0026

PRICE RIVER COAL COMPANY
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RECEIVED
JUN 27 1984
DIVISION OF OIL GAS & MINING

CERTIFIED MAIL

June 22, 1984

FILE ACT/007/004
FOLDER #2

Mr. D. Wayne Hedburg,
Permit Supervisor
Division of Oil, Gas & Mining
4241 State Office Building
Salt Lake City, UT 84118

Re: MINOR REVISION TO POND 014

Dear Mr. Hedburg:

Thank you for partially reviewing the past history related to changes to Pond 014. Further research by you might reveal several other interesting facts. I will list some important points and dates to aid you since you were apparently not involved in the permit review of the Crandall Facility.

9-14-81 - PRCC Submitted a response to the Crandall Canyon A.C.R. and a revised permit package. Contained in this document are discussions related to Ponds 014 and 015. PRCC proposed both structures to be temporary. No permanent pond is proposed due to the intended paving of the entire area. A device called an "oil separator" is proposed to minimize oil and grease discharges. Sediment was not considered a problem from a paved area.

2-19-82 - DOGM provided PRCC a copy of its T.A. on Crandall. The proposal for using an oil separator rather than sediment ponds was approved with some obvious trepidation; Stipulation 2-19-82-75K required monitoring to determine functionality of the system.

4-19-82 - DOGM issued final approval of the Crandall modification with the "no ponds" system intact. The monitoring stipulation also remained intact. It was clear to PRCC that DOGM would be continually "concerned" over this situation so we began to change our plans to include a permanent pond. (Note: one other ponds (016) was originally proposed to treat runoff from the top soil area. It was later reduced to an evaporation basin during A.C.R. discussions and finally eliminated altogether when the Crandall Canyon topsoil storage site was approved. Its 1.5 acre drainage area was included in an upgraded Pond 015.)

4-28-82 - PRCC requested to move and increase the size of Pond 014 due to unexpected excess ground water. This was an emergency request and it only required 5 months to extract approval from your office, during

which time PRCC had to incur a Notice of Violation for the admittedly unsatisfactory situation. There were many letters and far too many meetings over this structure. Various parties (UDH, DWR) were concerned about the stability of PRCC's retaining wall, the gradient of the inner slopes and the thickness of a bentonite layer.

7-27-82 - PRCC submitted clarifications of all matters and permits were issued (DOGM 8-6-82, UDH 9-3-82). Within this letter PRCC also stated that Pond 014 would be upgraded and retained as a permanent structure for the entire Crandall Facility. This action, we felt, would assuage continuing concerns by your office that the approved final drainage control system (no ponds) would meet effluent limitations.

8-26-82 - PRCC submitted a revised MRP in response to the 1st A.C.R. Included was a revised Crandall Canyon Exhibit 3.7-5, a plot plan for the final configuration of the Crandall site. This exhibit differed from the original in one significant point -- in keeping with commitment made by PRCC in the 7-27-82 letter, Pond 014 was shown as a permanent structure. (Note: referenced exhibit also shows location of all diversions, berms, etc.)

4-21-83 - PRCC requested to temporarily allow runoff from 7 undisturbed acres to drain to Pond 014. The approval received for this on 6-23-83 may have been based on an evaluation by the DOGM staff of the adequacy of Pond 014 to both contain runoff and safely pass discharge from the additional 7 acres. (Note: I mention this only because the 6-13-84 request bases the need for additional information on an "enlargement of the drainage area".)

3-16-84 - PRCC requested to modify Pond 014 to a more maintainable and stable configuration than that approved on 8-6-82. We proposed no modification to the drainage diversion system. Changes in drainage area are a direct result of developmental stages of the Crandall Facility construction. Such areal alterations were anticipated and clearly shown on maps and drawings included in the approved Crandall plan. Drawings, hand delivered to you on 3-14-84, show the only significant changes to an otherwise approved drainage control plan. These changes include, as you may have noted, a modification to the outlet of the diversion on the far eastern end of the facility. This is necessary because the retaining wall was inadvertently continued to the hillside and drainage must now flow over rather than around the wall. We had presumed that you already had all the needed information to analyze the flow and regulatory adequacy of this structure.

Before I launch into the calculations requested, one minor matter of concern to Inspector Pruitt could be clarified -- A 24" CMP culvert, proposed and approved, to direct undisturbed runoff from about 4 acres will on final construction be tapped into the 90" CMP draining basin CC-17 instead of discharging directly to the main channel. The 90" CMP has a flow capacity of 550 cfs. 100 yr storm runoff is estimated at 107.64 cfs (see attached Table 7-11). It should be obvious that our plan to direct an additional 4 acres to the 90" CMP will not threaten its adequacy.

POND 014

The following information is again provided:

AREA: Tank Pad and Access Road: 0.420 Acres

Upper Site:	6.284	Acres
Lower Site:	7.176	Acres
Total:	13.880	Say, 14 acres

Length (L):	Tank Pad to Upper Site:	670'
	Upper Site to Lower Site:	1670'
	Lower Site to Pond:	1385'
	Total (L):	3725'

Elevation: Tank 6935
Spillway Pond 014 6765 170' = H

L = 3725
H = 170
S = 0.045

Tc = 0.0078 L S = 14.46 minutes, say 15 minutes
i = 2.0 inches/hr
C = 0.45
0.45 x 14.0 x 2.0 = 12.6 cfs

Approval granted on 8-6-82 was for a spillway which could pass a minimum of 20 cfs. See attached nomographs and charts.

SPILLWAY

Principal: Barrel and riser type barrel 18" CMP - h = 14'
Flow 20.47

Riser 24" CMP - h = 1'
Flow 20 cfs

The principal spillway will flow at a rate = about 20 cfs at h = 1'. The emergency spillway at maximum flow will pass 13 cfs when h = 2'. At this point the principal will pass almost 22 cfs, h = 3'.

The combined capacity will be 34.88 cfs. Excess discharge capacity is provided to handle an event greater than the 25 yr storm due to the extended life of the facility.

The culvert for the east diversion draining basin cc-14 can pass 60 cfs (see nomograph). The 25 yr storm will produce about 22 cfs.

