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James Doyle Sell Mining Collection

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JDS notes

Chillito KCC + ICC (prod. KCC?)

10 mill tons oxide on surface

2000 ft holes on north side still in mineralization

30 mill tons @ 0.8% sulfide in KCC portion.

Palo Verde Eisenhower Mining Co. ASARCO - FIDELITY

125 mill @ 0.6% Cu

OP

Joe Bush ⁽⁶⁹⁾ ICC - ⁽²³⁾ Cities Service = 92 mill @ 0.65% (presently shipping)

Bear (Nevada, younger area?) Arco (Anacosta)

Indications of 500 mill tons at 0.40% total Cu.

...

Johnson Camp Area

Shang & Harris area (Superior acid)

52 mill tons @ 0.64% Cu & 0.7% Zn

UG

I-10 area (Cypress)

300 mill tons @ 0.5% Cu

UG

Dragoon area (? Cypress? or PD?)

15 mill tons @ 0.5% copper oxide

UG

Senchez ICC (Safford area)

basic process recovery 79 mill tons oxide ore with Cu content of 0.36%

and waste/ore ratio of 1.49/1.00

A larger

tonnage oxide could have been by mixed oxide-sulfide above
low grade sulfide zone as indicated.

Kirwin, Wyoming, AMAX

?
OP 100 mill @ 1% Cu or 200 mill @ 0.5% Cu
with 0.025% MuS_2 average.

Compilation

- > ① Hanna - Getty CG.
- ② Oracle Ridge
- > ③ Safford KCC - WLK call Anon Cook, or Hank K.
- > ④ Safford PD - JHC call Ray Ludden - Skip Clark
- > ⑤ Vekol Hill - JHC " Byron Handie
- ⑥ Hillsboro -
- > ⑦ West Helvetia Fred C. - call -
- > ⑧ East Helvetia " " - "
- > ⑨ Copper Basin PD - JHC - Ray Ludden (Environmental Impact out)
- ⑩ Santa Cruz
- ⑪ Red Mtn
- ⑫ Moonlight-Superior Calif.
- > ⑬ East Christmas Fred Graybird
- > ⑭ Copper Creek Newmont-Exxon - Ken Cornelius?
- > ⑮ Chillicothe KCC - WLK ~~Foreign in error on sheet~~
- x ⑯ Florence Conoco
- x ⑰ Hall
- x ⑱ Ann Mason
- > ⑲ Lyon - Anaconda - WLK
- ⑳ Ward Mtn

#

Compilations Continued

- (21) Pinos Altos
- (22) United Verde
- (23) Ladysmith
- (24) Rhineland
- (25) Ciudadon
- (26) Mt Tolman
- (27) Kirewin
- (28) ~~Car Fork~~ scheduled Prod in '79
- (31) (Leach Deposits: Boston Butte; ^{Asst. Co. Fred} CG West; ^{Asst. Co. Fred} Cayman Van Dyke)
- x (32) Mineral Butte
- (33) Waterloo
- (34) Hardshell
- (35) Rochester
- (36) Andabria
- (37) Ceede
- (38) Pinson
- (39) Preble
- (40) Gerritt Canyon

~~De Houston Magma Zn~~

JAN 24 1979

TITLE HANNA GETTY - CASA GRANDE ARIZ 1

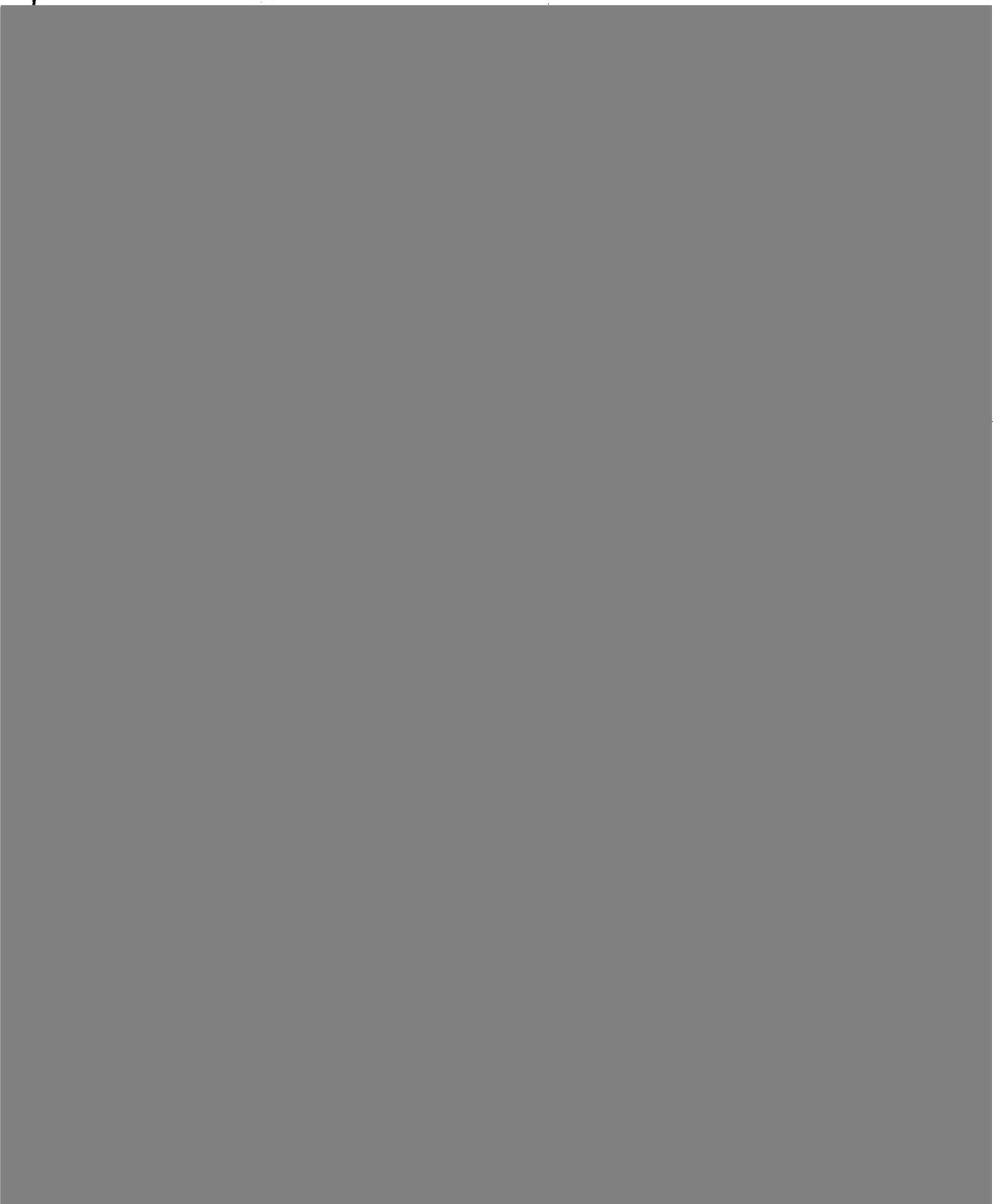
ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
350000.0	30000.		7.10			33
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.000	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	85.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	60000.	120000.	120000.	300000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

89250.	TONS	CU	1.05	1.16	1.28
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	186755.	206568.	227853.
\$/1000 YEARLY OPERATING COST	74550.	74550.	74550.
\$/1000 YEARLY TREATMENT COST	53550.	53550.	53550.
\$/1000 YEARLY CASH FLOW	58655.	78468.	99753.



TITLE ORACLE RIDGE , CONTINENTAL MATERIALS ETC. ARIZ 2

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
14000.0	2000.		18.00			20
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.820	0.0	0.0	0.0	.0	0.500
RECOVERY PCT.	90.0	0.0	0.0	0.0	0.0	50.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	1.90
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	8000.	16000.	16000.	40000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

11466.	TONS	CU	1.17	(1.28)	1.40
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
175000.	OZ	AG	6.00	6.00	6.00
\$/1000	YEARLY GROSS EARNINGS		27932.	30460.	33229.
\$/1000	YEARLY OPERATING COST		12600.	12600.	12600.
\$/1000	YEARLY TREATMENT COST		7212.	7212.	7212.
\$/1000	YEARLY CASH FLOW		8120.	10648.	13417.

TITLE SAFFORD KCC ARIZ

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE				YEARS
500000.0	30000.		7.60				37
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.500	0.0	0.0	0.0	.0	0.0	
RECOVERY PCT.	85.0	0.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	45400.	90800.	90800.	227000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.0 PCT.

44625.	TONS	CU	1.69	1.86	2.04
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			151279.	166005.	182069.
\$/1000 YEARLY OPERATING COST			79800.	79800.	79800.
\$/1000 YEARLY TREATMENT COST			26775.	26775.	26775.
\$/1000 YEARLY CASH FLOW			44704.	59430.	75494.

TITLE SAFFORD P.D.

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE				YEARS
280000.0	30000.		7.60				26
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.920	0.0	0.0	0.0	.0	0.0	
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	45400.	90800.	90800.	227000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.3 PCT. 22.3 PCT. 27.3 PCT.

89838.	TONS	CU	1.00	(1.08)	1.17
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000	YEARLY GROSS EARNINGS		179226.	194049.	210220.
\$/1000	YEARLY OPERATING COST		79800.	79800.	79800.
\$/1000	YEARLY TREATMENT COST		53903.	53903.	53903.
\$/1000	YEARLY CASH FLOW		45524.	60346.	76517.

TITLE VEKOL ARIZ - NEWMONT ARIZ 5

ORE RESERVE	PRODUCTION RATE	OPERATING COST		PROPERTY LIFE		
TONS * 1000	TONS/DAY	\$/ TON ORE		YEARS		
125000.0	20000.	5.40		17		

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.540	0.014	0.0	0.0	.0	0.0
RECOVERY PCT.	85.0	50.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	36000.	72000.	72000.	180000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

32130.	TONS	CU	1.38	1.55	1.74
490.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ.	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	94655.	105691.	117933.
\$/1000 YEARLY OPERATING COST	37800.	37800.	37800.
\$/1000 YEARLY TREATMENT COST	19278.	19278.	19278.
\$/1000 YEARLY CASH FLOW	37577.	48613.	60855.

TITLE HILLSBORO, QUINTANA

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
61600.0	12000.		5.30			14
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.460	0.020	0.0	0.0	.002	0.100
RECOVERY PCT.	94.0	66.0	0.0	0.0	***	100.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	200.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.0	5.8	1.02
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	19400.	38800.	38800.	97000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.2 PCT.

18161.	TONS	CU	1.21	1.37	1.55
554.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
8400.	OZ	AU	200.00	200.00	200.00
420000.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	54983.	60704.	67242.
\$/1000 YEARLY OPERATING COST	22260.	22260.	22260.
\$/1000 YEARLY TREATMENT COST	11374.	11374.	11374.
\$/1000 YEARLY CASH FLOW	21350.	27070.	33608.

TITLE WEST HELVETIA ANAMAX ARIZ 7

ORE RESERVE TONS * 1000 45000.0	PRODUCTI TONS/DAY 10000.	ON RATE	OPERATING COST \$/ TON ORE 6.80			PROPERTY LIFE YEARS 12
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COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
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AVERAGE GRADE	0.650	0.020	0.0	0.0	.0	0.0
RECOVERY PCT.	70.0	50.0	0.0	0.0	0.0	75.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	2.28

INVESTMENT \$/1000	PERIOD 1 20400.	PERIOD 2 40800.	PERIOD 3 40800.	TOTAL 102000.
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IHN220I FIOCS - UNIT NUMBER OUT OF RANGE. UNIT = 0

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

IHN220I FIOCS - UNIT NUMBER OUT OF RANGE. UNIT = 0

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

YEARLY METAL PRODUCTION	METAL PRICE TO OBTAIN DCFROI 17.0 PCT. 22.1 PCT. 27.1 PCT.		
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15925. TONS CU	1.65	1.84	2.05
350. TONS MO	6.00	6.00	6.00
0. TONS PB	0.0	0.0	0.0
0. TONS ZN	0.0	0.0	0.0
0. OZ AU	0.0	0.0	0.0
0. OZ AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	56752.	62724.	69413.
\$/1000 YEARLY OPERATING COST	23800.	23800.	23800.
\$/1000 YEARLY TREATMENT COST	9555.	9555.	9555.
\$/1000 YEARLY CASH FLOW	23397.	29369.	36058.

