	---	---	---	---	1.632
5.40	4.474	1385.40	1.64 oc	---	---	---	0.00	---	---	---	---	---	1.639
5.50	4.651	1385.50	1.65 oc	---	---	---	0.00	---	---	---	---	---	1.645
5.60	4.828	1385.60	1.65 oc	---	---	---	0.00	---	---	---	---	---	1.652
5.70	5.005	1385.70	1.66 oc	---	---	---	0.00	---	---	---	---	---	1.658
5.80	5.182	1385.80	1.67 oc	---	---	---	0.00	---	---	---	---	---	1.665
5.90	5.360	1385.90	1.67 oc	---	---	---	0.00	---	---	---	---	---	1.672
6.00	5.537	1386.00	1.68 oc	---	---	---	0.00	---	---	---	---	---	1.678
6.10	5.726	1386.10	1.68 oc	---	---	---	0.00	---	---	---	---	---	1.685
6.20	5.916	1386.20	1.69 oc	---	---	---	0.00	---	---	---	---	---	1.691
6.30	6.105	1386.30	1.70 oc	---	---	---	0.00	---	---	---	---	---	1.697
6.40	6.295	1386.40	1.70 oc	---	---	---	0.00	---	---	---	---	---	1.704
6.50	6.485	1386.50	1.71 oc	---	---	---	0.00	---	---	---	---	---	1.710
6.60	6.674	1386.60	1.72 oc	---	---	---	0.00	---	---	---	---	---	1.717
6.70	6.864	1386.70	1.72 oc	---	---	---	0.00	---	---	---	---	---	1.723
6.80	7.054	1386.80	1.73 oc	---	---	---	0.00	---	---	---	---	---	1.729
6.90	7.243	1386.90	1.74 oc	---	---	---	0.00	---	---	---	---	---	1.735
7.00	7.433	1387.00	1.74 oc	---	---	---	0.00	---	---	---	---	---	1.742
7.10	7.635	1387.10	1.75 oc	---	---	---	0.00	---	---	---	---	---	1.748
7.20	7.838	1387.20	1.75 oc	---	---	---	0.00	---	---	---	---	---	1.754
7.30	8.040	1387.30	1.76 oc	---	---	---	0.00	---	---	---	---	---	1.760
7.40	8.243	1387.40	1.77 oc	---	---	---	0.00	---	---	---	---	---	1.767
7.50	8.446	1387.50	1.77 oc	---	---	---	0.00	---	---	---	---	---	1.773
7.60	8.648	1387.60	1.78 oc	---	---	---	0.00	---	---	---	---	---	1.779
7.70	8.851	1387.70	1.78 oc	---	---	---	0.00	---	---	---	---	---	1.785
7.80	9.053	1387.80	1.79 oc	---	---	---	0.00	---	---	---	---	---	1.791
7.90	9.256	1387.90	1.80 oc	---	---	---	0.00	---	---	---	---	---	1.797
8.00	9.458	1388.00	1.80 oc	---	---	---	0.00	---	---	---	---	---	1.803
8.10	9.674	1388.10	1.81 oc	---	---	---	0.00	---	---	---	---	---	1.809
8.20	9.890	1388.20	1.82 oc	---	---	---	0.00	---	---	---	---	---	1.815
8.30	10.106	1388.30	1.82 oc	---	---	---	0.00	---	---	---	---	---	1.821
8.40	10.321	1388.40	1.83 oc	---	---	---	0.00	---	---	---	---	---	1.827
8.50	10.537	1388.50	1.83 oc	---	---	---	0.00	---	---	---	---	---	1.833
8.60	10.753	1388.60	1.84 oc	---	---	---	0.00	---	---	---	---	---	1.839
8.70	10.969	1388.70	1.84 oc	---	---	---	0.00	---	---	---	---	---	1.845
8.80	11.184	1388.80	1.85 oc	---	---	---	0.00	---	---	---	---	---	1.851
8.90	11.400	1388.90	1.86 oc	---	---	---	0.00	---	---	---	---	---	1.857
9.00	11.616	1389.00	1.86 oc	---	---	---	0.00	---	---	---	---	---	1.863
9.10	11.845	1389.10	1.87 oc	---	---	---	0.00	---	---	---	---	---	1.868
9.20	12.075	1389.20	1.87 oc	---	---	---	0.00	---	---	---	---	---	1.874
9.30	12.304	1389.30	1.88 oc	---	---	---	0.00	---	---	---	---	---	1.880
9.40	12.534	1389.40	1.89 oc	---	---	---	0.00	---	---	---	---	---	1.886
9.50	12.763	1389.50	1.89 oc	---	---	---	0.00	---	---	---	---	---	1.892
9.60	12.992	1389.60	1.90 oc	---	---	---	0.00	---	---	---	---	---	1.897
9.70	13.222	1389.70	1.90 oc	---	---	---	0.00	---	---	---	---	---	1.903
9.80	13.451	1389.80	1.91 oc	---	---	---	0.00	---	---	---	---	---	1.909
9.90	13.681	1389.90	1.91 oc	---	---	---	0.00	---	---	---	---	---	1.914
10.00	13.910	1390.00	1.92 oc	---	---	---	0.00	---	---	---	---	---	1.920

