PROFESSIONAL ENGINEERING CONSULTANTS, PA
1440 E. English
WICHITA, KANSAS 67211

(316) 262-2691

LETTER OF TRANSMITTAL

DATE	JOB NO.
November 2, 1987	36-87344-1104
ATTENTION: Ms. Vicky Huang	
RE: Wilderness 4th Addition	

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

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	11/6/87		"Drainage Plans & Supporting Calculations"

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 final plat will be submitted Friday, November 6, 1987, for hearing by the Subdivision Committee on Thursday, November 19, 1987.

COPY TO Mr. Terry Smythe
File

SIGNED: Charles B Brown

DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

FOR
WILDERNESS 4TH ADDITION
TO WICHITA, SEDGWICK COUNTY, KANSAS

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

NOVEMBER 6, 1987

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

PROFESSIONAL ENGINEERING CONSULTANTS
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ZIP CODE / 67211

Date Sept. 9, 1987 Page 1 of 13

Project Wilderness 4th Addition

Item Drainage Plan System 100

I HYDROLOGY Use Rational Formula $Q = cIA$

A. Determine "c"

Node	Soil Type	Land Use	C_2	C_{100}
101	D	Res. 1/4 Ac. Lot	0.50	0.76
100	End Section			

B. Determine "I"

Node	t_c	I_2	I_{100}
101	15	3.83	7.37
100	End Section		

C. Determine "A"

Node	Plan. Units	Area-SF	Area-Acres
101	29.00	290,000	6.65
100	End Section		

D. Determine "Q_2"

Node	c_2	I_2	A	Q_2
101	0.50	3.83	6.65	12.7
100	End Section			

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Project Wilderness 4th Addition

Item Drainage Plan System 100

E. Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
101	0.76	7.37	6.65	37.2
100	End Section			

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Project Wilderness 4th Addition

Item Drainage Plan System 100

II FLOOD ROUTING /INLET SIZING

Node	Inlet Condition	L	$Q_{approach}$ *	$Q_{intercept}$ #	Q_{bypass}	to Node #
101	Sump	10'	12.7	12.7	0.0	—
100	End Section					

Design overflow channel between Lots 55 & 54 (Prelim. Plat) for $Q_{100} - Q_2$.

* $Q_{approach} = Q_2$

\# $Q_{intercept}$ = Input Q in "Storm" Program

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Project Wilderness 4th Addition

Item Drainage Plan - System 100

III CHECK STREET FLOWS

2 YR

Node	Q_2	Distribution	street Slope	d	Comment
101	12.7	50% N = 6.4	1.0	0.35'	OK
		50% S = 6.3	1.0	0.35	OK

100-YR

Contributing Nodes	Q_{100}	street sl.	Q_{max} ≠	Comment
101	37.2	1.0%	77.4	OK

≠ From Page 6.

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Project Wilderness 4th Addition

Item Drainage Plan - System 100

IV OVER-FLOW SWALE (100-yr)

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

$= 37.2 - 12.7$

$= 24.5$ cfs

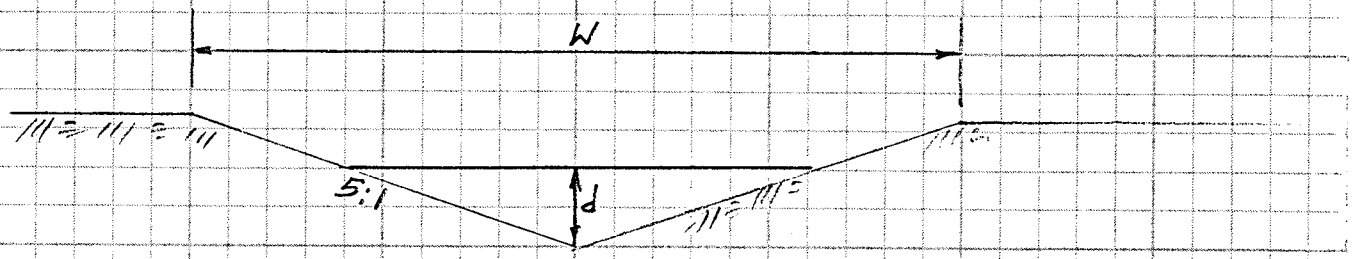
Use Manning's Eq'n $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

where $Q = 24.5$ cfs

$n = 0.030$

$S = 1\% = 0.01$

$$AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}} = \frac{24.5 \times 0.03}{1.486 \times 0.10} = \frac{0.735}{0.1486} = 4.95$$



d	A	P	R	$R^{2/3}$	$AR^{2/3}$
1.0'	5.00	10.198	0.49	0.62	3.11
1.1'	6.05	11.217	0.53	0.66	4.01
1.2	7.20	12.238	0.59	0.70	5.06

Use $d = 1.2'$ $V = Q/A = 24.5/7.2 = 3.40$ OK

W = width = $(1.2' + 1.0'$ Frbd$) \times 5 \times 2 = 22'$

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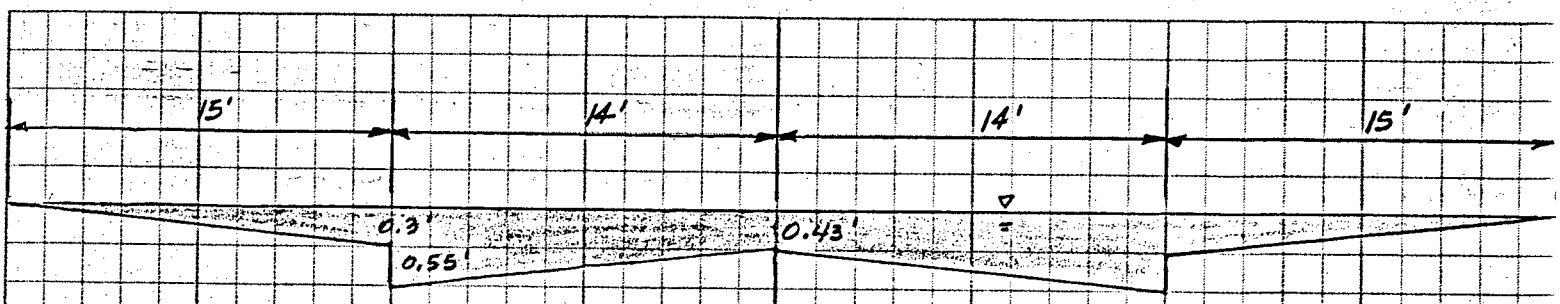
Project Wilderness 4th Addition

