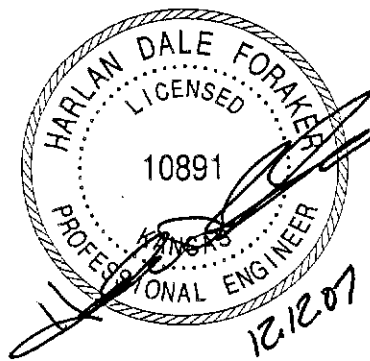


**DRAINAGE PLAN  
AND  
SUPPORTING CALCULATIONS  
FOR  
LIVING WORD OUTREACH ADDITION  
WICHITA, KANSAS**

**DECEMBER 12, 2007**

**PREPARED BY:**

**CERTIFIED ENGINEERING DESIGN, P.A.  
810 WEST DOUGLAS, SUITE C  
WICHITA, KANSAS 67203-6105  
(316)262-8808 PHONE  
(316)262-1669 FAX**

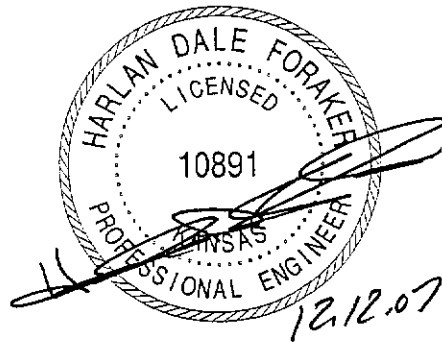


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**Public Works, Engineering Division  
Final Drainage Plan Submittal Checklist**

Reviewer: \_\_\_\_\_ Date: 12-12-07  
 Subdivision Name: LIVING WOODS OUTREACH Location: SOUTH OF GALENA BETWEEN PATIE AND VICTORIA  
 Total Land Area Of Ownership: 12.6 Acres  
 Type:  Residential  Commercial \_\_\_\_\_ Industrial \_\_\_\_\_ Recreation \_\_\_\_\_ Municipal \_\_\_\_\_ Other \_\_\_\_\_  
 Applicant: LIVING WOODS OUTREACH INC Contact: HEERS HUDSON Phone #: 683-8641  
 Engineer: CERTIFIED ENG. DESIGN, P.A. Contact: HARLAN FOCKER Phone #: 262-8808

Please check the appropriate box:

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

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

Tab 2. Existing Conditions Runoff Calculations	Applicant			Engr	
	I	NA	Explanation / Location in Plan	I	NA
A. Copy of applicable orthophoto showing proposed project boundaries (preferable in color)				<input checked="" type="checkbox"/>	
B. Runoff Method (Rational, Hydrograph Method, or other approved methods by Engineering)				<input checked="" type="checkbox"/>	
C. Existing topography (no greater than 2-foot contours, 1-foot recommend)				<input checked="" type="checkbox"/>	
D. Total Site Area and Total Impervious Area (acres)				<input checked="" type="checkbox"/>	
E. Benchmarks used for site control				<input checked="" type="checkbox"/>	
F. Streams, creeks, and waterway labeled					<input checked="" type="checkbox"/>
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					<input checked="" type="checkbox"/>
I. Location of existing roads, buildings, parking lots and other impervious areas.				<input checked="" type="checkbox"/>	



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 plat 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					✓

Living Word Addition Drainage Plan(Con't)  
Ms. Vicki Huang, P.E.  
December 12, 2007

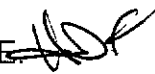
**CERTIFIED ENGINEERING DESIGN, P.A**  
810 West Douglas, Suite C  
Wichita, KS 67203-6105  
(316)262-8808 Office  
(316)262-1669 Fax

## **LETTER OF TRANSMITTAL**

DATE: December 12, 2007

TO: Ms. Vicky Huang, P.E.  
Engineering Division  
455 North Main  
Wichita, KS 67202

RE: Drainage Plan  
Living Word Outreach Addition  
Wichita, KS

FROM: Harlan D. Foraker, P.E. 

### **I. PROJECT NARRATIVE**

The proposed Living Word Outreach Addition is located west of Hydraulic Avenue, south of Galena and north of the I-135 Highway Right-of-Way within portions of Block 9 and 11 of the previously platted Rainbow 2<sup>nd</sup> Addition to Wichita, Kansas. The site is currently undeveloped with lawn grass cover. The SCS soil type present within Living Word Outreach Addition is Pratt Loam Fine which are SCS Type A Soils.

### **II. EXISTING CONDITIONS RUNOFF CALCULATIONS**

The rational method will be used to determine the peak discharges from the subareas of the study area. Rational 'C' Factors were assigned to the existing site and proposed improvements from "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation" for the City of Wichita, Kansas.

The rainfall intensity tables for the Sedgwick County, Kansas which were obtained from the Kansas Department of Transportation were utilized to determine the rainfall intensity for the 5 and 100 year design storms.

The Soil Conservation Service TR-55 manual was used to compute the Time of Concentration for the drainage subareas. A design assumption was made as follows that the minimum subarea time of concentration is 15 minutes

Living Word Addition Drainage Plan(Con't)

Ms. Vicki Huang, P.E.

December 12, 2007

Soil types were determined from the SCS Soil Survey for Sedgwick County, Kansas.

The developed drainage subareas have been delineated on the 1" = 50' site and topographic mapping survey performed for this site.

Design Storm Events Evaluated: 2, 5, 10, 25, 50 and 100 yr. storm events

The runoff calculations for the street, drainage channel design, drainage pipe design and detention pond storage have been completed utilizing the 5 year storm. A check of the drainage system has been made using the 100 year storm event.

The existing site has been subdivided into five separate subbasins for which the undeveloped peak runoff has been computed. The following tables summarize the undeveloped peak discharges for the existing conditions for each of the five subbasins.

<b>EXISTING PEAK RUNOFF</b>					
Description	C	Tc	I	Area	Q(cfs)
<b>Existing Subarea 1</b>					
2 yr. Peak Discharge	.10	22	3.49	4.73	1.65
5 yr. Peak Discharge	.11	22	4.49	4.73	2.34
10 yr. Peak Discharge	.15	22	5.24	4.73	3.72
25 yr. Peak Discharge	.18	22	5.99	4.73	5.10
50 yr. Peak Discharge	.22	22	6.86	4.73	7.14
100 yr. Peak Discharge	.25	22	7.74	4.73	9.15
<b>Existing Subarea 2</b>					
2 yr. Peak Discharge	.10	22	3.49	3.78	1.31
5 yr. Peak Discharge	.11	22	4.49	3.78	1.87
10 yr. Peak Discharge	.15	22	5.24	3.78	2.97
25 yr. Peak Discharge	.18	22	5.99	3.78	4.07
50 yr. Peak Discharge	.22	22	6.86	3.78	5.70
100 yr. Peak Discharge	.25	22	7.74	3.78	7.31
<b>Existing Subarea 3</b>					
2 yr. Peak Discharge	.10	15	4.06	2.65	1.08
5 yr. Peak Discharge	.11	15	5.21	2.65	1.52
10 yr. Peak Discharge	.15	15	6.08	2.65	2.42
25 yr. Peak Discharge	.18	15	6.95	2.65	3.32
50 yr. Peak Discharge	.22	15	7.97	2.65	4.65
100 yr. Peak Discharge	.25	15	8.98	2.65	5.95
<b>Existing Subarea 4</b>					
2 yr. Peak Discharge	.10	15	4.06	1.08	0.44
5 yr. Peak Discharge	.11	15	5.21	1.08	0.62
10 yr. Peak Discharge	.15	15	6.08	1.08	0.98
25 yr. Peak Discharge	.18	15	6.95	1.08	1.35
50 yr. Peak Discharge	.22	15	7.97	1.08	1.89
100 yr. Peak Discharge	.25	15	8.98	1.08	2.42
<b>Existing Subarea 5</b>					
2 yr. Peak Discharge	.10	15	4.06	0.40	0.16
5 yr. Peak Discharge	.11	15	5.21	0.40	0.23

Living Word Addition Drainage Plan(Cont)

Ms. Vicki Huang, P.E.

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10 yr. Peak Discharge	.15	15	6.08	0.40	0.36
25 yr. Peak Discharge	.18	15	6.95	0.40	0.50
50 yr. Peak Discharge	.22	15	7.97	0.40	0.70
100 yr. Peak Discharge	.25	15	8.98	0.40	0.90

The existing undeveloped site drainage is generally from north to south and would ultimately be discharged into the south ditch of I-135 right-of-way.

**III. POST DEVELOPMENT HYDROLOGIC ANALYSIS**

Design Storm Events Evaluated: 2, 5, 10, 25, 50 and 100 yr. storm events

The runoff calculations for the street, drainage channel design, drainage pipe design and detention pond storage have been completed utilizing the 5 year storm. A check of the drainage system has been made using the 100 year storm event.