...End

# Hydrograph Report

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

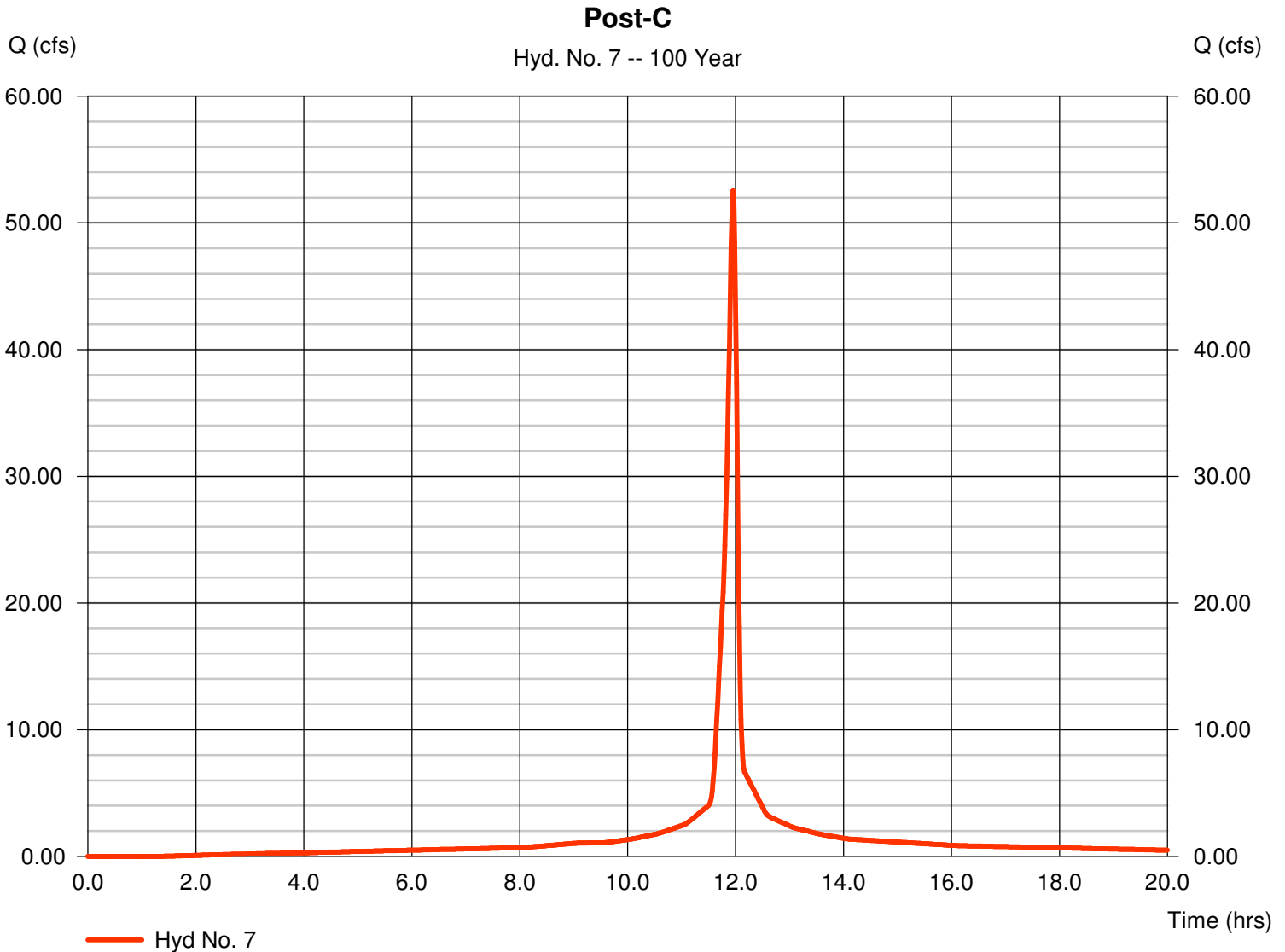
Monday, Dec 13, 2010

## Hyd. No. 7

Post-C

Hydrograph type = SCS Runoff  
 Storm frequency = 100 yrs  
 Time interval = 1 min  
 Drainage area = 4.600 ac  
 Basin Slope = 0.0 %  
 Tc method = USER  
 Total precip. = 7.80 in  
 Storm duration = 24 hrs

Peak discharge = 52.60 cfs  
 Time to peak = 11.95 hrs  
 Hyd. volume = 2.847 acft  
 Curve number = 95  
 Hydraulic length = 0 ft  
 Time of conc. (Tc) = 5.20 min  
 Distribution = Type II  
 Shape factor = 484



