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THE NORTHEAST PART OF FIEDMONT TOWNSHIP, ABITIBI-EAST COUNTY

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ET MINÉRALE

NORTHEAST PART OF FIEDMONT TOWNSHIP

W.G. Brown

Geological Report

THE NORTHEAST PART OF FIEDMONT TOWNSHIP,  
ABITIBI-EAST COUNTY, QUEBEC.

by

W. G. BROWN

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Plate IV -Amphibolite inclusion and quartz vein in albite granite, lot 46, range VI, Fiedmont township

INTRODUCTIONGeneral Statement

The northeast part of Fiedmont was mapped by the writer for the Quebec Department of Mines in the summer of 1957. The map-area has been intensively explored for base metals since 1948. Several zinc-copper deposits have been found and one, the Vendome, has been developed by a shaft and three levels. The survey correlated the mass of information acquired by the mining companies while it was still available.

Physiographically the area is in the clay belt that occupies the site of a <sup>post-</sup>glacial lake Barlow-Ojibway. The only noteworthy elevation rising above the plain-like surface is underlain by the Pascalis-Tiblement batholith.

All the consolidated rocks in the area are of Precambrian age. The oldest are conformable basic and intermediate lavas. The Lacorne and Pascalis-Tiblement batholiths enter the area and minor intrusive bodies related to both are abundant in the volcanic rocks. An overturned syncline crosses the area and both limbs dip at a steep angle to the north. The base metal mineralization is associated with silicified strike shears and silicified volcanic rocks. The mapping showed that similar silicified volcanic rocks occurred in parts of the map-area that have not been explored. Two major faults intersect in the area and this provides a generally favourable structural control for ore deposition.

Location

The area mapped is the northeast quarter of Fiedmont township, Abitibi-East county, and is about 30 miles north of the town of Val d'Or. The quarter township is bounded by latitudes 48° 21' to

48°26' and by longitudes 77°34' to 77°40' and has an area of 25 square miles. An additional 8 square miles adjoining the quarter in Fiedmont township is included in the report to bring all the base metal occurrences in Fiedmont township on a single sheet.

#### Access

The northern boundary of the map-area is half a mile south of the town of Barraute. A ~~good~~ gravel road linking Val d'Or to Barraute runs along lot line 43-44. Other gravel roads give access to within two miles of all parts of the area except the southeast, which is reached by a trail leaving the Val d'Or road in the middle of range VI.

The northern transcontinental line of the Canadian National Railways passes through Barraute and the northeast corner of Fiedmont township.

#### Field Work

Geological mapping on the scale of 1,000 feet to the inch was done on a base map supplied by the Draughting and Cartography Branch of the Quebec Department of Mines. Most outcrops were plotted by pacing from range and lot lines as they are too small to appear well on the aerial photos used. Available geophysical surveys and diamond drilling results were examined and three weeks were spent mapping the underground workings of the Vendome mine. These sources supply almost all the information on the geology west of the Laflamme river.

Outcrops project a few tens of feet above the plain and make up about 3 per cent of the area. Most occur east of the Val d'Or road in a belt 2,000 feet wide that trends 20 degrees east of north. It

extends fairly continuously through ranges VIII, IX and X except for a 4,000 foot gap straddling the IX-X range line.

The hills in the southeast corner are underlain by the Pascalis-Tiblement batholith. In general outcrops are low and scattered although the overburden appears to be slight. The hills are probably a smooth polished hump that rises gently from the volcanic rocks to the north.

Messrs. R. Leuner, A. Vezina, M. Paquin and R. Bell acted ably as assistants.

#### Acknowledgments

Mr. P. R. Geoffroy gave access to the drill core and records on the Vendome, Barmont and Roymont properties. Mr. M. B. Wiwchar, geologist at the Vendome mine, gave much information on the mine geology. Thanks to the collaboration of the above named the drill core and records for about 200 drill holes were available for examination and this provides the basis for the geology west of the Laflamme river. Mr. T. Koulomzine supplied geophysical surveys on many properties and gave much information on the general geology of the area. Mr. R. Leuner collected much of the information on the Vendome mine as preparation for a thesis and kindly made it available to the writer.

#### Previous Work

Tremblay (1950) correlated all previous mapping in the Fiedmont region and his map, on the scale of one inch to the mile, is a complete revision of the Fiedmont map 206A of James and Mawdsley (1929). The map-area adjoins to the north and west two sheets mapped on the scale of 1,000 feet to the inch. McDougall (1952) mapped the southeast part of Barraute township. Jones (1955) mapped the northwest quarter of Fiedmont township. The writer revised a portion

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of his sheet to put in the subsequently discovered Barvallee zinc-copper deposit. An M.Sc. thesis by Shields (1953) on the Vendome mine supplied useful petrological information.

### PHYSIOGRAPHY

Except for rounded hills in the southeast corner the map-area is a flat plain. <sup>Post-</sup>glacial lake clays form most of the surface. A northerly trending esker occurs west of the Laflamme river and there are a few low terminal moraines. Drainage into the Laflamme River valley has cut shallow valleys and made the clay suitable for farming. Only a few outcrops occur along them. East of lot 52 the drainage is towards the Courville river through swamps.

The north half of lake Fiedmont is in the southwest corner of the area. The Laflamme river flows northwards from the lake and passes through Barraute.

### GENERAL GEOLOGY

#### General statement

The map-area is on the north contact of a series of batholiths occupying a belt 35 miles long and extending through the townships of Tiblement, Pascalis, Fiedmont, Lacorne, Lamotte and Preissac. The belt strikes east or slightly south of east and is generally conformable to the strike of the Keewatin rocks. To the north of the batholiths these are almost entirely volcanic rocks. A few sediments occur on the contact of the Lacorne batholith in the northwest quarter of Fiedmont township.

Weber (1951) has worked out a general sequence of tight folds to the north of the map-area, in Barraute and La Morandiere townships. The fold axes are about 4 miles apart and plunge gently to the west. A syncline traverses the map-area.

The Manneville strike fault is a major shear zone in the volcanic <sup>rocks</sup> close to the contact of the batholiths. It extends at least as far

as Fiedmont township and probably passes through it. A major cross fault, striking northeast, follows the Laflamme River valley and intersects the Manneville fault in the map-area.

All the consolidated rocks in the map-area are of Precambrian age. The oldest rocks are Keewatin-type lavas. Andesite makes up most of the group. Dacite and basalt comprise the balance and pyroclastics are almost non-existent. Tremblay (1950) places the volcanic rocks of the area in the Kinojevis group.

The western tip of the Pascalis-Tiblement albite granite batholith enters the southeast part of the area and extends as far as the Val d'Or road, if not as the main body of the batholith at least as related stocks.

Hornblende monzonite and biotite-hornblende granodiorite intrusions related to the Lacorne batholith occur throughout the whole area west of the Val d'Or road. Dykes and sills are abundant. One stock straddles the north boundary. The intrusions are roughly conformable to the lavas in ranges IX and X. A few small dykes cut across the strike of the lavas in range VII. Aeromagnetic contours and diamond drilling indicates that the outcropping dykes are part of a tongue-like extension of the Lacorne batholith which has the same general northeast strike as the dykes.

A large number of dykes and sills intrude the lavas. All were intruded after the lavas were folded. Diorite and quartz diorite are the oldest. Feldspar porphyry, intrusive rhyolite and granodiorite are later and the succession among them is probably as named.

Two types of highly metamorphosed lavas occur in the area, associated respectively with the batholiths and their satellites. Amphibolite occurs at the contacts of the batholiths. The lavas

about the satellites are silicified to form a variety of rock types from massive to banded. The intrusive rhyolite forms some bodies of injection gneiss.

The Keweenawan-type diabase dykes are the youngest intrusive rocks in the area. The one following the Laflamme River valley is a quartz gabbro. Another dyke is believed to cut across the southeast corner of the map-area, following the general line of the Courville river.