SEDIMENT STORAGE

The information on sediment storage was provided in the original and approved Crandall modification. Through use of the universal soil loss equation PRCC was able to demonstrate that the minimum sediment storage ratio (0.035 ac.ft./ac.) was more than adequate for soil and precipitation conditions in this area. The use of the 0.035 storage ratio has been used in the design of ponds since 1981 (all approved). We do not believe that soil characteristics have altered recently.

MAPS AND DRAWINGS

Your office has adequate maps and drawings to evaluate this plan. I am unable to send you any new copies at this time. All of our original mylars are away being copied for the final compilation of the MRP.

There have been no changes to the overall drainage control plan except those noted herein since the 8-8-82 approval.

Please expedite further review. Your office is holding up completion of the approved permanent drainage control plans.

Sincerely,

PRICE RIVER COAL COMPANY

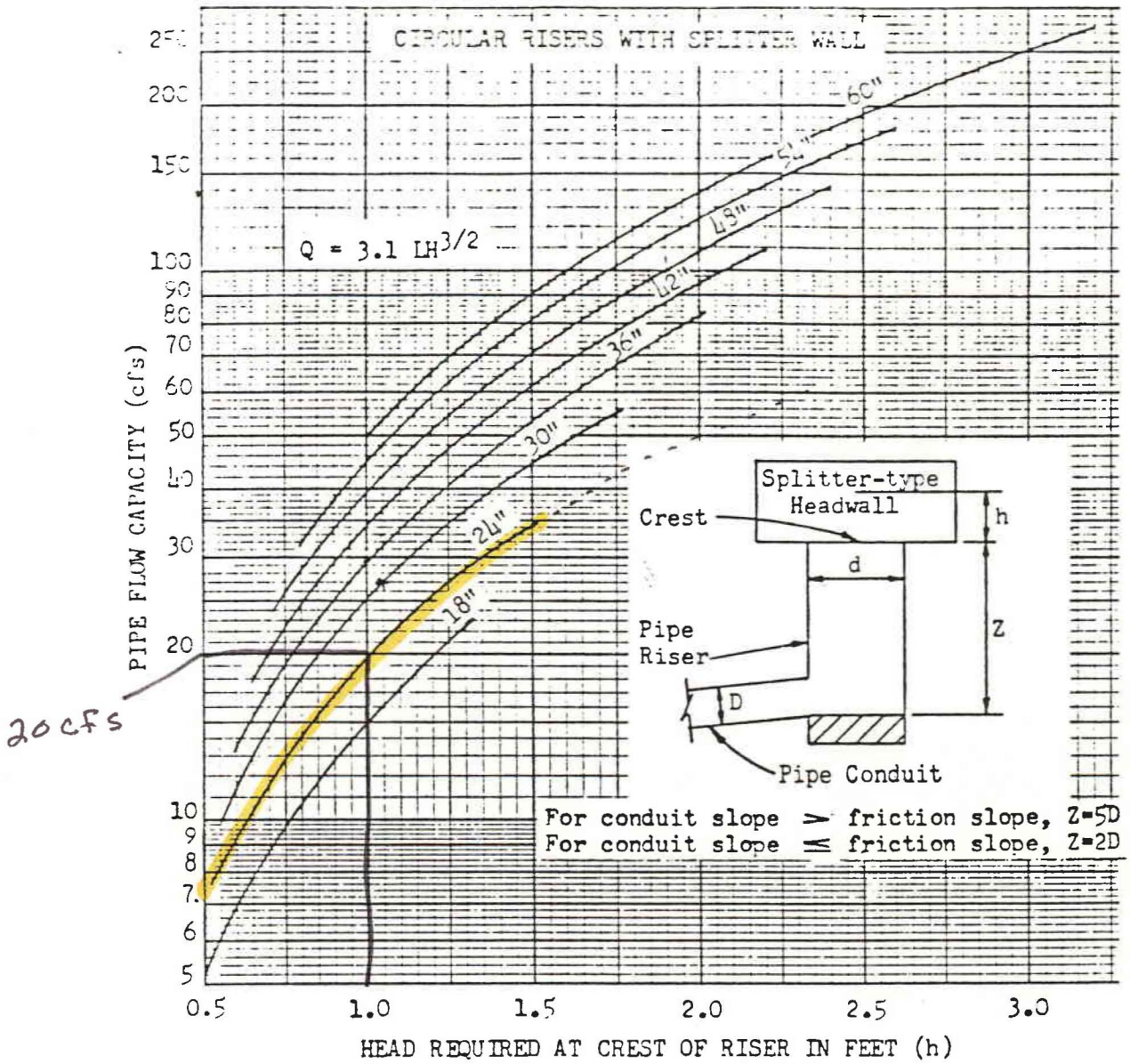
R.L. Wiley

Robert L. Wiley
Environmental Engineer

RLW/dsc

Attachments

cc: Ken Hutchinson



Inlet Proportions	
Pipe Conduit (D)-in.	Pipe Riser (d)-in.
8-12	18
15	21
18	24
21	30
24	30
30	36
36	48
42	54
48	60

Pipe Drop Inlet Spillway Design:

For a given Q and H, refer to Figure 6-25 or 6-26 for conduit size. Then determine the riser diameter (d) from the Inlet Proportions table on this figure. Next, refer to the above curves, using the conduit capacity and riser diameter and find the head (h) required above the crest of the riser. The height of the riser should not be less than 5D - h, except as noted in the above sketch.

Example - Given: CMP; Q = 20 cfs; H = 14 ft., h max. 1.0 ft.; L = 70 ft. From Figure 6-25 find conduit size (D) = 18 inches. From Inlet Proportions table, riser size = 30 inches. Head (h) required for Q = 20 and d = 30 is 0.85 foot.

