ROCKS AND MINERALS FOR THE COLLECTOR

Ann P. Sabina

Buckingham - Mont-Laurier - Grenville, Québec; Hawkesbury - Ottawa, Ontario

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Frontispiece. du Lièvre River valley looking north from the Emerald Mine. Formerly, this was an important mica/apatite mining district. (GSC 138748)

Abstract

Occurrences of rocks, minerals and fossils are described from over one hundred and fifty localities from Buckingham to Mont-Laurier, St-Jovite and Grenville in Quebec, and in Ontario between Hawkesbury and Ottawa. These occurrences provide a variety of specimens including some potential ornamental types such as feldspar, serpentine, marble and granite.

Probably the best known area is the du Lièvre River valley where the intense mining activity that began nearly a century ago has left numerous former apatite, mica, feldspar and graphite mines. Their dumps still furnish the collector with good specimens of the ore minerals as well as a variety of accessory minerals. Other deposits in the region yield specimens of hematite, asbestos, barite, galena, etc.

In the region between Mont-Laurier, St-Jovite and Grenville, dumps of old mines and quarries contain specimens of ilmenite, graphite, garnet, serpentine, kaolinite, marble, granite, etc. Only the serpentine and marble occur in specimens sufficiently large to be used for lapidary purposes.

Ordovician limestones containing some fossils are exposed along the highway, the shoreline, and in quarries between Hawkesbury and Ottawa. These rocks are not rich in minerals except for calcite.

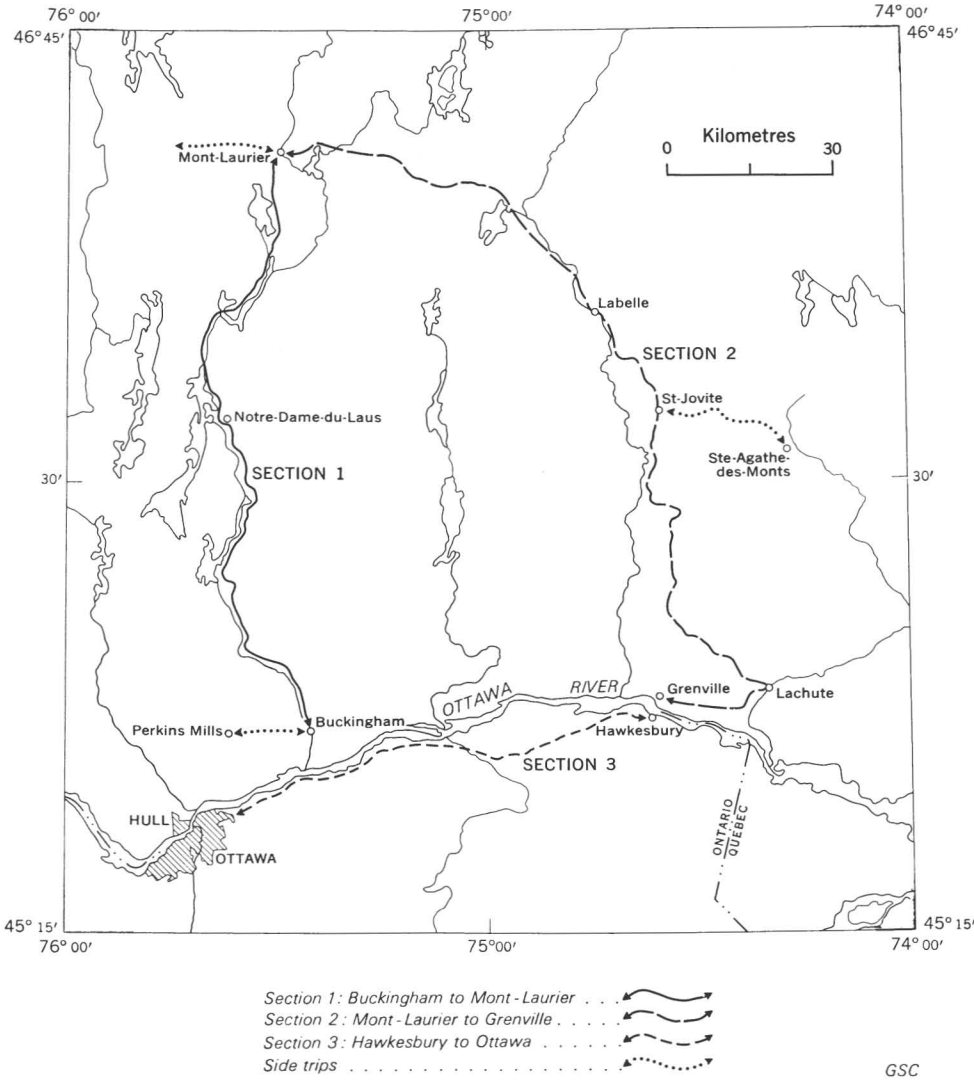


Figure 1. *Index map showing collecting routes.*

ROCKS AND MINERALS FOR THE COLLECTOR: BUCKINGHAM - MONT LAURIER - GRENVILLE, QUEBEC; HAWKESBURY - OTTAWA, ONTARIO

INTRODUCTION

This booklet, originally published in 1969 as Geological Survey of Canada Paper 68-51, describes mineral, rock and fossil localities in Quebec between Buckingham and Mont-Laurier, St.-Jovite and Grenville, and in Ontario along the south side of the Ottawa River from Hawkesbury to Ottawa. This edition incorporates the metric (SI) system to road logs, weights and measurements, and includes changes made to the Quebec highway numbering system, and minor revisions to the text.

The localities are easily accessible from the main highways and side roads, but in places may require a hike of about a mile to reach. Directions to locate each of the occurrences are given in the text and are designed for use with official Provincial road maps. Locality maps are included where deposits may be difficult to find. Additional detailed information may be obtained from the appropriate topographic and geological maps listed for each locality. These maps are available from the agencies listed on page 86.

Most of the old mines and quarries have not been worked for years so that entering shafts, tunnels and other workings is dangerous. The mica-apatite pits in some of the properties are very deep and partly water-filled and caution must be used when collecting from the adjacent dumps. Many of the localities are on private property and the fact that they are listed in this booklet does not imply permission to visit them. Please respect the rights of property owners at all times.

The localities were visited during the summer of 1967 by the author ably assisted by Miss Donna Daniels. The field investigation was facilitated by information received from Mr. Sylvio Chalifoux of Notre-Dame-de-la-Salette, Quebec. The laboratory identification of minerals by X-ray diffraction was performed by R.N. Delabio, Geological Survey of Canada. Their assistance is gratefully acknowledged.

A Brief Geological History

Two geological regions are represented in the collecting area – the Canadian Shield and the St. Lawrence Lowlands. The former is an immense, shield-shaped body of Precambrian rocks occupying over half of Canada and part of northern United States. The St. Lawrence Lowlands is a flat region of unfolded Paleozoic rocks extending from the Ottawa-Gananoque area to Quebec City. The localities described in this booklet include the rocks and minerals in the Laurentian Highlands of the Canadian Shield, and the sedimentary deposits along the Ottawa River valley portion of the St. Lawrence Lowlands.

During Precambrian time, there were repeated cycles of inundation, sedimentation, mountain building, intrusion, and erosion producing a variety of sedimentary, igneous, metamorphic and volcanic rocks. The rocks of this era contain deposits of mica, apatite, feldspar, graphite, iron, marble, granite, quartzite and anorthosite.

In this part of Canada a long period of erosion marked the close of the Precambrian era and reduced the Shield to a peneplain thus setting the stage for widespread inundation and deposition that took place during the Paleozoic era that followed. Great thicknesses of sediments were deposited by Paleozoic seas over much of the Shield particularly along its margins including the St. Lawrence Lowlands where the accumulated sediments still remain. These sedimentary rocks furnish building and structural material and provide numerous fossil localities.

More recently – during Pleistocene time – great ice sheets spread southwards across the Shield and the Lowlands scouring out the landscape to the shapes we know today and leaving behind accumulations of sand, gravel and till. As the ice withdrew from the St. Lawrence Lowlands, marine waters flooded the region forming the

Table 1

AGE (millions of years)	ERA	PERIOD	ROCKS FORMED	WHERE TO SEE THEM
	Cenozoic	Quaternary	Gravel, sand, clay	Stream beds, lakes, gravel pits throughout area.
			Peat	Alfred bog.
60		Tertiary	Not represented in collecting area	
230	Mesozoic		Not represented in collecting area	
	Paleozoic	Permian Pennsylvanian Mississippian Devonian Silurian	Not represented in collecting area	
		Ordovician	Limestone	Road-cuts and quarries between Ottawa and Hawkesbury; shoreline exposures along Ottawa River.
			Dolomite	Armstrong Brothers and Dibblee Construction Boyce quarries.
			Sandstone	With limestone in quarries and road-cuts between Hawkesbury and Ottawa
600		Cambrian	Not represented in collecting area	
	Precambrian		Crystalline limestone	Buckingham graphite deposits; road-cuts Highways 309, 117, 327; Poltimore asbestos mine.
			Pegmatite Granite	Feldspar quarries in Buckingham, Notre-Dame-de-la-Salette areas. Highway 117 road-cuts, Lac-des-Ecorces to Mont-Laurier; Guenette and Brownsburg quarries.
			Pyroxenite Anorthosite	Mica-apatite mines in Buckingham – Notre-Dame-de-la-Salette area. Highway 117 road-cuts, St-Jovite to Ste-Agathe; Desgrosbois, Ivry Mines
			Quartzite	St-Donat, Highway 117 (km 89.1) quarries.
			Syenite	Quarries north of Grenville.
			Dolomitic limestone	Val-Barrette quarries; Canada Marble quarry.
			Feldspar gneiss	Road-cuts, Highway 309; Haycock Mine.
			Garnet gneiss	Road-cuts, Highways 309, 117; Labelle garnet Mines.

Champlain Sea which, when it retreated, left unconsolidated deposits of glacial till, clay and sand over the Paleozoic strata. Other deposits of recent times include beach sands, stream detritus and peat bog.

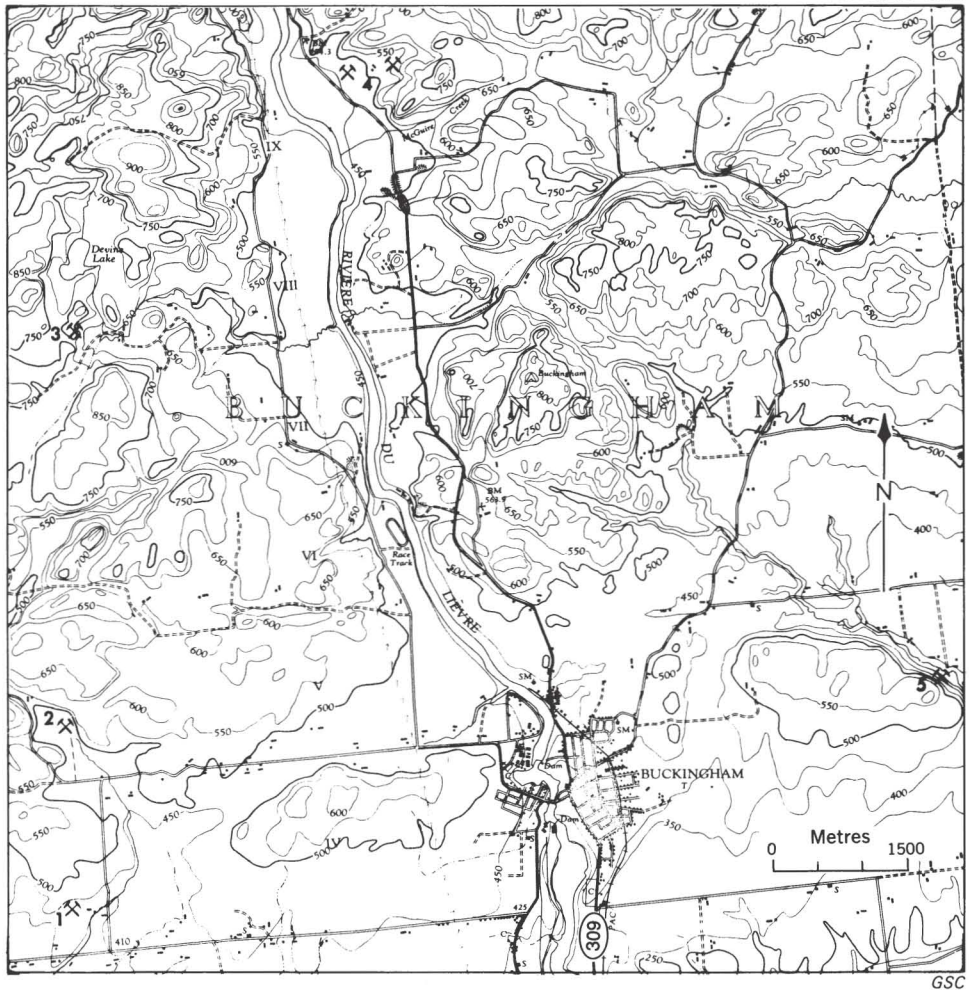
The geological history, with examples of rocks formed, is summarized in Table 1.

How to use this Guide

The route as shown in Figure 1, is divided into 3 sections: (1) Buckingham to Mont-Laurier, via Highway 309; (2) Mont-Laurier to Grenville, via Highways 117, 327 and 344; (3) Hawkesbury to Ottawa, via Highway 17.

Information on each collecting locality is systematically listed in the text as follows: distances (in kilometres) at the beginning of each section are highlighted by shaded areas along the highways starting at the beginning of each section; name of the locality or deposit; minerals or rocks found in the deposit (shown in capital letters); mode of occurrence; brief notes on the locality with specific features of interest to the collector; location and access; references to other publications, indicated by a number and listed at the end of the book; references to maps of the National Topographic System (T), and in geological maps (G) of the Geological Survey of Canada or of the Quebec Department of Natural Resources (scale 1 inch to 1 mile unless noted otherwise).

Part of 31 G/11



GSC

Map 1

Buckingham area

1. Buckingham galena occurrence
2. Dominion Mine
3. Walker Mine
4. Peerless Mine
5. Bell Mine

SECTION 1

BUCKINGHAM – MONT-LAURIER

km		
	0.0	Buckingham, at traffic light i.e. intersection rue Principal (Highway 309) and MacLaren Street. The main road log proceeds north along Highway 309.

Log for side trip to localities along Buckingham – Val-des-Monts road (occurrences in bold type are described in text following log):

km		
	0.0	Buckingham, at traffic light; proceed west along MacLaren Street West.
	0.3	Junction George Street; bear right continuing along MacLaren Street.
	0.8	Turn right onto Alexander Street.
	2.2	Junction, on right, road to **Walker Mine;** to continue log proceed straight ahead.
	5.9	Junction, on left, road to **Buckingham galena occurrence;** continue straight ahead.
	6.3	Junction, on right, road to **Dominion Mine.**
	6.4	Fork; bear right.
	13.2	Junction, turn right.
	14.6	Junction, turn left.
	19.5	Val-des-Monts, at church (on right) and intersection McGregor Lake-Templeton road. The junction with Highway 148 at Templeton is 13.8 km from this intersection.

Walker Mine

GRAPHITE, FELDSPAR, SCAPOLITE, PYROXENE, TITANITE, PYRITE, TOURMALINE, MICA, APATITE.

In crystalline limestone, biotite gneiss and pegmatite.

The orebody consisted of flake and columnar graphite with white feldspar, greyish scapolite, colourless to grey pyroxene, brown titanite, pyrite, and small amounts of black tourmaline, brown mica, and green apatite. Although flake graphite is readily available from the dumps, the columnar and foliated varieties are rather difficult to find. Titanite crystals up to 1 cm long occur in pegmatite and crystalline limestone. Graphite specimens were exhibited at the 1886 Colonial and Indian Exhibition, London.

The deposit was worked between 1876 and 1896, and briefly in 1906 by a series of 30 pits scattered through a wooded area extending about 1200 m. The main pit is an opening into the east side of a low ridge facing a small swamp. Except for the main pit, most of the openings and dumps are overgrown and difficult to locate.

Road log from Buckingham – Val-des-Monts road at km 2.2 (see log above):

km		
	0.0	Turn right (north) onto gravel road.
	5.3	Junction, single-lane road; turn left.
	6.7	Fork; bear left.
	7.9	Bridge over creek. The mill was located on the right side of the road and on the east side of the creek. There are a few dumps on the west side of the creek. The main pit is situated 305 m directly west of this bridge, and other pits extend 400 m northeast and 800 m southwest of the main opening.

Refs.: 52 p. 55-57; 55 p. 101-105; 61 p. 153.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Buckingham Galena Occurrence

GALENA, BARITE, SPHALERITE, CALCITE, HYDROCERUSSITE, HYDROZINCITE.

In veins cutting crystalline limestone.

Galena occurs as brilliant cleaveable aggregates in cream-white massive barite and in calcite. Tabular aggregates of barite are common. The calcite fluoresces bright pink when exposed to 'short' ultraviolet rays. Dark brown sphalerite and mica, and small amounts of pyrite and pyrrhotite are present. Cerussite, as a coating on galena, and white fluorite crystals have been reported. Cream-white hydrocerussite (fluoresces yellow under 'long' ultraviolet rays) and cream-white hydrozincite (fluoresces bluish white under 'short' ultraviolet rays) occur as finely granular coatings on galena and calcite.

The deposit has been known since the 1860's. It consists of two veins that average 10 cm wide and extend in a northwesterly direction for about 110 m and a shaft. Specimens can be obtained from the trenches and from exposed parts of the vein. The deposit is on the Dan Gorman farm.

Road log from Buckingham – Val-des-Monts road at km 5.9 (see page 5):

km		
	0.0	Proceed south from Buckingham – Val-des-Monts road.
	0.24	Road-cut on left. Crystalline limestone contains graphite flakes and grains of titanite, pyroxene and pyrite.
	1.3	Turn-off (right) to Mr. Dan Gorman's farm.

Refs.: 1 p. 126-127; 28 p. 48; 33 p. 19-20.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Dominion Mine

GRAPHITE, PYRITE, PYROXENE, TITANITE, MICA, APATITE, MOLYBDENITE, GYPSUM, ROZENITE, QUARTZ.

At contact of crystalline limestone and gabbro.

Flakes and foliated aggregates of graphite occur in gabbro and in crystalline limestone. Massive pyrite is commonly associated with it. Grains of green pyroxene and brown titanite occur in crystalline limestone. Molybdenite (uncommon) and massive apatite have also been reported from the deposit. Blusish white, powdery gypsum and white rozenite form encrustations on the gabbro. Amber mica and greyish blue quartz containing small amounts of graphite, pyrite and hornblende occur in gabbro.

The deposit was worked intermittently from 1910 to 1918 by an open pit measuring 46 m by 27 m and 23 m deep. A mill was installed 365 m southwest of the pit and remnants of it are still visible. The pit is now water-filled but specimens are plentiful in large dumps adjoining it. The mine is on the farm of Mr. Smith.

Road log from Buckingham – Val-des-Monts road at km 6.3 (see page 5):

km		
	0.0	Proceed north along a single-lane road.
	0.5	Site of old mill on right.

km 0.8 Smith farmhouse. The pit is at the side of a ridge approximately 183 m east of the house.

Refs.: 52 p. 52-53; 55 p. 105-107.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Road-cuts on Val-des-Monts – Templeton Road (Highway 366)

(a) SERPENTINE, TREMOLITE, MICA, GRAPHITE, PYRITE;

(b) GARNET, PYRITE, TOURMALINE, MAGNETITE, CHLORITE.

(a) In crystaline limestone; (b) in pink feldspar gneiss.

A road-cut on the west side of the road 0.7 km south of the Val-des-Monts intersection (km 19.5 on Buckingham – Val-des-Monts road, see page 5) exposes crystalline limestone containing abundant white to grey fibrous tremolite and greenish blue, massive serpentine with amber mica and tiny pyrite crystals. Serpentine-bearing crystalline limestone is also exposed on the west side of the same road 0.9 km south of the Val-des-Monts intersection. Some of the serpentine occurs as greenish blue to grey, porcelain-like masses up to 20 cm across, and some occurs as olive-green small (less than 1 cm across) irregular blotches in the white limestone. Both varieties could be used for lapidary purposes although the former is rather drab in colour and the latter contains tiny patches of graphite. A dark red calcite is also found in the limestone.

Garnetiferous granite and gneiss are exposed by two road-cuts, one 1.3 to 1.6 km south of the Val-des-Monts intersection and the other 1.85 km south of the intersection. Individual crystals of deep red garnets measure up to 5 mm across the crystal aggregates are commonly 2 cm across. Minerals associated with the garnet are: pyrite, black tourmaline, magnetite and greenish blue chlorite.

The road log for these occurrences is given in the text that follows for the Haycock Mine.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Haycock Mine

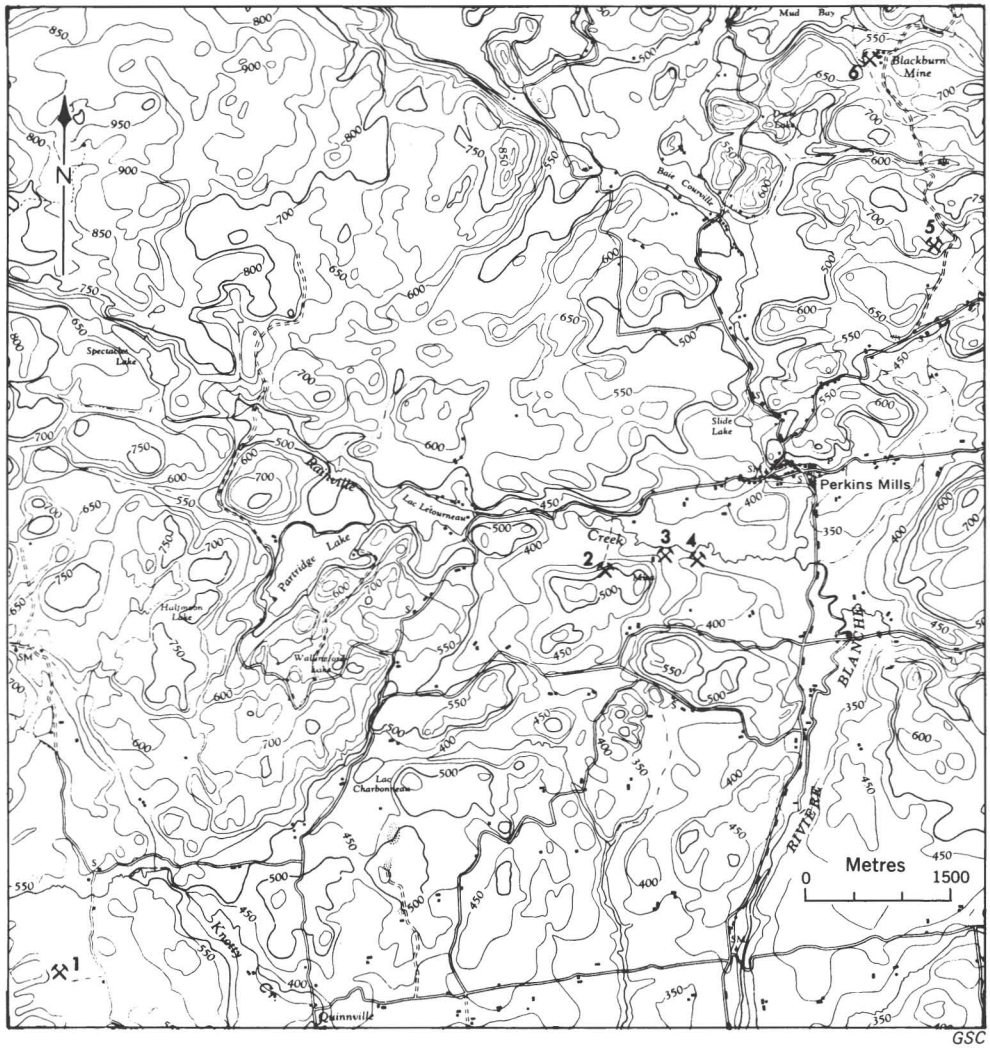
HEMATITE, ILMENITE, MAGNETITE, APATITE, MICA, PYROXENE, AMPHIBOLE, FELDSPAR, BARITE.

In feldspar gneiss.

Bright massive and platy hematite occurs as lenses and pockets in the gneiss. Its streak is black due to a high content of titanium. Small amounts of ilmenite and magnetite are associated with it. Other minerals found include: apatite, as colourless to red granular masses with hematite, and as slender green prisms in white to pinkish white calcite, amber mica; green pyroxene crystals; black amphibole crystals; and white massive feldspar that fluoresces pink under ultraviolet rays (particularly bright under 'short' rays). Grey barite has also been reported.

The deposit was first reported in the 1860s and was worked between 1873 and 1874. There are two large openings, one 21 by 6 m and 6 m deep, and a shallow one measuring 9 by 15 m, and several small pits that are now overgrown. Smelting equipment including charcoal furnaces and a 10 kilometer tramway to Pointe-Gatineau were installed. The main pits are now water-filled but specimens can readily be obtained from large dumps adjacent to the pits. The property belongs to Mr. Henri Charette of Gatineau.

