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REPORT

ON

CHURCHILL MAGNETITE
DEPOSIT

ZEBALLOS, B.C.

1964

MINING DIVISION
J.J. McDougall
Geologist

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C O N T E N T S

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This short report summarizes data pertaining to the Churchill iron deposit at Zeballos. Mr. Ray, the present owner, accompanied the writer on a trip to the property on November 7 and a rough ground magnetometer survey was carried out despite 14 inches of snow. The writer had traversed the property several times in the past and is familiar with the general layout. More detailed reports of earlier work, including those of Argonaut, have been obtained but unfortunately no maps are available and the poorly copied drill logs do not give drill hole location accurately enough to be of much use.

NAME: Churchill Magnetite Deposit

LOCATION: Showing of interest between elevations 3000 and 4000 feet at heads of Lime and Fault Creek 7 miles north of Zeballos and 2 miles north of the Ford deposit currently being worked by Falconbridge.

PROPERTY & OWNERSHIP: Ten located claims and fractions plus the 4 Ray Annex held by or for Mr. Ray. Falconbridge holds 2 adjoining locations to the north staked to cover an airborne anomaly discovered by us in 1961.

ACCESS: Preferably by helicopter, the property being on and above tree-line making landings easy. A good switchbacking 2 or 3 mile trail leads up from the Zeballos road generally following the north bank of Lime Creek.

HISTORY & DEVELOPMENT: The magnetite occurrences appear to have been first discovered by the G.S.C. in 1931 and reported on by Dr. H.C. Gunning

in 1933. Mr. Norman Ray staked the property in 1941 on behalf of himself and J.W. Foster of Vancouver. In 1944 Pioneer Mines optioned the property to investigate a closely associated gold showing. The results of 2 drill holes were apparently not encouraging and the option allowed to lapse. The first active work on the iron was undertaken by Argonaut Development (?) - a subsidiary of Utah then engaged in mining the Quinsam Lake iron deposit at Campbell River. Work done during late summer of 1951 and 1952 included 20 short X-ray drill holes put in on the main iron showings in Fault Creek Basin. Unfortunately the drill logs, available for about half of the 20 holes, do not give the locations of the holes except in general terms and maps of any description are not available. Argonaut allowed the option to lapse because of the limited tonnage available ($\pm$ 1,000,000 tons of 30-40% Fe) in this tough location and the exceptionally high sulphur content ($\pm$ 3%) contributed to the magnetite by the very objectional mineral pyrrhotite. Although not stated directly, a 'nuisance' copper content at least in part of the zone must have helped them arrive at their decision to abandon as they did their somewhat similar Iron River deposit located only a few miles from the Argonaut mine.

The property was optioned by Zeballos Iron Mines in August, 1961. Material as available was correlated, a dip needle survey made, and a road route surveyed. The option was dropped in 1962 for a combination of reasons including those listed above plus a very heavy option payment which made the project seem unsound at the time.

At present the property is open to deal and a few preliminary talks have been held with Mr. Ray. Any new deal is understood to involve a much more realistic option price.

The probable reserves at Zeballos Iron Mines remain unchanged at approximately that presented following St. Eugene's work 12 years ago.

thus the current interest in the Churchill as a possible additional nearby source of magnetite.

GENERAL GEOLOGY

The geology of the area has been well described by Gunning, Hoadley and Stevenson (See references). Mr. Willis (Argonaut) descriptions of local geology appears good and only the writer's additional observations require mention at this point.

The deposit is one of about a dozen of iron showings occurring northerly along a 7-mile "corridor" commencing at the Ford Mine. These showings approximate the contact between westerly dipping Quatsino Limestone and/or Bonanza Group sediments plus Volcanics with a diorite or quartz diorite body to the west. Structural control is important and any of the deposits which reach recognizable dimensions have been localized by faulting. The main faults are north-south paralleling the Zeballos River, the one of most importance being the Hiller Fault. A second fault system trending northwest intersects the Hiller Fault and at or near this intersection the magnetite bodies occur in whatever rocks happen to be available at this point. Most of the showings dip west being bedded replacements of sediments or volcanics.

