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REPORT ON THE GEOLOGY AND PRELIMINARY ECONOMIC ASSESSMENT ON THE SOUTHERN EXTENSION TO THE OTELNUK LAKE IRON DEPOSITS

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ON THE

GEOLOGY AND PRELIMINARY ECONOMIC ASSESSMENT

OF THE

SOUTHERN EXTENSION TO THE OTELNUK LAKE IRON DEPOSITS

FOR

KING RESOURCES COMPANY

Toronto, Ontario, Canada
December 31, 1975

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M P H CONSULTING LIMITED
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SUMMARY

In June and July of 1974 King Resources Company staked 95 additional mining claims in the Otelnuk Lake area of the Quebec-Labrador geosyncline, 125 miles northwest of Schefferville, Quebec. These new claims are contiguous to and cover the south extension of the original Otelnuk Lake property, which comprised a block of 292 claims and has been held by King Resources since 1970.

The original Otelnuk Lake deposit contains very large reserves of "flatlying" low-grade magnetite and mixed magnetite-hematite, taconite-type, iron formation suitable for commercial production of iron ore concentrates. Some 613 million tons of concentratable magnetite iron formation grading 25.08% magnetic iron have been drill indicated in the original Northern Otelnuk claim group.

An exploration program over the new claim block was carried out under contract by M P H Consulting Limited during the 1975 field season. This program consisted of linecutting and detailed geological mapping. No diamond drilling was conducted.

Outcrop data from the study of the

new claim group (hereinafter referred to as the Southern Extension) suggests a possibility of 480 million tons of low-grade magnetite iron reserves within the same horizon as those of the main deposit in the Northern Claim Group. Surface grab samples of outcrop areas suggest that the grade of the Southern Extension could average higher than the corresponding zone within the Northern Claim Group.

It is therefore recommended that a diamond drilling exploration program should be carried out during the 1976 field season to better assess the tonnage and grade characteristics of these reserves and to determine their importance with respect to the property's overall development potential. A bulk sampling and ore beneficiation testing program is recommended for the original Northern Claim Group. Estimated total cost of a 2000-foot diamond drilling and 50-ton bulk sampling program is $186,000. Completion of this program and its acceptance as assessment work should keep the entire 387 claims in good standing for a further two to three years.

INTRODUCTION

Iron occurrences in the Labrador Trough area were first reported in the writings of the Jesuit missionary-explorers in the late 1800's.

In 1929, the New Quebec Company discovered high-grade iron ore in the Ruth Lake area of Newfoundland.

In 1933, Geologic Survey of Canada geologists mapped extensive iron formations which they observed within the moderately metamorphosed Precambrian sedimentary belt exposed in the southern sector of the Labrador Trough.

In 1936 the Labrador Mining and Exploration Company (LME) was formed to prospect lands held by Weaver (Minerals) Limited and in 1937 LME's geologist, Dr. J. A. Retty, followed up high-grade iron samples brought to him by a Montagnais Indian trapper, Mathieu André, which resulted in the discovery of the Sawyer Lake direct shipping iron deposit at Knob Lake. In the years that followed Hollinger Consolidated Gold Mines Limited acquired controlling interest of Labrador Mining and Exploration and in 1942 obtained licences covering the area of iron interest in New Quebec. Exploration interest dropped off and remained inter-

mittent during the balance of the war years.

Depletion of the great direct-shipping iron deposits of Minnesota during the Second World War provided impetus for a post-war continent-wide search for new resources of similar material. Follow-up of the iron finds in Labrador resulted in the discovery of many high-grade deposits in the Knob Lake area by the late 1940's.

Once the Knob Lake iron ore potential was clearly established development moved along quickly and by 1951 a railway link between the deposits and tidewater on the St. Lawrence River at Sept Iles was completed. All necessary support facilities including a mine townsite at Schefferville were constructed. The first ore shipments were made in 1952.

Simultaneously rapid development in iron ore beneficiation techniques brought interest to bear on the concentratable low-grade iron deposits at the south end of the Labrador Trough and by 1960 three major fully-integrated operations were in production, these being:

1) the Carol Lake deposits of the Iron Ore Company of Canada (IOC); 2) the Lac Jeannine deposit of Quebec Cartier Mining Company (U.S.Steel's Canadian subsiduary); and 3) the Wabush deposit of Wabush Mines Limited.

Large concentration plants, railroads, hydro-electric installations, deep sea ports, ship

loading facilities and mine and port townsites were constructed to bring these operations into being. Over one billion 1960 dollars was spent on development of the area to establish it as Canada's principal source of iron concentrates and pellets for North American and European steel mills.

The initial search for iron deeply penetrated the remotest areas of the Quebec-Labrador Peninsula and general information on the distribution and potential of iron throughout the Trough, as far north as Ungava, was well established before market saturation finally brought the big iron exploration push to an end, about 1961.