Item Drainage Plan - System 100



Determine Q_{max} in street R-O-W

Use Manning's Equation $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

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

$n = 0.02256$

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

$A = 22.42$ SF

$R = A/P = 22.42/59.1 = 0.379357$

$R^{2/3} = 0.524041$

$$Q = \frac{1.486}{0.02256} \times 22.42 \times 0.524041 \times S^{1/2}$$

$Q = 773.89 \sqrt{S}$

7/13

```
100 j,  193.5000  100    3    2    1
110 t,wilderness 4th addition
120 t,drainage plan
130 t,storm water sewer system 100 analsis
140 i,  101     0.50     6.65     0.00     0.00    12.70    15.00   201.00
150 m,  100   193.50
160 p,  101  100   230.00   18 0.013  80.00   0.00
170 e
```

Date: 09-09-1987
Time: 16:46:23

Input File: wild100

wilderness 4th addition
drainage plan
storm water sewer system 100 analsis

8/13

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area								Hydrology Summation				Conduit Data				
Node to Node		C	Area (Ac)	Slope (%)	Length (Ft)	TC(Ø) (Min)	I(Ø) (In/Hr)	Q(Ø) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
101	100	0.50	6.65	0.00	0.0	15.00	4.06	12.70	15.00	4.06	12.70	12.70	18"	7.19	230.00	0.53	15.53

Date: 09-09-1987
Time: 16:46:23

Input File: wild100

wilderness 4th addition
drainage plan
storm water sewer system 100 analsis

9/13

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)
101	0.01462	3.3620	0.0000	0.0000	0.0000	0.0000	0.0000	3.3620	196.8620	201.0000	4.14
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	193.5000	193.5000	0.00

```
100 j,  194.0000  100    3    2    1
110 t,wilderness 4th addition
120 t,drainage plan
130 t,storm water sewer system 100 analsis
140 i,  101     0.76    6.65     0.00     0.00    37.20    15.00   201.00
150 m,  100   194.00
160 p,  101  100   230.00   24 0.013  80.00   0.00
170 e
```

10/13

Date: 09-09-1987
Time: 16:52:57

Input File: wild100-100

11/13

wilderness 4th addition
drainage plan
storm water sewer system 100 analsis

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)
101	0.02704	6.2192	0.0000	0.0000	0.0000	0.0000	0.0000	6.2192	200.2192	201.0000	0.78
100	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	194.0000	194.0000	0.00

Date: 09-09-1987
Time: 16:52:57

Input File: wild100-100

12/13

wilderness 4th addition
drainage plan
storm water sewer system 100 analsis

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

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)
101	100	0.76	6.65	0.00	0.0	15.00	8.97	37.20	15.00	8.97	37.20	37.20	24"	11.84	230.00	0.32	15.32

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Project Wilderness 4th Addition

Item Drainage Plan - System 100

SUMMARY

ALT. 1 - Design Storm Sewer System for 2-year storm
- 18" Pipe, 10' inlet, overflow swale

ALT. 2 - Design Storm Sewer System for 100-year storm
- 24" Pipe, 15' inlet

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Date Sept. 9, 1987 Page 1 of 13

Project Wilderness 4th Addition

Item Drainage Plan - System 200

I HYDROLOGY

Use Rational Formula $Q = cIA$

A. Determine "c"

Node	Soil Type	Land Use	C_2	C_{100}
201	D	Res. 1/4 Ac. Lots	0.50	0.76
200	End Section			

B. Determine "I"

Node	tc	I_2	I_{100}
201	15	3.83	7.37
200	End Section		

C. Determine "A"

Node	Plan. Units	Area - S.F.	Area - Ac.
201	23.82	238,200	5.47
200	End Section		

D. Determine "Q_2"

Node	C_2	I_2	A	Q_2
201	0.50	3.83	5.47	10.5
200	End Section			

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Project Wilderness 4th Addition

Item Drainage Plan System 200

E Determine "Q_{100}"

Node	C_{100}	I_{100}	A	Q_{100}
201	0.76	7.37	5.47	30.6
200	End Sections			

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Project Wilderness 4th Addition

Item Drainage Plan System 200

II FLOOD ROUTING / INLET SIZING

Node	Inlet Condition	L	$Q_{approach}$ *	$Q_{intercept}$ ≠	Q_{bypass}	to Node #
201	Sump	5'	10.5	10.5	0.0	-
200	End Section					

Design overflow channel between Lots 41 & 42 (Prel. Plat) for $Q_{100} - Q_2$

* $Q_{approach} = Q_2$

≠ $Q_{intercept}$ = Input Q in "Storm" program.

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Project Wilderness 4th Addition

Item Drainage Plan System 200

III STREET FLOW

2 Yr

Node	Q_2	Distribution	street slope	d	Comment
201	10.5	25% W = 2.6	1.1 %	0.23'	OK
		75% E = 7.9	1.1 %	0.37'	OK

100-YR

Contributing Nodes	Q_{100}	street slope	Q_{max} *	Comment
201	30.6	1.1%	81.2	OK

* From p. 6

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Project Wilderness 4th Addition

Item Drainage Plan - System 200

III OVERFLOW SWALE (100-yr.)

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

$= 30.6 - 10.5$

$= 20.1$ cfs

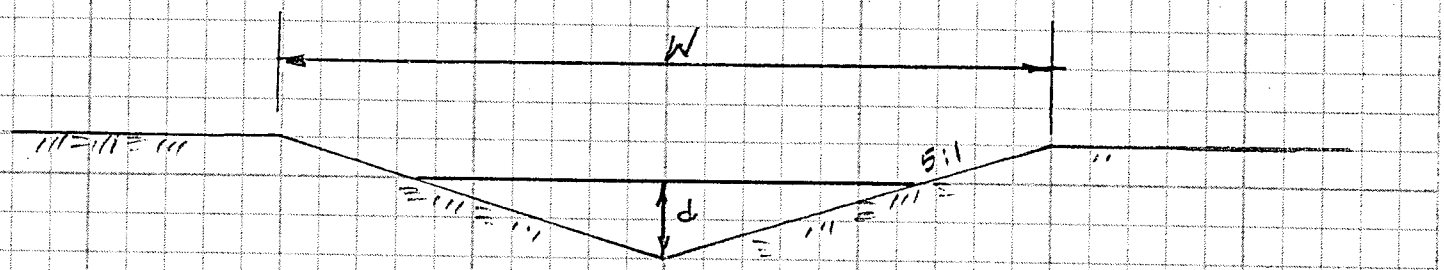
Use Manning's Eq'n $Q = \frac{1.486}{n} AR^{2/3} S^{1/2}$

where $Q = 20.1$ cfs

$n = 0.030$

$S = 1\% = 0.01$

$$AR^{2/3} = \frac{Q \times n}{1.486 \times S^{1/2}} = \frac{20.1 \times 0.03}{1.486 \times 0.10} = \frac{0.603}{0.1486} = 4.06$$



d	A	P	R	$R^{2/3}$	$AR^{2/3}$
1.0	5.00	10.198	0.49	0.62	3.11
1.1	6.05	11.217	0.53	0.66	4.01

Use $d = 1.1'$ $V = Q/A = 20.1/6.05 = 3.32$ fps OK

W = width = (1.1' + 1.6' Freeboard) x 5 x 2 = 21'