Storm sewer was analyzed for full flow conditions was using "Flowmaster" by Haestad Methods Inc.

The following tables summarize the peak discharges for developed conditions for Living Word Addition. The total drainage area for Living Word Addition is 12.63 acres.

DEVELOPED PEAK RUNOFF					
Description	C	Tc	I	Area	Q(cfs)
<b>Developed Drainage Subarea 1d &amp; 2d</b>					
2 yr. Peak Discharge	.10	15	4.06	7.03	1.08
5 yr. Peak Discharge	.11	15	5.21	7.03	1.52
10 yr. Peak Discharge	.15	15	6.08	7.03	2.42
25 yr. Peak Discharge	.18	15	6.95	7.03	3.32
50 yr. Peak Discharge	.22	15	7.97	7.03	4.65
100 yr. Peak Discharge	.25	15	8.98	7.03	5.95
<b>Developed Drainage Subarea 3d</b>					
2 yr. Peak Discharge	.10	15	4.06	2.65	1.08
5 yr. Peak Discharge	.11	15	5.21	2.65	1.52
10 yr. Peak Discharge	.15	15	6.08	2.65	2.42
25 yr. Peak Discharge	.18	15	6.95	2.65	3.32
50 yr. Peak Discharge	.22	15	7.97	2.65	4.64
100 yr. Peak Discharge	.25	15	8.98	2.65	5.95
<b>Developed Drainage Subarea 4d</b>					
2 yr. Peak Discharge	.10	15	4.06	1.08	0.44
5 yr. Peak Discharge	.11	15	5.21	1.08	0.61
10 yr. Peak Discharge	.15	15	6.08	1.08	0.98
25 yr. Peak Discharge	.18	15	6.95	1.08	1.35
50 yr. Peak Discharge	.22	15	7.97	1.08	1.89
100 yr. Peak Discharge	.25	15	8.98	1.08	2.42
<b>Developed Drainage Subarea 5d</b>					
2 yr. Peak Discharge	.10	15	4.06	0.40	0.16

Living Word Addition Drainage Plan(Con't)

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5 yr. Peak Discharge	.11	15	5.21	0.40	0.23
10 yr. Peak Discharge	.15	15	6.08	0.40	0.36
25 yr. Peak Discharge	.18	15	6.95	0.40	0.50
50 yr. Peak Discharge	.22	15	7.97	0.40	0.70
100 yr. Peak Discharge	.25	15	8.98	0.40	0.90

The peak developed discharge for the combined areas of the entire Living Word Outreach Addition is as follows:

<b>TOTAL AREA UNDEVELOPED</b>					
<b>PEAK DISCHARGE</b>					
Description	c	Tc	I	Area	Q(cfs)
Undeveloped Total Area(2 yr.)	.10	22	3.49	12.63	4.4
Undeveloped Total Area(5 yr.)	.11	22	4.49	12.63	6.2
Undeveloped Total Area(10 yr.)	.15	22	5.24	12.63	9.9
Undeveloped Total Area(25 yr.)	.18	22	5.99	12.63	13.6
Undeveloped Total Area(50 yr.)	.22	22	6.86	12.63	19.1
Undeveloped Total Area(100 yr.)	.25	22	7.74	12.63	24.4
<b>TOTAL AREA DEVELOPED</b>					
<b>PEAK DISCHARGE</b>					
Description	C	Tc	I	Area	Q(cfs)
Developed Combined SubArea(2 yr.)	.52	15	4.06	12.63	26.7
Developed Combined SubArea(5 yr.)	.53	15	5.21	12.63	34.9
Developed Combined SubArea(10 yr.)	.56	15	6.08	12.63	43.0
Developed Combined SubArea(25 yr.)	.57	15	6.95	12.63	50.0
Developed Combined SubArea(50 yr.)	.59	15	7.97	12.63	59.4
Developed Comb. SubArea(100 yr.)	.61	15	8.98	12.63	69.2

The developed combined peak runoff for the 5 year storm event is 34.9 cfs which is an increase of 28.7 cfs from the existing peak discharge of 6.2 cfs. The developed combined peak runoff for the 100 year storm event is 69.2 cfs which is an increase of 44.8 cfs from the existing peak discharge of 24.4 cfs. The existing drainage discharges from the south line of the platted area into the north ditch of the I-135 highway right-of-way.

A detention pond is proposed to be constructed in the Reserve D along the south line of the Living Word Outreach Addition. The pond proposed in Reserve D has a stage versus storage relationship as follows:

<b>DETENTION STORAGE FOR RESERVE D POND</b>	
Stage	Contour Area(sq.ft.)
1274.5	0
1275	36,125
1276	45,695
1277	51,863

Living Word Addition Drainage Plan(Con't)

Ms. Vicki Huang, P.E.

December 12, 2007

The results of the detention analysis for the Reserve D detention pond utilizing the Hydraflow Hydrographs program are presented in the table below:

<b>DETENTION ANALYSIS FOR RESERVE D POND</b>				
	Q5 In	Q5 Out	Peak	Storage Vol
Description	(cfs)	(cfs)	Stage	Req'd.(cu.ft.)
Developed Area	34.8	8.1	1275.37	24,144
	Q100 In	Q100 Out	Peak	Storage Vol.
Description	(cfs)	(cfs)	Stage	Req'd.(cu.f.t)
Developed Area	76.5	17.6	1275.96	48,196

The design of the detention pond is to reduce the peak discharge from the development of the Living Word Outreach Addition into the north ditch of the I-135 highway right-of-way ditch. The undeveloped 5 year discharge for the site is 6.2 cfs and the discharge from the detention pond is 8.1 cfs. There is a slight increase in the 5 year discharge. A copy of the drainage plan is being forwarded to Mr. Ben Koerner with KDOT for review to determine if the 1.9 cfs increase in the 5 year discharge into the highway ditch can be approved. The existing highway ditch is 5 to 7 feet deep and has a capacity of nearly 558 cfs. There is adequate conveyance capacity for the 8.1 cfs from the 5 year storm event within the existing ditch. The undeveloped 10 year discharge for the site is 9.9 cfs and the discharge from the detention pond is 16 cfs. The undeveloped 100 year discharge for the site is 24.4 cfs and the discharge from the detention pond is 17.6 cfs. The proposed detention pond provides a 28% reduction in the 100 year developed peak discharge.

**IV. FLOODPLAIN SUBMITTAL** – No FEMA floodplain is located on this plat.

**V. FEDERAL, STATE AND LOCAL PERMITS**

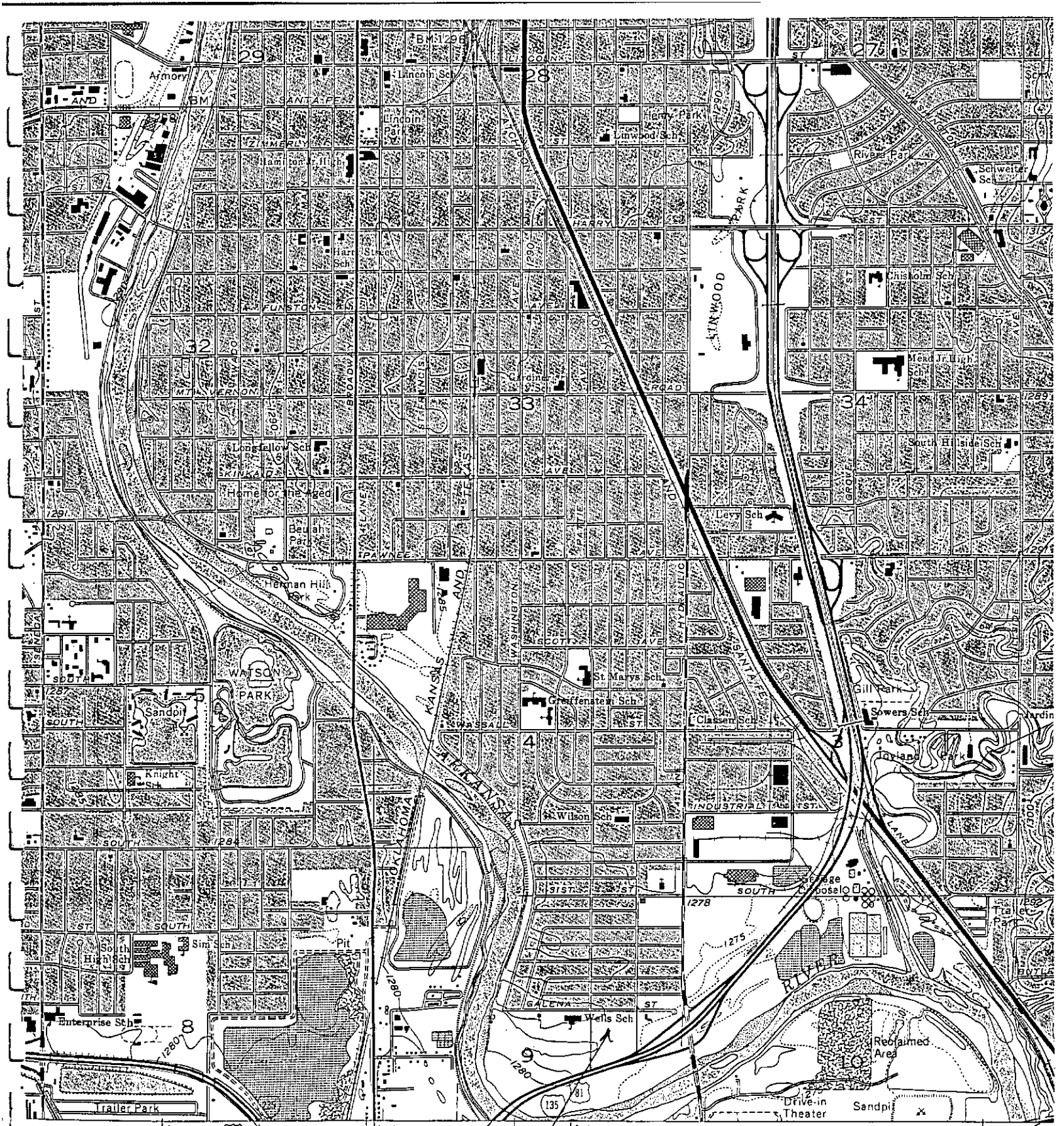
- A. US Army Corp of Engineers-Not Applicable
- B. Kansas Dept. of Agriculture-Not Applicable
- C. FEMA-Not Applicable
- D. Kansas Department of Transportation-Drainage Plan has been copied to Mr. Ben Koerner, KDOT Utility & Drainage Coordinator.
- E. Sedgwick County Right-of-Way Permit-Not Applicable

