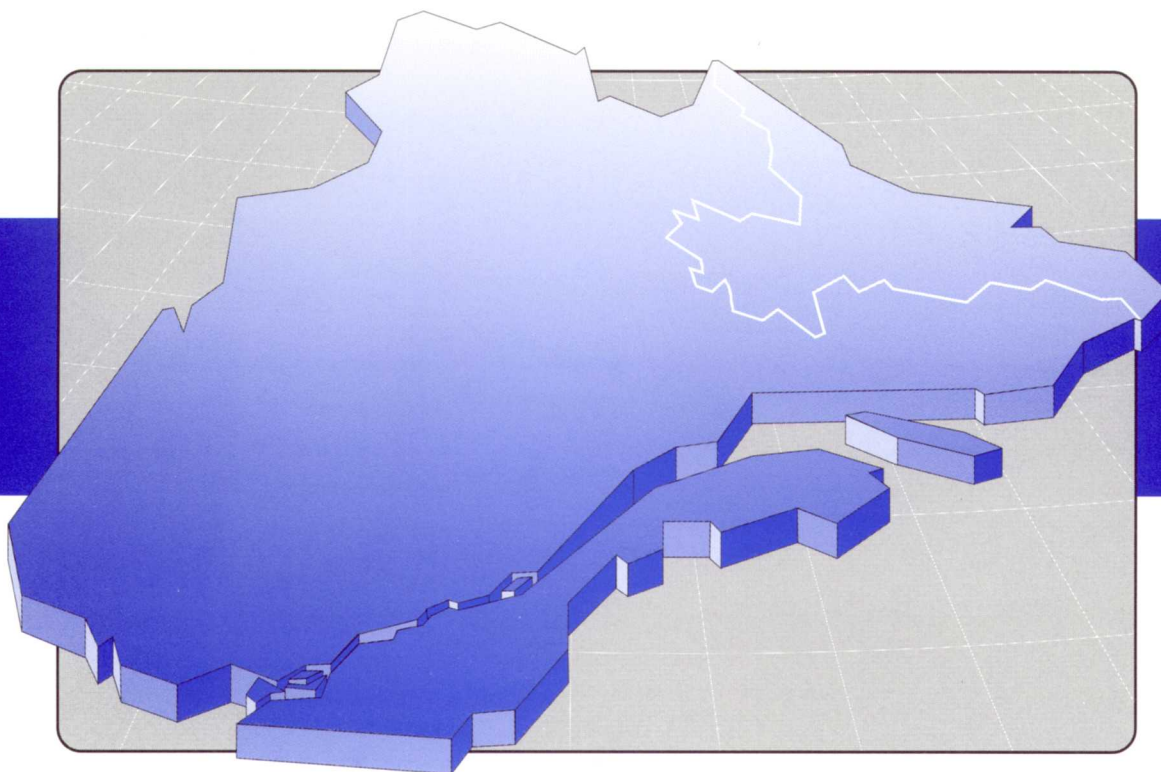




Potential resources of architectural granite and industrial minerals in the Sainte-Anne-du-Lac and L'Ascension areas (31J)

Suzie Nantel and Henri-Louis Jacob

PRO 2000-02



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Introduction

Occurrences of architectural granite, sillimanite, mica, garnet and graphite were discovered during recent geological mapping projects at the scale of 1/50 000 carried out by the Ministère des Ressources naturelles (MRN) in the southwestern part of the Grenville Province, in the Sainte-Anne-du-Lac (NTS sheet 31J/14) and L'Ascension areas (NTS sheets 31J/10 and 31J/15), between 1996 and 1999 (Figure 1). A graphite deposit was previously explored near L'Ascension (Hubert and Parent, 1994) and several granite quarries have been operated in Guénette, near Mont-Laurier (Bellemare, 1999). Only one quarry is still in production.

Architectural Granite

Quebec has been a producer of architectural granite since the middle of the 19th century. The granite industry is always in search of new varieties to add to its line of products. The most sought after varieties include white granites, medium-grained or coarse-grained red granites, and mafic rocks, especially those that are fine-grained and black.

