

DRAINAGE PLAN

**SMITHMOOR FOURTH ADDITION
WICHITA, KANSAS**

June 22, 1994



MUNICIPAL ENGINEERS, P.A.
Civil Engineers & Land Surveyors

254 Laura, Suite 201 • Wichita, Kansas 67211 • (316) 262-3842 • Fax (316) 262-8634

1.0 INTRODUCTION:

The proposed Smithmoor Fourth Addition is located along the southerly line of Smithmoor First Addition and Westerly line of Smithmoor Third Addition. Preliminary plat submitted in 1991 encompasses area which was platted as Smithmoor Third and this proposed Smithmoor Fourth Addition.

A sketch plan submitted to MAPD which showed how the area to south will be developed.

There is a ridge that runs northeasterly approximately through the middle of entire development. This ridge divides the development in to two drainage areas. One drain to North and other to South and East.

This drainage plan addresses area North of the ridge. The existing flow patterns will be maintained. The area drains to a drainage channel along the west side of Smithmoor First Addition.

SMITHMOOR 4TH ADDITION :

2.0. HYDROLOGY :

USE RATIONAL METHOD

SOIL TYPE = Ia

HYDRO GROUP = D

LAND USE = SINGLE FAMILY
MIN. LOT SIZE 6,600 S.F. ±

RUN OFF COEFFICIENTS:

PRORATE BETWEEN $\frac{1}{8}$ AC. LOTS & $\frac{1}{4}$ AC. LOTS

$$C_2 = 0.55$$

$$C_{100} = 0.78$$

$$T_c = 15 \text{ MIN.}$$

$$L_2 = 3.83 \text{ IN.}$$

$$L_{100} = 7.37 \text{ IN.}$$

NODE	DRAINAGE AREA	CFS @ 2	CFS @ 100
100	6.4 Ac.	13.5	36.8
101	2.7	5.7	15.5
102	1.4	2.9	8.0
103	10.2	21.5	58.6
104	4.0	8.4	23.0

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	<u>0.69</u>	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
6600 S.F.		0.55		0.78	
<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