Part of 31 G/12



Map 2

Val-des-Monts area

1. Haycock Mine
2. Wallingford Mine
3. Rainville Mine
4. Sabourin property
5. Jackson Rae Mine
6. Blackburn Mine

Road log from Val-des-Monts intersection (km 19.5 on Buckingham – Val-des-Monts road, see page 5):

km		
	0.0	Proceed south toward Templeton.
	0.7	Crystalline limestone road-cut on right. (for description of this and following road-cuts, see page 7).
	0.9	Crystalline limestone road-cut on right.
	0.95	Bridge over Blanche River.
	1.3 to 1.6	Garnetiferous gneiss road-cuts on both sides of road.
	1.85	Garnetiferous gneiss road-cut on right.
	5.4	Junction, gravel road; turn right. This junction is 8.4 km north of the junction with Highway 148 in Templeton.
	8.1	Crossroads, continue straight ahead.
	10.0	Junction; turn right.
	11.6	Junction; turn left.
	13.8	Junction; turn left.
	14.9	Junction single-lane road on right; turn right.
	15.4	Mine on right.

Refs.: 17 p. 61-67; 28 p. 46-47; 33 p. 20-21.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Sabourin Property

APATITE, MICA, PYROXENE, TITANITE, PYRITE, FELDSPAR, CALCITE.

In pyroxenite.

This is a former mica/apatite mine. Blue-green massive apatite and amber mica are associated with greyish green to grass-green pyroxene (both massive and as crystals up to 3 cm across), white calcite, and grey feldspar enclosing dark brown titanite crystals up to 1 cm long. Specimens of these mineals are plentiful in the dumps that lie adjacent to several pits in a pasture at the edge of a wooded area on Mr. A. Sabourin's farm.

Road log from the Val-des-Monts intersection (km 19.5 Buckingham – Val-des-Monts Road), see page 5):

km		
	0.0	Proceed west from the church.
	0.3	Junction; turn left.
	1.4	Turn left onto single-lane road to A. Sabourin farmhouse. The road leads south beyond the farmhouse for about 730 m to the pits on the lower part of a wooded ridge on the south side of a stream.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Rainville (Dugas) Mine

APATITE, MICA, PYROXENE, QUARTZ, PYRITE, TITANITE, FELDSPAR, CALCITE, ROZENITE, FLUORITE, AMETHYST, BARITE.

In pyroxenite.

The deposit consists mainly of massive green apatite and amber mica in pink calcite. When it was being mined, sheets of mica measuring 102 by 115 cm were obtained from large crystals. Accessory minerals include: pyroxene, as greyish green crystals and as dark green prismatic aggregates; white massive quartz containing cavities up to 2-3 cm across lined with quartz crystals; pyrite; titanite, as brown, 1 cm long crystals in grey feldspar; pink calcite; and rozenite as a white encrustation on rusty pyroxenite. Deep green fluorite and amethyst crystals occur with yellow, massive apatite. Platy pink barite is associated with amethyst.

The mine was originally opened for apatite in 1875 and was worked for mica between 1891 and 1906, and again briefly in 1918. Over 1815 t of apatite and $200,000 worth of mica were extracted during this time. The mine was reopened for a short time in 1937. A few small dumps scattered in a partly wooded area remain on the property, which belongs to Mr. A. Rainville.

Road log from Val-des-Monts intersection at church (km 19.5, page 5):

km		
	0.0	Proceed west.
	0.3	Junction; turn left.
	1.4	Turn-off to Sabourin property; continue straight ahead.
	1.9	Turn left onto single-lane road to Rainville farmhouse. The dumps are on the slope of a hill behind the farmhouse.

Refs.: 6 p. 37; 48 p. 68-69; 51 p. 89-90.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Wallingford Mine

APATITE, MICA, PYROXENE, CALCITE, TITANITE, FELDSPAR, WILSONITE.

In pyroxenite.

Green massive apatite and amber mica occur with greyish green crystals (up to 8 cm across) and dark green prismatic aggregates of pyroxene in pinkish white to salmon-pink calcite. Brown grains and small crystals of titanite are found in pyroxene and in grey feldspar. Wilsonite was previously reported from the deposit.

The mine was worked intermittently from 1882 to 1908, first for apatite and later for mica. An estimated 3630 t of apatite and 3265 t of mica was produced including one single crystal that yielded $33,000 worth of mica. First prizes for the quality of mica were awarded specimens from this mine at world exhibitions in Paris, St. Louis and Liège. The workings, a large pit, 52 m by 9 m and 60 m deep and several small pits at the top of a hill, are now water-filled but specimens may be obtained from large dumps adjacent to the pits.

Road log from Val-des-Monts intersection at church km 19.5 (see page 5):

km		
	0.0	Proceed west along road to Sabourin and Rainville Mines.
	1.9	Turn-off to Rainville Mine; continue straight ahead.
	2.4	Junction overgrown single-lane road on left. This road leads over a creek, then up a hill, down and through a swamp, then up to the top of another hill to the mine. The total distance is about 800 m.

Refs.: 48 p. 70-71; 50 p. 467; 51 p. 91.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Jackson Rae Mine

MICA, APATITE, TOURMALINE, ACTINOLITE, TITANITE, FELDSPAR, QUARTZ, EPIDOTE, PYROXENE, PYRITE,

In pyroxenite.

The deposit consists chiefly of light amber mica and green massive apatite. Radiating aggregates of black tourmaline crystals are associated with silky, dark green radiating actinolite, brown titanite crystals, pink calcite, pyrite and mica in quartz-feldspar dykes that traverse the pyroxenite. Titanite crystals up to 8 cm long, and yellow-green epidote associated with pyroxene and pyrite, have been reported from the deposit.

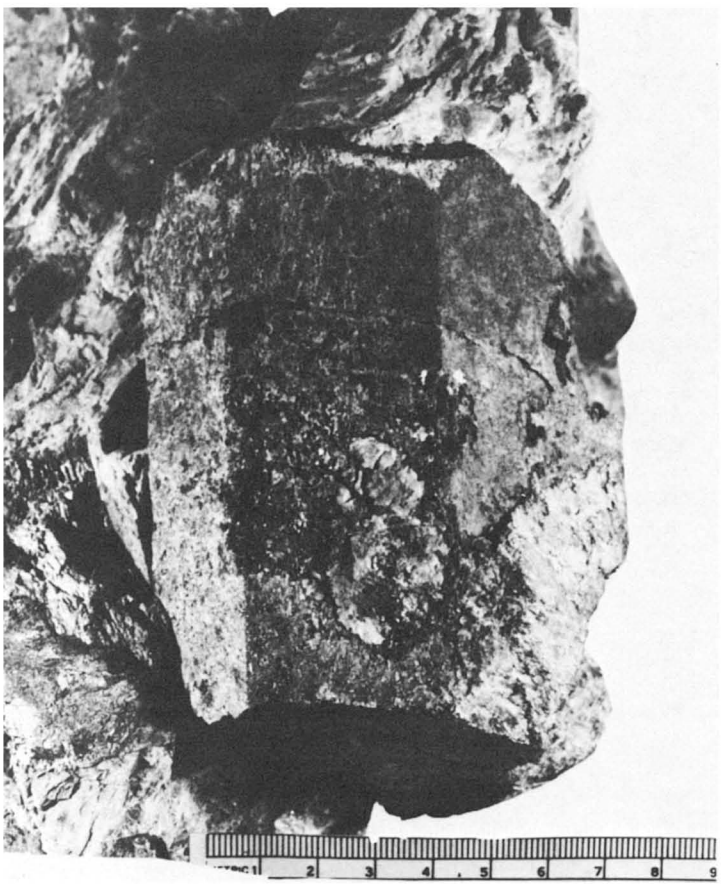


Plate I

Pyroxene crystal in calcite and apatite, Val-des-Monts area. (GSC 200854C)

This was one of the most extensively worked apatite mines in the Templeton district. From 1878 to 1890, the Jackson Rae Phosphate Company of London extracted several thousand tonnes of apatite, and since then about 32 t of mica have been mined. The most recent work was done by Perkins Mills Mica Company, Limited in 1945-46. It was worked by a large open-cut and by a number of small pits. Large dumps along the Blackburn Mine road mark the locality.

Road log from Val-des-Monts intersection at church (km 19.5, page 5):

km		
	0.0	Proceed north toward McGregor Lake.
	0.5	Junction; turn right.
	2.7	Junction; turn left onto single-lane road.
	3.7	Jackson Rae Mine dump on left.

Refs.: 10 p. 38; 11 p. 37; 48 p. 75-76; 51 p. 93-94.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Blackburn Mine

MICA, APATITE, CALCITE, PYROXENE, PYRITE.

In pyroxenite.

Dark amber mica and massive apatite occur in pink to brick-red calcite. Mica books, 15 cm across, and apatite crystals, about 3 cm across, are common in the dumps. Accessory minerals include dark green pyroxene and pyrite.

The mine was operated almost continuously from 1888 to 1958 and was the largest mica/phosphate producer in the district. It was originally worked for apatite by Messrs. Blackburn and McLaren. In the 1890s apatite mining declined in Canada due to the development of cheaper sources elsewhere and this mine, as well as others in the area, became chiefly a mica producer. It was worked by an open pit (91 m by 55 m, 37 m feet deep) and by underground methods. A mill was also installed. The openings are now inaccessible but specimens may be collected from extensive dumps.

Road log from Val-des-Monts intersection at church (km 19.5, page 5):

km		
	0.0	Proceed north toward McGregor Lake.
	0.5	Junction; turn right.
	2.7	Junction; turn left onto single-lane road.
	3.7	Jackson Rae Mine on left; continue straight ahead.
	4.7	Fork; bear left. This road crosses a swampy area and may not be accessible by automobile in wet weather.
	5.8	Mine. The main workings are located here. A 61-metre shaft is situated about 3.2 km to the northeast and is reached by continuing along the trail from km 5.8.

Refs.: 48 p. 78-81; 51 p. 95-97.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

This is the last occurrence described from the Perkins Mills area; the main log along Highway 309 from Buckingham to Mont-Laurier is resumed.

km 0.15 Buckingham, at junction road to Mayo (St. Joseph Street).

Bell Graphite Mine

GRAPHITE, FELDSPAR, QUARTZ, PYROXENE, SERPENTINE, TITANITE, PUMPELLYITE, PYRITE.

In crystalline limestone.

The graphite occurs as disseminated flakes and flaky aggregates in crystalline limestone and in grey feldspar-quartz aggregates. Pyroxene, as tiny dark green grains, is abundant; some grains have been altered to dull green serpentine. Brown titanite grains and crystals (2 mm long) are less common. Light greenish blue, translucent grains (up to 5 mm across) of pumpellyite are fairly common and could be mistaken for apatite. Pyrite also occurs in the limestone.

The deposit was worked by a series of adits driven into the north side of a ridge overlooking McNaughton Creek. A 3-storey mill was installed on the site. The property was operated by the Bell Graphite Company of London from 1906 to 1912 and about 2700 t of ore were mined. The most productive openings were those at the base of the ridge. They extend from the bottom of the ridge to 150 m up the slope and the lowest one was carried 61 m into the ridge. Frobisher Limited re-examined the property in 1952. The dumps are now partly overgrown. The deposit is situated on the MacNamara farm.

Road log from Buckingham at **km 0.15** on Highway 309:

km	0.0	Turn right (east) onto road to Mayo (St. Joseph Street).
	2.9	Junction; turn right.
	5.6	Turn right onto single-lane road to MacNamara property. (This road also leads to the Leo Kehoe farm).
	6.6	Road turns left to the Kehoe farmhouse. The mine is about 90 m north of this bend and it is necessary to cross the creek to reach it.

Ref.: 13 p. 49; 52 p. 50.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km 6.3 Junction, gravel road on right

Feldspar Quarry

FELDSPAR, QUARTZ, MICA, TOURMALINE, GOETHITE, THORITE.

In pegmatite dyke.

The deposit consists of white, greenish white, pink and flesh-red feldspar, colourless quartz, and silvery amber to black mica. Accessory minerals include magnetite, goethite and black massive tourmaline. Dull black laths of thorite occur in feldspar.

The deposit was worked in the 1920s by two side-hill openings on the east side of a lake. There is ample dump material for specimen collecting.

Road log from Highway 309 at **km 6.3:**

km		
	0.0	Turn right (east) onto gravel road.
	3.2	Fork; bear right.
	4.0	Fork; bear left.
	6.1	Fork; bear left.
	7.9	Fork; bear left.
	8.0	Fork; bear left.
	9.2	Fork; bear right.
	9.4	Quarry.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km 9.2 Turn-off (right) to E. Deguire property.

Peerless (Diamond) Mine

GRAPHITE, PYRITE, GARNET, TITANITE, PYRRHOTITE, AMPHIBOLE.

In feldspar gneiss and crystalline limestone.

The orebody consisted of flake graphite with pyrite, granular masses of garnet and of titanite, black amphibole, and pyrrhotite in feldspar gneiss. In places, the flaky aggregates form layers about 1 cm thick in the rock. The dumps at the west end of the deposit contain crystalline limestone enclosing foliated, flaky, and nodular graphite. Specimens of pure graphite 2 cm to 5 cm thick and several cm across can be found in small dumps on a wooded ridge just northwest of the Deguire farmhouse.

The mine was opened in 1906 by the Diamond Graphite Company of Rochester. A mill was installed and later the property was taken over by the Peerless Graphite Company of Rochester. Operations were intermittent until about 1920. A few water-filled pits are located near the top of a wooded hill facing Highway 309; they are on the Deguire property about 140 m northwest of the farmhouse. The mill was also located at this site but most of the ore was obtained from a pit (30 m long and 21 m deep) about 800 m to the east. Permission to enter the property must be obtained from Mr. Deguire whose farmhouse is 0.15 km east of Highway 309.

Ref.: 52 p. 57; 63 pp. 497-499.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km 10.5 Road-cut on right side of Highway 309.

Road-cut

GRAPHITE, PYROXENE, GARNET, TITANITE, PYRITE.

In gneiss.

Finely disseminated graphite is associated with small grains of pyroxene, pink garnet, brown titanite and pyrite. The mineralization is similar to that at the Peerless Mine.

Maps (T): 31 G/11 Thurso.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km 12.5 Junction, single-lane road on left.

km 12.7 Junction, single-lane road on left.

Cadieux Quartzite Quarry

QUARTZITE.

The quartzite is bluish grey and contains tiny grains of magnetite, rutile and hematite, and flakes of chlorite and mica. The quartzite exposed along the quarry walls is cut by diabase and by pink pegmatite dykes.

The quarry was opened into opposite sides of a hill and was worked in 1954 for silica by Mr. Omer Cadieux. The silica was used for flux in treating phosphate at the Electric Reduction Company in Buckingham.

Road log from Highway 309 at **km 12.5**:

km 0 Turn left (west) onto single-lane road. This is a very sharp turn.

0.08 Fork; bear right.

0.15 Gate on right. A trail, about 45 m long, leads from here to the quarry.

The other opening, on the north side of the hill, is accessible by a road, about 275 m long, that leaves Highway 309 at **km 12.7.**

Refs.: 14 p. 63; 28 p. 43-44; 43 p. 10.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

km 13.2 Junction, gravel road on left.

Emerald Mine

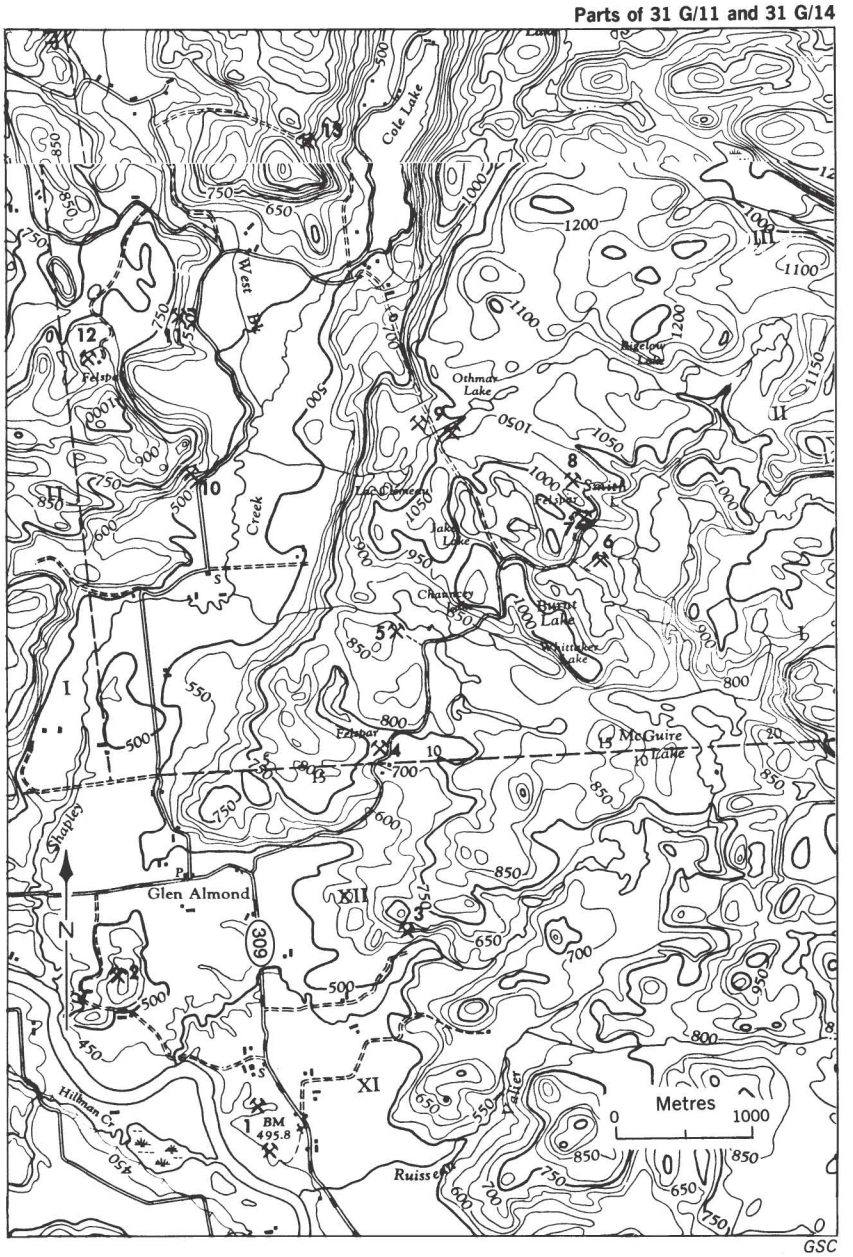
APATITE, PYROXENE, SCAPOLITE, CALCITE, TITANITE, ACTINOLITE, TREMOLITE, PYRITE, SPHALERITE, HYDROZINCITE, CHALCOPYRITE, GALENA, PYRRHOTITE.

In pyroxenite.

The apatite occurs as green crystals, in massive form, and as light green sugary masses enclosing crystals. It is associated with dark green pyroxene, scapolite, salmon-pink calcite, yellowish brown titanite (grains and small crystals), actinolite, tremolite, and pyrite. Massive, dark brown sphalerite occurs with galena and with white calcite that fluoresces bright pink when exposed to ultraviolet rays ('short' rays are more effective than the 'long' rays). Cream-white hydrozincite forms a powdery coating on the sphalerite; it fluoresces bluish white under ultraviolet rays. Chalcopyrite and pyrrhotite are also present. A white fibrous variety of amphibole known as mountain cork has been found as large masses during mining operations. A 250 kg apatite crystal with a circumference of 159 cm was displayed at the 1886 London Colonial and Indian Exhibition.

Apatite was first reported from the du Lièvre district in 1829 by Lieutenant Ingall but mining did not begin until 1871. The Emerald Mine was opened in 1875 by Buckingham Mining Company. It was worked almost continuously until 1892 and was one of the largest and most important phosphate mines in the district. Total production was estimated at approximately 3200 t. The most recent work was done in 1941-42 by Commercial Mineral Products; the apatite was shipped to the Electric Reduction Company in Buckingham for the manufacture of phosphorus and phosphorous salts. The mine consists of several pits at the top of a wooded hill on Mr. T. Lauzon's farm. The pits are filled with water and the dumps are partly overgrown.

Parts of 31 G/11 and 31 G/14



Map 3

Glen-Almond area

1. Cadieux quarries
2. Emerald Mine
3. Pedneaud quarry
4. Derry Mine
5. Daisy Mine
6. Burnt Lake Mine
7. Back Mine
8. Smith Lake Mine
10. Davis Mine
11. Glen-Almond Mine
12. Perkins Feldspar Mine
13. Cole Lake Mine

Road log from Highway 309 at **km 13.2:**

km 0.0 Turn left (west) onto gravel road.

0.8 Fork; bear right.

1.3 Lauzon farmhouse. A farm road leads west, then north and up the hill to the mine.

Refs.: 7 p. 23; 8 p. 37; 21 p. 4; 26 p. 227-229; 51 p. 64-65; 55 p. 89-93; 61 p. 94.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

km 13.7 Junction, single-lane road on right.

Pedneaud Quarry

FELDSPAR, QUARTZ, MICA, TOURMALINE, HORNBLENDE, GARNET, PYRITE, CALCITE, HEMATITE, CHAMOSITE, RUTILE, FLUORITE, APATITE, CHLORITE, KAOLINITE, THORITE, EPIDOTE, CHABAZITE, BARITE, MONAZITE, URANINITE, URANOTHORITE.

In pegmatite.

The chief constituents of the pegmatite are pink microcline and greenish white plagioclase feldspar, quartz, and silvery mica. Common accessories are: black massive tourmaline; greenish black hornblende; pink to dark red garnet; grains and tiny cubes of pyrite; white to salmon-pink calcite; lustrous, platy hematite; and, earthy green chamosite. Minerals that are uncommon or rare include: rutile (reddish brown prisms), fluorite, apatite (colourless prisms), chlorite, kaolinite, thorite (black massive patches), epidote, chabazite, barite, monazite, uraninite and uranothorite.

The mine consists of two open cuts (about 76 m long), one above the other on the south side of a ridge on the Gauthier farm. It was opened in the 1920s and was worked for quartz and feldspar. Since then operations have been intermittent. There are extensive dumps near the openings.

Road log from Highway 309 at **km 13.7:**

km 0.0 Turn right (east) onto single-lane road.

0.6 Gauthier farmhouse; the road continues straight ahead to the quarry.

1.6 Quarry.

Refs.: 28 p. 44-45; 43 p. 9-10; 54 p. 68-70.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

km 14.3 Junction, gravel road on right at bend (to left) on highway.

Derry Mine

FELDSPAR, QUARTZ, TOURMALINE, MICA, PYRITE, CHLORITE, GARNET, HEMATITE, KAOLINITE, GOETHITE.

In pegmatite.

Pink and greenish white feldspar and colourless to smoky quartz are the chief constituents of the pegmatite dyke. Tourmaline, as black crystalline aggregates and in massive form, is abundant. Dark amber to black mica, greenish black chlorite, and pyrite are common accessories. Garnet (tiny pink crystals), hematite, kaolinite (cream-white in cavities) and goethite are present but are relatively uncommon. The feldspar from this deposit was of an exceptionally high quality and some was in demand for dental purposes.

This was one of the more important feldspar producers in the du Lièvre district which has been the chief supplier of feldspar in Quebec for almost 50 years. The mines north of Buckingham were opened in 1919-1920 to meet a demand for a higher grade of feldspar than had been produced by the Verona (Ontario) feldspar mines which had already closed. The Derry Mine was the first (1919) to open in the district and operations were continuous until 1938. The total production was approximately 92000 t making this the largest feldspar operation at the time. Further operations were conducted intermittently from 1942 to 1949 and 1969 to 1970. The mine was initially worked by an open pit; underground operations to a depth of 60 m on the incline were started in 1926. The underground openings have since caved in but the pit is accessible.

Road log from Highway 309 at **km 14.3** (see page 17):

km		
	0.0	Proceed straight ahead on gravel road.
	0.3	Fork; bear right.
	1.8	Junction, on left single-lane road; bear left.
	2.0	Mine.

Refs.: 19 p. 295-306; 43 p. 9; 54 p. 71-72.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Daisy Mine

MICA, CALCITE, PYROXENE, PYRITE APATITE, QUARTZ CRYSTALS, DATOLITE, FAUJASITE, FLUORITE.

In pyroxenite.

Amber mica is associated with white calcite, greyish green pyroxene and small amounts of pyrite and apatite. Pyroxene crystals up to 2 cm across, occur with mica books measuring 10 to 12 cm across. Crystals of pyroxene and quartz were found in cavities in pyroxenite. Other minerals reported from the deposit are: datolite, as white, compact, porcelain-like masses occurring with purple fluorite in pyroxene and apatite; and faujasite, as white octahedrons associated with green fluorite.

About 80 years ago, the deposit was worked briefly for mica by numerous pits (3 to 24 m deep) on a wooded ridge overlooking the south shore of Chauncey Lake. The pits are now water-filled and the dumps largely grown over.

