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PRELIMINARY REPORT ON LAKE AYLMER AREA, WOLFE AND FRONTENAC COUNTIES

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DEPARTMENT OF NATURAL RESOURCES

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MINERAL DEPOSITS BRANCH

J.-É. GILBERT, CHIEF

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PRELIMINARY REPORT

ON

LAKE AYLMER AREA

WOLFE AND FRONTENAC COUNTIES

BY

GILLES DUQUETTE



QUEBEC  
1961

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### INTRODUCTION

The Lake Aylmer area here described lies between latitudes  $45^{\circ}45'$  and  $45^{\circ}50'$  and longitudes  $71^{\circ}15'$  and  $71^{\circ}25'$ , thus occupying 45 square miles. It includes parts of Weedon, Stratford and Garthby townships, in Wolfe county, and a very small triangular area in range III of Winslow township, in Frontenac county.

St. Gérard and Garthby, respectively 45 and 50 miles northeast of Sherbrooke on Highway 1, are both located near the western limit of the map-area. The village of Stratford, in the east central part of the area, is 10 miles east of St. Gérard. The Quebec-Sherbrooke line of the Quebec Central Railways passes through both St. Gérard and Garthby.

The Lake Aylmer area is included within the physiographic province of the "Appalachian Highlands" essentially characterized by three parallel series of ridges trending in a northeasterly direction and representing the northern extension of the Green Mountains of Vermont and the White Mountains of New Hampshire. The area lies mainly over the central series of ridges, commonly called the Stoke Mountain axis. Mount Aylmer at the southern boundary of the area rises 1,725 feet above sea-level. Maximum relief in the map-area is 925 feet.

Nearly a quarter of the map-area is occupied by lake Aylmer. This lake narrows down at St. Gérard and becomes St. Francis river which flows southward. Bernier river drains the southern part of the eastern half of the map-area flowing westward into lake Aylmer after having joined Maskinongé river a few hundred feet before reaching the lake.

The geological mapping on which this report is based was carried out on a scale of 500 feet to the inch. Compass and pace traverses were run at every 500 feet in a general S.  $45^{\circ}$ E.

direction. All traverses were tied to survey stations. The accompanying map is on a scale of 1,000 feet to the inch.

## GENERAL GEOLOGY

### General Statement

The area is believed to be entirely underlain by Palaeozoic rocks. These include:

a) the Quebec Group, inferred to be Cambrian or Ordovician in age and made up of two different sequences:

1 - The Beauceville "Group" consisting of sedimentary rocks including tuffs, slates, siltstones and sandstones.

2 - The Weedon schists belt representing a volcanic assemblage cut by porphyritic and acidic sill-like bodies of igneous material.

b) The Lake Aylmer Group and St. Francis Group of formations of Siluro-Devonian age consisting essentially of sedimentary rocks lying unconformably over the Weedon schists and the Beauceville Group of rocks.

c) A large mass of younger muscovite and biotite granite of the "Stanstead" type cropping out to the east of Elgin lake.

d) A green biotite-augite granite underlying a small area south of L'Équerre lake.

Table of Formations

Pleistocene and Recent			Drift, clay, sand and gravel
Post-Lower Devonian	Intrusive rocks related to Acadian orogeny		Augite-biotite granite Muscovite-biotite granite
Siluro-Devonian	Gaspé Group	St. Francis Group	Siliceous siltstone interbedded with black slate
		and	Interbedded silty limestone and calcareous siltstone
		Lake Aylmer Group	Slate, calcareous quartzite, calcareous siltstone, grit Basal conglomeratic lenses
Pre-Silurian	Intrusive rocks related to Taconic orogeny		Porphyritic, acidic sill-like bodies and plugs of albite rhyolite
	Quebec Group	Weedon schists	Greenstone and minor pyroclastic rock
		Beauceville Group	Acidic fine-grained pyroclastic rock
			Strined slate, acidic tuff, siltstone, sandstone, grit and minor greenstone

## Quebec Group

The rocks of the Quebec Group of inferred Pre-Silurian age are represented by a sedimentary sequence referred to as the Beauceville Group and a belt of schistose meta-volcanics cut by porphyritic intrusives called the Weedon schists belt.

