0030

CENTENNIAL ENGINEERING INC

(801) 268-4819
575 EAST 4500 SOUTH SUITE B-115 SALT LAKE CITY, UTAH 84107

Rc'd (RL) 6/7/83 3:30 PM

June 1, 1983

Rick Summers
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

RE: Sediment Pond #3 - Relocation

Dear Rick:

I would have delivered this revised report for the relocation of sedimentation pond No. 3, but I here you can only get to your office by boat.

Enclosed is the reply to your May 18, 1983 letter requesting additional information. Please review and give me a call when you have questions.

Thank you for your time and cooperation and I await your reply.

Sincerely,

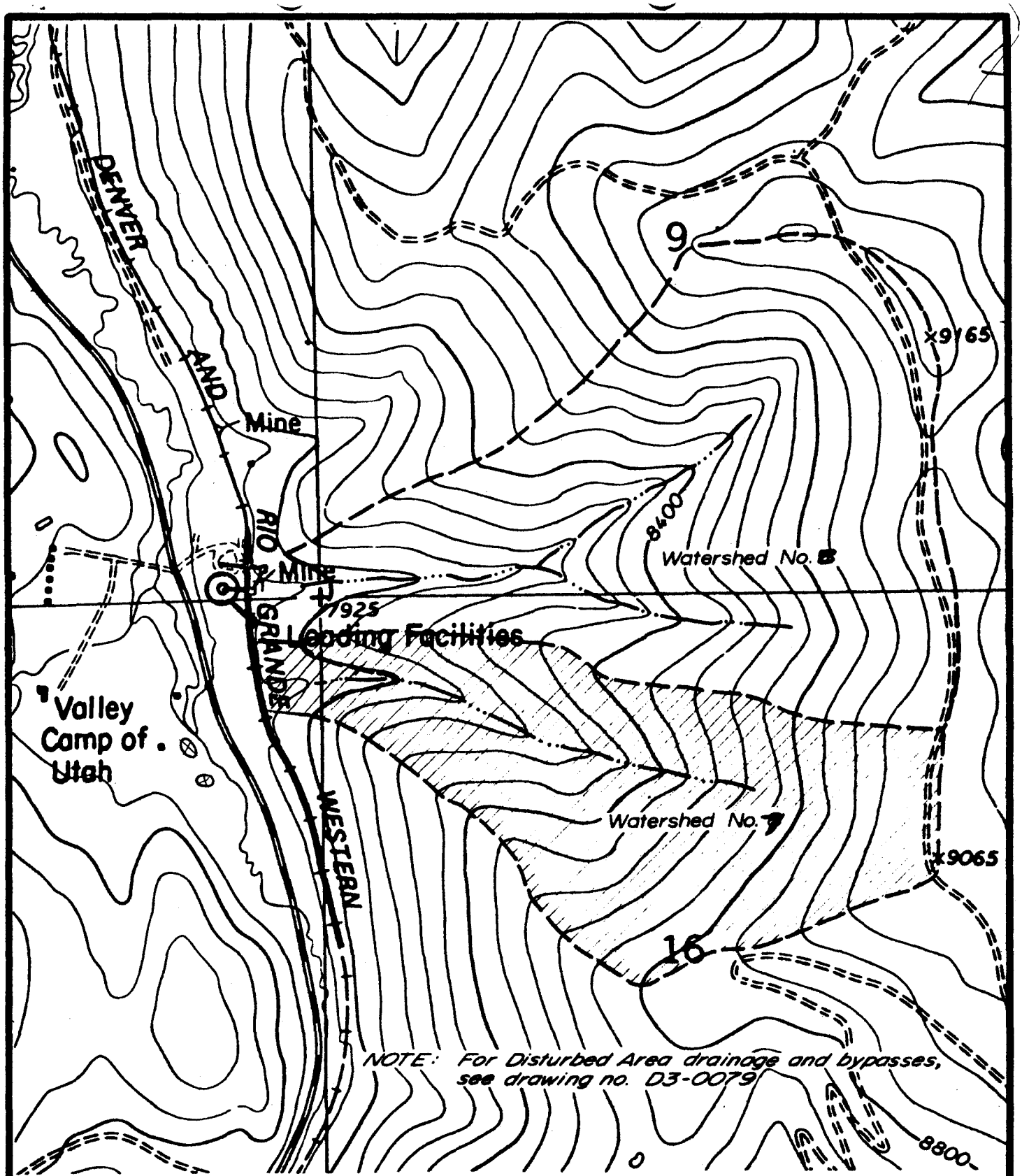
Robert C. Burns

Robert C. Burns PE
Branch Manager

RCB/sg

CC/ Cellars
Thomas
Whiteside

RECEIVED
JUN 0 3 1983
DIVISION OF
OIL GAS & MINING



DRAWN BY: Ed Sanderson	DATE: May 17, 1983	VALLEY CAMP of UTAH SCOFIELD ROUTE HELPER, UTAH 84526
CHECKED BY:	DATE:	
REVISED BY:	SCALE: 1" = 1000'	
APPROVAL ENG.:		
APPROVAL SAFETY:	TITLE: UTAH NO. 2, Drainage Areas	DRAWING NO. A3-0055 / REV. NO. 0
APPROVAL MINE:		

HYDROGRAPH COMPUTATION FORM

STREAM AND STATION UTAH NO 2 – WATERSHED 5

REMARKS 10 YEAR – 24 Hour STORM Runoff

DR. AREA 0.0094 SQ. MI. T_c — HR. RUNOFF CONDITION NO. —

RUNOFF CURVE NO. 90. STORM DISTRIB CURVE —. HYDRO. FAM. NO. 2

STORM DURATION 24 HR. RAINFALL: POINT — IN. AREAL — IN.

