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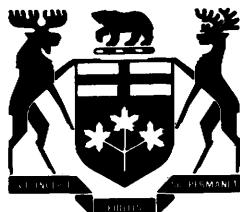
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Geological Notes for Maps Nos. 2053 and 2054

Madoc-Gananoque Area

By

D.F. HEWITT

Geological Circular No. 12

1964

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Key map showing the location of the Madoc-Gananoque area. Scale, 1 inch to 150 miles.....vi

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Map No. 2053 (coloured) — Madoc area, Ontario. Scale, 1 inch to 2 miles.

Map No. 2054 (coloured) — Gananoque area, Ontario. Scale, 1 inch to 2 miles.

KEY MAP



Key map showing the location of the Madoc and Gananoque map-areas. Scale, 1 inch to 150 miles.

GEOLOGICAL NOTES FOR MAPS NOS. 2053 AND 2054

MADOC-GANANOQUE AREA

By

D. F. Hewitt¹

INTRODUCTION

The Madoc-Gananoque maps are the second release in a series of southern Ontario compilation sheets on the scale of 1 inch to 2 miles. The first of the series, Map No. 1957b published in 1957, covers the Haliburton-Bancroft area.

The Madoc-Gananoque map-area partly adjoins, and is east of, the Haliburton-Bancroft area and covers an area of about 4,200 square miles, extending from 44°15'N. to 45°00'N. lat., and from 75°45'W. to 77°30'W. long., and comprising the following National Topographic map-sheets: Mazinaw Lake, Kaladar, Tweed, Sharbot Lake, Tichborne, Sydenham, Perth, Westport, Gananoque, Merrickville (west half), Brockville (west half), and Mallorytown (west half).

The Paleozoic contact from Madoc to Kingston crosses the southern part of the report-area. The Precambrian portion of the report-area (approximately 80 percent of the total) belongs to the Grenville geological province of the Canadian Shield. The Frontenac axis, a Precambrian area that separates the Lake Ontario Paleozoic homocline from the Ottawa-St. Lawrence Lowland and joins the Adirondacks to the main part of the Canadian Shield, is within the map-area.

Geological reconnaissance of the area was carried out in the summer of 1960 by the writer, assisted by K. A. MacLean.

PREVIOUS GEOLOGICAL WORK

Geological maps are available for most of the area with the exception of the townships of Sheffield, Camden, Cashel, Effingham, Abinger, and Miller, and portions of Portland, Hungerford, and South Sherbrooke townships. Geological maps and reports used for this compilation are the following:

¹Senior Geologist, Ontario Department of Mines, Toronto.

- Baker, M. B.
 1916: The geology of Kingston and vicinity; Ontario Bur. Mines, Vol. XXV, pt. 3 and Map No. 25e.
 1923: Geology and minerals of the county of Leeds; Ontario Dept. Mines, Vol. XXXI, 1922, pt. 6, and Map No. 31c.
- Burns, C. A.
 1951: Clare River area; *unpublished* M.Sc. thesis, Geol. Surv. Canada, and Queen's University, Kingston, Ontario.
- Harding, W. D.
 1944: Geology of Kaladar and Kennebec townships; Ontario Dept. Mines, Vol. LI, 1942, pt. 4, and Map No. 51d.
 1951: Geology of the Olden-Bedford area; Ontario Dept. Mines, Vol. LVI, 1947, pt. 6, and Map No. 1947-5.
- Meen, V. B.
 1944: Geology of the Grimsthorpe-Barrie area; Ontario Dept. Mines, Vol. LI, 1942, pt. 4, and Map No. 51d.
- Smith, B. L.
 1958: Geology of the Clarendon-Dalhousie area; Ontario Dept. Mines, Vol. LXV, 1956, pt. 7, and Map No. 1956-4.
- Wilson, A. E.
 1946: Geology of the Ottawa-St. Lawrence Lowland, Ontario and Quebec; Geol. Surv. Canada, Mem 241.
- Wilson, M. E.
 1940: Map 559A, Madoc area; Geol. Surv. Canada.
- Wilson, M. E., Brownell, G. M., and Wynne-Edwards, H. R.
 1959: Map 28-1959, Westport; Geol. Surv. Canada.
- Wilson, M. E., and Dugas, J.
 1961: Map 1089A, Perth; Geol. Surv. Canada.
- Wright, J. F.
 1923: Brockville-Mallorytown map area, Ontario; Geol. Surv. Canada, Mem 134.
- Wynne-Edwards, H. R.
 1962: Map 27-1962, Gananoque; Geol. Surv. Canada.
 1963: Map 7-1963, Brockville-Mallorytown area; Geol. Surv. Canada.

PHYSIOGRAPHY

The Madoc-Gananoque area occupies portions of three physiographic regions: to the south is the flat-lying Paleozoic plain of the Lake Ontario Homocline; to the east is the Paleozoic plain of the Ottawa-St. Lawrence Lowland; the remainder of the area forms part of the Precambrian peneplane of the Grenville geological province. The relief on the Precambrian peneplane in this area rarely exceeds 300 feet. The peneplane surface slopes from a maximum elevation of about 1,250 feet in Cashel township in the northwestern part of the area to about 300 feet in the vicinity of Gananoque on the St. Lawrence River. The elevation of Lake Ontario is 246 feet.

In the northern part of the area, drainage is through the Mississippi and Rideau rivers into the Ottawa River. Drainage in the southern part of the area is into Lake Ontario, via the Moira, Salmon, Napanee, Cataragui, and Gananoque rivers.

PROSPECTING AND MINING ACTIVITY

Mining activity began in the area shortly after the first settlement. About 1800, the first blast furnace in Ontario was erected at Lyndhurst to smelt iron ore from Bastard township. Iron mining began at the Glendower mine in Bedford township in the 1860s. The building of the Rideau Canal in the years 1827 to 1832 did much to open the area, and many stone quarries were developed to provide stone for the dams and locks along the canal. The stone-quarrying industry at Perth, Kingston, and Napanee began about this time. Phosphate mining began in North Burgess township near Perth in 1856 and flourished in

the Perth and Kingston areas in the 1870s and 1880s. Mica mining began in the 1870s, and the mines have been active intermittently to the present time, principally in the townships of North Burgess, South Burgess, North Crosby, South Crosby, Bedford, and Loughborough. The Lacey mica mine, largest in Ontario, was opened near Sydenham in 1884 and operated until the 1940s. Lead mining was begun in Bedford township in the 1850s, but production was meagre. The first discovery of gold in Ontario was made in Madoc township in 1866, and subsequently several small gold mines were opened in the townships of Madoc, Elzevir, Anglesea, Barrie, and Kaladar. These formed part of the "eastern Ontario gold belt" that was active in the early 1900s.

Talc mining began in the Madoc area in 1896, and has continued to the present time. Fluorspar mines were first opened near Madoc in 1905, and there has been intermittent production since then. Marble has been quarried in the Madoc area since 1890, and the industry is now flourishing. Sandstone for building stone has been quarried for many years in the Perth and Kingston areas. Gananoque was formerly the centre of a granite-quarrying industry. Feldspar mining was carried out in Bathurst township near Perth from 1910 to 1950 and in the Verona area from 1900 to 1948. Graphite mining began in North Elmsley township in 1870 and continued until 1920. Graphite was also mined in North Burgess township at the Timmins mine. Pyrite was mined at Queensboro and at Sulphide in the western part of the area. One of Ontario's first portland cement plants was formerly operated at Marlbank in Hastings county. Actinolite was formerly mined in Elzevir township and the settlement once known as Bridgewater was renamed Actinolite. Zinc was mined at Long Lake in Olden township, and molybdenite in Sheffield township. Vermiculite was discovered near Stanleyville in North Burgess township in 1950, and exploration has been carried out on several properties.

Over 500 mineral prospects have been recorded in the map-area. These are listed in the accompanying mineral inventory of the area (*see* pp. 10-31).

GENERAL GEOLOGY

The bedrock formations underlying the Madoc-Gananoque area are of Precambrian and Paleozoic ages. Approximately 80 percent of the area is Precambrian rock. The Precambrian-Paleozoic contact runs from Madoc to Kingston, and Ordovician limestones of the Black River and Trenton groups overlie the Precambrian rocks in Huntingdon, Thurlow, Hungerford, Sheffield, Camden, Ernestown, Portland, Loughborough, Storrington, Kingston, and Pittsburgh townships. Rocks of the Black River Group rest directly on the Precambrian surface throughout most of this area, but some Potsdam Sandstone is present on the west side of the Frontenac axis in parts of Pittsburgh, Kingston, Storrington, Loughborough, and Portland townships. Outliers of Potsdam Sandstone on the Precambrian rocks of the Frontenac axis indicate that the Potsdam Sandstone formerly extended across the Frontenac axis in the Kingston-Gananoque area.

Paleozoic rocks appearing in outcrops in the northeastern part of the report-area in Drummond, Bathurst, North Elmsley, South Elmsley, Kitley, Bastard, North Crosby, South Crosby, Front of Leeds and Lansdowne, Rear of Leeds and Lansdowne, Front of Yonge, Front of Escott, Rear of Yonge and Escott, and Elizabethtown townships form part of the Ottawa-St. Lawrence Basin and belong to the Potsdam Formation and the Beekmantown Group.

The lithologic rock classification used in this map-area is summarized in the Table of Formations.

TABLE OF FORMATIONS

CENOZOIC

PLEISTOCENE

Till, moraine, drumlins, eskers, kames, etc.

Unconformity

PALEOZOIC

ORDOVICIAN

Black River and Trenton Groups: Limestone.
Beekmantown Group: Dolomite and sandstone.

LOWER ORDOVICIAN OR CAMBRIAN

Potsdam or Nepean Formation: Sandstone.

Unconformity

PRECAMBRIAN

PLUTONIC ROCKS

Diabase and porphyritic andesite dikes.
Granite gneiss, migmatite, granitized gneiss, hybrid granite gneiss, granite pegmatite.
Granite and syenite.
Grey granite, granite gneiss, granodiorite, tonalite.
Diorite, gabbro, metagabbro, anorthosite, amphibolite.

