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

≟ 270,000

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

≟ 340,000

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 I

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]
20 LF	24" RCP	@	30	=	6,[illegible]
450 LF	18 RCP	@	25	=	[illegible]
210 LF	15' RCP	@	20	=	[illegible]
35 ea	Inlets	@	1,200	=	[illegible]
2 ea	Area Inlets	@	2,500	=	[illegible]
5 ea	Headwalls	@	5,000	=	[illegible]
34,000 CY	Excavation	@	3	=	[illegible]
					352,[illegible]
			add 25%		[illegible]
					340,[illegible]

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 — Figure E-1 — 10. 130 ac Equivalent DA — 11. 102 ac / 130 ac Actual DA / Equiv. DA
3. .2 % — Watershed Slope — Table E-1
4. F (F M or S) — Slope Class — Figure D-2
5. 90 — Runoff Curve No. — Table 2-1 or Figure 10
6. 6 in — Rainfall (24-hour) (100-yr. freq.)
7. 0 % — Ponds, Swamps — Table E-2, E-3 or E-4 (Location determines table)
8. 72 % — Impervious — Figure 4-1
9. 80 % — Hyd. Length Mod. — Figure 4-2

PEAK FACTOR
12. .78 Shape Adj.
X
13. .55 Slope Adj.
X
14. 55 cfs/in Basic Peak Disch.
X
15. 4.85 in Runoff Volume
X
16. 1.0 Ponds, Swamps Adj.
X
17. 1.28 Impervious Area Adj.
X
18. 1.32 Hyd. Length Adj.
=
19. ADJUSTED PEAK DISCHARGE 194 cfs

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

T_C FACTOR
1.67 Constant
X
9. 1.45 hr Basic Lag
X
10. .68 Hydr. Length Adj.
X
11. .71 Imp. Area Adj.
=
12. 1.17 hr T_C — Figure 5-2

PEAK FACTOR
13. 4.85 in Runoff Volume
X
14. 290 csm/in Basic Peak Disch.
X
15. .16 sq.mi Drainage Area
X
16. 1.0 Ponds, Swamps Adj.
=
17. ADJUSTED PEAK DISCHARGE 225 cfs

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) 140 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 = (Vs in. / 12 in/ft) (DA ac.) = (1.58 in.)(93.3 ac.) / 12 in./ft. = 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 / mi^2	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.

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" × 67" CMPA → 60" RCP

Elevation	d	d/D	Q_o	d/D	Q_o
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

Elev.	S	O	121S + O	O (60" RCP)	121S + O (60" RCP)
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, mi^2-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