TITLE EAST HELVETIA, ANAMAX ARIZ 8

ORE RESERVE TONS * 1000	PRODUCTI TONS/DAY	ON RATE	OPERATING COST				PROPERTY LIFE YEARS
337000.0	20000.		\$/ TON ORE				37
	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T	
AVERAGE GRADE	0.540	0.020	0.0	0.0	.0	0.070	
RECOVERY PCT.	80.0	50.0	0.0	0.0	0.0	75.0	
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	6.00	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	2.28	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	36000.	72000.	72000.	180000.			

YEARLY METAL
PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.0 PCT.

30240.	TONS	CU	1.39	1.59	1.80
700.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
367500.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	94974.	106758.	119468.
\$/1000 YEARLY OPERATING COST	40600.	40600.	40600.
\$/1000 YEARLY TREATMENT COST	18982.	18982.	18982.
\$/1000 YEARLY CASH FLOW	35392.	47186.	59887.

TITLE COPPER BASIN P.D. ARIZ

ORE RESERVE TONS * 1000	PRODUCTI TONS/DAY	ON RATE	OPERATING COST				PROPERTY LIFE YEARS
175000.0	20000.		\$/ TON ORE 5.30				25
	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T	
AVERAGE GRADE	0.550	0.020	0.0	0.0	.0	0.0	
RECOVERY PCT.	93.0	50.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	0.0	
TREATMNT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
INVESTMENT \$/1000	PERIOD 1 36000.	PERIOD 2 72000.	PERIOD 3 72000.	TOTAL 180000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.1 PCT. 27.2 PCT.

YEARLY METAL PRODUCTION	17.0 PCT.	22.1 PCT.	27.2 PCT.
35805. TONS CU	1.20	1.36	1.54
700. TONS MO	6.00	6.00	6.00
0. TONS PB	0.0	0.0	0.0
0. TONS ZN	0.0	0.0	0.0
0. OZ AU	0.0	0.0	0.0
0. OZ AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS	94332.	106147.	119037.
\$/1000 YEARLY OPERATING COST	37100.	37100.	37100.
\$/1000 YEARLY TREATMENT COST	21483.	21483.	21483.
\$/1000 YEARLY CASH FLOW	35749.	47564.	60454.

TITLE SANTA CRUZ FREEPORT ASARCO

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE				YEARS
250000.0	30000.		6.30				23
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	1.100	0.015	0.0	0.0	.003	0.170	
RECOVERY PCT.	85.0	25.0	0.0	0.0	50.0	75.0	
BASE METAL PRICE	0.75	6.00	0.0	0.0	200.	6.00	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	90.0	2.10	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	48000.	96000.	96000.	240000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.3 PCT. 22.0 PCT. 27.3 PCT.

98175.	TONS	CU	0.82	0.90	0.99
394.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
15750.	OZ	AU	200.00	200.00	200.00
1338749.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			177896.	192622.	210293.
\$/1000 YEARLY OPERATING COST			66150.	66150.	66150.
\$/1000 YEARLY TREATMENT COST			63134.	63134.	63134.
\$/1000 YEARLY CASH FLOW			48612.	63338.	81009.

TITLE RED MOUNTAIN ARIZ KM

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ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
200000.0	30000.		7.10			19

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.800	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	47400.	94800.	94800.	237000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.1 PCT. 27.2 PCT.

78120.	TONS	CU	1.09	1.18	1.29
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	169910.	185144.	201549.
\$/1000 YEARLY OPERATING COST	74550.	74550.	74550.
\$/1000 YEARLY TREATMENT COST	46872.	46872.	46872.
\$/1000 YEARLY CASH FLOW	48489.	63722.	80127.

TITLE MOONLIGHT SUPERIOR PLACER CALIF 12

ORE RESERVE TONS * 1000	PRODUCTI TONS/DAY	ON RATE	OPERATING COST				PROPERTY LIFE YEARS
240000.0	40000.		\$/ TON ORE				17
	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T	
AVERAGE GRADE	0.400	0.0	0.0	0.0	.0	0.0	
RECOVERY PCT.	90.0	0.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
INVESTMENT \$/1000	PERIOD 1 48600.	PERIOD 2 97200.	PERIOD 3 97200.	TOTAL 243000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.1 PCT. 27.2 PCT.

50400. TONS	CU	1.50	1.65	1.81
0. TONS	MO	0.0	0.0	0.0
0. TONS	PB	0.0	0.0	0.0
0. TONS	ZN	0.0	0.0	0.0
0. OZ	AU	0.0	0.0	0.0
0. OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS		151200.	166319.	182951.
\$/1000 YEARLY OPERATING COST		70000.	70000.	70000.
\$/1000 YEARLY TREATMENT COST		30240.	30240.	30240.
\$/1000 YEARLY CASH FLOW		50960.	66079.	82711.

GEOLOGY AND MINERALIZATION OF THE LIGHTS CREEK STOCK,
PLUMAS COUNTY, CALIFORNIA

by

Lester O. Storey¹

Abstract

The Lights Creek stock is located in northern California about 100 miles northwest of Reno, Nevada. It is within the Sierra Nevada physiographic province near its juncture with the Cascade and Basin and Range provinces. Structurally it is closely associated with Basin and Range-type features. The area is thought to lie within the influence of the Walker Lane structural lineament and may also be affected by the eastward projection of the Mendocino fracture zone.

The Lights Creek stock is of Late Jurassic to early Eocene age and was emplaced as a differentiated satellite of the Sierra Nevada batholith. The stock hosts at least three large porphyry-type copper-bearing zones. These zones are at the site of the old Superior mine and at the newly discovered Sulfide Ridge and Moonlight Valley areas. Geologic reserves at a 0.2% copper cutoff for the Moonlight Valley are estimated at 250 million tons of 0.35% copper. For the Superior mine, the reserves are approximately 100 million tons of 0.33% copper. An undetermined large tonnage of low-grade material in the Sulfide Ridge area is estimated to grade approximately 0.25% copper.

Petrographic studies indicate that the stock is of heterogeneous composition with a granodioritic center grading outwardly to a granitic periphery. The peripheral areas of the stock are also shown to be more fractured, exhibit the most copper mineralization, and have a higher content of potassium feldspar.

There is a most striking association of copper sulfides occurring with tourmaline as intergrowths in veinlets and disseminations. The abundant tourmaline suggests a late pneumatolytic vehicle for at least some of the ore.

There is a lack of characteristic alteration zonal patterns in the Lights Creek deposits. Alteration assemblages of minerals are present locally and occur overlapping in the ore areas; however, strong and discrete zonation is not apparent. The low sulfur content in the ore zones, as well as the possible contribution of late pneumatolytic copper to the ore zones rather than abundant hydrothermal ore, may account for the unusual mineral assemblages at Lights Creek.

It is suggested that the Lights Creek-type of copper occurrences are not easily recognized because of their unique mineral assemblages and that these low-grade types with relatively fresh appearing outcrops could become the orebodies of the future.

Introduction

The Lights Creek stock is located at the northern limit of the Plumas County copper belt in the Diamond Mountains (Fig. 1). The copper belt is about 18 miles long and has a northwesterly trend. It is defined by the Walker mine at the south and the Engels and Superior mines

at the north. Numerous other smaller mines and copper showings occur scattered within the zone. The Walker mine, largest of the producers, recorded more than 80 million pounds of copper during about half of its active life between 1922 to 1930 (Smith, 1970). The Engels and Superior mines were jointly operated by the California Engels Mining Company during the years 1916 to 1930. Production from both of these mines was about 161.5 million pounds of copper recovered from 4.5 million tons of ore (Smith, 1970). This indicates an

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Of the three mineralized zones, the Moonlight Valley deposit resembles other porphyry systems. However, sericitic and argillic alteration occur most typically only in the fracture zones and not pervasively throughout the rock. Chlorite is apparent at each of the mineralized areas and has formed at the expense of some of the ferromagnesian minerals. Although the stock is more potassium-rich in the Moonlight area, Juilland (1970) considers only the K-feldspar that occurs in veinlets to be positively hydrothermal and that which occurs as disseminations to have formed during crystallization of the magma (Fig. 6). If this is correct, potassic alteration would also be considered as minimal. However, the nearly complete absence of primary biotite in the stock has led Juilland to further conjecture that it may have been completely destroyed by late deuteric alteration from K-feldspathization and he cites the work of Hemley (1959) and Rutherford (1969) to support this hypothesis.

Tourmaline is the most remarkable mineral associated with the copper deposition. It is found principally as the iron-rich dark variety, schorlite, in both fracture vein fillings and as sunburst blebs throughout the rock. Interesting intergrowths with bornite and chalcopyrite are often associated with both forms of tourmaline (Fig. 7). Quartz commonly occurs with tourmaline in the mineralized veinlets. Epidote occurs throughout the stock in patches and veins and is particularly abundant within the zones of sulfide mineralization. It appears to increase in density closer to the contacts with the intruded rock or where xenoliths are abundant in the quartz monzonite.

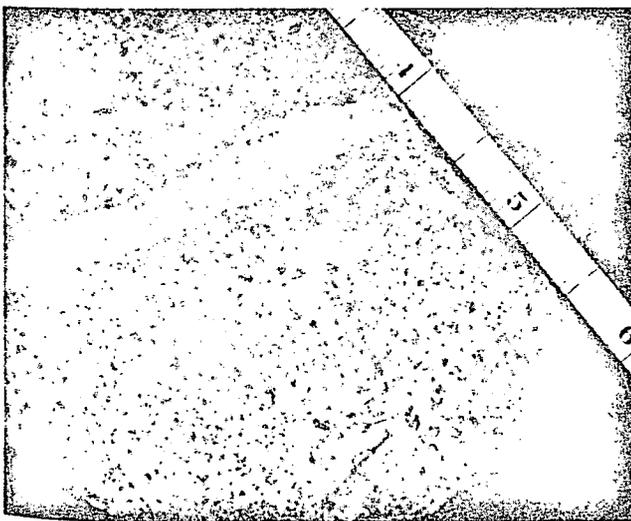


Fig. 6. Veinlet in quartz monzonite showing hydrothermal K-feldspar

Pyrite is relatively scarce in the Lights Creek stock. The predominant sulfides of the system are chalcopyrite and bornite. Magnetite and hematite are present as disseminations and in veins. However, hematite, generally occurring as specularite, is much more prominent in the Moonlight Valley area than magnetite. Specular hematite appears to be more pervasive on the southwest end of the Moonlight Valley deposit where it plunges under the older volcanic cover. This occurrence may represent a flooding front of iron out from the copper mineralized center into the overlying volcanic rock. The absence of pyrite and abundance of hematite at Moonlight Valley is evidence of a low sulfur environment and probably would account for the lack of supergene clay alteration.

