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Geology of the

Gowganda Lake-Miller Lake Silver Area

District of Timiskaming

By

W.H. McIlwaine

1978

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Scale 1:31,680 or 1 inch to ½ mile.

ABSTRACT

The Gowganda Lake and Miller Lake area comprises the townships of Van Hise, Milner, Haultain, and Nicol with an area of about 422 KM² (144 square miles) in the District of Timiskaming. The village of Gowganda is about 83 km (52 miles) west-northwest of New Liskeard.

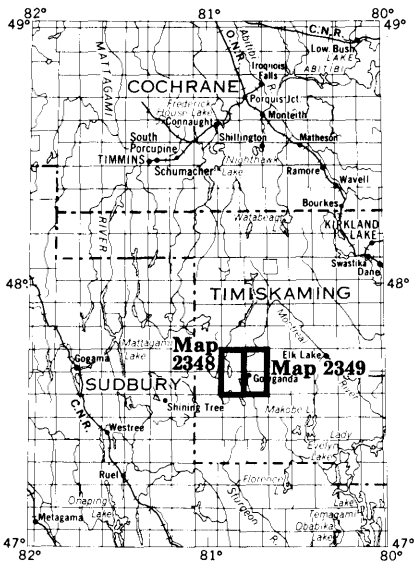

Figure 1–Key map showing location of Gowganda Lake - Miller Lake Silver Area. Scale: 1:3,168,000 or 1 inch to 50 miles

Remnants of an Early Precambrian metavolcanic belt occur as inliers in younger sedimentary and mafic igneous rocks. This metavolcanic assemblage, mainly mafic in composition, has subsequently been intruded by small serpentinized dunite bodies, granitic plutons, and diabase dikes. Granitic rocks are commonly trondhjemite and quartz diorite and represent two phases of intrusion at the southwest exposed extremity of the Round Lake Batholith.

The diabase dikes trend north and represent the earliest manifestation of a fracture trend which to a large degree influenced subsequent events.

Deposition of Huronian Supergroup rocks followed a period of erosion; the Cobalt Group is represented by the Gowganda, and Lorrain Formations. Feldspathic arenite, feldspathic greywacke, and paraconglomerate are the most common lithologies in the Gowganda Formation. Laminated argllite of the Gowganda Formation, Firstbrook Member are present locally. Sedimentation of this unit was controlled, in part, by north-trending fault scarps which were a result of continued movement along the fractures which were the loci of intrusion of the early diabase dikes.

The Lorrain Formation consists mainly of feldspathic and micaceous sandstones.

Several sheet-like bodies of Nipissing Diabase, also with a northerly trend, intruded the earlier rocks. These are composed mainly of pyroxene gabbro with local granophyric phases in upper parts of the sheets. One sheet in the Miller Lake area has a thickness of 284 m (935 feet).

Late diabase dikes trend northeast and northwest.

Silver mineralization, with associated cobalt-nickel-iron arsenides, occurs in carbonate veins, mainly in the Nipissing Diabase. Over 60,000,000 ounces of silver have been won from the area with two thirds of this coming from the Miller Lake O'Brien Mine.

The Geology of the Gowganda Lake and Miller Lake Silver Area

District of Timiskaming

by

W.H. McIlwaine[1]

INTRODUCTION

The map-area described in this report consists of the townships of Van Hise, Milner, Haultain, and Nicol in the District of Timiskaming. The village of Gowganda, which is in the approximate centre of the area, is about 83 km (52 miles) west-northwest of New Liskeard and 77 km (48 miles) southwest of Kirkland Lake. The four 9.6 km (6-mile) square townships form a square map-area of about 369 km^2 (144 square miles).

Gowganda, along with South Lorrain (McIlwaine 1970), is one of the more important satellite silver camps of the Timiskaming silver area. These camps arose owing to the more widespread prospecting for silver deposits following the rich discoveries in Cobalt in 1903.

Geological Setting

The map-area is underlain mainly by Middle Precambrian Huronian Supergroup sedimentary rocks which are relatively flat-lying, mildly metamorphosed, and intruded by several subcircular gabbroic intrusions of Nipissing Diabase. The metamorphism of the Huronian rocks was probably caused by the same tectonic events which deformed the Huronian rocks along the North Shore of Lake Huron (Card *et al.* 1970). The Nipissing Diabase is of great importance as it is closely related to the silver deposits for which the area is famous.