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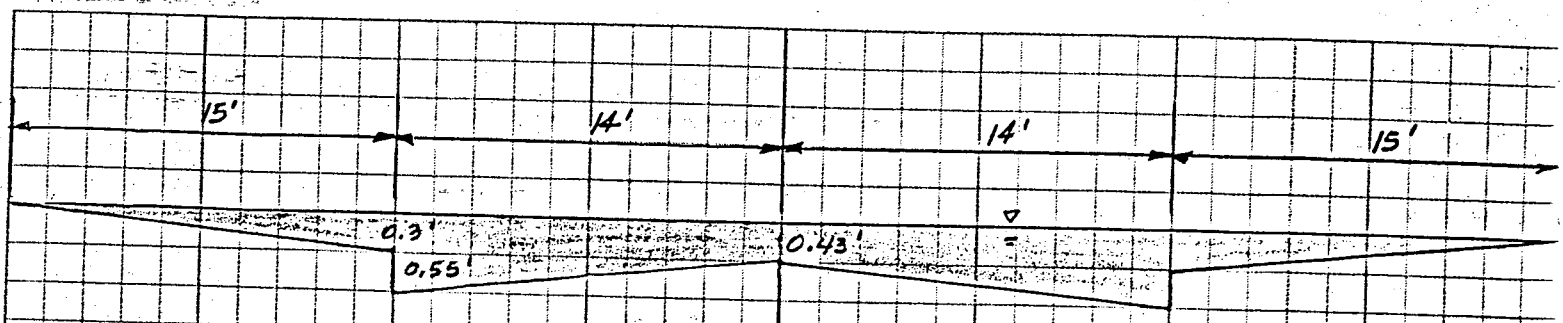
Project Wilderness 4th Addition

Item Drainage Plan - System 200



Determine Q_{max} in street R-O-W

Use Manning's Equation $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

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

$n = 0.02256$

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

$A = 22.42$ SF

$R = A/P = 22.42/59.1 = 0.379357$

$R^{2/3} = 0.524041$

$$Q = \frac{1.486}{0.02256} \times 22.42 \times 0.524041 \times S^{1/2}$$

$Q = 773.89 \sqrt{S}$

```
100 j,  197.5000  200    3    2    1
110 t,wilderness 4th addition
120 t,drainage plan
130 t,storm water sewer system 200 analysis
140 i,  201     0.50     5.47     0.00     0.00     10.50     15.00    203.00
150 m,  200   197.50
160 p,  201  200   210.00   18 0.013  20.00   0.00
170 e
```

7/13

Date: 09-10-1987
Time: 09:45:57

8/13

Input File: wild200

wilderness 4th addition
drainage plan
storm water sewer system 200 analysis

Storm Frequency = 2-Year

* * * HYDROLOGY * * *

Tributary Area								Hydrology Summation				Conduit Data				
Node to Node		C	Area (Ac)	Slope (%)	Length (Ft)	TC(Ø) (Min)	I(Ø) (In/Hr)	Q(Ø) (CFS)	TC (Min)	I (In/Hr)	Q (CFS)	Sum Q (CFS)	Size	Velocity (Ft/Sec)	Length (Ft)	TT (Min)	TT+TC (Min)
201	200	0.50	5.47	0.00	0.0	15.00	4.06	10.50	15.00	4.06	10.50	10.50	18"	5.94	210.00	0.59	15.59

Date: 09-10-1987
Time: 09:45:57

Input File: wild200

9/13

wilderness 4th addition
drainage plan
storm water sewer system 200 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)
201	0.00999	2.0983	0.0000	0.0000	0.0000	0.0000	0.0000	2.0983	199.5983	203.0000	3.40
200	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	197.5000	197.5000	0.00

```
100 j,  198.0000  200    3    2    1
110 t,wilderness 4th addition
120 t,drainage plan
130 t,storm water sewer system 200 analysis
140 i,   201    0.76     5.47     0.00     0.00    30.60    15.00   203.00
150 m,   200   198.00
160 p,  201  200   210.00   24 0.013  20.00   0.00
170 e
```

10/13

Date: 09-10-1987
Time: 09:55:14

Input File: wild200-100

11/13

wilderness 4th addition
drainage plan
storm water sewer system 200 analysis

Storm Frequency = 100-Year

* * * HYDROLOGY * * *

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)
201	200	0.76	5.47	0.00	0.0	15.00	8.97	30.60	15.00	8.97	30.60	30.60	24"	9.74	210.00	0.36	15.36

Date: 09-10-1987
Time: 09:55:14

Input File: wild200-100

12/13

wilderness 4th addition
drainage plan
storm water sewer system 200 analysis

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)
201	0.01830	3.8422	0.0000	0.0000	0.0000	0.0000	0.0000	3.8422	201.8422	203.0000	1.16
200	0.00000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	198.0000	198.0000	0.00