Copper Occurrences

Moonlight Valley Deposit

The main ore minerals occurring in the Moonlight Valley deposit are bornite and chalcopyrite with lesser amounts of covellite and chalcocite. Important gangue metallic minerals found with the ore are magnetite, hematite, and lesser amounts of pyrite. Nonmetallic vein minerals accompanying the copper mineralization are quartz, tourmaline, siderite, dolomite, calcite, epidote, chlorite, and rarely actinolite. Typically, there are centers with best copper mineralization which show abundant bornite and minor amounts of chalcocite. As the grade decreases, chalcopyrite increases and bornite decreases. Farther away from the

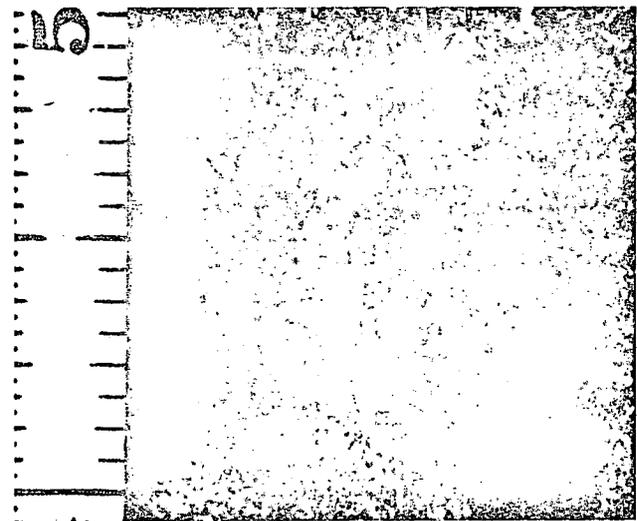


Fig. 7. Quartz monzonite specimen showing an interesting intergrowth of bornite and chalcopyrite associated with tourmaline

high-grade centers, the appearance of increased pyrite indicates even lower grades. Chalcopyrite occupies an intermediate position and perhaps makes up the greatest bulk of the ore. The chalcocite, with few exceptions, is believed to be hypogene. Under the microscope it appears to form exsolution textures with bornite and to replace bornite (Bryner, 1972). Bornite and chalcopyrite also commonly exhibit exsolution features (Bryner, 1972).

Other minerals occurring in very minor amounts are pyrrhotite, molybdenite, sphalerite, galena, tetrahedrite-tennantite, and luxonite. None of these minerals contributes economically recoverable metals with the exception of possibly the tetrahedrite-tennantite, as silver values for the deposit average + 0.1 oz per ton.

Very little supergene enrichment has occurred at the Moonlight Valley deposit. Surface exposures and the tops of some holes show meager oxidation and leaching with limited limonite, manganese oxides, malachite, azurite, chrysocolla, and native copper. Sparse sooty chalcocite is found in some holes but certainly does not express a significant enrichment to the orebody.

Although it is difficult to map structure in the Moonlight Valley area because of lack of surface outcrops, it is quite evident from drill-hole information that the better copper mineralization is closely associated with a higher degree of shattering and fracture fillings. Strong structural control for the ore is very apparent. The deposit is broadly arch shaped, conform-

ing to a domelike feature with a long dimension northeast-southwest (Fig. 8). From a limited few deep drill holes it is indicated that the orebody has several roots, with the largest and most persistent under the volcanic cover to the southwest. Geologic surface mapping has suggested a dome in the older volcanics conformable to both the Superior mine and the Moonlight Valley ore zones. Bryner (1972) postulated the occupancy of these domal structures by local apophyses into the roof by the stock. This would mean that these deposits are positioned in the uppermost portions of the stock.

Strong northeast, northwest, and north-south sets of shears in the Moonlight Valley area appear to be important for the overall structural plumbing system for the ore; however, the local brecciation and crackling which is apparent in the best ore zones may be closely related to the plutonic emplacement, perhaps as late resurgence into a semiconsolidated rim. This is substantiated by the fact that there is much less fracturing developed toward the center of the stock than near its margin.

Superior Mine

The Superior Mine mineralization is thought to be of a higher temperature of formation than Moonlight Valley. Anderson (1931) has given good descriptions of the Superior orebody. He has considered the ore-forming minerals to have been introduced under hydrothermal conditions into previously formed higher temperature pneumatolytic gangue minerals.

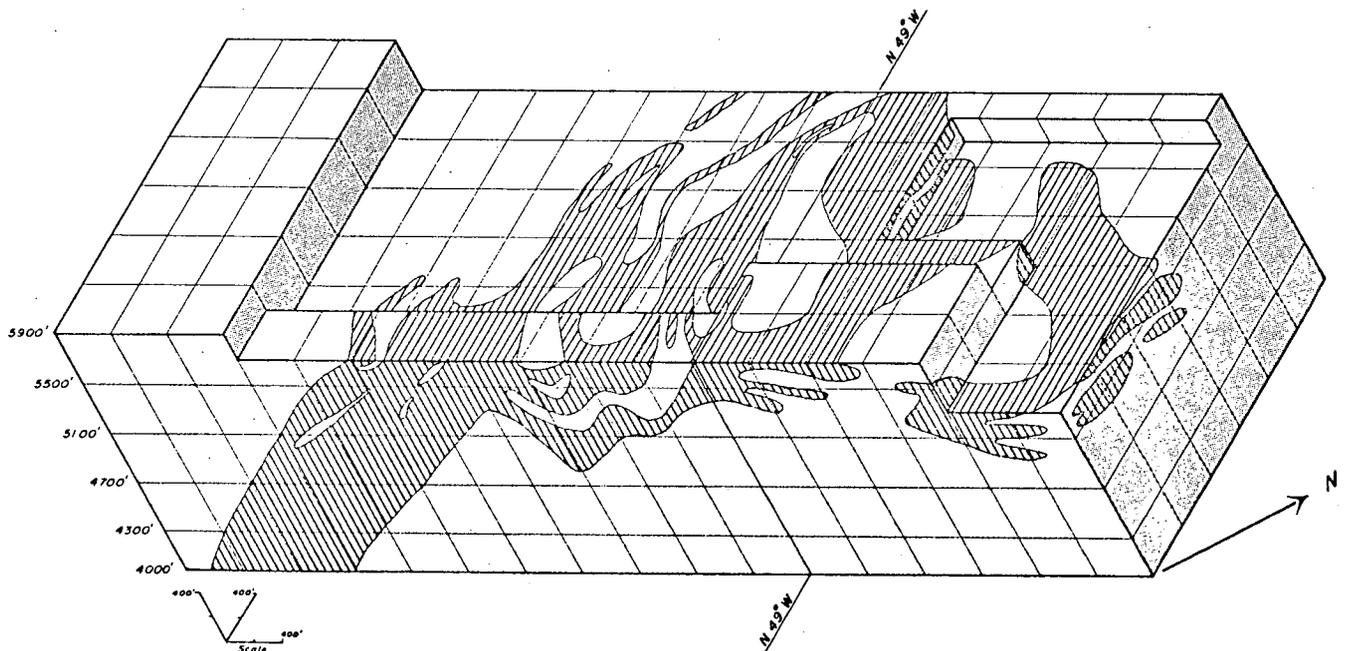


Fig. 8. Block diagram of the Moonlight Valley orebody (from Moonlight Valley drill sections)

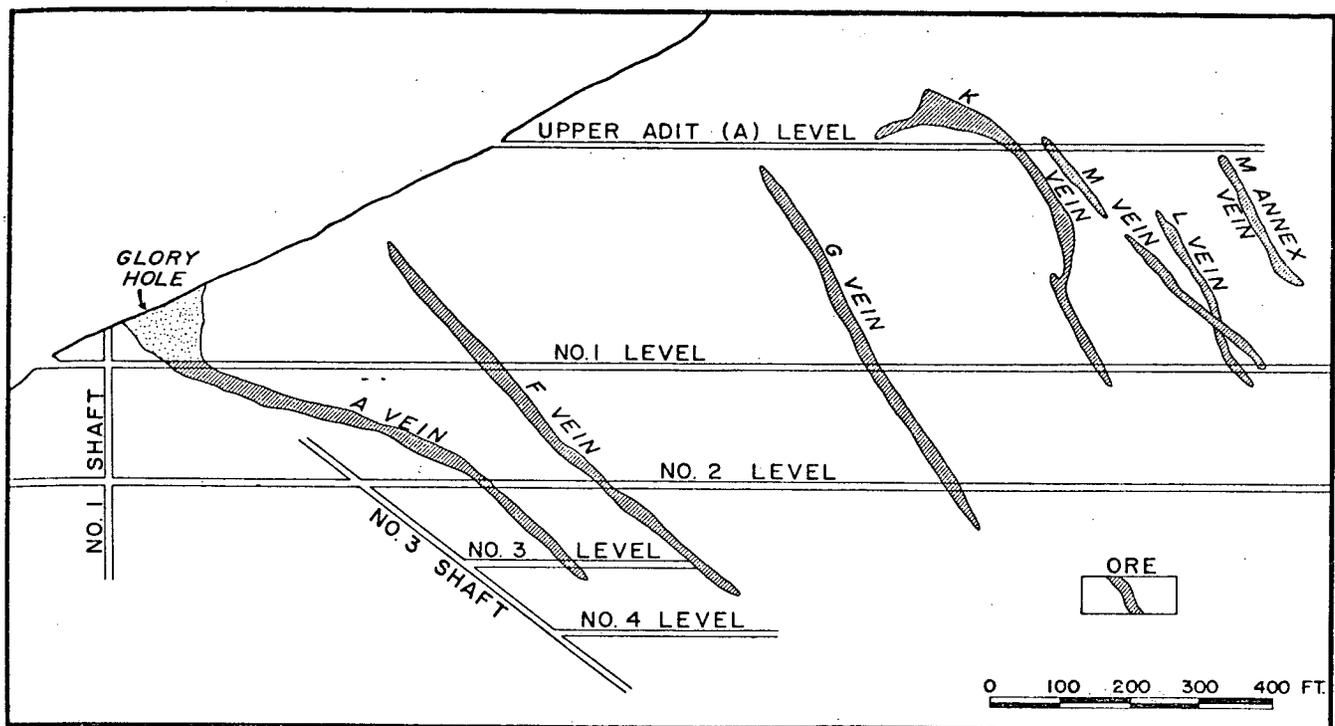


Fig. 9. Diagrammatic cross section of the Superior mine—after Anderson (1931)

The Superior deposit occupies a stockwork around seven parallel, northerly striking, easterly dipping (8 to 10 feet thick) vein zones with accompanying sheeting and brecciation (Fig. 9). Strong N. 30° E. shear zones dipping 55° E. limit the high-grade veining in an east-west direction. Mineralization is enhanced and/or cut off by northwest-striking, southwest-dipping shear zones superimposed on the vein system. The typical mineralized vein zone contains chiefly chalcopyrite with smaller amounts of bornite, magnetite, and pyrite in a dark gangue of black schorlite, green mica, actinolite, quartz, epidote, chlorite, sericite, apatite, titanite, and siderite. Intervein wall rock is also mineralized with disseminations and fracture fillings.

Magnetite is much more prevalent in the Superior area than at Moonlight Valley; however, specularite, which is very strong at Moonlight Valley, is nearly nonexistent at the Superior mine.

Sulfide Ridge Deposit

The Sulfide Ridge copper occurrence is more like the Superior mine than the Moonlight Valley deposit. However, the only subsurface information available for the area is from diamond drill cores. Outcrops show the strong influence of structural control for the mineralization (Fig. 10).

Summary and Conclusions

In summary, it can be stated that the Lights Creek quartz monzonite stock contains large concentrations of copper. These copper-bearing zones are of sufficient cohesion to qualify them as porphyry copper systems. However, some of the features commonly associated with the copper porphyry deposits of the southwestern United States are missing at Lights Creek. Most conspicuously absent are

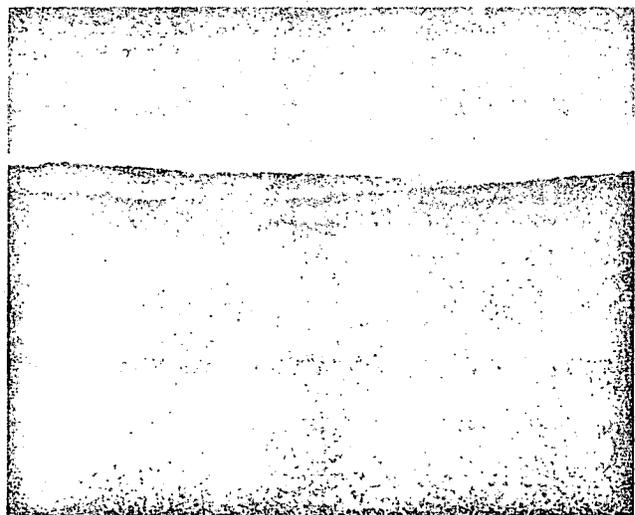


Fig. 10. View looking east of Sulfide Ridge

TITLE EAST CHRISTMAS ICC. ARIZ 13

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
400000.0	30000.		6.10			37

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.450	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	47400.	94800.	94900.	237000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.2 PCT. 27.1 PCT.

