0010

ACT/015/025

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MEC Mangum Engineering Consultants

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27 January 1992

Pamela Grubaugh-Littig
Permit Supervisor
Utah Division of Oil Gas & Mining
3 Triad Center, Suite 350
Salt Lake City, Utah 84180-1203

Dear Ms. Grubaugh-Littig:

Re: Review of Bear Canyon Mine Hydrology Section, Bear Canyon Mine, Co-Op Mining Company, ACT/015/025, Emery County, Utah

Attached are two copies of pages 7-108, 7-110 and Plate 7-2. Modifications and updates have been made to address issues discussed in a letter from the Division dated 16 January 1992.

Each issue is addressed separately on the attached pages. Plates and pages have been marked "DRAFT" to differentiate them from those previously approved. Also attached are pages listing the latest update dates for pages submitted to the Division during the last 6 months. Please review this list and notify which of these pages have been approved and which may still be under review.

Four copies of these revised pages will be forwarded to the Division upon receipt of written approval. Please notify me if there are any questions or additional concerns regarding this matter. A meeting can be arranged if desired.

Thank you,

Kimly C. Mangum, P.E.
Permitting & Compliance Consultant.

Enclosure(s)
cc: Co-Op Mining Co.

Hydrology Review

ITEM #1

p 7-108 64,951 cubic feet is the number calculated with the latest review conducted by EarthFax in October 1991. Text has been modified to correlate with the calculations.

ITEM #2

p 7-110 The volume 39,500 cubic feet was calculated with the latest review conducted by EarthFax in October 1991. Text has been modified to correlate with the calculations in Appendix 7-F.

ITEM #3

Plate 7-2 The maximum sediment elevation 7087.9 feet is a calculated value. The elevation (7087.1 feet) shown on Plate 7-2 is apparently in error and has been corrected.

ITEM #4

p 7-108 Text has been modified to improve clarity.

ITEM #5

The attached list of pages with latest revision dates should assist the Division in their review.

Dated Pages List
Co-Op Mining Co.
Bear Canyon MRP
Printed: 28 January 1992

	page	date
CHAPTER 1		
	1-2	6/90
	1-4 thru 1-12	7/90
CHAPTER 2		
	2-ii	7/90
	2-iii	7/91
	2-1	7/90
	2-2 and 2-3	1/91
	2-4	2/91
	2-5	1/91
*	2-9	10/91
	2-10 thru 2-15	7/90
	2A-2 thru 2A-5	10/90
	2B-20	1/91
*	2F-3 thru 2F-17	7/90
*	2F-19 thru 2F-29	deleted
	2G-1 thru 2G-3	7/91
Plates	2-1 thru 2-3	6/20/90
*	2-4A thru 2-4D	8/26/91
CHAPTER 3		
	3-ii and 3-iii	10/90
	3-iv	1/91
*	3-v	12/91
	3-vi	5/22/91
	3-2	3/90
	3-3 thru 3-5	7/90
	3-6	12/91
	3-7	5/91
	3-8	10/90
	3-9	7/90
	3-10	5/91
*	3-11 and 3-12	10/91
	3-13	12/90

- Pages not listed were submitted on, or before 13 July 1990 with Five Year Permit Renewal Material.
- "*" indicates pages that were revised since the last Dated Pages List was submitted to the Division, dated 5 July 1991.

	page	date
CHAPTER 3 (cont)		
	3-14 and 3-15	7/90
	3-17 and 3-18	12/90
	3-19	7/90
	3-23 thru 3-28	7/90
	3-37	10/90
*	3-38 and 3-39	10/91
	3-40	11/7/90
	3-41	7/90
	3-43	7/90
	3-44	11/7/90
	3-45	1/91
	3-46	11/7/90
	3-47	5/91
*	3-48 and 3-48A	1/92
	3-48A thru 3-49	10/90
	3-50	10/27/90
	3-58	1/91
	3-59 and 3-60	10/90
	3-61	5/91
	3-62 and 3-63	10/90
*	3-64	12/91
	3-65	10/90
*	3-66	12/91
	3-67	10/90
	3-68	11/7/90
	3-69 thru 3-71	10/90
*	3-72	12/91
	3-73 thru 3-74	10/90
	3-75	10/27/90
	3-76	5/91
	3-77 and 3-78	10/27/90
	3-79 thru 3-82	10/90
	3-83	5/91
	3-84 and 3-85	10/90
	3-86	5/17/91
	3-87 and 3-88	10/90
	3-89	5/17/91

