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BUTEUX AREA, ABITIBI COUNTY AND ABITIBI TERRITORY

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DIVISION OF GEOLOGICAL SURVEYS

I. W. JONES *chief.*

GEOLOGICAL REPORT 15

BUTEUX AREA

ABITIBI COUNTY AND ABITIBI TERRITORY

by

B. C. Freeman

QUEBEC

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1943

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ABITIBI COUNTY AND ABITIBI TERRITORY

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BUTEUX AREA

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INTRODUCTION

The discovery of bodies of massive sulphides carrying low values in gold, and the finding also of free gold in a quartz vein, has directed attention to the Buteux area. Since part of the area was unmapped and the remainder was known only from reconnaissance explorations, the writer was instructed to make a geological survey of the area and to investigate the mineral occurrences. This work was carried out during the summer of 1939.

Location, Field-work and Acknowledgments

The area studied is in the extreme south part of Abitibi Territory and the north part of Abitibi county. Longitude 75° passes a short distance within its eastern boundary, and latitude 49° is about six miles north of the southern boundary, which is some 60 miles directly north of Oskelaneo and 100 miles northeasterly from Senneterre, both stations on the Canadian National railway.

Examination of the area during the present investigation consisted of observations along lakes and streams, and along land traverses controlled by pace-and-compass. The geology was plotted on a topographical base-map, on a scale of one inch to half a mile, which had been compiled by draughtsmen of the Bureau of Mines from maps and plans supplied by the Department of Mines and Resources, Ottawa, and the Department of Land and Forests, Quebec. There is only one surveyed line in the area, but there have been numerous surveys of water routes, which are marked by small plates nailed to blazed trees. The mile-posts on the surveyed line and the plates on the trees served as tie points for traverses.

Wherever possible, observations along traverses were taken at about half-mile intervals, but in some parts of the area, particularly in the southeast corner, they were spaced at greater distances than this.

A set of Royal Canadian Air Force photographs covering most of the area was furnished and proved very useful.

Much helpful information was given by Messrs. Stuart and Albert King, and by Mr. Jack Griffith, prospectors within the area. The party is grateful also to the pilots of Dominion Skyways for efficient transportation of supplies and mail.

In addition to the writer, the party included M.C. Gardiner, McGill University, senior assistant; Jos. Gilbert, Laval University; and Harry Kent, Rouyn, and E.A. Villeneuve, Senneterre, respectively canoeman and cook. All performed their duties in a very satisfactory manner.

Means of Access

Aeroplane service is available at Senneterre and Oskelaneo but landing places within the area are few. In the western part, planes can land almost anywhere on Lacroix lake or along Aigle river, but east of that waterway most of the lakes are small, shallow, and too irregular in outline for planes to land. Access to and travel in Buteux township is particularly difficult. It is traversed by no large streams, and although aeroplanes can land safely on Buteux lake, it is not on a waterway.

The most convenient canoe route to the area starts from Rouleau Siding, at mileage 70 west of Oskelaneo, at which point the railway crosses Kekek river. The Kekek joins Mégiscane river 15 miles, airline distance, north of the railway track. From its mouth, the central and eastern part of the area may be reached by ascending Mégiscane and Pascagama rivers, and the western part by descending the Mégiscane and ascending Saint-Cyr river to Bailly lake, from which a portage of a mile and a half leads to a pond draining into Lacroix lake and Aigle river. If an outboard motor is used, the trip from Rouleau Siding to the Aigle can be made in two to three days, but it may take a week if heavy loads are carried, requiring several trips across the portages.

From the Chibougamau region, lying to the north, the area can be reached by ascending the rivers that drain into Lac Doda or into Surprise lake.

Previous Work

Very little geological work had been done in the Buteux area previous to the survey undertaken by the writer in 1939. The results of earlier reconnaissance work are included on the Chibougamau map-sheet issued by the Geological Survey of Canada in 1938 (1). Carl Faessler investigated a large area immediately to the southwest in 1935 (2), and W.H. Asbury reported on development work in Buteux township in 1937 (3).

Topography and Drainage

In its general topographical features, the Buteux area resembles other sections of the Precambrian shield. The relief is not marked; there are extensive swamps and many lakes; and most of the rivers have irregular courses. The north and west parts of the area in particular are characterized by many large swamps and extensive wet plains, with the general flatness of the country relieved only by occasional rounded hills that rise a few score feet above the plain. From the outlet of Rock Island lake, however, a prominent range consisting of east-west trending parallel ridges runs eastward for about ten miles to the centre of township No.121.

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(1) Maps 397A and 398A - Chibougamau Sheet, Abitibi Territory, Quebec, scale 1 inch to 4 miles; Geol. Surv. Can., 1938.