Road log from Highway 309 at **km 14.3** (see page 17):

km		
	0.0	Proceed straight ahead along gravel road.
	0.3	Fork; bear right.
	1.8	Turn-off (left) to Derry Mine; continue straight ahead.
	3.4	Turn left onto single-lane road. This turn-off is about 90 m west of Notre-Dame-de-Fatima Church.

km 3.5 Fork; bear left.

3.7 The first dump is on the right and a few pits are on the left. Other pits are found to the north.

Ref.: 48 p. 62-63, 285-286.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Jack (Jake) Lake Mine

FELDSPAR, QUARTZ, MICA, TOURMALINE, PYRITE, ROZENITE.

In pegmatite.

The deposit consists of pink and white feldspar, colourless to smoky quartz, and silvery and black mica. Slender black tourmaline crystals and massive pyrite are common. Rozenite occurs as a white encrustation on pyrite and on rusty weathered feldspar.

The deposit was developed by two open cuts situated 400 m apart. It was worked for feldspar in the 1920s.

Road log from Highway 309 at **km 14.3** (see page 17):

km 0.0 Proceed straight ahead along gravel road leading to the Derry and Daisy Mines.

3.4 Turn-off (left) to Daisy Mine; continue straight ahead.

3.45 Notre-Dame-de-Fatima Church on left.

3.5 Fork; bear left.

4.3 Fork; bear right.

4.5 Junction road to Jack (Jake) Lake; turn left. This road is accessible by automobile to Jake Lake (0.5 km from the turn-off); from this point access is by hiking.

5.3 Dump and open cut on right.

5.6 Dump and open cut on left.

Ref.: 54 p. 72-73.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Burnt Lake Mine

FELDSPAR (PERISTERITE), QUARTZ, MICA, TOURMALINE, GARNET, PYRITE, ROZENITE.

In pegmatite.

White feldspar, colourless to smoky quartz and black mica are the chief constituents of the pegmatite. Some of the feldspar (peristerite) has a blue schiller. Black tourmaline, red garnet, and pyrite are common. White rozenite forms a powdery encrustation on pyrite and on rusty feldspar.

The pegmatite was exposed by a small pit (now water-filled) that measures approximately 18 m by 7.6 m. There are small dumps adjacent to the pit.

Road log from Highway 309 at **km 14.3** (see page 17):

km		
	0.0	Proceed along road to Derry and Daisy Mines.
	3.4	Turn-off to Daisy Mines; continue straight ahead.
	4.5	Junction road to Jake Lake; continue straight ahead.
	5.1	Junction (on right) road to Smith, Burnt Lakes; turn right.
	5.6	Fork; bear right.
	5.7	Pit on left.

Maps (T): 31 G/11 Thurso.
(G): 1366 GlenAlmond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Back (Wallingford) Mine

FELDSPAR, QUARTZ, MICA, TOURMALINE, GARNET, CALCITE, PYRITE, PYRRHOTITE, GALENA, ILMENITE, ZIRCON, ALLANITE, URANINITE, THUCOLITE.

In pegmatite.

White microcline feldspar and colourless to smoky quartz are the main constituents of the pegmatite. White to greenish grey albite, biotite, muscovite, black tourmaline (massive and individual crystals), and reddish brown massive garnet are common. Peristerite and pale rose quartz are present and could be used for lapidary purposes. Minerals that are relatively uncommon include: white calcite, pyrite (massive and cubes), pyrrhotite, galena, ilmenite, greyish mauve zircon, greyish black allanite, uraninite, and thucolite. Some of the radioactive minerals form pseudomorphs after tourmaline.

This deposit was in continuous operation from 1924 when it was opened by Messrs. O'Brien and Fowler of Ottawa until 1972. It became the chief source of feldspar in Quebec upon the closing down of the Derry Mine. The last operator, International Minerals and Chemical Corporation (formerly Canadian Flint and Spar Company, Limited), worked the mine for feldspar and quartz since the 1930s. The mine consists of a stope and a series of benches opened into a pegmatite dyke that forms a low hill on the north side of Mud Lake. The feldspar was hauled by truck to the company's crushing plant in Buckingham. The ground feldspar was used in the ceramic and cleanser industries, and some was used for dental purposes.

Road log from Highway 309 at **km 14.3** (see page 17):

km		
	0.0	Proceed along gravel road toward Derry, Daisy, etc., mines.
	5.1	Junction road to Smith and Burnt Lakes; continue straight ahead.
	5.4	Back Mine.

Refs.: 22 p. 244-247; 43 p. 8-9; 46 p. 30-31; 54 p. 73.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1,000 feet to 1 inch).

Smith Lake Mine

FELDSPAR, QUARTZ, MICA, TOURMALINE, ILMENITE, PYRITE, ALLANITE, ROZENITE.

In pegmatite.

This deposit is in the same pegmatite dyke that was worked at the Back Mine on the opposite side of the hill. Both microcline and albite feldspars are present, as is a small quantity of peristerite. Muscovite, black tourmaline, dark brown massive and flat crystals of ilmenite, massive pyrite, and greenish black vitreous allanite occur in feldspar. Rozenite forms a white encrustation on pyrite.

The mine was opened about 35 years ago and was worked for both feldspar and quartz. It was not in operation in 1967.

Access is by a single-lane road that begins to the right of the entrance to the pit at the Back Mine, and proceeds up the hill for approximately 275 m to the mine and dumps.

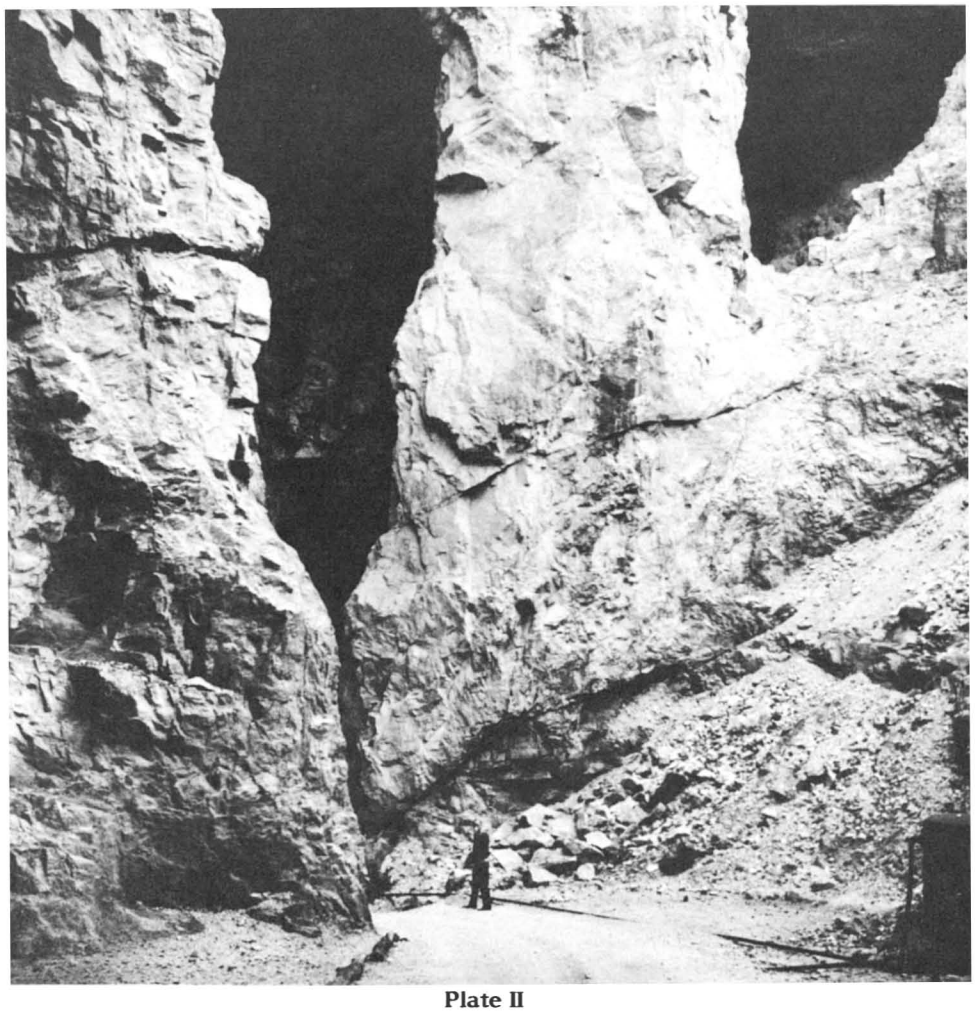


Plate II

Back (Wallingford) Mine, showing pegmatite pillars at entrance to cave-like quarry. (GSC 138633)

Ref.: 43 p. 9.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

km 14.9 Glen-Almond, at Post Office and junction (on right) gravel road.

Davis Mine

APATITE, MICA, CALCITE, PYROXENE, SERPENTINE, TITANITE, TREMOLITE, QUARTZ.

In pyroxenite.

Well-formed, green apatite crystals measuring 2 cm across occur with dark brown mica in salmon-pink and white calcite. Dark green pyroxene crystals (some partly altered to serpentine), brown titanite crystals (5 mm long), white radiating tremolite, and colourless to smoky quartz, are present in small amounts.

The deposit was exposed by a few small pits (now water-filled) on the south slope of a wooded ridge north of Glen-Almond. The dumps are small but good specimens can be found. The mine was worked for mica during a six-month period about 80 years ago.

Road log from Highway 309 at **km 14.9.**

km		
	0.0	Turn right (north) at Glen-Almond Post Office
	0.95	Junction; continue straight ahead.
	2.3	Junction, single-lane road on left (at sharp bend to right); turn left.
	2.5	Gate. On right, a partly overgrown trail leads sharply to the right and up the ridge for a distance of about 45 m to the mine.

Ref.: 48 p. 62.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Glen-Almond Mine

FELDSPAR, QUARTZ, TOURMALINE, GARNET, HEMATITE (SPECULARITE), CHLORITE, EUXENITE.

In pegmatite dyke cutting amphibolitic gneiss.

The dyke consists of red feldspar with massive white quartz and minor amounts of greenish white plagioclase feldspar. Slender black tourmaline crystals, up to a 30 cm long, are common in the red feldspar. Other minerals found in the feldspar area: dark brownish red garnet masses up to 3 cm across; hematite, as small patches and as platy aggregates (specularite) in tiny cavities; dark green chlorite (uncommon); and black euxenite grains measuring up to 1 cm in diameter. The euxenite can be recognized by its yellowish halo surrounding the grains.

The mine was opened for feldspar in 1930 by Mr. H. Mercier of Glen-Almond. It consists of a shallow cut into the south slope of a fairly steep ridge. The dump is visible from the road.

Road log from Highway 309 at **km 14.9** (see page 22):

km

0.0 Proceed north from Post Office along gravel road (see road log for Davis Mine).

2.3 Junction, on left, road to Davis Mine; continue on main road.

2.9 Junction at red school; turn left.

3.6 Junction, single-lane road on left (at sharp bend to right on main road); turn left.

3.7 Junction, partly overgrown tractor road on right. Proceed along this road up the ridge for about 140 m to the pit and dump.

Refs.: 46 p. 31; 54 p. 72.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

Cole Lake Mine

FELDSPAR, QUARTZ, TOURMALINE, CHLORITE, PYRITE, GARNET, MICA, TITANITE, PYROXENE, EPIDOTE, CALCITE, ALLANITE, ROZENITE.

In pegmatite.

The deposit consists chiefly of white, pink and dull green feldspar and massive quartz. Common accessory minerals include: slender black tourmaline crystals (up to 2 cm across and several cm long); massive, turbid green chlorite; massive pyrite; and garnet, as orange-red grains and as brownish red masses up to 3 cm across. Less common are: biotite; dark brown wedge-shaped crystals and crystal aggregates of titanite; dark green crystalline pyroxene; transparent, yellowish green, massive epidote associated with pyroxene and calcite; dull, brownish black, massive and lustrous black, elongated aggregates (with woody structure) of allanite; black, submetallic, massive ilmenite; and white, powdery rozenite on rusty-weathered pyrite and feldspar.

The deposit was worked for feldspar in 1948-49 by Canadian Flint and Spar Company Limited. The quarry, now filled with water, was opened into the side of a hill on property belonging to Mr. François Charette of Glen-Almond.

Road log from Highway 309 at **km 14.9** (see page 22):

km

0.0 Proceed north from Glen-Almond Post Office and follow road log to Glen-Almond feldspar mine.

3.6 Junction, single-lane road (to feldspar mine) at bend; continue along main road.

5.9 Fork; bear left.

6.0 Fork; bear right.

7.2 Gate and single-lane mine road on right; proceed up this road.

7.9 Mine.

Maps (T): 31 G/14 Chénéville.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Perkins Feldspar Mine

FELDSPAR, QUARTZ, MICA, TOURMALINE.

In pegmatite.

A large open pit exposes pink and white (less common) feldspar with massive quartz and biotite. Black tourmaline crystals occur sporadically in feldspar.

The deposit was operated in the 1930s by the Perkins Mining Company. The pit measures about 120 m by 30 m and is now filled with water. There is a large dump at the western end of the opening.

Road log from Highway 309 at **km 14.9** (see page 22):

km		
	0.0	Proceed north from Glen-Almond Post Office following the road to the Glen-Almond feldspar mine.
	3.6	Junction, single-lane road at bend; continue along main road.
	5.9	Fork; bear left.
	6.0	Fork; bear left (right fork leads toward Cole Lake Mine).
	7.1	Junction, on left, single-lane tractor road to mine; turn left.
	8.0	Fork; bear right.
	8.4	Mine.

Ref.: 6 p. 39.

Maps (T): 31 G/11 Thurso.
(G): 1366 Glen-Almond area, Electoral District of Papineau (Que. Dept. Nat. Resources, 1 inch to 1,000 feet).

km	19.8	Turn-off (right) to R. Blanchard house.
km	19.9	Turn-off (right) to M. Laframboise house and to Little Rapids Mine.

Little Rapids (Watts) Mine

APATITE, MICA, CALCITE, PYROXENE, FELDSPAR, ACTINOLITE, PUMPELLYITE, ALLANITE, FLUORITE, TITANITE, GARNET, PYRITE.

In pyroxenite.

Apatite occurs as light green sugary masses enclosing transparent, brighter green crystals and crystal aggregates. Associated minerals are: amber to dark brown mica, white calcite, grey and dark green pyroxene, white feldspar, and dark green bladed actinolite. Of less common occurrence are: pumpellyite, as white silky rosettes on pyroxene crystals, and as cream-white acicular aggregates in small cavities in pyroxenite; allanite, as dark brown resinous masses and as orange grains; purple fluorite (rare) associated with orange allanite; titanite, as light brown patches and dark brown crystals up to 1 cm long; tiny pink garnet grains associated with pyroxene; small pyrite crystals.

The deposit was worked for apatite and mica intermittently for about 40 years beginning in the 1870s. The mine consisted of several pits, the deepest being 64 m and 67 m. A tramway transported the ore to the du Lièvre River where it was loaded onto scows to be taken to Buckingham. The pits are located on the north side of a wooded ridge on Mr. R. Blanchard's property.

Access is by a trail that begins behind the M. Laframboise house (at **km 19.9**) and leads northeast along a fence for about 800 m to a pit and dump. Other pits are located higher up on the ridge. Permission to enter the property may be obtained from Mr. R. Blanchard whose farmhouse is located at **km 19.8** on Highway 309.

Refs.: 48 p. 60-61; 51 p. 67-69.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km	20.0	Junction (left) road to James MacLaren Poupore Locks Mill.

km 20.0 Road-cut, Highway 309.

APATITE, MICA, CALCITE, TREMOLITE, PYROXENE, TITANITE, SCAPOLITE.

In pyroxenite.

Apatite crystals up to 3 cm across occur with amber mica and light green, bladed tremolite in pink and white calcite veins cutting the pyroxenite. Green pyroxene crystals are common; less abundant are titanite, as transparent brown crystals about 1 cm across, and scapolite, as small white striated prismatic aggregates.

The deposit is exposed by road-cuts on both sides of the highway just north of the turn-off to the mill at **km 20.0.**

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km	24.6 to 25.1	Road-cuts on right expose biotite gneiss containing small pink garnets.

km 26.4 Road-cuts on Highway 309.

TITANITE, FELDSPAR, PYROXENE, TOURMALINE, MICA, GRAPHITE, PYRITE, SCAPOLITE, SERPENTINE, GARNET, EPIDOTE, APATITE, PUMPELLYITE, TREMOLITE, CALCITE.

In crystalline limestone.

Dark brown crystals of titanite, averaging 3 cm in length, occur with dark green pyroxene and black tourmaline crystals (measuring up to 2 cm across) in greyish white feldspar. Smaller titanite crystals are found in the crystalline limestone. Other minerals disseminated through the limestone include: amber mica, graphite, green pyroxene, amber tourmaline, white scapolite (as tiny prisms), serpentine, brownish yellow garnet, grey epidote, light blue apatite (uncommon), light bluish grey striated pumpellyite and colourless to light grey tremolite. Pink calcite veins cut the crystalline limestone.

The crystalline limestone is exposed on both sides of the highway.

Maps (T): 31 G/12 Wakefield.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

km	28.3	Turn-off (right) to Notre-Dame-de-la-Salette business section; continue along Highway 309.
km	30.2	Notre-Dame-de-la-Salette, at junction (left) to bridge over du Lièvre River and to Poltimore.

Hart Mine

FELDSPAR, TITANITE, HORNBLENDE, QUARTZ (CRYSTALS), THORITE, BIOTITE, CHLORITE, PYRITE.

In pegmatite.

High-grade pink potash feldspar was formerly mined at this deposit. The feldspar contains massive chocolate brown titanite (commonly) 3 to 8 cm across) associated with black hornblende. Terminated quartz crystals, measuring up to 5 cm across, occupy cavities in massive quartz and feldspar; the small crystals are clear, but the larger ones tend to be somewhat milky. Dull black massive thorite occurs as irregular patches (up to 3 cm across) in smoky quartz and feldspar. Biotite, dark green massive chlorite, and pyrite are present but are not abundant.

The deposit was discovered by Mr. Rodrigue Hart of Notre-Dame-de-la-Salette in 1943. It was acquired by Canadian Flint and Spar Company Limited which operated it from 1944 and 1951. The mine consists of a large cave-like opening in the north side of a hill. There are large dumps along the slope below the quarry. The property belongs to Mr. Gerard Lapointe of Notre-Dame-de-la-Salette.

Road log from Notre-Dame-de-la-Salette at **km 30.2** (see page 25):

km		
	0.0	Turn left (west) onto road to bridge over du Lièvre River.
	1.3	Junction; turn left.

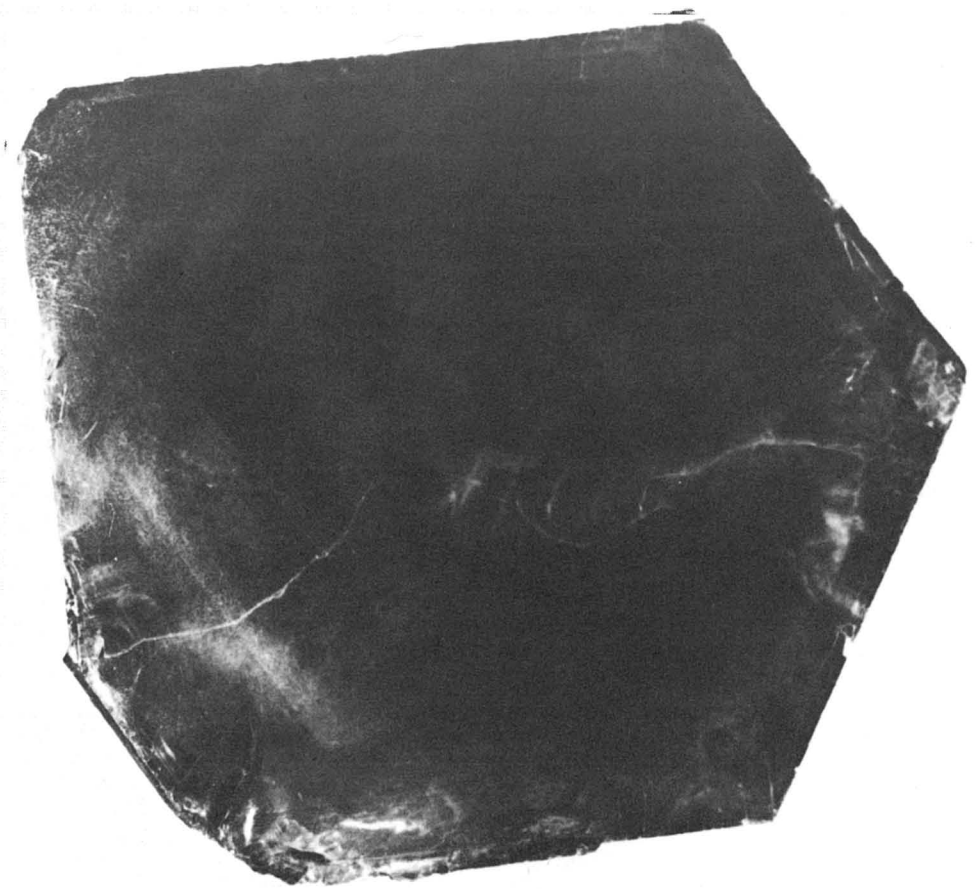
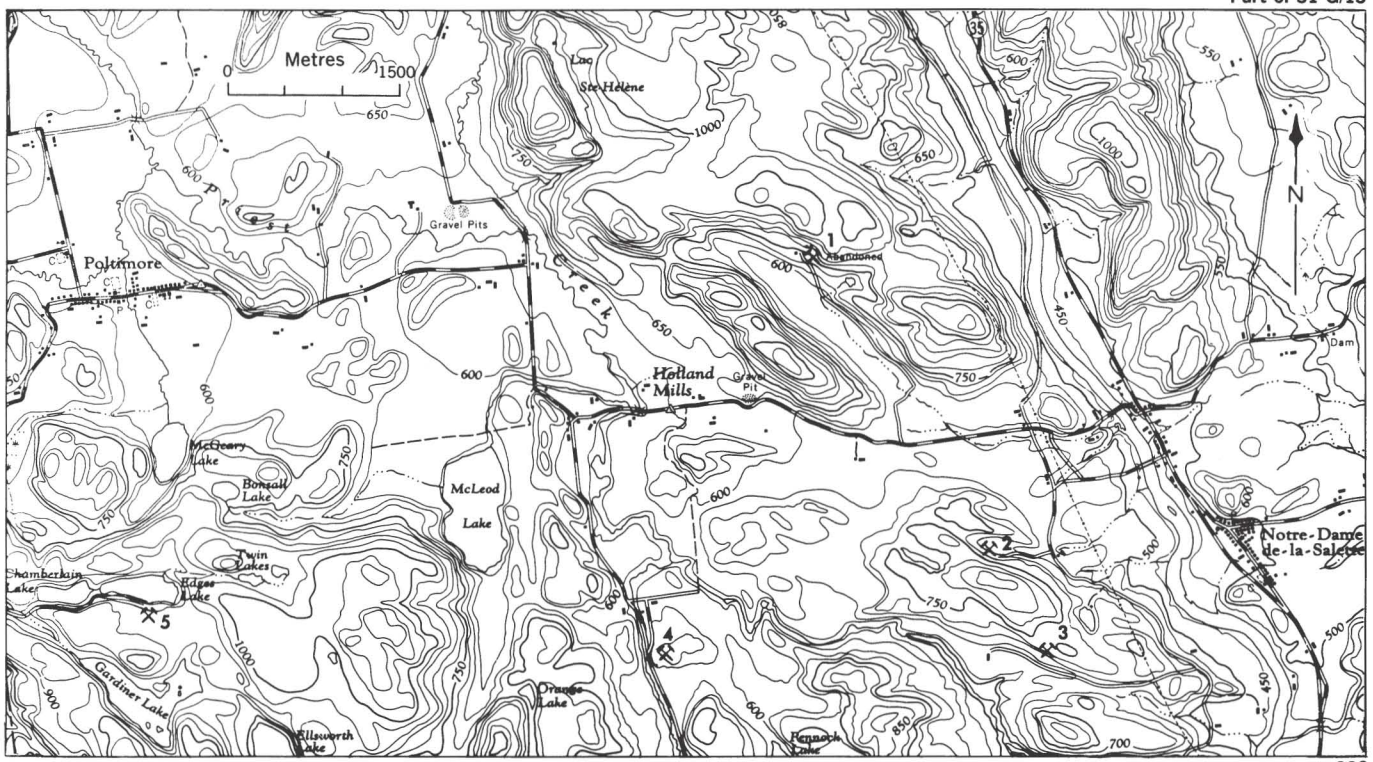


Plate III

Phlogopite crystal, Notre-Dame-de-la-Salette area. Specimen courtesy National Mineral Collection. (GSC 200854-L)



GSC

Map 4

Notre-Dame-de-la-Salette area

1. High Rock Mine
2. Hart Mine
3. Lapointe Mine
4. Poltimore asbestos property
5. Evans-Lou Mine

2.4 Junction (on right), single-lane road to mine. For permission to enter property, proceed to the Gerard Lapointe farmhouse on the left just beyond the turn-off to the mine.

