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PRELIMINARY REPORT ON VAL DES BOIS MAP-AREA, PAPINEAU AND GATINEAU COUNTIES

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PRÉLIMINARY REPORT
ON
VAL DES BOIS MAP-AREA
PAPINEAU AND GATINEAU COUNTIES

BY

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PRELIMINARY REPORT

ON

VAL DES BOIS MAP-AREA*

PAPINEAU AND GATINEAU COUNTIES

by P. Mauffette

I N T R O D U C T I O N

The area described is bounded by longitudes 75°30' and 75°45'W. and latitudes 45°50' and 46°N. It includes most of Bowman township, three-quarters of Villeneuve, the southern parts of Bigelow and Wells, and small parts of Portland and Derry townships. It fills the gap between the Buckingham area, mapped by M.E. Wilson (1) in 1913-15, and the McGill Township, mapped by E. Aubert de la Rüe in 1947 (2).

Val des Bois, the only village within the limits of the surface investigated, lies centrally in it. Highway No. 35, which links Buckingham to Mont-Laurier, follows the east bank of

(1) Buckingham Sheet; Geol. Surv. of Canada, Publ'n No. 1691, 1920.

(2) McGill Township Area, Papineau, Labelle, and Gatineau counties; Que. Dept. Mines, P. R. No. 215, 1948.

*Translated from French.

Lièvre river in its course across the map-area. Another road follows the west side of the same river. Several secondary roads and numerous trails, which criss-cross the region, make it, as a whole, easily accessible. The eastern extremity, as well as the northwestern part, between Poisson-Blanc lake and Lièvre river, is, however, without easy means of access.

The map-area is crossed in a general southwesterly direction by Lièvre river. In its southern part, the water level was raised and large lakes were created by construction of the Grandes Chutes dam.

R E L I E F

In general, the topography is irregular with an average relief of about 850 feet. North of Grandes Chutes dam, Lièvre river has an elevation of 629 feet and Poisson-Blanc lake is at the 660-foot level. The lowest elevation (565 feet above sea-level) is that of Argile lake, in Villeneuve township in the southeastern part of the area.

To the west of Lièvre river, the hills are from 1,100 to 1,400 feet high. On the east, many hills reach 1,500 feet, with some exceeding 1,600 feet. The highest point is on lot 43, range VI, Villeneuve township, in the easternmost part of the section studied. The maximum relief is thus in excess of 1,035 feet.

In the northeastern part of the ground investigated, there are about eight square miles of relatively low ground, devoid of relief and swampy in many places. A similar low and swampy stretch of about two square miles is found west of White Deer lake.

TABLE OF FORMATIONS

	Recent and Pleistocene	<p>Marine, lacustrine and fluvial deposits (gravel, sand, and clay)</p> <p>Glacial and fluvioglacial deposits (erratics, gravel, sand, and clay)</p>
P R E C A M B	Post-Grenville intrusions	<p>Diabase dykes</p> <p>Granites and associated pegmatites</p> <p>Intermediate rocks, granites, syenites, and associated pegmatites</p> <p>Gneissic augite syenite surrounded by a differentiation zone of hypersthene-rich gabbro</p>
R I A N	Grenville	<p>Paragneisses and composite gneisses, quartzite, crystalline limestone, metamorphic amphibole, and pyroxene-rich rocks</p>

GENERAL GEOLOGY

All the consolidated formations are of Precambrian age. These are mostly gneisses of igneous and sedimentary origin. The sedimentary rocks were intensely metamorphosed and were much injected by igneous rocks.

Metamorphic Rocks of Sedimentary Origin

The metamorphosed sedimentary rocks, which are in places highly injected, belong to the Grenville series. They outcrop in about four-fifths of the map-area and are mainly paragneisses, quartzites, and limestones. The sedimentary origin of the paragneisses is very evident when the exposures are not too feldspathic, since the stratification may then be fairly well seen. In some places, the calcareous rocks have been transformed to rocks rich in metamorphic amphiboles or pyroxenes.