Table of Formations

Quaternary	Recent	Stream and swamp deposits
	Pleistocene	Lacustrine clays, till, sand and gravel
Proterozoic	Keweenawan-type	Diabase, quartz gabbro
Archean	Algoman-type	Hornblende monzonite, biotite-hornblende granodiorite
		Intrusive rhyolite Albite granite
	Post-Keewatin-type	Feldspar porphyry Diorite, quartz diorite
	Keewatin-type	Basic volcanic rocks-andesite, basalt and minor pyroclastics Intermediate volcanic rocks-dacite and dacite flow breccia Highly metamorphosed volcanic rocks-amphibolite, amphibolite schist, acid biotite schist, silicified lavas associated with dyke swarms, injection gneiss

### Basic Volcanic Rocks

The principal exposures of Keewatin-type volcanics outcrop in lots 48 to 51, range VIII, in lot 51, range IX, and in lots 51 to 53, range X. The belt of outcrops cuts across the strike at right angles for a length of 16,000 feet. The volcanic rocks are conformable and occupy the trough of a syncline. Andesite is the lowest formation. It has a minimum thickness of 5,000 feet. The bottom is in doubt because of possible faulting and folding in range X. Dacite lies above the andesite and has a thickness of 1,500 feet. The upper formation is a basalt whose minimum thickness is 1,000 feet.

Although andesite is the thickest formation there are few representative outcrops of unaltered rock. Extensive exposures occur in lots 51 to 53, range X, but most of them show evidence of some form of alteration. Most outcrops are of a massive green rock, weathering rusty, dark green or white. Those that weather rusty are fine grained and crystalline, of a dioritic appearance. White-weathering varieties are cherty and break with a sort of conchoidal fracture. They are evidently more siliceous than the 'dioritic' rock and contain scattered oval blue quartz eyes. A third variety, weathering dark green is the ordinary type of greenstone. The three types are so intermingled that they cannot be mapped separately. Outcrops of andesite in lot 51, range IX, are so sheared that the original structures are mostly destroyed. A few amygdules and bun-type pillows were seen.

The outcrops described in range X are termed quartz diorite by Tremblay (1950, p. 23). The writer concludes that they are metamorphosed andesites mainly by analogy with the lavas exposed in the workings of the Vendome mine, lot 34, range X, and in the drill core from its vicinity. Massive siliceous and 'dioritic' rocks grade into each

other and in turn grade into fresh-appearing lava. The altered lavas occur about the stock and sills of granodiorite and contain numerous small dykes and sills of granodiorite and intrusive rhyolite. The metamorphism seems to have been accomplished more by the swarms of small intrusives than by emanations from the larger intrusive masses. There are no outcrops of the altered rocks which occur about the Vendome mine, however, the writer judges that they would appear on surface much as the varieties described from range X. Moreover four small dykes, averaging 2 feet in width, were found in the massive green rock. Two were intrusive rhyolite and two were hornblende granodiorite.

South and north of the massive silicified lava in range X there is a gradation into a greenstone possessing bun-shaped pillow structures. It is green, dense, and weathers dark green. The centres of pillows sometimes weather white. Carbonatization occurs along shears, one of which is large enough to represent on the map. Weather pits form in schistose lava. White-weathering patches also occur in schistose lava, giving the appearance of a pyroclastic. The rock is massive on fresh surfaces. The white weathering of the pillow centres and the patches is probably a consequence of carbonatization.

The one pyroclastic bed shown on the map occurs in range X, south of the silicified lavas. White-weathering oval fragments occur in a green schistose matrix. Superficially the fragments resemble the weathering patches in the schistose lava previously described. The pyroclastic fragments are graded in size, from 1/4 inch thick on the south to 3 inches thick on the north.

The assemblage of volcanic rocks in range X, south of the silicified lavas, resembles the nearest outcrop along strike to the east in lots 6 and 7, range VIII, Courville township. Tremblay (1950, p. 92) classified the outcrops as andesite, agglomerate, massive rhyolite and rhyolite breccia. The writer observed some thin acid pyroclastic beds but other fragmental-appearing rocks were massive on fresh surfaces. The white-weathering patches were similar to those seen in range X, Fiedmont township, and also occurred in a schistose basic lava.

The volcanic rocks outcropping in range X are either silicified basic volcanic rocks or else part of a band of acid volcanic rocks that runs through Courville township. In either case the outcrops are not good representatives of the lavas which, from drilling, are known to form a 5,000 foot thick formation west of the Laflamme river, presumably along the strike of the outcrops. There are numerous drill holes in lots 32 to 37, range X. Away from intrusions the lavas are everywhere remarkably uniform. They are fresh-appearing, green and only slightly schistose. Greyish-white quartz amygdules whose width averages  $1/4$  inch are abundant. The writer concludes that the unaltered andesite is amygdaloidal and has bun-shaped pillows.

Shields (1953, p. 5) made a petrographic study of 18 specimens from the vicinity of the Vendome mine. The average grain size is  $1/2$  mm. The only primary mineral is a plagioclase having an anorthite content between An30 and An55. This mineral makes up from 10 to 30 per cent of the lava. The secondary minerals are quartz 12 per cent, chlorite 15 per cent, hornblende 30 per cent and the balance a mat of biotite, epidote, sericite, carbonate, opaques. The quartz is in fine grains and has probably developed from the breakdown of plagioclase.

Chlorite is an alteration of primary mafics. The hornblende and biotite are fresh and have formed at the expense of chlorite. The hornblende has a pleochroic formula X pale green, Y blue, Z green. This is the same as the hornblende in the Mogador granodiorite stock. The rock is therefore a basic lava which has been amphibolitized by the granodiorite stock.

The writer studied some specimens further away from the stock and confirmed Shield's conclusion that the rock is a basic lava. The chief difference in the specimens is that fine grained biotite is more abundant than hornblende. It makes up 10 to 30 per cent of the lava and is responsible for the brown patches and bands seen in hand specimens.

Amygdules noted by Shields in thin sections were fine grained intergrowths of epidote, plagioclase and opaques. These are not visible in hand specimens, at least none can be seen in the mine workings. Amygdules seen by the writer were quartz.

The lavas show the effects of two types of alteration, first the breakdown of primary plagioclase and pyroxene into a fine grained mixture of plagioclase-quartz-chlorite-etc., second a development of biotite and hornblende as a result of granodiorite intrusion. Hornblende is confined to the vicinity of the stock. Biotite is more generally distributed and is produced by sills and dykes. The development of biotite and hornblende is accompanied by an effacing of the amygdules. The quartz in amygdules is spread through the ground mass and in hand specimen the lava is massive, with irregular brown patches and spots. The degree of alteration of hand specimens of andesite is gaged from the abundance of amygdules. Silicified andesite marked V6n on the map has few or no amygdules.

Basalts outcrop in the northern half of range VIII in lots 48 to 51. Shearing has obscured most of the primary structures but a few good examples of mattress-type pillows were found in fresh rock. This is green, massive, appears denser than the andesite and for these reasons is believed to be more basic. The presumed western extension of the basalt is cut by drill holes in lots 33 to 35, range IX. The holes are all within 1,600 feet of the contact with intermediate lavas. The drill core shows a uniform equigranular aggregate of feldspar and mafic minerals having a grain size about 1 mm. Rocks having a similar dioritic appearance occur as disconnected lens in the Vendome workings and these appear to be recrystallized andesite. The basalt in range IX is possibly of similar origin but no gradation was seen in core to amygdaloidal andesite.

#### Intermediate Volcanic Rocks

Good exposures of intermediate lavas occur in lots 48 to 51 in range VIII. Two bands about 2,000 feet wide are separated by basalt. The best exposures are a few hundred feet south of the VIII-IX range line. The lavas weather light greyish green to white. On fresh surfaces the rock is grey to light green. Pillows and flow breccia are universal; no massive sections were seen. Pillow centres and the breccia fragments weather white; the borders of pillows and the breccia matrix weather light grey green. Abundant quartz amygdules protrude from the surface. In some breccia fragments small quartz eyes are so numerous as to suggest that they are phenocrysts. The dacite flow breccia is illustrated in plates I-B, II-A and III. The lavas are classified as dacites.