2.9 Mine.

Ref.: 9 p. 51.

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Lapointe Mine

FELDSPAR, QUARTZ, TOURMALINE, MICA, SPECULARITE, BIOTITE.

In pegmatite.

The deposit consists mainly of pink feldspar with smaller amounts of white feldspar and quartz. Some of the white feldspar displays a faint blue play of colour. Black tourmaline crystals (measuring up to 20 cm long and 3 cm across) and crystalline aggregates are common. Mica is relatively rare. Cavities in quartz are lined with quartz crystals (about 7 mm across) coated with flaky specularite. Biotite is common.

The deposit was worked for feldspar in the 1920s. A pit, about 6 m in diameter was opened into the south side of a ridge. There are large dumps nearby.

Road log from Notre-Dame-de-la-Salette at **km 30.2** (see page 25):

km 0.0 Turn left (west) toward bridge over du Lièvre River.

1.3 Junction; turn left.

2.4 Turn-off (right) to Hart Mine; continue straight ahead.

4.0 Junction; turn right.

5.3 Mine in wooded area on right, approximately 45 m from the road.

Ref.: 54 p. 76.

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

High Rock Mine

APATITE, MICA, PYRITE, QUARTZ, HORNBLENDE, PYROXENE, GARNET, FELDSPAR, SCAPOLITE, WILSONITE, ZIRCON, ILMENITE, EPIDOTE, LEOPARD ROCK.

In pyroxenite.

Most of the apatite found at this deposit is the sea-green massive variety, although large crystals were found during mining operations. Mica and pyrite occur sparingly with the apatite. Attractive specimens of massive blue quartz are common in the dumps; this quartz is not suitable for lapidary purposes as it contains inclusions of dark brown mica. Small crystal aggregates of hornblende and pyroxene, and small red garnets occur in grey feldspar. During mining operations, the following minerals were found: scapolite, wilsonite, zircon, (pale red crystals), ilmenite (crystalline aggregates weighing up to 1 kg), and epidote. Leopard rock, a granite of unusual structure with fine-grained ferromagnesian minerals forming a network of curved connecting lines, occurs in the dumps. Both the leopard-rock and apatite were exhibited at the Paris International Exhibition of 1900.

The deposit was worked between 1879 and 1894, and again during the 1940s. Between 181 400 t and 226 700 t of apatite were mined. The mine consists of several open pits and underground workings, the main one being a 212-metres adit with 5 stopes. During the first period of activity, the mine-site included a small village with a mining camp, stores and a post office at the top of the ridge. A tramway transported the ore 3.2 km to the du Lièvre River where it was loaded on to scows for transfer to Buckingham. None of the buildings remain on the site now. The area is overgrown but specimens can readily be obtained from extensive dumps.

Road log from Notre-Dame-de-la-Salette at **km 30.2** (see page 25):

km		
	0.0	Leave Highway 309 and proceed west over the du Lièvre River bridge.
	1.3	Junction; continue straight ahead.
	2.5	Junction, single-lane road on right; turn right.
	2.9	Gate; continue straight ahead.
	4.2	Junction; continue straight ahead. This part of the road is very rough.
	4.4	Mine on right.

Refs.: 10 p. 42-43; 34 p. 7-11, 15; 51 p. 78-80; 56 p. 5-10; 62 p. 161, 188.

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Poltimore Asbestos Property

ASBESTOS, SERPENTINE, MICA, TREMOLITE, CHLORITE, PYRITE, GRAPHITE.

In crystalline limestone.

Silky-white asbestos (chrysotile) with fibres measuring up to 1 cm long occurs with massive yellowish green to olive-green and black (uncommon) serpentine. Ribbon-fibre asbestos – alternating bands of thin asbestos veinlets (less than 3 mm wide) separated by

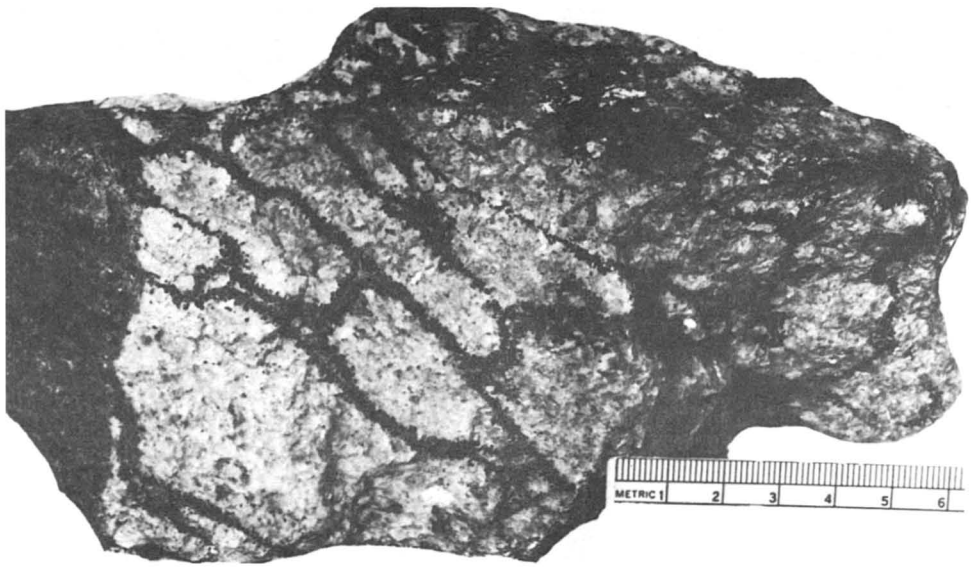


Plate IV

'Leopard rock', High Rock Mine. (GSC 200854B)

massive serpentine – is also present. The massive serpentine and another variety composed of yellowish green nodules and blotches (of serpentine) in white crystalline limestone, are very attractive and could have possibilities for lapidary purposes. Amber mica and colourless to light mauvish brown tremolite are common, while chlorite (colourless to light green), pyrite and graphite are relatively rare.

This deposit has been known for over seventy years. During the 1950s, Eastern Asbestos Company, Limited conducted a program of surface (trenches) and underground (adit, drifts and cross-cuttings) exploration on the deposit.

Road log from Notre-Dame-de-la-Salette at **km 30.2** (see page 25):

km		
	0.0	Leave Highway 309 and proceed west over the du Lièvre River bridge.
	1.3	Junction; continue straight ahead.
	2.5	Turn-off (right) to High Rock Mine; continue straight ahead.
	5.4	Holland Mills; at junction, turn left.
	8.0	Mine on left side of road; dumps on right.

Ref.: 18 p. 39.

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Evans-Lou Mine

WAKEFIELDITE, CAYSICHITE, HELLANDITE, MONTMORILLONITE, CENOSITE, MARCASITE, FERGUSONITE, TENGERITE, LOKKAITE, QUARTZ, PLAGIOCLASE, MICROCLINE, BIOTITE, MUSCOVITE, ALLANITE, TITANITE, URANOTHORITE, TOURMALINE, PYRITE, XENOTIME, APATITE, EPIDOTE, GARNET, ZIRCON, CALCITE, URANINITE, PYROCHLORE, EUXENITE, ANATASE, HORNBLENDE, DIOPSIDE, ACTINOLITE, BISMUTH, CHALCOPYRITE, PYRRHOTITE, MOLYBDENITE, MAGNETITE, GRAPHITE, HEMATITE, GOETHITE, CHRYSOCOLLA, CHAMOSITE, DOVERITE, BISMUTHINITE, BISMUTITE, BEYERITE, JAROSITE, EULYTITE, GYPSUM, ZAVARITSKITE, URANOPHANE, BETA-URANOPHANE, MALACHITE, AZURITE.

In granite pegmatite.

Two new mineral species, wakefieldite and caysichite, were originally described from this deposit. Wakefieldite occurs as a yellow or tan powder on quartz and hellandite. Montmorillonite, cenosite and marcasite are associated with it. Caysichite is colourless to white and, less commonly, yellow or green and occurs as powdery coatings, divergent columnar masses with reniform surface and as radiating crystal aggregates. It coats fractures and fills cavities in quartz, feldspar and hellandite. Fergusonite, cenosite, tengerite and lokkaite are associated with it. These minerals occur in pegmatite composed of quartz (including large crystals), white and pink plagioclase and pink and green (amazonite) microcline. Accessory minerals found in the pegmatite include: biotite books (up to 60 cm in diameter), greenish muscovite books, large black allanite crystals (up to 120 cm by 60 cm), black to dark brown fergusonite prisms, brown yttrian titanite crystals (up to 30 cm in diameter), black uranothorite prisms, black tourmaline prisms, pyrite cubes, yellow to green or pink xenotime crystals, blue apatite, epidote, black yttrian andradite garnet crystals, brown to black yttrian spessartite garnet, zircon, calcite crystals, hornblende, diopside, actinolite, uraninite cubes (up to 2 cm in diameter), brown earthy pyrochlore, dark brown resinous euxenite (tabular crystals), dull yellow anatase, native bismuth, chalcopyrite, pyrrhotite, molybdenite, magnetite and graphite. Hematite, goethite, montmorillonite and chrysocolla form coatings on quartz crystals. Hellandite occurs as yellow, brown to red or black crystals measuring up to 30 cm long. Small prisms of colourless or yellow to pink cenosite are associated with

black granular massive chamosite on hellandite. White fibrous tengerite forms rosettes and spheres and is associated with fibrous lokkaite. Pink doverite crystals occur on tengerite. Bismuthinite and greenish yellow powdery beyerite are associated with native bismuth. Minerals forming encrustations or coatings on quartz include cream-white yellow to green bismutite, yellow jarosite, white eulytite, yellow to green or white thorogummite, white gypsum and yellow to grey zavaritskite. Yellow uranophane and beta-uranophane occur as fibres and radiating crystals. Malachite and azurite occur uncommonly as stains on the host rock.

The deposit was originally opened for feldspar in 1932 by B. Winning of Notre-Dame-de-la-Salette. It was worked from 1934 to 1936 by William E. Evans of Perth; the mine derives its name from Mr. Evans and his daughter Louise. Between 1938 and 1956, Canada Flint and Spar worked the deposit for feldspar and quartz. The quarry cuts into the side of a hill overlooking Edges Lake.

Road log from Notre-Dame-de-la-Salette at **km 30.2** (see page 25):

km		
	0.0	Leave Highway 309 and proceed over du Lièvre River bridge.
	1.3	Junction; continue straight ahead.
	5.4	Holland Mills; at junction, turn right toward Poltimore.
	6.9	Junction; turn left.
	10.9	Poltimore; at junction, continue straight ahead.
	13.8	Junction; continue straight ahead.
	14.9	Junction, single-lane road on left; turn left.
	15.0	S.A. Chamberlin farmhouse. Obtain permission to proceed through their property. The mine road continues eastward.
	17.2	Fork; bear right.
	17.4	Mine.

Refs.: 12 p. 40; 29 p. 69-77; 30 p. 293-298; 34 p. 395-410.

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

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km 35.4 Road-cuts on Highway 309.

APATITE, MICA, CALCITE, PYROXENE, TITANITE, FELDSPAR, WILSONITE, SCAPOLITE, TREMOLITE, GARNET, PYRITE; SPHALERITE, MAGNETITE.

In pyroxenite; in quartzite.

Light green apatite crystals (up to 2 cm across) occur with greyish green transparent pyroxene and dark brown titanite (crystals up to 1 cm long) in white to pink calcite and in dark amber mica. Coarse, white to greyish white feldspar forms the matrix for a variety of minerals including: pyroxene, as dark green crystals about 3 cm long; titanite, as dark brown crystals commonly 2 cm long; massive, lilac-coloured wilsonite (uncommon); light grey scapolite (uncommon); tremolite, as light green to grey bladed aggregates; and garnet, as red porphyroblast commonly 5 mm across. Grey quartzite exposed on the east side of the highway contains grains of pyrite, sphalerite and magnetite.

The road-cuts are exposed on both sides of the highway at **km 35.4.**

Maps (T): 31 G/13 Low.
(G): 1691 Buckingham, Hull and Labelle Counties (G.S.C.).

Plate V

Flat garnet crystals in mica sheets, Villeneuve Mine. Specimen courtesy National Mineral Collection (Scale in mm) (GSC 200854F)

km	37.8	Junction road to Lac Brulé; continue along Highway 309.
	38.8	Gate on left and turn-off to Villeneuve Mine.

Villeneuve Mine

FELDSPAR, MICA, QUARTZ, TOURMALINE, GARNET, APATITE, FLUORITE, MONAZITE, ZIRCON, BERYL, THORITE, URANINITE, CERITE.

In pegmatite.

The occurrence of white peristerite having characteristic blue schiller made this a favourite collecting site for lapidary enthusiasts. The mineral can be cut and polished 'en cabochon' and makes an attractive gemstone. The other main constituents of the pegmatite are white to pink and less commonly, green microcline (amazonite), colourless to grey quartz, and light silvery-green mica. The feldspar was classed as very high-grade dental spar. During mining operations, a mica crystal weighing 127 kg and measuring 76 by 56 cm was found. Tourmaline, as slender black crystals (up to 30 cm long), and dark red garnet aggregates are common. An unusual occurrence is that of garnet crystals, about 5 mm across, enclosed in sheets of mica. Minerals occurring less commonly are: light blue massive apatite, purple fluorite, brown to orange monazite, zircon (as small crystals), beryl, black thorite, and uraninite (a mass weighing 5 kg was found in 1885). The rare-earth mineral, cerite, was also reported. Very fine, dendritic films of specularite and goethite in some of the mica produce a cloudy, almost opaque appearance; because of these inclusions, the mica was unsuitable for electrical purposes. Some of the massive quartz is very clear and was reported to display a six-rayed star when cut into cabochons. Mica specimens from this mine were exhibited at the Paris International Exhibition in 1900.

The deposit was worked for mica and feldspar between 1884 and 1909. The workings consist of a 30-metre open-cut into the south side of a hill and a 15-metre shaft. The dumps are now partly overgrown and the openings are water-filled. Good specimens can still be obtained from the dumps.

Access to the mine is by a trail about 185 m long, leading west from the gate at **km 38.8.**

Refs.: 22 p. 240-241; 48 p. 196-199; 49 p. 38-42; 62 p. 170.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

km	39.4	Road-cut exposes garnetiferous gneiss containing black orthopyroxene crystals (3 cm long).

km 41.7 to 42.2 Road-cuts both sides of Highway 309.

PYROXENE, SERPENTINE, PYRITE, GRAPHITE, MICA, PUMPELLYITE, GARNET, TITANITE, SCAPOLITE, FELDSPAR, APATITE; ROZENITE, JAROSITE.

In crystalline limestone; in gneiss.

The road-cuts expose garnetiferous gneiss enclosing bodies of crystalline limestone and grey feldspathic rock. The crystalline limestone contains grains of pyroxene, serpentine and pyrite; flakes of graphite and mica; nodules (averaging 2 mm across) of light blue to bluish grey pumpellyite, and cream-white garnet; light brown transparent granular

aggregates of titanite; and colourless to light yellow, granular scapolite. Apatite, as blue-green crystals (about 1 cm long) and as crystalline aggregates, occurs in quartz-feldspar zones with the following: dark green pyroxene aggregates; patches of light blue pumpellyite; crystals (1 cm long) of brown titanite; pyrite; graphite. Pink garnet (5 mm grains) and graphite occur in biotite gneiss which, in places, is coated with white to yellow finely crystalline rozenite, and with yellow powdery jarosite.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 43.3 Road-cut, west side Highway 309.

PYRITE, GRAPHITE, PYROXENE, FELDSPAR, GARNET, MAGNETITE, TITANITE.

In crystalline limestone and gneiss.

Pyrite, graphite and yellowish pyroxene are disseminated in crystalline limestone. Grey feldspar associated with the limestone contains grains of orange-red garnet, green pyroxene, and magnetite, and crystals of brown titanite (up to 2 cm long). Graphite and garnet occur in gneiss.

The exposure is on the west side of the highway opposite the south end of L'Original Lake.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 44.2 Road-cut, west side of Highway 309.

WOLLASTONITE, PYROXENE, TITANITE, PYRITE, GARNET.

In crystalline limestone.

Wollastonite, as white bladed aggregates, contains grains of dark green pyroxene with small amounts of titanite, pyrite, and garnet. Aggregates of grey quartz and light green plagioclase feldspar are associated with the wollastonite.

The road-cut is just south of the turn-off to Adelina Lake.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 44.3 Junction, on left, road to Adelina Lake.

Adelina Lake Mine

MICA, APATITE, CALCITE, FELDSPAR, PYROXENE, MAGNETITE, PYRITE, PYRRHOTITE.

In pyroxenite.

Amber mica (phlogopite) is associated with blue apatite (uncommon), pink calcite and grey feldspar. Grey to green pyroxene and small amounts of magnetite, pyrite and pyrrhotite occur in the deposit.

The mine was worked for mica about 70 years ago and the mica was sent to the Villeneuve Mine for trimming. The openings consist of several small pits and an adit cut into the west side of a steep hill overlooking Adelina Lake. The pits and dumps are partly overgrown. Caverns have been formed by water action on the crystalline limestone that forms the base of the hill in the vicinity of the mine.

Road log from Highway 309 at **km 44.3.**

km	0.0	Turn left (west) onto gravel road.
	0.1	Turn left onto single-lane dry weather road.
	0.8	East end of swamp. Bear left along overgrown trail and proceed about 45 m to the mine.

Ref.: 48 p. 64-65.

Maps (F): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 44.9 Road-cuts, both sides of Highway 309.

APATITE, MICA, CALCITE, PYROXENE, SERPENTINE, PYRRHOTITE, TITANITE, SCAPOLITE, AMPHIBOLE.

In gneiss.

Massive, greenish blue apatite is associated with amber mica in white calcite containing smaller amounts of brown to black pyroxene, green serpentine, pyrite and pyrrhotite. The calcite fluoresces pink when exposed to 'short' ultraviolet rays. Brown titanite crystals averaging 1 cm long occur with light green woody scapolite and green amphibole in coarse grey feldspar.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

km	46.7	Val-des-Bois. Road-cut on right exposes rusty-weathered blue quartzite.
km	48.0	Val-des-Bois at turn-off (left) to bridge over du Lièvre River.

Road-cuts, west side du Lièvre River

SERPENTINE, MAGNETITE, MICA, CALCITE, PYROXENE, APATITE.

In crystalline limestone.

The road-cut exposes an attractive, ornamental-type marble composed of yellow to olive-green nodules and irregular grains of serpentine in bluish white crystalline limestone. The rock could be polished and used for small ornamental objects such as paper-weights. On weathered surfaces, the serpentine becomes rusty-orange in colour. Small specks of magnetite are disseminated through the marble. The road-cuts also expose white crystalline limestone containing smoky-brown pyroxene, dark brown mica,

white fibrous calcite (5 mm veinlets), and light green apatite associated with greenish grey pyroxene in pink calcite. Massive green serpentine is also present. The crystalline limestone is enclosed by dark grey metamorphosed sediments of the Grenville Series.

The road-cuts are on the Val-des-Bois-Notre-Dame-du-Laus road on the west side of the du Lièvre River.

Road log from Highway 309 at Val-des-Bois **km 48.0:**

km		
	0.0	Turn left (west) and proceed over du Lièvre River bridge.
	0.3	Junction; turn right.
	2.1	Bridge over Pelletier Brook.
	5.1 to 5.8	Road-cuts, both sides of road.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 49.9 – 50.0 Road-cuts, both sides Highway 309.

PYROXENE, APATITE, CALCITE, SERPENTINE, OLIVINE, SPINEL, PYROAURITE, MAGNETITE, MARTITE, ZIRCON, FELDSPAR, PYRITE, GARNET, GRAPHITE, ROZENITE, GYPSUM.

In crystalline limestone cutting paragneiss and quartzite.

Crystals of dark brown pyroxene measuring up to 3 cm across are common in white coarsely crystalline calcite. Massive green apatite is associated with the pyroxene. Less common minerals in the crystalline limestone are: serpentine, as yellowish green irregular blotches; olivine, as transparent pale yellow grains; spinel, as smoky-mauve grains; pyroaurite, as tiny white waxy nodules and as white satiny fibres surrounding serpentine; magnetite, as small grains and patches; martite, as black lustrous grains; and feldspar, as grey to greyish green masses. Brown pyroxene, pyrite, and tiny pink crystals (about 2 mm across) of zircon occur in the feldspar. Blue quartzite bands in the paragneiss contain inclusions of mica, graphite and pyrite. Pink garnets averaging 5 mm across occur in paragneiss which in places is encrusted with white to yellow rozenite and light yellow, finely crystalline gypsum.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

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km 52.0 Rock Exposures on west side Highway 309.

MICA, PYROXENE, SERPENTINE, GRAPHITE, PYRITE, OLIVINE, SPINEL, QUARTZ, GARNET, ROZENITE.

In crystalline limestone.

Crystalline limestone containing dark amber mica, green pyroxene (partly altered to serpentine), graphite (common), pyrite, yellow and greyish transparent olivine aggregates, smoky-mauve spinel, and smoky quartz, occurs in boulders and rock

exposures along the highway. Except for mica and graphite none of the minerals is abundant. Red garnet aggregates, commonly 5 mm across, occur in a greenish grey feldspar rock. White rozenite forms a coating on rusty-weathered crystalline limestone and feldspathic rocks.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

km	53.6	Road-cut on right exposes crystalline limestone containing aggregates of pyroxene, mica, serpentine, garnet and pyrite.

km	55.0	Road-cut on right (opposite red farmhouse) exposes garnet gneiss containing graphite, pyrite, sillimanite and rutile. The garnets are dark red and measure about 2 cm across.

km	57.9	Bridge over St-Denis River.

km 60.7 Road-cut on north (right) side Highway 309.

PYROXENE, CALCITE, FELDSPAR, TITANITE, MICA, TOURMALINE, AMPHIBOLE, SERPENTINE, APATITE, SPINEL.

In crystalline limestone.

The most common mineral in the limestone is dark green pyroxene. It occurs as aggregates in coarse white calcite and in greyish white feldspar. Associated minerals include dark brown titanite, mica, amber tourmaline (massive patches), straw-yellow amphibole, light green serpentine, light blue apatite (uncommon), and bluish green spinel (uncommon).

The road-cut is on the north side of the highway at the Rivière du Sourd bridge.

Maps (T): 31 G/13 Low.
(G): 697 Val-des-Bois area, Papineau and Gatineau Counties (Que. Dept. Nat. Resources).

km	76.4	Notre-Dame-du-Laus, at turn-off (left) to bridge over du Lièvre River.

Chinohumite Occurrence

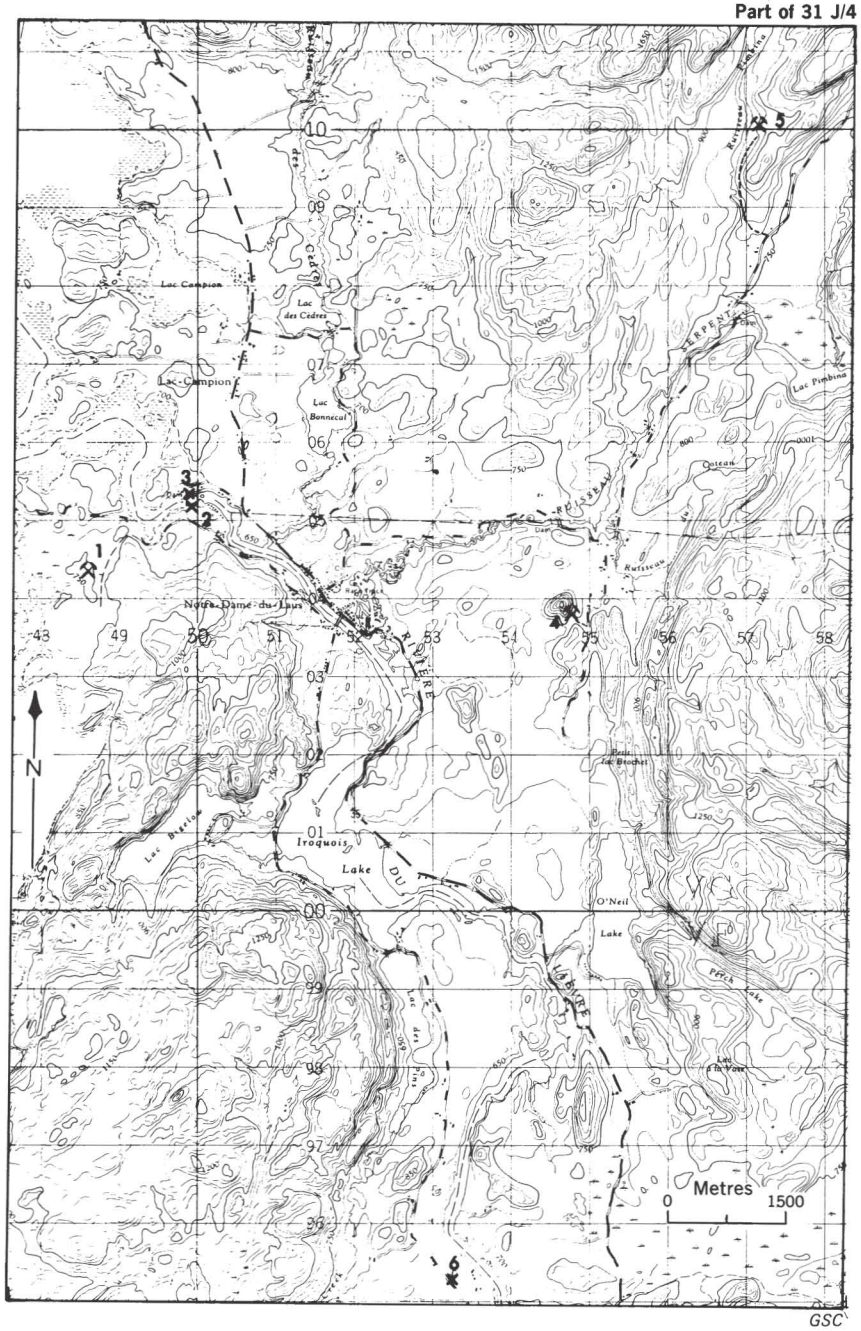
CLINOHUMITE, GRAPHITE, PYROXENE, AMPHIBOLE, SPINEL.

