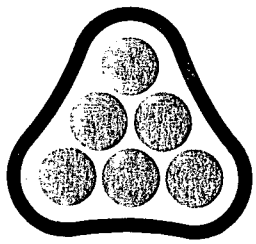


PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

DRAINAGE PLAN

AND

SUPPORTING CALCULATIONS

FOR

SMITHMOOR FIRST ADDITION

TO SEDGWICK COUNTY, KANSAS

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

ENGINEERS

WICHITA, KANSAS

JUNE 19, 1986

1440 EAST ENGLISH
WICHITA, KANSAS 67211
(316) 262-2691

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

Date June 13, 1986 Page 1 of 13

Project Smithmoor 1st Addition

Item Drainage Plan

HYDROLOGY

Determine Total Drainage Area.

From p. 2 D.A. = 203 Acres.

∴ Use Rational Method

From page 3, Soil Type = Type D

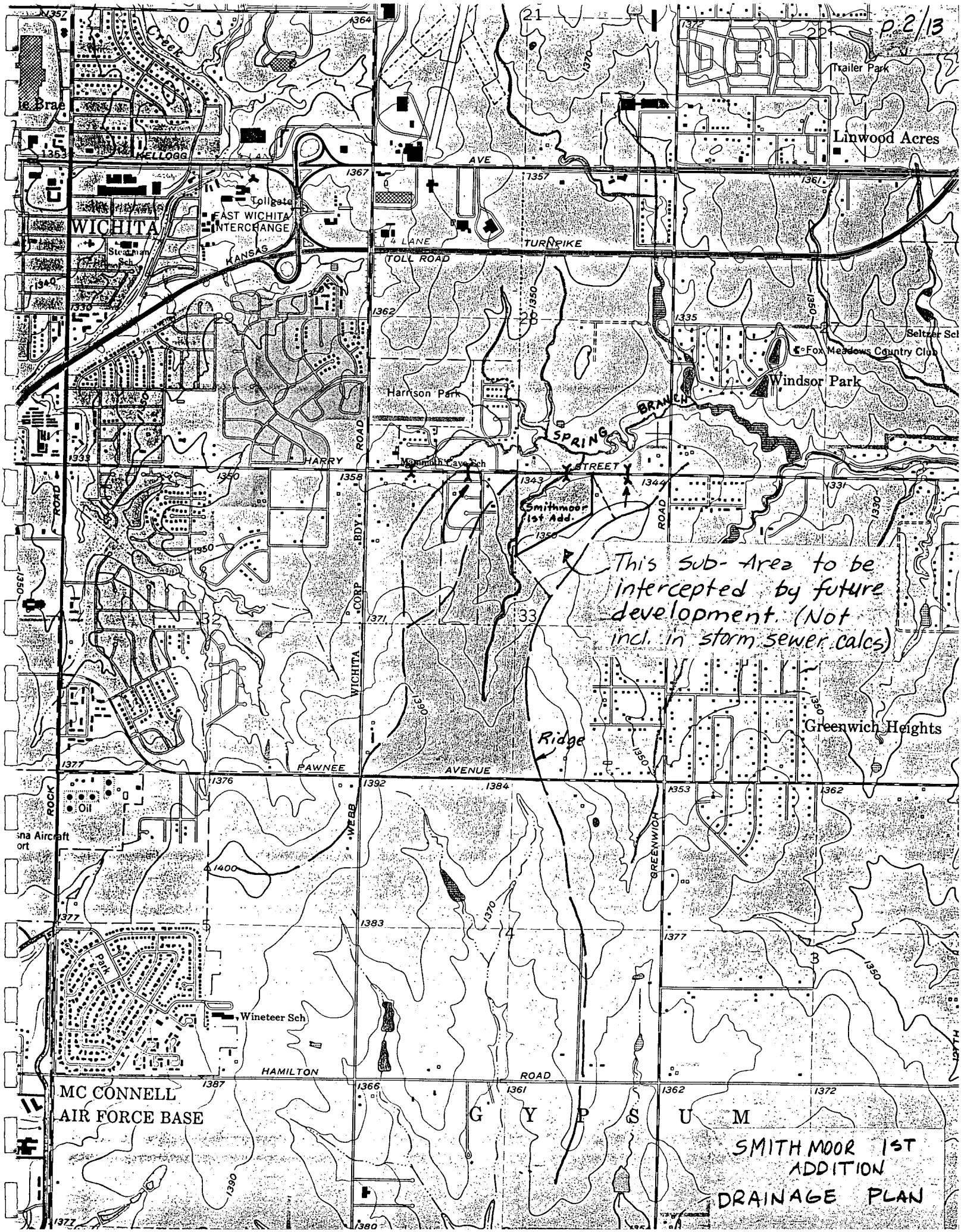
Avg. Lot Size = 65 x 115' ≈ 0.18 Ac. USE 1/4 Ac.

$C_2 = 0.50$ $C_{100} = 0.76$

Determine t_c to each node:

Node	Time		USE
100	— Headwall		—
101	(140' @ 0.45 fps) + (300' @ 4 fps) =	6.4	15
102	(200' @ 0.45 fps) + (850' @ 4 fps) =	10.9	15
103	(110' @ 0.45 fps) + (650' @ 4 fps) =	6.8	15
104	— Manhole		—
105	(250' @ 0.45 fps) + (750' @ 4 fps) =	12.4	15
106	(200' @ 0.45 fps) + (950 @ 4 fps) =	11.4	15
107	(110' @ 0.45 fps) + (550' @ 4 fps) =	6.4	15
108	(120' @ 0.45 fps) + (1000' @ 4 fps) =	8.6	15

For t_c = 15 min I_2 = 3.83 "/hr I_{100} = 7.37 "/hr.


Trailer Park
Linwood Acres
Tollgate
EAST WICHITA INTERCHANGE
WICHITA
KANSAS
4 LANE
TURNPIKE
TOLL ROAD
Fox Meadows Country Club
Windsor Park
Harrison Park
SPRING BRANCH
HARRY
ROAD
STREET
Smithmoor 1st Add.
This sub-Area to be intercepted by future development. (Not incl. in storm sewer calcs)
Greenwich Heights
Ridge
PAWNEE
AVENUE
WICHITA
CORP BDY
ROCK
WEBB
GREENWICH
Oil
Park
Wineteer Sch
HAMILTON
ROAD
MC CONNELL
AIR FORCE BASE
G Y P S U M
SMITH MOOR 1ST ADDITION
DRAINAGE PLAN

Smithmoor 1st Addition
Drainage Plan

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

Date June 13, 1986 Page 4 of 13

Project Smithmoor 1st Addition

Item Drainage Plan

Determine Q_2 for each node

Node	C_2	I_2	A	Q_2 *	
100	-	-	-	0	(Headwall)
101	0.5	3.83	2.0	3.8	
102	0.5	3.83	5.0	9.6	
103	0.5	3.83	2.0	3.8	
104	-	-	-	0	(Manhole)
105	0.5	3.83	4.0	7.6	
106	0.5	3.83	5.2	10.0	
107	0.5	3.83	1.8	3.4	
108	0.5	3.83	4.7	9.0	

* these values will be input as "known Q" in computer program.

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

Date June 13, 1986 Page 5 of 13

Project Smithmoor 1st Addition

Item Drainage Plan

Determine Q_{100} for Each Node:

Node	C_{100}	I_{100}	A	Q_{100}	
100	-	-	-	0	(Headwall)
101	0.76	7.37	2.0	11.2	
102	0.76	7.37	5.0	28.0	
103	0.76	7.37	2.0	11.2	
104	-	-	-	0	(Manhole)
105	0.76	7.37	4.0	22.4	
106	0.76	7.37	5.2	29.1	
107	0.76	7.37	1.8	10.1	
108	0.76	7.37	4.7	26.3	

6/13

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

ATTACHMENT A CONTINUED
Page 3

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

(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

11/13

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.