The paragneisses are by far the most important of the above series and they are also exposed in most parts of the area. Locally, quartzites are abundant and, in some places, they underlie extensive areas; they are common in the middle of masses of rock with an intrusive aspect, which suggests that they have resisted assimilation because of their massive nature and refractory character. Quartzites commonly form mountain summits and crests of hills on account of their resistance to erosion and, because of this feature, an exaggerated notion of the relative importance of the quartzite may be gained. The limestones outcrop in areas of low relief and, because of their relative softness, they have been more eroded than the other formations. Consequently, they appear to be less abundant than

they really are, especially as these low grounds are ordinarily covered by overburden, which conceals the presence of the limestone.

Paragneisses

Most of the paragneisses are well-banded, which facilitates their identification in the field. Differential erosion, especially on the lake shores, accentuates the banding since the more resistant parts, such as zones rich in quartz, stand in relief. Even in small exposures, the heterogeneity of the formation is seen in the juxtaposition of layers of diverse mineral composition. Mica is abundant in many layers as is also garnet in some. In many exposures, the paragneisses may be observed to have interbedded quartzites.

At certain localities, the paragneisses are much recrystallized and resemble igneous rocks. At an intrusive contact in many cases, they are injected and transformed to migmatites. In some places, they are rich in sulphides and their exposures show a rusty surface.

Quartzites

Quartzites of different colours, but mostly greyish blue or white, are common. Many of them are feldspathic.

One section in which quartzites occur extensively is north of White Deer, in range I of Bowman township. The beds there are of different colours - blue, white, or rust. Two other localities in which these formations occur are worthy of mention. One is at the Grandes Chutes dam, where the eddies at the foot of the falls have dug remarkable potholes, and the

other is at Argile lake, where some of the quartz is very white.

Crystalline Limestone

Crystalline limestones are found in the lower ground but do not cover a large part of the map-area. They are best shown on the east shore of Poisson-Blanc lake, where they are exposed nearly continuously for two miles and for a distance of a third of a mile inland. To the east of Amélia bay, where they are protected from erosion by more resistant rocks, they form remarkable white escarpments more than one hundred feet high. Some of the islands in the lake are also made up of limestone, as for example, d'Aigle island and the three other small islands in line with it. To the northwest of White Deer, west of the road, nearly all the exposures are of limestone.

The crystalline limestones commonly contain graphite, but in some bands mica instead is plentiful. Much of the limestone contains small yellowish orange, brown, or green grains which are silicates such as chondrodite, pyroxene, olivine, etc. The limestones are invariably granular, with grains as much as one-half inch in diameter. In places, silicified inclusions in the limestone give to the rock the appearance of a conglomerate or of a breccia. The inclusions are the result of a breaking up of the more brittle beds during deformation while the limestone was plastic.

Amphibolitic Rocks

Small masses of amphibole-rich rocks are frequently encountered. They are ordinarily very coarse, with crystals in some cases having

a length of several inches. Two easily accessible masses of this type are in Villeneuve township near Lièvre river: one is on lot 2, range VIII, and the other is on lot 2, range VII.

On the west shore of Argile lake, in range II, Villeneuve township, the quartzite is interstratified with an amphibolitic rock of variable texture. This association was also observed in other parts of the region. It is highly probable that these amphibole rocks represent a formation of sedimentary origin.

Metamorphic Pyroxenite

This rock is made up principally of pyroxene and varies in colour from green to greyish-green. It is frequently encountered, but its occurrences are of limited extent. The largest observed mass is on the east shore of Argile lake, in range II of Villeneuve township. It is over one mile in length and about a quarter of a mile in width, but does not appear to be of uniform character.

Composite Gneisses

To the northwest of Bowman lake, as well as in other parts of the map-area, the sedimentary rocks are much recrystallized and deformed, and locally they show zones of granitic aspect. The origin of these rocks is quite evident when they can be examined over extensive areas. If, on the contrary, exposures are small and scattered, many of them need to be examined to realize that one is dealing with rocks of sedimentary origin that have been granitized and not with rocks of an intrusive nature. The vestiges of stratification or banding, as seen in the larger exposures, indicate without a doubt

the origin of this rock. Deformation, in many cases intense, has given the rock a wrinkled appearance. Garnet is very abundant in most of these rocks.

Intrusive Rocks

No large masses of distinctly intrusive rocks are found in the area. The most extensive are in the northeastern part, where one mass of two and a half square miles occurs. There are also some intrusive bodies in the southern part of the area, the principal one of which, southwest of Argile lake, extends for some distance beyond the limits of the map-area. Part of an intrusive body, apparently of considerable extent west of the map-area, covers about one square mile southwest of Poisson-Blanc lake.