In crystalline limestone.

Clinohumite occurs as bright orange aggregates (commonly 5 mm across) in the limestone. In places it constitutes almost one-third of the rock. Flakes of graphite are disseminated through the rock. Minerals occurring less commonly are: pyroxene, as tiny honey-coloured grains; amphibole, as light brown striated aggregates; and spinel, as transparent greyish mauve grains measuring up to 5 mm across.

The clinohumite-bearing crystalline limestone is exposed on a hill on the west side of the du Lièvre River.

Part of 31 J/4



Map 5

Notre-Dame-du-Laus area

1. Parker Mine
2. des Cèdres dam occurrence
3. des Cèdres dam spinel occurrence
4. White's Mine
5. Canastota Mine
6. Clinohumite occurrence

Road log from Highway 309 at Notre-Dame-du-Laus **km 76.4**, (see page 37):

km 0.0 Turn left and proceed over du Lièvre River bridge.

0.2 Junction at end of bridge; turn left.

5.6 Bridge over Lac des Pins.

10.6 Clinohumite occurrence on left. Walk about 45 m to a small gravel pit. The exposures are just behind the pit.

Ref.: 3 p. 6-7.

Maps (T): 31 J/4 Bouchette.
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

Garnet Occurrence

GARNET.

In paragneiss.

Dark red garnet porphyroblasts, commonly 3 cm across, occur in coarse grey paragneiss in a road-cut on the west side of the Lac du Poisson Blanc Road. The garnet is fractured and not suitable as a gemstone.

Road log from Highway 309 at Notre-Dame-du-Laus **km 76.4**, (see page 37):

km 0.0 Turn left and proceed over the du Lièvre River bridge.

0.2 Junction; turn right onto Whitefish Lake road.

1.0 Road-cut (garnet occurrence) on left.

Maps (T): 31 J/4 Bouchette.
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

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des Cèdres Dam Occurrence

SPINEL, SERPENTINE, MICA, APATITE, OLIVINE, FLUORITE, HEMATITE, PYRITE, PYROAURITE.

In crystalline limestone.

Greyish to purplish blue spinel is common in the crystalline limestone; the octahedra are generally less than 5 mm long. Yellow-green to dark green, and cream-white (less common) serpentine is a conspicuous constitutent of the rock. Also present are: mica, as flaky masses; blue apatite, as granular aggregates; olivine, as vitreous grey irregular patches; fluorite (uncommon), as colourless to light green tiny octahedra; hematite and pyrite, as tiny grains; and pyroaurite (rare), as tiny white wax nodules.

The crystalline limestone is exposed along the south bank of the du Lièvre River on the downstream side of the des Cèdres dam.

Road log from Highway 309 at Notre-Dame-du-Laus, **km 76.4** (see page 37):

km 0.0 Turn left and proceed over the du Lièvre River bridge.

0.2 Junction; turn right onto the Lac du Poisson Blanc Road.

2.6 Junction; on right, single-lane road; turn right.

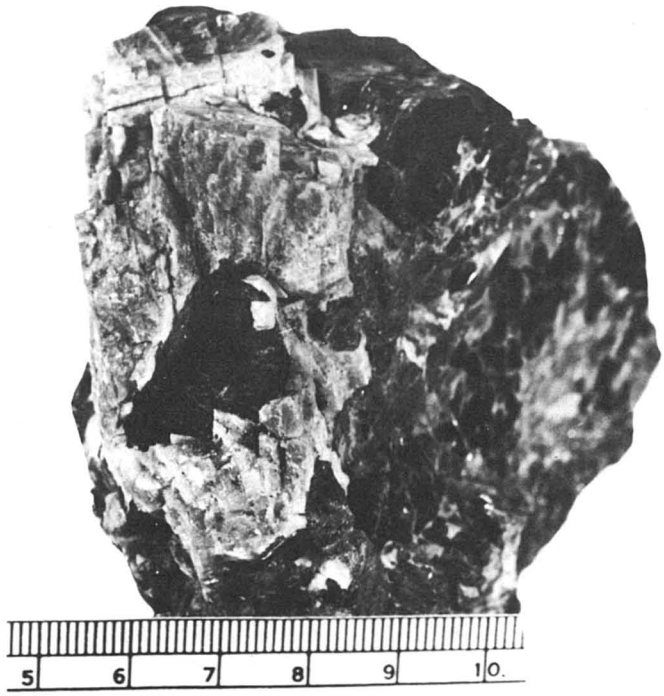


Plate VI

Olivine crystal with mica in calcite, Parker Mine. (Scale in mm) (GSC 200854D)

km 2.7 Fork; bear left. From this point, a path leads about 30 m to the spinel-bearing limestone exposed on the shore of the river.

Ref.: 3 p. 7.

Maps (T): 31 J/4 Bouchette.
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

Parker Mine

OLIVINE, SPINEL, CALCITE, MICA, APATITE, PYRITE, QUARTZ CRYSTALS, PYROXENE, HORNBLENDE.

In pyroxenite.

Large crystals of olivine and spinel are found at this former mica mine. The olivine occurs as olivine-green to almost black flattened crystals, commonly 5 cm long, embedded in calcite-mica aggregates. Crystals up to 10 cm long have been reported from this deposit. The olivine is opaque and is not suitable for gem purposes. When weathered, the crystals are friable and yellow to brown in colour. Black spinel octahedra measuring up to 5 cm in diameter have been reported from calcite and mica. Pink calcite contains dark amber books of mica, green granular apatite, and pyrite. Cavities in calcite are lined with clear quartz crystals (about 5 mm across) and with tiny calcite crystals (dogtooth spar). The cavities are 2 cm to 5 cm in diameter. Dark green and black pyroxene, and black hornblende occur in the deposit.

The mine was worked for mica about 80 years ago. The workings consisted of a 15 m pit (now water-filled) and several smaller pits and trenches on a low, wooded ridge overlooking Whitefish Lake. The dumps are partly overgrown.

Road log from Notre-Dame-du-Laus at **km 76.4** (see page 37):

km 0.0 Turn left and proceed over du Lièvre River bridge.

0.2 Junction; turn right onto Lac du Poisson Blanc Road.

3.4 Small pit on right exposes crystalline limestone containing grey-blue spinel crystals (small) and grains of amber serpentine, white pyroaurite, and pyrite.

3.7 Junction, on left, single-lane road; turn left. This road is partly overgrown and may not be accessible for automobiles.

3.9 Fork; bear right.

4.3 Fork; bear right and proceed about 27 m to the junction of a partly overgrown trail on the right. Proceed west (right) along this trail for about 275 m; at this point dumps will be visible on a slight rise of land to the left, 9 to 18 m from the trail.

Refs.: 48 pp. 66-67, 288, 298.

Maps (T): 31 J/4 Bouchette
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources)

km 76.9 Notre-Dame-du-Laus, at junction road to lac Serpent, Lac Corbeau.

White's Mine

MICA, PYROXENE, CALCITE, TITANITE, HORNBLENDE, PYRITE, FELDSPAR.

In pyroxenite.

Books of dark amber phlogopite measuring several cm across are common in this deposit. The mica occurs with pink calcite containing well-formed, dark green pyroxene crystals (commonly 1 cm across), pyrite, and black hornblende aggregates. Brown titanite crystals, generally less than 5 mm long, occur in light green pyroxenite and white feldspar.

The deposit was worked for mica in the 1940s. Two openings were made into the side of a wooded hill and small dumps lie adjacent to them.

Road log from Notre-Dame-du-Laus at **km 76.9**:

km 0.0 Turn right onto road to Lac Serpent.

0.8 Junction; bear right.

4.5 Junction; turn right onto gravel road.

5.6 Junction; bear left and continue along main road.

5.9 Junction, tractor-road on right (at top of hill); turn right and follow this road for about 800 m to the mine. (The trail crosses a small swamp that may be impassable in wet weather).

Ref.: 3 p. 18.

Maps (T): 31 J/4 Bouchette
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

Canastota Mine

GRAPHITE, TITANITE, PYRITE, QUARTZ, ROZENITE.

In gneiss and impure crystalline limestone.

Graphite occurs as columnar and flaky masses in gneiss and limestone. Dark brown crystals of titanite (about 2 cm across) occur in a greenish quartz-feldspar rock that also contains graphite. Pyrite is present in small amounts. Rozenite forms cream-white encrustations on rusty-weathered gneiss.

The graphite-bearing gneiss outcrops in a cleared area, and it was further exposed by stripping. Good specimens may be found in the piles of rock in the stripped area. The deposit was stripped in 1952 by Steel and Graphite Company and was later explored by Canastota Copper Mines, Inc.

Road log from Notre-Dame-du-Laus at **km 76.9** (see page 41):

km		
	0.0	Turn right (east) onto road to lac Serpent.
	4.5	Junction road to White's Mine; continue straight ahead.
	9.2	Junction; on left, single-lane road; turn left.
	10.9	Mine.

Ref.: 3 p. 18; 13 p. 50.

Maps (T): 31 J/4 Bouchette
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

km 78.3 Junction; on left, single-lane road to des Cèdres dam.

des Cèdres Dam Spinel Occurrence

SPINEL, OLIVINE, MICA, SERPENTINE, TREMOLITE, PYROXENE, CALCITE, GRAPHITE.

In crystalline limestone.

The spinel occurs as smoky mauve, grey and black octahedra measuring up to 2 cm across. Only the small crystals (5 mm across and less) are transparent. Olivine, as pale yellow, colourless, grey, and light green granular aggregates, is abundant and the spinel is generally associated with it. Amber mica (phlogopite), yellow-green to dark green serpentine, and colourless to grey tremolite are common and form bands in the rock. Occurring less abundantly are: greyish green crystal aggregates of pyroxene; coarsely crystalline greenish white calcite; graphite.

The minerals occur in the crystalline limestone exposure on the north bank of the du Lièvre River immediately downstream from the des Cèdres dam.

Access to the occurrence is by a road 800 m long, that leaves Highway 309 at **km 78.3**. The road ends at the dam, walk left to the exposures.

Ref.: 3 p. 7.

Maps (T): 31 J/4 Bouchette
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

km	90.4	Bridge over du Lièvre River.
km	100.2	Road-cuts on both sides of Highway 309 expose graphite-bearing crystalline limestone.
km	103.3	Notre-Dame-du-Pontmain at bridge.
km	108.4	Junction, on right, road to Lac du Cerf.

Lac du Cerf Occurrence

ZIRCON.

In hornblende syenite.

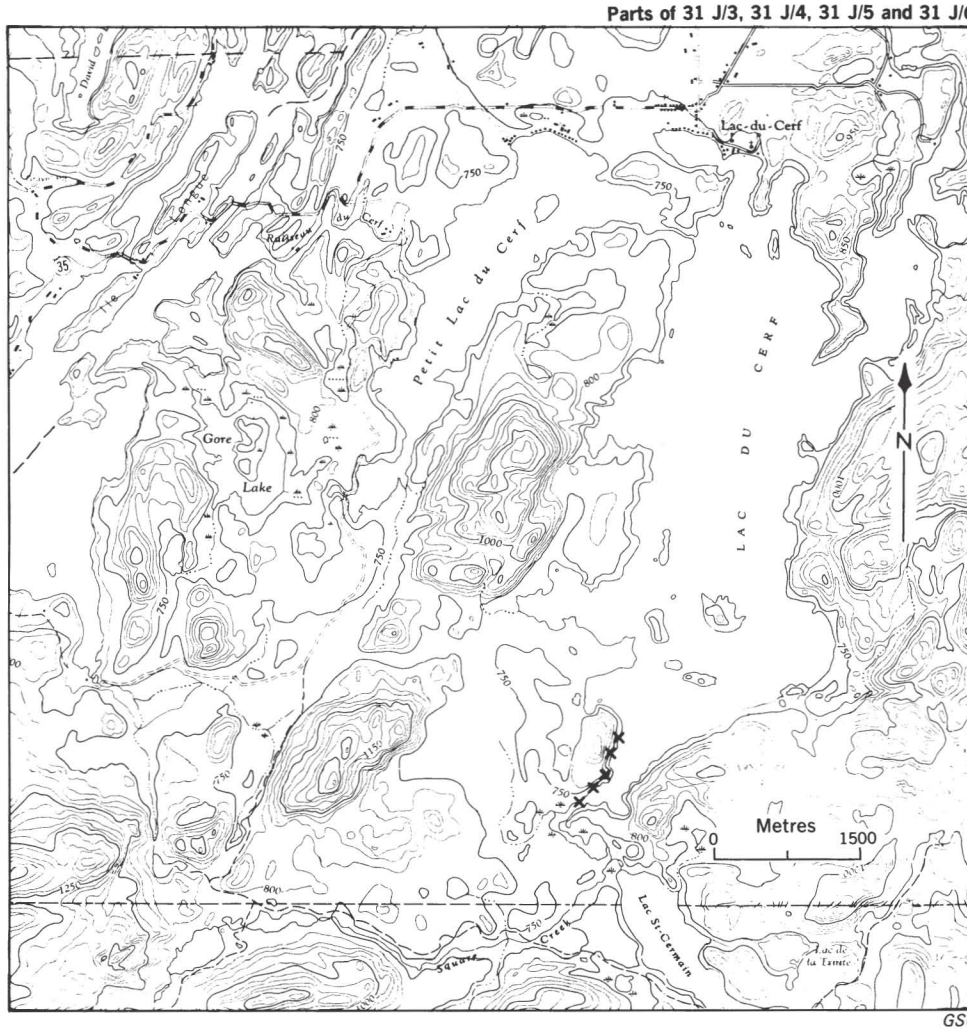
Pinkish brown zircon crystals occur with biotite in hornblende syenite. The crystals average about 5 mm across. The syenite is exposed for a distance of 800 m along the west shore of the southern tip of Lac du Cerf.

Access is by boat from Lac du Cerf village, a distance of approximately 6.5 km.

Plate VII

Spinel-bearing banded crystalline limestone, du Lièvre River at des Cèdres dam. (GSC 1-5-68)

Parts of 31 J/3, 31 J/4, 31 J/5 and 31 J/6



Map 6

Lac du Cerf zircon occurrence.

Road log from Highway 309 at **km 108.4:**

km	0.0	Turn right (east) onto Lac du Cerf road.
	0.9	Road-cuts expose crystalline limestone containing graphite, pyroxene, titanite, mica and masses of feldspar enclosing large hornblende crystals (up to 5 cm long).
	2.3	Road-cuts expose biotite gneiss containing mauve granular garnet and graphite. Powdery yellow jarosite coats the gneiss.
	2.8	Fork; bear left.
	3.1	Road-cut exposes biotite gneiss containing red garnet grains and aggregates (about 5 mm across).
	3.3	Junction; continue straight ahead.
	3.6	Fork; bear left.
	6.8	Road-cut (on left) exposes crystalline limestone containing hornblende crystals (1 cm across), mica, graphite and brown tourmaline.
	8.0	Lac du Cerf village at junction (on right) road to lakeshore. The occurrence is accessible by boat from the village.

Ref.: 3 p. 12.

Maps (T): 31 J/4 Bouchette
31 J/5 Maniwaki
(G): 922 McGill area, Gatineau, Labelle and Papineau Counties (Que. Dept. Nat. Resources).

km	111.7	Road-cuts on left; opposite lake, expose crystalline limestone containing graphite, mica, and grains of pyroxene, titanite and scapolite.

km	120.2	Road-cut on left, exposes biotite gneiss containing purplish pink garnet aggregates (5 mm across), sillimanite (colourless prisms), and graphite.

km	121.1	Junction road to St-Aimé.
km	125.2	Junction road to Lac-des-Iles.
km	140.5	Road-cuts. The north end of the cut exposes crystalline limestone containing graphite, mica, pyroxene, amphibole (light brown) and apatite (rare).

km 141.7 Road-cuts, both sides of Highway 309.

ACTINOLITE, SCAPOLITE, WILSONITE, ALLANITE, CLINOHUMITE, TOURMALINE, PYRITE, MAGNETITE.

In crystalline limestone.

Dark green bladed actinolite occurs with striated prismatic aggregates of colourless to light green scapolite. These are the most abundant minerals in the exposure. Patches (up to 1 cm across) of transparent mauve wilsonite occur sparingly in the scapolite.

Small masses of brown allanite occur with actinolite. Orange clinohumite forms granular aggregates about 1 cm across in crystalline limestone. Black tourmaline, and small amounts of pyrite and of magnetite occur in scapolite and limestone.

Maps (T): 31 J/12 Grand-Remous
(G): 545 Sicotte area, Labelle and Gatineau Counties (Que. Dept. Nat. Resources).

km 142.7 Junction Highway 117.

Road-cuts on Highway 117 west of Mont-Laurier:

km 0.0 Proceed west from junction Highway 309.

0.15 Road-cuts on both sides of highway expose crystalline limestone containing titanite, mica, chondrodite, tremolite, grey to dark bluish grey spinel, graphite and ilmenite.

3.2 Road-cut on right. Pinkish red garnet crystals (up to 1 cm across) occur in sillimanite gneiss.

5.8 St-Jean-sur-Lac, at church.

9.5 Road-cut on right. Aggregates of smoky brown to dark green pyroxene occur with grains of titanite, yellow clinohumite, mica and graphite in crystalline limestone.

10.3 Road-cut on left. Black hornblende crystals (5 mm across) occur in crystalline limestone with green pyroxene (grains), titanite (tiny crystals), magnetite and silvery mica.

11.6 Road-cuts both sides of highway expose crystalline limestone containing: dark green pyroxene crystals (up to 2 cm across) and crystal aggregates; lustrous brown titanite crystals (5 mm long); peach-colour granular aggregates of garnet; grey apatite crystals (uncommon); pyrite and magnetite.

15.6 Road-cut on left exposes biotite gneiss containing purplish red garnet (granular aggregates), graphite and sillimanite. Powdery jarosite coats the rock.

16.1 Road-cut on right. Crystalline limestone contains green pyroxene grains, light green bladed actinolite, pale blue apatite crystals (uncommon), tiny pink zircon crystals (rare), brown titanite crystals (less than 5 mm long), graphite and mica.

16.7 Junction road to Ste-Famille d'Aumond.

Maps (T): 31 J/12 Grand-Remous
(G): 545 Sicotte area, Labelle and Gatineau Counties (Que. Dept. Nat. Resources).

km 142.7 Junction; turn right (east) onto Highway 117 to Mont-Laurier.

km 144.2 Mont-Laurier, at intersection rue du Pont (Highway 309).

SECTION 2

MONT-LAURIER – GRENVILLE

km	0.0	Mont-Laurier, at junction Highway 117 (boulevard Paquette) and Highway 309 (rue du Pont). The main road log proceeds east along Highway 117.
km	1.8	Junction, on right, road to Lac-du-Cerf, Val-Barrette.

Road-cut on Val-Barrette Road

TREMOLITE, SERPENTINE, CLINOHUMITE, TOURMALINE, APATITE, MICA, PYROXENE.

In crystalline limestone.

Tremolite is abundant as white columnar and radiating aggregates. Olive-green compact serpentine commonly occurs as bands about 3 cm wide in the limestone. Other minerals present are: clinohumite, as yellowish orange granular aggregates; black tourmaline; light blue apatite crystals (uncommon); silvery and amber mica; and dark green pyroxene.

The crystalline limestone is exposed by road-cuts on both sides of the Val-Barrette road at a point 8.0 km from its junction with Highway 117 at **km 1.8.**

Maps (T): 31 J/11 Ferme-Neuve.
(G): 544 Nominingue area, Labelle County (Que. Dept. Nat. Resources).

Val-Barrette Quarries

SERPENTINE, TREMOLITE, ACTINOLITE, MICA, CLINOHUMITE, TITANITE, PYROXENE, APATITE, OLIVINE, QUARTZ, PYRITE, MAGNETITE, GRAPHITE, DOLOMITE.

In crystalline limestone.

The limestone (marble) is fine grained, compact, and white to bluish grey in colour. It is traversed by bands (2 cm to 5 cm thick) of yellow-green, dark olive-green and amber translucent serpentine. Tremolite is abundant; it occurs as white, grey and green bladed aggregates and as greenish white to apple-green dense fibrous masses. Silvery-amber to dark brown mica is common as flaky aggregates. Less common are: clinohumite, as orange granular patches averaging 5 mm across; titanite, as dark brown crystals about 1 cm long; dark green pyroxene (grains); cobalt-blue, massive apatite; olivine, as yellowish white granular masses; colourless to smoky quartz; massive pyrite; magnetite and graphite (both rare). Massive white to bluish white dolomite occurs as bands in the crystalline limestone. The serpentine-bearing marble and the massive tremolite are suitable for lapidary purposes.

The deposit was worked briefly for dolomite a few years ago. Three small quarries were opened.

Road log from Highway 117 at **km 1.8:**

km	0.0	Turn right (south) onto Lac-du-Cerf, Val-Barrette road.
	8.0	Road-cuts (see preceding description).
	10.1	Junction Kiamika road; continue straight ahead.
	11.1	Junction, on left, single-lane road; turn left.
	11.3	Turn-off (right) to first quarry.
	11.9	Second quarry on right.

Plate VIII

Crystalline limestone at a former Val-Barrette quarry (now the site of a fish hatchery, covered bridge over Kiamika River in background. (GSC 138752)

Ref.: 60 p. 29.

Maps (T): 31 J/11 Ferme-Neuve
(G): 544 Nomininque area, Labelle County (Que. Dept. Nat. Resources).

km	11.6	Lac-des-Ecorces, at junction road to Val-Barrette.
km	13.2	Road-cuts on both sides of Highway 117 expose coarse crystalline limestone containing disseminations of graphite, mica, and pyroxene.

km	18.0	Turn-off (left) to granite quarry.
km	22.0	Granite quarry on left.
km	22.1	Turn-off (on right) to granite quarry.
km	22.5	Granite quarry on left.
km	23.5	Granite quarry on left.
km	24.5	Turn-off (left) to Brodie's granite quarry.

Guenette Granite Quarries

GRANITE.

The granite in the Guenette area is pink, fine grained, and is composed of microcline, albite, biotite, muscovite with scattered small grains of magnetite, titanite, apatite and allanite. The rock takes a good polish and has been used for monuments and other purposes for over 70 years. The stone is commercially known as "Imperial pink".

Quarrying commenced in the district in 1910. The stone was first used for paving blocks and curbstone, and for press-rolls for use in the pulp and paper industry. The stone was in demand as a monument stone during World War II due to a shortage of imported red granites for that purpose. Its popularity increased and the granite from the Guenette area is considered to be one of the best red granites for monuments. It is also the only Canadian granite known to be suitable for use as press-rolls. A number of quarries have been operated but only one, that of Brodie's Limited, was active in 1967. The locations of the inactive quarries have been noted in the Highway 117 log preceding this description. Access to Brodie's quarry is by a road (1.3 km long) that leads east from Highway 117 at **km 24.5**.

Refs.: 2 p. 57; 16 pp. 76-81; 37 pp. 42-48.

Maps (T): 31 J/11 Ferme-Neuve.
(G): 544 Nomininque area, Labelle County (Que. Dept. Nat. Resources).

km	24.6	Turn-off (left) to granite quarry (1.5 km from highway).
km	24.9	Road-cut on left exposes biotite gneiss containing graphite, pyrite, and sillimanite. Yellow, powdery jarosite coats the gneiss. Stubby black tourmaline crystals (about 5 mm across) occur in quartz bands cutting the gneiss.

km	27.2 to 28.3	Road-cuts expose biotite gneiss cut by white pegmatite bands containing stubby black tourmaline crystals measuring up to 1 cm across.

km	34.6	Lac Saguay Granite Company's dressing plant on right.
km	35.0	Road-cuts on left expose graphite-bearing biotite gneiss coated with powdery yellow jarosite and with white to greyish and yellowish cauliflower-like encrustations of gypsum.

km	35.7	Junction road to Nominingue.
km	48.3	Road-cut on left. Deep pink to red garnets (about 5 mm across) occur in coarse biotite gneiss and in quartz bands cutting the gneiss.

km	56.5	Abandoned grey granite quarry on right.
km	57.3	Junction road to Bellerive, Nominingue.
km	61.3	L'Annonciation, at junction road to Lac Jaune (Montée Paquette).

