ROCKS AND MINERALS FOR THE COLLECTOR

Ann P. Sabina

Sudbury to Winnipeg

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COVER

Left: Amethyst – Thunder Bay, Ontario. Specimen measures 4.5 cm across the base. National Mineral Collection specimen no. 50263. GSC 204977-1

Right: Gypsum (selenite) – Red River Floodway, Winnipeg, Manitoba. Specimen measures 7 cm from left to right. National Mineral Collection specimen no. 17206. GSC 204971-I

Geological Survey of Canada
Miscellaneous Report 49

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1991

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Author's address

Geological Survey of Canada
601 Booth Street
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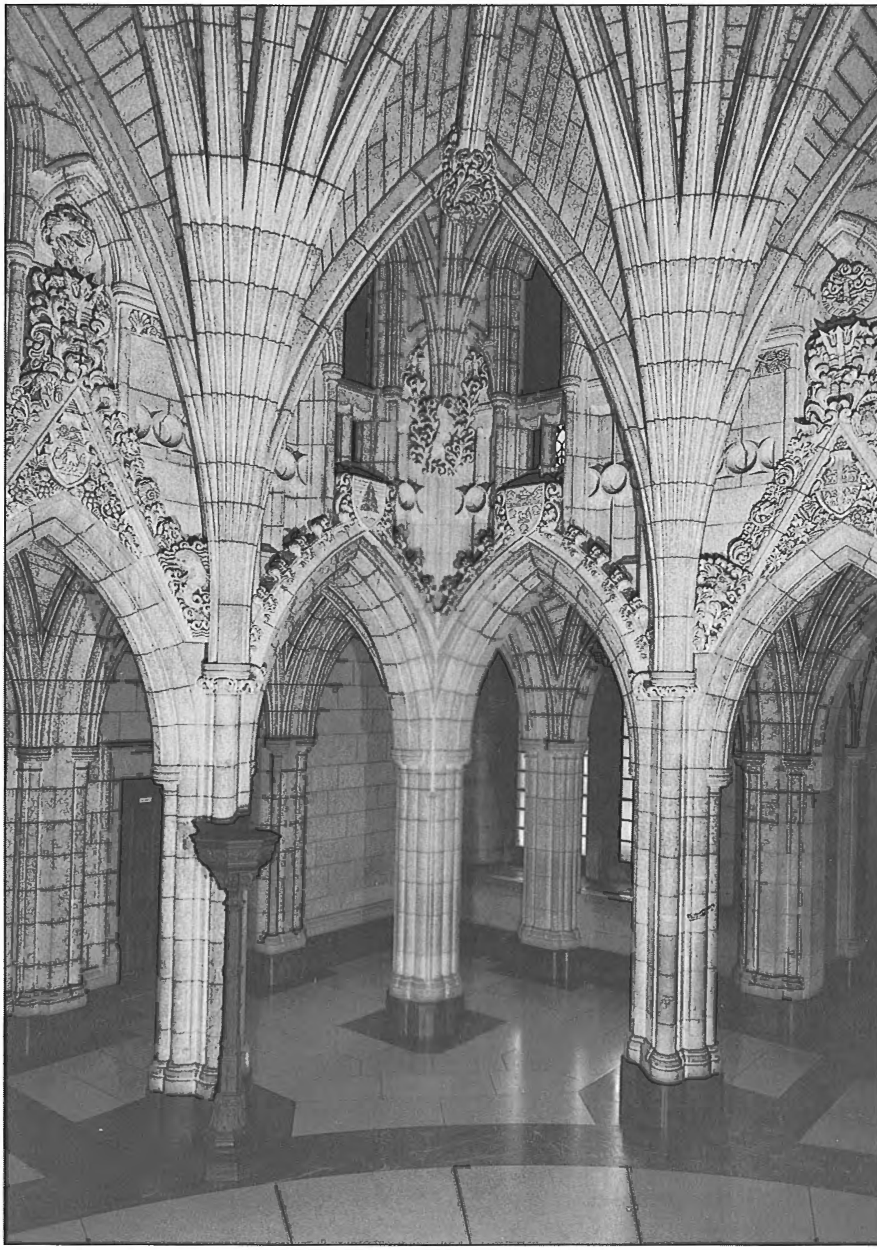

Frontispiece: Confederation Hall, Parliament Buildings, Ottawa. The arches, pillars and walls are faced with Tyndall limestone. (National Archives Canada PA-22420)

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Abstract

This guidebook describes mineral, rock and fossil occurrences between Sudbury, Ontario and Winnipeg, Manitoba. It is one of a series of guidebooks covering collecting localities in various accessible parts of Canada.

The principal collecting route is along the TransCanada Highway: Highway 17 from Sudbury to the Manitoba/Ontario border, and Highway 1 from the border to Winnipeg, a total distance of about 1700 km. A 285-km branch route is along Highway 11 from its western junction with Highway 17 to Fort Frances. There are several side trips leading from these highways. The collecting sites include mines and quarries, pits, rock exposures (road-cuts, rock outcrops) and shorelines. Most of these are shown on locality maps which accompany the descriptions.

The collecting routes parallel the water routes from Lake Huron to Winnipeg which were used by the voyageurs and early explorers and miners. These historic waterways provided access for the earliest mining ventures, including those dating back to prehistoric times. Today, motor routes replace the water routes for all but a few of the collecting sites, including the early mines. Each mine, from the earliest to the most recent, contributes its record to the mining history of the region. The text outlines a brief history of each mine and means of access to it. Photographs show some of the mines as they were in their early days.

The collecting route is divided into four sections. Section 1, Sudbury to Sault Ste. Marie, includes two great mining camps: the Sudbury nickel-copper mines dating back to the 1880s, and the more recent Elliot Lake uranium mines. Other deposits were worked for gold, copper, iron, cobalt, tungsten and industrial minerals including feldspar, garnet and kyanite. The region includes occurrences of fossils, placer gold and ornamental rocks – conglomerate, breccia, quartzite – suitable for lapidary purposes.

Section 2, Sault Ste. Marie to Thunder Bay, describes the agate and jasper occurrences and early gold, silver and copper mines along the shores and islands of Lake Superior, as well as inland deposits of gold, silver, copper, iron, zinc, barite and spodumene. The Thunder Bay amethyst mines provide special collecting privileges for collectors and tourists. Side trips lead to occurrences in the Wawa, Manitouwadge and Beardmore-Geraldton-Longlac areas.

Collecting sites described in Section 3, Thunder Bay to the Manitoba-Ontario border, are accessible from highways 17 and 11, and from side trips to Sturgeon Lake, Sioux Lookout and Red Lake. Localities include the accessible gold and silver mines which generated great excitement in the 1880s and 1890s, deposits of iron, copper, zinc, lead, molybdenum and sulphur minerals, and occurrences of jasper, beryl, spodumene, mica, uraninite, soapstone and ornamental rocks.

Manitoba occurrences, and Ontario occurrences accessible from Manitoba, are described in Section 4. Metallic minerals are found in former gold mines in the Bissett and Star Lake areas, and in nickel-copper mines in the Bird River-Cat Lake area and adjacent Ontario. The Winnipeg River pegmatite field presents a diverse mineral assemblage including spodumene, beryl, feldspar, topaz, mica, amblygonite, rose quartz, ornamental rock and a variety of less common minerals. The region west of the Canadian Shield contains deposits of limestone, gypsum, clay and gravel which provide collecting sites for fossils, 'micro' minerals, ornamental rock, selenite, and agate and jasper.

Among the occurrences described in the guidebook, are several which yield rare mineral species; the Sudbury, Hemlo and Elliot Lake mines and the Winnipeg River pegmatites are the most prolific sources. Of further interest to the species collector, are type localities for new

mineral species which include froodite, michenerite, sperrylite, tancoite, cernyite, hemloite and criddleite.

The final pages of the guidebook provide additional information for collectors: addresses for maps, reports and tourist information; lists of mineral and rock displays and publications referred to in the text; and a glossary of minerals, rocks and terms used in the text.

Résumé

Le présent ouvrage donne une description des minéraux, des roches et des fossiles qu'on peut trouver entre Sudbury, en Ontario, et Winnipeg, au Manitoba. Il s'inscrit dans le cadre d'une série d'ouvrages qui présentent des emplacements de cueillette dans différentes régions du Canada faciles d'accès.

Le principal axe routier des itinéraires proposés est la transcanadienne, soit la route 17 de Sudbury à la frontière entre l'Ontario et le Manitoba, puis la route 1 jusqu'à Winnipeg; la distance totale parcourue sur cette route est d'environ 1 700 km. Une partie du trajet suit un embranchement, la route 11, sur une distance de 285 km de son point de jonction ouest avec la route 17 jusqu'à Fort Frances. De part et d'autre de ces routes, plusieurs itinéraires secondaires sont proposés. Les emplacements de cueillette comprennent des mines et des carrières, des excavations, des formations rocheuses à découvert (tranchées routières, affleurements rocheux) et des zones de rivages. La plupart de ces endroits apparaissent sur les cartes locales qui accompagnent ces descriptions.

Du lac Huron au lac Winnipeg, les itinéraires sont parallèles aux voies d'eau empruntées autrefois par les explorateurs et les premiers prospecteurs ou travailleurs miniers. Ces voies d'eau ont donné accès aux premiers emplacements d'exploitation minière dont certains remontent à l'époque préhistorique. Aujourd'hui, ces voies d'eau sont remplacées par des routes carrossables qui desservent tous les emplacements de cueillette, à l'exception de quelques-uns, de même que les mines les plus anciennes. Chaque mine, des premières aux plus récentes, a écrit une page de l'histoire minière de la région. Cet ouvrage présente un bref aperçu de l'histoire de chaque mine et indique comment s'y rendre. Des photographies montrent certaines des mines à leurs débuts.

L'itinéraire principal se partage en quatre sections. La section 1, de Sudbury à Sault-Sainte-Marie, comprend deux grands camps miniers : celui des mines de nickel et de cuivre de Sudbury dont les débuts remontent aux années 1880, et celui, plus récent, des mines d'uranium d'Elliot Lake. On a extrait d'autres gisements de l'or, du cuivre, du fer, du cobalt, du tungstène et des minéraux industriels comme le feldspath, le grenat et la cyanite. Il y a aussi dans la région des fossiles, de l'or alluvionnaire et des roches ornementales soit du conglomérat, des brèches, et de la quartzite, présentant de l'intérêt pour les lapidaires.

La section 2, de Sault-Sainte-Marie à Thunder Bay, décrit des gisements d'agate et de jaspe et d'anciennes mines d'or, d'argent et de cuivre situées sur les îles et les rives du lac Supérieur ainsi que des gisements d'or, d'argent, de cuivre, de fer, de zinc, de barytine et de spodumène situés à l'intérieur des terres. Les collectionneurs et les touristes trouveront un plaisir particulier à visiter les mines d'améthyste de Thunder Bay. Des itinéraires secondaires conduisent à des gisements situés dans les régions de Wawa, Manitouwadge et Beardmore-Geraldton-Longlac.

Les emplacements de cueillette décrits dans la section 3, de Thunder Bay à la frontière entre l'Ontario et le Manitoba, se trouvent à proximité des routes 17 et 11 ou de routes secondaires menant à Sturgeon Lake, à Sioux Lookout et à Red Lake. Ces endroits renferment des mines d'or et d'argent qui ont connu leur heure de gloire dans les années 1880 et 1890 et des gisements de fer, de cuivre, de zinc, de plomb, de molybdène, de minéraux sulfurés, de jaspe, de béryl, de spodumène, de mica, d'uraninite, de stéatite et de roches ornementales. Tous ces emplacements sont faciles d'accès.

La section 4 présente les gisements accessibles à partir du Manitoba, qu'ils soient situés au Manitoba ou en Ontario. On trouve des minéraux métallifères dans de vieilles mines d'or situées dans les régions de Bissett et de Star Lake, et dans les mines de nickel et de cuivre situées dans la région de Bird River et du lac Cat ou en territoire ontarien voisin. Parmi les différents minéraux présents dans le contexte pegmatitique de la rivière Winnipeg, on remarque laprésence de spodumène, de béryl, de feldspath, de topaze, de mica, d'amblygonite, de quartz rose, de roches ornementales et d'une variété de minéraux moins communs. La région située à l'ouest du Bouclier canadien renferme des gisements de calcaire, de gypse, d'argile et de gravier où le collectionneur trouvera des fossiles, des minéraux microcristallins, des roches ornementales, de la sélénite, des agates et du jaspe.

À plusieurs des emplacements présentés dans le présent ouvrage, on remarque la présence d'espèces minérales rares; elles proviennent surtour des mines de Sudbury, de Hemlo et d'Elliot Lake et des pegmatites de la rivière Winnipeg. Pour les collectionneurs d'espèces minérales, il y a des emplacements dont l'intérêt tient à la présence de nouvelles espèces minérales comme la froodite, la michenérite, la sperrylite, la tancoïte, la cernyite, la hemloïte et la criddléite.

Les collectionneurs trouveront dans les dernières pages du livre des renseignements supplémentaires : où s'adresser pour obtenir des cartes, des rapports et de l'information touristique; une liste des endroits où des minéraux et des roches sont exposés; une liste des ouvrages mentionnés dans le texte et un glossaire des minéraux, des roches et des termes utilisés dans cet ouvrage.

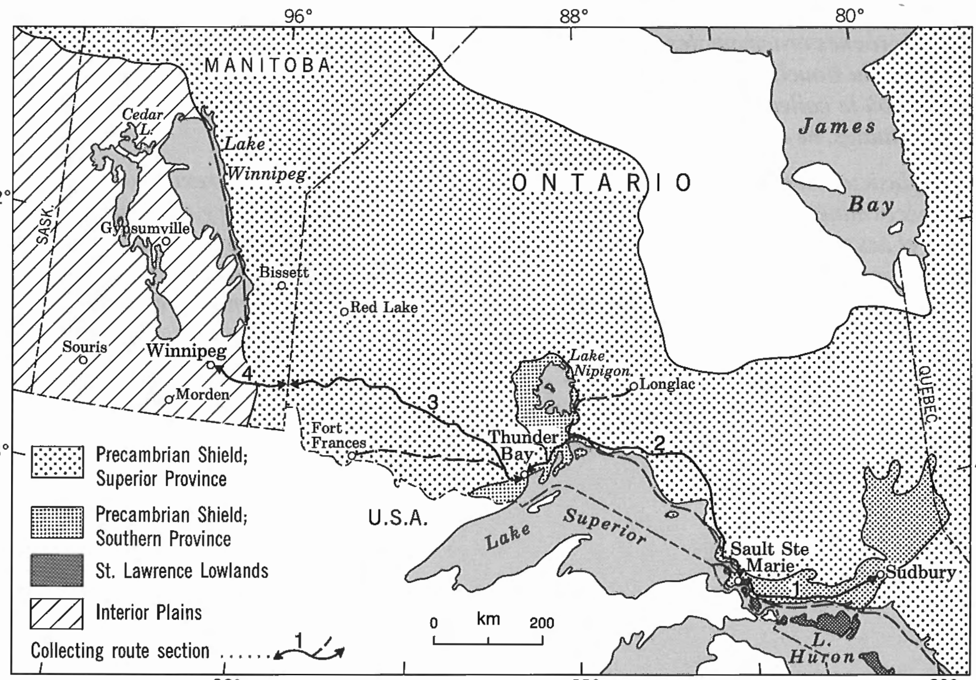

Figure 1. Map showing the collecting route and principal geological regions.

ROCKS AND MINERALS FOR THE COLLECTOR: SUDBURY TO WINNIPEG

INTRODUCTION

This guidebook describes mineral, rock and fossil occurrences between Sudbury, Ontario and Winnipeg, Manitoba. It is a revision of Geological Survey of Canada Paper 63-18 published in 1963. Occurrences in adjacent parts of Ontario are described in Geological Survey of Canada guidebooks covering the following areas: Bancroft-Parry Sound Area, Southern Ontario (Miscellaneous Report 43); Ottawa to North Bay, Ontario, Hull to Waltham, Quebec (Paper 70-50); Cobalt- Belleterre-Timmins, Ontario and Quebec (Paper 73-13) and Kirkland Lake-Noranda-Val d'Or, Ontario and Quebec (Paper 73-30). The guidebook, La Ronge-Creighton, Saskatchewan; Flin Flon-Thompson, Manitoba (Miscellaneous Report 42), describes occurrences in northern Manitoba.

Most of the collecting localities are accessible by automobile from the main highways and from secondary roads branching from them. A short hike and a boat trip are required to reach some of the localities. Directions to reach each of the occurrences are given in the text, and are designed for use with official provincial road maps. Locality maps for some occurrences are included in the text. Additional details can be obtained from the appropriate topographical and geological maps listed for each locality. These maps and reports are available from the agencies listed on page 265. Many of the inactive mines have not been operated for several years and entering shafts, adits, and other workings is dangerous. Collecting in operating mines may not be permitted; their descriptions are included as points 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.

The localities were investigated by the author during the summers of 1962, 1974 and 1984. Able assistance was provided by Judith A.C. Carson (1962), Marie Michaud (1974) and Susan Hamilton (1984). The field investigation was facilitated by information received from E.G. Pye, P.E. Giblin and G.C. Patterson, all of the Ontario Geological Survey. Identification of minerals by X-ray diffraction was done by A.C. Roberts and microprobe analyses by M. Bonardi, both of the Geological Survey of Canada. This assistance is gratefully acknowledged.

The collecting localities

The collecting area is shown in Figure 1. The principal route is Highway 17 from Sudbury to the Manitoba border, then Highway 1 to Winnipeg, and along Highway 11 to Fort Frances, Ontario. Distances in kilometres for the road logs along these highways are shown in bold print in the text. Numerous side trips lead from these highways. Field trips to the north, west and south of Winnipeg originate in Winnipeg, or in the most convenient town.

Information on each locality is listed systematically as follows: name of mine, quarry or occurrence; minerals or rocks found in the 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

Table 1. Rock formations referred to in text

EON	ERA	PERIOD	AGE (millions of years)	Groups, Formations: members, types
PHANEROZOIC	CENOZOIC	Quaternary	2	Souris gravel and sand
		Tertiary	63	
	MESOZOIC	Cretaceous	138	Riding Mountain: shale Vermilion River: including Morden, Pembina members, shale
		Jurassic	205	Amaranth: anhydrite, dolomitic limestone
		Triassic	240	
	PALEOZOIC	Permian	290	
		Pennsylvanian		
		Mississippian	360	Souris Valley: limestone, shale
		Devonian	410	Souris River: including Point Wilkins member limestone Elk Point: Winnipegosis and Dawson Bay dolomitic limestone; Elm Point limestone
		Silurian	435	Interlake: including Cedar Lake member dolomitic limestone Manitoulin: dolomitic limestone
		Ordovician	500	Stonewall: dolomitic limestone Stony Mountain: including Gunton and Penitentiary member dolomitic limestone Red River: dolomitic limestone Whitby: limestone, shale Verulum: limestone, shale Bobcaygeon: limestone, dolomitic limestone Gull River: limestone, dolomitic limestone
		Cambrian	570	
PRECAMBRIAN	PROTEROZOIC		2500	Keweenawan: Sibley, Osler sedimentary and volcanic rocks; diabase, syenite, and other igneous rocks Sudbury Igneous Complex Animikie: Kakabeka conglomerate, Gunflint shale, iron-formation, Rove shale Nipissing: diabase Cobalt: Gowganda conglomerate, Lorraine quartzite, Bar River quartzite Quirke Lake: Bruce conglomerate Hough Lake: Mississagi sandstone Elliott Lake: Matinenda conglomerate
	ARCHEAN			Granitic, gneissic rocks Metavolcanics, metasediments Volcanic rocks

References section beginning on page 268; 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 (G.S.C.), the Ontario Geological Survey (O.G.S.) and the Manitoba Minerals Division (M.M.D.).

Units of measurement obtained from geological reports referred to in the text have been converted from the Imperial to the metric system (SI). The following conversions were used:

1 inch	=	2.54 cm	1 foot	=	0.305 m
1 mile	=	1.609 km	1 acre	=	0.40469 ha
1 ounce (troy)	=	31.103 g	1 pound (avoirdupois)	=	0.453 kg
1 ton (short)	=	0.907 t	1 oz(troy)/ton(short)	=	34.285 g/t

A brief geological history

The area lies within three geological regions: the Canadian Shield of Precambrian age, and the St. Lawrence Lowlands and Interior Plains of post- Precambrian or Phanerozoic age. Both the Southern and Superior provinces of the Shield are represented in the collecting area; the Sudbury to Sault Ste. Marie area and a small area near Thunder Bay are in the Southern Province while the vast region between Sault Ste. Marie and Lake Winnipeg is in the much older Superior Province. The Shield is characterized by altered volcanic and sedimentary rocks and large bodies of granitic and gneissic rocks. These were produced during repeated cycles of volcanic activity, igneous intrusion, erosion, sedimentation and mountain-building during Precambrian time, more than three billion years ago. They are the source of a variety of metallic mineral resources and building stone.

At the close of the Precambrian, a long period of erosion reduced the Shield to a nearly featureless plain and set the stage for uplift, inundation and deposition that took place during the long Paleozoic era that followed. Paleozoic seas deposited great thicknesses of sedimentary rocks on the basement Precambrian rocks, particularly along the margins of the Shield including the Interior Plains and St. Lawrence Lowlands. In these regions, the generally undisturbed sedimentary rocks contain fossil remains of the abundant animal life that prevailed in the Paleozoic seas.

The Lowlands region is represented by Manitoulin Island and adjacent islands which are underlain by Ordovician and Silurian rocks. The Interior Plains, the region west of Lake Winnipeg, consists of Ordovician, Silurian and Devonian strata which contain Manitoba's industrial (non-metallic) mineral wealth.

During the more recent Pleistocene Period, continental glaciers spread southwards across the whole region including the Shield, Plains and Lowlands. The ice sheets scoured the bedrock and, upon their retreat, left deposits of sand, gravel and till. Deposits of more recent times are the beach sands and stream detritus.

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

SECTION 1
SUDBURY-SAULT STE. MARIE

The main road log along Highway 17 for occurrences from Sudbury to Sault Ste. Marie begins on page 23. Descriptions of occurrences in the Sudbury area are given in the following text beginning with the Sudbury nickel-copper deposits.

Sudbury Nickel-Copper Deposits

PYRRHOTITE, PENTLANDITE, CHALCOPYRITE, PYRITE, MAGNETITE, CUBANITE, SPHALERITE, GALENA, MILLERITE, NICKELINE, MAUCHERITE, GERSDORFFITE, COBALTITE, ILMENITE, GOLD, SILVER, BISMUTH, COPPER, TETRADYMITE, HESSITE, HEAZLEWOODITE, BORNITE, STANNITE, PARKERITE, SCHAPBACHITE, MARCASITE, HEMATITE, BISMUTHINITE, ALTAITE, BREITHAUPTITE, HAUCHECORNITE, CHALCOCITE, MOLYBDENITE, TETRAHEDRITE, SMALTITE, MACKINAWITE, WEHRLITE, MONCHEITE, SPERRYLITE, INSIZWAITE, KOTULSKITE, NIGGLIITE, MERENSKEYITE, MERTIEITE, VIOLARITE, VALLERIITE, HOLLINGWORTHITE, IRARSITE, FROODITE, MICHENERITE, SUDBURYITE, GRAPHITE, CASSITERITE, QUARTZ, CALCITE, DOLOMITE, SIDERITE, GARNET, PYROXENE, AMPHIBOLE, CHLORITE, BIOTITE, APATITE, TALC, FLUORITE, ZIRCON, TITANITE, PREHNITE, MELANTERITE, CHALCANTHITE, MORENOSITE, MALACHITE, ANNABERGITE, ERYTHRITE, GOETHITE

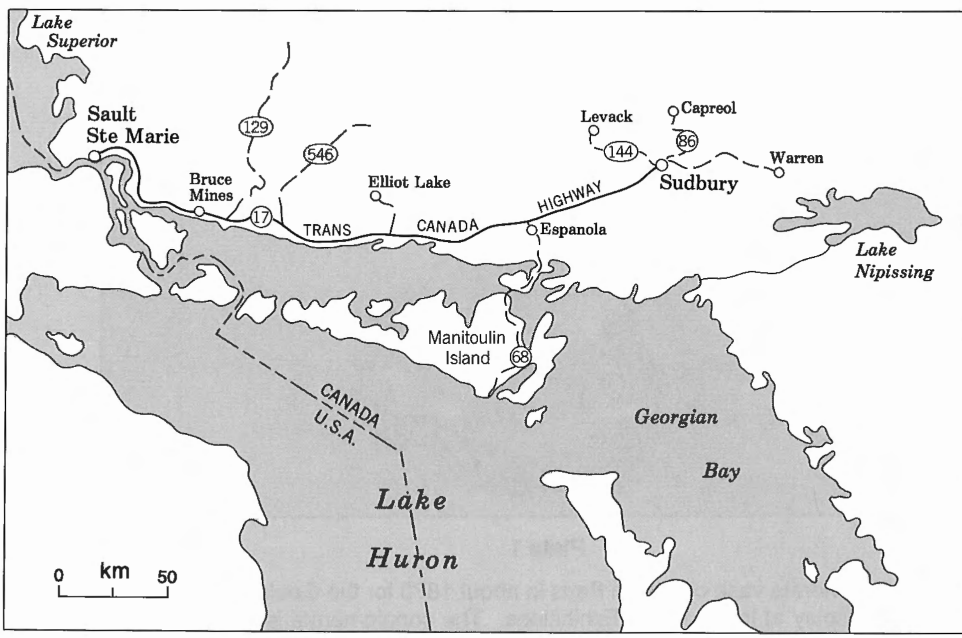

Figure 2. Map showing collecting area: Section 1.

In igneous rocks known as the Sudbury Igneous Complex (formerly referred to as the Sudbury irruptive)

The nickel-copper ore occurs as disseminations, in massive form, as a breccia consisting of sulphide minerals cementing rock fragments, and as veins or stringers in an igneous complex consisting of norite, granophyre and gabbro. The major minerals comprising the orebody are pyrrhotite, pentlandite, chalcopyrite, pyrite and magnetite. Cubanite is a minor component of copper-rich ores. The native metals, sulphides and other metallic minerals listed above occur in minor amounts. The platinum-group minerals froodite, michenerite and sudburyite were originally described from Sudbury ores. Nonmetallic minerals occurring within the ore and as wall rock alterations include quartz, carbonates, garnet, pyroxene, amphibole, chlorite and biotite. Apatite, talc, fluorite, zircon, titanite and prehnite have been reported to occur in some of the mines. Secondary minerals which formed as a result of surface weathering of the ore deposits include melanterite, chalcanthite, morenosite, malachite, annabergite, erythrite and goethite.

Plate 1

Jasper conglomerate vase carved in Paris in about 1870 for the Geological Survey of Canada for display at International Exhibitions. The conglomerate is from the Bruce Mines area. The vase is 12.5 cm high and 14.5 cm in diameter. National Mineral Collection. (GSC 203033-J)

The ore deposits occupy the perimeter of an elliptical ring surrounding the Sudbury Basin. The ring measures 60 km long and 27 km wide and strikes in a northeasterly direction approximately from Fairbank Lake to Wanapitei Lake. It comprises the Sudbury Igneous Complex (the Sudbury Irruptive) with norite forming the outer rim, granophyre (micropegmatite) the inner rim and gabbro in between. Dyke-like bodies of igneous rocks, "offsets", extending outward from the ring for several kilometres also contain nickel-copper deposits. The Complex is believed to have been emplaced in early Proterozoic time, about 1849 million years ago.

Discovery of magnetic mineralization in the area was made in 1856 by provincial land surveyor A.P. Salter while running a survey line. He brought this geological feature to the attention of Alexander Murray of the Geological Survey of Canada who visited the occurrence and reported copper-nickel-iron mineralization in a report published in 1857. In 1883, during the construction of the Canadian Pacific Railway westward, blacksmith Tom Flanagan discovered gossan-covered copper mineralization along the railway right-of-way. Later that year a railway cut made through the adjacent rock exposed high-grade mineralization in the rock cut. The deposit was developed as the Murray Mine which was worked at various intervals until 1971.

A prospecting rush followed the initial discovery, the characteristic rusty gossan (weathered pyrrhotite) in rock outcrops serving as the indication of an orebody. Most of the known ore bodies were discovered within the first few years of prospecting.

The first copper ore was produced in 1886 at the Copper Cliff Mine by the Canadian Copper Company. One year later, it was discovered that the ores also contained an economic nickel content which added an incentive to development of the many deposits. Impressive displays

Plate 2

Dominion (Blezard) Mine, one of the earliest mines in the Sudbury mining camp, was operated from 1889 to 1893. (National Archives Canada PA-50971)

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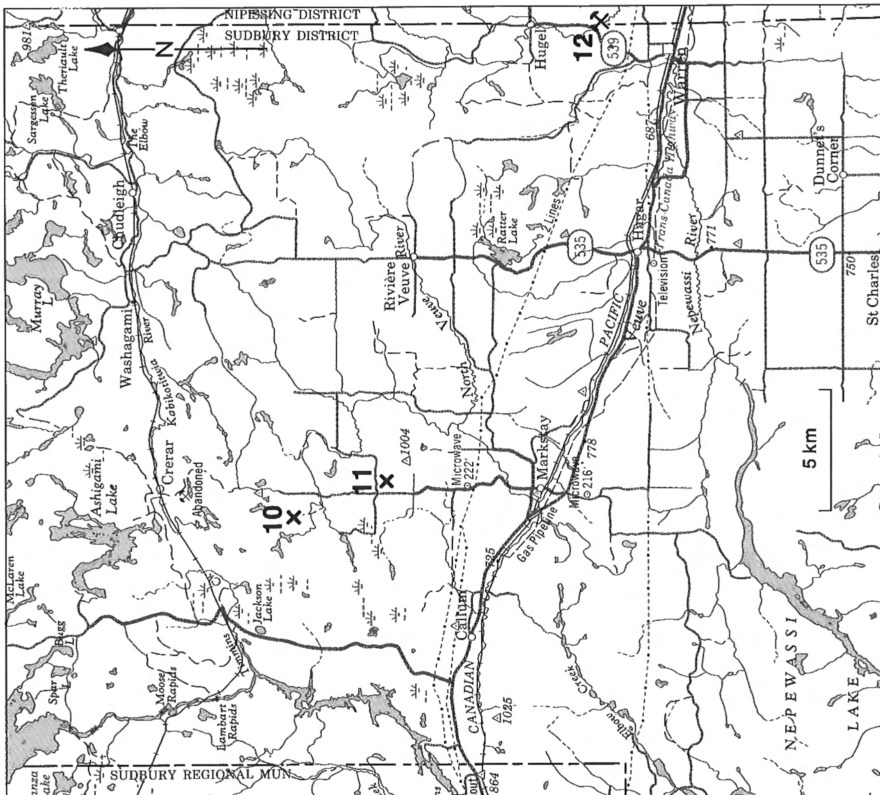
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Lake Ramsey
Minnow Lake
NEPEWASSI LAKE
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Veuve River
North Veuve
Timmins Chute
Moose Rapids
Lambart Rapids
Kakakiwaganda River
The Elbow
Elbow Creek
Emery Creek
Norway L
Coniston Creek
Massey Ck
CANADIAN PACIFIC
Trans-Canada Highway
Gas Pipeline
Television
Microwave
Radio
Refinery
Fire Lookout
Mine
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of the newly discovered nickel ores were exhibited by the Canadian Copper Company and by the Province of Ontario at the 1893 Columbian Exposition in Chicago. The Ontario exhibit consisted of nickel ore specimens weighing 2718 kg, 3624 kg and 5436 kg each, with a striking nickel trophy as the focal point. By 1915 the Sudbury mines accounted for 80 per cent of the world's nickel production, a dominance held until World War II after which it dropped to 18 per cent due to increased output by foreign producers. In 1974 an all-time high of 209 million kg of nickel were produced by Sudbury mines. Production of copper, the second most important metal extracted from Sudbury ores, is slightly less than that of nickel. The ore grades 1.25 to 1.35 per cent nickel and 1.02 to 1.33 per cent copper. Byproducts include cobalt, gold, silver, the platinum group metals (platinum, palladium, iridium, osmium, rhodium and ruthenium), selenium, tellurium, sulphur and iron.

The Sudbury copper-nickel mines are operated by Inco Limited and Falconbridge Limited. The original nickel producer, the Canadian Copper Company, was amalgamated in 1902 with most of the other producers to form the International Nickel Company, now Inco Limited. Other important former producers are the Mond Nickel Company, Limited (1900-1929) and the British American Nickel Corporation (1917-1924). Falconbridge Nickel Mines, Limited (now Falconbridge Limited) began production in 1928.

In 1985, Inco Limited operated the Frood-Stobie, Little Stobie, Creighton, Copper Cliff South, Garson, Levack, McCreedy West and Copper Cliff North mines and maintained the Clarabelle, Coleman, Crean Hill, Murray, Totten and McCreedy East mines. Falconbridge Limited operated the Falconbridge, Strathcona, Lockerby, East, North and Fraser mines; its Onaping Mine was put on stand-by in 1982.

Tours of the surface workings and plant operations are made available to visitors by Inco Limited and by Falconbridge Limited. The Inco tours originate in Copper Cliff, the Falconbridge tours in Falconbridge. The locations of several nickel- copper mines are given as points of interest in the road logs that follow.

Ref.: 53 p. 1-34; 55 p. 83-150; 59 p. 25-43; 91 p. 14-17; 114 p. 58-64; 137 p. 3-23; 164 p. 80-111; 237 p. 189; 238 p. 311-315; 239 p. 21-30; 281 p. 68-74; 323 p. 31.6-31.7; 324 p. 44.1-44.13; 361 p. 171-172; 378 p. 142-144; 185-190; 382 p. 146, 192, 194.

Maps: (T): 41 I/6 Copper Cliff 41 I/7 Coniston
41 I/10 Capreol 41 I/11 Chelmsford
(G): 2491 Sudbury, Sudbury District, Sudbury Municipality (O.G.S., 1:50 000)

Occurrences East of Sudbury

The description of the occurrences follows the road log:

km **0.0** Sudbury, at the junction of Highway 17 (Lloyd Street) and Highway 80 (Notre Dame Avenue): proceed east along Highway 17.

Map 1. (opposite) Occurrences east of Sudbury.

1-Wanup Quarry
2-Elizabeth Mine
3-Kyanite Occurrences
4-Kirkwood Mine
5-Garson Mine
6-Falcon Bridge Mines
7-Falcon Mine
8-Norduna Mine
9-Maclennan Mine
10-Page Occurrence
11-MacDonald Occurrence
12-Warren Quarry

km	**4.5**	Junction of Highway 86. Occurrences along Highway 86 are descrbed on pages 16 to 19. The road log continues along Highway 17.
km	**12.7**	Junction of Highway 90; the road log continues along Highway 17.
km	**17.5**	Wahnapitei, at the bridge over Wanapitei River.
km	**17.7**	Wahnapitei, at junction of Highway 537 to *Wanup quarry* and *Elizabeth Mine*; the road log continues along Highway 17.
km	**21.8**	*Wahnapitei occurrences* on right (see page 12 for description).
km	**36.8**	Junction of road (on left) to *Markstay* and to *MacDonald* and *Page occurrences* (see pages 13, 14 for description).
km	**58.2**	Warren, at junction of Highway 539 to *Warren quarry* (see page 14 for description).

Occurrences along Highway 17 from North Bay to Ottawa are described in Geological Survey of Canada guidebook, Rocks and minerals for the Collector: Ottawa to North Bay, Ontario; Hull to Waltham, Quebec (Miscellaneous Report 48).

Falcon Mine

PYRITE, ACTINOLITE, TALC

In talc-actinolite schist

Pyrite crystals measuring up to 2 cm in diameter occur in quartz-calcite veins cutting talc-actinolite schist. Crystal forms include the cube and pyritohedron. The pyrite carries gold values.

The deposit was explored for gold in the 1930s by Falcon Gold Mines, Limited. The workings consist of a shaft, 14 m deep. There is no record of production.

The mine is north of Wahnapitei and about 75 m east of Emery Creek. It is on the old Wahnapitei road, 250 m north of its crossing over Emery Creek.

Road log from Wahnapitei at km 17.5 (see road log above):

km	0	Wahnapitei; proceed onto road leaving Highway 17 on the west side of the bridge.
	4.1	Junction; continue straight ahead.
	5.9	Junction; follow trail on right.
	10.1	Emery Creek.
	10.3	Mine.

Refs: 256 p. 17-20; 333 p. 21.

Maps (T): 41 I/7 Coniston 41 I/10 Capreol
(G): 1957-5 Falconbridge Township, District of Sudbury, Ontario (O.G.S., 1:50 000)

Wanup Quarry

FELDSPAR, MICA, GARNET, EUXENITE, PYROCHLORE

Plate 3

Wanup quarry. (GSC 163117)

In granite pegmatite

Pink K-feldspar, white plagioclase feldspar and colourless to smoky quartz are the main constituents of the pegmatite. Light silvery green muscovite and black biotite occur as crystals measuring up to 20 cm in diameter. Brownish red garnet crystals measuring about 1 cm in diameter are common in the feldspar. Brown resinous pyrochlore and euxenite occur as irregular masses in the feldspar.

The deposit was worked for feldspar and mica between 1925 and 1928 by Wanup Feldspar Mines, Limited. About 8 894 t of feldspar and some mica were shipped from the mine. The opening consists of a pit measuring 60 m by 15 m with a depth of 27 m. It is now water-filled. The mine is on the property of F. Graf.

Road log from Wahnapitei at km 17.7 (see page 10):

km	0	Wahnapitei, at the junction of Highway 17 and Highway 537; proceed onto Highway 537.
	17.0	Junction; turn right. This junction is 2.2 km north of the highway 69/537 junction.
	17.5	Road on left leads 300 m to the F. Graf property. Arrangements to visit the quarry should be made here.
	17.65	Trail on left leads 300 m to the quarry which is located on the south side of a rocky ridge.

Refs.: 168 p. 22; 304 p. 59; 365 p. 59; 366 p. 80.

Maps (T): 41 I/7 Coniston
(G): 2017 Broder, Dill, Neelon, and Dryden Townships, District of Sudbury (O.G.S., 1: 31 680)

Elizabeth Mine

FELDSPAR, MUSCOVITE, BIOTITE, GARNET, ALLANITE, PYROCHLORE, ZIRCON

In granite pegmatite

The main constituents of the pegmatite are pink K-feldspar, quartz, muscovite and biotite. The mica occurs as large platy crystals. Dark red garnet occurs in feldspar. Allanite, pyrochlore and zircon have also been identified (T.S. Ercit, pers. comm., 1987).

The deposit was worked for feldspar from 1925 to 1926 by Elizabeth Feldspar Mines, Limited. About 4 617 t of feldspar were shipped from the mine. A plant to crush and hand-cobb the feldspar was in operation at the entrance to the pit; a tramway was used to transport the ore to a loading chute at a railway siding, 400 m away. The mine consists of an inclined cut, 45.7 m long, leading into a chamber measuring 18.3 m by 15.2 m and 9 m high.

Road log from Wahnapitei at km 17.7 (see page 10):

km	0	Wahnapitei, at the junction of Highway 17 and Highway 537; proceed onto Highway 537.
	17.0	Junction; turn right.
	17.65	Trail, on left, to the Wanup feldspar quarry; continue straight ahead.
	19.1	Junction; turn right.
	19.4	Junction; follow road on left proceeding straight ahead.
	20.7	Mine at the side of a low ridge.

Refs.: 168 p. 22; 304 p. 60.

Maps (T): 41 I/7 Coniston
(G): 2271 Burwash, Nipissing, Parry Sound and Sudbury districts (O.G.S., 1:126 720).

Wahnapitei Occurrences

KYANITE, GARNET, SILLIMANITE

In biotite gneiss

Kyanite occurs as blue and, less commonly, colourless and green, blade-like crystals measuring up to 10 cm long in biotite gneiss. Aggregates of red garnet crystals are common. Some kyanite also occurs in white quartz veins cutting the gneiss. Sillimanite occurs as white to grey lenses in gneiss.

The kyanite occurrence was discovered in 1890 by A.P. Barlow while mapping the area for the Geological Survey of Canada. In 1952 Hoyle Mining Company staked the deposits for kyanite which was to be used for the production of mullite. Its subsidiary, Northern Kyanite Mines Limited, explored the deposits by diamond drilling and trenches in 1953.

Plate 4

Wahnapitei kyanite occurrence. (GSC 163122)

There are three easily accessible occurrences. The main deposit is on the south side of Highway 17. A north-south trending trench measuring 30.5 m long exposes the deposit. Two additional showings are on the north side of the highway and north of the railway.

To reach the main showing, walk south from Highway 17 at km 21.8 (see road log on page 10) along the outcrop for 50 m to the trench. The two other showings are 300 m and 200 m north of the highway at points 205 m and 570 m respectively east of the main showing. A north-south trench was cut into the easternmost showing.

Refs.: 16 p. 160; 253 p. 35-37.

Maps: (T): 41 I/10 Capreol
(G): 2021 Kyanite occurrences in parts of Dryden Township, Lots 3-7, Cons. III-IV, District of Sudbury (O.G.S. 1:7920)

MacDonald Occurrence

GARNET, ORTHOAMPHIBOLE

In biotite gneiss

Dark red almandine garnet crystals measuring up to 5 cm in diameter occur in biotite gneiss. Some of the crystals, particularly the smaller ones, have well- developed crystal faces. Brown prisms of orthoamphibole also occur in the gneiss.

The garnetiferous zone strikes northwest and measures about 30 m by 800 m. It outcrops on the Lalonde property north of Markstay.

Road log from Highway 17 at km 36.8 (see page 10):

km	0	Proceed onto road to Markstay.
	1.5	Markstay, at intersection; turn left (north) onto road to Crerar.
	7.1	Crossroad; continue straight ahead.
	7.5	Lalonde house on right. The garnet occurrence is about 800 m from the house.

Ref.: 116 p. 18-19; 286 p. 2-3.

Maps: (T): 41 I/10 Capreol
(G): 48 m Ashigami Lake Area, District of Sudbury, Ontario (O.G.S. 1:31 680)

Page Occurrence

GARNET, KYANITE

In quartz-biotite gneiss

Pink to red almandine garnet crystals measuring up to 12 cm in diameter occur in light grey, quartz-biotite gneiss. Kyanite is a minor constituent of the gneiss. In places, garnet constitutes up to 60 per cent of the rock.

The garnetiferous rock outcrops in a series of knolls extending in a northwesterly direction for about 245 m. The property was held in the 1950s by Industrial Garnet Company Limited of Sudbury.

Road log from Highway 17 at km 36.8 (see page 10):

km	0	Junction of Highway 17 and the turnoff to Markstay. Proceed toward Markstay and to MacDonald garnet occurrence.
	7.1	Crossroad; continue straight ahead.
	7.5	Lalonde house and turnoff to MacDonald garnet occurrence on right. Continue north.
	11.2	Junction; turn left.
	12.4	Garnet occurrence.

Ref.: 286 p. 3-4.

Maps: (T): 41 I/10 Capreol
(G): 48 m Ashigami Lake Area, District of Sudbury, Ontario (O.G.S. 1:31 680)

Warren Quarry

FELDSPAR, BIOTITE, GRAPHIC GRANITE, HEMATITE

In granite pegmatite

Pink to red K-feldspar, colourless quartz, biotite and graphic granite are the main constituents of the pegmatite. Hematite occurs as black masses in feldspar. Dull greyish green altered mica occurs as platy aggregates in feldspar.

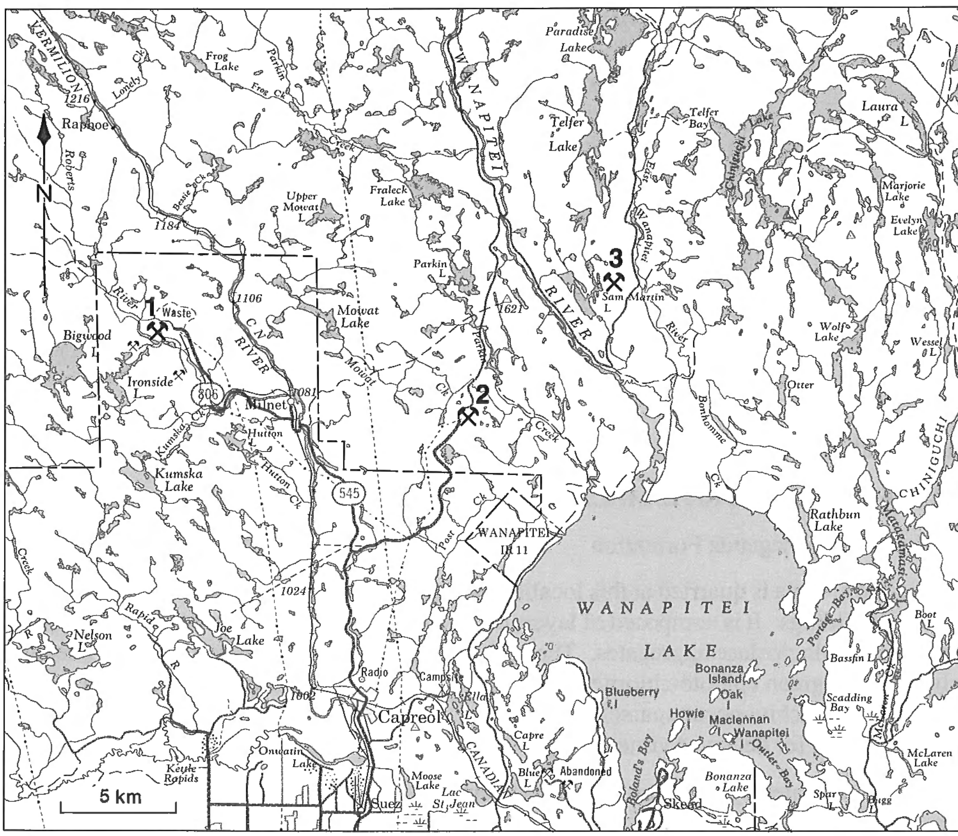
The deposit was worked for feldspar in 1926-1927 by Consolidated Feldspar, Limited. About 820 t of feldspar were produced. The mine consists of an open cut driven 15 m into the side of a wooded ridge. It is on the Carmichael farm.

Road log from Highway 17 at Warren:

km	0	Junction of Highway 17 and Highway 539; proceed north onto Highway 539.
	4.0	Bridge over Deer Creek.
	4.2	Carmichael farm on right. The quarry is 30 m from the road.

Refs.: 168 p. 22; 304 p. 61.

Part of 41-I



Map 2. Occurrences north of Sudbury.

1-Moose Mountain Mine 2-Milnet Mine 3-Wahnapitei Quarry

Maps: (T): 41 I/8 Verner
(G): 2188 Sudbury-Cobalt sheet, Algoma, Manitoulin, Nipissing, Parry Sound, Sudbury and Temiskaming Districts, Ontario (O.G.S., 1:250 000)

Occurrences Along Highway 86

km	**0**	Junction Highway 17 and Highway 86; proceed along Highway 86.
km	**5.2**	Junction road on left, to the *Kirkwood Mine*, a former nickel-copper producer worked by Inco Limited between 1882 and 1976. To reach it, proceed north from the junction for 1 km; turn right and proceed 0.7 km to the junction of the mine-road leading north 2.3 km to the mine.
km	**8.6**	Turn off (left) to the *Garson Mine*. This mine, now operated by Inco Limited, began production in 1908.
km	**10.8**	Turn-off (right) to the *Falconbridge, Falconbridge East* and *Norduna mines*. The Falconbridge and Falconbridge East nickel-copper mines are operated by Falconbridge Limited. The Falconbridge Mine has been in production since 1930, the adjoining Falconbridge East, since 1953. Visitors may arrange to participate in tours of the surface workings and plant by proceeding to the mine offices in Falconbridge. Tours are offered from June to September. The Norduna Mine, a past producer, was worked from 1958 to 1962.
km	**16.3**	Junction of Highway 85. Occurrences reached from this point are described on pages 16 to 19. The road log continues along Highway 86.
km	**21.7**	Junction of road on left to *Maclennan Mine*. This nickel-copper mine was operated by Inco Limited from 1965 to 1972.

Wanapitei Lake Quarry

BRECCIA, CHALCOPYRITE, MALACHITE

In wacke of the Gowganda Formation

An attractive breccia is quarried at this locality for use as a decorative stone for the interior and exterior of buildings. It is composed of layers of elongated angular fragments of pink dolomite and tan quartz-plagioclase aggregates. The rock has an attractive laminated texture. Irregular patches of dark green epidote-chlorite aggregates occur randomly throughout the rock. Chalcopyrite and malachite occur sparsely in the rock. Both polished and unpolished surfaces of the rock are used for decor. Aylmer antique is the trade name of the stone.

The quarry is operated by Northern Industrial Quarries Limited. It is located north of Wanapitei Lake.

Road log from the junction of Highway 85 and Highway 86:

km	0	Proceed onto Highway 85.
	9.5	Junction; turn right and proceed to Capreol.
	18.3	Capreol, at railroad crossing. Continue along Highway 84.
	25.3	Junction; turn right.

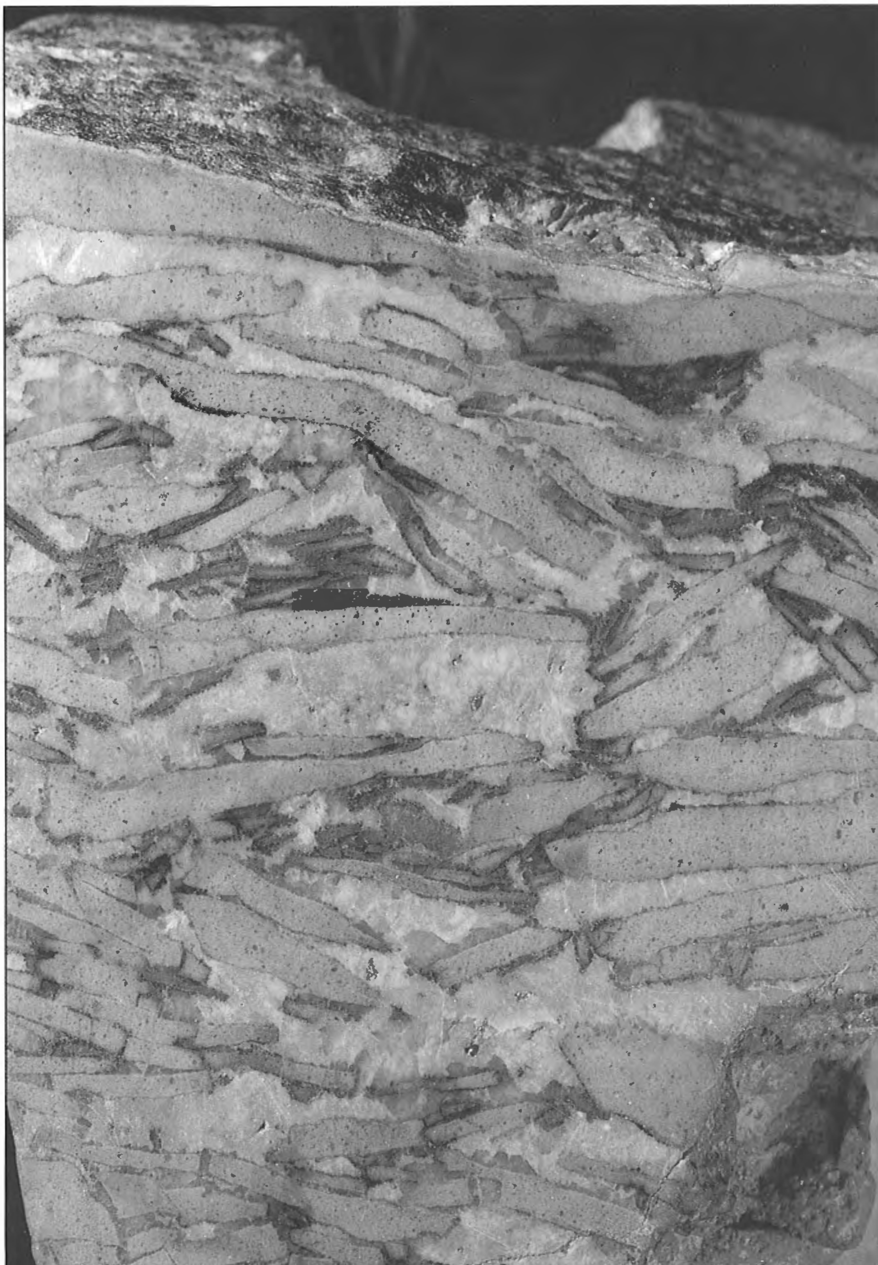


Plate 5

Wanapitei breccia, Wanapitei Lake quarry. The light-coloured fragments are dolomite, the darker coloured are a mixture of quartz and plagioclase. (GSC 203030-A)

34.9 *Milnet Mine* on right. This is a former nickel producer (1953-1954) which was operated by Milnet Mines Limited. Ore was mined from a shaft sunk to a depth of 145.5 m. The ore, consisting of disseminated pyrrhotite, pentlandite, chalcopyrite and pyrite (including pink nickeloan pyrite), occurred in quartz diorite. To reach the Wanapitei Lake quarry, continue along the road northward.

46.0 Junction; turn right onto road which crosses the Wanapitei River (north branch).

54.7 Junction; turn left.

58.0 Turn-off (left) to the quarry.

Refs.: 113 p. 115; 221 p. 54-58.

Maps: (T): 41 I/15 Milnet
(G): 2180 Hutton and Parkin Townships, District of Sudbury (O.G.S., 1:31 680)
2450 Otter Lake, Sudbury District (O.G.S., 1:31 680)

Vermilion River Placer Deposits

NATIVE GOLD

In gravel

Native gold was found as dust, scales and tiny flattened nuggets in gravel deposits along the Vermilion River channelway (from its headquarters to Capreol), along the Wanapitei River, and as far north as Meteor Lake (about 15 km southeast of Westree). The gravels of Onwatin, Marshy, Ross, Fraser, Gibson and Post lakes were found to contain gold. These gold-bearing gravels were investigated by test- pits and drilling. The gold was recovered by panning and sluicing. Most of the gold recovered occurred as colours, particles large enough to be visible to the eye. The largest nugget weighed 57.7 mg and was found in the Meteor Lake area where the gold was generally coarser than gold from the southern part of the Vermilion River waterway.

The discovery of gold was made in 1896 in the gravels of the Vermilion River, about 10 km west of Capreol. This led to a staking rush to the area and subsequently, various companies investigated the area between Capreol and Milnet and the Meteor Lake area further north. Sluicing plants were set up and gold was recovered from some by amalgamation with mercury. Various deposits were explored between about 1898 and 1910. The Capreol-Milnet section was investigated again between 1939 and 1942 and in 1959. The gold was found to be very fine with no concentrations sufficient for profitable mining.

The southern part of the Vermilion River and the various lakes formed by widening of the river are accessible from Capreol, from Highway 96 which crosses the river at a point 3.8 km north of its junction with Highway 80 in Val Therese, and from Highway 84 which crosses it at a point 14.5 km north of the railway crossing at Capreol.

Refs.: 89 p. 151-159; 94 p. 116-117; 143 p. 256-259; 221 p. 35-39; 259 p. 1, 7-8.

Maps: (T): 41 I/10 Capreol 41 I/11 Chelmsford
41 I/15 Milnet 41 P Gogama

(G): 2180 Hutton and Parkin Townships, District of Sudbury (O.G.S., 1:31 680) 2491 Sudbury, Sudbury District, Sudbury Municipality (O.G.S., 1:50 000)

Moose Mountain Mine

MAGNETITE, HEMATITE, PYRITE, QUARTZ, HORNBLENDE, ACTINOLITE, GRUNERITE, EPIDOTE, CHLORITE

In iron formation

Fine to coarse, granular magnetite occurs in a banded iron formation which forms lenticular bodies associated with volcanic rocks. The magnetite is intimately mixed with quartz and with the amphibole minerals: hornblende, actinolite and grunerite. The banded nature of the ore results from varying proportions of magnetite to quartz and to the amphibole minerals. Specular hematite also forms bands in the iron formation. Pyrite occurs as disseminated grains. Epidote occurs as finely granular aggregates associated with chlorite and brownish red, massive hematite.

Exposures of banded iron formation in the area were first noted by prospectors travelling the Roberts River during the gold rush of the early 1890s. An iron-ore outcrop encountered on one of the portage routes became known as Iron Dam. Later, in 1906, Moose Mountain Limited began development of the deposit and installed a crushing plant in 1907. The first shipment of ore was made in 1908 following completion of the railroad. The town of Selwood, now in ruins, came into existence to serve the mine which operated until 1920. Mining was by open

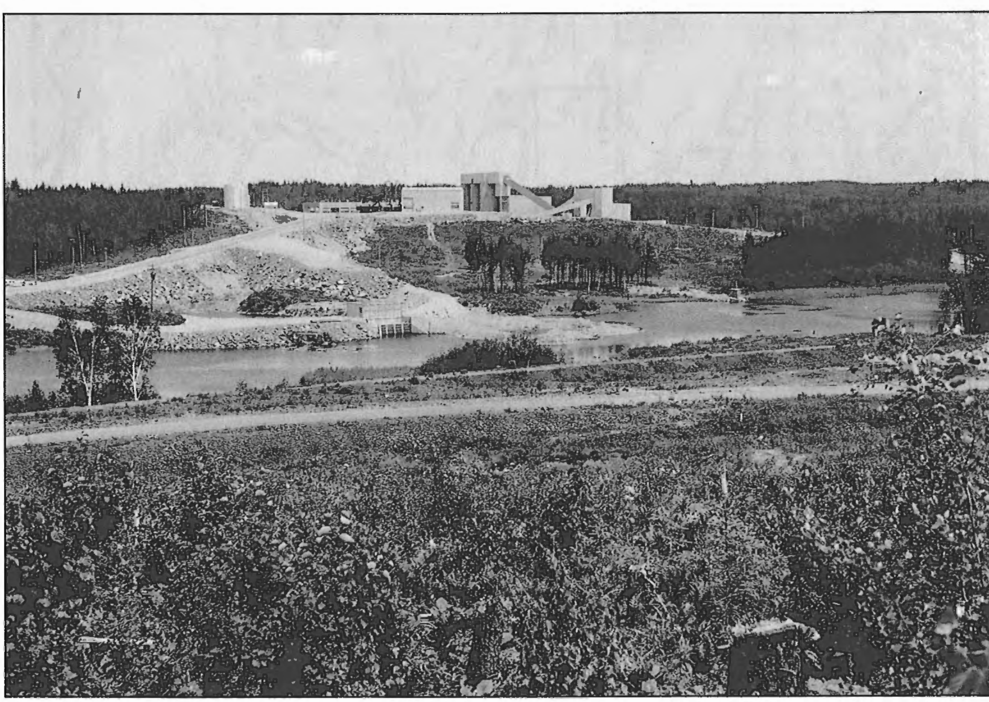
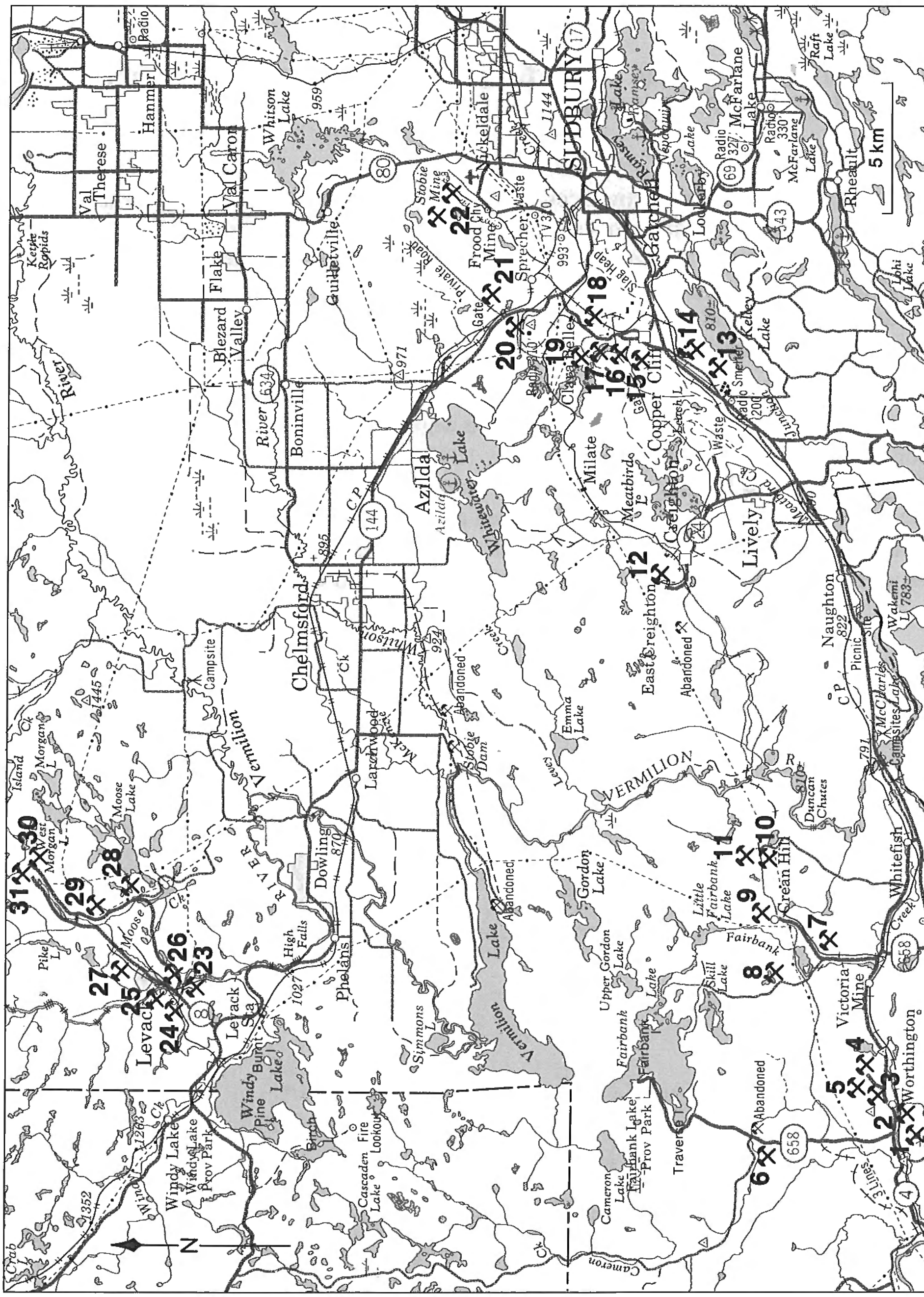


Plate 6

Moose Mountain Mine, 1958. (GSC 152366)

Part of 41-I



N
5 km
SUDBURY
Val Therese
Hanmer
Val Caron
Whitson Lake
Blezard Valley
Flake
Boninville
Guilletville
Azilda
Whitewater Lake
Chelmsford
Stobie Mine
Frood Mine
Nickeldale
Sprecher
Milate
Clara Belle
Copper Cliff
Gatchell
Lockerby
McFarlane Lake
Rheault
Kelley Lake
Meatbird L
Creighton
Lively
East Creighton
Naughton
Whitefish
Victoria Mine
Worthington
Crean Hill
Fairbank Lake
Upper Gordon Lake
Gordon Lake
Vermilion Lake
Levack
Levack Sta
Windy Lake
Windy Lake Prov Park
Fairbank Lake Prov Park
Dowling
Larchwood
Phelans
Vermilion River
Simmons L
Cascaden Lake
Fire Lookout
Moose Lake
Morgan L
Abandoned
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pit and a shaft which had a depth of 54.9 m. From 1959 until 1979 the mine was operated by National Steel Corporation of Canada Limited. It produced iron ore pellets and crude iron ore.

Road log from Highway 84 at Capreol:

km	0	Capreol, at railway crossing; proceed north onto Highway 84.
	7.0	Junction of the road to Milnet Mine and Wanapitei Lake quarry; continue along Highway 84.
	14.5	Bridge over Vermilion River.
	15.5	Junction; follow the road on left.
	22.0	Gate to mine.
	24.9	Mine.

Refs.: 185 p. 29-49; 197 p. 1-12; 207 p. 50-58; 221 p. 43-51; 298 p. 342-343.

Maps: (T): 41 I/14 Venetian Lake

(G): 2180 Hutton and Parkin Townships, District of Sudbury (O.G.S., 1:31 680)

Nickel-copper Mines West of Sudbury

Active and inactive nickel-copper mines belonging to Inco Limited and Falconbridge Limited are accessible from highways 144 and 17. The locations are given as points of historical interest.

Road log from Sudbury:

km	0	Junction of Highway 17 and Highway 144; proceed onto Highway 144.
	0.5	Junction; road on right leads 3.5 km to the *Frood-Stobie Mines* (Inco Limited).
	3.0	Junction of Highway 71; continue along Highway 144.
	6.2	Junction: the road on right leads 0.45 km to the *McKim Mine*, formerly operated by Falconbridge Limited. The former Inco Limited producer, the *Murray Mine* is 400 m south of this junction.
	52.9	Junction; turn right onto Highway 8 to Levack.
	54.9	*Hardy Mine*, formerly worked by Falconbridge Limited, is on the left side of the highway.

Map 3. (opposite) Nickel-copper mines west of Sudbury.

1-Totten
2-Worthington
Worthington No. 2
3-Howland
4-Gersdorffite
5-Robinson
6-Chicago
7-Vermilion
8-Victoria
9-Crean Hill
10-Ellen
11-Lockerby
12-Creighton
13-Copper Cliff South
14-Evans
15-Copper Cliff No. 1
16-Copper Cliff
17-Copper Cliff No. 2
18-Copper Cliff North
19-Clarabelle
20-Murray
21-McKim
22-Frood-Stobie Mines
23-Boundary
24-Hardy
25-McCreedy West
26-Onaping
27-Levack
28-North
29-Fecunis
30-Fraser
31-Strathcona

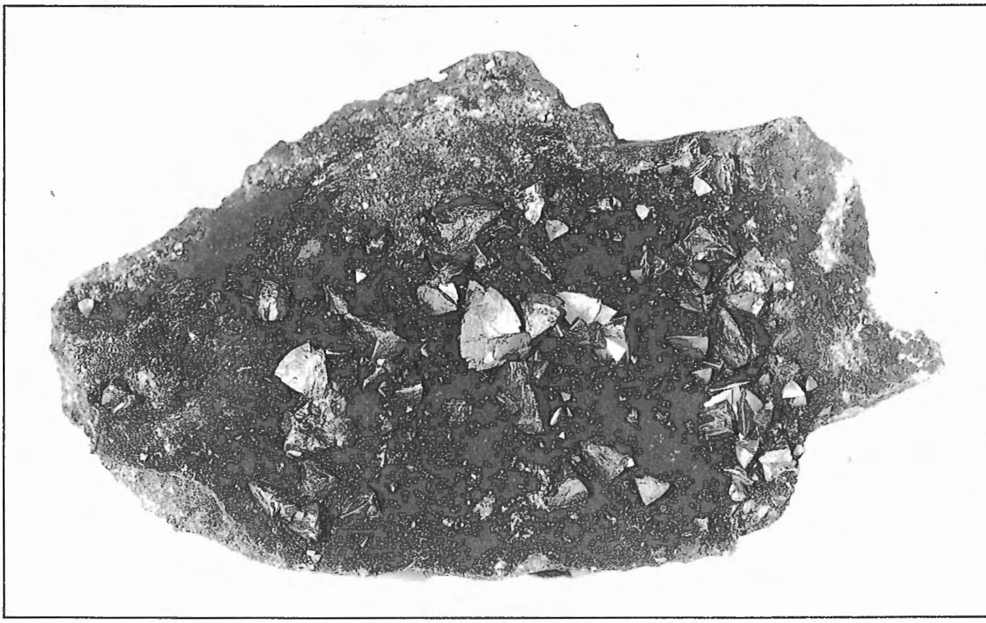


Plate 7

Chalcopyrite crystals, Frood Mine. (GSC 203376-S)

Plate 8

Levack Mine, 1929. (National Archives Canada PA-17771)

55.1 Junction of road on right. This road leads to the follwing Falconbridge Limited mines (distance from this junction to each mine is in parenthesis): *Boundary Mine* (200 m), *Onaping Mine* (1.25 km), *North Mine* (5.5 km), *Fecunis Mine* (6.3 km) and *Fraser Mine* (7.5 km).

55.5 Turnoff (left) to the *McCreedy West Mine* (Inco Limited).

57.7 *Levack Mine* on left (Inco Limited).

61.7 *Strathcona Mine* (Falconbridge Limited).

Maps: (T): 41 I/11 Chelmsford
(G): 2491 Sudbury, Sudbury District, Sudbury Municipality (O.G.S., 1:50 000)

The main road log for occurrences along Highway 17 from Sudbury to Sault Ste. Marie begins at the junction of Highway 17 (Lorne Street) and Highway 144 (Elm Street) in Sudbury.

km 0 Sudbury; proceed west along Highway 17.

km 6.0 Copper Cliff, at the junction of Power Street. This road leads to the main Inco Limited operations on the north side of the highway. These mines are the *Copper Cliff No. 2*, *Copper Cliff North* and *Clarabelle* mines. The *Copper Cliff South* and *Evans* mines are south of the highway.

To reach the starting point of the Inco tours, turn right and proceed 1.6 km to the mine office.

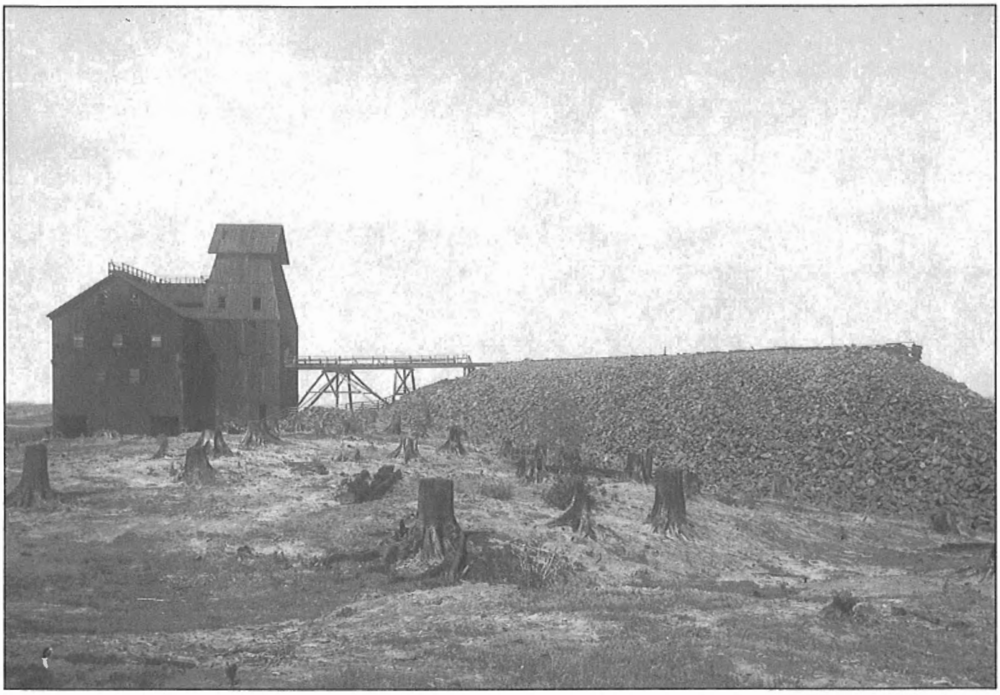


Plate 9

Evans Mine, 1898. (National Archives Canada PA-37575)

km	**13.2**	Lively, at the junction of Highway 24. The *Creighton Mine* operated by Inco Limited is located at Creighton, 5 km north of this junction.
km	**32.7**	Junction of Highway 4 to Worthington. Three former nickel- copper producers are located north of this junction. The mines and their distances from the junction are: *Vermilion Mine* (5.6 km) and *Crean Hill Mine* (8.6 km), both on the east side of Ethel Lake, and *Victoria Mine* (6.6 km) northwest of the lake. The mines were operated by Inco Limited. The Vermilion Mine dumps were a source of sperrylite crystals until the dumps were recovered a few years ago. Sperrylite was originally described from this deposit in 1889; it was named in honour of F.L. Sperry of the Canadian Copper Company. Other unusual minerals found in the deposit include bornite, polydymite, cassiterite, native copper and gold. The secondary nickel mineral, retgersite, was found as a blue-green coating associated with chalcopyrite-siegenite ore.

The westernmost extension of the Sudbury Igneous Complex is near Worthington where there are several former nickel-copper mines: the *Worthington Mine* (at Worthington); the *Totten Mine* (south of the village), and the following located along the road leading northeast of the village: *Worthington No. 2 Mine, Howland Pit, Robinson Mine* and *Gersdorffite Mine*. The *Chicago Mine* is located on Highway 4, 6.0 km north of Worthington.

Plate 10

Copper Cliff Mine, c 1890. (National Archives Canada PA-50965)

Maps: (T): 41 I/6 Copper Cliff
(G): 2055 Hyman and Drury Townships, Sudbury District (O.G.S., 1:31 680) 2119 Denison-Waters Area, Sudbury District (O.G.S., 1:31 680)

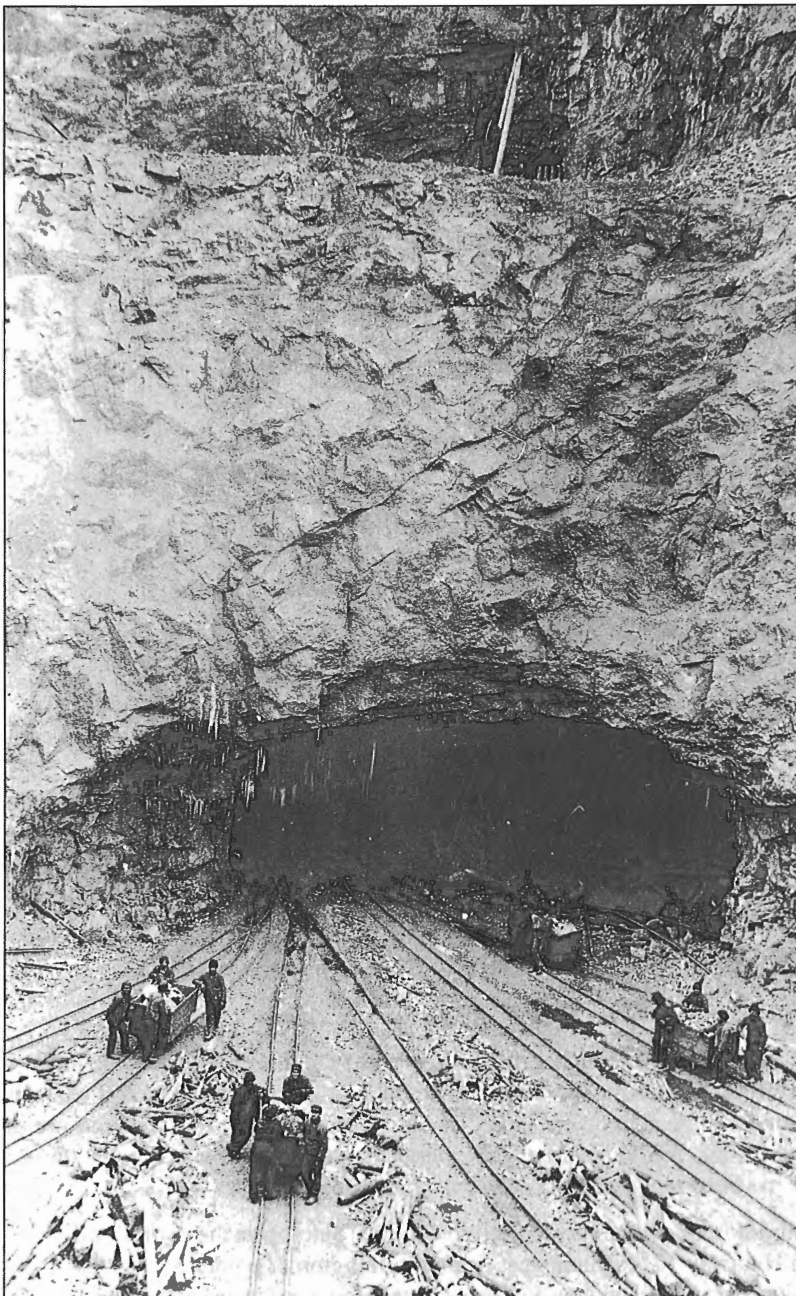


Plate 11

Creighton Mine, second level, c 1904. (Archives of Ontario OBM 14-3)

Plate 12

Sperrylite crystal, Vermilion Mine. The crystal measures 5 mm across. (GSC 203376-R)

High Falls Road Occurrences

STAUROLITE, CHLORITOID, GARNET, TITANITE, ANDALUSITE

In metamorphosed sedimentary rock

Brown staurolite crystal aggregates measuring up to 5 cm in diameter occur in metamorphosed sedimentary rock exposed along High Falls Road (Old Highway 17), and near High Falls. Individual crystals are about 5 cm long. Black chloritoid porphyroblasts measure up to 2 cm in diameter. Dark red almandine garnet and titanite are associated with these minerals. Andalusite has been reported from one of the outcrops.

The metamorphosed sedimentary rocks (metapelites) outcrop on the north side of the High Falls Road (Old Highway 17) leading west from Worthington at points 3.2 to 3.5 km and 4.5 km west of its junction with Highway 4. The latter outcrop is at the junction of the road to the High Falls power house.

Refs.: 56 p. 11-12; 281 p. 102.

Plate 13

Worthington Mine, 1890s. (National Archives Canada PA-50968)

Maps: (T): 41 I/5 Espanola
(G): 2055 Hyman and Drury Townships, Sudbury District (O.G.S. 1:31 680)

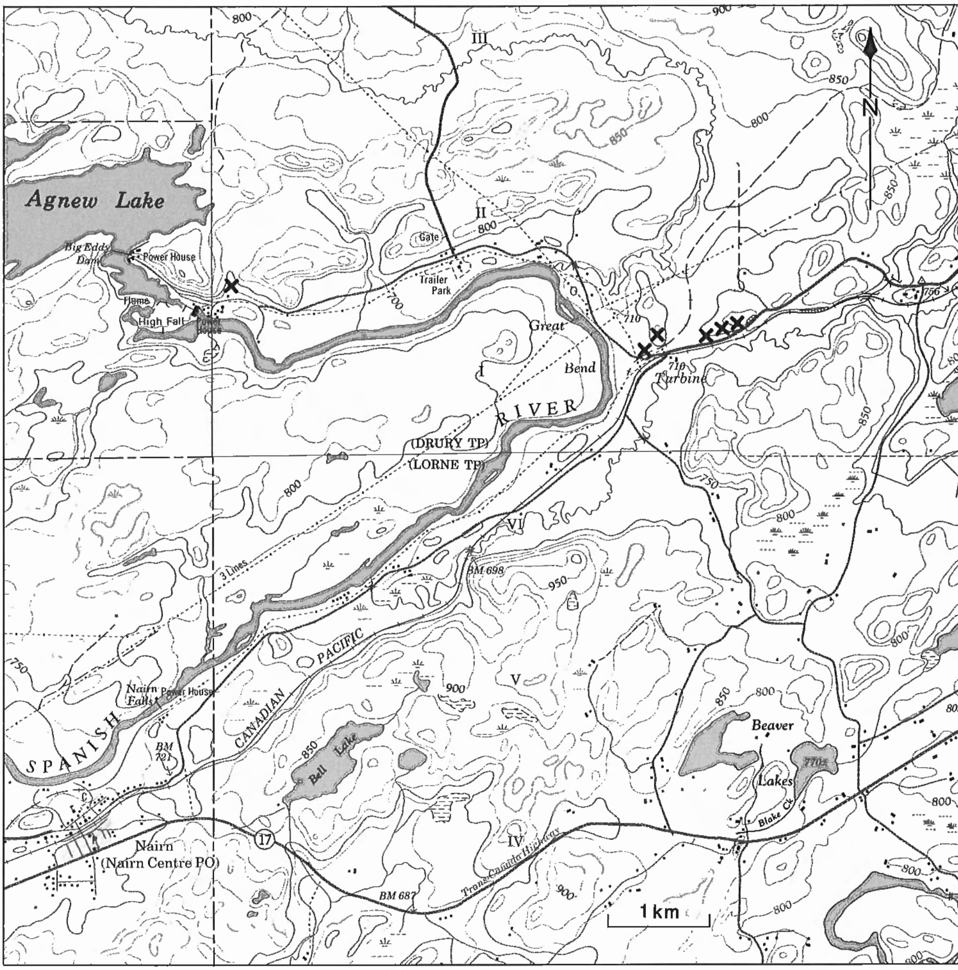
km	**42.5**	Junction of Worthington Road. The road log continues along Highway 17.
km	**49.7**	*Road-cut* exposes diabase cut by calcite veins. The calcite fluoresces pink in ultraviolet light.
km	**50.3**	Nairn Centre, at MacDonald Street.
km	**67.7**	Junction of Highway 6. The Espanola-Manitoulin Island side trip begins at this junction.

Espanola-Manitoulin Island Occurrences

Road log to Espanola-Manitoulin Island occurrences:

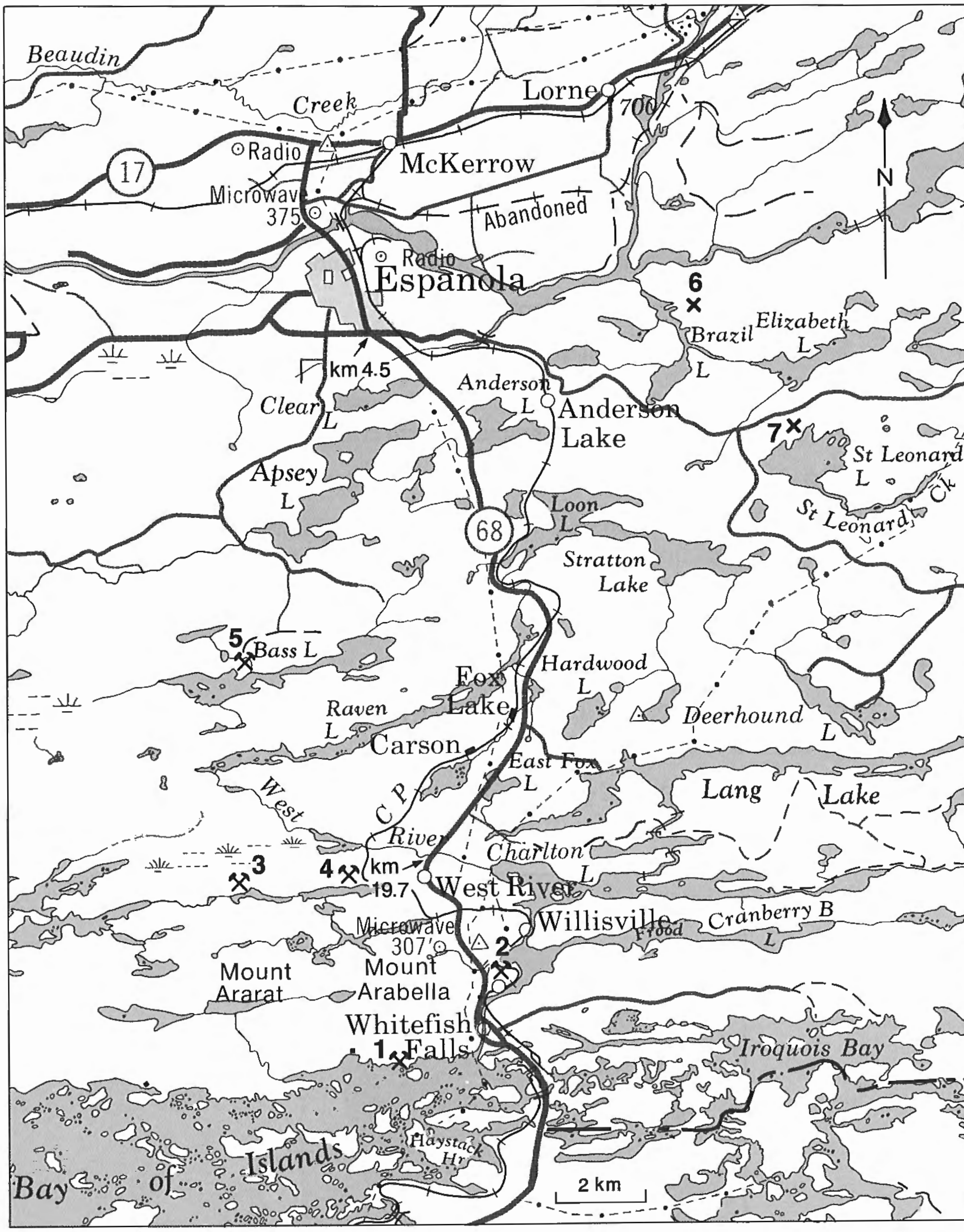
km	0	Junction of highways 17 and 6; proceed onto Highway 6.
	1.9	Espanola, at the bridge over the Spanish River.
	4.5	Junction of West Bay Penage Road on left and Queensway on right. The former leads to the *Brazil Lake cobaltite occurrence* and to the *St. Leonard Lake scheelite occurrence*, (see pages 30 and 32), the latter to the *Bass Lake magnetite occurrence* (see page 32).

Parts of 41-I/5 and 41-I/6



Map 4. High Falls Road occurrences.

19.7	Junction of the road to House Lake and to the *McMillan Mine* (see page 33).
22.4	Junction of Willisville Road.
23.5	Turn-off (left) to the *Lawson quarry*. Sandstone (Lorrain Formation) is quarried by Inco Limited for use as flux in its Sudbury smelters.
23.8	Turn-off (right) to Whitefish Falls. The *Wallace Mine* (see page 33) is on the shore of Bay of Islands, just west of this village.
32.5 to 32.8	*Road-cuts* expose sandstone (Mississagi Formation) showing cleavage surfaces.



Map 5. Espanola occurrences.

1-Wallace Mine
2-Lawson Quarry
3-McMillan Mine
4-Majestic Mine
5-Bass Lake magnetite occurrence
6-Brazil Lake cobaltite occurrence
7-St. Leonard Lake Scheelite occurrence

34.3 *Road-cuts* from this point to Little Current expose Ordovician limestone (Bobcaygeon and Gull River formations) containing cavities (about 3 cm in diameter) lined with colourless quartz crystals. Fossils, including corals, crinoids and shells are abundant in some of the exposures.

51.6 *Road-cuts* south of the bridge over Goat Island Channel expose Ordovician limestone (Verulum Formation) containing abundant fossils and cavities (measuring 5-7 cm) lined with white calcite crystals (dog-tooth spar) which fluoresce pink in ultraviolet light. The fossils include bryozoa, echinoderms and stromatoporoids.

52.8 Bridge over Little Current.

53.9 Little Current, at the junction of Highway 540.

58.8 Highway crosses a creek which exposes shale (Whitby Formation) containing shell fossils, graptolites and crinoids.

62.5 Junction of the road to *Sheguiandah quarry* (see page 34).

85.0 *Road-cut* exposes Silurian dolomitic limestone (Manitoulin Formation) containing coral fossils. This road-cut is 3.8 km south of the turn-off to Manitowaning.

Brazil Lake Occurrence

COBALTITE, PYRRHOTITE, CHALCOPYRITE, MARCASITE, ROZENITE, ROEMERITE, COPIAPITE, ACTINOLITE

In quartz-carbonate at the contact of gabbro and amphibolite

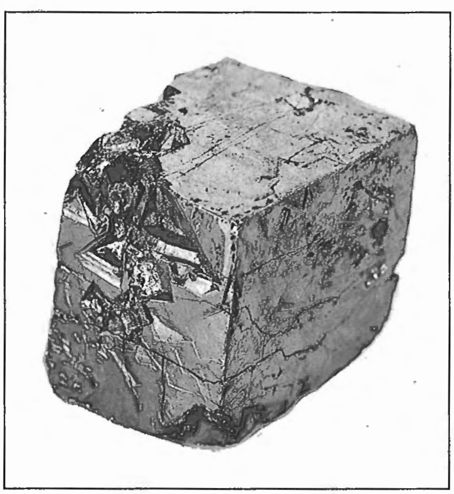


Plate 14

Cobaltite crystal, Brazil Lake. The crystal measures 25 mm along the edge. (GSC 203376-U)

Cobaltite crystals measuring up to 3 cm in diameter occur with pyrrhotite and chalcopyrite in a quartz-dolomite calcite vein. The crystals are in the form of cubes and pyritohedra. Encrustations of white rozenite and roemerite, and yellow copiapite occur as secondary minerals associated with black marcasite. Actinolite is a constituent of the amphibolite host rock.

The deposit was exposed by an adit driven 30 m into the side of a hill, and by strippings and trenches. It is northeast of Brazil Lake.

Road log from Highway 6 at km 4.5 (see page 27):

km	0	Proceed onto the West Bay Penage Road.
	8.2	Junction; turn left.
	10.3	End of the road at a cabin. From this point, a trail leads north to the occurrence.
	12.4	Adit and dump.

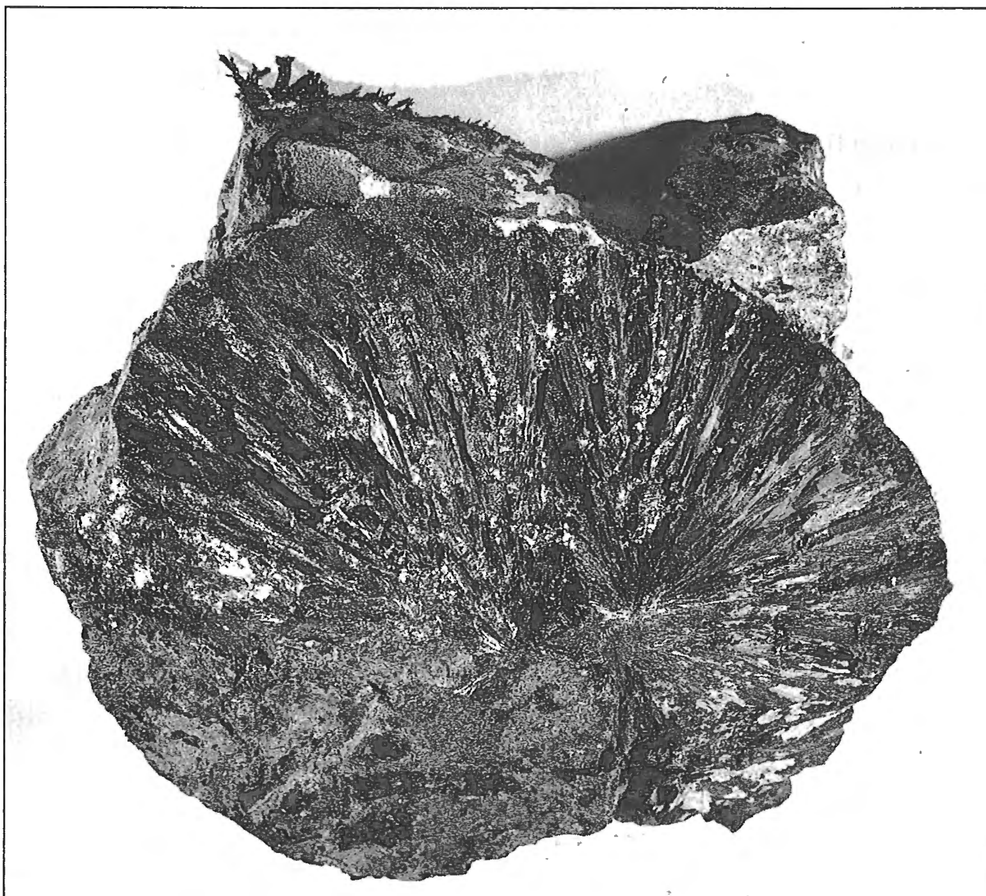


Plate 15

Magnetite, Bass Lake. (GSC 203247)

Refs.: 58 p. 48; 299 p. 276.

Maps: (T): 41 I/5 Espanola
(G): 2311 Merritt and Foster Townships, Sudbury District (O.G.S., 1:31 680)

St. Leonard Lake Occurrence

SCHEELITE, POWELLITE, SPHALERITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, MOLYBDENITE, ARSENOPYRITE, VESUVIANITE, GARNET, DIOPSIDE, WOLLASTONITE

In a skarn zone and in quartz veins associated with altered sediments

Scheelite, powellite and the sulphide minerals occur as disseminated grains in a calcite-quartz skarn zone and in quartz veins. Colourless vesuvianite crystals, reddish brown garnet crystals, green diopside and wollastonite occur with calcite and quartz. Coatings of goethite and black greasy birnessite occur on quartz and calcite.

The deposit was staked in the mid-1960s by T. Tamminen and V. Piispanen. It was explored by Texas Gulf Sulphur Company Inc. in 1965-1967 and by Cerro Mining Company of Canada Limited in 1970. The deposit is exposed by pits and trenches on the south side of a hill north of St. Leonard Lake.

Road log from Highway 6 at km 4.5 (see page 27):

km	0	Proceed onto West Bay Penage Road.
	8.2	Junction, road to Brazil Lake cobaltite occurrence; continue along West Bay Penage Road.
	9.65	Junction; turn right onto road to St. Leonard Lake.
	10.5	Diabase outcrop above the road on left and floor of outcrop on right. Walk 23 m southeast to a trench. Other openings are on the south side of the slope.

Ref.: 58 p. 59-61.

Maps: (T): 41 I/4 Whitefish Falls
(G): 2311 Merritt and Foster Townships, Sudbury District (O.G.S., 1:31 680)

Bass Lake Occurrence

MAGNETITE, SERPENTINE, CALCITE, CHALCOPYRITE, PYRRHOTITE, PYRITE

In peridotite

Magnetite occurs as compact radiating fibres forming colloform masses measuring up to 13 cm in diameter. Cream-white porcelaneous serpentine occurs as encrustations on magnetite and as green fibrous aggregates associated with colourless transparent calcite (Iceland spar) and white calcite. These minerals occur in a vein (5 to 15 cm wide) in altered peridotite. Chalcopyrite, pyrrhotite and pyrite are sparsely disseminated in the rock.

The occurrence is exposed by a pit near the north shore of Bass Lake. It was originally explored as a nickel prospect in 1929-1932 and was known as the Owen prospect.

Road log from Highway 6 at km 4.5 (see page 27):

km	0	Proceed west along Queensway from the junction of the West Bay Penage Road and Highway 6.
	0.85	Junction; turn left onto Aspey Lake Road.
	6.6	Junction; proceed onto road on left leading south.
	8.8	Junction; follow the road on right.
	10.3	Junction; turn right onto a rough single-lane road.
	11.4	Clearing at top of a low ridge. Walk west about 50 m to the pit.

Refs.: 58 p. 48-49; 226 p.387-390; 256 p. 27-28; 281 p.111.

Maps: (T): 41 I/4 Whitefish Falls
(G): 2312 Mongowin and Curtin Townships, Sudbury District (O.G.S., 1:31 680)

McMillan Mine

ARSENOPYRITE, PYRITE, CHALCOPYRITE, PYRRHOTITE

In quartz veins in sandstone and argillite (Gowganda Formation)

Native gold was associated with arsenopyrite at this former gold producer. Pyrite crystals, chalcopyrite and pyrrhotite also occurred in the vein.

The deposit was originally staked by A. Heard sometime prior to 1920. In 1926 McMillan Gold Mines, Limited began work on the deposit and operated the mine and mill from 1934 to 1937. Production amounted to 87 618 g of gold and 2 613 g of silver. The workings consisted of a shaft sunk to a depth of 274 m with eight levels. The mine is on the north shore of House Lake. A similar vein was explored at the Majestic Mine which is located along the trail to the McMillan Mine.

Road log from Highway 6 at km 19.7 (see page 27):

km	0	Proceed west along the road to House Lake.
	0.8	Trail on right to House Lake; proceed west along this trail.
	2.9	*Majestic Mine* on left. At this mine, a quartz vein carrying arsenopyrite, chalcopyrite and pyrite was explored by a shaft (61 m deep) in 1921-1922 by Majestic Gold Mines, Limited. Gold values were low and there was no production. The mine is about 400 m west of the point where the trail crosses the railway. Continue along the trail to the McMillan Mine.
	7.0	Mine.

Refs.: 58 p.56-57; 224 p.46; 281 p.113-114.

Maps: (T): 41 I/4 Whitefish Falls
(G): 2312 Mongowin and Curtin Townships, Sudbury District (O.G.S., 1:31 630)

Wallace Mine

PYRRHOTITE, PYRITE, CHALCOPYRITE

In the sheared contact of argillite, amphibolite and diabase

This occurrence is of historic interest as it was the first reported occurrence of nickel in Canada. It was opened as a copper mine in 1847 by Upper Canada Mining Company but operations were abandoned by 1848 due to lack of an economic orebody. Openings consisted of a shaft and a trench. The sulphides, pyrrhotite, pyrite and chalcopyrite occurred as disseminations in the rocks. In 1848, Alexander Murray of the Geological Survey of Canada visited the deposit and reported the occurrence of an arsenical ore of nickel, the first occurrence of nickel in Canada. Specimens of the nickel ore, chalcopyrite and specular hematite were displayed in the Geological Survey of Canada economic mineral exhibit at the first world's fair, the Grand Industrial Exhibition in 1851 at the Crystal Palace in London.

The mine is located on the north shore of the Bay of Islands, about 1300 m west of the mouth of Whitefish River at Whitefish Falls village (see road log page 27).

Refs.: 17 p.147-148; 58 p.50; 199 p.22; 200 p.695; 236 p.42-45; 281 p.115-116.

Maps (T): 41 I/4 Whitefish Falls
(G): 2312 Mongowin and Curtin Townships, Sudbury District (O.G.S., 1:31 680)

Sheguiandah Quarry

QUARTZITE

White chert-like quartzite of the Bar River Formation (Cobalt Group) was formerly quarried from this occurrence by Canadian Silica Corporation for the manufacture of ferrosilicon. Quartzite of this formation was used in prehistoric times for spear and arrow heads, and for implements of various types. The rock takes a high polish.

The quarry is located south of Little Current.

Road log from Highway 68 at km 62.5 (see page 27):

km	0	Junction of Highway 68 and a road leading south; proceed along this road.
	0.5	Junction; turn left (east).
	0.85	Quarry.

