



TRANSMITTAL

TO:
Vicky Huang, PE

COMPANY:
City of Wichita

ADDRESS:
7th Floor City Hall

CITY/ STATE:
Wichita, Kansas

FROM:
Trevor Kurth, PE

DATE:
1-21-08

PROJECT:
Drainage Plans

PROJECT NUMBER:

RE:
Via Christi & Kansas Truck Equipment

VIA: DELIVERY

We are sending you ☒ ATTACHED ☐ UNDER SEPARATE COVER

☒ PLANS ☐ PRINTS ☐ SHOP DRAWINGS ☐ SAMPLES ☐ SPECS
☐ COPY OF LETTER ☐ CHANGE ORDER ☐ DISK ☐ OTHER

COPIES	DATE	DESCRIPTION
1	1-21-08	Via Christi West Campus Drainage / Grading
1	1-21-08	Kansas Truck Equipment Addition

☐ URGENT ☒ FOR APPROVAL ☐ FOR YOUR INFO ☒ FOR REVIEW & COMMENT

☐ APPROVED, AS NOTED ☐ REVISE AS NOTED ☐ REVISE AND RETURN

☐ AS REQUESTED ☐ PLEASE REPLY ☐ FOR BIDS DUE ☐

NOTES/ COMMENTS:

SIGNED:

Trevor R. Kurth, P.E.

Copy: file

ENGINEERING
SURVEYING
PLANNING
LANDSCAPE
ARCHITECTURE

B a u g h m a n
C o m p a n y, P. A.
315 Ellis Street
Wichita, Kansas 67203
P 316.262.7271
F 316.262.0149

DRAINAGE PLAN
VIA CHRISTI
WEST CAMPUS ADDITION
TO
SEDGWICK COUNTY, KANSAS

PREPARED BY



18 JANUARY 2008

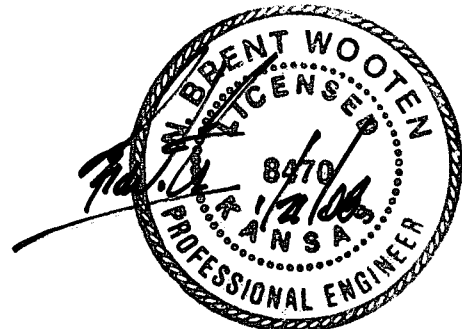


DRAINAGE PLAN VIA CHRISTI – WEST CAMPUS ADDITION

FINAL REPORT

**Prepared by Baughman Company, P.A.
18 January 2008**

**By N. Brent Wooten, P.E.
Trevor R. Kurth, P.E.
Nicholas H. Jefferson, P.E.**



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Adopted: February 23, 2007

WICHITA**Public Works, Engineering Division
Final Drainage Plan Submittal Checklist**

Reviewer: _____	Date: _____
Subdivision Name: <u>VIA CHRISTI - WEST CAMPUS</u>	Location: <u>21st N & 151st W</u>
Total Land Area Of Ownership: <u>± 120</u> Acres	
Type: _____ Residential <u>X</u> Commercial _____ Industrial _____ Recreation _____ Municipal _____ Other _____	
Applicant: <u>VIA CHRISTI MED CTR. INC</u>	Contact: <u>R. ALLEN ALLFORD, CEO</u> Phone #: _____
Engineer: <u>BAUGHMAN CO. PA</u>	Contact: <u>TREVOR KURTH, PE</u> Phone # <u>262-7271</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		Explanation / Location in Plan	Engr	
	I	NA		I	NA
A. Site Location Map, using USGS Map	X				
B. Discussion of development, existing conditions, and proposed impacts on stormwater, wetland, riparian, and flood plain	X				
C. Discussion of offsite conditions	X				
D. Summary of runoff calculations (pre/post development) No increase in peak discharge for all storm series	X				
E. Narrative description of the type and function of the permanent best management practices that are incorporated into the site design	X				
F. Copy of the plat	X				
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.)	X				
H. Professional Engineer seal, signature and date on cover of report	X				
I. CD of drainage plan in PDF format (one file) and one paper copy bound with this checklist included behind the cover	X				

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



WICHITA

Final Drainage Plan Submittal Checklist
Adopted: February 23, 2007

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

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



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

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

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)		x	No USACE Permit required		
B. Kansas Department of Agriculture - Division of Water Resources Permits (Stream Obstruction, Channel Change, Flood Plain Fill, Levee, Water Appropriations, Dam safety permit, etc.)	x		DWR Permit currently being obtained. Including, Flood plain fill, stream obstruction, channel change.		
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.	x		LOMR may be required on ZONE A		
D. Kansas Department of Transportation		x	None expected		
E. Sedgwick County Right-of-way Permit		x	" "		

PROJECT NARRATIVE

EXISTING CONDITIONS

The site is located near the northeast corner of the intersection of 151st Street West and 21st Street North. The subject property consists of approximately 120 acres of agricultural farmland and pasture land. The site has two drainage patterns. First, an apparent swale drains offsite runoff from the west, draining 535 acres, and through the site to the northeast. This site also conveys offsite drainage, approximately 745 acres, which encroaches from the north. Secondly, approximately 1/4 of the site drains via sheet flow and shallow concentrated flow to the south east and into Dry Creek North of Calfskin Creek. The site location is depicted on the USGS Quadrangle Sheet as Exhibit 1.

There is FEMA Special Flood Hazard Areas located on the property. As of this report, HNTB Corporation (under contract with the City of Wichita) is re-studying this reach of Dry Creek North of Calfskin Creek. This study is being utilized for this report as it is 'best available data'. However, the effective FIRM Panel will be referenced and attached as well.

PROPOSED CONDITIONS

The proposed Via Christi West Campus Addition is expected to consist of a main hospital and other out-buildings housing various medical entities. At the time of this report, a final site plan has not been provided. It is our assumption that the first phase of construction will consist of the main hospital facility with associated parking, drives, utilities, and storm water management facilities. A future bridge crossing is likely to span Dry Creek and will allow access from 21st Street North. Two ponds are expected to detain developed runoff to at least existing conditions when the site is fully developed. The proposed ponds will also serve as sedimentation basins and amenity lakes. The ponds final location and size will be determined upon submittal of the final site plans. The offsite runoff from the west and north is expected to be conveyed in a channel section and into a detention pond, before being discharged at the same location and elevation to the north.

OFFSITE CONDITIONS

This site receives runoff along the west and north property lines of this property. The offsite drainage area was obtained from a USGS Quadrangle Sheet (Site Location Map; Exhibit 1). The total offsite runoff was calculated using HydraFlow Hydrographs software with the SCS Curve Number Method. The offsite drainage area from the west produces approximately 915 cfs of runoff during the 100-year rainfall event. This runoff is expected to overtop 151st Street West during this event. The offsite drainage area encroaching from the north produces approximately 1005 cfs of runoff in the 100-year rainfall event. These flows combine near the north edge of the site and discharge offsite near the northeast corner of the site in what appears to be a non-uniform and shallow channel section. Approximately half of the site currently drains to this location with the remainder draining to the southeast and into Dry Creek North of Calfskin Creek. This drainage to the southeast appears to be conveyed via sheet flow and shallow concentrated flow.

EXISTING CONDITIONS RUNOFF CALCULATIONS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in calculating the existing conditions runoff values.

- **STORM SERIES**
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
 - 2-yr Rainfall Depth = 3.5 in
 - 5-yr Rainfall Depth = 4.5 in
 - 10-yr Rainfall Depth = 5.3 in
 - 25-yr Rainfall Depth = 6.1 in
 - 100-yr Rainfall Depth = 7.9 in
- **FLOW DATA**
 - Existing Conditions modeled in HydraFlow Hydrographs
 - Areas per USGS Quadrangle Sheet, Aerial Photos, and Site Visits
 - HydraFlow Hydrograph software for existing offsite flows
 - SCS Curve Number Method for on-site flows
 - Runoff Coefficient: CN = 76 (Types B & C Soils, Pasture – Fair Condition)
 - Time of Concentration: Lag Method (15 min minimum)

SITE CHARACTERISTICS

The site is currently agricultural pasture or rangeland considered to be in Fair to Poor condition. The soil types on the site vary from Type B to Type C and of the silt loam variety. The NRCS Soil Survey can be viewed in Appendix A.

The site drains to the north and east and into Dry Creek North of Calfskin Creek. The north drainage is conveyed in a non-uniform channel and travels offsite to the north and eventually into the creek. The east portion of the site appears to drain via sheet flow and shallow concentrated flow to the east and into Dry Creek. There is an apparent ridge running from the southwest corner to the northeast corner of the site. The aerial photograph with topography can be seen as Exhibit 2.

EXISTING CONDITIONS HYDROLOGIC ANALYSIS

The site was analyzed for pre-development conditions using the hydrograph method for the 2, 5, 10, 25, and 100 year storm events. A curve number of 76 was used for existing conditions assuming pasture or rangeland (Fair to Poor conditions) with Types B & C soils. The time of concentration was calculated using the Lag Method with a minimum time of concentration of 15 minutes. The hydraulic length and basin slope were obtained from USGS Quadrangle sheets for this area.

As mentioned previous, there are two points of offsite runoff encroaching the property. The north offsite drainage involves 745 acres and produces a 100-yr peak runoff of approximately 1005 cfs. This is based on a Curve Number of 76 and corresponding Time of Concentration of 163 minutes. The east offsite drainage encroaches the property via a wooden box under 151st Street West. During the 100-year rainfall event, this structure is not expected to convey the runoff amount and will cause overtopping of 151st Street. The drainage area is approximately 535 acres and will generate a runoff of approximately 915 cfs. This is based on a Curve Number of 76 and a Time of Concentration of 122 minutes.

The offsite runoff, as well as half the proposed site, discharges this property along the north line in a non-uniform channel. This flow, incorporating varying time of

concentrations of offsite flows and onsite flows, will produce approximately 1825 cfs of runoff during the 100-year rainfall event. This channel is located in a FEMA ZONE A SFHA. The east portion of the site currently drains to the east and directly into Dry Creek. This area is also located in FEMA ZONE AE SFHA. Currently, this portion of the site drains approximately 140 cfs during the 100-year rainfall event.

DOWNSTREAM DRAINAGE CAPACITY

There are no structures directly downstream of the sites two main discharge points. The north drainage discharges directly into the adjacent agricultural farmland. The east portion drains to the east and southeast onto the adjacent property, which Dry Creek North of Calfskin Creek flows. Dry Creek is located approximately 250 feet from the southeast corner of this property.