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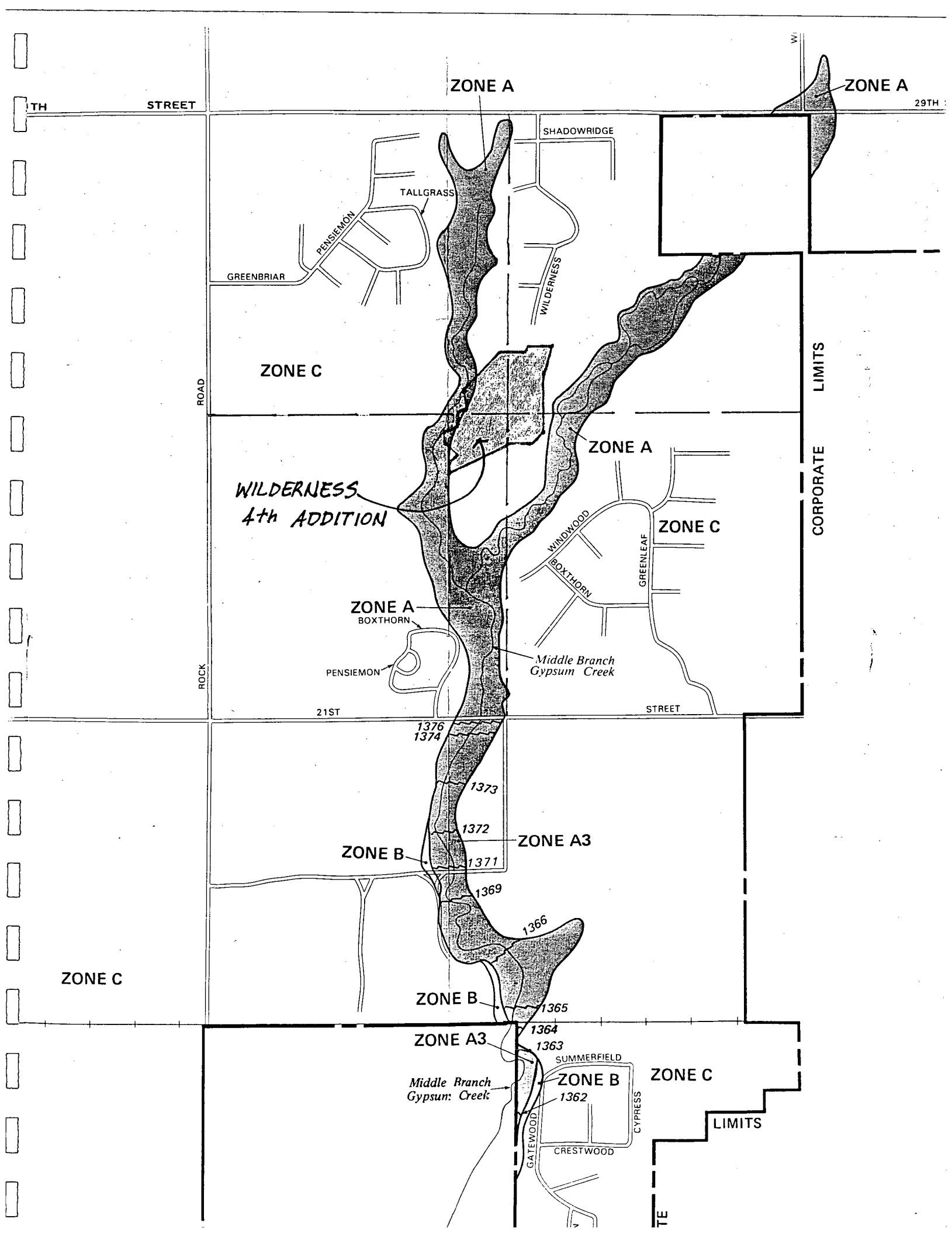
Project Wilderness 4th Addition

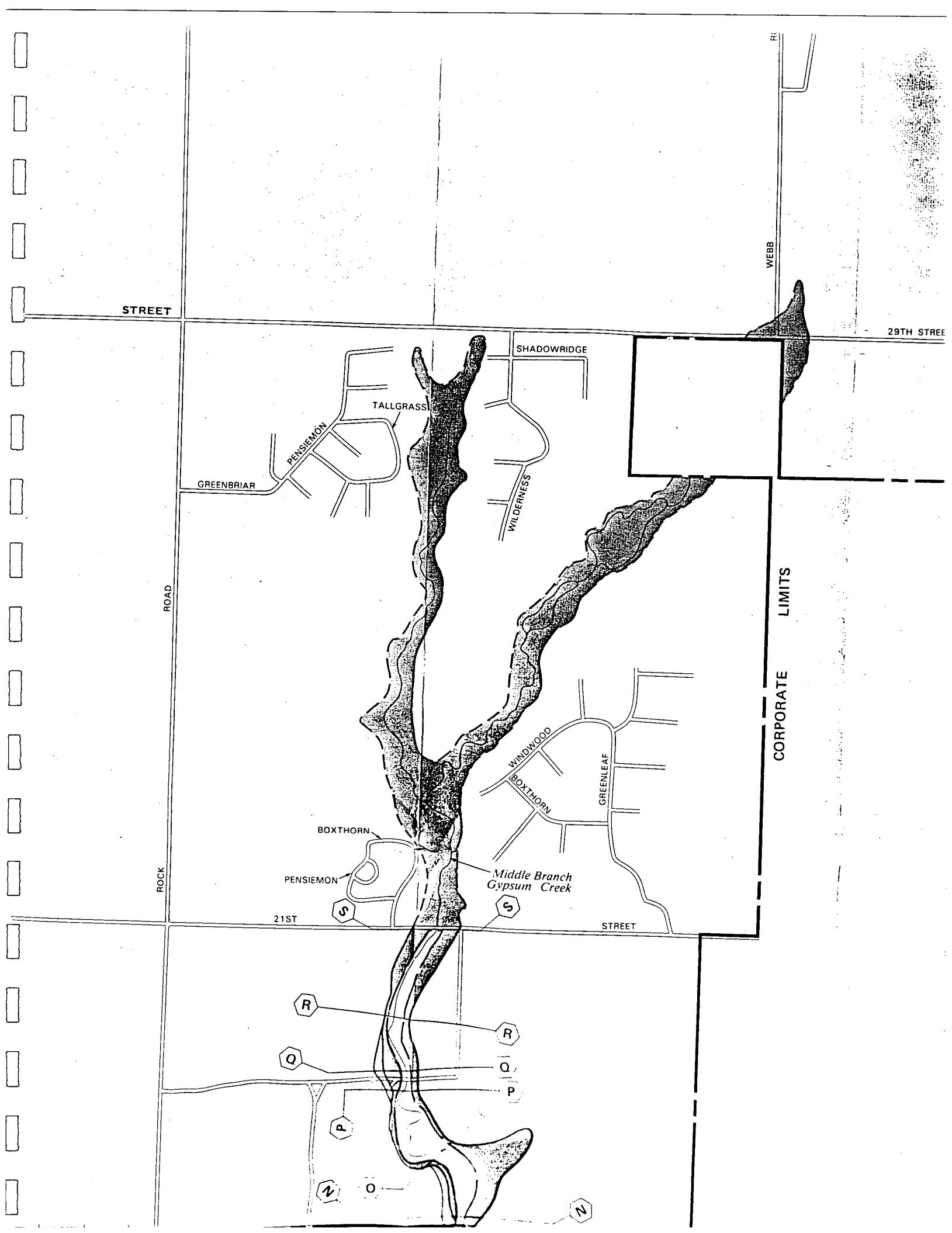
Item Drainage Plan System 200

SUMMARY

ALT. 1 - Design storm water sewer system for 2 year storm
- 18" pipe, 5' inlet, overflow swale

ALT. 2 - Design storm water sewer system for 100 year storm
- 24" pipe, 10' inlet


ZONE A
ZONE A
29TH
STREET
SHADOWRIDGE
TALLGRASS
PENSIEMON
GREENBRIAR
WILDERNESS
ZONE C
ROAD
LIMITS
CORPORATE
ZONE A
WILDERNESS
4th ADDITION
WINDWOOD
ZONE C
BOXTHORN
GREENLEAF
ZONE A
BOXTHORN
PENSIEMON
Middle Branch
Gypsum Creek
ROCK
21ST
STREET
1376
1374
1373
1372
ZONE A3
ZONE B
1371
1369
1366
ZONE C
ZONE B
1365
1364
ZONE A3
1363
SUMMERFIELD
Middle Branch
Gypsum Creek
ZONE B
ZONE C
1362
CYPRESS
GATEWOOD
CRESTWOOD
LIMITS


