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Preliminary report on Leaf lake area, New Quebec

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DEPARTMENT OF MINES

HON. W. M. COTTINGHAM, MINISTER

GEOLOGICAL SURVEYS BRANCH

PRELIMINARY REPORT

ON

LEAF LAKE AREA

NEW QUEBEC

BY

JEAN BÉRARD

QUEBEC
1959

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INTRODUCTION

The Leaf Lake area comprises 642 square miles of which roughly a fourth is covered by a part of Leaf lake. It is bounded by latitudes 58°30' and 59°00' and by longitudes 69°45' and 70°15'. The centre of the area is about 75 miles north of Fort Chimo.

This area is one of four mapped during the summer of 1958 by the Quebec Department oi Mines in a programme designed to embrace the major part of the iron-bearing zone between Leaf and Payne bays. The northernmost part of this zone already had been mapped by Bergeron (1957).

The Leaf Lake area is roughly bisected from north to south by the contact between the Lower Precambrian granitic gneisses to the west and the Upper Precambrian rocks of the Labrador Geosyncline to the east. This contact is an unconformity.

The western half of the area, underlain by the basement rocks, is a uniform plateau cut by only the prominent valley in which flows Leaf river. The plateau stands well above the sea, with many summits as high as 1,200 feet.

The eastern half of the area is noticeably different in that the topography is as diverse as the structure and the nature of the rocks. In particular, the northeastern quadrant is markedly rugged owing to the alternation of soft sedimentary rocks and resistant gabbros. The southeastern portion of the area on the other hand, being covered with glaciofluviatile debris, is a plain with a few steep hills standing in it.

The drainage is everywhere convergent towards Leaf lake.

There are few lakes, as compared with some of the adjacent areas. Streams are numerous, with Leaf and Chioak rivers being the most important.

GENERAL GEOLOGY

Table of Formations

RECENT and PLEISTOCENE	Moraine, eskers, alluvial deposits, marine terraces, river terraces
PROTEROZOIC ROCKS	Intrusive rocks: Meta-gabbro (amphibolite), Biotchy gabbro
	Sedimentary rocks: Metasedimentary rocks: Quartzite; Meta-dolomite (dolomite marble; phlogopite-actinolite-talc schist); Biotite schist, biotite-chlorite schist, chlorite schist, hornblende schist, sericite schist, etc. Dolomite (Abner fm.) Sandstones, siltstones, argillites (Chioak fm.) Iron formation (Fenimore fm.) Quartzite (Alison fm.)
	Unconformity
ARCHAEAN ROCKS	Granodiorite, granodiorite porphyry. Hornblendic rock, biotite schists

Archaean

The "basement rocks" underlie the western half, approximately, of the area. They consist primarily of granodiorite or granodiorite porphyry with inclusions of biotite schist or, more commonly, of hornblendic rocks.

The granodiorite is usually pink, pale grey, or white, and coarse-grained to pegmatitic. It is composed essentially of quartz, microcline, altered plagioclase, hornblende, and a little biotite or chlorite.

The granodiorite porphyry is characterized by pink microcline crystals ½ inch to 6 inches long. The twinning is readily seen in the weathered rock.

In this area, inclusions of hornblendic rocks are not as common as they are farther south and account for only 1 to 2 per cent of the whole rock. Usually, the inclusions are small, round and scattered. However, near Leaf lake, there are blocks more than 100 feet across. The biggest blocks can be recognized in aerial photographs, where they contrast in shade with the surrounding granodiorite.

Proterozoic

Sedimentary Rocks

In the Leaf Lake area, the sedimentary rocks in contact with the basement are slightly more metamorphosed than they are to the south in the Bones Lake and Finger Lake areas (Bérard, 1957, 1958). The stratigraphic sequence given in the Table of Formations applies to all three areas and may be considered, therefore, as well established. Meta-gabbros are associated with all formations except the basal quartzite and the iron formation.

The basal quartzite can be traced almost continuously along the contact with the Archaean rocks. It is medium-grained, massive, and may be white, yellow, olive green or dark grey in colour. North of Leaf lake, yellow amphiboles, garnet, biotite, stilpnomelane, and chlorite are common constituents. Crossbedding was observed at one place.

The most common facies of the iron formation overlying the quartzite are siliceous metallic, metallic, interbedded cherty carbonate, and spotted silica.

South of Leaf basin, both the quartzite and the iron formation are distinct. North of the basin, however, the

two formations are so involved structurally that it is almost impossible to separate them.

Immediately overlying the iron formation is a thick sequence of sandstones, siltstones, and argillites. These rocks show no, or very little, metamorphism in the southern part of the area, although they are locally converted to chlorite-biotite schists. North of Leaf lake, the sequence is very difficult to follow owing to structural complexities and to mineralogical changes.

Next in the stratigraphic sequence is a dolomite (Abner formation) that can be traced for miles near the western contact of the Proterozoic, south of Leaf lake. The rock is massive, buff-weathering and characterized by abundant quartz veinules. It was not found north of the lake.

