ROCKS AND MINERALS
FOR THE COLLECTOR

Geological Survey of Canada
Miscellaneous Report 39

Bancroft – Parry Sound area and Southern Ontario

Ann P. Sabina

1986

Natural Resources Canada
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COVER

Left:
Betafite crystals, Silver Crater Mine, Cardiff. Specimen measures 6 cm by 4 cm by 3 cm. National Mineral Collection specimen No. 42584. National Museum of Canada photo No. 1168B. Note: actual specimen is dark brown.

Right:
Nepheline crystals, Davis Hill, Bancroft. Specimen measures 21 cm by 20 cm. National Mineral Collection specimen No. 36463. National Museum of Canada photo No. 1361. Note: actual specimen is grey with pink cast.

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Frontispiece: Bancroft Gem-Boree, 1975. Each August, Bancroft is the scene of a mineral show featuring mineral/gem dealers, specimen trading and field trips. (GSC 175332)

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Abstract

This guidebook describes mineral, rock and fossil collecting localities in two parts of Ontario, the Bancroft-Parry Sound area and in Southern Ontario. It is one of a series of guidebooks covering various areas of Canada accessible to collectors.

The Bancroft-Parry Sound region includes the world famous collecting localities in the vicinity of Bancroft along with occurrences in the Wilberforce, Tory Hill, Gooderham, Haliburton and Parry Sound areas. Inactive mines, prospect pits and road-cuts provide a variety of minerals including sodalite, nepheline, cancrinite, corundum, the feldspars, scapolite, mica, apatite, pyroxene, the amphiboles, fluorite, garnet, chondrodite, graphite, magnetite, molybdentite, zircon, betafite, pyrochlore, uraninite and uranophane. Uncommon minerals such as stillwellite, perrierite, nordstrandite, fluoborite, sinhalite, lugwigite, warwickite and tochilinite are also found. For the lapidary, there is sodalite, peristerite, amazonite, sunstone, apatite and corundum.

Southern Ontario contains the industrial mineral wealth of the Province. It produces gypsum, salt, oil, gas, and building stone. Quarries for limestone and sandstone and rock exposures are the main collecting localities for minerals, fossils and rocks. Among the common minerals to be found are calcite, dolomite, quartz, celestite, gypsum, chert, pyrite and galena. Fossils of Ordovician, Silurian and Devonian age are found in quarries and in rock out-crops along lakes, rivers and roads throughout the area.

Most of the collecting localities are inactive mines and prospects and rock exposures along roads and shorelines. In general, operating mines are not collecting areas but, in some cases, arrangements may be made for visits to the mine or to surface operations.

Résumé

Le présent ouvrage donne une description des minéraux, des roches et des fossiles recueillis dans différents endroits de deux régions de l'Ontario soit la région de Bancroft-Parry Sound et le sud de la province. Cet ouvrage fait partie d'une série de guides préparés à l'intention des collectionneurs au sujet de différentes régions du Canada.

C'est dans les environs de la région de Bancroft-Parry Sound que se trouvent les emplacements de collecte de minéraux de réputation mondiale outre les gisements des régions de Wilberforce, de Tory Hill, de Gooderham, de Haliburton et de Parry Sound. Les mines inexploitées, les fosses d'exploration et les tranchées permettent de récupérer différents minéraux notamment de la sodalite, de la néphéline, de la cancrinite, du corindon, du feldspath, de la scapolite, du mica, de l'apatite, du pyroxène, de l'amphibole, de la fluorite, du grenat, de la chondrodite, du graphite, de la magnétite, de la molybdénite, du zircon, de la bétafite, du pyrochlore, de l'uraninite et de l'uranophane. On y trouve également des minéraux rares comme de la stillwellite, de la perriérite, de la nordstrandite, de la fluoborite, de sinhalite, de la ludwigite, de la warwickite et de la tochilinite. Les lapidaires peuvent être également intéressés par la sodalite, la péristerite, l'amazonite, le feldspath aventuriné (héliolite), l'apatite et le corindon qu'on trouve dans cette région.

Les régions du sud de la province renferment les précieux minéraux industriels comme le gypse, le sel, le pétrole, le gaz naturel et la pierre de taille. Les carrières de chaux et de grès ainsi que les affleurements rocheux sont les principaux emplacements où l'on peut trouver des échantillons de minéraux, de fossiles et de roches. La calcite, la dolomie, le quartz, la célestine, le gypse, le chert, la pyrite et la galène figurent à la liste des minéraux ordinaires de ces régions qui nous livrent également des fossiles de l'Ordovicien, du Silurien et du Dévonien dans les carrières et les affleurements rocheux le long des lacs, des rivières et des routes de la région.

La plupart des emplacements sont des mines inexploitées, des fosses de prospection et des affleurements rocheux le long des routes et des rives. En général, les mines en exploitation ne peuvent être considérées comme des emplacement de collecte d'échantillons mais, dans certains cas, il est possible de s'entendre avec les propriétaires afin de visiter la mine ou les installations en surface.

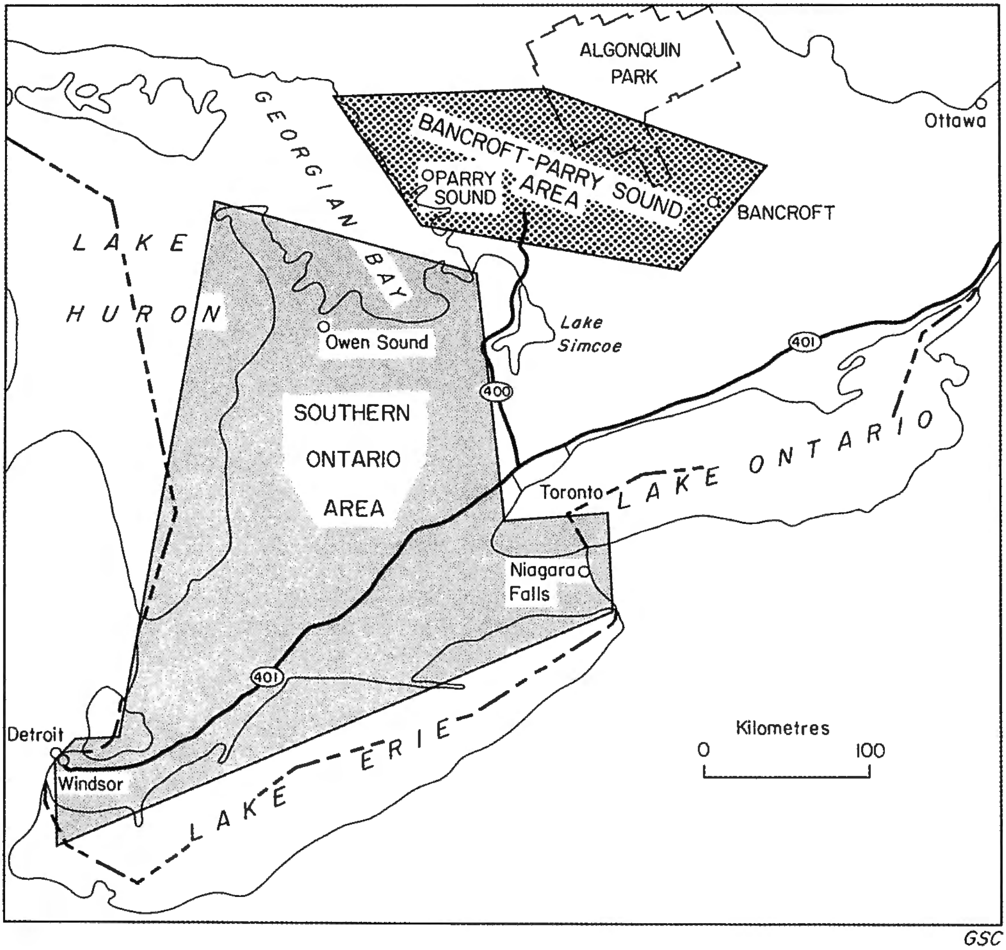

Figure 1. Map showing Bancroft-Parry Sound and Southern Ontario area

ROCKS AND MINERALS FOR THE COLLECTOR: BANCROFT – PARRY SOUND AREA SOUTHERN ONTARIO

INTRODUCTION

This guidebook describes mineral and rock occurrences in the Bancroft-Parry Sound area and in Southern Ontario. Occurrences in adjacent parts of Ontario are described in Geological Survey of Canada Miscellaneous Report 41 (Rocks and Minerals for the Collector: Hull-Maniwaki, Quebec; Ottawa-Peterborough, Ontario) amd Paper 70-50 (Rocks and Minerals for the Collector: Ottawa to North Bay, Ontario; Hull to Waltham, Quebec).

Most of the collecting localities are accessible by automobile from main roads and from secondary roads branching from them; in some cases, a short hike is required. Directions to reach each of the occurrences are given in the text, and are designed for use with the official provincial road map. Locality maps are included for deposits that may be difficult to find. Additional detailed information can be obtained from the appropriate topographic and geological maps listed for each locality. These maps are available from the agencies listed on page 157.

Many of the inactive mines have not been operated for years and entering shafts, adits, and other workings is dangerous. Collecting in operating mines may not be permitted; their descriptions are included as a point of interest to the collector. Some of the occurrences are on private property or are held by claims; their listing in this booklet does not imply permission to visit them. Please respect the rights of property owners at all times. For up-to-date information on visiting privileges to Bancroft area localities, collectors should contact the Bancroft and District Chamber of Commerce.

The localities were investigated by the author during the summer of 1975 with the able assistance of Suzanne Costaschuk. In subsequent visits to the Bancroft area assistance was provided by Valerie Williamson (1976), Wilma Nuyens (1977), Ethel Wahnon (1979) and Brigitte Bilodeau (1980). Identification of minerals by X-ray diffraction was done by A.C. Roberts and microprobe analyses by M. Bondari, both of the Geological Survey of Canada. This assistance is gratefully acknowledged.

The Collecting Localities

The collecting areas are shown in Figure 1. In the Bancroft area, collecting localities are described along highways 62 North, 28, 121, 503 and 648. The road logs along these highways are shown in bold print in the text. Numerous side trips lead from these highways. Road logs are given for occurrences in the Parry Sound area and in Southern Ontario but they do not follow any particular highway route. They generally originate in the most convenient town or city.

Information on each locality is systematically listed as follows: name of mine, quarry or occurrence; minerals or rocks found in deposit (shown in capital letters); mode of occurrence; brief description of the locality with special features of interest to the collector; location and access; references to other publications indicated by a number which is listed in the References section beginning on page 161; map references indicated by the letter T for maps of the National Topographic System and the letter G for geological maps of the Geological Survey of Canada and the Ontario Geological Survey.

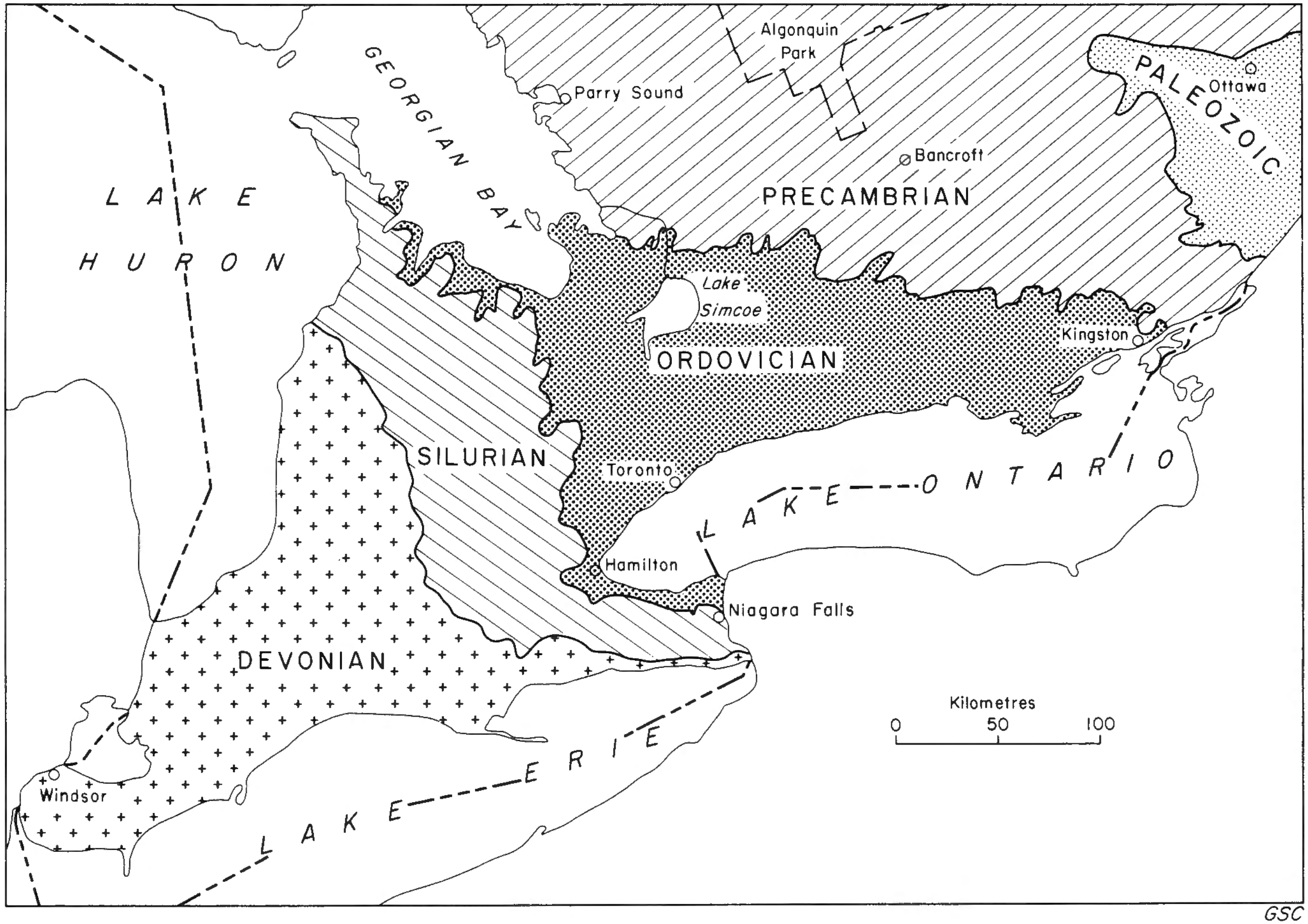

Figure 2. Geological map of the collecting area

A Brief Geological History

The guidebook area lies within two regions of striking geological contrast, the Precambrian Canadian Shield and the St. Lawrence Lowlands of Paleozoic Age. The Bancroft-Parry Sound section is in the Grenville Province, the 320-km wide southeastern section of the Shield that extends from Lake Huron to Labrador. The Southern Ontario section constitutes most of the St. Lawrence Lowlands, the region extending south from the Canadian Shield between Kingston and the southeastern tip of Georgian Bay.

The Grenville Province derives its name from the village and township of Grenville on the north shore of the Ottawa River (about midway between Ottawa and Montreal) where a group of metamorphosed sediments and igneous rocks were originally described by Sir William Logan in 1863 as the Grenville Series. Typical rock types of this group are crystalline limestone, quartzite, gneiss, granite and pegmatitic rocks.

The rocks of the Grenville Province were formed between 950 and 1700 million years ago when existing Precambrian rocks were repeatedly invaded by granitic masses producing upheaval of the crust and metamorphic changes to the invaded rocks. The last major granitic intrusion known as the Grenvillian Orogeny took place about 950 million years ago.

Later, Paleozoic seas inundated the Shield leaving a layer of sedimentary strata. During the late Paleozoic and early Mesozoic, the Shield was uplifted and the veneer of sedimentary rocks was removed by a long period of erosion that lasted until the Ice Age.

The St. Lawrence Lowlands region is underlain by Paleozoic sedimentary rocks dipping gently southwestward away from the Shield. The first rock formations were deposited by Ordovician seas advancing over the Precambrian basement. Sandstone, arkose, limestone, shale and siltstone were laid down. These rocks underlay the area extending south from the Canadian Shield to Lake Ontario and the Niagara Escarpment.

In Silurian time, seas again encroached upon the Lowland depositing limestone, sandstone and shale. In Middle Silurian time, regional crustal movements caused withdrawal of the sea except for a large basin of water which covered Southern Ontario. Material derived from the erosion of the sedimentary strata surrounding the basin was deposited in it. During this time the climate became extremely arid, the seawater evaporated causing the salinity to increase to the state where marine life became inviable and the basin became a dead sea. As the appropriate saturation points were reached, first gypsum, then salt were precipitated. Alternating beds of gypsum and salt were deposited as conditions changed from arid to wet causing fluctuations in salinity. Silurian sedimentation came to an end with the emergence of the land from the sea. Rocks of this age form the Niagara Escarpment a feature which extends from Niagara Falls to the Bruce Peninsula and Manitoulin Island.

Following a period of deformation, Devonian seas advanced and deposited formations consisting of shale, sandstone, and limestone which form the bedrock from the Niagara Escarpment to Lake Erie and Lake Huron. Withdrawal of the seas marked the close of Devonian time.

Post-Devonian local folding in Southern Ontario set the conditions for accumulation of oil and gas fields in Paleozoic strata. Erosion was the dominant feature in the St. Lawrence Lowlands from late Paleozoic time to the Ice Age. It created the dominant topographical feature of the area, the Niagara Escarpment, a cuesta of resistant Silurian strata that survived the erosional forces levelling softer Ordovician rocks.

In Pleistocene time, ice sheets advanced southward over the Shield and the Lowlands. Following their final retreat about 14 000 years ago the sea invaded the land reworking glacial sand and gravel deposits and leaving deposits of silt and clay along river valleys.

TABLE 1

EDN	ERA	PERIOD	AGE (millions of years)	ROCKS FORMED (formation: type)	WHERE TO SEE THEM
PHANEROZOIC	CENOZOIC	Quaternary	2	Gravel, sand, till	Gravel pits, shorelines
		Tertiary	63	Not represented in collecting area	
	MESOZOIC	Cretaceous	138		
		Jurassic	205		
		Triassic	240		
	PALEOZOIC	Permian	290		
		Carboniferous	360		
		Devonian		Kettle Point: shale	Ipperwash Beach
				Hamilton: limestone, shale	Thedford, Arkona
				Dundee: limestone	Port Dover quarry
				Delaware: limestone	St. Mary's quarries
				Detroit River: dolomitic limestone	Amherstburg, St. Marys, Ingersoll quarries
				Onondaga: limestone	St. Mary's quarries
				Bois Blanc: dolomitic limestone	Port Colborne, Cayuga Haldimand quarries
			410	Oriskany: sandstone	Cayuga quarry
		Silurian		Salina: shale dolomitic limestone	Grand River between Paris and Cayuga
				Guelph: dolomitic limestone	Guelph-Hespeler quarries
				Lockport-Amable: dolomitic limestone	Owen Sound-Wiarton qiarroes Vineland, Vinemount quarries
				Decew: dolomitic limestone	Thorold quarry
				Reynales: dolomitic limestone	Mount Nemo, Clappisons Cut quarries
				Manitoulin: dolomitic limestone	Glen Williams quarry
			435	Whirlpool: sandstone	Credit Valley, Deforest quarries
		Ordovician		Queenston: shale	Credit River near Glen Williams
				Whitby: shale	Craigleith
				Lindsay: limestone	Collingwood
			500	Gull River: limestone	Port McNicoll quarry
		Cambrian	570	Not represented in collecting area	
PRECAMBRIAN	PROTEROZOIC			Nepheline syenite and gneiss	Cancrinite Hill, Lily Robertson occurrences
				Nepheline pegmatite	Fraser, Gill quarries
				Granite	Hadley quarry, Highway 648 roadcuts
				Granite pegmatite	Hybla area feldspar mines
				Granite gneiss	Highways 35, 121 roadcuts
				Crystalline limestone	Highways 35, 121, 648 roadcuts
				Pyroxenite	Wilberforce, American molybdenite mine
				Amphibolite	Childs, Bessemer mines
				Biotite schist, gneiss	Parry Island garnet occurrence, Mill Lake quarry, Ruby Mine
			2500	Quartzite	Bessemer Mine
	ARCHEAN		4500	Not represented in collecting area	

Notes of Mining History

Mining in the Bancroft area began just over one hundred years ago. The earliest mining was for iron between 1875 and 1880 in the Irondale area. Other deposits were opened later near Bancroft and the largest iron producer was the Bessemer Mine which produced about 90 000 t* of magnetite ore between 1902 and 1913.

In the 1880s when exploration for apatite in Canada was at its peak due to a demand from Europe for fertilizer, several apatite deposits were opened in the Bancroft area. None of them became producers because of the larger deposits in the Perth area which were the main targets for phosphate mining in Ontario at that time. About a century later blue and green gem apatite was mined from a small deposit near Wilberforce and was marketed as the gemstone, trilliumite, so named after Ontario's floral emblem, the trillium.

In 1894 muscovite mica was mined from a pegmatite near Parry Sound. The small production included one book that weighed 45 kg. Phlogopite mica was obtained in the 1890s from several small deposits in the Wilberforce-Tory Hill area. Biotite was produced in 1927 and again from 1946 to 1951 from a mine near Cardiff. The mica was processed in a trimming shop near Bancroft.

In 1906 sodalite was produced from the Princess Mine for use as a decorative building stone. It was first exhibited as an ornamental stone at the 1893 World's Columbian Exposition in Chicago and has been used ever since by lapidairies.

The years between 1910 and 1930 provided the most diversified mining activity in the Bancroft area. After the decline of feldspar mining in the Verona district, attention shifted to the pegmatites near Bancroft. Several feldspar mines operated between 1919 and 1928 making Bancroft Ontario's third ranking producer after the Verona and Perth districts. There was also small-scale mining for graphite, fluorite, molybdenite and biotite mica. A few years later, between 1937 and 1942, nepheline syenite deposits near Bancroft and Gooderham were worked.

Following the discovery of uranium near Wilberforce in 1922, exploration led to the opening of several properties in Haliburton County but there was no commercial production during this period. More intensive exploration for uranium began in 1948 and resulted in four producing mines in the 1950s, making Bancroft the second uranium producing district in Ontario, the other being the Blind River district. One of the mines, the Faraday Mine, was reopened in 1976 and worked until 1982.

Southern Ontario has been providing the industrial mineral wealth of the province for over 150 years. Gypsum was first produced in 1822 from a deposit in the Grand River valley. Several other gypsum mines have been opened since that time including the Drumbo Mine which came into production in 1978.

A new industry sprang up in Southern Ontario when oil was discovered in Oil Springs in 1859. During the drilling boom that followed, several other oil fields were located and while drilling for oil at Goderich, in 1866, Ontario's first salt bed was encountered. Further drilling led to discoveries of salt deposits at Sarnia in 1884 and in the Windsor area in 1891.

Natural gas was encountered in wells drilled in Southern Ontario in the 1860s but it was only in the 1880s, when its use as a fuel was recognized, that gas companies were formed to exploit this resource. A Port Colborne company which was the first company to bore for natural gas in Canada struck gas in 1885. The flow, which lasted only three years, supplied some of the buildings in Port Colborne during that time. With the discovery of the Kingsville and Welland gas fields in 1889 and others in subsequent years, Ontario was established as a producer of natural gas by the turn of the century.

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*Weights referred to in text are in metric units.

The limestone and sandstone deposits of Southern Ontario have supplied fine building stone since the early 1800s. Many quarries were opened between 1824 and 1831 to provide stone for the construction of the Welland Canal. Following the completion of the Canal, the skilled stonemasons recruited from Britain became available for home and public building construction and many of the natural stone buildings in Ontario towns and villages date to the mid 1800s. The introduction of Portland cement manufacture in 1889 and of steel frame construction at about the same time brought about the decline in the use of natural stone for massive stone construction. The first brick works in Ontario were established in 1888 near Milton. In about 1900, the reinforced concrete building frame faced with a veneer of natural stone (dimension stone) or bricks was introduced. Natural stone veneer continues to be used for commercial buildings and for quality home construction.

THE BANCROFT-PARRY SOUND AREA

Road logs for the following field trips originate in Bancroft:

Bancroft to Denbigh: Highway 28

Bancroft to Maynooth: Highway 62 (See page 25)

Bancroft to Apsley: Highway 28 (See page 41)

Bancroft-Haliburton-Minden: Highway 121 (See page 48)

The localities along Highway 62 South are described in Geological Survey of Canada Paper Miscellaneous Report 41, Rocks and Minerals for the Collector: Hull-Maniwaki, Quebec; Ottawa-Peterborough, Ontario.

BANCROFT TO DENBIGH

km	**0**	Bancroft at junction Bridge Street East and Hastings Street North (Highway 62). Proceed east along Bridge Street East (Highway 28).
km	**2.7**	Junction Lakeview Road on left
km	**3.1**	*Roadcut* on left opposite Coltson Lake. Veins of pink and white calcite, containing small green apatite crystals and abundant black mica, cut syenite gneiss.
km	**3.7**	Junction single-lane road on right. This road leads to occurrences on Robertson, Cancrinite and Davis hills.

Lily Robertson Occurrence

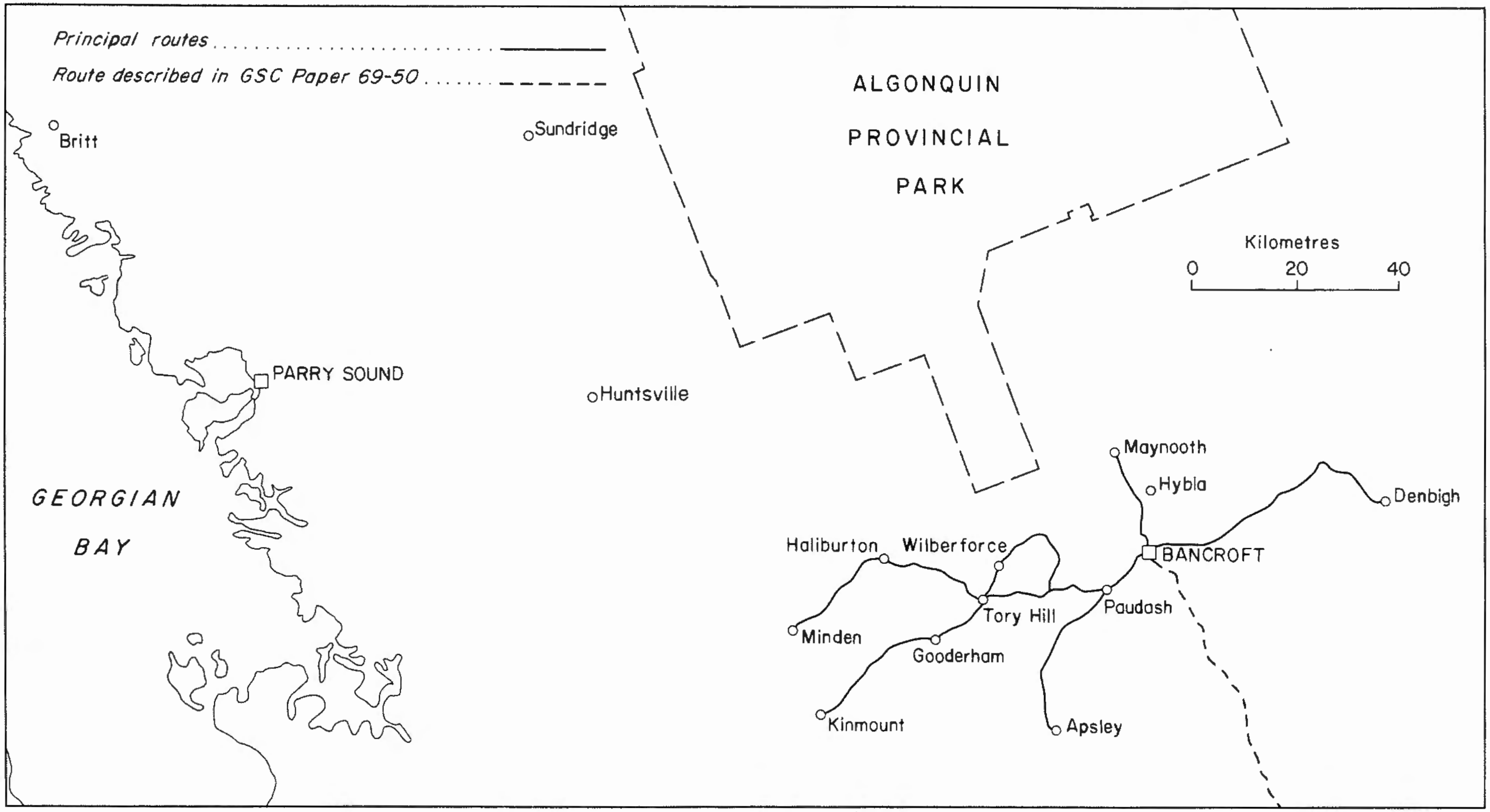
CORUNDUM, SCAPOLITE, SODALITE, SPINEL, TOURMALINE, MAGNETITE, MOLYBDENITE

In nepheline pegmatite and gneiss

Corundum occurs as blue-grey to charcoal-grey tapered prisms in nepheline pegmatite and nepheline-plagioclase gneiss. The corundum exhibits asterism when cut in the cabochon style yielding star sapphire. Crystals measuring up to 7 cm in diameter have been reported. Massive greyish blue to greyish purple scapolite and blue sodalite are associated with the corundum. Tourmaline (black crystals), spinel, magnetite and molybdenite are also present.

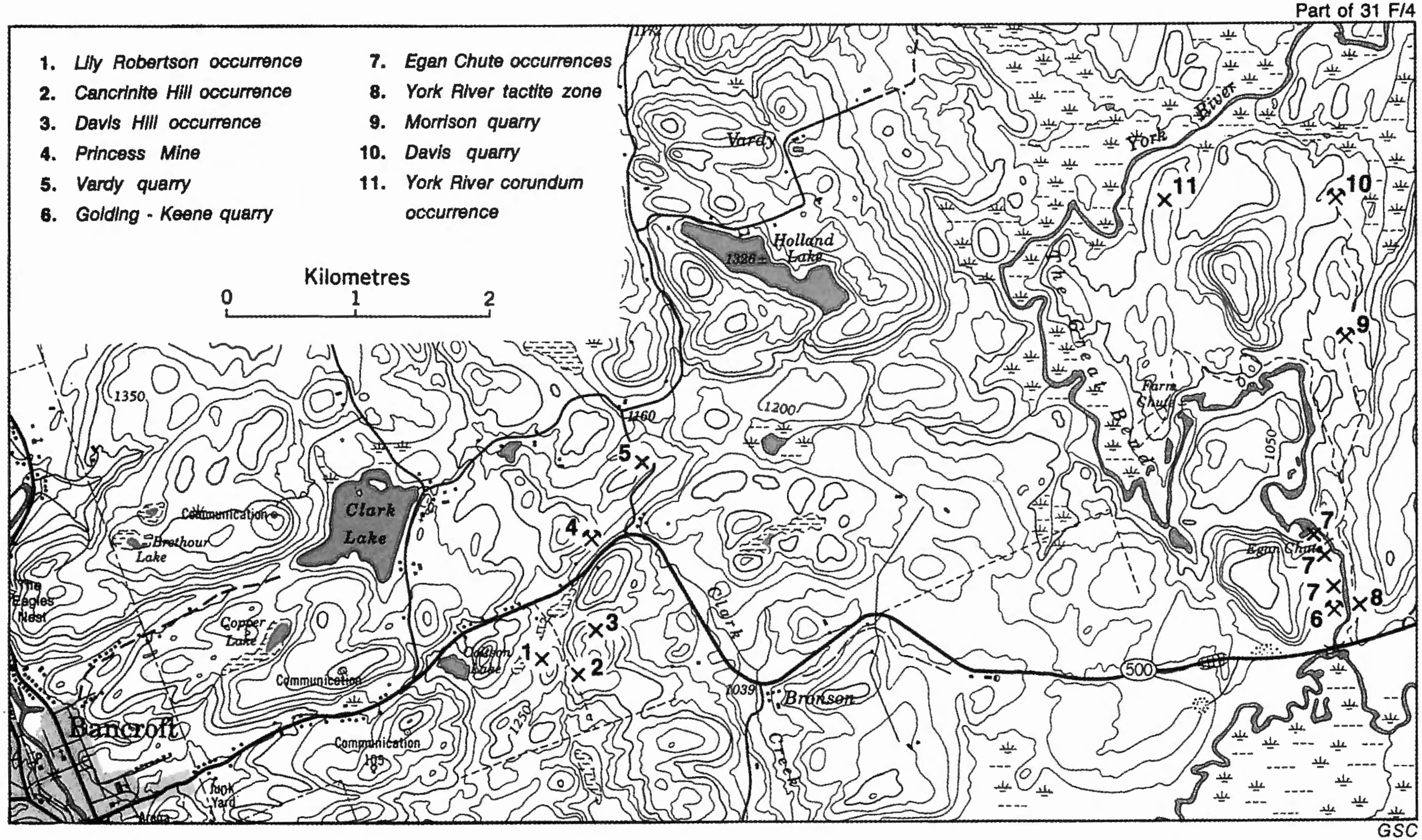
The deposit was exposed by Louis Moyd in 1947-48. The openings, on the northwest side of Robertson Hill, consist of a pit, a trench 30 m north of the pit and several other trenches to the northeast.

km	0	Proceed south along single-lane road leaving Highway 28 at **km 3.7**.
	0.2	Lily Robertson Cooney farmhouse. Proceed on foot along an old wagon road leading beyond the farmhouse and across a stream to a small clearing, a distance of about 100 m. Two footpaths lead from this clearing:



GSC

Figure 3. Map showing Bancroft-Parry Sound collecting area



Map 1. Bancroft-York River

the first on the right (west) side leads to the Lily Robertson occurrence; just beyond it another footpath branches off to the right from the wagon road and leads to Cancrinite Hill. (The wagon road continues straight ahead through and beyond the clearing.) Follow the first path on the west side of the clearing. It leads along the slope of the hill, then up the hill to the Lily Robertson openings, a distance of 500 m from the clearing.

Ref: *52* p.44.

Maps T): 31F/4 Bancroft
(G): 1955-58 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Cancrinite Hill Occurence

CANCRINITE, SODALITE, APATITE, ZIRCON, TOURMALINE, MOLYBDENITE, MAGNETITE, MONAZITE, CLEAVELANDITE, HYDRONEPHELINE

In nepheline gneiss and pegmatite

Yellow-orange to yellow-brown cancrinite occurs as cleavable masses with massive blue sodalite in biotite-nepheline-plagioclase gneiss and in nepheline pegmatitic patches developed from the gneiss. Accessory minerals include pink transparent apatite (massive), pink transparent "micro" crystals of zircon, black tourmaline, molybdenite crystals (1-2 cm in diameter) and magnetite. White cleavelandite occurs in the pegmatitic phase. Monazite and hydronepheline have also been reported.

The deposit was discovered in 1896 by A.E. Barlow and F.D. Adams while conducting a geological survey of the area. It is exposed by a pit on the steep western slope of Cancrinite Hill.

To reach the occurrence, follow the directions given for the Lily Robertson occurrence (page 7) to the clearing. From this point proceed along the second footpath branching off from the wagon road and leading south. The Cancrinite Hill occurrence is near the top of the hill, about 400 m from the clearing.

Refs: *24* p. 50A; *40* p. 69; *55* p.57.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Davis Hill Occurrence

NEPHELINE, BIOTITE, ANTIPERTHITE, MAGNETITE, APATITE, SODALITE

In calcite veins in nepheline gneiss

Large crystals of nepheline and biotite occur in coarsely crystalline calcite. Nepheline crystals measuring up to 60 cm have been reported from the deposit. The nepheline is greyish white. Biotite crystals are commonly 20 to 25 cm in diameter. Antiperthite, a lamellar intergrowth of albite and orthoclase, occurs as grey to light brownish grey crystals up to 10 cm long. Magnetite, apatite (pink massive), and sodalite form irregular patches in the nepheline gneiss.

The deposit is exposed by shallow pits near the top of Davis Hill. It was originally opened as a mica prospect in the early 1900s. To reach it follow the directions given for the Lily Robertson occurrence (p. 7). At the clearing, proceed along the old wagon road for about 300 m. At this point the road makes a sharp turn to the right; follow this road up the hill for about 320 m to the occurrence.

Ref.: *55* p. 57-60.

Maps	(T):	31 F/4 Bancroft
	(G):	1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 3.9 Turn-off (left) to Princess Sodalite Mine

Princess Sodalite Mine

SODALITE, NATROLITE, ANALCIME, DAWSONITE, NORDSTRANDITE, BOEHMITE, TOURMALINE, HYDROMAGNESITE, NEPHELINE, FELDSPAR, BIOTITE, CALCITE, CANCRINITE, APATITE, ZIRCON, CHLORITE, MAGNETITE, PYRITE, PYRRHOTITE, HEMATITE

In nepheline syenite gneiss and pegmatite

Sodalite from this deposit has been used as an ornamental stone since the 1890s. It occurs in massive form, the colour ranging from medium-dark royal blue to light blue and white. It is

Plate 1

Princess sodalite mine. Sodalite-bearing nepheline pegmatite is exposed along a wall of the open-cut.

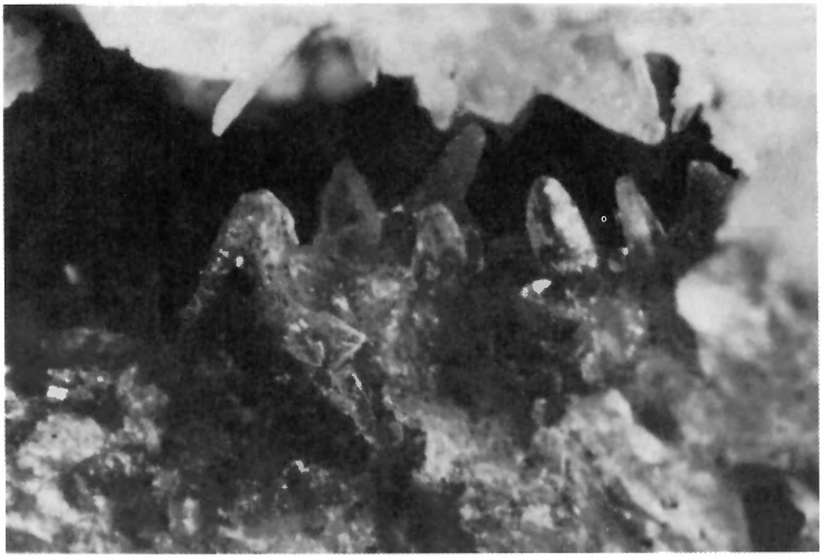


Plate 2

Nordstrandite crystal in natrolite, Princess sodalite mine. Average length of crystals is 0.5 mm. (GSC 203093-F)

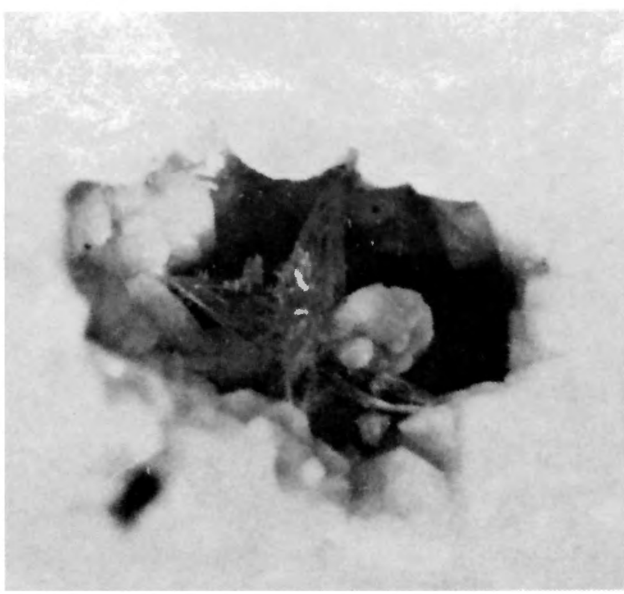


Plate 3

Tabular nordstrandite crystals in cavity lined with white natrolite crystals, Princess sodalite mine. The nordstrandite crystals are 1 mm long. (GSC 203441-W) commonly associated with orange-red, pink and white massive natrolite, which forms veinlets and irregular masses in the sodalite. Natrolite also occurs as colourless transparent acicular crystals and pearly white tabular or squat prismatic crystals lining very small cavities (averaging 5 mm in diameter) and as white to pink cross-fibre veinlets in massive natrolite and, less commonly, in sodalite. Massive white analcime occurs as irregular patches in sodalite from which it has altered. Dawsonite, boehmite, nordstrandite and tourmaline occur sparingly in natrolite, dawsonite in the pink to red natrolite, and nordstrandite and boehmite in chalky to pearly white natrolite which in the hand specimen has a weathered appearance. Dawsonite occurs as white silky fibres (about 1 mm long) forming tufts, radiating, parallel and felt-like masses, as cross-fibre veinlets and small striated masses. The dawsonite aggregates average 1 to 2 mm in diameter but may be as much as 1 cm. Nordstrandite forms colourless transparent to

Plate 4

Striated dawsonite in natrolite, Princess sodalite mine. (X25; GSC 203093-Q) slightly yellowish translucent blade-like or tabular prismatic crystals with oblique or pointed terminations. Individual crystals are about 1 mm long. They occur individually or as radiating, stellate or randomly oriented clusters in cavities (averaging 5 mm long) or as loose to compact crystalline aggregates embedded in the natrolite. Boehmite is associated with both nordstrandite and natrolite in cavities. It is white with a pearly to silky lustre and forms fluffy, flaky or granular aggregates in the cavities or wispy fibres on massive natrolite. Microscopic prisms and irregular patches of black tourmaline occur in massive natrolite. Silky white fibrous aggregates of hydromagnesite also occur in natrolite.

Minerals associated with the sodalite-natrolite masses include nepheline, feldspar (K-feldspar and plagioclase), biotite, calcite, cancrinite, apatite (yellow to light brown massive), zircon (pink turbid), chlorite, magnetite, pyrite, pyrrhotite and hematite. Crystals of nepheline occur along joint planes in the syenite.

Sodalite from this locality was first brought to attention at the 1893 World's Columbian Exposition in Chicago; a rough specimen was displayed in the Ontario Provincial exhibit and polished specimens were exhibited in the Court occupied by the Geological Survey of Canada.

The deposit was first described in a report published in 1894 by Frank D. Adams who discovered the Bancroft nepheline syenite deposits while investigating the geology of the Haliburton-Hastings area for the Geological Survey of Canada between 1892 and 1895. He noted that masses of pure sodalite measuring 10 by 10 by 4 inches occurred on the John Bowers property which later became known as the Princess Mine. The first commercial operation on the deposit was conducted in 1906 when Mr. T. Morrison of Princess Quarries Limited employed six men to extract 200 cubic feet (118 t) of sodalite for use as a decorative stone. This production was valued at $6000 and was shipped to London for use in decorating the residence of Sir Ernest Cassell, Park Lane, Hyde Park.

The original workings consisted of two open cuts, the larger measuring 30 m by 8 m. The cuts have since been extended by subsequent sporadic operations. The deposit is currently operated by Mr. Paul Rasmussen. Collecting is on a fee basis.

The mine is about 100 m north of Highway 28 at **km 3.9**. Access is by a footpath leading from the mine office and gift shop where permission for entry may be obtained.

Refs.: *1* p. 10-78; *2* p. 5; *3* p. 237-239, 392; *18* p. 185-194; *21* p. 106-107; *29* p. 4, 26; *52* p. 59; *55* p. 56-57; *59* p. 65-76; *122* p. 170-172.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km **4.6** Junction Clear Lake Road on left

Vardy Quarry

NEPHELINE, ANALCIME, BIOTITE, MAGNETITE, PYRITE, PYRRHOTITE

In nepheline-plagioclase gneiss

This quarry was worked for nepheline from 1937 to 1939. The nepheline is grey, massive and contains patches of pink to mauve analcime, an alteration product of nepheline. Accessory minerals include biotite, magnetite, pyrite and pyrrhotite.

The deposit is exposed by a quarry measuring 24 m by 12 m cut into the east side of a hill. The operator was New England Nepheline Company.

The quarry is located on the west side of the Clear Lake Road at a point 0.6 km north of Highway 28 at **km 4.6**.

Refs.: *40* p.5, 69; *52* p. 59.

Maps	(T):	F/4 Bancroft
	(G):	1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**5.9**	*Roadcut* on right exposes pink hornblende syenite containing coarsely crystalline aggregates of black hornblende.
km	**10.6**	Junction single-lane road on left

Golding-Keene Quarry

NEPHELINE, BIOTITE, CALCITE, CANCRINITE, SCAPOLITE, SODALITE, NATROLITE, ZIRCON, APATITE, PYRITE, GRAPHITE

In nepheline-plagioclase pegmatite

Grey nepheline and white plagioclase are the chief constituents of the pegmatite. Biotite and calcite are the main accessory minerals. Other minerals in the deposit include: pink and white massive cancrinite, white massive scapolite, blue massive sodalite, orange-red to pink natrolite, pink microscopic crystals of zircon, light green apatite, pyrite and graphite. Microscopic crystals of colourless to white natrolite line small cavities measuring up to 5 mm long in massive natrolite. The scapolite fluoresces pinkish orange when exposed to "short wave" ultaviolet light.

The deposit was worked for nepheline from 1927 to 1939 by New England Nepheline Company, an affiliate of the Golding-Keene Company Inc. of Keene, New Hampshire. The quarry, which is 25 m long, 18 m wide with a 12-m face, was cut into east side of a hill of the west bank of the York River.

Road log from Highway 28 at **km 10.6**:

km	0	Proceed north along the single-lane road.
	0.5	Golding-Keene quarry on left.

Refs.: *40* p. 75-76; *52* p. 57-58.

Maps	(T):	31 F/4 Bancroft
	(G):	1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Egan Chute Occurrences

CORUNDUM, SODALITE, CANCRINITE, SCAPOLITE, ANALCIME, TOURMALINE, ZIRCON, CALCITE, PYRITE

In nepheline-plagioclase gneiss

These minerals occur in exposures along the west side of the York River in the vicinity of Egan Chute, a waterfall in the York River. Blue-grey to grey corundum crystals measuring up to 5 cm long have been reported from one of the exposures; most of the crystals available are much smaller. The corundum is associated with small patches of black tourmaline, white to greyish or yellowish scapolite and pink analcime. Sodalite occurs as small irregular masses in the gneiss which also contains pink zircon and white calcite (fluoresces pink under "short" ultraviolet rays). At another exposure, yellow massive cancrinite is associated with white to pink analcime, biotite and pyrite.

To reach the exposures continue along the road leading north from the Golding-Keene quarry. The first outcrop which exposes cancrinite-bearing gneiss is on the left side of the road, 150 m from the quarry. The road ends 150 m beyond this outcrop. A path continues along the river bank; follow it for 200 m to the sodalite occurrence and another 70 m to the corundum occurrence.

Ref.: *40* p. 76.

Maps	(T):	31 F/4 Bancroft 1955-58 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**10.9**	Bridge over York River *Roadcut* on the north side of the highway at the bridge exposes crystalline limestone containing disseminated grains of orange-yellow to grey olivine, black spinel (as microscopic octahedra), light brown clinoamphibole, amber mica, green serpentine and graphite. White peristerite occurs in nepheline pegmatite cutting amphibolite associated with the crystalline limestone.
km	**11.1**	Junction single-lane road on left. This road leads to; York River tactite zone occurrence, Morrison quarry and Davis quarry.

York River Tactite Occurrence

GARNET, VESUVIANITE, SPINEL, CLINOPYROXINE, ZIRCON, CALCITE, CANCRINITE, PLAGIOCLASE, WOLLASTONITE, SCAPOLITE, SERPENTINE, BRUCITE, TOCHILINITE, HYDROTALCITE, HYDROMAGNESITE, BRUGNATELLITE, ARAGONITE, TREMOLITE-ACTINOLITE, HORNBLENDE, OLIVINE, APATITE, MONTICELLITE, PEROVSKITE, MICA, CHLORITE, MAGNETITE, PYRRHOTITE, GRAPHITE, LUDWIGITE, PERICLASE, SODALITE

In dolomitic skarn zone

About thirty mineral species are found at this locality. The more conspicuous minerals occur as aggregates of crystals, or less commonly, as individual crystals; these include: pink to brownish orange and brown grossular garnet, yellowish green and brownish yellow to brown vesuvianite, dark green and mauve spinel, light green to olive-green clinopyroxene and pink to brownish pink zircon. These minerals are generally translucent grading to opaque as the size of the crystals increases. Blue and white calcite, colourless cancrinite and white plagioclase are common as cleavable masses. Other relatively common minerals are: colourless to white striated wollastonite, white to greenish white scapolite, yellow-green to olive-green and amber serpentine and brucite nodules measuring up to 5 mm in diameter.

The brucite nodules are commonly replaced by tochilinite or by magnetite which gives the nodules a dark grey to pitch-black colour; since they are concentrated in bands in the marble they are readily recognized. Tochilinite also occurs as a partial replacement of serpentine nodules, as greasy black streaks, as irregular patches and veinlets, and as coatings on massive serpentine. Nodules of hydrotalcite, hydromagnesite, brugnatellite and aragonite measuring 1 to 3 mm in diameter, are associated with brucite.

Minerals occurring as disseminated grains and small crystals include: yellow-orange to brownish yellow clinohumite, colourless to light green tremolite-actinolite, hornblende, colourless, pink and yellow olivine, amber apatite, colourless to light yellow and green monticellite, lustrous black perovskite (octahedra 1 to 2 mm in diameter), amber and bluish green mica, chlorite, magnetite, pyrrhotite and graphite. Dull to sub-metallic black nodules and striated prisms of ludwigite (averaging 2 mm long) occur sparingly with amber-coloured periclase. Sodalite also occurs in the deposit (pers.comm., Louis Moyd).

This mineral-bearing marble is exposed along a cliff of the east side of the York River opposite the Golding-Keene quarry and on the east side of the single-lane road that leaves Highway 28 at **km 11.1**. The distance from the highway is 0.35 km.

Refs.: *55* p.62-63; *90* p. 223-228.

Maps (T): 31 F/4 Bancroft
1955-58 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Morrison Quarry

SODALITE, CANCRINITE, CALCITE, ZIRCON, TOURMALINE, MICA

In nepheline-albite pegmatite cutting nepheline-plagiocalse gneiss

The blue variety of sodalite and the less common variety, hackmanite, occur in this deposit. The blue sodalite fluoresces pink when exposed to ultraviolet radiation. Hackmanite is pink on the freshly broken surface but fades on exposure to daylight. It fluoresces bright orange when irradiated with ultaviolet light which also produces a magenta colour in the faded specimen after an exposure of only a few minutes; this colour fades in daylight. Associated with sodalite are: yellow and light green massive cancrinite, white cleavable calcite (fluoresces pink under “short” ultraviolet rays), microscopic crystals of brownish pink zircon, irregular patches of black tourmaline, and mica (biotite and a colourless variety).

The deposit was worked for nepheline in 1939 and 1940 by the Temagami Development Company. The openings are on a nepheline syenite ridge that parallels the east side of the York River. The main quarry is on the east side of the ridge; there are two smaller quarries, one 90 m north of the main quarry and another over the hill and just west of the main one.

For access to this deposit, see road log to Davis quarry.

Ref.: *52* p. 58.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Davis Quarry

SODALITE (HACKMANITE), ZIRCON, CANCRINITE, TOURMALINE, APATITE, CALCITE, BIOTITE, MUSCOVITE, URANINITE, GALENA, ALLANITE

In nepheline-albite pegmatite

Hackmanite, the fluorescent variety of sodalite that fades on exposure to daylight, occurs in considerable quantity at this quarry. On the freshly broken surface, it is a pink to magenta colour that becomes white to light pink after a few minutes exposure to daylight. On exposure to

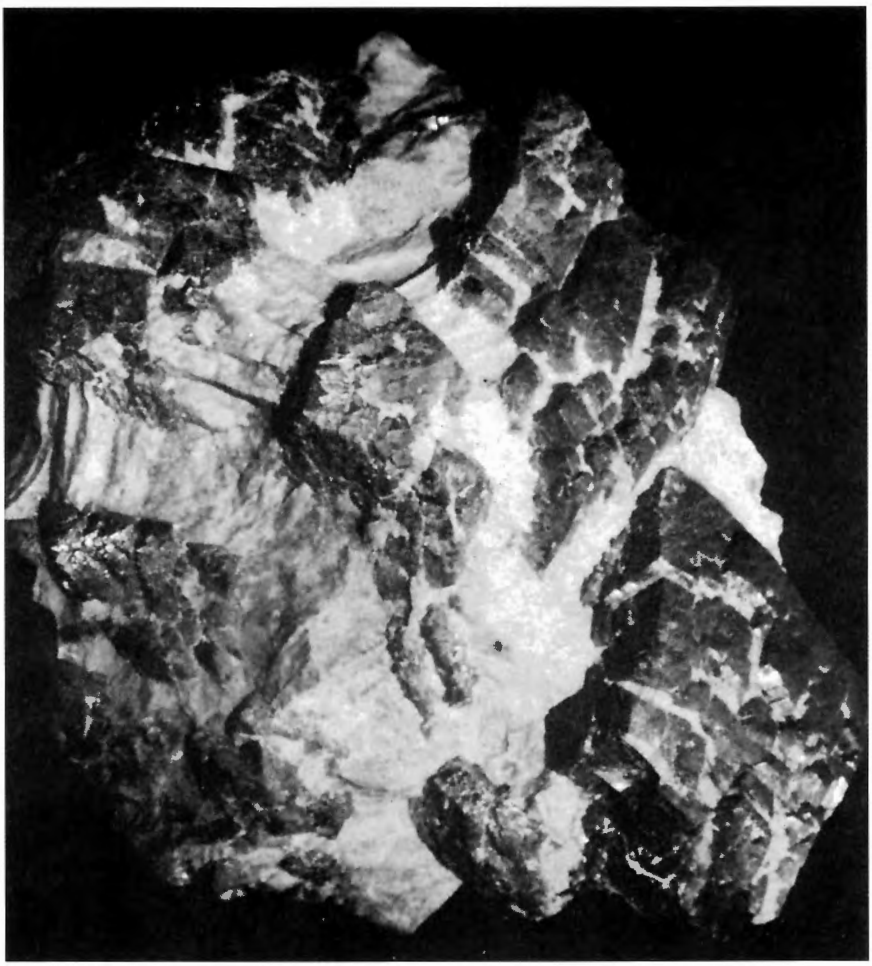


Plate 5
Cyrtolite, Davis quarry. (GSC 203369-K)

ultraviolet light it fluoresces bright orange and the irradiation causes a darkening of the colour of faded specimens to magenta which also fades in daylight. Crystal aggregates of reddish brown turbid zircon (cyrtolite variety) form masses in the rock. Accessory minerals include pink cancrinite, black tourmaline, reddish apatite, calcite (fluoresces pink in ultraviolet light), biotite, muscovite, uraninite (very small cubes associated with zircon), galena and allanite. The deposit was worked for nepheline between 1940 and 1942 by Canadian Flint and Spar Company, Limited. The quarry, named for N.B. Davis, quarry superintendent, is 30 m long and 11 m wide and was opened into the east side of the ridge.