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	page	date
CHAPTER 3 (cont)		
	3-90 thru 3-95	10/90
	3A-2 thru 3A-7	7/90
	3A-8	not used
	3A-9 thru 3A-16	7/90
	3C-3	7/90
	3C-4	1/91
	3C-5 and 3C-6	10/90
	3C-8	7/90
	3C-15	7/90
	3C-20 and 3C-21	7/90
	3C-24 and 3C-25	12/90
	3C-27 thru 3C-29	7/90
	3C-30	12/90
	3C-31	1/91
	3C-32	7/90
	3D-2 thru 3D-9	10/90
	3D-10	3/91
	3D-11	5/7/91
	3D-12	4/91
	3D-13	10/90
*	3E-2	10/91
	3E-3	11/7/90
	3G-2	10/90
	3G-3	11/7/90
	3G-4	10/90
	3G-6	10/90
	3H-3	7/90
	3H-5	7/90
	3H-6 and 3H-7	12/90
	3H-12	7/90
	3I-2 thru 3I-4	4/90
*	3K-3 thru 3K-6	12/91
	3L-1	5/91
*	3L-2	12/91
	3L-3	5/91
*	3L-4 thru 3L-6	12/91
	3L-7 thru 3L-13	5/91

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		page	date
CHAPTER 3 (cont)			
*		3L-14	12/91
		3L-15 thru 3L-18	5/91
*		3L-19	12/91
		3L-20 and 3L-21	5/91
*		3L-22 and 3L-24	12/91
	Plates	3-1	10/12/90
		3-1a	9/1/85
*		3-2A thru 3-2D	12/23/91
		3-3	1/15/91
*		3-4	1/1/92
		3-4A	6/7/90
		3-5	9/10/88
		3-6	6/20/91
CHAPTER 4			
		4-2 and 4-3	7/90
		4-8 and 4-8A	10/90
		4-10	5/91
		4-11	11/7/90
		4-12 and 4-13	10/90
		4-15	10/90
		4A-2	1/91
CHAPTER 5			
		5A-2 thru 5A-7	6/25/84
		5A-8 thru 5A-21	7/90
CHAPTER 6			
	Plates	6-1	4/10/91
		6-2 thru 6-8	6/20/90

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CHAPTER 7

	page	date
	7-ii	5/91
*	7-iii and 7-iv	10/91
	7-v and 7-vi	5/91
*	7-32	12/91
	7-33	10/90
	7-38	4/91
*	7-41, 41A, 42, 42A	7/91
	7-58 thru 7-76	5/91
*	7-77	10/91
	7-78 thru 7-82	5/91
*	7-83	10/91
	7-84	5/91
*	7-85 and 7-85A	10/91
	7-86	5/91
*	7-87 and 7-87A	10/91
	7-88	5/91
*	7-89	10/91
*	7-90 and 7-91	1/92
*	7-92	7/91
*	7-93	10/91
	7-94 thru 7-101	5/91
*	7-102	10/91
*	7-103 and 7-104	1/92
	7-105	5/91
*	7-106 and 7-107	10/91
*	7-108	1/92
*	7-109	12/91
*	7-110	1/92
	7-111	5/91
*	7-112	10/91
	7-113 thru 7-116	5/91
*	7-117	10/91
	7-118	5/91
*	7-119	10/91
	7-20	5/91
*	7-121 and 7-122	10/91
	7-123 thru 7-125	5/91
*	7D-2 thru 7D-5	7/91
*	Appendix 7-F	11/91