STREET
WEBB
29TH STREE
SHADOWRIDGE
TALLGRASS
PENSIEMON
GREENBRIAR
WILDERNESS
ROAD
CORPORATE LIMITS
WINDWOOD
BOXTHORN
GREENLEAF
BOXTHORN
PENSIEMON
Middle Branch
Gypsum Creek
ROCK
21ST
STREET
S
S
R
R
Q
Q
P
P
N
O
N

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)
MIDDLE BRANCH GYPSUM CREEK								
A	1000	109	690	2.7	1339.7	1339.7	1340.3	0.6
B	1269	109	646	2.9	1339.8	1339.8	1340.4	0.6
C	1391	32	270	7.0	1340.6	1340.6	1340.6	0.0
D	1891	45	405	4.7	1341.2	1341.2	1341.9	0.7
E	3760	70	202	9.3	1346.8	1346.8	1346.8	0.0
F	3860	70	376	5.0	1348.0	1348.0	1348.5	0.5
G	5010	119	626	3.0	1349.4	1349.4	1350.3	0.9
H	5460	110	474	4.0	1350.1	1350.1	1350.8	0.7
M	12,627	60[2]	216	5.8	1363.1	1363.1	1364.0	0.9
N	12,821	80	478	2.6	1365.6	1365.6	1365.8	0.2
O	13,611	150	530	2.3	1366.2	1366.2	1366.9	0.7
P	15,301	75	399	3.1	1369.3	1369.3	1369.4	0.1
Q	15,457	75	276	4.5	1370.8	1370.8	1370.8	0.0
R	16,037	100	327	3.8	1372.6	1372.6	1373.4	0.8
S	16,882	100	479	2.6	1376.1	1376.1	1376.3	0.2

[1]FEET ABOVE CONFLUENCE WITH GYPSUM CREEK
[2]THIS WIDTH IS BEYOND CORPORATE LIMITS

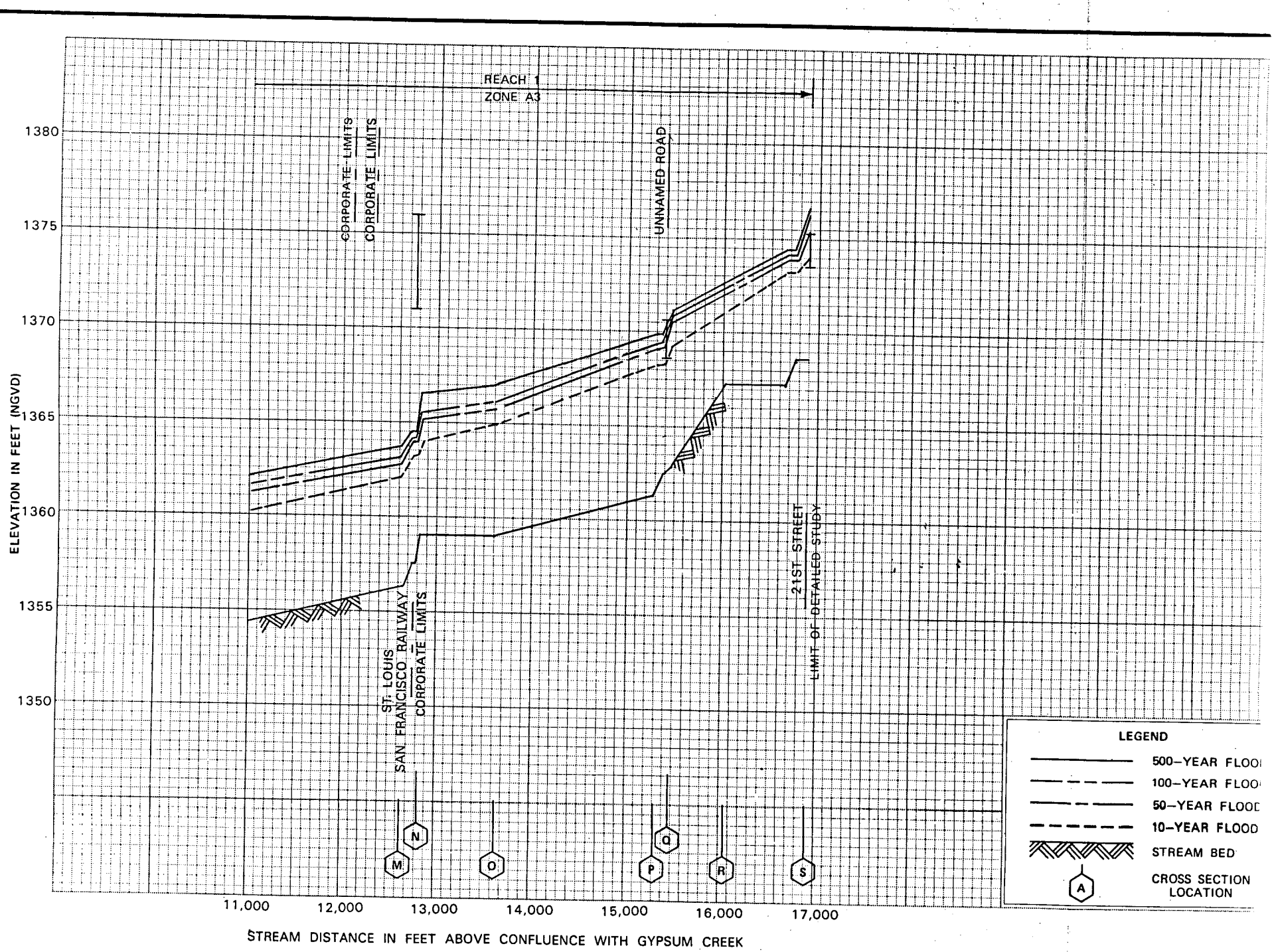
TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