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

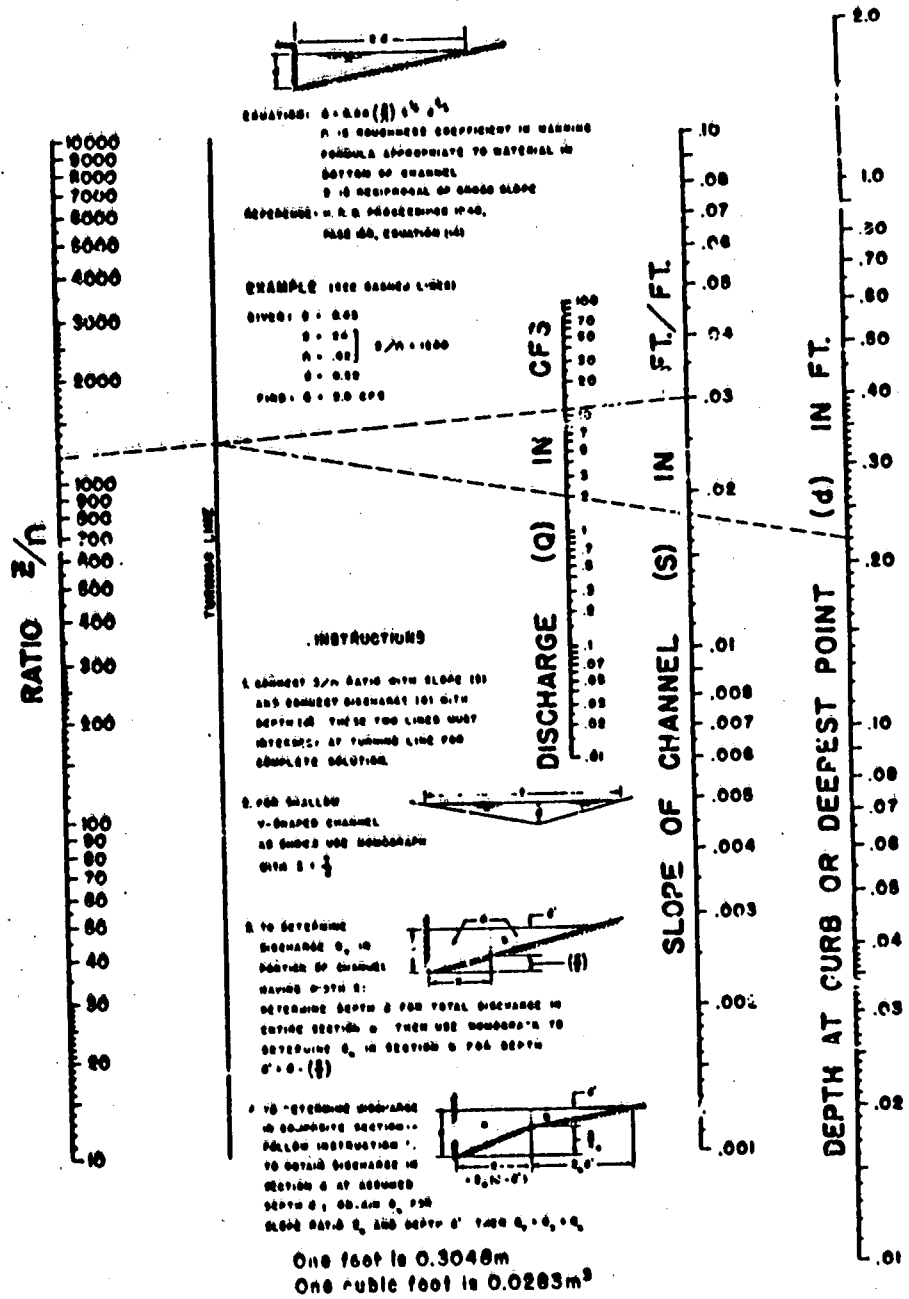


FIG. 5-1 (ADP of FHWA)

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

3.0 INLET SIZING

NODE	Q_2 CFS	INLET COND.	L	Q_{MAX} CFS	
100	13.5	SUMP	10'	22	O.K.
101	5.7	SUMP	5'	11	O.K.
102	2.9	SUMP	5'	11	O.K.
103	21.5	SUMP	10'	22	O.K.
104	8.4	SUMP	5'	11	O.K.

4.0 PIPE SIZING :

NODE FROM	NODE TO	Q CFS	ΣQ_2 CFS	PIPE SIZE
100	101	13.5	13.5	21" @ 0.7 %
102	101	2.9	2.9	12" @ 0.7 %
103	101	5.7	22.1	27" @ 0.5 %
104	103	21.5	43.6	36" @ 0.4 %
104	OUTFALL	8.4	52.0	42" @ 0.25 %

