Bridgeport I

Alt I

130 LF	60" RCP	@	80	=	10,400
100 LF	54" RCP	@	70	=	7,000
40 LF	48" RCP	@	60	=	2,400
380 LF	42" RCP	@	50	=	19,000
1000 LF	36" RCP	@	42	=	42,000
920 LF	30" RCP	@	35	=	32,200
280 LF	24" RCP	@	30	=	8,400
530 LF	18" RCP	@	25	=	13,250
150 LF	15" RCP	@	20	=	3,000
35 ea	Inlets	@	1,200	=	42,000
4 ea	Headwalls	@	5,000	=	20,000
37,000 CY	Excavation	@	3	=	111,000
					310,650
				add 25%	7,660
					388,300
					Say 390,000

= 390,000

Alt I

Outflow Line 1	70'	60" RCP	+ 1 Headwall
	60'	60" RCP	+ 1 Headwall
	100'	54" RCP	
	350'	42" RCP	
	150'	36" RCP	
	300'	30" RCP	
	40'	24" RCP	
	70'	15" RCP	
	11 Inlets		
Line 2	30'	42" RCP	+ 1 Headwall
	270'	36" RCP	
	530'	30" RCP	
	160'	24" RCP	
	40'	18" RCP	
	30'	15" RCP	
	10 Inlets		
Line 3	50'	30" RCP	w/ end section
	20'	15" RCP	
	3 Inlets		
Line 4	40'	48" RCP	w/ Headwall
	580'	36" RCP	
	40'	30" RCP	
	40'	24" RCP	
	400'	18" RCP	
	30'	15" RCP	
	9 Inlets		
Line 5	40'	24" RCP	w/ end section
	90'	18" RCP	
	2 Inlets		

= 440,000

Alt. II

Outflow line 1, Line 2 Same as Alt I

Line 3	40 LF	42" RCP	w/ Headwall
	280 LF	36" RCP	
	300 LF	30" RCP	
	10 LF	18" RCP	
	10 LF	15" RCP	
	3 Inlets		
	2 Field Inlets		
Line 4 & 5	750 LF	48" RCP	w/ Headwall
	550 LF	36" RCP	
	400 LF	18" RCP	
	100 LF	15" RCP	

Excavation Alt. II
Pond 24180 CY
Ditches 6750 CY = 30930 + 10% = 34,000 CY

Alt. I
Pond 21540 C.Y
Ditches 12125 CY = 33665 + 10% = 37,000 C.Y

Bridgeport I

§ Outlet Capacity
SWD#14 Central Drain
95" x 67" CMPA @ .11%
Q = 166 cfs (See Poe's Calculation)

§ Total Drainage Area = 102 Ac.
C = 0.7 (Rational Method)
L = 3825'
H = 7.3'
t_c = 50 min
I_5 = 2.63 I_{100} = 4.56
Q_5 = 188 cfs Q_{100} = 326 cfs

SCS Method
Lag-Tc Method Qpeak = 225 cfs
(See attached Sheet for computation)

Use rational method for conservatism
Q_p = 326 cfs
Corresponding discharge = 420 csm/in.
Tc = .67 hrs = 40 min.

Outflow pipe capacity – Q in area 10 (A = 8.7 Ac)
t_c = 55 min I_{100} = 4.23 Q = 26 cfs
Q_o = 140

Alt II

130 LF	60" RCP	@	80	=	[illegible]
100 LF	54 RCP	@	70	=	7,000
750 LF	48" RCP	@	60	=	[illegible]
420 LF	42" RCP	@	50	=	[illegible]
1250 LF	36" RCP	@	42	=	[illegible]
1130 LF	30" RCP	@	35	=	[illegible]
200 LF	24" RCP	@	30	=	6,000
450 LF	18" RCP	@	25	=	[illegible]
210 LF	15" RCP	@	20	=	[illegible]
35 ea	Inlets	@	1,200	=	[illegible]
2 ea	Area Inlets	@	2,500	=	5,000
5 ea	Headwalls	@	5,000	=	25,000
34,000 CY	Excavation	@	3	=	102,000
					352,000
				add 25%	88,000
					440,000