In the late 1960's long range views of the world's projected steel production and consequent iron ore requirements, began to point toward the need for major expansion of the existing operations in the Wabush-Carol Lake and the Lac Jeannine areas. Expansion soon followed and now, in 1975, U.S.Steel's Quebec Cartier operation was virtually doubled and IOC's Carol Lake operation has tripled production of iron concentrates. Table I. below contains reserves and production details:

Company	Deposit	Approximate Reserves (Est.d) (tons)	Initial Concentrate Output (tons)	Expanded Concentrate Output (tons)
Iron Ore Company of Canada	Carol Lake	2 billion	7.5 million	22 million
Quebec Cartier Mining (U.S.Steel)	Lac Jeannine	300 million	8.5 million	16 million
Wabush Mines Limited	Wabush	1 billion	6.5 million	6.5 million

The anticipated growth in world iron markets rekindled interest in the iron belt generally and more specifically in the areas containing the largest potential for concentrating-type deposits. As a result, the Otelnuk Lake iron occurrence was staked in March and April of 1970 on behalf of King Resources Company, a Calgary-based division of King Resources Company of Denver, U.S.A.

During the 1970 field season M P H Consulting Limited (then Metals, Petroleum & Hydraulic Resources Consulting Limited) was commissioned by King Resources Company to continue the evaluation of the Otelnuk deposit by means of exploration and diamond drilling.

As a result of the two field seasons of exploration and diamond drilling amounting to 4424 feet in 21 holes it was established that large concentratable reserves were available in the original property and furthermore a possibility existed that the southward extension of the iron formation could contain additional important zones of the same type of concentratable material. As a result, therefore, in 1974 King Resources Company acquired 95 additional mining claims forming the Southern Extension to the original Otelnuk Lake deposit.

During the 1975 field season, M P H Consulting Limited was once again engaged by King Resources Company to carry out a field examination of the new Southern Extension area.

The program included linecutting, geological mapping and outcrop sampling. The present report contains the data and results of this field work together with conclusions and recommendations regarding the further exploration and evaluation of the whole Otelnuk property.

HISTORY OF PREVIOUS WORK

The Otelnuk Lake iron occurrence was first held under concession by Norancon Exploration (Quebec) Limited, in the early 1950's. The Company extensively prospected the area for direct shipping ore. No direct shipping ore was discovered and the Company eventually dropped the concession.

In 1965 the Otelnuk Lake area was "withdrawn from staking" by the Quebec Department of Natural Resources to protect the area while department geologists conducted a base metal geochemical survey. The survey was subsequently completed and the area was re-opened for staking in 1968. From that time on it remained open until March, 1970 when it was acquired by staking for King Resources Company. Apart from the presence of old campsites and gas caches on some of the nearby lakes there is no evidence of previous physical work within the area.

PROPERTY

The subject property consists of ninety five (95) contiguous claims totalling approximately three thousand, eight hundred (3,800) acres. Licence numbers claim numbers, townships, staking dates and expiration dates are listed in Table II following.

All of these claims are situated north of the fifty-fifth (55th) parallel. According to the Mining Act, which governs mining in the Province of Quebec, required assessment work for mining claims north of the fifty-second (52nd) parallel need only be filed with the Department of Natural Resources of Quebec by the second staking anniversary of such claims. The required work must then involve, for the first two years, an expenditure of six dollars per acre and must be reported and filed with the Quebec Department of Natural Resources no later than the thirtieth day after the expiration date of a claim. Claims are ordinarily 40 acres in area. Upon completion of these requirements development licences are acquired at a cost of $0.25 per acre. Thereafter annually, development licence renewal costs $0.25 per acre and assessment work requirements are $4.00 per acre in the form of acceptable technical or physical work. Assessment

work reports must be filed with the Quebec Department of Natural Resources not later than 30 days after expiration date of the claims.