Intrusive Contact

METASEDIMENTARY ROCKS

Quartzite, quartzo-feldspathic rocks.
Paragneiss, pelitic and psammo-pelitic schists and gneisses.
Marble, lime silicate rocks, skarn.
Para-amphibolite, biotite-amphibole schists and gneisses.

METAVOLCANIC ROCKS

Basic volcanic rocks, greenstone, pillow lava, amphibolite.
Rhyolite and associated acid volcanic rocks.

The Precambrian rocks consist of basic and acid volcanic rocks, and metasedimentary rocks (mainly marble, para-amphibolite, paragneiss, and quartzite) intruded by basic and acidic intrusive rocks ranging in composition from gabbro to granite. Age determinations indicate that a period of orogeny, the Grenville orogeny, affecting the whole Precambrian area, took place approximately 1,000 million years ago. Some attempts have been made within certain parts of the area to set up a stratigraphic succession in the metasedimentary and metavolcanic series, particularly by Smith (1958) and Burns (1950), but no subdivisions applicable to the whole area have been made. The metasedimentary rocks in the Madoc area and in the Clare River syncline have been correlated by Wilson (1940) with the Hastings and Grenville series.

Grade of metamorphism increases from the greenschist facies in the Madoc area, through epidote-amphibolite and amphibolite facies to the east, to granulite facies in the Kingston-Gananoque area. Most of the Precambrian rocks are highly folded, metamorphosed, granitized, and faulted. Three major types of granitic intrusive rocks are recognized by lithology.

The northwesterly period of normal faulting which affected the Precambrian and Paleozoic rocks of the Ottawa-Bonnechere graben and Madawaska highlands has affected the Madoc-Gananoque area very little. The Plevna fault extends into Clarendon township in northern part of the map-area.

Strong regional northeast-trending lineaments in the Paleozoic rocks in the southern part of the map-area are continuous with faulting trends in the

Precambrian rocks. For example, the Rideau Lake fault continues southwest through Canoe, Desert, and Knowlton lakes, and its trend is marked by a strong and continuous lineament passing through the Paleozoic rocks at Odessa, west of Kingston. It is evident that strong zones of northeasterly faulting active in Precambrian times were reactivated in post-Paleozoic times.

During Pleistocene times, the whole area was glaciated and many glacial features such as eskers, drumlins, abandoned shorelines, kames, till-sheets, and moraines are present in the area.

Metavolcanic Rocks

RHYOLITE AND ASSOCIATED ACID VOLCANIC ROCKS

Pink, grey, and black rhyolite, rhyolitic tuffs and agglomerate are confined to a small area in Madoc township. Quarries have been opened in three rhyolite deposits for the production of roofing granules. Rhyolite, pyritic black schists, and massive pyrite deposits appear to form part of an acid volcanic centre association at the Queensboro pyrite mine in Madoc township.

BASIC VOLCANIC ROCKS

Large areas of basic volcanic rocks, mainly greenstone, pillow lava, and amphibole schists and gneisses, are present in the northwestern part of the map-area, particularly in Madoc, Elzevir, Grimsthorpe, Anglesea, Barrie, Palmerston, Hungerford, Kaladar, and Kennebec townships. Pillowed tops are found in the western part of the area where metamorphic grade is lower. Agglomerate and tuff are common in Barrie township. Basic volcanic belts may be traced from Barrie township through Clarendon and Palmerston townships, but in these latter areas volcanic features are lacking and the rocks are amphibolite. Burns (1950) has interpreted several bands of amphibolite in the Clare River syncline as of volcanic origin and they are so shown on the map.

Where definite evidence of a volcanic origin is lacking, the amphibolites are classed as para-amphibolite.

Metasedimentary Rocks

PARA-AMPHIBOLITE, BIOTITE-AMPHIBOLE SCHISTS AND GNEISSES

The para-amphibolites are fine-to medium-grained equigranular rocks composed predominantly of hornblende and plagioclase (usually andesine or oligoclase). Biotite, pyroxene, scapolite, titanite, and garnet are characterizing accessories; carbonate, vesuvianite, epidote, quartz, pyrite, magnetite, and apatite may occur as minor accessories. Included in this lithologic group is pyroxene granulite composed of pyroxene and plagioclase. There is a complete gradation from pyroxene amphibolite to pyroxene granulite. The pyroxene is usually augite or dark-green diopside. Texturally these rocks are usually even-grained and granoblastic, consisting of a mosaic of hornblende, pyroxene, and plagioclase.

The amphibolites and pyroxene granulites are frequently interbedded with marble and paragneiss and grade into these rocks.

Rocks of the para-amphibolite lithologic group are more common in the central portion of the map-area.

MARBLE, LIME SILICATE ROCKS, SKARN

Dolomitic and calcitic marble grading from fine to coarse in crystallinity is common throughout the map-area. All gradations from pure marble through

silicated marble, containing abundant diopside, tremolite, phlogopite, and other silicate minerals, to lime silicate rocks derived by the contact metamorphism of crystalline limestone or dolomite, are present. The marbles range in colour from white to grey or black, buff, pink, green, yellow, and blue. In the Madoc area an important marble-quarrying industry exists largely to supply terrazzo chips of various colours.

The marbles are frequently well-bedded or banded, but some coarsely crystalline varieties show flowage foliation. Marble tectonic breccias are often found in which fragments of other rocks such as amphibolite, paragneiss, quartzite, granite and pegmatite occur in a marble matrix.

Silicated marble contains up to 50 percent of the following minerals: diopside, tremolite, phlogopite, scapolite, serpentine, vesuvianite, garnet, quartz, feldspar, pyrite, pyrrhotite, apatite, chondrodite, spinel, titanite, and graphite. Lime silicate rock is a general term for rocks composed predominantly of lime silicates; these are generally the products of contact metamorphism or metasomatism of marble. Skarn and metamorphic pyroxenite are varieties of lime silicate rock. Skarn is an iron-rich metasomatic rock developed from marble, consisting of combinations of carbonate, diopside, augite, hornblende, scapolite, garnet, magnetite and sulphides. Phlogopite, vesuvianite, spinel, apatite, wollastonite, and forsterite may be present in skarn zones. It is essentially an iron-rich contact metamorphic deposit developed from marble. Metamorphic pyroxenite is a medium- to coarse-grained or pegmatitic rock consisting primarily of diopside or augite, usually accompanied by phlogopite, apatite, carbonate, scapolite, titanite, pyrite, and feldspar. Important phlogopite-apatite deposits in North Burgess, South Burgess, South Crosby, Bedford, Hinchinbrooke, and Loughborough townships are in pegmatitic metamorphic pyroxenites.

Narrow bands of marble in granite in southwest Hinchinbrooke township contain brucite. Blue-grey well-bedded fine crystalline marbles which have suffered only low-grade metamorphism are present in the Madoc area and in Dalhousie township.

PARAGNEISS, PELITIC AND PSAMMO-PELITIC SCHISTS AND GNEISSES

Paragneiss and pelitic and psammo-pelitic schists are derived by the metamorphism of argillaceous and sandy argillaceous rocks. These rocks consist essentially of quartz, biotite, microcline and plagioclase, with or without hornblende, often accompanied by characterizing accessories such as garnet, sillimanite, kyanite, staurolite, cordierite, hypersthene, or graphite. Scapolite, pyroxene, tourmaline, epidote, zoisite, titanite, magnetite, pyrite, zircon, apatite, and carbonate are sometimes present.

The paragneisses are medium-grained, equigranular in texture, with a pronounced gneissic banded or bedded structure. The pelitic and psammo-pelitic schists are fine-grained. Rusty-weathering slates are present in Barrie township. The paragneisses show varied degrees of granitization, particularly in the Mallorytown area.

QUARTZITE

The psammo-pelitic rocks and the marbles are interbedded with quartzite. Interbedded quartzite and marble is particularly common in the Westport and Gananoque map-areas. Quartzite described by Smith (1958, p. 10) shows excellent crossbedding. White to buff quartzite in varying stages of granitization is abundant in the Brockville-Mallorytown area where it occurs in thicknesses up

to 4,000 feet (Wynne-Edwards 1963). White linear quartzite ridges are a feature of the topography in the Gananoque and Lyn areas.

CONGLOMERATE

Conglomerate bands that are correlated by some geologists with the Hastings Series are present in the Madoc, Flinton, and Clare River areas in the western part of the map-area; *see* Meen (1944, p. 19); Burns (1951); Miller and Knight (1914); Harding (1944, pp. 65-67); Wilson (1940); Smith (1958).

Work by Burns (1951) indicated that two and perhaps three distinct conglomerate units are present in the Clare River area. Burns, using local stratigraphic names, has divided the rocks of the Clare River area into 4 groups: Elzevir, Flinton, Kaladar, and Tweed.

Plutonic Rocks BASIC INTRUSIVE ROCKS

Included in the basic intrusive group are quartz diorite, diorite, gabbro, anorthosite, metagabbro, and ortho-amphibolite. The principal basic intrusive bodies are the following:

Name	Townships	Reference
Lingham Lake quartz diorite...	Grimsthorpe.....	Meen 1944, p. 21
Skootamatta diorite.....	Anglesea.....	Meen 1944, p. 20
Dalhousie gabbro.....	Oso; Palmerston; Dalhousie..	Smith 1958, p. 20
Tichborne gabbro.....	Hinchinbrooke; Bedford.....	Harding 1951, pp. 20, 21
Attewell Lake gabbro.....	Oso; South Sherbrooke.....	Harding 1951, pp. 22, 23
Olden gabbro.....	Olden.....	Harding 1951, p. 24
Christie Lake diorite.....	South Sherbrooke.....	Wilson and Dugas 1961
Salmon Lake diorite.....	Loughborough	_____
Westport gabbro.....	North Crosby	_____

GRANITIC AND SYENITIC ROCKS

Granitic and syenitic rocks are divided into three groups on the Madoc and Gananoque sheets. The first group is grey soda-rich granite, granite gneiss, granodiorite, and tonalite. The second group is red and brown massive to porphyritic syenite and granite. The third group, which comprises the greatest amount, is pink granitic gneiss, leucogranite gneiss, granitized gneiss, migmatite, and granite pegmatite.

