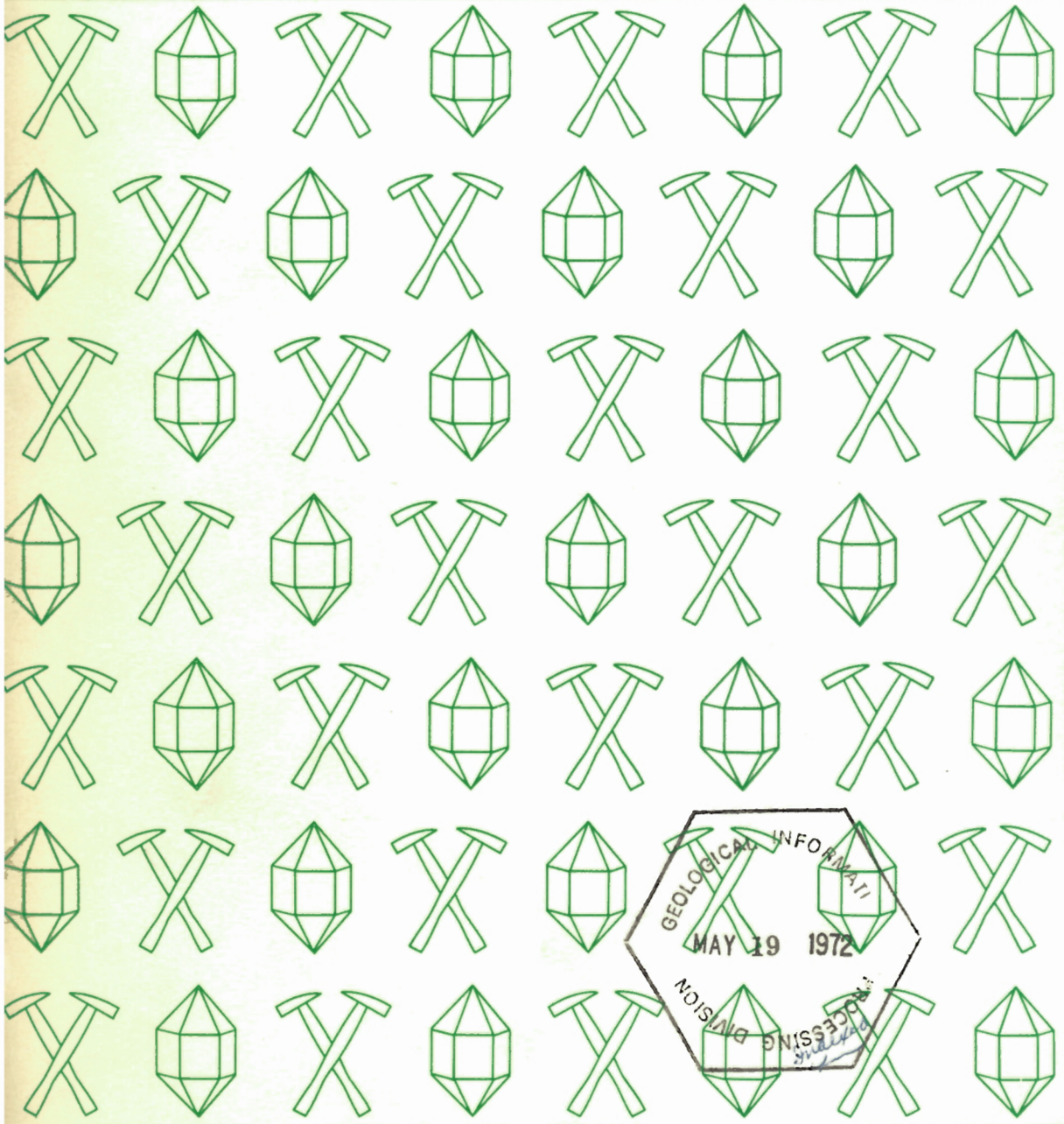
PAPER 71-27

ROCKS AND MINERALS FOR THE COLLECTOR

La Ronge-Creighton, Saskatchewan; Flin Flon-Thompson, Manitoba

Ann P. Sabina



DEPARTMENT OF ENERGY, MINES AND RESOURCES

GEOLOGICAL SURVEY
OF CANADA

PAPER 71-27

ROCKS AND MINERALS FOR THE COLLECTOR

LA RONGE-CREIGHTON, SASKATCHEWAN;

FLIN FLON-THOMPSON, MANITOBA

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DEPARTMENT OF ENERGY, MINES AND RESOURCES

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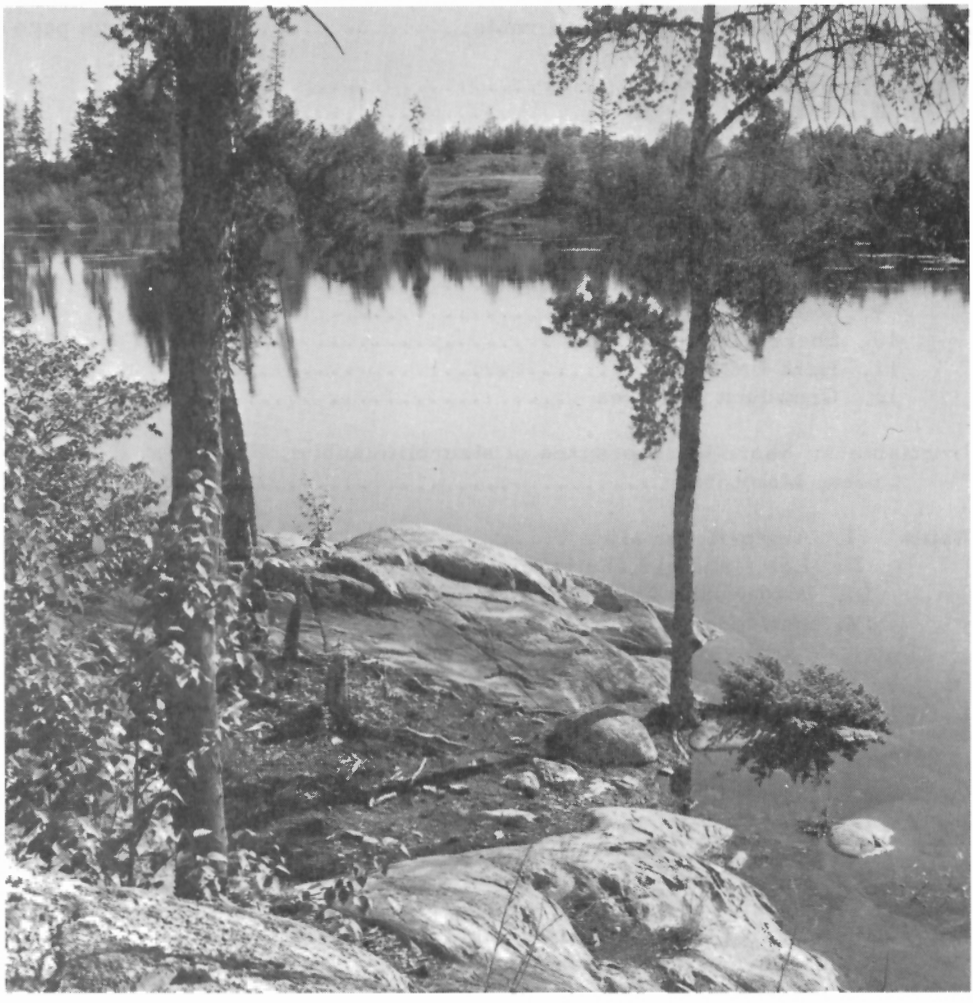


Frontispiece: Shoreline exposures of staurolite schist, Snow Creek, Manitoba. Large crystals of staurolite in rock exposure in left foreground. (G.S.C. photo 157944)

ABSTRACT

Occurrences of minerals, rocks and fossils are described from about one hundred localities in the La Ronge–Flin Flon–Thompson region of northern Saskatchewan and Manitoba.

Mineral specimens can be collected from numerous prospects, inactive mines, and other exposures. Prospecting in the region began about fifty years ago, first for gold, later for base metals, and more recently for uranium and lithium. Among the minerals furnished by these deposits are native gold, pyrite and arsenopyrite crystals, colourful secondary copper and iron minerals, uraninite and secondary uranium minerals, and metallic minerals such as pyrrhotite, pentlandite, galena and sphalerite. Nonmetallic minerals include beryl, garnet, staurolite, andalusite, spodumene, cordierite, and kyanite. These are not found in gem quality but good crystals of some of them can easily be collected. Of possible interest to the lapidary, are the soapstone from Wapawekka Lake and the mottled limestones from the Amisk Lake, Snow Lake, and Wekusko Lake areas.

Active mining of base metal deposits is currently conducted in the La Ronge, Flin Flon, Snow Lake, and Thompson areas. The world's second largest nickel producer is located in Thompson. Ore smelters are operated in Flin Flon and in Thompson, and visitors may take guided tours to view these operations.

Fossils can be found in limestone at several localities.

RÉSUMÉ

L'auteur décrit des venues de minéraux, de roches et de fossiles provenant d'une centaine de localités de la région de La Ronge–Flin Flon–Thompson, du nord de la Saskatchewan et du Manitoba.

Les échantillons de minéraux peuvent être recueillis dans de nombreux endroits où l'on a effectué des travaux de prospection, dans des mines abandonnées et autres affleurements. La prospection a commencé dans la région il y a environ une cinquantaine d'années, tout d'abord pour l'or, puis pour les métaux communs, et plus récemment pour l'uranium et le lithium. Parmi les minéraux fournis par ces dépôts, on trouve de l'or natif, des cristaux de pyrite et d'arsénopyrite, des minéraux secondaires colorés de cuivre et de fer, de l'uraninite et des minéraux secondaires d'uranium, et des minéraux métalliques comme la pyrrhotine, la pentlandite, la galène et la sphalérite. Les minéraux non métalliques incluent le béryl, le grenat, la staurolite, l'andalousite, le spodumène, la cordiérite et la cyanite. Ces roches ne se présentent pas sous forme de gemmes, mais de bons cristaux choisis parmi certaines d'entre elles peuvent être aisément recueillis. Pour le lapidaire, les roches susceptibles d'être intéressantes sont la pierre de savon du lac Wapawekka et les calcaires tachetés des régions du lac Amisk, du lac Snow et du lac Wekusko.

Les dépôts de métaux communs sont actuellement exploités dans les régions de La Ronge, Flin Flon, lac Snow et Thompson. Le deuxième producteur mondial de nickel se trouve à Thompson. Des fonderies fonctionnent à Flin Flon et à Thompson, et les visiteurs peuvent suivre des visites organisées afin de voir ces installations en action.

Dans plusieurs endroits, on peut trouver des fossiles dans le calcaire.

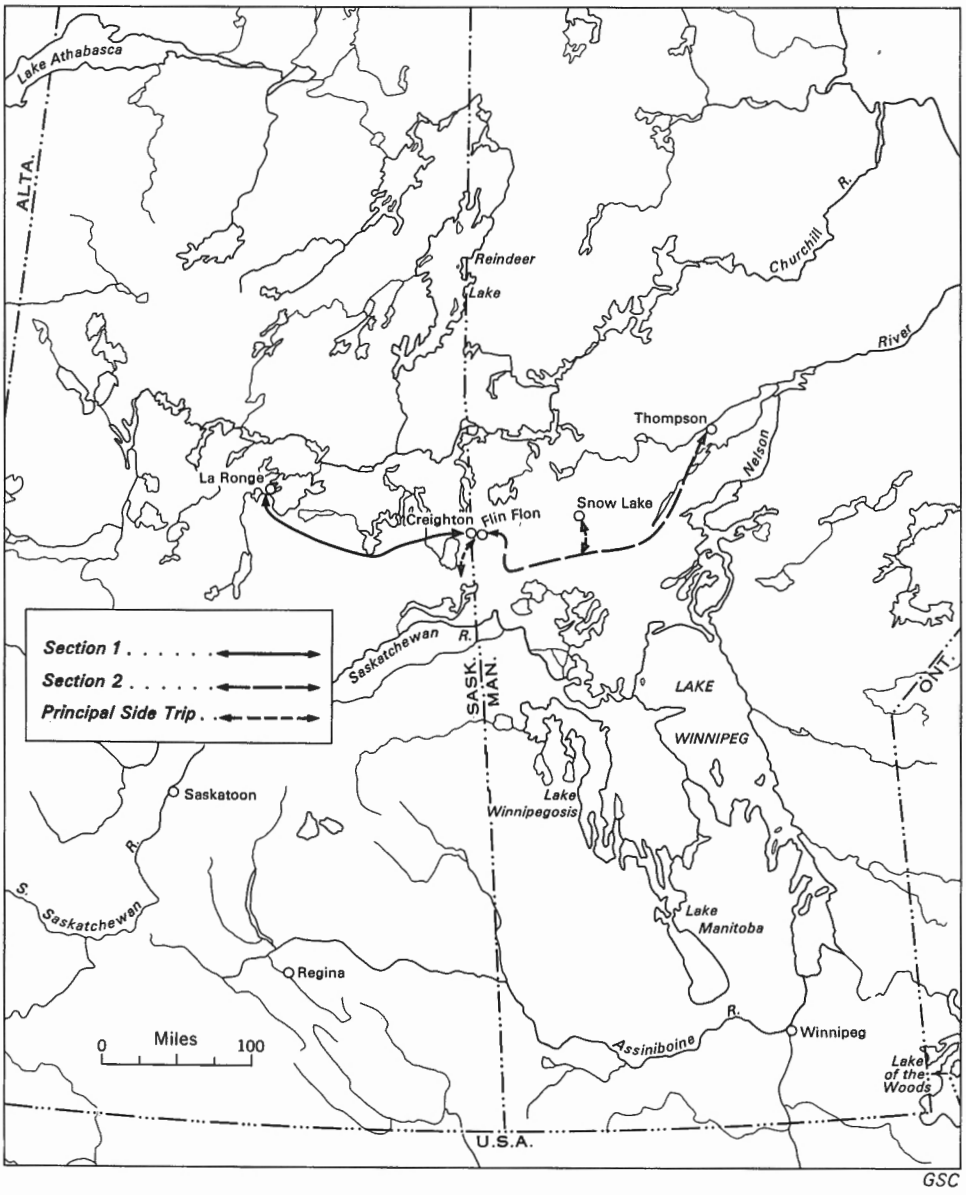


Figure 1: Map showing collecting route.

ROCKS AND MINERALS FOR THE COLLECTOR

LA RONGE-CREIGHTON, SASKATCHEWAN
FLIN FLON-THOMPSON, MANITOBA

INTRODUCTION

This booklet describes mineral, rock, and fossil occurrences between La Ronge, Saskatchewan and Thompson, Manitoba.

Most localities are easily accessible from main highways and from side roads, but to reach some of them access is by float-plane or by boat. Directions to each of the occurrences are given in the text and are designed for use with official provincial road maps. Locality maps are included where deposits may be difficult to find. Additional detailed information can be obtained from the appropriate topographic and geological maps listed for each locality. These maps are available from the agencies listed on page 76.

As most of the old prospects and inactive mines have been idle for many years, entering the shafts, tunnels, and other workings is dangerous. Some of the occurrences are on private property and the fact that they are listed in this booklet does not imply permission to visit them. Please respect the rights of property owners at all times. As a general rule, collecting is not permitted in operating mines.

The localities were visited during the summer of 1970 by the author ably assisted by Miss Frances Gombos. The field investigation and report were facilitated by information received from: Dr. A.J. Gracie, Department of Mineral Resources, La Ronge; Mr. A.L. Parres, Flin Flon; Dr. R.F.J. Scoates, Department of Mines and Natural Resources, Winnipeg; officials of Anglo-Rouyn Mines Limited, Falconbridge Nickel Mines Limited, Hudson Bay Mining and Smelting Company, Limited, and International Nickel Company of Canada Limited. Soapstone sculpture for photography was kindly supplied by Messrs. Gregg B. Charles and O. Desjarlais, Northern Handicrafts Co-operative Association Limited, La Ronge. The laboratory identification of minerals by X-ray diffraction was performed by M. Bonardi, Geological Survey of Canada. All assistance is gratefully acknowledged.

A BRIEF GEOLOGICAL HISTORY

The collecting area comprises the southern limit of the geological region known as the Canadian Shield – an immense shield-shaped body of Precambrian rocks occupying over half of Canada and part of the northeastern United States. To the south and west of the Shield is another geological region called the Interior Plains. This is an area of flat-lying sedimentary rocks that extend from Lake Winnipeg to the Rocky Mountains.

Original manuscript submitted: May 17, 1971
Final version approved for publication: June 2, 1971

TABLE I

AGE (millions of years)	ERA	PERIOD	ROCKS FORMED	WHERE THEY OCCUR
	Cenozoic	Quaternary	Gravel, sand, clay	Stream beds, lake shores
		Tertiary	Not represented in collecting area	
60	Mesozoic	Cretaceous	Conglomerate, sandstone, shale	South shore of Wapawekka Lake
		Jurassic Triassic	Not represented in collecting area	
230	Paleozoic	Permian Pennsylvanian Mississippian Devonian Silurian	Not represented in collecting area	
		Ordovician	Limestone	Exposures near Limestone Lake; Snow Lake, Wekusko quarries Tramping Lake occurrence; Highway 391 road-cuts.
		Cambrian	Not represented in collecting area	
600	Precambrian		Pegmatite	La Ronge, Lee Lake uranium mines; Crowduck Bay spodumene occurrences, Hanson Lake beryl occurrence
			Granite	Road-cuts Highways 10, 106, 392
			Andesite, basalt, conglomerate	Amisk Lake gold mines
			Quartz porphyry	North Star, Don Jon, Rex, and Amisk Lake gold mines
			Gabbro	Studer gold occurrence
			Pyroxenite	Rottenstone Mine
			Peridotite	Nickel mines in Thompson nickel belt
			Gneiss	Sherritt Gordon, Stall Lake, Osborne Lake, Anglo-Rouyn mines; road-cuts Highways 106, 391
			Schist	North Star, Newcor mines; road-cuts Highways 106, 392
			Diorite	Henning Maloney Mine; Amisk Lake gold mines

During Precambrian time, there were repeated cycles of inundation, sedimentation, mountain-building, intrusion, and erosion producing a variety of igneous, metamorphic, and volcanic rocks. The rocks containing the mineral deposits in the La Ronge, Flin Flon, Snow Lake and Thompson areas were formed during this era.

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. Great thicknesses of sediments were deposited by Paleozoic seas over much of the Shield particularly along its margins including the Interior Plains where the accumulated sediments have formed the existing limestone deposits near Amisk Lake and Wekusko Lake.

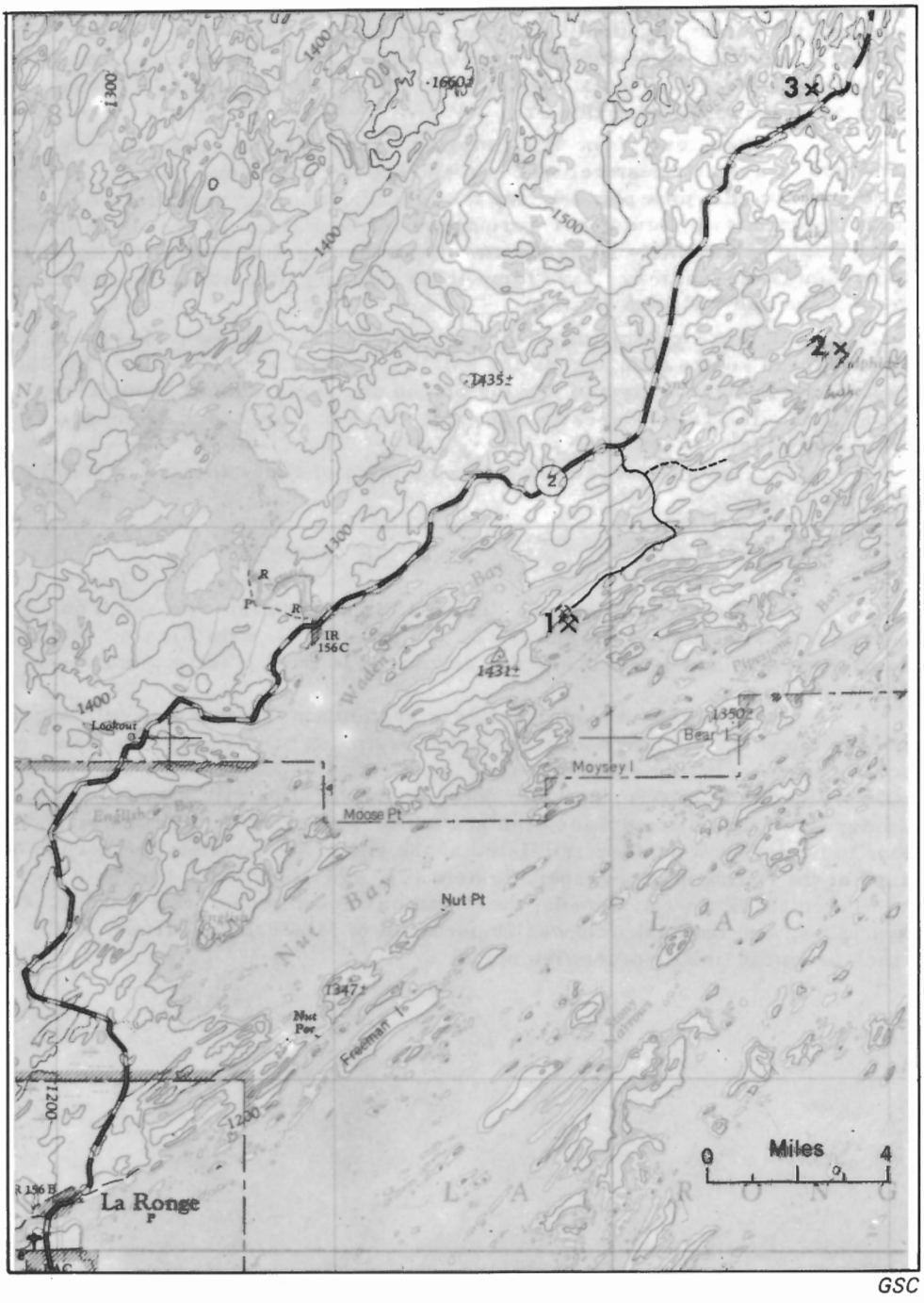
In more recent times – during the Pleistocene Period — great ice sheets spread southwards across the Shield and the Plains, moulding the landscape as we know it today and leaving behind accumulations of sand, clay, gravel, and till. Other deposits of recent times include beach sands and stream detritus.

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

COLLECTING ALONG THE ROUTE

The route, as shown in Figure 1, is divided into two sections: (1) La Ronge to Creighton via Highways 2, 165 and 106; (2) Flin Flon to Thompson via Highways 10 and 391. There are several side trips leading from these main routes.

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



1. Anglo-Rouyn Mine; 2. Studer gold occurrence; 3. Eureka occurrence.

Map 1. La Ronge area.

SECTION 1

LA RONGE-CREIGHTON

Mile 0.0 La Ronge, at junction Highways 166 and 2. The main road log follows Highways 2, 165 and 106 to Creighton. Several side trips originate from the main route.

Anglo-Rouyn Mine

CHALCOPYRITE, PYRRHOTITE, PYRITE, MAGNETITE, MALACHITE, AZURITE, GOETHITE, CALCITE, ACTINOLITE, PYROXENE, EPIDOTE, PLAGIOCLASE, SERPENTINE, TITANITE, SCAPOLITE, NATIVE COPPER, CHALCOCITE

In gneiss

Chalcopyrite, the ore mineral, is closely associated with pyrrhotite and pyrite. These minerals occur as grains and in massive form in quartz veins and stringers and in the rock; pyrite crystals measuring up to 1 inch in

Plate I. Anglo-Rouyn Mine. (G.S.C. photo 157931)

diameter have been reported. Magnetite is associated with the ore. Azurite and malachite are conspicuous as powdery to finely crystalline encrustations on the dark, fine-grained gneiss. Rusty coloured goethite also occurs as a powdery coating on the rock. Other minerals occurring in the deposit include: white to salmon-orange massive calcite, dark green bladed actinolite, greyish to olive-green massive pyroxene, yellowish green granular epidote, greenish grey plagioclase, dark brown serpentine (uncommon), dark brown titanite, and grey granular scapolite. A pink pegmatite cuts the ore. Native copper and chalcocite have been reported.

The deposit is worked for copper, gold and silver. It was discovered in 1915 by Richard and Gordon Hall, although claims for copper had been staked in the Lac La Ronge area prior to 1908. It was not worked until 1955 when Anglo-Rouyn Mines Limited, the present operator, sank a 3-compartment vertical shaft that now reaches a depth of 800 feet. The mine was idle from 1956 until 1965. Ore has since been obtained from the underground workings and from two open pits. A mill has been in operation since 1966 and the concentrate is shipped by trucks to the smelter in Flin Flon. During the summer of 1970 visitors were permitted to collect specimens from the dumps on Thursdays between 2:00 p.m. and 3:30 p.m.

Road log from La Ronge:

Mile	0.0	Junction Highways 166 and 2; proceed north along Highway 2.
	18.8	Turn-off (right) to Waden Bay camp-site; continue straight ahead.
	29.7	Junction; turn right.
	35.7	Mine.

Refs.: 4 pp. 77-78; 24 pp. 22-34; 38 p. 90; 48 pp. 30-42; 76 pp. 32-33.