# Hydrograph Report

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

Monday, Dec 13, 2010

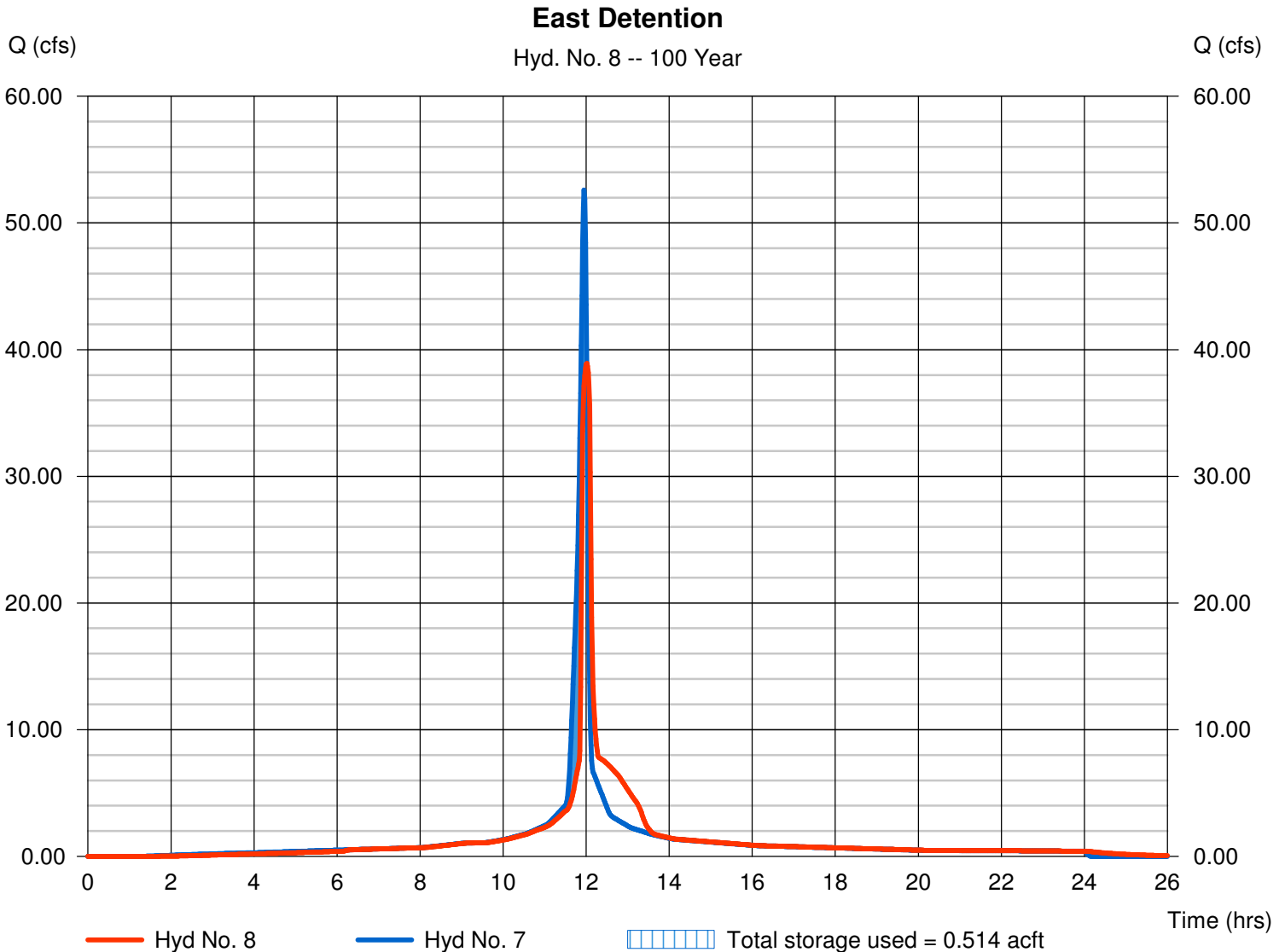
## Hyd. No. 8

East Detention

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyd. No. = 7 - Post-C  
Reservoir name = East Detention

Peak discharge = 38.92 cfs  
Time to peak = 12.02 hrs  
Hyd. volume = 2.847 acft  
Max. Elevation = 1383.97 ft  
Max. Storage = 0.514 acft

Storage Indication method used.



# Pond Report

## Pond No. 2 - East Detention

### Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Beginning Elevation = 1380.00 ft

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (acft)	Total storage (acft)
0.00	1380.00	2,168	0.000	0.000
1.00	1381.00	3,768	0.067	0.067
2.00	1382.00	5,569	0.106	0.174
3.00	1383.00	7,538	0.150	0.324
4.00	1384.00	9,676	0.197	0.521

### Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	6.00	0.00	0.00
Span (in)	= 24.00	12.00	0.00	0.00
No. Barrels	= 1	2	0	0
Invert El. (ft)	= 1379.00	1380.00	0.00	0.00
Length (ft)	= 50.00	1.00	0.00	0.00
Slope (%)	= 0.40	0.40	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)	= 16.00	0.00	0.00	0.00
Crest El. (ft)	= 1382.90	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	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).