(2) Faessler, Carl, Mégiscane River Headwaters Area; Que. Bur. Mines, Ann. Rept., Pt. C, 1935, pp.29-38.

(3) Ross, S.H., et al., Mining Properties and Development Work in Abitibi and Chibougamau Regions during 1937; Que. Bur. Mines, P.R. No.120, 1938, p.27.

In the south and east parts of the area, the relief is more pronounced. Swamps are much smaller, lakes are more numerous, and rounded hills are much more closely grouped than in the north and west. In the southern part of Buteux township, rounded bedrock hills covered with coarse glacial drift are so close together that in many places their bases touch. In the extreme southeast part of Marceau township, parallel rock ridges trend northeast.

Esker-like gravelly ridges are common in the area, trending south-southwest, or about in the direction of the ice movement of the Glacial period. They are somewhat more abundant and conspicuous in the lower land of the northwest than in the more hilly southeast, where bedrock becomes more important in shaping the topography.

The area embraces the drainage divide between several north-flowing streams and Pascagama river, and lies just northwest of the height-of-land between the rivers draining northward into Hudson bay and those draining southward to the Saint-Lawrence. The most striking characteristic of the drainage system is the remarkable parallelism of the streams. Though they twist and turn and are interrupted at frequent intervals by boulder rapids, they all follow a general north-northeast or south-southwest course. This is also the trend of Lacroix lake and Aigle river. It is to be attributed to the influence of glacial deposits or rock structures, or of both.

Apart from Aigle river, all the streams in the area are small, and many of them are navigable by canoe only because of frequent beaver dams along their courses. Unfortunately, the beaver have now been almost entirely exterminated. As a consequence, their dams will soon disappear and in a few more years travel within the area will be even more difficult than it is today.

Almost the entire area is covered by green timber, only a small section in the southeast having suffered from forest fires. On the higher ground to the south and east there are some fine stands of spruce and jackpine. Birch is common on the well drained ridges.

GENERAL GEOLOGY

The bed-rock in the area is all Precambrian in age. Crossing the central part is an east-west belt of greenstones and sediments, to north and south of which are later granitic rocks. Over most of the area the strike of the formations is about east-west, but the southeast section is underlain by gneisses that strike northeast. Metamorphism of the rocks is most pronounced in the southeast and becomes progressively less so toward the northwest. Thus, the lavas and sediments in the eastern part of the central belt are represented by garnetiferous hornblende and mica schists, a higher grade of metamorphism than is met with in the western part of the belt. The greenstones and sediments are similar to the corresponding rocks which, in the Chibougamau and Waswanipi area, lying to the north and northwest of Buteux area, have generally been regarded as Keewatin. They have not been definitely correlated with these or other Keewatin rocks of the region, however, and it is therefore considered more proper to refer to them in this report as Keewatin-type. Later than the greenstones and sediments is a series of intrusive rocks, for the most part granitic but including basic types. Also, there are several masses of quite fresh gabbro, which is believed to be the youngest rock exposed in the area and probably Keweenawan in age.

Table of Formations

Pleistocene and Recent	Boulder clay, lake clay, sand and gravel
	Great unconformity
Keweenawan (?)	Gabbro
	Intrusive contact
Post-Keewatin (?)	Complex of red and grey gneisses (mostly quartz-diorite); pegmatite; granite; granodiorite Hornblende-, mica-, and talc-schists cut by many stringers of pegmatite Red pegmatitic granite Grey to red gneisses; mainly quartz diorites Peridotite, amphibolite, altered gabbro
	Intrusive contact
Keewatin (?)	Acid to basic lava flows and associated tuffs and breccias; sediments comprising greywacke, impure quartzite, banded siliceous slate, and meta-argillites

Keewatin (?)

The original Keewatin-type rocks of the area included a predominantly volcanic group and one prevailingly sedimentary. As already mentioned, they form a belt that crosses the map-area in an east-west direction. The southern part of the belt is composed mainly of typical volcanic greenstone, but it contains also several narrow bands of sedimentary rock. Conversely, the northern part consists in the main of rocks of sedimentary origin with occasional intercalated bands or lenses of volcanic rock. In both parts, the rocks have been closely folded and dips are steep - mostly nearly vertical.

Lavas:

The flows are for the most part fine-grained rocks of andesitic composition and prevailingly green colour, the latter due to their abundant content of chlorite. They are more or less schistose, and in places are highly sheared, but vestiges of original flow textures and structures such as pillows, scoriaceous and amygdaloidal flow-tops, and flow lines, are still preserved. Grey, fairly coarse, amygdaloidal lava of fresh appearance is exposed on Narcisse lake. The vesicles have been filled with calcite and there is a pronounced development of hornblende needles around the amygdules. Hornblende and calcite are also developed in massive parts of the lava.