Maps (T): 73P Lac La Ronge.
(G): 115D Williams Peninsula East Part (1 inch to 1/4 mile, Sask. Dept. Min. Res.).
115A Stanley (west half) Saskatchewan (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
357A Lac La Ronge (west half) Saskatchewan (1 inch to 4 miles, G.S.C.).

Studer Gold Occurrence

ARSENOPYRITE, PYRITE, NATIVE GOLD

In shear zone in gabbro

Arsenopyrite crystals and small amounts of pyrite occur in quartz stringers and in gabbro. Native gold has been reported from fractures in arsenopyrite.

Some sulphide occurrences in the Sulphide Lake area were staked prior to 1909 but fairly intensive prospecting was not conducted until the 1930's, particularly after the discovery of a gold-bearing vein by Mr. A. Studer in 1937. A year later he staked another occurrence (the S and O claim) which has been exposed by several trenches; some gold was mined from an open pit. A small mill was installed at the site. There has been no activity since 1949. The deposit is now held by Mr. Vern Studer of La Ronge.

The deposit is located on the narrows of a large south-trending peninsula in Sulphide Lake. Several other claims were staked for gold in the area but little or no development work was done on them.

Road log from La Ronge:

Mile 0.0 Junction Highways 166 and 2; proceed north along Highway 2.

29.7 Junction road to Anglo-Rouyn Mine; turn right.

31.2 Junction bush road; turn left.

33.9 End of road at dock at south end of Sulphide Lake. Access from here is by boat; permission to enter the deposit should be obtained from Mr. Studer.

Refs.: 4 pp. 40-41; 29 pp. 5-6; 34 pp. 287-298; 39 p. 156.

Maps (T): 73P/7 Stanley.
(G): 115A Stanley (west half) Saskatchewan (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
115C Sulphide Lake West Part (1 inch to 800 feet, Sask. Dept. Min. Res.).
592A MacKay Lake, Saskatchewan (G.S.C.).
39-3 MacKay Lake, Saskatchewan (1 inch to 1/2 mile, G.S.C.).

Eureka Occurrence

CHALCOPYRITE, PYRITE, GOLD, SPHALERITE, GALENA, COVELLITE, TOURMALINE, MALACHITE, BROCHANTITE, CARBONATE-CYANOTRICHITE, GOETHITE, JAROSITE, MICA, CHLORITE

In sheared volcanic and sedimentary rocks

Chalcopyrite and pyrite are the most common metallic minerals in the deposit; they occur in quartz veinlets and in the sheared rocks. Pyrite crystals averaging 1/4 inch in diameter were noted. Native gold, sphalerite and galena have been reported from the deposit. Covellite occurs as a sooty black loose powder in tiny cavities in quartz. Tourmaline, as black needle-like crystals and aggregates of tiny prisms, is associated with the quartz. Secondary minerals found as coatings or encrustations on quartz and on the host rocks include bright green malachite, greenish blue brochantite, bright blue carbonate-cyanotrichite, dull rusty goethite, and dull yellow jarosite. Colourless mica, biotite, and chlorite occur in quartz.

The deposit has been explored by several trenches. It was originally staked for gold in 1938. The openings are on a lightly wooded ridge forming a peninsula at the southern end of Heyer Bay (MacKay Lake).

Road log from La Ronge:

Mile 0.0 Junction Highways 166 and 2; proceed north along Highway 2.

29.7 Junction road to Anglo-Rouyn Mine and Studer occurrence; continue along highway.

33.7 Outcrop on left exposes gneiss containing hornblende crystals and epidote.

37.2 Turn-off to Five Fingers Lake on left.

38.9 Junction road to MacKay Lake camp and picnic site; turn left.

38.95 End of road at Department of Natural Resources dock. To the right (north) of the dock, a path leads through the woods along the shore, then up one low ridge, down it, and up to a second ridge where the trenches are located. The distance from the dock is about 350 yards.

Refs.: 4 p. 38; 24

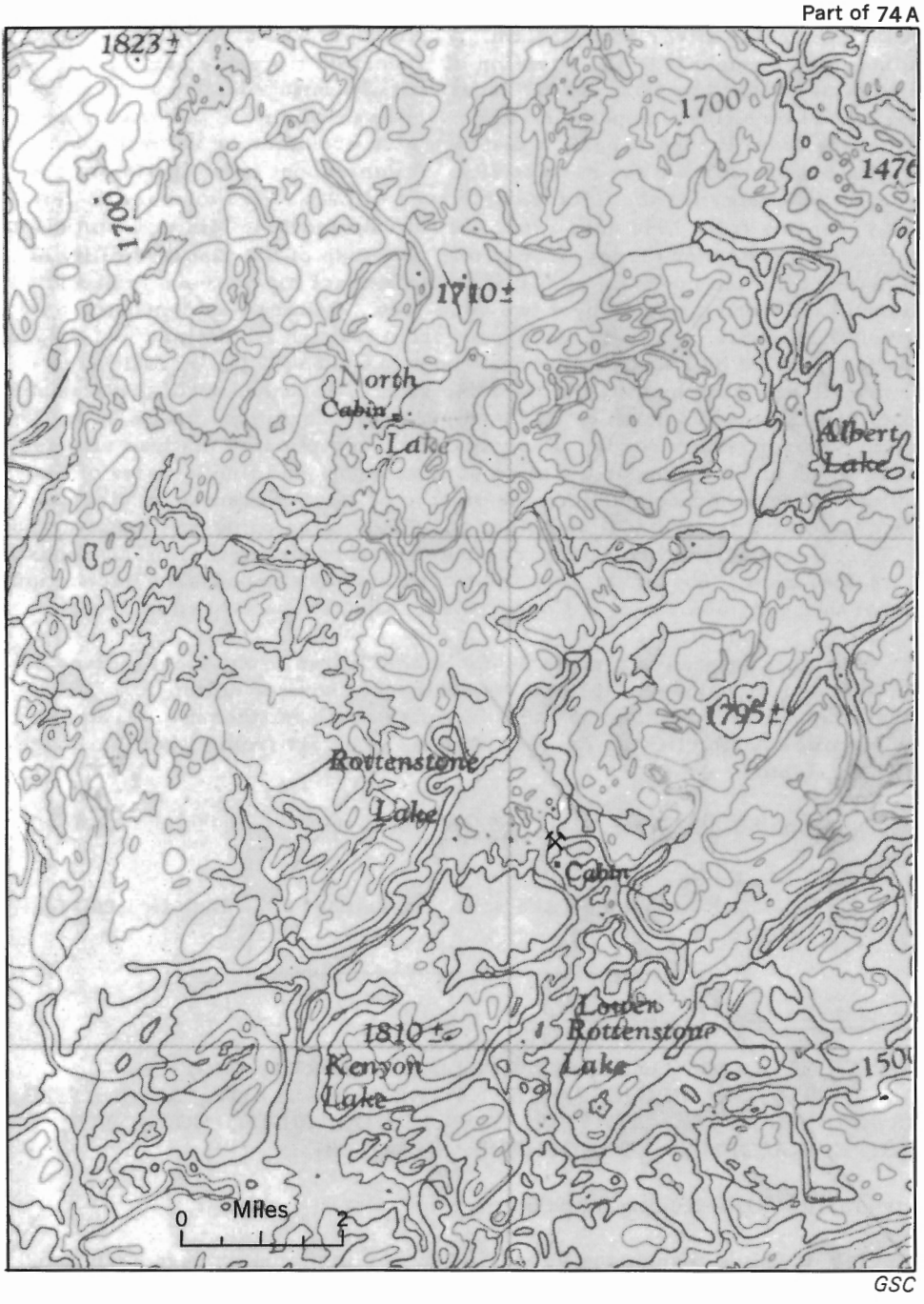
Maps (T): 73P/7 Stanley.
(G): 115A Stanley (west half) Saskatchewan (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
592 MacKay Lake, Saskatchewan (G.S.C.).
39-3 MacKay Lake, Saskatchewan (1 inch to 1/2 mile, G.S.C.).

Rottenstone Mine

PYRRHOTITE, VIOLARITE, CHALCOPYRITE, PENTLANDITE, SPERRYLITE, SPHALERITE, CUBANITE, MAGNETITE, GRAPHITE, SERPENTINE, OLIVINE, PYROXENE, CHLORITE, SIDERITE, CORDIERITE

In pyroxenite

The most common metallic minerals in the orebody are pyrrhotite, violarite and chalcopyrite. They occur as intimately associated masses containing pentlandite, sperrylite, sphalerite, and cubanite. Magnetite and, less commonly, graphite occur in the gangue consisting of green and amber serpentine, olivine crystals, pyroxene (hypersthene) crystals, dark green to black chlorite, and brownish grey siderite. Colourless to violet-blue cordierite is found as stout prisms and irregular masses associated with chlorite and serpentine; some of it is transparent and flawless but some crystals contain inclusions of sulphides and some have altered to chlorite.



Map 2. Rottenstone Mine.

The ore contains 2 per cent nickel, 2 per cent copper and values in platinum, palladium, gold, silver and rhodium. The deposit was discovered by local Indians who brought it to the attention of traders in the early part of this century; it was staked by Gordon and Robert Hall who optioned it to the Consolidated Mining and Smelting Company in 1928. Drilling equipment was transported by horses from Prince Albert, a distance of approximately 300 miles but results did not warrant further activity. A subsequent investigation in 1946 by J. B. Mawdsley for the Geological Survey of Canada led to renewed drilling programs from 1948 until 1962. In 1965 Rottenstone Mining Limited commenced operations from an open pit. Because of the inaccessibility of the deposit simple methods were utilized to extract the ore; one drill and a compressor were operated by a two-man crew. Mining was conducted only during the summer. A mill, purchased from Wabush Iron Mines in Labrador, was transported by truck, railway and boat to Quebec City, by railway to Prince Albert, then by truck to the mine site. Due to the lack of an all-weather road from Highway 2 north of La Ronge, the mill equipment had to be hauled by trucks over winter roads. Early break-up complicated matters necessitating much of the transporting to be done at night, and finally parts of the equipment were abandoned along the road to be later picked up by aircraft. The framework for the mill and other buildings in the camp was constructed by local Cree Indians who also participated in transporting the mill and assisted in its operation. The nickel-copper concentrate was shipped to the International Nickel Company of Canada at Copper Cliff. Operations ceased in 1968.

The deposit is located in a rusty 30-foot dome known to the local Indians as the "hill of rottenstone". It is on the southeast shore of Rottenstone Lake (longitude 104°50', latitude 56°30'), 90 miles north-northeast of La Ronge and 50 miles north of Otter Rapids. Access is by air from either La Ronge or Otter Rapids.

Refs.: 4 pp. 88-89; 35 pp. 9-12; 53 pp. 1423-1428; 76 p. 312.

Maps (T): 74A Foster Lake.
(G): 46-24 Rottenstone Lake area, Saskatchewan (1 inch to 1,000 feet, G.S.C.).

Lee (Jahala) Lake Occurrence

URANINITE, OLIGOCLASE, MICROCLINE, QUARTZ, BIOTITE, MUSCOVITE, GRAPHIC GRANITE, GARNET, MONAZITE, MAGNETITE, ZIRCON, ALLANITE, APATITE, ZOISITE, GOETHITE, COFFINITE, CURITE, KASOLITE, URANOPHANE, XENOTIME

In pegmatite sill intruding amphibolite

Uraninite crystals measuring up to 1 1/4 inches in diameter have been found in this deposit. Crystals of this size are no longer readily obtained but those averaging 1/2 inch in diameter are common. The uraninite occurs in brownish red oligoclase, a constituent of the pegmatite of which the other components are salmon-pink microcline (crystals measuring up to 2 feet along), colourless to smoky quartz, biotite (large plates measuring 1 to 2 feet across),

Plate II. Lee (Jahala) Lake uraninite occurrence. (G.S.C. photo 157933)

muscovite, and coarse graphic granite. Accessory minerals include garnet (granular aggregates), monazite (dark brown crystals measuring up to 1/2 inch long), magnetite, zircon, allanite, apatite, and zoisite. Goethite occurs as a rusty yellow, dull coating on feldspar. Encrustations and coatings of uranium minerals on feldspar and quartz are common. These include: coffinite, as greenish brown to blackish brown smooth waxy or crumbly crusts; curite, as orange, greenish yellow to olive-green fine compact layers or crusts; kasolite, as pale to medium dark yellow, greenish yellow, greyish beige or orange, dull to resinous, powdery to botryoidal encrustations; and uranophane, as yellow waxy coatings on uraninite. Xenotime is also present and is associated with uraninite.

The deposit was discovered in 1949 by Robert B. Ford and Richard T. Claus, geology students from the University of Wisconsin. In 1954, Jahala Lake

Uranium Mines sank a 120-foot inclined shaft in the pegmatite. The deposit is located at the side of a wooded hill facing the northeastern end of Lee (Jahala) Lake. A 150-yard trail leads from the shore up the hill to the shaft and adjacent trenches.

Lee Lake (longitude 104°17', latitude 55°12') is about 5 miles east of Hunter Bay (Lac La Ronge) and approximately 40 miles east northeast of La Ronge. Access is by floatplane from La Ronge.

Refs.: 22 pp. 196-205; 37 pp. 616-624; 58 p. 619; 73 p. 36.

Maps (T): 73P Lac La Ronge.
(G): 358A Lac La Ronge Sheet (east half) Saskatchewan (1 inch to 4 miles, G.S.C.).

Pitching Lake Occurrence

PYRRHOTITE, PYRITE, CHALCOPYRITE, TREMOLITE

In schist

Pyrrhotite, pyrite, and less commonly, chalcopyrite occur in hornblende and tremolite schist.

The deposit, known prior to 1924, was explored for copper in the 1950's. A pit measuring 178 feet by 65 feet and 20 feet deep, and a 42-foot shaft expose the original discovery at Hunter Falls on Drinking River at the south end of Pitching Lake. The openings are on the west side of Hunter Falls. A 235-foot adit driven into another sulphide body 1 1/2 miles to the northeast is connected by a trail to the main deposit. Glenn Uranium Mines Limited was involved in the exploration program.

Pitching Lake is located at longitude 104° 7' and latitude 55° 27', approximately 50 miles northeast of La Ronge. Access is by floatplane from La Ronge.

Refs.: 4 pp. 80-81; 40 pp. 21-22.

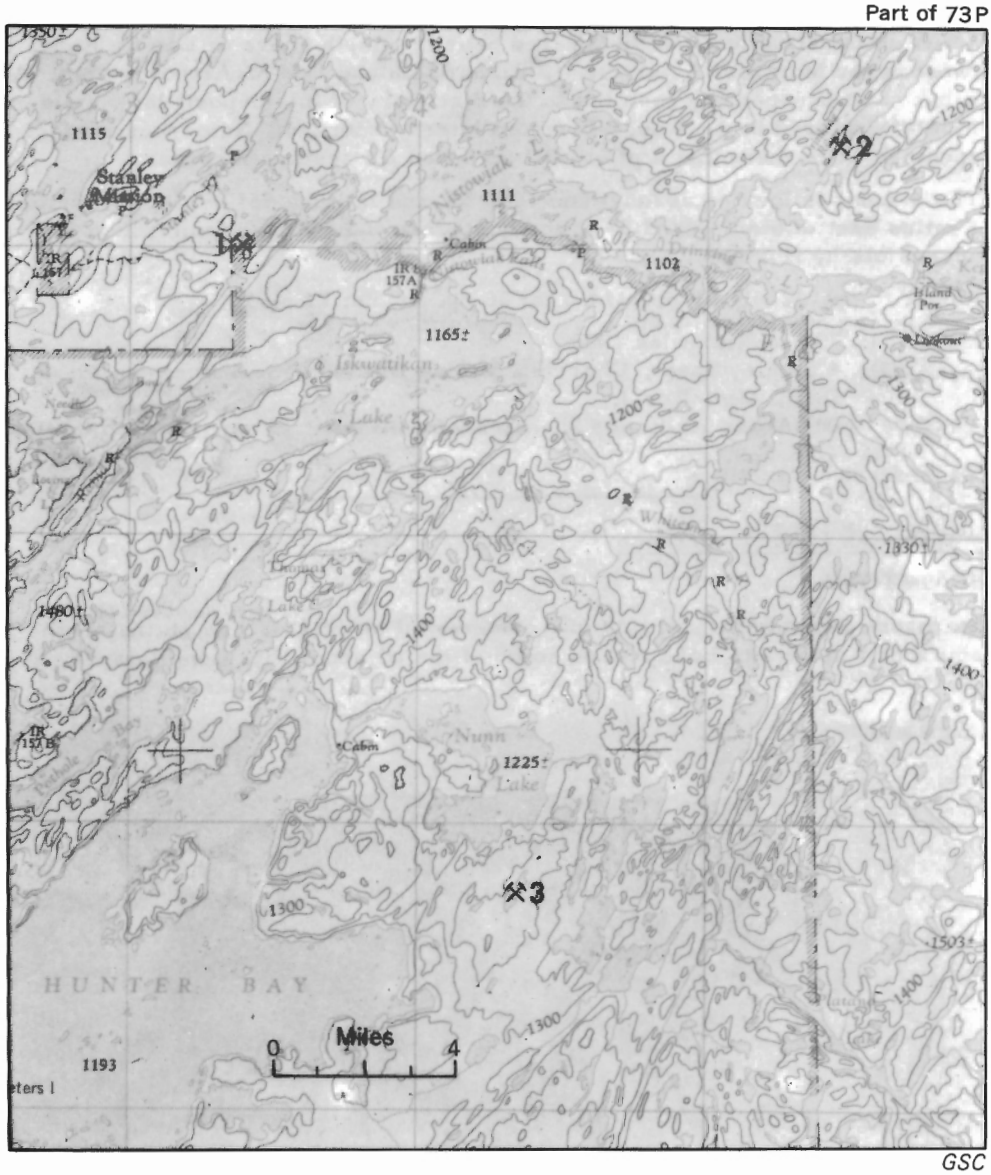
Maps (T): 73P/8 Nistowiak Lake.
(G): 70A Nistowiak Lake (east half) Saskatchewan (Sask. Dept. Min. Res.).
358A Lac La Ronge Sheet (east half) Saskatchewan (1 inch to 4 miles, G.S.C.).

La Ronge Uranium Mine

URANINITE, ORTHOCLASE, QUARTZ, BIOTITE

In pegmatite

Uraninite occurs in a coarse pegmatite consisting of salmon-pink orthoclase, white plagioclase, quartz, and biotite.



1. La Ronge uranium mine; 2. Pitching Lake occurrence;
3. Lee (Jahala) Lake occurrence.

Map 3. La Ronge area.

The deposit is located near the southwest corner of Nistowiak Lake, a part of the Churchill River which was formerly a canoe route used by early fur traders and explorers venturing to the Athabasca and Mackenzie Rivers. Radioactive mineralization was discovered near the north shore of Lac La Ronge (west of the Montreal River) by W. Richardson and Len McArthur in 1948. A subsequent prospecting rush led to the discovery of this deposit later (mid-1950's) explored by La Ronge Uranium Mines, Limited. Numerous surface openings were made and a pilot mill installed for testing purposes.

The deposit is located at longitude 104° 28' and latitude 55° 29', approximately 4 miles east of Stanley and 39 miles northeast of La Ronge from which it is accessible by floatplane.

Refs.: 6 pp. 52-53; 31 pp. 114-116; 36 pp. 26-28; 73 p. 36.

Maps (T): 73P/8 Nistowiak Lake.
(G): 4 Stanley Sheet, Churchill Mining Division, Saskatchewan (Sask. Dept. Min. Res.).
358A Lac La Ronge Sheet (east half) Saskatchewan (1 inch to 4 miles, G.S.C.).

Wapawekka Lake Occurrence

SOAPSTONE

Soapstone suitable for carving into ornamental objects occurs on the south shore of Wapawekka Lake and on some of the adjacent Pipestone Islands. It

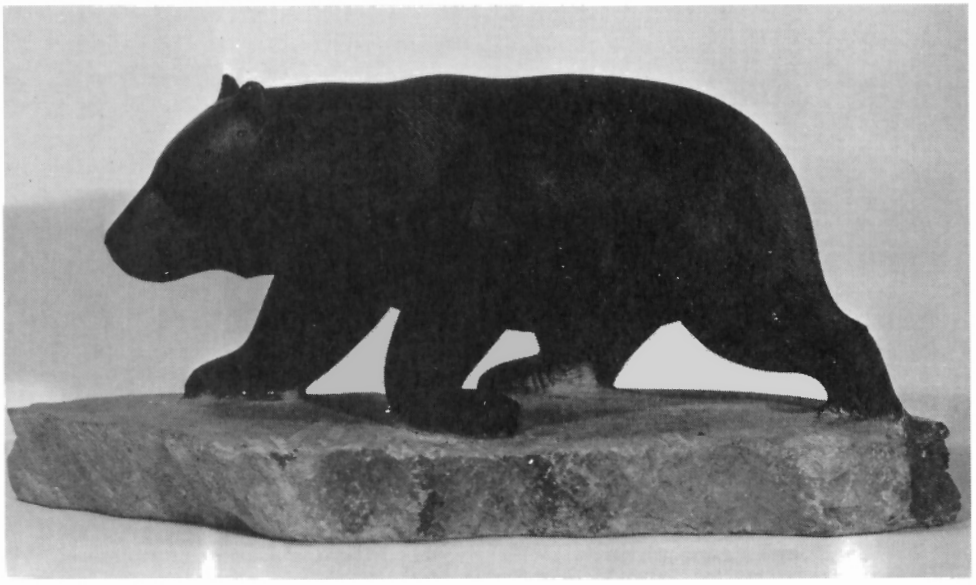
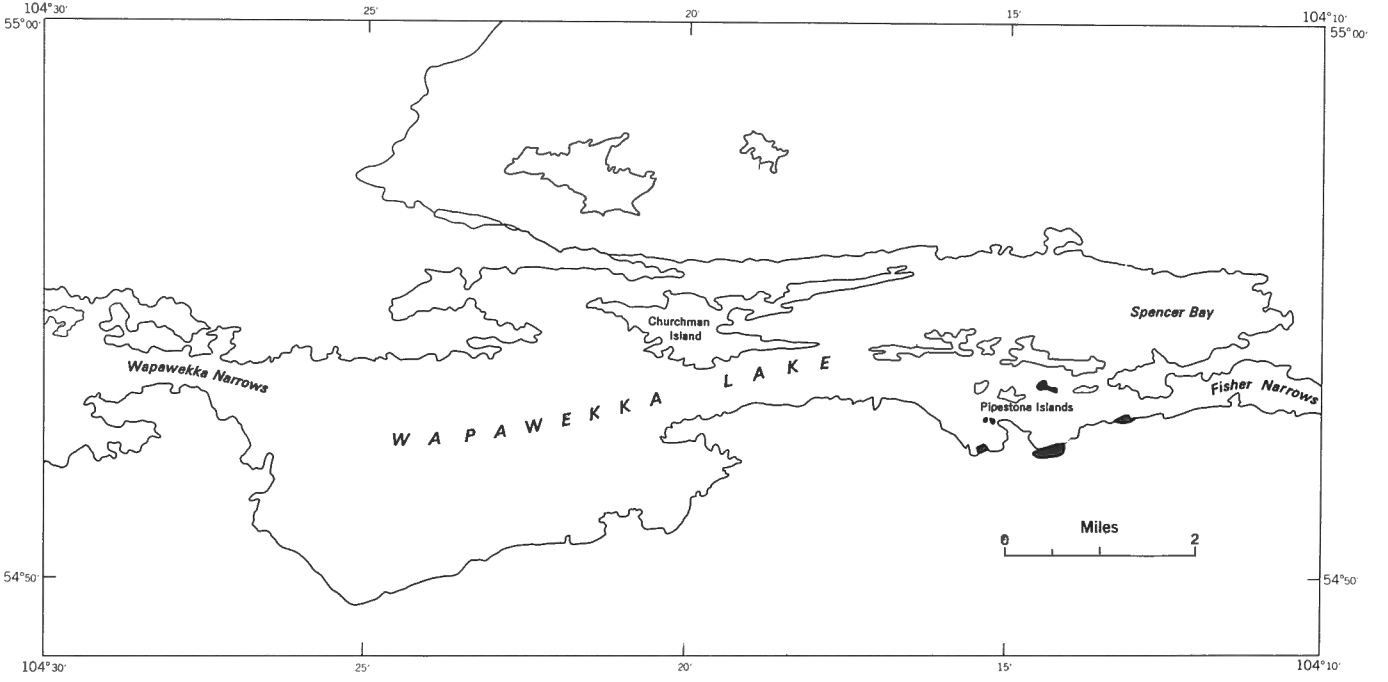


Plate III. Wapawekka Lake soapstone carving. The bear (5 inches in height) has been coated to produce the black colour; the platform is unpolished. Courtesy R. W. Boyle (G.S.C. photo 201713A)



Map 4. Wapawekka Lake soapstone occurrence.

Soapstone suitable for carving into ornamental objects occurs on the south shore of Wapawekka Lake and on some of the adjacent Pipestone Islands. It is greenish grey to greyish green in colour with deep red to chocolate-brown irregular specks and veinlets. It is fine-grained and compact, but weathered surfaces are porous to friable and more greyish in tone. It is composed principally of talc with minor amounts of dolomite, tremolite, hematite, and magnetite. The occurrence has been known to the local Indian population for many years and was used by them for making stone pipes over fifty years ago. It is now utilized by some Indians for carving into attractive sculptures featuring animal shapes. These sculptures may be seen at the Northern Handicraft store, operated by Handicraft Co-op Association Limited in La Ronge.

