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PRELIMINARY REPORT ON GRADIS - MACHAULT AREA, ABITIBI-EAST COUNTY

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PRELIMINARY REPORT

ON

GRADIS - MACHAULT AREA

ABITIBI-EAST COUNTY

BY

A.-N. DELAND

QUEBEC
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ABITIBI-EAST COUNTY

by

A. N. Deland

INTRODUCTION

Location

The Gradis-Machault area, which was geologically mapped during the summer of 1954, is in Abitibi-East county, about 275 miles north of Montreal and slightly over 50 miles southwest of Chibougamau village. It is bounded on the east and west by longitudes 75°00' and 75°15', respectively, on the north by latitude 49°30', and on the south by a line close to latitude 49°09'. The area includes about three-quarters of Gradis and Machault townships and smaller parts of Druillettes, Langloiserie, L'Espinay and Bressani townships. In all, it comprises about 275 square miles.

The map-area lies immediately west of the Surprise Lake area which was mapped by the author in the summer of 1953, (1). Its southern edge is adjacent to part of the Buteux area mapped by B.C. Freeman in 1939, (2).

Means of Access

The most practical way of reaching the area is by air from one of the several bases along the St. Félicien-Chibougamau highway, the flight distance to Doda lake being about 50 miles.

The northern part can easily be covered from Doda lake and Opawica river. Only one portage is necessary to reach No Rock lake and two portages to enter Remick lake. Two rivers, De l'Aigle and Hébert, can be used to gain access to the central and southern parts of the area. De l'Aigle river has many rapids in its north and central parts and is a rather difficult and hazardous canoe-route. The course along Hébert river is less practical as it can be used to cover only the west-central part of the map-area. Apart from several portages, the river is easily navigable, with deep and mostly calm waters.

South of Ann lake, De l'Aigle river is deep, without any swift current, and wide enough to permit hydroplanes of the Norseman type to land and take off. Des Claudes, Eva and Deland lakes also provide good landing places.

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(1) DELAND, A. N., Preliminary Report on Surprise Lake Area, Abitibi-East County; Que. Dept. Mines, P.R. No. 292, (1953).

(2) FREEMAN, B. C., Buteux Area, Abitibi County and Abitibi Territory; Que. Dept. Mines, G.R. 15, (1943).

On the east shore of Doda lake at the mouth of De l'Aigle river, The Quebec Department of Lands and Forests has a well established camp which is staffed from May to September.

Physical Features

The area has an average elevation of about 1,000 feet above sea-level, but the local relief is not pronounced. Most of the hills have gentle slopes, and few rise more than 100 feet above the general level of the lakes. There are, however, three higher hills that constitute exceptions to this low, gentle topography. One is a ridge between Remick and No Rock lakes that rises about 300 feet above these lakes. On tower peninsula a second hill rises 400 feet above Doda lake, and is the site of an observation tower of the Quebec Department of Lands and Forests. The third ridge, between Des Claudes and Eva lakes, attains a height of 500 feet above the latter lake.

About one-fifth of the area is covered by bodies of water and a large part of the remainder is low, swampy ground. Much of the area is drained northward to Doda lake by De l'Aigle and Hébert rivers. Opawica river enters Doda lake from the northeast and continues westward to drain this lake through the Waswanipi-Nottaway system into James Bay.

GENERAL GEOLOGY

General Statement

All the consolidated rocks of the area are of Precambrian age. The southern part is underlain mainly by gneissic granite, granite, syenite, diorite and related rocks. Rocks of Keewatin type occupy most of the northern part of the map-area. They consist largely of altered lavas (with some associated sills of gabbro and diorite), but also include some sedimentary rocks and minor amounts of pyroclastics. Between these respective areas of granitic and layered rocks is a relatively small sector underlain by a complex of hornblende schist and gneiss, amphibolite, and biotite schist and gneiss. The writer believes these rocks to be only more highly metamorphosed facies of the Keewatin-type rocks.

