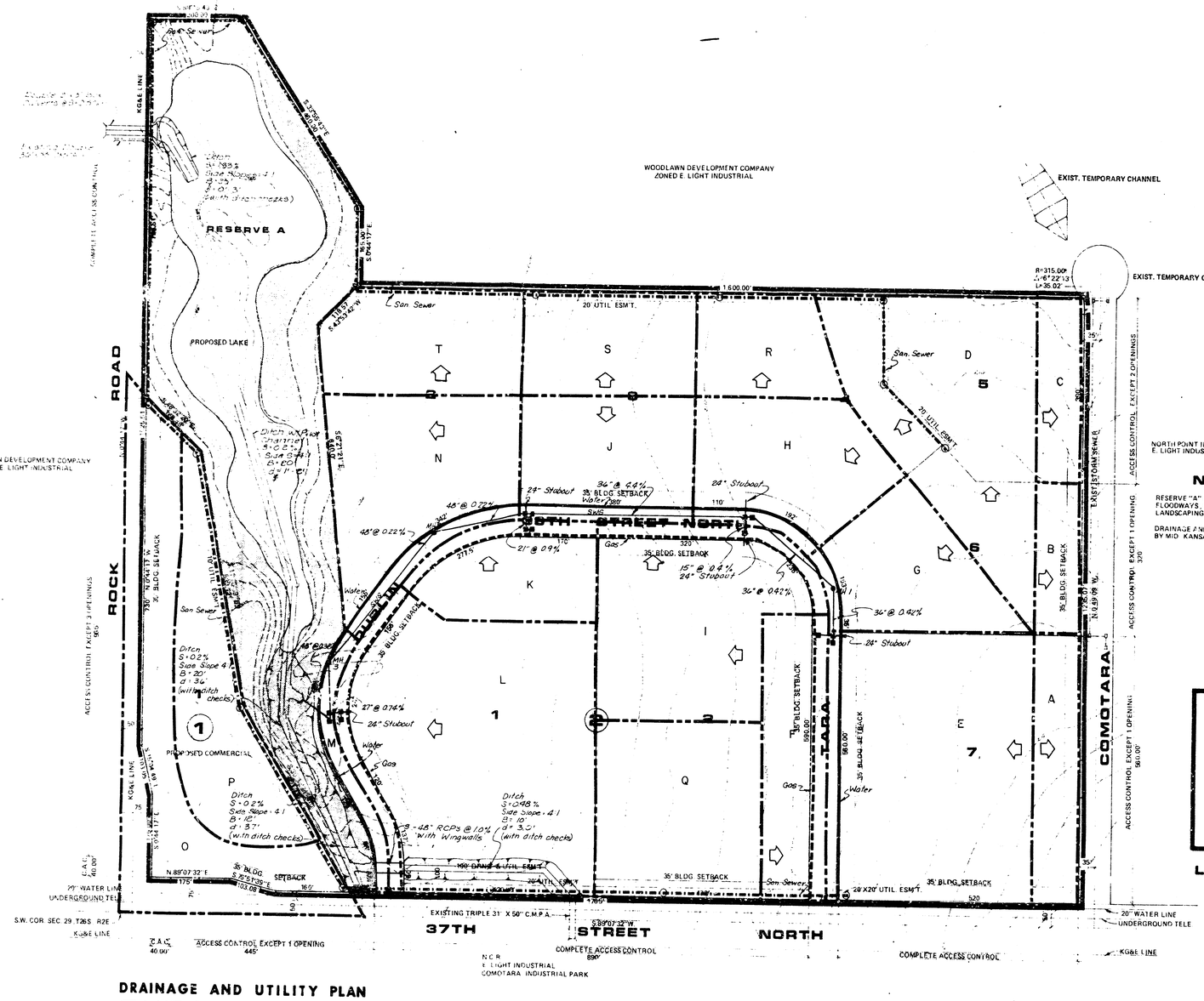

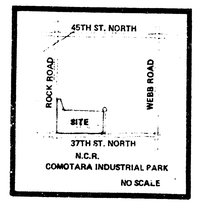

LOCATION MAP

NOTES

RESERVE "A" IS FOR CONSTRUCTION AND MAINTENANCE OF FLOODWAYS, PUBLIC UTILITIES, DRAINAGE, OPEN SPACE, LANDSCAPING AND RELATED RECREATIONAL USES.

