

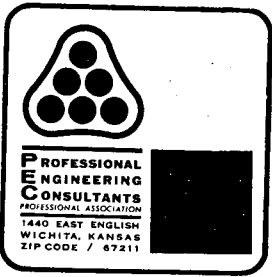
**P**ROFESSIONAL  
**E**NGINEERING  
**C**ONSULTANTS  
PROFESSIONAL ASSOCIATION

DRAINAGE PLAN  
AND  
SUPPORTING CALCULATIONS

FOR  
BARRINGTON PLACE  
AN ADDITION TO WICHITA, SEDGWICK COUNTY, KANSAS

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

JANUARY 15, 1988



Date 1.15.88 Page 1 of 19  
 Project Barrington Place  
 Item Drainage Plan System 100

I HYDROLOGY

Use Rational Method  $Q = CIA$

Determine "C"

<u>Node</u>	<u>Hyd Soil Gr.</u>	<u>Land Use</u>	<u>C<sub>2</sub></u>	<u>C<sub>100</sub></u>
115	C	Res. 1/8 Ac	0.55	0.73
114	10% C 50% C 10% B 30% B	Church Res 1/8 Ac Church Res 1/8 Ac	$.1 \times 0.7 = 0.070$ $.5 \times 0.55 = 0.275$ $.1 \times 0.6 = 0.060$ $.3 \times 0.52 = 0.156$	$.1 \times 0.80 = 0.08$ $.5 \times 0.73 = 0.365$ $.1 \times 0.70 = 0.07$ $.3 \times 0.67 = 0.201$
			0.56	0.72
113	C	Res 1/8 Ac	0.55	0.73
112	B	Res 1/8 Ac	0.52	0.67
111	B	Res 1/8 Ac	0.52	0.67
110	B	Res 1/8 Ac	0.52	0.67
109	B	Res 1/8 Ac	0.52	0.67
108	B	Res 1/8 Ac	0.52	0.67
107	B	Res 1/8 Ac	0.52	0.67
106	B	Res 1/8 Ac	0.52	0.67
105	(Manhole)			
104	B	Res 1/8 Ac	0.52	0.67
103	B	Res 1/8 Ac	0.52	0.67
102	B	Res 1/8 Ac	0.52	0.67
101	B	Res 1/8 Ac	0.52	0.67
100	(End Section)			



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Project Barrington Place

Item Drainage Plan System 100

Determine "I"

<u>Node</u>	<u>t<sub>c</sub></u>	<u>I<sub>2</sub></u>	<u>I<sub>100</sub></u>
115	15 min	3.83	7.37
114	15	3.83	7.37
113	15	3.83	7.37
112	15	3.83	7.37
111	15	3.83	7.37
110	15	3.83	7.37
109	15	3.83	7.37
108	15	3.83	7.37
107	15	3.83	7.37
106	15	3.83	7.37
105	(Manhole)		
104	15	3.83	7.37
103	15	3.83	7.37
102	15	3.83	7.37
101	15	3.83	7.37
100	(End Section)		



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Project Barrington Place

Item Drainage Plan System 100

Determine "A"

<u>Node</u>	<u>Plan. Units</u>	<u>Area (SF)</u>	<u>Area (Ac)</u>
115	797	127,520	2.93
114	3967	634,720	14.57
113	718	114,880	2.64
112	328	52,480	1.20
111	311	49,760	1.14
110	481	76,960	1.77
109	539	86,240	1.98
108	1779	284,640	6.53
107	548	87,680	2.01
106	791	126,560	2.91
105	(Manhole)		
104	641	102,560	2.35
103	599	95,840	2.20
102	857	137,120	3.15
101	1048	167,680	3.85
100	(End section)		



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Project Barrington Place

Item Drainage Plan System 100

Determine "Q<sub>2</sub>"

<u>Node</u>	<u>C<sub>2</sub></u>	<u>I<sub>2</sub></u>	<u>A</u>	<u>Q<sub>2</sub></u>
115	0.55	3.83	2.93	6.2
114	0.56	3.83	14.57	31.2
113	0.55	3.83	2.64	5.6
112	0.52	3.83	1.20	2.4
111	0.52	3.83	1.14	2.3
110	0.52	3.83	1.77	3.5
109	0.52	3.83	1.98	3.9
108	0.52	3.83	6.53	13.0
107	0.52	3.83	2.01	4.0
106	0.52	3.83	2.91	5.8
105	(Manhole)			
104	0.52	3.83	2.35	4.7
103	0.52	3.83	2.20	4.4
102	0.52	3.83	3.15	6.3
101	0.52	3.83	3.85	7.7
100	(End Section)			



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Project Barrington Place

Item Drainage Plan System 100

Determine "Q<sub>100</sub>"

<u>Node</u>	<u>C<sub>100</sub></u>	<u>I<sub>100</sub></u>	<u>A</u>	<u>Q<sub>100</sub></u>
115	0.73	7.37	2.93	15.8
114	0.72	7.37	14.57	77.3
113	0.73	7.37	2.64	14.2
112	0.67	7.37	1.20	5.9
111	0.67	7.37	1.14	5.6
110	0.67	7.37	1.77	8.7
109	0.67	7.37	1.98	9.8
108	0.67	7.37	6.53	32.2
107	0.67	7.37	2.01	9.9
106	0.67	7.37	2.91	14.4
105	(Manhole)			
104	0.67	7.37	2.35	11.6
103	0.67	7.37	2.20	10.9
102	0.67	7.37	3.15	15.6
101	0.67	7.37	3.85	19.0
100	(End Section)			



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Project Barrington Place

Item Drainage Plan System 100

II INLET SIZING

<u>Node</u>	<u>Inlet Condition</u>	<u>Q<sub>2</sub></u>	<u>Q<sub>max</sub> 5' Inlet</u>	<u>Q<sub>max</sub> 10' Inlet</u>	<u>Use</u>
115	Sump	6.2	11.0	22.0	5'
114	Sump	31.2	11.0	22.0	15'
113	Sump	5.6	11.0	22.0	5'
112	Sump	2.4	11.0	22.0	5'
111	Sump	2.3	11.0	22.0	5'
110	Sump	3.5	11.0	22.0	5'
109	Sump	3.9	11.0	22.0	5'
108	Sump	13.0	11.0	22.0	10'
107	Sump	4.0	11.0	22.0	5'
106	Sump	5.8	11.0	22.0	5'
105	(Manhole)				
104	Sump	4.7	11.0	22.0	5'
103	Sump	4.4	11.0	22.0	5'
102	Sump	6.3	11.0	22.0	5'
101	Sump	7.7	11.0	22.0	5'
100	(End Section)				



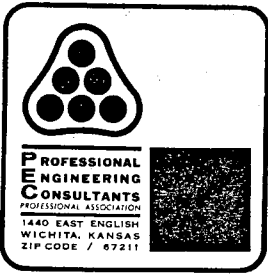
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Project Barrington Place

Item Drainage Plan System 100

III STREET FLOW - 2 - YR

<u>Node</u>	<u>Approach</u>	<u>Distribution</u>	<u>street slope</u>	<u>Flow Depth (Ft)</u>	<u>Allowable Depth</u>	<u>Comment</u>
115	6.2	≈ 100% N = 6.2	0.76%	0.37'	0.55	OK
114	31.2	70% N = 21.8 30% W = 9.4	0.76% 0.32%	0.55' 0.49'	0.55 0.55	OK OK
113	5.6	≈ 100% W = 5.6	0.32%	0.40	0.55	OK
112	2.4	≈ 100% W = 2.4	1.40%	0.22	0.55	OK
111	2.3	≈ 100% W = 2.3	0.50%	0.26'	0.55	OK
110	3.5	50% W = 1.7 50% E = 1.8	0.40% 0.32%	0.24 0.27	0.55 0.30	OK OK
109	3.9	≈ 100% W = 3.9	0.40%	0.33	0.55	OK
108	13.0	≈ 100% W = 13.0	0.40%	0.52	0.55	OK
107	4.0	≈ 100% W = 4.0	0.40%	0.34	0.55	OK
106	5.8	≈ 100% N = 5.8	0.32%	0.42	0.55	OK
105	(Manhole)					
104	4.7	65% W = 3.1 35% N = 1.6	0.32% 1.00%	0.33 0.21	0.55 0.30	OK OK
103	4.4	65% W = 2.9 35% S = 1.5	0.32% 1.00%	0.31 0.20'	0.55 0.30	OK OK
102	6.3	50% W = 3.2 50% E = 3.1	0.32% 0.32%	0.34 0.33	0.55 0.55	OK OK
101	7.7	65% W = 5.0 35% E = 2.7	0.32% 0.32%	0.38 0.30	0.55 0.55	OK OK
100	(End Section)					