Refs.: 166 p.13-14; 281 p.127-130.

Maps (T): 41 H/13 Little Current
(G): 2247 Little Current area, Manitoulin District (O.G.S., 1:63 360)

The main road log along Highway 17 West is resumed.

km	**67.7**	Junction of Highway 6 and Highway 17.
km	**71.4, 75.4**	*Staurolite schist outcrops* on the north side of the highway at **km 71.4** and on the south side at **km 75.4**. The staurolite crystals measure about 5 cm long.
km	**77.7**	Webbwood, at the junction of Agnew Road.

Shakespeare Mine

NATIVE GOLD, PYRRHOTITE, CHALCOPYRITE, PYRITE, ARSENOPYRITE

In silicified metasedimentary rock

Specimens containing native gold, visible to the eye, were reported from this former gold producer. The sulphide minerals, pyrrhotite, chalcopyrite, pyrite and arsenopyrite occur as disseminated grains in the rusty weathered rock.

The mine was worked from 1903 to 1907 producing gold valued at $38 327 from about 8000 t of ore. The underground workings consisted of a main shaft (90 m deep), 2 adits (18 m and 90 m) and several pits. A 10-stamp mill operated on the site. The mine is located northeast of Webbwood.

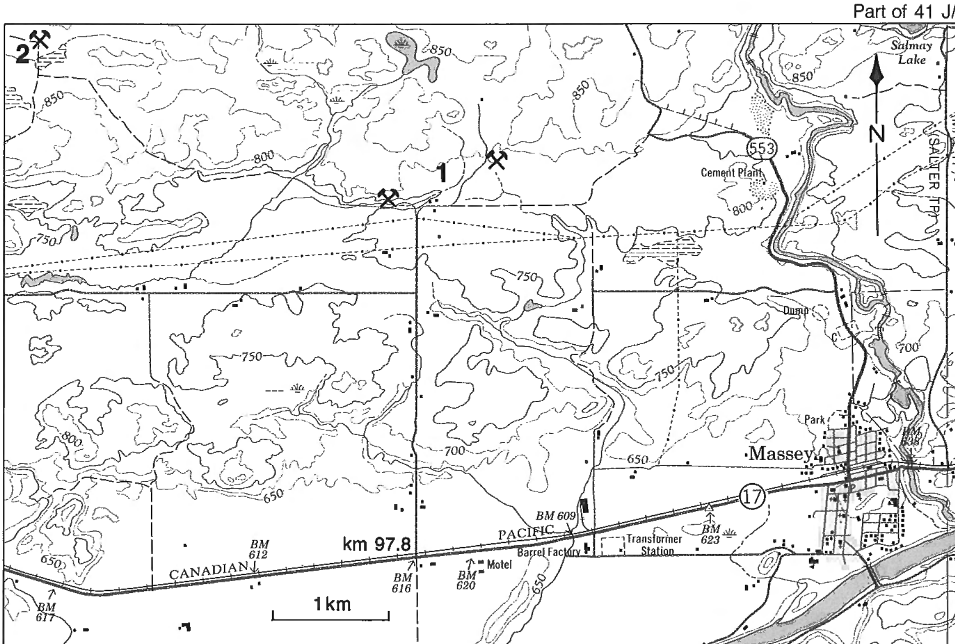
Road log from Highway 17 at **km 77.7**:

km	0	Proceed onto Agnew Road.
	4.0	Junction; follow the road leading straight ahead (east).
	5.3	Mine on right. (At this point the road meets the power-line.)

Refs.: 60 p.39-40; 171 p. 18; 224 p. 21-24.

Maps (T): 41/I 5 Espanola
(G): 2313 Dunlop and Shakespeare Townships, Sudbury District (O.G.S., 1:31 680)

Part of 41 J/1



Map 6. Massey Mines.

1-Massey Mine 2-Hermina Mine

km	**93.8**	Massey, at the junction of Highway 553.
km	**97.8**	Junction of the road leading north to Massey Mine and Hermina Mine.

Massey Mine

CHALCOPYRITE, PYRITE, CHALCOCITE, BORNITE, COVELLITE, HEMATITE, BROCHANTITE, GYPSUM, QUARTZ CRYSTALS

In silicified zones in cherty quartzite and argillaceous siltstone

Chalcopyrite, the principal ore mineral, occurs with pyrite as granular massive patches and stringers in deformed quartz-rich rocks. Chalcocite, bornite, platy crystals of covellite and specular hematite are associated with chalcopyrite. Brochantite and gypsum occur as coatings on ore specimens. 'Micro' crystals of quartz occur in small cavities in massive quartz; hematite coats some of the crystals and chlorite occurs as flakes in cavities. Yarrowite occurs as dark green iridescent and black velvety "micro" flakes forming aggregates on quartz and on chalcopyrite.

The mine was originally worked from 1901 to 1906 by Massey Station Mining Company. A concentrator was operated on the site and the concentrates were hauled by a horse over the narrow-gauge railway which connected the mine to Massey. In 1916, the mine was operated by the Sable River Company. The workings consisted of the main shaft (169.2 m), two additional shafts (490 and 850 m to the west of the main shaft) and an adit (36 m long) located 1400 m west of the main shaft. The total production of copper was 21 543.6 kg from ore grading between 2.7 and 3.5 per cent copper. Between 1968 and 1970, Hermina Copper Limited produced 13 370 t of ore averaging 2.5 per cent copper. The mine is located northwest of Massey.

Road log from Highway 17 at **km 97.8**:

km	0	Proceed north from Highway 17 along the mine road.
	3.2	Junction. The road on right leads east for a distance of 900 m to the main shaft area; the road on left leads 700 m to the western workings.

Refs.: 224 p.28-30; 254 p.301-302; 280 p.111-116; 299 p.262-263.

Maps (T): 41 J/I Spanish
(G): 2308 Victoria and Salter Townships, Sudbury District (O.G.S., 1:31 680)

Hermina Mine

CHALCOPYRITE, PYRITE, MALACHITE

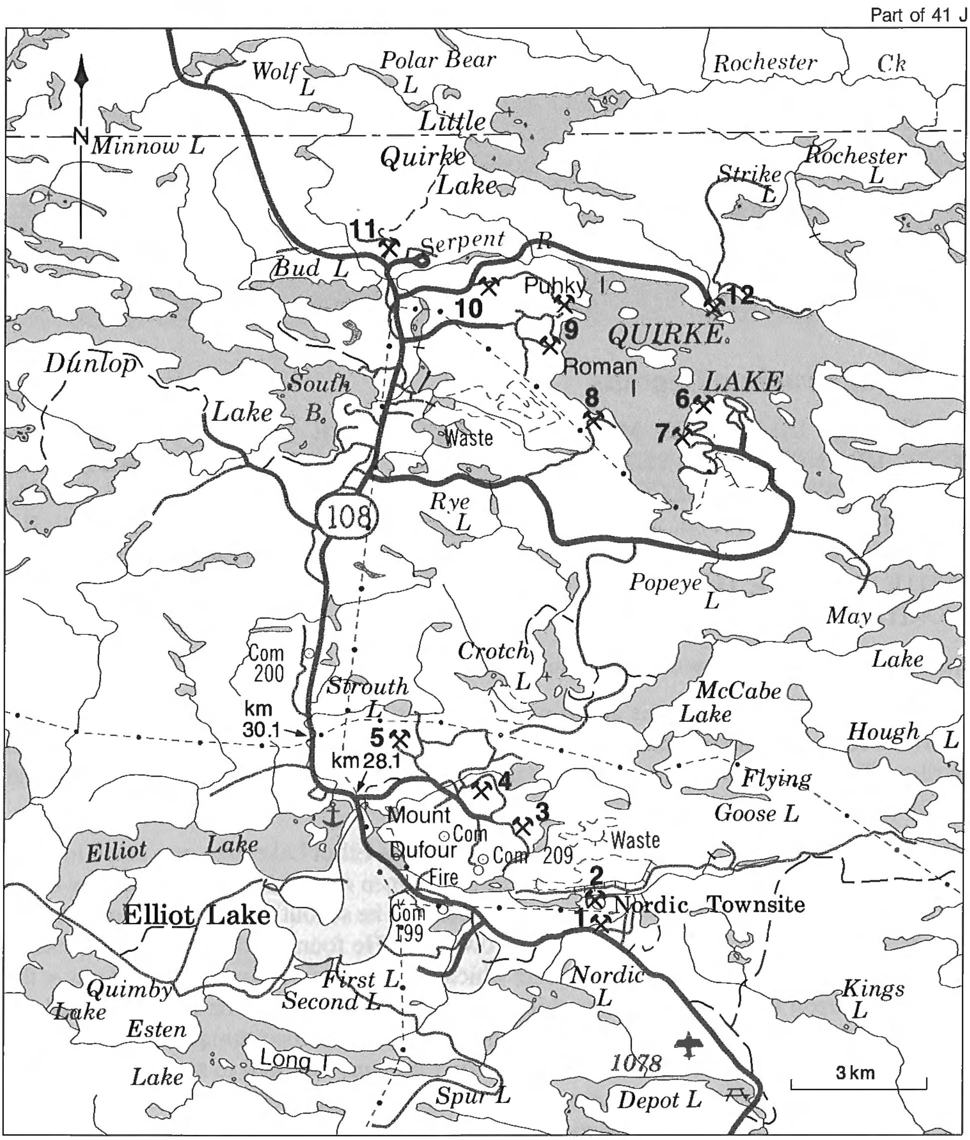
In quartz veins in diorite and granite

Chalcopyrite occurs as massive patches with minor pyrite in quartz. Malachite occurs as coatings on ore specimens.

The deposit was originally staked shortly after the discovery of the Massey deposit. It was operated from 1903 to 1909 by Hermina Mining Company which produced 11 821 t of ore yielding 454 701 kg copper for a grade averaging 3.6 per cent. Development consisted of the main shaft (150 m) and two additional shafts located 400 m and 1700 m southeast of the main shaft.

Road log from Highway 17 at **km 97.8**:

km	0	Proceed north along the road to the Massey Mine.
	3.2	Junction; proceed west along the road to the Massey Mine western openings and continue beyond them toward the Hermina Mine.



Map 7. Elliot Lake Mines.

1-Buckles
2-Nordic
3-Lacnor
4-Milliken
5-Stanleigh
6-Can-Met
7-Stanrock
8-Spanish American
9-Denison
10-New Quirke
11-Quirke
12-Panel

7.0 Junction; turn right (north).

7.4 Mine.

Refs.: 224 p.30-31; 280 p.108-111; 299 p.262.

Maps (T): 41 J/1 Spanish
(G): 2308 Victoria and Salter Townships, Sudbury District (O.G.S., 1:31 680)

km 111.5 Junction of Waterfalls Road.

km 123.6 Junction of Pierce's Road on right. *Outcrops* on the northeast side of this junction expose biotite-sericite schist containing pink garnet crystals measuring 3 mm in diameter.

km 134.2 Junction, Highway 108. *The rock outcrop* on the south side of the highway just west of the junction exposes biotite-sericite schist containing yellowish brown staurolite prisms and crystals of pyrite. Highway 108 leads to the Elliot lake uranuim mining area.

Elliot Lake Uranium Deposits

BRANNERITE, URANINITE, MONAZITE, THUCHOLITE, URANOTHORITE, COFFINITE, URANOPHANE, BETA-URANOPHANE, SODDYITE, BOLTWOODITE, LIEBIGITE, PYRITE, CHALCOPYRITE, PYRRHOTITE, ARSENOPYRITE, GALENA, COBALTITE, MARCASITE, MOLYBDENITE, SPHALERITE, GOLD, HEMATITE, ILMENITE, MAGNETITE, TITANITE, ANATASE, RUTILE, CASSITERITE, CHROMITE, APATITE, DIOPSIDE, GARNET, EPIDOTE, SPINEL, XENOTIME, YTTROFLUORITE, FLUORITE, ZIRCON, SCHEELITE, CHLORITE

In quartz-pebble conglomerate of the Matinenda Formation

The minerals listed above occur as grains measuring less than 1 mm in diameter disseminated in a sericite-feldspar quartzite matrix enclosing quartz pebbles. The most conspicuous mineral is pyrite. The uranium ore minerals are brannerite (reddish brown to black), uraninite and monazite. Other minerals listed occur in minor amounts.

The original discovery of radioactive mineralization in the Elliot Lake area was made in 1948 by prospector Karl Gunterman. After noting that a specimen of conglomerate on display at the Sault Ste. Marie mining recorder's office was radioactive, he set out to look for the occurrence which was labelled on the specimen as Long Township. He found and staked an occurrence of a similar-looking radioactive conglomerate which was previously exposed by test pits at the east end of Lauzon Lake in Long Township. He and his associate, Aime Breton, staked the occurrence. Subsequent examination of the showings gave disappointingly low assays. In 1949, a crew member of the Muskoka Construction Company engaged in rerouting Highway 17, discovered radioactive mineralization at Location "X" on the south side of the highway in Long Township about 3 km west of Algoma. Specimens from the occurrence gave encouraging assay values of 0.025 to 0.15 per cent U_3O_8, but the part-time prospector who made the discovery drowned in an accident before the exact location of his specimens became known.

The publication in 1952 of this occurrence with its promising uranium values in a Geological Survey of Canada publication (Ref. 193) prompted geologist Franc Joubin to stake thirty-six claims in the area, including the initial Gunterman-Breton discovery claim. Peach Uranium Syndicate was formed to explore the claims. Diamond drilling in 1953 indicated an average grade of 0.13 per cent U_3O_8 and sufficient tonnage to encourage further exploration and claim-staking. When results became widely known in 1953, the Sudbury- Sault Ste. Marie area became the scene of the greatest prospecting rush in the history of Ontario until that time. Many radioactive mineral occurrences were found, but only those in the Elliot Lake area became producers.

Pronto Uranium Mines Limited was formed to develop the discovery deposit and in 1955 became the area's first uranium producer. Within the next three years, eleven mines in the Elliot Lake-Quirke Lake area to the north came into production, the model town of Elliot Lake was established and a road (now Highway 108) connecting the mining camp to Highway 17 was built. Production reached its peak in 1959; a sudden drop in demand for uranium brought closure to five mines in 1960 and three more by 1965. Two mining companies, Denison Mines Limited and Rio Algom Limited, are the current producers.

The following road log to the mining camp is given to enable visitors to identify points of historical interest.

km 0 Junction of highways 17 and 108; proceed north along Highway 108.

20.1 Junction of the road (on right) to the *Nordic Mine* (Rio Algom Limited).

This mine was a producer of uranium, thorium and yttrium from 1957 to 1968. It produced 13 896 582 kg of U_3O_8 and was worked from a shaft sunk to a depth of 642.9 m.

20.9 Junction of road on right to the *Buckles Mine* (Rio Algom Limited). Originally a copper prospect, this mine produced uranium ore in 1958. It was opened by a shaft sunk to a depth of 72.9 m.

27.5 Turn-off (left) to Elliot Lake (business section) and to the Nuclear Museum.

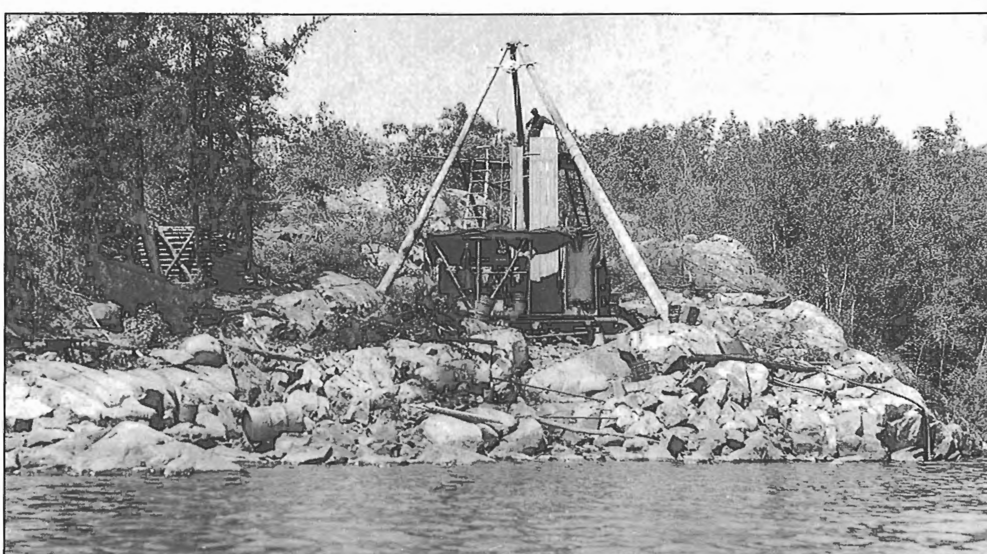


Plate 16

Diamond drilling the Denison property, 1955. (GSC 151012)

28.1 Junction of the road (on right) to Stanleigh, Milliken and Lacnor mines. The *Stanleigh Mine* (Rio Algom Limited) produced 2 215 054 kg U_3O_8 from 1958 to 1960. It was re- opened in 1983, and is serviced by two shafts sunk to depths of 1174.2 m and 1125.5 m. It is 2.5 km from Highway 108. *The Milliken Mine* (Rio Algom Limited) produced 6434 kg U_3O_8 from 1958 to 1964. Underground workings consist of two shafts put down to 936.6 m and 1037 m. The mine is 2.4 km from Highway 108. The *Lacnor Mine* was operated by Northspan Uranium Mines Limited and produced 2 857 977 kg U_3O_8 from 1957 to 1960. It was serviced by two shafts (1117.2 m and 766.5 m). It is 4.3 km from Highway 108.

30.1 *Road-cuts* expose grey compact crystalline limestone containing irregular blotches composed of granular massive red garnet in which small prisms of green vesuvianite are embedded. The rock belongs to the Bruce Formation.

Plate 17

Denison Mine, 1958. (GSC 135111)

36.7 Junction of the road (on right) to the Spanish American, Stanrock and Can-Met mines. *The Spanish American Mine*, formerly operated by Northspan Uranium Mines Limited, produced U_3O_8 for a short time in 1959. Two shafts were sunk, one to 1060.2 m, the other to 964.7 m. The mine is on the west side of Quirke Lake, 6 km from Highway 108. *Stanrock Mine* (Denison Mines Limited) produced yttrium and uranium (5 599 986 kg U_3O_8) between 1958 and 1970. The mine consisted of two shafts (900.7 m and 1030.6 m) and is near the shore of Quirke Lake, 14.8 km from Highway 108. *Can-Met Mine* (Denison Mines Limited) produced 1 127 890 kg U_3O_8 from 1957 to 1960. Development consists of two shafts sunk to 648.7 m and 730.5 m. The mine is on the south side of Quirke Lake, 14.5 km from Highway 108.

39.7 Junction of the road (on right) to the *Denison Mine* (Denison Mines Limited). This mine, a producer of uranium, thorium and yttrium, has been operating since 1961 and is the free world's largest single producer of uranium. Production to 1980 amounted to 37 464 t U_3O_8. The mine is serviced by two shafts sunk to depths of 566 m and 843.6 m. It is on the west side of Quirke Lake, 2.7 km from Highway 108.

40.8 Junction of the road (on right) to the New Quirke and Panel mines. *The New Quirke Mine* also referred to as Quirke No.2 Mine is operated by Rio Algom Limited for uranium and thorium. Production began in 1968. A shaft sunk to 695.4 m services the operation. The mine is 2 km from Highway 108. The *Panel Mine* (Rio Algom Limited), a producer of uranium and thorium, was originally worked in the period 1958-1961 and was re-opened in 1977. It is serviced by two shafts (559.9 m and 381.2 m) sunk in two islands on the north side of Quirke Lake. One of the islands is connected to the mainland by a causeway. In its initial period of operation the mine produced 3 541 554 kg of U_3O_8. It is 7.8 km from Highway 108.

41.3 Junction of Highway 639 leading north. Highway 108 leads east to the *Quirke No 1 Mine* (Rio Algom Limited), a former producer of uranium, thorium and rare earths. It was operated from a shaft (262.6 m) from 1956 to 1961 and from 1967 to 1971. In its initial period of operation, it produced 3 945 371 kg U_3O_8.

Refs.: 45 p.120-133; 193 p.130; 195 p.127-144; 274 p.43-55; 276 p.107-146; 277 p.84-86; 279 p.40-54; 281 p.156-174; 282 p.13-17; 380 p.119-121, 328-330.

Maps (T): 41 J/7 Elliot Lake
41 J/10 Rawhide Lake
(G): 2002 Township 144, District of Algoma, Ontario (O.G.S., 1:15 840)
2113 Township 149, Algoma District (O.G.S., 1:15 840)
2114 Township 150, Algoma District (O.G.S., 1:15 840)

km 134.2 Junction of Highway 108 and Highway 17.

Bi-Ore Mine

CHALCOPYRITE, HEMATITE, PYRITE, BORNITE, CHALCOCITE

In quartz-calcite veins cutting quartzite

Chalcopyrite is associated with specular hematite, pyrite, bornite and chalcocite in a gangue of quartz and calcite.

The mine was originally developed in 1929-1931 by White Lake Mines Limited. The development consisted of two adits driven 317.2 m and 417.2 m, and some trenches. The deposit was brought into production in 1947 by Bi-Ore Mines Limited and produced 746 127 kg of copper. Operations closed in 1949 and the mill was destroyed by a fire in 1950. The mine is on the south side of Cobre Lake.

Road log from Highway 17 at km **134.2:**

km	0	Junction of highways 17 and 108; proceed onto Highway 108.
	41.3	Junction of highways 639 and 108; proceed along Highway 639.
	62.5	Junction of the road to Cobre Lake; turn right. (This junction is 2.3 km south of the junction of highways 639 and 546.)
	62.7	Junction; turn right.
	63.7	Mine.

Refs.: 152 p.10; 299 p.70-71.

Maps: (T): 41 J/10 Rawhide Lake
(G): P610 Township 1A, District of Algoma (O.G.S., 1:15 840)

km 140.5 Spragge, at the turn-off (left) to Pater Mine.

Pater Mine

CHALCOPYRITE, PYRRHOTITE, PYRITE, SIDEROTIL, ILMENITE

In brecciated quartz veins in shear zone in metamorphosed volcanic rocks

Chalcopyrite, pyrrhotite and pyrite occur as disseminated grains and small granular masses surrounding quartz fragments in the conglomerate-like host rock. Siderotil occurs as white botryoidal coatings on rusty weathered sulphide-bearing rocks. Black nodules of ilmenite occur in sericite schist.

This deposit was originally prospected in about 1900 by a few pits. Initial underground development was done by Pater Uranium Mines Limited from 1954 to 1957. Rio Algom Mines Limited brought the mine into production in 1961 and continued operations until 1970 when the mine was closed. Production to the end of 1968 amounted to 31 709 118 kg of copper from 1 814 563 t of ore milled. The underground workings reached a depth of 1223 m.

The mine is on the south side of Highway 17 at **km 140.5** in Spragge.

Refs.: 254 p.299; 277 p.90-94; 299 p.65.

Maps (T): 41 J/2 Algoma
(G): 2186 Long and Spragge Townships and Part of Indian Reserve No. 7, Algoma District (O.G.S., 1:31 680)

km 145.8 Junction of Pronto Road.

Pronto Mine

The Pronto Mine is the discovery locality of the Elliot Lake-Blind River uranium deposits. The discovery claims which were staked by Karl Gunterman and Aime Breton were developed by Pronto Uranium Mines Limited. This was the first of the uranium mines to come into production. Total production from the start in 1955 until closure in 1960 was 2 103 657 kg U3O8. After the mine was closed, the mill was used to treat copper ore from the nearby Pater Mine and from other copper mines in the area.

The mineralization in this deposit is typical of the Elliot lake uranium deposits which are described on pages 38 to 41.

The dumps at the mine site provide specimens of sulphide minerals (chalcopyrite, pyrite and pyrrhotite) partly coated with rozenite and goethite. 'Micro' platy aggregates of lustrous black covellite occur on the goethite-stained specimens.

Road log from Highway 17 at **km 145.8**:

km	0	Proceed onto Pronto Road.
	1.25	Junction; turn right.
	1.35	Junction; turn right.
	1.6	Junction; continue straight ahead.
	3.0	Mine.

Refs.: 277 p.74-86; 282 p.36.

Maps (T): 41 J/2 Algoma
(G): 2186 Long and Spragge Townships and part of Indian Reserve No.7, Algoma District (O.G.S., 1:31 680)

Jasper Conglomerate Occurrences, Highway 546

JASPER CONGLOMERATE

Pebbles of brownish red jasper occur in a cream-white quartzite matrix producing an attractive ornamental stone. The pebbles are round to oval in shape and measure about 3 cm in diameter.

Specimens are available along Highway 546 at points 10.1 km and 16.1 km from its junction with Highway 639. At the occurrence at 10.1 km, boulders are found in talus on the north side of the highway and along the White River. The occurrence at km 16.1 is a cliff-side quartzite exposure in which a band of jasper conglomerate is exposed. Broken blocks of conglomerate are found at the base of the cliff. These occurrences are 50.4 km and 56.3 km respectively from the junction of Highway 17 and Highway 546 at Iron Bridge.

Maps (T): 41 J/10 Rawhide Lake
(G): 2347 Nicholas and Raimbault Townships, Algoma District (O.G.S., 1:31 680)

km 192.0 Iron Bridge, at the junction of Highway 546.

Glagoma Mine

CHALCOPYRITE, HEMATITE

In a quartz carbonate vein in gabbro

Chalcopyrite occurs as irregular masses in a gangue composed of quartz, dolomite and calcite. Hematite is associated with chalcopyrite. Malachite occurs as patchy coatings on chalcopyrite. Patches of colourless transparent calcite occurring in the vein fluoresce bright pink in 'short' ultraviolet light.

The deposit was originally worked from 1916 to 1918 by Sudbury Copper Company Limited. Two shafts were sunk, the main shaft to a depth of 76.3 m. Production of copper amounted to 808.6 kg valued at $468. In 1951 the deposit was investigated by diamond drilling by Glagoma Copper Mines Limited. In 1962 Aurora Quarrying Limited leased the property and drove an adit 45.7 m into the vein; the company produced about 145 t of copper ore which was treated at the Pronto Mill.

Road log from Iron Bridge:

km	0	Junction of Highway 17 and Chiblow Lake Road. This junction is 0.4 km east of the junction of Highway 546 and Highway 17. Proceed north along the Chiblow Lake Road.
	1.1	Junction; turn right continuing along the Chiblow Lake Road.
	2.2	Junction; turn left (north).
	2.3	Junction of a single-lane road on left. Proceed 175 m along this road crossing a meadow to the mine at the ridge.

Refs.: 275 p.53-55; 299 p.25.

Maps (T): 41 J/6 Iron Bridge
2012 Iron Bridge area, District of Algoma, Ontario (O.G.S., 1:31 680)

km	**192.0**	Iron Bridge, at the junction of Highway 546. The jasper conglomerate occurrences on Highway 546 (see page 43) may be reached from this junction.
km	**197.0**	*Road-cuts* expose conglomerate of the Gowganda Formation. The rock consists of pebbles of red granite and jasper in a dense, fine-grained greywacke matrix.
km	**199.6**	*Road-cut* exposes red granite in which a brecciated quartz- carbonate vein contains masses of chalcopyrite measuring several centimetres in length. Specular hematite, malachite and goethite are also present. Slender crystals of quartz occur in small cavities in massive quartz. Coarse cleavable masses of pink calcite fluoresce deep pink in 'short' ultraviolet light.
km	**201.3**	*Road cuts* expose Gowganda conglomerate similar to the exposure in the road-cut at **km 197.0**. Boulders of jasper conglomerate of the Lorrain Formation occur in a gravel pit on the north side of the highway.
km	**220.0**	Thessalon, at the junction Highway 129. This highway leads to the Gould and Cheney mines.

Cheney Mine

CHALCOPYRITE, HEMATITE, PYRITE, COVELLITE, SPIONKOPITE, MALACHITE, BROCHANTITE, CALCITE, ANKERITE, GOETHITE, EPIDOTE, CHLORITE, BARITE

In a quartz vein in conglomerate of the Gowganda Formation

Massive chalcopyrite occurs with massive and botryoidal hematite and minor pyrite in quartz. Covellite occurs as lustrous black platy aggregates in chalcopyrite. Spionkopite occurs as dark grey to black, flaky aggregates with a distinct blue and green iridescence; it is associated with chalcopyrite, malachite and brochanite on quartz. Calcite, brown-weathering ankerite and goethite occur in the quartz. Cavities in quartz are lined with small crystals of quartz. Epidote occurs as small granular patches in chlorite aggregates in quartz. A band of barite in quartz was encountered in one of the pits.

The deposit was opened in 1916 by Cheney Copper Mines Limited. The work consisted of trenches, pits and a shaft sunk to 21.3 m. Production amounted to 15 161 kg of copper valued at $564. In 1928-1929 Sudbury Basin Mines Limited deepened the shaft to 45.7 m. In 1966-1967 about 3175 t of ore material were shipped for treatment.

The mine is located along Highway 129 opposite Chub Lake.

Road log from Highway 17 at Thessalon:

km	0	Junction of highways 129 and 17; proceed onto Highway 129.
	31.5	Junction of Highway 554; continue along Highway 129.

Plate 18

Cheney Mine, 1928. (National Archives Canada PA-14605)

35.4	*Road-cuts* expose Gowganda conglomerate consisting of pebbles of granite, gneiss, diabase, chert and jasper in fine- grained black greywacke. The rock formation is exposed by intermittent road-cuts for the next 25 km.
43.6	Mine on left.

Ref.: 78 p.36-37; 224 p.10-15; 299 p.26-27.

Maps: (T): 41 J/11 Wakomata Lake
(G): 2331 Saunders Lake, Algoma District (O.G.S., 1:31 680)

Gould Mine

CHALCOPYRITE, CHALCOCITE, HEMATITE

In a quartz vein in Gowganda conglomerate and sandstone

Irregular masses of chalcopyrite, chalcocite and specular hematite occur in quartz.

The property was originally explored by open cuts in 1966-1967 by G. Poirier. In 1968 Gould Coppermine Limited continued the surface work and drove an adit 61 m into the side of a hill. A plant was installed in 1971 but there was no production.

Road log from Highway 17 at Thessalon:

km	0	Junction of highways 17 and 129; proceed onto Highway 129.
	43.6	Cheney Mine; continue along the highway.
	47.8	Junction of the mine road on left. Proceed west along this road.
	49.2	Mine.

Refs.: 78 p.34-35; 299 p.28.

Maps (T): 41 J/11 Wakomata Lake
(G): 2331 Saunders Lake, Algoma District (O.G.S., 1:31 680)

km	**223.5**	*Gravel pit* on right. Boulders of jasper conglomerate of the Lorrain Formation are found in this gravel pit and in others in the area.
km	**239.6**	Junction of Highway 561.

Havilah Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE

In quartz carbonate veins cutting diabase

The deposit consisted of native gold, pyrite and chalcopyrite in quartz. The quartz vein was reported to be rich in native gold.

A gold-bearing vein was discovered on this property in 1889 by William Moor. The property became known at that time as the Ophir Location. It was opened in 1892 by the Ophir Gold Mining Company. Two shafts were sunk to depths of 27.5 m and 32 m, and a 20-stamp mill was built. The ore gave assay values of silver and gold, but a financial depression in 1893 discouraged further activity. In 1909 the Havilah Gold Mining Company resumed mining operations and recorded production of 32 036 g of gold and 6656 g of silver valued at $26 535.

The mine is near the south end of Ickta Lake.

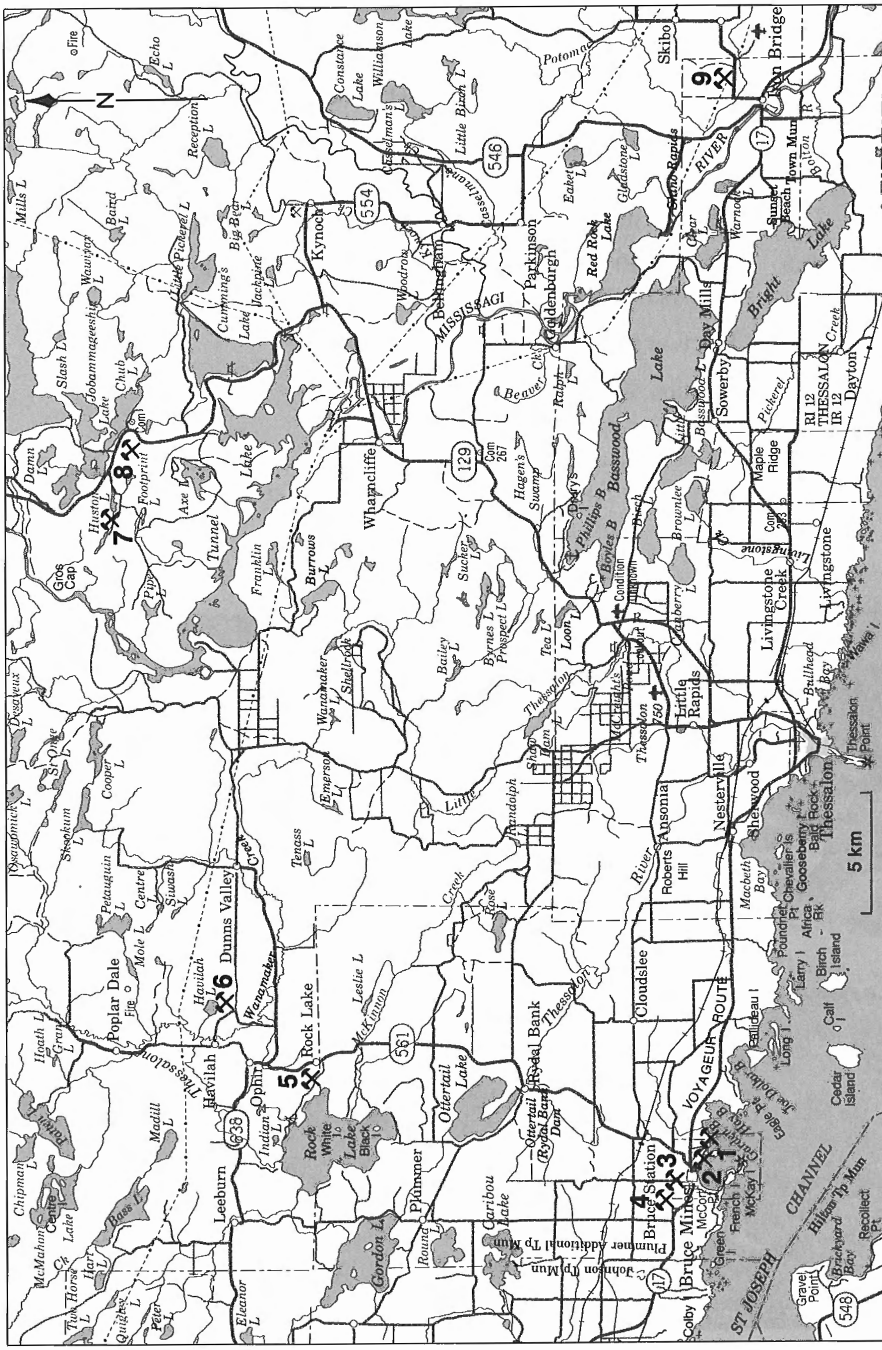
Road log from Highway 17:

km	0	Junction of highways 17 and 561; proceed north along Highway 561.
	8.5	Junction at Rydal Bank; turn right.
	11.6	*Jasper conglomerate outcrops* on the east side of the road. Boulders of this rock may be found in the gravel pit on the west side of the road.
	19.3	Trail on left leading to the Rock Lake Mine. The description of this mine follows this road log.
	21.6	Junction of Highway 638; turn right.
	23.6	Junction; turn left.

Plate 19

Rock Lake Mine, 1902. (Archives of Ontario, OBM 12)

Part of 41 J


N
5 km
Bruce Mines
Bruce Station
Plummer
Leeburn
Havilah
Ophir
Rock Lake
Poplar Dale
Dunns Valley
Rydal Bank
Cloudslee
Roberts Hill
Ansonia
Nesterville
Sherwood
Thessalon
Thessalon Point
Little Rapids
Livingstone Creek
Livingstone
Maple Ridge
Sowerby
Day Mills
Dayton
Sunset Beach
Iron Bridge
Skibo
Parkinson
Goldenburgh
Bellingham
Kynoch
Wharncliffe
Gros Cap
Colby
Gordon L
Ottertail Lake
Rock Lake
Basswood Lake
Bright Lake
Tunnel Lake
MISSISSAGI RIVER
VOYAGEUR ROUTE
ST JOSEPH CHANNEL
Plummer Additional Tp Mun
Johnson Tp Mun
Hilton Tp Mun
Town Mun
RI 12 THESSALON IR 12
Cedar Island
Calf I
Long I
Birch Island
Gravel Point
Recollect Pt
Brickyard Bay
Macbeth Bay
17
129
546
554
561
638
548

25.7 Junction; turn left.

26.5 Mine on right.

Refs.: 32 p.40-45; 95 p.110-118; 123 p.18-19.

Maps (T): 41 J/5 Bruce Mines
(G): 1414A Bruce Mines - Lake George Area, District of Algoma, Ontario (G.S.C., 1:50 000)

Rock Lake Mine

CHALCOPYRITE, BORNITE, BROCHANTITE

In a quartz-carbonate vein in a fault zone

Chalcopyrite and bornite occur as irregular masses in quartz and ankerite. Brochantite occurs as partial coatings associated with chalcopyrite. The copper- bearing vein cuts Gowganda greywacke and greywacke conglomerate.

Initial work on the deposit began in 1898 when two adits were driven into the side of a ridge. A shaft was later sunk to a depth of 128 m, a concentrating mill was built and a 21-km railway to Bruce Mines was constructed. The mine was closed in 1903 after producing 690 392 kg of copper.

The mine is located 1.6 km west of Highway 561 at km 19.3. (See road log to the Havilah Mine).

Ref.: 95 p. 126; 130 p. 73; 299 p. 14.

Maps (T): 41 J/5 Bruce Mines
(G): 1414A Bruce Mines-Lake George Area, District of Algoma, Ontario (G.S.C. 1:50 000)

km 240.3 Bruce Mines, at the junction of Cunningham Street.

Bruce Mines Copper Mines

CHALCOPYRITE, BORNITE, COVELLITE, BROCHANTITE, BARITE, SPIONKOPITE, YARROWITE

In quartz veins cutting Nipissing diabase

Massive chalcopyrite and bornite occur in quartz. Covellite occurs as lustrous black platy aggregates on copper-bearing specimens. Brochantite occurs as bluish green to green encrustations associated with the copper ore minerals. Cavities in massive quartz are lined with "micro" quartz crystals. Barite has been reported from the deposit. Spionkopite and yarrowite

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Map 8 (opposite). Bruce Mines-Iron Bridge area.

1-Bruce Mine
2-Taylor Mine
3-Wellington Mine
4-Copper Bay Mine
5-Rock Lake Mine
6-Havilah Mine
7-Gould Mine
8-Cheney Mine
9-Glagoma Mine

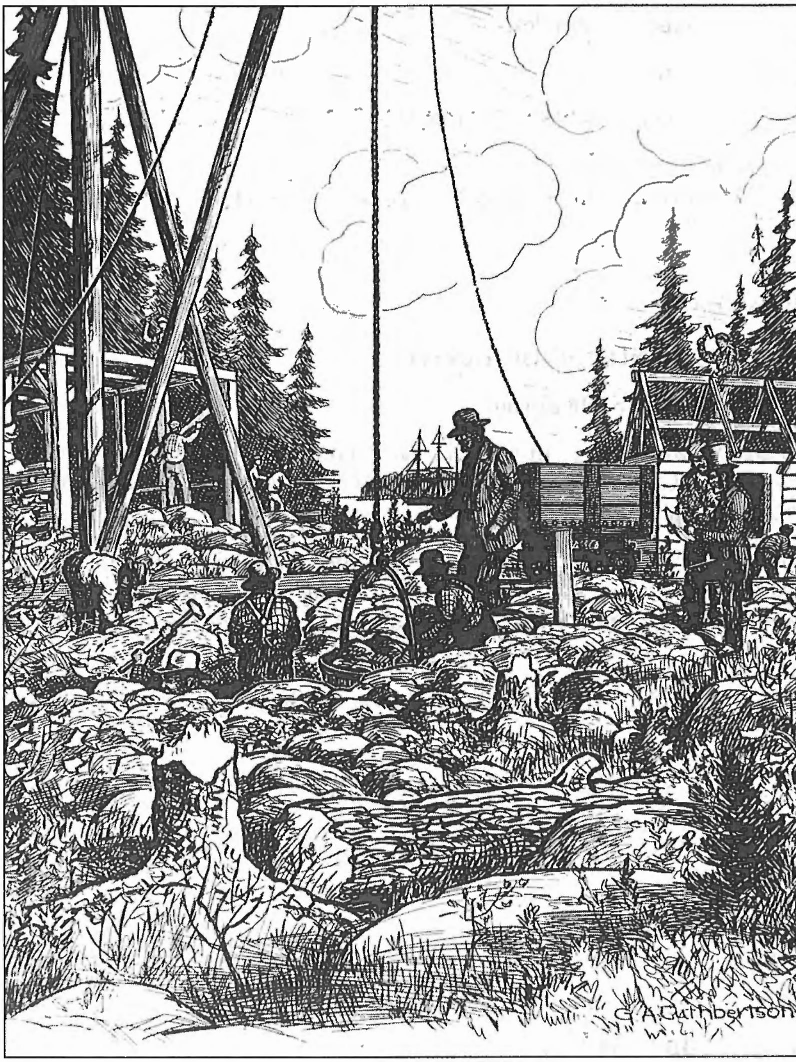


Plate 20

Work begins sinking the Moffat shaft, Bruce Mine, Canada's first copper producer, 1847. (Archives of Ontario S-5652)

occur as black metallic (with green and purple iridescence) flaky aggregates associated with chalcopyrite on quartz.

The copper deposits in the Bruce Mines area were discovered in 1846, the first copper deposits discovered in the region north of Lake Huron. They were worked from 1846 to 1875 and were the world's most important copper producers at that time. Shipments of 43175.4 t of concentrates were made to England, the copper content averaging about 20 per cent. Four mines worked the deposits which extended over a distance of 1830 m in a northwesterly direction from a point about 460 m north of Jacks Island. The mines, from east to west, were the Bruce, Taylor, Wellington and Copper Bay. Most of the production came from the Wellington and Copper Bay mines; ten shafts were sunk, the deepest was 137.2 m. Several shafts and pits were worked in the Bruce and Taylor veins. During this period, the operators of the mines were Montreal Mining Company and West Canada Mining Company. The deposits were worked again in 1898 by Lord Douglas of Hawick, from 1906 to 1907 by Copper Mining and Smelting Company of Ontario Limited, from 1908 to 1909 by Bruce Mines Limited, and from 1915 to 1921 by the Mond Nickel Company. In the final period of operations, siliceous copper ore was mined and shipped to the Mond Nickel Company's smelter in Coniston. In 1921, while mining the old underground workings in the vicinity of the Taylor Mine, miners found old Cornish-type wheelbarrows and miners' tools which are believed to have been used by miners just before the extensive cave-in in 1876.

Specimens of the copper minerals, chalcopyrite, chalcocite and bornite, were included in the Geological Survey of Canada economic minerals exhibit at the Grand Industrial Exhibition in

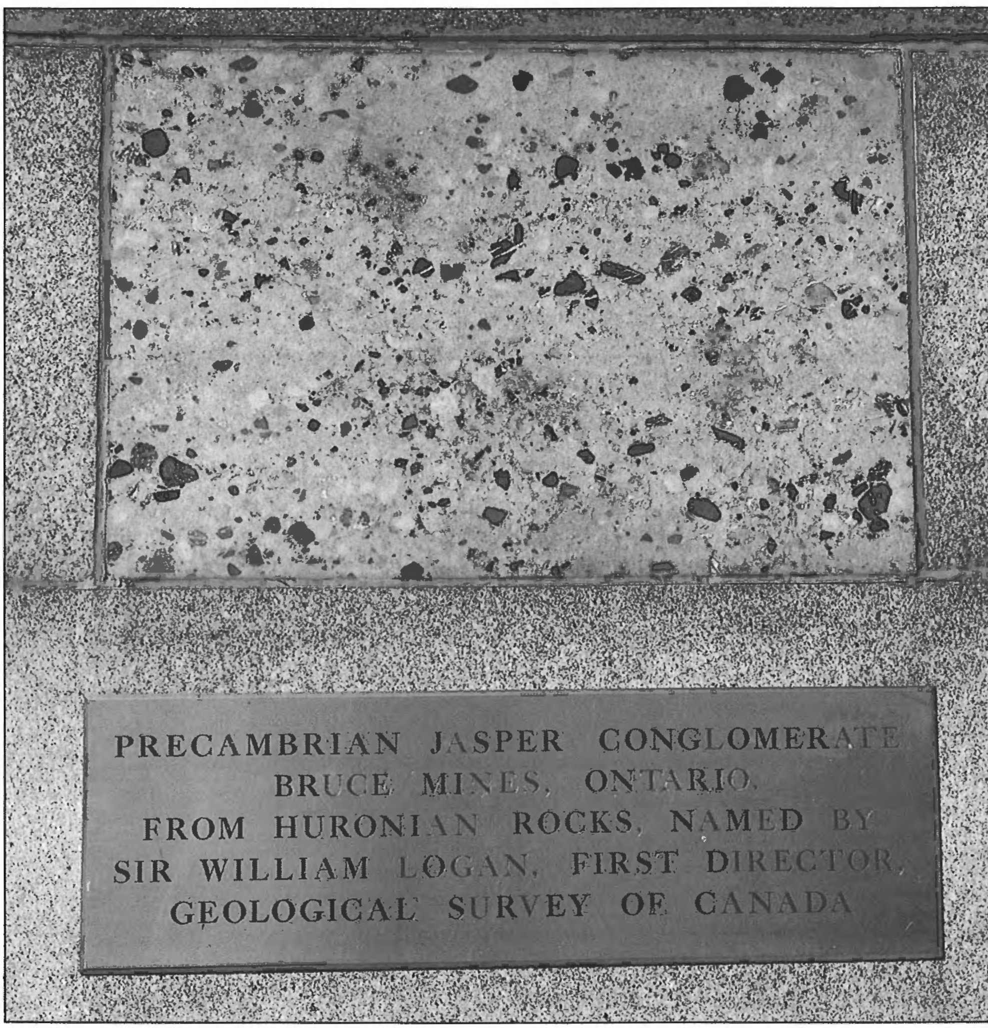


Plate 21

Jasper conglomerate cornerstone, Geological Survey Building, Ottawa. (GSC 163135)

1851 in London, and at subsequent world fairs held in various cities in the last half of the 19th century.

The Taylor and Bruce mines are located along the road leading southeast from Highway 17 in Bruce Mines. This road leaves the highway at a point 100 m west of the junction of highways 17 and 561; the Taylor mine is 150 m from Highway 17, the Bruce Mine is 850 m from Highway 17.

The Wellington and Copper Bay mines are north of Bruce Mines and are reached by proceeding north along Cunningham Street for 850 m from its junction with Highway 17.

Refs.: 98 p.70-71; 99 p.89; 108 p.38-39; 130 p.72-73; 190 p.231-235; 199 p.2; 299 p.53-54; 319 p.73-74; 320 p.77-78.

Maps (T): 41 J/5 Bruce Mines
(G): 1414A Bruce Mines - Lake George Area, District of Algoma, Ontario (G.S.C., 1:50 000)

km **249.6** Junction of the road to Gordon Lake.

Stobie Mine

HEMATITE

In white Lorrain quartzite

Hematite, including the specularite variety, occurs in quartzite veins which measure up to 1.5 m wide.

The mine produced iron ore from 1874 to 1878. The openings consisted of a shaft and an open-cut. The mine is located north of Gordon Lake.

Road log from Highway 17 at **km 249.6**:

km 0 Proceed north onto the road to Gordon Lake.

20.1 The road at this point turns sharply west and a trail leads east. Proceed along this trail for 500 m to the mine on the north side of the trail.

Refs.: 130 p.70; 299 p. 19.

Maps (T): 41 J/5 Bruce Mines
(G): 1414A Bruce Mines - Lake George Area, District of Algoma, Ontario (G.S.C., 1:50 000)

km **253.8** *Road-cuts* expose mauve to purplish Lorrain quartzite.

km **260.1** Junction of Highway 548 to St. Joseph Island.

Jasper Conglomerate Occurrences

Jasper conglomerate of the Lorrain Formation, an attractive ornamental stone, occurs in localities in this area and eastward to Bruce Mines. The conglomerate, also referred to as puddingstone, was first recorded by John Bigsby, a medical doctor and naturalist, while he was a member of a party surveying the northwest portion of Lake Huron in 1820. The jasper pebbles are various shades of red and brown grading to black, and banded in various shades of these colours. They are generally oval-shaped and average 2 to 5 cm long. They are embedded in a matrix of milky white quartzite which strikingly sets off the richly coloured pebbles. The rock takes an excellent polish. A polished slab of it constitutes the cornerstone of the Geological Survey of Canada building in Ottawa. The rock was displayed in various forms at several international exhibitions: boulders and a specimen intended for a vase at the London International Exhibition, 1862; rough specimens at Exposition universelle in Paris, 1867; rough specimens, a polished block and a vase (made in Paris) at the Philadelphia International Exhibition, 1876 and at the Exposition universelle in Paris, 1878; and a polished pedestal at the Colonial and Indian Exhibition in London, 1886.

The rock is exposed in several places along the north shore of Lake Huron and in the Bruce Mines – Lake George area. Some occurrences have been noted in the preceding text. Most gravel pits in the area furnish boulders of the rock. The shoreline of St. Joseph Island and adjacent islands are good collecting localities for pebbles and boulders of this rock.

Road log to St. Joseph Island:

km	0	Proceed south along Highway 548 from its junction with Highway 17.
	4.0	*Quarry*, on left, exposes red quartzite of the Lorrain Formation.
	4.6	*Quarry*, on left, exposes Ordovician limestone containing bryozoan and crinoid fossils. Dolomite crystals line cavities (about 2 cm across) in the limestone.
	5.5	Junction of the road to Richards Landing; turn right.
	12.0	Richards Landing and access to the shore of St. Joseph Island.

Refs.: 27 p. 254-272; 130 p. 52-53; 153 p. 117; 201 p. 71; 358 p. 57; 359 p. 133; 360 p. 162.

Maps (T): 41 J Blind River
41 K Sault Ste. Marie
(G): 1414A Bruce Mines – Lake George Area, District of Algoma, Ontario (G.S.C., 1:50 000)
2108 Sault Ste. Marie – Elliot Lake Sheet, Algoma, Manitoulin and Sudbury Districts (O.G.S., 1:250 000)

km 280.5 Echo Bay, at the junction of Highway 638.

km 287.0 Garden River, at the junction of a road leading north.

Jardun Mine

CHALCOPYRITE, GALENA, PYRITE, SPHALERITE, HEMATITE, BORNITE, CHALCOCITE, COVELLITE, ARSENOPYRITE, MAGNETITE, NATIVE SILVER, ARGENTITE, BARITE, FLUORITE, EPIDOTE

In shear zones in granite and amphibolite

Euhedral crystals of chalcopyrite have been obtained from this deposit, formerly known as the Victoria and Cascade mines. Chalcopyrite occurs with other sulphide minerals and with specular hematite, magnetite and native silver in quartz- carbonate gangue. Barite, fluorite and epidote have also been reported. The mineralized zone extends about 1.6 km in a north-south direction.

The deposit was discovered about 1870 and was originally worked from 1875 to 1885. Four shafts, the deepest being 140.3 m, and an adit comprised the mine. The operators were Victoria Consolidated Silver Mining Company Limited and Cascade Mines Limited. About 816 t of ore were shipped. From 1951 to 1957 Jardun Mines Limited extended the underground development and installed a mill. The mine produced lead (4 519 786 kg), zinc (3 218 770 kg), copper (31 484 kg), silver (6 766 115 g) and gold (3297 g) for a total value of $2 634 476.

Access to the deposit in by a 13-km road leading north from Garden River at **km 287.0**. The mining area extends from Sandy Lake to Weashkog Lake.

Refs: 130 p. 70; 299 p. 32-33.

Maps (T): 41 K/9 Sault Ste. Marie
(G): 1412A Sault Ste. Marie – Ile Parisienne Area, District of Algoma, Ontario, (G.S.C., 1:50 000)

km 303.2 Sault Ste. Marie, at the junction of Highway 17B.

SECTION 2
SAULT STE. MARIE TO THUNDER BAY

km **0** Sault Ste. Marie, at the junction of Highway 17 (Second Line) and Highway 17 B (Great Northern Road); proceed north along Highway 17.

km **13.5** Junction of Highway 556.

Breitung (Loon Lake) Mine

HEMATITE

In a fault zone in Gowganda argillite and conglomerate

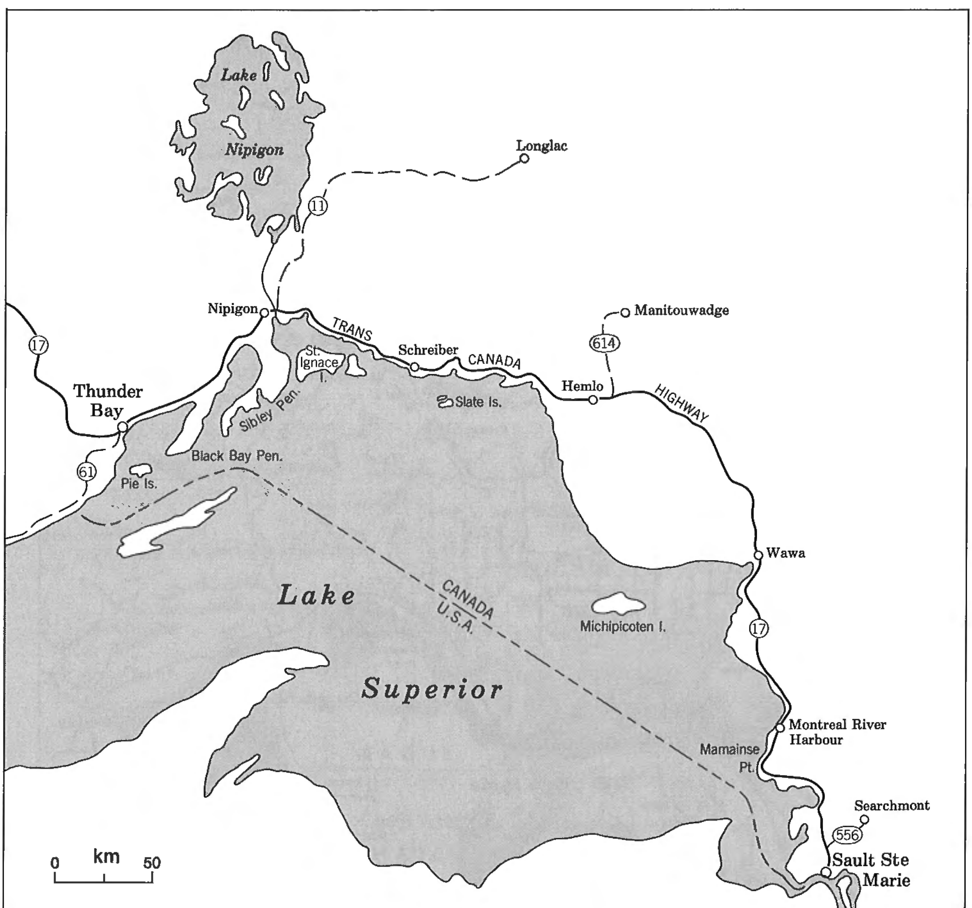


Figure 3. Map showing collecting area: Section 2.

Specular hematite occurs as disseminated grains and irregular lenses in quartz veins which cut brecciated argillite and conglomerate.

Development of the deposit began in 1900 by Breitung Iron Company which raised a small quantity of ore. From 1904 to 1905, Loon Lake Iron Company extended the underground development, built a power plant and crusher, and completed a 2.8-km railway spur connecting the mine to Northland station on the Algoma Central Railway. Between 1814 t and 2721.5 t of ore were shipped.

Part of 41 K

Map 9. Sault Ste. Marie area.

1-Bellevue quarry
2-Breitung Mine
3-Goulais River Mine
4-Haviland Beach occurrence

The mine is on the steep slope of a 91-m hill on the western shore of Northland (formerly Loon) Lake. It consists of two adits (40.2 m and 90.9 m long) located 24.5 m and 47.3 m above the lake, and an open pit and shaft (53.4 m deep) further up at 61 m above the lake. The richer pockets of ore occurred in the shaft area.

Road log from Highway 17 at **km 13.5**:

km	0	Junction of Highways 17 and 556; proceed onto Highway 556.
	4.4	Junction of Highway 552; continue along Highway 556.
	12.3	Turn off to *Bellevue silica quarry* on left across the railway. Pink to grey quartzite of the Lorrain Formation was formerly quarried for the manufacture of silica brick at the Algoma Steel Corporation plant.
	16.4	Junction of the road to Northland Lake; turn right.
	20.2	Mine on slope on right.

Refs.: 51 p. 31; 64 p. 263; 65 p. 75-76; 130 p. 70; 138 p. 20; 166 p. 8; 298 p. 21-22.

Maps (T): 41 K/9 Sault Ste. Marie
(G): 1412A Sault Ste. Marie – Ile Parisienne Area, District of Algoma, Ontario (G.S.C., 1: 50 000)

km **28.1** Junction of the road to Buttermilk Hill.

Goulais River Mine

GALENA, TETRAHEDRITE, PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, HEMATITE, GOETHITE, ANGLESITE, CERUSSITE

In a vein in shear zone at the contact of Nipissing gabbro and Gowganda argillite

Argentiferous galena and tetrahedrite are the principal constituents of the vein. The galena occurs as coarse, cleavable masses. Minor constituents are pyrite, chalcopyrite, brown sphalerite and pyrrhotite. Hematite and goethite form crusts on galena. Other minerals associated with the deposit are: anglesite, as colourless transparent crystals and as banded green and white crusts on galena; and cerussite, as white powdery coatings on galena, as colourless transparent prisms and as green vitreous patches on galena.

The high grade argentiferous galena vein was discovered in 1973 by Tribag Mining Company Limited as a result of a diamond drilling program. In 1975 Prace Mining Limited opened a trench and removed about 181 t of hand-sorted galena. Further development consisted of a decline to a depth of 30.5 m. A mill was built on the site and 102 t of lead-silver concentrates were produced. Operations closed in 1982. The mine is located south of Robertson Lake.

Road log from Highway 17 at **km 28.1**:

km	0	Junction of Highway 17 and the road to Buttermilk Hill; proceed onto the Buttermilk Hill road.
	0.5	Junction; turn right onto Robertson Lake Road.
	1.7	Junction; continue straight ahead.
	4.5	Junction; follow the road on left.

6.6 Junction; follow the road on right. This road crosses Robertson Creek.

7.2 Junction; follow the road on right. (The road on left leads along the south shore of Robertson Lake).

9.5 Mine, at the side of the crest of a hill.

The old *Goulais River Copper prospect* is located about 800 m south of this mine. About 1902 a shaft was sunk into a quartz vein carrying chalcopyrite. The vein occurs in schist.

Refs.: 24 p. 142; 25 p. 99; 299 p. 105.

Maps (T): 41 K/16 Searchmont
(G): 2419 Sault Ste. Marie – Elliot Lake Sheet, Algoma, Manitoulin and Sudbury Districts (O.G.S., 1: 253 440)

km **37.5** Junction of the road to Havilland Bay.

Havilland Beach Occurrence

AGATES, JASPER

As pebbles along the shoreline

Agate and jasper pebbles are found sparingly along the shores of small bays indenting Batchawana Bay. Highway 17 follows the shore for the next 30 km.

Maps (T): 41 K/16 Searchmont
41 K/15 Pancake Bay
(G): 2419 Sault Ste. Marie – Elliot Lake, Algoma, Manitoulin and Sudbury Districts (O.G.S., 1: 253 440)

km **50.5** *Road-cut* exposes epidote as fracture-fillings in granitic rock.

km **52.8** Bridge over Chippewa (Harmony) River. Chippewa Falls is on the north side of the highway.

km **62.1** Junction of Tribag Mine Road.

Tribag Mine

CHALCOPYRITE, PYRITE, PYRRHOTITE, MOLYBDENITE, SPHALERITE, GALENA, HEMATITE, ANHYDRITE, VOLTAITE, CROCOITE, SERPENTINE, CALCITE, QUARTZ CRYSTALS, K-FELDSPAR, LAUMONTITE, CHLORITE, FLUORITE, SCHEELITE, WOLFRAMITE, STIBNITE, NATIVE COPPER

In breccia near the contact of greenstone and granitic rocks

Massive chalcopyrite and pyrite occur with minor pyrrhotite, molybdenite, sphalerite, galena and hematite in a gangue consisting of quartz and calcite. Pyrite occurs as cubes measuring up to 3 cm along an edge. Anhydrite occurs as small white botryoidal aggregates on the ore minerals. Dark green to black, vitreous, tiny disc-like aggregates of voltaite occur in anhydrite. Bright yellow, powdery crocoite coats pyrite. Serpentine forms greyish white matted encrustations on the ore minerals. Calcite is generally white to pink, massive, and fluoresces red in ultraviolet light (long wave); it also occurs as transparent crystals (Iceland spar) containing minute chalcopyrite and pyrite crystals. Colourless crystals of quartz measuring up to 5 cm in diameter occur in a quartz-calcite matrix; some crystals are partially coated with small crystals of pink K-feldspar. Pink laumontite, chlorite and green and violet fluorite are associated with calcite and quartz. Scheelite, wolframite, stibnite and native copper have been reported (Ref. 136).

The deposit was worked for copper from 1967 to 1975. Three mineralized zones were developed. A shaft was put down 381.5 m in the main ore zone with underground development extending to the other zones. A mill operated on the site. Production amounted to about 14 959 267 kg of copper and 981 922 g of silver. The original operator (1967 to 1972) was Tribag Mining Company Limited. From 1973 until the mine was closed in 1975 Prace Mining Limited carried out mining operations.

Road log from Highway 17 at **km 62.1**:

km	0	Junction; proceed north onto Tribag Mine Road.
	28.6	Junction; follow the road on left.
	29.3	Gate to the mine property.
	31.7	Mine.

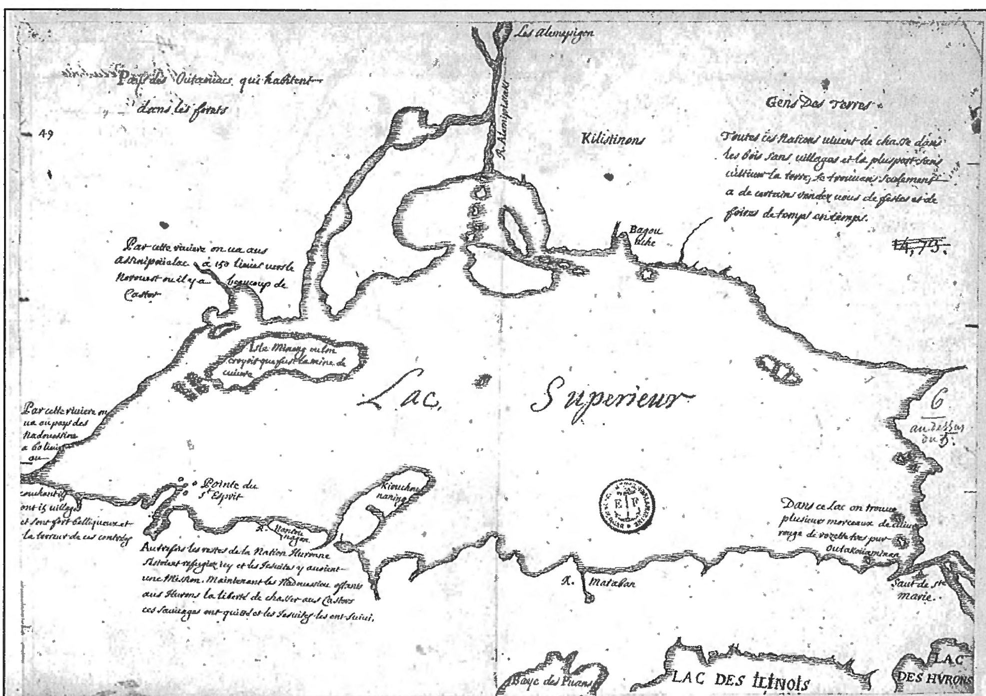


Plate 22

Map of Lake Superior by Claude Bernou, 1680. Notes on the map refer to a copper mine on Isle Minong (St. Ignace Island) and to the occurrence of 'red copper rosettes' (native copper) in the lake. (National Archives, Canada NMC-10335). Courtesy Service des Archives et des bibliotheques de la Marine, France (recueil 67, carte 49).

Map 10. Batchawana-Montreal River area.

1-Copper Creek Mine
2-Indian Diggings
3-Silver Creek Mine
4-Mammoth Vulcan occurrence
5-Tribag Mine
6-Mamainse Mine
7-Pointe aux Mines
8-Theano Point uranium occurrence
9-Ranwick Mine

Refs.: 31 p. 71-75; 136 p. 78-79; 299 p. 80; 367 p. 333; 368 p. 358; 370 p. 374; 371 p. 338; 372 p. 242.

Maps (T): 41 N/2 Mamainse Point
(G): 2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km 66.0 Junction of Highway 563.

km 66.6 Junction of the road to the garbage disposal area.

Mammoth-Vulcan Occurrence

HEMATITE, MAGNETITE, PYRITE, CALCITE, GLAUCONITE-CELADONITE, MICA, QUARTZ CRYSTALS, EPIDOTE

Iron formation in metasediments and metavolcanics

Specular hematite and magnetite occur as finely granular bands in a jasper iron formation. Cubes of pyrite, measuring about 2 cm along an edge, occur in the ore. White calcite which fluoresces red in ultraviolet light is associated with layers of a yellow green to dark green, granular to botryoidal alteration product consisting of mica and glauconite or celadonite in which drusy cavities are lined with "micro" quartz crystals. Stringers of epidote and jasper occur in the hematite-magnetite ore.

The deposit was discovered in 1865 by provincial Land Surveyor Hugh Wilson while he was engaged in surveying Palmer Township. It is exposed by several pits.

Road log from Highway 17 at **km 66.6**:

km	0	Junction; proceed north onto the road to the garbage disposal area.
	1.9	Junction; follow road on left.
	2.1	Junction; follow road on left.
	4.0	Junction; continue straight ahead.
	8.4	Junction; follow road on left.
	12.1	Junction; follow road on left.
	15.4	Pits.

Refs.: 223 p. 78-80; 298 p. 51-52.

Maps (T): 41 N/2 Mamainse Point
(G): 2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km 74.2 Turn-off to Pancake Bay Provincial Park.

Road-cuts, km 77 to km 98

CHALCEDONY, JASPER, NATIVE COPPER, STILBITE, HEULANDITE, LAUMONTITE, PREHNITE, CHLORITE, CALCITE, CLINOPYROXENE, HEMATITE, MAGNETITE

In amygdaloidal basalt of the Keweenawan Formation

Chalcedony including several varieties of agate and jasper, occur in amygdules (averaging about 2 cm in diameter) in basalt exposures along the highway. A specimen of native copper weighing about 67 kg was found at **km 83** in 1936 during construction of the highway. The zeolites, stilbite, heulandite, laumontite and prehnite, occur with chlorite and calcite in amygdules. The calcite fluoresces pink in ultraviolet light. White platy clinopyroxene and nodules of hematite and magnetite also occur in the cavities. The basalt exposures extend from about **km 77.0** to **km 98.0**. At **km 84.6**, a road-cut exposes conglomerate composed of pebbles cemented by calcite, quartz and feldspar. The calcite fluoresces pink in ultraviolet light. Exposures of these rocks may also be seen along the adjacent shoreline of Lake Superior.

Ref.: 332 p. 4.

Maps (T): 41 K/15 Pancake Bay
41 N/2 Mamainse Point
(G): 2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km **83.0** Turn-off to Coppermine Point.

Coppermine Point (Roussainville) Occurrence

CHALCOCITE, NATIVE COPPER

In conglomerate

Two shafts were sunk in a copper-bearing vein at Coppermine Point by Silver Islet Consolidated Mining and Lands Company between 1882 and 1884. The shafts were 19.8 m and 26.5 m deep. The copper ore was disappointing, with a grade of less than one per cent. At that time a fishing station known as Roussainville, headquarters of Captain John Roussainville, existed at this location. A lump of native copper was found on a small island off Roussainville by the captain of a steamer which regularly visited fishing posts along the eastern shore of Lake Superior.

Refs.: 32 p. 73-75; 299 p. 44-45.

Maps (T): 41 K/15 Pancake Bay
(G): 2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km **87.2** Junction of the road to Copper Creek Mine.

Copper Creek Mine

CHALCOCITE, BORNITE, CHALCOPYRITE, NATIVE COPPER, HEMATITE, NATIVE SILVER

In quartz-calcite veins cutting basalt and conglomerate of the Keweenawan Formation

Chalcocite, the principal ore mineral is associated with minor bornite, chalcopyrite and native copper. Specular hematite is common in the veins. The minerals occur in quartz-calcite veins and in the host amygdaloidal basalt and conglomerate. Specimens of native copper may be found on the dumps.

Native copper is believed to have been originally obtained from pits on this property by Prehistoric Indians. In 1856 the Montreal Mining Company acquired the property, then known as the Sand Bay Location, from the Crown for forty cents an acre and explored it for copper until 1857. The company sank five shafts varying in depth from 4.3 m to 18.1 m in veins 400 m northeast of Hibbard Bay which at that time was known as Sand Bay. The deepest shaft (No. 1 shaft) was sunk in a vein where the first Indian digging was located. This vein yielded a 271.8-kg (600 pound) mass of native copper and several smaller pieces, with a total weight of 362.4 kg (800 pounds). These rich pockets were found to be only surface features and the exploration was abandoned. Native silver was also found in the veins. From 1882 to 1884 Silver Islet Company explored the deposit for silver which was found, but in uneconomic quantity. Although the company located a vein (No. 11) rich in copper, it did not continue exploration. The next mining venture was by Canada Lands Purchase Company in 1891-1892. Following encouraging drilling results, the company sank a shaft to 93.9 m in No. 10 vein at Copper Creek, 2.4 km from Hibbard Bay. The mineralization zone was traced by pits and trenches for 2 km north and 518 m south of the shaft. There was no production. In 1955 Copper Corp Limited undertook development by sinking a shaft to 167.7 m. Vauze Mines Limited brought the mine into production and produced 10 956 518 kg of copper from 1965 to 1969. The mine was closed in 1972.

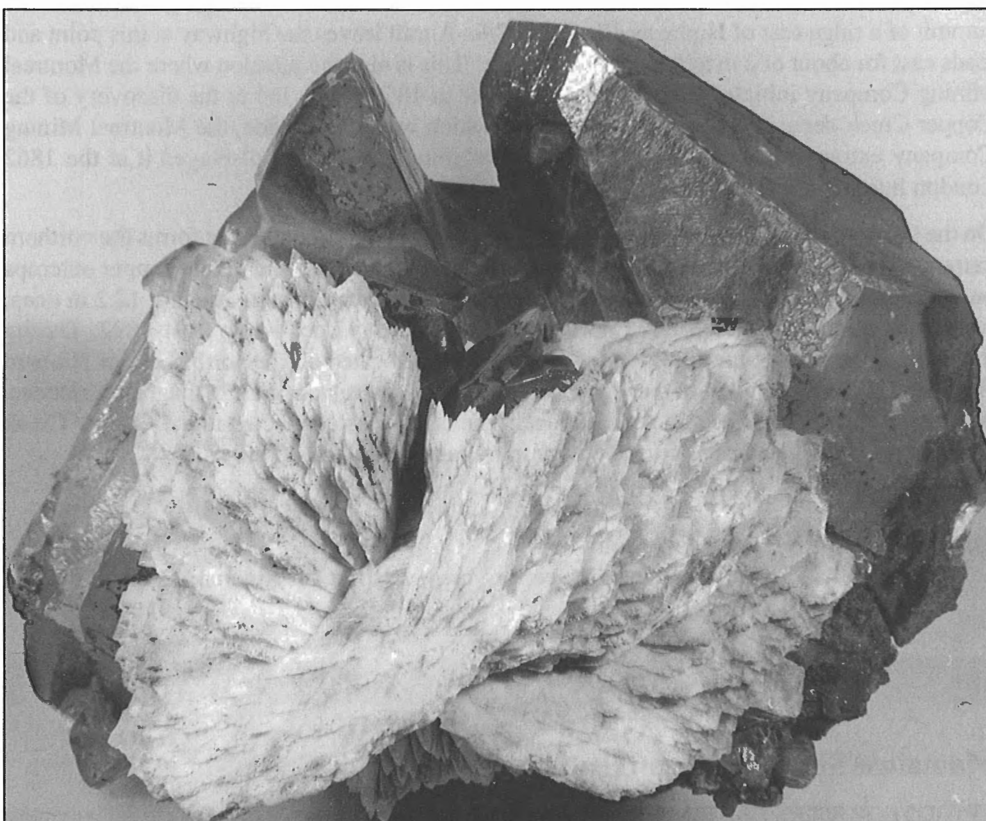


Plate 23

Barite with calcite crystals, Copper Creek Mine. (GSC 203376-T)

A road, 2 km long, leads to the mine from Highway 17 at **km 87.2.**

Refs.: 32 p. 64-75; 136 p. 77-78; 223 p. 82-84; 299 p. 45-46; 332 p. 19-23; 371 p. 96-97.

Maps (T): 41 N/2 Mamainse Point
(G): 1953-1 Mamainse Point copper area, District of Algoma, Ontario (O.G.S., 1: 12 000)
2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km 87.6 Junction of a trail on right.

Indian Diggings, Mineral Point Occurrence

The Indian Diggings are shallow pits excavated along veins by Indians in about 1620, before the arrival of European explorers. The excavations were made for native copper which occurred as plates and in arborescent form in quartz-carbonate veins cutting basalt and sediments. Stone hammers measuring 12 cm to 30 cm long were found in vein debris at these excavations. In his visit to the Mamainse area in 1798, explorer David Thompson met Indians who related to him that their grandfathers obtained pure copper from a location up a path a few miles from the shore. The copper was used as heads for lances, arrows, axes, knives and other functional implements. Their source of the copper is believed to be the Indian Diggings located at the summit of a ridge east of Highway 17 at **km 87.6.** A trail leaves the highway at this point and leads east for about 600 m to the top of the ridge. This is also the location where the Montreal Mining Company initiated exploration for copper in 1856 which led to the discovery of the Copper Creek deposit. From one of the veins which was 15 cm wide, the Montreal Mining Company extracted a sheet of native copper weighing 204 kg and displayed it at the 1862 London International Exhibition.

On the shore of Lake Superior, about 500 m west of **km 87.6,** Mineral Point forms the northern extremity of Hibbard Bay. A vein, 6 m wide, carrying chalcocite and native copper outcrops on the shore of Mineral Point. The vein is in conglomerate and basalt. A shaft, 12.2 m deep, was put down in the vein during exploration of the Sand Bay Location in 1891-1892. During this time the camp-site for the Copper Creek Mine was located on the north shore of Hibbard Bay about 100 m southwest of the highway at **km 87.6**; it consisted of the manager's residence, boarding houses, an office and a warehouse. The camp was connected to the Copper Creek Mine by a road which was also used during more recent mining operations.

Refs.: 32 p. 63-80; 358 p. 17-18.

Maps (T): 41 N/2 Mamainse Point
(G): 1953-1 Mamainse Point copper area, District of Algoma, Ontario (O.G.S., 1: 63 360)

km 89.3 Turn-off to Mamainse Point.

Mamainse Shoreline Occurrence

EPIDOTE, MESOLITE, HEMATITE, GROSSULAR

In basalt

Epidote and mesolite occur with specular hematite and quartz in cavities in basalt. Minute dodecahedral crystals of grossular garnet (cinnamon-stone) have been reported to occur with epidote. The basalt containing these minerals is exposed along the shoreline near Mamainse Point.

Ref.: 200 p. 71.

Maps (T): 41 N/2 Mamainse Point
(G) 2251 Batchawana, Algoma District (O.G.S., 1:63 360)

km 91.5 Junction of the road to *Silver Creek Mine.* The copper mineralization at this mine is the northern part of the vein system occurring at the Copper Creek Mine. Copper was produced from this mine by Vauze Mines Limited in the 1960s. Openings consist of shafts and an adit. A road, 3.7 km long, connects the Silver Creek Mine to Highway 17.

km 92.1 *Mamainse Mine.*

Mamainse Mine

CHALCOCITE, NATIVE COPPER, CHALCOPYRITE, BORNITE, HEMATITE, MALACHITE

In fracture zones and in quartz-calcite veins in conglomerate and basalt of the Keweenawan Formation

Chalcocite, the principal copper mineral, occurs with native copper in fracture zones and in the host basalt and conglomerate. Native copper was found in the veins and in amygdules in basalt. Chalcopyrite, bornite and specular hematite were also found in the veins. Malachite occurs as a coating on specimens in the dumps.

The copper-bearing vein crosses Highway 17 at **km 92.1** and is exposed along the shore of Lake Superior 140 km northwest of this point. The first attempt at developing it was made in about 1853. In 1882-1884, Lake Superior Native Copper Company sank three shafts to depths of 18.3 m, 85.4 m and 97.6 m. A mining camp consisting of a mill and upwards of thirty buildings was set up but there is no record of production. The shafts are located as follows: one 50 m southeast of the highway and two on the northwest side of the highway at points 50 m and 100 m from **km 92.1**.

Refs.: 223 p. 81-82; 267 p. 115; 299 p. 57; 332 p.18-19.

Maps (T): 41 N/2 Mamainse Point
(G): 1953-1 Mamainse Point copper area, District of Algoma, Ontario (O.G.S., 1:12 000)
2251 Batchawana, Algoma District (O.G.S., 1: 63 360)

km 98.2 Mica Bay on left.

"Daisy Stone" Occurrence

BASALT PORPHYRY

A striking basalt porphyry, locally known as 'daisy stone', occurs along the shore of Mica Bay in the vicinity of **km 98.2**. The rock is composed of reddish to greyish white tabular crystals of feldspar forming radiating groups, or rosettes, in a dark grey to greenish black basalt. The feldspar crystals measure up to 3 cm long.

The rock is exposed along the shore of Mica Bay; it also occurs as pebbles along the beach (H.G. Ansell, pers. comm., 1989).

Refs.: 3a p. 9, 30; 50 p. 2374; 223 p. 72.

Maps (T): 41 N/2 Mamainse Point
(G): 35b Batchawana area, District of Algoma, Ontario. (O.G.S., 1:126 720)

km	**103.4**	*Road-cuts* expose granitic rocks containing fracture fillings of epidote.
km	**104.7**	Junction of the road to Pointe aux Mines.

Pointe aux Mines Mine

CHALCOCITE, NATIVE COPPER, CHALCOPYRITE, BORNITE, HEMATITE, BARITE, SPHALERITE, GALENA

In veins in Keweenawan basalt

The copper minerals, chalcocite, native copper, chalcopyrite and bornite occur with specular hematite, barite, calcite and quartz in fissure veins in basalt. Specimens of chalcopyrite, galena and sphalerite were displayed at the 1876 Philadelphia International Exhibition.

Copper-bearing veins at Pointe aux Mines were investigated by the Quebec and Lake Superior Mining Company in 1865-1866. Exploration consisted of an adit driven 76.2 m into a ridge on the south shore of Alona Bay, 1000 m east of Pointe aux Mines. Three shafts were put down, including one to a depth of 12.2 m. Several buildings including a stamp-work were erected on the site but the copper content of the vein proved to be too low for further development.

At the base of the point, the Quebec Mining Company sank a 21.3 m shaft in a calcite-quartz vein carrying native copper, chalcopyrite, bornite and scales of native silver. The work was done in about 1860. Earlier work was done on the south shore of Pointe aux Mines where a vein containing chalcocite, chalcopyrite and sphalerite is believed to have been worked by early French miners.

A road, 1400 m long, leads west from Highway 17 at **km 104.7** to the mine.

Refs.: 200 p. 702; 241 p. 11; 299 p. 58; 359 p. 27, 31.

Maps (T): 41 N/2 Mamainse Point
(G): 1955-1 Montreal River Area, District of Algoma, Ontario (O.G.S., 1: 31 680)

km	**107.1**	Scenic Lookout – Alona Bay. An historic plaque commemorating Canada's first uranium discovery, in 1847, is located at the Lookout.
km	**108.8**	Junction of the road leading west to Theano Point.

Theano Point Uranium Occurrence

URANINITE, HEMATITE, CALCITE, CLAUSTHALITE

In fractures in granite at diabase contact

The occurrence of uranium mineralization at Theano Point is believed to be the first recorded occurrence of uranium in Canada. It was reported in 1847 by John L. LeConte who examined a collection of minerals made by Mr. B.A. Stannard from the north shore of Lake Superior seventy miles from Sault Ste. Marie. LeConte noted the similarity of the uranium mineral to pitchblende but referred to it as coracite, derived from the Greek work for raven. The exact locality of the mineral was unknown until 1948 when prospector Robert Campbell rediscovered it during a geiger counter reconnaissance of the shoreline referred to in early reports. He located the uranium-bearing vein in a cave on the west side of Theano Point while he was stranded after a storm wrecked his boat. He obtained the first indication of radioactivity in granite at the water's edge and noted the presence of black veinlets in the rock on the south wall of the cave. He found similar uraninite veins farther back and staked the occurrence. The Campbell discovery resulted in a prospecting rush to the region after which several other uranium deposits were found.

In 1949 Camray Mines Limited undertook development of the deposit and set up a mining camp including an office, bunk-house and a cook-house, and built a road to Highway 17. A 45.7-m shaft was sunk at a point 37 m from the lake, on the south side of the cave. A similar occurrence was explored by an adit driven 70 m into a slope on the south side of the road leading from Highway 17 at a point 800 m from **km 108.8**. The development work in these showings failed to locate economic grade ore and operations were discontinued.

The discovery location at Theano Point is 2.4 km by road from Highway 17 at **km 108.8**.

Refs.: 193 p. 122-125; 241 p. 15-19; 278 p. 21-22.

Maps (T): 41 N/2 Mamainse Point
(G): 1955-1 Montreal River area, District of Algoma, Ontario (O.G.S., 1: 12 680)

km	**113.4**	*Road-cuts* expose calcite veins in diabase and granite. The calcite fluoresces pink in ultraviolet light. Hematite and epidote are associated with calcite.
km	**117.3**	Bridge over the Montreal River. *Beach occurrence:* attractive pebbles consisting of epidote, pink feldspar and quartz occur in the beach gravels of Montreal River Harbour and adjacent shores of Lake Superior.
km	**121.5**	Turn-off to Ranwick Mine.

Ranwick Mine

URANINITE, GALENA, CHALCOCITE, CALCITE, HEMATITE, CLAUSTHALITE, MOLYBDOMENITE

In veins in diabase dyke

Uraninite was associated with minor galena and chalcocite in calcite-hematite veinlets measuring up to 3 cm wide. Pods of uraninite, 2 cm wide, occurred in the veinlets. Colourless, blade-like crystals (to 1 mm) and light yellow radiating fibrous aggregates of molybdomenite were found as an alteration of clausthalite.

The deposit was found by Roy R. Ranson in 1948 during the staking rush that followed the discovery of the Theano Point uranium occurrence. The Ranson and adjoining Kaulser-Barwick claims became the Ranwick property. In 1949-1950, Ranwick Uranium Mines Limited explored the deposit with trenches and an adit driven 320 m. In 1961 Roy Ranson opened the mine as a tourist attraction.

A road leads south from Highway 17 at **km 121.5** to the mine, a distance of about 300 m.

Refs.: 193 p. 132-134; 205 p. 819; 241 p. 25-26; 278 p. 17.

Maps (T): 41 N/2 Mamainse Point
(G): 1955-1 Montreal River area, District of Algoma, Ontario (O.G.S., 1: 31 680)

km	**139.2**	Bridge over the Agawa River. *Beach occurrence*: colourful pebbles composed of epidote, orange-red to pink feldspar and quartz occur along the shore of Agawa River and Agawa Bay.
km	**142.1**	Agawa Bay Scenic Lookout. Pink granite is exposed in the parking area.
km	**143.7**	Turn-off to Agawa Rock Indian Pictographs. The road leads to a parking lot from which a 800-m trail leads to Agawa Rock on the shore of Lake Superior overlooking the Agawa Islands. The Indian rock paintings are located on the sheer cliffs of Agawa Rock.
km	**152.0**	Bridge over Sand River.
km	**156.1**	*Road-cut* exposes basalt in which fractures are filled with epidote, quartz, calcite, chlorite, hematite and pink to white platy laumontite. 'Micro' quartz crystals occur in small cavities in massive quartz.
km	**158.5**	Bridge over Coldwater River.
km	**165.6 to 169.4**	*Road-cuts* expose granitic rock with epidote commonly filling fractures and coating surfaces.
km	**172.3**	*Road-cuts* expose altered basalt cut by quartz-calcite veins containing pink to orange-red platy laumontite, epidote, chlorite and pyrite.
km	**177.7**	*Road-cuts* expose greywacke cut by biotite granite containing aggregates of reddish brown garnet measuring about 1 cm across.
km	**178.7**	Bridge over Baldhead River.
km	**200.8**	Old Woman Bay.
km	**211.4**	*Road-cuts* expose white calcite veins in chloritized volcanic rock. The calcite fluoresces pink in ultraviolet light.
km	**212.2**	Lake Superior Provincial Park boundary.
km	**218.0**	*Road cut* exposes red granite containing small pyrite cubes measuring about 2 mm along an edge.

km	**219.0**	Bridge over Michipicoten River.
km	**220.1**	Junction of the road leading east to High Falls Dam.

Grace (Darwin) Mine

NATIVE GOLD, ARSENOPYRITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE

In quartz veins in diorite porphyry

Spectacular specimens of native gold were found in the quartz vein at the surface during early mining operations. Gold was associated with arsenopyrite. Tourmaline was also present in the quartz.

The Grace gold-bearing vein was discovered about 1899 by Julius George who sold the claim to the Algoma Commercial Company which undertook development in 1900. Production of gold began in 1902 from an inclined shaft sunk to a depth of 92.7 m. Intermittent production until 1910 totalled $71 124. Steam power was used for the mine and mill until 1907 when it was replaced by electric power from nearby High Falls. In 1926 the Power and Mines Corporation resumed development and deepened the shaft to 134.2 m; it carried out milling operations in 1929-1930. From 1934 to 1937 Darwin Gold Mines Limited operated the mine and mill. It deepened the shaft to 152.5 m, sank a new shaft to 253.1 m and produced 411 586

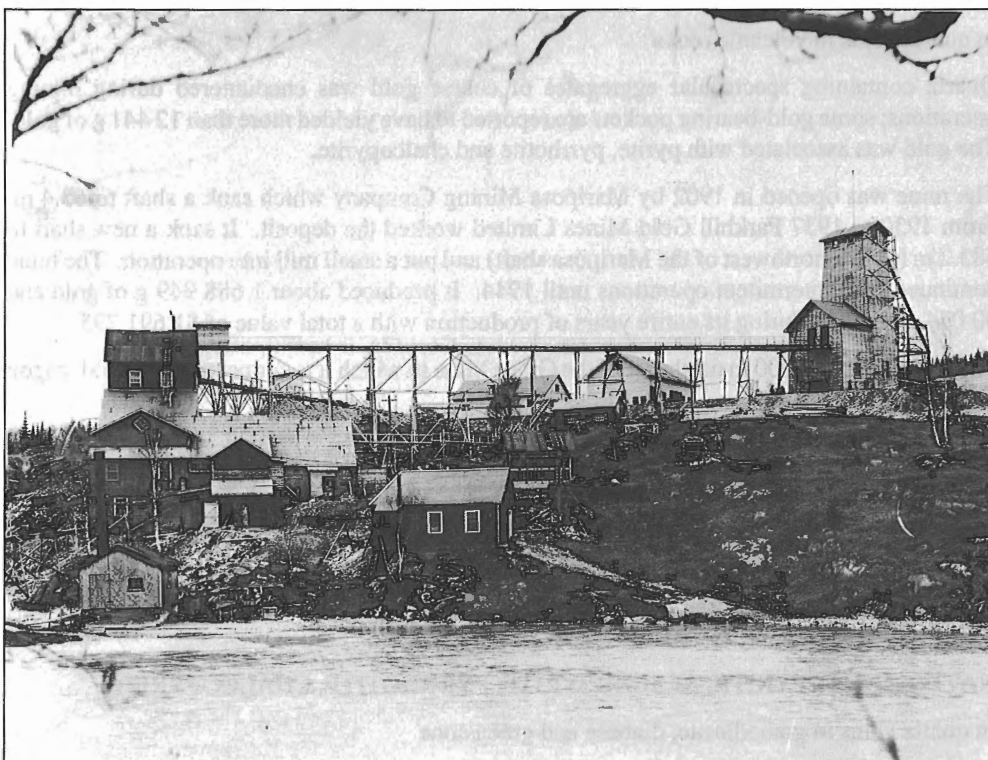


Plate 24

Grace Mine, 1935. (Archives of Ontario S-16401) g of gold and 31 570 g of silver. In the 1940s, gold was produced from the tailings resulting from the mine's first period of operation when the amalgamation process recovered only 60 to 80 per cent of the gold. The property was re-examined in 1981-1982. The mine produced a total of 472 486 g of gold and 42 393 g of silver, valued at $546 852.

The mine is located on the northwest side of a small lake about 100 m north of the hydro line.

Road log from Highway 17 at **km 220.1**:

km	0	Junction of Highway 17 and the road to High Falls Dam; proceed along the road to the dam.
	5.0	Junction; turn left onto the mine road.
	7.2	Mine.

Refs.: 123 p. 29; 132 p. 81-82; 140 p. 5-6, 30-34.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge – Wawa sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 253 440)

Parkhill Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE

In quartz veins in volcanic rocks

Quartz containing spectacular aggregates of coarse gold was encountered during mining operations; some gold-bearing pockets are reported to have yielded more than 12 441 g of gold. The gold was associated with pyrite, pyrrhotite and chalcopyrite.

The mine was opened in 1902 by Mariposa Mining Company which sank a shaft to 63.4 m. From 1930 to 1937 Parkhill Gold Mines Limited worked the deposit. It sank a new shaft to 583.2 m (500 m northwest of the Mariposa shaft) and put a small mill into operation. The mine continued with intermitent operations until 1944. It produced about 1 688 949 g of gold and 90 074 g of silver during its entire years of production with a total value of $1 691 795.

The mine is about 1000 m northeast of the Grace Mine to which it is connected by an old wagon road.

Refs.: 123 p. 32; 132 p. 78-79; 140 p. 45; 225 p. 39-41.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge-Wawa sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 1 253 440)

Manxman (Norwalk) Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE

In quartz veins in granodiorite, diabase and greenstone

Native gold occurred with sulphide minerals in quartz. The coarseness of the gold increased with depth where pockets of very rich ore were found.

The deposit was originally staked in 1898 by James H. Teare. The Manxman Gold Mining Company did some development work and operated a 10-stamp mill between 1901 and 1903. The mine was worked briefly in 1908-1909 by the Norwalk Mining Company, in 1910 by LePage Gold Mining Company and in 1919-1920 by Grace Mining Company Limited. Development consisted of the Main (Norwalk) shaft (77.5 m), the Fred C shaft (39 m) and an open cut located on a hill just south of the Norwalk shaft. The mine produced 1866 g of gold valued at $1412. It is located along the road to the High Falls Dam.

Road log from Highway 17 at **km 220.1** (see page 68):

km	0	Junction of Highway 17 and the road to the High Falls Dam; proceed toward the dam.
	5.0	Junction, road to Grace Mine; follow road on right toward the dam.
	6.5	Trail on left leads east to the Norwalk shaft which is located below the hydro line.
	7.0	Fred C shaft, on the left side of road.

Refs.: 123 p. 26; 140 p. 39-41.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge-Wawa Sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 253 440)

Centennial (Kitchigami) Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE

In quartz veins in granodiorite

Coarse native gold was found in quartz during early mining operations. It was associated with pyrite, pyrrhotite and chalcopyrite.

The gold-bearing quartz veins were found by James H. Teare. Between 1903 and 1905, Kitchi-Gammi Gold Mining Company Limited sank shafts to 33.5 m, 30.5 m and 27.5 m extending over a distance of 110 m. In 1937-1940, Agawa Gold Mines Limited sank an inclined shaft to 79.9 m and operated a mill on the site. Production during this period amounted to 18 973 g of gold and 1120 g of silver, valued at $22 397. The mine is north of High Falls Dam on the east side of the road to the dam at a point 9.5 km from its junction with Highway 17 at **km 220.1** (see page 68). The dumps are much overgrown.

Refs.: 123 p. 25-26; 132 p. 83; 140 p. 41.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge-Wawa Sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 253 440)

km **220.3** Junction of Mission Road which leads to the launching point for boats to Michipicoten Island.

Michipicoten Island Agate Occurrences

AGATE, JASPER, AMETHYST, THOMSONITE

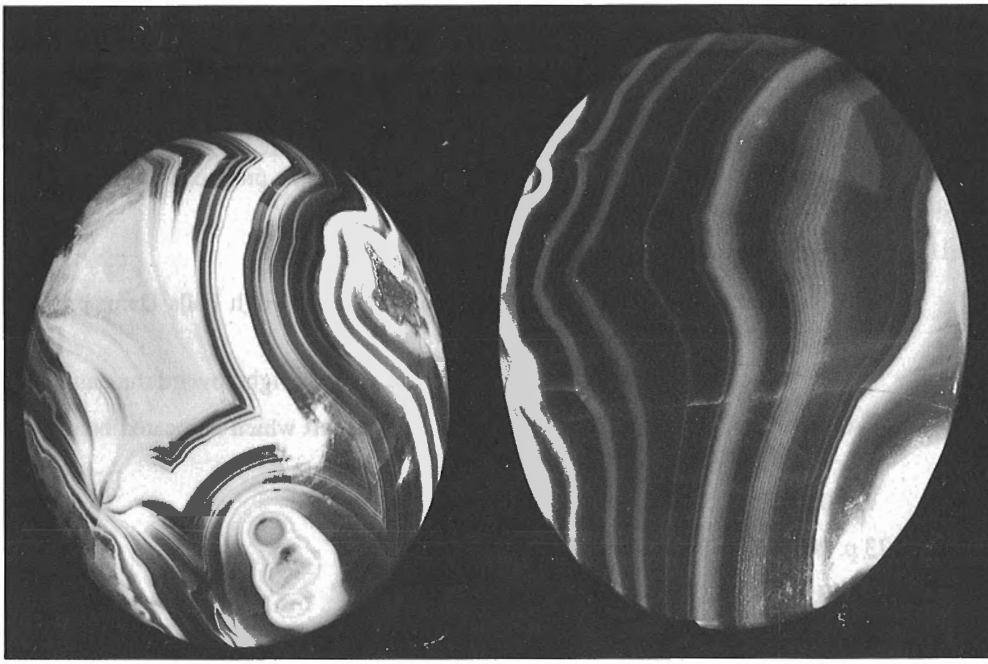


Plate 25

Agate cabochons, Lake Superior. (GSC 203033-Z)

In amygdaloidal basalt

Agate occurs in various colours and patterns in amygdaloidal cavities and veins in basalt. Specimens of agate measuring up to 45 cm have been found. Carnelian, jasper, amethyst-chalcedony and pink thomsonite also occur in the basalt. Agate arrowheads believed to be made by Prehistoric Indians have been found on the shore of Quebec Harbour. Specimens of agate from the island were displayed by the Geological Survey of Canada at the 1851 Grand Industrial Exhibition in London and at subsequent international exhibitions of the 19th century.

Specimens of agate and jasper are found in basalt and as beach pebbles along the western, southern and eastern shores of the island. Collecting localities include: Quebec Harbour, Agate Island (in Quebec Harbour), Cozens Harbour, Schafer Bay, the shore near Quebec Mine, the south shore west of West Sand Bay and along Channel Lake in the interior.

The island is about 60 km from Michipicoten Harbour where arrangements for boat travel may be made.

Refs.: 3b p. 112; 54 p. 15-40; 199 p. 3; 344 p. 76; 345 p. 438-442, 451.