Q 1.49 IN. COMPUTED T_p 0.15 HR. T_o 17.6 HR.

(T_o/T_p): COMPUTED 117 : USED 75. REVISED T_p 0.23

$q_p = \frac{484\ A}{REV.\ T_p} =$ 29.4 CFS. $Qq_p =$ 49.8 CFS.

t(COLUMN) = (t/T_p) REV. T_p q(COLUMN) = $(qc/qp)\ Qq_p$ $T_c = 1/0.6$

$\ell = 1380'$ $Y = 4.7\%$ A = 6 Acres CN = 90 S = 1.11 L = 0.13

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	13.80	0.5	41		
2	0.69	0.1	22	14.49	0.5	42		
3	1.38	0.1	23	15.18	0.5	43		
4	2.07	0.2	24	15.87	0.4	44		
5	2.76	0.3	25	16.56	0.4	45		
6	3.45	0.5	26	17.25	0.4	46		
7	4.14	1.5	27	17.94	0	47		
8	4.83	3.9	28	18.63	0	48		
9	5.52	3.1	29			49		
10	6.21	1.8	30			50		
11	6.9	1.4	31			51		
12	7.59	1.2	32			52		
13	8.28	1.0	33			53		
14	8.97	0.8	34			54		
15	9.66	0.7	35			55		
16	10.35	0.7	36			56		
17	11.04	0.6	37			57		
18	11.73	0.6	38			58		
19	12.42	0.5	39			59		
20	13.11	0.5	40			60		

Inflow Runoff Volume = 6 Acres × $\frac{1.49''}{12}$ = 0.75 Acre-ft

HYDROGRAPH COMPUTATION FORM

STREAM AND STATION UTAH NO 2 WATERSHED 5

REMARKS 25 YEAR - 24 HOUR STORM RUNOFF

DR. AREA 0.0094 SQ. MI. T_c _____ HR. RUNOFF CONDITION NO. _____

RUNOFF CURVE NO. 90 . STORM DISTRIB CURVE _____ . HYDRO. FAM. NO. 2

STORM DURATION 24 HR. RAINFALL: POINT _____ IN. AREAL _____ IN.

Q 1.91 IN. COMPUTED T_p 0.15 HR. T_o 17.6 HR.

(T_o/T_p): COMPUTED 117 : USED 75 . REVISED T_p 0.23

$q_p = \frac{484\ A}{\text{REV. } T_p}$ = 29.4 CFS. Qq_p = 56.15 CFS.

t(COLUMN) = (t/T_p) REV. T_p q(COLUMN) = $(qc/qp)\ Qq_p$

ℓ = 1380' Y = 4.7% A = 6 ACRES CN = 90 S = 1.11 C = 0.13

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21			41		
2	0.69	.1	22			42		
3	1.38	.2	23			43		
4	2.07	.2	24			44		
5	2.76	.4	25			45		
6	3.45	.6	26			46		
7	4.14	1.7	27			47		
8	4.83	4.4	28			48		
9	5.52	3.5	29			49		
10	6.21	2.0	30			50		
11	6.9	1.6	31			51		
12			32			52		
13			33			53		
14			34			54		
15			35			55		
16			36			56		
17			37			57		
18			38			58		
19			39			59		
20			40			60		

HYDROGRAPH COMPUTATION FORM

STREAM AND STATION UTAH NO2 - WATERSHED NO 6.

REMARKS 10 YEAR, 24 HOUR

DR. AREA .0039 SQ. MI. T_c — HR. RUNOFF CONDITION NO. —

RUNOFF CURVE NO. 80. STORM DISTRIB CURVE —. HYDRO. FAM. NO. 3

STORM DURATION 24 HR. RAINFALL: POINT _____ IN. AREAL _____ IN.

Q 0.85 IN. COMPUTED T_p .037 HR. T_o 13.8 HR.

(T_o/T_p): COMPUTED 370 : USED 75 . REVISED T_p 0.18

$q_p = \frac{484\ A}{REV.\ T_p}$ = 8.9 CFS. Qq_p = 7.5 CFS.

t(COLUMN) = (t/T_p) REV. T_p q(COLUMN) = $(q_c/q_p)\ Qq_p$

l = 400' S = 2.5 Y = 23% CN = 80 L = 0.32

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0.00		21	11.70	0.08	41		
2	0.58	.007	22	12.28	0.08	42		
3	1.17	0.04	23	12.87	0.07	43		
4	1.75	0.22	24	13.45	0.07	44		
5	2.34	0.50	25	14.04	0	45		
6	2.92	0.33	26	14.62	0	46		
7	3.51	0.24	27			47		
8	4.09	0.19	28			48		
9	4.68	0.16	29			49		
10	5.26	0.15	30			50		
11	5.85	0.13	31			51		
12	6.44	0.12	32			52		
13	7.02	0.11	33			53		
14	7.60	0.10	34			54		
15	8.20	0.09	35			55		
16	8.78	0.09	36			56		
17	7.56	0.08	37			57		
18	9.94	0.08	38			58		
19	10.53	0.08	39			59		
20	11.12	0.08	40			60		

Inflow Runoff Volume = 2.5 Acres x $\frac{0.85''}{12}$ = 0.18 Acre-ft

HYDROGRAPH COMPUTATION FORM

STREAM AND STATION UTAH NO2 - WATERSHED 8

REMARKS 10 YEAR, 24 HOUR STORM Runoff

DR. AREA 0.40 SQ. MI. T_c — HR. RUNOFF CONDITION NO. —

RUNOFF CURVE NO. 80. STORM DISTRIB CURVE —. HYDRO. FAM. NO. 3

STORM DURATION 24 HR. RAINFALL: POINT _____ IN. AREAL _____ IN.

