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PRELIMINARY REPORT ON HOPES ADVANCE BAY AREA, NEW QUEBEC

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PRELIMINARY REPORT

ON

HOPES ADVANCE BAY AREA

NEW QUEBEC

BY

D. P. GOLD

QUEBEC
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ERRATUM

The following paragraphs should be added at the end of the chapter entitled "ECONOMIC GEOLOGY".

Sulphides

Rusty zones and gossans are common. These usually represent disseminated sulphides, mostly pyrite, in black shales that weather deep purple.

Less common but perhaps more promising are the mineralized zones near the base of gabbro sills. These contain disseminated pyrite, pyrrhotite, chalcopyrite, and pentlandite. Jenkins (1957 Company Report) reports a mineralized zone 25 feet wide in a blotchy gabbro sill near the intersection of latitude 59°10' and longitude 69°49'. The gabbro is 100 feet thick and overlies a rusty zone of black shale which dips 70° east. A sample of this material assayed 0.25 per cent nickel and 1 per cent copper. At the north end of this zone a shear zone separates the gabbro from the overlying lava. A 2-inch vein of massive sulphides, exposed in a section perpendicular to the trend of the structure and traced for only 6 inches, assayed 5.24 per cent nickel and 2.90 per cent copper. (Jenkins 1957).

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INTRODUCTION

The Hopes Advance Bay area is one of four areas mapped by the Quebec Department of Mines during the summer of 1958 along the west coast of Ungava bay. This programme was designed to complete the regional mapping by the Department of the iron-bearing formations between Reine bay and Payne bay. The section immediately south of Payne bay was mapped by R. Bergeron in 1957.

The area covers approximately 640 square miles. It extends south of Hopes Advance bay to latitude 59°00'; to the north it is bounded in part by latitude 59°38' and in part by latitude 59°35'. The western boundary is longitude 69°50', and the eastern is Ungava bay.

Hopes Advance Bay, the main population centre in the area, has an airstrip which can handle DC-3 aircraft. It is 100 miles north-northwest of Fort Chimo. During the summer a floating wharf is available for servicing float planes. Consideration has been given to the construction of a deepwater harbour near Breakwater point in the bay. During the summer the Eskimos establish small communities at Merganser point and near the mouth of the Chien-Rouge river.

Topographically, the area is characterized by a series of ridges and hills of more resistant rocks reaching an elevation of about 550 feet above a coastal plain. The plain has a mean elevation of about 150 feet above sea-level. Post-glacial uplift of the area is evidenced by numerous raised beaches, 17 of which were noted up to the 250-foot level.

The topography is controlled mainly by rock structure, with the eastern part of the area more subdued than the western. In the southwestern sector, the gabbro and volcanic rocks form resistant ridges separated by long valleys and lakes underlain by softer rocks, mainly argillites. Siliceous, ferruginous formations form prominent hills in thickened drag-folded areas.

The ridges have been rounded and smoothed by continental ice moving generally N.30°E. Glacial stripping has exposed an area of almost continuous outcrop to the east whereas the central portion of the area is one of glacial deposition and marine sorting with consequent wide areas of overburden.

The drainage is generally convergent toward Ungava bay. In the south the rivers drain toward Reine bay. Lakes are abundant. Those to the east

are generally shallow and unsuitable for float planes. The "glint"-type lakes in the softer argillites are both larger and deeper. Though relatively small, Chien-Rouge river appears to offer the most suitable site for hydroelectric power in the area.

GENERAL GEOLOGY

Sedimentary, volcanic, and intrusive rocks of the Labrador geosyncline unconformably overlie basement gneisses in the western part of the area, and abut against siliceous paragneisses in the eastern part. The younger rocks have been folded into a series of large drag-folds in which one of the formations in particular, the iron-bearing sequence, is generally thickened in the troughs and crests.

The siliceous paragneisses are described as the Eastern paragneiss complex and form a coarse-grained siliceous phase which is thought to belong to the same sedimentary cycle as the argillaceous sedimentaries to the west.