DRAINAGE AND UTILITY CONCEPT PLAN TO BE PREPARED BY MID KANSAS ENGINEERING CONSULTANTS

DRAINAGE AND UTILITY PLAN

COMOTARA HI-TECH CENTER

OWNER WOODLAWN DEVELOPMENT COMPANY, 3500 N. ROCK ROAD, NO. 100, WICHITA, KANSAS 67226

1"=100'

SHEET 1

BILL G. YUNG DESIGN
8225 E. 38TH ST. NORTH, WICHITA, KS. 67226 316 682-5061

date NOVEMBER 16, 1984
rev. NOV 26, 1984

sheet title
PRELIMINARY PLAT

project
COMOTARA HI-TECH CENTER

sheet 1

	AREA (ACRES)	AREA ACCUM.	C	T (MIN)	I1 (IN/HR)	Q1 (CFS)	I2 (IN/HR)	Q2 (CFS)	PIPE SLOPE	PIPE SIZE	REMARKS
A	1.16		0.70	10	5.21	8.48	4.6	7.2			
		15.76	0.70	19	4.75	8.9	3.5	38.4		Exist.	Existing
B	0.72		0.70	15	5.21	8.48	2.6	4.5			
		16.48	0.70	19	4.75	8.9	3.4	39.5		Exist.	Existing
C	0.89		0.70	15	5.21	8.66	3.2	5.4			
		17.37	0.70	19	4.75	9.1	3.3	40.0		Exist.	Existing
D	1.82		0.70	20	4.58	8.33	3.2	37.1			
E	6.31		0.70	16	5.09	9.74	3.4	21.4			
F	1.86		0.70	5	5.21	8.48	7.1	11.3	1.4%	18"	
		7.97	0.70	6	5.09	8.74	4.8	24.3	1.22%	24"	
G	2.18		0.70	15	5.21	8.48	5.5	12.7			
		10.15	0.70	18	4.85	8.17	4.1	29.1			
H	2.53		0.70	15	5.21	8.39	5.4	13.9			
		12.68	0.70	19	4.75	8.19	4.2	37.3	1.4%	24"	
I	3.90		0.70	15	5.21	8.48	4.2	23.1			
		16.58	0.70	20	4.58	8.11	3.9	51.2			
J	2.23		0.70	15	5.21	8.48	4.1	14.3			
		18.81	0.70	21	4.57	7.8	3.8	50.2	1.1%	24"	
K	1.75		0.70	15	5.21	8.48	3.4	11.1			
		20.56	0.70	23	4.41	7.50	3.1	48.4	1.0%	24"	
L	7.22		0.70	16	5.09	8.74	2.7	44.2			
		27.78	0.70	25	4.27	7.26	2.3	44.1			
M	0.48		0.85	15	5.21	8.48	3.4	4.1			
		28.26	0.71	26	4.21	7.22	2.3	44.1	1.0%	24"	
N	3.37		0.70	15	5.21	8.46	2.2	20.5		Not Less Th	
O	4.50		0.70	15	5.21	8.48	2.4	28.1		Not Less Th	
P	1.58		0.70	15	5.21	8.48	2.7	28.8		Not Less Th	
Q	3.20		0.70	15	5.21	8.48	2.1	22.1		Not Less Th	
R	1.32		0.70	15	5.21	8.48	3.1	9.9		Not Less Th	
S	1.98		0.70	15	5.21	8.48	1.2	12.4		Not Less Th	
T	2.32		0.70	15	5.21	8.48	2.3	14.8		Not Less Th	
Reserve A	12.87		0.70	15	5.21	8.48	4.1	76.5		Not Less Th	
Ditch in Reserve A			25-min well sec.		45 sec to control erosion.						
Initial	13.92		0.70	18	4.86	8.27	4.4	81.6			
At Culvert Outer Banks		81.90	0.70	37	3.33	5.74	2.9	329.2			
Final		110.16	0.70	39	3.19	5.12	2.6	429.4			
Total Acreage of Runoff to Lake	145.18		0.70	45	2.86	4.95	2.0	503.2			

Culverts - 1

Determine max Q through the 4 - 31" x 50" CMPA's

Approx. Design Data

L=110'
S=0.004 ft/ft — CMPA w/ square edge entrance
Allowable HW=4' — Max head = 3'(2.5833)