Q 0.85 IN. COMPUTED T_p .28 HR. T_o 13.8 HR.

(T_o/T_p): COMPUTED 49.3 : USED 50 . REVISED T_p .28

$q_p = \frac{484\ A}{REV.\ T_p}$ = 691 CFS. Qq_p = 588 CFS.

t(COLUMN) = (t/T_p) REV. T_p q(COLUMN) = $(qc/qp)\ Qq_p$

A = 254 Acres ℓ = 5250' Y = 25.3% S = 2.5

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	12.6	9.0	41		
2	0.63	.47	22	13.23	8.8	42		
3	1.26	4.1	23	13.86	8.6	43		
4	1.89	27.9	24	14.49	1.6	44		
5	2.52	52.1	25	15.12	0	45		
6	3.15	37.7	26			46		
7	3.78	27.04	27			47		
8	4.4	22.0	28			48		
9	5.0	18.9	29			49		
10	5.67	16.8	30			50		
11	6.3	15.2	31			51		
12	6.93	14.0	32			52		
13	7.56	12.9	33			53		
14	8.19	11.8	34			54		
15	8.82	10.9	35			55		
16	9.45	10.17	36			56		
17	10.08	9.7	37			57		
18	10.71	9.5	38			58		
19	11.34	9.3	39			59		
20	11.97	9.2	40			60		

HYDROGRAPH COMPUTATION FORM

STREAM AND STATION UTAH NO2 — WATERSHED 6

REMARKS 25 year 24 Hour

DR. AREA .0039 SQ. MI. T_c _____ HR. RUNOFF CONDITION NO. _____

RUNOFF CURVE NO. 80. STORM DISTRIB CURVE _____. HYDRO. FAM. NO. 3

STORM DURATION 24 HR. RAINFALL: POINT _____ IN. AREAL _____ IN.

Q 1.19 IN. COMPUTED T_p .037 HR. T_o 13.8 HR.

(T_o/T_p): COMPUTED 370 : USED 75. REVISED T_p 0.18

$q_p = \frac{484\ A}{\text{REV. } T_p} =$ 8.9 CFS. $Qq_p =$ 10.6 CFS.

t(COLUMN) = (t/T_p) REV. T_p q(COLUMN) = $(qc/qp)\ Qq_p$

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21			41		
2	0.58	0	22			42		
3	1.17	.1	23			43		
4	1.75	.3	24			44		
5	2.34	.7	25			45		
6	2.92	.5	26			46		
7	3.51	.3	27			47		
8	4.09	.3	28			48		
9	4.68	.2	29			49		
10			30			50		
11			31			51		
12			32			52		
13			33			53		
14			34			54		
15			35			55		
16			36			56		
17			37			57		
18			38			58		
19			39			59		
20			40			60		

CENTENNIAL ENGINEERING, INC.
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Office Location: 15000 W. 64th Ave., Arvada, Colo. 80001

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JOB NO. _____ CLIENT _____ DATE _____

JOB TITLE/SUB-TITLE 10 YEAR 24 HOUR STORM

SUBJECT WATERSHED N07 BY _____ CK'D BY _____

AREA = 161 ACRES

$\ell = 4900'$

$Y = 23\%$

$S = \frac{1000}{CN} - 10 = \frac{1000}{80} - 10 = \underline{2.5}$

$L = \frac{(\ell^{0.8})(S+1)^{0.7}}{1900\, Y^{0.5}} = \frac{(4800)^{0.8}(2.5+1)^{0.7}}{1900\,(23)^{0.5}} = 0.23$ HOUR

$Q = \frac{(P - 0.2S)^2}{P + 0.8S} = \frac{[(2.45 - 0.2(2.5)]^2}{2.45 + 0.8(2.5)} = 0.85$ inch

HYDRO FAMILY NO 3

$T_p = 1.17L = 1.17(0.23) = 0.27$ HOUR

$\underline{T_o}$ $\frac{0.2S}{P} = \frac{.2(2.5)}{2.45} = 0.2$

TYPE II CURVE NO RUNOFF (10.2 HOURS)

$24 - 10.2 = T_o = 13.8$ HOURS EXCESS RAINFALL

$\frac{T_o}{T_p} = \frac{13.8}{.27} = 51.11$ CLOSEST RATIO 50

REVISED $T_p = \frac{13.8}{50} = 0.28$

$q_p = 484\left(\frac{161}{640}\right)\frac{(0.85)}{.28}$ $q_p = 484\,\frac{A\,Q}{T_p}$

$q_p = 370$ cfs

$q_c/q_p = 0.0972$

$q(\text{calc}) = \frac{q_c}{q_p}\,Q\,q_p$

$= (0.0972)(0.85)(370)$

$= 30.6$ cfs

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JOB NO. 292.01 CLIENT Valley Camp of UTAH DATE June 1, 1983

JOB TITLE/SUB-TITLE _____

SUBJECT Sizing Sed. Pond BY BB. CK'D BY _____

AREA DRAINING INTO RELOCATED POND = #6 + #5

AREA	ACRES	Runoff inches	inflow Runoff VOLUME
6	2.5	0.85"	0.18 Acre-ft
5	6.0	1.49"	0.75 Acre-ft