Another band of dolomite occurs farther east and extends into the Harveng Lake Area (Bergeron ,1956). It may be at a different stratigraphic horizon than the Abner dolomite as the two dolomites differ in gross aspects, as follows: whereas the dolomite to the west is massive, almost flat, quite pure despite the numerous quartz veinules and grains, and rarely interbedded with quartzites or shales, the dolomite in the eastern portion of the area is thinly bedded, laminated or flaggy, and slightly metamorphosed, and contains many argillaceous and sandy interbeds.

Metasedimentary rocks overlie the dolomite. The major types are listed in the Table of Formations. Most of the schists show gneissic facies, especially where abundant porphyroblasts have developed. These rocks contain numerous gabbro sills.

Meta-gabbros

The meta-gabbro sills of the area vary in thickness from a few feet to more than 1,000 feet. The islands in the southern part of Leaf lake provide the most spectacular display of gabbro sills of various thicknesses. Most of the contacts with the sedimentary rocks are readily observable. The sills dip gently to the east. Many apophyses cut the sedimentary rocks for short distances and give birth to miniature sills. In places, the thicker sills contain inclusions of sedimentary rocks.

The gabbro is fine-grained in contact with the sedimentaries and passes gradually into well crystallized facies away from the contact.

The composition of the gabbros is variable and is dependant, in large part, on the thickness of the particular sill. Most are actinolitic. The other important constituents are altered plagioclase, chlorite, biotite, blue quartz, and pyrite. The colour of the gabbros varies from pale greenish grey to black and, within one sill, may pass from pale grey to pitch black. The black facies are amphibolites and contain very little biotite, plagioclase, epidote, and quartz.

The few exposures of a mottled gabbro recorded contain white feldspar aggregates 2 to 10 centimeters long.

PLEISTOCENE

The area is in large part covered by a thin layer of till. Numerous erratics, some of which are enormous, are scattered everywhere. In the southeastern quadrant of the area, the river valleys were filled with thick alluvial deposits. These deposits were reworked later by the sea, and terraces were carved in them. Two terraces that hang upon the steep cliffs on both sides of Leaf river are about 150 feet and 500 feet, respectively, above present sea-level.

Glacial striae trending N. 30° E. are abundant; less abundant are striae trending north to N. 5° E. The rocks of the peninsula east of Profonde bay are spectacularly fluted. The flutes or grooves are parallel and range up to 200 feet wide, 30 feet deep, and 3 miles long.

STRUCTURE

Faults

Many faults were observed in the field and, from the study of aerial photographs, it is suspected that several others are present.

The most pronounced fault is west of Manihalluk lake. This is a strike fault involving both the Archaean granodiorite, which is brecciated, and the basal Proterozoic quartzite, which is fractured and chloritized. Pyrite is abundant

Three faults cut the basement west of Finger lake. At one place, sedimentary rocks abut against a fault scarp. Other faults of lesser importance are seen in the iron formation, dolomite, and gabbro sills. Thrusting from the east is also suspected.

Folds

The Proterozoic rocks near the contact with the Archaean basement dip gently to the east, but the dips increase eastward until the rocks become involved in complex folds overturned to the west.

The southeastern quadrant of the area provides excellent examples of tight overturned folds. The axial planes of these folds dip about 60° east, and their axes plunge gently to the south.

North of Leaf lake, there are numerous open folds. Some of these are basin-like owing to a combination of two sets of folds, one oriented north-south and the other east-west.

Small, tight folds are ubiquitous in such plastic rocks as the dolomites, phyllites, and biotite schists. This is especially striking in the area east of Finger lake, where thin gabbro sills are folded with the sedimentaries and where the geology is extremely complex.

ECONOMIC GEOLOGY

Sulphides

Many sulphide zones were recognized some years ago by company geologists. Most such zones are located in sheared gabbros and consist predominantly of pyrite and pyrrhotite with a little chalcopyrite and pentlandite. West of aux Baleines bay and aux Refuges bay, and also east of des Arpenteurs bay, interesting sulphide veins were noted during the present work.

The individual sulphide zones are narrow. Although well oxidized on the surface they show no secondary enrichment. Shallow drilling probably would bring a more accurate picture of the mineral content.

Traces of malachite were seen in a talc schist underlying a thick gabbro sill, east of Red bay. This gabbro sill is cut by numerous white quartz veins ranging from very small up to more than 500 feet long and 200 feet wide.

Iron

The iron formations north of Finger lake and also those near Red bay are of special interest. They are flat-lying

sedimentary rocks averaging 30 per cent of recoverable iron in the form of magnetite, hematite, and siderite. There is a large tonnage of low-grade ore of Bessemer quality here, and it is close to the sea.

North of Leaf lake the iron formations are folded and faulted and do not appear to have as great a potential value as those north of Finger lake.

Consolidated Fenimore Iron Mines, Limited, has an exploration license covering all the iron formations of the area.

Talc

Between des Arpenteurs bay and aux Refuges bay gently dipping talc schists underlie a thick gabbro sill. In most horizons the talc is mixed with phlogopite, calcite, and quartz, but there are some thin layers of rather pure talc. The talc schist zone is about 25 feet thick and is distributed over a wide area.

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