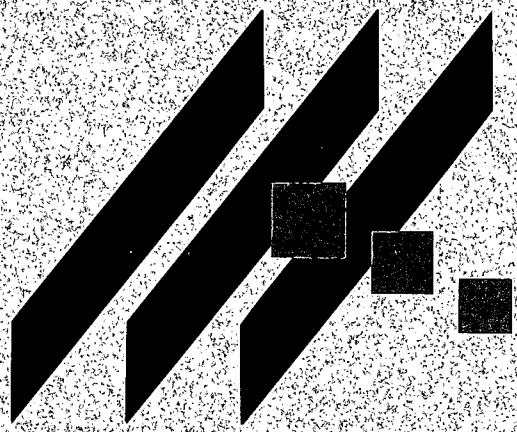
MKEC ENGINEERING CONSULTANTS, INC



DRAINAGE REPORT

FOR

THE EXECUTIVE AT WHITETAIL ADDITION

JULY 2002

REVISED SEPTEMBER 2002

411 N. WEBB ROAD • WICHITA, KS 67206 • 316.684.9600 • FAX 316.684.5100

Drainage Report for The Executive at White Tail Addition

Wichita, Kansas

Location

The subject property lies in the northwest quarter of the northeast quarter of Section 15, Township 27 South, Range 2 East. The property abuts 13th Street North on the north and Highway K-96 on the west. The properties to the south and east are developed as single family residences. The total site area is approximately 4.3 acres.

Soils

According to the NRCS (SCS) Sedgwick County Soil Survey, the majority of the drainage watershed soil is Irwin silty clay Loam, with 1-3 percent slopes and a Hydrological Soil Group (HSG) of "D". The northwest corner and the southeast corner of the site are Rosehill Silty Clay, with 1-3 percent slopes and a HSG of "D." See Appendix A for soil survey map.

Pre-developed Conditions

Current Development
The property is currently undeveloped and lies between developed properties.

Current Landform and Slope
The slopes in the area range between 1-3%. Elevations vary from 1381 ft in the southwest corner to 1373 ft in the northwest and southeast corners.

Current Drainage Conditions
No portion of the site is included in a regulatory floodplain. A copy of the effective FEMA map (FIRM Panel 150, Sedgwick County, June 3, 1986) is attached as Appendix B.

Current Runoff Characteristics
No runoff enters the site from surrounding areas. A high point is located in the southwest area of the site with all surrounding ground draining away from this point. See Appendix C for USGS quadrangle map showing the site. The site is divided into four drainage areas. See Appendix D for map of existing drainage patterns. Drainage area "A" comprises approximately the west half of the property and drains into a ditch that flows north along the western edge of the site (K-96). Drainage area "B" covers the northeast corner of the property and drains north onto the south side of 13th Street North. Drainage area "C" is the eastern and southeast section of the property. This area drains to the east off

the property into a ditch flowing north. Runoff from this ditch enters a 24" pipe, which then drains east to a manhole, and north across 13th Street North. The pipe discharges into an existing pond on the north side of 13th Street. Drainage area "D" comprises the far south section of the site and drains to the south and east into a ditch flowing east.

The rational method was used to calculate current runoff through the site. Time of concentration values ranged from 15-25 minutes and were based on runoff coefficients. These coefficients were determined from the soil type, percent impervious area, and slope and ranged from 0.30 to 0.65.

Table 1 shows the flow rates for 2, 5, 10, and 100 year events before development. The table displays the four drainage areas and the total flows for the entire site. Detailed calculations are included in Appendix E.

Table 1: Pre-development runoff.

Drainage Area	2-year (cfs)	5-year (cfs)	10-year (cfs)	100-year (cfs)
A	1.58	2.27	3.60	8.14
B	1.10	1.62	2.57	5.94
C	1.20	1.72	2.67	5.60
D	0.23	0.33	0.52	1.05
TOTAL	4.11	5.94	9.36	20.74

Post-developed Conditions

Proposed Development

The property will be developed as an office park. In addition to the buildings, parking lots and grass areas will be added.

Proposed Landform and Slope

The proposed development will affect the overall landform slope and basic drainage patterns on the property. The parking lots and building sites will decrease the overall slope and increase the runoff.