POST-DEVELOPMENT HYDROLOGIC ANALYSIS

DRAINAGE METHODS & STANDARDS

The following methods and standards, although not a complete list, were used in developing the drainage and grading plans.

- **STORM SERIES**
 - 24-hour; 2-yr, 5-yr, 10-yr, 25-yr, 100-yr Storm Events Modeled
 - HydraFlow Hydrographs software for existing flows
 - SCS Curve Number; CN = 88 (Type B Soils, Industrial District)
 - Time of Concentration; Lag Method, minimum Tc = 15min
- **STORM WATER SEWER PIPES & DRAINAGE CHANNELS**
 - Will be sized upon final site plans
- **GRADING CONSTRAINTS**
 - Match grades along entire property lines
- **POND ROUTING / GRADING**
 - Ponds will be sized and located according to final site plans

DETENTION FACILITIES

There are two (2) ponds proposed on the property at this time. The ponds' approximate location and size can be seen on the half-scale Drainage and Grading Plan in Exhibit 4. The ponds are described below in further detail.

➤ **NORTH POND**

This pond is expected to be located near the existing junction of the north and east channel/swale sections. This pond is expected to detain the majority of the site runoff. This pond will be located in FEMA SFHA once constructed. The pond is also expected to discharge to the north at the same location and elevation that the runoff currently discharges (unless approval from the adjacent landowner). The pond will be sized according to the final site plans and will detain developed runoff to at least existing conditions. No hydraulic modeling has been performed on this pond as of this report.

➤ **SOUTHEAST POND**

The southeast pond is expected to be located at the southeast corner of the proposed site. This pond is expected to detain runoff from approximately 27 acres of developed property and will be sized to limit developed runoff to at least existing conditions. The pond will need to discharge at the same point and elevation as the current runoff, unless an agreement is made with the adjacent landowner. This pond will also be located in a FEMA SFHA.

DETENTION SUMMARY

Detention will be provided on the site at the time of development. The ponds will detain the developed runoff to at least a minimum of existing conditions. This development will reduce the drainage basin draining to the southeast from approximately 50 acres to approximately 27 acres once fully developed. This will be

done by site grading and re-directing runoff to the north tributary. This area will also have a detention pond to further limit developed runoff to the southeast.

DISCHARGE POINTS SUMMARY

There are two main discharge points for this subdivision. Both points are located on adjacent agricultural fields. These points will have developed flows equal to existing flows once the entire site is developed.

POTENTIAL UPSTREAM/DOWNSTREAM IMPACTS

There are no impacts expected with this development as detention will be provided before development. The southeast basin, which drains to the southeast and into Dry Creek, will be greatly reduced upon development. Almost half of that current drainage area will be re-directed to the north and into the Dry Creek Tributary. Along with the reduction of drainage area, a detention pond will also be located in the southeast corner to further reduce runoff to this point. The Dry Creek Tributary, which drains to the northeast, will also have detention facilities to limit the discharge at the north property line to a minimum of existing conditions.

FLOODPLAIN SUBMITTAL

SOURCE OF FLOODPLAIN INFORMATION

Currently, the majority of the site lies within a FEMA SFHA. According to the effective FIRM Panel (310 of 700) (Exhibit 5), the southeast portion of the site is in Zone AE and Floodway, while a large portion of the site lies in Zone A. However, HNTB Corporation, under contract with the City of Wichita, is currently re-studying this reach and are expected to submit a LOMR sometime in early 2008 which would revise this reach of Dry Creek North of Calfskin Creek. This study will remove floodway entirely from the property as well diminish the encumbrance of the ZONE A Floodplain. This study is being used for this property and report as it is considered 'best available data'. The proposed Zone A boundary is expected to be studied and a LOMR performed once the site is mass graded. This preliminary LOMR FIRM Panel (307 of 700) is attached as Exhibit 6.

FEDERAL, STATE, & LOCAL PERMITTING

US ARMY CORPS OF ENGINEERS

The USACOE has been contacted regarding this property. No jurisdictional waters are present on the proposed property.

KANSAS DEPT OF AGRICULTURE – DWR PERMITTING

A DWR Permit is currently being assembled for permits regarding floodplain fill, channel change, and a stream obstruction. These permits will need to be obtained prior to development.

FEMA

There is mapped floodplain currently on the property. This reach of Dry Creek North of Calfskin Creek is currently being re-studied by The City of Wichita (contracted) and is expected to be submitted to FEMA in early 2008. All FEMA submittals related to this project are expected to utilize the City's LOMR. A separate LOMR is expected to be submitted for the Zone A which is located near the center of the property to establish Base Flood Elevations as well as delineate the location of the floodplain and floodway.

KANSAS DEPT OF TRANSPORTATION

There does not appear to be any KDOT permitting needed on the proposed project.

SEDGWICK COUNTY ROW

No discharge is expected in county rights of way.

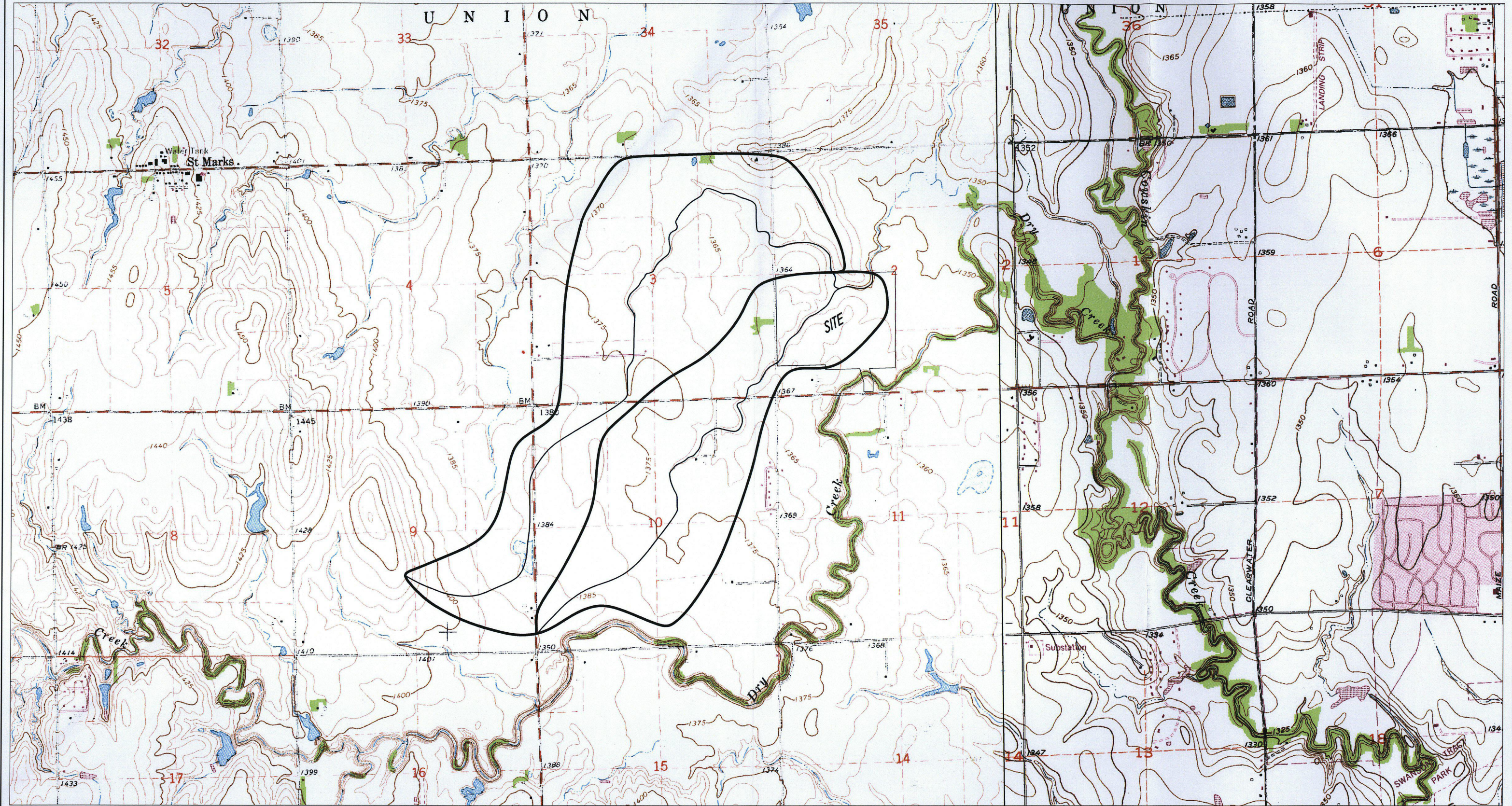
EXHIBITS

- EXHIBIT 1: Site Location Map**
- EXHIBIT 2: Aerial Photo Exhibit with Topography**
- EXHIBIT 3: Plat – Half Scale**
- EXHIBIT 4: Drainage & Grading Plan – Half Scale**
- EXHIBIT 5: Floodplain Location (FIRM)**
- EXHIBIT 6: Floodplain Location (preliminary LOMR FIRM Panel)**

SITE LOCATION EXHIBIT

VIA CHRISTI - WEST CAMPUS ADDITION

SEDGWICK COUNTY, KANSAS



0 1000 2000
DATE OF PREPARATION: 16 JANUARY 2007

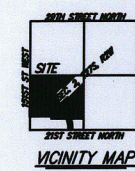


EXHIBIT 1
VIA CHRISTI - WEST CAMPUS ADDITION

Baughman Company, P.A.
315 S.W. 10th, Suite 200, Ft. Worth, TX 76102
Baughman INCORPORATED | SURVEYING | PLANNING | LANDSCAPE ARCHITECTURE
P:\PROJECTS\2007\20070116 VIA CHRISTI WEST CAMPUS ADDITION\20070116 VIA CHRISTI WEST CAMPUS ADDITION.dwg