Much of the bedrock is mantled by unconsolidated deposits, including glacial till, gravel, sand and clay.

Table of Formations

CENOZOIC	Recent and Pleistocene	Glacial till, gravel, sand, clay
Great unconformity		
PRECAMBRIAN		Gneissic granite, granite, syenite, syenite porphyry, diorite, pegmatite, aplite
	Intrusive contact	
	Keewatin (?)	Biotite schist, biotite gneiss Hornblende schist, hornblende gneiss, amphibolite Sedimentary rocks Rhyolite, pyroclastics Gabbro and diorite sills Andesite, basalt

Keewatin (?)

About one-half of the map-area is underlain by Keewatin-type rocks.

These consist largely of andesite and basalt flows with associated sills of gabbro and diorite, but embrace some rhyolite flows with associated pyroclastics, and sedimentary rocks.

The rocks belonging to this group have been, in general, much altered by regional as well as thermal metamorphism. In places, the rocks have also been metasomatised, with much introduction of new material.

Included in this group of rocks are more highly metamorphosed facies of the lavas, namely, hornblende schist and gneiss and amphibolite, as well as biotite schist and gneiss that, similarly, are metamorphic derivatives of the sedimentary rocks.

Andesites and Basalts

These rocks underlie much of the northern part of the area. They are fine-grained and slightly to highly schistose. The fresh surface is greyish-green to black, and the weathered surface is light- to dark-green with rusty

weathering on outcrops of the more schistose rocks. The latter break in slabs, the thickness of which varies with the degree of schistosity. Where shearing has been particularly intense, drag folding and crenulations are commonly observed. In more massive flows, pillows, vesicular borders, and amygdaloidal structure are present. Some massive flows have a porphyritic texture with creamy feldspar phenocrysts one-quarter inch wide and three inches long. In places the phenocrysts make up 50 per cent of the rock.

Some flows of basaltic composition have two sets of joints at right angles to each other. This characteristic and the darker colour of the rock were often used to distinguish the basalts from the less basic andesites. Pillows were not observed in these darker coloured lavas.

Gabbro and Diorite

The gabbro and diorite occur as sill-like masses interlayered with the andesite and basalt flows. They were nowhere observed in contact with the sedimentary rocks or the rhyolites. These intrusive bodies appear to be fewer in number and smaller than those found to the east in the Surprise Lake area, (1). There, sills up to 1,500 feet thick were recognized, whereas in the present area the largest sills seen are only 30 feet thick. They are thus too small to show on the accompanying map.

The sill-like bodies are more commonly massive than schistose. The massive rocks are various shades of dark-green. The texture is granular, with the mineral grains one to two mm. in diameter. As in the lavas, the mineral constituents are metamorphic and secondary.

Rhyolite and Pyroclastics

Rhyolite lava underlies several square miles in the vicinity of Remick lake and is also sparsely exposed at the centre of the northern boundary of the area. In contrast with the dark-coloured andesites and basalts, the rhyolite is light-grey or cream on the weathered surface, and light-grey with a greenish or bluish tinge on the fresh surface. The rock is also less altered, and massive to slightly schistose. The rhyolites generally form prominent exposures in contrast with the low outcropping andesites and basalts.

The rhyolite is composed essentially of grey altered feldspar and quartz. In many specimens, however, quartz was not observed, and the lava has the composition of a trachyte. The appearance of the trachyte is very similar to that of the rhyolite.

Highly sheared rhyolite is very well exposed at the falls on Opawica river, about a mile east of Doda lake. Here the rock is tan and very schistose, with much crenulation and development of talc. Subangular grains of quartz can still be observed.

Some agglomerate and volcanic breccia were observed associated with the rhyolites. The agglomerate is well exposed near mile-post VIII, a mile and a half northwest of Remick lake. The fragments of the agglomerate are three to four inches long and consist of a very fine-grained white material which appears to be essentially altered feldspar. They are embedded in a fine-grained, light-greenish-grey matrix and make up about 50 per cent of the rock.