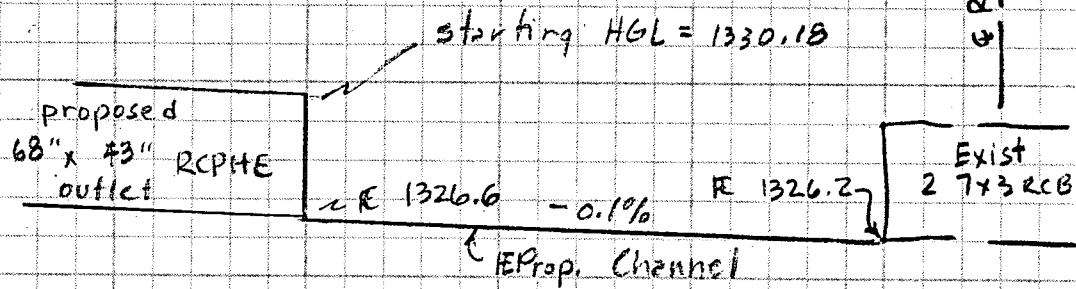


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Project Barrington Place

Item Drainage Plan System 100

IV HYDRAULICS



NTS

Note ① Computer program only takes round pipe 54" RCP Equivalent used in hydraulic analysis.

② Designer may adjust street grades (clearances) in order to use round pipe

100 j, 1330.1800 100 3 16 15

110 t, barrington place

120 t, drainage plan

130 t, storm water sewer system 100 analysis

140 i, 115	0.55	2.93	0.00	0.00	6.20	15.00	1341.00
150 i, 114	0.56	14.57	0.00	0.00	31.20	15.00	1341.00
160 i, 113	0.55	2.64	0.00	0.00	5.60	15.00	1341.00
170 i, 112	0.52	1.20	0.00	0.00	2.40	15.00	1337.00
180 i, 111	0.52	1.14	0.00	0.00	2.30	15.00	1335.30
190 i, 110	0.52	1.77	0.00	0.00	3.50	15.00	1334.00
200 i, 109	0.52	1.98	0.00	0.00	3.90	15.00	1334.00
210 i, 108	0.52	6.53	0.00	0.00	13.00	15.00	1334.00
220 i, 107	0.52	2.01	0.00	0.00	4.00	15.00	1334.00
230 i, 106	0.52	2.91	0.00	0.00	5.80	15.00	1334.00
240 m, 105	1333.80						
250 i, 104	0.52	2.35	0.00	0.00	4.70	15.00	1333.00
260 i, 103	0.52	2.20	0.00	0.00	4.40	15.00	1333.00
270 i, 102	0.52	3.15	0.00	0.00	6.30	15.00	1332.00
280 i, 101	0.52	3.85	0.00	0.00	7.70	15.00	1332.00
290 m, 100	1330.18						
300 p, 115 114	40.00	18 0.013	100.00	0.00			
310 p, 114 113	80.00	36 0.013	45.00	0.00			
320 p, 113 112	350.00	36 0.013	5.00	0.00			
330 p, 112 111	340.00	36 0.013	15.00	0.00			
340 p, 111 109	270.00	36 0.013	30.00	0.00			
350 p, 110 109	40.00	15 0.013	80.00	0.00			
360 p, 109 105	250.00	42 0.013	50.00	0.00			
370 p, 108 107	50.00	24 0.013	50.00	0.00			
380 p, 107 106	160.00	30 0.013	5.00	0.00			
390 p, 106 105	40.00	36 0.013	50.00	0.00			
400 p, 105 103	230.00	54 0.013	10.00	0.00			
410 p, 104 103	40.00	15 0.013	90.00	0.00			
420 p, 103 102	230.00	54 0.013	90.00	0.00			
430 p, 102 101	40.00	54 0.013	0.00	0.00			
440 p, 101 100	30.00	54 0.013	0.00	0.00			
450 e							

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Input File: barplal00

10/19

barrington place  
drainage plan  
storm water sewer system 100 analysis

Storm Frequency = 2-Year

\*\*\* HYDROLOGY \*\*\*

Node to Node		Tributary Area				Hydrology Summation							Conduit Data				
C	Area (Ac)	Slope (%)	Length (Ft)	TC(θ) (Min)	I(θ) (In/Hr)	Q(θ) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)		
115	114	0.55	2.93	0.00	0.0	15.00	4.06	6.20	15.00	4.06	6.20	6.20	18"	3.51	40.00	0.19	15.19
114	113	0.56	14.57	0.00	0.0	15.00	4.06	31.20	15.00	4.06	31.20	37.32	36"	5.28	80.00	0.25	15.25
113	112	0.55	2.64	0.00	0.0	15.00	4.06	5.60	15.25	4.03	5.56	42.89	36"	6.07	350.00	0.96	16.21
112	111	0.52	1.20	0.00	0.0	15.00	4.06	2.40	16.21	3.94	2.33	45.21	36"	6.40	340.00	0.89	17.10
111	109	0.52	1.14	0.00	0.0	15.00	4.06	2.30	17.10	3.86	2.19	47.40	36"	6.71	270.00	0.67	17.77
110	109	0.52	1.77	0.00	0.0	15.00	4.06	3.50	15.00	4.06	3.50	3.50	15"	2.85	40.00	0.23	15.23
109	105	0.52	1.98	0.00	0.0	15.00	4.06	3.90	17.77	3.80	3.65	54.35	42"	5.65	250.00	0.74	18.51
108	107	0.52	6.53	0.00	0.0	15.00	4.06	13.00	15.00	4.06	13.00	13.00	24"	4.14	50.00	0.20	15.20
107	106	0.52	2.01	0.00	0.0	15.00	4.06	4.00	15.20	4.04	3.98	16.98	30"	3.46	160.00	0.77	15.97
106	105	0.52	2.91	0.00	0.0	15.00	4.06	5.80	15.97	3.96	5.66	22.64	36"	3.20	40.00	0.21	16.18
105	103	0.00	0.00	0.00	0.0	0.00	0.00	0.00	18.51	3.74	0.00	75.83	54"	4.77	230.00	0.80	19.31
104	103	0.52	2.35	0.00	0.0	15.00	4.06	4.70	15.00	4.06	4.70	4.70	15"	3.83	40.00	0.17	15.17
103	102	0.52	2.20	0.00	0.0	15.00	4.06	4.40	19.31	3.68	3.99	84.09	54"	5.29	230.00	0.72	20.04
102	101	0.52	3.15	0.00	0.0	15.00	4.06	6.30	20.04	3.63	5.63	89.72	54"	5.64	40.00	0.18	20.16
101	100	0.52	3.85	0.00	0.0	15.00	4.06	7.70	20.16	3.62	6.86	96.58	54"	6.07	30.00	0.08	20.24