### Stage / Storage / Discharge Table

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0.000	1380.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.10	0.007	1380.10	3.88 oc	0.08 oc	---	---	0.00	---	---	---	---	---	0.080
0.20	0.013	1380.20	3.88 oc	0.16 oc	---	---	0.00	---	---	---	---	---	0.163
0.30	0.020	1380.30	3.88 oc	0.25 oc	---	---	0.00	---	---	---	---	---	0.246
0.40	0.027	1380.40	3.88 oc	0.33 oc	---	---	0.00	---	---	---	---	---	0.329
0.50	0.034	1380.50	3.88 oc	0.41 oc	---	---	0.00	---	---	---	---	---	0.412
0.60	0.040	1380.60	3.88 oc	2.08 oc	---	---	0.00	---	---	---	---	---	2.075
0.70	0.047	1380.70	3.88 oc	2.91 oc	---	---	0.00	---	---	---	---	---	2.907
0.80	0.054	1380.80	3.88 oc	3.55 oc	---	---	0.00	---	---	---	---	---	3.549
0.90	0.061	1380.90	3.88 oc	3.88 ic	---	---	0.00	---	---	---	---	---	3.881
1.00	0.067	1381.00	3.88 oc	4.17 ic	---	---	0.00	---	---	---	---	---	4.170
1.10	0.078	1381.10	3.88 oc	4.44 ic	---	---	0.00	---	---	---	---	---	4.439
1.20	0.089	1381.20	3.88 oc	4.69 ic	---	---	0.00	---	---	---	---	---	4.693
1.30	0.099	1381.30	3.88 oc	4.93 ic	---	---	0.00	---	---	---	---	---	4.934
1.40	0.110	1381.40	3.88 oc	5.16 ic	---	---	0.00	---	---	---	---	---	5.163
1.50	0.121	1381.50	3.88 oc	5.38 ic	---	---	0.00	---	---	---	---	---	5.383
1.60	0.131	1381.60	3.88 oc	5.59 ic	---	---	0.00	---	---	---	---	---	5.594
1.70	0.142	1381.70	3.88 oc	5.80 ic	---	---	0.00	---	---	---	---	---	5.798
1.80	0.152	1381.80	3.88 oc	5.99 ic	---	---	0.00	---	---	---	---	---	5.994
1.90	0.163	1381.90	3.88 oc	6.18 ic	---	---	0.00	---	---	---	---	---	6.185
2.00	0.174	1382.00	3.88 oc	6.37 ic	---	---	0.00	---	---	---	---	---	6.370
2.10	0.189	1382.10	3.88 oc	6.55 ic	---	---	0.00	---	---	---	---	---	6.549
2.20	0.204	1382.20	3.88 oc	6.72 ic	---	---	0.00	---	---	---	---	---	6.724
2.30	0.219	1382.30	3.88 oc	6.89 ic	---	---	0.00	---	---	---	---	---	6.894
2.40	0.234	1382.40	3.88 oc	7.06 ic	---	---	0.00	---	---	---	---	---	7.060
2.50	0.249	1382.50	3.88 oc	7.22 ic	---	---	0.00	---	---	---	---	---	7.222
2.60	0.264	1382.60	3.88 oc	7.38 ic	---	---	0.00	---	---	---	---	---	7.381
2.70	0.279	1382.70	3.88 oc	7.54 ic	---	---	0.00	---	---	---	---	---	7.536
2.80	0.294	1382.80	3.88 oc	7.69 ic	---	---	0.00	---	---	---	---	---	7.689
2.90	0.309	1382.90	3.88 oc	7.84 ic	---	---	0.00	---	---	---	---	---	7.838
3.00	0.324	1383.00	3.88 oc	7.98 ic	---	---	1.68	---	---	---	---	---	9.669
3.10	0.343	1383.10	4.80 oc	8.13 ic	---	---	4.76	---	---	---	---	---	12.89
3.20	0.363	1383.20	8.75 oc	8.27 ic	---	---	8.75	---	---	---	---	---	17.02
3.30	0.383	1383.30	13.47 oc	8.41 ic	---	---	13.47	---	---	---	---	---	21.88
3.40	0.402	1383.40	18.83 oc	8.55 ic	---	---	18.83	---	---	---	---	---	27.38
3.50	0.422	1383.50	24.75 oc	8.68 ic	---	---	24.75	---	---	---	---	---	33.43
3.60	0.442	1383.60	26.98 oc	8.81 ic	---	---	26.98 s	---	---	---	---	---	35.79
3.70	0.462	1383.70	28.04 ic	8.94 ic	---	---	28.04 s	---	---	---	---	---	36.98
3.80	0.481	1383.80	28.73 ic	9.07 ic	---	---	28.72 s	---	---	---	---	---	37.79

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East Detention

**Stage / Storage / Discharge Table**

Stage ft	Storage acft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.90	0.501	1383.90	29.30 ic	9.20 ic	---	---	29.30 s	---	---	---	---	---	38.50
4.00	0.521	1384.00	29.81 ic	9.32 ic	---	---	29.81 s	---	---	---	---	---	39.13