AERIAL EXHIBIT
VIA CHRISTI - WEST CAMPUS ADDITION
SEDGWICK COUNTY, KANSAS

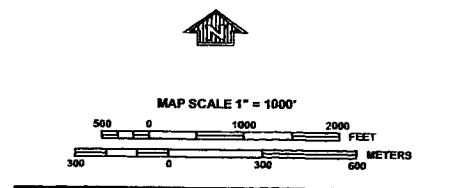
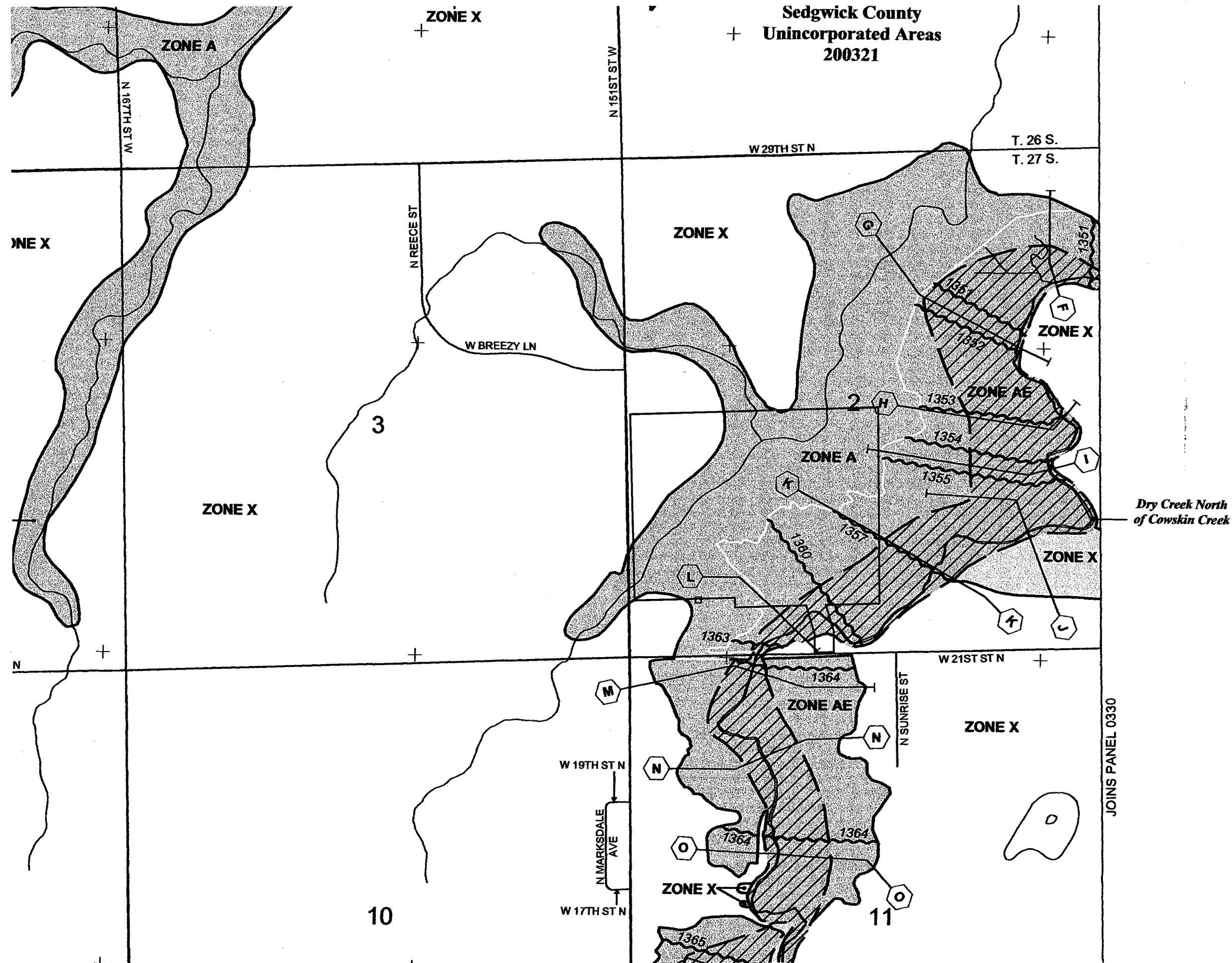


0 250 500
DATE OF PREPARATION: 16 JANUARY 2007



EXHIBIT 2
VIA CHRISTI - WEST CAMPUS ADDITION

Baughman Company, P.A.
315 8th St., Wichita, KS 67211 P 316-262-2271 F 316-262-0149
Baughman ARCHITECTS | ENGINEERS | PLANNERS | LANDSCAPE ARCHITECTS
F:\HYDRO\PROJECTS\ViaChristi\Task 15\15a\WV\CH\ST\WEST.P.dwg



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0310E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 310 OF 700

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY	NUMBER	PANEL	SHEET
SEDGWICK COUNTY	200321	0310	E
WICHITA, CITY OF	200328	0310	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
20173C0310E

EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency

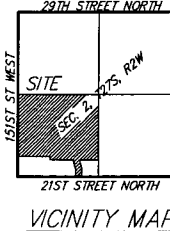
VIA CHRISTI - WEST CAMPUS ADDITION

SEDGWICK COUNTY, KANSAS

DRAINAGE & GRADING PLAN

OFFSITE DRAINAGE
745 ACRES
CN = 76
Tc = 180 min
Q = 1285 cfs

HERBERT CLIMENT & ADALINE
REV. 10/15/18 ST. W.
3015 N. 15TH ST. W.
WICHITA KS 67225-2012



DATE OF PREPARATION: 14 JANUARY 2007
DATE OF REVISION: 12 MAY 2007
CONTOUR INTERVALS = 1 FOOT

OWNER:
The Christ Regional Medical Center, Inc.
c/o S. Allen Allred, CEO
400 Christ Health Partners
3720 E. 29th
Wichita, KS 67218

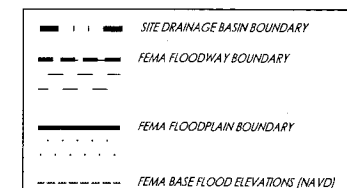
LEGAL DESCRIPTION:
The SW 1/4 of Sec. 2, Twp. 27-S, R. 2-W of the 6th P.M., Sedgwick County, Kansas EXCEPT therefrom the following described tract: Beginning at the SW corner of said SW 1/4, thence N01°35'00"W along the west line of said SW 1/4 663.57 feet, thence N08°30'00"E parallel with the south line of said SW 1/4 1110.00 feet, thence S01°55'00"E parallel with the west line of said SW 1/4 100.00 feet to a point 565.57 feet north of the south line of said SW 1/4 as measured parallel with the west line of said SW 1/4, thence N08°30'00"E parallel with the south line of said SW 1/4 144.50 feet, thence S02°02'00"E 313.70 feet, thence S00°14'30"E parallel with the east line of said SW 1/4 262.50 feet to a point on the south line of said SW 1/4, thence S88°50'00"W along the south line of said SW 1/4 1032.00 feet to the point of beginning, and EXCEPT that part of said SW 1/4 described as follows: Commencing at the SW corner of said SW 1/4, thence N08°30'00"E along the south line of said SW 1/4 212.09 feet to a point of beginning, thence N07°14'20"W parallel with the east line of said SW 1/4 287.00 feet, thence N10°20'00"E 288.42 feet to a point 565.57 feet north of the south line of said SW 1/4 as measured parallel with the west line of said SW 1/4, thence N08°30'00"E parallel with the south line of said SW 1/4 560.00 feet to a point on the east line of said SW 1/4, thence S00°14'30"E along the east line of said SW 1/4 565.50 feet to the SE corner of said SW 1/4, thence S88°50'00"W along the south line of said SW 1/4 480.00 feet to the point of beginning, all being subject to road right-of-way of record.

RESERVE USES:
Reserve A shall be reserved for entry drives, bridges, entry features, signage, landscaping, sidewalks, drainage and flooding.

BENCHMARK:
SW 1/4 corner, 3/4" iron with Sedgwick County Cap set in concrete
Elev. 1367.00 (NAVD 88)
W 1/4 corner, 3/4" iron with Sedgwick County Cap set in concrete
Elev. 1365.39 (NAVD 88)

ENTIRE SITE DRAINAGE DA = 120 ACRES	
EXISTING	DEVELOPED
Tc = 42 min	Tc = 42 min
CN = 72	CN = 88
Q ₁ = 75 cfs	Q ₁ = 185 cfs
Q ₂ = 125 cfs	Q ₂ = 255 cfs
Q ₃ = 160 cfs	Q ₃ = 315 cfs
Q ₄ = 300 cfs	Q ₄ = 505 cfs

*Time of Concentration calculated using Lag Method
Existing Conditions calculated using Lag Method with a hydraulic length of 2400'. Developed conditions calculated using a base of 100' with a hydraulic length of 1400' assuming a graded street-respect site with maximum flow length of 1400' including overhead and stormwater sewer or channel.



PROPOSED BRIDGE CROSSING

NOTE: PROPOSED PONDS and stormwater sewer locations and sizes to be determined upon final drainage plan. Locations shown are for representation only. Structures will be designed to detain runoff to at least existing conditions once developed.

FEMA Floodplain Boundaries are posted per location per PRELIMINARY FEMA LHM being developed for the City of Wichita. Mapping obtained from City of Wichita and is being used as best available data.

Proper permitting with the Kansas Department of Water Resources (DWR) will be obtained prior to development in the 100-year flood boundaries. This may include floodplain fill, channel change, and/or stream obstruction permits.

The cross-sections shown on the Zone A FEMA Floodplain Boundary correspond to the REC-HAS model submitted in the Drainage Plan Report. This model establishes BEFs, which, along with existing BEFs along Dry Creek North of Christian Creek, establish the site Minimum Lowest Opening.