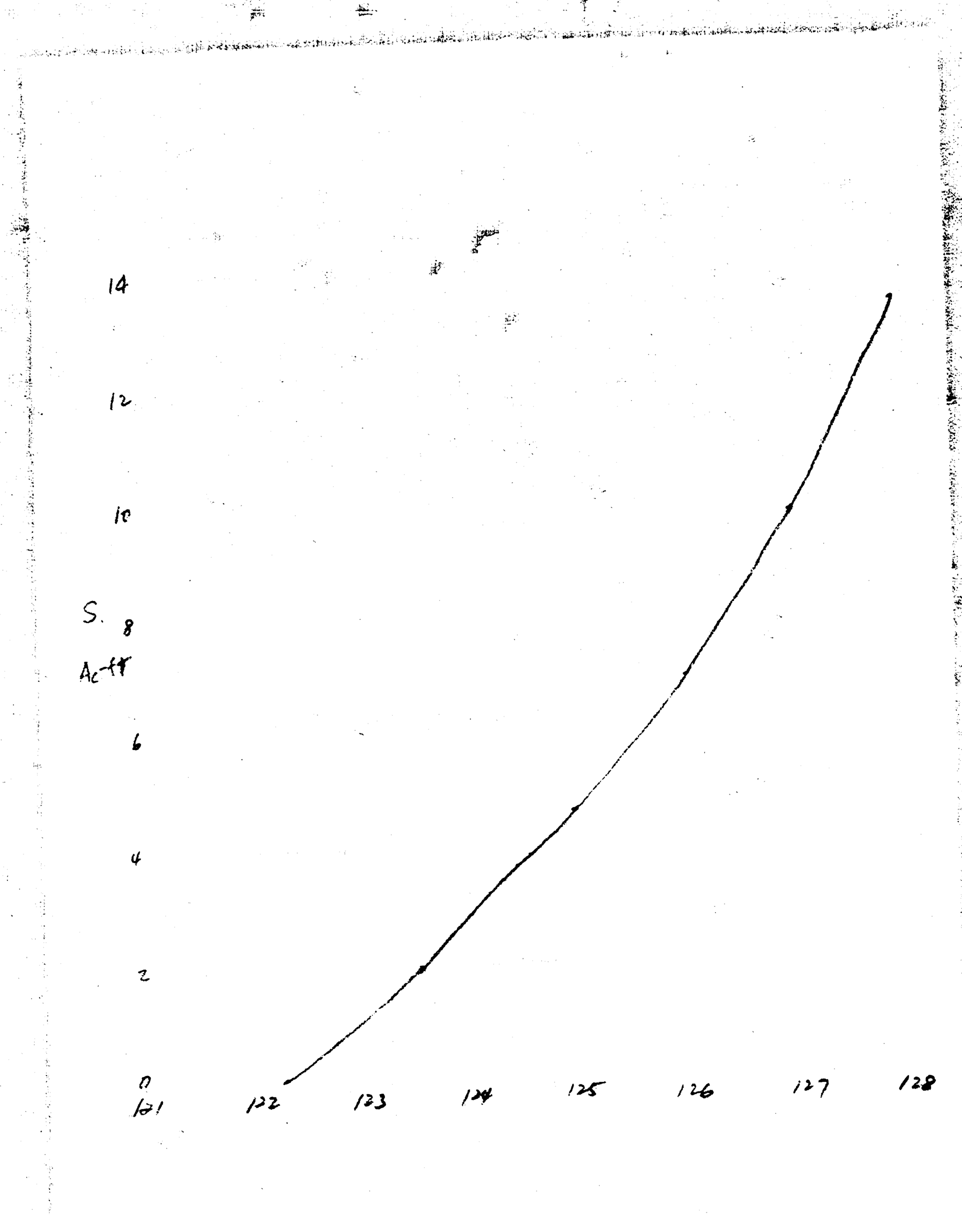
Table VI-4 TR 55 Form 3 - Hydrograph Computations