...End

# Hydrograph Report

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

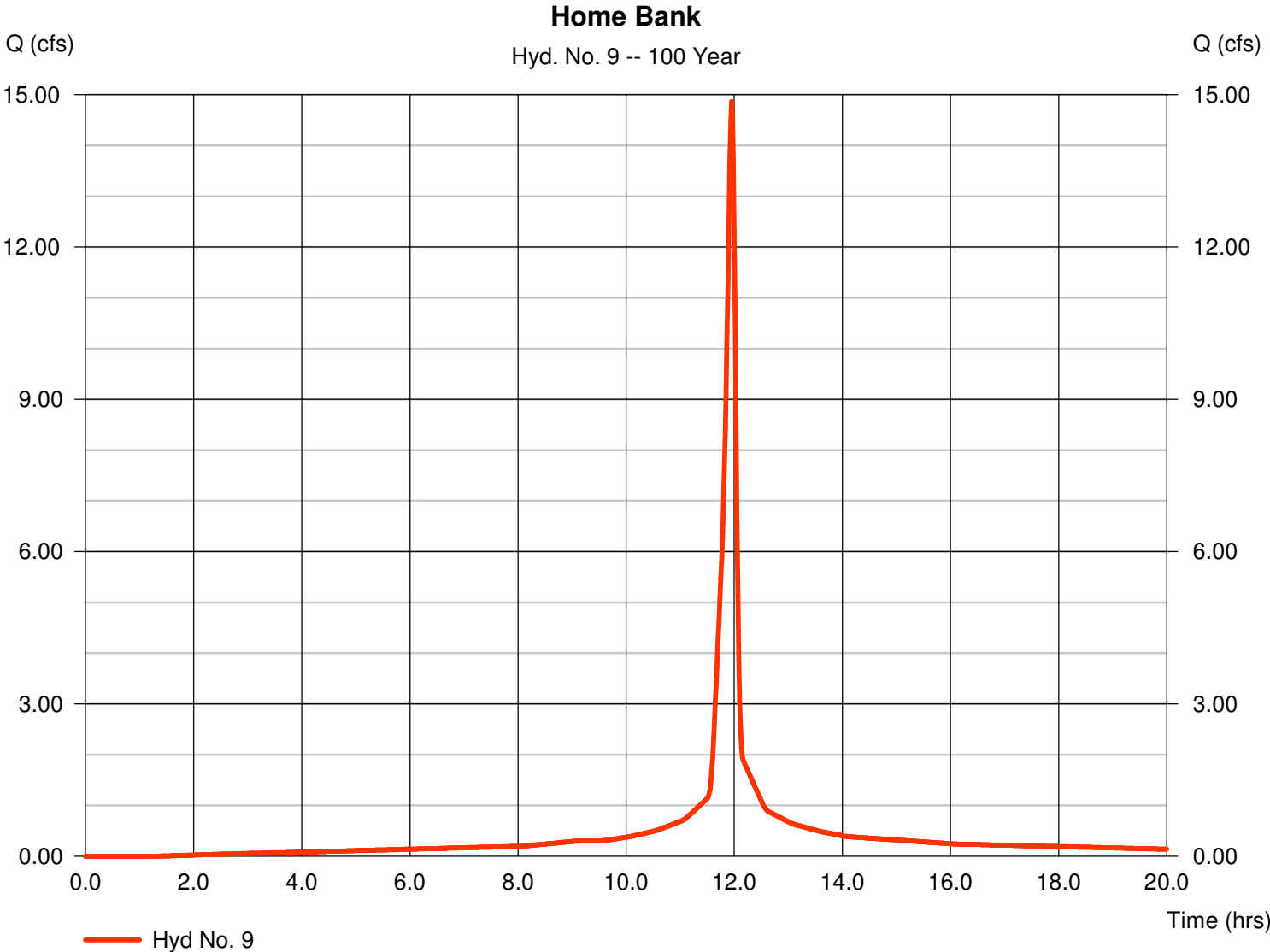
Monday, Dec 13, 2010

## Hyd. No. 9

Home Bank

Hydrograph type = SCS Runoff  
Storm frequency = 100 yrs  
Time interval = 1 min  
Drainage area = 1.300 ac  
Basin Slope = 0.0 %  
Tc method = USER  
Total precip. = 7.80 in  
Storm duration = 24 hrs

Peak discharge = 14.87 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 0.805 acft  
Curve number = 95  
Hydraulic length = 0 ft  
Time of conc. (Tc) = 5.00 min  
Distribution = Type II  
Shape factor = 484



