826740
92H/9

SUMMARY OF THE RESULTS AND CONCLUSIONS ON THE JURA - PRINCETON PROPERTY FOR COP-EX MINING CORPORATION LTD.

BY
J.W. Hogan, B.Sc., P.Eng.
March 21, 1973.

L. J. Manning & Associates Ltd.
310 - 890 West Pender Street
Vancouver 1, B.C.

L. J. MANNING & ASSOCIATES LTD.
CONSULTING MINING AND GEOLOGICAL ENGINEERS
310–890 WEST PENDER STREET VANCOUVER 1, B.C.

OFFICE PHONE:
683-5861

RESIDENTIAL PHONE:
L. J. MANNING - 985-5690

March 21, 1973.

Mr. J. Wishart
Cop- Ex Mining Corporation Ltd.
2560 - 700 West Georgia Street
Vancouver, B.C.

Dear Mr. Wishart:

Jura - Princeton Property

The following is a summary of the results and conclusions from a review of all data concerning your Princeton property. You are referred to my report of December 16, 1972, for a summary to that date, and also to the Mr. G. von Rosen, P.Eng. Report of September 2, 1971.

SUMMARY AND CONCLUSIONS:

A compilation and review of all data to date indicates that the property presents a potential for "porphyry copper" type mineralization, as indicated by intersections to date of 0.10% Cu/200' and 0.46% Cu/60'; and similarity of host rocks, intrusive dyke, alteration phenomena and structural setting to the nearby Copper Mountain and Ingerbelle deposits and other type deposits.

Logistically, the property can be broken up into the following areas:

100% 2600 acres - Total property.

29% 800 acres - Overburden depth exceeding 250'. Exploration potential only if a located shallow zone can be projected.

47% 1300 acres - No possible geochemical response due to excessive overburden thickness of +40'. (Includes 800 acres over 250' deep)

8% 240 acres - Okanagan Batholith. No known local potential for "porphyry copper" type mineralization.

12% 320 acres - Partial data available. Mainly over-burden covered.

6% 156 acres - Internal adverse ownership. Indicated good potential - geochemical and induced polarization surveys.

2% 50 acres - North Zone explored by grid drilling. Little potential remaining for locating ore grade mineralization of significance.

20% 560 acres - Effective induced polarization coverage (includes 50 acres of grid drilling and 69 acres of no possible geochemical response).

4% 91 acres - Potential areas - adjacent to induced polarization or geochemical grids but not surveyed.

In summary, 921 acres or 21% of the potential of the property has not been thoroughly explored (excludes known areas of overburden depths of 250'+ and the Okanagan Batholith).

These figures are presented to indicate the high exploration costs (± $250,000) relative to the possible total exploration coverage with the still remaining potential for locating a 2000' x 800' plan dimension (40 acre) ore body target in a 921 acre potential.

It is obvious that further exploration should be done in partnership with a major company which has the capabilities and monies for complete exploration follow up.

This partnership with a major company will be dependent upon the capability to work on the Cop-Ex ground in conjunction with the three adverse claims (Bethlehem controlled).

Therefore, the following recommendations are made:

1) Negotiate with Bethlehem Copper.

2) If unsuccessful, negotiate with a major who could make a deal with Bethlehem.

3) If 1 & 2 are not successful, three drill holes totalling 1000' are recommended to test the easterly extension of the main zone.

4) No work should be performed in the area of the adverse claims nntil a partnership is available.

5) Allow the following claims to lapse: ND 19,21,23, 48 fract. (excessive overburden depths). Allow ND 105-109 to lapse (overstaking of Joy claims). Keep all other 1973 expiry date claims in good standing.

EXPLORATION: - December, 1972 - February, 1973.

Geophysics

Scintrex Surveys Ltd. completed seven line miles of an induced polarization survey to test the western extension of the North Zone.

A three electrode array with "a" spacings of 400' and 800' and a gradient array with a current spread of 6000' and potential separation of 400' were used.

Results indicate a sharp northerly trending steep bedrock drop to the west of the North Zone, where basement (Nicola rocks) may be covered by up to 2000' of overburden and Princeton sediments.

Drill holes were recommended for background plus 10.0 milli-second areas (1% by volume of disseminated metallically conducting mineralization).

Diamond Drilling

Three holes totalling 1410' were drilled on the basis of the induced polarization survey.

Ideally, the holes should have been collared on a bearing of north-east to cross local observed structure. However, the indicated overburden depths necessitated vertical holes.

The best intersection was 0.22% Cu/10.0'.

MEGASCOPIC AND PETROGRAPHIC (GEOTEC) CORE ANALYSIS:

Petrographic (minor mineralographic) work by Geotec on holes 73-1, 73-2, 73-3 coupled with core logging and a similarity to all holes drilled on the Cop-Ex property to date indicates that the following observations are, in general, applicable to all of the North Zone.

Rock Types

Nicola agglomerate, tuff and andesitic flows. Dacite in part.

STRUCTURE

Steeply dipping fracture and shear zones, gouge and breccia in part. Multidirectional minor fractures.

Regional Metamorphism

Chloritization. Epidotization and carbonitization in part.

Intrusives

Intermediate and hornblendite dykes.

Alteration Phenomena

- buff k-spar, epidote and chlorite
- silica and younger carbonate veining
- biotite flooding

Metallic Mineralization

Pyritization. Fractured pyrite with later chalcopyrite veining and disseminations.

EXPLORATION POTENTIAL:

Overburden Depth Exceeding 250'

This known part of the property (800 acres - west boundary) does not present a good target for exploration unless sufficient encouragement is gained from tracing as yet undiscovered zones to warrant following them under such an extensive cover.

Geophysical test by Scintrex indicate a possible depth to basement of up to 2000'.

No Possible Geochemical Response

This includes an area of 1300 acres where overburden areas exceed 40'±. Not included are gentle slope areas where the known occurrence of caliche will suppress anomalies even if soil cover is thin.

To date, part of this area has been probed by induced polarization surveys. A good exploration potential remains to the west of the Kennecot Zone where neither their geochemical nor induced polarization surveys reached bedrock.

Okanagan Batholith

This area of 240 acres must be considered to be of low potential. Although Brenda Mines may be in part associated with the north-eastern contact of the Okanagan Batholith, the evidence of a multi-phase intrusion similar to the Brenda is not indicated in the Jura area.

Partial Data Available

320 acres at the north-east corner of the property is partly underlain by a zoned diorite-monzonite intrusive.

The area is mainly overburden covered but moderate to steep slopes indicate that geochemical coverage even with caliche may be effective. An adit in the core of the zoned intrusive shows pyritization as does mapping at the south end.

Although partial geochemical coverage has been negative, data has not been analyzed in conjunction with soil cover-caliche-slope data.

In summary, this area is low to intermediate exploration potential, and should only be explored on the basis of possible upgrading as based upon work in the Kennecot Zone or the western extension of the North Zone.

Internal Adverse Ownership

These three claims have been partially covered by geochemical and induced polarization surveys. The only available data indicates that copper mineralization is

associated with pyritic dacites. Kennecot drilled four holes in 1959 for a total of 744'. Good geochemical anomalies coupled with induced polarization anomalies (both partly on Cop-Ex ground) present a good target for exploration.

North Zone

Sufficient grid drilling has been accomplished over 50 acres to indicate that economic mineralization is not present. However, this drilling has indicated that with assays up to 0.10% Cu/200' and 0.46% Cu/60' "porphyry copper" type mineralization does occur. These values are one of the main reasons why the property in general still presents a target for locating areas where environmental controls may occur which will produce better grades.

Effective Induced Polarization Coverage

This area of 560 acres has been tested in anomalous areas in the North Zone drilling. Other anomalies remain to be tested, but in general, the adverse claim situation on the Kennecot grid and the lack of supporting data for further testing of the Amax grid anomalies warrants awaiting the solution of these two problems before testing.

Potential Areas Adjacent to Surveyed Induced Polarization and Geochemical Grids

These areas, totalling 91 acres, have not been surveyed geochemically or geophysically. Positive information resulting from present grid follow up would warrant extension.

RECOMMENDED DRILLING IF MAJOR COMPANY DEALINGS DO NOT MATERIALIZE:

DDH 73-4 - 300' - 16E - 15N

Section plotting of drill holes (sect 10+50N) indicates that any north-easterly extension of percussion hole P-14 would be through unsurveyed ground (no induced polarization and overburden of 40'±). This projection would be sub-parallel to a major north-easterly magnetic break which may be a controlling structure.

Even though the best interval was 0.13% Cu/60' in P-14, the possible extension; the possible major structural control and the necessity for geological data warrant this hole.

DDH 73-5 - 300' - 20E - 2+50N

This hole is recommended for the following reasons:

- small induced polarization peak on broad high.
- south-east trend direction of North Zone.
- flanks of magnetic (ground high). The cause of these strong magnetic highs on the property has not been determined to date. A non-formational configuration suggest that they are not magnetite rich volcanics. They may represent basic intrusives or contact phenomena, and the lack of a definative I.P. anomaly suggests a possible deep source.
- malachite in trenches
- immediately east of a major north-south break.
- provide geological data.

DDH 73-6 - 300' - 20E - 6+50S

This hole is recommended for the following reasons:

- coincident I.P. anomaly and flank of magnetic high.
- general strike projection of North Zone
- provide geological data. The paucity of outcrops on the property demands that geological data be accumulated. This gradual build up of a geological framework is the key to a successful interpretation of all data.

Respectfully submitted,

L. J. MANNING & ASSOCIATES LTD.

J. W. Hogan, P.Eng.

JWH:kdl
Enclosed: Drawing No. 1 - Compilation Plan - 1972
Drawing No. 2 - Compilation Plan - 1973
Drawing No. 3 - Drill Sections

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCTEON HOLE No. 73-1

DIP TEST		
	Angle	
Footage	Reading	Corrected
0		-90°

Hole No. 73-1 Sheet No. 1 of 2 Lat. 12N Total Depth 434'
Section Dep. 2E Logged By J. W. Hogan
Date Begun January/73 Bearing Claim
Date Finished Elev. Collar Core Size NQ

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE	% Cu	Oz/Ton Au	Oz/Ton Ag
0 - 272	OVERBURDEN					
272 - 434	AGGLOMERATE AND TUFF: Tuffaceous banding 60°/core axis Pervasive chlorite. Epidote alteration mainly as clots in matrix. Strong hematitic fractures and slips (chlorite in part) on irregular pattern. Minor quartz veinlets 45°-60°/core axis. Minor fine-grained pyritic fractures on main direction of small angle/core axis. Minor k-spar development up to ½" into fracture walls, partly associated with silica, on main direction of small angle to core axis.					
	At 290' - Strong hematite and gouge 45°/core axis.					
	294-313.5 - Strong fracture and gouge zone. Main direction parallel to core axis.					
	313.5-325 - Bleached? Minor pyrite. Fractures sub-parallel/core axis. Multi-directional chlorite slips.					
	434' End of DDH 73-1					
	For detailed log refer to G. von Rosen					

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-1

DIP TEST		
	Angle	
Footage	Reading	Corrected

Hole No. Sheet No. 2 of 2 Lat. Total Depth

Section Dep. Logged By

Date Begun Bearing Claim

Date Finished Elev. Collar Core Size

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE	% Cu	Oz/Ton Au	Oz/Ton Ag
313.5 - 323.0		51x	9.5'	0.03		
335.0 - 345.0		52x	10.0'	0.01		
370.0 - 380.0		53x	10.0'	0.02	Tr	0.02
410.0 - 420.0		54x	10.0'	0.02		
420.0 - 430.0		55x	10.0'	0.02		

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-2

DIP TEST		
	Angle	
Footage	Reading	Corrected
0		-90°

Hole No. 73-2 Sheet No. 1 of 3 Lat. 4S Total Depth 449'
Section Dep. 7+50E Logged By J. W. Hogan
Date Begun January/73 Bearing Claim
Date Finished Elev. Collar Core Size NQ

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE
0.0 - 116	OVERBURDEN		
116 - 449	AGGLOMERATE AND TUFF: Porphyritic andesite in part. Green, purple and gray colours. Weak to moderate magnetics. Pervasive chloritization. Fair matrix epidote development. Minor pyritic fractures. Minor fine-grained disseminated pyrite. Weak to moderate buff k-spar development. Minor quartz and carbonate veinlets (hairline to $\frac{1}{4}$" width) pyritic fractures mainly with k-spar development and epidote.		
116 - 150'	Strong fractures 45°-60°/core axis. Minor fractures parallel to 30°/core axis. Minor gouge zones small angle/core axis. Hematitic in part.		
150 - 180'	Medium fractures 30°-60°/core axis. Cemented (epidote) breccia zones in part. Minor serpentinization into fracture walls.		
180 - 270'	Porphyritic andesite. Trace of disseminated hematite. Trace to very minor fine-grained disseminated pyrite. Minor k-spar. Less alteration and pyrite than normal. Fair fractures 45°-70°/core axis. Porphyritic		
205 - 208'	Shattered. Gouge in part, small angle/core axis. Pyritic fractures main direction 0-30°/core axis.		
From 230'	Fractures becoming more hematitic and increasing percentage of quartz veinlets.		
At 239'	3/4" wide silicified and quartz zone (breccia in part) 30°/core axis. Fair associated pyrite. Trace of chalcopyrite. Minor k-spar development in walls. Fair epidote development for $\frac{1}{2}$" into walls.		
244 - 245	Minor chalcopyrite related to quartz and k-spar zone $\frac{1}{4}$" wide -20°/core axis.		
From 248'	Less to trace disseminated pyrite, fractures still hematitic but are less		

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-2

DIP TEST		
	Angle	
Footage	Reading	Corrected

Hole No. Sheet No. 2 of 3 Lat. Total Depth

Section Dep. Logged By

Date Begun Bearing Claim

Date Finished Elev. Collar Core Size

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE
	pyritic fractures. Main fracture direction 30°-80°/core axis.		
264 - 270'	Strong k-spar in epidote matrix. Minor pyrite. Trace of chalcopyrite. Zones 70°/core axis. At 269 - 6" gouge zone 70°/core axis.		
From 270'	Rock becoming more agglomeratic. Irregular zones of k-spar development and silica. Trace to minor pyrite mainly as fracture fillings but also disseminated. Pyritic fractures mainly small angle/core axis. Hematitic fractures main direction 70°/core axis.		
At 300'	Tuff bedding 75°/core axis.		
At 311'	1/8" wide quartz veinlet 20°/core axis. Fair associated pyrite. Minor chalcopyrite. Hematitic walls.		
From 315'	Agglomeratic. Less k-spar as zonal development. Becoming more confined to fracture (small angle/core axis) association where is up to $\frac{1}{4}$" into walls. Same percentage of hematitic fractures 70° and sub-parallel/core axis. Pyrite becoming coarser grained with veinlets (0°-30°/core axis) up to $\frac{1}{4}$" wide as opposed to 1/16" - 1/8" width to 315'. Less disseminated pyrite. Rare trace of chalcopyrite. Poor hematitic fractures 70° and sub-parallel/core axis. Hairline quartz 0°-30°/core axis.		
At 340'	Quartz pyritic fracture (30°/core axis) minor chalcopyrite.		
At 348'	1/8" wide pyritic-k-spar-SiO_2 stringer 10°/core axis. Trace of chalcopyrite.		
From 350'	Still agglomeratic but mainly porphyritic texture with k-spar alteration of phenocrysts and strong biotite development of matrix.		

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-2

DIP TEST		
	Angle	
Footage	Reading	Corrected

Hole No. Sheet No. 3 of 3 Lat. Total Depth

Section Dep. Logged By

Date Begun Bearing Claim

Date Finished Elev. Collar Core Size

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE				
	At 358' 1/16" pyrite stringer 20°/core axis. Trace of chalcopyrite.						
	358 - 360 Zone of quartz-k-spar-epidote-75°/core axis. At 360' trace of chalcopyrite.						
	At 396' 3/4" wide - 10°/core axis k-spar-hematite-epidote zone. Poor pyrite. Trace of chalcopyrite.						
	397.5-398.0 K-spar development. Minor pyrite and chalcopyrite. From 390' start of fair fractures and slips (hematitic and chloritic) 0°-70°/core axis. Major 0-30°/core axis. Pyritic fractures small angle/core axis. Rare trace of chalcopyrite. Fair multidirectional hairline quartz stringers.						
	413 - 435 Fault zone. Gouge in part. Main direction? 70°/core axis.						
	435 - 449 Strongly fractured 70°/core axis						
	449 End of DDH 73-2						
				% Cu	Oz/Ton Au	Oz/Ton Ag	
235 - 245		56x	10.0'	0.01	Tr	0.02	
245 - 255		57x	10.0'	0.01			
265 - 275		58x	10.0'	0.02			
305 - 315		59x	10.0'	0.02	Tr	0.03	
340 - 350		60x	10.0'	0.07			
355 - 365		61x	10.0'	0.07			
390 - 400		62x	10.0'	0.22	0.005	0.06	
430 - 440		63x	10.0'	0.03			

