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LADNER CRK PROP. N MINER 20 APRIL-78

92H/11W

92H/NW

Carolin Mines drills B.C. gold property

VANCOUVER – Sufficient drilling is expected to be completed within a month to re-evaluate the grade and tonnage of potential minable blocks north of 700 crosscut and along the next two thirds of the length being explored underground at the Carolin Mines gold property near Hope, B.C.

Underground drilling is scheduled to be upgraded to two drills working three shifts per day, and an additional 30 holes are planned during next phase of drilling, D. R. Cochrane, consultant, reports.

Just over one million tons grading 0.122 oz. gold per ton at 0.05 oz. cut-off grade have been indicated to 700 north point, about one third of the length of the decline. There is a considerable amount of higher grade material at higher cut off levels, he said.

A total strike length of 1,180 ft. has been explored to date and the zone is open to north.

GCNL #151 8-AUG-78 CAROLIN MINES LTD. 92H/11W 92H/NW

PRODUCTION FINANCING SUBJECT OF "AGREEMENT IN PRINCIPLE" - Carolin Mines Ltd. has advised that it is negotiating with Aquarius Resources Ltd. and four other companies, the Aquarius Gold Group, with respect to the financing of the Carolin Ladner Creek gold property near Hope, B.C. including financing for underground exploration, feasibility studies, and if acceptable, development financing to place the property into production.

Agreement in principle has been reached with the Aquarius Gold Group. However, it is subject to finalization of details and execution of formal documentation and regulatory authorities' approvals.

92HNW007

CAROLIN MINES LTD. **PRECAMBRIAN SHIELD RESOURCES LTD.**

AN IMPORTANT ANNOUNCEMENT SCHEDULED FOR EARLY IN 1976 ON THE GOLD MINE -- Orval Gillespie, president of Carolin Mines Ltd., has announced that the company and Precambrian Shield Resources Ltd., project manager for the Carolin gold mine, 10 miles east of Hope, B.C. will make an important announcement concerning plans for further development early in the new year.

Mr.Gillespie said,"The third year of work on Carolin's gold-rich property, ... saw the completion of a 39-hole diamond drilling program on the property's Idaho zone and the combination of drill-indicated and geologically-inferred estimates of the gross tonnage of the replacement-type deposit climb to better than three and one half million tons of gold bearing ore grading 0.114 troy ounce per ton.

"Crews also pushed on beyond the Idaho zone to two new targets - the underground workings of the old Pipestem Gold Mine, and the anomalies discovered by company geologists in the area close to McMaster's Pond, 3500 feet north of the Idaho zone. Some 7,000 feet of access road was constructed and a total of 1,600 feet of diamond drilling carried out. Surface sampling and trenching have produced chip samples grading up to .54 oz. gold per ton and there are strong indications that another replacement type gold deposit similar to that located in the Idaho zone exists in the area of the McMaster Pond."

In addition, Carolin acquired a 100% interest in the 21-claim Hill's Bar Mine which adjoins the rest of the property to the northeast. On these new claims, angular native gold has been discovered in 15 bulk samples dug from widely spaced test pits across the valley of Qualark Creek. Analysis of the concentrates from these bulk samples is now underway.

92 H/NW - 11E

3

STATEMENT OF DEFERRED EXPLORATION AND RELATED EXPENDITURES
(Without audit)

PRECAMBRIAN SHIELD RESOURCES LIMITED

Six months ended May 31, 1975
(With comparative amounts for 1974)

	1975	1974
Exploration and Development:		
Prospecting and development	$ -0-	$ 6,261
Share of expenditures under exploration agreements	60,135	95,314
Less *Recovery from sale of equipment* and supplies	37,352	-0-
	22,783	101,575
Administration:		
Salaries and benefits	14,736	13,864
Travel	969	1,218
Dues and fees	1,100	1,872
Telephone and telegraph	532	507
Rent and utilities	3,213	1,508
Legal and accounting	4,439	32,217
Office	1,026	1,070
Registrar and transfer fees	1,462	893
Printing and stationery	828	6,417
Loss on disposal of automobile	3,073	-0-
Other	1,373	2,134
	32,751	61,700
Interest income and other recoveries	18,680	17,220
	14,071	44,480
NET EXPLORATION AND RELATED EXPENDITURES	36,854	146,055
Balance deferred at beginning of period	531,390	280,287
	$568,244	$426,342
Summary:		
Exploration expenditures, less amounts transferred to deficit on abandonment of mineral claims	$523,222	$358,340
Administration	149,123	140,735
Interest income and other recoveries	(104,101)	(72,733)
DEFERRED EXPLORATION AND OTHER RELATED EXPENDITURES	$568,244	$426,342

STATEMENT OF CHANGES IN FINANCIAL POSITION
(Without audit)

PRECAMBRIAN SHIELD RESOURCES LIMITED

Six months ended May 31, 1975
(With comparative amounts for 1974)

	1975	1974
Source of funds:		
Issue of common stock	$ -0-	$389,000
Dividends received from affiliated company	6,061	-0-
	6,061	389,000
Use of funds:		
Net exploration and other expenditures	36,854	146,055
Equipment additions	(82)	2,586
Purchase of interest in non-producing petroleum and natural gas permits	-0-	1,706
	36,772	150,347
INCREASE (DECREASE) IN WORKING CAPITAL	(30,711)	238,653
Working capital at beginning of period	375,827	(6,252)
WORKING CAPITAL AT END OF PERIOD	$345,116	$232,401
Represented by:		
Current assets	$345,116	$232,401

APPROVED BY THE BOARD:

Earl E. Curry Director

Walter E. Clarke Director

PROPERTY FILE

PRECAMBRIAN SHIELD RESOURCES LIMITED

INTERIM REPORT

TO THE SHAREHOLDERS:

The major work conducted to date this year by your Company in equal participation with Numac Oil & Gas Ltd. was surface diamond drill exploration on this 78 claim gold property on Ladner Creek, 10 miles north of Hope, B. C. Six holes amounting to 5603 feet have been completed on the Idaho Zone, supplementing the 33 holes previously drilled by Carolin Mines Ltd., to bring the total footage to 21,876 feet. The program provided additional geological and tonnage and grade information at the north end of the zone, as well as fill-in data at other critical locations. The results of the total program are presented in the accompanying *Diamond Drill Hole Plan and Assay* Summary.

Hole No. 34, the first drilled by Precambrian-Numac, was collared 200 feet east of Hole No. 33, the then most northerly test, and encountered comparable excellent grades and widths. Hole No. 36, 150 feet west of Hole No. 33, suffered severe deviation and entered greenstone, west of the Ladner Creek host rocks, above the projected location of the Idaho Zone.

Hole No. 37 was an adventuresome 1600 foot deep test, 340 feet north of previous information, confirming that both the Upper and Lower Idaho Zones persist with no apparent interruption to this point, almost 1500 feet north of where the Upper Zone outcrops at surface. Gold values were sub-economic over moderate widths in both zones. Hole No. 35 was a fill-in along the eastern margin of the zone, while Hole Nos. 38 and 39 tested the geologic environment southwest of Hole No. 23. It is believed that the assay and geologic data now at hand will not be appreciably enhanced by further surface diamond drilling at this stage and this phase of the overall property exploration program has been terminated.

Drill indicated reserves on the Idaho Zone have been up-dated and are now estimated at 1,750,000 tons grading 0.114 ounces gold per ton, using a cut-off grade of 0.05 ounces gold per ton, or 1,000,000 tons averaging 0.157 ounces gold per ton using a cut-off of 0.09 ounces gold per ton. When combined with geologically inferred reserves at least double the tonnage of both grade categories may be anticipated.

A preliminary cash flow projection for a 2,000 ton per day production operation treating ore grading 0.157 ounces gold per ton showed that a satisfactory operating profit could only be achieved prior to deduction of the provincial "super" royalty or mineral land tax. For this reason it has been decided to defer an underground bulk test of the Idaho Zone for the present.

Exploration of other important mineralized zones is now in progress. The gold geochemical anomaly, near McMaster Pond, 3500 feet north of the Idaho, will be detailed and tested for possible expansion to the north by geochemical, geological and magnetometer surveys. The Montana and Pipestem Zones will receive further surface attention in addition to opening up the old underground workings *for examination and sampling. In the* mid 1930's, 1650 tons grading 0.165 ounces gold per ton were mined from the Pipestem on a quartz vein system containing shoots of high-grade free gold. Of considerable importance is reference in Government publications to heavy sulphide mineral*ization in the wallrocks which* could more than double mining widths. A recent grab sample of this material taken from the dump assayed 0.28 ounces gold per ton and 0.14 ounces silver per ton. Surface diamond drilling will be resumed as targets are developed.

Upon Precambrian-Numac's *election to place the property* in production, Carolin Mines Ltd. (N.P.L.) may maintain a 40% interest in the property by contributing its share of all expenditures over and above $880,000, or may revert to a 20% net profits interest.

In summary, we have no hesitation in restating our view that the Ladner Creek property is one of very considerable merit, with an excellent chance of being brought into production, creating employment and bearing a reasonable tax burden. A substantial increase in the "basic value" for gold, used in the calculation of "super royalty", would have a greater net effect on the viability of a future operation than additional positive exploration and development results. In the meantime we are persevering with exploration of the property, short of undertaking a major underground program. Precambrian Shield Resources Limited and the vendor company, *Carolin Mines Limited (N.P.L.)* are both British Columbia incorporated junior companies who do not presume to question the authority of Governments' right to set taxation levels. We prefer to believe that the Government will recognize the validity of our concern and will take the *necessary corrective measures.*

On behalf of the Board

Earl E. Curry

July 16th, 1975
EDMONTON, Alberta

EARL E. CURRY
President

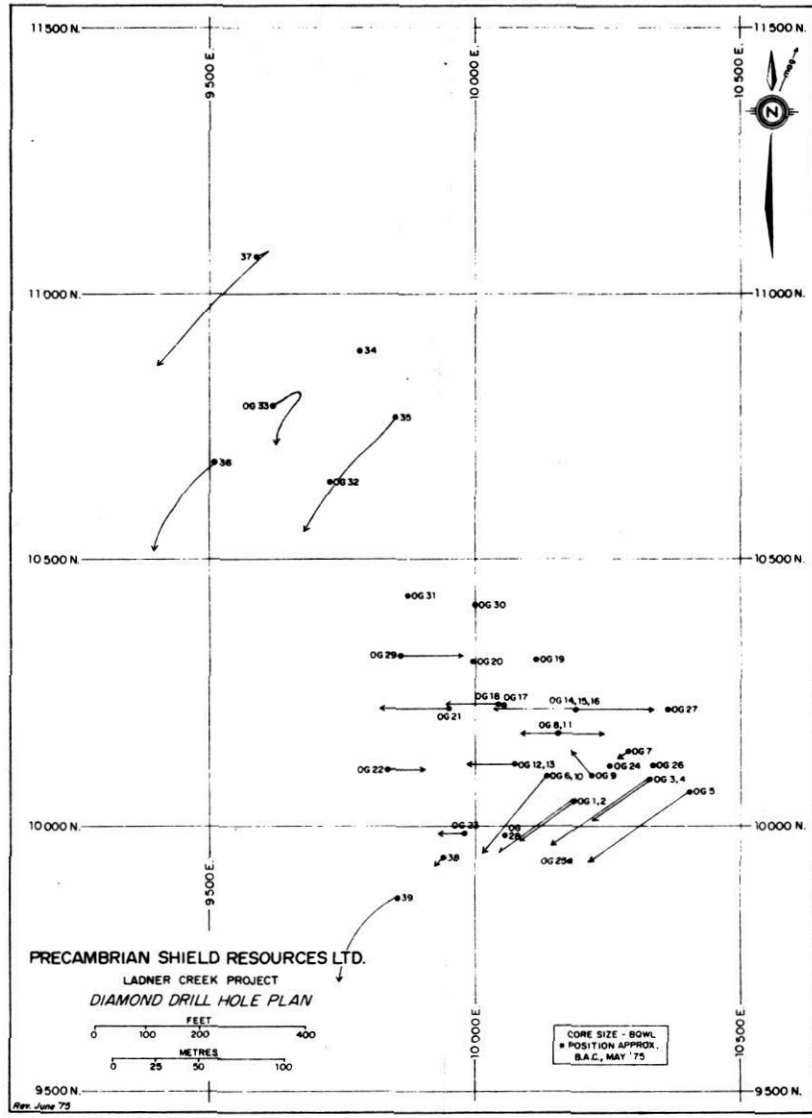
2000 t.p.d. = 700,000 t.p.y.
1,000,000 t = 3 yrs.

IDAHO, AURUM
92HNW003 (11W)
-07

* Lower Zone

DIAMOND DRILL ASSAY SUMMARY

				CUT-OFF GRADE 0.05 ozAu/ton ASSAY INTERSECTIONS				CUT-OFF GRADE 0.09 ozAu/ton ASSAY INTERSECTIONS			
D.D.H. #	AZIMUTH	DIP	DEPTH	FROM	TO	LENGTH	OZAU/TON	FROM	TO	LENGTH	OZAU/TON
1	234°	-35°	228	16.9	146.0	129.1	0.129	16.9	95.0	78.1	0.169
2	234°	-60°	267	11.0	116.0	105.0	0.201	11.0	86.8	75.8	0.247
3	235°	-40°	301	NO SIGNIFICANT INTERSECTIONS							
4	235°	-65°	305	67.0	72.5	5.5	0.065	NO		INTERSECTIONS	
5	235°	-40°	297	187.2	192.8	5.6	0.060	NO		INTERSECTIONS	
6	220°	-55°	336	87.0	214.9	127.9	0.066	93.1	143.1	50.0	0.101
7	ABANDONED										
8	90°	-75°	267	177.3	252.1	74.8	0.104	181.5	206.1	24.6	0.229
9	320°	-70°	155	18.1	145.0	126.9	0.078	109.5	139.2	29.7	0.169
10	---	-90°	223	86.0	213.4	127.4	0.130	86.0	213.4	127.4	0.130
11	270°	-80°	438	177.8	241.8	64.0	0.083	225.9	241.8	15.9	0.196
12	---	-90°	266	166.4	249.7	83.3	0.075	166.4	179.5	13.1	0.104
13	270°	-75°	338	169.3	232.6	63.3	0.086	169.3	180.6	11.3	0.256
				281.3	327.4	46.1*	0.129	281.3	327.4	46.1*	0.129
14	---	-90°	445	202.3	284.1	81.8	0.109	209.2	284.1	74.9	0.112
				393.0	435.0	42.0*	0.088	393.0	408.5	15.5*	0.131
15	90°	-77°	620	219.0	291.9	72.9	0.090	221.5	242.3	20.8	0.164
				422.7	485.9	63.2*	0.076	422.7	443.2	20.5*	0.158
16	270°	-77°	638	227.4	266.0	38.6	0.139	229.5	263.5	34.0	0.149
				353.2	366.4	13.2*	0.153	353.2	366.4	13.2*	0.153
17	---	-90°	557	329.9	360.0	30.1	0.208	329.9	355.0	25.1	0.237
				413.1	427.4	14.3*	0.091	413.1	418.8	5.7*	0.172
18	270°	-81°	528	334.3	375.0	40.7	0.148	334.3	375.0	40.7	0.148
				426.5	451.6	25.1*	0.188	426.5	451.6	25.1*	0.188
19	---	-90°	945	303.4	415.7	112.3	0.079	303.4	316.6	13.2	0.137
				510.8	534.1	23.3*	0.058	337.2	359.4	22.2	0.122
				623.0	690.2	67.2	0.073	662.2	690.2	28.0	0.101
20	---	-90°	451	419.6	436.9	17.3	0.201	419.6	436.9	17.3	0.201
21	270°	-78°	628	NO SIGNIFICANT INTERSECTIONS							
22	90°	-84°	599	304.5	325.7	21.2	0.060	NO		INTERSECTIONS	
23	270°	-85°	552	59.8	186.7	126.9	0.076	72.4	123.7	51.3	0.114
24	---	-90°	659	43.3	130.7	87.4	0.142	43.3	130.7	87.4	0.142
				302.0	316.9	14.9*	0.072	NO		INTERSECTIONS	
				359.5	378.6	19.1*	0.155	359.5	374.5	15.0*	0.184
25	---	-90°	338	13.0	72.8	59.8	0.065	13.0	33.8	20.8	0.090
				312.9	331.5	18.6*	0.085	62.2	68.7	6.5	0.307
26	---	-90°	413	109.1	142.0	32.9	0.065	NO		INTERSECTIONS	
				288.3	297.1	8.8*	0.110	288.3	297.1	8.8*	0.110
27	---	-90°	457	NO SIGNIFICANT INTERSECTIONS							
28	---	-90°	327	24.4	183.2	158.8	0.065	110.9	153.8	42.9	0.112
29	90°	-81°	781	498.8	617.6	118.8	0.129	498.8	617.6	118.8	0.129
30	---	-90°	893	458.5	537.5	79.0	0.080	458.5	483.3	24.8	0.134
				651.0	671.0	20.0*	0.203	655.4	671.0	15.6*	0.217
31	---	-90°	831	577.5	696.9	119.4	0.105	577.5	666.1	88.6	0.116
32	---	-90°	1038	726.4	779.4	53.0	0.076	726.4	743.0	16.6	0.147
				844.6	876.6	32.0*	0.101	844.6	876.6	32.0*	0.101
33	60°	-85°	1197	892.0	911.5	19.5	0.203	892.0	911.5	19.5	0.203
				953.0	1027.4	74.4	0.223	953.0	1027.4	74.4	0.223
				1056.3	1081.5	25.3*	0.206	1056.3	1081.5	25.3*	0.206
34	---	-90°	1128	847.6	1009.9	162.3	0.115	847.6	963.9	116.3	0.137
				1066.6	1082.8	16.2*	0.167	1066.6	1082.8	16.2*	0.167
35	---	-90°	998	718.9	736.4	17.5	0.073	730.1	736.4	6.3	0.090
				957.9	974.0	16.1	0.163	957.9	974.0	16.1*	0.163
36	---	-90°	1178	MAIN ZONE NOT INTERSECTED							
37	55°	-85°	1618	1534.0	1552.6	18.6*	0.064	NO		INTERSECTIONS	
38	---	-90°	280	87.8	96.0	8.2	0.070	NO		INTERSECTIONS	
39	246°	-65°	356	NO SIGIIFICANT INTERSECTIONS				NO		INTERSECTIONS	
	TOTAL FOOTAGE		21876								



The Geology and Geochemistry of the Carolin Gold Deposit, Southwestern British Columbia, Canada

G.E. Ray[1], J.T. Shearer[2], and R.J.E. Niels[3]

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ABSTRACT

The Carolin gold deposit of southwestern British Columbia is characterized by pyrrhotite, pyrite, arsenopyrite, albitic alteration, and quartz veining. Gold is associated mainly with sulphides, and the ore contains sporadic trace enrichment of Sb, Mo, Zn and Cu.

The mesothermal, replacement-type mineralization is both lithologically and structurally controlled. It is hosted by turbiditic wackes, siltstones, and conglomerates of the Jurassic Ladner Group, close to their unconformable, locally sheared contact with greenstones of the Triassic (?) Spider Peak Formation, and their faulted contact with ultramafic rocks of the Coquihalla serpentine belt. The host rocks were tectonically inverted and subsequently folded. However, the vertical pyrite-pyrrhotite zoning in the deposit suggests it is upright and therefore postdates the structural overturning event. Mineralization is concentrated along the hinge of a disrupted antiformal fold, and the orebodies exhibit a saddle-reef-like morphology.

Individual ore horizons are associated with potassium and barium depletion envelopes and a drop in K_2O/Na_2O ratios. The deposit as a whole is enveloped by zones of potassium depletion, sodium enrichment, and mineral alteration that extend several hundred metres into the country rocks. The alteration mineralogy comprises a wide, outer chloritic ± sericite zone and a narrow, inner albitic zone. The albitic zone includes sulphide-rich horizons that carry gold.

In this district, lithogeochemical sampling is a viable regional exploration method for discovering similar, sodium-enriched gold deposits. The potassium and barium depletion envelopes surrounding the auriferous horizons form valuable exploration drill targets.

RESUME

Le gisement d'or de Carolin au Sud-Ouest de la Colombie Britannique est caractérisé par la présence de pyrrhotite, pyrite, mispickel, une altération albitique et des veines de quartz. L'or est surtout associé avec les sulfures, et il contient des traces sporadiques de Sb, Mo, Zn et Cu.

La minéralisation mésothermale de type de remplacement est contrôlée par la lithologie et la structure. Elle est encaissée par des wackes de courants de turbidité, des aleuronites et des conglomérats du Groupe Jurassique de Ladner, près de leur contact discordant, et parfois cisaillé, avec les roches vertes Triassiques (?) de la Formation de Spider Peak et de leur contact faillé avec les roches ultramafiques de la ceinture de serpentine de Coquihalla. Les roches hôtes ont été tectoniquement renversées et ensuite plissées. La zonation verticale de pyrite-pyrrhotite du gisement suggère que le gisement est droit et il est plus jeune que l'événement de renversement structural. La minéralisation est concentrée le long de la charnière d'une faille antiforme rompue et les gîtes montrent une morphologie semblable aux voûtes anticlinales.

Les horizons individuels de minerai sont associés avec des enveloppes appauvries en potassium et baryum et une baisse du rapport de K_2O/Na_2O. Le gisement lui-même est enveloppé par des zones d'appauvrissement en potassium, d'enrichissement en sodium, et une altération qui s'étend quelques centaines de mètres dans les roches encaissantes. La minéralogie de l'altération renferme une large zone extérieure de chlorite ± séricite et une étroite zone intérieure d'albite. La zone albitique comprend les horizons riches en sulfures qui contiennent l'or.

Dans cette région, l'échantillonage lithogéochimique est une méthode viable d'exploration régionale pour découvrir des gisements d'or semblables à Carolin qui sont enrichis en sodium. Les enveloppes appauvries en potassium et baryum qui encadrent les horizons aurifères forment une cible valable pour le forage d'exploration.

INTRODUCTION

The Carolin gold mine lies approximately 120 km east of Vancouver and 20 km northeast of Hope in southwestern British Columbia (Figure 1). The deposit forms part of the "Coquihalla gold belt" which, in addition to the Carolin mine, comprises 4 former producers and 19 minor gold occurrences (Ray, 1983). Most of the gold in the belt is hosted in narrow, tension-fracture-filled quartz veins. However, at Carolin mine the mesothermal, epigenetic mineralization forms saddle-reef-like orebodies characterized by the introduction of sulphides, albite, quartz and gold.

At the time of intial development, the Carolin deposit comprised reserves of 1.5 million tonnes grading 4.4 g/t Au (at a cut-off grade of 2.7 g/t Au). The mineralization is hosted by Jurassic metasedimentary rocks of the Ladner Group, close to both their unconformable contact with Early Triassic (?) greenstones of the Spider Peak Formation and their faulted contact with ultramafic rocks of the Coquihalla serpentine belt (Figure 1).

EXPLORATION AND MINING HISTORY

The Carolin mine claims were first staked in 1915, and the mineralized surface exposures of the "Idaho zone", the gold deposit which later comprised the Carolin mine operation, were originally described by Cairnes (1929). In 1973, the property was purchased by Carolin Mines Ltd., who conducted a major exploration and drilling program; by 1974, the mining potential of the Idaho zone was realized. The mill, with a 1360 tonne per day capacity, was completed in 1981 and milling on a large scale began in December 1981. Details on the initial mining methods and milling procedures are given by Samuels (1981). Between 1982 and 1984, Carolin mine produced a total of 1354 kg of gold from 799 119 tonnes of ore milled. However, due to poor gold recoveries, environmental concerns and low world gold prices, the mine closed at the end of 1984.

Apr 87
VMR

A HISTORY OF CONTROVERSY

93A 141

#1

By Michael Schoen
B.A. Hons., M.A., M.A. EMR; S.P.E.

Controversial Findings

Carolin Mines Ltd. is appealing a February 10, 1987 order by the B.C. Deputy Superintendent of Brokers to cease trading. Carolin Mines has 2 years of proven reserves, or about 850,000 tons of ore left in the ground near Hope, grading .13 ounces of gold per ton.

There are also .05 ounces of ~~gold per ton in~~ about 850,000 tons ~~of tailings~~. Assuming that .03 ounces which represents roughly $15 are recoverable, can gold from the tailings and unworked orebodies be produced economically with modifications to the existing mine and mill?

Carolin Mines is trading at $5 per share on the "pink sheet" market, where brokers have assembled large pools of small denomination unregistered Carolin stock certificates that can be passed on like currency. There are 7 pink sheet market makers in Carolin stock, including 2 Canadian companies, Richardson Greenshields of Canada Ltd., and McLeod Young Weir.

80% of the stock is held in the U.S. When Carolin announced that tests based on a 400 pound sample of the mine tailings showed 1 oz. of gold and ½ oz of platinum per ton, the stock price jumped up to $6 in New York. Carolin last traded at 50¢ in Toronto on May 5, 1986.

After the announcement, a purchasing group consisting of Mr. Michael Berns, his brothers James and Neil Blumstein, all of New York, bought $26.7 million in convertible debentures held by the National Bank of Canada and State Farm, Mutual Automobile Insurance Co. of Bloomington, Ill. for $3.5 million. Upon conversion of this debt into common stock, the Purchasing Group will have consolidated a 44% position in the company, and full ownership of the Ladner Creek property.

The Vancouver Stock Exchange wants further clarification of the control position and intent of the purchasing group. There are concerns over the adequacy of their disclosures President Michael Berns chose to release assay results over others which showed much lower precious metal values because of the "sterling" and "impeccable" credentials of Martin Fife, the President of Intergold U.S.A.

Martin Fife, who is apparently a director of the multi-billion dollar Dreyfuss Fund, also owns 240,000 Carolin shares. Intergold reported values of 1 oz. of gold and ½ oz of platinum per ton for Carolin mine tailings. Intergold has never generated a cash flow from its operations.

According to Gordon Bacon, of Bacon Donaldson & Associates, a prestigious Vancouver consulting firm, there is "no validity" to the Intergold assay results, which show about 8 times as much gold in the tailings was originally supposed to be in the ore. Further samples taken to 4 other assayers, have provided results consistent with Carolin's historical operating statistics.

Gold recovery only averaged 50% in 1983, 60.8% in 1984, and 45.3% in 1985. Between 1982 and 1984, Carolin produced a total of 1354 kg of gold from 799,119 tonnes of milled ore. There are roughly .05 ounces of gold per ton in the tailings; processing problems in the Carolin mill hindered gold recovery.

and 90% from cyanidation, for a net recovery of 83%. But problems in both the flotation and cyanidation circuits compounded the loss of gold recovery.

The circuitry did not duplicate what happened in laboratories at the bench test stage. The ore was ground to 80% passing 200 mesh, floated, re-ground, and then leached. A gravity circuit was not included. Carolin gold can form very small grains up to .02 mm in size - approximately 600 mesh. Perhaps the primary grind was not high enough to liberate the sulphides. Should Carolin have expected to get 90% gold liberation with the grind it utilized? Was there sufficient flotation volume?

Nobody really knows. It has been said that "everyone had a shot at Carolin," but the recovery problem could not be rectified. Recovery improved in 1984, but Carolin could not build a high enough concentrate without losing some of the gold; and a at a lower concentrate, smelting charges were higher.

Initially, the precipitate was smelted on site, to gold bullion (dore bars); but Carolin had to convert the flotation circuit so that a sulphide concentrate could be produced. Pyrrhotite in the No. 1 orebody consumed a vast amount of cyanide.

Consequently, there was a threat that iron cyanide might go into solution, and a secondary water treatment plant, incorporating a sulphur dioxide treatment process for removing iron cyanide from the effluent had to be built.

Environmental Problems

In the fourth quarter of 1983, there was a 54 day shutdown of the tailing dam. Carolin was convicted and fined $135,000 in April for cyanide spills that polluted 2 tributaries of the Fraser, and resulted in an extensive fish kill and a total of 4 months of shutdowns in 1982 and 1983. All operations were suspended on Nov. 8 1984.

In 1982, Carolin mine discharged waste water from the mill into Ladner Creek in order to make room in the tailings pond for runoff from heavy snows. A week earlier, a fisheries officer had stocked the Coquihalla with 20,000 steelhead downstream from the mill.

The mine was using a new water recycling system that had not been operating long enough prior to discharge. The Steelhead Society of B.C. filed a class action law suit charging Carolin Mines with pollution.

In 1983, after heavy rains, water in the tailings pond dam exceeded permitted levels; and between 90 and 900 litres (20 and 200 gallons) of reclaimed water containing cyanide had to be discharged each minute for about a week into Ladner Creek.

The cyanide content measured as high as 8 parts per million. The maximum level considered acceptable is 2 tenths of a part per million. The United Fisherman and Allied Workers' Union urged Victoria to rescind the operating permit for Carolin Mines until a new tailings pond was constructed to protect fish and human life from cyanide. Carolin had to increase the capacity of the pond by heightening the dam to 117 feet.

The mine and tailings retention areas are located within a major geological fault zone: the Hozameen Fault. The mill is located on a 30 degree slope and is drained by the west branch of Ladner Creek. The ore body is up the slope of a mountain. Combined with high annual precipitation rates, these features

#2

Fiscal Year	1983	1984	1985
Tons milled	293,451	419,017	77,129
Gold grade	.088	0.99	.096
Gold shipped	12,914	25,234	3,604
Gold Recovery	50%	60.8%	45.2%

The Mine

The Carolin mine comprises 4 former gold-producing properties and 19 minor gold occurrences. The deposit forms part of the Coquihalla gold belt. Mineralized surface exposures were first staked in 1915. #3

Mineralization forms saddle reef like orebodies characterized by pyrrhotite, pyrite, arsenopyrite, albitic alteration, and quartz veining. Gold is associated mainly with sulphides, and the ore contains sporadic trace enrichment of lead, molybdenum, zinc, and copper.

3 saddle-reef-like ore bodies were outlined - an upper no.2, a middle no.1 and a lower no.3. No. 2 is pyrite rich and shows erratic gold grades. No.1 is pyrrhotite rich, and possesses extremely uniform gold grades. Little is known about no. 3 except that it resembles the overlying no.1 in its mineralogy and host rock lithology.

The Mill

Processing at Carolin consisted of 2 stages: grinding, followed by bulk flotation and cyanidation. Gold recovery was expected to be approximately 90% from the flotation cycle,

presented a potential hazard for contamination from tailings fines and dissolved chemical components that were not fully anticipated.

Corporate Structure and Finance

Carolin Mines and the Aquarius Group were equal partners in the Ladner Creek joint venture. Carolin Mines was the operator; the Aquarius Group earned a 50% working interest by providing $20 million to bring the mine into production.

It was a standard oil drilling partnership; provisions were made to cover unexpected expenses. If a partner failed to pay, or was unable to pay its share of operating expenses when due, the defaulting partner would only forfeit the unpaid share of its interest.

The Aquarius group were predominantely oil men, accustomed to making investment decisions based on drilling data where costs were fairly well established. Once gold reserves were geostatically proven, they were in a hurry to begin production. Construction of the tailing pond dam was scheduled to begin before submission of the final design.

The production decision was not based solely on potential profits. Great Basins Petroleum

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wanted to convert pre-tax petro-dollars into gold bullion, which could then be used as a financing instrument. Projected internal rates of returns on discounted cash flows were only 4%, 8%, and 14% with gold priced at $250, $275, and $300 per ounce. But at the prevailing gold price — $603 U.S. per troy ounce — Carolin was both a shelter, and an attractive investment.

Their agreement with Carolin was amended in 1981 to provide for an additional $16,475,000 when costs escalated. However, by the end of the year, an additional $17,980,778 was required; and a total of $33 million had to be raised through equity financing and debt.

The $33,000,000 investment in excess of the $23,362,000 originally estimated was to be paid off first from net cash flow; the next $2,622,000 would be paid to Carolin Mines for exploration and development costs incurred before Aquarius became a partner; the next $20,920,000 would be paid to Aquarius, ⅔ of the following $23,542,000 would be paid to Aquarius and ⅓ to Carolin Mines, and the rest equally to both.

But by 1981, the federal government's New Energy Plan had impacted on the oil patch, and U.S. owned petroleum companies operating in Canada were forced to restructure or liquidate.

A feasibility study conducted by Kilborn Engineering estimated operating costs of $12.53 per ton of ore milled. But capital costs, and operating costs per ton were virtually triple what had been forecast. Capital costs soared to

#4

David Minerals, owned by Orval Gillespie, "the man behind the mine," had never generated a positive cash flow, Orval Gillespie. President of Carolin Mines, had purchased the Ladner Creek Propery in 1973 and brought it into production in December 1981.

Anyone purporting to be able to solve the gold extracting problems that plagued Carolin was given the opportunity to do so.

Denver Cascade would form a B.C. corporation "Denver Newco" which would loan $20 million to Carolin Minerals. 500,000 freely tradeable shares would be issued to Denver Newco. Carolin Mineral would then purchase Moritz Mining Co., a subsidiary of Denver Cascade, for 1 million shares of the new company. Denver Cascade would provide the financing for Moritz Mining to make changes in the Carolin milling circuit, and modify the leach circuit with their proprietary method of cyaniding.

The plan was to complete the modifications, treat the tailings in the tailings pond to extract the contained gold, and to finance exploration for and development of ore reserves with cash flow. But it was contingent upon Carolin acquiring the remaining 50% interest in the Ladner Creek Mine.

Carolin was not able to acquire the remaining interest until a year later. James Berns and Neil Blumstein obtained control of the company and acquired the property interests from other members of the Ladner Creek joint venture at the annual general meeting on January 28, 1987.

	1980	1981	1982	1983
Average Gold Price	$603.48	$449.86	$378.38	$417.96
Revenues		$7,071,920	$12,444,503	$778,412
Costs		$10,413,511	$13,165,535	$1,718,324
Revenues per ton		$24.1	$29.7	$20.18
Costs per ton		$35.49	$31.42	$44.56
Loss per ton		$11.39	$1.72	$24.38

$50 million from an original estimate of $19,293,000 million.

#5

The Canadian subsidiary of Great Basins [illegible] sold off to United Canso. Carolin agreed to purchase all the shares of Columbian Northland Exploration Ltd. for 1.4 million shares of Carolin Mines stock.

Carolin tried to consolidate its stock holdings, in order to re-negotiate the financing, and provide more working capital; but the creditors wanted out. On Nov. 30 1985, Carolin was $12,049,000 in arrears on Principal and interest payments, and could not pay property taxes totalling $1,356,666 and $1,299,244 for 1984 and 1985.

Trading was stopped on Nasdaq in December 1985, when Carolin Mines failed to meet the minimum net-worth requirement. Share price dropped to $1.70, less than one-thirtieth of its 1980 price. Carolin applied for a temporary exemption from the net worth requirement.

In a last ditch effort to continue operations, Carolin Mines Ltd. and David Minerals Ltd. agreed to form an amalgamated company, Carolin Minerals Ltd., with interlocking ownerships: 23 shares of David Minerals for 1 share of Carolin Minerals, and 1 share of Carolin Mines for 1 share of Carolin Minerals.

And in his last act as President of Carolin Mines, Orval Gillespie announced the Intergold assay results and Carolin's plans to implement Intergold's proprietary process in order to enhance gold recovery.

It is too early to determine whether the purchasing group can make the Carolin mine operate profitable; approximately 50% of the gold mines that go into production fail. Invariably, those gold mines are purchased at a later date - when debts can be written off the balance sheet -and reworked.

A property can be explored, discarded, and developed 5 times before it becomes a profitable producer. But it would be interesting to have original metallurgical tests performed by Kilborn Engineering repeated to see if extraction values can be matched. Nobody questions whether the gold is there; extraction is Carolin's principal problem.

Michael Schoen is a Fuel and Non-Fuel Mineral Resource Consultant. 589-5052 ness slackness.

Apart from tougher bargaining on ore prices with major overseas steel industry consumers, Associated and Samancor face additional competition from a new producer, Middelplaats, brought on up for next year's tighter exhaust emission regulations, meaning greater demand for platinum group metals for exhaust catalysts, the two major platinum producers, Rustenburg and Impala, are embarking on expansion projects.

Only a few weeks ago, Rustenburg chairman Sir Albert Robinson made it clear that his company would *not increase production* except with firm consumption guarantees from industrial (and that means auto industry) users. As it is, Rustenburg is increasing annual platinum output from 1 million oz. to 1.2 million oz.

This was followed in August by Impala's announcement of plans to increase national platinum output by 100,000 oz. to 1 million oz. at a cost of R40 million.

Reaction different

In the past, increased platinum production announcements have always been a signal for canny investors to sell platinum shares ahead of an eventual metal price *downturn*. This time around, though some heavy U.S. selling of platinum shares has restrained stock market prices, increased production may be accompanied by sustained higher prices in the medium term. Impala's expansion is being funded in part by additional loans of R20 million. And though the company has not confirmed it, Johannesburg analysts feel that these loans have been guaranteed by major platinum users. And confidence that additional output will not lead to a glut of the metal has been underscored by end-August's $30 producer price hike to $380 per oz. Rustenburg and Impala have for years been ultrasensitive to any suggestions of price collusion, fearing U.S. anti-trust investigations of their activities. But their producer price quotes are never out of line for more than a day or two at a time, while the latest increases were announced simultaneously.

Big demand for big stones

Following July's announcement of lower Central Selling Organization (CSO) first-half diamond sales figures, few analysts were surprised at the lower first-half diamond account figures reported by De Beers. Rising interest charges world-wide have led diamond dealers in the main cutting centres to limit their stocks to rough stones. But this has been only in selected sizes. Though demand for smaller stones has slackened, stones larger than one *carat are* in increasingly strong demand.

To meet this, the CSO (and therefore De Beers) has apparently been running down stocks of the larger gems, meaning an obvious perceived threat to the diamond market stability. Memories of 1978 when

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Ocelot funds for Carolin Mines gold project

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CALGARY — **Ocelot Industries**, the Calgary-based oil and gas exploration and production company, is to play a major role in the financing to production of Carolin Mines' Ladner Creek, B.C., gold property.

Ocelot senior vice-president, R. A. McCullough, says that his company has made a financial commitment on behalf of the Aquarius group, which holds the right to a 50% in the project.

Carolin Mines will have an eventual 50% interest in the $19.3 million project which is scheduled to start production at 1,500 tons per day early in 1981 (**N.M.**, June 28).

Mr. McCullough says that the Aquarius group including **Great Basins Petroleum** as to 35.1%, **Ruperts Land Resource Co.** as to 9.8% and **Aquarius Resources** as to 10% have 60 days to join Ocelot with its 45% interest in the project's financing.

'Carolin Mines will have an eventual 50% interest in the project after certain investment recoveries are received by the financing group,' says Mr. McCullough.

Drill-indicated reserves on the property are estimated at 1.5 million tons averaging 0.14 oz. gold per ton. The estimate is based on a cut-off of 0.08 oz. per ton.

Fort Norman records 1st half '79 profit

Fort Norman Explorations reports net income of $83,709 or 4¢ per share for the six months ended June 30, 1979, as against net loss of $837,847 or 41¢ per share for the first half of last year.

Total revenue was $1,499,569, of which $1,308,791 came from gas production, $172,820 from barging operations in Alabama, and the rest by way of interest income. In the 1978 period, revenue amounted to $2,537,722, including $1,140,525 from gas sales and $1,397,197 from U.S. coal production (which was discontinued in November, 1978).

There was a working capital deficiency of $245,863 at June 30, 1979. Long-term debt amounted to $12,101,920, net of $1,117,646 included in current liabilities.

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Payback in less than three years

Carolin Mines gets go-ahead on Hope B.C. gold property

By Gillian Cobban

VANCOUVER – After six years and more than $4 million of extensive exploration and development work, plans are under way to place Carolin Mines' gold property near Hope, B.C., into production.

A full feasibility study on the Ladner Creek gold deposit has been completed and delivered to Carolin and its joint venture partner, the Aquarius Group. The latter is composed of three oil companies, **Great Basin Petroleum, Ocelot Industries, Canadian Obas Oil,** and a mining company, **Aquarius Resources.**

The study, prepared by Kilborn Engineering, concludes that it is technically and economically feasible to mine and mill gold ore from Carolin's Idaho zone gold deposit.

Kilborn recommends start-up at a milling rate of 1,500 short tons a day, equivalent to 525,000 tons a year. Operating costs are estimated at $12.53 per ton of ore milled.

The study recommends that a conventional, highly mechanized, low-cost sublevel open stoping method of mining be used. Processing is to be by conventional flotation – concentrate cyanidation. Capital and development costs are estimated at $19,293,000, all of which, under the joint-venture agreement, will be provided by the Aquarius Group, if it wishes to retain its current interest of 50%.

The Idaho zone lies in the southern quadrant of the property, on the south flank of a fairly steep ridge. The location of the orebody facilitates development of the mine from the side and below as opposed to the more usual situation in underground mining of having to lift the ore long distances from underground.

The zone is a sulphide arsenide replacement deposit and is adjacent to the former producing **Aurum Gold** mine where a small quantity of rich gold was discovered in 1928.

See Page 2

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...es, banks and ...e tour. Mr. La... of **Cenex Ltd.**, ...ranium ore to the Beaverlodge mill of Eldorado Nuclear at a rate of about 2,000 tons a week (**N.M.**, May 24, 1979).

Basically, a group of mining experts estimates, proven uranium ore reserves of Saskatchewan are worth about $40 billion and the group estimates that it will take over a period of years approximately $18 billion of expenditures to remove the reserves. The estimate of reserves is considered a conservative one.

Les Beck, director, geological surveys, Saskatchewan mineral resources dept., described, in a brief breakfast talk, the Athabasca sandstone formation as the most exciting

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Dome Petroleum downplays reports of new Alberta find

CALGARY – Dome Petroleums is discounting reports here that the company is a participant in a rumored major new oil discovery in Northwestern Alberta.

"The rumor greatly exaggerates the facts," says a Dome executive in referring to the reports. He conceded Dome's par...

Active labor scene

Inco, Gaspe long strikes settled start at Dome, Sherritt, Alcan

By Stephen Vitunski

There was good news and bad news on the labor scene in Canada's mineral industry. On the plus side, the 8½-month-long **Inco Limited**, Sudbury-area strike is now over with mechanical workers already back on the job in preparation for a return to "normal" operations.

Almost concurrently, some 1,200 miners and office workers at **Noranda Mines'** Gaspe Copper operation in Murdochville, Que., voted to end their eight-month walk-out. On the other side of the coin, striking workers at **Dome Mines** in Timmins rejected a proposed contract which would have increased their wages by $1.54 per hour over a two-year period. It is understood that this is close to what Local 7580 of the United Steel Workers of America wants for the first year, with perhaps another dollar in the second. The old contract expired Apr. 18, 1979.

Members of Locals 5757 and 8144 of the same union, representing workers at **Sherritt Gordon Mines'** Fox and Ruttan operations in Manitoba rejected a new contract by a slim 52% majority over the weekend. They turned down something in the order of the Inco Thompson settlement earlier this year. Direct hourly wage benefits, under the proposed three-year agreement, would have been 75¢, 27¢ and 22¢. Picket lines have been set up at both operations. Production at Ruttan is being maintained at 50% by staff personnel while Fox is undergoing "an orderly shutdown of operations." The old contract expired May 31, 1979.