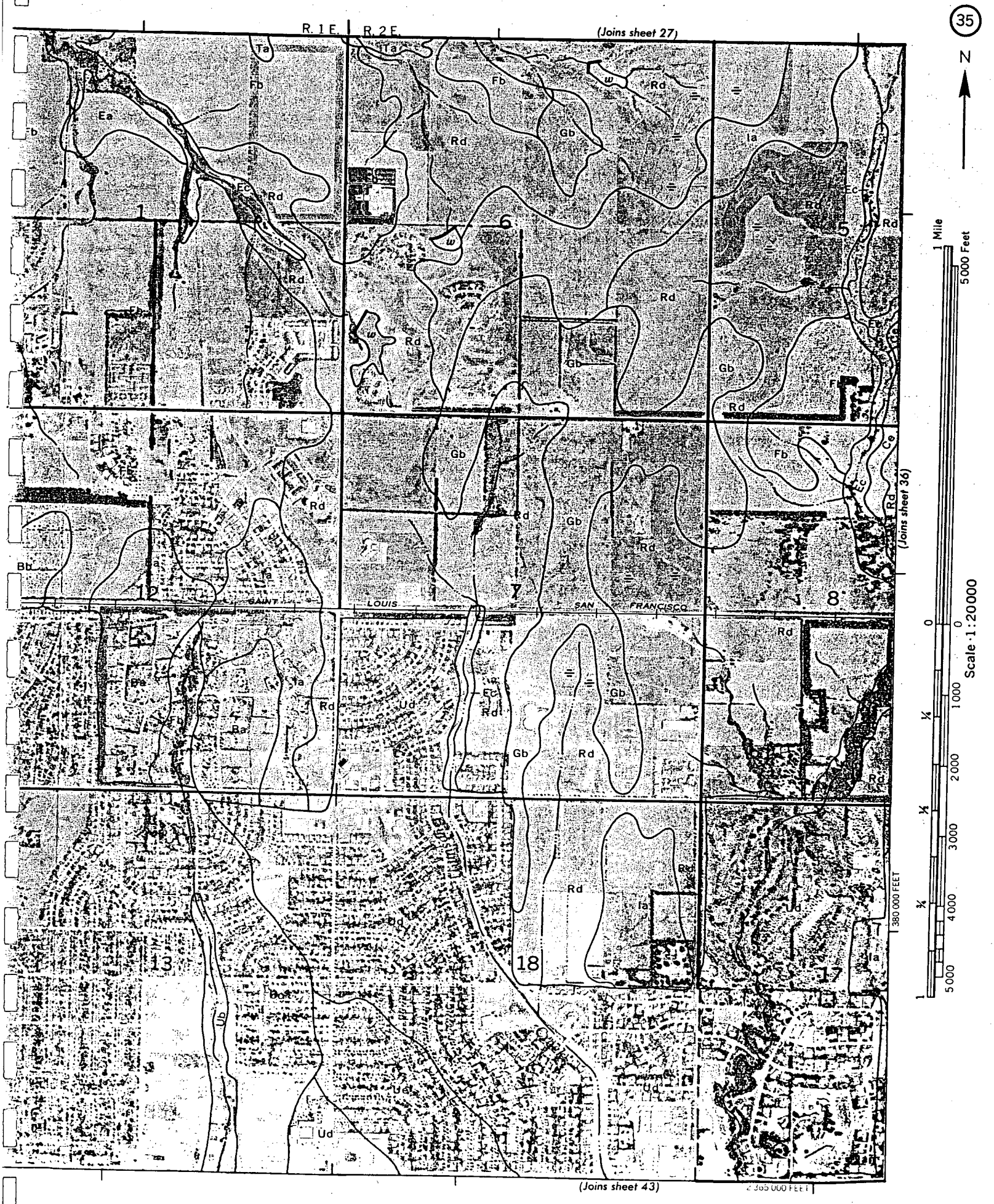
CITY OF WICHITA, KS
(SEDGWICK CO.)

FLOODWAY DATA

MIDDLE BRANCH GYPSUM CREEK


REACH 1
ZONE A3
CORPORATE LIMITS
CORPORATE LIMITS
UNNAMED ROAD
ELEVATION IN FEET (NGVD)
1380
1375
1370
1365
1360
1355
1350
ST. LOUIS SAN FRANCISCO RAILWAY
CORPORATE LIMITS
21ST STREET
LIMIT OF DETAILED STUDY
M
N
O
P
Q
R
S
11,000
12,000
13,000
14,000
15,000
16,000
17,000
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH GYPSUM CREEK
LEGEND
500-YEAR FLOOI
100-YEAR FLOOI
50-YEAR FLOOI
10-YEAR FLOOD
STREAM BED
A
CROSS SECTION LOCATION

S — SHEET NUMBER 35




(Joins sheet 28)
N
Gb
Rd
Ta
Ce
Ec
Ma
Ia
Ic
Ib
Va
5
4
3
8
9
10
16
17
15
SAINT LOUIS
SAN FRANCISCO
ST LOUIS
SAN FRANCISCO
water
Rawdon Landing Strip
LAKEVIEW GARDENS CEMETERY
(Joins sheet 35)
(Joins sheet 44)
1 Mile
5000 Feet
Scale 1:20000
380 000 FEET
2 370 000 FEET

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

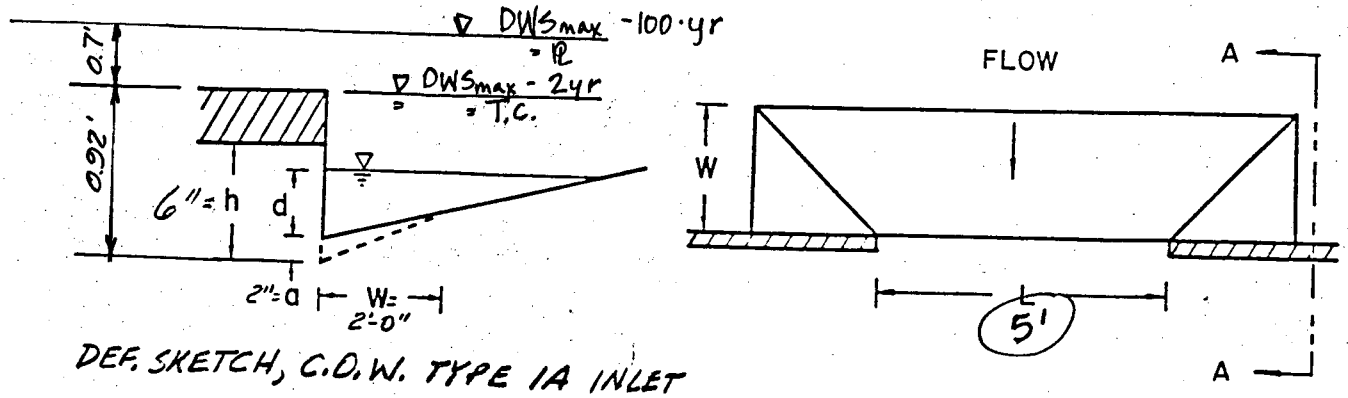
DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
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