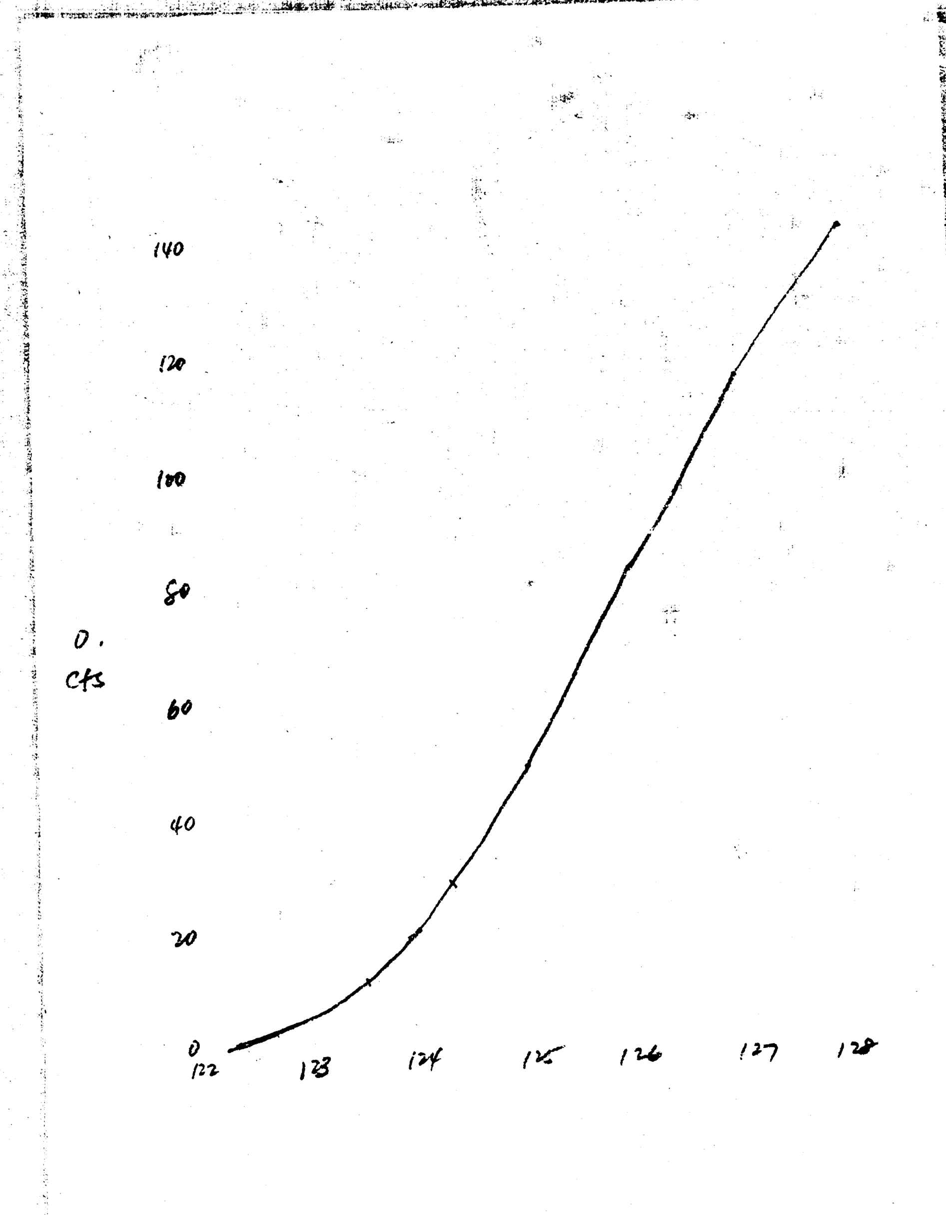
See next page for additional calculation