Maps (T): 41 N/12 Michipicoten Island South
41 N/13 Michipicoten Island North
(G): 1353A Michipicoten Island, Ontario (G.S.C., 1: 50 000)

Michipicoten Island Copper Occurrences

NATIVE COPPER, NATIVE SILVER, CHALCOCITE, BORNITE, DOMEYKITE, NICKELINE, GENTHITE, EPIDOTE, CHLORITE

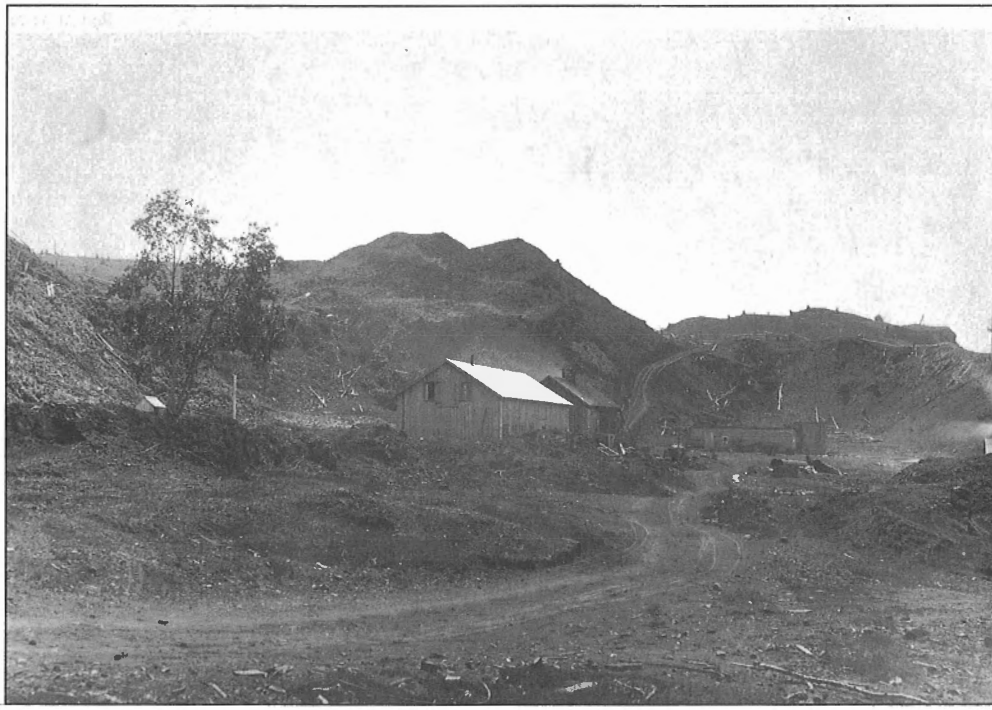


Plate 26

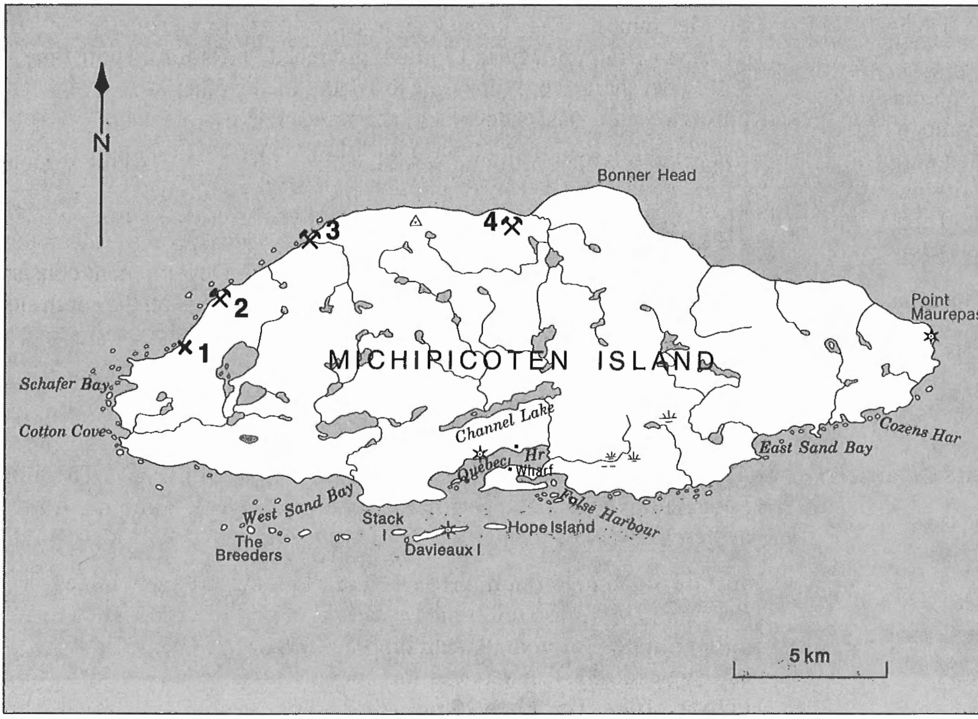
Quebec Mine, Michipicoten Island, 1882. (National Archives Canada PA-50755)

In basalt, conglomerate and sandstone

Native copper occurred in quartz-calcite veins and in the host rocks. It was associated with minor native silver, chalcocite, bornite, domeykite and nickeline. Genthite, epidote and chlorite were associated with the quartz-calcite gangue. Some of the native copper was found as irregular plates and masses cementing pebbles in conglomerate. Masses of copper weighing 18.1 to 22.7 kg were found on the west end of the island and near the east shore of Bonner Bay on the north shore of the island. Nodules of native copper and specimens of native silver and agate were exhibited by the Geological Survey of Canada at the 1851 Grand Industrial Exhibition in London, and at later world exhibitions.

The main copper deposit was located at the Quebec Mine on the northwest side of the island, about 91 m from the shore. The property was known as the Charles Jones Location. The deposit is believed to have been originally worked in 1846-1847 by Upper Canada Mining Company. In about 1853, the Quebec and Lake Superior Mining Association began exploration of the deposit. Within the next ten years, the company sank three shafts to depths of 29.3 m, 22.9 m and 15.5 m, and extracted between 272 t to 363 t of 2.5 per cent ore. In about 1875 the company erected several buildings and a mill, and continued exploration. Other attempts at working the deposit were made by Michipicoten Native Copper Company (1880-1884), Matthew Curtis, the Lord Mayor of Manchester (1885-1887) and Joseph Cozens (1887-1891). The development consisted of shafts sunk to depths of 156.2 m, 122 m, 109.8 m and 21.3 m.

Part of 41 N



Map 11. Michipicoten Island.

1-Copper occurrence	3-Philipps Mine
2-Quebec Mine	4-Bonner Mine

The Bonner Mine, 800 m south of the shore of Bonner Bay, was opened by a shaft (21.3 m) in about 1853 by the Quebec and Lake Superior Mining Association. Although the deposit was considered to be a remarkable showing of native copper and native silver which occurred in genthite, no further work was done.

Two other copper occurrences were explored. An occurrence of native copper in conglomerate was explored by a shaft at a location 2000 m southwest of the Quebec Mine and 244 m from the shore. A shaft was put down on another occurrence known as the Philipps Mine located on the south side of Philipps Creek on the northwest shore of the island, 3800 m from the Quebec Mine. It was explored by G.A. Philipps in about 1875.

Access is by boat from Michipicoten Harbour, a distance of about 60 km.

Refs.: 3b p. 4, 109-112; 88 p. 143; 199 p. 2, 5; 200 p. 703-704; 123 p. 307-309.

Maps (T): 41 N/13 Michipicoten Island North
(G): 1353A Michipicoten Island, Ontario (G.S.C., 1: 50 000)

km 225.3 Junction of Highway 101.

Cora (Surlaga) Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE

In quartz stringers and lenses in altered volcanic rocks and in diorite

Native gold was found with massive pyrite, pyrrhotite and chalcopyrite in quartz. Black tourmaline was associated with the metallic minerals.

The Cora claim was staked by J.H. Johnston of Sault Ste. Marie in 1897. He sank shafts to depths of 4.9 m and 9.7 m in the vein. Cora Gold Mines Limited drilled the property in 1927. The Cora claim and other claims in the area, including former producers, became the property of Surlaga Gold Mines Limited in the early 1960s. This company sank a shaft to 290 m on the old Cora claim and built a mill on the site. Its brief period of production in 1968-1969 yielded 96 357 g of gold and 2 364 g of silver. The mine is located at the north end of Jubilee Lake.

The Surlaga property included two former producers, the Jubilee and Minto mines to the south. Mineralization at these mines was similar to that of the Cora Mine, the native gold being very fine and sporadic. The Jubilee Mine is on the west side of Jubliee Lake, southwest of the Cora Mine. The veins extend to the east side of the lake where they were originally staked in 1897 by J.H. Lawlor and A. Lauzon of Sault Ste. Marie. The Great Northern Mining Company Limited sank a shaft to 18.3 m on the claim. By 1898 a mining camp, including sleeping and cooking houses, a blacksmith's shop and stables, existed on the site but there was no production from the mine during this time. The Minto veins were staked in 1897 by D. Tisdale, J.C. Boyd, J. Rouleau and J.C. Barnhisel. In 1898, Wawa Gold Mining Company Limited sank a shaft to

Plate 27

Miners and mine office, Quebec Mine, 1882. (National Archives Canada PA-50754)

30.5 m and put down several pits in the veins at the east end of Minto Lake. The water level of the lake had to be lowered 1.2 m to allow exploration of the veins near the shore. Several buildings were erected on the site, including an office building, blacksmith's shop, cook, dining and bunk houses, storage and engine houses and stables. Further development was done on both mines in 1926 by Cooper Gold Mines Limited, including work on the vein on the west side of Jubilee Lake.

The Jubilee and Minto mines were brought into production in 1931 by Minto Gold Mines Limited. A cyanide mill at the Minto Mine treated ore from both mines. The Minto Mine was in production until 1934 and produced 645 574 g of gold. From 1934 to 1939, the mill treated ore from the Jubilee Mine. Both of these properties were examined by Surlaga Gold Mines Limited in the 1960s.

Another property examined by this company was the old Hornblende Mine to the north of the Cora Mine. This mine was opened in 1898 by the Hornblende Mining Company Limited. It did not become a producer but it is of historic interest because it was the site where the Nissen stamp was invented by the mine manager, Peter N. Nissen. The stamp was a gravity stamp featuring a circular mortar and was developed by Nissen for use at the Hornblende Mine. It was not put to use there, but was used extensively in the Rand goldfields in South Africa.

These mines are located south of Wawa Lake.

Road log from Highway 17 at **km 225.3:**

km	0	Junction of highways 17 and 101; proceed onto Highway 101 toward Wawa.
	2.9	Wawa, at the junction of Broadway Avenue; continue along Highway 101.
	5.0	Junction Surlaga Road; turn right.

Plate 28

Minto Mine, 1928. (National Archives Canada PA-14081)

5.1 The cliff to the right (west) of the road is the site of the Hornblende Mine.

6.3 Cora Mine. Continue along the road leading south to the Jubliee and Minto mines.

6.8 Jubilee Mine.

7.1 Minto Mine.

Refs.: 41 p. 101-106; 42 p. 100-103; 43 p. 112-114; 123 p. 30-31; 132 p. 77-78; 140 p. 34-39, 45; 354 p. 194.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge-Wawa Sheet, Districts of Algoma, Cochrane, Sudbury and Thunder Bay (O.G.S., 1: 253 440)

Mackey Point Mine

NATIVE GOLD, TOURMALINE, PYRITE, PYRRHOTITE, CHALCOPYRITE, GALENA, SPHALERITE

In quartz veins in granodiorite porphyry

Native gold occurred with the sulphide minerals and as small crystals lining cavities in quartz. Tourmaline was also present in the quartz.

This occurrence did not become a producer but is of historical interest because it was there in 1897 that the first discovery of gold in the Michipicoten area was made by William Teddy and his wife, an Indian couple from Mission. In June of that year they paddled to Mackey Point on Wawa Lake, stopping on the Point for lunch. While drawing a pail of water from the lake, Mrs. Teddy noticed some bright specks in the rock. She pointed them out to her husband who collected some specimens and showed them to James M. Dickinson of North Bay. Dickinson staked the claim and transferred it to J.J. Mackey and J.L. Caverhill who did the original surface work. A payment of $1200 was made to Mr. Teddy for the discovery. When news of the discovery was reported in the press, referring to the region as another Klondike, a prospecting rush to the new goldfield began. Prospectors from the Klondike staked claims along the Michipicoten River and tested the gravels for placer gold. None was found and the placer miners left the area. Hard-rock prospectors from as far away as the Rocky Mountains and the eastern United States remained and prospected the region between Wawa Lake and Michipicoten River, located some promising showings and staked the whole area. Each newly arrived prospector visited the discovery claim and chipped off a specimen of free gold in quartz or tourmaline. Prospector James H. Teare, in one year alone (1899), made eight discoveries of visible gold and staked nearly fifty claims. By 1900, most of the discoveries were made, exploration of the showings was underway and mining operations began at the Grace Mine. The first production of gold was obtained in 1902 from the Grace Mine.

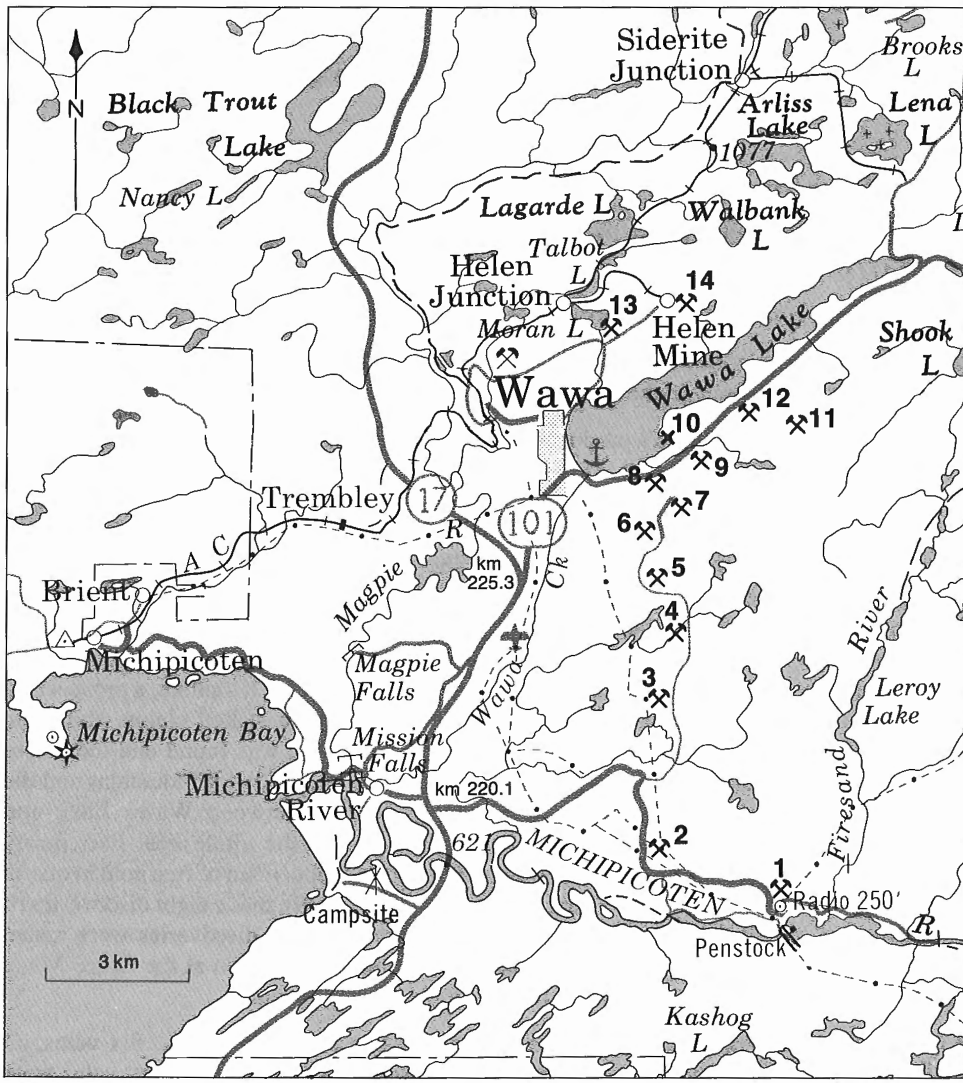
The original Mackey Point occurrence was exposed by two pits at the Point. Six veins, all carrying free gold, were found within 45 m of the shore. East of Mackey Point, veins were explored by Consolidated Mining and Smelting of Canada Limited in 1933-1935 and by Mackey Point Gold Mines Limited in 1936. Exploration consisted of shafts sunk to depths of 12.5 m and 76.2 m.

The Mackey Point Mine is on the south side of Highway 101 at a point 0.5 km northeast of the junction of the Surlaga Road.

Refs.: 41 p. 101; 43 p. 114; 123 p. 30; 132 p. 74-76; 140 p. 4-7, 25-26, 42-45; 354 p. 184-195.

Maps (T): 41 N/15 Michipicoten Harbour
(G): 2220 Manitouwadge-Wawa Sheet, Districts of Algoma Cochrane, Sudbury and Thunder Bay (O.G.S., 1: 253 440)

Parts of 41 N and 42 C



Map 12. Wawa area.

1-Centennial Mine
2-Manxman Mine
3-Grace Mine
4-Parkhill Mine
5-Minto Mine
6-Jubilee Mine
7-Cora Mine
8-Hornblende Mine
9-Mackey Point Mine
10-Mackey Point occurrence
11-Stanley Mine
12-Wawa Gold Fields Mine
13-McLeod shaft
14-Helen Mine

Wawa Gold Fields Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRTIE, SPHALERITE, GALENA, TOURMALINE

In quartz veins in altered volcanics and granodiorite

Visible gold was associated with the sulphide minerals and tourmaline. The vein system is a continuation eastward of the Mackey Point deposit. Wawa Gold Fields Limited explored the veins in 1933-1934 with a shaft sunk to a depth of 21.3 m and an adit driven 30.5 m into a hill.

The mine is on the south side of Highway 101 at a point 1.7 km northeast of its junction with the Surlaga Road (see page 76).

Refs.: 123 p. 43; 132 p. 76.

Maps (T): 42 C/2 Hawk Junction
(G): 2220 Manitouwadge-Wawa Sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 253 440)

Stanley (Smith) Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE

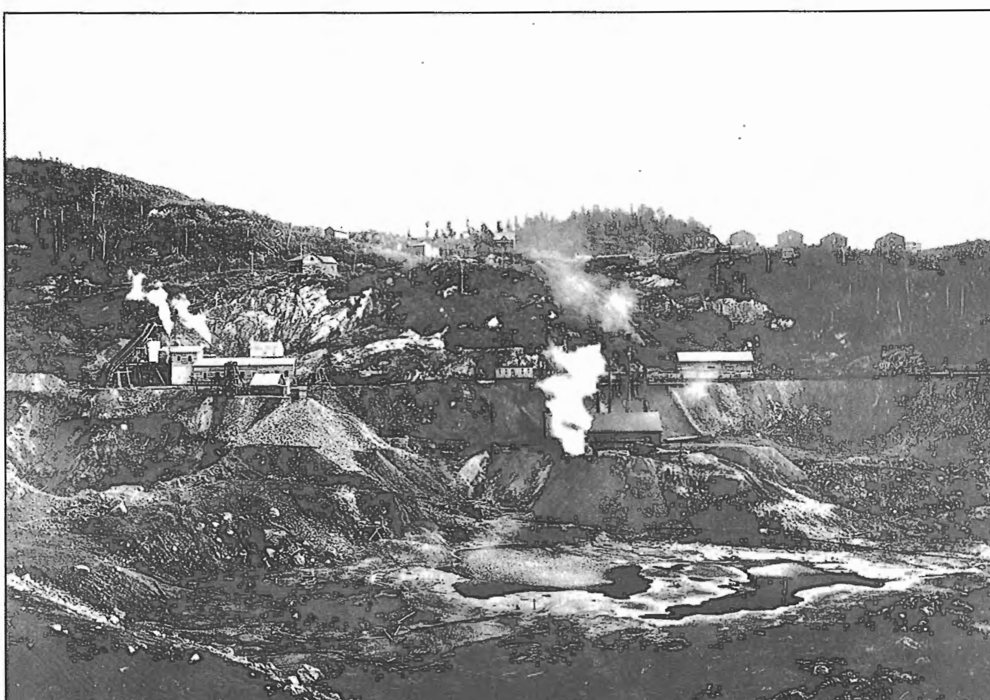


Plate 29

Helen Mine, 1906. The original bed of Boyer Lake is in the foreground. (National Archives Canada PA-17695)

In quartz veins in volcanic rocks

Native gold occurred in the old Smith vein which was discovered in the early days of the mining district. During this time it was extensively stripped. In the 1930s Stanley Gold Mines Limited sank an inclined shaft to a depth of 122 m and operated a mill from 1935 to 1938. Production amounted to 2613 g of gold and 93 g of silver for a total value of $2936.

A trail to the mine leads east from Highway 101 at a point 2.3 km northeast of its junction with the Surlaga Road (see page 76). It is about 400 m from the highway.

Refs.: 123 p. 33; 132 p. 76-77; 140 p. 47.

Maps (T): 42 C/2 Hawk Junction
(G): 2220 Manitouwadge-Wawa Sheet, Districts of Algoma, Cochrane, Sudbury and Thunder Bay (O.G.S., 1: 253 440)

Helen-Macleod Mines

GOETHITE, SIDERITE, PYRITE, MAGNETITE, PYRRHOTITE, CHALCOPYRITE

In iron formation in volcanic rocks

Goethite, pyrite and siderite are the ore minerals of the Helen iron range in which these mines occur. Goethite, which formed a weathered cap overlying the siderite orebody, was the principal ore mineral during the initial period of mining. Pyrite was associated with goethite and was also produced for the manufacture of sulphuric acid. Since 1939, siderite has been the principal ore mineral. It occurs as grey, yellowish brown to nearly black, fine-grained, dense

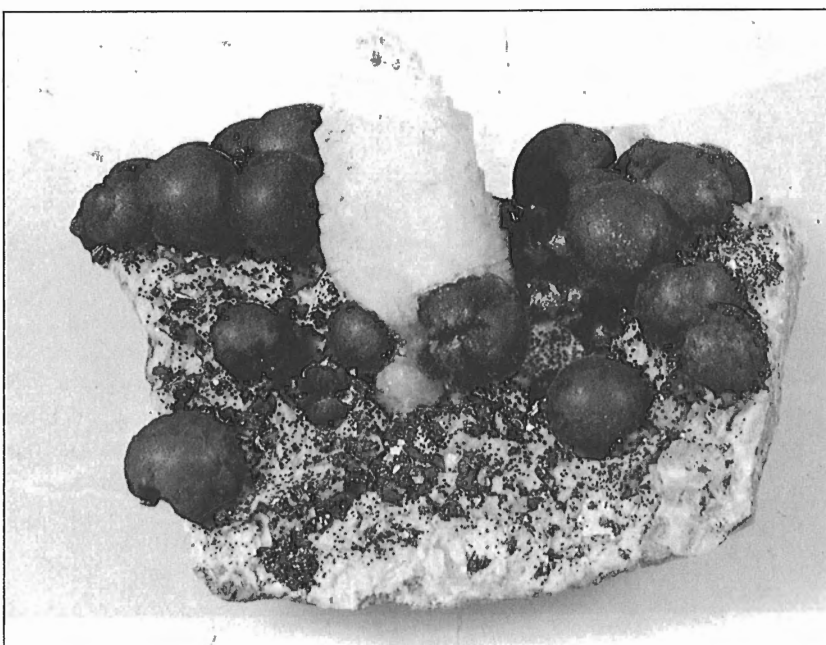


Plate 30

Globular goethite with calcite, Helen-MacLeod mines. (GSC 203376-Q) masses containing grains of quartz (quartz 'eyes') and crystals and grains of pyrite. It resembles a volcanic rock such as rhyolite. Magnetite, pyrrhotite and chalcopyrite are present in minor amounts.

The iron deposits north of Wawa Lake were discovered during the Michipicoten gold rush of the late 1890s. The first mine to come into production was the Helen Mine in the Helen Range. Outcrops of this deposit were discovered on a hill at the east end of Boyer Lake by Ben Boyer in 1897; the deposit was acquired by E.V. Clergue in 1898. The Lake Superior Corporation (which later became Algoma Steel Corporation Limited began open-pit mining of the Helen orebody in 1900. Goethite was the principal ore mineral mined until that orebody was exhausted in 1918. Attention then was directed to mining the siderite ore; mining began in 1939 and has been continuous since that time. Ore came from the Helen open pit (1939-1945), from the Victoria open pit (1946-1950), from underground operations at the Helen Mine (1950-1961) and since 1961 from the George W. MacLeod Mine which included extensions of the Helen, Victoria and Alexander orebodies. The Helen – Victoria – Alexander orebody extended in a northeasterly direction over a distance of 2135 m with a width of 31.5 m to 91.5 m. The Helen deposit was located at the western end of the mining area. The mine is serviced by six shafts, the deepest being 630 m, and a sinter plant. Algoma Steel Corporation Limited is the operator. The company arranges conducted tours of the operations for groups such as schools, universities, etc. Requests should be made by writing to the company.

Road log from Highway 17 at **km 225.3** (see road log on page 76):

km 0 Junction of Highway 17 and Highway 101; proceed north on Highway 101 to Wawa.

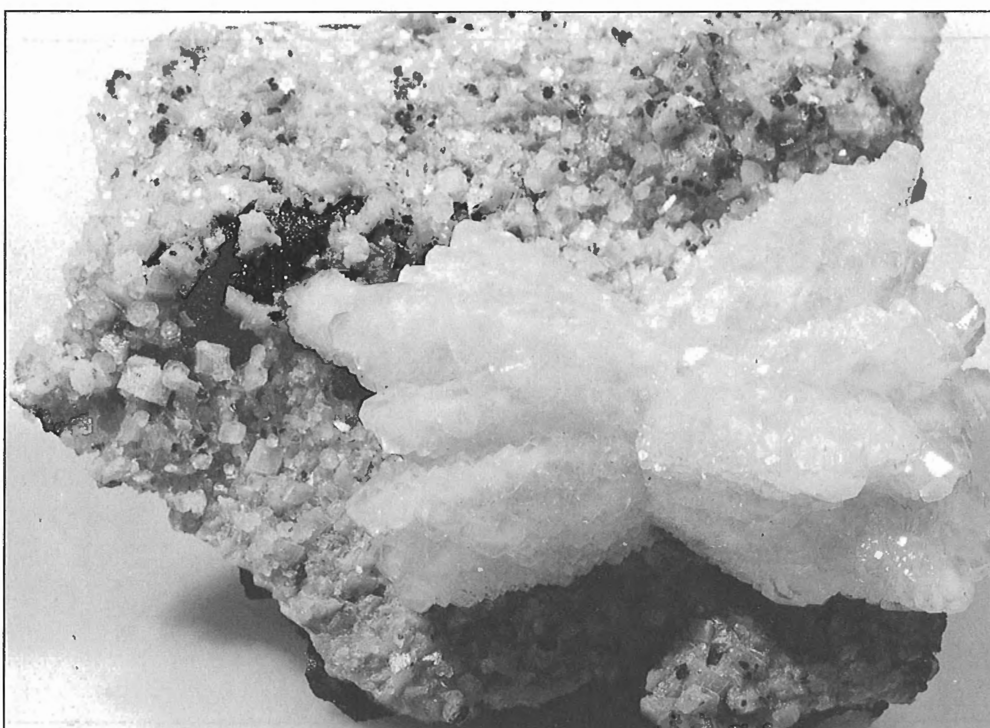


Plate 31

Calcite crystals forming a bow-tie, Helen-MacLeod mines. (GSC 203376-P)

2.9	Wawa, at the junction of Broadway Avenue and Highway 101; proceed along Broadway Avenue.
7.4	Mine office.

Refs.: 41 p. 102; 42 p. 103; 43 p. 113; 93 p. 254-258; 96 p. 83-87; 147 p. 54, 135; 227 p. 87-118; 298 p. 65-66.

Maps (T): 42 C/2 Hawk Junction
(G): 2220 Manitouwadge – Wawa Sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1: 253 440)

km	**280.3**	Turn-off to Obatanga Provincial Park. From here to White River, *road-cuts* expose pink granite with fracture-fillings and coatings of finely crystalline epidote.
km	**316.8**	White River, at the junction of Highway 631.
km	**335.7**	Bridge over White River.
km	**338.4**	*Road-cut* exposes hornblendite cut by veins of white to pink feldspar containing crystals of black amphibole and titanite.
km	**351.7**	Turn-off to White Lake Provincial Park.
km	**365.7**	*Road-cuts* between here and the junction of Highway 614 expose pink and grey granitic rocks containing epidote as coatings and fracture-fillings.

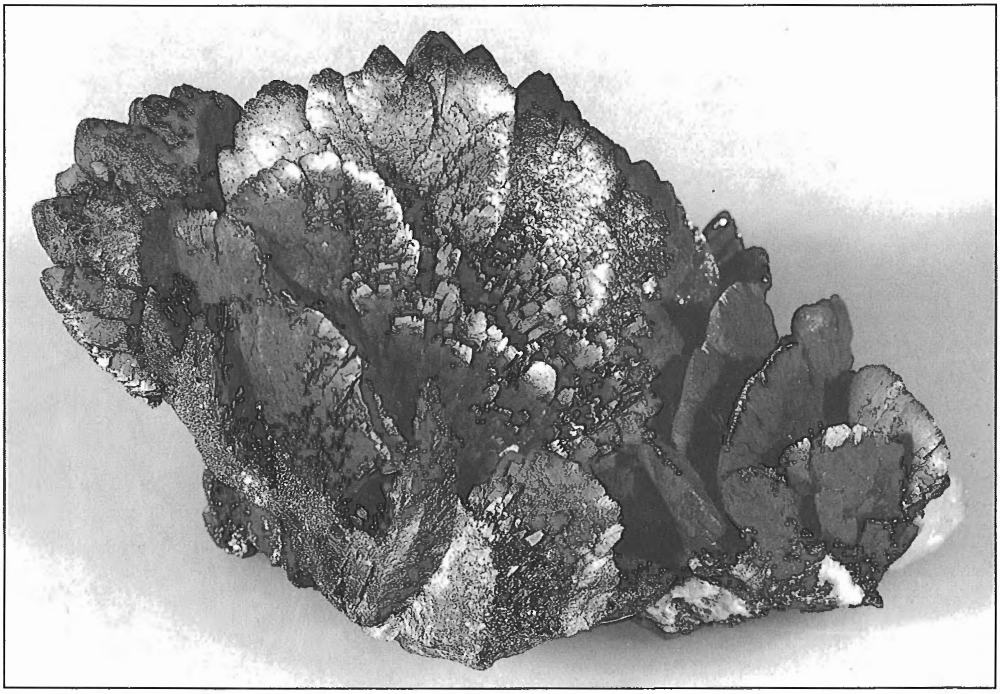


Plate 32

Marcasite, Helen-MacLeod mines. (GSC 203376-O)

Geco Mine

CHALCOPYRITE, PYRITE, PYRRHOTITE, SPHALERITE, GALENA, MARCASITE, ARGENTITE, CUBANITE, PYRARGYRITE, GAHNITE, CORDIERITE, GARNET

In quartz-muscovite schist

Chalcopyrite is the principal ore mineral. It occurs with pyrite, pyrrhotite and sphalerite forming a massive tabular body enveloped by the host quartz- muscovite schist. Disseminations of pyrite, chalcopyrite, pyrrhotite and sphalerite occur in the schist. Pyrite occurs as cubes embedded in the massive sulphides. Galena, marcasite, argentite, cubanite and pyrargyrite are present in minor amounts. Gahnite is associated with sphalerite. Cordierite, some of which is faceting grade material, occurs in garnetiferous biotite gneiss associated with the orebody. Faceted stones are among the gems in the collections of the National Museum of Canada and the Royal Ontario Museum.

The deposit, located 2 km north of Manitouwadge Lake, was originally staked in 1943 by Moses Fisher of the Heron Bay Reserve. He allowed the claims to lapse due to lack of interest in his discovery. Interest in the area was rekindled in 1952 when prospectors began staking the ground for nickel. In the following year, a prospecting team composed of Roy Barker, William Dawd and Jack Forster of Geraldton staked the original Moses Fisher claim. Diamond drilling of the deposit by General Engineering Company Limited revealed an economic copper-zinc-silver orebody. Geco Mines Limited was formed in the same year (1953) to develop the deposit. News of the discovery brought a staking rush to the area which resulted in discoveries of several

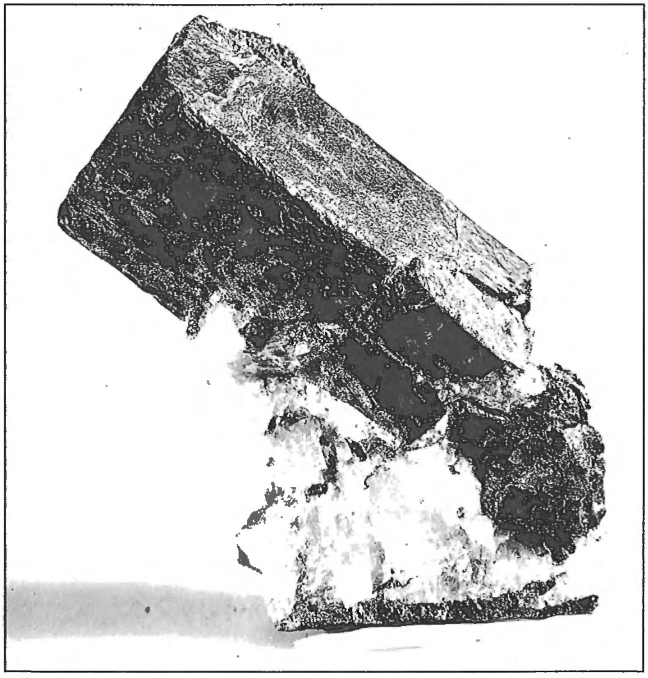


Plate 33

Cordierite crystal, Geco Mine. (GSC 203376-W) other deposits. Production at the Geco Mine began in 1957. In 1964, Geco Mines Limited was merged with Noranda Mines Limited, the current operator. The mine produces copper, zinc, silver, lead and gold.

Mining is from shafts put down to depths of 747.2 m, 782.3 m and 1321.9 m. Group visits to the mine may be arranged by contacting Noranda Mines Limited.

Road log from Highway 17 at **km 368.7** (see page 82):

km	0	Junction of Highway 17 and Highway 614; proceed north along Highway 614.
	5.3 to 28.8	*Road-cuts* expose granite with fracture fillings and surface coatings of finely crystalline epidote.
	53.1	Manitouwadge, at Adjala Avenue; continue straight ahead.
	59.4	Mine.

Refs.: 8 p. 17-21; 47 p. 1-9; 262 p. 3-5, 60-69, 81-86; 299 p. 286-287; 377 p. 254; 379 p. 254; 380 p. 280.

Maps (T): 42 F/4 Manitouwadge
(G) 1957-8 Manitouwadge Area, District of Thunder Bay, Ontario (O.G.S., 1:31 680)

Willroy Mine

PYRITE, PYRRHOTITE, SPHALERITE, CHALCOPYRITE, GALENA, ARGENTITE

In pyritized iron formation

The massive sulphide ore consists mainly of pyrite and pyrrhotite with smaller amounts of sphalerite and chalcopyrite. Galena is a minor constituent; argentite is associated with it.

The main orebody is on the east side of Slim Lake, about 3 km north of Manitouwadge. It was staked in 1953 by William Dawd and Roy Barker and derives its name from these prospectors. Willroy Mines Limited was formed to develop the deposit. Two shafts, 213 m apart, were put down to depths of 870.8 m and 161.6 m. The mill was put in production in 1957. To the end of 1969, the mine produced 182 866 642 kg of zinc, 40 495 578 kg of copper, 5 833 541 kg of lead, 157 637 375 g of silver and 332 584 g of gold. The mine has been inactive since 1970.

Road log from Highway 17 at **km 368.7** (see page 82):

km	0	Junction of Highway 17 and Highway 614; proceed onto Highway 614.
	33.0	Manitouwadge, at Adjala Avenue; turn left onto Adjala Avenue.
	36.5	Junction; follow road on right.
	37.5	Mine.

Refs.: 262 p. 68, 98-109; 299 p. 288-289; 368 p. 376; 380 p. 216.

Maps (T): 42 F/4 Manitouwadge
(G): 1957-8 Manitouwadge Area, District of Thunder Bay, Ontario (O.G.S., 1:31 680)

Nama Creek Mine

PYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, GALENA, GARNET

In biotite gneiss

The mineralization consists of massive and disseminated pyrite, pyrrhotite, chalcopyrite, sphalerite and minor galena. Dark red garnet occurs as porphyroblasts in the biotite gneiss host rock.

The deposit was originally explored by Nama Creek Mines Limited from 1954 to 1963, Willroy Mines Limited began development of the orebody in 1963. The Nama Creek and Willroy underground workings were connected by an underground drive from the 488-m level of the Willroy Mine. From 1968 to 1971 the mine produced 180 355.5 t of ore averaging 0.83 per cent copper, 4.16 per cent zinc and 35.66 g/t of silver for a total value of $2 134 186. Ore from the underground operations was exhausted in 1971. In 1976, ore was mined from an open pit. The mill at the Willroy Mine treated ore from the Nama Creek Mine.

Access to the mine is by a road, 2 km long, continuing northwest from the Willroy Mine.

Refs.: 262 p. 95-96; 299 p. 294-295; 375 p. 310.

Maps (T): 42 F/4 Manitouwadge
(G): 1957-8 Manitouwadge Area, District of Thunder Bay, Ontario (O.G.S., 1: 31 680)

Willecho Mine

PYRRHOTITE, PYRITE, CHALCOPYRITE, SPHALERITE, GALENA

In iron formation and gneiss

Pyrrhotite, pyrite, chalcopyrite, sphalerite and minor galena occur as disseminations, stringers and in massive form in shear zones in the host rocks.

The deposit was staked in 1953, and Lun Echo Gold Mines Limited explored it in 1954. Underground development was undertaken in 1964 by Willecho Mines Limited which was owned jointly by Lun Echo Gold Mines Limited and Willroy Mines Limited. Production began in 1965 and continued until 1977. Ore, obtained from a shaft which reached a depth of 549 m, was treated at the Willroy Mine mill. The mine produced zinc, copper, lead, silver and gold.

The mine is northwest of the Nama Creek Mine to which it is connected by a road, 3.7 km long.

Refs.: 262 p. 89-93; 299 p. 295; 375 p. 310-311.

Maps (T): 42 F/4 Manitouwadge
(G): 1957-8 Manitouwadge Area, District of Thunder Bay, Ontario (O.G.S., 1: 31 680)

km 368.7 Junction of Highway 614 and Highway 17. The main road log continues along Highway 17 West.

km 370.1 *Road-cuts* between this point and km 382.0 expose granite with surface coatings of epidote.

km	**371.7**	Turn-off (on right) to Golden Giant Mine which is located 1.1 km from the highway.
km	**372.3**	David Bell Mine on right.
km	**372.8**	Page-Williams Mine on right.
km	**373.5**	Turn-off (on right) to Page-Williams Mine, which is located 400 m from highway.

Hemlo Gold Deposits

PYRITE, NATIVE GOLD, AUROSTIBITE, CALAVERITE, MOLYBDENITE, CINNABAR, AKTASHITE, STIBNITE, REALGAR, ZINKENITE, TETRAHEDRITE, TENNANITE, NATIVE ARSENIC, NATIVE ANTIMONY, BERTHIERITE, GUDMUNDITE, SPHALERITE, ARSENOPYRITE, CHALCOPYRITE, PYRRHOTITE, GALENA, BOURNONITE, BOULANGERITE, GERSDORFFITE, PARAPIERROTITE, ROUTHIERITE, ALTAITE, TWINNITE, ORPIMENT, GEOCRONITE, NATIVE SILVER, CHALCOSTIBITE, JAMESONITE, ULLMANNITE, COLORADOITE, GALKAITE, MELONITE, TVALCHRELIDZEITE, BAUMHAUERITE, CUBANITE, SELIGMANNITE, DUFREYNOSITE, PARAREALGAR, STIBARSEN, BREITHAUPTITE, CLAUSTHALITE, WURTZITE, BARITE, MICROCLINE, SERICITE, MUSCOVITE, PHLOGOPITE-BIOTITE, TITANITE, RUTILE, ANHYDRITE, CALCITE, SCHEELITE,

Plate 34

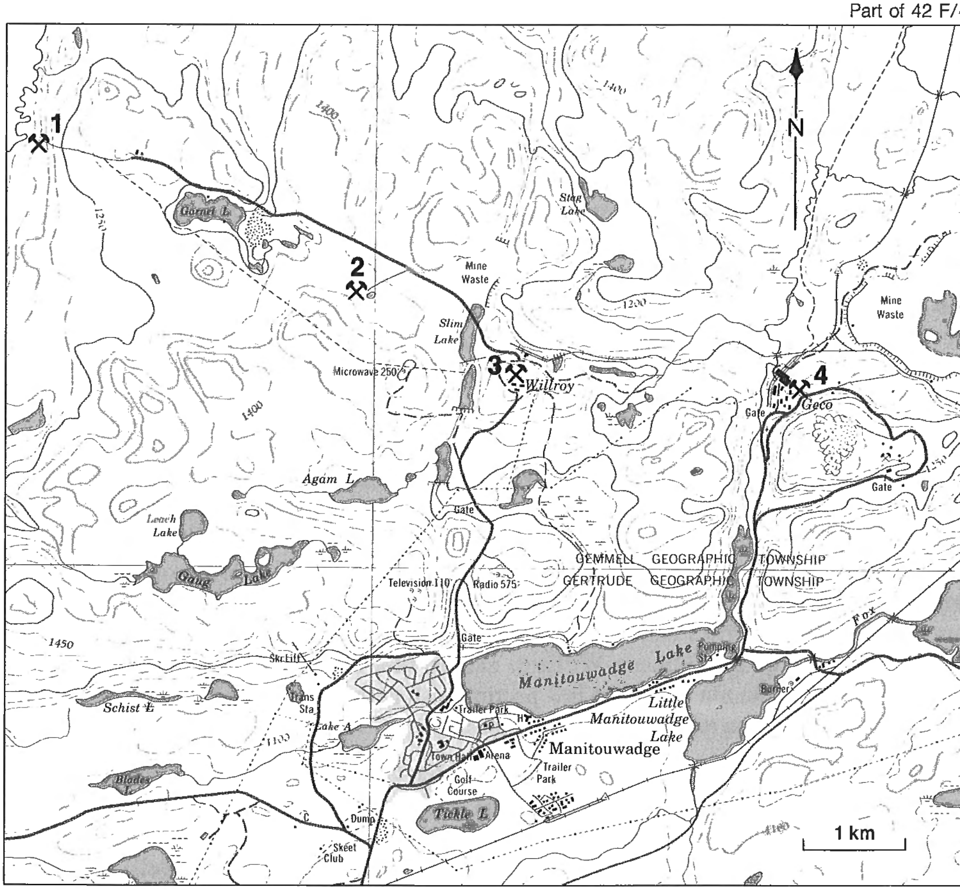
Hemlo gold mines, 1985. The mines are: David Bell Mine (foreground), Golden Giant Mine (middle) and Page-Williams Mine (top). Highway 17 is on left. (Photo by George Patterson, Ontario Ministry of Northern Development and Mines. GSC 203658-A)

APATITE, CLINOZOISITE, ZOISITE, ZIRCON, TOURMALINE, AMPHIBOLE, FLUORITE, CAFARSITE, FERBERITE, MONAZITE, ALLANITE, STILBITE, CHLORITE, GROSSULAR, VESUVIANITE, TOMICHITE, MAGNETITE, ILMENITE, HEMATITE, CHROMITE, PYROCHLORE, HEMLOITE, CRIDDLEITE

In sericite schist, siliceous metasedimentary and fragmental rocks

The minerals occurring in the ore zones are finely disseminated and, except for pyrite, are difficult to recognize in the hand specimen. Pyrite, the most abundant mineral, occurs as layers of coarse aggregates 1 to 3 mm across and as finely disseminated grains. Native gold occurs as finely disseminated grains, to 20 mm in size, and is rarely visible to the naked eye. It is the principal gold mineral; other gold minerals, aurostibite and calaverite are rare. Gold is associated with molybdenite, pyrite, cinnabar, aktashite, stibnite, realgar, aurostibite and with the sulphosalts, zinkenite and tetrahedrite-tennantite. Native arsenic and native antimony are associated with aurostibite, berthierite, realgar, stibnite and gudmundite. Sphalerite and arsenopyrite are relatively common. Occurring less commonly are chalcopyrite, pyrrhotite, galena, bournonite, boulangerite, gersdorffite, parapierrotite, routhierite, altaite, twinnite,

Part of 42 F/4



Map 13. Manitouwadge area.

1-Willecho Mine	3-Willroy Mine
2-Nama Creek Mine	4-Geco Mine

orpiment and geocronite. Among the rare minerals are native silver, chalcostibite, jamesonite, ullmannite, coloradoite, galkaite, melonite, tvalchrelidzeite, baumhauerite, cubanite, seligmannite, dufreynosite, calaverite, pararealgar, stibarsen, breithauptite, clausthalite and wurtzite. Of these minerals, pyrite, molybdenite, and stibnite are the most readily recognized in hand specimens, as well as realgar which is a conspicuous orange colour occurring in quartz. Molybdenite is an indicator of gold. Two new species, hemloite and criddleite, have been found in the deposit (Personal communication: D.C. Harris, 1987).

The most common gangue minerals are quartz, barite, microcline, and the mica minerals, sericite, muscovite, phlogopite-biotite, and a conspicuous green vanadium muscovite which along with molybdenite is an indicator of gold. Other minerals occurring in the deposit are titanite, rutile, anhydrite, calcite, scheelite, apatite, clinozoisite, zoisite, zircon, tourmaline, amphibole, fluorite, cafarsite, ferberite, monazite, allanite, stilbite, chlorite, grossular garnet, vesuvianite, tomichite, magnetite, ilmenite, hematite, chromite and the pyrochlore group.

The main Hemlo gold deposit, currently being mined by three companies, is estimated to contain more than 69 million t of ore with an average grade of about 8.2 g/t gold. The mineralization extends over a distance of 2900 m. The mines being operated are: Golden Giant (Noranda Inc.), David Bell (Teck Corporation) and Page-Williams (Lac Minerals Limited).

Interest in the Hemlo gold deposit was sparked by the 1944 discovery of a gold showing north of Moose Lake by Moses Fisher of the Heron Bay Reserve. He pointed out his discovery to Harry Ollmann of Heron Bay who, along with J.K. Williams of Maryland, staked the claim in 1945. Forty years later, these claims became the Williams Mine. At about the same time (1945), adjoining claims to the east were staked by a group consisting of T. Page, M. Bartley, Moses Fisher, A. Halliday and J.K. Williams. Between 1947 and 1959, these claims and the Ollmann-Williams claims were explored first by Lake Superior Mining Corporation Limited and later by Teck-Hughes Gold Mining Limited. In 1973-1974, Ardel Exploration Limited did some drilling on the deposit. None of these investigations resulted in locating the main ore zone. In the winter of 1979-1980, John Larche and Donald McKinnon staked blocks of claims which were later optioned to International Corona Resources Limited, Goliath Gold Mines Limited and Golden Sceptre Resources Limited.

The richness of the ore deposit was revealed in the summer of 1981 when the main ore zone was intersected during a drilling program directed by geologist David Bell on the International Corona property. By the end of that year, Teck Corporation undertook development of the property which became the Teck-Corona Mine, later renamed the David Bell Mine. After this company outlined a deposit of 1.18 million t grading 10.2 g/t gold in 1982, other companies became interested in the Hemlo deposit. Noranda Limited began development of the Golden Giant and Goliath properties which became the Golden Giant Mine, and Lac Minerals began open pit operations on the Ollmann-Williams claims, now the Page-Williams Mine. News of the developments at Hemlo brought a prospecting rush to the area and by the end of 1982 the entire region from Wawa to Terrace Bay was staked.

The first mine to come into production was the Golden Giant in March 1985. The David Bell Mine produced its first gold bar, which weighed 30 978.6 g, in May 1985. Six months later, Lac Minerals Limited poured its first gold bar from its open pit operation. The mines are operated from shafts to depths of 1100 m (Golden Giant), 1100 m (David Bell) and 350 m (Page-Williams). To the end of 1985 production of gold amounted to 3 052 915 g (Golden Giant Mine), 652 821 g (David Bell Mine) and 322 507 g (Page-Williams Mine).

Refs.: 46 p. 58-61; 156 p. 49-54; 157; 158 p. 297-310; 233 p. 30-37; 248, p. 66-84; 268 p. 39-44; 339 p. 47-53; 382 p. 238, 280, 362.

Maps (T): 42 C/12 Cedar Lake
(G): 2452 Hemlo, Thunder Bay District (O.G.S., 1: 31 680)

km 378.1 Junction of the road to Hemlo.

km 394.8 Junction of the trail to Northern Eagle barite occurrence.

Northern Eagle Occurrence

BARITE, CALCITE, PYRITE

In sericite schist

Massive white to grey barite occurs with white calcite and pyrite. The occurrence was exposed by trenches. It belongs to Northern Eagle Mines Limited which investigated the showing in 1983-1984. A trail, 1 km long, leads north from **km 394.8** on Highway 17 to the occurrence.

Ref.: 248 p. 74, 77-79; 380 p. 286.

Maps (T): 42 D/9 Marathon
(G): 2439 Heron Bay, Thunder Bay District (O.G.S., 1: 31 680)

km 395.8 Bridge over Black River.

km 396.5 A *barite occurrence* similar to the Northern Eagle prospect occurs 200 m north of the highway at this point. It was investigated by Padre Resources Limited in 1983. (Refs.: 248 p. 74-75; 379 p. 298).

km 402.6 Junction of Highway 627 to Heron Bay.

Peekongay Mine

GALENA, PYRITE, CHALCOPYRITE, SPHALERITE, MOLYBDENITE, TOURMALINE, BARITE

In quartz-carbonate veins in sheared felsic pyroclastic rocks

Galena, pyrite, chalcopyrite, sphalerite and molybdenite occur in quartz-dolomite matrix. Tourmaline and barite are also present. Native gold was reported to be present.

The gold-bearing veins were discovered in 1869 by an Indian, Moses Peekongay. In 1872, the showing was brought to the attention of explorers A. Cyrette, J. McLauren and W. Pritchard of Fort William. They examined the veins and brought specimens to Captain Wm.B. Frue of Silver Islet who had them assayed. The results indicated gold and silver values. In 1873, Captain Frue, the explorers and A.H. Sibley sank a shaft to a depth of 12.2 m. Other openings were made and some ore was shipped. The deposit was recently explored by trenches by Lytton Minerals Limited. It is located in the town of Heron Bay.

Road log from Highway 17 at **km 402.6**:

km 0 Junction Highway 17 and Highway 627; proceed south along Highway 627.

5.9 Heron Bay, at the railway crossing. The occurrence is on the south side of the railway at a point about 250 m west of the highway.

Refs.: 220 p. 23-24; 248 p. 66, 73-74, 78.

Maps (T): 42 D/9 Marathon
(G): 2439 Heron Bay, Thunder Bay District (O.G.S., 1: 31 680)

km **405.0** Scenic Lookout.

Road-cuts between here and **km 441.2** expose a variety of rocks known as the Coldwell syenite complex. The complex includes nepheline syenite, red hornblende syenite and purplish brown augite syenite; gabbro is associated with the syenites. The grey nepheline syenite contains hornblende and biotite; brick-red natrolite occurs as irregular blotches in the rock and produces a striking contrast to the light grey matrix. This syenite becomes reddish in colour with increased amounts of natrolite, an alteration product of nepheline. Weathered surfaces are chalky white. The rock takes a good polish.

The red hornblende syenite is composed of red feldspars (orthoclase and oligoclase) with minor amounts of hornblende and biotite.

Augite syenite is brown, purplish brown to greenish black with a medium to coarse texture. It is composed of K-feldspar, augite and minor amounts of hornblende and biotite. The feldspar exhibits a schiller or iridescence. When polished the rock makes an attractive ornamental stone. It was quarried in the 1880s for use in construction of the Canadian Pacific Railway bridges over the Pic and Little Pic rivers, and in 1927-1932 for use as a building and monument stone. It was used in the construction of several buildings in Canada and the U.S. including the T. Eaton Company College Street building in Toronto, now a heritage building. The rock was sold as black granite. The quarry is located on the shore of Peninsula Harbour opposite Skin Island, 1 km north of Marathon. Another quarry located 60 m east of the railway at a point 7 km north of Marathon provided red "granite" (hornblende syenite) for use as a monument stone.

Road-cuts exposing the various syenite rocks are indicated in the road log along Highway 17.

km **406.0** *Road-cuts* expose breccia containing pyrite, chalcopyrite and molybdenite. The occurrence has been drilled and trenched by various companies since it was exposed during construction of Highway 17 in the 1950s. (Ref. 232 p. 67).

km **407.7** *Road-cut* exposes layered gabbro containing pyrrhotite, chalcopyrite and minor pentlandite, cubanite, pyrite, bornite, arsenopyrite and mackinawite. (Ref.: 248 p. 76, 79).

km **407.8** *Road-cut* exposes nepheline pegmatite containing black bastnaesite, pink to reddish parisite crystals, (surrounding bastnaesite) and arfvedsonite, zircon and calcite. (Refs.: 206 p. 819; 294 p. 271).

km **409.4** Junction of Highway 626 to Marathon.

Downey Occurrence

FELDSPAR, HORNBLENDE, TOURMALINE, CLINOPYROXENE, BASTNAESITE, AENIGMATITE

In augite pegmatite

Grey feldspar in the pegmatite shows a blue, green and yellow schiller (iridescence) similar to that of labradorite. The feldspar is known as spectrolite. Some of the material is suitable for cutting in cabochons. Black tourmaline, hornblende and green clinopyroxene are associated with the feldspar. Yellowish brown crystals of bastnaesite, colourless apatite and white calcite are also present. The calcite fluoresces deep pink in ultraviolet light. Aenigmatite has been reported.

The deposit is exposed by two open-cuts in the side of a cliff overlooking Shack Lake. It was opened by Mr. C.T. Downey of Rossport.

Road log from Highway 17 at **km 409.4** (see page 90):

km	0	Junction of Highway 17 and Highway 626; proceed onto Highway 626 toward Marathon.
	1.4	Junction; turn right.
	1.6	Junction; follow road on right.
	1.75	Junction; turn left.
	2.4	Junction; follow road on right.
	2.6	Junction of a trail at Shack Lake; turn left.
	2.7	End of the trail at a foot-bridge over a creek. Cross the creek and walk 60 m to the occurrence.

Ref.: 191 p. 52-54.

Maps (T): 42 D/9 Marathon
(G): 2220 Manitouwadge - Wawa Sheet, Algoma, Cochrane, Sudbury and Thunder Bay Districts (O.G.S., 1:253 440)

km	**413.1**	*Road-cuts* expose augite syenite.
km	**424.0**	*Road-cuts* expose grey nepheline syenite from here to the turn-off to Port Coldwell. Natrolite is conspicuous in this rock which also contains magnetite and hematite.
km	**428.9**	*Road-cuts* expose red hornblende syenite from here to the Little Pic River at **km 438.0.** White platy barite occurs with quartz crystals in fractures in the rock at **km 428.9.**
km	**433.2**	Road-cuts expose red hornblende syenite containing small crystals of pink zircon.
km	**433.5**	Turn-off to Neys Provincial Park.

km	**438.0**	Bridge over Little Pic River. *Road-cuts* between this bridge and **km 439.8** expose titaniferous magnetite associated with minor titanite in augite syenite, red hornblende syenite and gabbro.
km	**440.0**	Trail on left leads 625 m to the *Smith copper showing.* Pits expose chalcopyrite, pyrite and pyrrhotite in gabbro. (Ref.: 299 p. 306).
km	**441.2**	*Road-cuts* expose red hornblende syenite. This is the western limit of the Highway 17 road-cuts exposing a variety of syenite rocks referred to as the Coldwell syenite complex. The eastern limit is at **km 405**. See page 90 for the description of the complex.
km	**443.5**	Bridge over Dead Horse Creek. At the *Dead Horse Creek occurrence,* on the west side of Dead Horse Creek about 800 m north of Highway 17, a calcite vein cuts altered lava. Galena, sphalerite and pyrite occur in the calcite. (Ref.: 346 p. 35).
km	**460.2**	Bridge over Steel River.
km	**464.6**	Turn-off to Jackfish and the *Jackfish quartz occurrence.* In 1924, about 190 t of quartz pebbles were collected from the shore of Lake Superior in the vicinity of Jackfish and sold for $1821. They were used in the U.S. and western Canada in tube mills for cement grinding. Jackfish is 4.6 km by road from Highway 17. (Ref.: 284 p. 25).
km	**473.6**	Junction of the road to Empress Mine.

Empress Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, SPHALERITE, NATIVE COPPER

In quartz veins in altered volcanic rock

Quartz specimens rich in native gold were found in this deposit during mining operations. Pyrite, the most abundant vein mineral, was associated with chalcopyrite, galena and sphalerite. Some native copper was found during early mining operations.

The deposit was discovered in June 1895 by an Indian who brought specimens from the occurrence to D. McKellar of Fort William, now Thunder Bay. A few years earlier, the McKellar brothers came upon a small quartz vein rich in native gold at a location 1.2 km west of the railway tunnel on the west side of Jackfish Bay. They later located four quartz veins at the Empress deposit. Between 1895 and 1897, they put down four pits to depths ranging from 3 m to 6 m, drove adits 14 m, 23 m and 127.2 m into the north side of a hill and built a mill south of the main adit to which it was connected by a tramway. A number of buildings were erected on the site, including a manager's residence, boarding house, dressing room, assay office, machine and blacksmith shops, stables, grain shed, powder houses and oil and pump houses. The mine was reopened for a few months in 1899, then closed.

A single-lane road, 1 km long, leads north from Highway 17 at **km 473.6** to the mine.

Refs.: 36 p. 80-81; 38 p. 82; 85 p. 84-85; 172 p. 18; 346 p. 34.

Maps (T): 42 D/15 Coldwell
(G): 2107 Jackfish - Middleton Area, Thunder Bay District (O.G.S., 1: 31 680)

km 486.1 *Road-cut* exposes granite containing veinlets and coatings of epidote.

km 488.6 Terrace Bay, at Cenotaph.

Slate Islands

JASPER, NATIVE GOLD

In conglomerate and brecciated chert

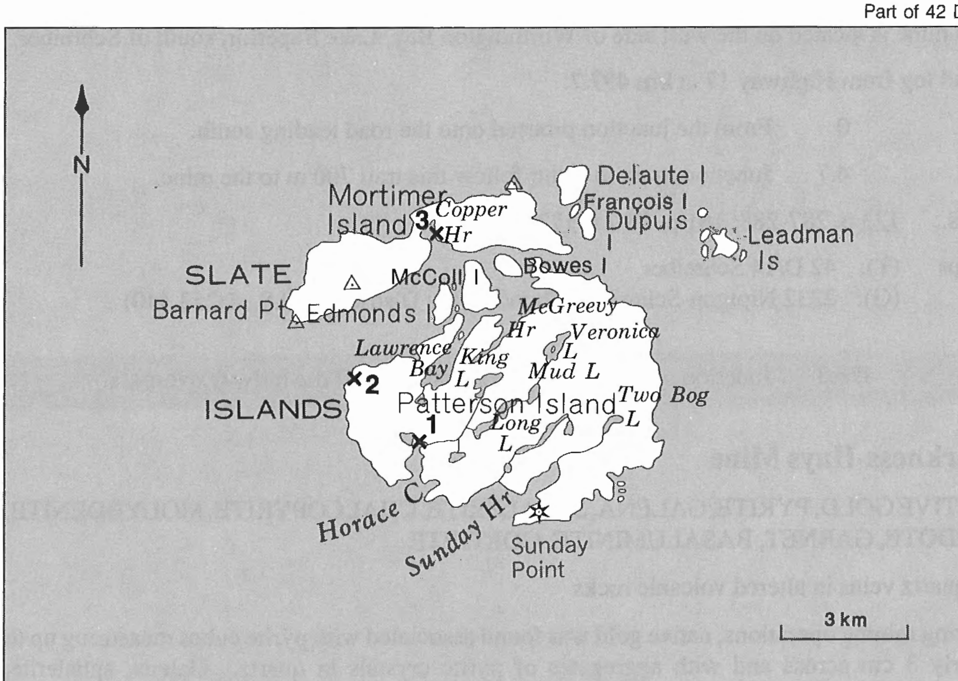
Red jasper pebbles measuring up to 35 cm long occur in conglomerate exposed on the northwest end of Patterson Island, just south of William Point. The pebbles are in striking contrast to the dark green matrix. The band of conglomerate is about 200 m wide along the shore.

This location was initially investigated for gold in 1898-1900 by two adits 122 m apart, about 2 m above the level of the lake. The adits were driven 7.5 m and 51 m into brecciated chert. Numerous pits were sunk in the area, but no visible gold was reported. At that time, the Slate Islands were held by J.C. Patterson, Lieutenant-Governor of Manitoba.

Native gold was found in a milky quartz vein on the west side of Horace Cove, near the north end of the cove. The vein was exposed by several test pits. The vein is 10 to 20 cm wide and 20 m long. Horace Cove is on the south shore of Patterson Island. In the 1960s various companies were engaged in exploring the quartz veins of this island for gold.

Massive and disseminated pyrite occurs in a sulphide zone on the east side of Lambton Cove, Mortimer Island. It was explored for copper by an adit driven 18 m from the lake level.

Part of 42 D



Map 14. Slate Islands.

1-Gold occurrence 2-Jasper occurrence 3-Pyrite occurrence

The Slate Islands are 11 km south of Terrace Bay and consist of seventeen islands of which the largest is Patterson Island.

Refs.: 37 p. 95-96; 39 p. 87-88; 90 p. 137-138; 123 p. 289-290; 245 p. 155-167; 291.

Maps (T): 42 D/10 Pic Island
42 D/11 Slate Islands
(G): P-997 Slate Islands, District of Thunder Bay (O.G.S., 1: 7 920)

km 497.7 Junction of the road to McKellar-Longworth Mine.

McKellar-Longworth Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, ARSENOPYRITE, PYRRHOTITE, TETRADYMITE

In quartz vein in rhyolite

Coarse native gold was encountered frequently during early mining operations. It was associated with pyrite, chalcopyrite, galena, pyrrhotite, arsenopyrite and small specks of tetradymite.

The deposit was originally explored by an adit between 1898 and 1900. Peter McKellar patented the claim in 1903. In 1920-1922, McKellar and W.L. Longworth extended the underground development and built a road to the property. North Shore Gold Mines Limited did additional development in 1933-1935 and installed a mill. In 1941 the company brought the mine into production and recovered 75 922 g of gold and 7029 g of silver for a total value of $73 716.

The mine is located on the west side of Worthington Bay, Lake Superior, south of Schreiber.

Road log from Highway 17 at **km 497.7**:

km 0 From the junction proceed onto the road leading south.

4.7 Junction, trail on right; follow this trail 700 m to the mine.

Refs.: 123 p. 287-288; 151 p. 18-21; 172 p. 14-16.

Maps (T): 42 D/14 Schreiber
(G): 2232 Nipigon-Schreiber, Thunder Bay District (O.G.S., 1:253 440)

km 498.3 Junction of old Highway 17, just north of the railway overpass.

Harkness-Hays Mine

NATIVE GOLD, PYRITE, GALENA, SPHALERITE, CHALCOPYRITE, MOLYBDENITE, EPIDOTE, GARNET, BASALUMINITE, GOETHITE

In quartz veins in altered volcanic rocks

During mining operations, native gold was found associated with pyrite cubes measuring up to nearly 3 cm across and with aggregates of pyrite crystals in quartz. Galena, sphalerite, chalcopyrite and minor molybdenite were also present in the veins. Epidote is common in the host (altered volcanic) rock found in the old dumps. Brownish red garnet is associated with

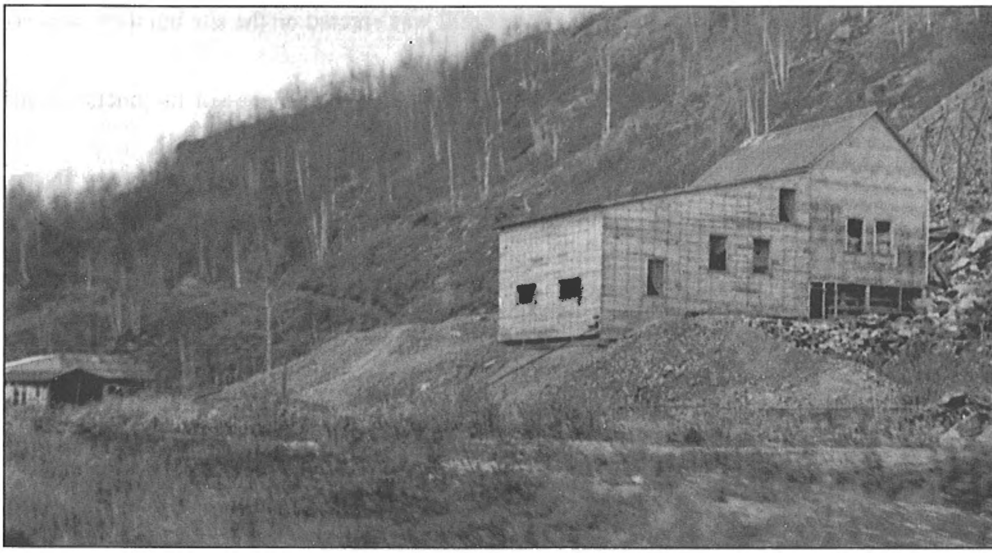


Plate 35

Harkness-Hays mill, 1937. (National Archives Canada PA-15038)

epidote. Basaluminite occurs as a dull white powdery coating and goethite as rusty powdery coatings on the vein minerals.

The deposit was originally known as the Vimy Ridge. It was staked in 1918 and investigated by W.S. Jackson in 1918-1920. Surface and underground work was done by Harkness-Hays Gold Mining Company Limited in 1925-1926. Two new adits were completed and a mill installed in 1934-1936 by Harkness-Hays Gold Mines Limited. The mine produced 6034 g of gold and 2333 g of silver, valued at $5879.

The mine workings are located at the side of a ridge along old Highway 17, about 320 m east of its junction with Highway 17 at **km 498.3.**

Refs.: 123 p. 287; 151 p. 23; 172 p. 14.

Maps (T): 42 D/14 Schreiber
(G): 2232 Nipigon-Schreiber, Thunder Bay District (O.G.S., 1: 1 253 440)

Gold Range Mine

NATIVE GOLD, PYRITE, MOLYBDENITE, GALENA, CHALCOPYRITE

In quartz veins and in the host metavolcanics

Pyrite cubes measuring up to 2 cm across were found with native gold in quartz during early mining operations. Molybdenite, galena and chalcopyrite occur with pyrite in quartz and in the host rock. Gold tellurides have been reported from the deposit. The vein system is a continuation of the Harkness-Hays deposit to the west.

Exploration of the deposit was sporadic from 1918 to 1934 when Gold Range Mines Limited explored the property by means of pits, two adits and shallow shafts. The adits, 152 m apart were driven into a northeast-facing cliff. A test mill was erected on the site but there was no production. Operations ended in 1937.

The mine is on the north side of old Highway 17 at a point 700 m east of its junction with Highway 17 at **km 498.3** (see page 94).

Refs.: 151 p. 22; 208 p. 230-233.

Maps (T): 42 D/14 Schreiber
(G): 2232 Nipigon-Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

km	**502.0**	*Road-cut* exposes metavolcanic rock containing pyrite. The weathered host rock is coated with white powdery rozenite and rusty goethite.
km	**503.0**	Schreiber, at the turn-off to the business section.
km	**503.5**	Schreiber, at the junction of Walker Lake Road.
km	**504.0**	*Road-cuts* expose volcanic rock containing pyrite, similar to the occurrence at **km 502.**
km	**508.5**	*Road-cuts* expose granite with fracture-fillings of small purple fluorite crystals. Epidote coats surfaces of the rock.
km	**512.0**	Junction of the road to Winston Lake and Zenith mines.

Zenith Mine

SPHALERITE, PYRRHOTITE, PYRITE, CHALCOPYRITE, NATIVE COPPER

In gabbro

This mine is a former producer of zinc, copper and cadmium. The ore consisted of dark brown, massive sphalerite with minor pyrrhotite, pyrite and chalcopyrite. It occurred as lenses, fracture-fillings and disseminations in gabbro. There were two zones, 152 m apart. Dendritic native copper was found during early mining operations.

The occurrence of zinc at this location was known in the 1860s but because of its inaccessibility was not worked at that time. In the early 1880s, the McKellar brothers of Fort William exposed a near-surface vein of solid zinc ore, and between 1898 and 1901 the Grand Calumet Mining Company Limited of Ottawa developed the deposit. The workings consisted of shafts put down to 12.2 m, 10.7 m and 3.7 m, open cuts and an adit driven 24.4 m into the side of a hill. The company shipped 966 t of ore averaging 45 per cent zinc. At that time access to the mine was by canoe only, and the ore was hauled in the winter over thirteen frozen lakes and connecting roads to Zinc Siding on the Canadian Pacific Railway, 8 km east of Rossport.

The property was idle until 1952-1953 when Zenmac Metal Mines Limited drilled the deposit. The high-grade orebody was found to be uneconomic due to a sudden drop in the price of zinc. In 1963, with the metal regaining its price, the company began development of the deposit. By 1966, a 21.8-km road was built to the property from Highway 17, a shaft was sunk to 130 m and a mill was erected at Selim Siding, 14.5 km west of Schreiber. From 1966 to 1970, when the ore was exhausted, the mine produced 25 217 950 kg of zinc, 234 298 kg of copper and 64 055 kg of cadmium for a total value of $3 152 617.

The main deposit is on the north side of Kenabic Lake; the No. 2 deposit is 152 m to the northwest. Access is by a 21.8-km road leading north from Highway 17 at **km 512.0.**

Refs.: 150 p. 132-134; 178 p. 244-248; 264 p. 39-42; 296 p. 6-7; 321 p. 190-198; 338 p. 7-8; 370 p. 400.

Maps (T): 42 D/14 Schreiber
(G): 2023 Big Duck Lake Area, District of Thunder Bay (O.G.S., 1: 15 840)

Winston Lake Mine

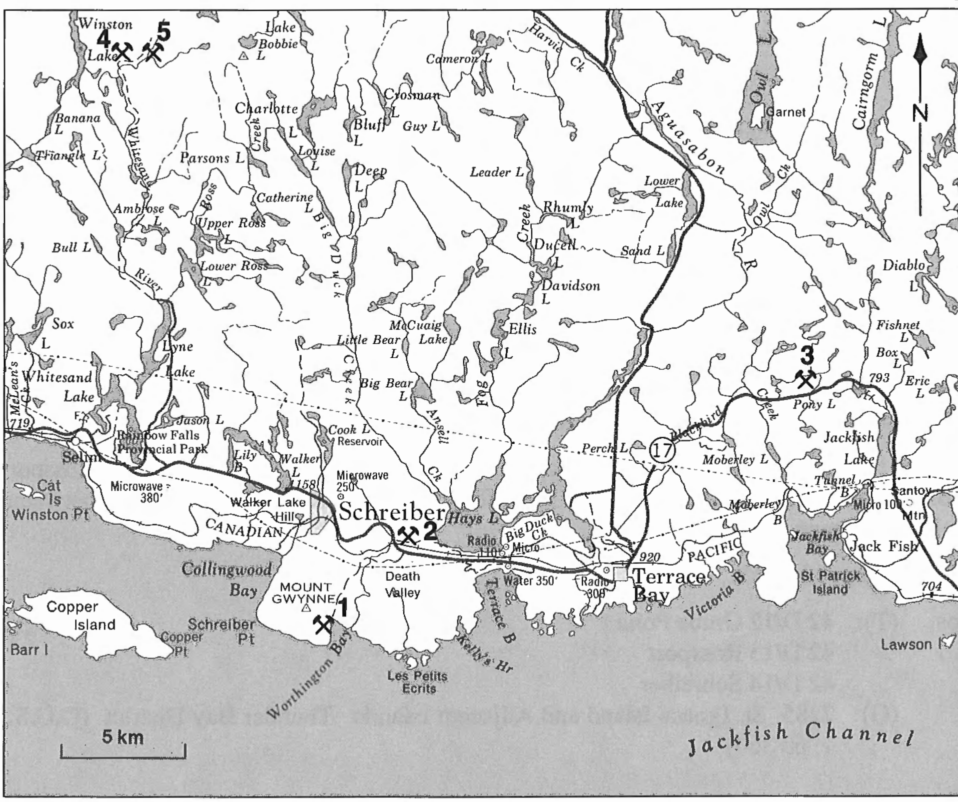
SPHALERITE, PYRRHOTITE, PYRITE, CHALCOPYRITE

In cherty volcanic rock

Dark brown to black massive sphalerite and pyrrhotite are the most common minerals in the ore. Pyrite and chalcopyrite are minor constituents. The ore occurs as a sheet averaging 4.3 m thick and 700 to 800 m by 300 to 400 m at a depth of 300 to 600 m. It occurs at the contact of rhyolitic rocks and basalt.

The deposit was discovered in 1982 by Corporation Falconbridge Copper as a result of a drilling program which began in 1981. Further drilling in 1983 outlined an orebody of 2 675 000 t

Part of 42 D



Map 15. Schreiber area.

1-McKellar-Longworth Mine
2-Harkness Hays and Gold Range mines
3-Empress Mine
4-Winston Mine
5-Zenith Mine

averaging 17.81 per cent zinc, 0.94 per cent copper, 25.3 g/t silver and 0.85 g/t gold. These results encouraged development of the deposit and the company made plans to put down a shaft to 510 m in 1984-1985. Work on the deposit was suspended in 1985.

The mine is near Winston Lake, on the road to the Zenith Mine located 1 km to the northeast.

Refs.: 296 p. 6-10; 381 p. 122.

Maps (T): 42 D/14 Schreiber
(G): 2023 Big Duck Lake Area, District of Thunder Bay (O.G.S., 1: 15 840)

km	**514.3**	Turn-off to Rainbow Falls Provincial Park.
km	**516.6**	*Road-cut* exposes purple fluorite in fractures in granite. Epidote occurs as coatings on the granite.
km	**524.1**	Turn-off to Rossport.

Copper, Wilson, Salter and Simpson Islands

AGATE, PREHNITE, PUMPELLYITE

In basalt

Banded chalcedony (agate) in shades of blue, green and grey occurs as nodules and veins in basalt. Some of the nodules measure up to 15 cm in diameter. Pumpellyite also occurs in amygdules in the basalt; it is referred to locally as Rossport or Nipigon Bay greenstone. Prehnite is commonly associated with green agate. A cabochon measuring 22 x 15 x 6 mm was cut by Grant G. Waite of Toronto from a specimen of prehnite containing specks of native copper; the specimen was collected from Simpson Island.

These minerals are found in the basalt exposures along the shorelines of the islands and as pebbles on beaches. Among the collecting localities are: the south shore of Copper Island, the south shore of Wilson Island, Old Man's Pocket Harbour at the south end of Salter Island, a cove at the west end of Harry Island and the south shore of Simpson Island.

Access to the islands is by boat from Rossport. Copper Island is 11 km southeast of Rossport and Simpson Island is 14 km southwest of this village. Wilson and Salter islands are in between. (See Map 19, page 112).

Refs.: 345 p. 434-451.

Maps (T): 42 D/12 Grebe Point
42 D/13 Rossport
42 D/14 Schreiber
(G): 2285 St. Ignace Island and Adjacent Islands, Thunder Bay District (O.G.S., 1: 63 360)

km	**525.5**	*Road-cuts* expose granitic rock containing irregular stringers of pyrite.
km	**527.9**	Scenic Lookout onto Lake Superior.
km	**530.5**	Bridge over Pays Plat Creek.

km	**534.5 to 536.8**	*Road-cuts* expose granite and syenite gneiss with fracture-fillings of fluorite, barite and quartz. The fractures, which measure up to 4 cm wide, are lined with purple to colourless fluorite cubes measuring up to 5 mm across. Pink platy barite and colourless to amethystine quartz crystals occur on the fluorite lining. Some of the fractures are lined only with quartz crystals. Siderite and marcasite have also been reported (Ref.: 149 p. 55). Fracture-fillings of epidote are also common in the granite.
km	**540.3**	Precambrian Shield Historic Plaque.
km	**568.7**	Turn-off to Scenic Lookout onto Kama Bay.
km	**574.0**	Junction of a road on right.

Little Bear Mine

AMETHYST

In quartz veins in biotite granite

Amethyst crystals occur in cavities in brecciated granite, individual crystals measuring up to 7 cm long. The amethyst-lined cavities measure up to 60 cm by 15 cm. Amethyst also occurs with white quartz cementing granite fragments.

The deposit is exposed in a quarry north of the northeast arm of Kabamichigama Lake. It was opened in 1972 by T. Galarneau. Specimens may be collected from the locality on a fee basis; arrangements should be made with Mr. Richard Paterson of Nipigon.

Access is via the Domtar Woodlands road leading north from Highway 17 at **km 574.0.**

km	0	Junction at **km 574.0** on Highway 17; proceed north.
	25.6	Junction; turn right.
	28.2	Junction; follow road on right leading east.
	43.7	Cottage on shore of Kabamichigama Lake. From the gravel pit just east of the cottage, a road leads to the mine.

Refs.: 62 p. 20-21; 342 p. 53-54.

Maps (T): 42 E/4 Gurney Lake
(G): 2293 Dickison Lake, Thunder Bay District (O.G.S., 1: 63 360)

km	**575.8**	Bridge over Ozone River.

Lawrence Occurrence

AMETHYST, BARITE, SPHALERITE, GALENA, CHALCOPYRITE, PYRITE

In brecciated granite and gneiss

Amethyst and platy barite occur in quartz which cements granite and gneiss fragments in a brecciated fault zone. These minerals also occur in veinlets in the granitic rocks. Sphalerite and galena and minor chalcopyrite and pyrite also occur in the quartz. The mineralized zone is up to 9 m wide and extends in an east-west direction. It was stripped over a distance of about 610 m, and a shaft was put down to 15.2 m at the west end of the zone. The east end of the zone is exposed in the steep bank of Ozone Creek.

The deposit was staked and explored before 1927 by James Lawrence of Port Arthur (now Thunder Bay).

The occurrence is north of Kama Bay. A 700-m trail leads north from Highway 17 to the occurrence; it leaves the highway at a point 650 m west of the bridge over Ozone Creek.

Refs.: 161 p. 84; 299 p. 346; 322 p. 183-184.

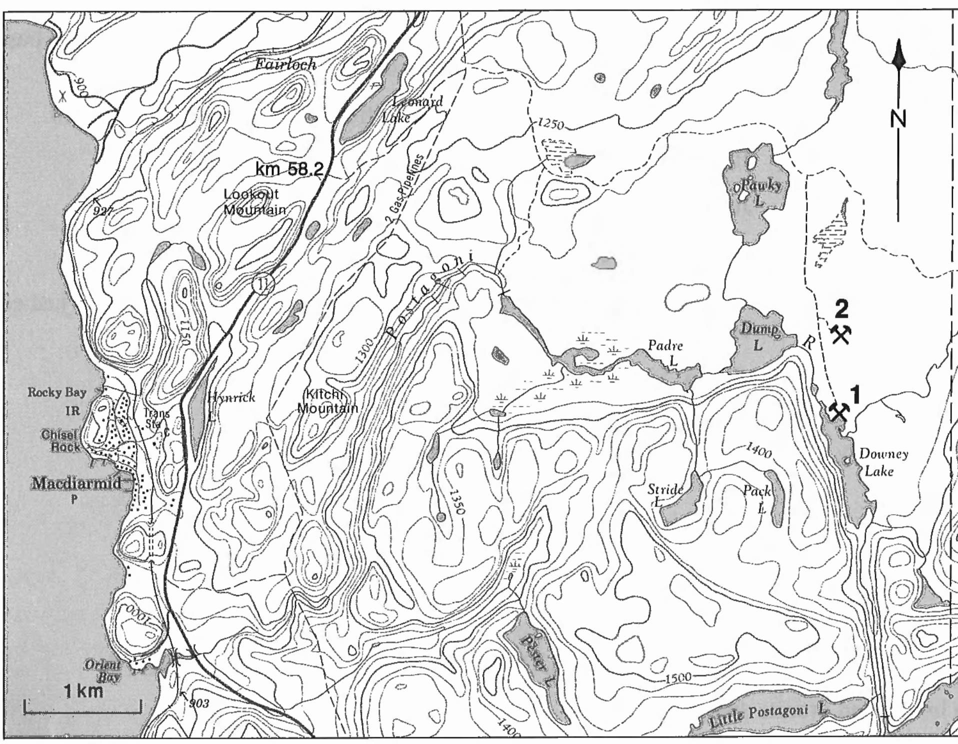
Maps (T): 52 H/1 Nipigon
(G): 2232 Nipigon-Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

km 593.6 Nipigon, at the junction of Highway 11.

Nipigon-Longlac Occurrences

Mineral occurrences along Highway 11 North from Nipigon to Longlac are described in the following pages. The main road log along Highway 17 West is resumed on page 109.

Part of 52 H/8



Map 16. Nama Creek lithium mine.

1-South zone 2-North zone

Nama Creek Lithium Mine

SPODUMENE, APATITE, GARNET

In pegmatite dyke in biotite gneiss

Light green spodumene crystals measuring up to 60 cm long were formerly obtained from a pegmatite dyke composed of K-feldspar, quartz and minor pale yellow muscovite. Accessory minerals included blue apatite and red garnet. The spodumene is partly altered to dark green and brown sericite.

The Nama Creek lithium deposit was staked by R. Grenier in 1955, the year that the region's first lithium-bearing pegmatites were discovered on a small island in Georgia Lake. The Nama Creek deposit consists of two main zones: the North zone located 760 m northeast of Downey Lake, and the South zone located 150 m north of Downey Lake. The zones were trenched and diamond drilled by Nama Creek Mines Limited from 1955 to 1957. A vertical shaft was sunk to a depth of 153 m in the North zone deposit. Further work was discontinued due to a lack of market for lithium at that time.

Access to the deposit is by a branch road leading east from Highway 11.

Road log from Nipigon:

km	0	Junction of highways 17 and 11; proceed north along Highway 11.
	46.6	Scenic viewpoint of Orient Bay.
	58.2	Junction; turn right onto a single-lane road.
	61.1	Junction; turn left.
	65.2	Junction. The road continues south to Downey Lake. The South zone is 580 m south of this junction. To reach the North zone, turn left (east).
	65.7	North zone shaft.

Refs.: 234 p. 56-57; 265 p. 26, 89-96.

Maps (T): 52 H/8 Orient Bay
(G): 2056 Georgia Lake Area, Thunder Bay District (O.G.S., 1:63 360)

Northern Empire Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, CHALCOPYRITE, GALENA, TOURMALINE

In quartz veins in greywacke

Native gold occurred in white quartz and in the rusty schistose wall rock. Some gold was obtained by panning the wall rock. The dumps provide specimens of white quartz with disseminations and massive patches of pyrite, arsenopyrite, chalcopyrite and galena. Black tourmaline occurs as small prisms and irregular masses in quartz.

The gold-bearing quartz vein was discovered in the early 1920s by Thomas Powers and Phil Silams. The discovery led to a staking rush in the Beardmore area. Original development of the deposit was done in 1926-1930 by Beardmore Gold Mines Limited. The work consisted of two shafts sunk to depths of 13.7 m and 45.7 m. In 1932, Northern Empire Mines Company Limited acquired the property, installed a mill and, in 1934, began production. The mine was

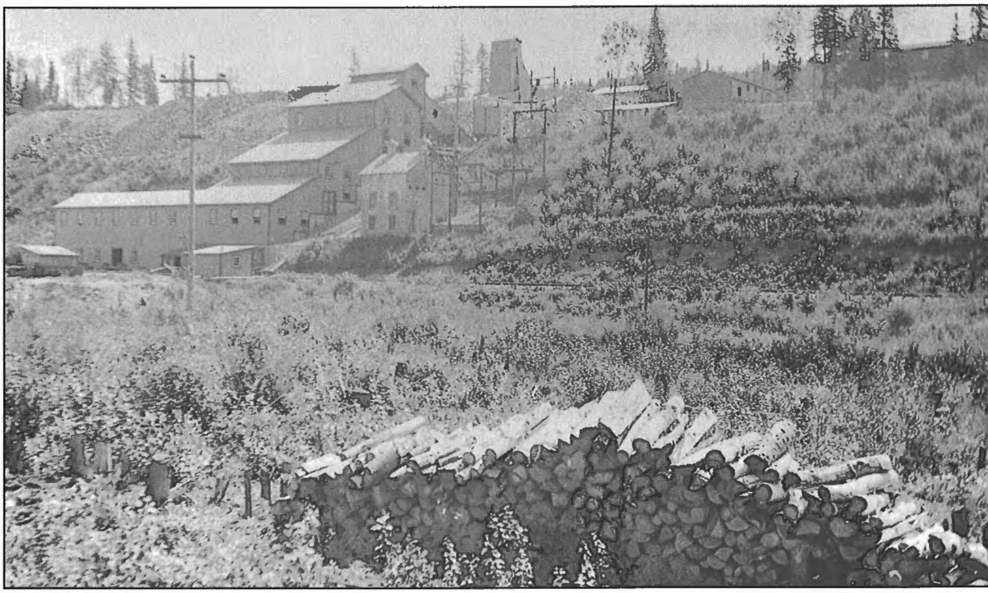


Plate 36

Northern Empire Mine, 1936. (National Archives Canada PA-14866)

worked from a shaft, 750 m deep, until 1941 when ore reserves were exhausted. Production amounted to 4 649 681 g of gold and 615 933 g of silver, valued at $5 384 514. The mine was worked again in 1978-1979 by Montana Contractors Limited. Some rich ore was mined and shipped to the Pamour Mine at Timmins. In 1982 Pan-Empire Joint Venture operated a new mill on the site and processed ore from the mine dumps and from other gold mines in the area.

The mine is located about 1.6 km northeast of Beardmore.

Road log from Nipigon:

km	0	Junction of highways 17 and 11; proceed north on Highway 11.
	58.2	Junction of the road to Nama Creek Mine; continue along Highway 11.
	60.8	Junction of the road to Blackwater Provincial Park.
	79.1	Junction, at Beardmore; turn right (east). This junction is 0.5 km south of the highway bridge over Blackwater Creek.
	79.5	Junction; continue straight ahead along a single-lane road.
	80.8	Mine at the end of the road.

Refs: 123 p. 284-285; 196 p. 102, 105; 250 p. 48,58.

Maps (T): 42 E/12 Beardmore
(G): 2012 Tashota-Geraldton Sheet, Thunder Bay and Cochrane Districts (O.G.S., 1:253 440)

Leitch Mine

NATIVE GOLD, PYRITE, TETRAHEDRITE, SPHALERITE, MALACHITE, AZURITE, HEMATITE, JASPER, MAGNETITE, SCHEELITE

In quartz veins in greywacke

Native gold occurred as fine specks in fractures in quartz and in a dark grey to black aggregate consisting of pyrite, tetrahedrite and sphalerite. Flakes of malachite, azurite and yellowish green sericite are found in fractures in quartz. Cubes of pyrite measuring about 2 mm along an edge are found in schisted greywacke in the mine dumps. The host greywacke is interbedded with conglomerate and with an iron formation consisting of banded hematite-jasper and finely disseminated magnetite.

The deposit was discovered in 1935 by Russell and James Cryderman who noted a spectacular gold showing while running a picket line along a vein striking east from the adjacent Sand River property. Leitch Gold Mines Limited was formed in the same year to develop the deposit. A gold brick weighing 2037 g was produced from 348.8 kg of selected high-grade ore obtained from the spectacular discovery pocket. Mining operations which continued to 1965 transformed the railway siding of Beardmore to a townsite serving the gold mines of the area. The mine was serviced by a shaft, 916.8 m deep and a 140-ton per day mill. Production, until ore was exhausted in 1965, amounted to 26 353 291 g of gold and 988 298 g of silver, valued at $30 500 485. At various times since mining ceased, the dumps were processed and additional gold was recovered. In the 1940s, 58.3 t of scheelite were produced.

The mine is located northwest of Beardmore.

Plate 37

Leitch Mine, 1936. (National Archives Canada PA-15800)

Road log from Nipigon:

km	0	Junction of highways 11 and 17; proceed north along Highway 11.
	80.2	Junction; turn left onto Highway 580.
	87.4	Junction; turn right onto a single-lane road.
	87.55	Mine.

Refs: 19 p. 512-519; 123 p. 271-272; 192 p. 101-105; 251 p. 98.

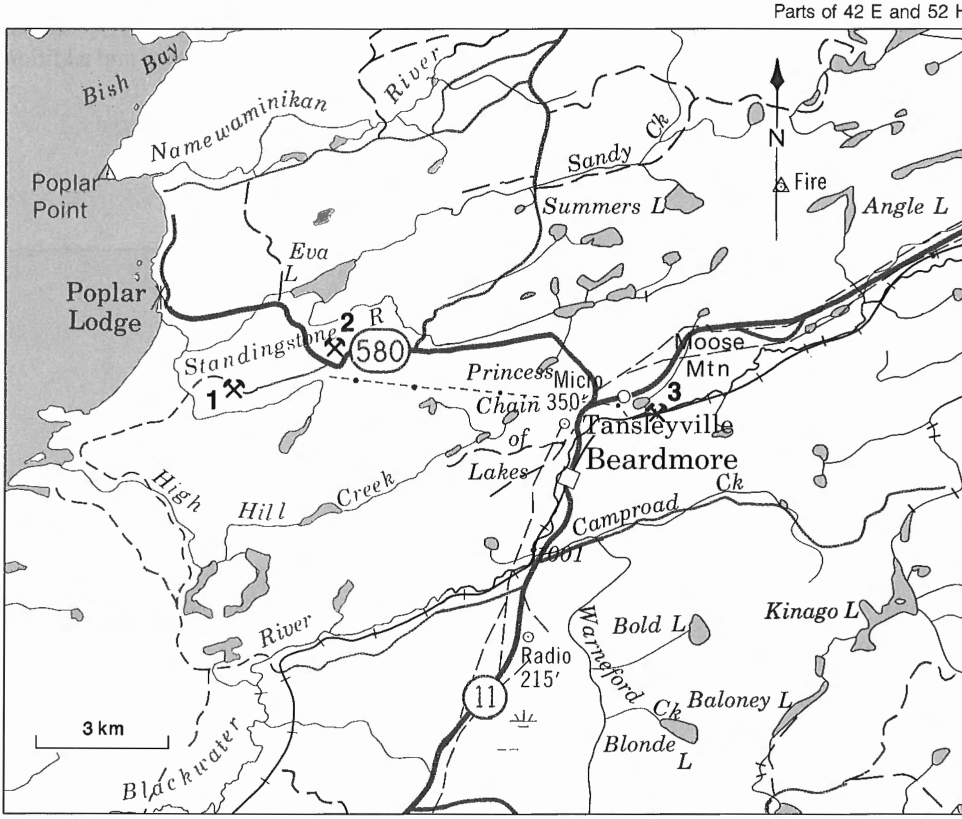
Maps (T): 52 H/g Shakespeare Island
(G): 2102 Tashota-Geraldton Sheet, Thunder Bay and Cochrane Districts (O.G.S., 1:253 440)

Sand River Mine

NATIVE GOLD, PYRITE, TETRAHEDRITE, MALACHITE, AZURITE, SCHEELITE

In quartz veins in shear zones in greywacke

Parts of 42 E and 52 H



Map 17. Beardmore area.

1-Sand River Mine 2-Leitch Mine 3-Northern Empire Mine

The mineralization at this deposit is similar to that of the Leitch Mine. Native gold occurred as specks in quartz.

The deposit, discovered and staked in 1934 by Russell Cryderman was originally worked from 1935 to 1941 by Leitch Gold Mines Limited, and subsequently by Northern Empire Mining Company Limited (1941-1942) and by Undersill Gold Mining Company Limited (1945-1948). Beginning in 1954, Leitch Gold Mines Limited operated the mine from its underground workings at the nearby Leitch Mine. From 1937 to 1942, the mine produced 1 557 172 g of gold and 112 842 g of silver, valued at $1 863 840. Some scheelite was mined from the deposit in 1942.

The mine is located northwest of Beardmore, near the Leitch Mine.

Road log from Highway 11:

km	0	Junction of highways 11 and 580; proceed onto Highway 580.
	7.2	Turn-off to the Leitch Mine; continue along Highway 580.
	7.55	Junction, at bend; turn left.
	7.65	Junction; follow road on right.
	8.2	Junction; continue straight ahead.
	8.4	Mine on right.

Refs: 123 p. 272-273; 192 p. 109-112.

Maps (T): 52 H/9 Shakespeare Island
(G): 2102 Tashota-Geraldton Sheet, Thunder Bay and Cochrane Districts (O.G.S., 1:253 440)

Bankfield Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, GALENA, ILMENITE, SCHEELITE

In sheared and silicified greywacke and porphyry

Ore shoots at this mine were characterized by much visible gold found in quartz along small fractures and along shear planes in silicified zones in greywacke. The principal metallic minerals were pyrite, arsenopyrite and pyrrhotite which occurred as disseminations and as lenses of massive sulphides. Minor amounts of chalcopyrite, sphalerite, galena, ilmenite and scheelite were present. The gangue minerals were grey quartz with minor ankerite and albite. Small crystals of pyrite occur in quartz and in altered chloritic rock found in the dumps.

The deposit was discovered on October 3, 1931 by T.A. Johnson who found gold- bearing quartz in a shear zone on a reef in Magnet Lake. The next day, Johnson and Robert Wells, who was with him when the discovery was made, staked a group of claims. In May 1931, Johnson discovered gold 300 m south of the lake by panning rusty weathered rock. Original development was done in this zone. Exploration was carried out between 1934 and 1936 by Bankfield Gold Mines Limited. In 1936, Bankfield Consolidated Mines Limited undertook development of the deposit and in the following year this mine became the second gold producer in the Little Long Lac camp, after the Little Long Lac Mine which began production in 1934. The Bankfield Mine was operated until 1942, and again between 1944 and 1947. It yielded 2 065 768 g of gold and 236 072 g of silver, valued at $2 424 545. The mine was worked from a shaft sunk to a depth of 395.6 m.

The mine is about 14 km west of Geraldton on the north side of Highway 11 at a point 10.6 km west of its junction with Highway 584 and 68.7 km east of the junction of highways 11 and 580. It is 149 km from the junction of highways 17 and 11 in Nipigon.

Refs: 49 p. 46-50; 50 p. 135-140; 123 p. 265-266; 261 p. 70-82.

Maps (T): 42 E/11 Wildgoose Lake
(G): 1951-7 Township of Errington, District of Thunder Bay, Ontario (O.G.S., 1:12 000)

Magnet Consolidated Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, GALENA

In quartz veins in sheared greywacke and iron formation

Native gold occurred as irregular grains in quartz and carbonates, and as fracture-fillings in quartz, pyrite and arsenopyrite. Pyrite, the most abundant sulphide, and arsenopyrite occur as small crystals in white massive quartz. Associated with these minerals are pyrrhotite, chalcopyrite, sphalerite and some galena. The gangue minerals are quartz, dolomite, calcite and plagioclase. Pods of bright green mica occur in chloritized rock. The iron formation consists of layers of iron oxides interbanded with chlorite slate.

Gold mineralization was discovered as a result of diamond drilling in 1934-1936 by Magnet Lake Gold Mines Limited and Wells Long Lac Gold Mines Limited. These companies were amalgamated forming Magnet Consolidated Mines Limited which mined the deposit from 1937 to 1952. The mine was developed to a depth of 796 m. It produced 4 730 424 g of gold and 524 988 g of silver, valued at $5 730 635.

The mine is located about 11 km west of Geraldton. Access is by a single-lane road, 800 m long, leading north from Highway 11 at a point 8.3 km west of its junction with Highway 584, south of Geraldton, and 2 km east of the Bankfield Mine.

Refs.: 123 p. 267; 261 p. 100-113.

Maps (T): 42 E/11 Wildgoose Lake
(G): 1951-7 Township of Errington, District of Thunder Bay, Ontario (O.G.S., 1:12 000)

MacLeod-Cockshutt Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, SPHALERITE, CHALCOPYRITE, GALENA, GOETHITE, HEMATITE, MAGNETITE, ILMENITE, TOURMALINE, SCHEELITE

In quartz-carbonate veins in greywacke and albite porphyry

Native gold occurred as tiny, irregular filaments in pyrite, arsenopyrite and quartz. Some of the gold content of the ore was contained in gold tellurides (possibly krennerite or coloradoite). Pyrite and arsenopyrite were the principal sulphides. Pyrrhotite, sphalerite and chalcopyrite were minor constituents of the ore. Galena, goethite, hematite, magnetite and ilmenite were

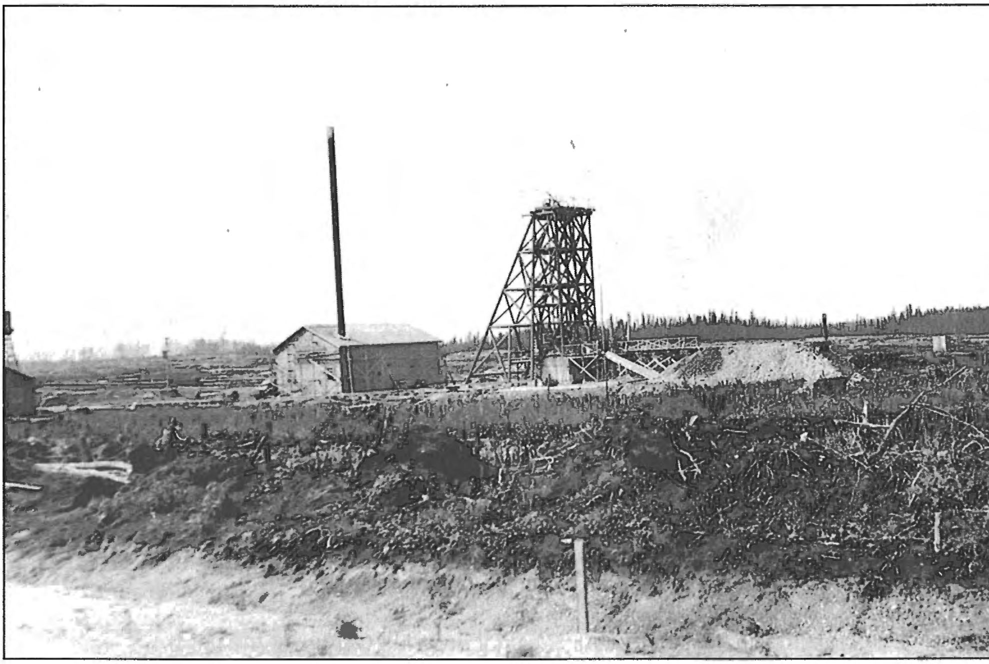


Plate 38

MacLeod-Cockshutt Mine, 1936. (National Archives Canada PA-14863)

also associated with the ore. The gangue consisted of quartz and calcite with tourmaline and scheelite.

The deposit was staked in 1931 by F. MacLeod and A. Cockshutt following the Smith discovery of gold mineralization on the nearby Hard Rock deposit. In 1934 MacLeod-Cockshutt Gold Mines Limited undertook underground exploration of the deposit, and located an economic orebody in 1938. Development consisted of two shafts sunk to depths of 686 m and 586 m. Production to 1967 amounted to 42 499 263 g of gold and 2 826 143 g of silver, valued at $49 163 569. The mine ceased operations in 1970.

The mine is 4 km south of Geraldton. No. 1 shaft is on the west side of Highway 584 just south of its junction with Highway 11. No. 2 shaft is on the east side of Highway 584 at a point 0.45 km south of its junction with Highway 11.

Refs.: 123 p. 263-264; 174 p. 5-6, 75-94.

