003569

M10

Property File

82J NW001

GEOLOGICAL REPORT
ON THE
BRUSSILOF PROJECT
BRITISH COLUMBIA

BY

E. STARY, P. ENG.

PREPARED FOR

BAYKAL MINERALS LTD.

DECEMBER, 1970

TABLE OF CONTENTS

continued....

GEOLOGICAL REPORT

ON THE

BRUSSILOF PROJECT

BRITISH COLUMBIA

A. SUMMARY:

Field work was carried out on the Brussilof Project during the 1970 field season to determine the extent of magnesite mineralization between Assiniboine Creek and Mitchell River. This work included geological mapping and diamond drilling.

The drilling outlined 14.8 million tons of proven ore and 11.8 million tons of probable ore, after allowing 20% for unsuitable grade and material not amenable to economic extraction. Grade of ore is 95.5% MgO on an ignited product basis, after allowing for extraction of pyrite, or 94.4% MgO before extraction. Additional possible tonnage was conservatively estimated at a minimum of 15 million tons. These reserves are sufficient to sustain a one million ton a year mining operation for a minimum of 15 years.

The location and shape of the orebody is such that it is readily accessible and amenable to open pit mining with no foreseeable major difficulties.

B. GENERAL INFORMATION:

1. Introduction:

This Report is a review of work done during the 1970 field season by Baykal Minerals Ltd. on the magnesite property in the Mount Brussilof area of British Columbia. The objective of this work was to outline sufficient magnesite of ore grade to support an economic mining operation. This objective was successfully accomplished.

Magnesite was first reported in the area in 1966 by G.B. Leech of the Geological Survey of Canada. Publication of his summary led to extensive claim-staking by New Jersey Zinc Exploration (Canada) Ltd. This Company did some exploration and subsequently let all but six of the claims lapse. Investigation of the mineralization was done by Imperial Oil Enterprises Ltd., but this Company declined to do any further work.

Baykal Minerals Ltd. acquired the remaining six claims held by New Jersey Zinc Exploration (Canada) Ltd., and subsequently staked additional claims to cover the surrounding territory. A preliminary geological field investigation in 1969 was sufficiently encouraging to warrant further exploration which led to the 1970 program.

2. Location and Access:

The Mount Brussilof property of Baykal Minerals Ltd. consists of 344 mineral claims located 20 miles northeast of Radium Hot Springs, British Columbia, (Figure 3).

Access to the property from Radium is gained by driving 10.5 miles north along Highway 93, then 8 miles southeast along Settler's Road and 15 miles up the Cross and Mitchell River valleys along a recently built, bulldozed access road. During dry weather the access road can be used by passenger car, but being rough, a pickup or a 4-wheel drive vehicle is generally preferred, particularly in bad weather.

Location of the property and access route are shown on Figures 1, 1A and 2. A list of the mineral claims is shown in the Schedule of Properties (Appendix I). Their relative location is shown on Figure 2. Figure 3 is a detailed map of the claims.

5. Diamond Drilling:

During August, 1970, diamond drilling, using a Boyles BBS-1 drill with Ax wireline equipment, was carried out to determine the depth and extent of the magnesite body. A total of 3,329 feet was drilled in 11 holes. This was done in addition to 857 feet in three holes drilled previously by New Jersey Zinc Exploration Company (Canada) Ltd. (Table I).

Drill core containing magnesite was split with a diamond saw and forwarded to Bondar-Clegg & Company Ltd. in Vancouver for assaying. Samples of the split core were taken in continuous twenty feet sections except where there appeared to be visible changes in the rock type, in which case shorter continuous sections were taken. The index to the assayed core intervals is shown in Appendix II.