Although breccia fragments project above the matrix on weathered surfaces there does not seem to be any difference in composition between fragments and matrix. Mild shearing is universal and is has

slightly schisted the matrix and the borders of pillows, making them less resistant to weathering. Flow breccia makes up about 20 per cent of the exposures. Fragments of all sizes up to a foot are found together. Some pillows show a transition to flow breccia fragments, the form of the pillow being preserved by slightly separated fragments. The dacite in the southern band is essentially similar but quartz amygdules and flow breccia are less abundant. The two bands are believed to be the same formation repeated by folding.

On the west side of the Laflamme river good outcrops of dacite and dacite flow breccia occur on lot line 31-32, just south of range line VII-VIII and on lot line 35-36, range VIII, 300 feet south of the road. These are believed to be in the southern band of dacites. The northern band outcrops in lot 32, range IX, about 1,500 feet south of the IX-X range line. These outcrops have abundant amygdules but flow breccia was not observed. Drill holes in lots 33 and 34 establish the thickness of the northern band. In drill core the dacites are greyish green and sometimes have a conchoidal fracture. Thin chips are white whereas thin chips of andesite are green. Quartz-carbonate amygdules are present but are not abundant. The presence of the amygdules distinguishes the dacite from the silicified andesite for the first effect of silicification is the destruction of the amygdules.

The dacite in the map-area is similar in thickness and general appearance to a dacite formation in ranges V and VI, Barraute township. The dacite in both areas could be the same formation repeated by folding. According to Weber (1951, p. 9) the dacite band in range VI Barraute township contains andesite members. Thin beds of cherty banded tuff was seen by the writer in range VI, and along strike to the east in lot 29, range V there is some flow breccia. Pillows in the dacite are very well preserved, as illustrated in plate I-A. The

dacite in lot 51, range VIII, Fiedmont township has pillows about the same size but they are sheared and deformed.

Thin sections of specimens from both localities have primary quartz clear plagioclase (An30) and give no evidence of introduced minerals. They are about the same acidity. The Barraute specimen has a granular seriate texture, 10 per cent quartz and 30 per cent plagioclase in the largest grains, and a finer grained ground mass of saussurite-quartz-tremolite. The Fiedmont specimen is coarser grained and has a pronounced trachytic texture. Microcrysts of quartz 20 per cent, plagioclase 30 per cent and hypersthene 10 per cent, are in a ground mass of plagioclase-saussurite-quartz-biotite.

Specimens west of the Laflamme river in Fiedmont township are so altered that there is little similarity to the type dacite of lot 51, range VIII. A specimen taken from the outcrop in lot 32, just south of the VII-VIII range line is dark green and has abundant quartz amygdules. The outcrop is classified as dacite because it contains flow breccia. In thin section the rock is composed of 45 per cent fresh hornblende and 50 per cent quartz. The hornblende is equally distributed throughout in very small grains. Some replaces the quartz in amygdules. It is a regenerated or introduced mineral. Saussurite forms a few vague feldspar outlines. Quartz is equally divided between amygdules and ground mass. The specimen from the northern dacite band was taken from a drill hole in lot 33, range IX. The ground mass comprises 70 per cent of the rock and is so fine grained that little can be made of it. A few vague feldspar outlines are formed by an intergrowth of quartz and saussurite. Iron oxide makes up 10 per cent and occurs as small grains equally distributed. Quartz and carbonate occur together in amygdules, and carbonate occurs as large patches in the ground mass.

Because of the alteration in the specimens taken west of the Laflamme river it is difficult to decide whether quartz is primary or introduced. The correlation to the type section must rest on the generally more siliceous appearance of the two bands, as compared to the andesite, and on the occurrence of flow breccia.

### Highly Metamorphosed Volcanic Rocks

#### Amphibolite and Amphibolite Schist

These rocks are formed of fine to coarse grained hornblende with minor biotite and chloritic material. The best exposures are in lot 47, about 1,000 feet north of the V-VI range line. A coarse grained aggregate of hornblende crystals is seamed by 1 inch dyklets of albite granite, forming a textbook example of an intrusive breccia. Elsewhere the amphibolite is schistose. Some injection of aplitic material has occurred along the schistosity. This is always close to a granite contact and the injection dies out within a few feet.

The amphibolite is recrystallized lava, produced by heat from large intrusions such as **batholiths**. It is illustrated in plates II-B and IV. It is notably absent from the borders of small intrusive masses in the northwest part of the area. As determined by Shields (1953, p. 21) the lavas about the Mogador stock are partially amphibolitized. The thickness of amphibolite on the contact of the batholiths is difficult to estimate since it is gradational into pillowed lava. However hornblende-rich varieties indicate the near presence of <sup>a</sup> batholith. The outcrops in lot 34, range VI suggests that there is a major intrusion below the lake. Also the amphibolite to the east of the Val d'Or road suggests that the main body of the Pascalis-Tiblement batholith is close to surface.

### Acid Biotite Schist

This rock type occupies most of lots 54 to 60 in ranges IV and V, in a band striking north or slightly east of north. It is an acid, light coloured, fine grained rock with a fairly pronounced schistosity or foliation caused by biotite and muscovite. The distinguishing of rock types in this area is difficult because most exposures are prospects or small outcrops. Some fine grained varieties of albite granite were observed in range VI which had a biotite foliation. The schist band may therefore contain some of this albite granite which could not be separated because of the similar appearance. A dark green biotite-bearing amphibolite is easily separated in the field but its relation to the acid biotite schist is not clear. The acid biotite schist is probably a recrystallized lava, more siliceous than that represented by the amphibolite. It is perhaps a repetition of the band of dacites, wrapped around the nose of an anticline plunging to the west. Tremblay (1950, p. 11) noted an increase in biotite contact going towards the granite contact and he considered that the biotite has developed from chlorite.

### Silicified Lavas

As previously discussed in relation to andesite there are outcrops of this type in lots 51 to 53, range X. Drilling indicates that there is a band about 2,500 feet wide in the northwest part of the area. This solid band extends from about lot line 36-37 to lot line 31-32, and presumably continues along the strike of formations to the northern limit of the area. It is roughly between the Mogador granodiorite stock and a sill of diorite. The band splits in two at lot line 36-37 and the two parts, separated by normal andesite, continue as far as the Laflamme river. South of the diorite sill the silicification is scattered.

The spatial relation of alteration to granodiorite and intrusive rhyolite bodies suggests a genetic relation. The alteration consists of a progressive effacing of pillow and amygdaloidal structures, accomplished by both recrystallization and silicification. The extreme in silicification is a very hard rock but all varieties of the silicified lavas have not necessarily received a great addition of silica. The first stage is the development of brown patches and bands of chloritic material. Under the microscope the brown colour is produced by fine shreds of biotite formed at the expense of chlorite. The brown material effaces the amygdules wherever it develops. The next stage is either a massive 'dioritic' rock of granular texture or an irregularly banded rock, evidently more siliceous than andesite, consisting of brown, **green** and occasional white, bands. The silicified lava marked V6n on the map has few or no amygdules.

The 'dioritic' type occurs as disconnected lenses in the Vendome mine and no doubt **elsewhere**. The irregularity of the bodies in contrast to the other diorites is the main reason for believing that they are recrystallizations of lava.

The band of silicified lavas defined by drilling does not outcrop. However these rocks were observed in the underground workings of the Vendome mine. There is a striking dissimilarity in the rock as seen in drill core and the same rock seen underground. In core the brown and green banding is striking and 'dioritic' rock is distinct from it. Underground one has to look closely to see the contact, both types appearing at first glance as a massive green rock. Purplish-brown rock appears as patches and masses rather than as narrow bands. A similar transformation affects the intrusive rhyolite dykes. In core they are flat grey and underground they are purplish brown.