Figure 6-27 Chart for determining inlet proportions and required head over inlet

PIPE FLOW CHART (Full flow assumed)

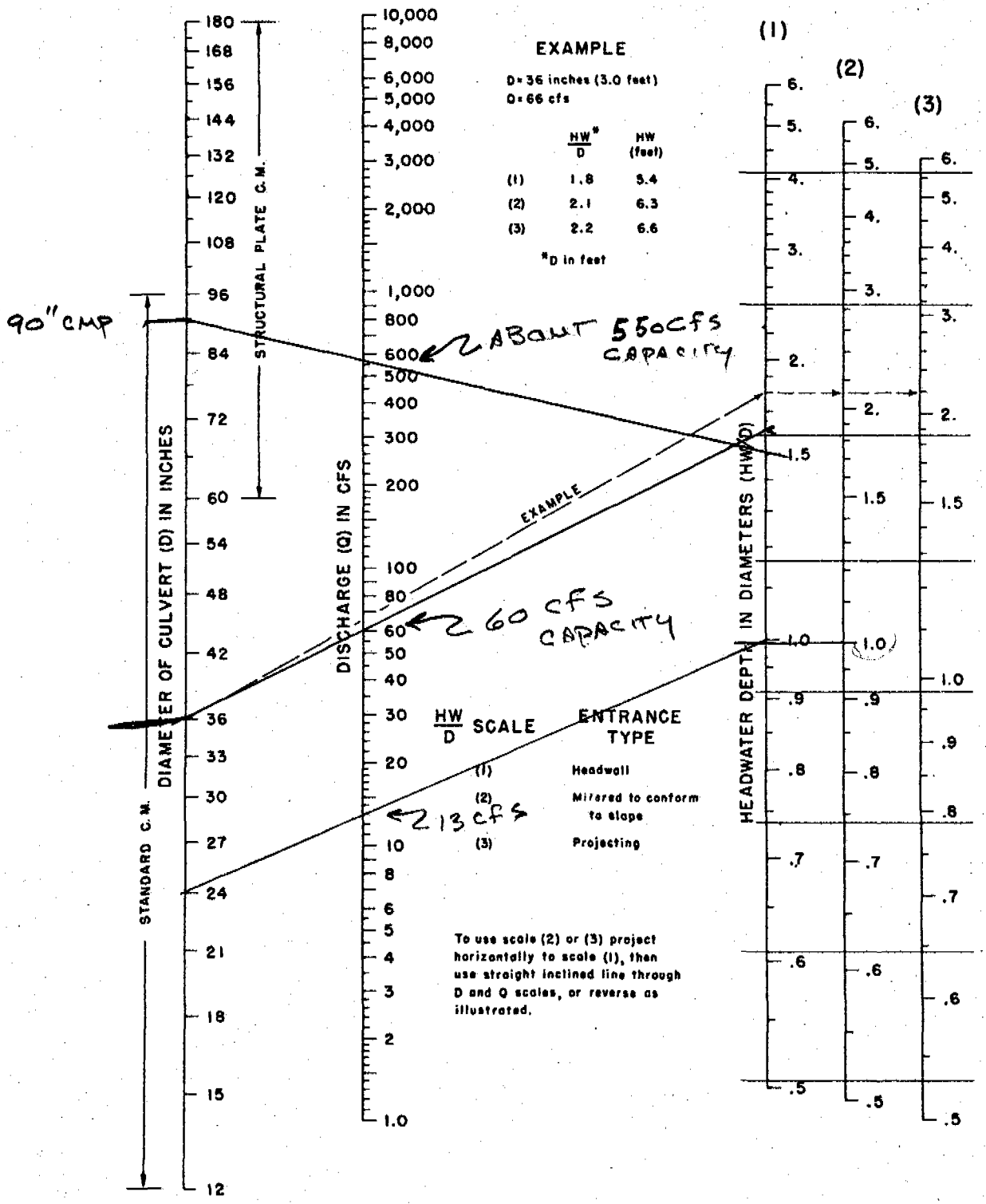
For Corrugated Metal Pipe Inlet $K_e = K_b = 1.0$ and 70 feet of Corrugated Metal Pipe Conduit n = 0.121. Note correction factors for other pipe lengths.

Dia. / H	12"	15"	18"	21"	24"	30"	36"	42"
2	2.84	4.92	7.73	11.30	15.60	26.60	40.77	58.12
3	3.48	6.03	9.47	13.84	19.10	32.58	49.93	71.19
4	4.02	6.96	10.94	15.98	22.06	37.62	57.66	82.20
5	4.49	7.78	12.23	17.87	24.66	42.06	64.46	91.90
6	4.92	8.52	13.40	19.57	27.01	46.07	70.60	100.65
7	5.32	9.21	14.47	21.14	29.19	49.77	76.28	108.75
8	5.68	9.84	15.47	22.60	31.19	53.19	81.53	116.23
9	6.03	10.44	16.41	23.97	33.09	56.43	86.49	123.30
10	6.36	11.00	17.30	25.26	34.88	59.48	91.16	129.96
11	6.67	11.54	18.14	26.50	36.59	62.39	95.63	136.33
12	6.96	12.05	18.95	27.68	38.21	65.16	99.87	142.37
13	7.25	12.55	19.72	28.81	39.77	67.83	103.96	148.21
14	7.52	13.02	20.47	29.90	41.27	70.39	107.88	153.80
15	7.78	13.48	21.19	30.95	42.72	72.85	111.66	159.18
16	8.04	13.92	21.88	31.96	44.12	75.24	115.32	164.40
17	8.29	14.35	22.55	32.94	45.48	77.55	118.87	169.46
18	8.53	14.77	23.21	33.90	46.80	79.81	122.33	174.39
19	8.76	15.17	23.84	34.83	48.08	81.99	125.67	179.15
20	8.99	15.56	24.46	35.73	49.33	84.12	128.93	183.80
21	9.21	15.95	25.07	36.62	50.55	86.21	132.13	188.36
22	9.43	16.32	25.65	37.47	51.73	88.22	135.21	192.76
23	9.64	16.69	26.23	38.32	52.90	90.21	138.27	197.12
24	9.85	17.05	26.80	39.14	54.04	92.15	141.24	201.35
25	10.05	17.40	27.35	39.95	55.15	94.05	144.15	205.50
L	Correction Factors For Other Pipe Lengths							
40	1.23	1.22	1.20	1.19	1.16	1.14	1.13	1.11
50	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07
60	1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.03
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	0.95	0.95	0.95	0.96	0.96	0.96	0.97	0.97
90	0.90	0.91	0.91	0.92	0.92	0.93	0.94	0.94
100	0.86	0.87	0.88	0.89	0.89	0.90	0.91	0.92

Figure 6-25 Pipe flow chart for corrugated metal pipe drop inlet spillway

FLOW CAPACITY FOR
90" CMP WITH 11.5' HEAD
36" CMP WITH 5.0' HEAD
24" CMP WITH 2.0' HEAD

Chart 2-53: HEADWATER DEPTH FOR C.M.P. CULVERTS WITH INLET CONTROL



BUREAU OF PUBLIC ROADS JAN. 1963

7.2-2(5) HYDROLOGIC CALCULATIONS - ASSUMPTIONS FORMULAS/REFERENCES

The following assumptions have been used for the determination of flow calculations for design of drainage control structures on the various mine sites (see Chapter III).