C. GEOLOGY:

1. General Geology:

The area is underlain by the Cathedral formation of Middle Cambrian age. This formation consists of bedded magnesite and dolomite. Beneath

TABLE I

SUMMARY OF DIAMOND DRILL HOLES

ES	DEPTH	OVERBURDEN	ASSAY FOOTAGE	NUMBER OF SAMPLES
	201	27	77	7
	163	35	102	9
	135	25	64	4
	110	24	-	-
5	239	30	132	9
6	338	22	298	18
7	434	5	388	20
8	411	6	361	20
9	485	13	452	23
10	465	4	428	23
11	348	5	299	16
	3,329		2,601	149
-1	178	0	156	9
-2	291	0	258	15
-3	288	2	257	14
-4	50	N.A.	-	-
-5	50	N.A.	-	-
	857		671	38

ote:- Core analysis was not available for NJ-4 and NJ-5.

the Cathedral is the Mount Whyte formation comprised of limestone and thin lenses of argillite, quartzite and shale (Baykal 1969).

2. Lithology:

(a) Magnesite:

The magnesite is a very coarse-grained, massive, white rock which weathers to a white to light buff colour. It is more resistant to weathering and tends to form projecting knobs with overhanging cliffs. An excellent example of this is the cliff which trends to the northwest at the south edge of the grid. On weathering, the magnesite breaks up into a magnesite sand and fine granular talus.

Drill core shows the presence of dolomite lenses within the magnesite. These appear to be thin and of limited lateral extent.

Thin irregular stringers of finely crystalline pyrite and quartz are also found as fracture fillings within the magnesite. These stringers appear to be very localized. There was practically no evidence of either pyrite and/or quartz in the magnesite outcrops which were examined. The pyrite was also found to occur in euhedral pyritohedrons, up to one half of an inch long.

Generally, two possible theories have been formulated for the origin of magnesite:

1. Sedimentary deposition.
2. Replacement of carbonates (dolomite and/or limestone) and magnesium silicates.

Both types are known to occur in North America, however, in this specific area the magnesium silicates are absent. Some evidence of each mode in this deposit can be detected within the map area. Assays of magnesite core near the dolomite contact show a high calcium content indicating possibly an incomplete replacement. Conversely, some of the contacts between the two rock types are sharp without any gradation. Considering the shape of the ore body (Figure 5) it appears that a sedimentary origin in terms of magnesite deposited in an embayment may be favoured.

(b) Dolomite:

The dolomite is fine grained, white to medium grey in colour. In outcrops, it has a relatively smooth light-grey weathered surface. It is generally massive with no indication of bedding planes.

Dolomite occurs along both the upper and lower contacts of the magnesite and also in thin layers within the magnesite body.

Dolomite underlying the magnesite bed outcrops in the northeast portion of the grid. It also occurs as lenses of limited extent in the southern portion and at the base of the cliff to the southeast of DDH NJ-1. In the same area a thin lense of dolomite occurs within the magnesite about 15 feet above the basal contact.

Dolomite was intersected in drill holes B-1 to B-7 except hole B-4 which is located to the east of the contact.

(c) Limestone:

The limestone is a fine-grained, well

bedded light grey rock. It weathers to a darker grey colour and has a tendency to part along the bedding planes. Locally it grades into fine grained calcareous argillite.

Limestone outcrops below and to the east of the magnesite and dolomite in the north-east portion of the grid. In this area it strikes N10° - 25°W and dips 35° - 45°SW.

(d) Quartzite:

Quartzite occurs as a hard, massive, pale grey, very fine-grained rock. The occurr-ences were few, having been encountered in only two of the drill holes and on one outcrop in the extreme southeast corner of the map area.

The lone small outcrop which was seen was massive and had a fine sugary texture. It had a rusty, weathered surface, probably due to the weathering of pyrite (Figure 4).

(e) Shale:

Shale was encountered in one drill hole.

It is a fine-grained, calcareous, well banded, soft, dark grey to black rock. It may possibly be an impure phase of the limestone.

(f) Argillite:

Argillite is a very fine-grained, pale, greenish-grey rock. It is usually well banded with dark grey bands less than one-quarter of an inch wide. This rock was encountered below the magnesite in several of the drill holes.

Some of the argillite has a high carbonate content and effervesces readily with dilute HCl. From its limited occurrences it would appear that it occurs in lenses and may grade vertically and/or laterally into both the limestone and shale (Figure 4).

A single outcrop of argillite was found within the map-area. This light brown, weathered lone outcrop was seen at the southeast corner of the map. Here the rock was well bedded and grey coloured.

