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0019

EMERY MINING CORPORATION

A SAVAGE BROTHERS COMPANY

July 1, 1985

RECEIVED

JUL 05 1985

DIVISION OF OIL
GAS & MINING

Mr. Lowell P. Braxton
Administrator, Mineral Resource Development
and Reclamation Program
Division of Oil, Gas and Mining
355 West North Temple
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Dear Mr. Braxton:

The following information is submitted as response to your letter of May 29, 1985, in which you outline five (5) deficiencies in the drainage plan as originally submitted. The supporting calculations and other materials are attached.

1. The erosional damage will be repaired and the affected area returned to approximate original contour.

2. The drop culvert inlet structure consists of a standard flared metal end-section sized for the 24 inch culvert. Runoff water will be collected and routed to the culvert by use of a terrace and a two (2) foot high berm as indicated on Vaughn Hansen Associates Drawing "Site Plan" DRWG 2 of 6.

3. Exit velocities, calculated to potentially reach 18.3 feet per second, will be controlled by a energy dissipation structure designed for this application. See drawing CS 765A.

4. The maximum flow capacity for a 24 inch culvert installed at a 54% slope is 90.3 cfs, as determined by use of the Manning equation. The calculated peak flow that might result from a 10-year, 24-hour storm event is 8.84 cfs.

5. Area 1 is the drainage located northwest of the Beehive substation as indicated on the attached map and drawing. It is defined by the East Mountain access road on the north, ridges on the east and west, and a bermed terrace on the south.

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Area 2 is identified in the original plan submittal as the section of access road directly above (north of) Area 1. Damage has occurred to the berm on the outside edge of the road. This allows water to flow from the road into Area 1. The road berm will be repaired to prevent road runoff from reaching Area 1.

Sincerely,

Larry J. Guymon

Larry J. Guymon
Construction Manager

Enclosure

LJG/jlj

cc: Bill Zeller
Morgan Moon
Ray Christensen
Tom Kerns
Dale Grange
Val Payne
Chris Shingleton

HYDROLOGIC ANALYSIS FOR

BEEHIVE SUBSTATION DRAINAGE PLAN

The method used to calculate the peak runoff flow is the Rational method, for which the formula is:

$$Q = CIA$$

Where Q = flow rate, cubic feet per second

C = runoff coefficient, dimensionless (0.60 selected)

I = intensity of rainfall, inches per hour, for a rainfall event with duration equal to the time of concentration, t_c, of the watershed.

A = area of watershed, acres.

DRAINAGE AREA - A (By planimeter from Map No. 1) = 1.9 acres

Average Slope - (Reference No. 2, Page 6 - 41)

$$Y = \frac{N(X)}{G} \times 100\%$$

Where Y is average watershed slop in %

N is number of contour lines crossing grid line.

X is contour interval in feet

G is length of grid lines in feet

Then: $$Y = \frac{(12)\ (5)}{100} \times 100\%$$

Average Slope = 60%

FLOW LENGTH - (From Map No. 1) = 460 feet

OVERLAND FLOW VELOCITY - V (Reference No. 1, Figure 2.34, See Appendix I)

V = 7.8 feet per second

TIME OF CONCENTRATION - t_c equals the flow length divided by the velocity.

$$t_c = \frac{L}{V} \div 60 \text{ sec/min}$$

$$t_c = 0.98 \text{ min.}$$

The rainfall intensity value is calculated as follows.

The recurrance interval for design is 10 years. The determination of the intensity for the 10 year rainfall event comes from the Precipitation - Frequency Atlas of the Western United States, Volume VI - Utah, National Oceanic and Atmospheric Administration, 1973, Pages 15 and 16.

The following table gives the rainfall values for the Beehive Mine site.