A. For Inlet Control

$\frac{HW}{D} = \frac{4}{2.5833} = 1.55$ from Chart 6 for 1 CMPA, Q = 65 cfs

Total Q = 4 x 65 = 260 cfs

B. For Outlet Control

$HW = 4' = H + h_o - LS \Rightarrow H - h_o = 4' + LS = 4' + 110(0.004) = 4.44'$

$H = 4.44 - 2.5833 = 1.85 \pm 1'$ from Chart 12, Q = 65 cfs

Total Q = 4 x 65 = 260 cfs

Design Ditch based on Q=260 cfs. Present Ditch is approx 5' deep. ∴ set d=4', $n = \frac{1.49}{Q}AR^{2/3}S^{1/2}$

Flow Cross Area = 3.2(.7)(5.18) = 20.1 sq ft

Ditch is B=6', d=4', S=0.002 ft/ft & Z=4:1 Slope

Initial ℄ Elev of Ditch = 205 - 5 = 200

℄ Elev @ ROW of Dublin = 201 - 0.02(45) = 200.10

To get Ditch 5' in ground, ℄ Elev @ R.O.W. of Dublin = 202 - 5 = 197.0. Then S new = $\frac{202-197.0}{225}$ = 0.022

With 2 ditch checks S = $\frac{5.0-1.0}{225}$ = 0.0178

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Culverts - 2

Try B=8', d=3', S side slopes 4:1 — Q=269.3 cfs No.

Try B=10', d=3', " 4:1 — Q=297.8 cfs > 260 cfs OK

Typ. cross configuration

Total ℄ Elev of Ditch = 206-4.0 = 202.0 — Is this the easiest ℄ of Ditch? NO

℄ Elev @ R.O.W. of Dublin = 202.0 - 0.01(45) = 197.85

Approx. depth below Basin = 205 - 197.85 = 7.15'

Before this culvert under Dublin can be designed, the ℄ of the ditch to the lake must be determined. To determine this ℄, the cor. culvert @ 37th (1053, 37th St N. must be designed). ℄ Elev @ outlet of RECC will be approx. 196.75. Assuming a slope of 0.2% on the ditch to the lake, the ℄ Elev of the ditch @ the outlet of the cor. culvert would be 196.75 - .002(221) = 196.65

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Culverts - 3

A. For Inlet Control

RCP Try 2 - 36" (Chart 2) — $\frac{HW}{D} = \frac{5}{3} = 1.33$ — Q = 50 cfs x 2 = 100 cfs N.G.

Try 3 - 42" — $\frac{HW}{D} = \frac{5.0}{4.0} = 1.14$ — Q = 60 cfs x 3 = 180 cfs N.G.

Try 3 - 48" — $\frac{HW}{D} = \frac{5.0}{4.0} = 1.0$ — Q = 80 cfs x 3 = 240 cfs N.G.

HERCP Try 3 - 38" x 60" (Chart 3) — $\frac{HW}{D} = 1.26$ — Q = 93 cfs x 3 = 279 cfs OK

CMP Try 3 - 42" (Chart 5) — $\frac{HW}{D} = 1.0$ — Q = 72 x 3 = 216 cfs N.G.

CMPA Try 3 - 36" x 98" (Chart 6) — $\frac{HW}{D} = 1.33$ — Q = 70 x 3 = 210 cfs N.G.

B. For Outlet Control

Try 3 - 48" RCP's — Q = 98 cfs — H = 1.55

$d_c = 2.9'$ (Chart 9) — TW = 4' - (197.19 - 196.65) = 3.46'

$\frac{h_o + D}{D} = \frac{2.9+4.0}{4.0} = 3.95'$ (Chart 18) — HW = H + h_o - LS = 1.55 + 3.95 - (.002)(221) = 4.34' > 4

Try 3 - 38" x 60" HERCP (Chart 10) — Q = 99 cfs — H = 1.48'

$d_c = 2.96$ (Chart 9) — $\frac{d_c + D}{2} = \frac{2.96+3.17}{2} = 3.01$ — TW = 3.46'

HW = 1.48 + 3.46 - .002(221) = 4.28' ≯ 4

An HW of 4' would put the water surface in 197.85 + 4 = 201.85.

