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REPORT

CONCERNING PROPOSED OPERATIONS

ON MINING PROPERTIES OF

MINES-METALLURGIES-KEBEC Inc
(No Personal Liability)

by

ALTON CHARLES BRAY, M. Sc.

CONSULTING GEOLOGIST

March 31, 1965

2

TABLE OF CONTENTS

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INTRODUCTION

MINES-METALLURGIES-KEBEC Inc. own several mining properties on the north shore of the gulf of St. Lawrence in the county of Duplessis, province of Quebec, having a total area of about 125 square miles.

They contain large unconsolidated beach and terrace deposits with which are associated such heavy minerals as magnetite, ilmenite, hematite, garnet, zircon, monazite and rutile. The Company proposes to start mining and producing concentrates of these minerals in the near future.

The properties consist of large groups of claims in the districts of Sept Iles - Moisie, Natashquan - Kegashka and Harrington as well as a copper prospect on the upper Natashquan river. Salient features of the properties at Moisie, Natashquan and Kegashka and of the copper prospect are described in the following report especially those related to their early development.

The writer was consulting geologist for Aconic Mining corporation from April 1952 until March 1960, serving also as their resident manager at Natashquan during 1955 and 1956. Copies of his reports on the the Natashquan operation, May 9, 1960 and on the properties of the present company (including Natashquan), March 17, 1965 are on file at the Department of Natural Resources, Quebec. The necessity of space limitation precludes a full discussion here of the contents of the previous reports.

LOCATION AND AREA

The Sept Iles - Moisie property is located 330 miles below the city of Quebec in the townships of Letellier and Moisie. It comprises 11,632 acres consisting of 1,632 acres of private beach lots and 10,000 acres acquired by staking. The property lies on both sides of the Moisie river at its mouth and the beach lots extend for a distance of more than twelve miles along the shore of the gulf of St. Lawrence (Plan B).

The Natashquan property , comprising 34,009 acres, was acquired by purchase, October 25, 1962. The larger part is held under Long Term Exploitation Permit No. 27249, issued by the Department of Mines, Quebec under the date of December 1, 1955. It has a surveyed area of 31,562.78 acres, embracing the bed of the Natashquan river in its lower reaches as well as the Natashquan terrace lying mainly north of the river. The remainder of the property

consists of a patented industrial site of 46 acres in the harbor area north of the village of Natashquan and six patented mining lots on the gulf of St. Lawrence comprising nearly 2,400 acres. It is located in the townships of Natashquan and Duval approximately 630 miles below the city of Quebec (Plan C).

The Kegashka property comprises a total area of 42,200 acres of which 2,200 acres are patented and 38,000 acres were acquired by staking. It is situated in the townships of Duval, Kegashka and Musquarro and its location is immediately to the east of the Natashquan group.

The copper prospect consists of ten claims comprising 400 acreas in townships 1380 and 1381 and are situated on the east bank of the Natashquan river approximately 45 miles north from its mouth. (Plan A)

APPENDICES

Attached please find the following plans: A, Main Mining Developments North of 50th Parallel, Showing Location of Company's Properties; B, Sept Iles - Moisie group; C, Natashquan-Kegashka Consolidated Properties; D, Copper Prospect.

REFERENCES

The basic government publications, most of which have been long out of print, dealing with the magnetic, or black, sands of the North Shore may be found listed in the second reference below. The following reports by the present writer are mentioned because they are on file at Quebec with the Department of Natural Resources:

1, Report on the Natashquan Property of Aconic Mining Corporation, May 9, 1960
2, Report on Certain Properties Belonging to Mines-Metallurgies-Kebec Inc., March 17, 1965

SUMMARY AND CONCLUSIONS

Three properties with large deposits of sediments containing magnetite and other heavy minerals and one copper prospect, all belonging to MINES-METALLURGIES-KEBEC Inc., are the subjects of the present report.

