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PRELIMINARY REPORT
on the
PHOENIX MINE

J. H. PARLIAMENT

May 12, 1956

THE GRANBY CONSOLIDATED M.S. & P. CO. LIMITED

C O P Y

Grand Forks, B.C.

May 12, 1956.

Mr. L. T. Postle,
The Granby Cons. Mining, Smelting & Power Co.Ltd.,
1111 West Georgia Street,
Vancouver 5, B. C.

Dear Sir:

I submit herewith a preliminary report on the Phoenix mine, near Grand Forks, B.C. This report was prepared to investigate the economics of mining the ore remaining from the previous operations of the Granby Company at Phoenix.

Operating costs were worked out in collaboration with Mr. J. A. C. Ross. Milling tests on the Phoenix ore were done by the Granby staff at Allenby.

Respectfully submitted,

J. H. PARLIAMENT,
CHIEF ENGINEER.

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Summary and Conclusions

The Phoenix mine is well situated for a low cost, open-pit mining operation based on a 500 ton per day concentrator. Study of the records of the previous operation by the Granby Company, and examination of the ground indicate that more than 1,000,000 tons of mineable ore still exists in the Knob Hill - Ironsides area. This ore will grade about 1% copper and contain about $1.00 in recoverable gold and silver. The broken nature of the ground due to old workings, precludes proving this tonnage by diamond drilling. Recent drilling of the Snowshoe pillar blocked out 300,000 tons of ore grading 0.92% copper with about $1.00 in recoverable gold and silver values. In addition, a possible zone of underground ore north of the Victoria Shaft, as indicated by past drilling, is worthy of further investigation.

With copper at 30¢ per pound it would require about seven years to repay the capital investment at no interest. With copper at 35¢ per pound or higher, the property is attractive.

Location

The Phoenix mine is located in the Boundary District in south-eastern British Columbia about seven miles north of the International Boundary. It is four miles east of Greenwood and about eight miles north-west of Grand Forks. It is reached by six miles of steep, winding gravel road from Greenwood, or by thirteen miles of pavement and six miles of dirt road

from Grand Forks. The camp is at an elevation of 4500 feet above sea level; 2000 feet higher than Greenwood and 2750 feet higher than Grand Forks.

The Canadian Pacific Railway passes through both Greenwood and Grand Forks. These towns are also on Highway 3, the Southern Transprovincial Highway.

History:

The Boundary District, from 1900 to 1918, was the major copper producing centre in British Columbia, and for some years during this period held the leading place in Canada. The principal producers were the mines of Granby Company at Phoenix.

The main Granby mines were the Knob Hill - Ironsides, Victoria, Gold Drop and Snowshoe. These mines were worked from shafts and numerous adits. The large flat-lying ore bodies were mined chiefly by glory holes and room-and-pillar stopes, requiring much lateral development. The various mines were interconnected underground and although some sections are caved or are full of ice, many of the old workings are still accessible. In 1915 open-pit mining, using an electric shovel on rails, was started at the Knob Hill - Ironsides. This method, which reclaimed pillars left from early mining, as well as mining new ore, was successfully continued until the close of the operations in 1919.

Ore from Phoenix was transported by railway to the Granby Smelter at Grand Forks. Two railways, the C.P.R. and the Great Northern, had lines up the mountain to Phoenix competing for business.

Between 1900 and 1919, according to the B.C. Minister of Mines Reports, Phoenix produced:

	Tons Ore	Copper %	Gold Oz/ton	Silver Oz/ton
Knob Hill, Ironsides, Victoria, Gold Drop	13,724,774	1.14	0.047	0.28
Snowshoe	600,904	1.16	0.069	0.26

In addition to the Granby mines, the nearby Rawhide, Brooklyn, Stemwinder and Monarch mines produced substantial tonnages of ore.

In 1919 a prolonged strike in the Crow's Nest Pass coal fields caused a shortage of coke and subsequent stopping of smelting operations. Because of this and the general unfavorable economic situation, the Phoenix mines and the Grand Forks smelter were permanently closed in June, 1919.

When the Granby Company faced the possibility of liquidation after the closing of Anyox in 1935, the Phoenix claims were purchased from the company by W. E. McArthur of Greenwood. Mr. McArthur successfully mined a small tonnage of high grade ore from the property between 1936 and 1942. In 1955, when increasing prices stimulated interest in copper mining, Granby optioned the property from McArthur.