Rainfall - Use Attached Tables 7-7 & 7-8

10 yr - 24 hr storm = 1.90"

25 yr - 24 hr storm = 2.30"

100 yr - 24 hr storm = 2.90"

storm intensities - Table 7-4

Castle Gate = 1.06 (Price)

Runoff - Soil Conservation Service methods

Ref. - National Engineering Handbook - Section 4

Engineering Field Manual

esp. Table 9.1 - runoff curve No's

Fig. 10.1 - solution of runoff equation

curve no.s - weighted

UNDISTURBED AREAS

Factors:

1. soil - sand, sandsilt, gravel, talus, boulders - hydro-group A and B; bare rock - D+

2. cover - Densely Vegetated Canyon

25% of basins	CN-25 to CN-55 average: CN-40	bottoms - oak brush, cottonwood, pine, rhus, prunus, etc., seasonal herbs and forbs
50% of basins	CN-25	north facing slopes - oak, maple, conifer - very dense.
50% of basins	CN-39 to CN-61 average: CN-50	south facing slopes - grasses, juniper, sage well-covered.
15% of basins	CN-92	upper canyon areas - sparsely vegetated to bare rock.

c.5 Av. CN

*grd. cover is 15-25% boulders

*canyon bottoms have very high infiltration rates

Table 9.1.--Runoff curve numbers for hydrologic soil-cover complexes

(Antecedent moisture condition II, and $I_a = 0.2\ S$)

Land use	Cover: Treatment or practice	Cover: Hydrologic condition	Hydrologic soil group: A	B	C	D
Fallow	Straight row	----	77	86	91	94
Row crops	"	Poor	72	81	88	91
	"	Good	67	78	85	89
	Contoured	Poor	70	79	84	88
	"	Good	65	75	82	86
	"and terraced	Poor	66	74	80	82
	" " "	Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	"and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded legumes 1/ or rotation meadow	Straight row	Poor	66	77	85	89
	" "	Good	58	72	81	85
	Contoured	Poor	64	75	83	85
	"	Good	55	69	78	83
	"and terraced	Poor	63	73	80	83
	"and terraced	Good	51	67	76	80
Pasture or range		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74	80
	Contoured	Poor	47	67	81	88
	"	Fair	25	59	75	83
	"	Good	6	35	70	79
Meadow		Good	30	58	71	78
Woods		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	25	55	70	77
Farmsteads		----	59	74	82	86
Roads (dirt) 2/		----	72	82	87	89
(hard surface) 2/		---	74	84	90	92

1/ Close-drilled or broadcast.
2/ Including right-of-way.

10yr. 24hr STORM : 1.9"

Figure 7.5

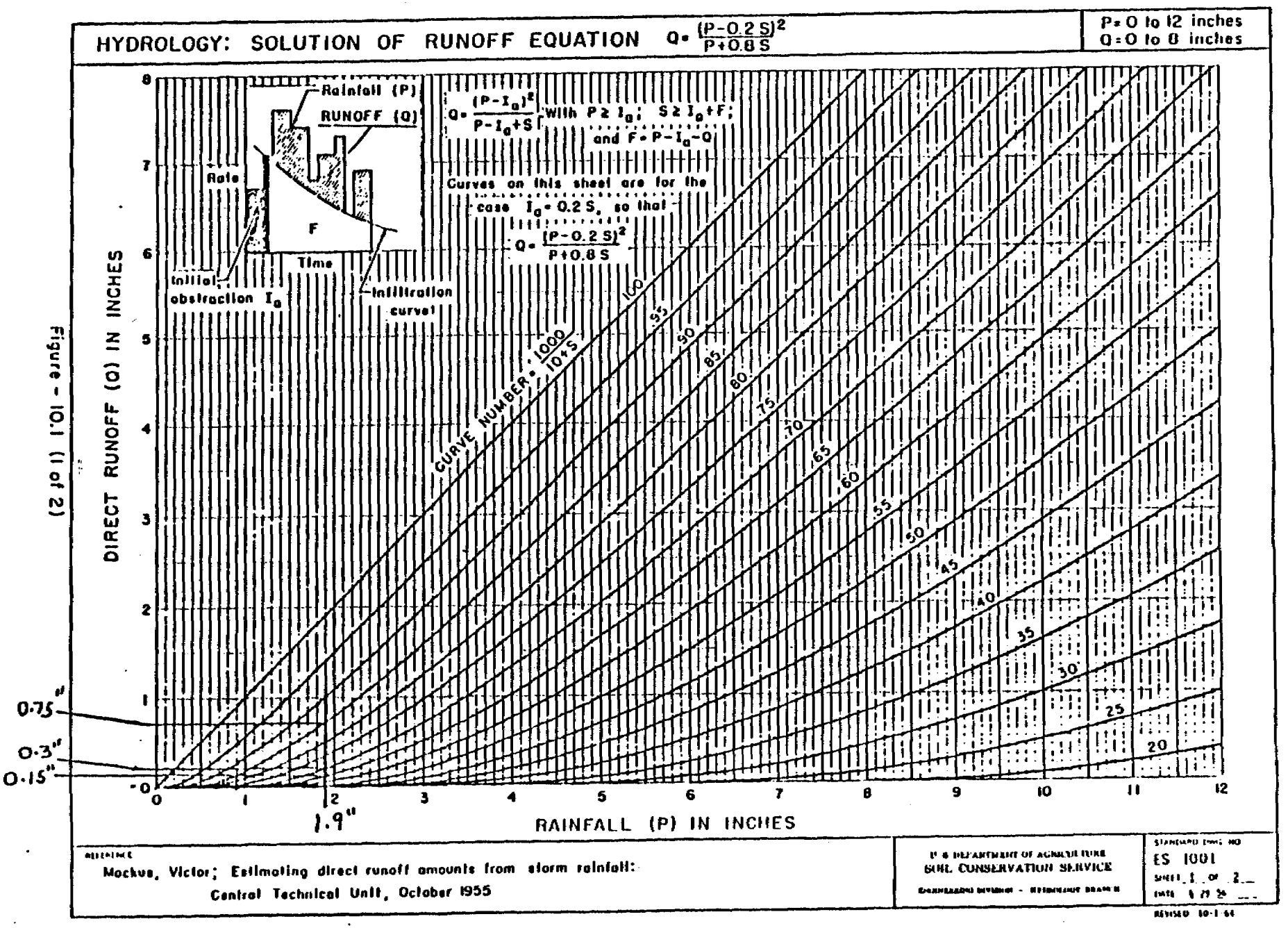


Figure - 10.1 (1 of 2)