**VI. SUMMARY DISCUSSION:**

A summary discussion of the offsite drainage peak discharge, existing peak discharge from the proposed development area and the developed peak discharge for each developed drainage basin or combination of drainage basins has been previously presented in Sections II and III for the analysis of peak drainage discharge.

**VII. APPENDIX I:**

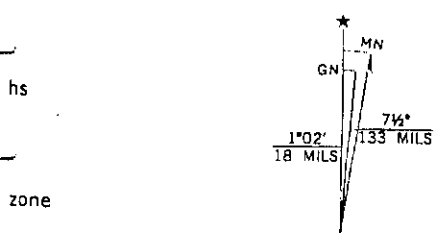
All charts, graphs, tables including a 1"=50' scale drainage plan map are included for review.



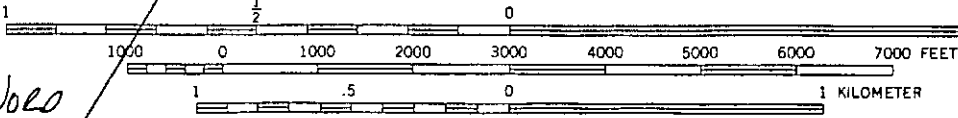
WICHITA INTERCHANGE 1.9 MI. MIDLAND 0.8 MI. WELLINGTON 27 MI.

SOUTH WICHITA INTERCHANGE 1.7 MI. (DERBY) SOUTH WICHITA INTERCHANGE 2.3 MI. 6559 III SE WELLINGTON INTERCHANGE 24 MI.

SCALE 1:24 000



*LIVING WORD  
OUTREACH ADDITION*



CONTOUR INTERVAL 10 FEET  
DOTTED LINES REPRESENT 5-FOOT CONTOURS  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA

LIVING WORD  
OUTREACH  
ADDITIO







# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

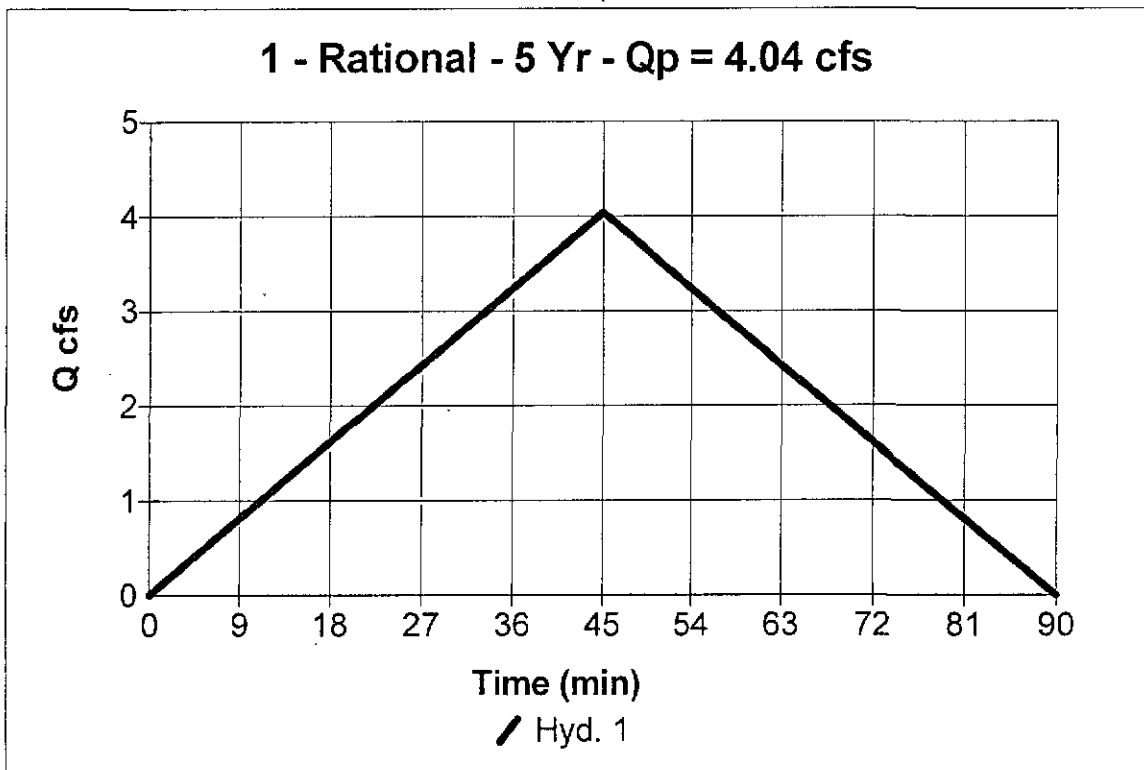
## Hyd. No. 1

### ~~Existing Peak Discharge~~

Hydrograph type = Rational  
Storm frequency = ~~5 yrs~~  
Drainage area = 12.6 ac  
Intensity = 2.910 in/hr  
IDF Curve = SedgwickCounty.idf

Peak discharge = 4.04 cfs  
Time interval = 1 min  
Runoff coeff. = 0.11  
Time of conc. (Tc) = 45 min  
Asc/Rec limb fact = 1/1