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[1]Geologist, Precambrian Geology Section, Geological Branch, Ontario Div. Mines, Thunder Bay. Approved for publication by the Chief Geologist, October18th, 1974.

Several areas of Early Precambrian rocks are exposed through the Middle and Late (?) Precambrian cover; these are composed mainly of mafic metavolcanics and granitic intrusions, both of which are intruded by diabase dikes of Early and Late (?) Precambrian age.

History of Mineral Exploration

Following the discovery of native silver deposits in the Cobalt area in 1903 it was not long before prospectors began searching for other areas of Nipissing Diabase with which the silver deposits are spatially and genetically related. Quickly several satellite camps became important in the search for and production of native silver. These include South Lorrain where silver was first discovered in 1907 (McIlwaine 1970, p.1) and Elk Lake in 1906 (MacKean 1968, p.1). Silver was first discovered in the present area on Bloom Lake in 1907 (Moore 1955, p.2).

The following paragraph is paraphrased from Moore (1955):

The first ore production of the Gowganda camp came from the Bartlett claims west of Gowganda Lake in Milner Township. By 1910 several properties in this area and around the Miller Lake basin were shipping ore.

The village of Gowganda was built around the north end of Gowganda Lake and by 1971 had a population of around 400. Gowganda had a post-office, bank, hotels, tourist camps, grocery stores and gas stations. There is also a satellite village at O'Brien, the site of the Miller Lake O'Brien mine.

The following four paragraphs are paraphrased from Moore (1955):

By 1925 the Gowganda area had produced from 14 properties 8,420,509 ounces of silver, with over half of this coming from the Miller Lake O'Brien mine. Second to the Miller Lake O'Brien was the Castle Trethewey; the Millerett produced 611,822 ounces of silver and 5,000 pounds of cobalt from 667 tons of ore and concentrates. The Mann, Reeve Dobie, Tonopah (Walsh Morrison), Bartlett (Crews McFarlan), Bonsall, Boyd Gordon, Miller Lake Everett, Welch, and Wigwam were minor producers, with the Mann, Reeve Dobie, and Tonopah the only ones producing more than 45,000 ounces of silver. Nearly all of them had closed by 1925.

The Miller Lake O'Brien operated until 1939 when it was closed for the duration of the war; 17,555,646 ounces of silver had been produced to that date. During the war years lessees were reported to have taken 620,000 ounces of silver from the mine. Siscoe Metals of Ontario Limited purchased the property in 1945 and reopened the mine; it has been in production since by this company.

New Morrison Mines Limited (now Consolidated Morrison Explorations Limited) operated the Morrison mine from August 1953 to the fall of 1954 on a profit-sharing basis with Lost Lake Mines Limited.

Castle Trethewey Mines Limited operated their mine from 1920 to 1931, when, like many other silver mines, it closed because of the depression. The mine was reopened in 1948 through the Capitol Shaft with production commencing in 1951.

McIntyre Porcupine Mines Limited purchased the property in 1959 but the mine was closed in 1965.

In 1967 all of McIntyre's property in the Gowganda area was leased to Sis-

TABLE 1 | RECORDED TOTAL PRODUCTION BY EACH MINE IN THE MAP-AREA TO THE END OF 1969.

Township	Mine	ounces of silver	Total pounds of cobalt	pounds of nickel	pounds of copper
Milner	Bartlett	20,219	18		
	Boyd-Gordon	4,678			
	Mann	118,942[1]			
	Reeve Dobie	88,584			
	South Bay	1,500[2]			
	Welch	1,000			
Haultain	Bonsall	114,527			
	Capitol	10,837,181	209,474	18,826	
	Castle Trethewey	6,461,021	299,847		
	Miller Lake Everrett	3,461			
	Millerett	611,822	5,000		
	Wigwam	896			
Nicol	Miller Lake[3] O'Brien	40,736,585	785,700	13,248	72,946
	Morrison	719,201	22,018		
	Walsh	453,424	3,555		
Totals		60,174,041	1,325,612	32,074	72,946

[1]Includes silver from tailings in 1952.
[2]Approximate
[3]Includes production from Castle lease.

coe and exploration in the old workings has met with success. Siscoe also had an agreement with Zenmac Metal Mines Limited for the mining of a deposit east of Milner Lake but this operation did not come up to expectations and the mine was closed in 1970.