On surface these dykes weather pinkish brown. The change in appearance of the silicified lavas from drill core to mine workings suggests that surface exposures will also be different. The outcrops in lots 51-53, range X, which are believed to be silicified lavas, are not characterized by banding. Green cherty dense rock, fine grained 'dioritic' rock, greenstone with or without relict pillows and amygdules are the principal varieties. They cannot be separated on the scale mapped. The cherty variety contains oval blue quartz eyes and occasionally feldspar crystals. Similar-appearing types occur in lots 42 to 44, range VIII.

Thin sections were cut of amygdaloidal andesite in the transition to silicified andesite. The three principal stages are summarized as follows:

	<u>Percentage of Minerals</u>					
	Quartz	Biotite	Carb.	Chlorite	Saussurite	Hblde
I-Amygdaloidal andesite, a few brown patches	20	20	10	20	20	10
II-Brown and green banded andesite	35	30	10	10	10	Augite 5
III-Siliceous brown and green andesite	60	10	5	10	5	Augite 10

The first two stages have about the same amount of mafic minerals. The lateration involves principally the distribution of the quartz in amygdules throughout the groundmass and the development of biotite, hornblende and augite from chlorite. The groundmass of the second stage is coarser grained than the first stage, suggesting a growth through recrystallization of all minerals. In the third stage quartz is definitely introduced as very fine grains in the ground mass. In hand specimen this stage has about the same colour as stage II but is much harder. The rock replaced by sulphides at the Vendome mine is probably about the composition of stage III, judging from its

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N.B. OMISSION

The rock type 'injection gneiss' was omitted in typing. Insert between 'silicified lavas' and 'diorite and quartz diorite' as:

Silicified lavas

.....  
Injection gneiss

.....  
Diorite and Quartz diorite

---

Injection Gneiss

The injection gneiss outcrops in the south half of lot 32, range IX, and in small exposures to the west along Barraute creek. Pinkish brown intrusive rhyolite dyklets intrude a schistose lava. The gneiss bands average 1 inch in width. Weathering sharply defines the banding. A drill hole 500 feet along strike to the east cuts the formation. In core the bands do not appear as distinctly as in the outcrop. Silicification outwards from the intrusive rhyolite makes the rock appear more massive. The intrusive rhyolite is grey and contains scattered blue quartz eyes and plates of chloritic material. Indefinite bands of pale grey-green chloritic material occurs between the intrusive rhyolite dyklets.

Other bands are known from drilling in range X. They are correlated to the injection gneiss outcropping in lot 32, range IX, on the general similarity, being grey, highly siliceous rocks. In detail, however, the appearance is extremely variegated. A faint to strong banding is formed by pale grey-green chloritic material. The outlines of bands are indistinct. Occasionally the chloritic material is purplish brown or green. This type appears to grade into a brown and green silicified andesite. In places the chloritic material is in braids rather than bands, so that the rock has a fragmental aspect. In sum, it is hard to decide, in drill core, just what is intrusion and what is silicification. It is fairly certain that both are present in the bands in range X but the relative proportion is difficult to estimate.

hardness, although Shields (1953, p.5) reached a much lower quartz content as the average composition of lavas in the mine vicinity.

#### Diorite and Quartz Diorite

Diorite sills are believed to be the oldest intrusive rock in the area. Occasionally quartz is visible but the quartz diorite seems to be an integral part of the more common diorite and the two rock types are not separated on the map.

Two good exposures of sills having a thickness of 500 and 700 feet occur, the one in the southern half of lot 32, range IX, and the other in the southern halves of lots 49 and 50, range VIII. A medium grained texture is commonest in the western exposure; a gradation from fine to coarse grain occurs in the eastern, going from north to south. The coarser varieties weather rusty brown and the medium grained varieties weather light brown to green. The outcrops weather in rounded surfaces. The fresh rock is greyish green with approximately equal amounts of light coloured plagioclase and dark coloured mafics.

Two sills of about the same thickness are known by drilling in range X. Their continuity is well established from lot 32 east to lot 38; the projection to the west is founded on fewer drill holes. In drill core the diorite is medium grained with some fine grained border facies. It is closely associated with faults and granodiorite and intrusive rhyolite sills. Offshoots of the diorite sill in lot 49, range VIII, intrude the dacite. All diorites are probably later than the folding of the lavas.

Microscopically, the diorite in the southern half of lot 32, range IX is formed of saussurite, tremolite and quartz. The first two minerals occupy the shapes of lath-like plagioclase and hornblende. About 10 per cent quartz occurs as small grains interstitial

to the laths and is primary. Another 10 per cent quartz is dispersed in the saussurite and is secondary. The diorite in lot 50, range VIII shows much more alteration under the microscope than its appearance in hand specimen would suggest. Introduced quartz and carbonate in veinlets and patches together make up 60 per cent of the rock. Chlorite and saussurite in equal amounts make up the balance.

#### Feldspar Porphyry

Feldspar porphyry dykes outcrop in only one location, in lot 36, range VI. Feldspar laths 1/4 inch long occur in a schistose acid matrix. Small dykes occur in drill core but are less numerous than the other intrusive types. Some silicification has been produced by the feldspar porphyry but the granodiorite and intrusive rhyolite bodies seem to be the chief silicifying agents in the map-area. At any event the lava about the outcrop of feldspar porphyry dyke is silicified and even exhibits a few brown and green bands close to the dyke contact. No age relation could be determined for the feldspar porphyry. Tremblay (1950, p. 6) assigns it to the Post-Keewatin.

#### Albite Granite

Numerous small outcrops of albite granite occur to the east of the Val d'Or road in ranges IV to VII. The scattered nature of the outcrops makes the shape of the granite body conjectural but it is probable that the main body of the Pascalis-Tiblement batholith comes as far west as the Val d'Or road and that it is capped by varying thicknesses of amphibolite. A small sill-like body of albite granite occurs in lots 25 and 26, range X.

The albite granite has a medium grained granular texture composed of equal parts of quartz and plagioclase with about 5 per cent biotite. Weathered surfaces are white and fresh surfaces are light grey. Close to contacts the albite granite picks up some chlor-

itic material which, with biotite, is arranged in a foliation. The albite granite in range X was examined microscopically by Jones (1955, p. 27), who describes it as a medium grained rock composed of quartz, albite (An<sub>4</sub>) and chlorite.

#### Intrusive Rhyolite

Intrusive rhyolite occurs as dykes, sills and injection gneiss in the northwestern corner of the area. Individual bodies, while numerous, are usually too small to put on the map. One sill having a thickness of 50 feet is shown on the north contact of the diorite in lot 32, range IX. North of it is a 300 foot wide band of injection gneiss consisting of equal parts of intrusive rhyolite and schistose lava. Persistent dykes a few feet wide in the Vendome mine are believed to follow strike faults. In the southeastern corner of the area the outcrops of intrusive rhyolite are so small that the shape of the bodies is unknown. Intrusive rhyolite or felsite is recognized by Bell (1933) as a phase of the Pascalis-Tiblement batholith.

All intrusive rhyolites in the area are very similar in appearance. Fresh outcrop surfaces are light brown with shades of pink, red and purple. Scattered quartz eyes are usually visible in the felsitic groundmass but they are not present in all occurrences. The dykes in the Vendome mine are without visible quartz. A mile along strike to the west the dykes in the Roymont deposit have numerous blue oval quartz eyes. In drill core the intrusive rhyolite is a flat grey.

The intrusive rhyolite is definitely later than the diorite sills. One small dyke striking east of north cuts the diorite in lot 32, range X. While logging core it was believed that the intrusive rhyolite was a fine grained phase of the granodiorite. A gradation

between granodiorite and what appeared to be intrusive rhyolite was observed in a drill hole on lot line 36-37, 600 feet south of the township boundary, and similar gradations were noted in company drill logs for other holes. The relation is rather the exception than the rule as granodiorite bodies are usually of a uniform medium grain, with no chilled contacts. A thin section of the felsitic material showed that it was composed of 70 per cent quartz and 30 per cent fresh biotite. It is probably a siliceous fraction of the granodiorite magma. Thin sections of intrusive rhyolite dykes show it to be composed mainly of highly altered plagioclase. The granodiorite is relatively unaltered and composed of fresh hornblende, biotite and feldspar. On the third level of the Vendome mine a granodiorite dyke striking east of north intersects rhyolite dykes in strike faults. The contact between the two dykes is fused, and is not clear enough to leave the same impression on all observers. The writer considers that emanations from the granodiorite have silicified the intrusive rhyolite. Others are of the opinion that the two dykes grade into each other as if they came from a common magma. From microscope study, the different degree of metamorphism of the intrusive rhyolite and the granodiorite suggests differing ages.