25 yr, 24 hr storm: 2.3"

Figure 7.6

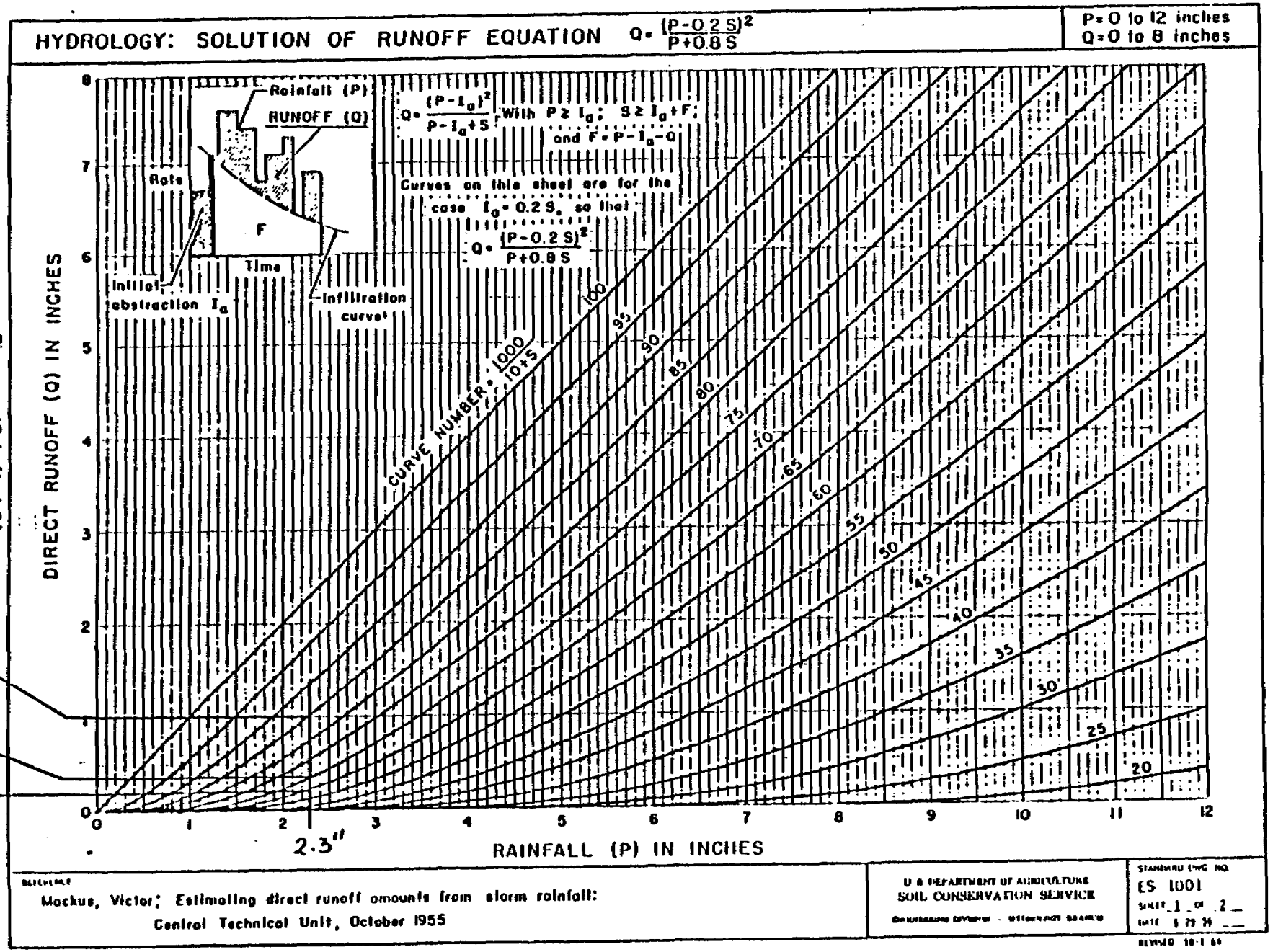


Figure - 10.1 (1 of 2)