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	page	date
CHAPTER 7(cont)		
*	Appendix 7-G	11/91
*	7G-38a	1/92
	Appendix 7-H	5/91
	7I-8 and 7I-9	10/90
	Appendix 7-J	4/91
	7K-1	10/90
	7K-2 thru 7K-4	5/91
	7M-1	7/90
	7M-2 thru 7M-6	1/91
	7M-7 thru 7M-12	7/90
*	7N-1 thru 7N-10	10/91
*	7N-11 thru 7N-17	10/91
Plates		
*	7-1A	1/2/92
*	7-1B	10/17/91
*	7-1C	1/2/92
*	7-1D	10/17/91
*	7-2	1/28/92
	7-3	8/1/91
	7-4	5/15/91
*	7-5	1/92
	7-6	5/14/91
	7-7	5/22/91
	7-8A and 7-8D	5/24/91
	7-9	6/16/86
	7-10A	5/91
	7-10B	5/91
	App 7-L - Fig 2, 4 thru 6	not dated

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	page	date
CHAPTER 8		
	8-ii and 8-iii	5/91
	8-1 thru 8-10	3/91
	8-11 thru 8-40	5/91
*	8-41	12/91
	8A-2	5/91
	8B-13 thru 8B-29	3/91
	8C-2 thru 8C-4	2/91
	8D-1	5/91
	8D-2 thru 8D-4	10/90
Plates	8-1	4/10/91
	8-2	10/29/90
	8-3	deleted
	8-4	11/15/88
*	8-5A thru 8-5D	10/91
CHAPTER 9		
	9-ii	12/90
*	9-iii	7/91
	9-6	10/27/90
	9-8	10/90
	9-10	7/91
*	9-11	10/91
	9-12	10/90
	9-13	5/91
	9-14 and 9-15	10/27/90
	9-16	5/91
	9-17 and 9-18	10/90
	9-21	10/90
	9-22	10/27/90
	9-23	10/90
	9-24	10/27/90
	9-25	10/90
	9-26 thru 9-28	10/27/90
	9A-2	10/90

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	page	date
CHAPTER 9(cont)		
	9A-5	10/90
*	9B-1	7/91
*	9B-3 and 9B-4	7/91
	9C-1 and 9C-2	12/90
Plate	9-1	10/15/90
CHAPTER 10		
	10-2	10/27/90
	10-6	10/90
	10-14	10/90
	10-16	10/90
	10A-12	10/27/90
	10B-10 and 10B-11	10/27/90
	10D-2	7/90
	10D-10	not used
	10D-11 thru 10D-15	7/90
Plate	10-1	10/12/90
CHAPTER 11		
	11-10 and 11-11	10/90

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7.2.8.1 Sediment Pond A

Calculations were performed on pond A in 1990 to determine whether the existing structure would fully contain the design sediment volume and runoff volume from the 10-yr, 24-hr storm. Also to see if the flowline of the existing decant device was located at the required elev of 2-ft above the 60 pct sediment clean out level.

To meet these requirements it was recommended that the pond be deepened 3 to 4 ft. In 1991 the pond was deepened 5 ft or 2 ft deeper than planned to a depth of 7,082 ft. This provides for additional storage and a greater margin of safety.

The stage-capacity curve for pond A is presented in Appendix 7-F. Calculations in Appendix 7-F were updated in Oct 1991 using the as-built dimensions. A summary of the revised data is contained in Table 7.2-12.

The storm runoff volume from the 10-yr 24-hr storm event is 64,951 cu ft (1.49 acre-ft). The computation of the runoff volume assumed a curve number of 90 for the disturbed areas, 100 for the pond area, and 76 or 83 for the undisturbed drainage contributing to the pond. Assuming the pond fully contains this runoff volume, the decant elevation is 7088 ft. The sediment clean out level is at an elevation of 7086 ft, 2 ft below the decant elevation.