Hydrograph Volume = 10,917 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

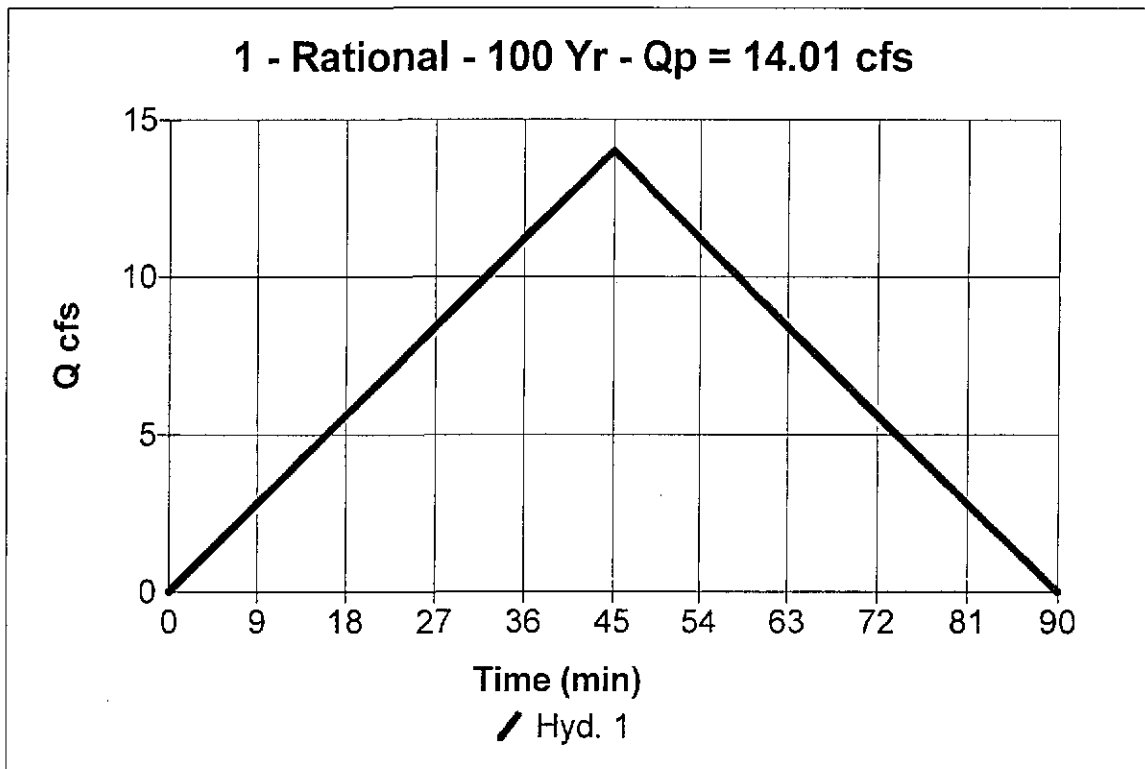
## Hyd. No. 1

~~Existing Peak Discharge~~

Hydrograph type = Rational  
Storm frequency = ~~100 yrs~~  
Drainage area = 12.6 ac  
Intensity = 5.043 in/hr  
IDF Curve = SedgwickCounty.idf

Peak discharge = 14.01 cfs  
Time interval = 1 min  
Runoff coeff. = 0.22  
Time of conc. (Tc) = 45 min  
Asc/Rec limb fact = 1/1

Hydrograph Volume = 37,836 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

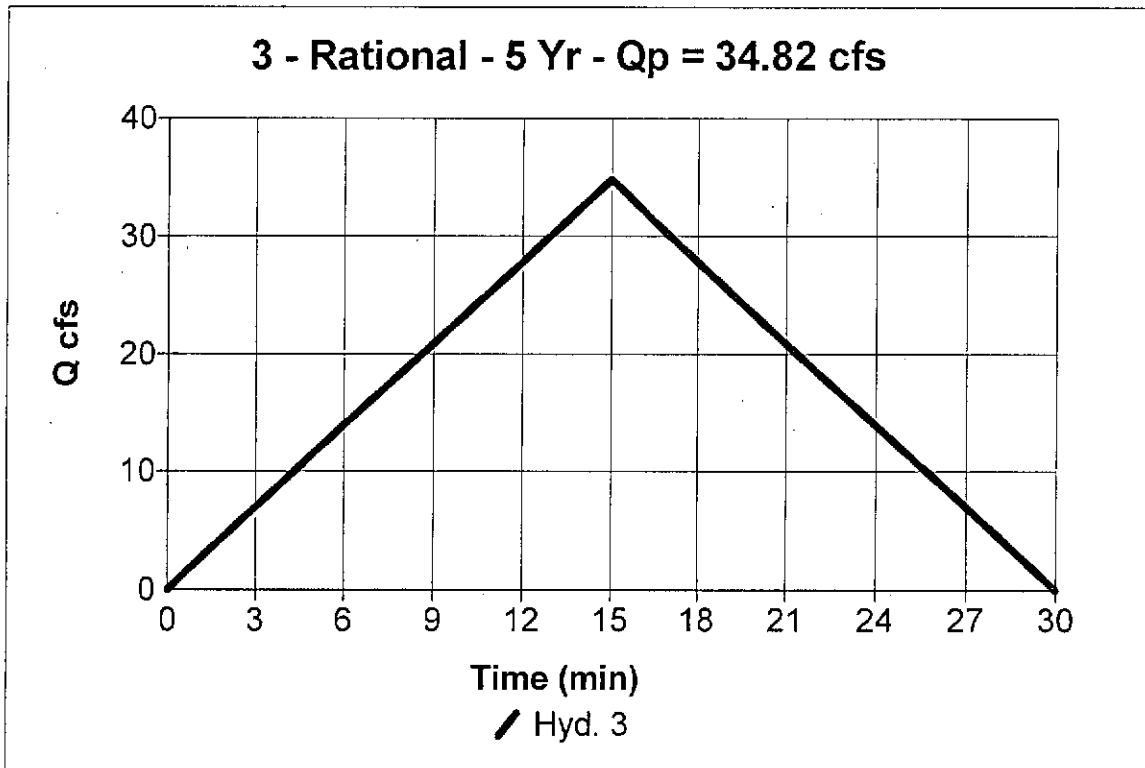
## Hyd. No. 3

Total Developed Area

Hydrograph type = Rational  
Storm frequency = 5 yrs  
Drainage area = 12.6 ac  
Intensity = 5.743 in/hr  
IDF Curve = SedgwickCounty.idf

Peak discharge = 34.82 cfs  
Time interval = 1 min  
Runoff coeff. = 0.48  
Time of conc. (Tc) = 15 min  
Asc/Rec limb fact = 1/1

Hydrograph Volume = 31,337 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

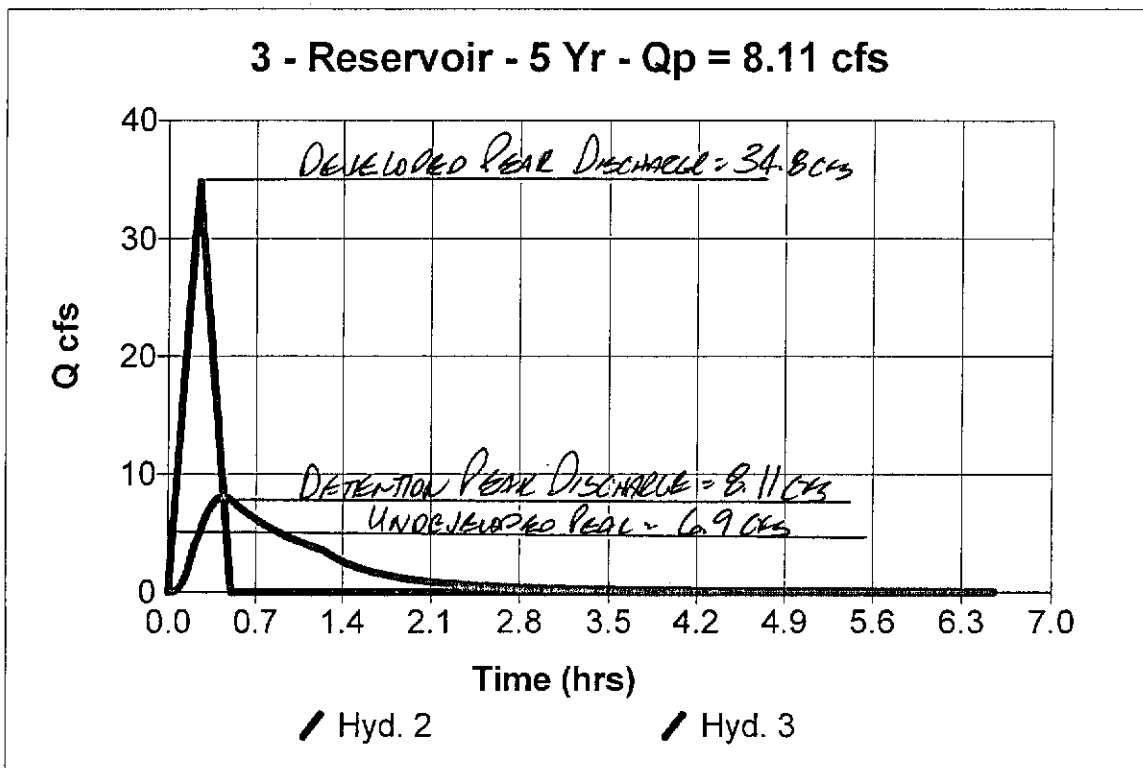
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = .5 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.37 ft

Peak discharge = 8.11 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 24,144 cuft

Storage Indication method used.

