

PRELIMINARY DRAINAGE PLAN AND SUPPORTING CALCULATIONS

FOR

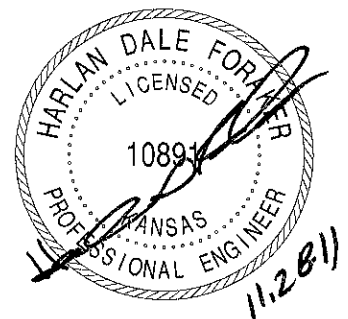
**SHELLMAN ADDITION
WICHITA, KANSAS**

**PREPARED FOR:
ARMSTRONG LAND SURVEY, P.A.
1601 E. HARRY
WICHITA, KS**

NOVEMBER 28th, 2011

PREPARED BY:

**CERTIFIED ENGINEERING DESIGN, P.A.
1935 WEST MAPLE
WICHITA, KANSAS 67213-3311
(316)262-8808 PHONE
(316)262-1669 FAX**



Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
November 28th, 2011

CERTIFIED ENGINEERING DESIGN, P.A

1935 West Maple
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LETTER OF TRANSMITTAL

DATE: November 28th, 2011

TO: Mr. Scott Lindebak, P.E.
Engineering Division
City of Wichita
7th Floor, City Hall
455 N. Main
Wichita, KS 67202

RE: Drainage Plan
Shellman Addition
Wichita, KS

FROM: Harlan D. Foraker, P.E. *HDF*

cc: Mr. Donn Armstrong, Armstrong Land Survey, P.A.

I. TAB 1 – PROJECT NARRATIVE:

Discussion of Development

The goal of this report is to analyze the existing drainage patterns and design the proposed drainage system to serve the Shellman Addition in Wichita, KS. This site is located on the south side of 43rd St. South about 500 ft east of the intersection of Ida St. and 43rd St. South. This site is undeveloped and consists of native grass. The SCS soil type present on the site is the Canadian-Waldeck Fine Sandy Loam and is a SCS type B soil. The proposed improvements include adding a residential single family structure to each of the two proposed lots. The total area of both of the proposed lots is 0.71 acres. An aerial photograph of the proposed plat site is located in the Appendix.

Offsite Conditions

It appears that no offsite drainage enters the site from surrounding properties based on looking at the LIDAR data for the City of Wichita. A copy of the USGS map is located in the Appendix.

Description of Best Management Practices

The proposed plat site is only being platted. Therefore there are no best management practices incorporated into the site design at this time.

The proposed runoff calculations cause an increase in peak discharge for all storm series when compared with existing runoff calculations. However, since the proposed site area is less than 1 acre, no detention is required. Table 1 shows existing and developed runoff calculations.

Existing & Developed Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Existing Basin A (2 yr.)	0.16	26	2.90	0.71	0.33
Existing Basin A (5 yr.)	0.18	26	3.50	0.71	0.45
Existing Basin A (10 yr.)	0.24	26	4.05	0.71	0.69
Existing Basin A (25 yr.)	0.26	26	4.72	0.71	0.87
Existing Basin A (100 yr.)	0.37	26	5.79	0.71	1.52
Developed Basin A (2 yr.)	0.39	26	2.90	0.71	0.80
Developed Basin A (5 yr.)	0.41	26	3.50	0.71	1.02
Developed Basin A (10 yr.)	0.47	26	4.05	0.71	1.35
Developed Basin A (25 yr.)	0.49	26	4.72	0.71	1.64
Developed Basin A (100 yr.)	0.57	26	5.79	0.71	2.34

TABLE 1 – EXISTING AND DEVELOPED RUNOFF CALCULATIONS

II. TAB 2 – EXISTING CONDITIONS RUNOFF CALCULATIONS

Runoff Method

The rational method was used to compute the peak discharges for existing and proposed conditions. Rational 'C' factors were assigned to the existing site and proposed improvements from the City of Wichita Storm Water Manual. Rainfall intensity tables from the same manual were utilized to determine the rainfall intensity for the 2, 5, 10, 25, and 100 year design storms. The Soil Conservation Service TR-55 manual was used to compute the time of concentration for the drainage areas. A design assumption was made as follows: that the minimum time of concentration is 15 minutes. Time of concentration calculations can be seen in the Appendix for each sub-basin.