The Churchill deposit differs from all others in the area being almost a mile east of the Main Hiller Fault but has enough similar structural features, including branching or subsidiary faults, to be grouped with the others. Except in the extreme northern portion of the claims, volcanic rock is missing although the diorite footwall rock cutting the deposit off at depth as well as to the west has features suggestive of dioritized andesite.

Generally, the Churchill deposits occur as a replacement of limy rocks at or near the easterly dipping contact of the diorite. Although regionally the limestones dip westerly, local folding has occurred and many of the rocks in the Churchill Zone are flattish or dip easterly (downhill) approximating the diorite contact. The overall dip a titude of the magnetite is then 20-50° easterly (dip slope). Faults plus folding combinations resulting in weak or brecciated areas have allowed more favourable replacement of the limestone in some places than in others. Erosion is at the stage where only a portion of the capping limestone host rock has been removed and adding the picture presented to one of primary irregularities of mineralization, the deposit is not easily decipherable despite an unusually high percentage of bare outcrop.

DESCRIPTION OF PROPERTY

A cross section including what to expect on the Churchill is presented on the cliffs about 1300 feet south of the main showings. Here examination via helicopter shows a several hundred foot wall of massive gray limestone resting on top of the diorite basement (?) - the contact striking north and dipping 10-30° (?) easterly. (See Photo #1.) The base of the limestone has been irregularly replaced by a roughly wedgelike body of rusty weathering magnetite which appears as much as 20-30 feet thick. (base elevation approx. 3300 feet.) The iron is temporarily (?) bounded on the west by a steep northerly striking, easterly dipping fault and plays out within a few hundred feet to the east only to re-occur weakly a few hundred feet further still in conjunction with more steep north-south faulting. The writer believes the limestone bluffs to be a scarp resulting from northwesterly faulting and the magnetite to occur at

this point, because of intersection with north-south faults - this rather than a blanket-like replacement extending indefinitely. This concept can then be applied to the main, more important deposits a short distance to the north.

The main showings in the Fault Creek Basin were designated A. B. C. D. E & F. by Argonaut. All are enclosed by a grid 2000 feet long north-south and 600 feet wide. Magnetite occurs along strike further north but was not drilled.

"A", the most northerly outcrop tested, occurs partially exposed on the northwesterly branch of Fault Creek between elevations 3340 and 3643. Seven short drill holes (#1-6, plus #19) put into the blue-black magnetite showed a body, or several bodies, which averaged 40 feet wide and assayed 57% Fe. One hole cut 110 feet of magnetite assaying 39.6% Fe, 1.24% S and 0.37% Cu. Sulphur content ranged between 1.24% and 5.37% averaging out at about 3% . Zeballos Iron figures show a copper content averaging 0.36%.

The largest outcrop "B" (elev. 3500-3800) is situated on the southwest "wall" of the amphitheatre-like basin at the head of the southerly fork of Fault Creek. This is apparently a dip-slope environment and most of the rusty weathering body is well exposed. Eleven holes (#7-17) totalling 918 feet were put in by Argonaut. The best one (#14) collared in limestone cut 83 feet of magnetite averaging about 59.0% Fe and 2.7% S.

An approximate un-weighted arithmetical average of 6 of the better holes (some sections excluded) shows an average 60-foot depth of magnetite assaying about 50% iron and 2.3% sulphur. Copper content, suggested by a few of the assays turned up by Zeballos Iron, is very low - less than 0.02%.

Drill holes #18 and 20 tested two other disconnected (C & D) bodies in the basin just below and east of "B". Assays available are fragmental but suggest, for C, a 60-foot thickness of about 38% Fe and a minimum of 4% S. Occasional assays for 20 indicate a 45-foot thickness going 40% Fe and 6% S. Sulphur assays approaching 20% are not uncommon in the "dirty" ore which seems to constitute these showings. No information is available on copper content.

Argonaut showed a total "proven" ore reserve - bodies A, B, C and D - of 1,020,500 tons of 45% material which should yield 664,000 long tons of concentrates averaging 56% Fe and 3% S. Probable ore consisting of a few "open pittable" deposits to the north bring the total to 729,000 tons of concentrates. Zeballos Iron Mines estimate was similar but showed in addition a copper content averaging about 0.25% from some source of information not available to the writer, as well as a lower calculated sulphur content of 1.8%.