REQUIRED STORAGE 0.93 Acre-ft
FOR 10 YEAR 24 HR
STORM

SEDIMENTATION VOLUME REQUIRED = 6 Acres × 0.1 $\frac{\text{Acre ft}}{\text{Acre}}$ = 0.6 Acre-ft
disturbed AREA

TOTAL SED POND VOLUME to High WATER = 0.93 + .6 = 1.53 Acre-ft

Proposed POND HAS STORAGE of 2.7 Acre-ft
THEREFORE EXCEEDING REQUIRED STORAGE of 1.53 Acre-ft

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JOB NO. 292.01 CLIENT Valley Camp of UTAH DATE JUNE 1, 1993

JOB TITLE/SUB-TITLE SED. POND NO 3

SUBJECT REVIEW 30" CMP BASIN 5A + 5B BY BB. CK'D BY _____

5A = 1.4 ACRES Runoff Curve No 90 ?

$l = 550$

$Y = \frac{25'}{550} = 4.6\%$

$S = \frac{1000}{90} - 10 = 1.11$

$L = \frac{(550)^{0.8}(1.11+1)^{0.7}}{1900\,(4.6)^{0.5}} = 0.064$ HRS

$Q = \frac{(2.45 - (0.2)(1.11))^2}{2.45 + 0.8(1.11)} = 1.49$ inch

Hydro Family No 2

$T_p = 1.17L = 1.17(.064) = 0.075$ HR.

$\frac{0.2(1.11)}{2.45} = 0.09$

Type II curve No Runoff 6.4 Hours

24 - 6.4 Hours $T_o = 17.6$ Hors. excess Rainfall

$\frac{T_o}{T_p} = \frac{17.6}{.075} = 234$ Closest Ratio 75

Revised $T_p = \frac{17.6}{75}$ 0.23

$q_p = 484\left(\frac{1.4}{640}\right)\frac{1.49}{.23} = 6.8$ cfs

$q_c/q_p = 0.0624$ $q = (0.0624)(6.8)(1.49) = 0.62$ cfs

EXISTING 3.0' CMP @ 4.1% Capacity EXCEEDS $q = 0.62$ cfs

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JOB NO. 292.01 CLIENT Valley Camp of ~~UTAH~~ DATE JUNE 1, 1983

JOB TITLE/SUB-TITLE SED POND NO 3

SUBJECT ~~Review~~ EXIST. 24 cmp BASIN 5B BY B.B. CK'D BY _____

DRAINAGE AREA
5C = 1.1 ACRES
5D = 0.5
5A = 0.9
5B = 0.5
3.0 ACRES

$l = 800'$

$Y = 4.6\%$

$S = \frac{1000}{90} - 10 = 1.11$

$t = \frac{(800)^{0.8}(1.11+1)^{0.7}}{1900(4.6)^{0.5}} = 0.09$ HRS

$Q = \frac{[2.45 - 0.2(1.11)]^2}{2.45 + 0.8(1.11)} = 1.49$ inch

Hydro family NO2

$T_p = 1.1t = 1.1(0.09) = 0.1$ HOUR.

$\frac{0.2(1.11)}{2.45} = 0.091$ Type II Curve NO Runoff 6.4 Hours

24 - 6.4 HRS $T_b = 17.6$ HR EXCESS RAINFALL

$\frac{T_b}{T_p} = \frac{17.6}{.1} = 176$ CLOSEST RATIO 75

REVISED $T_p = \frac{17.6}{75} = 0.23$ HR.

$q_p = 484\left(\frac{3}{640}\right)\frac{1.49}{.23} = 14.7$ cfs

$\frac{q_c}{q_{p_{max}}} = 0.0624$ $q = 0.0624(14.7)^{1.49} = \underline{1.37 \text{ cfs}}$

Existing 24 cmp @ 4.7% $Q_{max} = 27$ cfs $V_{max} = 8.4$ ft/sec
CMP $n = 0.024$ @ 10% $Q_{max} = 38$ cfs $V_{max} = 12.3$

$\frac{Q}{Q_f} = \frac{1.37}{27} = 0.05$ $\frac{d}{D} = 0.2$ depth $= 0.2(24") = 4.8"$

$= \frac{V}{V_f} = .47$ $V = (.47)(8.4) = \underline{3.9 \text{ ft/sec}}$

$\frac{V}{V_f} = .41$ $V = .41(12.3) = \underline{5 \text{ ft/sec}}$

$\frac{Q}{Q_f} = \frac{1.37}{38} = .036$ $\frac{d}{D} = .16$ depth $= .16(24") = 3.8"$

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JOB NO. _____ CLIENT _____ DATE _____

JOB TITLE/SUB-TITLE _____

SUBJECT Culvert Sizing from Pond BY _____ CK'D BY _____

Proposed 24" CMP into pond @ 9.0% ±

Inflow Runoff = 1.4 cfs page —

Q_{MAX} = 35 cfs V_{MAX} = 11.5 cfs

$\frac{Q}{Q_f} = \frac{1.4}{35} = .04$ $\frac{d}{D} = .17$ $\frac{V}{V_f} = .43$ $V = 5 \frac{ft}{SEC}$

d = 4"

Proposed 18" CMP @ 1.0% inlet condition

HEAD = Primary = 7.0' Q_{MAX} = 24 cfs V = 7.8 ft/sec

Emergency = 1.0 Q_{MAX} = 5.8 cfs V = 3.3 ft/sec

29.8 cfs

MAX Discharge Capacity of Sed. Pond Culverts

Total Runoff 25 year 24 Hour storm #6 = 0.7 cfs

#5 = 4.4 cfs

Design Discharge Required = 5.1 cfs

Therefore design capacity of 18" CMP = 29.8 cfs is greater than required = 5.1 cfs V = 2.8 ft/sec