Under the microscope the dykes are seen to be very fine grained and mostly composed of secondary minerals. The dominant impression is that the dykes have been thoroughly metamorphosed. A dyke in the mine and in the south half of lot 35, range X were examined. They are essentially similar so that the alteration of the dyke in the mine cannot all be ascribed to the period of ore deposition. The dykes are composed of 10 per cent clear albite, 50 per cent saussurite, 20 per cent quartz and 20 per cent chlorite. The outlines of stubby plagioclase crystals are fairly well preserved and the original texture

was probably aplitic.

Shields(1953,p.11)studied two dykes from the mine.One had an aplitic texture and the other had phenocrysts of quartz and feldspar. The quartz content was 15 and 40 per cent respectively. Jones(1955, p.26)noted quartz and feldspar phenocrysts in the intrusive rhyolite along Barraute creek.The original nature of the intrusive rhyolite is probably that of an aplite or quartz-feldspar porphyry.Intensive alteration has destroyed most of the original texture and produced a dominant felsitic texture.

#### Hornblende Monzonite and Biotite-Hornblende Granodiorite

Hornblende monzonite as defined by Tremblay (1950,p.31)for the Lacorne batholith has at least 30per cent hornblende,the remainder of the rock being sodic and potassic feldspar and occasional quartz. The potassic feldspar is sometimes white or else too fine to be visible.A rock type answering this description outcrops as dykes in lots 38 and 39,range VII.The outcrop on the VI-VII range line, close to the 42-43 lot line is also probably a dyke.These outcrops are medium grained with scattered coarse grained pegmatitic patches. Glistening black hornblende comprises 50 per cent of the rock. Anhedral white feldspar and a little quartz occur between the hornblende prisms.

The southern part of a plug-like intrusion is cut by two drill holes in lots 41 and 42,range X.The northern boundaries of the body are defined by a magnetic survey and one small outcrop in lot 44. In the drill core medium grained hornblende monzonite grades with depth into a rock composed of 90 per cent hornblende and 10 per cent feldspar.The transition from 40 to 90 per cent hornblende takes place over a vertical depth of 500 feet.Red potash feldspar is visible in the core.

The biotite-hornblende granodiorite of the Lacorne batholith is considered by Tremblay (1950, p. 31) to be an altered and silicified hornblende monzonite. It has about 15 per cent hornblende, 15 per cent quartz and 4 per cent biotite. In practice the amount of hornblende is the best means of distinguishing monzonite from granodiorite as the other minerals are small and not easily identified.

A stock of biotite-hornblende granodiorite, termed the Mogador stock, occurs along the north township boundary from lot 30 to 36. Since many inclusions of volcanic rocks occur in the stock its roof has probably not been deeply eroded. It possibly continues east to join the plug of hornblende monzonite. The proven length is 8,000 feet and it is 2,000 feet wide in the centre. The rock is medium grained and corresponds to the Lacorne type except that red potash feldspar is nearly everywhere visible in drill core. The amount of potash feldspar varies radically from almost nothing to 40 per cent. At the Vendome mine exposures of a northeast striking granodiorite dyke on the third level show that the potash feldspar occurs in streaks and bands in a granular aggregate of hornblende, white feldspar and quartz. It is also concentrated about joints as if the action of circulating water had altered the colour of white potash feldspar. The Mogador stock and the smaller intrusive masses of granodiorite appear to dip to the north, conformably to the lavas, but only a few drill holes definitely establish the dip of the intrusions.

In general the granodiorite does not have chilled contacts. Felsitic phases are a siliceous differentiate. The hornblende in the granodiorite and the enclosing volcanic rocks has the same absorption and pleochroic formulae (Shields, p. 22). The alteration of the volcanic rocks involves the formation of hornblende and biotite at the ex-

expense of chlorite and the introduction of silica. The whole process is probably caused by the granodiorite intrusions.

### Diabase

A diabase dyke of quartz gabbro composition enters the area in the south east corner and crosses it on a strike of 15 degrees east of north. It is composed of several offset segments. The position in ranges IX and X is well established by magnetic surveys and drilling. A similar dyke with the same general strike is indicated by magnetic surveys in ranges IV and V.

### Pleistocene and Recent

Post-glacial lake clays form most of the surface. One esker and a few terminal moraines are the last glacial deposits. Erosion has been slight and concentrated along the Laflamme River valley. East of the Val d'Or road the land is poorly drained, being on the watershed between the Laflamme and Courville rivers.

## STRUCTURAL GEOLOGY

### Intrusions

Since outcrops of intrusive rocks are so few and scattered the shape of intrusive bodies must in large part be interpreted from magnetic surveys. The amount of magnetism in granitic intrusive rocks and lavas is about the same but in the intrusions it is randomly distributed and in the lavas it is concentrated along certain flows. Magnetic contours over lavas tend to parallel the strike of flows; contours over intrusions have a random orientation and tend to form circles.

The Mogador stock is outlined by ground magnetic surveys. The granodiorite sills are not as definitely indicated. Intrusive-like anomalies over lavas are also produced by intense silicification or carbonatization, which has the effect of distributing randomly the original magnetic minerals. Thus the two bands of injection

gneiss in lot 41, range X, have anomalies similar to the plug-like body of hornblende monzonite in the same lot. Also, some anomalies in the southern halves of lots 44 to 47, range X, are apparently caused only by intense carbonatization of the lavas.

From aeromagnetic contours Dawson (1954, p. 6) predicted a tongue-like extension of the Lacorne batholith. This tongue strikes northeast, across the regional trend of formations, and, according to his interpretation, the end of it projects into the map-area. It occupies the whole of ranges VI and VII west of the Val d'Or road and extends a little beyond. Confirmatory evidence on the strike of the body comes from the northeast striking dykes of hornblende monzonite in lots 38 and 39, range VII. The main body of the intrusion is cut by 3 drill holes in lots 34, 36 and 37, range VII. Considerable amounts of included volcanic rocks occur in the granodiorite, suggesting that erosion has not cut deeply into the roof of the intrusion. Two outcrops occur in lot 32. It is probable that the Lacorne and Pascalis-Tiblement batholiths are close together in the vicinity of the Val d'Or road.

#### Folds

The axis of a syncline traverses the area. Good exposures in lots 48 to 51, range VIII, define the axis. Two bands of dacite are separated by a band of basalt. The similar appearance of the two dacite bands is the best evidence that folding has occurred. Determinations of the tops of lava flows are not too reliable because mild shearing has nearly everywhere schisted the borders of pillows. The top determinations least open to question are in the basalt to the north of the synclinal axis. The top determinations in the north band of dacite are also fairly reliable. In the south band the interpretation is less sure. The general sequence of two dacite bands and

an intervening basalt is also found to the west of the Laflamme river. The northern band of dacite is well defined by drilling and corresponds in width to the northern band across the river. The southern band appears to be wider than its counterpart, perhaps as the result of a change in strike to a southwest direction. The thickness of basalt is unknown as drill holes have cut it only near its northern contact. The divergence of the dacite bands is caused by the syncline's plunge to the west, similar to the plunge of folds in Barraute and La Morandiere townships (Weber, 1950, p. 14). The syncline is overturned. The axial plane dips about 60 degrees north.

A possible anticlinal axis is indicated by some top determinations in lots 48 to 51, range X. Another may run along the Pascalis-Tiblement batholith in ranges V and VI.