Climate and Topography

Phoenix is in the "dry belt" of British Columbia. Rainfall is light and temperatures are fairly moderate. During the winter of 1955-56, which was reportedly exceptionally severe, snowfall to a depth of more than five feet and temperatures to 20° below zero were observed. The usual maximum depth of snow is about three feet, which would not interfere greatly with year-round mining. Temperatures below zero do not normally persist for more than a few days at a time.

The local topography is a series of uniform, gently rounded ridges and hills, usually open on the south sides and heavily timbered on the north.

Water

Because of the light precipitation, water in the district is not plentiful except during Spring run-off. The main streams are Boundary and July Creeks, which are both tributaries of the Kettle River. Close to Phoenix are the headwaters of Twin, Providence and Fisherman Creeks. Irrigation is necessary on the farms in the district and the water resources are already heavily licenced.

Water for the operation of a concentrator at Phoenix is a serious problem, but preliminary study indicates that a sufficient supply can be obtained close by. A storage basin can be made by damming the outlet of Providence Lake. Water will be pumped from the old mine workings, Twin Creek and Fisherman Creek during most of the year, and the stored water used during dry periods. It will also be very important to reclaim and re-use as much water as possible from the concentrating process.

In the event of an insufficient local supply, water could be pumped from Boundary Creek. Because of the distance and the height this water must be pumped, an expensive installation would be required. It is unlikely, however, that this situation will arise.

Water licences have been applied for on all practical sources. These are presently being processed by the Water Branch, at Victoria.

Timber

One of the main industries of the district is lumbering. The immediate area has been fairly well logged off and logs are now brought by truck and rail for considerable distances to the mills. Sawmills located at Greenwood, Grand Forks and Midway would afford an ample supply of rough or finished lumber a short distance from the mine. The chief woods are pine, tamarack and fir.

Power

Electric power for the district is supplied by the West Kootenay Power and Light Company. Their main transmission line passes through the Phoenix property and it is assumed that this would be the source of power for the operation.

Claims and Land

A group of 22 claims and fractional claims, chiefly crown-grants, has been optioned from W. E. McArthur. These claims are to be paid for on the basis of $100 per month the first year, $200 per month the second year, $400 the third, $800 the fourth and so on until a total price of $110,000 has been paid.

Five claims have been leased from the Crown by Granby and six claims are held by location.

In addition, an option has been obtained on a farm which will afford suitable storage for tailings. The cost price of this is $3,000.

Ore Reserves

The Phoenix workings and the area around them was quite thoroughly drilled and explored by the Granby Company and the other previous operators. A detailed geological mapping

program and geophysical survey was recently carried out by Attwood Copper Co. Except for the Victoria Extension, mentioned later, no important ore was found. It is therefore believed unlikely that further work will discover any new major ore bodies. The ore to be mined at Phoenix might be termed chiefly salvage. The main potential sources are:

(1) The Knob Hill - Ironsides open pit area.

(2) The Snowshoe pillar.

(3) Possible underground ore north of the Victoria Shaft.

Study of the old Granby reports and records shows that the Phoenix mines were not closed because of shortage of ore, although their life was thought to be limited.

In his report for 1919, C. M. Campbell states:

"The ore now remaining amounts to 2,513,637 tons. This is the remnant from 15,391,910 tons originally blocked out. This ore remaining will have a content of 1% copper and 75 cents* in gold and silver."

(1) Knob Hill - Ironsides area

Ore shipments from the Knob Hill - Ironsides pit during the last years of operation graded:

Year	Copper %	Gold oz/T	Silver oz/T
1918	0.95	0.028	0.20
1917	1.00	0.027	0.25

Examination of the present face of the pit reveals a skarn zone well mineralized with chalcopyrite. It is evident that ore approximately 1% copper was being mined at the

* Approximately $1.25 at current prices.

cessation of operations.

This area is badly cracked and shattered by the subsidence resulting from the previous mining. It is therefore impossible to obtain information as to tonnage and grade by diamond drilling. The data in the old Granby records and observations of the existing pit and workings, however, indicate the existence of more than 1,000,000 tons of ore which will grade about 1% copper and contain about $1.00 in precious metals. This ore can be mined relatively cheaply by open pit methods.

