POE & ASSOCIATES
OF KANSAS, INC.
1720 East Morris Wichita, Kansas 67211
CONSULTING ENGINEERS
(316) 262-1497

October 20, 1981

Mr. Phil Dietrich
Sedgwick County Public Works
Flood Control
1250 S. Seneca
Wichita, Kansas

Re: Drainage Plan
West Lakewood Estates

Dear Phil:

Enclosed are one copy of the revised drainage plan and the corresponding drainage calculations for the above captioned addition.

Please review this information as soon as possible and contact me if I can answer any questions relative to obtaining approval of the drainage plan.

Sincerely,

POE & ASSOCIATES OF KANSAS, INC.

Kenny E. Hill, P.E.
Project Consultant

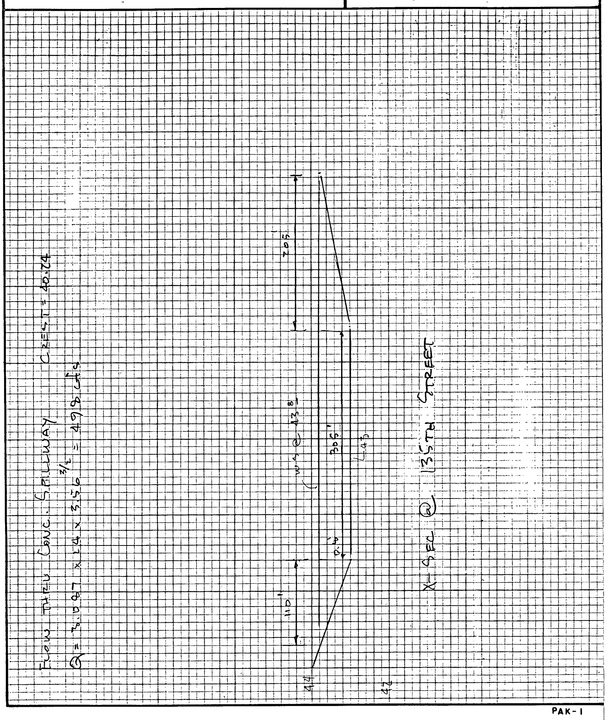
KEH:csr

Encls.

cc: Mr. Chris Breitenstein
Drainage Engineer
City of Wichita

POE & ASSOCIATES OF KANSAS, INC.
CONSULTING ENGINEERS

PROJECT W. LAKEWOOD EST NO. _____
SUBJECT @ ACCESS 135TH
CALCULATED BY R. HILL DATE 10-20-91
CHECKED BY _____ DATE _____
SCALE: 1" = 10' SHEET NO. 1 OF 2



PAK-1

CRITICAL DEPTH Q ACROSS 135TH ST

$$Z = \frac{e}{D} = \frac{110}{0.8} = 137.5$$

$$Y = \frac{D_c}{b} = \frac{0.8}{305} = .002623$$

$$Q = \frac{(1/Y + Z)^{3/2}}{(1/Y + 2Z)^{1/2}} \; g^{1/2} \; D_c^{5/2}$$

$$Q = \frac{(381.25 + 137.5)^{3/2}}{(381.25 + 275)^{1/2}} \; 32.2^{1/2} \; 0.8^{5/2}$$

$$Q = \frac{11815.1}{25.67} \times 5.67 \times .7155$$

$Q = 1871$ cfs

FLOW THRU CONC SPILLWAY = 498 cfs

TOTAL Q @ W.S. = 1343.8 = 2369 cfs REQ 1620 cfs

CONCLUSION:

W.S. WILL REMAIN BELOW 1343.8 IF TOTAL Q FLOODS 135TH

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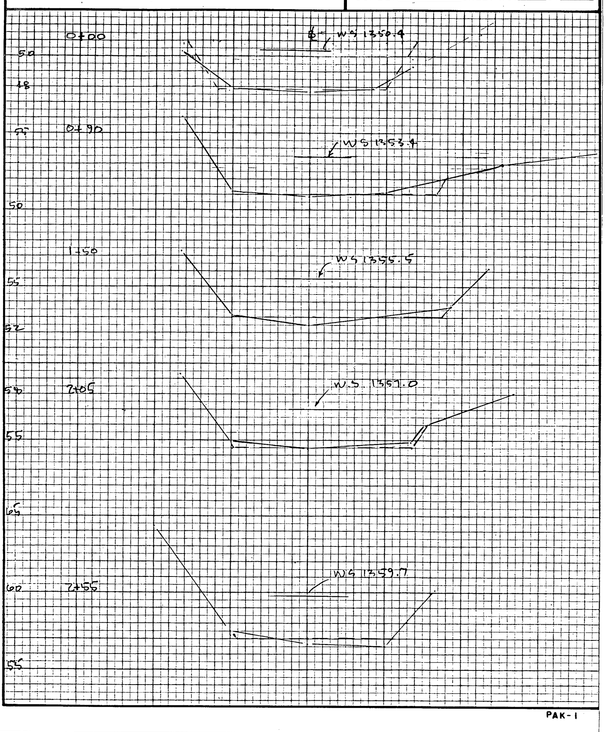
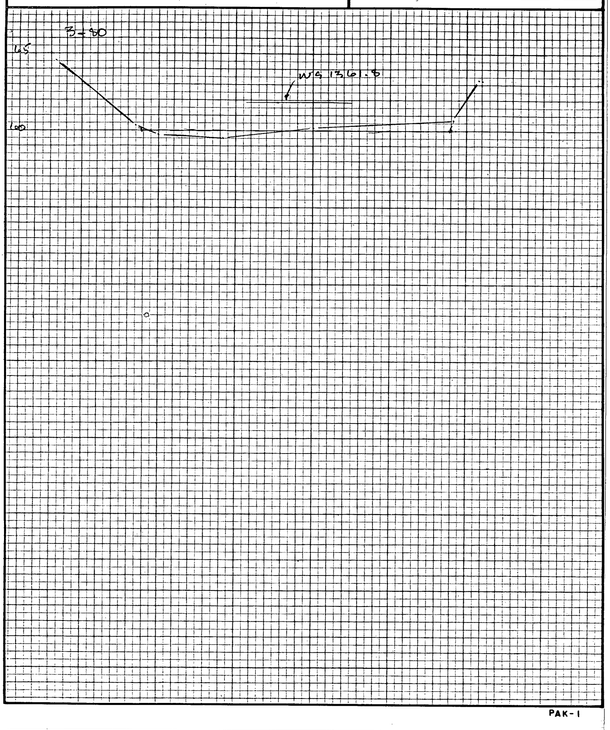
PROJECT W. LAKEWOOD EXT. NO. _____
SUBJECT W.S. THRU W. SPILLWAY
CALCULATED BY K. HILL DATE 10-13-81
CHECKED BY _____ DATE _____
SCALE: 1"=30' SHEET NO. 1 OF 5



PAK-1

POE & ASSOCIATES OF KANSAS, INC.
CONSULTING ENGINEERS

PROJECT W. LAWRENCE EST. NO. _____
SUBJECT W.S. THRU W SPILLWAY
CALCULATED BY K. HILL DATE _____
CHECKED BY _____ DATE _____
SCALE: 1" = 30' SHEET NO. 2 OF 5



PAK-1

10-16-81

WEST LAKEWOOD ESTATES

0+00	50	30	℄	25	40		
	51.3	47.8	47.7	47.8	49.3		
0+90	50	30	℄	30	75		
	56.0	51.2	50.8	51.1	53		
1+50	50	30	℄	55	70		
	57.3	53.1	52.5	53.7	54.2		
2+05	50	30	℄	40	45	80	
	59.3	54.9	54.4	54.8	55.9	58.2	
2+55	60	30	℄	30	50		
	64.4	57.5	56.7	56.5	60.1		
3+80	100	70	40	35	℄	55	65
	64.5	60.3	59.7	59.5	60.2	60.7	62.2