Acid flows, near rhyolite in composition, occur in several places, particularly just northeast of Fecteau lake, and at points one and a half miles northwest and two and a half miles southeast of Narcisse lake. Similar flows associated with acid tuffs and siliceous sediments are found north of Lavigne lake and are of interest because they are mineralized.

Volcanic breccias were noted in a few places, particularly in the greenstone band south of Lacroix lake.

Sedimentary Rocks:

The sedimentary rocks were evidently laid down in several small, separate basins. Volcanic activity was going on at the time of deposition and, as a result, volcanic ash and cinders, and even some lava flows, were deposited along with the sand and mud, that were carried into the basins of deposition. There are gradations, therefore, among all the various rock-types, both along the strike and from top to bottom of the beds. Specimens taken from various parts of the area can be arranged to show a complete gradation between any one rock-type and any other. For convenience, however, the sedimentary rocks are grouped into three classes, namely, greywacke, quartzite, and slate. Greywacke is more abundant on the north side of the belt, quartzite generally occurs farther south, and slate farthest south. However, the gradations of one type into either of the others, and the occurrences of lava within the belt, make it impossible to map three separate bands of sediments.

Greywacke.-The greywackes are granular rocks composed essentially of quartz, biotite, and plagioclase feldspar (mostly oligoclase). They form beds from an inch or so to about a foot thick and vary in colour from light to dark grey, depending on the relative amount of biotite present. Within individual beds, a banding caused by the segregation of the constituent minerals into biotite-rich and biotite-poor laminae is common. Lamination is not very noticeable in the coarser beds, made up of grains about 1 mm. in diameter, but is conspicuous in the fine grained beds which, also are poorer in feldspar and richer in quartz than the coarser ones.

Thin sections of the rock show round to sub-angular grains of quartz, feldspar fragments of very irregular and corroded outline, and laths of biotite, as well as numerous small grains of epidote and very ragged plates of white mica. In some of the thin sections examined, the lamination is seen to be due to the presence of almost complete layers of epidote grains separating quartz and feldspar layers. These specimens contain very little mica.

Quartzite.-The quartzites are massive, fine-grained (0.1 to 0.3 mm.) quartz-rich rocks containing more or less feldspar and very little biotite. Under the microscope, the quartz is seen to be in irregular, interpenetrating, strained grains. Some thin sections show alternating feldspar-rich and feldspar-poor bands, but this banding is not very noticeable in hand specimens.

Slate.-The slates are very fine grained, well laminated, light to dark grey siliceous rocks, some of them resembling banded cherts. They are well exposed on the rocky islands in the north part of Rock Island lake. There the slate is made up of layers varying in width from 0.01 to 0.05 inches and up to several feet long; that is, the layers are really lenses, and although

individual layers hold their width over the length of a hand specimen, they narrow and die out over a distance of five to ten feet. There is also a banding in the outcrops caused by the occurrence of a number of layers of about the same shade, followed by others all of a different shade. These light and dark bands vary in width from an inch to a foot.

In thin section, the lighter coloured bands are seen to be composed almost entirely of tiny, angular quartz grains with some sericite. The darker bands contain less quartz, some plagioclase, and more sericite. Some of them are composed of eye-shaped grains of plagioclase and quartz embedded in a base of crinkled sericite schist. This base is so hard that it is probable there are large amounts of chert mixed with the sericite.

In addition to the siliceous slates, two other types were seen. One of these is a conglomerate which outcrops one mile east of the south end of Rock Island lake. It contains elongated, flattened quartz pebbles in a siliceous slate matrix. The other is a dense, black slate, apparently containing no quartz, which outcrops a quarter of a mile north of the surveyed line, at mileage 16.5. For the most part, this slate is made up of mica flakes just large enough to reflect light, but some of it is as devoid of visible minerals as was the black mud from which it was formed. A slight amount of graphite has been formed, indicating the presence of carbonaceous matter in the original sediment.

Post-Keewatin (?) Intrusives

The igneous rocks of the area can be divided into five groups, as follows: (1) peridotite and altered gabbro; (2) granitic gneisses, prevailingly grey, comprising the bulk of the intrusives on both sides of the Keewatin-type belt; (3) massive red pegmatitic granite, occurring in a few places in township 121; (4) the complex of red and grey gneisses with abundant pegmatite lenses and many bands of schist (the latter representing remnants of Keewatin-type rock) that occur in the southeast part of the area; and (5) gabbro and related basic intrusives.

Peridotite and Altered Gabbro:

Two small masses are included in this group. One of these, on Aigle river, is represented by a group of outcrops of peridotite and amphibolite lying within the northern area of gneissic diorite. The other is exposed southwest of Narcisse lake.