The soapstone outcrops at three locations, each approximately 1/2 mile apart on the south shore of Wapawekka Lake, and on two islands located 1/4 and 1/2 mile north of the shore. It occurs in ridges up to 60 feet high along the shore of the lake. The occurrences are located approximately at longitude 104°15' and latitude 54°56' about midway between Wapawekka Narrows and Fisher Narrows in the eastern half of the lake.

Access to it is by floatplane from La Ronge, 43 miles to the northwest, or by a 50-mile canoe route from Lac La Ronge including a 1 3/4-mile portage connecting Nipekamew Bay to the northwestern end of Wapawekka Lake.

Ref.: 45 pp. 54-60, 112-113.

Maps (T): 73 I Wapawekka.
87A Wapawekka Narrows (north half) Saskatchewan (Sask. Dept. Min. Res.).

The main road log from La Ronge to Creighton is resumed:

Mile	0.0	La Ronge, at junction Highways 166 and 2; proceed south along Highway 2.
	19.5	Junction Highways 2 and 169; proceed onto Highway 169.
	20.4	Junction; turn left onto Highway 165.
	70.4	Junction; proceed straight ahead (east) along Highway 106 (Hanson Lake Road).
	125.0 to 132.0	Dolomitic limestone of Ordovician age outcrops on the left side of the highway. It is buff to yellow with yellowish brown mottlings and belongs to the Red River Formation. Some exposures contain fossils including corals, sponges, crinoids and gastropods. Ref.: 46 pp. 54-55.

Mile 133.0, 134.3 Andalusite occurrences.

Pink and white to grey andalusite occurs as transparent to opaque prismatic crystals that average about 1/2 inch in diameter. The crystals are too fractured for gem purposes. Chiastolite, a variety that exhibits a dark cruciform pattern in cross-section, is found sparingly. The andalusite is associated with white to deep greyish blue quartz and pink orthoclase; these minerals are harder than the enclosing rock and are therefore prominent on weathered surfaces. The andalusite-bearing schist is exposed in outcrops on the south side of the highway. Ref.: 46 p. 29.

Maps (T): 63L Amisk Lake.
(G): 114B The Viney Lake area (west half) and the major part of the Limestone Lake area (north half) (Sask. Dept. Min. Res.).

Mile 141.0 to 141.3 Rock outcrops on both sides of highway expose hornblende-biotite gneiss containing orange-red garnet crystals measuring up to 1/2 inch in diameter.

142.6 Junction road to Tulabi Lake.

144.0 Junction road to Hanson Lake. (This junction is 0.1 mile east of milepost 170 on the Hanson Lake Road, or 170 miles from Smeaton.)

Western Nuclear Mine

GALENA, SPHALERITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, ARSENOPYRITE, ARGENTITE, TETRAHEDRITE, GARNET, ACTINOLITE, FUCHSITE, MAGNETITE, HEMATITE

In sheared volcanics

The main ore zone consists of massive galena and dark brown sphalerite with lesser amounts of pyrite, pyrrhotite, chalcopyrite, arsenopyrite, argentite, and tetrahedrite. Crystals of pyrite and of arsenopyrite are present. The sulphides also occur as disseminated grains and as narrow veinlets in quartz porphyry. Garnet and actinolite are associated with the sulphide minerals in quartz-sericite-fuchsite schist. The green bands in the schist are due to fuchsite, a bright green mica. Garnet, magnetite and hematite occur in volcanic tuff.

The deposit was discovered in 1957 as a result of airborne surveys. It was worked briefly for lead and zinc by underground methods in the mid-1960's by Western Nuclear Mines which also erected a mill at the site. Operations ceased in 1967. The orebody lies beneath Hanson Lake, 600 feet east of the shore between Bertrum and McIlvenna bays.

Access is via a 6.2 mile road that leaves Highway 106 (Hanson Lake Road) at Mile 144.0. The mine site is at the end of the road and near the shore of the lake. There is a picnic site nearby.

Refs.: 4 p. 121; 12 pp. 38-40.

Maps (T): 63L Hanson Lake.
(G): 30A Hanson Lake Sheet (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Mile 146.5 Sharp bend on road (to left).

Hanson Lake Beryl Occurrence

BERYL, GARNET, MAGNETITE

In pegmatite

Pale green to yellow-green beryl crystals averaging 1/2 inch in diameter occur in pegmatite composed of pink to red feldspar, colourless to smoky quartz, biotite, and muscovite. Crystals measuring up to 2 1/2 inches in diameter and several inches in length have been reported. The beryl is not of gem quality. Garnet and magnetite are associated with the deposit.

The beryl-bearing pegmatite is exposed in an area 1 1/2 miles west of the northern end of Hanson Lake and 3 1/2 miles south of Winteringham Lake.

To reach the occurrence walk for about one mile east from Highway 106 beginning at the sharp bend (Mile 146.5).

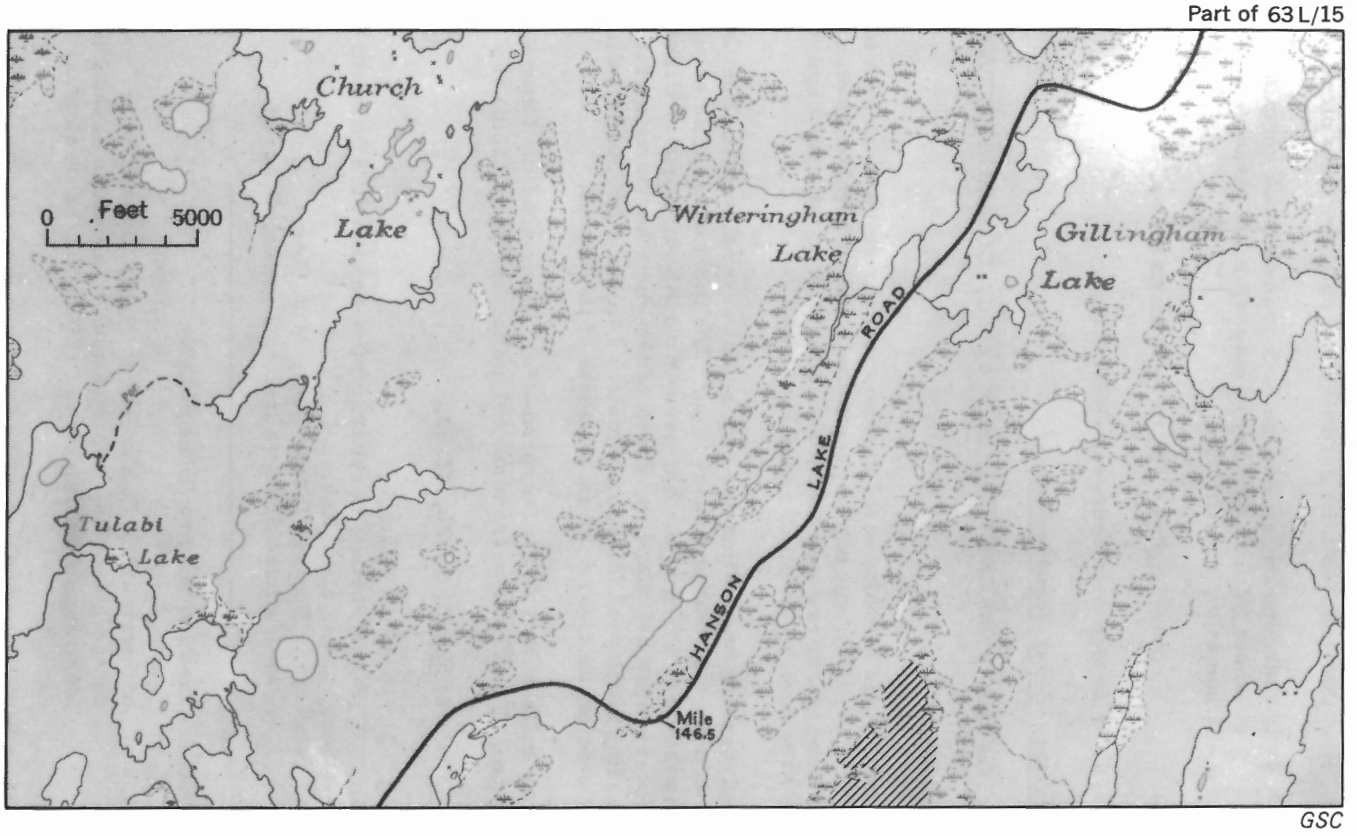
Ref.: 52 pp. 25-26, 53-54.

Maps (T): 63L/15 Birch Portage.
(G): 93B Birch Portage, Saskatchewan (Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Mile 148.8 Rock exposure on left. Garnet (pink to dark brown patches) occurs in a pegmatite composed of salmon-pink to maroon-red feldspar, colourless to smoky quartz, graphic granite, muscovite, and chlorite. This exposure is located 0.1 mile west of Milepost 175 on the Hanson Lake Road.

150.1 Pink to red garnet occurs as small crystals and grains (less than 1/4 inch in diameter) in granitic rock exposures at the side of the highway. Much of the garnet appears charcoal-grey in colour due to inclusions of chlorite.

150.6 Pink granitic rocks exposed on both sides of the highway contain small grains of pink to orange-red garnet.



Map 5. Hanson Lake beryl occurrence.

Mile 150.8 Junction (on right) road to Gillingham Lake.

150.9 Junction (on left) road to Winteringham Lake picnic site.

152.5 Outcrops on left expose pink granitic rock containing patches (about 1/2 inch across) of magnetite, of massive and platy hematite, and chlorite.

154.7 Junction Highway 135 to Pelican Narrows.

163.8 Bridge over Sturgeon-Weir River.

Birch Portage Beryl Occurrence

BERYL, GARNET, MAGNETITE, MONAZITE, COLUMBITE-TANTALITE

In pegmatite

Opaque pale green to white beryl crystals measuring up to an inch long and 1/2 inch in diameter occur in pink pegmatite intruding hornblende-biotite gneiss. Garnet and magnetite are commonly associated with it. Monazite and columbite-tantalite have been reported to occur sparsely.

The beryl-bearing pegmatites are exposed at several localities in the vicinity of the Birch Portage Indian Reservation. The most accessible occurrences are along the west shore of the Sturgeon-Weir River, north of Highway 106. These occurrences are along the shore of the river beginning at Birch Rapids and extending northward for approximately 2 miles. Another locality is on the west side of the river 6 1/2 miles north of the rapids.

Boats may be launched on the Sturgeon-Weir River near the Hanson Lake Road bridge. The distance from the bridge to the Birch Rapids is 2 miles.

Refs.: 43 p. 70; 52 pp. 25-26, 43-50.

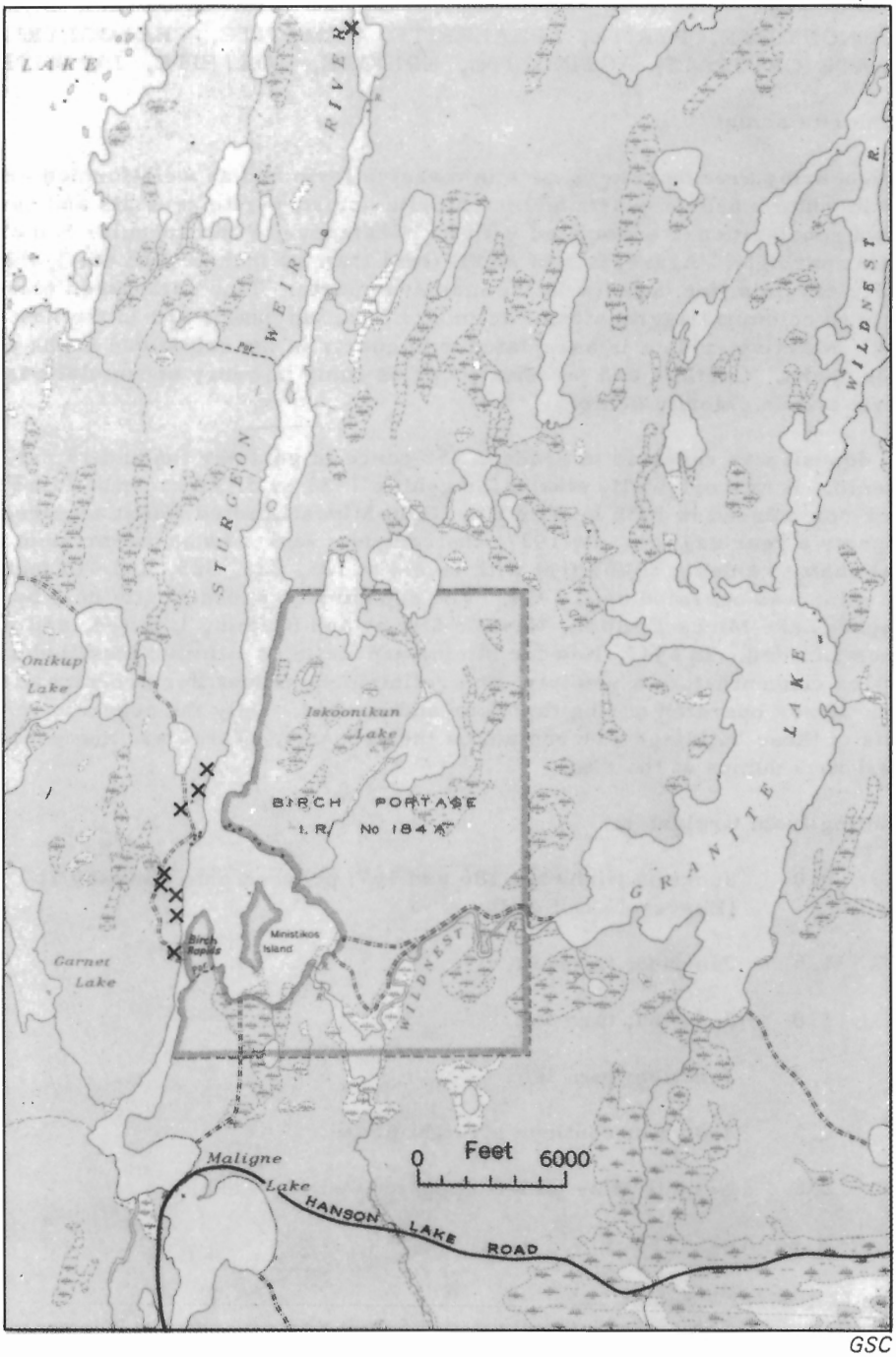
Maps (T): 63L/15 Birch Portage.
(G): 93C Birch Portage beryl pegmatite deposit (1.5 inches to 1,000 feet, Sask. Dept. Min. Res.).
93B Birch Portage (Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Mile 179.0 Junction road to Johnson Lake.

184.6 Memorial to J. B. Tyrrell on right. Joseph Burr Tyrrell conducted geological investigations of northern Saskatchewan and Manitoba in the 1880's and 1890's for the Geological Survey of Canada.

199.9 Creighton, at junction Highways 106 (Hanson Lake Road) and 167 (Beaver Lake Road).

Part of 63 L/15



Map 6. Birch Portage beryl occurrences.

Newcor Mine

ARSENOPYRITE, PYRITE, SPHALERITE, HEMATITE, CHALCOPYRITE, QUARTZ CRYSTALS, ACTINOLITE, EPIDOTE, GOETHITE, JAROSITE

In chlorite schist

Gold-bearing arsenopyrite occurs in massive form and as well-formed crystals in white massive quartz and in chlorite schist; pyrite crystals and dark brown sphalerite are associated with it. Chalcopyrite and specular hematite occur sparingly. Aggregates of small (less than 1/4 inch in diameter) white quartz crystals line cavities in the massive quartz. Tiny dark green prismatic to columnar aggregates of actinolite occur in quartz and in the host rock. Massive epidote is associated with quartz in the schist and in the volcanic rocks. Goethite and jarosite occur as rusty powdery accumulations on quartz and on chlorite schist.

The deposit was reported to grade 0.458 ounce of gold per ton and 15 per cent arsenic. It was originally staked for gold in 1933 by J. Tikkanen of Flin Flon. Work commenced in 1935 by Flin Flon Gold Mines Limited which acquired the property a year earlier. By 1937, the company sank a two-compartment vertical shaft to a depth of 465 feet with levels at 125, 225, 325, and 440 feet. The mine was operated until 1939. The deposit was subsequently held by Douglas Lake Mines Limited, Newcor Mining and Refining Limited, and Asfe Mines Limited. In 1947, Newcor Mining and Refining Limited installed a 200-ton concentrator, a smelter, and refining equipment (for arsenic) at the site. It was operated during that year and in 1948. Only the concrete remnants of these buildings now remain on the property. There are numerous small rock dumps at the site.

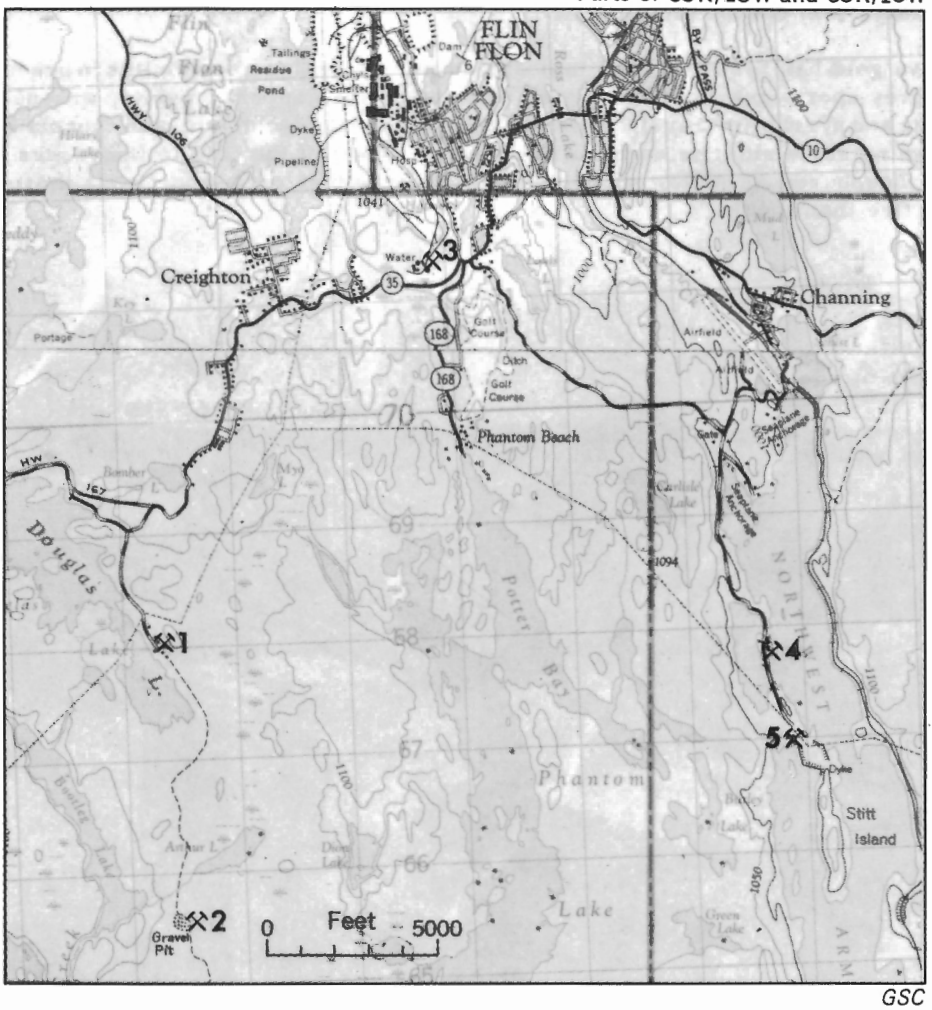
Road log from Creighton:

Mile	0.0	Junction Highways 106 and 167; proceed onto Highway 167 (Beaver Lake Road).
	1.6	Junction; turn left.
	1.8	Junction; turn left.
	1.9	Junction; turn left.
	2.3	Junction; continue straight ahead.
	2.6	Newcor Mine on left opposite Douglas Lake.

Refs.: 4 pp. 14-15; 13 p. 71.

Maps (T): K/12W Schist Lake.
(G): 62C Schist Lake (northwest quarter) Saskatchewan (1/2 inch to 1 mile, Sask. Dept. Min. Res.).
1078A Flin Flon–Mandy, Manitoba and Saskatchewan (1 inch to 1,000 feet, G.S.C.).

Parts of 63K/13W and 63K/13W



GSC

1. Newcor Mine;
2. Henning Maloney Mine
3. Flin Flon Mine;
4. Mandy Mine;
5. Schist Lake Mine.

Map 7. Flin Flon area

Henning Maloney Mine

GOLD, CHALCOPYRITE, PYRITE, ARSENOPYRITE, PYRRHOTITE, ANKERITE, CALCITE, CHLORITE, SIDERITE

In quartz vein cutting diorite

Native gold has been reported to occur as minute grains and veinlets in greenish grey cherty quartz. Associated with it are chalcopyrite, pyrite, arsenopyrite and pyrrhotite (rare). Yellowish massive calcite, chlorite, and chocolate-brown massive siderite occur in the quartz. Some of the calcite fluoresces and phosphoresces yellow when exposed to ultraviolet rays (short rays more effective than long).

Plate IV. Newcor Mine, remnants of mill overlooking Douglas Lake. (G.S.C. photo 157926)

The deposit was originally staked for gold by P. J. Maloney and A. J. Henning in 1931. Henning Maloney Gold Mines Limited was formed in 1933 and began developing the deposit in the following year. Development consisted of a two-compartment vertical shaft to a depth of 160 feet with levels at 125 and 150 feet. The mine has been inactive since 1941. The head frame and large dumps remain at the mine-site.

Road log from Creighton:

Mile 0.0 Junction Highways 106 and 167; proceed onto Highway 167 and follow road log to Newcor Mine.

2.6 Newcor Mine; continue along road.

3.9 Junction; continue straight ahead.

4.0 Gravel pit on left; continue straight ahead.

4.3 End of road at another gravel pit. A trail continues from this point. Proceed along trail through woods for approximately 300 yards to a fork; turn right and continue 50 yards to the mine.

Refs.: 4 p. 14; 13 pp. 67-69.

Maps (T): 63K/12W Schist Lake.
(G): 62C Schist Lake (northwest quarter) Saskatchewan (1/2 inch to 1 mile, Sask. Dept. Min. Res.).
1078A Flin Flon–Mandy, Manitoba and Saskatchewan (1 inch to 1,000 feet, G.S.C.).

Flexar Mine

CHALCOPYRITE, PYRITE, PYRRHOTITE, SPHALERITE, HEMATITE, SIDERITE, GARNET, EPIDOTE

In chlorite schist

The most abundant metallic mineral is chalcopyrite. It is intimately associated with pyrite, pyrrhotite, and sphalerite forming finely granular masses. Pyritohedrons and cubes of pyrite are embedded in the massive sulphides and in the chlorite schist; these crystals measure up to 3/4 inch in diameter. Thin veinlets of hematite and microscopic crystals of siderite are associated with the pyrite. Brownish red granular garnet and finely granular epidote occurs with quartz in green volcanic rocks. The ore contains 4 per cent copper, 0.6 per cent zinc and averages 0.03 ounce gold and 0.1 ounce silver per ton.

The mine is operated by Hudson Bay Mining and Smelting Company, Limited. A shaft to a depth of 1,378 feet has been sunk and production commenced in 1969. Since this is an active mine, mineral collecting on the premises is not permitted.

For location of the mine, see road log to the Birch Lake Mine.

Refs.: 11 pp. 123-124; 76 p. 175.

Maps (T): 63L/9 Denare Beach.
(G): 14F Denare Beach Sheet (northeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Birch Lake Mine

CHALCOPYRITE, PYRRHOTITE, PYRITE, MAGNETITE, SPHALERITE, EPIDOTE, BROCHANTITE, ATACAMITE, DEVILLINE

In chlorite schist

Pyrrhotite, pyrite, magnetite, and sphalerite are associated with massive chalcopyrite, the most common metallic mineral in the deposit. Light green granular epidote occurs with quartz in the schist. The secondary copper minerals brochantite, atacamite and devilline occur as powdery coatings on the sulphides and on volcanic rocks.

The deposit, at the north end of a small island in Birch Lake was discovered in 1949 by J. Brain of Flin Flon. Development was commenced by the Hudson Bay Mining and Smelting Company Limited in 1952. A shaft was sunk to 1,647 feet with six levels. Production from 1957 until 1960 amounted to 300,800 tons averaging 6.2 per cent copper. The mine buildings have been dismantled and a small amount of dump material now marks the site.

Road log from Creighton:

Mile	0.0	Junction Highways 106 and 167; proceed onto Highway 167 (Beaver Lake Road).
	1.6	Junction road to Newcor, Henning Maloney mines; continue straight ahead.
	8.0	Junction; turn left.
	9.1	Flexar Mine on right.
	10.2	Junction; turn right.
	10.4	Junction; turn right and proceed over causeway.
	10.5	Mine.

Refs.: 4 pp. 106-107; 11 pp. 123-124; 75 p. 166.

Maps (T): 63L/9 Denare Beach.