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Culverts - 4

A. For Inlet Control

$\frac{HW}{D} = \frac{5.5'}{4.0'} = 1.16$ Chart 2 — Q = 95 cfs x 3 = 285 cfs OK

$\frac{HW}{D} = 1.25$ — Q = 100 cfs x 3 = 300 cfs OK

B. For Outlet Control

3 - 48" RCP — Q = 95 cfs — H = 1.55' — TW = 3.46

$d_c = 2.95'$ (Chart 9) — $\frac{h_o + D}{D} = \frac{2.95+4}{4.0} = 2.08$ (Chart 18) — HW = 1.55 + 2.08 - .26 = 4.37' < 4.65' O.K.

Ditch To Lake

Initial Q = 81.2 cfs. Configuration of ditch would initially S=0.2%, Side Slope 4:1, Total Depth = 20.5 - 197.1 = 7.4'. With 4:1 Side Slope, the side slopes of ditch would be 30'. With B=8', d=2.25' Q=92.6 cfs

Total width of ditch would be (30x2)+8 = 68' < 75' easement.

@ Dublin culvert Q_{100} = 330.7 cfs

S=0.2% Side Slope = 4:1, B=12', d=3.7' Q=331.2 cfs > 330.2 cfs OK

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Culverts - 5

Culvert at Rock Road

Proposed top of curb for Rock Rd @ proposed culvert, Elev = 193.4

Top of Culvert must ∴ be @ 193.4 - 2.2 = 191.19

Per KDOT, assume lake is a ditch, rather than detention basin. ∴ Determine Time of Travel, T_c, to culvert from 45th RCP End Sect

Approx S = 0.5%, approx side slopes 1.5:1; approx B=20'

Approx d = 2.25' Q = 98 cfs

Area of channel X-section = 136 sq ft, V = $\frac{98 cfs}{136}$ = 0.7 fps

T_c = 1200 ft ÷ [0.7 fps x $\frac{60 sec}{min}$] = 5.9 min

T_c = 6 + 39 = 45 min — Q_{100} = 50.5 cfs

To minimize the depth of the ℄ @ Rock Rd make culvert height approximately equal to the depth of the channel 3' max. ∴ approx. ℄ elev of culvert = 191.19 - 3 - 1 = 187.19

A. For Inlet Control

Try two 8' x 3' RCBC's w/ 45° Wingwalls — Chart 1

$Q_{per\ box} = \frac{50.5}{2} = 25.2$ cfs — $\frac{Q}{B} = \frac{25.2}{8} = 3.15$. From Chart 1,

$\frac{HW}{D} = 2.05$. HW = 2.05(3) = 6.15' — 187.19 + 6.15 = 193.337 > 193.4 N.G.

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Culverts - 6

Based on d_c, HW = H - h_o - LS = .52 - 5 - .2(.005) = 3.37 ≯ 5' OK

Max HW = 5.0' for inlet control ∴ HW must be less than that to keep culvert under inlet control. This means TW < HW + h_o + LS = 5 - .52 - .35 = 3.23'

In order for flow to continue west of Rock Rd a ditch will be required. Per map, the nearest 3' contour is approximately 350' or west. Take slope of the ditch, S = $\frac{197-195}{350}$ = .0057 ≈ 0.005

Ave. Elev in this area = 190 ∴ depth of ditch ≈ 3'