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

12/13

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

```
100 j,  1338.0000  100    3     8
110 t,smithmoor first addition
120 t,drainage plan
130 t,storm water system 100    2 year storm
140 i,  108     0.50     4.70     0.00     0.00     9.00    15.00  1340.60
150 i,  107     0.50     1.80     0.00     0.00     3.40    15.00  1340.40
160 i,  106     0.50     5.20     0.00     0.00    10.00    15.00  1340.40
170 i,  105     0.50     4.00     0.00     0.00     7.60    15.00  1344.80
180 m,  104  1344.00
190 i,  103     0.50     2.00     0.00     0.00     3.80    15.00  1340.40
200 i,  102     0.50     5.00     0.00     0.00     9.60    15.00  1340.20
210 i,  101     0.50     2.00     0.00     0.00     3.80    15.00  1340.20
220 m,  100  1338.00
230 p,  108  107     70.00   24 0.013   90.00     0.00
240 p,  107  106     35.00   27 0.013   90.00     0.00
250 p,  106  101    260.00   36 0.013   90.00     0.00
260 p,  105  104     90.00   18 0.013   15.00     0.00
270 p,  104  102    400.00   18 0.013    0.00     0.00
280 p,  103  102     60.00   15 0.013   90.00     0.00
290 p,  102  101     35.00   36 0.013    0.00     0.00
300 p,  101  100    140.00   42 0.013    0.00     0.00
310 e
```

Date: 06-1[illegible]-86
Time: 15:27:02

Input File: smith

smithmoor first addition
drainage plan
storm water system 100 2 year storm

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Node	to Node	C	Tributary Area Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	Hydrology Summation TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Conduit Data Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
108	107	0.50	4.70	0.00	0.0	15.00	4.06	9.00	15.00	4.06	9.00	9.00	24"	2.86	70.00	0.41	15.41
107	106	0.50	1.80	0.00	0.0	15.00	4.06	3.40	15.41	4.02	3.36	12.36	27"	3.11	35.00	0.19	15.59
106	101	0.50	5.20	0.00	0.0	15.00	4.06	10.00	15.59	4.00	9.85	22.21	36"	3.14	260.00	1.38	16.97
105	104	0.50	4.00	0.00	0.0	15.00	4.06	7.60	15.00	4.06	7.60	7.60	18"	4.30	90.00	0.35	15.35
104	102	0.00	0.00	0.00	0.0	0.00	0.00	0.00	15.35	4.02	0.00	7.60	18"	4.30	400.00	1.55	16.90
103	102	0.50	2.00	0.00	0.0	15.00	4.06	3.80	15.00	4.06	3.80	3.80	15"	3.10	60.00	0.32	15.32
102	101	0.50	5.00	0.00	0.0	15.00	4.06	9.60	16.90	3.87	9.16	20.42	36"	2.89	35.00	0.20	17.10
101	100	0.50	2.00	0.00	0.0	15.00	4.06	3.80	17.10	3.86	3.61	46.18	42"	4.80	140.00	0.49	17.59

2/12

Da[illegible]06-1[illegible]36
Time: 15:27:02

Input File: smith

smithmoor first addition
drainage plan
storm water system 100 2 year storm

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)
108	0.00158	0.1108	0.0000	0.0000	0.0000	0.0000	0.0000	0.1108	1339.6449	1340.6000	0.96
107	0.00159	0.0558	0.0000	0.0023	0.0000	0.0637	0.1187	0.2405	1339.5341	1340.4000	0.87
106	0.00111	0.2884	0.0000	0.0003	0.0000	0.0751	0.1834	0.5473	1339.2936	1340.4000	1.11
105	0.00523	0.4711	0.0000	0.0000	0.0000	0.0000	0.0000	0.4711	1341.6337	1344.8000	3.17
104	0.00523	2.0939	0.0000	0.0000	0.0144	0.0167	0.0262	2.1512	1341.1626	1344.0000	2.84
103	0.00346	0.2076	0.0000	0.0000	0.0000	0.0000	0.0000	0.2076	1339.2191	1340.4000	1.18
102	0.00094	0.0328	0.0000	0.0315	0.0000	0.0000	0.2008	0.2651	1339.0115	1340.2000	1.19
101	0.00211	0.2950	0.0000	0.0204	0.0000	0.0767	0.3543	0.7464	1338.7463	1340.2000	1.45
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1338.0000	1338.0000	0.00

3/12

```
110 t,smithmoor first addition
120 t,drainage plan
130 t,storm water system 100    100 year storm
140 i,  103     0.76     4.70     0.00     0.00    26.30    15.00  1340.60
150 i,  107     0.76     1.80     0.00     0.00    10.10    15.00  1340.40
160 i,  106     0.76     5.20     0.00     0.00    29.10    15.00  1340.40
170 i,  105     0.76     4.00     0.00     0.00    22.40    15.00  1344.80
180 m,  104  1344.00
190 i,  103     0.76     2.00     0.00     0.00    11.20    15.00  1340.40
200 i,  102     0.76     5.00     0.00     0.00    28.00    15.00  1340.20
210 i,  101     0.76     2.00     0.00     0.00    11.20    15.00  1340.20
220 m,  100  1338.00
230 p,  108  107    70.00   24 0.013   90.00     0.00
240 p,  107  106    35.00   27 0.013   90.00     0.00
250 p,  106  101   260.00   36 0.013   90.00     0.00
260 p,  105  104    90.00   18 0.013   15.00     0.00
270 p,  104  102   400.00   18 0.013    0.00     0.00
280 p,  103  102    60.00   15 0.013   90.00     0.00
290 p,  102  101    35.00   36 0.013    0.00     0.00
300 p,  101  100   140.00   42 0.013    0.00     0.00
310 e
```

4/12

Input File: smit100

smithmoor first addition
drainage plan
storm water system 100 100 year storm

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

Node	to Node	C	Tributary Area Area (Ac)	Slope (%)	Length (Ft)	TC(0) (Min)	I(0) (In/Hr)	Q(0) (CFS)	Hydrology Summation TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Conduit Data Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
108	107	0.76	4.70	0.00	0.0	15.00	8.97	26.30	15.00	8.97	26.30	26.30	24"	8.37	70.00	0.14	15.14
107	106	0.76	1.80	0.00	0.0	15.00	8.97	10.10	15.14	8.94	10.06	36.36	27"	9.15	35.00	0.06	15.20
106	101	0.76	5.20	0.00	0.0	15.00	8.97	29.10	15.20	8.93	28.95	65.31	36"	9.24	260.00	0.47	15.67
105	104	0.76	4.00	0.00	0.0	15.00	8.97	22.40	15.00	8.97	22.40	22.40	18"	12.68	90.00	0.12	15.12
104	102	0.00	0.00	0.00	0.0	0.00	0.00	0.00	15.12	8.95	0.00	22.40	18"	12.68	400.00	0.53	15.64
103	102	0.76	2.00	0.00	0.0	15.00	8.97	11.20	15.00	8.97	11.20	11.20	15"	9.13	60.00	0.11	15.11
102	101	0.76	5.00	0.00	0.0	15.00	8.97	28.00	15.64	8.83	27.54	60.99	36"	8.63	35.00	0.07	15.71
101	100	0.76	2.00	0.00	0.0	15.00	8.97	11.20	15.71	8.81	11.00	137.24	42"	14.26	140.00	0.16	15.88

5/12

Date: 6-1-06
Time: 09:05:50

Input File: smit100

smithmoor first addition
drainage plan
storm water system 100 100 year storm

Storm Frequency = 100-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)
108	0.01352	0.9461	0.0000	0.0000	0.0000	0.0000	0.0000	0.9461	1352.3828	1340.6000	-11.78
107	0.01379	0.4825	0.0000	0.0211	0.0000	0.5441	1.0509	2.0986	1351.4368	1340.4000	-11.04
106	0.00959	2.4930	0.0000	0.0027	0.0000	0.6494	1.5846	4.7297	1349.3381	1340.4000	-8.94
105	0.04547	4.0926	0.0000	0.0000	0.0000	0.0000	0.0000	4.0926	1369.7904	1344.8000	-24.99
104	0.04547	18.1894	0.0000	0.0000	0.1247	0.1453	0.2278	18.6872	1365.6978	1344.0000	-21.70
103	0.03006	1.8036	0.0000	0.0000	0.0000	0.0000	0.0000	1.8036	1348.8141	1340.4000	-8.41
102	0.00836	0.2927	0.0000	0.2678	0.0000	0.0000	1.8416	2.4021	1347.0105	1340.2000	-6.81
101	0.01861	2.6050	0.0000	0.1834	0.0000	0.6628	3.1571	6.6084	1344.6084	1340.2000	-4.41
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	1338.0000	1338.0000	0.00

6/12

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

Date June 16, 1986 Page 7 of 12

Project Smithmoor 1st Addition

Item Drainage Plan

Check Street Flow 2-year storm

Node	Q_2	Distribution of Flow	d #	Comment
108	9.0	50% From W @ 0.4%	0.36'	OK *
		50% From S @ 0.87%	0.31'	OK
107	3.4	90% From S @ 0.87%	0.27'	OK
		10% From E @ 0.32%	0.15'	OK
106	10.0	95% From W @ 0.40%	0.47	OK
		5% From E @ 0.32%	0.17'	OK
105	7.6	80% From W @ 0.32%	0.43'	OK
		20% From E @ 0.60%	0.22'	OK
104	-	(Manhole)	-	
103	3.8	90% From S @ 0.90%	0.28'	OK
		10% From W @ 0.32%	0.15'	OK
102	9.6	60% From E @ 0.65%	0.36'	OK
		40% From S @ 0.90%	0.29'	OK
101	3.8	75% From E @ 0.65%	0.28	OK
		25% From W @ 0.32%	0.21	OK
100	-	(End Section or Headwall)		