Maps (G): 14F Denare Beach Sheet (northeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Coronation Mine

CHALCOPYRITE, PYRITE, PYRRHOTITE, SPHALERITE, MAGNETITE, CUBANITE, ILMENITE, MARCASITE, HEMATITE, TETRAHEDRITE, BORNITE, COVELLITE, ANTHOPHYLLITE, CHLORITE, GARNET, STAUROLITE, EPIDOTE, POSNJAKITE, DEVILLINE, BROCHANTITE, ANTLERITE, AZURITE, MALACHITE, GOETHITE

In sheared volcanic rocks

The orebody at this former copper mine consisted of disseminated and massive chalcopyrite, pyrite, and pyrrhotite with minor sphalerite and magnetite. Also present were very small amounts of cubanite, ilmenite, marcasite, hematite, tetrahedrite, bornite, and covellite. The principal gangue minerals included dark green bladed anthophyllite, dark green to black chlorite, and orange-brown to purplish brown garnet. Microscopic, dark brown, staurolite grains were also present. Granular epidote is associated with quartz in the dumps which furnish specimens coated with secondary copper minerals including; posnjakite, as blue powdery encrustations; devilline, as light blue flaky aggregates associated with posnjakite; brochantite, as emerald green coatings associated with posnjakite; and antlerite, as emerald green encrustations. Azurite and malachite have also been reported. Goethite occurs as a rusty brown powder on specimens.

The deposit, near the shore of Phil (McNally) Lake was discovered in 1952 and staked for the Hudson Bay Mining and Smelting Company, Limited. It was developed by a shaft to a depth of 1,452 feet with 9 levels. From 1960 until 1965, a total of 1,412,861 tons of ore with a grade of 4.25 per cent copper was produced. A railway was built by the company to transport the ore to the plant at Flin Flon. All mine buildings have been dismantled; some dump material remains on the site.

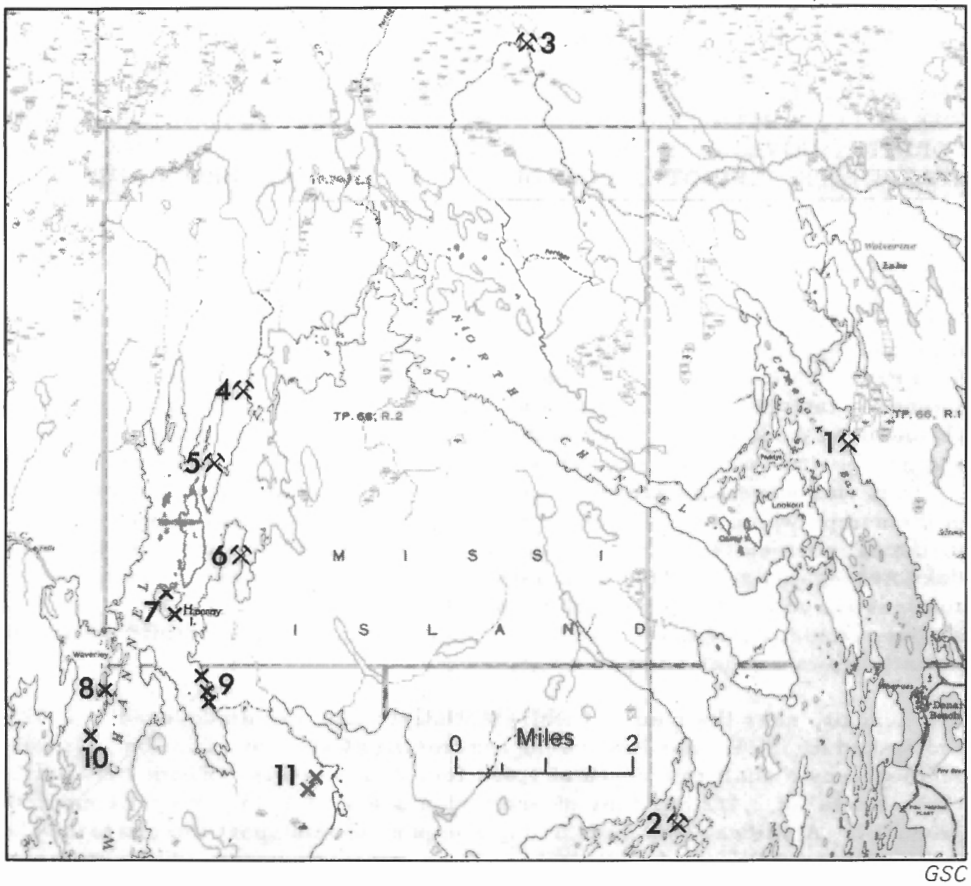
Road log from Creighton:

Mile	0.0	Junction Highways 106 and 167; proceed onto Highway 167 and follow road log to Birch Lake Mine.
	10.2	Junction road to Birch Lake Mine; continue straight ahead.
	16.1	End of road at Coronation Mine.

Refs.: 4 pp. 104-105; 13 pp. 85-89; 14 pp. 1-4; 23 pp. 55-77; 60 pp. 37-52.

Maps (T): 63K/12W Schist Lake.
(G): 62D Schist Lake (southwest quarter) (1/2 inch to 1 mile, Sask. Dept. Min. Res.).
633A Schist Lake (G.S.C.).

Parts of 63L/9 and 63L/16



1. Amisk Syndicate Mine;
2. Lucky Strike Mine;
3. Graham Mine;
4. Prince Albert Mine;
5. Amisk Gold Syndicate Mine;
6. Beaver Mine;
7. Hannay Island deposit;
8. Waverley Island occurrence;
9. Star occurrence;
10. Sonora deposit;
11. Ace deposit.

Map 8. Amisk Lake gold mines.

Amisk (Beaver) Lake Gold Mines

In 1913 free gold was discovered in the Amisk Lake area. Subsequent prospecting resulted in the discovery of numerous gold occurrences in the northern Amisk Lake area. Descriptions follow of those properties that are easily accessible by boat from Denare Beach where boat launching and rental facilities are available.

Road log from Creighton:

Mile	0.0	Junction Highways 106 and 167; proceed onto Highway 167.
	8.0	Junction road to Flexar, Birch Lake, Coronation mines; continue straight ahead.
	11.1	Junction to Denare Beach; turn right.
	11.6	Denare Beach.

Amisk Syndicate Mine

PYRITE, ARSENOPYRITE, ANKERITE

In sheared volcanics

Pyrite and arsenopyrite are disseminated in quartz and to a lesser extent in the sheared rocks. Gold values have been reported to be obtained from the quartz. Ankerite is associated with the quartz.

The deposit was staked by James Hayes in 1928. It is located on a north-trending rocky ridge on the west shore of Comeback Bay (northeast end of Amisk Lake), 3/4 mile south of the entrance to the bay leading to Wolverine Lake. Development consisted of several pits and trenches, a 40-foot adit just above the shoreline, and an adit on the east side of the ridge.

Refs.: 4 p. 16; 11 pp. 96-97.

Maps (T): 63L/9 Denare Beach.
(G): 14F Denare Beach Sheet (northeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Lucky Strike Mine

PYRITE, GOLD

In quartz vein at contact of diorite and andesite

Pyrite occurs in the quartz vein which has also been reported to contain native gold.

The property was developed in 1943 by Northwest Gold Mining Syndicate, Limited of Flin Flon. Work consisted of a pit (12 feet deep) and 6 shallow cuts.

The deposit is located 800 feet north of the end of a peninsula projecting south from the southeastern end of Missi Island; it is midway between the eastern and western shores of the peninsula.

Refs.: 4 p. 18; 11 pp. 108-109.

Maps (T): 63L/9 Denare Beach.
(G): 14F Denare Beach Sheet (northeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Graham Mine

PYRITE, NATIVE GOLD, CHALCOPYRITE, ARSENOPYRITE, ANKERITE

In quartz veins cutting greywacke and schistose conglomerate

Small cubic crystals of pyrite occur in quartz-ankerite veins and in the host rocks. Native gold, chalcopyrite, and arsenopyrite occur in quartz.

The deposit was originally staked in 1914 by J. Sales of Prince Albert. It was developed by a 35-foot shaft and several trenches. In 1932, a 10-ton mill was installed by W.W. Bowie. Although production was reported, no figures are available.

The mine is located north of North Channel at the northern tip of Amisk Lake. A trail, 2 miles long, leads from the northeast end of the channel to the shaft, the old mill-site, and a 185-foot trench. The trail continues northwest for a distance of 2,800 feet to additional trenches.

Refs.: 4 pp. 30-31; 11 pp. 102-104; 64 pp. 91-92.

Maps (T): 63L/16 Annabel Lake.
(G): 14D Annabel Lake Sheet (southeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Prince Albert (Monarch) Mine

NATIVE GOLD, PYRITE, ARSENOPYRITE, MAGNETITE, TETRAHEDRITE, GALENA, SPHALERITE, CHALCOPYRITE, MOLYBDENITE

In quartz veins cutting sericite schist

Native gold, visible to the unaided eye, has been reported to occur as specks and blebs in massive white quartz, and associated with yellowish white mica in cracks in the quartz. Tiny crystals of pyrite and of arsenopyrite and, less

commonly, disseminations of magnetite, tetrahedrite, galena, sphalerite, chalcopyrite, and molybdenite occur in the quartz. Calcite and ankerite are associated with quartz.

The deposit was discovered and staked by Dan and Tom Creighton, Leon Dion, and John Mosher in 1913. This was the first discovery of gold in the Amisk Lake district and the event sparked a prospecting rush to the area resulting in the staking of numerous deposits. This deposit is the only one in the district for which production figures are available. Development commenced in 1914 when the Beaver Lake Gold Mining Company sank an inclined shaft to a depth of 70 feet. The property was acquired by Prince Albert Gold Mines, Limited in 1921, and by Monarch Gold Miners Syndicate in 1936; the latter company deepened the shaft to 115 feet, established 2 levels, installed a 25-ton mill, and recorded the first production. From 1938 until 1945 when the mine was closed, Pamon Gold Mines, Limited conducted mining operations. The shaft was deepened to 225 feet and ore was shipped to the smelter of Hudson Bay Mining and Smelting Company, Limited in Flin Flon. Total production between 1937 and 1942 netted 4,882.36 ounces of gold and 837.06 ounces of silver from 5,821.9 tons of ore.

Plate V. Prince Albert Mine. (G.S.C. photo 157920)

The mine is located on a slope on the northwest shore of Amisk Lake near the base and on the east side of a peninsula that projects southward to Tarrington Island. The dump extends down the slope to the water's edge.

Refs.: 4 pp. 26-27; 9 pp. 66-67; 11 pp. 112-113; 64 pp. 104-105.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach Sheet (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Amisk Gold Syndicate Mine

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

In chloritic schist

Small crystals of arsenopyrite and of pyrite occur with small amounts of pyrrhotite, chalcopyrite, sphalerite and galena in chlorite schist and in quartz. Very fine grains of native gold were formerly panned from the rusty gossan that capped the deposit.

This deposit was originally staked by George Chatten in 1928. Between 1930 and 1932, the Amisk Gold Syndicate Company, Limited, sank two inclined shafts to depths of 125 feet and 30 feet. The shafts are 225 feet apart and there are 8 trenches over a distance of 600 feet to the north of the north shaft.

The mine is located on the west side of a narrow peninsula projecting south into the West Channel at the northwest end of Amisk Lake. The shafts are 50 and 100 feet from the shore and approximately 800 yards from the tip of the peninsula.

Refs.: 4 p. 22; 11 pp. 95-96; 64 pp. 96-99.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach Sheet (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Beaver Mine

NATIVE GOLD, PYRITE, MAGNETITE, CHALCOPYRITE, SPHALERITE

In chlorite schist, feldspar porphyry

Native gold has been reported to occur with pyrite crystals, magnetite, and chalcopyrite (uncommon) in schist. The gold values were obtained from the magnetite-bearing schist. The magnetite occurs as veinlets, lenses, and

small round masses. Gold has been panned from the rusty capping at a number of points on the deposit. Massive sphalerite and cubes of pyrite occur in schist that is exposed across the bay from the main deposit.

The deposit was staked in 1925 by John Hyslin and associates. A 28-foot shaft and several trenches along 1,200 feet of the shore comprise the workings on the property.

The shaft and trenches are on the east shore of a peninsula projecting north from the west side of Missi Island, immediately east of Tarrington Island. They are at approximately the mid-point between the northern tip of the peninsula and the bay it forms with Missi Island. Pits expose the deposit at the foot of the bay (magnetite cubes are associated with pyrite in porphyry), and on the west side of the bay at a point 930 feet north of its south end.

Refs.: 4 p. 23; 11 pp. 97-98; 64 p. 103.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Hannay (Bessie) Island Deposit

PYRITE, NATIVE GOLD

In schist

Pyrite is disseminated in quartz lenses enclosed by black schist that has been exposed by pits and trenches on the north shore and on the shore at the southeastern extremity of Hannay Island located in the West Channel immediately south of Tarrington Island. Gold has been panned from the rusty weathered schist in the vicinity of the pits on the north shore.

The occurrence was staked by Patty Houlihan and associates of Flin Flon. It has been exposed by a trench on the north shore of the island just west of a small bay, and by two pits and a trench at the southeastern end.

Refs.: 4 p. 25; 11 p. 105; 64 p. 101.

Maps (T): 63L/9 Denare Beach.
14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Waverley Island Occurrence

NATIVE GOLD, PYRITE, ARSENOPYRITE, CHALCOPYRITE, ANKERITE

In quartz veins cutting chlorite and sericite schist

Fine gold has been obtained by panning rusty weathered schist that forms a gossan on sulphide-bearing schist at the main deposit. Pyrite, arsenopyrite, chalcopyrite (uncommon), and ankerite occur in quartz veins and in schist.

The deposit was originally staked in 1914. Most of the development work was done in 1932 by a group including Roy Besler, John Hyslin, Richard Nelson, Shorty Russick and Rudolph Singbeil. The main deposit, on the east side of a large bay at the southwestern end of Waverley Island, has been exposed by two east-west trenches situated approximately 200 feet apart. One trench is 130 feet long and the other 75 feet long with a 10-foot shaft at one end. Other openings were made on the west shore approximately 400 feet south of the northern tip of the island, and on the east side of the island due east of the north side of the bay at the southwestern end.

Waverley Island is located in the West Channel, southwest of Tarrington and Hannay Islands.

Refs.: 4 p. 29; 11 pp. 118-119; 64 pp. 99-100.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Star Occurrence

PYRITE, SPHALERITE, GALENA, CHALCOPYRITE

In schist

Pyrite, sphalerite, galena and chalcopyrite occur as disseminations and veinlets in schist; some quartz-calcite veins contain these sulphides. Pyrite occurs as tiny cubic crystals.

The occurrence was staked for gold in 1930 by A.S. Davenport and Patty Houlihan. It has been exposed by trenches and pits on a small point projecting northward from the south end of Hannay Bay, and along the east shore of the bay at points 1,500 to 2,000 yards north of its south end.

Hannay Bay is located on the west side of Missi Island.

Refs.: 4 p. 28; 11 p. 116; 64 p. 101.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Sonora Deposit

ARSENOPYRITE, PYRITE

In sheared andesite

Pyrite and arsenopyrite occur in altered andesite; massive arsenopyrite is found as lenses measuring 12 to 30 inches wide and several feet long.

The deposit was staked for gold in 1931 and was optioned to McIntyre Porcupine Mines Limited in 1965. Seven trenches expose the mineralization on the east shore of the larger of two islands immediately southwest of Waverley Island. The openings are approximately 600 feet from the southern tip of the island.

Refs.: 4 pp. 27-28; 11 pp. 115-116.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Ace Deposit

NATIVE GOLD, PYRITE, CHALCOPYRITE, MOLYBDENITE, TETRADYMITE

In quartz-feldspar porphyry

Pyrite and chalcopyrite occur in fracture zones in porphyry. Native gold has been panned from the rusty weathered porphyry that forms a capping on the deposit. Molybdenite and tetradymite have been reported to occur in minute quartz stringers cutting the porphyry.

The deposit was staked prior to 1930 by R. Besler. It is located on the southwestern part of Missi Island. Development consists of four pits on the southwest side of a large outcrop and three pits on its northeast side. These groups of pits are 475 feet apart and a trail connects them to the south end of Hannay Bay, 3,600 feet to the west.

Refs.: 4 pp. 21-22; 11 p. 94; 64 pp. 100-101.

Maps (T): 63L/9 Denare Beach.
(G): 14E Denare Beach (northwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
314A Amisk Lake Sheet (1 inch to 2 miles, G.S.C.).

Amisk Lake Exposures

LIMESTONE, FOSSILS

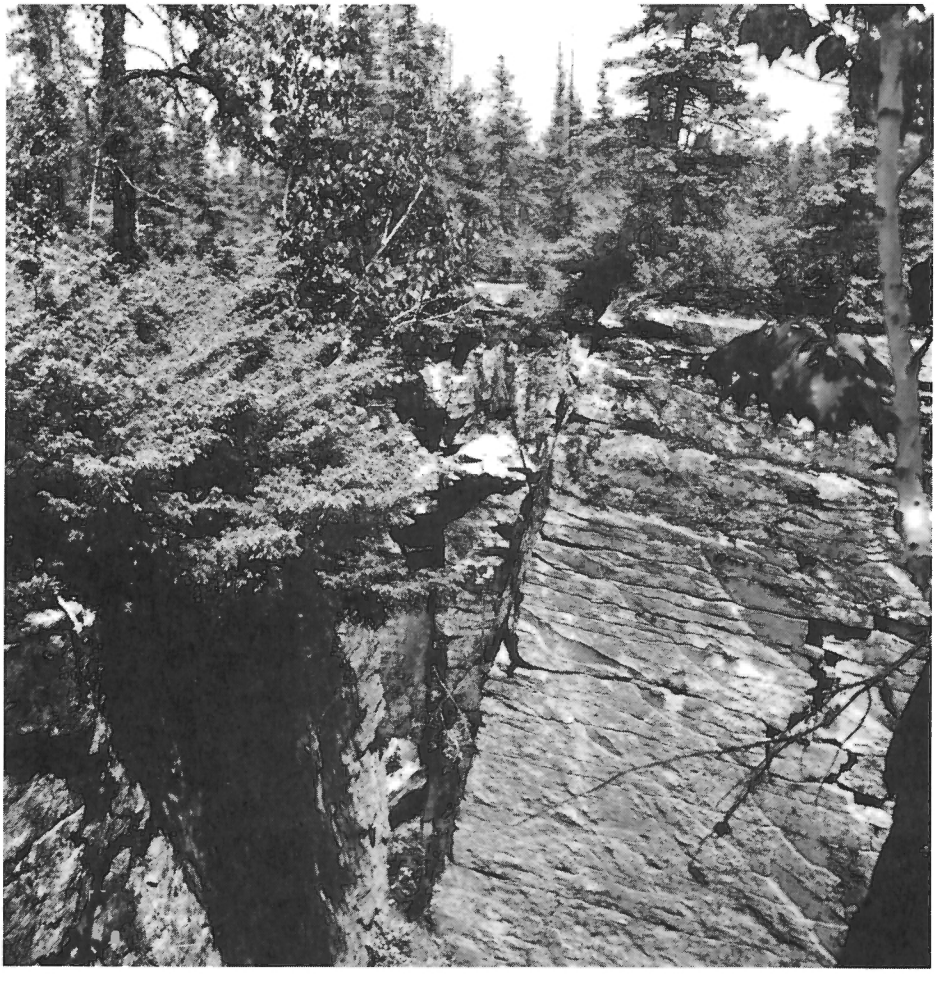


Plate VI. Limestone Crevices. The limestone in centre of photograph has been leached producing a deep opening in the rock. (G.S.C. photo 157914)

Dolomitic limestone of Ordovician age is exposed along the southeastern, southern and southwestern shore of Amisk Lake. It forms cliffs 30 to 70 feet above the lake level. It is buff coloured to grey mottled with bluish grey and subdued tones of maroon and purple. The rock takes a good polish and is suitable as an ornamental stone. It contains fossils including cephalopods, crinoids, corals and brachiopods, and weathers to a buff colour.

The limestone exposures along the lake begin south of the mouth of Meridian Creek on the east side of Amisk Lake and continue to the south side of the mouth of Sturgeon-Weir River on the west side of the lake. The exposures at Limestone Point are the most accessible by automobile. Similar rock is exposed at the Limestone Crevices.

Plate VII. Amisk Lake limestone exposures, at picnic site on southeastern end of lake. (G.S.C. photo 157916)

Road log from Creighton:

Mile	0.0	Junction Highways 167 and 106; proceed onto Highway 167 (Beaver Lake Road).
	11.1	Turn-off (right) to Denare Beach; continue along highway.
	21.3	Turn-off (left) to Limestone Crevices. Mottled limestone is exposed at this locality near the fire tower (0.1 mile east of the highway). The flat-lying rock has been eroded and long crevices approximately 20 feet deep and 6 feet wide have been produced. Because the area is overgrown with brush and trees, some of the openings are not readily visible; proper precautions must be taken.

To reach Limestone Point, continue along highway.

Mile 22.3 Rock exposure along cliff on left. Maroon coloured dolomitic limestone and grey to yellowish orange sandstone are exposed at this locality. The rocks are of Ordovician age.

30.6 Junction single lane road to Limestone Point picnic area; turn right. (The highway continues 0.3 mile to the Sturgeon-Weir River where it ends.)

30.8 End of road at picnic area near south shore of Amisk Lake. The limestone exposures along the shoreline are accessible from the picnic area.

Refs.: 9 pp. 44-49; 11 pp. 69-70.

Maps (T): 63L Amisk Lake.
(G): 14H Denare Beach Sheet (southeast quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).
1726 Athapapuskow Lake (1 inch to 3 miles, G.S.C.).

Mandy Mine

PYRITE, CHALCOPYRITE, SPHALERITE, ARSENOPYRITE, GALENA, RUTILE, MALACHITE, CHALCANTHITE, GYPSUM, BROCHANTITE, POSNJAKITE

In chlorite schist

The orebody at this former copper mine consisted of pyrite, chalcopyrite, sphalerite (dark brown), and small amounts of arsenopyrite and galena in a quartz-calcite gangue. Rutile and the secondary copper minerals, malachite and chalcanthite, have also been reported. During mining operations, crystals of selenite were found in vugs in chalcopyrite. At the mine site at present, a few ore specimens can be found; they are encrusted with colourless to white acicular gypsum crystals, green brochantite, and light blue posnjakite.

The deposit was staked in 1915 by two prospectors named Reynolds and Jackson. In the following year the Tonapah Mining Company diamond drilled the deposit and began preparations for mining. The Mandy Mining Company was formed and conducted operations from 1917 until 1920 when the high grade ore became exhausted.

This was the first deposit in northern Manitoba on which a diamond drill was used. A 200-foot shaft with two levels was used to extract the ore which occurred near the surface. Neither roads nor rail serviced the mine at the time, and the ore was hauled 35 miles by horse-driven sleighs (300 teams were employed) during the winter to Sturgeon Landing where it was stockpiled until break-up in spring. It was then transported by barges and boats 120 miles to The Pas and then by railway to the smelter in Trail, British Columbia. The high-grade ore averaged 17 per cent copper and when it was

mined out the high transportation costs did not warrant further operations. With the building of roads, interest was revived and Mandy Mines Limited deepened the shaft in 1928-29 to 1,025 feet with six levels. In 1934-44, Emergency Metals Limited installed a mill and produced copper, zinc, silver, and gold. The mine yielded a total of approximately 137,700 tons of ore averaging 7.3 per cent copper, 12.9 per cent zinc, and 0.09 ounce gold and 1.8 ounces silver per ton. The gold was contained in the chalcopyrite, the silver in the sphalerite.

The mine is located on a peninsula in the Northwest Arm of Schist Lake. The dumps have been levelled, and only small heaps of dump material, some drill cores and the foundation of the mill remain on the site.

Road log from Creighton:

Mile	0.0	Junction Highways 106 and 167; proceed east toward Flin Flon.
	1.2	Junction Phantom Lake Road; continue straight ahead.
	1.25	Junction; turn right. (This junction is 2.9 miles via Highway 10 from the junction of Highways 10 and 10A in Flin Flon.)
	4.4	Mandy Mine on left.

Refs.: 2 pp. 208-214; 9 pp. 72-77; 26 pp. 579-587; 56 pp. 4-5; 66 p. 102; 70 pp. 59, 81; 71 p. 84.

Maps (T): 63K/12W Schist Lake.
(G): 1078A Flin Flon–Mandy, Manitoba and Saskatchewan (1 inch to 1,000 feet, G.S.C.).
633A Schist Lake, Saskatchewan and Manitoba (G.S.C.).

Schist Lake Mine

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

In sericite-carbonate schist

The pyrite-chalcopyrite-sphalerite ore occurs in massive and disseminated forms. Minor amounts of arsenopyrite, galena, enargite and native gold are associated with the ore.

The deposit was discovered in 1947 by drilling beneath Schist Lake. Surface work and shaft sinking commenced in 1948 by Hudson Bay Mining and Smelting Company, Limited. Production began in 1954. The ore yields copper, zinc, gold, and silver. The present underground development consists of a three-compartment shaft sunk to 2,281 feet with 17 levels, and a winze to 3,567 feet. The ore is transported by a tramway to the company's plant in Flin Flon.

The mine is on the shore of the Northwest Arm of Schist Lake, 0.7 mile by road south of the Mandy Mine. Since it is an operating mine, collecting is not permitted.

Refs.: 17 pp. 258-262; 57; 76 p. 175.

Maps (T): 1078A Flin Flon-Mandy, Manitoba and Saskatchewan (1 inch to 1,000 feet, G.S.C.).
633A Schist Lake, Saskatchewan and Manitoba (G.S.C.).

SECTION 2

FLIN FLON–THOMPSON

Mile 0.0 Flin Flon, at junction Highways 10 and 10A; the main road log proceeds along Highway 10.

