

0004



**CASTLE
GATE**
COAL COMPANY

FILE COPY

RECEIVED
SEP. 24 1987

DIVISION OF OIL
GAS & MINING

September 23, 1987

Mr. Rick Summers
Division of Oil, Gas & Mining
3 Triad Center
Salt Lake City, UT 84180

Dear Rick:

Enclosed are the calculations for Ponds 004 and 007. I made the changes which were agreed upon at our meeting last week. Please note that the drawing on Pond 007 was wrong and the text was right at elevation 96.0 for the drop inlet. The following changes were made:

Pond 004

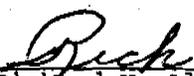
1. Corrected Mannings N to .024
2. Changed drop inlet to 24"

Pond 007

1. Recalculated pond volume to 40,666 ft.³ at elevation 96.0
2. Changed drop inlet to 30" diameter

I want to begin construction during the first week of October.

Sincerely,


Richard H. Allison, Jr., P.E.
Project Supervisor

RHA:jcr

Enclosures

cc: Dave Miller
DOGM File

cc5.rha923

Table: 3.2-2A (Revised September 1987)
Drop Inlet Discharge Design: Pond 004

The following methodology is taken from the S.C.S. Engineering Field Manual Chapter II, IV and VI.

1. Calculate peak inflow into Pond 004 given the following:

Weighted Curve No.

$$\begin{array}{r} \text{From Table 3.2-2} \\ 6.1 \text{ AC} \times 85 \text{ CN} = 518.5 \\ 2.5 \text{ AC} \times 65 \text{ CN} = 162.5 \\ \hline 681.0 \end{array}$$

$$681 - 8.6 = 79.1 \text{ Use } \underline{79 \text{ CN}}$$

$$\begin{array}{l} \text{From page 59 of MRP} \\ 25 \text{ yr} - 24 \text{ hr storm} = 2.3'' \end{array}$$

From page 2-66 Exhibit 2-10 of SCS Manual (Peak Rates of Discharge for Small Watersheds Type II Storm Distribution). For a moderate slope and curve No. of 80 peak discharge is 7 C.F.S.

Therefore, peak discharge of drop inlet from Pond 004 should be 7 C.F.S.

2. Determine head (h) required to pass 7 C.F.S. at crest elev. 97.5 (Exhibit 11.2). On page 57 of Chapter VII of the MRP. Figure 7-3C is the S.C.S. Chart for determining inlet proportions and required head over inlet. A 24" drop inlet with .6 feet of head over the crest elevation will pass the required 7 C.F.S.
3. Determine if the existing 18" CMP will pass the required 7 C.F.S. given the following:

$$\begin{array}{l} Q_h = 7 \text{ C.F.S.} \\ h = .6 \text{ ft.} \\ H = (97.5 - 95.0) + (.0278 \times 290) + .6 \text{ ft.} \\ \quad = 2.5' + 8.06' + .6' = 11.16 \text{ ft.} \\ N = \text{Mannings Coefficient} = .024 \text{ (Table 3-1 SCS Manual)} \\ K_p = .0621 \text{ ft/ft of pipe (Exhibit 3-4 of SCS Manual)} \\ K_m^p = K_e + K_{90} = .5 + .9 = 1.4 \text{ (Exhibit 3-8 of SCS} \\ \quad \quad \quad \text{Manual)} \\ a = 1.77 \text{ sq. ft. (x-section area of pipe)} \\ L = 290' \text{ (Exhibit 11.2 of MRP)} \end{array}$$

and from the continuity principle (EQ 3-12 of SCS Manual)

$$Q_{18} = a \sqrt{\frac{2gH}{1 + K_m + K_p L}} = 10.5 \text{ C.F.S.}$$

$Q_H < Q_{18}$ Therefore existing 18" pipe is adequate to
pass the required 7 C.F.S.

4. Determine elevation of freeboard:

Inlet elevation	97.5
Plus elevation of head in feet	.6
Freeboard required	<u>2.0</u>
Required top of embankment Elevation	100.1

Pond 007 (Revised September 1987)

Pond 007 collects drainage from the old substation/storage area, the No. 4 portal facilities, a portion of the maintenance facilities, sub-basins HC 10, and HC 18, which could not be diverted. Table 3.3-2 is a summation of the required capacities.