Maps (T): 42 E/10 Geraldton
(G): 1951-2 Township of Ashmore, District of Thunder Bay, Ontario (O.G.S., 1:12 000)

Hard Rock Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE, SPHALERITE, CHALCOPYRITE, GALENA, CUBANITE, GRAPHITE, SCHEELITE, TOURMALINE

In quartz veins in greywacke, iron formation and albite porphyry

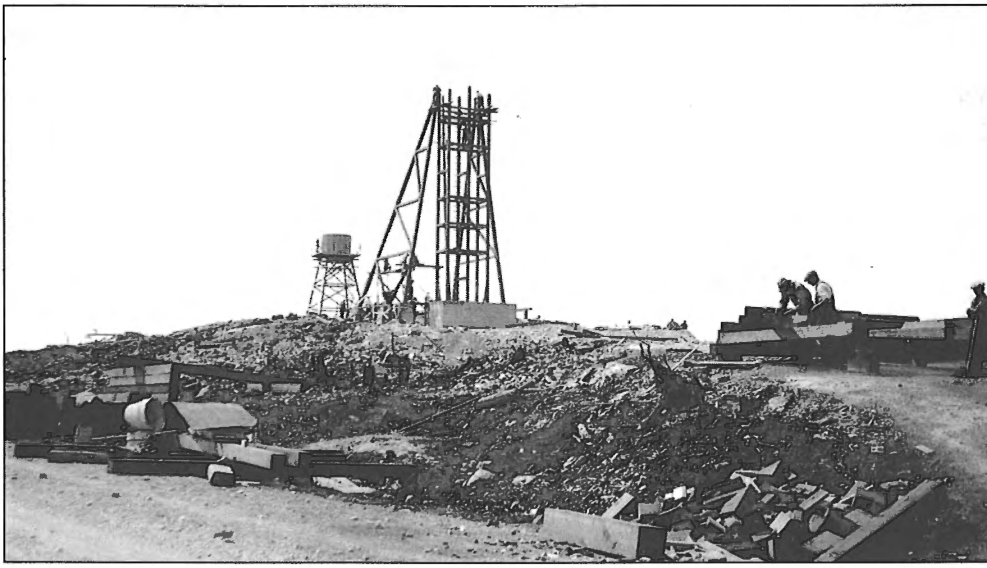


Plate 39

Hard Rock Mine, 1936. (National Archives Canada PA-14864)

Very rich concentrations of gold occurred in places in quartz veins and in the wall rocks. It occurred as visible gold in quartz and in association with the sulphides. Pyrite and arsenopyrite with minor pyrrhotite, sphalerite, chalcopyrite, galena, and cubanite occurred as disseminations and massive replacements in the wall rocks. The gangue consisted of quartz with some dolomite, graphite, scheelite and tourmaline. During mining operations, some exceedingly rich concentrations of native gold were found in quartz containing light-coloured anhedral pyrite crystals.

Discovery of gold on the Hard Rock property was made in 1931 when William W. (Hard Rock) Smith found gold-bearing quartz stringers in sheared greywacke at the water's edge on a point about 800 m south of the West Narrows, Kenogamisis Lake. No. 1 shaft was sunk to 138 m at this location between 1934 and 1936 by Hardrock Gold Mines Limited. Further development was discontinued when richer ore was found at the west end of the property where No. 2 shaft, the production shaft, was sunk to a depth of 430 m. No. 1 shaft was deepened to 145 m and connected at that level to No. 2 shaft. The mine and mill operated from 1938 until 1951 producing 8 369 226 g of gold and 280 207 g of silver, valued at $10 057 426.

The mine is about 5 km south of Geraldton and east of the MacLeod- Cockshutt Mine. No. 2 shaft is on the north side of Highway 584 at a point 1 km southeast of its junction with Highway 11. No. 1 shaft is located at Discovery Point, 750 m east of Shaft No. 2.

Refs.: 19 p. 515; 123 p. 262-263; 174 p. 5-6, 51-73; 210 p. 406-408.

Maps (T): 42 E/10 Geraldton
(G): 1951-2 Township of Ashmore, District of Thunder Bay, Ontario (O.G.S., 1:12 000)

Theresa Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, PYRRHOTITE, BORNITE, PETZITE, TOURMALINE

In quartz veins in shear zones

Coarse native gold occurred in quartz veins in shear zones at the contact of diorite and metavolcanics. Pyrite, chalcopyrite, pyrrhotite, bornite, petzite and tourmaline were also present in the quartz.

The deposit was discovered in 1934. It was explored by two prospect shafts sunk to depths of 41 m and 66 m between 1936 and 1937 on the west side of the Making Ground River. The work was done by N.A. Timmins Corporation. In 1938, the original stakers formed Theresa Gold Mines Limited which worked the mine between 1938 and 1953 from a new shaft sunk to 300.7 m on the east side of the Making Ground River. The mine produced 148 828 g of gold and 6 283 g of silver, valued at $167 722.

The mine is located south of Longlac which is 170 km from Nipigon.

Road log from Longlac:

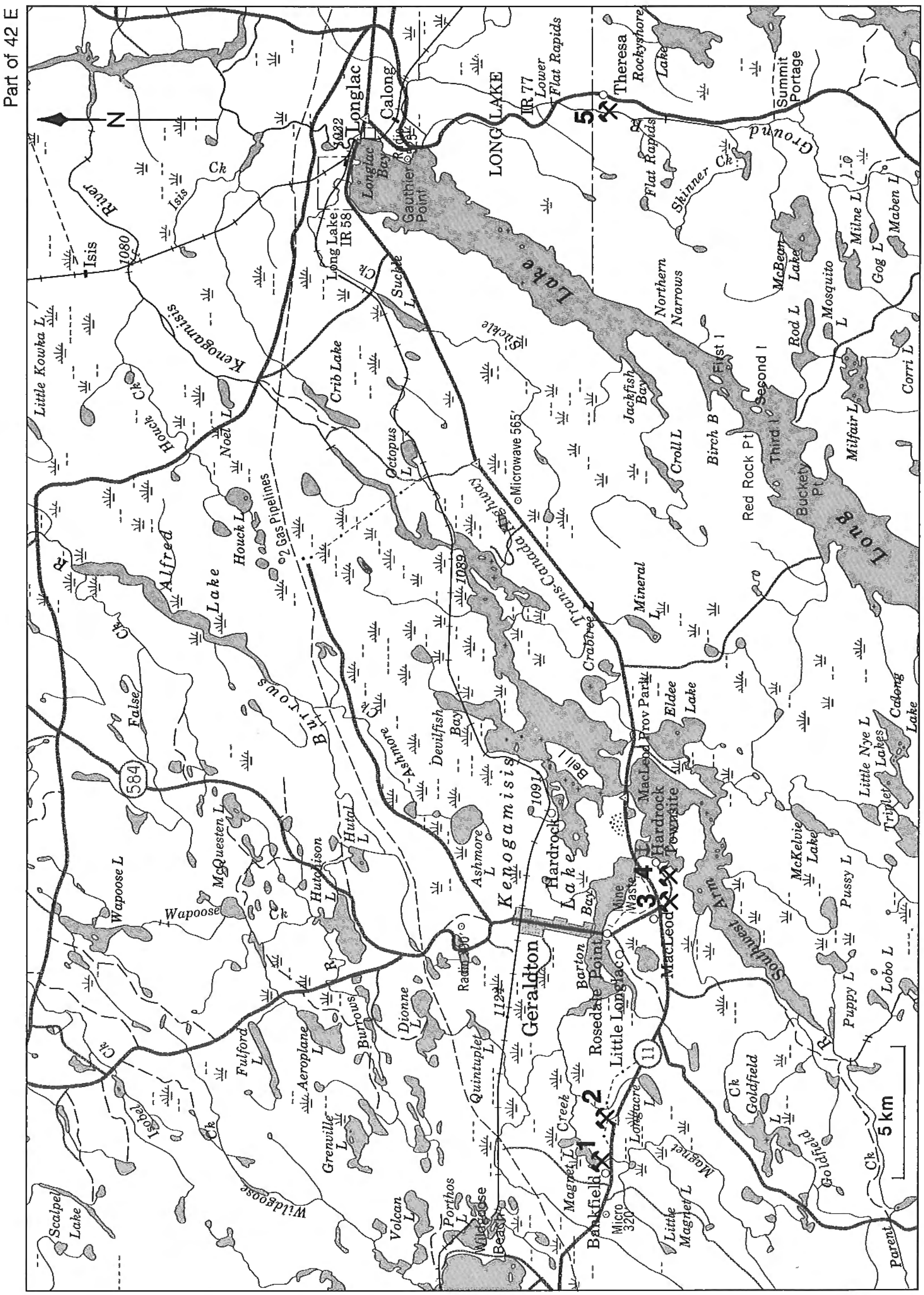
km	0	Longlac, at the junction of Highway 11 and Forestry Road (L. and F. Ranger Station); proceed south along the Forestry Road. This junction is 0.4 km east of the Highway 11 bridge over Kenogami River.
	0.6	Junction; turn right onto the Picnic Point Road.
	1.1	Intersection; continue straight ahead along the Picnic Point Road.
	1.7	Junction; turn left.
	3.2	Junction; turn left.
	4.0	Junction; turn right.
	9.0	Bridge over Making Ground River.
	11.6	Junction; turn right onto the mine road.
	11.8	Mine.

Refs.: 119 p. 18; 123 p. 291-292.

Maps (T): 42 E/10 Geraldton
(G): 2102 Tashota-Geraldton Sheet, Thunder Bay and Cochrane Districts (O.G.S., 1:253 440)

The road log to occurrences along Highway 11 North ends here. The main road log along Highway 17 West is resumed.

km **593.6** Nipigon, at the junction of Highway 11 and Highway 17.


Part of 42 E
N
Longlac
Calong
Longlac Bay
Gauthier Point
Long Lake IR 58
LONG LAKE
IR 77
Lower Flat Rapids
Flat Rapids
Theresa
Rockyshore Lake
Summit Portage
Ground
Skinner Ck
Northern Narrows
McBean Lake
Milne L
Gog L
Maben L
Mosquito L
Rod L
Corri L
Milfair L
Jackfish Bay
First I
Second I
Third I
Birch B
Croll L
Red Rock Pt
Buckety Pt
Long Lake
Mineral L
Microwave 565'
Trans-Canada Highway
Octopus L
Crib Lake
Suckle L
Isis
River
Kenogamisis
Little Kowka L
Houck Ck
Noel L
Houck L
2 Gas Pipelines
Alfred Lake
False
Burrows
Wapoose L
Wapoose
McQuesten L
Hutchison L
Hutal L
Ashmore
Devilfish Bay
Crabtree L
Bell I
Hardrock
Hardrock Lake
Hardrock Townsite
MacLeod Prov Park
Eldee Lake
Kenogamisis Lake
Ashmore L
Mine Waste
MacLeod
Southwest Arm
McKelvie Lake
Pussy L
Little Nye L
Triplet Lakes
Calong Lake
Puppy L
Lobo L
Goldfield L
Goldfield
Parent
Ck
5 km
Geraldton
Barton Bay
Rosedale Point
Little Longlac
Longacre L
Magnet L
Little Magnet L
Magnet
Bankfield
Micro 320
Creek
Dionne L
Quintuplet L
Burrows L
Aeroplane L
Fulford L
Grenville L
Isobel
Wildgoose
Scalpel Lake
Volcan L
Porthos L
Wildgoose
Beach
584
1080
1089
1091
1122
11
1
2
3
4
5

St. Ignace Island, Black Bay Peninsula (east side)

NATIVE COPPER, CHALCOCITE, PREHNITE, AGATE, NATIVE SILVER

In amygdaloidal basalt

Native copper occurs as nodules and disseminated fragments in dark grey amygdaloidal basalt and in calcite veins. It is associated with chalcocite, prehnite and chlorite in the veins. The copper-bearing basalt was explored by trenches and diamond drilling at the north end of Moffat Strait which separates the islands of St. Ignace and Simpson; the location of the investigation is at the northeast corner of St. Ignace Island, on the west side of the strait. Four veins, with widths of 7 cm to 1.8 m were found to contain native copper and chalcocite in calcite. The exploration was done in 1954-1955 by Horlac Mines Limited. The copper-bearing basalt extends southward along the shore of Moffat Strait on both St. Ignace and Simpson islands. Two other locations were drilled for copper: one is at the southeast shore of St. Ignace Harbour, the other on the west shore of the island along Nipigon Strait, about 2500 m south of the northwest corner. Native copper and chalcocite also occur in calcite veins in basalt along the east side of Black Bay Peninsula, 1.5 to 3 km south of Pointe à la Gourganne.

Agate occurs in amygdaloidal basalt at various localities on St. Ignace Island and on adjacent islands. Localities include the east side of St. Ignace Harbour, the south shore from Duncan Cove to Square Bay and the adjacent shore of Bowman Island, and the southern half of Agate Island. Agate occurs at numerous localities along the east side of Black Bay Peninsula and adjacent islands including the following occurrences: the north end of Fluor Island; islands off Agate Point; the south end of Otter Cove, at Heron Point and at the southwest shore; on the west side of Clark Bay; the west shore of Lasher Island; and along the shores of Shaganash and adjacent islands.

In 1846 the Montreal Mining Company explored a calcite-fluorite-chalcocite vein in the gorges dissecting Fluor Island. No economic deposit of fluorite was found although the island derives its name from the mineral fluorite which occurs only in small occurrences.

Agate from St. Ignace and neighbouring islands was included in the Geological Survey of Canada's exhibit at the 1851 Grand Industrial Exhibition in London and at subsequent international exhibitions. Specimens of native copper and native silver were also displayed; they were obtained from veins in basalt at a mining claim known as Harrison's Location at the east end of St. Ignace Island. Masses of native copper weighing more than 45 kg were found with native silver in calcite. In 1846, the Montreal Mining Company sank a shaft to a depth of 18 m in the vein but abandoned the operation in order to concentrate on its activities at Bruce Mines.

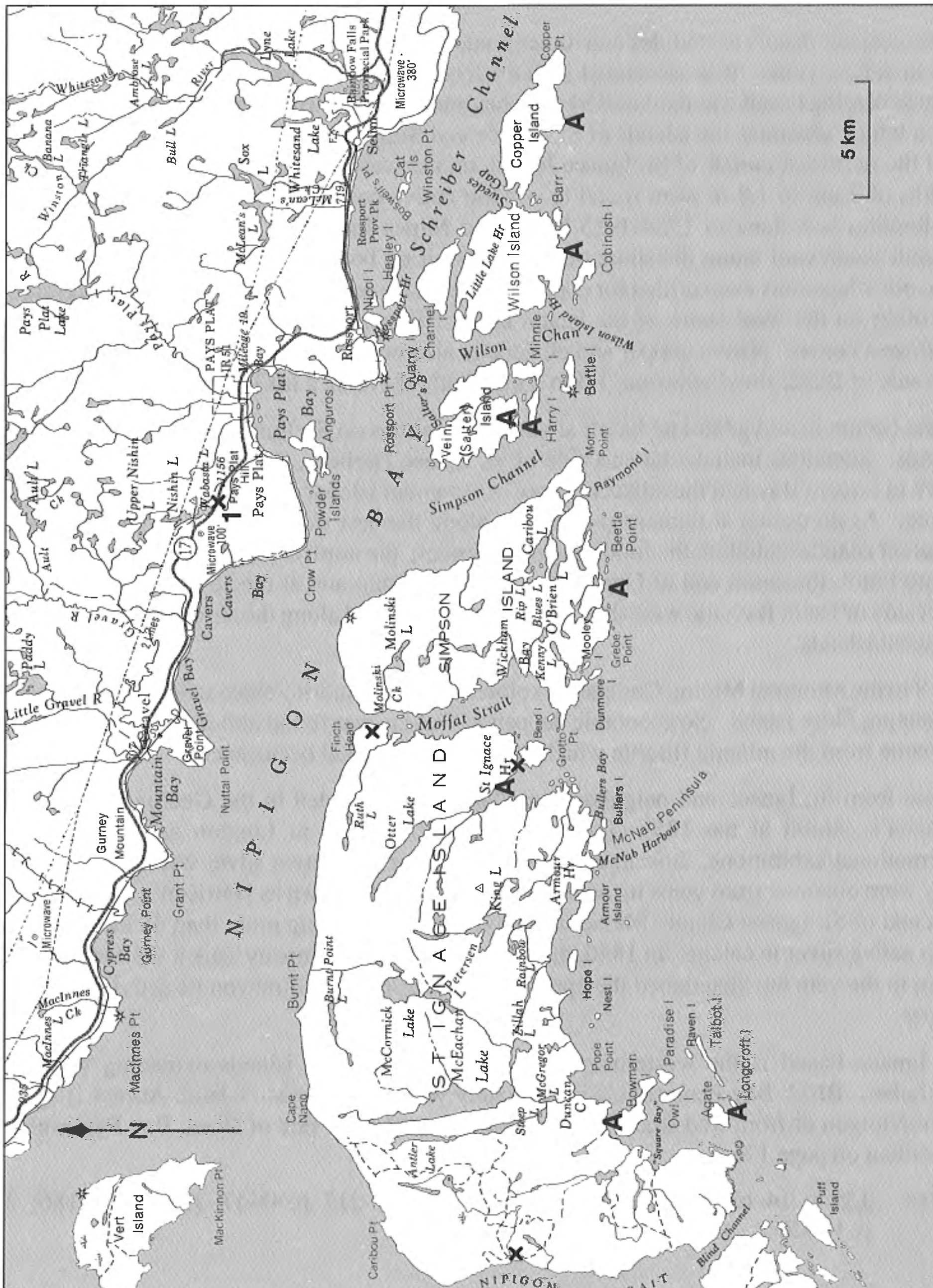
St. Ignace Island is the westernmost island in the string of islands extending west from Schreiber. Black Bay Peninsula is immediately west of St. Ignace Island. Access is by boat from Nipigon or from Red Rock. The localities on the west side of Black Bay Peninsula are described on page 126.

Refs.: 139 p. 14-16, 26-29; 199 p. 2,5; 200 p. 706; 217 p. 43-47; 322 p. 185-186; 358 p. 16-17.

Map. 18 (opposite). Geraldton-Longlac area.

1-Bankfield Area
2-Magnet Consolidated Mine
3-MacLeod-Cockshutt Mine
4-Hard Rock Mine
5-Theresa Mine

Parts of 42 D and 52 A



Maps (T): 42 D/12 Grebe Point
42 D/13 Rossport
52 A/8 Shaganash Island
52 A/9 Shesheeb Bay
52 A/16 Red Rock
(G): 2285 St. Ignace Island and Adjacent Islands, Thunder Bay District (O.G.S., 1: 63 360)
2304 Black Bay Peninsula, Thunder Bay District (O.G.S., 1: 63 360)

km **597.6** Junction of Highway 585.

km **606.1** Junction of Highway 628 to Red Rock, a launching point for boats to St. Ignace Island and to the east side of Black Bay Peninsula.

km **621.7** Junction of Highway 582 to Hurkett and the road to Armstrong.

km **638.6** Junction of the road to Ouimet Canyon.

km **642.3** Junction of the road to the Dorion, Ontario Gem and Marino Mountain mines.

Dorion Mine

AMETHYST, BARITE, PYRITE, CHALCOPYRITE

In calcite veins in conglomerate and sandstone (Sibley Group) and in quartz monzonite

Amethyst crystals measuring up to 7.5 cm in diameter occur in coarsely crystalline calcite. Pink platy barite and transparent calcite crystals also occur in the calcite. Pyrite and chalcopyrite occur as stringers in a brecciated zone containing quartz- calcite veins.

The deposit is exposed by four trenches. It was originally investigated for copper in 1967 and was later opened for amethyst by E.J. Williamson. Visitors are admitted to the property but collecting specimens is not permitted.

Road log from Highway 17 at **km 642.3**:

km 0 Proceed south along the road to the Dorion and Ontario Gem mines.

1.5 Junction; turn right.

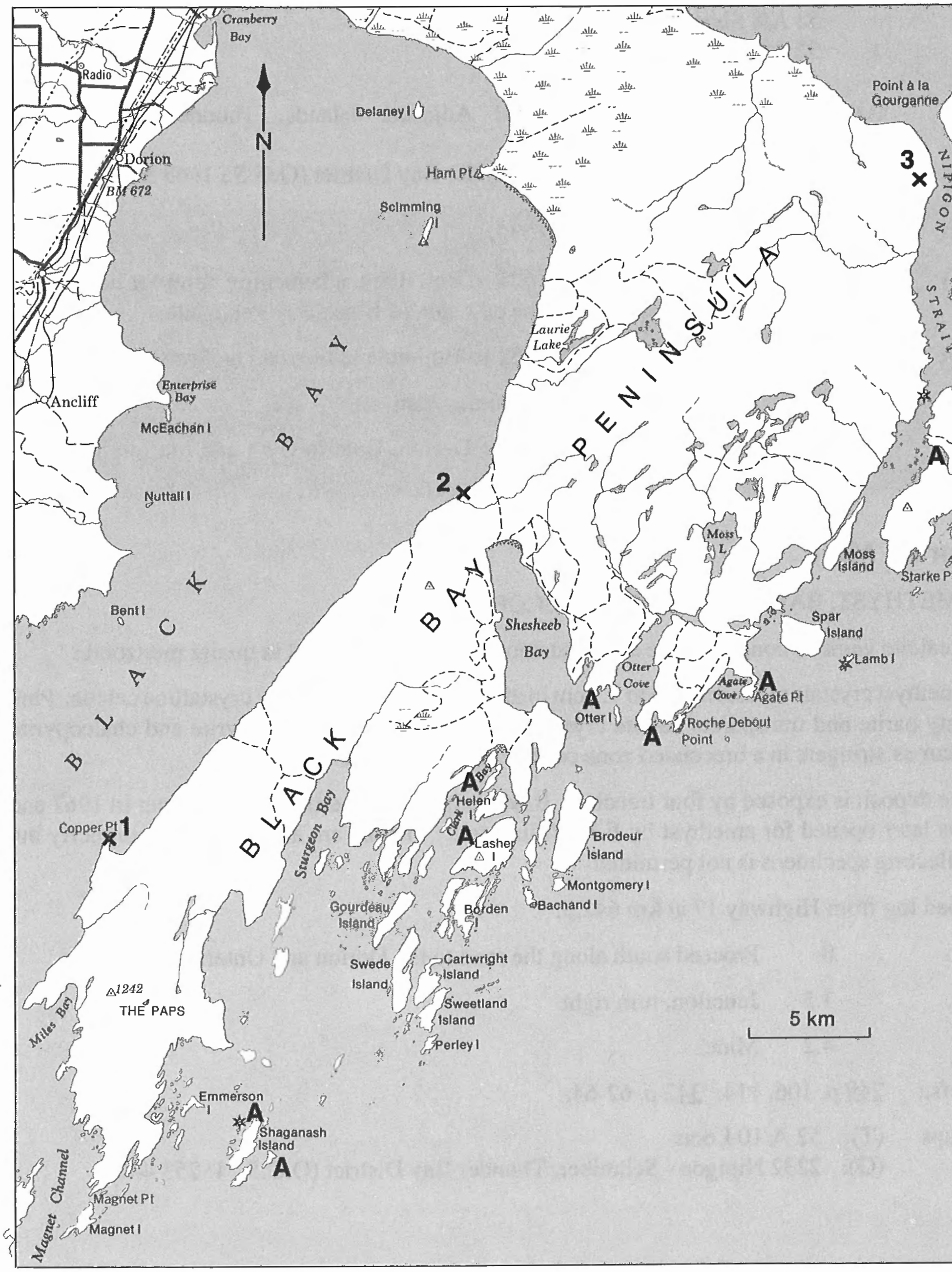
4.2 Mine.

Refs.: 249 p. 106, 114; 342 p. 62-64.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

Map 19 (opposite). St. Ignace and adjacent islands.

A - Agate occurrences X - Copper prospects 1-Fluorite Occurrence



Map 20. Black Bay Peninsula.

A-Agate occurrences
1-Copper Point occurrence
2-Magnetite occurrence
3-Copper occurrences

Ontario Gem Mine

AMETHYST, BARITE

In quartz breccia zone at contact of granite and Sibley sedimentary rocks

Amethyst crystals measuring up to 1 cm across occur lining cavities in brecciated quartz. Pink platy barite and calcite are also present.

The deposit is exposed by an open cut on the steep west side of a hill. Collecting is permitted and a fee is charged for material removed.

Road log from Highway 17 and **km 642.3** (see page 113):

km	0	Proceed south along the road to the Dorion and Ontario Gem mines.
	1.5	Junction; continue straight ahead.
	1.8	Gravel pit. Continue along the road.
	3.6	Ontario Gem Mine parking lot. A trail leads east 150 m to the mine.

Refs.: 249 p. 114, 116.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Marino Mountain Mine

AMETHYST

In quartz breccia zone at the contact of granite and Sibley sedimentary rocks

Amethyst crystals measuring up to 6 cm across occur in cavities in brecciated quartz veins; one cavity measured 0.6 by 2.4 by 3.7 m. Trenches expose the veins. About 100 m north of this zone, amethyst crystals measuring up to 2 cm across occur in cavities in brecciated chert. The cavities are up to 15 cm long and 5 cm wide. The chert is finely banded in white, grey and black, and occurs as stromatolites measuring up to 1 m across.

The deposit is 700 m south of the Ontario Gem Mine to which it is connected by a road. Arrangements for visits to the mine may be made at the Ontario Gem Mine.

Ref.: 251 p. 96-97.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Dzuba Ancliff Occurrence

AMETHYST, BARITE, GALENA, SPHALERITE

In brecciated fault zone at the contact of granite and Sibley sedimentary rocks

Amethyst and smoky quartz occurs as crystals about 2.5 cm wide. The crystals occur with coarsely crystalline white and grey calcite and pink barite. Galena and sphalerite are sparsely disseminated in calcite which fluoresces pink in ultraviolet light.

Early exploration of the deposit was for silver-lead-zinc mineralization. An adit was driven 6.1 m into a calcite vein on the side of a granite ridge. Amethyst crystals in calcite are exposed on the roof of the adit. The vein is also exposed west of the adit along the base of the ridge for about 46 m. At the western end, an opening into the vein was made exposing an amethyst-lined chamber which is high enough for a person to enter; it is 0.6 to 0.9 m wide and 7.6 m long. Fragments of amethyst cemented by red clay line the floor and amethyst rhombohedra line the walls. This occurrence, known as the amethyst cave, is preserved as a natural attraction and is not a collecting locality. The occurrence was worked by N. Dzuba.

Road log from Highway 17 at **km 642.3** (see page 113):

km	0	Proceed south along the road to the Dorion and Ontario Gem mines.
	1.8	Gravel pit. Follow single-lane road on left.
	2.8	Railway crossing. Continue along the road.
	3.6	Open cuts on outcrop on left. A trail continues to the "cave".

Refs.: 215; 342 p. 43-51.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

km 650.3 Junction of a road on left.

Enterprise Mine

AMETHYST, BARITE, GALENA, CHALCOPYRITE, PYRITE, SPHALERITE

In quartz-calcite veins in breccia zone in Sibley dolomitic limestone

Quartz crystals measuring up to 2 cm across occur in cavities in the breccia zone. The crystals include amethyst and varieties of smoky quartz. Barite occurs as orange-red radiating platy crystals. Galena cubes measuring up to 2 cm across occur with chalcopyrite and minor amounts of pyrite and sphalerite. Specimens of solid galena weighing 52.5 kg and 35 kg were displayed along with polished specimens of galena-chalcopyrite ore at the 1876 Philadelphia International Exhibition.

The deposit was discovered in 1865 by Peter and John McKellar. It was worked between 1870 and 1876 and produced 145 t of ore most of which was obtained from the surface where there was a thickness of 1.2 m of solid galena. The workings consisted of two shafts, one sunk to a depth of 54.9 m, the other to 18.3 m. They are 91 m apart. The mine is east of Pearl Lake and south of Highway 17.

Road log from Highway 17 at **km 650.3**:

km	0	Junction of Highway 17 and a single-lane road leading south; proceed along this road.
	1.2	Railway crossing. The road ends here. Turn left and walk north 300 m to the mine. The shafts and dumps are on the west side of the railway.

Refs.: 129 p. 1966-1967; 161 p. 79-81; 220 p. 6-7; 299 p. 294; 322 p. 168-169; 359 p. 32-33.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon-Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

km	**650.5**	Bridge over Pearl River.
km	**650.7**	Junction of Road No. 5.

Diamond Willow Mine

AMETHYST, HEMATITE, BARITE, GALENA

In breccia zone in granite and Sibley sedimentary rocks

Amethyst crystals occur in large cavities in brecciated quartz. Groups of crystals measuring up to 1 m have been found in cavities. Hematite and platy barite coat some of the crystals. Galena occurs sparingly in the quartz.

The deposit is exposed by open-cuts on the north side of Big Pearl Lake. Visitors may collect specimens; a fee is charged for specimens collected. The property belongs to Gunnard Noyes.

Road log from Highway 17 at **km 650.7**:

km	0	Junction of Highway 17 and Road No. 5; proceed north onto Road No. 5.
	0.3	Junction; continue straight ahead.
	2.0	Junction; turn right.
	2.2	Junction; turn right.
	3.2	Mine.

Refs.: 214; 249 p. 106, 114.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Barrett Mine

AMETHYST, GALENA, SPHALERITE, PYRITE

In brecciated fault zone in granitic rocks

Amethyst and smoky quartz occur in cavities in brecciated quartz. The smoky quartz grades to a black colour. The crystals measure up to 2 cm across and are highly lustrous. Galena, sphalerite and pyrite occur in quartz.

The deposit was opened by an open cut on the north side of a granite ridge by G. Noyes. It is now worked by J. Barrett. Collecting is not permitted at the mine, but specimens may be obtained from a sales outlet along the road.

Road log from Highway 17 at **km 650.7**:

km	0	Proceed north onto Road No. 5.
	2.0	Junction; turn left. (The road on right leads to the Diamond Willow Mine.)
	2.2	Barrett sales outlet.
	2.8	Open cut.

Refs.: 214; 249 p. 106, 114.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1: 253 440)

Gagnon Falls Occurrence

AMETHYST, GALENA, CHALCOPYRITE, SPHALERITE, PYRITE

In brecciated chalcedonic quartz at contact of granite and Sibley sedimentary rocks.

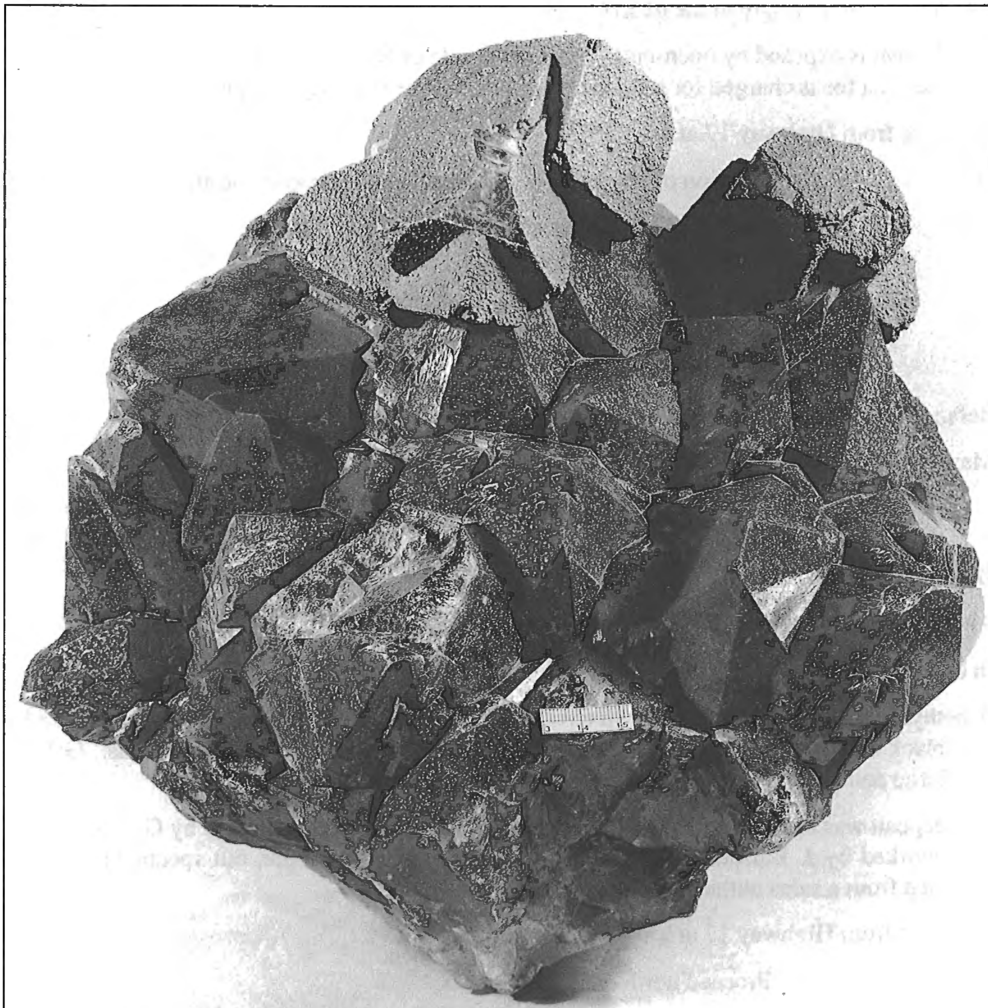


Plate 40

Amethyst crystals with pyrite-coated fluorite cubes, collected by Robert Bell (Geological Survey of Canada) in 1875 from vugs in syenite at the mouth of the Mackenzie River. Specimens from this locality were displayed at the Philadelphia International Exhibition in 1876. (Ref. 359, p. 134) (GSC 112324-B)

Amethyst crystals vary from light to deep violet, and grade to light yellow, smoky and black. Crystals measuring up to 7 cm across have been reported. Galena, chalcopyrite, sphalerite and pyrite occur in the massive quartz.

The deposit outcrops at Gagnon Falls and along the road adjacent to the creek. It is part of a vein system extending over a distance of 800 m. At Gagnon Falls, the vein is exposed by a trench 18.9 m long and 3.7 m wide on the east side of a creek, and by a cut into the ridge on the east side of the road. Trenches expose amethyst-bearing veins extending west from the creek showing to the hydro line.

The deposit was opened by G. Noyes. At present (1987) there are no arrangements for collecting at the site.

Road log from Highway 17 at **km 650.7** (see page 117):

km	0	Proceed north along Road No. 5.
	2.0	Junction; turn right.
	2.2	Junction; turn left. This road is suitable only for 4-wheel drive vehicles.
	2.55	Detroit Algoma Mine on right. (See description below.)
	4.8	Gagnon Falls occurrence.

Refs.: 214; 249 p. 106, 114; 342 p. 54-57.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Detroit Algoma Mine

GALENA, SPHALERITE, CHALCOPYRITE, PYRITE, BARITE, AMETHYST

In brecciated quartz at contact of granite and Sibley sedimentary rocks

Galena and sphalerite occurred in veinlets measuring up to 2.5 cm wide. Pockets of chalcopyrite occurred in the quartz. Amethyst, pyrite and coarse crystal aggregates of barite were also present in the quartz veins.

The silver-lead-zinc mineralized vein was discovered in 1871 by Duncan McEachern. It was explored from 1906 to 1914 by Detroit Algoma Mining Company. The exploratory work consisted of several pits and trenches, and three shafts sunk to depths of 15.8 m, 9.2 m and 4.6 m. The shafts have been filled.

The mine is on the north side of the road leading to Gagnon Falls at a point 2.6 km from Highway 17 (see preceding road log). This is about 330 m beyond the turnoff to the Diamond Willow Mine; there is a "Danger" road sign at this point. A dump is in an overgrown area at the side of the road beyond which there is a shaft. Other shafts are further up the hill.

Ref.: 322 p. 164-165.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)
214A Loon Sheet, Thunder Bay District, Ontario (G.S.C., 1: 63 360)

km 653.7 Junction of Silver Lake road.

Silver Lake Occurrence

GALENA, SPHALERITE, PYRITE, CHALCOPYRITE, BARITE, AMETHYST, STIBNITE

In brecciated quartz-calcite veins in Sibley sedimentary rocks

Argentiferous galena and sphalerite occur with minor pyrite and chalcopyrite in veins on the south side of Silver Lake and on an island in Silver Lake. Galena cubes measuring 2.5 cm along an edge were found in a vein which outcropped along the shore. Barite and some amethyst were associated with galena. Stibnite was reported from one of the pits. Specimens of galena weighing 35 kg were displayed at the 1876 International Exhibition in Philadelphia. The specimens were collected from the island.

The galena-bearing veins were discovered by Donald and Peter McKellar in 1865. The veins have been explored by a shaft and several pits at various times since the initial discovery. The openings are within 150 m of the south shore of the lake and extend eastward from the long bay near the west end of the lake.

Road log from Highway 17 at **km 653.7** (see page 119):

km	0	Proceed south onto Silver Lake Road.
	1.3	Junction; turn left.
	1.9	Junction; turn left.
	3.35	Shaft. The main vein extends southeast of the shaft for a distance of about 275 m.

Refs.: 162 p. 81-83; 216; 220 p. 19; 322 p. 162-164; 359 p. 32.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)
214A Loon Sheet, Thunder Bay District, Ontario (G.S.C., 1: 63 360)

km **657.3** Junction of East Loon Road.

Thunder Bay Amethyst Mine

AMETHYST

In brecciated quartz in multiple fault zones in quartz monzonite

Lavender to violet amethyst crystals measuring up to 30 cm across the base occur lining cavities and as loose crystals in clay-filled cavities. The amethyst-bearing cavities measure up to 1 m by 3 m by 10 m. Smoky quartz is also found in the deposit. The amethyst currently being mined is free of the hematite overgrowth on rhombohedral faces which characterized amethyst recovered from earlier surface operations. With increasing depth, there is a marked increase in the proportion of gem grade material. Current extraction methods are directed to recovering a higher yield of faceting grade material. Recent studies by gemmologists and cutters of the faceting grade amethyst indicate that superior stones of up to 10 carats showing the red flashes characteristic of the finest grade amethyst can be produced as a result of applying proper cutting procedures. A colour-change phenomenon was also noted: in incandescent light the stones take on a magenta-violet colour, and in daylight or fluorescent lighting, a blue-violet colour.

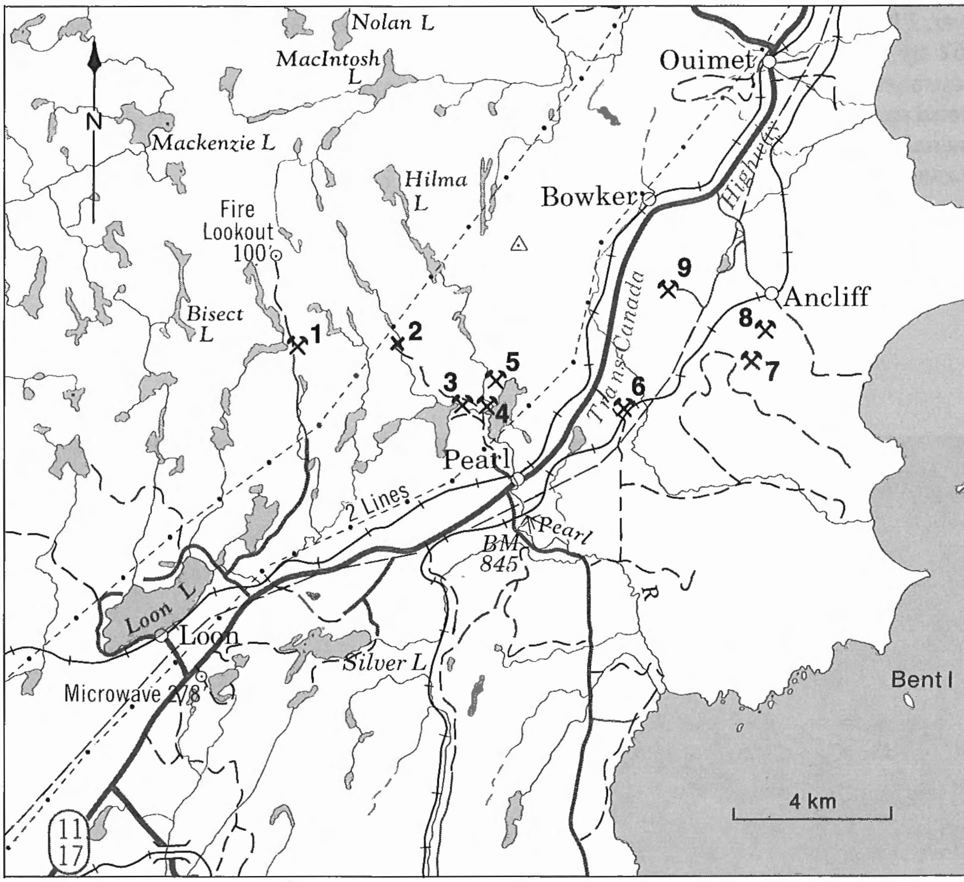
The deposit was discovered in the early 1960s during the construction of the road to the fire tower, 2 km north of the mine. It was originally staked by Rudy Hartviksen. Mining began in 1962 by Thunder Bay Amethyst Mines Limited. The current operator, Precious Purple Gemstones Limited, took over operations in 1980. The mine produces gem material for use in faceted stones, cabochons and tumbled stones, and crystal specimen material. It also produces material for decorative building and landscaping stone. Operations are from an open pit measuring 2.5 m by 175 m by 8 m.

The mine is at the east end of Elbow Lake. Visitors may collect on a fee basis from the dump material.

Plate 41

Thunder Bay Amethyst Mine, 1974. (GSC 163105)

Part of 52 A



Map 21. Thunder Bay amethyst area.

1-Thunder Bay Amethyst Mine
2-Gagnon Falls occurrence
3-Barrett Mine
4-Detroit Algoma Mine
5-Diamond Willow Mine
6-Enterprise Mine
7-Marino Mountain Mine
8-Ontario Gem Mine
9-Dorion Mine

Road log from Highway 17 at **km 657.3** (see page 120):

km	0	Proceed north along East Loon Road.
	0.75	Junction; follow the road on right.
	7.1	Mine.

Refs.: 183 p. 262-271; 203 p. 50-53; 204 p. 71-77; 249 p. 106; 251 p. 95-96; 267 p. 58-59; 288 p. 264-266; 342 p. 58-64.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Dzuba Thunder Bay Occurrence

AMETHYST, GALENA, PYRITE

In a brecciated quartz zone in quartz monzonite

Amethyst crystals varying from light to medium-dark violet occur with white to greenish quartz in a breccia zone. Some galena and pyrite are also present.

The deposit was exposed in 1974 by an open-cut into an outcrop. Amethyst was produced from it by N. Dzuba. The opening is 27 m long and 7.6 m wide.

Road log from Highway 17 at **km 657.3** (see page 120):

km	0	Proceed north along the East Loon Road.
	6.2	Junction; follow the road on right.
	6.55	Outcrop area and open cut.

Ref.: 342 p. 51-52.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

km 662.2 Junction of Highway 587.

Pass Lake Road Quarry

CONCRETIONS, GYPSUM, ARAGONITE, PYRITE, JAROSITE

In black carbonaceous shale

Concretions composed of shale and calcite and impregnated with pyrite occur in black shale of the Rove Formation. They are shaped like oblate spheroids. Pyrite occurs as small nodules (about 3 mm in diameter) in the shale. Secondary minerals occurring as coatings or encrustations on shale include: gypsum, as colourless to white "micro" plates and blades; aragonite, as white paint-like coatings; and jarosite, as rusty yellow powdery coatings.

The quarry is on the east side of Highway 587 at a point 3.5 km south of its junction with Highway 17 at **km 662.2**.

Ref.: 290 p. 26.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Silver Islet Mine

NATIVE SILVER, ARGENTITE, NICKELINE, GALENA, SPHALERITE, MARCASITE, COBALTITE, SMALTITE, DOMEYKITE, CHALCOPYRITE, TETRAHEDRITE, BREITHAUPTITE, MILLERITE, PYROLUSITE, CERARGYRITE, ERYTHRITE, ANNABERGITE, RHODOCHROSITE, BARITE

In a fault zone at contact of diabase and sedimentary rocks

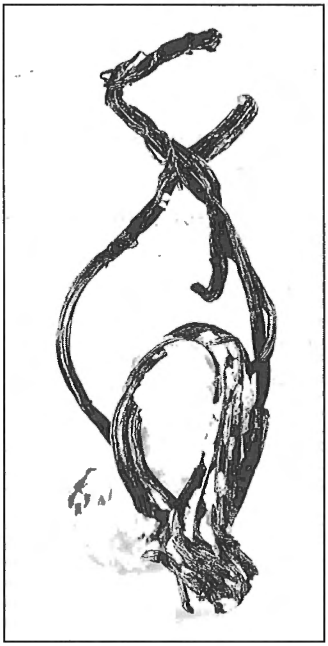


Plate 42

Native silver, Silver Islet Mine. The specimen is 5.5 cm high. (GSC 203376-V)

The silver ore at this former producer consisted of an intergrowth of native silver with argentite, nickeline, galena, sphalerite, marcasite, cobaltite, smaltite, domeykite, chalcopyrite, tetrahedrite, breithauptite and millerite. The ore occurred in dolomite and quartz which formed a breccia-cement in the fissured fault zone. Minor amounts of pyrolusite, cerargyrite, erythrite, annabergite, rhodochrosite and barite occurred in the deposit. Native silver was present as wires, leaves and nuggets. The wire silver formed bunches up to 7.5 cm long in vein cavities. Other cavities contained argentite in leaf form and cubes of galena. Some cavities were filled with a sticky brownish grey, clayey material which was put to use by early miners to afix candles onto underground walls.

The deposit yielded spectacular specimens of native silver. Displayed at the 1876 International Exhibition in Philadelphia, were the following: a polished slab, a rough specimen, nuggets, filiform masses and a bar of 999 fineness smelted from the ore, the total valued at $1450.

The discovery of mineralization on an off-shore islet, later named Silver Islet, was made in 1868 by Gerald C. Brown of the Montreal Mining Company which was engaged in an exploration program in the area. The first specimen of native silver was found in the galena-bearing vein by teammate John Morgan. One blast released specimens of native silver valued at $1200. This company worked the deposit until 1870 and made ore shipments to Montreal. The total shipped was 12 287 kg of ore valued at $25 043.

In 1872 Silver Islet Mining Company resumed mining, and in 1875 built a mill on the peninsula opposite the islet. The company mined the deposit until 1884 from underground workings to a depth of 375 m. The mine was reopened in 1920-1922 and some silver was produced. Total production of silver from the deposit was about 89 265 610 g valued at $3 261 000.

Plate 43

Officers of the Silver Islet Mining Company at Silver Islet, 1882. (National Archives Canada PA-51166)

Plate 44

Silver Islet Mine, 1921. (National Archives Canada PA-15956)

Silver Islet is at the southern tip of Sibley Peninsula. Prior to mining operations, it was a 22.9-m rock rising 2.4 m above the waters of the lake. It was enlarged by crib-work built around the islet to encompass rock-fill from the mainland and the mine.

Road log from Highway 17 at km **662.2** (see page 123):

km	0	Junction of highways 17 and 587; proceed south along Highway 587.
	3.5	Pass Lake quarry on left.
	21.4	Entrance to Sibley Provincial Park.
	37.6	Trail on right to the Sleeping Giant.
	38.8	Silver Islet Landing.
	38.9	Wharf and Historic Plaque commemorating the Silver Islet Mine. Boats may be launched here. Silver Islet is 1.2 km southeast of the wharf.

Refs.: 35 p. 125-158; 178 p. 27-40; 267 p. 55-57; 295 p. 74; 322 p. 92-104; 359 p. 37-38.

Maps (T): 52 A/7 Thunder Cape
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)

Edward and Porphyry Islands, Black Bay Peninsula (west side)

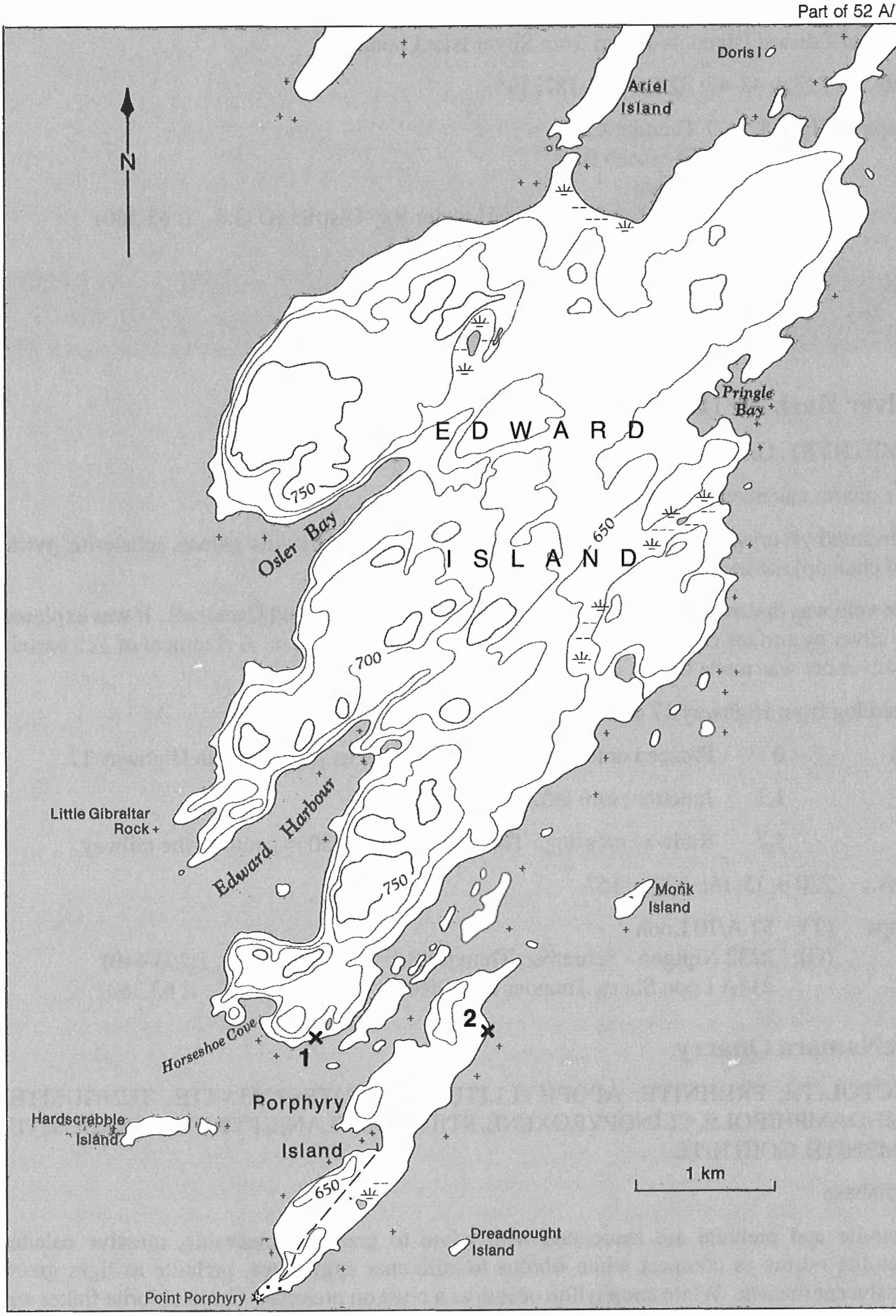
NATIVE COPPER, CHALCOCITE, AGATE, ZEOLITES, MAGNETITE, NATIVE ARSENIC, SPHALERITE, CHALCOPYRITE, GALENA, ARGENTITE, NATIVE SILVER, BARITE, LAUMONTITE

In basalt and sedimentary rocks

Native copper was found at a number of localities along the shore of Edward and Porphyry islands, and along the west side of Black Bay Peninsula. It was found as: small nuggets, measuring about 25 mm across, associated with chalcocite, zeolites, chlorite, agate and calcite in dark greenish grey basalt; as disseminations and thin sheets, about 1 mm thick and several centimetres long; in fractures in sedimentary rocks associated with basalt. Native copper was reported from the following locations: Edward Island, near the north end; Porphyry Island, along the west side; Black Bay Peninsula, on the north shore of George Point; in Miles Bay and at Copper Point. The Copper Point locality was explored by two adits driven 6.1 m and 6.7 m, and by a shaft, 9.5 m deep, on the west side of Louise Bay just south of Copper Point. The work was done between 1900 and 1910 by Pritchard Harbour Copper Mining Development Company Limited. About 14 km northwest of Copper Point, openings were made into calcite veins on the shore of Black Bay Peninsula. About 6 km further up the shoreline, magnetite-rich sands occur along a 1.6-km stretch of the beach.

Specimens of native arsenic were obtained from calcite veins which were explored by shafts at the south end of Edward Island in about 1921. One shaft was sunk to a depth of 10.7 m on the beach, the other one was 30 m to the northeast. A dump on the south shore of the island east of Horseshoe Cove marks the location. The arsenic was associated with sphalerite, chalcopyrite, galena, argentite and native silver.

On the east shore of Porphyry Island about 500 m from the northern tip, a calcite vein in a fracture zone in basalt is exposed at the water's edge. Barite, laumontite, chalcocite and chalcopyrite were reported from the vein.



Map 22. Edward and Porphyry islands.

1-Arsenic occurrence 2-Barite occurrence

The localities are accessible by boat from Silver Islet Landing. Porphyry Island, which lies just south of Edward Island, is 13 km from Silver Islet Landing.

Refs.: 217 p. 43-47; 322 p. 185-187, 195.

Maps (T): 52 A/7 Thunder Cape
52 A/9 Shesheeb Bay
52 A/10 Loon
(G): 2304 Black Bay Peninsula, Thunder Bay District (O.G.S., 1: 63 360)

km 676.8 Bridge over the MacKenzie River.

km 682.4 Junction of Lakeshore Drive.

Silver Harbour (Beck) Mine

AMETHYST, GALENA, SPHALERITE, PYRITE, CHALCOPYRITE

In a quartz-calcite vein in volcanic rocks

Pale amethyst crystals measuring up to 2 cm across occur with minor galena, sphalerite, pyrite and chalcopyrite in a quartz-calcite matrix.

The vein was discovered in 1870 by Messrs. Ambrose, Syrette and Campbell. It was explored for silver by surface cuts and a shaft put down to a depth of 12.2 m. A shipment of 125 barrels of silver ore was made before operations ceased in 1872.

Road log from Highway 17 at **km 682.4:**

km 0 Proceed onto Lakeshore Drive from its junction with Highway 17.

1.1 Junction; turn left.

1.7 Railway crossing. The shaft is about 150 m south of the railway.

Refs.: 220 p. 15-16; 322 p. 157.

Maps (T): 52 A/10 Loon
(G): 2232 Nipigon - Schreiber, Thunder Bay District (O.G.S., 1:253 440)
214A Loon Sheet, Thunder Bay District, Ontario (G.S.C., 1: 63 360)

McNamara Quarry

PECTOLITE, PREHNITE, APOPHYLLITE, CHLORITE, CALCITE, TUNGUSITE, CLINOAMPHIBOLE, CLINOPYROXENE, STILPNOMELANE, PYRITE, PYRRHOTITE, ILMENITE, GOETHITE

In diabase

Pectolite and prehnite are associated with white to greenish, cleavable, massive calcite. Pectolite occurs as compact white fibrous to columnar aggregates, prehnite as light green translucent masses. White apophyllite occurs as a crust on prehnite. Green chlorite flakes are associated with prehnite and with calcite. The rare mineral, tungusite, occurs as greyish green flaky aggregates associated with dark green prisms of clinoamphibole, the minerals forming irregular layers on the rock. "Micro" prisms of white clinoamphibole and pinkish brown clinopyroxene occur with calcite-pectolite assemblages. Stilpnomelane occurs as dark brown velvety and finely flaky crusts on the rocks. "Micro" crystals of pyrite (cubes), pyrrhotite (hexagonal plates) and ilmenite are disseminated in the calcite-pectolite assemblage. Goethite occurs as rusty powdery aggregates in pockets in the diabase.

The quarry, operated by McNamara Construction Co. Ltd., is located northeast of Thunder Bay.

Road log from Highway 17 at **km 682.4** (see page 128):

km	0	Junction of Highway 17 and Lakeshore Drive; proceed onto Lakeshore Drive.
	14.9	Junction Highway 527.
	16.2	Turn-off to McNamara quarry on right.

Maps (T): 52 A/6 Thunder Bay
(G): 2065 Atikokan-Lakehead sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

km 691.1 Junction of Highway 527 (Spruce River Road).

Mount Baldy Occurrence

AMETHYST, CHALCOPYRITE, PYRITE, MALACHITE

In brecciated quartz in sedimentary rock

Pale amethyst grading to colourless quartz crystals occurs in massive quartz. Calcite crystals occurring in quartz fluoresce weak pink in ultraviolet light. Chalcopyrite and bladed aggregates of pyrite occur in the quartz-calcite vein. Malachite occurs as a patchy coating on chalcopyrite. The occurrence is exposed by a side-hill cut.

Road log from Highway 17 at **km 691.1**:

km	0	Junction of Highways 17 and 527; proceed north along Highway 527 (Spruce River Road)
	3.1	Junction; turn right onto Mount Baldy Ski Road.
	3.8	Trail on right leads to the occurrence.

Maps (T): 52 A/11 Onion Lake
(G): 2065 Atikokan-Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

km 700.5 Terry Fox Lookout.

Thunder Bay Mine

NATIVE SILVER, ARGENTITE, GALENA, SPHALERITE, PYRITE

In veins in cherty carbonate and black shale

During mining operations, native silver and argentite were found as leaves, strings and grains in pockets measuring 7 to 45 cm wide and 1 to 12 m long in quartz-calcite veins. Galena, sphalerite and pyrite occurred in minor amounts. Specimens of native silver in quartz were displayed at the 1876 International Exhibition in Philadelphia.

The rich silver vein at this mine was discovered by Peter McKellar in 1866, the first discovery of silver in the Thunder Bay district. The deposit was mined from 1866 to 1869 and again in 1874. The mine consisted of two shafts at depths of 21.3 m and two others with depths of 10.7 m and 7.6 m. They extend over a distance of 183 m in a north-south direction. The mine was connected by a 4.8-km wagon road to the mill and dock on the shore of Thunder Bay.

The mine is located below the Terry Fox Lookout.

The road-cut opposite the Lookout exposes granite cut by quartz veins containing amethyst and some galena and chalcopyrite. Above the granite, cherty lenses occur in limestone of the Gunflint Formation. The lenses contain white-grey banded agate. Adits were driven into this rock on the side of the ridge extending north from the east end of the road-cut at the Lookout. The adits and overgrown dumps are about 100 m from the highway.

Refs.: 177 p. 54-56; 295 p. 67; 322 p. 155-156; 359 p. 37.

Maps (T): 52 A/6 Thunder Bay
(G): 2065 Atikokan - Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)
198A Fort William and Port Arthur Sheet, Thunder Bay District, Ontario (G.S.C., 1: 63 360)

km 701.9 Bridge over Current River. Chert and agate occur as pebbles along the Current River.

km 703.6 Junction of the road to the Radio Tower.

Shuniah Mine

AMETHYST, CALCITE, NATIVE SILVER, ARGENTITE, GALENA, SPHALERITE, FLUORITE

In a brecciated quartz-calcite vein in a fault zone in the Gunflint Formation

Quartz crystals ranging from colourless to smoky and light to medium violet occur in the vein. White to lilac-coloured calcite occurs as coarse cleavable masses; it fluoresces pink in ultraviolet light. During mining operations native silver and argentite were found in leaf form and strings forming rich bunches in the vein. Immense crystals of calcite were found in early operations. Galena, yellow sphalerite and fluorite occurred in minor amounts. A specimen of native silver in calcite was displayed at the 1876 Philadelphia International Exhibition.

The deposit was discovered in 1867 by John McKellar and George A. McVicar. In 1867-1868, the deposit was explored by trenches and two shafts sunk to depths of 9 m and 18 m. From 1870 to 1881, the mine was worked almost continuously employing a work force of between two to 100 men. The main shaft was deepened to 219.6 m. A 10-stamp mill was built at the mine and operated for only a few months. The mine was also known as the Duncan Mine. Total production of the mine was valued at $20 000.

The mine is located north of the Radio Tower on the north side of Highway 17 at **km 703.6.** To reach it follow the road leading north from Highway 17 for 0.3 km to the tower. A path from there leads to the left (west), then north for 250 m to the mine.

Refs.: 177 p. 56-63; 220 p. 8,9; 295 p. 68; 322 p. 153-155; 359 p. 36.

Maps (T): 52 A/6 Thunder Bay
(G): 2065 Atikokan - Lakehead, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)
198A Fort William and Port Arthur Sheet, Thunder Bay District, Ontario (G.S.C., 1: 63 360)

km 708.0 Thunder Bay, at the junction of Highway 102 (Dawson Road).

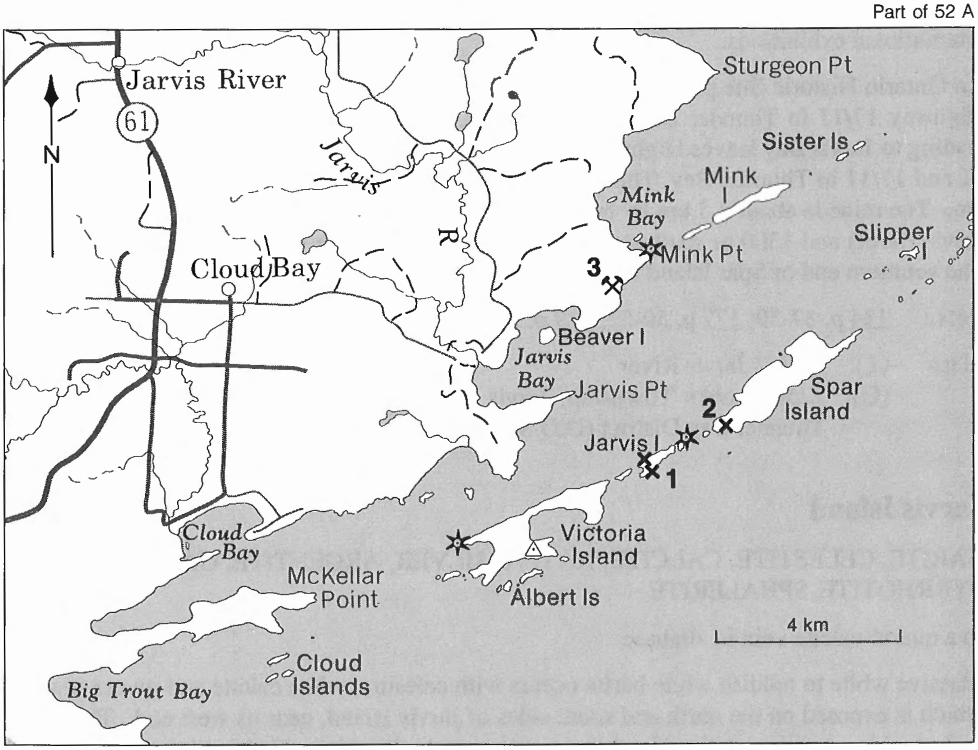
km 716.9 Thunder Bay, at the intersection of Lakehead Expressway (Highway 17/11) and Arthur Street. Highway 17/11 turns left (west) at this intersection.

Prince's Mine

NATIVE SILVER, ARGENTITE, CHALCOCITE, GALENA, SPHALERITE, BARITE, AMETHYST

In quartz-calcite veins at the contact of argillite and diabase

Part of 52 A



Map 23. Prince's Mine, Spar and Jarvis islands.

1-Barite occurrences 2-Prince Location 3-Prince's Mine

The vein carried copper and silver mineralization. Native silver occurred as fine laminae in calcite. Argentite, chalcocite, galena and sphalerite were also present. The gangue consisted of calcite, quartz (including amethyst) and barite.

The Prince's Mine is part of a property known as the old Prince Location which included a vein system extending northwest from the south end of Spar Island to the shore north of Jarvis Bay. The vein at both of these locations was originally worked by Colonel John Prince in 1846, the earliest mining operation on the Canadian side of Lake Superior. Because the vein exposed chalcopyrite-chalcocite mineralization, it was originally opened as a copper prospect. Further exploration revealed the presence of native silver and the deposit was then worked for silver. At Spar Island, the vein crosses the western tip of the island in a north-northwesterly direction. It is exposed along the shorelines and is composed predominantly of white calcite which provides a striking contrast to the dark host rocks. Two shafts were sunk to depths of 7.3 m and 14.3 m in the vein. On the mainland north of Prince Bay and about 1300 m southwest of Mink Point, a wider vein was exposed in a cliff rising 12.2 m from the lakeshore. About 55 m inland, an adit was driven west into a cliff for 19.8 m. Other openings were made on a hill about 230 m farther inland; they consisted of a shaft sunk to 27.5 m at the top of the hill and an adit driven 50.3 m into the hill below the shaft. In sinking the shaft, a very rich mass of ore was encountered; it yielded an average of 3 1/2 parts per hundred of silver. Fine specimens of amethyst were also found. No further economic pockets of silver ore were found and operations ceased in 1847.

Specimens of native silver and chalcocite from this deposit were exhibited in the Geological Survey of Canada display at the 1851 Grand Industrial Exhibition in London, and at subsequent international exhibitions.

An Ontario Historic Site plaque on Highway 61 at a point 35.5 km south of its junction with Highway 17/11 in Thunder Bay commemorates this mining venture. The Jarvis Bay Road leading to Jarvis Bay leaves Highway 61 at a point 36.2 km south of the junction of highways 61 and 17/11 in Thunder Bay. The distance from Highway 61 to the shore of Jarvis Bay is 8 km. The mine is about 3.5 km by boat from the south end of Jarvis Bay (at the mouth of the Jarvis River) and 1300 m southwest of Mink Point. There are no roads leading to the mine. The southern end of Spar Island is 5.5 km east of the shore of Jarvis Bay.

Refs.: 134 p. 37-39; 177 p. 50-52; 199 p. 2; 201 p. 707-708; 220 p. 5; 295 p. 62.

Maps (T): 52 A/3 Jarvis River
(G): 2250 Crooks Township, Jarvis and Prince Locations and Offshore Islands, Thunder Bay District (O.G.S., 1: 31 680)

Jarvis Island

BARITE, CELESTITE, CALCITE, NATIVE SILVER, ARGENTITE, GALENA, PYRITE, PYRRHOTITE, SPHALERITE

In a quartz-calcite vein in diabase

Massive white to reddish white barite occurs with celestite, white calcite and quartz in a vein which is exposed on the north and south sides of Jarvis Island, near its west end. The vein, 2 to 3 m wide, cuts across the island in a northwesterly direction. Native silver, in the form of leaves, strings and nuggets, and argentite were found in barite during early exploration of the vein. Sphalerite, galena, pyrite and pyrrhotite occur with barite. Specimens of barite weighing

45.3 kg and of native silver and argentite were displayed at the 1876 Philadelphia International Exhibition.

The vein was discovered in 1868 by Thomas Macfarlane while exploring the region for the Montreal Mining Company. In 1869 and 1870 he sank a shaft to 9.7 m in the vein on the north shore of the island and recovered some fine silver ore. The vein continued to be worked by various interests for brief periods until 1888. Four shafts were sunk, to depths of about 24, 49 and 9.5 m on the vein, the main shaft being near the north shore. A dump lies nearby.

Jarvis Island is part of the chain of islands extending southwest from Pie Island to Victoria Island. It is immediately southwest of Spar Island, and about 2 km southeast of Jarvis Point at the head of Jarvis Bay.

Refs.: 148 p. 7-8; 177 p. 43-45; 220 p. 9-10; 322 p. 89; 359 p. 35, 76.

Maps (T): 52 A/3 Jarvis River
(G): 276A Thunder Bay Silver Area, Thunder Bay District, Ontario (G.S.C., 1:253 440)
2250 Crooks Township, Jarvis and Prince Locations and Offshore Islands, Thunder Bay District (O.G.S., 1: 31 680)

South McKellar Island

BARITE, CALCITE, QUARTZ CRYSTALS, FLUORITE, SPHALERITE, NATIVE SILVER, ARGENTITE, GALENA, PYRITE, CHALCOPYRITE

In calcite vein in diabase

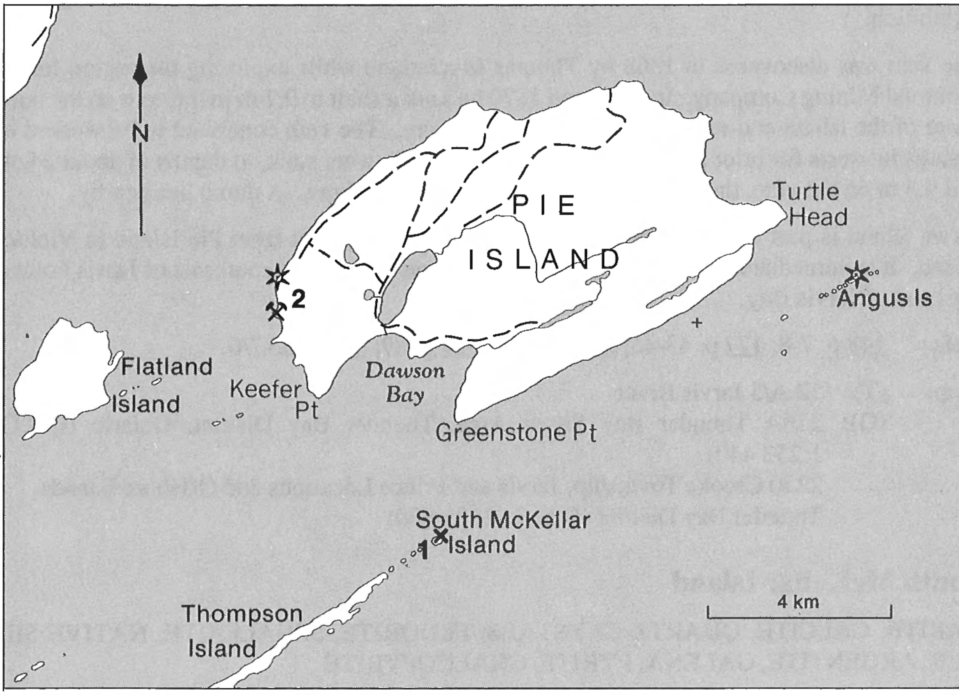
Barite occurs as white radiating tabular aggregates with white, coarsely crystallized calcite and minor colourless, white and amethystine quartz and purple fluorite. Crystals of colourless transparent quartz measuring up to 4 cm in diameter, and blade-like prisms of colourless barite measuring up to 4 cm wide were found in the vein.

The vein was discovered in 1869 by John and Donald McKellar. It was originally worked for silver and later (1886) for barite. The silver occurred in the native form as small nuggets and strings, and as argentite leaves. Both silver minerals were associated with sphalerite. Galena, pyrite and chalcopyrite were disseminated in the vein minerals. The calcite-barite vein crosses the island near the middle in a north-northwest direction. It is about 135 m long and 12 m wide on the steep north side of the island and 9 m wide on the south side. An adit was driven into the north side about 2.4 m above the water level and a shaft was put down to reach the adit level. A few pits were also sunk in the vein.

South McKellar Island is 2.5 km south of Greenstone Point, the southern tip of Pie Island. It measures about 300 m by 130 m and is 20 m above the lake.

Refs.: 148 p. 8-11; 177 p. 40-41; 220 p. 15; 322 p. 188.

Maps (T): 52 A/3 Jarvis River
(G): 2065 Atikokan - Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1: 253 440)



Map 24. South McKellar and Pie islands.
1-Copper occurrence 2-Mine

Pie Island

GALENA, SPHALERITE, PYRITE, NATIVE SILVER

In a brecciated quartz-calcite vein in diabase

The vein was worked for silver between 1875 and 1877. It was notable for the well developed crystals found in it, including prisms of colourless and amethystine quartz, calcite scalenohedra, galena and pyrite cubes. Polished specimens of native silver in quartz were displayed at the 1876 International Exhibition in Philadelphia.

The vein was developed by a 61-m shaft on the west shore of the island near Kestor Point.

Pie Island is about 15 km southeast of Thunder Bay.

Refs.: 177 p. 53-54; 322 p. 187-188; 359 p. 36.

Maps (T): 52 A/3 Jarvis River
(G): 2065 Atikokan - Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

SECTION 3

THUNDER BAY-MANITOBA BORDER

km	**0**	Thunder Bay, at the junction of Lakehead Expressway and Arthur Street; proceed west along Arthur Street (Highway 17/11).
km	**20.0**	Junction of Highway 588.

Silver Mountain – Rabbit Mountain Mines

NATIVE SILVER, ARGENTITE, GALENA, SPHALERITE, PYRITE, CHALCOPYRITE, BARITE, FLUORITE, AMETHYST

In quartz-calcite veins in shale of the Rove Formation and Keweenawan diabase

Several mines were worked for silver between 1880 and 1900 in the Silver Mountain and Rabbit Mountain areas, southwest of Stanley. The mineralization of the veins at the numerous mines was of a similar character. The veins were composed essentially of quartz and calcite and occupied brecciated fault zones in shale and in the intruded diabase. Native silver and argentite

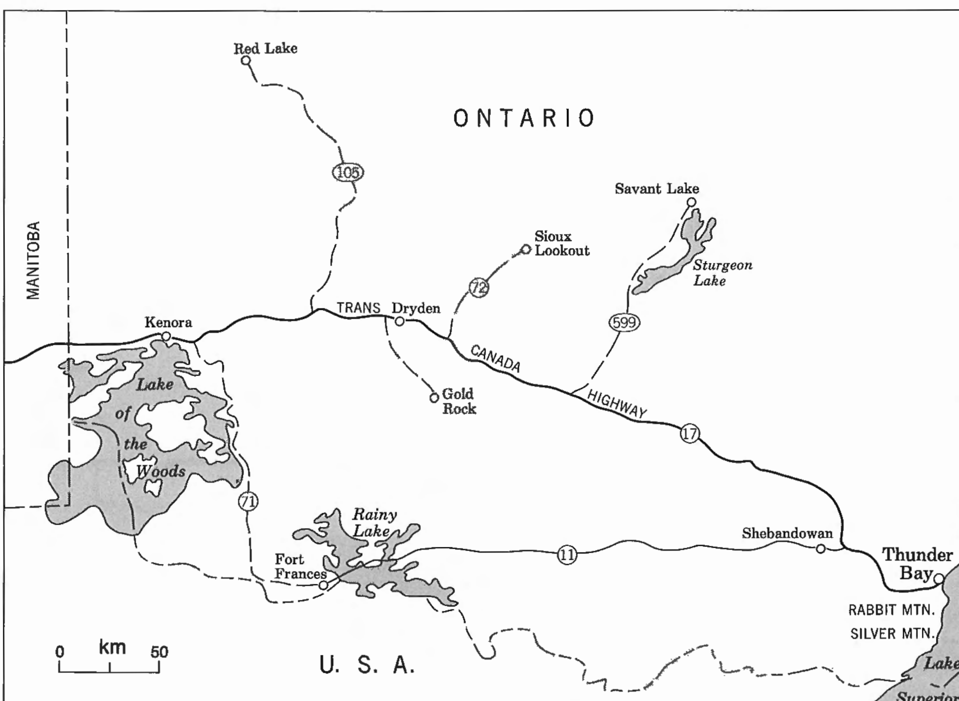


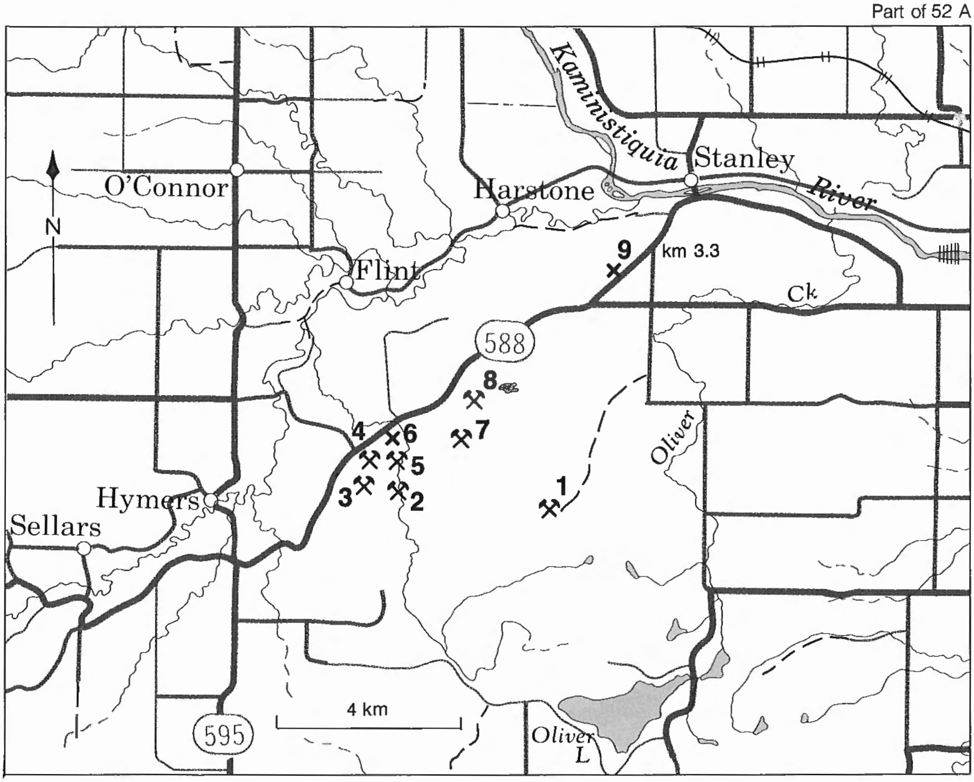
Figure 4. Map showing collecting area: Section 3.

were the principal silver ore minerals. They commonly occurred in nugget and leaf forms and were associated with variable amounts of galena, sphalerite, pyrite and chalcopyrite. These minerals occurred in a gangue consisting of calcite and quartz with lesser amounts of barite and violet and green fluorite. Pale to medium coloured amethyst was common; it graded into colourless and smoky quartz. Crystals found on the dumps measure up to 2 cm across the base. The calcite is white and commonly fluoresces pink in ultraviolet light. Additional notes on individual mines are given with the road log to the accessible Silver Mountain-Rabbit Mountain mines.

The first silver-bearing vein in this area was discovered in 1882 by Oliver Daunais, a trapper and explorer. This discovery became the Rabbit Mountain Mine. News of the rich surface showing caused a prospecting rush which resulted in the discovery of several other silver-bearing veins. These discoveries came a few years after the silver mines in the vicinity of Thunder Bay reached their peak in production. However, renewed mining activity in the region was short-lived, coming to a halt in 1892 when the price of silver fell.

The Rabbit Mountain Mine was developed by several shafts, trenches and pits. Rich silver ore was barrelled and sent to smelters. A mill and mining camp consisting of several buildings

Part of 52 A



Map 25. Rabbit Mountain area.

1-Rabbit Mountain Mine
2-Badger Mine
3-Porcupine Mine
4-Climax Mine
5-West Beaver Mine
6-Little Pig vein
7-Beaver Mine
8-Beaver Junior Mine
9-Victoria Pit

Plate 45

Oliver Daunais with his family and miners at Silver Mountain mining camp, 1885 or 1886. Daunais, a prospector and miner, was responsible for the discovery of several gold and silver deposits between Thunder Bay and Lake of the Woods. (GSC 46429)

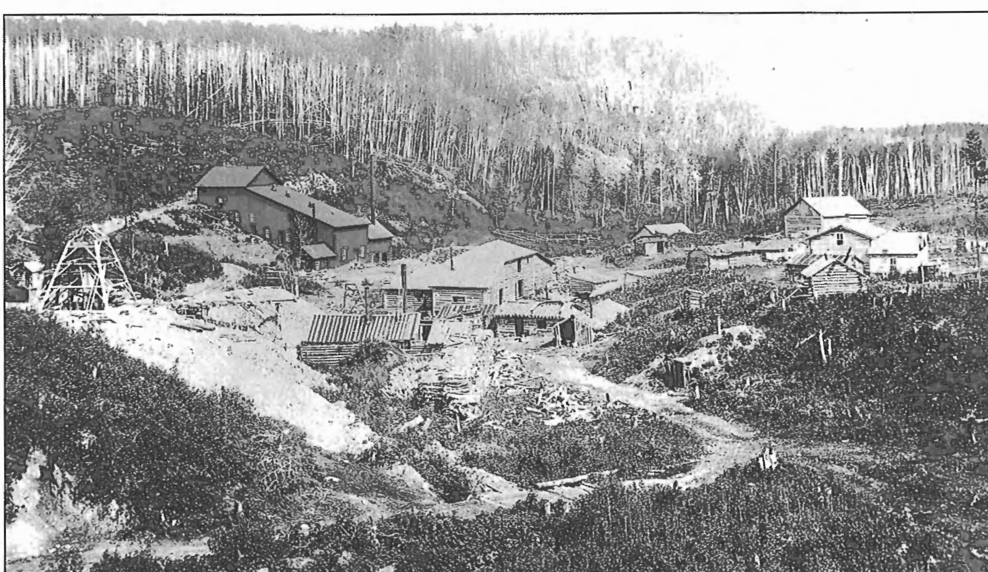


Plate 46

Rabbit Mountain Mine, 1887. (National Archives Canada C-82638) were built at the mine. The mine, located in a valley on the east side of Rabbit Mountain, produced about 1 555 150 g of silver valued at $50 000.

Several other mines were operated from Rabbit Mountain to Badger Mountain and in the Silver Mountain area. Some of these mines are accessible from Highway 588.

Road log to the Silver Mountain-Rabbit Mountain mines from Highway 17/11 at **km 20.0**:

km	0	Junction of highways 17/11 and 588; proceed onto Highway 588 toward Stanley.
	1.8	Junction of River Road; continue along Highway 588.
	3.3	Junction of a road on left. This road leads south; 2.8 km from the junction, a trail leads west. Follow this trail 3.5 km to the *Rabbit Mountain Mine*. The road log continues along Highway 588.
	4.5	*Victoria pit* on right, about 30 m north of the highway. The pit was put down to a depth of 2.4 m in the 1880s.

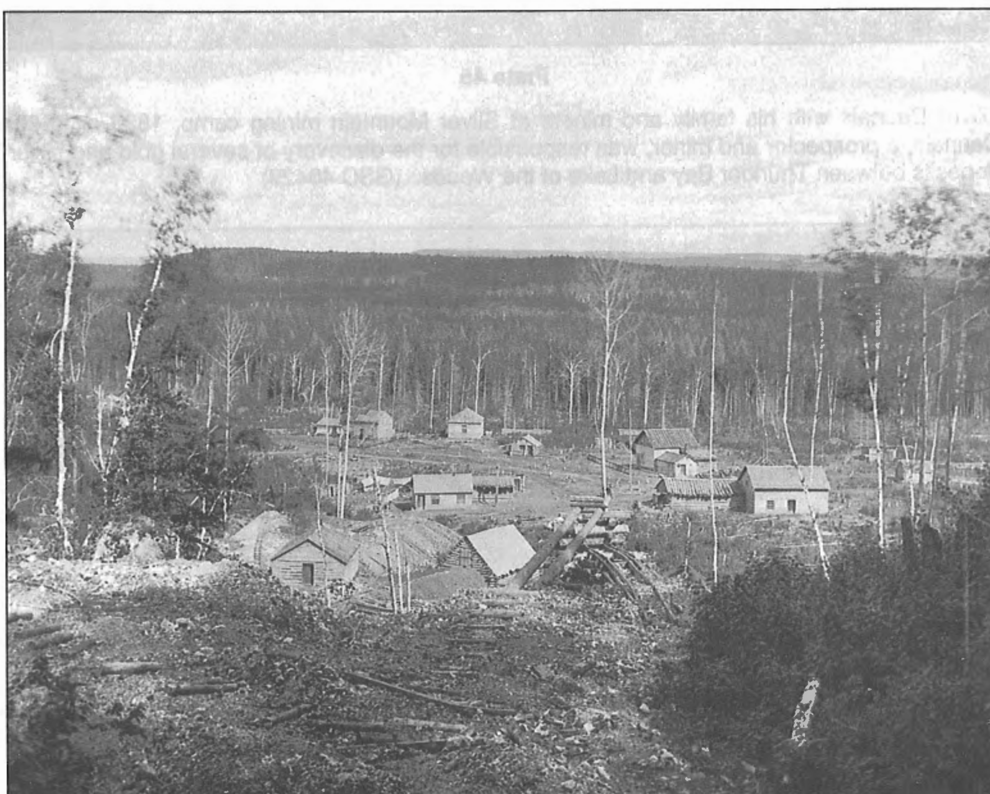


Plate 47

Silver Mountain East Mine, 1888. (National Archives Canada PA-45569)

8.8 *Beaver Junior Mine* on left at the base of a flat-topped hill, about 400 m from the highway. The mine was worked by several adits driven into the hill from the base to the diabase sill cap. Quartz-calcite veins carried transparent crystals of barite measuring up to 3.5 cm across and argentite nuggets on quartz crystals which lined cavities in the vein.

9.4 Junction of a road on left leading 650 m to the *Beaver Mine*. The mine was worked from 1884 to 1891 resulting in a production of about 15 551 550 g of silver valued at $550 000. Some rich pockets of argentite in nugget, leaf and sheet forms were encountered during mining operations. The mine was connected by a tramway to the mill on Silver Creek, about 800 m west of the mine.

10.15 Bridge over Silver Creek.

10.4 Trail on left leading 750 m to the *West Beaver Mine* (No. 2 vein) on the east side of a hill.

10.5 *West Beaver Mine* (Little Pig vein), on the north side of the hill on left, about 45 m from the highway. The West Beaver Mine was worked between 1885 and 1886. The Little Pig vein was worked by three adits driven into the base of the hill. No. 2 vein was worked in 1911 by an adit driven 76.2 m into the east side of the hill and by a shaft sunk 24.4 m to meet the adit. Rose quartz was found in this deposit in addition to the silver and associated vein minerals.

Plate 48

Beaver Mine, 1887. (National Archives Canada C-82637)

11.5 Junction of a road on right. Across the highway from this junction and on the west side of the hill, is the old *Climax (Keystone) Mine*. Some rich silver ore was produced from a vein in 1891. The mine was worked briefly in 1911 and 1912 when a shaft was sunk to 24.4 m. This mine is north of the Porcupine Mine.

12.1 Junction of a road on left to the *Porcupine and Badger mines*. The Porcupine Mine was worked between 1884 and 1887. The openings consist of two sets of adits driven into the west side of a hill and two shafts on the north side of the hill. Rich pockets of argentite were found during mining operations. Cavities in veins contained argentite in nugget and leaf forms, and native silver in wire and mossy forms. Radiating fibrous aggregates of witherite were found in the vein. This was the first reported occurrence of witherite in Canada. The Porcupine mine is about 600 m by road from the highway.

The Badger Mine, about 400 m east of the Porcupine Mine, was worked between 1887 and 1892 by two shafts. Some buildings were built at the mine, and a mill was installed at Silver Creek about 400 m east of the shafts. The mill treated ore from the Porcupine and Badger mines. The combined production amounted to 12 441 200 g of silver valued at $300 000.

14.9 Junction of Highway 595; continue along Highway 588.

20.7 Bridge over Whitefish River. Pebbles of jasper and algal chert occur in the bed of the Whitefish River.

24.0 Junction of Highway 590.

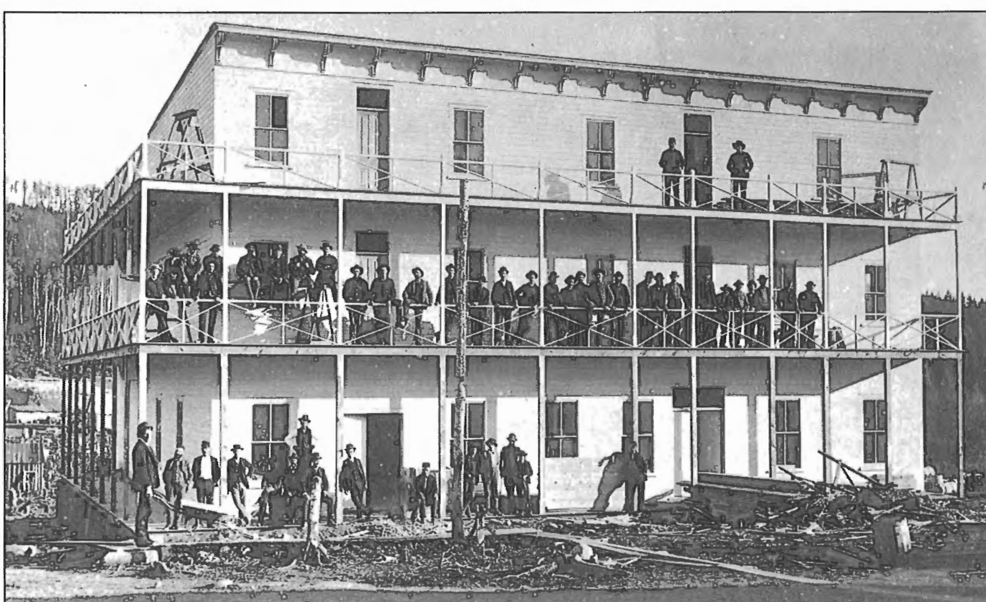


Plate 49

Miners at Beaver Mine, 1887. (National Archives Canada C-82633)

25.0 Nolalu, at intersection. Jasper and algal chert pebbles are found in the gravels of Whitefish River just south of this intersection and in the vicinity of the Highway 588 bridge, 2.8 km west of Nolalu.

27.8 Bridge over Whitefish River.

33.1 Junction of Highway 593; proceed south along Highway 593.

37.8 Junction of a road on left to the *Silver Mountain mines*. Discovery of a vein carrying rich silver ore was made in 1884 by Oliver Daunais. Subsequently, a silver-bearing vein system was located in a fault zone extending over a distance of 1600 m across the middle of Silver Mountain. It was developed as the East End and West End mines. The discovery showing was opened by a pit on the east slope of Silver Mountain; it yielded the richest ore in the deposit. Native silver occurred in leaf and wire forms associated with argentite in leaf, sheet and nugget forms; some of the nuggets weighed several grams. Development began in both mines in 1885. In 1886 the Silver Mountain Mine Company, Limited of England undertook mining of the deposit. The mines were worked until 1892 when all the area mines closed operations due to a decline in the price of silver. The workings consisted of adits and several shafts at the East End Mine and two shafts and a pit at the West End Mine. There was a mining camp and a post office at the East End Mine. The West End Mine was operated again from 1898 to 1903 when it contributed most of the 23 949 310 g of silver produced at Silver Mountain since the beginning of mining. The output was valued at $500 000. A 20-stamp mill operated at the West End Mine. The West End Mine is about 800 m east of Highway 593; the East End Mine is about 1250 m farther east. About 450 m north of the East End Mine, is the *Crown Point Mine* which was worked in the 1880s. The workings consist of two adits, pits, trenches and shafts. A trail leads to it from the East End Mine.

To reach the East End Mine proceed east from Highway 593 at km 37.8 for 0.8 km. Trails lead from the clearing at the top of the hill to the West End Mine.

Refs.: 177 p. 86-92, 125-131; 266 p. 89-90; 295 p. 63-65, 71-72; 322 p. 114-118, 124-137.

Maps (T): 52 A/4 Pigeon River
52 A/5 Kakabeka Falls
(G): 2065 Atikokan-Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)
213A Kakabeka Sheet, Thunder Bay District, Ontario (G.S.C., 1:63 360)

Stanley-Whitefish Lake Occurrences

JASPER, CHERT

As pebbles along shorelines

Jasper and algal chert occur as pebbles and boulders in the beds of creeks and rivers between Stanley and Whitefish Lake, along lake shores and in gravel pits. The pebbles are derived from the Gunflint Formation which forms the country rock along much of Highway 588. The jasper varies from orange-red to maroon-red and black, and has a beaded or granular appearance due to inclusions of hematite and magnetite. Algal and granular chert is generally grey. The algal chert is commonly banded in various shades of grey and red. Both the chert and jasper take a good polish and are suitable for lapidary purposes.

Collecting localities between Stanley and Whitefish Lake are numerous; included are the gravels of streams and rivers crossed by Highway 588, the shores of Arrow Lake (90 km west of Nolalu) and gravel pits in the area.

Refs.: 141 p. 51-53; 266 p. 19-20, 106.

Maps (T): 52 A/5 Kakabeka Falls
(G): 2065 Atikokan-Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:243 440)

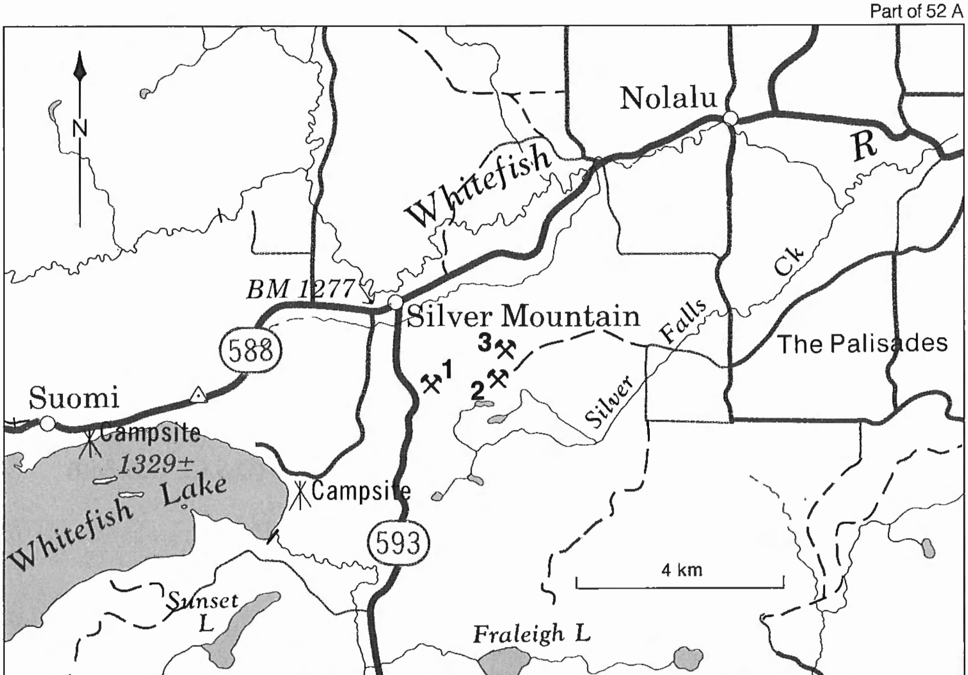
The main road log along Highway 17/11 is resumed.

km **20.0** Junction of Highway 588 to Stanley. *A gravel pit* on the south side of Highway 17/11 at this junction contains abundant jasper pebbles.

km **25.4** Kakabeka Falls, at the junction of the road to Kakabeka Falls Provincial Park. Iron formation is exposed at the entrance to the park; white rozenite and rusty goethite coat the rocks.

km **26.25** Junction of Highway 590.

Part of 52 A



Map 26. Silver Mountain area.

1-West End Mine 2-East End Mine 3-Crown Point Mine

km	**26.3**	*Road-cut* exposes conglomerate and chert-carbonate rock. Jasper pebbles occur in the conglomerate. The chert carbonate rock contains quartz crystals (about 5 mm across) and pyrite crystals (measuring up to 5 mm) and a botryoidal and colloform aggregate of pyrite.
km	**40.9**	*Road-cuts* expose volcanic rocks containing fracture-fillings of epidote.
km	**41.5**	Sistonens Corners, at the junction of Highway 102.

Kaministikwia River Occurrence

AXINITE, CLINOZOISITE, CHLORITE

In quartz veins in metavolcanic rock

Axinite occurs with light green clinozoisite, chlorite, plagioclase and calcite in massive white to colourless quartz. The axinite is a mauve to greyish violet colour and massive. It is the most conspicuous mineral in the veins which vary in width from 1 cm to 10 cm. Lilac coloured petalite was reported from this occurrence (Ref. 21).

The occurrence is on the east bank of the Kaministikwia River opposite the mouth of the Shebandowan (Mattawa) River. Highway 102 bridges the Kaministikwia River just south of the junction of the rivers. Specimens may be collected from the rock exposures on both sides of the highway bridge, on the east side of the Kaministikwia River. The occurrence is 4.25 km east of the junction of highways 17/11 and 102.

Ref.: 21 p. 319.

Maps (T): 52 A/12 Sunshine
(G): 2065 Atikokan-Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

km	**59.9**	Junction of Highway 11 West to Fort Frances; Highway 17 leads north. A side trip to occurrences along Highway 11 from Shebandowan to Fort Frances begins here. The main road log along Highway 17 West is resumed on page 161.

Shebandowan-Fort Frances Occurrences

km	**0**	Junction of Highway 17/11 and Highway 11; proceed onto Highway 11.
km	**12.5**	Junction of the road to Shebandowan.

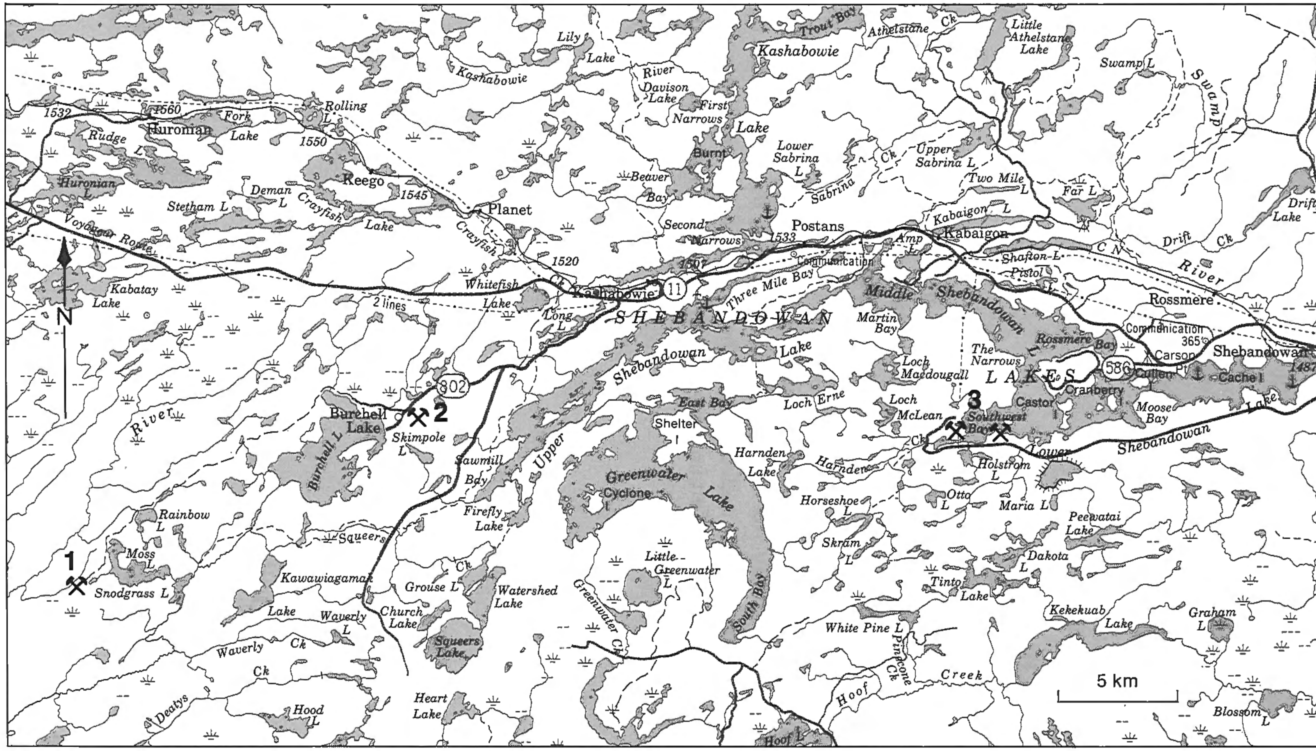
Shebandowan Mine

PYRITE, CHALCOPYRITE, PYRRHOTITE, POLYDYMITE, MAGNETITE, PENTLANDITE, MILLERITE, BRAVOITE, VIOLARITE, MERENSKYITE

In sheared peridotite

The ore occurs as a massive intergrowth of sulphides and as disseminated sulphides in serpentinized peridotite. It consists of pyrite with chalcopyrite, polydymite, magnetite and pentlandite and minor millerite, bravoite, violarite and merenskyite.

Part of 52 B



Map 27. Shebandowan area.

1-Huronian Mine   2-Tip Top Mine   3-Shebandowan Mine

The ore was mined for platinum metals, gold, silver, chromium, cobalt, nickel and copper. The deposit was discovered in 1913 by W.W. Benner, a Port Arthur assayer who found an outcrop of nickel ore on Discovery Point and on Discovery Bay, at the southwestern end of Lower Shebandowan Lake. In 1914, J.G. Cross of Port Arthur detected nickel in old pits further west. The showings were investigated by pits and trenches and by drilling during the next few years. In 1936, the International Nickel Company of Canada, Limited acquired the property. In 1966 the company began underground exploration and brought the mine into production in 1972. The mine consists of two shafts, 1.6 km apart, sunk to depths of 347.7 m and 730.5 m. No. 1 shaft is on Discovery Point, No. 2 is east of it on the other side of the bay. A mill was built on the site. Mining operations were suspended in 1986.

Road log from Highway 11 at **km 12.5**:

km	0	Junction; proceed onto the road to Shebandowan.
	0.5	Junction; continue straight ahead.

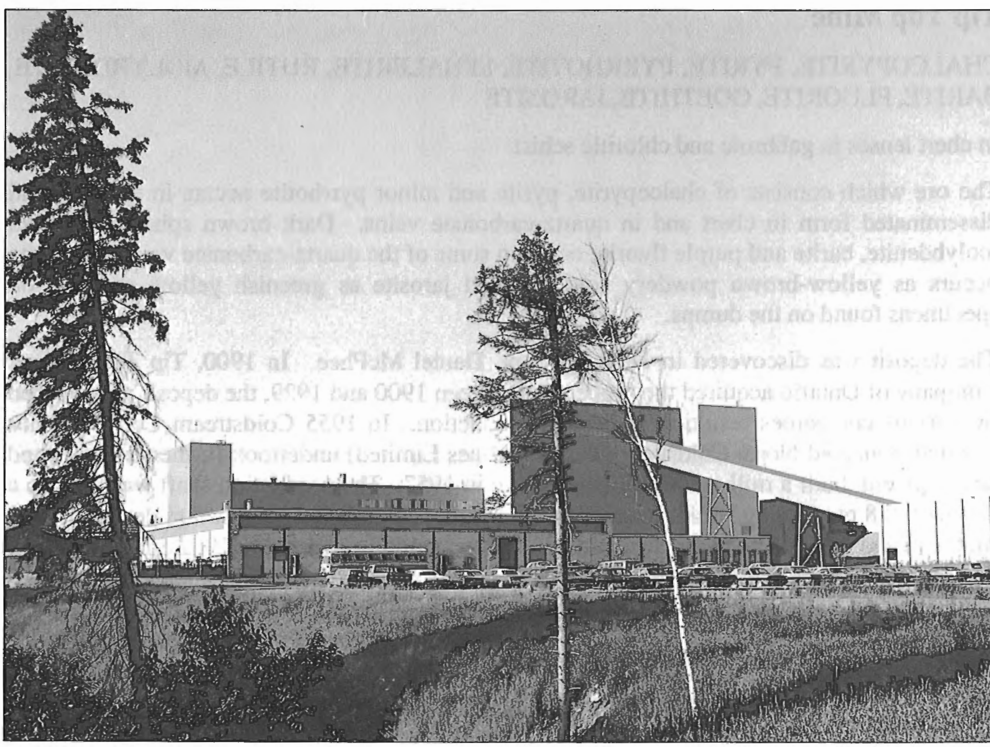


Plate 50

Shebandowan Mine, 1974. (GSC 163098)

1.9 *Road-cuts* expose conglomerate composed of angular pebbles of brick-red feldspar and hornblende in a greenish black chloritic matrix. Fractures in the rock are filled with epidote associated with quartz. The rock was quarried behind the road-cuts.

7.9,
8.5 *Road-cuts* expose conglomerate similar to the rock exposed at km 1.9.

15.1 *Road-cut* exposes banded iron-formation composed of fine bands of magnetite and jasper, with some pyrite.

16.2 Mine.

Refs.: 170 p. 25-26; 230 p. 21-27; 299 p. 289-290; 349 p. 659-661; 350 p. 128, 136, 145; 382 p. 192.

Maps (T): 52 B/9 Shebandowan
(G): 2267 Lower Shebandowan Lake, Thunder Bay District (O.G.S., 1:31 680)

km 44.6 Junction of Highway 802 South.

Tip Top Mine

CHALCOPYRITE, PYRITE, PYRRHOTITE, SPHALERITE, RUTILE, MOLYBDENITE, BARITE, FLUORITE, GOETHITE, JAROSITE

In chert lenses in gabbroic and chloritic schist

The ore which consists of chalcopyrite, pyrite and minor pyrrhotite occurs in massive and disseminated form in chert and in quartz-carbonate veins. Dark brown sphalerite, rutile, molybdenite, barite and purple fluorite occur in some of the quartz-carbonate veins. Goethite occurs as yellow-brown powdery coatings, and jarosite as greenish yellow coatings on specimens found on the dumps.

The deposit was discovered in 1872 by Capt. Daniel McPhee. In 1900, Tip Top Copper Company of Ontario acquired the property. Between 1900 and 1929, the deposit was worked by various companies resulting in limited production. In 1955 Coldstream Copper Mines Limited (renamed North Coldstream Copper Mines Limited) undertook further underground development, built a mill and began production in 1957. The production shaft was sunk to a depth of 488 m. During earlier operations, three other shafts were put down to depths of 15.9 m, 6.1 m and 61 m. The mine closed in 1967. Production from 1957 to 1967 amounted to 46 341 900 kg of copper and some gold and silver. The mine is near the east shore of Burchell Lake.

Road log from Highway 11 at **km 44.6**:

km 0 Junction of highways 11 and 802 South; proceed onto Highway 802 South.

11.1 Junction; follow the road on left.

11.4 Junction; turn left.

11.6 Mine.

Refs.: 135 p. 27-34; 299 p. 314-315.

Maps (T): 52 B/10 Burchell Lake
(G): 2036 Burchell Lake Area, District of Thunder Bay (O.G.S., 1:31 680)

Huronian (Moss) Mine

NATIVE GOLD, CHALCOPYRITE, PYRITE, GALENA, SPHALERITE, PETZITE, HESSITE

In a quartz-dolomite vein in metavolcanic rock

Native gold was found with sulphide and telluride minerals in quartz. During early exploration of the gold-bearing vein, very fine specimens of quartz containing strings, spangles and small nuggets of native gold were found. The gold contained streaks, coatings and small masses of telluride minerals identified as petzite and hessite. Chalcopyrite and pyrite were common in the vein, galena and sphalerite less abundant.

In the early days of mining this deposit some very rich ore was encountered; a selection of 57 kg of gold-silver ore specimens shipped to a smelter in New Jersey yielded a silver brick weighing 171 g and a gold button weighing 32 g. A specimen of native gold in quartz was exhibited at the 1876 Philadelphia International Exhibition.

This was the first gold mine in northwestern Ontario. The original quartz vein carrying gold was discovered in 1870 by two local men, J. Baptist and M. Puchat, who worked for the Hudson's Bay Company. They collected specimens from the vein and showed them to Neil Whyte, of the Hudson's Bay Company's Beau Blanc post. Whyte referred them to Peter McKellar of Fort William. After investigating the showing in 1871, McKellar and others, including the discoverers, staked the claim and formed the Jackfish Lake Mining Company to work the deposit. This company extracted about 82 t of ore containing gold and silver values. From 1882 to 1895, Huronian Mining Company worked the deposit. It installed a 10-stamp mill and sank two shafts to depths of 37.5 m and 15.2 m. A tramway connected the mill to the shaft and several buildings were built to serve the mine. Recovery of gold was low because the process was unsuitable for treating telluride ore, and mining ceased. Moss Gold Mines Limited operated the mine and a new mill from 1927 to 1933. Mining was from a shaft developed to the 228.7 m level. Ardeen Gold Mines Limited took over the property in 1933, deepened the main shaft to 388.9 m and installed a cyanide mill. Production was terminated in 1936 when the ore was no longer economic. Total production from the mine was 931 473 g of gold and 5 361 411 g of silver, valued at $962 326.

The mine is located on the south side of a gorge, 45.7 m deep, about 1.5 km west of Moss Lake. In addition to the main shaft there are two old shafts on the property, with depths of 18.9 m and 48.2 m. The mine is southwest of Burchell Lake. Access to it is via private roads.

Road log from Highway 11 at **km 44.6** (see page 146):

km	0	Junction of highways 11 and 802; proceed south along Highway 802.
	5.9	Junction; turn left onto the Great Lakes Paper Company road.
	16.0	Junction; turn right.
	19.7	Junction; continue straight ahead (west).
	20.4	Junction; turn left onto the mine road.
	27.0	Mine.

Refs.: 34 p. 121-125; 81 p. 215-219; 85 p. 76-78; 123 p. 280-281; 159 p. 42-48; 220 p. 20-21; 350 p. 109-129; 359 p. 41.

Maps (T): 52 B/10 Burchell Lake
(G): 2204 Powell Lake Sheet, Thunder Bay District (O.G.S., 1:31 680)

km 66.9 *Road-cut* exposes granite pegmatite containing small garnet crystals and mica books. Granite is exposed along the highway intermittently to Atikokan.

km 71.4 Highway crosses the Arctic-Atlantic Watershed at an elevation of 488 m above sea level.

km 98.0 Turn-off to Quetico Provincial Park.

km 115.0 Junction of Highwy 623.

Sapawe Mine

PYRITE, CHALCOPYRITE, SPHALERITE, SCHEELITE, NATIVE GOLD, TOURMALINE, QUARTZ CRYSTALS

In quartz-dolomite veins in metavolcanics and quartz porphyry

Pyrite, chalcopyrite and sphalerite occur with minor scheelite in white massive quartz. Native gold has been reported to occur in quartz. Black tourmaline occurs as small patches in quartz. Small cubes of pyrite measuring about 2 mm in diameter occur with altered light green mica and chlorite in quartz. Crystals of quartz measuring up to 5 mm in diameter occur in cavities in massive quartz.

The deposit was originally explored in the 1890s during the gold prospecting rush to the Lower Seine region. Development work was done on the deposit in 1960-1963 by Lindsay Exploration Limited. From 1963 to 1966, Sapawe Gold Mines Limited operated the deposit and produced 141 425 g of gold and 40 900 g of silver for a total value of $173 420. Mining was from a shaft, 309.9 m deep.

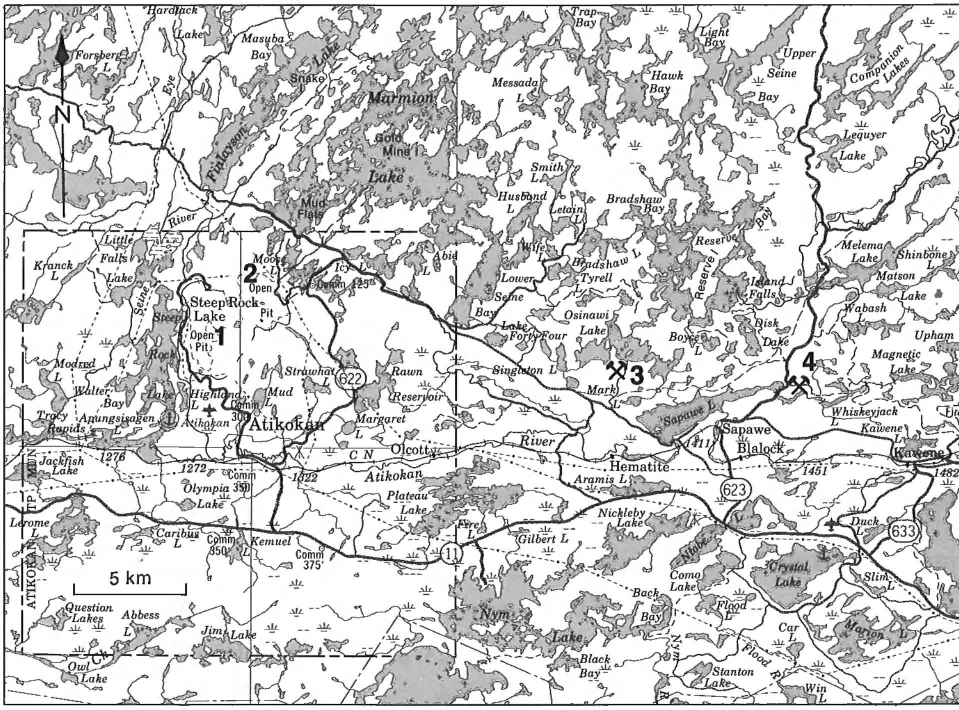
Road log from Highway 11 at **km 115.0:**

km	0	Junction of highways 11 and 623; proceed north along Highway 623.
	6.1	Junction; follow the road on left.
	9.5	Junction; follow the road on right.
	9.6	Junction; continue straight ahead.
	10.4	Intersection; continue straight ahead.
	10.7	Junction; continue straight ahead.
	11.7	Mine.

Refs.: 123 p. 251-252; 353 p. 34-36.

Maps (T): 52 B/14 Sapawe
(G): 2065 Atikokan-Lakehead Sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

Part of 52 B



Map 28. Atikokan area.

1-Steep Rock Mine
2-Caland Mine
3-Sapawe Mine
4-Atikokan Mine

Plate 51

Atikokan Mine, mine buildings, c 1913. (GSC 204031-K)

Atikokan Mine

MAGNETITE, PYRRHOTITE, PYRITE, CHALCOPYRITE, HEMATITE, SIDERITE, GOETHITE, GYPSUM, ANHYDRITE, JAROSITE, ROZENITE

In gabbro

The orebody consisted of magnetite, pyrrhotite, pyrite and minor chalcopyrite. Hematite and dark brown platy aggregates of siderite were associated with magnetite. Secondary minerals occur as coatings and encrustations on specimens found on the dumps. They include: brownish yellow goethite; colourless to white, acicular to bladed gypsum; white, paint-like anhydrite; dull yellow, earthy to fibrous jarosite; and white, powdery rozenite.

The deposit was discovered in 1882 by Jim Shogonosh, a trapper who worked for G. McLaurin of Savanne. It was acquired shortly after by the McKellar brothers and was explored by various interests between 1887 and 1900. Exploration consisted of trenches, strippings and an adit driven 86.6 m into a ridge formed by the ore zone. In 1905, the Atikokan Iron Company, Limited undertook development of the orebody. It sank three shafts to depths of 14.3 m, 45.7 m and 38.4 m, and drove three new adits. The mine was operated until 1913 producing 82 263 t of iron ore. It is about 1.6 km east by Sapawe.

Road log from Highway 11 at **km 115.0** (see page 148):

km	0	Junction of highways 11 and 623; proceed north along Highway 623.
	5.8	Junction; follow the road on left.
	9.0	Junction; follow the road on right.
	9.3	Mine on right.

Refs.: 161 p. 44-46; 198 p. 31-34; 298 p. 299.

Maps (T): 52 B/14 Sapawe
(G): 2065 Atikokan-Lakehead sheet, Kenora, Rainy River and Thunder Bay Districts (O.G.S., 1:253 440)

km	**136.7**	Junction of Highway 11B to Atikokan.

Caland Mine

GOETHITE, HEMATITE, PYROLUSITE, MANGANITE, JASPER, QUARTZ, CALCITE, MAGNESITE, DOLOMITE, KAOLINITE, VIVIANITE

In volcanics and sediments of the Steep Rock Group

Goethite was the principal ore mineral at this mine. It was about three times more abundant than hematite, also an ore mineral. Goethite occurred as brown to yellow and bluish black metallic masses, and as fragments in earthy hematite and in brown massive goethite. It also occurred as spectacular acicular, colloform, stalactitic and botryoidal aggregates, and as crystals lining cavities in brecciated carbonates and in massive goethite. Hematite occurred as red earthy and black compact masses associated with goethite. Pyrolusite occurred as grey to black, metallic, bladed aggregates, as black fibrous aggregates forming botryoidal masses, and as grey metallic to black earthy masses; crystals were found filling fractures. Manganite occurred as black lustrous bladed aggregates associated with goethite and quartz. These minerals were

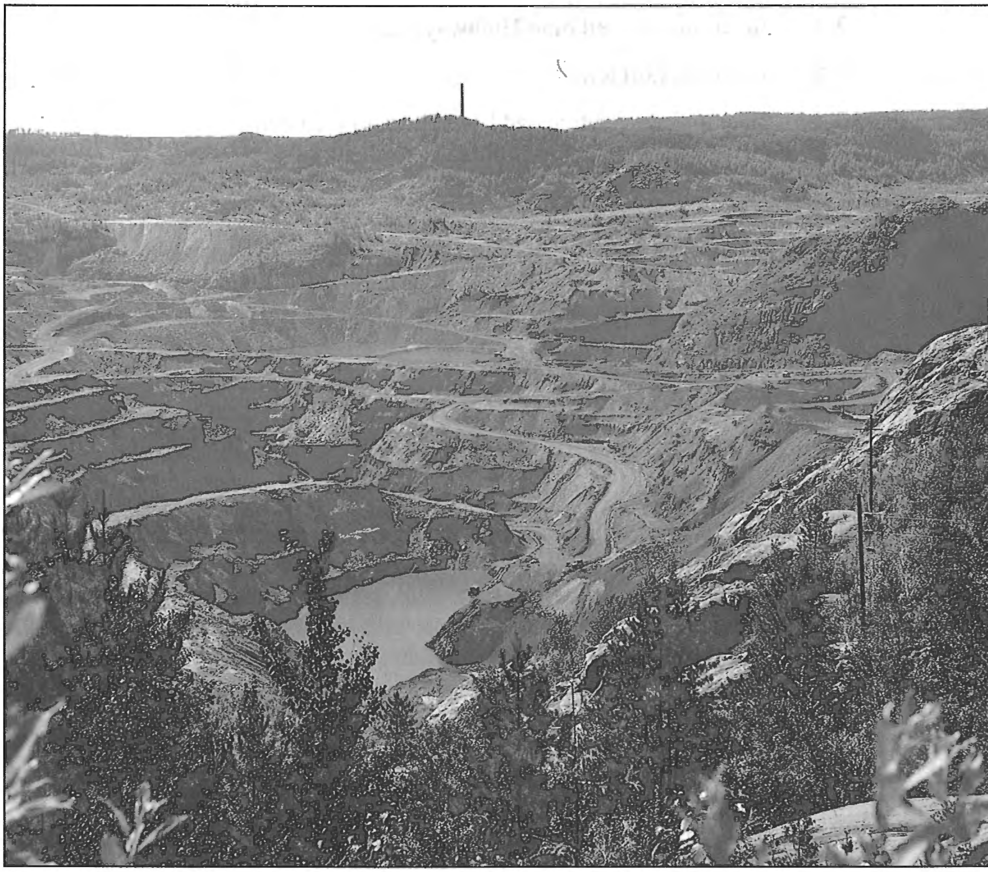


Plate 52

Caland Mine, 1974. (GSC 163100)

associated with quartz, chert, jasper, carbonates and kaolinite. Fine crystals of colourless transparent quartz measuring up to 5 cm long and crystals of calcite have been obtained from the deposit. Vivianite was found in the ore zone.

The mine is located just north of the former Falls Bay of Steep Rock Lake. The deposit was outlined as the C zone during diamond drilling of the ore beneath Steep Rock Lake between 1938 and 1943 (see Steep Rock Mine). In 1949, Caland Ore Company began exploration in the Falls Bay area and in 1953, it leased the C zone property from Steep Rock Iron Mines Limited. Falls Bay was drained to allow for open pit operations which began in 1960. A pellet plant was put in operation in 1966. Mining operations were terminated in 1979 and pelletizing came to an end in 1980. Production amounted to 31 751 t of ore.

The mine is about 6 km north of Atikokan.

Road log from Highway 11 at **km 136.7**:

km	0	Junction of highways 11 and 11B; proceed onto Highway 11B to Atikokan.

3.4 Junction; proceed onto Highway 622.

14.5 Junction; turn left.

15.7 Gate to Caland Mine and Lookout onto the open pit.

Refs.: 219 p. 92-103; 298 p. 304; 376 p. 256-257.

Maps (T): 52 B/15 Atikokan
(G): 2217 Steep Rock Lake Area, Rainy River District (O.G.S., 1:12 000)

Steep Rock Mine

GOETHITE, HEMATITE, PYRITE, PYROLUSITE, CRYPTOMELANE, MANGANITE, CALCITE, QUARTZ

In volcanics and sediments of the Steep Rock Group

Fine crystals of calcite and colourless quartz have been found in this former iron mine. Goethite and hematite were the ore minerals. They occurred in a manganiferous ore zone consisting of pyrolusite, cryptomelane, manganite, quartz, chert, illite, gibbsite, muscovite and apatite, and in a goethite ore zone consisting mainly of goethite and hematite with minor quartz and kaolinite. Goethite occurred as hard, blue-black to soft brown masses, as colloform aggregates and as a golden-yellow variety. Crystals of goethite occurred in cavities in massive goethite.

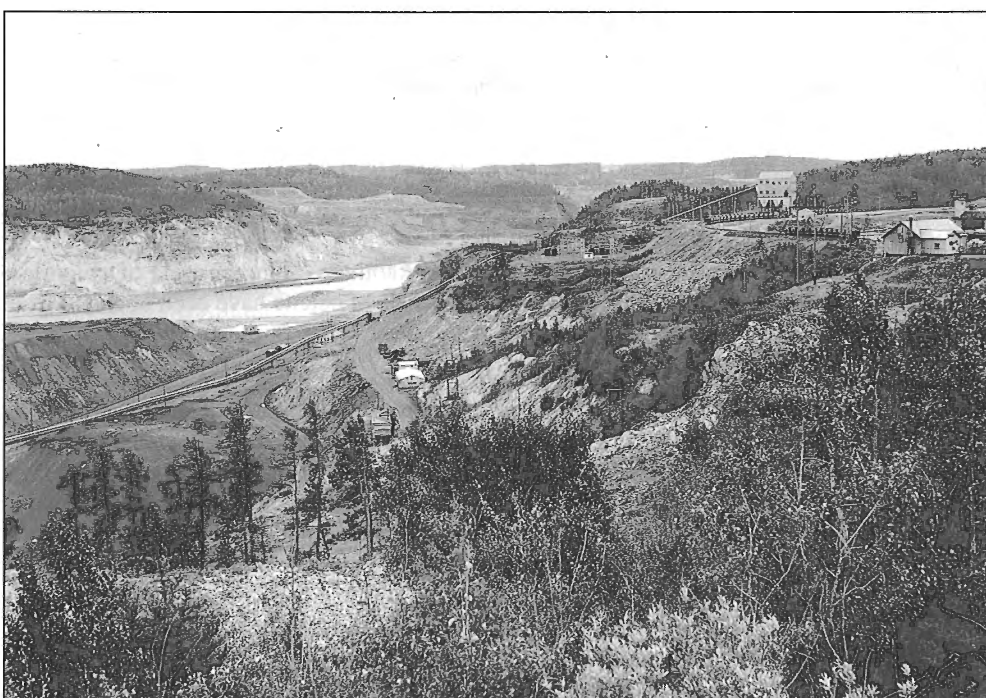


Plate 53

Steep Rock Mine, Hogarth Pit, 1958. (GSC 152402)

Hematite occurred as earthy red to compact black masses. Lenses and bands of pyrite were associated with the hematite-goethite ore. Melanterite was found as an alteration product.

The occurrence of iron ore in the Steep Rock Lake area was first noted in 1891 by H.L. Smyth. He suggested that the boulders of hematite which be observed along the shore, originated from a deposit beneath the lake. The area was investigated at various times after the discovery but no economic deposit was found until the 1930s. In 1930, Julian G. Cross found boulders of massive high-grade hematite on the south shore of Steep Rock Lake and he also concluded that the orebody lay beneath the lake. In the winter of 1938, Steerola Exploration Company Limited located three large orebodies during a diamond drilling program through the ice. Exploration was then directed to outlining the orebodies, which was done by drilling through the ice in the winters from 1938 to 1943. The work was done by Steerola and Steep Rock Iron Mines Limited. When the orebodies were outlined, plans were made for open pit and underground operations. A shaft was sunk to 257.7 m in the Hogarth orebody and open pit operations were planned for the Errington orebody. To make way for the open pit, Steep Rock Lake was drained by diverting the Seine River, and by draining and dredging operations which were completed in 1944. Mining began from the Errington pit in 1944; from 1953 to 1973 mining was by a shaft sunk to 381.2 m in the Errington deposit. Operations were from the Hogarth pit between 1953 and 1979. A shaft was put down to 451.4 m in the Hogarth pit in 1958. The Hogarth pit is 1830 m north of the Errington pit. Between them is the Roberts pit which was mined from 1962 to 1972. The pellet plant was operated from 1967 to the close of mining operations in 1979. Total production from these operations amounted to 57 360 208 t of ore.

The mines are located north of Atikokan.

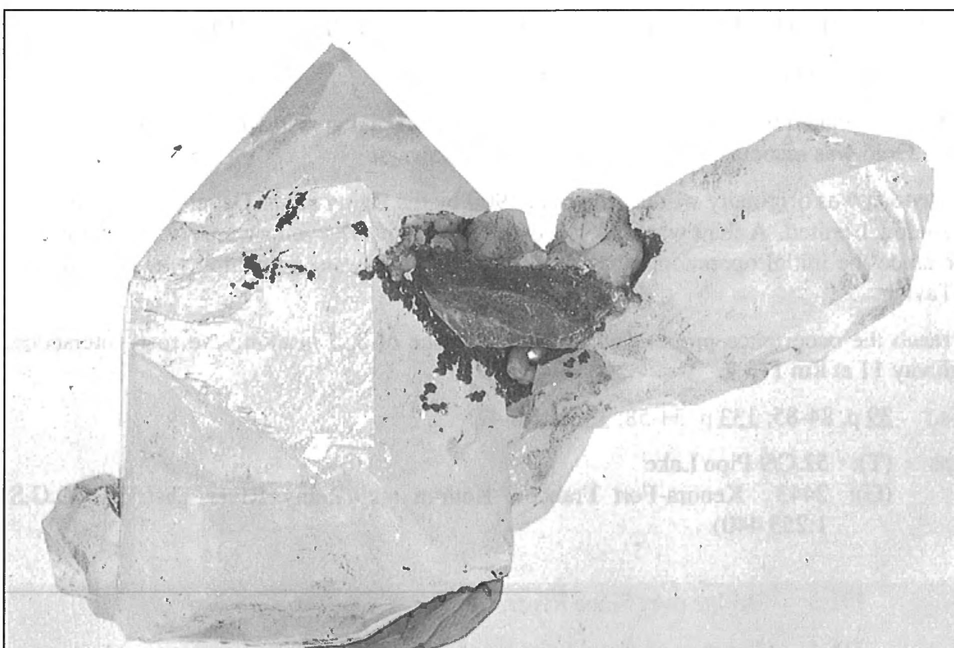


Plate 54

Quartz crystals, Steep Rock Mine. The larger crystal measures 4 cm across. (GSC 203376-M)

Road log from Highway 11 at **km 136.7** (see page 150):

km	0	Junction of highways 11 and 11B; proceed onto Highway 11B to Atikokan.
	3.4	Junction of Highway 622; continue along Highway 11B.
	4.0	Intersection of MacKenzie and Mercury streets; turn right onto Mercury Street.
	5.9	Turn right onto O'Brien Street.
	6.7	Intersection; turn left.
	11.1	Gate to Steep Rock Mine.
	14.3	Hogarth Lookout.

Refs.: 294 p. 231; 301 p. 72-76; 376 p. 256-257.

Maps (T): 52 B/13 Atikokan
(G): 2217 Steep Rock Lake Area, Rainy River District (O.G.S., 1:12 000)

km	**175.7**	Junction of Flanders Station Road.
km	**178.2**	Junction of a single-lane road.

Mayflower Mine

PYRITE, CHALCOPYRITE, SPHALERITE, GALENA, ARSENOPYRITE

In veins in banded chert, felsic tuff and sericite schist

Pyrite is associated with chalcopyrite, sphalerite, galena and arsenopyrite in quartz-carbonate veins. Gold was associated with the sulphide minerals.

The deposit was originally worked in about 1900 by the Rainy River Development Company of London, Limited. A shaft was sunk to a depth of 27.6 m. The veins were explored at various time since the initial operations, including in 1979 when some trenching was done by K.J. McTavish.

To reach the occurrence proceed north for a distance of 335 m along the road intersecting Highway 11 at **km 178.2.**

Refs.: 39 p. 84-85; 133 p. 54-58; 353 p. 46-47.

Maps (T): 52 C/9 Pipe Lake
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km	**191.3**	Bridge over Seine River.
km	**215.4**	Junction of Shoal Lake Road.

Golden Star Mine

NATIVE GOLD, CHALCOPYRITE, PYRITE, GALENA, PYRRHOTITE, SIDERITE

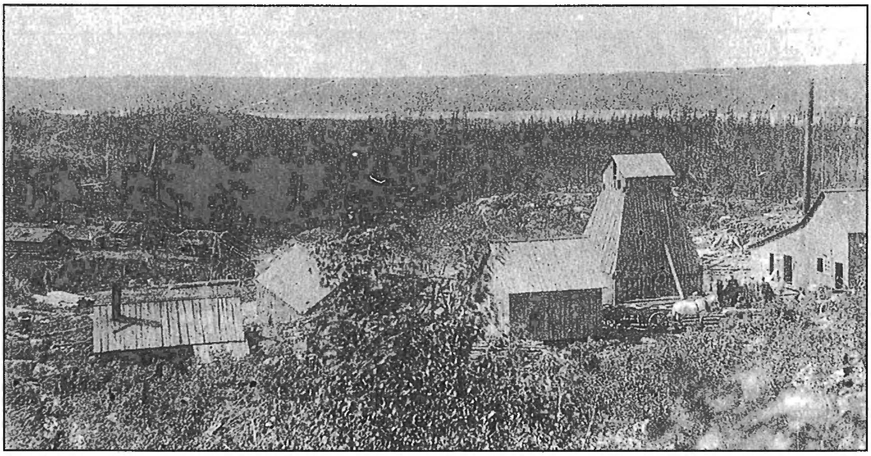


Plate 55

Golden Star Mine, 1899. (Archives of Ontario S-8693)

In quartz veins in a felsite dyke cutting metavolcanics

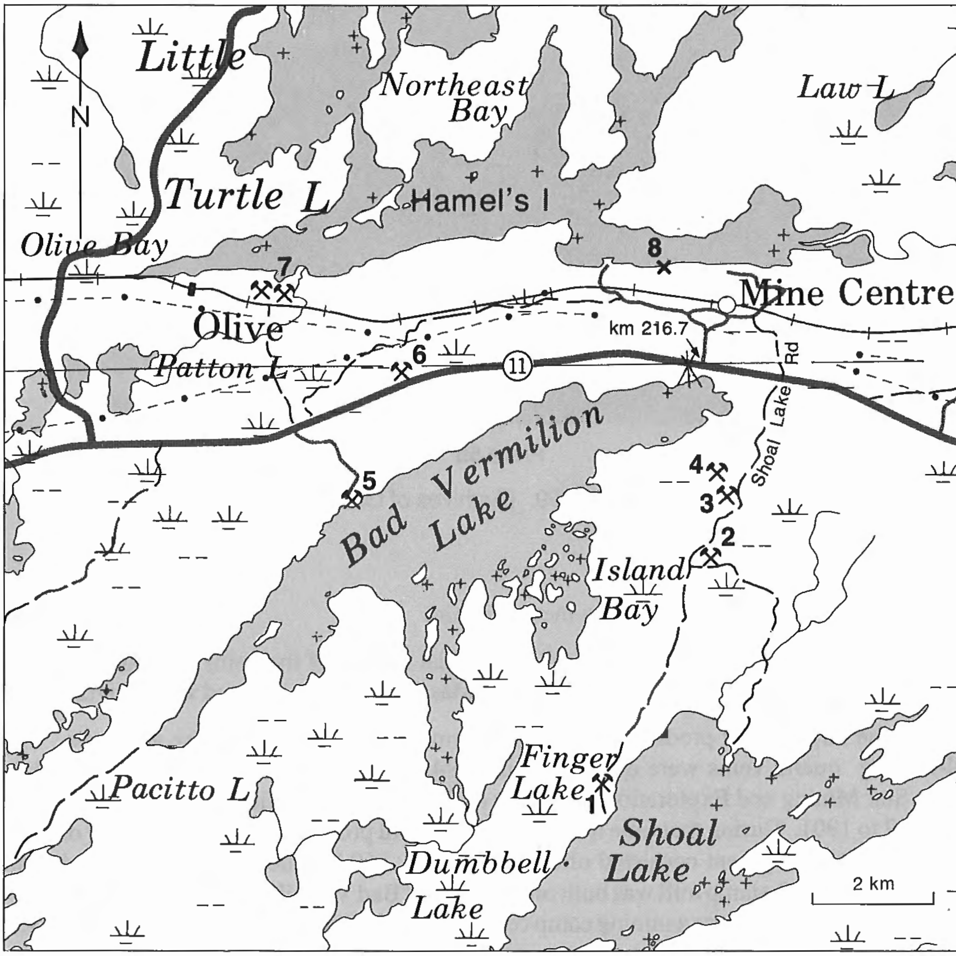
Native gold was reported to be plentiful during initial mining of the veins. It was associated with chalcopyrite, pyrite, pyrrhotite and galena. Massive siderite occurred with quartz.

This was the largest gold producer in the Bad Vermilion Lake – Shoal Lake gold area. The gold-bearing quartz veins were discovered in 1894 by Neil Berger and Edward Randolph. Golden Star Mining and Exploration Company of Ontario Limited did the development work from 1897 to 1901. During that time it was the largest gold producer in the Seine River district. Underground development consisted of the Main shaft, 162.3 m deep, and an inclined shaft sunk to 26.5 m. A 10-stamp mill was built on the shore of Bad Vermilion Lake, 825 m northwest of the Main shaft. There was a mining camp consisting of twenty to thirty buildings at the mine. After its initial period of operation, the mine was worked spasmodically by various companies. In 1917, two carloads of copper ore were shipped. In 1928, there was renewed activity when Northern Red Lake Mines Limited discovered a spectacular showing of native gold with arsenopyrite in a quartz-ankerite vein on the old Isabella property located about 790 m southwest of the Main shaft. A mill was built on the site and there was intermittent production of gold by this company and others to about 1941. In 1984, Cleyo Resources Incorporated did some exploration work on the deposit. The mine produced a total of 334 606 g of gold and 1057 g of silver, valued at $170 616.The mine is on the east side of Bad Vermilion Lake.

Road log from Highway 11 at **km 215.4**:

km	0	Junction of Highway 11 and Shoal Lake Road; proceed onto Shoal Lake Road.
	1.3	Pits on the left (east) side of road; they were sunk in veins carrying pyrite, chalcopyrite and sphalerite.
	2.15	Trail on right leads about 360 m to the Golden Star Mine.

Refs.: 30 p. 21; 36 p. 73-74; 37 p. 76-79; 48 p. 27-28; 123 p. 255-256; 161 p. 53-55.



Map 29. Mine Centre area.

1-Foley Mine
2-Lucky Coon Mine
3-Ferguson Mine
4-Golden Star Mine
5-Stellar Mine
6-Port Arthur Mine
7-Olive Mine
8-Little Turtle Lake occurrence

Maps (T): 52 C/10 Seine Bay
(G): 334A Mine Centre Area, Rainy River District, Ontario (G.S.C., 1:31 680)
2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Ferguson Mine

NATIVE GOLD, PYRITE, SPHALERITE, GALENA

In quartz veins in sheared quartz porphyry

Native gold occurred with pyrite, sphalerite and galena in quartz. Fine specimens of native gold were encountered during mining operations.

The deposit was staked by D.L. Kelly and partners in 1894. It was originally known as Kelly's location and was worked between 1894 and 1896 by Seine River Gold Mines Company Limited of London, England. There were several veins; four were opened by shafts sunk to depths of 44.5 m, 33.5 m, 32.6 m and 19.8 m.

The mine is located immediately south of the Golden Star Mine; it is on the west side of the Shoal Lake Road, at a point 0.35 km south of the turn-off to the Golden Star Mine (see road log to the Foley Mine, page 158).

Refs.: 20 p. 16; 85 p. 65; 86 p. 80-81.

Maps (T): 52 C/10 Seine Bay
(G): 334A Mine Centre Area, Rainy River District, Ontario (G.S.C., 1:31 680) 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Lucky Coon (Hillier) Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE

In quartz veins in felsic intrusive rocks

Specimens containing native gold were encontered frequently during early mining operations. The gold was associated with pyrite, chalcopyrite, sphalerite and a grey mineral believed to be argentite.

The first gold-bearing vein on this property was discovered in 1894 by William Campbell. Other veins were discovered by his partners A.M. Robertson and J. Mosher. In 1894-1895, George Hillier, Walter Miller and Hugh Steel of the Russell Miller Mining Company developed the deposit and installed a 5-stamp mill, the first in this district. Two gold bricks were produced. In 1899, Lucky Coon Gold Mining Company Limited produced a small amount of gold. The workings consisted of four shafts sunk to depths of 33 m, 23.8 m, 15 m and 7.3 m. The mine was worked again in 1935-1936 by Russell C. Cone. Total production amounted to 2177 g of gold and 311 g of silver valued at $249.

The mine is located south of the Golden Star Mine. To reach it, continue south along the Shoal Lake Road for a distance of 1.7 km from the turn off to the Golden Star Mine. It is on the east side of the road.

Refs.: 34 p. 155-157; 84 p. 57; 85 p. 65; 123 p. 257; 302 p. 230.

Maps (T): 52 C/10 Seine Bay
(G): 334A Mine Centre Area, Rainy River District, Ontario (G.S.C. 1:31 680) 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Foley Mine

NATIVE GOLD, SPHALERITE, PYRITE, CHALCOPYRITE, GALENA, ARSENOPYRITE

In quartz veins in shear zones in tonalite

During mining operations, considerable native gold was encountered in white quartz; it occurred with abundant sphalerite and with pyrite, chalcopyrite, galena and arsenopyrite.

Auriferous quartz veins were discovered on this property by Thomas Wiegand and Alex Lockhart in September, 1893. This was the first gold discovery in the lower Seine district. The discovery led to a prospecting rush in 1894-1895, and by the summer of 1895 the entire region between Shoal Lake and Bad Vermilion Lake was staked. The deposit was explored by Wiegand and associates in 1893-1894. Further development work was done by Wiegand Gold Mining Company and Ontario Gold Mines Company. It consisted of open cuts and several shafts, the deepest being 128.1 m and 30.8 m. Several veins were worked. In 1897-1898, Foley Gold Mines Company of Ontario, Limited brought the mine into production. Ore was treated in a 20-stamp mill located near the shore of Shoal Lake, 1336 m from the North shaft to which it was connected by a tramway. The ore cars were conveyed to the mill by gravity and brought back by horses. The mining camp, 800 m west of Shoal Lake, consisted of numerous buildings including several residences and boarding houses, mine offices, barns, a general store and a hospital. Wiegand Post Office was established on the shore of the lake near the mine dock. The mine has been worked spasmodically by various interests since the 1890s. Recently (1984) Sherritt Gordon Mines Limited did exploration work on the deposit. The mine produced a total of 26 593 g of gold and 4634 g of silver, valued at $52 658.

The mine is near the northwest shore of Shoal Lake.

Road log from Highway 11 at **km 215.4** (see page 154):

km	0	Junction of Highway 11 and Shoal Lake Road; proceed south along Shoal Lake Road.
	2.15	Turn-off to Golden Star Mine.
	2.5	Ferguson Mine on the west side of the road.
	3.8	Lucky Coon Mine on left (east) side of the road.
	4.8	Junction; follow the road on right.
	7.7	Foley Mine.

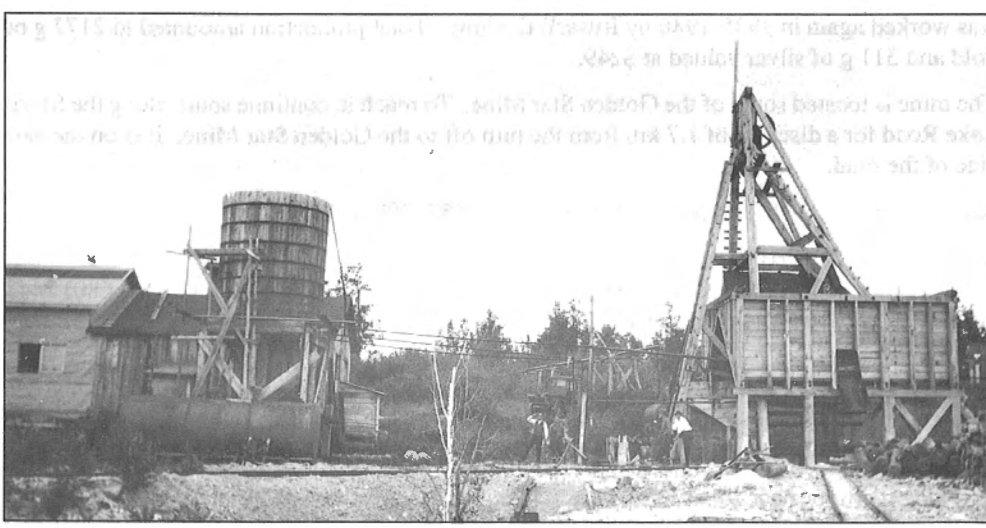


Plate 56

Foley Mine, 1928. (National Archives Canada PA-14073)

Refs.: 36 p. 68-71; 84 p. 55-57; 85 p. 65-66; 123 p. 253-254; 250 p. 74-75.

Maps (T): 52 C/10 Seine Bay
(G): 334 A Mine Centre Area, Rainy River District, Ontario (G.S.C., 1:31 680) 2443 Kenora-Fort Frances, Rainy River District (O.G.S., 1:253 440)

km 216.7 Junction of Mine Centre Road (access to Little Turtle Lake).

Little Turtle Lake Occurrence

SOAPSTONE

In metavolcanics and metagabbro

Dark grey massive soapstone was formerly quarried from a deposit on the shore of Little Turtle Lake. It was used for making metalworkers' crayons and gas-burner tips, and as a carving medium.

The deposit occurs on the south shore of the lake, northwest of Mine Centre. It was originally staked as a gold prospect during one of the gold-staking rushes in the region. In 1922-1923, H.H. Wood Talc Company worked the deposit from a pit which measured 1.5 m by 1.8 m and 3.7 m deep. About 15 t of soapstone were removed from the pit.Access to the occurrence is by boat.

Ref.: 317 p. 97-98.

Maps (T): 52 C/15 Mine Centre
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 221.6 Junction of a road on right.

Port Arthur Mine

PYRITE, CHALCOPYRITE, SPHALERITE, COVELLITE, HEMATITE, QUARTZ CRYSTALS, SIDERITE, POSNJAKITE, BROCHANTITE, CHALCANTHITE, SERPIERITE, CHALCOALUMITE, GYPSUM, ROZENITE, SPIONKOPITE, YARROWITE

In sericite schist

Pyrite and chalcopyrite occur with minor sphalerite and covellite in sericite schist. Hematite is present as red earthy patches associated with pyrite. Quartz occurs as nodules and as "micro" crystals associated with the nodules. Dark brown siderite rhombs are associated with quartz. Secondary minerals occurring as coatings and encrustations on specimens found on the dumps include: blue posnjakite, green brochantite, white chalcanthite, greenish blue fibrous serpierite, white silky chalcoalumite, colourless "micro" bladed aggregates of gypsum, and white rozenite. Spionkopite and yarrowite occur as lustrous black, fine flaky aggregates associated with posnjakite.

The deposit was worked for copper in 1916-1917 by Port Arthur Copper Mines, Limited. A shaft was sunk to a depth of 30.5 m into a lens of high grade copper. Production amounted to 12 008.6 kg of copper.

The mine is about 65 m north of Highway 11 at **km 221.6**; access is via the road (MIF-558) leading north from the highway at this point.

Ref.: 299 p. 224.

Maps (T): 52 C/15 Mine Centre
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 223.8 Intersection of the road leading north to Olive Mine and the road leading south to Stellar Mine.

Olive (Preston) Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GRAPHITE

In quartz veins in felsic volcanic rocks

Specimens very rich in native gold were found during initial mining operations. The gold occurred with pyrite, chalcopyrite and graphite in quartz.

The gold-bearing quartz vein was discovered in an outcrop near the southwest end of Little Turtle Lake by 'Doc' Gardner who staked the claim in 1895. Its unusual richness brought much interest and a prospecting rush to the area between Bad Vermilion Lake and Little Turtle Lake. Preston Gold Mining Company of Ontario, Limited did the exploration work on the deposit in 1896-1897, and Olive Gold Company of Seine River, Limited was formed to develop the deposit. This company worked the deposit until 1900; the work consisted of an inclined shaft sunk to a depth of 76.5 m and two other shafts sunk to depths of 19.8 m and 18.9 m. A 2-stamp mill on the shore of Little Turtle Lake was initially put into operation and was replaced later by a 25-stamp mill. Some gold was recovered by panning the schistose rock enclosing the vein. There was a mining camp consisting of twenty to thirty buildings at the site. The mine was worked again in 1935-1937 by Olive Gold Mines Limited and in 1941-1942 by Goldorel Mining Company, Limited. It was recently (1983) explored by Homestake Explorations Limited. Total production from the mine was 111 100 g of gold and 10 668 g of silver, valued at $80 636.

Access to the mine is by a road, 2.5 km long, leading north from Highway 11 at **km 223.8**. This junction is 7.1 km west of the junction of Highway 11 and the road to Mine Centre.

Refs.: 30 p. 21; 36 p. 71-73; 37 p. 79-81; 86 p. 82; 123 p. 259; 250 p. 74-75.

Maps (T): 52 C/15 Mine Centre
(G): 334A Mine Centre Area, Rainy River District, Ontario (G.S.C., 1:31 680) 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Stellar Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE

In quartz veins in sheared quartz porphyry, chlorite schist, metadiorite and gabbro

Native gold occurred with pyrite, chalcopyrite and sphalerite in quartz.

The deposit was opened by shafts sunk to depths of 20.7 m and 4.6 m. The work was done in 1934 by Stellar Gold Mines Limited. In 1983-1984 Central Crude Limited explored the deposit by diamond drilling.

The mine is near the northwest shore of Bad Vermilion Lake. A road, 1.8 km long, leads south from Highway 17 at **km 223.8** to the mine.

Refs.: 20 p. 38; 30 p. 21.

Maps (T): 52 C/10 Seine Bay
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)
334A Mine Centre Area, Rainy River District, Ontario (G.S.C., 1:31 680)

km	**230.7**	*Road-cut* exposes granite with epidote in fractures.
km	**246.5**	Scenic Lookout onto Swell Bay.
km	**259.3**	Junction of Nickle Lake Portage Road.
km	**265.1**	*Road-cuts* expose a gossan zone containing massive pyrite and pyrrhotite. Green acicular aggregates of actinolite are associated with pyrite. Secondary minerals occurring as powdery to earthy crusts include white rozenite, yellow jarosite and rusty goethite.
km	**267.5**	Junction of Reef Point Road.
km	**270.7**	Junction of Rocky Inlet Road.
km	**272.9**	Quarry.

Rocky Islet Quarry

EPIDOTE, ACTINOLITE, TREMOLITE, PYRITE, TOURMALINE, MAGNETITE, GOETHITE

In diorite and granite

Epidote occurs as fine prismatic and granular aggregates in fractures in diorite. Bladed actinolite, white fibrous tremolite and "micro" cubes of pyrite are associated with epidote. Black tourmaline occurs as radiating prisms associated with epidote in diorite and associated with pyrite and magnetite in white granite. Goethite occurs as an earthy coating on the rocks.

The quarry was formerly worked for crushed stone.

It is on the east side of Highway 11 at **km 272.9**.

Refs.: 160 p. 29-32; 317 p. 12.

Maps (T): 52 C/11 Fort Frances
(G): 2278 Rice Bay, Rainy Lake, Rainy River District (O.G.S., 1:31 680)

km	**274.6**	Scenic Look-out onto Rainy Lake.
km	**285.3**	Fort Frances, at the junction of Highway 71 (Scott and Centre streets).

The main road log along Highway 17 West is resumed. Descriptions of occurrences along Highway 71 begin on page 192.

km	**59.9**	Junction of Highway 17/11 and Highway 11 (see page 143); proceed along Highway 17 West.
km	**85.5**	The highway crosses the Arctic-Atlantic Watershed.
km	**111.7**	*Road-cuts* expose granite with surface-coatings and fracture- fillings of epidote. The granite road-cuts are intermittent to **km 294**.

Parts of 52 G and 52 J

Map 30. Sturgeon Lake area.

1-Mattabi Mine 2-Sturgeon Lake Mine 3-St. Anthony Mine

Sturgeon Lake area Occurrences

Highway 599 leads northeast from Highway 17 to the Sturgeon Lake area mines.

St. Anthony Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, SPHALERITE

In quartz veins in quartz porphyry

Native gold, readily visible to the eye, was found during early mining operations. It occurred in quartz veins which carried pyrite, chalcopyrite, galena and sphalerite. The gangue consisted of quartz, calcite and siderite.

Gold was discovered in the Sturgeon Lake area in 1899. Rich surface showings were found, including a vein described as being phenomenally rich in nuggety gold at the surface. Work on the St. Anthony Mine began in 1900 by Jack Lake Gold Mining Company Limited. Exploration consisted of several pits, trenches and shafts sunk to depths of about 30 m. The company built a 10-stamp mill on the site. From 1904 to 1907, St. Anthony Gold Mining Company, Limited continued exploration. Additional development work was done at various times by several concerns. The mine was brought into production in 1934 by St. Anthony Gold Mines Limited. The production shaft was operated to a depth of 308 m. The mine and mill

Plate 57

St. Anthony Mine, 1936. (National Archives Canada PA-14905) operations ended in 1942. From 1905 to the close of operations, the mine produced 1 969 131 g of gold and 508 254 g of silver, valued at $2 165 292.

The mine is located between the North Arm of Sturgeon Lake and Couture Lake.

Road log from Highway 17 at **km 240.5**:

km	0	Junction of highways 17 and 599; proceed onto Highway 599.
	11.4	Turn-off to Sandbar Lake Provincial Park.
	60.8	Junction of Highway 642.
	61.5	Junction of the road to *Mattabi* and *Sturgeon Lake mines*; continue along Highway 599. Descriptions of these mines follow this road log.
	125.0	Junction; turn right. This junction is 1.7 km south of the railway crossing at Savant Lake.
	128.7	Junction; follow the road on right.
	129.9	Junction (on left) road to air field; continued straight ahead.
	130.5	Junction; follow the road on left.
	141.0	Mine.

Refs.: 63 p. 102-103; 123 p. 294-295; 144 p. 45-48; 218 p. 90-92; 222 p. 82-84.

Plate 58

Mattabi Mine, 1974. (GSC 163077)

Maps (T): 52 J/2 Savant Lake
(G): 2456 North Arm of Sturgeon Lake, Precambrian Geology (O.G.S., 1:50 000)

Mattabi Mine

PYRITE, SPHALERITE, CHALCOPYRITE, ARSENOPYRITE, GALENA, TETRAHEDRITE, MAGNETITE, PYRRHOTITE, BOULANGERITE, BOURNONITE, SIDERITE, CHLORITOID, ANDALUSITE, KYANITE, ALMANDINE, GAHNITE

In rhyolite

The deposit consists of two ore zones separated by cherty rhyolite tuffs. Each zone is subdivided into five "facies": (1) high sphalerite ore, consisting of massive sphalerite with pyrite bands and minor chalcopyrite, (2) high pyrite-low sphalerite ore consisting of coarse pyrite (including cubic crystals) with up to 10 per cent sphalerite, (3) massive chalcopyrite ore with streaks of sphalerite and some arsenopyrite, tetrahedrite-tennantite and pyrite, (4) high galena ore which contains galena, sphalerite, some pyrite, minor arsenopyrite and tetrahedrite, and rare boulangerite and bournonite, (5) stringer ore, consisting of chalcopyrite, and minor pyrite, pyrrhotite arsenopyrite and magnetite. Pyrite, pyrrhotite and minor sphalerite occur in the alteration zone which consists of siderite, chloritoid, sericite, andalusite, kyanite, almandine garnet and gahnite. Andalusite occurs as tiny porphyroblasts and as blade-like crystals up to 5 mm long. Kyanite occurs as bladed aggregates (about 2 cm across) in the massive ore and in adjacent veins. Almandine garnet occurs as coarse aggregates measuring up to 10 cm in diameter, in chlorite-rich zones. Dark green octahedral crystals of gahnite, averaging 2 mm in diameter, occur in the massive ore and in a vein immediately below the massive ore.

The deposit was discovered in 1969 by Mattagami Lake Mines, Limited as a result of a program of airborne magnetic and electromagnetic surveys followed by ground geophysical work. Diamond drilling outlined a massive sulphide deposit containing zinc, copper, lead, gold and silver. In 1970, Mattabi Mines Limited was formed to develop the deposit. Open pit mining began in 1972 and the mill began producing copper, zinc and lead concentrates in the same year. Underground development consists of a 1067-m decline driven from the open pit, and a shaft sunk to a depth of 592 m. Since 1981, ore has been obtained from the underground operations. The ore contains 0.33 per cent copper, 8.82 per cent zinc, 0.95 per cent lead and 97.7 g/t silver.

The mine is south of Sturgeon Lake.

Road log from Highway 17 at **km 240.5** (see page 162):

km	0	Junction of highways 17 and 599; proceed onto Highway 599.
	60.8	Junction of Highway 642; continue along Highway 599.
	61.5	Junction; turn right.
	79.8	Turn-off (right) to the mine.

Refs.: 126 p. 1-51; 127 p. 63-69; 382 p. 257.

Maps (T): 52 G/15 Glitter Lake
(G): 2457 Sturgeon Narrows, Precambrian Geology (O.G.S., 1:50 000)

Sturgeon Lake Mine

PYRITE, SPHALERITE, CHALCOPYRITE, GALENA, TENNANTITE-TETRAHEDRITE, PYRRHOTITE, ARSENOPYRITE, GARNET, MAGNETITE, TOURMALINE

At the contact of andesitic and rhyolitic rocks

Pyrite, sphalerite and chalcopyrite are the main constituents of the orebody. Galena, tennantite-tetrahedrite and pyrrhotite occur in lesser amounts and arsenopyrite is a minor constituent. Garnet (as porphyroblasts), chlorite, magnetite, quartz, sericite, carbonates and tourmaline occur in an alteration zone below the massive sulphide ore.

The deposit was staked in 1969 by G. Zimmer and F. Corcoran. From 1975 to 1978 Sturgeon Lake Mines Limited mined the deposit from an open pit. Falconbridge Copper Limited continued operations from 1979 until 1980 when the mine was closed. The mine produced copper, zinc, lead, gold and silver.

The mine is south of Sturgeon Lake and east of the Mattabi Mine. The road to the Mattabi Mine (see page 165) continues to the Sturgeon Lake Mine, a distance of 8 km.

Refs.: 126 p. 51-55; 377 p. 102-103.

Maps (T): 51 G/15 Glitter Lake
(G): 2457 Sturgeon Narrows, Precambrian Geology (O.G.S., 1:50 000)

km 300.3 Junction of Highway 603.

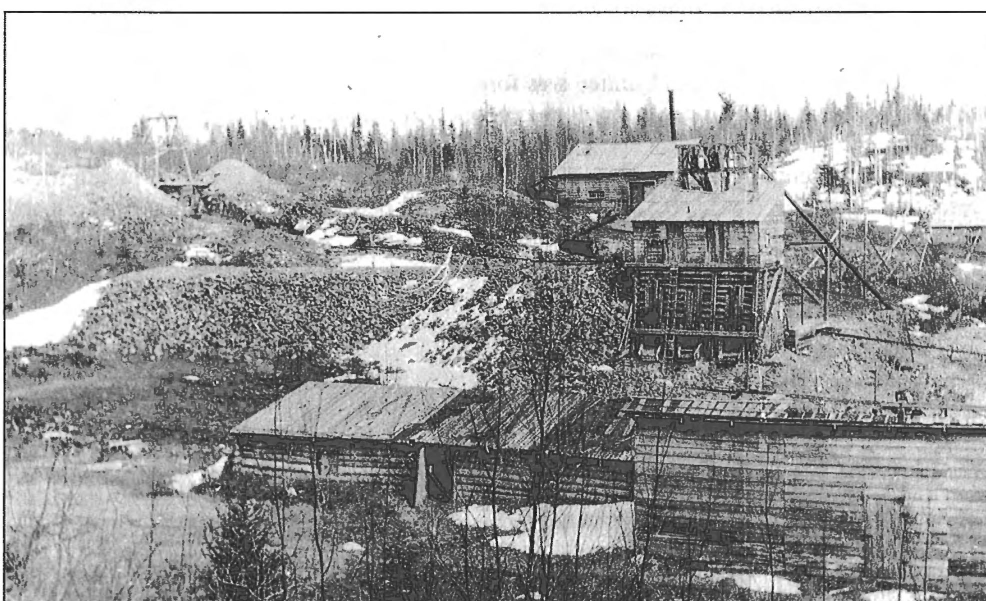


Plate 59

Sakoose Mine, 1907-1909. (Archives of Ontario 11060-40)

Sakoose (Golden Whale) Mine

NATIVE GOLD, NATIVE COPPER, PYRITE, CHALCOPYRITE, GALENA, SPHALERITE

In quartz veins in metavolcanics and metasediments

Native gold and native copper were found in dark blue quartz veins during early development of the veins. Pyrite is the most abundant mineral in the veins. Chalcopyrite, galena and sphalerite are present in minor amounts.

The deposit was staked in 1898 by the Hon. Robert Watson, Minister of Public Works for Manitoba, and John M. Monroe of Dinorwic. The claims that became the Golden Whale Mine, later renamed the Sakoose Mine, were the most promising of many claims staked during the 1898 prospecting rush to the region between Dyment and Kawashegamuk Lake. The new goldfield was known as the New Klondike. The discovery of gold in this region was made by Messrs. Walker and Brown in 1899. The surface showings were regarded as the finest discovered in northwestern Ontario to that time. By 1899 several of the properties were being worked. Dyment became a new railway station and townsite serving as the entry and supply point for the new mining region and a 14.5-km road was built connecting Dyment to the mines.

The Sakoose Mine originally known as the Golden Whale Mine, was in the centre of the New Klondike district and was originally worked by Watson and Monroe. It was developed by three shafts to depths of 32 m, 61 m and 24.4 m, and by several trenches. A mill was built on the bank of a river 800 m west of the shafts, and a mining camp, consisting of several buildings, was set up by 1900 when the property was taken over by the Ottawa Gold Mining and Milling Company. This company worked the mine until 1902. In 1944-1947, Van Houten Gold Mines Limited worked the deposit. Total production of the mine amounted to about 114 117 g of gold and 4 510 g of silver, valued at about $67 913.

The mine is about 9.6 km south of Dyment.

Road log from Highway 17 at **km 300.3**:

km	0	Junction of highways 17 and 603; proceed south along Sandy Point Road.
	3.9	Junction; continue straight ahead (south).
	5.1	Junction; follow the road on left leading south.
	7.0	Junction of the mine road; turn left.
	7.5	Mine.

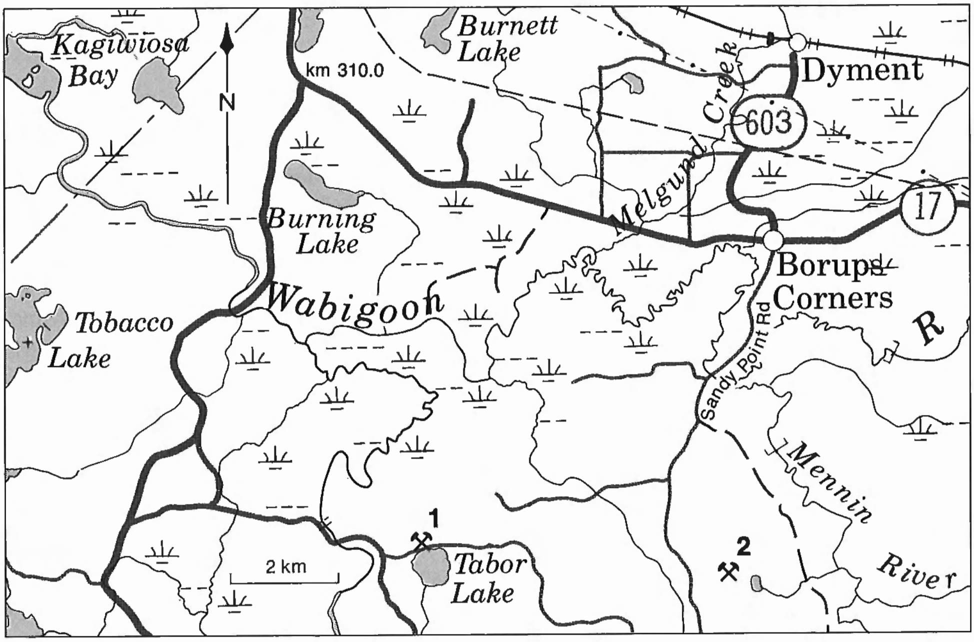
Refs.: 37 p. 72-75; 38 p. 63-64; 41 p. 77-79; 123 p. 174-175.

Maps (T): 52 F/9 Dyment
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 310.0 Junction of a road leading south.

Tabor Mine

PYRITE, NATIVE GOLD



Map 31. Dyment area.

1-Tabor Mine 2-Sakoose Mine

In quartz veins in porphyry

Native gold occurred with pyrite in quartz.

The deposit was originally staked by James Tabor and James Stevenson during the 1897-1898 staking rush in the New Klondike gold region. The auriferous quartz vein in the discovery claim was located on the north side of Tabor Lake, at the western end of the gold field. Gold was panned from the vein. The claim was leased to Eastern Townships Mining and Development Company which trenched the vein and sank an inclined shaft to a depth of 22.9 m. Work ended in 1899. In 1934-1938, Clark Gold Mines Limited worked the deposit from a vertical shaft sunk to a depth of 85.4 m and produced 1119.7 g of gold and 124.4 g of silver. The property has been investigated by various companies since that time but has not been brought into production.

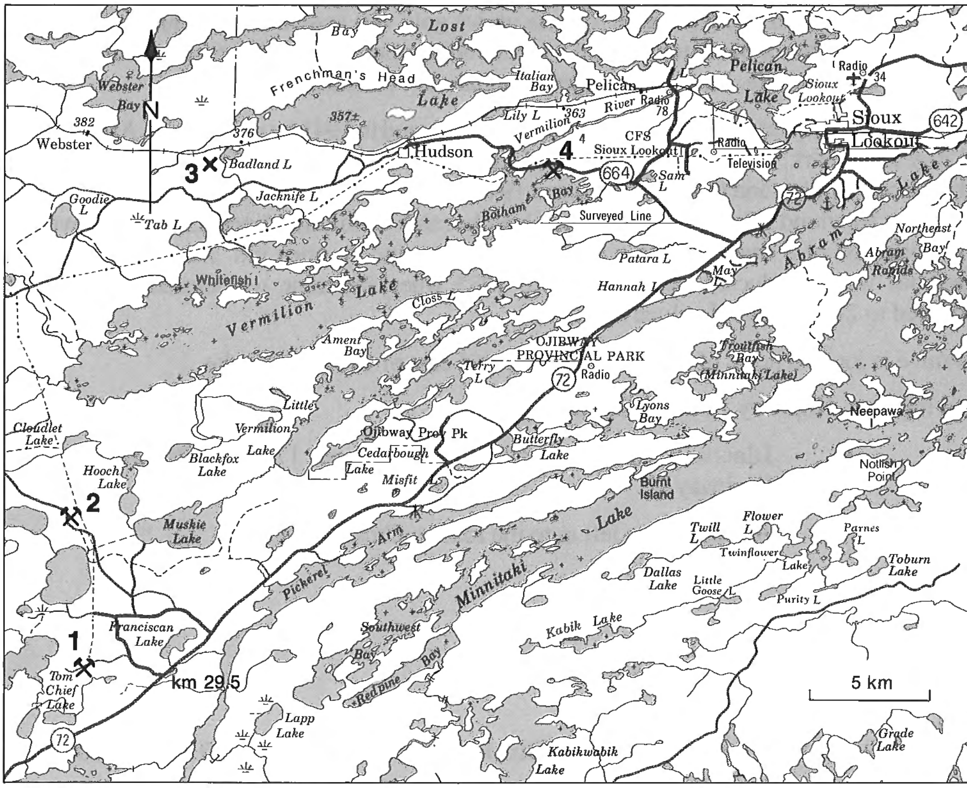
Road log from Highway 17 at **km 310.0**:

km	0	Junction; proceed onto road leading south.
	7.9	Junction; follow the main road on right.
	10.3	Junction; turn left.
	15.4	Junction; turn left.
	16.5	Mine on left.

Refs.: 37 p. 72-73; 123 p. 175-176.

Maps (T): 52 F/9 Dyment

Parts of 52 F, 52 G, 52 J and 52 K



Map 32. Sioux Lookout area.

1-Goldlund Mine	3-Rainbow quarry
2-Pidgeon Mine	4-North Pines Mine

(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 321.5 Dinorwic, at the junction of Highway 72.

Dinorwic-Sioux Lookout Occurrences

Occurrences in this area are accessible from Highway 72. The description of these occurrences follows. The road log to occurrences along Highway 17 west is resumed on page 172.

Goldlund Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, ILMENITE, MAGNETITE, SPHALERITE, GALENA, ALTAITE, SCHEELITE, TOURMALINE

In quartz veins in granodiorite

The deposit has furnished good specimens of quartz-carbonate containing pyrite crystals measuring up to 2 cm along an edge. Coarse native gold was associated with altaite. Acicular to prismatic crystals of black tourmaline were found in quartz. Other minerals occurring in the veins were chalcopyrite, ilmenite, magnetite, sphalerite, galena and scheelite.

The gold-bearing quartz vein in this deposit was discovered in 1941 by prospectors Arthur Ward and Roy Lundmark. Lunward Gold Mines Limited explored the deposit by diamond drilling and surface stripping and trenching between 1941 and 1948. Underground development began in 1949 by Newlund Mines, Limited which later became Goldlund Mines, Limited. Development consisted of a shaft sunk to a depth of 251.6 m and an open pit. Mining and milling operations were conducted from 1982 until 1985 when the mine was closed. Production amounted to 28.6 g of gold valued at $32.

The mine is located north of Sandybeach Lake and east of Crossecho Lake.

Road log from Highway 17 at **km 321.5**:

km	0	Dinorwic, at the junction of highways 17 and 72; proceed onto Highway 72.
	29.5	Junction; turn left onto the road to Crossecho Lake.
	31.4	Junction; turn left.
	33.4	Mine

Refs.: 4 p. 32-35; 79 p. 3-5; 123 p. 140; 382 p. 172.

Maps (T): 52 F/16 Sandybeach Lake
(G): 1950-1 Township of Echo, District of Kenora, Ontario (O.G.S., 1:12 000)

Pidgeon Mine

MOLYBDENITE, PYRITE, BISMUTHINITE, MAGNETITE, TOURMALINE, CASSITERITE, CHALCOPYRITE, FLUORITE

In quartz and pegmatitic stringers in aplite

Fine crystal specimens of the following minerals were formerly found in this deposit: pyrite cubes measuring up to 5 cm along an edge, hexagonal crystals of molybdenite, and bismuthinite prisms measuring up to 2 cm long and 2 mm wide. Tourmaline was found sparingly as small black radiating prisms. Magnetite, cassiterite, chalcopyrite and fluorite were associated with molybdenite.

The molybdenite-bearing quartz and pegmatite veins outcrop along a northeast- trending ridge, northeast of Lateral Lake. The mineralization was discovered in 1946 by field assistants, J.K. Webb and H.E. Neal while mapping the area under the direction of H.S. Armstrong, Ontario Department of Mines. It was staked by G.L. Pidgeon of Wabigoon. Exploration consisting of strippings and trenching and an adit driven 24.8 m into the ridge, was done by Delta Minerals Limited in 1954-1955.

Road log from Highway 17 at **km 321.5** (see page 168):

km	0	Junction of highways 17 and 72; proceed north along Highway 72.
	32.2	Junction; turn left onto the road to Maskinonge Lake.
	35.4	Junction; turn right.

	41.0	Mine. There are several trenches in the outcrops along the ridge.

Refs.: 4 p. 37; 293 p. 29-30; 340 p. 73-78.

Maps (T): 52 F/16 Sandybeach Lake
(G): 1950-1 Township of Echo, District of Kenora, Ontario (O.G.S., 1:12 000)

North Pines Mine

PYRITE, PYRRHOTITE, MAGNETITE, CHALCOPYRITE, SPHALERITE, GOETHITE, ROZENITE, COPIAPITE, HALOTRICHITE

In a shear zone in metavolcanics

This mine was the largest pyrite mine worked in Ontario. Pyrite was generally massive but some small crystals were also found. The dumps furnish specimens of pyrite associated with quartz. The specimens are commonly coated with: rusty, powdery goethite; white pulverulent rozenite; yellow powdery to botryoidal copiapite; and white radiating fibres of halotrichite.

The deposit was staked in 1905 by J. Shilton. It was opened in that year as the Shilton sulphur mine. From 1919 to 1921, Nichols Chemical Company Limited operated it as the North Pines Mine and produced about 453 590 t of pyrite. It was developed by a vertical shaft sunk to a depth of 102.8 m and an inclined shaft to 190.3 m. It is on the north shore of Botham Bay, Vermilion Lake.

Road log from Highway 17 at **km 321.5** (see page 168):

km	0	Junction of highways 17 and 11; proceed north along Highway 72
	44.6	Junction of the road to Ojibway Provincial Park.
	60.2	Junction of Highway 664; turn left.
	68.5	Junction; turn left onto the mine road.
	68.65	Mine.

Refs.: 169 p. 37; 176 p. 28-33; 180 p. 36-38.

Maps (T): 52 K/1 Hudson
(G): 2242 Vermilion Lake Sheet, Kenora District (O.G.S., 1:31 680)

Rainbow Quarry

QUARTZITE, PYRITE, CHALCOPYRITE, GALENA

In metavolcanics

Green quartzite, known locally as Hudson Jade, was formerly quarried as a decorative stone. The bright green colour of the rock is due to disseminations and streaks of green fuchsite-mariposite. Pyrite, chalcopyrite and galena occur in quartz veins cutting the quartzite and metavolcanics.

The deposit was worked by open cuts in about 1972 by Rainbow Quarries Limited. There are three openings about 33 m deep and about 120 m apart. The deposit is west of Hudson.

Road log from Highway 17 at **km 321.5** (see page 168):

km	0	Dinorwic, at the junction of highways 17 and 72; proceed onto Highway 72.
	60.2	Junction of Highway 664; turn left.
	68.5	Turn-off to North Pines Mine; continue along Highway 664.
	77.0	Hudson, at the junction of the road to the boat landing on Lost Lake; turn left.
	78.7	Junction; follow the road on left.
	79.2	Junction; turn right.
	80.7	Junction; follow the road on left.
	86.2	*Pit* on left. This opening exposes iron formation containing pyrite, pyrrhotite and chalcopyrite.
	87.7	Junction of the quarry road; turn right.
	88.5	Quarry.

Refs.: 180 p. 35; 317 p. 66.

Maps (T): 52 K/1 Hudson
(G): 2442 Vermilion Lake Sheet, Kenora District (O.G.S., 1:31 680)

The main road log along Highway 17 is resumed.

km	**321.5**	Dinorwic, at the junction of Highway 72; continue west along Highway 17.
km	**330.8**	Wabigoon, at the junction of the road to the Government wharf.

Wabigoon Occurrence

SOAPSTONE

Greenish grey soapstone occurs at Wabigoon and along shorelines of Wabigoon Lake to the southwest. The soapstone contains small grains of pyrrhotite and chromite, and patches of amber talc.

The Wabigoon occurrence is on a hill on the peninsula on the west side of Barritt Bay, Wabigoon Lake on the property of L. Pidgeon. It was explored by pits and trenches by E.G. Pidgeon in 1921 and by Wabigoon Soapstone Company Limited in 1926-1927. In 1983, Wabigoon Resources Limited investigated the deposit. Arrangements to visit the occurrence should be made by contacting Mrs. L. Pidgeon of Wabigoon.

Refs.: 292 p. 53-55; 317 p. 105-106.

Maps (T): 52 F/10 Wabigoon
(G): 50e Dryden-Wabigoon Area, District of Kenora, Ontario (O.G.S., 1:63 360)

km	**336.4**	Junction of the road to Aaron Provincial Park.
km	**341.6**	Junction of Thunder Lake Road.

Mavis Lake Occurrence

SPODUMENE, TOURMALINE, APATITE

In a feldspar-quartz pegmatite dyke

White to light and dark green spodumene occurs as crystals and irregular masses in a pegmatite dyke cutting chlorite-mica schist and amphibolite. Black tourmaline and light green mica are common. Light blue apatite is a minor constituent of the dyke.

The spodumene-bearing dyke is exposed for about 700 m on the south side of Mavis Lake. It was explored in 1954 by Lun Echo Gold Mines Limited and in 1956 by Milestone Mines Limited.

Road log from Highway 17 at **km 341.6**:

km	0	Junction of Highway 17 and Thunder Lake Road; proceed north onto Thunder Lake Road.
	0.15	Junction; turn left.
	2.2	Junction North Shore Road; continue straight ahead.
	2.4	Junction; follow the road on left.
	2.7	Junction; turn left onto Ghost Lake Road.
	4.5	Junction; follow the road on right.
	5.5	Junction; turn right onto a trail leading east.
	6.9	Mavis Lake occurrence.

Refs.: 234 p. 63-64; 343 p. 123; 366 p. 159-160.

Maps (T): 52 F/15 Dryden
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km	**345.5**	Junction of Highway 601.

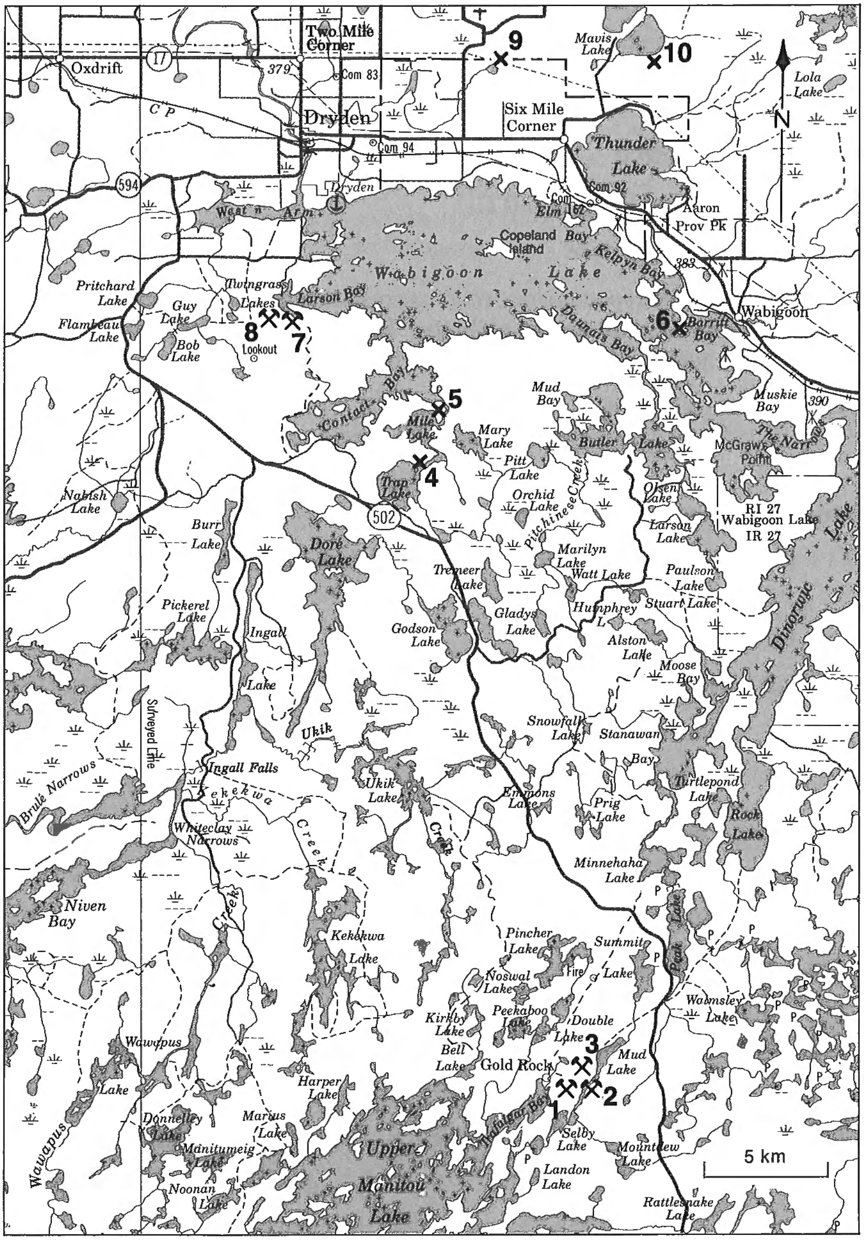
Zealand Occurrence

BERYL, TOURMALINE

In pegmatite and schist

Small, light green beryl crystals measuring 1 to 1.5 cm across occur in pegmatite; the crystals are turbid and not of gem quality. Black tourmaline crystals commonly measuring 7 cm long occur with the beryl. The pegmatite is composed of plagioclase feldspar, colourless to smoky quartz and mica.

Part of 52 F



Map 33. Dryden-Gold Rock area.

1-Jubilee Mine
2-Big Master Mine
3-Laurentian Mine
4-Trap Lake soapstone
5-Mile Lake soapstone
6-Wabigoon soapstone
7-Redeemer Mine
8-Bonanza Mine
9-Zealand beryl occurrence
10-Mavis Lake lithium occurrence

The deposit outcrops on the side of a gully north of Highway 17.

Road log from Highway 17 at **km 345.5**:

km	0	Junction of highways 17 and 601 (eastern junction); proceed north along Highway 601.
	3.4	Junction; turn right onto Zealand Road.
	4.2	Power line crosses road. A trail leads straight ahead. Follow this trail beyond the power line and along the base of a ridge (south side) to a gully. The beryl occurrence is on the side of the gully just beyond an outcrop. The distance from the power line crossing (of the road) is about 600 m.

Refs.: 292 p. 25-26, 39-40, 55; 343 p. 110-111.

Maps (T): 52 F/15 Dryden
(G): 50e Dryden-Wabigoon Area, District of Kenora, Ontario (O.G.S., 1:63 360)

km **352.0** Dryden, at the turn-off to the business section.

Bonanza Mine

NATIVE GOLD, SPHALERITE, PYRITE, GALENA

In quartz veins in volcanic rocks

Native gold occurred with sphalerite, pyrite and galena in white quartz.

The mine was worked from 1918 to 1923 by Contact Bay Mines, Limited which produced 7651 g of gold and 2582 g of silver, valued at $5379. Ore was obtained from a shaft, 101.6 m deep, and was treated at the nearby Redeemer Mine. The mine is located west of Wabigoon Lake.

Road log from Highway 17 at **km 352.0** (see page 173):

km	0	Junction of Highway 17 and the turn-off to the Dryden business section; proceed to Dryden.
	0.5	Turn right onto Earl Avenue.
	0.6	Turn right onto Duke Street.
	1.6	Junction; turn left after passing the paper plant.
	6.7	Junction; turn left (south) onto Highway 502.
	10.5	Junction; turn left.
	13.3	Junction; turn right onto a single-lane road.
	15.7	Junction; continue straight ahead 15 m to the Bonanza Mine. The road on left leads to the Redeemer Mine.

Refs.: 48 p. 39-41; 123 p. 156-157; 292 p. 49-50.

Maps (T): 52 F/10 Wabigoon
(G): 50e Dryden-Wabigoon Area, District of Kenora, Ontario (O.G.S., 1:63 360)

Redeemer Mine

NATIVE GOLD, PYRITE, GALENA, SPHALERITE

In a quartz vein in volcanic rocks

Native gold occurred with abundant pyrite and minor sphalerite and galena in quartz.

The deposit was discovered about 1900 and was originally known as the Herman and Lawson Mine. Redeemer Gold Mining and Milling Company worked the deposit betwen 1900 and 1905. Mining was from a shaft sunk to a depth of 71.7 m. A 10-stamp mill operated on the site and treated ore from both the nearby Bonanza Mine and the Redeemer Mine. There was additional production in 1918 by Contact Bay Mines, Limited. The mine produced a total of 3359 g of gold valued at $1920.

The mine is southeast of the Bonanza Mine. To reach it, follow the road log for the Bonanza Mine to km 15.7. At this junction follow the road on left leading east for 700 m to the Redeemer Mine.

Refs.: 48 p. 39-41; 123 p. 157; 292 p. 48-49.

Maps (T): 52 F/10 Wabigoon
(G): 50e Dryden-Wabigoon Area, District of Kenora, Ontario (O.G.S., 1:63 360)

Laurentian Mine

NATIVE GOLD

In a quartz vein in shear zone in metavolcanics

The mine was opened in 1903 on a small vein of dark quartz containing showy native gold specimens. During mining operations, a narrow vein of quartz rich in native gold was encountered on the first level at 24 m; in places the vein consisted of more gold than quartz.

The mine was originally worked by Laurentian Mining Company Limited from 1903 to 1905. During that time, a camp consisting of several buildings was established, and a 20-stamp mill was moved to the site from the Twentieth Century Mine which was located near the south western end of Upper Manitou Lake. Production began in 1906 and continued until 1909. The operator of the mine and mill was Anthony Blum Gold Mines Limited. Underground development consisted of a shaft and winze sunk to a depth of 146 m. The mine produced 253 272 g of gold valued at $141 140.

The mine is located at the head of Trafalgar Bay, Upper Manitou Lake, near Gold Rock settlement. The directions to reach this mine are given in the road log to the Big Master Mine on page 177.

Refs.: 28 p. 82-83; 48 p. 35-37; 97 p. 47, 50-52; 123 p. 164.

Maps (T): 52 F/7 Upper Manitou Lake
(G): 2437 Boyer Lake, Kenora District (O.G.S., 1:31 680)

Jubilee (Elora) Mine

NATIVE GOLD, TOURMALINE, PYRITE

In a quartz vein in a shear zone in metavolcanics

Small but spectacular pockets of native gold were found in quartz during mining operations. Gold occurred in white quartz veins which contained pyrite and tourmaline. Pyrite was also found in sericite schist.

This was one of the first gold deposits to be opened in the northern part of Upper Manitou Lake where prospecting for gold began about 1894. The Jubilee vein was originally explored by stripping in 1896 by the owners, Crawford, Kempfer and Doyle. In 1897-1898, Jubilee Gold Mining and Development Company of Ontario Limited sank a shaft to a depth of 22.9 m. Further operations were discontinued because the ore was found to be uneconomic. The mine was worked again between 1935 and 1938 by Elora Gold Mines Limited which sank a new shaft to a depth of 53.3 m and mined some ore from an open cut. During this period, the mine produced 42 611 g of gold and 9206 g of silver valued at $49 017.

The mine is near the north end of Trafalgar Bay, Upper Manitou Lake. The original shaft, the Helena shaft, is 380 m southeast of the Laurentian Mine and the Elora shaft is located on the road to the Big Master Mine. See page 177 for the road log to the Big Master Mine.

Refs.: 28 p. 83-84; 36 p. 76; 48 p. 35-37; 84 p. 64-67; 86 p. 85-86; 87 p. 122; 123 p. 162-163.

Maps (T): 52 F/7 Upper Manitou Lake
(G): 2437 Boyer Lake, Kenora District (O.G.S., 1:31 680)

Big Master Mine

NATIVE GOLD, PYRITE, SIDERITE

In quartz veins in shear zones in metavolcanics and felsite

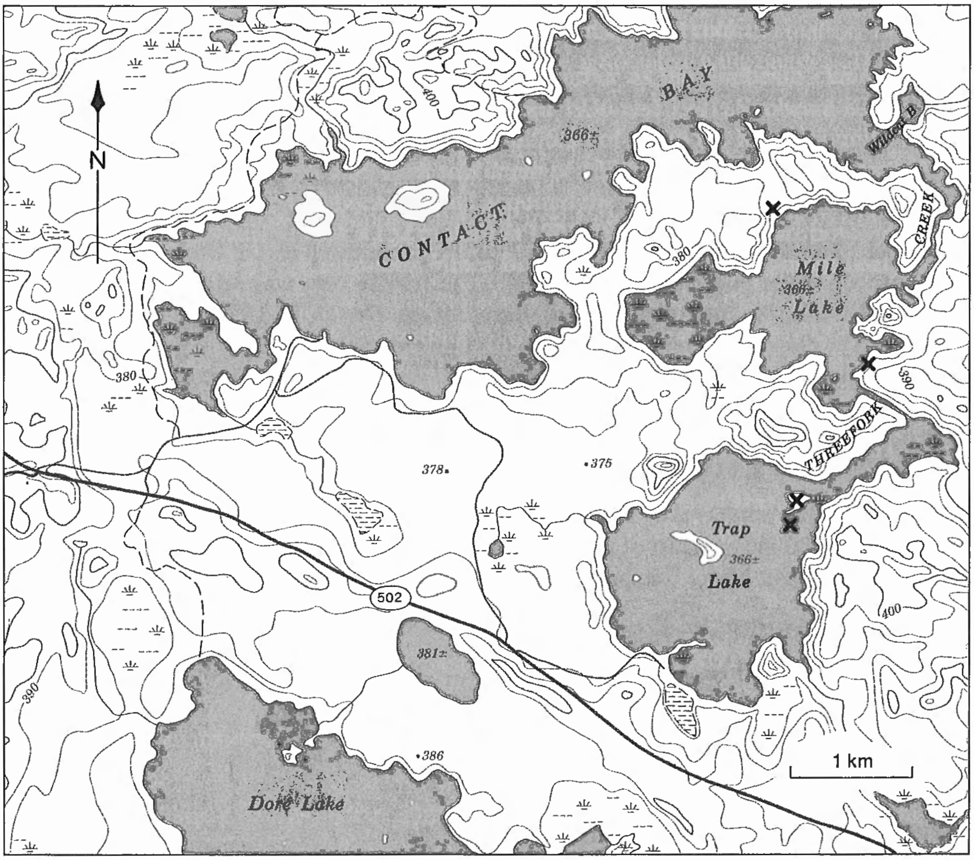
Native gold occurred in quartz as free (visible) gold and in pyrite. Siderite was associated with pyrite in one of the veins.

The deposit consisted of several parallel veins. It was worked from 1900 to 1904 by Interstate Consolidated Mining Company which sank three shafts to depths of 56.4 m, 30.2 m and 15.8 m and operated a 10-stamp mill. From 1905 to 1906, Big Master Mining Company operated the mine and deepened the No. 1 shaft to 86.9 m. Since that time, the mine has been investigated at various times and was brought into production again between 1940 and 1943 by Kenwest Mines Limited. The mine produced about 79 780 g of gold and 5723 g of silver, valued at $75 115.

The mine is east of Trafalgar Bay, Upper Manitou Lake, about 1.2 km southeast of the settlement of Gold Rock.

Road log from Highway 17 at Dryden (**km 352.0**):

km	0	Proceed onto turnoff to the Dryden business section and proceed to Highway 594 via Earl Avenue and Duke Street. Continue along Highway 594.
	6.7	Junction; turn left onto Highway 502.
	25.8	Junction; road on left leads to Trap Lake. Continue straight ahead.



Map 34. Trap Lake, Mile Lake occurrences.

45.6	Junction of the road to Butler Lake; continue along Highway 502.
64.0	Junction; turn right onto the road to Gold Rock.
68.3	*Laurentian Mine* on left. Continue straight ahead to reach *Jubilee* and *Big Master mines*.
68.7	Junction; turn left.
69.2	Junction. Follow the road on right for a distance of 150 m to the *Jubilee Mine* (Elora shaft). To reach the *Big Master Mine*, follow the road on left for a distance of 800 m.

Refs.: 28 p. 86-87; 48 p. 35-37; 63 p. 98; 123 p. 160-161.

Maps (T): 52 F/7 Upper Manitou Lake
(G): 2437 Boyer Lake, Kenora District (O.G.S., 1:31 680)

km **355.0** Junction of Highway 17 and Highway 119.

Trap Lake, Mile Lake Occurrences

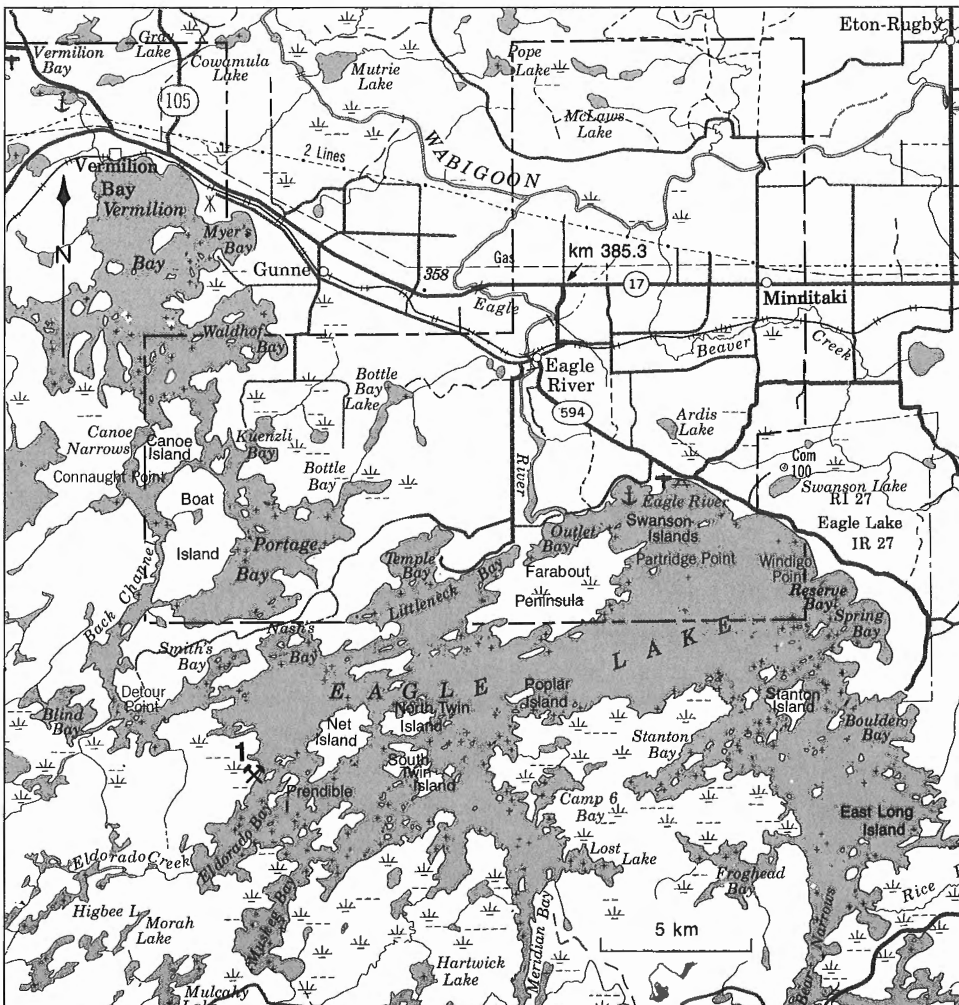
SOAPSTONE

In altered gabbro

Soapstone, ranging in colour from greyish green to dark grey, occurs in several places in the Trap Lake – Mile Lake area. The soapstone is compact massive and is suitable for use as a carving stone.

At Mile Lake, soapstone outcrops along the northwestern and southeastern shores of the lake. Test pits, now caved and overgrown, were put down in the deposits in 1924 by Wabigoon Soapstone Company.

Part of 52 F



Map 35. Eagle Lake quarry.

1-Eagle Lake quarry.

The Trap Lake deposit comprises the islands in the outlet at the northeastern end of the lake. The large island and the smaller islands immediately to the south of it are composed almost entirely of soapstone. The discovery of soapstone on these islands was made in 1923 by E.G. Pidgeon. In the same year, Thermo-Stone Quarries Limited explored the deposits by shallow pits and strippings. Some soapstone blocks were removed for testing.

Mile and Trap lakes are southeast of Contact Bay, Wabigoon Lake. Trap Lake is on the north side of Highway 502, at a point 19 km from its junction with Highway 594. Mile Lake is immediately north of Trap Lake.

Access is by boat.

Refs.: 292 p. 54-55; 305 p. 64-66; 317 p. 99-100, 103-104.

Maps (T): 52 F/10 Wabigoon
(G): 50e Dryden-Wabigoon Area, District of Kenora, Ontario (O.G.S., 1:63 360)

km **385.3** Junction of Highway 594 to Eagle River.

Eagle Lake Quarry

SOAPSTONE

In metavolcanics

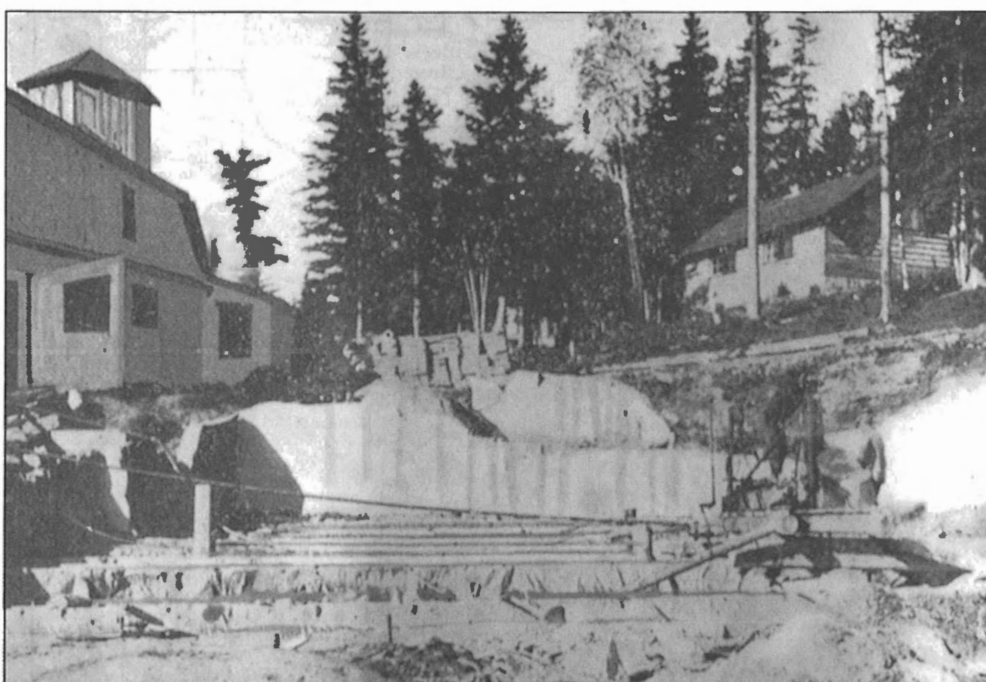


Plate 60

Eagle Lake quarry, 1926. (GSC 204031-L)

The soapstone is light greyish green to light green in colour. It is composed of talc, chlorite and dolomite.

The deposit was worked by Grace Mining Company Limited between 1923 and 1927. Blocks of soapstone were quarried and transferred by a derrick onto flat-cars which ran to a sawing shed where the blocks were sawn into 30-cm-square blocks and bricks measuring 30 cm and 46 cm long. They were used as furnace stone at the pulp mills in Dryden and Fort Frances.

The quarry is on the southwest shore of Eagle Lake. Access is by boat from Eagle River, a distance of about 34 km.

Refs.: 228 p. 25; 305 p. 66; 317 p. 93-94.

Maps (T): 52F/11 Osborne Lake
(G): 2443 Kenora-Fort Frances, Kenora-Rainy River Districts (O.G.S., 1:253 440)

km 394.0 Junction of Highway 105.

Ear Falls-Red Lake Occurrences

Descriptions of occurrences along Highway 105 follow. The main road log along Highway 17 West is resumed on page 189.

Griffith Mine

MAGNETITE, HEMATITE, GOETHITE, EPIDOTE, ACTINOLITE, GARNET, STAUROLITE

In iron formation associated with greywacke

Magnetite occurs as fine grains disseminated in quartz. The ore consists of magnetite-quartz bands in metasediments. Hematite is present in minor amounts in quartz-rich layers giving them a reddish colour. Goethite occurs as a coating on weathered ore specimens. Crystals of epidote measuring up to 3 cm long occur with actinolite, chlorite, K-feldspar and quartz in veins in the iron formation. Garnet and staurolite have been reported from the deposit.

The property consists of two deposits, the North and the South deposits, 2.5 km apart. It was staked in 1953 by L. Dempster, J. Dempster and A.C. Mosher. In the following year, Iron Bay Mines Limited was organized to explore the deposit. Stelco Inc. began preparations for open-pit mining in 1966. A pelletizing plant was constructed and the first shipment of pellets was made in 1968. Mining was conducted originally in the North Deposit and beginning in 1974, from open-pits in both deposits. Operations came to a close in 1986.

The mine is located on the west shore of Bruce Lake, north of Ear Falls. Part of the lake was drained to make way for open-pit operations.

Road log from Highway 17 at **km 394.0** (see page 180):

km 0 Junction of highways 17 and 105; proceed north along Highway 105.

9.1 Bridge over Wabigoon River.

15.4 *Road-cuts* expose granite with fracture-fillings of epidiote. These road-cuts are intermittent for the next 41 km.

100.7 Junction of Highway 804.

103.9 Junction of Highway 657 (Goldpines Road).

125.3 Junction of the road to Pakwash Provincial Park.

131.0 Junction of the road to Griffith Mine; turn right.

133.3 Mine office. The north pit is northeast of the office. The South pit is southeast of it.

Refs.: 298 p. 219-220; 300 p. 18-24; 382 p. 202.

Maps (T): 52 K/14Pakwash
(G): 2195 Bruce Lake Area, Kenora District (O.G.S., 1:31680)

Campbell Mine

NATIVE GOLD, PYRRHOTITE, PYRITE, ARSENOPYRITE,SPHALERITE, GALENA, CHALCOPYRITE, MAGNETITE, STIBNITE

In altered volcanic rocks

Native gold occurs with the sulphide minerals in quartz-carbonate gangue. Pyrrhotite, pyrite and arsenopyrite are the most common metallic minerals; sphalerite, galena, chalcopyrite, stibnite and magnetite occur in minor amounts.

The deposit was staked in 1944 by G.W. Campbell and C.A. Campbell who discovered a showing of native gold while trenching the property. In 1945, Campbell Red Lake Mines, Limited located economic orebodies about 460 m south of the original discovery. Development of the deposit began with shaft sinking in 1946, and production followed in 1949. It has been continuous since that time resulting in the production of 185 807 891 g of gold to the end of 1984. This is the largest production of any mine in the Red Lake gold field.

The mine is operated from a shaft sunk to a depth of 1316 m with 27 levels. Tours to the surface operations are arranged for visitors once a week. Further information may be obtained by contacting the company.

The road log to the mine is given in the description of the Dickenson Mine which follows.

Refs.: 80 p. 35-39; 123 p. 194; 381 p. 79-80.

Maps (T): 52 N/4 Red Lake
(G): 1951-3 Township of Balmer, District of Kenora (Patricia Portion), Ontario (O.G.S., 1: 12 000)

Dickenson Mine

NATIVE GOLD, PYRRHOTITE, PYRITE, ARSENOPYRITE, SPHALERITE, GALENA, CHALCOPYRITE, MAGNETITE, STIBNITE

In basalt

The minerals comprising the ore zone are similar to those of the Campbell Red Lake deposit. Stibnite is associated with gold.

The deposit was originally staked before World War II and explored by prospector C.J.A. Cunningham-Dunlop. It was restaked by Gordon Shearne in 1944 when there was renewed interest in the area following the discovery of visible gold at the Campbell Mine. Dickenson Red Lake Mines Limited (later became Dickenson Mines, Limited) began development in 1945, and the mine became the first producer in Balmer Township in 1948. The mine is developed to a depth of 1475.6 m. Production to the end of 1984 amounted to 67 918 688 g of gold and 183 308 g of silver. The mine is immediately east of the Campbell Mine.

Road log to Campbell and Dickenson mines from Highway 17 at **km 394.0** (see page 180):

km	0	From the junction of highways 17 and 105, proceed north along Highway 105.
	131.0	Junction of the road to *Griffith Mine*.
	173.1	Junction of Highway 125. A road-side plaque commemorates the discovery of gold in the Red Lake District. Proceed onto Highway 125.
	180.6	Junction; turn right onto the road to Balmertown.
	181.0	Junction; turn right onto McNeeley Road.
	181.8	*Campbell Mine* on left.
	182.4	*Dickenson Mine* on left.

Refs.: 80 p. 50-53; 123 p. 194-195; 374 p. 106; 378 p. 95-96; 381 p. 136.

Maps (T): 52 N/4 Red Lake
(G): Township of Balmer, District of Kenora (Patricia Portion), Ontario (O.G.S., 1:12 000)

Cochenour Willans Mine

NATIVE GOLD, ARSENOPYRITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, RUTILE, BOULANGERITE, TETRAHEDRITE, COBALTITE, PENTLANDITE, LEUCOXENE

In a silicified and carbonatized fault zone in lava

Native gold occurs as small grains associated with arsenopyrite. The most abundant metallic minerals are arsenopyrite (as small crystals) and pyrite. Pyrrhotite and chalcopyrite occur as small crystals. The ore contains minor amounts of rutile, boulangerite, tetrahedrite, cobaltite and pentlandite. Leucoxene occurs as an alteration product of rutile. The metallic minerals occur in a gangue of quartz, dolomite, calcite, muscovite and clay minerals.

The deposit was staked in 1926-1927 by W.M. Cochenour, Dan Willans and Horace G. Young. Initial exploration was done by the Cochenour Willans Syndicate. Cochenour Gold Mines Limited undertook development of the deposit in 1936 and produced the first gold ore in 1939. The mine is developed by two shafts sunk to depths of 844.2 m and 136 m; the shafts are 580 m apart. In 1960, the underground workings from the 396-m level were extended to the adjoining Wilmar deposit, and to the Annco deposit from the 625-m level. Production from the three deposits continued until 1971. Total production from these deposits was valued at $45 358 267.

The mine is on the east side of Bruce Channel, Red Lake. The town of Cochenour is south of the mine.

Road log from the junction of highways 105 and 125:

km	0	Proceed onto Highway 125.
	7.5	Junction; turn right onto the road to Balmertown.
	7.9	Junction; turn right onto McNeeley Road, continuing beyond the Campbell and Dickenson mines.
	13.6	Junction; turn right onto Lakeview Avenue.
	13.9	Cochenour Willans Mine.
	14.0	End of the road at the shore of Red Lake. The *McKenzie Mine* is on McKenzie Island, opposite this point.

Refs.: 121 p. 56; 123 p. 206-207; 371 p. 80-81.

Maps (T): 52 N/4 Red Lake
(G): 2074 Dome Township, Kenora District (O.G.S., 1:12 000)

McKenzie Mine

NATIVE GOLD, PYRITE, SPHALERITE, GALENA, CHALCOPYRITE, PYRRHOTITE, ARSENOPYRITE, KRENNERITE, PETZITE, ALTAITE, JAMESONITE, SCHEELITE, TOURMALINE

In quartz veins and lenses in shear zones in diorite

Native gold occurs as specks in quartz and as fine particles associated with pyrite, sphalerite, galena and arsenopyrite. Pyrite and sphalerite are the most abundant metallic minerals. Krennerite, petzite and altaite are associated with galena. Jamesonite, chalcopyrite and pyrrhotite also occur in the ore. These minerals occur in a gangue consisting of quartz with

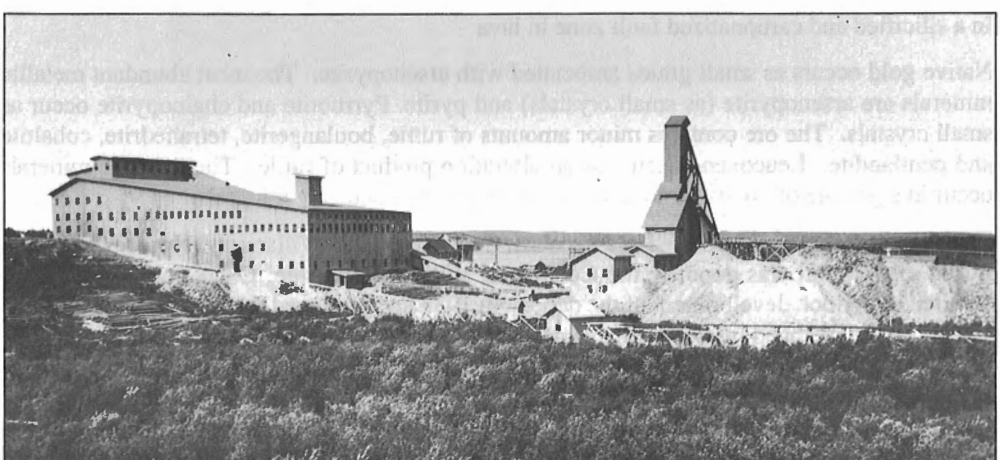


Plate 61

Howey Mine, 1931. (National Archives Canada PA-15627) ankerite, calcite, scheelite and tourmaline. There are three zones of mineralization, known as the north mine zone, the south mine zone and the west mine zone.

The property was staked in 1925 for McNeely Red Lake Holdings Limited. The surface exposure of the Main Shear zone was discovered in 1928 by M.L. Bouzan, a prospector for the company; it outcropped as a quartz vein carrying native gold. The underground extension of the surface showing was developed as the south mine zone. The north and west mine zones were found during underground development from the south main zone. In 1933, McKenzie Red Lake Gold Mines Limited began development of the deposit. Underground development by shafts and sub-shafts extended to a depth of 756.4 m. The mine was in production from 1935 to 1966 resulting in a production of 20 264 973 g of gold, 5 641 649 g of silver, valued at $3 066 449. Some tungsten was produced in the 1940s. The mine is located on the northwest side of McKenzie Island, Red Lake, opposite the Cochenour-Willans Mine.

Refs.: 121 p. 74-79; 123 p. 211-212.

Maps (T): 52 N/4 Red Lake
(G): Dome Township, Kenora District (O.G.S., 1:12 000)

Howey Mine

NATIVE GOLD, PYRITE, SPHALERITE, GALENA, CHALCOPYRITE

In quartz stringers and veins in fractured quartz latite

The mineralization in this deposit is similar to the Hasaga deposit which adjoins it to the west. (See following description.)

The deposit was staked in 1925 by Lorne Howey while prospecting the area. In the following year Howey Gold Mines Limited (later renamed Howey Consolidated Mines, Limited) was formed to bring the property into production. The mine was developed to a depth of 614.5 m. Production began in April 1930, making this the first gold mine to produce in the Red Lake gold camp. Mining continued until November 1941 when a shaft pillar began to cave. A few days after the closure, the pillar caved and several shocks were felt in the neighbourhood. During the final 11 years of operation, the mine was known as one of the first successful low grade gold operations in Canada. The mine produced 13 104 440 g of gold and 4 486 701 g of silver, valued at $13 246 506. Additional gold and silver valued at $9591 was recovered in clean-up operations from 1942 to 1957.

The mine is located on the road to the Hasaga Mine; the directions to reach it are given in the road log to the Hasaga Mine which follows.

Refs.: 121 p. 69-70; 122 p. 47-50; 123 p. 224-225; 173 p. 138-146.

Maps (T): 52 N/4 Red Lake
(G): 2125 Heyson Township, northern part, Kenora District (O.G.S., 1:12 000)

Hasaga Mine

NATIVE GOLD, PYRITE, SPHALERITE, GALENA, CHALCOPYRITE, SERPENTINE

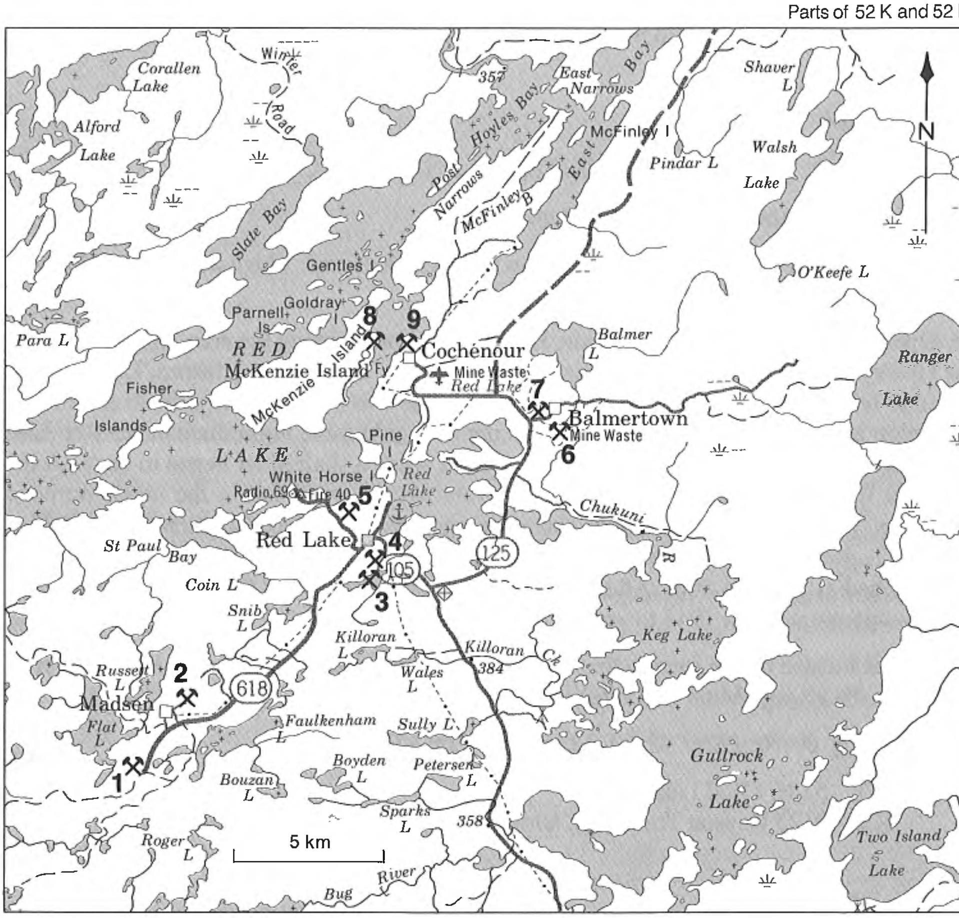
In quartz veins and stringers in fractured quartz latite

Native gold occurred as fine particles in quartz. Pyrite and sphalerite were the most abundant metallic minerals; galena and chalcopyrite occurred in minor amounts. Specimens found on the dumps include pyrite cubes, averaging 5 mm along an edge, associated with tiny black tourmaline prisms, galena and brown sphalerite in quartz. Some greenish grey serpentine occurs in the altered rock.

Gold was discovered on this property in 1927 by Ray Howey who was working for McIntyre Porcupine Mines Limited which staked the claim. In 1938 Hasaga Mines Limited was formed to develop the deposit. Three shafts were sunk: No. 1 to 327.9 m, No. 2 (762 m southwest of No. 1) to 71 m, and No. 3 (76 m northwest of No. 1) to 747.2 m. Ore was processed at the Red Lake Gold Shore mill on the adjoining property to the north. The mill and property were purchased by Hasaga Mines Limited in 1938 when operations at the Red Lake Gold Shore Mine closed. The Hasaga Mine was in production from 1938 until 1952 producing a total of 6 821 510 g of gold and 2 887 074 g of silver, valued at $8 246 398.

Road log from Highway 17 at **km 394.0** (see page 180):

Parts of 52 K and 52 N



Map 36. Red Lake area.

1-Starratt-Olsen Mine
2-Madsen Mine
3-Hasaga Mine
4-Howey Mine
5-Red Lake Gold Shore Mine
6-Dickson Mine
7-Campbell Mine
8-McKenzie Mine
9-Cochenour-Willans Mine

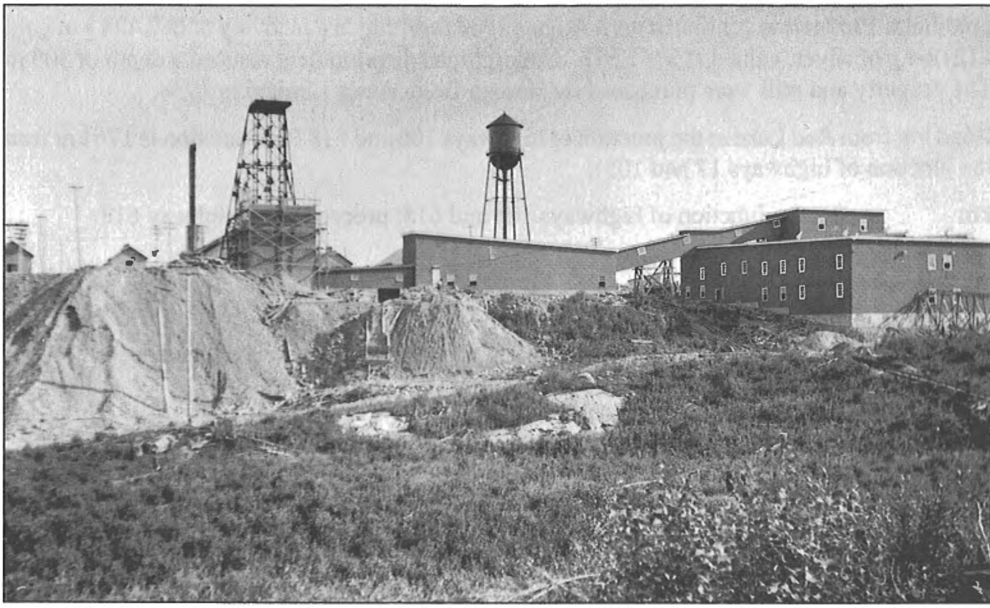


Plate 62

Red Lake Gold Shore Mine, 1936. (National Archives Canada PA-14852)

km	0	Junction of highways 17 and 105; proceed onto Highway 105.
	173.1	Junction of Highway 125; continue along Highway 105.
	175.2	Junction; turn left.
	175.35	*Howey Mine* on right, about 150 m north of the road.
	175.7	*Hasaga Mine.*

Refs.: 122 p. 33, 39-42; 123 p. 223-224.

Maps (T): 52 N/4 Red Lake
(G): 2125 Heyson Township, Northern part, Kenora District (O.G.S., 1:12 000)

Red Lake Gold Shore Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, TETRAHEDRITE, ALTAITE, TOURMALINE

In shear zone in granite

The ore consists of native gold associated with tetrahedrite, altaite and pyrite. Chalcopyrite and sphalerite are minor constituents of the ore. Small crystals of pyrite and black tourmaline occur in quartz.

The property was staked in the snow during the winter of 1925-1926 by C.E. St. Paul, Colin Campbell and J.W. Campbell. Red Lake Gold Shore Mines, Limited was formed in 1927 to develop the deposit. In August, 1936 the mine became the third gold producer in the Red Lake gold field. Production continued until August 1938 resulting in a recovery of 662 494 g of gold, 112 064 g of silver, valued at $747 577. Underground development reached a depth of 305 m. The property and mill were purchased by Hasaga Gold Mines Limited in 1938.

Road log from Red Lake at the junction of highways 105 and 618 (this junction is 176 km from the junction of highways 17 and 105):

km	0	Junction of highways 105 and 618; proceed onto Highway 618.
	0.5	Junction; turn right.
	0.8	Junction; turn right.
	1.3	Junction; continue straight ahead continuing beyond a cemetary.
	1.5	Mine on right.

Refs.: 121 p. 65-68; 123 p. 213-214.

Maps (T): 52 N/4 Red Lake
(G): 2074 Dome Township, Kenora District (O.G.S., 1:12 000)

Madsen Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, ARSENOPYRITE, MAGNETITE, ILMENITE, TITANITE, CHALCOPYRITE, SPHALERITE, SCHEELITE, MOLYBDENITE, REALGAR, ORPIMENT

In sheared and silicified zones in tuff

Native gold occurred as minute particles in the nonmetallic minerals and as coatings on sulphide minerals. Visible gold was common in the more siliceous ore. Pyrite and pyrrhotite, the most common minerals in the orebody, were associated with minor arsenopyrite, magnetite, ilmenite, titanite, sphalerite, chalcopyrite and scheelite. Molybdenite, realgar and orpiment were rare. The gangue consisted mainly of quartz and sericite with some calcite, amphibole and garnet.

The deposit was originally staked in 1928 and 1933 but the claims were allowed to lapse. In 1934 Marius Madsen staked the property for the Falcon Gold Syndicate. His interest in the area's gold potential was prompted by a geological report prepared by E.L. Bruce of the Ontario Department of Mines. In 1935, Madsen Red Lake Gold Mines Limited was formed to develop these and adjoining claims. Production began in 1938 and continued until 1976. The mine consisted of two shafts, sunk to depths of 157 m and 1274 m. The total production from the mine was 65 746 641 g of gold and 12 390 595 g of silver, valued at $76 287 518.

The mine is located at Madsen.

Road log from Red Lake:

km	0	Junction of highways 105 and 618; proceed onto Highway 618.
	0.5	Junction of the road to Red Lake Gold Shore Mine; continue along Highway 618.
	9.9	Junction; turn right.
	10.3	Mine.

Refs.: 115 p. 128; 120 p. 23-28; 122 p. 33-36; 123 p. 187-188; 173 p. 15, 174-185; 373 p. 176.

Maps (T): 52 K/13 Madsen
(G): 2072 Baird Township, Eastern part, Kenora District (O.G.S., 1:12 000)

Starratt-Olsen Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, ARSENOPYRITE, SPHALERITE, CHALCOPYRITE, MAGNETITE, GARNET, EPIDOTE, ACTINOLITE

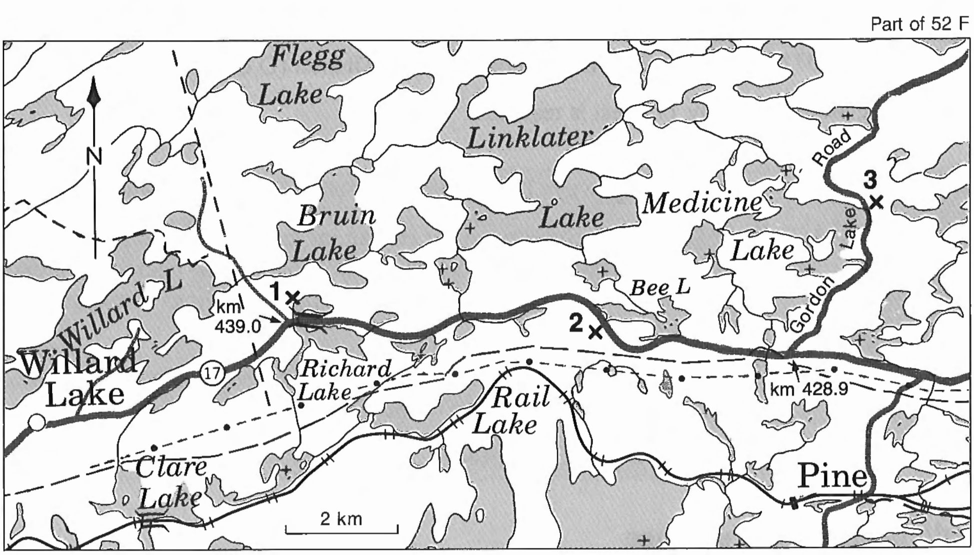
In lenses in tuff

Native gold occurred as fine particles in the gangue. Pyrite occurred as small grains and crystals with pyrrhotite and minor amounts of arsenopyrite, sphalerite, chalcopyrite and magnetite. The gangue consisted of quartz with chlorite, epidote and carbonate. Some of the tuff contains small garnet crystals. Minerals found on the dumps include small crystals of pyrite and epidote associated with actinolite and calcite. Serpentine occurs in altered volcanic rock.

The Starratt-Olsen property consists of the Starratt showing staked by R.W. Starratt and W. Cooks, the Olsen showing staked by David Olsen and the de Villiers showing staked by W. de Villiers. The claims were staked in 1934-1935. Development work was done by various companies until 1945 when Starratt-Olsen Gold Mines Limited was formed to take over the property. The mine was in production from 1948 to 1956. The total production was 5 100 581 g of gold and 853 218 g of silver, valued at $5 874 128. Mining operations were from a shaft sunk to a depth of 649.3 m.

The mine is located southwest of the Madsen Mine. To reach it, continue 2.3 km south along Highway 618 from the junction of the road to the Madsen Mine.

Refs.: <u>120</u> p. 35-39; <u>123</u> p. 190-191.



Map 37. Willard Lake area.

1-Richard Lake occurrence 2-Bee Lake occurrence 3-Medicine Lake occurrence

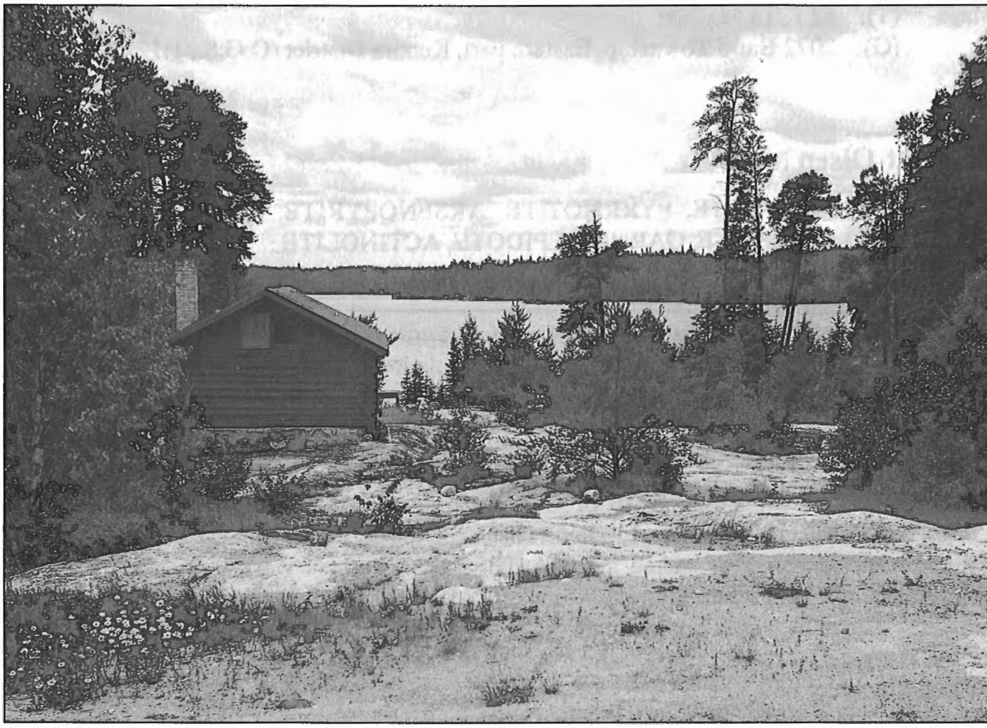


Plate 63

Medicine Lake occurrence. (GSC 13085)

Maps (T): 52 K/13 Madsen
(G): 2072 Baird township, Eastern part, Kenora District (O.G.S., 1:12 000)

The road-log along Highway 17 West is resumed.

km	**394.0**	Junction of highways 17 and 105; proceed west along Highway 17.
km	**397.4**	Road-cut exposes biotite granite containing black amphibole and grains of magnetite and titanite. Some of the titanite has altered to cream coloured anatase. Granite with epidote fracture fillings is exposed by road-cuts for the next 15 km.
km	**405.2**	Granite quarry. Pink biotite granite was quarried on the south side of Aaron Lake, about 90 m north of the Highway.
km	**428.9**	Junction of Gordon Lake Road.

Medicine Lake Occurrence

BERYL, TOURMALINE, GARNET, TANTALITE

In granite pegmatite

Yellow beryl crystals measuring up to 5 cm in diameter were found in a pegmatite consisting of colourless to smoky and black quartz, plagioclase feldspar and coarse books of light greenish to grey muscovite. The quartz is suitable for lapidary purposes. Some of the feldspar is the platy variety known as cleavelandite. Also occurring in the pegmatite are black tourmaline crystals measuring up to 15 cm long and garnet crystals up to 5 cm in diameter. Tantalite crystals, up to 2.5 cm long, were found in a pit located about 23 m northeast of the cabin and in pegmatite outcrops along the Gordon Lake Road. Some graphic granite is associated with the pegmatite.

The deposit was exposed in 1949 by trenches and strippings on the east shore of Medicine Lake. The work was done by E. Sobiski.

Road log from Highway 17 at **km 428.9** (see page 189):

km	0	Junction of Highway 17 and Gordon Lake Road; proceed north along Gordon Lake Road.
	4.2	The beryl-bearing pegmatite outcrops on both sides of the road. The strippings extend from the west side of the road to the shore of Medicine Lake.

Refs.: 235 p. 76; 260 p. 40-41; 343 p. 109-110.

Maps (T): 52 F/13 Feist Lake
(G): 2302 MacNicol and Tustin Townships, Kenora District (O.G.S., 1:31 680)

km	**431.3**	Bee Lake, on right.
km	**432.7**	*Bee Lake occurrence*, on left.

Bee Lake Occurrence

MOLYBDENITE

In biotite pegmatite

Molybdenite occurs sparingly in a pegmatite composed of pink microcline, quartz, coarse hornblende and biotite. The deposit was investigated for radioactive mineralization in the 1950s. The work consisted of diamond drilling and trenching on the south side of a small lake, just west of Bee Lake. The trenches extend over a distance of about 180 m. The first trench is about 80 m west of Highway 17 at **km 432.7**; the others are west of it.

Ref.: 260 p. 36.

Maps (T): 52 F/13 Feist Lake
(G): 2302 MacNicol and Tustin Townships, Kenora District (O.G.S., 1:31 680)

km	**434.4**	Junction of Linklater Road.
km	**439.0**	Junction of Richard Lake Road.

Richard Lake Occurrence

URANINITE, URANOTHORITE, ALLANITE, ZIRCON, BETA-URANOPHANE, URANOPHANE, KASOLITE, MAGNETITE, EPIDOTE

In a pegmatite dyke cutting metavolcanics

Uraninite, uranothorite, pink turbid zircon and allanite occur in pink granite pegmatite. Beta-uranophane, uranophane and kasolite occur as secondary minerals forming patchy coatings on the mineralized rock. Magnetite occurs as grains in the pegmatite. Epidote is associated with K-feldspar and actinolite in fractures in the altered volcanic rock.

The deposit was staked in 1954 by C.A. Campbell and F. McFarlane. Between 1954 and 1956 Campbell Island Mines and Exploration Limited explored it by trenches and two adits driven into the side of a hill near Richard Lake. There are small dumps near the openings.

Road log from Highway 17 at **km 439.0**:

km	0	Junction of Highway 17 and Richard Lake Road; proceed north along Richard Lake Road.
	0.08	Junction; turn right.
	0.25	Junction; follow the road on left.
	0.5	Junction; follow the road on left.
	0.57	Richard Lake uranium occurrence.

Refs.: 260 p. 45-46; 282 p. 85-86.

Maps (T): 52 F/13 Feist Lake
(G): 2302 MacNicol and Tustin Townships, Kenora District (O.G.S., 1:31 680)

km **441.6** Junction of Hawk Bay Road.

Hawk Bay Occurrence

URANINITE, EUXENITE, THORITE, URANOPHANE, BETA-URANOPHANE, MAGNETITE, MOLYBDENITE

In a pegmatite dyke cutting metavolcanics

The radioactive minerals, uraninite, euxenite and thorite are associated with masses and stringers of coarse magnetite in pegmatite composed of quartz, albite and minor microcline. The secondary minerals, uranophane and beta-uranophane occur as coatings on the rock. Molybdenite is a rare accessory mineral in the dyke.

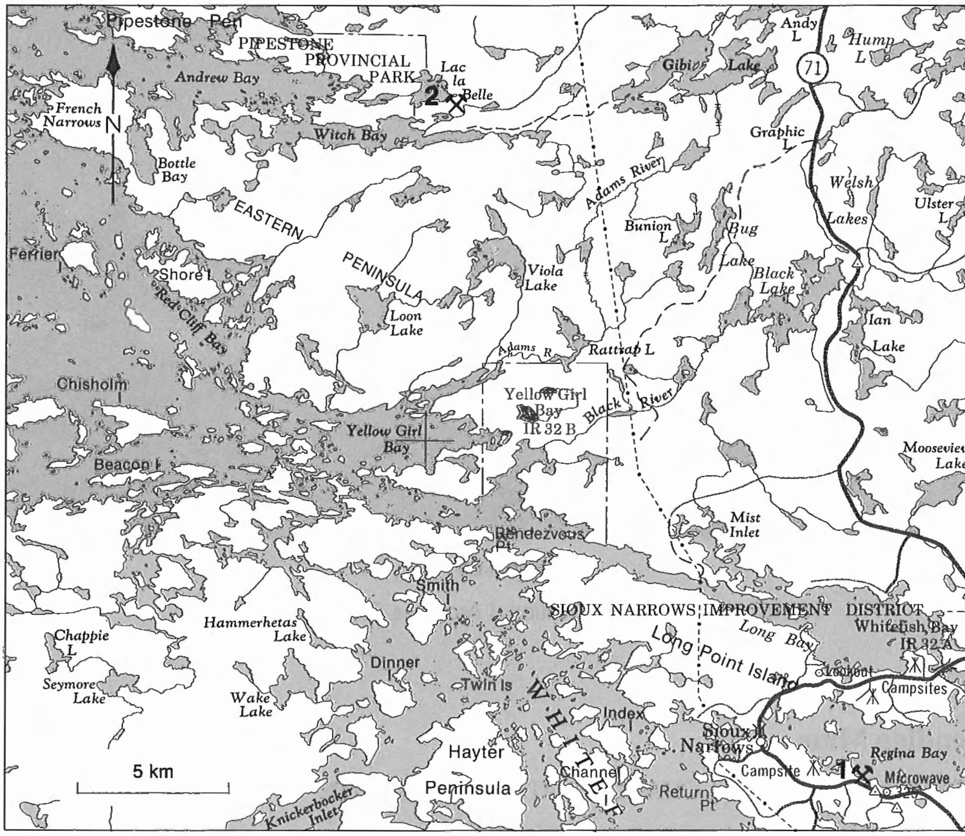
The deposit was staked in 1949 by H. Byberg of Kenora. It was explored by stripping, trenching and diamond drilling on the south side of Highway 17.

The occurrence is about 175 m south of the highway at a point 400 m west of the junction of Hawk Bay Road (see page 191).

Refs.: 260 p. 42-43; 282 p. 84-85.

Maps (T): 52 E/16 Kenora
(G); 2302 MacNicol and Tustin Townships, Kenora District (O.G.S., 1:31 680)

Part of 52 E



Map 38. Wendigo, Regina mines.

1-Regina Mine 2-Wendigo Mine

km	**446.6**	*Road-cut* exposes hornblende schist with fracture-fillings of epidote. Orange-red feldspar, bladed aggregates of dark green actinolite and tiny cubes of pyrite are associated with the epidote. This road-cut is just west of White Lily Lake.
km	**448.5**	*Road-cut* exposes granite with fracture fillings of epidote. Similar rock is exposed by road-cuts to about 6 km west of the junction of Highway 71, at **km 476.**
km	**470.0**	Junction of Highway 71.

Occurrences along Highway 71

Occurrences along Highway 71 are described in the following text. The road log along Highway 17 West is resumed on page 197.

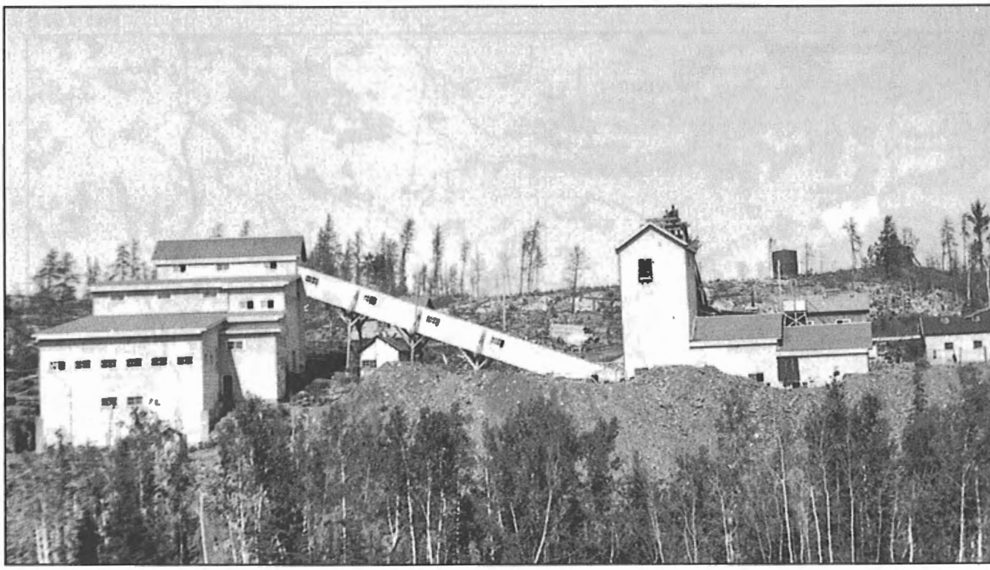


Plate 64

Wendigo Mine, 1936. (National Archives Canada PA-14917)

Wendigo Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, PYRRHOTITE

In quartz veins in a shear zone in basalt

Native gold occurred with pyrite, chalcopyrite and pyrrhotite in quartz. Large masses of solid sulphides were found in parts of the veins.

The deposit was discovered in 1899. Work began immediately by a syndicate, known as the Canadian Syndicate, and continued until 1902. Two shafts were sunk to depths of 32.9 m and 30.5 m. Ore was shipped to the Keewatin Reduction Plant. From 1933 until 1943, Wendigo Gold Mines Limited operated the mine. It extended the main shaft to 529 m and installed a mill which began operations in 1936. The mine produced a total of 2 097 057 g of gold and 459 142 g silver, valued at $2 510 076, and 854 469 kg of copper.

The mine is located north of Witch Bay, Lake of the Woods.

Road log from Highway 17 at **km 470.0** (see page 192):

km	0	Junction of highways 17 and 71; proceed south along Highway 71.
	0.5	*Road-cuts* expose granite containing fracture-fillings of epidote. The exposures are intermittent from this point to the turn-off to Caliper Lake Provincial Park.
	6.4	Turn-off to Rushing River Provincial Park.
	8.8	Junction of Trimberger Road.
	12.1	Junction; turn right onto Witch Bay Road.

	17.2	Junction; continue straight ahead.
	22.2	Junction at bend in the road; turn right.
	22.45	Mine.

Refs.: 48 p. 20; 123 p. 154-155.

Maps (T): 52 E/9 Longbow Lake
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Regina Mine

NATIVE GOLD, PYRITE, MOLYBDENITE

In quartz veins at the contact of granite and volcanics

Native gold occurred with pyrite and some molybdenite in glassy white quartz. Specks of gold were common, but little coarse gold was found. Pyrite was abundant, much of it occurring as cubic crystals.

Claims on this property were staked in 1894 by Paul Proulx, Jacob Henesy and John McLean. In the same year, the Regina Mining Company bought the property, built a mill and began mining. In 1895, the first brick was produced. The brick, along with fine specimens of ore from the mine, were taken by Lt. Gen. H.C. Wilkinson, president of the company, to London, England to show the shareholders. At that time, the Regina was about the only gold producer in Ontario. In its first year of operation, the mine produced 29 330 g of gold from 2528 t of ore, but there was a heavy loss of gold in the tailings. From 1896 to 1899, the mine was worked by Regina (Canada) Gold Mining Company, and from 1901 to 1905 by Black Eagle Gold Mining Company Limited.

Development consisted of four shallow shafts ranging from 5.5 m to 22 m deep, an adit driven 65.3 m, and the main shaft which was sunk to a depth of 167.7 m. The mine was re-activated by Horse Shoe Mines Limited in 1931-1934 and by Kenland Gold Mines Limited in 1937. Total production was about 242 977 g of gold and 45 410 g of silver, valued at $299 552.

The mine is located on the shore of Regina Bay, Lake of the Woods.

Road log from Highway 17 at **km 470.0** (see page 192):

km	0	Junction of highways 17 and 71; proceed south along Highway 71.
	12.1	Junction of Witch Bay Road.
	50.8	Turn-off to Sioux Narrows Provincial Park.
	56.3	Sioux Narrows.
	60.3	Regina Bay, on left.
	61.3	Junction of a single-lane road; turn left. (This junction is just north of the turn-off to the Microwave Tower, and 135.4 km north of the junction of highways 71 and 11 in Fort Frances, at Scott and Central streets).
	61.55	End of the road. A trail continues to the mine on the shore of Regina Bay, a distance of about 200 m.

Part of 52 E/9

Map 39. Pipestone Peninsula occurrence.

Refs.: 48 p. 10-13; 84 p. 68; 85 p. 173, 182-185; 86 p. 91-93; 123 p. 158-159; 303 p. 253-258.

Maps (T): 52 E/8 Sioux Narrows
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

Kakagi Lake Occurrences

SOAPSTONE

In gabbro and peridotite

Light to dark greyish green soapstone is exposed by road-cuts along Highway 71. The first occurrence is near Kakagi Lake where the soapstone occurs in gabbro. At the second occurrence, near Caliper Lake, it occurs in amphibolitized peridotite.

Road log from Highway 17:

km	0	Junction of highways 17 and 71; proceed south along Highway 71.
	61.3	Junction of the road to Regina Mine; continue along Highway 71.
		Road-cuts between this junction and Nestor Falls expose granite with epidote in fractures and on rock surfaces.
	87.1	*Soapstone road-cut* just south of the hydro line.
	106.8	Junction of the road to Caliper Lake Provincial Park.
	110.6	*Soapstone road-cut* on left.
	122.3	Junction of Highway 71 and Highway 11 (Scott at Central streets) in Fort Frances.

Ref.: 317 p. 91, 107-108.

Maps (T): 52 F/4 Kakagi Lake
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km	**470.0**	Junction of highways 17 and 71. The road log along Highway 17 West is resumed.
km	**476.2**	Longbow Lake.

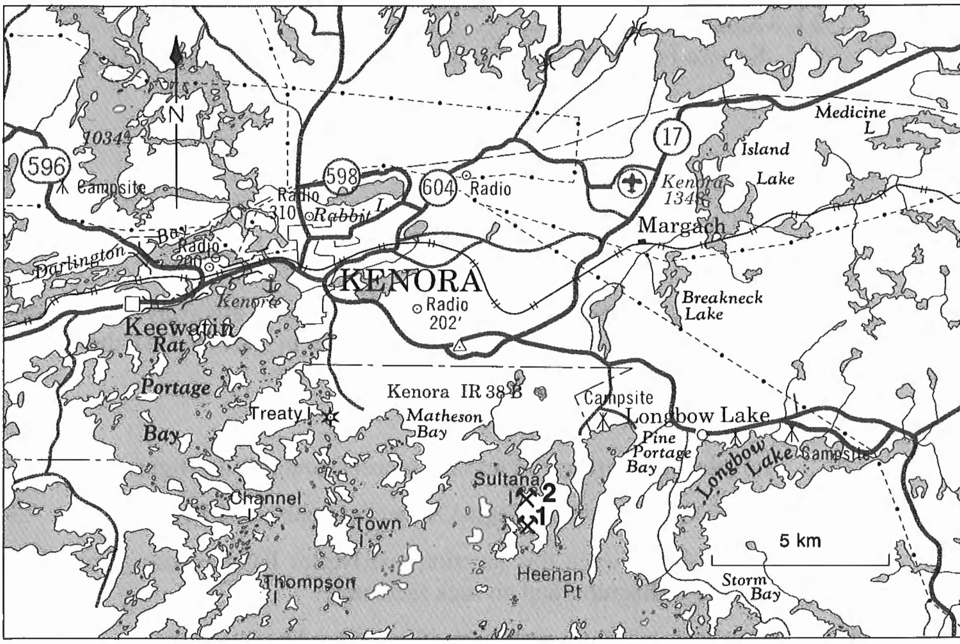
Pipestone Peninsula Occurrence

SOAPSTONE

In metavolcanics

Greyish green to green soapstone occurs in lenses in altered volcanic rock on the north shore of Pipestone Peninsula. It is composed of talc, chlorite and dolomite.

Part of 52 E



Map 40. Sultana Island mines.

1-Ophir Jack Mine 2-Sultana Mine

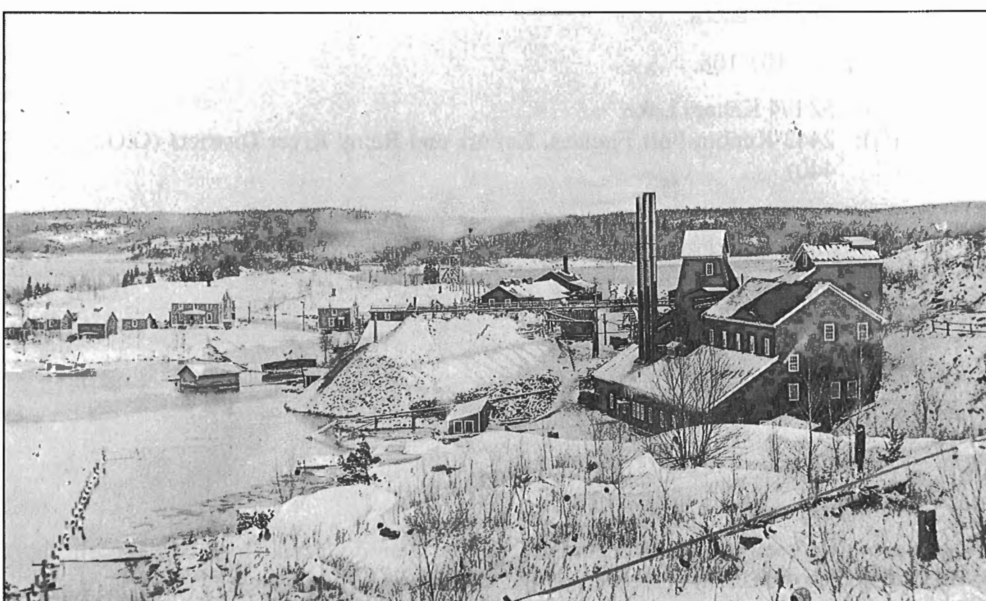


Plate 65

Sultana Mine, 1906. (Archives of Ontario OBM 15 1906)

The deposit was quarried in 1915 by Messrs. Mather and Beveridge and a few years later by the Dryden Pulp and Paper Company. It was mined for use as a furnace stone but was found to be unsatisfactory for this purpose. It has since found a use as a carving stone for hobbyists. The quarry was opened into a bluff on the shore of Moore Bay on the north shore of Pipestone Peninsula. The soapstone is also exposed by a small pit, 30 m south of the quarry.

Pipestone Peninsula is located southeast of Hay Island on the east side of Lake of the Woods. Access is by boat which may be launched from the north shore of Bigstone Bay. Several points on Bigstone Bay are connected by road to the town of Longbow Lake on Highway 17 at **km 476.2**.

Refs.: 305 p. 63-64; 317 p. 102-103.

Maps (T): 52 E/9 Longbow Lake
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River District (O.G.S., 1:253 440)

km **487.2** Junction of the road to Bald Indian Bay.

Sultana Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, PYRRHOTITE, GALENA, MOLYBDENITE

In quartz veins in quartz porphyry and mafic volcanics

Native gold occurred in the quartz veins as visible gold. Pyrite, including crystals, occurred with chalcopyrite, pyrrhotite, galena and molybdenite.

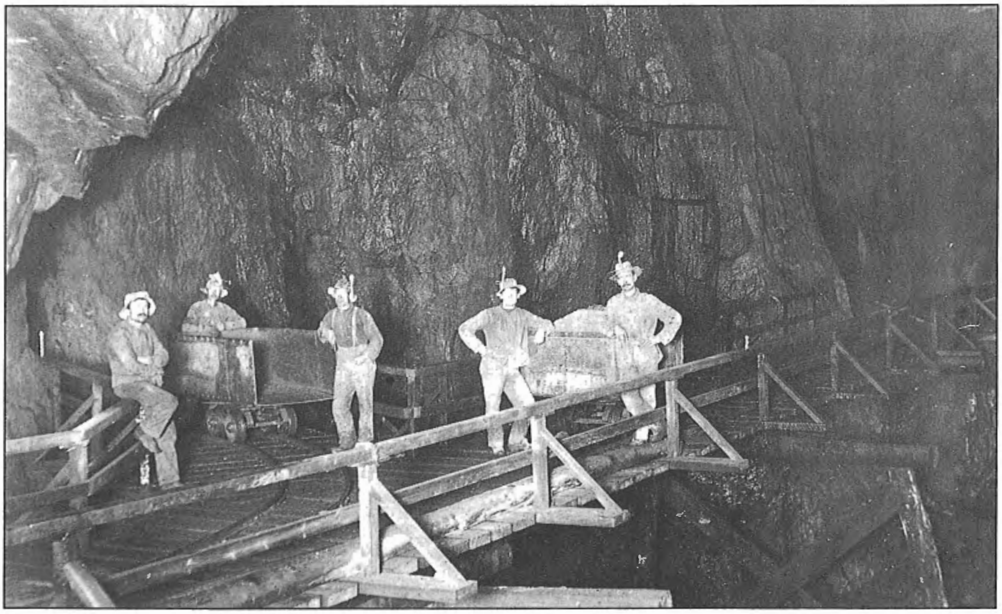


Plate 66

Sultana Mine, second level, 1906. (OBM 15 1906)

The Sultana Mine was regarded as the princess of Ontario gold mines. Toward the turn of the century it was the most prosperous gold producer in Ontario, and for a brief period, the only producer. The gold-bearing veins were discovered during the excitement resulting from the discovery of quartz veins rich in native gold at the Ophir Jack property to the south. The Sultana showing was staked in 1888 by H. Bulmer, J.H. Henesy, C.A. Moore and S.S. Scovil. The claims were acquired in 1890 by John F. Caldwell, of Winnipeg, who prospected the property and located three veins near the northwest shore of the island and in terraces rising from the shore. Caldwell developed the deposit, installed a mill and put it in operation in 1892. He continued mining operations until 1899 when Sultana Gold Mines Limited took over. The principal veins developed were the No. 3 vein, the Galena vein and the Crown Reef vein. Development consisted of the Main shaft sunk to 183 m, two shafts sunk to 43.6 m and 50 m, and several shallow shafts. The mining camp consisted of several buildings including sleeping, boarding and cook camps, mine officials' houses, horse and cow stables, a blacksmith shop and several mine buildings. In 1900, the Sultana was the only gold producer at Lake of the Woods. By 1902, mining was on a reduced scale and only the Crown Reef vein, at the western end of the deposit, was being mined. Operations came to a close in 1906. The mine produced about 496 933 g of gold and 124 g of silver, valued at $431 138.

The Sultana Mine is located on the west side of Sultana Island, on a bay immediately south of a peninsula extending in a northwesterly direction. The Ophir Jack Mine is on the north side of a bay on the west side of the island, near the southern tip. It is 1.4 km south of the Sultana. Exceedingly fine specimens of white quartz containing nuggets of gold were found when the Ophir Jack vein was opened in about 1890. A shaft, 15 m deep, was sunk in the vein. The mine was worked for brief periods from 1893 to 1911 producing gold valued at $22 677.

Sultana Island is located in Bald Indian Bay, Lake of the Woods. At one time it was connected to the mainland by swampy ground. It became an island in the late 1880s when a dam was built at the outlet of Tunnel Island, causing the lake to rise 1.2 m and flood the swamp.

Road log from Highway 17 at **km 487.2** (see page 197):

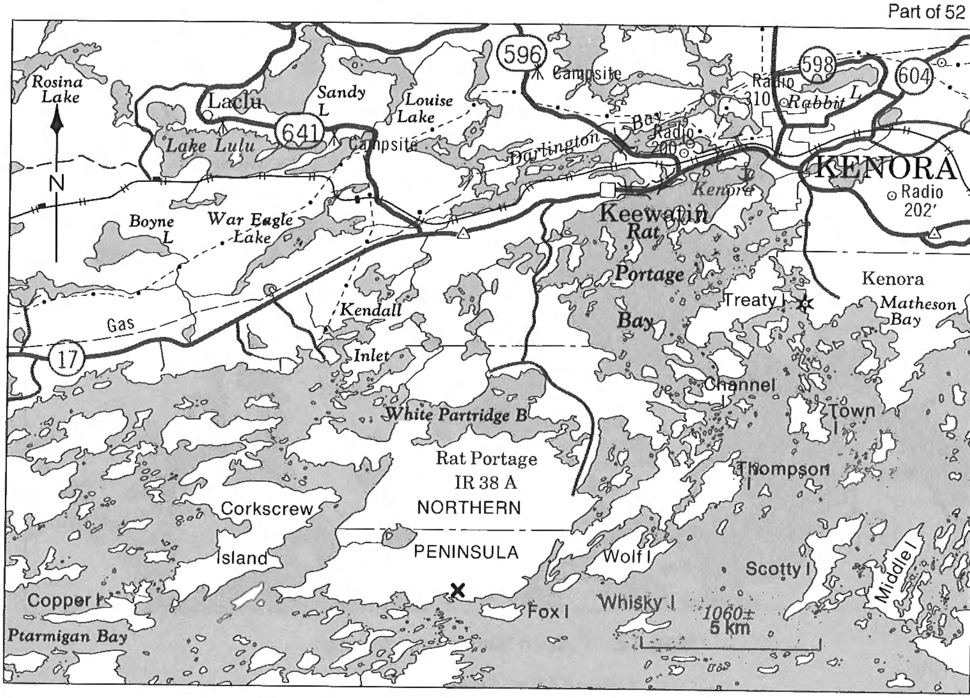
km	0	Junction of Highway 17 and the road to Bald Indian Bay; proceed south along this road.
	2.4	Junction; turn left.
	4.5	End of the road at the shore of Bald Indian Bay. Sultana Island is the large island southeast of this point. The Sultana Mine is 1.6 km southeast of the shore at the end of the Bald Indian Bay Road.

Refs.: 32 p. 14-19; 36 p. 45-49; 84 p. 68; 86 p. 93-96; 123 p. 181-182; 303 p. 249, 253-255.

Maps (T): 52 E/9 Longbow Lake
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km	**489.6**	Kenora, at the junction Highway 604.
km	**491.0**	Kenora, at the junction Highway 128.
km	**502.0**	Junction of Highway 641.
		Road-cuts between this junction and the Manitoba-Ontario border expose granite and volcanic rocks containing fracture fillings and surface coatings of epidote.

Part of 52 E



Map 41. Northern Peninsula occurrence.

Northern Peninsula Occurrence

CHROME-MICA ROCK

In sheared felsic metavolcanics

Bright green chrome-mica rock, also referred to as mariposite, was formerly quarried from this deposit for use as a decorative stone. The rock is composed mainly of chrome-mica, quartz, carbonates (dolomite and magnesite) and chlorite.

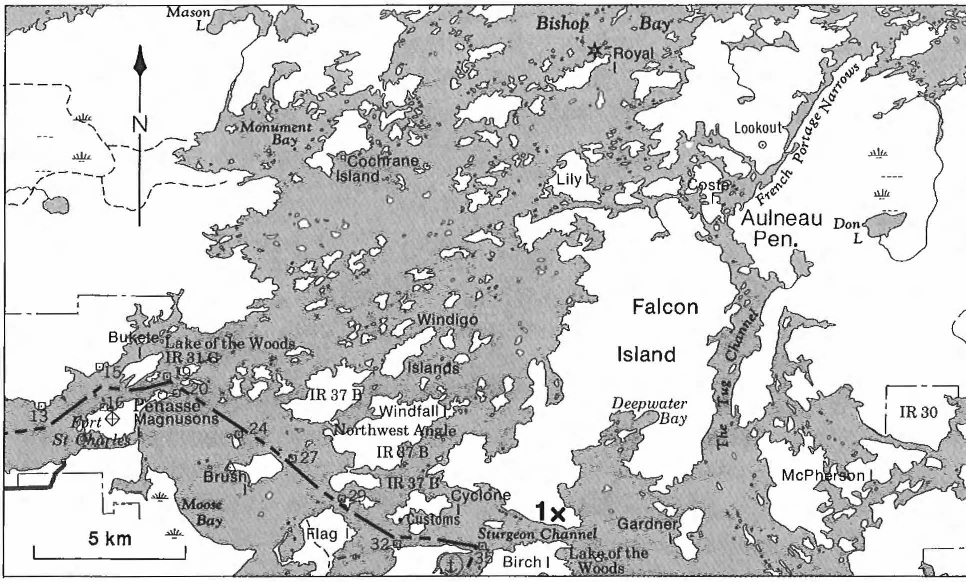
The deposit is exposed in pits and outcrops near the shore of Northern Peninsula, Lake of the Woods. It was investigated for gold at various times between the 1940s and 1980. It was worked for decorative stone by J.W. Campbell in 1972, and by I. McLandress in 1973-1976. The rock was used for local construction and one shipment was made to Texas.

The occurrence is near the south shore of Northern Peninsula, about 1 km west of Fox Island and 15 km southwest of Kenora. Access is by boat.

Ref.: 317 p. 71-72.

Maps (T): 52 E/10 Clearwater Bay
(G): 45b North Central part of the Lake of the Woods, District of Kenora, Ontario (O.G.S., 1:63 360)

Part of 52 E



Map 42. Falcon Island occurrence.

1-Beryl Mica Occurrence

Falcon Island Occurrence

BERYL, MICA, SOAPSTONE

In granite pegmatite

Beryl crystals measuring up to 20 cm in diameter were reported from the pegmatite dyke consisting of pink and white feldspar, quartz and mica. The dyke is 3 m wide, about 800 m long and trends northwesterly. Large crystals of muscovite occur along its contact with the schistose country rock. The mica is clear; it occurred in sheets measuring up to 45 cm across, and was suitable for electrical insulation.

The deposit was worked for mica in 1885 for use in coal stoves in Rat Portage (Kenora). It was obtained from two pits, one of which measured 12 m long, 7 m wide and 2.4 m deep. In 1927, Winnipeg Roofing Company extracted feldspar for use in its Winnipeg plant for the manufacture of stucco. Falcon Island Mining Company Limited was formed in 1943 to work the deposit, but there is no record of production.

The pegmatite is at the south end of Mica point, the southeastern tip of Falcon Island, Lake of the Woods. The volcanic country rock near the pegmatite intrusions has been metamorphosed to a talc-chlorite rock, or soapstone; these talcose zones are 3 to 12 m wide and are exposed at several places across Mica Point.

Falcon Island lies immediately west of Aulneau Peninsula, about 45 km south of Kenora. Access is by boat.

Refs.: 317 p. 106; 343 p. 100-101.

Maps (T): 52 E/7 Falcon Island
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 506.3 Junction of Kendall Inlet Road.

Kenricia Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, GALENA, TOURMALINE, ALTAITE

In quartz vein in felsic volcanics

Coarse native gold was formerly found in the vein and some was panned from its weathered surface. Pyrite, chalcopyrite, galena and black tourmaline occurred in the bluish quartz vein. Altaite was found as small grains in galena.

The deposit was originally worked in 1889-1890 as the Three Ladies Mine. It was discovered by Oliver Daunais who sank three shafts to depths of 17.4 m, 8.5 m and 9.1 m. No further work was done on the property until the 1930s. From 1936 to 1940, Kenricia Gold Mines Limited worked the deposit from a shaft sunk to a depth of 161.6 m. A mill operated on the site from 1939 to 1940 producing 78 784 g of gold and 16 205 g of silver, valued at $97 518.

The mine is located on Clearwater Bay, Lake of the Woods.

Road log from Highway 17 at **km 506.3**:

km	0	Junction of Highway 17 and Kendall Inlet Road; proceed south along Kendall Inlet Road.
	1.1	Junction; follow the road on left.
	1.9	Junction; turn right.
	2.5	Mine.

Refs.: 35 p. 48; 123 p. 182-183; 330 p. 31-36.

Maps (T): 52 E/10 Clearwater Bay
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 517.9 Junction of Rush Bay Road.

Golden Horn Mine

NATIVE GOLD, SPHALERITE, GALENA, PYRITE, CHALCOPYRITE

In a quartz vein in rhyolite

Native gold occurred in dark smoky quartz containing sphalerite, galena, chalcopyrite and pyrite.

The deposit was worked between 1901 and 1907 by Rush Bay Golden Horn Company Limited. It was developed by two shafts, sunk to depths of 77.8 m and 34.5 m. The mine produced 3515 g of gold valued at $1120.

The mine is located between Rush Bay and Echo Bay, Lake of the Woods.

Road log from Highway 17 at **km 517.9**:

km	0	Junction of Highway 17 and Rush Bay Road; proceed south along Rush Bay Road.
	4.1	*Rush Bay quarry* on left. The quarry produces flagstone. The rock is a light yellowish green felsic tuff with rusty staining due to hematite.
	5.9	Junction; proceed along the road on left.
	8.5	Junction; turn right to the shore of Rush Bay. Proceed by boat across Rush Bay to a point on the south shore opposite the tip of the peninsula extending southwest. The distance is about 2 km. A trail leads south about 245 m to the mine.

Refs.: 64 p. 251-252; 102 p. 45; 123 p. 145-146; 317 p. 67-68.

Maps (T): 52 E/10 Clearwater Bay
(G): 2069 Ewart-Forgie Area, Kenora District (O.G.S., 1:31 680)

Cornucopia (Cedar Island) Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, ARSENOPYRITE, SPHALERITE, GALENA, CHALCOPYRITE

In a quartz vein associated with aplite and pegmatite dykes in metabasalt

Native gold was associated with pyrite in sugary quartz. Specks of native gold also occurred in dolomite. Pyrite occurred as crystals and as granular masses. Pyrrhotite, arsenopyrite, sphalerite, galena and chalcopyrite were present in the vein.

The deposit was originally explored in 1896 by J.S. Whiting who had found some very rich ore in an outcropping vein on Cedar Island. The deposit became the Cornucopia Mine and was worked by Whiting to 1897, and from 1897 to 1898 by Cedar Island Gold Mining Company of Ontario Limited. Operations were from a shaft, 33.5 m deep. The mine was reactivated between 1929 and 1936 by Kenora Prospectors and Miners Limited. During this period, the Cornucopia shaft was deepened to 197 m and an inclined shaft was sunk 50.3 m. A mill was installed in 1935. Mining operations since 1896 resulted in the production of 153 680 g of gold and 120 804 g of silver, valued at $174 146.

The mine is on Cedar Island, at the southwest end of Bag Bay, Shoal Lake. It is west of the Mikado Mine. Directions to reach Bag Bay are given in the description of the Mikado Mine (page 206).

Refs.: 86 p. 107; 123 p. 146-147; 330 p. 51-53.

Maps (T): 52 E/10 Clearwater Bay
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 517.9 Junction of Rush Bay Road.

Mikado Mine

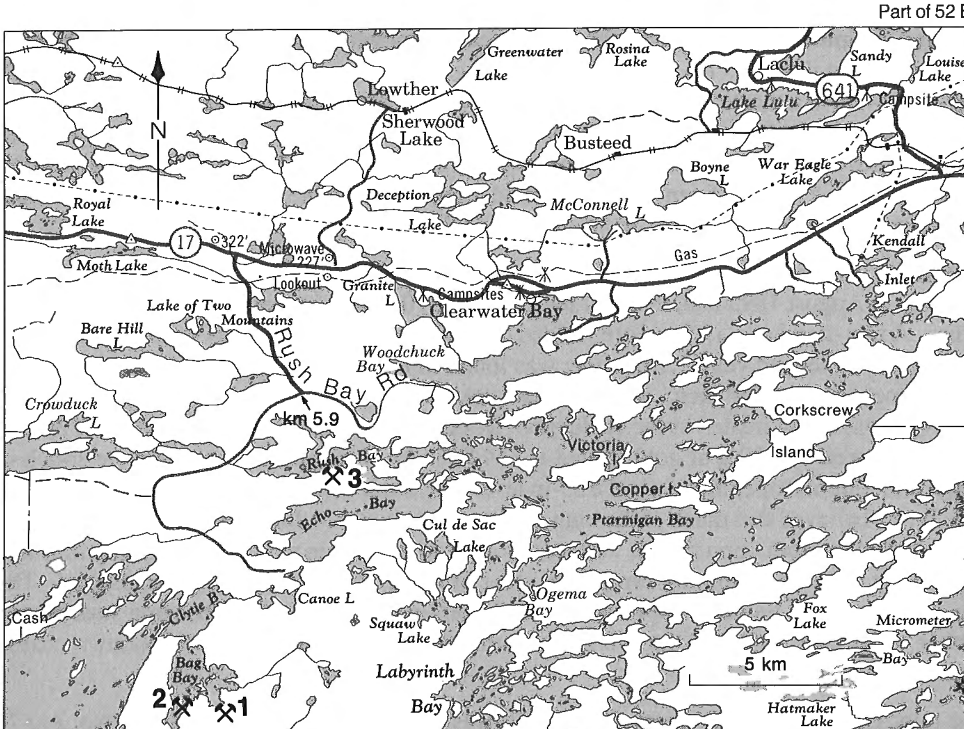
NATIVE GOLD, PYRITE, CHALCOPYRITE, TETRADYMITE, GALENA, MOLYBDENITE, BISMUTHINITE, TOURMALINE, NATIVE COPPER

In quartz veins in granite pegmatite

Specimens brilliant with native gold were obtained from the discovery vein during initial exploration activity. The gold in this deposit occurred as thin plates in massive quartz and in leaf form in fissures in the quartz which was bluish white in colour. Platy gold was unique to the Mikado veins, the gold at other mines in the region was of the nugget variety. The veins carried an unusual number of sulphides compared to other gold deposits in the area. The sulphide minerals were pyrite, chalcopyrite, tetradymite, galena, molybdenite and bismuthinite. Tourmaline and native copper were also found in the deposit.

The Mikado was the largest and most celebrated gold producer in the Lake of the Woods district. Gold was discovered in 1894 by a local inhabitant when he accidentally dropped his axe while coming onto Bag Bay, at the south end of Shoal Lake. When he stooped to retrieve it, his attention was drawn to a metallic glitter in the rock which the axe dislodged from the moss cover. He picked up several specimens containing gold and galena, and took them to Mr. Bunn, the Hudson's Bay Company officer at Rat Portage (now Kenora). Mr. Bunn and Dr. Scovil staked the ground, then sold it for $25 000 to Colonel W.T. Engledue of the South African Development Syndicate, Limited of London, England. Colonel Engledue undertook exploration

Part of 52 E



Map 43. Shoal Lake area.

1-Mikado Mine 2-Cornucopia Mine 3-Golden Horn Mine

Plate 67

Mikado Mine, 1899. (National Archives Canada PA-52781)

of the discovery vein in 1895. The vein was 1.8 m wide and about 30 m long. Its richness was revealed in initial stripping, and the vein became known as the most significant mining development of the year. An assay yielded 154.2 g/t (4? oz/ton). With this encouraging result, Engledue went to a meeting of the directors of the Syndicate in London in an effort to convince them to proceed with development of this rich showing. He was successful, and the Mikado Gold Mining Company was formed. The officials agreed that the Lake of the Woods district, only twelve days journey from London, looked promising, and they expected it to compensate for disappointing developments in the company's South African ventures.

The newly formed company sent a manager, Theodore Breidenback, from London to the property in August 1895 and, in about ten days, 12 970 g of gold were produced from 103.4 t of ore. A few days later, 19.9 t of ore yielded 3421 g of gold. These results were obtained from vein No. 1. A second vein, 1.2 m wide, was found to be as rich as the first, and underground development was undertaken. A shaft was sunk and, by the summer of 1896, the first ore shipment was being treated at the Reduction Works at Rat Portage. That shipment of 269.4 t of ore produced 30 139 g of gold valued at $14 535. Very rich pockets of ore were struck in initial underground operations. At the 55-m level, one shoot yielded about 450 kg of high grade ore. It was believed that much of the high grade ore encountered during mining operations was not recorded in production figures and was thought to have been stolen. A 20-stamp mill was built at the mine and a mining camp consisting of numerous buildings was established. The mine continued to produce impressively until 1902 when rich pockets became smaller and farther apart, and some of the workings were mined out. The mine temporarily ceased operations in 1903.

The mine consisted of four shafts. No. 1 shaft was developed to a depth of 201 m, No. 2 to 76 m and Nos. 3 and 4 to 24.4 m and 19.8 m respectively. The mill was in operation from 1898 to 1902 producing 859 034 g of gold valued at $408 532. There was minor production in

1910-1911 by Kenora Mines, Limited and in 1931 by Kenora Prospectors and Mines Limited; this production amounted to 22 270 g of gold and 1275 g of silver, valued at $12 538.

The mine is on the south shore of Bag Bay at the northeastern end of Shoal Lake.

Road log from Highway 17 at **km 517.9**:

km	0	Junction of Highway 17 and the Rush Bay Road; proceed south along Rush Bay Road.
	5.9	Junction; turn right.
	18.0	Junction; turn right.
	19.0	End of the road at Clytie Bay. Bag Bay is immediately south of Clytie Bay. The Mikado Mine is on the shore of a small bay on the southeast side of Bag Bay, 4.5 km by boat from Clytie Bay.

Refs.: 37 p. 64-67; 48 p. 3-8; 64 p. 252-253; 85 p. 49-50; 86 p. 105-107; 123 p. 147-148; 222 p. 95; 303 p. 256-258.

Maps (T): 52 E/10 Clearwater Bay
(G): 2443 Kenora-Fort Frances, Kenora and Rainy River Districts (O.G.S., 1:253 440)

km 526.4 Junction of Shoal Lake Road.

High Lake Mine

MOLYBDENITE, CHALCOPYRITE, PYRITE

In sheared quartz porphyry

Molybdenite occurs with chalcopyrite and pyrite in quartz.Molybdenite mineralization at this occurrence was discovered in 1937 by C.A. Alcock. Surface exploration and diamond drilling was done in the 1940s. Between 1959 and 1962, Evenlode Gold Mines Limited did some surface work and drilling, and in 1980-1981, Eco Exploration Company, Limited sank a shaft to 231.8 m and installed a mill on the site.

The occurrence is located at the outlet of High Creek at the east end of High Lake.

Road log from Highway 17 at **km 526.4:**

km	0	Junction of Highway 17 and Shoal Lake Road; proceed south along Shoal Lake Road.
	2.9	Junction; turn right.
	4.3	Pits on right. The pits, known as the *Electrum pits*, were put down in quartz veins carrying native gold (electrum), arsenopyrite, pyrite, pyrrhotite, chalcopyrite and tourmaline. Some spectacular gold specimens were found. The quartz veins are in quartz porphyry.
	5.8	Junction; turn left.
	6.0	Mine.

Refs.: 29 p. 2; 102 p. 33-35, 49-51; 179 p. 40.

Maps (T): 52 E/11 Falcon Lake
(G): 2069 Ewart-Forgie Area, Kenora District (O.G.S., 1:31 680)

km 533 Manitoba-Ontario border.

SECTION 4

ONTARIO BORDER – WINNIPEG

km **0** Manitoba-Ontario border. Proceed west along Highway 1, the Trans Canada Highway continuation of Highway 17 in Ontario.

km **4.2** Junction of Highway 44.

km **6.8** Junction of Highway 301. This highway provides access to the Sunbeam, Waverley and Penniac Reef mines.

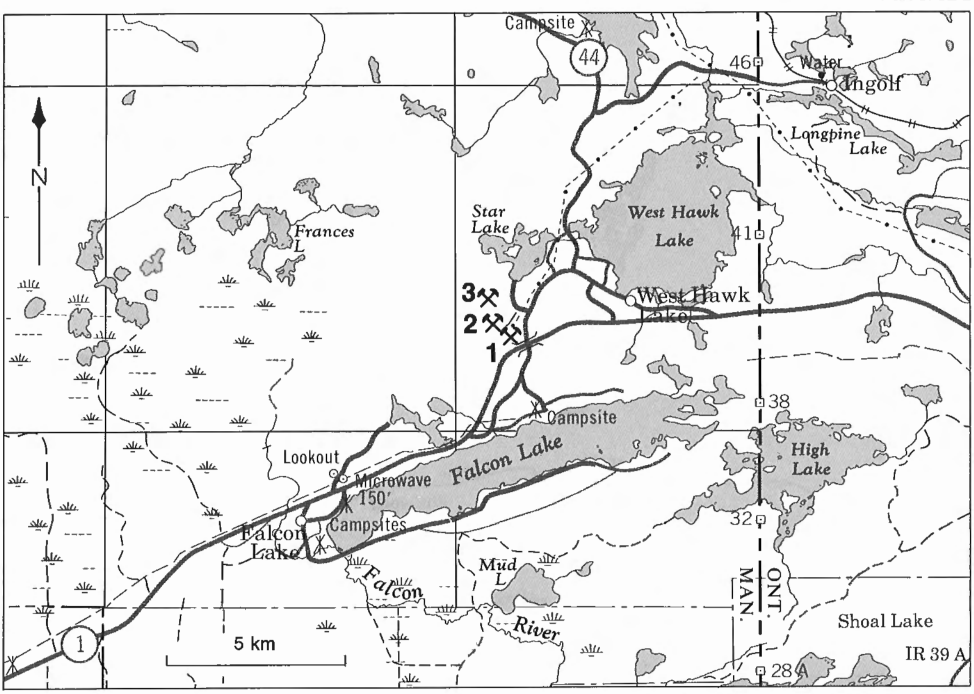
Sunbeam, Waverley Mines

NATIVE GOLD, PYRITE, PYRRHOTITE, ARSENOPYRITE, GALENA, SPHALERITE, MOLYBDENITE, TENNANTITE, CHALCOPYRITE, TOURMALINE

In silicified and sericitized granitic rock

Gold was present in the native state as free gold and in association with the sulphide mineralization. Pyrite, the most abundant mineral, was associated with pyrrhotite, arsenopyrite,

Part of 52 E



Map 44. Star Lake area.

1-Waverly Mine 2-Sunbeam Mine 3-Penniac Reef Mine galena and sphalerite. Molybdenite, tennantite and chalcopyrite were present in minor amounts. Small dark brown tourmaline prisms occur in the host rock.

The deposit was staked in 1912 by George R. Thurber as the Sunbeam claim. After the discovery it was explored intermittently. Between 1936 and 1941, Sunbeam Kirkland Gold Mines Limited operated the mine and shipped 4256.5 t of ore to the Kenricia mill. The mine was developed by an inclined shaft sunk to a depth of 133.6 m. Camp buildings were built on the site. In 1941, Goldbeam Mines Limited acquired the Sunbeam property and the adjacent Waverley claim on which it sank a 152 m shaft in 1945-1946. The shafts are now covered with a concrete slab placed by the Manitoba Mines Branch. There are small dumps near them.

Figure 5. Map showing collecting area: Section 4.

The mines are located south of Star Lake.

Road log from Highway 1 at **km 6.8** (see page 209):

km	0	Junction of highways 1 and 301; proceed north onto Highway 301.
	0.9	Junction; turn left onto the road to Star Lake.
	1.3	Junction; turn left onto a single-lane road.
	1.7	Junction. The trail on right leads 300 m to the Sunbeam Mine, the trail on left leads approximately the same distance to the Waverley Mine which is below a hydro line.

Refs.: 104 p. 23-24; 308 p. 14-15; 310 p. 4-5; 364 p. 87-88.

Maps (T): 52 E/11 Falcon Lake
(G): 53-4 West Hawk-Lake Falcon Lake Area, Lac du Bonnet Mining Division, Manitoba (M.M.D., 1:12 000)

Penniac Reef (Star Lake) Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, PYRRHOTITE

In quartz stringers in silicified agglomerate

Gold is associated with the sulphide mineralization. Pyrite, the most common mineral is disseminated through the host rock. Minor amounts of arsenopyrite and pyrrhotite are present.

This was one of the earliest mining ventures in the area. The deposit was staked as the Moore claim in 1890 by Tom Moore. In 1911, Penniac Reef Gold Mines, Limited undertook development of the deposit, built a 2-stamp mill and sank a shaft to a depth of 27.5 m. Some gold was produced. Star Lake Gold Mines Limited acquired the property in 1915 and did some work on it. There was no further production. The mine consisted of a shaft and some open cuts. The shaft is now covered with a concrete slab. There are some dumps nearby.

The mine is southwest of Star Lake, near the Sunbeam Mine.

Road log from Highway 1 at **km 6.8** (see page 209):

km	0	Junction of highways 1 and 301; proceed north along Highway 301.
	0.9	Junction; turn left onto the road to Star Lake.
	1.3	Turn-off to the Sunbeam and Waverley mines; continue along the road to Star Lake.
	1.9	Junction; turn left onto the mine road.
	2.9	Mine.

Refs.: 104 p. 24; 308 p. 15; 363 p. 115-116.

Maps (T): 52 E/11 Falcon Lake
(G): 53-4 West Hawk Lake-Falcon Lake Area, Lac du Bonnet Mining Division, Manitoba (M.M.D., 1:12 000)

km **42.6** *Road-cuts* expose granitic rocks. This marks the western margin of the Canadian Shield.

km **59.3** Junction of Highway 11. This highway provides access to the following collecting areas: Winnipeg River, via Pointe du Bois; Bird River and Werner Lake (Ontario), via Highway 315; Cat Lake, via Highway 314; Bissett, via highways 304 and 314.

Winnipeg River Area Occurrences

Most of these occurrences are south of the Winnipeg River. Access to them is by boat from Pointe du Bois, and a short hike from the river.

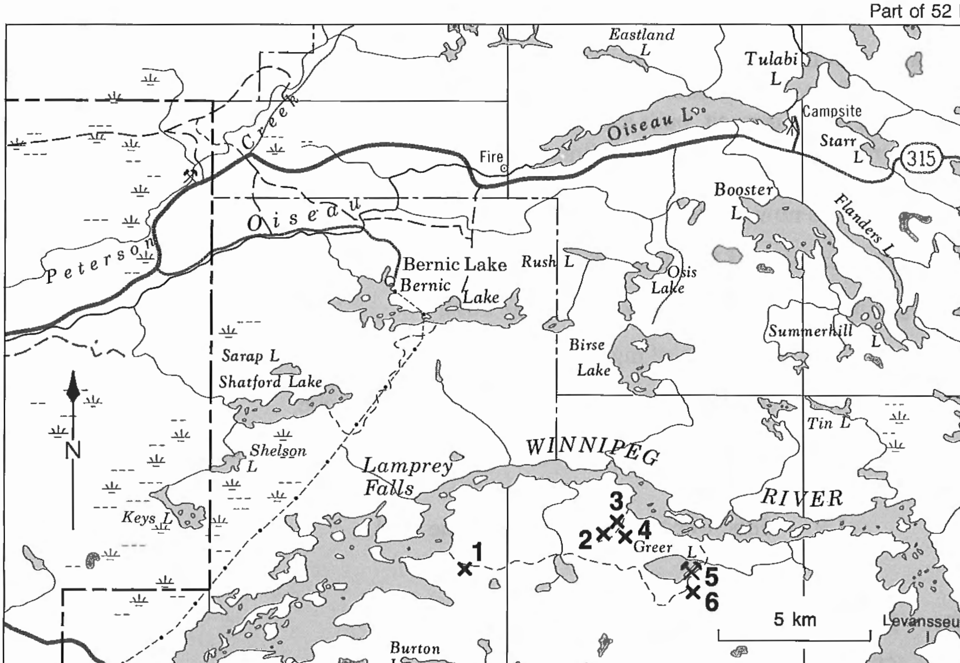
Chrome Mica Rock Occurrence

CHROME-MICA ROCK

In metavolcanic rock

Bright green chrome mica (fuchsite) occurs as streaks and lenses in quartz producing an attractive emerald-green ornamental rock. The rock was quarried in 1926 for use as stucco dash. It takes a good polish and is suitable for ornamental purposes.

Part of 52 L



Map 45. Winnipeg River area.

1-Chrome-mica rock occurrence
2-Silverleaf claims
3-Annie claim
4-Huron claim
5-Greer Lake feldspar quarry
6-Grace claims

The small quarry is located south of the Winnipeg River, on the east side of an expansion of the river. It is 2.5 km south of Lamprey Falls (Winnipeg River) and about 730 m from the shore of the river. By boat Lamprey Falls is 12 km east of Pointe du Bois.

Refs.: 106 p. 24; 313 p. 129.

Maps (T): 52 L/6 Ryerson Lake
(G): 56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Shatford Lake Occurrence

BERYL, MUSCOVITE, TOPAZ, MONAZITE, COLUMBITE-TANTALITE, EUXENITE, GADOLINITE, ALLANITE, YTTROTANTALITE, PSEUDO-IXIOLITE, ZIRCON, MICROLITE, APATITE, MAGNETITE, CASSITERITE, PYRITE, STIBNITE

In pegmatite dykes in metabasalt

White, yellow and green beryl crystals occur in microcline-albite-quartz-muscovite pegmatites along the south shore of Shatford Lake. The beryl crystals measure up to 30 cm long. Lithian muscovite occurs as coarse curvilammelar aggregates. Milky to brownish yellow topaz occurs as prismatic crystals, including patches of gem quality brownish yellow topaz. Much of the topaz is altered to mica. Accessory minerals occurring in the pegmatite are reddish to greyish brown monazite, columbite-tantalite (small tabular crystals), euxenite, black vitreous gadolinite, allanite, yttrotantalite, pseudo-ixiolite, zircon, microlite, apatite and magnetite. Cassiterite crystals measuring up to 5 mm across were found in the quartz-muscovite zone, pyrite and stibnite in feldspar.

The pegmatite dykes on this property were originally staked in 1928 as the Acme claim by Peter Osis and as the Shatford No. 1 claim by Hazel M. Harding. The dykes were worked by pits as various times. Between 1955 and 1966, Contact Minerals Limited removed beryl-bearing rock from eleven pits.

The pegmatite dykes are on the south side of Shatford Lake extending from 450 m to 910 m southwest of the old Tin Island Mine on Tin Island in Shatford Lake. The dykes outcrop in four places. Access to Shatford Lake is by old trails from Bernic Lake or from the Winnipeg River: from the south shore of Bernic Lake, a trail leads south 1.5 km to the east end of Shatford Lake; from the Winnipeg River, at a point 4 km due west of Lamprey Falls, a trail leads north 3.2 km to the east end of Shatford Lake. The pegmatite exposures are about 750 m west of the east end of the lake.

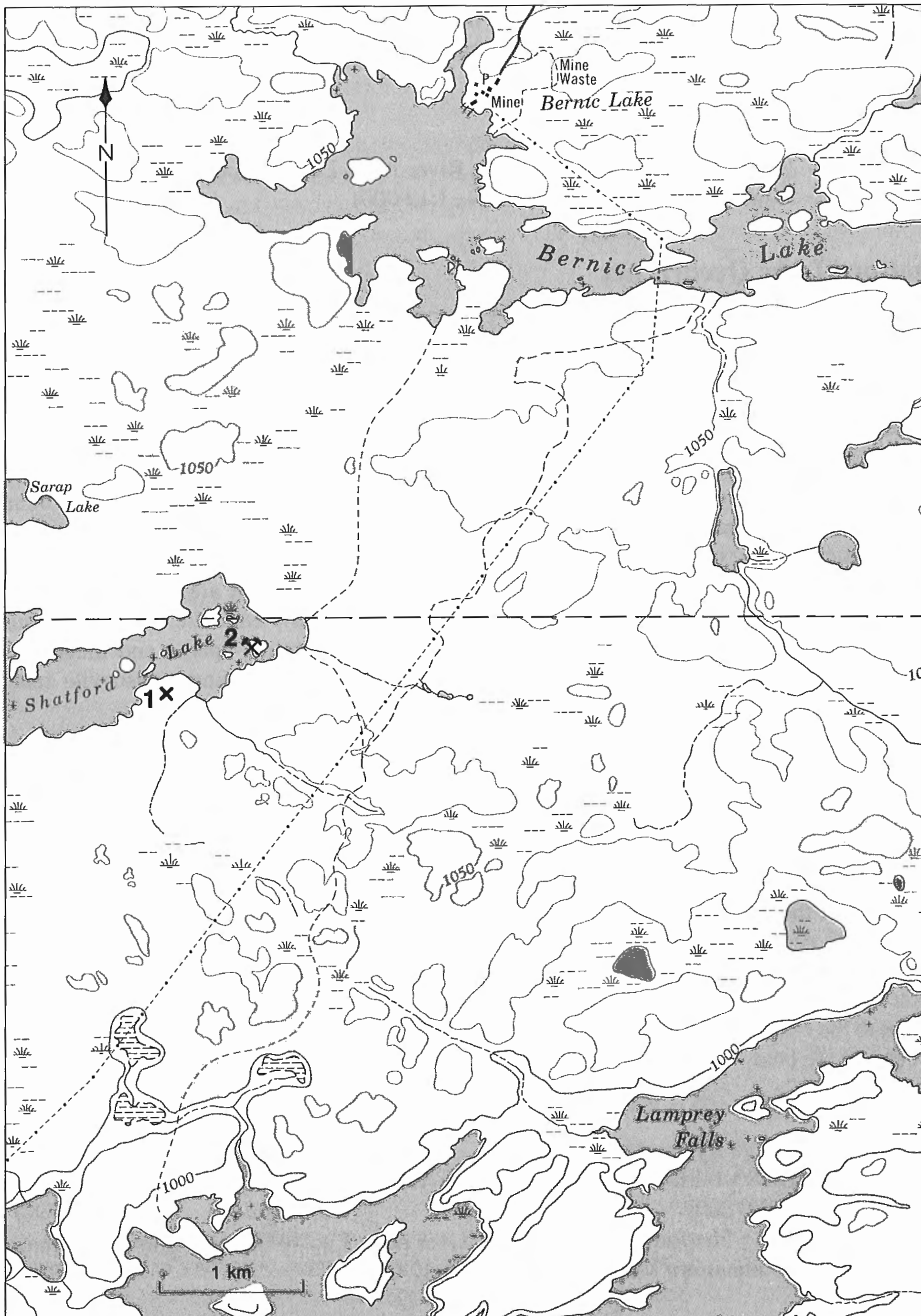
Refs.: 76 p. 75-78; 106 p. 23-24; 235 p. 74-75.

Maps (T): 52 L/6 Ryerson Lake
(G): ER 80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)
56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Tin Island Mine

CASSITERITE, BERYL, MUSCOVITE, GARNET, PSEUDO-IXIOLITE

In a pegmatite dyke in metavolcanics



Map 46. Shatford Lake occurrences.

1-Shatford Lake occurrence 2-Tin Island Mine

The deposit was originally staked as a tin prospect, the tin-bearing mineral being cassiterite. Beryl occurs as light green crystals measuring up to 5 cm across. Curvilammelar lithian muscovite, garnet and pseudo-ixiolite also occur in the pegmatite which consists of microcline, platy albite (cleavelandite), quartz and muscovite.

The pegmatite was found in 1924 by Ken E. Miller. It was staked in 1927 by G.W. Mark. Two years later, Manitoba Tin Company Limited sank a shaft to a depth of 34 m, but the cassiterite content was found to be uneconomic and further development was discontinued. In 1954-1955, Contact Minerals Limited did some surface work and removed some material.

The mine is on Tin Island, at the east end of Shatford Lake. The shaft is 30 m east of the original discovery which was on a very small island. The discovery dyke was about 3 m wide. It consisted of albite and quartz with minor tourmaline, biotite, yellow mica, cassiterite, beryl and fluorite.

Access to Shatford Lake is by trails from Bernic Lake or from the Winnipeg River. (See Shatford Lake occurrence, page 213).

Refs.: 76 p. 75-78; 106 p. 23-24; 110 p. 149-150; 235 p. 74-75; 307 p. 12-13.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)
56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Huron Claim

BERYL, COLUMBITE-TANTALITE, URANINITE, TOPAZ, GARNET, TOURMALINE, EPIDOTE, ZOISITE, MONAZITE, TITANITE, ZIRCON, EUXENITE-POLYCRASE, MICROLITE, APATITE, THORITE, FERSMITE, RUTILE, PSEUDO-IXIOLITE, MAGNETITE, BITYITE, BERTRANDITE, BAVENITE, URANOPHANE, SKLODOWSKITE

In pegmatite dyke in metavolcanics

The deposit is well known for the rare-element minerals it carries and for the uraninite which was used to make the first age determination of the Canadian Shield Precambrian rocks, found to be 2500 million years. The claim is also the source of large crystals formerly obtained from it, including light green to yellow beryl crystals measuring up to 45 cm across, and platy crystals of columbite-tantalite up to 10 cm across. Uraninite was found as steel-black cubes measuring 5 mm in diameter in feldspar. The pegmatite is composed of microcline, platy albite (cleavelandite), quartz and muscovite. Accessory minerals are numerous and include grey to greenish blue massive topaz, garnet, black tourmaline, greenish yellow to dark green epidote, zoisite (as honey-coloured crystals and dark grey granular masses), orange-brown monazite, brown titanite, light-green zircon, euxenite-polycrase, microlite, apatite, thorite, fersmite, niobian rutile, pseudo-ixiolite and magnetite. Beryl is partially altered to bityite, bertrandite, and bavenite intergrown with chlorite. Uranophane and sklodowskite occur as sooty black, yellow and orange alteration products of uraninite. Fersmite occurs as a replacement of columbite-tantalite.

The pegmatite outcrops on the vertical face of small cliffs separated by a swamp which is about 43 m wide. In 1930, 226 kg of columbite-tantalite were removed from the deposit. The deposit was staked as the Huron claim in 1925 by W.J. Davidson. The pegmatite was explored by pits

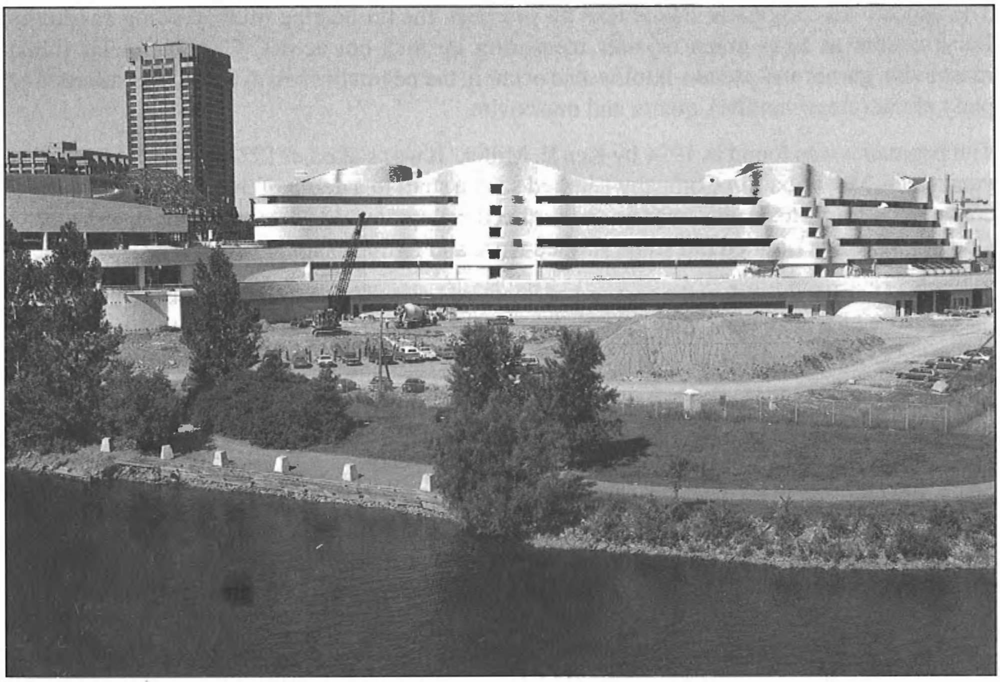


Plate 68

Canadian Museum of Civilization, under construction 1987. The museum, on the bank of the Ottawa River opposite Parliament Hill, is faced with Tyndall limestone. (GSC 192099)

at various times and by various concerns. There are two pits, 49 m by 1.8 m, and 29 m by 4.5 m, and about 2 m deep.

The occurrence is about 1.6 km south of the Winnipeg River and about 900 m northwest of Greer Lake. A trail to the occurrence leads south from the Winnipeg River at a point 7.5 km (along the Winnipeg River) east of Lamprey Falls, which is about 12 km by boat from Pointe du Bois. The Huron claim is 1550 m by trail from the Winnipeg River.

Refs.: 76 p. 75-78, 108, 112, 116; 106 p. 17-18; 109 p. 1017; 118 p. 164-167; 235 p . 75; 306 p. 15; 312 p. 127-128.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 00
56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division southeastern Manitoba (M.M.D., 1:12 000)

Annie Claim

BERYL, MUSCOVITE, CASSITERITE, GARNET, TOURMALINE, APATITE, COLUMBITE-TANTALITE

In pegmatite in metavolcanics

Beryl occurs as white to greenish white crystals measuring up to 2 cm in diameter in a pegmatite consisting of microcline, cleavelandite, smoky and white quartz and muscovite. Curvilammelar aggregates of grey and lilac lithian muscovite are also present. Accessory minerals include cassiterite, garnet, tourmaline, apatite and columbite-tantalite.

The deposit was staked in 1924 as the Annie Claim by Kay Wengel. In 1938-1948, Winnipeg River Tin Mines Limited explored the deposit for tin. The deposit is located between the Silverleaf and Huron deposits, 610 m northeast of the former and 450 m northwest of the latter.

Refs.: 106 p. 19; 109 p. 1017; 118 p. 157; 235 p. 75; 311 p. 121.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)
56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Silverleaf Claim

SPODUMENE, LITHIAN MUSCOVITE, AMBLYOGONITE, TRIPHYLITE-LITHIOPHILITE, LEPIDOLITE, TOPAZ, BERYL, GARNET, COLUMBITE-TANTALITE, APATITE, TOURMALINE, GAHNITE, MONAZITE, FLUORITE, CASSITERITE, PSEUDO-IXIOLITE

In pegmatite dykes in metavolcanics

The deposit is a former lithium producer. The lithium minerals include greyish to white, blade-like spodumene (intergrown with quartz), grey and lilac, scaly, platy and curvilammellar lithian muscovite, lepidolite, greyish-white amblygonite and salmon-orange cleavable massive triphylite-lithiophilite. These minerals occur in a pegmatite consisting of microcline, albite (cleavelandite), quartz and muscovite. Accessory minerals include grey to blue or greenish topaz (turbid crystals up to 10 cm long), white to pale pink beryl (crystals up to 15 cm long), spessartine (crystals in mica), columbite-tantalite, apatite, tourmaline, gahnite, monazite, fluorite and cassiterite. Pseudo-ixiolite occurs as brick-shaped and wedge-shaped crystals measuring up to 3 cm long in K-feldspar and lithium mica.

The deposit was originally staked as the Bear claim in 1924 by R.G.O. Johnston and F.B. Evans who exposed the pegmatite by stripping and trenching. The Silverleaf Mining Syndicate (Canada) Limited acquired the property in 1925. This was the first potentially economic lithium deposit found in Canada. Spodumene and lithium mica were mined from the deposit in 1926-1927 and shipped to the U.S., England and Germany.

The deposit is located on the side of a hill, south of the Winnipeg River. There is an open cut at the east end of the outcrop and dump material covers the remainder of the dyke. Some trenches and pits were put down in the adjacent swamp. Access is by a trail, 2250 m long, leading south from the Winnipeg River. This trail also leads to the Huron claim which is located 600 m east of the Silver Leaf claim.

Refs.: 76 p. 64, 102; 77 p. 755-771; 106 p. 22-23; 118 p. 148-157; 234 p. 78-79; 306 p. 10-11; 311 p. 114-120.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)
56-1a Shatford Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Greer Lake Quarry

MICROCLINE, ALBITE, MUSCOVITE, BISMUTHINITE, BERYL, GARNET

In pegmatite dyke in gneissic granodiorite and quartz diorite

Very large crystals of pink feldspar and large muscovite books occur in the pegmatite. The feldspars are microcline and albite. Bismuthinite, beryl and garnet occur as minor accessory minerals.

The deposit was originally staked in 1930 by G. Werner. Between 1933 and 1935, Winnipeg River Tin Mines Limited quarried the deposit and shipped feldspar to Minnesota.

The quarry is at the northeast end of Greer Lake, south of the Winnipeg River. Access is by a trail, 1150 m long, leading south from the Winnipeg River at a point 2.5 km east of the trail leading to the Huron and Silverleaf claims (see page 217). The trail to Greer lake crosses a stream 320 m east of the quarry.

Refs.: 106 p. 24; 307 p. 14; 362 p. 58.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

Grace Claims

BERYL, MUSCOVITE, GARNET, MICROLITE, TOURMALINE, PSEUDO-IXIOLITE

In pegmatite dyke in granodiorite and quartz diorite

Light green beryl crystals measuring up to 30 cm across occur in pegmatite composed of microcline, albite, quartz and muscovite. Smoky, black and white varieties of quartz are present. Lithian muscovite occurs as curvilammellar aggregates in the pegmatite. Accessory minerals include microlite, tourmaline and pseudo-ixiolite. Pseudomorphs of cordierite occur as columnar crystals measuring up to 30 cm long. The original cordierite was replaced by muscovite, green biotite and chlorite.