Proposed Runoff Characteristics

Current runoff characteristics will be affected by the proposed development. The majority of the site will be covered by impervious areas such as buildings and parking lots. The site will drain from the center of the property (behind the buildings) toward the parking lots. The parking lots will collect the majority of the runoff and direct it off the property. A proposed 15" stormwater sewer will run from the southeast corner of the site to an existing inlet approximately 90 ft to the east. This will collect the water from drainage areas "B," "C," and "D." The existing storm water sewer drains east through another inlet and into an existing

30" RCP. This pipe continues east and discharges into an existing retention/detention pond. Drainage area "A" will drain into a proposed 18" RCP on the northwest side of the property and then into the existing manhole on the south side of 13th Street. An analysis for the proposed and existing stormwater sewer north of the site is included in Appendix F. Although runoff into the stormwater sewer system will be increased in the 5-year design storm, the capacity of the existing system is adequate to handle the additional flow. Some detention will be provided in the parking area for large storm events. Drainage area "B" runoff will be directed northeast toward the parking lot and then south to the storm sewer. Drainage area "C" will drain east to the parking lot and then south to the storm sewer. Drainage area "D" will drain east to the proposed storm sewer and will be least affected by the proposed development. See Appendix G for the proposed drainage and utility map. Proposed drainage patterns will closely follow those proposed by the original White Tail Addition drainage plan prepared by Professional Engineering Consultants.

Table 2 shows the 2, 5, 10, and 100 year post-development runoff values. The runoff values increased for all events, especially for the 2 and 5-year events. The time of concentrations decreased with a range of 15-17 minutes. The runoff coefficients increased due to an increase in impervious area and ranged from 0.37 to 0.79. Detailed calculations are included in Appendix E.

Table 2: Post-development runoff.

Drainage Area	2-year (cfs)	5-year (cfs)	10-year (cfs)	100-year (cfs)
A	4.04	5.04	6.21	9.90
B	2.72	3.51	4.40	7.13
C	2.69	3.36	4.21	6.81
D	0.29	0.41	0.60	1.10
TOTAL	9.74	12.32	15.42	24.94