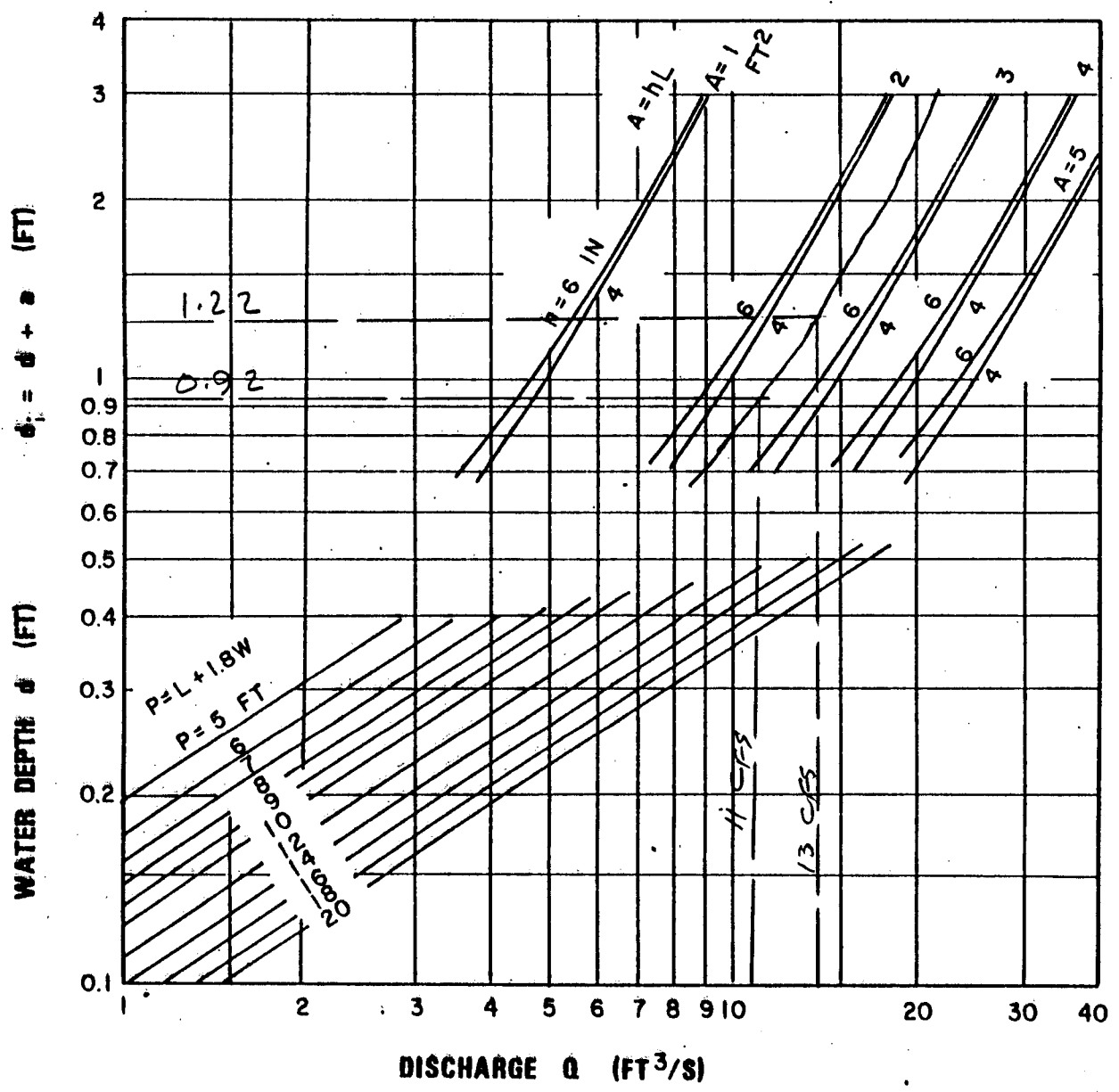
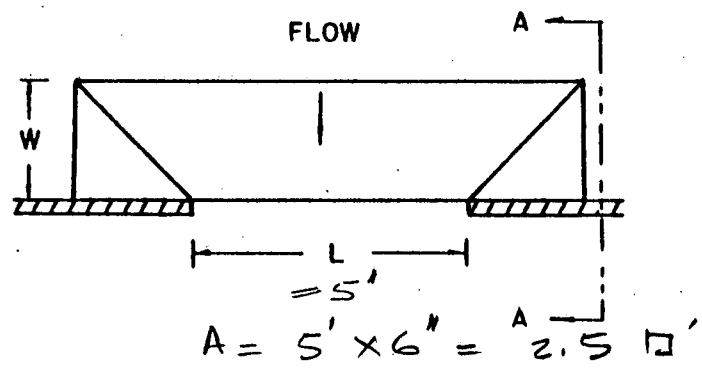
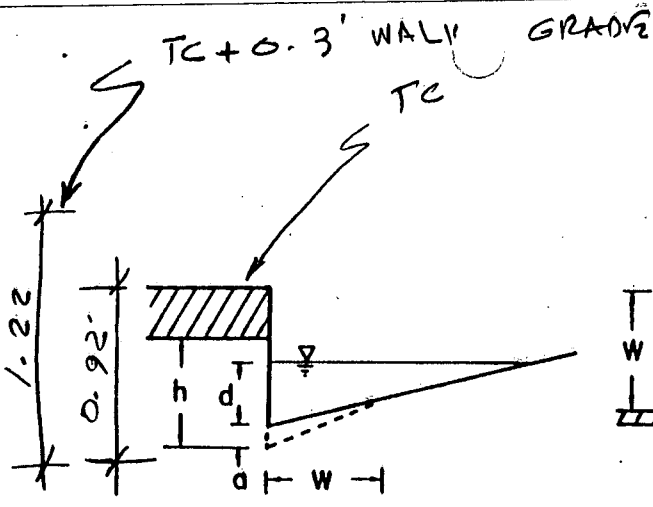
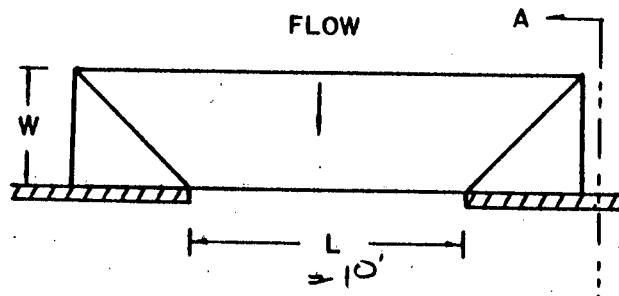
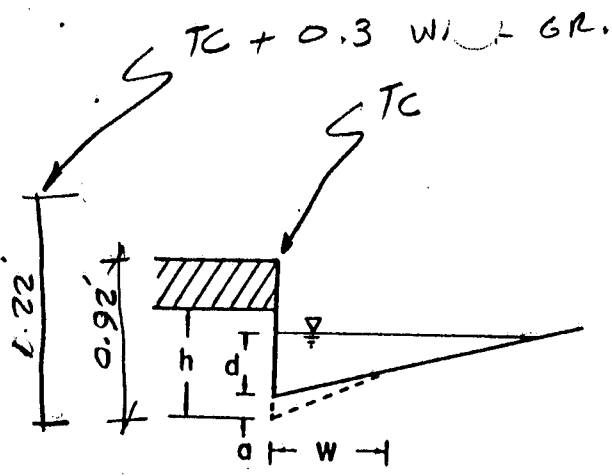


CHART 12. Depressed curb-opening inlet capacity in sump locations.