The maximum sediment storage volume is 39,500 cu ft, located at an elevation of 7087.9 ft. The sediment storage volume at the sediment clean out level elev of 7086 ft, is 23,702 cu ft. With an estimated annual sediment volume of 3848 cu ft, the enlarged pond will provide over 6 yrs of sediment storage. This scenario will allow for a greater sediment storage and less frequent maintenance.

The 25-yr, 6-hr storm was routed through the primary spillway to determine the maximum stage and flow rate. Data obtained from these watersheds were input to a computer code developed by Hawkins and Marshall (1979) to generate runoff hydrographs which were used for the design of drainage diversions. Inflow hydrographs to and outflow hydrographs from the sedimentation ponds were developed using the hydrology and sedimentology model SEDIMOT II (Warner et al., 1980; Wilson et al., 1980). Both of these codes model runoff using the rainfall-runoff function and triangular unit hydrograph of the U.S. Soil Conservation Service (1972).

Although the max allowable sediment elevation is 7086 ft, computations were conducted assuming that the pond contained the max available sediment volume of 32,288 cu ft at an elevation of 7087.9 ft. It was further assumed that the pond was full of water up to the spillway flowline prior to the start of the design runoff event. This results in a conservative estimation of the max stage since, in general, the pond can be assumed to be empty to the decant elevation at the beginning of a storm event.

7.2.8.1 Sediment Pond A

Calculations were performed on pond A in 1990 to determine whether the existing structure would fully contain the design sediment volume and runoff volume from the 10-yr, 24-hr storm. Also to see if the flowline of the existing decant device was located at the required elev of 2-ft above the 60 pct sediment clean out level.

To meet these requirements it was recommended that the pond be deepened 3 to 4 ft. In 1991 the pond was deepened 5 ft or 2 ft deeper than planned to a depth of 7,082 ft. This provides for additional storage and a greater margin of safety.

The stage-capacity curve for pond A is presented in Appendix 7-F. Calculations in Appendix 7-F were updated in Oct 1991 using the as-built dimensions. A summary of the revised data is contained in Table 7.2-12.

The storm runoff volume from the 10-yr 24-hr storm event is 64,951 cu ft (1.49 acre-ft). The computation of the runoff volume assumed a curve number of 90 for the disturbed areas, 100 for the pond area, and 76 or 83 for the undisturbed drainage contributing to the pond. Assuming the pond fully contains this runoff volume, the decant elevation is 7088 ft. The sediment clean out level is at an elevation of 7086 ft, 2 ft below the decant elevation.

The maximum sediment storage volume is 39,500 cu ft, located at an elevation of 7087.9 ft. The sediment storage volume at the sediment clean out level elev of 7086 ft, is 23,702 cu ft. With an estimated annual sediment volume of 3848 cu ft, the enlarged pond will provide over 6 yrs of sediment storage. This scenario will allow for a greater sediment storage and less frequent maintenance.

The 25-yr, 6-hr storm was routed through the primary spillway to determine the maximum stage and flow rate. Data obtained from these watersheds were input to a computer code developed by Hawkins and Marshall (1979) to generate runoff hydrographs which were used for the design of drainage diversions. Inflow hydrographs to and outflow hydrographs from the sedimentation ponds were developed using the hydrology and sedimentology model SEDIMOT II (Warner et al., 1980; Wilson et al., 1980). Both of these codes model runoff using the rainfall-runoff function and triangular unit hydrograph of the U.S. Soil Conservation Service (1972).

Although the max allowable sediment elevation is 7086 ft, computations were conducted assuming that the pond contained the max available sediment volume of 32,288 cu ft at an elevation of 7087.9 ft. It was further assumed that the pond was full of water up to the spillway flowline prior to the start of the design runoff event. This results in a conservative estimation of the max stage since, in general, the pond can be assumed to be empty to the decant elevation at the beginning of a storm event.