Soil Types were determined from the Natural Resource Conservation Soil Survey website. The SCS soil type present is the Canadian-Waldeck Fine Sandy Loam, which is a SCS type B soil.

Existing Conditions

The proposed plat site has been outlined as one drainage basin labeled "A." Drainage basin "A" sheet flows to the north across the site where it enters the existing ditch along the south side of 43rd St. South. Once the water reaches the ditch, it pools at the center of the property in the ditch. The water then infiltrates naturally into the ground. Drainage basin "A" is 0.71 acres with no impervious area, and has an average land slope near 1%. A summary of the existing drainage calculations can be seen in Table 2. The existing drainage basin can be seen on the 1" = 20' Existing and Developed Drainage map located in the Appendix.

Existing Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Existing Basin A (2 yr.)	0.16	26	2.90	0.71	0.33
Existing Basin A (5 yr.)	0.18	26	3.50	0.71	0.45
Existing Basin A (10 yr.)	0.24	26	4.05	0.71	0.69
Existing Basin A (25 yr.)	0.26	26	4.72	0.71	0.87
Existing Basin A (100 yr.)	0.37	26	5.79	0.71	1.52

Table 2 – Existing Runoff Calculations

The 100 yr peak discharge for the existing basin “A” is 1.52 cfs. Since the water stays and pools on sight, there are no downstream drainage structures affected by this discharge.

Ground Water Elevations

According to the Kansas Geological Survey’s Kansas Water Well Database, the static water surface elevation of the ground water in this area is around 10-15 ft.

III. TAB 3 – POST-DEVELOPMENT HYDROLOGIC ANALYSIS

Developed Conditions

The proposed plat site will contain one residential structure on each lot. For developed conditions, this site has 1 drainage basin. Drainage basin “A” will continue to drain the same as existing conditions. The only change to the site will be the addition of impervious area due to the residential structure. Therefore, the rational “C” factors for each design storm will be raised to model the addition of impervious area. A summary of the developed drainage calculations can be seen in Table 3. The developed drainage basin can be seen on the 1”=20’ Existing and Developed Drainage Map located in the Appendix.

Developed Peak Runoff					
Description	C	Tc	I (in./hr)	Area (acres)	Q (cfs)
Developed Basin A (2 yr.)	0.39	26	2.90	0.71	0.80
Developed Basin A (5 yr.)	0.41	26	3.50	0.71	1.02
Developed Basin A (10 yr.)	0.47	26	4.05	0.71	1.35
Developed Basin A (25 yr.)	0.49	26	4.72	0.71	1.64
Developed Basin A (100 yr.)	0.57	26	5.79	0.71	2.34

Table 3 – Developed Runoff Calculations

The 100 yr peak discharge for the developed basin “A” is 2.34 cfs. This gives an increase in the peak discharge of about 0.82 cfs for the 100 yr design storm. Since the development is less than 1 acre, no detention is required. The existing ditch at the front of the property is able to safely handle the increase in runoff. The improvements on the lot shall be graded to positively drain to the existing ditch at the front of the property. To keep the water from ponding on site, a proposed 15” RCP is recommended to drain the water into the ditch on the north side of 43rd Street South.

Mr. Scott Lindebak, P.E., (Con't)

Shellman Addition

November 28th, 2011

The 15" RCP at 0.40% slope is able to handle 4.43 cfs, which is more than enough for the 100 yr design storm runoff of 2.34 cfs. This ditch shall be re-graded to accommodate the proposed 15" RCP and provide positive drainage to the east. The ditch on the north side of 43rd Street South currently drains to the east, and should safely accommodate the increase in runoff.

Stormwater Quality

The proposed land disturbance will be less than 1 acre, therefore no stormwater quality will be required for this site.

IV. TAB 4 – FLOODPLAIN SUBMITTAL

FEMA Floodplain Boundary

There is no FEMA floodplain located on this property. A copy of the FEMA floodplain map is attached for review in the Appendix.

