PROFESSIONAL
ENGINEERING CONSULTANTS, PA
303 South Topeka
WICHITA, KANSAS 67202

(316) 262-2691

LETTER OF TRANSMITTAL

DATE: April 5, 1990
JOB NO.: 36-90000
ATTENTION: Ms. Vicky Huang, P.E.
RE: Oak Cliff Estates 5th Add.

TO: Michael E. Lindebak, P.E.
City Engineer
455 North Main
Wichita, KS

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via ________ the following items:

☐ Shop drawings ☒ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ ________

COPIES	DATE	NO.	DESCRIPTION
2	4-6-90		Drainage Concept

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval

☐ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return ____ corrected prints

☒ For review and comment ☐ ________

☐ FOR BIDS DUE ________ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS: The Preliminary Plat will be submitted by Bill Yung Design on 4/6/90 for hearing by the Subdivision Committee on 4/19/90.

COPY TO: Bill Yung Design
Slawson Devel. Corp.
File

SIGNED: Charles S Brown

If enclosures are not as noted, kindly notify us at once.

DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

FOR
OAK CLIFF ESTATES 5TH ADDITION
TO WICHITA, SEDGWICK COUNTY, KANSAS

PREPARED BY
PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
ENGINEERS
WICHITA, KANSAS

FEBRUARY 22, 1991

303 S. TOPEKA
WICHITA, KANSAS 67202
(316) 262-2691
FAX (316) 262-3003

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
303 S. TOPEKA
WICHITA, KANSAS
ZIP CODE / 67202

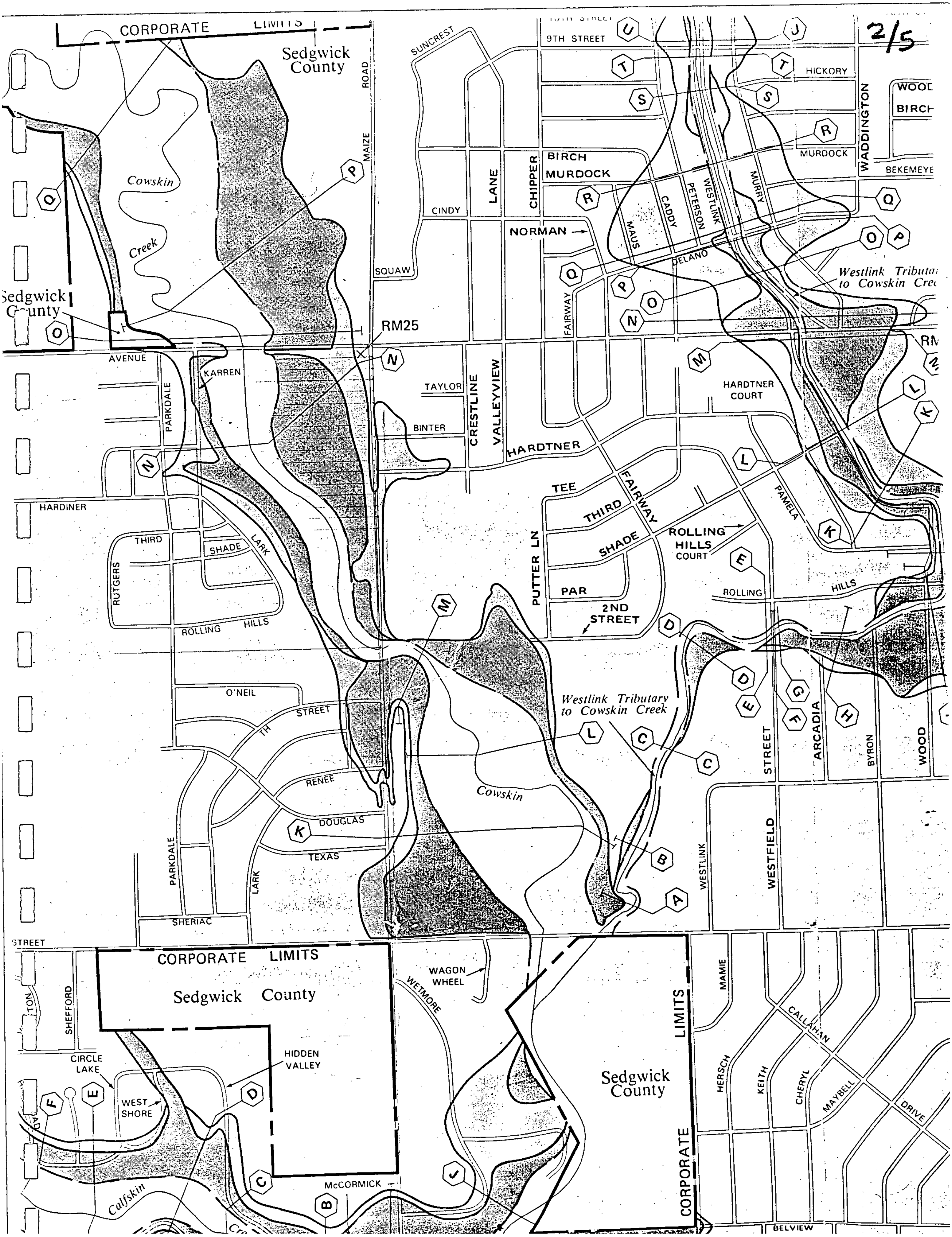
Date 2/16/91

Project Oak Cliff Estates 5th Addition

Item Drainage Plan Introduction

Oak Cliff Estates 5th Addition is a proposed replat of a portion of Oak Cliff Estates 3rd Addition (Lots 12-27 in Block 6, all of Blocks 7 and 8, Lot 11 in Block 9, Lots 8-14 in Block 10, All of Block 11, and Lots 1-7 in Block 12). This replat will replace multi-family ank patio lots with conventional single family lots. Proposed runoff from these areas should decease due to the reduction in density. Storm Water Sewers now in place, therefore, should not be adversely affected by this change. Therefore, this report concentrates on the proposed new storm sewer system in Merribeau.

FEMA Floodway and Flood Insurance Rate Maps are included herein. It appears that a portion of the plat may be within the FEMA Floodplain, but each lot should be well above the 100-year flood elevation of 1323.0 (135.6). No lots are within the FEMA Floodway.