VI-7

TR-55 APPENDIX "D" PEAK DISCHARGE COMPUTATION SHEET

Project Bridgeport I Watershed Condition Flat (Industrial)
By ______ Date ______
Checked by ______ Date ______

INPUT

1. 102 ac — Drainage Area (DA)
2. 3825 ft — Hydraulic Length
3. .2 % — Watershed Slope
4. F (F M or S) — Slope Class
5. 90 — Runoff Curve No.
6. 6 in (24-hour) (100-yr. freq.) — Rainfall
7. 0 % — Ponds, Swamps
8. 72 % — Impervious
9. 80 % — Hyd. Length Mod.

10. 130 ac — Equivalent DA (Figure E-1)
11. 102 ac / 130 ac — Actual DA / Equiv. DA

PEAK FACTOR

12. .78 — Shape Adj.
13. .55 — Slope Adj. (Table E-1)
14. 55 cfs/in — Basic Peak Disch. (Figure D-2)
15. 4.85 in — Runoff Volume (Table 2-1 or Figure 10)
16. 1.0 — Ponds, Swamps Adj. (Table E-2, E-3 or E-4 (Location determines table))
17. 1.28 — Impervious Area Adj. (Figure 4-1)
18. 1.32 — Hyd. Length Adj. (Figure 4-2)
19. 194 cfs — ADJUSTED PEAK DISCHARGE

VI-9

TR-55 LAG-T_C METHOD PEAK DISCHARGE COMPUTATION SHEET

Project Bridgeport I Watershed Condition ______
By ______ Date ______
Checked by ______ Date ______

INPUT

1. 6 in (24-hour) (100-yr. freq.) — Rainfall (Table 2-1 or Figure 10)
2. 90 — Runoff Curve No.
3. 3825 ft — Hydraulic Length
4. .2 % — Watershed Slope
5. 80 % — Hydr. Length Modified
6. 72 % — Impervious Area
7. .16 sq.mi. — Drainage Area (DA)
8. 0 % — Ponds, Swamps

T_c FACTOR

167 — Constant
9. 1.45 hr — Basic Lag (Figure 3-3)
10. .68 — Hydr. Length Adj. (Figure 3-4)
11. .71 — Imp. Area Adj. (Figure 3-5)
12. 1.17 hr — T_c

PEAK FACTOR

13. 4.85 in — Runoff Volume
14. 290 csm/in — Basic Peak Disch. (Figure 5-2)
15. .16 sq.mi — Drainage Area
16. 1.0 — Ponds, Swamps Adj. (Table E-2, E-3 or E-4 (Location determines table))
17. 225 cfs — ADJUSTED PEAK DISCHARGE

VII-13

TR-55 STORM WATER STORAGE COMPUTATION SHEET

PROJECT ______ By ______ Date ______

1. Design Frequency 100 – yr. Dr. Area (DA) 93.3 ac. .146 mi.²
   Sediment Storage ______ in. Struc. Release (q_o) 160 cfs 960 csm
   Runoff Depth (V_r = Q) 4.85 in. Prin. Spillway: Weir ______ or Pipe ______
   Peak Inflow (q_i) 326 cfs Reservoir Stage-Storage Curve Attached
2. Routing Curve: Use Release Rate (q_o) to select curve. Check one blank.

Figure 7-1	Type of Principal Spillway	Figure 7-2
____ Up to 150 csm	Weir Flow Structure	Over 150 csm ____
____ Up to 300 csm	Pipe Flow Structure	Over 300 csm X

3. Floodwater Storage Required (Vs), inches depth on watershed.

   Figure 7-1. Use Runoff Depth (Vr) and Structure Release Rate (q_o) as input to find Storage (Vs) ______ in.

   or

   Figure 7-2. Use Structure Release Rate (q_o) and Peak Inflow Rate (q_i) as the ratio, $\frac{q_o}{q_i} = \frac{140 \text{ cfs}}{326 \text{ cfs}}$ = .43

   to find the volume ratio, $\frac{\text{Volume of Storage (Vs)}}{\text{Volume of Runoff (Vr)}}$ = .325

   Vs = (Vs/Vr) (Vr) = (.325) (4.85 in.) = 1.58 in.
4. Floodwater Storage Required (Vs), acre-feet.