### Beauceville Group

Rocks of the Beauceville Group occur west and north of Aylmer lake, thus occupying the northwestern corner of the map-area. The descriptions of the various component members of the group are given below.

#### Striped Slate

Thinly laminated black slates underlie the greater part of the northwest corner of the map-area. Bedding and crossbedding are usually reflected by interlamination of black slate with very thin and rusty siltstone layers. The thickness of the beds varies from a fraction of an inch to a few inches. Owing to its fissility along two subparallel planes of cleavage, the slate weathers to chips usually smaller than an inch across.

#### Acidic Tuff

An acidic, very fine-grained and massive tuff is interbedded with the above described slate. The tuffs weather characteristically white and usually show some sericite along planes of lamination.

#### Siltstone, Sandstone and Grit

Interbedded with the black slate and the acidic tuff is a 500-foot-thick band of dark grey siltstone commonly grading into sandstone and grit and cropping out mostly to the west of the town of Garthby and south of the outlet of Coulombe river into Ward bay. Where gritty, the rock carries abundant clastic grains of quartz and rusty to light grey fragments of siltstone up to one quarter of an inch across. Three other very thin bands of grit were also mapped just to the west of the main band.

#### Greenstone

In a road cut along Highway 34, about 1,000 feet west of its junction with Highway 1, two bands of greenstone, three feet thick, are exposed, both being conformable with the adjoining black slates. The greenstone represents basic flows or sills.

### Weedon Schists

The Weedon schists crop out abundantly over a wide zone that extends diagonally across the eastern half of the map-area.

At the latitude of Elgin lake, this belt of schists is approximately 10,000 feet wide but it narrows down to 5,000 feet at the northern limit of the map-area. The schists can be grouped into two lithological units.

#### Acidic Fine-grained Pyroclastic Rock

The western part of the belt of schists is made up nearly exclusively of acidic fine-grained pyroclastic beds. A few coarse fragmental volcanic rocks were found interlayered with them. The larger fragments in the pyroclastics usually show a porphyritic texture. Occasionally rock is a black tuff on account of carbonatization. Exposures showing such a type of alteration are found along the north shore of Elgin lake.

#### Greenstone and Minor Pyroclastic Rock

Adjacent to the east of pyroclastic rocks are basic to intermediate flows interbedded with minor fine-grained to coarse-grained pyroclastic bands. The flows are green on account of their high content of chlorite. The tuffaceous facies of the pyroclastics are usually dark grey to green and show a planar schistosity. The agglomeratic variety normally contains fragments up to 6 inches across which are set in a chlorite-rich matrix. Pillows are common in the flows but are usually very highly deformed. Abundant pockets of epidote are also found in the flows.

#### Pre-Silurian Intrusive Rocks

Abundant intrusive rocks cut across both units of the Weedon schists but none were seen intruding rocks of the Beauceville Group. These intrusives are acidic porphyritic rocks, normally white on weathered surfaces and grey, green or blue on fresh surfaces. Phenocrysts of albite and quartz are common and the rock commonly contains veins of milky quartz. The intrusives form sill-like bodies in the schists although good cutting relationships were found in at least two places in the area.

#### Gasné Group

The Gasné Group of Siluro-Devonian age is represented in the map-area by rocks of the Lake Aylmer Group to the west of the Weedon schists and by rocks of the St. Francis Group on the east side of the same schists.

#### Lake Aylmer Group

A three-mile-wide zone of rocks belonging to the Lake Aylmer Group extends in a northeast direction from the southwest corner of the area to its northern limit. From the bottom upward, the sequence in the area is as follows: -

### Basal Conglomerate, Slate, Quartzite and Grit

Overlying unconformably the rocks of the Beauceville Group, conglomeratic lenses crop out in lots 17, 18 and 19 of ranges A and B and in the northern part of range Long Point of Garthby township. Abundant interbeds of greenish black slate and grit were also seen in most of the exposures. The pebbles, cobbles and boulders, some reaching over a foot in diameter, are by order of abundance: light green quartzite, light green granite, greenstone, light grey to green granophyre and a little black slate.

