

## INTRODUCTION

Pursuant to your request, I visited the Bradina Joint Venture at Houston, B.C. during the three days, June 18th, 19th and 20th, 1973, for the purpose of making an economic analysis together with evaluating the future possibilities of the operation.

As instructed, I spent little or no time in the concentrator except to review, briefly, current performance.

Unfortunately, Mr. K.G. Collins, Resident Manager, was involved at the time in negotiations with the United Steelworkers of America; hence I did not spend as much time with him at the property as would have been desirable. I did confer with Mr. J.F. Hutter, Chief Engineer, and Mr. W.W. Cummings, Chief Geologist, at some length. I also spent the morning of June 19th underground with Mr. J. Williams, Mine Superintendent, and visited two stopes in the upper or No. 1 level.

Subsequently, Mr. Collins and Mr. B. Salter, Chief Accountant, came to Vancouver and assisted me in the preparation of this report on July 4th and 5th, 1973.

## SUMMARY

Using property mill statement figures, during the period March 1972 to May 31st, 1973, 184,300 tons, containing 0.08 ozs. gold per ton, 5.27 ozs. silver per ton, 0.44% copper, 0.95% lead and 4.50% zinc, were milled. During May 1973, the grade of the material milled was 0.09 ozs. gold per ton, 5.02 ozs. silver per ton, 0.44% copper, 0.94% lead and 4.27% zinc, representing an estimated net smelter return of \$18.32 per ton milled, based on current metal prices.

It can be seen that the current grade of material being treated is about the same as the average grade of all that milled to date.

Mineralization is complex, and concentrator operation is correspondingly difficult. During the first five months of 1973, a concentrate assaying from 21% to 23% copper was produced. This contained about 61% of the copper and 22% of the silver in the heads. The lead content in this copper concentrate was between 5% and 6%. A bulk lead-zinc concentrate was also made, assaying about 8% lead and 48% zinc. This represented an 88% zinc recovery and contained a further 36% of the silver originally present.

It should be noted that although 42% of the silver was therefore lost in the mill tailings, it has been ascertained that the silver minerals present are intimately intermixed with pyrite and cannot be liberated even by what would be considered as extremely fine grinding. It is understood a similar association exists for gold values. Gold assays are not conducted on a routine basis, it is understood, but composite determinations made from time to time indicate about 0.08 to 0.09 ounces of gold per ton in millheads and a 60% total recovery in the two concentrates.

Net smelter returns in May 1973, based on March metal prices, amounted to \$227,883 or \$14.89 per ton milled, as compared with on-site operating costs of \$286,650 or \$18.73 per ton milled, representing an on-site operating loss of \$58,767 or \$3.84 per ton milled.

The current state of the mine should be noted. There are insufficient stopes opened up at present in the underground workings to support a desirable monthly milling rate of 16,000 to 17,000 tons. There are virtually no broken reserves currently, either in surface stockpiles or

in the stopes, to serve as a cushion while new stopes are being developed. Current labour relations are quite difficult and the mine is very short of skilled miners, with no rapid alleviation in sight.

#### SUGGESTED PROCEDURES

Three alternatives concerning future action are presented for consideration:-

##### Alternative No. 1 - 17,000 tons milled per month

Milling operations would be stopped and during the next two months enough raises and sub-drifts (see list attached) would be driven to establish a total of 10 stopes in addition to the 13 presently available. Cut and fill stoping would be introduced throughout the mine, replacing some of the present square set stopes. At the same time, 4,000 feet of AQ surface and underground definition type diamond drilling would be completed to outline clearly the various ore zones. The estimated direct on-site costs for this program are \$341,000. To this must be added capital costs which would be incurred after favourable results were encountered. These are detailed elsewhere and amount to a total of \$90,000 which, plus Vancouver costs of \$18,000, equal a total of \$449,000.

Milling would then be resumed at the rate of 17,000 tons per month. Mining would take place on a continuous basis in 20 stopes, with the remaining three available to account for erratic ore occurrences, together with mechanical and other delays in the stoping cycle.

The grade of ore to be treated is estimated to be 0.08 ozs. gold per ton, 5.96 ozs. silver per ton, 0.60% copper, 1.22% lead and 4.99% zinc. To calculate this estimate, it

has been assumed that the experience encountered during the period January 1st, 1973 to June 30th; 1973 will continue and that only stope type ore will be milled.

The net smelter returns, based on current metal prices, are estimated to be \$21.68 per ton milled, or \$368,600 per month.

On-site operating costs are estimated to be \$302,700 per month. Vancouver costs are estimated to be \$16,000 per month. Net estimated operating profit therefore would be \$49,900 per month. At least six months operation at this rate can be forecast, in relation to the stoping areas in consideration.

Positive ore reserves are currently estimated by the mine staff at 252,000 tons of about the same average grade as that quoted above. This therefore represents approximately 15 months' operation at the projected 17,000 tons per month rate.

It is reasonable to assume, moreover, that more ore of similar grade will be found and mined under the same equivalent economics.

About 6,000 to 7,000 tons of ore will be produced and stockpiled during the stope preparation period.

#### Alternate No.2

The mining and milling operation would be reduced to a 300 ton per day rate, on a 5-day week basis, or 6,250 tons milled per month.

Stoping would be conducted on a selective basis and the highest grade ore chosen. Eight stopes out of the present 11 stopes available would be operated on a continuous basis. Cut and fill stoping would gradually replace the present combination of cut and fill, and square set stoping.

The grade of ore to be treated is estimated to be 0.08 ozs. gold per ton, 5.78 ozs. silver per ton, 0.73% copper, 1.37% lead and 6.22% zinc. To calculate this estimate, it has been assumed that the experience encountered during the period January 1st, 1973 to June 30th, 1973 will continue.

The net smelter returns, based on current metal prices, are estimated to be \$24.96 per ton milled, or \$156,000 per month.

On-site operating costs are estimated to be \$167,000 per month.

An on-site operating loss of \$11,000 per month can therefore be forecast before any allowance for Vancouver costs.

### Alternative No.3

All mining and milling operations would be stopped immediately. An orderly shut down procedure would be followed, involving the removal and surface storage of mining equipment, "moth-balling" mill machinery and power units, return of rented buildings and equipment, negotiation of withdrawal from contracts, such as concentrate haulage and Vancouver storage facilities, cancellation of bus transportation arrangements, etc.

The "guesstimated" cost of such a shut down is \$146,800.

Actual costs will no doubt vary considerably from this figure, depending on the outcome of many of the considerations involved.

SUMMARY - ESTIMATED COSTS

Alternative No.1 - 17,000 tons milled per month.

(a) <u>Preparation</u>		
Direct costs - two months		\$341,000
(b) <u>Capital Construction</u>		
(1) Change house	\$30,000	
(2) Tailings dam extension	30,000	
(3) Sand fill installations	<u>30,000</u>	90,000
(c) <u>Vancouver Costs during Preparation Period</u>		
2 months @ \$9,000/month		<u>18,000</u>
		<u>\$449,000</u>
Estimated Net Operating Profit Per Month		<u>\$ 49,900</u>

Alternative No.2 - 300 tons milled per day or 6,250 tons per month

<u>Capital Construction</u>		
(1) Change house	\$30,000	
(2) Tailings dam extension	<u>30,000</u>	\$ 60,000
Operating loss per month		<u>\$ 11,000</u>

Alternative No.3 - Shut Down Costs

Total Estimated	<u>\$147,000</u>
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CONSIDERATIONS

Several extremely important factors must be considered.

Obviously the No. 2 Alternative incorporating an estimated operating loss is not attractive.

It is extremely unlikely that the estimated underground force related to the production of 17,000 tons of ore per

month in Alternative No. 1 can be recruited and continuously maintained.

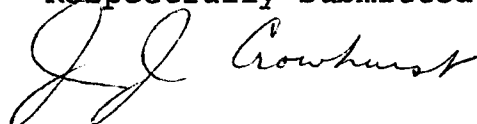
Metal prices have risen substantially in the past few months. Further increases cannot be forecast with any degree of certainty.

Very little is known about the vein areas above the present and proposed stoping areas. Weak spots in the mineralization could be present; these could interfere temporarily with projected production figures, on an individual monthly basis.

Current labour negotiations are not progressing favourably. It has been assumed these would be concluded shortly at a reasonable level. Should relatively large wage increases be necessary, the operating cost estimates will be increased proportionately.

Little or no plus factors can therefore be predicted and many uncertainties on the downside exist. A proper rate of return on new invested capital, relative to continued production as in the first alternative, cannot therefore be forecast with any degree of accuracy.

Respectfully submitted,



J.J. Crowhurst

July 5, 1973

SUMMARY CONCENTRATOR PERFORMANCE

<u>Month</u> <u>1973</u>	<u>Descr.</u>	<u>Au</u> <u>Assay</u>	<u>Ag</u> <u>5 -</u>	<u>Cu</u> <u>025 or</u>	<u>Pb</u> <u>%</u>	<u>Zn</u>	<u>Tons</u> <u>Milled</u>	<u>Recovery</u> <u>%</u>	<u>Mill</u> <u>Operating</u> <u>Hrs. %</u>
May	Feed		4.53	0.41	0.89	4.16	15,303	100.0	91.1
	Cu. Con.		92.47	22.07	5.49	3.34		23.3 Ag 61.5 Cu	
	Zn. Con.		21.62	1.12	7.56	47.39		36.9 Ag 82.9 Zn	
	Tails.		1.97	0.08	0.27	0.51		39.8 Ag	
April	Feed		4.92	0.41	0.90	3.93	15,185	100.0	90.2
	Cu. Con.		91.88	23.40	5.29	3.13		19.3 Ag 58.2 Cu	
	Zn. Con.		24.40	1.17	8.18	47.99		35.8 Ag 88.1 Zn	
	Tails.		2.41	0.10	0.28	0.47		44.9 Ag	
March	Feed		5.02	0.36	1.17	4.77	15,104	100.0	91.9
	Cu. Con.		75.02	22.35	6.04	2.62		11.3 Ag 47.2 Cu	
	Zn. Con.		23.64	1.00	8.38	48.02		41.6 Ag 89.6 Zn	
	Tails.		2.63	0.10	0.37	0.53		47.1 Ag	
Feb.	Feed		5.34	0.54	1.06	4.44	13,504	100.0	91.9
	Cu. Con.		84.31	20.77	5.76	4.08		27.0 Ag 67.6 Cu	
	Zn. Conc.		22.33	0.98	7.72	47.99		33.2 Ag 89.8 Zn	
	Tails.		2.60	0.11	0.32	0.45		39.8 Ag	
Jan.	Feed		6.32	0.60	1.15	5.61	14,260	100.0	64.2 (Short of ore)
	Cu. Con.		91.69	21.48	4.95	5.11		27.7 Ag 68.9 Cu	
	Zn. Con.		22.18	0.88	7.06	49.15		34.7 Ag 90.7 Zn	
	Tails.		2.83	0.11	0.31	0.48		37.6 Ag	



March to December 1972

A S S A Y S

R E C O V E R I E S

	Dry Tons	Ag	Cu	Pb	Zn	Ag	Cu	Pb	Zn
Calc. Head		5.22	0.42	0.84	4.45				
Assay Head.	111,024	5.31	0.42	0.89	4.45	100.0	100.0	100.0	100.0
Cu Con	1,269	104.27	20.93	7.72	4.17	22.8	56.5	10.5	1.0
Zn Con	8,366	23.56	1.18	6.13	46.96	34.0	21.1	54.7	79.5
Tails	101,390	2.47	0.10	0.32	0.95	43.2	22.4	34.8	19.5

BRADINA JOINT VENTURE  
TONS & GRADE OF ORE TREATED. \*  
FIRST HALF 1973

ACTIVE STOPEs	JUNE 1973						JAN. 1st, 1973 - JUNE 30th, 1973					
	Tons	AG.Ozs /Ton	Cu%	Pb%	Zn%	Net Smelter Return	Tons	AG.Ozs /Ton	Cu%	Pb%	Zn%	Net Smelter Return
1-N-1	823	4.60	1.10	2.40	4.92		5,431	5.79	1.37	1.57	3.98	
1-S-2	435	4.02	1.26	1.06	2.07		5,000	6.35	1.40	1.14	3.27	
1-S-8	541	4.20	0.09	1.65	7.40		541	4.20	0.09	1.65	7.40	
1-S-16	493	4.99	0.21	1.17	7.08		1,730	4.78	0.22	1.36	6.25	
1-S-70	1,069	4.90	0.38	1.86	5.55		3,289	5.20	0.31	2.12	5.58	
1-S-22	718	5.39	0.52	1.21	7.10		6,104	5.78	0.43	1.92	7.50	
3-N-11	118	2.37	0.51	1.30	5.03		3,211	3.30	0.54	0.89	3.99	
3-S-8	347	3.84	0.29	0.52	4.59		1,479	4.78	0.47	0.63	4.68	
3-S-16	-	-	-	-	-		836	4.25	0.29	0.79	6.98	
3-S-18	386	3.56	0.19	1.30	6.18		386	3.56	0.19	1.30	6.18	
3-S-20A	773	3.33	0.50	0.79	5.72		3,131	5.62	0.63	0.86	5.16	
3-S-22	22	5.19	0.32	0.96	7.92		1,246	7.00	0.49	1.34	7.68	
3-S-32	220	5.06	0.19	1.19	2.52		2,009	4.95	0.10	1.07	4.36	
3-S-40	344	14.28	0.42	0.58	3.30		1,604	8.52	0.34	1.17	3.87	
3-S-44	262	12.04	0.26	0.74	2.56		3,516	10.29	0.32	0.60	2.06	
3-S-142	-	-	-	-	-		220	8.61	0.85	0.25	0.71	
<b>SUB TOTALS</b>	<b>6,551</b>	<b>5.23</b>	<b>0.50</b>	<b>1.36</b>	<b>5.34</b>	<b>\$21.30</b>	<b>39,733</b>	<b>5.96</b>	<b>0.65</b>	<b>1.25</b>	<b>4.86</b>	<b>\$21.75</b>
<b>CLEAN DOWN STOPEs</b>												
3-N-3	304	4.35	0.72	0.44	5.33		1,697	3.78	0.57	0.52	4.05	
3-S-10	-	-	-	-	-		1,674	7.59	0.73	0.68	5.70	
3-S-12	-	-	-	-	-		1,113	6.99	0.75	0.60	7.29	
3-S-20	287	2.28	0.27	0.45	3.77		2,186	3.38	0.25	0.74	4.52	
3-S-34	-	-	-	-	-		1,244	5.66	0.08	1.73	5.55	
3-S-36	184	16.28	0.52	2.02	5.85		1,949	8.37	0.26	1.82	6.10	
3-S-38	44	8.92	1.60	1.37	8.47		1,836	6.54	0.42	1.68	5.55	
	819	6.55	0.57	0.85	5.07	\$21.74	11,699	5.95	0.42	1.12	5.42	\$21.32
<b>WEIGHTED AVERAGE</b>	<b>7,370</b>	<b>5.38</b>	<b>0.51</b>	<b>1.30</b>	<b>5.31</b>	<b>\$21.36</b>	<b>51,432</b>	<b>5.96</b>	<b>0.60</b>	<b>1.22</b>	<b>4.99</b>	<b>\$21.68</b>

(1) Based on following metal prices:

Gold	\$ 118.90	per oz
Silver	2.58	per oz
Copper	0.69	per lb
Lead	0.194	per lb
Zinc	0.239	per lb
Cadmium	3.578	per lb

\* Based on stope muck samples - note no development or stockpile material included.

BRADINA JOINT VENTURE

PROPOSED RAISING PROGRAM

<u>Stopping Area</u>	<u>Footage</u>
1-N-11	125 feet
1-N-9	125 "
1-S-6	200 "
1-S-8	180 "
3-N-11	75 "
3-S-8	150 "
3-S-10	200 "
3-S-12	200 "
3-S-18	130 "
3-S-20	175 "
3-S-20A	160 "
3-S-34,36 & 38 Prep	<u>120 "</u>
Total Raising	1,840 feet

PROPOSED SUB DRIFTING PROGRAM

1-N-11	150 "
1-N-9	150 "
1-S-6	100 "
3-S-10	150 "
3-S-12	150 "
3-S-20	125 "
3-S-34	120 "
3-S-36	120 "
3-S-38	120 "
3-N-13	<u>100 "</u>
Total Sub Drifting	1,285 feet

BRADINA JOINT VENTURE

ALTERNATIVE #1

Suspend Mill operation and prepare for 17,000 tons per month milled.

(A) ESTIMATED COSTS - PREPARATION PERIOD ON SITE

LABOUR:

<u>Mine</u>	<u>PER MONTH</u>
46 @ 4.36 x 8 x 20.83	\$ 33,421
Bonus 1.80 x 46 x 8 x 20.83	13,800
1 Mechanic	855
1 Bit Sharpener	855
1 Welder	855
1 Electrician	855
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	50,641
Add 9% Labour increase	3,316
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	53,957
Fringe Benefits 15%	8,094
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	62,051
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<u>Surface</u>	
Electrician	855
Mechanical	855
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	1,710
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<u>Mill</u>	
1 Head operator	881
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	2,591
Add 9%	233
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	2,824
Add Fringe Benefits 15%	424
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	3,248
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STAFF	30,000
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TOTAL LABOUR & FRINGE BENEFITS	\$ 95,299
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