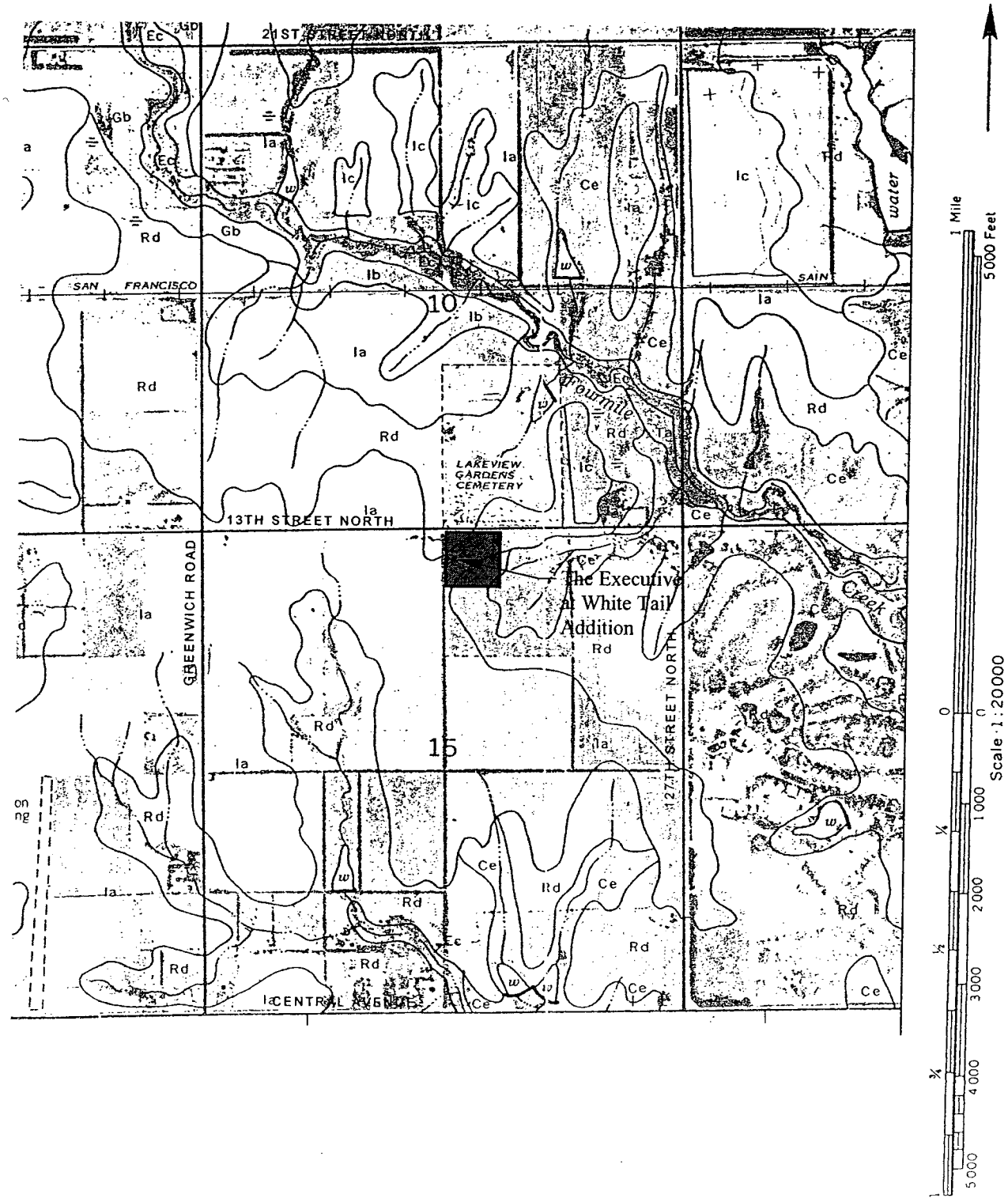
Summary

The site is approximately 4.3 acres of land on the southeast corner of 13th Street North and Highway K-96. The property is currently undeveloped with slopes ranging from 1-3%. An office park is proposed for the site. This will increase the amount of runoff for all rainfall events, especially the 2 and 5-year events. The site will continue to drain in the same directions as existing conditions with more concentrated outlets for runoff. Stormwater sewers will be added to handle