Hydrograph Volume = 31,329 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

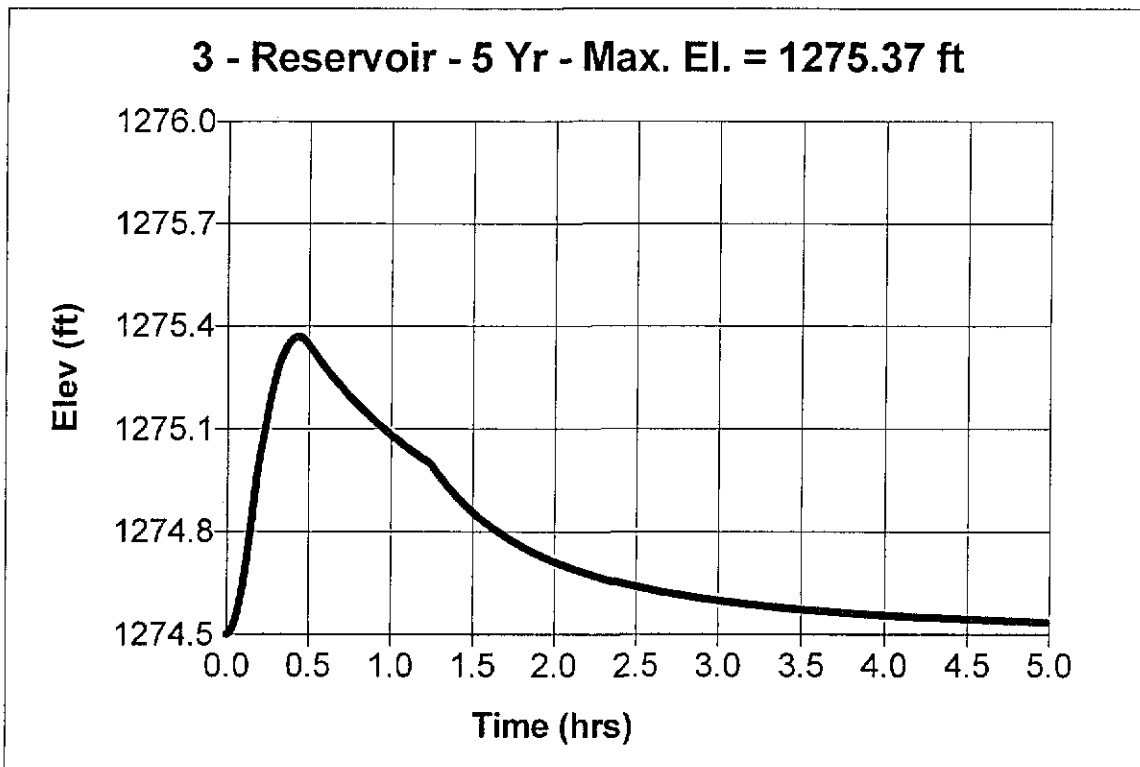
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = 5 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.37 ft

Peak discharge = 8.11 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 24,144 cuft

Storage Indication method used.

Hydrograph Volume = 31,329 cuft



# Hydrograph Plot

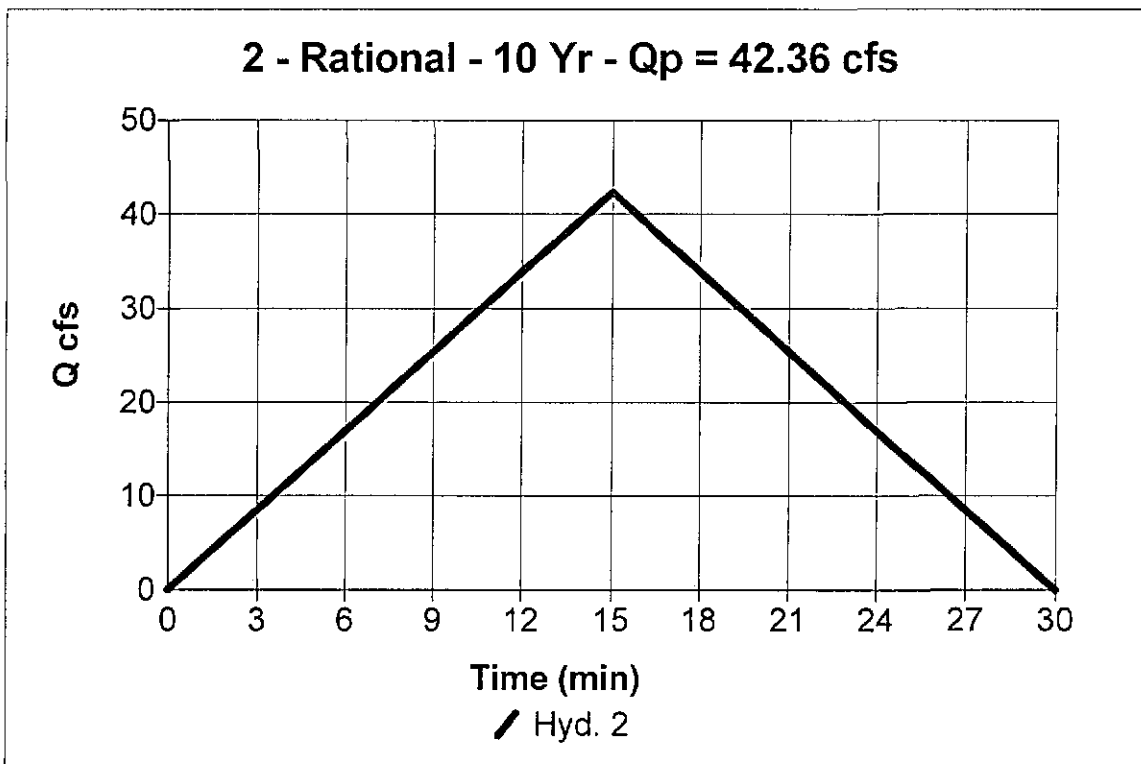
Hydraflow Hydrographs by Intelisolve

## Hyd. No. 2

Total Developed Area <sup>OK</sup> TOTAL DEVELOPED AREA

Hydrograph type	= Rational	Peak discharge	= 42.36 cfs
Storm frequency	= 10 yrs	Time interval	= 1 min
Drainage area	= 12.6 ac	Runoff coeff.	= 0.5
Intensity	= 6.708 in/hr	Time of conc. (Tc)	= 15 min
IDF Curve	= SedgwickCounty.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 38,124 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intellisolve

Hyd. No. 3

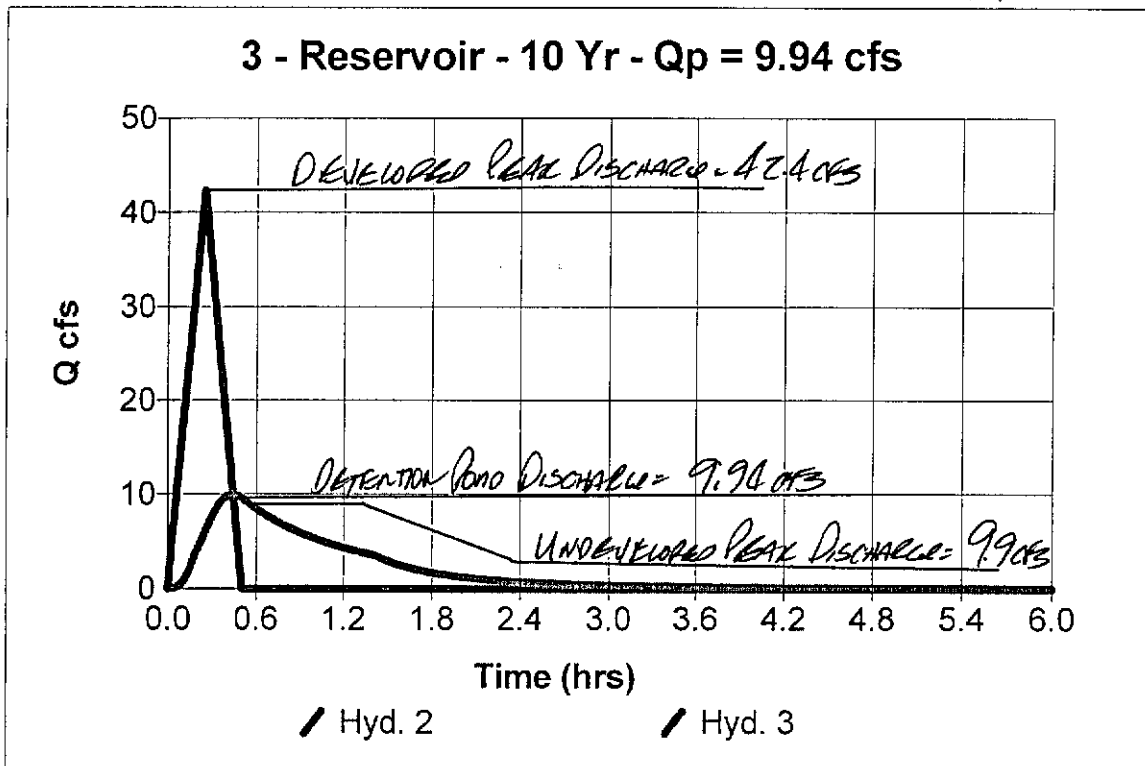
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.50 ft

Peak discharge = 9.94 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 29,360 cuft

Storage Indication method used.