TABLE OF FORMATIONS

CENOZOIC	PLEISTOCENE AND RECENT		Alluvials, marine-cut mud and boulder flats, marine terraces; moraines, eskers.
PRECAMBRIAN	PROTEROZOIC	INTRUSIVE ROCKS	Diabase Pegmatite Gabbro, diorite, blotchy gabbro, meta-gabbro, amphibolite
		SEDIMENTARY AND VOLCANIC ROCKS: Upper Schists (thick)	Biotite-chlorite schist; hornblende schist; quartz-biotite-muscovite-plagioclase schist; sericite schist; quartzose schist; calcareous schist; diopside marble; orthoclase-quartz-biotite gneiss.
		Upper Volcanics	Intermediate and basic, fine-grained lavas; Altered and sheared volcanics
		Dolomites and Schists	Talcose schists; siliceous dolomite
		Lower Volcanics	Fine-grained basalt; hornblende schist
		Schists; slate	Mainly schists with some slate
		Iron-bearing Sequence	Spotted carbonate member Oxide member Silicate member
		Basal Sequence Unconformity	Quartz- and garnet-muscovite-biotite schist. (Lower Schists) Quartzite
	ARCHEAN	Western Gneissic (Basement) Complex	Pink and grey granitic gneiss and pegmatite
	PROTEROZOIC?	Eastern Gneissic Complex (probably equivalent to the metasedimentary rocks to the west - above the Iron-bearing Sequence)	Pink and grey granitic gneiss with layers and inclusions of hornblende schist; quartzite; schists; garnet-hornblende gneiss; calc-silicate rock.

Archean

Western Gneissic Complex

The basement or western gneissic rocks are exposed only in the northwestern sector of the area and are overlain unconformably by rocks of the basal proterozoic sequence. The dominant rock is a pink (locally grey) granitic gneiss, composed essentially of potassic feldspar, plagioclase, quartz and biotite. Near Hopes Advance bay the rock is a pink, medium- to coarse-grained augen gneiss composed of ovoids of microcline in a finer-grained quartz-plagioclase-biotite matrix. The strike of the overlying sedimentary rocks is conformable with the foliation of the gneiss except in the "Bay zone" west of Hopes Advance bay (see map).

At the intersection of latitude 59°36' and longitude 69°48' a feldspathic pegmatite dyke is intruded along contact.

Proterozoic?

Eastern Gneissic Complex

The dominant rock type is a pink to grey, banded, siliceous, quartz-plagioclase-biotite gneiss. In places, this may contain stringer-like bands of quartz as a definite horizon. Farther east, a garnet-biotite-hornblende-plagioclase-quartz gneiss predominates. Locally, thick bands of augen gneiss, consisting of ovoids of microcline from one-quarter inch to one inch in diameter in a finer-grained quartz-plagioclase-hornblende-biotite matrix, are interlayered with siliceous paragneiss.

Layers up to 300 feet thick and numerous inclusions of black, glistening, granular quartz-hornblende amphibolite with minor plagioclase and garnet are present. These layers, which are schistose in places, represent metamorphosed basic intrusive or extrusive rocks.

A garnet-quartz-actinolite schist, a dolomite band 3 feet wide and quartzite occur together in a ridge extending from Range point to Turquetil bay. On the peninsula north of Reine bay, quartzite, garnetiferous amphibolite and dark grey garnet-quartz-hornblende-biotite schist appear in a series of well exposed folds. A few bands of magnetite 6 inches thick are present in the schist.

In the eastern section, dykes and horizontal sheets of pegmatite are abundant. The dykes occur in two prominent directions, N.50°E. and N.30°W. They are also found here and there along the contact between the Trough rocks and the western granite gneiss. The pegmatites are composed of intergrowths of quartz and potassic feldspar with subordinate booklets of muscovite.

Large-scale drag folds, similar to those in the metasedimentary rocks to the west, suggest that the two groups were deformed by a similar stress couple. These rocks may well represent the coarser-grained, siliceous homologues of the argillaceous sedimentaries to the west, but their metamorphism is generally of a moderate grade. The contact with the metasedimentaries (Upper Schists) to the west follows a northward-trending fault which dips 65o east. Though the structure near the contact is conformable, there is a marked thinning of the Upper Schist group northward. This contact may be gradational in places, for breccia

is singularly absent in a mylonitized zone 300 feet wide to the north of Hopes Advance bay. Also, to the south, a coarse, flaky muscovite-garnet schist is developed along contact.

Proterozoic

Basal Sequence

Quartzite generally occurs as a basal bed and as bands varying from a few inches to a few feet thick interbedded with lower schists. It is not everywhere present, and may be separated from the gneisses by schists. In the "Bay zone" the quartzite is basal, 10-15 feet thick and essentially continuous. Farther north it is represented by a discontinuous, rusty band 3 inches to 6 feet thick.

The quartzite is generally blue-grey, fine-grained, compact and glassy. It is composed of sub-angular quartz grains one to two millimeters across. Minor impurities include magnetite garnet, iron-amphibole and chlorite.