COMPUTE CRITICAL DEPTH FOR EACH X-SEC

0+00 b = 65 4:1 SIDES

$K_c = \frac{Q}{b^{2.5}} = \frac{1520}{65^{2.5}} = .0446$

DEPTH = .04 x 65 = 2.6' W.S. = 1350.4

AVE SLOPE OF SPILLWAY 3.6%

Q w/ W.S. @ 1350.4

$Q = 193.1 \frac{1.486}{.035} 1.06 \cdot .036^{1/2} = 2509$ cfs

USE CRITICAL FLOW

0+90 b = 80

$K_c = \frac{1520}{80^{2.5}} = .0266$

DEPTH = .03 x 80 = 2.4' W.S. = 1353.4

1+50 b = 82

$K_c = \frac{1520}{82^{2.5}} = .0250$

DEPTH = .03 x 82 = 2.5' W.S. = 1355.5

2+05 b = 70

$K_c = \frac{1520}{70^{2.5}} = .0371$

DEPTH = .035 x 70 = 2.5 W.S. = 1357.0

2+55 b = 60

$K_c = \frac{1520}{60^{2.5}} = .0545$

DEPTH = .045 x 60 = 2.7' W.S. = 1359.7

3+80 b = 120 $K_c = \frac{1520}{120^{2.5}} = .0096$

DEPTH = .015 x 120 = 1.8' W.S. = 1361.8

BACKWATER COMPUTATION WORK SHEET

Project: West Lakewood Estates — W. Spillway

Page 5 of 5

Computed by: K. Hill Date 10-20-81

Checked by: ______ Date ______

Q = 1520 cfs n = .035 c = 42.46

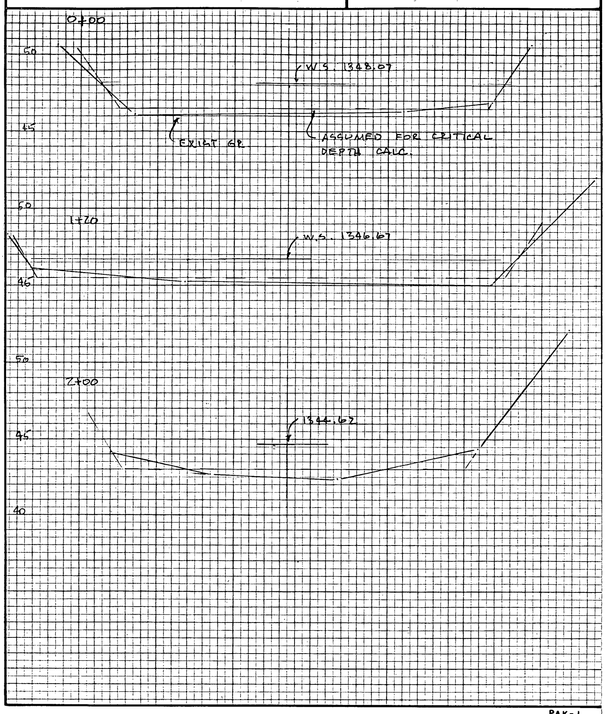
Mile or Sec. No.	Reach Length	Est. W.S. Elev.	Area	$r^{2/3}$	$S^{1/2} = 0.01$ 1	Q 1	S	Mean S	hf	V	Q	V^2Q	h_v	h_v Diff.	H	Comp. Elev.	
0+00			193.1	1.66	0.7	136.1	.0125	.0062	1.87	7.87	1520		.96	-.48	1.39	1350.4	Dc ✓
0+90	90	1353.5	233.6	1.43	0.61	141.8	.01148	.01199	1.08	6.51	1520		.66	.30	1.38	1351.78	
0+90			219.6							6.92			.74			1353.4	Dc ✓
1+50	60	1355.0	184.1	1.47	.62	114.9	.01749	.00874	.52	8.26	1520		1.06	-.16		1353.76	
1+50			236.6							6.42			.64			1355.5	Dc ✓
2+05	55	1357	193.5	1.53	0.65	125.7	.01462	.00731	.40	7.86	1520		.96	-.16	.24	1355.74	
2+05			193.5							7.86			.96			1357.0	Dc ✓
2+55	50	1359.0	151.8	1.52	0.65	97.97	.02407	.01203	.60	10.0	1520		1.56	-.30	0.30	1357.3	
2+55			209.9							7.24			0.81			1359.7	Dc ✓
3+80	125	1362	245.9	1.76	0.75	193.76	.00684	.00342	.43	6.18	1520		.59	.22	.65	1360.35	
3+80																1361.80	Dc ✓

$V = C r^{2/3} S^{1/2}$ $C = \frac{1.486}{n}$ $S = (0.01 \frac{Q}{Q_1})^2$ $V = V_1 \frac{Q}{Q_1}$ $h_v = \frac{V^2 Q}{64.4 Q}$ $H = h_v \text{ Diff.} + h_f$

SHT Form 49-C
Rev 18 Dec 81

POE & ASSOCIATES OF KANSAS, INC.
CONSULTING ENGINEERS

PROJECT W. LAKEWOOD EST. NO. _____
SUBJECT W.S. THRU E. SPILLWAY
CALCULATED BY K. HILL DATE 10-20-81
CHECKED BY _____ DATE _____
SCALE: 1"=30' SHEET NO. 1 OF 3



PAK-1

10-20-81

EAST SPILLWAY

0400 $\frac{90}{50^{\frac{1}{2}}}$ $\frac{60}{46^{\frac{1}{2}}}$ ℄ $\frac{45}{46^{\frac{3}{4}}}$ $\frac{80}{46^{\frac{1}{2}}}$ $\frac{95}{50^{\frac{1}{2}}}$

1420 $\frac{110}{48^{\frac{3}{4}}}$ $\frac{100}{46^{\frac{1}{2}}}$ $\frac{40}{45^{\frac{1}{2}}}$ ℄ $\frac{80}{45^{0}}$ $\frac{120}{52^{\frac{1}{2}}}$