Complex of non-differentiated intrusives and of sedimentary rocks

In the western part of Bowman township, there is an area, about eight miles long and as much as four miles wide in its southern part, in which the geology is of a highly complex nature. This zone is made up of a complex of rocks in which intermediate varieties, such as quartz mangerite, predominate. The complex includes narrow bands composed of quartzite in most cases, but in other cases they are made up of granitic gneiss or crystalline limestone. Pegmatites are abundantly exposed and in several places form rock masses of considerable extent.

The scale on which the field-investigation was carried out did not permit detailed dif-

ferentiation of the several units that make up this complex, and the accompanying map, in consequence, merely shows one symbol to indicate the location of the complex as a whole.

Intermediate intrusives and associated rock-types

Intrusive rocks of intermediate composition, particularly quartz mangerite and associated types, are the most common among the igneous rocks of the area. They are similar to the rocks of the Buckingham series as described by Wilson (1).

Some of these rocks are gneissic, but others, especially the coarse or pegmatitic varieties, are massive. They, as is the case for the other feldspathic rocks of the region, are ordinarily brown in colour. This colour, however, is the result solely of surface alteration which may be found to reach into the rock for a depth of several inches and even as much as a foot. In some cases, the very surface of the rock may be bleached white, but in many places it is of a rusty or reddish colour. Freshly exposed surfaces, such as in road-cuts, are invariably greenish-grey.

The texture and mineralogical composition of these rocks are fairly variable within the same intrusion. The grain size is from me-

(1) Buckingham Sheet, Geol. Surv. Can., Publ'n No. 1691, 1920.

dium to coarse. Hornblende, pyroxene, and mica are generally present. In the cases where mica is more or less abundant, the rock is feebly gneissic. In the granular varieties, hypersthene may at times be seen by the naked eye. Pegmatite dykes are common in these intermediate rocks.

Among the main occurrences of these rocks, the one east of Lièvre river, in ranges VIII and IX of Villeneuve township may be mentioned. Here particularly in the southern and northern ends of the intrusive mass, certain parts are very rich in mica and closely resemble the exposures of the Buckingham series at Buckingham itself, as described by Wilson. In the southern extremity of this same mass, garnet is abundant.

On the opposite bank of the river, in Bigelow township, there is a similar intrusion, except that here mica is rather scarce.

To the southwest of Argile lake, a third similar mass, containing hornblende and mica, lies in the centre of a structural fold. Its boundaries are not clearly defined because, over extensive areas, it has assimilated the sedimentary rocks which it has intruded. The invaded rocks, to a more or less degree, still show evidences of their original stratification.

West of White Deer, in ranges III and IV of Bowman township, a hill about half a square mile in area is made up entirely of a brown rock that contains varying amounts of hornblende and, in some places, mica and clearly visible hypersthene. The grain of the rock ranges from medium to coarse. Numerous quartz-rich pegmatites cut the mass.

Other bodies of brown quartz-mangerite, with or without syenitic or quartz-bearing pegmatites, show up in many places over the map-area. They form exposures of various sizes, but most of them are of small extent.

In some places, numerous exposures of pegmatite are scattered over areas of one square mile or more; in such cases, it seems very likely that they may cut sedimentary formations that are hidden by the overburden. In certain other places, the pegmatite outcrops in a continuous fashion over a large area, as shown by the exposure southwest of White Deer lake where a hill more than a quarter of a mile in length is entirely made up of quartz-bearing pegmatite. These syenitic and granitic pegmatites, beneath their brownish weathered surfaces, have a fresh, unaltered appearance and are not in the least gneissic. These features indicate that they were intruded after the Grenville rocks were folded and metamorphosed. Furthermore, according to field observations, they appear to be younger than all the other rocks of the area except the diabase, which will be described later.

Gneissic intrusives varying from syenite
to hypersthene gabbro

As mentioned before, southwest of Poisson-Blanc lake there is a mass of igneous rock that forms part of a large body which has been traced for more than one and a half miles west of the map-area. Most of the intrusion seems to be made up of a syenite with dark green pyroxenes, but the border facies is a gabbro rich in hypersthene. Both rock-types are gneissic.