The Aigle River mass is in part a peridotite composed of fresh diallage and olivine, the latter mineral altered along fractures to serpentine and magnetite. In most of the exposures seen, however, the rock is consisting of actinolite with some serpentine and a little biotite. Contacts are very poorly exposed, but those seen indicate that the adjacent acidic intrusive rocks are later and cut the basic mass. The rock is similar in character and type to the altered peridotite occurring near Chibougamau lake, and presumably it is of the same age as the latter.

The Narcisse lake mass is highly altered and consists now of interlacing laths of hornblende lying in a matrix of crushed plagioclase and quartz. It resembles phases of the gabbro-anorthosite on Bell river which has been correlated with the complex of basic intrusive rocks of the Chibougamau region (1).

(1) Geol. Surv. Can., Summ. Rept., Pt.D, 1932, p.40; Mem.185, 1935, pp.22-27.

Grey to Red Gneisses:

Gneisses of various types are the most widespread intrusive rocks in the area or perhaps they might better be described as rocks that have been greatly affected by injection of intrusive material followed by recrystallization. In some of these rocks, banding is very conspicuous; in others it is almost lacking. Generally, they are grey in colour, the particular shade depending on the content of ferromagnesian minerals; but some of the more poorly banded types are decidedly reddish. The grain size ranges from coarse to very fine.

A study of thin sections shows that the feldspar is almost all plagioclase, ranging in composition from acid oligoclase to median andesine. Albite is present in some sections and also potash feldspar, the latter invariably microcline. Both the albite and the microcline are secondary, having been developed at the expense of the earlier-formed plagioclase. Quartz usually forms about one-quarter or more of the volume of the rock. The ferromagnesian minerals are biotite or hornblende, or both, except that, in one of the sections examined, their place is taken by very much altered augite. Secondary minerals include chlorite and epidote, both very common, and, in those gneisses that contain soda-rich plagioclase, calcite, in the form of grains and veinlets. The rocks, therefore, are quartz-diorites rather than granites. In types that are reddish, the colour is not due to the presence of red orthoclase, but to red iron-oxide dust in the altered plagioclase.

Although these gneisses are mapped as intrusive rocks, they were probably in large part formed by injection and recrystallization of the volcanic and sedimentary rocks and not by direct crystallization from a magma. The more massive types, which are also the types containing the greater amount of microcline, probably represent rocks that were nearer the magma, and that have been more completely replaced, than those that gave rise to the well-banded gneisses.

Red Pegmatitic Granite:

The intrusives in the northeast corner of the area are of two distinct types: (a) gneisses similar to and mapped with those just described but cut by a host of reddish dykes, and (b) massive red granite composed of orthoclase (or microcline) and quartz with very little biotite. This latter rock is well exposed on the south shore of the east end of Yvonne lake, where excellent examples may be seen of quartz and orthoclase intergrown to form typical graphic granite. The possibility may be advanced that this or a related granite underlies the Keewatin-type volcanics and sediments at great depth and was responsible for their widespread conversion to gneisses.

Southeastern Gneisses:

The east-west trending rocks that underlie most of the area terminate in the southeast against, and grade into, a complex of gneisses and schists that strike northeast. This relationship is indicated on the Chibougamau sheet, Map 397A, issued by the Geological Survey of Canada. The volcanics are changed into rocks characterized by abundant hornblende in large needles and elongated grains; the sediments into coarse biotite schists. Locally, both types contain large amounts of garnet. Three masses of such rocks are large enough to be shown on the map; two of them, south

and southeast of Buteux lake, lie within a transitional zone between the east-west trending gneisses and the southeastern complex, while the third is indicated farther east within the complex composing the Southeastern Gneisses. Most of the Southeastern Gneisses are, however, coarse, grey quartz-diorite gneisses streaked by white to red contorted stringers of pegmatite. Other elements in the complex are contorted hornblende and biotite schists, many of them containing garnet, and massive, sugary-grained, red granites and granodiorites. The contact between the gneiss complex and other rocks is not sharp, the change taking place over a zone a mile or more wide. The contact shown on the map, therefore, is an arbitrarily drawn line. The complex is so different from the other gneisses, however, that it was represented on the map as a unit by itself. Its significance will be discussed in the section dealing with structure.

Gabbro and Related Basic Intrusives:

Several stock-like masses of gabbro occur in the eastern part of the area and are apparently related to one another. They are dark greyish-black to brownish-black, coarse grained rocks. Around the masses lying between the surveyed line and Boot lake, numerous irregular dykes of fine grained gabbro cut the Keewatin-type rocks. Elsewhere, contacts of the gabbro with the adjacent rocks are not exposed. The outcrops a few hundred feet north of the surveyed line at mileage 24.25 are typical of the freshest gabbro. The rock is coarse grained and dark grey. A thin section shows it to be composed essentially of labradorite (Ab40) in clear, angular grains forming about 60 per cent of the rock, and diopside in well formed laths altered around the rims to serpentine. Also present are small amounts of hypersthene and quartz and of biotite and hornblende, the two last named in part altered to chlorite and magnetite. The gabbro is probably closely related in time of intrusion to similar rocks in the Chibougamau Lake map-area (1).