# Hydrograph Report

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

Monday, Dec 13, 2010

## Hyd. No. 10

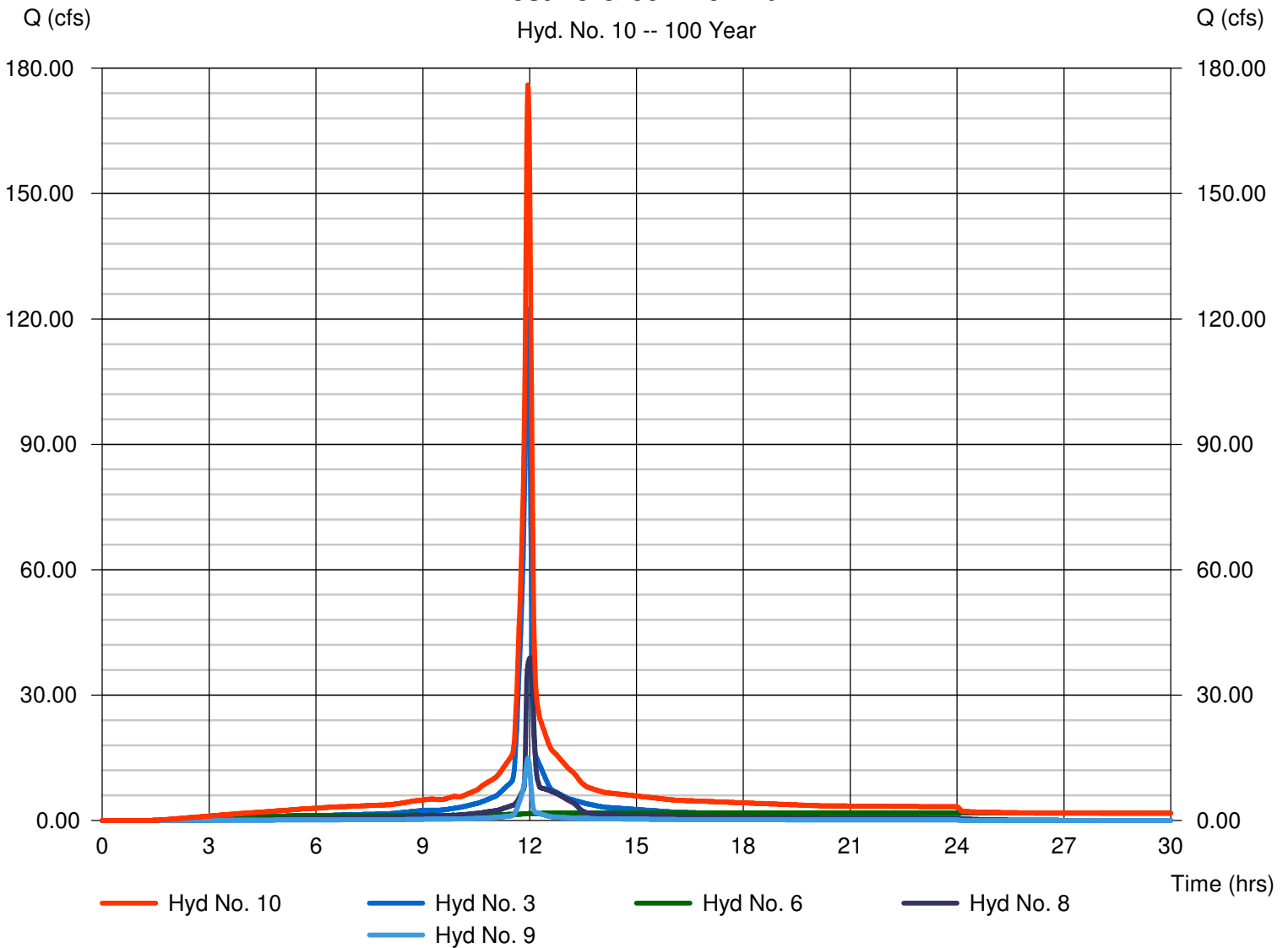
Post To Greenwich Rd

Hydrograph type = Combine  
Storm frequency = 100 yrs  
Time interval = 1 min  
Inflow hyds. = 3, 6, 8, 9

Peak discharge = 176.00 cfs  
Time to peak = 11.95 hrs  
Hyd. volume = 16.339 acft  
Contrib. drain. area = 12.000 ac

### Post To Greenwich Rd

Hyd. No. 10 -- 100 Year



## Appendix 2.6

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### Time of Concentration Calculations

Berkeley Square 1st Addition

City: Wichita  
 County: Sedgwick  
 State: Kansas

Basin Name	Sheet Flow (T <sub>T(sheet)</sub> )								Shallow Concentrated (T <sub>T(shallow)</sub> )							Open Channel (T <sub>T(open)</sub> )										Time of Conc. (T <sub>c</sub> ) (min)	Lag Time (min)		
	Surface Description	Manning's n (n)	Flow Length (L) (ft) (100' Max.)	2-Year, 24-Hour Rainfall (P <sub>2</sub> ) (in)	Max. Elev. (ft)	Min. Elev. (ft)	Land Slope (S) (ft/ft)	T <sub>T(sheet)</sub> (min)	Flow Cover	Velocity Coeff. (K)	Max. Elev. (ft)	Min. Elev. (ft)	Flow Length (L) (ft)	Slope (S) (ft/ft)	Velocity (V) (ft/s)	T <sub>T(shallow)</sub> (min)	Channel Type	Manning's n (n)	Cross Sectional Flow Area (A) (ft <sup>2</sup> )	Wetted Perimeter (P <sub>w</sub> ) (ft)	Hydraulic Radius (R)	Max. Elev. (ft)	Min. Elev. (ft)	Flow Length (L) (ft)	Land Slope (S) (ft/ft)			Velocity (V) (ft/s)	T <sub>T(open)</sub> (min)
Pre-A	Grass - Short grass prairie	0.15	100	3.5	1398.0	1397	0.01	12.4	Short grass pasture	7.0	1397	1392	300	0.0167	0.90	5.5	Minor Natural Stream - Regular section - Some grass & weeds; little or no brush	0.03	30	30	1.00	1392	1377	650	0.0231	7.54	1.4	19.3	11.6
Post-A	Smooth surfaces (concrete, asphalt,	0.011	100	3.5	1396.0	1395	0.01	1.5	Unpaved (as defined by TR-55)	16.3	1397	1392	300	0.0167	2.10	2.4	Minor Natural Stream - Regular section - Some grass & weeds; little or no brush	0.03	30	30	1.00	1392	1377	600	0.025	7.85	1.3	5.2	3.1
Post-B	Smooth surfaces (concrete, asphalt,	0.011	100	3.5	1396.0	1395	0.01	1.5	Unpaved (as defined by TR-55)	16.3	1395	1394	150	0.0067	1.33	1.9	Culverts & Storm Sewers - Concrete Pipe	0.013	7.1	9.4	0.76	1377	1371	850	0.0071	7.99	1.8	5.2	3.1
Post-C	Smooth surfaces (concrete, asphalt,	0.011	100	3.5	1396.0	1395	0.01	1.5	Unpaved (as defined by TR-55)	16.3	1395	1394	150	0.0067	1.33	1.9	Culverts & Storm Sewers - Concrete Pipe	0.013	7.1	9.4	0.76	1377	1371	850	0.0071	7.99	1.8	5.2	3.1
WF Residential	Grass - Short grass prairie	0.15	100	3.5	1396.0	1395.5	0.005	16.3	Unpaved (as defined by TR-55)	16.3	1395	1394	150	0.0067	1.33	1.9	Culverts & Storm Sewers - Concrete Pipe	0.013	0.8	3.1	0.26	1392	1390.4	400	0.004	2.94	2.3	20.5	12.3
Home Bank	Smooth surfaces (concrete, asphalt,	0.011	100	3.5	1396.0	1395	0.01	1.5	Unpaved (as defined by TR-55)	16.3	1395	1394	150	0.0067	1.33	1.9	Culverts & Storm Sewers - Concrete Pipe	0.013	7.1	9.4	0.76	1388	1387	50	0.02	13.44	0.1	3.5	2.1

## Appendix 2.7

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### Curve Number Calculations