On lot 27 of range I N.E., Stratford township, thin conglomeratic lenses interbedded with black slate and quartzite were cut by a diamond-drill hole along the contact between rocks of the Lake Aylmer Group and the Weedon schists. No other exposure of the basal conglomeratic beds were found but erosional remnants of a blue quartzite were seen on lot 37 of range III S.W., and on lot 32 of range T S.W., in Stratford township.

### Silty Limestone and Calcareous Siltstone

Silty limestone and calcareous siltstone are the most widespread formations of the Lake Aylmer Group and they occupy a belt more than 14,000 feet wide and extend from the southwest corner of the map-area to its north central limit. Interbedding of the two types of rock is characteristic and individual beds are usually less than one inch thick. On weathered surfaces, the silty facies is rusty, whereas the more limy beds are light bluish grey. Sericite is omnipresent and dolomite has locally replaced the limestone particularly in the zone of contact with the Weedon schists. Up to 1,500 feet southeast of that contact, slices of dolomitized limestone crop out in range V S.W. and in the western part of range III S.W., Stratford township. A well defined cleavage has been superimposed upon the original bedding so that much of the latter is very difficult to recognize.

Bryozoans, corals and crinoid stems were found on lot 29 of range III S.W., Stratford township, where the road passes near a limestone ridge. Similar fossils were seen on lot 27 of range II S.W. From a study of fossils found outside of the area but in the same group of formations, the Lake Aylmer Group has been established by previous workers as belonging to the Upper Silurian or Lower Devonian.

### St. Francis Group

To the east of and apparently unconformably overlying the Weedon schists is the sedimentary sequence of the St. Francis Group, two members of which, the basal beds and the silty limestone and calcareous siltstone, are correlative of the two upper members of the Lake Aylmer Group to the west.

## Basal Beds

At the base of the St. Francis Group and in contact with the Weedon schists to the west, black slate, limy quartzite and limestone form a band averaging about 700 feet in width and extending diagonally across almost the entire east half of the area. Near the south boundary the band is interrupted by the Mount Aylmer granite body and three mappable inclusions of basal beds were found within the granite mass exposed in the area. Except for exposures of quartzite in lot 4 of range VII S.W. in Stratford township, south of the road to Elgin lake, and in lot 2 of the same range, just east of the same road, and of gritty sandstone interbeds in black slate along the stream following range-line I N.E. - I S.W. in lot 40 of Stratford township, the basal beds consist of black slate and calcareous siltstone.

## Silty Limestone and Calcareous Siltstone

Conformably above and to the east of the basal beds lies a sequence of silty limestone and calcareous siltstone. The width of this sequence does not exceed 2,000 feet in the area, and the individual beds vary in thickness from a fraction of an inch to one and a half inches. The limestone commonly weathers to a two-inch-thick gossan of chestnut brown residual material but where such gossan has not formed the rock weathers light grey. On a fresh surface it is everywhere dark bluish grey. The rock is usually massive but bedding and cross-bedding can be seen on some weathered surfaces.

## Siliceous Siltstone and Black Slate

The next conformable unit cropping out still farther east extends to the eastern and southeastern limits of the map-area and is made up of interbedded black slate and siltstone. On its fresh surface the siltstone is medium to light grey but weathered surfaces are steel grey. The slate is characteristically black and highly fissile. Quartz and clay are essential constituents in both the siltstone and slate. Owing to large intrusives of granite in the very close proximity, the siltstone or slate have commonly become much harder and they carry porphyroblastic andalusite crystals, as for example in the south half of lots 63 and 64 of range III S.W., in Stratford township. The average thickness of the slate beds is 6 inches. Siltstone beds, on the other hand, may reach one and one-half feet across.

## Post-Lower Devonian Intrusive Rocks

### Muscovite-biotite Granite

A stock of light grey, medium-grained granite of the "Stanstead" type crops out abundantly and forms a prominent hill called the Mount Aylmer in range VII S.W., Stratford township, along the southern limit of the map-area. This granite intrudes the Weedon schists and the rocks of the St. Francis Group. Its most

abundant minerals are quartz, feldspar, biotite and muscovite. Large inclusions of basal beds of the St. Francis Group crop out in lots 7 and 10 of range VII S.W., Stratford township. A small plug of similar granite is also exposed in lot 7 of range V S.W., 700 feet southeast of the main road from Stratford Centre to St. Gérard.