Gabbro of similar type outcrops east of Esker lake, but the rock here contains some garnet and alteration of the pyroxene is more pronounced.

More highly altered still is the gabbro that occurs around and west of Marceau lake. It contains a fair amount of garnet intergrown with magnetite, and has well marked poikilitic texture, with hornblende crystals enclosing quartz 'chadacrysts'. The labradorite has been replaced in part by hornblende, quartz, calcite, biotite, and garnet, and some calcite has also been introduced. The rock is massive and unsheared and seems to be later than the surrounding highly sheared and contorted gneiss. Its more altered condition, however, suggests that it may be older than the gabbro masses farther north.

Basic dykes were seen in several places. At the prospect on Little Eagle river there are several dense, black dykes up to a foot in width. They are somewhat altered basalts containing in addition to plagioclase and augite much brown biotite and some calcite. Half a mile north of Griffith lake there is an outcrop (20 feet long and 10 feet wide) of coarse diabase, apparently the north side of a dyke. This rock resembles very closely the gabbro north of the surveyed line, except that the labradorite is in lath-shaped crystals and the pyroxene lies among them.

(1) Mawdsley, J.B. and Norman, G.W.H., Chibougamau Lake Map-area, Quebec; Geol. Surv. Can., Mem. 185, 1935, pp.49-50.

Airplane view looking west along Little Eagle river across Lacroix lake, showing topography characteristic of the low western part of the area. The light areas are swamps.

(Photo Royal Canadian Air Force)

Airplane view looking west across Esker. Helen and Buteux lakes, showing topography characteristic of the eastern part of the area. The light grey areas are rock hill forested with birch and poplar.

(Photo Royal Canadian Air Force)

Pleistocene and Recent

The unconsolidated deposits of the area are almost all of glacial origin, having been deposited directly from the melting ice or from its melt-water. Most of the material is boulder clay, and the chance accumulations of pebbles and boulders cause wide, flat rapids in the streams where they cross such coarse deposits. Eskers or crevasse fillings form long, narrow ridges of sand and gravel; these have winding courses but their general direction is about S.20°W. Such ridges are very common; of those seen, the most striking traverses the middle of Esker lake and extends beyond the lake to the north and south. Small sand plains occur near the eskers, especially near their south ends.

Clays, deposited from glacially-dammed lakes, occur in the low-lying parts of the area and are most widely distributed in the western half. Lavigne creek crosses an extensive clay-covered plain in a very crooked channel between high clay banks. The multitude of smaller creeks have not cut very deeply into the clay plains, and are bordered in many places by wide strips of marshy ground.

Striae indicate the movement of the ice-sheet to have been in a direction about S.20°W.

STRUCTURE

The structural geology of the area was worked out only in broad outline because of the lack of time necessary for detailed examination and also because of the scarcity of good exposures. The rocks have been complexly folded and closely compressed. Dips almost everywhere are steep and in most places are sensibly vertical. The trend of the formations is nearly east-west over much of the area, but toward the southeast the strike swings to northeast. The strike and dip of the sediments and lava flows, where observed, is essentially parallel to the schistosity. Except for the Southeastern gneisses, which strike northeast, the structure of the gneisses conforms to that of the Keewatin-type beds, and local variations in the strikes of both types of rock suggest the presence of secondary folds on the main east-west structure. Determinations of flow tops indicate the possibility of an anticlinal axis in the lavas about two miles south of the surveyed line. From variations in strike and dip, and from the shape and pitch of minor drag-folds, a synclinal axis passing through the north part of Rock Island lake is inferred. Both of these structures appear to be plunging to the east.

No major faults were observed, but the absence of known faults should not obscure the probability of important faults in the area. There is, indeed, some evidence for the presence of a northeast-southwest fault system. The parallelism of the streams and lakes is suggestive of faulting, even though the courses of the waterways in most places are governed by the alignment of glacial deposits.

Faults have been mapped outside the area, both southwest and northeast. Faessler has shown the presence of two faults in the area immediately to the southwest (1). One of them is in the

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(1) Faessler, op. cit., Map No.338.

valley of Aigle river and if it continues north it must pass through Petit Lac Hebert in the present map-area. A northeasterly fault system occurs in the Chibougamau Lake area (1). Norman (2) shows a relationship between this system and the northeasterly trending structures of the complex of gneisses which, in the Chibougamau area, are the equivalent of the Southeastern gneisses of the Buteux map-area.