Architectural granite in the Volvic pluton

The northeastern part of NTS sheet 31J/15 (Figure 1) is occupied by the Volvic pluton (unit I1Pb) composed of monzogranite, quartz monzonite and, in some places porphyritic farsundite (orthopyroxene monzogranite) and mangerite (orthopyroxene monzonite) (Nantel, 1999). This sector is served by a recent network of forest roads.

On the whole, the Volvic pluton is notable for the massive aspect in several outcrops (Photo 1), particularly at the Lac Volvic and Lac du Débordement sites (Photos 2 and 3). In addition, these sites correspond to several textural and esthetic requirements of the architectural granite industry. These sites are only sixty kilometers from L'Ascension by road.

The Lac Volvic site (UTM: 533935E, 5196997N) consists of monzogranite with reddish brown prismatic feldspars. This colour, for which there is a great demand,

is identical to the Northern Red variety exploited at Saint-Alexis-des-Monts. The monzogranite forms a hill whose sides suggest the presence of massive bedding eight metres high (Photo 2). This bedding is transected perpendicular to the escarpment by a joint system with a spacing of 5 to 6 metres. The colour, texture and granulometry of the rock are homogeneous.

The Lac du Débordement site (UTM: 533262E, 5193893N) consists of a farsundite that differs from other green granites exploited in Quebec by its prismatic feldspars (Photo 3). The rock is fresh below a thin weathered crust a few to a few centimetres thick. Its colour, texture and granulometry are homogeneous. The fracture system would allow extraction of commercial-size blocks.

On the whole, the Volvic pluton is an excellent exploration target for architectural granite. However, certain zones are not suitable for granite extraction given the presence of enclaves or veins and highly varied textures.

Sillimanite

Uses, production and characteristics¹

Sillimanite, kyanite and andalusite are the three aluminosilicates used by the refractory products industry¹. At high temperatures, these minerals convert into quartz and mullite, the latter of which, due to its mechanical and chemical resistance and its low dilation, is an essential component of bricks or refractory pastes with a high alumina content.

World production of aluminosilicates consists mainly of kyanite and andalusite and is estimated at 750,000 tons/year. The average price of concentrates is about \$200US per tonne.

A minable deposit of sillimanite must contain at least 15 to 20% of the mineral. The sillimanite must be present in crystal form suitable for concentrates with a minimum grain-size of 0.4 mm. The alumina content of the concentrates must be higher than 58%.

1. Information about uses, characteristics and production is taken in general from Berton and Le Berre (1983), Harben (1995) and Industrial minerals and rocks (1994).

Granite from Lac Adèle and Lac Beauregard

Sillimanite is a common mineral in the Grenville Province. It is often one of the major constituents of aluminous paragneisses, like those of the Lac-de-la-Maison-de-Pierre area (NTS sheet 31J/15; Figure 1). In this area sillimanite is also abundant in four peraluminous granite horizons (unit I1Mb; Nantel, 1999). Two of these horizons are in the range of ten kilometres long and about one kilometre wide in the Lac Adèle and Lac Beauregard sectors (Figure 1).

Sillimanite is concentrated in monomineralic laminae or in quartz-sillimanite laminae that are millimetric to centimetric in thickness. These laminae alternate with centimetric layers composed mostly of quartz and medium-grained K-feldspar. The average content of sillimanite is 10% and locally up to 20%. Sillimanite is prismatic and millimetric in length. Very large crystals of about a decimeter have been observed in the Lac Beauregard sector (Photo 4).

The granite horizons of Lac Adèle and Lac Beauregard can be considered a potential source for sillimanite given the extension, abundance and regular distribution of sillimanite.

Mica

Uses, production and characteristics

Muscovite and phlogopite are the main sources of sheet mica or ground mica used for plasterboard, joint cements, plastics, sealant products and oil-well drilling.

World production of ground mica is constantly growing and is currently rated at about 300,000 tons/year. The price of ground mica is between \$200 and \$600US per ton based upon provenance, processing and physical characteristics such as size, thickness and flexibility of the flakes.

Ground mica can be produced as a by-product of mining other substances or processing rocks containing a high proportion of mica.