If 18" CMP is under outlet condition

HEAD = 7.0 Q = 13.5 cfs from primary culvert

HEAD 1.0 Q = 3.6 cfs from emergency spillway

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JOB NO. _____ CLIENT _____ DATE _____

JOB TITLE/SUB-TITLE _____

SUBJECT 18" CULVERT UNDER HWY #96 BY _____ CK'D BY _____

18" CMP
S = 6.6%
L = 64'

REQUIRED FLOW = 5.1 NOTE MINOR DRAINAGE FROM STREET ASSUME MAX = 1 CFS

18" Q_{MAX} @ 6.6% = 14 cfs, 8.2 ft/sec, vel. inlet condition

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JOB NO. 292.01 CLIENT Valley Camp of UTAH DATE JUNE 1, 1983

JOB TITLE/SUB-TITLE _____

SUBJECT Exist Hwy 96 Culverts BY BB. CK'D BY _____

24 cmp @ 0.6% 9.7 cfs V= 2.9 ft/sec

18 cmp @ 1% Q_{MAX} = 5.8 cfs V= 3.3 ft/sec

18" cmp @ 6.6% 14 cfs V= 8 ft/sec

30" cmp @ 6.6% 55 cfs V= 11.5 ft/sec

Q_{MAX} 84.5 cfs

CENTENNIAL ENGINEERING, INC.
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JOB NO. 292.02 CLIENT Valley Camp of Utah DATE June 1, 1983

JOB TITLE/SUB-TITLE 10 year 24 Hour Storm Runoff

SUBJECT WATERSHED NO 8 BY ____ CK'D BY ____

$A_8 = 254$ Acres

$\ell = 5250$

$Y = 25.3$

$CN = 80$

$S = 2.5$

$$L = \frac{(5250)^{.8}(2.5+1)^{(.7)}}{1900\,(25.3)^{.5}} = .24$$

$Q = 0.85$

Hydro Family No 3

$T_p = 0.28$

$$\frac{T_b}{T_p} = \frac{13.8}{.28} = 49.3 \quad \text{use } \underline{50}$$

$q_{MAX} = 57.1$ cfs

proposed 36 CMP @ 8.82%
62.14' long $H_w = 1.8'$ Type 1 Entrance
with flared end sections

MAX capacity 100 cfs @ 8.82% natural grade
$V_{MAX} = 14.6$ ft/sec

$$\frac{Q}{Q_f} = \frac{57.1}{100} = 0.57 \qquad \frac{d}{D} = 0.62 \qquad d = \underline{22''} = 1.8' \text{ OK}$$

$$\frac{V}{V_f} = 0.89 \qquad V = .89 \times 14.6 = 13.0 \ \frac{ft}{SEC}$$

No good V to High

Try $S = 4.2\%$ $V_{MAX} = 9.9$ ft/sec $Q_{MAX} = 70$ cfs

$$\frac{Q}{Q_f} = \frac{70}{100} = .70 \qquad \frac{d}{D} = 0.7 \qquad \frac{V}{V_f} = .95$$

$d = \underline{25''}$ $V = \underline{9.4 \text{ ft/SEC}}$

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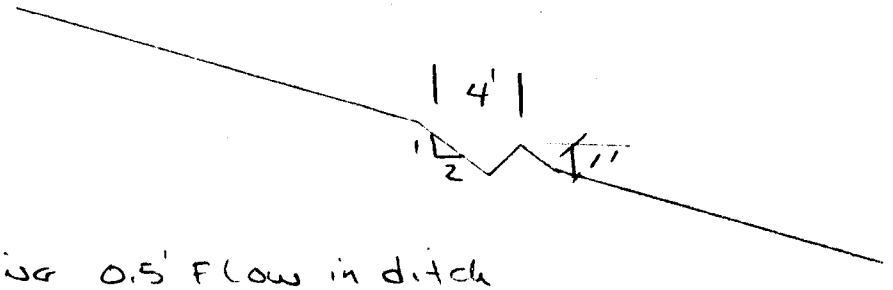
JOB NO. _____ CLIENT _____ DATE _____