3. Structural Geology:

The magnesite body appears to trend N30°W and dip 35° to 45° SW. Some minor folding is evident from the elevations at which the drill holes intersected the footwall (Figure 6). Due to the steeper inclination of the footwall relative to the surface, the thickness of the magnesite increases to the southwest. Since the main mass of magnesite is considerably thicker than its extension to the northeast and northwest, it is probable that it may have been deposited in a depression of the original surface which now forms the footwall. The attitude of the footwall is shown in Figure 6 while the magnesite isopach is illustrated in Figure 7.

There is evidence of slight fracturing but there is no evidence to indicate that any appreciable faulting took place within the drilled area. (See Cross-Sections, Figures 9 to 16). The southwest end of the magnesite body appears to be truncated by the Mitchell River fault, a southeasterly trending fault occupying the depression of the Mitchell River (Figure 5). The area along the river is completely covered by overburden and the extent of the magnesite in this area cannot be ascertained (Figure 4).

D. ECONOMIC GEOLOGY:

Ore reserves of magnesite, based on diamond drill results, can be summarized as follows (Figure 8, Appendices VIII & IX):

	Proven	Probable
Reserves in millions of tons	18.5	14.8
Less 20%	3.7	3.0
Total in millions of tons	14.8	11.8

The average grade of proven ore was calculated to be 95.5% MgO (Table III). Possible ore was assumed to be of the same grade. This figure is based on assays of dead-burned samples after allowing for pyrite extraction (Appendix VII). If the pyrite is allowed to remain (Appendix VII), the average MgO for the proven ore becomes 94.4% (Table II). In other words, the pyrite beneficiation improves the average grade of the ore body by 1.1% MgO (Tables II & III).

The 20% shown on the above table is a figure used to compensate for mining loss and possible zones of non-recovery.