Flin Flon Mine

PYRITE, SPHALERITE, CHALCOPYRITE, PYRRHOTITE, ARSENOPYRITE, MAGNETITE, CUBANITE, GALENA, NATIVE GOLD, TETRAHEDRITE-TENNANTITE, ENARGITE, SYLVANITE, TETRADYMITE, ALTAITE, NATIVE COPPER, ACTINOLITE, EPIDOTE, GYPSUM

In chlorite schist and sericite schist

Two types of ore are encountered in this deposit: a massive sulphide ore consisting of pyrite with black sphalerite and chalcopyrite, and a disseminated

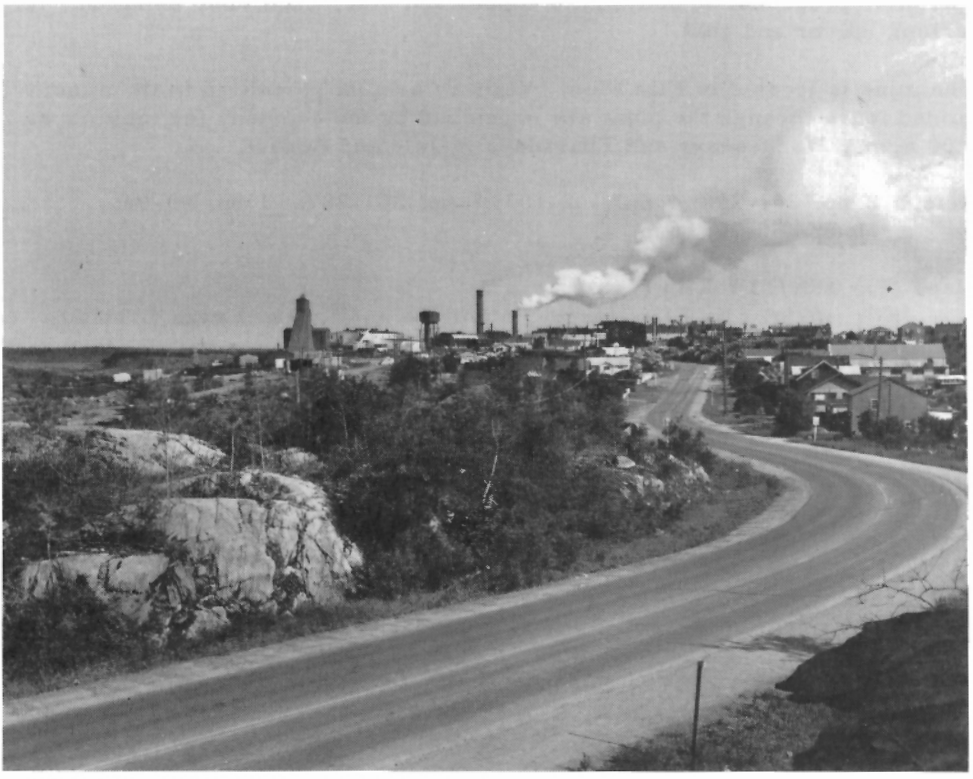


Plate VIII. Flin Flon with Flin Flon Mine and metallurgical plant in background. (G.S.C. photo 157924)

ore composed of chalcopyrite, pyrite, pyrrhotite, and brown sphalerite in chlorite and talc. Minerals reported to occur less abundantly in the orebody include arsenopyrite, magnetite, cubanite, galena, native gold, tetrahedrite-tennantite, enargite, sylvanite, tetradymite, and altaite. A crystal aggregate of native copper was found during the sinking of Shaft No. 2. Actinolite has been found with hornblende in chlorite schist, and epidote in volcanic rocks. Gypsum crystals have been reported to occur in clay on the surface.

The deposit was discovered in 1914 by Tom Creighton. The discovery was made on the shore of Flin Flon Lake where the sulphide body outcropped. In 1915, Creighton and his associates, Jack Mosher and Leon Dion, staked the deposit. It was subsequently explored by diamond drilling and, in 1920, the Mining Corporation of Canada sank two shafts. A test mill was installed in 1926, and in the following year, the Hudson Bay Mining and Smelting Company, Limited was incorporated to develop the property. A railway was built from The Pas in 1928, and in 1930 the company built a hydro plant at Island Falls in the Churchill River some 60 miles north of Flin Flon. Production commenced in 1930 and has been continuous since that date. The deposit has been developed by an open pit, a 2,219-foot No. 1 main shaft, a 4,073-foot south main shaft, and a 3,250-foot No. 3 auxiliary shaft. The mill, smelter and No. 1 and No. 3 shafts are located in Manitoba, the South shaft in Saskatchewan. The mine produces, in addition to copper and zinc, cadmium, selenium, tellurium, silver and gold.

The mine is located in Flin Flon. Visitors are not permitted to the mine; guided tours through the plant are organized by the company for visitors at 9:00 a.m., Wednesdays and Thursdays in July and August.

Refs.: 2 pp. 202-208; 4 pp. 102-103; 7 pp. 261-287; 13 pp. 90-94; 50 pp. 55-70; 56 p. 4.

Maps (T): 63K/13W Flin Flon.
(G): 1078A Flin Flon–Mandy, Manitoba and Saskatchewan (1 inch to 1,000 feet, G.S.C.).
62B Flin Flon (southwest quarter) (1 inch to 1/2 mile, Sask. Dept. Min. Res.).

Mile 1.9 Junction road to Channing.

9.9 Junction road to Cuprus Mine, White Lake Mine, Centennial Mine.

Cuprus Mine

PYRITE, CHALCOPYRITE, SPHALERITE, PYRRHOTITE, ARSENOPYRITE, GALENA, DOLOMITE, MICA, STILPNOMELANE, CHLORITE, JAROSITE, ARAGONITE, BROCHANTITE, DEVILLINE

In graphitic schist and chert

The orebody consists of massive sulphides, mainly pyrite, chalcopyrite, sphalerite, and pyrrhotite, with small amounts of arsenopyrite and galena. The schist has a greasy black appearance due to the presence of graphite. Pinkish white massive dolomite, found on the dumps, fluoresces bright pink when exposed to "short" ultraviolet rays. Pale green mica, black stilpnomelane (patches on quartz), and chlorite were also noted. Coatings of yellow jarosite and white aragonite were observed on some specimens obtained from the dumps. Green to greenish blue powdery brochantite and light blue flaky devilline occur in the schist.

The deposit was discovered in 1914 by Baptiste Le Vasseur. In 1941, the Hudson Bay Exploration and Development Company undertook a diamond drilling program, and in 1942, Cuprus Mines Limited was incorporated to develop the property. The main shaft was sunk to 1,052 feet with 9 levels, and an auxiliary shaft to 125 feet. A concentrator was installed at the site and the mine was in production from 1948 until 1954. A total to 509,374 tons of ore were milled averaging 3.25 per cent copper, 6.4 per cent zinc, and 0.038 ounce gold and 0.84 ounce silver per ton. The mine buildings have been dismantled; specimens may be collected from the dumps.

Road log from Highway 10 at Mile 9.9:

Mile 0.0 Turn right (south) onto gravel road.

0.05 Junction; turn left.

0.1 Mine. The main shaft is located on left; the auxiliary shaft is located 1,000 feet south.

Ref.: 15 pp. 253-258.

Maps (T): 63K/12E Schist Lake.
(G): 807A Athapapuskow Lake (G.S.C.).

White Lake Mine and Centennial Mine are currently (1971) being developed by Hudson Bay Mining and Smelting Company, Limited. Both are copper-zinc deposits.

Mile 13.4 Junction North Star Road.

Pine Bay Mine

PYRITE, CHALCOPYRITE, PYRRHOTITE, SIDERITE, QUARTZ CRYSTALS, TALC, EPIDOTE, CHLORITE, ROZENITE, LEONHARDTITE

In chlorite schist and volcanic rocks

Massive pyrite and crystals (averaging 1/4 inch in diameter) occur with chalcopyrite and small amounts of pyrrhotite in quartz, and in schist and volcanics.

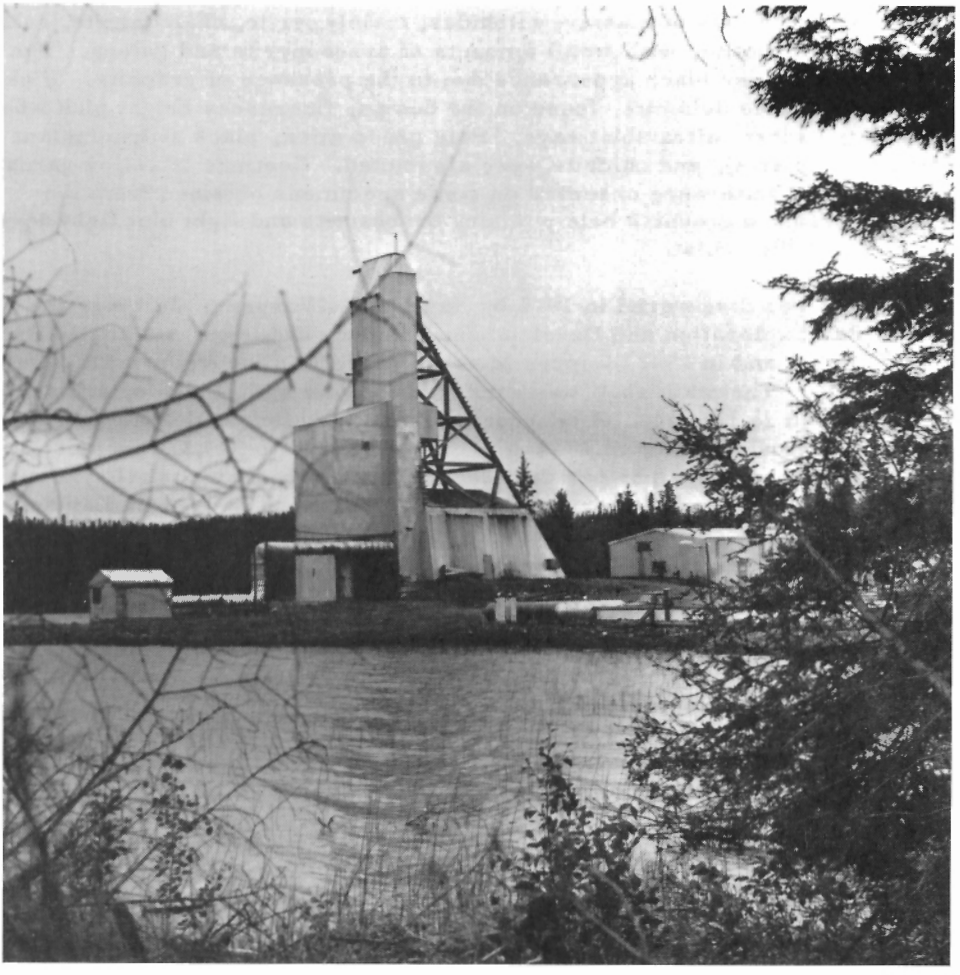


Plate IX. Pine Bay Mine. (G.S.C. photo 157918)

Small cavities in the ore are lined with microscopic crystals of siderite and quartz. Other minerals associated with the ore include: white to yellow massive and fibrous talc, epidote (associated with quartz and pink feldspar), and massive chlorite. Rozenite and leonhardtite occur as a snow white powder on the sulphides and associated minerals and rocks.

The deposit, estimated to contain 1,500,000 tons of 1.5 per cent copper, was being explored jointly in 1970 by Cerro Mining Company of Canada Limited and Straus Exploration. A shaft had been sunk on the shore of Sourdough Bay at the north end of Athapapuskow Lake.

Road log from Highway 10 to Mile 13.4:

Mile 0.0 Junction; turn left onto the North Star Road.

Mile 3.0 Junction; turn right.

3.5 Mine.

Ref.: 76 p. 84.

Maps (T): 63K/13E Flin Flon.
(G): 832A Mikanagan Lake (G.S.C.).

Baker-Patton Deposit

PYRITE, CHALCOPYRITE, ARSENOPYRITE, QUARTZ CRYSTALS, JAROSITE

In cherty chlorite schist and sericite schist

Pyrite in massive form, as individual pyritohedrons and cubes measuring 1/2 inch in diameter, and as aggregates of cubic crystals, is common in the rock dumps. The massive pyrite is bronze-yellow in colour but the crystals are silvery yellow. Uncommon are small prisms of arsenopyrite in the massive pyrite. Microscopic crystals of quartz were noted lining vugs in massive quartz. Yellow jarosite and rusty brown goethite occur as powdery coatings on pyrite-bearing schist.

The deposit was discovered by H. L. Baker and Wm. Patton and was optioned to the London Exploration Company which explored it by trenches in 1922. In 1928 Callinan Flin Flon Mines sank a shaft to 415 feet with 3 levels, and installed a mining plant. No further work was done and all buildings were burned when a forest fire swept the area in 1930.

The property is located just east of the north end of Sourdough Bay. Specimens are available from numerous rock dumps.

Road log from Highway 10 at Mile 13.4:

Mile 0.0 Junction; turn left (east) onto the North Star Road.

3.0 Turn-off to the Pine Bay Mine; continue on main road to left.

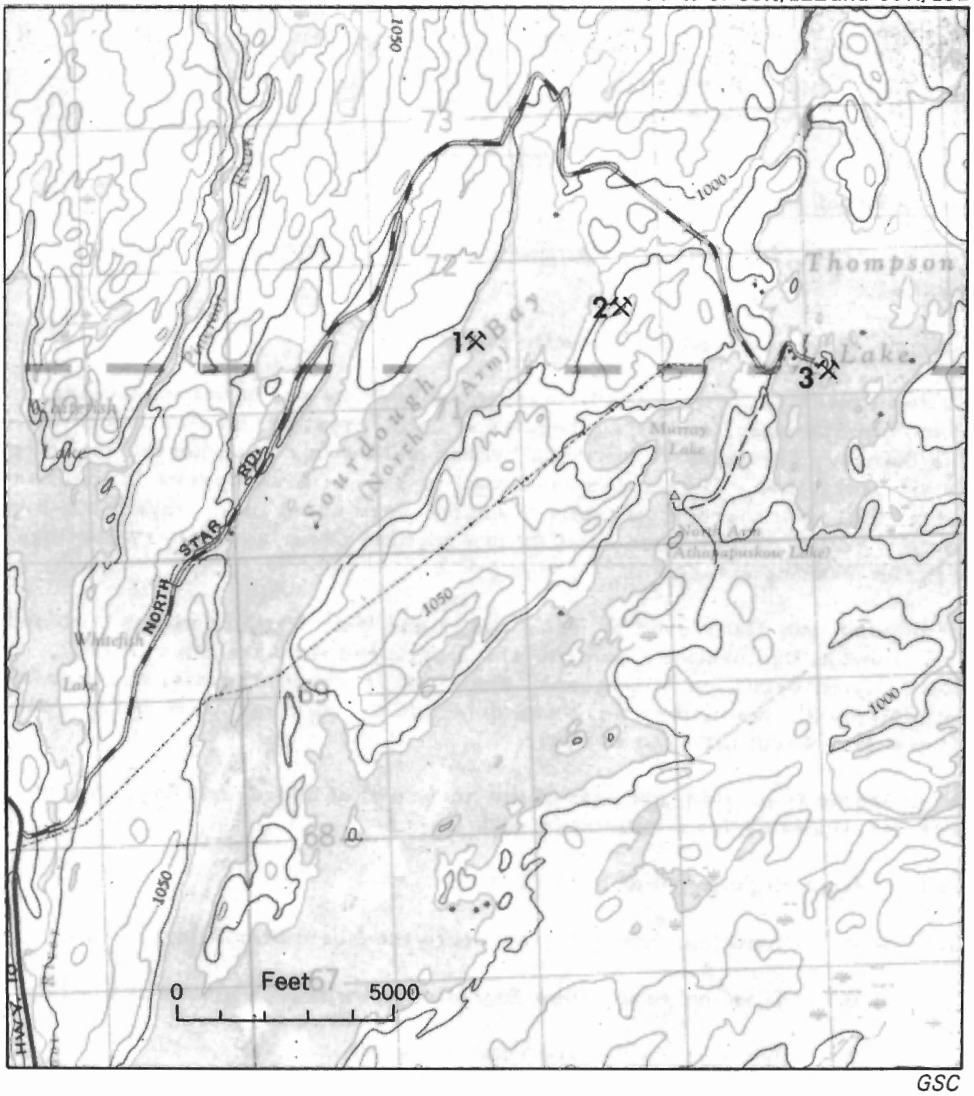
5.8 Junction single lane road; turn left.

6.4 Mine at end of road.

Refs.: 3 p. 5; 63 pp. 51-52.

Maps (T): 63K/13E Flin Flon.
(G): 832A Mikanagan Lake (G.S.C.).

Parts of 63K/12E and 63K/13E



GSC

1. Pine Bay Mine; 2. Baker-Patton deposit;
3. North Star, Don Jon mines.

Map 9. Sourdough Bay area.

North Star, Don Jon Mines

PYRITE, CHALCOPYRITE, QUARTZ CRYSTALS, BROCHANTITE, POSNJAKITE, EPIDOTE, CHLORITE, DOLOMITE, FELDSPAR, TALC, GOETHITE

In cherty chlorite schist

Pyrite and chalcopyrite occur as irregular masses in the rock. Vugs in the massive sulphides are lined with microscopic crystals of colourless quartz and rusty white calcite. Crystals of pyrite occur in the massive pyrite. Bright green brochantite occurs as encrustations on the ore-bearing rock, as does silky, light-blue posnjakite. Epidote, chlorite, dolomite (pink), and feldspar (salmon-pink) are associated with massive quartz. Grey talc was noted in the schist. Rusty yellow goethite occurs as a powdery coating on the rocks.

The pyrite outcrop at the North Star deposit was discovered in about 1930 on the west shore of an island near the west side of Thompson Lake. Exploration between 1949 and 1951 by the Hudson Bay Exploration and Development Company, Limited resulted in locating the orebody below Thompson Lake, at a point 300 feet north of the outcrop. The development of the orebody was undertaken by the Hudson Bay Mining and Smelting Company, Limited which sank a shaft to 1,623 feet. The mine was operated until 1958 and produced 218,847 tons of copper ore.

The Don Jon deposit is located on the south shore of a small island located approximately 350 yards southeast of the North Star Mine. It was discovered in 1929 by David Collins and it was trenched by the Consolidated Mining and Smelting Company. In 1951, Don Jon Mines Limited was formed to mine the deposit. The ore was mined from the shaft at the North Star deposit which was connected by a crosscut at the 600-foot level. Operations ended in 1957 and 69,811 tons of copper ore were extracted.

Road log from Highway 10 at Mile 13.4:

Mile 0.0 Junction; turn left onto the North Star Road.

5.8 Junction road to Baker-Patton deposit; continue straight ahead.

6.5 North Star Mine.

Refs.: 3 pp. 5-6; 16 pp. 247-253; 20 p. 73; 63 pp. 52-53.

Maps (T): 63K/13E Flin Flon.
(G): 832A Mikanagan Lake (G.S.C.).

Mile 17.6 Junction road to Flin Flon airport.

24.4 Junction road to Neso Lake.

Plate X. Sherritt Gordon Mine. Remnant of mill in background. (G.S.C. photo 157930)

Mile 26.9 to 27.1 Road-cuts expose pink granite containing veinlets and fracture-fillings of epidote.

27.8 Junction road to Payuk Lake.

33.6 to 35.3 Road-cuts expose volcanic and granitic rocks. Pyrrhotite, pyrite, chalcopyrite, epidote, and small patches of tremolite were noted in the volcanics; epidote and magnetite in the granitic rocks.

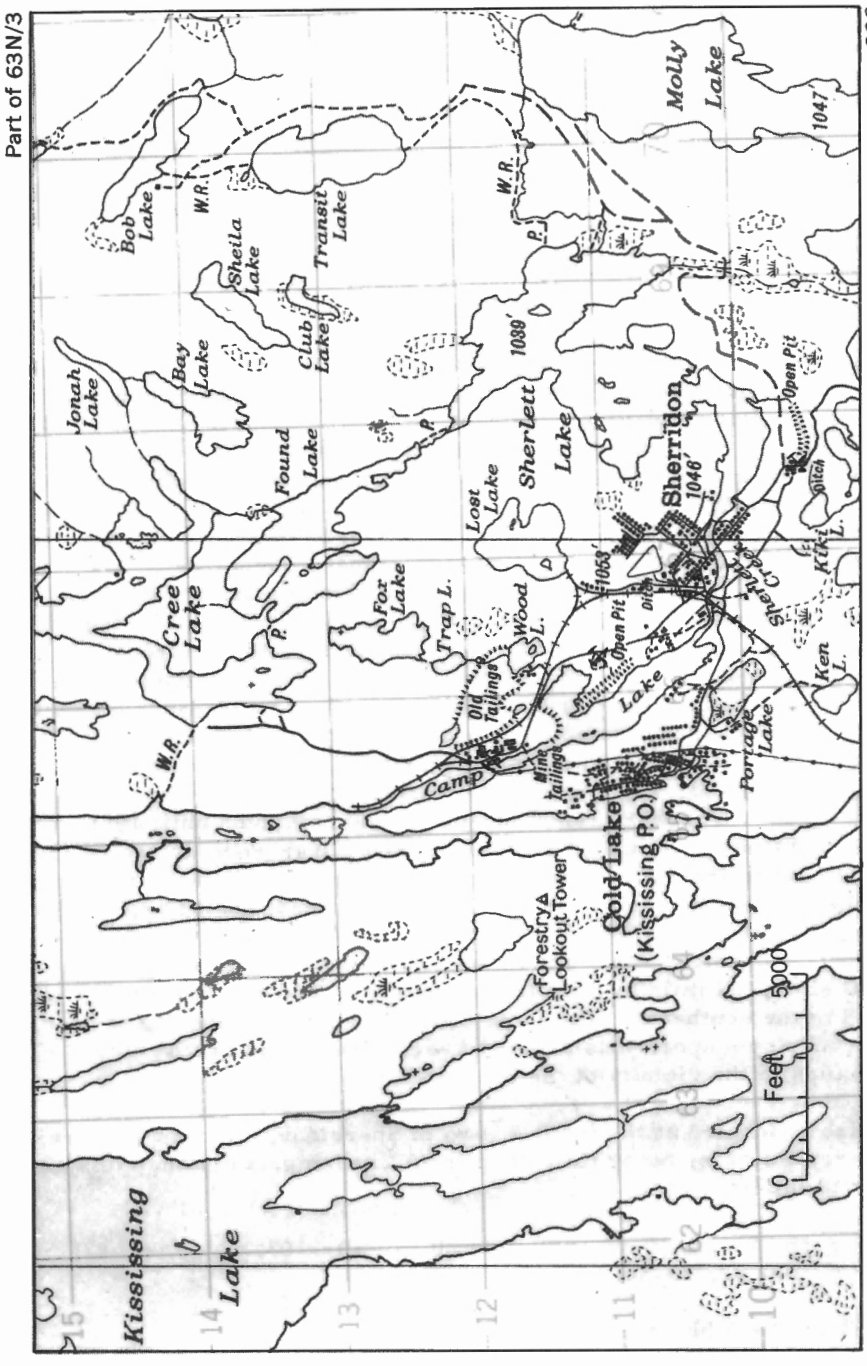
36.9 Cranberry Portage, at junction Cranberry Lake Road.

Sherritt Gordon Mine

PYRRHOTITE, PYRITE, CHALCOPYRITE, SPHALERITE, CUBANITE, MARCASITE, GALENA, GARNET, GRAPHITE, MOLYBDENITE, CHLORITE, PYROXENE, HORNBLENDE, EPIDOTE, APATITE, TREMOLITE, BIOTITE, MUSCOVITE, SCAPOLITE, CALCITE, JAROSITE, GYPSUM, DEVILLINE, NATROLITE, ANALCIME, CHABAZITE, SIDERITE, GRAPHIC GRANITE

In quartz-feldspar gneiss

The ore at this former copper-zinc mine consisted of a coarse aggregate of pyrrhotite, pyrite, chalcopyrite, sphalerite (dark brown), cubanite, and small amounts of marcasite and galena. Specimens of gneiss containing ore minerals



Map 10. Sherritt Gordon Mine.

can be found on the rock dumps. The most common mineral in the gneiss is garnet; it occurs as red crystals commonly measuring 1/2 inch in diameter and as garnet-quartz nodules measuring over an inch across. Other minerals found in the gneiss include: graphite, molybdenite (uncommon), chlorite, pyroxene (dark green), hornblende, epidote, apatite (light blue grains, rare), tremolite (light green), biotite, muscovite, and scapolite (grey, uncommon). Pegmatite rocks associated with the gneiss are composed of pinkish white plagioclase, colourless and pink quartz, and muscovite. Greyish white calcite occurring in the pegmatite fluoresces bright pink when exposed to "short" ultraviolet rays. Secondary minerals have formed encrustations on ore-bearing specimens. Included are: dull olive-green powdery jarosite; white finely crystalline gypsum; light blue devilline.

During mining operations, zeolites were encountered in cavities in gneiss. Natrolite occurred as colourless crystals forming spherical aggregates, and as radiating fibres; analcime, as white trapezohedral crystals; and chabazite as pale greyish rhombohedrons. Associated with them as a brown encrustation in the cavities was siderite. White, fine-textured graphic granite was noted on the rock dumps.