Gneissic granite dykes that are very abundantly exposed along the south shore of Paisson-Blanc lake may be genetically related to the syenite and gabbro intrusive.

Granite

The only body of granite exposed continuously is the one that forms nearly the whole of the large island in Bowman lake. This is in range IV of Bowman township, three-quarters of a mile south of the road. The granite is here coarse grained; it is flesh coloured, with orthoclase as the principal constituent mineral. It shows no evidence of deformation in its texture and structure. Unfortunately, this rock-type was not found in contact with any other formation. Near the middle of the southern part of the island, however, there is an apple-green, granular pyroxenite with crystals of phlogopite and apatite.

A distinctive grey granite is found on the south bank of Lièvre river, at Grandes Chutes dam, as well as on the west bank below the dam. On the Buckingham map-sheet, the name "High Falls" was given this granite by Wilson, but, as no report accompanies the sheet, the granite has not been described. In the vicinity of Grandes Chutes it is quite variable. At the dam and south of there, it is very siliceous, has a high content of garnet and more or less mica. On the east bank of the river, the composition varies from hornblende granite to mica granite, the grain size from medium to coarse, and the colour from pink to grey.

Diabase

Diabase dykes cut all the other formations that have been described. They strike approximately east-west with a slight tendency towards northwest and southeast. The diabase has a fresh appearance, a further indication that it is younger than the other rocks, but it still is to be considered as being most probably of Precambrian age.

An examination of serial photographs reveals a large number of fractures parallel to the diabase dykes; this is further discussed in the section on tectonics.

Pleistocene and Recent

Much of the bed-rock is concealed by glacial or post-glacial boulders, gravel, sand, and clay, which cover most of the map-area. Where low ground prevails, as along Lièvre river, these deposits have been reworked by the river when its channel was much wider than it is now. The Champlain sea penetrated into the map-area, especially via the valley of Argile creek, and covered the ground that is now at the 600-foot level. Shells of Macoma type, deposited in that sea, are to be found in abundance in the clays at the mouth of Argile creek.

STRUCTURAL GEOLOGY

Folds

The structural geology in many parts of the area is difficult to decipher. In the southern part, three well-defined and more or

less closed folds cause repetition of formations and individual beds. The axes of these folds, which are shown on the accompanying map, plunge northeast or southwest and, as a result, outcrops in their vicinity form an arcuate pattern. The convexity of the curved outcrop-lines in the case of the most western of these folds is towards the southwest, whereas it is towards the northeast in the case of the central one, and north for the one that crosses Argile lake. The axial planes of these folds are almost vertical; the general strike in the case of the two most westerly ones is N.40°E., and the strike of the most easterly one is almost north-south or curved slightly, so that its trace is concave towards the east.

In the northwestern part of the map-area, the sedimentary formations are folded such that their outcrops are arcuate, with a convexity towards the southwest. The axial plane of the principal fold appears to have a steep dip and it strikes in a northeast-southwest direction.

The structural conditions in the central and northeastern parts of the area are still more complicated and, in the eastern part, there is not sufficient information available to obtain even a general idea of the structural trends.

Faults and Joints

A close examination of aerial photographs of the area reveals the presence of numerous fractures. These fractures are represented by depressions where, however, the overburden makes their study in the field impossible. They are more or less straight and the diabase dykes

of the area seem to follow some of the same general directions.

Some shear zones were found, but it was impossible to trace their extensions. One of these shear zones, marked by the presence of crushed limestone, may be seen for a short distance along the road that leads from White Deer to Clair lake. Nearby, a diabase dyke follows a trend similar to that of the fault.

Other possible rectilinear structures are discernible on the topographic map. The most noteworthy is the one in the southeast corner of the map-area, extending from range II, Villeneuve township, in a northwesterly direction; it passes about two miles east of Val des Bois and was encountered on several traverses. The reason for this topographic expression has not as yet been found, but it can be said that, if it is interpreted as a fault, there is no indication of any displacement of the rocks.

ECONOMIC GEOLOGY

No mineral deposits in the area are being exploited at the present time, Industrial minerals such as mica, feldspar, and apatite, however, have been produced in the past.