**Curve Number Calculations**  
Berkeley Square 1st Addition

Basin	Total Area		HSG	Area of Impervious by Land Use															Undisturbed Pervious			Disturbed Pervious			Impervious			Water Surfaces			Composite CN	Pervious CN	Percent Impervious									
	ac	mi <sup>2</sup>		Commercial		85%		Industrial		72%		Residential 1/8 ac or less		65%		Residential 1/4 acre		38%		Residential 1/2 acre		25%		Residential 1 acre		20%		Area	CN	Weighted CN				Area	CN	Weighted CN	Area	CN	Weighted CN	Area	CN	Weighted CN
				Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.	Area	Perv.	Imp.															
Pre-A	4.7	0.0073	D		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	4.7	84	84	0.0	88	0.0	0.0	98	0.0		100	0	84.0	84.0	0%
Pre-B	17.1	0.0267	D		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	17.1	84	84	0.0	88	0.0	0.0	98	0.0		100	0	84.0	84.0	0%
Post-A	4.7	0.0073	D		0	0		0	0		0	0		0	0		0	0		0	0		0	0		0	0	4.7	84	84	0.0	88	0.0	0.0	98	0.0		100	0	84.0	84.0	0%
Post-B	20.0	0.0313	D	20	3	17		0	0		0	0		0	0		0	0		0	0		0	0		0	0		84	0	3.0	88	13.2	17.0	98	83.3		100	0	96.5	88.0	85%

## Tab 3. Post-Development Conditions

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### ***Description***

The site is 23.3 acres that will develop as 4 commercial lots. There are additional unplatted and undeveloped areas south of this site that were included as developed for the post-project calculations. The detention provided with this site accommodates the detention needed for those areas to develop for commercial land use.

### ***Drainage Calculations***

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

The site was modeled using Hydraflow Hydrographs by AutoCAD 2009, 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 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 2.6.

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

Weighted curve numbers were calculated to represent the land usage of the basins. A pervious curve number of 88.0 is used to represent the commercial development which resulted in a composite curve number of 96.5.

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

The existing temporary detention pond on site will be modified and expanded into a permanent dry detention pond. The West Pond will be located in a reserve near the northwest corner of the site. The pond will capture runoff from the Waterfront Residential Addition and portions of the site will be routed into the proposed pond. Some additional unplatted and currently undeveloped areas will be routed to the proposed pond also. The pond will outlet thru a SWS to Greenwich Road. The SWS will either tie directly into the 15" RCP near the north property line, or will be routed to the south to tie into the 36" RCP. Additional information will be provided at the time further modeling is available. The specifications of the pond are shown in Table 3.2. A portion of the site and some offsite area to the south will drain to the East Detention. This dry detention pond will provide some additional detention and will outlet to the north into a swale that will run along the front of the lots. Details of the East Pond are in Table 3.3. The swale will convey runoff and will outlet into the SWS system along Greenwich Road. Total flow from the site is shown in Table 3.4. The proposed detention is shown on the drainage and utility plan, Appendix 3.1.

**Table 3.2. West Pond Details.**

Description	Design Storm Flows				
	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Water Surface Elevation (ft)	1384.3	1385.3	1385.8	1386.6	1387.7
Storage Volume (ac-ft)	2.9	4.2	5.2	6.7	8.9
Outlet Structure	2'x2' Riser at 1380.0 with an 8" pipe to the East				

**Table 3.3. East Pond Details.**

Description	Design Storm Flows				
	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Water Surface Elevation (ft)	1382.9	1383.3	1383.4	1383.6	1384.0
Storage Volume (ac-ft)	0.3	0.4	0.4	0.4	0.5
Outlet Structure	4'x4' Riser at 1382.9 with 2-6"x12" Openings at 1380.0 and a 24" RCP to the North				

**Table 3.4. Post-Development Flow Rates.**

Description	Design Storm Flows (cfs)				
	2-Yr	5-Yr	10-Yr	25-Yr	100-Yr
Post-Project	67.0	90.6	113.1	144.0	176.0

**Utilities**

**Storm Water Sewer**

Proposed storm water sewer systems will route runoff to both the West Pond and the East Pond. SWS will route runoff from the eastern portion of the site to a swale which will drain into the existing SWS system in Greenwich Road. Storm Water Sewer pipe sizes have not yet been determined, but will be sized to accommodate at least a 5-year design storm with escape routes for the 100-year event.

**Water**

The proposed water system will tie into the existing system along the proposed street.

**Sanitary Sewer**

The site will tie into the existing 8" sanitary sewer that runs along the east side of the site. The sewer will be extended to all four lots.

**Minimum Lowest Opening**

The minimum lowest opening for all of the lots is 1390.7.

## Appendix 3.1

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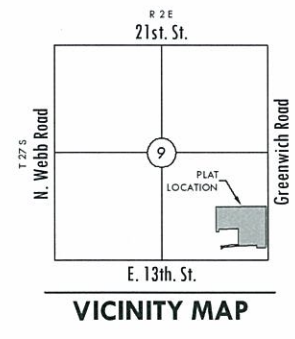
### Drainage and Utility Plan