Road log from Highway 28 at **km 11.1** (see page 16):

km	0	Proceed north onto single-lane road.
	0.35	*York River tactite zone occurrence* on right; continue straight ahead.
	1.4	Y-junction; proceed onto right fork. This is a very rough road and not recommended for vehicles with low clearance.
	2.4	*Morrison quarry*. Continue along this road to reach the Davis quarry.
	3.7	*Davis quarry*.

Refs.: *52* p. 58; *71* p. 16.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

York River Corundum Occurrence

CORUNDUM, GARNET, ZIRCON, TOURMALINE, HORNBLENDE, APATITE, BIOTITE, MUSCOVITE, SCAPOLITE

In plagioclase-scapolite gneiss

Corundum crystals measuring up to 5 cm long occur in white micaceous plagioclase-scapolite syenite gneiss. The crystals are blue transparent to translucent in the centre and grade to light blue or bluish grey toward the edges. Some gems have been cut from the crystals although fracture-free crystals are not common. Grains of brown corundum also are present along with garnet, tourmaline, zircon, hornblende, apatite, biotite and muscovite. The rock containing these minerals differs significantly from other rocks in the area and was named dungannonite a corundum-scapolite-plagoiclase (andesine)-gneiss with a low nepheline content. A specimen of corundum (sapphire variety) was exhibited at the 1901 Pan-American exhibition in Buffalo.

The corundum-bearing rock occurs along a north-south trending ridge on the south side of the York River where it forms two parallel bands 1.5 m wide and 15 m apart. It was prospected for corundum, the openings consisting of several pits and trenches, the largest being 12 m long and about 2 m wide and 1.5 m deep located at the top of the ridge, 0.4 km south of the York River.

A single-lane road leads from the Y-junction in the road to the Morrison and Davis quarries (km 1.4, above) to the south end of the dungannonite ridge, a distance of about 2.85 km. From there access is by foot (about 450 m) along an old wagon road.

Refs.: *3* p. 317-322; *52* p. 38, 44; *71* p. 19.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships. County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

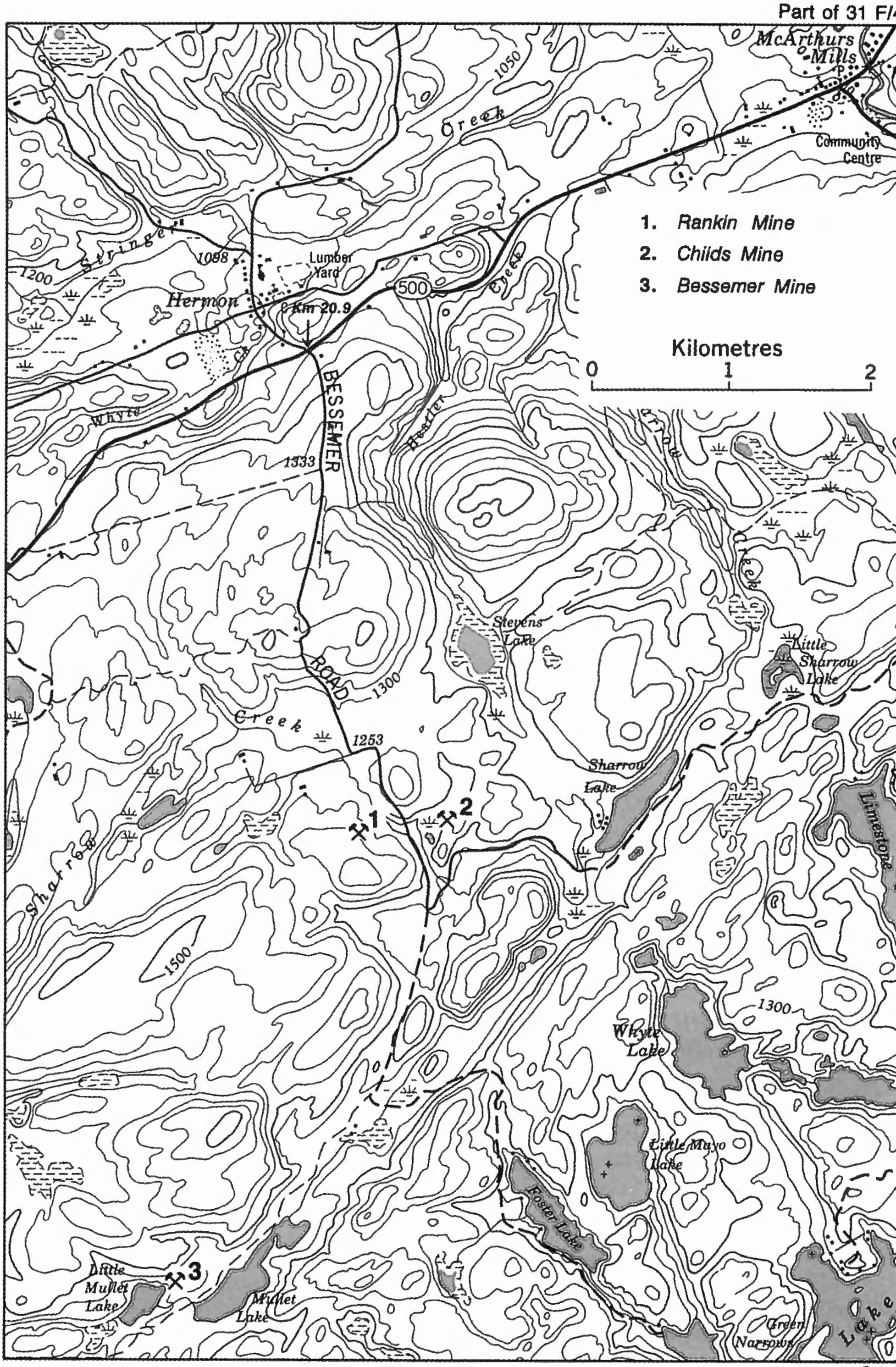
km	**11.1**	Junction road to occurrences on east side of York River (York River tactite zone occurrence, etc.)
		Road-cuts on Highway 28, just east of this junction. Crystalline limestone is disseminated with amber mica, pyrrhotite, graphite, olivine (grey, smoky violet, yellow to orange), clinopyroxene, serpentine, clinohumite (yellow to orange), clinoamphibole and spinel (dark green to black octahedra). Nodules of brugnatellite and brucite also occur in the rock; the brucite is black due to admixture with tochilinite.
km	**11.9**	*Roadcut*. Black tourmaline prisms occur in a pegmatite vein cutting amphibolite. The prisms measure up to 15 cm long and 6 cm wide.
km	**12.2-12.4**	*Road-cuts*. Finely crystalline aggregates of epidote occur in fractures in amphibolite. Actinolite, dark green pyroxene and hornblende are associated with the epidote.
km	**13.2**	*Roadcut*. Finely crystalline white gypsum forms an encrustation on amphibolite.
km	**13.8**	*Roadcuts*. Radiating blades and fibres of grey to blue-green and dark green tremolite-actinolite occur abundantly in white to pink calcite. Some of the crystals measure 1 cm in diameter. Small grains of hematite occur in the calcite.
km	**14.0**	Junction Detlor Road
km	**14.5-14.8**	*Road-cuts*. White to light green tremolite-actinolite occurs in crystalline limestone.
km	**15.7-17.0**	*Road-cuts*. Bladed aggregates of tremolite-actinolite are associated with smoky quartz, sugary green diopside, amber mica and pink, coarsely cleavable mica.
km	**18.0-18.8**	*Road-cuts*. Tremolite-actinolite, brown tourmaline, amber mica and pyrite occur in crystalline limestone.
km	**19.5**	*Road-cuts*. Acicular crystals of gypsum form tufts and botryoidal encrustations on rusty biotite-plagioclase gneiss. Goethite is associated with gypsum.
km	**20.9**	Junction Bessemer Road. This road leads to three formerly operated iron mines: the Childs, Rankin and Bessemer mines.

Childs Mine

MAGNETITE, GARNET, PYROXENE, HORNBLENDE, EPIDOTE, ZOISITE, CALCITE, PYRITE.

In skarn zone in crystalline limestone and amphibolite

Magnetite, the ore mineral, occurs as granular masses in the skarn zone and as disseminated grains in amphibolite. Pyrite is associated with it. The minerals present in the skarn zone are brown garnet, pyroxene, hornblende, epidote, zoisite and calcite.



Map 2. Bessemer Road

Work on this deposit began in 1901 when Mineral Range Iron Mining Company developed it with two open-cuts. In 1913 it was re-opened by Canada Iron Mines Limited which produced 8752 t of magnetite ore averaging 38.7 per cent iron. Some diamond drilling and surface work were done on the property in 1941 by Frobisher Exploration Company, Limited. The workings consist of three open cuts and several trenches.

For access to this occurrence, see road log to Bessemer Mine (page 23).

Refs.: *3* p. 356-358; *13* p. 260-261; *23* p. 134; *52* p. 52-53; *86* p. 32-33.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Rankin Mine

MAGNETITE, PYRITE, PYRRHOTITE, GOETHITE, JAROSITE, EPIDOTE, CALCITE, APATITE

In garnet-pyroxene skarn and hornblende schist

Magnetite occurs as granular masses and disseminated grains with minor amounts of pyrite and pyrrhotite. Rusty goethite and dull greenish black jarosite occur as coatings on the iron minerals and the host rocks. Gypsum forms a finely crystalline crust on the iron-bearing rocks. Epidote, calcite and apatite are present as finely crystalline aggregates.

A small amount of ore was removed from the deposit in about 1913 by Canada Iron Mines, Limited. The mine openings consist of an open-cut (22 m by 6 m) into the side of a hill and two trenches located 30 m and 67 m to the west of it.

Access to the deposit is given in the road log to the Bessemer Mine (p. 23).

Refs.: *23* p. 135; *52* p. 50-52; *86* p. 50-51; *97* p. 170.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Bessemer (Mayo) Mine

MAGNETITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, GARNET, EPIDOTE, PYROXENE, HORNBLENDE, CALCITE

In skarn zone in amphibolite and quartzite

Coarsely granular massive and disseminated magnetite occurs with minor pyrite, pyrrhotite and chalcopyrite in a skarn rock composed of dark brown garnet, epidote, pyroxene, hornblende and calcite. The garnet occurs as coarsely crystalline aggregates with poorly developed individual crystals.

This deposit was originally worked from 1901 to 1907 by Mineral Range Mining Company. From 1909 to 1910 it was worked by Canada Iron Corporation, and subsequently (1912-1913) by Canada Iron Mines, Limited. Total production was 90350 t of ore, the iron content varying from 49 to 61 per cent. The mine workings consist of an open cut, three open pits and a shaft, 72m deep. Ore was transported by a standard-gauge railway (Bessemer and Barry's Bay Railway) built for the purpose from the Childs Mine to the Central Ontario Railway at L'Amable station. A camp was built on the site and was known as Bessemer.

Road log from Highway 28 at **km 20.9** (see page 20):

km 0 Proceed south onto Bessemer Road.

3.9 Trail on right leads to the *Rankin Mine*.
This trail leaves the Bessemer Road on the south side of its crossing over Sharrow Creek and leads west about 300 m to the Rankin Mine open-cut at the side of a hill. There is a small mine dump near the opening.

4.2 Trail on left leads to the *Childs Mine*. To reach it, proceed along this trail for about 23 m to an old stockpile at the side of the trail; continue along the trail to a beaver dam. Cross the dam and proceed about 200 m to the mine on the ridge.

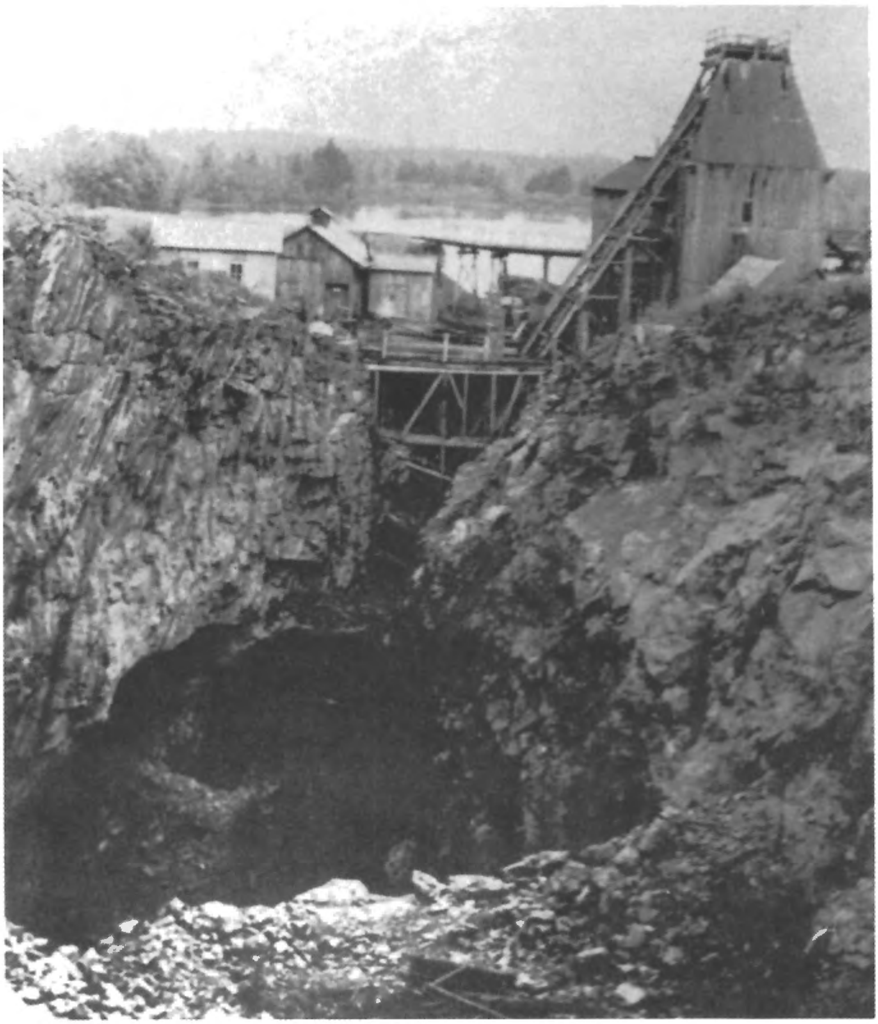


Plate 6

Bessemer Mine No. 4 workings, about 1907. The ore was hauled by a skip from the open pit, then dumped and crushed in the rock house. Later, an inclined shaft was sunk from the ore-zone. These workings supplied over 90 per cent of the magnetite ore produced by this mine. (Public Archives Canada PA124001)

6.0	Junction; turn right.
6.3	Junction trail on right opposite cottage on lake. Proceed about 200 m along this trail to the *Bessemer Mine*.

Refs.: *3* p. 357-358; *13* p. 260-261; *22* p. 126; *52* p. 46-51; *86* p. 20-22; *97* p. 167-168.

Maps (T): 31 F/4 Bancroft
(G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**22.0**	*Road-cut.* Black tourmaline crystals occur in quartz-calcite veins cutting rusty biotite-plagioclase gneiss. The rusty colour is due to goethite. Acicular gypsum forms tufts and botryoidal crusts on the rock.
km	**25.4**	Junction Hartsmere Road
km	**26.0**	McArthur Mills; junction Boulter Road. The mineral occurrences accessible from the Boulter road are described in Geological Survey of Canada Paper 70-50, Rocks and Minerals for the Collector; Ottawa to North Bay, Ontario; Hull to Waltham, Quebec.
km	**31.7**	*Road-cut.* Greyish blue tremolite occurs as prismatic aggregates in crystalline limestone. Pink calcite, pyrite and actinolite are associated with tremolite.
km	**38.5**	*Road-cuts.* Light green to white scapolite occurs as coarse prismatic aggregates in banded crystalline limestone. Crystal aggregates of dark brown tourmaline, green clinopyroxene, colourless tremolite and light green actinolite occur in the rock with amber mica, graphite and pyrite.
km	**38.5**	Junction Highway 514. This road leads to collecting localities in the Quadeville, Palmer Rapids and Combermere areas; they are described in Geological Survey of Canada Paper 70-50.
km	**46.5**	At the side of the highway (just beyond the highway bridge), there is a stockpile of biotite gneiss and schist containg red garnet crystals measuring up to 5 mm in diameter.
km	**46.7**	Junction single-lane road (on south side of highway) leading to the Ruby garnet mine.

Ruby (Jewell Ruby) Mine

GARNET

In biotite gneiss and schist

Garnet crystals measuring up to 1.5 cm in diameter occur with fibrous amphibole in biotite gneiss and schist. The colour varies from pink to red. The garnet comprises about 30 per cent of the rock.

The deposit was originally staked for garnet in 1910 by James Coyne and Thomas Ryan. J. J. Jewell and Company took over the claims in 1910 and did some exploratory work. From 1922 to 1924 Bancroft Mines Syndicate, Limited worked the deposit from a quarry; the ore was treated in a small concentrator erected on the site and over 1360 t of picked ore and concentrates were shipped to the Carborundum Company, Niagara Falls, New York for use in the manufacture of abrasive sandpaper. The quarry was opened into the side of a hill and measures 12 m by 15 m with a 4.5 m face.

Road log from Highway 28 at **km 46.7**:

km	0	Proceed onto single-lane road leading southeast.
	0.3	Junction; turn right just after crossing creek.
	0.5	Junction; turn right.
	1.2	Road bends to left.
	1.7	Ruby Mine open cut on northeast side of hill on right.

Refs.: *26* p. 26; *93* p. 126.

Maps	(T):	31 F/3 Denbigh
	(G):	2031 Ashby Township, County of Lennox and Addington, Ontario (O.G.S., 1 inch to ½ mile).

km 60.3 Denbigh, at junction highways 41 and 28.

BANCROFT TO MAYNOOTH

km	**0**	Bancroft at junction Station Street (Highway 28) and Hastings Street North; proceed north along Hastings Street North (Highway 62).
km	**2.2**	Junction Eagles Nest Park Road on right.

Eagles Nest Occurrence

URANINITE, URANOTHORITE, ZIRCON, APATITE, TITANITE, TOURMALINE, HORNBLENDE, PYROXENE, MAGNETITE, JAROSITE, GOETHITE

In syenite and granite pegmatite dykes cutting syenite and granite gneiss.

Uraninite and uranothorite occur sparingly in fracture zones in pegmatite. Associated minerals include: small grey to brown zircon crystals, colourless to light green apatite, titanite, dark brown tourmaline, hornblende, pyroxene and magnetite. Powdery coatings of yellow to rusty jarosite and rusty goethite occur on the host rocks.

The deposit was explored by numerous pits and trenches for radioactive mineralization. The work was done in 1956-57 and in 1967-68 by Eagle Nest Mines Limited. The openings are on the north side of a ridge that extends northeastward from The Eagles Nest, a bald cliff overlooking the York River.

To reach the occurrence, proceed along the Eagles Nest Park Road for a distance of 4.8 km to the junction of a wagon road; turn left onto this road and follow it for about 400 m to the pits and trenches.

Ref.: *49* p. 36.

Maps	(T):	31F/4 Bancroft (G): 1955-8 Dungannon and Mayo Townships, County of Hastings, Ontario (O.G.S., 1 to ½ mile)

km	**2.6**	Junction York River Boulevard on left.
km	**4.5**	*Road-cuts*. Calcite veins cut granite gneiss, granite pegmatite and metamorphosed pyroxenite. The veins have yielded good crystals of biotite, pink and white calcite (fluoresces pink in "shore wave" ultraviolet light), dark green pyroxene, hornblende and green apatite. Molybdenite, pyrite and quartz crystals occur in coarsely cleavable calcite. The calcite veins have been mined out by collectors who drove tunnel-like openings into the walls of the road-cut. Because of the danger imposed by these openings, collecting is no longer permitted.
km	**5.1**	*Road-cuts*. Light brown tourmaline, amber mica, graphite and pyrite are disseminated in crystalline limestone which is associated with granitic rocks.
km	**6.8**	Birds Creek, at junction Baptiste Lake South Road on left. This road leads to the Baptiste Lake South occurrences between Birds Creek and Highland Grove.

Baptiste Lake South Occurrences

Road log to occurrences along Baptiste Lake South Road:

km	0	Junction Highway 62 and Baptiste Lake South Road.
	0.5	Junction road to *McFall Lake diopside occurrence* on right. (description of the occurrence follows the road log; see page 27).
	9.6	*Road-cut* on left. Crystalline limestone contains green to grey crystals (2-3 cm long) of clinopyroxene, colourless to greyish and light yellow prismatic aggregates of scapolite and disseminated grains of orange chondrodite, and colourless and light green clinoamphibole, titanite, pyrite and pyrrhotite. Allanite occurs as irregular patches in the rock and gypsum forms white crystalline encrustations on rusty weathered zones. The yellow scapolite fluoresces an intense pink in "short wave" ultraviolet light.
	10.1	*Road-cut* on left. Calcite veins containing good biotite crystals cut granite gneiss.
	12.1	*Road-cut* on right. *Warwickite occurrence* (description follows road log; see page 27).
	14.3	Junction road to Boat Launching area on right.
	14.6-14.8	*Road-cuts* on right opposite Diamond Lake. Granite gneiss and granite pegmatite are exposed by this series of road-cuts. The rocks contain coarse prismatic aggregates of yellow to grey scapolite (fluoresces intense pink in "shore-wave" ultraviolet light) associated with crystals of pyroxene, titanite, k-feldspar, mica and hornblende. Gypsum occurs as fibrous and flaky encrustations on fieldspar.

15.3	Junction road on right.
16.1	*Road-cut* on right opposite Jordan Lake. Hornblende and calcite occur in red syenite.
18.5	Junction Highway 648 at Highland Grove.

McFall Lake Diopside Occurrence

DIOPSIDE, CALCITE, SCAPOLITE, MICA, HORNBLENDE, ZIRCON, TITANITE, FELDSPAR

In crystalline limestone near granite pegmatite contact

Green diopside crystals measuring up to 7 cm long occur in pink calcite; the crystals are transparent to translucent and some have been cut into faceted stones. The diopside is associated with greenish white scapolite, amber mica, black hornblende (crystal aggregates), pink zircon, brown titanite and pink K-feldspar. White flaky talc occurs as an alteration product on the feldspar and some of the diopside has altered to serpentine. The calcite is white to pink, coarsely crystalline and fluoresces pink in ultraviolet light.

The deposit is exposed by a small pit at the side of a cliff overlooking McFall Lake.

Road log from Baptiste Lake South Road at km 0.5 (see page 26):

km	0	Proceed north along single-lane road.
	1.3	From this point, the road is not accessible for automobiles; continue on foot.
	1.45	Junction; follow road on right which parallels the east shore of McFall Lake. At the north end of the lake the road is flooded by beaver dam, but a footpath continues parallel to the ridge at the water's edge for about 150 m to the occurrence. The total distance from the Baptiste Lake South Road is 2.6 km.

Refs: *71* p. 20; *110* p. 76.

Maps	(T):	31F/4 Bancroft
	(G):	1957b Haliburton-Bancroft area, Province of Ontario (O.G.S., 1 inch to 2 miles)

Warwickite Occurrence

WARWICKITE, ANATASE, SINHALITE, CHONDRODITE, SPINEL, MICA, CLINOAMPHIBOLE, TOURMALINE, APATITE, SERPENTINE, FLUORITE, SCAPOLITE, SZAIBELYITE, GRAPHITE, ILMENITE, MARCASITE, PYRRHOTITE, PYRITE, GOETHITE, TOCHILINITE

In dolomitic crystalline limestone at contact with granitic rocks

Four relatively uncommon minerals — warwickite, sinhalite, szaibelyite and tochilinite — occur at this locality. Warwickite occurs as prisms measuring up to 2 mm by 5 mm, as grains, and as small microcrystalline masses. The crystals have rounded edges and lack terminal faces. Warwickite is black, subtranslucent to opaque with adamantine to submetallic and, less commonly, pearly lustre. The surface may have a coppery red or grey cast and the streak is

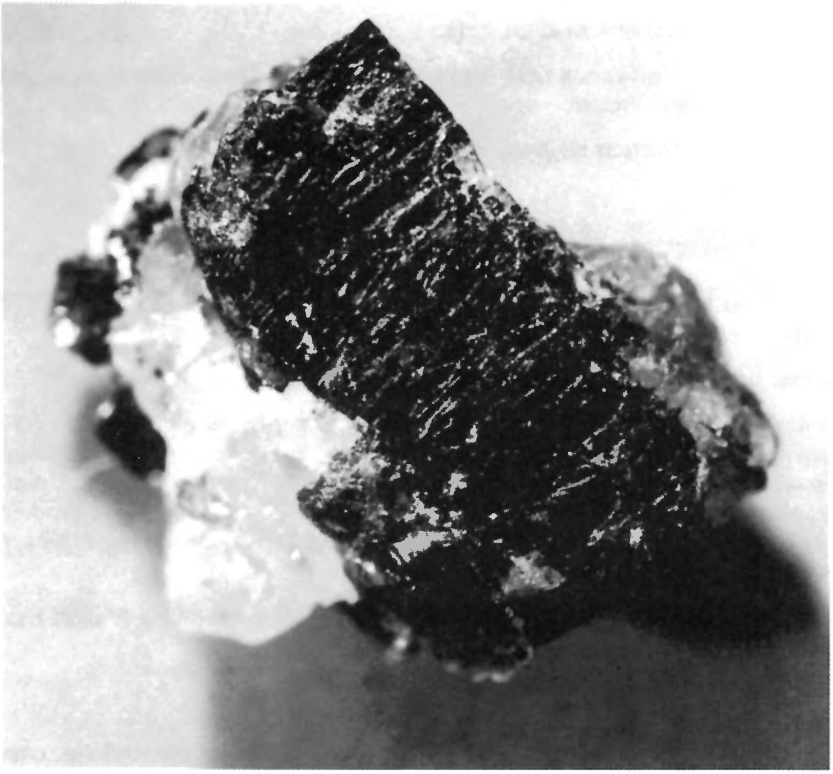


Plate 7

Warwickite crystal with calcite, South Baptiste Lake Road. The crystal measures 5 mm long. White transverse ribbing is due to anatase, an alteration product. (GSC 201836-F)

reddish brown. Grey to tan-coloured anatase forms transverse irregular lines on prism faces giving them a ribbed effect. Warwickite alters to grey to brownish grey anatase. It is disseminated in the limestone with a number of other minerals including: orange chondrodite, dark green spinel, amber mica, light green to brown clinoamphibole, amber to orange and dark brown tourmaline, light blue apatite, green serpentine, light green and yellow fluorite, light yellow scapolite, ilmenite, marcasite, pyrrhotite, pyrite, graphite and goethite.

Sinhalite occurs as colourless to light yellow transparent irregular masses averaging about 2 mm in diameter and as a microcrystalline crust enclosing dark green spinel. It is difficult to recognize but its vitreous conchoidal fracture and lack of cleavage distinguish if from the calcite and dolomite which comprise the host rock, and it is generally intimately associated with spinel.

Szaibelyite occurs in small concentrations on or near exposed surfaces of chondrodite-rich bands in the limestone. It forms buff-coloured to rusty nodules and scaly, craggy or woody aggregates in pockets in the rock. Its lustre is silky on freshly broken surfaces, and earthy on exposed surfaces. the nodules and aggregates are irregularly shaped and are 2 to 5 mm long.

Tochilinite occurs as microscopic black plates and scales, and as smear-like patches along dolomite cleavage planes. It has a bronze tinge and greasy lustre which distinguish it from graphite. The platy or scaly aggregates measure about 1 mm in diameter and are sparsely distributed in the rock.

The mineral suite is confined to the chondrodite-rich bands in the limestone which is exposed by a road-cut on the north side of the Baptiste Lake South Road at km 12.1 (see page 26).

Ref.: *90* p. 226.

Maps	(T):	31E/1 Wilberforce
	(G):	1957b Haliburton-Bancroft area, Province of Ontario (O.G.S., 1 inch to 2 miles)

The road log along Highway 62 is resumed.

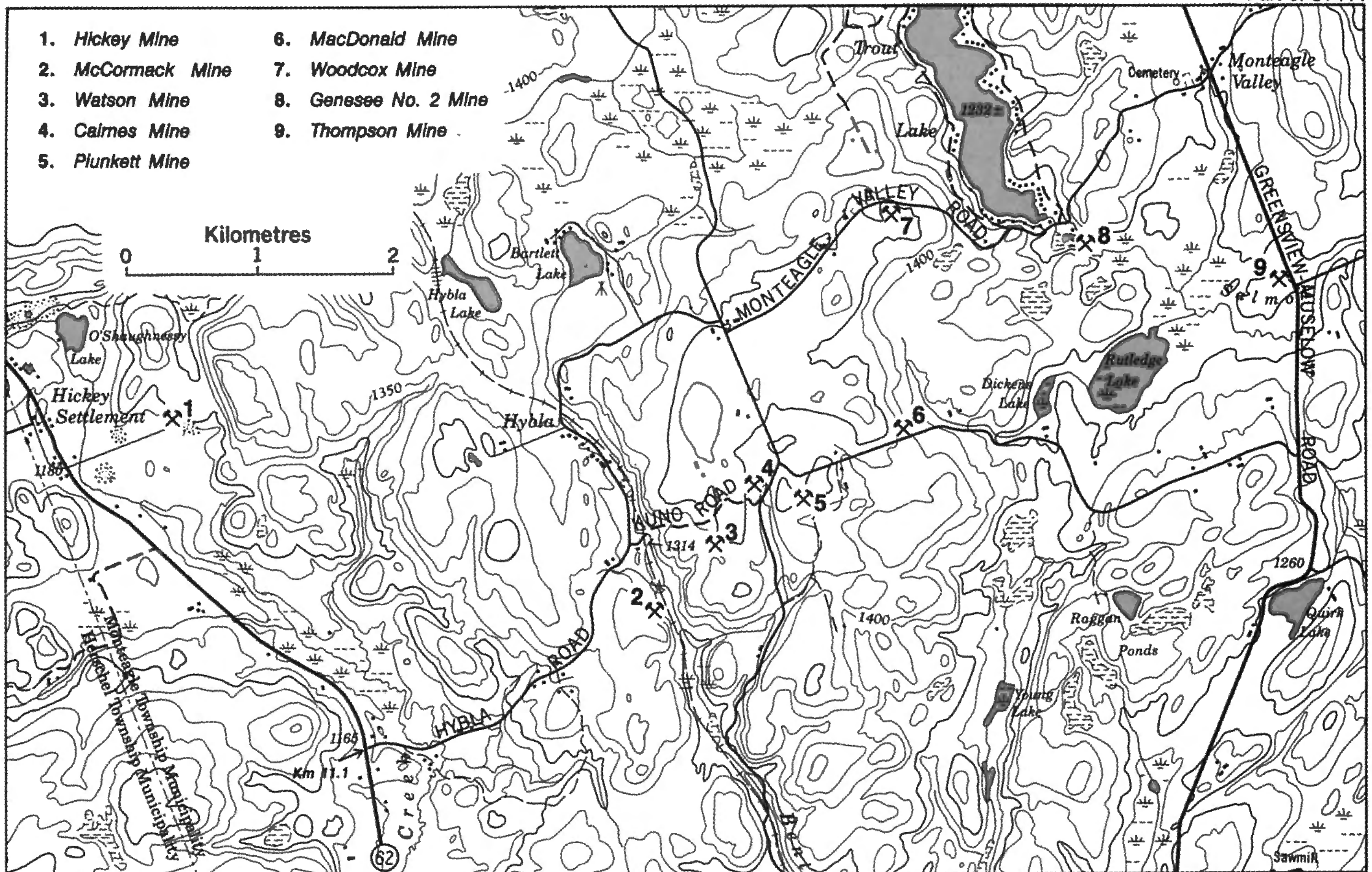
km	**7.6**	Junction Musclow Road on right.
km	**8.1**	Junction Buck Hill Road on right.
km	**8.5**	*Road-cuts*. Pyroxenite and granite pegmatite are exposed on both sides of the highway. Scapolite, pyroxene, titanite and apatite occur with pink calcite in pyroxenite.
km	**11.1**	Junction Hybla Road on right. This road provides access to several former feldspar mines in the Hybla-Monteagle Valley area which was an important feldspar producing district from 1919 to 1950.

Hybla-Monteagle Valley Occurrences

Road log to occurrences in the Hybla-Monteagle Valley area (descriptions of the occurrences follow the road log):

km	0	Junction Highway 62 and Hybla Road; proceed onto Hybla Road.
	0.4	Junction; follow road on left.
	2.8	Junction Kuno Road on right. This road leads to the *McCormack Mine* (see page 31) and to the *Watson Mine* (see page 31). Road log continues along Hybla Road.
	5.6	Junction; turn right.
	5.7	Junction. Monteagle Valley Road on left. The road that continues straight ahead leads to the *Cairns Mine* (see page 32), the *Plunkett Mine* (see page 32), and the *MacDonald Mine* (see page 33). Road log continues along the Monteagle Valley Road.
	7.2	Junction; turn right.
	7.6	Turn-off to *Woodcox Mine* on right (see page 34).
	8.9	Junction; turn right.
	9.0	*Genesee No. 2* Mine and turn-off to A. Joseph farm (see page 35).
	10.8	Monteagle Valley at intersection of Greensview-Musclow Road; turn right.
	12.5	Turn-off (right) to the Rudolph Kuno farmhouse and *Thompson Mine* (see page 36).
	13.8	Junction. Road on right is an alternate road to the MacDonald Mine. The distance from this point to the MacDonald Mine is 3.5 km.

Part of 31 F/4



GSC

Map 3. Hybla-Monteagle

McCormack Mine

AMAZONITE, PERISTERITE, GRAPHIC GRANITE, QUARTZ, BIOTITE, HORNBLENDE, TITANITE, SCAPOLITE, MAGNETITE, ZIRCON, ALLANITE, BETAFITE, CHLORITE, MICROCLINE, PLAGIOCLASE

In granite pegmatite dyke

Light green amazonite, pink and white peristerite and pink graphic granite suitable for lapidary purposes occur in this deposit. They occur in pegmatite with colourless and smoky quartz, biotite, hornblende and minor amounts of titanite, greenish white scapolite, magnetite, pink zircon, allanite, betafite and chlorite. The pegmatite is composed of pink microcline, white to buff-coloured plagioclase and graphic granite; it intrudes amphibolite and granite gneiss.

The deposit was opened as a feldspar prospect by P.J. Dwyer in 1926. A cut was made into the side of a hill, it measures 18 m by 6 m with a 15-m face at the southwest end. There was no production from this cut but a similar pegmatite dyke located 120 m to the south was worked in 1920 and 1926 from a side-hill cut measuring 44 m by 3m; it produced 135 t of feldspar.

To reach the mine follow the road log along the Hybla Road (see page 29) to Km 2.8. Proceed onto the Kuno Road to the railway crossing (about 0.15 km from the Hybla Road). Walk south along the railway for about 410 m to a footpath leading west (this is just north of the railway signpost "HYBLA ONE MILE"). Proceed along the path for 60 m to the North open-cut.

Ref.: *37* p. 42.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Watson Mine

MICROCLINE, PLAGIOCLASE, PERISTERITE, AMAZONITE, GRAPHIC GRANITE, QUARTZ, HORNBLENDE, PYROXENE, CHLORITE, BETAFITE, BASTNAESITE, TITANITE, PYRITE, JAROSITE

In pegmatite dyke cutting granite gneiss, crystalline limestone and amphibolite

Pink microcline, white plagioclase, colourless and smoky quartz and graphic granite are the chief constituents of the pegmatite. White peristerite and light green amazonite occur in small amounts. Hornblende and dark green pyroxene form coarse crystal aggregates in the pegmatite. Accessory minerals include: chlorite, dark brown to black betafite, dull black bastnaesite, titanite, and pyrite. Jarosite occurs as yellow to brownish yellow coatings on feldspar.

The deposit was worked between 1919 and 1926 by P.J. Dwyer, Mount Eagle Feldspar Company and by Consolidated Feldspar Company; total production of feldspar was 455 t. It was developed by a side-hill cut (18 m by 6 m with a 12-m face) from which an adit was driven 30 m into the hill. There are large dumps adjacent to these openings.

To reach the mine follow the road log along the Hybla Road (see page 29) to km 2.8. Then proceed east along the Kuno Road for 0.6 km to the junction of a wagon road leading south. Follow this road for 110 m to the mine.

Ref.: *37* p. 41.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Cairns Mine

PERISTERITE, GRAPHIC GRANITE, MICROCLINE, PLAGIOCLASE, QUARTZ, BETAFITE, BASTNAESITE, CYRTOLITE, HORNBLENDE, TITANITE, PYRITE, MAGNETITE

In pegmatite dyke cutting amphibolite

Pink peristerite occurs with pink graphic granite in a pegmatite consisting of pink microcline, white and greenish grey plagioclase and smoky quartz. Black lustrous betatite, dull greenish black bastnaesite, and pink cyrtolite occur sparingly in feldspar. Accessory minerals include hornblende, titanite, pyrite and magnetite.

The deposit was worked between 1920 and 1924 from a pit (15 m by 9 m and 8 m deep) by Messrs. Dillon and Mills, by the Feldspar Mines Corporation and by Mr. P.J. Dwyer. Two car-loads of feldspar were shipped from the deposit. It is on the Davidson farm.

Road log from Hybla Road at km 5.7 (see page 29):

km	0	Junction road to Monteagle Valley; leave the Hybla-Monteagle Valley Road and proceed south.
	0.5	Davidson farmhouse on right. Obtain permission to visit mine.
	1.1	Junction; turn right. (Road on left leads to the Plunkett and MacDonald mines).
	1.25	Junction; turn right.
	1.3	Junction wagon-road on right. Follow this road for 60 m to the pit in a wooded area.

Ref.: *37* p. 47.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, county of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Plunkett Mine

AMAZONITE, PERISTERITE, MICROCLINE, PLAGIOCLASE, QUARTZ, HORNBLENDE, TITANITE, GARNET, FLUORITE, BETAFITE, EUXENITE, ALLANITE

In granite pegmatite cutting biotite gneiss and crystalline limestone

Green amazonite and pink and white peristerite occur in a pegmatite composed mainly of pink microcline, pink and white plagioclase and smoky quartz. Both the amazonite and peristerite are suitable for lapidary purposes. Other minerals occurring in the pegmatite include: hornblende, titanite, garnet, fluorite, betafite, euxenite and allanite.

The pegmatite was exposed by a small pit (3 m by 3 m and 1 m deep) on the Harvey Plunkett farm about 300 m west of the farmhouse. Both the dump and the pit are now overgrown. Another pit about 200 m to the south yielded two car-loads of feldspar obtained from a similar pegmatite dyke.

To reach the occurrence, follow the road log for the Cairns Mine to the junction at km 1.1; then proceed along the road leading east for 0.5 km to the Plunkett farmhouse on the south side of the road.

Ref.: *37* p. 40.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

MacDonald Mine

MICROCLINE, PLAGIOCLASE, QUARTZ, GRAPHIC GRANITE, PERISTERITE, AMAZONITE, PYROXENE, ALLANITE, TITANITE, GARNET, CALCITE, SCAPOLITE, CYRTOLITE, BETAFITE, URANOTHORITE, HORNBLENDE, BIOTITE, CHLORITE, APATITE, MAGNETITE, ILMENITE, PYRRHOTITE, PYRITE, CHALCOPYRITE, MOLYBDENITE, GALENA, FLUORITE, GYPSUM, GOETHITE

In pegmatite dyke cutting amphibolite, marble and gneissic rocks

This was the largest feldspar producer in the Bancroft area and was famous for the coarse crystallization of the minerals in the pegmatite and for the abundant radioactive minerals found in it. The pegmatite dyke consisted of large masses of white quartz (up to 9 m in diameter), pink microcline crystals (up to 5 m long), white to greenish white plagioclase and pink graphic granite. White peristerite and amazonite suitable for lapidary purposes occur in the pegmatite. Pyroxene and allanite crystals measuring up to 30 cm, titanite crystals of about 8 cm in diameter, and large aggregates of reddish brown to black radioactive rare-earth-bearing garnet were found in the deposit. Large masses of coarsely crystalline white to salmon-pink calcite mixed with quartz were encountered during mining operations; the masses contained greenish yellow scapolite, crystals and crystal aggregates of reddish brown cyrtolite and yellow to brown nodular masses of betafite (ellsworthite). Other minerals found in the pegmatite include: uranothorite (black prisms, 1.2 cm in diameter), hornblende, biotite, chlorite, apatite (colourless to light green), magnetite, ilmenite, and pyrrhotite associated with pyrite, chalcopyrite, molybdenite, galena, and purple fluorite which emits a fetid odour when struck. Clusters of microscopic gypsum crystals and powdery goethite occur on feldspar.

This occurrence of uranothorite was the first to be reported in Canada and the mineral ellsworthite was described in 1923 as a new mineral; it is now considered to be a betafite with a high uranium content.

The MacDonald Mine was opened in 1919 by Pennsylvania Feldspar on the property of Peter MacDonald. It was subsequently operated by the Verona Mining Company and the Genesee Feldspar Company until 1928. It was then worked by Peter MacDonald from 1929 to 1935. Total production amounted to 31789 t of feldspar. In 1955-56 Philips — Doubt Grubstake Syndicate explored the deposit for radioactive minerals.

The workings consist of several open-cuts into the slope of one of the highest hills in the area. The main cut is 168 m long, 21 m wide and 37 m deep. An adit was driven into the hill for a distance of 53 m from an open-cut 12 m below the main cut. There are three other open-cuts: one (33 m by 7 m and 6 m deep) is 30 m west of the main cut; another (6 m by 15 m and 2.5 m deep) is 15 m north of this and a third (76 m by 12 m and 7.5 – 9 m deep) is 30 m north of the last. There are large rock dumps near the main workings.

To reach the mine follow the directions given for the Plunkett Mine (see page 32). At the turn-off to the Plunkett farmhouse, continue along the road leading east for a distance of 0.4 km to the junction of the MacDonald Mine road on the north side of the road. Proceed 0.2 km to the main cuts.

Refs.: *27* p. 200-209; *37* p. 43-47; *55* p. 63-66; *94* p. 138-140.

Maps (T): 31F/4 Bancroft
(G): 1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Woodcox Mine

AMAZONITE, PERISTERITE, MICROCLINE, QUARTZ, CYRTOLITE, COLUMBITE, PYROCHLORE, HORNBLENDE, PYROXENE, BIOTITE, TITANITE, ALLANITE, CALCITE, GARNET, TOURMALINE, FLUORITE, EPIDOTE, MAGNETITE, PYRITE, HEMATITE

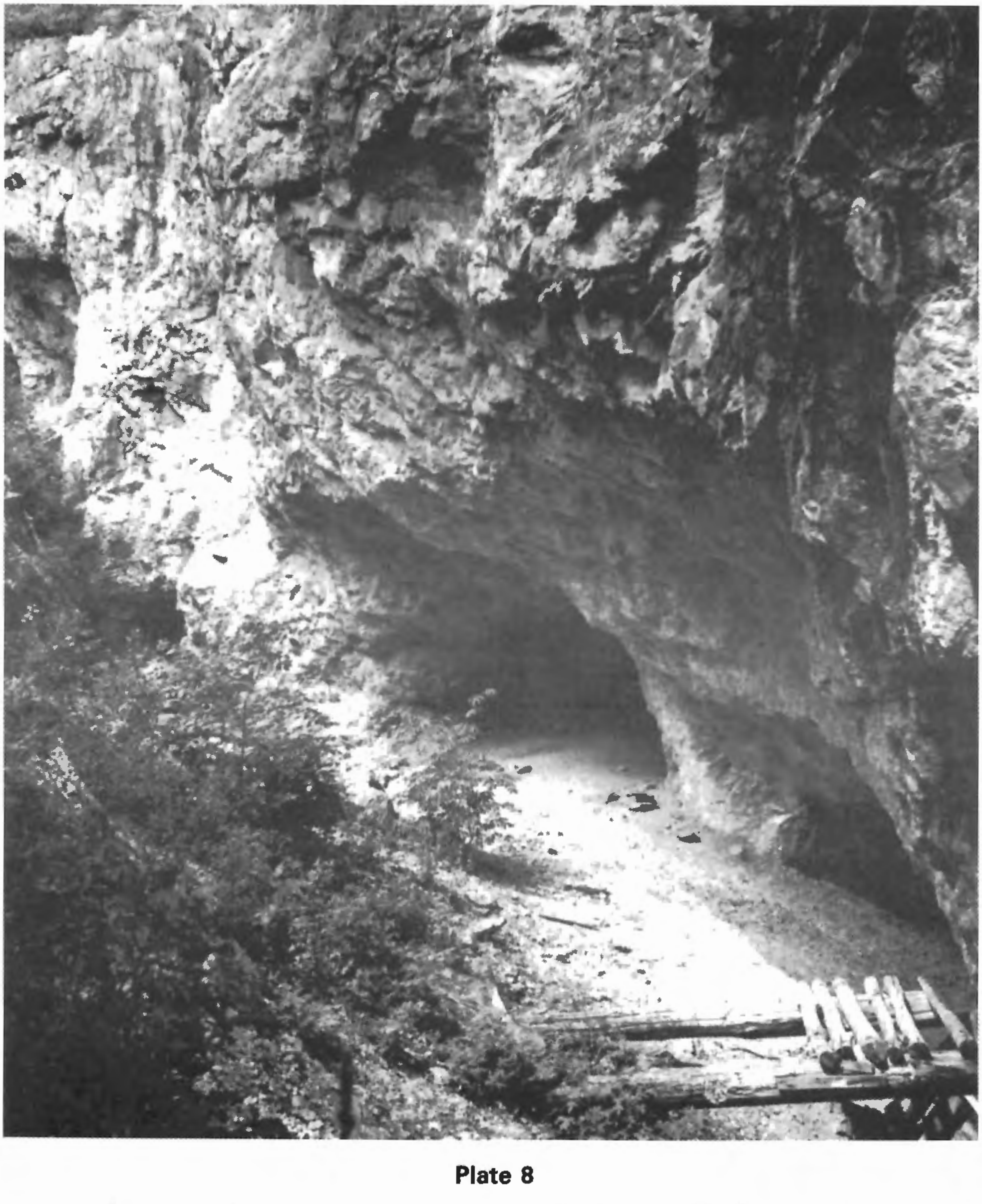


Plate 8

MacDonald Mines, side-hill open-cut and adits, 1975. (GSC 175308)

In granite pegmatite dyke cutting granite gneiss

This deposit is known for the good quality amazonite recovered from it and for the occurrence of large masses of radioactive minerals. Green amazonite and white peristerite occur in a pegmatite composed of pink microcline and white quartz. The radioactive minerals occurred together in red feldspar forming large masses weighing up to 50 kg; included were: cyrtolite as grey crystals and irregular masses, pyrochlore (hatchettolite) as amber to black irregular masses, calciosamarskite as lustrous jet-black large masses, and massive finely crystalline columbite. Accessory minerals in the dyke were: hornblende, pyroxene, biotite, titanite, allanite (crystals 2.5 cm long), white and pink coarsely crystalline calcite, red garnet, black tourmaline, purple fluorite, epidote, magnetite, pyrite and hematite.

The deposit was worked for feldspar from 1921 to 1923 by Feldspar Mines Corporation yielding 3707 t. Several tonnes of beautiful amazonite are reported to have been removed from the dyke. In 1955 Metro Minerals and Uranium Mines Limited explored the deposit for radioactive minerals.

The mine, consisting of a pit, 100 m by 9-10 m and 6-9 m deep, is in an open field on the Woodcox farm. It is 152 m south of the Hybla-Monteagle Valley Road at km 7.6 (see road log on page 29).

Refs.: *27* p. 209-212; *37* p. 50-51; *94* p. 143.

Maps (T): 31F/4 Bancroft
(G): 1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Genesee No. 2 Mine

MICROCLINE, QUARTZ, PLAGIOCLASE, GRAPHIC GRANITE, BETAFITE, EUXENITE, PYRITE

In granite pegmatite dyke cutting amphibolite, marble and gneiss

The pegmatite consists of coarsely crystallized pink microcline and white quartz with plagioclase and pink graphic granite. Quartz crystals line cavities in the dyke. Betafite (ellsworthite), euxenite and pyrite occur in small amounts.

The mine consists of a cave-like cut extending 33.5 m into the side of a hill. There is a large dump adjacent to it.

The deposit was worked from 1926 to 1931 by the Genesee Feldspar Company, and from 1948 to 1950 by D. Vardy and W. Jessup. A total of 2581 t of feldspar was extracted. The mine is located on the south side of the Hybla-Monteagle Valley Road at km 9.0 (see page 29). It is on the farm of A. Joseph.

Refs.: *37* p. 48-49; *61* p. 145; *101* p. 48.

Maps (T): 31F/4 Bancroft
(G): 1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Thompson Mine

MICROCLINE, QUARTZ, PLAGIOCLASE, AMAZONITE, MICA, ALLANITE, SCAPOLITE, PYROXENE, TITANITE, CALCITE, CHLORITE, HORNBLENDE, EPIDOTE, MAGNETITE, HEMATITE, GRAPHIC GRANITE

In pegmatite dyke cutting amphibolite, pyroxenite and gneiss

Pink microcline, white quartz and white plagioclase are the main components of the pegmatite. Fine green amazonite was formerly found in one of the small pits. Accessory minerals include: light green black mica, dark brown to black allanite, white to light green scapolite (fluoresces pink when irradiated by "short" ultraviolet rays), pyroxene, titanite, white coarsely crystalline calcite, chlorite, hornblende, epidote, magnetite and hematite. Buff-coloured graphic granite is abundant.

The deposit was opened on the farm of R. Thompson in 1925 by Feldspar Mines Corporation. It was operated until 1925 and again in 1927. Production amounted to 2463 t of feldspar.

The main pit is 55 m long and 6-7 m wide with a 9-m face. There are two smaller pits: one pit located 55 m to the south-west is 9 m by 6 m and 3.5 m deep and the other 15 m west of this is 24.5 m by 6 m and 3-3.5 m deep. The property belongs to Rudolph Kuno. The mine is on the west side of the Greensview-Musclow Road, just north of the Kuno farmhouse at km 12.5 on the road log given on page 29.

Ref.: *37* p. 43.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

The road along Highway 62 North continues from page 29.

km	**11.1**	Junction Hybla Road
km	**14.1**	Intersection. Road on right leads to the *Hickey Mine*.

Hickey Mine

SUNSTONE, MICROCLINE, QUARTZ, GRAPHIC GRANITE, ALLANITE, PYROXENE, MICA, CHLORITE, HEMATITE

In pegmatite dyke cutting gneiss and amphibolite

Attractive pink sunstone occurs in a pegmatite composed of pink microcline, colourless and smoky quartz and fine-textured pink graphic granite. "Micro" crystals of quartz and feldspar occupy cavities in feldspar. Other minerals found in the dyke are allanite, pyroxene, mica (colourless and dark brown), chlorite and hematite.

The deposit was worked by an open-cut (24.5 m by 6-9 m with a 12-m face) into the side of a hill. It was operated in 1949 by W. Jessup and produced 151 t of feldspar.

To reach the mine, proceed east from **km 14.1** on highway 62 for 0.2 km. From here a partly overgrown wagon road leads in a northeasterly direction for a distance of 140 m to the pit and dumps in a wooded area.

Ref: *37* p. 51-52.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 14.8 Junction Hickey Road West on left.

km 16.2 Junction Baptiste Lake North Road on left.

Selby Hill Sunstone Occurrence

SUNSTONE, GRAPHIC GRANITE

In granite pegmatite

Pink sunstone and pink graphic granite occur in microcline-quartz pegmatite exposed by road-cuts on Highway 62 extending south of its junction with the Baptiste Lake North Road, and by a pit on Selby Hill on the west side of Highway 62 just south of the junction of Baptiste Lake North Road.

A single-lane road leads west 160 m from Highway 62 at **km 16.0** to a cottage; the pit is at the north end of a clearing just beyond the cottage.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 18.3 Junction Graphite Road on right.

National Graphite Mine

GRAPHITE, CLINOPYROXENE, SCAPOLITE, TITANITE, CHONDRODITE, TOURMALINE, MICA, APATITE, SERPENTINE, CLINOAMPHIBOLE, FLUORITE, GARNET, MAGNETITE, PYRITE, PYRRHOTITE, MOLYBDENITE, ROZENITE; SUNSTONE

In crystalline and silicated limestone; in pegmatite

Graphite flakes measuring up to 5 mm in size occur in crystalline limestone and in silicated limestone associated with pyroxenite, gneiss, pegmatite and amphibolite. Crystalline aggregates and grains of several minerals occur with the graphite. They include: colourless, light yellow and grey clinopyroxene; colourless to grey columnar scapolite; brown titanite; yellow to orange chondrodite; black tourmaline; amber mica; colourless to light green apatite; dull green serpentine; colourless to light green clinoamphibole, purple fluorite (rare); orange-red to brownish red garnet; and magnetite, pyrite, pyrrhotite and molybdenite. Rozenite occurs as white encrustations on rusty crystalline limestone. Reddish sunstone occurs in pegmatite.

Plate 9

National Graphite Mine, about 1916. The open-cut, which measured 46 m by 9 m and 46 m deep, was cribbed and timbered, and equipped with a skidway for hoisting buckets of ore. (GSC 204031-C)

The deposit was worked by several pits extending over a distance of 500 m. Two companies were involved in mining operations: the Tonkin-Dupont Graphite Company in the eastern section of the orebody from 1912 to 1914, and National Graphite Company in the continuation on the western section from 1915 to 1919. Both companies operated mills for the treatment of the ore; the Tonkin-Dupont mill was at Wilberforce, that of the National Graphite Company at Mumford Station. Operations terminated due to a decrease in demand for graphite following World War 1. There are nine pits: two water-filled pits are on the east side of the road southeast of the farmhouse and the others extend westward over about 245 m. The largest pits are 61 m by 4-12 m and 23 m deep, and 18 m by 9 m and 46 m deep. The property belongs to John Freymond. Collecting is not permitted on this property; it is described for historical interest only.

Road log from Highway 62 at **km 18.3**:

km	0	Proceed east onto the Graphite Road.
	3.2	Junction; continue straight ahead.
	4.3	Turn left onto road to mine.
	5.0	Freymond farmhouse

Refs.: *37* p. 53-54; *99* p. 26-27.

Maps	(T):	31F/4 Bancroft
	(G):	1954-3 Monteagle and Carlow Townships, County of Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**19.2**	Junction road to Herschel Scenic Tower. The Tower stands on the top of a hill with an elevation of 503 m, slightly higher than most of the hills in the area. The viewing platform is reached by an 89-step stairway.
km	**22.8**	Maynooth, at junction Highway 127.