JOB TITLE/SUB-TITLE _____

SUBJECT Ditch CALC. Stockpile BY _____ CK'D BY _____



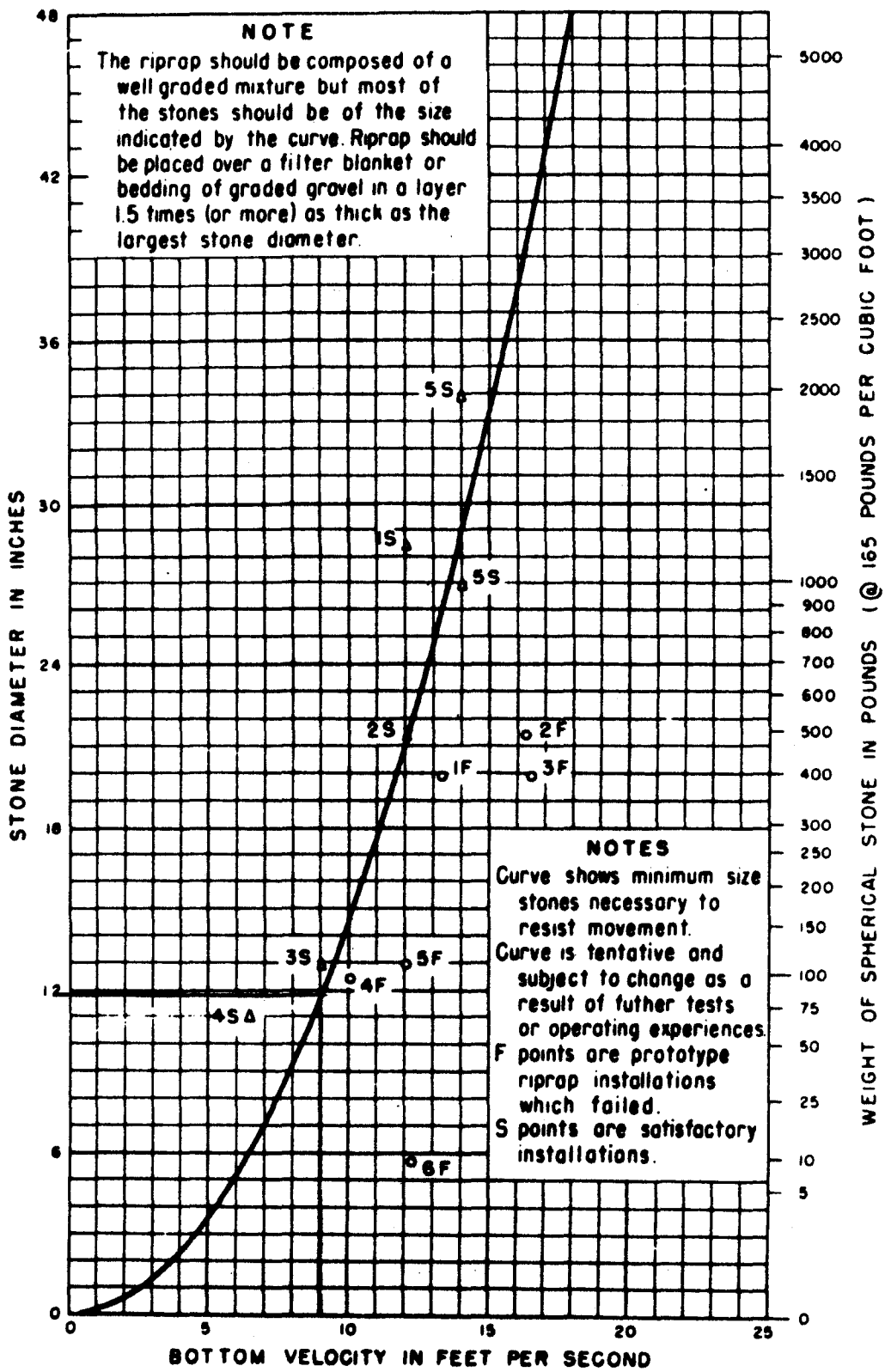
using 0.5' Flow in ditch

S = 0.3%

n = 0.4

Q = 1.5 cfs

V = 3 ft/sec.