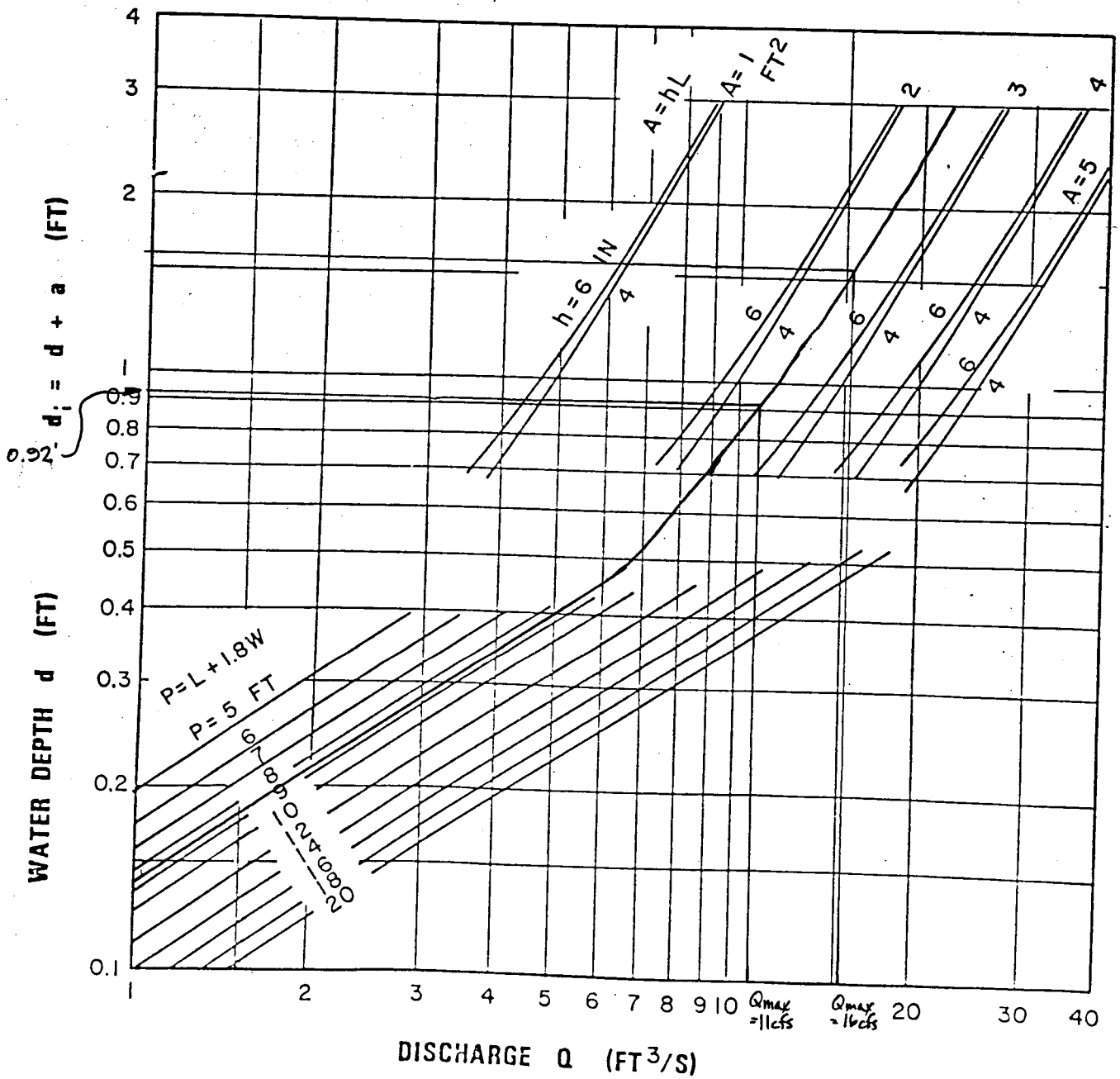
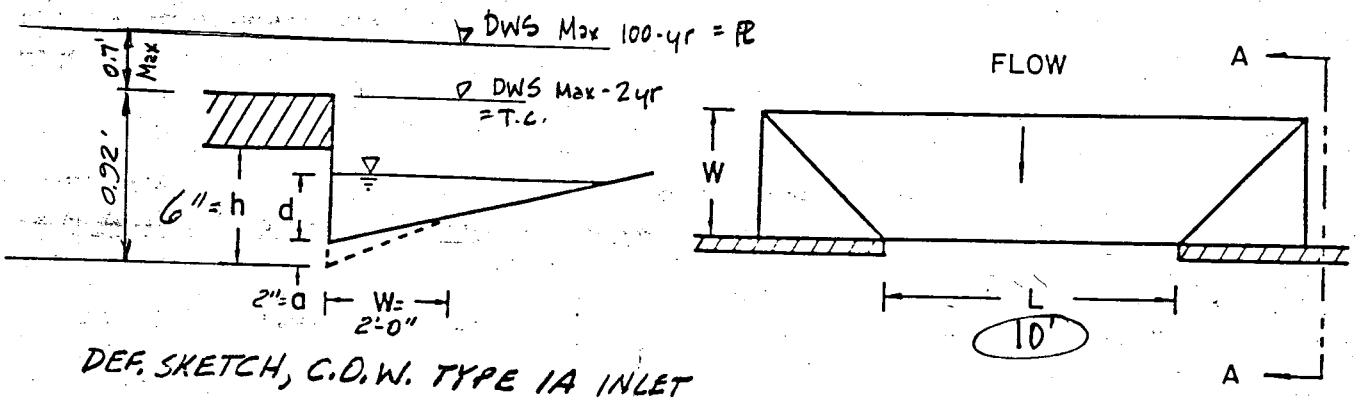


CHART 12. Depressed curb-opening inlet capacity in sump locations.