Production figures for the Gowganda area are shown in Table 1.

Means of Access

Highway 560 west from Elk Lake traverses the centre of the map-area in an east-west direction. Several roads, most of which can be travelled by car, branch from this road to other parts of the map-area. From these roads boats can be launched into numerous lakes. A float-equipped aircraft was used to fly to Elkhorn Lake to map the southern part of Milner Township.

Acknowledgments

The author was ably assisted in the field by the following: W.E. Roscoe, senior assistant 1966, M. Hoque, senior assistant 1967, Keith Masters, senior assistant 1968, R.H. Fish, junior assistant 1966 and senior assistant 1968, W.R. Costello, junior assistant 1966, W. Coleman, junior assistant 1967, Henry Wallace, junior assistant 1967, W.N. Houston,junior assistant 1967, and the late P.R. White who was a junior assistant for all three years of field work.

Discussions with D. Tenny and A. Reed, mine geologists for Siscoe Metals Ontario Limited at the time of mapping, and with E.E. Campbell and Robert Thomson, consulting geologists were very beneficial.

Accommodation in the field was assisted by Siscoe Metals of Ontario Limited in 1966 and by Mr. and Mrs. D.J. White in 1967 and 1968.

Present Geological Survey

Geological mapping was done during the summers of 1966, 1967, and 1968 at a scale of 1 inch to ¼ mile (1:15,840). Pace-and-compass traverses were run at approximately 400 m (¼ mile) intervals. The geology was plotted on acetate sheets over aerial photographs flown in 1958 and obtained from the Ontario Division of Forests. This information was then transferred to base maps compiled by the Cartography Section of the Ontario Division of Lands from Forest Resources Inventory maps of the Silviculture Section of the Ontario Division of Forests and Preliminary geological maps were published following each field season. P.374 was issued for Nicol Township in 1966, P.475 for Milner Township in 1968, and P.517 and P.518 for Van Hise and Haultain Townships in 1969 (McIlwaine 1966; 1968b; 1969 a and b).

Previous Geological and Geophysical Work

The first mapping in the area was done by W.H. Collins (1913) at a scale of 1 inch to 4 miles (1:253,440). Later more detailed mapping was done by A.G. Burrows (1921) at a scale, 1 inch to 1 mile (1:63,360). A revision of this map, published in 1926, concentrated on the Miller Lake basin (Burrows 1926) and was at a scale, 1 inch to ½ mile (1;31,680). The most recent map is E.S. Moore's (1955), also at a scale, 1 inch to ½ mile (1:31,680); this map used much of the data of Burrows and Collins but contained some revisions.

Numerous other papers and studies, too numerous to mention here, on the general and economic geology of the area have been written. Many of these will be referred to throughout this report.

Aeromagnetic maps of the area have been published by the Geological Survey of Canada (GSC 1956a and b) at a scale, 1 inch to 1 mile (1:63,360). These maps were issued again in 1970 at the same scale (ODM-GSC 1970a, b) and at a scale, 1 inch to ½ mile (1:31,680) (ODM-GSC 1970c, d, e, f). One aeromagnetic

map at a scale, 1 inch to 4 miles (1:253,440) also includes the map-area (ODM-GSC 1970g).

Topography

The area is one of moderate relief with a maximum of 120 m (400 feet) being attained just to the west of Flatstone Lake where a ridge of Nipissing Diabase reaches an elevation of 460 m (1,500 feet) above sea level. North-trending hills of similar elevation, and formed of Gowganda Formation rocks, occur in western Milner Township. These two examples illustrate, in part, the generalization that areas underlain by Middle Precambrian rocks are more rugged than those underlain by Early Precambrian rocks. In the latter, hills are lower and more rounded.

Drainage

All of the drainage in the map-area belongs to the north-flowing Montreal River system. The main tributaries of the Montreal River are Wapus Creek, Miller Creek, and Calcite Creek, all of which join the Montreal River north of the map-area.

Natural Resources

The forest cover consists mainly of spruce, poplar, birch, cedar, balsam fir, and jack pine. The animals observed include moose, bear, beaver, rabbits, and numerous small rodents.