the additional runoff. The proposed drainage patterns will follow those shown in the original drainage plan for White Tail Addition. Most of the site will drain to an existing stormwater sewer system, and will discharge into an existing retention/detention pond. The existing system appears to be adequate to handle the increased runoff, and additional detention should not be required. Grading

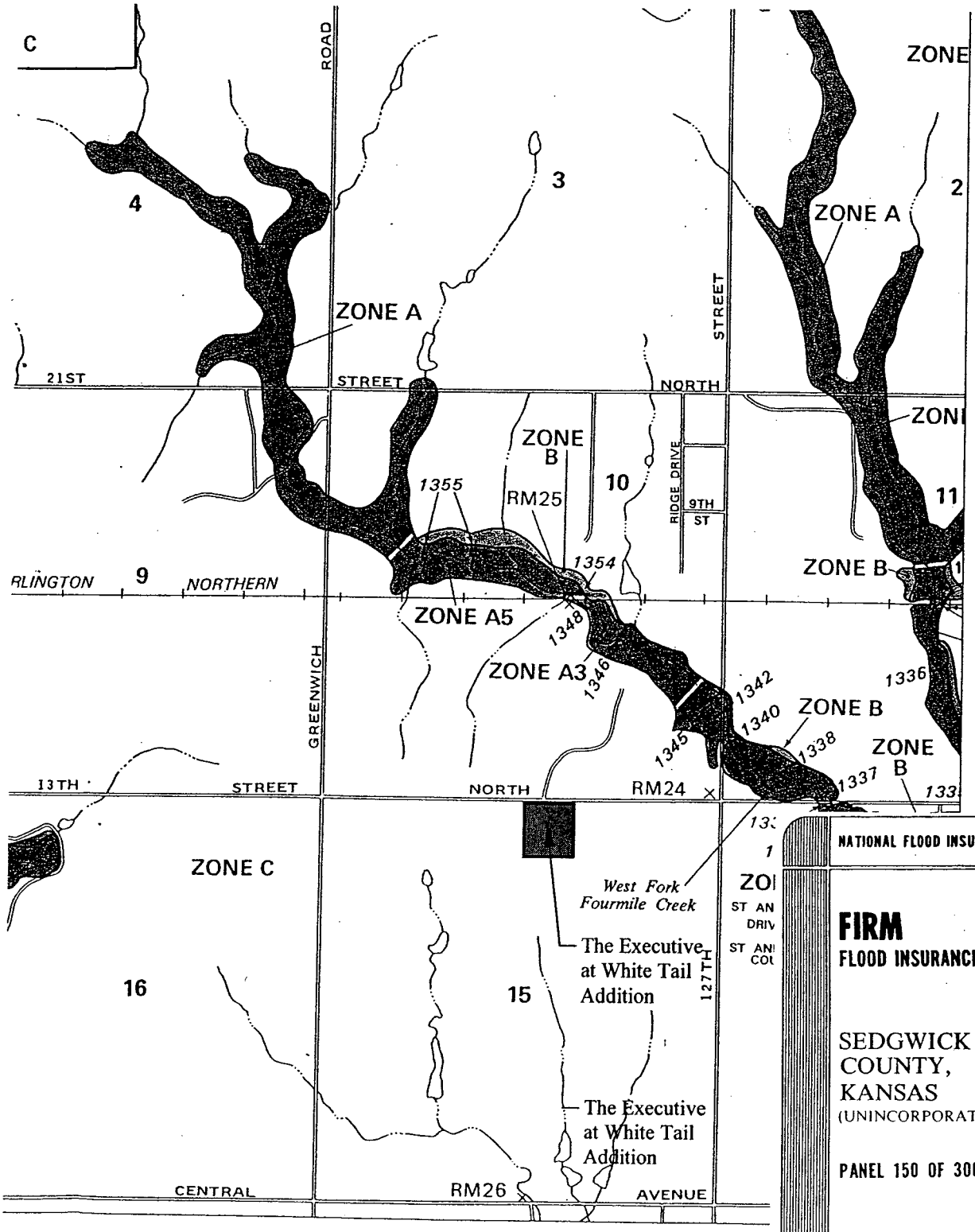
for the site will be such that proper escape routes will be provided for large storm events.