\*\*\*\*\*

Input File: barplai00

11/19

barrington place  
 drainage plan  
 storm water sewer system 100 analysis

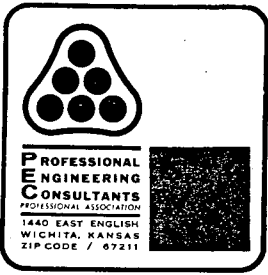
Storm Frequency = 2-Year

\* \* \* HYDRAULICS \* \* \*

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*****
Node      Hyd-Slope  Friction   Bend      Transition  Manhole  Deflection  Junction  Total   Hyd-GI   Desired  Diff.
(Ft/Ft)   (Ft)      (Ft)      (Ft)      (Ft)      (Ft)      (Ft)      (Ft)      (Ft)   Elevation Elevation (Ft)
*****
115      0.00348   0.1393    0.0000    0.0000     0.0000   0.0000    0.0000    0.1393  1339.7462  1341.0000  1.25
114      0.00313   0.2505    0.0000    0.0242     0.0000   0.1085    1.2511    1.6343  1339.6069  1341.0000  1.39
113      0.00413   1.4470    0.0000    0.0139     0.0000   0.0942    0.2961    1.9512  1337.9725  1341.0000  3.03
112      0.00460   1.5624    0.0000    0.0064     0.0000   0.0089    0.1496    1.7273  1336.1213  1337.0000  0.88
111      0.00505   1.3636    0.0000    0.0063     0.0000   0.0370    0.1502    1.5571  1334.3940  1335.3000  0.91
110      0.00294   0.1174    0.0000    0.0000     0.0000   0.0000    0.0000    0.1174  1332.9543  1334.0000  1.05
109      0.00292   0.7295    0.0000    0.0406     0.0000   0.0934    -0.0270    0.8364  1332.8369  1334.0000  1.16
108      0.00330   0.1651    0.0000    0.0000     0.0000   0.0000    0.0000    0.1651  1332.7053  1334.0000  1.29
107      0.00171   0.2742    0.0000    0.0160     0.0000   0.0657    0.0507    0.4066  1332.5492  1334.0000  1.46
106      0.00115   0.0461    0.0000    0.0053     0.0000   0.0029    0.0787    0.1330  1332.1335  1334.0000  1.87
105      0.00149   0.3420    0.0000    0.0285     0.0000   0.1224    0.0304    0.5233  1332.0005  1333.8000  1.80
104      0.00529   0.2117    0.0000    0.0000     0.0000   0.0000    0.0000    0.2117  1331.6891  1333.0000  1.31
103      0.00183   0.4206    0.0000    0.0031     0.0000   0.0126    0.1709    0.6122  1331.4773  1333.0000  1.52
102      0.00203   0.0833    0.0000    0.0060     0.0000   0.2171    0.1301    0.4364  1330.8651  1332.8000  1.93
101      0.00241   0.0724    0.0000    0.0078     0.0000   0.0000    0.1685    0.2407  1330.4237  1332.8000  2.37
100      0.00000   0.0000    0.0000    0.0000     0.0000   0.0000    0.0000    0.0000  1330.1801  1330.1801  0.00
*****

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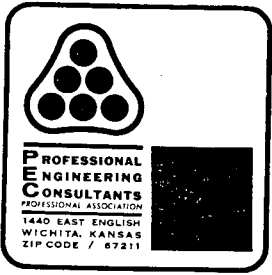
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Project Barrington Place

Item Drainage Plan system 100

V STREET FLOW - 100 YR

<u>Location</u>	<u>Contrib. Nodes</u>	<u>Q<sub>100</sub></u>	<u>Q<sub>pipe</sub></u>	<u>Q<sub>street</sub></u>	<u>street slope</u>	<u>Q<sub>max</sub></u>	<u>Comment</u>
Approaching Nodes 115, 114 (N)	100% 115 = 70% 114 =	15.0 54.1 <u>69.9</u>	0.0	69.9	0.76%	76.9	WL Gr = +0.3'
Approaching Nodes 114, 113 (W)	Westwind Add = 30% 114 = 100% 113 =	37.2 23.2 14.2 <u>74.6</u>	0.0	74.6	0.32%	86.8	WL Gr = +0.5'
Approaching Node 112 (W)	Westwind Add = 100% 115 = 100% 114 = 100% 113 = 100% 112 = 30% 109 =	37.2 15.8 77.3 14.2 5.9 2.9 <u>153.3</u>	42.9	110.4	1.40%	140.8	WL Gr = +0.4'
Approaching Node 111 (W)	Westwind Add = 100% 115 = 100% 114 = 100% 113 = 100% 112 = 100% 111 = 60% 109 =	37.2 15.8 77.3 14.2 5.9 5.6 5.9 <u>161.9</u>	45.2	116.7	0.50%	135.2	WL Gr = +0.6'

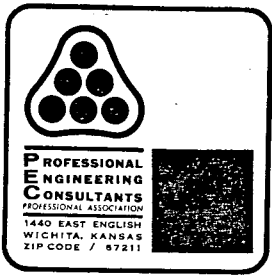


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Project Barrington Place

Item Drainage Plan System 100

<u>Location</u>	<u>Contrib. Nodes</u>	<u>Q<sub>100</sub></u>	<u>Q<sub>pipe</sub></u>	<u>Q<sub>street</sub></u>	<u>street slope</u>	<u>Q<sub>max</sub></u>	<u>Comment</u>
Approaching Nodes 110, 109 (W)	Westwind Add = 100% 115 = 100% 114 = 100% 113 = 100% 112 = 100% 111 = 50% 110 = 100% 109 =	37.2 15.8 77.3 14.2 5.9 5.6 4.3 9.8					
		<u>170.1</u>	47.4	122.7	0.50%	135.2	WK Gr = +0.6'
Approaching Nodes 106, 105 (W)	Westwind Add = 100% 115 = 100% 114 = 100% 113 = 100% 112 = 100% 111 = 100% 110 = 100% 109 = 20% 106 =	37.2 15.8 77.3 14.2 5.9 5.6 8.7 9.8 2.9					
		<u>177.4</u>	54.4	123.0	0.32%	131.3	WK Gr = +0.7'
Approaching Nodes 108, 107 (W)	100% 108 = 100% 107 =	32.2 9.9					
		<u>42.1</u>	0.0	42.1	0.40%	55.8	WK Gr = +0.3'
Approaching Nodes 106, 105 (W)	100% 108 = 100% 107 = 80% 106 =	32.2 9.9 11.5					
		<u>53.6</u>	17.0	36.6	0.32%	49.9	WK Gr = +0.3'