Gowganda has a thriving tourist industry with numerous tourist camps catering mainly to hunters and fishermen. Pike, pickerel, and trout are the main fish caught.

GENERAL GEOLOGY

The map-area is near the northwestern edge of the Cobalt Plain of the Southern Structural Province of the Canadian Shield. The Early Precambrian rocks exposed represent inliers in the Middle Precambrian cover with the exception of the metavolcanic assemblage exposed inside the Miller Lake diabase basin.

The rocks of the area are readily divisible into four major units as follows:

Late gabbroic rocks (Nipissing Diabase and later dikes)
Cobalt Group Sedimentary rocks
Granitic intrusions
Metavolcanics with associated iron formation.

Table 2, the Table of Lithologic Units, gives the above in more detail.

The main exposures of mafic metavolcanics are in south-central Van Hise Township in southwest and central Haultain Township, within the Miller Lake diabase basin, which straddles the Haultain-Nicol township boundary, and northeast of Wilson Lake in central Nicol Township. Less extensive outcrops are found in south-central and northwestern Milner Township, northwest and northeast Van Hise Township, and central Nicol Township near Bonsall Lake.

Felsic metavolcanics underlie a "horseshoe"-shaped area in northwest Nicol Township. Sulphide facies iron formation is associated with this unit.

Locally in Van Hise and Haultain Townships the mafic metavolcanics have been intruded by serpentinized ultramafic rocks and apparently associated gabbro.

Felsic plutonic rocks are exposed over much of north-central Van Hise and Haultain Townships. These granitic rocks represent the extreme southwestern limit of the Round Lake Batholith (Lawton 1954) and are actually part of a large inlier in the Huronian cover (see Ginn *et al.* 1964 and Ayres *et al.* 1971). Granitic rocks are also exposed in central Nicol Township north of Wilson Lake.

North-trending Matachewan-type diabase dikes are ubiquitous throughout the metavolcanic and granitic rocks.

Nonconformably overlying the Early Precambrian basement rocks are relatively flat-lying Middle Precambrian clastic sedimentary rocks of the Cobalt Group, which is part of the Huronian Supergroup (Robertson *et al.* 1969). Only the Gowganda and Lorrain Formations are present in the map-area.

Intruding the Huronian and older rocks are several basin and tabular-shaped gabbroic intrusions of Nipissing Diabase. Late (?) Precambrian quartz diabase and olivine diabase dikes are the youngest rocks in the area.

Early Precambrian (Archean)

METAVOLCANICS

Mafic to Intermediate Metavolcanics

This unit of Early Precambrian rocks has been mapped as the oldest in the area and is composed mainly of fine-grained flows of basaltic composition with local coarse-grained facies and pyroclastics. The rocks have been metamorphosed mainly under greenschist facies conditions but amphibolite facies conditions prevailed locally. A narrow belt of layered amphibolite separates quartz diorite from albite trondhjemite in central Haultain Township.

The metavolcanics, which occur as local inliers in the Middle Precambrian cover rocks, are found in five main areas as follows:

1. Van Hise Township
2. Dinny Lake–Everett Lake
3. Miller Lake

TABLE 2 TABLE OF LITHOLOGIC UNITS FOR THE GOWGANDA LAKE AND MILLER LAKE SILVER AREA.

CENOZOIC
QUATERNARY
RECENT
Swamp, lake, stream deposits
PLEISTOCENE
Glacial deposits

UNCONFORMITY

PRECAMBRIAN
LATE PRECAMBRIAN(?)
MAFIC INTRUSIVE ROCKS
Olivine diabase, porphyritic olivine diabase, diabase

INTRUSIVE CONTACT

MIDDLE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS (NIPISSING DIABASE)
Pyroxene gabbro, amphibole gabbro, granophyre

INTRUSIVE CONTACT

HURONIAN SUPERGROUP
COBALT GROUP
Lorrain Formation
Micaceous sandstone, feldspathic sandstone, greywacke, quartzose sandstone, ferruginous sandstone conglomerate

Gowganda Formation
Firstbrook Member
Laminated argillite, quartzite

Coleman Member
Feldspathic greywacke, feldspathic sandstone, arkose, conglomerate, ferruginous sandstone, breccia, argillite, siltstone, protoquartzite, lithic greywacke