Canada Marble and Lime Quarry

SERPENTINE, TREMOLITE, DIOPSIDE, SCAPOLITE, APATITE, MICA, GRAPHITE, CHONDRODITE, WILSONITE.

In dolomitic limestone.

Serpentine is common; it occurs as yellow-green, olive-green and smoky amber translucent masses and as blotches in white limestone. Although much of it is brittle and friable due to weathering, specimens suitable for small ornamental objects are readily available. Minerals occurring less commonly in the limestone are: brownish grey columnar tremolite; white to bluish white massive diopside; greyish to bluish white scapolite; light blue apatite (uncommon); colourless to amber mica; and graphite (uncommon). Cinnamon-brown chondrodite and blue- to lilac-coloured wilsonite have been reported from the deposit.

The quarry was operated during the 1930s for dolomite which was used in the glass industry and as a building material (terrazo, stucco, plaster). Three openings were made into the east side of a ridge. The area is now partly overgrown.

Road log from Highway 117 at **km 61.3.**

km	0.0	Turn right (west) onto Lac Jaune road (Montée Paquette).
	0.15	Junction; turn left.
	1.1	Junction; turn right onto Lac Paquette road.
	1.9	Junction, single-lane road at bend in main road. Proceed north along single-lane road.
	2.6	Quarry.

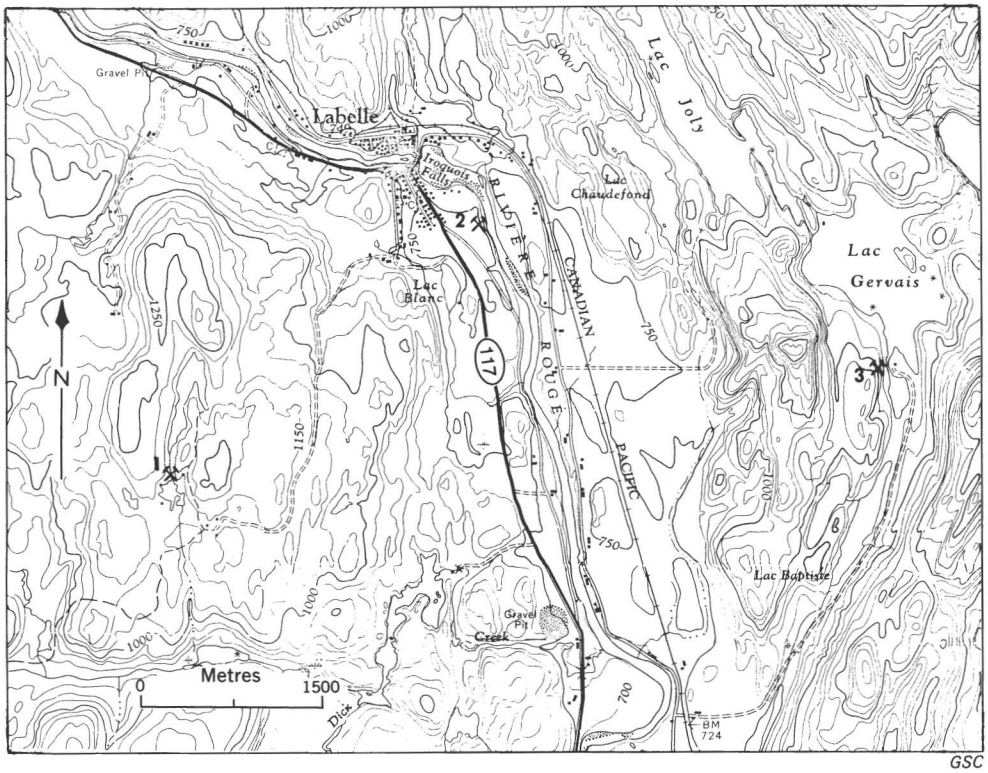
Refs.: 23 p. 79; 38 p. 39-41.

Maps (T): 31 J/7 L'Annonciation.
(G): 316 Labelle-l'Annonciation area, Counties of Labelle and Montcalm (Que. Dept. Nat. Resources).
11-1966 Mont-Laurier – Kempt Lake, Quebec (G.S.C. 4 miles to 1 inch).

km	76.4	Road-cuts on both sides of Highway 117 expose sillimanite-biotite gneiss containing red garnet aggregates (about 1 cm across).

km	77.6	Junction road to Lac Labelle.
km	81.6	Labelle, at intersection rue Principale.
km	82.0	Labelle, at junction rue St-Georges.

Parts of 31 J/2, 31 J/7



GSC

Map 7

Labelle area

1. LaBelle garnet mine
2. McLean-McNicoll Mine
3. Castor Lake Mine

Labelle Garnet Mines

GARNET, ILMENITE, RUTILE, PYRITE, MONAZITE, ROZENITE; PYRRHOTITE, MAGNETITE, AMPHIBOLE, TITANITE.

In biotite gneiss and pegmatite; in silicated crystalline limestone.

Garnet occurs at two former mines – one operated by the LaBelle Mining Company, the other by McLean and McNicoll. The garnets are deep red, less than 1 cm across, and are generally fractured and contain inclusions.

They most commonly occur in biotite gneiss and in pegmatite where they are associated with small amounts of pyrite, ilmenite and rutile. In parts of the deposit, garnet is reported to have constituted 20 per cent of the rock. Amber monazite grains were identified in the garnetiferous pegmatites at the McLean-McNicoll property. A silicated crystalline limestone containing large clots of garnet with aggregates of pyrrhotite, magnetite, amphibole and titanite occurs at the LaBelle Mine. White rozenite coats rusty-weathered gneiss in the mining areas.

The mines were operated for a short time about 50 years ago, and some garnet for abrasive purposes was marketed. The LaBelle property was worked by open-cuts, a 6-metre shaft, and a 40-metre adit. The McLean-McNicoll Mine consisted of a small

quarry cut into the steep west bank of the Rouge River. Both properties were equipped with a mill to produce sandblasting material. The mine dumps are small and partly overgrown.

Road log to LaBelle Mine from Highway 117 at **km 81.6** (see page 50):

km		
	0.0	Turn right (west) onto rue Principale.
	0.1	Turn left onto rue de l'Eglise (Lac Nantel road).
	0.8	Junction; bear right. This road is very rough in places and may not be accessible for automobiles.
	4.3	Fork; bear right.
	4.8	Mine shaft on left. The adit is at the base of the hill below the shaft and a short distance from the shore of a small lake.

Road log to McLean-McNicoll Mine from Highway 117 at **km 82.0** (see page 50):

km		
	0.0	Turn left (east) onto rue St-Georges.
	0.15	Turn left onto rue 22 ième.
	0.6	End of road at Rouge River beach. Walk a few metres ahead (south) to the openings along the cliff.

Refs.: 7 p. 19; 38 p. 31-37.

Maps (T): 31 J/7 L'Annonciation
(G): 316 Labelle-L'Annonciation area, Counties of Labelle and Montcalm. (Que. Dept. Nat. Resources).
11-1966 Mont-Laurier-Kempt Lake (G.S.c., 4 miles to 1 inch).

Castor Lake (Clot) Mine

GRAPHITE, PYRITE, SZOMOLNOKITE, PYRRHOTITE, GARNET, ENSTATITE, SERPENTINE.

In diopside rock and granite pegmatite.

The graphite occurs as columnar, foliated and nodular masses measuring several cm across. Associated with it is a small amount of pyrite which, in places, is coated with white szomolnokite. Pyrrhotite was reported from the deposit. Deep purplish red granular garnet and brownish to greyish green enstatite occur in the diopside rock. Specimens of crystalline limestone containing narrow bands of green serpentine were found in the dumps.

The deposit was opened about 80 years ago by a shaft and trenches at the base of a cliff near Castor Lake. Mr. J.A. Bigonesse of Labelle was the operator. Further prospecting and development was carried out in 1951-52 by O. Clot Graphite Mine Limited. Good specimens of graphite can be obtained from the dumps.

Road log from Highway 117 at Labelle **km 81.6** (see page 50):

km		
	0.0	Turn left (east) at rue Principale and proceed over bridge over Rough River.
	0.15	Intersection; continue straight ahead.
	0.3	Turn right onto rue St-Adolphe.
	6.6	Junction; turn left onto Lac la Mine road.
	11.0	Junction, mine road on left; turn left.
	11.1	Mine.

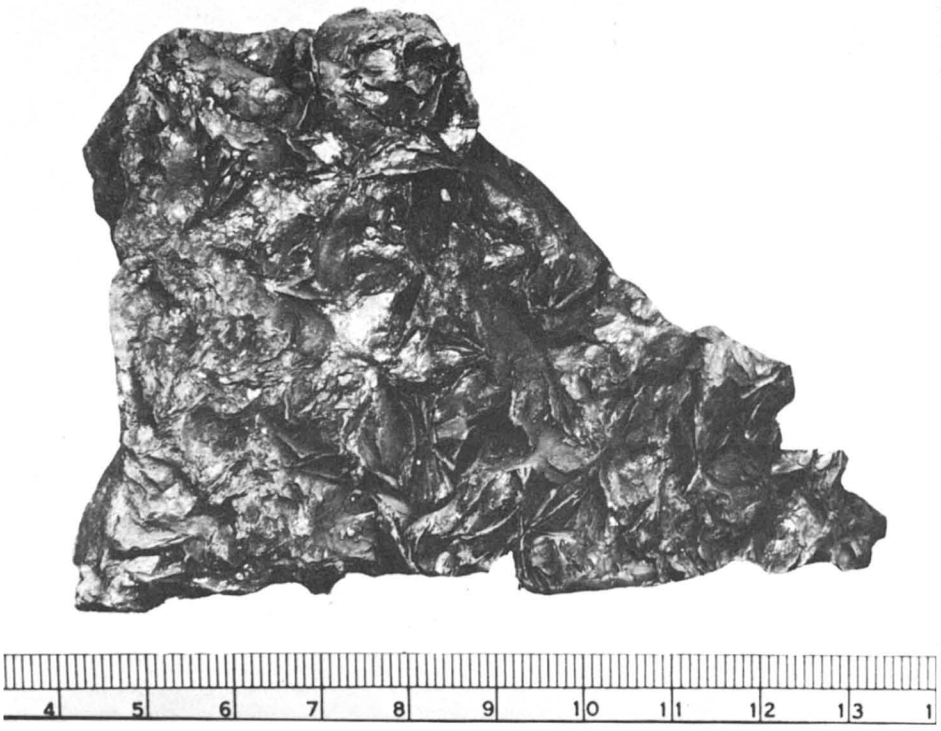


Plate IX

Foliated graphite, Castor Lake Mine. (GSC 200854-I)

Refs.: 12 p. 41; 38 p. 38-39.

Maps (T): 31 J/7 L'Annonciation.
(G): Labelle-l'Annonciation area, Counties of Labelle and Montcalm (Que. Dept. Nat. Resources).
11-1966 Mont-Laurier-Kempt Lake, Quebec (G.S.C. 4 miles to 1 inch).

km	82.7 to 86.9	Road-cuts expose garnetiferous quartz gneiss.
km	89.1	Quartzite quarry on left (east) side of highway.
km	95.1	Road-cut on left exposes crystalline limestone containing disseminations of graphite, titanite, apatite and pyroxene.
km	98.3	La Conception, at junction Mont-Tremblant road.
km	99.4	Road-cut on left exposes crystalline limestone containing graphite, pyroxene, titanite, apatite and garnet (amber grains).
km	103.6	Road-cut on left exposes rusty-weathered graphitic sillimanite gneiss containing purplish pink grains and granular aggregates of garnet.

km	104.6 to 104.9	Road-cuts expose crystalline limestone containing disseminations of graphite, pyroxene and titanite.

km	110.4	St-Jovite, at junction Highway 323.
km	111.0	St-Jovite, at junction Highway 327.

Log for side trip along Highway 117 to Ste-Agathe-des-Monts:

km	0.0	St-Jovite at junction Highway 327; proceed east along Highway 117.
	2.6	Road-cut, on left just north of motel, exposes coarse, crystalline limestone containing grains of pyroxene, mica, graphite, pyrite, titanite and apatite (uncommon), and crystalline aggregates of yellow to amber vesuvianite, greenish brown tourmaline and white orthoclase.
	3.4	Road-cut on right exposes anorthosite.
	4.3	Road-cut on left exposes crystalline limestone containing disseminations of pyroxene, graphite, magnetite, quartz, mica, titanite and vesuvianite (yellow).
	4.8	Rock exposure on right adjacent to gravel pit. Amphibole (black crystals), graphite, pyroxene, magnetite, vesuvianite (yellow granular), and orange garnet occur in crystalline limestone and white pegmatite.
	5.3	Road-cuts expose coarse pink granite.
	7.2 to 9.0	Road-cuts expose anorthosite.
	10.0	St-Faustin, at junction road to Mont Tremblant Park.
	14.1 to 20.1	Road-cuts expose anorthosite.
	20.9	Turn-off (right) to Desgrosbois deposit (description follows log).
	21.1	Railway crossing.
	23.0	Anorthosite road-cuts.
	23.6	Junction road to Ivry-sur-le-Lac and Ivry Mine.
	24.1 to 25.1	Anorthosite road-cuts.
	27.3	Junction paved road to Ivry-sur-le-Lac.
	28.8	Junction Highway 329 to St-Donat-de-Montcalm.
	30.7	Ste-Agathe-des-Monts at junction Highway 329.

Anorthosite Exposures

The anorthosite exposed by road-cuts between St-Jovite and Ste-Agathe is coarse grained, purplish brown in colour, and is known as the Morin anorthosite. Its main constituent is plagioclase feldspar (andesine or labradorite). Hypersthene, augite, biotite, ilmenite, orthoclase, apatite, quartz and magnetite may comprise up to 30 per cent of the rock. In general, the feldspar does not exhibit a play of colour.

Desgrosbois Deposit

MAGNETITE, ILMENITE.

In anorthosite.

Massive intergrowths of magnetite and ilmenite occur in very coarse anorthosite. Pyroxene and feldspar are intimately associated with the metallic minerals.

The deposit has been exposed by a pit on the north side of a small hill. The opening was made by Pershing Amalgamated Limited in 1952.

Access to the deposit is by a trail, about 45 m long, that leads south from Highway 117 at km 20.9 (see road log, page 54):

Refs.: 20 p. 35; 39 p. 85-88.

Maps (T): 31 J/1 Ste-Agathe-des-Monts.
(G): 343 Sainte-Agathe – Saint Jovite area, County of Terrebonne (Que. Dept. Nat. Resources).
11-1966 Mont-Laurier-Kempt Lake, Quebec (G.S.C., 4 inches to 1 mile).

Ivry Mine

ILMENITE, HEMATITE, PYRRHOTITE, PYRITE, CHALCOPYRITE, MARCASITE, FELDSPAR, PYROXENE, SCAPOLITE, DOLOMITE, GYPSUM.

In anorthosite.

The ore consists of a coarse intergrowth of ilmenite and hematite. Minor amounts of pyrrhotite, pyrite, chalcopyrite, marcasite, feldspar, pyroxene, scapolite and dolomite (tiny crystal aggregates) are associated with it. Gypsum forms a bluish white coating on the ore.

The deposit was worked by an open pit near the top of a ridge. Between 1912 and 1922 some 14 500 t of ilmenite were mined. Operations have since been of a sporadic nature and the most recent work was done in 1958 by Heavy-Rock Mines, Limited.

Road log from Highway 117 at km 23.6 (see road log, page 54):

km		
	0.0	Turn left (south) onto gravel road to Ivry-sur-le-lac.
	1.8	Junction; turn right.
	3.0	Fork; bear right.
	4.5	Junction; on left, mine road; turn left.
	4.8	Mine.

Refs.: 39 p. 76-78; 45 p. 55-56.

Maps: (T): 31 J/1 Ste-Agathe-des-Monts.
(G): 343 Sainte-Agathe – St. Jovite area, County of Terrebonne (Que. Dept. Nat. Resources).
11-1966 Mont-Laurier-Kempt Lake, Quebec (G.S.C. 4 inches to 1 mile).

St-Donat Quarry

QUARTZITE.

The quartzite is coarse grained, white, and friable. Small, irregular cavities in the rock contain colourless quartz crystals averaging 5 mm. Impurities in the quartzite include small amounts of rutile, hematite, kaolinite and black tourmaline.

The quarry has been in operation since 1955. The silica is used for the manufacture of glass, silicon carbide and silica flour. The operator is Minéraux Industriels du Canada Limitée, Division Silice (formerly Dominion Silica Corporation). The quartzite is processed in the company's plant in Lachine.

The quarry is located near the town of St-Donat-de-Montcalm. The entrance is on Highway 329 at a point 31.8 km from Highway 117 (at km 28.8; see road log, page 54):

Numerous road-cuts along Highway 329 expose anorthosite.

Maps (T): 31 J/8 St-Donat-de-Montcalm.
(G): 11-1966 Mont-Laurier-Kempt Lake, Quebec (G.S.C. 4 inches to 1 mile).

The main road log from St. Jovite to Grenville is resumed:

km 111.0 St-Jovite, at junction Highways 117 and 327; the road log proceeds south along Highway 327.

km 130.6 Arundel, at junction road to Huberdeau.

Rockway Valley Marble Quarry

SERPENTINE, APATITE, DIOPSIDE, BRUCITE, QUARTZ, MICA, GRAPHITE, SPHALERITE, MAGNETITE, SCAPOLITE.

In dolomitic limestone (marble).

Translucent yellow-green to olive-green and amber, massive serpentine is a common constituent of the marble. It occurs as blotches, masses and bands in gleaming white marble. Both the serpentine and the serpentine marble could be effectively used for ornamental purposes. Small grains and prisms (up to 1 cm long) of transparent blue apatite are common in the limestone. Other minerals found in the limestone are: diopside, as apple-green sugary masses; brucite, as silky, white fibres in veins up to 1 cm wide; colourless quartz; colourless to light amber mica; graphite; sphalerite (uncommon); and magnetite (uncommon). Scapolite was reported from the deposit. Dolomite occurs as white bands in the limestone.

The deposit is exposed by a small quarry. Specimens can readily be obtained from blocks of limestone in the opening.

Road log from Highway 327 at Arundel **km 130.6:**

km 0.0 Turn right (west) onto road to Huberdeau.

1.8 Huberdeau; turn left onto road to St-Rémi-d'Amherst.

8.8 Crossroad; turn left to Rockway Lake.

9.4 Quarry on right.

Refs.: 23 p. 132; 40 p. 32.

Maps (T): 31 G/15 Arundel.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

St-Rémi China Clay Mine

KAOLINITE, QUARTZ CRYSTALS, HEMATITE, TOURMALINE, MAGNETITE.

In quartzite.

Kaolinite occurs as cream-white powdery masses in cavities in quartzite. Associated with it are quartz crystals averaging 1 cm in diameter. Most of the crystals are cloudy or milky and only the very small ones are clear. Hematite occurs as tiny specks in the quartzite. Tourmaline and magnetite have been reported from the deposit.

This occurrence has been known since 1894 and was originally worked for kaolinite between 1911 and 1923. During its most recent period of activity, 1941 to 1946, the mine was worked for quartz and for kaolinite by Canada China Clay and Silica, Limited. The mine consists of a quarry opened near the top of a ridge.

Road log from Highway 327 at Arundel **km 130.6:**

km	0.0	Proceed along road to Huberdeau.
	1.9	Huberdeau; turn left onto road to St-Rémi-d'Amherst.
	8.8	Crossroad; continue straight ahead.
	11.7	Junction mine road; turn left. (This junction is 4.0 km from Highway 323 at St-Rémi-d'Amherst.)
	12.7	Mine.

Refs.: 39 p. 68-70; 40 p. 28-31; 59 p. 29-37.

Maps (T): 31 G/15 Arundel
(G): 1681 Portion of Amherst Township, Labelle County, Quebec (G.S.C. 1 inch to 1,750 feet).
408 Lachute area (West Sheet), Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

km	138.4	Weir, at junction road to Morin Heights.
km	150.8	Rock exposures on left. Graphite, pyroxene, mica, titanite, pyrite and apatite (blue) are disseminated in crystalline limestone.
km	151.2	Road-cut on right exposes crystalline limestone containing dark green serpentine (massive) with light amber mica, graphite, titanite, pyroxene and light green enstatite.
km	151.6	Road-cuts, both sides of Highway 327 expose crystalline limestone containing feldspar, pyroxene, blue apatite (uncommon), graphite, titanite, pyrite and vesuvianite (yellow grains).
km	155.7	Lost River, at junction road to Morin Heights.

Laurel Diopside Occurrence

DIOPSIDE, VESUVIANITE, TITANITE, APATITE, SCAPOLITE, CALCITE, PHLOGOPITE.

In pyroxenite.

Crystals of pale lilac-coloured diopside and light yellow vesuvianite occur with dark brown titanite, blue apatite, scapolite, pink to white calcite and amber mica. At one time specimens of diopside and vesuvianite suitable for gem purposes were available, but they are now difficult to find in the dumps.

Plate X

St-Rémi china clay quarry. (GSC 138754)

The deposit was exposed by a pit some 30 years ago. The opening and dump are on a wooded knoll and are now partly overgrown. The occurrence is on the property of Mr. Albert Morrow, about 800 m from the farmhouse.

Road log from Highway 327 at Lost River **km 155.7:**

km		
	0.0	Turn left onto road to Morin Heights.
	1.4	Road-cut on left exposes crystalline limestone containing pyroxene, graphite, titanite, and pyrite.
	6.8	Junction on left road to Parc du Lac Long; on right is the Albert Morrow farmhouse where permission to enter the property may be obtained.

Refs.: 40 p. 24; 44 p. 47-48.

Maps (T): 31 G/16 Shawbridge.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

Lac Noir Mica Occurrence

PHLOGOPITE, CALCITE, DIOPSIDE, SCAPOLITE.

In pyroxenite.

Phlogopite is associated with salmon-pink calcite and light green diopside. Scapolite has also been reported.

The deposit was worked briefly by an open cut about 60 years ago. Small dumps are found in the woods near the pit.

Road log from Highway 327 at Lost River **km 155.7** (see page 57):

km		
	0.0	Turn left onto road to Morin Heights.
	6.7	Albert Morrow farmhouse on right.
	7.6	Junction road to Lac Argenté; continue straight ahead.
	9.8	Laurel, at Post Office.
	14.0	Junction road to Grand Lac Noir; continue straight ahead.
	15.0	Mica pit in woods on right. A short trail leads to the pit.

Refs.: 40 p. 34; 53 p. 67.

Maps (T): 31 G/16 Shawbridge.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

km 162.2 Junction road to Kilmar.

Kilmar Mines

SERPENTINE, BRUCITE, DIOPSIDE, TALC, PHLOGOPITE, PYRITE, SPHALERITE, GRAPHITE, TITANITE, DOLOMITE, MAGNESITE, PYROAURITE.

In Grenville sediments.

Massive serpentine in colours ranging from amber to yellow, yellow-green to dark green and black, occurs as a constituent of the magnesite-dolomite ore. Chrysotile (asbestos) occurs sparingly as thin, light green veinlets in the serpentine. Silky white fibrous brucite occupies narrow veins in magnesite and in serpentine. Grey to light green diopside, light greenish grey massive talc, and books of phlogopite are also present. Minerals occurring sparingly include pyrite, sphalerite, graphite and titanite. White to grey granular magnesite is intimately associated with dolomite. Grey translucent nodules of pyroaurite occur in serpentine.

This deposit was discovered in 1900 by the Rev. W.P. Boshart who noticed an unusually white glistening boulder (of magnesite ore) near the house of Mr. Donald McPhee on lot 15 range IX, Grenville Township. A specimen sent to Ottawa was identified as magnesite by the Geological Survey of Canada. The area was then prospected but mining did not commence until 1907 when the Canadian Magnesite Company began operations at the site of the original discovery. Operations have been continuous by various companies. Dresser Canada Inc., Canadian Refractories, the present operator, worked the mines at Kilmar since 1933. In 1936 open pit operations were discontinued and underground methods were employed. Two mines are currently being worked. The ore was treated at the Company's Kilmar and Marelan plants for use in metallurgical and refractory products.

Road log from Highway 327 at **km 162.2**:

km		
	0.0	Proceed west on road to Kilmar, Harrington.

km 2.6 Road-cut on right exposes crystalline limestone containing disseminations of graphite, titanite, pyroxene, vesuvianite (yellow) and pyrite.

3.7 Junction; turn left onto road to Kilmar.

5.3 Turn-off to Mine No. 2 on left.

7.7 Mine No. 1 and office on right.

21.1 Junction Highway 148.

Refs.: 15 p. 164-166; 41 p. 65-78; 58 p. 17-18, 28-29.

Maps (T): 31 G/15 Arundel.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

Dobbie Mine

MAGNESITE, DOLOMITE, SERPENTINE, PYROAURITE, BRUCITE, DIOPSIDE, PHLOGOPITE, HEMATITE.