Grey Soda-rich Granite, Granite Gneiss, Granodiorite, Tonalite

There are three large bodies of grey soda-rich granite, granodiorite, tonalite, and granite gneiss in the western part of the report-area. They are the following:

Name	Townships	Reference
Weslemkoon granite.....	Grimsthorpe; Cashel; Effingham.....	Hewitt and James 1956, p. 27
Elzevir granite.....	Elzevir, Kaladar; Grimsthorpe; Anglesea.....	Meen 1944; Ingham and Keevil 1951
Cross Lake (Northbrook) gneiss	Kaladar; Kennebec; Barrie; Clarendon; Olden; Palmerston.....	Smith 1958, p. 21

Three thin sections of typical grey Cross Lake granite gneiss are reported by Smith (1958, p. 21) to contain 30 percent quartz, 40–50 percent plagioclase, 10–15 percent microcline, 10 percent biotite, and traces of hornblende, apatite, zircon, and sphene.

Red and Brown Massive Syenite and Granite

There are many bodies of massive to porphyritic red to brown syenite and granite in the map-area, and they may be distinguished lithologically from the prevalent pink granitic gneisses. The principal bodies recognized are the following:

Name	Townships	Reference
Lingham Lake syenite.	Grimsthorpe	Meen 1944
Mount Moriah syenite	Grimsthorpe; Elzevir	Meen 1944
Skootamatta syenite	Anglesea	Meen 1944
Elphin granite	Palmerston; Dalhousie; Oso; North Sherbrooke	Smith 1958
Westport pluton	North Crosby	Wilson, Brownell, Wynne-Edwards 1959
Wolfe Lake pluton	North Crosby	Wilson, Brownell, Wynne-Edwards 1959
Rideau Lake pluton	North Burgess	Wilson, Brownell, Wynne-Edwards 1959
Newboro granite	North Crosby	Wilson, Brownell, Wynne-Edwards 1959
Battersea granite	Storrington	Wynne-Edwards 1962
Perth Road syenite	Loughborough	Wynne-Edwards 1962
Lyndhurst granite	Rear of Leeds and Lansdowne	Wilson, Brownell, Wynne-Edwards 1959
Gananoque syenite	Front of Leeds and Lansdowne; Rear of Leeds and Lansdowne; Pittsburgh	Wynne-Edwards 1962

These syenites and granites are of the Frontenac type (Wynne-Edwards 1963).

Pink Granitic Gneiss, Migmatite, Leucogranite Gneiss

Most of the granitic rocks of the area belong in this category, which includes pink granitic gneiss, leucogranite gneiss, migmatite, and granite pegmatite. Granitic rocks (Wynne-Edwards 1963) of the Rockport type are included in this group.

DIABASE AND PORPHYRITIC ANDESITE DIKES

The youngest Precambrian rocks are diabase and porphyritic andesite dikes.

Paleozoic Rocks

POTSDAM OR NEPEAN SANDSTONE

The Potsdam or Nepean sandstone of Lower Ordovician or Cambrian age rests with unconformity on the Precambrian rocks. The Potsdam Sandstone has been studied and described by Keith (1949). A basal conglomerate occurs in some areas. The sandstone is quarried for building stone in Pittsburgh and Storrington townships near Kingston, and in North Elmsley township near Perth. The sandstone has a maximum thickness of 500 feet (Wilson 1946, p. 11).

The sandstone is medium-grained, thin to massive bedded, and ranges in colour from white, to grey, buff, salmon, red, or purple.

BEEKMANTOWN GROUP

Dolomite and sandstone of the Beekmantown Group are found in the north-east part of the report-area within the Ottawa-St. Lawrence Lowland. On the east side of the Frontenac axis the Potsdam Sandstone grades upward into dolomitic sandstone and sandy dolomite of the March Formation. Wilson (1946, p. 12) places the lower contact of the March Formation at the lowest dolomitic layer. Sandstone beds within the March Formation resemble the Potsdam Sandstone. Because the Potsdam-March contact is transitional, Wilson has correlated the Potsdam (Nepean) Formation as Beekmantown in age. The March Formation is 25 to 30 feet thick (Wilson 1946).

Above the March Formation is the Oxford Formation, which is mainly a thick-bedded rusty-weathering grey dolomite, up to 300 feet thick.

BLACK RIVER AND TRENTON GROUPS

The basal formations of Paleozoic rocks throughout the southwestern part of the area in the Lake Ontario homocline belong to the Black River Group. The Black River and Trenton groups are mainly limestone and argillaceous limestone. Several feet of reddish argillaceous limestone, red shales, and arkose form the basal members of the Black River Group. The Black River and Trenton limestones are quarried for crushed stone and building stone.

Pleistocene

The whole area was glaciated in Pleistocene times. The hummocky, rocky, irregular Dummer moraines occupy parts of Huntingdon and Hungerford townships in Hastings county. Farther east, the glaciers have scoured the limestone plain and left little drift in Kingston, Portland, Storrington, Loughborough, and Camden townships. There is pronounced northeasterly glacial fluting in these townships. There is an excellent drumlin field in Hungerford and Thurlow townships in Hastings county. Two prominent and lengthy eskers, the Tweed and Marlbank eskers, are marked on Map No. 2053 (Madoc area). Shoreline features of glacial Lake Iroquois may be observed in the Tweed-Belleville area. Kames are worked for sand and gravel in the Joyceville and Seeleys Bay areas.

MINERAL OCCURRENCES IN THE MADOC-GANANOQUE AREA

FRONTENAC COUNTY, BARRIE TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Fluorspar	IX, 23				
Gold	I, 11-13 I, 16 I, 35 I, 36 V, 15 VI, 14 VI, 20 X, 16 X, 24	Cobalt Frontenac Mining Co. Pay Rock Gold mine Ore Chimney mine Camgar Mining Syn. Camgar Mining Syn. Camgar Mining Syn. Helena mine Big Dipper mine Star Gold mine	1936 1909-32 1939-40 1939-40 1939-40 1901 1904-5 1903-7		Meen 1944, p. 42 Meen 1944, p. 42 Meen 1944, p. 42 Meen 1944, p. 39 Meen 1944, p. 40 Meen 1944, p. 40 Meen 1944, p. 47 Meen 1944, p. 47 Meen 1944, p. 44
Lead-Zinc	I, 34-36 VI, 13 VIII, 10-12 IX, 8, 9	Ore Chimney mine Camgar Mining Syn. Mazinaw Base Metals International mine	1909-32 1937 1902-3	\$ 1,941	Alcock 1930, p. 154 Meen 1944, p. 40 Meen 1944, p. 41 Meen 1944, p. 41

FRONTENAC COUNTY, BEDFORD TOWNSHIP

Apatite	Concession and Lot	Name	Years of Operation	Production	Reference
	II, 4 IV, 6 VII, 7 VII, 32 X, XI, 27, 28 XII, 3 XVI, 3 XVII, 1	Bedore McLaren	1880-90 1880-90, 1943-45	1,000 tons	Harding 1951, p. 36 Spence 1920, p. 44 Spence 1920, p. 44 Harding 1951, p. 36 Harding 1951, p. 37 Spence 1920, p. 44 Spence 1920
Barite	VI, 16	Opinicon Lake Brennan	1870-72, 1892	550 tons	Spence 1920, p. 44 Harding 1951, p. 41
Feldspar	II, 1 II, 30 III, 2 III, 3	Richardson Robinson Hoppins Jenkins	1901-18, 1928-29, 1946-48 1927-30 1919-21 1902-5	228,690 tons 1,940 tons 2,884 tons	Harding 1951, p. 50 Harding 1951, p. 51 Harding 1951, p. 52 Harding 1951, p. 52

	III, 25 III, 27 IV, 4 IV, 5 IV, 28 V, 28 VII, 11	Federal Steele Wilson Wilson Kennedy Dominion Noonan	1920-21 1920 1904, 1918 1919 1915-18	4,420 tons 300 tons 145 tons	Harding 1951, p. 52 Harding 1951, p. 53 Harding 1951, p. 54 Harding 1951, p. 55 Harding 1951, p. 55 Harding 1951, p. 55
Graphite	IV, V, 4 VI, 2 VIII, 18	Desert Lake Bowden	1919		Harding 1951, p. 61 Harding 1951, p. 62 Harding 1951, p. 62
Iron	I, 4 II, III, 6 III, 3 IV, 8 IV, 28	Howse Glendower Black Lake	1869, 70 1865-88 1882-84 1890-1900	50,000 tons 4,000 tons	Harding 1951, p. 64 Harding 1951, p. 64 Ingall 1899, p. 29 Harding 1951, p. 65 Harding 1951, p. 66
Lead	IV, 12 V, 13 VI, 17 VI, 20 VII, 18 VIII, 19 VIII, 21	Murphy Murphy Murphy-Hickey Crozier Robinson Crozier			Harding 1951, p. 67 Harding 1951, p. 67 Harding 1951, p. 67 Harding 1951, p. 70 Harding 1951, p. 70 Harding 1951, p. 71 Harding 1951, p. 72
Mica	I, 8 II, 5 II, 31 III, 1 III, 15 III, 32 IV, 17 IV, 25 IV, 31 IV, 32 V, 9 V, 11 V, 13 V, 15 V, 26 V, 34 VI, 30	Fitzgerald 30 Island Lake Lunn Hoppins Lenschner Bros. Goods Island Bertrim Anderson Sangster Lake Kingston Mica W. W. Lee Burns Bedore Bobs Lake Warfel Robison	1896, 1908-10, 1942-45, 1948-50 1924, 1942 1937-38, 1944 1900 1905 1905 1904-41 1939-45 1934 1898-1909 1943-44 1943 1891, 1897-1900, 1907-28, 1945-48	1,244 tons 1 ton 320 tons	Harding 1951, p. 80 Harding 1951, p. 80 Harding 1951, p. 83 Harding 1951, p. 84 Harding 1951, p. 84 Spence 1929, p. 72 Harding 1951, p. 84 Harding 1951, p. 84 Harding 1951, p. 84 Harding 1951, p. 85 Harding 1951, p. 85 Harding 1951, p. 85 Harding 1951, p. 85 Harding 1951, p. 86 Harding 1951, p. 86 Harding 1951, p. 87 de Schmid 1912, p. 160