Hydrograph Volume = 38,115 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

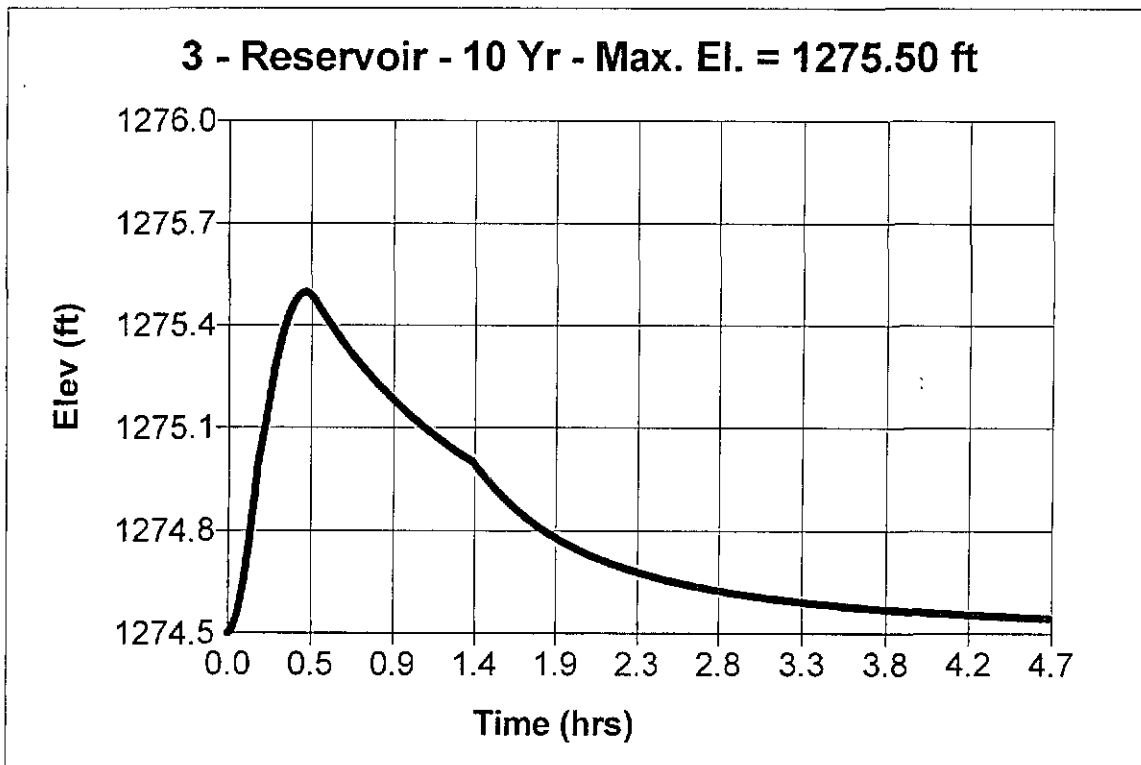
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = 10 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.50 ft

Peak discharge = 9.94 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 29,360 cuft

Storage Indication method used.

Hydrograph Volume = 38,115 cuft



Conveyance Capacity of North I-135 highway road ditch  
Worksheet for Trapezoidal Channel

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Project Description

Worksheet	Trapezoidal Channel
Flow Element	Trapezoidal Channel
Method	Manning's Formula
Solve For	Discharge

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Input Data

Mannings Coeffic	0.030
Slope	007100 ft/ft
Depth	4.00 ft
Left Side Slope	4.00 H : V
Right Side Slope	4.00 H : V
Bottom Width	4.00 ft

---

---

Results

Discharge	558.43 cfs
Flow Area	80.0 ft <sup>2</sup>
Wetted Perim	36.98 ft
Top Width	36.00 ft
Critical Depth	3.67 ft
Critical Slope	0.010687 ft/ft
Velocity	6.98 ft/s
Velocity Head	0.76 ft
Specific Energ	4.76 ft
Froude Numb	0.83
Flow Type	Subcritical

---

# Hydrograph Plot

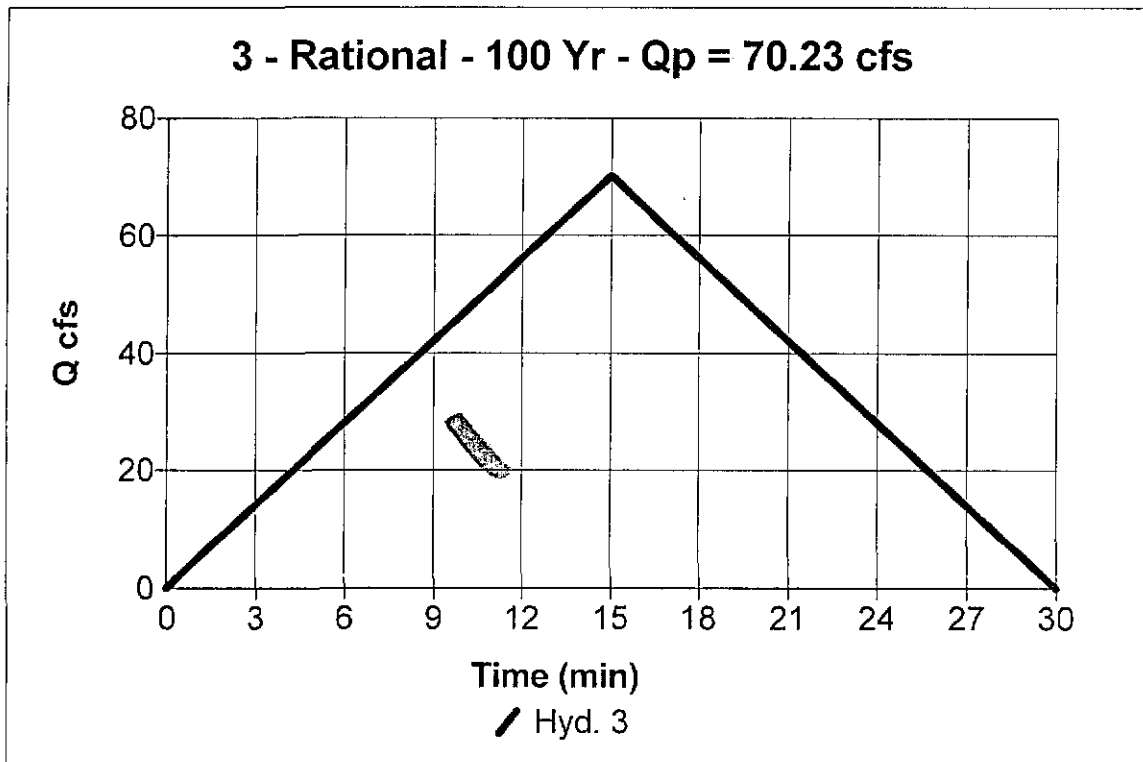
Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

Total Developed Area

Hydrograph type	= Rational	Peak discharge	= 70.23 cfs
Storm frequency	= 100 yrs	Time interval	= 1 min
Drainage area	= 12.6 ac	Runoff coeff.	= 0.56
Intensity	= 9.929 in/hr	Time of conc. (Tc)	= 15 min
IDF Curve	= SedgwickCounty.idf	Asc/Rec limb fact	= 1/1