UNCONFORMITY

EARLY PRECAMBRIAN
MAFIC INTRUSIVE ROCKS (MATACHEWAN DIABASE)
Diabase, porphyritic diabase

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS
Trondhjemite, porphyritic trondhjemite, quartz diorite, syenodiorite, contaminated zone, pegmatite dikes, feldspar porphyry dikes

INTRUSIVE CONTACT

MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS
Metagabbro, serpentinized dunite

INTRUSIVE CONTACT

FELSIC METAVOLCANICS
Dacite, porphyritic dacite, tuff

MAFIC TO INTERMEDIATE METAVOLCANICS
Basalt, andesite, amphibolite, layered amphibolite, gabbroic flows, amygdaloidal basalt, pillow lava, pyroclastic rocks, andesite porphyry, schists, sedimentary rocks

4. Jacobs Lake
5. North-central Haultain Township.

There are also several smaller areas, which include Penassi Lake, Wapus Creek, Elkhorn Lake, Obushkong Lake, and Bonsall Lake. The foliation in the rocks, however, suggests that all of the larger areas, at least, and some, if not all, of the smaller areas were at one time part of the same belt. The foliation also suggests that a large fold possibly displaced, in part, by faulting, is present within the metavolcanics.

On the basis of colour index, the metavolcanics are believed to be mainly basaltic in composition. They are massive to weakly foliated, fine grained, dark greenish grey to almost black, and locally have a mottled appearance. Estimated compositions from thin sections indicate altered plagioclase 35 to 70 percent, secondary amphibole 40 to 50 percent, chlorite apparently after biotite, 5 to 15 percent, and opaque oxides 7 to 15 percent. One thin section of a mafic metavolcanic rock contained about 20 percent carbonate minerals (mainly calcite). Coarser grained metavolcanics, presumably central parts of flows are found throughout the metavolcanic sequence; particularly good exposures are found around the western part of Miller Lake. The coarse-grained rocks tend to be lighter in colour and more altered than the fine-grained rocks. Estimated mineralogical compositions are sausseritized plagioclase 30 to 50 percent, chlorite and/or secondary amphibole 5 to 60 percent, and opaque oxides 3 to 5 percent. The coarser grained rocks, may in part, be intrusive but as relationships were not observed in the field this is difficult to determine.

Light- to medium-greenish grey rocks, considered by the author to be of andesitic composition, are commonly porphyritic. The phenocrysts are 1 to 2 mm and are composed of rounded, corroded, and highly altered plagioclase in a groundmass of plagioclase and quartz; pyroxene, chlorite, and carbonate are less abundant. The porphyritic andesite is most common west of Wapus Creek.

Massive amphibolites are associated with the metavolcanics; foliated amphibolite forms a narrow belt in north-central Haultain Township. The massive amphibolite is a fine- to medium-grained dark greenish grey rock with amphibole crystals up to 2 mm observable on the fresh surface. The rock is composed of actinolite (40 to 50 percent) in a fine-grained groundmass of chlorite (20 to 25 percent), clinozoisite (10 to 15 percent), plagioclase (10 to 15 percent), and opaques (about 7 percent) mainly pyrite.

The foliated amphibolite is a fine-grained black rock with local narrow granitic stringers near the contact with the granitic rocks. Thin section examination indicates an average composition of 70 to 80 percent hornblende, 10 to 25 percent plagioclase; one section contains 10 percent magnetite, 5 percent garnet, and 3 percent chlorite. The hornblende is strongly pleochroic with interstitial corroded plagioclase. The layered amphibolite is interpreted as a contact metamorphic rock by the author because of its proximity to the Round Lake Batholith.

Pyroclastic units, lavas with poorly preserved pillows, and amygdaloidal lavas occur locally in the metavolcanics. Tops to the northeast are indicated from pillows east of the southend of Miller Lake.

Narrow sedimentary units, composed mainly of quartzite, east of Miller Lake and west of Serpentine Lake, also occur.

Also occurring locally, but too small to show on the maps, are very narrow lamprophyre dikes.