In Grenville sediments.

This deposit is similar to that at the Kilmar Mine. The serpentine is mostly yellow-green and occurs as grains and small irregular masses in magnesite-bearing dolomite. Pyroaurite, as waxy white nodules, and brucite, as silky white fibres also occur in the dolomite.

This deposit was discovered in 1916 by A. Lannigan and J. Milway of Calumet. From 1918 until 1942 it was operated by the International Magnesite Company. The present owner, Canadian Refractories Limited, continued open pit operatons until 1948.

Road log from Highway 327 at **km 162.2** (see page 59):

km 0.0 Proceed west on road to Kilmar, Harrington.

3.7 Junction road to Kilmar; continue straight ahead.

4.9 Junction mine road on right. The mine is about 800 m from this point.

Refs.: 41 p. 65-67, 78-79; 58 p. 18, 28-29.

Maps (T): 31 G/15 Arundel.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

km 168.1 Road-cut on right side of Highway 327 exposes pyroxenite containing brownish red garnet aggregates.

km 183.6 Brownsburg, at traffic light (Highway 327 turns left).

Brownsburg Quarries

GRANITE.

Two types of granite occur in quarries west of Brownsburg: a brownish pink variety and a light greenish grey one. Both are medium textured and consist of feldspar, quartz and hornblende. The colour of the pink variety is due to inclusions of microscopic grains of red iron oxide along minute cracks in the feldspar. The stone was ued for curbstone and paving blocks, and as a building and monument stone.

Granite was first quarried in the Brownsburg district in about 1890. Since World War I, activity has declined and, at present, no quarries are in operation.

Road log from Highway 327 at Brownsburg **km 183.6:**

km		
	0.0	Turn right (west) at traffic light.
	2.4	Turn-off (left) to quarries (0.5 km from main road).
	3.1	Turn-off (right) to quarry (1.2 km from main road).
	4.8	Junction; turn right.
	6.6	Junction; continue straight ahead.
	7.1	Quarry on left.

Refs.: 16 p. 82-83; 37 p. 49-62.

Maps (T): 31 G/9 Lachute.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

km	189.2	Lachute at junction Highway 148; proceed along Highway 148 toward Hawkesbury.
km	210.6	Junction road to Grenville, Hawkesbury.

Gaboriault & Nevers Reg'd Quarry

SYENITE.

The syenite is pink, medium to coarse textured and is composed of feldspar and hornblende. It takes a good polish and is used as a building and monument stone.

The quarry was opened into the side of a hill north of Grenville. It is operated by Gaboriault & Nevers Reg'd.

Road log from Highway 148 at **km 210.6** (turn-off to Hawkesbury):

km		
	0.0	Continue east along Highway 148 toward Hull.
	0.25	Crossroad; turn right (north) onto Scott's Road.
	1.9	Junction; turn right.
	2.9	Junction; turn left.
	6.1	Quarry on right.

Ref.: 16 p. 83-84.

Maps (T): 31 G/10 Hawkesbury.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

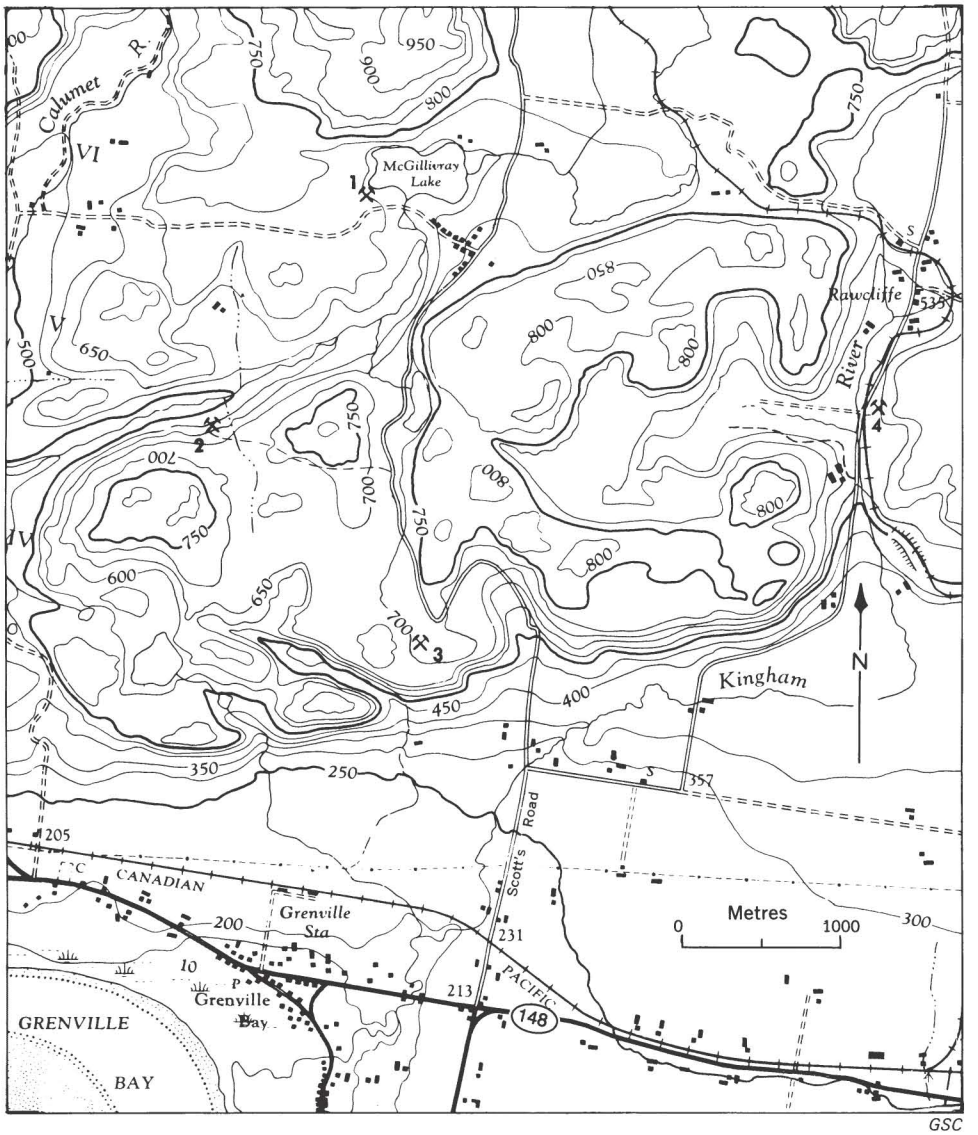
Miller (Keystone) Mine

GRAPHITE, WOLLASTONITE, DIOPSIDE, FELDSPAR, QUARTZ, CALCITE, TITANITE, VESUVIANITE, GARNET, ZIRCON, PHLOGOPITE.

In crystalline limestone.

Massive graphite is intimately associated with coarsely crystalline minerals including wollastonite, green diopside, feldspar, quartz and calcite. Occurring less commonly are titanite, vesuvianite, garnet, zircon and phlogopite.

Part of 31 G/10



GSC

Map 8

Grenville area

1. McGillivray Lake Mine
2. Miller (Keystone) Mine
3. Syenite quarry
4. Gaboriault and Nevers quarry

This deposit was first worked in about 1845 and was the first graphite mine opened in Canada. It was worked briefly at that time and again between 1890 and 1900. The main pit measures 61 by 15 m, and is up to 23 m deep. The workings are now overgrown and difficult to locate without the assistance of a local guide.

Road log from Highway 148 at **km 210.6** (turn-off to Hawkesbury, see page 61):

km		
	0.0	Continue east along Highway 148 toward Hull.
	0.25	Crossroad; turn right onto Scott's Road.
	1.9	Junction; continue straight ahead.
	3.6	Fork; bear right. The left fork leads 30 m to a syenite quarry (inactive). The syenite is brownish pink and medium-textured.
	5.4	Junction trail on left to Miller Mine.
	6.7	Mine.

Refs.: 36 p. 73-79; 51 p. 42, 45-46.

Maps (T): 31 G/10 Hawkesbury.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

McGillivray Lake mine

MICA, CALCITE.

In pyroxenite.

Amber mica occurs with small amounts of white to pink calcite. Mica books measuring 5 to 10 cm across are common.

The deposit was worked briefly over a hundred years ago. The pits and dumps are on the west side of McGillivray Lake and are now mostly overgrown.

Road log from Highway 148 at **km 210.6** (turn-off to hawkesbury, see page 61):

km		
	0.0	Proceed west along Highway 148.
	0.25	Turn right onto Scott's Road and follow log toward Miller Mine.
	5.4	Junction road to Miller Mine; continue straight ahead.
	7.1	Junction; turn left to Amy Molson Camp.
	7.6	Bridge.
	7.9	Mica pits in wooded area on right.

Maps (T): 31 G/10 Hawkesbury.
(G): 408 Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

McGill Property

SCAPOLITE, DIOPSIDE.

In pegmatite.

Lemon-yellow to light green scapolite and pale lilac-coloured diopside (crystals) occur at this locality. The scapolite fluoresces bright yellow when exposed to ultraviolet rays.

The deposit is worked by stripping and the scapolite is sold to mineral collectors and dealers. Much of the scapolite is suitable for gem purposes. Collecting is not permitted on the property, but specimens may be purchased from Mr. Lawrence McGill, owner.

Road log from Highway 148 at **km 210.6** (turn-off to Hawkesbury, see page 61):

km		
	0.0	Proceed west on Highway 148 toward Hull.
	6.4	Junction road to Kilmar. (The Canadian Refractories Limited Kilmar Mine may be reached by following this road for a distance of 13.3 km).
	13.3	Pointe-au-Chêne; turn right.
	16.9	Turn-off (left) to the Lawrence McGill farmhouse.

Ref.: 40 p. 25.

Maps (T): 31 G/10 Hawkesbury.
(G): Lachute area (West Sheet) Papineau and Argenteuil Counties (Que. Dept. Nat. Resources).

To reach localities described in Section 3, proceed from **km 210.6** to Hawkesbury.

SECTION 3

HAWKESBURY – OTTAWA

km	0.0	Hawkesbury, at Memorial (Main Street at McGill Street). Proceed west along Main Street.
km	5.8	Junction; proceed west along Highway 17 toward Ottawa.
km	13.0	Turn-off to Bertrand Quarry on right.

Bertrand & Frère Quarry

FOSSILS, CALCITE, CHERT.

In Black River Limestone.

Ordovician shell fossils are numerous in some of the limestone beds exposed along the walls of the quarry. White crystals of calcite occupy cavities about 3 cm across in the limestone. Black chert was reported from the deposit.

The quarry and crushing plant are operated by Bertrand & Frère Construction Company Limited for use in road construction. The quarry is just north of Highway 17 at **km 13.0.**

Ref.: 27 p. 80.

Maps (T): 31 G/10 Hawkesbury.
(G): 622A L'Original, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	25.9	Junction road to Alfred Station.

Alfred Bog

PEAT.

A peat bog, comprising about 2835 ha, is located south of Alfred. The bog is 2 to 3 m deep and is covered with shrubs, heaths and moss. The peat is composed of sphagnum with hypnum, Eriophorum and carex. It is considered to be a good quality peat fuel.

The bog extends for about 6.6 km in a south-easterly direction from Alfred Station, 2.7 km south of Highway 17. Roads leading east from the Alfred Station road at points 2.7 and 4.0 km from Highway 17 cross the bog. A peat plant and the bog were operated on an experimental basis by the Canada Department of Mines in 1910-11. A subsequent attempt to develop the bog by private interests failed due to the onset of World War I. In 1918, because of a fuel shortage, a Peat Committee was formed by the Federal and Provincial Governments to investigate the feasibility of a commercial operation of the bog. During the 5-year project, three large plants were installed and operated in the bog immediately north of the Canadian Pacific railway just east of Alfred Station. In the early 1940s the bog was operated by private interests.

Refs.: 25 p. 96-181; 30 p. 65.

Maps (T): 31 G/10 Hawkesbury.
(G): 662A L'Original, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	39.1	Junction Wendover – Plantagenet road.
km	39.3	Junction road to Plantagenet quarry.

Plantagenet Quarry

FOSSILS, CALCITE.

In limestone and shale.

Ordovician shell fossils occur in dark grey shale and in dense grey limestone. Brachiopods and crinoids are abundant. Fractures in the limestone are filled with white crystalline calcite. The quarry was not in operation in 1967.

Road log from Highway 17 at **km 39.3.**

km	0.0	Turn left onto gravel road.
	1.1	Junction; turn left.
	2.1	Turn-off to quarry on left.
	2.7	Jean Viau farmhouse on right. Obtain permission here to enter quarry.

Maps (T): 31 G/11 Thurso.
(G): 587A Casselman, Russel, Dundas, Stormont, Prescott, Carleton, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	53.7	Junction road to Clarence.
km	57.6	Turn-off (right) to Skyrock Enterprises Limited Quarry.

Skyrock Enterprises Limited Quarry

CALCITE.

In Ordovician limestone.

white to pink calcite occurs in veins up to 2 cm wide and in cavities commonly 5 cm across. Some of the calcite fluoresces pink when exposed to ultraviolet rays ('short' rays more effective than the 'long'). Similar rock is exposed by road-cuts on Highway 17 at the entrance to the quarry.

The quarry has not been worked for several years and is partly water-filled. It is located on the north side of the highway at **km 57.6.**

Maps (T): 31 G/11 Thurso.
(G): 587A Casselman, Russell, Dundas, Stormont, Prescott, Carleton, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	58.1	Turn-off (left) to Rockland business section.

Stewart Quarry

FOSSILS, CALCITE.

In limestone.

The limestone is medium grey, dense and contains abundant Ordovician fossils including corals, brachiopods, bryozoans, gastropods, cephalopods, trilobites and algae. White crystalline calcite occurs in fractures in the rock; some of it fluoresces pink when exposed to ultraviolet rays.

The quarry has been idle for many years and its walls are partly overgrown.

Road log from Highway 17 at **km 58.1:**

km	0.0	Turn left onto road to Rockland business section.
	0.4	Turn right onto old Highway 17.
	0.7	Turn left and continue along gravel road.
km	3.2	Junction; turn left onto single-lane road.
	3.5	Quarry.

Refs.: 4 p. 209-244; 24 p. 180; 57 p. 33-34.

Maps (T): 31 G/11 Thurso.
(G): 587A Casselman, Russell, Dundas, Stormont, Prescott, Carleton, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

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km 73.2 Highway 17 Quarry

CALCITE, MARCASITE.

In Ordovician limestone and sandstone.

White to pink crystalline calcite with platy marcasite occurs in veins and cavities in greenish grey sandstone and in grey to black shale. The calcite fluoresces pink when exposed to ultraviolet rays ('short' rays more effective than 'long'). Irregular, tubular shaped bodies in the shale are believed to be worm burrows or trails.

The quarry, now inactive, was opened into the north side of a cliff on the south side of Highway 17 at **km 73.2.**

Maps (T): 31 G/11 Thurso.
(G): 587A Casselman, Russell, Dundas, Stormont, Prescott, Carleton, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	79.0	Turn-off (left) to Orleans.
km	84.9	Queensway (Highway 17) at junction with Montreal Road.

Francon Quarry

FOSSILS, CALCITE, DOLOMITE.

In limestone.

Ordovician fossils including corals and shell fossils occur sparingly in dark grey, dense limestone. Colourless to white crystal aggregates of calcite are common in fractures and in cavities in the limestone. The calcite fluoresces pale yellow when exposed to ultraviolet rays. Buff-coloured, powdery dolomite coats the limestone.

The quarry, formerly operated by Ottawa Valley Crushed Stone Limited, is now being worked by Francon (1966) Limited. The crushed limestone is used for concrete aggregate and for road building.

Road log from Queensway at **km 84.9.**

km	0.0	Leave Queensway, then turn left (east) onto Montreal Road.
	0.5	Bridge over Green's Creek.
	0.7	Junction Bearbrook Road; turn right.
	0.85	Junction; turn left onto Ottawa Valley Drive.
	1.3	Entrance to quarry.

Ref.: 27 p. 75-77.

Maps (T): 31 G/5 Ottawa.
(G): 588A Nepean, Carleton, Lanark, Grenville, Dundas, Gatineau, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	87.8	Ottawa; Queensway (Highway 17) at exit to Blair Road.
km	94.9	Queensway at exit to Metcalfe Street.

Dibblee Construction Bowesville Quarry

FOSSILS, CALCITE.

In limestone.

Fossil corals and shells of Ordovician age occur in some of the limestone beds exposed by the quarry. In places, the shells are abundant and form a coquina limestone. White massive calcite occupies fractures in the limestone.

The quarry belongs to the Dibblee Construction Company Limited and is no longer in operation.

Road log from Metcalfe Street exit from Queensway:

km	0.0	Proceed west along Catherine Street.
	0.3	Turn left (south) onto Bank Street.
	5.5	Turn right onto Walkley Road.
	6.7	Turn left onto McCarthy Road.
	7.9	Entrance to quarry on left.

Ref.: 27 p. 77-80.

Maps (T): 31 G/5 Ottawa.
(G): 588A Nepean, Carleton, Lanark, Grenville, Dundas, Gatineau and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

Greely Quartz Crystal Occurrence

QUARTZ CRYSTALS.

Doubly terminated quartz crystals occur in the soil and in limestone exposures on the A.C. Rancourt property. The crystals are colourless or smoky, transparent with brilliant lustre and several cm long. The crystals resemble the quartz crystals from New York ('Herkimer diamonds') and are used locally for jewellery.

The occurrence is in a lightly wooded area on the Jacques Rancourt property in Greely. Entry is by prior permission.

Road log from Metcalfe Street exit from Queensway.

km	0.0	Proceed west along Catherine Street.
	0.3	Turn left (south) onto Bank Street.
	5.5	Intersection Walkley Road; continue along Bank Street (Highway 31).
	16.1	Turn-off to Armstrong Brothers Company Limited quarry (Ordovician dolomite is quarried here).
	16.7	Turn-off (left) to Dibblee Construction Company Limited Boyce quarry (Ordovician dolomite is quarried here).

Plate XI

Quartz-crystal bracelet fashioned by Mrs. H. Parker, Ottawa. Crystals from Greely occurrence. (GSC 200854N)

km	26.4	Junction, secondary road; turn right.
	27.3	Junction, single-lane road, turn right.
	27.6	Rancourt house on right.
Maps	(T):	31 G/4 Kemptville
	(G):	588A Nepean, Carleton, Lanark, Grenville, Dundas, Gatineau, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

km	99.9	Queensway, at Carling Avenue exit.

Frazer Duntile Quarry

CALCITE, CELESTITE, BARITE, STRONTIANITE, MARCASITE, FOSSILS.

In limestone.

Calcite, celestite, barite, strontianite and marcasite are common in fractures in dark grey to brownish grey, fine-grained limestone. The calcite occurs as colourless, transparent crystals (dogtooth spar) and as white to pink granular and cleavable masses; some of the massive variety fluoresces pink when exposed to ultraviolet rays. Celestite forms silky white to buff-coloured radiating fibrous aggregates that become friable on weathered surfaces; it is commonly associated with buff-coloured massive barite.

Strontianite occurs as clusters of colourless acicular crystals and as fibrous aggregates in calcite. Marcasite, as radiating, platy, and granular patches, is associated with calcite, barite, celestite and strontianite. The limestone belongs to the Black River Group of Ordovician age. Some shaly partings and dolomitic limestone are also present. Fossils identified from the limestone include: corals, brachiopods, pelecypods, gastropods, cephalopods and trilobites.

The quarry was opened into the north side of an escarpment. It was operated by Frazer Duntile Company Limited for use in road construction.

Road log from the Queensway (Highway 17) at **km 99.9.**

km		
	0.0	Leave the Queensway at the Carling Avenue exit and proceed west along Carling Avenue.
	1.4	Proceed south (left) on Clyde Avenue.
	1.9	Entrance to quarry.

Refs.: 27 p. 72-74; 57 p. 24-26.

Maps (T): 31 G/5 Ottawa.
(G): 588A Nepean, Carleton, Lanark, Grenville, Dundas, Gatineau, and Papineau Counties, Ontario and Quebec (G.S.C., 1 inch to 2 miles).

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Rock and Mineral Collecting in Canada by Ann P. Sabina, 1964. Miscellaneous Report No. 8.

* Vol. I Yukon, Northwest Territories, British Columbia, Alberta, Saskatchewan and Manitoba, 147 p., 23 maps.

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* Rocks and Minerals for the Collector: Sudbury to Winnipeg, by Ann P. Sabina, 1963. Paper 63-18, 69 p.

* Rocks and Minerals for the Collector: Bay of Fundy Area (part of Nova Scotia and New Brunswick), by Ann P. Sabina, 1964. Paper 64-10, 96 p.

* Rocks and Minerals for the Collector: Northeastern Nova Scotia, Cape Breton and Prince Edward Island, by Ann P. Sabina, 1965. Paper 65-10, 76 p.

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* Rocks and Minerals for the Collector: Hull-Maniwaki, Quebec; Ottawa-Peterborough, Ontario, by Ann P. Sabina, 1970. Paper 69-50, 177 p.

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GLOSSARY

Actinolite $Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$. H=5-6. Bright green to greyish green columnar, fibrous or radiating prismatic aggregates. Variety of amphibole.

Allanite $(Ca, R)_2(Al, Fe, Mg)_3Si_3O_{12}(OH)$. H=6 1/2. Black, less commonly dark brown tabular aggregates, or massive with conchoidal fracture. Vitreous or pitchy lustre. Generally occurs in granitic rocks or in pegmatite and is commonly surrounded by an orange-coloured halo. Distinguished by its weak radioactivity.

Albite $NaAlSi_3O_8$. H=6. Generally white tabular crystals or cleavable masses. Vitreous lustre. Variety of plagioclase feldspar. Used in manufacture of ceramics.

Amazonite $KAlSi_3O_8$. H=6. Apple-green to bright green variety of microcline. Used for jewellery and ornamental purposes.

Anatase TiO_2. H=5 1/2-6. Yellowish or reddish brown pyramidal or tabular crystals with adamantine lustre; also grey or blue massive. Also known as octahedrite.

Anorthosite An igneous rock composed almost entirely of plagioclase feldspar.

Apatite $Ca_5(PO)_4)_3(F, Cl, OH)$. H=5. Green to blue, colourless, brown red, hexagonal crystals or granular, sugary massive. Vitreous lustre. May be fluorescent. Distinguished from beryl and quartz by its inferior hardness; massive variety distinguished from calcite, dolomite by lack of effervescence in HCl, and from diopside and olivine by its inferior hardness. Used in manufacture of fertilizers and in production of detergents.

Asbestos Fibrous variety of certain silicate minerals such as serpentine (chrysotile) and amphibole (anthophyllite, tremolite, actinolite, crocidolite) characterized by flexible, heat- and electrical-resistant fibres. Chrysotile is the only variety produced in Canada; it occurs as veins with fibres parallel (slip-fibre) or perpendicular (cross-fibre) to the vein walls. Used in manufacture of asbestos cement sheeting, shingles, roofing and floor tiles, millboard, thermal insulating paper, pipe-covering, clutch and brake components, reinforcing in plastics, etc.

Azurite $Cu_3(CO)_3)_2(OH)_2$. H=3 1/2-4. Azure blue to inky blue tabular or prismatic crystals; also massive, earthy, stalactitic with radial or columnar structure. Vitreous, transparent. Secondary copper minerals. Effervesces in acids. Ore of copper.

Barite $BaSO_4$. H=3-3 1/2. White, pink, yellowish blue tabular or platy crystals; granular massive. Vitreous lustre. Characterized by a 'high' specific gravity (4.5) and perfect cleavage. Used in the glass, paint, rubber, and chemical industries, and in oil-drilling technology.

Beryl $Be_3Al_2Si_6O_{18}$. H=8. White, yellow-green, blue, hexagonal prisms, or massive with conchoidal or uneven fracture. Vitreous; transparent to translucent. Distinguished from apatite by superior hardness, from topaz by its lack of perfect cleavage; massive variety distinguished from quartz by density test (beryl has higher density). Ore of beryllium which has numerous uses in the nuclear energy, space, aircraft, electronic and scientific equipment industries; used as alloying agent with copper, nickel, iron, aluminium and magnesium.

Beta-uranophane $Ca\ (UO_2)_2\ Si_2O_7 \cdot 6H_2O$. H=2 1/2-3. Yellow to yellowish green aggregates of acicular crystals or short prismatic crystals. Silky to waxy. May fluoresce green in ultraviolet light. Secondary mineral occurring in granitic rocks and calcite veins containing uranium minerals.

Beyerite $(Ca, Pb)Bi_2(CO_3)_2 \cdot O_2$. H=2-3. White, yellow, greenish yellow to green or grey platy, tabular crystals or earthy. Vitreous to dull lustre. Occurs as encrustations, or filling in cavities, fractures. Secondary mineral formed from bismuth minerals.

Biotite $K(Mg, Fe)_3(Al, Fe)Si_3O_{10}(OH, F)_2$. H=2 1/2-3. Dark brown, greenish black transparent hexagonal platy crystals, platy or scaly aggregates. Splendent lustre. Occurs in pegmatite.