CORPORATE LIMITS
Sedgwick County
ROAD
MAIZE
Cowskin
Creek
Sedgwick County
RM25
AVENUE
SUNCREST
9TH STREET
HICKORY
WOOD
BIRCH
WADDINGTON
MURDOCK
BEKEMEYE
BIRCH
MURDOCK
CHIPPER
LANE
CINDY
NORMAN
MAUS
CADDY
PETERSON
WESTLINK
MURRY
DELANO
FAIRWAY
SQUAW
Westlink Tributary to Cowskin Creek
KARREN
PARKDALE
TAYLOR
CRESTLINE
VALLEYVIEW
BINTER
HARDTNER
HARDTNER COURT
HARDINER
TEE
THIRD
FAIRWAY
SHADE
PAMELA
ROLLING HILLS
ROLLING HILLS COURT
THIRD
SHADE
LARK
RUTGERS
PUTTER LN
PAR
2ND STREET
ROLLING
HILLS
ROLLING
HILLS
O'NEIL
STREET
TH
Westlink Tributary to Cowskin Creek
RENEE
Cowskin
DOUGLAS
TEXAS
PARKDALE
LARK
SHERIAC
WESTLINK
STREET
WESTFIELD
ARCADIA
BYRON
WOOD
STREET
CORPORATE LIMITS
Sedgwick County
WAGON WHEEL
WETMORE
SHEFFORD
CIRCLE LAKE
HIDDEN VALLEY
WEST SHORE
MAMIE
CALLAHAN
LIMITS
Sedgwick County
CORPORATE
HERSCH
KEITH
CHERYL
MAYBELL
DRIVE
Calfskin
McCORMICK
BELVIEW
A
B
C
D
E
F
G
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Q
R
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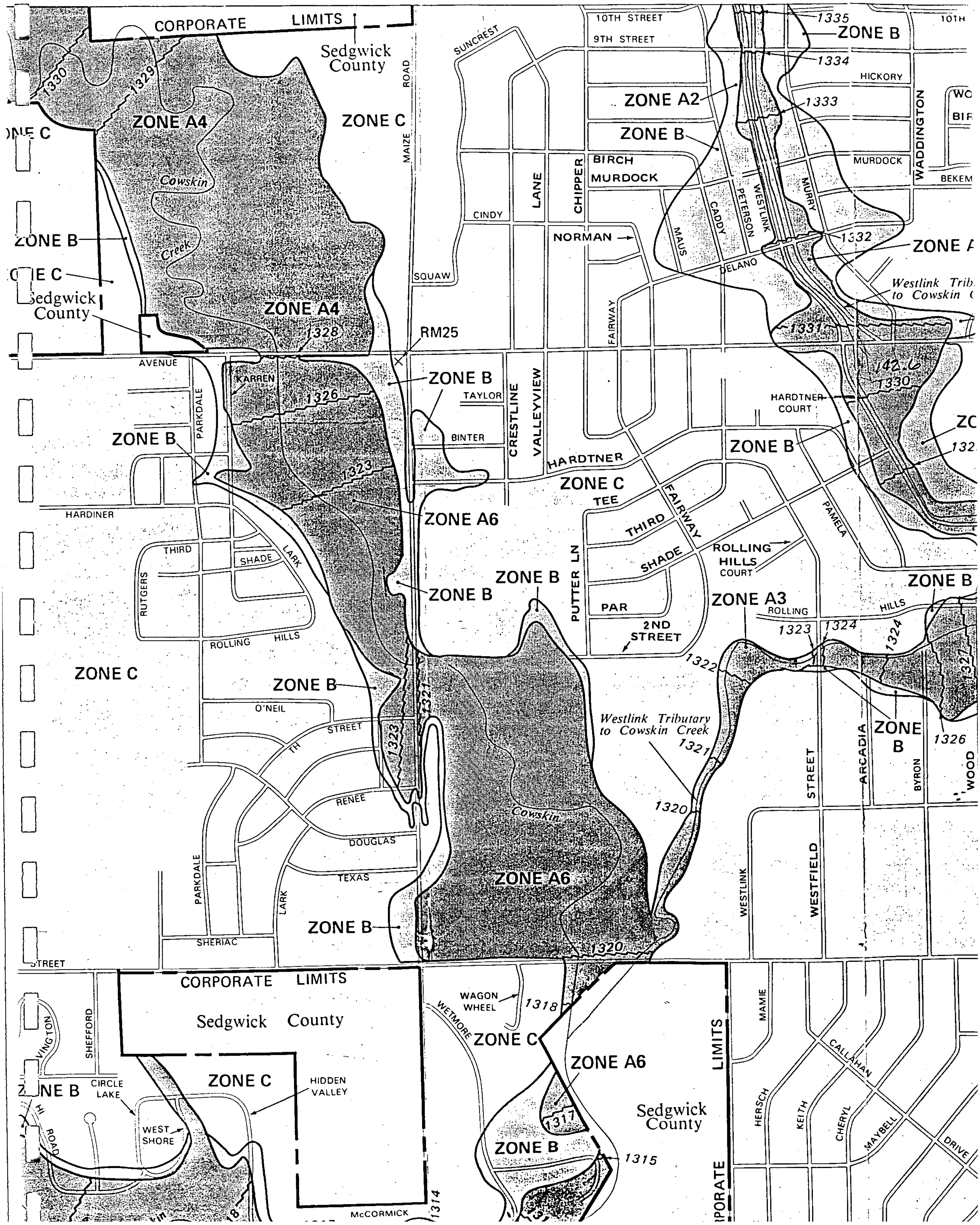
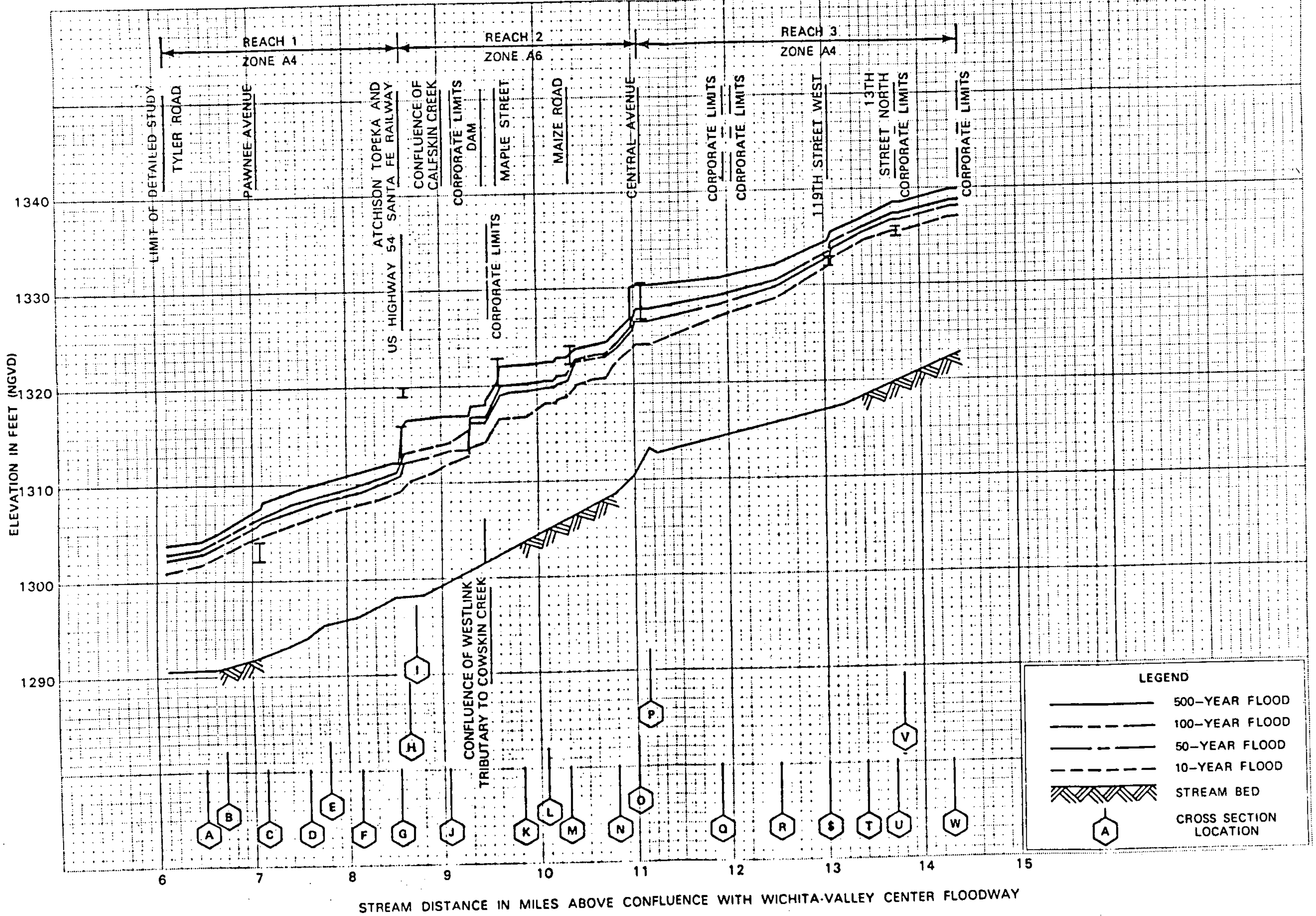
T
U


