0038

Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

August 8, 1983

Mr. John J. Whitehead
Division of Oil, Gas, & Mining
4241 State Office Building
Salt Lake City, Utah 84114

Ref: July 27th letter NOV N83-5-8-3

Dear John:

I have reviewed the original plan submitted to the Division, relative to the sediment pond in Bear Canyon (pond A). I feel that a portion of the problem lies in the terminology used to describe the structures that allow water to pass from the pond. I believe the 4" de-watering pipe with the antivortex devices has been mistaken for the spillway, and the normal spillway has been miss-named as an emergency spillway. (Please note the attached diagrams).

The firm of Horrocks & Carolle have completed the computations relative to sizing of the pond, and have suggested capacities which will accommodate a 10-year, 24-hour event. I have also attached a copy of their work for your review.

I personally measured the pond, and the minimum squared off bottom area alone, meets the requirements stipulated by the engineering firm. The original size had to be modified due to the presence of a large rock outcrop on the south-west corner. However, the original width has been more than compensated for with the addition of approximately 40'in length.

Relative to the embankment slopes; the slopes are within 1' in 20' of meeting UMC 817.46 (m) requirement, and I personally feel that the stability of this slope, due to the degree of revegetation, does, in fact, more than meet the intent of the law if not the letter.

I am confident that with a minimal amount of work, this slope could be brought up to standard. However, I sincerely question the merit of this for the simple reason that the stabilizing effect of more material would not compensate for the loss in vegetative cover which presently exists. I feel that due to the proven effectiveness of this structure for the past 3 years, and the apparent stability of the structure as it now exists, that a variance would be in order on the slope. Although, if the Division deems it necessary, the Co-Op is committed to adding material to bring the slopes into compliance.

On the last item, (#3), relative to rip-rap on the spillway, I concurr with your observation and will take whatever steps are necessary to

fortify this spillway with a minimum of 6" additional fill with rock rip-rap on the inlet side, and 2' to 3' of material where the water would gain momentum on the down slope of the enbankment.

The above action will be implemented upon your review of both the attached information and your recommendations.