TABLE II

OTELNUK LAKE IRON PROPERTY CLAIM RECORD

Licence No.	Claim No.	Township No.	Staking Date	Renewal Date
345503	1,2	4650	June 27, 1974	June 27, 1976
345503	3,4,5	4650	June 28, 1974	June 28, 1976
345504	1,2,3	4650	June 28, 1974	June 28, 1976
345504	4,5	4650	June 29, 1974	June 29, 1976
345505	1,2,3,4	4650	June 29, 1974	June 29, 1976
345505	5	4650	June 30, 1974	June 20, 1976
345506	1,2,3,4,5	4650	June 30, 1974	June 30, 1976
345507	1,2,3,4,5	4650	July 1, 1974	July 1, 1976
345608	1	4650	July 1, 1974	July 1, 1976
345508	2,3,4,5	4650	July 2, 1974	July 2, 1976
345509	1,2	4650	July 2, 1974	July 2, 1976
345509	3,4,5	4650	July 3, 1974	July 3, 1976
345630	1,2,3,4,5	4750	June 26, 1974	June 26, 1976
345631	1	4750	June 26, 1974	June 26, 1976
345631	2,3,4,5	4550&4750	June 27, 1974	June 27, 1976
347191	1,2,3,4,5	4650	June 26, 1974	June 26, 1976
347192	1	4650	June 26, 1974	June 26, 1976
347192	2,3,4,5	4650	June 27, 1974	June 27, 1976
347193	1,2	4650	June 27, 1974	June 27, 1976
347193	3,4,5	4650	June 28, 1974	June 28, 1976
347194	1,2,3	4650	June 28, 1974	June 28, 1976
347194	4,5	4650	June 29, 1974	June 29, 1976
347195	1,2,3,4	4650&4651	June 29, 1974	June 29, 1976
347195	5	4651	June 30, 1974	June 30, 1976
347196	1,2,3,4,5	4651	June 30, 1974	June 30, 1976
347197	1,2,3,4,5	4651	July 1, 1974	July 1, 1976
347198	1	4651	July 1, 1974	July 1, 1976
347198	2,3,4,5	4651	July 2, 1974	July 2, 1976
347199	1,2	4651	July 2, 1974	July 2, 1976
347199	3,4,5	4651	July 3, 1974	July 3, 1976
347200	1,2,3	4651	July 3, 1974	July 3, 1976
347200	4,5	4651	July 4, 1974	July 4, 1976

LOCATION AND ACCESS

The property covers approximately six square miles in the centre of the Quebec-Labrador Peninsula, between latitudes 55° 55'N and 56°05'N and longitudes 68°10'W and 68°30'W.

The mining town built by the Iron Ore Company of Canada, Schefferville, lies about 115 miles southeast of the Southern Otelnuk property and is the centre of communication and supply for the Northern region. Schefferville is also the railhead for the Quebec North Shore and Labrador Railway Company, a distance of 357 railmiles due north of Sept Iles, tidewater super-port on the Gulf of St. Lawrence.

Schefferville is serviced by air by Quebecair Limited, with scheduled daily commercial flights from Montreal and Sept Iles. At present the Otelnuk Lake area is reached by float or ski-equipped aircraft from Schefferville.

GEOGRAPHY AND PHYSIOGRAPHY

Flora and Fauna - The most remarkable biological feature of this general area is its fairly heavy forest cover, which exists despite the high altitude (56°N). Commonly within the Quebec-Labrador Peninsula the treeline lies well to the south; in fact, the Schefferville area is virtually forest free. Altitude is of course a contributing and controlling climatic factor and locally the treeline is at an elevation of approximately 1750 feet a.s.l. Maximum elevation at the property is 1250 feet above sea level. Substantial stands of black spruce and balsam fir occupy the area with a ground cover of moss and low-growing willow and Arctic birch shrubbery.

Caribou, black bear, wolves and the usual small fur-bearing animals inhabit the area. Common migratory waterfowl, partridge and smaller birds are present in limited numbers and lake trout and speckled trout are plentiful in the rivers and lakes.

Topography and Drainage - The property area covers a series of eastward sloping ridges with elevations ranging from 1000 to 1250 feet above sea level. The western margin of the property comprises steep outcrop terraces bounded by a strong north-south drainage system

occupied by M P H Lake, Concession Lake and connecting lakes and streams flowing northwestward into the Kaniapiskau River. Within 1/2 mile of the western boundary of the claim group, the terrain slopes gently eastward toward the irregular, glacial drift covered, basin occupied by Otelnuk Lake. Otelnuk Lake is approximately 875 feet above sea level.

Regionally, the principal direction of flow for the main drainage systems is northward. On the west side of a series of granite hills, lying 15 miles west of the claim group, the Kaniapiskau River follows a straight course northwestward for 100 miles or more to a point where it joins the Koksoak River and eventually empties into Ungava Bay some 50 miles beyond.

Within the terrain immediately to the west of the property, the drainage system of M P H Lake and Concession Lake flows through a series of lakes and fast-moving streams, running first northward and then westward into the Kaniapiskau. To the east the Swampy Bay River System works its way northward from headwaters in the Schefferville area to the broad shallow basin of Otelnuk Lake. The outlet of Otelnuk Lake cascades over a spectacular 75-foot waterfall, known as High Falls, fifteen miles to the northeast of the Southern property's basecamp. From this point the Swampy Bay River flows northwestward into the Kaniapiskau, some 65 miles to the north of High Falls.

Within the property itself the drainage is sluggish and immature; the lakes tend to be

small, shallow and marshy because of the flatlying sub-crop and the mantle of glacial debris. Although water is plentiful, the property itself is not wet by normal northern Quebec standards.