And finally, **Alcan Aluminum** employees at three of the company's smelters in Quebec walked out this Monday, as they too turned down a three-year pact calling for increments of 90¢, 65¢ and 70¢ per hour.

Getting back to the Inco situation, the new agreement was approved by 5,983 or 67.6% of the 8,852 members of Local 6500 of the USW who voted. In effect, they will be getting $4.07 per hour more at the end of the three-year pact than they were earning when the strike started on Sept. 12, 1978. This new figure is about 40¢ more than the amount rejected last month by the rank-and-file after being approved by the union negotiating committee.

See Page 2

At 4-month low

NMINER 3FEB1986

Carolin issuing shares to pay off creditors

92H/11W (092HNW003)

Vancouver shareholders at **Carolin Mines**' annual meeting approved the issue of up to 7 million shares to pay off creditors and acquire the remaining 50% interest in the Ladner Creek property from the Aquarius group. The approval will also allow it to raise approximately $3 million in working capital, a key item if Carolin is to avoid insolvency.

The transaction will see Carolin's issued capital more than double to approximately 14 million shares, a major dilution in shareholder's equity, but a fact of life if the company is to continue as an ongoing concern. President Orval E. Gillespie believes the new share allotment will "persuade its major creditors to accept shares in settlement of their accounts."

The company's Ladner Creek mine suspended operations in November, 1984, due to a lack of readily accessible ore and a shortage of working capital. Gold recoveries were much lower than expected and Carolin was unable to resolve environmental problems to the satisfaction of regulatory authorities.

Late last year the company concluded an agreement with Denver-based Moritz Mining which could see that company's proprietary cyanide leach circuit utilized at the Ladner mine site. Changes are being made to the milling circuit and gold will be recovered from tailings initially, the company expects.

A backfill plant will be constructed and an attempt made to increase ore reserves, by driving a drift northward towards other known zones and drilling the targets. Because of the configuration of the ore zone, Carolin says it's impractical to drill it from surface or from existing mine workings.

Management estimates there are economical, recoverable reserves of 5 million tons of which 4 million are inferred and not included in any formal geological report. No grade was assigned to the reserves in the company's annual report. The underground program would proceed as the tailings are being treated, says Carolin.

The company is contemplating a merger with **David Minerals**, subject to a fairness report and shareholder approval. Carolin says the merger "will broaden the asset base of Carolin and will increase cash flow substantially." The meeting also approved the allotment of 200,000 shares to Mr. Gillespie for "services rendered" which would add to his existing holding of 119,000 shares.

Carolin Mines Ltd (CLL) Oct 28/87

Mr Claus Jensen reports:

The company, in joint venture with Wright Engineers Ltd, has signed a letter of intent with Carolin Mines Ltd to evaluate, test, and bring back to production Carolin's Ladner Creek Gold Mine which ceased production in 1984 because of various technical problems. The Giant Bay/Wright joint venture will, as long as results warrant, fund an evaluation and metallurgical test program estimated to cost less than $600,000 and to take approximately six months. S.W.

Upon successful completion of this program Wright Engineers will conduct a formal feasibility study at Carolin's expense. Upon delivery of a positive feasibility study, the Giant Bay/Wright joint venture will, at Carolin's expense, redesign, modify, and rebuild to the extent necessary Carolin's production facility. In addition, the Wright/Giant Bay joint venture will be appointed operator and receive a management fee. After pay-back to Carolin and the joint venture of appropriate costs including test work, the Giant Bay/Wright joint venture will receive 15% of the mine cash flow and continue to receive the management fee.

Carolin estimates the Ladner Creek Mine's known mineral inventory is a gold deposit of approximately 1,000,000 tons grading 0.125 ounces of gold per ton and 800,000 tons of mine tailings grading between 0.045 and 0.055 ounces of gold per ton. 92HNW003

The joint venture program will involve laboratory test work, on-site evaluation, and the transfer of the Salmita demonstration plant to the Ladner Creek site near Hope, BC.

CAROLIN MINES LIMITED Mar 12/87

(Suspended CLL-V,T;CRNLF-Nasdaq) GCNL 50

INCONSISTENT GOLD AND PLATINUM ASSAY RESULTS REVIEWED

Michael Berns, chairman of Carolin Mines Limited, has reviewed the inconsistent results from assays of the company's mine tailings by Intergold U.S.A. Inc.'s secret process compared with those of four other assay laboratories. The formerly producing mine is located 15 miles north of Hope,B.C. 92HNW003(11W)

The March 9,1987 news release stated that the Jan.19, 1987 report of preliminary assays from test work by Intergold indicated 1 ounce of gold and 0.5 ounce of platinum could be recovered from each ton of tailings at an estimated cost of $100 U.S. per ton. These results are at enormous variance with the historical operating results which showed the deposit's head grade to be approximately 0.09 oz.gold/t with recoveries of 50%. Historical operating statistics indicate no platinum metals. Intergold's preliminary results are at enormous variance with test work conducted by researchers, refiners and assayers which indicate a wide variance of values in the tailings ranging from trace platinum group elements to higher platinum group elements and lower gold values to higher gold values than reported by Intergold. Intergold and others have advised that the tailings are geologically and metallurgically complex which could explain the disparities in results.

Intergold believes that the traditionally accepted and commonly relied upon method of precious metal detection, fire assaying, is ineffective in analysing the tailings. Mr.Berns states that, because Intergold's process is proprietary, Carolin is "unable to verify Intergold's preliminary results, scrutinize its recovery process, determine whether Intergold owns the rights to this process, or evaluate the technical and professional qualifications of Intergold, its employees and consultants upon whom, Intergold has represented, it is heavily dependent. Intergold's preliminary results cannot be relied upon. To the best of management's knowledge, Intergold has never 1) acted as an operator of a mining project, 2) brought a mining project to the production stage, or 3) generated cash flow from its operations."

Fire assays and a chemical assay recently conducted by Lakefield Research, Bondar Clegg, Skyline Labs. and Jacobs Assay returned between 0.05 and 0.064 oz.gold/t and trace amounts of platinum and palladium. Further assays from these samples are expected about the end of March 1987.

At Nov.30,1986, Carolin had current liabilities of $28,000,000 and a negative equity of $10,400,000. Of this debt $25,500,000 has been converted to 13,100,149 shares and liabilities are now $7,400,000 of which $4,100,000 may not be a Carolin debt. A further 6,203,158 shares are yet to be issued which will bring the then issued to 27,230,359 shares.

As reviewed in GCNL No.38, Feb.24,1987, control of Carolin has changed, new directors have been elected and additional sampling and testing are underway. Results from the further testing are expected in early April. Carolin now holds a 100% interest in the property.

GCNL 91 **CAROLIN MINES LTD.** (CLL-V,T) 12 MAY 87

NEW FUNDING SOUGHT FOR EXPLORATION - Carolin Mines Ltd. (11W)92HNW003 has started a program to evaluate the known underground gold deposit at its Ladner Creek Mine, Hop, B.C. The deposit contains 900,000 tons grading 0.126 oz. gold/T. Exploration for additional reserves is expected.

A review of the metallurgical aspects of the 1982-1984 operation of the mine has started. This will include a review of the mill, having a 1,500 tons per day capacity and production records to determine what changes could be made to raise the gold recovery and if a potentially marketable concentrate can be made which eliminate the need for cyanide leaching, and how the tailings could profitably be treated.

Intergold U.S.A., Inc. has not provided the company with a certification of Intergold's recovery process. The company and Intergold on May 9, 1987 agreed to cease dealings. Based upon recently conducted tests, the company believes that its tailings contain approximately 0.05 ounce of gold per ton and no platinum group elements. Carolin is negotiating to acquire an approximately 90% interest in 9,900 acres or 14.5 square miles of mineral claims contiguous to the north and south of the mine. These claims straddle the same geological structure, the Hozameen Fault, upon which the mine is located. Numerous gold-bearing anomalies have been identified by others on this property.

Norman H. Ross has been appointed secretary replacing Neil Blumstein, who remains as chief financial officer.

The company is seeking financing to provide working capital. The company estimates that, through June 30th, cash requirements exceed available funds by approximately $125,000 Can. The company's appeal from the British Columbia Superintendent of Brokers Cease Trade Order will be heard on May 12, 1987.

GCNL 38 **CAROLIN MINES LIMITED**

(Suspended CLL-T,V-CRNLF-Nasdaq) FEB24/87

FURTHER GOLD AND PLATINUM TEST RESULTS EXPECTED SOON

92HNW003(11W)

Results of processing about 35 tons of samples from the tailings of Carolin Mines Limited are expected to be available in two to three weeks, about mid-March 1987. The Ladner Creek mine of Carolin is 15 miles north of Hope,B.C. The testing is being done by Intergold U.S.A. Inc., Nevada in a pilot plant built for the purpose and now nearing completion. Intergold will use a secret proprietory process. Intergold is also working on the process for use in its own mines. Intergold is not now using the process in its own or any other mines. The work will be monitored by an, as yet unnamed, well qualified prestigious consulting engineer for Carolin.

The preliminary samples processed from the tailings pond were collected at random and, as reported by the company Jan.19,1987, indicated that each ton of tailings will yield 1 ounce of gold and 1/2 oz. of platinum at a cost of $100 U.S. per ton. The company also reported, "Assaying of tailings performed by others has resulted in a wide variance of metal values ranging from trace amounts of platinum group metals to substantially higher platinum group metal values than those reported by Intergold." Golder & Associates, in the week of Jan.5,1987, supervised a systematic grid and bulk sampling of the tailings which cover an area about 400 feet by 800 feet and as much as 100 feet deep and are estimated to contain 800,000 tons. The samples collected are to be used in the further testing by Intergold. The samples were all taken from the top 14 feet. Five or 6 holes have been drilled to the bottom of the tailings for sampling purposes.

Michael Berns, vice-chairman of Carolin, told the 23Feb87 shareholders' meeting that, if the Intergold process works and is confirmed, then Carolin will negotiate a licensing agreement to use the secret process to rework the tailings. Limited production could start in 60 to 90 days, he stated. If the Intergold process works, then it is clear that the mineralization at the Carolin mine was not well understood at the time of exploration or production.

- Directors elected at the meeting were: Neil Blumstein, New York, chairman, owning 7,132,123 shares; Michael Berns, New York, vice-chairman, owning 673,209; C.R. Morton, Victoria,B.C.; R.H.Ross, Victoria,B.C.; J.M. Morton; Victoria.

The meeting approved:

-changing the authorized capital to 38,000,00 A and 2,000,000 B shares of no par value; issuing a $10,000,000 debenture convertible into 13,333,333 shares;

-issuing an undetermined number of shares to Mr.Gillespie in settlement of $418,614 in debts plus some $600,000 or 200,000 treasury shares for past services rendered;

-the issue of 21,000,000 shares in settlement of $26,700,100 Cdn. in debts held by Messrs Blumstein, Berns and Berns which they recently acquired from State Farm Automobile Insurance Company;

-the issue of a further 1,000,000 shares in the acquisition of 22.5% and 17.55% interest in the Ladner Creek property, thereby bringing the interest owned to 100%

-and the granting of director and employee stock options to buy 10% of the issued shares.

At Nov.30,1986 the company had 6,977,467 shares issued and, on completion of the approved transactions, will have approximately 30,000,000 shares issued of which 20,000,000 shares are expected to be restricted from trading for as much as 24 months. At that point Carolin should be debt free.

The cease trading orders from the B.C. Superintendent of Brokers and the Toronto Stock Exchange require filings which have been made or will be made following the meeting. A reply from the B.C.Superintendent of Brokers is expected as early as Feb.23,1987.

VANCOUVER MARKET RPT FEB 1987

Carolin Mines Changes Hands

92HNW003

In connection with a major restructuring of Carolin Mines Ltd. of Vancouver, British Columbia, the Board of Directors and all executive officers have agreed to resign on or about January 28, 1987. Mr. Neil Blumstein of Manhasset, New York has been appointed Chairman of the Bo-d and Mr. Michael Berns of New York, has been appointed Vice Chairman. The other Directors are Major General Norman H. Ross, (Ret.), Mr. Chuck Morton and Mrs. Jean Mary Morton, all of Victoria, British Columbia. Mr. Berns has been appointed Chief Executive Officer and President. Mr. Blumstein has been appointed Chief Financial Officer and Secretary.

Carolin owns an underground gold mine located in Hope, British Columbia which was in production for approximately two years during 1982-1984. Production from the mine during that period was unprofitable because of metallurgical problems.

Messrs. Blumstein, Berns and James Berns, of New York City (the "Purchasing Group"), have purchased approximately $26,700,000 Canadian of secured and unsecured debt of Carolin. On January 14, 1987, the Purchasing Group gave notice to convert approximately $13,468,854 Canadian of these liabilities into common shares. Notice will be given shortly to convert an additional $8,000,000 of these liabilities into common shares. These conversions will give the Purchasing Group effective control of the Company.

In addition, the Purchasing Group has agreed to advance, subject to regulatory approval, new financing to Carolin in consideration of the issuance by Carolin of a debenture in the face amount of $10,000,000 and the right to convert the indebtedness from time to time owing by Carolin into common shares of Carolin at a price to be determined.

Since November 14, 1986, the Purchasing Group has provided 100% of all working capital requirements of the Company; it is expected that it will continue to provide working capital over the short term. The Purchasing Group has also arranged, subject to regulatory approval, to acquire the remaining interests in the mine held by Ocelot Industries Ltd. and Columbian Northland Explorations Ltd., giving Carolin 100% ownership of the mine.

The Purchasing group has also arranged for Intergold U.S.A Inc. to conduct metallurgical testing and recovery work on the mine's approximately 800,000 tons of tailings. Preliminary recovery testing by Intergold has indicated that each ton of tailings will yield 1 ounce of gold and ½ ounce of platinum at a cost of $100 U.S. per ton. The preliminary recovery testing was done on randomly gathered samples.

Assaying of tailings performed by others has resulted in a wide variance of metal values ranging from trace amounts of platinum group metals to substantially higher platinum group metal values than those reported by Intergold. Accordingly, during the week of January 5, 1987 the Purchasing Group retained independent consulting engineers who supervised a systematic grid and bulk sample of the tailings taken by Intergold. The tailings pile, which is over 100 feet deep, will be drilled in the near future and samples analyzed to determine overall values.

The Company intends to have its share relisted for trading on NASDAQ during February, 1987 and to make the necessary applications to the Ontario Securities Commission for rescission of its cease trading order. Although the Company is considering a resumption of trading on the Vancouver and Toronto Stock Exchange, no decisions have yet been made in this regard.

PIEZOMETER MONITORING DATA | Figure **4**

NOTES

1) Unit locations shown on Figure 3.
2) Unit 3560 ceased to function on Aug 20/81.
3) Units 4600, 4601 & 4602 located in toe berm do not register significant pressure
4) Units 5785, 5786 & 5787 located beneath rock drain at elev 3173 ft do not register significant pressure.
5) Units 5788, 5789 & 5790 located in fill core at elev. 3195 ft do not register significant pressure.
6) Units 5825, 5827 and 5828 inoperative 1995.

Golder Associates Revised Oct. 1995

GCNL #77 22 APRIL 1985 **CAROLIN MINES LTD.** (CLL-V,T) 92H/11W (092HNW003)

PROPOSED REFINANCING & DEBT SETTLEMENTS ARE SUMMARIZED - Orval E. Gillespie, president of Carolin Mines Ltd., announces that 4 of its creditors have agreed on a private placement basis to convert $531,303 of debt into 222,302 shares of Carolin at $2.39 each. The shares would be held for the greater of 6 months from the day the loan is converted and 12 months from the day on which the creditors advanced the funds, being May 1984 for $96,681 and October of 1984 for the balance.

Mr. Gillespie also reports that Lion Metals Corporation of London, England is prepared to renew its efforts to arrange a private placement of Carolin shares to raise $1,500,000 U.S., subject to Carolin raising at least $5,000,000 Cdn. in Carolin's forthcoming rights offering to its United States shareholders. The private placement would be for 800,000 shares at $2.60 each with warrants to buy 800,000 more at $3.05 each within 1 year. The private placement is subject to Carolin shareholders' approval by 4July85 and completion of the placement by 4Aug85.

The private placement is contingent on the Mercantile Bank of Canada agreeing to accept $6,500,000 Cdn. and 500,000 shares as full payment of its Carolin loan, which Mercantile is prepared to do, and to State Farm Automobile Insurance Company agreeing to convert its loan to Carolin of about $10,500,000 Cdn. into 500,000 Carolin shares as arranged last November for an uncompleted transaction.

Carolin owns 50% interest in the Ladner Creek mine near Hope,B.C. The other 50% is owned by the Aquarius group, being Ocelot Industries Ltd. which owns 22.5%; Columbian Northland Exploration Ltd. 17.55%; Aquarius Resources Ltd. 5% and Windjammer Power & Gas Ltd. 4.95%. Carolin's attempt last fall to acquire the Aquarius group's interest in the Ladner Creek Mine was subsequently abandoned. If the proposed rights offering is successful, Carolin will seek to acquire the Aquarius group's interest in the Ladner Creek mine. Mr. Gillespie says, to date, cash calls totalling $4,818,890 have been made to the Aquarius group, being their share of unpaid costs incurred by Carolin in respect to the mine. No monies have been received.

If Lion Metals completes the private placement of 800,000 shares, Carolin has agreed to pay them a fee of 6% of the monies raised and to grant them a 12 month option to buy 150,000 shares at $2.60 each, subject to approval of Carolin's shareholders.

N. MINER FEB 16/87 93A 141 (11W12E) 92HNW003 (11W)

Credibility problem still looms for Carolin

by David Duval

VANCOUVER – The history of **Carolin Mines**, an industry "soap opera" if there ever was one, has taken yet another turn. A new management group has now assumed control but the old guard has left them with a big credibility problem.

Shortly before his departure, President Orval Gillespie announced assay results from tailings at the Carolin mine site (N.M., Feb 2/87). Although they were "randomly gathered samples," the results nevertheless stretched the bounds of credibility just one more time.

The test work was done by an American firm, Intergold U.S.A., which came up with 1.0 oz gold and 0.5 oz platinum per ton in the tailings. The gold content alone was more than 10 times the head grade achieved by Carolin in its brief operating history.

New management at Carolin has supplied operating statistics on the mine to The Northern Miner which incidentally were compiled for regulatory authorities in the U.S. rather than in Canada. This country's disclosure policies are somewhat more lenient so previous managemen' rarely made such information available to the general public here.

Those operating statistics show head grades of 0.096 oz gold for the period June 1, 1984, to May 31, 1985. The recovery rate over that period was 45.2% which indicates there was 0.053 oz gold left in the tailings. In the 1983 fiscal year the company milled 293,451 tons of ore with a head grade of 0.088 oz gold and a 50% recovery rate. Throughput jumped the following year to 419,017 tons at a 0.099 oz head grade and 60.8% recovery rate.

Sources familiar with the Carolin mine tailings were polled by The Northern Miner and they almost uniformly agreed that the maximum recoverable gold content was about 0.03 oz. Dr Gordon Bacon, from Bacon Donaldson & Associates, a Vancouver consulting firm, states flatly that there is "no validity" whatsoever to the recent assay results published by Carolin.

Carolin's new vice-chairman, Michael Berns, tried to shed some light on the situation in a recent interview. A lawyer by training, he admits to having "no technical background" in mining, but adds his law firm has acted in a legal capacity for Carolin. While visiting Vancouver last summer, he said Mr Gillespie suggested to him that there was more gold and also some platinum in mine tailings than was previously indicated.

Mr Gillespie put him in touch with Martin Fife who is president of Intergold U.S.A. which Mr Berns describes as a research firm specializing in "complex" ores. To the best of his knowledge its staff members are "mathematicians, chemists and process engineers." Apparently Mr Fife is a director of the multi-billion-dollar Dreyfus Fund, and someone who has "impeccable business credentials."

Test samples were collected by Carolin in late 1986 and shipped to Intergold for analysis. The 200 lb of samples were collected on a random basis and there was no pre-concentration in the test work, he claims. Then how does one explain the high gold results and also the platinum values where none were known to exist before? Mr Berns says it has been suggested to him that perhaps some of the gold was tied up with platinum and it didn't appear in earlier results. Mr Bacon disputes this, pointing out that it goes against the law of physics and just about every other law for that matter.

Carolin is planning to test a 40-ton bulk sample and results should be out within the month. This sample material was taken from the top 14 ft of the tailings area by Golder Associates and submitted to Intergold for testing. Mr Berns confirms that an independent metallurgical consultant will be appointed to confirm Intergold's test results.

Carolin is financing the construction by Intergold of a test plant to process the sample material. There could be one or two plants and they will be built in Nevada where Intergold operates through an answering service. He feels "there is no credibility problem with Intergold" and when pressed said it was possible that a large Canadian firm might eventually be called in as a referee. He adds that Intergold has "taken steps to protect its process" which he implied was quite revolutionary.

Mr Bern's group bought control of Carolin by purchasing secured convertible debt from the National Bank of Canada and subordinated (unsecured) debt from State Farm Mutual Automobile Insurance Co. of Illinois. Carolin owed the National Bank $13.1 million which was secured by company assets but State Farm's $13.4 million was unsecured. Carolin's new management has converted National's debenture and they purchased the two debt entities for $3.5 million.

Mr Berns says that Windjammer Power and Gas and Aquarius Resources were sued by the National on Carolin's behalf and they forfeited their interests. Under threat of legal action Ocelot Industries turned its interest into the bank which the Berns group has acquired and plans to put into Carolin for $1. Columbia Northland will receive one million Carolin shares for its 17.55% interest, subject to regulatory and shareholder approval, he adds. By acquiring these companies' interests, Carolin now has a 100% interest in the property.

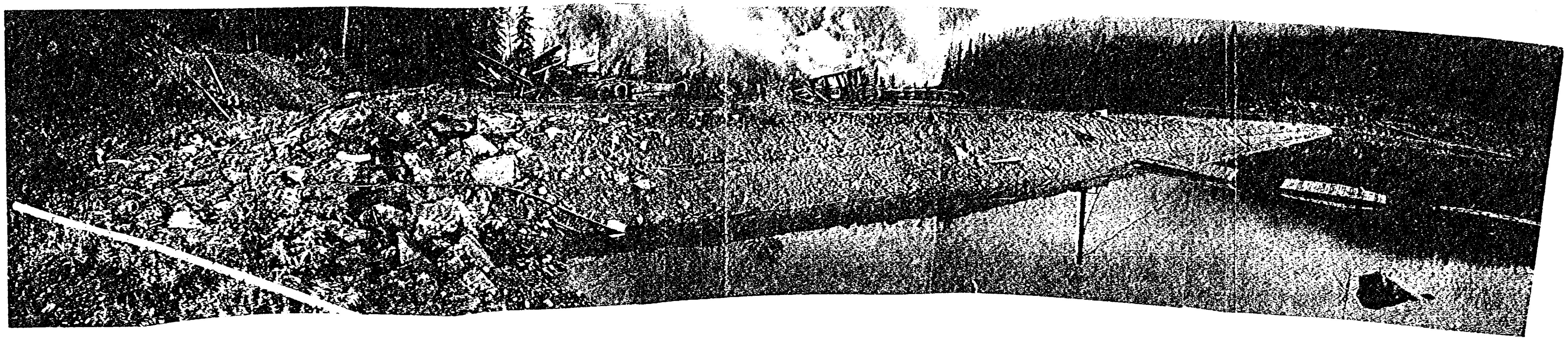
Player Resources has changed its name to **Cons. Player Resources Inc.** on the basis of 1 new for 2 old shares.

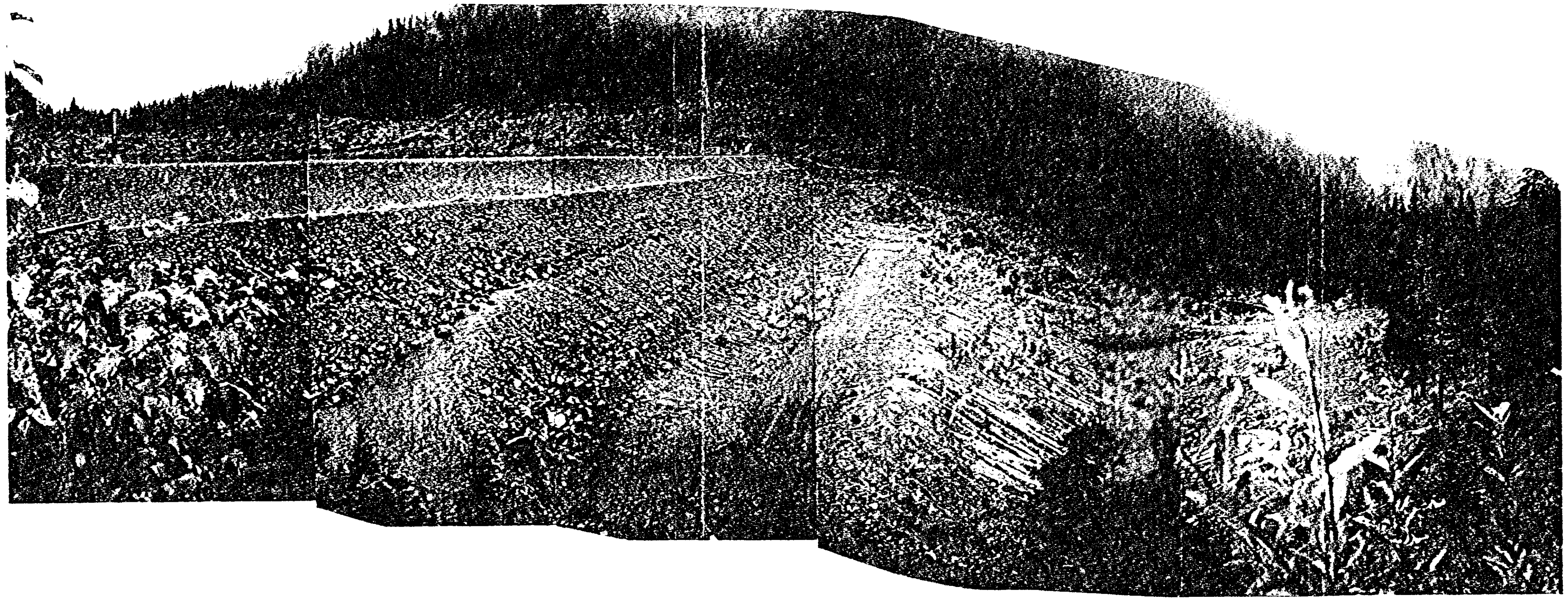
No 220 **CAROLIN MINES LIMITED** (CLL-V,T) 17 NOV 86

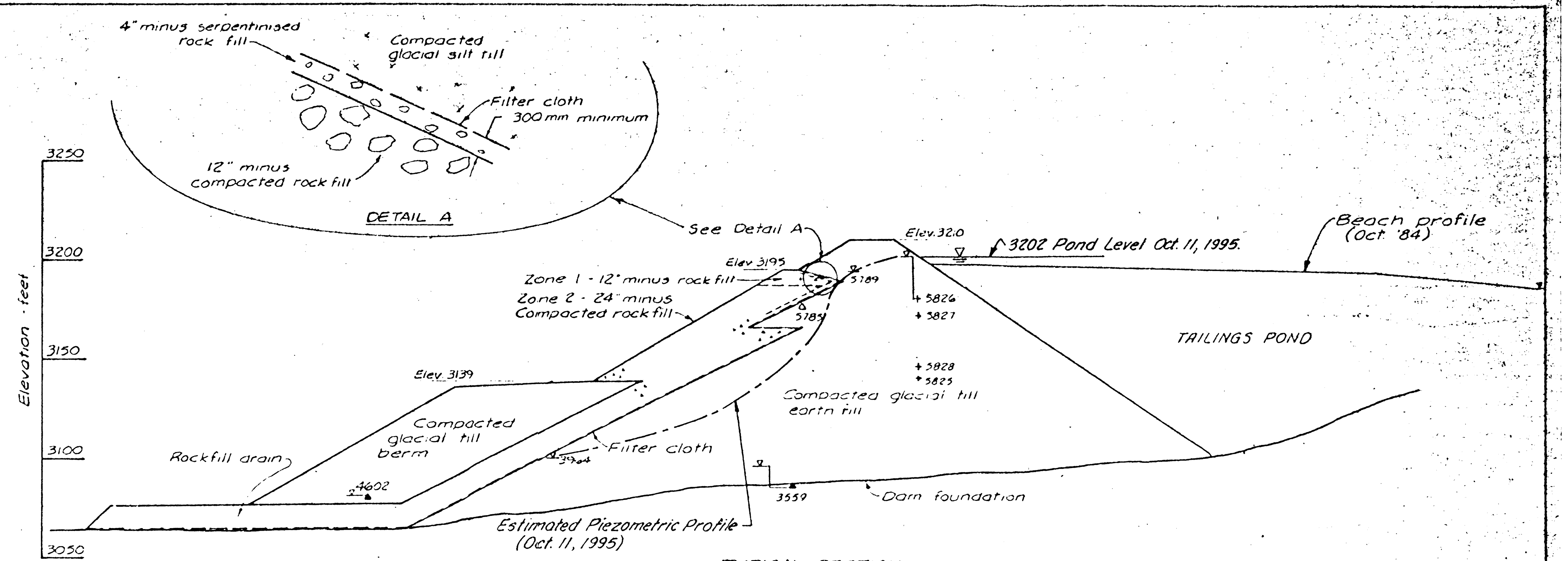
MINE INTEREST CHANGE - Carolin Mines Ltd. president O.E. 92HNW003(?) 11W Gillespie has announced that oline's banker has, through a default judgement, ained an additional 9.5% interest in the mine by uiring the Windjammer and, Aquarius interests. In ition, other people are negotiating with the bank to chase Carolin's debenture.

Carolin has continued to investigate metallurgical hods to improve recoveries of gold and silver from reserves at the Carolin Mine, 20 miles north of e, B.C. Progress has been made using alternative hods. While doing this work, it has been found that reserves contain platinum group metals in addition the gold and silver. Further sampling and test work needed to determine the commercial values and overies of these metals.

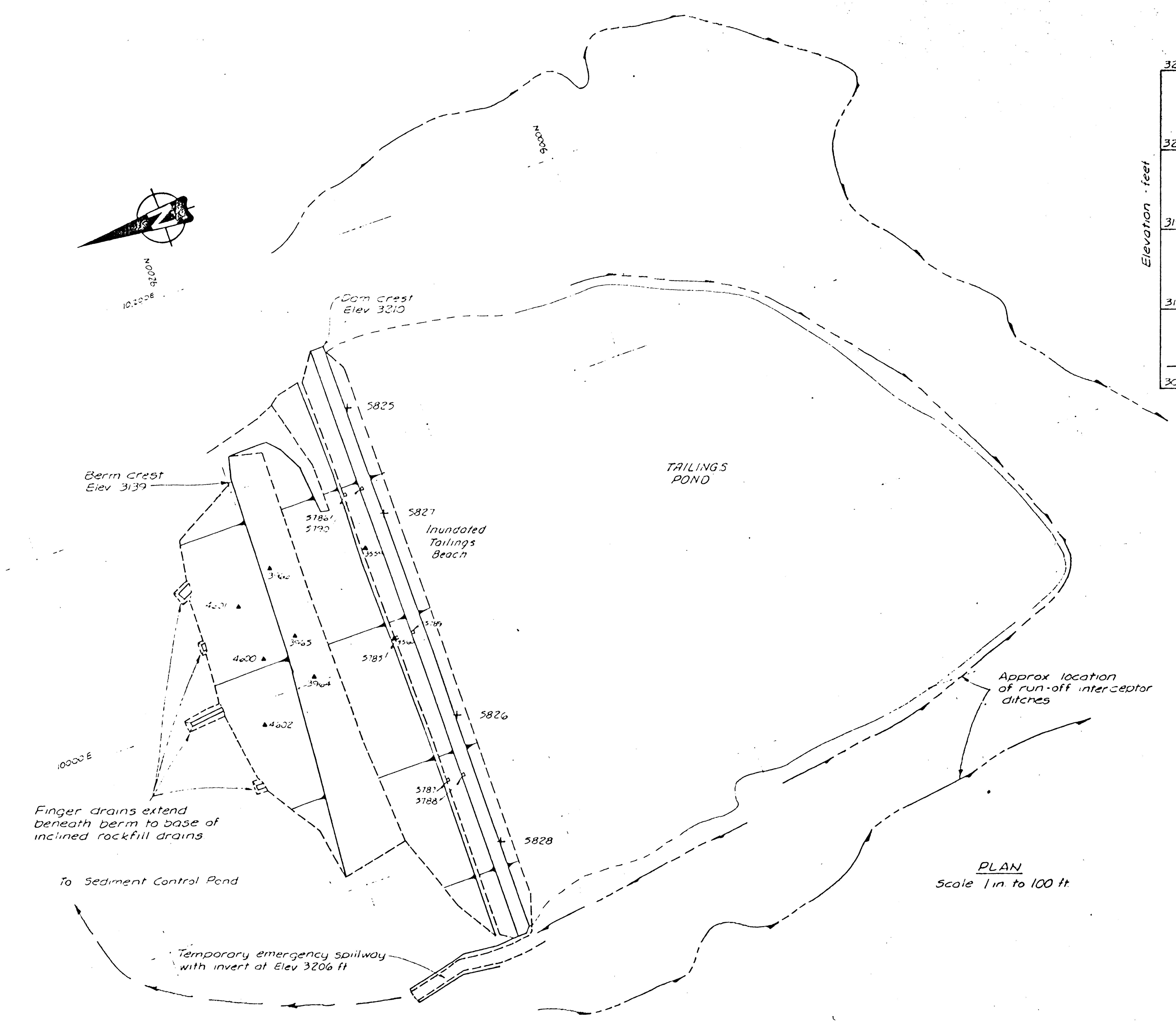
Figure 5 PHOTOGRAPHS OCT. 11, 1995







TYPICAL SECTION
Scale 1 in to 40 ft



PLAN
Scale 1 in to 100 ft

LEGEND

- ▵ Pneumatic piezometers installed during 1983
- ▲ " " prior to 1983
- \+ Standpipe piezometers converted to pneumatic piezometers during 1983
- Indicates elevation head recorded at piezometer (Oct. 11, 1995)

REFERENCE

As built information obtained from Carolin Mines Ltd drawing dated Nov. 1983, scale 1:500

NOTE

Monitoring data for piezometers shown on Fig 4.
Grid shown on plan is metric

Revised Oct. 1995

CAROLIN MINES LTD.

Golder Associates

CAROLIN MINES TAILINGS DAM COMPLETION OF FIRST PHASE STAGE II DAM

drawn R.D.	checked	reviewed T.E.
date OCT. '95	project 952-1483	figure 3

GCNL #25 5FEB1985 **CAROLIN MINES LIMITED** (CLL-T,V,Nasdaq)

RIGHTS OFFERING PROPOSED TO PAY BANK AND CONTINUE EXPLORATION - Carolin Mines Ltd. has announced its London, England agent, Lion Metals Corp. has been unable to complete to date the private placement of up to 4,000,000 Carolin shares. All deposited funds are to be returned. Lion Metals will continue its efforts to obtain the needed funds.

The Mercantile Bank of Canada, have issued a demand for the repayment of their various loans which total approximately $5,000,000 U.S., and $5,000,000 CDN. The Bank has stated that it will accept $6,500,000 CDN. plus 500,000 shares of Carolin Mines Ltd. as full settlement of these outstanding loans. Carolin's financial difficulties are a result, to a large extent, of the failure of its joint venture partners to provide their proportionate shares of the funds required to run the Ladner Creek Mine located 120 miles East of Vancouver, B.C. in which Carolin has a 50% interest. Cash calls have been issued to the joint venture partners, and a total of $4,819,000 is currently outstanding from them.

Carolin proposes to make within 30 days a rights offering to shareholders to raise approximately $12,000,000 to retire bank indebtedness and for development drilling. Corolin intends to proceed with the purchase for treasury shares of the Aquarius Group's 50% interest in the Ladner Creek Mine. 92H/11W (092HNW003)

NMINER 14 FEB 1985

Carolin funding unsuccessful now planning rights offering

VANCOUVER – Given the timing, the fact that **Carolin Mines** was unable to complete a private placement overseas involving some four million shares came as no surprise to the investment community. Claiming European investors were hesitant to commit funds because of the "weak gold market," Carolin President, Orval E. Gillespie confirms that a $12-million rights offering will replace the earlier proposal and that rights offering material will be mailed to shareholders by the end of the month.

Mr. Gillespie says the company intends to proceed with the purchase of the Aquarius Group's 50% interest in the Ladner Creek mine adding: "It is contemplated that these interests would be acquired by the issuing of shares."

92H/11W (092HNW003)

The company has been paying creditors by this method for years and the fact Carolin's stock has been dropping steadily (lately it's slipped below $2) means the dilution would be even greater than from the cancelled private placement.

Carolin's largest creditor is the Mercantile Bank of Canada which has issued a demand for the repayment of various loans totalling approximately $11.7 million. According to Mr. Gillespie, the Mercantile has agreed to accept $6.5 million and 500,000 shares of Carolin in full settlement of the loans. But since that agreement was concluded, Carolin's stock has dropped considerably and there is concern the bank would seek to realize a higher return by selling off assets held by the company.

Arguing that Carolin's financial difficulties are to a large extent the result of the failure of its joint venture partners to provide working capital for the mine, Carolin notes they currently owe about $4.8 million to the project.

Funds from the rights offering would be used to retire Carolin's bank debt and provide capital to drill additional reserves at the Ladner Creek mine which are far from certain even with the funding.

The trouble-plagued operation, which has had more lives than even the most optimistic of people expected, has more than the financial hurdle to overcome if it's to run successfully and at a profit. The head grade has been lower than anticipated because of excessive dilution underground and mill recoveries have rarely reached design levels nor has the company been able to master the environmental aspect of its complicated flow sheet. As a last resort prior to closure, the company was selling its gold in concentrate form which added to processing costs.

81

GCNL #232, 1984

CARCLIN MINES LTD.(CLL-V,T,Nasdaq) 92H/11W (092HNW003)

SHAREHOLDERS MEETING APPROVED REORGANIZATION PLAN - Mining operations at the Ladner Creek Gold Mine, 50% owned by Carolin Mines Ltd., 10 miles ~~northeast~~ of Hope, B.C., have been suspended for 12 weeks. The milling operation is continuing on an inventory of concentrates and is expected to continue with the reprocessing of tailings when the concentrates processing has been completed. During the mine shutdown it is hoped that the financing and debt reorganization plan, now approved by shareholders, will be completed and that exploration for reserves can proceed and that mine development can follow and mining will eventually resume. The time of mining resumption is dependant upon too many factors for management to make an accurate forecast at this time.

Orval E.Gillespie, president, told the Nov.30,1984 shareholders meeting that he was confident that the reorganization plan will be completed on the due date, Dec.15,1984, that 400,000 shares will be taken down at $2.60 each to provide $10,400,000 or net of $9,776,000 to the company. When completed, this will provide the company with some $4,000,000 after compulsory debt payments with which to carry out the mine exploration and refurbish the concentrating plant including installation of new pumping capacities. He told the meeting that with these new funds, which could grow to as much as $17,000,000 if all of the options and warrants forming part of the reorganization plan are exercised, the mine will resume or attain profitable production and that a mine life of 20 years or more is very possible.

The four areas to be explored for new reserves are: to the north into the mountain along the strike of the existing ore zones; the McMaster zone located 3,000 feet to the north where limited past surface drilling has given some encouraging values; the No.3 and No.4 zones down the hill to the south from the existing mine and mill; and fourth is the Aurum zone just south of the No.3 and No.4 zones where good grade gold values have been found in quartz veins of mining widths.

Metallurgical work in the concentrator will be directed to improving overall gold recovery. Past plant production gave unsatisfactory gold recoveries ranging between 60% and 80% of the contained gold. Part of the problem arose through the iron sulphide content of the ore with the resulting high cyanide consumption. This in turn gave rise to chemical recovery and disposal problems and a high gold content in the tailings. The present objective is to determine if a 100 to one concentration ratio can be attained in a series of flotation circuits and cleanings. If this type of concentrate can be produced, then they would be shipped to a smelter for the gold recovery thereby reducing chemical disposal and tailing problems while cutting operating costs.

Preliminary indications are that gold can be recovered from the tailings at about $280 Canadian per ounce and that recovery costs of ore mined from underground will approximate $325 to $350 per ounce.

A key part of the reorganization plan is the private placement of 4,000,000 shares at $2.60 each with warrants attached to buy a further 4,000,000 shares at $3.05 for nine months. The private placement is being organized through Lion Metal Corp. and Jackson Graham Moore & Partners of London, England. Lion Metal has commissioned an independent mining consultant evaluation of the mine and plant which is being prepared by MacKay, Schnellman. They have had experts on the Ladner Creek property several times in recent weeks. This report will form a large part of the work to be done with the proceeds from the private placements.

The second phase of the reorganization includes the joint venture participants holding 50% in the mine transferring their interest to Carolin for 2,100,000 treasury shares of Carolin and a warrant to purchase a further 2,100,000 treasury shares at a price of $3.05 each for 12 months. If exercised, these warrants would generate a further $6,400,000. The joint venture participants have invested in the order of $30,000,000 in the mine. Carolin is also to receive some potentially valuable adjoining claims.

Mercantile Bank has agreed to release its security, which is a first charge on the company's assets and presently amounts to approximately $11,000,000, on the payment of a total of $6,500,000 within nine months, including $2,000,000 cash and 500,000 shares of Carolin payable on closing expected Dec.15,1984. Carolin is indebted to State Farm Insurance Company for approximately $10,000,000. State Farm has agreed to convert this debt to 500,000 shares of Carolin.

The shareholders approved an increase in authorized capital from 10,000,000 to 25,000,000 shares. An option to purchase 500,000 treasury shares at $2.70 each for 21 months to Lion Metals Corporation for its part in securing the reorganization was approved by the shareholders meeting.

GCNL #10 15 JAN 1985

FOR THE RECORD

CORRECTION: CAROLIN MINES LTD. (CLL-V,T)-In GCNL 8(85), it was reported that Carolin has an option to buy 949,000 A shares at 43.05 per share; this is incorrect and should read at $3.05 per share. 92H/11W (092HNW003) LADNER CREEK

80

..N MINER 30 DEC 1985

Carolin Mines posts loss major financing in work

VANCOUVER — **Carolin Mines** reports a loss of $1.97 per share for the year ended May 31, which includes an extraordinary expenditure of approximately $6 million for what the company describes as "provision for the apparent uncollectibility of monies due to Carolin pursuant to its Ladner Creek joint venture agreement."

092H/11W
092HNW008

The company, which also reports a loss of 14¢ per share for the period ended Sept. 30, points out it was unable to make its contributions to the joint venture.

Carolin says tests by Moritz Mining showed that a leach circuit would produce gold recoveries in the high 90% range and an agreement has been signed with that company to incorporate the process into the Carolin milling circuit. These modifications are planned immediately.

A major financing and restructuring program is also in the works, Carolin says, adding the move would result in the satisfaction of its debts and lead to the buyout of its partner's interests in the project. Efforts by the company in the past to restructure ended in failure.

The company claims that Denver Cascade of Colorado is supplying interim financing to maintain and also to modify the mill and treat old mine tailings. A backfill plant is planned plus more underground development work to increase ore reserves. Trading of the company's shares on NASDAQ were halted early in December until Carolin meets the exchange's minimum net worth requirements.

(092HNW003)
92H/11W
N MINER 22 NOV 1984

Carolin placement $8 million

VANCOUVER — **Carolin Mines** says agreements have been reached with regulatory authorities, joint venture partners and major creditors over a reorganization and private placement estimated to bring in about $8 million.

Apparently Carolin has secured a private placement overseas involving about four million shares and an equal number of share purchase warrants which would involve a further substantial dilution of existing shareholders' equity in the troubled company.

The shares are to be placed at $2.60 each and a further four million shares are available at $3.05 each through the exercise of the warrants for a period of nine months, says Carolin.

The proceeds will be used to pay the company's debts and upgrade its Ladner Creek gold mining operation for production at a later date. The Mercantile Bank of Canada, a major creditor, will receive $2 million initially along with 500,000 shares towards payment of the $6.5 million it has agreed to settle for. The remaining $4.5 million has to be paid within nine months, at which time the bank's security will be released, says Carolin.

At least $2 million has been allocated for development drilling and mill refurbishing at the Ladner Creek mine and the rest towards outstanding accounts. In the past, the company has settled many of its trade debts by issuing shares.

Carolin says its milling operation will be suspended for approximately 12 weeks so mill circuitry can be refurbished to allow the 80% recovery rate specified in the original engineering report. Recoveries have generally been poor and the company was never able to master the complexities of its flow sheet. After that is completed, the tailings treatment program implemented earlier this year will be continued. Extensive underground development work will also be carried out to prove up additional ore reserves in order to maintain mill throughputs at the rated capacity.

Assuming shareholder approval is obtained, Carolin has given an option to its agents, Lion Metals Corp. and associates, for 500,000 shares at $2.70 for a 12-month period following the expirty date for the warrants in the original offer.

Carolin will also buy the remaining 50% ownership in the Ladner Creek mine and adjoining mineral claims from its partners for yet more shares — in this case 2.1 million shares with warrants to purchase an equal amount at $3.05 each for a period of 12 months. Of that original amount, two million must be held for nine months. State Farm Insurance has agreed in principle to accept 500,000 shares for the debt owed it, says Carolin.

Carolin completed 10 drill holes (1,770 ft.) at the Ladner Creek property, seven of which encountered the Aurum zone 600 ft. east of the present mine workings. The silicified zone was 10-20 ft. wide with gold-bearing intercepts ranging from 5.4-14.8 ft. in four holes. The company didn't reveal how close these were to true widths. But the 14.8-ft. intersection assayed 0.648 oz. gold while a 12.3-ft. intercept graded 0.261 oz. An 8.5-ft. core length assayed 0.196 oz. and 5.4 ft. returned 0.558 oz. If these are true widths they are near or lower than the minimum widths required for blast hole stoping which the company utilizes extensively.

GCNL #178 14SEPT84 LADNER CREEK

CAROLIN MINES LIMITED (CLL-T,V) 92H/11W (092HNW003)

VARIOUS PROBLEMS & SOLUTIONS REVIEWED - O.E. Gillespie, president of Carolin Mines Limited, reports that progress is being made toward the purchase of the Aquarius Group's interest in the Carolin mine near Hope, B.C. The Aquarius Group members have signed the share exchange agreement. Approvals of Toronto and Vancocouver Stock Exchanges and of the U.S. Securities and Exchange Commission will be sought.

Carolin is now producing a sulphide concentrate containing the gold, instead of using cyanide to produce dore bars. Mr. Gillespie says the new process is simpler and will avoid environmental problems. Resulting lower operating costs will increase the cash flow. However, due to a short term cash shortage caused by the longer delay in receiving revenue from the concentrates, the payroll was late this week, but has now been made. The company is in arrears on remittances to Revenue Canada. A third party demand has been served, but meetings to resolve that problem are being held. Shareholders have approved the allotment of 577,000 shares to be available to settle accounts.

Preparations are being made to retrieve part of the material in the tailings pond to recover gold which was not recoverable by the cyanide process. It is necessary to retrieve the tailings now before new tailings from which the sulphides have been extracted are deposited on top of the old ones. Thes program will remove the need to raise the tailings dam this year. Mr. Gillespie says about 85 ounces of gold will be produced each day at a cost of $278 Cdn. per ounce.

While milling the tailings, there will be time to prepare the present ore reserves further ahead of mining, which will facilitate mine production, and to outline additional ore reserves. Mr. Gillespie says a substantial surface drilling program is underway.

Mr. Gillespie also reports that directors have been negotiating with a U.K. company to supply $12,000,000 to buy the Mercantile Bank of Canada debenture and to supply working capital. He says their consultants have spent the last week on the project and the property, and the financiers have indicated that the review is positive. No formal arrangements have been concluded yet.

GCNL #203 22OCT1984

CAROLIN MINES LIMITED((CLL-T,V) 92H/11W (092HNW003)

NEW FUNDING UNDER NEGOTIATION - O.E.Gillespie, president of Carolin Mines Limited has reported that an interim financing for $500,000, plus $200,000 contingent for overuns, has been raised from private investors and bankers. The funds are to be used to implement the tailings retrieval program at the Ladner Creek gold mine near Hope,B.C. Test work on the tailings indicate that reprocess will recover 85 oz.gold/t at 1,500 tons per day throughput. It is expected that this funding will enable the company to maintain full mill utilization and continued production until negotiations on the proposed new financing is completed with the U.K.syndicate. The proposed equity injection of $16,000,000 is under negotiation with mining consultants visiting the mine Oct.21 and final negotiations expected to start Oct.2?,1984.

GCNL #206 25OCT1984 LADNER CREEK 92H/11W (092HNW003)

CORRECTION **CAROLIN MINES LIMITED**(CLL-T,V)The No.203, page one story on the company showed gold recovery of 85 oz gold/t, which is wrong and should be 85 oz.gold/day.

78

GCNL #176 12SEPT84

COLUMBIAN NORTHLAND EXPLORATION LTD. (CXX-Pacific Coast Stock Exchange) (092HNW003) 92H/11W

YEAR ENDED 31 JULY	1984	1983
Revenue	$2,285,000	$1,761,000
Net Loss	$1,207,000	$1,366,000
Per Share (Loss)	11¢	13¢

LOSS DECLINED 12%

The major asset of Calgary-based Columbian Northland Exploration Ltd. is its 17.55% interest in the Ladner Creek Joint Venture, a mine and mill located some 90 miles east of Vancouver, B.C., that is operated by CAROLIN MINES LTD. Columbian Northland president R.D. Anthony says the venture has been unable to generate a positive cash flow and the total operating cash flow deficiency for the year ended 31July84 was $1,550,000 Cdn. Capital expenditures in the year totalled $1,220,000.

As a result of being unable to operate at a profit and the inability of certain of the joint venturers to pay cash calls, the venture has a working capital deficit of $3,900,000 at 31July84. Included in current liabilities are payroll deductions withheld from wages and related payroll costs of $600,000 for May, June and July. Revenue Canada has started legal actions against the operator to collect this amount.

Carolin Mines, as operator, has been providing working capital for the venture by issuing treasury shares to trade creditors and Carolin shareholders have approved the issue of sufficient treasury shares to substantially reduce the working capital deficit.

In August, the mill operated only intermittently because the mine was unable to deliver material continuously. Remaining probable ore reserves are estimated at some 800,000 tons grading 0.13 oz. per ton, but, these have not been developed to a stage where they can be mined. Known mineralized areas in the immediate vicinity of the mine are being tested by surface drilling.

At present, the mill is being adjusted to produce a saleable concentrate from the tailings pond sand. Preliminary investigations indicate it may be possible to process certain portions of these sands through the mill in such a way as to achieve a cash flow. These tests have not been completed.

Mr. Anthony says, "The future of the project depends mainly on an infusion of capital, increased price for gold, and the solving of metallurgical problems."

NMINER 13SEPT84

92H/11W (092HNW003)

By Columbian Northland

Carolin's troubles spelled out

According to **Columbian Northland Exploration**, which holds a 17.55% interest in the Ladner Creek joint venture gold mine and mill operated by **Carolin Mines** about 90 miles east of Vancouver, the operation is now experiencing severe financial difficulties.

Columbian says it is the result of the mine being unable to operate at a profit, and the inability of certain of the participants to pay cash calls. As at July 31, the operation had a working capital deficit of $3,900,000.

The LCJV (joint venture) has been unable to generate a positive cash flow and the total operating cash flow deficiency for the year ended July 31 was $1,550,000, Columbian says. Capital expenditures during the same period totalled $1,220,000.

Included in the current liabilities are payroll deductions withheld from wages and related payroll costs of $600,000, it continues. This amount includes May, June and July payroll remittances and applicable penalties. At the present time Revenue Canada has commenced legal actions against the operator for collection of this amount, Columbia says.

In addition, the payrolls for the LCJV which were due Aug. 31, 1984 and Sept. 7, 1984 have not yet been met.

The operator has been providing working capital for the LCJV by the issuance of treasury shares to trade creditors. On Aug. 31 the operator received approval from its shareholders to issue sufficient treasury shares to substantially reduce the working capital deficiency.

During August the mill only operated intermittently because the mine was unable to continuously deliver material. Remaining probable ore reserves are estimated at approximately 800,000 tons grading 0.13 oz. gold per ton, but these have not been developed to a stage where they can be readily mined.

A surface drilling program is being carried out to investigate certain known mineralized areas in the immediate vicinity of the mine.

The mill is being adjusted to produce a salable concentrate from the tailings pond sand. Preliminary investigations indicate that it may be possible to process certain portions of these sands through the mill in such a way as to achieve a cash flow. These tests have not been completed.

Columbian says the future of the project depends mainly on an infusion of capital, increased price for gold, and the solving of metallurgical problems.

Columbian itself reports a loss of $1,207,000 for the year ended July 30, on revenue of $2,285,000, compared with a loss of $1,366,000, on revenue of $1,761,000 in the year previous.

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CAROLIN MINES LTD. (CLL-V,T;CRLNF-Nasdaq) **AQUARIUS RESOURCES LTD.** (AQR-V,Alberta)
COLUMBIAN NORTHLAND EXPLORATION LTD. **OCELOT INDUSTRIES LTD.** (OIL-T,M,Alberta)
GCNL #97 18MAY84 **WINDJAMMER POWER & GAS LTD.** (WIN-Alberta) 92H/11W (092HNW003)

BY NEW DEAL CAROLIN IS TO BE SOLE OWNER OF GOLD MINE - Orval Gillespie, president, announces that Carolin Mines Ltd. has agreed to acquire from Ocelot Industries Ltd., Columbian Northland Exploration Ltd. and Aquarius Resources Ltd. their interest in the Ladner Creek gold mine near Hope, B.C., and a large group of adjoining mineral claims in exhcange for 3,026,900 Class B shares of Carolin. In addition, agreements are being completed for Carolin to acquire the interest of Windjammer Power & Gas Ltd. in the same property for an additional 255,200 Class B shares.

Under the previous agreement, Carolin owns 50% of the mine, and cash flow from the mine was to be distributed to Carolin as to the first $2,600,000, to the vendors (Ocelot, Columbian, Aquarius and Windjammer) as to the next $20,900,000, to Caroline one-third and the vendors two-thirds for the next $23,500,000 and thereafter equally between Caroline and the vendors.

Under the new agreement, Carolin would own 100% of the Ladner Creek mine and would receive 100% of the cash flow immediately. In addition, Carolin would hold interests varying from 68.9% to 90.1% in the adjoining mineral claims which cover some 25,000 acres.

The total purchase price is $32,821,000 payable in 3,282,100 yet to be created Class B convertible preferred shares to be issued at a deemed value of $10 each. The existing common shares will be designated Class A shares. The B shares will be non-voting, will pay an annual dividend of 12% for 3 years and will be convertible into A shares on a one for one basis from 10May85 to 10May87. The conversion date may be brought forward if Carolin completes equity financings totalling $15,000,000.

Carolin has agreed to raise that $15,000,000 by way of cash flow from the mine and/or equity financing within the next 12 months. These funds would be used to retire Carolin's presnet $9,000,000 bank debt and to rpovide working capital. To date, about $3,500,000 has been raised. For every $10 of cash flow and of equity financing up to $15,000,000 Carolin fails to raise before 10May85, one Class A share is to be issued to the vendors as their proportionate interest may appear. On the basis that to date Carolin has raised $3,500,000, the maximum number of Class A shares which would be released to the vendors would be 1,150,000.

Completion of all transactions is anticipated by mid-September, 1984.

Columbian will appoint one director to Carolin's board. Columbian, Carolin and Ocelot will continue to form management committee to administer the Ladner Creek mine.

NMINER 24MAY1984

Carolin will buy out partners

92H/11W (092HNW003)

By David Duval

Carolin Mines has concluded an agreement to buy out its joint venture partners in the Ladner Creek joint venture near Hope, B.C. Last month the company said it had reached agreement with **Columbian Northland Exploration** (**N.M.**, Apr. 26/84) but that purchase has now been expanded to include **Ocelot Industries** and **Acquarius Resources.**

The deal involves not only the mine but a large group of claims adjoining the property, say Carolin, pointing out that slightly over three million class B Carolin shares will be issued for their respective interests.

Negotiations have yet to be completed for the interest of Windjammer Power & Gas which could involve the issue of another 255,200 B shares.

Under the buyout plan, Carolin would own 100% of the Ladner Creek mine and receive 100% of the cash flow from the operation. Its interest in the remaining claims (approximately 25,000 acres) would range from 68.9% to 90.1%.

Existing common shares will now be classified as a series and the B shares will be convertible into A shares on a one-for-one basis in the two-year period from May 10, 1985.

The B shares are non voting and pay an annual dividend of 12% for three years. Those shares have been assigned a value of $10 each so the total purchase represents a market value of approximately $32.8 million.

Carolin adds that within the next year it's agreed to raise $15 million through mine cash flow and/or equity. Much of the money will be used to retire existing bank debt of $9 million. Carolin says it has already raised $3.5 million of that commitment, noting there will be a penalty should the $15 million not be raised. For every $10 in cash flow or equity not realized, Carolin will have to issue one class A share relative to its partners' respective interests.

Carolin predicts the transaction will be completed by mid-September, adding that Columbian Northland will appoint one representative to the board.

Columbian, Carolin and Oceloi will continue to administer the operation by a management committee.

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NMINER 8 DEC 1983

Carolin struggles under heavy debt

VANCOUVER — Burdened by a substantial debt load and joint venture partners who are unable to finance their ongoing participation in its gold mining venture, **Carolin Mines** is planning a major share issue to buy out its partners and pay off some of its creditors. This is a complicated proposal with a number of hurdles to overcome and one which will determine the future of the company and its Ladner Creek operation.

92H/11W (092HNW 003)

The Aquarius Group, which includes **Aquarius Resources, Columbian Northland Exploration, Ocelot Industries** and **Windjammer Power and Gas**, has a 50% interest in the Ladner Creek mine and also a large block of claims contiguous to the property. Three of the companies have expressed interest in the buy-out plan.

In order to pave the way for the acquisition, shareholders have approved an increase in authorized share capital to 20 million shares (designated as "A" shares) plus the creation of five million convertible Class B non-voting shares which would be used to purchase the Aquarius Group's interest.

Carolin owes the Mercantile Bank of Canada $9 million which is secured by a debenture against the company's interest in the Ladner Creek mine and property. The bank has requested that part or all of that loan be converted into Class A common shares at $7.50 per share or 75% of the average TSE closing price for the three days preceding the notice of conversion. This, no doubt, would mean additional dilution of existing shareholders' equity through the issuance of a further 1.2 million shares. The conversion period would be to Dec. 31, 1988.

Because of the conversion feature, Carolin says the bank has agreed to give back 4,000 warrants entitling it to purchase a certain amount of gold (not exceeding one ounce per warrant) at a specified price.

The company also has approximately $1.4 million in outstanding accounts which it proposes to pay back with shares subject to the approval of its various creditors. Carolin notes that TSE regulations allow it to set aside up to 10% of its outstanding shares for this purpose, but it doesn't anticipate distributing them all at this time. The 10% would represent about 537,500 shares.

Efforts have been made to avoid problems encountered in the past with toxic substances being discharged into Ladner Creek. The company faces 14 charges (the same charge repeated 14 times) under the Fisheries Act. To prevent any future occurrences the tailings dam has been raised to a level where spring runoff will not cause any overflow, shareholders were assured at the annual meeting.

Ore grade from the underground has not met expectations because of excessive dilution, but steps have been taken to improve this situation. Recoveries in the mill have not met expectations either in what has been a lengthy tuneup period.

NMINER 26APR1984

Report from Vancouver

Columbian to sell Carolin interest

Columbian Northland Exploration says it has entered into negotiations with **Carolin Mines** to sell its 17.55% interest in the Ladner Creek joint venture along with varying interests in mineral claims adjoining the property for approximately $12.1 million. If the deal is successfully concluded, Carolin will make the purchase by issuing 1,205,800 12% cumulative preferred shares and releasing the $1,188,694 in loan guarantees that Columbian put up originally. Carolin must also arrange long-term financing totalling $15 million and register the new common shares for trading in the United States.

92H/11W (092HNW 003)

Apparently draft documents have been prepared and Columbian says the agreement would remove the obligation to fund past the future operating deficits at the mining operation, or additional capital expenditures for that matter.

Claiming the Carolin shares are more liquid than the property itself, R. D. Anthony, Columbian president, predicts that any increase in gold prices would be reflected in higher share prices and the marketability of the shares.

Following completion of the transaction, Mr. Anthony says Columbian will become active again in the mineral exploration field. Shareholder approval is required before the deal is finalized, however.

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W MINER
NOV 1983

Two BC mines using Inco's cyanide removal process

92H/11W (092HNW003)

Inco Limited has completed licensing agreements with two additional Canadian gold producers for the use of Inco's SO_2-Air cyanide removal process for effluent treatment. Carolin Mines Ltd will utilize the process at its Ladner Creek operation near Hope, BC and DuPont of Canada Explorations Ltd will implement it at its Baker Mine facility. The process will enable these companies to discharge mill tailings which will be low in total cyanide concentrations.

GCNL #233 1 DEC 1983

COLUMBIAN NORTHLAND EXPLORATION LTD.

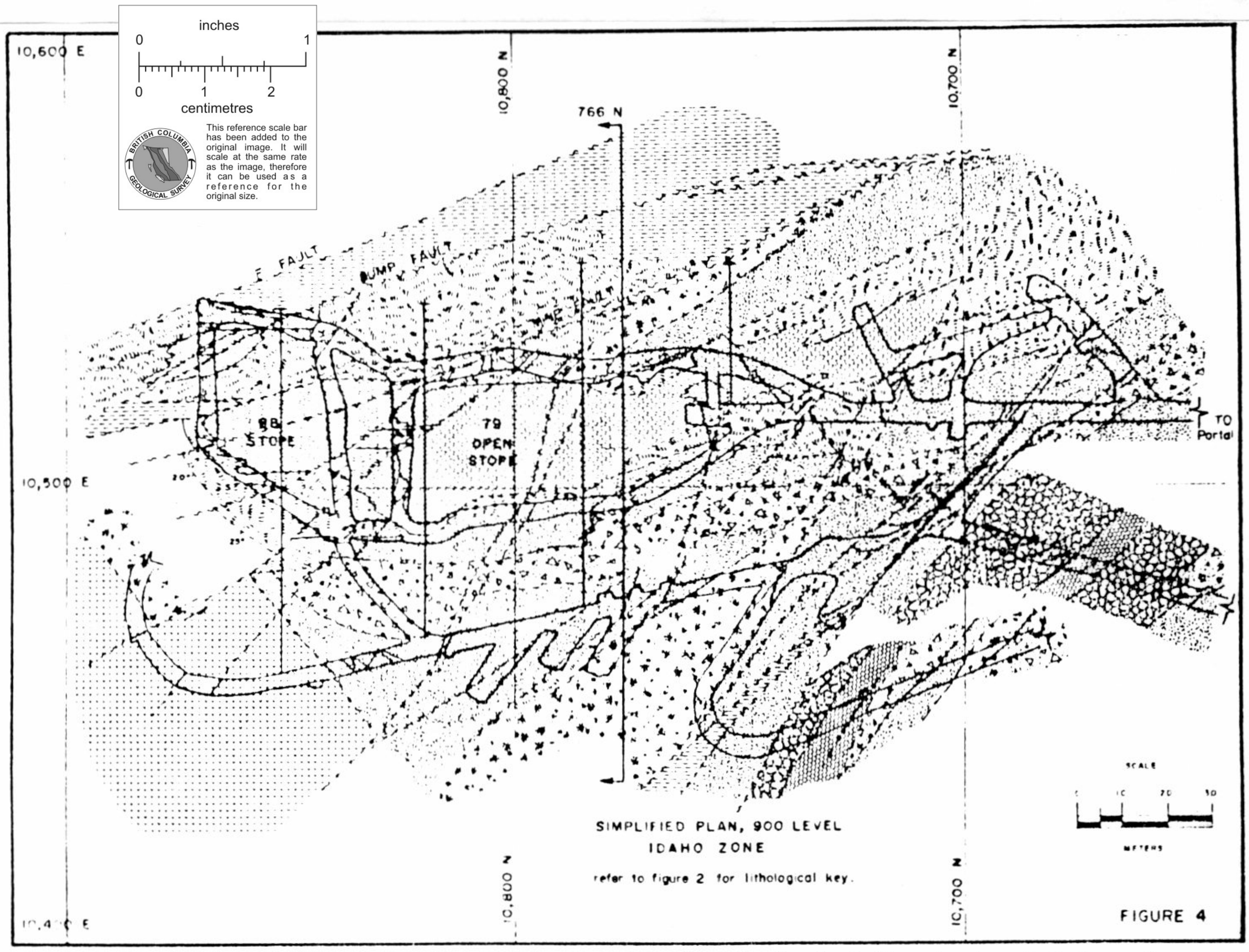
92H/11W (092HNW003)

3 MONTHS TO OCTOBER 31	1983	1982
Revenue	$470,166	$ 352,070
Net Loss	314,906	1,071,618*
-Per Share	3¢	10¢

* Includes $800,000 writeoff of abandoned mining property

OPERATING PROFIT EXPECTED SHORTLY

Columbian Northland Exploration Ltd.'s principal asset is their interest in the Ladner Creek joint venture, operating a 1,500-ton-per-day gold mine in B.C. H.Brodie Hicks, president, says technical problems which have delayed achievement of sustained profitable operation are gradually being overcome. Ore grades and metallurgical recoveries demonstrate progressive improvement. He anticipates an operating profit in the next quarter.



SIMPLIFIED PLAN, 900 LEVEL
IDAHO ZONE
refer to figure 2 for lithological key.

FIGURE 4

complex series of antiformal fold structures which contain certain favourable beds that have been replaced by quartz-albite-carbonate rock carrying gold. This general setting has been subjected to intense post-mineral faulting.

The source of the mineralizing solutions are subject to some debate because little study in the way of fluid inclusions, isotopic compositions or other detailed analysis has been attempted. A significant consideration is the occurrence of "zone-like" alteration hosted by volcanic rocks in the south part of the mine associated with east-trending faults. The presence of a major ultramafic complex adjacent to the ore zones is unlikely to be an unrelated coincidence. More concrete conclusions concerning the genesis of the deposits may be possible after the completion of presently proposed exploration programs.

The basic geometry and apparent ore-controls at the Carolin Mine, considering the large number of mineralized horizons, suggest that other similar ore zones exist along the three kilometre length of the Belt between the Idaho orebodies and the Pipestem Mine. An aggressive rigorous exploration program will be needed to test this large area adequately.

ACKNOWLEDGEMENTS. The authors wish to thank O E Gillespie, President, and K G Collins, General Manager, Carolin Mines Limited for co-operation and permission to publish this article. The enthusiastic encouragement of P W Richardson, Vice-President, Exploration, Carolin Mines Limited is greatly appreciated.

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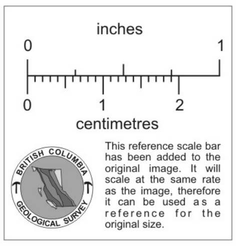

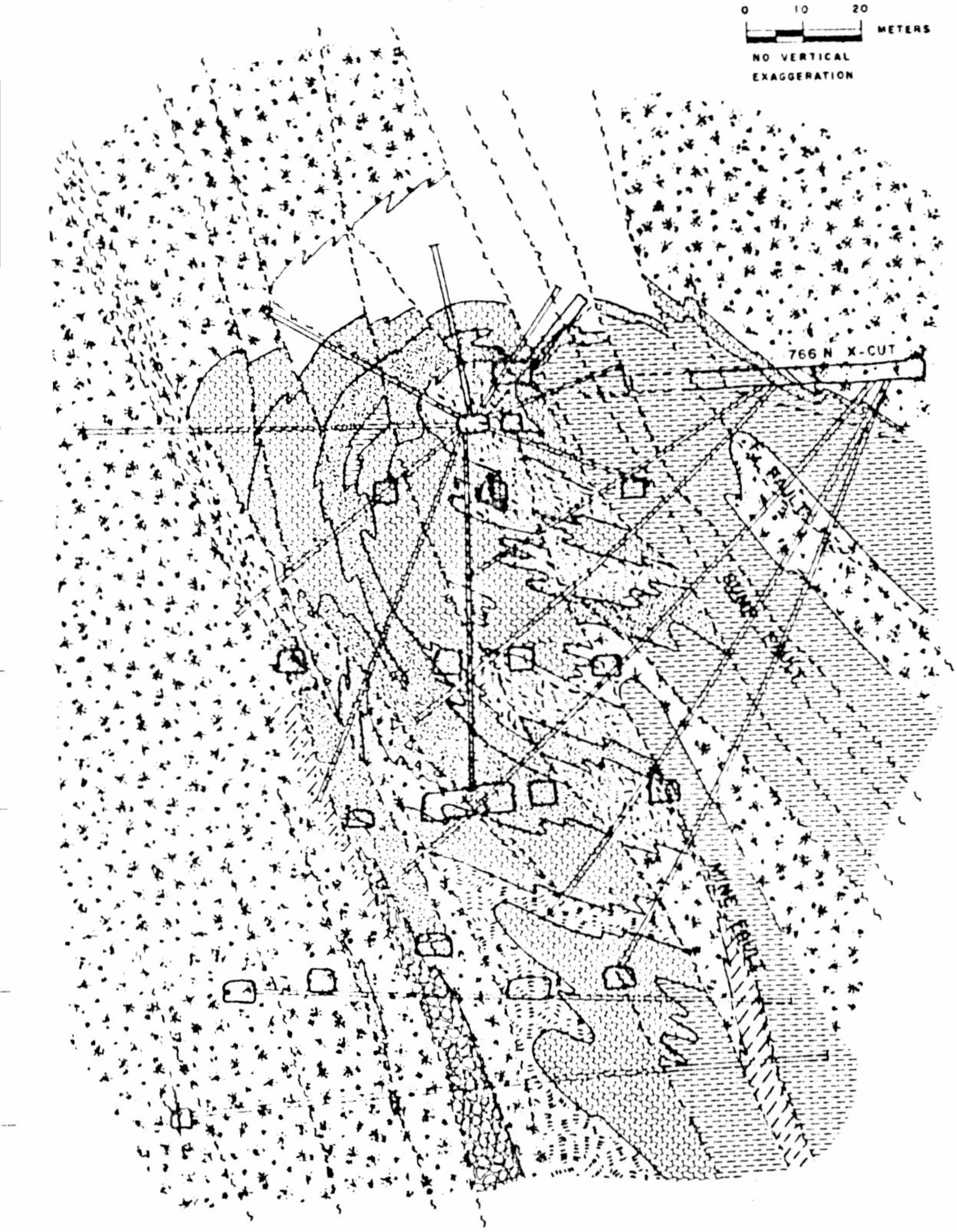

Figure 3. Simplified vertical cross section at 766N (looking north); refer to Fig 2 for lithological key

Occasionally visible free gold is seen mainly smeared along slickensides.

No 1 Zone, which is presently being mined, is hosted by a medium to coarse grained greywacke horizon. Alteration by quartz and albite is very intense in certain areas, and less intense in others. The gold content does not appear to correlate directly with the degree of alteration. The No 1 Zone's main sulfide is pyrrhotite. No 2 Zone is contained in a silicified siltstone unit. Distinctive bedding features are well preserved despite intense alteration. The dominant sulfide in this zone is disseminated, euhedral pyrite followed by arsenopyrite, pyrrhotite, and chalcopyrite.

The No 3 Zone, which is presently undergoing detail definition drilling, is also hosted by a chloritized, coarse-grained greywacke unit similar to No 1 Zone. An interesting feature observed along the fringes of the Idaho Orebodies and in the Pipestem Mine is the presence of quartz-breccia lenses which are spatially related to the more extensive replacement albite-quartz-carbonate bodies.

In summary, the Carolin deposits are contained within a

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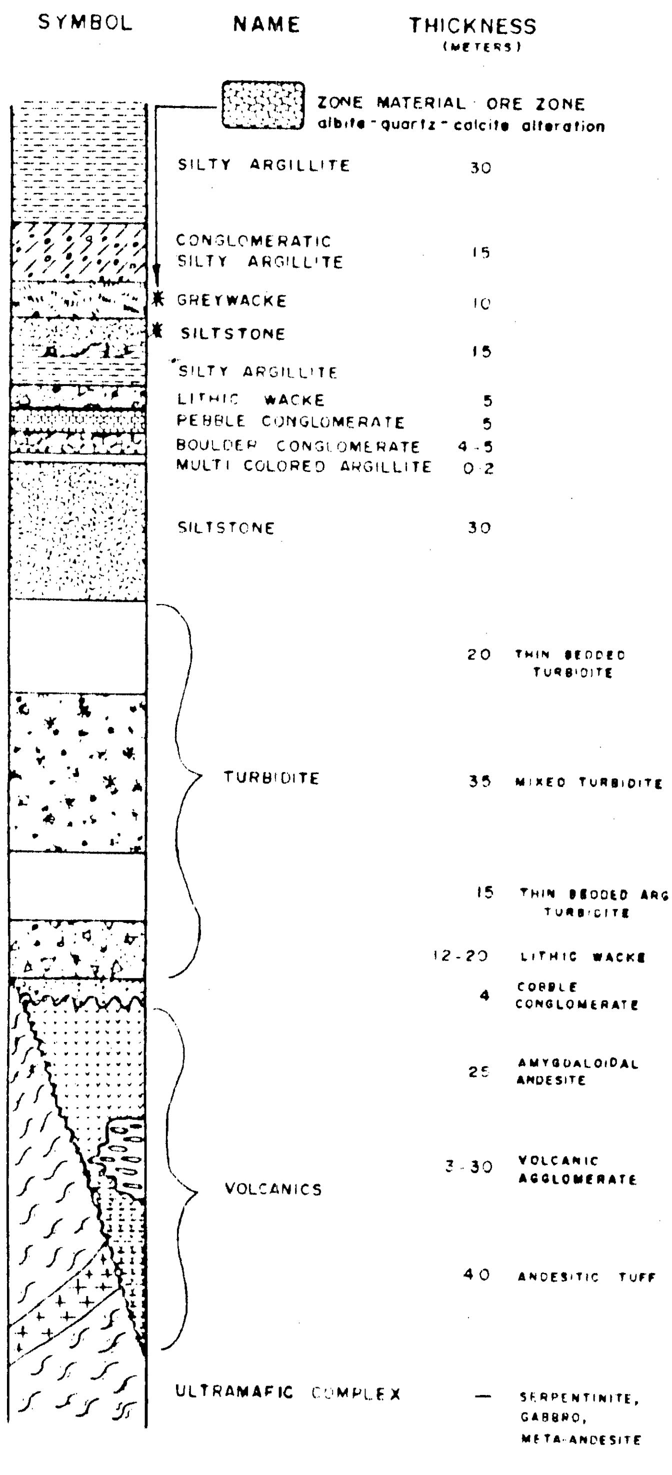
geologist. also through the entire program, was Mr D J Griffith. Mr Cochrane is still consultant on work connected with Carolin's wholly-owned Ladner Creek North Project. Mr W E Clarke who became associated with the property in 1975 continues as geological consultant in the present Mine.

GEOLOGY

The Carolin Property covers part of the east boundary of the Coquihalla Serpentine Belt and adjacent Lower Jurassic Ladner Group. Serpentine belts are generally associated with fundamental fractures that are believed to mark major crustal boundaries. The Coquihalla Serpentine belt separates two important geological units. the Hozameen and Ladner Groups. that are of different age and contrasting character (Ray 1983).

Figure 2. Stratigraphy in the vicinity of the Carolin Mine



Most of the significant gold occurrences have been found along the eastern edge of the serpentine in the boundary fault which has been named the Hozameen Fault. The zones presently being mined are hosted by the Ladner Group sedimentary rocks.

Stratigraphy: key to structure at the minesite

Lower Ladner Group rocks represent the transition between a proximal turbidite depositional environment to a progressively distal turbidite and deeper water regime. A uniform and regular stratigraphic sequence is recognized within the Ladner Group in the mine based on detail underground mapping and drill hole information (Figure 2). An integral part of establishing the stratigraphic succession was the creation of a representative rock specimen suite using a large diamond saw which allowed all personnel concerned with mapping to adopt a uniform terminology for each rock type.

The lower section is characterized with coarsely graded cycles dominated by poorly sorted lithicwacke. The sequence gradually becomes dominated by finer clastic rocks until laminated silty argillite predominates. However, this general progression toward finer-grained sediments was interrupted by a distinctive coarse clastic episode which occurs near the top of the column in the immediate mine area and can be used as a marker horizon. These marker units, which are multi-coloured argillite, boulder conglomerate and pebble conglomerate, provide a basis for correlation between drillholes and main levels, and have been traced continuously from the outcrop near the surface expression of No 2 Zone Orebody to the fartheast north underground workings. Primary sedimentary structures such as graded bedding and slump features indicate that portions of the stratigraphic sequence in the mine area have been inverted.

The basic structure in the Carolin Mine is a complex, asymmetric antiform plunging about 20° to the northwest. The ore zones amenable to open longhole stoping are located in the thickened hinge area (Figure 3). This arrangement is analogous to the well known "saddle reef" ore structures in the Bendigo-Ballarat, Australia, or Nova Scotia gold fields. Two well-defined ore-bearing saddle reef structures have been discovered to date: an upper (no 2 Zone) and lower (No 1 Zone) with a partially outlined third lens below No 1 Zone. The possibility of additional mineralization below No 3 Zone is suggested by isolated deep drill intersections. Weekly mineralized zones have been noted in widely spaced surface diamond drill holes above No 2 Zone, and perhaps are related to the high level McMaster Zone. Mineralized zones appear to thin along the limbs of the main fold. Bedding orientation is highly variable with attitudes from subhorizontal to vertical common between short distances.

The recognition of this major antiformal structure has been hampered in past by a lack of definitive stratigraphic control and the complicating factor of many post-ore faults trending subparallel to the main fold axis. The most prominent of these post-ore faults is referred to as the 'Mine Fault' and lies close to the fold's axial plane (Figure 4). However, these later faults also cut the fold at a small angle. Recognition of rock types in the "nose" of the fold is also difficult due to shearing, crumpling and plastic flow.

A major consideration for exploration is the presence of early northeast-trending cross faults which have displaced the main fold structure but have in turn been cut by the Mine Fault set of fractures.

The most southerly of the cross faults has displaced No 2 Zone at 625N on the 950 Level.

The ore consists of roughly equal amounts of quartz, calcite, and albite. Variable minor constituents are chlorite, sericite, and sulfides. The main sulfide minerals are pyrrhotite, pyrite, and arsenopyrite. Average sulfide content is 6-8% by volume, although marked variations occur. Gold is associated with the main sulfide minerals usually along the rims of grain boundaries and usually accompanied by traces of chalcopyrite.

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J T Shearer, Exploration Geologist
R J E Niels, Mine Geologist
Carolin Mines Limited

Carolin Mines: a geological update

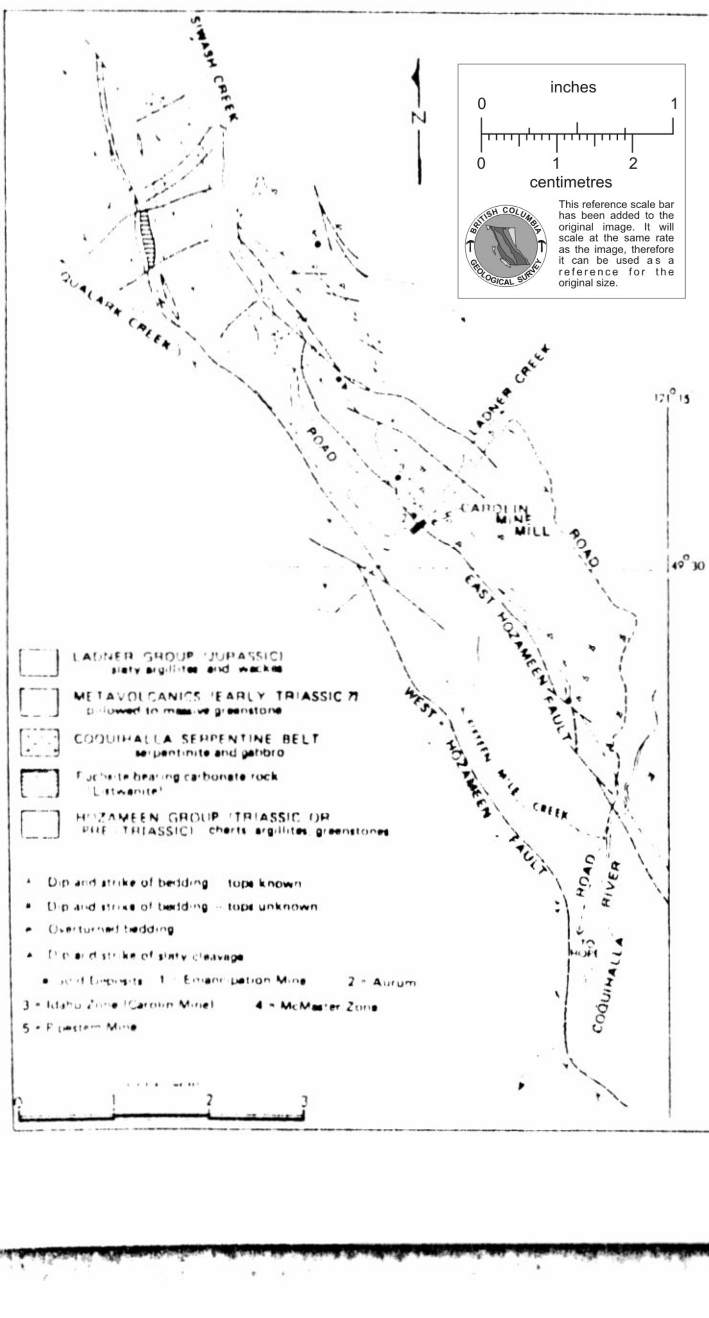
92H/11W
092HNW003

This article discusses some of the geological concepts developed at the Carolin Gold Mine based on experience from underground mining. Also a substantial amount of detailed diamond drilling has been completed since the end of initial exploration in 1978.

Carolin Mines Limited and its joint venture partners, the Aquarius Group, are currently conducting mining and milling operations at the Ladner Creek minesite located 16km northeast of Hope, British Columbia. A 32km gravel road along the Coquihalla River provides access from the Trans-Canada Highway at Hope (Figure 1).

The Ladner Creek gold mineralization occurs as many individual ore lenses that can be grouped into two major ore zones plus a drill-indicated third zone. Milling on a large scale began in December 1981 on ore mined from 79 Stope located in the centre of No 1 Zone. Mining is by open stope blasthole methods taking vertical slices from longhole rings 1.5 metres apart. Ore reserves as of January 1983 were 1,357,000 tons of 0.128 ounces per ton gold with minor silver values in proven & probable ore categories. A major exploration program is planned to investigate the untested northward plunge of the three known ore zones. Wide spaced diamond drilling is presently being carried out on the No 3 Zone to test tonnage potential.

Figure 1. The regional geology of the Carolin-Pipestem-Emancipation gold mines area (after Ray 1983)



The showings which comprise the present operations were discovered around 1915 by J O'Connell, T De Angelis, and A McLean. At present, the tested ore blocks are confined to the Idaho Claim which was located by T De Angelis on 9 August 1915. Mr De Angelis still resides in Hope. A discovery in 1926 of spectacular high grade gold values in a talc shear zone on the Aurum Claim led to the small scale development of the Aurum Mine and brought considerable interest to the area, named the Coquihalla Gold Belt (Figure 1). Production was realized from four properties: The Ward, Pipestem, Emancipation, and Aurum. In 1945-1946, the first diamond drilling consisted of eight holes collared near the surface expression of No 2 Zone. The average grade defined by this drilling is very similar to the present mine grade. In the early 1960s, Summit Mines Ltd succeeded in consolidating a large group of contiguous claims covering many old showings along the Belt.

In 1973, an agreement was negotiated by Carolin Mines Limited to purchase the Ladner Creek Property from Summit Mines Limited. An aggressive exploration program was launched by Carolin in 1973 that led to a significant mineral reserve being established by the end of 1974. The property was optioned to Precambrian Shield Resources in 1975. However, they relinquished the option in 1976. During this period, a mineralized zone very similar in character to the present orebodies was found on surface in McMaster Pass approximately 1000 meters north of the present workings and 675 metres elevation above.

Underground diamond drilling and bulk sampling were carried out from an exploration decline during 1977 and 1978. The Aquarius Group of companies joined with Carolin to finish the decline work. In 1979, a feasibility study completed by Kilborn Engineering Ltd recommended production of 1500 tons/day on published ore reserves of 1,500,000 tonnes at 0.141 oz/tonne gold using a 0.08 oz/tonne cut-off which included 10% added dilution at 0.050 oz/tonne and 10% dilution at zero grade.

A production decision was made in 1979 with Carolin Mines Limited as operator and having a 50% interest. The Aquarius Group partners with respective interests in the property are Ocelot Industries Ltd 22.5%, Great Basin Petroleum 17.55%, Windjammer Power and Gas 4.95%, and Aquarius Resources 5.0%.

Starting in 1973 and throughout the exploration that eventually led to the feasibility study, Carolin Mines Ltd retained Mr D R Cochrane as geological consultant. Project

(70)

N MINER
24 NOV 1983

LADNER CREEK (092HNW003) 92H/11W

Carolin Mines says it's about to enter a "normal, profitable period of gold production" after a year of intensive effort to develop the mining, milling and environmental aspects of the operation. In order to improve gold production, the cutoff grade underground was increased to 0.08 oz. gold and a cable bolting technique has been adopted for ground support, which also reduces dilution. Two drills are now attempting to delineate additional ore reserves and the company is currently investigating the northern extension of existing reserves together with the No. 3 zone.

Additional flotation cells are being added to the mill as well as a concentrate dryer which will allow a carbon-gold concentrate to be produced. This product would be dried and shipped to a smelter but routine pouring of doré-bars will continue, says Carolin.

The operation's water purification systems have been augmented with the newly developed Inco SO_2 Air Process and the tailings dam was raised to give added protection in case of heavy runoff.

Carolin says it has offered to buy out the 50% interest in the mine held by certain joint venture partners who were behind in their cash calls. Negotiations are continuing on this matter. The company had a working capital deficiency as of May 31 totalling $10.3 million and a loss for the period of $5.04 million or 99¢ per share. Liabilities May 31 were $12.2 million.

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(CAROLIN CONT')

New financing mooted

The Illinois-based State Farm Mutual Insurance interests hold a current 12% of Carolin's 4.9 million common shares as a result of previous financing arrangements. On the conversion of rights to Carolin shares, State Farm could end up with a 22% ownership of the Vancouver company.

Carolin is looking at new financing avenues and the form that such financing will take is expected to be divulged soon.

Heavy cost over-runs of bringing in the Ladner Creek joint venture mine have boosted total capital costs to the $48-$50-million range, or almost 2½ times the original (in 1979 dollars) capital estimate of some $20 million. A sizable portion of the cost over-runs related to resolving technical and other problems that emanated from a tighter environmental control framework than had been envisaged at the mine-mill planning stages.

It's estimated, for example, that 20% of the over-all costs relating to the mill involve pollution control features. And frequent demands for changed or tighter controls can impose costly responses in order to ensure operational continuity.

To meet B.C. environment ministry concerns some weeks ago over an increasing water level and cyanide content of the tailings pond, Carolin recently poured about $100,000 worth of chlorine into the pond to speed up degradation. It also completed a rock berm to raise the downstream drain on the tailings pond dam. Pilot tests are under way on an Inco sulphur dioxide process for minimizing iron cyanide levels. The Inco process would complement the operation's current alkaline chlorination system. Controlled discharges into the Ladner Creek are tightly monitored.

Before the most recent shutdown the Ladner Creek workforce totalled 135 and was somewhat lower at the time of The Northern Miner's visit. In addition to Mr. Collins, mine manager, senior operating personnel at Ladner Creek include Rod Samuels, mill superintendent and John Michell, assistant mine manager.

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The Northern Miner

NMINER 23 JUNE 1983

JUNE 23, 1983

92H/11W
(092HNW003)

Carolin believes improvements in mine operation to continue

By Nicholas Cotter

HOPE, B.C. — Some mines just have to struggle a lot harder than others to make it to the ranks of continuous producers.

In the case of the Carolin Mines-operated Ladner Creek gold mine, located in a narrow scenic valley within the Cascade Mountains 14 miles northeast of here, the struggle has been continuous since initial production late in 1981.

The project's prolonged and interrupted run-in period is a reflection, in large part, of unusually rigorous environmental control parameters within which the company is overcoming the normal "quota" of mine run-in problems — and then some — as it strives for profitable operating continuity.

Indeed, senior Carolin personnel ruefully refer to the problems, challenges and costs relating to environmental concerns as "the price" for conducting a mining operation at an environmentally high-profile location that is only a 2-hour car drive from Vancouver. Ladner Creek itself is part of a drainage system that flows into the (steelhead) fish-stocked Coquihalla River which, in turn, is a tributary of the Fraser.

At the time of The Northern Miner's visit, the operation had been back in production for about one month following the latest temporary shut-down to allow for upgrading of mill feed for further improvements to the operation's waste disposal system.

"I believe the main problems are now behind us," commented K. G. Collins, mine manager.

Given a sustained period of uninterrupted production, with improved mill heads and recovery, operator Carolin Mines is confident the project will achieve consistent profitability for the joint venture partners.

In addition to being mine operator, Carolin holds a 50% interest in the (approximately) $48-million project. The other 50% is shared by Aquarius Group participants comprising **Ocelot Industries, Columbian Northland Exploration, Aquarius Resources** and **Windjammer Power and Gas.**

Prior to its recent 4-week shutdown, Ladner had been recording a mine operating profit of about $100,000 a month for the previous four months even though mill heads and recovery were relatively low, according to Carolin.

Mill at design capacity

Within weeks of resuming production in early May, the Ladner Creek mill was operating above design capacity of 1,500 tons per day. Although millheads were averaging just below 0.1 oz. gold per ton, Carolin's immediate objective is to get them to the 0.12-0.13-oz.-per-ton level as soon as a stockpile of lower grade ore is processed.

Recovery, which has been an acknowledged problem in the flotation and cyanidation mill processes, is being steadily improved. In early June, the mill recovery rate was averaging better than 70%. This is a marked improvement over 1982 mill recovery rates, but senior Carolin personnel are confident the average can be increased to the mill's 83% designed rate.

The mine's two main access tunnels are located at the 900-m and 800-m levels, with current production coming from stopes at the 800 horizon. Primary and secondary crushers are located underground, with crushed ore moved by a conveyor system to the modern mill facilities.

With three years' reserves blocked out on the basis of a 1,500-ton-daily milling operation, and the potential for reserve additions considered to be strong, Carolin is working towards a steady 2,000-ton-per-day-plus project.

"We would like to be at 2,000 tons by July . . .possibly at 2,500 tons," says Carolin President Orval E. Gillespie, who notes that no new capital equipment is needed to go to the higher mill rate.

Reserve additions' potential

Using a 0.05 oz. cut-off grade, reserves at the Ladner Creek South mine's Idaho zone are calculated at almost two million tons averaging 0.127 oz. per ton. Using a higher 0.08 oz. cut-off, as Carolin is now doing, the reserve tonnage is calculated at 1.7 million tons averaging 0.15 oz. gold per ton.

Drilling is scheduled to get under way on the McMaster zone to the north of the Idaho. From previous drill results, the McMaster is considered to be geologically similar to the Idaho structure which trends in a northwest direction, dips easterly and plunges at about 20° to the north. Mineralization in the Idaho occurs as a replacement-type material in altered sediments — predominantly greywackes.

Any discussion of potential reserve additions has to include a reference to Carolin's 100%-owned Ladner Creek North property, which adjoins the joint venture operation. The Ladner Creek North encompasses the former (limited) producing Pipestem mine. The geology of both Ladner Creek properties is similar. Currently, a drill program is being lined up for the north property.

Although cumulative gold output by Carolin at Ladner Creek South approximated 8,700 oz. to the end of 1982, gold production in recent months has been between 2,000 and 2,400 oz. a month, with increases to 3,000 and 3,500 oz. a month envisaged over the near term. And Carolin anticipates a production rate of 5,000 oz. per month, assuming a continuation of the improved operating trend. The gold content of recent doré production has ranged from 85% to better than 90%.

The company estimates that, on the basis of sustained production of 5,000 oz. gold per month and a Canadian gold price of $550 an oz., a mine operating profit of about $2 million a month is achievable. Carolin is also confident that there is room for reducing recent operating costs of about $28 per ton.

Carolin has drawn down $9 million of a $10-million bank demand loan negotiated last October and, according to Mr. Gillespie, bank indebtedness now amounts to $9 million.

(In reporting its share of the Ladner Creek joint venture operating losses at $886,500 for the fiscal half year ended Nov. 30 last, Carolin also disclosed its own bank indebtedness of $10.4 million at that date, along with other long-term debt of $7.56 million. Revenue for that 6-month period totalled $1.23 million.)

(CONT.)

NMINER 28APR1983

Gets environmental approval

Carolin resuming full production at its Ladner Creek gold mine

92H/11W

(092HNW003)

By Kerry Knoll

Carolin Mines will be resuming full operations at its Ladner Creek gold operation within the week, following a one-month shutdown to implement changes to its waste disposal system and to upgrade the ore from the mine.

The Northern Miner quoted an official of the British Columbia Ministry of Environment last week as saying it could be up to two months before the mill resumes operations, and then at only 10% of capacity. However, ministry spokesman Kelly Francis tells The Northern Miner that this is not the case, and that her department has given Carolin the go-ahead after the company agreed to install a sulphur dioxide treatment plant to reduce levels of iron cyanide in its waste effluent discharges.

Carolin's current problem began early in February, when the company was in the process of modifying the ore outline at the mine from a 0.05 oz. gold per ton cutoff to a 0.08 oz. cutoff in order to raise millhead. To do this Carolin was considering a temporary suspension of operations so that it could draw out and stockpile 20,000 tons of lower grade material, allowing it access to higher grade ore.

But at the same time, the Waste Management Branch of the Ministry of Environment called a meeting with Carolin officials to express its concern over the increasing waste level and cyanide content in the tailings pond. (Carolin has since applied to the ministry to have the maximum limit raised to 0.3 ppm coupled with an overall average of 0.2 ppm. The current allowable is 0.1 ppm.)

Carolin decided to solve both problems at once by closing the mine for a short period of time.

Then another government department, the Ministry of Energy, Mines and Petroleum Resources expressed concern over high water levels caused by spring run off. The two sides agreed that the situation could be rectified by the construction of a rock berm containing some 30,000 yds. of rock to be erected in order to raise the downstream drain on the dam. Carolin officials say the berm should be completed this week, and the chief inspector of mines, William Robinson, tells The Northern Miner that when this is completed the company will be able to resume operations.

The higher level of cyanide measured in the tailings pond stemmed from a routine tuning of the circuits. While not increasing actual cyanide levels, it did increase the level of iron cyanide which could not effectively be treated with the existing alkaline chlorination system. But by adding a new system, under the direction of Inco Research Laboratories as consultants, Carolin has shown through pilot testing it is now able to keep the iron cyanide level within ministry guidelines.

While giving Carolin the go-ahead to begin production, the ministry has qualified its position in a letter to the company stating: "the practicability of utilizing the SO_2 process is based upon pilot scale tests and therefore final acceptance of the cyanide treatment processes will depend upon their continued and satisfactory performance during full scale application . . ."

Carolin officials say the removal of the 20,000 tons of lower grade ore from the mine is now complete and the first blasting of the higher grade material has begun. The company is expecting a grade of 0.135 oz. gold per ton when production resumes.

The company had originally reduced its cutoff grade to 0.05 oz. when gold prices were at a cyclical high. But while this increased reserves from the 1.68 million tons grading 0.128 oz. indicated when development began, it meant mining an initial grade of less than 0.1 oz. The company now expects the operation to be "very profitable" at this grade, and current prices, Paul W. Richardson, vice president, exploration, says.

In order to clarify the situation further, Carolin has invited a representative of The Northern Miner to visit the Ladner Creek site, and a field story will be appearing within the next few weeks.

GCNL #88 6 MAY 1983

CAROLIN MINES LIMITED 92H/11W (092HNW003)

PRODUCTION RESUMED - Carolin Mines Ltd. has announced that the Ladner Creek Mine near Hope, B.C. has resumed full production at 1500 tons per day effective 4May83. Construction of the rock berm across the face of the tailings dam has been completed. Mill operations were suspended in March. (See GCNL No.61 and 64 (1983).

NMINER 12MAY1983

Carolin resumes

Carolin Mines has resumed production at its Ladner Creek, B.C., gold mine after shutting down temporarily to address environmental concerns and allow the company time to draw out 20,000 tons of low grade ore, giving it access to higher grade material. The resumption of operations was announced May 4, after construction of a rock berm across the face of the tailings dam was completed. 92H/11W

(092HNW003)

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GCNL #75 19APRIL1983 **CAROLIN MINES LIMITED** 92H/11W LADNER CREEK (092HNW003)

PRODUCTION EXPECTED TO RESUME IN TEN DAYS - Carolin Mines Ltd. tailing pond proposal has been accepted by both the B.C. Ministry of Energy, Mines and Petroleum Resources and the Ministry of Environment. The company will build a rock berm across the face of the tailing dam, enabling continued strage of water. Work has started on the project, and completion is expected within approximately ten days. Mill production will resume within this time frame at 1500 tons per day.

The Ministry of Environment has requested a report assessing the practicability of treatment processes for cyanide-bearing wastes. Preliminary tests by consultants on Carolin's SO2 plant have provided positive results in eliminating iron cyanide and the company's report has been accepted. Inco Research Laboratories has been engaged in a consulting capacity to carry out additional testwork and to develop an operating treatment system.

These programs will benefit both environmental control and mill recovery, with fresher water conditions in the pond. The mine and plant are near Hope B.C.

Carolin mine has more problems with cyanide leaking into creek

By David Duval

VANCOUVER — Carolin Mines' gold operation near Hope, B.C., has been shut down for the second time by the Ministry of Environment after cyanide from mine tailings was detected in Ladner Creek at levels well above those outlined in ministry guidelines.

Although Carolin President Orval Gillespie said at the time of closing that the "milling operation was recently stopped so that access to higher grade ore could be facilitated," the company has now stated it will be building a rock berm across the face of the tailings dam to enable the continued storage of water, and that mill production will resume when this is completed. Carolin says it began work on the berm earlier this week, and expects the job to take about 10 days.

The mine was closed by the ministry at this time last year on similar charges and operations were allowed to resume after two months when the tailings reservoir was pumped down to a level where it no longer posed a danger.

But despite Carolin's claims to the contrary, the ministry feels the operation will be closed down for at least two months or more paralleling last year's closure. And when production does start it will probably be at about 10% of capacity until the company proves it has the cyanidation [illegible]

The lower mainland regional director for the ministry, Donald Hehn says his budget has been "stretched to the limit" by the Carolin operation and pointed out the company undertook changes in the cyanide circuit without informing his agency. This increased the level of cyanide going into the tailings area and the subsequent runoff from heavy snowfall earlier this year compounded the problem, resulting in higher than normal concentrations of cyanide being found in the creek.

Carolin approached ministry officials about continuing operations even though it was violating the conditions of its operating permit, saying it would have to lay off staff and shut down the mine if they didn't agree. But the ministry had no choice, Mr. Hehn argues.

According to him, the tailings pond has been topped off "beyond its capacity" and the "whole chemistry of the operation is screwed up," about the strongest statement officials have made thus far.

The tailings dam will have to be "reinforced" and they will need to devise a system to bring their recovery technique under control, he says. The work the company did last year building up the dam was unsuccessful since water ran right through it, he pointed out.

In a release dated Mar.24, Carolin said "an additional facility is being built to allow the use of SO_2 to treat iron cyanide compounds in the leach residue" and that the completion of the program would take approximately two weeks. But this time frame has already been surpassed.

Carolin has always been somewhat of an enigma in B.C. mining circles. One of the reasons surrounds the production rate at Ladner. With a limited reserve of 1.4 million tons grading 0.15 oz. gold (based on a 0.08 oz. cutoff) Carolin opted for a production rate of 1,500 tons per day when most experts felt the rate should be around 500 tons. In order to provide that excess capacity the company incurred some major cost overruns. And this appears to be what is doing Carolin in at the moment.

Carolin even announced in 1981 (to a group of U.S. investors) that a boost in throughput to 3,000 tons per day was being contemplated for the summer of 1982, subject to the development of "additional ore reserves" as expected. More recently it stated a 2,000-ton rate was targeted for this June.

Last December Carolin admitted the grade mined for that month averaged 0.097 oz. gold but didn't divulge the actual recoveries. But it said they were expected to hit 83% in early 1983. The company also predicted production levels would exceed 5,000 oz. gold per month in the first quarter (at $C550 gold) and a mine operating profit of $2 million per month. Management announced the increase in mill rate at the same time they said the over-all grade would rise because of a higher cutoff underground. Higher cutoff grades effectively reduce the amount of reserve tonnage available which is a highly unusual strategy, industry sources conclude, unless gold prices are sure to rise.

With an election coming up and the very real possibility of a socialist New Democratic government coming into power in B.C. the trouble at Carolin is the last thing the industry needs right now, they argue. Everyone is holding their breath, hoping the company can resolve its problems satisfactorily. There doesn't seem to be much time left

LADNER CREEK
92H/11W (092HNW003)

GCNL #61 28MARCH1983

CAROLIN MINES LIMITED (92H/11W) (092HNW003)

PRODUCTION EXPECTED TO RESUME IN TWO WEEKS - Carolin Mines Limited president Orval E. Gillespie has reported a program to modify the ore outline of the Carolin Mine near Hope, B.C., from a 0.05 oz/ton gold cutoff to a 0.08 oz/ton gold cutoff is nearly complete. The 79 Stope drawpoints are being cleared of low grade material which is being crushed and set aside in a low grade stockpile. When production from the stope resumes, it is anticipated that the mill feed will be 0.135 oz/ton gold. Preparation of a second stope is almost complete.

LADNER CREEK

The company is continuing its treatment of the tailings pond so that a purer effluent from the pond will be obtained. This will achieve maximum recoveries of gold within the mill, because tailings pond effluent is used in the milling process, and also the purer effluent will allow the secondary treatment plant to maintain an improved quality of water released into the stream system. The completion of these programs and the resumption of gold production will take place in approximately two weeks.

Exploration drilling near the south end of the mine has encountered additional mineralized zone material beneath the ore reserves in the No.1 zone. The intersection has a length of 103 feet. Check assaying by a commercial laboratory is being awaited.

GCNL #64 31MARCH1983

CAROLIN MINES LIMITED (92H/11W) (092HNW003)

PRODUCTION RESUMPTION PROGRAM REVIEWED - Carolin Mines Limited president Orval E. Gillespie has reported that the milling operation at the Ladner Creek mine near Hope, B.C., was recently stopped so that access to higher grade ore could be facilitated. Work continues on this process in the stopes and drawpoints and it is anticipated that these operations will be satisfactorily concluded in the next couple of weeks. He anticipates the new material will grade out around 0.135 as opposed to the previous lower grade mill feed. At the same time the company has been enhancing the storage pond system for the mine tailings. The Chief Inspector of Mines for B.C. must be satisfied prior to the resumption of milling operations. Consulting engineers, Golder & Associates, continue to liase with representatives of the Inspector of Mines to ensure adequate compliance with directives of the Inspector. He is hopeful that no delay will be occasioned to the planned resumption of milling by reason of any difficulties in this area.

(See previous story on plant shutdown in GCNL NO.61, 28Mar83).

NMINER 7APR1983

Carolin halts milling

Carolin Mines reports milling operations at its 50%-owned Ladner Creek gold mine near Hope, B.C., have been stopped to facilitate access to higher grade ore at the mine.

Carolin President Orval Gillespie says work is continuing on this process in the stopes and drawpoints, and should be concluded "in the next couple of weeks." He said it is expected the new material will grade out at around 0.135 oz. gold per ton, an increase over lower grade material previously being milled.

Mr. Gillespie adds that the company is also currently at work enhancing the storage pond system for its mine tailings.

92H/11W

(092HNW003)

GCNL #246 23DEC82 CAROLIN MINES LIMITED (92H/11W) (092HNW003)

OPERATING PROFIT OF $200,000 - REPORTED FOR NOVEMBER 1982

Carolin Mines Limited has ~~reported November~~ November 1982 was the first profitable month of operations at its 50% owned Ladner Creek South Joint Venture mine near Hope, B.C. During November four bullion bars were poured at the mine, having a total gold content in excess of 2,400 troy ounces. This gold generated revenues of more than $1,000,000 while operating costs were approximately $800,000 leaving an operating profit of approximately $200,000. On Dec.15 bullion bars No.21 and 22 were cast at the mine. The gold content of these ingots exceeded 90%, the highest purity bullion bars poured to date.

Ore production at the mine-mill complex is now approaching the 1,500-ton per day rate. This should increase during 1983 with a 2,000-ton per day rate targeted for June 1983. No new capital equipment is expected to be needed for this higher production rate other than a mechanical jig for the mill. This jig is now being installed and will scalp off coarse gold from the ball mill discharge. The net effect of the jig will be to reduce costs and improve mill recovery. It is planned to have the jig operational before the end of December.

The grade of gold ore being mined in December 1982 is approximately 0.097 ounce gold per ton. Current mining of this low grade ore zone is scheduled for completion by early January 1983. At that time, the grade will improve to 0.135 ounce gold per ton which is the approximate average grade of the mine.

Mill recovery has been improving steadily. With the installation of the mechanical jig, and further fine tuning, a mill recovery rate of 83% should be achieved in early 1983. This is the designed recovery rate of the mill.

Orval E.Gillespie, president of Carolin Mines states that during the first quarter of 1983, as the mine production increases and the mill recovery rate continues to improve, gold production will exceed 5,000 troy ounces per month. Assuming a $550 Canadian price for gold, a mine operating profit of approximately $2,000,000 per month is projected.

He continues, "The Ladner Creek South Joint Venture Mine is the largest gold mine in western Canada. After a difficult tune-up period, the mine is now fulfilling its promise to be one of the most efficient and lowest cost gold producers in North America."

THE NORTHERN MINER December 30, 1982

NMINER 30DEC82

Carolin reports first mine profits

Carolin Mines is looking for a rapidly improving profit picture at its 50%-owned Ladner Creek gold mine near Hope, B.C. The operation is a joint venture with several other companies.

According to Carolin's president, Orval E. Gillespie, November was the first profitable month of operations at the mine, with four bullion bars being poured with a total gold content in excess of 2,400 oz. This generated revenues of more than $C1 million. "With the mine/mill start-up phase essentially behind us, operating costs have been declining steadily and ~~are approximately~~ $800,000 per month."

92H/11W

092HNW003

On Dec. 15, the 21st and 22nd bullion bars were cast at the mine, the gold content of the ingots exceeding 90%. These are the highest purity bullion bars to date, Mr. Gillespie says.

Ore production at the mine/mill complex is now approaching the 1,500-ton-per-day rate. An increase in the rate to 2,000 tpd is targeted for next June. No new capital equipment is expected to be needed for this higher production other than a mechanical jig for the mill, which is now being installed.

The grade of gold ore being mined in December is approximately 0.097 oz. per ton. Current mining of this low grade material is scheduled for completion by early January, 1983, when Carolin expects the grade to rise to about 0.135 oz.

There has been a steady improvement in mill recovery, which it is hoped to get up to 83% in early 1983. This is the recovery rate the mill was designed for.

Mr. Gillespie predicts that gold production will reach a level exceeding 5,000 oz. per month during the first quarter of 1983. "Assuming a $C550 per oz. gold price, a mine operating profit of approximately $2 million per month is projected," he states.

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N MINER 9DEC82

Carolin accounts show lack of working capital

Carolin Mines had an unaudited working capital deficiency of $16,275,545 at Aug. 31, as against a deficiency of $3,557,039 a year earlier.

A 3-month financial report shows "source of working capital" for the period at $404,079, consisting of $62,079 depreciation and $342,000 raised from issue of capital stock. "Use of working capital" totalled $2,665,623, of which $1,834,904 applied to the Ladner Creek joint gold mine venture near Hope, B.C. (start-up costs, additions to tailings dam, and secondary plant). Other items included deferred administration costs ($696,873) and deferred exploration costs ($102,846).

The net result was an increase of $2,261,544 in working capital deficiency during the 3-month period.

Cumulative deferred costs amounted to $9,241,423 at Aug. 31.

Ladner Creek
92H/11W
092HNW003

NO.239(1982)
DECEMBER 14, 1982

GCNL #239 14DEC82

COLUMBIAN NORTHLAND EXPLORATION LTD. 92H/11W 092HNW003

CAROLIN MINES SHAREHOLDER REPORTS FIRST QUARTER RESULTS - H.Brodie Hicks, president of Columbian ~~Northland~~ Exploration Ltd. has reported that this Alberta corporation which was recently listed on the Pacific Exchange, San Fransisco,U.S.A., following the liquidation of Great Basins Petroleum Co. Columbian Northland Explorations holds as its main asset a 17.55% interest in the Carolin Mines Ltd. Ladner Creek gold operation near Hope,B.C. This mine has overcome its environmental problems, gold recoveries have improved and the outlook for the second quarter and the balance of the year is for substantial improvements.

In Columbian's first quarter, the three months ended Oct.31,1982, revenue was $352,000 and the loss was $1,139,000, of 10¢ per share. Included in the current quarter results was a charge against income of $800,000 following the decision to abandon certain undeveloped mining properties.

NMINER 25NOV82

The Foreign Investment Review Agency (FIRA) has approved a $US6 million loan to Carolin Mines by the State Farm Mutual Automobile Insurance Company of Bloomington, Illinois. Carolin says the company has the right to convert all or part of the principal amount of the loan into Carolin shares at a conversion price of $US7.01 each. This would result in an additional 855,921 shares being issued and represent 14.7% of Carolin's outstanding shares.

The loan has a 10-year term, maturing July 1, 1992, with interest set at 14.75% of which 12% is payable semi-annually and the remainder accruing until the termination date when the principal amount must be paid.

Some of the loan will be utilized to repay a loan of $US3 million made by State Farm in June of 1982 for which the maturity date has been extended pending the final closure of the $US6 million loan.

Ladner Creek

92H/11W

092HNW003

GCNL #228 29NOV82 92H/11W 092HNW003

Carolin Mines Ltd. has completed two financings. First, through The Mercantile Bank of Canada Vancouver, B.C., Carolin has refinanced its secured indebtedness and secondly, State Farm Mutual Automobile Insurance Company of Bloomington, Illinois, has now advanced the balance of its $6,000,000 U.S. loan. The Mercantile Bank loan will be used to repay existing secured bank financing in the sum of $9,000,000 Canadian and $1,000,000 Canadian has been placed in a term deposit. The proceeds of the State Farm loan will be used to pay accrued interest and Carolin's share of operating costs in respect to the Ladner Creek, B.C., gold mine in which Carolin has a 50% interest.

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NMINER 29JULY82

Carolin secures $US6 million loan

Carolin Mines has reached an agreement in principle with State Farm Mutual Automobile Insurance of Bloomington, Ill., for loans totalling $US6 million, to be represented by a subordinated note.

The note will mature on June 1, 1992 and bear interest of 12%, payable semi-annually, and be convertible into common shares. While the conversion price has not yet been agreed upon, and is subject to the approval of both the Toronto and Vancouver stock exchanges, Carolin has suggested a price of $US5.50 (Carolin is currently trading at about $C10.00). If approved and eventually converted, the note would give State Farm 18% of the outstanding shares of Carolin. An application has been made to the Foreign Investment Review Agency for approval of the note.

In June, State Farm advanced Carolin $3 million secured by a promissory note due to mature this fall, and it is expected this loan will be rolled into the $6 million note.

The funds will be used by Carolin to pay its share of costs to bring its Ladner Creek gold mine in British Columbia into production and to carry out exploration and development work on the adjoining Ladner Creek North property.

92H/11W

092HNW003

NMINER 28OCT82

LADNER CREEK

There's been a delay in the receipt by **Carolin Mines** of a $3 million advance from State Farm Mutual automobile insurance company. The loan package is for a total of $US6 million. The original date has been extended one month to Nov. 1, 1982, says Carolin. The company also points out that a decision is expected from the Foreign Investment Review Agency by the end of the month which is probably the reason the deal has been held up, The Northern Miner gathers. Carolin operates a gold mine near Hope, B.C., but has provided very little information on how much gold is currently being produced.

92H/11W

092HNW003

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The Northern Miner

NMINER 24JUNE82 (92H/1W) 092HNW003

Carolin resumes Ladner production

THE NORTHERN MINER June 24, 1982

After a 2-month shutdown Carolin Mines has resumed production at its Ladner Creek gold mine near Hope, B.C. Clearance was given by government regulatory bodies June 17 after the company was charged with dumping hazardous wastes into the Coquihalla River in April.

According to Kelly Francis, Ministry of Environment, following an initial court appearance May 18, Carolin's trial date has now been extended to December 14. Ms. Francis says the milling operation will now be operating on a "recycling basis" thereby eliminating any effluent entering the water system.

Earlier fears of excessive spring run-off causing uncontrolled discharge from the tailings dam, seem to have been alleviated, she reports, as the pond was rising about one inch per day prior to startup.

Dr. K. Warren Geiger, president and managing director of Aquarius Resources, part of the Aquarius Group joint venturing the property with Carolin, told The Northern Miner that "everything was under control" and the reservoir was pumped down to a level where it didn't pose any danger.

Carolin has been plagued by startup problems and delivery of ore to the mill only commenced Nov. 23, 1981. However, expansion of the mill rate was hampered by the fact the underground crusher hadn't been completed and the company was forced to rely on a portable surface crusher with limited capacity.

Most of the problems in the mill involved the cyanide leach circuit which later got the company into trouble with the Ministry of Environment. The first gold bar was poured February 11.

Aquarius, which has a 5% interest in the operation, also has extensive holdings near the Carolin mine in the Coquihalla gold belt.

Although approached by The Northern Miner for details on the operation, Carolin officials, as in the past, would not respond to our questions.

NO.142(1982)
JULY 26, 1982

GCNL #142 26JULY 82 CAROLIN MINES LIMITED 92H/1W (092HNW003)

NEW FUNDS OF $6,000,000 U.S. - SECURED SUBJECT TO APPROVALS - State Farm Mutual Insurance Company of Bloomington, Illinois has agreed to advance $6,000,000, secured by a 12% debenture of ten year term and convertible into shares of Carolin Mines Limited at a price yet to be fixed but suggested to be $5.50 U.S. per Carolin share to provide State Farm Mutual with an 18% equity interest in Carolin if converted. An initial advance of $3,000,000 U.S. was completed June 28,1982, that advance being secured by a 12% subordinated promissory note which matures October 1,1982. It is contemplated that the June 28,1982 note will be rolled over into the $6,000,000 subordinated note. The proposal is subject to approvals from the stock exchanges and the Foreign Investment Review Agency. The monies will be used to pay the Carolin share of the plant and mine production costs at Ladner Creek and to carryout exploration and development work on the adjoining Ladner Creek North property.

NMINER. 29MAY82

Carolin Mines says that of the 21 charges ~~it faces~~ for dumping hazardous chemicals into the Coquihalla River near Hope, B.C., 15 are identical and refer "to each day water was released to alleviate the level of water in the tailings pond."

Unusually heavy run off from heavy snow has been putting considerable pressure on the tailings pond making it impossible to dump tailings from their process plant, a fact which is causing serious financial problems for the company, industry sources conclude. Cost overruns bringing the mine into production are also hurting as well.

Carolin rejects speculation that as many as 20,000 fish may have been killed, noting only about 100 have been found dead and none of these could be attributed to the Carolin operation.

The company would not comment on other charges relating to the late filing of certain reports and having possible non-functioning drainage ditches as a result of the snowpack.

A detailed program is under way by consulting engineers to rectify the problem which would enable the mine to dispose of excess water into the tailings pond in a controlled manner when it starts up again, says Carolin.

92H/11W

092HNW003

LADNER CREEK

NO.118(1982)
JUNE 21, 1982

GCNL #118 21JUNE82

CAROLIN MINES LTD. 92H/11W 092HNW003

PRODUCTION RESUMPTION REPORTED - Official resumption of production at the Ladner Creek Mine took place on 17Jun82. The mine is to operate three shifts per day, seven days a week and is expected to attain the designed capacity of 1,500 tons per day in a few days. The mine is located about 10 miles north of Hope, B.C. The mine had been shut down for about two months following flooding conditions during heavy rain and melting snow. Interests in the mine are approximately: Carolin Mines Ltd. 50% as operator; Great Basins Petroleum Co., through its subsidiary, Columbian Northland Explorations Ltd., 17.5%; Aquarius Resources Ltd. 5%; Ocelot Industries Ltd. 17.5% and Windjammer Power & Gas Ltd. 9.9%. Earlier this year, Carolin Mines had agreed to purchase the interest in the mine held by Great Basins Petroleum but the tax and securities regulations frustrated the acquisition. Windjammer Power & Gas has reported that it had hoped to sell all or a portion of its interest in the mine to assist in the reduction of Windjammer's bank debts.

The first gold bar poured at the Ladner Creek mine was made on 11Feb82 and was of 31 pounds, the second pour was on 18Feb. and was of 25 pounds.

Windjammer has stated that the revenue payout to its account from the Ladner Creek mine will be 4.95% of the first $14,000,000 of gold produced, then 9.9% of 20/23 of the next $23,000,000, then 9.9% of 2/3 of another $23,000,000 and, finally, 4.95% of all remaining revenues.

(See also GCNL No.80, 27Apr82, page two, for details of the shutdown).

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NO.80(1982)
APRIL 27, 1982

92H/11W 092HNW003

GCNL #80 27APR82 CAROLIN MINES LIMITED LADNER CREEK

WATER DISCHARGE FROM THE TAILINGS POND REVIEWED

The Carolin Mine, 1,500 tons per day gold operation, located at Ladner Creek near Hope,B.C, has been proceeding through normal start-up operations. The procedure sought to maintain a balanced control of the effluent during which all solutions are contained by a tailings dam to avoid any uncontrolled discharge. The milling operation was designed to release a controlled amount of treated and non-toxic solution into the stream system when necessary.

It became apparent to the Carolin management in late March that due to the high water content of the exceptionally heavy snow pack, the water level in the tailings pond was rising at an abnormal rate. Management then decided to release a controlled amount of 200 gallons per minute to alleviate any hazard of the dam overflowing.

This continued from March 26 to April 8 when Carolin Mines was notified that its effluent contained above ~~the~~ allowable limit of 0.1 ~~part~~ per million total cyanide. Carolin Mines, in cooperation with the requests of the environmental authorities, immediately ceased milling operations until it could be ascertained if there was any possible danger to the environment. Reports have been circulated by uninformed sources that 20,000 fish have been killed, that the safety of water for drinking had been imperiled and that nearby wells might be adversely affected. All of these reports are erroneous and, unfortunately, alarmist. The facts are that fewer than 100 fish have been found dead and not one fish death can be in any way attributed to the Carolin operation. The company is of the view that there were not and are not any amounts of chemicals in the Coquihalla River or adjacent wells hazardous to either humans or fish.

Of the 21 charges reported to the public, 15 are identical and refer to each day water was released. The other charges included late filing of certain reports, and having possible non-functioning drainage ditches as a result of the abnormal snowpack. These charges are before the courts and it would not be appropriate for the company to comment in detail on the facts surrounding them.

The effluent in the tailings pond, because of start-up procedures, appears to have attained levels higher than the company would like to see. The company, through its consulting engineers, is continuing a detailed programme to identify and rectify any problems found so that in recommencement of operation of the mill, the company can safely dispose, in a controlled manner, excess water in its tailings pond as the snowpack melts during the spring.

Carolin and its consulting engineers continue to consult with the responsible environmental bodies to ensure that the operation is run in a proper manner. The company is confident that no harm has been nor indeed will be caused to either wildlife or humans in the Coquihalla area. The company trusts that the media will see fit to take steps to correct the unfounded statements previously disseminated.

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NMINER 4MAR82

Aquarius Resources says it has received confirmation that the first gold bar has been poured from the Ladner Creek Mine in which it is a partner with Carolin Mines and that it has been shipped to Canadian Mint. The B.C. gold mine lies along the Coquihalla Gold Belt.

92H/11W

092HNW003

THE NORTHERN MINER March 11, 1982

NMINER 11MAR82

Carolin Mines has terminated its agreement to purchase all of the assets of **Columbia Northland**, a subsidiary of **Great Basins Petroleum** of Los Angeles. It is unclear whether Carolin will negotiate to acquire only the 17½% interest Columbia holds in the Ladner Creek gold mine near Hope, B.C.

92H/11W 092HNW003

NMINER 15APR82

Pollution fears temporarily close Carolin mill

092HNW003

92H/11W

VANCOUVER — Investigators from both the federal and provincial governments here are trying to determine if the Carolin gold mine near Hope, B.C., has caused any environmental damage to two Fraser River Tributaries.

Sources indicate that Carolin Mines allowed waste water from its mill, containing cyanide, to drain into Ladner Creek instead of directing the effluent to its tailings site. The move was originally thought to be a precautionary measure in case there was a massive runoff into the tailings area from unusually high snow levels in the surrounding mountains.

The mill has been shut down but Carolin expects the closure to be of short duration, *The Northern Miner* was told at presstime.

From 20-200 gallons per minute of reclaimed water containing cyanide were believed discharged into Ladner Creek over a one-week period at levels approaching a high of eight parts per million, well above the maximum allowable level of ⅒ths of a part per million, the fisheries department points out.

Carolin wasn't aware the levels were so high, noting the recycling system was still being tested. It appears they hadn't acquired enough operating expertise on the system, sources conclude.

The mine is located in an environmentally sensitive area where all water drainage systems empty into the Coquihalla River and the ministry of environment has been re-stocking this river in order to increase the fish (steelhead) population. Speculation has risen these fish may have been adversely effected by the cyanide.

Drinking and fishing from the two tributaries has been banned as a precautionary measure. There are no reports of anybody becoming ill from the contamination.

"LADNER CREEK"

NMINER 25 FEB 82

First gold bar poured at Carolin operation

I am interested in developments at the B.C. gold mine of Carolin Mines. At the end of 1981, ~~The Northern Miner~~ had a story about a proposed increase in mill rate to 3,000 tons of ore per day, but I would like to know whether the first gold bar has actually been poured yet.

T. K., Hamilton, Ont.

Your query couldn't be more timely. It appears that Feb. 11 was the milestone date when **Carolin Mines** poured the first gold brick at its Ladner Creek mine, near Hope, B.C., and shipped it to the Canadian Mint.

This information has just been released by **Aquarius Resources**, one of the joint venture partners in the operation, which has a net 5% interest in the cash flow proceeds. During the period of payback of all preproduction and capital costs, Aquarius will receive somewhat more than 5% of the cash flow. Other participants include **Ocelot Industries** and **Windjammer Power & Gas.**

However, apart from this news, little else is known about the current state of the Carolin operation. Last December (**N.M.**, Dec. 31/81), Carolin's president, Orville Gillespie, was talking in terms of expecting production of 200 oz. gold per day in the first quarter of 1982, and announced plans for an increase in mill rate to 3,000 tons per day by mid-summer, if additional ore resources develop as expected. This would require expansion of the existing 1,500-2,000-ton mill. Whether these hopes are realized remains to be seen.

92H/11W

092HNW003

NMINER 4MAR82

As reported last week, **Carolin Mines** after much delay, has now poured the first two gold bars at its joint venture Ladner Creek mine near Hope, B.C. The major components of the underground crushers are now complete, and the 1,500-tons-per-day mill is operating over capacity. That capacity will be increased to a maximum of 3,000 tons as more mine and milling experience is gained by the staff, the company says.

On the company's wholly-owned Ladner Creek North property, adjacent to the joint venture holdings, a limited program of diamond drilling last fall and winter confirmed gold geochemical anomalies and rock formations similar to those at the Carolin Mine. Assays from 21 surface diamond drill holes have been received. One zone in hole 81-5 assayed 0.206 oz. gold/ton across 0.5 m and one zone in hole 81-20 assayed 0.11 oz. gold/ton across 3 m.

A joint venture of Carolin Mines and **Aquarius Resources** has staked an extensive area near Likely, B.C., for a future gold exploration project.

92H/11W

092HNW003

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AQUARIUS RESOURCES LTD. GCNL #36 22FEB82 CAROLIN MINES LTD.

FIRST GOLD BAR SHIPPED FROM LADNER CREEK GOLD MINE, B.C. - Dr.K.Warren Geiger, president of Aquarius Resources Ltd. has received confirmation that the first gold bar was poured and shipped to the Canadian Mint from the Carolin Mines Ltd. Ladner Creek mine on Feb.11,1982. 92H/11W 092HNW003

Aquarius Resources Ltd. is a joint venture partner in the mine with a net 5% interest in the cash flow proceeds. During the period of payback of all pre-production and capital costs, Aquarius Resources Ltd. receives somewhat more than 5% of the cash flow.

NO.39(1982)
FEBRUARY 25,1982

GCNL #39 25FEB82 CAROLIN MINES LIMITED 92H/11W 092HNW003

PRODUCTION ATTAINED AND EXPLORATION FOR INCREASED RESERVES NOW UNDERWAY - Orval E.Gillespie, president of Carolin Mines Limited, has reported that the last major components, the underground crushers, are now complete, and the whole mine and mill complex is now milling in excess of the designed capacity of 1500 tons per day on a regular basis. The mine and concentrating plant are located 10 miles north of Hope, B.C. Fairly coarse native gold has been found in the rod and ball mill overflow, It is planned to recover this gold by installing a jig and table. Two gold bricks had been shipped by Feb.22,1982.

In the mine, work has begun on the 3,000-foot extension of the main haulage level northward to the McMaster zone. This working has advanced to the location of the first diamond drill station. This station will be slashed and holes will be drilled to outline the northern extension of the Carolin orebody as well as to investigate other gold mineralization encountered in previous exploration.

Last Fall, limited surface diamond drilling on the wholly owned Ladner Creek North property was done to test gold geochemical anomalies. Hole 81-5 assayed 0.206 oz.gold per ton across 0.50 meter and one zone in hole 81-20 assayed 0.110 oz.gold per ton across 3 meters. In other greywacke intersections, several zones have been intersected which assay in the range of 0.03 to 0.084 oz.gold per ton across 1.0 to 1.5 meters. Follow up drilling is continuing, Eight character samples from caved trenches along a strike length of 130 feet assayed: 0.75; 0.195; 2.350; 0.067; 0.10; 0.344; 0.114 and 0.069 oz.gold per ton. The drilling program will investigate the northward extension of this mineralization.

An extensive area has been staked by a joint venture of Carolin Mines Limited and Aquarius Resources Ltd. near Likely, B.C., where a helicopter geophysical survey located a number of targets where ground follow up work is planned.

NMINER 31 DEC 81

Carolin plans production boost to 3,000 tpd at B.C. gold mine

With productive operations barely a month old at its Ladner South (~~Idaho~~) gold mine near Hope, B.C., Carolin Mines has decided to proceed with a big boost in output by mid-summer of 1982. At that time, if additional ore resources develop as expected, mill rate will be increased to 3,000 tons per day.

Addressing the New York Society of Security Analysts, Carolin's president, Orval Gillespie, said the mine would then be producing approximately 400 oz. gold per working day, up from about 200 oz. per day expected in the first quarter of 1982.

Expansion of the existing 1,500-2,000-ton mill is expected to begin this spring. As previously reported, a 3,000-ft. extension of the main haulage tunnel is being driven to develop additional reserves.

"We may produce a little more ore than we had originally planned," Mr. Gillespie said. He added that Carolin would report its first profit during the fiscal quarter ending Feb. 28, 1982, but did not project the amount of earnings due to unresolved tax questions.

Carolin recently agreed to purchase an additional 17.5% interest in the mine and other assets from Great Basin Petroleum, a joint venture partner, for 1.4 million Carolin shares (N.M., Dec. 3/81). The transaction will give Carolin a 67.5% ownership of the property, with the balance owned by the Aquarius Group (Ocelot Industries, Windjammer Power & Gas and Aquarius Resources).

Meanwhile, exploration is at an advanced stage at Carolin's wholly-owned Ladner North property. According to Mr. Gillespie, preliminary drilling results indicate ore showings potentially much larger than those at the Ladner South (Idaho) mine.

"We think we may have one of the larger gold deposits in the world," Mr. Gillespie said drilling indicated tonnage figures should be available by next fall, "then we'll see how big it really is."

92H/11W
092HNW003

WMINER JAN 82

Carolin joins producer ranks with start-up at Ladner Creek

BC's newest gold producer, Carolin Mines Limited started milling operations at its Ladner Creek mine near Hope in December 1981. Once operating at full capacity of 1500 tons/day, the mine will be the province's largest underground gold producer.

Production, initially planned for the summer of 1981, was delayed because of the weather, installation of larger power lines and a decision to go on one shift and to move the 3000 ton/day crusher underground.

The company has spent $36-million on the project, including $2-million on a 3000ft northerly extension of the Idaho tunnel. Production costs are estimated at $120/oz.

Long-term plans call for expanding the mill from the present capacity to 3000 tons/day at an additional cost of $4- to $5-million. To justify such an expansion, the company is currently drilling on its wholly-owned Ladner Creek North property, about three-quarters of a mile from the mine site. Favourable results are reported from preliminary drilling.

Carolin is making a bid to buy the 17.5% interest in the property held by Great Basin Petroleums which, if successful, would increase Carolin's interest to 67½%. Great Basin is part of the Aquarius Group which earned a 50% interest in the mine by providing $23-million in development funds. Other group members are Ocelot Industries, Aquarius Resources ~~and~~ Windjammer Power and ~~Gas.~~

92H/11W
092HNW003

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GCNL #243 CAROLIN MINES LTD. 21 DEC 81 GREAT BASINS PETROLEUM COMPANY

INTEREST IN GOLD MINE TO BE INCREASED BY 17½% -Carolin Mines Ltd. has agreed to pay 1,400,000 treasury shares to Great Basins Petroleum Company of Los Angeles, California for a 17½% interest in the Ladner Creek gold mine already 50% owned by Carolin Mines Ltd. As operator, Carolin Mines is placing the 1,500-ton per day rated capacity concentrator into production at present with full production expected shortly. The mine is located 10 miles north of Hope, B.C.

To acquire the interest, Carolin is purchasing a wholly-owned subsidiary of Great Basins which holds other mining properties in Western Canada, all of which are in the exploration stage. Carolin presently has outstanding 4,939,981 shares. Application will be made to register the 1,400,000 shares in the U.S.A. for distribution of a major portion of the shares to the shareholders of Great Basins pursuant to the presently adopted plan of liquidation in respect to Great Basins.

The transaction is to close prior to June 1,1982 and it is subject to completing all necessary filings with the regulatory authorities and a definitive agreement being executed by Jan. 31, 1982.

92H/11W
092HNW003

THE NORTHERN MINER December 24, 1981

NMINER. 24 DEC 81

Great Basins Petroleum of the U.S. has agreed to sell its Canadian subsidiary, **Columbia Northland** of Alberta, to **Carolin Mines** for 1.4 million shares of Carolin stock, valued at $35.7 million.

Carolin will thus acquire the 17.5% interest in Columbia Northland held in the Ladner Creek, B.C., gold mine and boost its own interest to 67.5%. Carolin, the operator of the mine, will also acquire other mining properties in Western Canada, all of which are in the exploration stage. All monies on hand in Columbia will be removed prior to closing.

Carolin will make an application to register the 1.4 million shares in the U.S. to allow the distribution of a major portion of the units to Great Basins shareholders. The purchase price represents about 20% of Carolin's shares outstanding.

Carolin has not yet poured gold from the $36-million project as had been anticipated for early December.

92H/11W
092HNW003

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NMINER 3 DEC 81

92H/11W

092HNW003

Carolin Mines' President Orvall Gillespie told shareholders at the annual meeting the company has made a bid for **Great Basins Petroleum's** 17½% interest in ~~the Ladner Creek, B.C.,~~ mine. Great Basins, which is being liquidated together with its U.S. parent, is part of the Aquarius Group (**Ocelot Industries, Windjammer Power and Gas** and **Aquarius Resources**), which jointly hold a 50% interest in the mine.

If the bid is successful, Carolin's interest will be raised to 67½%. It may also lead to Carolin's acquisition of Great Basins' assets which include seven to eight properties in the gold belt of Saskatchewan and Manitoba now held by its subsidiary, **Cumberland Northland.** If the company does purchase the properties, they will probably be resold as Carolin "doesn't want more exposure at this time," Mr. Gillespie explained. The bid is expected to be wrapped up in a few days time.

Carolin's first ore bar, to be poured Dec. 5, is expected to be better than 90% gold and will be sold on the spot market. The cost of production is $120 per oz. including an allowance for 20% inflation. Mr. Gillespie said a commitment will be made in a few days with metal traders on a 90-day basis. He said production, initially scheduled for last summer, was delayed because of the weather, installation of bigger power lines and the decision to go on one shift and move the 3,000-ton-per-day crusher system underground.

The cost to bring the mine to production is $36 million, including $2 million on a 3,000-ft. northerly extension of the Idaho tunnel expected to be completed in 3-4 months' time.

The mill itself will be in full production in 30-60 days. But the grand opening of the mine won't be held until spring, mainly because of weather considerations. Long-term plans call for expanding the mill capacity from the current 1,500 tons per day (producing 200 oz. gold) to 3,000 tons per day. It would cost about $4 to $5 million Mr. Gillespie said. To justify mill expansion, Carolin Mines is currently drilling on its wholly-owned property some ¾ miles north from the portal of the present mine. Limited drilling so far has indicated another deposit in the greywackes. Some of the beds are thicker than expected and can be traced for 2½ miles, Mr. Gillespie said.

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GCNL #221 19 NOV 81 CAROLIN MINES LTD. 92H/11W 092HNW003

PRELIMINARY MILL TUNE-UP IS NOW UNDERWAY _
FULL CONCENTRATOR TURN OVER SCHEDULED NOV.27 _
FIRST GOLD BARS SHOULD BE POURED BY MID-DEC. _
IDAHO, LADNER CREEK

June 1973 was the start of exploration on the Idaho zone of the Carolin Mines Ltd. gold property, located 12½ miles north of Hope, B.C. Nov.27,1981 is the scheduled date for the start of tune-up of the concentrating plant now in the early stages of testing and adjustment. After eight years and expenditure of over $35,000,000, the first gold bars should be poured before the year end and likely in time for Christmas.

The information in this story has been drawn from the recently issued annual report for the 12 months ended May 31,1981 and dated Oct.30,1981, previously published reports and a most interesting property visit Nov. 17,1981.

The annual report features a number of good photographs of the plant construction and underground.

May 30,1979 the company reported that Kilborn Engineering Ltd. had completed the feasibility study on the property. The engineers concluded....."it is technically and economically feasible to mine and mill gold ore from the Idaho zone......recommended milling rate is 1,500 tons per day, 525,000 short tons per year." Operating costs were estimated at $12.53 Canadian per short ton of ore milled and using a gold price of $250 to $300 per ounce Canadian. A conventional, highly mechanized, low cost sublevel open stoping mining method was recommended together with a conventional flotation - concentrate cyanidation gold recovery process. Ore reserves were reported as 1,530,000 tonnes grading 0.141 oz.Troy gold per tonne, based on a cut-off of 0.08 oz.gold per tonne. In Feb.1979 the company's in-house reserve estimate was 1,980,000 tons grading 0.127 oz.gold per ton using a 0.05 oz.gold per ton cut-off.

Since these calculations were done, the mine development has been extensive and the work has added significant amounts of additional gold mineralization. Because the pressure has been to get the mine ready for production, no tonnage or grade calculation has been made. The opinion is general that, when production is underway and mine exploration can be resumed, then the chances of adding very large additional tonnages of gold mineralization are good.

The mine and concentrating plant are at about 2,500 feet elevation with the mine having three adit levels, sub-levels and raises etc. When steady production is achieved the crew is expected to be approximately 100 persons, with 27 miners working five days a week and the concentrating plant seven days with a crew of about 30. The mine has no camp since the crews all commute to Hope.

One of the features underground is an Atlascopco 1,000 electric hydraulic, single boom drill which has demonstrated its ability to drill between 500 and 600 feet of blast hole per shift. One 70-foot hole was completed in 30 minutes. Working two shifts for five days the machine completed a total of 4,900 feet of 2 1/8-inch hole. K.G.Collins, mine manager, pointed out that that type of performance together with the low cost mining method will assist greatly in keeping operating costs down.

Because the concentrating plant site is in a steep narrow valley which experienced a mud slide a year ago, the company installed a 12-foot diameter concrete pipe to carry Ladner Creek. This culvert was backfilled and now forms a substantial portion of the plant site. This solution to a problem becomes a significant asset.

Underground, about 50 feet below the main haulage level, a series of rooms have been excavated for coarse ore storage, a 36 by 42-inch primary jaw crusher, screens, a 5½-foot secondary cone crusher and conveyor belts. While all of the major pieces of machinery are now in place it is expected to take a month to six weeks to make the crushing unit operational. In the meantime, the company has installed a temporary portable crusher which will feed the concentrating plant in the tune-up period.

The high light of the property tour was the visit to the concentrating plant with Rod Samuels who recently joined the company as mill manager after several years at Whitehorse Copper. The plant construction was completed about two months ago and the finishing touches have been in the process of being completed during this period. (This has got to be the best time to tour a plant, when construction is complete and before it is operating. It is all nice and neat, clean and so quiet one can hear and understand the explanations.) The ore is approximately 3% sulphides with the gold native and about 83% recoverable with the present plant design. On a daily basis at about the designed capacity, of 1,500 tons, the plant should produce 175 oz. gold plus between 30 and 40 oz. silver. The plant has been over designed in a number of areas and is likely to be able to process well in excess of its designed rate as ore feed is available. The ore is to be crushed to 98% minus 325 mesh, processed in a flotation circuit which will provide a ten to one concentration with the concentrate processed in a 72-hour leach circuit prior to a zinc recovery unit and melting into dore bars. Net production proceeds are to be used to reimburse Carolin and the Aquarius group their pre-production costs according to a complex formula and then to be split 50-50 between Carolin and the group comprising Aquarius Resources Ltd., Ocelot Industries Ltd., Great Basin Petroleum Ltd. and Windjammer Power and Gas Ltd.

		$000s to be spent			
Company	**Purpose of expenditure**	**1981**	**1982**	**1983**	**Beyond 1983**
Scottie Gold Mines 104B/1E 104B 074	The company's gold-silver mine was recently placed in production.	7,500			
	Total: $7.5 million				
Teck Corp	Construction is slated to begin on the Bullmoose coking coal mine in northeast BC in the spring of 1982. It is designed to supply 1.7 million tons of coal annually, beginning in late-1983.		110,000	110,000	
	Total: $220 million				
Westmin Resources 92F/12E 092F 071, 072	The shaft is being sunk for development of the Creek zone copper-lead-zinc deposit near the Myra and Lynx mines at Buttle Lake, BC. Production is expected by 1983 and ore will be milled at the existing concentrator.	5,000	5,000	5,000	
	Total: $15 million				

Company	Purpose of expenditure	$000s to be spent 1981	1982	1983	Beyond 1983
Equity Silver (continued)	Regional exploration		100		111
	Replace mill equipment	155	~~6~~		6
	Buy on-stream analyzer	200			
	Additions to flotation	200			
	Mill expansion				2,500
	Replace plant equipment	121	300	70	280
	Move carpenter shop	55			
	Replace misc. equipment	41	177	39	363
	New warehouse storage	50			
	Buy computer facilities		75	75	
	Replace telephone system	20			
	Total: $11.64 million				
Esso Minerals Canada	Having just bought the Byron Creek colliery in southeastern BC, Esso plans to expand it.	35,000	35,000		
	Total: $70 million				
Fording Coal Ltd	The $115 million coal mine expansion at Elkford is well under way.	38,000	26,000	20,000	
	Total: $84 million				
Lornex Mining Corp Ltd 92I/7W 092ISE008	The $160 million expansion of the copper mine at Logan Lake, BC, is complete. Project included upping the milling rate to 80,000 tpd and purchasing additional pit equipment.	78,300			
	Total: $78.3 million HIGHLAND VALLEY				
Noranda Mines Ltd 82M/9W 082M 141	The Goldstream copper-zinc mine near Revelstoke is scheduled to be in production late in 1982 at a rate of 1350 tpd. Total cost of the project is estimated at $62 million.	27,600	16,300		
	Studies have started on modifications to the ore handling and processing systems at the Granisle mine.	300	300		
	Total: $44.5 million				
Norco Resources	A hydraulic and longwall coal mine is planned at Bowron River, near Prince George, BC. Output will be sold to Taiwan Power Co.	40,000	41,000		
	Total: $81 million				
Placer Development Limited 93K/3E 093K 006	The bulk of spending at the Endako moly mine will be for upgrading the mill.				
	Replace mobile equipment	50	1,291	1,511	
	Upgrade and replace process equipment	536	1,815	1,040	
	Complete flotation expansion	185			
	Complete roaster expansion	1,697			
	Total: $8.125 million				
Ruth Vermont Mine Limited 82K/15W 082KNE009	This silver-lead-zinc producer was reopened this summer in southeastern BC.	4,000			
	Total: $4 million				

Company	Purpose of expenditure	$000s to be spent 1981	1982	1983	Beyond 1983
BP Canada	Plans are being made for the Sukunka coal mine development near Chetwynd, BC.			400,000	
	Total: $400 million				
Carolin Mines Ltd 92H/11W 092HNW003	The Ladner Creek gold mine development was completed this year.	10,000			
	Total: $10 million				
Cominco Ltd 82F/9E 082FNE052	The modernization and associated metallurgical projects at the Trail smelter will receive the bulk of spending — $355 million.				
	Trail modernization	85,000	105,000	160,000	
	Sullivan mine and mill	7,000	10,000	40,000	
	Minor projects	12,000	12,000	12,000	
	Total: $443 million				
Crows Nest Resources Ltd	The Line Creek coal mine at Sparwood is nearing production set for next year.	70,000	50,000		
	Total: $120 million				
Dankoe Mines Ltd 82E/4E 082ESW002	Spending is modest at the silver mine near Keremeos, BC	250	250	250	
	Total: $750,000				
Denison Mines Ltd	With the promise of a rail line to northeastern BC, development of the Quintette coal deposit is planned by 1985.		100,000	100,000	500,000
	Total: $700 million				
Dickenson Mines Limited KAM-KOTIA 82F(14W)	The silver-lead-zinc mine near New Denver, BC is receiving several improvements.				
	Conversion to central diesel plant for mine and mill plus upgrading and increasing hydro plant	100	300		
	Replacing mill equipment and upgrading capacity 60 per cent to 200 tpd SILMONAC		150		
	Total: $550,000				
Dimac Resource Corporation	This small tungsten mine was recently placed in production near Clearwater, BC	2,500			
	Total: $2.5 million GOTCHA MAY SILENCE LAKE				
DuPont Canada Inc	The Baker gold mine at Chappelle, BC, is in production.	6,000			
	Total: $6 million CHAPPELLE				
Equity Silver Mines Ltd 93L/11W 093L 001	This newly-opened silver mine is planning expenditures of about $7 million for mining and $3 million for milling.				
	Replace pit equipment SAM GOOSLY	477	695	4,673	855

92H/11W

A Southam Business Publication
Vol 102, No 10 October 1981

CANADIAN MINING JOURNAL

CMJ Capital Spending Report

BRITISH COLUMBIA $2.996 billion

Company	Purpose of expenditure	1981 ($000s to be spent)	1982	1983	Beyond 1983
Afton Operating Corporation 92I/10E 092INE023	Mobile equipment for open pit copper mine	3,500	3,500		
	Systems improvements at mill	750	750		
	Systems improvements at smelter	750	750		
	Total: $5 million				
BC Coal Ltd	The $278 million Greenhills coal mine is expected to begin production in mid-1983 at a rate of 1.8 million tonnes/year.	63,000	100,000	60,000	
	Expenditures at Sparwood include $17.6 million for pit equipment, $13 million for land acquisition and residential construction and $1.6 million for a new lab.	53,000	46,000	28,000	10,000
	Construction at the Harmer mine includes a new dry and office and maintenance shop extension.	9,458	7,635		
	Cost of increasing the throughput of Westshore terminals and upkeep.	43,000	74,000	38,000	
	Total: $472.093 million				
BC Hydro	The price tag of the Hat Creek coal mine and generating plant due to come on stream in 1988 has risen to $5 billion, with roughly 45 per cent of the cost being for the mine.	32,000	32,000	32,000	129,000
	Total: $2.25 billion				
Bethlehem Copper Corporation 92I 7W 092ISE001	Spending at this open pit copper mine has nearly doubled this year over last.				
	Replace mining equipment	4,554	2,117	1,468	
	Construct tailings dam	7,316	2,376		
	Total: $17.831 million				
Brenda Mines Ltd 92H/10E 092HNE047	A new mining shovel and mill equipment were added at this copper-moly producer.				
	New mining shovel	2,000			
	Classifying and flotation equipment	4,250			
	Normal equipment replacement	3,500	4,000		
	Total: $13.75 million				

NMINER 15 OCT 81

Carolin Mines has announced that its jointly owned ~~Ladner Creek~~ gold mine near Hope, B.C., will be in production by the time of its annual meeting on Nov. 27. President Orval Gillespie, speaking to a group of analysts in New York, said that expected gold production is 200 oz. per day from the milling of 1,500 tons of ore. It will mark the first period of earnings in the history of the company, he said.

The mine is jointly owned by Carolin (50%) and the Aquarius group, which is owned by **Ocelot Industries** (45%), **Great Basins Petroleum** (35.1%), **Windjammer Power & Gas** (9.9%) and **Aquarius Resources** (10%).

Work has begun on the 3,000 ft. extension of the main haulage tunnel to develop additional reserves in a similarly mineralized zone.

Carolin owns title and options to numerous other properties in the area. Recent exploration work on the wholly-owned Ladner Creek North property has indicated the possibility of large reserves in the area, Mr. Gillespie said.

92H/11W 092HNW003

Mr. Gillespie also heads **David Minerals** which acquired a complete milling operation and ancillary equipment near Salmo, B.C., valued at over $15.1 million. The HB mill's production capacity is 1,200 short tons of lead-zinc ore per day.

A checking and renovation program has begun to prepare a flotation circuit to custom mill gold-bearing sulphide ores produced by David and other mining operations in the area. A second circuit will be altered to treat molybdenite-gold ore from the company's Rossland property where estimated reserves are 1,078,300 short tons grading 0.282% molybdenite and 0.034 troy oz. gold per short ton and having economic grades of bismuth and cobalt in certain areas of mineralization.

Construction of a cyanide circuit has also been initiated to treat gold-bearing concentrates produced in both circuits. Treatment in the first circuit is scheduled for the first quarter of 1982.

GCNL #204 26 OCT 81

WINDJAMMER POWER & GAS LTD.

TWO GOLD PROJECTS REVIEWED 92H/11W 092HNW003

Hole No.		Intersection	Oz.Gold/T
1		1.2 ft.	0.11
2		3.0	.52
	also	1.0	1.34
3		1.0	.80
4		1.0	1.35
	also	1.0	.12
5		1.5	.78
	also	1.0	.06
7		1.7	.04
8		1.4	.04

Windjammer Power & Gas Ltd. president Joseph Sabo has reported the company holds a 9.9% interest until payout in the Ladner Creek gold mine of Caroline Mines at Hope, B.C. The company expects production to commence 15Nov81. The mill will process 1500 tons per day.

Winjammer Power & Gas also owns 50% interest in 1,320 acres located approximately 40 miles south of Kirkland Lake, Ontario, called the Brisco-Bryce program. Gold assay results from the drilling program were exciting and are shown in the table. Nine holes were drilled 300 feet apart which proved up to 2800 feet of sheer zone, average 3 feet wide, 170 ft. deep and assaying approximately averaging 0.21 ounces per ton.

Hole #9 on the eastern extension encountered a new gold zone 3.5 feet wide which assayed at 0.155 - 0.13 ounces of gold per ton. Winjammer plans are to drill additional infill holes and possibly extend the new vein zone.

complete, according to Collins' estimations.

The $35 million required to get the mine to start-up point has been split 50/50 between Carolin Mines and the Aquarius Group, which is comprised of Ocelot Industries Ltd., Grand Basins Petroleum Ltd., Windjammer Power and Gas Ltd. and Aquarius Resources. The financing agreement allows the Aquarius group ownership of 50 per cent of the assets and net proceeds of the mine. Carolin owns the other half outright. According to Collins the mine site itself has been split in half, with the south half going to Aquarius and the north half owned by Carolin.

In addition to the usual costs of mine development Carolin is faced with the outlay of between $250,000 and $300,000 for a sophisticated pumping system to transfer tailings from the mill. The tailings pond is to be situated 3,500 feet from the mill, and will be elevated 600 feet above it.

"It was the only flat space in the area with sufficient room to store the tailings," explains Collins, "so that's where we had to put it. We figure the space we have should give us about 10 years' storage capacity. If the mine is still going beyond that time, we'll have to locate another area."

Water from the tailings pond will be recycled back into use in the mill, says Collins, thereby increasing capacity to some extent.

By mid June there were about 120 people working on the remote site. Collins estimates that about 50 of those were employed by the various contractors who were helping with various construction and installation projects. The number of employees was expected to peak at about 140 during the summer months, and once the mine is actually in production somewhere between 100 and 110 people will be employed full time.

No residential quarters are planned for the site, according to Collins. All employees have been — and will be — maintaining their own residences in the Hope area.

"There's no doubt about it, it will be a shot in the arm for Hope," says Collins.

And, the way things are going, those people are likely to stick around for a good many years. Ore reserves at the Carolin site are estimated at about two million tons at present.

"We didn't explore any further," explains Collins, "because we just wanted to be assured that there would be enough there to cover our costs. There's still a lot of it open for development."

The mill capacity at the mine has been set at 1,500 tons per day, with expected production of 165 to 170 ounces of gold daily. Actual production is expected to begin by the end of September. □

Carolin Gold Mine Born

Putting your money where your gold is

Nothing's certain in this world anymore — least of all the price of gold. But Carolin Mines Ltd. and an investment group known as The Aquarius Group have enough faith in the future of the precious yellow metal to believe that their new gold mine near Hope will prosper.

Currently in the final stages of completion, the Carolin Gold Mine has been hewn during the past two years from a mudslide-prone valley nestled in the mountains about 30 road kilometres northeast of Hope. The site's 90 claims include nine Crown grants and cover the property that made up the old Aurum and Pipestem Mines that went in in the early part of this century.

"Site preparation has been very difficult at times," admits Carolin's Cal Collins. "The area has been heavily logged, and we had real problems with mudslides when we first went in there."

One mudslide, in fact, demolished a shed that had been placed on some benchland above the main mill site, killing one man early in the construction stages. That was the last shed, says Collins, that *did* get put on benchland.

There were other problems to be contended with as well, including a tributary to the Coquahalla River that had to be protected. To keep the environmentalists happy Carolin and its associates spent $1.2 million to install 730 feet of 12-foot culvert, then covered it with 50 feet of fill.

Although the actual development of the Carolin property is a recent project, the company has been involved with that particular chunk of land since 1973, when surface and underground explorations were undertaken.

"By the end of 1978 the price of gold was on the move," explains Collins, "so we decided to have a feasibility study prepared. That was completed by May of 1979, and by the fall of the same year we'd decided to put the mine into production."

Site preparation got under way in October, 1979, and crews worked throughout the winter, sometimes battling 30 feet of snow, to get the mine on the rails. Surface site preparation for the mill began in the spring of 1980, and by June of this year the mill was about 70 per cent complete, the mine 75-80 per cent

(cont)

IDAHO, LADNER CREEK

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Apart from tough-- bargaining on ore prices with major overseas steel industry consumers, Associated and Samancor face additional competition from a new producer, Middelplaats, brought on

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Ocelot funds for Carolin Mines gold project

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CALGARY — **Ocelot Industries**, the Calgary-based oil and gas exploration and production company, is to play a major role in the financing to production of Carolin Mines' Ladner Creek, B.C., gold property.

Ocelot senior vice-president, R. A. McCullough, says that his company has made a financial commitment on behalf of the Aquarius group, which holds the right to a 50% in the project.

Carolin Mines will have an eventual 50% interest in the $19.3 million project which is scheduled to start production at 1,500 tons per day early in 1981 (**N.M.**, June 28).

Mr. McCullough says that the Aquarius group including **Great Basins Petroleum** as to 35.1%, **Ruperts Land Resource Co.** as to 9.8% and **Aquarius Resources** as to 10% have 60 days to join Ocelot with its 45% interest in the project's financing.

'Carolin Mines will have an eventual 50% interest in the project after certain investment recoveries are received by the financing group,' says Mr. McCullough.

Drill-indicated reserves on the property are estimated at 1.5 million tons averaging 0.14 oz. gold per ton. The estimate is based on a cut-off of 0.08 oz. per ton.

Fort Norman records 1st half '79 profit

Fort Norman Explorations reports net income of $83,709 or 4¢ per share for the six months ended June 30, 1979, as against net loss of $837,847 or 41¢ per share for the first half of last year.

Total revenue was $1,499,569, of which $1,308,791 came from gas production, $172,820 from barging operations in Alabama, and the rest by way of interest income. In the 1978 period, revenue amounted to $2,537,722, including $1,140,525 from gas sales and $1,397,197 from U.S. coal production (which was discontinued in November, 1978).

There was a working capital deficiency of $245,863 at June 30, 1979. Long-term debt amounted to $12,101,920, net of $1,117,646 included in current liabilities.

up for next year's tighter exhaust emission regulations, meaning greater demand for platinum group metals for exhaust catalysts, the two major platinum producers, Rustenburg and Impala, are embarking on expansion projects.

Only a few weeks ago, Rustenburg chairman Sir Albert Robinson made it clear that his company would not increase production except with firm consumption guarantees from industrial (and that means auto industry) users. As it is, Rustenburg is increasing annual platinum output from 1 million oz. to 1.2 million oz.

This was followed in August by Impala's announcement of plans to increase national platinum output by 100,000 oz. to 1 million oz. at a cost of R40 million.

Reaction different

In the past, increased platinum production announcements have always been a signal for canny investors to sell platinum shares ahead of an eventual metal price downturn. This time around, though some heavy U.S. selling of platinum shares has restrained stock market prices, increased production may be accompanied by sustained higher prices in the medium term. Impala's expansion is being funded in part by additional loans of R20 million. And though the company has not confirmed it, Johannesburg analysts feel that these loans have been guaranteed by major platinum users. And confidence that additional output will not lead to a glut of the metal has been underscored by end-August's $30 producer price hike to $380 per oz. Rustenburg and Impala have for years been ultra-sensitive to any suggestions of price collusion, fearing U.S. anti-trust investigations of their activities. But their producer price quotes are never out of line for more than a day or two at a time, while the latest increases were announced simultaneously.

Big demand for big stones

Following July's announcement of lower Central Selling Organization (CSO) first-half diamond sales figures, few analysts were surprised at the lower first-half diamond account figures reported by De Beers. Rising interest charges world-wide have led diamond dealers in the main cutting centres to limit their stocks to rough stones. But this has been only in selected sizes. Though demand for smaller stones has slackened, stones larger than one carat are in increasingly strong demand.

To meet this, the CSO (and therefore De Beers) has apparently been running down stocks of the larger gems, meaning an obvious perceived threat to the diamond market stability. Memories of 1978 when

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GCNL #60 27MAR81 CARCLIN MINES LIMITED 92H/11W 092HNW003

PROGRESS TOWARD PRODUCTION AND CONTINUED EXPLORATION REVIEWED - In a 24Mar81 program report, Orval E. Gillespie, president of Carolin Mines Limited, states that the company continues to expect the new mill at the Idaho gold mine near Hope, B.C. will go into production before the end of June 1981. The final stages of completion work on the mill and tailings dam, are on schedule and proceeding smoothly. As a result of recent underground development work and fill-in diamond drilling in the Idaho mine, Carolin and its joint venture partners, the Aquarius Group, are contemplating a major expansion of this development program. This program would include a further 3,000 feet of tunneling along the mineralized zones, extending from the northern end of the developed portion of the Idaho Zone further north to the McMaster Zone, where several diamond drill holes and surface trenching have indicated there is another mineralized zone similar to the Idaho. Considerable potential is expected between the Idaho and McMaster Zones, and at the McMaster, since these areas lie along the same structure and have remarkable geological and mineralogical similarities with the Idaho Zone. Mr. Gillespie believes that this program will result in significant increases in the ore reserves. F

The exploration program on the wholly-owned Ladner Creek North property, underway since last June, has yielded particularly encouraging results, he says. Several major gold-in-soil anomalies have been outlined by geochemical sampling. The largest of these appears to have dimensions in excess of 2,000 feet length and 500 foot width. One anomaly has gold-in-soil values ranging as high as 0.15 oz. gold per ton. It may be an extension of the McMaster Zone. The recommended $1,000,000 program will include 5,000 lineal meters of diamond drilling, and will focus on the major anomalies and an evaluation of the Georgia No.2 mine and the Pipestem mine, whose workings have been rehabilitated and initial samples from which have also shown significant gold values. Diamond drilling on the Ladner Creek North property is forecast to start by mid April. F

GCNL #143 28 JULY 81 CAROLIN MINES LIMITED 92H/11W 092HNW003

CONCENTRATOR TUNE-UP - TO START THIS WEEK - Carolin Mines Limited president Orval E. Gillespie has reported that the schedule for the opening of the gold mine and completion of the 1,500-ton per day mill on the Ladner Creek Joint Venture property near Hope, B.C., has been delayed by the worst spring and early summer weather in B.C. since 1936. He said that now the mill assembly is about complete, it is expected to turn the power on and 'turn over' the mill for the first time in the week of 27July81 and to get the bugs out. A large underground muck storage area and the underground crusher rooms will also be complete in about one week, which will finally permit installation of the ore crushers. As soon as the crushers are installed and operating, the mine can begin to put ore through the mill. The official opening of the mine and mill is expected in early November. F

In the middle of August the mine will begin a 3,000-foot extension of the main haulage tunnel northward to the McMaster zone to develop new ore reserves. There will be cross cuts from the main tunnel into the mineralized zones and extensive underground diamond core drilling will be done. This work will be on-going for several months and is budgeted at a total cost of $2,000,000 Cdn. to the Joint Venture partners and Carolin.

Large core diamond drilling from the surface will begin on the wholly-owned Ladner Creek North property on August 3. The access road has been completed. This program will explore, by surface drilling, stripping and sampling, the several large geochemical anomalies. as well as the underground workings of the old Pipestem mine. During the last couple of months a detailed geochemical survey has more closely defined the anomalies. The program will be on-going into the winter and is budgeted at $1,000,000 Cdn. in the first phase.

Mr.Gillespie notes, "As we near production in what, with output of up to 200 ounces of gold per day, should be western Canada's largest gold mine, we are confident that we will be one of the lowest cost producers in North America."

DESTINY PETROLEUM INC.

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Rupertsland spreading bets with major U.S. expansion

CALGARY — Like other companies caught in the current political bind in Canada, **Rupertsland Resources'** financial plans for 1981 are heavily weighted in favor of U.S. plays. The company expects to spend a total of $27.7 million in Canada (primarily acquiring land), compared with a sharply higher figure anticipated for U.S. activities.

"We will improve our land position this year in Canada, but delay development until 1983-85 when, I believe, everyone will have come to their senses," Dennis L. Kolesar, president, told shareholders at the company's annual meeting held last week in Calgary.

"However, we will rapidly expand our U.S. involvement," he continued.

This strategy is reflected not only in the company's 1981 budget ($10 million earmarked for Canada and $32 million for the U.S.), but in the total spending power to which Rupertsland has access. The company recently closed a $14.5 million drilling fund to be spent entirely in Canada and has raised an additional $3.2 million for the Canadian program from West German sources.

In contrast, Rupertsland completed an equity funding of $20 million to be used in the U.S., has raised $6 million from West German sources for U.S. activities (with the strong potential for an additional $10 million from these sources), and established a credit line of $36 million in bank financing for U.S. exploration and development.

Of the funds earmarked for Canada, Rupertsland is spending $1 million on a preliminary drilling program (currently in progress) on its Hope, B.C., gold claims which offset the Ladner Creek **Carolin Mines** property. The company has a 9.9% interest in the 23,000-acre Hope project.

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In the U.S., Rupertsland is involved in a variety of petroleum, natural gas and mining joint ventures in several states (**N.M.**, Mar. 19/81). The company recently obtained a gas contract for its Anadarko County, Texas, deep gas project and the Elrod No. 1 well should be on stream within three months, Mr. Kolesar said. Two additional wells are scheduled for this year. Rupertsland has an 18.75% working interest and a 2% gross overriding royalty on the 1,100-acre project.

Mr. Kolesar predicts an average daily production in 1981 of 8.5 million cu. ft. of gas and 300 bbl. of oil from the company's North American operations. This compares with total production for the 1980 ten-month period to Oct. 31, 1980, of almost one billion cu. ft. of gas and 38,157 bbl. of oil.

Approximately 50% of the company's gas reserves are shut in, Mr. Kolesar said.

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increasing the indicated reserves by 25%.

Carolin's Ladner Creek property is located in an environmentally sensitive area with all water drainage systems emptying into the Coquihalla River. The fish and wildlife branch of the B.C. ministry of environment has been restocking the river in an effort to increase the steelhead population. This program is showing a fair degree of success so consequently Carolin must take great precautions to guard against siltation and pollution of Ladner Creek. B.C. Research conducted tests on the final mill effluent and, after a few failures, they successfully designed a process to clean up the effluent so that it is non-toxic to fish in the undiluted condition.

The mine is situated in a narrow valley with side slopes of 30° to 35°. It soon became apparent during road building and site preparation work, particularly in the rainy season, that it would be difficult to carry out construction without causing siltation of the creek. A study conducted by Ker Priestman & Associates resulted in the decision to culvert the creek over a length of 730 ft. The water management branch of the B.C. ministry of environment approved the idea but stipulated that the culvert must be constructed of concrete and must be sized to accommodate the 200-year flood. The fisheries branch would not allow concrete to be poured in place so the culvert had to be precast. The 200-year flood criterion required the pipe to be sized at a 10-ft. inside diameter. The pipe sections were precast by **Ocean Cement** in Vancouver in 8 ft. 2 in. lengths, with 1 ft. thick reinforced walls each section weighed 21½ tons. The culvert installation completed last November carried the runoff from the heavy rainfall of December with no problem. A second benefit from this culvert is that it will allow the placing of fill in the valley to create much needed flat yard area.

It is most important in this day of greater environmental awareness that companies considering mine production start gathering baseline data as soon as practically possible. Carolin instituted a program in 1977 whereby B.C. Research began a study of Ladner Creek. The information obtained proved invaluable in preparing the Stage One report in 1979 for presentation to the environmental land use committee. This data will be available in later years to assess the impact, if any, of the operation of Ladner Creek.

It is imperative also that applications for permits and licences be applied for as early as possible. The processing of the applications for the major licences such as water use and tailings disposal can take 12 to 15 months as many government departments are involved and interdepartmental communications are not too swift. We also recommend strongly that consultants be used particularly in the environmental, hydrology and geotechnical fields. These people have had considerable experience dealing with the government representatives and can save countless hours of time and allay many potential problems. Consultants also should be used to prepare and submit licence and permit applications as they are very familiar with the routines. Junior companies in particular usually do not have the personnel to perform these duties.

The underground mine development program was commenced in November, 1979. The work is being done by **White Mine Development Ltd.**, a mining contractor, which will drive the two main access headings, complete stope development and excavate for the underground crushing plant. This work should be completed by the end of May.

Surface site preparation work got under way in June, 1980, for the mill and tailings area. All stripped material had to be moved to storage areas where precautions were taken by constructing rock berms to contain the material and prevent erosion into the creek.

Completion in June

By the end of 1980 the mill building being erected by **G. W. Carlson Construction Ltd.** was closed in, the tailings area was logged and the base for the earth fill dam was prepared. Present schedules call for mill completion in June and tailings dam construction to be advanced sufficiently to permit use of the impoundment area while construction continues.

Carolin's location, 20 miles from Hope, will, we feel, be advantageous in attracting a competent work force. Employees will live in the Hope area and will be based to and from the site. Vancouver is less than 100 miles from Hope and can be reached in two hours driving time. This too should assist the company in attracting personnel.

Mining is not new to Hope. Giant Mascot operated for several years with their employees living in the town. The merchants and townspeople recognize the beneficial economic effects of an operating mine close by and indicate they are ready to welcome Carolin Mines and its employees into their community.

Nine years' hard work

Carolin to be B.C.'s top underground gold producer

By Kelson G. Collins*
General Manager
Carolin Mines Ltd.

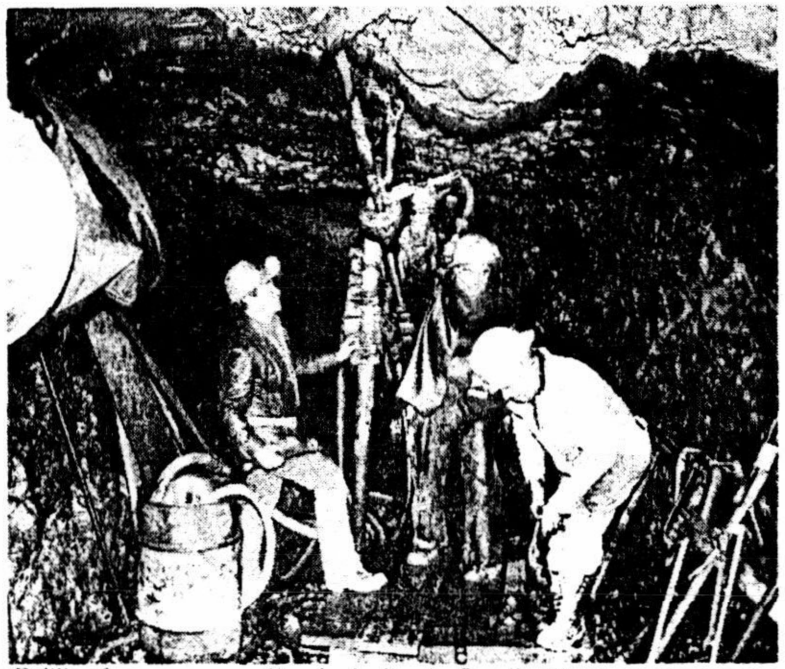
Carolin Mines, scheduled to be in production in mid-1981 and, at 1,500 tons per day, will be British Columbia's largest underground primary gold producer.

This achievement will be the result of about nine years' hard work in the financial community raising the necessary funds to permit a thorough exploration program. The reward for the efforts by the directors and field crews will be fully realized with the pouring of the first gold bar.

Carolin acquired the property, consisting of eight crown granted claims from Summit Mining in 1972. These claims are located near the headwaters of the west fork of Ladner Creek, a tributary of the Coquihalla River, some 20 road miles northeast of Hope. Over the years additional claims have been added to this core group and today there are just over 80 contiguous claims collectively known as the Ladner Creek Group.

During 1973 and 1974 extensive surface exploration work was conducted on the property including line cutting, geochem and magnetometer surveys and diamond drilling. The work focused on the Idaho gold bearing zone and by November, 1978, 44 surface holes had been drilled totalling 6,908 m or 22,665 ft. Earlier in 1975 the property was optioned to **Numac Oil & Gas** and **Precambrian Shield Resources** who carried out further surface work, including the drilling of seven holes included in the 44-hole total. In mid-1976 Carolin reacquired control of the property by purchasing Numac's earned interest.

Carolin was able to arrange further financing and during 1977 and 1978 carried out an extensive underground exploration program, including 744 m of decline and crosscut development from which 120 diamond drill holes were completed. This drilling totalled 6,792 m or 22,284 ft. Subsequent reserve calculations indicated 1.4 million tons grading 0.15 oz. gold per ton using a 0.08 oz. per ton cutoff grade, or 1.98 million tons with a grade of 0.127 oz. per ton using a 0.05 oz. per ton cutoff grade.



Drilling from crosscut off main decline in Carolin Mines.

The Idaho mineralization occurs as a replacement type material in altered sediments, predominantly greywackes. The alternation zones consist mainly of varying amounts of pyrite, pyrrhotite, arsenopyrite and chalcopyrite in silicified, albitized, choritized and carbonated host rocks. The zones trend generally in a northwest direction, dip easterly and plunge at about 20° to the north.

Partners

During 1978 Carolin arranged financing with the **Aquarius Group** of companies which include **Ocelot Industries Ltd., Great Basins Petroleum Ltd., Windjammer Power and Gas Ltd.** and **Aquarius Resources Ltd.** The Aquarius Group agreed to finance the final underground exploration phase and subsequent feasibility study. Only the south half of the property is included in the agreement with the northern half remaining wholly-owned by Carolin.

Kilborn Engineering (B.C.) Ltd. conducted the economic feasibility study with metallurgical test information provided by **Britton Research Ltd.** and **B.C. Research**. Hydrology studies were conducted by **Ker, Priestman & Associates** with geotechnical data provided by **Golder Associates.**

The feasibility report confirmed the reserve figures and concluded that a 1,500-ton-per-day mill would recover the capital expenditure in 2.9 years with gold priced at $C250 Canadian or in 2.1 years at $C300 Canadian per ounce and mining to a 0.08 oz. per ton cutoff grade. The subsequent increases in the gold price make for a much shorter payback period and also will allow mining to the 0.05 cut offgrade outline,

*A paper presented at the 69th annual meeting of British Columbia & Yukon Chamber of Mines.

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GCNL #16 26 JAN81 CAROLIN MINES LIMITED 92H/11W 092HNW003F

FULL PRODUCTION SCHEDULED FOR SECOND QUARTER 1981 - Orval E. Gillespie, president of Carolin Mines Limited has reported that the concentrating plant at the Idaho gold mine, near Hope, B.C. is scheduled to start full production during the second quarter of 1981. Carolin will be manager of the plant with an initial designed capacity of 1,500 tons per day and will own 50% of the venture. Final installation of the mill equipment in the main mill building, installation of the underground crushers and final work on the tailings dam are currently in progress and on schedule.

Further underground development and fill-in diamond drilling in recent weeks is increasing proven Idaho ore reserves. This program is continuing. Results of the work are to be reported.

The president said that the exploration program on the Ladner Creek North property is progressing. Several major geochemical anomalies have been located and are being intensively investigated on the North Property. The anomalies lie in a path trending generally north from the earlier discovered McMaster zone, 4,000 feet north of the Idaho, and extend to and beyond the site of the old Pipestem mine. One of these geochemical anomalies, well in excess of 2,000 feet in length and 500 feet in width, has gold-in-soil samples ranging as high as 0.15 oz.gold per ton and may be an extension of the McMaster zone.

Four of the old levels on the Pipestem mine have been opened, geologically mapped, surveyed and intensive sampling of the 2,500 feet of workings is underway. Initial underground sampling gives a range from nominal values to a high of 1.45 oz.gold/t. Assays of samples from the old Pipestem dump have run well in excess of 0.2 oz.gold/t. Diamond drilling on this area of the property is expected to start shortly.

Dr. Paul W. Richardson, P.Eng., has joined Carolin as a director and vice-president of geology.

Mr. Gillespie stated that as the knowledge of the geology of the Ladner Creek claims increases, the confidence increases that the property contains a number of large, repetitive gold bearing zones of significant economic importance, both to depth and extending northerly from the Idaho zone through the North property.

Eucpeans active in financing NMINER 15 JAN 81

B.C. shaping up as significant gold producer

G(2) F(?) 92H/11W 092HNW003

By David Duval

VANCOUVER — Mining may soon replace forestry as B.C.'s largest industry. It's also becoming "little business" in the province since smaller companies are playing ever more important roles in bringing new mines into production.

No longer is it beyond their capabilities to raise $10-20 million for a mining venture. Although much of this funding is available through Canadian financial institutions and private groups, Europeans are also contributing large amounts for a piece of the action.

While the trend in new mines appears to be towards the development of smaller mining operations (mostly in the precious metals sector) the majors were responsible for nearly all of the large capital expenditures made by the industry during 1980. And these companies will continue to lead spending in the forseeable future analysts agree.

In the Highland Valley, **Teck Corp.** spent about $150 million bringing its Highmont mine into production at 25,000 tons per day, while nearby, Lornex Mining budgeted $160 million to increase its capacity 68% to 80,000 tons per day beginning in July, 1981. **Cominco's** huge Valley Copper deposit, situated near Lornex, is expected to be developed at a cost of $500 million or more in the near future. The company recently acquired an additional 26% equity interest in **Bethlehem Copper** raising its interest to 65%. Bethlehem has a 5.1% interest in **Valley Copper Mines** and a 20% interest in the billion ton Lake Zone ~~deposit~~ which straddles both companies' border.

Above the Arctic Circle on Little Cornwallis Island, Cominco is spending $150 million to develop the Polaris mine. The operation will treat 2,000 tons daily and it will be one of the larger zinc-lead producers in the world.

Placer busy

Amax of Canada, owned by the huge U.S. molybdenum producer Amax Inc., is reopening its Kitsault molybdenum mine situated on Alice Arm in B.C. at a cost of $145 million. Expected to come on-stream by July 1981, the operation will have a throughput of 12,000 tons per day.

Owned 70% by **Placer Development, Equity Silver Mines** $107 million Sam Goosley project near Houston began production in September. With a mill rate of 5,000 tons per day, Equity is designed to produce over 5.6 million oz. silver, 14.1 million lb. copper and 10,900 oz. gold annually.

Elsewhere in the province, Placer increased molybdenum output by more than 300,000 lb. per year at its Endako mine. Cost of the project was $12.5 million. The **Gibraltar Mines'** East Pit orebody was prepared for mining in a $40 million program. **Canada Wide Mines**, the **Esso Minerals Canada** subsidiary, reopened the Granduc copper mine near Stewart at a cost of $20 million in October of last year. An improvement in the mining method is expected to enhance the profitability of the mine. A production rate of 4,000 tons daily is scheduled.

Noranda Mines is also getting into the act with plans for a copper-zinc mine in the Goldstream Valley, 80 km north of Revelstoke. At a capital cost of $62 million, it will produce 75,000 short tons of copper concentrate and 11,600 tons of zinc concentrate annually, starting in the third quarter of 1982.

Meanwhile, mill capacity is being expanded at Noranda's Bell Copper division. An increase to 17,000 tons per day is planned for this year, part of a $19 million program. At the Boss Mountain division near 100 Mile House mill rate is to be increased from 1,800 to 3,000 tons per day by early 1982. The $12.5 million program is intended to reap profits from projected price increases for molybdenum in the future.

New gold mines

The province may soon rank as a significant gold producer with a number of new mines coming on stream. **Carolin Mines** and its joint are planning production in early 1981 from the $20.4 million Ladner Creek gold project near Hope. Mill capacity is designed for 1,500 tons per day. At a smaller price tag, **Du Pont of Canada Exploration** has allotted $12 million to bring its high grade Baker gold-silver deposit at Chapelle into production at 100 tons per day early in 1981. **Scottie Gold Mines**, managed and controlled by **Northair Mines**, has plans for a 200 ton per day gold-silver operation at Stewart scheduled for production by mid-year.

Late last year, Scottie secured $15 million in financing to develop the property. Payback period is estimated to be less than a year. Some of the smaller companies are taking advantage of the low capital cost involved in developing small tonnage but high grade precious metal deposits around the province. Among these companies is **United Hearne Resources** and its joint venture partner **Taurus Resources**. In a 60-40 split, they are constructing a 150 ton per day mill at their gold prospect in the Cassiar area of B.C. **Cusac Industries** has also set up a 30-50 ton portable mill in the same area. Even more significant is **Nu Energy Developments'** Erickson gold mine joint venture, now being expanded to 200 tons per day at a cost of $450,000.

Near Stewart, **British Silbak Premier Mines** is working to a resumption of production based on a 100 ton mill rate for its gold-silver mine. South of Golden, B.C., **Ruth Vermont Mines** expects to produce 500 tons daily from its precious metals property starting in April.

Dekalb Mining reopened the OK Copper Mine in the Highland Valley at 700-800 tons per day last year. About 200,000 oz. silver and 3,300 oz. gold are expected from the mine annually. **Mosquito Creek Gold Mining** and **Peregrine Petroleum** are operating their gold mine near Wells at 100 tons per day and **Robert Mines** Boundary Falls gold-silver property expects to produce at the same rate.

The Yukon is also reaping the benefits of higher metal prices with **United Keno Hill Mines** deciding to reactivate the Venus property near Carcross. Nearly $7 million will have to be spent to bring the former gold-silver prospect into operation at 100 tons per day.

Near Faro **Cyprus Anvil Mining** has announced a $240 million eight-year program to develop the Grum and Vangorda deposits east of the Faro mine. Modifications are planned to the mill as part of the program which will see open pit life in the Anvil District extended to 1997.

Klondike fever has hit both large and small companies alike with **Copperfields Mining Corp.**, **Canada Tungsten**, **Queenstake Resources**, **Forum Resources** and **Crescent Mines** all involved in placer operations around Dawson City and throughout the Yukon. An important $10 million underground exploration program is being conducted by Hudson Bay Mining and Smelting on its Tom claims near Macmillan Pass. Most analysts believe the lead-zinc-silver prospect will become a producer. In the same area, Amax of Canada is contemplating a production decision for its Mactung deposit straddling the Yukon-N.W.T. border near Macmillan Pass.

VSE listed **Cadillac Explorations** intends to develop a silver-lead-zinc mine in the Nahanni district of the N.W.T. by spending $35 million for a 1,000 ton per day mining operation. Production is scheduled to begin in late 1981.

Jaridge Explorations

Jaridge Explorations has agreed to acquire a 50% interest in five mining claims in Lincoln County, Nevada. Payment of $5,000 has been made as part of the deal. Once matters pertaining to the lease and title of the property are taken care of, a more definitive arrangement will be reached, with Jaridge responsible for 50% of future expenses as well as for any expenses already incurred by **Midpines Explorations, Inc.** which holds the remaining 50%.

On Aug. 31, Jaridge had working capital of $1[illegible]2,297, slightly higher than $100,5[illegible] a year earlier.

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exhausted.

Noranda Mines continued its $19-million project at the Bell Copper Division near Granisle, seeking to expand mill throughput from 15,000 to 17,000 tons/day by 1981. Despite lower molybdenum prices, a $12.5-million program was announced at its Boss Mountain molybdenum mine, near 100 Mile House, which will increase mill rate from 1800 to 3000 tons/day by early 1982. 93K/3E

Placer Development completed work to increase molybdenum output by more than 300,000 lb annually at its Endako mine. The $12.5-million project included 093K expanding the rougher flotation circuit, adding a new roaster and a new plant to produce lubricant-grade molybdenum. A $40-million program at Placer's Gibraltar mine to prepare the Gibraltar East orebody for Stage Two mining was also completed, facilitating transfer of mining from the Pollyanna pit. 93B/9W

093B 012

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92H|11W 17

Lively progress for Canadian mining

A steady pattern of growth has characterized the mining industry in recent years and 1980 proved to be no exception.

General economic indicators pointed to a year of slow growth with the US recession having a big impact on Canadian industry. But the mining industry pushed ahead regardless — carrying on with massive expansion programs and announcing new developments across the country.

The trend in the provinces hasn't changed much from previous years, with copper projects leading the way in British Columbia, and uranium and potash continuing strongly in Saskatchewan. Golds were in the forefront in Ontario and Quebec with a lot of old-timers making comebacks.

Total capital requirements of the non-fuel mineral industry from 1980 to 1990 according to the Department of Energy, Mines and Resources will be more than $42-billion, roughly 6% of total business investment in that period. In current dollars, assuming an average rate of price increase of 6.2% annually over the ten-year period, this $42-billion mushrooms to $63.5-billion.

While activity in the minerals sector is providing significant stimulus to the Canadian economy in general, problems with taxes, excessive regulations, rising costs and lack of skilled labour still cloud the future. The softer prices for many metals in the latter half of 1980 may have dampened prospects for some potential new mining projects, but on the whole, the industry is healthy and the outlook is good.

A brief survey covering new Canadian mine developments and major expansion follows. Refer to similar article in *Western Miner* Dec '79 for additional information on many of the on-going projects.

92H|11W

BRITISH COLUMBIA

Prominent in the expanding mining industry are developments in British Columbia. Here, capital expenditures exceeding $700-million in the next few years are slated for the Highland Valley region alone.

92I|7W 092ISE013

The $150-million Highmont project of Teck Corporation will come on-stream late in December 1980 at a rate of 25,000 tons/day and Cominco Limited's 85%-owned Valley Copper Mine is expected to be placed in production at a cost of $400- to $500-million. Cominco's recent purchase of a controlling interest in Bethlehem Copper Mines (raising its equity from 39% to 65%) paves the way for a production decision on the 112,000 tonnes/day project. (Bethlehem has a 5.1% interest in Valley Copper Mines and a 20% interest in the Lake Zone deposit which straddles the Bethlehem-Valley border.)

Nestled between these two, another copper giant Lornex Mining Corporation is spending $160-million on an expansion program to increase its daily milling rate from 40,000 to 80,000 tons/day by July 1981.

Elsewhere in the province, several new mine projects are making headway. Amax of Canada Limited is spending $145-million to reopen its open pit molybdenum mine near Kitsault by July 1981. Throughput will be 12,000 tons/day. Equity Silver Mines' 107-million Sam Goosley project near Houston came on-stream in September at a rate of 5000 tons/day. Owned 70% by Placer Development, the mine will produce 5,680,000 oz silver, 14,109,000 lb copper and 10,900 oz gold annually.

A new mine announcement in 1980 came from Noranda Mines Limited which intends to develop a copper-zinc mine in the Goldstream Valley, 80km north of Revelstoke. Estimated to cost $62-million, the mine will begin producing 75,000 short tons of copper concentrate and 11,600 short tons of zinc concentrate annually starting in the third quarter of 1982.

The former Granduc Copper mine was reopened in October by Canada Wide Mines Limited, a subsidiary of Esso Minerals Canada. The company spent $20-million to rehabilitate the mine, which will treat 4000 tons/day.

Among the golds, Carolin Mines Limited and its joint venture partners the Aquarius Group expect production early 1981 from their $20.4-million Ladner Creek gold project near Hope. The mill will treat around 1500 tons/day.

Du Pont of Canada Exploration is spending $12-million to place its high grade Baker gold-silver property at Chapelle into production early 1981, at 100 tons/day. And Scottie Gold Mines, managed and controlled by Northair Mines, secured a $15-million financing to bring its property near Stewart on-stream by 1981.

104B|1E 104B 074

The 200 ton–day operation will produce 4500 oz gold and 2800 oz silver per month when in full production.

Spiralling prices for precious metals prompted several junior companies to enter producing ranks with small-scale operations, some using small portable mills to process the ore.

In the Cassiar area, a 150-ton mill is being built by United Hearne Resources (60%) and its partner Taurus Resources (40%), while Cusac Mines has plans for a 30-50 ton/day portable mill on its property in the same area. One producer already in the area, Nu Energy Development is expanding its joint venture Erickson gold mine from 100 to 200 tons/day at a cost of $450,000.

Mosquito Creek Gold Mining Company and its partner Peregrine Petroleum poured the first brick at their 100 ton/day gold mine near Wells in May 1980. The Boundary Falls gold-silver property of Robert Mines was scheduled to come on-stream in the fall at the same rate and British Silbak Premier is resuming production at 100 tons/day at its gold-silver property near Stewart. A lead-silver-zinc mine south of Golden is being brought back to life by Ruth Vermont Mines. The company plans a 500 ton/day operation beginning April 1981.

DeKalb Mining Corporation, a wholly-owned subsidiary of DeKalb AgResearch Inc of DeKalb, Illinois reopened the O K copper mine in the Highland Valley in 1980, renaming it the Highland Valley mine. Milling capacity at the trackless underground operation is 700 to 800 tons/day for annual production of 11-million lb copper, 200,000 oz silver and 3300 oz gold.

Several major expansions were carried out during the year. In the Kootenay area, Cominco Limited is moving ahead with its $420-million, eight-year expansion and modification program at Kimberley and Trail (the program began in 1977). A new zinc pressure leach plant was officially opened in October.

At Newmont Mines Limited's Similkameen Division, a $23.4-million project was completed. The work included installation of a new primary crusher and conveyor to transport ore from the Copper Mountain orebodies starting July 1981; the same time as the Ingerbelle ore is

GCNL #52 13-03-80 CAROLIN MINES LIMITED 092HNW003 92H/11W

CONCENTRATION PLANT CONSTRUCTION AND MINE EXPLORATION PROGRAM REVIEWED - Orval E. Gillespie president of Carolin Mines Limited has reported on the progress at the Idaho zone gold mine near Hope, B.C. Much of the recent work in the $20,400,000 program has been underground development including the driving of a main haulage adit at 2,670 feet and a second service level at 2,870 feet. On March 9, 1980, the 2,670 foot level had been advanced 637 feet, and the 2,870 foot level had been advanced to 345 feet. An underground shop has been cut approximately 107 feet inside the 2,670 foot portal and the ore dump area above the planned underground crushing plant has been slashed to size.

The major mill equipment for the 1,500-ton per day plant has been ordered. A number of key pieces of mining equipment have been delivered. The contractor's camp has been completed. A purchase contract to supply the mill buildings has been awarded to Quesnel Mine Mill Industrial Service Ltd. Site preparation for the mill and ancillary buildings and the construction of the tailings impoundment dam is planned to commence early in April. The contract to do this work will be awarded within the next few days. The contract to construct the electrical power system for the mine and mill will also be awarded soon. The work is scheduled for October completion.

In cutting the shop on the 2,670 foot level, mineralization similar to the Idaho zone has been encountered approximately 700 feet east and 600 feet further to depth from the original Idaho deposit. The full extent and grade of this new zone is unknown. It will be diamond drill tested.

The goal is to bring the mine into production by the end of 1980 or early 1981.

Although detailed exploration work to date has been concentrated on the Idaho zone, geological studies indicate mineralization in other areas. Some 4,000 feet north of the Idaho is the McMaster zone, which is within the joint venture with the Aquarius Group. At the McMaster zone, several diamond drill holes have indicated a gold deposit similar in nature to the Idaho. Considerable potential is expected on McMaster since it lies along the same structure and has remarkable geological and mineralogical similarities with the Idaho. Because of this potential, further exploration work in the future is warranted on this zone.

To the north of the joint venture property, Carolin Mines owns 32 claims which are referred to as the Ladner Creek North property. Most of these claims have been gridded, mapped and soil sampled. From these programs there is good reason to believe additional deposits could be discovered since there are a number of anomalous areas and two formerly producing mines, the Pipestem and the Georgia Number Two. The old Pipestem mine has approximately 2,500 feet of underground workings wiwhich are still in stable condition.

Consultants to the company, Cochrane Consultants Ltd., have recommended a program of additional geological, geophysical and geochemical surveys on the wholly owned Ladner Creek North property. This program calls for initial expenditures of $460,000 Canadian, and is expected to start about mid-April.

GCNL #114 12-06-80 CAROLIN MINES LIMITED 092HNW003 92H/11W

CONSTRUCTION PROGRAM MINE DEVELOPMENT REVIEWED - Orval E. Gillespie, president of Carolin Mines Limited has reported good progress in the $20,400,000 program to bring the Idaho zone gold mine near Hope, B.C., into production in late 1980 or early 1981. As of May 26, 1980, the main haulage adit, at 2,670 feet elevation, had been advanced 1,535 feet from its portal. It has also been widened to double track width for a distance of 215 feet in order to facilitate the passing of ore cars. Mineralization similar to the Idaho Zone has been encountered at various points in the path of the main haulage level during the advance. Diamond drilling is planned to test these areas.

As at May 26, the service adit, at 2,870 ft. elevation, which is being driven up at a 4% grade, had been advanced 1,430 feet. It has reached the south end of the ore zone at an elevation of 2,950 feet. At a point 1,245 feet from the portal within the service adit, a third adit is being driven around the ore zone to connect with the north end of the Idaho zone decline. This new heading will provide a second exit. Some major mill equipment has been delivered. Mill site excavation and construction work, to be carried out by Emil Anderson Construction Co.Ltd., of Hope, B.C. is scheduled to commence early this month. In early May, work began to upgrade the main access road to the mine site.

The company recently raised $648,286 by a share sale with the proceeds to be used exploring.

92 H/10E

CAROLIN MINES LIMITED: A full feasibility study on the company's Ladner Creek gold deposit near Hope, BC, has been completed and plans are underway to place the property into production. 92 H/NW-3

The study, prepared by Kilborn Engineering Limited, concluded that it is technically and economically feasible to mine and mill gold ore from the Idaho zone gold deposit and recommended start up at a milling rate of 1500 short tons/day. Operating costs are estimated at $12.53/short ton of ore milled.

A conventional, highly mechanized, sublevel open stoping method of mining will be used and processing will be by conventional flotation-concentrate cyanidation. Capital and development costs are estimated at $19,293,000, all of which will be provided by Carolin's joint venture partners, the Aquarius Group, if they wish to retain a 50% interest. The Aquarius Group is composed of Great Basin Petroleum Limited, Ocelot Industries Limited, Canadian Obas Limited, and Aquarius Resources Limited.

The feasibility study projects payback of the required capital investment from cash flow within three years, assuming a price per ounce of gold ranging from $250 to $300. W MINER

Present drill-indicated reserves, based on a cut-off of 0.08 oz/ton and applying anticipated mining dilution, are estimated at 1,530,000 tonnes grading 0.141 oz/tonne of troy gold. JUNE 1979

GCNL #184 24-09-79 CAROLIN MINES LTD. 092HNW003 092H/11W

COMMITMENT MADE FOR PRODUCTION FINANCING - Carolin Mines Ltd. has announced a $20,400,000 financing commitment by Ocelot Industries Ltd. in its own capacity and on behalf of the Aquarius Group, Carolin's joint venture partners, to bring into production Carolin's Ladner Creek gold property near Hope, B.C. The Aquarius group is a four company consortium composed of Ocelot Industries Ltd., Great Basin Petroleum Ltd., Aquarius Resources Ltd. and Rupertsland Resources Company Ltd. Carolin will be the manager and operator of the mine with a 50% net carried interest in its production after paybacks. The feasibility report by Kilborne Engineering Ltd. recommends startup at a milling rate of 1,500 short tons per day and estimates operating costs at $12.53 Canadian per short ton of ore milled, which will put the property in the category of a major North American gold mine. A more detailed summary is to be issued in a few days.

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GCNL #191 03-10-79 WINDJAMMER POWER AND GAS LTD. 92H/11W 092HNW003

INTEREST ACQUIRED IN B.C. GOLD MINE PROJECT - Windjammer Power and Gas Ltd. confirm that the company have bought the 9.9% interest of Rupertsland Resources Co. Ltd. in the Ladner Creek gold properties of Carolin Mines Ltd. some 9 miles north of Hope, B.C. Windjammer have 60 days to exercise an option to join in development of the gold mine now being constructed on the properties by the Aquarius Group.

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Kilborn Engineering conducted a feasibility study and recommended a starting mill rate of 1500 short tons a day or 525,000 tons a year. They projected repayment of the capital investment from cash flow in the third year of operation based on a gold price ranging between $216 and $260 U.S. an ounce.

Windjammer's consideration to Rupertsland was $100,000 plus 150,000 shares.

Elsewhere, Windjammer have 25% working interest in a Mississippian test to be drilled later this year in SE Saskatchewan.

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92H/11W ID 01325 M# 092HNW003

Miner

JUNE 7, 1979 VOL. 65 NO. 13

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Payback in less than three years

Carolin Mines gets go-ahead on Hope B.C. gold property

By Gillian Cobban

VANCOUVER – After six years and more than $4 million of extensive exploration and development work, plans are under way to place Carolin Mines' gold property near Hope, B.C., into production.

A full feasibility study on the Ladner Creek gold deposit has been completed and delivered to Carolin and its joint venture partner, the Aquarius Group. The latter is composed of three oil companies, **Great Basin Petroleum, Ocelot Industries, Canadian Obas Oil,** and a mining company, **Aquarius Resources.**

The study, prepared by Kilborn Engineering, concludes that it is technically and economically feasible to mine and mill gold ore from Carolin's Idaho zone gold deposit.

Kilborn recommends start-up at a milling rate of 1,500 short tons a day, equivalent to 525,000 tons a year. Operating costs are estimated at $12.53 per ton of ore milled.

The study recommends that a conventional, highly mechanized, low-cost sublevel open stoping method of mining be used. Processing is to be by conventional flotation – concentrate cyanidation. Capital and development costs are estimated at $19,293,000, all of which, under the joint-venture agreement, will be provided by the Aquarius Group, if it wishes to retain its current interest of 50%.

The Idaho zone lies in the southern quadrant of the property, on the south flank of a fairly steep ridge. The location of the orebody facilitates development of the mine from the side and below as opposed to the more usual situation in underground mining of having to lift the ore long distances from underground.

The zone is a sulphide arsenide replacement deposit and is adjacent to the former producing **Aurum Gold** mine where a small quantity of rich gold was discovered in 1928.

See Page 2

Active labor scene

Inco, Gaspe long strikes settled start at Dome, Sherritt, Alcan

By Stephen Vitunski

There was good news and bad news on the labor scene in Canada's mineral industry. On the plus side, the 8½-month-long **Inco Limited,** Sudbury-area strike is now over with mechanical workers already back on the job in preparation for a return to "normal" operations.

Almost concurrently, some 1,200 miners and office workers at **Noranda Mines'** Gaspe Copper operation in Murdochville, Que., voted to end their eight-month walk-out. On the other side of the coin, striking workers at **Dome Mines** in Timmins rejected a proposed contract which would have increased their wages by $1.54 per hour over a two-year period. It is understood that this is close to what Local 7580 of the United Steel Workers of America wants for the first year, with perhaps another dollar in the second. The old contract expired Apr. 18, 1979.

Members of Locals 5757 and 8144 of the same union, representing workers at **Sherritt Gordon Mines'** Fox and Ruttan operations in Manitoba rejected a new contract by a slim 52% majority over the weekend. They turned down something in the order of the Inco Thompson settlement earlier this year. Direct hourly wage benefits, under the proposed three-year agreement, would have been 75¢, 27¢ and 22¢. Picket lines have been set up at both operations. Production at Ruttan is being maintained at 50% by staff personnel while Fox is undergoing "an orderly shutdown of operations." The old contract expired May 31, 1979.

And finally, **Alcan Aluminum** employees at three of the company's smelters in Quebec walked out this Monday, as they too turned down a three-year pact calling for increments of 90¢, 65¢ and 70¢ per hour.

Getting back to the Inco situation, the new agreement was approved by 5,983 or 67.6% of the 8,852 members of Local 6500 of the USW who voted. In effect, they will be getting $4.07 per hour more at the end of the three-year pact than they were earning when the strike started on Sept. 12, 1978. This new figure is about 40¢ more than the amount rejected last month by the rank-and-file after being approved by the union negotiating committee.

See Page 2

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...s, banks and ... tour. Mr. La... Cenex Ltd.. ...anium ore to the Beaverlodge mill of Eldorado Nuclear at a rate of about 2,000 tons a week (**N.M.**, May 24, 1979).

Basically, a group of mining experts estimates, proven uranium ore reserves of Saskatchewan are worth about $40 billion and the group estimates that it will take over a period of years approximately $18 billion of expenditures to remove the reserves. The estimate of reserves is considered a conservative one.

Les Beck, director, geological surveys, Saskatchewan mineral resources dept., described, in a brief breakfast talk, the Athabasca sandstone formation as the most exciting

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Dome Petroleum downplays reports of new Alberta find

CALGARY – Dome Petroleums is discounting reports here that the company is a participant in a rumored major new oil discovery in Northwestern Alberta.

"The rumor greatly exaggerates the facts," says a Dome executive in referring to the reports. He conceded Dome's par-...

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GCNL #45 05-03-79

CAROLIN MINES LIMITED 92H/11W 01325 092HNW003 F R

TONNAGE AND GRADE ESTIMATES FOR THE LADNER CREEK GOLD MINE - Orval E. Gillespie, president of Carolin Mines Limited has reported that the company has completed the in-house grade and tonnage estimates on the Ladner Creek property, located 12½ miles northeast of Hope, B.C. The estimates are:

at a cut-off of 0.05 oz/t 1,980,000 tons of 0.127 oz./t gold
at a cut-off of 0.08 oz/t 1,409,000 tons of 0.15 oz./t gold

The data upon which these estimates are based has been collected at a cost of $4,000,000 spent over the six years since 1973. The work included: field camp construction; many miles of line cutting; bulldozer trenching; road building, upgrading and repair; thousands of geochemical soil samples and analyses; extensive ground magnetometer surveying; geological mapping; transit surveying; discovery of the McMaster Zone (an area about 4,000 feet to the north of the Idaho Zone where there are strong indications of mineralization similar to the Idaho); over 8½ miles of diamond drilling, including 22,665 feet of surface B.Q wireline drilling in 44 diamond drill holes, and 22,284 feet of underground A.Q. wireline diamond drilling in 120 diamond drill holes; underground development totalling 2,441 lineal feet in one -20% main decline ramp and six crosscuts; muck, chip and drill core sample assaying; mill testing; and the purchase and erection of a 25-ton per hour sample plant.

The 78 claims of the property contain about 9 square miles, an area 5 miles long by 1½ miles wide with the elevation varying from 2,500 ft. to 5,000 ft. The location of the ore body within a steep ridge provides for a good access for mining from the side and below without hoisting the majority of the reserves.

Mr. Gillespie also states, "last September, Carolin concluded a joint venture agreement with the Aquarius Group (composed of three oil companies: Great Basin Petroleum Ltd., Ocelot Industries Ltd., Canadian Obas Oil Ltd., and a mining company, Aquarius Resources Ltd.), for the financing of the development of our mine. Should a positive feasibility report be rendered by Kilborn, and should the Aquarius Group elect, ... to provide all funds, including working capital, required to place the mining property into production, this will prove to be the most significant financing (the) company has yet undertaken."

Carolin Mines shares were approved for listing by the National Association of Securities Dealers on NASDAQ in the over-the-counter market in the U.S. with the ticker symbol CRLNF. Mr. Gillespie says, "there are currently eight NASDAQ member firms making a market in Carolin stock. And, on Feb.14,1979 the company's stock price began to appear in the Wall Street Journal's daily list of over-the-counter stock quotations."

He says, "we believe it is highly probable that the Kilborn feasibility report will be positive and that the Aquarius Group will elect to go forward with Carolin to develop the mine aggressively to its fullest potential."

In the six months ended Nov.30,1978, the company received $2,467,200 in new funds, made up of $1,461,200 from the sale of treasury shares, $960,000 from a debenture loan, and $46,000 interest on a debenture. Expenditures in the period were $2,821,323 of which $510,026 were incurred by the Aquarius Group, $1,161,200 is shown as finance fees, $400,000 as mineral claim purchases, $559,347 exploration expenses and $150,776 administration expenses. As at Nov.30,1978, the company had $7,172 in working capital and 4,362,332 shares issued.

The agreement with the Aquarius Group provided that, if the property is funded to production, all costs to production are to be repaid from first cash flow, then the profits are to be divided on a 50-50 basis to Carolin and Aquarius Group.

F R

GCNL #105 31-05-79

CAROLIN MINES LTD. 92H/11W 01325 092HNW003

CAPITAL COST OF $19,300,000 TO BE RETURNED IN 2.93 YEARS OPERATION - Kilborn Engineering Ltd. has delivered a feasibility study to Carolin Mines Ltd. and to the financial backers known as the Aquarius Group from Calgary and Edmonton, Alberta. The report concludes that, on the basis of present drill indicated ore reserves, using a cut-off grade of 0.08 oz. gold per short ton, of 1,530,000 tons grading 0.141 Troy oz. of gold per tonne, a daily plant capacity of 1,500 short tons per day at a capital cost of $19,293,000 Canadian, operating costs are estimated at $12.53 Canadian per ton and a capital repayment from cash flow within 2.13 to 2.93 years. This is assuming a price per oz. for gold ranging from $250 Canadian (approximately $216.00 U.S.) to $300.00 Canadian (approximately $260.00 U.S.). The report assumes that all of the capital required will be provided pursuant to the joint venture agreement by the Aquarius group. Kilborn recommends that a conventional, highly mechanized, low cost sublevel open stoping method of mining be used. Processing is to be by conventional flotation - concentrate cyanidation handling 525,000 tons per year.

The report concludes that it is technically and economically feasible to mine and mill gold ore from the Idaho gold zone of Carolin Mines Ltd. The property is located on Ladner Creek, 10 miles north of Hope, B.C.

interior and south of Fraser Lake-Vanderhoof.

Results from the URP geochemical program have indicated a number of Late Mesozoic granitic plutons with anomalous uranium values in southeastern and northwestern British Columbia. These may represent potential source rocks for basal-type deposits or may contain primary deposits within or adjacent to them. The distribution of some of these relative to Late Tertiary volcanic rocks is shown on Figure 5 and these include the Surprise Lake batholith near Atlin, and the [illegible] Creek, [illegible] and Nelson batholiths and Bugaboo and Horsethief Creek stocks in southeast British Columbia. URP data have shown anomalous uranium values in stream sediments and waters from drainages underlain by Eocene volcanic sequences along the west side of Okanagan Lake.

Molybdenum

Molybdenum production in British Columbia in 1977 was 34-million pounds, or about 20% of free world production, second only to the United States. The Province's prominent position in molybdenum production was attained in 1965 with the start-up of the Endako and Boss Mountain mines. Molybdenite is the principal commodity at present price levels at Brenda, and byproduct molybdenite is recovered at four porphyry copper mines — Bethlehem, Lornex, Gibraltar, and Island Copper. Climax Molybdenum of British Columbia Limited have announced a 1982 production date for the former British Columbia Molybdenum mine on Lime Creek near Alice Arm. The deposit will produce 10 million pounds of molybdenum per year over a 25-year life.

92H/16E-1557

At the end of 1977, molybdenum reserves of producing mines and significant undeveloped molybdenum-bearing deposits was estimated to be 1340-million tonnes of contained Mo, making British Columbia one of the world's truly great molybdenum metallogenic provinces.

A great number of significant molybdenite deposits and prospects are known throughout the Province (Fig 6) and, while the greatest known concentration is in the Intermontane Belt, they are distributed throughout all tectonic belts with the exception of the Eastern Marginal Belt. The majority of deposits are stockworks and are associated with composite quartz monzonite stocks of Late Cretaceous-Early Tertiary age which intrude older layered rocks or granitic batholiths, as at Adanac and Boss Mountain. 93A-2W

Molybdenite mineralization at Endako and Brenda is related to late stage intrusive phases of the Francois Lake and [illegible] batholiths, both of Late Jurassic age. 93K-3E

Significant molybdenum deposits have been identified in the Omineca Belt and, like the majority of those in the Intermontane Belt, are related to small stocks of Late Cretaceous and Early Tertiary age. These include the clustering of deposits near Cassiar where the Mount Haskins and Mount Reed deposits are associated with small Eocene quartz monzonite stocks, while the Storie and Cassiar Moly deposits are hosted by acidic intrusive phases of a Late Cretaceous stock on the eastern margin of the older Cassiar batholith. 104P

At Trout Lake in southeast British Columbia (Fig 6), molybdenum mineralization is related to a buried Late Cretaceous quartz monzonite stock which intrudes a highly deformed Lower Paleozoic sedimentary sequence. Drilling of this significant discovery by Newmont and Esso Minreals is continuing to further define a reported 900-foot intersection of 0.40% MoS_2. An underground exploration program is under consideration for 1979. 82K 12E

The significance of molybdenite mineralization in the Coast Crystalline Belt was recognized by the discovery of the US Borax Quartz Hill deposit east of Ketchikan in southeast Alaska. Molybdenite mineralization in quartz vein stockworks is associated with a multiple phase Oligocene intrusion which cuts older plutonic and metamorphic rocks. Similar young intrusions host molybdenite mineralization at the Salal and Gem properties in southwest British Columbia. The Moly Taku prospect, east of the International Boundary in northwest British Columbia (Fig 6) and being explored by Omni Resources, may be of a similar type. 92J/14E 104K/6W

The great clustering of molybdenum deposits in the Alice Arm-Terrace area (Fig 6) includes the Lime Creek and other stockwork deposits marginal to the Coast Plutonic Complex as well as a number of occurrences within Coast granitic rocks. A significant feature of these deposits is their coincidence with the distribution of Quaternary basalt flows.

The discovery of significant molybdenite deposits in the Coast and Omineca Belts effectively renders two-thirds of British Columbia attractive for molybdenum exploration, particularly in areas that have heretofore received only limited attention.

SYNTHESIS

Exploration for a variety of mineral commodities increased throughout the Province in 1978. 'Glamour' commodities were molybdenum, uranium, tungsten, and tin, and molybdenum exploration is expected to continue at a good pace while the levels of activity for uranium, tungsten, and tin will depend on the success of exploration ventures currently underway. Lead-zinc exploration is expected to increase, particularly in northeast British Columbia, and at present price levels increased effort will be directed to the search for gold and silver. Coal exploration should show a noticeable increase in response to work requirements on new licence areas. Finally, strengthening world copper markets will further encourage exploration for massive sulphide deposits and may in turn predicate a return to significant porphyry exploration.

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Endako - 93K/3E; 93K-6; 00482
Mt. Haskin - 104P/6W; 104P-38; 04492
Storie - 104P/5W; 04491
Cassiar - 104P/4W; 104P-35; 04489
Trout Lake - 82K/12E; 82K/NW-3,4,87
Salal - 92J/14W; 92J/W-5; 00419
Gem - 92J/9E
Moly Taku - 104K/6W

Bethlehem - 92I/7W; 04819
Lornex - 92I/6E; 03771
Gibraltar - 93B/10; 00541

Island Copper - 92L/11W; 5984
Adanac {Ruby Creek} - 104N/11W; 104N-51; 1619
Boss Mtn. - 93A/2W; 93A-1; 00477

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limestones adjacent to Cretaceous intrusions.

As shown on Figure 3, tungsten analyses of 700 stream sediment samples from the 1976 Uranium Reconnaissance Program survey area were released in August 1978. Anomalous values were obtained from several areas, principally in the southwest corner of the area adjacent to the US border.

One of the most active exploration areas in the Province was in the Atlin-Jennings River-Cassiar area where considerable effort was directed to the search for tungsten and tin. Three types of tin occurrences are known in this part of northwest British Columbia and adjacent Yukon. Cassiterite occurs in the gold placer creeks east of Atlin which drain the Surprise Lake batholith which hosts quartz-wolframite veins with tin as a minor constituent. Minor tin is associated with scheelite at the Adanac 104N 11W molybdenum property, and in skarns in the general area.

Geochemistry indicates higher than average trace amounts of tin in the polymetallic multiphase Surprise Lake batholite. Further east, the Seagull, Klinkut, and Glundebery batholiths underwent considerable exploration for tungsten and tin. Principal rock types are miarolytic biotite quartz monzonites with muscovite granite and aplite phases. Tin-tungsten mineralization with beryllium and molybdenum is associated with fluorite and boron minerals (tourmaline, axinite) in skarns developed marginal to these plutons. At Ash Mountain, tin 104 N12 occurs in an andradite garnet skarn while at the Blue Lite property cassiterite and 104/12 scheelite are contained in magnetite-pyrite veins. In the Cassiar area tin is a minor constituent of lead-zinc sulphide veins marginal to the Cassiar batholith.

Logtung, on the British Columbia-Yukon border (Fig 3), is a significant stockwork tungsten-molybdenum property on which a major drilling program was continued by Amax. Scheelite and molybdenite occur in a quartz veinlet stockwork in porphyritic alaskites, quartz monzonites, and contact-hornfels and skarn. The skarns also contain beryl, minor wolframite, and tin, fluorite, and tourmaline. Published drill-indicated reserves are 200-million tons of 0.12% WO_3 and 0.06% MoS_2.

Tungsten analyses of stream sediments collected in the Atlin area by the URP survey were released earlier in 1978 and tungsten will be analysed along with 11 other elements in samples collected from the Jennings River-McDame map-area in 1978.

Uranium

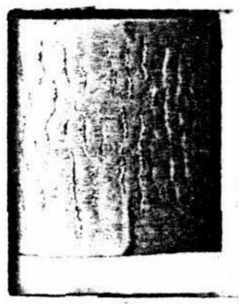
1978 was the third year in which intense exploration activity took place for uranium. It is probable that 60 per cent of the mineral claim units recorded to date were located principally for uranium. Areas of significant claim staking activity were the Okanagan, the south-central interior, south of Fraser Lake, and Atlin (Fig 4).

Two potentially economic types of uranium deposit have been identified in British Columbia. Rexspar is a volcanogenic deposit in which uranium minerals and fluorite occur in trachytic volcanic rocks which are part of Paleozoic pile of schistose acid fragmental volcanic rocks. The Blizzard, southeast of Kelowna, is a basal or paleo-stream channel deposit in which secondary uranium minerals are contained in poorly consolidated Tertiary sediments preserved beneath a Pliocene basalt cap. Continued drilling of this deposit, owned by Lacana and under option to Norcen, has indicated the presence of 2.1-million tons averaging 5 pounds per ton U_3O_8. 82M 12 82E/10

Primary and secondary uranium minerals are also known to occur in pegmatite swarms in Monashee gneisses at China Creek near Castlegar and north of Grand Forks (Fig 4). Drilling programs on both of these properties were carried out during the year.

Exploration drilling for basal Tertiary-type deposits continued in the southeast Okanagan, at Chilanko River and 70 Mile House in the south-central

p. 15



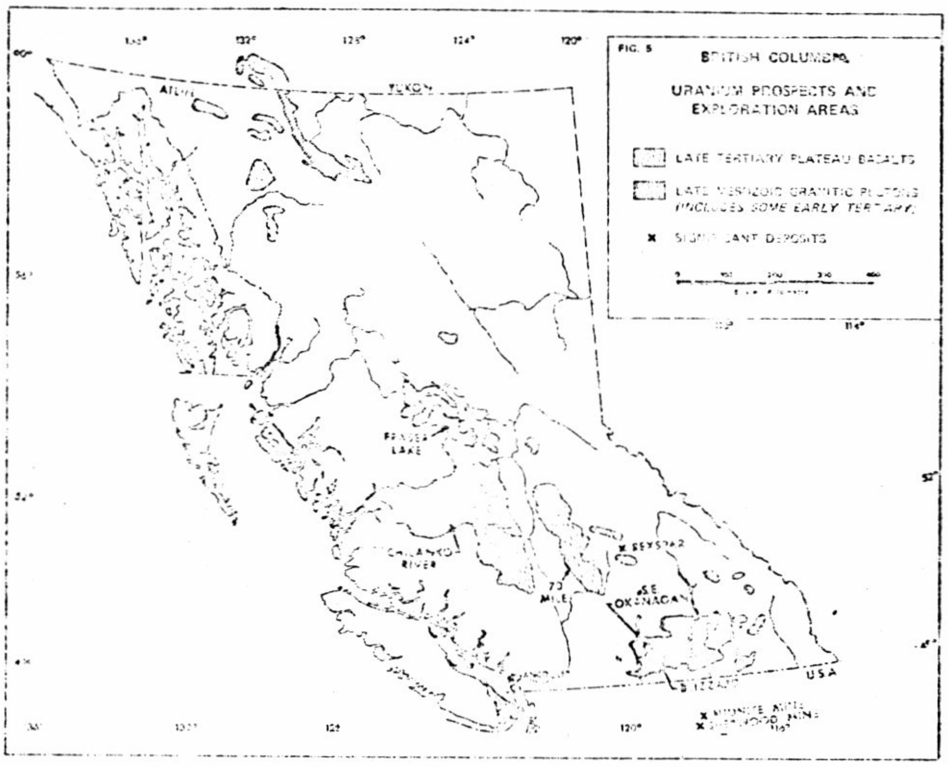
Thermal coal deposits explored elsewhere in the Province included drilling programs by Luscar-Weldwood 93F/10 at Quinsam on Vancouver Island and by Cyprus Anvil at Tulameen and Telkwa. 93L/5E
92H/7E

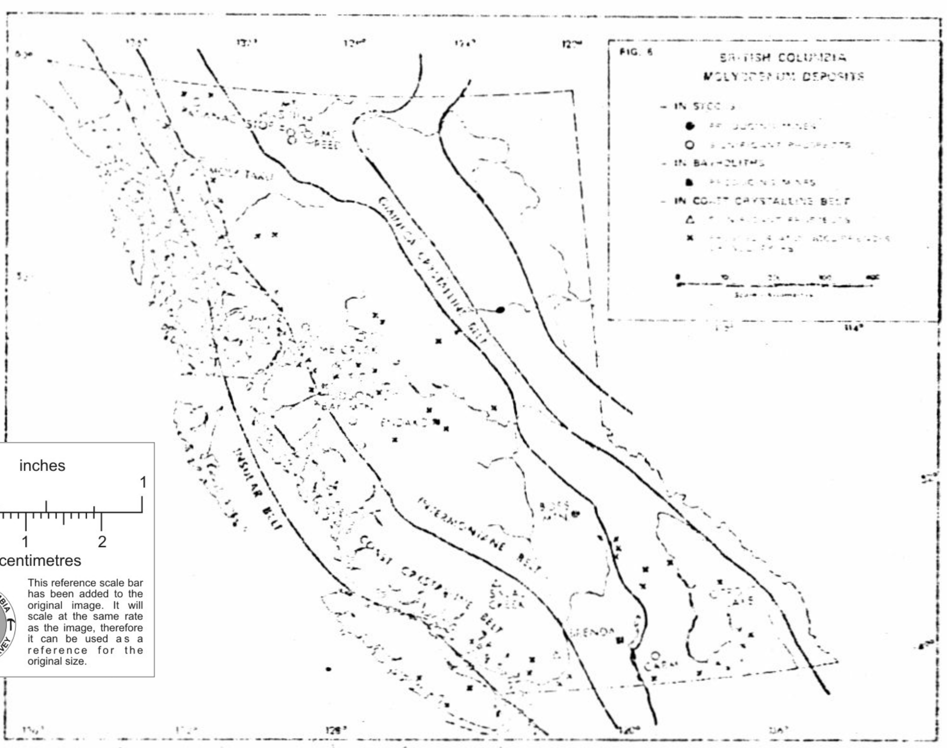
GOVERNMENT PROGRAMS TO ENCOURAGE EXPLORATION

Ongoing geological programs include regional mapping in areas of mineral potential and studies directed to the better understanding of ore deposits. Related programs include reconnaissance geochemical surveys in selected areas (Fig 2), principally through the three-year Federal-Provincial Uranium Reconnaissance Program (URP) which was completed in 1978. This program involved the collection of stream sediments and waters at a sample site density of one per 5 square miles. Waters are analysed for fluorine and uranium and sediments for uranium and up to 11 other elements. To date results for six 1:250 000 map sheets have been published, including five in southeastern British Columbia (Fig 2) and the Atlin sheet in the northwestern part of the Province. The 1978 sampling program included the Jennings River-McDame map-area east of Atlin, and survey results will be made available in the spring of 1979.

The 1978 Accelerated Mineral Development Program, funded by $5-million made available through Bill 5, Revenue Surplus of 1976/77 Appropriation Act, 1978, included an Accelerated Geochemical Survey of two map-areas in west-central British Columbia (Fig 2). This program is modelled after the Uranium Reconnaissance Program except that sample site density was one per three square miles. Data from this program are to be released in April of 1979.

The Accelerated Mineral Development Program also expanded existing Ministry programs including Prospectors' Assistance, funds for mineral roads, and mine site reclamation. In addition, funds were made available to assist with labour costs for underground mine development and property exploration, and for the Mineral Exploration Incentive Program which reimburses junior mining companies and prospectors for one-third of field expenditures up to a maximum of $50,000.





MOLYBDENUM, URANIUM, TUNGSTEN, TIN EXPLORATION

These four elements occur together in a number of areas in British Columbia, particularly in the Omineca Belt, noted for its diversity of elements. A significant correlation between the four has been noted in northwest British Columbia, specifically in the Atlin area where URP geochemistry has shown the Late Cretaceous Surprise Lake batholith to be anomalous not only in these four elements but also in lead and zinc and to a lesser degree copper and nickel.

Tungsten-Tin

Tungsten and tin minerals occur together in the northwest and southeast parts of the Omineca Belt (Fig 3), commonly within Mesozoic and younger granite plutons and adjacent late Precambrian and Early Paleozoic miogeoclinal sedimentary rocks.

At present there is no tungsten production in British Columbia. Tin is produced as a byproduct (187 478 kilograms, 1977) from the Sullivan mine where cassiterite occurs throughout the lead-zinc deposit but is mainly concentrated just above the footwall of the orebody and in tourmalinized fractures in the footwall. The origin of this tin mineralization is not clear but it may be related in part to tourmaline-beryl-bearing granitic stocks of Precambrian age which are known south of the mine.

Numerous tin occurrences are known throughout the Kootenays where many lead-zinc veins contain stannite and some tungsten. At the former Emerald tungsten mine near Salmo, scheelite occurs in skarns developed in Cambrian

Emerald - 82F/3E;
- 01195

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EXPLORATION REVIEW

The most active metal exploration areas in the Province included, from north to south: the Atlin-Jennings River area (uranium, tungsten-tin), Kechika-Gataga Rivers (stratiform lead-zinc), Fraser Lake-Vanderhoof and central interior (uranium), and the southeast Okanagan (uranium). A notable feature of the 1978 exploration scene was the relatively low level of porphyry copper exploration, a reflection of depressed world copper prices over the past three years.

In contrast, exploration for massive sulphide deposits containing copper, zinc, and byproduct gold-silver increased over 1977. The Goosly copper-silver deposit south of Smithers (see Fig 1) was optioned from Equity Mining-Kennco by Canex Placer in mid-year. Additional development drilling and metallurgical studies are underway pending a production decision. Esso Minerals continued drilling the significant Kutcho massive sulphide deposit in northwest British Columbia, part of which is held by Sumitomo who have reported at least 10-million tons of good grade copper-zinc mineralization. Nearby is the Letain asbestos deposit (Fig 1), on which Cassiar Asbestos conducted 15,000 feet of diamond drilling.

93L/1W
02449

104I/2E
35/28

104I/7E
05614

Other massive sulphide prospects explored in 1978 included two in the Coast Range — the Nifty near Bella Coola, drilled by Pan Ocean, and Maggie Mines property near Howe Sound north of Vancouver, drilled by Canex Placer. Regional exploration was conducted in the Omineca area northwest of Prince George and near Barriere Lakes north of Kamloops, where several prospects in Paleozoic Eagle Bay-Fennel Formation rocks were drilled. One of these programs disclosed interesting copper mineralization in acid volcanic rocks on the CC property, owned by the Vestor group of companies and under option to Craigmont.

-93D/9W
06122; 06123

92P/8E

Lead-zinc deposits explored in southeast British Columbia included the Vine deposit at Moyie Lake, drilled by Cominco and the Cottonbelt Shuswap-type deposit drilled by Metallgesellschaft.

82G/5W
04149

82M/7W
00334

Significant lead-zinc-barite deposits in Upper Devonian-Mississippian black shale sequences in the Kechika River area of northeast British Columbia attracted considerable attention. Gataga Joint Venture conducted a major drilling program at Driftpile Creek and Cyprus Anvil drilled a similar deposit to the southeast. Also in northern British Columbia, exploration drilling continued on the Susie property where galena and sphalerite occur in dolomitized limestone.

94L/1E

94C/5W

Underground development and mill construction went on at the Nu-Energy gold deposit near Cassiar where production and mill tune-up started in December 1978. Feasibility studies continued at the Carolin gold property near Hope. Exploration programs for gold and silver included Tournigan Mining's drilling and underground work at Big Missouri north of Stewart, and projects by several companies on gold mineralization on Porcher and Banks Island south of Prince Rupert and on the Queen Charlotte Islands.

92H
10E

104B
1E

103G
E

The moratorium on the issuance of new coal licences was lifted in February and this had the effect of doubling the number of valid licences. In the Peace River Coalfield, significant drilling programs were carried out on the Sexton and Belcourt properties of Denison Coal, on the Pacific Petroleum-Canadian Superior-McIntyre Wapiti River property, and on Ranger Oil's Mount Spieker property. Underground development and drilling on the Sukunka property was continued by BP Coal, and Brameda explored the Burnt River thermal coal deposit. Various companies began preliminary exploration of new licence areas.

93I/2

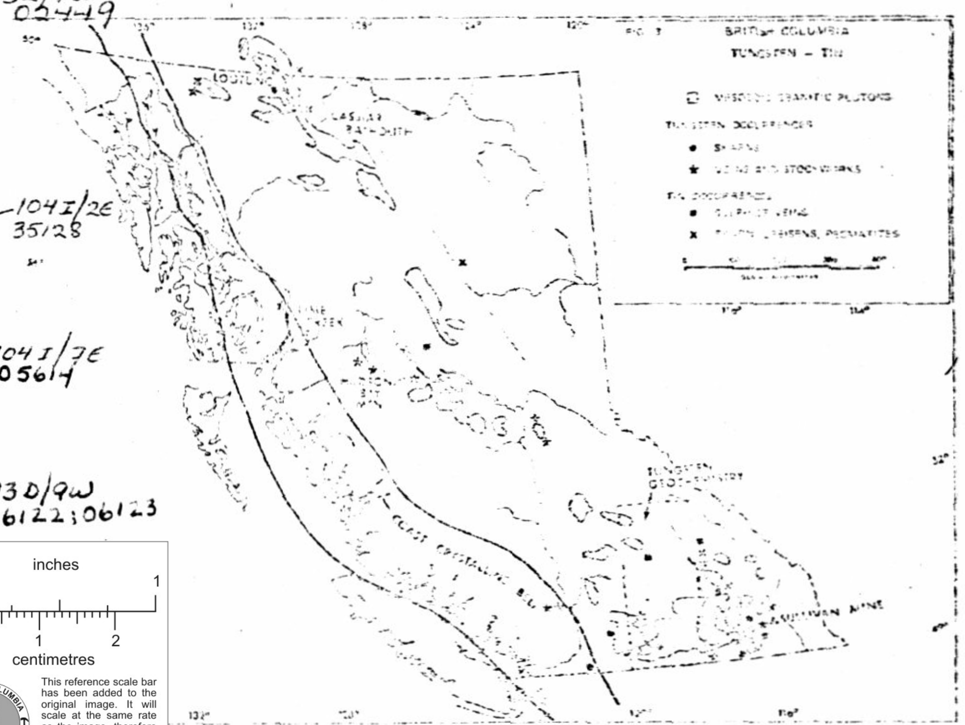
93I/E

93P/3W

93P/4E

93P/5W

Crowsnest Resources continued development of the Line Creek thermal coal property in southeast British Columbia and also drilled their Corbin and Sage Creek properties.



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BRITISH COLUMBIA GEOLOGICAL SURVEY
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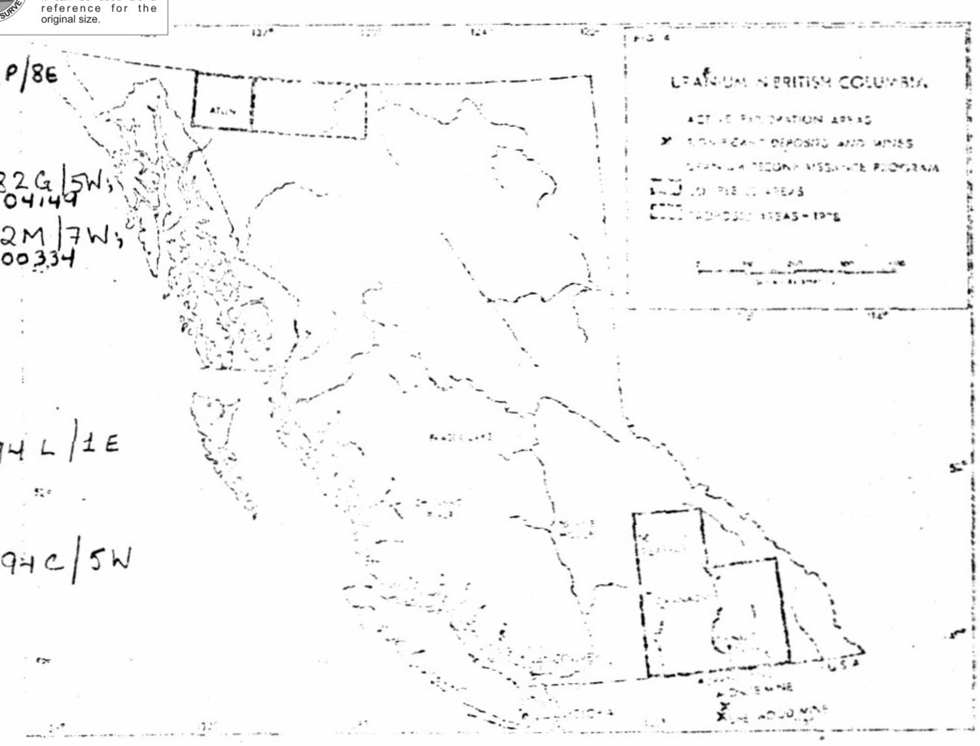

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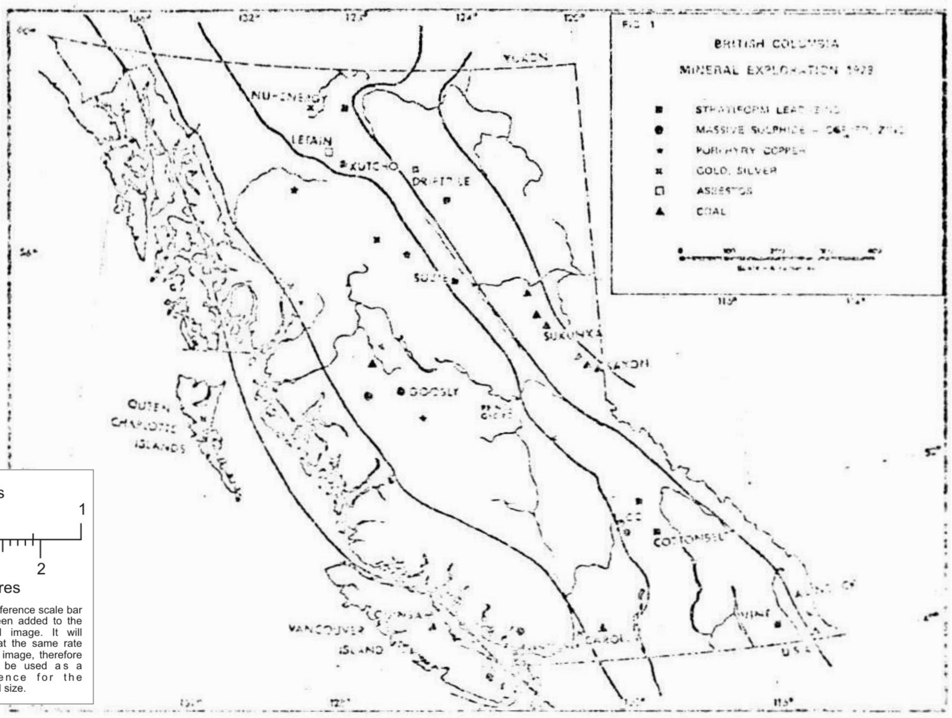
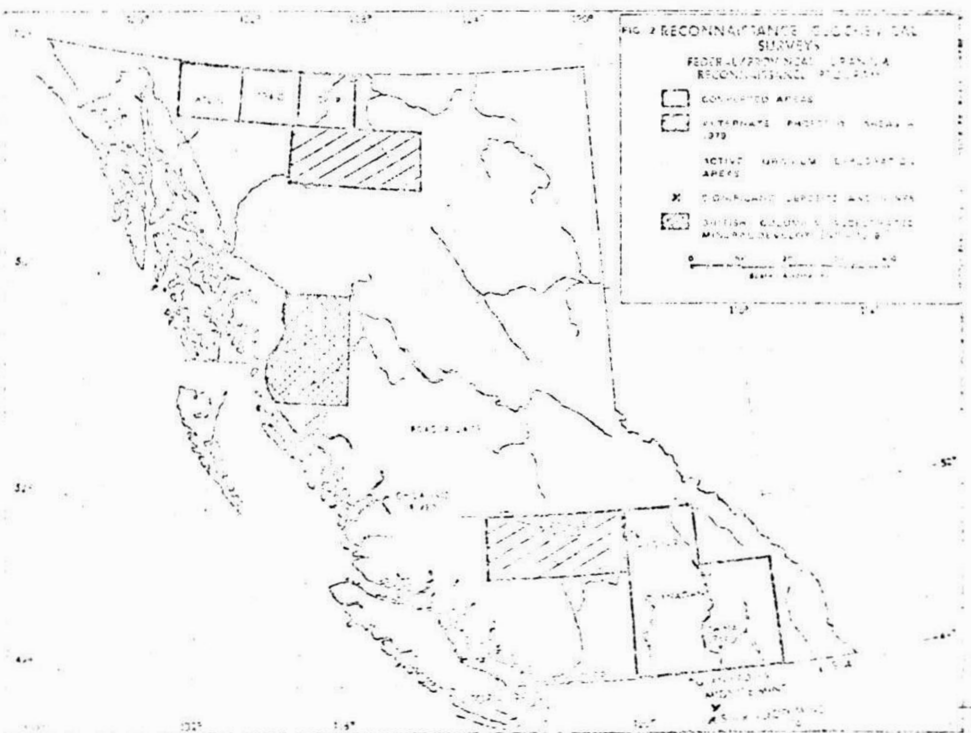
Dr N C Carter
Mineral Resources Branch
BC Ministry of Energy, Mines and Petroleum Resources

Mineral exploration in British Columbia: molybdenum, tungsten, uranium, tin are attractive





Depressed prices for traditional British Columbia mineral commodities, principally copper, resulted in a re-direction of mineral exploration effort throughout the Province in 1978. Attractive mineral commodities included molybdenum, uranium, tungsten, and tin, and a review of the geological settings for the occurrence of these elements in British Columbia will be the main theme of this paper.

The emphasis on these four elements does not imply that there was no interest in other minerals in 1978, and a summary of exploration and development follows.

GENERAL REVIEW

Mineral exploration expenditures in British Columbia during 1978 are expected to show an increase over last year due to a greater number of drilling programs. The number of mineral claim units recorded to the end of December were in the order of 33,909 or a little more than 2000 units short of the number recorded by the end of 1977.

The value of mineral production, excluding petroleum and natural gas, is estimated at $1.39 billion, or a 12 percent increase over the actual 1977 value, due in large part to a positive effect of the current exchange rates whereby British Columbia coal and most base metal producers have contracts based on US dollars. This factor is expected to maintain copper as the leading commodity by value in spite of decreased production caused by an ongoing strike at Gibraltar and the closures of Granduc and Phoenix. The value of coal production will be nearly that of copper, and molybdenum remains a solid third.

In addition to the previously mentioned copper producers which suspended operations, Cominco's HB lead-zinc mine at Salmo also closed in 1978. Diminishing the effects of mine closures was the first full year of production from the Afton copper mine and smelter at Kamloops, the announcement of Newmont's intentions to mine Similkameen Mining's Copper Mountain orebody [illegible] Ingerbelle, and the production [illegible] by Climax Molybdenum of British Columbia Limited regarding the former British Columbia Molybdenum mine at Alice Arm. Production was started by year-end from Nu Energy's underground gold property near Cassiar.

Gibraltar – 93B/ ; 00541
Granduc 104B/ ; 08408
Phoenix - 82E/2E ; 1383
H. B. - 82F/3E ; 00931

Afton - 92I/10E ; 1850
Copper Mtn - 92H/7E 01268
Alice - 103P/ W ; 5101
~~Nu Energy Erickson Ck~~

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GEORGE CROSS NEWS LETTER LTD. NO.28(1979) ~~(Page Two)~~ FEBRUARY 8,1979

copy to
mineral file

CAROLIN MINES, LTD. 92H/11W 01325-092HNW003

GEOLOGICAL RESERVE ESTIMATE REPORTED - Carolin Mines, Ltd. ~~and their joint~~ venture partners, the Aquarius Group comprising Great Basin Petroleum Ltd., Ocelot Industries Ltd., Canadian Obas Oil Ltd. and Aquarius Resources Ltd., announce their latest in-house grade and tonnage estimates on Carolin's Ladner Creek gold deposit near Hope, B.C. These figures are part of the data submitted to Kilborn Engineering Ltd., who are conducting a full study to determine the feasibility of putting the property into production.

Grade and tonnage estimates for the Idaho zone at the 0.05 oz./ton cut off were 1,980,000 tons at a grade of 0.127 oz./ton and, at the 0.08 oz./ton cut off, were 1,405,000 tons at a grade of 0.150 oz./ton Calculations are based primarily on geological considerations. When a mining plan has been finalized there will be some sectors where variations from these grade and tonnage calculations will occur, and the effects of dilution on the overall grade may be estimated more accurately.

The report says the geological configuration of the various mineralized zones may make it possible to consider the mixing of various grades to suit a particular mill head grade. This may be done so that overall costs and an acceptable profit margin can be maintained during fluctuations in the price of gold.

The reserve estimates are based on exploration in the Idaho zone to date. The report adds, "It is possible that additional tonnage may be located in the Idaho zone to depth. These locations could not be tested from the existing underground workings but will be available for exploration from the anticipated mine development openings. The strong association of the mineralization with the throughgoing fault system, the lack of any offsetting structures to this fault system mapped either underground or on the surface as far north as the McMaster zone, 1,200 meters (4,000 feet) north, strongly suggest that the mineralization continues to the north for a considerable distance."

92H/NW-3

Carolin gold mine estimate nearly two million tons

N. Miner Feb 15/79
p. A21

VANCOUVER – Carolin Mines and its joint venture partners, the Aquarius Group, composed of Great Basin Petroleum, Ocelot Industries, Canadian Obas Oil, and Aquarius Resources have completed their latest in-house grade and tonnage estimates on Carolin's Ladner Creek gold deposit near Hope, B.C.

92H/11W
1325

These grade and tonnage figures are part of the data which have been submitted to Kilborn Engineering, which is currently conducting a full feasibility study.

Grade and tonnage estimates for the Idaho Zone at the 0.05 oz. gold per ton cut off were 1.98 million tons at a grade of 0.127 oz./ton, and at the 0.08 oz./ton cut off, were 1.405 million tons at a grade of 0.150 oz./ton. The calculations are based primarily on geological considerations. When a mining plan has been finalized there will be some sectors where variations from [illegible]

[illegible] ous mineralized zones may make it possible to consider the 'mixing' of various grades to suit a particular mill head grade (compatible with the current price of gold). This may be done in order that overall costs and an acceptable profit margin can be maintained during fluctuations in the price of gold."

The grade and tonnage estimates are based on the exploration work completed to date in the Idaho Zone. The report concludes that "it is possible that additional tonnage may be located in the Idaho Zone to depth. These locations could not be tested from the existing underground workings but will be available for exploration from the anticipated mine development openings. The strong association of the mineralization with the throughgoing fault system, the lack of any offsetting structures to this fault system mapped either underground or on the surface as far north as the McMaster zone, 1,200 metres (4,000 ft.) north, strongly suggest that the mineralization continues to the north for a considerable distance."

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Conclusions

With the exception of a few locations, the exploration work completed to date has outlined the major tonnage that may be expected from the portal of the decline to section 866N. It is possible that additional tonnage may be located in the I zone to depth. These locations could not be tested from the existing underground workings but will be available for exploration from the anticipated mine development openings. The strong association of the mineralization with the throughgoing fault system, the lack of any offsetting structures to this fault system mapped either underground or on the surface as far north as the McMaster zone, 1,200 metres (4,000 feet) north, strongly suggest that the mineralization continues to the north for a considerable distance.

Respectfully submitted,

W.E. Clarke, P.Eng.

D.J. Griffith, B.Sc.

D.R. Cochrane, P.Eng.

TABLE B

Summary at 0.08 cut off grade

A. Category One

Block No.	Short tons		Average grade (troy ounces per ton)
I-1	43,542		0.111
I-2	769,749		0.156
I-3	assigned to category Two at 0.08 cut off		
II-1	383,208		0.144
II-2	49,804		0.136
III-1	22,533		0.124
IV-1	38,422		0.125
V-1	45,534		0.205
Total category one	1,352,792	average	0.151
B. Category Two			
Total	52,768		0.133
Grand Total:	1,405,560		0.150

or approximately 1.4 million short tons

averaging 0.15 troy ounces per ton.

TABLE A

Summary at 0.05 cut off grade

A. Category One

Block No.	Short tons		Average grade (troy ounces per ton)
I-1	60,930		0.095
I-2	1,039,068		0.136
I-3	22,760		0.100
II-1	539,291		0.121
II-2	101,979		0.105
III-1	15,674		0.104
IV-1	52,785		0.111
V-1	62,700		0.185
Total category one	1,895,187	average	0.129
B. Category Two			
Total	83,612		0.093
Grand Total:	1,978,799		0.127

or approximately 1.98 million short tons averaging 0.127 troy ounces per ton.

8. Areas consistent with geological and cut off criteria were outlined on the various sections. Based on geological parameters, (and the definition for category ONE material) a specific summed area on each section was projected to a corresponding summed area on adjacent sections. This formed category ONE blocks.

9. Each specific summed area on a section was arithmetically averaged with the corresponding summed area on the next section, to obtain an "average" area at the midpoint between sections. The midpoint between sections was determined and the tonnes calculated by the frustrum of a pyramid formula from the first section to the midpoint, from the midpoint to the next section and so on.

10. The grade from each summed area was applied to the volume of material between the closest Northerly midpoint and closest Southerly midpoint. (See Longitudinal Sections).

RESULTS:

The results for various blocks are shown in the following table:

3. Intersections from drill holes were area weighted to arrive at an average grade for an "area" and the various areas were measured, numbered and summed. (see mine sections).

4. Lateral and longitudinal open ended drill hole influence was limited to 7.5 metres.

5. Two categories of grade and tonnage were estimated. Category ONE includes those blocks within which there is sufficient information to develop continuity between sections. Category TWO includes those blocks for which there is insufficient information to interpolate between sections.

6. Drill hole, underground, and geological information was plotted on 1:250 scale mine section maps; and 1:500 scale longitudinal sections, maps and a 1:500, and 1:250 mine plan. This information was derived from surveying, geological mapping (on a 1:250 scale) and assay information.

7. Assay information from all surface drill holes, and underground holes to and including hole 68 considers Bondar Clegg assays with over 15% Loring check "control" assays on Bondar Clegg rejects. The following formula was used where control checks are available.

$$\frac{\text{Bondar Clegg assay} + 2 \times \text{Loring Control assay}}{3}$$

Calculations on assay information from underground drill holes 69 thru 120 are calculated by:

$$\frac{\text{Bondar Clegg assay 1} + \text{Bondar Clegg assay 2} + 2 \times \text{Loring assay 2}}{4}$$

Assays from rejects submitted to Loring between Sept/78 to Dec/78 (drill holes IU 69 to IU 120, IS 40 to IS 43, chip samples in 650 X-C, 766 X-C, 800 X-C and 866 X-C) did not agree well with Bondar Clegg. To determine which lab was correct, the rejects were retrieved from Loring. 62 of the rejects were selected on the basis of discrepancy and size of reject and run through a Jones riffle splitter. 50% of the reject was shipped to Bondar Clegg for regular assay under a new number and 50% of the reject was shipped to Loring for control assay under a new and different number.

It was found that Bondar Clegg was able to repeat their original assays well but Loring did not repeat well. Bondar Clegg's second assays and Loring's second control assays agreed excellently with each other, and because of this the initial Loring control assays on work done during the last half of 1978 have been discarded.

The results of the recent check assays are acceptable for the purpose of this calculation, but further work will be required to determine the confidence interval.

PROCEDURES USED:

1. Calculations are based on a 0.05 troy ounce of gold per short ton cut off level at periphery of individual drill hole intersection.
2. Drill hole assay information was length weighted and chip samples were area weighted.

(2) Muck sample assay information from consecutive rounds in the 700N crosscut.

(3) Chip sample assay information from the 650N; 700N; 800N and 866 N cross cuts.

(4) Geological information collected and compiled by Messers Clarke and Griffith.

Notes:

Cutting: Only one assay value was cut, and this from drill hole IU 105 sample 44. The original assay value of 1.81 was cut to 0.42 for the 0.05 cut off grade and to 0.68 for the 0.08 cut off grade calculation. (block 90-6).

Minimum width. A minimum width of 3 metres was used in calculations, i.e. intersections less than 3 metres (such as 0.15 across 1.5 m) was not utilized. Occasionally, if an intersection was less than 3 metres adjacent and below cut off level assays were used to average to 3 m. in order to provide continuity.

Block III-1 is included as part of II-1 at the 0.05 cut off grade (see section 650).

Check Assaying: In excess of 15% of the samples which have been included in this grade and tonnage calculation have been assayed first by Bondar Clegg, and then the reject was submitted to Loring Laboratories for control assay. These assays are included in the calculation as described under "Procedures Used".

<u>Mine Co-ordinates:</u> a metric grid established on the property with mine north at 33 30' west of astronomic north. The new portal is positioned at approximately 510N; 540E and mine sections (mine east west) include 550N; 580N; 600N; 620N; 660N; 700N; 730N; 766N; 800N; 833N; 866N; and 900N. Longitudinal sections include 500E; 515E; 530E; 545E; and 560E.

<u>Frustrum of a Pyramid:</u> the formula used to calculate tonnage:

Tonnes $\frac{A+B+\sqrt{AB} \times H \times S.G.}{3}$

Where A-area in square metres of section A

B-area in square metres of section B

H-perpendicular distance (in metres)

S.G. is the specific gravity of the zone material (2.78, as determined by John Britton in the first metallurgical test.)

<u>Assays:</u> All assay values are of gold in troy ounces per short English ton.

<u>Metric Tonne:</u> 1000 kilograms equivalent to 2,205 English pounds.

One troy ounce per short English ton $\cong$ 34.2857 grams per metric tonne.

INFORMATION USED:

The data used in this estimation of grade and tonnage may be classed into four categories:

(1) Assay information and geological logs from 120 underground A-Q wireline diamond drill holes (totalling 6926 lineal metres) and also from a total of 43 surface B-Q wireline holes (with a total of 6911 lineal metres.)

Introduction

Two grade and tonnage estimates of the Idaho Zone have been completed by Messrs. Griffith, Cochrane and Clarke, utilizing 0.05 and 0.08 oz. gold/ton cut off grades. The calculations are based primarily on geological considerations. When a mining plan has been finalized there will be some sectors where variations from these grade and tonnage calculations will occur, and also at this time the effects of dilution on the overall grade may be estimated more accurately.

The following report sets out the parameters used in the calculations, with a brief statement as to the geological indications for future exploration.

Definitions

Zone Material

Altered rock in which geochemically anomalous amounts of gold may be expected. Alteration normally consists of various combinations of silicification, chloritization, carbonatization, albitization and argillization.

Zones: Continuous volumes of zone material.

Blocks: Continuous volumes within a specific zone which meet a specified cut off level.

Cut off: An assay grade. Where the grade is below this value on the periphery of any area, it is not considered in the grade and tonnage calculations.

Notes

on

Grade and Tonnage Estimates

at an

0.05

and

0.08 Cut off level

on the

Idaho Gold Deposit

of

Carolin Mines Ltd.

by

W.E. Clarke (P.Eng.)

D. Griffith (B.Sc.)

D.R. Cochrane (P.Eng.)

January 31, 1979

Vancouver, B.C.

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available for exploration from the anticipated mine development openings. The strong association of the mineralization with the throughgoing fault system, the lack of any offsetting structures to this fault system mapped either underground or on the surface as far north as the McMaster zone, 1,200 meters (4,000 feet) north, strongly suggest that the mineralization continues to the north for a considerable distance."

CAROLIN MINES, LTD.

Orval Gillespie

(ORVAL GILLESPIE)
President.

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VANCOUVER, BRITISH COLUMBIA, February 6, 1979.

CAROLIN MINES, LTD. (Vancouver Stock Symbol: CLLV; NASD: CRLMF) and its joint venture partners, the Aquarius Group, which is composed of Great Basin Petroleum Ltd., Ocelot Industries Ltd., Canadian Obas Oil Ltd., and Aquarius Resources Ltd., to-day announced the results of their latest in-house grade and tonnage estimates on CAROLIN's Ladner Creek gold deposit near Hope, B.C. These grade and tonnage figures are part of the data which has been submitted to Kilborn Engineering Ltd., which is currently conducting a full feasibility study to establish the viability of putting the property into production.

Grade and tonnage estimates for the Idaho zone at the 0.05 oz./ton cut off were 1.98 million tons at a grade of .127 oz./ton, and at the 0.08 oz./ton cut off, were 1.405 million tons at a grade of 0.150 oz./ton. The calculations are based primarily on geological considerations. When a mining plan has been finalized there will be some sectors where variations from these grade and tonnage calculations will occur and the effects of dilution on the overall grade may be estimated more accurately.

The report indicated that: "The gological configuration of the various mineralized zones may make it possible to consider the 'mixing' of various grades to suit a particular mill head grade (compatible with the current price of gold). This may be done in order that overall costs and an acceptable profit margin can be maintained during fluctuations in the price of gold."

The grade and tonnage estimates are based on the exploration work completed to date in the Idaho zone. The report concludes that, "It is possible that additional tonnage may be located in the Idaho zone to depth. These locations could not be tested from the existing underground workings but will be

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Two-month feasibility study for Carolin gold property

92H/11W

N. Miner 14-Dec-78 Pg 6

VANCOUVER – Carolin Mines and the Aquarius Group have engaged **Kilborn Engineering** to complete a full feasibility study to establish the viability of placing into production the Ladner Creek gold property near Hope, B.C., Carolin president, Orval E. Gillespie, announced at the annual meeting.

Mr. Gillespie expressed confidence that the property will be brought into production. Management, he said, is looking for an operation initially at a rate of 1,000 tons per day, later increasing to 2,000 tons per day.

The feasibility study, he said, will be completed in about two months, and it would require 16 to 18 months after the completion of the feasibility study to put the property into production.

The capital cost, it is estimated, will exceed $10,000,000. In September the company signed an agreement with the Aquarius Group, consisting of **Aquarius Resources, Great Basin Petroleum, Ocelot Industries** and **Canadian Obas Oil,** which has agreed to provide the production financing if the feasibility study shows a four-year return of capital. In consideration of this financing the group will be entitled to 50% interest in the mine, mill and production.

Underground work has established 1.2 million tons of 0.152 oz. gold per ton. On the basis of a 1,000-ton-per-day operation, current gold prices and mining and milling costs estimated in the area of $12 a ton, Mr. Gillespie said that the anticipated payback of the capital costs of the Aquarius Group would be accomplished well within the agreed upon time.

92H/11W

CAROLIN MINES LTD. JAN. 9/79 ID. 01325

TWO ENGINEERING STUDIES NEARING COMPLETION - Carolin Mines Ltd. has two engineering studies currently underway on its large tonnage gold mine at Ladner Creek, near Hope, 110 miles east of Vancouver, B.C.

The full feasibility study is being prepared by Kilborn Engineering Ltd. Orval E. Gillespie, president of Carolin Mines, has reported that Kilborn has stated that this study is approximately 70% complete and is proceeding in a satisfactory manner.

The second study is a detail ore reserve calculation and mining plan which is being prepared by the company's staff and consultants. This second study is nearly complete and is expected to be in its final form in the next two weeks. Present indications are that the new ore reserve calculation will reflect an important increase over earlier ore reserve calculations.

Carolin continuing gold property studies

N. Miner Jan 25/79 p.21

Carolin Mines has two engineering studies currently under way on its Ladner Creek gold property, near Hope, B.C. 92H/NW-3

The full feasibility study is about [illegible] within the next two weeks.

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N. MINER 17-AUG-78

92H/11W

Carolin getting together with Aquarius group on Ladner Creek bet

VANCOUVER – Carolin Mines reports it is negotiating with Aquarius Resources and four other companies (the "Aquarius Gold Group") with respect to financing Carolin's Ladner Creek property near Hope, B.C. This would include financing for underground exploration, feasibility studies, and if acceptable, development financing to place the property into production.

Agreement in principle has been reached with the group. However, it is subject to finalization of details and execution of formal documentation. It will also be subject to regulatory authorities' approvals.

N. MINER 28-SEPT-78

92H/11W

Carolin Mines takes on partner production decision likely in 1978

VANCOUVER – Carolin Mines has signed an agreement whereby the **Alberta Gold Group** can earn a 50% interest in Carolin's Idaho gold zone, Ladner Creek, 12 air miles northeast of Hope, B.C., by placing it into production. The group consists of **Great Basin Petroleum, Ocelot Industries, Canadian Obas Oil** and Aquarius Resources.

Under the deal, Orval Gillespie, Carolin president, tells The Northern Miner, the Alberta group is committed to finance a $740,000 development and feasibility program that is now under way and is scheduled for completion by the end of 1978. Upon completion of the feasibility a production decision will be made. Carolin is the operator.

To date work has included 21,800 lineal ft. of surface diamond drilling, 1,542 ft. of crosscutting, 10,000 lineal ft. of underground diamond drilling, preliminary mill testing and extensive sampling and geological evaluations.

Development work proceeding in conjunction with the feasibility study consists of an additional 650 ft. of crosscutting and 11,000 ft. of underground close spaced diamond drilling.

Previous surface diamond drilling indicated a geologic potential for 4.2 million tons grading 0.098 oz. gold per ton at a cutoff grade of 0.05 oz.

Recent underground work has centred around the central core of the gold bearing zones and has investigated about 700 ft. of strike length. The mineralization is open to the north. The most recent grade and tonnage estimates are 1.2 million tons of 0.152 oz. gold per ton with additional reserves expected from the current program.

The Idaho gold zone becomes higher grade with depth and to the north. The third last hole in the recently completed underground drilling program averaged 0.167 oz. per ton across 194 ft. and the last hole 0.37 oz. per ton over 19.4 ft.

While a decision on production awaits completion of the feasibility study, initial thinking of management was an operation in the order of 1,000 tons per day, a level that may be low in the light of presently high gold prices.

GCNL #231 1-Dec-78 CAROLIN MINES LTD. 92H/11W NW

FEASIBILITY STUDY CONTRACT LET – Carolin Mines Ltd. and the "Aquarius Group" have engaged Kilborn Engineering Ltd. to complete a full feasibility study on the Ladner Creek gold deposit to establish the viability of putting the property into production. The mine is located near Hope, B.C.

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GCNL #22 Feb. 1/78 CAROLIN MINES LTD. file only (92H/11)

UNDERGROUND SAMPLING SHOWS GOOD GOLD GRADE - Carolin Mines Ltd. president Orval Gillespie has reported that the scheduled program of diamond drilling, 2000 ft. of decline and cross-cutting, is now progressing on a satisfactory basis at the mine near Hope, B.C. A delay in work, caused by holidays and change of road and tunnelling contractors, has been rectified and the overall program is now progressing exceedingly well. The new underground contractor is "White Mine Developments" of Vancouver, B.C.

To date, the first 492 feet of a single mineable ore block has been determined and the results have been established, so that the ore block has made 1,923 tons of ore per horizontal foot which gives 942,000 short tons of ore grading 0.122 troy oz. gold per ton. Taking today's approximate value of $175 per troy oz. American or $192 per troy gold oz. Canadian, the value of the Carolin ore is equal to $22.30 per short ton

Additional drilling will increase this block by approximately 500 short tons per horizontal foot which should increase the block by 246,000 short tons giving a total tonnage in the 492-foot mineable block of ore equal to 1,188,000 short tons--this is approximately 1/3 of the drill indicated ore zone.

To define the block, data from the following was used: 50 surface and underground diamond drill holes, 492 feet of main ramp plus crosscutting in 2 sections of the ore block and samples from a surface trench.

Assaying procedures were used to reduce any possibility of error in results. Mr. Gillespie said the company is convinced the previous 1,200 feet of drill indicated ores could be extended more than double that length.

The president points out that, "The company has done extensive research of data on gold mines in various parts of the world in order to find a similar property to that of Carolin so that the shareholders could use the data to compare the results that are forthcoming -- The company has been unsuccessful in accomplishing this because of the unique nature of the deposit. The width and thickness of the Carolin ore zone is more comparable to base metal type deposits. Preliminary work indicates the possibility of tunnelling under the ore body and moving the ore by gravity and conveyor system."

GCNL #75 19-April-78 CAROLIN MINES LTD. 92H/11 (92H/NW)

SIGNIFICANT UNDERGROUND HOLE INTERSECTIONS

Hole No.	Width ft.	Oz.Gold/t
IU-7	28.5 ft.	0.059
IU-8	16.1	0.109
IU-9	15.8	0.088
IU-10	19.0	0.105
IU-11	39.4	0.159
IU-12	32.6	0.165
IU-13	34.6	0.112
IU-14	124.0	0.140
IU-16	94.9	0.175
IU-17	33.0	0.127
"	57.2	0.137
IU-18	33.0	0.112
IU-19	16.7	0.166
IU-21	79.2	0.113
IU-27	83.8	0.193
IU-29	39.4	0.197
IU-32	142.5	0.151
" including	103.5 ft.	0.180
IU-33	59.0	0.122
" including	20.5 ft.	0.287

Intersections of less than 0.1 oz. gold per ton were made in holes No. IU-15, IU-20, IU-22, IU-23, IU-24, IU-25, IU-26, IU-28, IU-30, IU-31

Note: The gold bearing mineralized bands trend northerly and dip at moderate angles to the east. All holes drilled perpendicular to this attitude represent approximate true thickness. No holes were drilled down dip. Several of the flat holes drilled to the east were prospect holes to aid sideways viewing from the main decline.

Carolin Mines Ltd. has reported that underground decline work and underground diamond drilling has continued uninterrupted for the last three months at the mine located 10 miles north of Hope, B.C. A total of 200 meters (656 feet) of a 3.3 by 3.3 meter (10 ft. x 10 ft.) decline at minus 20% has been completed since January bringing the total of the underground work to 530 meters (1,740 lineal feet).

There has been a total of 1,560 lineal meters (5,118 ft.) of AQ wire line drilling in 36 drill holes. The underground drilling rate is currently scheduled to be upgraded to two drills, three shifts per drill per day.

A total of just over 1,000,000 short tons has been indicated by the decline to the point '700 North' which is approximately one third of the length of the decline. The grade is 0.122 troy ounces of gold per short ton at the 0.05 ounce cut-off level. There is a considerable amount of higher grade material at higher cut off levels. An additional 30 holes are planned during the next phase of drilling which will bring total underground drilling to just over the 3,000 meter (10,000 foot) mark.

The company anticipates that sufficient drilling will be completed within one month to re-evaluate grade and tonnage of potential mineable blocks north of 700 and along the next two thirds of the underground work.

The company is considering additional underground exploration work to determine the potential of the Idaho gold zone further along strike. A total strike length of 360 meters (1,180 ft.) has been explored to date and the zone remains open to the north.

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92H/11W
LADNER CRK
(IDAHO ZONE)

producer file

(NW)

CAROLIN MINES LTD.

+ Better Grade Gold Values Cut in Underground Drilling and Drifting Program

Assay Results From First Four Holes

Hole No.	Interval From	Interval To	Intersection Metres	Intersection Feet	Oz/t Gold
1	27.28	40.95	13.67	44.8	0.177
including			4.83	15.8	.213
2	6.30	46.30	40.00	131.0	.138
including			9.48	31.1	.203
3	19.34	45.30	26.96	85.17	.088
including			3.78	12.4	.172
4	7.77	24.20	16.43	53.9	.168
including			2.05	6.72	.58

Car Samples From Upper Idaho Crosscut

Interval From	Interval To	Intersection Metres	Oz./T Gold
183.5	185.2	1.7	0.14
185.2	187.1	1.9	.20
187.1	189.9	2.8	.183
189.9	191.8	1.9	.063
191.8	194.4	2.6	.050
194.4	196.6	2.2	.152
196.6	199.6	3.0	.190
199.6	201.8	2.2	.16
201.8	203.8	2.0	.33
203.8	205.8	2.0	.19

Chip Samples From Wall of Decline

Distance From Portal	Sample Length Metres	Oz./t Gold
196.1	2.5	0.61
198.6	1.55	.33
200.5	1.65	.045
202.3	1.30	.36

Orval E.Gillespie, president of Carolin Mines Ltd., told the annual meeting that, as anticipated, the underground program has provided ever more encouraging results. Ten holes have been drilled from underground and results for the first four are reported above. The six unreported holes were all in the zone and appear to be of at least similar grade. He pointed out that it is quite important to know that, until now, the company has referred to the gold deposits of the company, located 10 miles north of Hope, B.C., as being of very fine consistency virtually impossible to view with the naked eye(micro or 'no seeum'). Now, however, native gold, clearly visible to the naked eye, has been observed in drill core and in the main decline.

As of Nov.14, the main decline has been driven at a grade -20° for a distance of 251.2 metres (824 ft.) and has recently been turned mine east and is now cross cutting on the 700 metre section. The decline has opened the Upper Idaho zone mineralization for 47 metres (154.2 feet). The weighted average of 29 assays (approximately three assay samples per round) from car samples across the first 22 metres(72.2 ft.) of the Upper Idaho Zone is 0.165 oz. gold per short ton.

The decline is proving some 2,800 tons per foot of advance and if this continues to the full 800 feet of advance then one can calculate the anticipated proven tonnage at the end of the program (2,240,000 tons). The program of underground decline, cross cut and drifting has some 600 feet to go to reach the area of the No.33 and No.34 diamond drill holes. It is expected that it will take some 10 weeks to reach this point at which time the company will make a decision on perhaps advancing the underground working beyond the present planned limit.

Mr.Gillespie told the meeting that it is hoped to have the final feasibility study well underway prior to the completion of the underground program. The bulk sampling plant is expected to be ready for operation in about a week and it will have a capacity of 25 tons per hour or 600 tons per day.

The meeting authorized the directors to proceed with increasing the capital of the company from 5,000,000 shares to 10,000,000 shares as well as approving the deletion of N.P.L. from the company name. The meeting was also told that the company is now working on the spending of the second $400,000 from Norvan Management which group has entered an agreement to provide up to $1,500,000 for the current exploration and development program. The financing agreement gives Norvan the right to acquire up to 1,000,000 of Carolin treasury shares if all of the $1,500,000 loans are advanced by Norvan to the company.

Letters

Geostatistical study

The Editor, Western Miner
In reference to the excellent 'Geostatistical Study of the Ladner Creek Gold Deposit of Carolin Mines Ltd' by Montgomery, Sinclair, Symonds, and Giroux (Mar 77 Western Miner), there is one point with which I strongly disagree. While the evidence is not conclusive, the preponderance of evidence suggests very strongly that the gross form of the deposit is determined not by a fold, but by a series of facies changes, wherein a group of aphanitic to fine grained carbonaceous sediments (known locally as the 'Dead Stuff in the Middle') 'shale out' to the west.