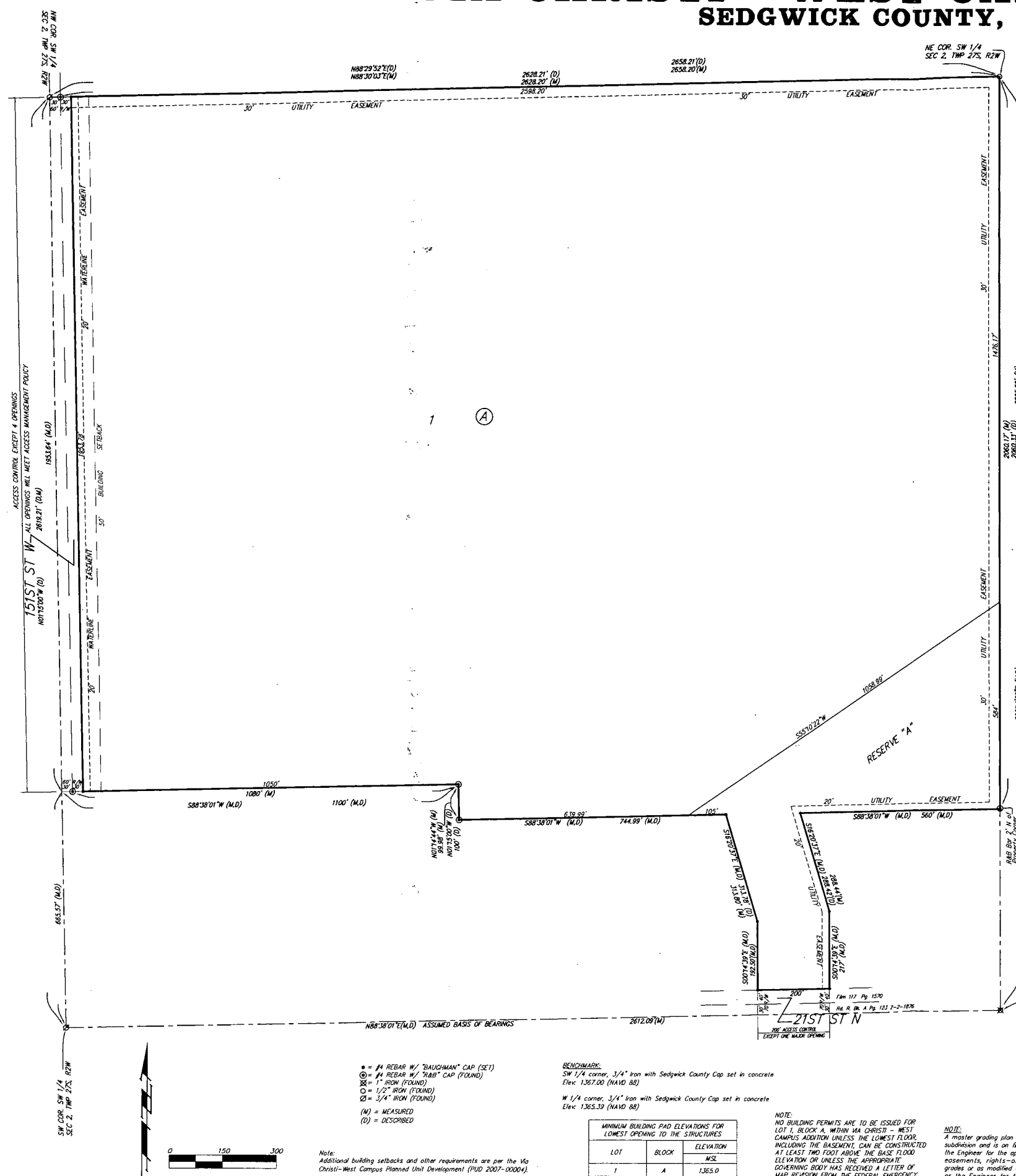
Grades will be established upon site development. All grades along property lines adjoining adjacent owners will be left as existing.

DRAINAGE & GRADING PLAN VIA CHRISTI WEST CAMPUS ADDITION

BAUGHMAN COMPANY, P.A.
1115 E. 10th St., Suite 100, Wichita, KS 67202
P: 316.262.5171 F: 316.262.5199
www.baughmancompany.com

VIA CHRISTI - WEST CAMPUS ADDITION

SEDGWICK COUNTY, KANSAS



State of Kansas)
Sedgewick County, SS We, Baughman Company, P.A., Surveyors in
aforesaid county, do and hereby certify that we have surveyed and
platted "IA CHRISTI - WEST CAMPUS ADDITION", Sedgewick County, Kansas
and that the accompanying plot is a true and correct exhibit of the
original survey made by us on the 27th day of Dec. 2, 1995.
I-2-W of the 6th PM, Sedgewick County, Kansas EXCEPT therefrom the
following described tract: Beginning at the SW corner of said SW1/4,
thence N017°50'00"W along the west line of said SW1/4, 665.57 feet,
thence N88°38'01"E parallel with the south line of said SW1/4, 1110.00
feet, thence S88°38'01"E parallel with the west line of said SW1/4, 102.00
feet, thence to a point 565.37 feet north of the west line of said SW1/4,
measured parallel with the west line of said SW1/4, thence N88°32'01"E
parallel with the south line of said SW1/4, 744.99 feet, thence
S16°20'37"E, 31.78 feet; thence S0074°39'19"E parallel with the east line of
said SW1/4, 262.50 feet to a point on the south line of said SW1/4,
thence S88°38'01"E parallel with the east line of said SW1/4, 1932.09 feet
to the point of beginning, and EXCEPT therefrom the following
as follows: Commencing at the SW corner of said SW1/4, thence
N88°38'01"E along the south line of said SW1/4, 2132.09 feet for a point
of beginning; thence N0074°39'19"W parallel with the east line of said SW1/4,
280.00 feet, thence S16°20'37"E, 280.42 feet to a point 565.37 feet
north of the west line of said SW1/4, as measured parallel with the west
line of said SW1/4, thence N88°32'01"E parallel with the south line of
said SW1/4, 560.00 feet to a point on the east line of said SW1/4, thence
S0074°39'19"E along the east line of said SW1/4, 565.68 feet to the SE
corner of said SW1/4, thence S88°38'01"E along the south line of said
SW1/4, 480.00 feet to the point of beginning, all being subject to road
right-of-way.

Existing public easements and dedications
being invoked by virtue of K.S.A. 12-512(b).

_____, Surveyor
Michael G. Conrey

Know all men by these presents that we, the undersigned, have caused the land in the surveyors certificate to be plotted into a lot and Block, to be known as "1A CHRISTI - WEST CAMPUS ADDITION", Wichita, Sedgewick County, Kansas. The utility easements are hereby granted as indicated for the construction and maintenance of all public utilities. Reserve "A" shall be reserved for entry drives, bridges, entry features, the drainage of the property, and floodway. Reserve "A" shall be owned and maintained by the owner of Lot 1, Block "A", until such time as the appropriate governing body elects to assume the responsibility for maintenance and improvements to the drainage. No buildings shall be constructed on or placed within said floodway, nor any fill, any change of grade, creation of channel, or any other action that may be carried out that would interfere with said appropriate governing body. Access controls shall be as depicted on the face of the plat and are hereby granted to Sedgewick County, Kansas. The permitted opening locations shall be as determined by the Engineer for Sedgewick County, Kansas. The Engineer for the appropriate governing body. The Minimum Building Foot Cancellation for the permitted opening to the structures shall be as indicated on the face of the plat.

Via Christi Regional Medical Center, Inc.,
a not-for-profit corporation.

_____, CEO
R. Allen Allford

State of Kansas) SS The foregoing instrument acknowledged before
Sedgwick County) me, this _____ day of _____, 2008, by R. Allen Allford, CEO,
on behalf of Via Christi Regional Medical Center, Inc. a not-for-profit
corporation.

My App't. Exp. _____

This plot of "VIA CHRISTI - WEST CAMPUS ADDITION", Sedgwick County, Kansas has been submitted to and approved by the Wichita-Sedgwick County Metropolitan Area Planning Commission, Wichita, Kansas.

Dated this _____ day of _____, 2008.

Wichita-Sedgwick County Metropolitan Area Planning Commission

Chair

_____, Secretary
John J. Schlegel

This plat approved and all dedications shown hereon accepted by the Board of Commissioners of Sedgwick County, Kansas, this _____ day of _____, 2008.

_____, Chairman
Thomas G. Winters

ATTEST: _____, County Clerk
Dan Brace

*This plat approved and all dedications
shown hereon accepted by the City Council of the City of Wichita,
Kansas, this _____ day of _____, 2008.*

_____, Mayor
Carl Brewer

_____, City Clerk
Karen Sublett

Reviewed in accordance with K.S.A. 58-2005
on this _____ day of _____, 2008.

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

Entered on transfer record this _____ day
of _____, 2008.

_____, County Clerk
on Brace

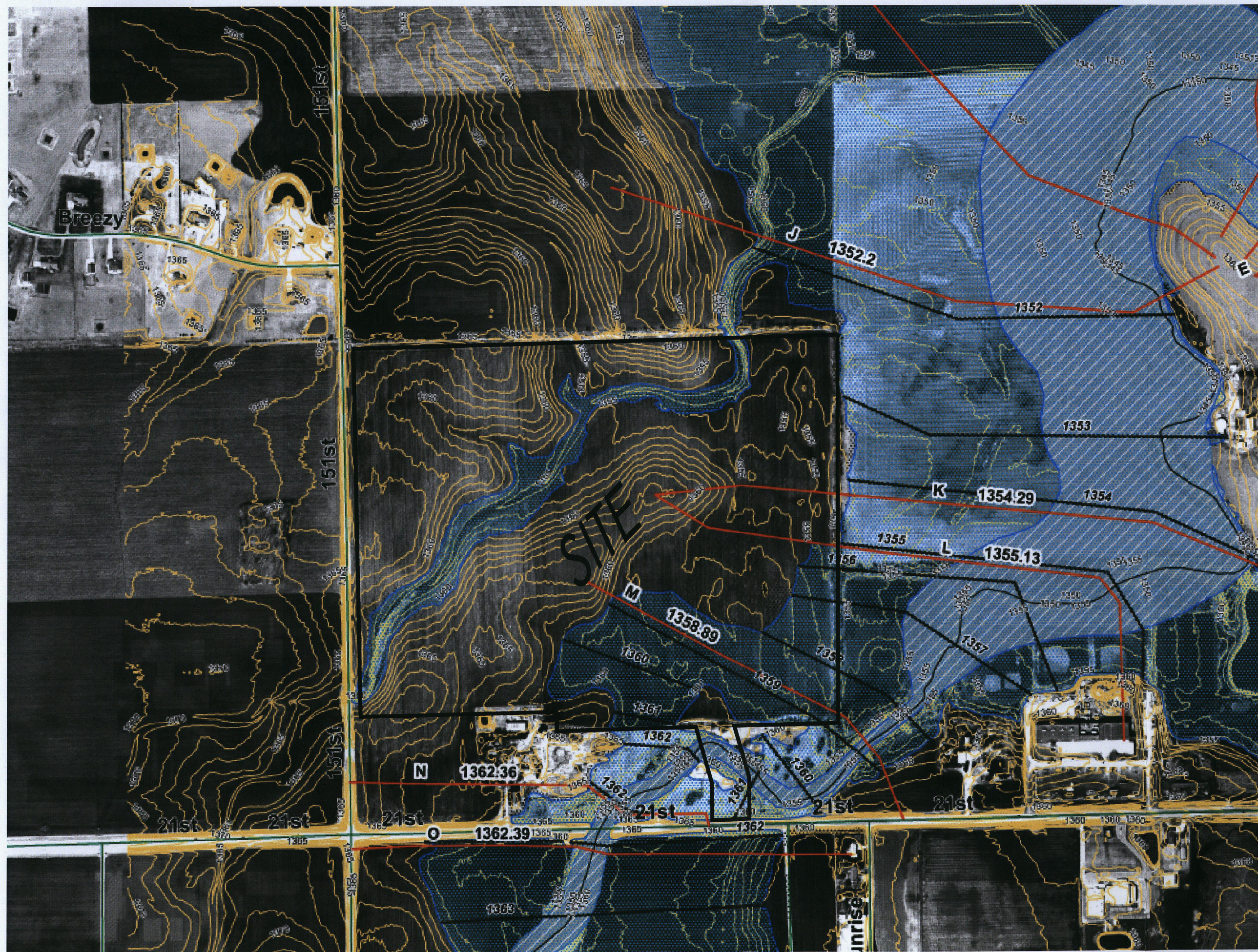
State of Kansas)
Sedgwick County) *SS* *This is to certify that this plat has been*
filed for record in the office of the Register of Deeds, this _____ day
of _____, 2008 at _____ o'clock _____ M; and is duly recorded.