Figure 7.7

100 YR, 24 HR STORM: 2.9"

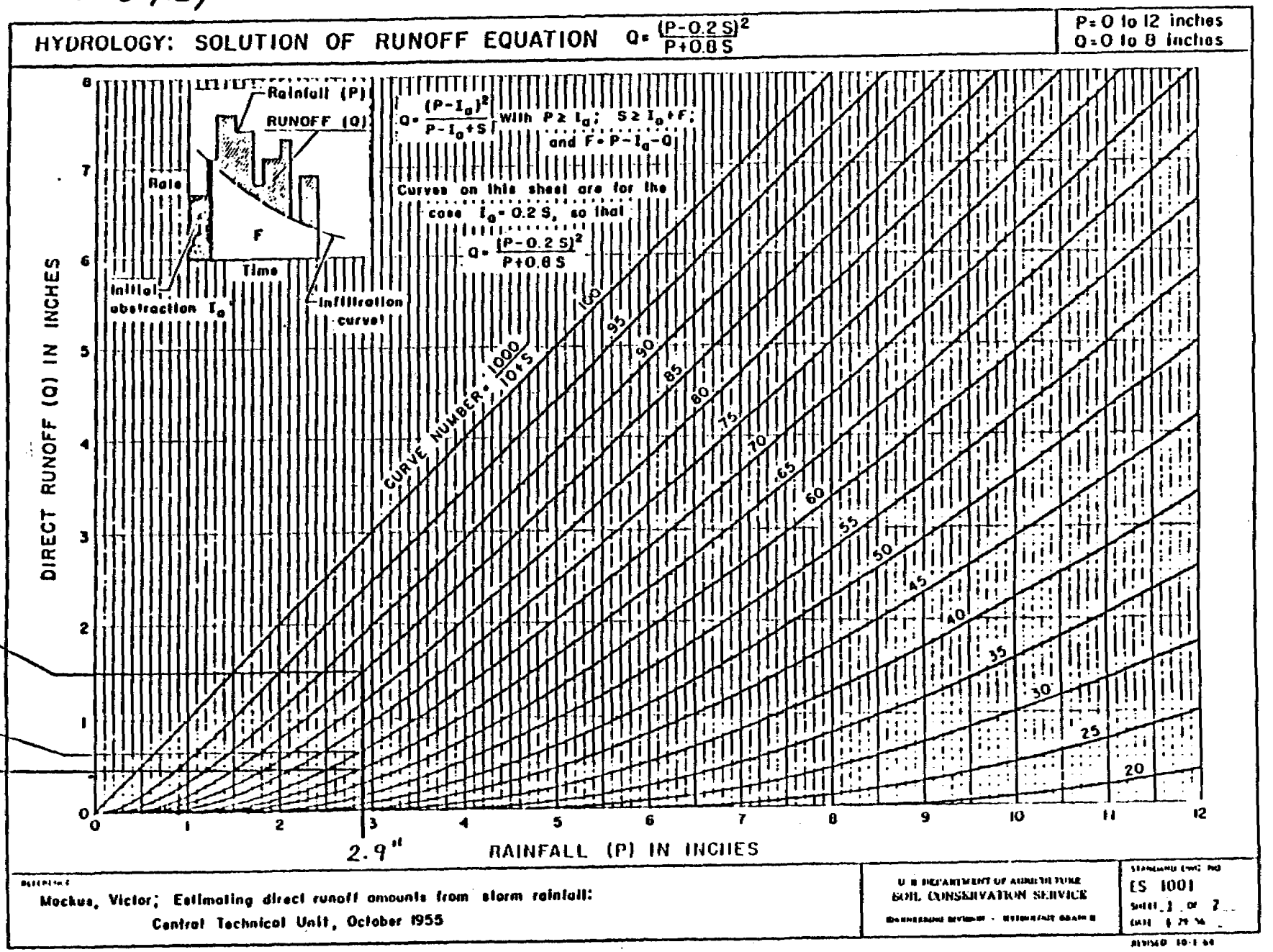


TABLE 7-7

PRECIPITATION FOR CASTLE GATE AREA*

Storm	Precip (in)	Storm	Precip (in)
2 yr-6 hr	0.92	2 yr-24 hr	1.30
5 yr-6 hr	1.20	5 yr-24 hr	1.65
10 yr-6 hr	1.32	10 yr-24 hr	1.90
25 yr-6 hr	1.65	25 yr-24 hr	2.30
50 yr-6 hr	1.85	50 yr-24 hr	2.70
100 yr-6 hr	2.05	100 yr-24 hr	2.90

*Ref: National Oceanic and Atmospheric Administration, 1974, NOAA Atlas 2, Vol. VI, Rainfall Frequency Maps of Utah.

TABLE 7-8

ESTIMATED RETURN PERIODS FOR SHORT DURATION PRECIPITATION (INCHES) - PRICE, UTAH **

Return Period (yrs)	5 Min	10 Min	15 Min	30 Min	1 Hr	2 Hr	3 Hr	6 Hr	12 Hr	24 Hr
1	0.08	0.13	0.17	0.23	0.29	0.37	0.44	0.62	0.78	0.9
2	0.12	0.18	0.23	0.32	0.40	0.49	0.58	0.80	1.00	1.2
5	0.16	0.25	0.32	0.44	0.56	0.68	0.79	1.07	1.32	1.5
10	0.20	0.31	0.39	0.54	0.68	0.81	0.94	1.25	1.53	1.8
25	0.24	0.37	0.47	0.65	0.82	0.98	1.13	1.50	1.83	2.1
50	0.28	0.43	0.54	0.75	0.95	1.12	1.29	1.71	2.18	2.4
100	0.31	0.49	0.62	0.85	1.08	1.27	1.45	1.91	2.32	2.7

**Ref: Utah State University, 1971, Department of Soils and Biometorology, Bulletin No. 1.

3. slopes - steep 5% to 55%

raise CN to 65 to account for steep slopes and seasonal variations in quality of veg. cover.

Use Fig. 10.1 NEH-Sec 4

CN65

"C" 1.9" rainfall = 0.15" runoff - $\frac{0.15}{1.9}$ = 0.079 - use 0.1

2.3" rainfall = 0.25" runoff - $\frac{0.25}{2.3}$ = 0.11 - use 0.15

2.9" rainfall = 0.4" runoff - $\frac{0.4}{2.9}$ = 0.14 - use 0.2

conservative design - both 10 yr & 100 events for short steep (<1/4 mile) use 0.3 for Coef. of runoff - C

long flat drainages use 0.15

mine sites - packed earth, paved roads
40% of area - CN90 - high activity, buildings
60% of area - CN80 - storage, ponds, sparse veg.

weighted CN-85

1.9" rainfall = 0.75" runoff - $\frac{0.75}{1.9}$ = 0.39 use 0.40

2.3" rainfall = 1.0" runoff - $\frac{1.0}{2.3}$ = 0.43 use 0.45

2.9" rainfall = 1.5" runoff - $\frac{1.5}{2.9}$ = 0.52 use 0.55

coal piles - very permeable but have some inherent moisture.