Proven ore tonnage is defined as the ore out-

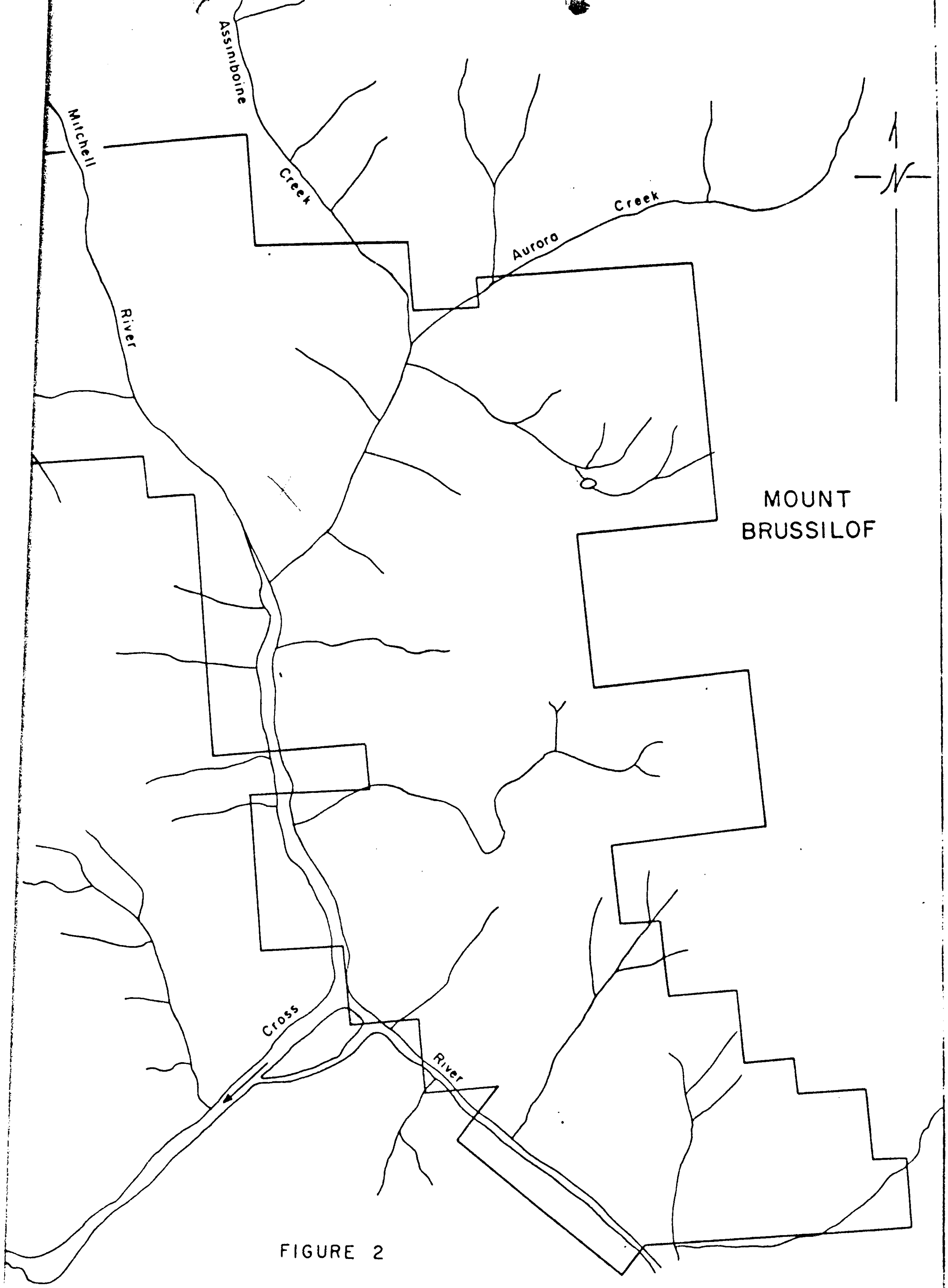

FIGURE 2

OUTLINE OF CLAIMS

SCALE: 1" = 1 Mile

lined by drill holes on approximately 200 feet horizontal spacing and for 200 feet horizontally beyond those holes along both dip and strike, less 20% of total as included waste and non-recoverable material (Figure 8).

Proven grade is the weighted average of assays of drill hole core in magnesite rock ($MgCO_3$) excluding sections assaying over 10% contaminants (except Fe_2O_3) on an ignited product basis. The contaminants present are CaO, Al_2O_3, SiO_2 and HF insolubles. Cutoff for ore grade material was taken as 90% MgO, resulting from the presence of any combination of these contaminants. The cutoff limits are illustrated in the Cross-Section of Diamond Drill Holes (Figure 18).

Figure 18 illustrates both the plan and cross-sections of the drill holes. The cross-sections are projected on a common vertical plane, along a datum line joining drill holes B-10 and NJ-1, with the drill holes located at their true elevations above sea level.

Probable ore is that lying 200 feet horizontally outside proven ore outlined, less 20% as above. Probable ore grade is assumed to be of the same grade as proven ore.

The Regional Geology Map (Figure 5), shows that the area underlain by readily accessible magnesite is 4.875 million square feet. Assuming an average vertical depth of 120 feet, this indicates a total of 48.75 million tons. Subtracting the proven and probable tonnage from this leaves an additional 15.5 million tons possible ore before subtracting 20% as above.

The assumed average vertical depth of 120 feet is a very conservative figure, taking into consideration that four of the drill holes intersected over 300 feet of magnesite, which appeared to be thickening to the northwest within the map area. This thickening is probably the result of the magnesite being deposited in a basin or embayment. The thickening is evident from the cross-sections (Figures 9-15 inclusive). It should also be noted that the limit of the magnesite along the south and west has been assumed, as there is no direct evidence of its exact location.

Tonnage was calculated from cross-sections taken at 200 feet intervals perpendicular to a datum line joining drill holes B-10 and NJ-1. Limit of proven reserves was taken at 200 feet from the drill holes. This distance appears to be reasonable from the consistent nature of the magnesite, both in grade and thickness (Figure 18, Appendices IV, V and VI).

A compilation of assay results is illustrated on the Assayed Magnesite Isopach Map, Figure 16, while Figure 17 shows the Assayed Magnesite Grade.

Weighted averages of assay results were used in determining the average grade of ore reserves. First the weighted average grade of core from each drill hole (Appendices IV, V and VI) was calculated by multiplying the assay values of each compound by the length of the core sample. The total values of each compound thus obtained were divided by the total length of core assayed to arrive at the weighted average (Appendix VI).