McKenzie Lake Mine

MICROCLINE, OLIGOCLASE, QUARTZ, GRAPHIC GRANITE, MICA, PYROXENE, SCAPOLITE, TITANITE, CALCITE, PYRITE, GOETHITE

In pegmatite

Pink microcline, oligoclase and quartz are the main constituents of the dyke. Pink graphic granite is present in small amounts. The oligoclase is greenish white, bluish to greyish green to charcoal-grey in colour; it is transparent to translucent, and exhibits very coarse twinning striations. Some of the quartz breaks with a pseudo-cleavage. The quartz is colourless to white, and is commonly stained to rusty yellow and reddish tints due to goethite and hematite. Accessory minerals are: colourless to dark amber-coloured mica, dark green pyroxene, grey to greenish scapolite, titanite, calcite and pyrite.

The deposit was worked from an open-cut by J. Gunter between 1928 and 1937. Production amounted to 2202 t of feldspar. The open-cut is 36 m long and 18 m wide; it is now water-filled and the dumps (scattered over a distance of about 30 m) are partly overgrown. The deposit is about 3 km north of McKenzie Lake.

Road log from Highway 62:

km	0	Maynooth at junction highways 62 and 127; proceed onto Highway 127.
	13.3	Junction road to Lake St. Peter Provincial Park on right.
	17.6	Junction; turn right onto McKenzie Lake South Road.
	21.6	Junction; turn right.

Plate 10

McKenzie Lake Mine. Pegmatite rock is exposed along the wall of the water-filled open pit. (GSC 175327)

21.75	Junction; proceed onto road on right.
24.4	Junction single-lane mine road on right.
24.5	*McKenzie Lake Mine*. Continue a short distance beyond the opening to the dumps.

Refs.: *36* p. 12; *101* p. 53.

Maps (T): 31E/8 Whitney
(G): 52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

BANCROFT TO APSLEY

km	**0**	Bancroft, at junction Hastings Street (Highway 62) and Station Street (Highway 28); proceed west along Station Street.
km	**0.5**	Junction; proceed west along Highway 28.
km	**2.7**	Junction Monck Road on right.
km	**5.0**	Junction single-lane road on left to Greyhawk Mine.

Greyhawk Mine

URANOTHORITE, URANINITE, ALLANITE, PYROCHLORE, FERGUSONITE, MAGNETITE, ZIRCON, TITANITE, PYRITE, APATITE, PYROXENE, FLUORITE, TOURMALINE, EPIDOTE, CLINOAMPHIBOLE, PERISTERITE, GRAPHIC GRANITE, GOETHITE

In granite pegmatite cutting amphibolite and diorite

The radioactive mineralization consists of uranothorite, uraninite, allanite, pyrochlore, and fergusonite. These minerals occur in magnetite-rich zones in a pegmatite composed of pink to brick-red microcline, plagioclase and colourless to smoky quartz. Accessory minerals include: grey zircon (small prisms), brown titanite, pyrite, apatite, pyroxene, purple fluorite, and black tourmaline. Epidote occurs as finely crystalline aggregates associated with green clinoamphibole, pyrite, pyroxene, titanite, magnetite, and tourmaline in fracture zones in amphibolite. Pink peristerite and graphic granite occur in a non-ore-bearing zone of the pegmatite which is composed of microcline and quartz. Goethite occurs as rusty coatings on magnetite-bearing ore.

The deposit was discovered in 1955 and was a uranium producer from 1957 to 1959; the total yield was valued at $834 889. Greyhawk Uranium Mines, Limited worked the deposit and the ore was treated at the Faraday mill. In 1975, the property was acquired by Madawaska Mines Limited.

To reach the mine, proceed south from Highway 28 at **km 5.0** for 0.24 km; turn left and continue 68 m to the mine.

Refs.: *38* p. 75-77; *49* p. 38-39; *94* p. 117-121; *106* p. 443.

Maps (T): 31F/4 Bancroft
(G): 1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 5.5		Junction Siddon Lake Road on right.
km 6.3		*Road-cut* on right. Crystalline limestone contains the following minerals: pink calcite, amber mica, light green clinopyroxene, greyish green scapolite, light green clinoamphibole, brown tourmaline (small crystals), and pyrite.
km 7.7		Junction road to Madawaska Mine on right.

Madawaska (Faraday) Mine

URANOTHORITE, URANINITE, THORITE, ALLANITE, URANOPHANE, BETA-URANOPHANE, MAGNETITE, HEMATITE, PERISTERITE, GRAPHIC GRANITE, PYROXENE, ZIRCON, TITANITE, PYRITE, MARCASITE, APATITE, FLUORITE, CLINOAMPHIBOLE, TOURMALINE, MOLYBDENITE, SELENITE, ANHYDRITE, CALCITE, CHALCOPYRITE

In granite and pegmatite

The main ore minerals are uranothorite and uraninite. Uranothorite occurs as greenish black to black, orange to brown or dark red grains, and uraninite as black minute grains and cubes. Other radioactive minerals are thorite (small orange prisms), allanite (dark brown to black tabular crystals measuring up to 7.5 mm long), uranophane (yellow coatings and fibrous aggregates in cavities in feldspar), and beta-uranophane (yellow radiating acicular crystals in cavities in feldspar). These minerals occur in magnetite-rich granite composed of pink microcline, plagioclase and colourless to smoky and black quartz. In the higher grade ore, hematite

Plate 11

Madawaska (Faraday) Mine, 1975. View is from Highway 28. (GSC 175292)

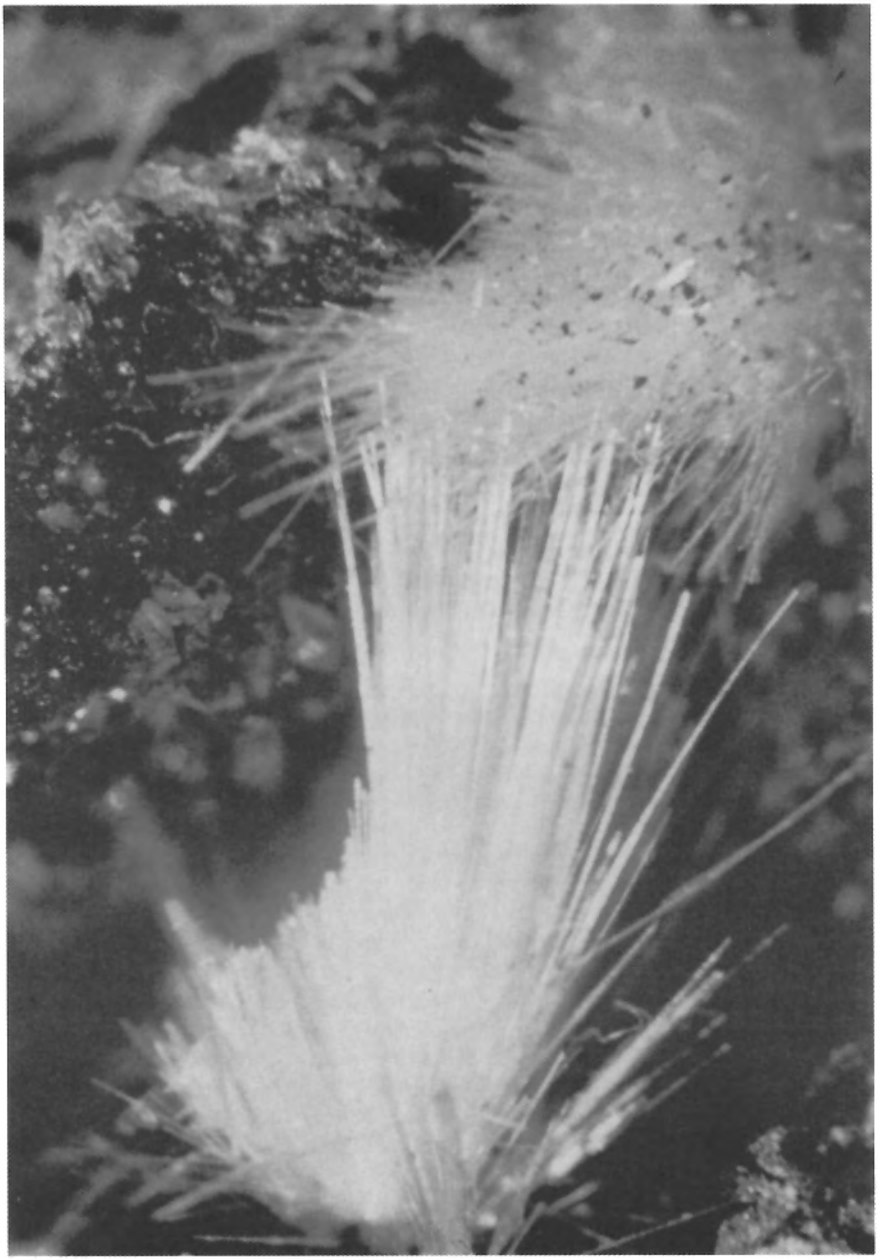


Plate 12

Beta-uranophane, Madawaska Mine. (GC 203377) inclusions produce a purplish red colour in the feldspar and jasper-red flecks in the quartz. White peristerite and purplish red to pink graphic granite are associated with the ore-body. In the non-ore zones the granite is light buff-coloured.

Other minerals occurring in the orebody are: pyroxene, zircon (grey to brown crystals), titanite, pyrite, marcasite, apatite (light green crystals), purple fluorite, grey to light green clinoamphibole, tourmaline, molybdenite, selenite (large crystals), and greyish green to purple anhydrite. Among the more spectacular specimens that were collected from the underground workings are the honey-yellow transparent calcite crystals containing inclusions of chalcopyrite and pyrite, and coated with botryoidal hematite. The crystals measured up to 13 cm long and were found in cavities in pink feldspar associated with pegmatite.

The deposit was discovered and originally staked in 1949 by A.H. Shore of Bancroft. Undergound development began ln 1954 by Faraday Uranium Mines Limited which brought the mine into production ln 1957. A mill was erected on the site. Mining and milling operations continued until 1964 when existing contracts for the sale of uranium concentrate had expired. The ore was obtained from a 444-m shaft; other underground development consisted of a 50-m shaft and three adits. Production amounted to 2 544 716 t of ore with an average grade of 0.1074 per cent U_3O_8. Mining operations were resumed in 1975 by Madawaska Mines Limited. The shaft was deepened to 473 m and production began in 1976 ending in 1982.

Access to the mine is by a 0.6 km road leading north from Highway 28 at **km 7.7** (see page 42)

Refs.: *38* p. 70-75; *49* p. 37-38; *89* p. 72-73; *94* p. 3, 108-116; *106* p. 117; *125* p. 170.

Maps	(T):	31F/4 Bancroft
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (1 inch to ½ mile)

km 8.5 *Road-cuts*. Coarsely crystalline aggregates of black clinoamphibole are associated with pink coarsely crystalline calcite in red granite and biotite gneiss. Brown epidote, light blue apatite (small grains), titanite and pyrite also occur in the calcite.

km 8.8-8.9 *Road-cuts*. Biotite gneiss is exposed on both sides of Highway 28 at **km 8.8** and on the south side of the highway at **km 8.9**. Blue to mauve-coloured, massive scapolite and orange-red to brick-red natrolite are conspicuous in the gneiss. The scapolite, which is colourless to greyish-green on the freshly broken surface, becomes blue on exposure to sunlight; it fluoresces yellowish white in "long" ultraviolet light. A number of minerals are associated with the scapolite including individual grains, crystals and crystalline aggregates of yellow-green to amber-yellow epidote, pink to brown garnet, brown titanite, dark green pyroxene, pink zircon, black tourmaline, and purple to almost black fluorite. Calcite occurs as white coarsely crystalline masses that fluoresce bright pink in "short" ultraviolet light. Pyrite, graphite, magnetite and molybdenite are disseminated in the gneiss. Microcline occurs as small crystals in cavities in the gneiss which also contains pink to greenish grey peristerite. Dark brown to black bastnaesite occurs as irregular patches in white feldspar.

km	**9.3**	Junction Lower Faraday Road on left.
km	**13.0**	Junction Highway 121. The occurrences along Highway 121 are described on page 00.
km	**18.2**	*Road-cuts.* Amphibolite is exposed by a series of road-cuts opposite Paudash Lake. Surfaces of the rock are coated with finely crystalline epidote; green fibrous clinoamphibole and chlorite are associated with epidote.
km	**20.3**	Junction McGillivray Road on right.
km	**20.9-21.0**	*Road-cuts.* Finely banded crystalline limestone contains greenish grey fibrous clinoamphibole, green serpentine, amber mica, pyrite, and reddish brown rutile prisms.
km	**21.7**	Junction South Paudash Lake Road on right.
km	**22.5-22.6**	*Road-cuts.* Finely crystalline epidote occurs as encrustations on hornblende gneiss.
km	**24.0**	Junction road to Silent Lake Provincial Park. *Road-cut* (on right) exposes crystalline limestone containing coarse bladed aggregates of grey to light green clinoamphibole and some pink calcite, amber mica and pyrite.
km	**24.4-26.5**	*Road-cuts.* This series of road-cuts exposes crystalline limestone containing abundant green fibrous clinoamphibole with pyrite and amber mica.
km	**24.8**	Junction Dyno Road on right

Dyno Mine

URANOTHORITE, URANINITE, URANOPHANE, KASOLITE, ALLANITE, MAGNETITE, MICROCLINE, PERISTERITE, QUARTZ, PYROXENE, AMPHIBOLE, ZIRCON, TITANITE, PYRITE, MOLYBDENITE, APATITE

In granite pegmatite dyke in amphibolite and hornblende gneiss.

The radioactive minerals — uranothorite, uraninite, uranophane, kasolite, and allanite — occur in magnetite-rich zones in the pegmatite. The uraninite and uranothorite occur as disseminations and allanite occurs as platy crystals. Uranophane and kasolite occupy fractures in the rock. Uranium mineralization in the rock is indicated by a deep red to purplish red colour of the host rock due to hematization, and by the presence of abundant magnetite. Pink pegmatite and graphic granite occurred in the low-grade sections. The pegmatite consists of pink microcline, white to grey albite (peristerite), smoky to black quartz with minor pyroxene, and black amphibole. Accessory minerals include zircon, titanite, apatite, pyrite and molybdenite.

The deposit was worked by Canadian Dyno Mines Limited from 1954 to 1960. It was discovered in 1953 by Paul Mulliette. A shaft sunk to a depth of 524.6 m was used and a mill operated on the site. Production amounted to 363 758 kg of U_3O_8.

To reach the mine proceed along the Dyno Road for 4.7 km from its junction with Highway 28; turn right and proceed 0.15 km to the mine.

Refs.: *38* p. 62-63; *49* p. 11; *94* p. 43-45; *106* p. 318.

Maps	(T):	31D/16 Gooderham
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (1 inch to ½ mile)

km	**28.9**	Junction Eel's Lake Public Landing Road on right.
km	**30.5-31.5**	*Road-cuts.* Epidote is associated with green fibrous clinoamphibole, titanite, pyrite and red feldspar in fractures measuring up to 3 cm wide in hornblende gneiss exposed by road-cuts between **km 30.5** and the bridge over Eel's Creek (**km 31.5**). Malachite occurs as radiating fibres and spheres in the road-cuts on both sides of the single-lane road leading west from Highway 28 on the south side of the Eel's Creek bridge.
km	**33.3**	Junction Eel's Lake Road on right.
km	**43.1**	Junction Highway 620 to Apsley.

Highway 620 Road-cuts

GARNET, CLINOPYROXENE, VESUVIANITE, SCAPOLITE

In skarn zone in gabbro at or near contact of crystalline limestone

Orange-red hessonite garnet occurs as individual crystals and as aggregates of crystals in coarsely crystalline white calcite. Crystals and crystal aggregates of green clinopyroxene, yellow to brown vesuvianite and yellow scapolite also occur in the calcite. These minerals are exposed by road-cuts on Highway 620.

Road log along Highway 620 from **km 43.1** on Highway 28:

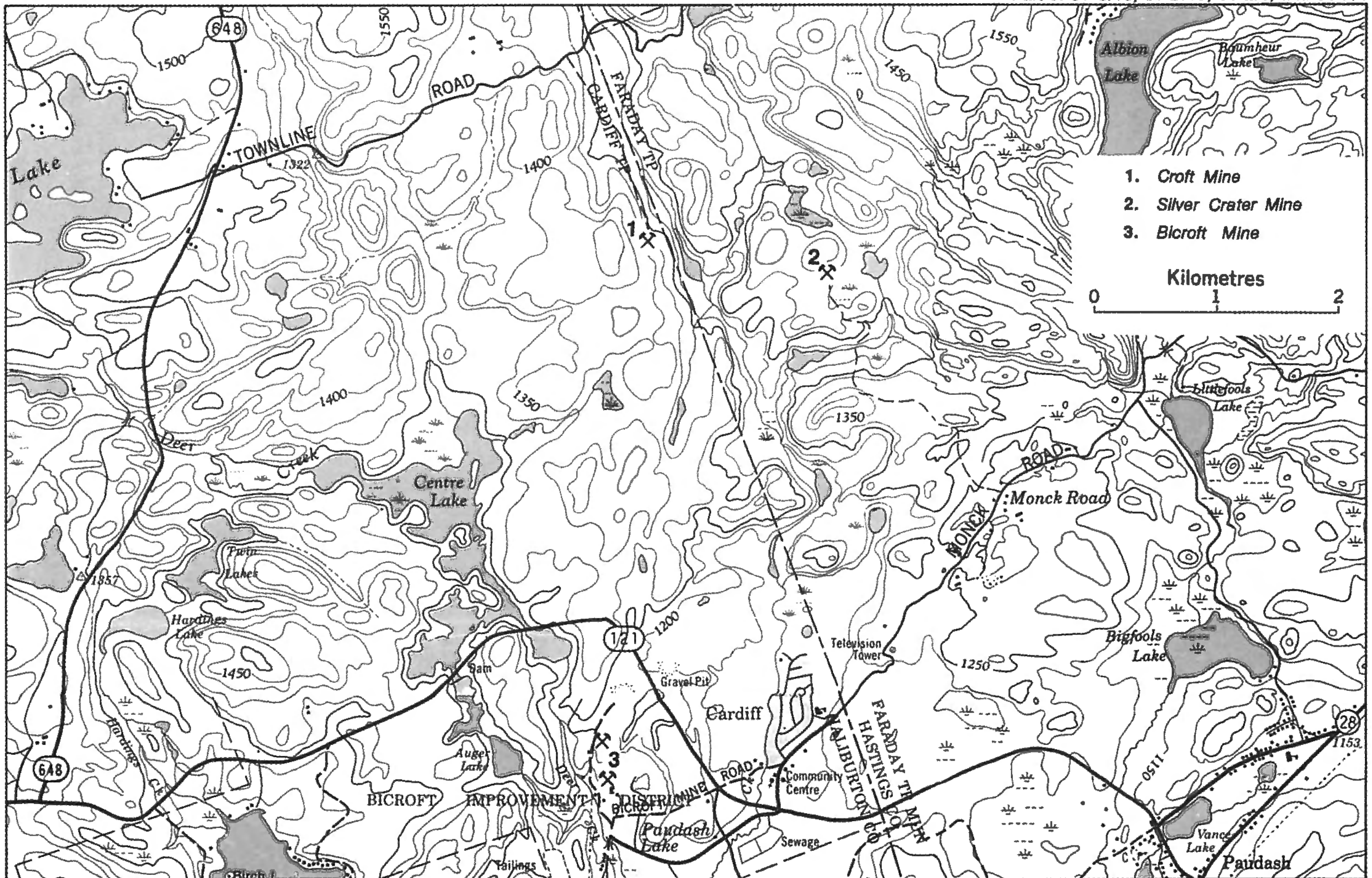
km	0	Proceed east along Highway 620
	9.9	Road-cut exposes pink granite cut by calcite veins containing black amphibole crystals.
	10.6	Junction Knox Point Road.
	11.2-11.7	*Road-cuts*. Calcite containing garnet, pyroxene, vesuvianite and scapolite is exposed by these road-cuts.
	12.1	Maplewood Wayside chapel on left.
	12.2	Road-cut exposes calcite containing garnet and associated minerals.
	12.5	Junction Doc Evans Road on right.

Ref.: *96* p. 10-11.

Maps	(T):	31D/16 Gooderham
	(G):	2019 Chandos Township, County of Peterborough, Ontario (O.G.S., 1 inch to ½ mile)

The mineral collecting sites south of Apsley are described in Geological Survey of Canada Paper 69-50, Rocks and Minerals for the Collector: Hull-Maniwaki, Quebec; Ottawa-Peterborough, Ontario.

Part of 31 C/13, 31 D/16, 31 E/1, and 31 F/4



GSC

Map 4. Cardiff

km	**0**	Paudash, at junction highways 121 and 28; proceed onto Highway 121.
km	**1.7-2.1**	*Road-cuts.* Pink to cream-coloured marble containing abundant light green tremolite-actinolite associated with green clinopyroxene and grey talc is exposed on the right side of the highway.
km	**4.0**	Junction Bicroft Mine Road on left. The road on right leads to Cardiff and to the Silver Crater Mine (see page 49).

Bicroft Mine

URANINITE, URANOTHORITE, ALLANITE, EUXENITE, PYROCHLORE, BETAFITE, ZIRCON, PERISTERITE, MICROCLINE, QUARTZ, PYROXENE, TITANITE, PYRITE, PYRRHOTITE, MOLYBDENITE, MAGNETITE, AMPHIBOLE, APATITE, FLUORITE, CALCITE, BASTNAESITE, ANATASE, UMANGITE, GARNET, SILLIMANITE, SCAPOLITE, TOURMALINE, GRAPHITE

In pegmatite dykes cutting biotite gneiss and amphibolite

This mine was the second largest producer of uranium in the Bancroft area. Uranothorite and uraninite were the most important radioactive minerals in the deposit. Uranothorite occurred as small grains and as granular aggregates measuring up to 30 cm in diameter. Other radioactive minerals included allanite, euxenite, pyrochlore, zircon and betafite. The pegmatite in which these minerals occurred was composed of pink to greenish grey peristerite, dark red microcline, colourless and smoky quartz and dark green pyroxene; accessory minerals included titanite, pyrite, pyrrhotite, molybdenite, magnetite, black amphibole, apatite, dark purple fluorite, pink calcite, dark brown bastnaesite and rare grains of anatase and umangite. Garnet, sillimanite, scapolite, tourmaline and graphite occurred in the biotite gneiss wall-rock. Most of these minerals can be found in the mine dumps.

The deposit was discovered in 1952 by G.W. Burns of Peterborough. Centre Lake Uranium Mines Limited began exploration of the deposit in 1953. By 1955 when the company was amalgamated with Croft Uranium Mines Limited to form Bicroft Uranium Mines Limited, exploration work consisted of surface cuts, a 53.4-m adit and a 71.4-m shaft. The newly formed company erected a mill, sank another shaft to a depth of 562 m and brought the mine into production in 1956. From then until operations were terminated in 1963, 2 016 693 kg of U_3O_8 were recovered from 2 233 055 t of ore.

Road log from Highway 121 at **km 4.0**:

km	0	Junction; turn west onto the Bicroft Road.
	1.6	Junction; turn right.
	1.7	Bicroft Mine.

Refs.: *38* p. 18, 58, 60; *49* p. 16-17; *94* p. 65-6; *106* p. 205.

Maps	(T):	31 D/16 Gooderham
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Silver Crater Mine

BETAFITE, LEPIDOMELANE, APATITE, AMPHIBOLE, ALBITE, ZIRCON, TOURMALINE, TITANITE, FLUORITE, EUXENITE, PYRITE, PYRRHOTITE, MOLYBDENITE, MAGNETITE

In calcite enclosed in hornblende-plagioclase gneiss

This deposit is known for the large crystals of betafite and other minerals that have been found. Betafite crystals measuring 6 mm to 8 cm have been reported, the majority being less than 2 cm in diameter. The crystals are octahedrons modified by cubic faces; dodecahedrons are uncommon.

The betafite is dark brown to black with resinous to submetallic lustre. It is commonly surrounded by a red halo in the calcite. Lepidomelane, an iron-rich biotite, is commonly associated with betafite; it occurs as black lustrous to submetallic crystals measuring up to 60 cm in diameter; during early mining operations plates over 120 cm in diameter were recovered. The crystals commonly enclose crystals of betafite and apatite. Large green crystals of apatite and black amphibole have been reported; the largest apatite reported was 30 cm in diameter and 61 cm long, and amphibole crystals measured from 7 to 122 cm in diameter. Greenish white albite crystals up to 30 cm in diameter have been found. The calcite also contained minor amounts of zircon (crystals up to 2.5 cm long), black tourmaline, brown titanite, purple fluorite, euxenite, pyrite, pyrrhotite, molybdenite and magnetite. The calcite host mineral is cream white to pink, coarsely crystalline, and fluorescent under ultraviolet light (deep pink, especially bright under "short rays").

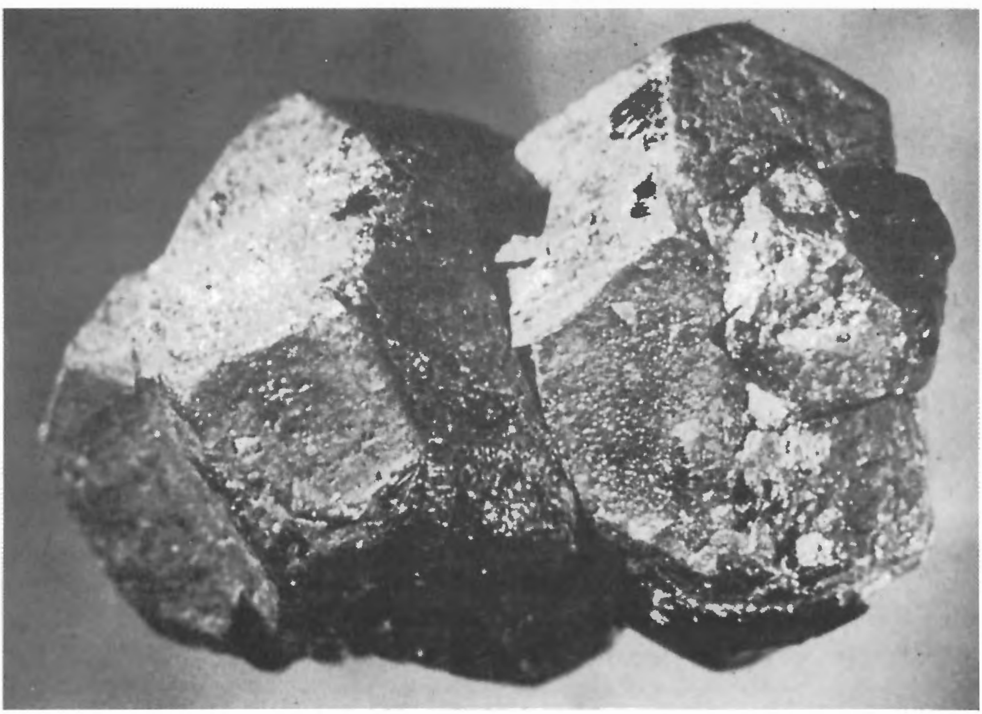


Plate 13

Betafite crystals, Silver Crater Mine. (GSC 203369)

The deposit, also known as the Basin property, was originally worked for mica by the Bancroft Mica Company. It was discovered in 1925 by prospectors who noted caverns in a calcite band in nepheline syenite which was exposed on the southwest slope of a hill. The caverns represented areas in the carbonate bank where the calcite had been leached releasing crystals of mica, apatite, and associated minerals which were subsequently enclosed in earth that filled the cavern. One of the caverns opened by the prospectors measured 3 m by 1 m and 2.5 m deep; crystals of mica measuring 2 cm to 90 cm and apatite crystals up to 45 cm long and 12 cm in diameter were found in the earth along with albite, fluorite, magnetite and pyrite.

The deposit was opened in 1927 by the Bancroft Mining Company. Mica was obtained from several small pits, the deepest being 4.5 m deep. The mica was ground at the company's mill at Bancroft for use in the roofing industry. From 1947 to 1949 Bancroft Mica and Stone Products Mining Syndicate Limited operated the deposit from a pit with a diameter of 9 m, a 20-m face at the side of a hill and a 3.6-m wall on the opposite side. In 1950, a small amount of mica was mined by Norman Weeks and Irvin Gibson of Lanark and Reuben Watts of Perth.

The deposit was explored for radioactive mineralization from 1953 to 1955 by Silver Crater Mines Limited which cut several trenches and drove an adit 70 m into the side of a hill. The adit is 91 m south of the old mica pit and the trenches are between the pit and the adit. For entry, contact Mr. D. Kerr, Monck Road.

Road log from Highway 121 at **km 4.0**:

km	0	Junction; proceed onto road to Cardiff village. Continue east beyond the village along the Monck Road.
	3.5	Junction; turn left onto single-lane rough road.
	6.4	Silver Crater Mine. The adit is on the right side of the road, the trenches on the left side. There are several dumps along the road. Continue north along the road to the mica pit.
	6.5	Mica pit

Refs.: *38* p. 76-78; *80* p. 84; *94* p. 123-32; *100* p. 87; *113* p. 20-25; *114* p. 86.

Maps	(T):	31E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**4.3-5.5**	*Road-cuts*. Crystalline limestone containing sparsely disseminated black tourmaline, light green clinoamphibole, green clinopyroxene and blue apatite is exposed on both sides of the highway.
km	**6.1**	*Road-cuts*. Amphibole gneiss, containing abundant black amphibole as aggregates of prismatic crystals, is exposed on both sides of the highway. Granitic rocks associated with the gneiss are cut by pink calcite veins containing green pyroxene, biotite, titanite, amphibole and scapolite.
km	**11.4**	Junction Highway 648 North which forms a loop north of Highway 121 and rejoins it at **km 22.8**. The collecting localities along Highway 648, the Wilberforce area, are described in a section beginning on page 68.

km	**13.2**	Junction Highway 648 South. The Dyno Mine (see page 45) may be reached by proceeding south along this highway for 5.0 km to the junction of the Dyno Mine road. For a distance of 3.5 km beginning 1.5 km from its junction with Highway 121, Highway 648 South follows the eastern boundary of a large body of pink granite known as the Cheddar batholith. It is exposed by road-cuts from, km 1.8 to km 4.5. The rock is composed of K-feldspar, quartz, plagioclase, pyroxene and amphibole, and is pegmatitic in places. Magnetite, allanite and epidote occur in the rock exposed by the road-cuts.
km	**14.6**	Junction Cheddar Road on left.

Canada Radium Mine

URANINITE, URANOTHORITE, URANOPHANE, BETAFITE, UNAKITE, EPIDOTE, MICROCLINE, AMPHIBOLE, PYROXENE, TITANITE, CALCITE, FLUORITE, APATITE, MAGNETITE, PYRITE

In graphic granite pegmatite cutting hornblende gneiss

This deposit was explored for feldspar, quartz and radioactive minerals. Uranothorite, uraninite, uranophane and betafite are the radioactive minerals. Betafite (ellsworthite) was found as crystals in calcite. Epidote occurs as veinlets and irregular patches in orange-red feldspar producing an attractive ornamental rock known as unakite; some pyrite and chlorite occurs in this rock. The pegmatite is composed of pink to red microcline, quartz and plagioclase with accessory black amphibole, pyroxene, titanite, calcite, purple fluorite, apatite, magnetite and pyrite.

This was one of the first properties in the Bancroft area to be explored for radioactive minerals. Between 1932 and 1942, Canada Radium Mines Limited investigated the deposit for feldspar, quartz and radioactive minerals. The company sank a shaft to a depth of 122 m and installed a mill on the site. The mine was closed in 1942 after test runs were made.

To reach the deposit, proceed south from Highway 121 at **km 14.6** for 0.5 km, then turn left onto a single-lane road and continue 366 m to the shaft. The mine dumps are south of the shaft.

Refs.: *27* p. 227-228; *38* p. 42, 61-62; *92* p. 83; *94* p. 3, 41-42; *106* p. 598.

Maps	(T):	31D/16 Gooderham
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

West Lake Mine

URANOTHORITE, PERISTERITE, PYROXENE, BIOTITE, TITANITE, ZIRCON, FLUORITE, TOURMALINE, MAGNETITE, PYRITE, ILMENITE, APATITE, FELDSPAR

In granite pegmatite and calcite veins in pegmatite

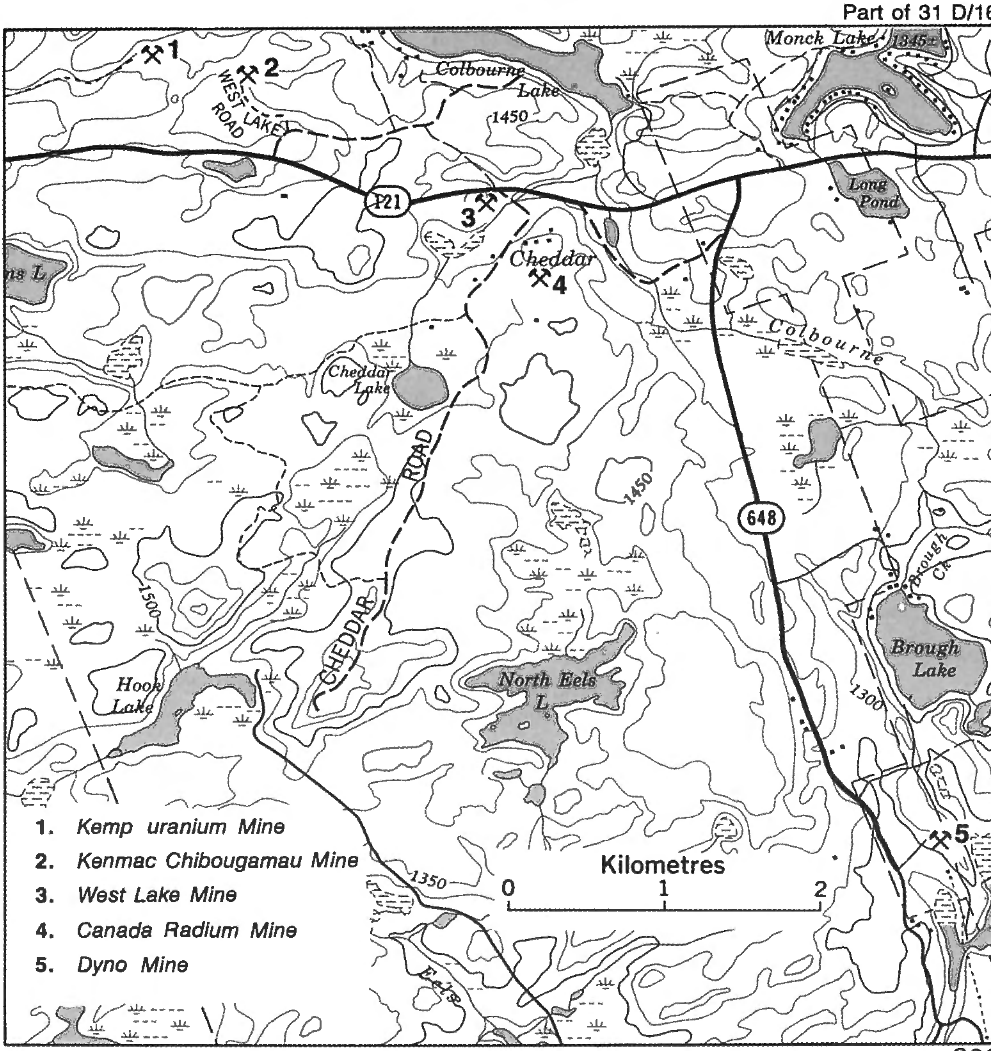
Uranothorite occurs sparsely in the pegmatite. Minerals occurring more commonly are pink peristerite, green pyroxene, biotite, titanite, zircon, fluorite, tourmaline, magnetite, pyrite and ilmenite. Light green to yellowish green apatite crystals measuring 1 cm in diameter occur with mica in calcite. Small crystals of pink feldspar occupy cavities in feldspar.

The deposit was explored by several trenches (9 m to 60 m long) between 1944 and 1951 for radioactive mineralization. The work was done by West Lake Mining Company Limited. The openings, now partly overgrown, are located along the east slope and near the top of a ridge about 30 m south of Highway 121 at a point 30 m west of the junction of Cheddar Road and Highway 121.

Ref.: *94* p. 76-77.

Maps (T): 31D/16 Gooderham
(G): 1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Part of 31 D/16



GSC

Map 5. Cheddar

km	**15.3**	*Road-cut*. Pink calcite veins in granite contain pyroxene, biotite, titanite, amphibole and scapolite.
km	**16.2**	Junction West Lake Road on right.

Kenmac Chibougamau Mine

ALLANITE, URANOTHORITE, MAGNETITE, ZIRCON, APATITE, SCAPOLITE, CALCITE, BIOTITE

In granite and syenite pegmatite

The radioactive minerals, allanite and uranothorite, occur with magnetite in pyroxene-rich pegmatite. Accessory minerals are zircon, apatite, scapolite, calcite and biotite.

The deposit was explored for radioactive minerals in 1955 by Kenmac Chibougamau Mines Limited. The exploration consisted of several trenches, the largest measuring 26 m long and 9 m wide, and an 84-m adit driven under this trench. These openings are at the west end of a clearing and on the north side of a ridge. Another trench, 17 m long is 51 m east of the adit.

Road log from highway 121 at **km 16.2**:

km	0	Proceed onto West Lake Road.
	0.1	Junction; turn right.
	0.2	Junction; turn left.
	0.6	Road ends; follow trail 150 m to the mine openings.

Refs.: *49* p. 15-16; *94* p. 64-65.

Plate 14

Canadian Radium Mine, 1932. Headframe and surface plant. (Public Archives Canada PA 14706)

Maps	(T):	31D/16 Gooderham
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**18.2**	Junction single-lane road on right.

Kemp Uranium Mine

THORITE, URANOTHORITE, PYROXENE, TITANITE, PYRITE, QUARTZ, MICA, SCAPOLITE, PLAGOICLASE

In pyroxene skarn

Doubly terminated thorite crystals measuring up to 7 cm in diameter occur with abundant green crystal aggregates of pyroxene in pink to white calcite. The thorite crystals are dull reddish brown with rough surfaces. The pyroxene skarn also contains disseminated grains of uranothorite, titanite, pyrite, quartz (colourless and smoky), amber mica, greenish brown scapolite and yellowish white plagioclase.

The deposit was explored for uranium minerals in 1954-55 by Kemp Uranium Mines Limited. It was exposed by several trenches and strippings.

Road log from Highway 121 at **km 18.2**:

km	0	Proceed onto single-lane road.
	0.25	Junction; turn right. Caution: this road is very rough.
	0.35	Junction; follow road on right.
	2.0	Trenches near base of ridge just beyond an old shed.

Refs.: *38* p. 55; *49* p. 15; *94* p. 64.

Maps	(T):	31D/16 Gooderham
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**21.2**	*Road-cuts*. Granitic rocks containing epidote, black amphibole, calcite, pyroxene and titanite are exposed on both sides of the highway. Massive black garnet occurs in pink pegmatite.
km	**21.9**	*Road-cut* on left. Amphibole, as dark greyish green bladed crystals, occurs with green massive pyroxene and green serpentine in crystalline limestone.
km	**22.8**	Junction Highway 648 North. The occurrences along this highway are described in a section beginning on page 68. *Road-cuts* on south side of junction expose red syenite with epidote coating fracture surfaces.
km	**23.3**	Junction Hadlington Road on left.

Rare Earth Mines

ALLANITE, URANOTHORITE, URANINITE, ZIRCON, BASTNAESITE, AMPHIBOLE, GRAPHITE, PYRITE, PYRRHOTITE, MOLYBDENITE, CALCITE, CORUNDUM, SCAPOLITE, VESUVIANITE, GARNET, CLINOPYROXENE, TALC, TITANTITE, GALENA, FERGUSONITE, URANOPHANE, PERISTERITE, GRAPHIC GRANITE

In granite and granite pegmatite

Two mines known as Rare Earth No. 1 and Rare Earth No. 2 were formerly developed for uranium. The principal radioactive minerals are allanite, uranothorite and uraninite. At the Rare Earth No. 1 Mine, black platy crystals of allanite measuring up to 4 cm long were encountered during exploration. It more commonly is found as grains and small tabular crystals associated with orange uranothorite grains, small dark brown zircon crystals and dark green to grey bastnaesite. Accessory minerals include black amphibole, graphite, pyrite, pyrrhotite, molybdenite and calcite. Mauve to grey corundum and yellow to green scapolite occur as irregular patches in grey plagioclase. Marble, composed of sugary calcite with grains and crystals of orange to brown vesuvianite, pink garnet, light to dark green clinopyroxene, light blue and green talc (nodules, fibrous aggregates), brown titanite, galena and pyrrhotite also occurs at the No. 1 deposit. The marble country rock was intruded by the pegmatite.

At the Rare Earth No. 2 Mine, the radioactive minerals are allanite, uranothorite, uraninite, fergusonite (black grains and crystals), and uranophane. Peristerite and pink graphic granite occur in the pegmatite. Other minerals occurring in the ore-bearing granite are zircon and titanite.

Each of the mines was developed by a shaft, an adit and several trenches. No. 1 shaft is 200 m deep and No. 2 shaft was sunk to a depth of 134 m. Rare Earth No. 1 Mine was originally explored in 1948 by Lead Ura Mines Limited which was renamed Rare Earth Mining Corporation of Canada Limited in 1951. This company carried out underground exploration until 1956.

Underground exploration of the Rare Earth No. 2 deposit was conducted by Blue Rock Cerium Mines Limited from 1954 to 1956. This company was amalgamated in 1956 with Rare Earth Mining Corporation of Canada Limited to form Rare Earth Mining Company Limited (renamed Rare Earth Resources Limited). There was no production from either of these mines.

Road log from Highway 121 at **km 22.3**:

km	0	Proceed onto Hadlington Road.
	2.7	Junction single-lane road on right to Rare Earth No. 1 Mine: proceed along this road for 0.6 km to a junction; turn left and continue 0.95 km to the mine.
		To reach the Rare Earth No. 2 mine continue south along the Hadlington Road.
	4.7	Junction single-lane road on right. Proceed along this road for 0.8 km to a junction; follow left junction for 0.9 km to Rare Earth No. 2 Mine.

Refs.: *49* p. 25-26; *94* p. 92-99.

Maps	(T):	31D/16 Gooderham
	(G):	2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**23.8**	*Road-cut* on right exposes crystalline limestone containing black clinoamphibole, green clinopyroxene, titanite and quartz.
km	**24.1**	*Road-cut* on right exposes pegmatite cut by calcite veins containing green clinopyroxene, purple fluorite, plagioclase, serpentine, greenish blue talc, magnetite and pyrrhotite. The calcite fluoresces bright pink under "short" ultraviolet rays.
km	**24.2**	Junction road on left to Monmouth garbage disposal area.

Saranac Mine

ZIRCON, THORITE, ALLANITE, PYROXENE, TITANITE, SCAPOLITE, TOURMALINE, CALCITE, HEMATITE, CHLORITE, GOETHITE, GRAPHITE, SERPENTINE, VESUVIANITE, FLUORITE, PYRITE, PYRRHOTITE, MOLYBDENITE, URANOTHORITE, URANOPHANE

In granite, granite pegmatite and crystalline limestone

The property consists of two deposits, the Zircon and the Pegmatite showings which are 1.7 km apart. At the Zircon showing, zircon occurs as doubly terminated crystals averaging 1 cm long with some crystals measuring up to 2 cm long. They range in colour from grey to tan, brown, pink and reddish brown and have a brilliant lustre. They occur in white granite and granite pegmatite with earthy brown to brownish yellow thorite crystals measuring up to 1.5 cm in diameter. Associated minerals include grey to black platy allanite, dark green pyroxene, brown to brownish green titanite, light green scapolite (fluoresces yellow-orange in ultraviolet light), black tourmaline, white to grey calcite, hematite, chlorite, goethite, graphite and serpentine. Crystalline limestone which was intruded by the pegmatite contains yellow to brownish yellow vesuvianite (prismatic aggregates), purple fluorite, green pyroxene, feldspar (plagioclase and K-feldspar), smoky quartz, pyrite, goethite, pyrrhotite and molybdenite.

At the Pegmatite showing, zircon occurs with allanite, uranothorite, uranophane, titanite and pyrite. Hornblende is abundant as prismatic crystals measuring up to 7.5 cm long.

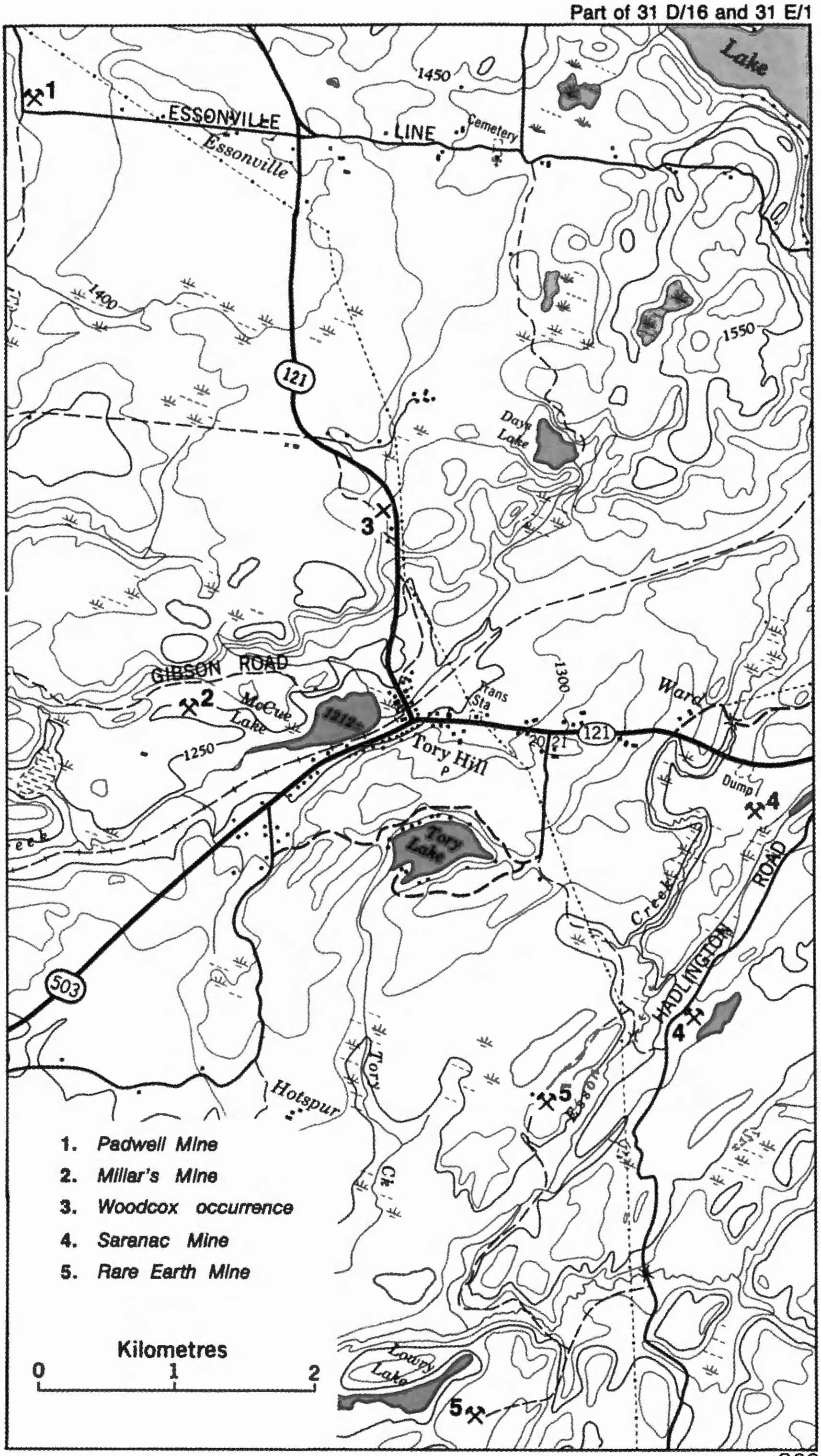
The showings were explored for radioactive minerals by several open cuts from 1954-1956. The work was conducted by Saranac Uranium Mines Limited. At the Zircon showing, granite and granite pegmatite are exposed by a 46-m long open-cut and by a trench 30 m to the south. A skarn in crystalline limestone is exposed by two trenches 90 m north of the open-cut. The Pegmatite showing is exposed by an open-cut 46 m long.

To reach the Zircon showing, proceed onto the road that leaves Highway 121 at **km 24.2** and continue beyond the garbage disposal area along a single-lane road for about 350 m to the open-cut. The trenches exposing the skarn are along this road.

To reach the Pegmatite showing, proceed along the Hadlington Road for 2.45 km from Highway 121; turn left and proceed 100 m to the open-cut which is 9 m above the level of the swamp (on the east side of the opening). The junction of the Hadlington Road is at **km 23.3**.

Refs.: *49* p. 31-32; *94* p. 102-104.

Maps (T): 31D/16 Gooderham
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)



Map 6. Tory hill

km	**24.3-24.5**	*Road-cuts* on both sides of Esson Creek. White nepheline syenite gneiss, pink syenite and crystalline limestone are exposed. Coarse aggregates of magnetite associated with biotite and pyrite occur in the nepheline rock and in the syenite. Light brown vesuvianite occurs as granular aggregates with clinopyroxene in crystalline limestone on the west side of Esson Creek.
km	**26.3**	*Road-cuts*. Crystalline limestone contains small crystals of colourless to light green scapolite and disseminated grains of orange tourmaline, colourless to light green clinoamphibole, yellow clinopyroxene, green serpentine and graphite.
km	**26.7**	Tory Hill, at junction Highway 503. The occurrences along Highway 503 from Tory Hill to Kinmount are described in a section beginning on page 00.
km	**26.9**	Junction Gibson Road on left.

Millar's Mine

APATITE, AMPHIBOLE, MICA, PYROXENE, TITANITE, ORTHOCLASE, PYRITE, CHONDRODITE, THORITE, THORIANITE, URANOPHANE, SERPENTINE

In calcite veins cutting graphic granite pegmatite

This deposit was opened as a phosphate prospect about 1900. Apatite occurs as light green transparent crystals and granular masses in coarsely cleavable pink to white calcite which fluoresces bright pink under "short" ultraviolet rays and reddish pink under the "long" rays. Black mica and colourless crystals of orthoclase also occur in the calcite. The pegmatite contains crystals of dark green amphibole, pink feldspar, biotite, titanite and pyrite. Crystalline limestone associated with the deposit contains orange chondrodite, light green and blue apatite, mica, colourless to smoky clinoamphibole, colourless to light green clinopyroxene and serpentine. These minerals occur in the adit area and in the nearby trench.

Thorite, thorianite and uranophane occur as irregular grains and aggregates in calcite exposed by a trench on the ridge that parallels Gibson Road. Colourless, white and light grey clinoamphibole is abundant as coarsely bladed aggregates. Smoky quartz, light green clinopyroxene, green apatite, pyrite and white to grey and tan-coloured talc also occur in the calcite.

Road log from Highway 121 at **km 26.9**:

km	0	Proceed onto Gibson Road.
	0.95	Junction. Proceed onto road on right leading up a hill. (This is a rough road not suitable for vehicles with low clearance.) Follow this road for 460 m to a point where there is a clearance on both sides of the road for parking. Walk up the ridge to the left for 60 m to an open-cut on the crest; the cut exposes granitic rock cut by a calcite vein which carries crystals of greenish black to dark grey clinoamphibole, yellowish green and reddish apatite, pink feldspar, titanite, pyrite and goethite. From this opening, continue in the same direction for 60 m to a wagon road which parallels this ridge. Cross the road and proceed up the ridge about 6 m to the trench exposing the coarsely bladed clinoamphibole and the radioactive minerals.

To reach the other openings, return to the first open-cut. From the south side of the cut, walk in a westerly direction down the gully for about 110 m. On the slope a few metres to the right of this point is the open-cut exposing coarsely crystalline amphibole with apatite, feldspar and titanite in granitic rock. To reach Millar's Mine continue in a westerly direction along the gully for about 75 m to an adit and a pit. The adit was driven into the ridge for about 9 m intersecting the apatite-bearing calcite vein. Pits and trenches in the vicinity expose the calcite-apatite mineralization and associated chondrodite-bearing crystalline limestone.

Refs.: *3* p. 383; *92* p. 20.

Maps (T): 31D/16 Gooderham
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**27.5-28.1**	*Road-cuts*. Crystalline limestone and granitic rocks are exposed by this series of road-cuts. Coarsely crystalline masses of amphibole occur in the granitic rock. Yellowish grey scapolite, titanite, pyroxene, apatite, pyrite and coarsely crystalline amphibole occur in the crystalline limestone. On the west side of the road above the road-cut, several pits were opened in hornblende syenite pegmatite as a result of prospecting for rare-element minerals. Apatite and calcite occur in the pegmatite.
km	**28.15**	Turn-off (left) to Dave Woodcox farmhouse

Woodcox Occurrence

APATITE, AMPHIBOLE, TITANITE, ZIRCON

In granite pegmatite

Crystals of apatite and greenish black amphibole are associated with titanite and zircon. Shallow pits expose the deposit. For access to the occurrence, enquire at the Dave Woodcox farmhouse at **km 28.15**.

Ref.: *92* p. 20.

Maps (T): 31D/16 Gooderham
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**29.1**	Junction Coumbes Road on right.
km	**29.3**	*Road-cut*. Granite gneiss is cut by calcite veins containing dark green coarsely crystalline amphibole, red apatite crystals (about 2 cm long), pyroxene, titanite and molybdenite.
km	**30.2**	*Road-cut*. Colourless to greenish white massive scapolite (fluoresces bright pink under "short" ultraviolet rays) occurs with orange calcite, pyroxene and titanite in crystalline limestone.
km	**31.2**	Intersection Essonville Line.

Padwell Mine

MOLYBDENITE, PYRITE, PYRRHOTITE, SCAPOLITE, PLAGIOCLASE, PYROXENE, APATITE, TOURMALINE, CLINOAMPHIBOLE, MICA, GARNET

In pyroxenite and crystalline limestone

Molybdenite flakes occur sparingly in pyrite-pyrrhotite-quartz masses. Scapolite is common as white to greenish white masses which fluoresce pink under "short" ultraviolet rays. Associated are white plagioclase (peristerite) which exhibits a blue schiller, green to dark green clinopyroxene crystals, light blue "micro" apatite crystals, black tourmaline, green bladed aggregates of clinoamphibole and colourless to light amber mica. These minerals occur in orange and cream-white coarsely crystalline calcite. Pale yellow garnet has been reported from the deposit.

The deposit was worked for molybdenite in 1916 and 1917 by G. Padwell. Shipments totalling 107 t of hand-picked ore were made. The ore was obtained from a long open-cut measuring 46 m long, 6 to 15 m wide and 4.6 to 6 m deep.

Road log from Highway 121 at **km 31.2**:

km	0	Proceed west along the Essonville Line.
	2.0	Padwell Mine on wooded ridge on right side of road. The mine-dumps are along the open cut.

Refs.: *92* p. 67-68; *109* p. 134-135.