43942.	TONS	CU	1.56	1.74	1.93
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	137100.	152919.	169398.
\$/1000 YEARLY OPERATING COST	64050.	64050.	64050.
\$/1000 YEARLY TREATMENT COST	26365.	26365.	26365.
\$/1000 YEARLY CASH FLOW	46685.	62504.	78982.

TITLE COPPER CREEK ARIZ NEWMONT EXXON 14

ORE RESERVE	PRODUCTION RATE	OPERATING COST		PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE		YEARS	
100000.0	20000.	7.20		14	

	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
AVERAGE GRADE	0.700	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	35600.	71200.	71200.	178000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.3 PCT. 27.2 PCT.

45570.	TONS	CU	1.28	1.40	1.53
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	116887.	127823.	139444.
\$/1000 YEARLY OPERATING COST	50400.	50400.	50400.
\$/1000 YEARLY TREATMENT COST	27342.	27342.	27342.
\$/1000 YEARLY CASH FLOW	39145.	50082.	61702.

Well-developed, pervasive alteration patterns are not easily recognized on the surface at Copper Creek. Much of the alteration is confined to vein selvages, breccia pipes, and dacite porphyry plugs and their margins. However, some alteration aspects for the different rock types can be generalized. In the Precambrian and Paleozoic sedimentary rocks, the carbonate rocks exhibit the greatest effect. They are mostly recrystallized, with some local argillization and limited calc-silicate development. The Glory Hole Volcanics exhibit pervasive propylitic alteration and silicification with abundant pyrite, especially adjacent to vein sets and where intruded by a cluster of dacite porphyry plugs. Weak, pervasive propylitic alteration with local areas of superimposed potassic and phyllic alteration is common for the granodiorite. Dacite porphyry shows weak to strong phyllic alteration. Very strong phyllic alteration with silicification and local tourmalinization is exhibited by most breccia pipes.

In the American Eagle basin, the rocks contain higher sericite and quartz and lower total feldspar than rocks outside the area. Potassic alteration occurs primarily as the addition of orthoclase by veinlets, vein selvages, or metasomatic replacement. At the surface, potassic alteration is spotty. However, the amount of potassic alteration increases with depth below the basin and a "floor" of fairly intense pervasive potassic alteration underlies the zone of copper-rich mineralization.

Phyllic alteration predominates at the surface in the American Eagle basin. It is confined to vein selvages, breccia pipes and some of the dacite porphyry plugs and their margins; vein selvages are the most common and exhibit well-developed zoning. Quartz-sericite typically borders the quartz-sulfide veinlet. This assemblage grades outward to a quartz-sericite-chlorite zone and to an outer zone of sericite-argillite. This outer zone is characterized by the presence of cloudy to waxy, light-green plagioclase. The alteration product is a mixed mica comprised of sericite, montmorillonite, kaolinite, and illite. With depth the phyllic alteration decreases due to the diminishing size of sericite selvages. This decreasing phyllic alteration and increasing pervasive potassic alteration with depth form an overlapping zone of mixed alteration. Combination of complex vein selvages, i.e., sericite and orthoclase, and the mixed zone of alteration suggest the overprinting of phyllic alteration onto potassic alteration. In the lower portion of the mixed alteration zone and just into the area of intense potassic alteration occurs the zone of significant copper mineralization. There is some suggestion that propylitic alteration may occur below the po-

tassic alteration. Rock from a deep drill hole in the central portion of the American Eagle basin exhibits weak sericite and secondary orthoclase with stronger chlorite-epidote alteration.

Two special alteration minerals, tourmaline and anhydrite, occur at Copper Creek. Tourmaline, schorl variety, is present districtwide and appears to be limited to the upper levels of the deposit. It occurs as acicular crystals in breccias, along veinlets, in quartz-sericite selvages, and as blebs or rosettes in dacite porphyry. Tourmaline may occur alone or may be associated with quartz and pyrite. Purple and white anhydrite is common in the deeper chalcopryrite mineralized zones, occurring as disseminated masses and veinlets.

Mineralization

Significant copper mineralization occurs 2,000 feet or more beneath the surface of the American Eagle basin. It covers an elliptical area approximately 2,500 feet east-west and 1,500 feet north-south. The copper zone underlies a relatively intense east-northeast-trending fracture zone and is associated with a cluster of breccia pipes and dacite porphyry intrusions. Mineralization is hypogene as there is only surficial oxidation and no supergene enrichment. An exception to this is the breccia pipes where oxidation and leaching may occur 100 to 200 feet in depth.

The copper porphyry system at Copper Creek is a relatively low sulfide system in comparison with most Southwest porphyry systems. Dominant sulfides are pyrite and chalcopryrite. Minor amounts of bornite and molybdenite are present in the deeper portion of the system, and galena and sphalerite have been noted in the periphery. Sporadic occurrences of specularite have been noted, especially in some breccias and strongly altered zones. Within the system there is a pronounced vertical zoning of sulfides. Pyrite with very minor chalcopryrite is the principal sulfide in the upper portions of the deposit. With depth, pyrite diminishes and chalcopryrite becomes dominant. Within the copper-rich zone, chalcopryrite is the principal sulfide. At the base of the system, bornite appears and may form up to half of the sulfides. Some high-level chalcopryrite and occasional bornite does occur at Copper Creek and is associated directly with certain breccia pipes.

Surface expression of mineralization at Copper Creek is not overly impressive. Granodiorite and dacite porphyry host limonite-stained breccias and are cut by oxidized quartz-pyrite veins. Visible copper oxides are rare, al-

TITLE CHILLITO ARIZ KCC

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS	
400,000.0 40,000.0	10000.		5.60			37 //	
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.800	0.0	0.0	0.0	.0	0.0	
RECOVERY PCT.	80.0	0.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	18200.	36400.	36400.	91000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.3 PCT. 22.3 PCT. 27.2 PCT.

22400.	TONS	CU	1.14	1.27	1.42
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			51072.	57120.	63504.
\$/1000 YEARLY OPERATING COST			19600.	19600.	19600.
\$/1000 YEARLY TREATMENT COST			13440.	13440.	13440.
\$/1000 YEARLY CASH FLOW			18032.	24080.	30464.

TITLE FLORENCE, ARIZ CONOCO ARIZ 16

ORE RESERVE	PRODUCTION RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE				YEARS
800000.0	30000.	5.60				37

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.420	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	90.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	47400.	94800.	94800.	237000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.1 PCT. 27.2 PCT.

39690.	TONS	CU	1.63	1.82	2.04
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	129191.	144670.	161935.
\$/1000 YEARLY OPERATING COST	58800.	58800.	58800.
\$/1000 YEARLY TREATMENT COST	23814.	23814.	23814.
\$/1000 YEARLY CASH FLOW	46577.	62056.	79321.

TITLE HALL NEV ANACONDA NEVADA 17

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS	
54000.0	10000.	5.80			15	

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.460	0.033	0.0	0.0	.0	0.0
RECOVERY PCT.	90.0	50.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	18400.	36800.	36800.	92000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.0 PCT. 27.1 PCT.

14490.	TONS	CU	1.45	1.63	1.85
577.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	48878.	54312.	60615.
\$/1000 YEARLY OPERATING COST	20300.	20300.	20300.
\$/1000 YEARLY TREATMENT COST	8694.	8694.	8694.
\$/1000 YEARLY CASH FLOW	19884.	25318.	31621.

TITLE ANN MASON NEV. ANACONDA NEV. 18

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
110000.0	10000.		6.95			31
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.510	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	90.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	26200.	52400.	52400.	131000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.1 PCT. 27.0 PCT.

16065.	TONS	CU	1.86	2.13	2.41
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			59762.	68437.	77594.
\$/1000 YEARLY OPERATING COST			24325.	24325.	24325.
\$/1000 YEARLY TREATMENT COST			9639.	9639.	9639.
\$/1000 YEARLY CASH FLOW			25798.	34473.	43630.

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS	
33000.0	7000.		8.10			13	
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	1.220	0.0	0.0	0.0	.0	0.0	
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0	
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0	
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	21400.	42800.	42800.	107000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.0 PCT. 27.0 PCT.

27798.	TONS	CU	1.09	1.20	1.33
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			60460.	66714.	73303.
\$/1000 YEARLY OPERATING COST			19845.	19845.	19845.
\$/1000 YEARLY TREATMENT COST			16679.	16679.	16679.
\$/1000 YEARLY CASH FLOW			23936.	30191.	37279.

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
12000.0	2000.		23.00			17
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.300	0.0	0.5	3.0	.0	1.500
RECOVERY PCT.	85.0	0.0	85.0	85.0	0.0	85.0
BASE METAL PRICE	0.75	0.0	0.40	0.34	0.	6.00
TREATMENT CHARGE	0.30	0.0	0.16	0.25	0.0	0.55
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	12000.	24000.	24000.	60000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.2 PCT.

7735.	TONS	CU	1.10	1.21	1.33
0.	TONS	MO	0.0	0.0	0.0
2975.	TONS	PB	0.59	0.64	0.71
17850.	TONS	ZN	0.50	0.55	0.60
0.	OZ	AU	0.0	0.0	0.0
892500.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			43752.	47409.	51588.
\$/1000 YEARLY OPERATING COST			16100.	16100.	16100.
\$/1000 YEARLY TREATMENT COST			15009.	15009.	15009.
\$/1000 YEARLY CASH FLOW			12643.	16300.	20479.

TITLE PINOS ALTOS EXXON N.M.

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ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
10000.0	2000.		14.95			14
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.800	0.0	0.0	2.4	.0	1.800
RECOVERY PCT.	90.0	0.0	0.0	80.0	0.0	54.0
BASE METAL PRICE	0.75	0.0	0.0	0.34	0.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.25	0.0	0.64
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	16000.	32000.	32000.	80000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.0 PCT. 27.2 PCT.

11340.	TONS	CU	1.09	1.22	1.38
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
13440.	TONS	ZN	0.49	0.55	0.63
0.	OZ	AU	0.0	0.0	0.0
680400.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			41999.	46705.	52197.
\$/1000 YEARLY OPERATING COST			10465.	10465.	10465.
\$/1000 YEARLY TREATMENT COST			13959.	13959.	13959.
\$/1000 YEARLY CASH FLOW			17574.	22281.	27772.

Diopside in the garnet skarns is relict from prograde thermal metamorphism inasmuch as it occurs only in magnesium-bearing strata of the Magdalena Group and in the Box or upper member of the Percha shale. Diopside is absent in the massive garnet skarns formed from the clean Lake Valley Limestone.

Thus, compositional changes from bed to bed control the degree to which the various strata are affected by thermal metamorphism or metasomatism. The impure carbonates of the Syrena form diopside-bearing metamorphic skarns upon which metasomatic garnet skarns are superimposed. The Oswaldo Formation, with a higher proportion of limestone, forms a massive garnet skarn containing less diopside, and skarns formed in the Lake Valley Limestone are entirely metasomatic garnet skarns (Fig. 4).

Alteration of the lower Paleozoic strata is poorly known. A few holes have penetrated the Ready Pay or lower member of the Percha Shale which is baked to a chlorite-biotite hornfels but is not affected by metasomatism. Talc and diopside, intercepted in Ordovician dolomites near the stock contact, probably developed through additions of silica and water, rather than from isochemical thermal metamorphism.

Retrograde Alteration

Retrograde alteration affected the metasomatic and to a lesser extent, the metamorphic skarns. The minerals produced during this stage are characteristically the hydrous phases—chlorite, clay, actinolite, talc, and sericite (Fig. 3). Calcite, quartz, iron oxides and sulfides also occur in this assemblage. A variety of other minerals is also present, but their distribution is sparse and sporadic.