Appendix A

(SCS) Sedgwick County Soil Survey



Appendix B



APPROXIMATE SCALE

2000 0 2000 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS

(UNINCORPORATED AREAS)

PANEL 150 OF 300

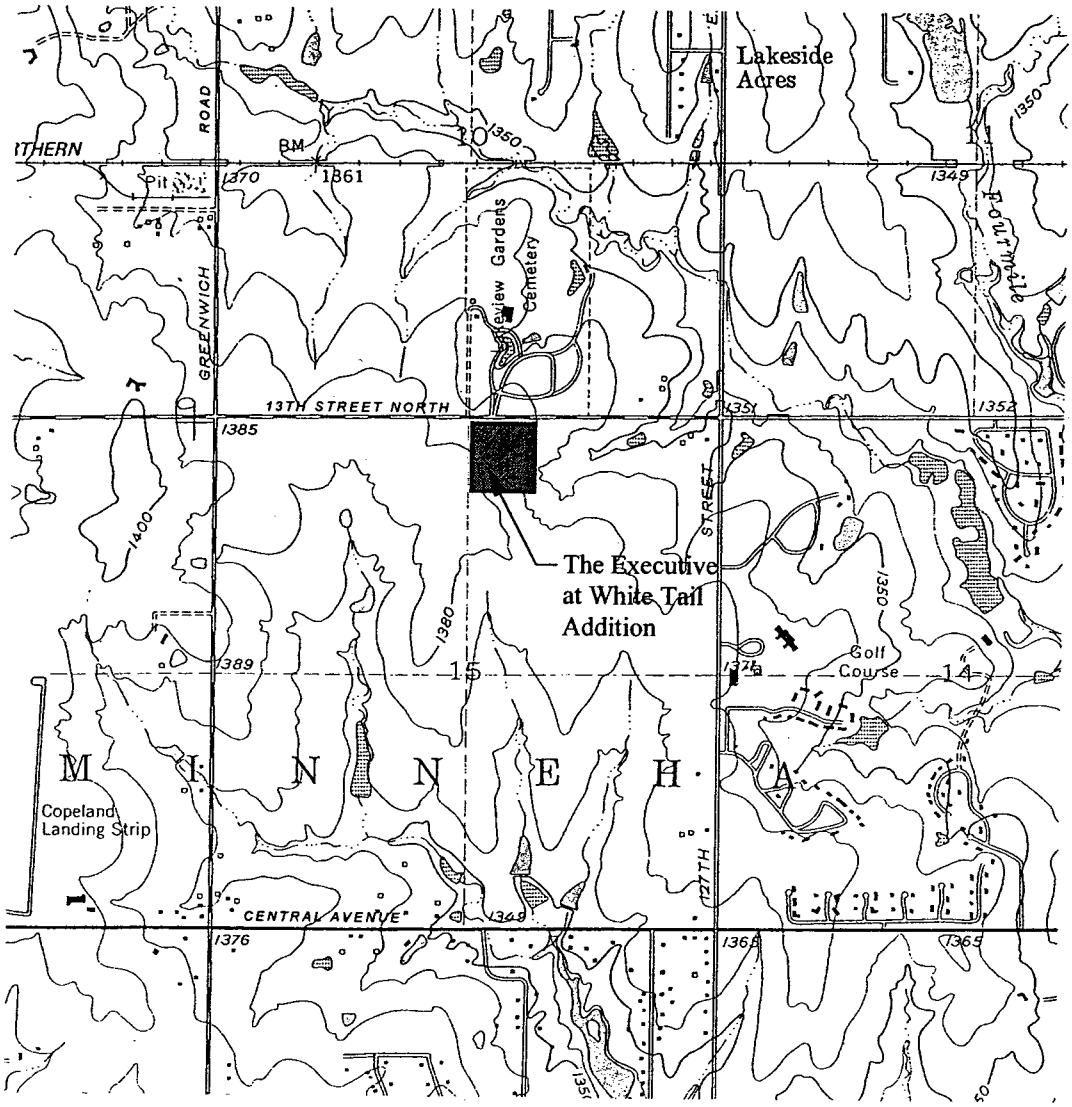
COMMUNITY-PANEL NUMBER
200321 0150 A

EFFECTIVE DATE:
JUNE 3, 1986

Federal Emergency Management Agency

Appendix C

ANDOVER KANSAS QUADRANGLE
United States
Department of the Interior
Geological Survey



SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Appendix D

Appendix E

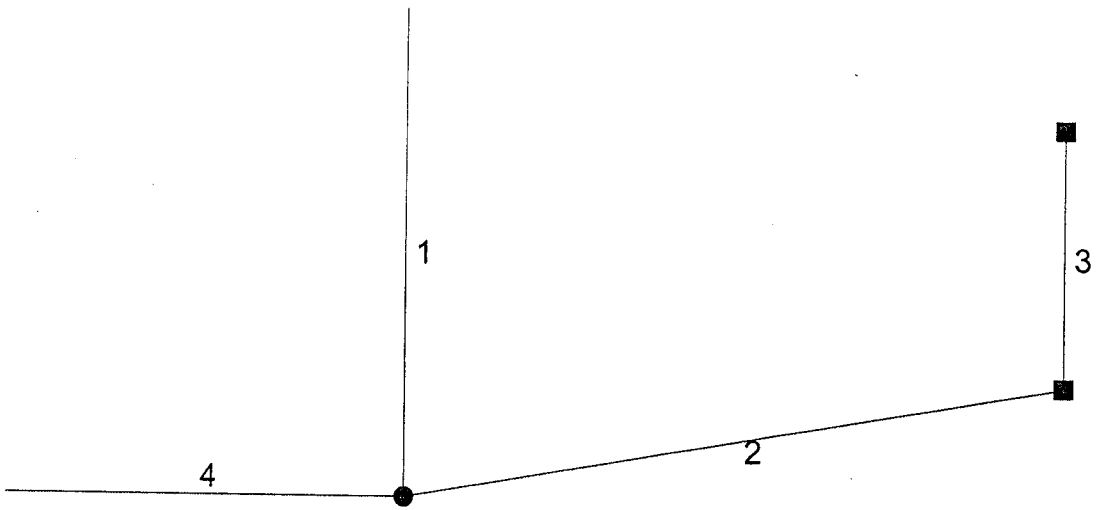
DRAINAGE ANALYSIS SUMMARY

The Executive at Whitetail Addition

rea ID	Area ac	Accum. Area ac	C2	C5	C10	C100	Elev Max	Elev Min	Flow Length	Tc2 min	Tc5 min	Tc10 min	Tc100 min	I2 in/hr	I5 in/hr	I10 in/hr	I100 in/hr	Q2 cfs	Q5 cfs	Q10 cfs	Q100 cfs
efore Development																					
A	1.70		0.30	0.35	0.45	0.65	1381.00	1373.00	420.00	24	22	19	15	3.10	3.81	4.71	7.37	1.58	2.27	3.60	8.14
B	1.24		0.30	0.35	0.45	0.65	1380.00	1376.00	340.00	25	24	20	15	2.96	3.73	4.60	7.37	1.10	1.62	2.57	5.94
C	1.17		0.30	0.35	0.45	0.65	1381.00	1374.00	320.00	20	19	16	15	3.42	4.20	5.08	7.37	1.20	1.72	2.67	5.60
D	0.22		0.30	0.35	0.45	0.65	1381.00	1373.00	320.00	19	18	15	15	3.51	4.31	5.22	7.37	0.23	0.33	0.52	1.05
otal	4.33																	4.11	5.94	9.36	20.74
ter Development																					
A	1.70		0.62	0.65	0.70	0.79	1381.00	1373.00	420.00	15	15	15	15	3.83	4.56	5.22	7.37	4.04	5.04	6.21	9.90
B	1.24		0.59	0.62	0.68	0.78	1380.00	1376.00	340.00	16	15	15	15	3.72	4.56	5.22	7.37	2.72	3.51	4.40	7.13
C	1.17		0.60	0.63	0.69	0.79	1381.00	1374.00	320.00	15	15	15	15	3.83	4.56	5.22	7.37	2.69	3.36	4.21	6.81
D	0.22		0.37	0.42	0.52	0.68	1381.00	1373.00	320.00	17	16	15	15	3.61	4.43	5.22	7.37	0.29	0.41	0.60	1.10
otal	4.33																	9.74	12.32	15.42	24.94
nlet	0.75		0.30	0.35	0.45	0.65	1382.00	1370.13	500.00	24	23	20	15	3.03	3.81	4.71	7.37	0.68	1.00	1.59	3.59

Appendix F

Hydraflow Plan View



Project file: wtexist.stm	IDF file: Sedgwick County.IDF	No. Lines: 4	09-23-2002

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.0	0.00	5.48	0.00	0.00	2.51	0.0	45.1	2.6	6.44	12.39	2.12	24	0.30	1368.50	1368.20	1370.27	1370.20	1373.71	0.00	24 Outflow
2	1	135.0	0.56	1.12	0.88	0.49	0.99	15.0	15.5	4.5	4.42	12.47	1.72	24	0.30	1369.01	1368.60	1370.38	1370.34	1372.92	1373.71	24 S. Side 13th
3	2	53.0	0.56	0.56	0.88	0.49	0.49	15.0	15.0	4.5	2.24	8.87	2.83	15	1.89	1369.90	1368.90	1370.50	1370.47	1373.11	1372.92	15 acros 13th
4	1	81.0	4.36	4.36	0.35	1.53	1.53	44.0	44.0	2.6	3.97	0.00	1.26	24	-3.83	1368.50	1371.60	1373.63	1373.60	1373.60	1373.71	24 in from k96

Project File: wtexist.stm

IDF File: Sedgwick County.IDF

Total number of lines: 4

Run Date: 09-23-2002

NOTES: Intensity = 52.62 / (Inlet time + 11.20) ^ 0.75; Return period = 5 Yrs. ; Initial tailwater elevation = 1370.20 (ft)