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Project Barrington Place

Item Drainage Plan System 100

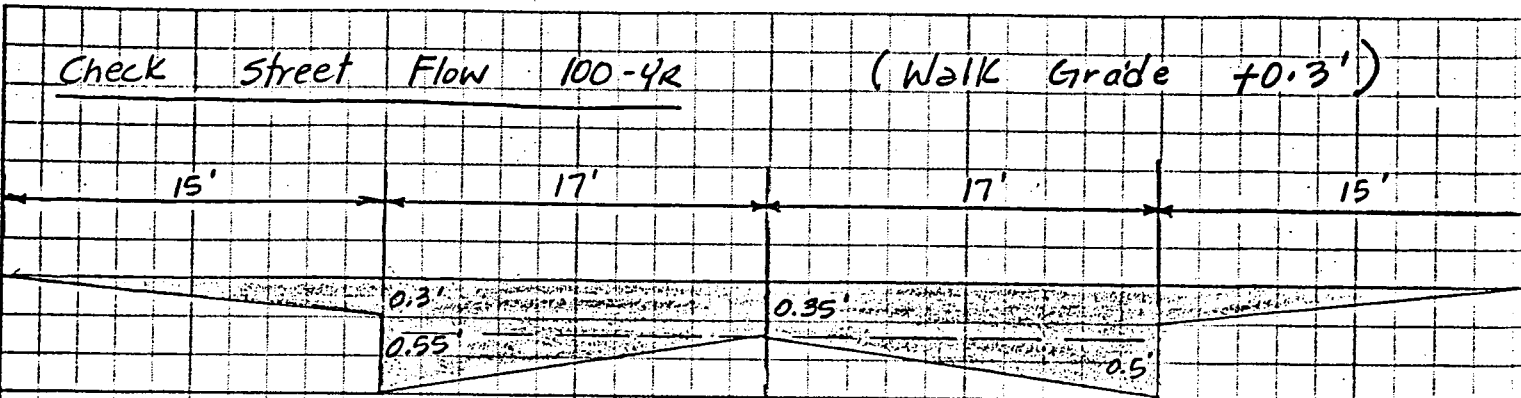
<u>Location</u>	<u>Contrib. Nodes</u>	<u>Q<sub>100</sub></u>	<u>Q<sub>pipe</sub></u>	<u>Q<sub>street</sub></u>	<u>street slope</u>	<u>Q<sub>max</sub></u>	<u>Comment</u>
Approaching	Westwind Add:	37.2					
Nodes 104,103	100% 115	15.8					
(W)	100% 114	77.3					
	100% 113	14.2					
	100% 112	5.9					
	100% 111	5.6					
	100% 110	8.7					
	100% 109	9.8					
	100% 108	32.2					
	100% 107	9.9					
	100% 106	14.4					
	65% 104	7.5					
	65% 103	7.1					
		<u>245.6</u>	75.8	169.8	0.53%	169.0	WK Gr. = +0.7'
Approaching	Westwind	37.2					
Nodes 102,101	100% 115	15.8					
(W)	100% 114	77.3					
	100% 113	14.2					
	100% 112	5.9					
	100% 111	5.6					
	100% 110	8.7					
	100% 109	9.8					
	100% 108	32.2					
	100% 107	9.9					
	100% 106	14.4					
	100% 104	11.6					
	100% 103	10.9					
	50% 102	7.8					
	65% 101	12.4					
		<u>273.7</u>	84.1	189.6	0.66%	189.6	WK Gr. = +0.7'



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Project Barrington Place

Item Drainage Plan - System 100



Determine  $Q_{max}$  in Street R-O-W

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

$$n = \frac{2(14.5 \times 0.030) + 2(1.05' \times 0.013) + 2(17 \times 0.016)}{65.1}$$

$$n = \frac{1.4413}{65.1} = 0.0221$$

$$A = 2\left(\frac{1}{2} \times 15 \times 0.3\right) + (34 \times 0.35) + 2\left(\frac{1}{2} \times 0.5 \times 17\right) = 24.90 \text{ SF}$$

$$p = (2 \times 15) + (2 \times 17) + (2 \times 0.55) = 65.1'$$

$$R = A/p = 24.9/65.1 = 0.38249$$

$$R^{2/3} = 0.527$$

$$Q = \frac{1.486}{0.0221} \times 24.90 \times 0.527 \times S^{1/2}$$

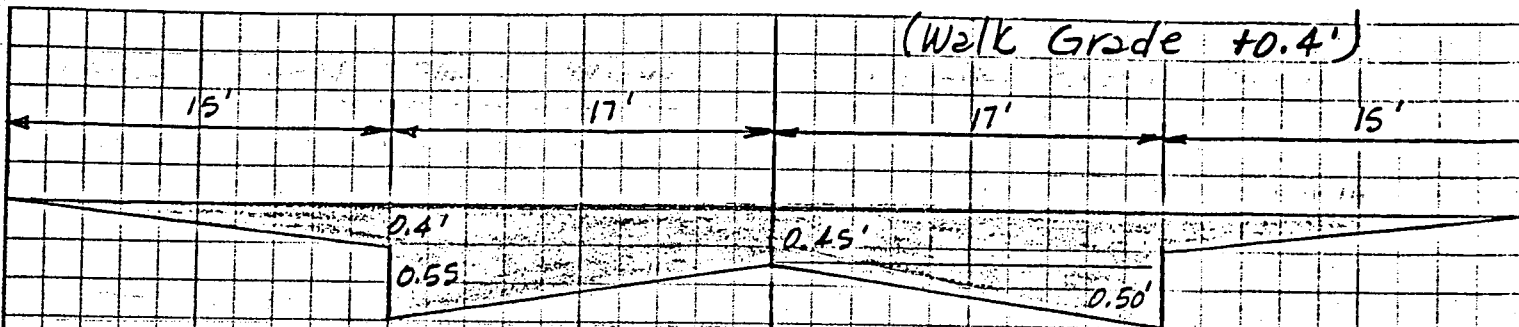
$$Q = 882.3 \times S^{1/2}$$



Date 1.15.88 Page 16 of 19

Project Barrington Place

Item Drainage Plan - System 00



$n: 0.0221$  (see previous sheet)

$$A = 2\left(\frac{1}{2} \times 15' \times 0.4'\right) + (34 \times 0.45') + 2\left(\frac{1}{2} \times 17' \times 0.5'\right)$$

$$= 29.8 \text{ SF}$$

$$P = 65.1'$$

$$R = A/P = 29.8/65.1 = 0.4577$$

$$R^{2/3} = 0.594$$

$$Q = \frac{1.486}{0.0221} \times 29.8 \times 0.594 \times 5^{1/2}$$

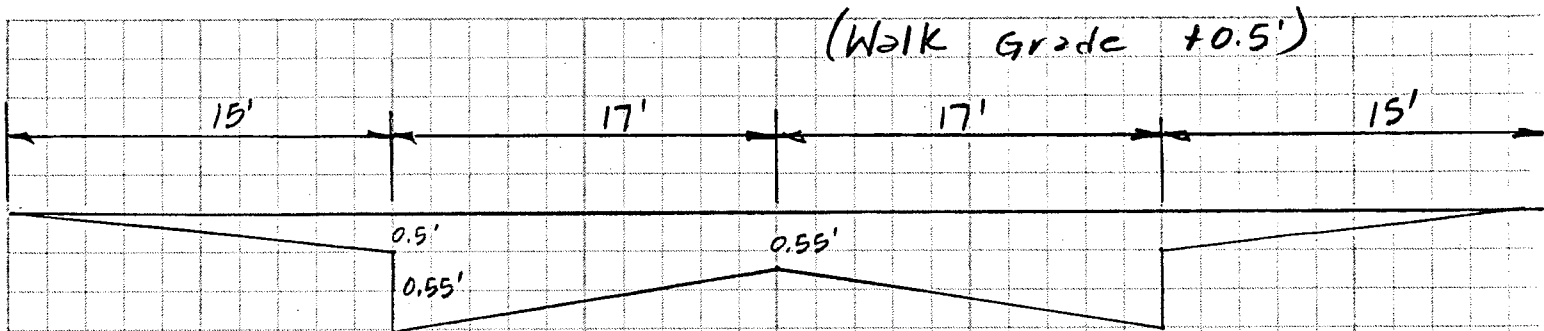
$$Q = 1,190.2 \text{ s}^{1/2}$$



Date 1. 15. 88 Page 17 of 19

Project Barrington Place

Item Drainage Plan System 100



$$n = 0.0221 \quad (\text{see sheet 15})$$

$$A = 2\left(\frac{1}{2} \times 15 \times 0.5\right) + (34' \times 0.55') + 2\left(\frac{1}{2} \times 17' \times 0.5\right)$$