CORPORATE LIMITS
Sedgwick County
ZONE A4
ZONE C
ZONE B
Cowskin
Creek
1330
1329
1328
MAIZE ROAD
RM25
AVENUE
KARREN
PARKDALE
1326
1323
ZONE A6
HARDINER
THIRD
SHADE
LARK
RUTGERS
ROLLING HILLS
O'NEIL
STREET
RENEE
DOUGLAS
TEXAS
SHERIAC
STREET
1321
10TH STREET
9TH STREET
SUNCREST
ZONE A2
BIRCH
MURDOCK
CINDY
LANE
CHIPPER
NORMAN
SQUAW
MAUS
CADDY
PETERSON
WESTLINK
MURRY
DELANO
FAIRWAY
1335
1334
1333
1332
1331
HICKORY
WADDINGTON
BEKEM
Westlink Trib. to Cowskin
142.6
HARDTNER COURT
TAYLOR
BINTER
CRESTLINE
VALLEYVIEW
HARDTNER
TEE
PAMELA
ROLLING HILLS COURT
PUTTER LN
PAR
2ND STREET
ZONE A3
1324
1322
1327
Westlink Tributary to Cowskin Creek
1320
STREET
ARCADIA
BYRON
WOOD
1326
WESTFIELD
1318
WAGON WHEEL
WETMORE
1317
1315
1314
McCORMICK
LIMITS
CORPORATE
MAMIE
CALLAHAN
HERSCH
KEITH
CHERYL
MAYBELL
DRIVE
SHEFFORD
CIRCLE LAKE
WEST SHORE
HIDDEN VALLEY
ROAD



FLOOD PROFILES

COWSKIN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WICHITA, KS

(SEDGWICK CO.)

37P

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
COWSKIN CREEK								
A	6.47	1020	5081	3.4	1303.2	1303.2	1303.6	0.4
B	6.70	782	3800	4.6	1304.3	1304.3	1304.6	0.3
C	7.14	750	5440	3.2	1306.7	1306.7	1307.3	0.6
D	7.59	950	5289	3.3	1308.2	1308.2	1308.6	0.4
E	7.81	965	4135	4.2	1308.8	1308.8	1309.3	0.5
F	8.14	577	3897	4.5	1309.7	1309.7	1310.2	0.5
G	8.54	933	4713	3.7	1311.0	1311.0	1311.7	0.7
H	8.65	700	6792	2.6	1313.1	1313.1	1313.7	0.6
I	8.72	600	5182	3.4	1313.3	1313.3	1313.9	0.6
J	9.06	400[2]	6215	2.5	1314.0	1314.0	1314.6	0.6
K	9.83	1333	6208	2.5	1320.1	1320.1	1321.0	0.9
L	10.08	1147	6419	2.4	1320.5	1320.5	1321.3	0.8
M	10.30	169	1387	7.2	1321.0	1321.0	1321.7	0.7
N	10.80	470	2439	6.2	1324.0	1324.0	1324.7	0.7
O	11.02	1215[2]	10,601	1.4	1327.8	1327.8	1328.4	0.6
P	11.14	1020[2]	10,439	2.0	1327.9	1327.9	1328.5	0.6
Q	11.89	1029	5792	2.6	1329.0	1329.0	1330.0	1.0
R	12.50	1199	5571	2.7	1330.6	1330.6	1331.3	0.7
S	13.01	1068	4327	3.5	1333.3	1333.3	1334.0	0.7
T	13.40	500[2]	4532	2.7	1336.0	1336.0	1336.5	0.5
U	13.71	980[2]	6093	2.5	1337.3	1337.3	1337.4	0.1
V	13.79	1313[2]	6548	2.0	1337.6	1337.6	1337.6	0.0
W	14.30	928[2]	4015	3.6	1338.6	1338.6	1339.1	0.5

[1]MILES ABOVE CONFLUENCE WITH WICHITA-VALLEY CENTER FLOODWAY
[2]THIS WIDTH EXTENDS BEYOND CORPORATE LIMITS

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF WICHITA, KS
(SEDGWICK CO.)

FLOODWAY DATA

COWSKIN CREEK

5/5

Use Rational Formula $Q = CIA$
Design for 2-yr storm in pipe, 100-yr in st. r-o-w.

Determine "C"

Node	Soil Type	Hydrologic Group	Land Use	C_2	C_{100}
104	Vb, Ma	B	Res; 1/4 Ac	0.44	0.61
103	Vb, Ma	B	Res; 1/4 Ac	0.44	0.61
102	Ma, Ea	B	Res; 1/4 Ac	0.44	0.61
101	Ma, Ea	B	Res; 1/4 Ac.	0.44	0.61
100	(Headwall)				

Determine "I"

Assume t_c = 15 minutes for all nodes

∴ $I_2 = 3.83$ in/hr $I_{100} = 7.37$ in/hr.

Determine "A"

Node	Planimeter Units	Area SF	Area Acres
104	33.76	337,600	7.75
103	4.66	46,600	1.07
102	5.25	52,500	1.21
101	21.44	214,400	4.92
100	(Headwall)		

Determine "Q_2"

Node	C_2	I_2	A	Q_2
104	0.44	3.83	7.75	13.1
103	0.44	3.83	1.07	1.8
102	0.44	3.83	1.21	2.0
101	0.44	3.83	4.92	8.3
100	(Headwall)			

Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
104	0.61	7.37	7.75	34.9
103	0.61	7.37	1.07	4.8
102	0.61	7.37	1.21	5.4
101	0.61	7.37	4.92	22.1
100	(Headwall)			

PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
303 S. TOPEKA
WICHITA, KANSAS
ZIP CODE / 67202

Date 2/13/91

Project Oak Cliff Estates 5th Addition

Item Drainage Plan SWS

INLET SIZING / ROUTING

Node	Inlet Condition	Q_2 approach	sump: Qmax 10' inlet	sump: Qmax 5' inlet	on grade: st. slope	on grade: L_T	on grade: L	on grade: Eff	Bypass to	Inlet L
104	Sump	13.1	22	11						10'
103	on grade	1.8	–	–	0.6	16	5	0.46	1.0 node 102	5'
					(Qintercept = 1.8×0.46 = 0.8)					
102	sump	2.0 + 1.0 = 3.0 (node 103)	22	11						5'
101	sump	8.3	22	11						5'
100										

Qintercept: ‡

Node	Q
104	13.1
103	0.8
102	3.0
101	8.3

‡ input data in PEC's "Storm" program.