Mineral assemblages characterized as retrograde either replace earlier formed metamorphic and metasomatic minerals or occur interstitially to metasomatic skarn minerals. Retrograde alteration affects prograde skarns to varying degrees from slight alteration of the edges to complete replacement of the silicate grains.

Sulfide Distribution and Paragenesis

Copper-zinc-silver-iron sulfides and iron oxides are interstitial to the calc-silicates, and the sulfides may or may not be found with associated retrograde alteration minerals. For example, the upper zone contains extensive retrograde alteration products associated with mineralization, whereas in the lower zone sulfides and iron oxides occur in generally unaltered prograde metasomatic skarn. Mineral-

ization typically occurs with retrograde alteration in pervasive stockwork fractures.

Sulfide and iron oxide minerals in the upper zone are apparently zoned with respect to the stock-wall rock contact. Figure 5 illustrates the typical mineral zoning and paragenesis observed. Magnetite was deposited early; it is abundant near the stock but diminishes abruptly outward. With time and with increasing distance from the stock, chalcopyrite and pyrite become the major iron-bearing phases reaching successive peaks and then declining. Later sphalerite and galena are the predominant sulfide minerals in the distal parts of the mineralized zones. The volume of sulfides increases outward, reaching a maximum in the pyrite-chalcopyrite-sphalerite zone, and then decreasing.

Mineral distribution in the lower mineral zone differs in several respects from that in the upper zone. The lower zone generally contains smaller bodies of higher grade chalcopyrite mineralization. In addition, detectable chalcopyrite is present over a much broader area in the lower zone. Furthermore, magnetite is more abundant in the lower zone, whereas pyrite is less abundant in the lower zone than in the upper zone.

The paragenetic sequence (Fig. 6) is essentially the same in all zones. Prograde calc-silicate formation was followed by iron oxides and a wide variety of copper, zinc, silver, lead, and bismuth sulfides. Although much of the sulfide deposition accompanied the silicate-destructive retrograde event, significant mineralization does occur without obvious retrograde effects on associated silicates.

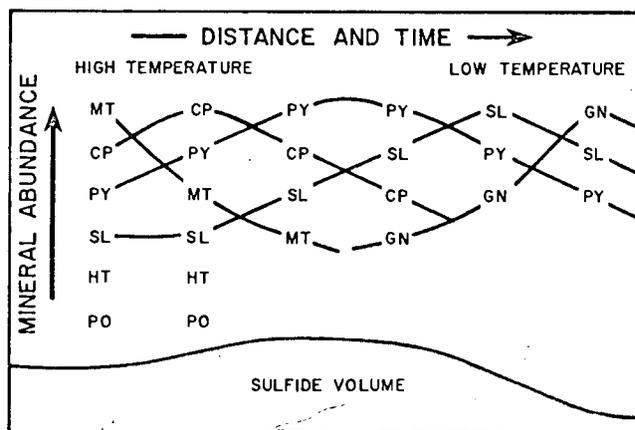


Fig. 5. Schematic sulfide-oxide zoning sequence at Pinos Altos as a function of time and distance from the Pinos Altos stock

TITLE UNITED VERDE P.D. ARIZ.

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
40000.0	5000.		21.85			22
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	4.0	.0	0.0
RECOVERY PCT.	0.0	0.0	0.0	80.0	0.0	0.0
BASE METAL PRICE	0.0	0.0	0.0	0.34	0.	0.0
TREATMENT CHARGE	0.0	0.0	0.0	0.25	0.0	0.0
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	22000.	44000.	44000.	110000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.2 PCT. 27.1 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
56000.	TONS	ZN	0.79	0.85	0.92
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			88345.	95581.	103196.
\$/1000 YEARLY OPERATING COST			38238.	38238.	38238.
\$/1000 YEARLY TREATMENT COST			28000.	28000.	28000.
\$/1000 YEARLY CASH FLOW			22108.	29343.	36959.

TITLE RHINELANDER NORANDA WISC

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS	
2300.0	500.	13.00			13	

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T

AVERAGE GRADE	1.000	0.0	0.0	4.5	.0	0.0
RECOVERY PCT.	90.0	0.0	0.0	90.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.34	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.25	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	0.	4000.	6000.	10000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.6 PCT. 22.5 PCT. 27.1 PCT.

1575.	TONS	CU	0.93	0.98	1.03
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
7087.	TONS	ZN	0.42	0.45	0.47
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	8906.	9408.	9911.
\$/1000 YEARLY OPERATING COST	2275.	2275.	2275.
\$/1000 YEARLY TREATMENT COST	4489.	4489.	4489.
\$/1000 YEARLY CASH FLOW	2142.	2645.	3147.

TITLE CRANDON, EXXON

WISC

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ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
70000.0	10000.		6.40			20
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.000	0.0	0.0	5.0	.0	0.0
RECOVERY PCT.	90.0	0.0	0.0	90.0	0.0	0.0
BASE METAL PRICE	0.70	0.0	0.0	0.30	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.25	0.0	0.0
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	27000.	54000.	54000.	135000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.5 PCT. 22.4 PCT. 27.5 PCT.

31500.	TONS	CU	0.75	0.79	0.84
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
157500.	TONS	ZN	0.32	0.34	0.36
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			148302.	156617.	166319.
\$/1000 YEARLY OPERATING COST			22400.	22400.	22400.
\$/1000 YEARLY TREATMENT COST			97650.	97650.	97650.
\$/1000 YEARLY CASH FLOW			28252.	36567.	46269.

TITLE KIRWIN AMAX WYO 27

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS	
100000.0	20000.	6.30			14	

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.000	0.150	0.0	0.0	.0	0.0
RECOVERY PCT.	85.0	50.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	30000.	60000.	60000.	150000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.5 PCT. 22.4 PCT. 27.3 PCT.

59500.	TONS	CU	0.95	1.03	1.11
5250.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	113347.	122272.	132089.
\$/1000 YEARLY OPERATING COST	44100.	44100.	44100.
\$/1000 YEARLY TREATMENT COST	35700.	35700.	35700.
\$/1000 YEARLY CASH FLOW	33547.	42472.	52289.

TITLE CARR FORK ANACONDA UTAH 28

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS	
65000.0	10000.	12.05			18	

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.830	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.26	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	27000.	54000.	54000.	135000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.5 PCT. 22.3 PCT. 27.1 PCT.

59566.	TONS	CU	0.85	0.92	1.00
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	101859.	109900.	118834.
\$/1000 YEARLY OPERATING COST	42175.	42175.	42175.
\$/1000 YEARLY TREATMENT COST	30975.	30975.	30975.
\$/1000 YEARLY CASH FLOW	28709.	36750.	45685.

TITLE CARR FORK ANACONDA PHASE II EXT. UTAH 29

ORE RESERVE	PRODUCTION RATE	OPERATING COST					PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE					YEARS
150000.0	20000.	11.55					21

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.300	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	13000.	26000.	26000.	65000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.1 PCT. 22.1 PCT. 27.1 PCT.

84630.	TONS	CU	0.86	0.88	0.91
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	144844.	148905.	153475.
\$/1000 YEARLY OPERATING COST	80850.	80850.	80850.
\$/1000 YEARLY TREATMENT COST	50778.	50778.	50778.
\$/1000 YEARLY CASH FLOW	13216.	17277.	21847.

TITLE CARR FORK ANACONDA PHASE III UTAH

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS	
264000.0	30000.	6.95			25	

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.560	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	13000.	26000.	26000.	65000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

54684.	TONS	CU	1.09	1.12	1.17
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	118691.	122874.	127467.
\$/1000 YEARLY OPERATING COST	72975.	72975.	72975.
\$/1000 YEARLY TREATMENT COST	32810.	32810.	32810.
\$/1000 YEARLY CASH FLOW	12906.	17089.	21682.

TITLE MINERAL BUTTE, GILA INDIANS ARIZ 32

ORE RESERVE	PRODUCTION RATE	OPERATING COST					PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE					YEARS
40000.0	10000.	8.50					11

	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
AVERAGE GRADE	0.400	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	70.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.99 75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.27	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	16000.	32000.	32000.	80000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.1 PCT. 27.1 PCT.

9800. TONS	CU	2.75	2.99	3.26
0. TONS	MO	0.0	0.0	0.0
0. TONS	PB	0.0	0.0	0.0
0. TONS	ZN	0.0	0.0	0.0
0. OZ	AU	0.0	0.0	0.0
0. OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	53943.	58600.	63839.
\$/1000 YEARLY OPERATING COST	29750.	29750.	29750.
\$/1000 YEARLY TREATMENT COST	5292.	5292.	5292.
\$/1000 YEARLY CASH FLOW	18901.	23558.	28797.

TITLE WATERLOO ASARCO (CU=BARITE) CALIF 33

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS
26000.0	6000. <i>Barite</i>	6.29			12

COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T

AVERAGE GRADE	14.700 ?	0.0	0.0	0.0	0.0	3.110
RECOVERY PCT.	50.0	0.0	0.0	0.0	0.0	60.0
BASE METAL PRICE	0.00	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	0.	22000.	33900.	55900.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

154350. ?	TONS -CH BA	0.01	0.02	0.03
0.	TONS MO	0.0	0.0	0.0
0.	TONS PB	0.0	0.0	0.0
0.	TONS ZN	0.0	0.0	0.0
0.	OZ AU	0.0	0.0	0.0
3918598.	OZ AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	26938.	29701.	32680.
\$/1000 YEARLY OPERATING COST	13209.	13209.	13209.
\$/1000 YEARLY TREATMENT COST	1763.	1763.	1763.
\$/1000 YEARLY CASH FLOW	11966.	14729.	17708.

TITLE ROCHESTER, ASARCO NEV. 35

ORE RESERVE	PRODUCTION RATE	OPERATING COST					PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE					YEARS
70000.0	10000.	7.35					20

	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.007	1.500
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	85.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.45

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	16000.	33000.	33000.	82000.

YEARLY METAL PRODUCTION	METAL PRICE TO OBTAIN DCFROI		
	-2.5 PCT.	-2.5 PCT.	-2.5 PCT.

0. TONS CU	0.0	0.0	0.0
0. TONS MO	0.0	0.0	0.0
0. TONS PB	0.0	0.0	0.0
0. TONS ZN	0.0	0.0	0.0
20825. OZ AU	200.00	200.00	200.00
4462498. OZ AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	30940.	30940.	30940.
\$/1000 YEARLY OPERATING COST	25725.	25725.	25725.
\$/1000 YEARLY TREATMENT COST	2158.	2158.	2158.
\$/1000 YEARLY CASH FLOW	3057.	3057.	3057.

TITLE CANDALARIA, OCCI NEVADA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
20000.0	2000.		12.00			28
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.0	4.000
RECOVERY PCT.	0.0	0.0	0.0	0.0	0.0	80.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	14000.	28000.	28000.	70000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
3.4 PCT. 3.4 PCT. 3.4 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
2239999.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			13440.	13440.	13440.
\$/1000 YEARLY OPERATING COST			8400.	8400.	8400.
\$/1000 YEARLY TREATMENT COST			1008.	1008.	1008.
\$/1000 YEARLY CASH FLOW			4032.	4032.	4032.

TITLE CREEDE HOMESTAKE COLORADO

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
5000.0	1000.		14.00			14
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.0	4.980
RECOVERY PCT.	0.0	0.0	0.0	0.0	0.0	77.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	10000.	20000.	20000.	50000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
-3.8 PCT. -3.8 PCT. -3.8 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
1342109.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			8053.	8053.	8053.
\$/1000 YEARLY OPERATING COST			4900.	4900.	4900.
\$/1000 YEARLY TREATMENT COST			604.	604.	604.
\$/1000 YEARLY CASH FLOW			2549.	2549.	2549.