Try B=20', d=3.0', S side slopes = 4:1 — Q = 79.5 < 50.5 cfs NG

Try B=25', d=2.5', " " — Q = 45.5 cfs > 50.5 cfs OK

Try B=25', d=2.6', " " — Q = 49.5 cfs OK

Try B=26', d=2.8', " " — Q = 56 cfs > 50.5 cfs OK

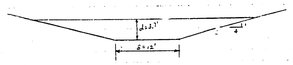
TW = 2.8' < 3.23' OK

Contra HL-Tech Center
FEN 1/28/84

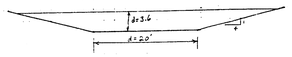
Ditch Cross-Sections - 1

Ditch in Reserve A, N. of 3-48" RCP's

Initial Cross Section



2nd Cross Section



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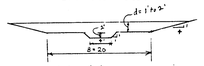
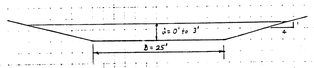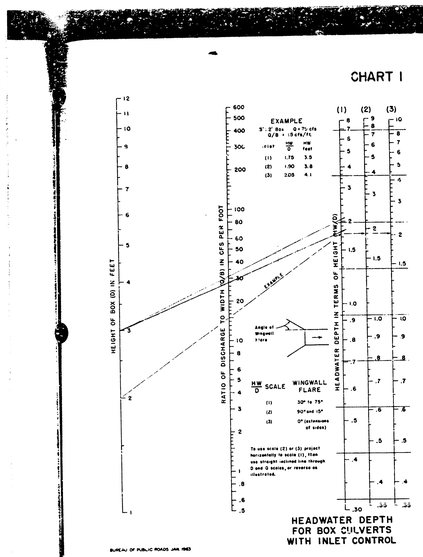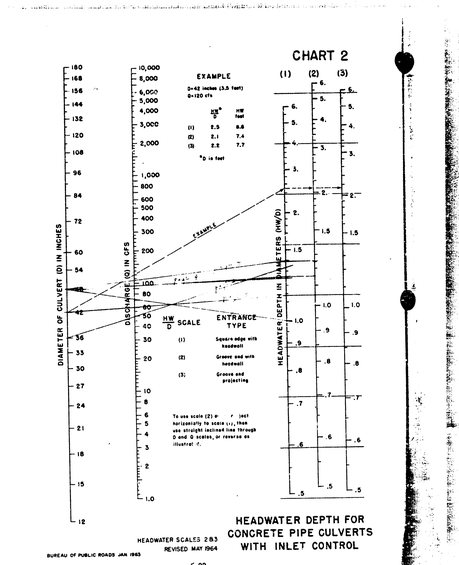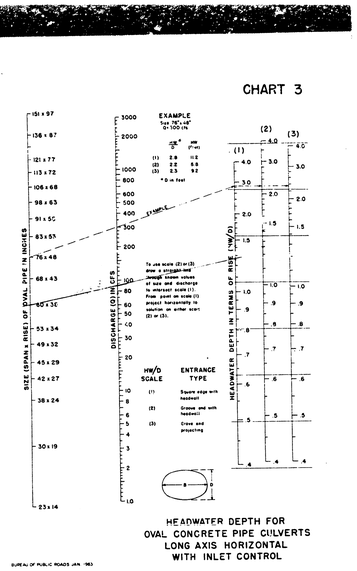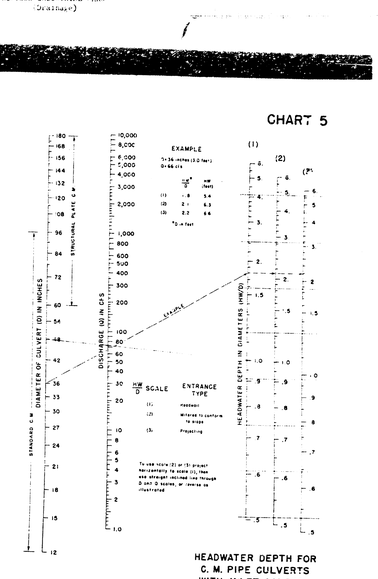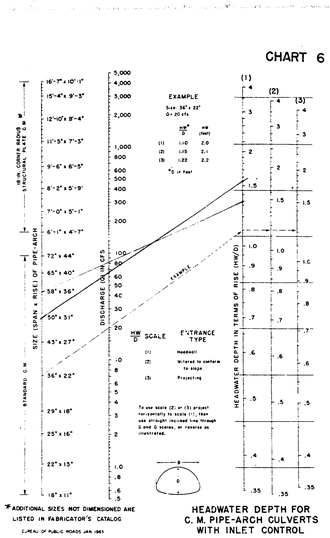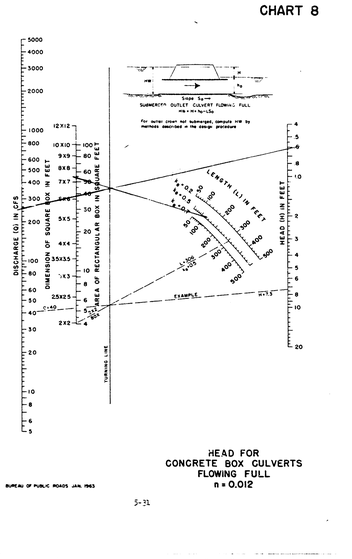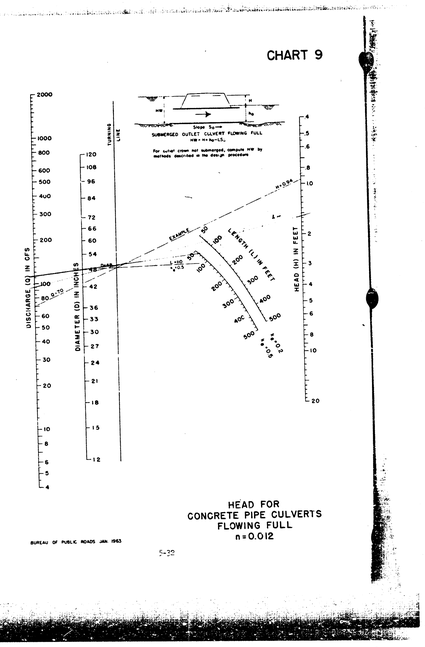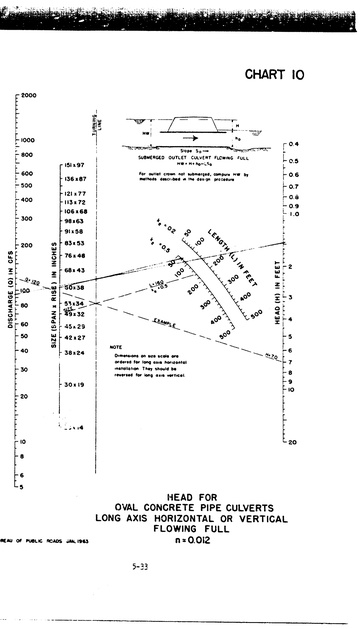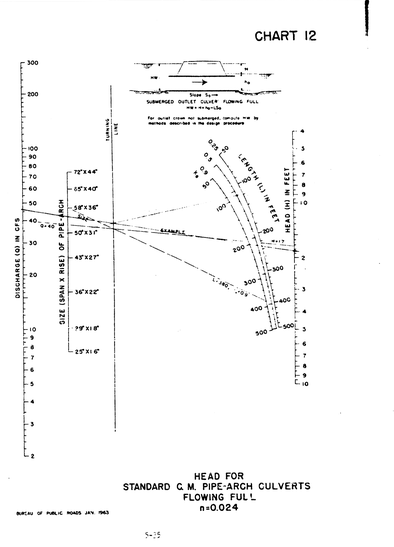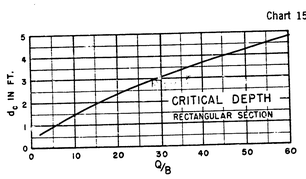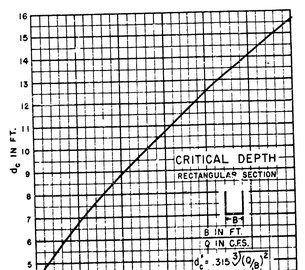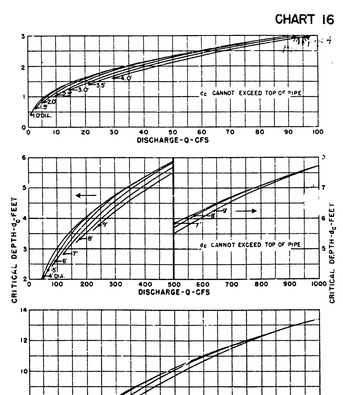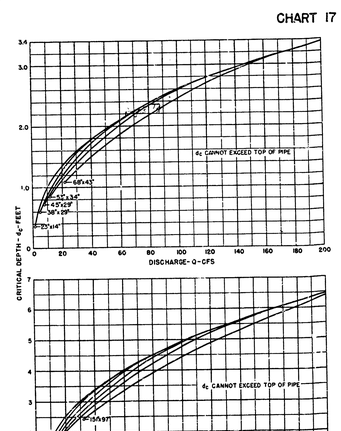
Ditch in Reserve A, South of Double 9'x3' Box Culverts.