The gabbro masses in the eastern part of the area lie in the direction of the trend of similar rocks in the Chibougamau district to the northeast, which rocks are parallel to the known faults there (3). It is possible that the formations in the Buteux area have been broken by many faults, large and small, that were formed when a northeast trending mountain range was built east of the area. This possibility should be borne in mind when examining the contacts on the accompanying map. In several places where there are abrupt swings in the contact, this swing may be caused by the presence of a major fault.

These northeasterly trending structures are particularly characteristic of the Southeastern gneisses which were described above. This complex of rock types is composed of metamorphic rocks of the deep zone as is indicated by the extreme grade of metamorphism of the rocks. The original rocks - volcanics, sediments, and intrusives - have been so severely altered that the products of the metamorphism approach a common type. An enormous pressure from the southeast must have been applied to the rocks in order to cause the great changes that have been produced in them. Faulting and the intrusion of basic dykes featured the late stages of the folding that effected the metamorphism. Such folding, faulting, and intrusion is characteristic of the cores of complexly folded mountain ranges and indicates the probable presence of a large northeast-trending mountain system. The time of the deformation has been tentatively placed as late Precambrian and this complex of highly altered rocks therefore is regarded as the roots of a late Precambrian mountain system that was superposed on the earlier folding. The late deformation obliterated the older trends, and the intensity of deformation was so great that the rocks in the southeast are markedly different from the less deformed east-west trending rocks. The contact between the Southeastern gneisses and the rest of the rocks of the area is believed to mark the boundary of two geological sub-provinces of widely divergent character. The Southeastern gneisses are on the border of the Grenville sub-province and the rest of the area lies within the Temiskaming sub-province.

In a few places there is topographic evidence for east-west trending faults. The most striking is a narrow, straight valley running from Claim lake to the north end of Schist lake. A north-facing scarp parallel to this valley and lying south of Susanne and Indian lakes possibly indicates another of these east-west faults.

Drag-folding is prominently developed in the well banded rocks, and in some of these folds there is a large amount of thickening and thinning of the beds. Brittle bands enclosed in more

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(1) Mawdsley, J.B., and Norman, G.W.H., op. cit., pp.51-57.

(2) Norman, G.W.H., The Northeast Trend of Late Precambrian Tectonic Features in the Chibougamau District, Quebec; Trans. Royal Soc. Can., Vol.XXX, Section IV, 1936, pp.125-126.

(3) Norman, op. cit., p.126.

easily deformed ones have been broken and sheared so that they form series of contorted lenses. Many quartz veins have been deformed in such a manner. Minute faults are common and may even be seen in thin sections of the rocks.

ECONOMIC GEOLOGY

General Statement

Gold is the only metal that has been searched for or found in the area. Many claims have been staked, particularly in Buteux township, but little intensive prospecting has been carried on. Some gold discoveries have been made, but the prospects have not been developed. A small amount of stripping and trenching has been done on five prospects that were visited during the course of the work. On four of these there are silicified zones or quartz veins, or both, and on the fifth there are small bodies of massive sulphides. Four of the prospects are described in this report and the fifth, that on the west side of Lac Chanceux, is described in the report by R.L. Milner (1) on the region adjoining this map-area on the west.

All the prospects are in the belt of volcanic rocks or in the gneiss near its southern margin. Pyrite mineralization was seen in various places in the zone containing the prospects, and in every instance it was found to occur in rocks of acidic type, either acid flows or quartzitic sediments included in the basic flows; also, it was noted that the more prominent mineralization is associated with small basic intrusives. Such association of mineralized siliceous rocks and basic intrusives may be merely fortuitous, but there is a possibility that the basic rock acted as a precipitating agent on the mineralized solutions.

Very little mineralization was seen within the belt of sedimentary rocks. They may have been too homogeneous for the development of fractures. Metamorphism increases in intensity toward the east and, though carbonate is developed in the rocks in that section of the area, very little mineralization was seen. Probably the metamorphism was so intense that no important mineralization occurred.

The most favourable ground for further prospecting appears to be along the southern side of the volcanic belt in the western part of the area.

Description of Properties

Sigouin-Griffith Claims (Little Eagle river, Buteux township)

At this property (No.1 on the map), some work has been done on a group of outcrops which lie on either side of Little Eagle river on claims A-83749, 83750, and 83755, as shown in Figure 1. The outcrops are along a northeast trending ridge of high ground, and consist of grey, gneissic quartz-diorite. The gneissic structure is not strongly developed. It has a variable, but in general nearly east-west, strike and the dips range from 10°N. to vertical. The gneiss is altered and varies widely in texture and general appearance from place to place. The least altered type is a coarse grained aggregate of saussuritized oligoclase, poikilitic soda amphibole, quartz, and biotite, in

(1) Barry Lake Area; Que. Bur. Mines, Geol. Rept. No.14, 1940.