Lac Tapani dyke

A large dyke of alkaline mafic rock with layering of phlogopite and clinopyroxene \pm feldspar \pm amphibole \pm apatite \pm zircon \pm barite \pm pyrite (unit I4O) in Sainte-Anne-du-Lac (Nantel, 1998), was observed in 1998 in NTS sheet 31J/14 (Figure 1). This dyke outcrops for over two kilometres in length and about 300 metres in width along the western shore of Lac Tapani. It extends for nine kilometres.

The dyke possesses a magmatic layering of centrimetric to metric thickness with fine (0.7 mm) to coarse (5 mm) granulometry. The phlogopite is free from inclusions and

accounts for 40 to 50% of the rock (Photo 5); it contains 20 % MgO. Apatite, another industrial mineral, represents nearly 10% in places (3.71% P_2O_5).

With its mineralogical and chemical composition, the alkaline mafic rock of Lac Tapani is very similar to the rock mined at Parent for suzorite. The size of the dyke and its high phlogopite content make it a potential source of mica.

Garnet

Uses, production and characteristics

Garnet is used especially as an abrasive given its hardness and conchoidal fracture, but is also an excellent agent for filtering water.

World production of garnet is rated at about 180,000 tons/year, more than half of which comes from the United States. The average price of concentrates is \$180US per ton. Demand is growing given the problems of using silica as an abrasive.

Desirable sources are rocks containing between 10 and 20% or more of garnet. This mineral must be well crystallized, non-granulated and have a uniform grain size so that garnets can be liberated after crushing to minus 2 mm.

Amphibolite at Lac à l'Aigle

In Lac-de-la-Maison-de-Pierre area (NTS sheet 31J/15; Figure 1), there is an amphibolite horizon containing garnet with certain mineralogical characteristics required by the industry. The Lac à l'Aigle horizon (unit M16b) is four kilometres in length and one kilometre wide (Nantel, 1999). There are six outcrops distributed over a distance of 1.5 kilometres which contain amphibolite with, on average, 15% garnet distributed heterogeneously. Garnets are idiomorphic and their diameter varies from 5 mm to 7 cm (Photo 6). Their only inclusions are quartz.

The amphibolite at Lac à l'Aigle is a good exploration target for garnet given the large size of the garnets locally and the extension and uniformity of the horizon. It is a matter of delimiting the richest zones. The quarry at Gore Mountain in New York is an example of a garnet deposit concentrated from an amphibolite in the Grenville Province.

Quartzite

Uses and characteristics

Pure Grenville quartzites are white, vitreous and massive rocks related, in industrial terms, to vein-quartz. They generally provide good raw material for the production of lump silica for the ferroalloy industry. Quartzites

can also be ground to produce silica sands for the glass and carborundum industries.

Deposits of interest as a source of silica must be conveniently located in relation to the target markets and generally must have silica contents higher than 99%. To produce lump silica, the quartzite is simply crushed, washed and screened to the required size, while for silica sand products, it can be processed to eliminate certain impurities.

Exploration targets

In L'Ascension area, in the northeastern part of the NTS sheet 31J/10 (Figure 1), there is a kilometric horizon belonging to unit mPwin2a of the Rouge-Matawin supra-crustal sequence (Hébert and Nantel, 1999) which includes decametric quartzite layers. An outcrop of grey quartzite with 1% biotite and 1% garnet (UTM : 505650E, 5159008N) and blocks of white quartzite with 1% graphite (UTM : 532219E, 5169956N) seem at first glance to be sufficiently pure to justify further exploration in the surrounding sectors.

Graphite

Uses, production and characteristics

Flake crystalline graphite is used in a wide range of applications due to its chemical and physical properties. Graphite is very soft and flexible and is a good conductor of electricity. It is chemically inert and it melts at about 3500°C

World production of flake graphite is on the order of 325,000 tons/year. China, with production of 130,000 t/year, is the major producer.

Flake graphite is generally disseminated in the metasedimentary rocks of the Grenville Province. In general terms, a deposit is made up of thick and continuous layers of graphitic rocks. The grade is important but the quality and size of the flakes and the ease with which they can be extracted are also determining factors. In the only deposit being mined in Quebec, at Lac-des-Îles, south of Mont-Laurier, the average graphite content is 7%.