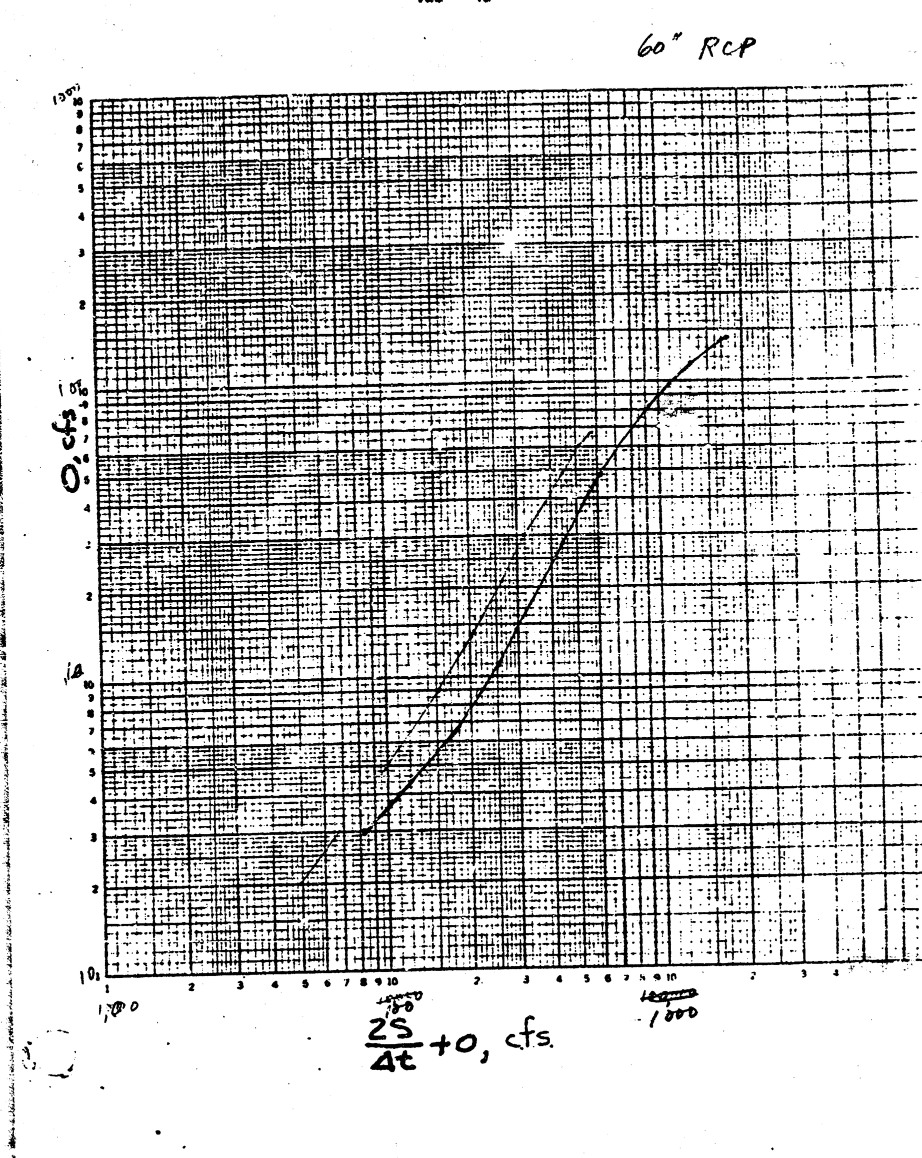
Subarea	T_c	T_t	C[1]	11.0 hrs.	11.5 hrs.	12.0 hrs.	12.4 hrs.	12.6 hrs.	12.8 hrs.	13.0 hrs.	13.2 hrs.	13.5 hrs.	14.0 hrs.	14.5 hrs.	15.0 hrs.	16.0 hrs.	18.0 hrs.	20.0 hrs.
1	23	8	.141	2.5	4.7	53.2	50.1	31.7	20.1	14.0	10.8	8.2	6.3	5.1	4.4	3.5	2.6	2.0
2	21	8	.083	1.5	2.9	35.1	27.5	16.8	10.7	7.6	6.0	4.7	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