FRONTENAC COUNTY, BEDFORD TOWNSHIP (continued)

Metal or Mineral	Concession and Lot	Name	Year of Operation	Production	Reference
Zinc	VIII, 4, 5	Tett	1900-13, 1924	89 tons	Harding 1951, p. 87
	VIII, 6		1910		Harding 1951, p. 88
	VIII, 9	Fitzgerald	1900		Harding 1951, p. 88
	VIII, 10				Harding 1951, p. 88
	IX, 7, E. ½	Antoine	1906-9		de Schmid 1912, p. 161
	IX, 19	Butterill			Harding 1951, p. 88
	IX, 20	Patterson	1942-43		Harding 1951, p. 89
	XI, 10	Poole			de Schmid 1912, p. 161
	XIII, 4	Stoness			de Schmid 1912, p. 162
	XIII, 6	Smythe	1899-1900		de Schmid 1912, p. 163

FRONTENAC COUNTY, CLARENDON TOWNSHIP

Arsenic	IX, 23				Smith 1958, p. 39
Gold	VII, 28	Boerth	1900		Smith 1958, p. 38
	VIII, 27	Webber			Smith 1958, p. 39
Kyanite	VIII, 27				Smith 1958, p. 36
	XI, 26				Smith 1958, p. 36
Lead	IX, 27				
Pyrite	VII, 26				Smith 1958, p. 35
	VIII, 25				Smith 1958, p. 35
	VIII, 26				Smith 1958, p. 35
	XIII, 26				Smith 1958, p. 35
	XIV, 25				Smith 1958, p. 35

FRONTENAC COUNTY, HINCHINBROOKE TOWNSHIP

Apatite	I, 2 I, 29, 30 II, 2 II, 3	Hickey Eagle Lake mine Kenehan Campsall	1887-91 _____ _____	_____ _____ _____ _____	4,000 tons _____ _____ _____	Harding 1951, p. 35 Harding 1951, p. 35 Harding 1951, p. 35 Harding 1951, p. 36
Barite	I, 1	Howes	_____ _____	_____ _____	_____ _____	Harding 1951, p. 41
Brucite	XII, 3 XII, 4, 5 XII, 6	Dillon Dwyer	_____ _____ _____	_____ _____ _____	_____ _____ _____	Harding 1951, p. 44 Harding 1951, p. 44 Harding 1951, p. 44
Corundum	V, 13 VII, 11	Leslie Leslie	_____ _____ _____	_____ _____ _____	_____ _____ _____	Harding 1951, p. 47 Harding 1951, p. 47
Feldspar	III, 4 IV, 20 VII, 19 X, 3	Kenehan York Cronk Eureka	1915 1920 1918-22 1920	_____ _____ _____ _____	_____ _____ _____ _____	Harding 1951, p. 48 Harding 1951, p. 49 Harding 1951, p. 49 Harding 1951, p. 49
Iron	III, 27	Neadow	_____ _____	_____ _____	_____ _____	Harding 1951, p. 63
Marl	II, 6	Judge	_____ _____	_____ _____	_____ _____	Harding 1951, p. 73
Mica	I, 1 II, 27 II, 28 II, 30 III, 1 III, 30 X, 4	Hickey Campbell Howes Campsall Godfrey Green Dillon	1905-10 1898, 1921 1890, 1940-41 1942 1920-30	_____ _____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____ _____	Harding 1951, p. 77 Harding 1951, p. 78 Harding 1951, p. 78 Harding 1951, p. 78 Harding 1951, p. 78 Harding 1951, p. 79 Harding 1951, p. 79
Molybdenum	VIII, 26 X, 18	Sills Drader	_____ _____ _____	_____ _____ _____	_____ _____ _____	Harding 1951, p. 90 Harding 1951, p. 90
Pyrite	III, 22	_____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____	Harding 1951
Zinc	XII, 6	_____ _____	_____ _____ _____	_____ _____ _____	_____ _____ _____	_____

FRONTENAC COUNTY, KENNEBEC TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Copper	II, 11	_____	_____	_____	Harding 1944, p. 74
Gold	II, 32 V, 30	Dome Mines Gold Base Mining Corp.	1939 1939	_____	Harding 1944, p. 73 Harding 1944, p. 73
Graphite	VI, 8	_____	_____	_____	Harding 1944, p. 74
Mica	II, 17	_____	_____	_____	Harding 1944, p. 74
Molybdenum	I, 15 X, 1	_____	_____	_____	Harding 1944, p. 74 Harding, Map No. 51d
Pyrite	I, 9 X, 10	_____	_____	_____	Harding, Map No. 51d Harding, Map No. 51d

FRONTENAC COUNTY, KINGSTON TOWNSHIP

Barite	IV, 16, 17	Woodruff	_____	100 tons	Spence 1922, p. 50
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FRONTENAC COUNTY, LOUGHBOROUGH TOWNSHIP

Apatite	VII, 11, W, 1/2 IX, 5, W, 1/2 IX, 16 X, 6, 7 X, 10 X, 13	Lacey Coe Gould Lake Foxton	1882-1947 1880 1890-91 1880-? 1886-92	200 tons 100 tons 5,000 tons	Spence 1920, p. 45 Spence 1920, p. 46 Spence 1920, p. 46 Spence 1920, p. 46 Spence 1920, p. 47 Spence 1920, p. 47
Feldspar	IX, 11 X, 1, 2 XI, 1 XII, 1, 2	 Gardner Freeman or Imperial	1920-21 1926 1920-22, 1925 1902-3, 1922-26	1,250 tons small 2,080 tons 9,660 tons	Spence 1932, p. 39 Spence 1932, p. 83 Spence 1932, p. 39 Spence 1932, p. 39

	XII, 3 XII, 5 XIII, 1 XIV, 3	Reynolds Mink Lake	1925 1913-14 1925-29, 1949-50	500 tons 8,000 tons 14,000 tons	Spence 1932, p. 39 Hewitt 1952, p. 10 Hewitt 1952, p. 10
Graphite	IX, 6				Spence 1920, p. 41
Lead	IX, 15, 16	Frontenac	1916-17	19 tons lead	Thomson 1957, p. 5
Mica	VII, 1, W. ½ VII, 3, W. ½ VII, 11 VII, 12 VIII, 6 VIII, 7 VIII, 8 VIII, 10 VIII, 12 VIII, 13 VIII, 14 IX, 1 IX, 6 IX, 7 IX, 9, N. ½ IX, 10 IX, 12 X, 1 X, 6, S. ½ X, 7, E. ½ X, 8 X, 10 XI, 18 XI, 20 XI, 22 XII, 23 XIV, 14	Freebern Lacey Bennett Serwin and White Foxton Folger Stevens New York and Ontario Amey Major Martin Birch Lake Birch Lake Reamer and Solliday Sloan Arcade Baby Gould Lake McClatchey Bear Lake Birch Lake	1899 1893-1907 1882-1921, 1944-1947 1922 1909-10, 1923 1917 1913-14 1889-97, 1909 1889-1904 1889 1909 1899 1907 1907-9 1887-?, 1909-10 1882-?, 1912-13 1898-1908 1899-1903 1900-3 1917	over 6,000 tons 166 tons 101 tons 10 tons 3,000 pounds 74 tons 8 tons	de Schmid 1912, p. 144 de Schmid 1912, p. 141 de Schmid 1912, p. 145 Spence 1929, p. 71 Spence 1929, p. 71 de Schmid 1912, p. 146 de Schmid 1912, p. 148 de Schmid 1912 de Schmid 1912, p. 149 de Schmid 1912, p. 149 de Schmid 1912, p. 149 de Schmid 1912, p. 149 de Schmid 1912, p. 153 de Schmid 1912, p. 150 de Schmid 1912, p. 150 de Schmid 1912, p. 152 de Schmid 1912, p. 153 de Schmid 1912, p. 153 de Schmid 1912, p. 153 de Schmid 1912, p. 154 de Schmid 1912, p. 154 Spence 1929, p. 71 de Schmid 1912, p. 154 Wilson 1912, p. 70
Pyrite	XIV, 7	Snooks			
Rare-element minerals	IX, 11		1920-21		Spence 1932, p. 39
Strontium	XII, 5		1907		Spence 1922, pp. 78, 79

FRONTENAC COUNTY, OLDEN TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Apatite	X, 3	Vinkle	—	—	Harding 1951, p. 33
Feldspar	XI, 17	—	1920	—	Harding 1951, p. 48
Garnet	VII, 1	Wager	—	—	Eardley-Wilmot 1927, p. 10
Gold	IV, 10	McKnight	—	—	Harding 1951, p. 57
Iron	X, 18 XI, 17	—	—	—	Harding 1951, p. 62 Harding 1951, p. 63
Marl	VII, 16 X, 14, 15	White Lake Black Lake	—	—	Harding 1951, p. 72 Harding 1951, p. 72
Mica	X, 4	Ellsworth	—	—	Harding 1951, p. 74
Molybdenum	IV, 19 VI, 6 VI, 7 IX, 24	Gray Smith Neadow Avery	1916-17 1915	—	Harding 1951, p. 89 Harding 1951, p. 89 Harding 1951, p. 89 Harding 1951, p. 90
Nickel	VI, 10	Raymond	—	—	Harding 1951, p. 57
Pyrite	VI, 15	Bertrim	1936	—	Harding 1951, p. 57
Zinc	II, 8 V, VI, 3	Smith Long Lake	1897-1915	—	Harding 1951, p. 91 Harding 1951, p. 91

FRONTENAC COUNTY, OSO TOWNSHIP

Apatite	I, 6 VI, 14	Hollywood Silver Lake mine	1885-91 1891	1,500 tons 250 tons	Harding 1951, p. 34 Harding 1951, p. 34
Barite	I, 25 VI, 16	Crawford	1908	—	Harding 1951, p. 40 Harding 1951, p. 40