Sincerely,

M.A. Coonrod
PERMITTING & COMPLIANCE DIRECTOR
Co-Op Mining Company

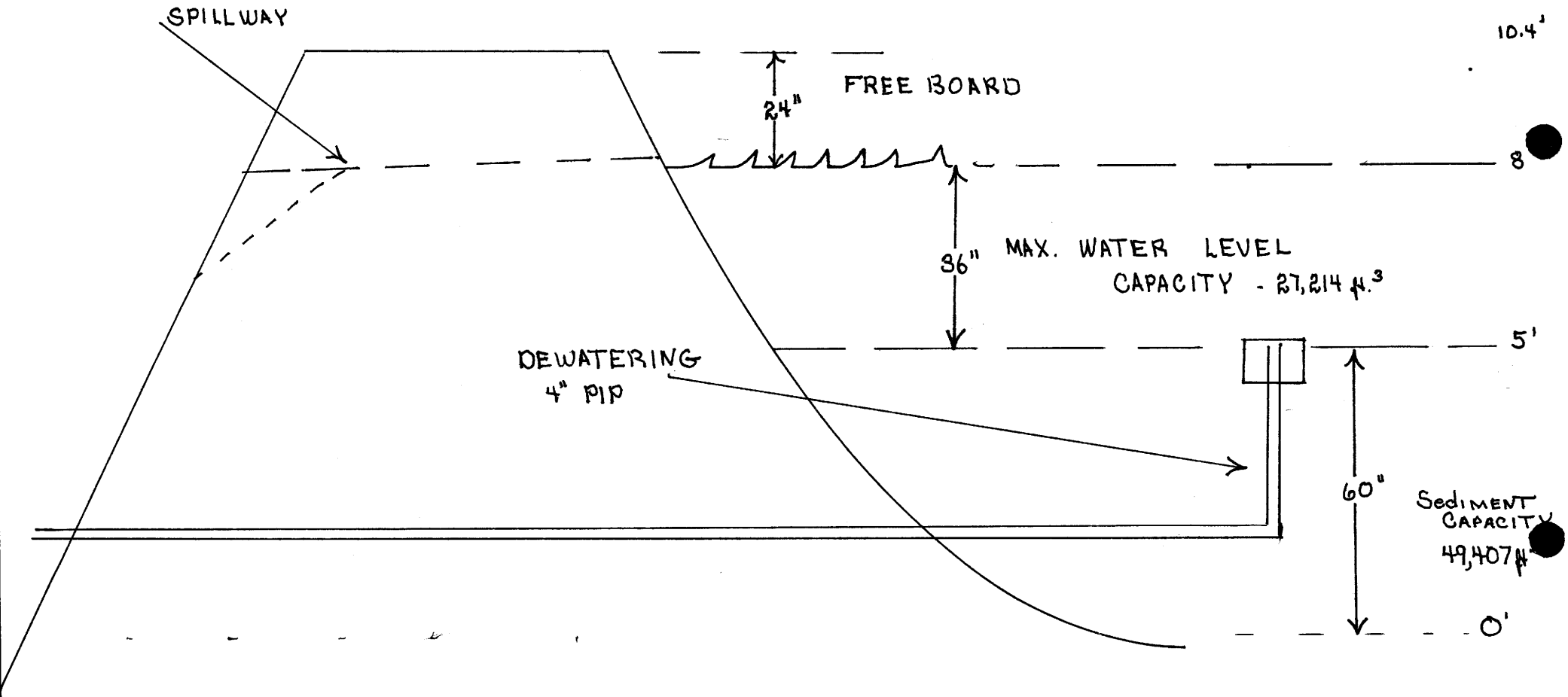
MAC/nc

Attachments

CO-OP MINING CO.

BEAR CANYON MINE

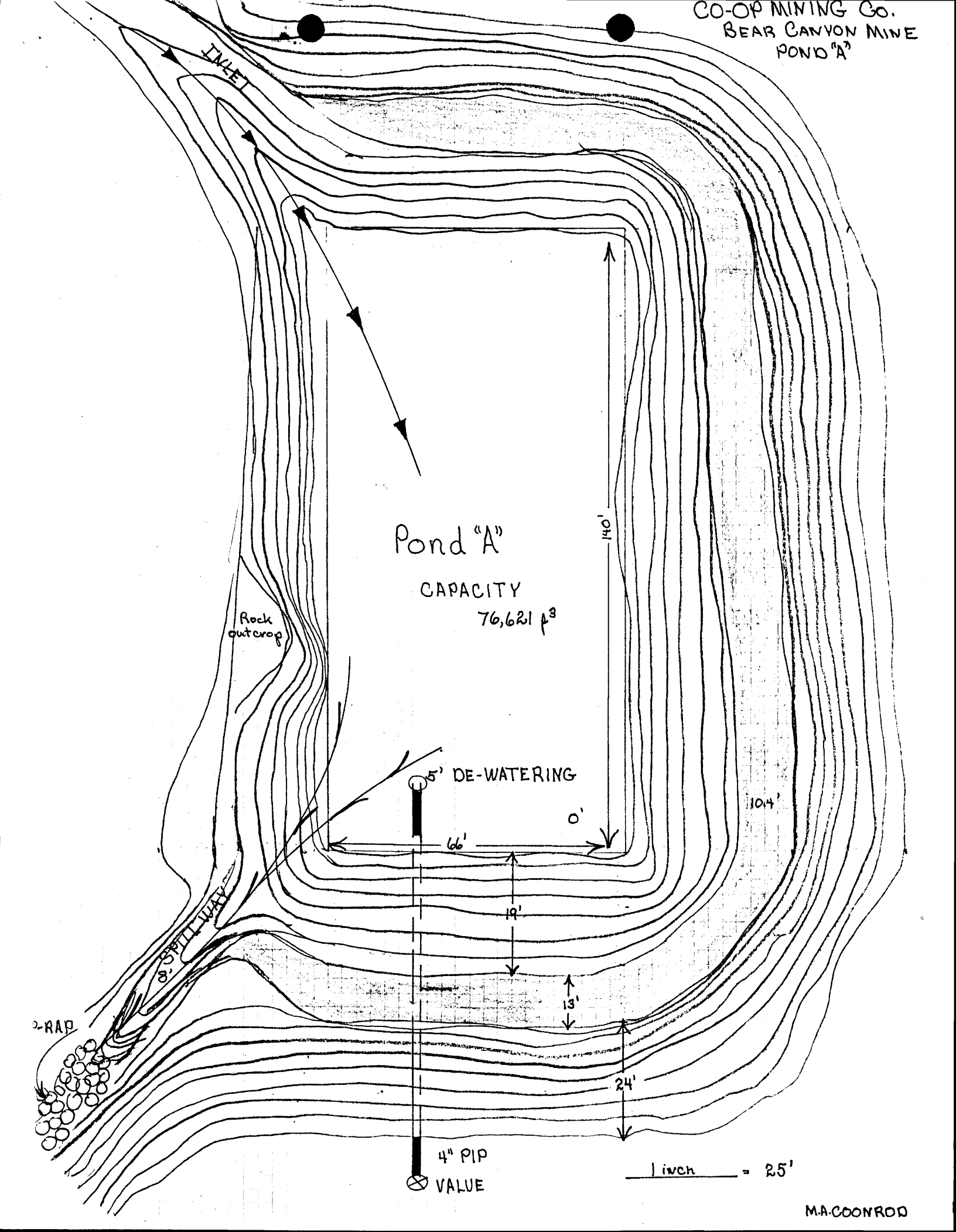
POND "A"