Table VI-4 TR 55 Form 3 - Hydrograph Computations

Subarea	T_c	T_t	C[1]	11.7 (~~11.0~~) hrs.	11.8 (~~11.5~~) hrs.	11.9 (~~12.0~~) hrs.	12.0 (~~12.4~~) hrs.	12.1 (~~12.6~~) hrs.	12.2 (~~12.8~~) hrs.	12.3 (~~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				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								





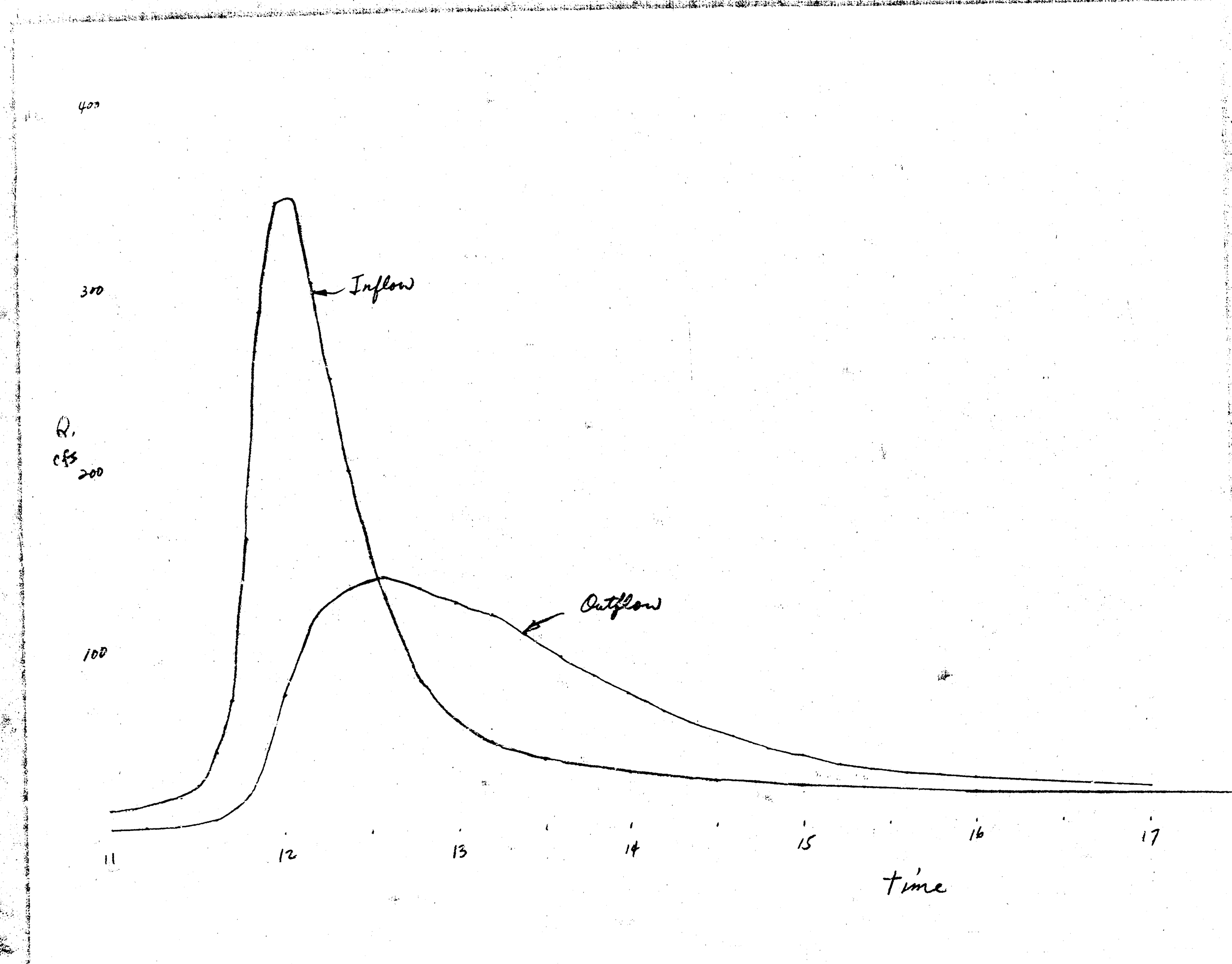


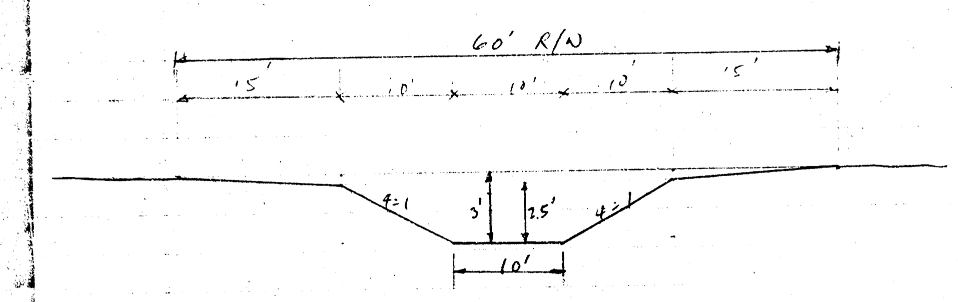
Design Pond Routing

	0	1	2	3	4	P VII-41 5	P VII-42 6	P VII-41 7
Line	Time	I_1	I_1+I_2 +	$\frac{2S_1}{\Delta t} - O_1$ =	$\frac{2S_2}{t} + O_2$	Elev	Outflow O_2	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	699	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

	0	1	2	3	4	5	6	7
Line	Time	I_1	I_1+I_2 +	$\frac{2S_1}{\Delta t} - O_1$ =	$\frac{2S_2}{t} + O_2$	Elev	Outflow O_2	Storage S_2
17	14.2	29	60	693	753		64	
18	14.4	27	56	625	681		56	
19	14.6	25	52	569	621		50	
20	14.8	23	48	521	569		43	
21	15.0	22	45	483	528		39	
22	15.2	21	43	450	493		33	
23	15.4	20	41	427	468		31	
24	15.6	19	39	406	445		28	
25	15.8	18	37	389	426		27	
26	16.0	18	36	372	408		25	
27	16.2	17	35	358	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	330	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. $d = 3.25'$

$A = 74.75$

$Q_{cap.} = \frac{1.486}{.035}\left(\frac{74.75}{33.8}\right)^{2/3} \times 74.75 \times (.002)^{1/2}$