### Augite-biotite Granite

A medium to dark green granitic rock representing a westward projection of a large mass of acidic intrusive rock present immediately to the east of the present area crops out around L'Équerre lake along the eastern boundary of the map-area. One exposure of similar rock was also found in lot 4 of range VI, Stratford township, about 1,800 feet north of the same lake. The characteristic minerals of this granite are quartz, feldspar, biotite and augite, and the rock is believed to be derived from the same magma as the muscovite-biotite described above.

Probably associated to these granite masses, are small sills and dykes of fine-grained and porphyritic granites which are exposed at the following places in Stratford township: lot 38, range II N.E.; lot 41, range I N.E.; lots 43 and 44, range II S.W.; lots 48 and 64, range VII S.W.; and lot 2, range VIII S.W.

### Pleistocene and Recent

Drift and fluvio-glacial deposits are abundant in the low ground area bordering Bernier river and Aylmer lake. Glacial striae indicate that the general direction of movement of the latest glaciation was about S.60°E. Some of the glacial boulders are Precambrian rocks found in situ north of the St. Lawrence.

## STRUCTURAL GEOLOGY

### Schistosity

The rocks of the Beauceville Group, the Lake Aylmer Group and the Weedon schists have a general schistosity striking N.35°E. to N.45°E. The schistosity or cleavage of the St. Francis Group of rocks strikes from true north in the southeastern part of the map-area to N.40°E. in its northeastern corner. The dips are everywhere steep to the east or southeast.

### Lination

In the rocks of the Beauceville Group, a lination can be seen which is subparallel to the schistosity and plunges from a few degrees to 30 degrees northeast or southwest.

The lination found in the rocks of the Lake Aylmer Group is also almost parallel to the strike of the schistosity and usually plunges 30 degrees to the southwest.

Two lineations have been recognized in the Weedon

schists. One strikes S.45°E. to S.70°E. and plunges 35° to 85° to the southeast, and the other strikes N.55°E. and plunges 45° to 75° to the northeast.

In the rocks of the St. Francis Group, two lineations are likewise present. One has a strike varying from true north to N.40°E. and plunges most commonly to the north at an angle smaller than 60°. The other lineation strikes S.50°E. and plunges 45° to 90° to the southeast.

### Folding

Bedding in the Weedon schists is assumed to be subparallel to the schistosity. Where determined, tops are facing southeast. In the sedimentaries of the Beauceville, Lake Aylmer and St. Francis Groups, the strike of the beds follows quite closely the strike of the schistosity but the dip is either steeply to the southeast or less commonly to the northwest. Overturned beds are common in all those groups of rocks.

The rocks of the Beauceville Group are tightly folded in a general northeasterly direction, the axes of the folds being generally about 300 feet apart. The folds plunge from 30° northeast to 30° southwest.

The overall structural picture of the Lake Aylmer Group of rocks tends to confirm Burton's \*hypothesis (p. 120) that "the band forms a syncline, slightly overturned to the northwest on the western side and strongly so on the eastern side".

In the St. Francis Group, the basal beds and calcareous siltstone sequence do not appear to have been intensely disturbed but the black slate and siltstone unit is everywhere tightly folded. Folds are asymmetrical or isoclinal and plunge up to 65° to the northeast or southwest. Tops were determined through gradations of grain size reflected on the weathered surface by change in colour, the light-coloured siltstone beds at the base of the beds passing gradually to black-coloured slates at the top. The average spacing between the axes of the different folds is about 175 feet, a figure similar to the one determined by the writer in the Gould area\*\*.

### Faulting

Definite field evidence supports Burton's \*contention (p. 125) that a major fault separates the Lake Aylmer limestone from the Weedon schists. The fault is of the thrust type and dips very steeply to the southeast. A similar relationship would prevail along

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\* Burton, F.R. - Vicinity of Lake Aylmer, Eastern Townships; Que.  
Dept. of Mines, Ann. Rept. 1930, Pt. D. pp. 101-145.