Maps	(T):	31D/16 Gooderham
	(G):	2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**34.9**	Junction Paynes Road on left. This road provides alternate access to the Padwell Mine: proceed along this road for 2.7 km to a junction; turn left and proceed 0.1 km. The mine is on the left side of the road.
km	**36.0**	Junction Trappers Trail on right.
km	**36.1**	*Road-cut*. Red pegmatite contains zones of white to pink peristerite and crystals of black amphibole. The peristerite zones measure 15 to 20 cm wide.
km	**42.0**	Junction Burview Road on right.
km	**44.9**	Junction Buckhorn Road on left.
km	**45.4-47.9 48.6**	*Road-cuts*. Crystalline limestone associated with granitic rocks is exposed by these road-cuts. The limestone contains crystals of pyroxene and apatite and disseminated grains of pyrite, titanite and mica. The crystalline limestone at **km 48.6** contains blotches of green to greenish yellow serpentine, coarse prismatic aggregates of greyish blue to grey clinoamphibole and green pyroxene.
km	**50.9**	Haliburton, at junction Highway 519.

Eagle Lake Quarry

CLINOAMPHIBOLE, SERPENTINE, CALCITE, CLINOPYROXENE, SCAPOLITE, APATITE, CHLORITE, MICA, PYRITE, QUARTZ, TITANITE, SPHALERITE, TALC

In dolomitic crystalline limestone

Clinoamphibole occurs as coarse prismatic and fibrous aggregates. Other minerals occurring in the marble are green serpentine, salmon-pink, coarsely cleavable calcite, green clinopyroxene, bluish grey to greenish grey scapolite, light blue apatite (small grains and crystals), chlorite, amber mica, pyrite, smoky quartz, titanite, sphalerite (rare) and talc (white to green flaky).

The quarry and crushing plant are operated by Bolender Brothers for use as poultry grit, terrazzo chips, stucco dash and road-surfacing. The quarry opens into the west side of a marble ridge.

Road log from Haliburton:

km	0	Junction highways 121 and 519; proceed onto Highway 519.
	8.7	Eagle Lake; turn left onto Road No. 6.
	9.0	Turn-off (right) to quarry.

Crystalline limestone containing the same mineral assemblage is exposed by road-cuts on Highway 519 extending north from its junction with Road No. 6 for a distance of 0.8 km.

Refs.: *46* p. 16-17; *92* p. 87.

Maps	(T):	31E/2 Haliburton
	(G):	52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

km	**51.0**	Haliburton, at junction Highway 519 South. Continue along Highway 121.
km	**63.5**	*Road-cut* on left. The highway cuts through a low outcrop of anorthosite which contains patches of black tourmaline, greenish scapolite and sunstone variety of K-feldspar. The rock was quarried (for road metal) on the N. McKnight property about 90 m north of the highway.
km	**63.7**	Junction Old Allsaw Road on left.
km	**73.2**	Minden, at junction Highway 35.

Crystal Lake Fluoborite

FLUOBORITE, NORBERGITE, CLINOAMPHIBOLE, SERPENTINE, FLUORITE, MICA, RUTILE, GRAPHITE, PYRRHOTITE, PERISTERITE

In dolomitic crystalline limestone; in pegmatite

Fluoborite occurs in the crystalline limestone as colourless to cream-white hexagonal prisms which are characterized by rounded edges and the absence of terminal faces. The crystals occur individually and as parellel and divergent clusters, resembling apatite. They are up to 2 cm long and 8 mm in diameter. On the fresh surfaces the crystals have a silky to pearly lustre, but become chalky on weathering. They fluoresce white when exposed to short-wave ultraviolet light. Orange norbergite is the most conspicuous mineral in the rock. Other minerals associated with fluoborite are colourless to light green clinoamphibole, grey to green serpentine, violet and amber fluorite, amber mica, rutile, graphite and pyrrhotite.

The fluoborite-bearing crystalline limestone is in contact with red granite pegmatite and is exposed by a road-cut. Grey peristerite occurs in the pegmatite.

Road log from Minden at **km 73.2** on Highway 121:

km	0	Junction Highways 121 and 35; proceed south on Highway 121/35.
	2.6	Turn-off to Minden business section; continue along Highway 121/35.
	3.9	*Road-cut*. Clinohumite, serpentine, clinopyroxene, clinoamphibole, titanite, mica and pyrite occur as disseminations in dolomitic crystalline limestone.
	4.5	Highway 121 leaves Highway 35; proceed onto Highway 121.
	12.7	Junction Highway 519.

Plate 15

Fluoborite crystals in crystalline limestone, Crystal Lake Road occurrence. The crystal in centre is 15 mm long. (GSC 203442-A)

19.0	Junction Boundary Road. This road leads to the Paxton Mine (see this page) and to the Davis Lake corundum occurrence (see page 66). Continue along Highway 121.
20.5	Kinmount at junction Highway 503 to Gooderham. Continue along Highway 121.
24.5	*Road-cut*. Siliceous crystalline limestone contains disseminations of orange to brown tourmaline, clinopyroxene, serpentine, mica and pyrite. Rozenite, goethite and jarosite are associated with pyrite as coatings on exposed surfaces.
27.5	Junction; turn left onto Crystal Lake Road.
38.3	Fluoborite occurrence on right.

Ref.: *90* p. 223.

Maps (T): 31D/10 Fenelon Falls
(G): 52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

Crystal Lake (Silver Crater) Mine

PERISTERITE, ALLANITE, URANOTHORITE, THORITE, URANOPHANE, ZIRCON, TITANITE, AMPHIBOLE, PYRITE, CALCITE, SCAPOLITE, FLUORITE, GRAPHIC GRANITE

In granite pegmatite

Greenish grey to grey peristerite exhibiting an attractive deep blue schiller occurs in this deposit which was explored for radioactive mineralization. The peristerite is suitable for lapidary pruposes. The radioactive minerals, allanite, uranothorite, thorite, uranophane and cyrtolite are associated with titanite, black amphibole and pyrite. Calcite contains disseminated grains of scapolite and fluorite. Pink graphic granite occurs in the pegmatite which is composed of dark red to purplish red feldspar and smoky to black quartz.

Silver Crater Mines Limited explored the deposit between 1954 and 1957. The work consisted of several pits and trenches and an adit driven 91.5 m into a hill overlooking Nogies Creek. The adit and dumps are on the west side of Nogies Creek which flows into Crystal Lake.

To reach the mine from the Crystal Lake fluoborite occurrence (page 61), continue west along the Crystal Lake Road for 0.2 km to the dam at Nogies Creek; on the south side of the dam a footpath leads south along the west side of Nogies Creek for a distance of about 60 m to the adit. The pits and trenches are on the hill behind the adit.

Refs.: *49* p. 62-63; *94* p. 172-173.

Maps (T): 31D/10 Fenelon Falls
(G): 52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

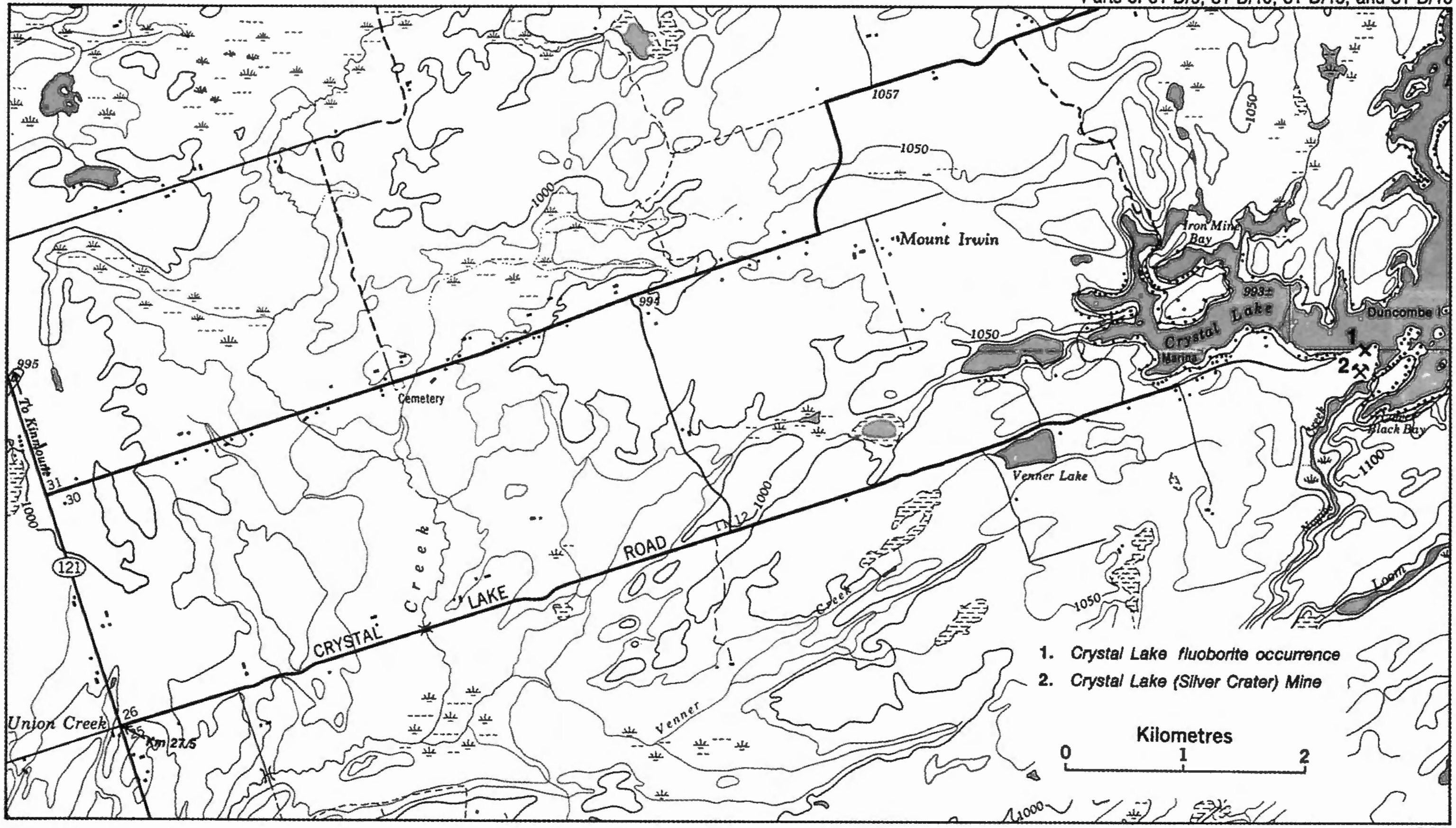
Paxton Mine

MAGNETITE, GARNET, AMPHIBOLE, PYROXENE, SCAPOLITE

In hornblende gneiss

Magnetite occurs as coarse granular masses associated with dark brown to black garnet, black amphibole, dark green pyroxene, greyish green scapolite, feldspar and calcite.

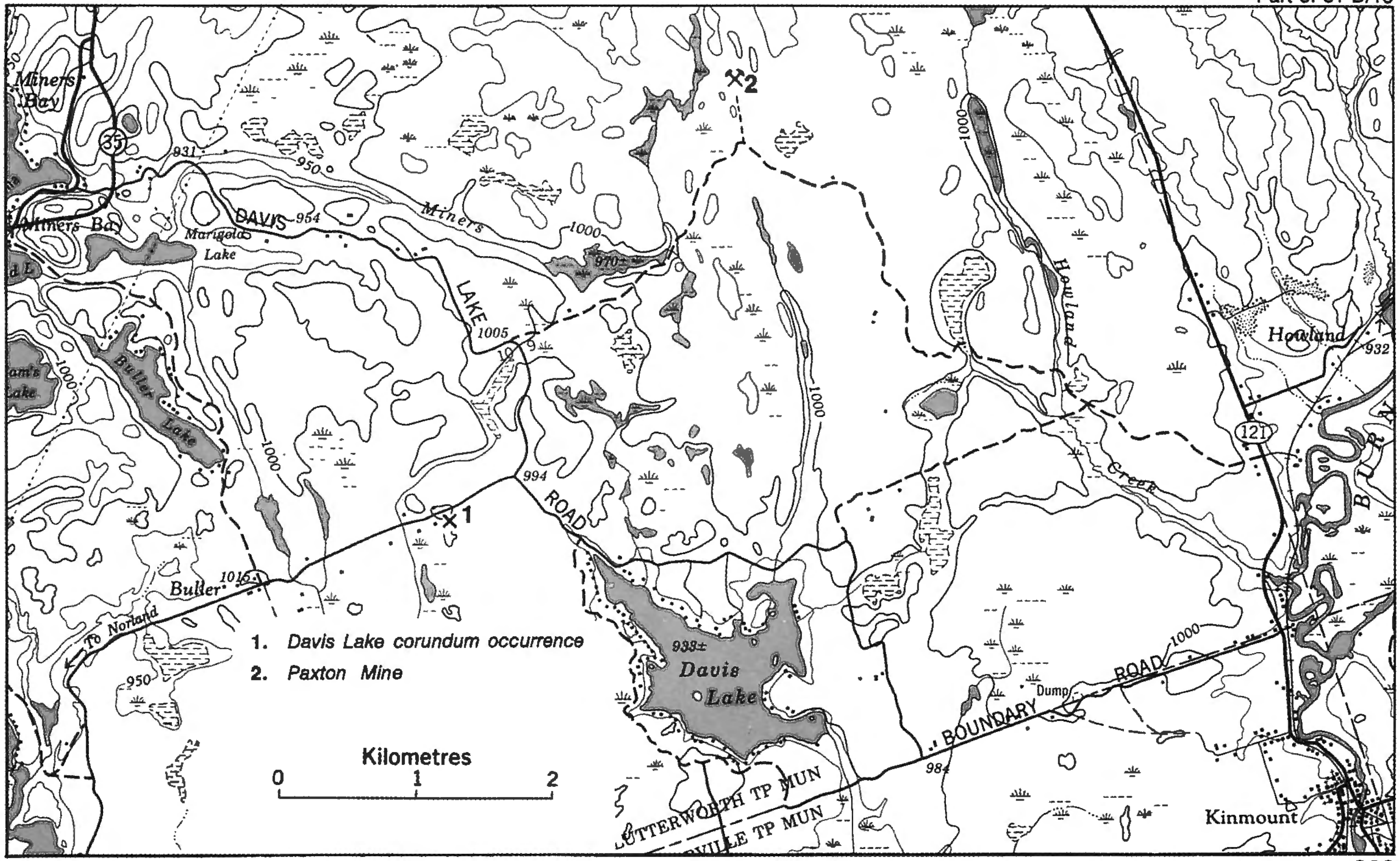
Parts of 31 D/9, 31 D/10, 31 D/15, and 31 D/16



GSC

Map 7. Crystal Lake

Part of 31 D/15



GSC

Map 8. Miners Bay

The deposit was worked for iron between 1870 and 1892. About 907 t of magnetite were mined from two pits measuring 15 by 23 m and 15 by 18 m. In 1975 the property was owned by Harry Butt of Kinmount.

Road log from **km 19.0** on Highway 121 (see road log to Crystal Lake fluoborite occurrence, page 61):

km	0	Proceed west along Boundary Road.
	4.8	Junction; follow road on left to Davis Lake.
	7.7	Junction; turn right. (Road on left leads to Norland.)
	8.8	Junction; turn right onto rough road. (To reach this point from Highway 35, see page 67.)
	11.1	Junction trail on left at sharp bend in road. Proceed onto this trail.
	11.6	Paxton Mine. The pits are about 40 m apart in a north-south direction.

Refs.: *8* p. 61; *86* p. 46-47; *92* p. 45.

Maps	(T):	31D/15 Minden
	(G):	52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

Davis Lake Corundum Occurrence

CORLINDUM, PERISTERITE, RUTILE, PYRITE, MAGNETITE

In syenite pegmatite

Smoky brown corundum prisms measuring up to 10 cm long and 2 cm wide occur in pink syenite pegmatite. Pink peristerite, brown rutile, pyrite and magnetite also occur in the rock.

The corundum-bearing pegmatite outcrops on a low knoll which is traversed by the road leading from Davis Lake to Norland, and in outcrops to the north and south of this road.

Road log from Highway 121 at km 19.0 (see road log to Crystal Lake fluoborite occurrence, page 61):

km	0	Junction Boundary Road and Highway 121; proceed west along Boundary Road.
	4.8	Junction; follow road on left to Davis Lake.
	7.7	Junction; follow road on left leading to Norland. (Road on right leads to Miners Bay and Paxton Mine.) This junction is 4.8 km from Highway 35 at Miners Bay (see page 68).
	8.2	Corundum occurrence. At this outcrop, the hydro line crosses the road; hydro pole No. 109 marks the occurrence.

Ref.: *92* p. 22.

Maps	(T):	31D/15 Minden
	(G):	52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles).

Minden-Norland Road-cuts (Highway 35)

A number of road-cuts along Highway 35 between Minden and Norland expose dolomitic crystalline limestone and granitic rocks; the crystalline limestone contains disseminations of several minerals which are listed in the following road log.

km	0	Minden, at junction highways 35 and 121; proceed south along Highway 35/121.
	2.6	Turn-off to Minden business section.
	3.9	*Road-cut.* Orange chondrodite, green clinopyroxene, green clinoamphibole, amber to grey and green serpentine, amber mica, pink calcite, titanite, grey K-feldspar and pyrite occur in crystalline limestone.
	4.5	Junction. Highway 121 leaves Highway 35; continue along Highway 35.
	7.6- 8.1	*Road-cuts.* Crystalline limestone contains coarse cleavable pink calcite which contains light to dark green clinoamphibole, quartz crystals (in vugs), serpentine, clinopyroxene and amber mica.
	8.1	Junction Sandy Bay Road.
	8.1	*Road-cut* (south of junction). Green clinoamphibole, greenish scapolite, titanite and mica occur in crystalline limestone.
	10.0- 14.2	*Road-cuts.* Crystalline limestone in this series of cuts contains mica, pyrite, salmon-pink calcite, clinoamphibole, titanite, clinopyroxene and serpentine. In the road-cuts at km 12.7, pink fluoborite, chondrodite, blue apatite as tiny prisms, colourless fluorite, pink zircon as tiny prisms, epidote, black tourmaline as prismatic aggregates and colourless to light green scapolite also occur in the limestone which is associated with pegmatite containing white to pink peristerite; these road-cuts are on both sides and opposite a junction of a cottage road leading west. In the crystalline limestone exposures at km 13.5 and km 14.2, small aggregates of pink platy barite occur in vugs in white feldspar. Chondrodite, apatite and pink zircon were noted at the north end of the road-cut at km 14.2.
	14.5	*Road-cut.* Pyroxenite is associated with granitic rocks. Pink calcite in pyroxenite contains small quartz crystals, serpentine and titanite.
	14.7	Junction Davis Lake Road. This road leads to the Paxton Mine (see page 63) and to the Davis Lake corundum occurrence (see page 66). To reach the Paxton Mine, proceed 3.7 km along the Davis Lake Road to a junction; the road on left leads 2.3 km to the junction of the trail to the Paxton Mine and to the corundum occurrence. To reach the latter follow this road for 1.1 km to a junction; turn right and proceed 0.5 km to the outcrops.
	14.8	*Road-cut.* Crystalline limestone and granitic rocks are exposed. Pink calcite, black amphibole, colourless to yellowish scapolite as prismatic aggregates, red garnet as small grains, mica, pyrite and magnetite occur in the limestone.
	15.3	*Road-cuts.* Crystalline limestone, pyroxenite and granitic rocks are exposed. Chondrodite, blue apatite as tiny prisms, green clinopyroxene, light green clinoamphibole, purple fluorite, pink zircon, serpentine, mica, pyrite and magnetite occur in the limestone.

15.6	Miners Bay, at junction Clear Lake Road.
16.9	*Road-cut.* White columnar scapolite, colourless to light green clinoamphibole, green to brown serpentine, light blue apatite, mica, pyrite and chlorite occur in crystalline limestone.
18.7	Junction East Moore Lake Road.
20.6	*Road-cut.* Granite gneiss contains black massive allanite and pyrite.
29.5	Norland, at junction Highway 503.

WILBERFORCE AREA

Mineral occurrences along Highway 648 North are described in this section. Highway 648 North forms a loop north of Highway 121, the eastern end leading to Highland Grove, the western end to Wilberforce. The road log begins at its western junction with Highway 121.

km	**0**	Junction Highway 648 North and Highway 121; proceed north onto Highway 648.
km	**1.3**	Junction South Wilberforce Road on right.
km	**2.9**	*Road-cut* (east side) exposes crystalline limestone containing disseminated grains of chondrodite, clinoamphibole, serpentine, apatite, graphite, pyrite and amber mica.
km	**3.0**	Junction South Wilberforce Road on right.

Halo Mine

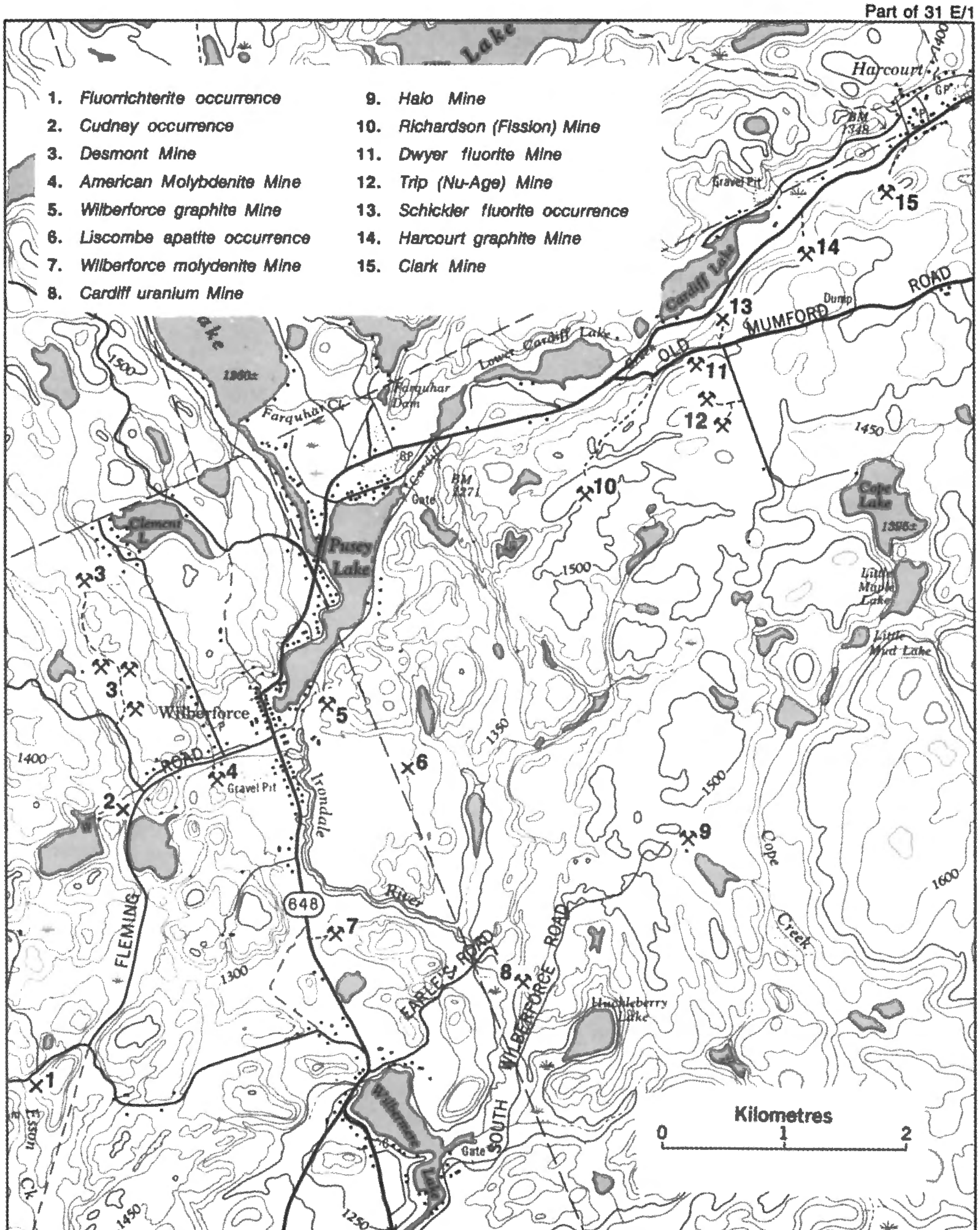
URANINITE, URANOTHORITE, THORITE, THOROGUMMITE, ZIRCON, BETAFITE, PYROXENE, CHLORITE, TOURMALINE, TITANITE, AMPHIBOLE, MOLYBDENITE, PYRITE, PYRRHOTITE, CALCITE, FLUORITE

In syenite or granite pegmatite cutting biotite gneiss and garnet-biotite gneiss.

Uraninite, uranothorite, thorite and betafite are the radioactive minerals in this deposit; uraninite occurs as small cubes and grains associated with black and amber thorite, greyish white earthy thorogummite and zircon in pyroxene-rich zones in pegmatite. Black uranothorite and crystals of betafite occur sparingly. Accessory minerals include chlorite, black tourmaline (small crystal aggregates), brown titanite, black amphibole, molybdenite, pyrite and pyrrhotite. Fractures in the pegmatite are filled with fluorite-calcite-pyrite veinlets. The pegmatite is composed of peristerite feldspar, microcline, quartz and abundant pyroxene.

The deposit was discovered by E.T. Hogan and was explored for uranium mineralization by Stratmat Limited in 1953 and by Halo Uranium Mines Limited in 1955-56. Underground development consists of two adits and a shaft sunk from one of the adits. The deposit is located on the northwest side of Hall Lake; No. 1 adit is near the shore of the lake and No. 2 adit is 300 m northwest of it. The property is held by Rare Earth Resources Limited.

Part of 31 E/1



GSC

Map 9. Wilberforce

Road Log from Highway 648 at **km 3.0**:

km	0	Junction South Wilberforce Road and Highway 648; proceed onto South Wilberforce Road. This road leads southeast along the south shore of Wilbermere Lake.
	1.5	Junction; turn right.
	2.2	Junction; follow road on right which proceeds between two farm buildings.
	2.3	Junction; follow road on right. This road is suitable only for vehicles with high clearance.
	3.3	Junction; continue straight ahead.
	6.3	Halo Mine

Refs.: *38* p. 67-68; *49* p. 8-9; *94* p. 59-63.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 3.3 Junction Earle's Road on right

Cardiff Uranium Mine

URANINITE, FLUORITE, CALCITE, APATITE, PHLOGOPITE, PYROXENE, SCAPOLITE, MOLYBDENITE; NORBERGITE, FLUOBORITE, SEPIOLITE, TOURMALINE, SERPENTINE, TITANITE, TALC, GRAPHITE, PYRITE, PYRRHOTITE

In veins cutting amphibolite and syenite gneiss; in crystalline limestone

This deposit was formerly explored for uraninite and fluorite. These minerals occur in calcite veins. Uraninite cubes measuring 5 mm to 2.5 cm have been reported. Fluorite is purple to almost black and commonly forms bands in cream-white to pink calcite that fluoresces pink under "short" ultraviolet rays. Green apatite crystals measuring up to 5 cm in diameter and mica books, 7 to 10 cm in diameter were reported from the deposit. Green pyroxene, scapolite, titanite, molybdenite and "micro" quartz crystals also occur in the calcite.

Dolomitic crystalline limestone associated with the deposit contains: orange norbergite commonly forming bands in the limestone, pink fluoborite crystals (about 5 mm long), white fibrous sepiolite forming patchy encrustations on the limestone, pink tourmaline grains, green serpentine, brownish pink titanite grains, amber mica, colourless to grey prismatic aggregates of clinoamphibole, blue apatite grains, white to light blue fibrous talc, light green prismatic clinopyroxene, graphite, pyrite and pyrrhotite.

The deposit was originally explored for fluorite in 1943 by Cardiff Fluorite Mines Limited; exploration for uranium was conducted by Cardiff Uranium Mines Limited from 1953 to 1955. The mineralization extends for about 3 km along the contact of gneiss and crystalline limestone. The development at the South zone consists of two adits, a shaft to a depth of 83.8 m and trenches. The openings are on the eastern slope of a ridge overlooking Irondale River. There is a large dump adjacent to the shaft. The property is held by Rare Earth Resources Limited.

Road log from Highway 648 at **km 3.3**:

km	0	Junction Earle's Road and Highway 648; proceed onto Earle's Road.
	0.4	Junction; turn left.
	1.1	Road-cut on right exposes crystalline limestone containing disseminations of black tourmaline, greenish yellow to grey scapolite, blue apatite, pink zircon (cyrtolite), light green clinoamphibole, brown titanite, light green clinopyroxene, amber mica and graphite.
	1.5	Gate to Lloyd Barnes Farm. Permisson to pass through the farm property may be obtained from Mr. Barnes.
	1.6	Gate on right to mine property.
	2.0	Cardiff Uranium Mine.

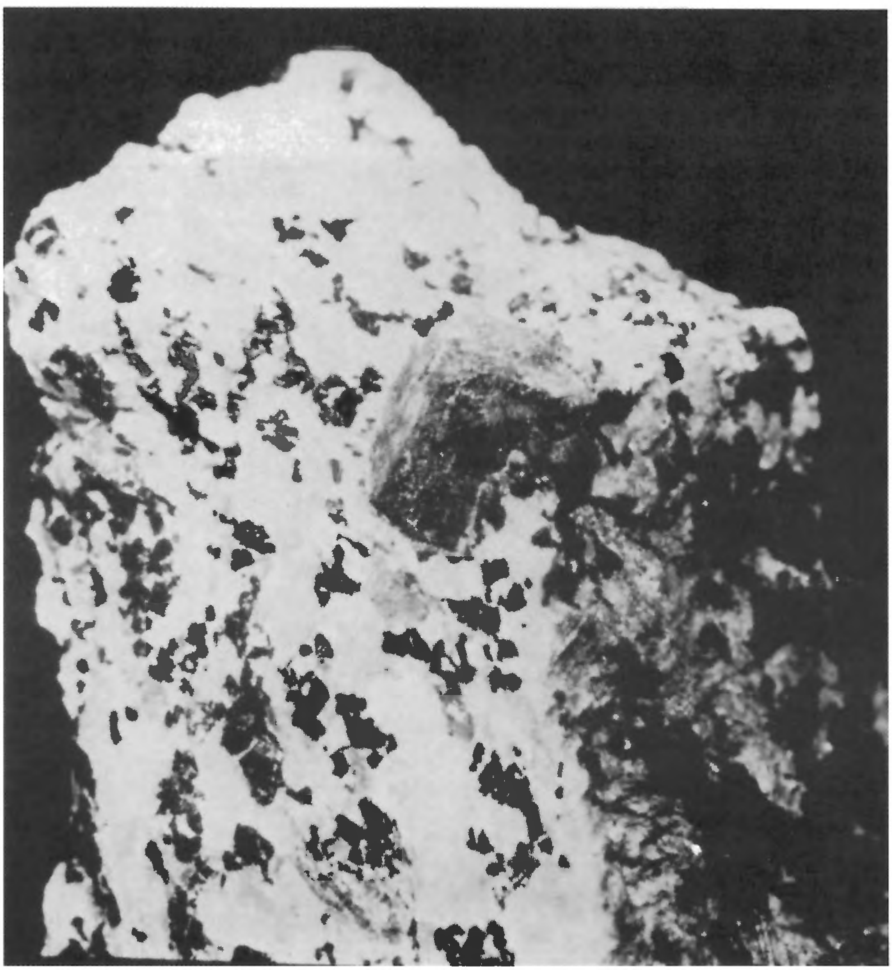


Plate 16

Uraninite crystal in calcite-fluorite matrix, Cardiff Uranium Mine. (GSC 203369-H)

Refs.: *38* p. 63-65; *49* p. 12; *55* p. 72-73; *94* p. 46-50; *118* p. 58.

Maps (T): 31E/1 Wilberforce
(G): 1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 3.45 Junction road to Sunset Cottages on left

Fluor-richterite Occurrence

FLUOR-RICHTERITE, CALCITE, MICA, CLINOPYROXENE GOETHITE

In gneiss

Prismatic crystals of fluor-richterite measuring up to 25 cm long occur with minor amber mica and clinopyroxene in light salmon-pink coarsely crystalline calcite. The fluor-richterite crystals are bluish grey to black, and in places are coated with goethite. The calcite fluoresces bright pink in "short" ultraviolet light and reddish pink in "long" ultraviolet light.

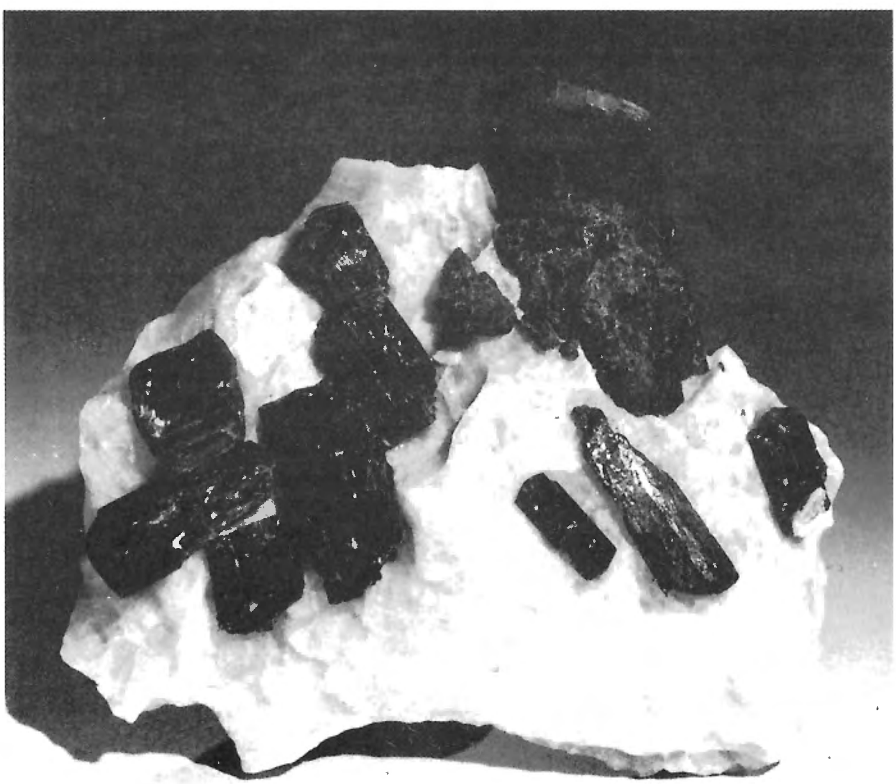


Plate 17

Fluor-richterite crystals in calcite, Earle occurrence, Wilberforce. (GSC 202481-T)

The occurrence was formerly exposed by an open cut on the property of Mr. George Earle. The rock exposure was removed recently when the road was widened. The occurrence is described here for historic interest.

Road log from Highway 648 at **km 3.45**:

km	0	Junction road to Sunset Cottages and Highway 648; proceed west along road to Sunset Cottages.
	2.3	George Earle farmhouse on left; specimens of fluor-richterite may be purchased from Mr. Earle.
	2.8	Junction; turn left. (An abandoned railway right of way leads south from this junction; crystals of green clinopyroxene occur in cream-white calcite exposed in outcrops along the former railroad.)
	3.2	Turn-off (right) to Sunset Cottages.
	3.3	Fluor-richterite occurred in a rock exposure formerly located on left.

Ref.: *70; 83* p. 73.

Maps (T): 31 E/1 Wilberforce
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**3.5**	*Road-cut* on left exposes pegmatite containing some peristerite.
km	**4.7**	Junction single-lane road on right to Wilberforce Molybdenite Mine

Wilberforce Molybdenite Mine

MOLYBDENITE, CLINOPYROXENE, MICA, PYRRHOTITE, CLINOAMPHIBOLE, TITANITE

In pyroxenite at contact of crystalline limestone and granite

Molybdenite occurs sparingly with green clinopyroxene and amber mica at this molybdenite prospect. Pyrrhotite, dark green clinoamphibole and titanite occur in the pyroxenite.

The deposit was opened in 1917 by Wilberforce Molybdenite Company, Limited. The openings consist of an adit and two trenches. The property belongs to Mr. Harry Clark and is accessible by a single-lane road leading east 175 m from Highway 648 at **km 4.7**.

Refs.: *60* p. 30-31; *92* p. 68-69.

Maps (T): 31 E/1 Wilberforce
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km 5.8 Turn-off (right) to The Glens Campground.

Liscombe Apatite Occurrence

APATITE, CLINOPYROXENE, MICA

In calcite vein cutting gneiss

Clear green apatite crystals ranging in colour from light green to yellowish green and greenish blue to aquamarine-blue occur in calcite with green clinopyroxene and amber mica. Gem quality apatite crystals were extracted from the deposit, cut into faceted stones and marketed as "trilliumite" in the 1970s. The stones were set in fine Karat gold jewellery. Books of mica measuring up to 25 cm in diameter have been reported from the deposit.

The deposit was originally opened for mica. In the 1970s it was worked for apatite by John Shearer. It is exposed by trenches measuring up to 20 m long on the western slope of a ridge.

Access is by a single-lane road (1.5 km long) leading east from Highway 648 at The Glens Campground at **km 5.8**. Enquire at the campground for permission to proceed through the property.

Refs.: *71* p. 11.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km 6.3 Wilberforce, at junction Fleming Road

American Molybdenite Mine

MOLYBDENITE, PYROXENE, PLAGIOCLASE, APATITE, TITANITE, PYRRHOTITE

In pyroxenite at contact of granite and crystalline limestone

Molybdenite occurs as flakes with green pyroxene in white plagioclase.

Light green apatite crystals (up to 7 cm long), brown titanite crystals and pyrrhotite are associated with molybdenite.

The deposit was opened for molybdenum in 1917. Development consisted of two shafts, 9 m and 12 m deep, and an open-cut. A concentrator was built on the site. About 78 t of ore were shipped from the deposit. Mine dumps are adjacent to the cement foundation of the concentrator. The mine is on the property of Mr. Orme.

Road log from Highway 648 at **km 6.3**:

km	0	Junction Highway 648 and Fleming Road; proceed west onto Fleming Road.
	0.6	A trail leads south beyond a beaver pond to the mine. The distance from the Fleming Road is about 180 m.

Refs.: *60* p. 32; *92* p. 69; *109* p. 132-134.

Maps (T): 31 E/1 Wilberforce
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

Desmont Mine

STILLWELLITE, HYDROXYLBASTNAESITE, MONAZITE, ANCYLITE, CLINOPYROXENE, PYRITE, GARNET, URANOTHORITE, THORIANITE, APATITE, MOLYBDENITE, TITANITE, SERPENTINE, QUARTZ, PLAGIOCLASE, K-FELDSPAR, CALCITE, SCAPOLITE, TOURMALINE, CLINOAMPHIBOLE, MARCASITE, MAGNETITE, SULPHUR, GOETHITE, CHONDRODITE, PERRIERITE, GRAPHITE, SPHALERITE, PYRRHOTITE, GYPSUM, ALLANITE

In calcite, granite pegmatite, crystalline limestone

This deposit is exposed by pits, strippings and trenches extending over a distance of 1150 m. At the Main showing, calcite veins in marble contain the uncommon minerals stillwellite and hydroxylbastnaesite. Stillwellite occurs as maroon-red, brownish red to brown, pink or grey hexagonal tabular crystals (measuring up to 4 mm by 5 mm) and lenticular or irregular masses with smooth to porcelain-like texture. It is generally opaque with a waxy to resinous lustre but it may also be almost transparent and resemble titanite. It commonly forms partial crusts around smoky quartz and clinopyroxene. Hydroxylbastnaesite is intergrown with stillwellite and also occurs as finely granular masses in calcite. It is brown, pinkish brown or dark green, opaque with waxy to resinous lustre. Yellow to orange monazite and light yellow ancylite are closely associated with stillwellite and hydroxylbastnaesite. The calcite in which they occur is coarsely crystalline cream-white to pink. Other minerals occurring in the calcite are: emerald green clinopyroxene (euhedral crystals), pyrite (crystals up to 5 mm long showing a variety of forms), orange sugary garnet, amber to dark green and black uranothorite, black thorianite, light green apatite crystals, molybdenite, brown titanite, dark green serpentine, smoky quartz (crystals and massive), pinkish grey plagioclase crystals (up to 1 cm long), grey K-feldspar crystals, grey to light green and yellow prismatic scapolite, black tourmaline, colourless to light green prismatic clinoamphibole, marcasite, magnetite, black sulphur (admixed with pyrite) and goethite. This mineral assemblage is exposed at the Main and East showings and in small trenches along the trail leading north from them. Black tourmaline occurs in white pegmatite exposed by trenches in the eastern part of the Main showing.

In a stripped area about 550 m (by trail) from the East showing, crystalline limestone and some pyroxene-bearing calcite are exposed. The mineralization of the calcite is similar to the East and Main showings. The crystalline limestone contains orange chondrodite with sparingly disseminated reddish brown to dark brown perrierite plates and irregular masses measuring up to 2 mm in diameter. Other minerals occurring in the crystalline limestone are amber mica, titanite, colourless to grey clinoamphibole, tourmaline, green clinopyroxene, yellow scapolite, graphite, light blue apatite, pyrite, sphalerite, pyrrhotite and molybdenite. Gypsum occurs as a white encrustation associated with pyrite in white granite pegmatite.

The most northerly pits expose white granitic rocks and crystalline limestone. The granitic rocks contain black glassy quartz, black tourmaline, black thorianite, uranothorite, greenish black allanite and chlorite. The deposit was explored for uranium mineralization in 1954 and 1955 by Desmont Mining Corporation, Limited.

Road log from Highway 648 at **km 6.3** (see p. 74):

km	0	Junction Highway 648 and Fleming Road; proceed west onto Fleming Road.
	1.1	Junction; turn right onto Cedar Lake Road.
	1.8	Junction; turn right onto single-lane road.
	1.9	Junction mine road on right. Proceed along this road for 100 m to the junction of a road on right; this road leads up a low ridge curving to the right and leads to the Main showing, a distance of 120 m. To reach the East showing, return to the mine road and proceed 275 m to the junction of a road on right; follow this road for 100 m to the East showing trenches.
		To reach the remaining strippings and trenches, return to the mine road and continue northward; they are located along the road at the following points beyond the turn-off to the East showing: 100 m, 330 m, 530 m, 760 and 880 m.

Refs.: *49* p. 28; *90* p. 225; *94* p. 86-88.

Maps	(T):	31 E/1 Wilberforce
	(G):	2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

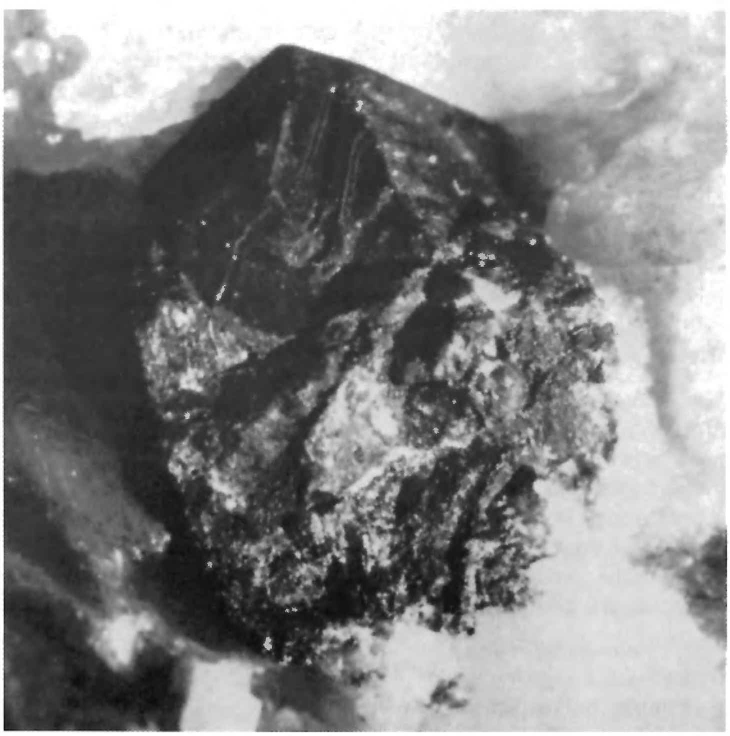


Plate 18

Stillwellite crystal in calcite, Desmont Mine. The crystal is 5 mm long and is partly capped with monazite. (GSC 203092-Z)

Cudney Occurrence

ZIRCON, COFFINITE, URANOTHORITE, PERISTERITE, PYROXENE, AMPHIBOLE, TITANITE, PYRRHOTITE, GOETHITE, KASOLITE

In syenite pegmatite

Turbid pink zircon (cyrtolite) crystals up to 5 mm long occur with black coffinite and orange uranothorite in pegmatite. Pink peristerite is a constituent of the pegmatite which contains green pyroxene, black amphibole, titanite, pyrrhotite and goethite. Yellow kasolite has been reported from the deposit.

The deposit is exposed by bulldozed strippings and shallow trenches on the east side of a ridge, near the crest. The openings were made by 1955 during exploration for radioactive mineralization. The deposit is on the property of T. Cudney.

Road log from Highway 648 at **km 6.3** (see p. 74):

km	0	Junction Highway 648 and Fleming Road; proceed west onto Fleming Road.
	1.2	Junction; turn right onto Cedar Lake Road.
	1.3	Junction; turn left.
	1.6	End of road at gate. The trenches and strippings are on the side of a wooded ridge, about 100 m south of the road.

Ref.: *94* p. 85-86.

Maps	(T):	31 E/1 Wilberforce
	(G):	2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

Wilberforce (Virginia) Graphite Mine

GRAPHITE, TOURMALINE, CLINOPYROXENE, CLINOAMPHIBOLE, SCAPOLITE, TITANITE, SERPENTINE, MICA, PYRRHOTITE, GOETHITE

In crystalline limestone

Graphite occurs as disseminated flakes in crystalline limestone comprising up to 10 per cent of the rock. Associated minerals include orange to brown tourmaline, yellow to green clinopyroxene, colourless to light yellow and brown clinoamphibole, light green massive scapolite (fluoresces yellow-orange under "long" ultraviolet light), brown titanite, green serpentine, amber mica, pyrrhotite and goethite.

The deposit was worked for graphite from 1910 to 1914 by the Virginia Graphite Company which was renamed the Tonkin-Dupont Graphite Company, Limited in 1913. The mine consists of an adit, 30 m long, and four pits, the largest measuring 12 m by 23 m and 30 m deep. A mill was erected just above the adit and treated ore from this deposit and from the National Graphite Mine.

Road log from Highway 648 at **km 6.3** (see p. 74);

km	0	Junction Highway 648 and Fleming Road; proceed east onto Fleming Road.

0.4 Dam on right. Walk from here across the dam and then along a footpath for 60 m to a clearing; continue beyond the clearing for another 60 m. Turn left and proceed up the hill to the adit. The pits are located 600 m by trail southeast of the adit. The property belongs to Mrs. Clara Schofield of Wilberforce.

Refs.: *92* p. 43; *99* p. 27-28.

Maps (T): 31 E/1 Wilberforce
(G): 2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**6.7**	*Road-cuts* expose crystalline limestone with disseminated grains of orange chondrodite, white fluoborite, amber mica, colourless clinoamphibole, yellow scapolite, colourless clinopyroxene and graphite.
km	**6.9**	Junction Dark Lake Road.
km	**7.2**	*Road-cuts* expose crystalline limestone containing grains of yellow to dark brown tourmaline, amber mica, blue apatite, green clinopyroxene, brown titanite, green serpentine, pyrite and pyrrhotite. Pyroxenite is associated with the crystalline limestone.
km	**7.7**	Junction road to Harcourt Park, Grace River.
km	**9.2**	Junction road to Farquhar Lake.

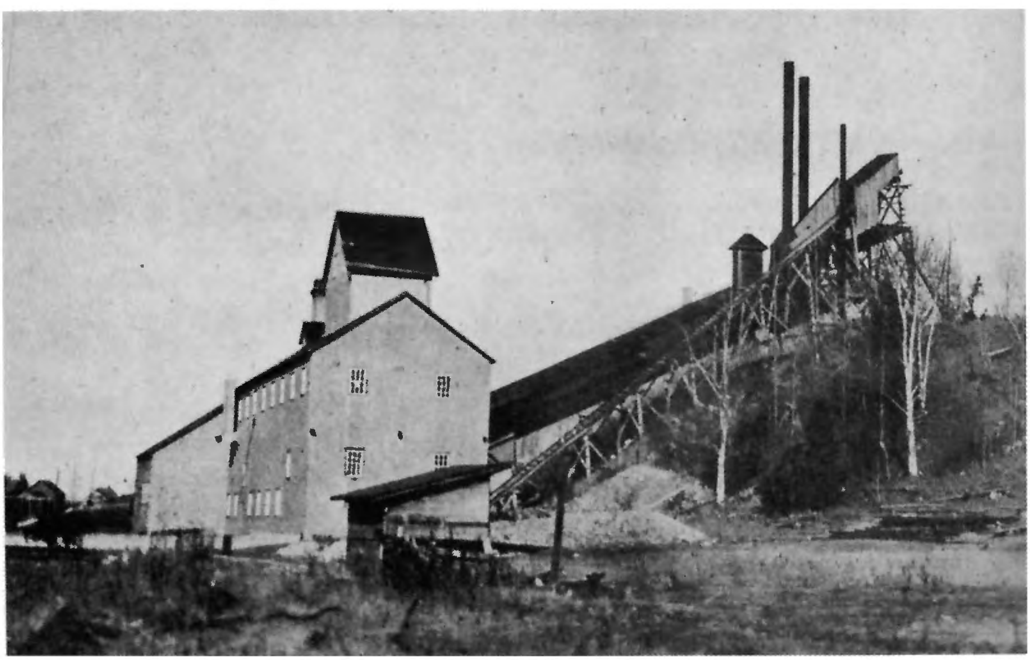


Plate 19

Mill at Wilberforce (Virginia) graphite mine, 1914. The mill was completed in 1912 and milled ore from the nearby side-hill pit and from other properties in the district. (GSC 204031-B)

		Road-cuts on Highway 648 on west side of this junction expose coarsely crystalline black amphibole in amphibolite associated with pegmatite containing titanite and amphibole crystals. East of the junction, road-cuts expose crystalline limestone containing brown tourmaline, clinopyroxene and mica.
km	**9.5**	Junction Glen Drive on right.
km	**9.8**	*Road-cut* on left. Coarse cleavable masses of white calcite (fluoresces bright pink under ultraviolet light) occur with black lustrous coarse crystal aggregates of clinoamphibole, colourless to yellowish massive scapolite (fluoresces pink in "short" ultraviolet light), green apatite crystals (measuring up to 10 cm long and 2 cm in diamater), green clinopyroxene, titanite, pyrite and mica.
km	**10.1**	*Road-cut* on left. Rusty weathered hornblende syenite is coated with white finely crystalline gypsum.
km	**10.4**	Junction Elizabeth Road on left.
km	**10.9**	Junction Old Mumford Road. This road leads to: Richardson Mine, Dwyer fluorite mine, Schickler fluorite occurrence and the Tripp Mine.

Richardson (Fission) Mine

URANINITE, URANOTHORITE, URANOPHANE, BETAFITE, EUXENITE, FLUORITE, APATITE, CLINOAMPHIBOLE, ZIRCON, TITANITE, BIOTITE, FELDSPAR, MAGNETITE, ALLANITE, CLINOPYROXENE, PYRITE, MOLYBDENITE, CHLORITE, MELANOCERITE, CHALCOPYRITE, PYRRHOTITE, HEMATITE

In calcite-fluorite rock and syenite pegmatite.

The first discovery of uraninite in the Wilberforce area was made here in 1922 by Mr. W.M. Richardson, owner of the property and experienced prospector and miner of Alaska and the Yukon. He came to this district to prospect for molybdenite and fluorite. While prospecting, he encountered a heavy black mineral in pegmatite outcrops and identified the mineral as uraninite which was sought at the time as the richest ore of radium. The occurrence created considerable attention due to the fairly abundant large crystals (up to 5 cm in diameter) and masses of uraninite recovered from the first opening. Uraninite was found in cavities in pegmatite with magnetite, mica or calcite-fluorite intergrowths. The crystals were cubes modifed by octahedral faces.

The radioactive minerals, uranothorite, uranophane, euxenite and betafite, have been reported from the deposit. Deep purple fluorite which bleaches on exposure to sunlight is the most conspicuous mineral; it occurs as fine to coarse granular aggregates forming wavy and contorted bands in cream-white calcite which fluoresces pink under "short" ultraviolet rays. This compact deep purple fluorite is generally associated with uraninite and emits a fetid odour when crushed. The calcite is host to several minerals which were found as large crystals in the initial mining operations: clear, brownish green apatite crystals up to 15 cm in diameter and 30 cm long with well developed prism faces and either poor terminations or conspicuous development of the basal plane; black clinoamphibole crystals up to 30 cm in diameter; grey to brown or black zircon crystals with sharp faces measuring up to 4 cm long and 1 cm wide; brown titanite crystals, 25 mm in diameter; biotite books, measuring 30 cm in diameter; pink feldspar crystals up to 90 cm in diameter; magnetite, as crystals and irregular masses intergrown with uraninite, apatite and clinoamphibole. Other minerals associated with calcite include allanite,

Plate 20

Radioactive spring, International Radium and Resources Limited property, 1932. A stone wall is being built around the spring which was then considered of commercial importance. The property is known as the Richardson deposit. (Public Archives Canada PA 14703)

clinopyroxene, pyrite, molybdenite, chlorite, melanocerite, chalcopyrite, pyrrhotite and hematite. Emerald-green clinoamphibole suitable for lapidary purposes occurs in the deposit.

This was the largest and one of the first deposits in Canada to be explored as a source of radium, which was used in radiology in hospitals. The original openings were made by Mr. Richardson in 1922. The pit from which he extracted the large uraninite crystals measured 15 m long and 1.8 to 2.4 m deep. It cut across a pegmatite dyke which had an east-west strike. This opening is known as the Richardson pit. It is about 200 m northeast of a shaft put down a few years earlier for fluorite. In 1923, Mr. Charles Baycroft opened a 9-m trench near the Richardson pit. Results of concentration tests did not warrant further exploration until 1929 when the Ontario Radium Corporation discovered uraninite-bearing calcite-fluorite bodies in pegmatite about 500 m northeast of the Richardson discovery pit. Most of the subsequent exploration from 1929 to 1931 was directed to this new discovery. A shaft was sunk 15 m from the top of the hill where outcrops had been explored by 36 pits and trenches over an area 75 m wide and 950 m long and extended into an adit which was driven 183 m into the steep north side of the hill. International Radium and Resources Limited built a mill on the site in 1931-1932 and made test runs in 1933. The company tested the water of a lake (460 m north west of the deposit) and springs along the ridge and found the water to be strongly radioactive. Further surface exploration was done by Fission Mines, Limited between 1946 and 1948 and in 1955.