$$= 34.7 \text{ SF}$$

$$p = 65.1'$$

$$R = A/p = 34.7/65.1 = 0.53303$$

$$R^{2/3} = 0.6574$$

$$Q_{\max} = \frac{1.486}{0.0221} \times 34.7 \times 0.6574 \times 5^{1/2}$$

$$Q_{\max} = 1,533.9 \text{ s}^{1/2}$$

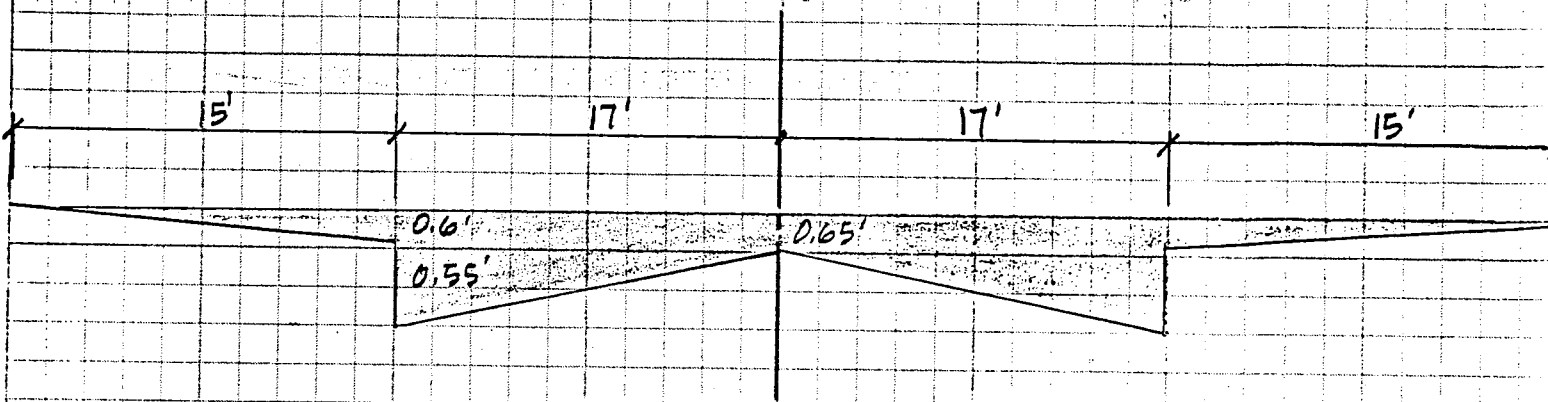


Date 1.15.88 Page 18 of 19

Project Barrington Place

Item Drainage Plan System 100

CHECK STREET FLOW 100-YEAR (WALK GRADE = 0.6')



$$n = 0.0221 \text{ (see previous sheet)}$$

$$A = 2\left(\frac{1}{2} \times 15 \times 0.6\right) + (34 \times 0.65) + 2\left(\frac{1}{2} \times 17 \times 0.5\right)$$
$$= 39.6 \text{ SF}$$

$$p = 65.1'$$

$$R = A/p = 39.6/65.1 = 0.6083$$

$$R^{2/3} = 0.71792$$

$$Q_{\max} = \frac{1.486}{0.0221} \times 39.6 \times 0.71792 \times s^{1/2}$$

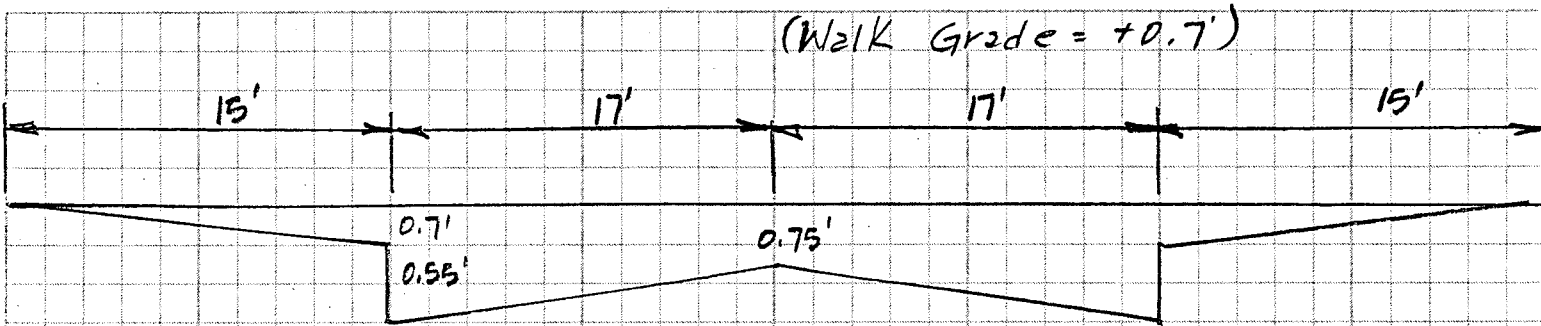
$$Q_{\max} = 1,911.6 \text{ s}^{1/2}$$



Date 1.15.88 Page 19 of 19

Project Barrington Place

Item Drainage Plan System 100



$$n = 0.0221 \quad (\text{see sheet 15})$$

$$A = 2\left(\frac{1}{2} \times 15 \times 0.7\right) + (34 \times 0.75) + 2\left(\frac{1}{2} \times 17 \times 0.5\right)$$
$$= 44.5$$

$$p = 65.1$$

$$R = A/p = 44.5/65.1 = 0.68356$$

$$R^{2/3} = 0.77598$$

$$Q_{max} = \frac{1.486}{0.0221} \times 44.5 \times 0.77598 \times 5^{1/2}$$

$$Q_{max} = 2,321.9 \text{ s}^{1/2}$$



Date 1.15.88 Page 1 of 3  
 Project Barrington Place  
 Item Drainage Plan - Channel

Design Channel for  $Q_{100}$

$$Q_{100} = \text{Overflow from Westwind Add} + \sum Q_{100} \text{ Nodes 115-100}$$

$$= 37.2 + 250.9$$

$$Q_{100} = 288.1 \text{ cfs}$$

Use Manning's Equation

$$Q = \frac{1.486}{n} AR^{2/3} s^{1/2}$$

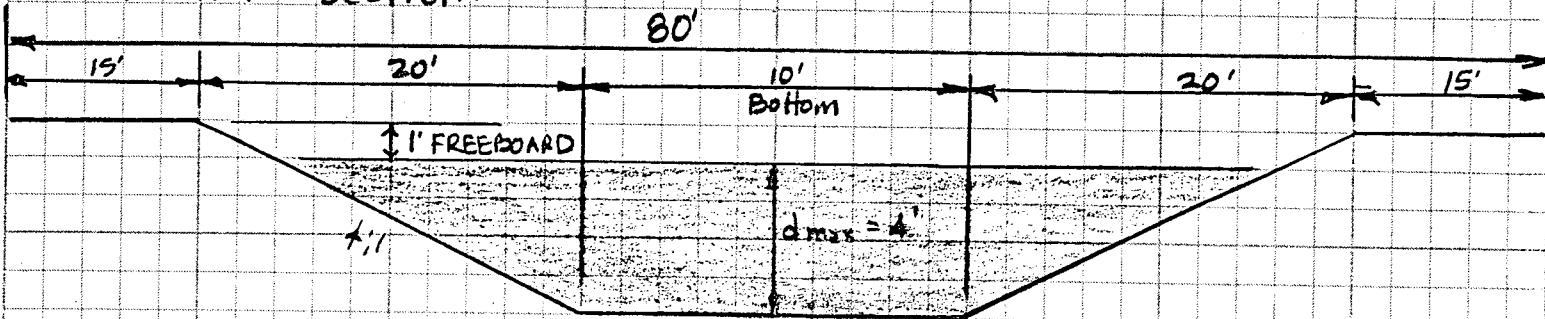
where  $Q = 288.1 \text{ cfs}$   
 $n = 0.03$   
 $s = 0.1\%$

$$288.1 = \frac{1.486}{0.03} (AR^{2/3}) 0.031623$$

$$AR^{2/3} = \frac{288.1 \times 0.03}{1.486 \times 0.031623} = \frac{8.643}{0.046992}$$

$$AR^{2/3} = 183.93$$

Channel Section:



<u>d</u>	<u>A</u>	<u>P</u>	<u>R</u>	<u>R<sup>2/3</sup></u>	<u>AR<sup>2/3</sup></u>
4.0'	104.00	42.98	2.419	1.80	187.4 ←
3.9'	99.84	42.16	2.368	1.776	177.4