The Company plans to start operations at their Kegashka property in the near future with the object of producing magnetite and bulk heavy-minerals concentrates for use as heavy-media and heavy aggregates. The initial operation will be on a limited scale and co-ordinated with further testing, research, exploration and drilling for the purpose of providing an adequate reserve for a concentration plant of larger capacity. A similar program is planned for Moisie to start at a later date.

The origin of the heavy-minerals on these properties is the mineral-rich interior of northeastern Quebec. The geological history of the North Shore may be summarized as follows: 1, Glaciation of the region of the gulf of St. Lawrence; 2, Subsidence of the area under the weight of the ice; 3, Melting and retreat of the glacier to the north; 4, Flooding, southward-flowing rivers carrying detritus resulting from the disintegration of the rocks of the interior by glaciation and other agents of erosion; 5, Deposition of detritus and concentration of heavy minerals by wave and current action at existing shore lines; 6, Successive uplifts of the land surface to form new shore lines and

beaches to the south and parallel lines of terraces; and 7, Erosion of the older terraces with dispersion and subsequent local re-concentration of heavy minerals.

The heavy minerals reported from these deposits include magnetite, ilmenite, hematite, garnet, zircon, monazite and rutile. Ample markets exist for concentrates of all of these minerals. Research to date, especially at Natashquan, has reached the stage where it may be said that nearly all of the theoretical technical problems related to the effective concentration of the heavy minerals have been solved.

The Company properties of Moisie, Natashquan and Kegashka share a common physical geology and geologic history and the deposits exhibit similar mineralogic associations and structure. It may be inferred that other physical relationships not yet established and the metallurgical treatment best adapted to the crude sands will likewise, from property to property, have much in common.

The three properties are now at different stages in their development. Natashquan has an established mine reserve of 1,500,000,000 metric tons averaging 3.73 per cent Fe and perhaps 6 per cent heavy minerals, including the marketable iron minerals, in an area of 13.7 square miles to an average depth of 88.4 feet. It could be made ready for large scale production of magnetite concentrate within a few months. Kegashka has no established mine reserve that can as yet be expressed in terms of tonnage and average grade, but the

size, grade and accessibility of the principal showings is such as to warrant a limited scale operation for the production of magnetite and heavy-minerals concentrates to start as soon as the mining and concentration equipment can be set up. Moisie is a potential producer but requires extensive development to bring it to the present stage of Kegashka.

The Company's plans provide for the use of a floating mining and concentration plant to deal with the more accessible and higher grade deposits in the initial operation at Kegashka and to carry on research connected with the utilization and marketing of heavy minerals and heavy-minerals products.

Recommendations by the writer include limited drilling and exploration to establish a three to five year mine reserve, based on the initial production; further testing and research to determine optimum daily production and tenor, and standardization of equipment and procedures for maximum economy and efficiency.

When considered as a group, the present holdings of the Company are seen to be of great potential value. The surface deposits so far tested at Kegashka and Moisie indicate that some sections of the beach and terrace deposits are of higher tenor than those at Natashquan and volume for volume may well be richer. In the opinion of the writer, MINES-METALLURGIES-KEBEC Inc. are fully justified in their decision to commence active operations in the near future.

GEOLOGY

At several places in the interior of northern Quebec, rocks rich in magnetite and ilmenite occur which also contain other heavy minerals in smaller amounts. In comparatively recent geological time, the surfaces of these rocks were disintegrated by various agents of erosion and the resulting detritus was carried southward by rivers to be laid down eventually as beach and offshore deposits. Their heavy minerals were subsequently concentrated by the sorting action of waves and currents in the region of the present North Shore. In the following section, an attempt is made to explain how the mineral deposits reached their present state.

GEOLOGICAL HISTORY OF THE NORTH SHORE

Since very early in geological time, the St. Lawrence valley has existed as a depression extending from the Atlantic far into the interior of the continent. During the Pleistocene period, the North Shore was covered by the 12,000 foot thick Labrador glacier whose weight caused the land surface to sink at least 700 feet.