Pond 007 with drop inlet has a constructed capacity of 40,666 ft³. This is more than the required capacity of 35,290 ft.³ for a 10 year storm plus sediment storage. This basin is an excavated structure, shot partly out of solid rock.

Pond 007 discharges into Pond 008. A spillway is proposed to conduct excess flow. Designs are shown on Exhibit 3.3-5 peak flow from drainage areas HC-10, HC-18 and 7.0 acres of disturbed area.

Design $Q=CiA$
C = 0.30 for HC - 10 and HC - 18
C = 0.45 for disturbed area (D.A.)

i for $T_c = 5$ min. = 3.12 in./hr.

A = HC - 10 - 6.2 ac.
 Hc - 18 - 1.5 ac.
 D.A. - 7.0 ac.

Q = D.A. - 9.8 cfs
 HC - 10 - 5.8 cfs
 HC - 18 - 1.4 cfs

TOTAL 17 cfs needed

Discharge Structure Design
(Revised September 1987)

The following calculations are based on the methodology found in Chapters 3 and 6 of the U.S. Soil conservation Field Manual. The structure modifications are shown on Exhibit 11.4.

1. Determined the required Q from a 25 year/24 hour precipitation event:

From Section 3.1 page 10 of the MRP the required Q for the drop inlet design is 17 C.F.S.

2. Determine head required to pass 17 C.F.S. at Crest Elevation 96.0:

On page 57 of Chapter VII of the MRP Figure 7-3C is the S.C.S. Chart for determining inlet proportions and required head over inlet. A 30" drop inlet with .8 ft. of head over the crest elevation will pass the required 17 C.F.S.

3. Determine if existing 24" C.M.P. will pass the required 17 C.F.S. given the following:

$$\begin{aligned}
 Q_p &= 17 \text{ C.F.S.} \\
 h &= .6 \text{ ft.} \quad H = 96.0 - 83.1 = 12.9 + .8 = 13.7 \text{ FT.} \\
 N &= \text{Mannings Coefficient} = .024 \text{ (Table 3-1 SCS Manual)} \\
 K_p &= .0423 \text{ FT./FT. of Pipe (Exhibit 3-4 of SCS Manual)} \\
 K_m &= K_e + K_{90} = .5 + .9 = 1.4 \text{ (Exhibit 3-8 of SCS Manual)} \\
 a &= 3.14 \text{ sq. ft. (x-section area of pipe)}
 \end{aligned}$$

$$L = 281' \text{ (Exhibit 11.4 of M.R.P.)}$$

and from the continuity principle (eq. 3-12)

$$Q = a \sqrt{\frac{2gH}{1+K_m + K_p L}} = Q_{24" \text{ Pipe}} = 27.15 \text{ C.F.S.}$$

where Q = discharge-cfs
a = pipe area-sq. ft.
g = acceleration of gravity-ft/sec. ²
H = elevation head differential-ft.
K_m = coefficient of minor losses
K_f^m = pipe friction coefficient
L_p^f = pipe length-ft.

Q_h < Q_{24"} pipe Therefore existing 24" pipe is adequate to pass the required 17 C.F.S.

4. Determine elevation of freeboard:

Elevation of inlet...	96.0
plus elevation of head of water...	.8
Elevation of water during 25 yr/24 hr storm event...	96.8
Freeboard required...	2.0
Required top of embankment elevation...	98.8

The top of the existing embankment is 99.0 FT. (From Exhibit 11.4).

Therefore, the existing embankment is adequate for the drop inlet spillway. A diversion, in the form of a concrete slotted box culvert, is proposed for Pond 007. Design characteristics are shown on Figure 3.3-2.

Pond 008

Pond 008 has a drainage area which includes the maintenance area, Dog Flat storage site, the warehouse storage area, HC 12 and HC 13. Table 3.3-3 is a summation of the required capacities.

Pond 008 has a constructed capacity of 35,500 ft. ³, which is what is needed to contain the 10 year event. Pond 008 is partially excavated and has an embankment.

Drainage from Pond 007 is diverted to Pond 008. A spillway is proposed to direct excess runoff to proposed Pond 009. The spillway, designed to pass the 25 year storm from the drainage areas of both Pond 007 and Pond 008 (see Exhibit 3.3-6 B for design detail).