Use  $d = 4.0'$   $V = \frac{Q}{A} = \frac{288.1}{104} = 2.77 \text{ fps}$  OK

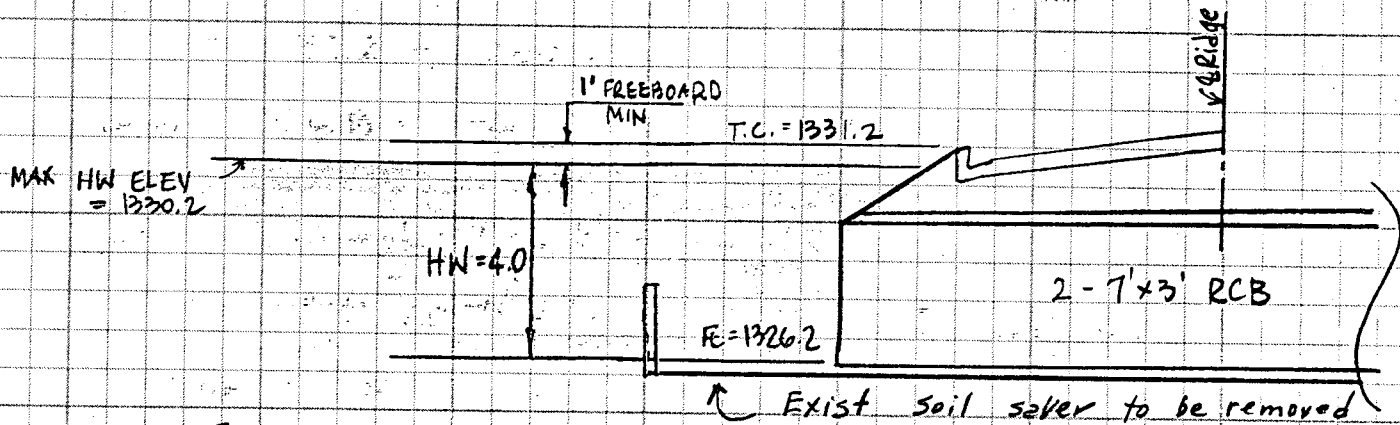


Date 1.15.88 Page 2 of 3

Project Barrington Place

Item Drainage Plan RCB

Check Capacity of Existing RCB under Ridge Road (Inlet Control)



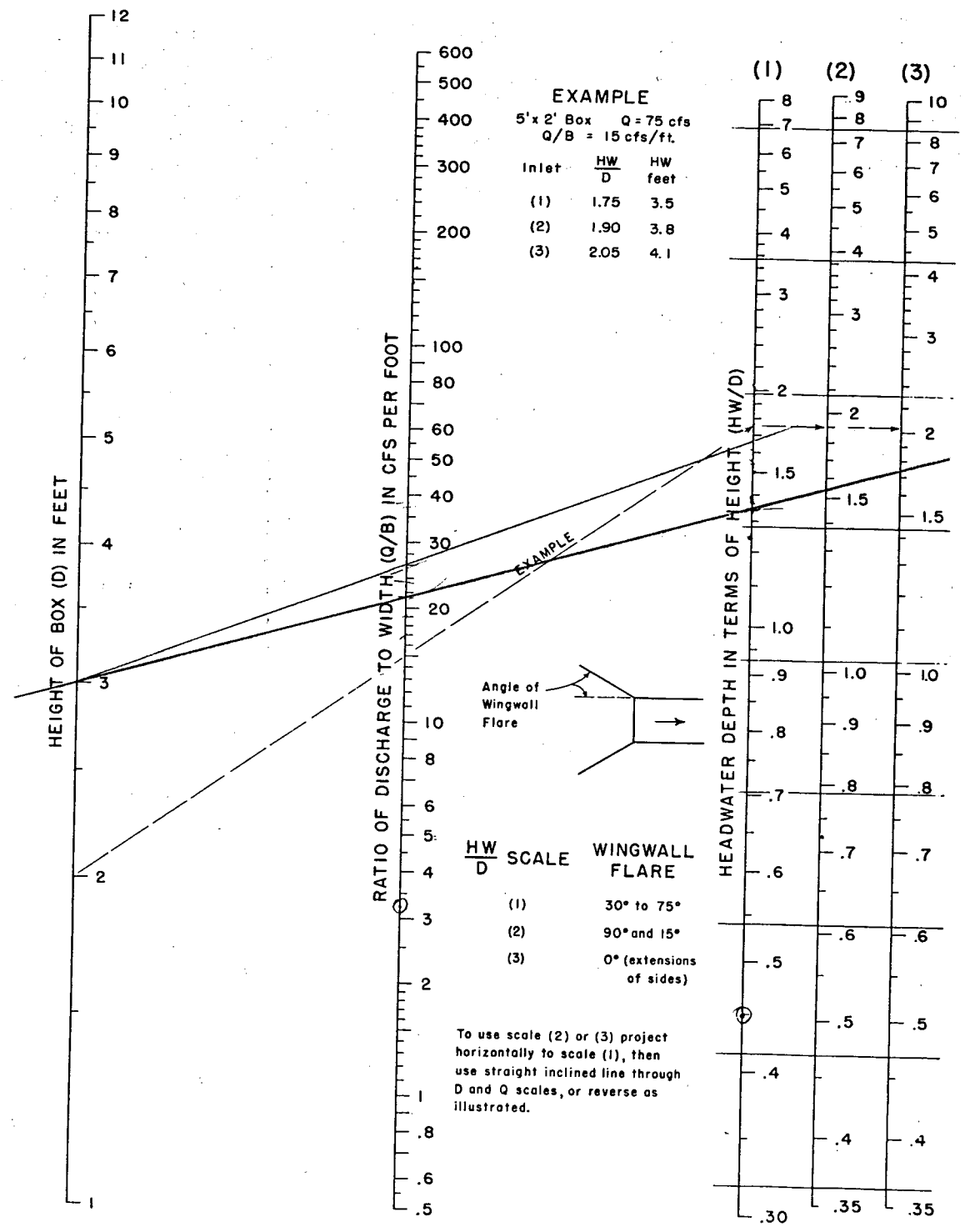
w/ 1' Freeboard

$$\begin{aligned} & HW = 4.0' \\ & D = 3.0' \\ & HW/D = 4/3 = 1.333 \\ & Q/B = 21.5 \text{ cfs/ft} \\ & w/B = 14' \\ & Q_{max} = 21.5 \times 14 = 301.0 \text{ cfs} \end{aligned}$$