$= 227.6$ cfs

80' R/W, Max $d = 4.5'$, $S = .2\%$

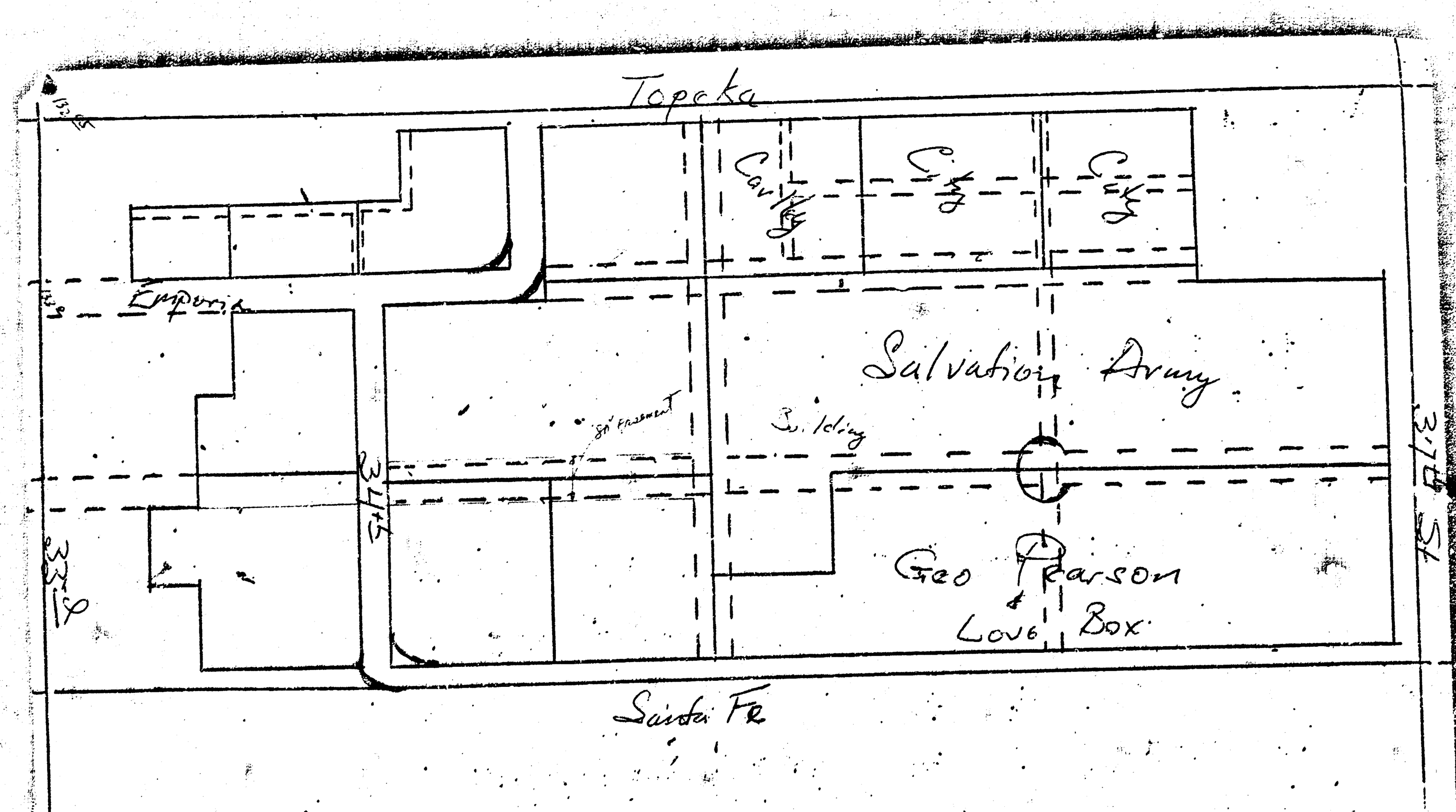
$A = 126$

$Q_{cap.} = \frac{1.486}{.035}\left(\frac{126}{47.1}\right)^{2/3} \times 126 \times (0.002)^{1/2}$