SECTION A-A

$A = 10' \times 6" = 5.0 \text{ sq. ft.}$

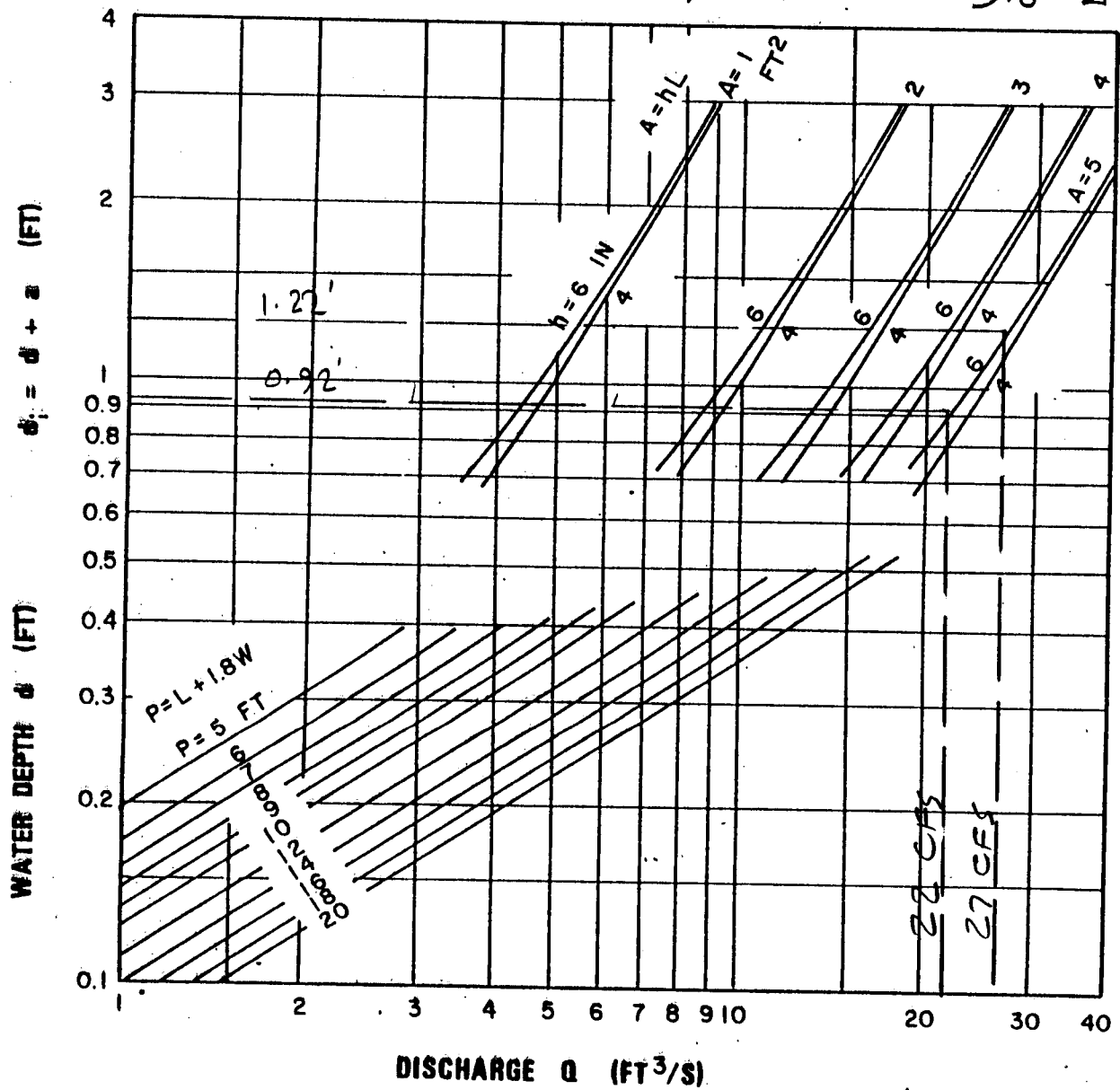


CHART 12. Depressed curb-opening inlet capacity in sump locations.