   Vs = $\frac{\text{Vs in.}}{\text{12 in/ft}}$ (DA ac.) = $\frac{\text{1.58 in.}}{\text{12 in./ft.}}$ (93.3 ac.) = 12.3 acre-feet
5. Proportion the structure so that the desired release rate and the required storage occur at the same water surface elevation in the reservoir. Consider Sediment Storage requirement and prepare summary table below. The optional design should include provision for additional water use needs as can be met by the site.

STRUCTURE SUMMARY DATA

Reservoir Design	Water Surface Elevation ft.	Volume (in.)	Volume (ac.-ft.)	Surface Area (acres)
Minimum				
Permanent Pool	122.2			
Flood Pool	128.0			
Optional				
Permanent Pool				
Flood Pool				

6. Proportion an emergency spillway to safely convey flows during storms greater than the design frequency.

Table VI-2 — TR 55 Form 1 - Hydrograph Computations- Basic Data

Subarea	Drainage Area, Ac / mi²	Y[1]	CN[2]	PIA,[3] %	HLM,[4] %	l,[5] ft
1	18.6 / 0.029					
2	10.9 / 0.017					
3	2.1 / 0.003					
4	13.2 / 0.021					
5	20.1 / 0.031					
6	7.0 / 0.011					
7	4.1 / 0.006					
8	12.5 / 0.019					
9	4.8 / 0.008					
Σ	93.3 / .145					
10	8.7 / .014					

1 Y = average watershed land slope, %
2 CN = runoff curve number
3 PIA = percent impervious area, %
4 HLM = percent of hydraulic length modified, %
5 l = hydraulic length of watershed, ft., distance from point of design up the channel until it disappears, then normal to the contours up to the divide.

VI-25

STORAGE Vol.

Elevation	Area	Ave Area	Increment of depth	Δ Volume	Σ Volume
122.2	1.42	1.49	1.3	1.94	0
123.5	1.56	1.78	1.5	2.67	1.94
125.0	1.73 + .28	2.27	1	2.27	4.61
126.0	1.85 + .68	2.88	1	2.88	6.88
127.0	1.96 + 1.26	3.59	1	3.59	9.76
128.0	2.09 + 1.87				13.35

Outflow rate 95" x 67" CMPA x 60" RCP

Elevation	d	d/D	Qo	d/D	Qo
122.2	0	0	0	0	0
124.0	1.8	.32	35	.36	20
125.0	2.8	.50	80	.56	48
126.0	3.8	.68	120	.76	82
127.0	4.8	.86	150	.96	115
128.0	5.8	1.04	166	1.16	140

Routing Curve 60" RCP

Elev.	S	O	121S + O	O	121S + O
122.2	0	0	0	0	0
122.7	0.65	3		3	81.6
123.5	1.94			11	245.7
124.3	3.40			28	439.4
125.0	4.61	53	610.8	48	605.8
126.0	6.88	85	917.5	82	914.5
127.0	9.76	135	1316.0	115	1296.0
128.0	13.35	166	1781.4	140	1755.4

Table VI-3 — TR 55 Form 2 - Hydrograph Computations - Time of Concentration, Travel Time and Runoff

Subarea	L Basin Lag, hrs	F_{HLM}[1]	F_{IMP}[2]	T_c[3]	Length of Channel, ft	Average velocity	T_t	Design Precip., in	Q[4], in.	[5] C = DA·Q, mi²-in
1				23			8	6	4.85	.141
2				21			8			.083
3				15			5			.016
4				20			5			.100
5				24			5			.152
6				15			0			.053
7				15			0			.031
8				20			3			.095
9				15			0			.037
10				55			0			.066

1 Correction Factor for hydraulic length modified from Fig. 3-4, p. 3-8, TR 55
2 Correction Factor for imperviousness from Fig. 3-5, p. 3-9, TR 55
3 T_c = 1.67 · L · F_{HLM} · F_{IMP}
4 ... Table 2-1, p. 2-3, TR 55 for the design storm precipitation