* Based on Standard Curb & Gutter

See Page 8

X-Slope = 3/8 "/Ft = .0325 "

$Z = \frac{1}{X\text{-Slope}} = \frac{1}{0.03125} = 32$

$n = 0.016$

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

Smithmoor 1st Add.
Drainage Plan

8/12

Chart 1

EQUATION: $Q = 0.56\left(\frac{Z}{n}\right) S^{\frac{1}{2}} d^{\frac{8}{3}}$

n IS ROUGHNESS COEFFICIENT IN MANNING FORMULA APPROPRIATE TO MATERIAL IN BOTTOM OF CHANNEL

Z IS RECIPROCAL OF CROSS SLOPE

REFERENCE: H. R. B. PROCEEDINGS 1946, PAGE 150, EQUATION (14)

EXAMPLE (SEE INSTRUCTION 1)

GIVEN: S = 0.03
Z = 24
n = .02
Z/n = 1200
Q = 20 CFS

FIND: d = 0.22 BY FOLLOWING DASHED LINES

RATIO Z/n: 10000, 9000, 8000, 7000, 6000, 5000, 4000, 3000, 2000, 1000, 900, 800, 700, 600, 500, 400, 300, 200, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10

TURNING LINE

DISCHARGE (Q) IN CFS: 100, 70, 50, 30, 20, 10, 7, 5, 3, 2, 1, .7, .5, .3, .2, .1, .07, .05, .03, .02, .01

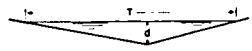
SLOPE OF CHANNEL (S) IN FT./FT.: .10, .08, .07, .06, .05, .04, .03, .02, .01, .008, .007, .006, .005, .004, .003, .002, .001

DEPTH AT CURB OR DEEPEST POINT (d) IN FT.: 2.0, 1.0, .80, .70, .60, .50, .40, .30, .20, .10, .08, .07, .06, .05, .04, .03, .02, .01

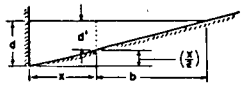
INSTRUCTIONS

1. CONNECT Z/n RATIO WITH SLOPE (S) AND CONNECT DISCHARGE (Q) WITH POINT WHERE LINE CROSSES TURNING LINE READ DEPTH AT CURB (d) Q CAN BE FOUND FROM d BY CONNECTING d WITH CROSSING OF TURNING LINE.

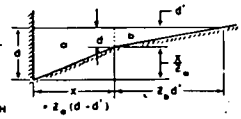
2. FOR SHALLOW V-SHAPED CHANNEL AS SHOWN USE NOMOGRAPH AS EXPLAINED IN INSTRUCTION 1 BUT WITH $Z = \frac{T}{d}$



3. TO DETERMINE DISCHARGE Q_x IN PORTION OF CHANNEL HAVING WIDTH X: DETERMINE DEPTH d FOR TOTAL DISCHARGE IN ENTIRE SECTION AS EXPLAINED IN 1. THEN USE NOMOGRAPH TO DETERMINE Q_b IN SECTION OF WIDTH b FOR DEPTH $d' = d - \left(\frac{X}{Z}\right)$. THEN $Q_x = Q - Q_b$.



4. TO DETERMINE DISCHARGE (Q_T) IN COMPOSITE SECTION:- FOLLOW INSTRUCTION 3. TO OBTAIN DISCHARGE (Q_a) IN SECTION a AT ASSUMED DEPTH d BASED ON AN EXTENSION OF SLOPE RATIO Z_a TO INTERSECT WATER SURFACE; OBTAIN Q_b FOR SLOPE RATIO Z_b AND DEPTH d'; $d' = d - \frac{X}{Z_a}$ THEN $Q_T = Q_a + Q_b$.



BUREAU OF PUBLIC ROADS
REV. JAN. 1968

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

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

Date June 16, 1986 Page 9 of 12

Project Smithmoor 1st Addition

Item Drainage Plan

Check Street Flow - 100-yr Storm.

Street Location	Contributing Area	Q_{100}	$Q_{allow.}$ #	Comment
Lockmoor (west of Shiloh)	50% Node 108	13.2		
	90% Node 106	26.2		
		39.4	48	OK
Shiloh (south of Lockmoor)	50% Node 108	13.2		
	100% Node 107	10.1		
		23.3	71	OK
Honeytree (south of Lockmoor)	100% Node 103	11.2		
	40% Node 102	11.2		
	$Q_{100}-Q_2$ Node 105	14.8		
		37.2	72	OK
Smithmoor (south of Lockmoor)	60% Node 102	16.8		
		16.8	72	OK
Lockmoor (east of Honeytree)	60% Node 102	16.8		
	75% Node 101	8.4		
		25.2	61	OK
Lockmoor (west of Honeytree	$Q_{100}-Q_2$ Node 108	17.3		
	$Q_{100}-Q_2$ Node 107	6.7		
	$Q_{100}-Q_2$ Node 106	19.1		
		43.1	45	OK

$Q_{allow} = 758.94\sqrt{S}$ (See Page 10)

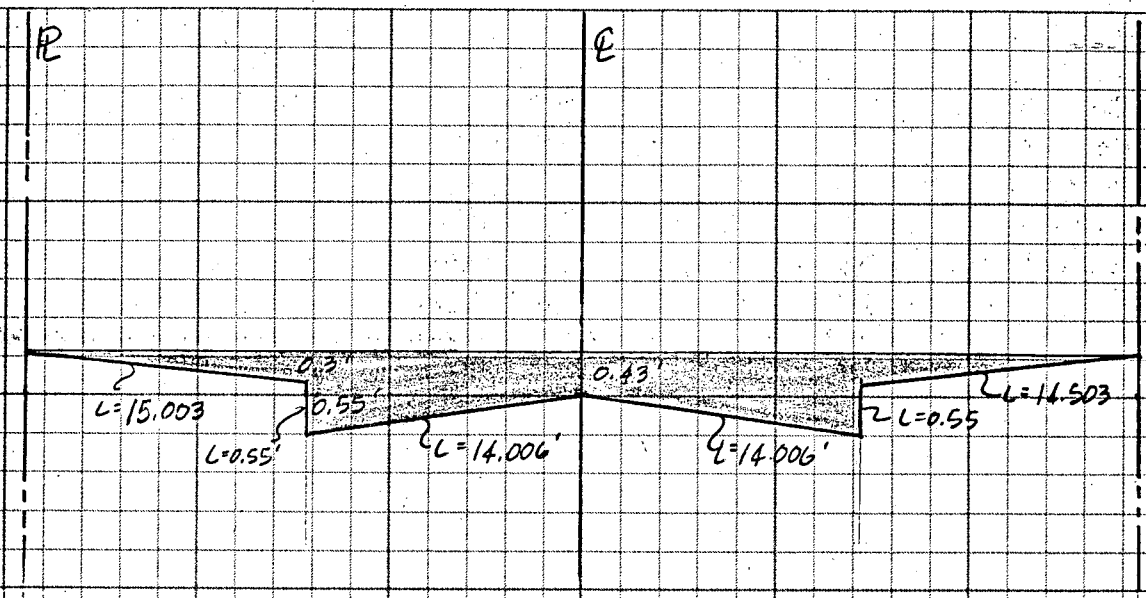
where S = long. street slope in Ft/Ft.