2400 $\frac{70}{44^{\frac{1}{2}}}$ $\frac{30}{42^{\frac{3}{4}}}$ ℄ $\frac{20}{42^{\frac{1}{4}}}$ $\frac{75}{44^{\frac{1}{4}}}$ $\frac{110}{52^{\frac{1}{2}}}$

0400 $b = 144$ $K_c = \frac{1660}{144^{2.5}} = .00675$

DEPTH $= 144 \times .0107 = 1.57'$ W.S. = 1348.07

1420 $b = 133$ $K_c = \frac{1660}{133^{2.5}} = .00771$

DEPTH $133 \times .0064 = 1.17'$ W.S. = 1346.67

2400 $b = 138$ $K_c = \frac{1660}{134^{2.5}} = .00804$

DEPTH $134 \times .01209 = 1.62'$ W.S. = 1344.62

16.3' FALL IN 230' = 7.74% AVE GRADE

W.S. 1344.6 $q = 207.1$ $R = \frac{207.1}{145} = 1.43$

$Q = 207.1 \frac{1.486}{.035} 1.43^{2/3} .0274^{1/2} = 1247$ cfs

CRITICAL DEPTH CONTROLS @ 1344.62

BACKWATER COMPUTATION WORK SHEET

Project: WEST LAKEWOOD ESTATES — EAST SPILLWAY

Page 3 OF 3

Computed by: K. HILL Date 10-20-81

Checked by: _____ Date _____

Q = 1650 cfs n = .035 c = 43.46

Mile or Sec. No.	Reach Length	Est. W.S. Elev.	Area	2/3 r	S1/2 = 0.01 I	S1/2 = 0.01 Q I	S	Mean S	hf	V	Q	V^2Q	h_v	h_v Diff.	H	Comp. Elev.	
2+00			207.1							8.11			1.02			1344.62	✓
1+70	90	1346.7	283	1.30	.55	1556.21	.01157	.00558	.46	5.92	1675		.54	.48	.94	1345.56	
1+70													.54			1346.67	DC ✓
0+00	170	1348.1	317	1.57	.67	2079.93	.00675	.009054	1.08	5.21	1688		.45	.09	1.17	1347.84	
																1349.67	DC ✓

$V = Cr^{2/3}s^{1/2}$ $C = \frac{1.486}{n}$ $S = (0.01\frac{Q}{Q_1})^2$ $V = V_1\frac{Q}{Q_1}$ $h_v = \frac{V^2Q}{64.4Q}$ $H = h_v$ Diff. $+ h_f$

SeT Form 49-C
Rev 16 Dec 81

10-12-81

WEST LAKEWOOD ESTATES

DRAINAGE AREA TO NW COR. OF ADDN.

(1900 x 750) ÷ 2 = 712,500

[(350 + 600) ÷ 2] x 750 = 370,500

(550 x 600) ÷ 2 = 165,000

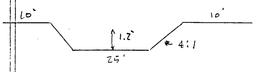
1,248,000 SQ FT = 28.65 Ac.

$L = 2300' = 0.436$ mi $\quad F = 35'$

$T_c = \left(\frac{11.9 \times .436^3}{35}\right)^{0.385} = .25$ HRS = 15 MIN $\quad i_{100} = 8.98$

$Q_{100} = 28.65 \times 0.5 \times 8.98 = 128.6$ cfs

CHANNEL SECTION



$a = 35.75 \quad R = \frac{35.75}{34.6} = 1.03 \quad S = 1/150' = .0067$

$Q = 35.75 \quad \frac{1.486}{.035} \; 1.03^{2/3} \; .0067^{1/2} = 126.7$ cfs

MAX CHANNEL DEPTH 3' - WIDTH AT TOP 69'
USE 70' EASEMENT

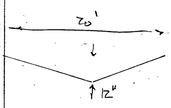
DRAINAGE AREA 600' S. OF NW COR OF ADDN

300 x 900 = 450000

(200+500) ÷ 2 = 105000

555000 SQ FT = 12.74 AC.

$Q_{100} = 12.74 \times 0.5 \times 8.98 = 57.2$ cfs



$a = 10 \quad R = \frac{10}{20} = .5 \quad S = 1.33\%$

$Q = 10 \quad \frac{1.486}{.016} \cdot .5^{2/3} \cdot .0133^{.5} = 67.5 \text{ cfs} \quad O.K.$