(2) Snowshoe Pillar

The Snowshoe or "railway" pillar is a section of ore left during the working of the Snowshoe mine to allow the C.P.R. access to Phoenix. This area was recently tested by diamond drill holes spaced at 50 foot intervals and all the accissible workings surveyed and mapped. This work blocked out 291,583 tons of ore grading 0.92% copper, 0.03 oz/ton gold and 0.20 oz/ton silver. There is a possibility of additional ore along the east edge of the pillar and this area is being diamond drilled at present. For purposes of calculation, a mining grade of 0.90% was used for the Snowshoe ore.

(3) Victoria Shaft Area

During 1951 and 1952 an extensive program of geological mapping and diamond drilling was done by Attwood Copper Mines Ltd. at Phoenix, and in the surrounding district. Drilling in the area north of the Victoria Shaft indicated the possibility of an ore zone. Intersections in Attwood drill holes and nearby old Granby holea are:

Drill Hole No.	Width (Ft.)	% Copper	Oz/ton Silver	Oz/ton Gold
A6	2.8	2.10	0.65	0.01
A8	20.0	2.07	0.55	0.1275
A9	16.0	1.375	0.20	0.011
G649) G650)	20.0	0.775	0.12	0.02
Average		1.44	0.31	0.058

Further drilling to test this ore would be done after the mine was in operation. Recovery of this ore, which is too deep for open pit methods, would require underground mining.

Mining

It is proposed to mine the Snowshoe and Knob Hill - Ironsides ore by open pit methods. Both ore bodies are well situated for this method, with relatively easy access to the ore. Some difficulty is anticipated in mining around the old Snowshoe stopes, but this problem is not serious.

Calculations based on drilling and surveying show the Snowshoe ore to have a stripping ratio of 1.2 tons of waste to one ton of ore. By removing 200,000 tons of waste during the pre-production period this ratio would be reduced to 0.51 tons of waste to one ton of ore for the operating period.

Records of ore and waste mined by the electric shovel during the old Granby operation were used to calculate the stripping ratio for the Ironsides pit. For the life of the pit, from 1915 to 1919, 1.33 tons of waste were removed for each ton of ore mined. In 1919 this ratio was 1.29 waste to one ore. For cost calculations a ratio of 1.3 waste to one ore was used.

Mining costs are estimated to be:

Snowshoe

	Ore	Waste	
Breaking	0.40	0.40	
Loading	0.12	0.12	
Hauling	0.12	0.05	
Bulldozing, roads, etc.	0.12	-	
	$0.76	$0.57	per ton

Direct cost per ton mining (.76 + .29)	1.05
Indirect	.42
Total	$1.47

Knob Hill - Ironsides

Ore $0.76 per ton, waste $0.57 per ton

Direct cost per ton mining (0.76 + .74)	1.50
Indirect	0.42
Total	$1.92

The lower cost per ton for Snowshoe mining results from charging part of the waste removal as a pre-production expense, whereas for Ironsides mining, waste removal is treated as an operating cost. In addition to mining costs, a charge of $0.27 per ton is allowed for exploration.

Mining is assumed to be at a rate of 3500 tons per five-day week to supply a 500 ton per day concentrator operating seven days per week.

Concentrator

A concentrator capable of milling 500 tons of ore per day is proposed. This concentrator would be located at Phoenix approximately equidistant from both open pits. The proposed site is a flat area with rising ground to one side, and with numerous exposures of bed rock for good foundations. Ore would

be hauled by truck a distance of less than a mile from each pit on nearly level roads. Tailings would flow eastward about one mile to an old farm where they would be impounded. This farm land is estimated to afford sufficient storage for more than 2,000,000 tons of tailings. Concentrates would be hauled about six miles to Greenwood, where they would be loaded into railway cars and shipped via C.P.R. to the smelter at Tacoma.

Experimental milling tests at Allenby on samples of Phoenix ore indicate a recovery of 90% with concentrates containing 25% copper. Recovery of gold and silver values to date has been 85%. Further test work is being done and it is expected that these results will be improved upon in practice.

Buildings

Buildings for warehouse, engineering office, change-house and assay office would be erected near the concentrator. Suitable office space at a reasonable rent is presently occupied in Grand Forks and it is proposed to keep the main office there.

Housing

Housing for staff or crew is almost non-existent on a rental basis in either Grand Forks or Greenwood. However, a number of houses are available for purchase in Grand Forks and possibly a few might be obtained in Greenwood. Prices are very reasonable and although the houses are old and would require some repairing or renovating, the cost would be less than new buildings. It is planned to have the staff live in Grand Forks, which is about 30 minutes drive from Phoenix. If housing can be

obtained in Greenwood, most of the mill operators and mechanics would live there.