Felsic Metavolcanics

A "horseshoe"-shaped area of about 2.6 km^2 (1 square mile) in northwest Nicol Township is underlain by felsic metavolcanics which are mainly dacite in composition. Previous authors have suggested this unit is intrusive. Collins (1913, p.31) described the rocks as a "broad dyke of light grey porphyritic granite". Burrows (1926, p.9) on the other hand considered the rocks to form a stock as "its outcrop is nearly round in shape". This may be true but the present shape of the area of outcrop is controlled by faulting, deposition of Cobalt Group sedimentary rocks, and the intrusion of Nipissing Diabase. The occurrence, however, of spatially associated tuffaceous rocks leads the author to believe the unit is volcanic.

The porphyritic rocks vary from medium grey-green to medium grey-pink and are mainly massive and fine-grained rocks with up to 25 to 30 percent phenocrysts of plagioclase and quartz. The weathered surface is grey.

Thin sections show the rock to be composed of phenocrysts of plagioclase and quartz in a groundmass composed of a mosaic of quartz, feldspar, secondary white mica, and lesser amounts of carbonate and secondary amphibole. Phenocrysts range from 0.5 to 2 mm with an average of about 1 mm. The composition of the plagioclase is oligoclase.

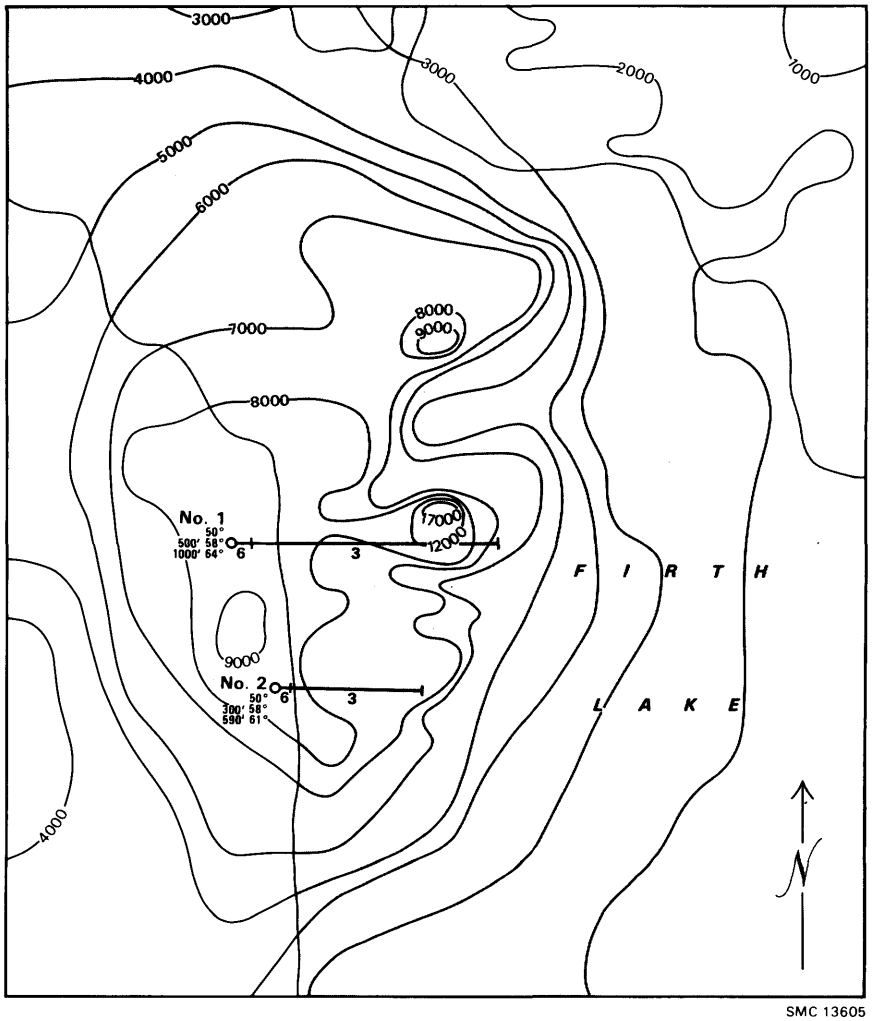
A thin section of a tuffaceous rock is composed of a mat of brown saussurite and chlorite with scattered quartz phenocrysts. Fragments are about 2 to 3 mm.

East of the Siscoe No.6 shaft on claim RSC 92 is an outcrop similar in composition to the dacite porphyry described above but phenocrysts of quartz (30 percent) are more abundant than plagioclase (10 percent). The groundmass is similar to the above.