During our short trips in and around the Churchill, we have run the air mag in an attempt to locate new "hidden" sources of magnetite. Success in this area has been to the north as extensions to the most northerly outcrops described by Argonaut. Our ground mag work - both Arvela and MF1 - of the limestone capped over between the cliffs on Lime Creek and the main zone has not been very suggestive of further ore of magnetite with the only positives registered being in the zone above and about 500 feet north of the cliffs. It is felt that the occurrences are "fault intersection" controlled and disconnected.

CONCLUSIONS

Without a map of the Argonaut work it would be pointless to attempt another estimate of ore reserves. The writer sees no reason to question those established. The copper impurity, not mentioned in the

Argonaut data available, is dynamite and should be more carefully considered - such may be limited to one deposit ("A" or Fault Creek) and might in large part be eliminated by selective mining or blocked out to form a mineable by-product.

The best chance for additional reserves is to the north.

Advantages the property has include a main deposit which could be easily mined by open pit methods with a minimum of stripping plus a relatively high iron content (assuming assays are for soluble iron).

The list of disadvantages is long and includes a rough location and short open pit season (late June or July to late October normally). The ore is "dirty", containing a not easily eliminated sulphur content double that of any iron showing seriously considered in B. C. as yet. To obtain a marketable product, and with the copper content in mind, flotation appears a must unless drastic blending, from say the Hiller or the remaining Ford properties, is practical. An assessment work drill hole (WC 1) put in by us this fall on our claims just north of the Churchill showed abundant pyrrhotite in the magnetite but little chalcopyrite was visible.

General personal observations made by the writer, best considered under this heading, and void of economic considerations at present, include as regards access and mining the following:

The only feasible access route to the Churchill would be a tote or haulage road up the north side of Lime Creek commencing at the Zeballos River Road. (This route was checked by Zeballos Iron Mines.) Tramline connections may be in order - a haulage adit at the base of the cliffs or about the 3000 foot level would seem the most practical approach as winter operation would then be possible providing underground mining of a

sizeable part of the deposit is practical. Such an adit would have to be about 3000 feet in length and the operation would have to include at least one and possibly two 500-foot raises depending on whether sufficient underground ore can be proven north of "A" deposit.

RECOMMENDATIONS

Should the property be acquired (on presumably far easier terms than previously offered) the following would be in order:

1. At least 3000 feet of additional drilling to better outline and confirm the deposits previously worked on.
   This work, with respect to time, cost and recovery could easily be done with a packsack drill providing the Falconbridge Formulae for such is applied. The copper content should be closely checked.
2. A BBS1 Ex or Ax drill is required to test and extend the northern deposit where an additional 1/2 million tons could be present - estimate at least 3000 feet.
3. Re-map the main showings extending such south to the cliff area.
4. Using the BBS1 drill, a few exploratory holes are required to check the anomalous area north of the cliffs, where, if underground haulage is in order, 1 or 200,000 tons of ore might be available through underground mining - estimate 1500 feet initial drilling.
   With helicopter support (Okanagan of Campbell River suggested as our own machine will be north next season) the drilling job should cost no more than $50,000.
5. A large freshly blasted bulk sample should be hauled out via helicopter for mill tests.
6. A preliminary fe sibility study by a qualified engineer of the whole project as proposed. Costs of underground mining will be better

known following Zeballos experience and milling costs at Tasu will be available in the not too distant future. This will also include the Hiller and Skoglund Deposits. #68, AR 433, 1365