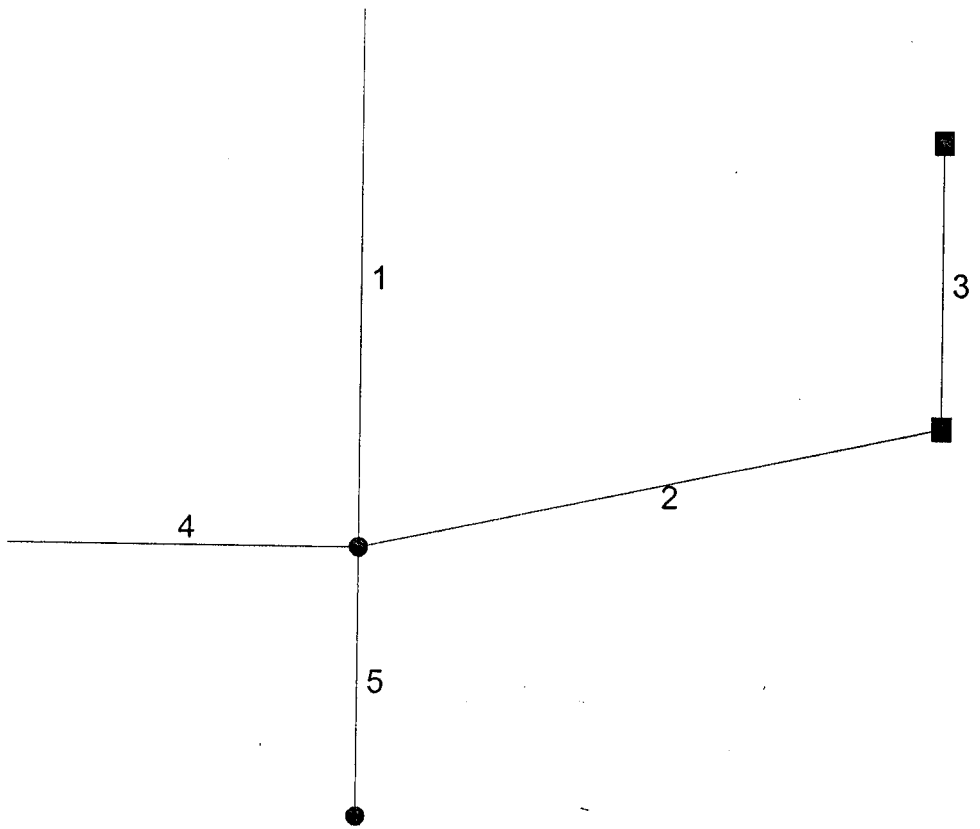
Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
		(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1	End	100.0	0.00	5.48	0.00	0.00	2.51	0.0	44.6	4.4	11.04	12.39	3.54	24	0.30	1368.50	1368.20	1370.42	1370.20	1373.71	0.00	24 Outflow
2	1	135.0	0.56	1.12	0.88	0.49	0.99	15.0	15.3	7.3	7.20	12.47	2.40	24	0.30	1369.01	1368.60	1370.73	1370.62	1372.92	1373.71	24 S. Side 13th
3	2	53.0	0.56	0.56	0.88	0.49	0.49	15.0	15.0	7.4	3.63	8.87	3.05	15	1.89	1369.90	1368.90	1371.02	1370.88	1373.11	1372.92	15 acros 13th
4	1	81.0	4.36	4.36	0.35	1.53	1.53	44.0	44.0	4.4	6.76	0.00	2.15	24	-3.83	1368.50	1371.60	1373.67	1373.60	1373.60	1373.71	24 in from k96

Project File: wtexist.stm | IDF File: Sedgwick County.IDF | Total number of lines: 4 | Run Date: 09-23-2002

NOTES: Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; Initial tailwater elevation = 1370.20 (ft)

Hydraflow Plan View



Project file: wtprop.stm	IDF file: Sedgwick County.IDF	No. Lines: 5	09-23-2002

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.0	0.00	5.48	0.00	0.00	3.26	0.0	45.8	2.5	8.29	12.39	2.70	24	0.30	1368.50	1368.20	1370.32	1370.20	1373.71	0.00	24 Outflow
2	1	135.0	0.56	1.12	0.88	0.49	0.99	15.0	15.5	4.5	4.42	12.47	1.63	24	0.30	1369.01	1368.60	1370.47	1370.44	1372.92	1373.71	24 S. Side 13th
3	2	53.0	0.56	0.56	0.88	0.49	0.49	15.0	15.0	4.5	2.24	8.87	2.62	15	1.89	1369.90	1368.90	1370.56	1370.55	1373.11	1372.92	15 Across 13th
4	1	81.0	2.66	2.66	0.35	0.93	0.93	44.0	44.0	2.6	2.42	0.00	0.77	24	-3.83	1368.50	1371.60	1373.61	1373.60	1373.60	1373.71	24 In From K96
5	1	50.0	1.70	1.70	0.79	1.34	1.34	15.0	15.0	4.5	6.11	6.64	3.46	18	0.40	1368.80	1368.60	1370.60	1370.44	1374.00	1373.71	In From Site

Project File: wtprop.stm | IDF File: Sedgwick County.IDF | Total number of lines: 5 | Run Date: 09-23-2002

NOTES: Intensity = 52.62 / (Inlet time + 11.20) ^ 0.75; Return period = 5 Yrs. ; Initial tailwater elevation = 1370.20 (ft)