This rock type is also found on the west end of the mafic metavolcanics which are exposed south of Highway 560 in Nicol Township.

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS

Six small plutons of mafic and ultramafic rocks occur in the map-area; four of these, in Van Hise Township, occur around the shores of Firth Lake and the other two are in Haultain Township, one of which is east of Siscoe No.6 shaft and the other at the southeastern end of Dinny Lake. The presence and outline of one of the Firth Lake bodies under Middle Precambrian sedimentary rocks is interpreted from diamond drilling and geophysical work (Desson 1968) by Texmont Mines Limited (10)(see Figure 2).

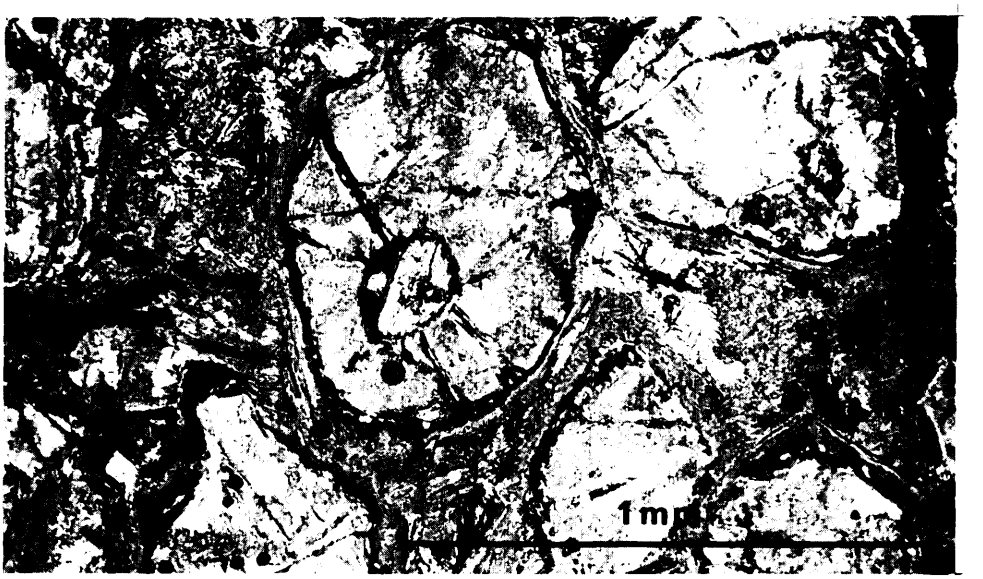


LEGEND

Diamond drill hole with number and inclination.

Magnetic contour, value in gammas.

Figure 2–Magnetic anomaly and diamond drill holes indicating buried peridotite (3) body under the Gowganda Formation (6). Modified from assessment work data of Texmont Mines Limited (10), 1966 and 1968.



ODM9790

Photo 1–Photomicrograph of serpentinized olivine grains in a serpentinized dunite (plane light). Approximately 65X magnification.

Serpentinized Dunite

Serpentinized dunite occurs mainly between Firth and Serpentine Lakes in Haultain Township; it is found to a lesser extent just to the north along the shore of Firth Lake, also near Dinny Lake and east of Siscoe No.6 shaft in Haultain Township. Collins (1913) described the rock as harzburgite. This may be so locally but in all but one of the thin sections examined by the author insufficient pyroxene is present to classify the rock as harzburgite.

In the field the rock weathers a dark rusty brown and the outcrops are generally well rounded and smooth. The fresh surfaces are fine grained and dark green. The subrounded shape of original olivine grains can be seen on some weathered surfaces. Locally slickensided fractures contain a serpentine mineral which owing to its brittleness and difficulty in separating the fibres is identified as picrolite.

Thin section examination revealed serpentine varying in amounts from 50 to 80 percent, with 7 to 40 percent magnetite, 5 to 40 percent chlorite, trace to 15 percent talc, 2 to 3 percent sulphide minerals, and traces of biotite, carbonate, and pyroxene. Most of the serpentine is pseudomorph after olivine (Photo 1) and forms flaky or felted aggregates ranging from 0.3 mm to 1 mm in diameter.

The magnetite fills tiny fractures in the grains, surrounds the grains, or occurs as discrete grains. Talc and chlorite surround the grains of serpentine also.