Climate - The winters in the area are cold and snows are heavy. The summers are generally cool and wet. Spring and Fall seasons, common to southern regions, are virtually non-existent in the Otelnuk Lake region.

Combined mean annual rain and snowfall amounts to approximately 35 inches (90 cm) of precipitation.

In spite of a rather inclement summer season and the usual insect problems, field work can be carried out with good efficiency between June 1st and September 30th. Winters, although cold, are excellent for claim staking, surveying, drilling and freighting operations. No doubt they are also suitable for open pit mining operations.

EXPLORATION WORK - 1975

Working from a basecamp on a nearby lake, designated M P H Lake (see geological map), the area was explored in considerable detail by a crew of 7 men, during the period from June 26 to July 27, 1975.

A picket line grid system was set out with crossline spacings at 2000-foot intervals. Outcrop mapping as well as claim post localization was conducted using this picketline grid for control.

Personnel - Field and consulting personnel included the following men working for various intervals during the field season and subsequent report preparation period:

Consultant:	E.D.Black, Bradford, Ontario
Party Leader:	P.G.Schoch, Montreal, Quebec
Senior Assistant:	K.L.Reading, Markham, Ontario
Bushmen:	E.Etienne, Pointe Bleu, Quebec
	M. Dominique, Pointe Bleu, Que.
	B. Germain, Pointe Bleu, Quebec
	W.Germain, Pointe Bleu, Quebec
	L.Ouellet, Mont Laurier, Que.

Outcrop Mapping - Using the 2000-foot gridlines for mapping control, outcrops and geological contacts encountered along the lines and on traverses carried out between these lines, were recorded in field notes and subsequently transferred to the base map. A geological map sheet at a scale of 1" equals 1000' has been prepared and forms part of the present report.

Because of the uniform nature of the formations and simplicity of structures the mapping was carried out with little difficulty, however, in areas lacking outcrop the contacts were located by topographic features and interpolation.

Claim Localization - Considerable effort was put into the accurate localization of the claim posts with respect to the picketline grid. This was deemed to be very important because of the unreliability of claim lines oriented by the staking using simple magnetic compasses.

All of the claim posts were found and have been plotted on the map sheet accompanying this report.

GEOLOGY

Regional Geological Setting - The Labrador Trough extends from Wabush Lake to the mouth of Ungava Bay, a distance of approximately 600 miles. The Trough is mainly underlain by a succession of sedimentary volcanic and intrusive rocks of late Precambrian Age.

Carbonate and siliceous iron oxide facies form part of the sedimentary sequence. These iron formations generally occur near the bottom of the sequence along the western margin of the Trough, in a belt 4 to 6 miles wide and almost 600 miles in length. A complex of Archean granites and granitic gneiss rocks unconformably underlies these sediments along the western margin of the geosyncline.

Above the granitic basement, in ascending order, the near-basement sediments and their low-order metamorphic derivatives are identified as follows: arkosic conglomerate, slate, argillaceous quartzite, iron formation, slate and dolomite. The iron formation is mainly a metallic cherty or jaspilite type with both carbonate and oxide iron minerals present in the different amounts.

Regional metamorphism, responsible for the development of granular characteristics in the iron for-

mation, increases from west to east and from north to south over most of the Trough.

Folding and faulting is pronounced within north, south and easterly extremities of the main geosynclinal belt and the trend of the main fold axes and faults has a general north to north-westerly direction; that is, parallel to the long axis of the geosynclinal trough. Along the western margins of the central part of the Trough, folding is scarce but the north-south faults often persist.

Geology of the Otelnuk Iron Property - All of the consolidated rocks outcropping in the Otelnuk iron property are of Precambrian Age. Locally, the sedimentary member which immediately underlies the iron formation is a siliceous argillite. The iron formation, itself, is divisible into four principal members or units. In ascending order these units are designated as follows: a) lower oxide iron formation (unit 4); b) lower cherty carbonate formation (unit 3); c) upper oxide iron formation (unit 2); and, d) upper cherty carbonate formation (unit 1). For the most part the iron is present as minerals such as magnetite, hematite and siderite or ferro-dolomite. Hematite and/or magnetite bearing units represent about two thirds of the estimated 625-foot thickness of the iron succession. Of immediate current interest are the magnetite bearing sub-units in which siderite and ferro-dolomite are at a minimum. Most important is the uppermost cherty-magnetite and jasper-magnetite sub-units. These important iron oxide sub-units are partially

overlain by a thick layer of cherty-carbonate iron formation with the iron being mainly in the form of iron carbonates.

The whole iron-bearing sequence is capped by shales and dolomites beyond the Otelnuk property limits to the east and northeast.