TITLE PINSON CORDEX NEVEDA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS	
2000.0	500.		15.00			11	
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.0	0.0	0.0	0.0	.152	0.0	
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	0.0	
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0	
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	0.	15000.	20000.	35000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
-8.5 PCT. -8.5 PCT. -8.5 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
22610.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			4522.	4522.	4522.
\$/1000 YEARLY OPERATING COST			2625.	2625.	2625.
\$/1000 YEARLY TREATMENT COST			163.	163.	163.
\$/1000 YEARLY CASH FLOW			1734.	1734.	1734.

TITLE PREBLE CORDEX NEVADA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS	
1200.0	500.		14.00			6	
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.0	0.0	0.0	0.0	.070	0.0	
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	0.0	
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0	
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	0.	10000.	20000.	30000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
 **** PCT.-298.5 PCT.-298.5 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
10412.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			2082.	2082.	2082.
\$/1000 YEARLY OPERATING COST			2450.	2450.	2450.
\$/1000 YEARLY TREATMENT COST			75.	75.	75.
\$/1000 YEARLY CASH FLOW			-442.	-442.	-442.

TITLE JERRITT CANNON FREEPORT NEVADA

ORE RESERVE	PRODUCTION RATE	OPERATING COST	PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE	YEARS
5000.0	1000.	14.00	14

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.300	0.0
RECOVERY PCT.	0.0	0.0	0.0	0.0	80.0	0.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	0.	20000.	30000.	50000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
19.2 PCT. 19.2 PCT. 19.2 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
84000.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	16800.	16800.	16800.
\$/1000 YEARLY OPERATING COST	4900.	4900.	4900.
\$/1000 YEARLY TREATMENT COST	605.	605.	605.
\$/1000 YEARLY CASH FLOW	11295.	11295.	11295.

	Cyanide Mills	Tonnage/day	Capital Cost	
(33)	Waterloo	4,000 tpd	\$ 55.9	millions (2316)
(34)	Hardshell	1,000	40.0	(40000)
(35)	Rochester	10,000	82.0	(8200)
(36)	Andalucia	2,000	70.0	(35,000)
(37)	Creedle	1,000	50.0	(50,000)

Pumpkin Hollow Fe-Cu 250 mill tons @ slightly less than
40% iron with 0.30% copper. (MW, June 1970, p. 39)

Jan. WM, 1971, p. 49. Florence, Conoco. 4 widely spaced hole indicates
sulfide higher than 0.50% Cu. (One sulfide interval over
753 ft averaged 0.56%. Oriskany thickness of 158 ft averaged
0.59%.



	1	2	3	4	5	6	7	8	9	10	11	12	13
OP 2/1	CHILITO	ARK	KCC	40	.8 (80%)		10,000 tpd						
OP 4/1	COPPER BUTE	ARK	KCC	60	.6 (70%)	oxide-sulfate	10,000 tpd						
OP 5/1	East Christmas	ARK	ICC	400	.45 (93%)		30,000 tpd						
UG	Red Mt	ARK	KM	200	.8 (98%)					depth to top 4,000			
OP 2/1	Moonlight-Superior - Placer	Calif		240	.40 (93%)		40,000 tpd						
Leach In Situ	Poston Butte	ARK	Asarco	175	.46		Cost 33¢/lb	35 million capital	prod =	13,000 tons Cu/year			
Leach In Situ	Santa Cruz	ARK	Asarco - ERBENET	100	.50		"	"	"	13,000 tons Cu/year			
Leach In Situ	Miami Van Dyke	ARK	OCC	128	.52		"	"	"	13,000 tons Cu/year			
UG	Santa Cruz	ARK	Freeport Asarco	250	1.1 (85%)	.015 Mo (50%)	30,000 tpd			3,000' to top			
UG	CARR FORK	UTAH	Anasconda	65	1.33 (93%)		10,000 tpd			135 capital			
UG	"	"	"	150	1.30 (93%)								
OP/UG	CARR FORK	UTAH	"	264	.56 (93%)	in addition to PL GSM being developed	30,000 tpd						
OP	MT TOLMAN	WA		? 500	.12 Cu (90%)	.078 Mo (?)							
OP	KIRWIN	WYO	AMAX	100	1.0 Cu (85%)	.015 Mo (50%)							

mo

low grade
 Selenite undraged

9-5-71
 ②

OP	Case #	Location	Tons/yr	Cu %	Zn %	Pb %	Au g	Ag g	Moz	Capital	Production	Cu	Zn	Pb	A	A ₂
OP	1/1	MESQUERO Quintan	70	? .43 (93%)					(50%) .02		10,000 tpd					
OP	2/1	San Juan Smelter Arizona	45	.60 (85%)							10,000 tpd					
OP	3/1	SAET MONTANA	357	.51 (80%)							20,000					
OP	5/1	WEST MONTANA	45	.45 (70%)							10,000 tpd					
UG		YOUNG MEX. AMERICAN	32	1.22 (9%) + 1200' to top							7,000 tpd					
UG		Rocky Hillow "														
UG		YOUNG MEX. AMERICAN	110	.51 (90%)					300' to 1500' OP/UG		10,000					
UG		YOUNG MEX. AMERICAN									10,000 tpd					
UG	3/13	YOUNG MEX. AMERICAN	54	.40 (90%)					(50%) .035 MO							
UG		YOUNG MEX. AMERICAN	18	1.90												
UG		DEEP BARRAGE	68	1.22												
UG		" KILGIL	69	.87												
UG		" STEWART	97	.67												
UG		" LOW GRADE MINE	820	.24												
		Hedderston	93	0.48 tpd												
		Silhouette	17	.35					.05 MO							
OP	2/1	FLORENCE CANOCO	800	.27 (90%)	0x .46				own old 2/1 1st 540? .46 5ml							
Leach		W. Ben Park - Arizona	175	.16 (50%)					334/16. #35							
UG		YOUNG MEX. AMERICAN	100	.7 (90%)					1500' to top		20,000 tpd.					13,000 tpy
		Additions by JIS														
OP	2/1	Chillto KCC	40 million	.8 (80%)							10,000 tpd.					
OP		Joe Bush ICC - Arizona	92	.65												

EPITA
 1300th SAN XAVIER

9-I-70
 (A) (B)

4513 EYEGLASS
 45413 20/20 BUFF

② 6.4% increase received
 June 1970

RECEIVING

	1	2	3 ⁰²	4 ⁰²	5	6	7	8	9	10	11	12	13
		Cu	Al	Mg				Other	Capital Ex		7005 exp	02/10/10	02/10/10
1	✓ <small>Notes on production</small> WINDYBROOK ASARCO	30		(60% MoS ₂) 3.11	2,000 tpd		70 (50%)	14.7% MoS ₂	50 million		13 million op/yr		
2													
3	✓ ROCHESTER ASARCO	70		.007	1.5			operating 4.50	60 million			85	85
4													
5	UG ✓ <small>ASARCO</small> ASARCO	7	?	(? 85%) 8.0	fractious			operating 2.0	2,000 tpd				
6													
7	✓ <small>Front (Spartan)</small> ASARCO	40	174		1.54				170 million	9,500 tpd	2,500		1,500,000
8													
9	✓ <small>Alta</small> CANADIANA OCCI	10			4.0								
10													
11	✓ <small>9/1</small> <small>Alta</small> ASARCO	5			4.98 (71%)								280
12													
13	OP ✓ <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>	10			1.4								
14													
15	✓ Escabante Parachute	1.8			11.2 (100% MoS ₂)								
16													
17	UG ✓ Santa Cruz	250		1.1 (85%)	1.025 MoS ₂ (50%)			30,000 tpd	3,000 tpd				
18													
19													
20													
21	OP 1% <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>	1.2			0.074 Al								
22													
23	OP 7% <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>	2.0			0.158 O.K.								
24													
25	✓ <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>	1.5			.3								
26													
27	✓ <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>	10			.4	have excess							
28													
29	✓ <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>												
30													
31													
32	✓ <small>Alta</small> <small>Alta</small> <small>Alta</small> <small>Alta</small>												

operating? 30,000 op/yr Au

		1 Tons	2 Cu	3 Au	4 Ag	5	6	7	8	9	10	11	12	13
1	Bella	RUEI TRAMP SOUTH OF MOUNTAIN	13		.07	12								
2														
3	Bella	ZUCRANOV-EL-HURU - MOUNT CIPROUS	43		.07									
4														
5		WERRING MOUNT GIBBY	75		1.1?									
6														
7		✓ NORTH UZBERGLAND CIPROUS MOUNT	1011		.05 1.05									
8														
9	ES/UG	✓ Warratcha Wash Cypri	510		0.10									
10														
11	U.G	WARD MTN (Silver King)	12		\$50 rock (Cu-Pb-Zn)?		80% 3% Zn	85% 1.3 Cu	85% .5 Pb	85% 1.5 Ag		200000	300000?	of 20?
12														
13														
14														
15	OP	Taylor (Silver King)	5		3.5 of Ag									
16														
17	(OP)	Gold Hill (Houston)	+1		.09 of Au									
18														
19	OP	Manhattan (Houston)	21		20 of Au									
20														
21														
22														
23	UC	VICTORIA (Ahaonlal)												
24	UP/UG	Gatchell (?)												
25	UG	Butte Valley (Kee-Cyprius)												
26	OP	Picche Au												
27														
28														
29														
30														
31														
32														

Probably not in production by '95 if at all.

approximately very low grade

80% 85% 85% 85%
3% Zn 1.3 Cu .5 Pb 1.5 Ag 200000 300000? of 20?

No can not establish a mineral reserve (alt)

Do not include too small prod - if produced (alt)

Do not include too small prod. (alt)

Other long shot possibilities

NAME

STATE

Reserve (S.T.)
Production Rate _____ TPD
Recovery %
Base Price (lb/oz)
Treatment Cost (lb/oz)
Operating Cost _____ per ton ore

	Cu %	Mo %	Pb %	Zn %	Au oz.	Ag oz.
Reserve (S.T.)						
Production Rate _____ TPD						
Recovery %						
Base Price (lb/oz)						
Treatment Cost (lb/oz)						

Investment Year 1 Year 2 Year 3

TITLE HANNA GETTY - CASA GRANDE ARIZ 1

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
350000.0	30000.		7.10			33

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	1.000	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	85.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	60000.	120000.	120000.	300000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

89250.	TONS	CU	1.05	1.16	1.28
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	186755.	206568.	227853.
\$/1000 YEARLY OPERATING COST	74550.	74550.	74550.
\$/1000 YEARLY TREATMENT COST	53550.	53550.	53550.
\$/1000 YEARLY CASH FLOW	58655.	78468.	99753.

TITLE HILLSBORO, QUINTANA

ORE RESERVE TONS * 1000 61600.0	PRODUCTI TONS/DAY 12000.	ON RATE	OPERATING COST \$/ TON ORE 5.30	PROPERTY LIFE YEARS 14
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	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
AVERAGE GRADE	0.460	0.020	0.0	0.0	.002	0.100
RECOVERY PCT.	94.0	66.0	0.0	0.0	****	100.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	200.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.0	5.8	1.02

INVESTMENT \$/1000	PERIOD 1 19400.	PERIOD 2 38800.	PERIOD 3 38800.	TOTAL 97000.
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YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.2 PCT.

18161.	TONS	CU	1.21	1.37	1.55
554.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
8400.	OZ	AU	200.00	200.00	200.00
420000.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	54983.	60704.	67242.
\$/1000 YEARLY OPERATING COST	22260.	22260.	22260.
\$/1000 YEARLY TREATMENT COST	11374.	11374.	11374.
\$/1000 YEARLY CASH FLOW	21350.	27070.	33608.

TITLE VEKOL ARIZ - NEWMONT ARIZ 5

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS
125000.0	20000.	5.40			17

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.540	0.014	0.0	0.0	.0	0.0
RECOVERY PCT.	85.0	50.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	36000.	72000.	72000.	180000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

32130.	TONS	CU	1.38	1.55	1.74
490.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ.	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	94655.	105691.	117933.
\$/1000 YEARLY OPERATING COST	37800.	37800.	37800.
\$/1000 YEARLY TREATMENT COST	19278.	19278.	19278.
\$/1000 YEARLY CASH FLOW	37577.	48613.	60855.