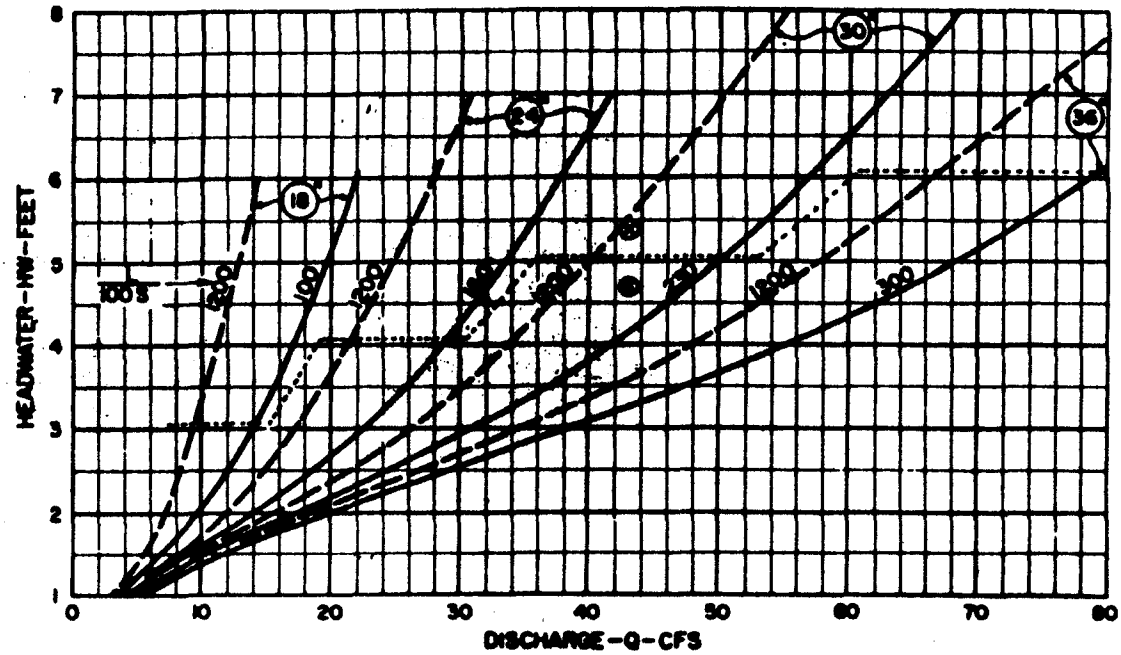


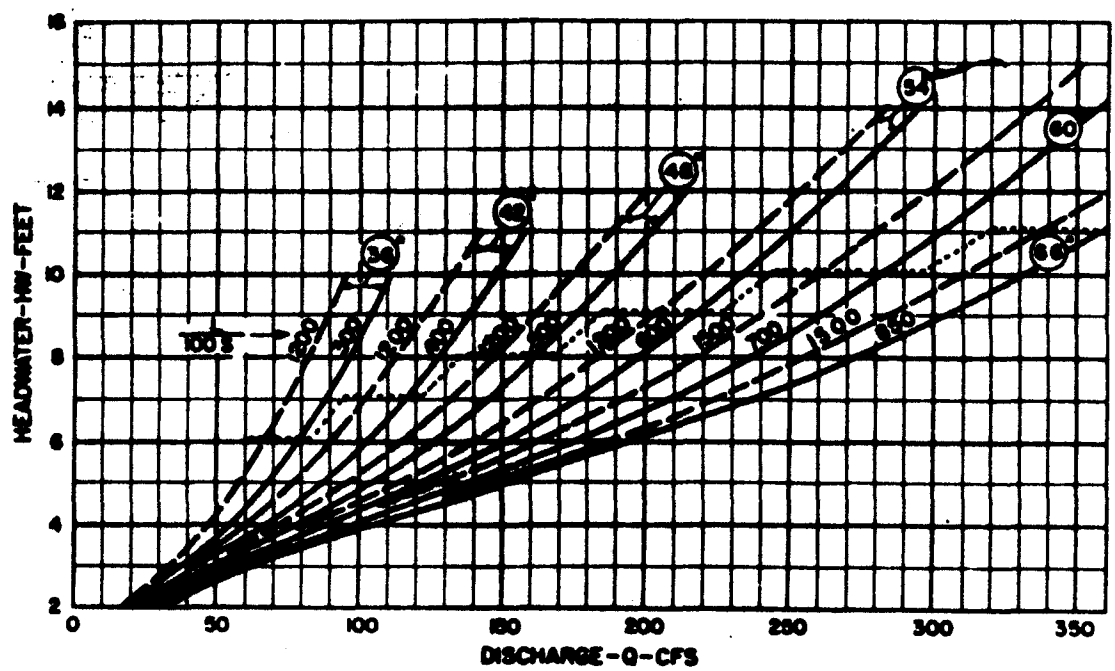
From USBR

FIGURE 5-1. RIPRAP SIZING (13)

NOTE: ALL RIPRAP 12" DIA MIN MAX V=9 ft/sec

12-15-68





From BPR
EXAMPLE

⊗ GIVEN:
43 CFS ; AHW = 5.4 FT.
L = 180 FT.; S_o = 0.002

⊕ SELECT 30"
HW = 4.7 FT.

CULVERT CAPACITY
CIRCULAR CONCRETE PIPE
GROOVE-EDGED ENTRANCE
18" TO 66" ○

FIGURE 10-7.