Melting and withdrawal northward of the ice opened the St. Lawrence depression to the sea and a great marine inlet formed called the Champlain sea. At about the same time, the land surface began to rise in successive stages toward its former level.. As the glaciated surface continued to rise, the Champlain sea slowly drained away into the Atlantic and its place was taken by the St. Lawrence river which gradually became adapted to its present river channel.

The early post-Glacial rivers were greatly swollen by floods of fresh water from the melting ice and carried southward enormous quantities of debris from the eroded interior. This was deposited at the shore line and offshore in the Champlain sea and, later, in the St. Lawrence river, where wave and current action effected partial segregation of heavy minerals. Concentration by these means was always most effective on the beaches although weaker concentrates were also formed in deeper water.

After each uplift, coastal terraces resulted overlooking new beaches each of which was further south than its predecessor. As they were composed of unconsolidated materials, many of the older terraces were soon obliterated by erosion and their materials dispersed to form local concentrates elsewhere; others, protected from erosion by vegetation or in other ways, have survived at least in part.

CHARACTERISTICS OF DEPOSITS

The seaward edges of terrace areas were likewise so eroded that they are now smaller in area than they were at the time of the last uplift and in some places like Aquanish, which is west of Natashquan, they have almost entirely disappeared except in sheltered rocky bays. In a few places on the North Shore, substantial remnants still remain, as at Sept Iles - Moisie and Natashquan - Kegashka. In the latter district, the terrace area is still over 6 miles wide at its widest point south of the village of Natashquan.

Three classes of natural heavy-minerals concentrates have been recognized: 1, High grade, stratified black sands of current beaches and most recent terraces (coastal terraces); 2, Lower grade magnetite-bearing deposits resulting from the erosion of the older terraces and containing local concentrations of richer material (usually unstratified or weakly stratified), and 3, The weak concentrations of heavy minerals characteristic of past or present offshore deposits of well-stratified beds of Champlain or recent age. The last type is invariably composed of fine-grained sand with associated thin seams of clay, whereas the others are medium-grained, clay-free and sometimes associated with beds of fine gravel.

The rolling sand plains, peat and dune areas lying inland from present coastal areas, as at Natashquan, undoubtedly contain large amounts of heavy minerals, some deposits of which may be mineable. The same applies to local concentrations in the beds of existing and past river channels.

MINERALOGY

The principal minerals so far reported as occurring in the unconsolidated deposits on the Company's properties are as follows: A, Heavy minerals, having specific gravity in excess of 4.0: Hematite (5.26), Sphene (5.00 - 5.50), Magnetite (5.18), Monazite (5.00 - 5.30), Ilmenite (4.70), Zircon (4.68), Garnet (4.25), and Rutile (4.18 - 4.25);

B, Light minerals, having specific gravity less than 4.0 and considered as waste: Spinel (3.60 - 4.00), Pyroxene (3.40 - 3.50), Hornblende (3.20), Feldspar (2.54 - 2.76), and Quartz (2.65).

The metallic element Vanadium has also been detected by chemical and spectrographic means but its mineral occurrence has not yet been identified.

ECONOMIC IMPORTANCE OF HEAVY MINERALS

MINES-METALLURGIES-KEBEC Inc. plans to develop its properties so as to produce all heavy minerals over 4.0 specific gravity including magnetite for a broad market rather than to serve as sources of supply for the steel industry. This is an entirely new approach to the problem of what to do with the magnetite-bearing, unconsolidated deposits occurring at a few favored localities on the North Shore. The Company plans not only to produce heavy-minerals concentrates but also, through the media of subsidiaries, to manufacture mineral products as desired.

During the past twenty-five years, there have been great improvements in minerals technology and an increasing use of minerals and mineral products. Since 1948, the accelerating demands for certain heavy minerals including high quality magnetite and ilmenite, rutile, zircon and monazite have exceeded available supplies.