Copper	IV, 31	Crain	—	—	Harding 1951, p. 46
Corundum	VI, 11 VII, 7	Palmer	—	—	Harding 1951, p. 46 Harding 1951, p. 46
Feldspar	VII, 8	Gray	1904	—	Harding 1951, p. 46
Graphite	I, 3 IV, 19	Young Harris	—	—	Harding 1951, p. 61 Harding 1951, p. 61
Mica	I, 8 II, 5 II, 8 IV, 12 IV, 13 V, 1 V, 2 V, 13 VII, 2, 3 VII, 12	Reid Brash Cook R. Gray	1925, 1930-35 1915-18 1915-20 1900	—	Harding 1951, p. 74 Harding 1951, p. 74 Harding 1951, p. 74 Harding 1951, p. 75 Harding 1951, p. 75 Harding 1951, p. 75 Harding 1951, p. 76 Harding 1951, p. 76 Harding 1951, p. 76 Harding 1951, p. 77
Pyrite	VI, 15	—	—	—	—

FRONTENAC COUNTY, PALMERSTON TOWNSHIP

Calcite	VII, 4	Marlhill	—	—	Smith 1958, p. 42
Copper; gold	IX, 1	Picamine	—	—	Smith 1958, p. 42
Garnet	II, 21	—	—	—	Eardley-Wilmot 1927, p. 29
Iron	IX, 3, 4	Robertsville	—	—	Ingall 1899, p. 29
Mica	II, 24	—	—	—	Smith 1958, pp. 37, 44
Pyrite	VIII, 15	—	—	—	—
Talc	VI, 6	—	—	—	Smith 1958, p. 45

FRONTENAC COUNTY, PITTSBURGH TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Granite	IV, 5 IV, 32	Kingston Quarries Findley	1961-62 1921-25	_____	_____
Sandstone	V, 8, 9	Kingston Quarries	1958-present	_____	_____
Silica	V, 13, 14 II, 29-32	Kingston Silica Mines Paddle quarry	1946-1953	_____	_____

FRONTENAC COUNTY, PORTLAND TOWNSHIP

Barite	VIII, IX, 5	_____	1917	_____	Spence 1922, p. 51
Feldspar	X, 1 X, 3 X, 16 XI, 16, E. ½ XI, 16, W. ½ XI, 17 XI, 18, 19 XI, 20 XII, 3, 4 XII, 5, 6 XII, 11 XIII, 1 XIII, 15	Walker Burnham Feldspar Quarries Card Feldspar Quarries Bellrock Huffmann Gamey _____ _____ _____	1902-3 1922-25 1915-19 1905-11, 1917-18 1915-21 1920-21 1907, 1927 1911, 1919-20 1902, 1906-7, 1910, 1920 1911, 1914 1925-29	_____ _____ 6,000 tons 384 tons 25,099 tons small 600 tons small _____ 6,000 tons small 800 tons small	Hewitt 1952, p. 10 Spence 1932, p. 40 Spence 1932, p. 40 Spence 1932, p. 40 Spence 1932, p. 40 Hewitt 1952, p. 10 _____ Hewitt 1952, p. 10 Hewitt 1952, p. 10 Hewitt 1952, p. 10 Spence 1932, p. 40 Hewitt 1952, p. 10
Garnet	XI, 12 XI, 14, W. ½	Ludbrook Card	_____	_____	Eardley-Wilmot 1927, p. 10 Eardley-Wilmot 1927, p. 11
Iron	X, 5 X, 7	_____	_____	_____	Ingall 1899, p. 78 Ingall 1899, p. 78
Mica	X, 1	Redmond	1909	_____	Spence 1929, p. 69

FRONTENAC COUNTY, STORINGTON TOWNSHIP

Apatite	VI, 14 XIV, 2 XIV, 4, 5 XIV, 18 XV, 21	Morris Mace Bawden Opinicon	1880 1885-1900 1888-92	300 tons 500 tons 1,500 tons	Spence 1920, p. 49 Spence 1920, p. 50 Spence 1920, p. 50
Feldspar	XIII, 7, 8, 9	Rock Lake	1921-26	2,500 tons	Spence 1932, p. 40
Iron	IX, 14 X, 20	Ernis Equitable	_____	_____	Ingall 1899, p. 76
Mica	XII, 8 XIV, 5 XIV, 8 XIV, 9 XV, 1 XV, 15	Boal Bawden Rowan Kent and Stoness	1885-1900 1892-1910	_____	O.B.M. 1901, p. 135 Spence 1920, p. 50 Spence 1929, p. 71 de Schmid 1912, p. 155 Spence 1929, p. 71
Sandstone	VI, 11 VIII, 18 IX, 14	Kingston Quarries Argo Block Co. Credit Valley Quarries	1958-present 1961-62 1961	_____	_____

HASTINGS COUNTY, ELZEVR TOWNSHIP

Actinolite	VII, 4 VII, 5 XI, 7 XI, 8	_____	_____	_____	_____
Garnet	II, 2	_____	_____	_____	Eardley-Wilmot 1927, p. 12
Gold	IV, 2 IV, 25	Silver King	1904	_____	_____
Marble	I, 7	Bonter Marble Co.	1962	_____	_____

HASTINGS COUNTY, GRIMSTHORPE TOWNSHIP

Talc	V, 9	_____	_____	_____	Spence 1940, p. 75
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HASTINGS COUNTY, HUNGERFORD TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Limestone	XI, 12	Lajoie	_____	_____	Gouge 1938, p. 95
Marl	I, 30-34 II, 30-32	Lime Lake Dry Lake	_____	_____	_____
Pyrite	XI, 21 XII, 23 XII, 26	Ontario Sulphur Mines Hungerford mine Canada mine	1908-11 1903-? 1907	_____	Janes 1952, p. 38 Janes 1952, p. 37 Janes 1952, p. 37

HASTINGS COUNTY, HUNTINGDON TOWNSHIP

Fluorspar	VIII, 18 IX, 15	Palmateer Jones	1942 1917	44 tons	Wilson 1929, p. 48 Wilson 1929, p. 49	
	XI, 14, E, ½	Howard	1918-20, 1929, 1940-44	2,500 tons 1,150 tons	Wilson 1929, p. 49 Wilson 1929, p. 49	
Fluorspar	XI, 14, W, ½ XI, 15 XII, 10	Johnson Wright Blakeley	1918-20, 1928, 1941-47	5,026 tons	Wilson 1929, p. 57	
	XII, 13	Noyes	1916-20, 1941-43	25,000 tons	Wilson 1929, p. 50	
	XIII, 7	South Reynolds	1917-18, 1943	100 tons	Wilson 1929, p. 63	
	XIII, 10	Coe	1941-42, 1960-61	114 tons	Wilson 1929, p. 63	
	XIII, 11	Perry	1915-20, 1941-43, 1952, 1960	12,000 tons	Wilson 1929, p. 59 Wilson 1929, p. 66	
	XIV, 8 XIV, 9, E, ½ XIV, 9, W, ½	North Reynolds Kilpatrick Keen	1944, 1953-59 1917-19	11,566 tons	Wilson 1929, p. 64 Wilson 1929, p. 64 Wilson 1929, p. 66	
	XIV, 10 XIV, 11	Rogers	1493-44, 1950 1910-14, 1943-51	5,000 tons 43,500 tons	Wilson 1929, p. 64 Wilson 1929, p. 66	
	Limestone	IX, 10	Crookston	1890-1927	_____	Gouge 1938, p. 94
	Talc	XIV, 14 XIV, 15	Henderson Connolly	1896-present 1912-present	_____	Wilson 1926, p. 78 Wilson 1926, p. 84
		XIV, 16	Pitt	_____	_____	Wilson 1926, p. 89

HASTINGS COUNTY, MADOC TOWNSHIP

Fluorspar	IV, 1 V, 1	Bailey Hill	1905-7, 1916-17, 1944-50	25,100 tons	Wilson 1929, p. 66 Wilson 1929, p. 67
Garnet	X, XI, 9-11				Eardley-Wilmot 1927, p. 12
Gold	X, 14, 15	Sophia			Miller and Knight 1914, p. 111
Iron	VI, 4 VI, 5 VI, 7 VII, 8	St. Charles			Rose 1958, p. 63
		Sexsmith			Miller and Knight 1914, p. 108
Marble	V, 3 V, 4 VI, 4 VI, 9 VI, 10 VIII, 12 VIII, 15 IX, 1	Madoc Marble Co. Bonter Marble Co. Stoklosar Marble Quarries Madoc Marble Co. Stoklosar Marble Quarries Stoklosar Marble Quarries Madoc Marble Co. Bonter Marble Co.	1961-62 1961-62 1961-62 1961-62 1958-62 1961-62 1962		
Pyrite	X, 9 XI, 11	Canadian Sulphur Ore Co. Blakely			Miller and Knight 1914, p. 97 Miller and Knight 1914, p. 100
Slate	V, 2 VI, 5				
Stone	VIII, 6 VIII, 8 X, 9	(Limestone) (Rhyolite) (Rhyolite)			

HASTINGS COUNTY, THURLOW TOWNSHIP

Limestone	VI, 1, 2				
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HASTINGS COUNTY, TYENDINAGA TOWNSHIP