5.0 STREET FLOWS (2 YEAR):

BLUESTEM / HONEYTREE WILL HAVE COMB. C & G.

$$X\text{-SLOPE} = \frac{3/8''}{1} = 0.03125$$

$$Z = \frac{1}{0.03125} = 32$$

$$n(\text{ASPH.}) = 0.016$$

$$Z/n = \frac{32}{0.016} = 2,000$$

$$S = 0.0032$$

$$d = 0.55'$$

$$Q_{CAP.} = 14 \text{ CFS} \leftarrow (\text{HALF STREET})$$

$$Q_2 \text{ @ NODES } 100, 101, 102 \text{ \& } 104 < Q_{CAP}$$

$$Q_2 \text{ @ NODE } 103 = 21.5 \text{ CFS}$$

$$\begin{aligned} Q_2 (\text{FROM SOUTH}) &= \frac{D.A. (S)}{D.A.} \times 21.5 \\ &= \frac{3.5}{10.2} \times 21.5 = 7.4 \text{ CFS} \end{aligned}$$

$$Q_2 (\text{FROM NE}) = 21.5 - 7.4 = 14.1 \text{ CFS}$$

↑
O.K.

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

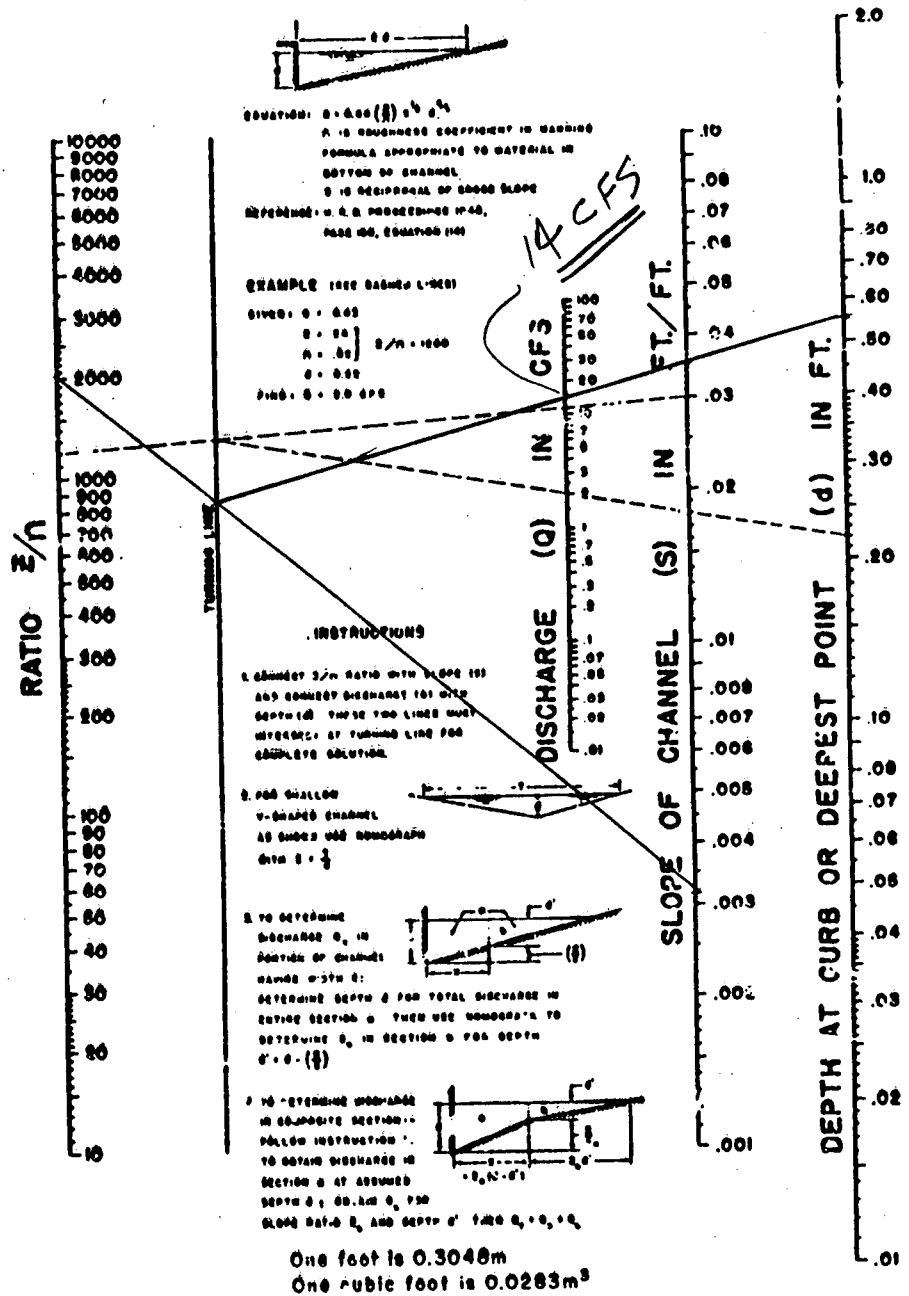
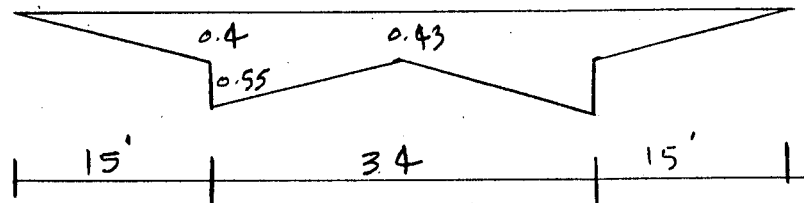