Exploration targets

Since 1996, our mapping projects have indicated relatively high graphite content in paragneisses generally

interbedded with quartzites or paragneisses containing biotite, sillimanite, garnet and graphite. Contents of 2.3 and 2.9% C_{graphite} were found respectively in the Sainte-Anne-du-Lac (31J/14; Nantel, 1998) and L'Ascension (31J/10; Hébert and Nantel, 1999) areas. However, the highest contents found were 7.2 and 17.2% C_{graphite} in the paragneisses horizons of Lac-de-la-Maison-de-Pierre area (31J/15; UTM : 526167E, 5186996N and UTM : 511790E, 5184142N). The graphite is generally platelike and has a diameter of 0.5 to 3 mm.

In this sheet, several other graphite-rich outcrops were located in paragneisses containing biotite and sillimanite ± garnet.

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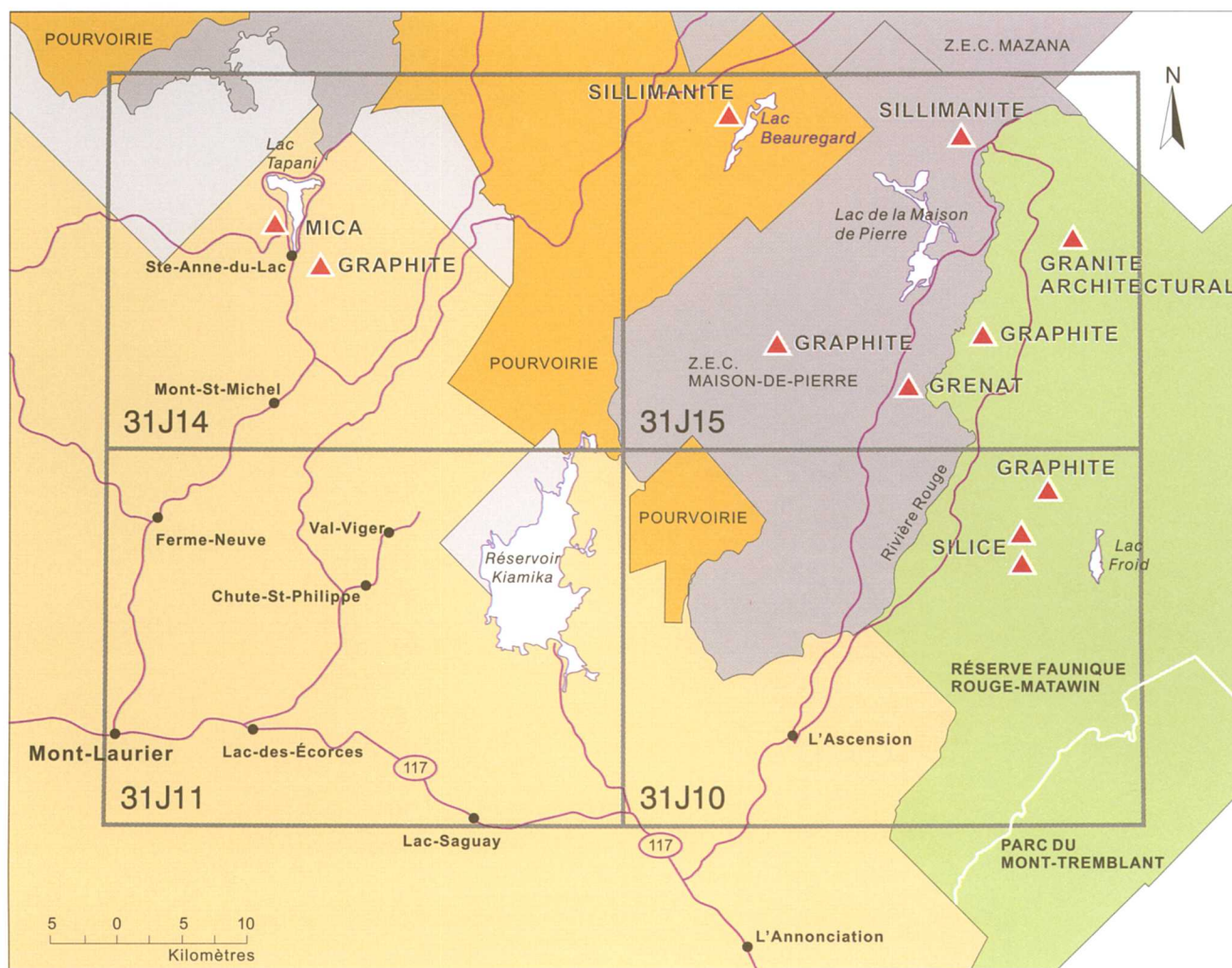