The properties of MINES-METALLURGIES-KEBEC contain large established and potential reserves of heavy minerals

that have been rising in price. They expect soon to be in a position to supply a considerable part of the demand for heavy-media and heavy aggregates as well as concentrates of certain strategic minerals.

MAGNETITE

Besides its value as a high quality iron ore, magnetite concentrated from the Company's North Shore deposits has been shown by research to possess qualities which make it especially desirable for use as a "high density suspension medium", or heavy-media. In this field, it can command a premium of $ 3.00 to $ 4.00 per ton over that of magnetite shipped for use as iron ore.

Present markets for magnetite heavy-media are in coal preparation, iron ore beneficiation, the concentration by cyclone of ores of ilmenite, spodumene, tin and many others. It is used extensively for floating such light minerals as brucite, chrysocolla, graphite, gypsum and sulphur, and has also been used in the treatment of corundum and industrial diamonds. It is most commonly used alone but may sometimes be mixed with ferrosilicon.

It possesses certain qualities desirable for heavy-media to a superior degree including hardness, resistance to abrasion, corrosion and chemical action, excellent recoverability and moderate cost.

Increasing use is being made today of magnetite and other high gravity minerals as heavy aggregates. One such use is as a fine aggregate replacing sand in the manufacture of heavyweight concrete slabs used as shields to absorb radiation from nuclear reactors and other sources of atomic radiation.

TITANIUM MINERALS (Ilmenite, Rutile and Sphene)

Ilmenite, rutile and sphene are all present in the Company's unconsolidated deposits but only the first occurs in really significant quantity.

The demand for titanium as metal, alloy and oxide has risen so sharply during the past decade that both ilmenite and rutile have assumed great importance.

A major use of this element is in the form of the oxide used in the manufacture of white pigment which is preferred for its extreme whiteness, high refractive index, chemical stability and relative cheapness. However, its use as titanium metal and titanium alloys threatens to surpass that of the pigment use of the oxide. Its light weight as compared with steel, high strength and resistance to high temperatures and corrosion have caused it to be used extensively in such industries as aviation, ship-building, chemical and military supply.

Rutile is less abundant and, because of its high TiO_2 content, its price per ton is several times that of ilmenite. A process has been reported which converts ilmenite into artificial rutile which, if applied to the Company's concentrates of the former mineral, may add materially to its earnings.

On the North Shore, ilmenite most commonly occurs in close association with hematite so that the concentrate contains a large amount of hematite. As the combination has a specific gravity very slightly less than that of high density magnetite, it is equally suitable for use both as heavy-media and as heavy aggregate.

Magnetizing roasting of North Shore ilmenite-hematite concentrate, followed by low intensity magnetic separation, will produce an ilmenite concentrate containing 46 per cent TiO_2, which is competitive with other North American ilmenites used in the manufacture of white pigment.

HEMATITE

See remarks under "Ilmenite", above.

GARNET

The chief use of garnet is as an abrasive but increasing quantities are being used in sandblasting marble, slate and other soft rocks; for cleaning spark plugs; and for polishing and marking plate glass. Other possible markets include its use as granules for the protective coating of asphalt roofing and siding and for hardfacing concrete floors.

ZIRCON

Zirconia, or ZrO_2, is one of the most refractory substances known and is relatively inert to molten silicate slags and other corrosive agents. Its principal uses, therefore, are in fields where these qualities are most desired.

At Kegashka, the zircon content ($ZrSiO_4$) of beach and terrace deposits at two separate locations (Oyster bay and Iron bay) was found to be 1.2 to 1.7 per cent (0.8 to 1.2 per cent ZrO_2). One bulk sample of natural concentrate from Natashquan also yielded 0.8 per cent ZrO_2 on analysis. Elsewhere at Kegashka, Moisie and Natashquan, it runs between 0.2 and 0.4 per cent ZrO_2. A little hafnium was detected in zircon concentrates produced from the Natashquan "Upper Bed" deposit.