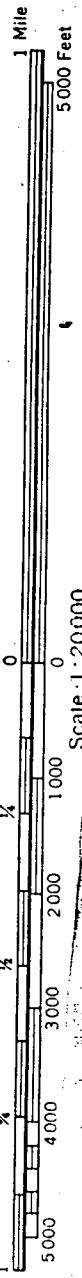
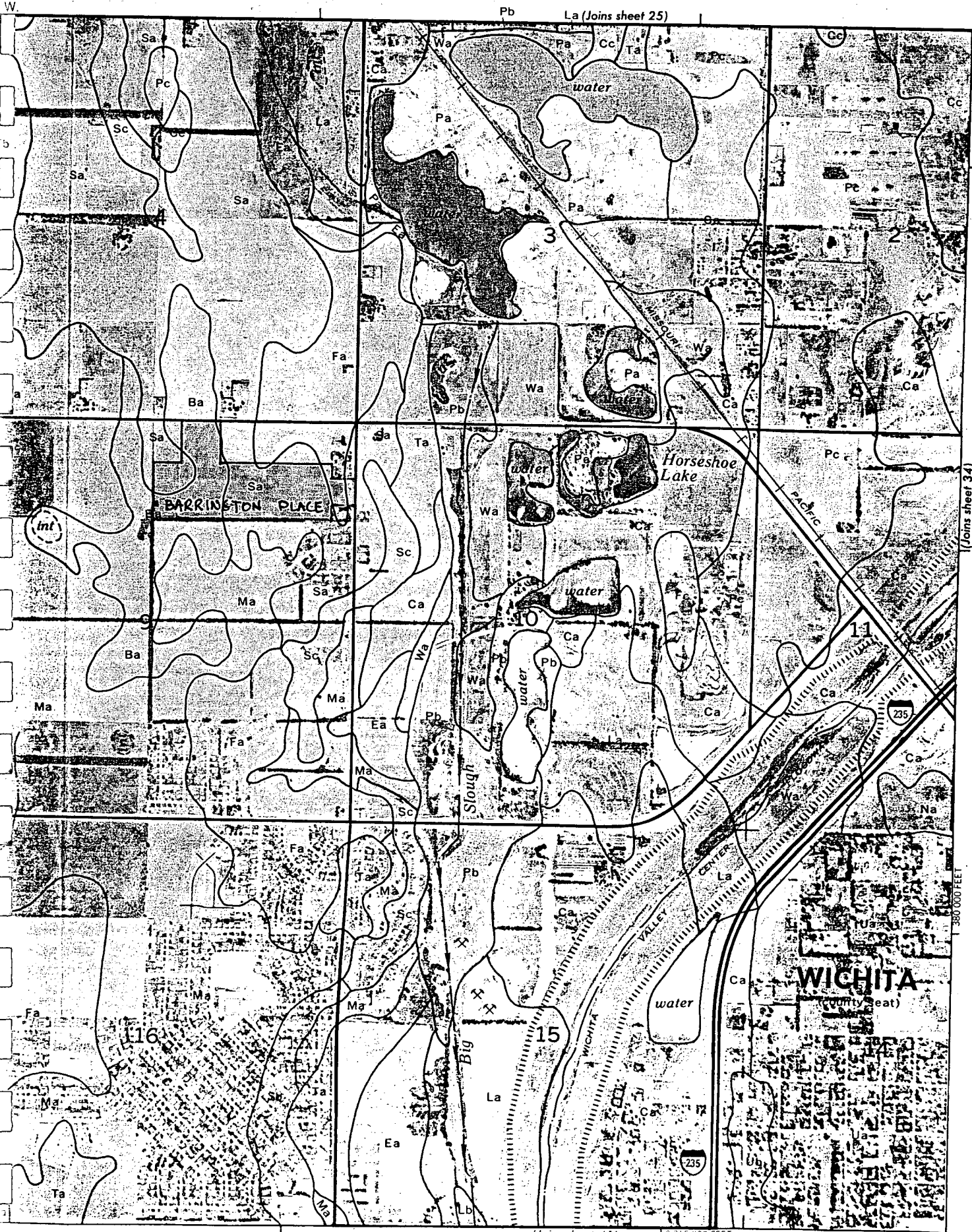
w/ 0' Freeboard (@ T.C. Ridge Rd)

$$\begin{aligned} & HW = 5.0' \\ & D = 3.0' \\ & HW/D = 5/3 = 1.667 \\ & Q/B = 26.0 \text{ cfs/ft} \\ & w/B = 14' \\ & Q_{max} = 26.0 \times 14 = 364.0 \text{ cfs} \end{aligned}$$

# CHART I



## HEADWATER DEPTH FOR BOX CULVERTS WITH INLET CONTROL



## EXHIBIT NO. 1

## SOIL LEGEND

<u>SYMBOL</u>	<u>HYDROLOGIC GROUP</u>	<u>NAME</u>
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loams, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loam, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loam
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	Cline 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 slopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

## ATTACHMENT D

## DRAINAGE CRITERIA

## CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD  
AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

<u>Land Use or Surface Characteristics</u>	<u>Percent Impervious</u>	<u>Frequency</u>			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<b>1. Business:</b>					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
<b>2. Residential:</b>					
<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
<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

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<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
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
<u>Multi-Family (Soil Group A)</u>					
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):					
<u>Soil Group A</u>					
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
<u>Soil Group B</u>					
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
<u>Soil Group C</u>					
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			
		<u>2</u>	<u>5</u>	<u>10</u>	<u>100</u>
<u>Soil Group D</u>					
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

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  
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<u>DURATION IN MINUTES</u>	<u>RETURN PERIODS OF</u>						
	<u>1-YR</u>	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
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

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<u>DURATION IN MINUTES</u>	<u>RETURN PERIODS OF</u>						
	<u>1-YR</u>	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
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

<u>DURATION IN HOURS</u>	<u>RETURN PERIODS OF</u>						
	<u>1-YR</u>	<u>2-YR</u>	<u>5-YR</u>	<u>10-YR</u>	<u>25-YR</u>	<u>50-YR</u>	<u>100-YR</u>
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

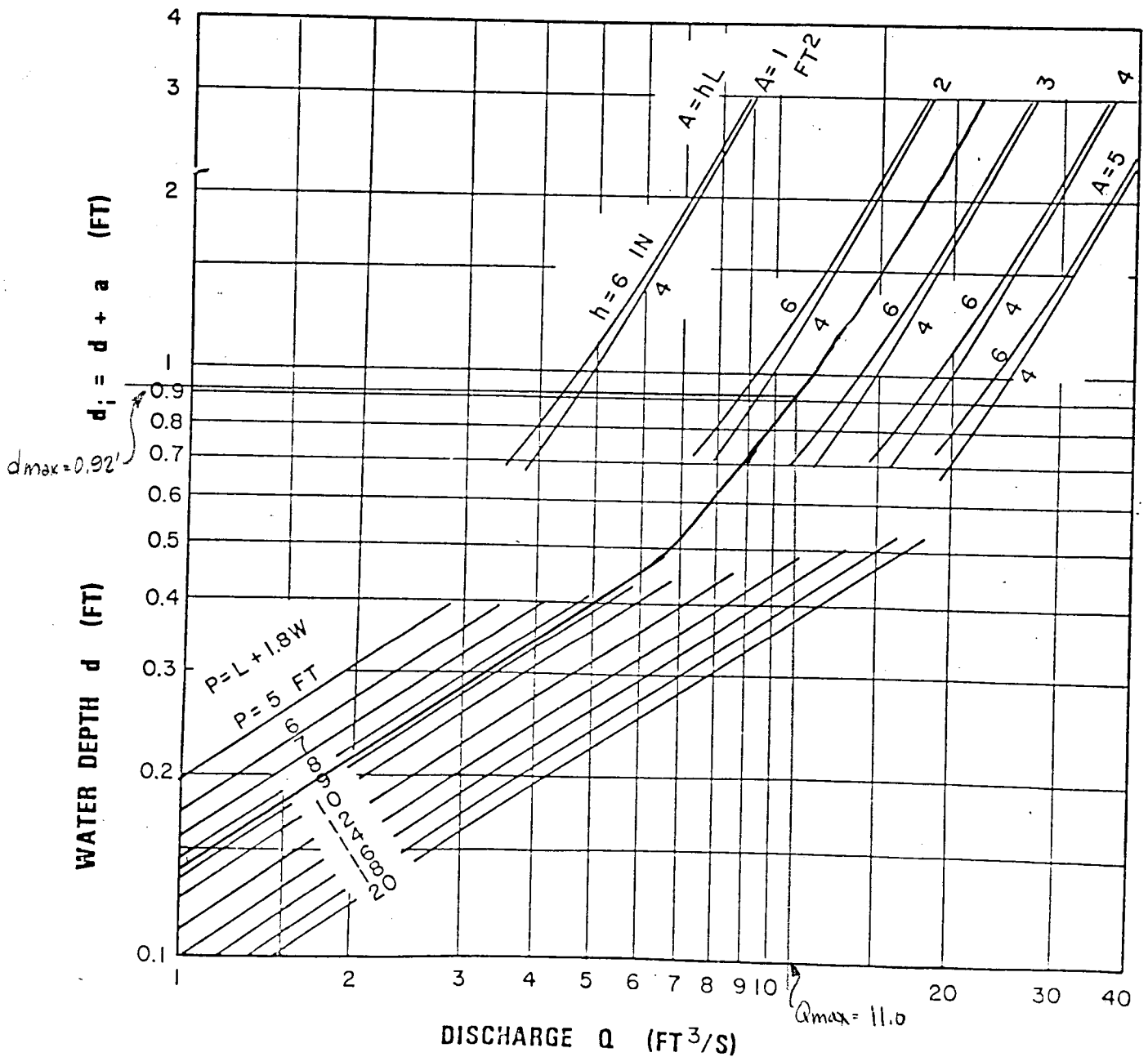
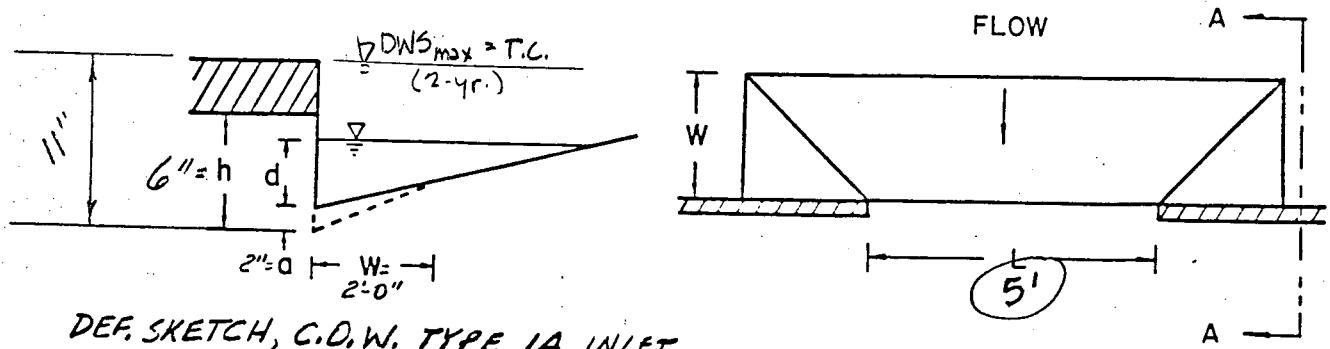