Limestone	IV, 13				
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LANARK COUNTY, BATHURST TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Apatite	VIII, 11	_____	_____	_____	Spence 1920
Barite	VI, 12, E. ½	Palmer	1917	_____	Spence 1922, p. 52
Feldspar	I, 1	Mendels	1918	312 tons	Hewitt 1952, p. 11
	II, 1	O'Halloran	1920-21	few cars	Spence 1932, p. 41
	III, 2	Burns	1920-22	_____	Spence 1932, p. 41
	III, 5	Palmer	1922	_____	Hewitt 1952, p. 11
	IV, 4	_____	_____	_____	Spence 1932, p. 41
	VI, 10	Truelove	1920	618 tons	Hewitt 1952, p. 11
	VII, 3, 4	Kirkham	1919-21	3,140 tons	Hewitt 1952, p. 11
	VIII, 9	Charles	1928-29, 1943, 1947	_____	Spence 1932, p. 41
	VIII, 12	Foster	1929	974 tons	Spence 1932, p. 41
	VIII, 15, 16	Bathurst	1926-1950	_____	Hewitt 1952, p. 11
	VIII, 16, E. ½	Bowes	1929-30, 1944, 1950	99,450 tons	Spence 1932, p. 41
	IX, 12, W. ½	McDonald	1928-38	_____	Hewitt 1952, p. 11
	Iron	IX, 16	Furlong	1940-41, 1950	23,872 tons
IX, 18		Noonan	1929-30	1,238 tons	Hewitt 1952, p. 11
IX, 19, E. ½		_____	1921	few cars	Spence 1932, p. 42
IX, 20, 21, N. ½		Keays	1922-23	2,000 tons	Spence 1932, p. 42
IX, 20, 21, S. ½		Perth	1921-27	20,841 tons	Spence 1932, p. 42
IX, 22		Ennis	1922-26	4,685 tons	Spence 1932, p. 43
IX, 22		Ennis	1922	_____	Hewitt 1952, p. 11
Mica	IV, 2	Foley	_____	_____	Ingall 1899
	VIII, 10, 11 X, 22, 23	_____	_____	_____	I.O.C. 1924, p. 232 Ingall 1899, p. 74
	II, 21, 22 IX, X, 19	_____	1907	_____	de Schmid 1912, p. 185 Spence 1929, p. 72

LANARK COUNTY, DALHOUSIE TOWNSHIP

Iron	IV, 1	_____	_____	_____	_____
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Apatite	III, 16 IV, 11 V, 3, 4 V, 13, E. ½ V, 16 V, 18, 19 VI, 1 VII, 9 VII, 11, 12 VIII, 1 VIII, 2 VIII, 3 VIII, 4-6 IX, 4	Silver Queen Donnelly McMartin Byrnes Otty Lake MaClaren	1871 1871 1867 1903-12 1870 1871 1883 1870-74 1871, 1873, 1908 1870-75, 1907 1870, 1908 1870-1912	100 tons _____ _____ _____ 100 tons 200 tons _____ 2,000 tons 1,500 tons 350 tons _____ 1,000 tons 7,000 tons	Spence 1920, p. 50 Spence 1920, p. 51 Spence 1920, p. 51 Spence 1920, pp. 51-53 Spence 1920, p. 53 Spence 1920, p. 53 Spence 1920, p. 54 Spence 1920, p. 55 Spence 1920, p. 55 Spence 1920, p. 55 Spence 1920, p. 56 Spence 1920, p. 56 Spence 1920, p. 57
Barite	X, 20	_____	_____	_____	Spence 1922, p. 55
Feldspar	V, 13, E. ½	Silver Queen	1911-14	2,990 tons	Hewitt 1952, p. 11
Graphite	V, 24-26 (?) VI, 21, 22	Timmins Globe	1918 1870-75, 1901-2, 1908-11, 1916-20	_____	Spence 1920, p. 28
Mica	III, 16 IV, 26 V, 3 V, 4 V, 8 V, 9 V, 10 V, 11 V, 13, E. ½ V, 13, W. ½ V, 16 V, 21, E. ½ V, 24 V, 26 VI, 10 VI, 11 VI, 12 VI, 13, E. ½	Rogers Smith Mahon Blackhall Silver Queen Baby Donnelly McNally Byrnes Haughan (?) Old Anthony Hanlon Old Adams Martha	1893-1909 1903-17 1898-1912, 1942 1898-99 1903-9 1893-1912 1901-5 1900-1 1907 1908 1871, 1873-74, 1906 1901-9 1901-7 1871, 1892, 1900-6, 1941-42	_____	de Schmid 1912, p. 164 de Schmid 1912, p. 165 de Schmid 1912, p. 165 de Schmid 1912, p. 166 de Schmid 1912, p. 167 de Schmid 1912, p. 167 de Schmid 1912, p. 168 de Schmid 1912, p. 168 de Schmid 1912, p. 169 de Schmid 1912, p. 170 de Schmid 1912, p. 170 de Schmid 1912, p. 170 de Schmid 1912, p. 171 de Schmid 1912, p. 172 de Schmid 1912, p. 172
				389 tons	de Schmid 1912, p. 172

LANARK COUNTY, NORTH BURGESS TOWNSHIP (continued)

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Mica (continued)	VI, 13, W. ½	Munslow	1871, 1891-1907, 1940	—	de Schmid 1912, p. 173
	VI, 18, 19	Star Hill	1910	—	de Schmid 1912, p. 174
	VI, 20, 21		1883-?, 1904-6	—	de Schmid 1912, p. 174
	VII, 9	Otter	1891, 1937,	—	de Schmid 1912, p. 175
	VII, 11		1950, 1952	—	
	VII, 12	Byrnes	1901, 1904	—	de Schmid 1912, p. 175
	VII, 20		1947	—	de Schmid 1912, p. 176
	VIII, 1	Otty Lake mine	1871, 1873,	—	
	VIII, 2		1908-10	—	de Schmid 1912, p. 176
	VIII, 3	Anglo-Canadian	1907-12	—	de Schmid 1912, p. 177
	VIII, 4	Cordick	1908, 1917	—	de Schmid 1912, p. 178
	VIII, 4, 5, 6	MacLaren	1906-18	—	de Schmid 1912, p. 178
	VIII, 7	Adams	1892	—	de Schmid 1912, p. 179
	IX, 4			—	de Schmid 1912, p. 179
	IX, 6, E. ½		1906	—	de Schmid 1912, p. 180
	IX, 7, E. ½		1905	—	de Schmid 1912, p. 180
	IX, 14	Murphy	1907	—	de Schmid 1912, p. 180
	IX, 16, 17	Pike Lake	1860, 1892, 1902	—	de Schmid 1912, p. 181
Rare-element minerals	V, 8			—	Ellsworth 1932, p. 237
Vermiculite	VIII, 17	Olympus	1950-61	—	Guillet 1962, p. 7
	IX, 14	Farrell	1951	—	Guillet 1962, p. 11
	IX, 17	Smith	1961	—	Guillet 1962, p. 13
Zircon	VIII, 4			—	

LANARK COUNTY, NORTH ELSMLEY TOWNSHIP

Apatite; Mica	VIII, 25		prior to 1870	100 tons	Spence 1920, p. 58
Graphite	VI, 21, 22	Globe	1870-75, 1901-3, 1916-20	—	Spence 1920, p. 29
Mica	IX, 25	Gibson	1901	—	de Schmid 1912, p. 186

LANARK COUNTY, SOUTH SHELBURNE TOWNSHIP

Corundum	VI, 1-12	Orser-Kraft			Eardley-Wilmot 1927, p. 19
Euxenite	V, 13				Ellsworth 1932, pp. 233-36
Feldspar	IV, 10 V, VI, 12, 13 VI, 15 VI, 17 VIII, 11	Morrow Patterson Munroe	1919-20 1916-23 1920 1916 1920	2,836 tons 100 tons	Spence 1932, p. 87 Spence 1932, p. 43 O.D.M. 1921, p. 130 O.B.M. 1917, p. 141 O.D.M. 1920, p. 113
Gold	II, 12, N. ½				Miller 1902, p. 204
Iron	I, 3 III, 18-20 IV, 16 VII, 16 VIII, 13	Bygrove Fournier Christie Lake Silver Lake Ritchie Morrow	1873		I.O.C. 1924, p. 231 I.O.C. 1924, p. 231 I.O.C. 1924, p. 232 I.O.C. 1924, p. 232 I.O.C. 1924, p. 232 Ingall 1899, p. 43
Mica	II, 7 II, 9 III, 4, N. ½ III, 4, S. ½ III, 7 IV, 2 IV, 8	Fowler Mills Ritchie McEwen	1909 1904 1901, 1908-9 1909 1908-11 1905		de Schmid 1912, p. 181 de Schmid 1912, p. 182 de Schmid 1912, p. 183 de Schmid 1912, p. 184 de Schmid 1912, p. 184 de Schmid 1912, p. 184 de Schmid 1912, p. 185

LEEDS COUNTY, BASTARD TOWNSHIP

Barite	X, 24				Spence 1922, p. 55
Fluorspar	I, 28	Bulger			Wilson 1929, p. 78
Graphite	I, 10 II, 7	Cornell	1959		
Iron	X, 23				Ingall 1899, p. 79
Mica	III, 1 III, 14	Martin	1937		
Silica	VII, 28				

LEEDS COUNTY, ELIZABETHTOWN TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Pyrite	II, 37	Shipman	1870	—	Wright 1923, p. 52

LEEDS COUNTY, FRONT OF ESCOTT TOWNSHIP

Mica	Tar Island	—	—	—	—
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LEEDS COUNTY, FRONT OF LEEDS AND LANSDOWNE TOWNSHIP

Granite	I, 3 II, 7 II, 8 III, 10	— — — Gordon	— — in 1920s —	— — — —	— — — Carr 1955, p. 134
Quartz crystals	III, 18, 19	—	—	—	Harrison and Fortier 1944

LEEDS COUNTY, NORTH CROSBY TOWNSHIP

Barite	II, 19	—	—	—	—
Iron	IV, 27 V, 24 VI, 1 VI, 27	Allan Matthews	— — 1860-71 —	— — — —	Ingall 1899, p. 36 Ingall 1899, p. 66 Ingall 1899, p. 66
Mica	I, 5 I, 10 I, 15 II, 7 II, 16 II, 18 III, 8 IV, 10	— — — Kane Egan Drysdale	— — — — 1904, 1908 1901-7 —	— — — — — — — —	— — — de Schmid 1912, p. 186 de Schmid 1912, p. 186 de Schmid 1912, p. 186

	V, 7 IX, 21 IX, 22	Locality	Year	Reference
Molybdenum	V, 14	Webster	1900	de Schmid 1912, p. 187
Silica	I, 1	Merkley		Eardley-Wilmot 1925, p. 115