MONAZITE

Although this is the least abundant of the heavy minerals reported, it is worth mentioning because there is a ready market for all that can be produced.

Monazite is the source of the rare earth elements and thorium, all of which are of great importance in numerous industrial and scientific applications. For many years, it was kept on the "critical list" of the U.S. government. It is a very scarce mineral and present production comes almost entirely from placer deposits.

VANADIUM MINERAL (Unidentified)

Vanadium has been detected in semi-quantitative spectrographic analyses of samples from Natashquan and Kegashka as a trace element. Chemical analyses of concentrates from Kegashka showed the following percentages of the oxide, V_2O_5: a, magnetite concentrate, 0.5; b, ilmenite concentrate, 0.27; c, heavy-minerals residue (i.e., less magnetite and ilmenite), 0.02 per cent. It is evidently associated with monazite although its mineral affiliation has not as yet been determined.

HEAVY-MINERALS RECOVERY

Numerous data are available to show the relative proportions of the various heavy minerals present in crude sands at Natashquan and Kegashka. In general, mineralographic and other laboratory studies tend to show that the magnetic portion of the beach and terrace deposits, consisting mainly of magnetite, amounts to somewhat less than half of the heavy mineral fraction (including magnetite) by weight.

One large scale investigation was made for the express purpose of establishing the relative proportions of recoverable heavy minerals in a medium-grade Natashquan terrace deposit. A mill run of several days' duration yielded a magnetite concentrate of tenor, 65 per cent Fe and 3.5 per cent TiO_2, and representing 4 per cent of the mill feed. The tailings, containing all of the gangue and the residue of the heavy minerals, were treated for the recovery of ilmenite, hematite, garnet and zircon as concentrates. The proportions of recoverable minerals for this particular type of sample were found to be: Magnetite, 10; Ilmenite, 4; Hematite, 4; Garnet, 2; Zircon, 0.2 . In other words, 4 per cent of the mill feed emerged as magnetite and 4 per cent, after further treatment of the tailings, was recovered as ilmenite, hematite, garnet and zircon, giving a total of 8 per cent recoverable heavy minerals.

PROPERTIES CONTAINING DEPOSITS OF HEAVY MINERALS

In Part I (Introduction), the writer described the location and areas of the Company properties that are discussed in the pages that follow.

SEPT ILES - MOISIE

This property is noteworthy for being the site of a successful mining and smelting operation between 1867 and 1875. The Moisie Iron Company operated 8 furnaces here producing pig iron that was shipped to the United States where it was esteemed for its high quality. In the latter year, this market was lost due to a change in American tariff regulations which increased the duty from $ 7.00 to $ 33.60 per ton, thus rendering Moisie iron non-competitive, and the company was forced to shut down.

The Moisie black sands are well exposed along the beaches of the gulf of St. Lawrence for four to five miles eastward from the mouth of the Moisie and also for about two miles from a point three miles west of it. There is also a band several hundred feet long following the concave (west) side of the estuary. Overlooking the beach, there are terraces composed of magnetite-bearing sand which extend east and west for unknown distances.

E. Dulieux examined part of this property in 1911 on behalf of Mines Branch, Quebec Department of Colonization, for the purpose of establishing the iron ore potential of the principal showings.

He sampled two miles of the beach east of the Moisie river and a one-mile length of the terrace back of the beach, and estimated that the two sections would yield a total of 97,000 tons of magnetite concentrate grading 65 to 67 per cent Fe. A composite of 29 beach samples yielded 36.42 per cent Fe and 7.48 per cent TiO_2. Recent sampling in the same beach area for MINES-METALLURGIES-KEBEC Inc. yielded slightly higher results. Bulk sampling for the Company at Woolves cove west of the river returned on analysis 51.77 per cent Fe and 16.29 per cent TiO_2.