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

Date June 16, 1986 Page 10 of 12

Project Smithmoor 1st Addition

Item Drainage Plan



$$\text{Composite } n = \frac{(2\times 15.003\times 0.03)+(2\times 0.55\times 0.016)+(2\times 14.006\times 0.016)}{(2\times 15.003)+(2\times 0.55)+(2\times 14.006)} = 0.023$$

$$\text{Area} = (2\times \tfrac{1}{2}\times 0.3'\times 15.0)+(28'\times .43')+(2\times \tfrac{1}{2}\times .42\times 14.0) = 22.42'$$

$$p = (2\times 15.003)+(2\times 0.55)+(2\times 14.006) = 59.118''$$

$$R = A/p = 22.42/59.118 = 0.379242$$

$$Q_{allow} = \frac{1.486}{n} AR^{2/3} S^{1/2} = \frac{1.486}{0.023}(22.42)(0.379242)^{2/3} S^{1/2}$$

$$= (64.6087)(22.42)(0.52394)$$

$$= 758.94\ S^{1/2}$$

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

Date June 16, 1986 Page 11 of 12

Project Smithmoor 1st Addition

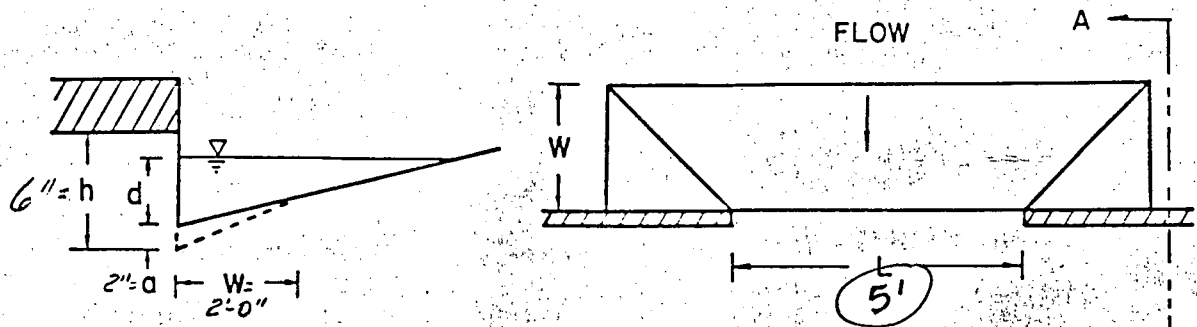
Item Drainage Plan

Check Inlet Sizes Based on 2-yr. storm

Node	Inlet Condition	Q_2	Q_{allow} #	Comment
100	- (Headwall)			
101	Sump	3.8	11.0	USE 1 Type 1A, L=
102	Sump	9.6	11.0	"
103	Sump	3.8	11.0	"
104	— (Manhole)			
105	Sump	7.6	11.0	"
106	Sump	10.0	11.0	"
107	Sump	3.4	11.0	"
108	Sump	9.0	11.0	"

from chart, page 12 L = 5'

Smithmoor 1st Addition 12/12
Drainage Plan



DEF. SKETCH, C.O.W. TYPE IA INLET

d allowable = 11" = 0.92'
From C-O-W Std Detail

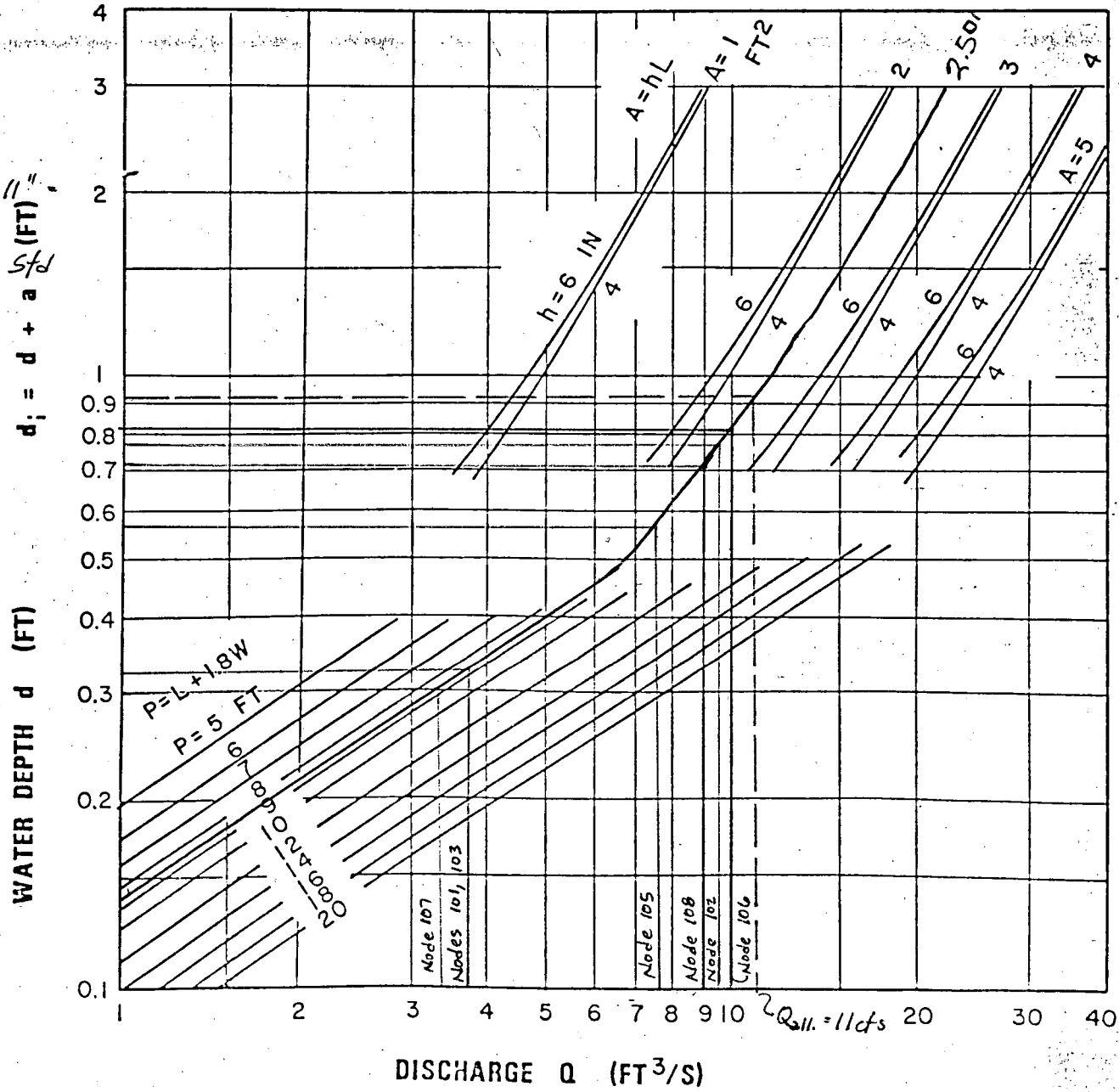


CHART 12. Depressed curb-opening inlet capacity in sump locations.

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

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

Date June 17, 1986 Page 1 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Channel Improvements - West side of Property (Also on N side - west of box)

100-YEAR STORM

D.A. = 207 Ac. (see page 2)

composite c = 40 Ac. ± residential (1/4 Ac Lots Type D) c = 0.76
(Red-Oaks / Huntcrest)

167 Ac agricultural pasture, c = 0.67
(1-4% slopes Type D soil)

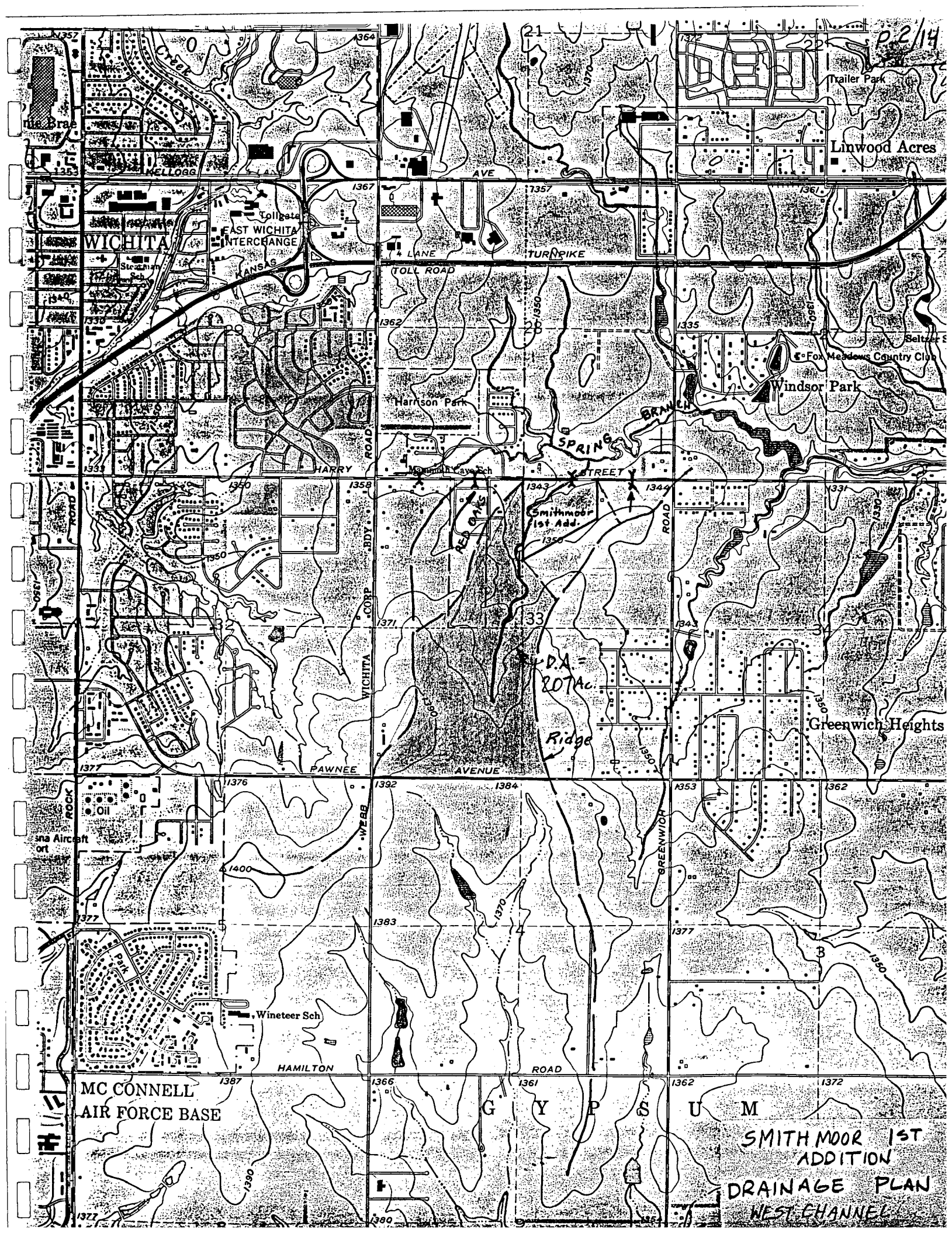
$$\text{comp. } c = \frac{(40 \times 0.76) + (167 \times 0.67)}{207} = 0.69$$