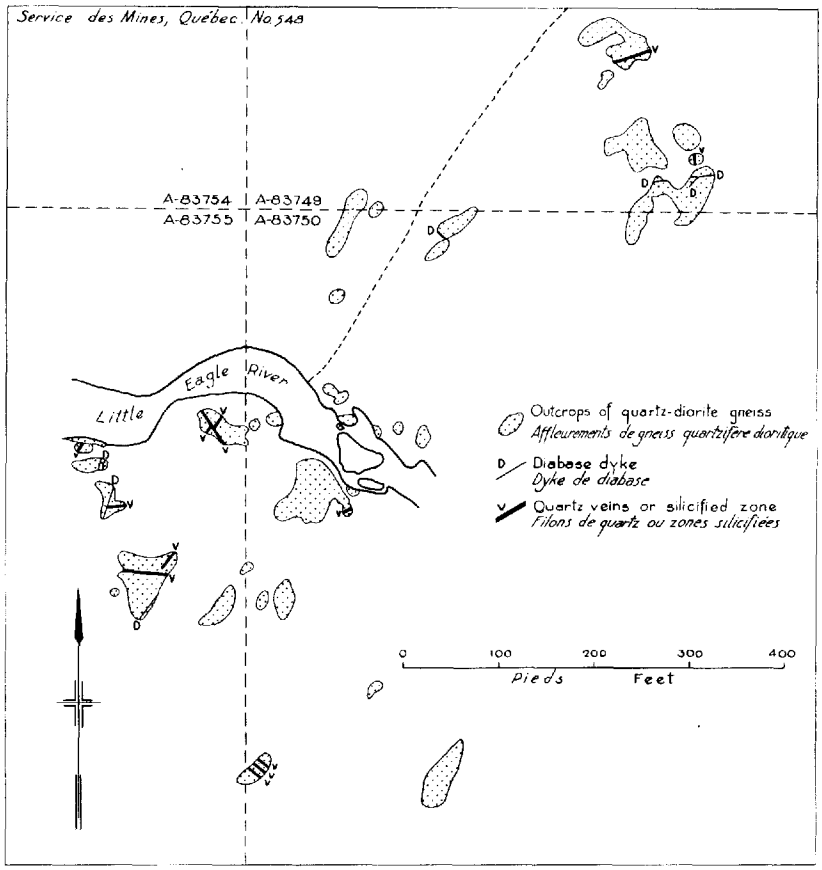

Figure 1.-Sketch-map showing outcrops on the Sigouin-Griffith claims.

order of decreasing amount. All the constituent minerals are in irregular interpenetrating grains. Many finer grained apophyses occur with the coarser rock and these are all severely altered. The dark minerals in these fine grained types are biotite and epidote, and they contain much introduced quartz as well as some albite and carbonate.

Along some zones of shearing, quartz, with some albite and a little pyrite, has completely replaced the original constituents of the gneiss, forming silicified zones. The rock is severely jointed, in places faulted somewhat, and in other places greatly sheared. Diabase dykes have been intruded along some joint and fault planes and quartz veins are formed along others. The fractures and shear-zones are not adequately exposed, so conclusions regarding their extent are tentative. However, their distribution, as shown on the map, is erratic and does not seem to be related to any extensively developed zone of deformation.

Some of the veins can be followed for their whole length and are seen to be short.

One of the more important veins outcrops about sixty feet south of Little Eagle river, on claim 83755. It strikes east-west, dips vertically, and has a maximum width of one foot along its exposed length of thirty feet. At the west end it abuts against a northerly trending vertical diabase dyke and no continuation of the vein on the west side of the dyke is exposed. The quartz is dark grey and broken by small fractures, along some of which there are seams of biotite. Pyrite is developed along many of the fractures, and near the diabase dyke free gold in easily visible specks occurs with pyrite along the fractures.

Five hundred feet northeast of the river, on claim 83749, a silicified zone crosses a small knoll of gneissic rock. Its boundaries are indefinite but the most highly silicified section is about five feet wide and consists principally of quartz, with some albite and pyrite and remnants of the quartz diorite. The zone strikes N.70°E. and dips at 60° to the northeast. It is exposed for a length of only forty-five feet across the rock knoll, at either end of which the ground is low with heavy overburden. A channel sample taken across the five-foot zone is reported by Jack Griffith, prospector, to have assayed $2.80 in gold per ton.