FREQUENCY	DURATION	RAINFALL INCHES	METHOD OF DETERMINATION
2 Yr	6 Hr	1.0	Fig 19
2 Yr	24 Hr	1.4	Fig 25
100 Yr	6 Hr	2.2	Fig 24
100 Yr	24 Hr	3.4	Fig 30
2 Yr	1 Hr	.66	Table 11
100 Yr	1 Hr	1.57	Table 11
10 Yr	1 Hr	1.05	Figure 6
10 Yr	5 Min	.305	Table 12
10 Yr	10 Min	.473	Table 12
10 Yr	15 Min	.599	Table 12
10 Yr	30 Min	.830	Table 12

The intensity value for the short duration rainfall event for the drainage area is determined by curve fitting techniques and the relationship between duration and rainfall:

$$Y = AX^B$$

$$\text{or } \log Y = \text{Log } A + B \log X$$

where Y = rainfall, inches

X = duration, minutes

A, B = constants

Using the method of least squares for the 5, 10, 15 and 30 minute data points, the values for the constants are found to be 0.128 and 0.558 for A and B, respectively.

The intensity for the area in question is given by the following equation:

$$\text{Intensity} = 0.128\ (tc)^{0.558} \times \frac{60}{TC}$$

$$= 0.128\ (.098)^{0.558} \times \frac{60}{0.98}$$

$$= 7.75 \text{ inches/hour}$$

Using this data in the Rational Formula gives the following peak runoff:

$$Q = C\ I\ A$$

$$= (0.60)\ (7.75)\ (1.9)$$

$$= 8.84 \text{ cfs}$$

CULVERT CAPACITY – (24 inch diameter)

$$Q = AV = \frac{\pi D2}{4} \frac{1.49}{n} R^{2/3} S^{1/2}$$

Where: D is diameter of pipe in feet.

R is hydraulic radius equals $\frac{\text{Area}}{\text{Wetted Parameter}}$

therefore $R = \frac{\frac{\pi D^2}{4}}{D} = \frac{D}{4}$

$S = \frac{\text{rise}}{\text{run}} \times 100\%$ (From Map No 2 Rise = 28ft., Run = 52 ft.

S = 54%

n = Manning's Coefficient of Roughness
= .024 for CMP

$$\text{Then } Q = \frac{\pi D^2}{4} \frac{1.49}{n} \frac{D}{4}^{2/3} S^{1/2}$$

$$Q = 90.3 \text{ cfs}$$

VELOCITY CALCULATION

For 24" corrugated metal pipe, slope = .54, n = .024

$$\text{Flow } Q = \frac{1.49}{n} AR^{2/3} S^{1/2}$$

Where both A and R are dependent on depth of Flow d.

For Q = 8.84 cfs, solving for d gives d = 0.4235 ft. and Area of flow = 0.4843 ft^2.

$$\text{Velocity} = \frac{Q}{A} = \frac{8.84 \text{ cfs}}{0.4843} = 18.3 \text{ fps}$$

Energy dissipation structure is shown on drawing CS 765A.

REFERENCE PUBLICATIONS

1. Barfied, B.J., Warner, R.C., Haan, C.T., Applied Hydrology and Sedimentology for Disturbed Areas, Oklahoma Technical Press, Stillwater, Oklahoma, 1981.