CN-70

1.9" rainfall = 0.3" runoff - $\frac{0.3}{1.9}$ = 0.16 use 0.2

2.3" rainfall = 0.4" runoff - $\frac{0.4}{2.3}$ = 0.17 use 0.2

2.9" rainfall = 0.65" runoff - $\frac{0.65}{2.9}$ = 0.22 use 0.25

Pond capacity evaluation

Volume of storage needed for 10 year, 24 hr storm =
drainage area x rainfall x coef. runoff (C) + sediment factor

C FACTORS - volume of runoff

	10 yr, 24 hr	25 yr, 24 hr
undisturbed	0.10	0.15
mine Site	0.40	0.45
coal Piles	0.20	0.20

Sediment storage factor = 0.035 ACFT/acre

Ditch & Culvert Design

peak flow : Q = CiA

C - same as above

A - same as above

i - intensity in inches/hr
based on time of concentraction - Tc

$Tc = 0.007\ L^{0.77}\ S^{-.385}$

where L = length of drainage area - feet

s = overall gradient - feet/foot

Use Table 7-8 (C.G = 1.06 (Price))

Table 7-9

Estimated return period for short duration precipitation (converted for Castle Gate)

Tc	5 Min	10 Min	15 Min	30 Min	1 Hr
10 Yr	0.21	0.33	0.41	0.57	0.72
25 Yr	0.26	0.39	0.50	0.69	0.87
100 Yr	0.32	0.52	0.66	0.90	1.10

Table 7-10. Rainfall intensities in inches per hour based on time of concentration for the 10 yr, 25 yr and 100 yr, 24 hr storm events.

10 yr intensities (in/hr)

Tc =	5 min	10 min	15 min	30 min	1 hr
i =	2.52	1.98	1.64	1.14	0.72

25 yr intensities (in/hr)

POND

Tc =	5 min	10 min	15 min	30 min	1 hr
i =	3.12	2.34	2.00	1.38	0.87

100 yr intensities (in/hr)

Tc =	5 min	10 min	15 min	30 min	1 hr
i =	3.84	3.12	2.64	1.80	1.10

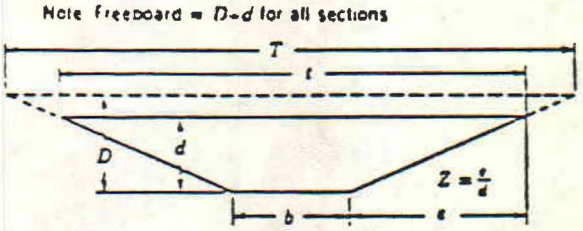
Calculated Tc is rounded to nearest time increment from table; 5 min, 10 min, etc., C factors were rounded up to account for this.

Figure 7-8

CHANNEL DESIGN

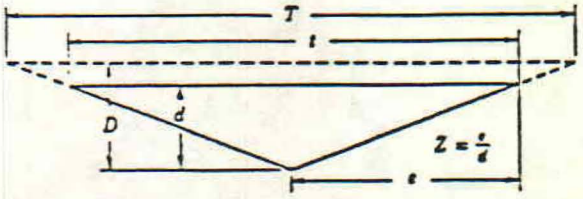
The following formulae are used:

Note Freeboard = D-d for all sections



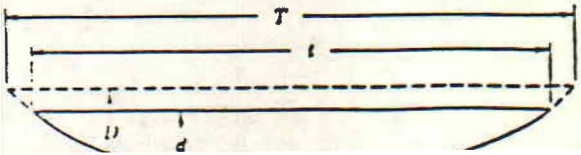
Cross-Sectional Area a	Wetted Perimeter, p	Hydraulic Radius $R = \frac{a}{p}$	Top Width
$bd + Zd^2$	$b + 2d\sqrt{Z^2+1}$	$\frac{bd + Zd^2}{b + 2d\sqrt{Z^2+1}}$	$t = b + 2dZ$ $T = b + 2DZ$

Trapezoidal cross section



Zd^2	$2d\sqrt{Z^2+1}$	$\frac{Zd}{2\sqrt{Z^2+1}}$ or $\frac{d}{3}$ approx.	$t = 2dZ$ $T = \frac{D}{d}t$

Triangular cross section



$\frac{2}{3}td$	$t + \frac{8d^2}{3t}$	$\frac{t^2d}{15t^2 + 4d^2}$ or $\frac{2d}{5}$ approx.	$t = \frac{8}{0.67d}$ $T = t\left(\frac{D}{d}\right)^{1/2}$

Velocity - V(fps) = $\frac{1.486}{n} R^{2/3} S^{1/2}$

Capacity - Q(cfs) = av

Figure 7-10

Values of n from S.C.S. Eng. Field Manual

Table 14-3 Value of "n" for drainage ditch design

Hydraulic radius	"n"
Less than 2.5	0.040 - 0.045
2.5 to 4.0	.035 - .040
4.0 to 5.0	.030 - .035
more than 5.0	.025 - .030

Values for n in rip-rap channels = $0.0395\ (d)^{1/6}$

where d = diameter of large rocks (in.)

if	d = 48"	36"	24"	12"
then	n = 0.0497	0.0474	0.0443	0.0395

CULVERT DESIGN

For peak flow capacity of c.m.p. culverts, Bureau of Public Roads Chart 2-53 is used.

CHANNEL STABILIZATION

Reclaimed channels will be stabilized with rock Rip-Rap - amply available on most sites.

Use Velocities from $\frac{1.486}{n} R^{2/3} S^{-1/2}$

Size derived from Isbash Curve (S.C.S. EFM)

TABLE 7-11

PEAK FLOW CALCULATIONS FOR SELECTED 7-1
UNDISTURBED DRAINAGE AREAS (SEE EXHIBIT [illegible])