VI-27

Table VI-4 — TR 55 Form 3 - Hydrograph Computations

See next page for additional calculation

Subarea hydrographs, cfs

Subarea	T_c	T_t	C[1]	11.0 hrs.	11.5 hrs.	12.0 hrs.	12.4 hrs.	12.6 hrs.	12.8 hrs.	13.0 hrs.	13.2 hrs.	13.5 hrs.	14.0 hrs.	14.5 hrs.	15.0 hrs.	16.0 hrs.	18.0 hrs.	20.0 hrs.
1	23	8	.141	2.5	4.7	53.2	50.1	31.7	20.1	14.0	10.8	8.2	6.3	5.1	4.4	3.5	2.6	2.0
2	21	8	.083	1.5	2.9	35.1	27.5	16.8	10.7	7.6	6.0	4.7	3.6	3.0	2.6	2.1	1.5	1.2
3	15	5	.016	0.3	0.7	8.8	3.8	2.3	1.5	1.2	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.2
4	20	5	.100	2.0	3.9	53.2	26.5	16.1	10.5	8.0	6.6	5.4	4.2	3.5	3.1	2.5	1.8	1.4
5	24	5	.152	2.7	5.4	66.5	48.5	30.7	19.8	14.1	11.1	8.6	6.6	5.4	4.7	3.8	2.7	2.1
6	15	0	.053	1.2	2.4	34.4	8.5	6.0	4.3	3.7	3.1	2.7	2.1	1.8	1.6	1.3	1.2	0.7
7	15	0	.031	0.7	1.4	20.1	5.0	3.5	2.5	2.2	1.8	1.6	1.3	1.1	0.9	0.7	0.6	0.4
8	20	3	.095	1.9	3.7	52.5	23.9	17.2	10.0	7.6	6.3	5.1	4.1	3.3	2.9	2.3	1.7	1.3
9	15	0	.037	0.8	1.7	24.0	6.0	4.2	3.0	2.6	2.2	1.9	1.5	1.3	1.1	0.9	0.7	0.5
Total				13.6	26.8	347.8	199.8	128.5	82.4	61.0	48.9	39.0	30.4	25.1	21.8	17.5	13.1	9.8

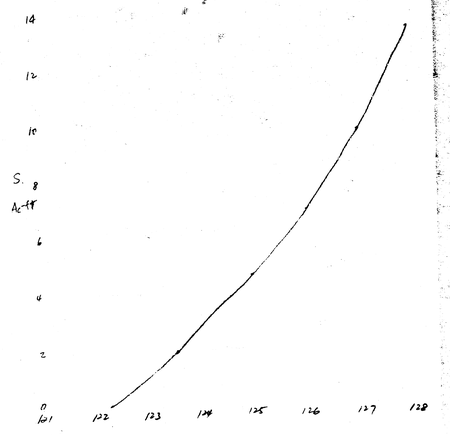
VI-28

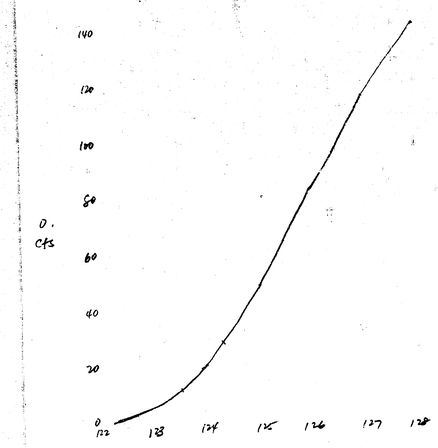
Table VI-4 — TR 55 Form 3 - Hydrograph Computations