V. TAB 5 – FEDERAL, STATE, AND LOCAL PERMITS

A. US Army Corps of Engineers

Not Applicable

B. Kansas Department of Agriculture

Not Applicable

C. Federal Emergency Management Agency (FEMA)

Not Applicable

D. Kansas Department of Transportation

Not Applicable

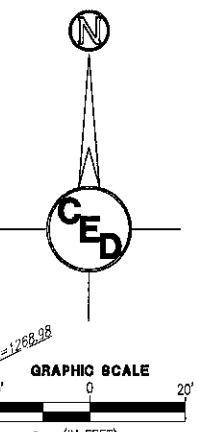
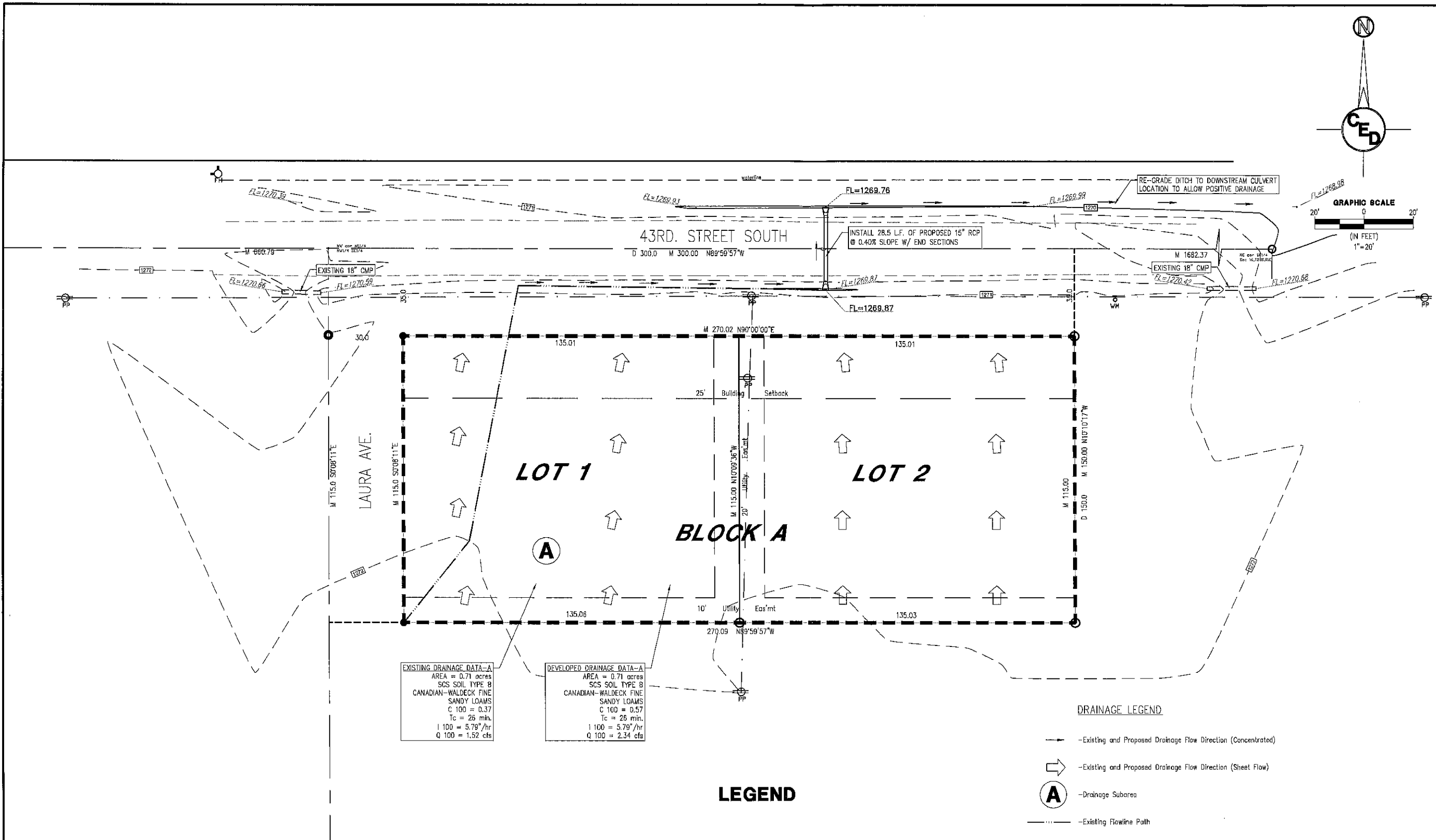
E. Sedgwick County Right-of-way Permit