tershed No.	Area (acres)	C	Length (feet)	Slope (ft/ft)	Tc (min)	i(in/hr) 10 yr	25 yr	100 yr	PEAK FLOW (cfs) 10 yr, 24 hr	25 yr, 24 hr	100 yr, 24 yr
B-1	16.4	0.15	1600	0.51	5	2.52	3.12	3.84	6.20	7.68	9.45
B-2	130.2	0.15	3200	0.41	5	2.52	3.12	3.84	49.22	60.93	75.00
B-3	1006.7	0.15	8700	0.22	15	1.64	2.00	2.64	247.66	302.02	398.67
B-4	131.3	0.15	3700	0.33	5	2.52	3.12	3.84	49.64	61.46	75.65
B-5	4.3	0.3	600	0.57	5	2.52	3.12	3.84	3.25	4.03	4.95
B-6	9.9	0.3	1250	0.45	5	2.52	3.12	3.84	7.48	9.27	11.41
B-7	1.5	0.3	100	1.00	5	2.52	3.12	3.84	1.13	1.40	1.73
C-1	127.5	.15	3100	0.34	5	2.52	3.12	3.84	48.21	59.69	73.46
C-2	60.9	.15	2600	0.37	5	2.52	3.12	3.84	23.03	28.52	35.10
C-3	61.3	.15	1600	0.66	5	2.52	3.12	3.84	23.18	28.70	35.33
C-4	181.0	.15	3400	0.35	5	2.52	3.12	3.84	68.42	84.71	104.26
C-5	339.3	.15	5950	0.22	10	1.98	2.34	3.12	106.72	126.13	168.17
C-6	29.4	.15	1700	0.56	5	2.52	3.12	3.84	11.11	13.76	16.93
C-7	5.6	0.3	600	0.50	5	2.52	3.12	3.84	4.23	5.24	6.45
C-8	11.1	.15	1600	0.58	5	2.52	3.12	3.84	4.21	5.21	6.41
C-9	12.4	.15	1800	0.37	5	2.52	3.12	3.84	4.69	5.80	7.14
C-10	6.2	0.3	1000	0.56	5	2.52	3.12	3.84	4.69	5.80	7.14
C-11	52.4	.15	2250	0.59	5	2.52	3.12	3.84	19.81	24.52	30.18
C-12	9.5	.15	1900	0.47	5	2.52	3.12	3.84	3.60	4.46	5.49
C-13	2.4	0.3	550	0.58	5	2.52	3.12	3.84	1.81	2.25	2.77
C-14	1.9	0.3	550	0.51	5	2.52	3.12	3.84	1.44	1.78	2.19
C-15	21.0	0.3	1250	0.48	5	2.52	3.12	3.84	15.88	19.66	24.19
C-16	19.7	0.3	1000	0.53	5	2.52	3.12	3.84	14.89	18.44	22.69
C-17	1.0	0.3	550	0.74	5	2.52	3.12	3.84	.76	.94	1.15
C-18	1.5	0.3	600	0.44	5	2.52	3.12	3.84	1.13	1.40	1.73
C-19	0.2	0.3	400	0.88	5	2.52	3.12	3.84	.15	.19	.23
G-1	90.4	0.15	2400	0.56	5	2.52	3.12	3.84	34.17	42.31	52.07
G-2	8.4	0.30	1000	0.60	5	2.52	3.12	3.84	6.35	7.86	9.68
G-3	26.4	0.15	1450	0.49	5	2.52	3.12	3.84	9.98	12.36	15.21
G-4	101.0	0.15	3600	0.44	5	2.52	3.12	3.84	38.18	47.27	58.18
G-5	63.9	0.15	3400	0.45	5	2.52	3.12	3.84	24.17	29.92	36.83
G-6	6.3	0.30	670	0.45	5	2.52	3.12	3.84	4.76	5.89	7.26
G-7	8.4	0.15	1450	0.28	5	2.52	3.12	3.84	3.18	3.93	4.84
G-8	3.7	0.30	750	0.53	5	2.52	3.12	3.84	2.80	3.46	4.26
G-9A	1050.0	0.15	12500	0.18	30	1.14	1.38	1.80	179.55	217.35	283.50
G-9B	188.2	0.15	6900	0.26	10	1.98	2.34	3.12	55.90	66.06	88.08
G-10	5.7	0.30	800	0.23	5	2.52	3.12	3.84	4.3	5.3	6.6
WC-1	26.0	0.15	1600	0.34	5	2.52	3.12	3.84	9.85	12.17	14.98
WC-2	15.1	0.15	1750	0.50	5	2.52	3.12	3.84	5.72	7.09	8.72
WC-3	67.9	0.15	3540	0.49	5	2.52	3.12	3.84	25.68	31.79	39.15
WC-4	32.5	0.15	1960	0.52	5	2.52	3.12	3.84	12.30	15.23	18.74
WC-5	25.9	0.15	2100	0.74	5	2.52	3.12	3.84	9.80	12.14	14.94
WC-6	9.2	0.30	1250	0.61	5	2.52	3.12	3.84	6.96	8.62	10.60

rshed	Area (acres)		Length (feet)	Slope (ft/ft)	Tc (min)	i(in/hr) 10 yr	25 yr	100 yr	PEAK FLOW (CFS) 10 yr, 24 hr	25 yr 24 hr	100 yr, 24 hr
cc-											
-1	49.2	0.15	2600	0.46	5	2.52	3.12	3.84	16.71	20.69	25.46
-2	108.0	0.15	4500	0.34	10	1.98	2.34	3.12	32.08	37.91	50.54
-3	7.4	0.30	950	0.66	5	2.52	3.12	3.84	5.59	6.93	8.53
-4	25.1	0.15	1970	0.62	5	2.52	3.12	3.84	9.50	11.76	14.48
-5	12.46	0.15	1500	0.73	5	2.52	3.12	3.84	4.71	5.83	7.18
-6	15.1	0.15	1710	0.67	5	2.52	3.12	3.84	5.72	7.08	8.72
-7	45.7	0.15	2460	0.54	5	2.52	3.12	3.84	17.29	21.40	26.34
-8	27.5	0.15	2220	0.55	5	2.52	3.12	3.84	10.41	12.89	15.86
-9	10.4	0.30	1270	0.75	5	2.52	3.12	3.84	7.86	9.73	11.98
-10	9.0	0.30	1190	0.74	5	2.52	3.12	3.84	6.80	8.42	10.37
-11	6.9	0.30	950	0.73	5	2.52	3.12	3.84	5.22	6.46	7.95
-12	5.0	0.30	1000	0.67	5	2.52	3.12	3.84	3.78	4.68	5.76
-13	4.0	0.30	850	0.66	5	2.52	3.12	3.84	3.02	3.74	4.61
-14	46.5	0.15	3000	0.47	5	2.52	3.12	3.84	17.59	21.78	26.80
-15	2644.2	0.15	17300	0.18	30	1.14	1.38	1.80	452.16	547.35	713.93
-16	230.0	0.15	5000	0.30	10	1.98	2.34	3.12	68.31	80.73	107.64
-17	230.0	0.15	5027	0.37	10	1.98	2.34	3.12	68.31	80.73	107.64
-18	48.0	0.15	2920	0.48	5	2.52	3.12	3.84	18.14	22.46	27.65
-19	19.5	0.15	1480	0.40	5	2.52	3.12	3.84	7.38	9.14	11.25
-20	32.0	0.15	1850	0.57	5	2.52	3.12	3.84	12.10	14.98	18.45