Since this prospect is within a 'granite' area, the age relationship of the mineralization to the 'granite' intrusion is important. The granitic rock is not an intrusive body in the ordinary sense of the term but was emplaced by a process of replacement or assimilation of the Keewatin-type rocks. It is believed to represent a wide, basic border-phase of an underlying intrusive mass. The mineralization seems to be later than the intrusion of the diabase dykes, which are correlated with the late gabbro of the area. The time relationship between the gabbro intrusion and the formation of the Southeastern gneisses was discussed above. The evidence at hand, although admittedly not conclusive, indicates the possibility that the mineralization is closely related in time to a late period of folding. If so, its occurrence on these claims in the quartz-diorite gneiss is of no special significance, and in that case the 'granite' zone may be as favourable as any other for the occurrence of gold. In other words, the fact that, on this prospect, the gold occurs in the gneiss is not to be regarded as an unfavourable feature. Unfortunately, however, there appears to be lack of continuity of the zones of fracturing and shearing.

Griffith Claims (Buteux township)

The Griffith claims (No.2 on the map) are near the centre point of Buteux township. The chief outcrops extend over a width of about three hundred feet near the creek flowing south to Griffith lake, and most of the rock exposed is amphibolite in which faint traces of pillow structure can be seen. It is thus an altered basic lava. The north edge of a dyke or sill of fresh diabase is exposed in the southernmost outcrop.

The strike of the lavas is N.30°-45°E. and the dip ranges from vertical to 50° southeast. Interbedded with them are four bands of impure quartzite, now altered to quartz-biotite schist, which contains red garnets in places. Within this rock a white quartz vein, parallel to the bedding, is exposed for a length of about fifty feet. Both the vein and the quartzite have been broken by drag-folding, and the quartz vein, being relative-

ly brittle, has been torn into lenses which are separated by amphibolite that has flowed around the broken masses.

The sediments at the south end of the main group of outcrops have been mineralized by the addition of disseminated pyrite. A curved lens of quartz about fifteen feet long and five feet wide, in the central part of the exposures, is apparently a thickened mass forming the crest of a drag-fold; it contains carbonate, pyrite, and gold. A one-pound sample taken by the writer from this mass of quartz and assayed in the laboratory of the Bureau of Mines gave $11.79 in gold per ton.

The mineralization of these drag-folded, cracked, siliceous rocks is noteworthy. The close association of the basic intrusive with the gold mineralization is of interest in view of the possible genetic relationship between the two, but yet if may be of no significance.

Golden Eagle Syndicate (Buteux township)

This property (No.3 on the map) is one mile west of the centre point of the township, and about three miles east of the Sigouin-Griffith claims, described above. It is situated within the belt of Keewatin-type rocks, near its south margin, and is underlain by light-coloured, sheared tuffs, which strike N.20°E. and dip at 60° to the southeast. Cutting the tuffs are two parallel diabase dykes, about two feet wide and one foot apart, and the tuff beds between them are strongly sheared. Quartz, calcite, and pyrite have been introduced along the shear and also in small amount in the adjacent dykes. It is reported that grab samples of the shear material have given low assays in gold.

Radio Prospectors, Limited (Buteux township)

This property (No.4 on the map) is about two miles northeast of the centre point of the township and just west of Claim lake. From the lake, a valley, some five hundred feet wide, extends westward. The rock along its north side is strongly sheared pillow andesite. Bounding the valley on the south is a steep wall of massive andesite, with quartzitic slates and acidic tuffs on its north or valley side. The slates and tuffs strike N.85°-90°E. and dip vertically or high to the south. They are severely drag-folded, and in places within the curves of the folds the rock has been replaced by massive sulphides, which have the form of lenticular bodies up to twenty-seven feet long and nine feet wide. Several such lenses were discovered by trenching, but the workings are now largely filled-in by caving, making examination of the deposits difficult. Two representative samples taken from veins or lenses on the property by W.N. Asbury in 1937, and assayed in the laboratory of the Bureau of Mines, gave trace and nil, respectively, in gold (1).

The sulphide bodies can be grouped into three classes; pyrite, pyrrhotite, and pyrite-pyrrhotite masses. Lenses of the first class are composed of masses of cracked pyrite grains in the form of imperfect cubes up to a quarter of an inch in diameter, which have almost entirely replaced the quartz and biotite of the slate and tuff. The pyrrhotite-rich lenses are composed of massive, fine grained pyrrhotite and a little chalcopyrite enclosing irregular grains of quartz and biotite. Polished surfaces

(1) Que. Bur. Mines, P.R. No.120, 1937, p.20.

of these two types show strikingly different textures, the smooth even surface of the pyrrhotite contrasting with the rough, cracked pyrite.

The mixtures of pyrite and pyrrhotite combine the textures characteristic of the other two. A polished surface resembles the bird's eye ore of Ducktown, Tennessee. Large irregular pyrite grains lie in a smooth-surfaced mass of pyrrhotite, quartz, and biotite.

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