After discovery of the gold deposits in the Amisk Lake area in 1913, prospecting activity moved eastward toward Flin Flon and later toward the Wekusko Lake area. Much of the prospecting was done by local Indian trappers who were familiar with the appearance of the rusty sulphide outcrops. In 1922, a Cree trapper and prospector, Philip Sherlett, discovered and staked what later became the Sherritt Gordon deposit. It was restaked in 1925 by Carl Sherritt and Richard Madole and in 1927 Sherritt Gordon Mines, Limited was formed to mine the ore. The company sank 3 shafts and installed a concentrating plant by 1931 when operations were suspended due to the low price of copper. Operations were renewed in 1937 and continued until 1951 when the ore was exhausted. Copper, zinc, gold, and silver were extracted from the ore; the copper and zinc concentrates were shipped to Flin Flon for smelting. The mine was worked from the West (No. 3 inclined) shaft to 2,105 feet, the Central (No. 2) shaft to 480 feet, and the East (No. 1 shaft) to 370 feet. The West shaft and concentrator are located on the east shore of Camp Lake, the Central shaft, 3/4 mile by road to the southeast, and the East shaft 1 1/2 miles by road to the southeast. The mine equipment and buildings have been moved to the company's operations at Lynn Lake. Specimens can be obtained from rock dumps in the vicinity of the old workings.

The mine is located at the former town of Sherridon. Access is by rail from Cranberry Portage, or by floatplane from Channing, a distance of approximately 40 miles.

Refs.: 8 pp. 19-22; 10 pp. 457-469; 20 pp. 101-103; 62 pp. 65-87; 63 pp. 22, 33-36.

Maps (T): 63N/3 Sherridon.
(G): 44-4 Sherritt-Gordon Mine area, Prelim. Map (1 inch to 1,000 feet, G.S.C.).
862A Sherridon (G.S.C.).

Mile 47.1 Junction; turn left onto Highway 391.

60.3 Junction (left) to Simonhouse Lake Provincial Park.

60.7 Road-cuts from here to the junction of Highway 392 expose compact, buff-coloured limestone of Ordovician age.

85.9 Junction (left) to Reed Lake Provincial Park.

99.8 Junction single-lane road on left.

Tramping Lake Limestone Occurrence

FOSSILS

In limestone

Ordovician fossils are abundant in compact, buff- to maroon-coloured dolomitic limestone. Some of the rock is mottled in lighter and darker shades of maroon with tones of grey and buff. It takes a good polish and could be fashioned into small ornamental objects. The fossils include colonial and columnar corals, brachiopods, cephalopods, gastropods, crinoids, and "sunflower coral" (Receptaculites). Some of the fossils have been replaced by white finely crystalline calcite that fluoresces pinkish yellow when exposed to "short" ultraviolet rays. Colourless massive quartz also occurs in the limestone. The limestone forms flat-lying beds to the south of Tramping Lake and an escarpment 15 to 20 feet high at the south end of the lake.

A long narrow opening has been made in the limestone just east of Grass River Provincial Park. Access is by a road 0.2 miles long leading north from Highway 391 at Mile 99.8. This turn-off is on the east side of the road sign indicating the eastern boundary of the park. A road-cut at the turn-off exposes this limestone, but fossils are uncommon in it.

Ref.: 27 p. 21.

Maps (T): 63K/9E Tramping Lake.
(G): 906A Tramping Lake (G.S.C.).

Snow Lake–Wekusko Lake Occurrences

Mile 110.0J Junction Highway 392 to Snow Lake.

Road log for side trip to Snow Lake area (underlined localities are described in text following road log):

Mile 0.0 Junction Highways 391 and 392; proceed onto Highway 392.

3.7 to 6.1 Road-cuts expose pink and grey granite.

6.6 Junction (left) to Snow Lake limestone quarry.

6.7 to 6.9 Road-cuts expose maroon and buff coloured banded and mottled marble similar to that found in the Snow Lake limestone quarry.

7.2 Road-cut exposes orange-red granite with fracture-fillings of granular epidote.

8.3 Road-cuts expose dark red granite.

8.5 Road-cuts expose grey granite.

10.8 Junction (right) road to Wekusko Lake Camping and Picnic Site.

14.5 Junction (right) road to Government dock. Rex Mine, Bingo Mine, Moose Horn Mine, Kiski Mine, Ferro Mine, McCafferty Mine, Crowduck Bay Staurolite Occurrences, Crowduck Bay Spodumene Occurrences.

15.8 Anderson Creek bridge. A trail leads west along the north side of the creek to a ridge (at east end of Anderson Lake) exposing chlorite schist containing kyanite, staurolite and garnet crystals. Ref: 1 pp. 21-22.

15.9 to 16.2 Rock-cuts expose biotite schist and gneiss containing pink garnet crystals (about 1/4 inch in diameter). Tiny books of muscovite occur in orange feldspar associated with the gneiss (Mile 16.2).

16.35 to 16.5 Rock-cuts expose chlorite schist containing garnet and staurolite crystals, and pyrite.

17.1 Junction (right) road to Stall Lake Mine, Stall Lake Mines Limited, and Osborne Lake Mine.

17.2 to 17.8 Rock-cuts and outcrops expose chlorite, hornblende and biotite schist and gneiss containing deep red, well-formed garnet crystals measuring from 1/8 inch to 1/4 inch in diameter. The crystals are prominent on weathered surfaces of the rocks. Orange-brown nodules (1/4 to 3/8 inch in diameter) and tiny prisms of staurolite occur in the schist.

18.5 Junction (left) road to Anderson Lake Mine, Chisel Lake Mine, and Ghost Lake Mine.

18.8 Bridge over Snow Creek. Snow Creek staurolite occurrence.

19.1 to 19.3 Tiny pink garnet crystals occur in biotite gneiss exposed in road-cuts.

20.8 Snow Lake village, at turn-off to business section. Nor Acme Mine.

Snow Lake Quarry

DOLOMITIC LIMESTONE

Limestone (marble) suitable for ornamental purposes occurs at this quarry. It is compact and takes a good polish. In colour, it is yellowish grey to light yellowish brown mottled, streaked and banded with maroon-red. The colours contrast strongly producing an attractively patterned rock. A few crinoids were observed in the rock. Quartz occurs as chalky white granular aggregates in tiny cavities in the rock. The limestone is of Ordovician age and forms a flat-lying escarpment on the south side of the Precambrian Shield.

The deposit was worked for road metal and was used for surfacing Highway 392.

Plate XI. Ordovician limestone, Snow Lake limestone quarry.
(G.S.C. photo 157937)

Access is by a road 0.1 mile long leading west from Highway 392 at Mile 6.6.

Ref.: 1 pp. 28-29.

Maps (T): 63J/13 Herb Lake.
(G): 55-3 Snow Lake–Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
665A Wekusko (G.S.C.).

Rex (Laguna) Mine

ARSENOPYRITE, NATIVE GOLD, GALENA, SPHALERITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, TOURMALINE, MUSCOVITE, FELDSPAR

In quartz veins cutting quartz-feldspar porphyry

Finely crystalline arsenopyrite is the most common mineral present; small amounts of galena, native gold, sphalerite, pyrite, pyrrhotite, and chalcopyrite are associated with it. Black tourmaline, muscovite, and red feldspar occur sparingly in the quartz.

The deposit was discovered in 1914 and staked by J.A. Campbell, Robert Hassett, and Frank Moore. Development began the following year and the first production was recorded by Herb Lake Gold Mines, Limited in 1918. A 30-ton mill was installed and in three periods of operation (1918, 1920-21, 1924-25), a total of 7,162 ounces of gold was produced from two shafts that had been sunk to 110 feet and 423 feet. In 1934, Laguna Gold Mines, Limited acquired the property, installed a new mill (50 to 90 ton capacity) and deepened the main shaft which eventually reached a depth of 1,125 feet in 1937. The mine was in production from 1936 until 1939 when the ore became exhausted.

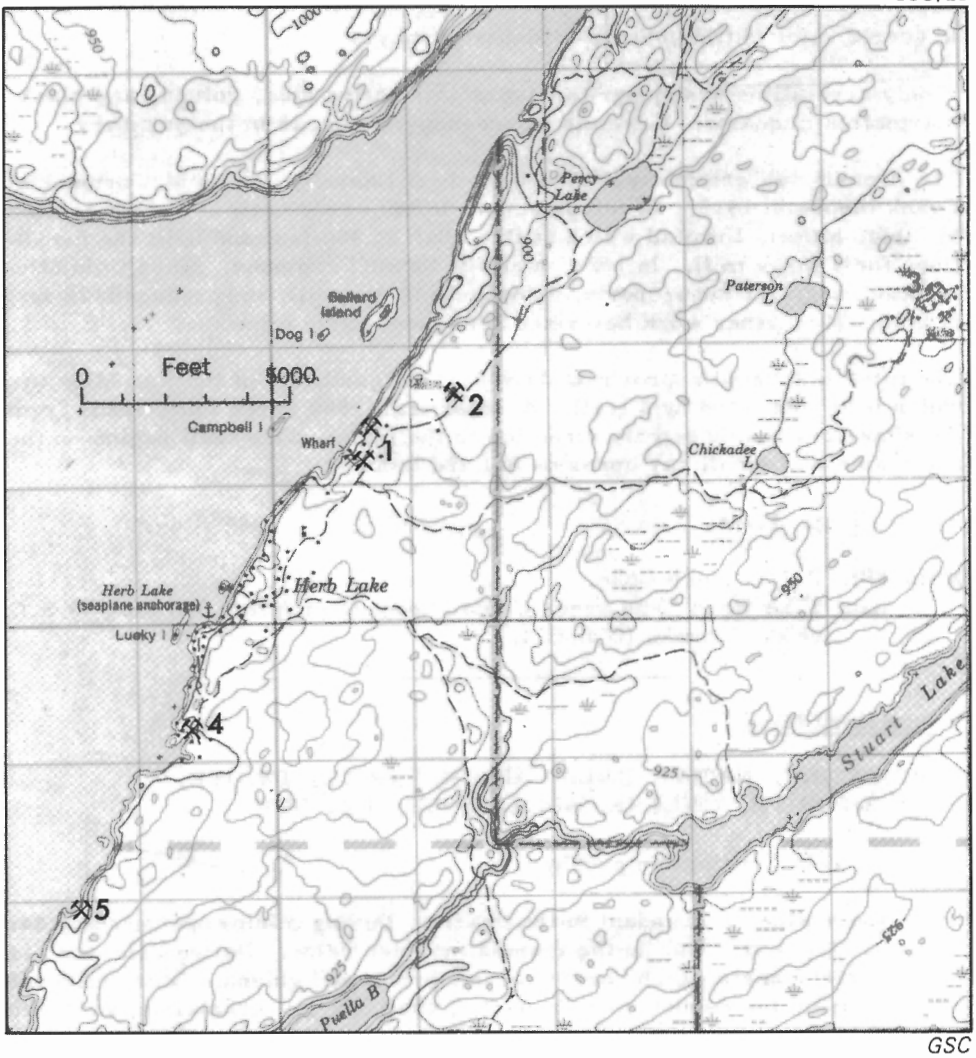
The mine is located 200 feet from the east shore of Wekusko (Herb) Lake about 1 1/4 miles north of the former settlement of Herb Lake and opposite Campbell Island. The shafts are approximately 275 yards apart, the main shaft being the northerly one.

Access is by boat from the Government dock located on the west side of Wekusko Lake, a distance of approximately 8 miles from the mine. The dock is 0.1 mile by road east of Highway 392 at Mile 14.5. The old mine workings are visible from the shore.

Refs.: 55 pp. 28-31; 69 p. 114.

Maps (T): 63J/13 Herb Lake.
(G): 375A Herb Lake area, Centre Sheet (1 inch to 1,000 feet, G.S.C.).
665A Wekusko (G.S.C.).
1763 Portion of the Rex Group of Claims, Wekusko Lake, Manitoba (1 inch to 200 feet, G.S.C.).

Part of 63J/13



1. Rex Mine;
2. Bingo Mine;
3. Ferro Mine;
4. Moose Horn Mine;
5. Kiski Mine.

Map 11. Herb Lake area.

Bingo Mine

ARSENOPYRITE, NATIVE GOLD, GALENA, TOURMALINE

In quartz veins cutting quartz-feldspar porphyry

Finely crystalline arsenopyrite occurs with native gold, galena, and black tourmaline in quartz. Crystals of arsenopyrite occur in the porphyry.

The deposit was originally staked by Robert Hassett, James McCormack and Frank Moore in 1915. Development work from 1922 until 1924 was conducted by Bingo Mines, Limited which sank a shaft to 400 feet and built the foundations for a large mill. In 1926, a newly formed company, Bingo Gold Mines, Limited, acquired the property, installed a 10-ton mill, and produced 128 ounces of gold. No further work has since been done at the mine.

The mine is located approximately 900 yards northeast of the Rex Mine to which it is connected by a trail. Another trail, 500 yards long, leads from the shore in a southeasterly direction to the mine. This trail begins on the south side of a small bay opposite Ballard Island.

Ref.: 55 pp. 25-26.

Maps (T): 63J/13 Herb Lake.
(G): 375A Herb Lake area, Centre Sheet (1 inch to 1,000 feet, G.S.C.).
665A Wekusko (G.S.C.).

Moose Horn Mine

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

In quartz veins cutting lamprophyre

Black tourmaline is abundant in the quartz. During mining operations, coarse native gold was abundant in the tourmaline-rich veins. Native gold was also found in blue quartz which carried arsenopyrite and galena. Other minerals reported from the deposit include pyrite, chalcopyrite, sphalerite, and another mineral believed to be petzite.

The deposit was discovered in 1914 by Richard Woosey. It was a small, high-grade deposit that, with the Mandy Mine, was the first gold producer in Manitoba. In 1917, the Northern Manitoba Mining and Development Company shipped 28.5 tons of ore to the smelter at Trail, British Columbia, and 108 ounces of gold were recovered. Intermittent operations by various groups until 1931 resulted in a further production of 86 ounces of gold and 9 ounces of silver.

The mine is located on the east side of Wekusko Lake, approximately 50 yards north of the north end of a bay 1/2 mile south of the former settlement of Herb Lake which is opposite Lucky Island. A 1/2 mile trail connected the mine with the settlement. For access to the area, see Rex Mine (page 54).

Ref.: 55 pp. 31-32.

Maps (T): 63J/13 Herb Lake.
(G): 376A Herb Lake area, South Sheet (1 inch to 1,000 feet, G.S.C.).
665A Wekusko (G.S.C.).

Kiski Mine

ARSENOPYRITE, NATIVE GOLD, TOURMALINE, CHALCOPYRITE, SPHALERITE, PYRITE, TETRAHEDRITE, EPIDOTE

In quartz-feldspar porphyry and andesite

Arsenopyrite, native gold and tourmaline occur with small amounts of chalcopyrite, sphalerite, pyrite, and tetrahedrite in quartz veins cutting porphyry and andesite. Crystals of arsenopyrite and black tourmaline are found in sericite schist, formed as an alteration of the porphyry. Lumps of arsenopyrite measuring a foot across have been reported to occur in andesite.

The deposit has been explored by several trenches and by a 53-foot shaft. The discovery of it in 1914 by M. J. Hackett and Richard Woosey was made after gold-bearing quartz boulders were found on the beach near the vein; it was the first discovery of gold in the Wekusko Lake area. The event led to a prospecting rush in the region and to the discovery of numerous gold-bearing quartz veins. Exploration of the Kiski Mine was done originally by Kiskoba Mining Company, Limited and later by Kiski Mining and Development Company, and the Consolidated Mining and Smelting Company, Limited. The most recent work was done in 1930.

The mine is located approximately 100 yards from the east shore of a small bay on the east side of Wekusko Lake, 2.3 miles south of Herb Lake settlement. Access is by boat from the Government dock on the west side of Wekusko Lake, a distance of approximately 8 miles. A short road to the dock leads east from Highway 392 at Mile 14.5.

Refs.: 1 pp. 30-31; 55 pp. 32-34; 63 pp. 75-77.

Maps (T): 63J/13 Herb Lake.
(G): 376A Herb Lake area, South Sheet (1 inch to 1,000 feet, G.S.C.).
665A Wekusko (G.S.C.).

Ferro Mine

NATIVE GOLD, PYRITE, CHALCOPYRITE, PYRRHOTITE, MUSCOVITE, FELDSPAR

In quartz veins cutting biotite schist

Visible gold has been found in quartz veins cutting the schist. Pyrite, chalcopyrite, pyrrhotite, muscovite, and red feldspar also occur in quartz. Gold was panned from a pit located 80 feet east of the shaft.

The deposit was first staked in 1923 by Louis Revord. In 1932, the North British Mining and Milling Company brought the mine into production which resulted in the recovery of 731 ounces of gold and some silver by 1933. The 10-ton mill from the Bingo Mine was moved to the site and a summer road was built from the Rex Mine to this mine. Most of the ore was obtained from an open pit near the mill. The pit measured 100 feet by 10 to 20 feet and 60 feet deep. A dump lies near it. Other openings made by the company consist of a pit, 30 feet long, located 250 feet northeast of the main pit, a 160-foot shaft located 800 feet southwest of the main pit, a pit 50 feet southwest of the shaft, and one 80 feet east of the shaft. Between 1944 and 1948, Wekusko Consolidated Limited deepened the shaft to 543 feet and did some lateral development; surface exploration was done by Explorers Alliance Limited between 1957 and 1960. The latter company installed a 50- to 75-ton mill and did some small-scale milling.

The mine is located approximately 3 1/2 miles (by trail) northeast of the Rex Mine.

Refs.: 55 pp. 37-39; 67 p. 327; 72 pp. 231-232; 74 p. 12.

Maps (T): 63J/13 Herb Lake.
(G): 375A Herb Lake area, Centre Sheet (1 inch to 1,000 feet, G.S.C.).
987A Crowduck Bay (G.S.C.).

McCafferty Mine

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

In quartz veins cutting chlorite schist

Visible gold was found in fractures in white quartz; in some specimens it is reported to have been abundant. Crystals of arsenopyrite measuring up to 1/2 inch long, and acicular crystals of black tourmaline are common in the quartz; chalcopyrite, galena, and pyrite occur sparingly in the schist.

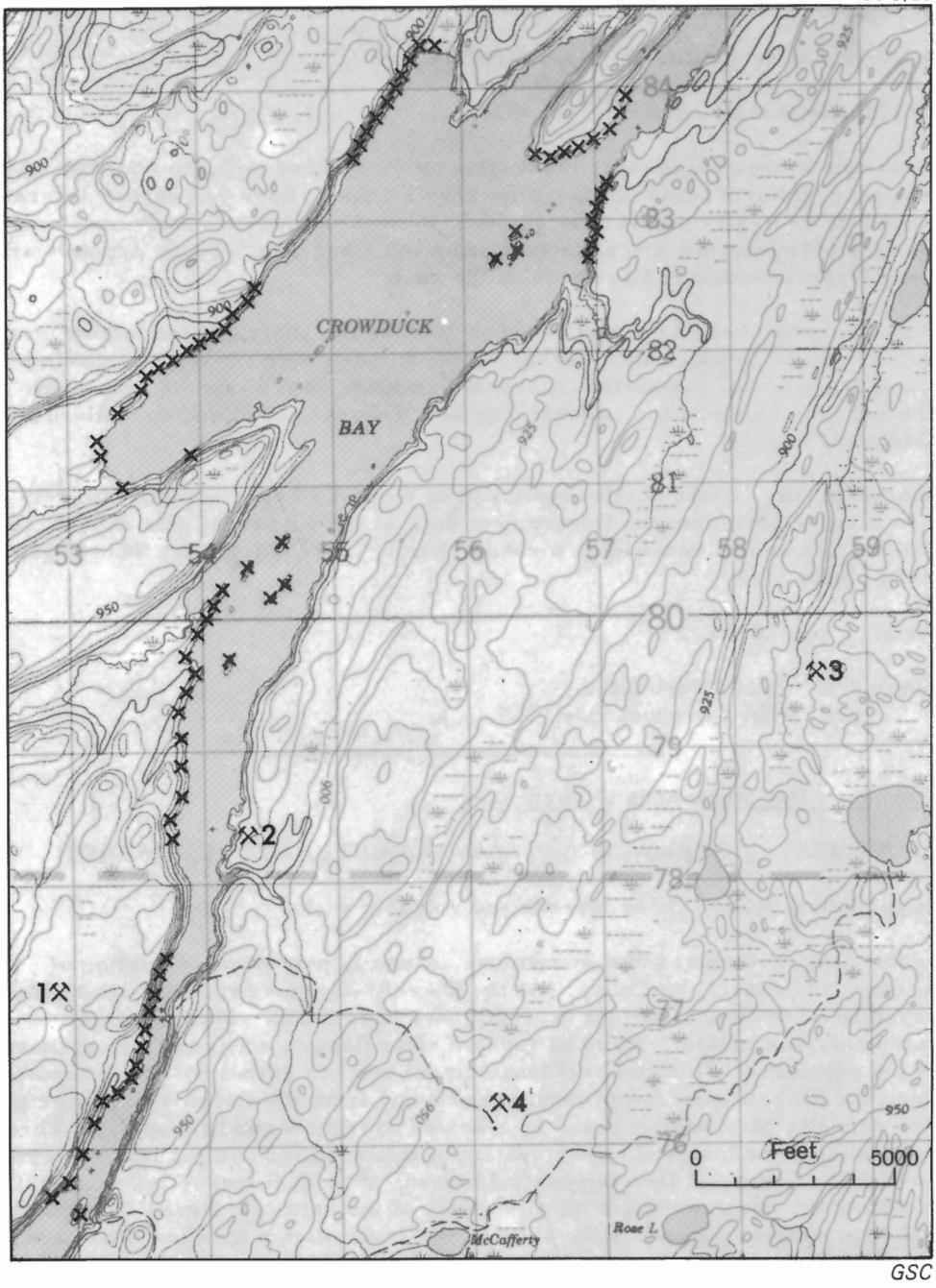
The deposit has been exposed by two shafts, one to a depth of 27 feet, another to 90 feet, and by several trenches over a length of 1,600 feet. It was discovered in 1915 by H.A. McCafferty. Involved in the exploration were Bingo Gold Mines, Consolidated Mining and Smelting, Canadian Mining Projects, Limited, and Bailor Gold Mines, Limited. It has been idle since 1939.

The property is located east of the narrows between Wekusko Lake and Crowduck Bay. A 2-mile trail beginning about 3 miles northeast of Ballard Island leads to the mine.

Refs.: 55 pp. 18-19; 63 pp. 84-86; 68 p. 101.

Maps (T): 63J/13 Herb Lake.
(G): 374A Herb Lake area, North Sheet (1 inch to 1,000 feet, G.S.C.).
987A Crowduck Bay (G.S.C.).

Part of 63 J/13



1. Sherritt Gordon property;
2. Combined Developments Limited property;
3. Green Bay property;
4. McCafferty Mine;

(xxx) Staurolite occurrences.

Map 12. Crowduck Bay area.

Crowduck Bay Staurolite Occurrences

STAUROLITE, GARNET, TOURMALINE

In chlorite schist

Crystals of brown staurolite measuring up to 4 inches long are abundant in the schist; cruciform twins of staurolite are common. Dark red garnet dodecahedrons, generally measuring less than 1/2 inch in diameter, and small brown prisms of tourmaline are associated with the staurolite. These crystals are prominent on weathered surfaces of the rock.

The staurolite-bearing schist is exposed along the shores of the islands in the south end of Crowduck Bay, and along the adjacent west shore; in islands and along the shore at the northeast end of Crowduck Bay; along the west shore of the narrows connecting Crowduck Bay and Wekusko Lake; and on Ballard and Campbell Islands.

Crowduck Bay, at the northeastern end of Wekusko Lake, is approximately 14 miles by boat from the Government dock at the northwest side of Wekusko Lake which can be reached by a road 0.1 mile long leading east from Highway 392 at Mile 14.5.

Ref.: 1 pp. 22-23.

Maps (T): 63J/13 Herb Lake.
(G): 987A Crowduck Bay (G.S.C.).

Crowduck Bay Spodumene Occurrences

SPODUMENE, TOURMALINE, CLEAVELANDITE, BERYL, GARNET

In pegmatite dykes cutting igneous and volcanic rocks

Light green to almost white spodumene occurs in pegmatite consisting of microcline, quartz, and mica. At the Sherritt-Gordon property, blade-like crystals measuring 1 1/2 feet in length have been found. Black tourmaline is commonly associated. White to reddish cleavelandite occurs as a constituent of the pegmatite. Golden beryl (uncommon) and red garnet have been reported from the Sherritt-Gordon property, and beryl from the Green Bay property. The deposits have been exposed by a series of trenches and strippings. Three companies were involved in exploration of this area for lithium between 1950 and 1956: Combined Developments Limited, at an occurrence 300 feet east of Crowduck Bay, and about 1/2 mile north of the narrows; Green Bay Mining and Exploration Limited, at an occurrence 2 1/2 miles southeast of Crowduck Bay; Sherritt-Gordon Mines Limited, at its property 1/2 mile west of the narrows of Crowduck Bay.

Access to the area is by boat from the Government dock at the northwest end of Wekusko Lake. A 1/2-mile trail leads from the narrows at a point approximately 6 miles north of the settlement of Herb Lake to the property of Combined

Developments Limited; the dyke is also exposed at the shore where a camp was formerly located. Access to the Green Bay property is by a 2 1/2-mile tractor road that leads east from the Crowduck Bay narrows at a point about 8 miles north of Herb Lake settlement. The Sherritt-Gordon property is reached by a 1/2-mile trail leading west from Crowduck Bay narrows as a point 5 miles north of Herb Lake settlement.

Refs.: 42 pp. 80-83; 43 pp. 70-71; 54 pp. 3-4; 55 pp. 42-43.

Maps (T): 63J/13 Herb Lake.
(G): 665A Wekusko (G.S.C.).
987A Crowduck Bay (G.S.C.).