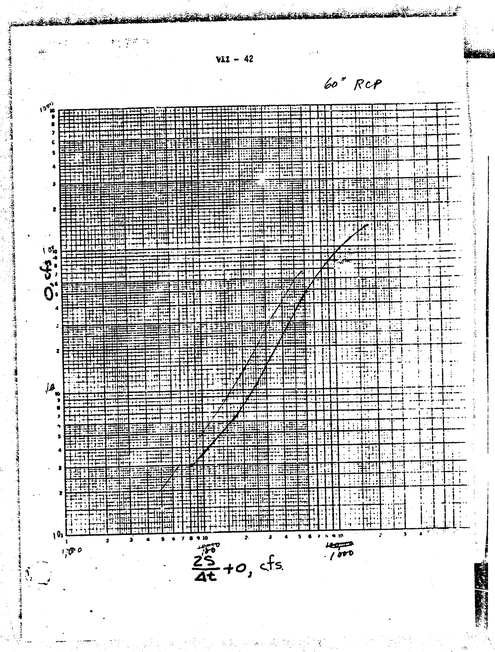
Subarea hydrographs, cfs

Subarea	T_c	T_t	C[1]	~~11.0~~ 11.7 hrs.	~~11.5~~ 11.8 hrs.	~~12.0~~ 11.9 hrs.	~~12.4~~ 12.0 hrs.	~~12.6~~ 12.1 hrs.	~~12.8~~ 12.2 hrs.	~~13.0~~ 12.3 hrs.	13.2 hrs.	13.5 hrs.	14.0 hrs.	14.5 hrs.	15.0 hrs.	16.0 hrs.	18.0 hrs.	20.0 hrs.
1				10.5	21.2	39.3	55.7	65.8	64.9	58.3								
2				6.7	13.9	25.7	35.1	39.7	38.4	33.6								
3				2.1	4.9	8.3	8.8	8.0	6.5	5.0								
4				9.9	21.5	39.4	50.0	50.6	44.2	35.9								
5				12.4	25.4	47.4	66.5	75.6	69.4	59.3								
6				9.2	22.1	36.6	34.4	25.4	16.4	11.2								
7				5.4	12.9	21.4	20.1	14.9	9.6	6.5								
8				10.5	23.3	42.6	52.3	49.7	40.3	31.3								
9				6.5	15.4	25.6	24.0	17.7	11.4	7.8								
Total				73.2	160.6	286.3	346.9	347.4	301.1	248.7								

VI-28





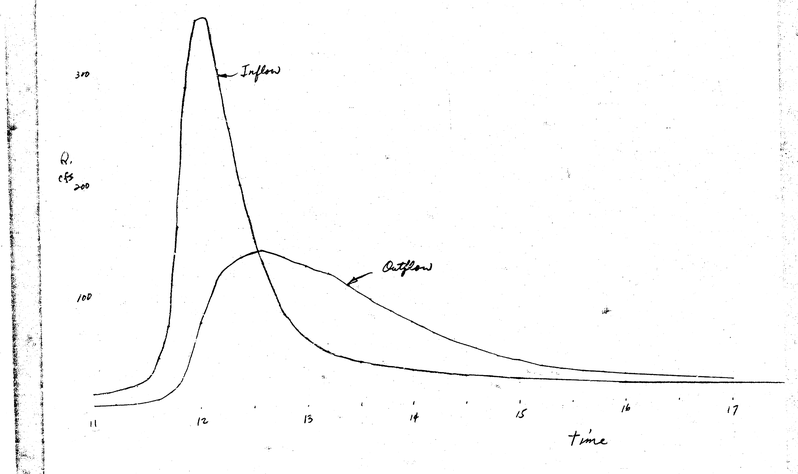


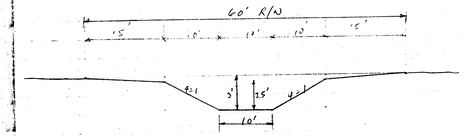
Design Pond Routing

Line	0 Time	1 I_1	2 I_1+I_2	3 $\frac{2S_1}{\Delta t}-O_1$	4 $\frac{2S_2}{t}+O_2$	P VII-41 5 Elev	P VII-42 6 Outflow O_2	P VII-41 7 Storage S_2
1	11.0	14			82		3	
2	11.2	17	31	76	107		4	
3	11.4	22	39	99	138		5	
4	11.6	45	67	128	195		8	
5	11.8	161	206	179	385		22	
6	12.0	347	508	341	849		75	
7	12.2	301	648	659	1347		118	
8	12.4	200	501	1111	1612		133	
9	12.6	129	329	1346	1675		140	
10	12.8	82	211	1395	1606		133	
11	13.0	61	143	1340	1483		125	
12	13.2	49	110	1233	1343		118	
13	13.4	42	91	1107	1198		107	
14	13.6	37	79	984	1063		95	
15	13.8	34	71	873	944		84	
	14.0	31	65	776	841		74	