Structural Geology - Within the Otelnuk Lake property the structure is very simple. The iron formation is flatlying to gently inclined and rolling. Dips average 4-5 degrees easterly. The individual members of the sedimentary succession are well exposed as a series of benches or terraces in the western part of the property and the upper magnetic iron formation sub-unit forms the top of the column in the claim staked part of the property where it is mainly covered by glacial drift.

Metamorphism - Metamorphism within the Otelnuk Lake property appears to be of low to moderate rank. The development of a fine crystalline mineral texture appears to be related to regional matamorphism of a moderate nature.

Facies Changes - Within the interesting oxide iron formation units, the most notable compositional feature is the rather abrupt vertical change from magnetite to hematite to carbonate iron minerals. Peculiarly enough this change is not always accompanied by a corresponding alteration of the silica from chert to jasper. The iron carbonate minerals, principally siderite and ferro-dolomite, are more abundant in the upper and middle iron formation units.

Lateral facies changes are notable within the various units and sub-units as they progress northward and southward within the property.

These changes bring about an increase or decrease in the iron tenor of the individual units and sub-units and are described more fully in subsequent parts of this text.

Compositional changes appear to be related to primary deposition features rather than metamorphic change; thus the relative content of various minerals, while persistent over large areas, does tend to rise and fall within the confines of the property and, indeed, is noticeable even within the southern portion of the property, which is of course the subject area.

IRON FORMATION - SEQUENCE, FORMATIONAL DESCRIPTIONS AND THICKNESSES

To retain continuity with detailed formational descriptions in earlier reports on the northern property the following is laid out on a similar format and differs only according to local findings. A comparison of these descriptions with previous ones covering the northern property shows the important similarities and some of the more subtle differences.

Unit 1 - Upper Cherty Carbonate Formation - Estimated thickness ≠ 200 ft.

This unit forms the bedrock ledge within most of the eastern part of the area mainly to the east of the claim group. In general it is a rusty weathering, banded or fragmental, cherty iron carbonate.

Some horizons contain black or greenish chert oolites in a grey chert matrix, with carbonate interlayers an inch or so in thickness.

Magnetite is disseminated and occurs in minor amounts throughout, but its content in this rock varies widely and gradually increases toward the lower part of the member. In the South Extension this unit forms fairly prominent, readily identifiable, outcrop ridges in the eastern portion of the claim group.

Unit 2 - Upper Oxide Iron Formation - Thickness approximately 250 ft.

This is the principal unit of initial economic potential and comprises the following three distinctive sub-units:

Sub-unit 2a - Cherty Magnetite-thickness approximately 50 ft.

This sub-unit contains banded green and grey chert, with fine grained magnetite occurring as dissemination or in irregular bands, lenses and thin laminae-often massive. Carbonate is present throughout, but gradually decreases toward the lower part of the horizon. Overall average grade is estimated to be 30% soluble iron and average magnetic iron content is probably ≠ 25% Fe.

Drilling in the north Otelnuk Lake property indicates that the thickness of this sub-unit ranges from 35 to 71 feet. It appears to have a similar thickness in the southern property and visual estimates of thickness from outcrop data tends to suggest an average of 50 feet in this sector as well.

This sub-unit thins southward in the northern property but it appears to thicken again in the South Extension and possibly thins once more toward the south property boundary.

From outcrop evidence, the average grade would ap-

pear to be at least as high in the South Extension as in the northern part of the property, i.e. 25% Mag Fe. Additionally, a higher grade zone appears to develop between lines 210 ⁄ 00 south and 290 ⁄ 00 south, a strike length of approximately 8000 feet. In this sector there are large areas of exposed cherty magnetite with magnetic iron content well above the 25% Mag Fe average.

The cherty magnetite in this enriched zone contains bands up to 2 feet in thickness of nearly 100% magnetite (65-70% magnetic iron) separated by cherty magnetite with lower magnetic iron content. Analysis of a selected high-grade sample contained 65.9% soluble iron and 64.6% magnetic iron (see Table III-Certificate of Analysis Sample No. 32). The maximum exposed thickness in outcrops of this enriched zone is approximately 12 feet and it is estimated to have an average magnetic iron content of over 30%. Representative samples averaged 34.1% soluble iron and 31.1 magnetic iron. See Table III, Sample No.28.

Total thickness of the unit here is visually estimated to be at least 50 feet in the Southern Extension.

Throughout the property the cherty-magnetite subunit is transitional downward into a jasper-magnetite-hematite member. There is a transition zone

PHONE: (705) 352-3341 P. O. BOX 430

LAKEFIELD RESEARCH OF CANADA LIMITED

LAKEFIELD, ONTARIO
CANADA

Certificate of Analysis

Date: December 17, 1975

Received: October 27, 1975

From: MPH Consulting Limited,
100 Adelaide Street, West,
Toronto, Ontario, Canada.