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```
100 j,  133.2000  100    3    5    4
110 t,oak cliff estates 5th addition
120 t,drainage plan
130 t,storm water sewer system no.100 analysis
140 i,  104     0.44     7.75     0.00     0.00    13.10    15.00   143.20
150 i,  103     0.44     1.07     0.00     0.00     0.80    15.00   142.00
160 i,  102     0.44     1.21     0.00     0.00     3.00    15.00   136.60
170 i,  101     0.44     4.92     0.00     0.00     8.30    15.00   136.60
180 m,  100   131.10
190 p,  104  103   180.00   18 0.013  30.00   0.00
200 p,  103  101   260.00   18 0.013  75.00   0.00
210 p,  102  101    40.00   15 0.013  35.00   0.00
220 p,  101  100   100.00   30 0.013   0.00   0.00
230 e
```

5/6

Date: 02-13-1991
Time: 11:09:09

Input File: oak5

oak cliff estates 5th addition
drainage plan
storm water sewer system no.100 analysis

Storm Frequency = 2-Year

* * * H Y D R O L O G Y * * *

Tributary Area									Hydrology Summation				Conduit Data				
Node	to Node	C	Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
104	103	0.44	7.75	0.00	0.0	15.00	4.06	13.10	15.00	4.06	13.10	13.10	18"	7.41	180.00	0.40	15.40
103	101	0.44	1.07	0.00	0.0	15.00	4.06	0.80	15.40	4.02	0.79	13.89	18"	7.86	260.00	0.55	15.96
102	101	0.44	1.21	0.00	0.0	15.00	4.06	3.00	15.00	4.06	3.00	3.00	15"	2.44	40.00	0.27	15.27
101	100	0.44	4.92	0.00	0.0	15.00	4.06	8.30	15.96	3.96	8.10	24.94	30"	5.08	100.00	0.33	16.28

Date: 02-13-1991
Time: 11:09:09

Input File: oak5

oak cliff estates 5th addition
drainage plan
storm water sewer system no.100 analysis

Storm Frequency = 2-Year

* * * HYDRAULICS * * *

Node	Hyd-Slope (Ft/Ft)	Friction (Ft)	Bend (Ft)	Transition (Ft)	Manhole (Ft)	Deflection (Ft)	Junction (Ft)	Total (Ft)	Hyd-Gl Elevation	Desired Elevation	Diff. (Ft)
104	0.01555	2.7995	0.0000	0.0000	0.0000	0.0000	0.0000	2.7995	141.9948	143.2000	1.21