The lower schist member is a fine- to medium-grained biotite-sericite-chlorite-quartz rock; garnet and tremolite are minor constituents. Certain bands are highly garnetiferous, with some porphyroblasts up to one inch in diameter. This member may be up to 100 feet thick. Near the top, thin bands of hematite and iron carbonate occur in a dark grey-brown, sugary, biotite-muscovite-quartz schist.

Iron-bearing Sequence

Silicate member

This is a schistose unit composed mainly of quartz and iron-rich silicates, with some local and thin bands of magnetite and hematite.

In the "Bay zone", the lower schists are overlain by a friable, specularite-quartz-biotite schist up to 15 feet thick. A narrow bed of iron and magnesium silicates separates the oxide member from the lower schists.

Oxide member

The oxide member consists of a siliceous hematite band, followed by hematite plus magnetite and massive siliceous magnetite. This may be divided into two broad sub-members; hematite and magnetite, depending on which of the two oxides predominates.

The hematite sub-member is characterized by thin bands of hematite interlayered with cummingtonite schists. In some places, the rock is schistose and friable. It is generally dark blue and consists of specular hematite and varying amounts of amphibole, quartz and magnetite.

The magnetite sub-member is a hard, fine-grained, dark blue rock. The upper beds contain lenses and irregular layers of cummingtonite and actinolite schist. Silicate minerals are more abundant in the magnetite-rich sections.

The thickness of the oxide member varies from 200 feet in the "Bay zone" to 20 feet or less on the limbs of the drag folds.

Spotted Carbonate member

The spotted carbonate member is the youngest member of the iron-bearing sequence. It consists of white sugary quartz with nodules, irregular patches and thin discontinuous beds of carbonate, mainly siderite. Fibrous amphiboles, actinolite, and cummingtonite are more abundant in the more distorted beds.

This member is more siliceous near the base and grades into a rusty orange, ferriferous, cummingtonite and quartz rock. Towards the middle, dirty grey, quartz-biotite-muscovite schist occurs here and there. To the north a ferriferous, shale may be present.

Near the top the carbonate member is interlayered with the overlying quartz mica schists.

Schists and Slates

This sequence overlies the iron-bearing rocks and is a succession of metamorphosed impure sandstones, siltstones and shales. It is at least 5,000 feet thick. The main rock types are fine-grained, grey-white, quartz-biotite-muscovite schist. Quartz-muscovite-biotite-plagioclase schist and quartz-muscovite schist flecked with biotite occur near the base and grade upward into slate, knotted garnetiferous slate, black shale, and sericite schist. A thin band of dolomite exists south of Chien-Rouge river and along the north shores of Hopes Advance bay. South of Chien-Rouge river the formation is followed upward by a series of volcanic flows. Farther north, where the volcanic formation is absent, the boundary is ill defined. However, north of 59°28'N. - 69°46'W., a shear zone separating quartz-mica schist from quartzose schist is taken as the boundary.

Lower volcanics

The lower volcanics south of Chien-Rouge river are a thick series of fine-grained basalt and blue-green hornblende schists. These rocks form a distinctive ridge along the western margin of the area. The formation thins toward Reine bay and contains some highly deformed pillows.

Dolomites and Schists formation

Highly folded, buff-weathering, light-coloured, siliceous dolomite is intermittently exposed in a low-lying belt that extends from Hopes Advance bay to Reine bay. It is characterized by numerous siliceous veinlets, and is intercalated with chlorite-mica and talcose schists. Though the dolomite is generally fine-grained, it is coarsely crystalline just west of Voltz lake.

Muscovite-biotite-quartz schists, slaty schist, and black shale overlie the dolomite.

Upper volcanics

A series of basic and intermediate lavas and hornblende schist with numerous in-folded gabbro sills overlie the dolomites and schists. A prominent member of this formation is a hard, ultrabasic rock, which weathers light brown and is easily distinguished on aerial photographs. This rock may be extrusive or intrusive. It is partly serpentinized and slip fibre asbestos (picrolite) is developed along fractures.

Upper Schists

A series of hornblende-biotite schist, sugary quartz-muscovite-biotite schist, quartzose schist, phyllite, and micaceous slate extends upwards some 8,000-10,000 feet before being truncated by the eastern gneissic complex. North of Hopes Advance bay these upper schists are arbitrarily separated from the schists and slates overlying the iron-bearing sequence by a shear zone.

Intrusive Rocks

Meta-gabbro, Amphibolite, Blotchy Gabbro and Diorite

Sills are abundant in the southwest quadrant of the area where they are interfolded with sheared basic lavas and micaceous schists and form hills on a wave-cut surface. They vary in composition from hornblende amphibolite to quartz diorite. Their contacts are usually marked by a thin sheared slaty band.