The Grace claims are located near the southeast end of Greer Lake, about 600 m south of the Greer Lake feldspar quarry:

Refs.: 76 p. 79-80, 108; 106 p. 18-19; 306 p. 11.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Geology of the Cat Lake Winnipeg River Pegmatite Field (M.M.D., 1:100 000)
56-1b Ryerson Lake-Winnipeg River area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

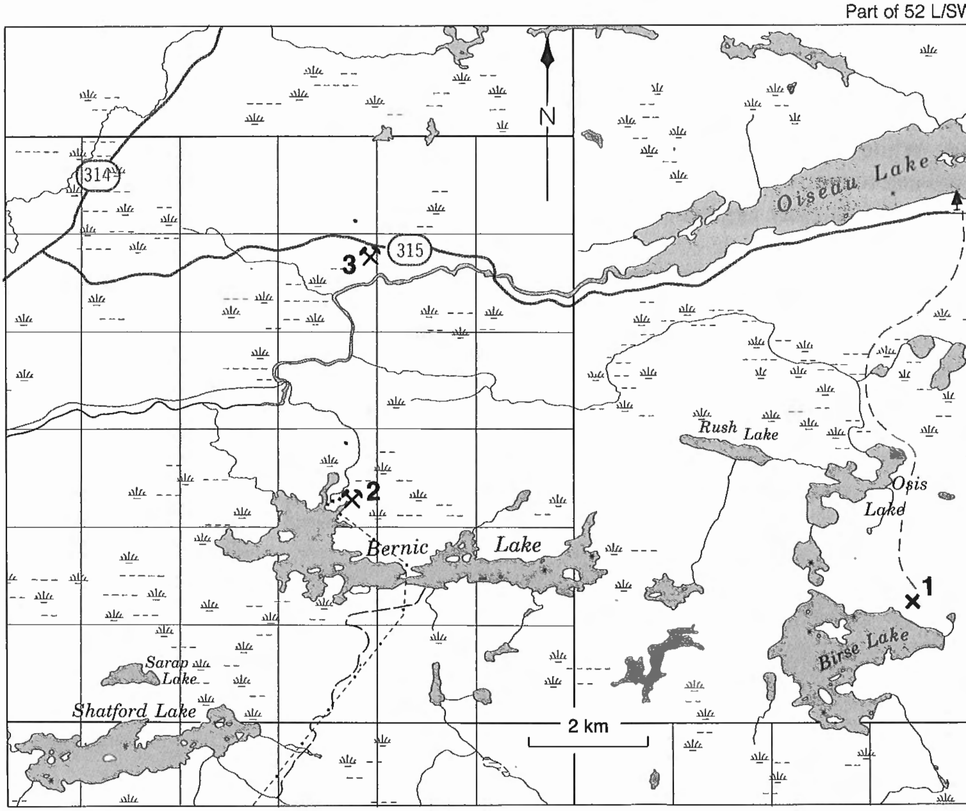
Bird River Area Occurrences

These occurrences are accessible from Highway 315.

Bernic Lake (Tanco) Mine

SPODUMENE, MICROCLINE, ALBITE, PETALITE, POLLUCITE, AMBLYGONITE, MONTEBRASITE, MICA, EUCRYPTITE, TRIPHYLITE, LITHIOPHILITE, LITHIOPHOSPHATE, MANGANOTANTALITE, TAPIOLITE, PSEUDO-IXIOLITE, WODGINITE, SIMPSONITE, CASSITERITE, ZIRCON, BERYL, GARNET, TOURMALINE, APATITE, ANALCIME, ADULARIA, COOKEITE, RHODOCHROSITE, CALCITE, MONTMORILLONITE, ILLITE, HOLMQUISTITE, THORITE, BARITE, SCHEELITE, WHITLOCKITE, FAIRFIELDITE, CRANDALLITE, OVERITE, ILMENITE, MAGNETITE, GALENA, SPHALERITE, PYRRHOTITE, PYRITE, MARCASITE, ARSENOPYRITE, MOLYBDENITE, COSALITE, GLADITE, PEKOITE, GUSTAVITE, TETRAHEDRITE, FREIBERGITE, BOURNONITE, DYSCRASITE, PYRARGYRITE, MIARGYRITE, CUBANITE, CHALCOPYRITE, STANNITE, KESTERITE, BISMUTHINITE, HAWLEYITE, BISMUTH, LEAD, ARSENIC, ANTIMONY, STIBARSEN, TANCOITE, CERNYITE

Part of 52 L/SW



Map 47. Bird River area.

1-Birse Lake occurrence 2-Bernic Lake (Tanco) Mine 3-Dumbarton Mine

In pegmatite dyke in hornblende schist

The quartz-feldspar pegmatite contains some seventy minerals including two new species. These minerals occur in nine zones of differing mineral composition. The pegmatite contains tantalum, lithium, beryllium, cesium and rubidium mineralization. The tantalum minerals are wodginite, manganotantalite, tapiolite, ixiolite, microlite and simpsonite. The lithium minerals include spodumene, petalite, amblygonite, montebrasite, eucryptite, lithiophosphate, triphylite-lithiophilite and lithum micas. Beryl is the only beryllium mineral. Pollucite is the principal cesium mineral; analcime and microcline-albite also contain cesium. Rubidium is carried by the feldspars and micas.

Several of the minerals have been found as large crystals or large masses in the deposit. White tabular and lath-like crystals of spodumene up to 1.5 m long were found. Microcline was found as pink, buff to grey crystals measuring up to 1.5 m by 2.5 m, and petalite as grey to white, log-shaped crystals measuring up to 2 m long. These crystals were embedded in white to grey massive quartz, the most abundant mineral in the pegmatite. Large masses of amblygonite were encountered, including one weighing 90 t.

Spodumene commonly occurs as colourless transparent fibrous aggregates, as divergent bundles of white lath-shaped crystals and as colourless to light greenish fibrous, columnar aggregates. Microcline is generally intergrown with albite resulting in a microcline perthite which is commonly colour-zoned with a dark grey core and pink rim. Petalite crystals are tabular to log-shaped, white to grey, altering to milky white. Pollucite occurs as colourless to greyish white pods and nodules, 1 to 2 m in diameter, and as large lenticular bodies; it has a slight pinkish tint and a greasy lustre, properties which distinguish it from quartz. Amblygonite-montebrasite is associated with pollucite, spodumene and the feldspars; it occurs as white irregular masses (up to 1.5 m across) and as tapered crystals with white cores and yellowish rims. White to pinkish white amblygonite and tan to brownish grey and greenish montebrasite have been found. Albite is white to bluish white and occurs in two forms: as compact sugary masses, and as platy aggregates (cleavelandite). The micas include white to yellowish and

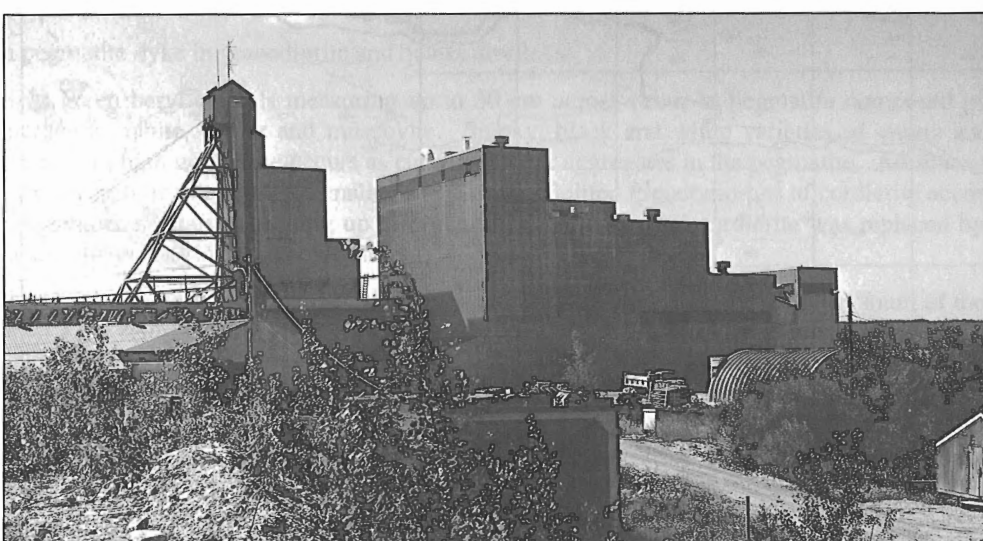


Plate 69

Bernic Lake Mine, 1974. (GSC 163090)

greenish muscovite, violet to greyish violet lithian muscovite and rare violet lepidolite. They occur as masses of microscopic to coarse flaky aggregates, as disseminations in silicate components of the pegmatite, and as violet curved books forming large columnar masses. Other lithium minerals occur as follows: eucryptite, as greyish white to pink, transparent to translucent grains measuring up to 4 cm across (fluoresces red in ultraviolet light); triphylite-lithiophilite, as pink to tan and greenish grey masses measuring several centimetres across; lithiophosphate as tan crystals measuring up to 5 cm long in cavities associated with quartz and analcime.

The tantalum minerals generally occur in feldspar as follows: manganotantalite occurs as reddish brown to black grains measuring up to 1 cm across, tapiolite as rare grains indistinguishable from manganotantalite, microlite as cream-white octahedra and lustrous yellow to yellow-green grains associated with tantalite and tapiolite, pseudo-ixiolite as black platy crystals measuring up to 1 cm in diameter, and wodginite as brown to black prisms measuring up to 4 cm across and as granular masses. Brown cassiterite and reddish brown zircon are associated with these minerals.

Beryl, including a cesium-bearing variety, is relatively uncommon in the pegmatite. It occurs as white, greenish white to pinkish tan crystals measuring up to 20 cm long, as colourless to pinkish tan crystals up to 12 mm long, as thick tabular pinkish tan crystals, and in massive form. Cs-beryl is rare, occurring as colourless prisms about 1 cm long, some having a pink rim.

A number of other minerals occur in the deposit. They include: pink and black tourmaline crystals up to 2 cm long, and columnar aggregates up to 20 cm long; blue and mauve apatite, as granular aggregates several centimetres across and as pink to brown crystals in cavities; colourless transparent analcime trapezohedra, often with a brownish yellow tint; adularia, as hatchet-shaped crystals and cauliflower-like radial aggregates; garnet; cookeite, as disseminated flakes; and rhodochrosite, as salmon-pink small cleavable masses. Crystals of quartz and calcite line small cavities and fissures; rhodochrosite and apatite are associated with these crystals. The clay minerals illite and montmorillonite occur in the pegmatite, the latter as white to apple-green dense fibrous masses. Holmquistite, thorite, barite, scheelite, whitlockite, fairfieldite, crandallite, overite, ilmenite and magnetite have been found in the deposit.

Several metallic minerals have been identified, but most are not recognizable in the hand specimen. Sphalerite occurs as yellow to brown grains and aggregates measuring up to 8 cm across, and molybdenite occurs as flakes in quartz and spodumene. Botryoidal crusts of pyrite with marcasite coat quartz crystals in cavities. Most of the metallic minerals occur in various assemblages forming nodules and filling cavities and fissures in the pegmatite. These minerals include pyrrhotite, pyrite, cosalite, gladite, pekoite, gustavite, tetrahedrite, freibergite, bournonite, dyscrasite, pyrargyrite, miargyrite, cubanite, chalcopyrite, stannite, kesterite and bismuthinite. Hawleyite occurs as minute grains with native bismuth, pyrrhotite and chalcopyrite. Native elements reported from the deposit include bismuth, lead, arsenic, antimony and stibarsen.

The deposit has yielded new mineral species including cernyite and tancoite. Cernyite is grey metallic and occurs as microscopic grains with other sulphides. It was described as a new mineral in 1978. Tancoite, described in 1980, occurs as colourless to pink transparent tabular crystals measuring up to 1 mm long, and as columnar aggregates of fine crystals; it is associated with pink apatite and lithiophosphate.

The pegmatite was originally staked as a tin occurrence by Jack Nutt in 1929. Jack Nutt Tin Mines, Limited explored the deposit by sinking a shaft to 58 m on the north shore of Bernic Lake. In 1930, Consolidated Tin Mining Company, Limited discovered a spodumene body at a depth of 42.7 m during a diamond drilling program. At that time, there was little interest in lithium and there was no further serious exploration until 1954-1957 when Montgary Exploration Limited (later became Chemalloy Minerals Limited) diamond drilled the deposit and sank a shaft to 93 m. In 1957, American Metal Climax Inc. located the pollucite body but it was not recognized as source of cesium at the time. Tantalum mineralization was discovered in 1959-1961 by Chemalloy Minerals Limited which deepened the shaft to 103 m. In 1967, Tantalum Mining Corporation of Canada Limited (Tanco) undertook development of the deposit and began production of tantalum concentrates in 1969. Pollucite was produced in 1970-1971 for shipment to USSR, and lithium was produced in 1973-1974. The mine continued with production of tantalum until 1983. Spodumene, for use in production of ceramics, was produced in 1984. The mine is worked from a shaft, 168.6 m deep.

The mine is on the northwestern shore of Bernic Lake, about 180 km northeast of Winnipeg. A 10.5-km road, the Bernic Lake Road, leads south from Highway 315 at a point 25.5 km east of its junction with Highway 313 just east of Lac du Bonnet.

Refs.: 66 p. 643-652; 67 p. 708-710; 68 p. 714-724; 69 p. 660-672; 70 p. 625-640; 71 p. 679-681; 73 p. 313-316; 74 p. 489-496; 75 p. 325-327; 100 p. 591-605; 101 p. 169-176; 146 p. 609-634; 186 p. 139-145; 240 p. 1-38; 270 p. 185-190; 272 p. 690-691; 381 p. 389.

Maps (T): 52 L/6 Ryerson Lake
(G): ER80-1-1 Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

Dumbarton Mine

PYRRHOTITE, PENTLANDITE, CHALCOPYRITE, VIOLARITE, MARCASITE, MAGNETITE, ILMENITE, CUBANITE, SPHALERITE, AMPHIBOLE

In amphibolite and chert at the granite-andesite contact

Pyrrhotite is the major sulphide occurring in this nickel-copper orebody. Associated with pyrrhotite are pentlandite, chalcopyrite, violarite, marcasite, magnetite and ilmenite. These minerals occur as disseminations and in massive form in amphibolite. Cubanite was also reported. Coarse amphibole crystals measuring up to 10 cm long occur in the sulphide ore and in the host amphibolite. A siliceous zone, referred to as chert beds, contains disseminated pyrrhotite and chalcopyrite with minor pentlandite and rare sphalerite in a gangue of quartz, albite with minor biotite, and amphibole. Ilmenite is an accessory mineral in the gangue.

The deposit was worked for nickel and copper by Dumbarton Mines Limited from 1969 to 1974. The orebody was located during a drilling program conducted by Muskwa Nickel Chrome Mines, Limited between 1949 and 1965. Development consisted of an inclined shaft sunk to a depth of 183 m and an open pit, 46 m deep.

The mine is located near Bird River, about 160 km northeast of Winnipeg. It is on the south side of Highway 315, at a point 36.7 km east of its junction with Highway 314.

Refs.: 181 p. 143-154; 325 p. 20-21; 357 p. 30; 375 p. 104.

Maps (T): 52 L/6 Ryerson Lake
(G): 54-1 Bird Lake Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:12 000)

Birse Lake Occurrence

ROSE QUARTZ, TOURMALINE, BERYL, APATITE

In pegmatite in metavolcanics

Rose quartz forms the core zone in a pegmatite dyke composed of microcline, albite, quartz and muscovite. Black tourmaline, white to light green beryl and apatite are minor accessories. The rose quartz is a deep pink colour and is reported to be equal to the best rose quartz from other countries. The gem collection of the Royal Ontario Museum, Toronto contains several stones cut as oval cabochons; the largest is 20 mm long. Also in the collection are carvings and spheres, including one which shows asterism (a 6-rayed star).

The pegmatite outcrop measures 30 m by 6 m and is exposed by open cuts. It is about 650 m north of Birse Lake. Access is by a road, 6.5 km long, leading south from Highway 315 at a point 15.4 km east of the junction of highways 315 and 314, and 6.8 km east of the Highway 315 bridge over Bird (Oiseau) River. The property is held by R.J.R. Schaller of Winnipeg.

Refs.: 247 p. 16; 307 p. 14; 348 p. 54.

Maps (T): 52 L/6 Ryerson lake
(G): ER80-1-1 Geology of the Cat Lake Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

Werner Lake Occurrences

Occurrences at Werner Lake, Ontario are reached by Manitoba Highway 315 and the Werner Lake Road.

Gordon Lake Mine

PYRRHOTITE, PENTLANDITE, CHALCOPYRITE, PYRITE, MAGNETITE, CHROMITE

In serpentinized peridotite

Nickeliferous pyrrhotite, pentlandite and chalcopyrite were the ore minerals at this former nickel-copper producer. They occurred with pyrite as disseminations, stringers and bands of massive sulphides in shear zones in peridotite. Crystals of pentlandite measuring up to about 3 cm in diameter were found in the sulphide bands. Magnetite and chromite occurred in the sulphides and in the host rock.

The discovery of nickel-copper mineralization at the southeast corner of Gordon Lake was made in 1942 by H. Byberg and A. Vanderbrink. Exploration of the deposit was done by various companies in the 1940s and 1950s. The mine was brought into production in 1962 by Nickel Mining and Smelting Corporation. This, company was later taken over by Consolidated Canadian Faraday Limited which continued production until 1972 when mining operations ended. The mill continued to operate, treating ore from the Dumbarton Mine. The concentrates were trucked to Lac du Bonnet, then shipped by rail to the Inco smelter in the Sudbury area. The mine produced 12 095.1 kg of copper, 8607 kg of nickel and some platinum, palladium, gold and silver. It was serviced by two shafts, 33.5 m and 518.5 m deep and 825 m apart.

The mine is on the south shore of Gordon Lake, in the town of Werner Lake. Access to Werner Lake is by Manitoba Highway 315 to the Ontario border. From the border, the Werner Lake

Road continues 17.2 km to a junction in Werner Lake; at the junction, one road leads northeast 0.4 km to the Gordon Mine on the shore of Gordon Lake, the other leads south to Werner Lake.

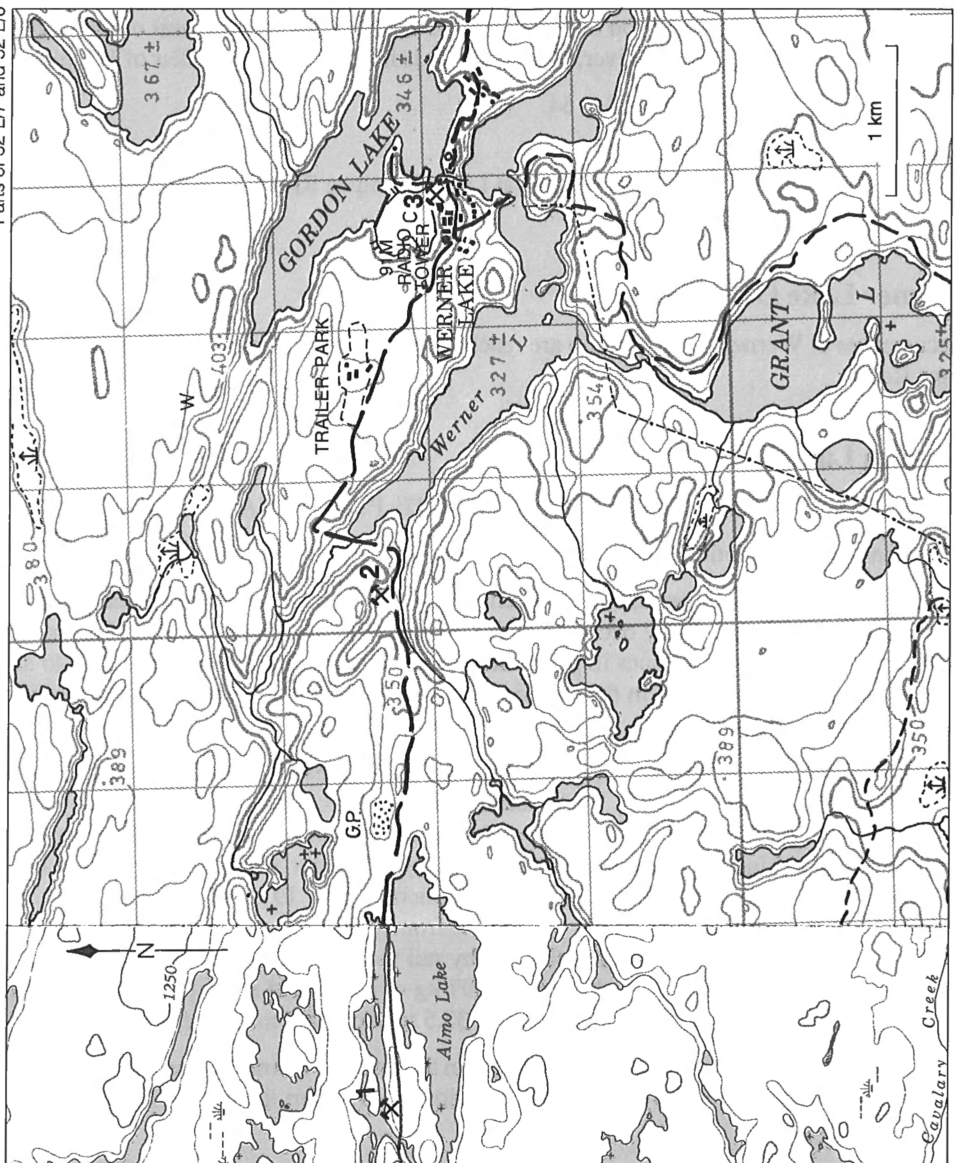
Refs.: 61 p. 1-3, 20-24; 285 p. 4-6; 299 p. 169-170; 371 p. 89.

Maps (T): 52 L/7 Umfreville Lake
(G): 1957-2 Werner Lake-Rex Lake Area (west sheet), District of Kenora (Patricia Portion), Ontario (O.G.S., 1:31 680)

Werner Lake Mine

COBALTITE, CHALCOPYRITE, PYRRHOTITE, PYRITE, MAGNETITE, HEMATITE, ANNABERGITE, ERYTHRITE, MALACHITE

Parts of 52 L/7 and 52 L/6



In amphibolite and biotite-feldspar schist

Cobalt was formerly produced from this deposit. Cobaltite, the ore mineral, was associated with chalcopyrite, pyrrhotite, pyrite and magnetite. These minerals occurred as disseminations and small lenses and pods in biotite-feldspar schist. Secondary minerals found in exposed parts of the ore zone include hematite, annabergite, erythrite and malachite. The mineralization occupied a fault zone at the contact of garnetiferous paragneiss and granite.

The deposit was discovered by M. Carlson in 1920. It was acquired by Kenora Prospectors and Miners Limited which began development in 1929. The workings consist of trenches, pits and a shaft sunk to about 11 m. A mill was flown in and assembled at the mine in 1942. Cobalt was produced in 1932 and from 1940 to 1944, most of it during the last period of operation. A total of 63 420 kg was produced.

The mine is located about 500 m west of the west end of Werner Lake. It is on the west side of the Werner Lake Road at a point 3.1 km west of the junction in Werner Lake (see Gordon Lake Mine, page 223), and on the north side of a gully.

Refs.: 61 p. 1, 25; 295 p. 38.

Maps (T): 52 L/7 Umfreville Lake
(G): 1957-2 Werner Lake-Rex Lake Area (west sheet), District of Kenora (Patricia Portion), Ontario (O.G.S., 1:31 680)

Norpax (Almo Lake) Mine

PYRRHOTITE, PENTLANDITE, VIOLARITE, CHALCOPYRITE, PYRITE

In a fault zone in peridotite

The mineralized zone consists of pyrrhotite and pentlandite with violarite, chalcopyrite and pyrite. These minerals occur as disseminations and as massive sulphide bodies in peridotite.

Exposures of nickel-copper mineralization on the north and west shores of Almo Lake were discovered in 1953 by C. Alcock. In the following year, Norpax Oils and Mines, Limited explored the deposit by drilling and underground exploration. It sank a vertical shaft to a depth of 123 m near the northwest corner of the large island in Almo Lake. The deposit was subsequently investigated by various companies, but there was no production.

The island, on which the mine is located, is crossed by the Werner Lake Road. The mine is on the north side of this road, at a point 150 m east of the bridge at the west end of the island, and 6.5 km west of the junction in Werner Lake (see Gordon Lake Mine, page 223).

Refs.: 61 p. 2, 25-27; 299 p. 172.

Maps (T): 52 L/6 Ryerson Lake
(G): 1957-2 Werner Lake-Rex Lake Area (west Sheet), District of Kenora (Patricia Portion), Ontario (O.G.S., 1:31 680)

Map 48 (opposite). Werner Lake area.

1-Norpax Mine 2-Werner Lake Mine 3-Gordon Lake Mine

Cat Lake Occurrences

Occurrences in the vicinity of Cat Lake are accessible by Highway 314. Cat Lake is about 75 km from Lac du Bonnet.

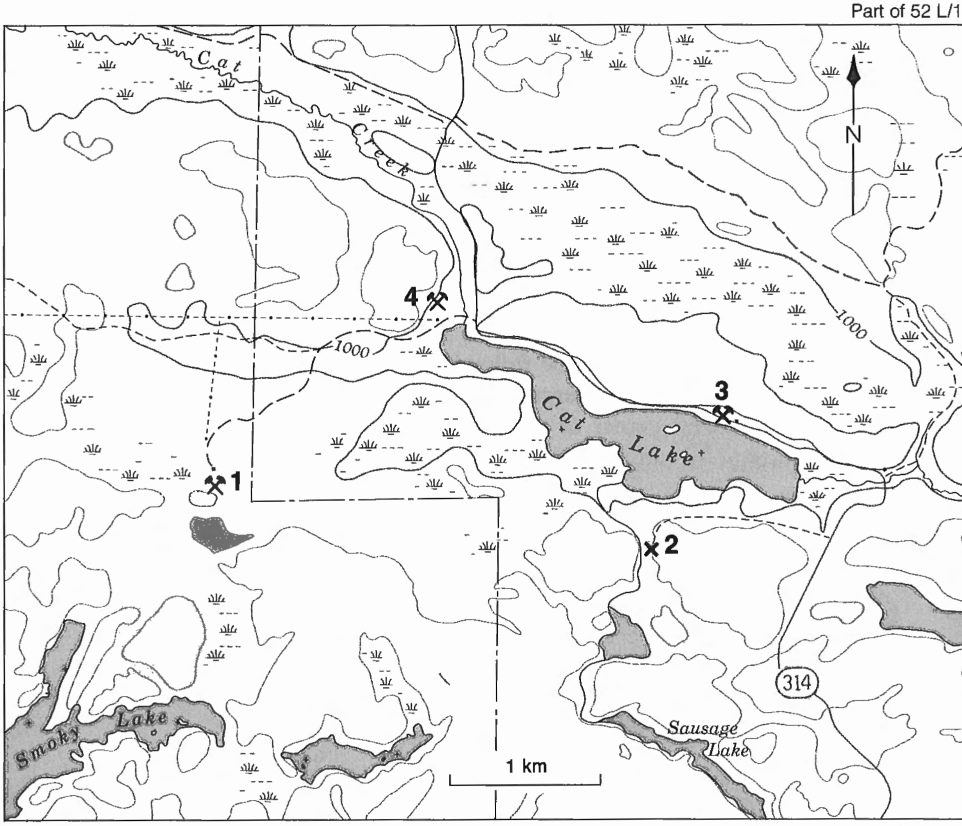
Central Claim

SPODUMENE, MUSCOVITE, GARNET, TOURMALINE, BERYL, CASSITERITE, COLUMBITE-TANTALITE, APATITE, CHRYSOBERYL, ALLUAUDITE, VIVIANITE

In pegmatite dyke in microcline granite

Platy light green spodumene crystals measuring up to 60 cm long occur in quartz which is a constituent of a microcline-albite-muscovite pegmatite. Also occurring in the pegmatite are lithian muscovite, garnet, tourmaline, green to white beryl, cassiterite, columbite-tantalite (as microscopic acicular crystals), blue apatite and chrysoberyl (as light yellow-green tabular crystals measuring up to 20 mm by 3 mm). Alluaudite and vivianite occur as alteration products of triphylite-lithiophilite.

Part of 52 L/11



Map 49. Cat Lake area.

1-New Manitoba Mine
2-Central claims
3-Irgon claim
4-Eagle claim

The property was staked as the Cat Lake claim in 1926 by F. Zeemel. It has been explored by pits and trenches at various times since the original staking.

The deposit is located on the side of a granite ridge, about 300 m south of Cat Lake. Access is by a road, 1.2 km long, leading west from Highway 314 at a point 20 km north of the junction of highways 314 and 315.

Refs.: 76 p. 93-97, 112; 234 p. 72; 235 p. 73; 307 p. 8-9.

Maps (T): 52 L/11 Flintstone Lake
(G); ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

Irgon Claim

SPODUMENE, GARNET, TOURMALINE, BERYL, APATITE

In pegmatite dyke in metavolcanics

Light green and white spodumene crystals occur in microcline-albite-quartz- muscovite pegmatite. Spodumene crystals are intergrown in quartz. Garnet, black tourmaline, white to light green beryl and blue apatite are accessory minerals.

The deposit was staked by Peter Osis in 1926. In 1956-1957, Lithium Corporation of Canada sank a shaft to 73.5 m but discontinued operations due to an unfavourable market for lithium. The occurrence is on the north side of Cat Lake. Access is by a road, 350 m long, leading north from Highway 314 at a point 21.2 km north of the junction of highways 314 and 315.

Refs.: 76 p. 93-95; 234 p. 71-72; 306 p. 14-15; 307 p. 8-9.

Maps (T): 52 L/11 Flintstone lake
(G): ER80-1-1 Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

Eagle Claim

SPODUMENE, BERYL, GARNET, APATITE, COLUMBITE-TANTALITE, TOURMALINE

In a pegmatite dyke in metavolcanics and granite

White to light green spodumene crystals occur with small greenish white beryl crystals, red garnet, and minor blue apatite and columbite-tantalite. Black and blue tourmaline have been reported. The pegmatite is composed of microcline, albite, quartz and muscovite.

The deposit was opened by several trenches in 1946. The pegmatite dykes extend about 800 m west from a granite bluff near the northwest end of Cat Lake. Access is by a road leading west 1.0 km from Highway 314 at a point 23 km north of the junction of highways 314 and 315.

Refs.: 76 p. 93-95; 234 p. 71; 307 p. 8-9.

Maps (T): 52 L/11 Flintstone Lake
(G): ER80-1-1Geology of the Cat Lake-Winnipeg River Pegmatite Field (M.M.D., 1:100 000)

New Manitoba Mine

CHALCOPYRITE, PENTLANDITE, PYRRHOTITE

In gabbro

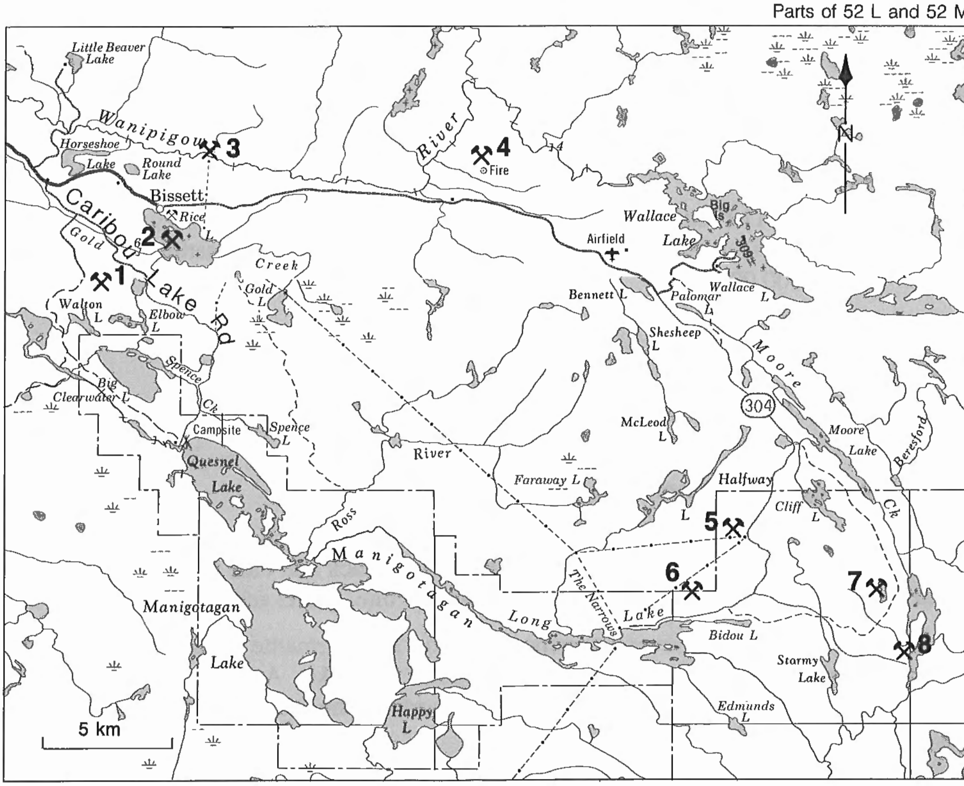
Chalcopyrite and pentlandite occur as disseminations and lenses in gabbro. Pyrrhotite is associated with these minerals.

Copper-nickel mineralization was discovered on this property in 1943 by L. Johnson, E. Buckler and S. Anderson. The deposit was explored by trenching and diamond drilling at that time. Further exploration was done from 1955 to 1957 by New Manitoba Gold Mines Limited. The work consisted of a shaft sunk to a depth of 193 m. A 900 t concentrator was in the process of construction when operations were suspended. The mine is located southwest of Cat Lake.

Road log from Highway 314 at the west end of Cat Lake, 23.0 km north of the junction of highways 314 and 315:

km	0	Proceed west along an old mine road.
	1.2	Junction; turn left (the road straight ahead leads to the Eagle claim).
	2.6	Mine.

Parts of 52 L and 52 M



Map 50. Bissett area.

1-Packsack Mine
2-San Antonio Mine
3-Vanson Mine
4-Jeep Mine
5-Central Manitoba Mine
6-Ogama-Rockland Mine
7-Oro Grande-Solo Mine
8-Gunnar Mine

Ref.: 357 p. 35.

Maps (T): 52 L/11 Flintstone Lake
(G): 49-7 Cat Lake-Winnipeg River Area, Lac du Bonnet Mining Division, Southeastern Manitoba (M.M.D., 1:63 360)

Bissett Area Occurrences

Occurrences in the Bissett area are accessible from Highway 304.

San Antonio Mine

NATIVE GOLD, PYRITE, PETZITE, CHALCOPYRITE, SPHALERITE, GALENA, TOURMALINE, MOLYBDENITE, MAGNETITE

In quartz veins in diabase

Native gold occurred as fine particles in quartz and associated with pyrite and petzite. A specimen of native gold weighing 6564 g found in the deposit in 1961 is now in the National Mineral Collection at the National Museum, Ottawa. The most abundant mineral was pyrite which occurred as disseminated grains and cubes in the veins and as abundant cubes in the wall rock. Chalcopyrite, sphalerite and galena were minor constituents of the veins. The gangue consisted of quartz with ankerite, calcite, chlorite, feldspar and tourmaline. Molybdenite and crystals of magnetite occurred in the wall rock.

Plate 70

San Antonio Mine, 1934. (National Archives Canada PA-14543)

This was the most important gold mine in Manitoba. The gold-bearing vein in the San Antonio claim was discovered and staked in May, 1911 by Alexander Desautels, two months after the original Rice Lake gold discovery was made on the adjoining Gabriella claim by Capt. E.A. Pelletier. Later, these two claims became the San Antonio Mine. Intensive exploration of the San Antonio claim began in 1926 by the Wanipigow Syndicate on veins which outcropped on the shore of Rice Lake and on an offshore island. A shaft was sunk on each of the locations. The island was later connected to the mainland by infilling with waste rock from the mine. In 1927, San Antonio Mines, Limited (later renamed San Antonio Gold Mines, Limited) began development work. Two years later, economic ore was located in vein No. 16 which was reached by No. 2 shaft, sunk on the island. A mill was built and began production in 1932 continuing until 1968 when a fire destroyed the main surface hoist room. The underground development consisted of shafts and winzes sunk to depths of 1640 m (main shaft), and 50 m and 274m (shafts used in early operations). The mine produced about 37 319 805 g of gold and 5 978 152 g of silver.

The mine is on the north shore of Rice Lake in Bissett. It is 1 km from Highway 304.

Refs.: 271 p. 495-499; 309 p. 337-350; 310 p. 2, 5-6; 314 p. 38-51; 356 p. 80-86.

Maps (T): 52 M/4 Bissett
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Packsack Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, TOURMALINE

In quartz veins in shear zone in diabase dykes in porphyritic dacite

Native gold occurred in milky quartz. Pyrite was the most common mineral in the veins; it occurred as cubes in quartz-ankerite along the wall rock. Some chalcopyrite and tourmaline were present in the vein, and magnetite in the chlorite schist wall rock.

The deposit was staked as the Montcalm claim in 1917 by Frank Simard. The gold-bearing quartz vein was exposed on the side of a hill. This claim and several adjacent claims were acquired by Packsack Mines Limited in 1934. The company explored the deposit by trenching, diamond drilling and by a shaft sunk to a depth of 152.5 m. The exploration ended in 1940.

The mine is about 800 m southwest of Little Rice Lake (Red Rice Lake), and southwest of Bissett.

Road log from Bissett:

km	0	Junction of Highway 304 and the turn-off to Bissett; proceed west along Highway 304.
	5.1	Junction; proceed south onto Caribou Lake Road.
	8.4	Junction of a trail on right; follow this trail for a distance of 1.6 km to the mine.

Refs.: 103 p. 24-26; 309 p. 337-350; 356 p. 86, 87.

Maps (T): 52 L/13 Manigotagan lake
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360).

Vanson Mine

NATIVE GOLD, PYRITE, PYRRHOTITE, CHALCOPYRITE, FUCHSITE, MAGNETITE, ZOISITE-EPIDOTE

In quartz veins in shear zones in quartzite and diabase

Native gold occurred in quartz with abundant pyrite and lesser amounts of pyrrhotite and chalcopyrite. Green mica (fuchsite), calcite and epidote were also present in the quartz. Magnetite and zoisite/epidote occurred in chlorite-sericite schist wall rock.

The deposit was worked between 1932 and 1935 by Vanson Manitoba Gold Mines Limited. Some spectacular high-grade ore was encountered during mining operations. A mill was installed at the mine and a small amount of gold was produced. Operations were from a shaft, 150 m deep.

The mine is located on the north side of the Wanipigow River, about 2.5 km northeast of Bissett.

Road log from Highway 304 at the turn off to Bissett:

km	0	Proceed west along Highway 304.
	1.4	Junction; turn right (north)
	2.5	Junction; follow the road on right.
	5.4	Mine, on the north side of the Wanipigow River.

Ref.: 309 p. 337-350.

Plate 71

Vanson Mine, 1934. (National Archives Canada PA-14550)

Maps (T): 52 M/4 Bissett
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Jeep Mine

NATIVE GOLD, ARSENOPYRITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, SCHEELITE

In quartz veins in shear zones in dioritic and gabbroic rocks

Native gold occurred as visible gold in quartz and in association with arsenopyrite. Pyrite, the major metallic mineral, occurred with pyrrhotite, chalcopyrite and some scheelite.

The mine was worked by Jeep Gold Mines, Limited, a subsidiary of San Antonio Gold Mines Limited which treated the Jeep Mine ore at its mill in Bissett. The mine was worked between 1948 and 1950 from a shaft which reached a depth of 180 m. The mine produced about 423 903 g of gold.

The mine is located between Wallace Lake and Bissett. Access to it is by a road, 1.5 km long, leading north from Highway 304 at a point 13.7 km east of the turn- off to Bissett.

Ref.: 309 p. 337-350; 310 p. 6, 7.

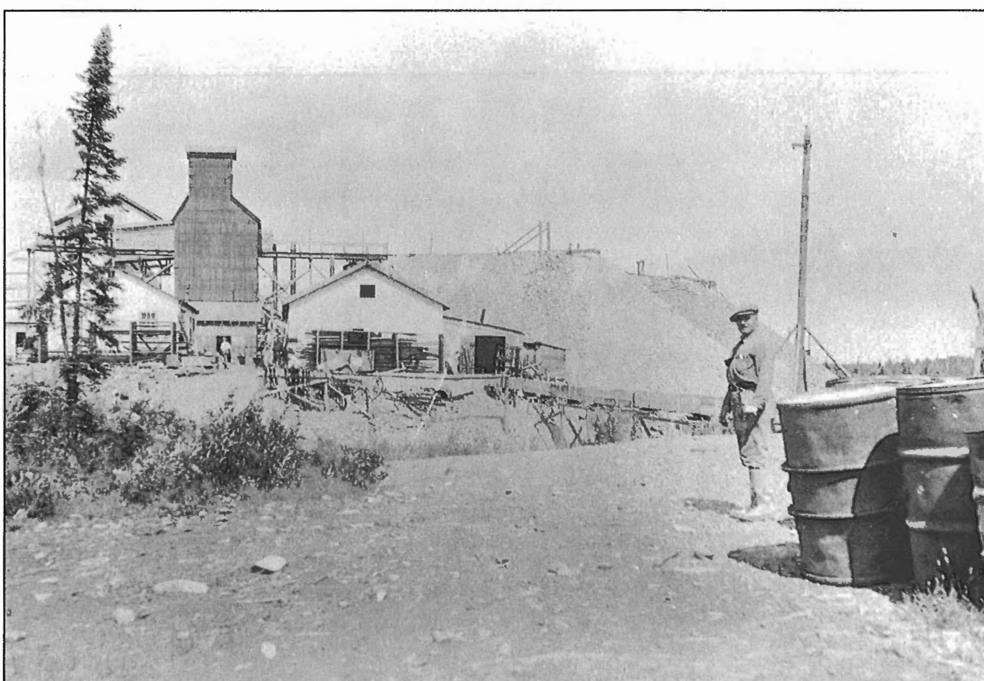


Plate 72

Central Manitoba Mine, 1929. (National Archives Canada PA-14203)

Maps (T): 52 M/3 Aikens Lake
(G): 71-1/4 Geology of the Wanipigow-River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Central Manitoba Mine

PYRITE, ARSENOPYRITE, PYRRHOTITE, CHALCOPYRITE, SPHALERITE, NATIVE GOLD, ZOISITE-EPIDOTE

In shear zones in gabbro, tuff and chert

Pyrite, chalcopyrite and pyrrhotite occurred as disseminated grains and veinlets in grey, sugary quartz. Native gold occurred as microscopic grains. Pyrite crystals and zoisite-epidote occurred in the schistose wall rock.

The mine was the first gold producer in Manitoba. Its period of operation was from 1927 to 1937. The original claims, known as the Kitchener and Growler claims were staked in 1915 by Louis Simard (for Letitia Germaine) and by George Baird respectively. Work on these and adjoining claims began in 1924-1925 by W.A.D. Syndicate and Anglo-Canadian Explorers which were amalgamated in 1925 to form Central Manitoba Mines, Limited. Intensive development of the deposit was undertaken by this company, a mill was built and production began in 1927. Eight veins were worked from five shafts extending over a distance of 1616 m in an east-west direction. The deepest shaft was the Kitchener shaft which was sunk to a depth of 277 m. The mine produced about 4 953 215 g of gold and 809 673 g of silver before ore was depleted and the mine closed.

The mine is located about 7 km northwest of Beresford Lake and about 10 km south of Wallace Lake. The former townsite of Wadhope was established near the mine. Highway 304 passes by the mine at a point 35.2 km south of the turn-off to Bissett.

Refs.: 309 p. 337-350; 310 p. 6, 8; 316 p. 46-59; 356 p. 66-74.

Plate 73

Kitchener shaft, 1927. (National Archives Canada PA-15269)

Maps (T): 52 L/14 Garner Lake
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Ogama-Rockland Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, ARSENOPYRITE, MOLYBDENITE, MAGNETITE, ZOISITE-EPIDOTE

In quartz veins in shear zones in diorite

Native gold occurred as specks in quartz veins which carried pyrite, chalcopyrite and minor sphalerite and arsenopyrite. Gold tellurides were reported from the vein. Molybdenite, magnetite, pyrite, arsenopyrite and zoisite-epidote occurred in the quartz sericite wall rock.

The deposit was staked in 1915 by William A. Quesnel, William Walton, G.B. Hall and William Ainslie. Some exploration work was done on it in 1940-1941 by Gunnar Gold Mines Limited. Ogama-Rockland Gold Mines, Limited mined the deposit in 1942, and from 1946 until 1951.

The mine consisted of two shafts: the Ogama shaft sunk to a depth of 314 m, and the Rockland shaft sunk to 83 m. The mill and several buildings including office and staff quarters, a community hall and a school at the Gunnar Mine were dismantled and moved to the Ogama-Rockland Mine in 1947. The mine produced about 1 410 303 g of gold.

The mine is located about 1.2 km north of Long Lake.

Road log from the Central Manitoba Mine:

km	0	Central Manitoba Mine; proceed south along Highway 304.
	2.9	Junction of Highway 304 (to Long Lake) and Highway 314 (to Beresford Lake); proceed toward Long Lake.
	4.4	Junction; turn right.
	6.4	Mine.

Refs.: 82 p. 44-46; 309 p. 337-350; 310 p. 6, 9; 316 p. 62-63.

Maps (T): 52 L/14 Garner Lake
(G): 71-1/4 Geology of Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Gunnar Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, GALENA, MARCASITE, TOURMALINE, FUCHSITE

In quartz veins in shear zones in basalt, andesite and porphyry

Native gold occurred as irregular grains and irregular stringers in quartz. Pyrite, the most abundant mineral, was associated with chalcopyrite, dark brown to black sphalerite, pyrrhotite, galena and marcasite. The presence of dark sphalerite was an indicator of high gold values. Black tourmaline, green mica (fuchsite), chlorite, calcite and ankerite were also present in the vein. The quartz varied from white to dark smoky grey, the darker cherty quartz giving the highest gold values. Pyrite cubes occurred in the wall rock.

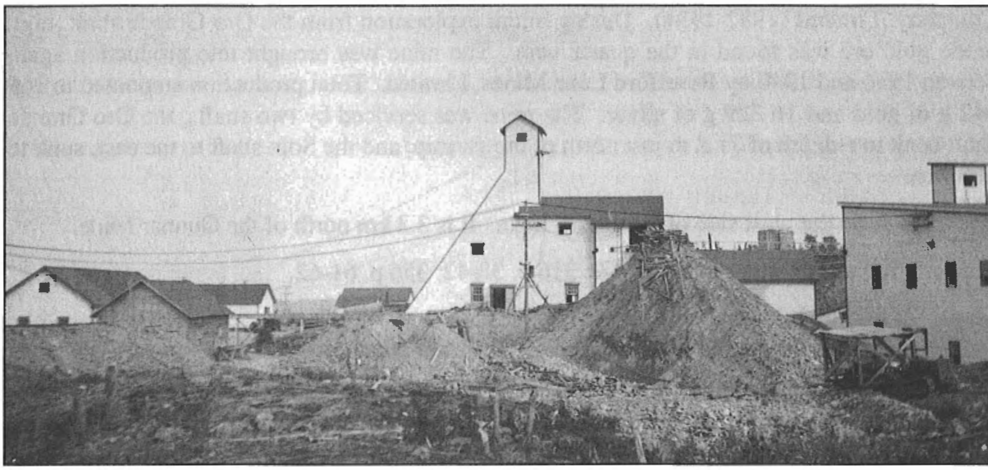


Plate 74

Gunnar Mine, 1936. (National Archives Canada PA-14910)

The claims that became the Gunnar property were staked between 1920 and 1924 by William Walton, Gunner Berg, Leo Seaberg and William Quesnel. During assessment work done in 1933, a rich surface showing of gold in quartz was discovered on the Gunnar claim. Later that year, Gunnar Gold Mines, Limited was formed and development began in 1934. A mill was installed and the first bullion was poured in June, 1936. By January, 1938, $1 million worth of gold was produced. The mine was in production until 1942 when the ore was mined out. It produced a total of about 3 155 804 g of gold. The mine was serviced by two shafts, sunk to depths of 625.3 m and 114.4 m.

The mine is on the west side of Beresford Lake and on Highway 314 at a point 7.2 km east of its junction with Highway 304. It is 10 km from the Central Manitoba Mine.

Refs.: 297 p. 406-415; 309 p. 337-350; 310 p. 6, 9; 316 p. 27-35.

Maps (T): 52 L/14 Garner Lake
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Oro Grande-Solo Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, PYRRHOTITE, SPHALERITE, HEMATITE

In quartz in a shear zone in gabbro

Native gold occurred as free gold in quartz and in association with pyrite in grey quartz. Chalcopyrite, pyrrhotite and sphalerite were also present in the quartz. The schistose wall rock contained pyrite cubes and specular hematite in a gangue of quartz, ankerite and chlorite.

The Oro Grande claim, staked in 1919 by G.H. Porter, was developed following the 1923 discovery by W.M. Dowell of a rich showing of native gold in quartz on a ridge at the edge of a swamp at the northwest end of Beresford Lake. Work was done on the Oro Grande claim and the adjoining Solo claims by various companies including Anglo-Canadian Explorers, Limited (1924-1926), Oro Grande Mines, Limited (1927-1929), and Oro Grande Development

Company, Limited (1932-1934). During initial exploration from the Oro Grande shaft, high grade gold ore was found in the quartz vein. The mine was brought into production again betwen 1936 and 1940 by Beresford Lake Mines, Limited. Total production amounted to 169 542 g of gold and 16 329 g of silver. The mine was serviced by two shafts, the Oro Grande shaft sunk to a depth of 77.8 m just north of the swamp, and the Solo shaft to the east, sunk to 160.7 m.

The mine is on the west side of Beresford Lake. It is 3.3 km north of the Gunnar Mine.

Refs.: 309 p. 337-350; 310 p. 6, 8-9; 316 p. 38-42; 356 p. 61-62.

Maps (T): 52 L/14 Garner Lake
(G): 71-1/4 Geology of the Wanipigow River-Manigotagan River Region, Winnipeg Mining District (M.M.D., 1:63 360)

Clangula Lake Quarry

MARBLE

In serpentinized peridotite

Dark green to black serpentine rock was formerly quarried east of Clangula (Goldeye) Lake. The rock is veined with magnesite, quartz and a bright green mineral. The rock was quarried in 1929 by Manitoba Marble Quarries Limited and was known as 'black marble'. The venture was abandoned because the rock was found to be too friable for use as a commercial ornamental building stone. It may be suitable for fashioning into small ornamental objects.

Clangula Lake is 8 km north of Manigotagan and about 270 km from Winnipeg. The quarry is 700 m east of the east end of Clangula Lake to which it is connected by a trail.

Refs.: 107 p. 169; 288 p. 14, 21.

Maps (T): 62 P/1 English Brook
(G): 48-3 English Brook Area, Rice Lake Division, Manitoba (M.M.D., 1:31 680)

The main road log along Highway 1 (Trans-Canada Highway) is resumed.

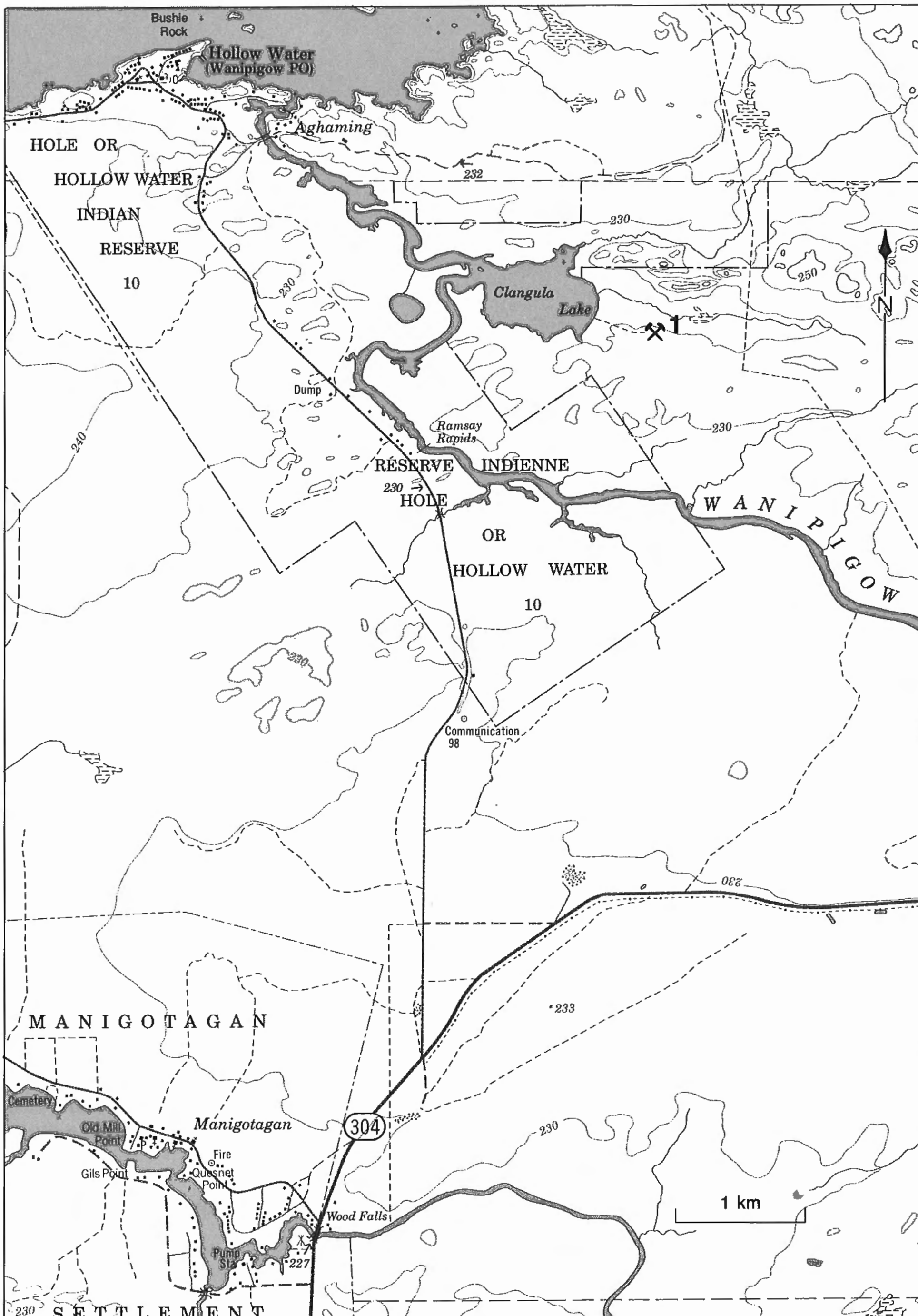
km 114 Junction of Highway 12.

Garson Quarry

DOLOMITIC LIMESTONE

In Red River Formation of Ordovician age

A decorative mottled limestone known as Tyndall stone, Garson Stone and Manitoba Tapestry stone occurs in the Garson-Tyndall area. The rock is mottled in a tapestry-like pattern. It contains abundant fossils including cephalopods, gastropods, stromatolites, and sunflower, honeycomb, chain and horn corals. Two varieties of limestone occur: one with an ivory to cream-white background with yellowish brown mottling, the other with a light grey to bluish grey background and grey-brown mottling. The groundmass is composed of compact calcite and the mottling is composed of a compact mass of dolomite rhombs cemented by calcite with hematite and goethite impurities which contribute to the darker colour. Calcite, which replaces fossils, fluoresces amber-yellow in ultraviolet light. Tyndall limestone has long been regarded



Map 51. Clangula Lake quarry.

1-Clangula Lake Quarry.

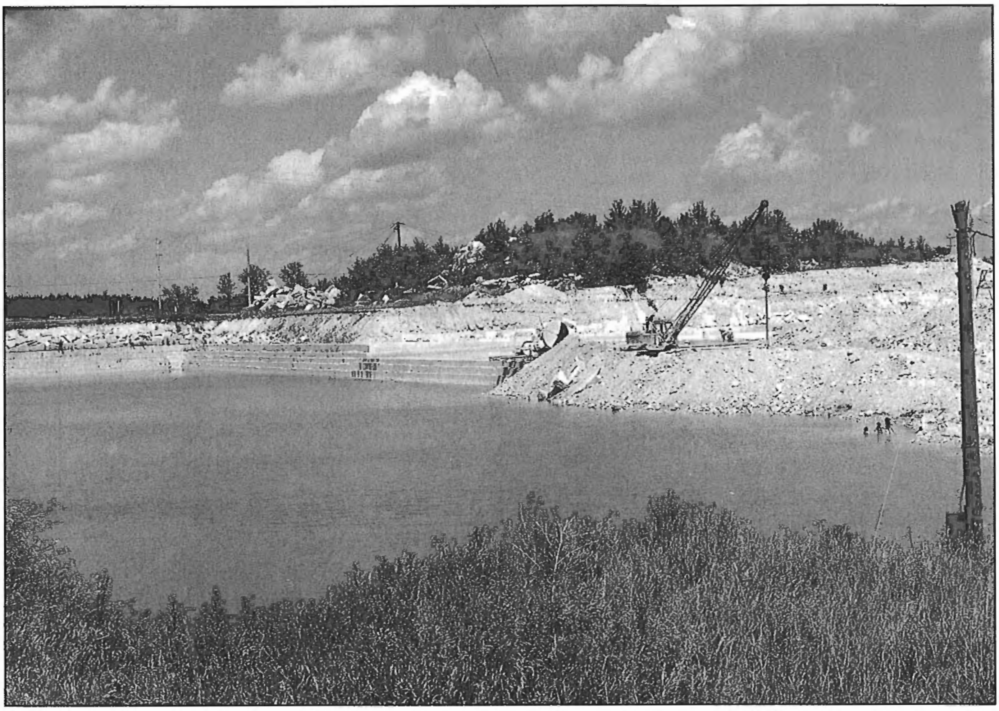


Plate 75

Garson quarry, 1974. (GSC 163091)

as the best building stone in western Canada and one of the finest in Canada. Examples of its use as an interior and exterior decorative building stone can be seen in numerous buildings across Canada, including the Saskatchewan and Manitoba legislative buildings, and most notably in the Parliament Buildings in Ottawa where it clads the walls of the entrance and main foyer of the Centre Block. Its more recent use is in the National Capital Region as the exterior stone in the Canadian Museum of Civilization which was nearing completion in 1988 as this report was going to press.

The mottled limestone was first noted in 1823 by Major Long in an outcrop on the west bank of the Red River in Lower Fort Garry. It was first quarried in 1832 for use in the construction of the fort and warehouses at Lower Fort Garry. The quarries in the Garson-Tyndall area began operations in about 1896, and building stone has been produced from the area continuously since then. The Garson quarry, now operated by Gillis Quarries Limited, has been in operation since 1898.

The Garson quarry is located in Garson, about 40 km northeast of Winnipeg, and 50 km north of the Trans Canada Highway (No. 1) junction with Highway 12.

Refs.: 7 p. 50; 107 p. 167-168; 142 p. 19-27; 243 p. 40-66.

Maps (T): 62 I/2 Selkirk
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

km 142 Highway 1 bridge over the Red River Floodway.

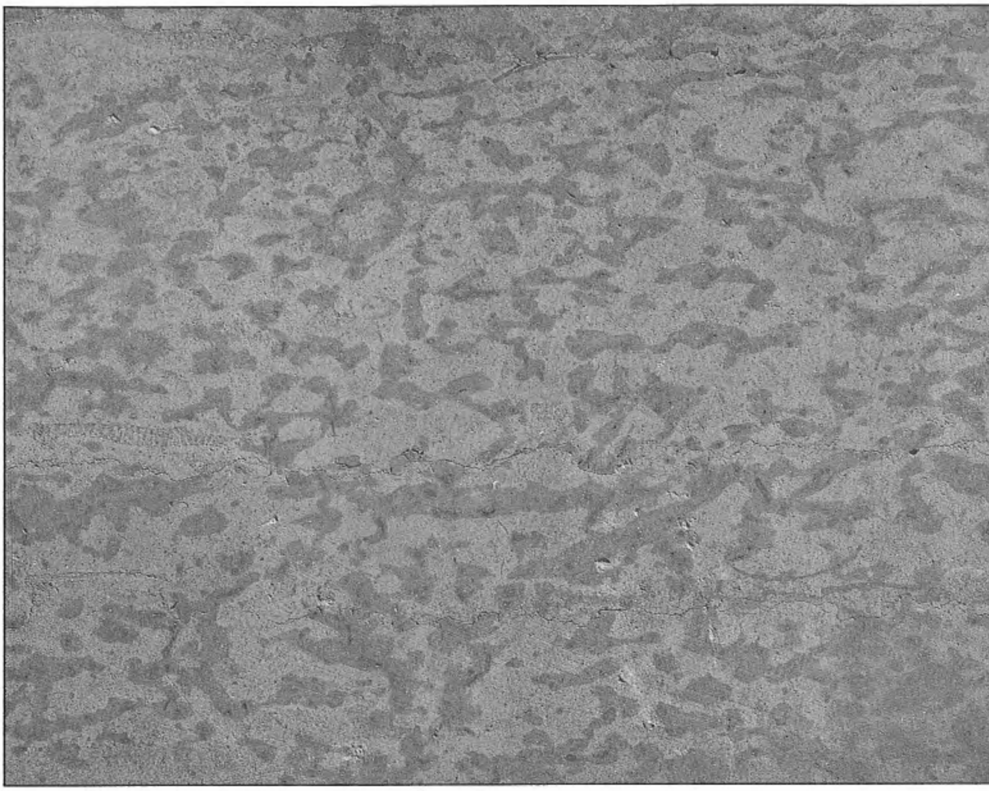


Plate 76

Tyndall limestone. (GSC 163079)

Floodway Selenite Occurrences

SELENITE, ANHYDRITE, CHERT

In clay

Selenite was first noted in the clay beds in the vicinity of Winnipeg during excavation of the Red River Floodway which was completed in 1968. Since then, the Floodway has provided numerous collecting sites for selenite of various forms, including museum-type specimens. Selenite occurs as individual blade-like and tabular crystals ranging from microscopic to several centimetres in length. Aggregates of crystals are of various shapes including spherical and elongated rosettes with crystals radiating from a central core, and tablets formed of random layers of blade-like crystals. The rosettes range from a few millimetres to about 12 cm in diameter. Selenite varies from colourless and transparent to grey and amber with varying transparency. Nodules of white, grey, pinkish grey and amber gypsum, white anhydrite and chert are also found in the clay.

The selenite crystals occur randomly in yellowish grey to yellow lacustrine clay beds consisting of silt and clay which were deposited in the deep waters of glacial Lake Agassiz during Pleistocene time. The clay beds are up to 18 m thick. Bedrock beneath the Pleistocene deposits consists of Ordovician limestone. Selenite is found in depths ranging from just below the surface to about 3 m. It is recovered by digging with garden spades or forks. A long blade, screw-driver or rigid wire is used to probe into the clay to locate crystals or "seams" in which concentrations of crystals occur. The crystals are liberated from the clay matrix by soaking the specimens in water.

The Red River Floodway is a 47.3 km diversion for the Red River, extending from just south of Winnipeg to Lockport. The Trans Canada Highway bridges it at km 142. Collecting sites include areas in the vicinity of the Trans Canada Highway and Highway 15 bridges, and the Canadian National and Greater Winnipeg Water District railway bridges. Collectors are required to fill their excavations before leaving the site.

Plate 77

Selenite crystals, Winnipeg Floodway. The specimen is 8 cm high. (GSC 203035-R)

Refs.: 211; 257 p. 30.

Maps (T): 62 H/14 Winnipeg
62 H/15 Dugald
(G): AR80-1 Quaternary Geology and Sand and Gravel Resources of the Rural Municipality of Springfield (M.M.D., 1:50 000)

km 142.8 Winnipeg, at the junction of Perimeter 101. Occurrences north, west and south of Winnipeg are described in the text that follows.

Lilyfield Quarry

LIMESTONE

Attractively mottled dolomitic limestone suitable for ornamental purposes occurs in this inactive quarry. The rock is buff-coloured with pale yellow, orange-yellow and purplish red mottling in swirled patterns. It takes a good polish. The rock is the Gunton member, Stony Mountain Formation of Ordovician age.

Similar rock occurs at a quarries located west of Highway 7. The roads to these quarries lead west from Highway 7 at points 0.5 km and 1.6 km north of the junction of highways 7 and 67.

The Lilyfield quarry was formerly operated by the Winnipeg Supply and Fuel Company, Limited. It is located south of Stony Mountain.

Road log from Winnipeg:

km	0	Junction of Highway 7 and Perimeter 101; proceed north along Highway 7.
	4.8	Junction; turn left (west)
	7.0	Quarry, on the right (north side of the road).

Ref.: 107 p. 170.

Maps (T): 62 I/3 Stonewall
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Stony Mountain Quarry

FOSSILS, CALCITE CRYSTALS, CHERT

In dolomitic limestone

Ordovician limestone of the Stony Mountain Formation forms a 6-m cap on a shale hill (Stony Mountain) that rises 18 m above the surrounding plain. The hill measures about 800 m across and its cap is cut by a northwest-trending valley. It rises in steep cliffs on the north and west sides, and slopes gently on the east side. The rock forming the cap is quarried on the northwest side of the hill.

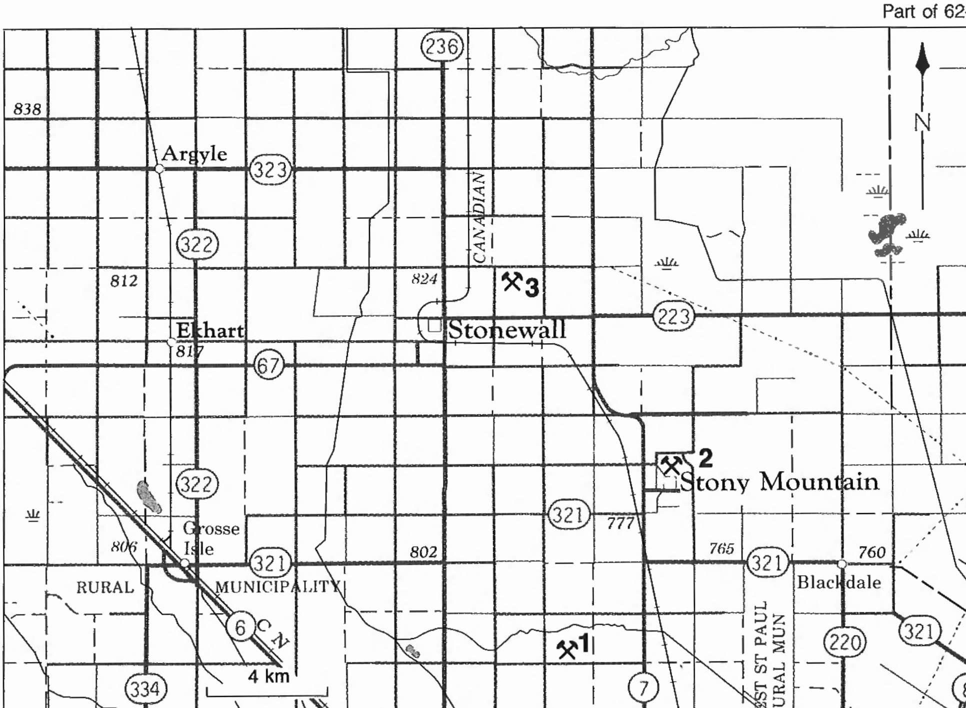
The quarry exposes three members of the Stony Mountain Formation. The Stony Mountain shale member is exposed in the lower 3 m of the quarry. It consists of grey to purple-grey argillaceous limestone interbedded with red calcareous shale. This member is rich in fossils. Above it, the Penitentiary member is exposed in the next 5 m. It consists of yellow to greyish green, reddish brown and purple argillaceous dolomitic limestone, and some yellowish calcareous shale. This rock is attractively mottled in these various colours and, at one time, was used as a building stone. It is also fossiliferous. The upper 15 m of the quarry exposes the Gunton member consisting of a hard, fine grained dolomitic limestone in various shades of yellow grading to reddish at the top. It includes a mottled variety consisting of alternating concentric red and greyish green bands in a swirled pattern. This member contains chert nodules, has numerous small cavities, and few fossils. It polishes well and makes an attractive decorative stone. The Stony Mountain shale and Pententiary members are rich in fossils, including coelenterates, echinoderms, bryozoa, brachiopods, pelecypods, gastropods, cephelopods and trilobites. White calcite replaces the fossils, it fluoresces white in 'short' ultraviolet light. 'Micro' crystals of colourless to white calcite (dog-tooth spar) occur in cavities which measure up to 2 cm across.

The quarry and crushing plant are operated by the City of Winnipeg Primary Materials Division for use as crushed stone and for asphalt filler. It is located in Stony Mountain. It is reached by proceeding north along Highway 7 for a distance of 11.5 km from its junction with Perimeter 101.

Refs.: 7 p. 18-21, 32-34; 107 p. 168-172; 142 p. 33-36.

Maps (T): 62 I/3 Stonewall
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Part of 62-I



Map 52. Stonewall-Stony Mountain.

1-Lilyfield Quary 2-Stony Mountain Quarry 3-Lillie's Farm Quarry

Stonewall Quarries

PYRITE, GOETHITE

In dolomitic limestone of Ordovician age

Dolomitic limestone of the Stonewall Formation forms a resistant cap, about 3 m thick, on a low circular mound measuring about 1.5 km in diameter. The mound is a remnant of glacial erosion which produced the surrounding plains. Quarrying began at the Gunn property in 1880. By 1905, five quarries were operating; they were known as Irwin's, Fallbrook's, William's, Patterson's and Gunn's quarries. The limestone was used to produce building stone, crushed stone, dolomite for chemical use, and white dolomitic lime. The stone was used for the construction of several buildings in Stonewall.

The limestone which is exposed in the quarry is hard, fine grained and compact. It varies in colour from cream-white to greyish yellow, greenish grey to grey, and pinkish buff. Some is mottled in these colours. Cavities in the limestone contain pyrite, as individual crystals, as crystal aggregates and as small nodules. Some of the pyrite is altered to goethite retaining the crystal form of pyrite.

The original quarries were acquired at various times by Winnipeg Supply and Fuel Company Limited. From 1927 to 1967, when quarrying ended, this company was the sole operator in Stonewall. It also operated five lime kilns and a crusher.

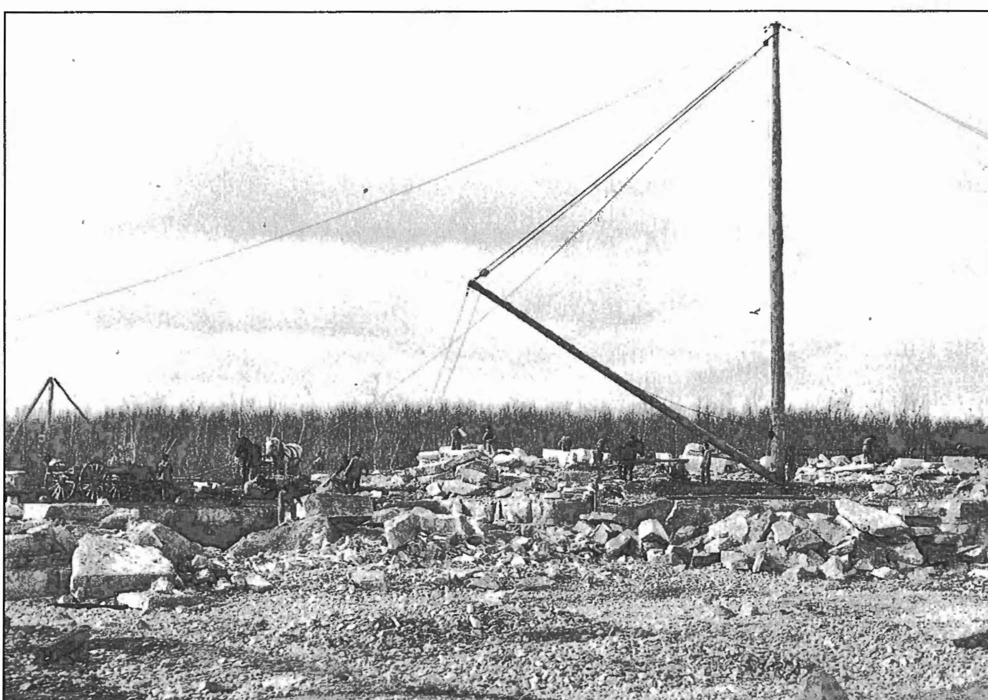


Plate 78

Gunn's quarry, 1897. (National Archives Canada PA-53618)

The quarries were located on the north and east sides of Stonewall. The Irwin quarry was at the west end and on the north side of Kimsey Street. It is now a park. Adjoining it to the east was the William's quarry and, south of this one, was the Fulbrook quarry on Lilly Street between Jackson and Hickey avenues. The second William's quarry was on the opposite side of Hickey Avenue, and south of it (at Young Street and Hickey) was the Patterson quarry. The Gunn quarry was on Hickey Avenue between Young and Rothwell streets.

Refs.: 7 p. 55; 107 p. 169-171; 142 p. 36-40; 352 p. 43-47.

Maps (T): 62 I/3 Stonewall
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Lillie's Farm Quarry

LIMESTONE

Ordovician limestone of the Stony Mountain Formation, Gunton member, was formerly quarried at Lillie's farm, northeast of Stonewall. The rock is buff- coloured and faintly mottled in reddish tones. It is an attractive decorative stone. The quarry was operated from 1957 to 1967 by Winnipeg Supply and Fuel Company, Limited. The rock was used to produce high magnesian lime.

The quarry is located along the road leading west from Highway 7 at a point 1.6 km north of the junction of highways 7 and 67. It is on the south side of the road and 2.8 km west of Highway 7.

Ref.: 107 p. 136, 170.

Maps (T): 62 I/3 Sonewall
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Interlakes Area Occurrences

Occurrences in the Interlakes region – the area between lakes Winnipeg and Manitoba – are accessible from Highway 6.

Oak Point Quarry

FOSSILS

In limestone

Mottled Devonian limestone of the Elm Point Formation is exposed in an inactive quarry north of Oak Point. The limestone is buff coloured with light brown mottling and contains well preserved brachiopods (*Atrypa arctica*).

The quarry was worked in the 1920s by David Bowman for lime and for crushed stone. It is located on the east side of Highway 6 at a point 2.4 km north of its junction with Highway 511. It is about 85 km northwest of Winnipeg.

Refs.: 5 p. 16; 12 p. 41-43; 142 p. 55-56.

Maps (T): 62 J/9 Lundar
(G): 65-1 Geological map of Manitoba (M.M.D. 1:1 267 200)

Lundar Quarries

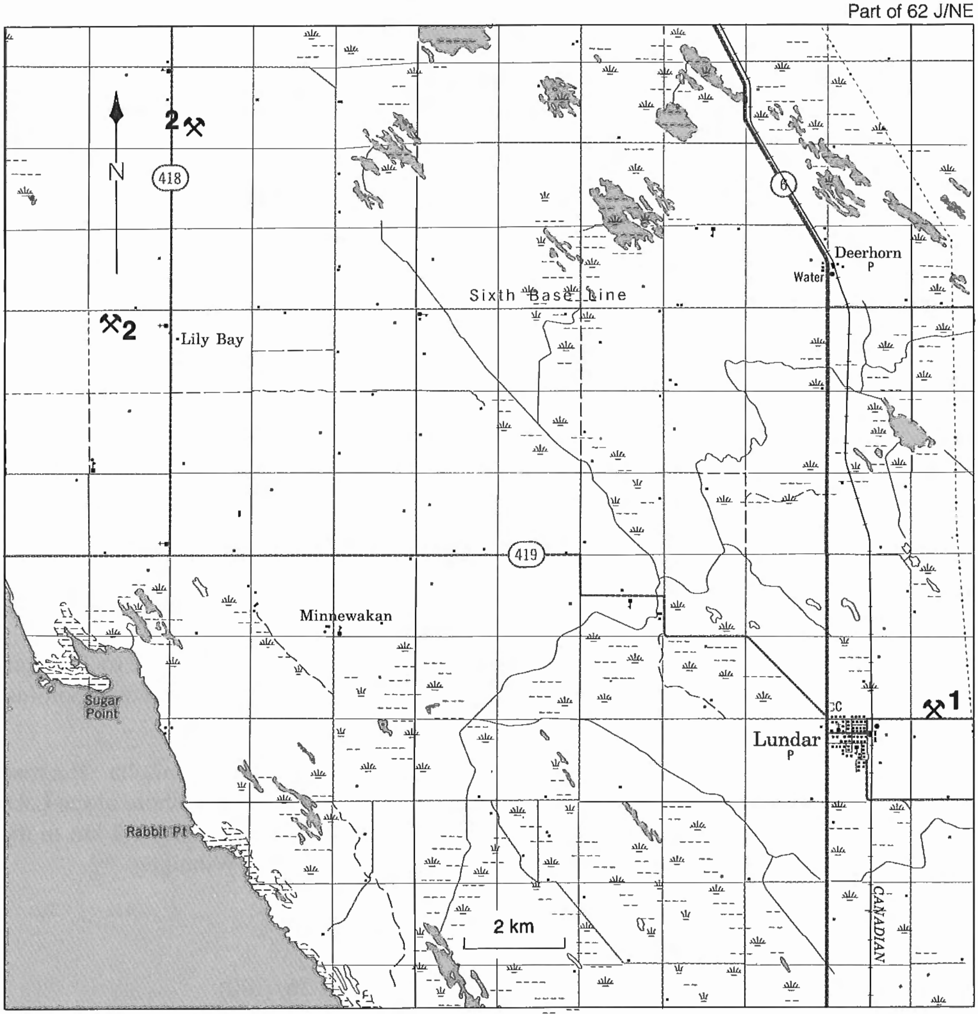
FOSSILS

In limestone

Dolomitic limestone of the Silurian Interlake Group, Cedar Lake member is exposed in two formerly operated quarries. The limestone is pale greyish yellow, richly fossiliferous and contains red argillaceous bands. Stromatoporoids are the most abundant fossils; also abundant are tetracorals, favosite colonies and crinoid columnals.

The quarries are located on both sides of Highway 419 at a point 2 km east of its junction with Highway 6 in Lundar which is about 95 km northwest of Winnipeg. The quarry on the north

Part of 62 J/NE



Map 53. Lundar, Lily Bay quarries.

1-Lundar quarries 2-Lily Bay quarries

side of the road was operated in 1966, the one on the south side, in about 1940. The limestone was used for road metal.

Ref.: 213 p. 25-26.

Maps (T): 62 J/9 Lundar
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Lily Bay Quarries

FOSSILS

In limestone

Quarries formerly operated near the village of Lily Bay expose limestone of the Devonian Elm Point Formation. At the quarry operated by Canada Cement Lafarge Limited between 1971 and 1975, the limestone is light yellowish grey with brown mottling. Buff-coloured limestone with medium brown to chocolate brown mottling is exposed in a quarry opened in 1970 by the Manitoba Department of Highways for road construction. This limestone is fossiliferous and contains brachiopods, gastropods and crinoid stems.

Access to Lily Bay is by a road leading west from Highway 6 at a point 0.8 km south of Deerhorn. Lily Bay is at the junction of this road and Highway 418 and is 13.2 km from Highway 6. The Canada Cement Lafarge quarry is 1.3 km west of Lily Bay and on the south side of the road. The Department of Highways quarry is 0.5 km east of Highway 418 at a point 3.8 km north of Lily Bay.

Ref.: 12 p. 14, 47-49.

Maps (T): 62 J/16 Eriksdale
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 167 200)

Rosehill Quarry

FOSSILS

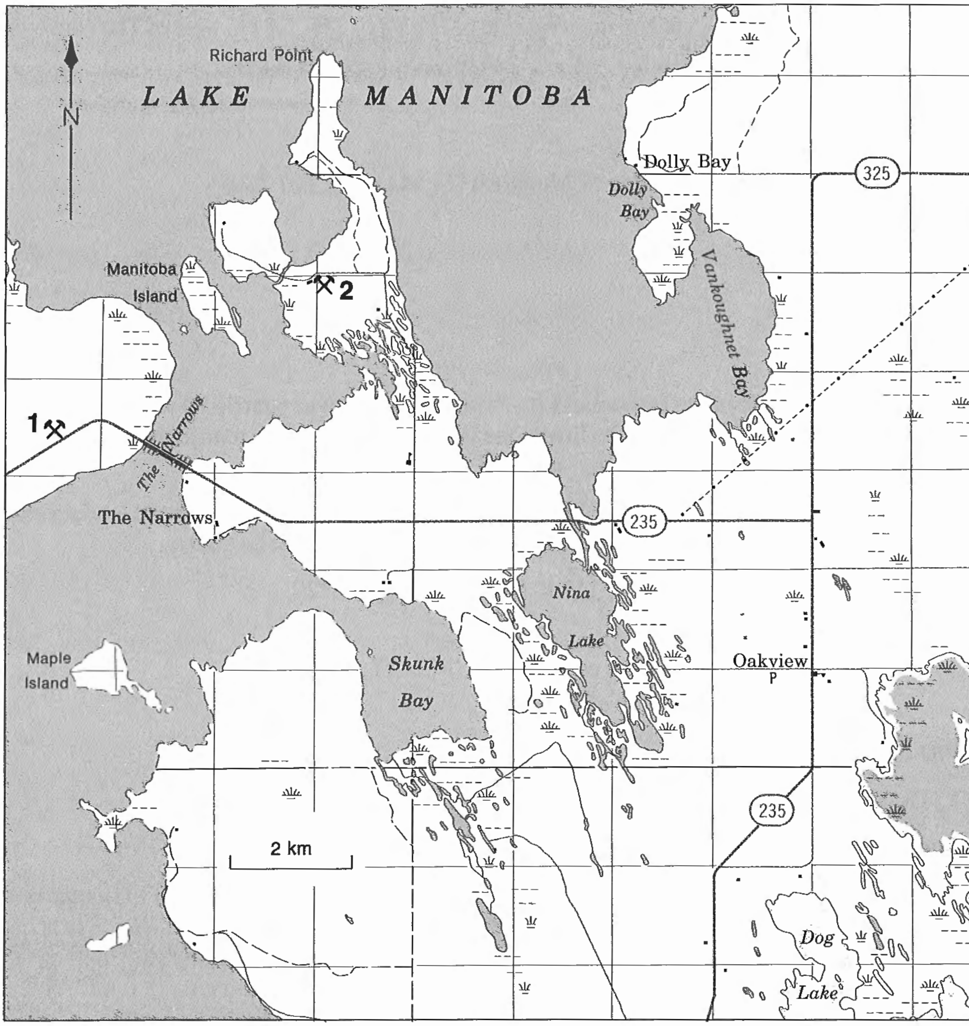
In limestone

Devonian limestone of the Winnipegosis Formation is exposed in this quarry. The rock is light yellowish brown and fossiliferous. Fossils found in the limestone include stromatoporoids, corals, crinoids, brachiopods and cephalopods.

The quarry is located near Richard Point, northeast of the Narrows of Lake Manitoba. The road to the quarry leads north from Highway 235 at a point 4.0 km east of the east shore of the Lake Manitoba Narrows. This road leads north 4.3 km, then turns west continuing 1.2 km to the quarry on the south side of the road. The quarry is about 205 km from Winnipeg.

Refs.: 5 p. 25-31; 213 p. 27-28.

Maps (T): 62 O/2 Ebb and Flow
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)



Map 54. Rosehill, The Narrows quarries.

1-The Narrows quarry   2-Rosehill quarry

The Narrows Quarry

FOSSILS

In limestone

Fossiliferous dolomitic limestone of the Devonian Winnnipegosis Formation was formerly quarried just west of The Narrows, Lake Manitoba. The rock is pale orange-brown and is a coquina type, consisting of abundant fossils and fossil fragments. Included are brachiopods, bryozoa, corals, pelecypods, gastropods and crinoids.

The limestone was quarried in 1964 by the Manitoba Department of Highways as a source of road metal. The quarry is located on the west side of Highway 235, 1.4 km west of The Narrows of Lake Manitoba. The locality is about 205 km northwest of Winnipeg.

Ref.: 213 p. 48-49.

Maps (T): 62 O/2 Ebb and Flow
(G): 65-1 Geological Map of Manitoba (M.M.D., 1;1 267 200)

Spearhill Quarry

FOSSILS

In limestone

High-calcium limestone of the Devonian Elm Point Formation was quarried from 1913 to 1976 for chemical limestone and lime. The limestone is mottled with a buff matrix and light brown mottling. Brachiopod fossils have been reported from the quarry.

The quarry is located at Spearhill, 177 km northwest of Winnipeg. A 7.7 km road leading east from Highway 6 at a point 1.5 km northwest of Moosehorn reaches the quarry.

Refs.: 5 p. 15-16; 12 p. 17, 50-52; 142 p. 58-60; 243 p. 121-122.

Maps (T): 62 O/8 Moosehorn
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Steep Rock Quarry

PYRITE, MARCASITE, FOSSILS

In limestone

Pyrite occurs as clusters of crystals associated with marcasite nodules in green to orange and brown clay which occupies cone-shaped solution cavities in limestone. Crinoid stems also occur in the clay. The limestone is light grey to yellowish grey with darker mottlings and belongs to the Elm Point Formation of Devonian age. In places, it is oolitic and abundantly fossiliferous. The fringed brachiopod, *Atrypa arctica*, is the most abundant fossil in the formation. Corals, cephalopods, gastropods, trilobites and stromatoporoids also occur in the limestone. Calcite occurs in vugs and veins in the rock.

The quarry has been operated since 1912. The original operation was on the shore of Lake Manitoba, north of the plant. The quarry is operated by Canada Cement Lafarge Limited for use in making Portland cement.

The quarry is located on the northeast side of the village of Steep Rock which is connected to Highway 6 by Highway 239. It is about 240 km northwest of Winnipeg.

Refs.: 5 p. 12-17; 12 p. 13-14, 52-53; 142 p. 64-66; 243 p. 122-124.

Maps (T): 62 O/7 Steep Rock
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

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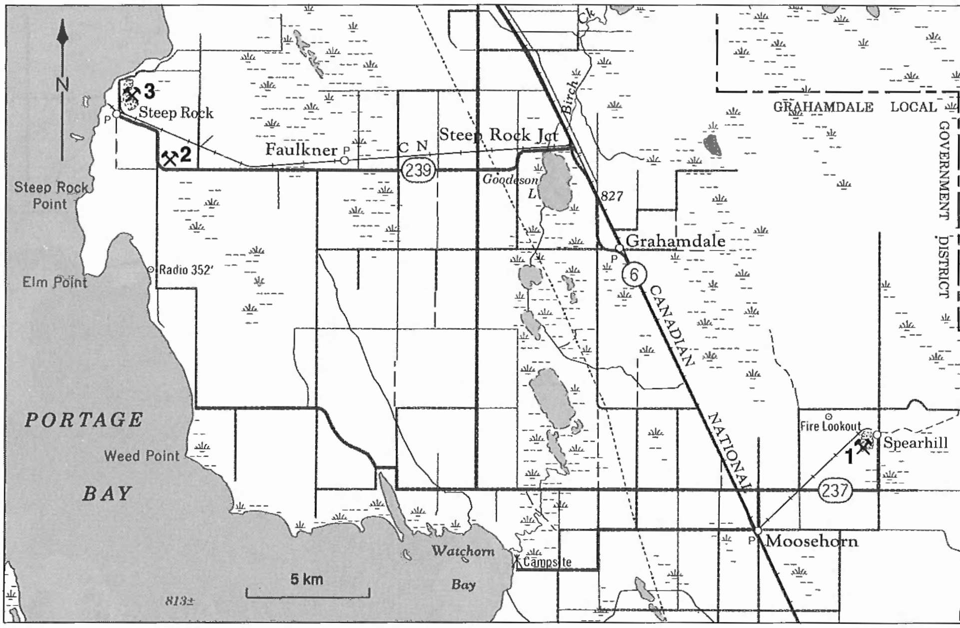


Map 55. Steep Rock area.

1-Spearhill quarry 2-Faulkner quarry 3-Steep Rock quarry

Faulkner Quarry

High-calcium limestone of the Devonian Elm Point formation is quarried by Steel Brothers Canada Limited for lime. The limestone is buff with medium brown mottling and is similar to the nearby Steep Rock deposit.

The quarry is 6.4 km west of Faulkner and 3.2 km southeast of Steep Rock. The quarry road leads north from Highway 239 at a point 16.4 km west of its junction with Highway 6.

Ref.: 12 p. 17-18, 52-55.

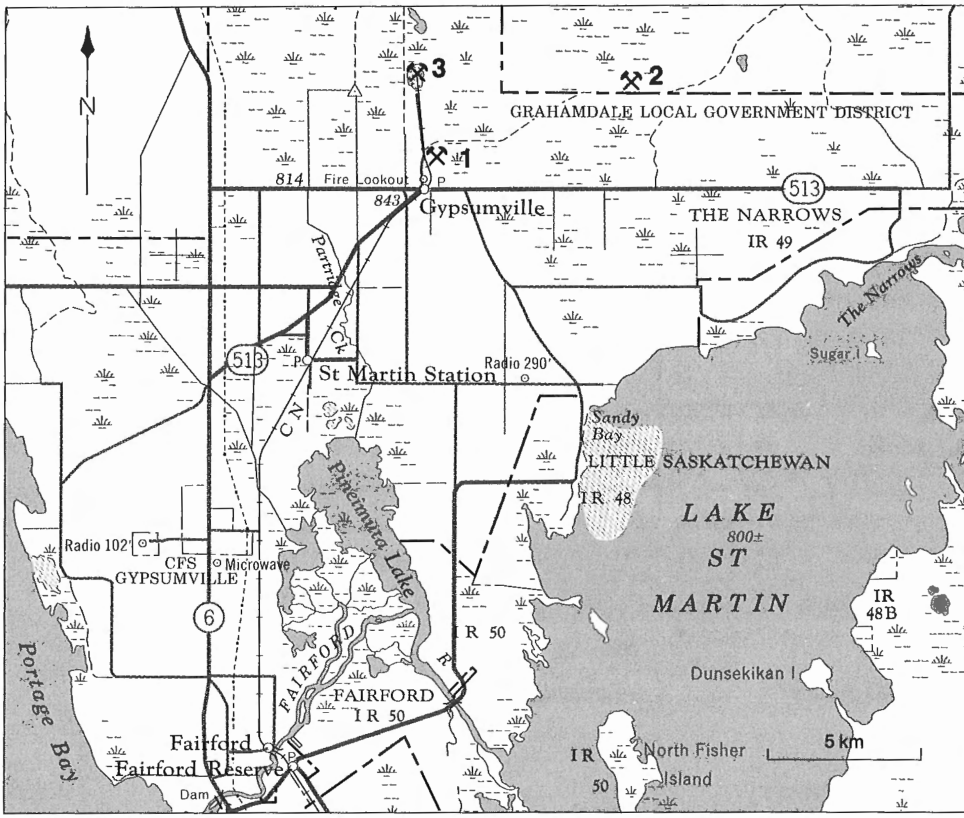
Maps (T): 62 O/7 Steep Rock
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Gypsumville Quarries

GYPSUM, ANHYDRITE

In shale and sandstone of the Amaranth Formation

White to reddish, granular, massive gypsum containing veinlets of white fibrous gypsum (satin spar) occurs in quarries at Gypsumville. One of the quarries, the Elephant Hill quarry, produces snow-white, finely granular massive gypsum which is referred to as alabaster, a variety used for sculpture and carving. Colourless transparent gypsum (selenite) occurs as plates measuring up to 60 cm across. Bluish white translucent anhydrite is associated with gypsum. About 28 m below the quarry floor (Old Gypsumville quarry), a 1-m-thick bed of glauberite was located by drilling.



Map 56. Gypsumville quarries.

1-Old quarry 2-Elephant Hill quarry 3-New quarry

The Gypsumville deposits occur in a ridge almost 5 km long, rising 5 m to 20 m above the surrounding plains. The ridge extends north from Gypsumville. Gypsum also occurs in a hill northeast of the town. Outcrops of compact snow-white gypsum in sinkholes and caves along the ridge were first reported by Geological Survey of Canada geologist J.B. Tyrrell following his investigation of the area in 1888. The occurrences were known earlier to local Indians who hunted hibernating bears that retired to the caves in winter. To reach their prey, the Indians enlarged the openings of the caves with axes, exposing the white gypsum. They were familiar with the lamellar masses of selenite which occurred in the massive gypsum, particularly at Elephant Hill, and referred to the platy masses as mica. The long gypsum ridge north of Gypsumville was the original gypsum quarrying location in Manitoba.

The exploitation of the deposits was the result of a one-man search for a commercial source of gypsum in Manitoba for use as plaster in building construction to replace imported material. The man who undertook the search was J.R. Spear, a railroad surveyor. He studied Tyrrell's geological report and map, and eventually contacted an Indian from the Fairford Indian Resrve who was reported to know of a "mica" occurrence in the Lake St Martin area. Mr. Spear suspected that the "mica" was probably selenite, and visited the occurrence. His suspicions were confirmed and he staked the ground. This was in the summer of 1900. He then convinced the directors of the Manitoba Union Mining Company, Limited, of which he was president, to

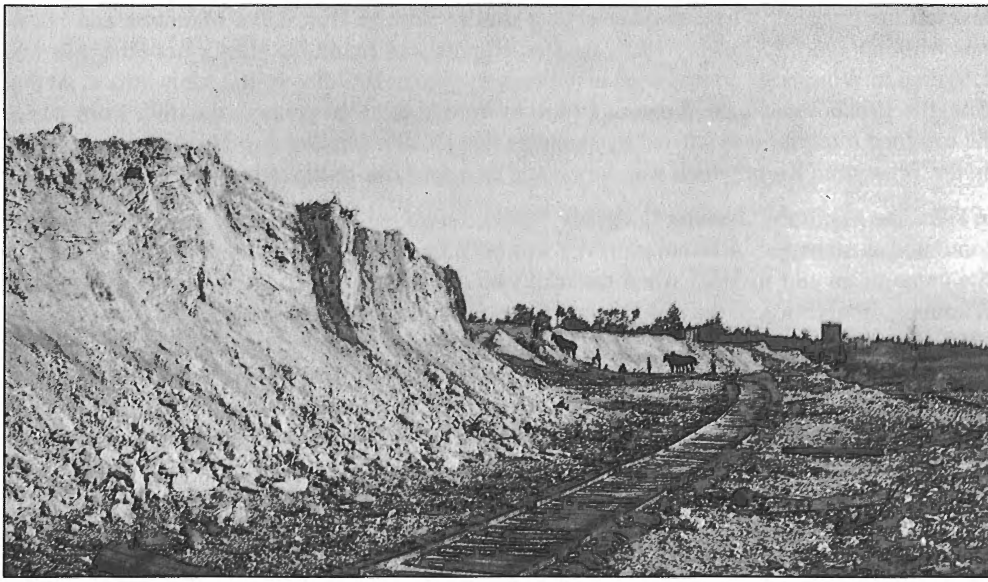


Plate 79

Gypsumville quarry, 1904-1910. (National Archives Canada PA-45539)

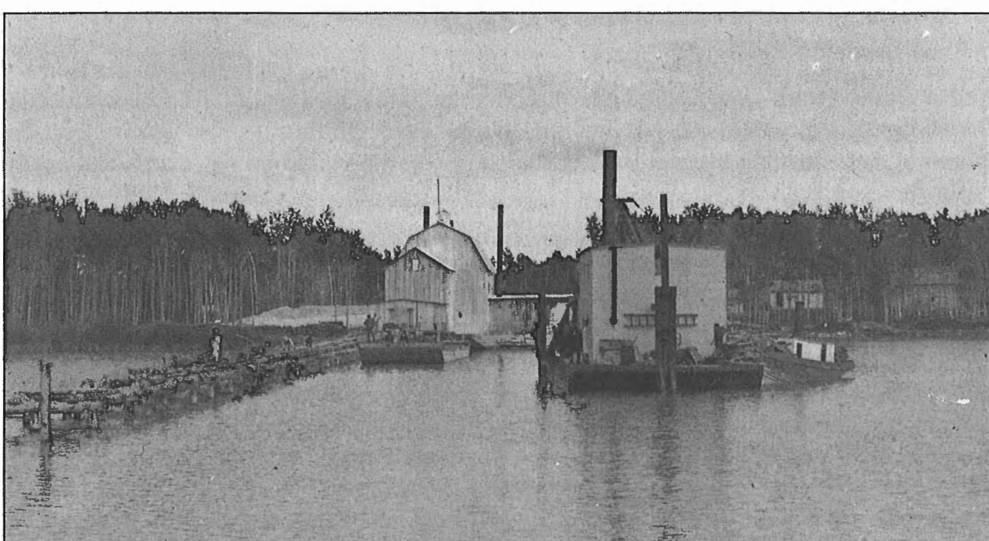


Plate 80

Plaster mill near Davis Point, Lake Manitoba, 1902. (National Archives Canada PA-136282) develop the deposit. The company built a mill at Portage Bay, Lake Manitoba and began quarrying operations. In May 1901, the first shipment of Manitoba plaster from the mill was delivered to Winnipeg and was used in building the Baker Building at 468 Main Street. At that time, the gypsum was hauled over a 19-km bush road from the mine to the mill, from which the calcined material was carried by steamers down Lake Manitoba to Mc Arthur's Landing on the Whitemud River which was connected by a spur line to the railway at Westbourne.

In 1904, the Manitoba Gypsum Company, Limited acquired the quarry and mill, and Mr. Spear continued as manager. A steam tramway was built from the quarry to the mill. Milling at that site came to an end in 1905 when the mill was destroyed by fire. A new mill was built in Winnipeg. Freighting of the raw gypsum by tramway and steamboats continued until January 1910 when the first train pulled into the quarry for its first shipment. The settlement of Gypsumville which was located at the mill-site on Portage Bay was relocated to the quarry site. In 1928, Gypsum, Lime and Alabastine (Canada) Limited took over operations until 1959 when the company was sold to Dominion Tar and Chemicals Limited, now Domtar Inc., the current operator.

The original quarry, referred to as the Old Quarry, is at the south end of the gypsum ridge, just north of the town of Gypsumville. In 1953, the New Quarry was opened at the north end of the ridge, about 5 km north of Gypsumville. The Elephant Hill quarry is 6.4 km east of the Old Quarry. Gypsumville is on Highway 513, northeast of its junction with Highway 6, about 255 km northwest of Winnipeg.

Refs.: 9 p. 5, 30-37; 13 p. 1, 4-6; 83 p. 47-50; 111 p. 20-23; 336 p. 354-357.

Maps (T): 62 O/15 Gypsumville
(G): 80-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Cedar Lake Occurrence

AMBER

In beach debris

Amber was collected from Cedar Lake beaches prior to the flooding of the beaches when the Grand Rapids hydro dam was put into operation in 1965. In time, as new beaches become stabilized, it is possible that amber fragments may be washed up by wave action to newly established beaches.