To reach the deposit proceed west along the Old Mumford Raod for a distance of 0.5 km from its junction with Highway 648 at **km 10.9** (See page 79) to the junction of a single-lane road leading south a distance of 1200 m to the adit.

Refs.: *27* p. 213-227; *49* p. 19-20; *72* p. 44; *88* p. 1-16; *92* p. 83-85; *94* p. 56-58; *95* p. 420; *106* p. 205-244; *118* p. 8-10.

Maps (T): 31 E/1 Wilberforce
(G): 1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile).

Dwyer Fluorite Mine

FLUORITE, APATITE, CLINOPYROXENE, CLINOAMPHIBOLE

In calcite vein cutting granite.

Purple fluorite occurs as coarsely granular aggregates forming bands in cream-white calcite which fluoresces pink when exposed to "short" ultraviolet rays. The bands are straight, wavy or contorted and produce attractively patterned specimens. Green and red apatite occurs as crystals commonly 3 cm in diameter. Black hornblende and green clinopyroxene also occur in the calcite.

The deposit is exposed by an open-cut (measuring 9 m in diameter) on the north slope of a ridge facing the Old Mumford Road. It was mined by Mr. P.J. Dwyer who shipped 33.5 t of ore in 1918.

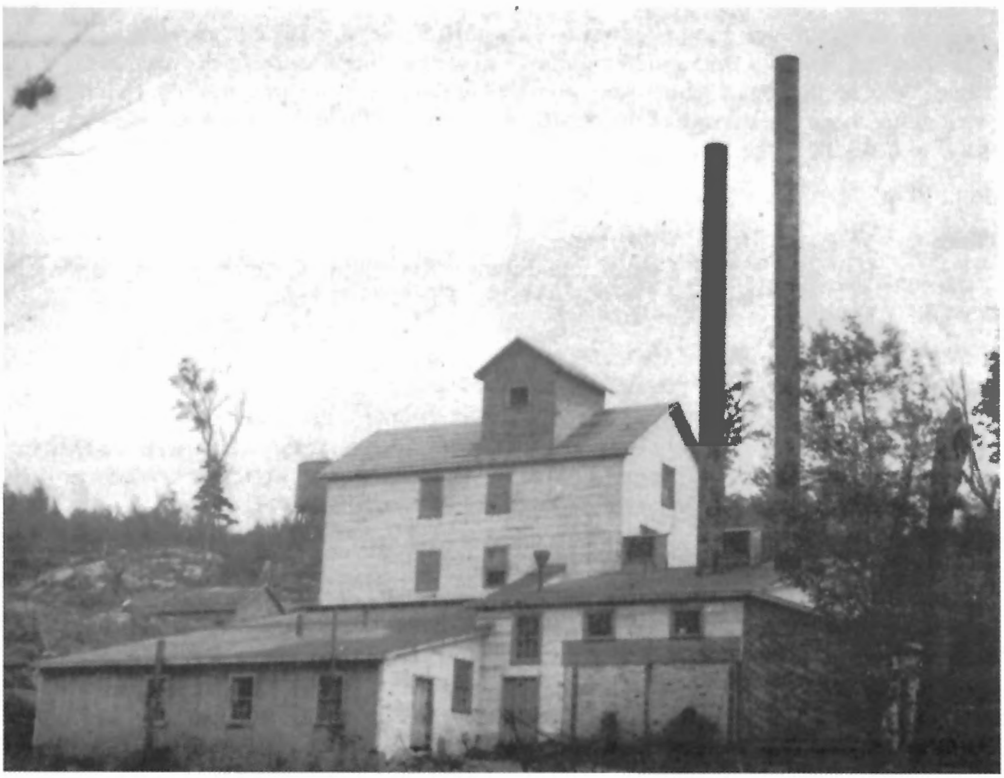


Plate 21

Mill at International Radium and Resources Limited property, 1932. After test runs were made in 1932-33, the mill was dismantled. It was on the property known as the Richardson mine. (Public Archives Canada PA 14707)

To reach the mine, proceed east along the Old Mumford Road for a distance of 0.7 km from its junction with Highway 648 at **km 10.9** (see page 79). The mine is about 50 m from the road and the dumps are readily visible from it.

Refs.: *92* p. 33-34.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Schickler Fluorite Occurrence

FLUORITE, APATITE, CLINOPYROXENE, CLINOAMPHIBOLE, SCAPOLITE, FELDSPAR

In calcite vein cutting hornblende granite

Purple fluorite occurs as grains and granular aggregates in white calcite. Red and green apatite crystals averaging 1.5 cm in diameter occur with green clinopyroxene in the calcite. The vein also carries black clinoamphibole, grey to green scapolite and pink feldspar.

The deposit was exposed by a trench 33 m long, 2 m wide and 2 to 3 m deep in a clearing north of the Old Mumford Road.

To reach the occurrence, leave Highway 648 at **km 10.9** (see page 79) and proceed east along the old Mumford Road for 0.95 km to a point 45 m west of the junction of the road to the Tripp Mine. Walk north along a partly overgrown wagon road for 140 m to a clearing; turn right and walk along the northern edge of the clearing for 130 m to the trench in an outcrop area at the edge of a wooded area.

Ref.: *92* p. 34.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

Tripp (Nu-Age) Mine

FLUORITE, URANINITE, URANOTHORITE, APATITE, CLINOPYROXENE, SCAPOLITE, BIOTITE, FELDSPAR, CLINOAMPHIBOLE, ALLANITE, THORITE, ZIRCON, MAGNETITE, PYRITE, CHALCOPYRITE, PERISTERITE

In fluorite-calcite veins, pegmatite and syenite gneiss

This deposit was originally developed for fluorite and later was explored for radioactive minerals. Fluorite occurs as dark purple compact granular aggregates in white to pinkish white calcite (fluoresces pink when exposed to "short" ultraviolet rays). Associated with fluorite are: light green to red apatite, green clinopyroxene and light greyish green scapolite. Uraninite cubes (up to 1 cm along an edge), uranothorite crystals, zircon, allanite, brown to black thorite and biotite crystals also occur in the calcite. Crystals of black clinoamphibole, red feldspar and apatite line the walls of the calcite-fluorite veins and lenses in syenite gneiss. Uraninite also occurs in dark red syenite where it is associated with magnetite, pyrite and chalcopyrite. Syenite pegmatite carries uranothorite. Some pink peristerite was noted in pegmatite in the dumps.

The deposit was worked in 1924 for fluorite by Industrial Minerals Corporation. The workings consisted of trenches and a shaft put down to a depth of 6.7 m. A shipment of 1.8 t of hand-picked fluorite was made. In 1954, Nu-Age Uranium Mines, Limited conducted a scintillometer survey of the property and discovered radioactive zones which were explored from 1954 to 1956 by surface openings and an inclined shaft.

Road log from Highway 648 at **km 10.9** (see page 79):

km	0	Junction; proceed east onto the Old Mumford Road.
	0.5	Junction (on right) road to Richardson (Fission) Mine; continue straight ahead.
	0.7	Dwyer Fluorite Mine on right.
	0.95	Junction (on left) road to Schickler fluorite occurrence; continue straight ahead.
	1.0	Junction gravel road; turn right (south).
	1.55	Junction Tripp Mine road; turn right.
	1.75	Junction. Road on right leads 200 m to the inclined shaft. The road on left leads 300 m to a pit (measuring 3 m by 9 m and 3.6 m deep) which yielded high-grade uranium ore. About 100 m southwest of this pit a trench (3 m by 19 m and 1.2 to 1.8 m deep) exposes a calcite-fluorite vein, and about 210 m southeast of the pit is the original shaft sunk from a trench (48 m long) at about its midpoint. The walls of the vein as exposed in the trench are lined in places with crystals of red apatite, black clinoamphibole and uraninite crystals measuring 3 mm to 2.5 cm in diameter.

Refs.: *32* p. 19; *49* p. 21; *92* p. 32-33; *94* p. 69-72.

Maps (T): 31 E/1 Wilberforce
(G): 1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**11.3**	Junction Little Cardiff Lake Road on left.
		Road-cuts on the east side of this junction expose crystalline limestone containing disseminations of orange chondrodite, graphite, amber mica, violet fluorite, colourless to light green and brown clinoamphibole, colourless olivine, green serpentine, blue apatite, pyrite, pyrrhotite and magnetite.
km	**12.95**	Junction single-lane road on right to Harcourt Graphite Mine.

Harcourt Graphite Mine

GRAPHITE, GOETHITE, JAROSITE, CLINOPYROXENE, CLINOAMPHIBOLE, FELDSPAR, ALLANITE, TITANITE, APATITE, MICA

In biotite paragneiss

Graphite flakes occur in calcite-clinopyroxene zones in paragneiss. Rusty goethite and yellow jarosite occur as powdery coatings on graphite. Black clinoamphibole, yellow plagioclase, grey K-feldspar, black allanite, titanite and mica are associated with graphite.

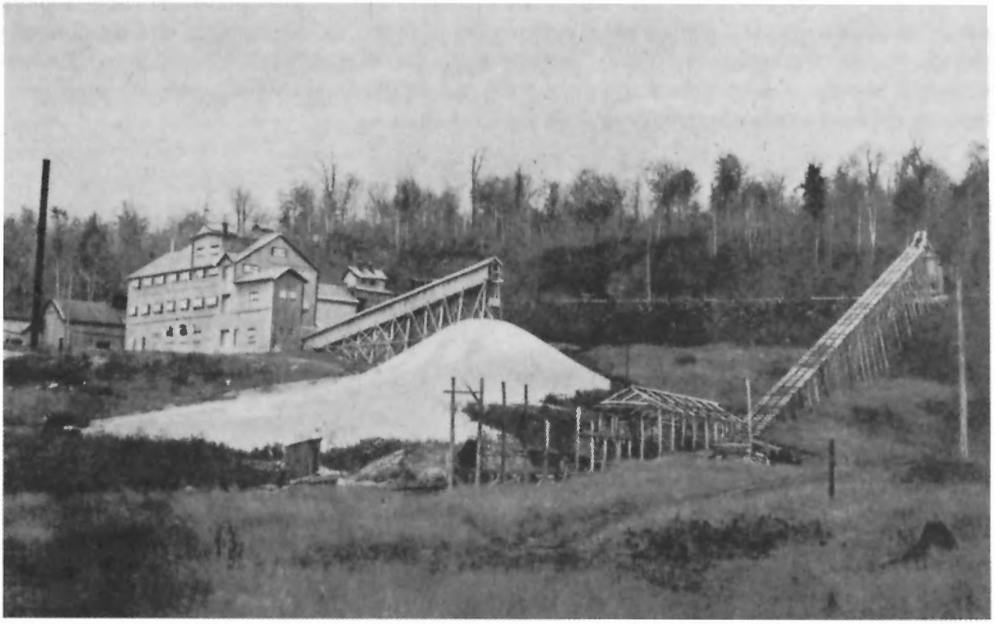


Plate 22

Mill at Harcourt graphite mine, about 1916. The mill was built by the New York Graphite Company in 1913. Ore from the dump was conveyed by an inclined tramway and loaded onto railway cars for transport to drying kilns. (GSC 204031-A)

The deposit was worked for graphite from 1912 to 1915 by New York Graphite Company. The openings consist of several pits and an adit along the north slope of a ridge, the largest pit measuring 18 m by 4.5 m and 12 m deep. A three-story mill was built at the base of the ridge and treated ore from this deposit and from the National Graphite Mine.

Access to the mine is by a single-lane road leading south from Highway 648 at **km 12.95** for a distance of 300 m. Remnants of the mill are located about 100 m from the adit.

Refs: *92* p. 41; *99* p. 26-27.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**13.0**	Junction Upper Cardiff Lake Road on left.
km	**14.2**	Junction Old Harcourt Road on left and single-lane road to Clark Mine on right.

Clark Mine

FLUORITE, SCAPOLITE, CLINOPYROXENE, APATITE, TITANITE, CALCITE, URANOTHORITE, SUNSTONE

In syenite pegmatite intruding hornblende gneiss

Lilac-coloured to purple fluorite occurs as coarsely crystalline aggregates with green clinopyroxene, greenish white scapolite, green apatite and pink calcite. Crystals of pink feldspar measuring up to 60 cm in diameter and of pyroxene up to 90 cm in diameter and terminated crystals of scapolite and apatite have been reported from the deposit. Titanite occurs as crystals measuring 6 mm long. Uranothorite occurs in pyroxene and some pink sunstone occurs in the pegmatite.

The deposit was worked for fluorite by Mr. W.E. Clark from 1940 to 1942; shipments totalling 27.2 t of acid-grade fluorite were made. The ore was obtained from several pits and trenches extending over a distance of 180 m along the top of a hill. In 1950 Topspar Fluorite Mines, Limited conducted exploration consisting of an open-cut (3 m by 24 m) and an adit driven 27 m from the south end of the cut on the north side of the hill. A mill was constructed on the site.

Road log from Highway 648 at **km 14.2**:

km	0	Junction single-lane road (on right) and Old Harcourt Road on left; proceed onto single-lane road on right.
	0.15	Junction; turn right onto wagon road. Proceed along this road for 240 m to the adit and mine dumps.

Refs.: *32* p. 13,15; *92* p. 34; *94* p. 74-75.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**15.1**	Harcourt (Mumford) at junction Old Harcourt Road on left. This road leads south to a road leading west joining Highway 648 at **km 10.9** (see page 79).
km	**15.9**	Junction Elephant Lake Road on left.
km	**23.6**	Highland Grove, at junction Baptiste Lake Road. This road leads to the Baptiste Lake South occurrences (see page 26).
		Road-cut on Highway 648 just north of the junction exposes rusty weathered syenite coated in places with acicular crystal aggregates of white gypsum.
km	**27.3**	Junction Camp Keewaydin Road on right and East Line Road on left.

Drury Occurrence

APATITE, TITANITE, MICA

In calcite cutting granite

Crystals of green to brownish green apatite measuring up to 7 cm wide and 30 cm long have been reported from this occurrence. They occur with brown titanite crystals and mica.

The deposit is exposed by a shallow, partly overgrown pit measuring 2.4 m by 1.2 m on the farm of Mr. Harold Drury which is on the north side of the Camp Keewaydin Road at a point 1.3 km west of its junction with Highway 648.

Ref.: *92* p. 20.

Maps	(T):	31 E/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)

km	**28.5-28.8**	*Road-cut* exposes red syenite containing coarse crystal aggregates of black clinoamphibole with some pyrite and magnetite.
km	**29.5**	Junction Townline Road on left.

Croft Mine

URANINITE, URANOTHORITE, ALLANITE, BETAFITE, PYROCHLORE, GARNET, SILLIMANITE, TOURMALINE, ZIRCON, MONAZITE, APATITE, CLINOPYROXENE, TITANITE, CHLORITE, GRAPHITE, PYRITE, MOLYBDENITE, SULPHUR

In biotite-granite pegmatite cutting gneiss and amphibole

Radioactive mineralization consisting of uraninite (minute crystals), uranothorite, allanite, betafite and pyrochlore occurs in pegmatite in which the radioactive zones are characterized by a dark red colour and by dark grey to almost black smoky quartz. Pink garnet is common in biotite-sillimanite gneiss and in pegmatite; the crystals average 1 cm in diameter in the gneiss and measure up to 3 cm in diameter pegmatite. Sillimanite occurs as small colourless prisms and as white fibrous to prismatic aggregates. Lustrous black tourmaline occurs as crystals measuring up to 2 cm in diameter in pegmatite, and as masses up to 7 cm in diameter in gneiss. Other accessory minerals occurring in the deposit include: pink to grey zircon (cyrtolite) crystals, yellow to yellowish green monazite, yellow to orange apatite as granular masses, dark green glassy clinopyroxene, brown titanite, black chlorite, graphite, pyrite, molybdenite, and sulphur as grey earthy to black sooty aggregates.

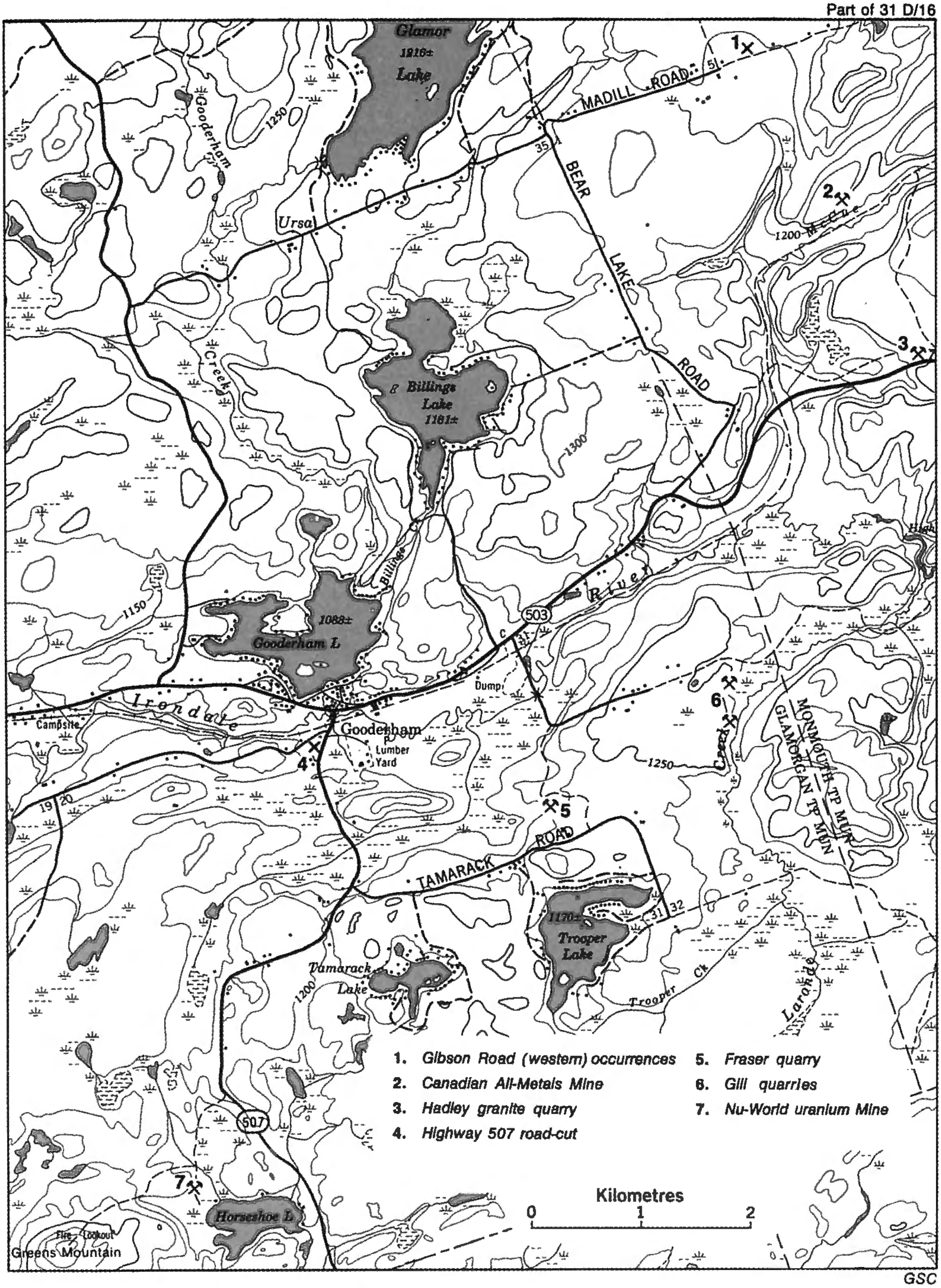
The deposit was explored for uranium mineralization from 1953 to 1955 by Croft Uranium Mines Limited. Development consists of an adit and several trenches.

Road log from Highway 648 at **km 29.5**;

km	0	Junction Highway 648 and Townline Road; proceed east along Townline Road.
	3.3	Junction; turn right onto mine road.
	5.1	Adit and mine dumps.

Refs.: *38* p. 58-61; *94* p. 37-40.

Maps	(T):	E 31/1 Wilberforce
	(G):	1957-1 Cardiff and Faraday Townships, Counties of Haliburton and Hastings, Ontario (O.G.S., 1 inch to ½ mile)



Map 10. Gooderham

km	30.2, 30.6	*Road-cuts* expose hornblende syenite coated with colourless to white crystalline crusts of gypsum and earthy yellow jarosite.
km	30.9-31.7	*Road-cuts*. Magnetite occurs as irregular masses in red hornblende syenite. Dark red garnet, pyrite, titanite and coarsely crystalline aggregates of hornblende occur in the syenite.
km	35.0	Junction Highway 121.

TORY HILL – GOODERHAM – KINMOUNT

km	0	Tory Hill, at junction Highway 121 and Highway 503; proceed onto Highway 503.
km	0.5	*Road-cut* on right exposes crystalline limestone and granite. Veins of coarse white to pink and orange calcite cut the granite; the calcite contains dark green to black thorianite crystals ("micro"), light brown to amber plagioclase crystals measuring up to 2 cm wide, greenish blue to light green prismatic aggregates of clinopyroxene, green clinoamphibole, orange-red to brown bastnaesite as irregular patches associated with pyroxene and plagioclase, and reddish brown titanite grains. The white and pink calcite fluoresces pink under "short" ultraviolet rays. The crystalline limestone is finely disseminated with molybdenite, pyrite (small crystals) and amber mica. It contains crystals of green apatite and greyish green prismatic aggregates of plagioclase.
km	1.3	Junction Lee's Road.
km	4.3	Intersection Bryan's Road. This road is the old Tory Hill — Gooderham road.
km	5.3	Junction road (on right) to Hadley granite quarry.

Hadley Granite Quarry

GRANITE

Fine-grained red granite was formerly quarried from this deposit. Grains of magnetite and pyrite occur in the granite.

The quarry was opened in 1912. It was operated in 1935 by Mr. Allan Hadley who shipped about 136 t of granite to Toronto for use as paving stone and monuments. Examples of its use as monument stone may be seen at the Gooderham cemetery on Highway 503 at **km 10.4**.

Access to the quarry is by a single-lane road that leaves Highway 503 at **km 5.3**. Proceed along this road for 150 m to a junction; turn left and continue for 75 m to the quarry.

Ref.: *92* p. 87-88.

Maps	(T):	31 D/16 Gooderham
	(G):	2174 Monmouth Township, Haliburton County (1 inch to ½ mile)

km	6.7	Intersection single-lane road. This road, an abandoned railway right of way, leads to the Canadian All Metals Mine.

Canadian All Metals Mine

URANINITE, THORIANITE, BETAFITE, CLINOPYROXENE, DATOLITE, SEPIOLITE, TALC, CLINOAMPHIBOLE, MICA, QUARTZ, SERPENTINE, ZIRCON, APATITE, TOURMALINE, MAGNETITE, GRAPHITE, MOBLYDENITE, PYRITE

In silicated marble containing lenses and pods of calcite

The radioactive minerals, uraninite, thorianite and betafite, occur as grains and crystals measuring up to 5 mm in diameter in pink to orange massive calcite. Light green clinopyroxene is common in the calcite. Colourless, transparent datolite occurs as irregular masses up to 2 mm in diameter and as tabular and stubby prismatic crystals up to 0.5 mm long embedded in calcite. Silky white scaly to pulverulent sepiolite occupies small pockets in calcite, the pockets commonly being rimmed by datolite. Other minerals in the calcite include: finely flaky white talc, light green clinoamphibole, amber mica, colourless quartz, green serpentine, pink zircon crystals, light blue apatite grains, small black tourmaline prisms, magnetite as grains and tiny octahedra, graphite, molybdenite and pyrite.

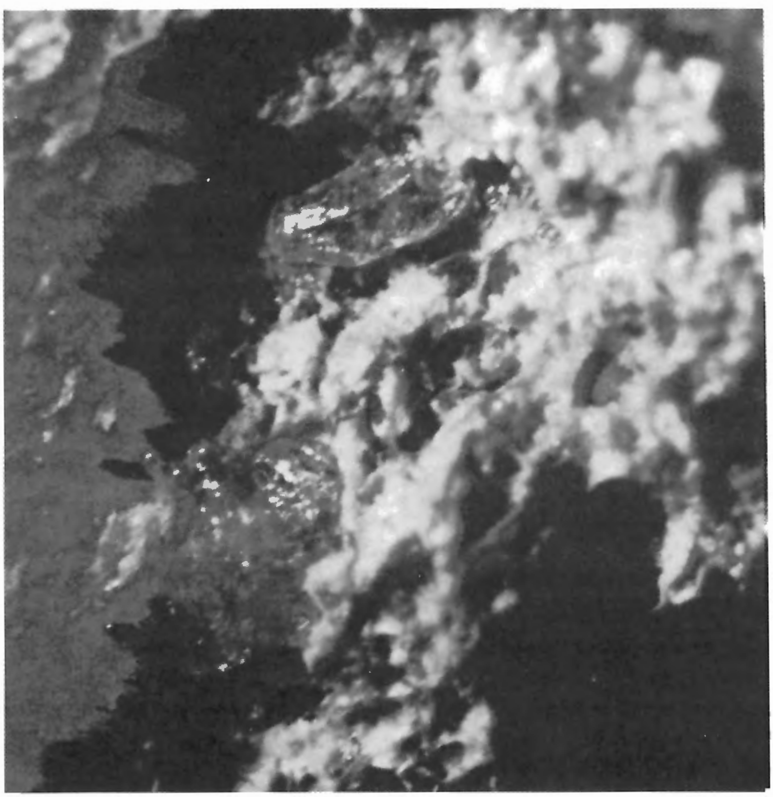


Plate 23

Datolite crystals in sepiolite, Canadian All Metals Mine. The crystals are transparent, tabular and measure 0.5 mm long. (GSC 201836-F)

The deposit was opened in 1955 for uranium minerals by Canadian All Metals Explorations, Limited. Exploration consisted of bulldozing, stripping, trenching and an adit. Dumps near these openings are partly overgrown.

Road log from Highway 503 at **km 6.7**:

km	0	Turn right (north) onto single-lane road.
	2.1	Junction; turn left onto rough road leading up steep hill.
	2.25	Junction wagon road on right at crest of ridge; follow this road for about 60 m to the openings and dumps.

Ref.: *94* p. 83-85.

Maps	(T):	31 D/16 Gooderham
	(G):	2174 Monmouth Township, Haliburton County (1 inch to ½ mile)

km	**7.8**	*Road-cut* on right. White calcite veins containing dark green prismatic aggregates of clinopyroxene, titanite crystals averaging 2 cm long, and light green apatite cut pink granite exposed by this road-cut.
km	**8.4**	Junction Bear Lake Road on right.

Gibson Road (Western) Occurrence

AMPHIBOLE, BIOTITE, APATITE, TITANITE

In calcite veins cutting granitic rocks

This locality is known for its large crystals. Black amphibole occurs as large crystals and crystal groups in buff to pink coarsely crystalline calcite. Large crystals of biotite about 30 cm in diameter, and light green apatite crystals measuring up to 30 cm long occur with the amphibole. Titanite crystals measuring up to 20 cm long occur in calcite and in the granitic rocks. The calcite fluoresces bright pink in "short" ultraviolet light.

The occurence is exposed by several shallow pits along the western end of the Gibson Road. It is also known as the Bear Lake occurrence.

Road log from Highway 503 at **km 8.4**:

km	0	Junction Bear Lake Road; proceed onto this road.
	4.1	Junction; continue straight ahead.
	4.2	Junction; turn right onto Madill Road.
	5.5	Junction; continue straight ahead.
	6.9	The road at this point deteriorates and may be unsuitable for vehicles with low clearance. (Parking is not allowed on private property on either side of the road at this point.)
	7.1	Pits along side of road. (The road continues to the Gibson Road occurrences near Tory Hill; (see page 58).

Maps	(T):	31 D/16 Gooderham
	(G):	2174 Monmouth Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	10.4	Junction road on left at cemetery.

Gill Quarries

NEPHELINE, SODALITE, CANCRINITE, NATROLITE, ANALCIME, APATITE, ZIRCON, PLAGOICLASE, CALCITE, GRAPHITE, MAGNETITE, PYRITE, GOETHITE, TALC

In nepheline pegmatite

Small amounts of blue sodalite and yellow cancrinite occur in grey nepheline. The cancrinite fluoresces white in "long" ultraviolet light. Colourless to pink and orange-red natrolite is associated with sodalite and white massive analcime is associated with cancrinite. Light green granular apatite and pink to brown zircon also occur in the pegmatite which consists of nepheline, white to yellowish plagoiclase, light pink calcite and biotite. Graphite, magnetite and pyrite occur as minor accessories. Goethite and talc form sparse coatings on the rock. Some peristerite was noted in the deposit.

The deposit was opened by two quarries, about 500 m apart. About 6 cars of nepheline were removed from the deposit by Gooderham-Nepheline in about 1938.

Road log from Highway 503 at **km 10.4**:

km	0	Proceed south along road leading south from highway at cemetery.
	0.3	Junction; continue straight ahead.
	2.2	Gate to V. Schmohl property. The upper quarry is located on the south slope of a hill near the farmhouse. It measures about 10 m in diameter. The lower quarry is 500 m south of the upper quarry.

Ref.: *92* p. 72-74.

Maps	(T):	31 D/16 Gooderham
	(G):	2173 Glamorgan Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	10.5	Junction Wolf Lake Road (on right).
km	**12.1**	Gooderham, at junction Highway 507.

Highway 507 Road-cut

SCAPOLITE, TOURMALINE, CLINOAMPHIBOLE, APATITE, CLINOPYROXENE, SERPENTINE, MICA, PYRITE, PYRRHOTITE, GRAPHITE, SPHALERITE

In crystalline limestone

Mauve to greyish blue and colourless scapolite occurs in crystalline limestone; some gem quality scapolite was formerly obtained from this occurrence. Associated minerals include: brownish green tourmaline, colourless to light green prismatic aggregates of clinoamphibole, light blue sugary apatite, bluish white and light green clinopyrexene, blue-green to green serpentine, mica, pyrite, pyrrhotite, graphite and sphalerite.

This road-cut is on the east side of Highway 507, 0.6 km south of its junction with Highway 503.

Maps	(T):	31 D/16 Gooderham
	(G):	2173 Glamorgan Township, Haliburton County (O.G.S., 1 inch to ½ mile)

Fraser Quarry

NEPHELINE, SODALITE, AMPHIBOLE, ZIRCON, NATROLITE, CALCITE, BIOTITE, BETAFITE, PYRRHOTITE, GRAPHITE, CORUNDUM

In nepheline pegmatite

The pegmatite consists of grey nepheline and grey plagioclase with small amounts of sodalite, black amphibole, pink to brown zircon, orange-red natrolite, white calcite (fluoresces pink in "short" ultraviolet light) and biotite. Betafite occurs as small black irregular masses in nepheline. Pyrrhotite grains and graphite flakes occur sparingly in nepheline. Corundum has been reported from the deposit.

The deposit was worked for nepheline in 1937 and 1938 by J.A. Fraser. About 2880 t of nepheline were shipped from the deposit. The workings consist of two adjacent quarries, one measuring 24 m long and 3 to 6 m deep, the other 68 m long and 7.5 m deep.

Road log from Highway 503 at **km 12.1**:

km	0	Gooderham at junction highways 503 and 507; proceed onto Highway 507.
	0.6	Road-cut on left (see page 91).
	1.7	Junction; turn left onto Tamarack Lake Road.
	2.3	Junction; continue straight ahead.
	3.3	Junction; continue straight ahead.
	3.9	Farmhouse on left. Enquire regarding entry to quarries. The turn-off to the quarries is 0.2 km east of the farmhouse.

Refs.: *40* p. 39-40; *92* p. 71-73.

Maps	(T):	31 D/16 Gooderham
	(G):	2173 Glamorgan Township, Haliburton County (O.G.S., 1 inch to ½ mile)

Nu-World Uranium Mine

URANOTHORITE, ALLANITE, BASTNAESITE, TOURMALINE, TITANITE, CALCITE, CLINOPYROXENE, PYRITE, SCAPOLITE, APATITE

In granite pegmatite

This deposit was explored for radioactive mineralization in 1955. The radioactive minerals are uranothorite and allanite. Uranothorite occurs as sparse grains in pegmatite, and allanite occurs as black plates measuring up to 2 cm long in calcite pods in the pegmatite. Dull black bastnaesite occurs as irregular patches in feldspar. Accessory minerals in the pegmatite include black tourmaline, titanite, clinopyroxene and pyrite. Crystalline limestone, which is in contact with the pegmatite dykes, contains crystals of apatite, scapolite and clinopyroxene.

The deposit was explored by several trenches in an outcrop area along the slope of a bald knoll.

Road log from Highway 503 at **km 12.1**: (see page 91).:

km	0	Gooderham, at junction highways 503 and 507; proceed onto Highway 507.
	1.7	Junction Tamarack Lake Road; continue along Highway 507.
	4.1	Junction single-lane road on right; follow this road toward the fire tower.
	4.25	Junction; continue straight ahead.
	4.9	Junction wagon road on left at bend in road. Follow the wagon road for 200 m to the trenches. There are eight trenches extending in an east-west direction over a distance of 280 m.

Ref.: *92* p. 80-81.

Maps (T): 31 D/16 Gooderham
(G): 2173 Glamorgan Township, Haliburton County (O.G.S., 1 inch to ½ mile)

km	**12.4**	*Road-cut* on north side of Highway 503 exposes crystalline limestone containing grains of green clinopyroxene, light yellow scapolite, dark brown allanite, mica, titanite and pyrrhotite.
km	**12.9**	*Road-cuts* expose crystalline limestone disseminated with orange chondrodite, colourless to yellow and green clinopyroxene, colourless to light brown clinoamphibole, colourless to greyish green scapolite (prismatic aggregates), green serpentine, light blue apatite, amber mica, titanite, pyrite, pyrrhotite and graphite.
km	**13.8**	Junction Buckhorn Road North.
km	**24.4**	Turn-off (left) to Irondale.
km	**30.0**	Turn-off (right) to Th. Dancey farm.

Dancey Tremolite Occurrence

TREMOLITE, CALCITE, APATITE, PYRITE

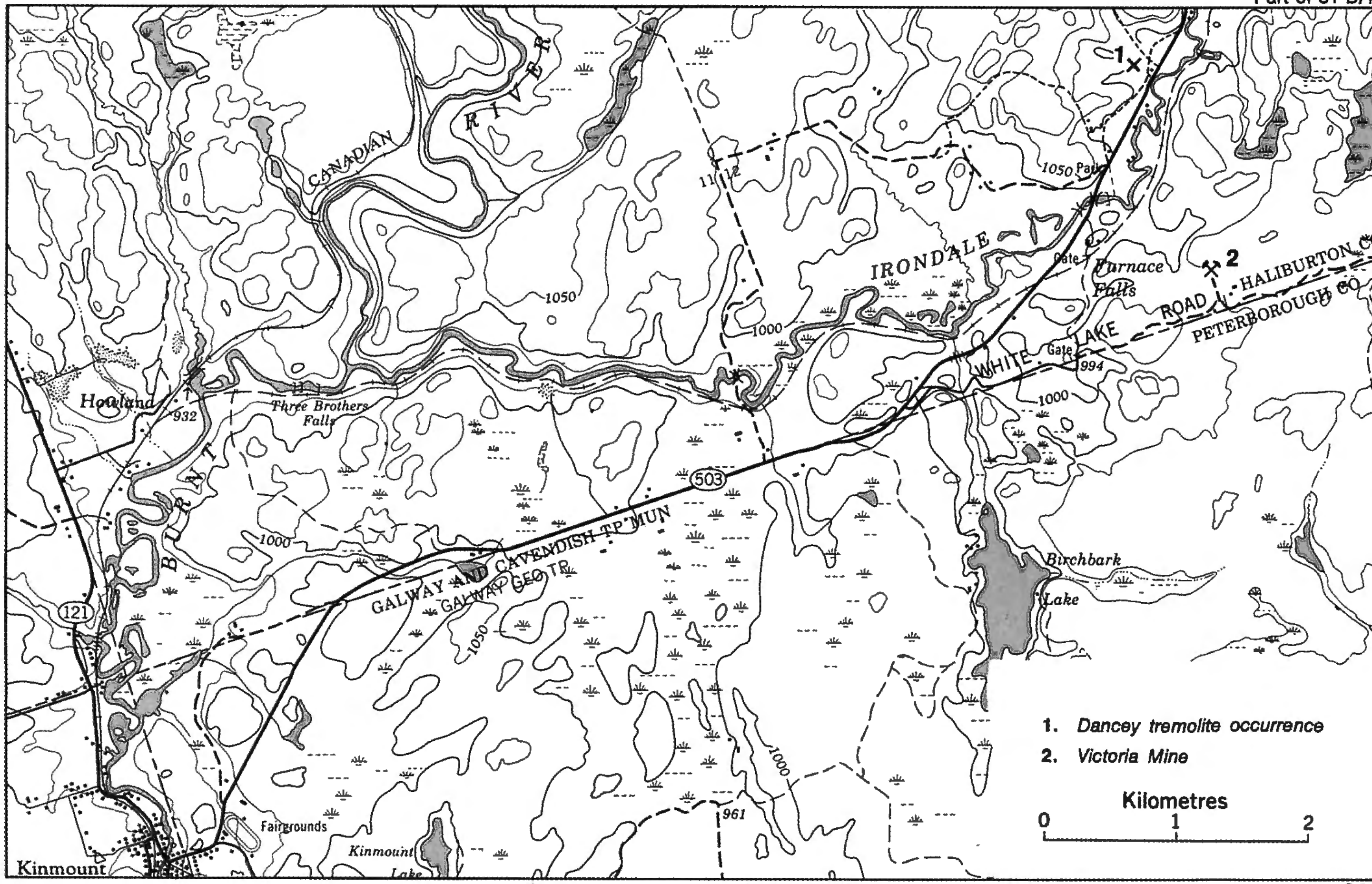
In crystalline limestone

Coarsely bladed white tremolite occurs in crystalline limestone. White granular massive calcite is associated with it. Tiny light blue apatite crystals and patches of pyrite occur in the tremolite.

The tremolite-bearing crystalline limestone outcrops on a hillside on the west side of the barn on the farm of Mr. Th. Dancey at **km 30.0** on Highway 503.

Maps (T): 31 D/15 Minden
(G): 52a Haliburton Area, Province of Ontario (O.G.S., 1 inch to 2 miles)

Part of 31 D/15



GSC

Map 11. Irondale

km	33.2	Junction White Lake Road.

Victoria Mine

MAGNETITE, PYROXENE, SCAPOLITE, GARNET, AMPHIBOLE, PYRRHOTITE, GOETHITE

In calcite at contact of crystalline limestone and hornblende-feldspar gneiss

Magnetite, the ore mineral, occurs as granular masses associated with dark green pyroxene, greenish yellow scapolite, orange-red garnet, abundant black amphibole and pyrrhotite. Goethite occurs as coatings on magnetite.

The deposit was opened for iron in 1872 by Thomas Shortiss who made a shipment of iron ore. The ore was obtained from a trench measuring 5 m by 73 m. In 1882 Messrs. Parry and Mills examined the property and began the construction of a blast furnace but funds ran out before completion.

Road log from Highway 503 at **km 33.2**:

km	0	Junction Highway 503 and White Lake Road; proceed onto the White Lake Road.
	1.4	Junction; follow road on right
	2.6	Junction single-lane mine road on left; turn left onto this road.
	3.0	Trench at sharp bend in road. Dumps are located in the wooded area on both sides of the trench.

Refs.: *86* p. 55-56; *92* p. 45-46; *121* p. 326, 394.

Maps	(T):	31 D/15 Minden
	(G):	52a Haliburton, Province of Ontario (O.G.S., 1 inch to 2 miles)

km	40.4	Kinmount, at junction Highway 121 and Highway 503.

PARRY SOUND – HUNTSVILLE AREA

Mill Lake Quarry

ALLANITE, GARNET, MAGNETITE

In feldspar-biotite gneiss

Allanite occurs as lustrous black small masses in the gneiss. Grains of red garnet and magnetite are sparsely disseminated in the rock.

The quarry is on the western shore of Mill Lake. It is operated by Mr. W. R. Hall for gneiss used as flagstone, and veneer for buildings.

Road log from Parry Sound:

km	0	Junction Highway 69 and Highway 69B North; proceed south onto Highway 69.
	2.1	Quarry on left just north of bridge over Seguin River.

Ref.: *48* p. 57.

Maps	(T):	41 H/8 Parry Sound
	(G):	2118 Parry Sound-Huntsville area, Ontario (O.G.S., 1 inch to 2 miles)

Ambeau Mine

FELDSPAR, QUARTZ, BIOTITE, GARNET, CHLORITE, FERGUSONITE, ALLANITE, HEMATITE

In pegmatite dyke cutting granite gneiss

The main constituents of the pegmatite are pink microcline feldspar, white plagioclase, colourless to smoky quartz and biotite mica. Red garnet occurs as crystals measuring up to 12 mm in diameter in biotite books and in quartz and feldspar. Other minerals present are light green chlorite, dark brown to black fergusonite (in massive form and as small prisms), black allanite and massive hematite.

The deposit was worked for feldspar in 1926-27 by Wanup Feldspar Mines Limited from a pit measuring 42.6 m long, 3 to 6 m wide and 4.5 to 6 m deep. Shipments totalling 907 t were reported to have been made.

Road log from Parry Sound:

km	0	Junction Highways 69 and 69B North; proceed north along Highway 69.
	68.0	Junction Highway 526; proceed onto Highway 526 toward Britt.
	68.6	Turn-off to Ambeau Mine on right. Proceed straight ahead along a fence for 45 m to the crest of an outcrop area; turn left and walk along the outcrops for about 15 m to the open-cut.

Refs.: *91* p. 58; *101* p. 55-56.

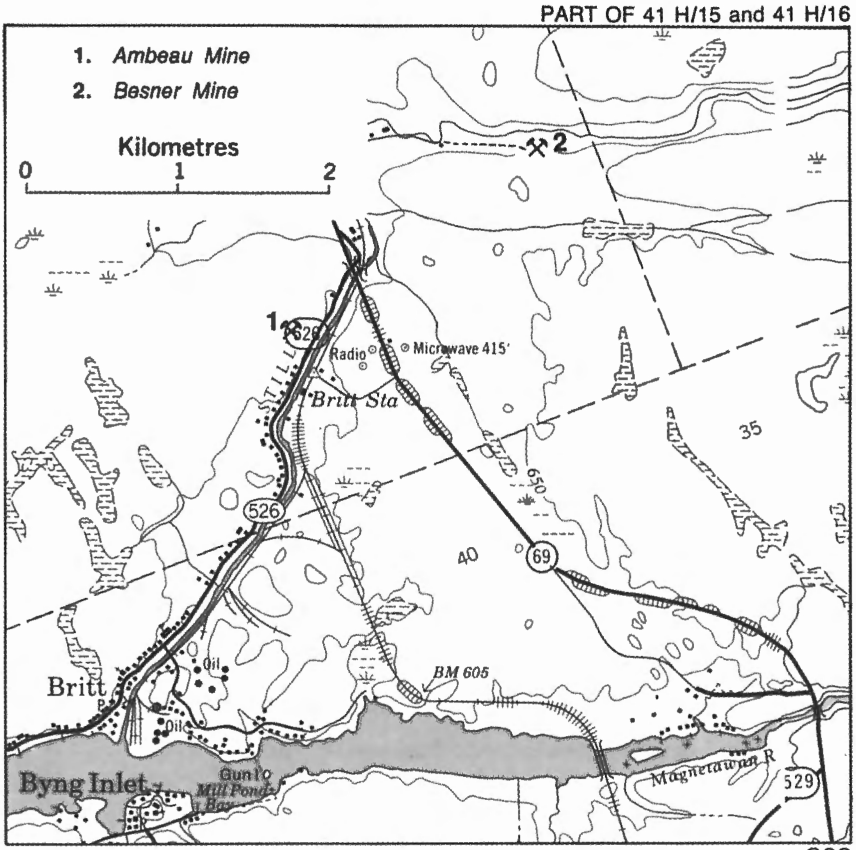
Maps	(T):	41 H/15 Key Harbour
	(G):	51a Portions of the districts of Parry Sound and Muskoka, Province of Ontario (O.G.S., 1 inch to 2 miles)

Besner Mine

MICROCLINE, PLAGIOCLASE, PERISTERITE, PERTHITE, GRAPHIC GRANITE, QUARTZ, BIOTITE, MAGNETITE, AMPHIBOLE, GARNET, MUSCOVITE, APATITE, BERYL, ZIRCON, CHERT, MARCASITE, THUCHOLITE, URANINITE, TITANITE, ALLANITE, OIL

In pegmatite dyke

Pink microcline feldspar, white plagioclase, pink peristerite, colourless quartz, graphic granite and perthite are the main constituents of the dyke. Accessory minerals include: large thin books of biotite, massive magnetite, large black amphibole crystals, and red garnet, muscovite, light blue apatite (microprisms), greenish blue beryl (small crystals and massive), and zircon



Map 12. Britt

(cyrtolite). Some massive greenish grey chert containing marcasite was noted. The radioactive hydrocarbon, thucholite, is associated with radiating green chlorite and it occurs as black irregular masses measuring up to 10 mm in diameter, as nodules (up to 25 mm in diameter), as cubic crystals up to 25 mm along the edge, and as veinlets in feldspar. Cubic crystals of uraninite and massive uraninite occur in thucholite. Massive allanite, titanite and massive zircon (cyrtolite) are associated with thucholite. Yellow liquid oil and nodules of hardened oil were reported to occur in fracture zones in the pegmatite.

The deposit was worked for feldspar from 1926 to 1929 by Wanup Feldspar Mines Limited which shipped about 2268 t of feldspar. It was the largest feldspar operation in the district. The open-pit measures 46 m by 15 m and 9 m deep. It is on the Charles Besner property.

Road log from Parry Sound:

km	0	Junctions highways 69 and 69B North; proceed north along Highway 69.
	68.0	Junction Highway 526 to Britt; continue along Highway 69.
	68.3	Junction; turn right onto gravel road.

	68.95	Charles Besner farmhouse. (Obtain permission to enter property here.) The road to the mine continues straight ahead.
	69.3	Junction; turn right.
	69.8	Cabin. Continue along road for 180 m to the mine.

Refs.: *27* p. 171-173; *91* p. 58; *101* p. 56.

Maps (T): 41 H/15 Key Harbour
(G): 51a Portions of the districts of Parry Sound and Muskoka, Province of Ontario (O.G.S., 1 inch to 2 miles)

Bernard Lake Sunstone Occurrence

SUNSTONE, PERISTERITE

In granite gneiss and granite pegmatite

Patches of pink sunstone and pink peristerite occur in granite gneiss exposures along the eastern shore of Bernard Lake. The patches measure 10 to 15 mm in diameter. Both the sunstone and peristerite are suitable for lapidary purposes.

Road log from Parry Sound:

km	0	Junction highways 69 and 69B North; proceed north along Highway 69.
	1.5	Junction; proceed onto Highway 124.
	79.5	Junction; proceed onto Highway 11 North.
	82.9	Turn-off to Sundridge; turn right.
	83.2	Junction; turn left.
	85.4	Junction; turn right.
	86.3	Junction; turn left.
	88.5	Junction; turn right onto road to Glen Bernard Camp.
	89.3	End of road at Camp. The granitic rocks containing peristerite and sunstone are exposed along the shore of Bernard Lake beginning about 500 m south of the Camp buildings.

Maps (T): 31 E/11 Burk's Falls
(G): 51a Portions of the districts of Parry Sound and Muskoka, Province of Ontario (O.G.S., 1 inch to 2 miles)

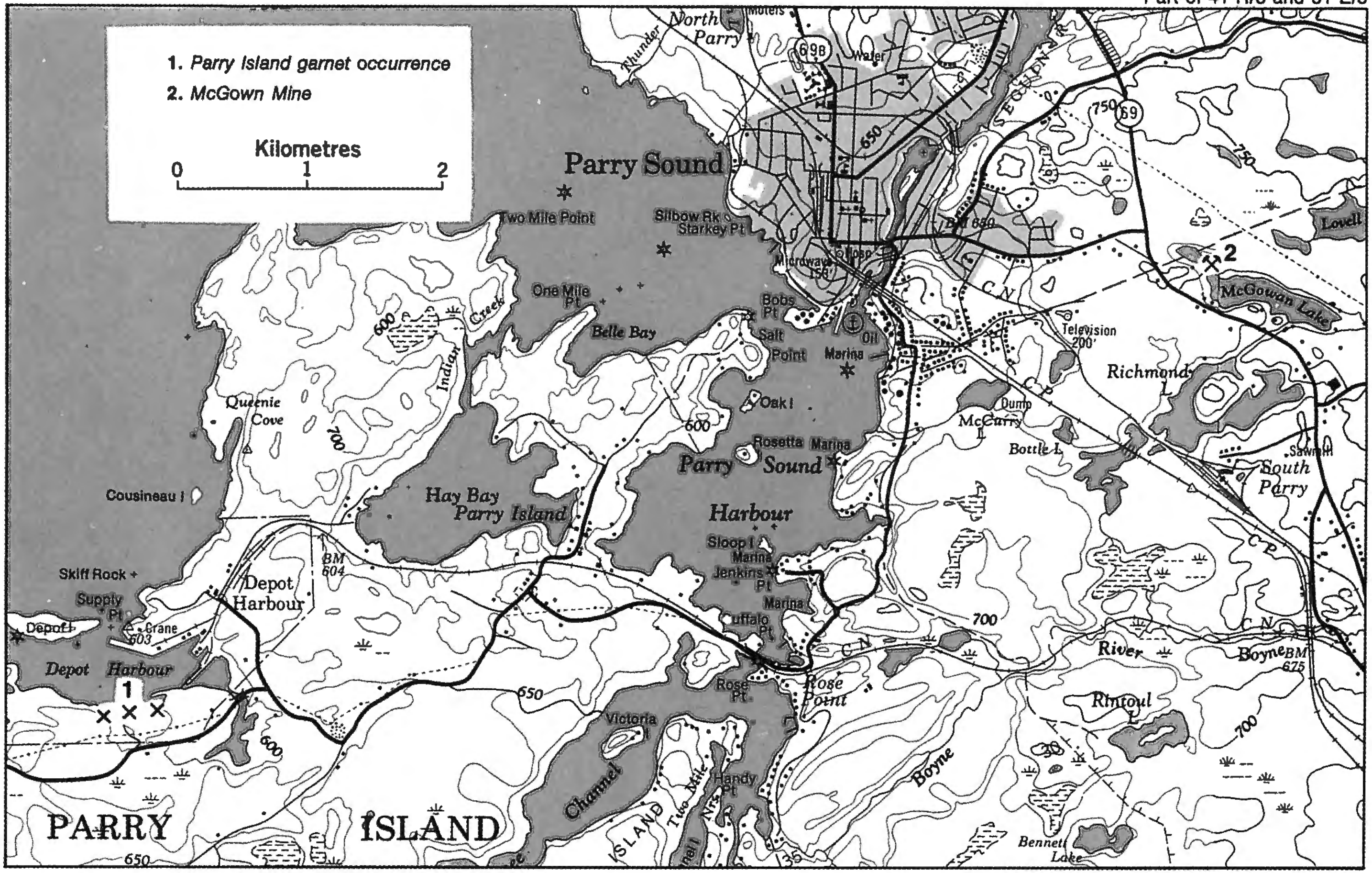
Parry Island Garnet Occurrence

GARNET, SILLIMANITE, STAUROLITE, APATITE, GRAPHITE

In hornblende gneiss and mica schist

Pink to red garnet crystals measuring up to 4 cm in diameter occur in alternating bands of hornblende gneiss and mica schist. Associated with the garnet are colourless to white fibrous aggregates of sillimanite, dark brown prisms (micro) and grains of staurolite, colourless massive apatite and graphite flakes. The garnet constitutes up to 15 per cent of the rock.

Part of 41 H/8 and 31 E/5



GSC

Map 13. Parry Sound

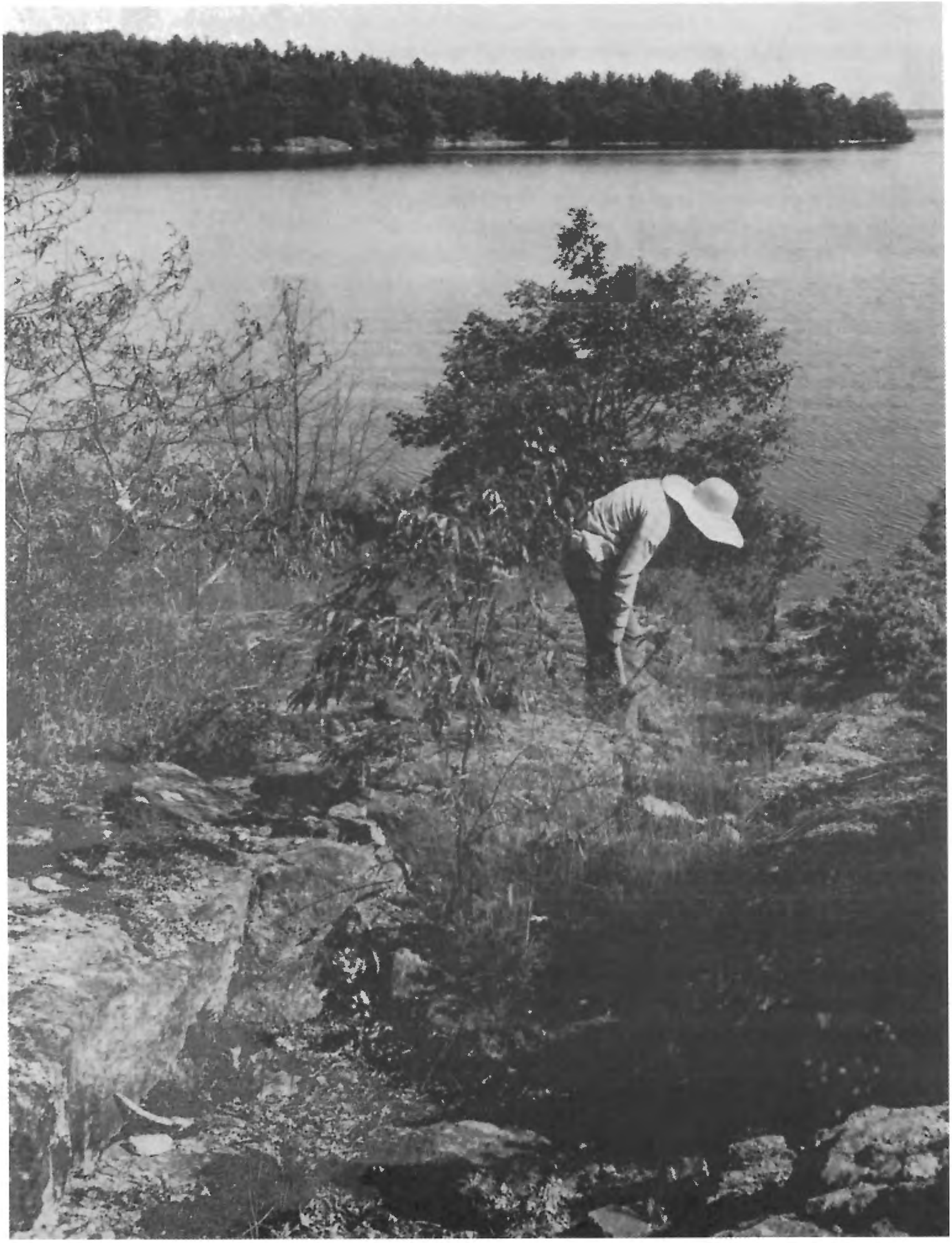


Plate 24

Parry Island garnet occurrence. The garnet-bearing rock is exposed by a trench extending diagonally from left foreground to the shoreline of Depot Harbour. (GSC 175286)

The deposit was explored by several trenches in 1921 and a test shipment of garnet was made in the following year. The garnetiferous rocks are exposed along the north shore of Parry Island at Depot Harbour.