\*\* Duquette, G. - (1960) Preliminary Report on Gould Area, Que.  
Dept. of Mines, P.R. No. 432.

the eastern contact of the three limestone slices found a few hundred feet east of the major fault.

## ECONOMIC GEOLOGY

### Description of Mining Properties

#### Solbec Copper Mines Ltd.

Following a discovery made by Cyprus Exploration Corp. Ltd. in the winter of 1958, a new company, Solbec Copper Mines Ltd., was formed in 1959 in order to bring to production a copper-zinc deposit located about one and one half miles north of the village of Stratford. The ground held by the company comprises lots 30 to 45 in range II S.W., lots 30 to 40 in range I S.W. and I N.E., and lots 30 to 36 in range II N.E.; all are in Stratford township.

The orebody is found in the northeasterly striking belt of Weedon schists consisting of metavolcanics and porphyritic intrusives of Pre-Silurian age in the eastern part of lot 34, range I. S.W. It is approximately 1,500 feet long, its maximum width is 25 feet and it lies parallel to the local schistosity, which strikes N.40°E. and dips 45° to the southeast. The orebody does not crop out on the surface and its size appears to have considerably decreased at a depth of 1,000 feet. Sulphides are, by order of abundance, pyrite, sphalerite, chalcopyrite, galena and tennantite-tetrahedrite. The pyrite is characteristically yellowish grey and the sulphides have replaced the lower part of a fine-grained pyroclastic horizon that contains abundant quartz and sericite. The ore is fine-grained, massive to semi-massive and the mineralization has generally followed three subparallel zones separated one from another by a layer of barren schists two feet thick. The contact of the orebody with the chloritic footwall is everywhere quite sharp. Above the main ore zones, disseminated sulphides are usually found over a distance not exceeding 50 feet. The host rock is here strongly sericitic and it represents acidic pyroclastic beds. Above this zone of disseminated mineralization, chloritic rocks are present and, still higher in the sequence, thick volcanic agglomerate lenses with a chloritic matrix are seen interbedded with greenstone. In the footwall the chloritic schist is commonly cut by sill-like bodies of blue, green or grey porphyritic or aphanitic, acidic intrusive rock.

Ore reserves are estimated to be over 1,000,000 tons grading approximately 2.16 per cent copper, 3.9 per cent zinc, 1.2 ounces of silver per ton, and 0.02 ounce of gold per ton.

Shaft sinking is to be completed by April 1961 to a vertical depth of 1,400 feet. Plans are for a 1,000-ton-per-day operation.

#### Hastings Mining and Development Company Ltd.

The ground held by Hastings Mining and Development Company

Ltd. comprises lots 23 to 29, range I N.E.; 22 to 29, range I S.W.; 27 to 29, range II N.E.; 25 to 29, range II S.W.; 27 to 29, range III N.E.; 32 to 41, range III S.W.; 1 to 6, range VII; the southeast half of lots 1 to 4, range V S.W.; and the northwest half of lots 1 to 4, range VI S.W. All are in Stratford township.

Part of the property was optioned to Sullico Mines Ltd. and Sullivan Consolidated Mines Ltd., and a base-metal-bearing zone was discovered 13,000 feet southwest of, and in strike with, the Solbec orebody and in similar geological settings. By September 1960 a total of 30 diamond drill holes had been completed in the northwestern half of lots 4 and 5 in range VI S.W. and, although the drilling is not yet over, the work has already indicated the presence of an orebody approximately 600 feet long, having a maximum width of 15 feet and lying parallel to the local schistosity, which strikes N.40°E. and dips 45° to the southeast. It appears that the orebody has its full width and length at the depth of 1,200 feet.

The sulphides are, by order of abundance, pyrite, sphalerite, chalcopyrite, bornite and galena. They have replaced a fine-grained pyroclastic horizon in the Weedon schists, in all respects similar to the one on the Solbec property, rich in quartz and sericite. The ore is fine grained and usually massive. Disseminated sulphides, mostly pyrite, are found in the same kind of rock over a distance reaching locally 40 feet on both sides of the orebody. The rock of the hanging wall is made up of acidic and sericitic volcanic agglomerate, lapilli tuffs and normal tuffs, the latter having locally been carbonatized. The rock of the footwall is rich in chlorite as at Solbec but that mineral is not found farther than a few tens of feet away from the orebody. As is the case on the Solbec property, the rock is cut by small sill-like bodies of blue, green or grey, porphyritic to aphanitic, acidic intrusive rocks.

