Whitehorse Copper Mines
A DIVISION OF HUDSON BAY MINING AND SMELTING CO., LTD.

P.O. Box 4280, Whitehorse, Yukon Territory, Canada
telephone (403) 668-2171, Telex 049-8218

MEMORANDUM

Date: APRIL 30th, 1981

TO: D. Tenney
FROM: A. Hureau
RE: COWLEY PARK SOUTH ZONE RESERVES

Results of drilling to the completion of hole CP 135 have been interpreted and reserves have been calculated as shown on the attached summary. A 0.5% copper cutoff was generally used to provide some continuity between sections.

Except on sections 8150 E to 8250 E (drilling was started on 8200 E) where it has an irregular open 'V' shape, the zone dips at approximately 50° to the north. Most drilling east of section 80 E was done with holes inclined at 60° to the north i.e. down the dip of the zone and its width has not been well defined. Ore outlines were interpolated in such cases and those on sections 8050 E and 81 E are particularly open to question.

Small ore grade tonnages may exist east of section 8275 which was taken as the eastern limit of reserves. Drilling east of this section may have missed the zone which may be in the order of 200 to 300 tons/horizontal foot and may extend east of section 9600 E (1400'). Part of this potential zone could be checked from a decline if one is driven from the valley on section 88 E to provide access to the ore.

The zone west of section 7800 E has not been tested over a strike length of 800' and appears to offer the best possibility for increased tonnage. Its value (low grade copper good grade molybdenum on section 78 E) is particularly contingent on the implementation of molybdenum recovery, however the existence of small very high grade zones, as on section 7950, on the limestone skarn contact, would alone warrant further testing along strike.

The figure of 100 000 tons of ± .9 copper which could possibly be recovered from below the pit limit of the main zone is conjectural. Approximately 3000' of drilling would be required to determine the reserves. The zone could be checked by approximately 1000' of drilling after the pit is mined.

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Assay data for gold and silver are incomplete. Good positive correlation was found between silver and copper (correlation factor 0.79 power fit regression analysis program for 124 samples). While the value of 0.39 oz/ton silver for 2.4 % copper is slightly high compared to other zones on the belt, it is in accord with individual intersections obtained in the Cowley South zone. No correlation was found between gold and copper for forty samples available. A value of 0.005 oz/ton gold is assumed from three holes for which data are available and results of work done on the main zone. This figure will be revised when results of composite assays are received.

A. HUREAU
Exploration Geologist

AH/slf

cc: P. Martin
D. Linzey
J. Janssens
P. Percival

ORE RESERVES COWLEY PARK SOUTH ZONE

Section	# Area sq. ft.	Grade % Cu	Grade % MoS2	Grade Ag oz/t	Area Sq. In. X % Cu	Area Sq. In. X % MoS2	Area Sq. In. X % Ag	Feet Projected	* Tons	% Cu	% MoS2	oz/T Ag	*** oz/T Au
78	1, 1.35	.44	.404										
	2, 3.56	.63	.197										
					2.84	1.247		100	75 830	0.58	.254		
79	1, 0.35	5.98	TR .01						4 054	5.98	TR		
	2, 0.40	.06	.368						4 633	.06	.368		
					2.117	.147		75	8 687	2.82	.196		
79 50	1, 0.42	9.85	.034	2.99									
	2, 0.63	10.82	.08	2.89									
					10.95	.059		50	8 108	10.43	.059	2.93	
80	1, 0.76	6.93	.01	1.31									
	2, 1.37	1.78	.259										
					7.70	.362		50	16 448	3.62	.170		
80 50	1, 3.80	1.63	.172	.29	6.19	.654		50	29 344	1.63	.172		
81	1, 1.73	2.10	.051										
	2, 2.95	2.37	.251	.44									
					10.62	.829		50	36 139	2.27	.177		
81 50	1, 2.19	0.78	.274	.263									
	2, 2.80	2.46	.247	.30									
	3, 1.46	1.48	.047	.38									
	4, 2.75	1.77	.086	.169									
					15.62	1.597		50	71 042	1.70	.173	.26	
82	1, 1.25	6.86	.058	.44									
	2, 2.47	2.01	.119	?									
	3, 1.76	1.41	.058	.24									
					16.02	.468		50	42 316	2.92	.085		
82 50	1, 1.10	1.93	.076	0.5									
	2, 2.50	1.02	.121	.17									
					4.67	.386		50	27 800	1.30	.107	.27	
					T X % Cu	T X % MoS2							
7925 - 8275					554 411.58	33 629.34			231 197	2.40	.145	.39**	.005
Incl. Block 1 79 00 (4 054 T @ 5.98 Cu)					578 654.82	33 629.34			235 251	2.46	.143	.39**	.005
Incl. High MoS2 Blocks Sect. 78 00 E & Block 2, 79 00 E (80 463 T @ .55 Cu, .26% MoS2)					622 914.2	54 595.1			315 714	1.97	.173	.34**	.005
					[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

An additional 100 000 tons possible ore @ .9 Cu, .1 MoS2 may be available from the main zone 600 feet NW, below the pit limit.