Bismuth Bi. H=2-2 1/2. Light grey metallic reticulated crystal aggregates; also foliated or granular. Iridescent tarnish. Used as a component of low melting-point alloys and in medicinal and cosmetic preparations.

Bismuthinite Bi_2S_3. H=2. Dark grey striated prismatic or acicular crystals; also massive. Iridescent on tarnished surface. Ore of bismuth.

Bismutite $(BiO)_2(CO_3)$. H=2 1/2-3 1/2. Yellowish white to brownish yellow, light green or grey earthy or pulverulent masses; also fibrous crusts, spheroidal aggregates, scaly or lamellar. Dull, vitreous or pearly lustre. Effervesces in HCl. Uncommon secondary mineral formed by alteration of bismuth minerals.

Brucite $Mg(OH)_2$. H=2 1/2. White, grey, light blue or green, tabular or platy aggregates; also foliated, massive and fibrous. Pearly, waxy lustre. Soluble in HCl. Distinguished from gypsum and talc by its superior hardness and lack of greasy feel. Resembles asbestos but lacks silky lustre. Is more brittle than muscovite. Used for refractories and as a minor source of magnesium metal.

Caysichite $(Y, Ca)_4Si_4O_{10}(CO_3)_3 \cdot 4H_2O$. Colourless, white and less commonly yellow or green coatings or encrustations with divergent, columnar structure. Associated with other yttrium minerals. Originally described from the Evans-Lou Mine near Wakefield, Quebec. Name is for the elements: Ca, Y, Si, C, H.

Celestite $SrSO_4$. H=3-3 1/2. Transparent, colourless, white or pale blue tabular crystals; also fibrous massive. Vitreous lustre. Perfect cleavage. Resembles barite but is not as heavy. Ore of strontium.

Cenosite $Ca_2(Ce, Y)_2Si_4O_{12}(CO_3) \cdot H_2O$. H=5-6. Yellowish, brown, pink short prismatic crystals. Vitreous lustre. Associated with other rare earth minerals in granitic rocks.

Cerite $(Ce, Ca)_9(Mg, Fe)Si_7(O, OH, F)_{28}$. H=5 1/2. Brown, red or grey; massive, granular. Occurs in pegmatite. Uncommon mineral.

Chabazite $CaAl_2Si_4O_{12} \cdot 6H_2O$. H=4. Colourless, white, yellowish or peach-coloured cube-like aggregates. Vitreous lustre. Commonly occurs in cavities in basalt. Distinguished from other zeolites by its crystal form, from calcite by its lack of effervescence in HCl.

Chalcopyrite $CuFeS_2$. H=3 1/2-4. Brass-yellow, massive. Iridescent tarnish. Brass colour is distinguishing feature. Also called copper pyrite. Ore of copper.

Chamosite Fe-rich chlorite. H=3. Yellowish to dull green or grey earthy or clay-like masses. Occurs in some sedimentary iron deposits.

Chert Massive, opaque variety of chalcedony; geneally drab-coloured (grey, greyish white, yellowish grey or brown).

Chlorite Hydrous silicates of Al, Fe, Mg. H=2-2 1/2. Transparent, green flaky aggregates. Distinguished from mica by its colour and by the fact that its flakes are not elastic.

Chondrodite $2Mg_2SiO_4 \cdot Mg(F, OH)_2$. H=6-6 1/2. Orange-yellow grains and granular masses. Vitreous to slightly resinous lustre. Subconchoidal to uneven fracture. Occurs in crystalline limestone. Distinguished by its colour.

Chrysocolla $Cu_2H_2Si_2O_5(OH)_4$. H=2-4. Blue to green, translucent to opaque, vitreous or waxy to earthy; compact fibrous or granular massive. Secondary mineral formed by oxidation of copper minerals.

Chrysotile Fibrous variety of serpentine (asbestos).

Clinohumite $Mg_9Si_4O_{16}(F, OH)_2$. H=6. Yellow to orange granular masses or nodules. Vitreous to resinous lustre. Occurs in crystalline limestone.

Datolite $Ca(OH)BSiO_4$. H=6 1/2. Transparent colourless, pale yellow or green, white, short prismatic crystals; also botryoidal, porcelain-like masses or granular. Vitreous lustre. Easily fusible. Distinguished by its colour and crystal form and ease of fusibility.

Diopside $CaMgSi_2O_6$. H=6. Colourless, white to green monoclinic variety of pyroxene.

Doverite This mineral is now referred to as synchisite-Y.

Enstatite $MgSiO_3$. H=6. Orthorhombic variety of pyroxene. White to pale green with vitreous lustre. Occurs as coarse cleavable masses in pyroxenites, peridotite.

Epidote $HCa_2(Al, Fe)_3Si_3O_{13}$. H=6-7. Yellowish green massive fibrous aggregates. Vitreous lustre. Often associated with quartz and pink feldspar, producing attractive mottled or veined patterns. Takes a good polish and can be used for jewellery and other ornamental objects.

Eulytite $Bi_4(SiO_4)_3$. H=4 1/2. Yellow, grey, light green, brown, white, tetrahedral crystal aggregates, also spherical forms. Associated with bismuth minerals.

Euxenite (Y, Ca, Ce, U, Th) $(Nb, Ta, Ti)_2O_6$. H=5 1/2-6 1/2. Black massive, or prismatic crystals forming parallel or radial groups. Brilliant, sub-metallic or greasy lustre. Conchoidal fracture. Radioactive. Distinguished from other radioactive minerals by X-ray methods.

Faujasite $(Na_2, Ca)Al_2Si_4O_{12} \cdot 8H_2O$. H=5. Colourless or white octahedral crystals. Vitreous lustre. Distinguished from fluorite by its superior hardness.

Fergusonite (Y, Er, Ce, Fe) $(Nb, Ta, Ti)O_4$. H=5 1/2-6 1/2. Black prismatic or pyramidal crystals; also massive. Brilliant to submetallic lustre on fresh surfaces. Alters to grey, yellowish or brownish on exposed surfaces. Subconchoidal fracture. Radioactive. Occurs in granite pegmatites. Distinguished from other radioactive minerals by X-ray methods.

Fluorescence Property of certain substances to glow when exposed to light from an ultraviolet lamp. It is caused by impurities in the substance or by defects in its crystal structure. Two wave lengths are commonly used to produce fluorescence: long wave (3,200 to 4,000 Angstrom units); short wave (2,537 Angstrom units).

Fluorite CaF_2. H=4. Transparent, colourless, blue, green, purple, yellowish cubic crystals; also granular massive. Vitreous lustre. Good cleavage. Often fluorescent; this property derives its name from this mineral. Used in optics, steel-making, ceramics.

Gabbro A dark, coarse-grained igneous rock composed mainly of plagioclase and pyroxene. Used as building and monument stone.

Galena PbS. H=2 1/2. Dark grey metallic, cubic crystals; also massive with excellent cubic cleavage. Heavy (S.G.=7.58). Ore of lead; may contain silver.

Garnet Silicate of Al, Mg, Fe, Mn, Ca. H=6 1/2-7 1/2. Transparent red dodecahedral crystals or massive; also yellow, brown, green. Clear garnet is used as a gemstone. Also used as abrasive. Distinguished by its crystal form.

Gneiss A coarse-grained foliated metamorphic rock composed mainly of feldspar, quartz and mica. Used as building and monument stone.

Goethite $HFeO_2$. H=5-5 1/2. Dark brown to yellowish brown earthy, botryoidal, bladed or massive. Has characteristic yellowish brown streak. Weathering product of iron-rich minerals. Ore of iron.

Granite Grey to reddish coloured, relatively coarse-grained igneous rock composed mainly of feldspar with quartz. Used as a building and monumental stone.

Graphite C. H=1-2. Dark grey to black metallic flaky or foliated masses. Flakes are flexible. Greasy to touch. Black streak and colour distinguish it from molybdenite. Usually occurs in metamorphic rocks. Used as lubricant, 'lead' pencils, refractories.

Gypsum $CaSO_4 \cdot 2H_2O$. H=2. White, grey, light brown; granular massive. Also fibrous (satin spar); colourless, transparent tabular crystals (selenite). Distinguished from anhydrite by its softness. Occurs in sedimentary rocks. Alabaster (fine grained translucent massive) and satin spar are used for carving into ornamental objects; the latter is chatoyant on the polished surface.

Hellandite $(Ca, Y)_6(Al, Fe)Si_4B_4O_{20}(OH)_4$. H=5 1/2. Red to brown tabular, prismatic crystals. Occurs with tourmaline and rare earth minerals in granite pegmatite.

Hematite Fe_2O_3. H=5 1/2-6 1/2. Reddish brown to black massive, botryoidal, earthy; also foliated or micaceous with high metallic lustre (specularite). Characteristic red streak. Ore of iron; also used as pigment.

Hornblende $NaCa_2(Mg, Fe, Al)_5(Si, Al)_8O_{22}(OH)_2$. H=6. Member of amphibole group. Dark green or brown, black. Vitreous lustre. Occurs as prismatic crystals and in massive form. Common rock-forming mineral.

Hydrocerussite $Pb_3(CO_3)_2(OH)_2$. H=3 1/2. Colourless to white or grey tiny hexagonal scales and plates. Transparent to translucent with adamantine or pearly lustre. Associated with cerussite from which it is not readily distinguished.

Hydrozincite $Zn_5(OH)_6(CO_3)_2$. H=2-2 1/2. White to grey, yellowish, brownish, pinkish, fine-grained, compact to earthy or gel-like masses; also stalactitic, reniform, pisolitic, concentrically banded or radially fibrous structures; flat blade-like crystals. Dull, silky or pearly lustre. Fluoresces pale blue or lilac in ultraviolet light. Secondary mineral found in oxidized zones in zinc deposits.

Ilmenite $FeTiO_3$. H=5-6. Black compact or granular massive; thick tabular crystals. Metallic to submetallic lustre. Black streak distinguishes it from hematite. Source of titanium.

Jarosite $KFe_3(SO_4)_2(OH)_6$. H=2 1/2-3 1/2. Yellow to brown pulverulent coating associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Kaolinite $Al_4Si_4O_{10}(OH)_8$. H=2. Chalk-white or tinted with grey, yellow or brown, dull earthy masses. Clay mineral formed chiefly by decomposition of feldspars. Becomes plastic when wet. Used as a filler in paper and in manufacture of ceramics.

Limestone Soft white or grey sedimentary rock formed by the deposition of calcium carbonate. Dolomitic limestone contains variable proportions of dolomite and is distinguished from the normal limestone by its weaker (or lack of) effervescence in HCl acid. Crystalline limestone (marble) is a limestone that has been metamorphosed and is used as a building and ornamental stone. Shell limestone (coquina) is a porous rock composed mainly of shell fragments.

Lokkaite $(Y, Ca)_2(CO_3)_3 \cdot 2H_2O$. White radiating fibrous aggregates; massive. Alteration product of yttrium minerals.

Magnesite $MgCO_3$. H=4. Colourless, white, greyish, yellowish to brown lamellar, fibrous, granular or earthy masses; crystals rare. Vitreous, transparent to translucent. Distinguished from calcite by lack of effervescence in cold HCl. Used in manufacture of refractory bricks, cements, flooring; for making magnesium metal.

Malachite $Cu_2CO_3(OH)_2$. H=3 1/2-4. Bright green granular, botryoidal, earthy masses; usually forms coating with other secondary copper minerals on copper-bearing rocks. Distinguished from other green copper minerals by effervescence in HCl acid. Ore of copper.

Marble See limestone.

Marcasite FeS_2. H=6-6 1/2. Pale bronze to grey metallic radiating, stalactitic, globular, or fibrous forms. Yellowish to dark brown tarnish. Transforms to pyrite from which it is difficult to distinguish in hand specimen.

Martite Fe_2O_3. H=5 1/2-6 1/2. Black octahedral crystals. Dull to splendent lustre. Pseudomorphous after magnetite.

Mica A mineral group consisting of hydrous aluminum silicates characterized by sheet-like platy structure producing perfect basal cleavage. Muscovite, biotite and phlogopite are common members of this group.

Microcline $KAlSi_3O_8$. H=6. White, pink to red, or green (amazonite) crystals or cleavable masses. Member of feldspar group. Distinguished from other feldspars by X-ray or optical methods.

Molybdenite MoS_2. H=1-1 1/2. Dark grey metallic (blue tinged) tabular, foliated, scaly aggregates; also massive. Sectile with greasy feel. Distinguished from graphite by its bluish lead-grey colour and by its streak (greenish on porcelain, and bluish grey on paper). Ore of molybdenum.

Monazite $(Ce, La, Y, Th)PO_4$. H=5-5 1/2. Yellow, reddish brown or brown equant or flattened crystals and grains. Resinous to vitreous lustre. Radioactive. Resembles zircon but is not as hard. Distinguished from titanite by its superior hardness and radioactivity. Occurs in granitic and pegmatitic rocks. Ore of thorium.

Muscovite $KAl_2Si_3O_{10}(OH)_2$. H=2-2 1/2. Colourless, light shades of green, grey, brown; transparent with splendent or pearly lustre. Tabular hexagonal crystals, sheet-like, platy or flaky aggregates. Occurs in pegmatite. Constituent of granitic and metamorphic rocks. Used as electrical and heat insulator, in cosmetics paints and wallpaper to produce a pearly lustre, in manufacture of simulated pearls. White silky fine scaly aggregate of muscovite is known as sericite which occurs as an alteration of minerals such as topaz, kyanite, feldspar, spodumene and andalusite.

Nemalite A fibrous variety of brucite.

Olivine $(Mg, Fe)_2SiO_4$. H=6 1/2. Olive-green vitreous granular masses or rounded grains; also yellowish to brownish, black. Distinguished from quartz by having a cleavage, from other silicates by its olivine-green colour. Used in manufacture of refractory bricks; transparent variety (peridot) is used as a gemstone.

Orthoclase Pink to white monoclinic variety of potash feldspar.

Orthopyroxene Orthorhombic variety of pyroxene, including enstatite and hypersthene.

Peat Dark brown decomposition product of mosses and plants in marshy areas. Used as fertilizer, soil conditioner, insulating material, packing material, etc.

Pegmatite A very coarse grained dyke rock.

Peristerite White albite having a blue schiller. Also called moonstone. Used as a gemstone.

Phlogopite $KMg_3(AlSi_3O_{10})(OH)_2$. H=2 1/2. Amber to light brown variety of mica. Used in electrical industry.

Plagioclase $(Ca, Na)(Al, Si)AlSi_2O_8$. H=6. White or grey tabular crystals and cleavable masses having twinning striations on the cleavage surfaces. Vitreous to pearly lustre. Distinguished from other feldspars by its twinning striations.

Pumpellyite $Ca_4(Al, Fe, Mg)_6Si_6O_{23}(OH)_3 \cdot 2H_2O$. H=5 1/2. Bluish green to green, white tiny fibrous aggregates; also platy, massive. Silky to vitreous lustre. Occurs in amygdaloidal basalt and in metamorphic rocks. Blue variety distinguished from apatite by silky lustre and superior hardness.

Pyrite FeS_2. H=6-6 1/2. Pale brass-yellow (iridescent when tarnished) metallic crystals (cubes, pyritohedrons, octahedrons) or massive granular. Distinguished from other sulphides by colour, crystal form, and superior hardness. Source of sulphur.

Pyroaurite $Mg_6Fe_2CO_3(OH)_{16} \cdot 4H_2O$. H=2 1/2. Colourless, yellowish, bluish green, or white flaky with pearly or waxy lustre. Crushes to talc-like powder. Effervesces in HCl acid.

Pyrochlore $NaCaNb_2O_6F$. H=5-5 1/2. Dark brown, reddish brown to black octahedral crystals or irregular masses. Vitreous or resinous lustre. Light brown to yellowish brown streaks. Distinguished from perovskite by its lustre and streak, from titanite by its crystal form. Ore of niobium.

Pyroxene A mineral group consisting of Mg, Fe, Ca and Na silicates related structurally. Diopside, enstatite, aegirine, jadeite, etc., are members of the group. common rock-forming mineral.

Pyroxenite A igneous rock composed mainly of pyroxene with little or no feldspar.

Pyrrhotite $Fe_{1-x}S$. H=4. Brownish bronze massive granular. Black streak. magnetic; this property distinguishes it from other bronze sulphides.

Quartzite A quartz-rich rock formed by the metamorphism of sandstone. Used as a building and monumental stone, and, if colour is pleasing, as an ornamental stone; high purity quartzite is used in the glass industry.

Rozenite $FeSO_4 \cdot 4H_2O$. Snow-white, greenish white, finely granular, botryoidal or globular encrustations. Metallic astringent taste. Difficult to distinguish in hand specimen from other iron sulphates with which it is associated.

Rutile TiO_2. H=6-6 1/2. Brownish red to black striated prismatic or acicular crystals; massive. Crystals are often twinned, forming elbow-shapes. Adamantine lustre. Resembles cassiterite, but not as heavy and has light brown streak (cassiterite has white streak). Ore of titanium.

Scapolite $(Na, Ca)_4(Si, Al)_{12}O_{24}\cdot(CO_3, SO_4, OH, F, Cl)$. H=6. White to grey (less commonly pink, yellow, bluish, greenish) prismatic and pyramidal crystals; also massive, granular with splintery, woody appearance. Vitreous, pearly to resinous lustre. Distinguished from feldspar by its square prismatic form, its prismatic cleavage, its splintery appearance on cleavage surfaces. May fluoresce under ultraviolet rays. Clear varieties used as gemstone.

Serpentine $Mg_6(Si_4O_{10})(OH)_8$. H=2-5. Usually massive with waxy lustre. Translucent to opaque in shades of yellow-green to deep green also bluish, red, brown, black. Often mottled, banded or veined. Asbestos is the fibrous variety. Formed by alteration of olivine, pyroxene, amphibole, or other magnesium silicates. Found in metamorphic and igneous rocks. Used as ornamental building stone (verde-antique) and for cutting and/or carving into ornamental objects (ash-trays, book-ends, etc.).

Shale Fine-grained sedimentary rock composed of clay minerals.

Sillimanite Al_2SiO_5. H=7. White or colourless fibrous or prismatic masses. Vitreous or silky lustre. Distinguished from wollastonite and tremolite by its superior hardness. Occurs in schists and gneisses.

Specularite Black variety of hematite having a splendent lustre.

Sphalerite ZnS. H=3 1/2-4. Yellow, brown, or black, granular to cleavable massive; also botryoidal. Resinous to submetallic. Honey-brown streak. Ore of zinc.

Spinel $MgAl_2O_4$. H=7 1/2-8. Dark green, brown, black, deep blue or green octahedral crystals, grains, or massive with conchoidal fracture. Vitreous lustre. Distinguished from magnetite and chromite by its superior hardness and lack of magnetic property.

Strontianite $SrCO_3$. H=3 1/2. Colourless, white, grey, yellowish or greenish prismatic crystals, fibrous, columnar, massive granular. Vitreous lustre. Effevesces in dilute HCl. Distinguished from celestite by its effervescence in acid, from aragonite by its higher specific gravity. Ore of strontium.

Syenite An igneous rock composed mainly of feldspar with little or no quartz. Used as a building stone.

Synchisite-Y $(Y,Ce)Ca(CO_3)_2F$. H=6-7. Pink to reddish brown small prisms; massive granular. Associated with yttrium minerals.

Szomolnokite $FeSO_4\cdot H_2O$. H=2 1/2. White, to pinkish white, fine hair-like aggregates or finely granular encrustations; also botryoidal, globular crusts. Vitreous lustre. Metallic taste. Associated with pyrite and with other iron sulphates from which it is not readily distinguished in the hand specimen.

Talc $Mg_3Si_4O_{10}(OH)_2$. H=1. Grey, white, various shades of green. Fine-grained massive, foliated. Translucent with greasy feel. Massive, varieties are known as steatite and soapstone, and because of their suitability for carving, are used for ornamental purposes. Formed by alteration of magnesium silicates (olivine, pyroxene, amphibole, etc.) in igneous and metamorphic rocks. Used in cosmetics.

Tengerite $CaY_3(CO_3)_4(OH)_3\cdot 3H_2O$. Dull white powdery, fibrous coating, or encrustations; associated with yttrium minerals from which it alters.

Thorite $ThSiO_4$. H=5. Black to reddish brown tetragonal prisms with pyramidal terminations; also massive. Radioactive. Distinguished by crystal form, radioactivity. Source of thorium.

Thucholite Hydrocarbon containing U, Th, rare-earth elements and silica. H=3 1/2-4. Jet black with brilliant lustre and conchoidal fracture. Occurs in pegmatite.

Titanite $CaTiSiO_5$. H=6. Brown, wedge-shaped crystals, also massive granular. May form cruciform twins. Adamantine lustre. White streak. Distinguished from other dark silicates by its crystal form, luster and colour.

Tourmaline $Na(Mg, Fe)_3Al_6(BO_3)_3(Si_6O_{18}(OH)_4$. H=7 1/2. Black, deep green or blue, pink, brown, amber-coloured, prismatic crystals; also columnar, granular. Prism faces vertically striated. Vitreous lustre. Conchoidal fracture. Distinguished by triangular cross-section in prisms; by striations, fracture. Used in manufacture of pressure gauges; transparent varieties used as gemstone.

Tremolite $Ca_2Mg_5Si_8O_{22}(OH)_2$. H=5-6. White, grey, striated prismatic crystals, bladed crystal aggregates, fibrous, perfect cleavage. Usually occurs in metamorphic rocks. Fibrous variety is used for asbestos; clear crystals are sometimes cut and polished as a gem curiosity.

Uraninite UO_2. H=5-6. Black, brownish black, cubic octahedral crystals; also massive, botryoidal. Submetallic, pitchy to dull lustre. Uneven to conchoidal fracture. Radioactive. Distinguished by high specific gravity (10.3 to 10.9), crystal form, radioactivity.

Uranophane $CaO \cdot 2UO_3 \cdot 2SiO_2 \cdot 7H_2O$. H=2-3. Yellow fibrous, radiating aggregates or massive. Occurs with uraninite.

Uranothorite (Th, U)SiO_4. H=4 1/2-5. Black prismatic crystals, grains. Pitchy lustre. May have orange-coloured sun-burst effect on enclosing rock. Radioactive. Occurs in granitic and pegmatitic rocks. Granular variety distinguished from thorite and uraninite by X-ray methods.

Vesuvianite $Ca_{10}Mg_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$. H=7. Yellow to brown or green, apple-green, lilac transparent prismatic or pyramidal crystals with vitreous lustre; also massive, granular, compact, or pulverulent. Distinguished from other silicates by its tetragonal crystal form; massive variety distinguished by its ready fusibility and intumescence in blowpipe flame. May be used as a gemstone.

Wakefieldite YVO_4. H=5. Yellow to tan pulverulent masses in cavities in quartz powdery coatings on quartz. Originally described from the Evans-Lou Mine near Wakefield Lake for which it is named.

Wilsonite An altered scapolite. Pink, rose-red, mauve to purple in colour. Translucent variety used as gemstone. Was named for Dr. J. Wilson of Perth where it was originally found.

Wollastonite $CaSiO_3$. H=5. White to greyish white compact cleavable or fibrous masses with splintery or woody structure. Vitreous to silky lustre. May fluoresce under ultraviolet rays. Distinguished from tremolite (H=6) and sillimanite (H=7) by inferior hardness and by its solubility in HCl. Used in ceramics and paints.

Xenotime YPO_4. H=4-5. Yellow brown or grey prismatic crystal resembling zircon. Vitreous to resinous lustre. Its inferior hardness distinguishes it from zircon.

Zavaritskite BiOF. Yellow to grey granular to powdery with greasy to submetallic lustre. Associated with bismutite, bismuthinite, bismuth.

Zircon $ZrSiO_4$. H=7 1/2. Reddish to greyish brown tetragonal prisms terminated by pyramids; also colourless, green, grey. May form knee-shaped twins. Vitreous to adamantine lustre. May be radioactive. Distinguished by its crystal form, hardness and colour. Ore of zirconium and hafnium. Used in moulding sand, ceramics and refractory industries; transparent varieties used as gemstones.

CHEMICAL SYMBOLS FOR CERTAIN ELEMENTS

Ag – silver
Al – aluminum
As – arsenic
Au – gold
B – boron
Ba – barium
Be – beryllium
Bi – bismuth
C – carbon
Ca – calcium
Cb – columbium (niobium)
Ce – cerium
Cl – chlorine
Co – cobalt
Cr – chromium
Cu – copper
Er – erbium
F – fluorine
Fe – iron
H – hydrogen
K – potassium
La – lanthanum
Mg – magnesium
Mn – manganese
Mo – molybdenum
Na – sodium
Nb – niobium
Ni – nickel
O – oxygen
P – phosphorus
Pb – lead
R – rare-earth elements
S – sulphur
Se – selenium
Si – silicon
Sn – tin
Sr – strontium
Ta – tantalum
Th – thorium
Ti – titanium
W – tungsten
Y – yttrium
Yb – ytterbium
Zn – zinc
Zr – zirconium

INDEX OF ROCKS AND MINERALS