Province of British Columbia

MEMORANDUM

To: Bruce McRae

Date: Feb. 13, 1986

896246

Re: Highland Valley Rationalization

1. Points to consider from running at 165 000 tpd.

   1.1 The major problem in my view is technical - to produce at 165 000 tpd from Valley will be very difficult in view of the water problem, the in-pit space problem, the area needed to store waste, and the 'traffic' circulation problem of routing product, to three mills.

   1.2 Another issue that has been raised in the past is the impact of dewatering on the regional water regime; ranchers to the east have shown serious concerns.

   1.3 Mining Lornex ore for Highmont would require a continuation of the present "high grading"; this is not desirable, it sterilizes material that would be ore with a moderate copper price increase.

   1.4 At Lornex, hardness blending was critical to maintaining a good grinding rate in their semi-autogenous circuits.

I am not qualified to comment on Mr. Phillip's other questions.

My opinion is that it would be best to leave the Highmont closed.

W.J. McMillan

WJM/dlb

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

MEMORANDUM

To: Vic Dawson, Chief Inspector - MIE
Bill MacMillan, Manager Geoscience - MGE

Date: February 12, 1986

Re: Highland Valley Rationalization

I have attached a set of questions (posed by Art Phillips, Commissioner of Critical Industries) and answers prepared by Price Waterhouse pertaining to Highland Valley rationalization and, in particular, options for using Highmont mill. Art Phillips will be meeting with the Premier on Tuesday, February 18 and would like our written comments in advance of that meeting. The central issue is whether it makes sense to expand Valley to 165,000 tpl to operate all three (Bethleham, Lornex, Highmount) mills. It seems generally agreed that running Highmont while closing Bethleham makes little sense, if Highmont requires subsidization through Critical Industries Commission. Can you please review this material as soon as possible.

Bruce

Bruce McRae
Director
Mineral Policy and Evaluation

Attachment

cc: ADMM

LOC # 12 Feb. GEO 6
ACTION

W 390

HIGHMONT-VALLEY-LORNEX COMBINATION

In answer to your five questions on using the Highmont mill, we have the following comments. These are no more than hurried thoughts. Any estimate has an error potential of about +50% - 20%.

1. What are the negative aspects of running all three mills at 165,000 t/d?

1.1 Assuming all the ore came from the Valley pit.

1.1.1 Dewatering requirements would be onerous.

Glacial sediment in the northern and northeastern side of the pit contains great quantities of water, and the method of dealing with this water is to drill a number of wells around the periphery of the pit and pump steadily to lower the water table. Without doing this the glacial till walls of the pit would be extremely unstable. The faster the rate of mining the more rapid the installation of wells and the more water must be pumped. As the water is recharged from snow melt and rainfall the problem is a continuous one.

The mining schedule would call for 37 wells to be in operation after two years pumping 16,500 gallons per minute and installed at a capital cost of over 3 million dollars. Each well takes about a month to drill and establish and as there are only two rigs in B.C. to do this kind of work it means that if we started today we would be about half way prepared by the end of the two year period. This first period is most critical in numbers of wells, and this aspect would probably delay getting to 165,000 tonnes per day by a couple of years; i.e. in year four.

1.1.2 Insufficient working area in pit

Valley, Lornex and Highmont have mining equipment suited to their particular pits and individual mining rates. Much of this equipment is fairly small - Valley's four shovels are 13 yd.^{3}; Highmonts three are 15 yd.^{3}; Lornex have five 15 yd.^{3} and have four 22 yd.^{3} machines.

Mining 165,000 tons of ore a day may require moving up to 138 million tonnes of material per year in peak periods. The combined capacity of all of the shovels is insufficient at 132 million tonnes/year. There is insufficient room to operate 16 shovels in a confined pit. Likewise the operation would probably require 40,

rising to 105, 170 ton trucks operating in the same confined area. Enormous centralized maintenance facilities would be required, far greater than any we have at the moment.

1.1.3 At 165,000 tonnes/day (60 million tonnes per year) entire Valley orebody plus marginal low grade material will be exhausted in 14 years. This rapid depletion of the orebody is not in the best interests of any of the three companies.

1.1.4 At some stage the effect of increased volume on cash flow has to diminish and then start becoming a penalty. It is probable that at 138 million tonnes per year this point has been surpassed especially considering the size of the Valley pit both now and in the next five years.

In a survey of large open pit copper mines production at 60 million tonnes/year tonnes milled compares as follows:

160% of Chuquicamata
205% of Palabora
154% of Bingham Canyon
144% of Bougainville

All of these mines have taken years to achieve their current production rates. To expect an instant expansion to 1 1/2 times these mines is naive.

1.2 Assuming the 40,000 tonnes for Highmont comes from the Lornex pit.

1.2.1 The reserves of the Lornex 80¢ U.S. copper pit are 247 million tonnes grading 0.33% copper and 0.013% molybdenum. To mine this pit requires a strip ratio of 0.52:1 overall. Lornex has a second pit requiring a 95¢ U.S. copper price. This gives additional reserves of 202 million tonnes at 0.29% copper and 0.012% molybdenum.

1.2.2 Assuming mining the 80¢ pit only over 17 years the following is the expected schedule.

Years	Ore Milled x 10^3/yr.	% Cu.	% Mo.	Ag oz./T	Waste	Strip Ratio
1-10	14,600	0.335	0.013	0.027	12,094	0.83:1
11-17	14,600	0.332	0.012	0.027	1,146	0.08:1

We have looked at two ways to get ore to the Highmont pit. Firstly by trucking and secondly by conveyor belt.

1.3 Truck haulage to the Highmont mill.

1.3.1 A road between the Lornex pit and the Highmont mill has been estimated at 4.8 kms. Grades have been estimated, and a centre of gravity of the ore mined from the 80¢ pit has been used to estimate a haulage cost.

1.3.2 Capital cost estimate to build the road is half million dollars. (Based on our cost to build the haul road to the Valley.) Thirty-two trucks will be required. Highmont has 16, and it is assumed that the balance would come from the parked Lornex 120 ton trucks.

1.3.3 Operating cost is estimated at:

Mining	$2.58
Milling	1.88
O/H	0.30
	$4.76/tonne or $69.5 million/year.

1.3.4 Metallurgy will be
Copper production 94,479,000 lbs. (91,408,000 saleable)
Cost/lb. = $0.74 CAD/lb.
Using an exchange rate of 1.3582
= $0.54 US/lb. produced
or $0.56 US/lb. saleable.

1.3.5 Projected cash flow per pound at 70¢ US price:- 10 year scenario

		U.S. ¢
	Copper	0.70
	Moly equivalent	0.10
	Ag equivalent	0.03
	Sub Total	0.83
Deduct	Treatment & Refining	0.12
	Freight	0.05
Net Revenue		0.66
Production Cost		0.56
Cash Flow		0.10

Cash flow per year $12.4 million U.S.

No account has been made for depreciation, depletion or interest on debt.

1.4 Conveyor belt to the Highmont mill.

Power required for this belt has been estimated at 3500 HP and have an average power draw of 2MW.

Power cost 4¢ per tonne.

1.4.1 The length of a conveyor belt from the Lornex crushers to the Highmont mill has been estimated at 3 kms. Elevation difference is 200m.

At 40,000 tonnes/day belt capacity is 3,000 tonnes/hour.
Belt width 48".
Based on Wrights estimate @ \$23.45 x 10^6 for a seven kilometer belt, the capital cost here is prorated at ten million dollars.

1.4.2 One of the two crushers at Lornex is assumed available.

1.4.3 Operating cost is estimated at (per tonne milled)

Mining	\$1.93
Milling	1.88
O/H	0.30
	\$4.11 or \$60 million/year

1.4.4 Using the same logic as for the haulage case the cash flow is calculated at \$16.5 million U.S. per year.

1.5 General comment on the Highmont mill.

Cominco through CESL started to take a critical look at the Highmont mill in the spring of 1985. CESL was commissioned to develop an action plan for a feasibility study of using the Highmont mill for Valley ore.

Two large questions emerged from this process requiring the following action (which has not been taken to date)

a) Evaluation of the design and condition of the existing autogenous primary grinding mills to ensure their suitability as semi autogenous mills at the anticipated output.

b) An assessment of the tailings disposal potential in the existing pond and an appraisal of the alternatives for the longer term.

These two questions are equally important for treating Lornex ore.

In order to increase the throughput of the Highmont mills a capital expenditure in the order of 12 million dollars was estimated.

Also, additional floation capacity would be required to treat the increased concentrate production.

Lornex are particularly concerned with the hardness of their ore and have identified five grades of hardness with vastly different potential for making tonnage through their SAG mills. What effect this would have on throughput of the Highmont mill is unknown, but given the similarly of the mills the effect could be significant, casting doubt on the ability to grind the Lornex ore at 40,000 tonnes per day.

2. How many jobs are there in the leaching operations?

2.1 Number of men employed in proposed leaching, solvent extraction and electrowinning facility = 15.

2.2 A minimum of two years would be required from preliminary design to operation.

3. What is the power consumption for leaching?

3.1 The overall power consumption is expected to be 1.6 kw^h/lb copper produced. The anticipated 11 million lb. annual production would require 2 megawatts.

4. What are the jobs now for Valley and Lornex? How many construction jobs will be created, and what will be the job total for all three mills combined?

4.1 Present Strengths

	Staff	Hourly	O&T	Total
Valley	66	364	22	452
Lornex	125	671	56	852

4.2 Combined operation (very preliminary figures, assuming one organization)

	Staff	Hourly	O&T	Total
1. Valley/Lornex combined	135	936	35	1176
Highmont - Haulage	37	310	22	369
Total	172	1246	57	1475
2. Valley/Lornex combined	135	936	35	1176
Highmont - Conveyor	37	274	22	333
Total	172	1210	57	1439

4.3 Construction jobs. (Very very preliminary)

The Valley/Lornex combination has estimated 200 construction jobs.

The Highmont concentrator upgrading will give jobs to about 100 construction workers.

A conveyor between Highmont and Lornex would create about 50 construction jobs but this work may be performed by the 200 construction workers at Valley/Lornex.

5. What is the cost of moving the Highmont mill to the Lornex site excluding purchase price? What would this cost be amortized over 15 years?

5.1 The cost of moving the mill has been estimated by two separate groups as follows: (Both estimates are +50% - 10% error margin)

	Millions of Dollars	
	Group 1	Group 2
Site Development	5.5	9.5
Site Services	2.6	3.5
Mine Production (crusher)	10.5	9.0
Concentrator	20.8	23.0
Concentrator Services	22.1	14.5
Labour cost to dismantle	Included	5.0
Mine Services	-	3.0
Sub Total	61.5	67.5
Indirects	24.6	42.5
Total	86.1	110.0
Contingency 50%	43.0	55.0
Total	129.1	165.0

Group 1 estimates 4 million dollars is included in the estimate to bring the mill to 40,000 tonne/day capacity.

5.2 Amortized over 15 years at 12% interest.

Millions $

Moving Cost	Annual Payment
129.4	18.6
147.2	21.2
165.0	23.8

From the above it would appear the annual amortization payment approximates to the margin from mining the Lornex orebody and processing it in a relocated mill.

ADM:sam

86/A6-6.5