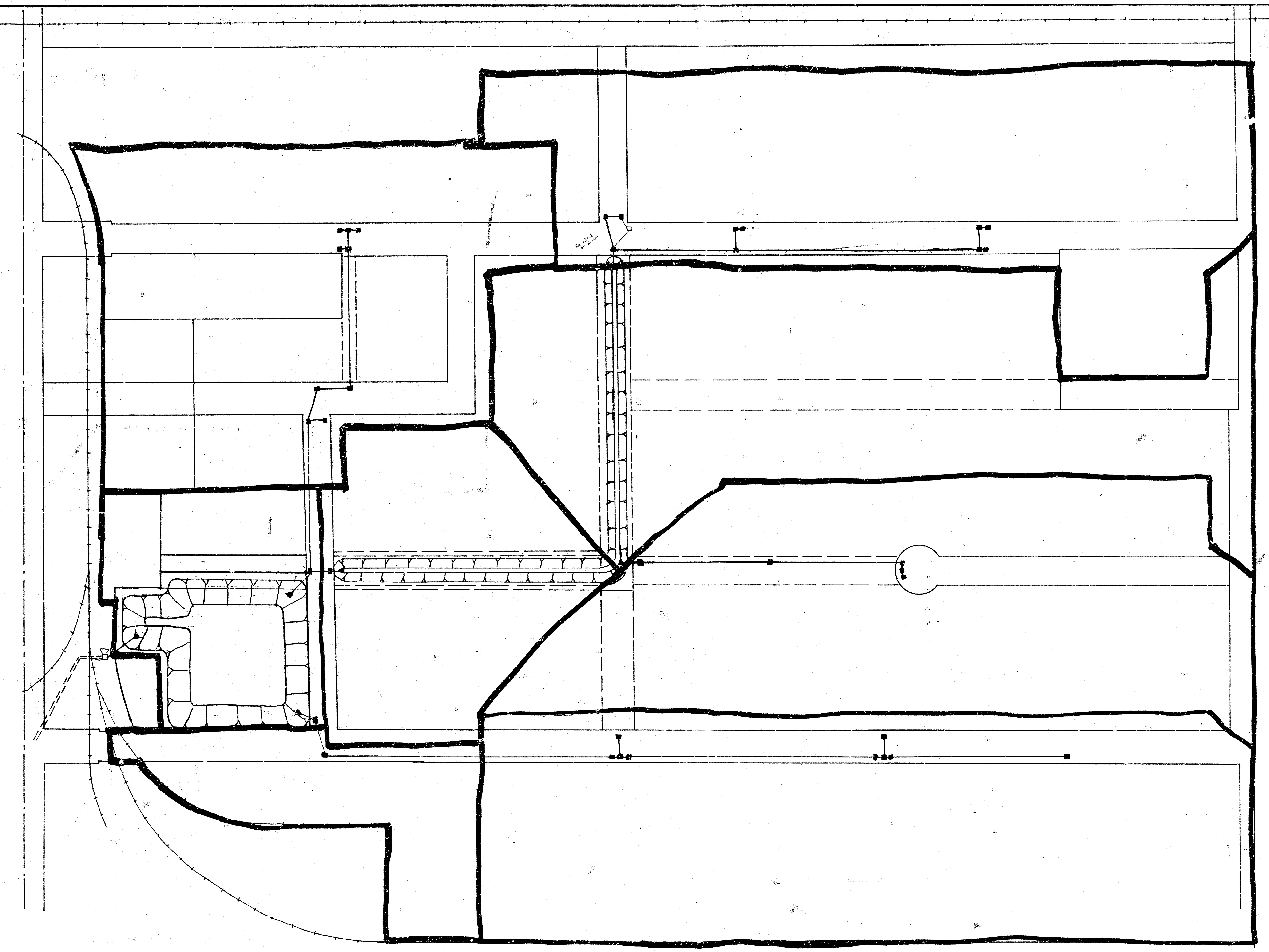
$= 461$ cfs > 265 cfs O.K

Schematic I

Elevation	Area	Ave Area	Increment of depth	Δ Volume	Σ Volume
122.2	1.57	1.62	.8	1.29	1.29
123.0	1.66	1.75	1	1.75	3.04
124.0	1.77 + .07	2.00	1	2.00	5.04
125.0	1.89 + .26	2.41	1	2.41	7.45
126.0	2.12 + .56	2.80	1	2.80	10.25
127.0	2.14 + .77	3.08	1	3.08	13.33
128.0	2.26 + .99				11.17 + 2.16



BRIDGEPORT INDUSTRIAL PARK I
(DRAINAGE)



PROJECT DESCRIPTION

Bridgeport Industrial Park

Drainage Concept - Alt. II

PROJECT NUMBER