The lavas strike from 75 to 80 degrees east of south throughout the central part of the area, that is, roughly from lot 30 to 50. Good strike determinations are available from the outcrops in lots 48 to 51, range VIII and from intensive drilling in lots 32 to 37, range X. East and west of the central part the lavas strike 60 degrees east of south. In the Laflamme river valley, between lots 37 and 48, no information is available on the strike. In Barraute township, range VII, the volcanic rocks on the west side of the valley swing sharply southwards as they approach the Laflamme river (Weber, 1950). In range V of Barraute township the volcanic rocks are faulted 1,200 feet to the north on the east side of the Laflamme river (McDougall, 1952, p. 9). The evidence for the displacement is the offset of a magnetic anomaly that follows a basic sill. Since no evidence positively supporting one or other of these facts was obtained in the map-area, the strike of formations crossing the Laflamme River valley is shown as straight and uninterrupted.

### Shears

Strike shearing is the commonest movement in the area. Continuous adjustment has occurred along these shears as well as successive dyke intrusion, silicification and carbonatization. Branching and related shears trending from N. 55° E. to N. 75° E. are common, also with attendant dyke intrusion, silicification and carbonatization. A good example of this is in lots 51 to 54, range X. The outcrop is elongated in the direction of the northeast shears, as if silicification had occurred along them. One carbonatized shear is large enough to map. The northeast trend of formations, across the trend of formations, is also evident in other parts of the area.

The synclinal axis is a region of increased shearing. Small strike shears are especially prominent in the basalt, south of the synclinal axis, where they contain a little pyrite. The shears average an inch in width and 5 feet in length. Nowhere does the pyrite amount to more than 5 per cent of an exposure. In the dacites the shearing goes around the edges of pillows and these also contain a little pyrite.

The shear zones south of the Mogador stock are highly siliceous bands having widths up to 200 feet. The two main types within the bands are a massive greyish white rock with a porcellaneous lustre and a cherty, grey and white rock of a tuffaceous or agglomeratic appearance. Numerous intrusive rhyolite dykes are present in the shear zones. The porcellaneous type appears to be a massive silicification in the shears. A gradation to the cherty, banded, tuffaceous type was observed in drill core.

A shear zone is well exposed in two cross-cuts on the third level of the Vendome mine. It consists entirely of the cherty, grey and white type. Both tuffaceous and agglomeratic varieties are present in about equal amounts. The 'tuff' consists of alternating grey and

white bands, averaging 1/4 inch in thickness. The bands are very regular in thickness and are intricately drag folded in places. The 'tuff' passes gradationally into what appears to be an agglomerate. Elongated grey and white cherty fragments 1 inch to 1 foot in length are closely spaced and separated only by thin films of sericite. Slight pyrite mineralization follows the banding in the 'tuff' and the sericite matrix in the 'agglomerate'. Other pyrite occurs in clean fractures that follow 'tuff' bands for the most part but also cut across the bands. The 'agglomerate' fragments are also cut by pyrite-filled fractures. In drill core such rock types certainly appear to be true acid tuffs and agglomerates. Many bands have been logged as such by various observers from drill holes within the map-area. It is probable, however, that the tuffaceous and agglomeratic appearance is caused by successive and repeated shearing and silicification in basic lavas. The 'tuff' is the result of silicification outwards from closely spaced shears. The grey and white bands produced were subsequently drag folded and fractured. The 'agglomerate' results from the fracturing of a massive silicified lava. On appearance alone there is not much evidence to choose between the hypotheses of a sheared acid pyroclastic and a silicified shear. The principal reason for choosing the shear hypothesis is that the band containing the 'tuff' and 'agglomerate' on the third level diminishes gradationally into a clean-walled strike fault which itself is filled with an intrusive rhyolite dyke. The dyke continues through and cuts the 'tuff'. The widths of other shear zones in the map-area are also highly variable along strike.

## Faults

Two major faults are believed to intersect in the area but the lack of outcrop in critical areas makes their location conjectural in detail. These are the Manneville fault, considered as the eastern extension of the Porcupine-Destor fault, and the Laflamme fault. The Manneville fault is a strike fault characterized by shear zones 50 to 200 feet wide of carbonatized or silicified schist. It is usually expressed topographically by valleys. The Laflamme fault cuts across the regional trend of formations and is expressed topographically by a lineation extending from Blouin lake through Fiedmont lake and along the Laflamme River valley.

The Laflamme fault is cut by two drill holes in lots 41 and 42, range X, which go through intensely crushed hornblende monzonite. As the drill holes are almost parallel to the presumed strike of the fault neither the width nor strike of the fault zone can be obtained from them. Similar fault zones have been cut along the Laflamme River valley in Barraute township (\*) so there is not much doubt that a fault underlies the valley. As previously noted the east side of the fault has an apparent displacement of 1,200 feet to the north.

The nearest exposure of the Manneville fault is on the north shore of lake Roy, just west of the Fiedmont-Lacorne township boundary (Latulippe, 1953). It is a hundred foot wide band of highly sheared volcanic rocks. Assuming the fault follows the regional trend of S. 80° E. it will cut the VIII-IX range line at lot line 31-32, and intersect the Laflamme fault in the northern half of range VIII. No outcrops occur along this line. Drilling was done in lots 32 and 33, close to the VIII-IX range line and one hole went through intensely crushed rock for a thickness of 200 feet. The hole was directed due

(\*) T. Koulomzine, personal communication

south and was collared 100 feet south of range line VIII-IX and 200 feet west of lot line 32033(\*). No other holes cut the same zone so the strike and continuity are unknown. North 1,500 feet from the VIII-IX range line in lot 32 there is a 300 foot thick formation of injection gneiss, formed of intrusive rhyolite dyklets in schisted lava. A sill of diorite borders the injection gneiss. Along strike to the west albite granite, diorite and injection gneiss are exposed in the bed of Barraute creek. The succession of intrusions over considerable widths suggests that they occupy a major shear zone. Lenticular masses of albite granite also occur in or close to the Manneville fault north of lake Roy. Therefore this fault appears to follow a due east line until it hits Barraute creek and then it swings southwards on a line  $S.80^{\circ}E$ .

East of the Laflamme river it appears definite that the fault does not continue on the same line of  $S.80^{\circ}E$ . The belt of outcrops extending through range VIII and the lower half of range IX is the most continuous in the map-area. It is not likely that a major shear passes through here. Either the fault swings south, taking a strike about  $S.60^{\circ}E$  and passing through ranges VII and VI or the fault is offset to the north, along the Laflamme fault, and passes through the upper half of range IX. The outcrops bordering ~~the upper half of~~ range IX are highly sheared and carbonatized.

It is possible that the Manneville fault is not present in the map-area as a single major shear but as a series of sub-parallel shears. Individual shears could be expected to branch or die out,

(\* ) P.R. Geoffroy, personal communication

making speculation on their extensions pretty uncertain. Norman (1944, p.5) suggests that the Manneville fault splits into several shears at lake Figuery, 20 miles west of the map-area. In support of this there are many strike shears or faults known south and north of the shear at lake Roy. About half a mile south of the lake there are two strike faults exposed in the underground workings of the Quebec Lithium mine. Multiple intrusions of granodiorite, diorite and intrusive rhyolite occur in range X. Parallel faults composed of 10 to 15 feet of chlorite-sericite schist are within or close to the intrusions. Strike shears and faults occur close to the north and south contacts of the Mogador stock. A carbonatized strike shear outcrops in range II, Barraute township. The number of sub-parallel shears makes it difficult to project any of them along strike, especially when they are intruded. The evidence to date indicates that the Manneville fault in the map-area is split into a series of sub-parallel shears, of which the shear at lake Roy is no doubt the largest.

### ECONOMIC GEOLOGY

#### General Statement

Three types of metallic mineral deposits occur in the region; gold-bearing quartz veins, pyrrhotite-sphalerite-chalcopysite replacements low in gold, pyrite-sphalerite deposits high in gold. The quartz veins are in strike shears or faults and the veins occur in both volcanic rocks and intrusions. The pyrrhotite base metal deposits are in acid volcanic rocks, silicified strike shears and silicified lavas. The pyrite-sphalerite-gold deposits are close to the Pascalis-Tiblement batholith and are most probably derived from it.