Mr. Dulieux sampled only 1 per cent of the present property. He failed to sample areas that he described in his report such as the west beach, the remainder of the terrace and of the east beach, and the showing inside the mouth of the estuary. His samples have no real depth to them and take no account of the associated lower grade magnetite-bearing beds which at Natashquan constitute an important part of the mine reserve. Finally, the heavy mineral concentrates in the areas he did sample can be expected to reach at least 200,000 tons, using his figures for magnetite and the experience at Natashquan in their research on heavy-minerals recovery as a guide.

NATASHQUAN

The Aconic operation at Natashquan had as its chief objective the mining and preparation of magnetite concentrates of high quality for the steel industry. The potential of its associated heavy minerals such as ilmenite-hematite, garnet and zircon was recognized but they were primarily regarded as by-products that would yield additional income to an operation that otherwise was expected to be self-sustaining.

The present Company's approach to the problem of successfully exploiting the mineral resources of the Kegashka, Natashquan and Moisie properties differs from that of Aconic in that a self-sustaining operation can be expected on the basis of the production and marketing of all of the heavy minerals that are present. They will not, therefore, be committed to the large-scale production contemplated by Aconic and can safely engage in selective mining to ensure the optimum return on capital investment.

HISTORY OF OPERATION

The present Natashquan holdings of MINES-METALLURGIES-KEBEC Inc. were staked on behalf of Aconic Mining Corporation in February and March 1954, and were prospected and mapped by the writer the same summer. Wash-boring (drilling) and bulk sampling were also performed in a test area of slightly under two square miles. Results from drilling and sampling indicated a deposit of magnetite-bearing Champlain sediments containing approximately 200,000,000 metric tons to a depth of 65 feet and averaging 4.09 per cent Fe and 0.54 per cent TiO_2.

A concentration plant was designed and installed by Klockner & Company, Duisberg, West Germany by September 1955. After several changes of equipment and lay-out, the plant was ready for full operation on July 28, 1957. An inspection team from La Surveillance Generale de Surveillance S.A. de Geneve supervised the running of a Mill Performance Test on October 3 and 4, 1957 and issued a certificate to Klockner & Company to the effect that they had fulfilled their part of the agreement with Aconic by supplying a concentration plant that was capable, a, of treating and concentrating 220 metric tons of crude per hour; b, of recovering 90 per cent of the magnetite present in the crude sand; c, of producing magnetite concentrate containing more than 65 per cent Fe and less than 3.85 per cent TiO_2. This plant, as installed, was acquired in 1962 by MINES-METALLURGIES-KEBEC Inc.

Research on all phases of the operation was carried out at the mine, the mine laboratory and the company's testing laboratory near Montreal at Ville Jacques Cartier. The investigations embraced research on both terrace deposits and the lower grade material associated with them and it is believed that most of the major theoretical problems connected with metallurgical treatment have been solved.

Aconic came under new management in August 1957 and a program of drilling was initiated the following year as part of a complete reappraisal of the property. As a result of the drilling, which eventually covered 13.7 square miles, or 27.4 per cent of the present property, a potential reserve

was seen of 1,500,000,000 long tons averaging 3.73 per cent Fe to a depth of 88.4 feet. Part of the area, centered on the present mine and concentration plant, was selected as the immediate mine area and designated as New Area "C". It covers 5.47 square miles and has an established mine reserve of 645,000,000 long tons averaging 3.98 per cent Fe to a depth of 95 feet.

EVALUATION

The importance of the Natashquan property to the present Company lies in its large established mine reserve, its more advanced stage of development and the concentration plant that was acquired with the property. Metallurgical research here has solved most problems connected with the preparation of marketable, heavy-minerals concentrates. The concentration plant is fully equipped and capable of handling 220 metric tons of crude per hour to produce high quality magnetite. As it stands, it is an entirely operative production plant suitable for limited scale operation. With additional equipment, it may be modified to meet the requirements for the separation of other heavy minerals as well. The procedures for doing this have already been worked out.