103	0.01749	4.5473	0.0000	0.0106	0.0000	0.1142	0.2957	4.9677	139.1953	142.0000	2.80
102	0.00216	0.0863	0.0000	0.0000	0.0000	0.0000	0.0000	0.0863	134.3139	136.6000	2.29
101	0.00370	0.3698	0.0000	0.1117	0.0000	0.3855	0.1606	1.0276	134.2276	136.6000	2.37
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	133.2000	131.1000	-2.10

starting HGL = DWS_{100} in pond

outlet submerged

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WICHITA, KANSAS
ZIP CODE / 67202

Date 2/13/91

Project Oak Cliff Estates 5th Addition

Item Drainage Plan Street Flow

Check 2-yr. flow in street.

Max depth = top curb = 0.55' (std. curb)

Node	Q_2	Distribution	street slope	d	dmax	Comment
104	13.1	≈ 100% (W) = 13.1	0.6%	0.49'	0.55'	OK
103	1.8	≈ 100% (N) = 1.8	0.32%	0.27	0.30'	OK
102	2.0	80% (W) = 1.6 + 1.0 = 2.6	2.00%	0.22'	0.55'	OK
		20% (E) = 0.4	0.32%	0.16'	0.55'	OK
101	8.3	≈ 100% (W) = 8.3	2.00%	0.33'	0.55'	OK

2-yr street flow OK

PROFESSIONAL ENGINEERING CONSULTANTS
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WICHITA, KANSAS
ZIP CODE / 67202

Project Oak Cliff Estates 5th Addition

Item Drainage Plan Street Flow

Check street flow at various locations for Q_{100}

$$Q_{street} = Q_{100} - Q_{pipe}$$

Location	Contrib. Areas	Q_{100}	Q_{pipe}	Q_{street}	street slope	Q_{max} ≠	comment
Approaching Node 104 from west	100% 104 =	34.9	0.0	34.9	0.60%	59.8	OK Walk Gr = 0.3' Std Cb.
Approaching Node 103 from west	100% 104 = 100% 103 =	34.9 14.8 39.7	13.1	26.6	0.60%	59.8	OK Walk Gr = 0.3' Std. Cb.
Approaching Nodes 102 & 101 from west	100% 104 = 100% 103 = ≈ 100% 102 = ≈ 100% 101 =	34.9 4.8 5.4 22.1 67.2	13.9	53.3	2.00%	109.2	OK WK Gr = 0.3' Std. Cb.

≠ see pege 3

PROFESSIONAL ENGINEERING CONSULTANTS
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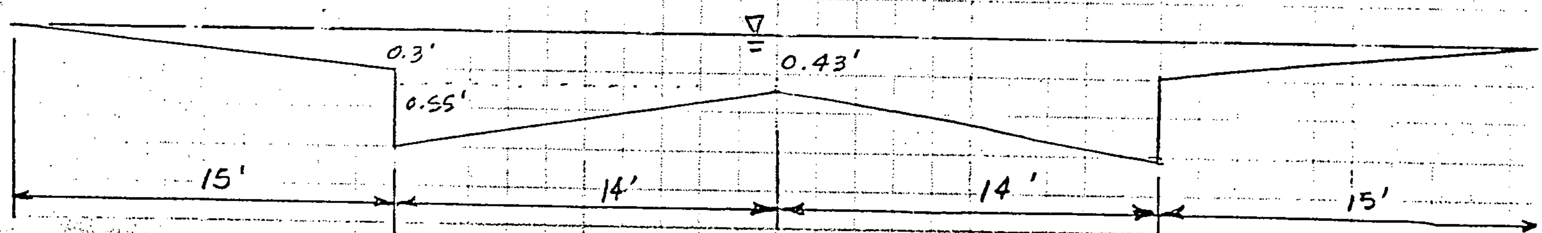
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Project Oak Cliff Estates 5th Addition

Item Drainage Plan Street Flow