Road log from Parry Sound:

km	0	Junction Highway 69B and Great North Road; proceed south along Great North Road.
	1.1	Turn right onto Emily Street.
	4.75	Junction; turn right.
	6.9	Junction at cemetery; turn left.
	8.9	Junction; turn right.
	9.8	Junction; turn left.
	10.9	Junction; turn right.
	11.2	Chechock house. The trenches are along the shoreline of Parry Sound north of the house.

Refs.: *26* p. 15-17; *85* p. 24.

Maps (T): 31 H/8 Parry Sound
(G): 2118 Parry Sound-Huntsville area, Ontario (O.G.S., 1 inch to 2 miles)

McGown Mine

CHALCOCITE, BORNITE, NATIVE GOLD, GARNET, EPIDOTE, TITANITE

In hornblende gneiss

Chalcocite and bornite occur as disseminations with chalcopyrite in grey quartz veins and in the hornblende gneiss host rock where it is associated with garnet, epidote and titanite. Native gold has been found as scaly aggregates in chalcocite-bornite veinlets in the gneiss.

This deposit was discovered and originally worked in 1894 for gold by Thomas McGown. Initially he found enough gold to enable a local jeweller to hammer a few rings and was encouraged to form his own company to exploit the gold. The gold occurred as small nuggets and scales associated with the copper minerals in quartz. The deposit was opened by a trench (30 mm long) near the northwestern end of McGown Lake. In 1897 McGown Gold Mining Company sank a 48-m shaft from the east end of the trench. In 1898, local boys while swimming in McGown Lake discovered a blue boulder which was found to be bornite, and the discovery of copper mineralization caused a short-lived staking rush to the area. From 1898 to 1908, mining was conducted by Parry Sound Copper Mining Company, Limited which sank three shafts to depths of 72.5 m, 10 m and 26.5 m, and erected a 10-stamp mill near the shore of the lake. A total of 151.5 t of ore obtained from the open-cut on the shore of the lake shipped in 1899 to the Orford Copper Company. The ore graded 15.68 per cent copper and carried some gold and silver. This old mine is on the property of J.C. Easton.

km	0	Junction highways 69 and 69B South; proceed south along Highway 69.
	0.55	Turn-off (left) to the Easton property.

Refs.: *19* p. 98-100; *48* p. 31-33; *91* p. 31-32; *98* p. 212; *123* p. 266.

Maps (T): 31 H/8 Parry Sound
(G): 2118 Parry Sound-Huntsville Area, Ontario (O.G.S., 1 inch to 2 miles)

Burcall Mine

CALCITE, SCAPOLITE, APATITE, CLINOPYROXENE, CLINOAMPHIBOLE, TITANITE, PLAGIOCLASE, CHLORITE, MICA, GRAPHITE, PYRITE, QUARTZ

In crystalline limestone

Calcite occurs as medium-grained aggregates ranging from white to pink in colour. It is sparsely disseminated with small crystals or irregular grains of yellow to light green scapolite, light blue apatite, green clinopyroxene, black clinoamphibole, brown titanite, light yellow plagioclase, green chlorite, amber mica, graphite, pyrite and colourless quartz.

The deposit was worked for calcite between 1971 and 1975 by Burcall Industrial Minerals Limited. The calcite was mined from an open-pit measuring 60 m by 8 m and 10 m deep. The calcite was processed in the company's plant in Burk's Falls.

Road log from Parry Sound:

km	0	Junction highways 69 and 69B South; proceed onto Highway 69 South.
	1.9	Junction; turn left onto Highway 518.
	33.7	Junction; turn left onto road leading north.
	42.5	Junction; follow road on right.
	52.4	Junction; continue straight ahead.
	53.3	Junction, at Spence; turn left. (This junction is 19.5 km from Burk's Falls.)
	58.8	Junction. Main road curves to the right; follow road straight ahead.
	60.0	Burcall Mine.
Maps	(T):	31 E/12 Magnetawan
	(G):	51a Portions of the districts of Parry Sound and Muskoka, Province of Ontario (O.G.S., 1 inch to 2 miles)

McKay Feldspar Mine

FELDSPAR, GRAPHIC GRANITE, QUARTZ, BIOTITE, SUNSTONE, MAGNETITE

In pegmatite dyke cutting biotite gneiss

The pegmatite consists of pink microcline, white plagioclase, graphic granite, white quartz and books of biotite. Some sunstone is also present. Magnetite occurs as an accessory.

The deposit was worked in 1941 by F.C. Hammond and Allan McKay for feldspar which was obtained from a pit measuring about 8 m in diameter. A car-load of feldspar was shipped.

Road log from Huntsville:

km	0	Junction Highway 60 and Highway 11, north of Huntsville; proceed south along Highway 11.
	3.5	Junction; turn right onto Muskoka Road No. 3 (Lake Vernon Road).
	11.3	Junction; turn left.
	11.4	Turn-off to the McKay farm house. The feldspar pit is on a wooded slope of a ridge about 50 m from the house.

Ref.: *91* p. 61.

Maps (T): 31 E/6 Huntsville
(G): 2118 Parry Sound-Huntsville Area, Ontario (O.G.S., 1 inch to 2 miles)

Ojaipee Mine

ALLANITE, FELDSPAR, QUARTZ, BIOTITE

In granite pegmatite

Large prismatic crystals of allanite have been reported from this former quartz-feldspar producer. The crystals measured up to 7 cm wide, 3 cm thick and 90 cm long. They occurred in a pegmatite dyke composed of pink microcline feldspar, white plagioclase, colourless to white quartz and biotite.

The deposit was worked from a trench in 1910 by Ojaipee Silica Feldspar Company which produced 90 t of feldspar and 1350 t of quartz.

Access is by an old road leading west from Highway 69 at a point 5 km south of its junction with Highway 141, or 4.4 km north of the Canadian National Railway crossing at Gordon Bay. The trench is on the north side of the road. To reach it, proceed along this road for 1.9 km to a railway crossing, then continue another 300 m to the occurrence.

Refs.: *27* p. 187; *91* p. 57.

Maps (T): 31 E/4 Lake Joseph
(G): 2118 Parry Sound-Huntsville area, Ontario (O.G.S., 1 inch to 2 miles)

McQuire Mine

URANINITE, THUCHOLITE, CYRTOLITE, CALCIOSAMARSKITE, ALLANITE, FELDSPAR, QUARTZ, MUSCOVITE, BIOTITE

In granite pegmatite

Uraninite was discovered at this deposit in 1921 by James Robinson. The uraninite, remarkable for its unaltered nature, occurred as steel-grey to black metallic cubes modified by octahedral faces. The cubes averaged 5 mm in diameter but crystals measuring up to 2.5 cm were found. The crystals were found in a pegmatite dyke consisting of colourless to smoky quartz, pink microcline feldspar and crystals of muscovite and biotite. Other minerals reported from the pegmatite include lustrous black nodules and globular aggregates (up to 3 cm in diameter) of thucholite, square prisms of black submetallic calciosamarskite measuring up to 3 cm long and 5 mm wide, radiating aggregates of cyrtolite and small crystals of allanite.

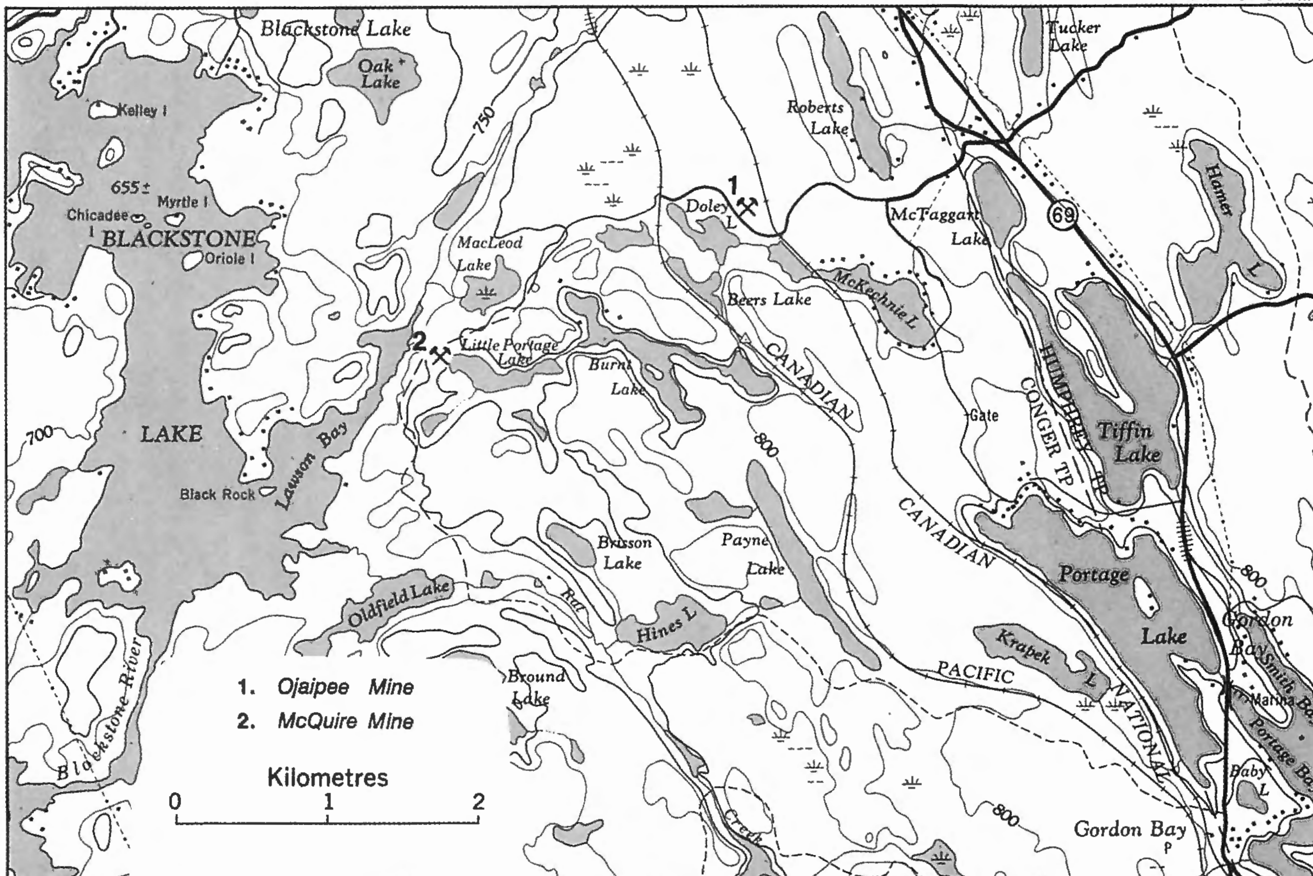
The dyke is exposed on the north side of a hill on the east side of Blackstone Lake. It is about 18 m wide and is exposed for a length of 21 m. It was opened by a few small pits in 1922 by Robinson and McQuire for radioactive minerals.

To reach the deposit, follow the road to the Ojaipee Mine. This road continues westward crossing a railway and leads to the north slope of the hill exposing the dyke. The distance from the Ojaipee mine is 1.5 km.

Refs.: *27* p. 174-181; *48* p. 46; *91* p. 57; *101* p. 55.

Maps (T): 31 E/4 Lake Joseph
(G): 2118 Parry Sound-Huntsville Area, Ontario (O.G.S., 1 inch to 2 miles)

Part of 31 E/4



Map 14. Blackstone Lake

Plate 25

Tourists at Niagara Falls in winter, 1855-1867. Niagara Falls, southern Ontario's most prominent geological and topographic feature, is one of Canada's most famous tourist attractions. (Public Archives Canada C 77893)

SOUTHERN ONTARIO

OWEN SOUND – BRUCE PENINSULA AREA

Owen Sound Quarry

CALCITE, DOLOMITE, PYRITE

In dolomitic limestone

Colourless to bluish grey calcite crystals up to 3 cm long occur in vugs in porous light grey to bluish grey dolomitic limestone. Fine crystal aggregates of cream-white to yellowish dolomite are associated with the calcite crystals. Fine grains of pyrite form a coating on calcite crystals producing a grey colour in some crystals. The limestone belongs to the Lockport Formation and is of Silurian age.

The quarry and crusher are operated by E.C. King Limited.

Road log from Owen Sound:

km	0	Owen Sound at junction 16th Street East (Highway 26) and 9th Avenue; proceed east along 16th Street East.

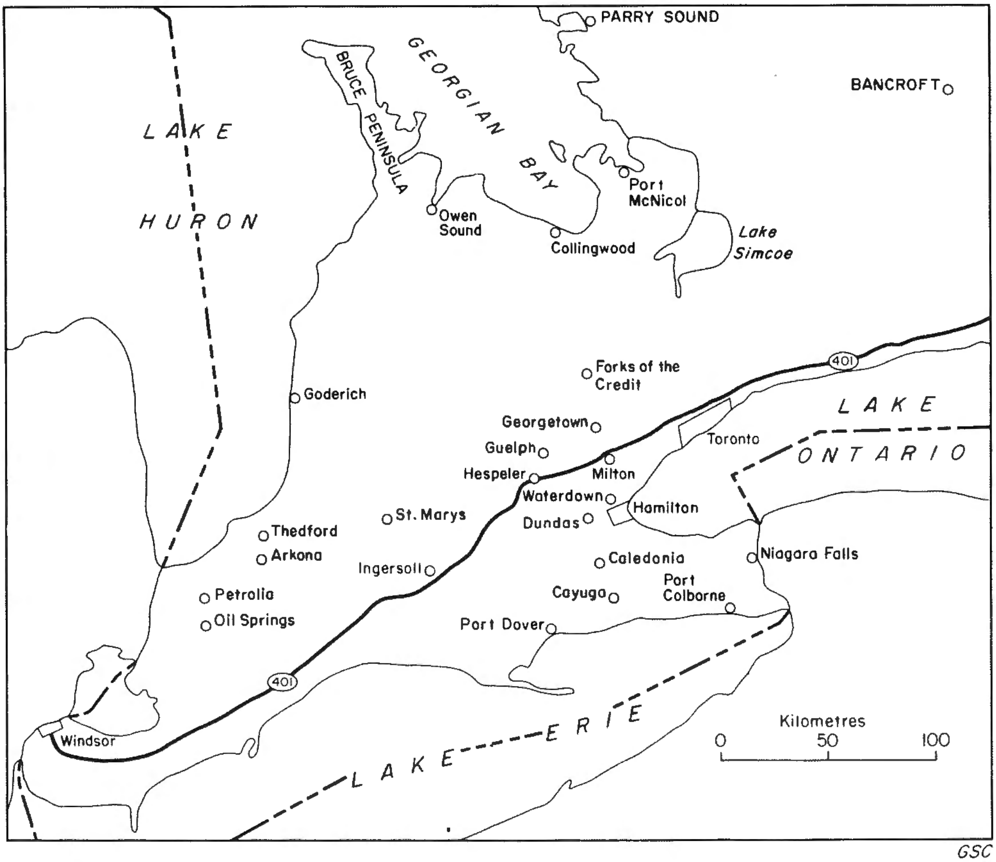


Figure 4. Map showing principal collecting localities in Southern Ontario

5.8	Junction; turn right (south) onto Concession 8 Road.
6.9	E.C. King quarry on right.

Refs.: *53* p. 53; *64* p. 39-43.

Maps (T): 41 A/10 Owen Sound
(G): 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)

Cruickshank Quarry

CHERT, CALCITE

In dolomitic limestone

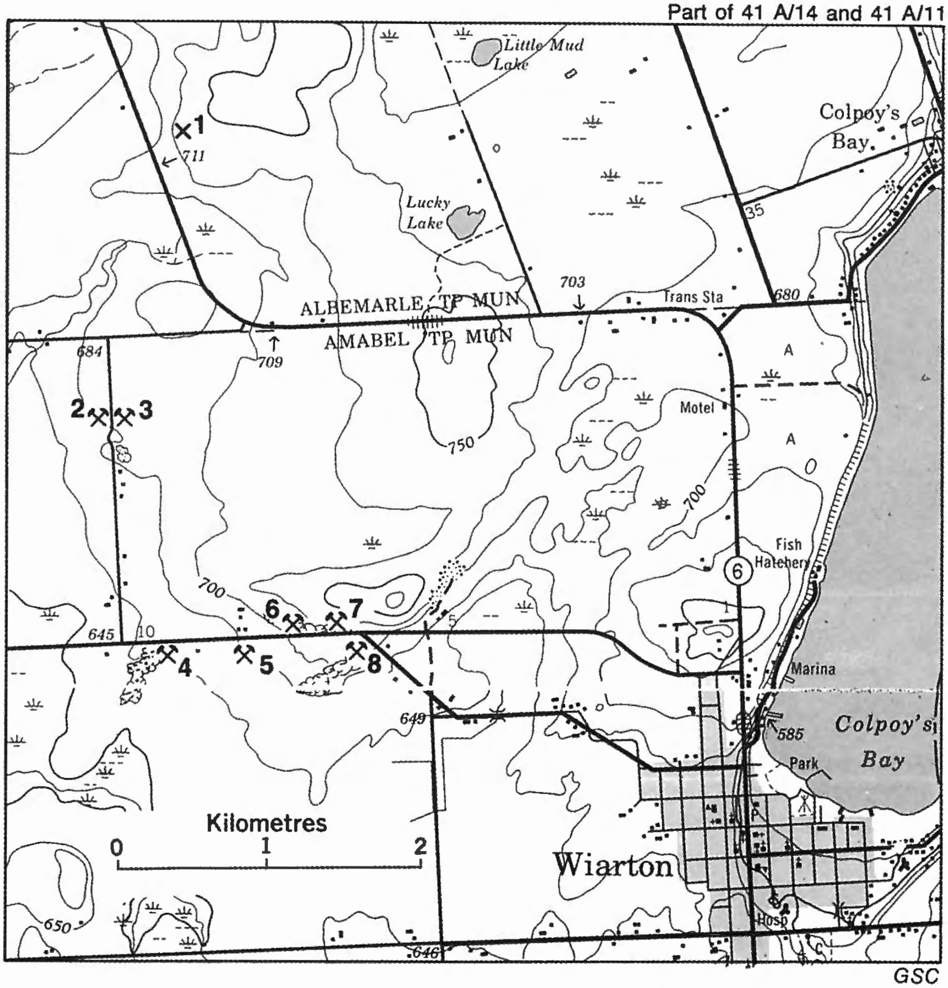
Grey chert occurs as nodules in greyish brown banded dolomitic limestone. Colourless calcite crystals (15 mm long) occur with pyrite grains in the limestone which belongs to the Lockport Formation of Silurian age. It is used for flagstone, interior and exterior wall-facings, window-sills, hearthstones and mantles. The quarry is operated by Owen Sound Ledgerock Limited.

Road log from Owen Sound:

km	0	Owen Sound at Junction highways 6 and 26; proceed onto Highway 6.
	5.5	Junction; proceed onto Highway 70.
	11.3	Turn left onto Ledgerock Road.
	11.7	Quarry.

Refs.: *44* p. 10-11; *53* p. 55; *64* p. 39-41, 88.

Maps (T): Wiarton 41 A/11
(G): 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)



1. *Albermarle zinc occurence*
2. *Don Ross quarry*
3. *Dick Smith quarry*
4. *Owen Sound Ledgerock Limited quarry*
5. *Abandoned quarry*
6. *J.S. Cook quarry*
7. *Bruce Peninsula quarry*
8. *Ebel quarry*

Map 15. Bruce Peninsula

Wiarton-Oliphant Road Quarries

CALCITE, CHERT, PYRITE, MAGNETITE, FOSSILS, HYDROCARBON

In limestone

The quarries expose Eramosa dolomitic limestone (Amabel Formation) of Silurian age. The limestone is finely banded grey and brown. Vugs (up to 4 cm in diameter) in the rock are lined with small colourless calcite crystals. Cleavable masses of calcite in the limestone fluoresce pink under "short" ultraviolet rays. Chert occurs as white to greyish white nodules. Very small nodules of pyrite and magnetite grains occur sparingly. Fossils, including eurypterids and graptolites, are uncommon. Pitchy black hydrocarbon is disseminated through the limestone.

Limestone has been quarried in this area for about 70 years. Its thin-bedded character makes it suitable for use as veneer facings on buildings and for sills, hearths, mantles, steps and flagstone. The quarries are located along the Oliphant Road.

Road log from Wiarton:

km	0	Wiarton, at intersection William and Berford (Highway 6) streets: proceed west onto William Street.
	0.3	Turn right onto Gould Street.
	0.5	Turn left onto Division Street.
	3.1	Ebel quarry on left.
	3.2	Bruce Peninsula quarry on right.
	3.4	J.S. Cook quarry on right.
	3.9	Abandoned quarry on left.
	4.5	Owen Sound Ledgerock Limited quarry on left.
	4.7	Junction; turn right.
	6.1	Don Ross quarry on left and Dick Smith quarry on right.

Refs.: *9* p. 51, 55-57, 58; *44* p. 11-18; *64* p. 39-43, 88.

Maps (T): 41 A/14 Cape Croker
(G): 1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)

Albermarle Zinc Occurrence

SPHALERITE, HYDROZINCITE, SMITHSONITE, DOLOMITE, FOSSILS

In dolomitic limestone

Sphalerite occurs as irregular masses in pore spaces and vugs in porous light brown mottled limestone and as a replacement of fossils in this rock. It ranges from clear yellow to amber, brown and nearly black. Faceted gemstones have been cut from the transparent yellow sphalerite. White hydrozincite and smithsonite occur as patchy crusts on sphalerite and on the host rock. Tiny white crystals of dolomite commonly line cavities in the rock. The porous or vuggy nature of the rock is believed to be the result of fossils being dissolved or leached from the rock. Large fossils including cephalopods measuring 30 cm long have been reported from the limestone which is of Silurian age. The rock takes a good polish and makes an attractive ornamental stone.

The deposit was discovered by D. Wolverton of London. Development consisting of open-cuts, the largest measuring 9 m by 3 m and 9 m deep and a shaft (9 m deep), was done by Albermarle Zinc Mines Limited from 1910 to 1915. A test shipment of 6.2 t of hand-cobbed ore averaging 47.9% zinc was made in 1911.

Road log from Wiarton:

km	0	Wiarton, at intersection William and Berford streets; proceed north along Berford Street (Highway 6).
	0.5	*Road-cut*. Dolomitic limestone of Silurian age is exposed by this road-cut. The locality is the type section of the Wiarton member of the Amabel Formation. It is a porous, crinoidal dolomitic limestone containing pelecypods, gastropods, cephalopods, cysteds, brachiopods and crinoids.
	7.5	Junction (on right) old road to Albermarle Mine. This road meets the highway just north of the highway sign "First Aid Post 1 Mile". At the highway, the road branches; follow the left fork for 30 m to another junction. Follow the road on left for 140 m to a junction; proceed along road on left for 90 m to the mine.

Refs.: *9* p. 53-54; *64* p. 89-90; *98* p. 112; *110* p. 77; *116* p. 102-103.

Maps (T): 41 A/14 Cape Croker
(G): 1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)

Hope Bay Quarry

CALCITE, FOSSILS

In dolomitic limestone

Colourless transparent "micro" crystals of calcite occur in small cavities in the limestone which belongs to the Amabel Formation of Silurian age. Fossils, including gastropods, pelecypods and brachiopods occur in the limestone which is mottled and streaked light grey to bluish grey.

The quarry is located at Hope Bay and is operated by Angelstone Limited. Blocks are quarried for use as a building stone and for interior decor, including hearths and mantles.

Road log from Wiarton:

km	0	Junction William and Berford streets; proceed north along Berford Street (Highway 6).
	2.9	Junction; turn right onto Colpoys Bay Road (Bruce Road 9).
	8.8	Junction; continue straight ahead toward Lions Head.
	11.4	Junction Berford Lake Road; continue straight ahead.
	15.1	Junction; turn right.
	16.2	Junction; turn left.
	19.0	Quarry on left.

Refs.: *9* p. 51-57; *53* p. 46; *64* p. 39-43.

Maps (T): 41 A/14 Cape Croker
(G): 1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)

Plate 26

Hope Bay quarry, 1975. 1.8-metre mill blocks of building stone are produced by vertical drilling followed by blasting to shear the block horizontally from the quarry floor. The crane lifts the blocks and buckets of rubble (small angular blocks) to the surface for loading onto trucks. (GSC 175289)

Collingwood Quarry

FOSSILS, CALCITE

In limestone

Light grey Ordovician limestone of the Lindsay Formation contains abundant fossils including bryozoa, brachiopods, corals, gastropods, pelecypods, trilobites and crinoids. In places it forms a coquina limestone. Some of the shell fossils are replaced by calcite which fluoresces orange-yellow in ultraviolet light. The quarry is inactive.

The quarry is located on the north side of Highway 26 at Lakeview Avenue, 2.9 km east of Collingwood.

Ref.: *53* p. 57-63; *78* p. 100-104.

Maps (T): 41 A/8 Collingwood
(G): 2341 Collingwood-Nottawasaga, Southern Ontario (O.G.S., 1:50 000)
1228A Lake Simcoe Area, Ontario (GSC, 1 inch to 4 miles)

Craigleith Shale Oilworks Historic Site

OIL

In calcareous shale

A historic plaque marks the site of oil production from Ordovician shale of the Whitby Formation. Fossils including graptolites, brachiopods and trilobites occur in the black shale which is interbedded with brownish grey limestone.

Recovery of oil from the shales began in 1859. Wood-burning ranges were used to heat twenty-four longitudinal cast-iron retorts filled with small broken fragments of shale for two to three hours. With eight to ten distillations per day, a daily yield of 250 gallons of crude oil was obtained from 30 to 36 tons of shale at a cost of 14 cents a gallon. The crude was rectified and deodorized to produce burning oil and heavy lubricating oil. The works were repeatedly destroyed by fire and the venture was finally abandoned in the early 1860s after larger oil fields were discovered in Oil Springs in 1861. Samples of the oil-bearing shale and oil for lubrication and illumination were displayed in the Canadian exhibit at the 1862 London International Exhibition.

The historic site is marked by a plaque on Highway 26, 11.9 km west of its junction with Highway 24 at Collingwood.

Refs.: *63* p. 65-72, 146-147; *66* p. 24; *67* p. 784-785.

Maps (T): 41 A/9 Nottawasaga
(G): 2341 Collingwood-Nottawasaga (O.G.S., 1:50 000) 1228A Lake Simcoe Area, Ontario (GSC, 1 inch to 4 miles)

Craigleith Fossil Occurrences

FOSSILS, PYRITE

In Ordovician shale and limestone

Abundant fossils including trilobites, brachiopods, graptolites, cephalopods, pelecypods, gastropods, bryozoa, crinoids, ostracods, conularids and worms occur in shale interbedded with limestone along the shore of Nottawasaga Bay between Thornbury and Craigleith. The shale belongs to the Whitby Formation; it is dark grey to black, bituminous and very fissile breaking in thin sheets to which the term paper shale may be applied. Pyrite occurs as disseminated grains in the shale and as coatings on fossils.

Fossiliferous grey to greenish grey argillaceous limestone of the Lindsay Formation is exposed along the shore of Nottawasaga Bay from Craigleith to Collingwood. Fossils including bryozoa, brachiopods, gastropods and trilobites occur in the limestone which is interbedded with crinoidal limestone and contains thin shale partings.

Refs.: *63* p. 57-73; *108* p. 16.

Maps	(T):	41 A/8 Collingwood
		41 A/9 Nottawasaga
	(G):	2341 Collingwood-Nottawasaga, Southern Ontario (O.G.S., 1:50 000)
		1228A Lake Simcoe area, Ontario (GSC, 1 inch to 4 miles)

Port McNicoll Quarry

FOSSILS, CHERT, CALCITE, PYRITE, GLAUCONITE

In limestone

Fossils of Ordovician age including brachiopods, ostracods and bryozoas are abundant in grey limestone of the Gull River Formation. Nodules of chert are common; they range from greyish white to white, and are banded: grey and charcoal grey. Calcite occurs as small colourless crystals and as brownish cleaveable masses that fluoresce dull yellow under ultraviolet light. Pyrite grains occur sparingly. Dark green glauconite is conspicuous as flaky, lath-like, dendritic and irregular aggregates in the limestone.

The quarry was formerly operated by the Canada Iron Furnace Company of Midland. It is located in Port McNicoll.

Road log from Highway 12 at turn-off to Port McNicoll:

km	0	Leave Highway 12 and proceed to Port McNicoll.
	1.6	Port McNicoll, at intersection First Avenue and First Street; turn left onto First Avenue.
	3.85	Turn left onto Earldom Boulevard.
	4.1	Turn right onto Silver Drive.
	4.4	Quarry.

Refs.: *39* p. 28-29; *64* p. 11-13.

Maps	(T):	31 D/13 Penetanguishene
	(G):	1228A Lake Simcoe Area, Ontario (GSC, 1 inch to 4 miles)

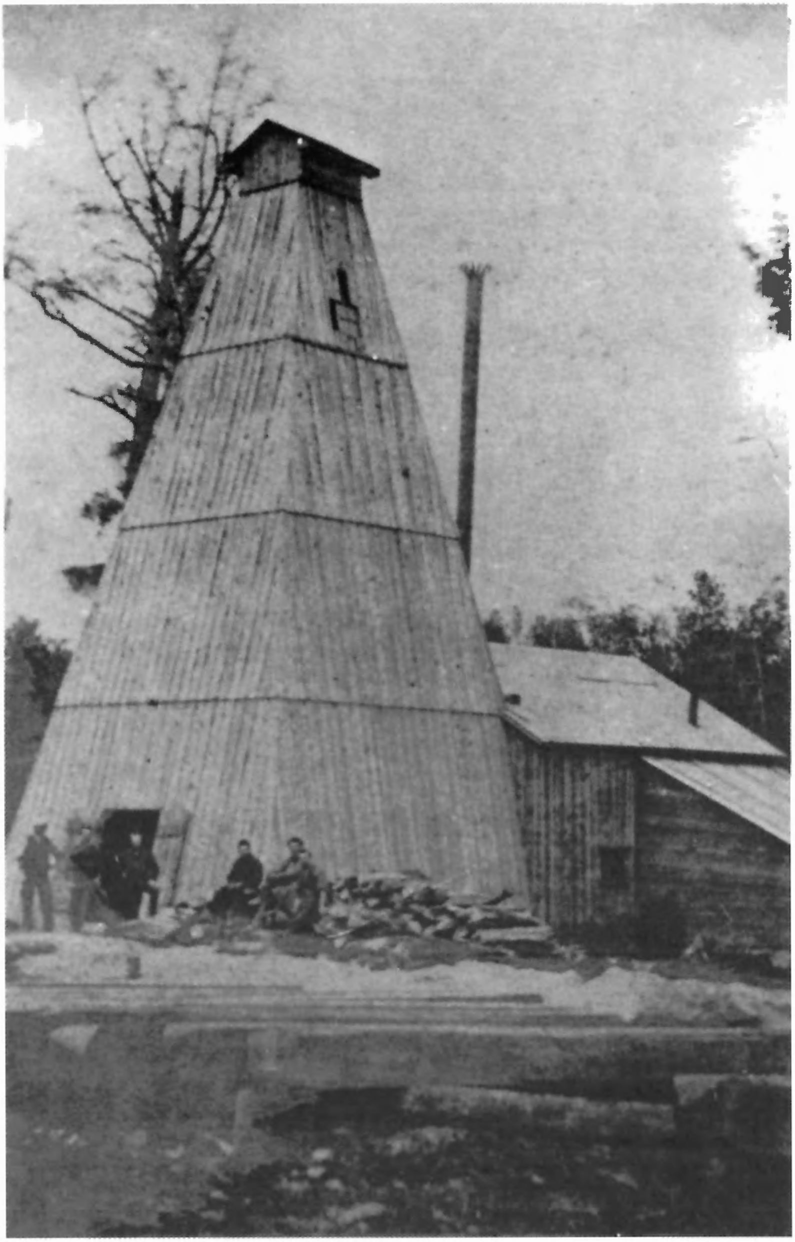


Plate 27

Goderich Salt Works, operator of a brine well from 1866 to about 1900. (Archives of Ontario Acc. 13544-2)

Goderich Salt Mine

HALITE

In dolomitic limestone and shale

Halite has been recovered from the Salina Formation of Silurian age since 1866 when Mr. Samuel Platt of the Goderich Petroleum Company encountered salt while drilling for oil on the north bank of the Maitland River in Goderich during the Ontario oil boom of the 1860s. This was the first discovery of salt in Ontario. When a depth of 209 m was reached without encountering oil, the stockholders abandoned the venture, but financing by the county and municipality enabled Mr. Platt to continue drilling. At a depth of 294.8 m he intersected a bed of rock salt. The salt, in layers of 30 cm or more, was interstratified with thin layers of blue clay, the salt layers comprising 9 m of the 12.5-m salt-clay bed. The salt was in the form of a saturated brine of exceptional purity.

A renamed company, the Goderich Salt Company, proceeded to pump the brine and to process it in two 52-kettle blocks at the rate of 100 barrels per day. The process was later changed to the more economical pan method of evaporation. The success of this discovery lead to further discoveries along the Maitland valley and by 1872 there were eleven other producers. Table salt from this deposit was included in Canada's exhibit at the 1876 Philadelphia International Exhibition.

The Goderich Salt Company operated two wells until 1950 when operations were taken over by Dominion Salt Company Limited which became Sifto Salt Limited in 1954. This company discovered a 24.4-m bed of rock salt at depths of 510.5 m and 535 m, and sank a shaft in 1957. Production from the shaft began in 1959. Chemical grade and highway grade salt are produced.

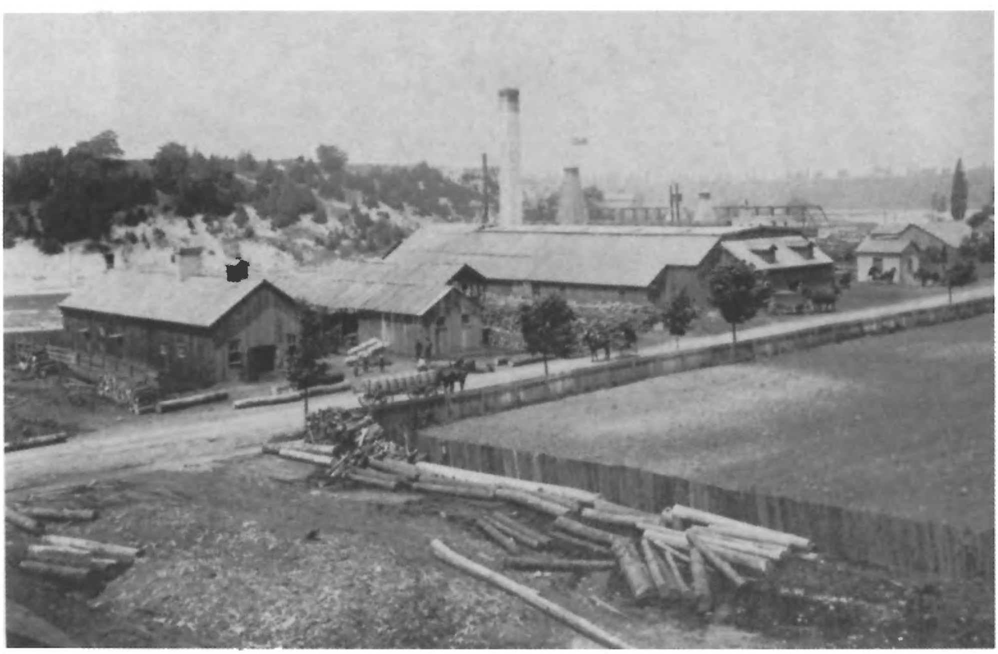


Plate 28

Salt mill at Saltford on the north side of the Maitland River near Goderich. (Archives of Ontario Acc. 135449-9)

Visits to the plant may be arranged through the company office in Goderich.

Refs.: *17* p. 31-34, 36; *20* p. 195; *41* p. 30-36; *64* p. 51, 89; *69* p. 110; *119* p. 79.

Maps (T): 40 P/12 Goderich
40 P/13 Lucknow
(G): 1194A Bruce Peninsula Area, Ontario (GSC, 1 inch to 4 miles)

ARKONA – THEDFORD AREA

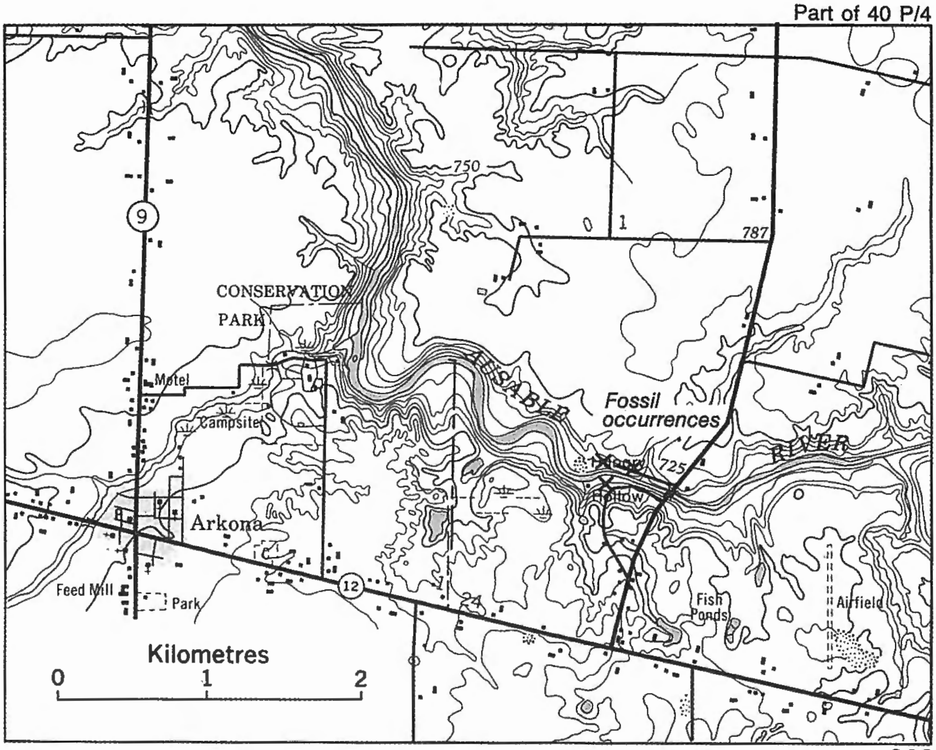
Hungry Hollow Occurrence

FOSSILS, CALCITE, PYRITE, GOETHITE

In limestone and shale.

Fossils including brachiopods, corals, gastropods, pelecypods, bryozoa, crinoids and trilobites occur in limestone and shale of the Hamilton formation which is exposed along the banks of the Ausable River at Hungry Hollow, near Arkona. The fossils are of Devonian age. Calcite replaces some of the fossils and occurs as tiny crystals (dog-tooth spar) in some fossils. Pyrite grains are disseminated through the limestone and partially replace some fossils. Goethite occurs as a rusty powder on the rocks.

Part of 40 P/4



GSC

Map 16. Hungry Hollow

Road log from Arkona:

km	0	Arkona, at junction Highway 7 and Lambton County Road No. 12; proceed along Road No. 12.
	3.2	Junction; turn left.
	4.2	Junction single-lane road on left. This road leads 0.15 km to the rock exposures on the south side of the Ausable River.
	4.3	Junction single-lane road on left. This road leads to exposures along the north side of the river at points 0.3 and 0.6 km from this junction.

Refs.: *10* p. 51-59; *115* p. 101-110.

Maps (T): 40 P/4 Parkhill
(G): 691A Huron, Ontario (GSC, 1 inch to 4 miles)

Thedford Quarry

FOSSILS, CALCITE, PYRITE, CHERT

In limestone and shale

The quarry exposes fossiliferous limestone and shale which belong to the Hamilton Formation of Devonian age. This occurrence is similar to the Hungry Hollow fossil locality. The shale and limestone contain corals, brachiopods, bryozoa and some pelecypods, cephalopods and trilobites. Greyish white chert occurs in the limestone.

The quarry is operated by George Coulis and Sons Limited. The limestone is crushed and used for road construction.

Road log from Thedford:

km	0	Thedford at Highway 82 railway crossing.
	0.5	Junction; proceed straight ahead along Bosanquet Concession IV Road.
	0.95	Turn right onto road to brick plant and proceed beyond brick plant to quarry.
	1.4	Quarry.

Refs.: *42* p. 70; *103* p. 173-182; *115* p. 101-107.

Maps (T): 40 P/4 Parkhill
(G): 691A Huron, Ontario (GSC, 1 inch to 4 miles)
2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Kettle Point Concretions

CONCRETIONS, FOSSILS

In shale

Marcasite and calcite concretions occur in black fissile shale of the Kettle Point Formation of Devonian age. The marcasite concretions are ellipsoidal and measure up to 7 cm long. The calcite concretions are spherical and resemble inverted kettles. They are composed of brown calcite crystals which radiate from a shaly core. They range from 20 cm to about 1 m in diameter. Fossil plants and brachiopods occur in the shale.

Plate 29

Kettle Point concretion in shale. (GSC 175358)

The concretion-bearing shale is exposed at Kettle Point where the unique occurrence has been designated an Ontario Historic Site. Collecting of specimens from the site is not permitted.

Road log from Forest:

km	0	Forest, at junction highways 21 and 12; proceed north along Highway 21.
	8.5	Junction; turn right onto West Ipperwash Beach Road.
	8.6	Junction; turn right onto road to Kettle Point.
	8.8	Junction; turn right.
	15.2	The Kettle Point Concretions Historic Site.

Refs.: *11* p. 46-49; *89* p. 136; *103* p. 182-184; *117* p. 70.

Maps	(T):	40 O/1h Cape Ipperwash
	(G):	828A Windsor-Sarnia, Essex, Kent and Lambton townships, Ontario (GSC, 1 inch to 4 miles)

Oil Springs, Petrolia Oil Fields

OIL, NATURAL GAS

In Devonian limestone of the Delaware and Onondaga formations

The Oil Springs and Petrolia oil fields are the oldest oil producers in Canada and among the most productive in Ontario. They have produced continuously since they were first tapped about 120 years ago. At that time, oil was found: as surface seepages or natural springs, as 1-60 cm-thick layers of solidified bitumen or gum-beds in clay at a depth of about 3 m, as liquid petroleum in unconsolidated gravels overlying bedrock, and as liquid petroleum in a porous rock layer (2-4 m thick) at the top of the limestone formation. The wells tapping the gravel layer were referred to as surface-wells, those penetrating bedrock were rock-wells. Natural gas was struck in the underlying Guelph Formation in 1913 at a depth of 560 to 600 m.

The petroleum, a mixture of hydrocarbons, was originally used without any treatment as a lubricant and later was refined to produce gasoline, kerosene, naphtha, illuminating oil, lubricating oil, coke, vaseline and paraffin. The paraffin was used for candle-making and for chewing gum. Because the petroleum contained a significant sulphur content, it required deodorizing during the refining process.

Oil in the area was known to early settlers who observed oil seepages in local creeks. In 1859 the Geological Survey of Canada reported two natural oil springs in Black Creek which flows through Oil Springs. These natural oil springs produced surface layers of natural asphalt over an area of about 4000 m^2 in two locations. Exploration and development of the oil field was sparked by the successful introduction of oil for lubricating and illumination purposes in the late 1850s. The oil then used was derived from coal.

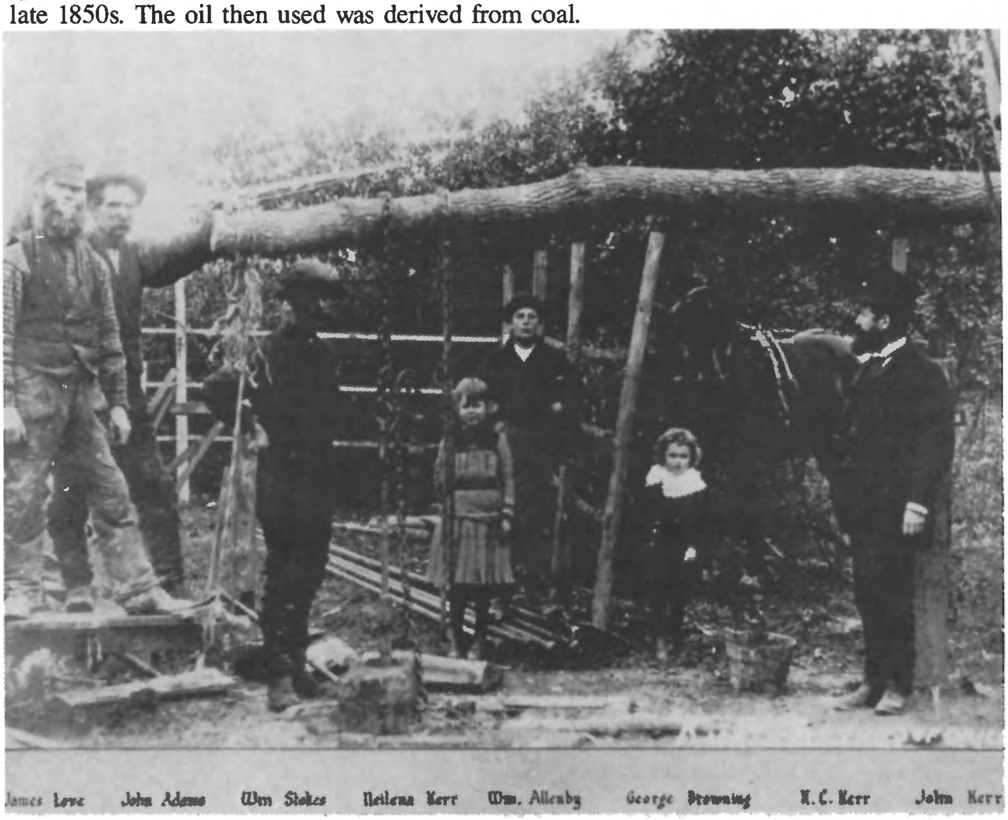


Plate 30

Drilling for oil in Petrolia using the spring-pole, about 1870. A 7.5 cm drill suspended by a cable from a horizontal wooden spring-pole is lowered into a well initially bored by an auger. Men on left jump up and down on wooden platform connected by ropes to the end of the spring-pole causing the drill to repeatedly strike the bottom of the well, thus boring into the rock. In the 1880s the cable was replaced by wooden poles with an iron-bar drill afixed to one end allowing the driller more control in boring through difficult rock. (Archives of Ontario S.5655)

Plate 31

Oil wells pumped by the jerker line system, Petrolia, 1870. Drilling and maintenance apparatus was suspended by wooden rods and lowered and withdrawn from the well by a derrick which was replaced in the 1880s by the tripod as seen today. (Archives of Ontario S. 4748)

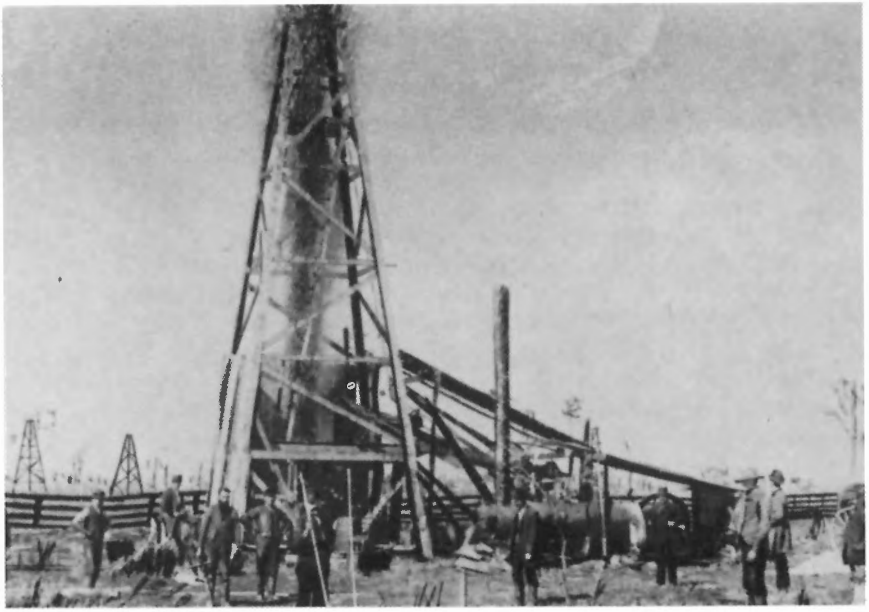


Plate 32

Exploding a torpedo in an oil well at Petrolia, 1886. Oil well was shot with a charge of nitroglycerine to break up the rock; the dislodged rock fragments are hurled up forming a black columnar spray. (Public Archives Canada C30224)

Plate 33

Building housing engine for jerker line which was used for powering several oil well pumps from the same motor. The jerker line consists of a horizontal double line of wooden jerker rods hung by iron suspenders from horizontal wooden bars; the lines are connected to opposite sides of a horizontal wooden wheel (near the engine-house) and to each pump along the line. The engine produces a backward and forward movement of the wheel which transfers this jerking movement to each line activating the pumps. (Public Archives Canada PA 98728)

The first production of oil in North America was undertaken in 1857 by Mr. W.M. Williams of Hamilton who refined oil from the gum-beds along Black Creek and produced lubricating and illuminating oil. This provided a substitute for coal-derived oil or coal-oil which was used for oil-burning lamps. In 1858, he dug a well into the oil-bearing gravel bed overlying bedrock and struck the first surface-well; oil rose "several feet" (Ref: Harkness, 1924) and was used as a lubricant in the crude or natural state. Several other surface wells struck oil at depths of 12 m to 18 m, and when 1860 drew to a close, 100 wells had been dug in the area. These wells were 1.2 to 1.5 m in diameter.

A significant event in oil exploration was the 1859 discovery of rock-oil in Pennsylvania, which also marked the first discovery of oil in the U.S.A. Oil-seekers in Ontario then directed their efforts to drilling below the oil-bearing gravel layer and into the underlying limestone. In the winter of 1861, Mr. James Shaw, using a spring-pole drill, reached bedrock striking a gusher at a depth of 49 m. This was the first of several great flowing wells that was struck that winter bringing a drilling boom to the area. These wells, in their initial flow in the winter of 1861-62, produced 2000 to 5000 barrels per day and one, the Black and Mathewson well, produced a record 7500 barrels per day. Due to the spectacular flow and limited storage facilities, the flow got out of control, oil flooded the area, and trees in the low ground were "blackened to a height of several feet by the oil" (Ref: Bell 1888, p. 124). The village of Oil Springs sprang into existence and its oil field became one of the most prolific producers in Ontario.

Oil was discovered in Petrolia in 1862 in a well dug for water. The first flowing well was struck in 1865 but the flow was not as spectacular as the initial flow of Oil Springs, the greatest flow being 400 to 500 barrels per day. By 1890, 2500 wells were drilled and the Petrolia oil field was on its way to becoming one of the largest producers in Ontario.

While the wells in Oil Springs were about 113 m deep, those at Petrolia were about 30 to 40 m deeper. The early wells were 1.2 to 1.5 m in diameter with wood-cribbing to bedrock; they were then hand-drilled into the limestone. In 1863, shortly after the wells were struck, they gradually decreased their free flow and had to be pumped. The first pumped wells were worked by a spring-pole using hand-power. In 1863, the jerker-line system which is still used today, was

Plate 34

Pumping and shipping oil, Petrolia. Oil was pumped into the storage tanks and transferred into wagons for transport to a refinery. (Public Archives Canada PA 98720)

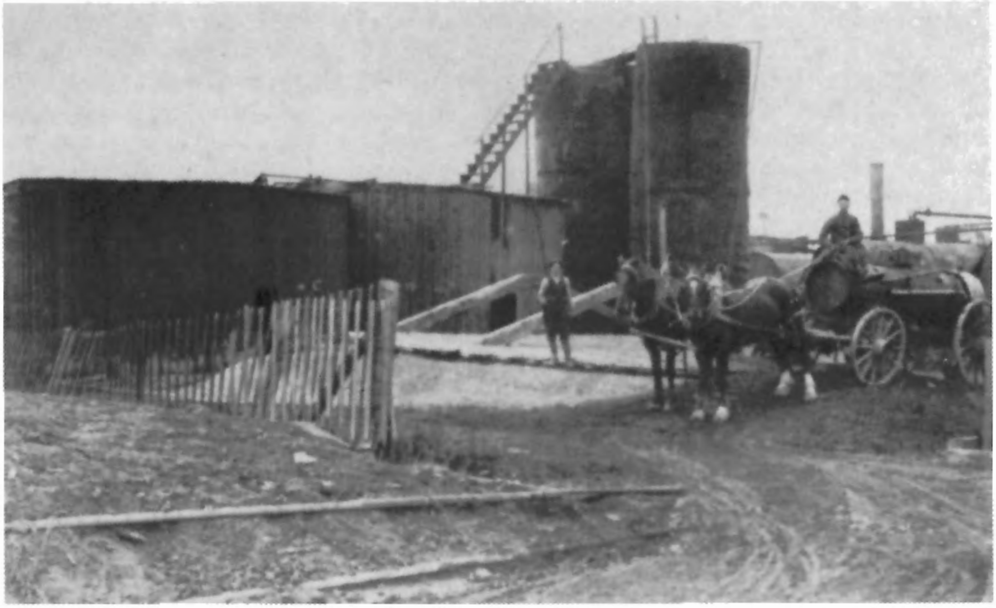


Plate 35

Receiving crude oil at Premier Oil Company, Petrolia. Many producers built pipelines to carry oil from their wells to receiving stations; those not connected by pipeline delivered the crude in wooden tanks transported by teamsters. (Public Archives Canada PA 936393)

Plate 36

Oil exchange at the 'Woodshed', Bothwell, 1866 (Public Archives Canada PA 96379) developed in Oil Springs and was adopted in Petrolia as well. Up to 90 wells were connected to a central power station and operated simultaneously. Initially, coal-burning steam-engine stations supplied power; this was replaced by gas engines and finally, in the 1920s by electric motors.

Among the hazards experienced by workers were the emissions of a gas which produced the effect of nitrous oxide or laughing gas, and vapours of hydrocarbons such as naphtha and anilene which had anaesthetic effects. It was not uncommon for the gas to issue in great quantities producing what appeared to be boiling cauldrons of pitch in the wells. To reduce its physiological effects on the workman, the gas was cleared by exploding it.