Stall Lake Mine

CHALCOPYRITE, SPHALERITE, PYRITE, PYRRHOTITE, MAGNETITE, GARNET, STAUROLITE, KYANITE, GAHNITE, CORDIERITE, GYPSUM, EPIDOTE

In quartz-hornblende gneiss and staurolite schist

The ore minerals are chalcopyrite, sphalerite, pyrite, and pyrrhotite. Crystals of pyrite measuring up to 8 inches in diameter have been found. Magnetite occurs as tiny crystals in the gneiss. Pink to red garnet crystals, dark brown staurolite crystals (including cruciform twins), and, less commonly, light blue to grey kyanite blade-like crystals were identified from the specimens in a small rock dump near the shaft. Bluish green transparent gahnite occurs with quartz in association with the sulphides. Dark smoky green cordierite was also found with the sulphides. Gypsum was noted as colourless crystals and as a white encrustation on ore specimens. Epidote, as granular aggregates, is associated with quartz.

The mine produces copper, zinc, gold, and silver. Development began in 1957 and production in 1964. A shaft has been sunk to 2,941 feet and Stall (Miller) Lake was drained to make way for mining operations. The mine is operated by the Hudson Bay Mining and Smelting Company, Limited. Since the mine is in operation, visitors are not permitted on the site.

Road log from Highway 392 at Mile 17.1:

Mile 0.0 Junction; turn right (east) onto Highway 393.

Road-cuts from the junction to Mile 0.3 expose basalt and gneiss containing tiny red garnet crystals and small grains of ilmenite.

0.4 Junction; turn right onto mine road.

0.5 Stall Lake Mine.

Refs.: 20 pp. 88-89; 76 p. 175.

Maps (T): 63J/13 Herb Lake.
(G): 55-3 Snow Lake–Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
665A Wekusko (G.S.C.).

Stall Lake Mines Limited Mine

CHALCOPYRITE, SPHALERITE, PYRITE, PYRRHOTITE, ARSENOPYRITE, GARNET, STAUROLITE, GAHNITE, HORNBLENDE, ANTHOPHYLLITE, CHLORITE, MICA, CHAMOSITE, LEONHARDTITE, SULPHUR

In chlorite schist

The ore consists of coarse aggregates of chalcopyrite, sphalerite (dark brown), pyrite, pyrrhotite, and arsenopyrite. Crystals of pyrite and arsenopyrite were found in specimens on the dumps. Pink to red garnet, as crystals and granular aggregates, and dark brown staurolite crystals are abundant. Other minerals found in the deposit are: gahnite, as bluish green vitreous patches; hornblende, as black prismatic aggregates; anthophyllite, as light brown prismatic aggregates; chlorite, as coarse green flaky masses; dolomite, as microscopic crystals in cavities; light bluish green mica; and greenish grey massive chamosite. Coatings of white leondhardtite and pale yellow sulphur were noted on specimens.

The deposit was mined for copper, zinc, silver, and gold from 1962 until 1964 by Stall Lake Mines Limited. A shaft was sunk to 300 feet.

Road log from Highway 392 at Mile 17.1:

Mile	0.0	Junction; turn right onto Highway 393.
	0.4	Junction road to Stall Lake Mine; continue straight ahead.
	0.8 to 1.3	Road-cuts expose garnetiferous gneiss and volcanics.
	1.3	Junction; turn right.
	1.8	Mine.

Ref.: 76 p. 335.

Maps (T): 55-3 Snow Lake–Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
665A Wekusko (G.S.C.).

Osborne Lake Mine

CHALCOPYRITE, PYRITE, SPHALERITE, PYRRHOTITE, ARSENOPYRITE, GARNET, TITANITE, TOURMALINE, MICA, ANTHOPHYLLITE, FELDSPAR, HORNBLENDE, PYROXENE, CHLORITE, SERPENTINE, EPIDOTE, PLAGIOCLASE, QUARTZ CRYSTALS

In quartz-biotite gneiss

The ore is composed of massive chalcopyrite, pyrite, sphalerite, pyrrhotite, and arsenopyrite. Pink to red garnet crystals and granular aggregates are common in the gneiss. Brown titanite crystals measuring 1/2 inch in diameter occur in white massive quartz. Other minerals found in the deposit are amber tourmaline (uncommon), bright green mica, smoky brown prismatic anthophyllite, white to greenish feldspar, hornblende, greyish green pyroxene, chlorite, green serpentine, light green epidote, greyish blue massive plagioclase, and tiny quartz crystals (associated with the metallic minerals).

The deposit is being worked for copper and zinc by the Hudson Bay Mining and Smelting Company, Limited. Development consisting of a shaft to a depth of 2,462 feet was started in 1962. Production commenced in 1968. Since this is an operating mine, visitors are not permitted on the site.

Road log from Highway 392 at Mile 17.1:

Mile	0.0	Junction; turn right (east) onto Highway 393 and follow log to the Stall Lake Mines Limited property.
	1.3	Turn-off to Stall Lake Mines Limited Mine; continue straight ahead. Road-cuts from this junction to the Osborne Lake Mine expose biotite gneiss containing tiny garnet crystals.
	12.0	Osborne Lake Mine.

Refs.: 20 p. 88; 52 p. 9.

Maps (T): 63J/13 Herb Lake.
(G): 987A Crowduck Bay (G.S.C.).

Anderson Lake Mine

KYANITE, STAUROLITE, GARNET, ANHYDRITE, ANTHOPHYLLITE, CORDIERITE, MAGNETITE, GAHNITE, CALCITE, ACTINOLITE, PLAGIOCLASE, CHLORITE, GYPSUM, CHALCOPYRITE, PYRITE, PYRRHOTITE

In chlorite schist

Light blue to greyish green and grey kyanite is common as coarse, bladed aggregates; individual crystals measure up to an inch wide and several inches long. It is associated with dark brown staurolite crystals, pink to red garnet,

coarsely cleavable masses of mauve anhydrite, brown prismatic aggregates of anthophyllite, and smoky greenish blue cordierite. Crystals and nodules of magnetite occur in the chlorite schist, and small nodules (2 to 3 millimetres in diameter) of bluish green gahnite in sericite schist. Pale orange and transparent coarsely cleavable calcite is associated with massive quartz; the calcite fluoresces bright pink when exposed to ultraviolet rays ("short" rays more effective than "long"). Radiating acicular clusters of green actinolite, and silky white fibrous plagioclase is associated with the calcite. Dark green chlorite is common as coarse flaky aggregates. Gypsum was noted as white fibrous aggregates. The ore minerals consist of chalcopyrite, pyrite, and pyrrhotite. Pyrite cubes measuring several inches in diameter occur in the deposit.

Development of the deposit began in 1966 and production in 1970. A shaft has been sunk to a depth of 2,866 feet. The deposit is being mined for copper by the Hudson Bay Mining and Smelting Company, Limited. Due to mining operations, visitors are not permitted on the site.

Road log from Highway 392 at Mile 18.5:

Mile 0.0 Junction; turn left onto Highway 395.

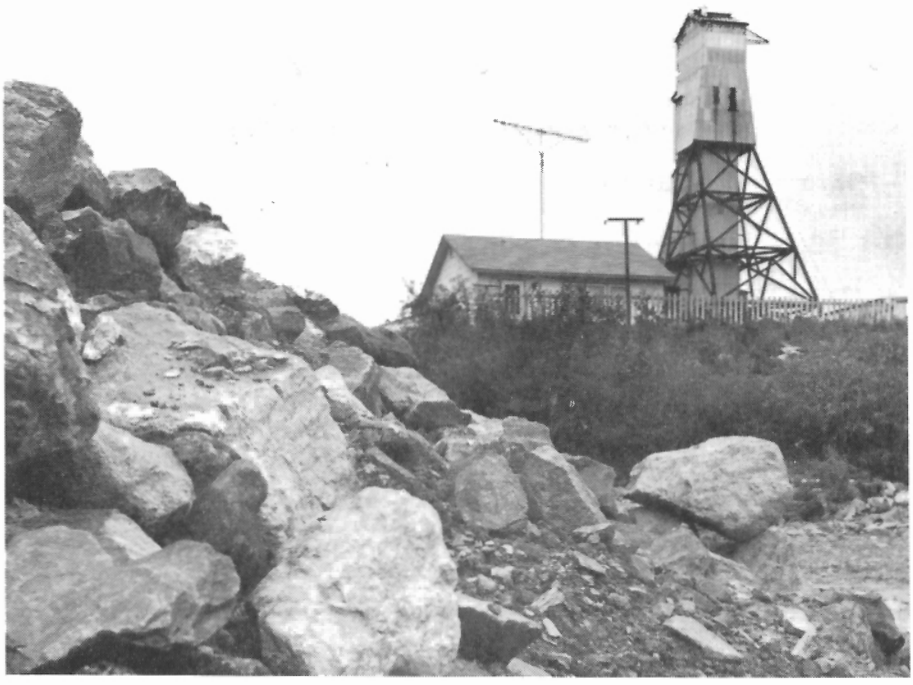


Plate XII. Anderson Lake Mine. Stockpile in foreground. (G.S.C. photo 157936)

Mile 0.2 Junction; turn left.

1.2 Mine. Kyanite occurs in sericite schist exposed along the railway about 500 yards east of the mine. (Personal communication, E. Froese).

Ref.: 76 p. 175.

Maps (T): 63K/16 File Lake.
(G): 55-3 Snow Lake-Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
665A Wekusko (G.S.C.).

Chisel Lake Mine

SPHALERITE, PYRITE, PYRRHOTITE, CHALCOPYRITE, GALENA, ARSENOPYRITE, GUDMUNDITE, MARCASITE, MENEGHINITE, TETRAHEDRITE, BOURNONITE, NATIVE GOLD, LEONHARDTITE, JAROSITE, GARNET, STAUROLITE, TREMOLITE-ACTINOLITE, HORNBLENDE, GAHNITE, DOLOMITE, TOURMALINE, EPIDOTE, CHLORITE, MICA, PLAGIOCLASE, TITANITE, TALC, SERPENTINE, APATITE, KYANITE, ANDALUSITE

In biotite schist and chlorite schist

The ore consists of a massive aggregate of sphalerite (dark brown to black), pyrite (including crystal aggregates), pyrrhotite, chalcopyrite, galena, and arsenopyrite with small amounts of gudmundite, meneghinite, tetrahedrite, bournonite, and native gold. Powdery coatings of white leonhardtite and of yellow jarosite were noted on ore specimens. Crystals of deep red garnet measuring up to 2 inches in diameter have been found in the deposit. The garnet is associated with dark brown staurolite crystals. Light greyish green to dark green fibrous aggregates of tremolite-actinolite are common. Other minerals associated with the deposit are: black hornblende (crystals), deep green transparent gahnite (octahedrons and nodules), pink dolomite, black tourmaline (crystals), green granular epidote, chlorite, mica, plagioclase, titanite, talc, serpentine, apatite, kyanite, andalusite, and quartz.

The orebody lies below the southern end of Chisel Lake which was partly drained to make way for mining operations. It was discovered in 1956 by the Hudson Bay Mining and Smelting Company, Limited, operator of the mine. Shaft sinking commenced in 1957, and production in 1960. Zinc and minor amounts of copper, silver, gold, and lead concentrate are produced. The shaft has been sunk to a depth of 1,450 feet. The ore is shipped by rail to the company's smelter in Flin Flon. Since this mine is in operation, collecting is not permitted.

Road log from Highway 392 at Mile 18.5:

Mile 0.0 Junction; turn left onto Highway 395.

0.2 Junction road to Anderson Lake Mine; continue straight ahead.

8.3 Chisel Lake Mine.

Refs.: 33 pp. 208-214; 61 pp. 29-34; 76 p. 175.

Maps (T): 63K/16 File Lake.
(G): 1180A Chisel Lake area (1 inch to 1,000 feet, G.S.C.).
929A File Lake (G.S.C.).

Ghost Lake Mine

This deposit is similar to that at the Chisel Lake Mine and mining development is conducted by the Hudson Bay Mining and Smelting Company, Limited. It is located approximately 4,000 feet east of the Chisel Lake orebody and mining is to be done by a decline which begins near the Chisel Lake shaft. Production is planned for 1972.

Refs.: 61 p. 35; 76 p. 175.

Maps (T): 63K/16 File Lake.
(G): 1180A Chisel Lake area (1 inch to 1,000 feet, G.S.C.).
929A File Lake (G.S.C.).

Snow Creek Staurolite Occurrence

STAUROLITE, GARNET

In mica schist

Dark brown staurolite crystals measuring approximately 3/4 inch in diameter and several inches long are abundant in exposures along Snow Creek. Cruciform twins are common, and crystals are prominent on weathered rock surfaces due to their greater hardness relative to the schist. Tiny pink garnet crystals are associated with the staurolite.

The staurolite schist is exposed along Snow Creek at the Highway 392 bridge over the creek (Mile 18.8), along the north side of the narrows on the east side of Snow Lake (about a mile west of the bridge), and along Snow Creek east of the bridge.

Maps (T): 63J/13 Herb Lake.
63K/16 File Lake.
(G): 55-3 Snow Lake-Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
929A File Lake (G.S.C.).
665A Wekusko (G.S.C.).

Nor Acme Mine

NATIVE GOLD, ARSENOPYRITE, PYRRHOTITE, PYRITE, SPHALERITE, CHALCOPYRITE, ILMENITE, STAUROLITE, GARNET, HORNBLENDE,

Plate XIII. Staurolite crystals in schist, Snow Creek near Highway 392 bridge. (G.S.C. photo 157945)

PYROXENE, TREMOLITE, EPIDOTE, TOURMALINE, AXINITE, CHLORITE, FELDSPAR, CALCITE, SERPENTINE, GYPSUM, CLINOZOISITE

In volcanics, hornblendite, schist

The ore at this former gold mine consisted of native gold associated with arsenopyrite and smaller amounts of pyrrhotite, pyrite, sphalerite and chalcopyrite. Gold particles were generally associated with needle-like bunches of arsenopyrite. Ilmenite has also been reported. Minerals associated with the ore, and now occurring on the rock dumps include: dark brown staurolite (crystals measuring 2 to 4 inches long), pink to purplish red garnet crystals, hornblende, pyroxene, light green tremolite (prismatic aggregates), granular

epidote, black tourmaline (crystals), pink axinite (crystals, uncommon), chlorite, calcite, feldspar, serpentine and gypsum (white rosettes forming encrustation on rock). Clinozoisite has also been reported from the deposit.

The deposit was mined by the Howe Sound Exploration Company Limited from 1949 until 1958; 511,816 ounces of gold and 41,406 ounces of silver were recovered. The original claims had been staked in 1927 by C.R. Parres. The mine was serviced by a five-compartment shaft, 1,965 feet deep. A mill was operated on the site and the town of Snow Lake came into being due to mining activity. Visitors to the site should refrain from collecting concentrates which are high in arsenic.

Road log from Snow Lake village:

Mile 0.0 Junction Highway 392 and turn-off to business section (Mile 20.8); continue straight ahead along Highway 392.

0.3 Junction; turn right.

0.5 Junction; turn left.

0.6 Mine dump.

Refs.: 20 pp. 82-83; 27 pp. 68-73; 28 pp. 262-275.

Maps (T): 63K/16 File Lake.
(G): 55-3 Snow Lake–Herb Lake area (2 inches to 1 mile, Man. Dept. Mines and Nat. Res.).
929A File Lake (G.S.C.).

The main road log along Highway 391 to Thompson is now resumed.

Mile 110.0 Junction Highway 392; proceed east along Highway 391.

111.2 to 111.7 Road-cuts on right expose Ordovician limestone.

113.1 Copper-Man Mines Limited prospect (copper-zinc) on left. The prospect has been diamond drilled and drill cores have been left near a shed about a hundred yards north of the highway. Chalcopyrite, sphalerite, and pyrite were noted in volcanic rocks in the drill cores.

113.7 to 117.4 Road-cuts expose Ordovician limestone containing small fossil shells.

118.2 Junction, on left, road to Herb Lake. At one time this road led to the settlement of Herb Lake; it is no longer accessible by automobile to that point.

Mile 121.2 Junction, on right, road to Wekusko.

121.3 Wekusko limestone quarry on right.

123.6 Wekusko limestone quarry on left.

Wekusko Limestone Quarries

FOSSILS

In limestone

Ordovician fossils including horn corals and crinoids are abundant. The limestone is purplish to brownish red, mottled, streaked, and banded with brownish to greyish yellow. The rock is compact and takes a good polish; it is suitable for ornamental purposes such as bookends, paperweights, etc.

Plate XIV. Banded limestone, Wekusko limestone quarry.
(G.S.C. photo 157947)

The quarries were formerly operated for road metal. They were not in operation in the summer of 1970.

Maps (T): 63J/12 Buzz Lake.
(G): 1801 Reed and Wekusko Lakes Region, Manitoba (1 inch to 2 miles, G.S.C.).

Mile 143.3 Bridge over Mitishto River.

150.1 Junction road on right (proposed road to Winnipeg via Grand Rapids).

156.5 Outcrop on right exposes granite containing magnetite.

158.5 Bridge over Kiski Creek.

159.6 Outcrops expose granite containing magnetite.

163.2 Junction on right, road to Manibridge Mine.

Road-cut at junction exposes pink granite with layers of finely crystalline epidote associated with layers of hornblende and of chlorite. The epidote layers average about 1/2 inch in thickness. Dark brown tiny crystals and grains of titanite are associated with epidote and quartz. Irregular patches of magnetite were noted in the granite.

Manibridge Mine

PYRRHOTITE, PENTLANDITE, PYRITE, CHALCOPYRITE, VIOLARITE, MAGNETITE, HEMATITE, SERPENTINE, ACTINOLITE, CHLORITE, FELDSPAR, CALCITE

In serpentinite

The ore consists of disseminated and massive pyrrhotite, pentlandite, pyrite, chalcopyrite, and violarite. Magnetite and hematite are associated with these minerals, hematite occurring as a red powder and as specularite. Light to dark green massive serpentine contains narrow veinlets of pale green chrysotile asbestos; some picrolite occurs with the serpentine. Other minerals present are fibrous actinolite, chlorite, orange-red feldspar, and quartz. White calcite that coats the serpentine fluoresces bright pink under "short" ultraviolet rays.

The deposit is being developed by Falconbridge Nickel Mines Limited with production expected in 1971. The ore averages 2.55 per cent nickel and 0.27 per cent copper. A mill is to be constructed on the site.

Road log from Highway 391 at Mile 163.2:

Mile 0.0 Junction; turn right.

2.7 Junction; turn right.

2.8 Mine.

Refs.: 18 p. 15, 76 p. 144.

Map (T): 63J/10 Muhigan Lake.

Mile 169.0 Junction road to Sipiwesk.

179.7 Junction road to Wabowden.

180.1 to 180.8 Road-cut exposes pink granite traversed by veinlets of epidote and containing small amounts of tremolite and chlorite.

188.6 Quarry on left exposes pink granitic rocks. Some epidote occurs in these rocks.

190.6 Turn-off (left) to Setting Lake.

202.2 Junction road to Pisew Falls.

202.7 Junction, on left, road to Soab South Mine.

Soab South Mine

PYRRHOTITE, PENTLANDITE, PYRITE, CHALCOPYRITE, MAGNETITE

In serpentinized peridotite

The ore consists of pyrrhotite, pentlandite, pyrite, chalcopyrite, and magnetite. This deposit is one of several orebodies within the Thompson (Manitoba) nickel belt which lies along a fault zone extending for approximately 100 miles from Setting Lake to the Mystery Lake–Moak Lake area near Thompson. Numerous deposits were discovered along the fault zone during an intensive exploration program that began in 1946. The mine is operated by the International Nickel Company of Canada Limited. Development began in 1966 and production in 1970. A shaft has been sunk to a depth of 2,038 feet. The ore is transported by rail to the refinery at Thompson. Due to mining operations, visitors are not permitted to the mine.

The mine is located 0.6 mile from Highway 391.

Refs.: 30 pp. 276-293; 76 p. 185.

Maps (T): 63O/1 Halfway Lake.
(G): 64-5 Halfway Lake area (west half) (Man. Dept. Mines and Nat. Res.).
54-13 Nelson House (1 inch to 4 miles, G.S.C.).

Mile 204.3 Soab North Mine on left.

Soab North Mine

This deposit is similar to that at the Soab South Mine.

It has been developed by a shaft to a depth of 1,650 feet. Production began in 1970. It is operated by the International Nickel Company of Canada Limited. The ore is shipped by rail to the company's refinery in Thompson. Due to mining operations, visitors are not permitted to visit the mine.

The mine is located 0.1 mile from Highway 391.

Refs.: 30 pp. 276-293; 76 p. 185.

Maps (T): 63O/1 Halfway Lake.
(G): 64-5 Halfway Lake area (west half) (Man. Dept. Mines and Nat. Res.).
54-13 Nelson House (1 inch to 4 miles, G.S.C.).

Plate XV. Pipe Mine. (G.S.C. photo 157948)

Mile 228.7 Junction, on left, road to Pipe Mine.

Pipe Mine

The ore is similar to that at the Soab mines.

The deposit is being developed by International Nickel Company of Canada Limited by means of a shaft and an open pit. Production is expected in 1971. Visitors cannot be accommodated in the mine due to mining operations.

A 2-mile road leads from Highway 391 to the mine.

Refs.: 25 pp. 41-42; 30 pp. 276-293; 76 p. 185.

Maps (T): 63O/8 Hambone Lake.
(G): 63-1 Hambone Lake area (1 inch to 5,000 feet, Man. Dept. Mines and Nat. Res.).
54-13 Nelson House (1 inch to 4 miles, G.S.C.).

Mile 228.7 Junction, on right, road to Paint Lake Camping and Picnic Site.

Mile 243.3 Junction, on left, road to Birchtree Mine.

Birchtree Mine

PYRRHOTITE, PENTLANDITE, PYRITE, CHALCOPYRITE, MAGNETITE

In serpentinized peridotite

The ore consists of pyrrhotite, pentlandite and pyrite with lesser amounts of chalcopyrite and magnetite.

The mine is operated by the International Nickel Company of Canada Limited. It is worked by a shaft that extends to 2,822 feet. Production began in 1969. Visitors are not permitted due to operations.

The mine is connected to Highway 391 by a road 1 1/4 miles long.

Refs.: 30 pp. 276-293; 76 p. 185.

Maps (T): 63P/12W Thompson.
(G): 60-4 Thompson-Moak Lake area (Man. Dept. Mines and Nat. Res.).

Mile 246.7 Junction, on right, road to Thompson Mine and plant.

Mile 248.5 Thompson, at bridge over Burntwood River.

Thompson Mine

PYRRHOTITE, PENTLANDITE, PYRITE, CHALCOPYRITE, MARCASITE, GERSDORFFITE, MAGNETITE, GRAPHITE, VIOLARITE, GARNET, SILLIMANITE, DIOPSIDE, PHLOGOPITE, CLINOZOISITE, TREMOLITE, ZIRCON, APATITE, TITANITE, SERPENTINE, OLIVINE, SPINEL

In biotite schist; in skarn, quartzite, peridotite

The ore consists of pyrrhotite and pentlandite with lesser amounts of pyrite, chalcopyrite, marcasite, and gersdorffite in biotite schist. Magnetite, graphite and violarite are associated with the ore. Garnet and sillimanite occur in the schist. Other minerals reported from the deposit include: diopside, phlogopite, clinozoisite, and tremolite in skarn (carbonate); zircon, apatite, and titanite in quartzite; and serpentine, olivine, and spinel in peridotite.

The deposit was discovered in 1956 by the International Nickel Company of Canada Limited using airborne magnetic and electromagnetic surveys. The discovery of this high-grade deposit was the result of ten years of exploration

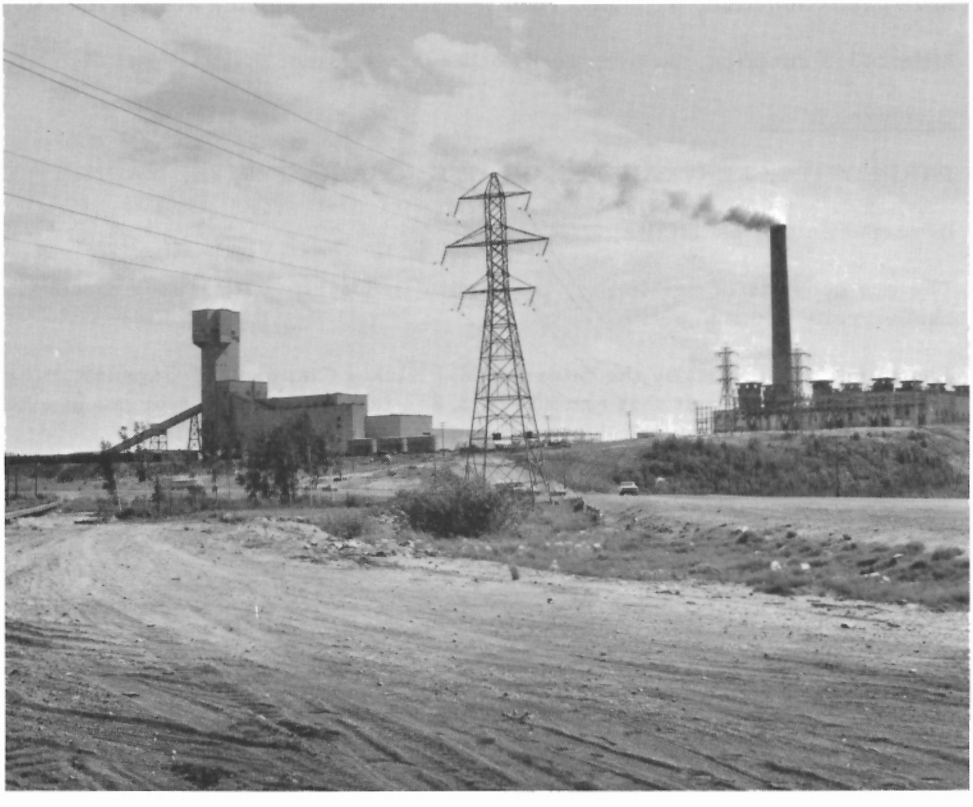


Plate XVI. Thompson Mine and Refinery. (G.S.C. Photo 157949)

in the area; numerous smaller orebodies were also discovered. The Thompson area is the world's second most important nickel producing area after Sudbury. Development commenced in 1957 and production in 1960. This is the only operation in which mining and refining of nickel are conducted at one site. A concentrator, smelter, and refinery were constructed at the mine site, a hydroelectric plant at Kelsey, and a railway from Sipiwesk to the mine. A modern town site was laid out, which in 1970, was incorporated as the city of Thompson, the third largest city in the province. Among the problems encountered during construction were those due to muskeg and permafrost. The mine has been developed by No. 1 production shaft, No. 2 development shaft, and No. 3 production shaft to depths of 4,430 feet, 1,100 feet and 2,607 feet respectively. Tours through the plant are arranged for visitors; due to mining operations, visitors are not permitted in the mine.