Determine Capacities of Standard Curb Streets w/ Various Walk Grades for 100-year storm analysis (58' R-O-W)

0.3' WALK GRADE



$$n = \frac{(2 \times 14.5 \times 0.03) + (2 \times 3.05 \times 0.013) + (2 \times 12 \times 0.016)}{59.1}$$

$$= \frac{(0.87) + (0.0793) + (0.384)}{59.1} = \frac{1.3333}{59.1} = 0.0226$$

$$A = (2 \times \tfrac{1}{2} \times 15 \times 0.3) + (28 \times 0.43) + (2 \times \tfrac{1}{2} \times 14 \times 0.42)$$

$$= (4.5) + (12.04) + (5.88)$$

$$= 22.42$$

$$P = 59.1$$

$$R = A/P = 22.42/59.1 = 0.379357 \qquad R^{2/3} = 0.52404$$

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$

$$Q = \frac{1.486}{0.0226} \times 22.42 \times 0.52404 \times S^{1/2}$$

$$Q = 772.5 \sqrt{S}$$

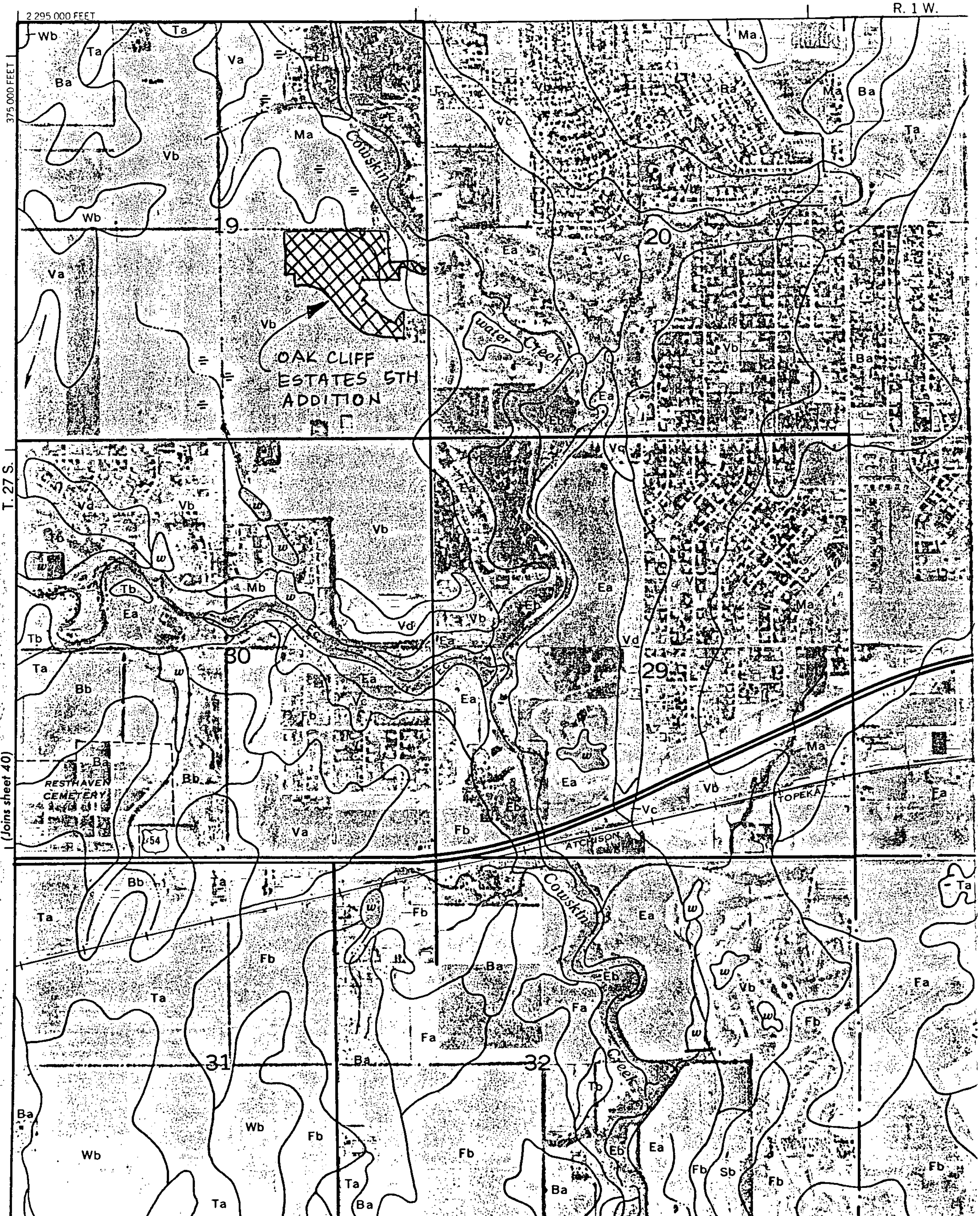

2 295 000 FEET
R. 1 W.
375 000 FEET
T. 27 S.
(Joins sheet 40)
OAK CLIFF
ESTATES 5TH
ADDITION
Cowskin
Cowskin
Creek
Water Creek
RESTHAVEN
CEMETERY
ATCHISON
TOPEKA
54
9
20
30
29
31
32
Wb
Ta
Ba
Va
Vb
Ma
Eb
Ea
Vc
Ba
Ma
Ba
Ta
Vd
Tb
Mb
Ec
Bb
Fb
Fa
Sb
w

EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
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
Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	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 lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

(3 pages)

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:					
Single Family (Soil Group D)					
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
Multi-Family (Soil Group D)					
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
Single Family (Soil Group C)					
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
Multi-Family (Soil Group C)					
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
Single-Family (Soil Group B)					
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
Multi-Family (Soil Group B)					
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 2	5	10	100
Single Family (Soil Group A)					