Miners, truck-drivers and most of the labor force would be recruited from the district. Most of these men would already have homes within driving distance of Phoenix.

Total cost for housing is estimated to be $81,000. The economy of Grand Forks is fairly stable as it is not based on any one industry. At the termination of operations at Phoenix it would be possible to realize a partial return of the housing cost by resale.

CAPITAL COST ESTIMATE - PHOENIX MINE

(With 500 Tons per day Concentrator)

Surface		
Concentrator	$ 550,000	
Main Water Supply	60,000	
Repair Shop	11,000	
Repair Shop Equipment	16,500	
Powder Magazine	2,000	
Office Warehouse & Engineering Office	20,000	
Engineering & Office Equipment	4,000	
First Aid Equipment	1,000	
Dry and Damp Room	18,000	
Assay Office	3,500	
Assay Office Equipment	2,000	
Power Distribution	50,000	
Concentrate Loading Ramp	2,500	
Core Shed, Tool Sheds, etc.	2,000	
Water Tanks	5,000	$ 747,500
Mine Equipment		
2 - G-D "Air Trace" with 4½" drills	$ 22,000	
5 Jack Legs	3,500	
Compressor and Equipment for 1400 cfm	35,000	
Compressor House	5,000	
Hose, Pipe, Steel, etc.	4,000	
Cat Tractor	18,000	
3 - 1/2 ton Pickup Trucks	7,200	94,700
Housing and Real Estate		
Houses (bought & renovated) 3 @ $7000	$ 21,000	
Houses do 9 @ $5000	45,000	
Houses (new) 1 @ 15000	15,000	
Land for Damsite, Marshall Lake	1,000	
Tremblay Ranch	3,000	
Right of way - Pipelines, etc.	2,000	87,000
Pre-Production		
Roads	$ 5,000	
Tailings	6,000	
Pre-Production Administration	35,000	46,000
Working Capital		
Warehouse	$ 75,000	
Operation for 4 months	190,000	
Pre-production Stripping	114,000	379,000
Total		$1,354,200
Contingencies - 15%		203,000
Cost of Property		114,000
Devel. Expense to Date		50,000
Total Est. Capital Cost		$1,721,200

Estimated Profit and Loss Statement

Snowshoe Pillar - Phoenix

Ore Reserves - Tons	291,583		
Tons ore to be treated per year	180,000		
Life with existing Ore Reserves	1.61		
Grade - % copper	0.90		
Est. Recovery %	90		
Pounds of Copper recovered per ton treated	16.2		
Price per pound of Copper - cents	.30	.36	.43
Value of Copper recovered per ton ore	$4.86	$5.83	$6.96
Value of Gold & Silver recovered per ton ore	1.05	1.05	1.05
Total value metal recovered per ton ore	$5.91	$6.88	$8.01
Less all charges against concentrates @ 7.9¢ per pound of Copper	1.28	1.28	1.28
Net value per ton of ore after treatment	$4.63	$5.60	$6.73
Net value of annual production after treatment	$833,400	$1,008,000	$1,211,400
Less: Operating Costs			
Mining $1.47 per ton			
Expl. & Devel. 0.27			
Milling 1.20			
Administration .23			
$3.17 x 180,000	$570,600	$ 570,600	$ 570,600
Annual Operating Profit	$262,800	$ 437,400	$ 640,800
Profit from Known Snowshoe Ore	$423,100	$ 704,200	$1,031,700

Ironsides Pit - Phoenix

Ore Reserves	1,000,000+		
Tons to be treated per year	180,000		
Grade % Copper	0.95		
Est. Recovery %	90		
Pounds of Copper per ton treated	17.1		
Price per pound of Copper - cents	.30	.36	.43
Value of Copper recovered per ton ore	$5.13	$6.15	$7.35
Value of gold and silver rec. per ton ore	0.99	0.99	0.99
Total Value metal recovered per ton ore	$6.12	$7.14	$8.34
Less all charges against concentrates @ 7.9¢ per pound of copper	1.35	1.35	1.35
Net value per ton of ore after treatment	$4.77	$5.79	$6.99
Net value of Annual Production after treatment	$858,600	$1,042,200	$1,258,200
Less: Operating Costs			
Mining $1.92			
Expl.& Devel; .27			
Milling 1.20			
Administration .23			
$3.62 x 180,000	$651,600	$ 651,600	$ 651,600
Annual Operating Profit	$207, 000	$ 390,600	$ 606,000