(1) DELAND, André, Op. cit.

Volcanic breccia is exposed about a mile and a half west of Remick lake. The matrix looks very much like rhyolite and contains small angular grains of quartz and feldspar. The fragments, which make up 65 per cent of the rock, are either whiter than the matrix or dark-grey to black. The white fragments are subangular, the black ones angular with sharp outlines. One of the black fragments is obsidian. The ejected blocks average three inches in diameter with some up to six inches. They show no preferred orientation. The dark fragments weather more easily than the matrix leaving some depressions on the surface of the rock, whereas the white ones are more resistant and form small elevations.

Sedimentary Rocks

Generally well bedded and laminated rocks of sedimentary origin occur interstratified with the lava flows. Only four small patches of sedimentary rocks are shown on the accompanying map. Other exposures were observed, but they are too small to be shown on the map. The individual beds, which are up to two inches thick, are grey, dark-grey, or nearly black, with some layers showing brownish or purplish colours. These rocks lack the greenish colour characteristic of the lavas of intermediate composition.

The sedimentary rocks are very fine-grained and even-textured. Altered grey feldspar appears to be by far the most common constituent of many of the beds and these rocks are tentatively classified as metamorphosed greywackes. There are also some quartzites and minor amounts of black slate. Some outcrops on the southeast shore of Doda lake contain small red garnets. These exposures are close to the granite contact and have been more metamorphosed than those found farther away from the granite.

Locally, where bedding is not very pronounced, the sediments and the lavas are difficult to distinguish, as metamorphism has rendered the macroscopic textures of these two rocks much alike.

Hornblende Schist, Hornblende Gneiss and Amphibolite

These rocks are believed to represent various stages in higher-grade metamorphism of the andesites and basalts.

One large patch lies along or close to the contact between the lavas of the northern part of the area and the granitic rocks of the southern part, and a number of smaller lenses occur as remnants within the area of granitic rocks.

The hornblende schists are fine-grained, black rocks with hornblende needles as the only constituent that can be seen in the hand-specimen. This type of rock was referred to as "amphibolitized lavas" in the preliminary report on the Surprise Lake area, (1). There, pillow, vesicular and amygdaloidal structures were noticeably absent, presumably having been obliterated by metamorphism. Within this area, however, on the south shore of Des Claudes lake and also on the west shore of a small lake half a mile south of Des Claudes lake, some well preserved, though deformed, pillows were observed, although vesicular and amygdaloidal structures were not recognized.

(1) DELAND, A.N., Op. cit.

The hornblende gneiss is more recrystallized than the hornblende schist and the granularity is coarser. The rock consists of about 80 per cent hornblende needles and 20 per cent grey feldspar which is commonly segregated in parallel stringers and lenses up to one-quarter inch thick. In places, elongated porphyroblasts of grey feldspar up to one inch in length constitute 15 per cent of the rock. Locally, bands of light-green epidote alternate with black hornblende-rich layers and segregations of light-grey feldspar, with lenses of injected quartz paralleling the banding.

The most highly metamorphosed facies of this group of rocks is black, massive, coarse-grained amphibolite, composed essentially of hornblende and feldspar.

The transition from hornblende schist to hornblende gneiss to amphibolite can be observed north of Eva lake. Amphibolite is found close to the granite contacts, hornblende gneiss farther away, and hornblende schist still more distant from the granite.

Biotite Schist and Biotite Gneiss

These rocks probably represent the strongly metamorphosed equivalents of the well bedded sedimentary rocks described previously in this report.

Four small lenses of these rocks are indicated on the accompanying map - three immediately south of Noël lake, the fourth trending across De l'Aigle river, south of Ann lake. It is pointed out, however, that these rocks contain, in places, some of the hornblende schist-hornblende gneiss-amphibolite group of rocks and vice versa.