Hydraflow Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	
1	End	100.0	0.00	5.48	0.00	0.00	3.26	0.0	45.0	4.4	14.26	12.39	4.54	24	0.30	1368.50	1368.20	1370.60	1370.20	1373.71	0.00	24 Outflow
2	1	135.0	0.56	1.12	0.88	0.49	0.99	15.0	15.3	7.3	7.20	12.47	2.29	24	0.30	1369.01	1368.60	1371.01	1370.92	1372.92	1373.71	24 S. Side 13th
3	2	53.0	0.56	0.56	0.88	0.49	0.49	15.0	15.0	7.4	3.63	8.87	2.96	15	1.89	1369.90	1368.90	1371.30	1371.13	1373.11	1372.92	15 Across 13th
4	1	81.0	2.66	2.66	0.35	0.93	0.93	44.0	44.0	4.4	4.12	0.00	1.31	24	-3.83	1368.50	1371.60	1373.63	1373.60	1373.60	1373.71	24 In From K96
5	1	50.0	1.70	1.70	0.79	1.34	1.34	15.0	15.0	7.4	9.89	6.64	5.60	18	0.40	1368.80	1368.60	1371.36	1370.92	1374.00	1373.71	In From Site

Project File: wtprop.stm | IDF File: Sedgwick County.IDF | Total number of lines: 5 | Run Date: 09-23-2002

NOTES: Intensity = 62.28 / (Inlet time + 10.10) ^ 0.66; Return period = 100 Yrs. ; Initial tailwater elevation = 1370.20 (ft)

Appendix G

BENCH MARK

BM#1 — 0.25 mile East of Greenwich on 13th St. N. (K-96 & 13th St.)
C.O.W. Bench mark NW. corner of bridge on concrete sidewalk
ELEV. = 1391.62 NGVD
204.22 City Datum

BM#2 — R.R. spike in S. face guy pole at NW. cor., Lot 136, Block 4, White Tail Addition
ELEV. = 1376.27 NGVD
188.87 City Datum

LEGEND

- GM – GAS METER
- YLG – GROUND YARD LIGHT
- YLP – YARD LIGHT ON POLE
- ELECT MH – ELECTRIC MANHOLE
- SIG LIGHT – SIGNAL LIGHT
- CON – CONIFEROUS TREE & DIAMETER
- DEC – DECIDUOUS TREE & DIAMETER
- SN – SIGN
- BUSH
- PP – POWER POLE AND GUY ANCHOR
- EGE – ELECTRIC BOX
- CO – SEWER CLEANOUT
- EDGE OF TREES
- FENCE
- BM – BENCHMARK
- SWMH – STORM WATER MANHOLE
- SSMH – SANITARY SEWER MANHOLE
- TPMH – TELEPHONE MANHOLE
- SECTION CORNER
- 5/8" REBAR/MKEC CLS #39 SET
- PROPERTY CORNER FOUND
- POLE – POLE
- GATE
- TRAFFIC SIGNAL MANHOLE
- SPK – SPRINKLER HEAD
- WALL
- LP – LIGHT POLE
- FH – FIRE HYDRANT
- WV – WATER VALVE
- WM – WATER METER
- ICV – IRRIGATION CONTROL VALVE
- GRATE INLET
- TR – TELEPHONE RISER
- INLET
- STORM SEWER PIPE
- WATER LINE
- SANITARY SEWER LINE
- GAS LINE
- TELEPHONE LINE
- UNDERGROUND ELECTRIC LINE
- OVERHEAD ELECTRIC

NOTES

1. ZONING: EXISTING AND PROPOSED LIMITED COMMERCIAL "LC"
2. RESERVE "A," IS PLATTED FOR PRIVATE STREETS, UTILITIES, DRAINAGE, PARKING, LANDSCAPING, IRRIGATION, MONUMENTS, BERMING, AND SIDEWALKS

SCALE: 1" = 40'
0 20 40 80

EXISTING DRAINAGE PATTERNS

THE EXECUTIVE AT WHITE TAIL ADDITION

DATE: JULY, 2002

OWNERS/DEVELOPER: Ink Construction LLC P.O. Box 780427 Wichita, Kansas 67278 316-681-3500
Goodpasture Real Estate Group LLC P.O. Box 780089 Wichita, Kansas 67278 316-618-5100

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