The gold-bearing quartz veins attracted the earliest prospecting in the region. Numerous prospects of this type outcrop in Landrienne,

Barraute and Courville townships. The best known are the Fisher in Landrienne township and the Venus in Barraute township. Both are in or close to strike shears which, according to Tremblay (1950, p. 67); are themselves close to a synclinal axis. If so the belt of shears passes through the northeast corner of the map-area. No gold-bearing quartz veins outcrop in the area but some have been cut by drill holes which were searching for base metals. They occur in the west end of the Mogador stock (McDougall, 1952, p. 16) and in the granodiorite sill east of the Vendome shaft.

The gold deposits believed to be derived from the Pascalis-Tiblement batholith are represented by a showing of gold in a lens of sphalerite in lot 56, range V. It was discovered in 1938 and was explored by 3,500 feet of drilling. Gold values cut were insufficient and whatever base metals were cut were not assayed. Discovery of the Barvue and Mogador zinc deposits in 1950 renewed interest in the showing as a zinc prospect. Considerable acreage is held about the showing by various companies but work has been limited almost entirely to geophysical surveys.

A pyrrhotite-sphalerite-chalcopyrite deposit was discovered in 1950 in lot 34, range X. It is developed on three levels and about a million tons of prospective ore has been outlined. It was first called the Mogador mine and is now the Vendome mine. The discovery was made with the aid of geophysical methods as the deposit does not outcrop. The intersection of the Manneville and Lafiamme faults was picked in 1948 as a favorable location for ore deposits (\*). A magnetometer survey was made in ranges VII to X. During the survey base metal float was found at several places in ranges VIII and IX.

(\* ) T. Koulomzine, personal communication

Drilling to the north of the float was unsuccessful, for it had travelled from 1 to 2 miles from the Vendome deposit. It was then realized that granodiorite float was frequently found together with the base metal float. No granodiorite intrusion outcrops to the north of the float so a search was made for such intrusions in the area covered by the magnetic survey. The Mogador stock showed up on the magnetic survey as an area of randomly orientated magnetic contours. When the existence of the stock was confirmed by drill holes the drilling was concentrated in its vicinity and the ore deposit was found shortly afterwards. The Barvallee and Roymont base metal deposits were found along the west strike of the Vendome deposit.

#### Description of Mining Properties

##### Northern Quebec Explorers (Ross, 1940)

This property contains the gold and zinc prospect known as the Swanson showing which has caused exploration in ranges IV and V and, presumably, in ranges VI and VII directly to the north. The property includes lots 53 to 59, range V. A flat-lying lens of massive sphalerite 2 feet wide and several inches thick occurs in a trench 50 feet west and 125 feet north of lot line 56-57 and range line IV-V. It assayed 3 ounces of gold per ton and 46 per cent zinc. The host rock is acid biotite schist and amphibolite that strikes north and dips at low angles to the east. Disseminated sphalerite and pyrite occur in the host rock and low gold values are carried by the pyrite.

The showing was drilled along a strike length of 2,100 feet by Dome Exploration Ltd. in 1939. Eight holes totalling 3,500 feet were drilled. No repetition of the values of the showing were cut and the property was dropped as a gold prospect. In 1948 Jervis Mines Ltd. investigated the showing as a zinc prospect. They did magnetic and self-potential surveys in lots 54 to 59, range V and in lots 55 to 59, range IV. The present owners have made a geochemical survey over

the south halves of lots 56 and 57, range V.

Mariette Mines Limited

The property consists of the north halves of lots 55 to 59 in range IV. Half of the drill holes put down by Dome Exploration Ltd. are in the property. The surveys made by Jervis Mines Ltd. include the property. The present owners have made a geochemical survey in lots 56 and 57.

Carnegie Mines Limited

The company holds lots 60 to 62, range V and lots 60, 61 and the north half of 62, range IV. The Pascalis-Tiblement batholith outcrops in lot 62 and probably occurs at shallow depths under the acid biotite schist in lots 60 and 61. Magnetic and self-potential surveys were done in 1951.

The results of all the geophysical surveys give some clues to the geology and structure in the area about the Swanson showing but since no drilling has been done to check the interpretations of the surveys the information has to be taken cautiously. The showing itself does not contain magnetic minerals. The magnetic surveys are then useful only in indicating structures, such as faults, which may control ore formation. The host rock at the Swanson showing is massive and lack of channelways is perhaps the chief reason for the pockety nature of the mineralization. The showing did not give a self-potential anomaly, thereby confirming the evidence of drilling that no large bodies of massive sulphides are present. Geochemical surveys, however, obtained well defined anomalies over the showing trending parallel to the schistosity. The disseminated mineralization therefore follows the schistosity, in accordance with what can be seen in outcrops. The magnetic survey obtained trend lines

parallel to the schistosity, indicating a slight concentration of magnetic minerals along this. The main feature discovered by the magnetic surveys are some northeasterly trending anomalies. These possibly represent quartz gabbro (diabase) dykes in faults. A few southeasterly trending anomalies are taken to be other faults. The survey also gives an idea of the granite contact. Nothing definite is known of the structure in the area. If the faults indicated by the magnetic survey are present they would be favourable structural controls for the mineralization associated with the batholith.

#### Malartic Goldfields Limited

In 1956 an electromagnetic survey was made in range VI on lots 48 to 57 and the north halves of lots 58 to 62. Two anomalies trending close to north were found in lots 55 and 57 about 2,500 feet south of the VI-VII range line. They were explored by packsack drill holes which found granite and intrusive rhyolite beneath the anomalies but no apparent reason to account for them. A total of 261 feet was drilled in 8 holes. The whole area is probably underlain by albite granite with a cap of amphibolite in places. The company now holds only lots 55 to 57 of the group surveyed.

In 1955 a geochemical survey was carried out by soil sampling over lots 50 to 61 in range VII. No anomalies judged worthy of investigation were found. The company now holds only lots 53 to 55. Extensive outcrops in range VIII close to the northwest corner of the claim block consist of dacite and diorite. These probably underly the block with the exception of albite granite in the southwest corner.

#### Vendome Mines Limited

The property comprises lots 31 to 39 and the north half of lot 40 in range X, and the north half of lot 31, range IX. A mile long zone containing base metal mineralization is shared by three proper-

ties. The zone stretches from the Vendome shaft in lot 34 to the west part of lot 28, Barraute township. The Vendome deposit is in lots 33 and 34, the Barvallee deposit is in lot 29 and the Roymont deposit (owned by Vendome Mines Ltd.) is 160 feet north of the township boundary in lot 28.

The Vendome deposit is developed by a shaft and three levels. Mr. M. B. Wiwchar, company geologist, kindly provided all available information. The property is managed by Mr. P. R. Geoffroy. The writer and Mr. Leuner spent three weeks examining the levels. The shaft is now flooded because the deposit is not economic at the present price of zinc.

The host rocks to the ore are silicified shear zones and silicified andesite. The major structural controls are parallel shears and faults that dip steeply north or south. Flat shears branch between them and are no doubt structurally related. The steep shears have widths up to 100 feet and possibly more. They pinch into faults (filled by intrusive rhyolite dykes) and branch into zones of injection gneiss two or three hundred feet wide. The transition from shear to fault is seen in the mine; the transition to injection gneiss is postulated from drill holes. The exact tracing of the shears and faults is difficult but they all seem to be parallel to the strike of the andesite.

The dip of the ore shoots is steeply north or south at the Vendome deposit, 50 degrees north at the Barvallee deposit, and 50 to 20 degrees north at the Roymont deposit. The main faults and shears at the Vendome deposit dip steeply north and south; at the Barvallee and Roymont deposits they appear to dip 70 degrees to the north. The Roymont shoot appears to be in a flat shear connecting two shears dipping 70 degrees north.

The third level of the mine is shown in map 2. The main point of interest is the transition of the wide silicified shear to a fault. The persistent intrusive rhyolite dyke fills the fault and continues through the shear zone.