t_c = 1700 Ft @ 0.45 fps = 63 min (overland flow)
4000 Ft @ 5 fps = 13 min (channelized flow)
76 min

I_{100} = 3.26 inches/hr.

$Q_{100} = C_{100} I_{100} A = 0.69 \times 3.26 \times 207$
= 466 cfs

A-4


Trailer Park
Linwood Acres
KELLOGG
AVE
Tollgate
EAST WICHITA
INTERCHANGE
WICHITA
KANSAS
4 LANE
TURNPIKE
TOLL ROAD
Fox Meadows Country Club
Windsor Park
Harrison Park
SPRING
BRANCH
HARRY
STREET
ROAD
Smithmoor 1st Add.
RED OAKS
CORP BDY
WICHITA
D.A. = 207 Ac.
Ridge
Greenwich Heights
PAWNEE
AVENUE
ROCK
Oil
Park
Wineteer Sch
HAMILTON
ROAD
GREENWICH
MC CONNELL
AIR FORCE BASE
G Y P S U M
SMITH MOOR 1ST ADDITION
DRAINAGE PLAN
WEST CHANNEL

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

Date June 17, 1986 Page 3 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Channel Design

Q = 466 cfs

slope = $\frac{1340 \text{ @ Huntcrest} - 1335 \text{ @ Harry St. Box}}{2400'} = 0.2\%$

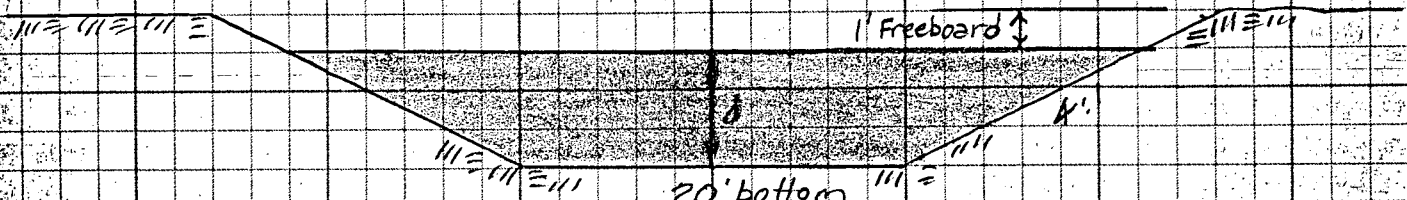
Use Manning's Eq'n $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$ where Q = 466 cfs
n = 0.030
S = 0.002 Ft/Ft

$466 = \frac{1.486}{0.03} A R^{2/3} (0.002)^{1/2}$

$466 = 49.53\ A R^{2/3}\ 0.044721$

$A R^{2/3} = 210.4$

TRIAL #1



d	A	p	R	$R^{2/3}$	$AR^{2/3}$	
3'	96	44.73	2.14	1.66	159	
3.5'	119	48.86	2.44	1.81	215	← USE
3.4'	114.24	48.04	2.38	1.78	203	

d = 3.5' $V = Q/A = 466/119 = 3.9$ OK

MIN. TOTAL WIDTH REQ'D = $(2 \times 15') + (2 \times [3.5' + 1'] 4) + 20' = 86'$

WHERE ADJACENT TO HARRY, MIN. W = $15' + 20' + (2 \times 4 \times 4.5) = 71'$

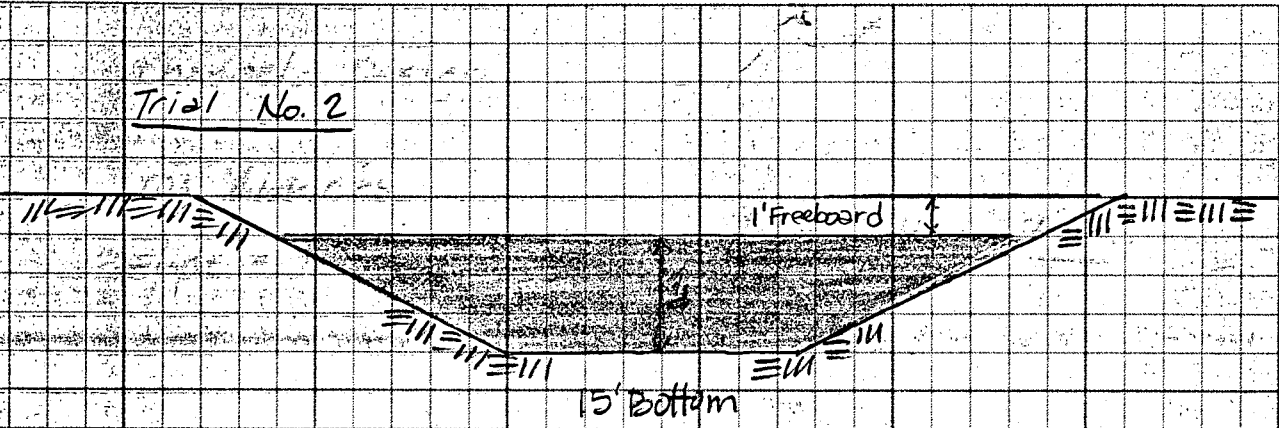
PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date June 17, 1986 Page 4 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Trial No. 2



Req'd $AR^{2/3} = 210.4$

d	A	P	R	$R^{2/3}$	$AR^{2/3}$	
3.5	101.5	43.86	2.31	1.75	177.6	
4.0	124.0	47.98	2.58	1.88	233.5	
3.7	110.26	45.51	2.42	1.80	198.9	
3.8	114.76	46.34	2.48	1.83	210.1	← USE

$d = 3.8'$ $V = Q/A = 466/114.76 = 4.06$ fps OK

MIN TOTAL WIDTH REQ'D = $(2 \times 15') + 2(3.8' + 1.0')4 + 15' = 83.4'$

WHERE ADJACENT TO HARRY STREET, MIN. W = $15' + 15' + (2 \times 4 \times 4.8) = 68$

USE TRIAL NO. 2 (requires less excavation)

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

Date June 17, 1986 Page 5 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Channel Improvements - North side of Property (east of box)

D.A. = 26 Acres (see page 6)