_____, Register of Deeds
Bill Meek

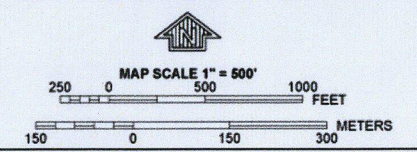
_____, Deputy
va Buckingham

**VIA CHRISTI - WEST
CAMPUS ADDITION**

B Baughman Company, P.A.
315 Ella St., Wichita, KS 67211 P 316-262-7271 F 316-262-0819
ENGINEERING | SURVEYING | PLANNING | ENVIRONMENTAL ARCHITECTURE
EQUILIBRIUM • CRISTOFORO COLUMBO AVENUE • DALLAS COLLEGE CAMPUS



able located in the Flood Insurance Study report for this jurisdiction.
 mine if flood insurance is available in this community, contact your insurance agent or call
 nal Flood Insurance Program at 1-800-638-6620.



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0307E

FIRM
 FLOOD INSURANCE RATE MAP

**SEDGWICK COUNTY,
 KANSAS
 AND INCORPORATED AREAS**

PANEL 307 OF 700
 (SEE LOCATOR DIAGRAM OR MAP INDEX FOR
 FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
Sedgwick County	20021	0307	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.

PRELIMINARY DATE MAP NUMBER
NOVEMBER 16, 2007 20173C0307E



State of Kansas
 Federal Emergency Management Agency

EXHIBIT C
VIA CHRISTI - WEST CAMPUS ADDITION

Baughman Company, P.A.
 315 Elm St., Suite 200, Wichita, KS 67201 P 316-262-7271 F 316-262-0140
 www.baughman.com

SUPPORTING CALCULATIONS

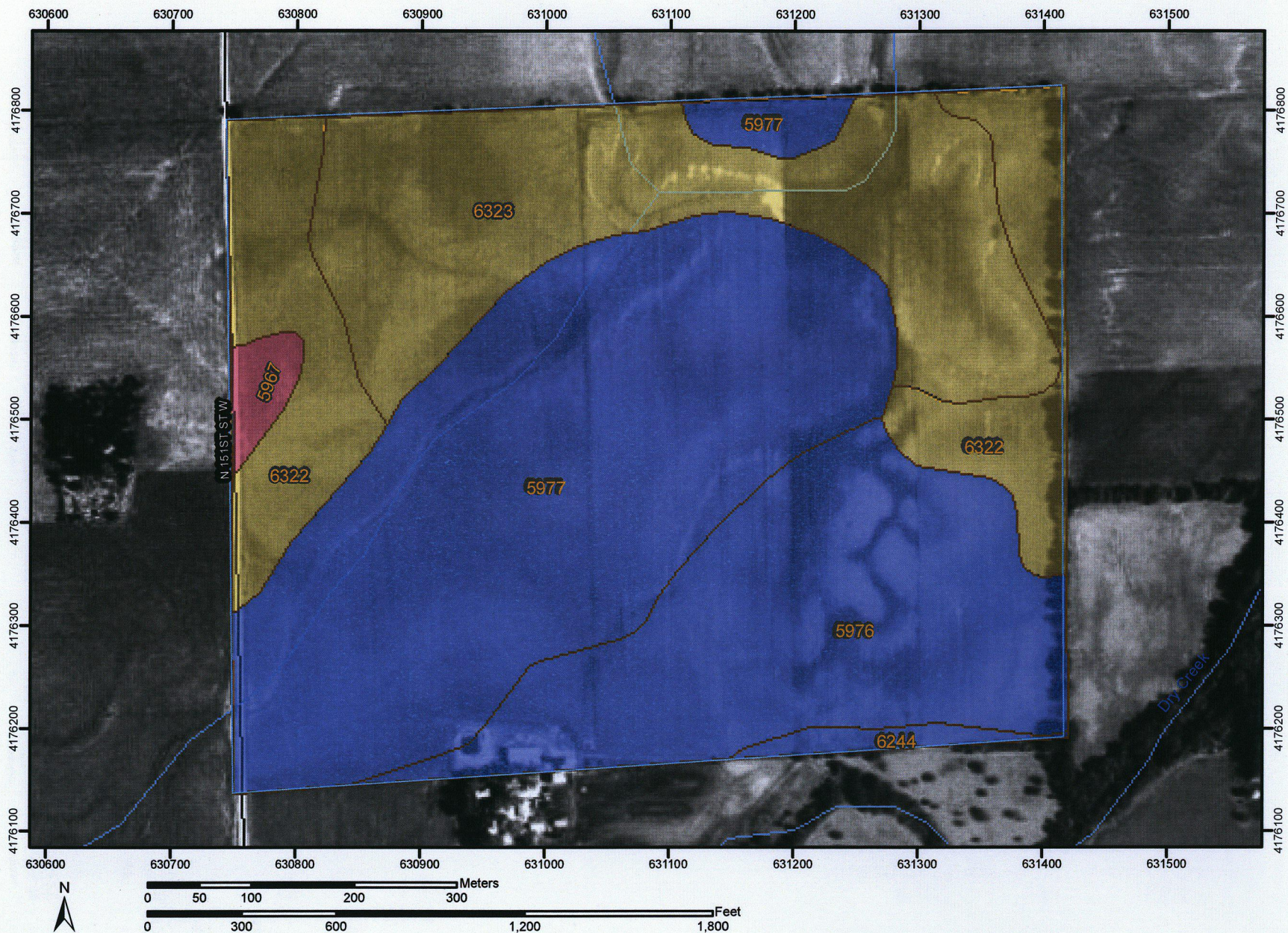
APPENDIX A: USGS Soils Survey

APPENDIX B: HydraFlow Hydrographs Routing
 -Offsite Runoff
 - Existing & Proposed Runoff

APPENDIX C: HEC-RAS Modeling

USGS Soils Survey

Hydrologic Soil Group—Sedgwick County, Kansas
(Via Christi West Campus Addition)



Natural Resources
Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

1/15/2008
Page 1 of 5

Hydrologic Soil Group—Sedgwick County, Kansas
(Via Christi West Campus Addition)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Units

Soil Ratings

 A

 A/D

 B

 B/D

 C

 C/D

 D

 Not rated or not available



Local Roads



Other Roads

Political Features

Municipalities

 Cities

 Urban Areas

Water Features

 Oceans

 Streams and Canals

Transportation

 Rails

Roads

 Interstate Highways

 US Routes

 State Highways

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
Coordinate System: UTM Zone 14N

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

Soil Survey Area: Sedgwick County, Kansas
Survey Area Data: Version 4, Dec 29, 2007

Date(s) aerial images were photographed: 8/17/1991; 3/20/1996; 3/31/1996

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



Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Sedgwick County, Kansas				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5967	Tabler silty clay loam, 0 to 1 percent slopes	D	1.5	1.2%
5976	Vanoss silt loam, 0 to 1 percent slopes	B	28.6	22.2%
5977	Vanoss silt loam, 1 to 3 percent slopes	B	50.0	38.8%
6244	Elandco silt loam, rarely flooded	B	1.3	1.0%
6322	Blanket silt loam, 0 to 1 percent slopes	C	17.6	13.7%
6323	Blanket silt loam, 1 to 3 percent slopes	C	29.6	23.0%
Totals for Area of Interest (AOI)			128.7	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie.