TOTAL CAPACITY
WATER & SEDIMENT = 76,621 ft³

1" = 2.5'

Prepared M.A. Coonrod


CO-OP MINING CO.
BEAR CANYON MINE
POND "A"
INLET
Pond "A"
CAPACITY
76,621 ft³
140'
Rock outcrop
5' DE-WATERING
0'
66'
104'
19'
13'
24'
8' SPILLWAY
RAP
4" PIP
VALVE
1 inch = 25'
M.A. COONROD

HORROCKS & CAROLLO ENGINEERS
A JOINT VENTURE
ONE WEST MAIN
P. O. BOX 377
AMERICAN FORK, UTAH 84003

July 8, 1983

Mr. Wendell Owen
Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

Subject: Bear Creek Canyon Mine Site
Hydrology Computations

Dear Mr. Owen:

As discussed with you in our meeting Monday, June 6, 1983, and subsequent discussions I have performed hydrologic calculations for sediment storage and runoff at the subject site and have the following results and conclusions:

1. The computed volume for sedimentation in Pond A (the larger pond) is 76,621 cubic feet. If the pond can be constructed 8' deep this would require a pond approximately 120 feet by 80 feet. If, however, the pond can only be constructed 6' deep it would require a pond of 140 feet by 91 feet. Pond B (the smaller pond) needs to have 9,309 cubic feet of storage and this pond could be 4' deep and approximately 50 feet by 50 feet.

2. Based on the calculations I would recommend that the downspout #1 (the upper downspout) be constructed to conform to the grade of the existing contours on the hillside and be constructed of 15" corragated metal pipe. Particular care should be paid to the construction of the inlet to this pipe as it will probably be subseptible to plugging from debris. The lower downspout should be constructed of 18" corragated metal pipe laid to conform to the existing ground contours.

3. The drainage berm or ditch to convey the water to the sediment pond for the "A" area could be constructed of a V-type ditch with one to one side slopes at least 1½ feet deep at a grade of 6%.

4. For the spillway needed on the sediment storage ponds, I would recommend an 18" riser pipe connected to an 18" CMP outlet pipe laid at a minimum of 6% slope.

5. The ditch to convey the water to the upper downspout could be constructed of a V-type ditch with one to one side slopes at least 1 foot deep at an average slope of 6%. A greater slope than 6% should be avoided to prevent errosion upstream of the downspout. If it is necessary to construct this channel at a greater slope, it should be riprapped or reinforced with Gabions to prevent errosion. The ditch to convey the water from the end of the upper downspout to the lower downspout can be constructed of V-type ditch with one to one side slopes at least 1½ feet deep. Again, this ditch will need to be riprapped if constructed at a greater slope than 6%. The area next to the 15" outlet from the 15" pipe will need to be riprapped to reduce the outlet velocity of 12.4 feet per second without creating errosion. This riprap should meet specifications for NCSA No. R-6 with an average partical size of 12", or by the use of Gabions.

6. The capacity of the 10" culverts on the upper access road is 3.76 cubic feet per second when flowing full, which is adequate.

7. The capacity of the 12" culverts on the upper access road is 6.12 cubic feet per second when full, which is adequate.

8. I have reviewed the calculations on the existing culverts which provided drainage for the undisturbed areas through the disturbed areas and find that the 18" culvert located near the middle of the plot plan on the north side of the stream is adequate to convey the flows with a minimum headwater over the top of pipe depth of 20". The existing 60" culvert in the mainstream channel is adequate to convey the flows with a minimum headwater depth of 84" over the top of the pipe.