The original storage tanks were wooden with a capacity of 150 barrels. After the disastrous two-week long fire of 1867 destroyed thousands of barrels of oil and the storage tanks in Petrolia, underground storage tanks were introduced. Pits measuring up to 18.3 m deep and 12 m in diameter were excavated into the clay which in this area was impervious to oil. The sides were lined with wood curbing, the bottom was clay and the wooden cover was made to slope to drain water. Each of these storage pits had a capacity of 5565 barrels. Refined and crude oil was stored up to 10 years without leakage. Oil was removed by pipelines. In order to prevent collapse, the pits were kept full by having water replace any oil pumped out.

Refineries were first erected in 1857 in Oil Springs and about five years later in Petrolia. When operations peaked in 1887, there were nine refineries in Petrolia. Oil Exchanges, where buyers and sellers met, were organized in Petrolia and in other producing centres. By the late 1890s, Sarnia became the oil refining centre and a pipeline, 25.7 km long, carried the crude oil there from a central receiving station in Petrolia. The oil from producer's tanks in Petrolia and Oil Springs reached the Petrolia receiving station by means of a 99.8 km network of pipes.

A few years before oil was commercially exploited in Oil Springs, asphalt or solidified bitumen from the tarry gum-beds of Black Creek was exhibited in the Canadian economic minerals collection assembled and brought by William E. Logan to the world's first international

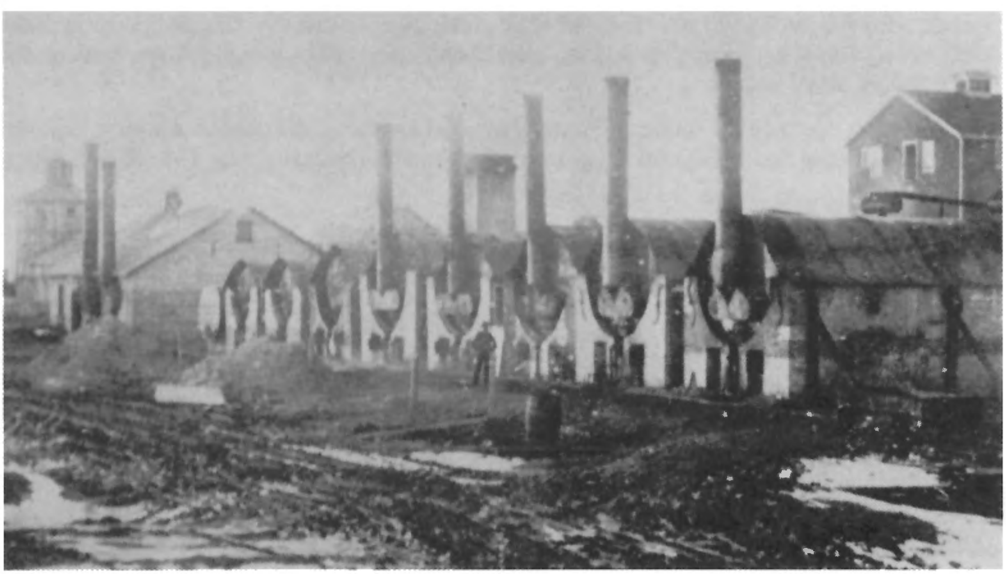


Plate 37

Producers Oil Refining Company, 1886. This refinery operated 8 stills which produced refined oil, gas oil, coke, benzene and tar. Its illuminating oil reached markets from the Atlantic to Brandon, Manitoba., (Public Archives Canada C 30223) economic exposition, the Grand Industrial Exhibition of 1851 in London. At the 1862 London International Exhibition, petroleum or rock-oil from Oil Springs was included in the Canadian exhibit of economic minerals. At subsequent international exhibitions, examples of the refined product were also displayed. These included various types of lubricating oil and grease, illuminating oil, oil for use in paints, rope manufacture, wool-washing and tannery, and paraffin wax in the form of flour, cakes, candles of various sizes, shapes and colours, drinking cups and statuettes and ornaments.

The development of North America's first petroleum industry is displayed and demonstrated at the Oil Museum in Oil Springs and The Petrolia Discovery in Petrolia.

Refs.: *5* p. 124-125, 134-137; *6* p. 9-20; *11* p. 59-64; *34* p. 148-150; *35* p. 81-85; *56* p. 30-40; *57* p. 247-250; *65* p. 3; *66* p. 23; *67* p. 373-379, 522-524, 786-790; *81* p. 313-322; *103* p. 252-256; *119* p. 60-62; *120* p. 34-87; *121* p. 153-167; *124* p. 154-158.

Maps (T): 40 I/16 East Sarnia
(G): 1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

WINDSOR AREA

Amherstburg Quarry

CELESTITE, CALCITE, QUARTZ, FLUORITE, DOLOMITE, CHALCEDONY, HYDROCARBON, FOSSILS

In limestone and dolomitic limestone

Grey limestone of Devonian age (Detroit River Group) contains cavities lined with crystals of colourless to light blue transparent and white celestite, colourless to white calcite, colourless quartz, violet fluorite and light brownish yellow dolomite. Quartz crystals also occur in white chalcedony. Black hydrocarbon occurs as streaks and tubes in the limestone. Brachiopods and coral fossils are abundant.

The quarry is operated by Amherst Quarries Limited for use in road construction. It is on the south side of Pike Road at a point 1.9 km east of its junction with Highway 18 in Amherstburg.

Refs.: *31* p. 219; *39* p. 168; *53* p. 66-67.

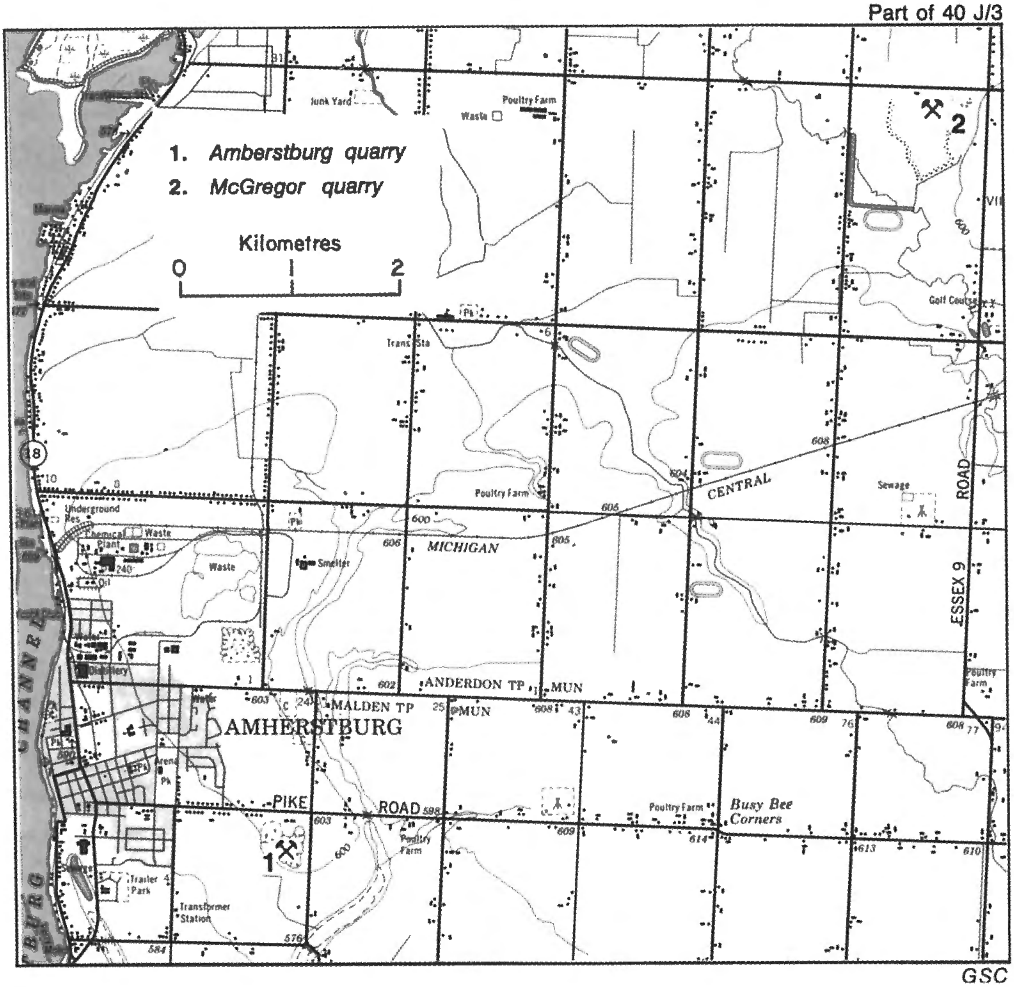
Maps (T): 40 J/3 Amhertsburg
(G): 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

McGregor Quarry

CELESTITE, CALCITE, BARITE, FLUORITE, PYRITE, GLAUCONITE, HYDROCARBON, FOSSILS

In limestone and dolomitic limestone

Grey limestone and brown dolomitic limestone of the Detroit River Group (Devonian) contain numerous cavities lined with: celestite, as colourless to blue tabular crystals and as white tufts; calcite, as colourless to white crystals, cleaveable masses and radiating fibres forming tufts; barite, as colourless to white platy aggregates forming rosettes; fluorite, as yellow and violet



Map 17. Amherstburg

small crystals associated with calcite and celestite; pyrite, as fracture-fillings and irregular masses in limestone. Some of the calcite is brownish tinted due to hydrocarbon. Glauconite forms a green coating on the limestone. Coral fossils and brachiopods are common.

The quarry was opened in 1970 by Allied Chemicals Limited. The limestone is used in the chemical industry. The quarry is located northeast of Amherstburg.

Road log from Amherstburg:

km	0	Junction Pike Road and Highway 18; proceed east along Pike Road.
	1.9	Turn-off (right) to Amherstburg quarry.
	8.7	Crossroad; turn left onto Essex 9 Road.
	16.0	Junction; turn left.
	16.3	Turn-off (left) to McGregor quarry.

Plate 38

Amherstburg quarry, 1975. Thick-bedded limestone and dolomitic limestone of the Detroit River Formation is exposed along the quarry face. (GSC 175353)

Refs.: *53* p. 65-66; *103* p. 201-206.

Maps	(T):	40 J/3 Amherstburg
	(G):	2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 4 miles)
		1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

Ojibway Mine

HALITE, ANHYDRITE

In dolomitic limestone and limy shale

Halite is colourless to white translucent, medium-to coarse-grained. In places it is banded with paper-thin lamellae of anhydrite. The main salt bed is 8.2 m thick and is at a depth of 289 m to 297 m below the surface. Another bed is 9 m above it. The salt is exceptionally pure containing less than 2 per cent impurities. The salt beds occur in the Salina Formation of Silurian age.

The salt bed was discovered by Canadian Rock Salt Company as a result of diamond drilling carried out in 1952. A production shaft was sunk to a depth of 335 m. The mine workings extend

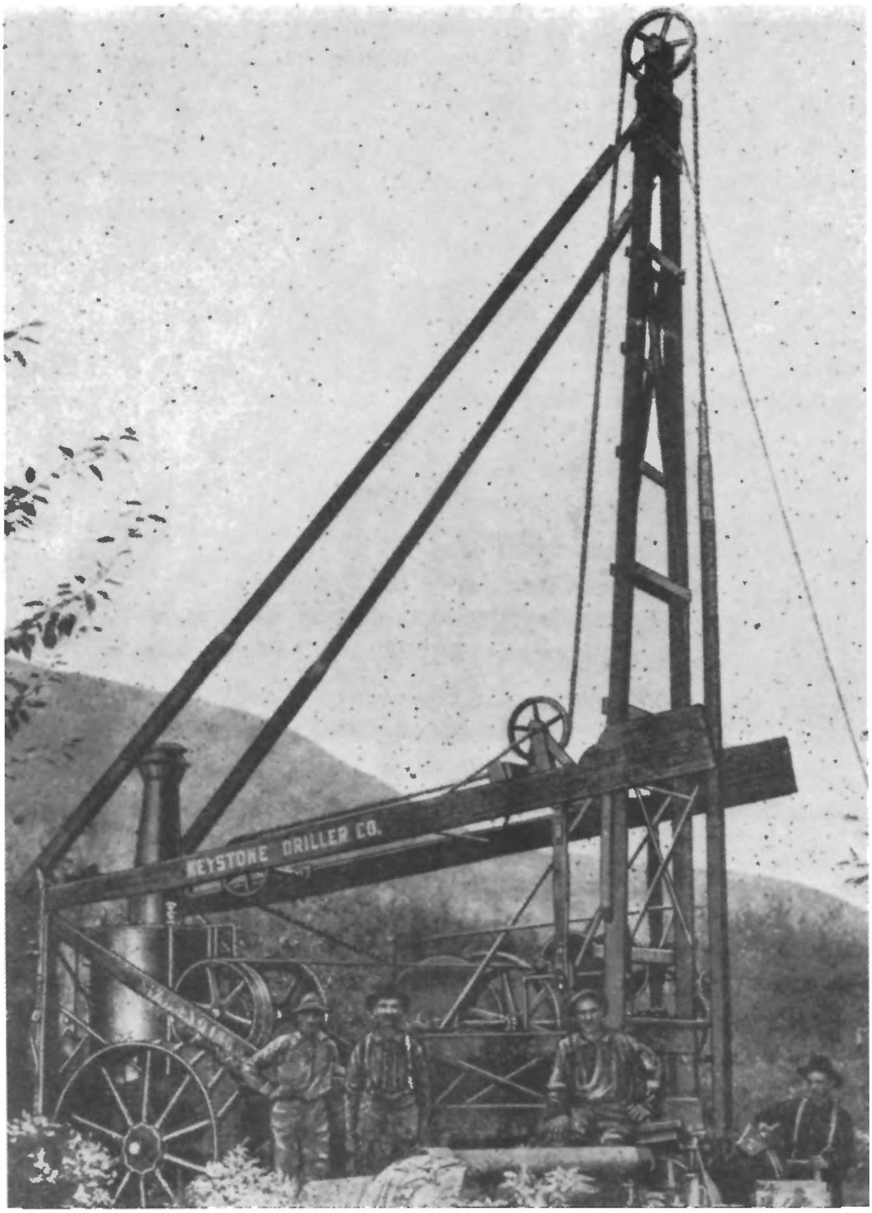


Plate 39

Drilling machine for salt, about 1913. (GSC 204031-E)

Plate 40

Weighing, bagging and sewing machines for table salt, about 1929 at Canadian Industries Limited plant, Sandwich. The plant, opened in 1929, was regarded as the most modern salt plant on the continent at the time. (GSC 204031-F)

beneath the Detroit River. Due to water conditions (aquifers) and hydrogen sulphide gas, the ground had to be frozen to a depth of 229 m by a series of freeze-holes drilled 1 m apart along the circumference of a circle 9.7 m in diameter prior to shaft-sinking. Production began in 1955.

Salt mining in the Windsor area began in 1893, two years after a 9 m rock salt bed was discovered by Windsor Salt Company at a depth of 347 m in a well drilled near the Canadian Pacific Railway station in Windsor. Salt was obtained in the form of brine; water was forced down the well-casing and brine pumped by compressed air up an inner pipe. In 1901, the Canadian Salt Company took over operations. The Windsor plant produced table salt and salt for use in the dairy and cheese industries. It operated until 1929 when the company opened a new plant in Sandwich, 3.2 km north of the Ojibway Mine. Brine from the Sandwich wells was used for producing caustic soda, bleaching powder, liquid chlorine, hydrochloric acid and ammonia. The salt produced from the Ojibway Mine is used to produce various chemical and industrial products and for food processing and table salt. The mine is operated by Canadian Rock Salt Company.

The mine is located on Riverside Drive (Highway 18) at a point 6 km southwest of its junction with Ouellette Street (Highway 38) in Windsor.

Refs.: *11* p. 53-54; *15* p. 40-42; *17* p. 40-46; *41* p. 25-33.

Maps	(T):	40 J/6 Windsor
	(G):	1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

St. Marys Quarries

CALCITE, PYRITE, FOSSILS

In limestone

Grey to brownish grey limestone of Silurian and Devonian age has been worked in several quarries in St. Marys for over 70 years. The quarries in the eastern part of town are in Silurian rocks whereas those in the western and southwestern parts are in Devonian beds; the latter contain abundant fossils, including corals, bryozoa, brachiopods, pelecypods, gastropods, cephalopods and trilobites. Some calcite crystals and pyrite occur in the limestone. The Devonian limestone belongs to the Delaware and Detroit River formations.

The quarries are operated by St. Marys Cement Company Limited.

Refs.: *31* p. 268-275; *39* p. 161-164; *53* p. 70-71; *103* p. 113-119.

Maps	(T):	40 P/3 Lucan
	(G):	691A Huron, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Ingersoll Quarries

CALCITE, FOSSILS

In limestone

Calcite crystals and abundant coral fossils occur in Devonian limestone which is quarried in the Ingersoll area. The limestone belongs to the Detroit River Formation and is quarried by three companies.

Road log from Ingersoll:

km	0	Ingersoll, at junction highways 2 and 19; proceed east along Highway 2 toward Woodstock.
	2.2	Turn-off (left) to quarry operated by Stelco Chemical Lime Works.
	4.5	Turn-off (left) to Beachville quarry operated by Cyanamid of Canada Limited.
	5.5	Turn-off (left) to Domtar quarry.

Refs.: *39* p. 155-158; *53* p. 67-69.

Maps	(T):	40 P/2 Woodstock
	(G):	624A Waterloo, Ontario (1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Drumbo Mine

GYPSUM

In dolomitic limestone and shale

White gypsum occurs in a seam, 2 m wide, in dolomitic limestone and shale of the Silurian age Salina Formation. The gypsum seam is at a depth of 114 m and was discovered by extensive diamond drilling. It is mined from a shaft by Westroc Industries Limited and is expected to produce for 30 years. Production began in 1978.

The mine is located on the west side of the Drumbo Road and the north side of Highwy 401, 3 km north of Drumbo.

Refs.: *33* p. 92.

Maps	(T):	40 P/7 Stratford
	(G):	1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

Guelph-Hespeler Quarries

CALCITE, DOLOMITE, FOSSILS

In dolomitic limestone

Colourless to white calcite crystals measuring up to 1 cm long occur in vugs in buff-coloured dolomitic limestone of the Guelph Formation. "Micro" crystals of dolomite occur in small cavities in the limestone. The limestone is of Silurian age and is quarried near Hespeler (Glenchristie quarry) and at Guelph. Abundant coral fossils and reef beds occur in the lower part of the Glenchristie quarry. The rock at both quarries is quarried for use as crushed stone and agricultural lime. Building stone was formerly obtained from the Guelph quarry and several buildings in Guelph are constructed of this stone. Limestone from the Guelph quarries was exhibited as a building stone at numerous world exhibitions including the 1862 London International Exhibition.

The operators of the quarries are Domtar Inc. at Glenchristie and Canadian Gypsum Company Limited in Guelph. The Glenchristie quarry is located on the east side of Highway 24 at a point 4.2 km north of the bridge over the Speed River in Hespeler. The Guelph quarry is on the east side of the Speed River in the southern outskirts of Guelph.

Refs.: *31* p. 291-295; *39* p. 123-125; *42* p. 55-57; *66* p. 32.

Maps	(T):	40 P/8 Galt
		40 P/9 Guelph
	(G):	1228A Lake Simcoe Area, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2342 Guelph, Southern Ontario (O.G.S., 1/50 000)

GEORGETOWN – FORKS OF THE CREDIT AREA

Acton Quarry

CALCITE, FOSSILS

In dolomitic limestone

Crinoidal limestone of the Amabel Formation of Silurian age has been quarried at Acton for crushed stone since 1930, and prior to that date, for lime. It is porous and cavities are lined with very small calcite crystals.

This is one of the largest limestone quarries in Ontario. It was formerly known as the Dolly Varden quarry. At one time, three large draw kilns and eleven large pot kilns were in operation to produce lime in the nearby village of Limehouse. The quarry is now operated by Indusmin Limited.

Road log from Acton:

km	0	Acton, at junction highways 25 and 7 (Main and Mill streets); proceed east along Highway 7.
	2.9	Junction; turn right onto Halton Hills Concession 4 Road.
	5.8	Turn-off (right) to quarry.

Refs.: *31* p. 237-238; *42* p. 53-55; *53* p. 50-51.

Maps	(T):	40 P/9 Guelph
	(G):	1228A Lake Simcoe Area, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Glen Williams Quarries

CELESTITE, GYPSUM, QUARTZ CRYSTALS, CHERT, CALCITE, PYRITE, MARCASITE, FOSSILS

In sandstone and limestone

Celestite occurs as orange to white tabular aggregates along the contact of sandstone and dolomitic limestone. Transparent yellowish brown gypsum (selenite) occurs as nodules in limestone. The rocks are of Silurian age. White quartz crystals (about 2 mm long) and small crystals of calcite occur in small cavities in limestone. Pink calcite occurs as fracture-fillings in the limestone. Light grey chert occurs as lenses in the limestone and as a replacement of crinoid and shell fossils. "Micro" quartz crystals occur in the silicified fossils. Pyrite, chalcopyrite, magnetite and marcasite occur as grains in the limestone and as crystals in the silified fossils.

The Glen Williams quarries have produced sandstone for the exterior facings of numerous buildings including Casa Loma in Toronto and buildings at the University of Western Ontario in London. The sandstone is greyish white varying to light brown and brownish red. It belongs to the Whirlpool Formation (Cataract Group) and is overlain by dolomitic limestone of the Manitoulin Formation. Both formations are Silurian in age. The Whirlpool sandstone also forms the base of the Niagara Escarpment.

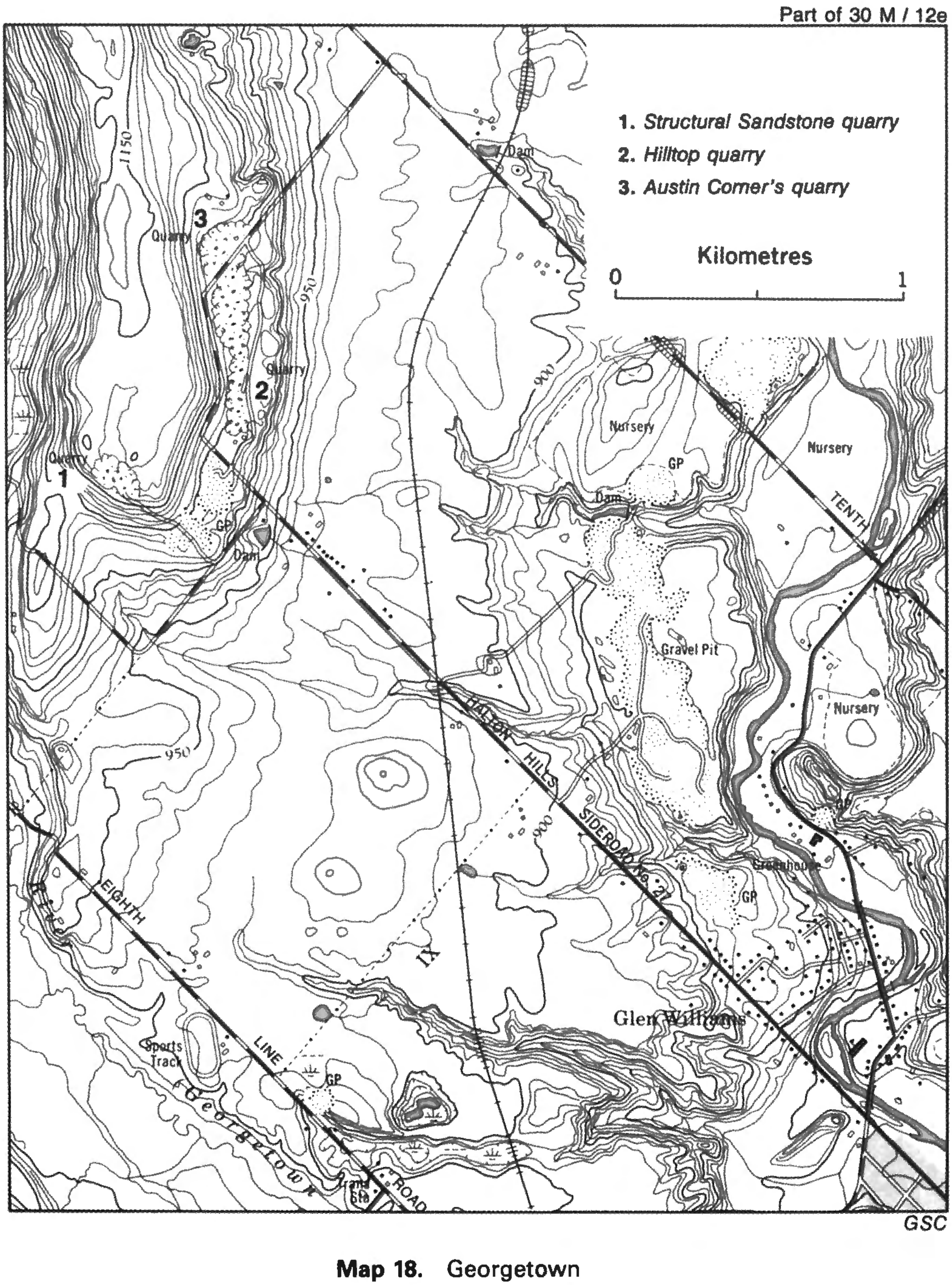
The Glen Williams quarries are located northwest of Glen Williams.

Road log from Glen Williams at intersection Main and Confederation streets:

km	0	proceed northwest along Main Street (this street becomes Halton Hills Sideroad No. 27).
	3.0	Junction. To reach the Structural Sandstone quarry, follow road on left for 0.3 km to the junction of the quarry road (0.4 km long) leading north. To reach other quarries continue straight ahead.
	3.15	Turn-off right to the Hilltop quarry. This is the largest sandstone quarry in Ontario.
	4.1	Austin Corner's quarry on left.

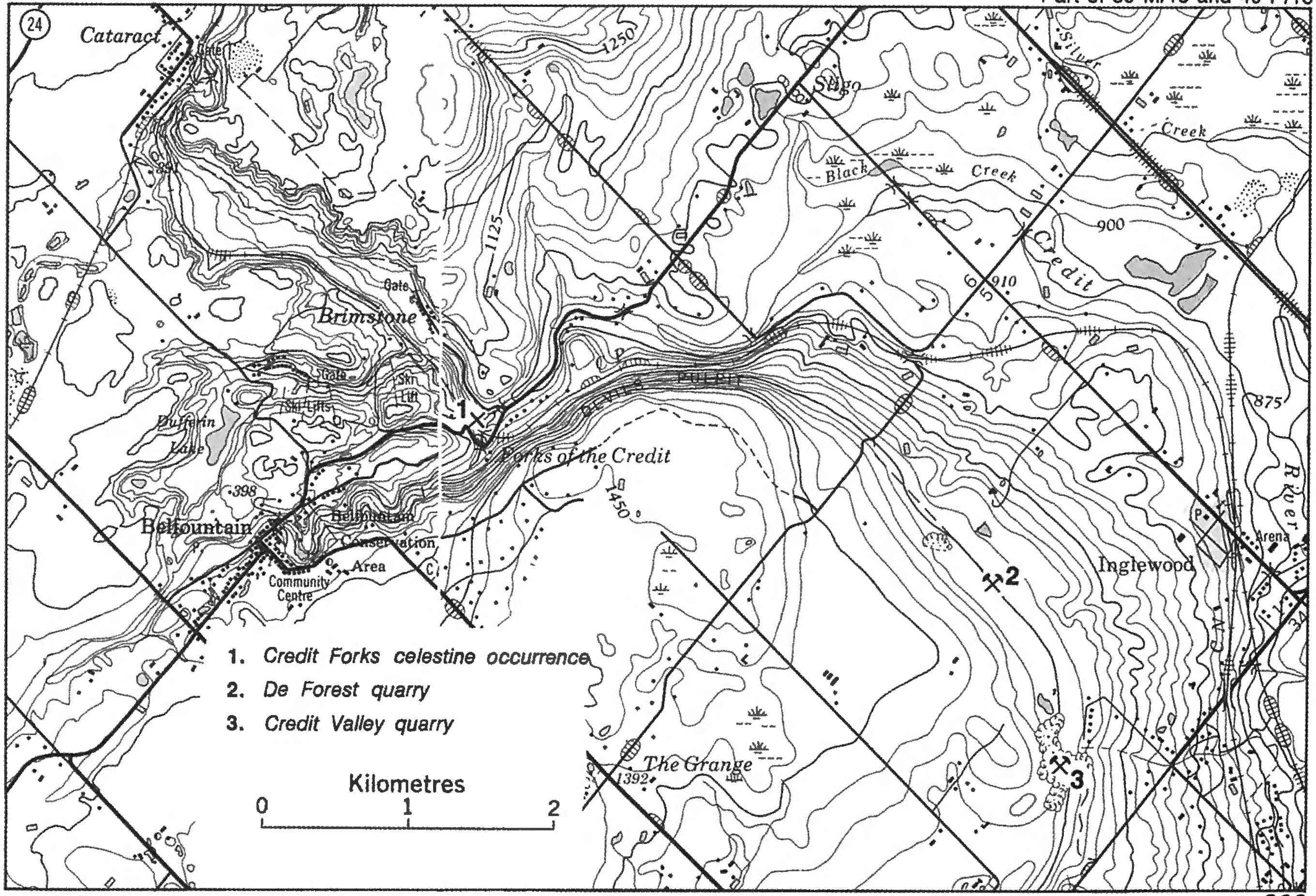
Refs.: *9* p. 9-11; *46* p. 18-19, 26-30.

Maps (T): 30 M/12 Brampton
(G): 1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 Miles)
2176 Brampton Area, Southern Ontario (O.G.S., 1 inch to 1 mile)



Map 18. Georgetown

Part of 30 M/13 and 40 P/16



GSC

Map 19. Forks of the Credit

Plate 41

City Hall, Toronto 1897. Sandstone from quarries at Forks of the Credit and Inglewood was used in the construction of this building. (Public Archives Canada RD 629)

Credit Valley Quarry

GYPSUM, QUARTZ, CHERT, DOLOMITE, CHALCOPYRITE

In limestone and sandstone

Gypsum occurs as fine tabular crystal aggregates in grey limestone which overlies Silurian sandstone of the Whirlpool Formation. Quartz occurs as small colourless crystals and white chalky patches associated with grey banded chert and small dolomite crystals. Small crystals of chalcopyrite occur in the white quartz.

The quarry was formerly worked for brown and grey sandstone for use as a building stone. The stone was used for exterior facing in several buildings in southern Ontario including the Ontario Legislative Building and old City Hall in Toronto.

The quarry cuts into the Niagara Escarpment southwest of Inglewood.

Road log from Inglewood at railway crossing:

km	0	Proceed south from railway crossing.
	0.6	Crossroad; turn right.
	2.9	Junction quarry road; turn right.
	3.7	Quarry.

Refs: *24* p. 171A; *46* p. 32.

Maps	(T):	30 M/12 Brampton
	(G):	1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles) 2337 Brampton, Southern Ontario (O.G.S., 1:50 000)

Deforest Quarry

CELESTITE

In limestone and sandstone

Orange to white celestite occurs as small bladed and tabular aggregates at the contact of limestone and sandstone. The quarry produces grey and red Whirlpool sandstone of Silurian age for use as flagstone. The limestone, also Silurian, caps the sandstone.

The quarry is located west of Inglewood.

Road log from Inglewood at railway crossing:

km	0	Proceed north from railway crossing.
	2.5	Crossroad; turn left.
	3.3	Junction; turn left.
	4.0	Junction; turn left.
	5.1	Quarry.

Ref.: *46* p. 38.

Maps	(T):	30 M/13 Bolton
	(G):	1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles) 2338 Bolton, Southern Ontario (O.G.S., 1:50 000)

Credit Forks Celestite Occurrence

CELESTITE, GYPSUM, FOSSILS

In dolomitic limestone

Orange, colourless and blue celestite occurs as bladed aggregates in cavities in Silurian dolomitic limestone near its contact with the underlying Whirlpool sandstone along the valley of the Credit River between Cataract and Terra-Cotta and in quarries in that region. Gypsum occurs as white nodules in limestone. Silurian fossils including corals, brachiopods, bryozoa and trilobites occur in the limestone. Weathered exposures along the valley produce talus from which specimens are available in the vicinity of Forks of the Credit.

Formerly, brown and white sandstone was quarried from the steep slope of the Escarpment at the following locations: on both sides of the west (Erin) branch of the Credit River; on the north branch; on the Credit River below the forks; and along the Belfountain Road. The open-cut method was used until the excavation reached the limestone cap which measured 45.7 m thick; at that point, underground mining was conducted. This consisted of using explosives to drive tunnels, 6 m wide and about 2 m high, into the limestone along the top of the underlying sandstone bed. The tunnels were about 18 m apart. Drifts, 9 m wide, were run laterally from the tunnels at a point 6 m from the mouth of the tunnel. The sandstone was excavated downward

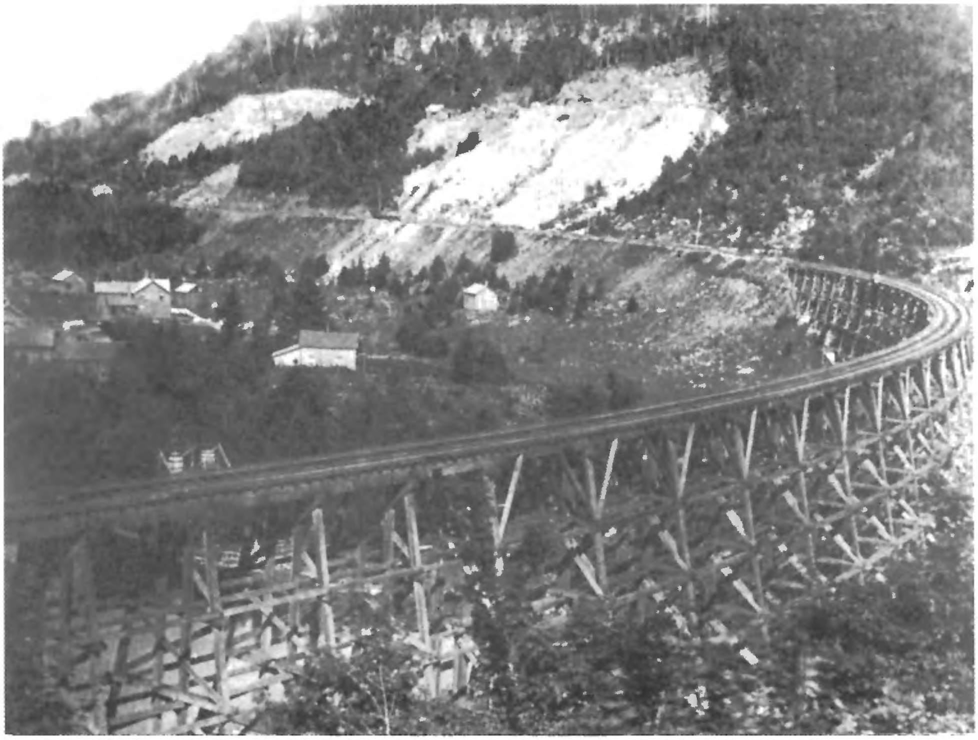


Plate 42

Forks of Credit quarries, 1891. (Archives of Ontario S. 2914)

Plate 43

Stonecutters employed in the construction of the Ontario Legislative Building, 1888. Sandstone from the Credit Forks quarries was used for the exterior of the buildings. (Archives of Ontario S. 16146)

Plate 44

Ontario Legislative Building, Toronto, in 1890s. Quarries from the Forks of the Credit valley supplied the brown sandstone for this building. (Public Archives Canada RD 407)

from the tunnels and the drifts to the base of the sandstone bed which was 2 m to 3 m thick. Dry walls were constructed at the back of the drifts and another 9-m strip was quarried. The 6-m area between the drifts and the face provided support for the roof. The underground workings extended "several hundred feet into the mountain" (Ref. *77* p. 156) and were about 53 m above the level of the Credit River. The conventional open-cut method of quarrying was used in some of the quarries. The sandstone was transported from the steep workings by tramway and cableway to the railway.

The quarries furnished attractive grey and brown building and ornamental stone, the brown being more highly sought for these purposes. They were worked in the 1880s and 1890s and supplied stone for the old Toronto City Hall and for the Ontario Legislative Building which were completed in 1893. The brown sandstone was selected for most of the exterior walls of the Legislative Building. The sandstone, cut into 15 cm cubes, was displayed as a building stone at the 1886 Colonial and Indian Exhibition in London. Forks of the Credit is 4.9 km southwest of Highway 10 at a point 4.4 km southeast of its junction with Highway 24 at Caledon.

Refs.: *54* p. 26T; *76* p. 153-159; *27* p. 8-13; *89* p. 132; *120* p. 118; *122* p. 73-74, 79.

Maps (T): 30 M/13 Bolton
(G): 1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)
2338 Bolton, Southern Ontario (O.G.S., 1:50 000)
2339 Orangeville, Southern Ontario (O.G.S., 1:50 000)

Milton Quarries

CALCITE, MARCASITE, GOETHITE, FOSSILS

In dolomitic limestone

"Micro" crystals of colourless calcite occur in small cavities in porous limestone. Rusty goethite coats small marcasite nodules which occur on the calcite crystals. Crinoids and brachiopods occur in the limestone which belongs to the Amabel Formation of Silurian age.

The limestone is quarried near Milton along the crest of the Niagara Escarpment which extends from Niagara Falls through Hamilton, Georgetown and Owen Sound to the tip of Bruce Peninsula; west of Milton, it rises 110 m above the plain, the upper 30 m forming a cliff. Milton Quarries Limited operates a quarry 2.5 km west of Milton (south of Highway 401). Quarries on the north side of Highway 401 are operated by Dufferin Materials and Construction Limited and Indusmin Limited. Access to these is by Highway 25.

Refs.: *39* p. 119-121; *53* p. 50, 52-53.

Maps	(T):	30 M/12 Brampton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971, (O.G.S., 1 inch to 16 miles)

WATERDOWN AREA

Mount Nemo Quarry

CALCITE, DOLOMITE, GYPSUM, PYRITE, FOSSILS

In dolomitic limestone

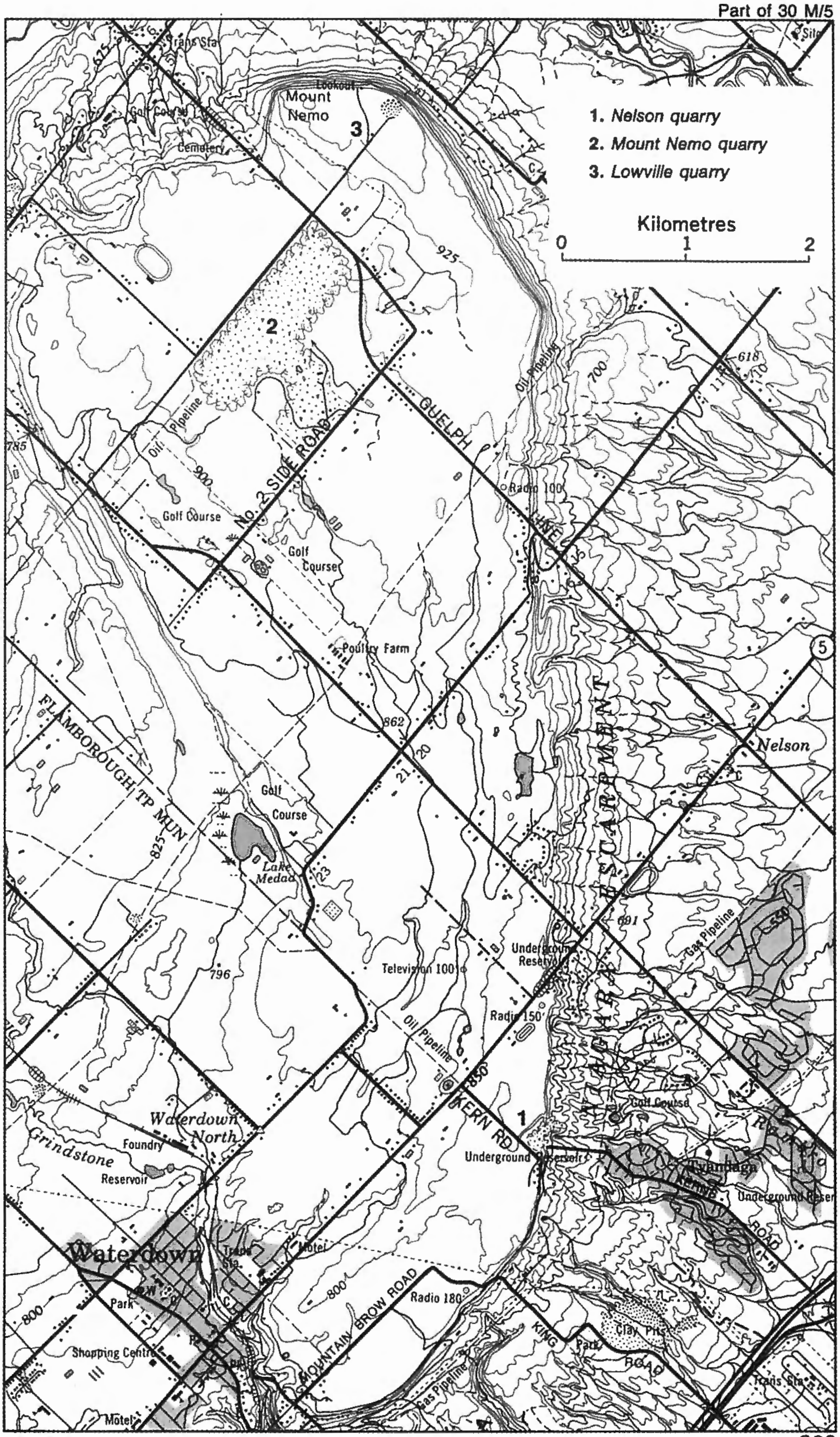
Grey to buff porous dolomitic limestone of the Amabel and Reynales formations of Silurian age occurs at this quarry. "Micro" crystals of calcite and dolomite line vugs in the limestone. Gypsum occurs as colourless transparent tabular masses (selenite) and as white fibrous masses. Pyrite is associated with gypsum. Crinoid and coral fossils occur in some of the beds and reef mounds up to 30-90 m wide and 6-15 m high are exposed in the upper part of the quarry.

This is one of the largest quarries in Ontario. It is worked by Nelson Crushed Stone Limited for use in road construction and concrete aggregate. Similar crinoidal coralline Amabel dolomitic limestone was formerly quarried by Lowville Quarries Limited at Mount Nemo on the Niagara Escarpment.

Road log from Waterdown:

km	0	Waterdown at Highway 5 railway crossing; proceed east along Highway 5.
	6.4	Junction; turn left onto Guelph Line.
	10.9	Junction; turn left onto No. 2 Sideroad.
	11.3	Turn-off (right) to Mount Nemo quarry operated by Nelson Crushed Stone Limited.

To reach the Lowville quarry, follow this road log to the Junction at km 10.9, then continue along Guelph Line for 1.6 km; turn right and proceed 1.0 km to the quarry.



Map 20. Waterdown

Refs.: *39* p. 113-118.

Maps	(T):	30 M/5 Hamilton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles) 2336 Hamilton; Southern Ontario (O.G.S., 1:50 000) 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Nelson Quarry

CALCITE, DOLOMITE, QUARTZ CRYSTALS, GYPSUM, SPHALERITE, MARCASITE, GALENA, FOSSILS

In dolomitic limestone

Grey to buff limestone of Silurian age contains numerous small cavities lined with very small crystals of calcite, dolomite and quartz. Colourless to white platy to massive gypsum occurs in some areas. Amber to black sphalerite forms irregular small masses in the limestone and massive dolomite. Marcasite and galena are associated with sphalerite. Crinoid and coral fossils occur in the rock. The quarry is of geological interest because it exposes a transition area between well-bedded Lockport dolomitic limestone of the Niagara Peninsula-Dundas area and the reefy dolomitic limestone of the Amabel Formation of the Waterdown-Georgetown-Bruce Peninsula area.

The quarry, formerly worked by Nelson Crushed Stone Limited, is on the brow of the Niagara Escarpment.

Road log from Waterdown;

km	0	Highway 5 at railway crossing; proceed east along Highway 5.
	2.7	Junction; turn right onto Kerns Road.
	3.8	Turn-off (left) to quarry.

Refs.: *39* p. 113.

Maps	(T):	30 M/5 Hamilton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles) 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles) 2336 Hamilton, Southern Ontario (O.G.S., 1:50 000)

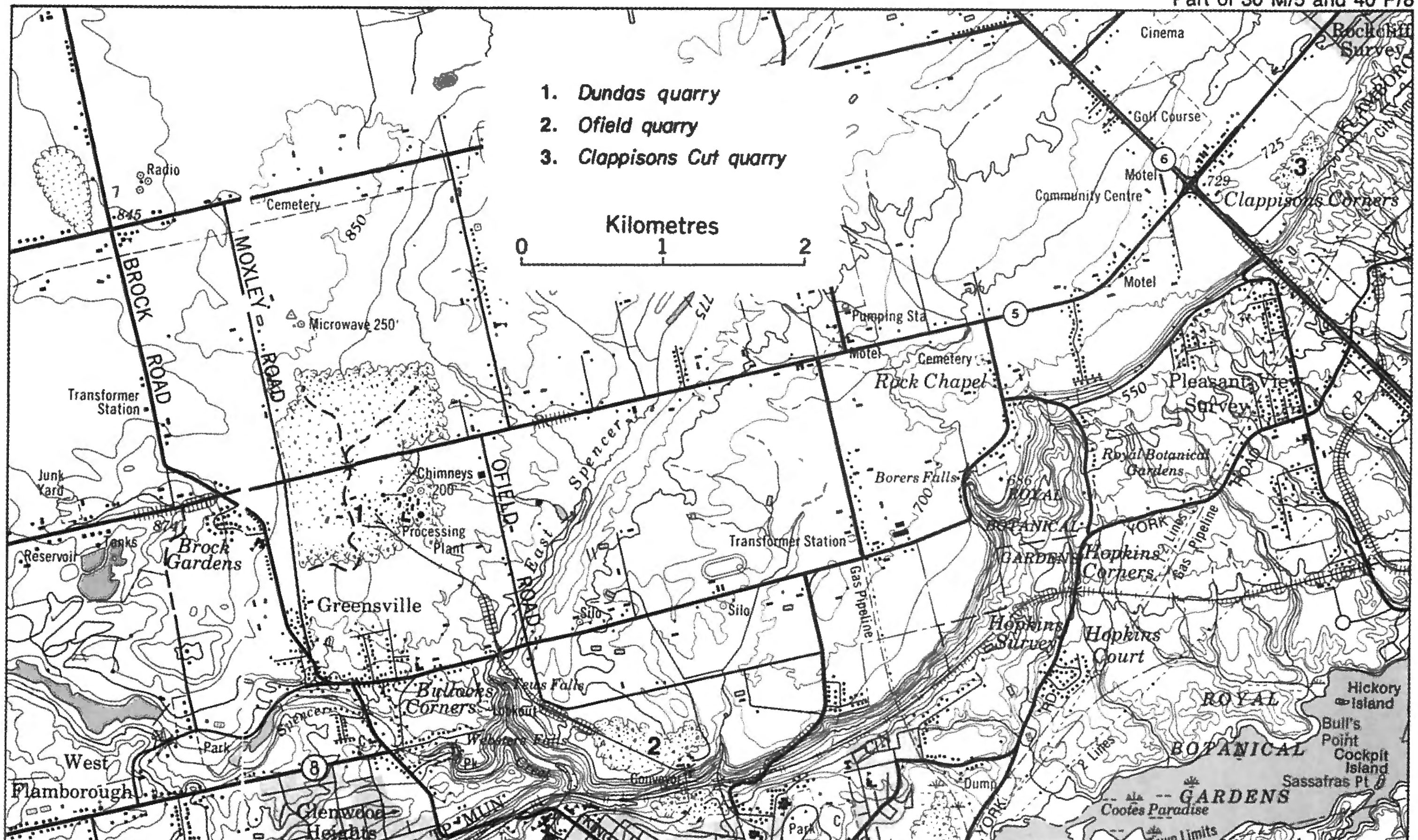
DUNDAS AREA

Clappisons Cut Quarry

CALCITE, DOLOMITE, MARCASITE, GYPSUM, FOSSILS

In dolomitic limestone

Colourless calcite crystals measuring up to 1 cm long occur in cavities (several centimeters in diameter) in Silurian dolomitic limestone of the Lockport and Clinton formations. White dolomite commonly lines cavities and small crystals of marcasite and calcite occur on the dolomite. Gypsum occurs as white nodules in the limestone. The limestone is buff to grey, porous and is interbedded with shale and sandstone. Fossils including crinoids, corals, Part of 30 M/5 and 40 P/8



GSC

Map 21. Dundas

bryozoa, brachiopods, cephalopods and trilobites occur in the rocks which are exposed at Clappisons Cut quarry and in the Highway 6 road cut 0.7 km southeast of its junction with Highway 5 at Clappisons Corners.

Clappisons Cut quarry is located on the crest of the Niagara Escarpment. It is operated by Armstrong Brothers Company Limited.

Road log from Clappisons Corners:

km	0	Junction highways 5 and 6; proceed southeast along Highway 6.
	0.3	Junction; turn left.
	1.1	Clappisons Cut quarry at end of road.

Refs.: *9* p. 93; *39* p. 112-113.

Maps	(T):	30 M/5 Hamilton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2336 Hamilton, Southern Ontario (O.G.S., 1:50 000)

Ofield Road Quarry

CALCITE, GYPSUM, BARITE, CHERT, PYRITE, GALENA, SPHALERITE, GOETHITE, FOSSILS

In dolomitic limestone

The quarry, now inactive, exposes grey dolomitic limestone of the Lockport Formation of Silurian age. Crystals of calcite, gypsum, barite, pyrite and galena occur in the limestone. Massive white to grey gypsum, yellow to black sphalerite and grey to black chert also occur in the limestone. Goethite occurs as rusty pulverulent coatings on pyrite. Brachiopods are abundant.

The quarry is located on the top of the Niagara Escarpment north of Dundas. It was operated until 1935 by Canada Crushed Stone Company Limited.

Road log from Clappisons Corners:

km	0	Highway 5; proceed along Highway 5.
	5.5	Junction; turn left onto Ofield Road.
	8.4	Junction; turn right.
	8.9	Quarry on right.

Refs.: *31* p. 299-300.

Maps	(T):	30 M/5 Hamilton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2336 Hamilton, Southern Ontario (O.G.S., 1:50 000)

Dundas Quarry

CELESTITE, FLUORITE, CALCITE, DOLOMITE, GYPSUM, QUARTZ, STRONTIANITE, ARAGONITE, PYRITE, MARCASITE, GALENA, SPHALERITE, CHALCOPYRITE, PYRRHOTITE, SULPHUR, GOETHITE, GUNNINGITE, ROZENITE, CERUSSITE, ANGLESITE, CHERT, HYDROCARBON, FOSSILS

In dolomitic limestone

Bituminous dolomitic limestone of the Guelph and Lockport formations has been quarried from this deposit since 1935. It is of Silurian age and contains a variety of minerals and fossils. The minerals occur as small or "micro" crystals in a variety of forms lining cavities. They include: colourless to blue celestite, colourless to yellow fluorite (fluoresces white in ultraviolet light), colourless calcite, white to yellowish brown dolomite; colourless to white gypsum (selenite); colourless to white quartz (crystals and botryoidal or spherical aggregates); colourless crystals and white spheres of strontianite; white aragonite; pyrite; marcasite; galena; yellow to amber, orange, brown and black sphalerite (crystals and radiating fibrous aggregates); chalcopyrite, and pyrrhotite. Powdery to finely crystalline coatings of the following minerals occur on the sulphides: yellow to rusty sulphur, rusty goethite, greyish white gunningite, white rozenite, greyish white cerussite, and white anglesite. White and brown chert occurs as nodules and lenses in the limestone. Black lustrous hydrocarbon occurs as small nodules and irregular patches. The fossils include crinoids, corals, bryozoa, brachiopods, gastropods, and trilobites. Some of them are replaced by small dolomite crystals.

The quarry is one of the largest in Canada. It is operated by Canada Crushed Stone Division of Steetley Industries, Limited. It produces blast furnace flux, commercial crushed stone, agricultural lime and stone for the dead-burned dolomite refractory kiln.

Road log from the junction of highways 6 and 5 at Clappisons Corners:

km	0	Clappisons Corners; proceed west along Highway 5.
	7.0	Junction Moxley Road; turn left.
	7.2	Dundas quarry on left.

Refs.: *9* p. 92-93; *39* p. 106-111; *53* p. 47-48.

Maps	(T):	30 M/5 Hamilton
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2336 Hamilton, Southern Ontario (O.G.S., 1:50 000)

HAMILTON – NIAGARA FALLS AREA

Stoney Creek Quarry

CALCITE, GYPSUM, CHERT

In dolomitic limestone

Colourless to white calcite crystals occur in small cavities in brownish grey limestone of the Lockport Formation of Silurian age. White gypsum and grey to light brown chert also occur in the limestone which is interbedded with shale.

The quarry is operated by A. Cope and Sons Limited for use in road construction, asphalt concrete and concrete aggregate.

Road log from junction highways 8 and 20 at Stoney Creek:

km	0	Stoney Creek; proceed south along Highway 20.
	2.5	*Road-cuts* expose a 21.9-m section of middle Silurian dolomitic limestone, limestone, shale and sandstone. The limestones contain chert nodules and fossils including bryozoa, brachiopods, corals and crinoids.
	3.3	Junction; turn right onto Green Mountain Road.
	4.6	Quarry, on right; the quarry on left is inactive.

Refs.: *9* p. 89-90; *39* p. 103-105; *53* p. 49-50.

Maps (T): 30 M/4 Grimsby
(G): 584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
2343 Grimsby, Southern Ontario (O.G.S., 1:50 000)

Vinemount Quarry

CALCITE, GYPSUM, GALENA, SPHALERITE, CHERT

In dolomitic limestone

The limestone contains white calcite crystals which fluoresce pink in "short" ultraviolet light. Gypsum occurs as colourless to white crystals and in massive form. Galena and yellow to orange sphalerite are associated with both of these minerals. White chert nodules occur in limestone. The limestone is interbedded with shale and belongs to the Lockport Formation of Silurian age.