Our Reference No. L.R. 1886

Invoice No. _____

Samples submitted to us show results as follows:

Sample No.	% Sol. Fe	% Mag. Fe*	Formational Sub-Unit
4	33.5	32.9	4a
5	19.7	14.6	3c - 3b
6	21.0	9.6	3b - 3a
7	24.2	16.3	2c
18	36.7	25.8	2a - 2b trans.
21	25.7	17.7	2a
25	38.1	14.8	2b
28	34.1	31.1	2a
32	65.9	64.6	2a H.G.
38	35.1	30.3	2a
49	23.8	6.86	4b

DEC 19 1975

* Satmagan

To: Mr. G.A. Tremblay (2)

SIGNED A.G. Scobie

MANAGER

A.G. Scobie, P. Eng.,

between the two which averages 2 feet in thickness but varies from 1 to 10 feet in thickness. Representative outcrop samples of the transition zone contained 36.7% soluble iron or 25.8% magnetic iron (see Sample #18 Table III).

Sub-unit 2b - Jasper-Magnetite-Hematite-Thickness approximately 100 ft.

Like the northern part of the property, in the Southern Extension this sub-unit is diagnostically bright red in colour. It is composed of fine-grained magnetite and hematite in bands separated by jasper layers and lenses, generally containing disseminated magnetite and hematite. Distinct oolitic and concretionary textural forms are common, contrasting sharply with the fine-grained laminar characteristics of the underlying cherty-magnetite 2c sub-unit.

In the northern part of the property drilling indicated an average thickness of approximately 100 feet, an average soluble iron content of 35.75% Fe and an average magnetic iron content of 19.54%.

There is an apparent gradation in soluble and magnetic iron content from top to bottom of this unit. Usually the uppermost portion of the unit is at least as high in soluble and magnetic iron content as the overlying cherty magnetite. The iron content decreases towards the bottom of the unit. A

local reference outcrop sample of the 2b sub-unit graded 38.1% soluble iron or 14.8% magnetic iron (Sample #25 Table III). The difference between soluble and magnetic iron is largely a reflection of hematite content.

Sub-unit 2c - Banded Cherty-Magnetite Iron Formation - Thickness approximately 100 ft.

Characteristically, in the northern Otelnuk property this is a laminated to banded, fissile, grey to black, siliceous iron sub-unit. Good segregation between magnetite-rich and silica or carbonate-rich laminae exists. In fact, there is little magnetite in the chert and carbonate interlayers and vice versa. The minerals are quite fine-grained and massive. Three drill holes have intersected the full thickness of this sub-unit in the northern sector where it ranges from 85 ft. to 100 ft.

This sub-unit appears to be reasonably consistent from the northern to southern sector with the banding becoming slightly less obvious toward the south.

An outcrop sample of representative 2c assayed 24.2% soluble iron and 16.3% Mag. iron, the difference being due to hematite and partly to iron carbonate content. (see Sample #7, Table III).

Unit 3 - Lower Cherty Carbonate - Thickness approximately 125 Ft.

In the northern sector this carbonate facies com-

prises three sub-units; a cherty-carbonate, a cherty magnetite-carbonate and an argillaceous-cherty-carbonate unit. The central member, which contains enough magnetite to be of some economic interest, may not be a continuous horizon throughout the property. In the south sector, there is a less obvious segregation between the sub-units and the whole becomes a cherty-carbonate-magnetite unit with varying magnetite content throughout.

Sub-unit 3a - Cherty-Carbonate - Thickness approximately 35 ft.

This is a grey, massive to irregular, banded rock, comprising principally chert and siderite or ferro-dolomite. It appears to be simply a cyclical replica of the upper cherty carbonate unit. A local increase in the magnetite content makes this sub-unit distinguishable from its cherty-magnetite-carbonate underlayer. In the northern property drill holes have intersected 35 feet of this member. It is not well exposed in the southern map area however it probably grades similarly about 19-20% soluble iron and 14-16% magnetic iron.

Sub-unit 3b - Cherty-Magnetite or Black Ironstone - Thickness approximately 40 ft.

An increase in the amount of granular magnetite disseminated throughout the cherty layers, develops a sometimes separable sub-unit that resembles the cherty-magnetite of the upper oxide iron formation

facies. In the northern map area up to 50 feet of this stratum, averaging 26.51% soluble iron, where intersected by drill holes.

No clear identification has been made for this sub-unit in the Southern Extension.

Sub-unit 3c - Argillaceous-Cherty-Carbonate-Thickness approximately 50 ft.

In the northern sector the diagnostic difference between this sub-unit and other cherty carbonate horizons in the sequence is its abundance of argillaceous laminae and silty carbonate bands. Magnetite content is very low and the overall iron content is correspondingly low. The rock is a grey, fine-grained, massive to banded variety.