FIGURE 1. Location of architectural granite, sillimanite, mica, garnet and silica occurrences in NTS sheets of L'Ascension (31J10), Sainte-Anne-du-Lac (31J14) and Lac-de-la-Maison-de-Pierre (31J15). Modified map (Commissariat industriel de la M.R.C. d'Antoine-Labelle, 1990).

PHOTOGRAPHS



Photo 1- Massive aspect of a mangerite outcrop in the Volvic pluton (UTM : 534163E, 5196101N)

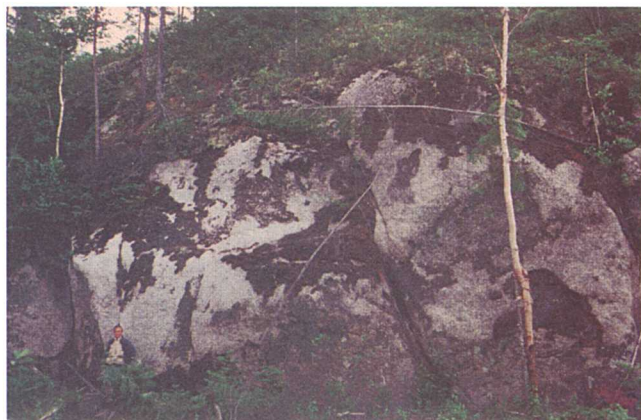


Photo 2- Site of brownish red monzogranite at Lac Volvic (UTM : 533935E, 5196997N)



Photo 3- Farsundite with prismatic feldspars at Lac du Débordement (UTM : 533262E, 5193893N)



Photo 4- Monzogranite with sillimanite laminae at Lac Adèle (UTM : 525290E, 5201350N)

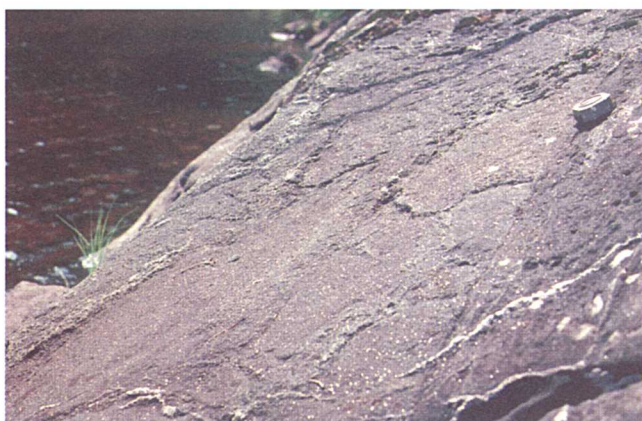


Photo 5- Phlogopite-rich rock along Lac Tapani (UTM : 474921E, 5194715N)

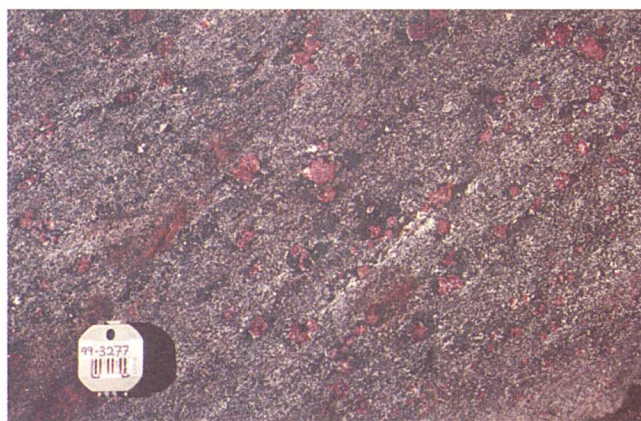


Photo 6- Garnet amphibolite at Lac à l'Aigle (UTM : 522087E, 5181685N)

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