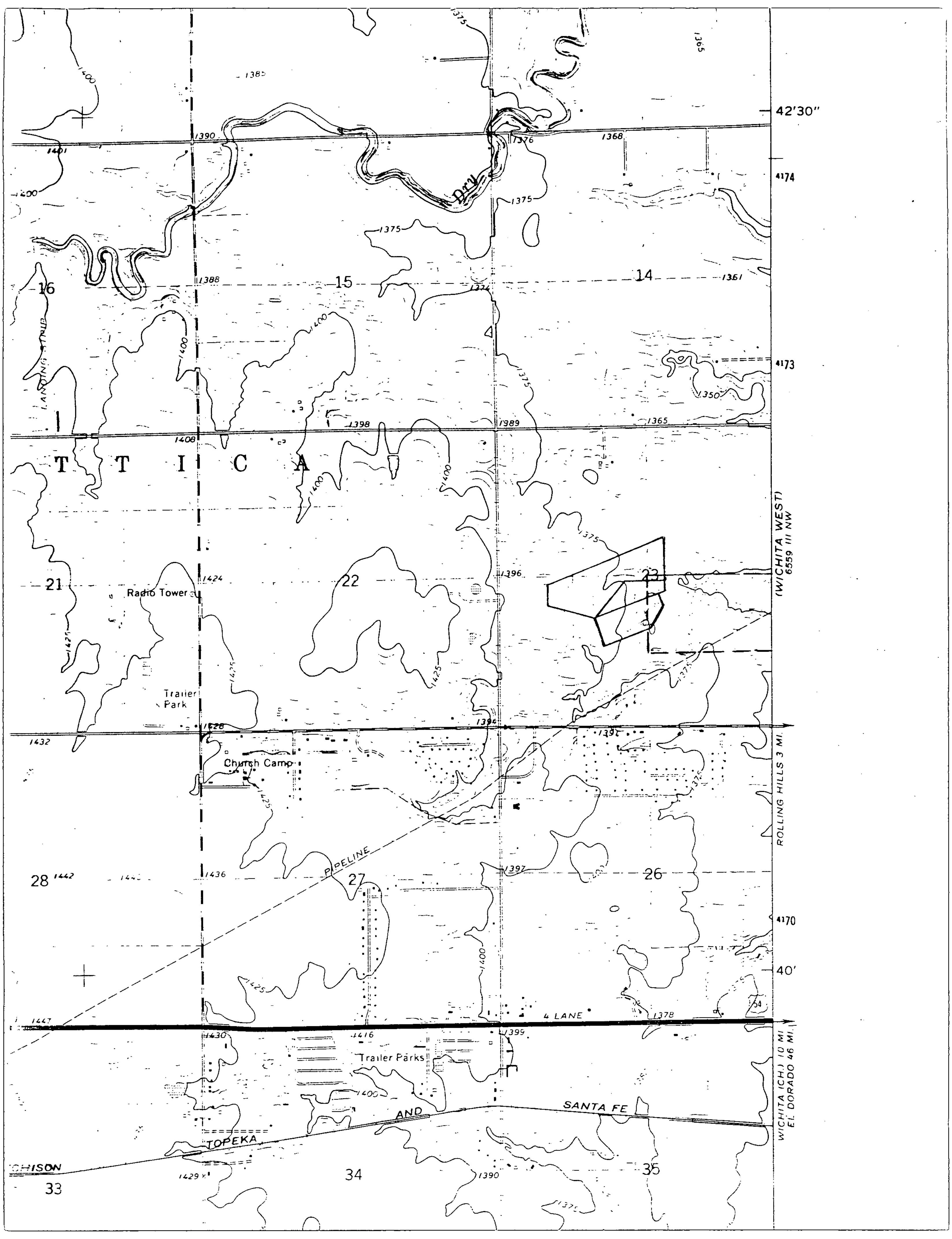
DA JUST SOUTH OF NW COR OF ADDN.

$1400 \times 450 \div 2 = 315000 \text{ SQ FT} = 7.23 \text{ AC}$

$Q_{100} = 7.23 \times 0.5 \times 8.98 = 32.5 \text{ cfs}$

USE ABOVE "V" SWALE W/SLOPE = .005

$Q = 10 \quad \frac{1.486}{.016} \cdot .5^{2/3} \cdot .005^{1/2} = 41.4 \text{ cfs} \quad OK.$


42'30"
T I C A
Radio Tower
Trailer Park
Church Camp
PIPELINE
4 LANE
Trailer Parks
TOPEKA AND SANTA FE
CHISON
(WICHITA WEST)
6559 III NW
ROLLING HILLS 3 MI
WICHITA (CH) 10 MI
EL DORADO 46 MI
40'
16
15
14
21
22
23
28
27
26
33
34
35