The mine and plant are located just south of the city of Thompson.

Refs.: 20 pp. 103-108; 47 pp. 42-47; 65 pp. 227-236; 76 p. 185.

Maps (T): 63P/12W Thompson.
(G): 60-4 Thompson-Moak Lake area (Man. Dept. Mines and Nat. Res.).

Moak Lake Mine

The ore is similar to that at the Birchtree Mine.

The deposit was discovered in 1955 by the International Nickel Company of Canada Limited, and an exploration shaft was sunk to 1,325 feet. Work was suspended when the company commenced development of the Thompson Mine; it has remained idle and is closed to visitors.

The mine is located approximately 1/2 mile north of Moak Lake, and 20.5 miles by road northeast of Thompson.

Refs.: 20 p. 109; 47 pp. 41-47; 76 p. 185.

Maps (T): 63P/13E Mystery Lake.
(G): 60-4 Thompson-Moak Lake area (Man. Dept. Mines and Nat. Res.).

ADDRESSES FOR MAPS, REPORTS

For geological maps and reports:

* Publications Office,
Geological Survey of Canada,
Department of Energy, Mines and Resources,
601 Booth Street,
Ottawa, Ontario,
K1A 0E8.

Manitoba Department of Mines and Natural Resources,
Winnipeg, Manitoba.

Saskatchewan Department of Mineral Resources,
Regina, Saskatchewan.

For topographic maps (50 cents per sheet):

* Map Distribution Office,
Surveys and Mapping Branch,
Department of Energy, Mines and Resources,
615 Booth Street,
Ottawa, Ontario,
K1A 0E9.

For road maps and travel information:

The Canadian Government Travel Bureau,
Department of Industry, Trade and Commerce,
150 Kent Street,
Ottawa, Ontario,
K1A 0H6.

Manitoba Department of Tourism and Recreation,
408-401 York Avenue,
Winnipeg 1, Manitoba.

Saskatchewan Department of Industry and Commerce,
Tourist Development Branch,
Power Building,
Regina, Saskatchewan.

* Prepayment is required for all orders; cheques should be made payable to the Receiver General of Canada.

MINERAL, ROCK DISPLAYS

Saskatchewan Precambrian Geological Laboratory,
Saskatchewan Department of Mineral Resources,
La Ronge, Saskatchewan.

Museum of Natural History,
Albert and College Streets,
Regina, Saskatchewan.

Winnipeg Museum of Man and Nature,
Winnipeg, Manitoba.

* PUBLICATIONS OF THE GEOLOGICAL SURVEY OF CANADA FOR ROCK AND MINERAL COLLECTORS AND TOURISTS

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Misc. Rept. No. 8 — Rock and Mineral Collecting in Canada, by Ann P. Sabina.

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Paper 66-51 — Rocks and Minerals for the Collector: Eastern Townships and Gaspé, Quebec, and parts of New Brunswick, by Ann P. Sabina, 1967, 170pp., figure, 12 location maps and 16 plates ($2.00).

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Paper 68-51 — Rocks and Minerals for the Collector: Buckingham-Mont-Laurier-Grenville, Quebec; Hawkesbury-Ottawa, Ontario, by Ann P. Sabina, 1969, 107pp., figure, 8 location maps and 11 plates ($2.00).

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Paper 70-50 — Rocks and Minerals for the Collector: Ottawa-North Bay, Ontario; Hull-Waltham, Quebec, by Ann P. Sabina, 1971, 130 pp., figure, 13 location maps and 21 plates ($2.00).

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FOR VISITORS AND TOURISTS

Illustrated guide books describing the geology and scenery of Canada's National Parks.

Miscellaneous Report Series

No. 2 Rocks and Scenery of Fundy National Park, Nova Scotia, by David M. Baird. 1962. 32pp. ($.75).

3 Prince Edward Island National Park: The Living Sands, by David M. Baird. 1962. 56pp. ($.75).

4 Yoho National Park, British Columbia: The Mountains, the Rocks, the Scenery, by David M. Baird. 1962. 107pp. ($.75).

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7 The National Parks in Ontario: A Story of Islands and Shorelines, by David M. Baird. 1963. 70pp. ($.75).

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GLOSSARY

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

Allanite $(Ca, R)_2(Al, Fe, Mg)_3Si_3O_{12}(OH)$. H=6.5. Black, less commonly, dark brown tabular aggregates, or massive with conchoidal fracture. Vitreous or pitchy lustre. Generally occurs in granitic rocks or in pegmatite and is commonly surrounded by an orange-coloured halo. Distinguished by its weak radioactivity.

Altaite PbTe. H=3. Tin-white, yellowish metallic; bronze-yellow. Massive. Associated with gold, tellurides or sulphides in vein deposits.

Amphibole A mineral group consisting of complex silicates including tremolite, actinolite and hornblende. Common rock forming mineral.

Amphibolite A metamorphic rock composed essentially of amphibole and plagioclase feldspar.

Analcime $NaAlSi_2O_6$. H_2O. H=5-5.5. Colourless, white, yellowish or greenish, vitreous transparent, trapezohedral crystals or massive, granular. Distinguished from garnet by its inferior hardness. Often associated with other zeolites.

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 evident in cross-section. Occurs in metamorphosed shales. Used in manufacture of mullite refractories, especially spark plugs.

Andesite Dark coloured volcanic rock composed of plagioclase feldspar and amphibole or pyroxene.

Anhydrite $CaSO_4$. H=3-3.5. White, bluish or greyish granular massive with vitreous lustre. Alters to gypsum by absorption of water. Distinguished from gypsum by its superior hardness. Used as a soil conditioner and in the manufacture of portland cement.

Ankerite $Ca(Fe, Mg)(CO_3)_2$. Variety of dolomite from which it cannot be distinguished in hand specimen.

Anthophyllite $(Mg, Fe)_7Si_8O_{22}(OH)_2$. H=6. White, light grey to brown fibrous or prismatic aggregates with vitreous or silky lustre. Orthorhombic variety of amphibole. Distinguished from tremolite by its fibrous habit and silky lustre. Fibrous variety resembles asbestos but is more brittle. Used in asbestos cement, for boiler coverings and fireproof paints because of its heat resistant property.

Antlerite $Cu_3SO_4(OH)_4$. H-3.5 Emerald-green to light and dark green granular, fibrous, tabular or prismatic aggregates. Vitreous lustre.

Colour is similar to atacamite and brochantite but streak is paler. Soluble in dilute sulphuric acid. Associated with other secondary copper minerals.

Apatite $Ca_5(PO_4)_3(F, Cl, OH)$. H=5. Green, blue, colourless, brown, red hexagonal crystals, or granular, sugary massive. Vitreous lustre. May be fluorescent. Distinguished from beryl and quartz by its inferior hardness; massive variety distinguished from calcite, dolomite by its superior hardness and lack of effervescence in HCl, and from massive diopside and olivine by its inferior hardness. Used in the manufacture of fertilizers and detergents.

Aragonite $CaCO_3$. H=3.5-4. Colourless to white or grey and, less commonly, yellow, blue, green, violet, rose-red, prismatic or acicular crystals; also columnar, globular, stalactitic aggregates. Vitreous lustre. Transparent to translucent. Distinguished from calcite by its cleavage and higher specific gravity (2.93). Effervesces in dilute HCl.

Argentite Ag_2S. H=2-2.5. Dark grey cubic, octahedral crystals; arborescent, massive, metallic. Very sectile. Occurs in sulphide deposits with other silver minerals.

Arsenopyrite FeAsS. H=5.5-6. Light to dark grey metallic striated prisms with characteristic wedge-shaped cross-section; also massive. Tarnished 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, pipe covering, clutch and brake components, reinforcing in plastics, etc.

Atacamite $Cu_2(OH)_3Cl$. H=3-3.5. Bright to dark green prismatic, tabular aggregates; granular massive, fibrous. Adamantine to vitreous lustre. Soluble in acids. Associated with other secondary copper minerals.

Axinite $(Ca, Mn, Fe)_3 Al_2(BO_3)Si_4O_{12} (OH)$. H=7. Violet to brown, yellow, pink wedge-shaped crystals; massive. Vitreous lustre. Occurs in cavities in granite, diabase, in hydrothermal veins.

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, transparent. Secondary copper mineral. Effervesces in acids. Ore of copper.

Beryl $Be\ Al_2Si_6O_{18}$. H=8. White, yellow, green, blue, hexagonal prisms, or massive with conchoidal or uneven fracture. Vitreous, transparent to translucent. Distinguished from apatite, by its superior hardness, from topaz by its lack of perfect cleavage, from quartz by its higher

specific gravity. Ore of beryllium which has numerous uses in the nuclear energy, space, aircraft, electronic and scientific equipment industries; and used as alloying agent with copper, nickel, iron, aluminum, and magnesium. Includes gem varieties: emerald (bright green), aquamarine (light blue or green), morganite (pink), yellow (heliodor).

Bornite Cu_5FeS_4. H=3. Reddish brown metallic. Usually massive and tarnished to iridescent blue, purple, etc. Known as peacock ore and variegated copper ore. Ore of copper.

Bournonite $PbCuSbS_3$. H=2.5-3. Grey to blackish grey metallic. Short prismatic or tabular crystals with striated faces; massive. Occurs in veins with sulphides and sulphosalts. Not readily identified in hand specimen.

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.

Carbonate-cyanotrichite Cu Al sulphate-carbonate. Very soft. Light to intense medium blue. Finely granular encrustation with vitreous lustre; also silky fibrous. Secondary mineral formed from copper minerals and is associated with other secondary copper minerals. Dissolves in HCl.

Chabazite $CaAl_2Si_4O_{12}.6H_2O$. H=4. Colourless, white, yellowish or pinkish square crystals. Vitreous lustre. Occurs in cavities in basalt. Distinguished from other zeolites by its almost cubic crystal form; distinguished from calcite by its superior hardness and its lack of effervescence in HCl.

Chalcanthite $CuSO_4.5H_2O$. 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.

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 or sulphurette of copper. Soluble in HNO_3. 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 hardness, from gold by its superior hardness and lower density. Also called copper pyrite. Ore of copper.

Chamosite Iron-rich chlorite.

Chert Massive opaque variety of chalcedony; generally drab coloured (various tints of grey or brown).

Chiastolite see andalusite.

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.

Chrysotile Fibrous varieties of serpentine (asbestos).

Cleavelandite Platy, tabular or lamellar variety of albite; white with pearly lustre.

Clinozoisite $Ca_2Al_3Si_3O_{12}(OH)$. 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.

Coffinite Hydrous U silicate. H=5-6. Black, adamantine lustre; dull brown. Finely granular massive. Associated with uraninite from which it is indistinguishable in the hand specimen.

Columbite-Tantalite Series $(Fe, Mn)Nb_2O_6$ - $(Fe, Mn)Ta_2O_6$. H=5 to 7. Brownish black to black prismatic or tabular crystals forming parallel groups; also massive. Submetallic lustre. Occurs in pegmatites. Ore of niobium which is used in high-temperature steel alloys, and of tantalum which is used in electronics.

Conglomerate A sedimentary rock formed of rounded pebbles or gravel.

Cordierite $(Mg, Fe)_2Al_4Si_5O_{18}$. 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.

Covellite CuS. H=1 1/2.2. Inky blue iridescent in shades of brass yellow, purple, coppery red. Massive; crystals (hexagonal plates) rare. Metallic lustre. Distinguished from chalcocite and bornite by its perfect cleavage and colour.

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.

Curite $2PbO.5UO_3.4H_2O$. H=4-5. Orange, yellow-brown, greenish yellow to greenish brown, finely granular. Waxy to dull lustre. Strongly radioactive. Associated with uraninite.

Devilline $Cu_4Ca(SO_4)_2(OH)_6.3H_2O$. H=2.5. Bright green to bluish green transparent platy crystals forming rosettes or tiny masses. Associated with azurite, malachite on copper-bearing rocks. Not readily distinguishable from other copper minerals in hand specimen.

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. Ore of magnesium which is used in the manufacture of light-weight alloys.

Dyke A long narrow body of igneous rocks that cuts other rocks.

Enargite Cu_3AsS_4. H=3. Grey to almost black metallic (dull when tarnished) prismatic or tabular crystals; also massive granular. When twinned it forms star-shaped cyclic trillings. Associated with pyrite, galena, sphalerite, and copper sulphides. Distinguished by perfect cleavage. Ore of copper.

Epidote $Ca_2(Al, Fe)_3Si_3O_{12}(OH)$. H=6-7. Yellowish green to deep green prismatic crystals, also fibrous or granular masses. Vitreous lustre. Yellow-green colour is distinguishing feature. Occurs in metamorphic and granitic rocks, and in basalt.

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), 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.

Fluorescence Property of certain substances to glow when exposed to light from an ultraviolet lamp. It is caused by impurities in the substance or by defects in its crystal structure. Two wave lengths are commonly used to produce fluorescene: long wave (3200 to 4000 Angstrom units), short wave (2537 Angstrom units).

Fuchsite An emerald-green chromium-rich muscovite.

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

Gahnite $ZnAl_2O_4$. H=7.5-8. Dark blue-green, yellow or brown octahedrons, rounded grains, massive. Vitreous lustre. Occurs in granite pegmatite.

Galena Pb S. 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.

Garnet Silicate of Al, Mg, Fe, Mn, Ca. H=6.5-7.5. Transparent red dodecahedral crystals, or massive granular; also yellow, brown, green. Distinguished by its crystal form. Used as an abrasive. Clear garnet is used as a gemstone.

Gersdorffite NiAsS. H=5.5. Light to dark grey metallic; octahedral, pyritohedral crystals or granular massive. Associated with other nickel minerals in vein deposits.

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

Goethite $HFeO_2$. 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 A decomposed or weathered rusty covering on masses of pyrite or in upper zone of veins; consists of hydrated iron oxides.

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

Graphic granite A granite in which the quartz is arranged in the feldspar in geometrical patterns, 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.

Greywacke Sedimentary rock containing large amounts of amphibole or pyroxene and feldspar.

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 hand specimen.

Gypsum $CaSO_4.2H_2O$. H=2. White, grey, light brown, granular massive; also fibrous (satin spar), or colourless transparent crystals (selenite). Distinguished from anhydrite by its inferior hardness. Occurs in sedimentary rocks. Used in construction industry (plaster, wallboard, cement, tiles, paint) and as a soil conditioner and fertilizer. Satin spar and alabaster (fine-grained translucent variety) are used for carving into ornamental objects.

Hematite Fe_2O_3. H=5.5-6.5. Reddish brown to black massive, botryoidal, or earthy; also foliated or micaceous with high metallic lustre (specularite). Characteristic red streak. Greasy to dull lustre. Ore of iron.

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

Igneous Rocks that have crystallized from magma or from the melting of other rocks; composed of feldspar, quartz, and hornblende, pyroxene or biotite.

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

Jarosite $K\,Fe_3(SO_4)_2(OH)_6$. H=2.5-3.5. Yellow to brown pulverulent coating associated with iron-bearing rocks and with coal. Distinguished from iron oxides by giving off SO_2 when heated.

Kasolite $PbO.UO_3.SiO_2.H_2O$. 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 other radioactive minerals from which it is not easily distinguished in the hand specimen.

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 A fine-grained dyke rock composed of plagioclase feldspar and pyroxene or amphibole.

Leonhardtite $MgSO_4.4H_2O$. Dull white encrustations. Bitter metallic taste. Difficult to distinguish in hand specimen from other sulphates. Also known as starkeyite.

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.

Malachite $Cu_2CO_3(OH)_2$. H=3.5-4. Bright green granular, botryoidal, earthy masses; usually forms coating with other secondary copper minerals on copper-bearing rocks. Distinguished from other green copper minerals by effervescence in HCl acid. Ore of copper.

Marble See limestone.

Marcasite FeS_2. H=6-6.5. Pale bronze to grey metallic radiating, stalactitic, globular or fibrous forms; twinning produces cockscomb and spear shapes. Yellowish to dark brown tarnish. Massive variety difficult to distinguish from pyrite in hand specimen.

Meneghinite $Pb_{13}Sb_7S_{23}$. H=2.5. Blackish grey; bright metallic. Slender striated prismatic crystals, fibrous, massive. Oxidized by HNO_3. Associated with sulphides and sulphosalts.

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

Molybdenite MoS_2. H=1-1.5. Dark bluish grey metallic tabular, foliated, scaly aggregates or hexagonal crystals; also massive. Sectile with greasy feel. Distinguished from graphite by its bluish lead-grey colour and by its streak (greenish on porcelain, bluish grey on paper). Ore of molybdenum.

Monazite (Ce, La, Y, Th)PO_4. H=5-5.5. Yellow, reddish brown or brown equant or flattened crystals and grains. Resinous to vitreous lustre. Radioactive. Resembles zircon but is not as hard. Distinguished from titanite by its superior hardness and radioactivity. Occurs in granitic or pegmatitic rocks. Ore of thorium.

Natrolite $Na_2Al_2Si_3O_{10}.2H_2O$. H=5. Colourless, white or reddish needle-like crystals often forming radiating or nest-like aggregates; also nodular, or as slender prisms. Vitreous to pearly lustre. Distinguished from other zeolites by its acicular habit. Occurs with other zeolites.

Oligoclase Plagioclase feldspar.

Olivine $(Mg, Fe)_2SiO_4$. H=6.5. Olive-green, vitreous, granular masses or rounded grains; also yellowish to brownish black. Distinguished from quartz by having a cleavage; from other silicates by its olive-green colour. Soluble in hot dilute HCl. Used in manufacture of refractory bricks. Transparent variety (peridot) is used as a gemstone.

Orthoclase $KAlSi_3O_8$. H=6. Red-pink or white feldspar. Short prismatic crystals. Vitreous lustre. Perfect cleavage. Distinguished from plagioclase feldspar by absence of twinning striations.

Pegmatite A very coarse grained dyke rock.

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.

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.

Picrolite A non-flexible fibrous variety of antigorite (serpentine).

Phosphorescence Property of certain substances to continue to glow after being heated or after exposure to ultraviolet rays.

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

Porphyry A dyke rock that consists of distinct crystals (phenocrysts) in a fine-grained matrix.

Posnjakite Basic Cu sulphate. Minute blue flaky and radiating sheaf-like aggregates on copper-bearing rocks. Associated with other secondary copper minerals; not readily distinguished from them in hand specimen.

Pyrite FeS_2. H=6-6.5. Pale brass-yellow metallic crystals (cube, pyritohedrons, octahedrons) or massive granular. Iridescent when tarnished. Distinguished from other sulphides by its colour, crystal form, and superior hardness. Source of sulphur.

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.

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

Radioactive minerals Minerals that give off radiation due to spontaneous distintegration of uranium or thorium atoms. Detected by a Geiger counter.

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

Rutile TiO_2. H=6-6.5. Brownish red to black striated prismatic or acicular crystals; also massive. Crystals are commonly twinned forming elbow shapes. Adamantine lustre. Resembles cassiterite, but has lower specific gravity and has light brown streak (cassiterite has white streak). Ore of titanium.

Sandstone Sedimentary rock composed of sand-sized particles (mostly quartz).

Scapolite $(Na, Ca)_4[(Al, Si)_4O_8]_3(Cl\ CO_3)$. H=6. White, grey or less commonly pink, yellow, blue, green prismatic and pyramidal crystals; also massive granular with splintery, woody appearance. Vitreous, pearly to resinous lustre. Distinguished from feldspar by its square prismatic form, its prismatic cleavage, its splintery appearance on cleavage surfaces. May fluoresce under ultraviolet rays. Clear varieties may exhibit chatoyancy (cat's-eye effect) when cut into cabochons.

Schist Metamorphic rock composed mainly of flaky minerals such as mica and chlorite.

Sericite Fine scaly or fibrous muscovite that is an important constituent of some schists and gneisses.

Serpentine $Mg_6(Si_4O_{10})(OH)_8$. H=2-5. White, yellow, green, blue, red, brown, black massive; may be mottled, banded or veined. Waxy lustre. Translucent to opaque. Asbestos (chrysotile) is the fibrous variety. Formed by alteration of olivine, pyroxene, amphibole, or other magnesium silicates. Found in metamorphic and igneous rocks. Used as an ornamental building stone (verde antique) and for cutting and/or carving into ornamental objects.

Serpentinite A rock consisting almost entirely of serpentine.

Shear zone See fault.

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.

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.

Slate A fine-grained metamorphic rock characterized by a susceptibility to split into thin sheets.

Soapstone A metamorphic rock composed chiefly of talc; has massive fibrous texture and unctuous feel. Used for electrical switch boards, acid-proof table-tops and sinks, and laundry tubs. Attractive varieties used for carved ornamental objects.

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. Honey-brown streak. Soluble in HCl, and gives off H_2S. Ore of zinc.

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.

Spodumene $LiAlSi_2O_6$. H=6.5. White, grey, pink, violet, green long prismatic crystals or platy masses. Perfect cleavage. Vitreous lustre. Distinguished by form and cleavage. Occurs in pegmatite. Source of lithium. Used in ceramics.

Staurolite $FeAl_4Si_2O_{10}(OH)_2$. 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.

Stilpnomelane Fe silicate. Black, greenish black foliated plates, fibrous. Commonly associated with iron ores.

Talc $Mg_3(Si_4O_{10})(OH)_2$. H=1. Grey, white, green, finely granular or foliated. Translucent with greasy feel. Massive varieties are known as steatite and soapstone, and because of their suitability for carving are used for ornamental purposes. Formed by alteration of magnesium silicates (olivine, pyroxene, amphibole, etc.) in igneous and metamorphic rocks. Used in cosmetics, ceramics, paint, rubber, insecticide, roofing, and paper industries.

Tetradymite Bi_2Te_2S. H=1.5-2. Grey with high metallic lustre. Foliated, bladed, massive. Dull or iridescent tarnish. Perfect cleavage. Soils paper. Occurs in gold-quartz veins.

Tetrahedrite-Tennantite $Cu_{12}Sb_4S_{13}$ - $Cu_{12}As_4S_{13}$. H=3.5-4. Flint-grey to iron-black, metallic, tetrahedral crystals; also massive granular to compact brown, black, or deep red streak. Ore of copper; may contain silver, antimony values.

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

Tourmaline $Na(Mg, Fe)_3Al_6(BO_3)_3(Si_6O_{18})(OH)_4$. H=7.5. Black, deep green, blue, pink, brown, amber-coloured prismatic crystals; also columnar, massive granular. Prism faces striated vertically. Vitreous lustre. Conchoidal fracture. Distinguished by triangular cross-section in prisms, by striations, fracture. Used in manufacture of pressure gauges; transparent variety used as a gemstone.

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

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

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

Violarite Ni_2FeS_4. H=4 1/2-5 1/2. Violet grey, brilliant metallic; tarnishes to violet grey. Massive. Distinguished by colour. Associated with copper, nickel and iron sulphides in vein deposits. Rare mineral.

Xenotime $Y PO_4$. H=4-5. Prismatic crystals like zircon in shades of yellow, brown, grey. Vitreous to resinous. Distinguished from zircon by its inferior hardness.

Zircon $ZrSiO_4$. H=7.5. Pink, reddish to greyish brown tetragonal prisms terminated by pyramids; also colourless, green or grey. May form knee-shaped twins. Vitreous to adamantine lustre. May be radioactive. Distinguished by its crystal form, hardness. Ore of zirconium and hafnium. Used in moulding sand, ceramics, and refractory industries; transparent varieties used as gemstones.

Zoisite $Ca_2Al_3Si_3O_{12}(OH)$. 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 distinguished from amphibole by its perfect cleavage. Transparent varieties used as gemstones; pink variety 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

Cb - columbium (niobium)

Ce - cerium

Cl - chlorine

Co - cobalt

Cr - chromium

Cu - copper

Er - erbium

F - fluorine

Fe - iron

H - hydrogen

K - potassium

La - lanthanum

Li - lithium

Mg - magnesium

Mn - manganese

Mo - molybdenum

Na - sodium

Nb - niobium

Ni - nickel

O - oxygen

P - phosphorus

Pb - lead

Pt - platinum

R - rare earth elements

S - sulphur

Sb - antimony

Se - selenium

Si - silicon

Sn - tin

Sr - strontium

Ta - tantalum

Te - tellurium

Th - thorium

Ti - titanium

U - uranium

W - tungsten

Y - yttrium

Yb - ytterbium

Zn - zinc

Zr - zirconium

INDEX OF ROCKS AND MINERALS