The ore shoots of the Vendôme deposit are not uniformly mineralized but are an assemblage of irregular-shaped replacement lenses of massive sulphide. The average width of individual lenses is about 4 feet. A little disseminated mineralization occurs outside the massive sulphide lenses occurring in the silicified shears but almost none in the silicified andesite. The contacts of the lenses are therefore knife-sharp for the most part. Although the shoots themselves have a regular continuity and attitude the lenses exhibit every possible attitude and are not very continuous. The most persistent are parallel and in contact with the intrusive rhyolite dyke, and hence conformable to the dip of the shoot. Others 45 degrees north or south. Some, however, are flat, as on the third level where a lens underlies a flat intrusive rhyolite dyke branching off from the main dyke. The outlines of lenses, in addition to being knife-sharp, tend to be straight and rectangular. The impression gained is that the mineralizing solutions have followed the dyke-filled fault and spread into the andesite along joints. A curious feature, however, is the absence of fault breccia next to the dyke, either in sulphide lenses or andesite. The extremely massive nature of the host rock has apparently prevented the usual mode of sulphide replacement, i.e. elongated flat conformable lenses with rounded outlines and aureoles of disseminated mineralization.

The sulphide lenses consist of massive pyrrhotite-pyrite containing fairly regular bands of dark brown sphalerite. Chalcopyrite occurs as erratically distributed patches in the lenses and singly

in minor shears in the wall rock. It appears later than the other minerals.

The mineralogy of the sulphide lenses was studied in polished sections by Shields (1953, p.16). He concluded that pyrrhotite or sphalerite is the dominant sulphide, followed in abundance by pyrite, chalcopyrite and galena. The pyrrhotite, sphalerite, chalcopyrite and galena were deposited more or less contemporaneously, as indicated by exsolution blebs of these minerals in each other. Pyrite and quartz are earlier, are embayed by the other minerals, and possibly belong to an earlier period of mineralization.

The base metal sulphides are later than all rocks in the mine. They replace the intrusive rhyolite dyke. A few stringers cross the northeast striking granodiorite dyke.

The ore reserves given by the company are as follows:

Tons	Aum	Ag	Cu	Pb	Zn
1,121,000	0.034	1.63	0.47	0.34	7.3

Of this total, 935,000 tons is proven by drifts and raises and 186,000 tons is listed as probable ore because it is delimited only by diamond drilling. An additional 109,000 tons is indicated by drill holes below the third level. It contains about 1 per cent copper but less zinc than in the proven reserves. The Roymont deposit, owned by the Vendome interests, contains about 300,000 tons of ore of about the same grade.

Barvallee Mines Limited (Jones, 1955, p.52)

The property comprises lots 27 to 30, range X and lots 29 and 30, range IX. It was explored by about 50 drill holes after the discovery of the Vendome deposit. A shoot was found in lot 29 along strike from the Vendome shoots. The rock types, mineralization and ore-controlling structures are probably similar in most respects to those of the Vendome property.

The ore reserves given by the company are:

Tons	Ag	Cu	Zn
200,000	1.43	1.23	5.7

Bar Metals Limited (Jones, 1955, p. 52)

The property held comprises lots 23 to 26 and the north halves of lots 20 to 22 in range X. Following a magnetometer survey in 1951 seven drill holes totalling 6,431 feet were put down. These cut massive dacite, andesite and diorite. Very little shearing or alteration was found and the Vendome mineralized zone appears to swing into Barraute township before reaching the claims.

Barmont Mines Limited

The property includes lots 32 to 38 and the south half of lot 31, range IX, and lots 31 to 37, range VIII. It is owned by the Vendome interests and was the initial property explored. At least 50 drill holes have been put down since 1948. Slight pyrrhotite mineralization with associated sphalerite and chalcopyrite was found in strike shears. Some of these concentrations showed as anomalies on the magnetic map. The Vendome deposit itself did not show as an anomaly because it is covered by over a hundred feet of overburden.

Granodiorite intrusions are frequent about the IX-X range line, suggesting that ~~at stock~~ occurs below the depths drilled. The Manneville fault, or a shear forming part of it, crosses the property in the southern half of range IX.

Celta Development and Mining Limited

The company holds lots 41 and 42 in range X. Ten holes were drilled in 1952 to explore the Laflamme fault. Two holes cut about 200 feet of crushed hornblende monzonite but there was only a little pyrite in the breccia.

Valray Exploration Limited

The company holds the north halves of lots 47 to 50, range X. No exploration is recorded on behalf of the company for these claims, which are part of a block held in Barraute township.

Balacalan Mines Limited

The company formerly held lots 43 to 50, range X. A magnetometer survey was made over the claims and this indicated several intrusive bodies in the south halves of lots 44 to 46. They were explored by 6 drill holes in 1955. One granodiorite sill was found. Other anomalies thought to represent intrusions turned out to be highly carbonatized lavas. Shearing and carbonatization were evident in all the lavas drilled. No base metal mineralization worthy of note was cut.

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APPENDIX

Assays of base metal float from the Vendome deposit found on the Barmont property are given as an illustration of the use of float in prospecting. The locations are plotted on map 1 according to the number given. The no. 3 assay is from a specimen found in trenching and so is not strictly 'float'.

	Au	Ag	Pb	Zn	Cu
1)	6.614	1.47	1.44	2.01	tr
2)	0.021	4.32	2.38	2.42	tr
3)	0.005	7.26	11.13	35.51	tr
4)	0.022	1.40	1.91	tr	tr
5)	0.031	6.74	0.70	2.34	0.85

Plate I



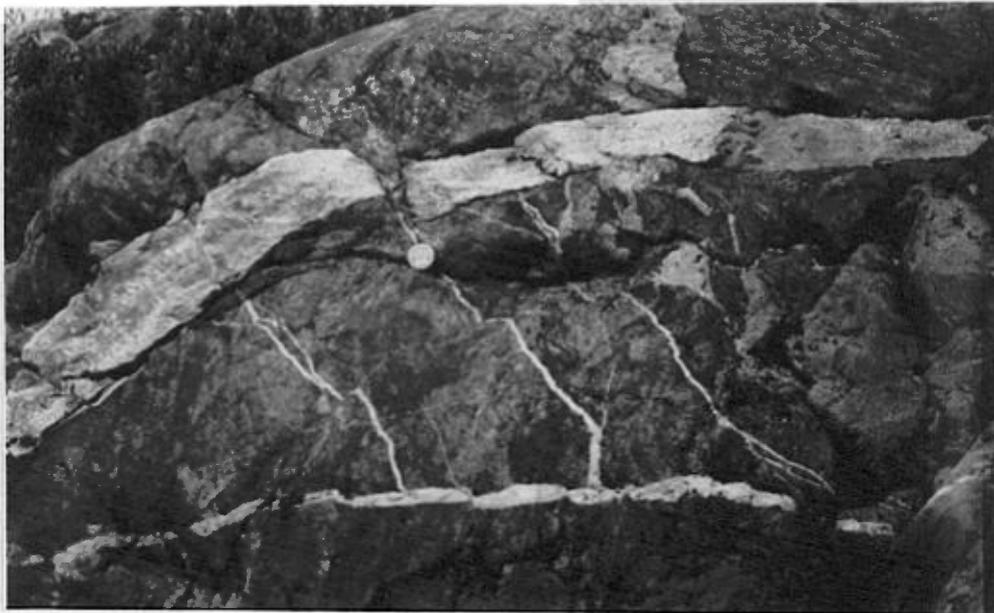
A.-Pillowed intermediate lavas in lot 20, range VI, Barraute township



B.-Dacite flow breccia, lot 51, range VIII, Fiedment township



A.- Dacite flow breccia, lot 51, range VIII, Fiedmont township



B.-Aplite dyklets in amphibolite, lot 34, range VI, Fiedmont township



Plate III.- Dacite flow breccia, lot 52, range VIII,  
Fiedmont township



Plate IV.-Amphibolite inclusion and quartz vein in albite granite,  
lot 46, range VI, Fiedmont township