C = 0.67 (see page 1)

t_c = 1000' @ 0.45 fps = 37.0
2000' Channelize flow @ 4 fps = 8.3
45.3 min

I_{100} = 4.38

$Q_{100} = C_{100} I_{100} A = 0.67 \times 4.38 \times 26 =$ 76 cfs

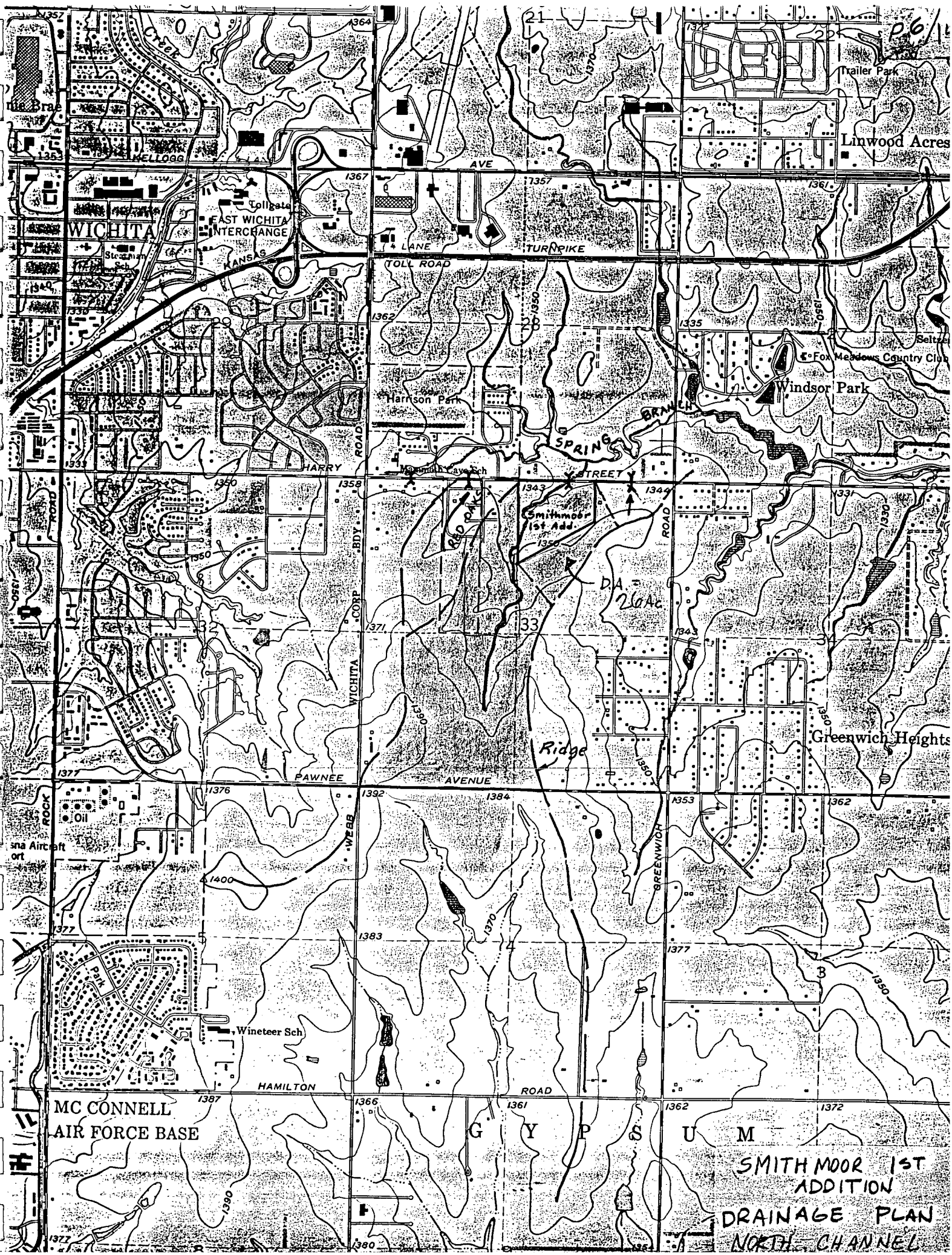
USE Manning's Equation

$$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$$ where n = 0.03, Q = 76 cfs, S = 0.002 FT/FT

$$76 = \frac{1.486}{0.03} A R^{2/3} (0.002)^{1/2}$$

$$76 = 49.53 \; A R^{2/3} \; 0.044721$$

$$A R^{2/3} = 34.3$$

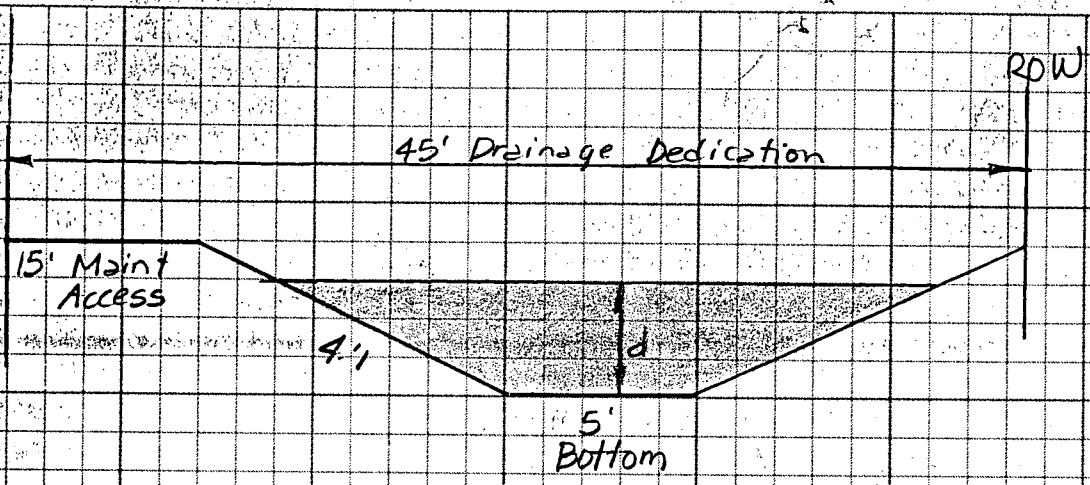

P6
Trailer Park
Linwood Acres
AVE
Tollgate
EAST WICHITA
INTERCHANGE
WICHITA
LANE
TURNPIKE
KANSAS
TOLL ROAD
Fox Meadows Country Club
Windsor Park
Harrison Park
SPRING
BRANCH
HARRY
ROAD
Mammoth Cave Sch
STREET
Smithmoor
1st Add.
ROAD
D.A.
26 Ac
WICHITA
CORP
BDY
Ridge
Greenwich Heights
PAWNEE
AVENUE
ROCK
Oil
WEBB
GREENWICH
Park
Wineteer Sch
HAMILTON
ROAD
MC CONNELL
AIR FORCE BASE
G Y P S U M
SMITH MOOR 1ST
ADDITION
DRAINAGE PLAN
NORTH CHANNEL

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

Date June 17, 1986 Page 7 of 14

Project Smithmoor 1st Addition

Item Drainage Plan



Required $AR^{2/3} = 34.3$

d	A	P	R	$R^{2/3}$	$AR^{2/3}$	
2.0'	26	21.49	1.21	1.13	29.5	
2.1'	28.14	22.32	1.26	1.17	32.8	
2.2'	30.36	23.14	1.31	1.20	36.4	← USE