Only one drill hole intersected the full thickness of the member in the northern property, indicating a thickness of at least 48 feet exists. The contact between this argillaceous sub-unit and its overlying carbonate member is transitional within a few feet. The underlying contact with the lower oxide iron formation is very sharp and distinctive.

This sub-unit has been observed in the Southern Extension but it has not been clearly distinguished as a persistent mapable iron formation member.

Unit 4 - Lower Oxide Iron Formation - Thickness approximately 50 ft.

Three sub-units are distinguishable in the northern property but a lack of outcrop in the Southern Extension renders the local distinction uncertain at this stage. Sub-units are, from top to bottom:

Sub-unit 4a - Cherty Magnetite

Sub-unit 4b - Bedded jasper-hematite-magnetite

Sub-unit 4c - Augen jasper-hematite

A single drill hole intersected the whole unit in the north property where the thickness was 51 ft. Soluble iron content of core indicated 36.06% Fe, however magnetic iron ranged from 2.20% Fe to 25.4% Fe. Hematite is the principal iron mineral but obviously magnetite can be quite important in certain horizons.

Sub-unit 4a - Cherty Magnetite Iron Formation - Thickness approximately 2 ft.

This sub-unit comprises granular magnetite with replacement hematite disseminated and interlayered with chert. This is a grey-blue member notably more magnetic than its underlying oxide iron relatives.

A drill core penetration in the northern map sheet cut 2 feet which assayed 30.96% Sol Fe and 25.4% Mag Fe.

An outcrop sample of the same sub-unit in the

Southern Extension to the property assayed 33.5% soluble iron and 32.9% Mag iron (see Sample #4 Table III) - a notable improvement in grade and magnetic iron content. In that outcrops are scarce in the South this can hardly be considered representative of the 4a sub-unit overall.

Sub-unit 4b - Bedded Jasper-Hematite-Magnetite - Thickness approximately 40 feet

A well bedded member of the iron formation containing distinct layers or beds of massive fine-grained metallic hematite and red jasper. The hematite rich beds range from a fraction of an inch to a foot in thickness and contain only minor jasper impurity.

Assays of three drill hole core samples in the Northern property averaged 35.75% soluble iron and 3.1% magnetic iron over an average thickness of 31.5 feet.

In the South Extension outcrop data is scarce. A single outcrop sample assayed 23.8% soluble iron and 6.86% magnetic iron (see Sample #49 Table III). How representative this sample is of the sub-unit for the southern sector is not known at this stage.

Sub-unit 4c - Augen Jasper - Hematite-Magnetite Iron Formation - Thickness estimated at 5 feet.

In the northern property this sub-unit is identified by its lenticular to nodular jasper which

appears to be a deformational or unusual depositional characteristic of the earliest iron oxide member. Some goethite, limonite, clay silicates and possibly manganese hydroxide minerals may be present at times. Magnetic properties are low compared with overlying members.

A drill intersection in the northern property cut five feet of 30.1% soluble and 7.7% magnetic iron. In the southern property the member has not been widely identified and no characteristic outcrop samples have been assayed. Thickness is possibly similar in both northern and southern sectors.

The 4c iron oxide sub-unit is in sharp contrast and disconformity with underlying argillaceous rocks.

Unit 5 - Argillite

Directly beneath the lowest main member, sub-unit 4c, a few feet of massive jaspillite separates the iron formation from an underlying argillite. The latter is a poorly banded, fine grained dark brown weathering, fissile rock. This member is transitional downward into a 15-foot thick massive green chert, containing minor pyrite.

Unit 6 - Arkose, Granite and Granite Gneiss

The oldest sedimentary member is a pink to red arkosic sandstone which forms a thin layer over

the underlying granite, and granite gneisses. This rock is likely a derivative of the older granitic rocks upon which it lies.

The local basement rocks have been observed in several outcrops west of M P H Lake.

At one locale the rock is a pink pegmatitic, coarse-grained granite with large phenocrysts of K-feldspar, biotite and quartz.

Elsewhere the basement comprises a poorly developed grey gneiss of a dioritic composition.

ECONOMIC CONSIDERATIONS

Prime Iron Formation - The initial economic potential of the South Extension property at Otelnuk lies within the uppermost iron oxide sub-unit, i.e. the Cherty Magnetic 2a sub-unit. This is clearly the strike extension of the same iron formation member that contains an estimated 613 million tons of open pit mineable magnetic iron averaging 25.08% Mag Fe in the central part of the original Northern Property.

In the Northern Property, both the thickness and iron tenor of the 2a sub-unit drop off southward from the main reserve, however, approximately two miles south of the boundary between the two properties the thickness appears to be regained and the magnetic iron content also appears to return to levels equal to or greater than those of the principal reserves in the northern claims.