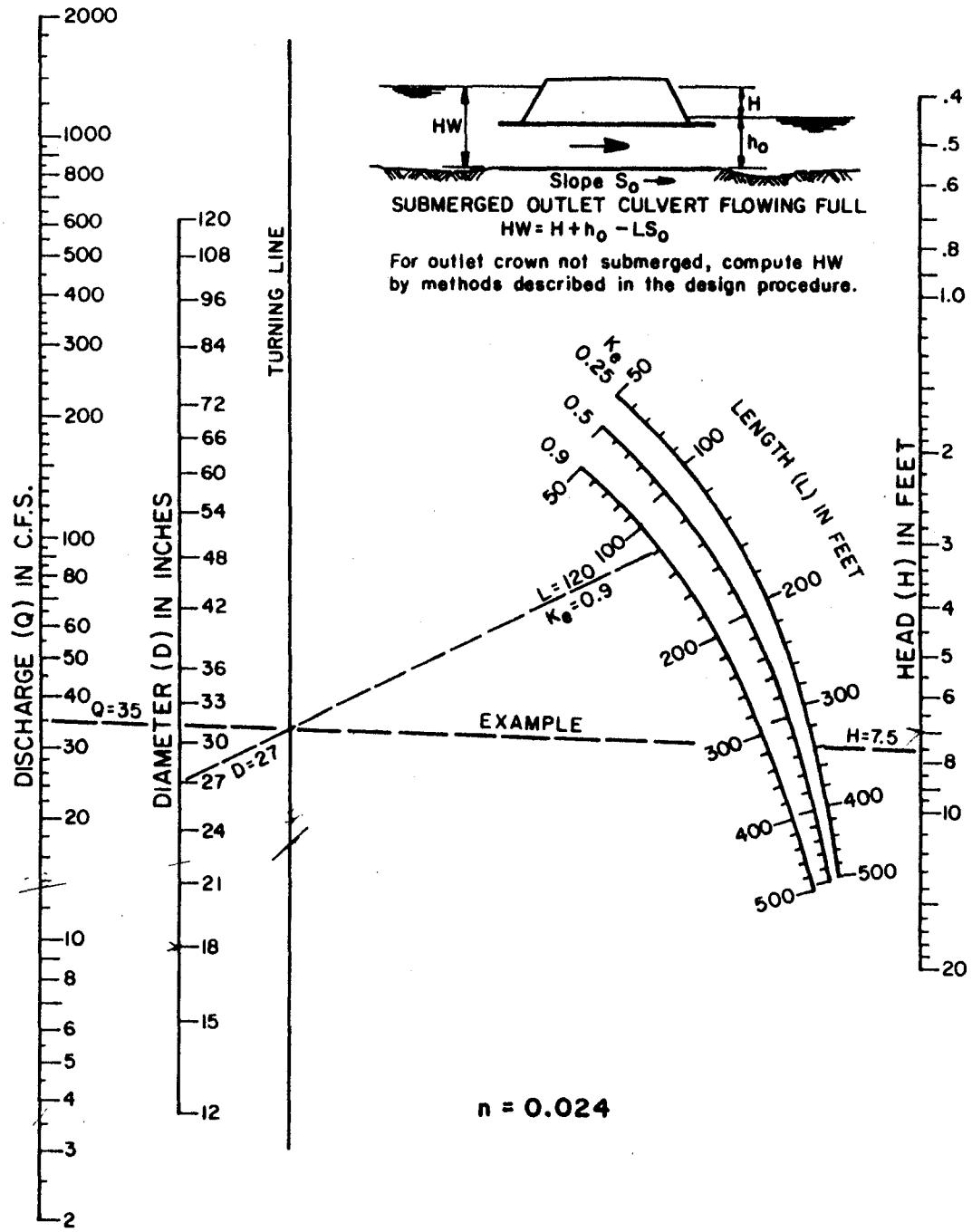


Figure 7.4.3-1 HEAD FOR STANDARD CORRUGATED METAL PIPE CULVERTS FLOWING FULL (From: U.S. Dept. of Commerce, Bureau of Public Roads, Dec. 1965)

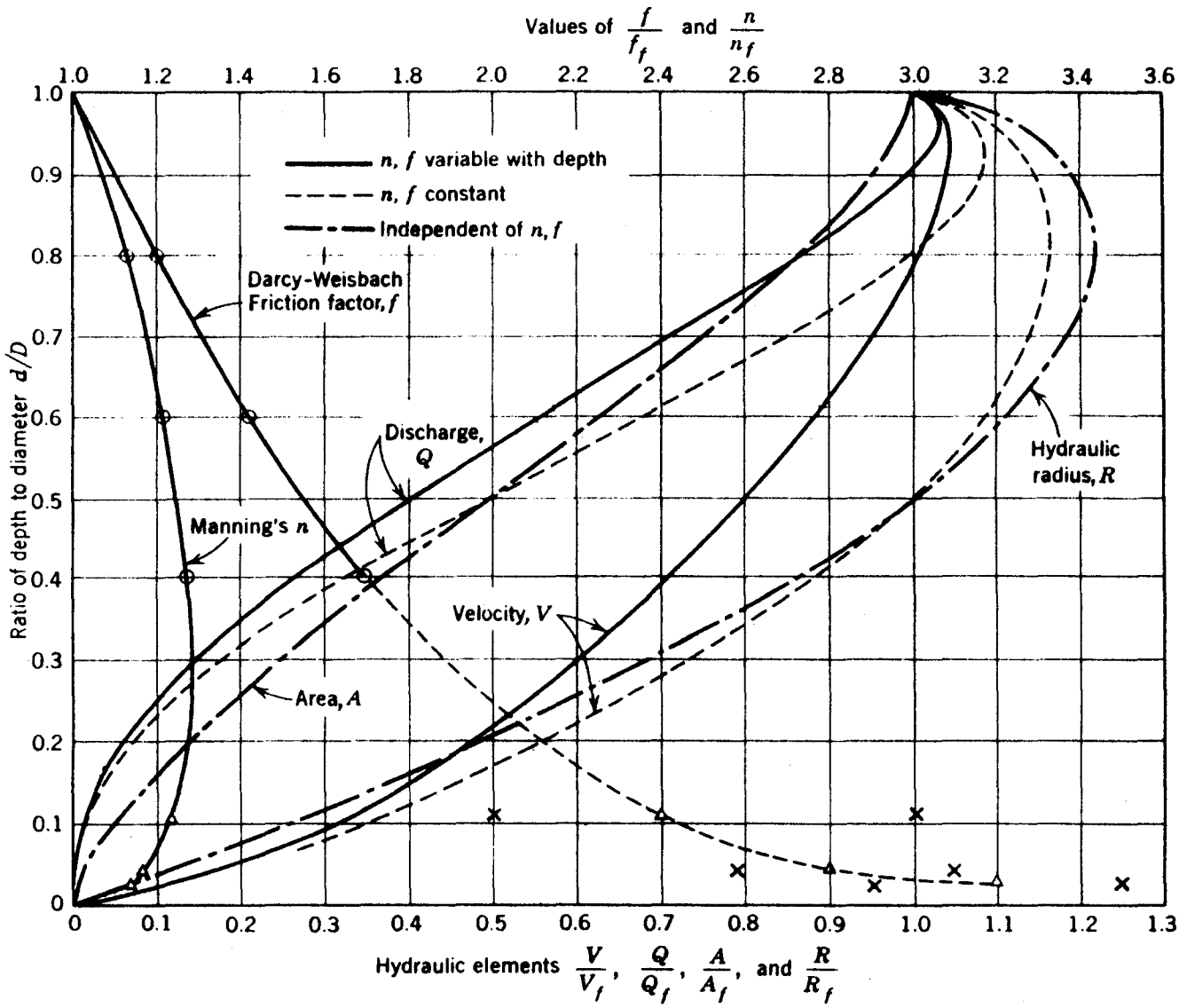


Figure 6.2.3-1 HYDRAULIC ELEMENTS OF CIRCULAR CONDUITS (From American Society of Civil Engineers and Water Pollution Control Federation, 1970)