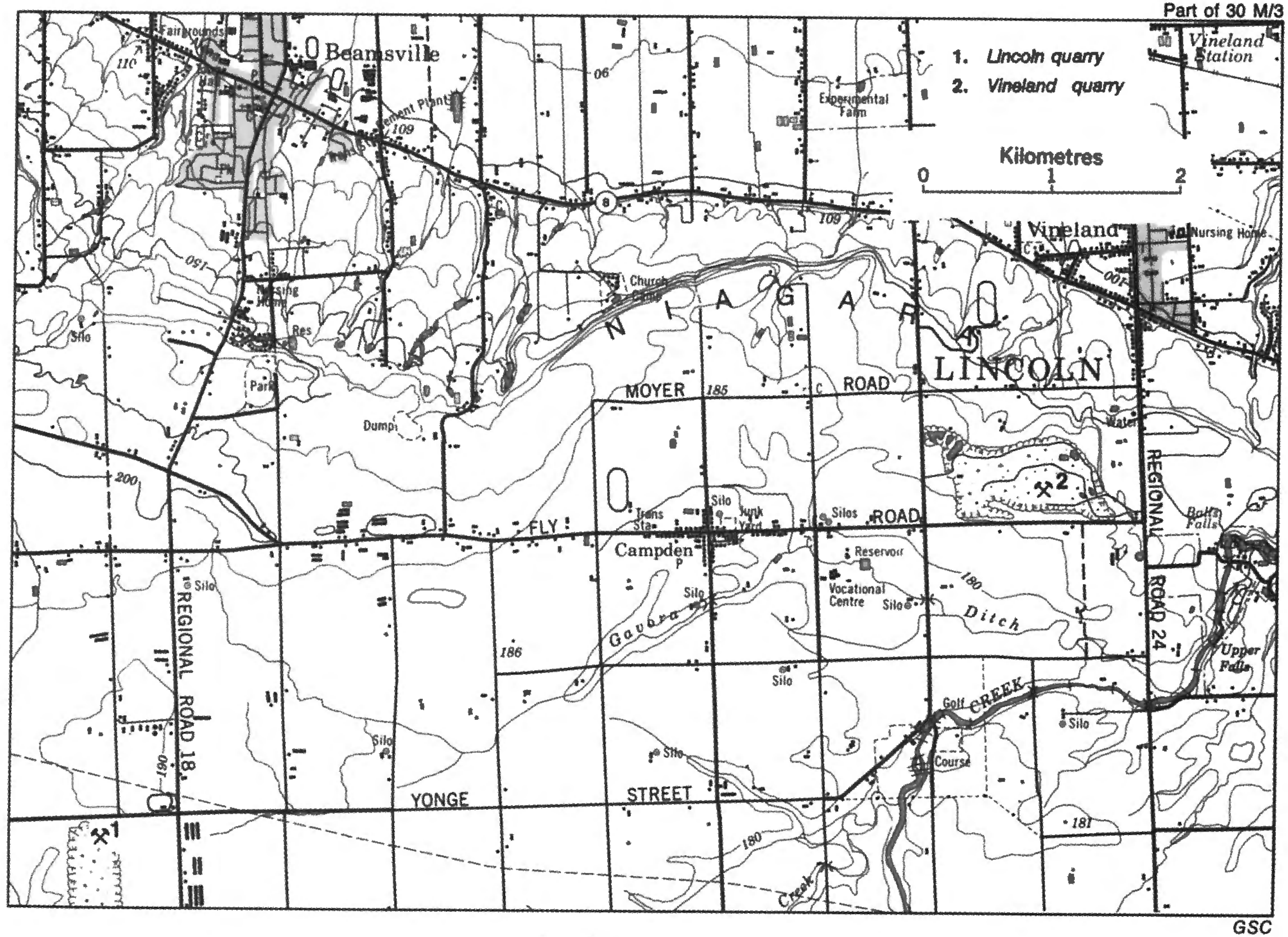
The quarry is operated by Armstrong Brothers Company Limited and is located south of Vinemount.

Road log from junction of highways 8 and 20 at Stoney Creek:

km	0	Stoney Creek; proceed east along Highway 8.
	4.4	Junction; turn right onto De Witt Road.
	5.8	Junction: turn left onto Ridge Road.
	11.3	Junction; turn right onto Tenth Road East.
	13.2	Quarry on right. The quarry on left is inactive.

Refs.: *39* p. 100-103.

Maps (T): 30 M/4 Grimsby
(G): 584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
2343 Grimsby, Southern Ontario (O.G.S., 1:50 000)



Map 22. Niagara

Lincoln Quarry

CALCITE, DOLOMITE, GYPSUM, SPHALERITE, BARITE, MARCASITE, FLUORITE, CELESTITE, GALENA, MAGNETITE, PYRITE, FOSSILS, HYDROCARBON

In dolomitic limestone

The limestone, which belongs to the Lockport Formation of Silurian age, contains cavities lined with several minerals exhibiting a variety of crystal forms. Most of the crystals are small and suitable for micro-mounts. Calcite occurs as colourless to white crystals that fluoresce yellow in ultraviolet light. White dolomite crystals are common. Associated with dolomite are: colourless, transparent gypsum (selenite), yellow to orange transparent sphalerite, white platy barite, marcasite, colourless to light yellow fluorite and colourless to light blue celestite. Galena, magnetite and pyrite occur in the limestone. Some of the limestone contains fossils and a black hydrocarbon.

The quarry was opened in 1969 by Aiken and McLachlan. It is operated by King Paving and Materials Limited and is located south of Beamsville.

Road log from Beamsville (reached by Ontario Street exit from the Queen Elizabeth Way):

km	0	Beamsville at junction King Street East (Regional Road 18): proceed south along Mountain Street.
	5.8	Junction; turn right onto Yonge Street.
	6.3	Turn-off (left) to quarry.

Refs.: *53* p. 54.

Maps	(T):	30 M/3 Niagara
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles) 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles) 2344 Niagara, Southern Ontario (O.G.S., 1:50 000)

Vineland Quarry

GYPSUM, CALCITE, SPHALERITE, FOSSILS

In dolomitic limestone

White massive gypsum is common in grey dolomitic limestone of the Lockport Formation of Silurian age. Colourless to white calcite crystals occur in cavities; if fluoresces dark pink in "short" ultraviolet light. Yellow to orange sphalerite is associated with calcite and gypsum. Some of the limestone is crinoidal.

The quarry is located south of Vineland and is operated by Vineland Quarries and Crushed Stone Limited.

Road log from Vineland (reached by Victoria Avenue exit from the Queen Elizabeth Way):

km	0	Vineland, at junction Regional Road 81 (Heritage Highway) and Victoria Avenue (Regional Road 24); proceed south on Victoria Avenue.
	1.6	Junction; turn right onto Fly Road.
	1.8	Quarry on right.

Refs.: *39* p. 98-99, *53* p. 55-56.

Maps	(T):	30 M/3 Niagara
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2344 Niagara, Southern Ontario, (O.G.S., 1:50 000)

Thorold Quarry

DOLOMITE, GYPSUM, CALCITE, CELESTITE, SPHALERITE, GALENA, FOSSILS, HYDROCARBON

In dolomitic limestone

Dolomitic limestone of the Lockport Formation comprises most of the quarry face and it overlies buff to bluish grey reef-like dolomitic limestone of the Decew Formation. The latter is referred to as waterlime or "cement-rock" because of its former use to produce natural cement by the addition of water. Dolomitic shale of the Rochester Formation underlies the Decew limestone at the floor of the quarry. The rocks are of Silurian age. The Lockport limestone contains cavities lined with crystals of white dolomite and calcite and light blue celestite. White platy gypsum and white translucent massive gypsum (alabaster) occur in the limestone, and gypsum nodules occur in the shaly limestone. Amber to black sphalerite, galena and black hydrocarbon occur in the limestone. Crinoidal fossils replaced by pink and white calcite occur in limestone.

The Lockport limestone is crushed and used for road metal and concrete aggregate; pulverized limestone is used for flux stone and in the pulp and paper industry. The Rochester dolomitic shale, also known as wool rock, was used for the manufacture of rock wool, as an insulating material and as an ingredient in acoustic tile. The rock wool was produced from about 1935 to 1978. The wool rock (shale) was melted in a coke-burning furnace; the molten rock was atomized by steam under pressure transforming the globules of molten rock into thin pliable glassy fibres. It resembled sheep's wool except that it could not be woven. It was sold in bulk or processed into various forms including granulated form, blocks, blankets or sheets. The raw material from the quarry was shipped to the Spun Rock Wools, Limited plant in Thorold for manufacturing the rock wool. Its use has been replaced by glass wool (fibre glass) and slag wool.

The quarry is located east of Thorold. It is operated by Walker Brothers Limited.

Road log from the Queen Elizabeth Way at Glendale Road exit (east of St. Catherines);

km	0	Proceed east along Glendale Road East.
	0.3	Junction; turn left onto Taylor Road.
	1.6	Junction; turn right onto Warner Road.
	1.8	Junction; turn left onto Beechwood Road.
	2.4	Quarry Gate.

Refs.: *30* p. 1-6; *31* p. 251, 278-279; *39* p. 94-95; *53* p. 56.

Maps	(T):	30 M/3 Niagara
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)
		2344 Niagara, Southern Ontario (O.G.S., 1: 50 000)

Plate 45

Tourists walking on snow bluffs, Niagara Falls, 1890. Beyond the bluffs, the Niagara River cascades over the steep rock face of the Niagara Escarpment as it flows down from Lake Erie to Lake Ontario. The rock face consists of a hard resistant cap of Lockport dolomitic limestone over softer Rochester shale. The whirling waters erode the shale, undermining the cap which collapses in giant rock falls; this fallen rock churns away the softer strata below causing further erosion. In this way, the Falls carved a gorge in the Escarpment since the final retreat of the glaciers in Pleistocene time. The original position of the Falls was at the head of the Escarpment at Queenston. (Public Archives Canada PA 68371)

Queenston Quarry

DOLOMITE

In dolomitic limestone

A durable and attractive pearl-grey to silver-grey limestone has been quarried from the Queenston area for use as a building and engineering construction stone since 1837. It is known in the building trade as Queenston Limestone. The Queenston quarry was the principal producer of limestone building stone in Canada until it ceased producing building stone in 1979. Numerous buildings were constructed of this stone including the East Block of the Legislative Buildings in Toronto. The building stone was quarried from the lower bench of the quarry. This rock and the limestone of the upper bench belong to the Lockport Formation of Silurian age. Underlying it near the floor of the quarry is a darker grey dolomitic limestone of the Decew Formation (Silurian); this rock is known as waterlime or cement-rock and was formerly used to produce natural cement by the addition of water. Shaly limestone of the Rochester Formation underlying the Decew Formation was formerly quarried and shipped to rock wool manufacturing plants. The Lockport limestone contains crinoids and small cavities lined with white to pink dolomite crystals.

The quarry and crushing plant are operated by Queenston Quarries Division of Steetley Industries Limited. The quarry is located west of Queenston.

Road log from Niagara Falls:

km	0	Intersection Portage Road and Stanley Road; proceed north along Stanley Road.
	1.1	Quarry entrance. This is just north of the Highway 405 overpass.

Refs.: *31* p. 251-254; *39* p. 91-94; *53* p. 55.

Maps	(T):	30 M/3 Niagara
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles) 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles) 2344 Niagara, Southern Ontario (O.G.S., 1:50 000)

Montrose Occurrence

CALCITE, GYPSUM, DOLOMITE, FLUORITE, CELESTITE, SPHALERITE, QUARTZ, CHERT

In dolomitic limestone

Cavities in Lockport dolomitic limestone (Silurian) contain small crystals of white dolomite, violet fluorite, colourless to light blue celestite, yellow to orange sphalerite and colourless quartz. White massive gypsum and white to grey chert occur in the rock. Some of the chert contains cavities lined with quartz crystals.

These minerals occur in limestone which was removed during the excavation of the local canal system and deposited in the Montrose Road — Kalar Road area, near Niagara Falls.

Road log from the Queen Elizabeth Way at the McLeod Road exit:

km	0	Proceed onto McLeod Road (west).
	0.5	Junction Montrose Road; proceed along McLeod Road. The rock disposal area is bounded by Montrose, McLeod and Kalar roads. To reach parking area, continue along McLeod Road.
	1.3	Junction; turn right onto Kalar Road.
	1.5	Turn-off (right) to parking area.

Refs.: *89* p. 134.

Maps	(T):	30 M/3 Niagara
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles) 2344 Niagara, Southern Ontario (O.G.S., 1:50 000)

Campbell (Stevensville) Quarry

CHERT, QUARTZ CRYSTALS, CALCITE, PYRITE, GLAUCONITE, FOSSILS

In limestone

The quarry face exposes light grey limestone of the Bois Blanc Formation (Devonian) in the upper 1.2 m and, below this, brown to greyish brown dolomitic limestone of the Bertie

Formation (Silurian). The Bois Blanc limestone contains white to grey chert, white calcite and pyrite. Colourless quartz crystals occur in small cavities in chert. Green glauconite is disseminated in interbedded sandstone layers. Cup corals are common in the Bois Blanc limestone; some are replaced by chert.

The limestone is quarried by George C. Campbell Company Limited for use in road construction and asphalt aggregate. It is located southeast of Stevensville.

Road log from the Queen Elizabeth Way at Ridgemount Road (This is 19 km south of the Highway 20 exit at Niagara Falls.):

km	0	Proceed south along the Ridgemount Road.
	2.0	Intersection Bowen Road; continue straight ahead.
	2.3	Turn-off (right) to Campbell quarry. (This turn-off is 2.9 km north of the junction of Ridgemount Road with Highway 3.)

Refs.: *39* p. 128-130; *53* p. 57-58.

Maps (T): 30 L/14 Welland
(G): 584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Ridgemount Quarry

CHERT, QUARTZ CRYSTALS, FOSSILS

In limestone

White to grey and black chert occurs as nodules and lenses in grey Bois Blanc limestone of Devonian age. Small crystals of colourless quartz occur in the chert. Brachiopods and abundant cup corals are commonly replaced by chert. The Bois Blanc limestone overlies brown dolomitic limestone of the Silurian Bertie Formation and it is overlain by the Devonian Amherstburg Formation consisting of grey crinoidal coral-bearing limestone.

The quarry is operated by Ridgemount Quarries Limited for use in road construction. It is located south of the Campbell quarry and on the west side of the Ridgemount Road 1.8 km south of the Campbell quarry, or 1.1 km north of the junction of Ridgemount Road and Highway 3.

Refs.: *39* p. 130; *53* p. 62-63; *117* p. 65-66.

Maps (T): 30 L/14 Welland
(G): 584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Humberstone Quarry

CHERT, CALCITE, GYPSUM, PYRITE, FOSSILS

In limestone

The upper 2.6 m of the quarry exposes grey Bois Blanc limestone (Devonian) which contains white chert nodules and abundant coral fossils. This limestone is underlain by brownish grey to light brown dolomitic limestone of the Bertie Formation (Silurian); white calcite, white massive gypsum and pyrite occur in this rock. The unconformity between the two formations is marked by a 1-m layer of glauconitic siltstone and black shale.

The quarry is operated by Port Colborne Quarries Limited for use in concrete and road construction. It is located at the northeastern end of Port Colborne on Chippewa Road, 1.1 km from its junction with Highway 3 in Port Colborne.

Refs.: *39* p. 130-132; *53* p. 62.

Maps	(T):	30 L/14 Welland
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Law Quarry

CHERT, CELESTITE, CALCITE, PYRITE, FOSSILS, GYPSUM

In limestone

White, grey, brown, and black chert occurs as nodules and irregular masses in grey Bois Blanc limestone (Devonian) which is exposed along the upper part of the quarry face. White tabular crystals of celestite, white massive calcite, pyrite and abundant coral and shell fossils occur in the limestone. Glauconitic siltstone marks the base of this formation which is underlain by brown mottled dolomitic limestone of the Bertie Formation (Silurian). In it gypsum occurs as colourless to white crystals in cavities, and as white irregular masses. Some chert also occurs in it.

The limestone is quarried by R.E. Law Crushed Stone Limited for use in road construction and for concrete aggregate. The quarry is on the north side of Highway 3 at a point 5.1 km west of its junction with Chippewa Road in Port Colborne.

Refs.: *39* p. 134-136; *53* p. 61-62.

Maps	(T):	30 L/14 Welland
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Port Colborne Quarries

CHERT, QUARTZ CRYSTALS, FOSSILS, CALCITE

In limestone

White to grey and black chert occurs as nodules and irregular masses in grey Bois Blanc limestone of Devonian age; it is particularly abundant in the upper part of the quarry face. Quartz crystals occur in small cavities in the chert. Coral fossils replaced by calcite are abundant. In places, the coral fossils form white tabular bodies (biostromes) in the limestone; these bodies contain pockets of liquid petroleum.

The quarries were formerly worked by Canada Cement Company, Limited for the manufacture of Portland cement. The quarries are located west of Port Colborne.

Road log from Port Colborne:

km	0	Junction Highway 3 and Chippewa Road; proceed west along Highway 3.
	5.1	Law quarry on right; continue along Highway 3.
	5.5	Junction; turn left onto Quarry Road.
	6.1	Turn-offs to quarries on left and right.

Refs.: *31* p. 281-282; *39* p. 132-134.

Maps	(T):	30 L/14 Welland
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)

CAYUGA - CALEDONIA AREA

Cayuga Quarry

CHERT, FOSSILS, CELESTITE, GYPSUM, CALCITE, PYRITE

In limestone

The quarry face exposes grey Bois Blanc limestone (Devonian) overlying light grey Oriskany sandstone (Devonian) and brown Bertie dolomitic limestone (Silurian). White, grey and brown chert nodules occur in the grey limestone and in sandstone. Coral and shell fossils occur in the limestone. Brown to brownish grey dolomitic limestone of the Bertie Formation comprises most of the quarry face; white to colourless platy aggregates of celestite, white gypsum and white calcite occur in cavities and fractures in the limestone. Pyrite occurs in calcite and in limestone.

The quarry is operated by Cayuga Materials and Construction Company Limited; it produces crushed stone for road construction, railroad ballast, agricultural lime and silica sand. It is located on the north side of Highway 3 at a point 6.3 km southwest of its junction with Highway 54 in Cayuga.

Refs.: *39* p. 138-140; *53* p. 58-59.

Maps	(T):	30 L/13 Dunnville
	(G):	584A Toronto-Hamilton, Ontario (GSC, 1 inch to 4 miles)
		2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Haldimand Quarries

CHERT, FOSSILS, GYPSUM, CELESTITE, CALCITE

In limestone

White, grey, greyish blue, brown, bluish black, black and reddish brown chert occurs as nodules and irregular masses in grey limestone and sandstone of the Bois Blanc Formation (Devonian) which overlies the brown dolomitic limestone of the Bertie Formation (Silurian). Some of the chert is banded and variously patterned; it varies from opaque to translucent. Cup corals, commonly silicified, are abundant in the limestone. White tabular celestite and white calcite occur in limestone and in shaly limestone. The base of the formation is marked by a glauconitic shaly zone. White gypsum occurs in the brown dolomitic limestone.

The quarries are at the eastern and western outskirts of Hagersville. The quarry operated by Haldimand Quarries and Construction Limited is on the east side of Highway 6 at a point 0.9 km northeast of the intersection of King Street in Hagersville. A quarry formerly operated by Canada Crushed and Cut Stone Limited is located on the west side of Hagersville; access to it is by a road, 0.6 km long, which leads south from King Street at a point 0.8 km west of its intersection with Main Street. Dufferin Materials and Construction Limited operates a quarry on the south side of Mud Street at a point 1.1 km west of its intersection with Main Street (Highway 6). Opposite it, on the north side, is an inactive quarry. The quarries produce crushed stone, railway ballast and asphalt aggregate.

Refs.: *31* p. 231-233; *39* p. 140-146; *53* p. 59-61.

Maps (T): 40 I/16 Simcoe
(G): 2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

Hagersville Mine

GYPSUM, ANHYDRITE

In dolomitic limestone and shale

White translucent and white mottled finely granular massive gypsum is mined from a seam varying from 9 to 1.2 m wide in dolomitic limestone and shale of the Salina Formation (Silurian). The anhydrite content increases with depth. The seam is at a depth of 18 to 30 m.

The deposit was discovered in 1930 by Canadian Gypsum Company Limited which has operated the mine continuously since 1931. The gypsum seam is mined from a shaft 29 m deep. The plant produces gypsum plasters and wallboard.

The mine and plant are located on the west side of Highway 6 at the junction of Oneida 3rd Line Road; this junction is 6.0 km northeast of the intersection of Main Street (Highway 6) and King Street in Hagersville.

Ref.: *33* p. 88-91.

Maps (T): 40 P/1 Brantford
(G): 2053 Brantford area (O.G.S., 1 inch to 1 mile)
1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

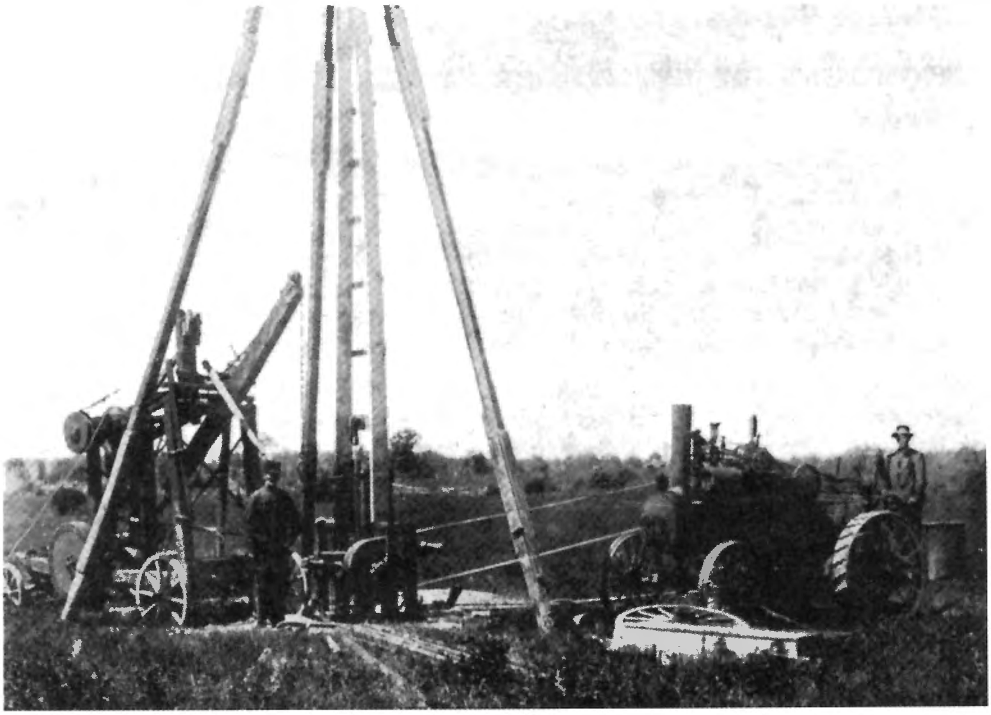


Plate 46

Drilling for gypsum at Crown Gypsum Company property, York, about 1912. The Grand River valley, from Paris to Cayuga, has produced gypsum since it was discovered near Paris in 1822. It was ground and used as a land fertilizer until the 1880s when calcining plants were built to manufacture plaster for building construction. Gypsum was mined from the York deposit almost continously from 1846 to 1919. (GSC 204031-G)

Caledonia Mine

GYPSUM

In dolomitic limestone and shale

Gypsum is mined from a seam, 2.4 m wide, in interlayered dolomitic limestone and dolomitic shale at a depth of 23 m. The gypsum is white to light brown and grey sugary massive. It contains fracture-fillings of white fibrous gypsum and colourless selenite, and embedded colourless selenite crystals. The host rocks belong to the Salina Formation of Silurian age.

The deposit was opened in 1905 by the Alabastine Company of Paris and was subsequently operated under various company names until 1961 when the name was changed to Domtar Construction Materials Limited. The No. 1 mine operated from an inclined shaft from 1905 to 1953 producing nearly 4 million tonnes of gypsum. In 1952, No. 2 mine was opened; it is mined from an inclined shaft. The plant is located at the mine site; it manufactures gypsum building products.

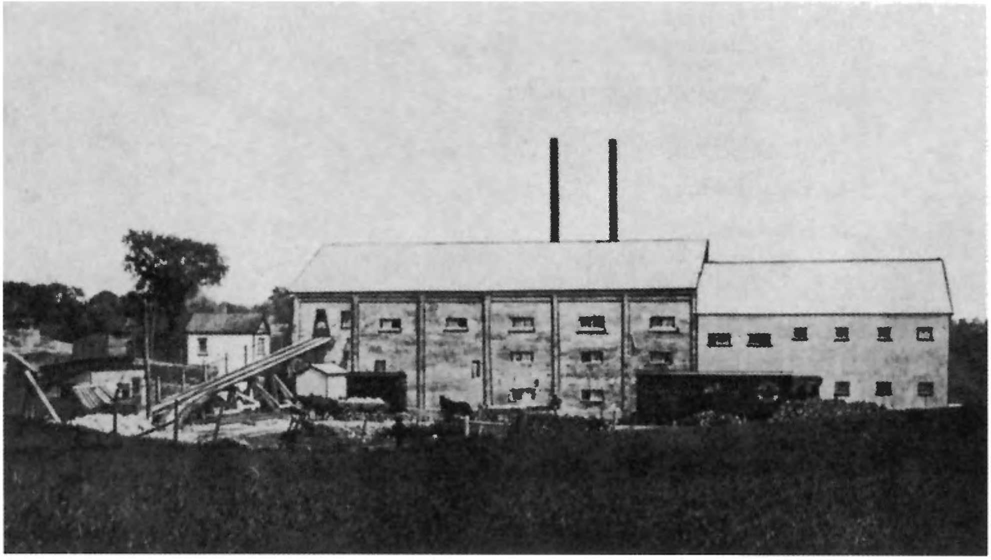


Plate 47

Alabastine Company Limited mill, Caledonia, about 1912. Gypsum was conveyed from the mine to the head of the incline at the upper part of the building and dumped into a crusher. The pulverized gypsum was calcined by heating in kettles to produce plaster of Paris and stucco. Wagon-loads of gypsum hauled by horses were brought to the mill from near-by mines. (GSC 204031)

The mine and plant are located on the west side of Highway 6, 0.8 km north of its junction with Highway 54 in Caledonia.

Refs.: *16* p. 35-39; *33* p. 78-86.

Maps	(T):	30 M/4 Grimsby
	(G):	2343 Grimsby, Southern Ontario (O.G.S., 1:50 000)
		1263A Toronto-Windsor Area, Ontario (GSC, 1 inch to 3.95 miles)

PORT DOVER

Port Dover Quarry

CHERT, FOSSILS

In limestone

White to bluish grey and black chert occurs as nodules and lenses in grey to bluish grey limestone of the Dundee Formation (Devonian). Coral and shell fossils occur in the limestone, The quarry cuts into an old river bed northeast of Port Dover. It is operated by Norfolk Quarry Company for crushed stone.

Road log from Port Dover at intersection Prospect Street and Cocksutt Road:

km	0	Proceed east along Cocksutt Road.

0.9	Intersection; continue straight ahead.
2.5	Intersection; turn right.
3.75	Junction; turn right.
4.1	Quarry.

Refs.: *42* p. 66-67; *53* p. 69-70.

Maps	(T):	40 I/16 Simcoe
	(G):	2264 Ontario Limestone Quarries, 1971 (O.G.S., 1 inch to 16 miles)

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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 $(Ce, Ca, Y)_2(Al, Fe)_3(SiO_4)_3(OH)$. H = 6.5. 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.

Amazonite $KAlSi_3O_8$. H = 6. Green variety of microline feldspar. Occurs in pegmatites. Used for jewellery and ornamental purposes.

Amphibole A mineral group consisting of complex silicates including tremolite, actinolite and hornblende. Common rock-forming mineral.

Amphibolite A metamorphic rock composed essentially of amphibole and plagioclase feldspar.

Anatase TiO_2. H = 5.5–6. Yellowish or reddish brown pyramidal or tabular crystals with adamantine lustre; also grey or blue; massive. Also known as octahedrite.

Ancylite $SrCe(CO_3)_2(OH).H_2O$. H = 4–4.5. Pale yellow, yellowish brown, grey, translucent prismatic crystal or rounded crystals aggregates. Splintery fracture. Soluble in acids. Rare mineral.

Anhydrite $CaSO_4$. H = 3-3.5. White, bluish or greyish with vitreous lustre. Generally granular massive. Alters to gypsum by absorption of water. Distinguished from gypsum by its superior hardness. Used as a soil conditioner and for portland cement.

Antiperthite Lamellar intergrowth of potassium and sodium feldspars in which sodium feldspar is dominant.

Apatite $Ca_5(PO_4)_3(F, Cl, OH)$. H = 5. Green, 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 and dolomite by its superior hardness and lack of effervescence in HCl, and from massive diopside and olivine by its inferior hardness. Used in the manufacture of fertilizers and detergents.

Aragonite $CaCO_3$. H = 3.5–4. Colourless to white or grey and, less commonly, yellow, blue, green, violet, rose-red, prismatic or acicular crystals; also columnar, globular, stalactitic aggregates. Vitreous lustre. Transparent to translucent. Distinguished from calcite by its cleavage and higher density (2.93). Effervesces in dilute HCl.

Asterism Intersecting lines or bands of light forming a star, as seen in transmitted light in mica, or in reflected light in cabochon-cut sapphire or garnet. Caused by light reflected from microscopic inclusions arranged along crystallographic directions.

Bastnaesite $(Ce, La)(CO_3)F$. H = 4–4.5. Yellowish to reddish brown and grey platy, lath-shaped or granular masses with dull, greasy or pearly lustre; also greenish brown earthy. Occurs with other rare element minerals. Soluble in HCl. Difficult to identify in hand specimen.

Betafite $(Ca, Na, U)_2(Nb, Ti, Ta)_2O_6(OH)$. H = 4–5.5. Brown to black, waxy to sub-metallic octahedral or modified octahedral crystals. Metamict. Occurs with euxenite, fergusonite, cyrtolite in granite pegmatite; in calcite veins.

Beta-uranophane Ca $(UO_2)_2Si_2O_7.5H_2O$. H = 2.5–3. 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.

Biotite $K(Mg, Fe)_3(Al, Fe)Si_3O_{10}(OH, F)_2$. H = 2.5–3. Dark brown, greenish black transparent hexagonal platy crystals, platy or scaly aggregates. Splendent lustre. Occurs in pegmatitie, calcite veins, pyroxenite. Constituent of igneous rocks (granite, syenite, diorites, etc.) and in metamorphic rocks (gneiss, schist). Elasticity of individual plates or sheets distinguishes it from chlorite. Sheet mica is used as electrical insulators and for furnace and stove doors (isinglass); ground mica is used in manufacture of roofing materials, wallpaper, lubricants and fireproofing material. Mica group.

Bitumen Natural mixture of hydrocarbons which may by in the liquid state (petroleum) or solid (asphalt or mineral pitch).

Boehmite AlO(OH). H = 3. White with pearly to silky lustre. Flaky, fibrous, granular or powdery aggregates; also pisolitic. Associated with other aluminum minerals.

Brucite $Mg(OH)_2$. H = 2.5. White, grey, light blue or green tabular, platy, foliated or fibrous aggregates, also massive. Pearly or 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.

Brugnatellite $Mg_6Fe(CO_3)(OH)_{13}.4H_2O$. H = 2. White silky pearly or waxy, flaky, aggregates, or foliated, lamellar nodules; may be tinted reddish, yellowish, brownish. Associated with brucite and serpentine.

Cabochon A polished gemstone having a convex surface; translucent or opaque minerals such as opal, agate, jasper, and jade are generally cut in this style.

Calciosamarskite Name given to Ca-rich samarskite. Not a valid species.

Calcite $CaCO_3$. H = 3. Colourless, white scalenohedral or rhombohedral crystals; granular or cleavable masses. Transparent to translucent with vitreous, pearly or dull lustre. May fluoresce in ultraviolet light. Effervesces in dilute HCl. Common vein-filling mineral in ore deposits. Main constituents of limestone and marble.

Cancrinite $Na_6Ca_2Al_6Si_6O_{24}(CO_3)_2$. H = 6. Yellow, pink, grey, massive or prismatic crystals; vitreous to greasy lustre. Associated with nepheline and sodalite in nepheline syenite. Effervesces in warm HCl.

Celestite $SrSO_4$. H = 3–3.5. 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.

Cement rock See water-lime.

Chalcedony SiO_2. H = 7. Translucent micro crystalline variety of quartz. Colourless, grey, bluish, yellowish, reddish, brown. Formed from aqueous solutions. Attractively coloured chalcedony is used for ornamental objects and jewellery. Varieties include agate, carnelian, jasper, etc.

Chalcopyrite $CuFeS_2$. H = 3.5–4. Brass-yellow massive, or tetrahedral crystals. Iridescent tarnish. Brass colour distinguishes it from pyrrhotite. Distinguished from pyrite by its inferior hardness, from gold by its superior hardness and lower density. Also called copper pyrite. Ore of copper.

Chert Massive opaque variety of chalcedony; generally drab, coloured in various tints of grey or brown.

Chlorite (Mg, Fe, Al)$_6$(Al, Si)$_4$O$_{10}$(OH)$_2$. H = 2–2.5. Transparent green flaky aggregates. Distinguished from mica by its colour and non-elastic flakes.

Chondrodite (Mg, Fe)$_5$(SiO$_4$)$_2$(F, OH)$_2$. H = 6–6.5. Orange-yellow grains and granular masses. Vitreous to slightly resinous lustre. Subconchoidal to uneven fracture. Occurs in crystalline limestone. Orange colour is distinguishing feature. Also distinguished from tourmaline by its inferior hardness, from apatite by its superior hardness. Member of humite group.

Clinopyroxene Monoclinic member of the pyroxene group. Includes acmite, augite, clinoenstatite, diopside.

Columbite-Tantalite Series (Fe, Mn)Nb$_2$O$_6$–(Fe, Mn)Ta$_2$O$_6$. H = 5–7. Brownish black to black prismatic or tabular crystals forming parallel groups; also massive. Submetallic lustre. Occurs in pegmatites. Ore of niobium which is used in high-temperature steel alloys, and of tantalum which is used in electronics.

Concretion Rounded mass formed in sedimentary rocks by accretion of some constituent (iron oxides, silica, etc.) around a nucleus (mineral impurity, fossil fragment, etc.).

Conglomerate A sedimentary rock formed of rounded pebbles or gravel.

Coquina A porous limestone composed almost entirely of fossil shells or shell fragments.

Corundum Al$_2$O$_3$. H = 9. Blue, red, yellow, brown hexagonal prisms or barrel-shaped, pyramidal, flat tabular crystals. Uneven to conchoidal fracture. Adamantine to vitreous lustre. Distinguished by its hardness and characteristic barrel-shaped form. Used as an abrasive. Red (ruby) and blue (sapphire) varieties are used as gemstones.

Crystalline limestone A limestone that has been metamorphosed or recrystallized. Also known as marble. Used as building, monument, and ornamental stone. Dolomitic crystalline limestone is one containing a high proportion of dolomite.

Cyrtolite A radioactive zircon containing uranium and rare elements.

Datolite CaBSiO$_4$(OH). H = 6.5. Transparent colourless, pale yellow, 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.

Dawsonite NaAl(CO$_3$)(OH)$_2$. H = 3. Transparent, striated square prismatic crystals; rosettes or incrustations of bladed or acicular cystals; tufts of colourless needles; also very fine micaceous aggregates. Lustre is vitreous or pearly in crystals, and silky in micaceous variety. Effervesces in HCl. Distinguished by its striated crystal form. Generally difficult to identify in hand specimen since crystals are very small. Originally found in Montreal near the McGill University campus. Named for John William Dawson (1820-1899), a Canadian geologist and principal of McGill University.

Diopside CaMgSi$_2$O$_6$. H = 6. Colourless, white to green monoclinic variety of pyroxene.

Diorite A dark coloured igneous rock composed mainly of plagoiclase and amphibole or pyroxene.

Dolomite CaMg(CO$_3$)$_2$. H = 3.5–4. Colourless, white, pink, yellow or grey rhombohedral or saddle-shaped crystals; also massive. Vitreous to pearly lustre. Slightly soluble in cold HCl. Common vein-filling mineral in ore deposits and essential constituent of dolomitic limestone and dolomitic marble. Ore of magnesium which is used in the manufacture of lightweight alloys.

Dolomitic limestone Limestone containing 10-50 per cent dolomite.

Dyke A long narrow body of igneous rock that cuts other rocks.

Ellsworthite Uranpyrochlore, member of the pyrochlore group. Amber yellow to dark brown massive; adamantine lustre. Originally found (1922) at the McDonald Mine near Bancroft and named in honour of H.V. Ellsworth, mineralogist, Geological Survey of Canada. Subsequently found to be a uranian pyrochlore.

Epidote $Ca_2(Al, Fe)_3(SiO_4)_3(OH)$. 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.

Euxenite $(Y, Ca, Ce, U, Th)(Nb, Ta, Ti)_2O_6$. H = 5.5–6.5. 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.

Facet cut Polished gemstone featuring flat surfaces as in diamond.

Fault Structural feature produced by the movement of one rock mass relative to another; shear zone, brecciated zone, fault zone refer to the region affected by the movement.

Feldspar A mineral group consisting of alumino-silicates of potassium and barium (monoclinic or triclinic), and of sodium and calcium (triclinic). Orthoclase and microcline belong to the first group, plagioclase to the second. Used in the manufacture of ceramics, porcelain-enamel, porcelain, scouring powders, and artificial teeth.

Fluoborite $Mg_3(BO_3)(F, OH)_3$. H = 3.5. Colourless, white, pink transparent to translucent hexagonal prisms, prismatic or granular aggregates; vitreous, silky or pearly lustre. May fluoresce white in ultraviolet light. Resembles apatite but has an inferior hardness. Occurs in crystalline limestone.

Fluor-richterite $Na(Ca, Na) Mg_3Si_8O_{22}F_2$. H = 5–6. Dark grey to dark greenish grey long prismatic crystals or aggregates of crystals. Member of amphibole group.

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 = 2.5. Dark grey metallic, cubic crystals; also massive with excellent cubic cleavage. Heavy (D = 7.58). Ore of lead; may contain silver.

Garnet Silicate of Al, Mg, Fe, Mn, Ca. H = 6.5–7.5. 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 FeO(OH). H = 5–5.5. Dark brown, reddish or yellowish brown, earthy, botryoidal, fibrous, bladed or loosely granular masses; also prismatic, acicular, tabular crystals or scaly. Has characteristic yellowish brown streak. Weathering product of iron-rich minerals. Ore of iron.

Gold Au. H = 2.5–3. Yellow metallic irregular masses, plates, scales, nuggets. Rarely as crystals. Distinguished from other yellow metallic minerals by its hardness, malleability, high density (19.3). Precious metal.

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

Granite gneiss A gneiss having the mineral composition of granite.

Granite pegmatite Pegmatite having the mineral composition of granite.

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 a lubricant, in "lead" pencils, and refractories.

Grossular $Ca_3Al_2(SiO_4)_3$. H = 6.5–7. Colourless, white, yellow, pink, orange, brown, red, black or green transparent to opaque dodecahedral or trapezohedral crystals; massive granular. Vitreous. Occurs in metamorphosed limestone with other calcium silicates. Garnet group. Transparent varieties are used as a gemstone.

Gunningite $ZnSO_4.H_2O$. H = 2.5. White powder occurring as an efflorescence on sphalerite from which it has oxidized. First described from the Keno Hill deposits, it was named for Dr. H.C. Gunning, a former geologist with the Geological Survey of Canada, and later, Head of the Geology Department, University of British Columbia.

Gypsum $CaSO_4.2H_2O$. H = 2. White, grey, light brown, granular massive; also fibrous (satin spar), or colourless transparent crystals (selenite). Distinguished from anhydrite by its inferior hardness. Occurs in sedimentary rocks. Used in construction industry (plaster, wallboard, cement, tiles, paint) and as a soil conditioner and fertilizer. Satin spar and alabaster (fine grained translucent variety) are used for carving into ornamental objects.

Hatchettolite Uranpyrochlore (pyrochlore group). H = 4. Amber to black irregular masses. Occurs with radioactive zircon (cyrtolite) in pegmatite.

Hematite Fe_2O_3. H = 5.5–6.5. Reddish brown to black massive, botryoidal, or earthy; also foliated or micaceous with high metallic lustre (specularite). Characteristic red streak. Greasy to dull lustre. Ore of iron.

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

Hydromagnesite $Mg_5(CO_3)_4(OH)_2.4H_2O$. H = 3.5. Colourless or white, transparent, flaky, acicular or bladed crystals, aggregates forming tufts, rosettes or encrustations; also massive. Vitreous, silky or pearly lustre. Associated with serpentine, brucite, magnesite. Effervesces in acids. Distinguished from calcite by its habit.

Hydronepheline Pink to orange red nodular or irregular patches in nepheline syenite. Not a valid species. In Bancroft area, what was referred to as hydronepheline is natrolite.

Hydrotalcite $Mg_6Al_2(CO_3)(OH)_{16}.4H_2O$. H = 2. White, transparent foliated lamellar aggregates; also platy. Pearly to waxy lustre. Greasy feel. Distinguished from talc by its effervescence in dilute HCl and by its superior hardness. Associated with talc, serpentine deposits.

Hydroxylbastnaesite (Ce, La)(CO_3)(OH, F). H = 4. Yellow to brown, pinkish brown or dark green, opaque, irregular to reniform masses. Waxy, greasy or resinous lustre. Associated with other rare earth minerals.

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 = 2.5–3.5. Yellow to brown pulverulent encrustation associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Lepidomelane Ferrian biotite.

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.

Ludwigite Mg_2FeBO_5. H = 5. Greenish black to opaque, longitudinally striated prisms; dull to sub-metallic lustre. Also fibrous, acicular or granular masses. Occurs with brucite, serpentine in contact metamorphic zones.

Magnetite Fe_3O_4. H = 5.5–6.5. Black metallic octahedral, dodecahedral or cubic crystals; massive granular. Occurs in vein deposits, in igneous, metamorpic rocks and in pegmatites. Strongly magnetic. Ore of iron.

Marble See limestone.

Marcasite FeS_2. H = 6–6.5. Pale bronze to grey metallic radiating, stalactitic, globular or fibrous; twinning produces cockscomb and spear shapes. Yellowish to dark brown tarnish. Massive variety difficult to distinguish from pyrite in hand specimen.

Metagabbro A metamorphosed gabbro.

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 = 1–1.5. Dark bluish grey metallic tabular, foliated, scaly aggregates, or hexagonal crystals; also massive. Sectile with greasy feel. Distinguished from graphite by its bluish lead-grey colour and by its streak (greenish on porcelain, bluish grey on paper). Ore of molybdenum.

Monazite (Ce, La, Nd, Th)PO_4. H = 5–5.5. 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 or pegmatitic rocks. Ore of thorium.

Monticellite $CaMgSiO_4$. H = 5. Colourless, grey, small prismatic crystals or grains. Vitreous lustre. Occurs in calcite and crystalline limestone. Related to olivine group. Not readily identifiable in hand specimen.

Muscovite $KAl_2(Si_3Al)O_{10}(OH,F)_2$. H = 2–2.5. 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. 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. Used as electrical and heat insulator; in cosmetics, paints and wallpaper to produce a pearly lustre; in manufacture of simulated pearls.

Mylonite Chert-like rock with streaky, banded or flow structure.

Natrolite $Na_2Al_2Si_3O_{10}$. $2H_2O$. H = 5. Colourless, white or reddish needle-like crystals often forming radiating or nest-like aggregates; also nodular or slender prisms. Vitreous to pearly lustre. May be distinguished from other zeolites by its acicular habit. Occurs with other zeolites in amygdaloidal basalts, and it some igneous rocks.

Nepheline (Na, K)$AlSiO_4$. H = 6. White to grey irregular masses, less commonly as hexagonal prisms. Greasy to vitreous lustre. Distinguished from feldspar and scapolite by its greasy lustre and by its gelatinizing in HCl. Used in manufacture of glass and ceramics.

Norbergite $Mg_3(SiO_4)(F, OH)_2$. H = 6–6.5. Yellow to orange, transparent to translucent squat crystals, grains. Vitreous to resinous lustre. Occurs in crystalline limestone. Humite group; distinguished from other members of group by X-ray diffraction and chemical analysis.

Nordstrandite $Al(OH)_3$. H = 3. Colourless to white, yellowish or greyish white, transparent, tabular, blade-like crystals or fine crystal aggregates. Vitreous, pearly to greasy lustre. Occurs in limestone and altered igneous rocks.

Oligoclase (Na, Ca)(Al, Si)Si_2O_8. H = 6–6.5. Colourless, white, pink, grey, greenish, yellowish, brown, transparent to translucent cleavable masses; tabular crystals (less common). Vitreous to pearly lustre. Occurs in pegmatite, granitic rocks. Plagoiclase feldspar group.

Olivine $(Mg, Fe)_2SiO_4$. H = 6.5. Olive-green, vitreous, granular masses or rounded grains; also colourless, yellowish to brownish, black. Distinguished from quartz by having a cleavage, from other silicates by its olive-green colour. Used in manufacture of refractory bricks; transparent variety (peridot) is used as a gemstone.

Orthoclase $KAlSi_3O_8$. H = 6–6.5. Colourless, white, pink, green, grey, yellow, transparent to translucent squat prismatic or tabular crystals; cleavable massive. Vitreous to pearly lustre. Occurs as a constituent in pegmatite and granitic rocks. Feldspar group.

Orthogneiss A gneiss derived from the metamorphism of an igneous rock.

Paragneiss A gneiss derived from the metamorphism of a sedimentary rock.

Pegmatite A very coarse-grained dyke rock.

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

Perovskite $CaTiO_3$. H = 5.5. Reddish brown to black cubic or octahedral crystals; also granular massive. Adamantine to metallic lustre. Uneven fracture. Colourless to grey streak. Distinguished from titanite by its crystal form, from pyrochlore by its lustre and streak.

Perrierite (Ca, Ce, Th)$_4$(Mg, Fe)$_2$(Ti, Fe)$_3Si_4O_{22}$. H = 5.5. Dark reddish brown to black opaque striated tabular plates, or flat prismatic; resinous to greasy lustre. Occurs in crystalline limestone, in weathered tuffs. Resembles titanite; striations, platy habit and lustre distinguish it from titanite.

Perthite A subparallel intergrowth of pink microcline or orthoclase and colourless albite. Exhibits satiny sheen or golden aventurescence. Named for Perth, Ontario where it was originally found. Used as a gemstone.

Pitchblende Massive uraninite containing only trace amounts of thorium and rare earths.

Phlogopite $KMg_3Si_3AlO_{10}(F, OH)_2$. H = 2.5. Amber to light brown variety of mica. Used in electrical industry.

Plagioclase $(Na, Ca)Al(Al,Si)Si_2O_8$. H = 6. White or grey tabular crystals and cleavable masses having twinning striations on cleavage surfaces. Vitreous to pearly lustre. Distinguished from other feldspars by its twinning striations.

Pyrite FeS_2. H = 6–6.5. 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.

Pyrochlore $(Na, Ca)_2Nb_2O_6(OH, F)$. H = 5–5.5. 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 An 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.

Quartz SiO_2. H = 7. Colourless, yellow, violet, pink, brown, black, six-sided prisms with transverse striations or massive. Transparent to translucent with vitreous lustre. Rock forming mineral. Occurs in veins in ore deposits. Used in glass and electronic industries. Transparent varieties used as gemstones.

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

Radioactive minerals Minerals that give off radiation due to spontaneous disintegration of uranium or thorium atoms. Detected by a Geiger counter.

Rock wool Felted or matted fibres produced by blowing or spinning molten self-fluxing siliceous and argillaceous dolomitic limestone. Used as insulating material and for acoustic tiles. Now replaced by fibre glass for insulation.

Rozenite $FeSO_4.4H_2O$. White or 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.

Sandstone Sedimentary rock composed of sand-sized particles (mostly quartz).

Scapolite $Na_4Al_3Si_9O_{24}Cl - Ca_4Al_6Si_6O_{24}(CO_3, SO_4)$. H = 6. White, grey, or less commonly pink, yellow, blue, green, 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 may exhibit chatoyancy (cat's-eye effect) when cut into cabochons. Mineral group.

Schiller Near-surface reflection of light producing iridescent colours as in feldspar (peristerite).

Schist Metamorphic rock composed mainly of flaky minerals such as mica and chlorite.

Selenite Colourless, transparent variety of gypsum.

Sepiolite $Mg_4Si_6O_{15}(OH)_2.6H_2O$. H = 2–2.5. White, greyish, yellowish fibrous, scaly, earthy, clay-like or compact nodular; silky, waxy or dull lustre. Secondary mineral formed from serpentine, magnesite. Also referred to as meerschaum.

Serpentine $Mg_3Si_2O_5(OH)_4$. H = 2–5. White, yellow, green, blue, red, brown, black massive; may be mottled, banded or veined. Waxy lustre. Translucent to opaque. Asbestos (chrysotile) is the fibrous variety. Formed by alteration of olivine, pyroxene, amphibole, or other magnesium silicates. Found in metamorphic and igneous rocks. Used as an ornamental building stone (verde-antique) and for cutting and/or carving into ornamental objects.

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

Sinhalite $MgAlBO_4$. H = 6.5–7. Colourless, yellow, pink, greenish to pinkish brown, dark brown, transparent vitreous grains or massive. Occurs in skarn zones in marble and in crystalline limestone. Transparent varieties used as gemstone.

Skarn An altered rock zone in limestone and dolomite in which calcium silicates (garnet, pyroxene, epidote, etc.) have formed.

Sodalite $Na_8Al_6Si_6O_{24}Cl_2$. H = 6. Royal-blue to purplish blue granular masses, dodecahedral crystals. Vitreous lustre. Resembles lazurite but is harder, also distinguished by its association: sodalite in nepheline rocks, lazurite in crystalline limestone.

Specularite Black variety of hematite having a high lustre.

Sphalerite ZnS. H = 3.5–4. Yellow, brown or black, granular to cleavable massive; also botryoidal. Resinous to submetallic. Honey-brown streak. Soluble in HCl, and gives off H_2S. Ore of zinc.

Sphene See titanite.

Spinel $MgAl_2O_4$. H = 7.5–8. Dark green, brown, black, deep blue, pink or red grains or octahedral crystals; also massive. Conchoidal fracture. Vitreous lustre. Distinguished from magnetite and chromite by its superior hardness and lack of magnetic property.

Stillwellite (Ce, La, Ca)$BSiO_5$. Grey, pink, brownish yellow, brownish red to brown, translucent to opaque, hexagonal tabular or rhombohedral crystals; also massive, compact procelain-like. Waxy to resinous lustre. Occurs with other rare-earth minerals in marble.

Sunstone A feldspar (orthoclase or oligoclase) containing flaky inclusions of goethite or hematite which cause bright copper-coloured reflections. Used as a gemstone.

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

Szajbelyite $(Mg,Mn)(BO_2)(OH)$. H = 3–3.5. White, fine fibrous or platy matted or hair-like aggregates. Silky lustre. Soluble in acids. Uncommon mineral not readily identified in hand specimen.

Tactite Carbonate rock containing coarse-grained lime-silicate minerals produced by contact metamorphism and metasomatism.

Talc $Mg_3Si_4O_{10}(OH)_2$. H = 1. Grey, white, green, finely granular or foliated. Translucent with greasy feel. Massive impure 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, ceramics, paint, rubber, insecticide, roofing and paper industries.

Thorianite ThO_2. H = 6.5. Dark grey to black cubic crystals or rounded grains. Dull to submetallic lustre. Grey streak. Radioactive. Soluble in nitric and sulphuric acids. Occurs in pegmatites, crystalline limestone, stream gravels.

Thorite $ThSiO_4$. H = 5. Black to reddish brown tetragonal prisms with pyramidal terminations; also massive. Resinous to submetallic lustre. Conchoidal fracture. Radioactive. Distinguished by crystal form, radioactivity. Source of thorium. Occurs in pegmatite, crystalline limestone.

Thorogummite $Th(SiO_4)_{1-x}(OH)_{4x}$. Grey, light brown, yellowish brown to dark brown earthy, nodular, massive; encrustation or replacement of thorite or thorium minerals. Secondary mineral formed from thorium minerals.

Titanite (sphene) $CaTiSiO_5$. Brown, wedge-shaped crystals; also massive granular. May form cruciform twins. Adamantine lustre. White streak. Distinguished from other dark silicates by crystal form, lustre and colour.

Tochilinite $6Fe_{0.9}S.5(Mg, Fe)(OH)_2$. Black fibrous, acicular, flaky or platy aggregates; bronze lustre. Occurs in serpentinite and in serpentine-bearing marble. Distinguished from graphite by its bronze lustre.

Tourmaline $Na(Mg, Fe)_3Al_6(BO_3)_3Si_6O_{18}(OH,F)_4$. H = 7.5.Black, green. blue, pink, brown, yellow, orange, 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 $Ca_2(Mg, Fe)_5Si_8O_{22}(OH)_2$. H = 5–6. White, grey, striated prismatic crystals, bladed crystal aggregates, or fibrous; perfect cleavage. Usually occurs in metamorphic rocks. Fibrous variety is used for asbestos; clear crystals are sometimes cut and polished as a gem.

Umangite Cu_3Se_2. H = 3. Bluish black, grains or massive granular. Metallic lustre. Associated with copper sulphide and selenide minerals such as chalcocite, chalcomenite and chalcopyrite.

Unakite A rock consisting of pink to orange-red feldspar, epidote and some quartz. Used as an ornamental stone.

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

Uranophane $Ca(UO_2)_2Si_2O_7.5H_2O$. H = 2–3. Yellow fibrous, radiating aggregates; massive. Occurs with uraninite.

Uranothorite Hydrous silicate of Th,U. H = 4.5–5. 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 $Ca_{10}Mg_2Al_4(Si,O_4)_5(Si_2O_7)_2(OH)_4$. H = 7. Yellow, brown, 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. Also known as idocrase. Transparent varieties may be used as a gemstone.

Warwickite $(Mg, Ti, Fe, Al)_2(BO_3)O$. H = 3.5–4. Black opaque, long prismatic crystals without terminations, rounded grains, granular aggregates. Adamantine to submetallic, dull or pearly lustre. May have coppery-red tarnish on surface. Occurs with spinel, chondrodite, serpentine in crystalline limestone.

Water lime A clayey limestone containing alumina, silica and lime in the proper proportions to produce cement by the addition of water. Also known as cement rock.

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 solubility in HCl. Used in ceramics and paints.

Zircon $ZrSiO_4$. H = 7.5. Pink, reddish to greyish brown tetragonal prisms terminated by pyramids; also colourless, green or grey. May form knee-shaped twins. Vitreous to adamantine lustre. May be radioactive. Distinguished by its crystal form, hardness. 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)
Cd	cadmium
Ce	cerium
Cl	chlorine
Co	cobalt
Cr	chromium
Cu	copper
Er	erbium
F	fluorine
Fe	iron
H	hydrogen
Hf	hafnium
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
Sb	antimony
Se	selenium
Si	silicon
Sn	tin
Sr	strontium
Ta	tantalum
Te	tellurium
Th	thorium
Ti	titanium
U	uranium
V	vanadium
W	tungsten
Y	yttrium
Yb	ytterbium
Zn	zinc
Zr	zirconium

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