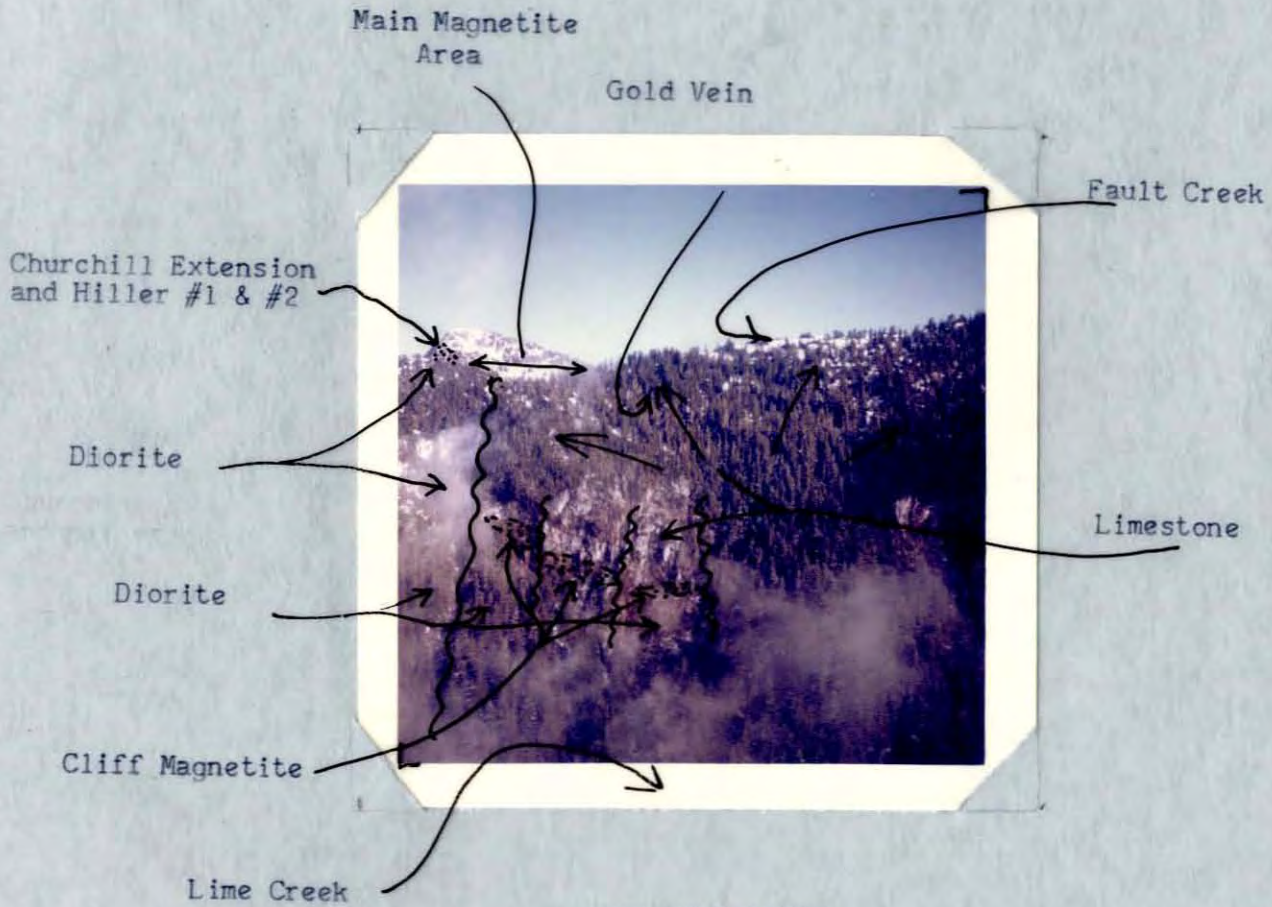
The writer is inclined to feel that the Churchill deposit is too contaminated and too remote to be of value alone unless the tonnage can be at least tripled. This will not be easy and any additions will have to be underground.

On the other hand we have at least 2,000,000 additional tons in the Hiller Deposits which can not be overlooked although their paramount problems also involve location (but not grade). Integrated mining of all is not an impossibility but will require a sharp pencil.

Should the property be acquired, the writer can prepare a map showing the approximate locations of the sites referred to. Utah re-mapped part of the zone in 1962 and their information is available.

Vancouver, B. C.
November 9, 1964

J. J. McDougall
Geologist.



CHURCHILL GROUP

Looking north from Zeballos Iron Mines showing Churchill Cliffs.

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