Mica

During the first world war, a fairly important deposit of amber mica was worked, near Adélina lake, in lot 6, range III, Villeneuve township (see locality No. 1 on map). About ten pits yielded considerable quantities of good-quality mica. Deposits of similar type, but few of them of possible commercial value, are to be

found in many other parts of the area. As an example of one of these other deposits, mention might be made of the mica showing in a small pit near the southwest corner of Poisson-Blanc lake, in range VII of Bowman township (locality No. 2 on map). All these deposits are associated with pyroxenite and the amber mica is accompanied by apatite.

White mica, muscovite, has been mined, along with white feldspar, from a pegmatite dyke at the "Villeneuve" mine in lot 29, range I of Villeneuve township (No. 3 on map). This mine is the best known of the former mica producers in the region and, when it was in operation, it was one of the important muscovite producers of the country.

Feldspar

Aside from the aforementioned deposit, known locally as the "Villeneuve mine" or "Mine de Mica", apparently no other dyke in the area was exploited for feldspar, although a few pits were dug a short distance north of the Villeneuve mine in a pegmatite containing pink potassic feldspar and quartz (See No. 9 on map).

During the course of the present investigation, some pegmatite dykes containing flesh-coloured potassic feldspar were observed south of Grandes Chutes dam, near the southern boundary of the map-area, in range I of Villeneuve township. It is quite possible that systematic prospecting might yet reveal the presence of some economic deposits of this feldspar in that part of the area.

Granitic pegmatites, containing large crystals of feldspar, were observed in several other places in ranges I and II of Villeneuve township, west of the road which follows Argile creek.

Apatite

Apatite is of common occurrence in the map-area. As is the case for amber mica, it is invariably associated with pyroxenite. According to available information, it is only at one place, however, that this mineral was produced. This was during the first world war, when a small, but rather rich, deposit was worked at what is known as the Brazeau property, on lots 27 and 28, range V of Bowman township (deposit No. 4 on map).

Quartz Crystals

Quartz crystals were noted in four different places between Poisson-Blanc lake and White Deer. Most of them are small, with a common dimension of three-quarters of an inch by one inch and a half, but some of them are as much as several inches long. Many of the crystals are quite clear, but some are rose-tinted.

The largest of these deposits is the one on the east shore of Poisson-Blanc lake, approximately on lot 38, range VII, Bowman township (locality No. 5 on map). Another is on lot 33 of the same range, on the west shore of the lake (No. 6 on map), and a third one is on lot 42, range VI, Bowman township, (deposit No. 8). The fourth deposit (No. 7 on map) is approximately on lot 54, in the northern part of range III, Bowman township.

The exposures at all these deposits are in themselves too small to be of economic importance, being limited to half a dozen or so cavities, none of which exceeds a few feet in width. Furthermore, while crystal faces at the fourth locality (No. 7 on map) are such as to indicate that the small crystals there are untwinned, the absence of similar faces on the crystals of the other deposits would indicate that the quartz crystals at these other three places may be

twinned and, consequently, of no commercial value, regardless of what large size they may attain. Further search around the known occurrences and elsewhere in this northwestern part of the map-area, however, may reveal the presence of geodes from which quartz crystals of commercial grade may be extracted, even though it may be on a small scale.

Brucite

Brucite, a hydroxide of magnesium, is mined for its magnesia and magnesium metal content at Wakefield, southwest of the map-area, about 17 miles north of Hull.

In Quebec and Ontario, brucite is found in the Grenville limestones as granules, of nail-head size, weathering on the surface of exposures to a compound resembling chalk.

Grenville limestones are quite abundant in the present map-area. No brucite has as yet been seen in them, but they are worth prospecting for the discovery of this mineral in such places as the limestone area west of Argile creek where the rock contains appreciable quantities of serpentine.

Uranium

In certain reports on the mica mine of lot 31, range I, Villeneuve township, the discovery of a piece of uranium ore weighing one pound is mentioned (1).

Evidently, the occurrence is here a mineralogical curiosity. A check with a Geiger counter revealed no particular indications here or in the other parts of the area where the instrument was used.

(1) Principal references:

de Schmid, Hugh S., Feldspar Industry in Canada; Mines Branch, Ottawa, Publ'n No. 40, p. 40, 1916.

Ellsworth, H.V., Rare-element minerals of Canada; Geol. Surv. Can., Econ. Geol. Series No. 11, 1932. pp.240-244.