LEEDS COUNTY, REAR OF LEEDS AND LANSDOWNE TOWNSHIP

Gold	IX, 9	Sherman		
Granite	IX, 9, 10	Lyndhurst		Carr 1955, p. 135
Lead-Zinc	VIII, 2-6			Alcock 1930, p. 141
Mica	X, 6			
Quartz crystals	VIII, 10-12; IX, 9			Harrison and Fortier 1944
Strontium	VIII, 2	O'Connor		Spence 1922, p. 79

LEEDS COUNTY, REAR OF YONGE AND ESCOTT TOWNSHIP

Marl	VIII, 13; IX, 7-9	Mud Lake		
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LEEDS COUNTY, SOUTH BURGESS TOWNSHIP

Graphite	I, 10 I, 19			Spence 1920, p. 41
Mica	I, 5 I, 7 II, 4 II, 12 III, 3 IV, 1 IV, 4	Heffron Webster Cantin	1905-6 1928 1902, 1924-26 1893 1900	de Schmid 1912, p. 188 de Schmid 1912, p. 189 47 tons 281 tons de Schmid 1912, p. 190 de Schmid 1912, p. 190

LEEDS COUNTY, SOUTH CROSBY TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Apatite; mica	VII, 14, 15	Sand Lake	1870, 1900-7	_____	de Schmid 1912, p. 187
Iron	VI, 27	Chaffey mine	1858	_____	Rose 1958, p. 12
Ochre	VI, 4	_____	_____	_____	_____

LEEDS COUNTY, SOUTH ELMSLEY TOWNSHIP

Marl	III, 25	Bass Lake	_____	_____	_____
Mica	III, 30, W. 1/2	_____	1925	270 tons	Spence 1929, p. 73

LENNOX AND ADDINGTON COUNTY, ANGLESEA TOWNSHIP

Arsenic	IV, 6 V, 7	_____	_____	_____	Meen 1944, p. 39 Meen 1944, p. 39
Gold	II, 8 III, 6	_____	_____	_____	Meen 1944, p. 38 Meen 1944, p. 38

LENNOX AND ADDINGTON COUNTY, CAMDEN TOWNSHIP

Iron	VIII, 17	Kellert		
Limestone	I, 19 I, 26 I, 41 I, 44 II, 18 IV, 26 VI, 1, 2 VI, 19 VII, 15	Roblindale Quarries		Hewitt 1960, p. 61

LENNOX AND ADDINGTON COUNTY, EFFINGHAM TOWNSHIP

Arsenic	XII, 14			Hurst 1927, p. 110
Mica	VI, 8	Orser	1938-42	Hoadley 1960, p. 87

LENNOX AND ADDINGTON COUNTY, ERNESTOWN TOWNSHIP

Limestone	VII, 20			
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LENNOX AND ADDINGTON COUNTY, KALADAR TOWNSHIP

Metal or Mineral	Concession and Lot	Name	Years of Operation	Production	Reference
Actinolite	I, 11 II, 13	Marisette	_____	_____	Harding, Map No. 51d Harding 1944, p. 72
Arsenic	V, 23	_____	_____	_____	Harding 1944, p. 72
Copper	XI, 32	_____	1939	_____	Harding 1944, p. 72
Feldspar	VII, 14	_____	_____	_____	Harding, Map No. 51d
Garnet	V, 5 V, 21	Beatty	_____	_____	Eardley-Wilmot 1927, p. 15 Harding, Map No. 51d
Gold	IV, 20 V, 23 VI, 24, 25	Ewing J. H. Stone Golden Fleece	1935-37 1939 1887, 1915-22	_____	Harding 1944, p. 72 Harding 1944, p. 72 Harding 1944, p. 70
Iron	I, 10	_____	_____	_____	Harding, Map No. 51d
Marble	VII, 10	Pulverized Marble Products	_____	_____	_____
Molybdenum	II, 13 III, 12	_____	_____	_____	Harding, Map No. 51d Harding, Map No. 51d

LENNOX AND ADDINGTON COUNTY, NORTH FREDERICKSBURG TOWNSHIP

Limestone	VII, 19	_____	_____	_____	_____
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LENNOX AND ADDINGTON COUNTY, RICHMOND TOWNSHIP

Limestone	III, 30 IV, 21 V, 21 VII, 21						
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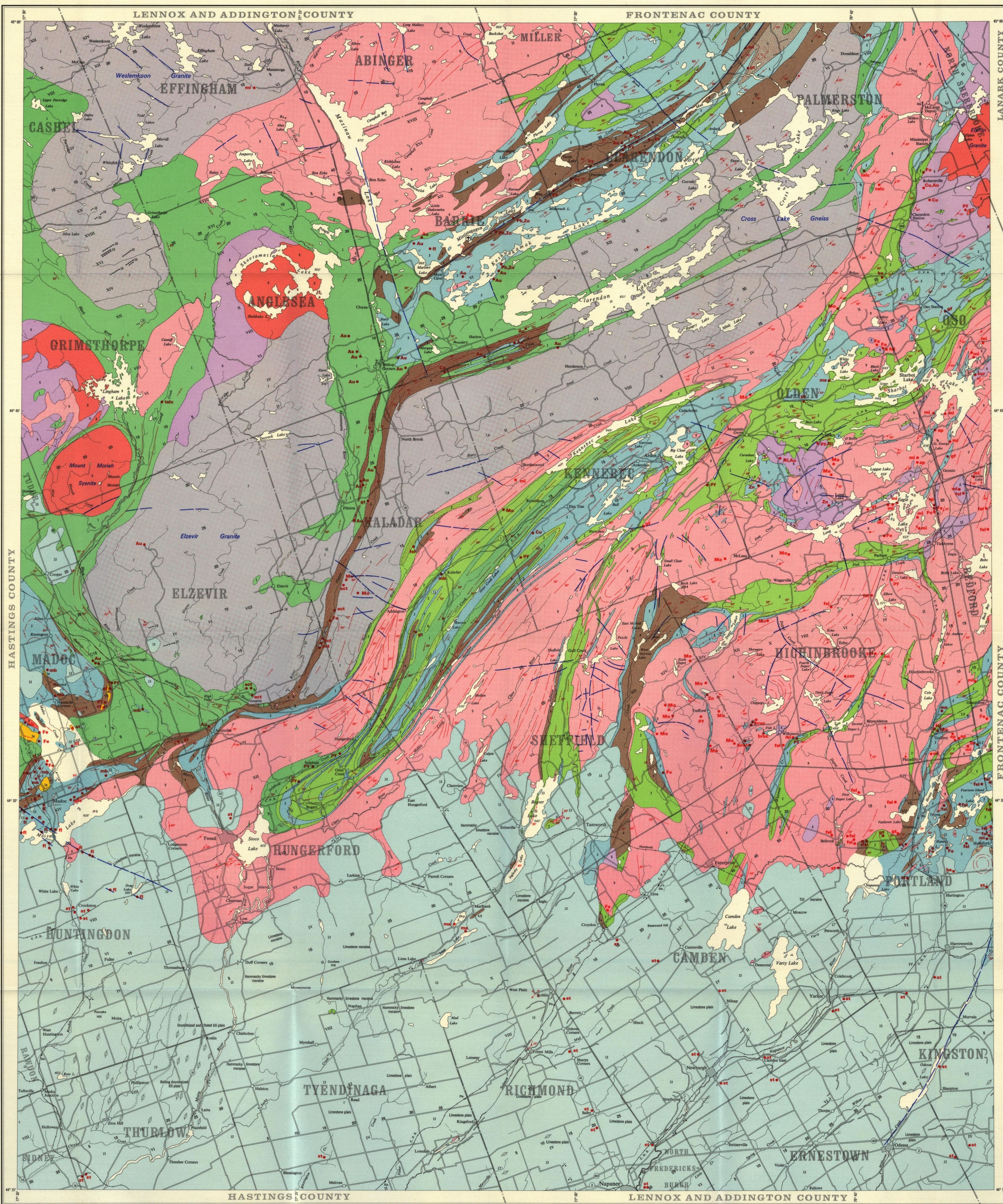
LENNOX AND ADDINGTON COUNTY, SHEFFIELD TOWNSHIP

Iron	XI, 4, 5	Sheffield Iron Mines					
Molybdenum	XII, 9, 10 XIII, 10 XIII, 11 XIII, 12 XIV, 5 XV, 4 XV, 8 XV, 12 XV, 15	Calvert Molony Oberkerk Kellar Chisholm Burns Spratt Wager	1917 1916 1904, 1915-17 1916 1915				Eardley-Wilmot 1925, p. 78 Eardley-Wilmot 1925, p. 81 Eardley-Wilmot 1925, p. 78 Eardley-Wilmot 1925, pp. 78-80 Eardley Wilmot 1925, p. 80 Eardley-Wilmot 1925, p. 81 Eardley-Wilmot 1925, p. 81 Wilson 1912
Pyrite	XIV, 8	Foley					
Zinc	XV, 10						

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SYMBOLS

- Esker.
- Drumlin.
- Outcrop shown only in areas of sand exposure.
- Geological boundary.
- Strike and dip of foliation or gneissosity.
- Strike of vertical foliation or gneissosity.
- Strike and dip of foliation or bedding.
- Strike and dip of vertical foliation or bedding.
- Horizontal foliation or bedding.
- Strike and dip of stratiform foliation.
- Strike of vertical stratiform foliation.
- Strike and dip, top in direction of arrow.
- Synclinal axis.
- Anticlinal axis.
- Direction of plunge of fold axis, crest line or trough line.
- Lineation.
- Lineament or fault.
- Limestone scarp.
- Restricted access highway with provincial highway number and access point.
- Motor road with provincial road number.
- Other road.
- Aircraft landing facilities.
- International boundary.
- County boundary, approximate location only.
- Township boundary, approximate location only.
- 700' contour.
- Sand or gravel pit.
- Mine, quarry, or mineral occurrence.