FIG. 5-1 (After FHWA)

6.0 STREET FLOW (100 YEAR)

$$\text{WALK GRADE} = + 0.4'$$



$$n(\text{PARKING}) = 0.03$$

$$n(\text{GUTTER}) = 0.013$$

$$n(\text{ASPHALT}) = 0.016$$

$$n(\text{COMP.}) = \frac{(2 \times 14.5 \times 0.03) + (2 \times 3.05 \times 0.013) + \frac{30 \times 0.01}{0.01}}{65.1}$$

$$n(\text{COMP.}) = 0.022$$

$$A = \frac{2 \times 0.4 \times 15}{2} + \frac{2 \times 0.52 \times 17}{2} + 0.43 \times 34$$

$$= 29.5 \text{ s.f.}$$

$$P = 65.1$$

$$R = \frac{A}{P} = \frac{29.5}{65.1} = 0.45$$

$$S = 0.0032$$

$$Q_{\text{CAP}} = 29.5 \times \frac{1.486}{0.022} \times 0.45^{\frac{2}{3}} \times 0.0032^{\frac{1}{2}}$$

$$Q_{\text{CAP}} = 66.0 \text{ CFS}$$

$$Q_{CAP} \text{ (HALF STREET)} = 66/2 = 33.0 \text{ CFS.}$$

$$Q_{100} \text{ @ NODE 101, 102 \& 103} < Q_{CAP}$$

O.K.

$$Q_{100} \text{ @ NODE 100} = 36.8 \text{ CFS}$$

$$\begin{aligned} Q_{100} \text{ @ } \underline{\text{NODE 100}} \text{ (FROM SOUTH)} &= \frac{D.A. \text{ (SOUTH)}}{D.A.} \times 36.8 \\ &= \frac{1.9}{6.4} \times 36.8 \\ &= 10.9 \text{ CFS} \leftarrow \text{O.K.} \end{aligned}$$

$$\begin{aligned} Q_{100} \text{ @ } \underline{\text{NODE 100}} \text{ (FROM NE)} &= 36.8 - 10.9 \\ &= 25.9 \text{ CFS.} \leftarrow \text{O.K.} \end{aligned}$$

$$Q_{100} \text{ @ NODE 103} = 58.6 \text{ CFS}$$

$$\begin{aligned} Q_{100} \text{ @ NODE 103 (FROM SOUTH)} &= \frac{D.A. \text{ (SOUTH)}}{D.A.} \times 58.6 \\ &= \frac{3.5}{10.2} \times 58.6 \\ &= 20.1 \text{ CFS} \leftarrow \text{O.K.} \end{aligned}$$

$$\begin{aligned} Q_{100} \text{ @ NODE 103 (FROM NE)} &= 58.6 - 20.1 \\ &= 38.5 \text{ CFS} \leftarrow \\ &= 33.0 \text{ CFS.} \end{aligned}$$

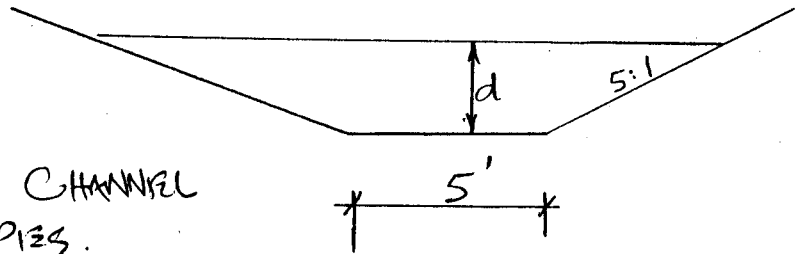
O.K.