Similarly the weighted average grade of a cross-section was computed. The average grade of each drill hole, in a section, was multiplied by the length, and the sum of the products divided by the total footage. This quotient was multiplied by the area of the cross-section. In the same way the weighted average grade of two adjacent sections was calculated in the manner explained below to arrive at the grade of the block of ore between them (Appendix IX).

The area of each cross-section was measured with a planimeter. The average area of every two adjacent cross-sections was multiplied by the perpendicular distance between them to arrive at the volume of the block (Appendix VIII). In calculating tonnage a factor of 12 cubic feet to the short ton was used. This figure somewhat underestimates the tonnage, because assuming a specific gravity of 3.00 and porosity of 5% this results in a value of 11.25 cubic feet per ton.

Samples containing high amounts of CaO, Al_2O_3 and/or SiO_2 with consequent low MgO, generally occurring at the top or base of the magnesite band, were omitted in these calculations.

Where significant amounts of pyrite were present, Fe_2O_3 content was reduced to 1% of total assay. Where Fe_2O_3 content was greater than 10% of total assay, this was reduced by 90% (assuming 90% extraction during beneficiation). This was done since preliminary tests have shown that the pyrite can be easily extracted. Appendix VII graphically illustrates the percentage of MgO in the drill holes as assayed, and where applicable, after beneficiation by pyrite extraction.

Due to the limited extent of the stringers of pyrite and quartz (Appendix III), significant amounts of Fe_2O_3 and SiO_2 in some of the assayed core samples probably give an exaggerated indication of the average amount of these minerals present in the magnesite.

A spectrographic analysis was done on two samples of drill core. A copy of the results is included in Appendix IV. This analysis shows only very minute amounts of various elements present, insufficient to be detrimental to the quality of the magnesite.

E. CONCLUSIONS:

Field work was carried out on the Mount Brussilof magnesite property during the summer of 1970 to determine the extent and quality of the magnesite mineralization. Interpretation of drill results shows the presence of 14.8 million tons of proven ore grading 95.5% MgO from a dead-burn analysis, after extraction of pyrite, and 11.8 million tons of probable ore of the same grade after subtracting 20% for possible impure zones and non-recovery.

The mineralized zone is essentially a thickened tabular body trending about N 30° W and dipping 35°-40°SW.

The surface has an overall slope of approximately 30° to the southwest. Overburden of unconsolidated material is minimal, averaging 20 feet vertical depth or less.

The slope of the hill, the attitude of the magnesite bed and small amount of overburden present a very favourable situation for a low cost open pit mining operation. Transportation presents no problems as a haulage road can be put in along the river valleys with no significant grades necessary.

Proven tonnage is sufficient to support a one million ton per year operation for 15 years and the probable reserves would almost double that period. In addition to this there are the possible reserves and also the magnesite on the other side of Aurora Creek described by J.D. Godfrey in his report.

The assaying results show that the magnesite is of extremely high quality and preliminary tests indicate that iron, where present, can be easily extracted.

All these facts lead to the conclusion that magnesite mineralization is of sufficient size and quality and is readily accessible to constitute an extremely attractive orebody. It presents no foreseeable major difficulties in extraction or refining.

F. RECOMMENDATIONS:

The chief recommendation is presently being implemented - namely a study of the feasibility of mining the orebody. This work is being done by Acres Western Ltd. of Vancouver, British Columbia.

To fully outline the magnitude of the magnesite will require additional drilling. This could be most economically done by drilling perpendicular to the footwall. Due to the amount of proven ore available, this may not be necessary at the present time.

In the event that additional drilling is contemplated, it is recommended that another base line be cut from 12+00N, 6+00W on a bearing of N30°W with cross-section lines perpendicular to it at 400 or 500 feet intervals, and these chained and marked every 100 feet. This grid would serve as ground control. Holes should be spaced 400 or 500 feet apart and inclined at -50° or -55° on a bearing of N60°E. Closer spacing may be required if any significant changes in the magnesite band are encountered. Additional holes should be drilled both up and down dip of the proven ore block.

A total of 12 to 15 holes averaging 350 feet