LEGEND

- CENOZOIC**
- PLEISTOCENE**
Till, moraine, drumlin, esker, kame deposits, etc.
- UNCONFORMITY**
- PALEOZOIC**
- ORDOVICIAN**
Black River & Trenton Groups
- Limestone.
- Beekmantown Group.
- Dolomite and sandstone, f.
- LOWER ORDOVICIAN OR CAMBRIAN**
Potsdam or Nepean Formation
- Sandstone.
- UNCONFORMITY**
- PRECAMBRIAN**
- PLUTONIC ROCKS**
- Diabase or porphyritic andesite dikes.
- Granitic gneiss, migmatite, granitized gneiss, hybrid granite gneiss, granite pegmatite.
- Granite and syenite.
- Grey granite, granite gneiss, granodiorite, tonalite.
- Diorite, gabbro, anorthosite, meta-gabbro, amphibolite.
- INTRUSIVE CONTACT**
- METASEDIMENTARY ROCKS**
- Quartzite, quartz-feldspathic rocks.
- Paragneiss, pelitic and psammopelitic schists and gneisses.
- Marble, lime silicate rocks, skarn.
- Pare-amphibolite, biotite-amphibolite schists and gneisses.
- METAVOLCANIC ROCKS**
- Basic volcanic rocks, greenstone, pillow lava, amphibolite.
- Rhyolite and associated acid volcanic rocks.
- Conglomerate.

*Selected glacial features are shown on the map.
†These rocks are not mapped in this sheet area.

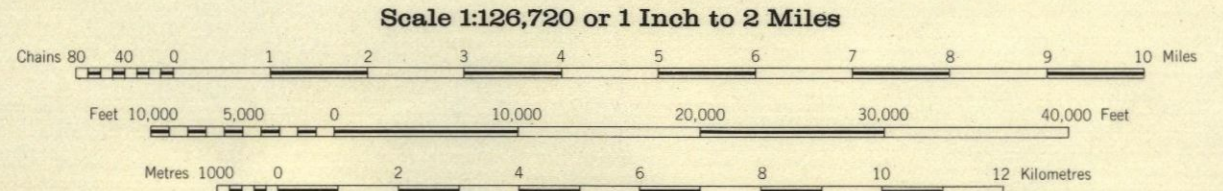
SOURCES OF INFORMATION

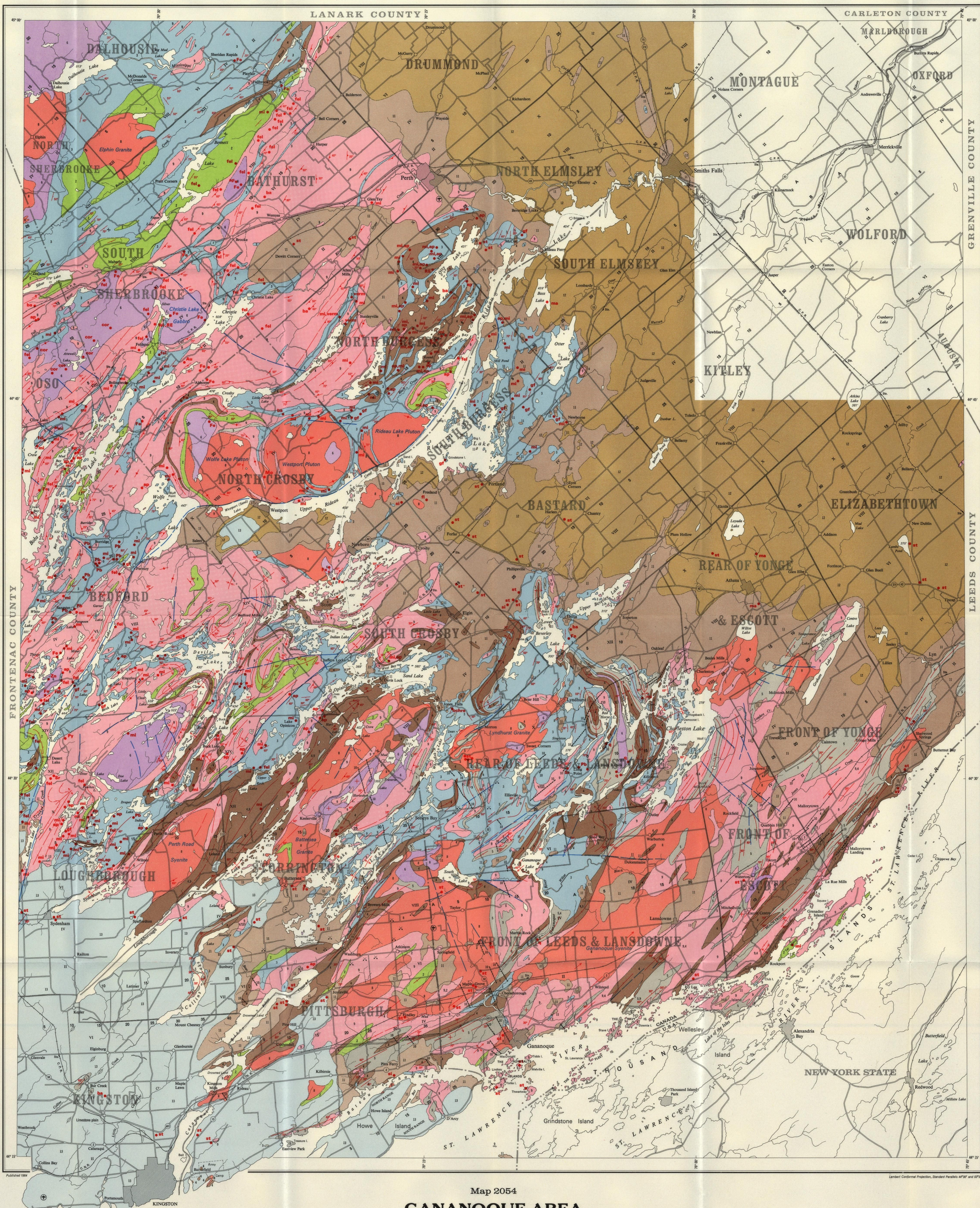
- Geological compilation and revision by D. F. Hewitt, Ontario Department of Mines, 1962.
- Geology from:
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MINERAL OCCURRENCE

- REFERENCE**
- act Actinolite
 - ag Agalite
 - as Arsenic
 - au Gold
 - ba Barite
 - bc Beryl
 - ca Calcite
 - car Carborundum
 - cu Copper
 - flu Fluorite
 - gr Graphite
 - ky Kyanite
 - al Almandine
 - mb Marble
 - mic Mica
 - mo Molybdenum
 - nick Nickel
 - py Pyrite
 - qtz Quartz
 - st Staurolite
 - si Silica
 - st Staurolite
 - sr Strontium
 - st Stone
 - tal Talc
 - ver Vermiculite
 - zn Zinc
 - zr Zircon

Map 2053
MADOC AREA
ONTARIO





SYMBOLS

- Esker.
- Drumlin.
- Outcrop; shown only in areas of scant exposure.
- Geological boundary.
- Strike and dip of foliation or gneissosity.
- Strike of vertical foliation or gneissosity.
- Strike and dip of foliation or bedding.
- Strike and dip of vertical foliation or bedding.
- Horizontal foliation or bedding.
- Strike and dip of stratiform foliation.
- Strike of vertical stratiform foliation.
- Strike and dip; top in direction of arrow.
- Synclinal axis.
- Anticlinal axis.
- Direction of plunge of fold axis, crest line or trough line.
- Lineation.
- Lineament or fault.
- Limestone scarp.
- Restricted access highway with provincial highway number and access point.
- Major road with provincial road number.
- Other road.
- Aircraft landing facilities.
- International boundary.
- County boundary, approximate location only.
- Township boundary, approximate location only.
- Altitude.
- Sand or gravel pit.
- Mine, quarry, or mineral occurrence.

MINERAL OCCURRENCE

- REFERENCE**
- act Actinolite
 - am Amibolite
 - an Anorthite
 - as Apatite
 - bc Biotite
 - br Biotite
 - ca Calcite
 - co Corundum
 - cp Copper
 - eu Euclase
 - fs Feldspar
 - fl Fluorite
 - gr Garnet
 - ky Kyanite
 - ma Magnetite
 - mi Mica
 - mo Molybdenum
 - ni Nickel
 - py Pyrite
 - qt Quartz
 - se Serpentine
 - st Strontium
 - st Stone
 - ta Talc
 - ve Vermiculite
 - zn Zinc

LEGEND

- CENOZOIC**
PLEISTOCENE*
Till, moraine, drumlin, esker, kame deposits, etc.
- UNCONFORMITY**
Black River & Trenton Groups
- PALEOZOIC**
ORDOVICIAN
11 Limestone.
12 Beekmantown Group.
13 Dolomite and sandstone.
- LOWER ORDOVICIAN OR CAMBRIAN**
14 Potsdam or Nepean Formation.
15 Sandstone.
- UNCONFORMITY**
- PRECAMBRIAN**
PLUTONIC ROCKS
16 Diabase or porphyritic andesite dikes.
17 Granitic gneiss, migmatite, granitized gneiss, hybrid granite gneiss, granite pegmatite.
18 Granite and gneiss.
19 Grey granite, granitic gneiss, granodiorite, tonalite, ?
20 Diorite, gabbro, anorthosite, metabasite, amphibolite.
- INTRUSIVE CONTACT**
21 Quartzite, quartz-feldspathic rocks.
22 Paragneiss, pelitic and psammitic schists and gneisses.
23 Marble, lime silicate rocks, slates.
24 Para-amphibolite, biotite-amphibole schists and gneisses.
- METAVOLCANIC ROCKS**
25 Basic volcanic rocks, greenstone, pillow lava, amphibolite, ?
26 Rhyolite and associated acid volcanic rocks, ?
27 Conglomerate, ?
- *Selected glacial features are shown on the map. These rocks are not mapped in this sheet area.

SOURCES OF INFORMATION

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Map 2054
GANANOQUE AREA
ONTARIO

Scale 1:126,720 or 1 Inch to 2 Miles