The true thickness, extent, and average grade of the Upper Cherty-magnetite iron formation in the Southern Property is not accurately known, as there has been no drilling in this part of the property thus far. On the other hand, a review of the outcrop data indicates that the grade comes back to the 25% Mag Fe level and the thickness to an average of 50 feet, by gridline 9000 ft. south (i.e.

9000 feet south of the boundary between the two claim groups.

With a reasonable degree of confidence this grade and thickness is considered to be maintained southward to approximately crossline 410 ⁄ 00 S.

Initial Potential Reserves - In the Southern Extension the prime open pit reserves potential lie with the Upper Cherty-Magnetite Iron Formation.

In this regard preliminary calculations indicate potential magnetic iron reserves of 480 million long tons expected to average 25% Mag Fe or better. These reserves are based on a formational strike length of 32,000 feet (i.e. from 90 ⁄ 00 S to 410 ⁄ 00 S). Widths vary somewhat but average approximately 3000 feet in an east-west direction. Thickness is taken as a consistent average of 50 feet. For convenience, a tonnage factor of 10 cubic feet per ton is used in all calculations.

Calculations -

$$\frac{32000 \times 3000 \times 50}{10} = 480{,}000{,}000 \text{ long tons}$$

Long Range Additional Potential Reserves - As in the case in the Northern Property the Southern Extension contains enormous long range reserves of underlying material in the form of the hematite-magnetite-jasper and cherty-magnetite, 2b and 2c iron formation sub-units, not to mention formations lower down in the sequence which may prove economically mineable at some time in the distant future.

Although it is somewhat academic a quick calculation of the 2b and 2c sub-units directly beneath the zone involved in the above-mentioned 2a reserves indicates that 1.92 billion long tons lies in the offing - disregarding surface exposed zones to the west and extensions eastward beyond the current area of consideration. Conceivably well over 2 billion tons will become available some day when the 2a Cherty-Magnetite member has been removed by mining.

Calculations:

$$\frac{32000 \times 3000 \times 200}{10} - 1,920,000,000 \text{ long tons}$$

Grade of this material will likely average 35% Sol Fe in the 2b hematite-magnetite member and 20-25% Sol Fe or 15-20% Mag Fe in the 2c magnetite-chert member.

For obvious reasons no effort is made at this time to look beyond, to iron reserves that lie within the underlying cherty carbonate and jasper hematite 4c iron sub-units. Nevertheless this very long range reserve is not being overlooked.

CONCLUSIONS

The Southern Extension of the Otelnuk Lake Property contains the southward continuation of the flatlying iron formation sequence previously mapped and diamond drilled in the original Northern claim group. All of the iron formation units and sub-units appear to be represented with roughly similar iron tenor, thicknesses and mineralogical and textural characteristics.

Primary reserves of open pit mineable and readily concentratable iron lie within the extension of the same cherty-magnetite iron formation sub-unit 2a, that contains the previously estimated 613 million tons (25.08% Mag Fe) drill indicated reserves within the original Northern property.

Within the Southern Extension it is estimated that the 2a iron formation member could contain 480 million long tons of open pit mineable reserves at an average grade of 25% Mag Fe or better. Outcrop mapping suggests that a zone of iron enrichment lies in the central part of these southern reserves that could enhance their grade and thickness and thereby increase the tonnage and grade beyond these preliminary estimates. This could shift the emphasis of initial reserves to the Southern Otelnuk

Property.

Mineralogical and textural characteristics of the cherty-magnetite which forms the primary reserves is sufficiently similar to its northern counterpart so as to suggest that no beneficiation problems or detrimental characteristics are to be expected in the eventual concentrate production from these primary reserves.

Diamond drilling is required to establish grade, thickness and compositional consistency in order to confirm these preliminary reserves estimates.

Because of the general similarities of the various iron formation members in both North and South properties major long range reserves in the 2 billion ton (plus) category can well be expected directly beneath the reserves within the top Cherty Magnetite Member. Also, like its Northern counterpart, the Southern Extension probably contains still larger reserves within the iron formation units which underlie the principal upper members. Here again diamond drilling will be required for grade and tonnage determinations and beneficiation tests will be needed to establish concentratability.

RECOMMENDATIONS

The results of the 1975 geological mapping program over the Otelnuk Southern Property have been sufficiently encouraging to warrant recommending a program to retain and expand the claim group and to conduct a systematic diamond drilling program to verify indicated reserves approaching the same order of magnitude as the original Northern Property.

A program of 2000 feet of wireline diamond drilling is required at an estimated total cost of $136,000.

It is further recommended that a bulk sample or modest diamond drilling program be carried out simultaneously on the Northern claim group to expand the data base on this part of the property and to meet its assessment requirements for the coming year. It is estimated that the bulk sample program will cost in the neighbourhood of $50,000. A drilling program in its stead is estimated at a cost of $32,500.