2. Skelly and Loy, A Compliance Manual - Methods for Meeting OSM Requirments, McGraw-Hill, New York, N.W., 1979.

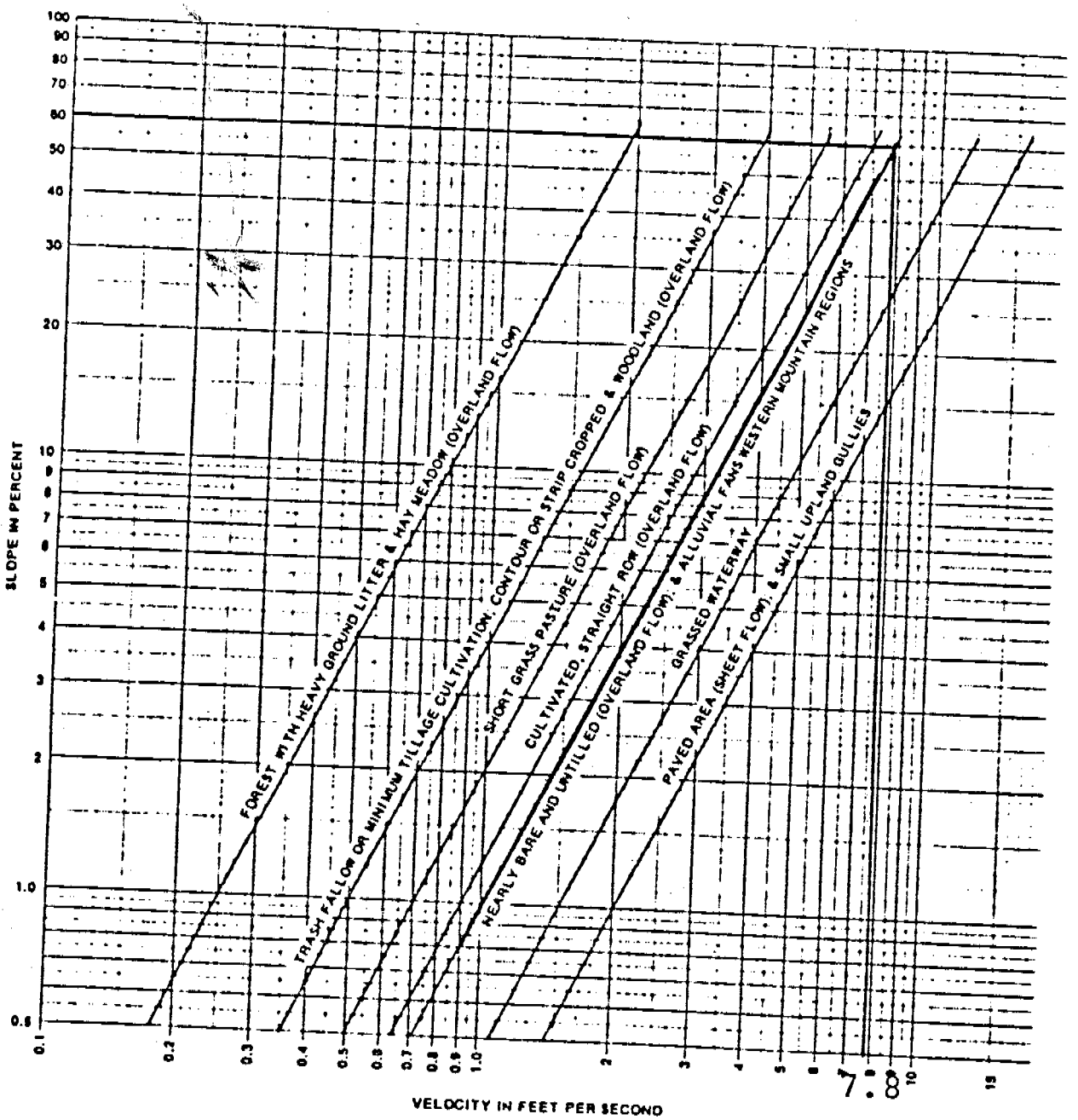
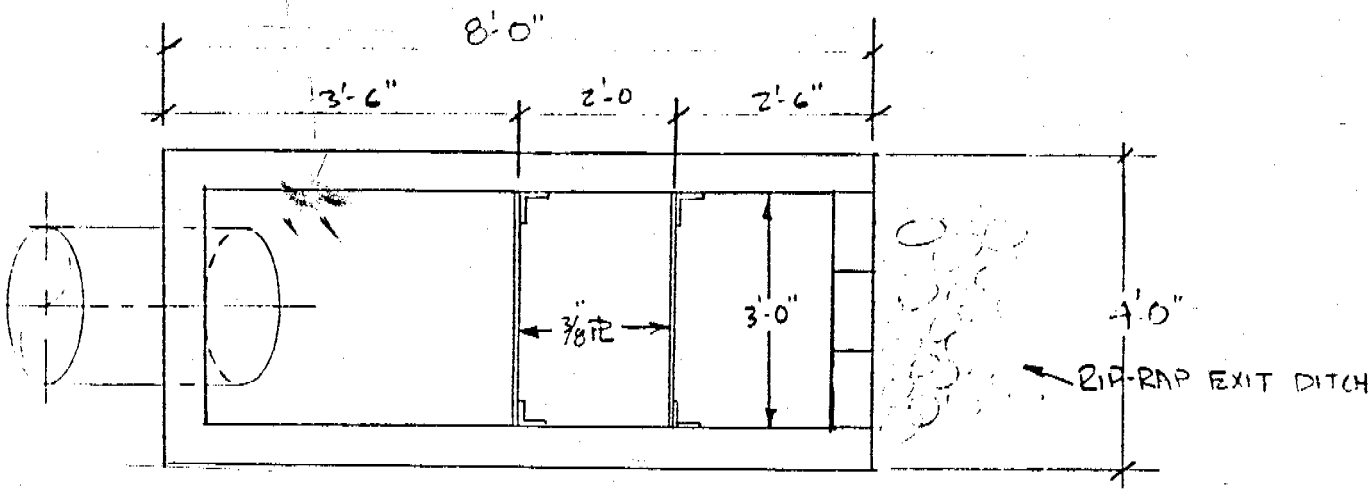
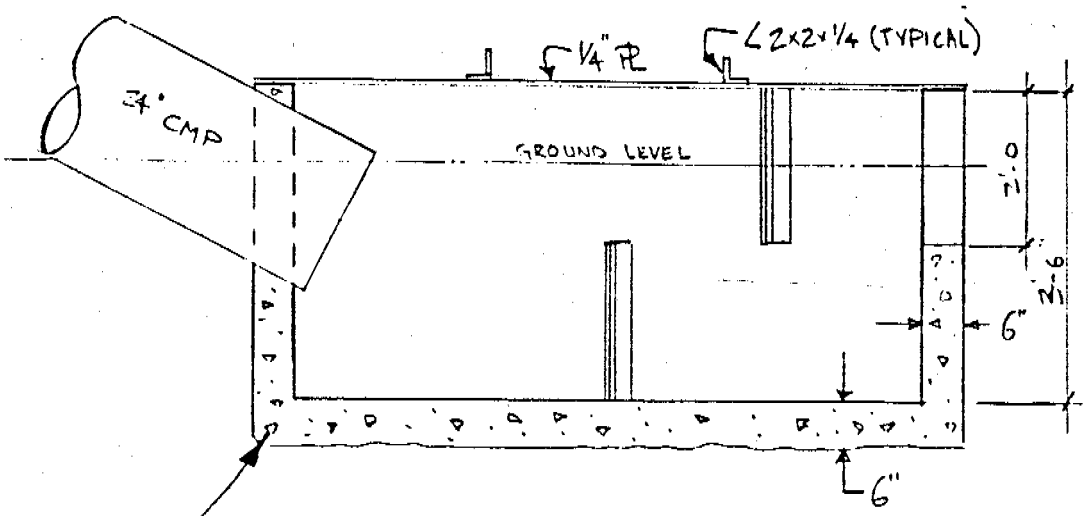


Figure 2.34. Velocities for upland method of estimating t_c.

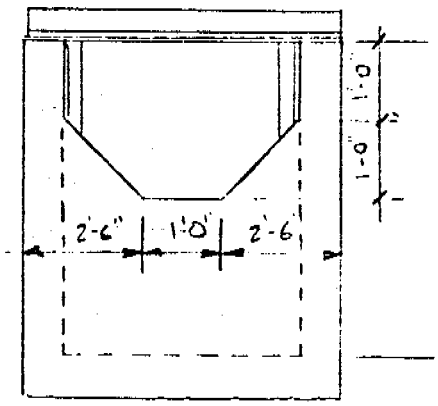
APPENDIX I



PLAN VIEW
(STEEL COVER REMOVED)



ELEVATION VIEW



END VIEW

3500 PSI CONCRETE
w/ #4 BAR @12" CC EW

EMERY MINING CORP.

HUNTINGTON, UTAH 84528

ENERGY DISSIPATION BOX
BEE HIVE SUBSTATION DRAINAGE

MARK	REVISIONS	DATE

DRAWN BY:	APPROVED BY:	DRAWING NO.
TJF		CS-765-A
SCALE: 1"=2'-0"	DATE: 6-28-85	