Design Pond Routing

Line	0 Time	1 I_1	2 I_1+I_2	3 $\frac{2S_1}{\Delta t}-O_1$	4 $\frac{2S_2}{t}+O_2$	5 Elev	6 Outflow O_2	7 Storage S_2
17	14.2	29	60	693	753		64	
18	14.4	27	56	605	621		56	
19	14.6	25	52	569	621		50	
20	14.8	23	48	531	569		93	
21	15.0	22	45	483	532		29	
22	15.2	21	43	450	493		33	
23	15.4	20	41	427	468		31	
24	15.6	19	39	406	865		28	
25	15.8	18	37	389	426		27	
26	16.0	18	36	372	408		25	
27	16.2	17	35	357	393		23	
28	16.4	17	34	347	381		22	
29	16.6	16	33	337	370		21	
30	16.8	16	32	328	360		20	
31	17.0	15	21	320	351		19	
32								





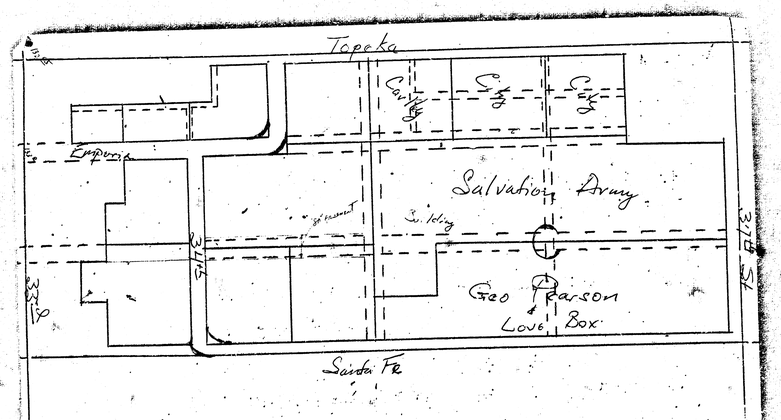
Ditch Capacity
10' bottom
2' Water depth
.3% Slope
$A = 36\ ft^2$
$R = 1.36$
$n = 0.035$
$Q_{cap} = \frac{1.486}{0.035}(1.36)^{2/3} \times 36 \times (.003)^{1/2}$
$= 102.7$ cfs
$V = 2.85$ fps

70' R/W — 10' bottom .2% Slope
Max. $d = 3.75'$
$A = 74.75$
$Q_{cap.} = \frac{1.486}{.035}\left(\frac{74.75}{36.8}\right)^{2/3} \times 74.25 \times (.002)^{1/2}$
$= 227.6$ cfs