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1974

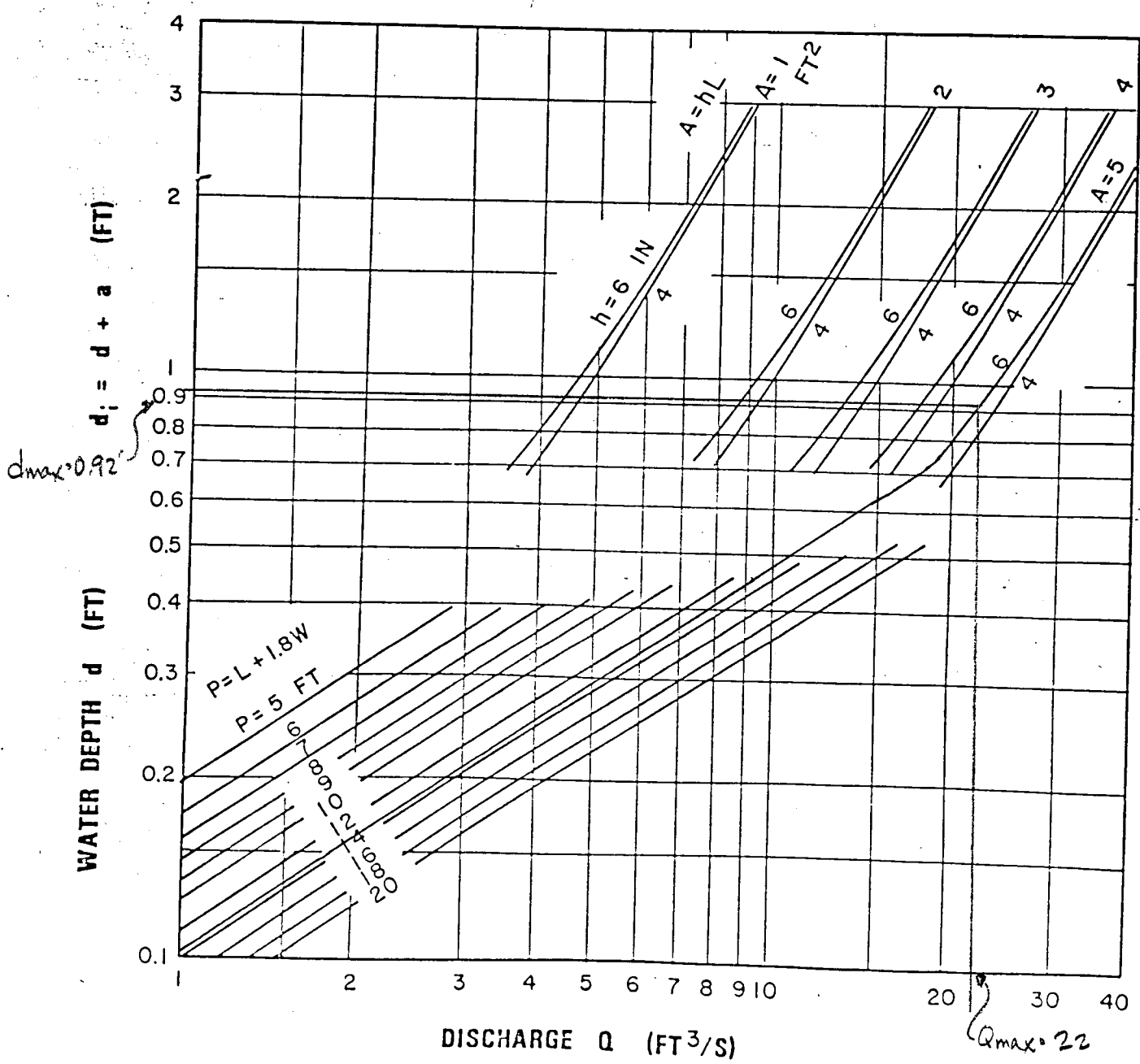
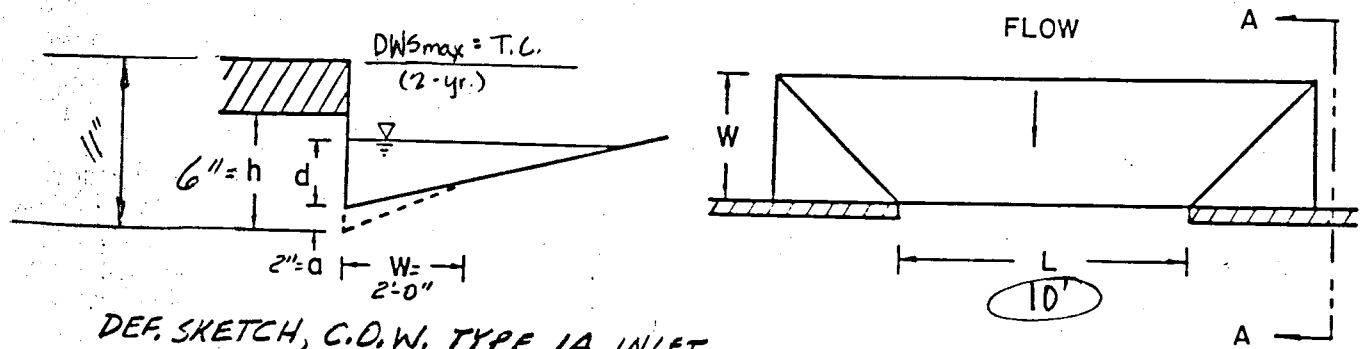


CHART 12. Depressed curb-opening inlet capacity in sump locations.

FROM: HEC-12, DRAINAGE OF HIGHWAY PAVEMENTS, F.H.W.A., MAR., 1974

$x\text{-slope} = 3/8" / \text{ft} = .03125 ' / 1'$   
 $z = 1/x\text{-slope} = 1/.03125 = 32$   
 $n = 0.016$   
 $z/n = 32/0.016 = 2000$