Cedar Lake amber occurred as grains, fragments and as nodules about the size of a robin's egg. It is yellowish brown to deep orange and, less commonly, straw yellow. It is transparent and contains well-preserved fossils including beetles, flies, spiders, aphids and midges. The fossils are small, generally less than 2 mm long. These fossil species which date back to the Cretaceous period, about 70 million years ago, are similar to present-day insects of Australia, New Zealand and South Africa. The climate and ecological conditions in which these insects lived were probably similar to those of Florida today. Most of the amber recovered from Cedar Lake was in the form of small fragments; some of it was large enough to be cut and polished into cabochons. The National Mineral Collection of the National Museum of Canada contains several oval cabochons measuring up to 21 mm long, and the gem collection of the Royal Ontario Museum includes a necklace of round beads and an oval cabochon measuring 23 mm long.

Cedar lake amber is the retinite variety of fossil resin, similar to amber from the Dominican Republic and Burma. Baltic amber contains succinic acid and is classified as a succinite resin.

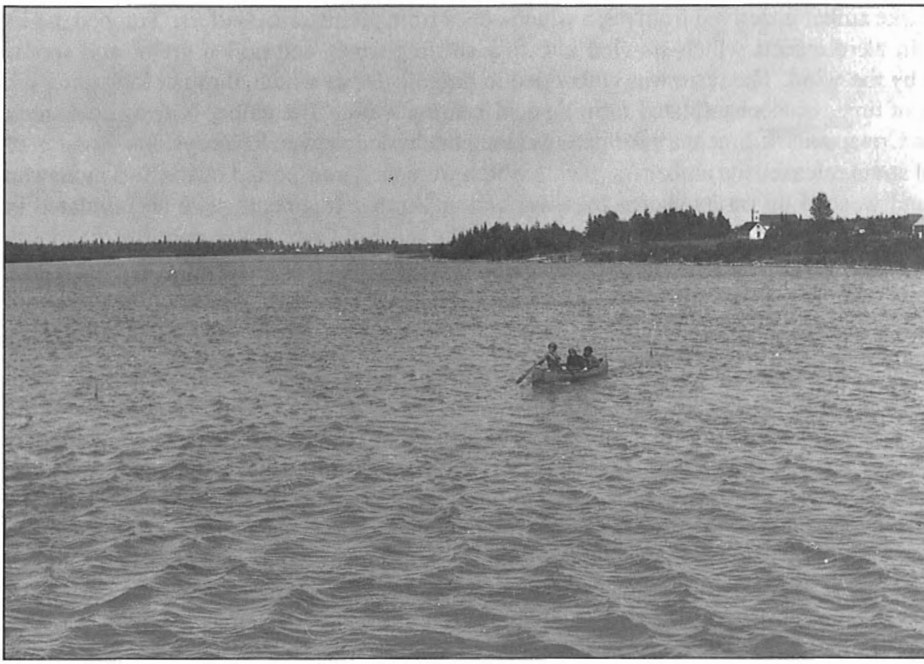


Plate 81

Chemahawin, the former Hudson's Bay Company trading post on the shore of Cedar Lake, c 1920. (National Archives Canada PA-41462)

Plate 82

Joseph B. Tyrrell field party in the Riding Mountain-Duck Mountain area, 1887. Tyrrell, of the Geological Survey of Canada, mapped much of Manitoba, including the Interlakes area, Stony Mountain and the northwestern part of the province. (National Archives Canada PA-50843)

Cedar Lake amber is derived from resin which oozed from prehistoric conifers. Trapped in this soft resin were insects which crawled into it, plant fragments, and pollen grains and spores carried by the wind. The resin was embedded in organic debris which, through long geologic periods of time, was consolidated forming coal-bearing strata. The amber-bearing coal strata occur in Cretaceous sedimentary formations along the Saskatchewan River system. Erosion of the coal strata released the amber fragments which were then transported by the Saskatchewan River and washed up on its shores by wave action. Amber fragments were accumulated in various sheltered beaches, the most important was the shore of Cedar Lake, opposite the mouth of the Saskatchewan River. At this site and at all others in which amber was found, the amber fragments were mingled with shells, coal fragments, sand and, most characteristically, with woody debris.

The Cedar Lake amber site was revealed in 1889 by Indians to W.C. King of the Hudson's Bay Company trading post known as Chemahawin, which was located at the entrance of the Saskatchewan River, about 5 km northwest of Oleson Point. The name chemawinite was given to the amber by B.J. Harrington, of the Geological Survey of Canada, to distinguish it from other retinite resins. Because of the economic importance of amber, then obtained from the Baltic, the Cedar Lake deposits were given particular attention. The deposits were investigated by J.B. Tyrrell (1890) and B.J. Harrington (1891) of the Geological Survey of Canada, and by Otto J. Klotz (1891) of the Department of the Interior. Various attempts were made to exploit the deposit, none of them successful. Only about 1 t of amber was recovered between 1895 and 1937, most of it by W.C. King who worked with R. MacFarlane, Chief Factor of the Hudson's Bay Company at Cumberland House. The material was obtained from Amber Beach located on the west shore of Cedar Lake prior to the flooding of the lake. In the 1950s, Native Minerals Limited made another attempt to mine the deposits but this venture was not profitable. Some of the material was presented by the company to the Canadian National Collection of Insects.

Because Cedar Lake amber was an exceptionally fine source of well-preserved fossils, the material was collected for scientific study. Collections were made in 1938 by F.M. Carpenter of Harvard University and in 1940 by W.C. Legg of Princeton University. These collections are now in the Museum of Comparative Zoology, Harvard University. Collections for the Canadian National Collection of Insects were made in 1950 by W.J. Brown and R.D. Bird, and in 1963 by J.F. McAlpine and J.E. Martin of the Department of Agriculture, Canada. Collections of Cedar Lake amber are retained at the National Museum of Canada, Ottawa and at the Royal Ontario Museum, Toronto.

The most prolific amber occurrence was at Amber Beach which was located on the former west shore of Cedar Lake, just south of the mouth of the Saskatchewan River. The beach extended in a southwesterly direction for 915 m on the west side of the peninsula terminating at Oleson Point, now Oleson Island. Some amber was found along the shorelines of lakes which occupied the marshy area between Oleson Point, Kelsey Lake and Moose Lake, including the south shore of Moose Lake at the entrance of Moose River.

Cedar Lake is about 450 km northwest of Winnipeg, between Grand Rapids and The Pas.

Refs.: 153 p. 471-473; 155 p. 323-335; 189 p. 18-27; 212 p. 819-838; 337 p. 225-229; 347 p. 5-10.

Map (T): 63 F The pas
(G): 80-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Amaranth Gypsum Mines

GYPSUM, ANHYDRITE, DOLOMITE, QUARTZ, CELESTITE

In shale and sandstone of the Amaranth Formation

The varieties of gypsum found in the deposit include white, pink and pinkish orange granular massive variety, white and light yellow fibrous variety (satin spar), colourless to greenish transparent platy aggregates (selenite), and white chalky nodules. The satin spar and selenite varieties occur as veinlets in massive gypsum. Some of the massive gypsum is compact, finely granular and suitable for carving. White to bluish white massive anhydrite and white dolomite are associated with gypsum. Quartz occurs as colourless, yellow and reddish orange nodules and as tiny transparent crystals in gypsum. Translucent to opaque yellow nodules of celestite occur sparingly in massive gypsum.

The deposit was discovered during a drilling program in 1929 by J.R. Spear of Winnipeg. In the same year, Western Gypsum Products, Limited began production. Two shafts, 335 m apart, were sunk about 40 m into the gypsum layer. The gypsum was broken into blocks underground, raised to the surface and dumped into cars for transport to the company's plant in Winnipeg. The mine was operated until 1963. It is located on the west side of Highway 50 at a point 1.9 km south of its junction with Highway 261 in Amaranth.

Another mine, located south of the Western Gypsum Products Mine, was operated in the Amaranth deposit from 1967 to 1970 by B.A.C.M. Industries, Limited. Operations were conducted from a sloped incline sunk 106.7 m on the east side of Highway 50. A tunnel beneath Highway 50 provided access to the deposit on the west side of the highway. The gypsum was crushed underground and transported by ore cars to the surface where it was stockpiled or dumped into railway cars for transport to Winnipeg. The mine is 1.9 km south of the turnoff to the Western Gypsum Products Mine and 3.8 km south of Amaranth.

Refs.: 9 p. 24-28; 13 p. 6-7; 14 p. 163-166.

Maps (T): 62 J/10 Amaranth
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 270)

Harcus Mine

GYPSUM, DOLOMITE, CHALCEDONY

In shale and sandstone of the Amaranth Formation

White to pink gypsum containing layers of white dolomite and chalcedony concretions is presently being mined in a quarry near Harcus. The deposit is being worked by Westroc Industries Limited for use in the manufacture of wallboard and cement. This is Manitoba's newest gypsum mine. It was opened in 1978.

The quarry is located 5.7 km northeast of Harcus which is on Highway 50, 16.3 km north of Amaranth.

Ref.: 14 p. 163-165.

Maps (T): 62 J/10 Neepawa
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Winnipegosis Quarries

FOSSILS

In limestone

Devonian limestone of the Souris River Formation was formerly quarried. The rock is cream-coloured to yellowish grey, weathering to white. It is fossiliferous and contains corals, stromatoporoids, brachiopods, pelecepods, gastropods, cephelopods, trilobites and crinoids.

Three quarries were operated between 1926 and 1975. The original quarry is now a garbage dump. Two quarries, which were operated in the 1970s, are on Highway 20, 0.5 km west of the junction of Highway 364, just west of Winnipegosis. The distance from Winnipeg is about 370 km.

Refs.: 5 p. 45, 57-58; 12 p. 83-87; 142 p. 68-75.

Maps (T): 62 O/12 Winnipegosis
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Mafeking Quarries

FOSSILS, PYRITE

In limestone

Devonian limestone of the Souris River Formation is exposed in quarries north of Mafeking, and in a 25-m cliff at Steep Rock Point (Point Wilkins) in Dawson Bay, Lake Winnipegosis. The exposures consist of yellowish grey to yellowish brown mottled micrite and biomicrite of the Point Wilkins member overlying argillaceous limestone of the lower part of the Souris River Formation. The latter is buff coloured with purple streaks and weathers to a red colour. There is a layer of green shale near the base of the Point Wilkins member. Both limestones are rich in fossils which include gastropods, brachiopods and oncolites (concentric algal growths). Nodules of pyrite, about 2 cm across, occur in the Point Wilkins member.

The old Mafeking quarry was worked from 1956 to 1976 by Inland Cement Industries Limited. In 1977, the company opened a new quarry just north of the old one. The limestone is shipped to the company's Portland cement plant in Regina.

The old quarry is on the west side of Highway 10, 16 km north of Mafeking. The turn-off to the new quarry is 0.6 km north of the turn-off to the old one. These quarries are about 535 km northwest of Winnipeg.

Refs.: 5 p. 50; 12 p. 14, 90-93; 142 p. 72-75; 243 p. 131-135.

Maps (T): 63 C/14 Barrow
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Highway 10 Road-cut

FOSSILS, CALCITE

In limestone

A road-cut on Highway 10, 2 km north of the turn-off to the new Mafeking quarry exposes Devonian limestone containing partly silicified stromatoporoid masses measuring 10 to 20 cm in diameter and coral fossils. The fossiliferous limestone is buff to cream, contains patches of chert and is exposed in the upper part of the road-cut. Below it is a pink to light brown calcitic limestone with numerous cavities measuring up to 25 mm across; the cavities are lined with calcite crystals. This limestone weathers to an orange brown colour. These rocks are also exposed in a gravel pit west of the road-cut.

Ref.: 12 p. 96.

Maps (T): 63 C/14 Barrow
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Souris Gravel Pit

AGATE, JASPER, CHERT, PETRIFIED WOOD, EPIDOTE

In Souris gravel and sand deposit

Agate, in a variety of colours and patterns, and salmon-pink, red, yellow, brown and grey jasper, brown chert, and petrified and agatized wood occur as pebbles of various sizes in a gravel pit, east of Souris. These pebbles have been used in the lapidary arts since the early 1960s as are

Plate 83

Souris gravel pit. (GSC 163084)

the attractive pebbles of epidote-quartz and epidote-feldspar-quartz (unakite). The deposit also contains pebbles and small boulders of grey to brownish grey argillite, quartzite, volcanic porphyries, granite and metamorphic and carbonate rocks.

The Souris gravel pit is the reference section for the stratigraphic unit known as the Souris Gravel and Sand unit. About 75 per cent of the gravels are preglacial and are derived from Rocky Mountain rocks. They include subrounded to rounded pebbles of argillite, jasper, agate, chert, petrified wood, quartzite and porphyritic volcanics, of which argillite and quartzite are the most abundant constituents; the chalcedonies are present in significant amounts. A smaller proportion of the gravels are glacial eratics transported from the Canadian Shield. These pebbles are subangular to rounded and consist of carbonate, granitic, and foliated metamorphic rocks. The deposit also includes pebbles of shale and sandstone from local sources.

The Souris Gravel and Sand unit overlies bedrock consisting of Cretaceous shale of the Riding Mountain Formation. The Gravel and Sand unit is believed to be early Pleistocene age (Pre-Wisconsin) and was deposited about 42 000 years ago in preglacial valleys. The Gravel and Sand unit occurs as discontinuous patches along the valley walls and as discontinuous shoe-string type deposits in valley bottoms. It is overlain by up to 60 m of drift.

The Souris Gravel and Sand originated from two sources, the Rocky Mountains and the Canadian Shield. Tertiary (preglacial) streams flowing from the west and southwest to Hudson Bay incised the Cretaceous shales and deposited gravels derived from the Rocky Mountain area in the preglacial valleys they created. During early Pleistocene time, glaciers and glacial and interglacial streams carried gravels south from the Canadian Shield depositing them in the preglacial valleys. These gravels, consisting of granitic, foliated metamorphic and carbonate rock pebbles, were mixed with the western gravels producing the Souris Gravel and Sand unit as we know it today. Following deposition, the gravel deposits were buried under a mantle of sediments about 60 m thick over the valleys.

The Souris Gravel and Sand is exposed in gravel pits just above a low terrace at an elevation of 411.5 m above sea level in the Souris River valley at Souris. The valley cuts across the Souris Basin, a glacial lake plain underlain by sand, silt and clay.

Agate was discovered in the Souris gravel pit in 1961 by John Janz who began extracting agate, jasper, and other pebbles in 1962 for jewellery use. The pit is east of Souris and is operated by Souris River Gem Limited.

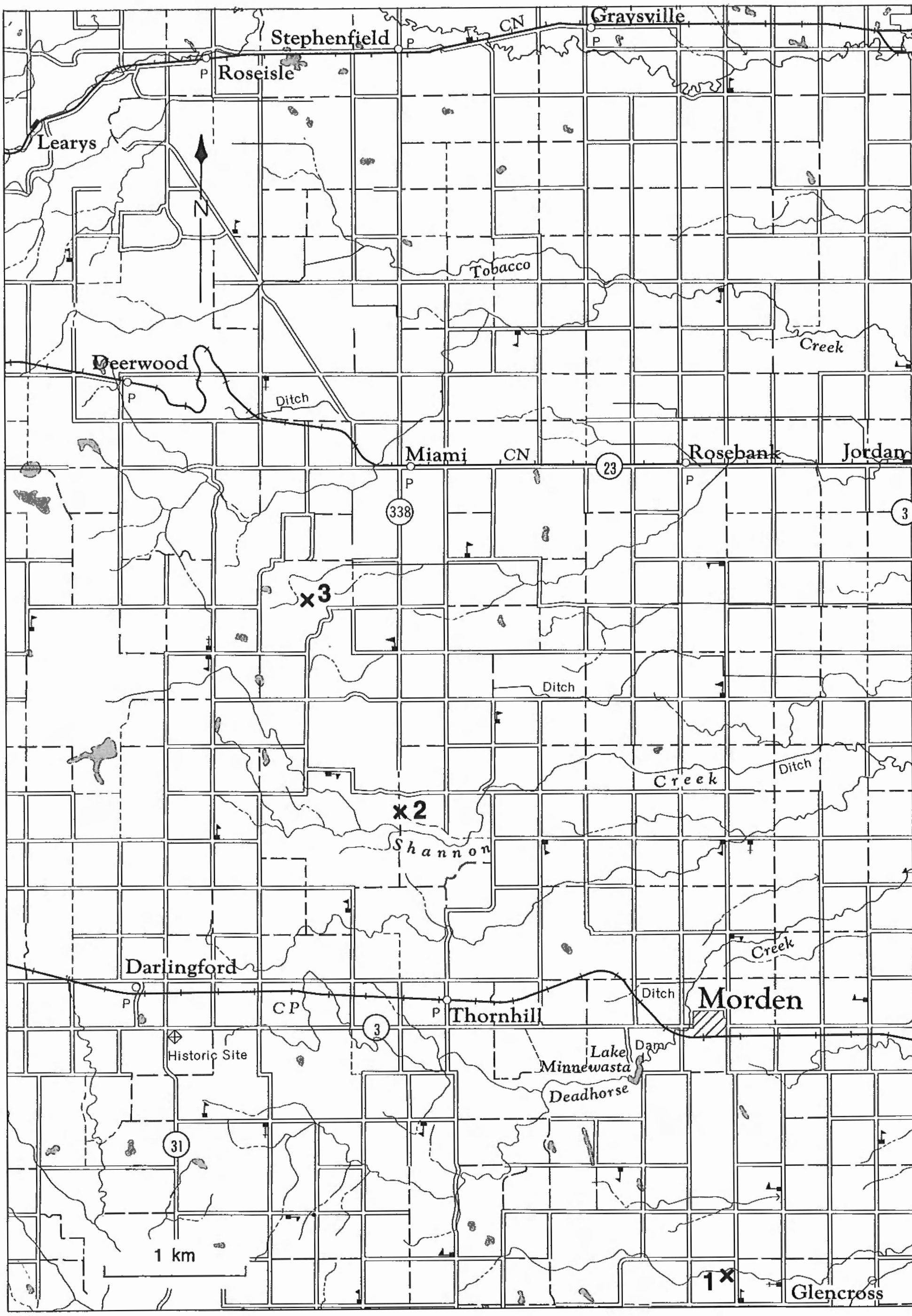
Collecting is permitted on a fee-basis. Arrangements for visits should be made by contacting Souris River Gem Limited at 1st Street South and Highway 2 in Souris.

Road log from Souris:

km	0	Junction of highways 2 and 22; proceed south along Highway 22.
	1.9	Junction; turn left onto Gravel Pit Road.
	3.8	Souris gravel pit.

Refs.: 117 p. 62-72; 187 p. 2-8; 188 p. 3-5, 8.

Maps (T): 62 F/9 Souris
(G): 62F Quaternary Geology Map, Southern Manitoba (M.M.D., 1:250 000)



Map 57. Morden area.

1-Morden selenite occurrence

2-Spencer pit

3-Miami pit

Silver Plains Mine

GYPSUM, ANHYDRITE, DOLOMITE, QUARTZ CRYSTALS

In shale and sandstone of the Amaranth Formation

The gypsum is pink to orange and white, coarsely granular. Fibrous and colourless transparent (selenite) varieties occur in massive gypsum. White anhydrite and white to pink dolomite are associated with gypsum. Quartz occurs as colourless nodules and as small transparent crystals.

The deposit was worked by Westrock Industries Limited from 1964 to 1975. The mine consisted of a decline driven 45.7 m into the gypsum bed. The gypsum was crushed underground and brought by conveyor belts to loading bins. It was then transported by truck to wallboard and cement plants in Winnipeg and in Saskatchewan and Alberta. The mine was closed when water from an aquifer flooded the workings.

The mine is located on the east side of Highway 75 at a point 39.7 km south of the Perimeter 100 over-pass in Winnipeg.

Ref.: 13 p. 8.

Maps (T): 62 H/6 Morris
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

Morden Selenite Occurrence

SELENITE, JAROSITE, PYRITE

In shale

Tabular colourless transparent selenite crystals up to 12 cm long occur in carbonaceous shale. The rock belongs to the Morden member, Vermilion River Formation of Cretaceous age. Patches of black clayey material occur as inclusions in the crystals. Yellow jarosite occurs as a powdery coating on the selenite and on the host rock. Pyrite concretions occur in shale below the selenite.

The selenite-bearing shale outcrops along a roadside, south of Morden. Loose crystals, weathered from the rock, can be found on the outcrop area.

Road log from Morden:

km	0	Morden, at the junction of Highway 3 and 1st street; proceed south along 1st street, passing by the Experimental Farm.
	1.6	Junction; turn left.
	1.9	Junction; turn right.
	8.9	Bridge over brook. The selenite occurrence is on the west side of the road just south of the brook.

Ref.: 107 p. 144.

Maps (T): 62 G/1 Morden
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

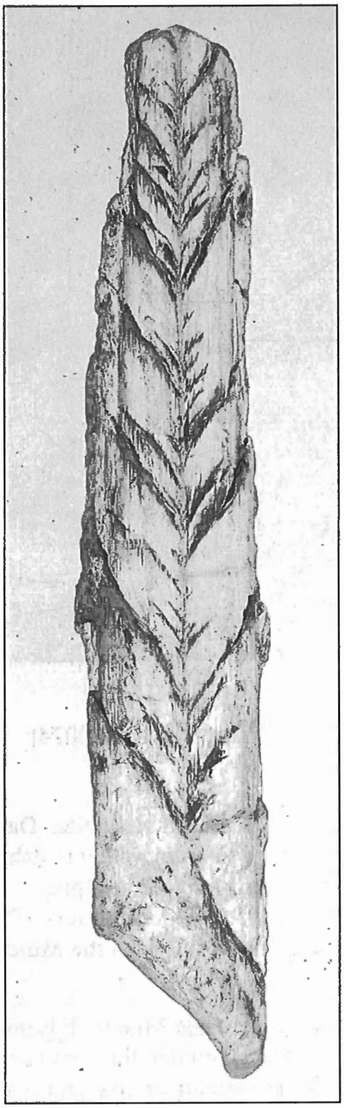


Plate 84

Selenite crystal, Morden. The crystal contains inclusions of black clay; it is 15 cm long. (GSC 203376-M)

Miami-Thornhill Bentonite Occurrences

SELENITE, JAROSITE, FOSSILS

In bentonite

Yellow non-swelling bentonite of the Pembina member, Upper Cretaceous Vermilion River Formation has been quarried at several localities along the Manitoba Escarpment in the Miami-Morden area. It is interbedded with black carbonaceous shale. Crystals of selenite occur along bedding planes between the bentonite and shale beds. Jarosite occurs as yellow

Plate 85

Selenite crystals on shale outcrop, Morden. (GSC 163074)

coatings, encrustations and rounded to botryoidal-like masses in bentonite. Dark grey patches of pyrite are found in the clay. The bentonite is derived from volcanic ash resulting from volcanic activity in the Elkhorn Mountains in western Montana in Upper Cretaceous time. Vertebrate fossils including birds, fish, squids, turtles and dinosaurs (Plesiosaurs and Mosasaurs) occur in the Pembina shale. Specimens are displayed at the Morden and District Museum in Morden.

Bentonite is quarried by Pembina Mountain Clays Limited near Miami. It is used for clarification of mineral and vegetable oils. The bentonite is transported to the company's drying plant in Morden. Some of the dried bentonite is used for pelletizing animal and poultry feeds, and in foundry sands.

Bentonite mining began in 1934 when John O'Day produced a carload of the material and shipped it to Edson, Alberta for use in oil refining. The bentonite beds were opened by several pits and by adits driven 24 m and 91.4 m into the west side of a hillside near Thornhill. Between 1936 and 1948, the Spencer Brothers of Morden were the main producers of bentonite, operating a pit on the Spencer farm. This operation was taken over by Pembina Mountain Clays Limited which installed a drying plant in Morden in 1943. About twenty pits have been worked for bentonite in the Miami-Thornhill area. Mining is done by scraping the bentonite from the shale by a scraper operated from a tractor.

Road log to the Miami and Spencer pits:

km 0 Miami, at the junction of highways 23 and 338; proceed south along Highway 338.

Plate 86

Ironstone concretion, La Riviere. A section through the concretion exposes black dendritic birnessite and silvery brown flaky aggregates of rancieite. The concretion is 13 cm long. (GSC 202645)

5.0 Junction. The road leading west from this junction leads to the Miami pit. Follow it for 2.5 km to a junction; continue west from the junction for 2.2 km to the pit.

To reach the Spencer pit continue south along Highway 338.

13.3 The highway turns left (east); turn right and proceed west 1.7 km to a road leading south. Follow this road 0.6 km to the Spencer pit. The discovery location, the O'Day pit, is located 1 km south of the Spencer pit and on the south side of the creek.

Refs.: 10 p. 4-18; 15 p. 145-153; 209 p. 324-325; 287 p. 42-45, 49-50.

Maps (T): 62 G/1 Morden
62 G/8 Miami
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

La Rivière Occurrence

BIRNESSITE, RANCIEITE, SIDERITE, GOETHITE, BASSANITE

In shale

Manganese and iron minerals occur in clay ironstone concretions in Cretaceous shale of the Riding Mountain Formation. The rock is exposed in a quarry in La Rivière. Birnessite, the most common manganese mineral, occurs as black metallic radiating aggregates and fine granular patches, and as black sooty and brownish grey dendritic to banded configurations. Rancieite, as silvery brown flaky aggregates, is associated with birnessite. Siderite occurs as ochre-yellow to brownish yellow earthy masses associated with calcite. Brown to black massive goethite occurs with siderite and birnessite. Bassanite occurs as greyish white irregular earthy to clay-like patches on limestone. The minerals occur in siliceous shale of the Odanak member, Riding Mountain Formation.

The quarry is on Highway 3 in the town of La Rivière, 0.15 km north of the railway station.

Ref.: 11 p. 56-64.

Maps (T): 62 G/2 Pilot Mound
(G): 65-1 Geological Map of Manitoba (M.M.D., 1:1 267 200)

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MANITOBA

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BINSCARTH
R0J 0G0

B.J. Hales Museum of Natural History
Brandon University
BRANDON R7A 6A9

J.A.V. David Municipal Museum
414 Williams Avenue
KILLARNEY R0K 1G0

Miami Museum
Third Street at Kirby
MIAMI R0G 1H0

Morden and District Museum
Morden Recreational Complex
MORDEN R0G 1J0

The Sam Waller Little Northern Museum
1359 Gordon Avenue
No. 10 Highway
THE PAS R9A 0N6

Manitoba Museum of Man and Nature
190 Rupert Street
WINNIPEG R3B 0N2

Mineral Museum
Wallace Building
University of Manitoba
WINNIPEG R3T 2N2

ONTARIO

Quetico Provincial Park Museum
Ministry of Natural Resources
ATIKOKAN P0T 1C0

Timber Village Museum
Highway 17
BLIND RIVER P0R 1B

Dryden & District Museum
15 VanHorne Avenue
DRYDEN P8N 2A5

Ear Falls Museum
Highway 105
EAR FALLS P0V 1T0

Lake of the Woods Museum
Water Street
KENORA P9N 3X5

St. Joseph Island Museum
20th Side Road & 1 Line
RICHARDS LANDING, ST. JOSEPH ISLAND P0R 1J0

Sault College of Applied Arts and Technology
P.O. Box 60, 443 Northern Avenue
SAULT STE. MARIE P6A 5L3

Howland Little Current Centennial Museum
SHEGUIANDAH P0P 1W0

Science North
100 Ramsey Lake Road
SUDBURY P3E 5S9

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435 James Street S.
THUNDER BAY P7E 6E3

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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. Occurs in metamorphic rocks. Commonly associated with epidote. Amphibole group.

Adularia. Transparent to translucent, generally colourless, variety of K-feldspar; may exhibit an opalescent effect, or schiller, as in moonstone. Occurs as pseudo-rhombohedra in low-temperature hydrothermal veins in schists and gneisses.

Agate. Patterned and variously coloured variety of microcrystalline quartz (chalcedony). Translucent to opaque; colours are due to metallic oxide impurities. Used as an ornamental stone.

Aktashite. $Cu_6Hg_3As_4S_{12}$. Grey metallic. Occurs as grains with other mercury sulphide minerals.

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

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, in pegmatites, and is commonly surrounded by an orange-coloured halo. Distinguished by its weak radioactivity.

Allemontite. A mixture of stibarsen and arsenic or antimony. Not a valid mineral species.

Alluaudite. $(Na, Ca)\,Fe\,(Mn, Fe, Mg)_2(PO_4)_3$. H = 5-5.5. Yellow to brownish yellow massive granular or compact radiating fibrous aggregates. Generally opaque. Occurs as an alteration of varulite-huhnerkobelite in pegmatites.

Almandine. $Fe_3Al_2(SiO_4)_3$. H = 7-7.5. Dark red transparent to opaque dodecahedral or trapezohedral crystals; also massive. Generally occurs in mica schists or gneisses; also in granites and pegmatites. Used as an abrasive (sand paper); transparent variety is used as a gemstone. Garnet group.

Altaite. PbTe. H = 3. Light grey metallic with bronze tarnish. Generally massive but may occur as cubic or cubo-octahedral crystals. Sectile with perfect cleavage. Occurs with native gold and with other tellurides and sulphides in vein deposits.

Amethyst. Violet-coloured variety of quartz. Colour is due to natural irradiation of quartz containing Fe impurities. Generally occurs in igneous and volcanic rocks. Transparent variety is used as a gemstone.

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.

Amygdaloidal lava. Fine-grained lava (basalt) having cavities (amygdules) which may be filled with quartz, calcite, chlorite, zeolites, etc.

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.

Andalusite. Al_2SiO_5. H = 7.5. White, grey, rose-red, brown prismatic crystals with almost square cross-section. Vitreous to dull lustre. Transparent to opaque. Chiastolite variety has carbonaceous inclusions arranged in crossed lines which are evident in cross-section. Occurs in metamorphosed shales. Used in the manufacture of mullite refractories, especially spark plugs; transparent variety is used as a gemstone.

Anglesite. $PbSO_4$. H = 2.5-3. Colourless to white, greyish, yellowish or bluish tabular or prismatic crystals, or granular. Adamantine to resinous lustre. Characterized by high specific gravity (6.37) and adamantine lustre. Effervesces in HNO_3. Secondary mineral, generally formed from galena. Ore of lead.

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.

Ankerite. $Ca(Fe,Mg,Mn)(CO_3)_2$. Variety of dolomite from which it cannot be distinguished in the hand specimen.

Annabergite. $Ni_3(AsO_4)_2{\cdot}8H_2O$. H = 1.5-2.5. Light green finely crystalline or earthy encrustations. Soluble in acids. Secondary mineral formed by the oxidation of cobalt and nickel arsenides. Colour and association with nickel minerals are distinguishing characteristics.

Antimony. Sb. H = 3-3.5. Light grey metallic cleavable massive, also radiating or botryoidal. Perfect cleavage. Occurs in hydrothermal veins with silver, antimony and arsenic ores. Minor source of antimony for use in alloys of lead and tin, and for flame-proofing textiles, paints and ceramics.

Apatite. $Ca_5(PO_4)_3(F, Cl, OH)$. H = 5. Green to blue, colourless, brown, red, hexagonal crystals or granular to sugary massive. Vitreous lustre. May be fluorescent. Distinguished from beryl and quartz by its inferior hardness; massive variety is distinguished from calcite and dolomite by lack of effervescence in HCl, and from diopside and olivine by its inferior hardness. Used in the manufacture of fertilizers and in production of detergents. Apatite is a mineral group which includes the species fluorapatite, chlorapatite, hydroxylapatite, carbonate-fluorapatite, etc.

Aplite. A light coloured igneous (dyke) rock with a fine grained granitic texture and composition similar to granite.

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 specific gravity (2.93). Effervesces in dilute HCl.

Arfvedsonite. $Na_3(Fe, Mg)_4FeSi_8O_{22}(OH)_2$. H = 5-6. Greenish black to black tabular or long prismatic crystals. Vitreous lustre. Occurs in alkali igneous rocks. Amphibole group.

Argentite. Ag_2S. H = 2-2.5. Dark grey metallic cubic, octahedral crystals; arborescent, massive. Very sectile. Occurs in sulphide deposits with other silver minerals. Inverts to acanthite at temperatures below 180°C.

Argillite. A clayey sedimentary rock without a slaty cleavage or shaly fracture.

Arkose. A sandstone in which feldspar grains predominate.

Arsenic. As. H = 3.5. Light grey to black, submetallic. Massive, reniform or stalactitic. Volatile without fusion, giving garlic odour. Occurs in veins with silver, cobalt, nickel ores.

Arsenopyrite. FeAsS. H = 5.5-6. Light to dark grey metallic striated prisms with characteristic wedge-shaped cross-section; also massive. Tarnishes to bronze colour. Ore of arsenic; may contain gold or silver.

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

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, garnet, etc. Caused by light reflected from microscopic inclusions arranged along crystallographic directions.

Augite syenite. A relatively coarse-textured igneous rock composed mainly of feldspar and pyroxene (augite) with little or no quartz. Used as a building stone.

Aurostibite. $AuSb_2$ H~3. Dark grey metallic. Occurs as grains with gold and sulphide minerals. Resembles galena. Not readily identified in hand specimens.

Axinite. $(Ca, Mn, Fe, Mg)_3Al_2BSi_4O_{15}(OH)$. H = 7. Violet, pink, yellow to brown wedge-shaped crystals or massive, lamellar. Vitreous lustre. Fuses readily with intumescence. Occurs commonly in contact-altered calcareous rocks. Transparent varieties are used as gemstones.

Azurite. $Cu_3(CO_3)_2(OH)_2$. H = 3.5-4. Azure-blue to inky blue tabular or prismatic crystals; also massive, earthy, stalactitic with radial or columnar structure. Vitreous lustre, transparent. Secondary copper mineral. Effervesces in acids. Ore of copper.

Barite. $BaSO_4$. H = 3-3.5. White, pink, yellowish, blue tabular or platy crystals; granular massive. Vitreous lustre. Characterized by a high specific gravity (4.5) and perfect cleavage. Used in the glass, paint, rubber, and chemical industries, and in oil-drilling technology.

Basalt. Dark coloured, fine grained volcanic rock or lava composed predominantly of an amphibole or pyroxene with plagioclase. Amygdaloidal basalt is one that contains cavities that may be hollow or occupied by one or more minerals.

Basaluminite. $Al_4(SO_4)(OH)_{10}\cdot5H_2O$. White powdery to compact massive. Dull lustre. Secondary mineral.

Bassanite. $2CaSO_4\cdot H_2O$. White microscopic prisms, fibres, plates. Silky to dull lustre. Associated with gypsum on which it may form chalky coatings. Dehydration product of gypsum; also occurs in volcanic rocks.

Bastnaesite. $(La,Ce)(CO_3)F$. 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 the hand specimen.

Baumhauerite. $Pb_3As_4S_9$. H=3. Grey metallic striated prismatic or tabular crystals. Brown streak. Occurs with other lead sulphosalt minerals.

Bavenite. $Ca_4Be_2Al_2Si_9O_{26}(OH)_2$. H = 5.5. White; greenish, pinkish or brownish white prismatic crystals; also fibrous or radiating lamellar aggregates. Vitreous lustre. Associated with beryl in granite pegmatites.

Berthierite. $FeSb_2S_4$. H = 2-3. Dark steel-grey metallic striated prismatic crystals; fibrous or granular masses. Tarnished surface is iridescent or brown. Generally associated with stibnite and not readily distinguished from it in the hand specimen.

Bertrandite. $Be_4Si_2O_7(OH)_2$. H = 6-7. Colourless light yellow tabular, prismatic crystals. Vitreous or pearly lustre. Associated with beryl in granite pegmatites.

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

Betafite. $(Ca, Na, U)_2(Ti, Nb, Ta)_2O_6(OH)$. H = 4-5.5. Brown to black, waxy to submetallic octahedral or modified octahedral crystals. Metamict. Occurs with euxenite, fergusonite, cyrtolite in granite pegmatites and in calcite veins.

Beta-uranophane. $(H_3O)_2\ Ca(UO_2)_2(SiO_4)_2\cdot3H_2O$. H = 2.5-3. Yellow to yellowish green aggregates of acicular crystals or short prismatic crystals. Silky to waxy lustre. May fluoresce green in ultraviolet light. Secondary mineral occurring in granitic rocks and calcite veins containing uranium minerals.

Biomicrite. Limestone composed of skeletal fossil debris and carbonate-mud (micrite). Described by major fossil type present, eg. crinoid biomicrite.

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 pegmatites, 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 the manufacture of roofing materials, wallpaper, lubricants and fireproofing material. Mica group.

Birnessite. $Na_4Mn_{14}O_{27}{\cdot}9H_2O$. H = 1.5. Black opaque grains, granular aggregates, earthy. Dull lustre. Secondary mineral associated with the other manganese minerals. Difficult to identify except by x-ray methods.

Bismuth. Bi. H = 2-2.5. Light grey metallic reticulated crystal aggregates; also foliated or granular. Iridescent tarnish. Used as a component of low melting-point alloys and in medicinal and cosmetic preparations.

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

Bityite. $CaLiAl_2(AlBeSi_2)O_{10}(OH)_2$. H = 5.5. White, yellow, brownish white transparent tabular, pseudohexagonal crystals, or micaceous. Associated with lithium minerals in granite pegmatites.

Boltwoodite. $(H_3O)K(UO_2)(SiO_4)$. H = 3.5-4. Light yellow acicular, fibrous aggregates. Silky, vitreous to dull lustre. Fluoresces dull green in ultraviolet light. Secondary mineral formed from uranium minerals.

Bornite. Cu_5FeS_4. H = 3. Reddish brown metallic. Usually massive. Tarnishes to iridescent blue, purple, etc. Ore of copper. Known as peacock ore, variegated copper, vitreous copper and purple copper ore.

Boulangerite. $Pb_5Sb_4S_{11}$. H = 2.5-3. Dark bluish grey, metallic; striated, elongated prismatic to acicular crystals; also fibrous, plumose aggregates. Fibrous cleavage is distinguishing characteristic. Ore of antimony.

Bournonite. $PbCuSbS_3$. H = 2.5-3. Grey to blackish grey metallic. Short prismatic or tabular crystals with striations; massive. Occurs in veins with sulphides and sulphosalts. Not readily identified in the hand specimen.

Brannerite. $(U, Ca, Y, Ce)(Ti, Fe)_2O_6$. H = 4.5. Black opaque grains, prismatic crystals, granular masses. Resinous to dull lustre. Brownish yellow on weathered surfaces. Conchoidal fracture. Radioactive. Ore of uranium.

Bravoite. $(Ni, Fe)S_2$. Yellow to grey metallic with violet tinge. Member of the pyrite group. Resembles pyrite except for colour.

Breccia. A rock composed of angular fragments; may be attractively patterned and coloured and used as an ornamental rock.

Breithauptite. NiSb. H = 5.5. Light copper-red with violet tint. Metallic lustre. Occurs as disseminated grains, massive, arborescent, and rarely as tabular or prismatic crystals. Reddish brown streak. Associated with silver and nickel minerals in vein deposits.

Brochantite. $Cu_4(SO_4)(OH)_6$. H = 3.5-4. Vitreous emerald green acicular crystal aggregates; massive, granular. Secondary mineral formed by oxidation of copper minerals. Distinguished from malachite by lack of effervescence in HCl.

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.

Cafarsite. $Ca_8(Ti, Fe, Mn)_{6\text{-}7}(AsO_3)_{12}{\cdot}4H_2O$. Dark brown cubic, octahedral, dodecahedral crystals. Opaque. Conchoidal fracture. Yellowish brown streak.

Calaverite. $AuTe_2$. H = 2.5-3. Brass-yellow to silver-white, metallic, bladed, lath- like or striated short prismatic crystals. Fuses readily; on charcoal gives bluish green flame and gold globules. Ore of gold. Occurs in veins with pyrite, native gold.

Calcite. $CaCO_3$. H = 3. Colourless, white rhombohedral, scalenohedral crystals; cleavable, granular massive. May be variously coloured due to impurities. Transparent to opaque. Vitreous, pearly or dull lustre. May fluoresce in ultraviolet light. Effervesces in dilute HCl. Distinguished from dolomite by its inferior hardness and superior solubility in HCl. Major constituent of chalk and limestone.

Cassiterite. SnO_2. H = 6-7. Yellow to brown prismatic crystals; twinning common. Also radially fibrous, botryoidal, or concretionary masses; granular. Adamantine to splendent lustre. White to brownish or greyish streak. Distinguished from other light coloured nonmetallic minerals by its high specific gravity (6.99), from wolframite by its superior hardness. Ore of tin. Concentrically banded variety is used as a gemstone.

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.

Cernyite. Cu_2CdSnS_4. H ~4. Steel-grey metallic. Occurs as rare grains in pegmatite at the type locality, Bernic Lake (Tanco) Mine, Manitoba. Named in honour of Prof. Petr Cerny, University of Manitoba.

Cerussite. $PbCO_3$. H = 3-3.5. Transparent white, grey or brownish tabular crystals with adamantine lustre; also massive. High specific gravity (6.5) and lustre are distinguishing features. Secondary mineral formed by oxidation of lead minerals. Fluoresces in shades of yellow in ultraviolet light. Ore of lead.

Chalcanthite. $CuSO_4{\cdot}5H_2O$. H = 2.5. Light to dark blue, short prismatic, tabular crystals; massive, granular. Vitreous lustre. Metallic taste. Secondary mineral formed in copper sulphide deposits. Distinguished from azurite by lack of effervescence in HCl.

Chalcedony. SiO_2. H = 7. Translucent microcrystalline 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.

Chalcoalumite. $CuAl_4(SO_4)(OH)_{12}{\cdot}3H_2O$. H = 2.5. Light blue, bluish green, bluish grey transparent to translucent platy, fibrous aggregates. Vitreous to dull lustre. Secondary mineral associated with copper minerals.

Chalcocite. Cu_2S. H = 3.5-4. Dark grey to black metallic; massive. Tarnishes to iridescent blue, purple, etc. Also referred to as vitreous copper, sulphurette of copper and copper glance. Soluble in HNO3. Black colour and slight sectility distinguish it from other copper sulphides. Ore of copper.

Chalcopyrite. $CuFeS_2$. H = 3.5-4. Brass-yellow massive, or as tetrahedral crystals. Iridescent tarnish. Brass colour distinguishes it from pyrrhotite. Distinguished from pyrite by its inferior harness, from gold by its superior hardness and lower density. Also called copper pyrite and yellow copper. Ore of copper.

Chalcostibite. $CuSbS_2$. H = 3-4. Dark grey metallic blade-like crystals, or massive. Associated with copper and antimony minerals.

Chert. Massive opaque variety of chalcedony; generally drab coloured in various tints of grey or brown.

Chlorite. $(Mg, Fe, Al)_6(Al, Si)_4O_{10}(OH)_8$. H = 2-2.5. Transparent green flaky aggregates. Distinguished from mica by its colour and non-elastic flakes. Occurs in metamoprhic, igneous, volcanic rocks.

Chloritoid. $(Fe, Mg, Mn)_2Al_4Si_2O_{10}(OH)_4$. H = 6.5. Dark grey to black tabular crystals; also platy, scaly, foliated aggregates and massive. Translucent. Pearly lustre. Occurs in schists, lava.

Chromite. $FeCr_2O_4$. H = 5.5. Black metallic, octahedral crystals (rare); generally massive. Distinguished from magnetite by its brown streak and weak magnetism. Commonly associated with serpentine. Ore of chromium.

Chrysoberyl. $BeAl_2O_4$. H = 8.5. Yellow, green, brown tabular or short prismatic crystals commonly striated and twinned forming six broad radiating spokes. Vitreous, transparent to opaque. Transparent variety used as a gemstone. Other gem varieties include: alexandrite, which is green in natural light and red in artifical light; cat's eye which exhibits a movable streak of light when cut in a cabochon. Occurs in pegmatites and in mica schist.

Chrysocolla. $(Cu,Al)_2 H_2 Si_2O_5 (OH)_4 \cdot nH_2O$. H = 2-4. Blue to blue-green earthy, botryoidal, or fine-grained massive. Conchoidal fracture. Secondary mineral found in oxidized zones of copper-bearing veins. Often intimately mixed with quartz or chalcedony, producing attractive patterns; because of being mixed with these minerals, the resultant superior hardness renders it suitable for use in jewellery and ornamental objects. Minor ore of copper.

Chrysotile. Fibrous variety of serpentine (asbestos).

Cinnabar. HgS. H = 2-2.5. Orange-red to brownish red, dark grey rhombohedral, tabular or prismatic crystals; also granular to earthy massive. Adamantine, metallic or dull lustre. Opaque. Perfect cleavage. Occurs in veins formed at low temperatures. Commonly associated with pyrite, marcasite and stibnite in silica-carbonate gangue. Ore of mercury.

Clausthalite. PbSe. H = 2.5-3. Dark grey metallic with bluish tint. Granular massive, foliated. Associated with other selenides in ore deposits.

Cleavelandite. Platy, tabular or lamellar variety of albite; white with pearly lustre.

Clinopyroxene. Monoclinic member of the pyroxene group. Includes acmite, augite, clinoenstatite, diopside.

Clinozoisite. $Ca_2Al_3(SiO_4)_3(OH)$. H = 7. Pale green to greenish grey prismatic crystals; also granular or fibrous masses. Vitreous lustre. Perfect cleavage. Member of epidote group. Occurs in metamorphic rocks.

Cobaltite. CoAsS. H = 5.5. Light grey metallic crystals (cubes, pyritohedrons) or massive. Perfect cleavage. Pinkish tinge distinguishes it from other grey metallic minerals. Associated with cobalt and nickel sulphides or arsenides. Ore of cobalt.

Coffinite. $U(SiO_4)_{1-x}(OH)_{4x}$. H = 5-6. Black with adamantine lustre; dull brown. Finely granular massive. Associated with uraninite from which it is indistinguishable in the hand specimen.

Coloradoite. HgTe. H = 2.5. Dark grey to black metallic granular masses. Soluble in HNO3. Occurs with gold and silver tellurides.

Columbite. $(Fe, Mn)(Nb, Ta)_2O_6$. H = 6-7. Brownish black to black prismatic or tabular crystals forming divergent or parallel groups; also massive. Submetallic lustre. Black to reddish brown streak. Occurs in pegmatites. Ore of niobium which is used in high-temperature steel alloys.

Concretion. Rounded mass formed in sedimentary rocks by accretion of some constitutent (iron oxides, silica, etc.) around a nucleus (mineral impurity, fossil fragment, etc.).

Conglomerate. A sedimentary rock composed of rounded pebbles or gravel.

Cookeite. $LiAl_4(Si_3Al)O_{10}(OH)_8$. H = 2.5-3.5. White, pink, greenish, yellowish, brown pseudo-hexagonal plates; also scaly. Transparent to translucent with pearly or silky lustre. Occurs with lithium minerals in granite pegmatites. Chlorite group.

Copiapite. $Fe_5(SO_4)6(OH)_2 \cdot 20H_2O$. H = 2.5-3. Pale yellow to orange-yellow and greenish yellow granular to scaly aggregates; also tabular crystals. Transparent to translucent. Vitreous to pearly lustre. Secondary mineral formed from oxidation of sulphides, especially pyrite. Yellow colour is characteristic.

Copper. Cu. H = 2.5-3. Massive filiform or arborescent; crystals (cubic or dodecahedral) rare. Hackly fracture. Ductile and malleable. Occurs in lavas.

Cordierite. $Mg_2Al_4Si_5O_{18}$. H = 7. Blue to purplish blue, bluish grey, colourless massive or irregular grains. Vitreous lustre. Subconchoidal fracture. Alters readily to muscovite or chlorite. Distinguished by its colour and by its alteration products. Occurs in metamorphic rocks (schists, gneisses). Gem variety is known as iolite or dichroite.

Cosalite. $Pb_2Bi_2S_5$. H = 2.5-3. Dark grey metallic prismatic, needle-like, fibrous or feathery aggregates; massive. Soluble in HNO_3. Associated with smaltite and cobaltite.

Covellite. CuS. H = 1.5-2. Inky blue metallic; iridescent in shades of brass yellow, purple, coppery red. Massive; crystals (hexagonal plates) rare. Distinguished from chalcocite and bornite by its perfect cleavage and colour.

Crandallite. $CaAl_3(PO_4)_2(OH)_5 \cdot H_2O$. H = 5. Yellow to white or grey minute prisms; also fibrous, nodular, finely granular massive. Transparent to translucent with vitreous or dull lustre. Occurs with other secondary phosphate minerals.

Criddleite. $TlAg_2Au_3Sb_{10}S_{10}$. Grey metallic fine grains (up to 50μm) associated with aurostibite; recognized only by microscopic examination of polished sections. Occurs in the Hemlo gold deposit, the type locality. Named in honor of ore mineralogist Dr. A.J. Criddle of the British Museum, London. (Personal communication: D.C. Harris).

Crocoite: $PbCrO_4$. H = 2.5-3. Red-orange to yellow prismatic crystals; massive. Transparent to translucent; adamantine to vitreous lustre. Secondary mineral formed by oxidation of minerals containing lead and chromium.

Cryptomelane. KMn_8O_{16}. H = 6-6.5. Grey, greyish black to black compact to loosely granular massive; also radiating fibres, botryoidal. Metallic to dull lustre. Brownish black streak. Secondary mineral associated with manganese minerals.

Crystalline limestone. A limestone which 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.

Cubanite. $CuFe_2S_3$. H = 3.5. Brass- to bronze-yellow tabular crystals or massive. Distinguished from chalcopyrite by its strong magnetism. Associated with other copper-iron sulphides. Rare mineral.

Cuprite. Cu_2O. H = 3.5-4. Red to almost black crystals (octahedral, dodecahedral or cubic), massive, earthy. Adamantine, submetallic or earthy lustre. Brownish red streak. Distinguished from hematite by its inferior hardness, from cinnabar and proustite by its superior hardness. On charcoal it is reduced to a metallic globule of copper. Soluble in concentrated HCl. Associated with native copper and other copper minerals. Ore of copper.

Danaite. (Fe, Co)AsS. Variety of arsenopyrite containing up to 9 per cent cobalt. Not a valid mineral name.

Diabase. Dark coloured igneous rock composed mostly of lath-shaped crystals of plagioclase and pyroxene. Used as a building, ornamental and monument stone.

Diopside. $CaMgSi_2O_6$. H = 6. Colourless, white, grey, green, blue monoclinic variety of pyroxene. Transparent to opaque with vitreous lustre. Occurs as short prisms or granular masses in calcium-rich metamorphic rocks.

Diorite. A dark coloured igneous rock composed mainly of plagioclase 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 to 50 per cent dolomite.

Domeykite. Cu_3As. H = 3-3.5. Light grey metallic massive, reniform or botryoidal. Becomes yellowish to brown or iridescent when tarnished. Occurs with other copper minerals. Soluble in HNO_3 but not in HCl.

Dufrenoysite. $Pb_2As_2S_5$. H = 3. Grey metallic, striated long tabular crystals. Reddish brown streak. Perfect cleavage. Associated with sphalerite and arsenic minerals.

Dyke. A long narrow body of igneous rock which cuts other rocks which it intrudes.

Dyscrasite. Ag_3Sb. H = 3.5-4. Light grey metallic, tarnishing to dark grey. Granular massive, foliated; also pyramidal crystals. Sectile. Occurs in veins with silver minerals and sulphide minerals. Decomposed by HNO_3.

Epidote. $Ca_2(Al, Fe)_3(SiO_4)_3(OH)$. H = 6-7. Yellowish green, massive or fibrous aggregates. Vitreous lustre. Often associated with quartz and pink feldspar producing attractive mottled or veined patterns. Forms during metamorphism of igneous rocks and limestone, and in veins. Takes a good polish and can be used for jewellery and other ornamental objects.

Erythrite. $Co_3(AsO_4)_2 \cdot 8H_2O$. H = 1.5-2.5. Rose-red to crimson globular, radial, reniform aggregates; also earthy or pulverulent; prismatic to acicular crystals (rare). Dull to adamantine lustre. Soluble in HCl. Secondary mineral formed by oxidation of cobalt arsenides.

Eucryptite. $LiAlSiO_4$. H = 6.5. Colourless, white hexagonal short prisms; more commonly massive granular. Transparent with vitreous lustre. Fluoresces pink in ultraviolet light. Occurs with lithium minerals in granite pegmatite.

Euxenite. $(Y, Ca, Ce, U, Th)(Nb, Ta, Ti)_2O_6$. H = 5.5-6.5. Black massive prismatic crystals forming parallel or radial groups. Brilliant, submetallic or greasy lustre. Conchoidal fracture. Radioactive. Distinguished from other radioactive minerals by X-ray methods.

Facet cut. Polished gemstone featuring numerous flat surfaces, as in diamond.

Facies. A distinctive rock type corresponding to a certain environment or mode of origin.

Fairfieldite. $Ca_2(Mn, Fe)(PO_4)_2 \cdot 2H_2O$. H = 3.5. White, greenish white, yellow transparent prismatic crystals; also foliated, fibrous, lamellar, radiating aggregates. Brilliant or pearly lustre. Soluble in acids. Occurs in granite pegmatite.

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.

Felsic. A term describing an igneous rock composed mostly of light-coloured minerals such as feldspar, feldspathoids, quartz and muscovite.

Felsite. A dense, fine grained, light coloured (pink or grey) igneous rock composed mainly of feldspar with little or no quartz.

Ferberite. $FeWO_4$. H = 4-4.5. Black striated wedge-shaped prisms; also bladed or massive. Metallic lustre. Brownish black to black streak. Weakly magnetic. Ore of tungsten.

Fersmite. $(Ca, Ce, Na)(Nb, Ta, Ti)_2(O, OH, F)_6$. H = 4-4.5. Dark brown to black striated prisms; also tabular. Subvitreous to resinous lustre. Greyish brown streak. Occurs with niobium minerals in marble and in pegmatites.

Fluorescence. Property of certain substances to glow when exposed to light from ultraviolet light or X-rays. It is caused by impurities in the substance or by defects in its crystal structure. Two wavelengths are commonly used to produce ultraviolet fluorescence: long wave (3200 to 4000 Angstrom units), short wave (2537 Angstrom units).

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

Freibergite. $(Ag, Cu, Fe)_{12}(Sb, As)_4S_{13}$. A silver-rich member of the tetrahedrite group.

Froodite. $PdBi_2$. H = 2. Grey metallic grains associated with arsenic-lead- copper ores. Originally described from the Frood Mine for which it is named.

Fuchsite. An emerald-green chromian muscovite. Not a valid mineral name.

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

Galena. PbS. H = 2.5. Dark grey metallic cubic crystals or crystal aggregates; also massive. Perfect cleavage. Distinguished by its high (7.58) specific gravity and perfect cleavage. Ore of lead; may contain silver.

Galkhaite. $(Cs, Tl)(Hg, Cu, Zn)_6(As, Sb)_4S_{12}$. H = 3. Orange-red cubic crystals; granular aggregates. Vitreous to adamantine lustre. Occurs in arsenic- antimony-mercury deposits.

Garnet. Silicate of Al, Mg, Fe, Mn, Ca. H = 6.5-7.5. Transparent red dodecahedral crystals or massive; also colourless, yellow, brown, orange, green, black. Used as an abrasive; clear garnet is used as a gemstone. Distinguished by its crystal form. Mineral group consisting of several species including almandine, grossular, pyrope.

Genthite. Hydrous nickel silicate, also known by the general term garnierite. Not a valid mineral species.

Gersdorffite. NiAsS. H = 5.5. Light to dark grey metallic; octahedral, pyritohedral crystals or granular massive. Associated with other nickel minerals in vein deposits.

Gladite. $PbCuBi_5S_9$. Dark grey metallic prismatic crystals. Associated with other lead-bismuth sulphide minerals.

Glauconite. $(K, Na)(Fe, Al, Mg)_2(Si, Al)_4O_{10}(OH)_2$. H = 2. Greyish, bluish or yellowish green, fine platy aggregates. Commonly occurs in sedimentary rocks. Mica group.

Gneiss. A coarse grained foliated metamorphic rock composed mainly of feldspar, quartz and mica. Used as a 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 specific gravity (19.3). Precious metal.

Gossan. Rusty oxidation product consisting of hydrated iron oxides derived from the weathering of pyrite and pyrrhotite. Commonly occurs as an outcrop of the upper zone of pyrite-bearing veins.

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.

Granodiorite. A coarse-grained igneous rock with composition intermediate between granite and diorite.

Graphic granite. A granitic rock composed of a regular intergrowth of quartz and K-feldspar producing a geometrical pattern resembling hieroglyphic writing. An attractive ornamental stone.

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

Greenstone. A metamorphosed volcanic rock composed mainly of chlorite.

Greywacke. Sedimentary rock containing large amounts of amphibole or pyroxene and feldspar.

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 lustre. Occurs in metamorphosed limestone with other calcium silicates. Transparent varieties are used as a gemstone. Garnet group.

Gudmundite. FeSbS. H = 6. Light to dark grey metallic, elongated striated prismatic crystals; also massive, lamellar. Pale bronze when tarnished. Not readily distinguishable from other grey metallic sulphides in the hand specimen.

Gustavite. $PbAgBi_3S_6$. Dark grey metallic tabular grains. Rare mineral associated with bismuth-lead-silver sulphosalt minerals.

Gypsum. $CaSO_4 \cdot 2H_2O$. H = 2. White, grey, light brown, granular massive; also fibrous (satin spar), or colourless transparent (selenite). Distinguished from anhydrite by its inferior hardness. Occurs in sedimentary rocks. Used in the construction industry (plaster, wallboard, cement, tiles, paint) and as a soil conditioner and fertilizer. Satin spar, selenite and alabaster (fine- grained translucent variety) are used for carving into ornamental objects.

Halotrichite. $FeAl_2(SO_4)_4 \cdot 22H_2O$. H = 1.5. White hair-like crystals; spherical aggregates. Vitreous lustre. Astringent taste. Secondary mineral formed by weathering of pyrite.

Hauchecornite. $Ni_9Bi(Sb,Bi)S_8$. H = 5. Light yellow metallic, tarnishing to dark bronze; tabular, bipyramidal, prismatic crystals. Conchoidal fracture. Black streak. Occurs in nickel-bismuth ores.

Hawleyite. CdS. Bright yellow powdery coating; earthy. Associated with sphalerite and siderite. First described from the lead-silver-zinc deposit at the Hector-Calumet Mine in Elsa, Yukon. Named for Professor J.E. Hawley of Queen's University, Kingston.

Heazlewoodite. Ni_3S_2. H = 4. Yellow metallic; massive, granular, or platy aggregates. Distinguished from pyrite by its inferior hardness.

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.

Hemloite. $(As,Sb)_4(Ti,Fe,V,Al)_{24}(O,OH)_{48}$. Black metallic to submetallic with black streak. Occurs as grains associated with rutile, molybdenite, titanite, pyrite, sphalerite, arsenopyrite, vanadian muscovite, microcline and quartz in the Hemlo gold deposit, the type locality. It is named for the locality. (Personal communication: D.C. Harris).

Hessite. Ag_2Te. H = 2-3. Grey metallic finely granular, massive. Sectile. Occurs with native gold and with other tellurides in vein deposits.

Heulandite. $(Na, Ca)_{2-3}Al_3(Al, Si)_2Si_{13}O_{36} \cdot 12H_2O$. H = 3-4. Colourless, white, pink, orange tabular crystals. Vitreous or pearly lustre. Distinguished from other zeolites by its crystal form.

Hollingworthite. (Rh, Pt, Pd)AsS. H > 6. Grey metallic grains intergrown with platinum minerals such as sperrylite.

Holmquistite. $Li_2(Mg, Fe)_3Al_2Si_8O_{22}(OH)_2$. H = 5-6. Violet to light blue prismatic, acicular to fibrous aggregates; also massive. Transparent to translucent with vitreous lustre. Associated with lithium-rich pegmatites occurring in the wall rock. Amphibole group.

Hornblende. $Ca_2(Fe, Mg)_4 Al(Si_7Al)O_{22} (OH, F)_2$. H = 6. Dark green, brown, black prismatic crystals or massive. Vitreous lustre. Common rock-forming mineral. Amphibole group.

Igneous. Rocks that have crystallized from magma or from the melting of other rocks; usually composed of feldspar, quartz, and hornblende, pyroxene or biotite.

Illite. $(K, H_3O)(Al, Mg, Fe)_2(Si, Al)_4O_{10} (OH)_2, H_2O$. H = 1-2. White finely micaceous to clay-like. Dull lustre. Perfect cleavage. Mica-clay mineral.

Ilmenite. $FeTiO_3$. H = 5-6. Black metallic to submetallic. Compact or granular massive; thick tabular crystals. Black streak distinguishes it from hematite. Ore of titanium.

Ilmeno-magnetite. Titanium-bearing magnetite containing ilmenite in exsolution. Not a valid mineral name.

Insizwaite. $Pt(Bi, Sb)_2$. Metallic grains and massive. Associated with pentlandite, chalcopyrite and with nickel and platinum minerals.

Irarsite. (Ir, Ru, Rh, Pt)AsS. Black metallic massive. Associated with platinum minerals.

Iron formation. Metamorphosed sediment containing iron minerals and silica.

Jarosite. $KFe_3(SO_4)_2(OH)_6$. H = 2.5-3.5. Yellow to brownish pulverulent coating associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Jasper. An opaque deep red to brown, yellow, green or mauve variety of chalcedony. Used as an ornamental stone and as a gemstone.

Jaspilite. A rock consisting of alternating bands of red jasper and iron oxides. An attractive ornamental rock.

Kaolinite. $Al_2Si_2O_5(OH)_4$. H = 2. Chalk-white, greyish, yellowish or brownish earthy masses. Dull lustre. Clay mineral formed chiefly by decomposition of feldspars. Becomes plastic when wet. Used as a filler (in paper) and in the manufacture of ceramics.

Kasolite. $Pb(UO_2)SiO_4{\cdot}H_2O$. H = 4-5. Yellow, greenish yellow, brown finely granular; also minute prismatic crystals. Dull to resinous lustre. Radioactive. Soluble in acids. Associated with uraninite and secondary radioactive minerals from which it is not easily distinguished in the hand specimen.

Kesterite. $Cu_2(Zn, Fe)SnS_4$. H = 4.5. Greenish black, opaque, massive. Associated with sulphide minerals.

K-feldspar. $KAlSi_3O_8$. H = 6. Includes the potash feldspars: sanidine (colourless), orthoclase (white, pink) and microcline (white, pink, green).

Kotulskite. Pd(Te, Bi). Metallic minute grains intergrown with chalcopyrite and platinum group minerals.

Krennerite. $AuTe_2$. H = 2-3. Light grey to yellow metallic prismatic striated crystals. Occurs with other gold tellurides and with native gold in vein deposits.

Kyanite. Al_2SiO_5. H = 4-5, 6-7. Blue, green, greyish blue long bladed crystals and bladed masses. Vitreous to pearly lustre. Hardness is 4-5 along length of crystal and 6-7 across it. Occurs in schist and gneiss. Colour and variable hardness are distinguishing characteristics. Used in the manufacture of mullite refractories.

Lamprophyre. Fine-grained dark-coloured dyke rock composed of plagioclase feldspar, amphibole and/or pyroxene.

Latite. A porphyritic igneous rock consisting of approximately equal amounts of plagioclase and K-feldspar phenocrysts, with little or no quartz, in a fine- grained to glassy-matrix.

Laumontite. $CaAl_2Si_4O_{12}{\cdot}4H_2O$. H = 4. White to pink or reddish white, vitreous to pearly, prismatic crystal aggregates; also friable, chalky due to dehydration. Characteristic alteration distinguishes it from other zeolites.

Lead. Pb. H = 1.5. Grey metallic platy, dendritic, rounded masses; less commonly octahedral, dodecahedral or cubic crystals. Malleable and ductile. Rare mineral occurring in various rock environments and in placer deposits. Decomposes readily in HNO_3.

Leucoxene. A general term referring to alteration products of ilmenite. Not a valid mineral species.

Liebigite. $Ca_2(UO_2)(CO_3)_3 \cdot 11H_2O$. H = 2.5-3. Light green, yellowish green short prismatic crystals; also scaly, granular, botryoidal aggregates. Transparent to translucent with vitreous to pearly lustre. Fluoresces green in ultraviolet light. Secondary mineral formed in uranium deposits.

Limestone. Soft, white, grey or buff 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. Used as a building stone and as road metal. Shell limestone (coquina) is a porous rock composed mainly of shell fragments. Crystalline limestone (marble) is a limestone that has been metamorphosed and is used as a building and ornamental stone.

Limonite. Field term referring to natural hydrous iron oxide whose true identity is unknown. Yellow-brown to dark brown earthy, porous, ochreous masses; also stalactitic or botryoidal. Secondary product of iron minerals. Not a valid mineral species.

Lithiophilite. $LiMnPO_4$. H = 4-5. Yellow, yellowish brown, brown, pink cleavable to compact massive; crystals (prismatic) are rare. Transparent to translucent with vitreous to subresinous lustre. Becomes brown, dark grey to black on weathered surfaces. Soluble in acids. Occurs with other lithium and phosphate minerals in granite pegmatites. Forms a series with triphylite.

Lithiophosphate. Li_3PO_4. H = 4. Colourless, white, pink prismatic crystals or massive. Vitreous lustre. Perfect cleavage. Occurs with other lithium minerals in granite pegmatites.

Mackinawite. $(Fe, Ni)_9S_8$. H = 2.5. Yellow metallic; light grey metallic on freshly broken surfaces. Tetragonal, platy or pyramidal crystals; also massive, finely lamellar aggregates. Associated with sulphide ore minerals.

Mafic. A term describing an igneous rock composed mostly of dark-coloured (ferromagnesian) minerals such as amphibole, pyroxene, biotite.

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

Magnetite. Fe_3O_4. H = 5.5-6.5. Black metallic octahedral, dodecahedral or cubic crystals; massive granular. Occurs in vein deposits, in igneous, metamorphic rocks and in pegmatites. Strongly magnetic. Ore of iron.

Malachite. $Cu_2CO_3(OH)_2$. H = 3.5-4. Bright green granular, botryoidal, earthy masses; usually forms coatings with other secondary copper minerals on copper-bearing rocks. Distinguished from other green copper minerals by effervescence in HCl. Ore of copper.

Manganite. $MnO(OH)$. H = 4. Steel-grey to iron-black metallic prismatic striated crystal aggregates; also columnar, fibrous, stalactitic, finely granular. Not readily distinguishable from other dark manganese minerals in the hand specimen. Ore of manganese.

Manganotantalite. $MnTa_2O_6$. H = 6-6.5. Brownish black tabular, short prismatic crystals or massive. Dark red streak. Vitreous to resinous lustre. Iridescent on tarnished surfaces. Occurs in granite pegmatite. Columbite group.

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 the hand specimen.

Matildite. $AgBiS_2$. H = 2.5. Black to grey metallic massive granular; striated indistinct prismatic crystals (rare). Uneven fracture. Occurs intergrown with galena from which it alters. Associated with sulphide minerals in deposits formed at moderate to high temperatures.

Maucherite. $Ni_{11}As_8$. H = 5. Grey metallic with reddish tinge tarnishing to copper-red. Tabular or pyramidal crystals; also massive, granular or radiating fibrous. Decomposed by acids. Associated with cobalt-nickel ores.

Melanterite. $FeSO_4{\cdot}7H_2O$. H = 2. Greenish white to green or blue massive, pulverulent; also stalactitic, concretionary, fibrous or capillary; short prismatic crystals (less common). Vitreous to dull lustre. Metallic, astringent taste. Soluble in water. Secondary mineral associated with pyrite and marcasite deposits.

Melonite. $NiTe_2$. H = 1-1.5. Reddish white metallic, tarnishing to brown. Tiny hexagonal plates or lamellae. Dark grey streak. Perfect cleavage. Occurs with sulphides and other tellurides in nickel-copper deposits.

Merenskyite. $(Pd, Pt)(Te, Bi)_2$. Minute metallic grains intergrown with platinum minerals. Distinguished from the associated minerals by microscopic examination of polished surfaces.

Mertieite. $Pd_{11}(Sb, As)_4$. Yellow metallic grains, massive. Sparingly associated with platinum minerals.

Metagabbro. A metamorphosed gabbro.

Metasediments. Metamorphosed sedimentary rocks.

Metavolanics. Metamorphosed volcanic rocks.

Miargyrite. $AgSbS_2$. H = 2.5. Black to dark grey metallic striated tabular crystals; massive. Red streak. Occurs with other silver sulphosalts and with sulphide minerals in low temperature hydrothermal veins.

Michenerite. (Pd, Pt)BiTe. H = 2.5. Greyish white metallic minute grains; massive. Black streak. Associated with gold, platinum and bismuth minerals. Originally described from the Frood Mine and named in honour of geologist Dr. C.E. Michener who discovered the mineral.

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.

Microlite. $(Ca, Na)_2Ta_2O_6(O, OH, F)$. H = 5-5.5. Yellow to brown, reddish octahedral crystals, grains or massive. Translucent to opaque with vitreous lustre. Occurs with lithium minerals in granite pegmatites.

Micropegmatite. A granitic rock composed of an irregular microscopic intergrowth of quartz and K-feldspar. Synonym of granophyre.

Millerite. NiS. H = 3-3.5. Pale brass-yellow, slender, elongated, striated crystals; acicular radiating or hair-like aggregates. Grey iridescent tarnish. Distinguished from pyrite by its crystal form, and its inferior hardness. Ore of nickel.

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.

Molybdomenite. $PbSeO_3$. H = 3.5. Colourless to white, yellowish white scaly aggregates. Pearly to greasy lustre. Occurs with clausthalite (PbSe) from which it forms.

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 it is not as hard. Distinguished from titanite by its superior hardness and radioactivity. Occurs in granitic rocks. Ore of thorium.

Montmorillonite. $(Na, Ca)_{0.3}(Al, Mg)_2Si_4O_{10}(OH)_2{\cdot}nH_2O$. H = 1-2. White, grey, greenish, yellowish flaky or finely granular massive. Waxy to dull lustre; opaque. Expands with absorption of water becoming viscose, gelatinous.

Morenosite. $NiSO_4{\cdot}7H_2O$. H = 2-2.5. Light green to greenish white fibrous encrustations; stalactitic. Generally translucent to opaque. Vitreous to dull lustre. Astringent metallic taste. Soluble in water. Secondary mineral formed by oxidation of nickel sulphide minerals.

Muscovite. $KAl_2(Si_3Al)O_{10}(OH, F)_2$. H = 2-2.5. Colourless or light green, grey, brown; transparent with splendent or pearly lustre. Tabular hexagonal crystals, sheet-like, platy or flaky aggregates. Occurs in pegmatites. 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.

Niccolite. See nickeline.

Nickeline. NiAs. H = 5-5.5. Light copper-coloured metallic massive, reniform with columnar structure; crystals (tabular, pyramidal) rare. Exposed surfaces alter readily to annabergite. Occurs in veins with cobalt arsenides and native silver. Colour is distinctive. Formerly known as niccolite; the use of the new name was recommended recently by International Mineralogical Association's Commission on New Minerals and Mineral Names.

Niggliite. PtSn. H = 3. Silver-white metallic minute grains. Associated with platinum and palladium minerals.

Norite. A gabbro with orthopyroxene (hypersthene) as the dominant ferromagnesian component.

Orpiment. As_2S_3. H = 1.5-2. Yellow foliated, columnar, fibrous, reniform, botryoidal, granular to powdery aggregates; short prismatic crystals (rare). Transparent to translucent with pearly or resinous lustre. Alteration product of arsenic minerals, notably realgar. Associated with arsenic and antimony minerals.

Orthoclase. $KAlSi_3O_8$. H = 6. Colourless, white, pink, green, grey, yellow, transparent to translucent squat prismatic or tabular crystals; cleavable massive. Vitreous to pearly lustre. Perfect cleavage. Occurs as a constitutent of pegmatite and granitic rocks. Feldspar group. Distinguished from plagioclase feldspar by absence of twinning striations.

Orthogneiss. A gneiss derived from the metamorphism of an igneous rock.

Orthopyroxene. Orthorhombic variety of pyroxene, including enstatite and hypersthene.

Overite. $CaMgAl(PO_4)_2(OH)\cdot 4H_2O$. H = 3.5-4. Light green to colourless platy crystals and aggregates; massive. Vitreous lustre. Soluble in hot HNO_3. Associated with other phosphate minerals.

Paragneiss. A gneiss derived from a sedimentary rock.

Parapierrotite. $Tl(Sb, As)_5S_8$. Black semi-metallic small prismatic crystals. Occurs in cavities in realgar.

Pararealgar. AsS. H = 1-1.5. Yellow, orange-yellow to orange-brown powdery to granular aggregates. Vitreous to resinous lustre. Associated with realgar, stibnite.

Parisite. $Ca(Ce, La)_2(CO_3)_3F_2$. H = 4.5. Yellow, brownish, or greyish yellow hexagonal pyramids or rhombohedral crystals. Striated. Transparent to translucent; vitreous to resinous or pearly lustre. Soluble in hot acids.

Parkerite. $Ni_3(Bi, Pb)_2S_2$. H ~2. Bronze-coloured, minute grains or massive. Excellent cleavage. Associated with nickeline and bismuth minerals.

Pectolite. $NaCa_2Si_3O_8(OH)$. H = 5. White needle-like crystals forming radiating and globular masses. Silky to vitreous lustre. Decomposed by warm dilute HCl. Associated with zeolites in basalt.

Pegmatite. A very coarse-grained igneous rock occurring as dykes, lenses and veins at the margins of batholiths.

Pekoite. $PbCuBi_{11}(S, Se)_{18}$. Grey metallic thin bladed crystals associated with lead-bismuth minerals.

Pentlandite. $(Fe, Ni)_9S_8$. H = 3.5-4. Light bronze-yellow massive, granular aggregates. Octahedral parting distinguishes it from pyrrhotite with which it is commonly associated. Nonmagnetic. Ore of nickel.

Peridotite. An igneous rock consisting almost entirely of olivine and pyroxene with little or no plagioclase feldspar.

Petalite. $LiAlSi_4O_{10}$. H = 6-6.5. Colourless white, grey, yellow cleavable massive. Vitreous to pearly lustre. Transparent to translucent. Associated with lepidolite in granite pegmatite.

Petzite. Ag_3AuTe_2. H = 2.5-3. Light to dark grey metallic; massive granular. Associated with other tellurides in vein deposits. Decomposed by HNO_3.

Phlogopite. $KMg_3Si_3AlO_{10}(F, OH)_2$. H = 2.5. Amber to light brown variety of mica. Used in the electrical industry.

Pitchblende. Massive uraninite containing only trace amounts of thorium and rare earths. Not a valid mineral name.

Placer. Sand or gravel deposit containing gold and/or other heavy minerals; generally refers to deposits in paying quantities.

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. Feldspar group.

Pollucite. $(Cs, Na)_2Al_2Si_4O_{12}\cdot H_2O$. H = 6.5-7. Colourless, white, grey massive; crystals (cubic) are rare. Transparent to translucent with vitreous to pearly lustre. Conchoidal to uneven fracture. Associated with spodumene, amblygonite in granite pegmatites. Resembles quartz but has a slightly greasy lustre.

Polycrase. $(Y, Ca, Ce, U, Th)(Ti, Nb, Ta)_2O_6$. H = 5.5-6.5. Black prismatic crystals; parallel to radial aggregates of crystals, or massive. Submetallic to greasy lustre. Yellowish, greyish or reddish brown streak. Radioactive. Conchoidal fracture. Occurs in granite pegmatite.

Polydymite. Ni_3S_4. H = 4.5-5.5. Grey metallic octahedral crystals, massive. Associated with other sulphide minerals in hydrothermal vein deposits.

Porphyroblast. A large crystal formed in a metamorphic rock by recrystallization, eg. garnet in schist. Also referred to as metacryst.

Porphyry. A dyke rock consisting of distinct crystals (phenocrysts) in a fine-grained matrix.

Posnjakite. $Cu_4(SO_4)(OH)_6\cdot H_2O$. H = 2-3. Minute blue flaky, radiating sheaf-like aggregates on copper-bearing rocks. Associated with other secondary copper minerals; not readily distinguished from them in the hand specimen.

Prehnite. $Ca_2Al_2Si_3O_{10}(OH)_2$. H = 6.5. Light green globular, stalactitic masses with fibrous or columnar structure and crystalline surface. Vitreous lustre. Colour and habit are distinguishing features.

Pseudo-ixiolite. A disordered columbite-tantalite. Not a valid mineral name.

Pumpellyite. $Ca_2(Mg,Fe)Al_2(SiO_4)(Si_2O_7)(OH)_2\cdot H_2O$. H = 5.5. Bluish green to green or white tiny fibrous aggregates; also platy, massive. Silky to vitreous lustre. Occurs in amygdaloidal basalt and in metamorphic rocks.

Pyrargyrite. Ag_3SbS_3. H = 2.5. Deep red prismatic crystals or massive. Adamantine lustre. Deep red streak. Occurs in veins carrying other silver minerals. Known as ruby silver. Ore of silver. Colour is identifying characteristic.

Pyrite. FeS_2. H = 6-6.5. Pale brass-yellow (iridescent when tarnished) metallic crystals (cube, pyritohedron, octahedron), 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.

Pyrolusite. MnO_2. H = 6-6.5 (crystals), 2-6 (massive). Light to dark grey metallic or bluish tint. Columnar, fibrous or divergent masses; reniform, concretionary, granular to powdery and dendritic. Soils fingers easily and marks paper. Ore of manganese.

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, eg. pyrite.

Quartz. SiO_2. H = 7. Colourless, yellow, violet, pink, brown, black, six-sided prisms with tranverse 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 sandstone. Used as a building, monument and ornamental stone; high-purity quartzite is used in the manufacture of glass.

Radioactive minerals. Minerals which give off radiation due to spontaneous disintegration of uranium or thorium atoms. Detected by a Geiger counter.

Rancieite. $(Ca, Mn)Mn_4O_9{\cdot}3H_2O$. Black, dark brown, grey metallic massive; also lamellar. Associated with manganese minerals.

Rare earth elements. A series of elements from atomic number 57 (lanthanum) to 71 (lutetium) and yttrium which were originally believed to be of rare occurrence.

Realgar. AsS. H = 1.5-2. Orange-red to orange-yellow granular to compact massive; also striated short prismatic crystals. Resinous to greasy lustre. Transparent on freshly broken surface. Alters to light yellow to reddish yellow powder (consisting of orpiment and arsenolite) on exposure to light. Occurs with orpiment and other arsenic minerals and with ores of antimony, lead, silver and gold. Decomposed by HNO_3 and aqua regia.

Retgersite. $NiSO_4{\cdot}6H_2O$. H = 2. Dark emerald-green to blue-green fibrous encrustations and veinlets; crystals (prismatic) are rare. Vitreous lustre. Greenish white streak. Occurs as an alteration product of nickeline.

Rhodochrosite. $MnCO_3$. H = 4. Pink to rose, less commonly yellowish to brown, massive granular to compact;. also columnar, globular, botryoidal; crystals (rhombohedral) uncommon. Vitreous lustre, transparent. Distinguished from rhodonite (H = 6) by its inferior hardness. Ore of manganese.

Rhyolite. A fine grained volcanic rock with composition similar to granite.

Rose quartz. Pink to rose-coloured variety of quartz; used as an ornamental stone.

Routhierite. $TlHgAsS_3$. Reddish black metallic grains and veinlets associated with stibnite, sphalerite, pyrite, realgar and orpiment.

Rozenite. $FeSO_4{\cdot}4H_2O$. 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.

Rutile. TiO_2. H = 6-6.5. Brownish red to black striated prismatic or acicular crystals; massive. Crystals are often twinned, forming elbow-shapes. Adamantine lustre. Resembles cassiterite, but not as heavy and has light brown streak (cassiterite has white streak). Ore of titanium.

Sandstone. A sedimentary rock composed of sand-sized particles, mostly quartz.

Schapbachite. High temperature form of $AgBiS_2$, matildite. Not a valid mineral name.

Scheelite. $CaWO_4$. H = 4.5-5. White, yellow, brownish, transparent to translucent; massive. Also dipyramidal crystals. High specific gravity (about 6). Generally fluoresces bright bluish white under "short" ultraviolet rays; this property is utilized in prospecting for this tungsten ore mineral.

Schiller. Internal near-surface reflection of light producing display of colours, or iridescence, as in feldspar (peristerite).

Schist. A metamorphic rock composed mainly of flaky minerals such as mica and chlorite.

Selenite. Colourless, transparent variety of gypsum.

Seligmannite. $PbCuAsS_3$. H = 3. Dark grey to black metallic short prismatic to tabular crystals. Brown to purplish black streak. Associated with sulphide and sulphosalt minerals.

Sericite. Fine scaly or fibrous muscovite, an important constituent of some schists and gneisses.

Serpentine. $(Mg, Fe)_3Si_2O_5(OH)4$. H = 2-5. White, yellow, green, blue, red, brown, black massive; may be mottled, banded or veined. Waxy lustre. Translucent to opaque. Asbestos (chrysotile) and picrolite are the fibrous varieties. 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.

Serpentinite. A metamorphic rock consisting almost entirely of serpentine.

Serpierite. $Ca(Cu, Zn)_4(SO_4)_2(OH)_6 \cdot 3H_2O$. Light blue minute elongated lath-like crystals; also tufts, crusts of flattened fibres. Transparent with vitreous to pearly lustre. Secondary mineral associated with other sulphate minerals in copper deposits.

Shale. A fine grained sedimentary rock composed of clay minerals and having a laminated structure.

Shear zone. A region is which lateral movements along rock planes has produced crushed or brecciated rocks.

Siderite. $FeCO_3$. H = 3.5-4. Brown rhombohedral crystals, cleavable masses, earthy, botryoidal. Distinguished from calcite and dolomite by its colour and higher specific gravity, from sphalerite by its cleavage. Ore of iron.

Siderotil. $FeSO_4 \cdot 5H_2O$. White, pale green to bluish fibrous crusts, needle-like crystals, or finely granular encrustations. Vitreous lustre. Metallic, astringent taste. Not distinguishable in the hand specimen from other iron sulphates.

Siegenite. $(Ni, Co)_3S_4$. H = 4.5-5.5. Grey metallic tarnishing to copper-red. Octahedral crystals or massive granular. Uncommon mineral occurring with copper, nickel or iron sulphides in vein deposits.

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.

Siltstone. A very fine-grained sedimentary rock with composition between sandstone and shale, lacking the fissility of shale.

Silver. Ag. H = 2.5-3. Grey metallic arborescent, wiry, leaf, platy or scaly forms; crystals (cubic, octahedral, dodecahedral) rare. Tarnishes to dark grey or black. Hackly fracture. Ductile, malleable. Colour, form and sectility are identifying characteristics.

Skarn. An altered rock zone in limestone and dolomite in which calcium silicates (garnet, pyroxene, epidote, etc.) have formed.

Sklodowskite. $(H_3O)_2Mg(UO_2)_2(SiO_4) \cdot 2H_2O$. H = 2-3. Light yellow to greenish yellow small acicular crystals or fibres forming rosettes, radial tufts; also powdery to earthy. Silky, vitreous to dull lustre. Secondary mineral formed from uranium minerals.

Skutterudite. $CoAs_{2\text{-}3}$. H = 5.5-6. Grey metallic cubic, cubo-octahedral or pyritohedral crystals; massive, colloform. Resembles arsenopyrite but is distinguished by crystal form. Associated with other cobalt, nickel minerals in vein deposits.

Slate. A fine-grained compact metamorphic rock characterized by a susceptibility to split into thin sheets.

Smaltite. $(Co, Ni)As_{3-x}$. An arsenic-deficient variety of skutterudite. Not a valid mineral name.

Soapstone. A metamorphic rock composed chiefly of talc; has massive fibrous texture and unctuous feel. Used as a carving medium, for retractory bricks, as marking crayons for metal-workers, and as heat resistant pads.

Soddyite. $(UO_2)_2SiO_4{\cdot}2H_2O$. H = 3.5. Yellow, amber-yellow to yellowish green small bipyramidal or tabular crystals or radial fibrous aggregates; powdery to earthy masses and crusts. Vitreous, resinous to dull lustre. Secondary mineral formed from uraninite.

Specularite. Black variety of hematite having a brilliant lustre.

Sperrylite. $PtAs_2$. H = 6-7. Light grey metallic, cubic or cubo-octahedral crystals. Associated with pyrrhotite-pentlandite-chalcopyrite ores.

Sphalerite. ZnS. H = 3.5-4. Yellow, brown or black, granular to cleavable massive; also botryoidal. Resinous to submetallic. Light yellow streak. Soluble in HCl, giving 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. Transparent varieties used as a gemstone.

Spionkopite. $Cu_{39}S_{28}$. Grey to black metallic, flaky, lamellar aggregates (microscopic). Generally intergrown with other copper sulphides. Originally described from the sandstone and quartzite copper deposits in the Yarrow Creek and Spionkop Creek area, southwestern Alberta; named in honour of the locality.

Stannite. Cu_2FeSnS_4. H = 4. Grey to greyish black metallic; granular massive or disseminated grains. Bluish tarnish. Black streak. Occurs in tin-bearing veins associated with chalcopyrite, sphalerite, tetrahedrite, pyrite and cassiterite.

Staurolite. $(Fe, Mg, Zn)2Al_9(Si, Al)_4O_{22}(OH)_2$. H = 7. Brownish yellow to brown prismatic crystals commonly twinned forming cruciform shapes. Vitreous to resinous lustre. Colour and habit are diagnostic. Occurs in schists and gneisses.

Stibarsen. SbAs. H = 3-4. Tin-white, reddish grey metallic; fibrous, lamellar, reniform, mammillary or finely granular masses. Tarnishes to grey or brownish black. Perfect cleavage in one direction. Fuses to a metallic globule. Occurs in veins with other arsenic and antimony minerals, and in pegmatites containing lithium minerals.

Stibnite. Sb_2S_3. H = 2. Lead-grey, metallic (bluish iridescent tarnish), striated, prismatic crystals; also acicular crystal aggregates, radiating columnar or bladed masses, and granular. Soluble in HCl. Most important ore of antimony.

Stilbite. $NaCa_2Al_5Si_{13}O_{36}{\cdot}14H_2O$. H = 4. Colourless, pink, white, platy crystals commonly forming sheaf-like aggregates. Vitreous, pearly lustre. Transparent. Sheaf-like form distinguishes it from other zeolites with which it is associated in volcanic rocks. Also occurs in metamorphic and granitic rocks.

Stilpnomelane. $K(Fe,Al)_{10}Si_{12}O_{30}(OH)_{12}$. H = 4. Black, dark green, golden to reddish brown foliated plates, fibrous aggregates. Associated with magnetite, hematite, goethite in iron deposits, and with chlorite and epidote in schists.

Sudburyite. (Pd, Ni)Sb. Microscopic metallic grains occurring in cobaltite and maucherite. Identified by microscopic examination of polished section of ore minerals. Originally described from the Copper Cliff South and Frood mines, and named for Sudbury, Ontario.

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

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.

Tancoite. $HNa_2LiAl(PO_4)_2(OH)$. H = 4-4.5. Colourless to pink equant or tabular crystals, often elongated and commonly in parallel multiple growth. Transparent with vitreous lustre. Conchoidal fracture and two cleavages. Associated with lithiophosphate and apatite in spodumene-bearing pegmatite. Soluble in dilute HNO_3 and in HCl. Originally described from the Bernic Lake (Tanco) Mine for which it is named.

Tapiolite. $Fe(Ta, Nb)_2O_6$. H = 6-6.5. Black short prismatic or equant crystals with submetallic to subadamantine lustre. Rusty or greyish brown to brownish black streak. Occurs in granite pegmatite.

Tennantite. $(Cu, Fe)_{12}As_4S_{13}$. H = 3-4.5. Dark grey to greyish black metallic tetrahedral crystals; compact to granular massive. Black, brown to red streak. Occurs in hydrothermal veins with copper, lead, zinc and silver minerals. Forms a series with tetrahedrite but is much less abundant.

Tetradymite. Bi_2Te_2S. H = 1.5-2. Light grey metallic indistinct pyramidal crystals; also bladed, foliated or granular aggregates. Blades are flexible, inelastic. Tarnishes to dull or iridescent surfaces. Soils paper as does graphite. Occurs with telluride and sulphide minerals in gold-quartz veins formed at moderate to high temperatures, and in contact metamorphic deposits.

Tetrahedrite. $(Cu, Fe)_{12}Sb_4S_{13}$. H = 3-4.5. Dark grey to greyish black metallic tetrahedral crystals; granular to compact massive. Black to brown streak. Ore of copper, silver-rich variety may be important ore of silver. Occurs with chalcopyrite, galena, pyrite, sphalerite, bornite and argentite in hydrothermal veins. Forms a series with tennantite.

Thomsonite. $NaCa_2Al_5Si_5O_{20}\cdot 6H_2O$. H = 5-5.5. Snow white, pinkish white to reddish, pale green, radiating columnar or fibrous masses; also compact. Vitreous to pearly lustre. Transparent to translucent. Associated with other zeolites. Massive variety used as a gemstone. Zeolite group.

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 pegmatites, crystalline limestone and hydrothermal veins.

Thucholite. Hydrocarbon containing U, Th, rare earth elements and silica. H = 3.5-4. Jet black with brilliant lustre and conchoidal fracture. Occurs in pegmatites. Not a valid mineral species.

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

Tomichite. $(V, Fe)_4Ti_3AsO_{13}(OH)$. Minute black opaque tabular crystals. Black streak. Associated with vanadian muscovite and quartz.

Tonalite. A quartz-rich diorite containing hornblende and biotite as the chief dark minerals.

Topaz. $Al_2SiO_4(F, OH)_2$. Colourless, white, pale blue, yellow, brown, grey, green, prismatic crystals with perfect basal cleavage; also massive granular. Vitreous lustre, transparent. Distinguished by its crystals habit, cleavage and hardness. Used as a gemstone.

Tourmaline. $Na(Mg, Fe)_3Al_6(BO_3)_3Si_6O_{18}(O,OH,F)_4$. H = 7.5. Black, deep green or blue, pink, brown, amber-coloured, prismatic crystals; also columnar, granular. Prism faces are vertically striated. Vitreous lustre. Conchoidal fracture. Distinguished by its triangular cross-section in prisms and by its striations. Used in the manufacture of pressure gauges; transparent varieties are used as a gemstone. Mineral group consisting of several species of which schorl (black) is the most common.

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 gemstone.

Triphylite. $LiFePO_4$. H = 4-5. Greenish to bluish grey cleavable to compact massive; crystals (prismatic) rare. Transparent to translucent with vitreous to sub-resinous lustre. Occurs with lithium and phosphate minerals in granite pegmatite.

Tuff. A rock formed from volcanic ash.

Tungusite. $Ca_4Fe_2Si_6O_{15}(OH)_6$. H ~2. Green to yellow-green platy aggregates resembling chlorite. Pearly lustre. Associated with analcime and other zeolites in lava.

Tvalchrelidzeite. $Hg_{12}(Sb, As)_8S_{15}$. Dark grey metallic granular aggregates with dark reddish tint. Adamantine lustre. Associated with cinnabar and realgar.

Twinnite. $Pb(Sb, As)_2S_4$. Black metallic minute grains. Streak is black with brownish tint. Rare mineral associated with other sulphosalts. Originally described from a prospect pit located near Madoc, Ontario.

Type locality. Locality from which mineral species was originally described.

Ullmannite. NiSbS. H = 5-5.5. Silver-white to grey metallic cubic, octahedral or pyritohedral crystals with striations on cube faces. Greyish black streak. Perfect cleavage. Occurs with nickeline and other nickel minerals in vein deposits. Distinguished from pyrite by its colour.

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 its high specific gravity (10.3 to 10.9), crystal form and radioactivity.

Uranophane. $(H_3O)_2Ca(UO_2)_2(SiO_4)_2{\cdot}3H_2O$. H = 2-3. Yellow fibrous, radiating aggregates; massive. Occurs with uraninite from which it alters.

Uranothorite. (Th,U) SiO_4. H = 4.5-5. Black prismatic crystals, grains. Pitchy lustre. May have orange-coloured sunburst effect on enclosing rock. Radioactive. Occurs in granitic and pegmatitic rocks. Granular variety distinguished from thorite and uraninite by X-ray methods. Variety of thorite; not a valid mineral name.

Valeriite. $4(Fe, Cu)S{\cdot}3(Mg, Al)(OH)_2$. Very soft, sooty. Bronze-black platy, massive with perfect cleavage. Occurs in high-temperature copper deposits.

Vesuvianite. $Ca_{10}Mg_2Al_4(SiO_4)_5(Si_2O_7)_2(OH)_4$. 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 is distinguished by its ready fusibility and intumescence in blowpipe flame. Also known as idocrase. Transparent varieties are used as a gemstone.

Violarite. $FeNi_2S_4$. H = 4.5-5.5. Light grey, brilliant metallic; tarnishes to violet grey. Massive. Distinguished by colour. Associated with copper, nickel and iron sulphides in vein deposits. Rare mineral.

Vivianite. $Fe_3(PO_4)_2{\cdot}8H_2O$. H = 1.5-2. Colourless transparent when fresh becoming blue to greenish blue to deep blue translucent due to oxidation. Vitreous to dull, earthy lustre. Prismatic crystals; bladed, globular, fibrous, powdery to earthy aggregates. Streak is colourless to bluish white quickly altering to dark blue or brown. Soluble in acids. Darkens in H_2O_2. Occurs as a secondary mineral in metallic ore deposits and as a weathering product of iron-manganese phosphates in pegmatites.

Voltaite. $K_2Fe_9(SO_4)_{12}{\cdot}18H_2O$. H = 3. Greenish black to black, dark green cubic or octahedral crystals; also massive granular. Resinous lustre. Greyish green streak and conchoidal fracture. Decomposed by water leaving a yellow precipitate. Soluble in acids. Associated with other iron sulphate minerals.

Wacke. A sandstone consisting of angular, generally unsorted, mineral and rock fragments in a clay-silt matrix.

Wall-rock. The rock forming the walls of a vein, dyke or other ore deposit.

Wehrlite. Mixture of hessite, Ag_2Te and pilsenite, Bi_4Te. Not a valid species.

Whitlockite. $Ca_9(Mg, Fe)H(PO_4)_7$. H = 5. Colourless to white, grey or yellowish rhombohedral crystals; granular to earthy massive. Transparent to translucent with vitreous to subresinous lustre. Soluble in dilute acids. Occurs in phosphate rock deposits and in pegmatites.

Witherite. $BaCO_3$. H = 3-3.5. Colourless to white, greyish, yellowish, greenish or brownish six-sided dipyramids and prisms; also tabular, globular, botryoidal, fibrous, or granular massive. Transparent to translucent with vitreous to resinous lustre. Occurs with barite and galena in low temperature hydrothermal veins. Effervesces in dilute HCl.

Wodginite. $(Ta, Nb, Sn, Mn, Fe)_{16}O_{32}$. H ~6. Reddish brown to dark brown and black irregular grains. Submetallic lustre. Occurs in granitic rocks.

Wolframite. $(Fe, Mn)WO_4$. H = 4-4.5. Dark brown to black, short prismatic striated crystals; lamellar or granular. Submetallic to adamantine lustre. Perfect cleavage in one direction. Distinguishing features are colour, cleavage, and high specific gravity (7.1-7.5). Ore of tungsten.

Wurtzite. (Zn, Fe)S. H = 3.5-4. Brownish black resinous crystals (pyramidal, prismatic, tabular) or fibrous, columnar, concentrically banded crusts. Like sphalerite but has darker colour and brown streak. Occurs with sulphide minerals.

Xenotime. YPO_4. H = 4.5. Prismatic crystals similar to zircon in shades of yellow, brown, grey. Vitreous to resinous lustre. Distinguished from zircon by its inferior hardness.

Yarrowite. Cu_9S_8. Dark grey to black metallic flaky or platy (microscopic) aggregates with green iridescence. Associated with chalcopyrite, bornite and other copper minerals from which it alters. Indistinguishable in hand specimen from spionkopite. Originally described from the sandstone and quartzite copper deposits in the Yarrow and Spionkop creeks area, southwestern Alberta; named in honour of the locality.

Yttrofluorite. Yttrian fluorite with yttrium substituting for Ca. Yellow, brown, violet, or blue, granular massive. Density and hardness are somewhat greater than in fluorite. Not a valid mineral name.

Yttrotantalite. $(Y, U, Fe)(Ta, Nb)O_4$. H = 5-5.5. Black to dark brown prismatic or tabular crystals; irregular grains, massive. Submetallic, vitreous to greasy lustre and conchoidal fracture. Streak grey. Occurs in pegmatites.

Zeolites. A group of hydrous silicates related in composition but differ in crystallization; water is given off continuously when heated but can be taken up again. Heulandite, chabazite, stilbite, natrolite, analcime belong to this group.

Zinkenite. $Pb_9Sb_{22}S_{42}$. H = 3-3.5. Grey metallic columnar to radial fibrous aggregates, massive; indistinct slender striated prisms. Tarnishes to iridescent surfaces. Occurs with stibnite, jamesonite and other sulphosalts, and galena, pyrite and sphalerite in veins formed at low to moderate temperatures.

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 are used as gemstones.

Zoisite. $Ca_2Al_3(SiO_4)_3(OH)$. H = 6.5. Grey to brownish grey, yellowish brown, mauvish pink, green aggregates of long prismatic crystals (striated); also compact fibrous to columnar masses. Vitreous to pearly lustre. Transparent to translucent. Massive variety is distinguished from amphibole by its perfect cleavage. Transparent varieties are used as gemstones; pink variety is known as thulite, deep blue variety as tanzanite.

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
Cd - cadmium
Ce - cerium
Cl - chlorine
Co - cobalt
Cr - chromium
Cs - cesium
Cu - copper
Er - erbium
F - fluorine
Fe - iron
Gd - gadolinium
Ge - germaniu
mH - hydrogen
Hg - mercury
Ir - iridium
K - potassium
La - lanthanum
Li - lithium
Mg - magnesium
Mn - manganese
Mo - molybdenum
Na - sodium
Nb - niobium
Ni - nickel
O - oxygen
P - phosphorus
Pb - lead
Pd - palladium
Pt - platinum
R - rare earth elements
Rb - rubidium
Rh - rhodium
Ru - ruthenium
S - sulphur
Sb - antimony
Se - selenium
Si - silicon
Sn - tin
Sr - strontium
Ta - tantalum
Te - tellurium
Tl - thallium
Th - thorium
Ti - titanium
U - uranium
V - vanadium
W - tungsten
Y - yttrium
Yb - ytterbium
Zn - zinc
Zr - zirconium

INDEX OF MINERALS, ROCKS AND FOSSILS