7.0 OVERFLOW CHANNEL

$$\text{TOTAL } Q_{150} = 141.9 \text{ CFS}$$

$$\text{TOTAL } Q_2 = 52.0 \text{ CFS}$$

$$89.9 \text{ CFS}$$



TRY 5' BOTTOM CHANNEL
WITH 5:1 SLOPES.

$$S = 0.005$$

$$d = 1.75'$$

$$A = 5 \times 1.75 + 2 \times 1.75 \times 5 \times 1.75 / 2$$
$$= 24.1 \text{ SF.}$$

$$P = 5 + 2 \sqrt{(1.75^2 + (5 \times 1.75)^2)}$$
$$= 22.8$$

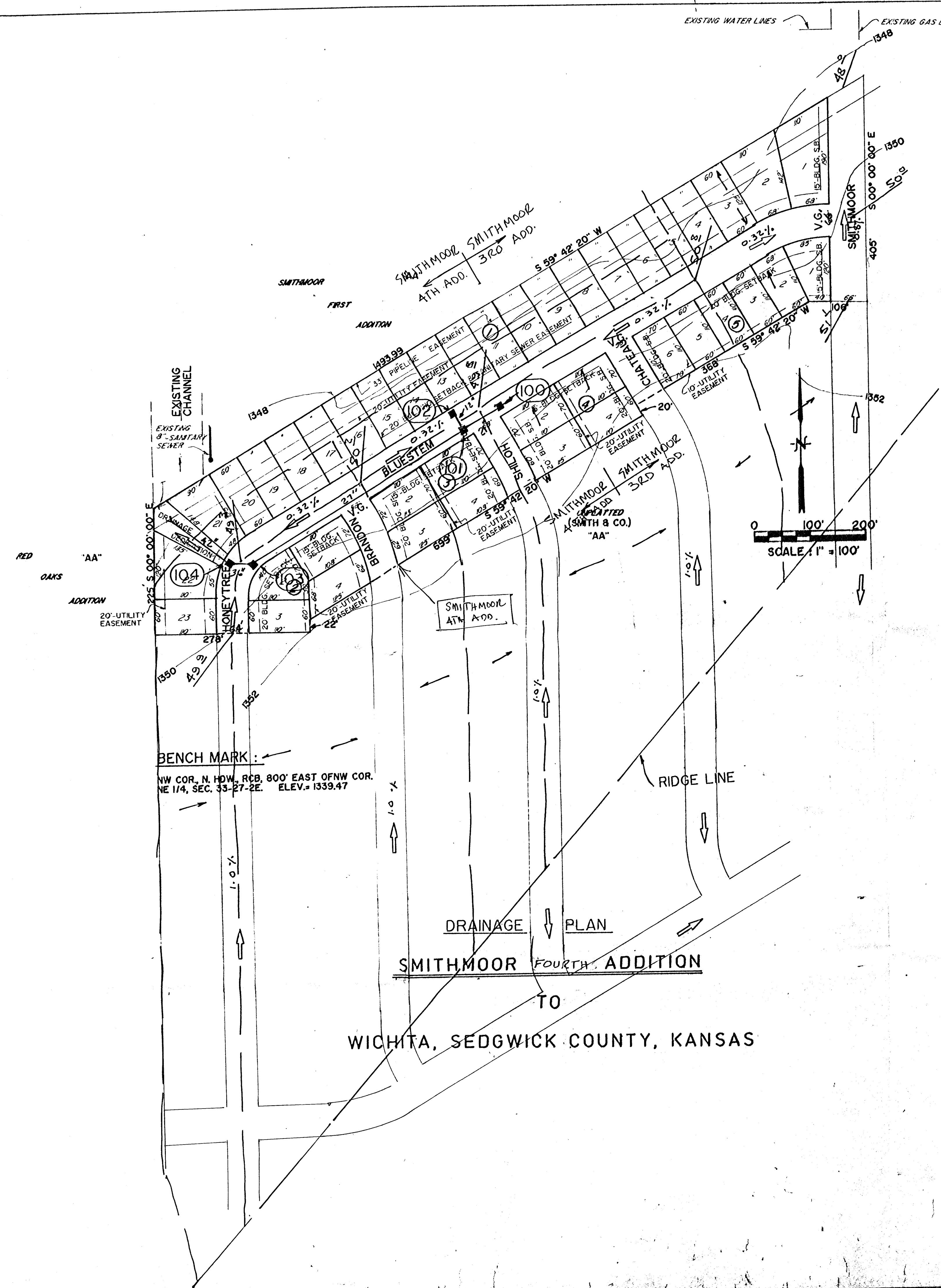
$$R = 24.1 / 22.8 = 1.057$$

$$Q_{CAP} = 24.1 \times \frac{1.486}{0.03} \times 1.057^{2/3} \times 0.005^{1/2}$$