TITLE ORACLE RIDGE , CONTINENTAL MATERIALS ETC. ARIZ 2

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE				YEARS
14000.0	2000.		18.00				20

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T

AVERAGE GRADE	1.820	0.0	0.0	0.0	.0	0.500
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RECOVERY PCT.	90.0	0.0	0.0	0.0	0.0	50.0
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BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	6.00
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TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	1.90
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INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	8000.	16000.	16000.	40000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

11466.	TONS	CU	1.17	1.28	1.40
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
175000.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	27932.	30460.	33229.
\$/1000 YEARLY OPERATING COST	12600.	12600.	12600.
\$/1000 YEARLY TREATMENT COST	7212.	7212.	7212.
\$/1000 YEARLY CASH FLOW	8120.	10648.	13417.

TITLE EAST HELVETIA, ANAMAX ARIZ 8

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
337000.0	20000.		5.80			37

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.540	0.020	0.0	0.0	.0	0.070
RECOVERY PCT.	80.0	50.0	0.0	0.0	0.0	75.0
BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	2.28

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	36000.	72000.	72000.	180000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.2 PCT. 22.1 PCT. 27.0 PCT.

30240.	TONS	CU	1.39	1.59	1.80
700.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
367500.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	94974.	106768.	119468.
\$/1000 YEARLY OPERATING COST	40600.	40600.	40600.
\$/1000 YEARLY TREATMENT COST	18982.	18982.	18982.
\$/1000 YEARLY CASH FLOW	35392.	47186.	59887.

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tions by Anaconda's professional personnel of factual data such as drilling logs, core samples and assays, all of which data Anaconda has made available to Banner as it was accumulated and to Amax during the course of the latter's investigation of the properties. Information of this nature, however, is subject to differences of interpretation, analysis and value judgments. Anaconda is continuing exploration and development work on these properties. Although the results of this work cannot be predicted, it will undoubtedly lead to revisions in these estimates, and it may reveal the presence of additional quantities of copper mineralization.

Mining reserves at Twin Buttes are estimated to be approximately 417,000,000 tons of sulphide ore with an average grade of 0.63% copper and 0.03% total molybdenum and approximately 55,000,000 tons of oxide ore with an average grade of 1.20% total copper (0.82% acid soluble).

The foregoing reserve estimate represents tonnages that may be excavated and treated under several alternative mining plans Anaconda and Amax are jointly considering. The sulphide ore reserve was calculated using a 0.2% copper cutoff and includes materials too low in grade to be mined separately but containing sufficient copper to be treated if removed from the mine in order to expose higher grade ore. The oxide ore reserve was calculated at a cutoff grade of 0.6% total copper. It is estimated that approximately 68% of the total copper content of the oxide ore is acid soluble and subject to recovery in the oxide sulfuric acid leaching plant now planned for construction at Twin Buttes. Approximately 21,000,000 tons of this higher grade oxide ore have been mined and stockpiled on the surface. In addition to the oxide ore referred to above, the mining plans provide for the excavation of an additional 28,000,000 tons of oxide material with an average grade of 0.49% total copper, calculated at a cutoff grade of 0.4% total copper. Although this oxide material is too low in grade to be considered mill feed for the proposed oxide plant at this time, depending upon operating costs, market conditions or other factors, it may well be treated at a later time. Not all of the copper contained in the sulphide and oxide ores to be mined will be recovered because of normal operational and metallurgical losses.

In addition to the above ore reserves, widely spaced drill hole intercepts and other geological work in the Twin Buttes mineral zone provide the basis for an estimate that there may be approximately 300,000,000 tons of mineralized material with an average grade of 0.8% total copper (above a cutoff of 0.4% total copper) both below and outside the lateral limits of the joint mining plans being considered. Some of this material is contained in small pockets located up to several thousand feet from the boundaries of the mining plans and some of it is at such great depths that extraction could only be by underground mining methods, which are more expensive than the open pit operations now being utilized and may not be economically feasible. The drill hole intercepts also indicate the presence of substantial additional tonnages of copper bearing material too low in grade to be mined separately but containing sufficient copper to be treated to the extent such material might have to be removed in order to expose higher grade material. Whether any of this material can be mined at some future date will depend on further geological work, development of viable mining plans, metallurgical and other technological advances, market conditions and other factors.

Drilling and other exploration work have indicated the presence at Palo Verde (Mineral Hill) of approximately 95,000,000 tons of sulphide material with an average grade of 0.74% copper, calculated using a 0.35% copper cutoff, and at the Helvetia properties of approximately 320,000,000 tons of sulphide material with an average grade of 0.64%, calculated using a 0.3% copper cutoff, approximately 20,000,000 tons of oxide material with an average grade of 0.55% acid soluble copper, calculated using a 0.3% soluble copper cutoff, and, in another mineralized zone about two miles from the foregoing, approximately 23,000,000 tons of mixed oxide-sulphide material averaging 0.75% copper, calculated using a 0.4% copper cutoff. Whether any of this material may at a future date be classified as ore reserves depends upon additional exploration, acquisition

East Helvetia
320 mill tons of sulfid @ ave 0.64 % grade, using 0.3% Cu cutoff
plus 20 mill tons of oxide @ ave 0.55 acid soluble, using 0.3% Cu cutoff

TITLE WEST HELVETIA ANAMAX ARIZ 7

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST	PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE	YEARS
45000.0	10000.		6.80	12

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T

AVERAGE GRADE	0.650	0.020	0.0	0.0	.0	0.0
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RECOVERY PCT.	70.0	50.0	0.0	0.0	0.0	75.0 ²
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BASE METAL PRICE	0.75	6.00	0.0	0.0	0.	6.00
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TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	2.28 ²
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	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	20400.	40800.	40800.	102000.

IHN220I FIOCS - UNIT NUMBER OUT OF RANGE. UNIT = 0

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

IHN220I FIOCS - UNIT NUMBER OUT OF RANGE. UNIT = 0

STANDARD FIXUP TAKEN , EXECUTION CONTINUING

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.1 PCT. 27.1 PCT.

15925.	TONS	CU	1.65	1.84	2.05
350.	TONS	MO	6.00	6.00	6.00
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	56752.	62724.	69413.
\$/1000 YEARLY OPERATING COST	23800.	23800.	23800.
\$/1000 YEARLY TREATMENT COST	9555.	9555.	9555.
\$/1000 YEARLY CASH FLOW	23397.	29369.	36058.

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tions by Anaconda's professional personnel of factual data such as drilling logs, core samples and assays, all of which data Anaconda has made available to Banner as it was accumulated and to Anax during the course of the latter's investigation of the properties. Information of this nature, however, is subject to differences of interpretation, analysis and value judgments. Anaconda is continuing exploration and development work on these properties. Although the results of this work cannot be predicted, it will undoubtedly lead to revisions in these estimates, and it may reveal the presence of additional quantities of copper mineralization.

Mining reserves at Twin Buttes are estimated to be approximately 447,000,000 tons of sulphide ore with an average grade of 0.63% copper and 0.03% total molybdenum and approximately 55,000,000 tons of oxide ore with an average grade of 1.20% total copper (0.82% acid soluble).

The foregoing reserve estimate represents tonnages that may be excavated and treated under several alternative mining plans Anaconda and Anax are jointly considering. The sulphide ore reserve was calculated using a 0.2% copper cutoff and includes materials too low in grade to be mined separately but containing sufficient copper to be treated if removed from the mine in order to expose higher grade ore. The oxide ore reserve was calculated at a cutoff grade of 0.6% total copper. It is estimated that approximately 68% of the total copper content of the oxide ore is acid soluble and subject to recovery in the oxide sulfuric acid leaching plant now planned for construction at Twin Buttes. Approximately 21,000,000 tons of this higher grade oxide ore have been mined and stockpiled on the surface. In addition to the oxide ore referred to above, the mining plans provide for the excavation of an additional 25,000,000 tons of oxide material with an average grade of 0.49% total copper, calculated at a cutoff grade of 0.4% total copper. Although this oxide material is too low in grade to be considered mill feed for the proposed oxide plant at this time, depending upon operating costs, market conditions or other factors, it may well be treated at a later time. Not all of the copper contained in the sulphide and oxide ores to be mined will be recovered because of normal operational and metallurgical losses.

In addition to the above ore reserves, widely spaced drill hole intercepts and other geological work in the Twin Buttes mineral zone provide the basis for an estimate that there may be approximately 300,000,000 tons of mineralized material with an average grade of 0.8% total copper (above a cutoff of 0.4% total copper) both below and outside the lateral limits of the joint mining plans being considered. Some of this material is contained in small pockets located up to several thousand feet from the boundaries of the mining plans and some of it is at such great depths that extraction could only be by underground mining methods, which are more expensive than the open pit operations now being utilized and may not be economically feasible. The drill hole intercepts also indicate the presence of substantial additional tonnages of copper bearing material too low in grade to be mined separately but containing sufficient copper to be treated to the extent such material might have to be removed in order to expose higher grade material. Whether any of this material can be mined at some future date will depend on further geological work, development of viable mining plans, metallurgical and other technological advances, market conditions and other factors.

Drilling and other exploration work have indicated the presence at Palo Verde (Mineral Hill) of approximately 95,000,000 tons of sulphide material with an average grade of 0.74% copper, calculated using a 0.35% copper cutoff, and at the Helvetia properties of approximately 320,000,000 tons of sulphide material with an average grade of 0.64%, calculated using a 0.3% copper cutoff, approximately 20,000,000 tons of oxide material with an average grade of 0.55% acid soluble copper, calculated using a 0.3% soluble copper cutoff, and, in another mineralized zone about two miles from the foregoing, approximately 23,000,000 tons of mixed oxide-sulphide material averaging 0.75% copper, calculated using a 0.4% copper cutoff. Whether any of this material may at a future date be classified as ore reserves depends upon additional exploration, acquisition

West Helvetia
23 mill tons of oxide sulphide ave 0.75% Cu, using 0.4%
Cu cutoff.

TITLE SAFFORD KCC ARIZ

3

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
500000.0	30000.		7.60			37

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.500	0.0	0.0	0.0	0.0	0.0
RECOVERY PCT.	85.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	45400.	45400.	45400.	136200.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.3 PCT. 22.1 PCT. 27.2 PCT.

44625.	TONS	CU	1.51	1.61	1.73
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	134544.	143915.	154625.
\$/1000 YEARLY OPERATING COST	79800.	79800.	79800.
\$/1000 YEARLY TREATMENT COST	26775.	26775.	26775.
\$/1000 YEARLY CASH FLOW	27969.	37340.	48050.

TITLE SAFFORD P.D.

4

ORE RESERVE	PRODUCTI	ON RATE	OPERATING COST			PROPERTY LIFE
TONS # 1000	TONS/DAY		\$/ TON ORE			YEARS
280000.0	30000.		7.60			26

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.920	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	93.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.75	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.30	0.0	0.0	0.0	0.0	0.0

	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
INVESTMENT \$/1000	45400.	90800.	90800.	227000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.3 PCT. 22.3 PCT. 27.3 PCT.

89838.	TONS	CU	1.00	1.08	1.17
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	179226.	194049.	210220.
\$/1000 YEARLY OPERATING COST	79800.	79800.	79800.
\$/1000 YEARLY TREATMENT COST	53903.	53903.	53903.
\$/1000 YEARLY CASH FLOW	45524.	60346.	76517.

TITLE MINERAL BUTTE, GILA INDIANS ARIZ 32

ORE RESERVE	PRODUCTION RATE	OPERATING COST					PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE					YEARS
40000.0	10000.	8.50					11

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.400	0.0	0.0	0.0	.0	0.0
RECOVERY PCT.	70.0	0.0	0.0	0.0	0.0	0.0
BASE METAL PRICE	0.99	0.0	0.0	0.0	0.	0.0
TREATMENT CHARGE	0.27	0.0	0.0	0.0	0.0	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	16000.	32000.	32000.	80000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.1 PCT. 27.1 PCT.