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
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
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):					
Soil Group A					
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
Soil Group B					
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
Soil Group C					
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

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
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.

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

CITY OF WICHITA, KANSAS

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 Modified to NWS Hydro-35, 1977 During First Hour

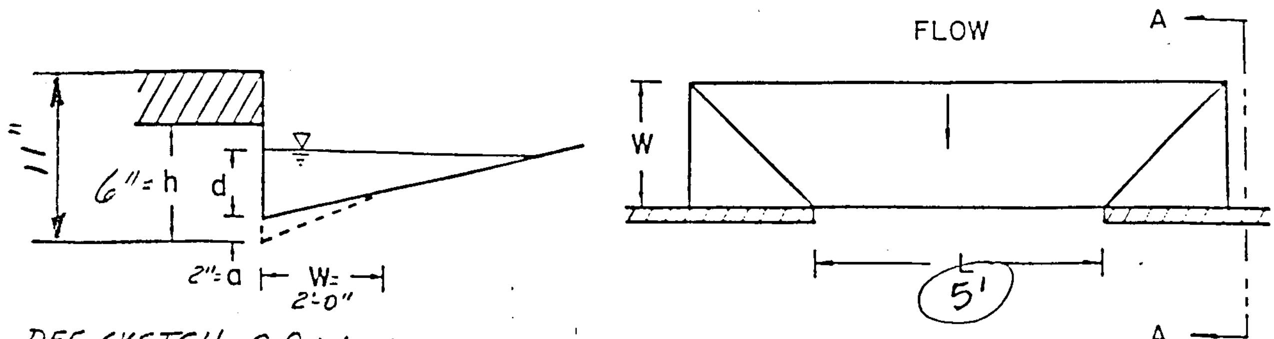
DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54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

ATTACHMENT A CONTINUED
Page 2

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
46	1.70	2.05	2.54	2.97	3.48	3.93	4.33
47	1.67	2.02	2.50	2.93	3.44	3.88	4.28
48	1.66	2.00	2.47	2.90	3.39	3.84	4.23
49	1.64	1.97	2.44	2.86	3.35	3.79	4.18
50	1.61	1.95	2.41	2.83	3.32	3.75	4.13
51	1.59	1.92	2.38	2.79	3.28	3.71	4.09
52	1.56	1.89	2.35	2.76	3.24	3.67	4.05
53	1.54	1.86	2.33	2.73	3.20	3.63	4.00
54	1.52	1.84	2.30	2.70	3.17	3.59	3.96
55	1.50	1.81	2.27	2.67	3.14	3.55	3.92
56	1.47	1.79	2.25	2.64	3.10	3.51	3.88
57	1.45	1.76	2.22	2.61	3.07	3.48	3.84
58	1.43	1.74	2.20	2.59	3.04	3.44	3.81
59	1.42	1.72	2.18	2.56	3.01	3.41	3.77
60	1.40	1.69	2.15	2.53	2.98	3.37	3.73
61	1.38	1.67	2.13	2.51	2.95	3.34	3.70
62	1.36	1.65	2.11	2.48	2.92	3.31	3.67
63	1.34	1.63	2.09	2.46	2.89	3.28	3.63
64	1.33	1.61	2.07	2.44	2.86	3.25	3.60
65	1.31	1.59	2.05	2.41	2.84	3.22	3.57
66	1.30	1.57	2.03	2.39	2.81	3.19	3.54
67	1.28	1.56	2.01	2.37	2.79	3.16	3.51
68	1.26	1.54	1.99	2.35	2.76	3.13	3.48
69	1.25	1.52	1.97	2.33	2.74	3.10	3.45
70	1.24	1.50	1.95	2.31	2.71	3.08	3.42
71	1.22	1.49	1.93	2.28	2.69	3.05	3.39