* 1 Ton = 10.36 Cu Feet.

** Ag content estimated, regression analysis Cu/Ag from 124 samples from ore zone, correlation Co-efficient 0.79

*** No correlation found from 42 samples for Cu/Au. Au assays received for only 4 holes assume 0.005 oz/ton Au from available data.

A. Hureau April 28 1981

Whitehorse Copper Mines Ltd.

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MEMORANDUM

Date: May 7th, 1979

TO: D. TENNEY
FROM: A. Hureau
RE: COWLEY PARK PIT
GOLD CONTENT IN ORE

A comparison was made of results of gold analysis on fifty-two samples from the Cowley Park Zone which had been analysed by Chemex Labs and Whitehorse Assay office.

The arithmetic mean of all samples was 200 PPb AU (Chemex) and 214 PPb (Whitehorse Assay office). Omitting sample 9329 (0.1 AU) these means were 138 PPb (Chemex) and 156 PPb (Whitehorse Assay office). Since the copper average for all samples was 1.76 % Cu the calculated gold content (assuming a positive correlation) for 0.9 % Cu was reduced to .003 oz/ton (Chemex) and .0032 oz/ton (Whitehorse Assay office). Omitting the high sample #9329, these values were reduced to .0021 and .0024 respectively.

Regression analysis, using Whitehorse Assay office gold, assays and Chemex copper results were done using an HP 67 Calculator and program # SD-03A. Programs for a linear fit, exponential fit and power curve fit were tried. The linear fit yielded the best correlation with a correlation factor of 0.6 while omitting all samples below 0.2 % copper and above 3 % copper (31 samples unused). These results yielded a value of 139 PPb (0.04) gold at 0.9 % copper.

A. Hureau
Exploration Geologist

cc; D. Linzey
D. Bent

Cowley Park

Sample analysis of 51 mineralized core samples selected by D.T. 1979

Sample #	CHEMEX PPB Au	oz/ton AG	% Mo	% Cu	WHSC Assay Office PPb Au	X Ray Lab ppb Au
9313	570	.98	.005	4.50	815	
4	190	.52	.028	2.07	500	300
5	30		.025	.37	35	47
6	20		.078	.07	20	20
7	20		.001	2.20	160	55
8	30		.004	.40	90	84
9	30	.40	.035	.72	35	46
9320	90	.56	.018	12.4	135	120
1	10		.010	.41	20	17
2	20	-	.002	.43	25	20
3	<10		.003	.03	25	51
4	10		.005	.08	30	18
5	140		.032	.89	125	160
6	60		<.001	.01	25	22
7	50		.031	.22	35	60
8	430	.67	.387	3.96	535	
9	3330	.58	.011	2.71	3160	3450
9330	470	.48	.023	2.97	565	640
1	440	1.24	.060	2.20	560	|
2	20		.004	0.06	35	67
3	380	.30	.006	1.89	540	
4	110	.28	.004	.82	110	150
5	30		.036	.02	20	30
6	140		.471	.96	115	14
7	70		.017	.48	70	85
8	<10		.010	.05	<20	150
9	10		.192	.05	25	16
9340	430	.60	.084	3.96	570	620
1	290	.38	.028	1.86	360	370
2	70		.018	.23	60	62
3	60		.039	.34	70	100
4	-	-	-	-	-	
5	40		.003	.65	35	16
6	140		.038	.67	210	250
7	40		.001	3.43	85	55
8	30		.045	.20	30	7
9	220		.014	.54	280	260
9350	330	.46	.004	7.10	170	180
1	60	.26	.033	1.80	70	100
2	160	.34	.144	1.65	210	280
3	110	.24	.002	1.44	210	140
4	30		.003	.70	20	16
9355	40	.40	.004	7.31	45	200
6	20		.011	.17	20	110
7	70		.003	.09	25	26
8	360	1.08	.002	4.91	4?5	[illegible]

50	330	.46	.004	7.10	170		100
1	60	.26	.033	1.80	70		100
2	160	.34	.144	1.65	210		280
3	110	.24	.002	1.44	210		140
4	30		.003	.70	20		16
55	40	.40	.004	7.31	45		200
6	20		.011	.17	20		110
7	70		.003	.09	25		26
8	360	1.08	.002	4.91	425		480
9	120		.024	.96	125		110
60	270	.32	.167	1.66	230		300
1	<10		.010	.01	20		14
2	250		.026	1.16	305		300
3	250	.42	.006	2.40	265		290
4	40		.012	.41	25		55
65	230	.32	.144	2.40	265		350

Calculate ① - AB mean & Standard Deviation each Set, Au, Ag, Mo

② linear regression program for correlation Au assays a (Chem to xRay) (b) Chem to wet assay, (c) xRay to wet assay

③ as in ②

(a) Chem to Cu + to Au chem to Au wet assay " " " Au xRay use all Samples

(b) as (a) omit all Samples below 0.3% Cu

(c) as (a) omit all high Samples

(d) as (c) omit all Samples below 0.5% Cu.

Calculate gold content for A, b, c, d, for 1.25% Cu

4 Get Correlation for Cu-Mo Cu-Ag @ 0.4% Cu cutoff. grade Mo, Ag @ 1.25% Cu

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MEMORANDUM

Date: May 22nd, 1979

TO: D. Tenney
FROM: A. Hureau
RE: EXPLORATION SUMMARY TO MAY 22nd, 1979

COWLEY PARK

From March 21st to May 19th, 1979 eighteen holes aggregating 6451 feet were drilled in the Cowley Park area. Drilling charges were $100,734 or $15.62/ft.

Eleven holes were drilled on the south contact of the Cowley Park pendant. Two of the holes, CP 81 and CP 88, had intersections of 99 feet at 2.01% copper and 52.2 feet at 2.38% respectively. Copper was intersected in each of the other eleven holes on this zone but the intersections were narrow and of good grade or of low grade (0.3 - 0.6 % Cu) and up to 160 feet in length.

The localization of mineralization appears to be erratic and a good deal more drilling would be required to determine the extent of the higher grade zones. Present drilling indicates that they are probably less than 200,000 tons.

The most westerly holes on this contact intersected only 14 feet at approximately 1.5% copper. The contact does extend approximately 2000 feet west of this hole.

One hole, CP 84, was drilled down dip of the main Cowley Park zone and intersected 41.6 feet at 1.57% copper.

The other six holes drilled to test IP or mag anomalies intersected magnetic intrusive rocks or pyritic sediments.

BROWN CUB

The drill is being moved to approximately 1500 feet east of Black Cub South pit to test a weakly magnetic IP anomaly on strike with the Black Cub Zone. Cost of this holes is estimated to be $12,000 to $13,000.

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EXPLORATION SUMMARY TO MAY 22nd, 1979 - CONTINUED

KODIAK CUB

Approval has been given to drill two holes to test for depth extensions of known mineralization. Cost is estimated at $18,000.

SUITS OPTION

A contract has been let to cut approximately eighteen line miles of grid at a cost of $5,000. This will be followed by ground mag, mapping and soil sampling. An IP survey will be completed if funds are made available.

NORTH STAR, ARCTIC CHIEF, BEST CHANCE

One hole in each of these areas has been approved at a total cost of $22,000. Owing to overspending approximately $52,000 in the Cowley Park area to follow up intersections, funds will have to be approved to complete this drilling.

The budget should be increased from $140,000 to $180,000 to drill the approved holes and complete the IP survey on the Suits option.

A. Hureau

Whitehorse Copper Mines Ltd.

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MEMORANDUM

Date: June 6th, 1979

TO: D. Tenney
FROM: A. Hureau
RE: COWLEY PARK SOUTH ZONE

General

Eleven holes aggregating 4573' were drilled from March 31st, 1979 to May 20th, 1978, over a strike length of 800', on the south side of the Cowley Park pendant. Drilling costs were approximately $15.65 per foot. Drilling was done to determine the extent of mineralization in hole CP 81 which intersected 68' at 2.64% copper (99' @ 2.01% or 192' @ 1.26%). The higher grade section of the hole extended from 240' below surface while the lower grade mineralization commenced at a depth of 160' vertically below surface.

While copper mineralization was intersected in each of the other ten holes, only CP 88 (drilled 100' west of CP 81) intersected mineralization of comparable width and grade (52.2' @ 2.38% copper or 197' @ 0.97% copper). In this hole the higher grade part of the intersection commenced at a depth of 150' vertically below surface and does not appear to correlate with the higher grade part of CP 81.

Mineralization

Chalcopyrite, bornite, chalcocite and molybdenite occur disseminated in skarns derived from limestone and siliceous metasediments and in endo skarn or altered diorite. Short sections of massive chalcopyrite occured in CP 81 and CP 88 while most of the mineralization east and west of these holes occured as disseminated chalcocite with minor bornite.

Molybdenum, gold and silver content are comparable with the main Cowley Park zone and are approximately 0.08 MOS_2 .007 oz/ton gold and 0.16 oz/ton silver for intersections CP 81 and CP 88. Good positive correlation exists between gold, silver and copper values while MOS_2 values appear to be erratic in relation to copper content.

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Structure

Interpretation of the extent and continuity of mineralization is difficult because of: a) the lack of any marker horizons, b) the presence of mineralization in different types of skarn and also in the altered intrusive, c) the irregularity of the intrusive - skarn contact.

The mineralization occurs in skarns derived from interbedded limestone and clastic sediments now forming a roof pendant in quartz diorite. The skarn intrusive contacts appear to be steep and irregular with much of the mineralization in CP 81 and CP 88 occuring in endoskarn or altered intrusive.

The dip of sediments is believed to be to the south from 30 degrees to steep. Banding in the core where visible was generally from 60 degrees to 90 degress, most holes were drilled at -60 degrees north. Banding in a few outcrops near the zone does not support this interpretation. Banding in skarn and limestone on line 80 E in trenches is vertical to steeply north. Radical changes in relative thickness of limestone and siltstone or quartzite bands occur along strike. East of section 8200 E the best mineralization occurs as chalcocite in tremolite skarn probably derived from limestone while most mineralization to the west occurs in garnet diopside skarn much of which appears to be derived from biotite - quartz rich metasediments.

Hole CP 77 on 7550 E section drilled in 1978 intersected nearly 250' of limestone apparently dipping to the south while CP 92 drilled on section 78 (250' East) intersected quartzite, greywacke and skarn apparently derived from them.

Consideration was given to drilling some holes to the south and if further drilling is approved to explore the contact to the west of present drilling, a hole should be drilled south on section 7550 E from approximately 45 N.

"Reserves"

Notwithstanding the number of holes drilled into it, the erratic nature of the grade and geometry of the zone makes an estimate of tonnage and grade conjectural. Using a 0.5% copper cutoff and generally projecting mineralization 50' from drill holes a figure of 737,000 tons at 0.9% was arrived at. Approximately 7000' of drilling from section 78 E to 85 E would be required to establish a meaningful reserve figure.

3 . . .

Using only the high grade portions of intersections on sections 80 E, 81 E and 82 E, a figure of 190,000 tons at 2.3% copper was calculated. Approximately 5000' of drilling would be required to establish this reserve.

Geophysics

I.P. done over the south zone in 1968 gave a weakly high chargeability response from section 78 E to 82 E. I.P. done in 1978 gave a high chargeability response from section 76 E to 86 E. I.P. was not done in 1978 over the south contact on section 78 E or west of section 76 E. Because of the high pyrite content in some of the skarnified sediments it is felt that pyrite is the probable main source of the I.P. anomaly.

Since: a) much of the copper occurs as chalcocite so that one percent sulphides is of economic interest, b) the best mineralization intersected on 78 E(Hole CP 92)while still low grade was at a depth of more than 200', or probably beyond the detection limit of the survey, it is felt that the lack of I.P. response west of section 78 E, in the 1968 survey, should not be considered to preclude the existence of economic mineralization in that area.

No magnetic correlation exists over the zone. A magnetic high near the zone from section 80 E to 82 E is caused by a magnetic feldspar porphry dyke.

Recommendations

1. Funds should be requested to test the contact west of section 78 E. Allow four holes, 2000' @ $16/ft = $32,000.

2. Drilling should be continued to determine the limits of better grade mineralization intersected from section 80 E to 82 E.

   Allow seven (7) holes, 2500' @ $16/ft = $40,000
   An additional 4500' would be contingent on obtaining favourable results.

3. Consideration should be given to exploring the zone by means of a decline from section 8700 E.

cc: R. Cairns