The biotite schists are medium- to coarse-grained, highly schistose rocks made up essentially of grey feldspar, quartz and biotite. Small red garnets are locally present in some outcrops. Feldspar porphyroblasts also occur, usually surrounding the small garnet grains.

Associated with the biotite schists are some exposures of biotite gneiss. Bands rich in biotite alternate with ones rich in grey feldspar, the layers having an average thickness of one inch. The regularity of the banding, the sharp contacts between the bands, and the changes in composition of the different layers are distinctive characters of these rocks.

Gneissic Granite, Granite, Syenite, Syenite Porphyry, Diorite, Pegmatite and Aplite

More than half of the area is underlain by gneissic or granitoid intrusive rocks. Medium-grained grey gneissic granite is the most abundant rock of this group. It consists of 30-75 per cent feldspar, 10-30 per cent quartz, and 5-30 per cent dark minerals. The mafic constituents are either biotite or hornblende or both and, where these are concentrated into bands, give the rock its gneissic structure. Some dark layers contain as much as 80 per cent mafic minerals.

In many exposures the grey gneissic granite grades into massive granite, in others the massive granite intrudes the grey gneissic granite and has sharp contacts. The granitoid rock is either grey or pink due to variable

amounts of grey and pink feldspars. The best exposures of granite are found on Tower peninsula. Here the rock is massive, medium-grained, pink to red on the fresh surface, and light-red to grey on the weathered surface. The content of mafic minerals is generally low, and light-green epidote, which increases near the granite contact, accounts for about half of the non-felsic minerals. The rock is very well jointed and some of the joints are filled with quartz.

South of Doda lake, exposures of massive pink granite are rare and the rocks grade into syenite. The gradation is very abrupt in places, as one end of an exposure may contain 15 to 20 per cent quartz and the other end may be quartz free. The syenite is medium- to coarse-grained, with many crystals as much as five, or even eight, millimeters in diameter. Pink feldspar and hornblende are the only essential constituents, and quartz and epidote are the accessories. The rock varies in composition from 35 per cent hornblende and 60 per cent feldspar to 35 per cent feldspar and 60 per cent hornblende. It occurs either as large masses in the grey gneisses or as dykes cutting across the hornblende gneiss.

Hornblende syenite is well exposed in the southwest corner of the map-area at the falls on De l'Aigle river. Here the rock is massive with a mottled dark-grey and pink colour. Some pink feldspar crystals, as much as one inch in diameter, give the rock a porphyritic texture. Locally, the feldspar phenocrysts constitute 30 per cent of the rock. Epidote is common and occurs either as disseminated grains or as veinlets cutting the syenite porphyry.

Near the eastern boundary of the map-area, east of Des Claudes lake, good exposures of granite are present. One mile to the west, on the shore of Des Claudes lake, is a massive, grey rock with good granitoid texture. This rock contains no quartz and should probably be classified as diorite. It is much less altered than the diorites found associated with the lavas, however, and for now is grouped with the granites.

This complex of gneissic granite, granite, syenite, and diorite is, in turn, intruded in places by pegmatite and aplite. The pegmatites occur as irregular patches, lenses or dykes as much as two and one-half feet wide. Some also intrude the country rocks near the granite contacts. Most of the pegmatite exposures are in the southeast corner of the area; occurrences are rare and small in other parts of the area. The pegmatites consist essentially of feldspar and quartz, but contain small amounts of dark minerals, mostly biotite with some magnetite. A few dykes of fine-grained, sugary aplite intrude the granites, but these too are rare and of small extent.

Pleistocene and Recent

Unconsolidated glacial deposits of variable thickness cover much of the bedrock. They consist, for the most part, of till composed of sand, gravel and boulders. Some boulder trains, formed of granite boulders averaging two feet in diameter, were seen in the southern part of the map-area. A few small deposits of sand were noted here and there. Unstratified clay deposits are present in the central part of the area, especially south of Noël lake and along the small streams flowing from No Rock and Jay lakes into De l'Aigle river.