No estimate has yet been made of the heavy-minerals reserve even in the drilled area, especially in the fine-grained beds that constitute a greater part of the mine reserve. As compared with the terrace deposit, these associated beds exhibit a somewhat higher ratio of magnetite-free heavy minerals to magnetite. For this reason, and subject to later revision, the overall percentage of recoverable heavy minerals in the Natashquan mine reserve is set at 6 per cent and in the terrace, or Upper Bed, at 8 per cent.

KEGASHKA

This is the eastern member of the Natashquan-Kegashka group which extends 27 miles from east to west and 6½ miles from north to south at its widest south of the village of Natashquan. It contains within its boundaries the greater part of the Natashquan terrace area.

PHYSICAL FEATURES

On the Kegashka property the terrace area becomes more narrow to the east and practically disappears at the eastern end of the property. The interior is marked by numerous small lakes, ponds and patches of muskeg. The seaward-facing edges of the coastal terrace show signs of extensive erosion which, sparing large areas, has also removed vast quantities of material so that sections of the shore and the rocky offshore islands have been denuded of the deposits that possibly once covered them.

The largest section of the coastal terrace that remains extends from the eastern end of the bay of Kegashka westward 31,000 feet to Iron bay, the whole roughly centering on the island and village of Kegashka.

It is highest and widest in the central portion at Clam bay where the bluffs are 39 to 40 feet high and it extends inland for about 6,000 feet. To the east and west, the bluffs are more eroded and lower. At Kegashka bay and Iron bay, they have been reduced to slopes which attain terrace height only at some distance inland. On the basis of its area of 1,920 acres, this potentially favorable ground will yield approximately 3,100,000 cubic yards of mineralized crude per foot of depth.

PRINCIPAL DEPOSITS

Extensive sampling has been performed on the faces of the bluffs, on the beaches and at various places from the top of the coastal terrace. Drilling by hand auger yielded valuable information but, as it cannot be used for depths below the water table, this method of sampling is limited to the surface of the dry terrace.

At Clam bay, the strongest mineralization occurs in a layer 4 to 5 feet thick near the top of the bluff west of Oyster point. Sampling gave results of 26.5 to 28.9 per cent magnetite, 35.0 to 38.1 per cent ilmenite and 1.4 to 1.7 per cent zircon. A 41-foot channel sample from top to bottom showed more than 10 per cent heavy minerals including 4.8 per cent magnetite.

At Iron bay, a low terrace above the present beach showed heavy-minerals content of 80 - 95 per cent, including 30 per cent magnetite, 40 per cent ilmenite and 1.2 per cent zircon. 1,000 feet inland from this showing, the slope yielded 12 per cent heavy minerals and 4 per cent magnetite.

Samples taken on the so-called "long beach" west of Iron bay gave 15 per cent heavy minerals of which 6 per cent was magnetite, representative of 4,000 feet of beach.

An area of 3,000 by 900 feet on the bottom of Kegashka bay was "pipe" sampled to depths of 1.4 to 1.8 feet and yielded 4.5 per cent magnetite on the average.

The above are the results of literally hundreds of analyses and scores of tests and indicate that the deposit has a high mineral potential.

EVALUATION

No overall estimate can yet be made of the deposits of probable economic importance at the Kegashka property. When established, they are expected, in the areas mentioned alone, to amount to tens of millions of cubic yards.

In view of the large amount of work involving analyses and tests on material from the most attractive showings, it is likely that enough information can be obtained from a co-ordinated drilling campaign of relatively short duration to permit calculation of a substantial mine reserve based on the important deposits of Iron bay, Clam bay and Kegashka bay.

COPPER PROSPECT

As already stated, the copper prospect is located in townships 1380 and 1381 on the Natashquan river about 45 miles north from its mouth.