$d = 2.2'$ $V = Q/A = 76/30.36 = 2.5$ OK

MIN. TOTAL WIDTH REQUIRED = $15' + 5' + 2 \times 4 \times (2.2 + 1.0)$

$= 20 + 25.6$

$= 45.6'$

OK

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

Date June 17, 1986 Page 8 of 14

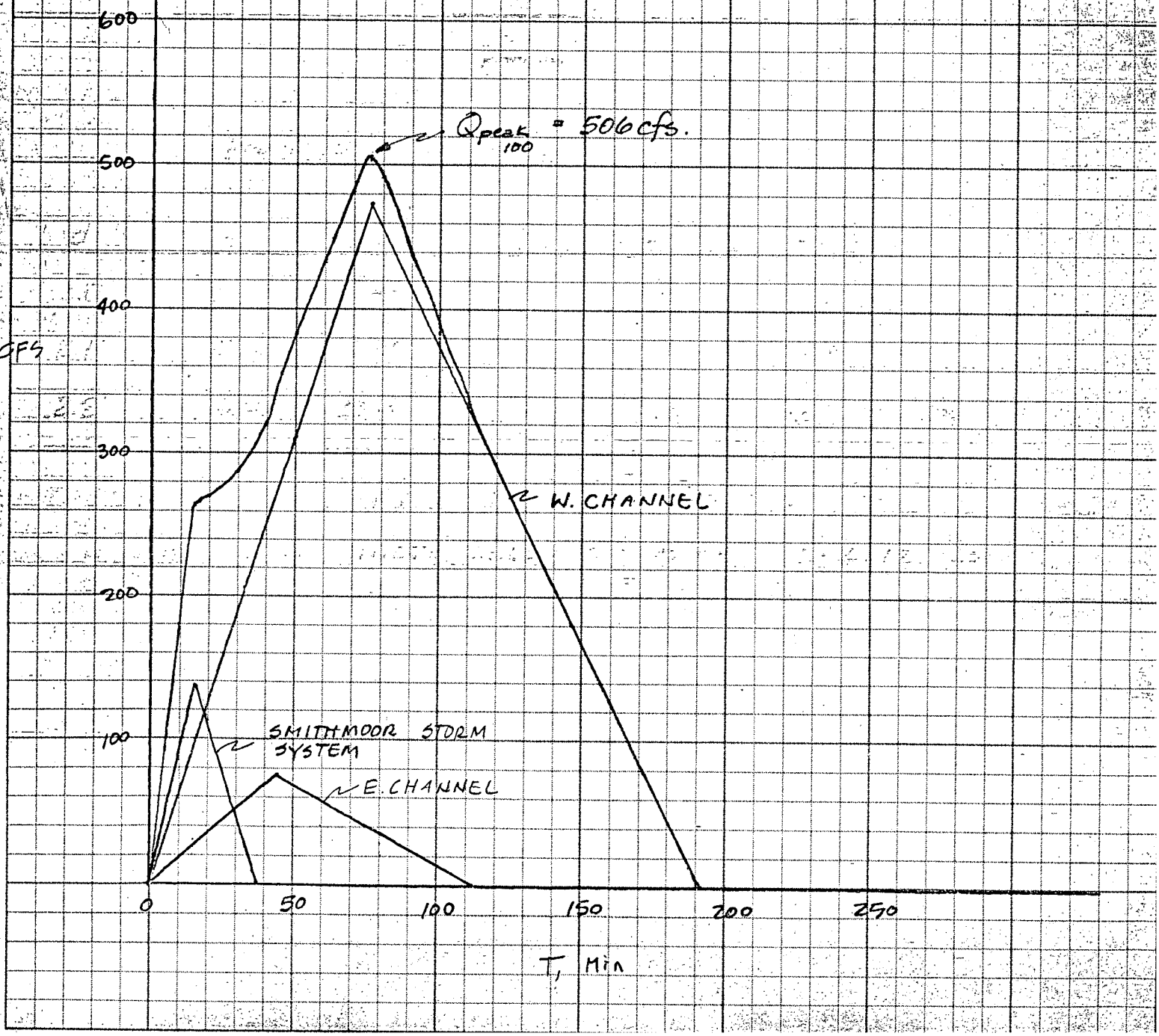
Project Smithmoor 1st Addition

Item Drainage Plan

Check culvert capacity @ Harry St

Structure = 2 - 5'x2' RCB (From County Drain. Maps)

Inflow Hydrograph (100-yr)

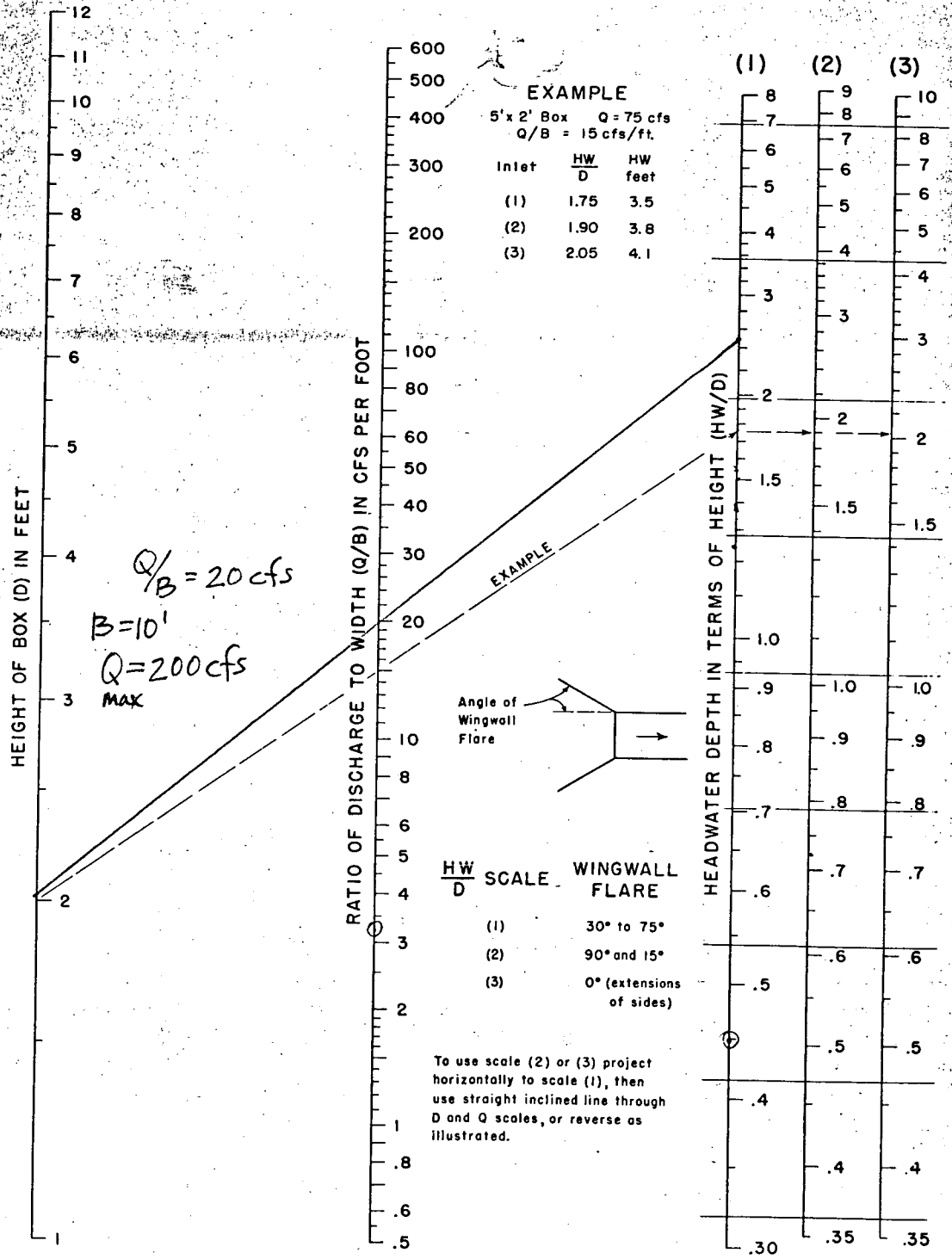


Allow. HW = Top Road − HE = 1340.0 − 1335.0 = 5

D = 2'

HW/D = 5/2 = 2.5

CHART I



Q/B = 20 cfs

B = 10'

Q = 200 cfs max

HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL

BUREAU OF PUBLIC ROADS JAN. 1963

$Q_{max} < Q_{actual}$

$\therefore Q_{100}$ overtops road.

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

Date June 17, 1986 Page 10 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Determine Size of Overflow Channel Between Lots 5 & 6, Block 1

Size Channel for $Q_{100} - Q_2$

$Q_{100} = 137$ cfs

$Q_2 = 46$

$Q_{channel} = 91$ cfs

TRIAL 1: USE 'V' Ditch 5:1 sideslopes 0.5 long. slope

Use Mannings Eq'n $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$ where $Q = 91$ cfs
$n = 0.03$
$S = 0.005$ Ft/Ft.

$91 = \frac{1.486}{0.03} AR^{2/3} 0.070711$

$AR^{2/3} = 25.98$

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

Date June 17, 1986 Page 11 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

Overflow Channel (Con'd)

Required $AR^{2/3} = 25.98$

d	A	P	R	$R^{2/3}$	$AR^{2/3}$
2'	20	20.39	0.98	0.99	19.7
2.1'	22.05	21.42	1.03	1.02	22.5
2.2'	24.2	22.44	1.08	1.05	25.5 ← USE

$d = 2.2'$ $V = Q/A = 94/24.2 = 3.76$ OK

Width required = $2(2.2 + 1.0)5 = 32'$

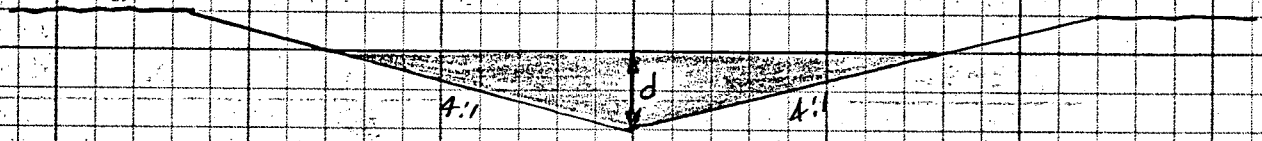
PROFESSIONAL ENGINEERING CONSULTANTS
PROFESSIONAL ASSOCIATION
1440 EAST ENGLISH
WICHITA, KANSAS
ZIP CODE / 67211

Date June 17, 1986 Page 12 of 14

Project Smithmoor 1st Addition

Item Drainage Plan

TRIAL No. 2



Required $AR^{2/3} = 25.98$

d	A	p	R	$R^{2/3}$	$AR^{2/3}$	
2.0'	16	16.49	0.97	0.98	15.7	
2.5'	25	20.61	1.21	1.14	28.4	
2.4'	23.04	19.79	1.16	1.11	25.5	← USE