Glacial striae in several parts of the map-area have an approximate average strike of S.40°W.

STRUCTURAL GEOLOGY

In the volcanic and sedimentary rocks the beds and flows generally strike close to east. Most of these rocks are schistose, and the schistosity seems everywhere to parallel the flows, bedding and banding. The chief exceptions to the easterly strikes are found around the northern part of Doda lake and south and west of Noël lake, where these structures conform closely to the contacts of the nearby granite masses. With few exceptions the flows, beds and bands dip either vertically or steeply to the north. It is evident that these layered rocks have been tightly folded, but information is too scarce to permit a detailed interpretation of the structure. The pillows in the lava flows are generally too deformed to indicate reliably the direction of tops of flows, and in only one exposure of sedimentary rocks was the writer able to use graded bedding for top determination. Drag folding and crenulation are common in the more schistose lavas and sedimentary rocks.

In the granitic rocks the gneissic structure is variable in attitude and locally is highly contorted, although in the southern part of the area northeasterly strikes predominate. The schistosity and gneissic banding in the highly metamorphosed volcanic and sedimentary rocks included as remnants within the area of granitic rocks everywhere trend close to the strike of the gneissic structure in the granite.

ECONOMIC GEOLOGY

Sulphide Mineralization

Pyrite mineralization is fairly widespread throughout the layered rocks of the northern part of the area. Many of the shear zones in the volcanic flows are carbonatized, silicified and mineralized with fine-grained, disseminated sulphides. However, three samples taken from different shear zones showed, on assay, no values in gold and only traces of copper. Disseminated pyrite is also common in the gabbro-diorite intrusive bodies.

Some of the stronger shear zones and mineralized exposures are shown on the accompanying map.

The highly metamorphosed facies of the volcanic and sedimentary rocks also contain sulphides in places. The two most important occurrences seen are on the south shores of Eva and Des Claudes lakes, respectively. On Eva lake pyrite, chalcopyrite and other sulphides occur in hornblende gneiss. Assays of samples revealed the presence of silver, copper, nickel and zinc, but all in very small amount.

At Des Claudes lake, a group of 25 claims was formerly held by Lake Surprise Mines, Ltd. The claims were numbered: C 31324, cls. 1-5; C 31325, cls. 1-5; C 31326, cls. 1-5; C 31327, cls. 1-5; and C 31328, cls. 1-5. That company's main showing was within C 31327, cls. 3 and 4, on the large point of the south shore of the lake. Stripping, trenching and blasting were done and, in 1950, ten diamond-drill holes, totaling more than 3,000 feet, were bored. The main showing consists of a seven-foot-wide band of diorite

within a black, hornblende-rich rock. Both rocks are schistose and silicified. The diorite body has sharp contacts parallel to the schistosity, and includes some lenticular masses of the hornblende-rich rock. Very fine-grained, disseminated pyrite, chalcopyrite and other sulphides occur in both the diorite and the enclosing rock. The diorite shows rusty weathering and some copper colours, concentrated in a zone about three feet wide. One sample taken by the writer from this zone assayed: 0.270 ounces of gold per ton; 0.24% copper and 0.24% zinc.

Radioactive Minerals

In the late summer of 1954, radioactive minerals were discovered by private interests in the vicinity of Yvonne lake, Bressani township, about a mile south of the southeast corner of the area. Considerable staking followed, and by October several hundred claims had been registered. The original discovery is in the Buteux area, mapped by Freeman (1), who described the country rock as "red pegmatitic granite". It has been reported that Barnat Mines, Ltd., in conjunction with East Malartic Mines, Ltd. and Malartic Gold Fields, Ltd., have carried out both aerial magnetometer and aerial scintillometer surveys and, further, that Barnat has planned a programme of diamond-drilling for its showings, to commence early in 1955.

(1) FREEMAN, B.C., Op. cit.