The geological environment is essentially one of pre-Cambrian schists and quartzites which have been intruded by a series of gabbro-diabase sills. At numerous places in the area, chalcopyrite has been found in fissures either in the intrusivesor at their contacts.

One of these sills crosses the Company's property from east to west and contains fissures carrying chalcopyrite mineralization . The results of two samples taken from a narrow zone of disseminated material gave, respectively, 2.28 per cent Cu and $ 0.31 Au, 4.78 per cent Cu and $ 1.26 Au.

The results are encouraging and an experienced prospector should be sent to the property to investigate more fully.

RECOMMENDATIONS

INTRODUCTION

MINES-METALLURGIES-KEBEC Inc. have already established a policy with regard to the utilization of the mineral deposits on their properties which is based on: 1) The presence of large established and potential reserves of heavy minerals; 2) The presence and accessibility of high grade deposits, especially at Kegashka.

Plans are already well advanced which include the following:

1, To start operations at Kegashka on a limited scale at first using a floating mining and extraction plant.

2, To start with Kegashka because of the presence of high grade deposits, their accessibility to a floating plant, the availability of local labor, the presence of a new wharf at the village of Kegashka and of a new road connecting the village and wharf with the deposits at Iron bay and Clam bay.

3, To acquire other promising properties of this type.

4, To start with the production of high density magnetite for heavy-media and heavy aggregate or bulk heavy minerals for heavy aggregate.

5, To expand the operation as circumstances permit to include other properties belonging to the Company.

Based on the best available information, the estimated cost of dredging will be 4 to 6 cents per cubic yard and that of producing bulk heavy minerals by gravity separation (spirals), 4 to 5 cents per cubic yard (i.e., 3 to 4 cents per ton of mill feed).

RECOMMENDATIONS

Following is a synopsis of recommendations submitted to the Directors, March 17, 1965. They are applicable to Kegashka in particular, to the other Company properties in general.

1) Establish a 3 to 5 year mine reserve by exploration and drilling to be based on first year's operation.

2) Establish minimum acceptable grade consistent with scale and area of operation for guidance in selective mining operation.

3) Standardize and select equipment on the basis of eventual integration into a large scale operation.

4) Prepare for eventual exploration of property by wash-boring and other methods.

5) Arrange for research for new uses for heavy minerals, also new products that can be processed by subsidiaries.

6) Establish small shore-based laboratory for analytical work and minor testing.

7) Arrange for early prospecting trip to copper prospect.

CONCLUSIONS

In the present state of knowledge of the deposits at Natashquan, Kegashka and Moisie, it is concluded that: 1) Natashquan can support a large scale operation; 2, Kegashka can support a limited scale operation, and 3, an operation at Moisie should be postponed until further information is obtained. For reasons given elsewhere in the report, the Kegashka operation should have precedence.

Respectfully submitted,

Adam A Bruf.

CERTIFICATE

I, Alton Charles Bray, do hereby certify as follows:

1) That I am a Consulting Geologist, currently residing at Montreal in the Province of Quebec;

2) That I am a graduate of McGill University in Mining Engineering with the degree of Bachelor of Science and of the School of Graduate Studies and Research at McGill University with the degree of Master of Science in Geology and Mineralogy;

3) That I have practised my profession of Geologist and Consulting Geologist for more than twenty-five years;

4) That because of extensive prior experience with the magnetite and heavy-minerals deposits at Natashquan, Quebec, I have been retained by MINES-METALLURGIES-KEBEC Inc. for the purpose of writing this report;

5) That I have no personal interest, either directly or indirectly, in any property of MINES-METALLURGIES-KEBEC Inc. and do not expect to receive, either directly or indirectly, any interest in the securities of that Company.

Dated this 31st day of March, 1965, at Montreal.

Alton C. Bray.

Alton C. Bray
Consulting Geologist