Plans are for shaft sinking as soon as sinking operations at Solbec are completed - that is in April or May 1961.

#### Stratford Pyrite Deposit.

In the extreme southeastern part of lot 8 of range VI S.W., in Stratford township, and on ground now held by East Sullivan Mines Ltd. and Sullivan Consolidated Mines Ltd., two inclined shafts were sunk in 1914 on a pyrite orebody that had been discovered in 1910 by Stratford Metals Limited. It is reported that one of the shafts was sunk to a depth of 75 feet. A drift was also started at the 50-foot level in a southwesterly direction. The company, which operated from 1914 to 1916, is reported to have shipped more than 10,000 tons of coarse-grained pyrite before a fire destroyed the mine buildings, thus forcing the closure of the operation.

The ore is of the vein type and is situated in a white acidic and porphyritic intrusive rock that cuts greenstones of the Weedon schists. The intrusive rock, as well as the greenstones, is of Pre-Silurian age. The strike of the vein is parallel to the

local schistosity, that is N.30°E., and the dip is 65° to the southeast.

According to a company's report, the formations, as well as the vein, plunge northward. The immediate hanging wall is a chlorite schist and the footwall is a sill of albite rhyolite porphyry. Pyrite is found in the porphyry.

At the time of the writer's visit, the two shafts, the openings of which are approximately 20 feet by 30 feet, were water filled. The broken material of the old dump shows considerable pyrite mineralization of a granular type. No chalcopyrite was seen.

In strike with this sulphide lens, many short mineralized patches were found, varying in length from 5 to 30 feet and from a few inches to 5 or 6 feet in width.

### Other Sulphide Occurrences

#### Pyrite Mineralization

A small exploration pit was found on lot 10 of range VI S.W., 400 feet northwest of range-line VI - VII S.W., in Stratford township. Some pyrite was seen in the rock that resembles the host rock of the Stratford Pyrite deposit described above.

Another pit having dimensions of 10 by 10 feet was also examined on lot 9 of range VII S.W., Stratford township, close to range-line VI-VII S.W. The mineralization and host rock are similar to those of the first-described occurrence.

A similar pit was likewise found on lot 8 of range VII S.W. in Stratford township, approximately 700 feet northeast of the latter occurrence. The host rock and mineralization are also similar but the rock of the hanging wall is a biotite-muscovite granite of the Stanstead type.

At approximately 150 feet southeast of the above occurrence, another pit was examined, the opening of which is 10 feet by 10 feet. This pit is inclined at 70° to the southeast. The material in the pit is too altered to permit the identification of the host rock.

On the same lot, 100 feet farther to the south, a 100-foot trench has been excavated across the strike of hornfel rocks of the St. Francis Group. No mineralization was seen in the trench or in the rocks of the dump.

On lot 5 of range VII S.W. in Stratford township, 200 feet west of the road to Mount Aylmer, a 20-foot-deep pit is to be seen, which shows stringers of pyrite in highly schistose, sericitic and chloritic metasedimentary rock belonging to the St. Francis Group. The stringers are parallel to the enclosing schists, which

strike N.45°E. and dip at 60° to the southeast.

On lot 38 in range II S.W., also of Stratford township, a greenschist was found, carrying approximately 10 per cent pyrite and traces of sphalerite.

#### Pyrrhotite-chalcopyrite Mineralization

A diamond-drill hole was put down by the Sullivan group on lot-line 4 - 5, range V S.W. Stratford township, 150 feet south of Bernier river. Massive chalcopyrite and pyrrhotite were reported for a core length of 6 inches. The host rock is a biotite-rich rock carrying quartz grains and interlayered with schistose acidic fine-grained pyroclastic rocks belonging to the Weedon schists.

#### Gravel and Sand

Several gravel deposits were noticed in the area, the largest of them being those immediately to the south of the village of Stratford Centre. The material is used mostly for local road building purposes.

One sand pit is operated in lots 18 and 19, range IV S.W., Stratford township.