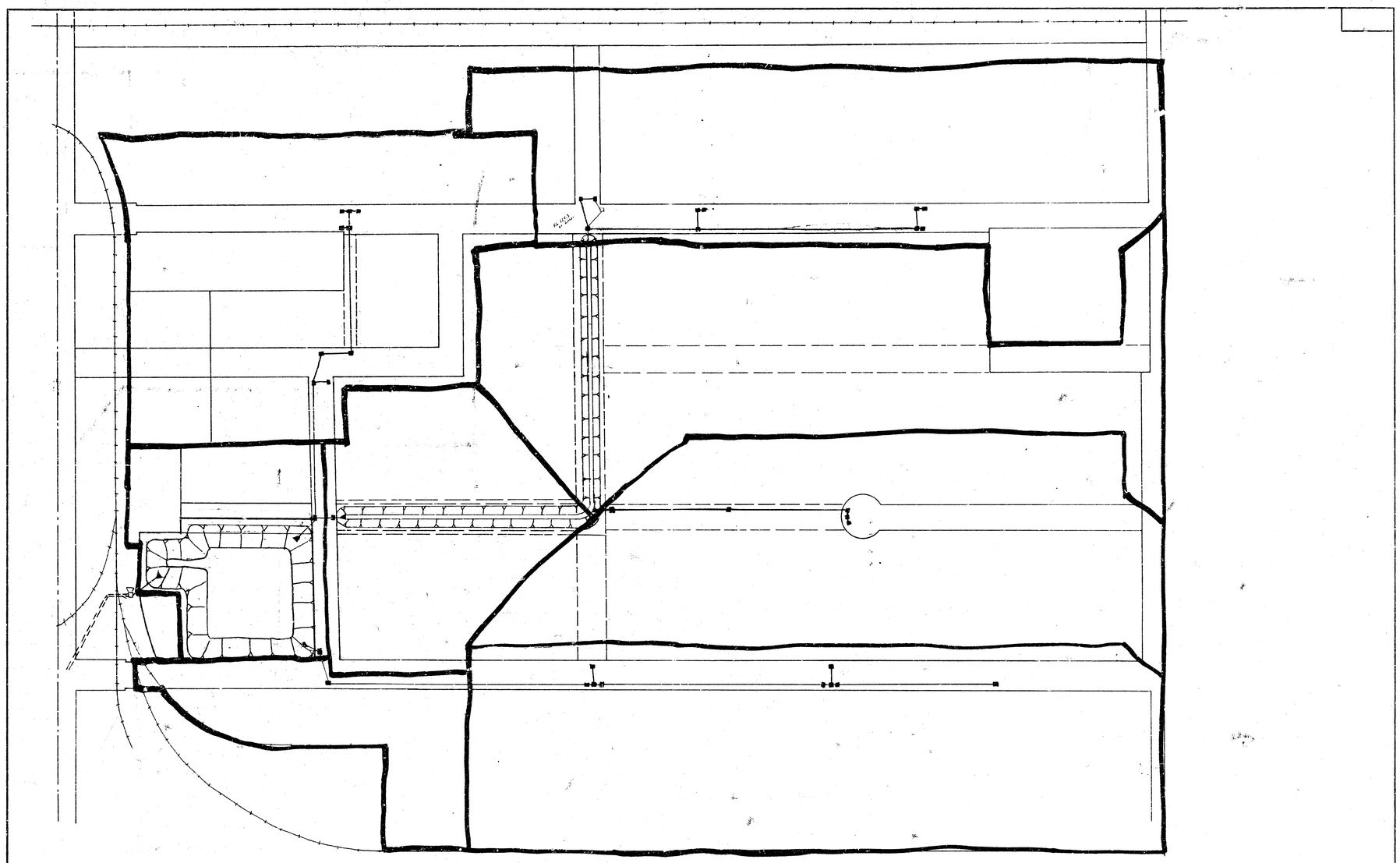
80' R/W, Max $d = 4.5'$, $S = .2\%$
$A = 12.6$
$Q_{cap.} = \frac{1.486}{.035}\left(\frac{12.6}{0.71}\right)^{2/3} \cdot 12.6 \times (0.002)^{1/2}$
$= 461$ cfs > 265 cfs O.K

Schedule I

Elevation	Area	Ave Area	Increment Depth	Volume	Volume
122.2	1.27	1.62	.8	1.29	1.29
123.0	1.66	1.95	1	1.75	3.04
124.0	1.77 + .97	2.00	1	2.00	5.04
125.0	1.89 + .36	2.91	1	2.91	7.95
126.0	2.12 + .34	2.80	1	2.80	10.75
127.0	2.197 + .77	3.08	1	3.08	13.83
128.0	2.36 + .99				11.17 + 7.16



BRIDGEPORT INDUSTRIAL PARK I
(DRAINAGE)



PROJECT DESCRIPTION
Bridgeport Industrial Park
Drainage Concept - Alt. II
PROJECT NUMBER