72	1.21	1.47	1.92	2.26	2.67	3.02	3.36
73	1.20	1.46	1.90	2.25	2.64	3.00	3.34
74	1.18	1.44	1.88	2.23	2.63	2.98	3.31
75	1.17	1.43	1.86	2.21	2.61	2.95	3.29
76	1.16	1.41	1.85	2.19	2.58	2.93	3.26
77	1.15	1.40	1.83	2.17	2.55	2.90	3.24
78	1.13	1.38	1.82	2.15	2.53	2.88	3.22
79	1.12	1.37	1.80	2.14	2.50	2.86	3.19
80	1.11	1.36	1.79	2.12	2.48	2.84	3.16
81	1.10	1.34	1.77	2.10	2.46	2.82	3.13
82	1.09	1.33	1.76	2.08	2.43	2.79	3.10
83	1.08	1.32	1.74	2.06	2.41	2.76	3.07
84	1.07	1.31	1.73	2.04	2.39	2.74	3.04
85	1.06	1.30	1.72	2.02	2.37	2.71	3.01
86	1.05	1.28	1.70	2.00	2.34	2.69	2.99
87	1.04	1.27	1.69	1.99	2.32	2.66	2.96
88	1.03	1.26	1.68	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

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
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

DURATION IN HOURS	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
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



DEF. SKETCH, C.O.W. TYPE 1A INLET

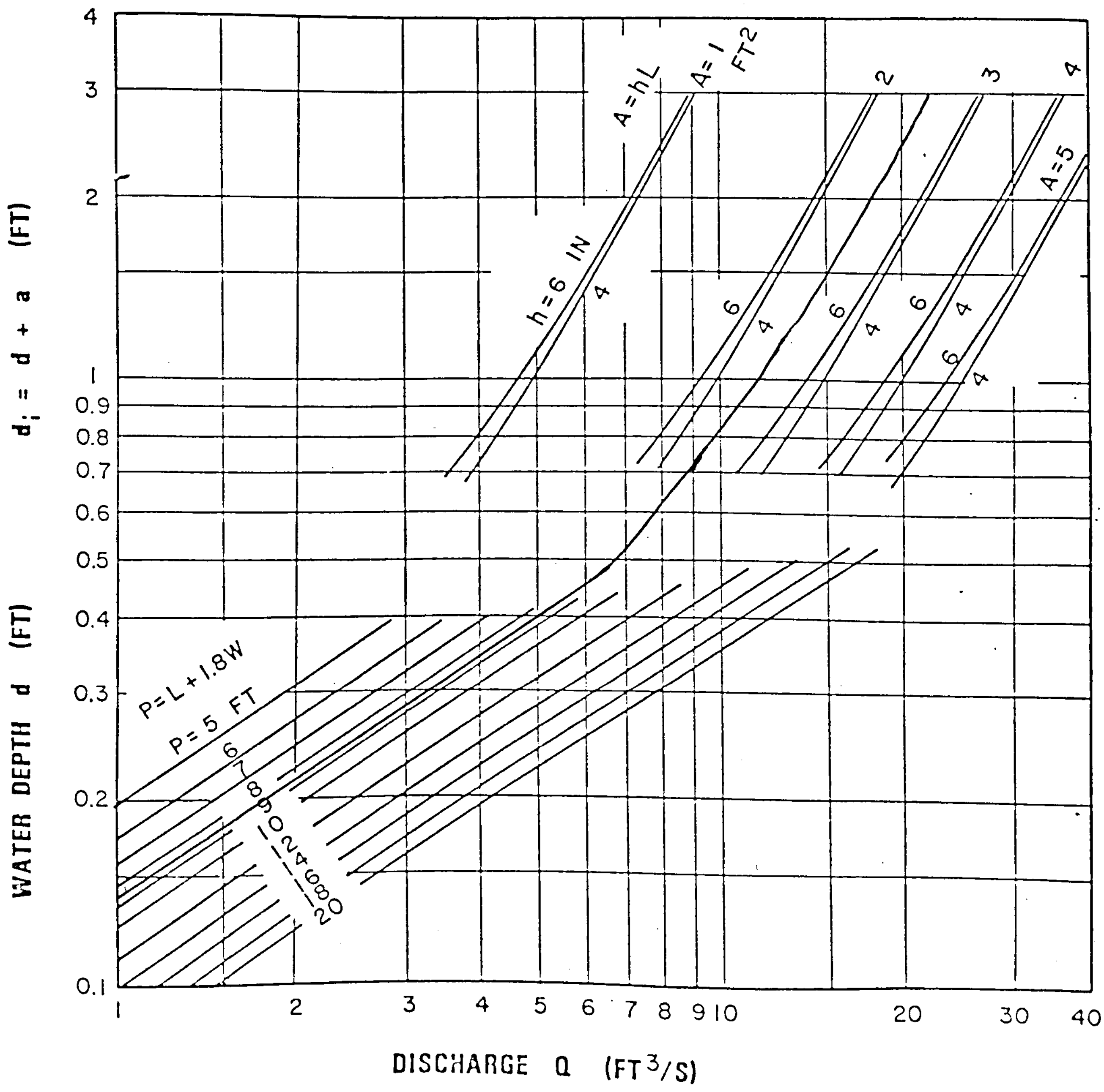
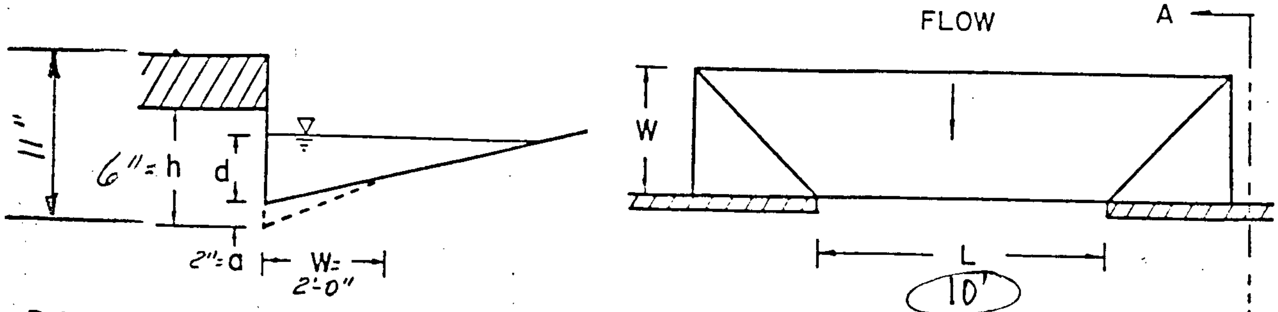


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1984



DEF. SKETCH, C.D.W. TYPE 1A INLET

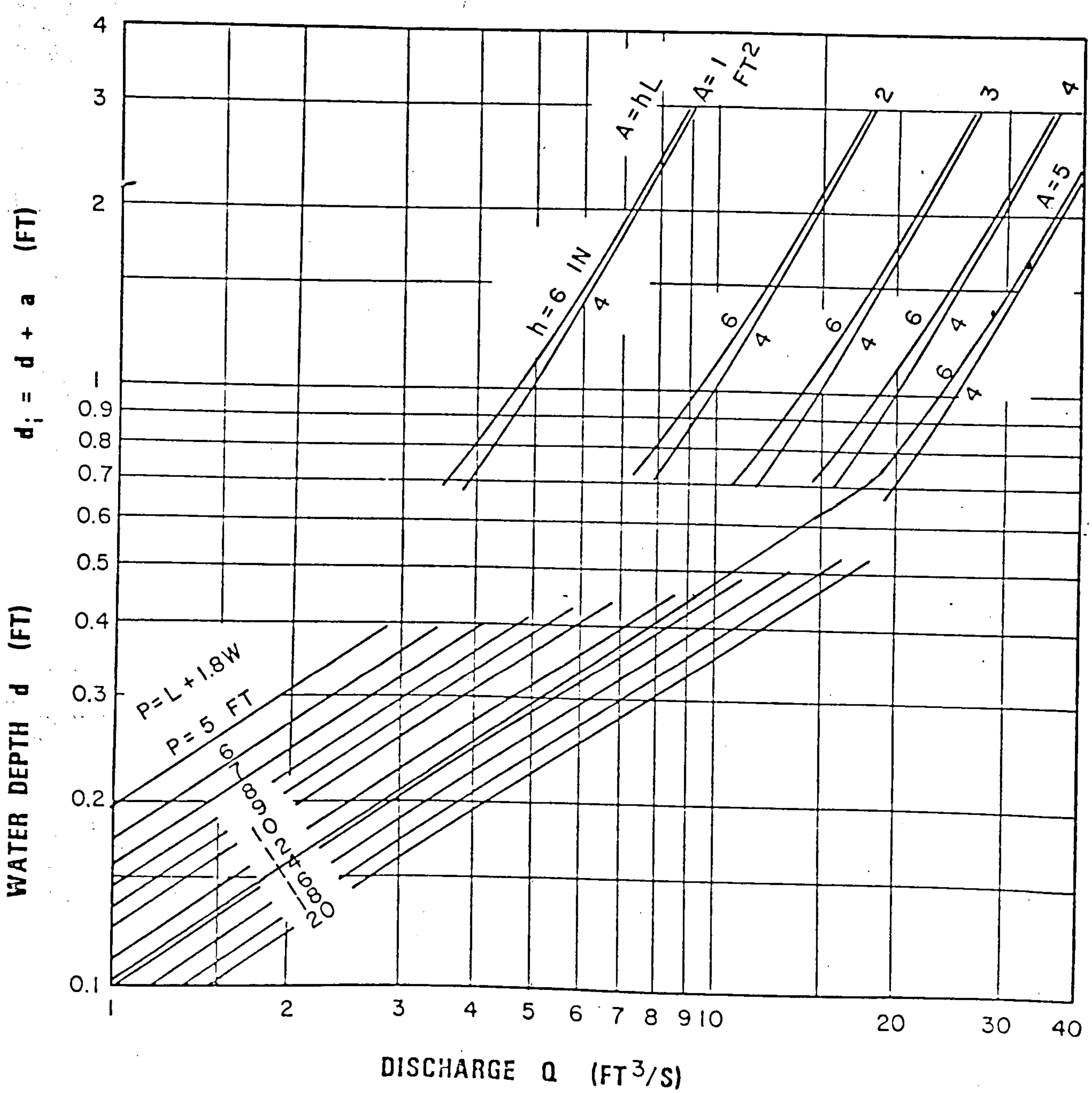


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, Drainage of Highway Pavements, F.H.W.A., Mar., 1984

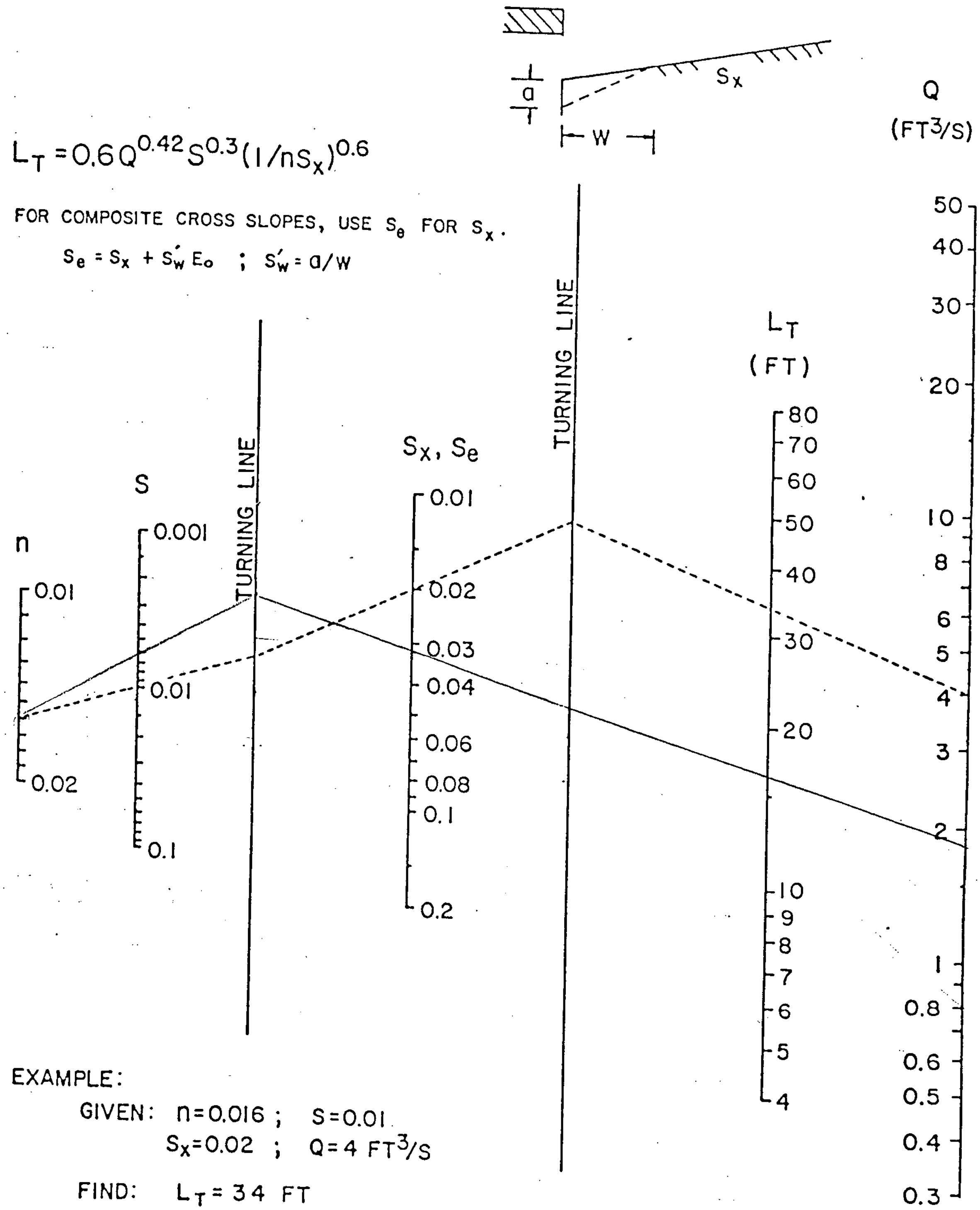


CHART 9. Curb-opening and slotted drain inlet length for total interception.

From: HEC-12, Drainage of Highway Pavements, F.H.W.A., Mar. 1984.

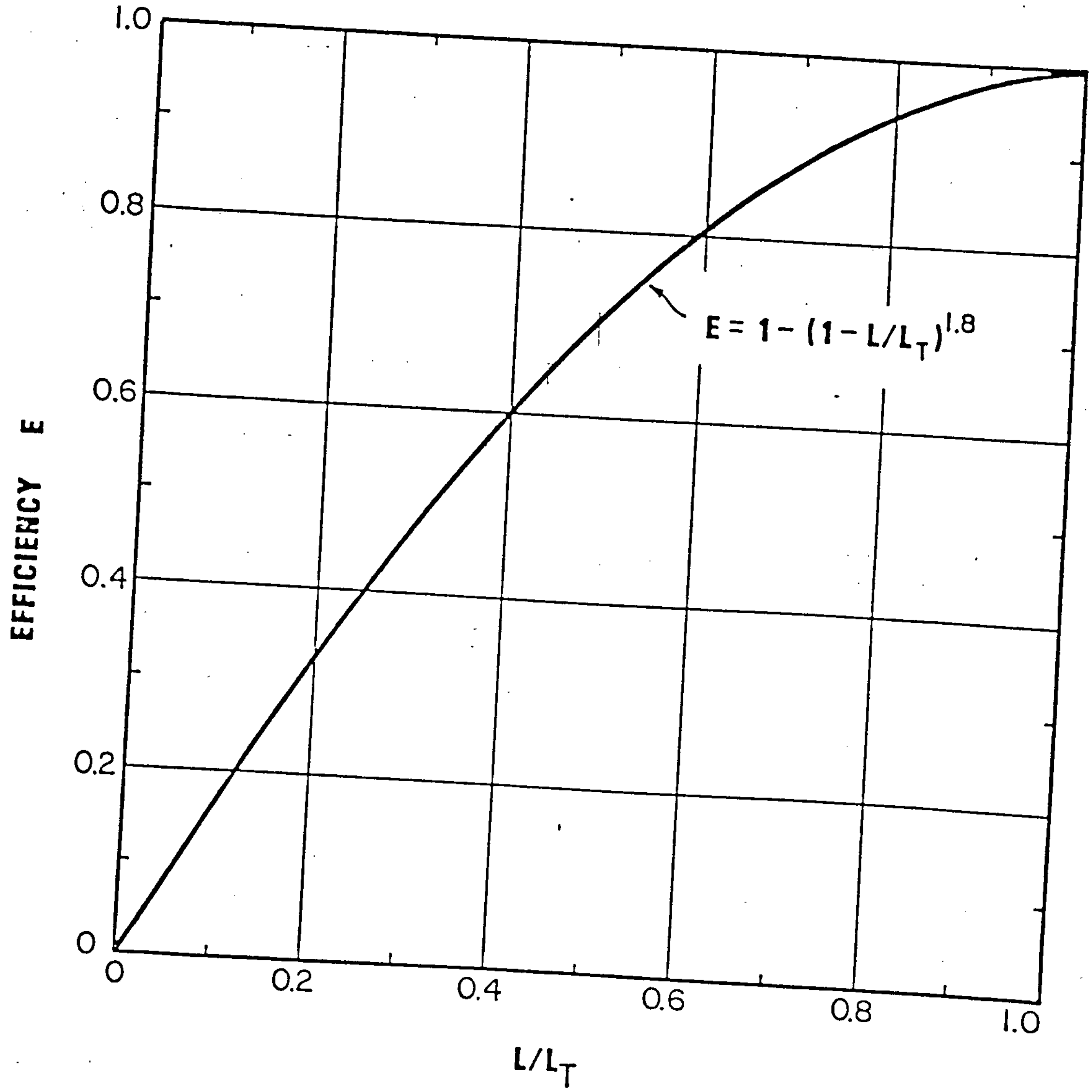


CHART 10. Curb-opening and slotted drain inlet interception efficiency.

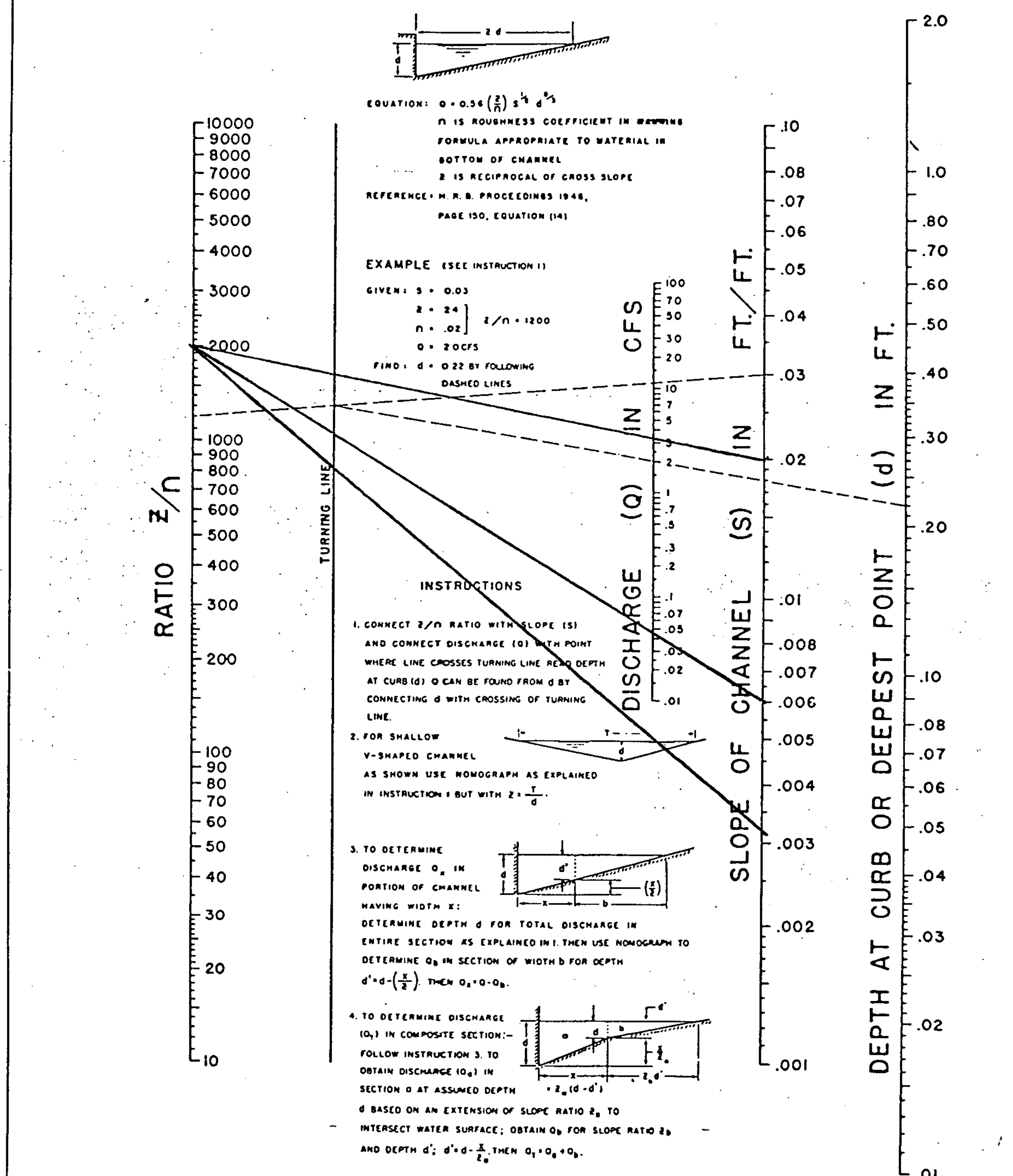
FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., Mar. 1984 x-slope = 3/8"/ft = 0.03125'/'

z = 1/x-slope = 1/0.03125 = 32

n = 0.016

z/n = 32/0.016 = 2000

Chart 1



BUREAU OF PUBLIC ROADS

REV. JAN. 1968

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS