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GIBRALTAR MINES LTD.

SUMMARY REPORT, 1966

CLARK & MANN, LTD.

PLANT REPORT, 1966

ON

COPPER CREEK PROPERTY

MOLISEE LAKE, D. C.

February 8, 1967.

TABLE OF CONTENTS

Page No.

1.	TABLE OF CONTENTS	
2.	SUMMARY	1
3.	PROPERTY	2
4.	WORK COMPLETED	2
5.	DIAMOND DRILLING	3
6.	INDUCED POLARIZATION	4
7.	GEOCHEMICAL SURVEY	5
8.	GEOLOGY	6
	a) General Geology	6
	b) Rock types and alteration	6
	c) Mineralization	8
9.	CALCULATED RESERVES	11
10.	ECONOMICS	11
11.	CONCLUSIONS	12
12.	RECOMMENDATIONS	13

1. SUMMARY

During the period January 1, 1966 to September 16, 1966, work on the property consisted of 21,195 feet of B.Q. diamond drilling, geological mapping of the claim group and Induced Polarization and geochemical surveys of the "key claims".

The property was optioned by Cominco Ltd. on May 15, 1966. Of the above work, 10,982 feet of drilling was completed by Gibraltar during the period January 1, 1966 to May 15, 1966. The total cost of the programme was approximately \$290,000, of which approximately \$160,000 was Gibraltar's contribution.

Drilling in the western zone yielded reasonably assured ore reserves of 27,200,000 tons grading 0.503% copper of which a minimum of 20,400,000 tons will be available for open pit mining. This zone is open to the east.

Limited drilling in the northeast zone resulted in the discovery of a very large mineralized zone which contains bornite and molybdenite as well as chalcopyrite and pyrite and may, with additional drilling, be found to be larger than the western zone. The intervening area has not been explored to date.

3. PROPERTY

A total of 152 full-size claims and fractions are presently held in good standing for periods of one to three years.

4. WORK COMPLETED

During the year 37 B.Q. diamond drill holes aggregating 21,195 feet were drilled by Canadian Long-year Limited on behalf of Gibraltar Mines (10,982 feet) and Cominco Ltd. (10,213 feet). 487 feet of AX (standard) drilling was completed by McKinnon Diamond Drilling. The AX standard drilling was found, in this instance, to be unsatisfactory both from the point of view of core recovery and general progress. Mud was used for approximately 5,000 feet of the B.Q. drilling. The additional cost of the mud operation was \$1 - \$2 per foot with no significant increase in recovery.

The geology of the claim area was mapped by Cominco geologists.

Cominco Ltd. staff also completed an I.P. survey and geochemical survey over selected areas.

A core shack was constructed by Gibraltar to store approximately 15,000 feet of core. The remainder of the core is stored on the property in open core racks.

Previous work on the property has been described by Mr. A.R. Allen in his report dated October, 1965.

5. DIAMOND DRILLING

The following is a table summarizing diamond drilling completed during 1966.

Hole No.	Location *	Elevation	Bearing **	Dip	Depth	Size-Drilled
66-1	16+00E-16+00N		S45°W	-45°	180	AX - Gib
66-2	4+00E-2+00S		N30°E	-45°	307	AX - Gib
B-1	20+00E-11+00N	3076	N45°E	-45°	1011	BQ - Gib
B-2	20+00E-16+00N	3149	N30°E	-45°	921	BQ - Gib
B-3	15+20E-14+70N	3070	N30°E	-45°	586	BQ - Gib
B-4	24+75E-17+50N	3168	N30°E	-45°	506	BQ - Gib
B-5	4+00W-3+50S	2748	N45°E	-45°	529	BQ - Gib
B-6				-60°	469	BQ - Gib
B-7	21+75E-20+00N	3177	North	-45°	561	BQ - Gib
B-8	8+00W-4+50S	2699	N45°E	-45°	550	BQ - Gib
B-9	8+00W-2+00S	2741	N45°E	-45°	561	BQ - Gib
B-10	18+75E-23+00N	3168	N30°E	-45°	439	BQ - Gib
B-11	8+00W-7+00N	3176	N45°E	-45°	573	BQ - Gib
B-12	6+00W-4+00S	2718	N45°E	-45°	577	BQ - Gib
B-13	18+00E-23+00N	3168		-90°	316	BQ - Gib
B-14	12+00W-4+00S	2698	N45°E	-45°	551	BQ - Gib
B-15	12+00W-4+00S	2698		-90°	712	BQ - Gib
B-16	16+00E-0+40N		N45°E	-45°	541	BQ - Gib
B-17	16+00E-8+00S	2500	N45°E	-45°	367	BQ - Gib
B-18	14+00W-2+00S	2754		-90°	657	BQ - Gib
B-19	12+00W-0+00	2771		-90°	767	BQ - Gib, Com
B-20	14+00W-4+00S	2725		-90°	507	BQ - Gib, Com
C-21	18+00W-6+00S	2693		-90°	671	BQ - Com.
C-22	18+00W-2+00S	2763		-90°	556	BQ - Com.
C-23	18+00W-10+00S	2590		-90°	696	BQ - Com.
C-24	14+00W-10+00S	2595		-90°	370	BQ - Com.
C-25	10+00W-10+00S	2600		-90°	627	BQ - Com.
C-26	6+00W-9+50S	2650	N45°E	-45°	695	BQ - Com.
C-27	8+00W-9+00S	2625	N45°E	-45°	350	BQ - Com.
C-28	22+00W-8+50S			-90°	660	BQ - Com.
C-29	26+00W-2+00S	2726		-90°	650	BQ - Com.
C-30	10+00W-35+00N	3235		-90°	574	BQ - Com.
C-31	10+00W-27+00N	3205		-90°	526	BQ - Com.
C-32	22+00W-16+00S	2575		-90°	771	BQ - Com.
C-33	14+00W-16+00S	2570		-90°	642	BQ - Com.
C-34	16+00W-15+00N	3050		-90°	367	BQ - Com.
C-35	40+00E-14+00N	3330		-90°	687	BQ - Com.
C-36	32+00E-30+00N	3340	N45°E	-45°	456	BQ - Com.
C-37	70+00E-32+00S	2910		-90°	194	BQ - Com.

* W.R.T. line grid (grid north = N45°E) Total: AX 487

BQ 21,193 Gib

21,680 Com.

** True bearing.

6. INDUCED POLARIZATION

A combined induced polarization and resistivity survey was completed by the Cominco staff covering approximately 19 line miles. The survey employed the frequency domain technique using 300 foot dipoles and "n" values of 1, 2 and 3. The survey was restricted to an area near the known mineral occurrences.

A very large anomalous area extends from about 8E to 28W and from 15S to the northern boundary of the survey area, at about 40N. The southern part of this anomaly includes the western zone. The larger northerly section, where the anomalies are stronger, has not been tested except in a few places with surface trenching which produced indefinite results. It should be noted, however, that the geochemical anomaly over this area covers only a portion of the induced polarization anomaly. Several diamond drill holes were located near the margins of the geochemical anomaly leaving the better targets to be investigated by additional drilling.

Three target areas, recommended in the Cominco Induced Polarization Report, have not yet been drilled.

7. GEOCHEMICAL SURVEY

A geochemical survey for copper was carried out by Cominco Ltd. staff over the existing line grid (between 28 + 00W and 64 + 00E). Samples were taken at 100-foot intervals on lines spaced 400' to 800' apart. Several anomalies were outlined which confirm anomalies indicated by previous work. Two major anomalies have not been explained by exploration drilling to date.

One anomaly bounded approximately by lines 10W and 26W between 14N and 38N has been tested by three widely spaced holes on or near the margins of the anomaly. Hole C-30 located at 10W - 35N intersected 40 feet of mineralization grading 0.5% Cu. Hole C-31 returned no "ore" intersections but was drilled in scattered low grade sulphides. Hole C-34 located at 16W - 15N intersected several short high grade sections.

A large soil anomaly bounded approximately by lines 24E and 64E and between 13N and 38N has copper values in the soil ranging up to 2400 parts per million against a background for the area of approximately 50 ppm. One hole drilled in this anomaly (C-35) encountered low copper values.

An extension from the main survey on an 800-foot grid was completed ~~to~~ east of the key area. This survey indicated a number of scattered anomalies.

8. GEOLOGY

a) General Geology The claims are located on the west central portion of a body of gneissic quartz diorite of uncertain but possibly Jurassic age. The batholithic body, measuring approximately 16 miles in the north-south direction and 2 - 6 miles in the east-west direction, intrudes metamorphic rocks of the Cache Creek group. A roof pendant of Cache Creek rocks is located on the southern portion of the claims. Flat lying Tertiary basalts lie unconformably over the intrusive and Cache Creek group near the western margin of the claim group.

b) Rock Types and Alteration(i) Quartz Diorite

This rock, in varying degrees of alteration, underlies most of the claim area. The typical relatively "fresh" quartz diorite consists of the following:

Plagioclase	30 - 60%
Quartz	15 - 30%
Chlorite (pseudomorphs after mafic minerals) . .	5 - 20%
Epidote (alteration of feldspar)	10%
Minor sericite and carbonate alteration.	
Minor sphene, zircon and apatite.	

The quartz diorite is characterized by a light regional foliation striking N 45°W and dipping 15-30°S.W. This is due to the parallel alignment of the chlorite pseudomorphs and elongation of the quartz grains. About 95% of the rock exposed on the property is of this type.

Diamond drilling in the north-east zone (centered around 24 + 00E - 16 + 00N) intersected intensely fractured, medium-to-well-foliated dark green quartz diorite. This rock contains a stockwork of quartz veins. Silicification is evident throughout the country rock. A.P. Juhas, of the Cominco staff, mapped an area of similar rocks at approximately 3500 N. between lines 40E and 56E. This band of rocks is probably part of the same zone. One of the dominant fracture systems is along the foliation controlled by segregations of chlorite. At least two other fracture systems strike across the foliation. Quartz partially heals fractures in all directions indicating that it was post fracturing.

Diamond drilling in the western zone (south of the base line between line 0 + 00 and line 26 + 00W) intersected light-to-moderately-foliated chloritic quartz diorite with undulating bands of well foliated chlorite-sericite and sericite schists. The principal body of mineralization in the western zone occurs in a band of sericite schist varying in thickness from 50 - 150 feet. This band extends from near 0 + 00 on the base line, north 55° west for a considerable distance. It appears to be a warping effect within the main westerly dipping structure. Quartz veins and irregular quartz lenses up to 10 feet thick occur within the altered rocks. Post mineral faults locally interrupt the continuity of the zone. The area has a complex history of deformation.

(ii) Cache Creek Group

A roof pendant of the Cache Creek rocks occurs in the south central part of the claims area. Outcrops are limited and consist of lenses of grey limestone partially altered to a garnet-epidote skarn with bands of altered volcanic rocks.

(iii) Tertiary Basalt

The west side of the claim group is overlain by flat lying vesicular basalts of Tertiary age. These rocks are of no economic interest.

c) Mineralization(i) Western Zone

The mineralization in the western zone consists of chalcopyrite and pyrite in disseminations and stringers along the foliation in sericite schist. Irregular quartz lenses are generally quite well mineralized by fine to coarse blebs of pyrite and chalcopyrite. Minor molybdenite occurs in quartz and on fractures along the foliation. In near-surface sericite schist zones, secondary chalcocite occurs with minor amounts of malachite and azurite. In the less altered rocks & lower percentages of sulphides are usually present as fine disseminations and fracture fillings.

Sections at 200-foot intervals were drawn through the western zone (Sections 8E to 26W) - on a scale of

200 feet per inch. Sections at various intervals are drawn through the adit area (Sections 8E to 0 + 85E) on a scale of 40 feet per inch. The latter are based on previous drilling by Gibraltar Mines, Major Mines and others. (See Fig. 2). The "M" series of holes were drilled with a Copco percussion drill, the "E" series with EX standard and the remainder with either AX, A or B wireline equipment. It should be noted that the sludge samples in some holes of the "E" series returned assays 30% to 100% higher than the equivalent core.

The assays from the percussion drilling are conspicuously lower than core assays from diamond drilling in the same area. These were shallow holes drilled with air in wet broken ground, with questionable recovery and sampling techniques. The assays are considered to be below true values. The majority of the drilling probably did not reach the main ore body.

For calculating the ore reserves of the western zone, only core assays and percussion drill assay were used. Consequently, the grade estimates are probably somewhat lower than the true grade, particularly those in the adit area.

(ii) Northeast Zone

Widespread pyrite and chalcopyrite mineralization occurs with chlorite along and across the foliation. Minor sulphides varying from fine disseminations to coarse crystalline masses replace altered mafics. The loss of iron from the biotite and hornblende appears to have been important during sulphide mineralization. Molybdenite occurs in quartz stringers, short silicified sections and as smears on fractures along the foliation. Scattered fine grains of bornite occur on fractures along the foliation in the lower part of the zone. Magnetite occurs throughout the zone in widely scattered blebs and stringers. Minor copper carbonates occur in the surface exposures.