Hydrograph Volume = 63,204 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

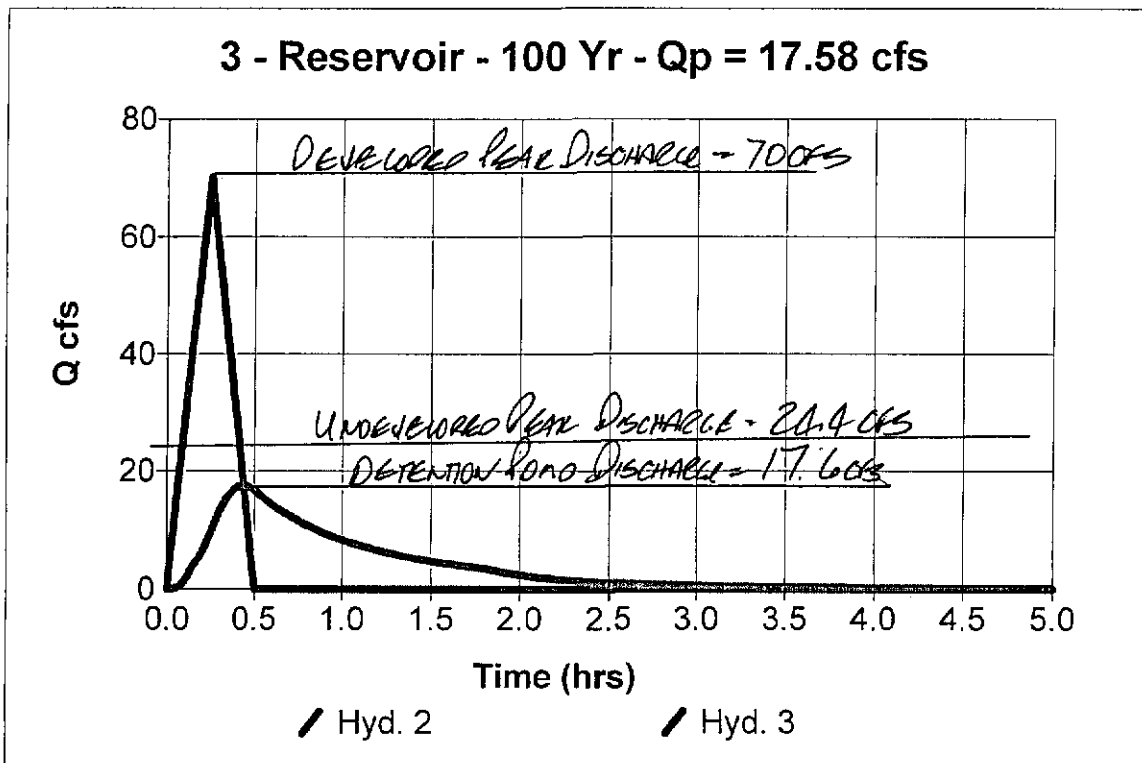
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.96 ft

Peak discharge = 17.58 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 48,196 cuft

Storage Indication method used.

Hydrograph Volume = 63,196 cuft



# Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

## Hyd. No. 3

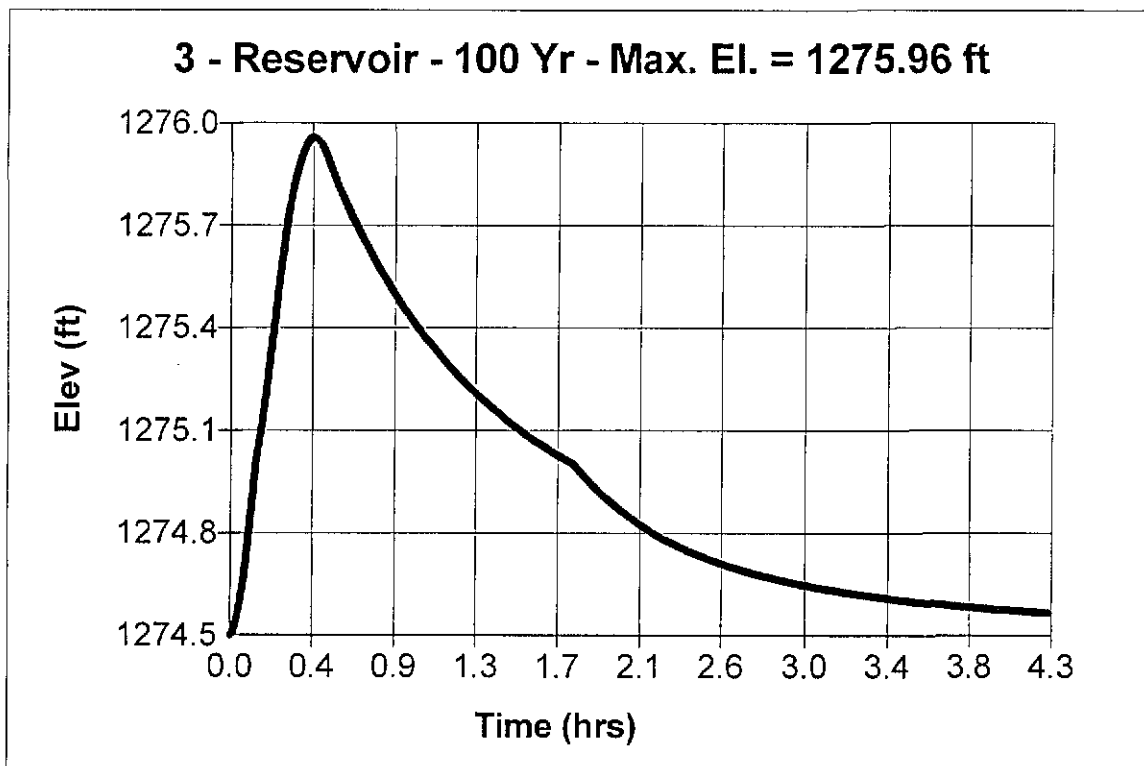
Reserve D Detent. Pond

Hydrograph type = Reservoir  
Storm frequency = 100 yrs  
Inflow hyd. No. = 2  
Max. Elevation = 1275.96 ft

Peak discharge = 17.58 cfs  
Time interval = 1 min  
Reservoir name = Detention Pond  
Max. Storage = 48,196 cuft

Storage Indication method used.

Hydrograph Volume = 63,196 cuft



# Reservoir Report

## Reservoir No. 1 - Detention Pond

Hydraflow Hydrographs by Intelisolve

### Pond Data

Pond storage is based on known contour areas. Average end area method used.

### Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	1274.50	00	0	0
0.50	1275.00	36,125	9,031	9,031
1.50	1276.00	45,695	40,910	49,941
2.50	1277.00	51,863	48,779	98,720

### Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .013	.000	.000	.000
Orif. Coeff.	= 0.60	0.00	0.00	0.00
Multi-Stage	= n/a	No	No	No

### Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 3.00	0.00	0.00	0.00
Crest El. ft	= 1274.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Cipiti	—	—	—
Multi-Stage	= No	No	No	No

Exfiltration Rate = 0.00 in/hr/sqft Tailwater Elev. = 0.00 ft

### Stage / Storage / Discharge Table

Note: All outflows have been analyzed under inlet and outlet control.

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	Civ D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Total cfs
0.00	0	1274.50	---	---	---	---	0.00	---	---	---	---	0.00
0.50	9,031	1275.00	---	---	---	---	3.53	---	---	---	---	3.53
1.50	49,941	1276.00	---	---	---	---	18.35	---	---	---	---	18.35
2.50	98,720	1277.00	---	---	---	---	39.49	---	---	---	---	39.49

SOIL LEGEND

<u>SYMBOL</u>	<u>HYDROLOGIC GROUP</u>	<u>NAME</u>
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loams, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loam, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loam
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
Va	B	Vanoss silt loam, 0 to 1 percent slopes
Yb	B	Vanoss silt loam, 1 to 3 percent slopes
Yc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent slopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

(SECTION 5.10, B. - CONTINUED)

FIGURE 5-3

RAINFALL INTENSITY TABLE for SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40.

DURATION IN MINUTES	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.67	6.23	8.00	9.34	10.67	12.23	13.79
6	4.35	5.80	7.45	8.70	9.94	11.39	12.84
7	4.09	5.46	7.02	8.19	9.36	10.72	12.09
8	3.88	5.18	6.66	7.77	8.89	10.18	11.48
9	3.71	4.95	6.36	7.43	8.49	9.72	10.96
10	3.56	4.75	6.11	7.13	8.15	9.33	10.52
11	3.43	4.58	5.89	6.87	7.85	8.99	10.14
12	3.32	4.40	5.69	6.64	7.59	8.69	9.80
13	3.21	4.29	5.51	6.43	7.35	8.42	9.50
14	3.12	4.17	5.36	6.25	7.14	8.18	9.23
15	3.04	4.06	5.21	6.08	6.95	7.97	8.98
16	2.96	3.96	5.09	5.93	6.78	7.77	8.76
17	2.90	3.86	4.97	5.79	6.62	7.59	8.55
18	2.83	3.78	4.86	5.67	6.48	7.42	8.37
19	2.77	3.70	4.76	5.55	6.34	7.27	8.19
20	2.72	3.63	4.66	5.44	6.22	7.12	8.03
21	2.67	3.56	4.57	5.34	6.10	6.99	7.88
22	2.62	3.49	4.49	5.24	5.99	6.86	7.74
23	2.57	3.43	4.41	5.15	5.89	6.74	7.60
24	2.53	3.38	4.34	5.07	5.79	6.63	7.48
25	2.49	3.32	4.27	4.99	5.70	6.53	7.36
26	2.45	3.23	4.21	4.91	5.61	6.43	7.25
27	2.42	3.18	4.15	4.84	5.53	6.33	7.14
28	2.38	3.05	4.09	4.77	5.45	6.25	7.04
29	2.35	2.97	4.02	4.68	5.38	6.16	6.95
30	2.32	2.89	3.92	4.56	5.31	6.08	6.79
31	2.29	2.82	3.82	4.44	5.19	6.00	6.62
32	2.26	2.75	3.73	4.33	5.07	5.87	6.45
33	2.24	2.68	3.64	4.23	4.95	5.73	6.30
34	2.19	2.62	3.55	4.13	4.83	5.60	6.16
35	2.14	2.57	3.47	4.04	4.73	5.47	6.02
36	2.09	2.51	3.40	3.95	4.62	5.35	5.89
37	2.05	2.46	3.33	3.87	4.52	5.23	5.76
38	2.00	2.41	3.26	3.79	4.43	5.13	5.64
39	1.96	2.36	3.19	3.71	4.34	5.02	5.53
40	1.92	2.32	3.13	3.64	4.26	4.92	5.42
41	1.89	2.27	3.07	3.57	4.18	4.83	5.32
42	1.85	2.23	3.01	3.51	4.10	4.74	5.22
43	1.82	2.19	2.96	3.44	4.02	4.65	5.13
44	1.78	2.15	2.91	3.38	3.95	4.56	5.03
45	1.75	2.11	2.86	3.32	3.88	4.48	4.95