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



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

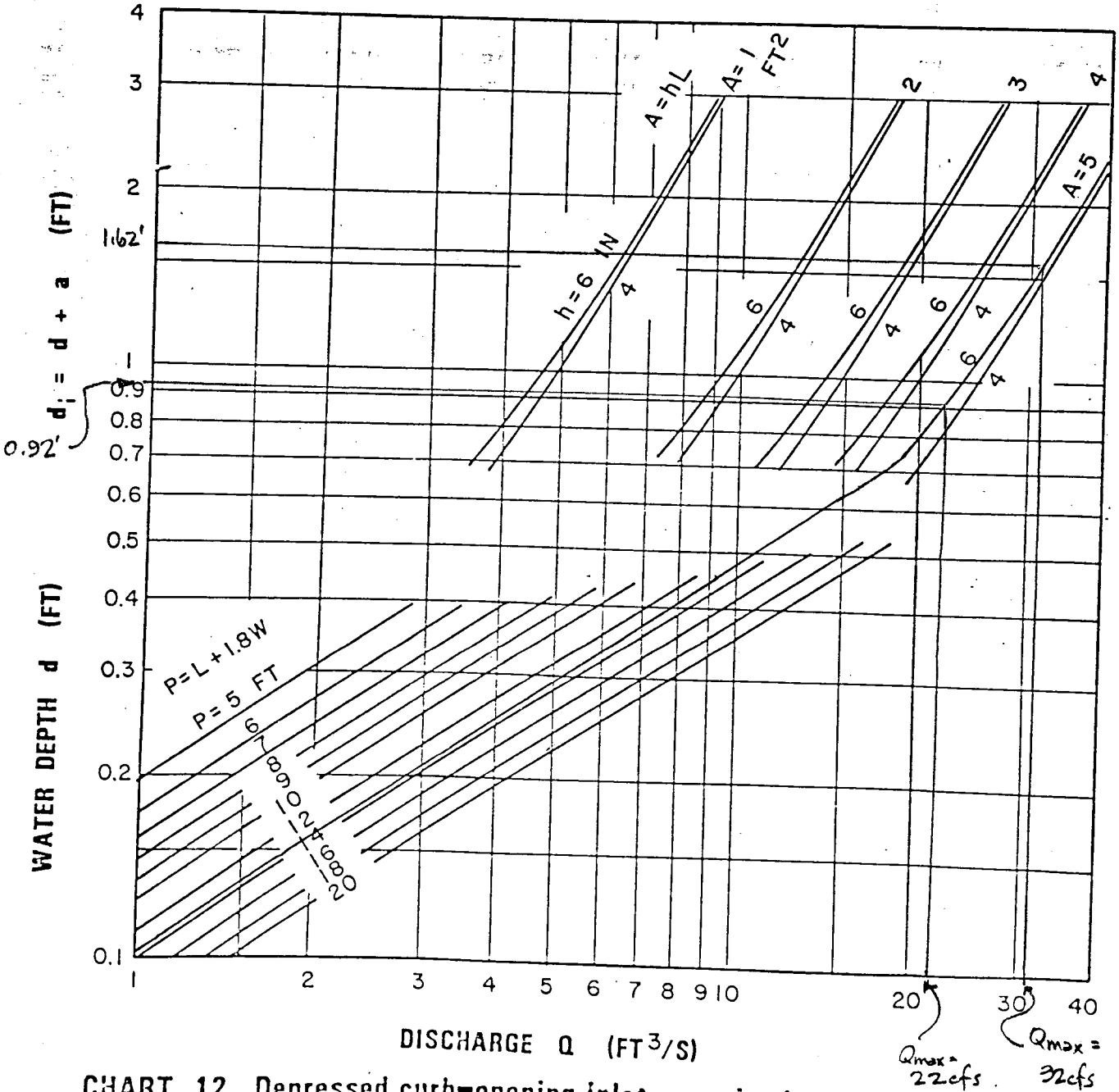


CHART 12. Depressed curb-opening inlet capacity in sump locations.

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

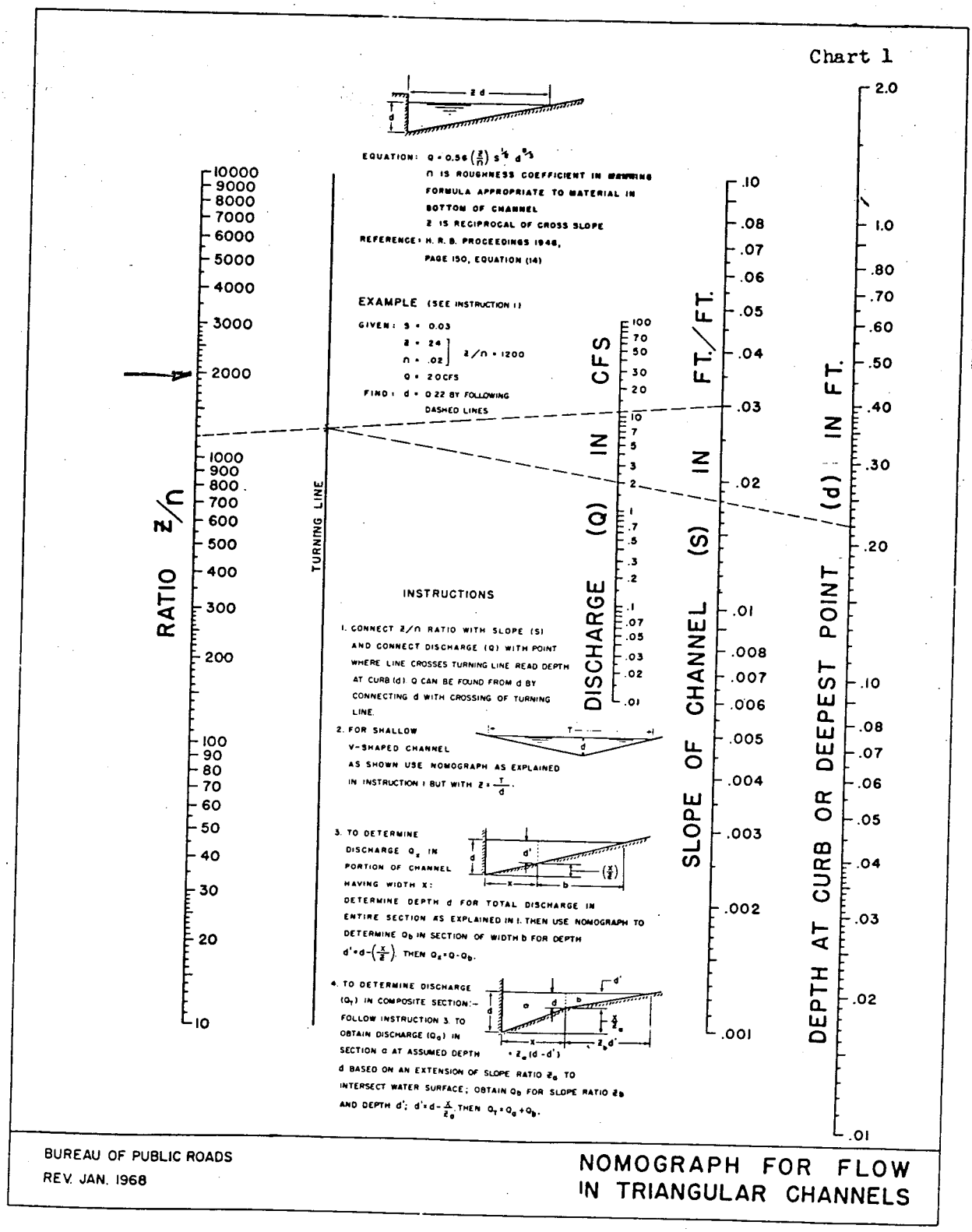
Wilderness 4th Addition

X-slope = 3/8"/Ft = 0.03125 z = 1/X-slope = 32

n = 0.016

z/n = 32/0.016 = 2000

Chart 1



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