The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Lower

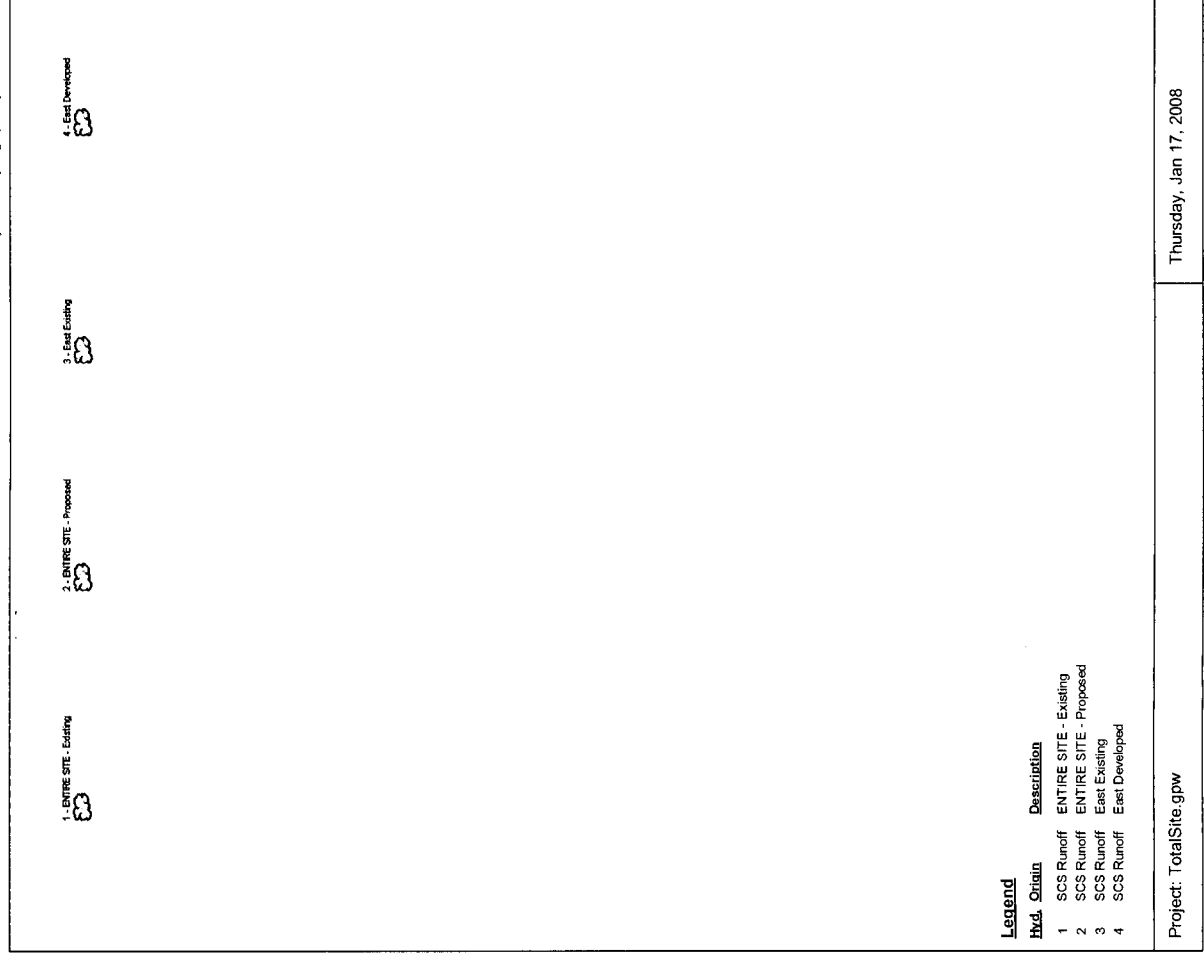
The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

Hydraflow HydraFlow Routing

**Offsite Runoff
Existing & Proposed Runoff**

Watershed Model Schematic

Hydraflow Hydrographs by Intellisolve v9.02



Hydrograph Return Period Recap

Hydraflow Hydrographs by Intellisolve v9.02

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	-----	-----	75.95	-----	122.25	161.59	202.21	-----	296.29	ENTIRE SITE - Existing
2	SCS Runoff	-----	-----	182.71	-----	255.98	314.83	373.62	-----	505.28	ENTIRE SITE - Proposed
3	SCS Runoff	-----	-----	35.49	-----	57.05	75.35	94.24	-----	137.95	East Existing
4	SCS Runoff	-----	-----	78.13	-----	106.75	133.27	157.72	-----	212.41	East Developed
Proj. file: TotalSite.gpw											
Thursday, Jan 17, 2008											

Hydrograph Summary Report

Hydraflow Hydrographs by Intellisphere v9.02

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time to peak interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph description
1	SCS Runoff	75.95	2	758	598,111	---	---	---	ENTIRE SITE - Existing
2	SCS Runoff	182.71	2	740	979,412	---	---	---	ENTIRE SITE - Proposed
3	SCS Runoff	35.49	2	752	250,433	---	---	---	East Existing
4	SCS Runoff	78.13	2	722	220,809	---	---	---	East Developed
TotalSite.gpw									
Return Period: 2 Year							Thursday, Jan 17, 2008		

Hydrograph Report

Hydraflow Hydrographs by Intellisphere v9.02

Thursday, Jan 17, 2008

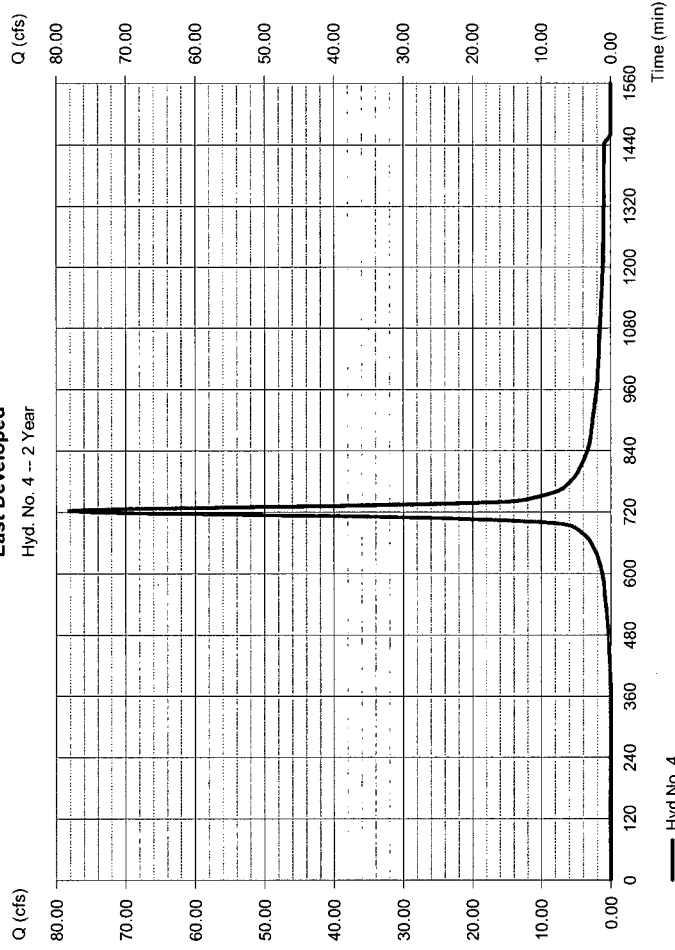
Hyd. No. 4

East Developed

Hydrograph type = SCS Runoff
 Storm frequency = 2 yrs
 Time interval = 2 min
 Drainage area = 27.500 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 3.50 in
 Storm duration = 24 hrs

Peak discharge = 78.13 cfs
 Time to peak = 722 min
 Hyd. volume = 220,809 cuft
 Curve number = 88
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.00 min
 Distribution = Type II
 Shape factor = 484

East Developed Hyd. No. 4 -- 2 Year



Hydrograph Summary Report

Hydralfow Hydrographs by Intellisolve v0.02

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	122.25	2	758	933,013	----	-----	-----	ENTIRE SITE - Existing
2	SCS Runoff	255.98	2	740	1,379,846	----	-----	-----	ENTIRE SITE - Proposed
3	SCS Runoff	57.05	2	752	390,659	----	-----	-----	East Existing
4	SCS Runoff	108.75	2	722	311,087	----	-----	-----	East Developed
TotalSite.gpw									Return Period: 5 Year
									Thursday, Jan 17, 2008

Hydrograph Report

Hydralfow Hydrographs by Intellisolve v0.02

Thursday, Jan 17, 2008

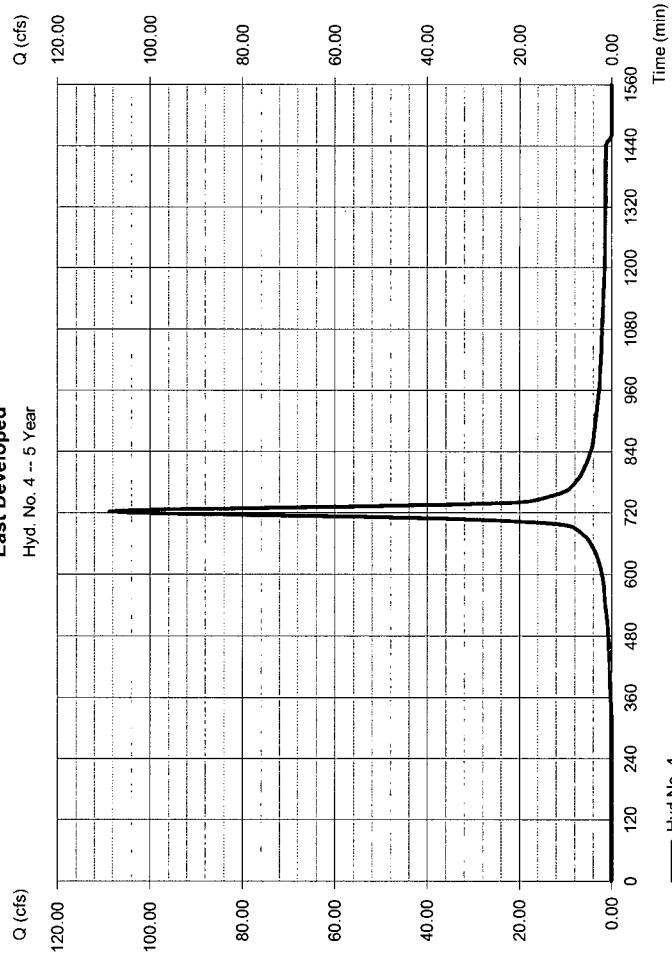
Hyd. No. 4

East Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 108.75 cfs
Storm frequency	= 5 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 311,087 cuft
Drainage area	= 27.500 ac	Curve number	= 88
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 15.00 min
Total precip.	= 4.50 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

East Developed

Hyd. No. 4 -- 5 Year



Hydrograph Summary Report

Hydroflow Hydrographs by Intellisolve v9.02

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph description
1	SCS Runoff	161.59	2	1,219,919	----	-----	-----	ENTIRE SITE - Existing
2	SCS Runoff	314.83	2	1,707,240	----	-----	-----	ENTIRE SITE - Proposed
3	SCS Runoff	75.35	2	510,788	----	-----	-----	East Existing
4	SCS Runoff	133.27	2	384,899	----	-----	-----	East Developed
TotalSite.gpw								
Return Period: 10 Year					Thursday, Jan 17, 2008			