(SECTION 3.10, B. - CONTINUED)

FIGURE 5-3 (Continued)

DURATION IN MINUTES	RETURN PERIODS OF						
	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.72	2.08	2.81	3.27	3.82	4.41	4.86
47	1.69	2.04	2.76	3.21	3.75	4.33	4.78
48	1.67	2.01	2.72	3.16	3.69	4.26	4.70
49	1.64	1.98	2.67	3.11	3.63	4.19	4.63
50	1.61	1.95	2.63	3.06	3.58	4.13	4.56
51	1.59	1.92	2.59	3.01	3.52	4.06	4.49
52	1.56	1.89	2.55	2.97	3.47	4.00	4.42
53	1.54	1.86	2.51	2.92	3.42	3.94	4.35
54	1.52	1.84	2.48	2.88	3.37	3.88	4.29
55	1.50	1.81	2.44	2.84	3.32	3.83	4.23
56	1.47	1.79	2.41	2.80	3.27	3.77	4.17
57	1.45	1.76	2.37	2.76	3.23	3.72	4.11
58	1.43	1.74	2.34	2.73	3.19	3.67	4.06
59	1.42	1.72	2.31	2.69	3.14	3.62	4.01
60	1.40	1.69	2.28	2.65	3.10	3.57	3.95
61	1.38	1.67	2.25	2.62	3.06	3.53	3.90
62	1.36	1.65	2.22	2.59	3.02	3.48	3.85
63	1.34	1.63	2.20	2.55	2.99	3.44	3.81
64	1.33	1.61	2.17	2.52	2.95	3.40	3.76
65	1.31	1.59	2.14	2.49	2.92	3.35	3.71
66	1.30	1.57	2.12	2.46	2.88	3.31	3.67
67	1.28	1.56	2.09	2.44	2.85	3.27	3.63
68	1.26	1.54	2.07	2.41	2.81	3.24	3.59
69	1.25	1.52	2.05	2.38	2.78	3.20	3.54
70	1.24	1.50	2.02	2.35	2.75	3.16	3.51
71	1.22	1.49	2.00	2.33	2.72	3.13	3.47
72	1.21	1.47	1.98	2.30	2.69	3.09	3.43
73	1.20	1.46	1.96	2.28	2.66	3.06	3.39
74	1.18	1.44	1.94	2.25	2.63	3.03	3.36
75	1.17	1.43	1.92	2.23	2.61	3.00	3.32
76	1.16	1.41	1.90	2.21	2.58	2.96	3.29
77	1.15	1.40	1.88	2.18	2.55	2.93	3.25
78	1.13	1.38	1.86	2.16	2.53	2.90	3.22
79	1.12	1.37	1.84	2.14	2.50	2.88	3.19
80	1.11	1.36	1.82	2.12	2.48	2.85	3.16
81	1.10	1.34	1.81	2.10	2.46	2.82	3.13
82	1.09	1.33	1.79	2.08	2.43	2.79	3.10
83	1.08	1.32	1.77	2.06	2.41	2.76	3.07
84	1.07	1.31	1.75	2.04	2.39	2.74	3.04
85	1.06	1.30	1.74	2.02	2.37	2.71	3.01
86	1.05	1.28	1.72	2.00	2.34	2.69	2.99
87	1.04	1.27	1.71	1.99	2.32	2.66	2.96
88	1.03	1.26	1.69	1.97	2.30	2.64	2.93
89	1.02	1.25	1.68	1.95	2.28	2.62	2.91
90	1.01	1.24	1.66	1.93	2.26	2.59	2.88

<u>DURATION IN MINUTES</u>	<u>RETURN PERIODS OF</u>						
	<u>1-YR</u>	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
91	1.00	1.23	1.65	1.92	2.24	2.57	2.86
92	1.00	1.22	1.63	1.90	2.22	2.55	2.83
93	0.99	1.21	1.62	1.89	2.20	2.53	2.81
94	0.98	1.20	1.61	1.87	2.19	2.51	2.79
95	0.97	1.19	1.59	1.85	2.17	2.49	2.76
96	0.96	1.18	1.58	1.84	2.15	2.46	2.74
97	0.96	1.17	1.57	1.82	2.13	2.44	2.72
98	0.95	1.16	1.56	1.81	2.12	2.42	2.70
99	0.94	1.15	1.54	1.80	2.10	2.41	2.67
100	0.93	1.14	1.53	1.78	2.08	2.39	2.65
101	0.93	1.13	1.52	1.77	2.07	2.39	2.65
102	0.92	1.13	1.51	1.75	2.05	2.35	2.61
103	0.91	1.12	1.50	1.74	2.04	2.33	2.59
104	0.90	1.11	1.49	1.73	2.02	2.31	2.57
105	0.90	1.10	1.47	1.72	2.01	2.30	2.55
106	0.89	1.09	1.46	1.70	1.99	2.28	2.54
107	0.88	1.09	1.45	1.69	1.98	2.26	2.52
108	0.88	1.08	1.44	1.68	1.96	2.25	2.50
109	0.87	1.07	1.43	1.67	1.95	2.23	2.48
110	0.87	1.06	1.42	1.65	1.93	2.21	2.46
111	0.86	1.06	1.41	1.64	1.92	2.20	2.45
112	0.85	1.05	1.40	1.63	1.91	2.18	2.43
113	0.85	1.04	1.39	1.62	1.89	2.17	2.41
114	0.84	1.03	1.38	1.61	1.88	2.15	2.40
115	0.84	1.03	1.37	1.60	1.87	2.14	2.38
116	0.83	1.02	1.36	1.59	1.86	2.12	2.36
117	0.82	1.01	1.36	1.58	1.84	2.11	2.35
118	0.82	1.01	1.35	1.57	1.83	2.09	2.33
119	0.81	1.00	1.34	1.56	1.82	2.08	2.32
120	0.81	0.99	1.33	1.55	1.81	2.07	2.30

<u>DURATION IN HOURS</u>	<u>RETURN PERIODS OF</u>						
	<u>1-YR</u>	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
2	0.81	0.99	1.33	1.55	1.81	2.07	2.30
3	0.59	0.72	0.97	1.13	1.32	1.51	1.68
4	0.47	0.58	0.78	0.91	1.06	1.21	1.35
5	0.40	0.49	0.66	0.77	0.89	1.02	1.14
6	0.35	0.42	0.57	0.67	0.78	0.89	0.99
8	0.28	0.34	0.46	0.53	0.62	0.71	0.79
10	0.23	0.29	0.39	0.45	0.52	0.60	0.67
12	0.20	0.25	0.33	0.39	0.45	0.52	0.58
18	0.15	0.18	0.24	0.28	0.33	0.38	0.42
24	0.12	0.15	0.20	0.23	0.27	0.31	0.34

## ATTACHMENT D

## DRAINAGE CRITERIA

## CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD  
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
<u>Single Family (Soil Group D)</u>					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
<u>Multi-Family (Soil Group D)</u>					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
<u>Single Family (Soil Group C)</u>					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
<u>Multi-Family (Soil Group C)</u>					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
<u>Single-Family (Soil Group B)</u>					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
<u>Multi-Family (Soil Group B)</u>					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Single Family (Soil Group A)</u>					
1/3 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
<u>Multi-Family (Soil Group A)</u>					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:					
	15	0.33	0.35	0.42	0.55
5. Schools:					
	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:					
	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas: Offsite Flow Analysis (when land use not defined)					
	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:					
	96	0.87	0.87	0.88	0.89
10. Roofs:					
	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
<u>Soil Group A</u>					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
<u>Soil Group B</u>					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
<u>Soil Group C</u>					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Soil Group D</u>					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.