I have attatched to this letter my engineering calculations and backup reference data for your files.

If you desire clarification or have additional questions or need additional information please contact me.

Very truly yours,

HORROCKS ENGINEERS

H. Lee Wimmer

H. Lee Wimmer, P.E.
Hydrologist

HLW:map

Enclosures

Bear Canyon Site Plan

Sediment storage from disturbed area

<u>Design data</u>

Site elevation : 7150 feet (U.S.G.S.)
Runoff Area : see 1"=50' map for individual areas
Average slope length : see table below
Average slope gradient : " " "
6 hour - 10 year storm : 1.4 inches
Soil characteristics : 12% silt, 24% fine sand, 36% sand, 0% organic matter, course graded soil, moderate permeability

Table

Area #	Area* (acres)	Average slope length (feet)	Average slope gradient (%)
A1	2.24	420	36
A2	4.96	560	14
A3	3.51	640	11
B	1.79	520	10

*By Planimeter

<u>Determinations</u>

Use Uniform Soil Loss Equation, $A = RKLSPC$

R : From figure 1 "Universal Soil Loss Equation", SCS, Jan. 1976
use $R = 40$

K : From "A soil erodability nomograph ...", where % silt plus % fine sand = 36%, % sand = 36%
$K = 0.32$

LS : From Table 1, "Universal soil Loss Equation", SCS, Jan. 1976 (see table above) For A1, $LS = 22.06$
A2, $LS = 5.42$
A3, $LS = 4.14$
B, $LS = 3.12$

C : Assume bare ground, use $C = 1$
P : Assume no erosion control, use $P = 1$

$\Rightarrow$ $A_{A1} = (40)(0.32)(22.06)(1)(1) = 282.4$ tons/acre/year
$A_{A2} = (40)(0.32)(5.42)(1)(1) = 69.4$ " " "
$A_{A3} = (40)(0.32)(4.14)(1)(1) = 53.0$ " " "
$A_B = (40)(0.32)(3.12)(1)(1) = 39.9$ " " "

Co-op Mining Company | Lee Wimmer | 2-25-83

Bear Canyon Site Plan

Sediment storage from disturbed area cont.

For areas, 3 years (OSM regulations 817.46 (b)(1)),
Soil = 90 lbs / ft^3

$V_{A1} = (282.4)(2.24)(3)(\frac{2000}{1})(\frac{1}{90}) = 42,172\ ft^3$ *
$V_{A2} = (69.4)(4.96)(3)(\frac{2000}{1})(1/90) = 22,948\ ft^3$
$V_{A3} = (53.0)(3.51)(3)(\frac{2000}{1})(1/90) = 12,402\ ft^3$
$V_{B} = (39.9)(1.79)(3)(\frac{2000}{1})(1/90) = 4,761\ ft^3$

* To high, this calculated figure is higher than will ever occur in practice because the soil type for this hillside would consist of large rocks and other particle sizes being larger also. I would recommend reducing this figure to the amount calculated for one (1) year, 14,057 ft^3

⇒ For $A_1+A_2+A_3$, sediment storage volume =
$14,057 + 22,948 + 12,402 = \underline{\underline{49,407\ ft^3}}$

For B, sediment storage = $\underline{\underline{4,761\ ft^3}}$

42-381 50 SHEETS 5 SQUARE
42-382 100 SHEETS 5 SQUARE
42-389 200 SHEETS 5 SQUARE
NATIONAL

Bear Canyon Site Plan

Runoff Storage from disturbed area

Design Data

24 hour - 10 year storm : 2.25 inches

Determinations

CN = 80 ±, From Table 9.1, "SCS National Engineering Handbook", Section 4, "Hydrology"

Runoff from figure 10.1, reference as above = 0.7 inches

→ Volume of runoff in ft^3

$$V_{A1} = (2.24)(43{,}560)(0.7)(1/12) = 5{,}692 \ ft^3$$
$$V_{A2} = (4.96)(43{,}560)(0.7)(1/12) = 12{,}603 \ ft^3$$
$$V_{A3} = (3.51)(43{,}560)(0.7)(1/12) = 8{,}919 \ ft^3$$
$$V_B = (1.79)(43{,}560)(0.7)(1/12) = 4{,}548 \ ft^3$$

$\Big\rangle$ 27,214 ft^3

⇒ Total Volume in ponds required for sediment and runoff:

Pond A = 49,407 + 27,219 = 76,621 ft^3

Pond B = 4,761 + 4,548 = 9,309 ft^3

Bear Canyon Site Plan

Surface runoff into diversions around site

Design Data

Area : See previous table
Slope : " " "
Maximum length : $A_1 = 480'$, $A_2 = 660'$, $A_3 = 1040'$, $B = 520'$
Runoff coefficient : 0.40
25 Yr-24hr storm : Hiawatha data by E. Arlo Richardson, State Climatologist

Determinations

Use Rational equation, $Q = CIA$
For Area A_1 use $T_c = 5$ min $\Rightarrow I_{max} = 2.76$ in/hr
For other Areas use $T_c = 10$ min $\Rightarrow I_{max} = 2.10$ in/hr

$Q_{A1} = (0.40)(2.76)(2.24) = 2.47$ cfs

$\longrightarrow$ Use 15" CMP for downspout #1

check headwater depth - UDOT chart 2-53
need Hw of 12 inches ±, OK

$Q_{A2} = (0.40)(2.10)(4.96) = 4.17$ cfs

Total Q @ downspout #2 $\approx Q_{A1} + Q_{A2} = 2.47 + 4.17 = 6.64$ cfs

$\longrightarrow$ Use 18" CMP for downspout #2

Hw = 20" or 2" over top of pipe, OK

$Q_{A3} = (0.40)(2.10)(3.51) = 2.95$ cfs

Total Q in ditch $\approx Q_{A1} + Q_{A2} + Q_{A3} = 9.6$ cfs

Company | Lee Wimmer | 6-28-83

Bear Canyon site flow

Surface runoff into diversions around site cont.

For required ditch cross section area, use Manning equation, $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

For earth lined channel, $n = 0.035$

Try channel of 1:1 side slopes, 2' deep
Average slope of ditch - 6%±

For slope shown, $P = 2\sqrt{8}$, $A = 4 ft^2 \Rightarrow R = 0.71$

$Q = \frac{1.486}{0.035}(4)(0.71)^{2/3}(0.06)^{1/2} = 33.0$ cfs

Try channel of 1:1 side slopes, 1½ feet deep, $P = 3$, $A = 2.25 ft^2$
$\Rightarrow R = 0.75$

$Q = \frac{1.486}{0.035}(2.25)(0.75)^{2/3}(0.06)^{1/2} = 19.3$ cfs, ok

→ Use a ditch with 1:1 side slopes at least 1½ feet deep

- - - - -

For spillway on sediment storage pond,

Use an 18" riser and 18" CMP outlet pipe at 6% grade ±

$\Rightarrow Q = 13.97$ cfs ok
(see computer printout)

UNIFORM FLOWS IN CIRCULAR CONDUITS PARTIALLY FULL KDB 7/7/83

DATA

n	SLOPE	Dia (in)	LIMIT
.024	.060000	18.0	.001000

DEPTH IS KNOWN; Velocity and flow are found

RESULTS

Q (cfs)	Q (gpm)	Q (MGD)	DEPTH (in)	VELOCITY (fps)	R	AREA sq in	ITER
13.97	6,273	9.03	18.0	7.91	0.3750	254	1

Bear Canyon Site Plan

Ditch Size to convey runoff to downspouts

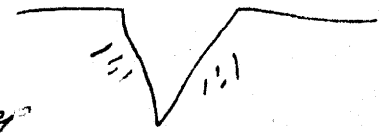
Design Data

As before, $Q_1 = 2.47$ cfs, $Q_2 = 6.64$ cfs

Determinations

For ditch size to convey runoff to upper downspout use Manning Equation, $Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

For earth lined channel, $n = 0.035$



Try channel of 1:1 side slopes, 1' deep
Try average slope of 6%± (greater slope will probably cause erosion)

For shape shown, $P = 2\sqrt{2}$, $A = 1$ ft^2 $\Rightarrow R = A/P = 0.35$

$Q = \frac{1.486}{0.035}(1)(0.35)^{2/3}(0.06)^{1/2} = 5.16$ cfs, ok

→ Use a ditch with 1:1 side slopes at least 1 feet deep with slope of 6% to channel runoff to upper downspout

Check need for riprap below downspout

outlet velocity = 12.4 ft/sec (see computer printout)

⇒ Need riprap NCSA No. R-6 (average particle size of 12 inches) or use Gabions

To convey runoff to lower downspout

→ Use a ditch with 1:1 side slopes at least 1½ feet deep with slope of 6%