Two persistent sills of blotchy gabbro (a medium-grained gabbro containing light grey ovoids of plagioclase and clinozoisite varying from a quarter inch to 3 inches across) extend almost continuously to near Hopes Advance Bay. The blotchy gabbros are typically fine-grained near their contacts.

Thick sills of a medium- to coarse-grained, mottled white and black hornblende-plagioclase-quartz amphibolite occur in the eastern gneissic complex near De Villiers point and the Try beacon (59°16'N - 69°28'W.).

Pegmatites

Numerous pegmatite dykes intrude the eastern gneissic complex. Their age relations are uncertain. Dykes or sills of pegmatite occur in some places along the contact between the eastern gneisses (metasedimentaries) and the western granite gneiss.

Younger diabase dykes

Two fresh, fine- to medium-grained, diabase dykes transgress the regional structure near latitude 59°30'. They are displaced by the regional northward-trending fault.

Pleistocene

A thin veneer of glacial material covers a large part of the area. On the low plains the till has been reworked and distributed by wave action to form a boulder and mud-flat cover. Large erratics are scattered throughout the area, and in some of the tidal estuaries there are extensive boulder beds. Along the Chien-Rouge River valley two terraces at 10 and 15 feet elevation, respectively, are cut in alluvium. Near Hopes Advance bay there are four prominent terraces at, respectively, 150 feet, 100 feet, 50 feet, and 10 feet elevations. The airstrip is built on the terrace at 150 feet elevation.

Glacial striae indicate the dominant ice movement as N.30°E. Less abundant are striae trending N.80°E. The former direction coincides with the direction of the major streams. Plucked surfaces are common features on the more resistant gabbro and quartzite ridges. The softer quartzose schist and mica schists of the south-central part of the area are fluted on a grand scale.

In protected areas, some wind-blown drift sand has accumulated.

STRUCTURE

Faults

The dominant structural feature is the thrust fault that trends north-northwest and dips 65° east and that brings paragneisses of the eastern complex in contact with mica schists. The fault zone is not well-marked and, especially in the south, the rocks on either side of the fault grade from quartzose schist to a finely banded, fine-grained, siliceous, micaceous gneiss.

Near latitude 59°30' a fresh vertical diabase dyke shows a right-hand strike separation of 1,000 feet. The straightness of this zone is impressive.

The metasedimentary formations are markedly thinned, and the volcanic formations are cut out, just south of Hopes Advance bay. A series of thrust faults are inferred to explain these features and also the repetition of the intrusive rocks.

Many small faults, associated mainly with drag folds were observed in the field and others were inferred from photographs.

Folds

The metasedimentary and volcanic rocks represent the easterly-dipping western limb of a geosyncline. The geosyncline extends from the Mount Wright - Mount Reed area northwards to a point 70 miles north of Payne bay, a total distance of more than 600 miles.

Both the geosynclinal rocks and the basement rocks to the north are dragfolded on a grand scale. The plunge is southeast at 20° to 45°. The axial planes of the folds are generally overturned to the southwest and dip 65° northeast. Small, tight folds are present everywhere but are particularly common in the incompetent beds. Banding, in most cases, represents original bedding and, apart from the development of cleavage, most of the finer structures are primary.

Of interest is the change in plunge of the lineation in the schists, near the fault contact, at Merganser point and Apex hill.

ECONOMIC GEOLOGY

Iron

Ore is found in the troughs and crests of dragfolds in the iron-bearing sequence. Here the beds thicken and the grade improves. The change in strike of this sequence in the "Bay zone", though modified by later stress, is a reflection of original deposition in an embayment (Béland and Auger, 1958).

Some of the ground near Hopes Advance bay has been developed by Atlantic Iron Ores Company. The proved ore for blocks A and B (see Map), as reported by the Company in 1957, is as follows:

Block	Tons x 10^6	Grade % Soluble Iron	Ratio Magnetite/Hematite
A	0.5	38.5	50/50
B	10.2	35.4	64/36

An average grade of 35+ per cent iron is anticipated for the "Bay zone".

Farther north near latitude 59°28' the iron-bearing rocks are mostly banded iron silicates, spotted carbonates and schists. The general dip is 34° south. A thinly banded hematite and magnetite horizon is 10-15 feet thick. Northward along the contact, the siliceous magnetite horizon is from 10 to 40 feet thick. In general, it is thicker to the north. The general dip is 60° east.

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