Calculations of true thicknesses from core angles of the 'Dead Stuff in the Middle' show that there is indeed a progressive thinning of true thickness to the west, and the interfingering nature of the contacts are illustrated in their General Geologic Cross-section.

The lower contact of the 'Dead Stuff in the Middle' to the southeast of the drilling area is quite definite and can be followed for over 1.2 km.

Lack of distinct marker beds, the generally very fine grained nature of the sediments, and varying degrees and type of alteration make conclusive determination of the gross structure impossible with the present state of knowledge. Other definite facies changes can be shown within the drilling area however, and after over three years of living with the area and the Idaho Zone in particular, I feel quite strongly that the lateral changes in the sediments are due to sedimentary facies changes rather than folding.

David Griffith
Carolin Mines Ltd

The Editor, Western Miner
We appreciate the comments made by D Griffith regarding our paper 'Geostatistical Study of the Ladner Creek Gold Deposit of Carolin Mines Ltd.' Our paper is geostatistical in nature and is not an expose of the geology of the Ladner Creek gold deposit. Never-the-less, a brief geological description of the deposit was included because we believe that many aspects of geostatistical studies are closely tied to geological features. One of the most important features is geometric form of the field of mineralization under study. It is this importance of form that led us to describe the mineralized zone as having the shape of a recumbent fold. Our use of the word 'fold' is in quotation marks in each of the 3 places it is used in our introduction, to emphasize the descriptive rather than genetic meaning of the word. It was perhaps an unfortunate use of words because of the ambiguity it engendered. In fact, our cross section of the geology of the deposit was prepared from more detailed sections interpreted and prepared by Mr Griffith for which we are most thankful.

In summary, our only disagreement with Griffith's comments is his implication that we are passing judgement on the genesis of the Ladner Creek gold deposit. No such implication was intended in our brief descriptive section on the geometry of the mineralized zone.

J H Montgomery
A J Sinclair
D F Symonds
G H Giroux

NWT loses land

The Editor, Western Miner
I have noted the anguish of Mrs Dickson and your explanation of the transportation of the Aishihik (Letters, February, 1977).

On the CBC Television Show "Front Page Challenge" of Monday, May 2, 1977, Gordon Sinclair and Pierre Berton (who should know better) happily placed Headless Valley and the Nahanni in the Yukon.

I do not know whether this item will reconcile Mrs Dickson to Southerners who muck about north of "60", but as the manager of the Expos said at the end of the 1976 season: "You win a few and you lose a few".
Tom S Smith
Vancouver, B.C.

New sales outlets for Kaiser

At the annual meeting of Kaiser Resources Ltd in May 1977, new prices for coal and new sales outlets were announced. Although the sales to Japan, Kaiser's largest market, were down in 1976 in volume and it is expected that new demand will remain soft for some time to come, the Japanese customers have agreed to a price increase of 42 cents a long ton retroactive to 1 Jan 77. The price can be reviewed 1 Apr'77.

A new long-term customer for metallurgical coal is the Pakistan Steel Mills Corporation Ltd, at Karachi. This new steel company is due to start production in 1978, and Kaiser are to be the primary coal supplier, at the same price as the Japanese contract. From 1979 Kaiser expect to ship between 1.3-million and 2-million tonnes over a five-year period. The exact rate is to be decided by 30 Sept'77.

Kaiser are also due to ship a 20,000-tonne trial cargo to Somisa, an Argentine steel company, by 31 July'77. Somisa have an option for a further 20,000 tonnes in 1977.

An additional trial cargo of 40,000 tonnes is to be shipped to Brazil by 31 July'77.

The Hosmer-Wheeler project (a proposed underground hydraulic mine: *Coal Miner* March'77 p25) could go ahead if current sales negotiations are successful, though the market for new coal is limited and the project competes with other proposed coal developments in Canada and Australia. Negotiations are under way to include the Brazilian Companhia Vale do Rio Doce as a partner in the project (which already involves Mitsui Mining Company and Mitsubishi Corporation).

It is foreseen that Japan's demand for metallurgical coal during the next 15 years will continue to grow, though not dramatically. Kaiser project sharp increases in metallurgical coal demand by Korea, Mexico, and the Peoples Republic of China.

It is hoped that negotiations will soon be complete for a new collective agreement with the United Mine Workers of America. Contracts have been signed with the longshoremen at Roberts Bank and office and technical employees at Sparwood.

Sale of 3.5-million shares by Kaiser Steel to the Canadian public increased public ownership to 41% in 1976. The company has applied to the Foreign Investment Review Agency (FIRA) for a ruling which would exempt Kaiser Resources from the FIR Act.

INVESTMENT CUT IN JAPAN
It is reported that Japan's six largest iron and steel firms are to cut their equipment investments in fiscal 1977 to 34.6% below the total for the previous fiscal year. Planned investment totals about 815.5-billion yen (US$2.9-billion) or far below the level of one-trillion yen (US$3.6-billion) for the first time in two years.

Steelmakers predict that their annual investments for the rest of the 1970s will have to be kept at about the same levels as in fiscal 1977 in light of the demand outlook for steel. Their investments so far have accounted for about 20% of total investment in the industrial field. Consequently, it is expected that the sudden decline in investments by the iron and steel industry will seriously affect future business trends.

(7)

correlation beyond this sample spacing. The variograms appear reasonably well defined in spite of the uneven distribution of drill holes and illustrate well the useful application of geostatistical methods early in the evaluation of mineral deposits in general. The principal advantage of the procedure is that a statistical error can be calculated for estimates of tonnage, mean grade, etcetera, so that the uncertainty of estimation can be quantified. For the Ladner Creek gold deposit, assuming normal error distribution, we estimate with 95 percent uncertainty a minimum of 3.0-million tons of ore grading 0.098 ± 0.015 oz gold per ton in the upper and lower limbs of what seems to be a recumbently folded mineralized structure.

The fact that a spherical geostatistical model with range (a) of 150 feet and a sill (C_1) that is large relative to the nugget effect (C_0) can be fitted to the data means that global estimates will improve progressively as sample spacing decreases from 150 feet. Thus, we find a very substantial decrease in error estimates for an approximately 100 feet by 100 feet grid compared with those errors estimated from existing drill data. It is apparent that this kind of study could be repeated for several patterns and different amounts of additional data to minimize drilling costs by optimizing drill hole locations to provide an acceptable margin of error to estimations of tonnage and mean grade.

It is to be emphasized that a variety of empirical methods of grade and tonnage estimations might produce values that correspond closely with the figures reported here. The main difficulty with such techniques is that one is inclined to accept the precise values of the estimates without being aware of their quality. The big advantage of a geostatistical approach as shown in this study is that the magnitude of estimation errors is known. For the Ladner Creek gold deposit, available data provide grade and tonnage estimates good to approximately 20 percent. There would be little point to quoting such estimates to 6 or 7 significant figures as is done commonly in many empirical ore estimations!

We have outlined a study based on a cut-off grade of 0.05 oz Au/ton. A comparable study could be done for any desired cut-off grade, and, in fact, we are involved in such an evaluation based on a cut-off grade of 0.09 oz Au/ton. Note that ore thickness is affected by cut-off grade, hence, accumulation (grade x thickness) is also affected. Consequently, each cut-off grade defines new variables for which new structural analyses (ie, variogram models) are required.

If classical statistical methods were followed the estimation of thickness would be 96.1 with a standard deviation of 52.21. Thus, the standard error of the mean is $52.21/\sqrt{n} = 9.23$ or a relative error of $(9.23/96.09) \times 100 = 9.61\%$ which compares fairly closely with the error we quote. However, to reduce the error to 5% requires a standard error of 4.8 which in turn requires a total of 118 randomly located drill holes (ie, 86 additional holes). It is apparent that ignoring the autocorrelation and relying on statistics of independent variables could lead to financial disaster!

ACKNOWLEDGEMENT

This case study was done by Montgomery Consultants in cooperation with MINDEP project of the Department of Geological Sciences, University of British Columbia, Vancouver. Financial support was obtained from Carolin Mines Ltd. Cooperation of Mr D R Cochrane is appreciated. Mr Orville Gillespie, President, Carolin Mines, kindly made the data available to the writers for publication.

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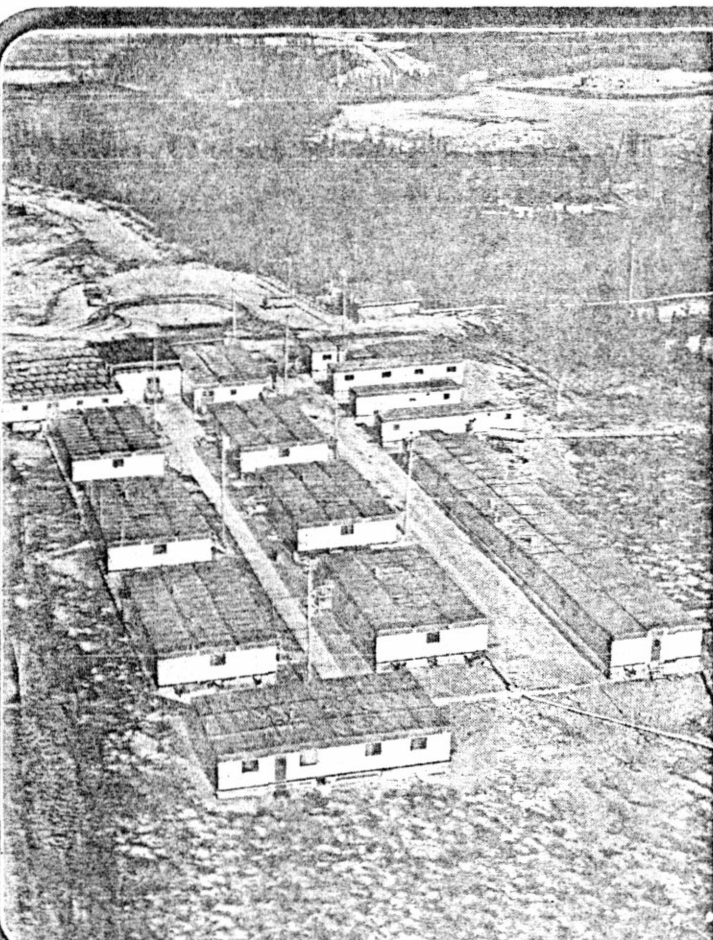

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Table III. *Global estimators for a grade cutoff of 0.05 oz/ton*

	Mean	Variance	Relative std dev
Thickness	98.7	97.9	10.0%
Accumulation	9.66	1.18	11.2%
Grade	0.098	0.000058	7.7%

Table IV. Error estimates based on 22 additional drill holes with locations shown in Fig 6

	Thickness	Accumulation	Grade
mean	98.7	9.66	0.098
s	4.77	0.588	0.004
100 s/m	4.8%	6.1%	4.1%

We have assumed on geological grounds that the deposit is continuous within the area outlined in figure 3. Thus, the error in volume estimation is due to uncertainty in thickness, ie, a relative error of 10%. In addition, a small error is contributed by the conversion factor f. These two sources of error are independent and, hence, are additive. Assuming a variance of 0.5 for f a relative error of about 11% is obtained for tonnage. If the distribution of tonnage estimates is normal (a reasonable approximation) there is a 95 percent chance that tonnage is in excess of $\bar{x} - 1.65s$; ie, in excess of 3.0-million tons.

EFFECTS OF ADDITIONAL WORK

One of the principal advantages of geostatistics is in calculating the effects that additional samples have in reducing estimation errors. This arises from the fact that once the autocorrelation function (the semi-variogram) is established the geometric disposition of samples controls error estimates. Consequently, we can assume any sample sites (drill sites in this case) we wish and calculate the error corresponding to that particular pattern of data. For the Ladner Creek gold deposit we have done the calculation for the situation in which 22 hypothetical drill holes have been added to the 32 that now exist in the block we are evaluating. This new geometry closely approximates a 100 feet by 100 feet drilling grid over the ore block we have defined for estimation purposes. Estimated errors are given in Table IV.

There is a very significant improvement in the estimation errors for both grade and thickness, both being about half of what they are with existing drill data, and this with an additional 22 well located drill holes (see figure 6). The corresponding relative error in tonnage estimation is reduced to 4.9%.

DISCUSSION

The deposit appears isotropic for the scale and type of study we report here. Semi-variograms for both thickness and accumulation have equal ranges of 150 feet indicating autocorrelation over distances less than 150 feet and lack of

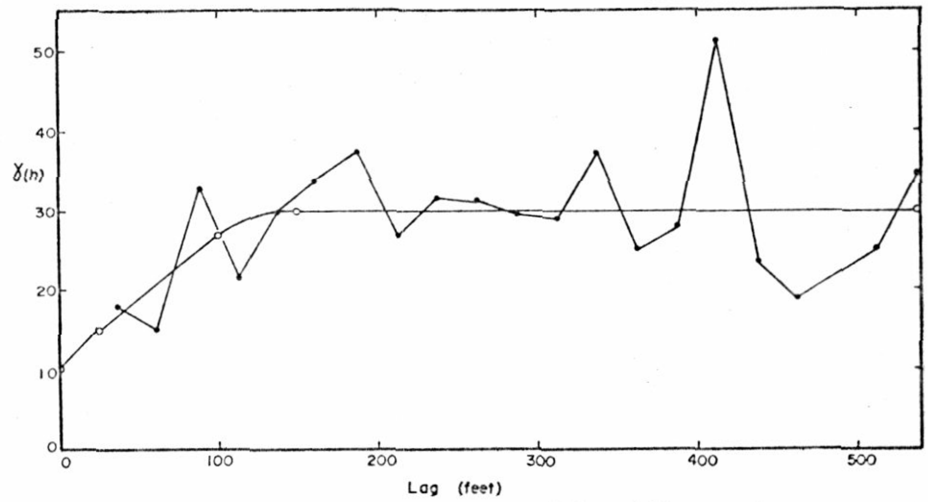

Figure 5: Semi-variogram for accumulation (grade x thickness). The jagged curve represents real (experimental) data; the smooth curve is a spherical model fitted to experimental data and having parameters given in the text.

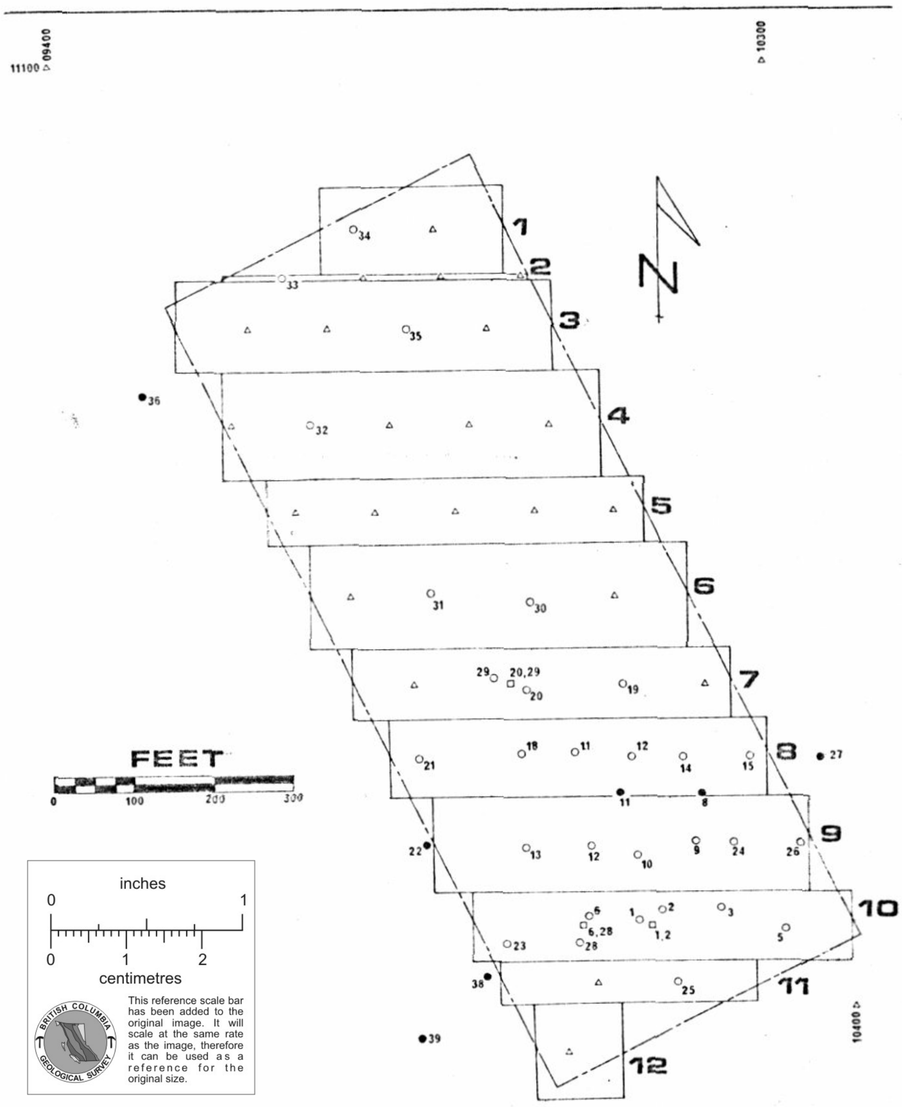

Figure 6: Plan of real drill holes (numbered open circles) and vertical projections of Au-sulphide intersections for inclined holes (numbered open squares). Compare with Fig 3. Black circles indicate existing drill holes not used in grade and tonnage estimations. Open triangles are proposed new drill hole locations that would reduce errors in estimations by about 50% to give a 10% error at the 95% confidence level. Small rectangular blocks with medially arranged drill holes are weighting areas used in calculations.

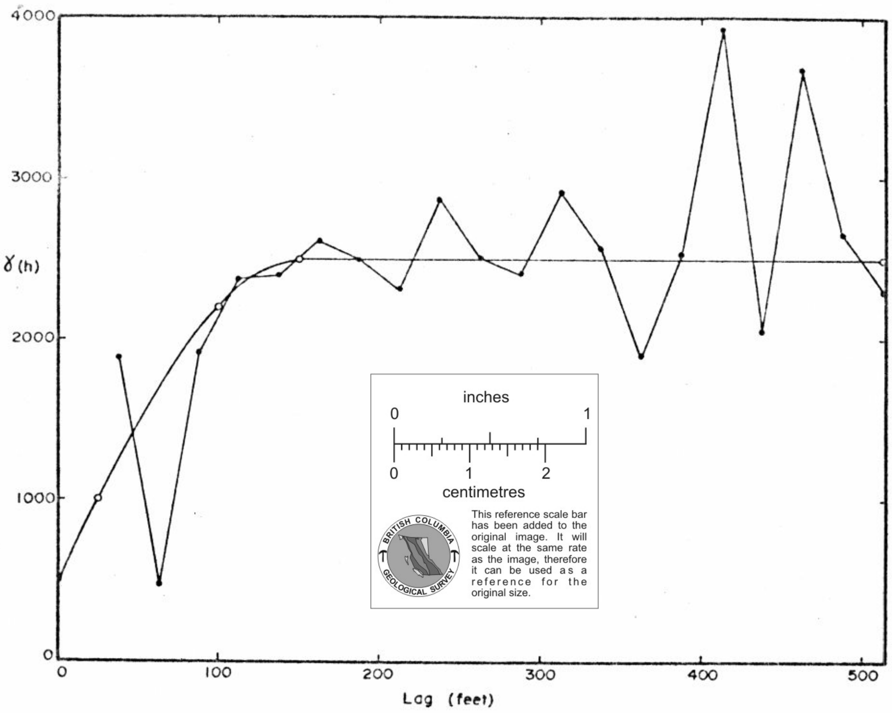

Figure 4: Semi-variogram for thickness. The jagged curve represents real (experimental) data; the smooth curve is a spherical model fitted to experimental data and having parameters given in the text.

Table I: Basic drill hole data (0.050 cut-off grade)

HOLE	X	Y	TH	GRADE	ACC
1	10132	10013	129.10	0.1286	16.600
2	10161	10029	92.30	0.2057	18.990
3	10233	10026	6.60	0.1204	0.795
4	10291	10062	6.70	0.0344	0.230
5	10317	10003	10.20	0.0479	0.489
6	10067	10018	173.10	0.0564	9.763
8	10211	10176	116.80	0.0745	8.702
9	10204	10113	119.10	0.0846	10.076
10	19133	10095	104.20	0.1576	16.422
11	10108	10176	62.30	0.0747	4.673
12	10071	10108	84.80	0.0664	5.631
13	10007	10108	123.80	0.0951	11.773
14	10190	10220	118.50	0.1045	12.383
15	10270	10220	141.80	0.0803	11.387
16	10125	10220	72.50	0.1079	7.823
17	10053	10226	62.20	0.1273	7.918
18	09987	10226	94.60	0.1195	11.305
19	10114	10313	135.60	0.0750	10.170
20	09993	10309	44.20	0.1001	4.424
21	09864	10221	72.80	0.0317	2.308
†22	09865	10110	31.70	0.0484	1.534
23	09967	09983	126.90	0.0763	9.683
24	10252	10112	80.10	0.1681	13.465
25	10181	09933	78.40	0.0697	5.464
26	10336	10111	48.90	0.0636	3.110
†27	10362	10220	8.50	0.0450	0.382
28	10056	09983	152.70	0.0682	10.414
29	09955	10320	118.80	0.1237	14.700
30	09999	10417	158.90	0.0712	11.314
31	09870	10432	119.40	0.1049	12.525
32	09722	10642	174.40	0.0566	9.871
33	09687	10831	167.80	0.1634	27.419
34	09872	10891	191.00	0.1104	21.086
35	09848	10768	38.50	0.0657	2.529
†36	09511	10681	0.00	0.0000	0.0000
†37	09588	11172	103.30	0.0270	2.796
†38	09943	09941	16.40	0.0400	0.759
†39	09856	09865	0.00	0.0000	0.00

†drill holes outside block to be estimated

X and Y are eastings and northings respectively, in feet;
TH = apparent thickness; GRADE = weighted average grade;
ACC = accumulation (TH × GRADE).

tive standard deviation, 1.08/ 9.66 x 100%, is 11.2%.

The global variance for grade (g) is calculated from the following expression:

$$\sigma_g^2 = \bar{g}^2 \left[\frac{\sigma_a^2}{\bar{a}^2} + \frac{\sigma_p^2}{\bar{p}^2} - \left(2r_{ap} \cdot \frac{\sigma_a}{\bar{a}} \cdot \frac{\sigma_p}{\bar{p}} + \ldots\ldots\right)\right]$$

Where $\bar{g}$ is 9.66/98.72 = 0.098, the mean grade, $\bar{p}$ is the mean thickness, $\bar{a}$ is the mean accumulation, σ_g^2, σ_p^2, σ_a^2 are their respective variances and r_{ap} is the simple correlation coefficient for accumulation and thickness (r_{ap} = 0.74), A value of 0.000058 was obtained for global variance of grade (σ_g^2). The standard deviation is 0.0076 and the relative standard deviation is 0.0076/ 0.098 x 100% is 7.7%.

In terms of confidence limits, assuming a normal distribution, the following inequality may be applied for 96 percent confidence:

$$(\bar{x} - 1.96\sigma) < \bar{x} < (\bar{x} + 1.96\sigma)$$

where $\bar{x}$ is the estimate of a parameter and σ is the error (standard deviation). Therefore, we may state that there is 95% confidence that mean thickness ($\bar{p}$) falls in the interval 98.7 ± 19.4 feet, that mean accumulation ($\bar{a}$) falls in the interval 9.66 ± 2.12 feet-oz/ton, and that mean grade ($\bar{g}$) falls in the interval 0.098 ± 0.015 oz/ton.

TONNAGE CALCULATION

Tonnage was calculated according to the following equation:

$$T = \frac{S \times \bar{p}}{f}$$

where S is the area of the block, $\bar{p}$ is the mean thickness, and f is a factor to convert cubic feet to tons. A value of 11.45 was used for this conversion factor. This total tonnage of the block estimated (figure 3) is 3.65-million tons.

Table II. Parameters for isotropic semi-variogram models for thickness and accumulation

THICKNESS (random grid)

Parameter	Value
C_0	500
C_1	2000
C	2500
a	150
m_1	98.7

ACCUMULATION (random grid)

C_0	10
C_1	25
C	35
a	150
m_1	9.7

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are well-defined distances beyond which $\gamma(h)$ becomes approximately constant. This distance is called the range (a) and $\gamma(a + i)$ is the sill. At distances less than the range, the variance of the sample pairs is related to distance and hence, is called the zone of influence. Beyond the range sample pairs are without mutual influence.

CALCULATION OF MEANS

Means were calculated for thickness and accumulation using the reciprocal of area to weight the values for individual blocks. Although this is not a strict statistical procedure, it was felt that this approach was sound because of the uneven (non-random) distribution of data. Some small blocks have numerous drill holes while other larger blocks have only one. In order to weight the 'well-holed' areas more, the following formula was used:

$$\overline{X} = \frac{\sum_{i=1}^{n} \left(\frac{X_i}{A_i}\right)}{\sum_{i=1}^{n} \left(\frac{1}{A_i}\right)}$$

where Ai's are areas of blocks (i) used in the calculations. Calculated means are listed in Table II.

Standard deviation for thickness is 74.7 for 0.05 ounce per ton cutoff. For accumulation the standard deviation is 6.1. The standard deviations are measures of dispersion of the ore intersection mean values for the 10 small blocks used as a basis for weighting means (see figure 3) and are not to be construed as representing dispersion of individual drill hole data. Using the figures for mean thickness and accumulation shown in Table II a mean grade of 0.098 ounce gold per ton was obtained for the 0.05 ounce per ton cutoff.

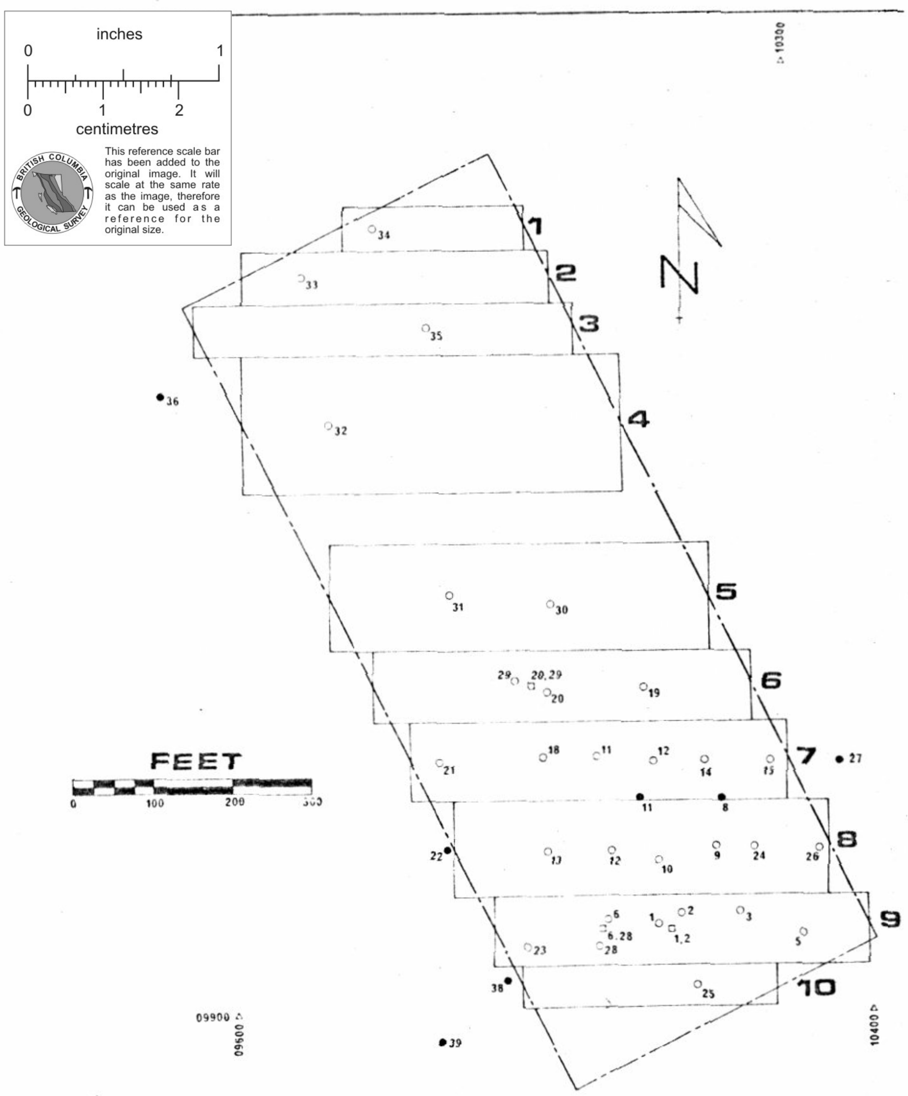

Figure 3: Locations of existing vertical and steeply plunging drill holes. Superimposed on this plan is a large rectangular block within which the Au-sulphide mineral association is thought to be continuous. Numbers at the corners of the diagram are grid reference lines for the property. Small rectangular blocks with drill holes arranged more-or-less medially represent areas used as weighting functions as described in the text.

PRECISION OF ESTIMATES

In order to calculate the global variance, that is, an error estimate for mean values relating to the entire orebody, the estimation block was divided into 10 rectangles as shown in fugure 3. If more than one drill hole was present per block, further sub-divisions were made to make a total of 26 such blocks. These were selected so that drill holes fell on median lines along the sub-blocks.

The global variance was approximated by:

$$\sigma^2 = \underbrace{\frac{C_0}{n}}_{\text{nugget term}} + \underbrace{\frac{\sum_{i=1}^{26} l_i^2 \sigma_i^2 (l_i)}{(\sum l_i)^2}}_{\text{line term}} + \underbrace{\frac{\sum_{i=1}^{10} (D_i h_i)^2 \sigma^2 E_i}{[\sum (D_i h_i)]^2}}_{\text{slice term}}$$

The nugget term is determined by dividing the nugget effect (C_0) by the number of samples (n). This represents the variance contributed by microstructures smaller than the scale at which the variogram was calculated. In addition, it concludes any errors in measurement. A line term is calculated by summing the estimation variances ($\sigma_i^2(l_i)$) for each line, weighted by the squares of line lengths (l_i). This represents the total of the variance contributed by extension of the known data (drill hole assays) along a line (l_i).

The slice term is determined by summing the estimation variances (σE_i^2) for each block weighted by the squares of the areas of the blocks ($D_i h_i$). This represents the total of the variance contributed by extension of the known data over an area ($D_i h_i$).

The individual estimation variances $\sigma_i(l_i)$ and σE_i^2 were determined graphically using information obtained from the semi-variograms for thickness and accumulation (figures 4 and 5). Results of the calculations are shown in Table III.

For thickness, the nugget term is 19.2, the line term is 71.1 and the slice term is 7.61 to give a global variance of 97.9. The standard deviation is 9.89 and the relative standard deviation, 9.89/98.7 x 100%, is 10.0%.

For accumulation, the nugget term is 0.39, the line term is 0.71, the slice term is 0.076 and the global variance is 1.18. The standard deviation is 1.08 and the rela-

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'fold', the two zones, of course, become a single zone.

In order to define the limits of the upper and lower mineralized zones, geological boundaries were selected for both top and bottom of the upper zone and for the top of the lower zone. An assay boundary of 0.050 ounce per ton gold was used for the bottom of the lower zone where a geological boundary was not so clearly defined. The X-Y coordinates given in Table I and used for computing a variogram on a random grid were defined as vertical projections of points from the middle of the combined zones drill hole intersections.

Thicknesses were taken as the uncorrected drill hole intervals because the angles of intersection with mineralized zones are not known exactly although drill holes are more-or-less perpendicular to the tabular gold-bearing zones. The apparent dip of the gold-bearing zones appears such that corrections would be less than 10% of intersected thickness in the worse case and, at this stage, need not be taken into consideration.

Table I contains the basic drill hole data used for reserves estimations with a 0.050 ounce per ton cut-off.

OUTLINE OF GEOSTATISTICAL PROCEDURE

A critical evaluation of available data indicated that geostatistical methods could be applied most usefully to total tonnage and average grade estimations. Evaluations relating to specific blocks must await much more complete assay coverage. The general study first involved a 'structural study' where structure here refers to zones of autocorrelation as indicated by a semi-variogram.

The semi-variogram is half the mean squared difference of values separated by a distance h as given by:

$$\gamma(h) = \frac{1}{2n} \epsilon (x_i - x_{i+h})^2$$

where $\gamma(h)$ is the semi-variogram for lag h (lag is spacing of samples), x_i is value at location i, x_{i+h} is value a distance h from i, and n is the number of pairs.

Experimental semi-variograms were calculated by computer separately for thickness and accumulation in four different directions (NW, N, NE, E) in a horizontal plane.

Once the experimental semi-variogram had been determined a smooth mathetical model was fitted to it and this model forms the basis of geostatistical calculation. In many cases, including this study, a spherical model describes experimental semi-variograms adequately. This spherical model has the form:

$$\gamma(h) = C_0 + C_1 \gamma_1(h) \text{ for } h \leq a$$
$$= C_0 + C_1 \qquad \text{for } h > a$$

where:

$$\gamma_1(h) = \left[\frac{3}{2}\frac{h}{a} - \frac{1}{2}\frac{h^3}{a^3}\right]$$

where:
C_0 is a nugget effect (essentially a random part of the variable)
C_1 is the sill of the semi-variogram
a is the range of the semi-variogram
and h is the lag or separation of samples and takes on many values to outline the form of the semi-variogram.

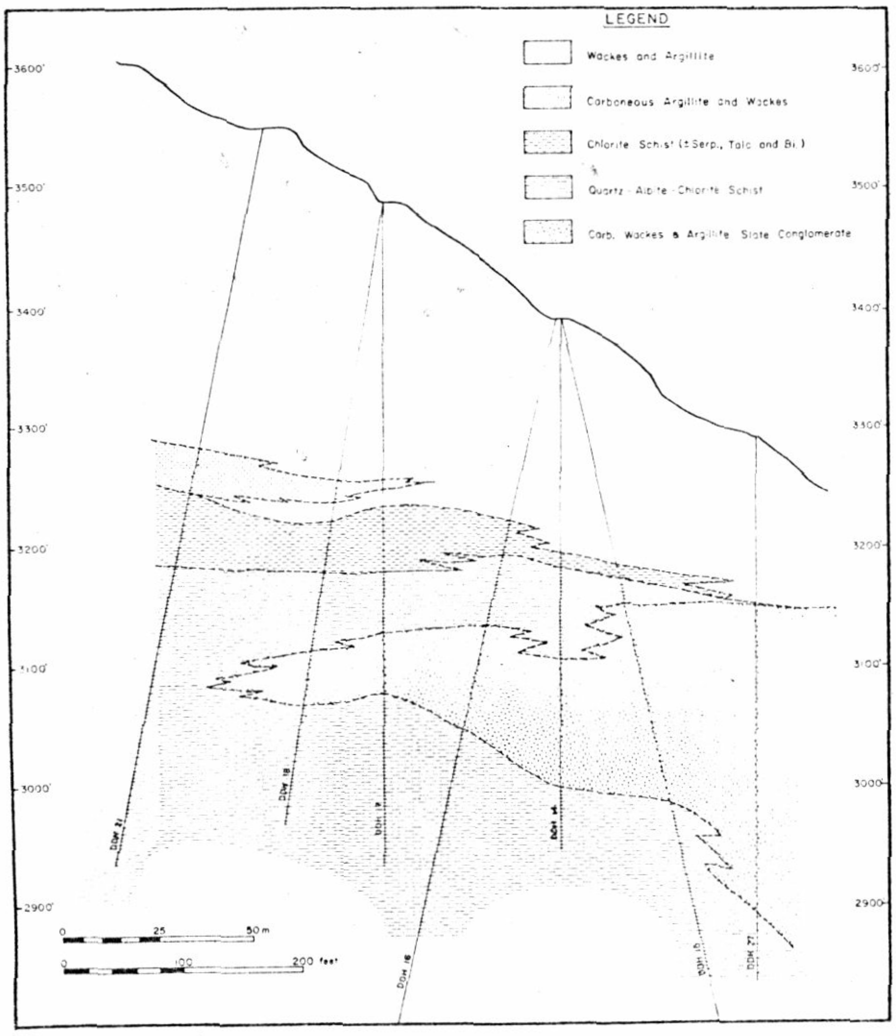
These models provided the basis for error estimations. A large block selected for reserves estimation on geological grounds was divided into smaller blocks (figure 3) related to the configuration of the drill holes. These smaller blocks of **variable** size are necessary to provide **different weights** to the errors attached to drill holes with **variable** spacing. Calculations were then made for tonnage, grade and accumulation and also estimates of error for those values. The procedure follows that of Sinclair and Deraisme (1974).

RESULTS

Experimental semi-variograms were calculated by computer in four directions using a random grid computation. Figure 4 illustrates the average semi-variogram for thickness, and figure 5 the average for accumulation. Spacings (h) of 25 ± 12.5 feet, 50 ± 12.5 feet, etc, were used to obtain average $\gamma(h)$ values. The average semi-variograms for thickness and accumulation seemed good estimations of each of the corresponding directional variograms. Thus, isotropy was assumed and spherical models were fitted to both average semi-variograms. These models are shown by the smooth curves in fugures 4 and 5 and their parameters are given in Table II.

The behaviour of the curves near the origin provides some information about the continuity of the regionalization. For example, in figures 4 and 5, which illustrate the model variograms for thickness and accumulation, there are discontinuities of the curves at the origin. This is called the nugget effect and may be due to superimposed structures at a scale smaller than that of the sampling grid or it may be due in part to errors in measurement. In the variograms, there

Figure 2: General geologic cross-section, Ladner Creek gold deposit. For location on plan compare drill hole numbers with Figure 3. Au-sulphide concentrations are within the albitized quartz-chlorite-carbonate schist.



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Geostatistical study of the Ladner Creek gold deposit of Carolin Mines Ltd

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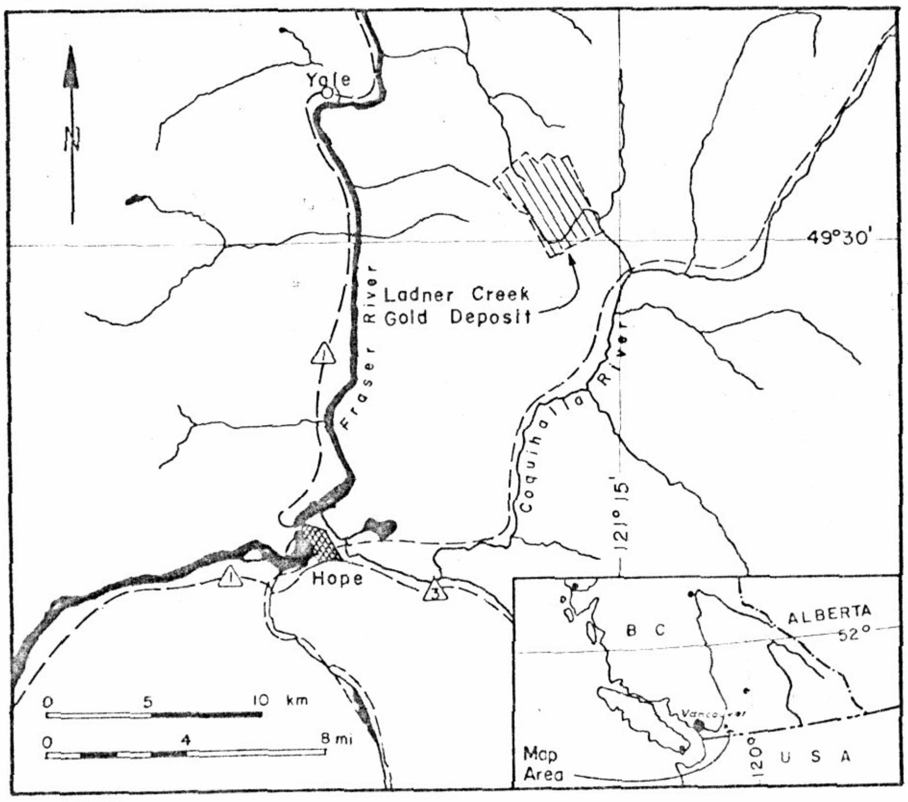
A geostatistical case study is outlined for the Ladner Creek gold deposit of Carolin Mines Limited. The study provides preliminary global estimates for a block based on information in 38 diamond drill holes and selected on the basis of geological information. In situ reserves are estimated to be 3.65 ± 0.80 million tons averaging 0.098 ± 0.015 oz gold per ton at the 95% confidence level assuming normal error distribution.

This example illustrates the advantages of geostatistics when applied as early as possible in the evaluation of a mineral deposit. In this case, the study provides an estimate of the quality of grade and tonnage figures based on available data and outlines an optimum disposition of 22 additional drill holes to reduce the estimation error by about 50 percent.

The geostatistical approach to ore grade and tonnage calculations is based on the theory of regionalized variables, that is, those variables such as grade, thickness, etc. whose values are related to the surrounding values. The methods were developed by Matheron (eg, 1971) and extended by others in applications to many types of mineral deposits (eg, Sinclair and Deraisme, 1974 and 1976). By using sampling data such as drill holes, a **structural** analysis of the deposit may be made and an estimation of the accuracy of calculated values determined. A structural analysis, in the sense used here, concerns an evaluation of the extent to which neighbouring values of a variable are correlated (ie, extent of auto-correlation). In an obvious case auto-correlation manifests itself as high grade zones within low grade zones, such as ore shoots in a vein.

Figure 1: Location map of Ladner Creek gold deposit of Carolin Mines Ltd.



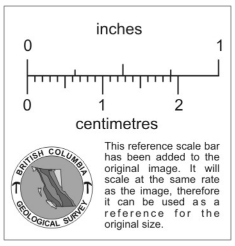
The Ladner Creek gold deposit of Carolin Mines Ltd is near Hope, BC (figure 1) and has a sheet-like form in a clastic pile that has been folded recumbently. Crest of the 'fold' is to the west; sub-parallel limbs and the axial plane of the 'fold' dips gently to the north (figure 2). The south end of the deposit crops out on the north side of Ladner Creek valley. Ore minerals consist mainly of pyrite, arsenopyrite and pyrrhotite with small amounts of chalcopyrite and gold. Spatially related extensive albitization appears to have favoured the coarser-grained greywacke members within the slate, greywacke, greenschist sequence.

At the time of writing this report, the deposit has been outlined by 38 diamond drill holes. It is open to the north but surface drilling becomes more costly in this direction because of the northerly dip of the deposit. Consequently, the next phase of work will include underground drilling from a decline into the southern part of the deposit.

A block was selected for reserves estimation based, in part, on geologic information obtained from drill holes and includes **both** upper and lower zones of the deposit (ie, upper and lower limbs of the 'fold'). Therefore, these initial estimations should be termed geologic or 'in situ' reserves. Additional estimations can be made using various cut-off grades or other criteria based on mining method, but detailed studies are not warranted at this stage of exploration.

TREATMENT OF DATA

Gold assays were available for 38 diamond drill holes and, of these, 32 holes intersected significant mineralized zones **and** were located within the block selected for reserves estimation. In the results reported here, the upper and lower zones were **combined** to provide overall values for thickness and accumulation (thickness weighted average grade). In the area of the crest of the



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