Hydrograph Report

Hydroflow Hydrographs by Intellisolve v9.02

Thursday, Jan 17, 2008

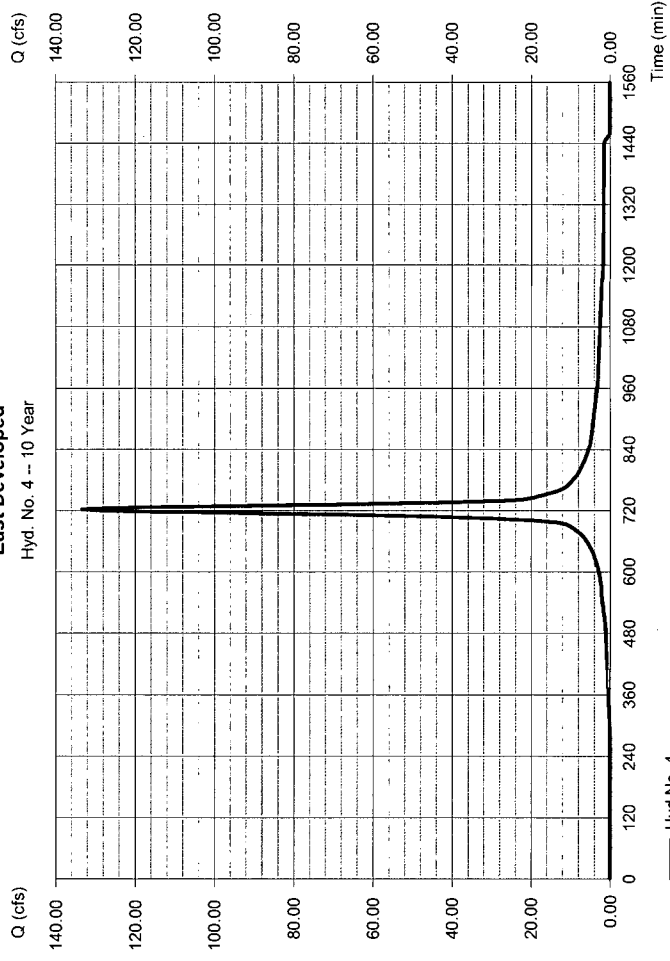
Hyd. No. 4

East Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	133.27 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	384,899 cuft
Drainage area	=	27.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	5.30 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

East Developed

Hyd. No. 4 -- 10 Year



Hydrograph Summary Report

Hydroflow Hydrographs by Intellisolve v9.02

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph description
1	SCS Runoff	202.21	2	758	1,518,612	----	----	----	ENTIRE SITE - Existing
2	SCS Runoff	373.62	2	740	2,038,636	----	----	----	ENTIRE SITE - Proposed
3	SCS Runoff	94.24	2	752	635,853	----	----	----	East Existing
4	SCS Runoff	157.72	2	722	459,612	----	----	----	East Developed
Total/Site.gpw									Return Period: 25 Year
									Thursday, Jan 17, 2008

Hydrograph Report

Hydroflow Hydrographs by Intellisolve v9.02

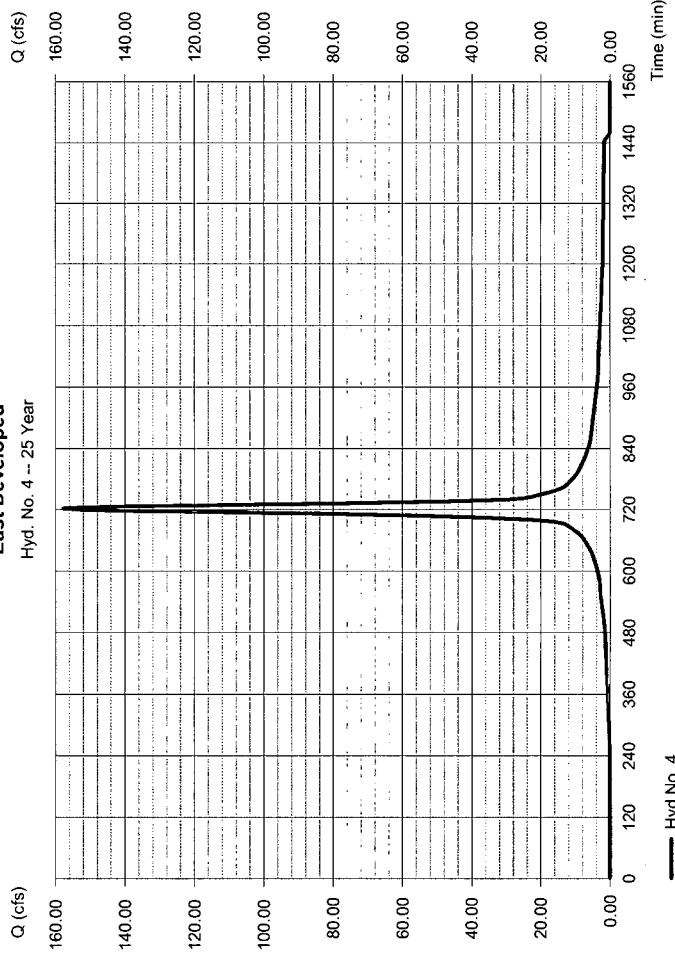
Thursday, Jan 17, 2008

Hyd. No. 4

East Developed

Hydrograph type = SCS Runoff
 Storm frequency = 25 yrs
 Time interval = 2 min
 Drainage area = 27.500 ac
 Basin Slope = 0.0 %
 Tc method = USER
 Total precip. = 6.10 in
 Storm duration = 24 hrs

Peak discharge = 157.72 cfs
 Time to peak = 722 min
 Hyd. volume = 459,612 cuft
 Curve number = 88
 Hydraulic length = 0 ft
 Time of conc. (Tc) = 15.00 min
 Distribution = Type II
 Shape factor = 484

East Developed
Hyd. No. 4 -- 25 Year

Hydrograph Summary Report

Hydraflow Hydrographs by Intelsolve v0.02

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total storage used (cuft)	Hydrograph description
1	SCS Runoff	296.29	2	758	2,219,716	----	-----	-----	ENTIRE SITE - Existing
2	SCS Runoff	505.28	2	740	2,793,383	----	-----	-----	ENTIRE SITE - Proposed
3	SCS Runoff	137.95	2	752	929,411	----	-----	-----	East Existing
4	SCS Runoff	212.41	2	722	629,766	----	-----	-----	East Developed
TotalSite.gpw						Return Period: 100 Year		Thursday, Jan 17, 2008	

Hydrograph Report

Hydraflow Hydrographs by Intelsolve v0.02

Thursday, Jan 17, 2008

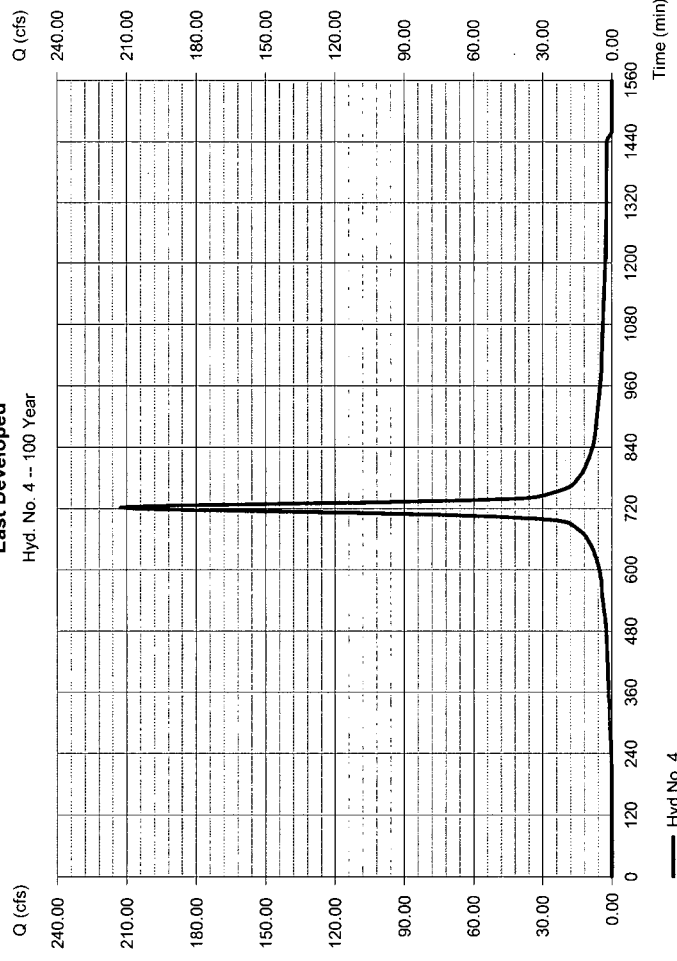
Hyd. No. 4

East Developed

Hydrograph type	=	SCS Runoff	Peak discharge	=	212.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	629,766 cuft
Drainage area	=	27.500 ac	Curve number	=	88
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	USER	Time of conc. (Tc)	=	15.00 min
Total precip.	=	7.90 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

East Developed

Hyd. No. 4 -- 100 Year



Hydraflow Rainfall Report

Hydraflow Hydrographs by Intellisolve v9.02

Thursday, Jan 17, 2008

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Hydraflow Hydrographs by Intellisolve v9.02

TotalSite.gpw

Thursday, Jan 17, 2008

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Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)				
	B	D	E	(N/A)	
1	0.0000	0.0000	0.0000	-----	
2	76.3137	14.3000	0.8844	-----	
3	0.0000	0.0000	0.0000	-----	
5	52.6224	11.2000	0.7487	-----	
10	55.1841	11.1000	0.7229	-----	
25	60.7012	11.1000	0.7068	-----	
50	68.0222	11.3000	0.7004	-----	
100	62.2794	10.1000	0.6824	-----	

File name: wichita.IDF

$$\text{Intensity} = B / (T_c + D)^E$$

Return Period (Yrs)	Intensity Values (in/hr)										
	5 min	10	15	20	25	30	35	40	45	50	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	5.57	4.54	3.85	3.35	2.97	2.67	2.43	2.23	2.06	1.92	1.69
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	6.52	5.33	4.55	3.99	3.57	3.24	2.97	2.75	2.57	2.41	2.15
10	7.40	6.09	5.22	4.60	4.13	3.76	3.46	3.21	3.00	2.82	2.53
25	8.51	7.03	6.05	5.35	4.81	4.39	4.05	3.76	3.52	3.32	2.98
50	9.47	7.88	6.78	6.00	5.41	4.94	4.56	4.24	3.98	3.75	3.37
100	10.31	8.53	7.37	6.53	5.90	5.40	5.00	4.68	4.37	4.13	3.73

Tc = time in minutes. Values may exceed 60.

Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0.00	3.50	0.00	4.50	5.30	6.10	6.80	7.90
SCS 6-Hr	0.00	1.80	0.00	0.00	2.60	0.00	0.00	4.00
Huff-1st	0.00	1.55	0.00	2.75	4.00	5.38	6.50	8.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	1.75	0.00	2.80	3.90	5.25	6.00	7.10

Precip. file name: wich 24hr.pcp

HEC-RAS MODELING

HEC-RAS Version 3.1.2 April 2004
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```

X      X  XXXXXX      XXXX      XXXX      XX      XXXX
X      X  X          X      X      X      X  X      X
X      X  X          X          X      X      X      X
XXXXXXXX XXXX      X      XXX XXXX XXXXXX XXXX
X      X  X          X          X      X      X      X
X      X  X          X      X      X      X      X
X      X  XXXXXX      XXXX      X      X      X      XXXXX

```

PROJECT DATA

Project Title: existing conditions
Project File : exist.prj
Run Date and Time: 1/15/2008 8:27:48 AM

Project in English units

PLAN DATA

Plan Title: Plan 01
Plan File : f:\HYDRO\Projects\Via Christi 21st & 151st\hec ras exist\exist.p01

Geometry Title: existing conditions
Geometry File : f:\HYDRO\Projects\Via Christi 21st & 151st\hec ras exist\exist.g01

Flow Title : existing conditions
Flow File : f:\HYDRO\Projects\Via Christi 21st & 151st\hec ras exist\exist.f01

Plan Summary Information:

Number of:	Cross Sections =	11	Multiple Openings =	0
	Culverts =	0	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: existing conditions
Flow File : f:\HYDRO\Projects\Via Christi 21st & 151st\hec ras exist\exist.f01

Flow Data (cfs)

River	Reach	RS	PF 1
trib to dry creevia christi		1.068	915
trib to dry creevia christi		0.618	1825

Boundary Conditions

EXISTING

River Reach Profile Upstream
Downstream

trib to dry cree via christi PF 1
Normal S = 0.005

GEOMETRY DATA

Geometry Title: existing conditions
Geometry File : f:\HYDRO\Projects\Via Christi 21st & 151st\hec ras
exist\exist.g01

CROSS SECTION

RIVER: trib to dry cree
REACH: via christi RS: 1.068

INPUT

Description:

Station Elevation Data		num= 16							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5000	1365.5	5110	1365.7	5213	1365.2	5267	1365	5305	
1364.8									
5401	1364.8	5464	1365	5593	1365.2	5631	1365	5689	
1364.7									
5782	1364.3	5829	1364.1	5869	1364.1	5877	1364	5943	
1364.7									
6000	1365								

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5782	.03	5943	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.
Expan.							
	5782	5943		322	322		.1
.3							

CROSS SECTION

RIVER: trib to dry cree
REACH: via christi RS: 1.007

INPUT

Description:

Station Elevation Data		num= 14							
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5000	1362.7	5053	1362	5355	1361.9	5379	1361	5416	
1360									
5422	1359	5424	1358	5432	1358	5441	1359	5478	
1360									
5498	1361	5519	1362	5541	1363	5571	1364		

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5422	.03	5441	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.
Expan.							
	5422	5441		160	269		.1
.3							

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.956

INPUT

Description:

Station	Elevation	Data	num=	16					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5000	1363.4	5018	1363	5079	1362	5137	1361	5182	
1360									
5223	1359	5246	1358	5258	1357	5267	1357	5286	
1358									
5300	1359	5333	1360	5371	1361	5422	1362	5492	
1363									
5564	1364								

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5246	.03	5286	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.
Expan.							
	5246	5286		219	222		.1
	.3						

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.914

INPUT

Description:

Station	Elevation	Data	num=	15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5000	1363.8	5122	1363	5191	1362	5232	1361	5266	
1360									
5297	1359	5328	1358	5353	1357	5369	1357	5398	
1358									
5424	1359	5459	1360	5494	1361	5528	1362	5571	
1363									

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5328	.03	5398	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.
Expan.							
	5328	5398		330	348		.1
	.3						

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.848

INPUT

Description:

Station	Elevation	Data	num=	15					
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
5000	1363.1	5087	1363	5178	1362	5211	1361	5244	
1360									
5278	1359	5315	1358	5359	1357	5411	1357	5446	
1358									
5486	1359	5557	1360	5608	1361	5662	1362	5716	
1363									

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5278	.03	5486	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.
Expan.							

5278 5486 577 565 542 .1

.3

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.741

INPUT
 Description:
 Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
5008	1362	5073	1361	5140	1360	5207	1359	5278
1358	5361	1357	5485	1356	5540	1355	5554	1355
1356	5708	1357	5750	1358	5794	1359	5832	1360
1361	5928	1362						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5008	.03	5485	.03	5597	.03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.

Expan.	Sta	Sta	Lengths	Lengths	Lengths	Coeff	Contr.
.3	5485	5597	206	232	245	.1	

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.697

INPUT
 Description:
 Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
5000	1362.8	5064	1362	5125	1361	5186	1360	5239
1359	5287	1358	5327	1357	5363	1356	5395	1355
1355	5660	1356	5698	1357	5735	1358	5767	1359
1360	5834	1361						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
5000	.03	5363	.03	5660	.03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.

Expan.	Sta	Sta	Lengths	Lengths	Lengths	Coeff	Contr.
.3	5363	5660	483	417	259	.1	

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.618

INPUT
 Description:
 Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta
5000	1359.6	5020	1359	5047	1358	5075	1357	5110
1356	5158	1355	5233	1354	5252	1353	5264	1353
1354	5466	1355	5532	1356	5578	1357	5614	1358
1359								

Manning's n values
 Sta n Val Sta num= 3
 5000 .03 5233 .03 5282 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.
 Expan. 5233 5282 178 216 269 .1
 .3

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.577

INPUT
 Description:
 Station Elevation Data num= 15
 Sta Elev Sta Elev Sta Elev Sta Elev Sta
 Elev 5000 1361.2 5010 1361 5040 1360 5068 1359 5096
 1358 5126 1357 5175 1356 5233 1355 5276 1354 5314
 1353 5341 1353 5445 1354 5539 1355 5632 1356 5694
 1357

Manning's n Values
 Sta n Val Sta num= 3
 5000 .03 5276 .03 5445 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.
 Expan. 5276 5445 237 438 538 .1
 .3

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.494

INPUT
 Description:
 Station Elevation Data num= 16
 Sta Elev Sta Elev Sta Elev Sta Elev Sta
 Elev 5000 1362.3 5074 1362 5136 1361 5175 1360 5206
 1359 5247 1358 5286 1357 5317 1356 5361 1355 5466
 1354 5533 1353 5562 1352 5583 1352 5591 1353 5673
 1354 5800 1354.5

Manning's n Values
 Sta n Val Sta num= 3
 5000 .03 5533 .03 5591 .03

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr.
 Expan. 5533 5591 207 312 408 .1
 .3

CROSS SECTION

RIVER: trib to dry cree
 REACH: via christi RS: 0.435

INPUT
 Description:
 Station Elevation Data num= 18
 Sta Elev Sta Elev Sta Elev Sta Elev Sta
 Elev 5023 1362 5124 1361 5198 1360 5245 1359 5281
 1358

5310	1357	5352	1356	5409	1355	5422	1354	5434
1353	5461	1352	5478	1351	5491	1350	5496	1350
1351	5528	1352	5563	1353	5635	1353.4		

Manning's n Values

Sta	n Val	Sta	n Val	Sta	n Val
5023	.03	5434	.03	5563	.03

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff Contr.
Expan.						
	5434	5563		0	0	.1
.3						

SUMMARY OF MANNING'S N VALUES

River: trib to dry cree

Reach	River Sta.	n1	n2	n3
via christi	1.068	.03	.03	.03
via christi	1.007	.03	.03	.03
via christi	0.956	.03	.03	.03
via christi	0.914	.03	.03	.03
via christi	0.848	.03	.03	.03
via christi	0.741	.03	.03	.03
via christi	0.697	.03	.03	.03
via christi	0.618	.03	.03	.03
via christi	0.577	.03	.03	.03
via christi	0.494	.03	.03	.03
via christi	0.435	.03	.03	.03

SUMMARY OF REACH LENGTHS

River: trib to dry cree

Reach	River Sta.	Left	Channel	Right
via christi	1.068	322	322	322
via christi	1.007	160	269	412
via christi	0.956	219	222	223
via christi	0.914	330	348	355
via christi	0.848	577	565	542
via christi	0.741	206	232	245
via christi	0.697	483	417	259
via christi	0.618	178	216	269
via christi	0.577	237	438	538
via christi	0.494	207	312	408
via christi	0.435	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: trib to dry cree

Reach	River Sta.	Contr.	Expan.
via christi	1.068	.1	.3
via christi	1.007	.1	.3
via christi	0.956	.1	.3
via christi	0.914	.1	.3
via christi	0.848	.1	.3
via christi	0.741	.1	.3
via christi	0.697	.1	.3
via christi	0.618	.1	.3
via christi	0.577	.1	.3



via christi
via christi

0.494
0.435

EXISTENT
.1
.1

.3
.3

HEC-RAS Plan: Plan 01 River: trib to dry cree Reach: via christi Profile: PF 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
via christi	1.068	PF 1	915.00	1364.00	1365.11	1365.11	1365.32	0.008854	4.28	286.25	687.83	0.80
via christi	1.007	PF 1	915.00	1358.00	1361.18		1361.82	0.006548	8.05	166.87	127.65	0.83
via christi	0.956	PF 1	915.00	1357.00	1360.32		1360.61	0.002521	5.09	249.00	177.29	0.52
via christi	0.914	PF 1	915.00	1357.00	1359.90		1360.10	0.001879	3.97	282.72	186.47	0.44
via christi	0.848	PF 1	915.00	1357.00	1358.89		1359.12	0.004754	3.84	238.05	199.32	0.62
via christi	0.741	PF 1	915.00	1355.00	1357.15		1357.29	0.002275	3.39	347.48	366.27	0.46
via christi	0.697	PF 1	915.00	1355.00	1356.83		1356.90	0.001197	2.14	441.05	358.53	0.32
via christi	0.618	PF 1	1825.00	1353.00	1356.25		1356.38	0.001498	3.87	680.57	441.98	0.40
via christi	0.577	PF 1	1825.00	1353.00	1355.93		1356.06	0.001278	3.27	683.50	445.79	0.36
via christi	0.494	PF 1	1825.00	1352.00	1355.21		1355.38	0.001941	4.42	617.81	448.03	0.46
via christi	0.435	PF 1	1825.00	1350.00	1353.90	1353.65	1354.41	0.005009	5.92	338.33	211.74	0.70

PLAN SHEETS

DRAINAGE & GRADING PLAN

Scale 1:150