An apparent zoning effect of minerals was noted in this zone, particularly in drill holes B-1 and B-2. The ratio of chalcopyrite to pyrite increases to the north and with depth. Bornite and molybdenite also appear to increase in the same way. Section 24E is taken through the centre of the zone and shows all of the holes drilled in the zone projected on to the section. (See also Fig. 2 - Plan of Drill Hole Locations.)

(iii) Cache Creek Group (roof pendant)

Although very little of the field work has been directed to this area of the property, copper, lead and zinc mineralization has been exposed in two open cuts in the skarn zone. Limited trenching exposed lead - zinc mineralization associated with magnetite in fractured limestone. This trenching was guided by a magnetometer survey completed in 1964.

9. CALCULATED RESERVESWestern Zone

Ore reserves from Section 6E to Section 26W are calculated to be 27,200,000 tons grading 0.503% copper with recoverable values in gold and silver. Of this a minimum of 20,400,000 tons are available for open pit mining. This latter figure includes 5.7 million tons grading 0.388% copper in the adit area which undoubtedly will be substantially up-graded by further wire line diamond drilling. (The adit graded 1.3% copper over a length of 110 feet.)

10. ECONOMICS

I. With assumptions that: -

- i) The limited assaying for gold and silver in the adit area is representative of the whole zone.

i.e. .35 oz/T Ag, .005 oz/T. Au.

- ii) Approximately 90% recovery for copper.

II. Estimated operating costs per ton for a 5,000 T/day open pit project are as follows:

i) Administration	\$.25
ii) Mining (2:1 waste to ore)	.75
iii) Milling	.70
iv) Transportation and marketing	<u>.65</u>
	\$ 2.35 per ton

III. Estimated operating profit per ton, in Canadian funds.

Smelter payments per pound of copper	.40	.45	.50
Value, copper	3.60	4.05	4.50
Value, gold and silver	<u>.50</u>	<u>.50</u>	<u>.50</u>
	\$ 4.10	\$ 4.55	\$ 5.00
Estimated operating profit, in Canadian funds	\$ 1.75	\$ 2.20	\$ 2.65

IV. Estimated capital requirements for a 5,000 ton per day operation. Using costs for the installation of other plants in British Columbia, it is estimated that 13 to 15 million dollars would be required to bring this property to the production stage.

IX. CONCLUSIONS

Diamond drilling during 1966 has outlined in the western zone a copper deposit which appears to be economic at today's metal prices. Prospects for extending the reserves and improving the grade are excellent. Very limited diamond drilling in the north-east zone indicates immense reserves of low grade copper-molybdenum mineralization. No drilling has been carried out between the two zones even though the several Induced Polarization surveys on the property suggest that the mineralization extends beyond the limits tested by drilling.

Several Induced Polarization and geochemical anomalies, particularly on the northern part of the property, have been only superficially tested.

A large part of the claim group underlain by altered intrusive rocks remains untested by any of the preliminary surveys.

12. RECOMMENDATIONS

The following are considered minimum recommendations for the ensuing six months:

- i) Conduct Induced Polarization surveys over selected areas of the property not as yet tested by this method.
- ii) Conduct detailed magnetometer surveys over selected areas of the property in order to attempt to locate zones of mineralized schist.
- iii) Diamond drill between the adit and northeast zone.
- iv) Conduct development drilling on all mineralized zones where warranted.
- v) On suitable samples, representing the mineralization sections, conduct metallurgical tests.
- vi) Arrange for a formal feasibility study to be conducted by a firm of independent consulting engineers.

Respectfully submitted

A.R. Allen
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W. Meyer
W. Meyer

February 8, 1967
Vancouver, B.C.

ALLEN GEOLOGICAL ENGINEERING LTD.

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August 15, 1967

C E R T I F I C A T E

I, Alfred R. Allen, of 1115 - 409 Granville Street,
Vancouver, B.C. certify that:

I am a graduate of the University of British Columbia
and hold the following degrees therefrom:

BASc Geological Engineering 1939
MASc Geological Engineering 1941

I am a member of the Association of Professional
Engineers of the Province of British Columbia, and
a member of the Consulting Engineers' Division.

I have practised my profession for the past twenty-
four years.

I hold no interest in the properties or securities
of Gibraltar Mines Ltd. nor do I expect to receive
any, directly or indirectly.

My report of February 8, 1967, is based upon examin-
ation on the ground by myself and W. Meyer.

Alfred R. Allen, P. Eng.

Alfred R. Allen