9800.	TONS	CU	2.75	2.99	3.26
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	53943.	58600.	63839.
\$/1000 YEARLY OPERATING COST	29750.	29750.	29750.
\$/1000 YEARLY TREATMENT COST	5292.	5292.	5292.
\$/1000 YEARLY CASH FLOW	18901.	23558.	28797.

TITLE WATERLOO ASARCO (CU=BARITE) CALIF 33

ORE RESERVE	PRODUCTION RATE	OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE			YEARS
26000.0	6000.	6.29			12

	COPPER PCT.	MOLY PCT.	LEAD PCT.	ZINC PCT.	GOLD OZ/T	SILVER OZ/T
AVERAGE GRADE	14.700	0.0	0.0	0.0	.0	3.110
RECOVERY PCT.	50.0	0.0	0.0	0.0	0.0	60.0
BASE METAL PRICE	0.00	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	0.	22000.	33900.	55900.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
17.0 PCT. 22.0 PCT. 27.0 PCT.

154350. ?	TONS	CU	0.01	0.02	0.03
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
3918598.	OZ	AG	6.00	6.00	6.00

\$/1000 YEARLY GROSS EARNINGS	26938.	29701.	32680.
\$/1000 YEARLY OPERATING COST	13209.	13209.	13209.
\$/1000 YEARLY TREATMENT COST	1763.	1763.	1763.
\$/1000 YEARLY CASH FLOW	11966.	14729.	17708.

TITLE HARDSHELL ASARCO ARIZ 34

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
7000.0	1000.		20.00			20
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.0	8.000
RECOVERY PCT.	0.0	0.0	0.0	0.0	0.0	80.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	8000.	16000.	16000.	40000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
10.9 PCT. 10.9 PCT. 10.9 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
2239999.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			13440.	13440.	13440.
\$/1000 YEARLY OPERATING COST			7000.	7000.	7000.
\$/1000 YEARLY TREATMENT COST			1008.	1008.	1008.
\$/1000 YEARLY CASH FLOW			5432.	5432.	5432.

TITLE ROCHESTER, ASARCO NEV. 35

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
70000.0	10000.		7.35			20
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.007	1.500
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	85.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	16000.	33000.	33000.	82000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
-2.5 PCT. -2.5 PCT. -2.5 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
20825.	OZ	AU	200.00	200.00	200.00
4462498.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			30940.	30940.	30940.
\$/1000 YEARLY OPERATING COST			25725.	25725.	25725.
\$/1000 YEARLY TREATMENT COST			2158.	2158.	2158.
\$/1000 YEARLY CASH FLOW			3057.	3057.	3057.

TITLE CANDALARIA, OCCI NEVADA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
20000.0	2000.		12.00			28
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.0	4.000
RECOVERY PCT.	0.0	0.0	0.0	0.0	0.0	80.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	14000.	28000.	28000.	70000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
3.4 PCT. 3.4 PCT. 3.4 PCT.

0. TONS	CU	0.0	0.0	0.0
0. TONS	MO	0.0	0.0	0.0
0. TONS	PB	0.0	0.0	0.0
0. TONS	ZN	0.0	0.0	0.0
0. OZ	AU	0.0	0.0	0.0
2239999. OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS		13440.	13440.	13440.
\$/1000 YEARLY OPERATING COST		8400.	8400.	8400.
\$/1000 YEARLY TREATMENT COST		1008.	1008.	1008.
\$/1000 YEARLY CASH FLOW		4032.	4032.	4032.

TITLE CREEDE HOMESTAKE COLORADO

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
5000.0	1000.		14.00			14
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.0	4.980
RECOVERY PCT.	0.0	0.0	0.0	0.0	0.0	77.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	0.	6.00
TREATMENT CHARGE	0.0	0.0	0.0	0.0	0.0	0.45
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	10000.	20000.	20000.	50000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
-3.8 PCT. -3.8 PCT. -3.8 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
0.	OZ	AU	0.0	0.0	0.0
1342109.	OZ	AG	6.00	6.00	6.00
\$/1000 YEARLY GROSS EARNINGS			8053.	8053.	8053.
\$/1000 YEARLY OPERATING COST			4900.	4900.	4900.
\$/1000 YEARLY TREATMENT COST			604.	604.	604.
\$/1000 YEARLY CASH FLOW			2549.	2549.	2549.

TITLE PINSON CORDEX NEVEDA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS
2000.0	500.		15.00			11
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T
AVERAGE GRADE	0.0	0.0	0.0	0.0	.152	0.0
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	0.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL		
INVESTMENT \$/1000	0.	15000.	20000.	35000.		

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
-8.5 PCT. -8.5 PCT. -8.5 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
22610.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			4522.	4522.	4522.
\$/1000 YEARLY OPERATING COST			2625.	2625.	2625.
\$/1000 YEARLY TREATMENT COST			163.	163.	163.
\$/1000 YEARLY CASH FLOW			1734.	1734.	1734.

TITLE PREBLE CORDEX NEVADA

ORE RESERVE	PRODUCTION RATE	OPERATING COST				PROPERTY LIFE
TONS * 1000	TONS/DAY	\$/ TON ORE				YEARS
1200.0	500.	14.00				6

	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T

AVERAGE GRADE	0.0	0.0	0.0	0.0	.070	0.0
RECOVERY PCT.	0.0	0.0	0.0	0.0	85.0	0.0
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0

INVESTMENT \$/1000	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL
	0.	10000.	20000.	30000.

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
 **** PCT.-298.5 PCT.-298.5 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
10412.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0

\$/1000 YEARLY GROSS EARNINGS	2082.	2082.	2082.
\$/1000 YEARLY OPERATING COST	2450.	2450.	2450.
\$/1000 YEARLY TREATMENT COST	75.	75.	75.
\$/1000 YEARLY CASH FLOW	-442.	-442.	-442.

TITLE JERRITT CANNON FRFEPOT NEVADA

ORE RESERVE	PRODUCTION RATE		OPERATING COST			PROPERTY LIFE	
TONS * 1000	TONS/DAY		\$/ TON ORE			YEARS	
5000.0	1000.		14.00			14	
	COPPER	MOLY	LEAD	ZINC	GOLD	SILVER	
	PCT.	PCT.	PCT.	PCT.	OZ/T	OZ/T	
AVERAGE GRADE	0.0	0.0	0.0	0.0	.300	0.0	
RECOVERY PCT.	0.0	0.0	0.0	0.0	80.0	0.0	
BASE METAL PRICE	0.0	0.0	0.0	0.0	200.	0.0	
TREATMENT CHARGE	0.0	0.0	0.0	0.0	7.2	0.0	
	PERIOD 1	PERIOD 2	PERIOD 3	TOTAL			
INVESTMENT \$/1000	0.	20000.	30000.	50000.			

YEARLY METAL PRODUCTION

METAL PRICE TO OBTAIN DCFROI
19.2 PCT. 19.2 PCT. 19.2 PCT.

0.	TONS	CU	0.0	0.0	0.0
0.	TONS	MO	0.0	0.0	0.0
0.	TONS	PB	0.0	0.0	0.0
0.	TONS	ZN	0.0	0.0	0.0
84000.	OZ	AU	200.00	200.00	200.00
0.	OZ	AG	0.0	0.0	0.0
\$/1000 YEARLY GROSS EARNINGS			16800.	16800.	16800.
\$/1000 YEARLY OPERATING COST			4900.	4900.	4900.
\$/1000 YEARLY TREATMENT COST			605.	605.	605.
\$/1000 YEARLY CASH FLOW			11295.	11295.	11295.

① Hanna Getty.

Original Assump of 350 mill tons @ 1% Cu
at rate of 30,000 tpd = 10 mill tons/year
or life of 33 years.

Same rate of 10 mill tons/year for 20 years = 200 mill tons.
Assume excess tonnage might be of 0.6% grade

$$\begin{aligned} \text{Cu: } (150 \text{ m tons})(0.4\%) + (200 \text{ mill tons})(? \%) &= (350 \text{ mill tons})(1\%) \\ 90 + 200? &= 350 \\ 200? &= 350 - 90 = 260 \\ ? \text{ grade} &= 1.3\% \text{ Cu.} \end{aligned}$$

⑥ Hillshoro

Recheck quantitative estimate figures - see where
difference is.

② Oracle Ridge.

See Ann. Report calculations.

⑤ Vekol Hills

SHC has earlier data indicating higher values on
less ore.

1% Cu
1.20
[Signature]

5
15

- 1.) 20 year life
- 2.) what are tax & reserve required for 20 year life
- 3.) what is upfactor for grade of 20 year reserve
 - a.) how to calculate it
 - b.) use 0.4% Cu as cutoff to simplify
- 4.) with new grade and tax for 20 year life
 - a.) assume for open pit
 - 1st 5 years at 20% above average grade
 - last 15 years at 7% below average grade
 - b.) assume for underground block cave
 - 1st 10 years at 10% above average grade
 - last 10 years at 10% below average grade

$$.25(20) + x(80) = 1$$
$$x = \frac{1 - (.25(20))}{80}$$

1.00
1.500
80

5.00

See attached examples.

Review of C. Helvetia

Open-Pit

Original Tonnage/grade 337 million @ 0.54%

Rated capacity @ 20,000 tons/day = 7 million tons per year

∴ @ 20 year life = 140 million tons.

? 337 mill - 140 mill = 197 mill ton @ ? grade.

lets assume the grade is lower than ave or 0.45% Cu.

Or: have $(337 \text{ mill}) \times (0.54\%) = 182$

and $(140 \text{ mill}) \times (? \text{ grade}) + (197 \text{ mill}) \times (0.45\%) = \text{the } 182$

or $(140) \times (? \text{ grade}) = 182 - 89 = 93$

Assumpt ③ OR ? grade = $\frac{93}{140} = 0.66\% \text{ Cu.}$ for 20 year life.

Using formula # 4 for open-pit mine.

Then 1st five years @ grade of $0.66 + 20\% = 0.66 + 0.13 = 0.79\% \text{ Cu.}$

Then last 15 years @ grade of $0.66 \text{ minus } 7\% = 0.66 - 0.05 = 0.61\% \text{ Cu.}$

	tous %	280
		200 x
280 x .92 =	257	
120 x .4	48	
400	305	

→ 0.35

$$(5 \text{ years}) (1.20\%) + (15 \text{ years}) x \% = 1.00\% (20 \text{ years})$$

$$15x = 1(20) - 5(1.20)$$

$$15x = 20 - 6 = 14$$

$$x = \frac{14}{15} = 0.93\%$$

E Helvetia

140 M tous @ 0.66

337	
140	
197	.66
	20
	177

~~337~~

(337 million tous) (0.54% Cu)

66
13
79

$$(140 \text{ M tous}) x \% + (197 \text{ M tous}) 0.45\% =$$

.66
7
.62

$$(140 \text{ M tous}) x = ~~182~~ 182 - 89 = 93$$

.66

$$x = \frac{93}{140} = 0.66$$

1st 5 years @ 0.79 % Cu

last 15 years @ 0.61 % Cu

Review of Safford PD (Das Sobue)

Underground

Original tonnage/grade = 280 million @ 0.92%

Rated capacity @ 30,000 tons/day = 10 mill ton per year

∴ 20 year life = 200 million tons

Let's assume the excess tonnage (280 - 200 = 80) was 0.7% grade

$$\text{OR } (80 \text{ mill ton})(0.7\%) + (200 \text{ m ton})(? \%) = (280 \text{ mill ton})(0.92\%)$$

$$56 + 200? = 258$$

$$200? = 258 - 56 = 202$$

? grade = 1% Cu for 20 year life.

Using formula #4 for UG mines (block cave).

1st 10 years @ grade of 1% + 10% = 1.10% Cu

last 10 years @ grade of 1% minus 10% = 0.90% Cu.

Dos Pabres (PDSafford)

$$(80 \text{ Mtons}) 0.7 + (200 \text{ Mtons}) x \% = (280 \text{ Mtons}) .92\%$$

$$200x = 257 - 56 = 201$$