$$= 87.6 \text{ CFS} \quad \underline{\underline{89.9 \text{ CFS}}}$$

O.K. ←

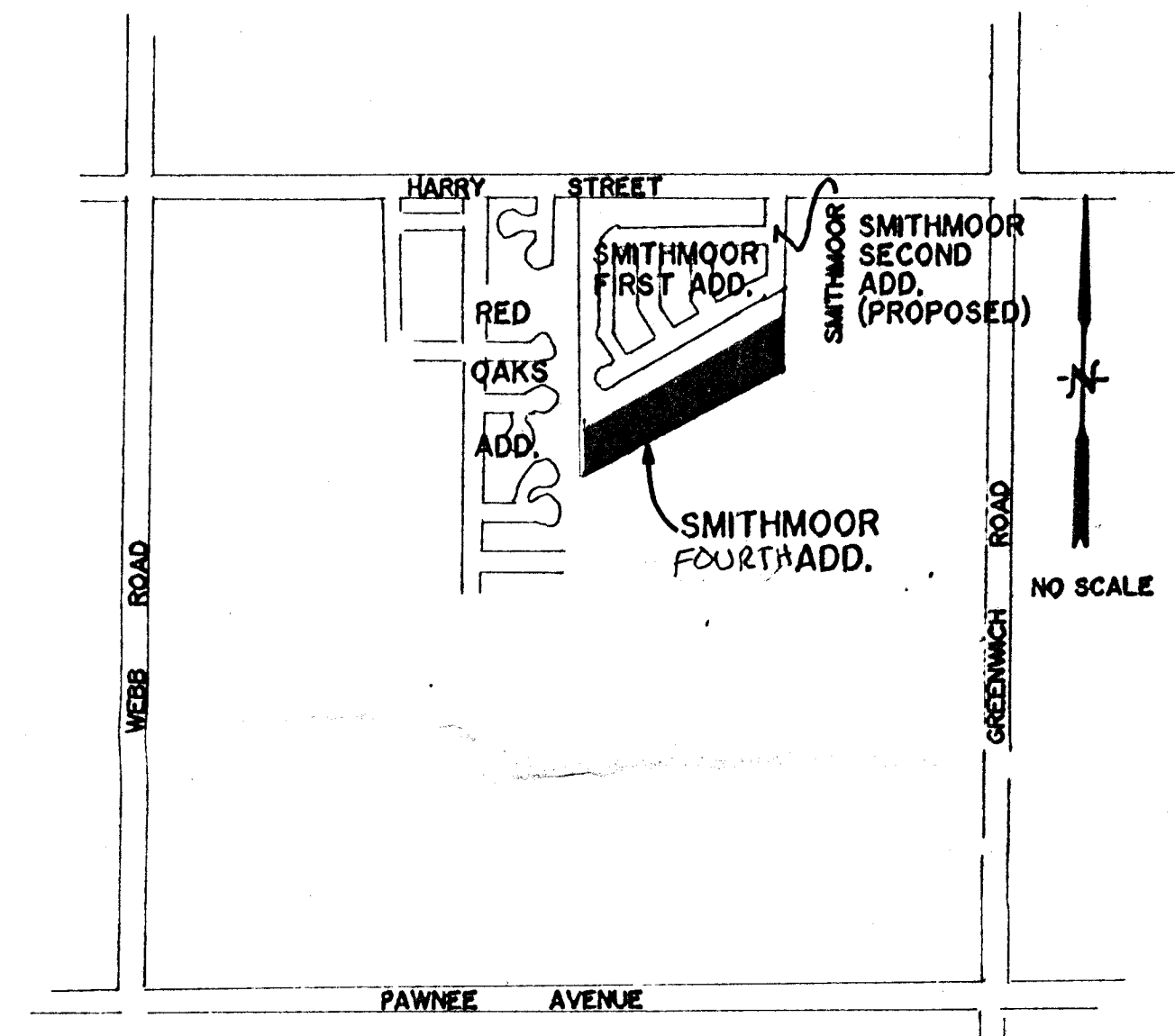
$$\text{MIN. DRAINAGE DEDICATION} = 2 \times 1.75 \times 5 + 5$$
$$= 22.5' \approx 25'$$



UNPLATTED
"R-6"
(SMITH & CO.)

SCALE 1" = 100'

SMITHMOOR FOURTH ADDITION
TO
WICHITA, SEDGWICK COUNTY, KANSAS



VICINITY MAP

SUBDIVIDER:
SMITH & CO., INC.
P.O. BOX 780595
WICHITA, KANSAS 67278



TOPOGRAPHIC SURVEY FURNISHED BY OWNER

BABAR M. KHAN, P.E., L.S.
MUNICIPAL ENGINEERS
Civil Engineers & Land Surveyors
254 Laura, Suite 201
Wichita, Kansas 67214
50-02 FEB 1994