Not Applicable

Mr. Scott Lindebak, P.E., (Con't)
Shellman Addition
November 28th, 2011

APPENDIX

REV.	DESCRIPTION	DATE



EXISTING DRAINAGE DATA-A
 AREA = 0.71 acres
 SCS SOIL TYPE B
 CANADIAN-WALDECK FINE SANDY LOAMS
 C 100 = 0.37
 Tc = 26 min.
 I 100 = 5.79"/hr
 Q 100 = 1.52 cfs

DEVELOPED DRAINAGE DATA-A
 AREA = 0.71 acres
 SCS SOIL TYPE B
 CANADIAN-WALDECK FINE SANDY LOAMS
 C 100 = 0.57
 Tc = 26 min.
 I 100 = 5.79"/hr
 Q 100 = 2.34 cfs

LEGEND

- - "Armstrong" capped bar set
- ⊙ - "ACLS" capped bar found
- ⦿ - 3/4" iron pipe
- - 1/2" iron pipe found
- M - measured distance
- D - deed distance
- TV - cable TV riser
- TR - telephone riser
- ⊕ - fire hydrant
- ⊙ - power pole
- ⊙ - manhole
- WM - water meter

DRAINAGE LEGEND

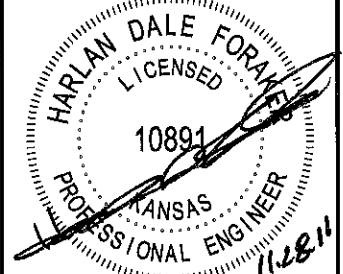
- - Existing and Proposed Drainage Flow Direction (Concentrated)
- ⇨ - Existing and Proposed Drainage Flow Direction (Sheet Flow)
- Ⓐ - Drainage Subarea
- - Existing Flowline Path

SHELLMAN ADDITION
 WICHITA, KS
 SEDGWICK COUNTY, KS

CERTIFIED ENGINEERING DESIGN, P.A.
 CIVIL ENGINEERING SERVICES



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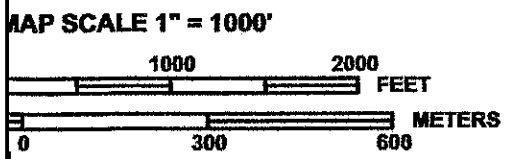
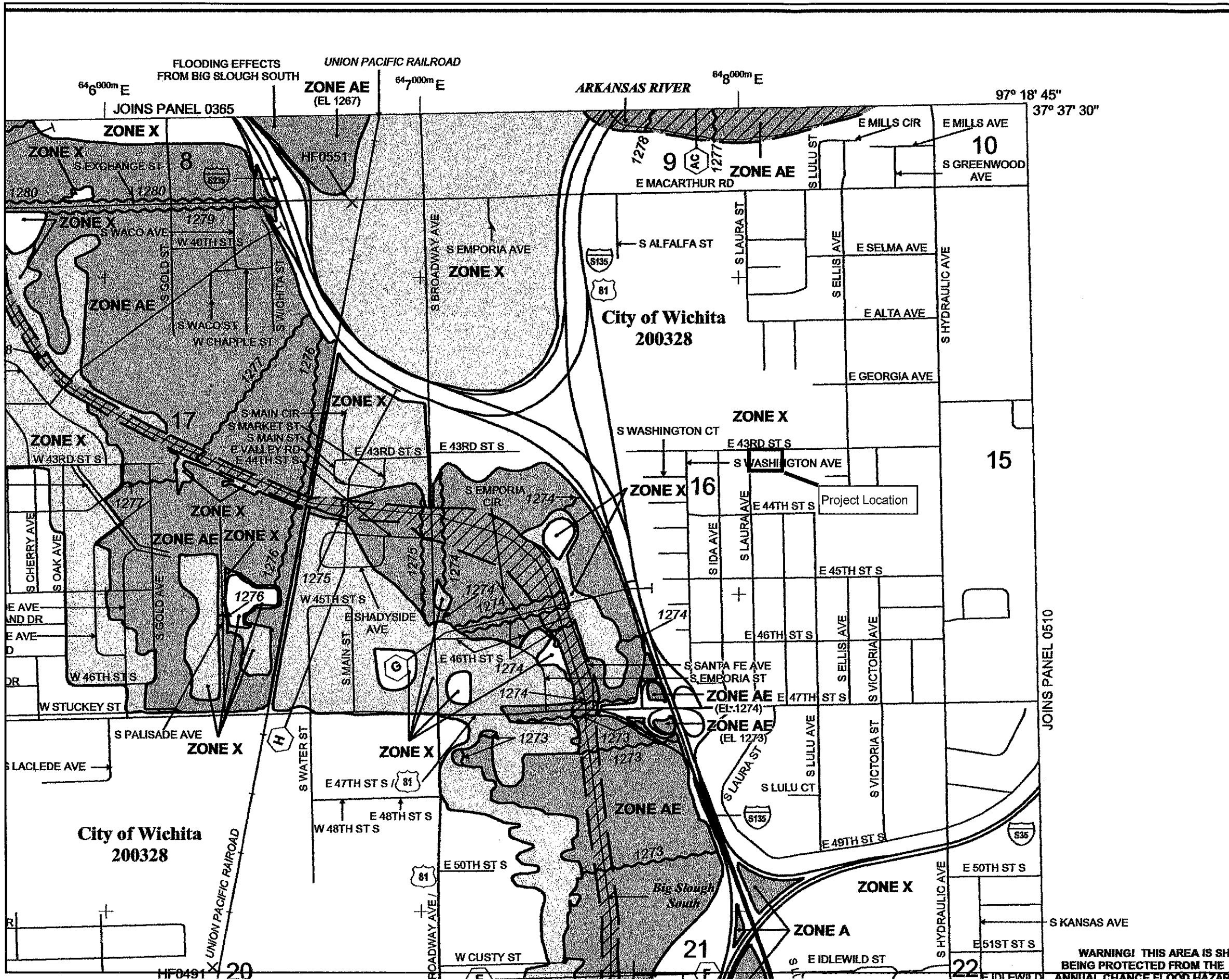
PROJECT NO.: 20111999
 ISSUE DATE: 11/11/11
 CONTACT: L. MILLS / H. FORAKER
 CHECKED BY:

EXISTING AND DEVELOPED DRAINAGE MAP

Aerial Photo

Shellman Addition
500 ft East of Intersection of Ida St. and 43rd St. S.
Wichita, Kansas, 67216
CED Job # 20111999





PANEL 0505E

FIRM

FLOOD INSURANCE RATE MAP

SEDGWICK COUNTY, KANSAS AND INCORPORATED AREAS

PANEL 505 OF 700

SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WICHITA, CITY OF	200324	0505	E
EDGWICK COUNTY	200321	0505	E
WICHITA, CITY OF	200328	0505	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
20173C0505E

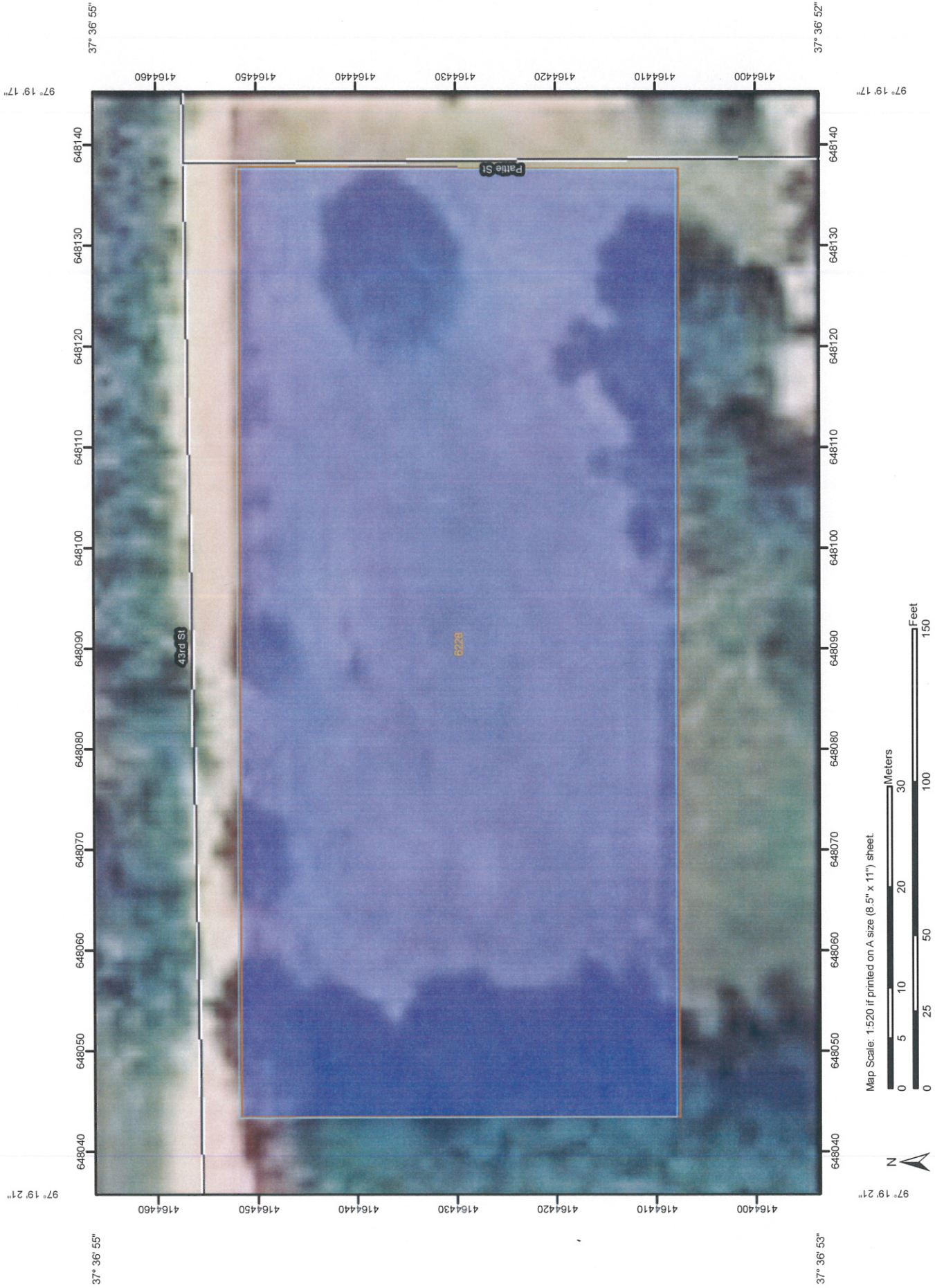
EFFECTIVE DATE
FEBRUARY 2, 2007

Federal Emergency Management Agency


















This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

WARNING! THIS AREA IS SH
BEING PROTECTED FROM THE

Hydrologic Soil Group—Sedgwick County, Kansas



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
- Political Features
 -  Cities
- Water Features
 -  Streams and Canals
- Transportation
 -  Rails
 -  Interstate Highways
 -  US Routes
 -  Major Roads
 -  Local Roads

MAP INFORMATION

Map Scale: 1:520 if printed on A size (8.5" x 11") sheet.
 The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>
 Coordinate System: UTM Zone 14N NAD83

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 7, Nov 30, 2010

Date(s) aerial images were photographed: 6/20/2006

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 (KS173)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6228	Canadian-Waldeck fine sandy loams, rarely flooded	B	1.0	100.0%
Totals for Area of Interest			1.0	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

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Time of Concentration (T_c) Worksheet

Project Shellman Addition Drainage Plan By LJM Date 11/11/2011

Location Wichita, KS Checked HDF Date 11/11/2011

Circle one: Pre & Post Developed _____

Circle one: T_c a _____

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet Flow (Applicable to T_c only)

	Segment ID	Pre & Post-A			
1. Surface description (table A-1)		Grass			
2. Manning's roughness coeff., n (table A-1).....		0.240			
3. Flow length, L (total L \leq 300 feet)..... ft		146			
4. Two-yr 24-hr rainfall, P_2 (3.5"typ. for Sedgwick Co)..... in		3.5			
5. Land Slope, s..... ft/ft		0.01			
6. $T_t = \frac{0.007 (nL)^{0.8}}{P_2^{0.5} s^{0.4}}$ Compute $T_t \dots (T_t \times 60) =$ min.		24			

Shallow concentrated flow

	Segment ID	Pre & Post-A			
7. Surface description (paved or unpaved).....		Unpaved			
8. Flow length, L (Until reach blue line stream)..... ft		121			
9. Watercourse slope, s..... ft/ft		0.005			
10. Average velocity, V ft/s		1.06			
11. $T_t = \frac{L}{3600 V}$ Compute $T_t \dots (T_t \times 60) =$ min.		1.9			
Total		26			

Channel Flow

	Segment ID	Pre & Post-A			
12. Cross sectional flow area, a..... ft ²		0			
13. Wetted perimeter, P_w ft		0			
14. Hydraulic radius, $r = \frac{a}{P_w}$ Compute r..... ft		0.00			
15. Channel slope, s..... ft/ft		0			
16. Manning's roughness coeff., n.....		0			
17. $V = \frac{1.49 r^{2/3} s^{1/2}}{n}$ Compute V (Around 1.2 ft/s) ft/s		0.00			
18. Flow Length, L (Where Blue Line Streams show on USGS or c) ft		0			
19. $T_t = \frac{L}{3600 V}$ Compute $T_t \dots (T_t \times 60) =$ min.		0.0			
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19)... Total		26			

Table A-1 Roughness Coefficients (Manning's n) for Sheet Flow

Surface Description ¹	Manning's n
Smooth surfaces (concrete, asphalt, gravel or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover < 20%	0.06
Residue cover > 20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses ^A	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods ^B	
Light underbrush	0.40
Dense underbrush	0.80

¹ Source: SCS, TR-55, Second Edition, June 1986.
^A Includes species such as bluestem grass, buffalo grass, grama grass, and native grass mixtures.
^B When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

Table A-2 Manning's n Values

Street and Pavement Gutters ²		Manning's n
Asphalt pavement		0.016
Concrete gutter		0.016
Concrete pavement		0.018
Culverts and Storm Sewers³		
	Roughness or Corrugation	Manning's n
Concrete Pipe	Smooth	0.013
Concrete Boxes	Smooth	0.013
Corrugated Polyethylene	Corrugated	Per manufacturer
Smooth Polyethylene	Smooth	0.011
Polyvinyl chloride (PVC)	Smooth	0.011

1988 Drainage Criteria Manual

City of Wichita, Kansas

Rainfall Intensity Table for Sedgwick County, KS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

Table 1 Rainfall Intensity Table (Duration 15 min – 120 min)

DURATION, in hours	DURATION, in minutes	RETURN PERIOD						
		1 YR	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
0.0833	5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
0.1000	6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
0.1167	7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
0.1333	8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
0.1500	9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
0.1667	10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
0.1833	11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
0.2000	12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
0.2167	13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
0.2333	14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
0.2500	15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
0.2667	16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
0.2833	17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
0.3000	18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
0.3167	19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
0.3333	20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
0.3500	21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
0.3667	22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
0.3833	23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
0.4000	24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
0.4167	25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
0.4333	26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
0.4500	27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
0.4667	28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
0.4833	29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
0.5000	30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
0.5167	31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
0.5333	32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
0.5500	33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
0.5667	34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
0.5833	35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
0.6000	36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
0.6167	37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
0.6333	38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
0.6500	39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
0.6667	40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
0.6833	41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
0.7000	42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
0.7167	43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
0.7333	44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
0.7500	45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

Table C-1 Rational C Values

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
<u>Business</u>					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
<u>Residential 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>Residential 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>Residential 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>Residential 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>Residential 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>Residential 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
<u>Single Family (Soil Group A)</u>					
1/8 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

15" RCP Report

Label	Solve For	Friction Method	Roughness Coefficient
Circular Pipe - 1	Full Flow Capacity	Manning Formula	0.012
Channel Slope (ft/ft)	Normal Depth (ft)	Diameter (ft)	Discharge (ft ³ /s)
0.00400	1.25	1.25	4.43
Flow Area (ft ²)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	Top Width (ft)
1.23	3.93	0.31	0.00
Critical Depth (ft)	Percent Full (%)	Critical Slope (ft/ft)	Velocity (ft/s)
0.85	100.0	0.00612	3.61
Velocity Head (ft)	Specific Energy (ft)	Froude Number	Maximum Discharge (ft ³ /s)
0.20	1.45	0.00	4.76
Discharge Full (ft ³ /s)	Slope Full (ft/ft)	Flow Type	Notes
4.43	0.00400	SubCritical	

Messages

15" RCP Report

Messages