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-3

DIP TEST		
	Angle	
Footage	Reading	Corrected

Hole No. Sheet No. 3 of 3 Lat. Total Depth

Section Dep. Logged By

Date Begun Bearing Claim

Date Finished Elev. Collar Core Size

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE				
	480-482- Strong shearing (chloritic) 20/core axis.						
485-515	As 317-430. Slips mainly chloritic, minor						
	hematitic.						
	499'- End of k-spar veining.						
	512-515- Gouge- breccia zone small angle/core						
	axis.						
515-527	Dioritic rock. Fine-grained. Grey-green colour.						
	Non-magnetic. Sericitic. Minor gouge-breccia						
	zones parallel/core axis. Calcite stringer						
	network.						
	525-527- Fair chloritic slips small angle/core						
	axis.						
	527' - END OF DDH 73-3						

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-3

DIP TEST		
	Angle	
Footage	Reading	Corrected

Hole No. Sheet No. 3 of 3 Lat. Total Depth

Section Dep. Logged By

Date Begun Bearing Claim

Date Finished Elev. Collar Core Size

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE				
	480-482- Strong shearing (chloritic) 20/core axis.						
485-515	As 317-430. Slips mainly chloritic, minor						
	hematitic.						
	499'- End of k-spar veining.						
	512-515- Gouge- breccia zone small angle/core						
	axis.						
515-527	Dioritic rock. Fine-grained. Grey-green colour.						
	Non-magnetic. Sericitic. Minor gouge-breccia						
	zones parallel/core axis. Calcite stringer						
	network.						
	525-527- Fair chloritic slips small angle/core						
	axis.						
	527' - END OF DDH 73-3						

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-3

DIP TEST		
	Angle	
Footage	Reading	Corrected
0		-90 degrees

Hole No. 73-3 Sheet No. 1 of 3 Lat. 245 Total Depth 527'
Section Dep. 8E Logged By J. W. Hogan
Date Begun February/73 Bearing Claim
Date Finished Elev. Collar Core Size NQ

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE
0-285	OVERBURDEN:		
285-307	BRECCIA-SHEAR ZONE. Intensely shattered with calcite cement. Strong chloritic slips 0-30 to core axis. Main direction of 30/core axis. Hematitic slips 45-80/core axis (main direction) Hairline calcite fractures on main direction parallel/core axis and 70/core axis. 70 set is pre 0 set. Trace of pyrite. 303-307 - strong calcitic stringers 20-30/core axis.		
307-317	DARK GREEN STRONGLY CHLORITIC ROCK. Still brecciated with calcitic cement. Minor k-spar veining small angle/core axis.		
317-430	Granular textured (porphyrytic-feldspar) rock. Andesitic, tuffaceous? in part. Fair magnetite. Serpentinization in part. Epidotized. Weak buff k-spar (pink in part) veining sub-parallel/ core axis up to 2" width. Zonal in part. Hematitic and chloritic slips on main pattern of 60-70/core axis. Slickensides on slips show movement-30° ab 30/core axis slip.		

DIAMOND DRILL RECORD

PROPERTY COP-EX, PRINCETON HOLE No. 73-3

DIP TEST		
	Angle	
Footage	Reading	Corrected
0		-90 degrees

Hole No. 73-3 Sheet No. 1 of 3 Lat. 245 Total Depth 527'
Section Dep. 8E Logged By J. W. Hogan
Date Begun February/73 Bearing Claim
Date Finished Elev. Collar Core Size NQ

DEPTH	DESCRIPTION	SAMPLE No.	WIDTH OF SAMPLE				
0-285	OVERBURDEN:						
285-307	BRECCIA-SHEAR ZONE. Intensely shattered with calcite cement. Strong chloritic slips 0-30 to core axis. Main direction of 30/core axis. Hematitic slips 45-80/core axis (main direction) Hairline calcite fractures on main direction parallel/core axis and 70/core axis. 70 set is pre 0 set. Trace of pyrite. 303-307 - strong calcitic stringers 20-30/core axis.						
307-317	DARK GREEN STRONGLY CHLORITIC ROCK. Still brecciated with calcitic cement. Minor k-spar veining small angle/core axis.						
317-430	Granular textured (porphyrytic-feldspar) rock. Andesitic, tuffaceous? in part. Fair magnetite. Serpentinization in part. Epidotized. Weak buff k-spar (pink in part) veining sub-parallel/ core axis up to 2" width. Zonal in part. Hematitic and chloritic slips on main pattern of 60-70/core axis. Slickensides on slips show movement 30 to 30/core axis slip.						