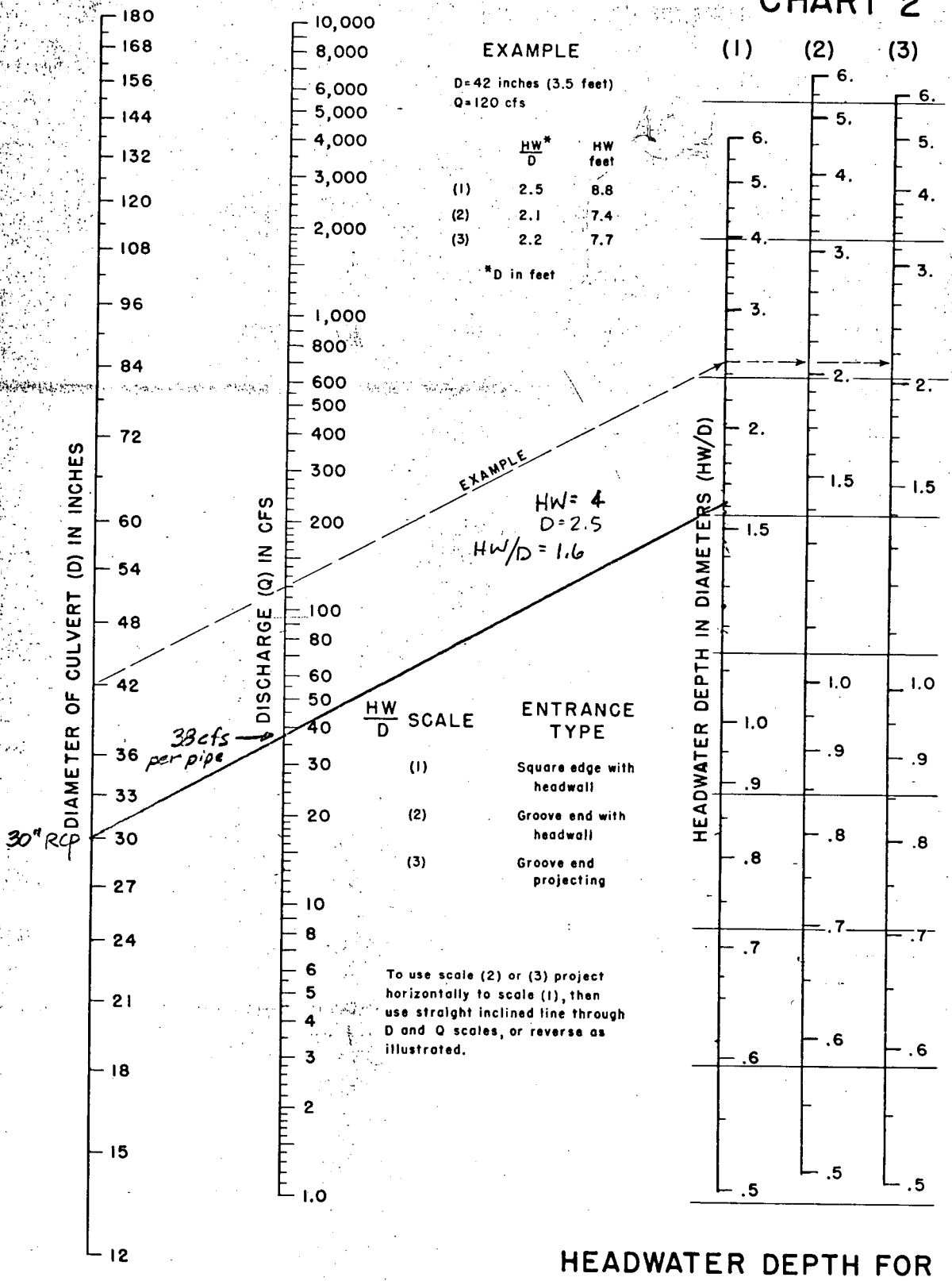
$d = 2.4'$ $V = Q/A = 91/23.04 = 3.94$ OK

$W = 2(2.4 + 1.0)4 = 27.2'$

USE: TRIAL NO. 2 (4:1 SIDESLOPES)

Smithmoor 1st Add.
Drainage Plan
Culvert @ Smithmoor St.

CHART 2



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

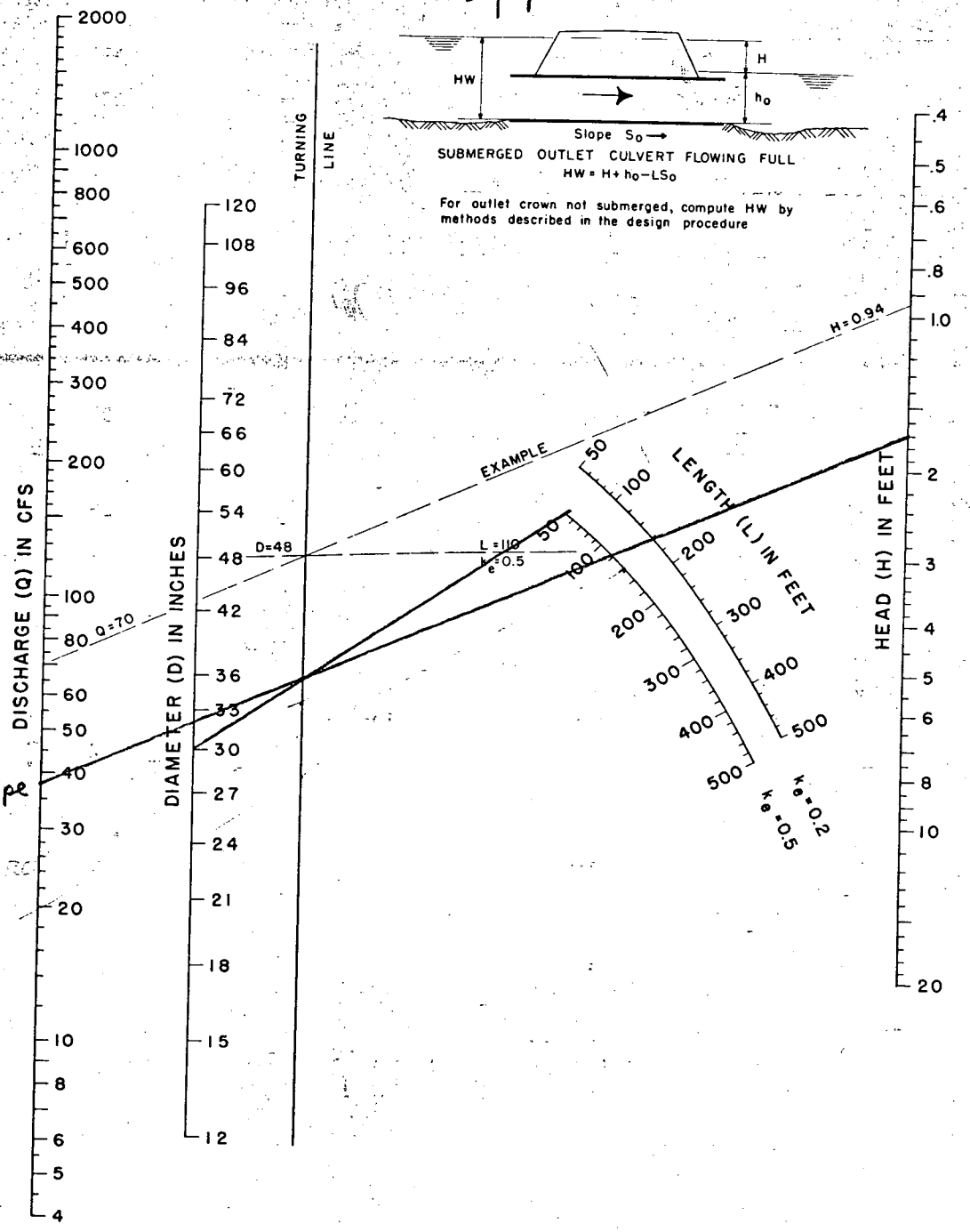
HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN. 1963

Smithmoor 12" Add
Drainage Plan
Culvert @ Smithmoor St.

Q=76 cfs
2 pipes

CHART 9



38 cfs/pipe

H = 1.7'

h_o = 2.2' (from channel downstream

H + h_o = 3.9'

HEAD FOR CONCRETE PIPE CULVERTS FLOWING FULL n = 0.012

BUREAU OF PUBLIC ROADS JAN. 1963