**BERKELEY SQUARE ADDITION**  
WICHITA, KANSAS  
**DRAINAGE & UTILITY PLAN**

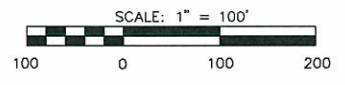
DATE  
*December 10*  
REVISED

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

SHEET NUMBER  
**1**



- LEGEND**
- CT - CONIFEROUS TREE
  - DT - DECIDUOUS TREE
  - SN - SIGN
  - PK - POWER POLE
  - EB - ELECTRIC BOX
  - LP - LIGHT POLE
  - FD - FIRE HYDRANT
  - WV - WATER VALVE
  - WM - WATER METER
  - SC - SECTION CORNER
  - BM - BENCHMARK
  - EA - EASEMENT
  - BS - BUILDING SETBACK
  - F - FENCE
  - SSP - STORM SEWER PIPE
  - WL - WATER LINE
  - SSL - SANITARY SEWER LINE
  - GL - GAS LINE
  - GP - GAS PIPELINE
  - TL - TELEPHONE LINE
  - UE - UNDERGROUND ELEC.
  - OE - OVERHEAD ELECTRIC
  - FOC - FIBER OPTIC CABLE
  - DSB - DRAINAGE SUB BASIN
  - DB - DRAINAGE BASIN
  - FA - FLOW ARROW
  - A17 - AREA FOR SWS SIZING
  - SB - SITE BOUNDARY



**WEST DETENTION**

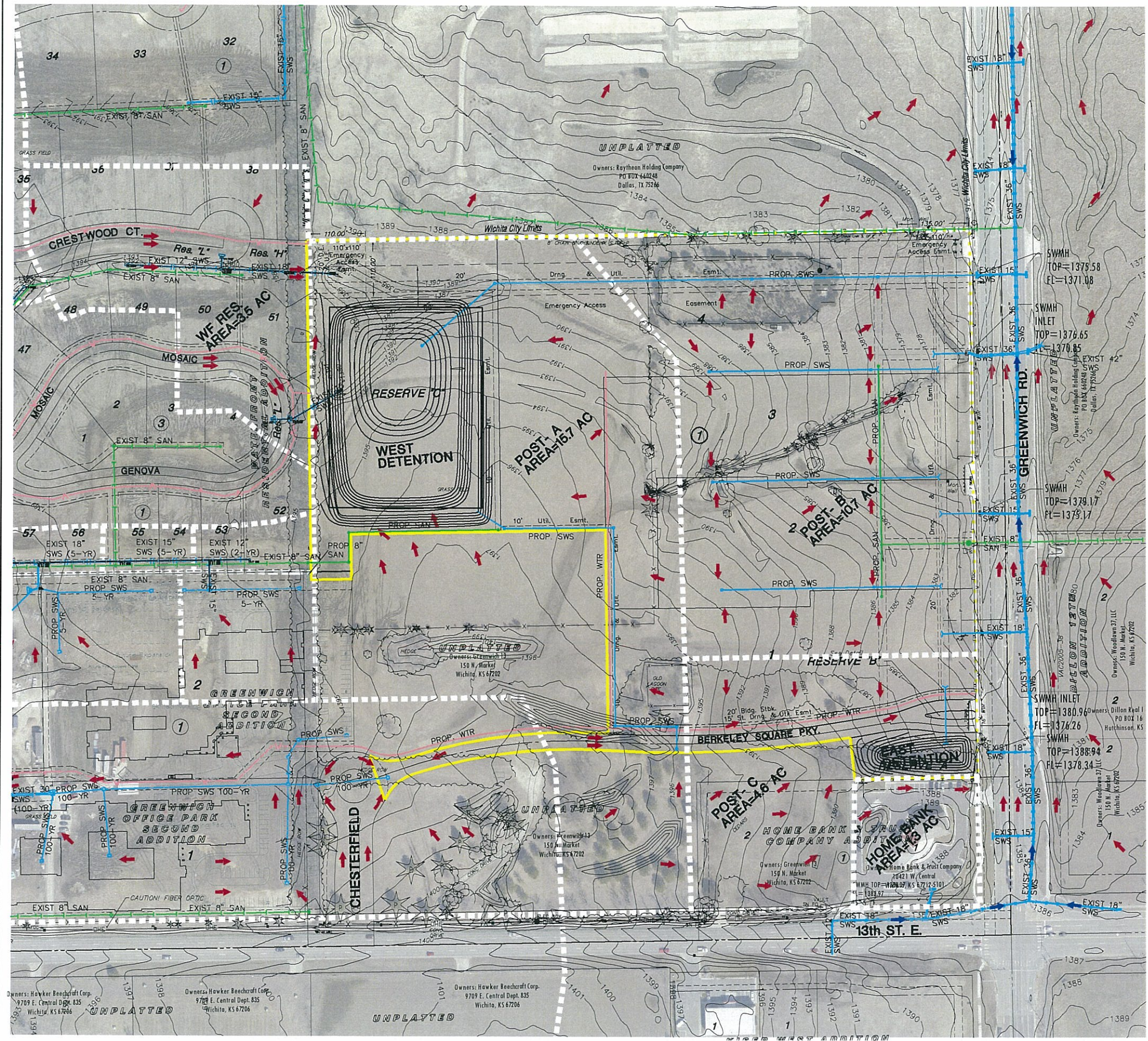
OUTLET: 2'X2' RISER AT 1380.0  
8" PIPE

YEARS	STORAGE AC.-FT.	ELEVATION FT.
2-YEAR	2.9	1384.3
5-YEAR	4.2	1385.3
10-YEAR	5.2	1385.8
25-YEAR	6.7	1386.6
50-YEAR	7.8	1387.2
100-YEAR	8.9	1387.7

**EAST DETENTION**

OUTLET: 2-6"X12" OPENINGS AT 1380.0  
4'X4' RISER AT 1382.9  
24" RCP

YEARS	STORAGE AC.-FT.	ELEVATION FT.
2-YEAR	0.3	1382.9
5-YEAR	0.4	1383.3
10-YEAR	0.4	1383.4
25-YEAR	0.4	1383.6
50-YEAR	0.5	1383.8
100-YEAR	0.5	1384.0



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## **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.