Gabbro

Gabbro in part is spatially related to the serpentinized dunite, but ultramafic rocks were not found associated with the outcrop area of gabbro on Firth Lake unless the buried body to the west represents a zone within the gabbro.

In outcrop the rock weathers rusty brown to grey and outcrops are rounded. An ophitic texture is displayed on the water-washed shoreline outcrops on Firth Lake. The gabbro is generally fine to medium grained.

In thin section the gabbro consists of 40 to 50 percent saussuritized plagioclase and 40 to 50 percent uralitized pyroxene; less common are chlorite (5 to 15 percent), sulphide minerals (2 to 3 percent), and traces of apatite and quartz.

That these ultramafic and mafic intrusive rocks are of Early Precambrian age is indicated by their stratigraphic position under the Huronian Gowganda Formation, and by the Matachewan-type diabase dikes which intruded them. The intense mineralogical alteration displayed by these intrusive rocks suggests that they are older than the granitic rocks which are generally fresher.

A serpentinized dunite core surrounded by gabbro is suggestive of a zoned ultramafic intrusion (McTaggart 1971). More detailed work may reveal other zones within those presently delineated.

The gabbro body near the north end of Firth Lake may be a coarse-grained central part of a thick flow. No contact relations with the surrounding rocks were observed.

FELSIC INTRUSIVE ROCKS

Felsic intrusive rocks ranging in composition from albite trondhjemite to quartz diorite underlie most of the northern part of Van Hise and Haultain Townships. Just north of Wilson Lake in Nicol Township is a small area which is composed mainly of trondhjemite and syenodiorite. The northern exposures represent the extreme southwestern exposed edge of the Round Lake Batholith (Lawton 1954). In itself, however, the outcrop area is part of a larger inlier of the batholith (see Ginn *et al.* 1964 and Ayres *et al.* 1971) in the Cobalt Group rocks. The relationship of the Wilson Lake granitic rocks to the Round Lake Batholith is not known and these two will be described separately in this report. The Wilson Lake inlier, however, may be a syenitic stock similar to others which have been described adjacent to the Round Lake Batholith, but later sedimentation and gabbro intrusions have obscured contact relationships at the surface.

Numerous small feldspar porphyry dikes are found.

Modal analyses for the granitic rocks are shown in Table 3 and the volume percent of quartz and feldspar recalculated to 100 percent is shown in Figure 3.

Round Lake Batholith

Two distinct rock types are recognized in the Round Lake Batholith. Quartz diorite is confined to Haultain Township, north of the narrow belt of foliated

TABLE 3 MODES OF FELSIC INTRUSIVE ROCKS.

	1	2	3	4	5	6	7	8	9	10	11
Quartz	30	20.6	29.9	23.0	29.7	24.9	23.6	26.4	27.6	28.8	28.2
Plagioclase	61	62.6	66.6	9.4	64.6	56.9	63.1	63.4	53.2	63.2	56.0
Hornblende	—	14.2	—	—	2.1	—	4.0	—	14.0	1.0	—
Biotite	—	—	tr	—	tr	—	8.0	7.0	1.0	6.6	—
Chlorite	8	2.0	tr	1.8	3.0	14.8	0.5	1.8	4.0	—	6.8
Sphene	tr	—	—	—	tr	tr	—	—	—	—	—
Pyroxene	—	—	tr	—	—	—	0.5	—	—	—	—
Epidote	—	—	—	—	—	—	—	1.4	—	—	9.0
Fe Oxide	tr	0.6	tr	—	—	3.4	—	—	tr	—	—
Groundmass	—	—	—	65.8	—	—	—	—	—	—	—
Plagioclase Composition	Albite Olig	Albite Olig	Olig	Albite Olig	Albite Olig	Albite	An_{34}		An_{34}	Sodic And.	Sodic And.

1 — M-36-01 — Trondhjemite
2 — F-36-01 — Trondhjemite
3 — R-31-13 — Trondhjemite
4 — M-27-10 — Porphyritic trondhjemite
5 — W-123-01 — Trondhjemite
6 — W-25-4 — Biotite Trondhjemite
7 — W-67-20 — Quartz diorite
8 — W-67-24 — Quartz diorite
9 — W-126-06 — Quartz diorite
10 — M-29-06 — Quartz diorite
11 — F-32-02 — Quartz diorite

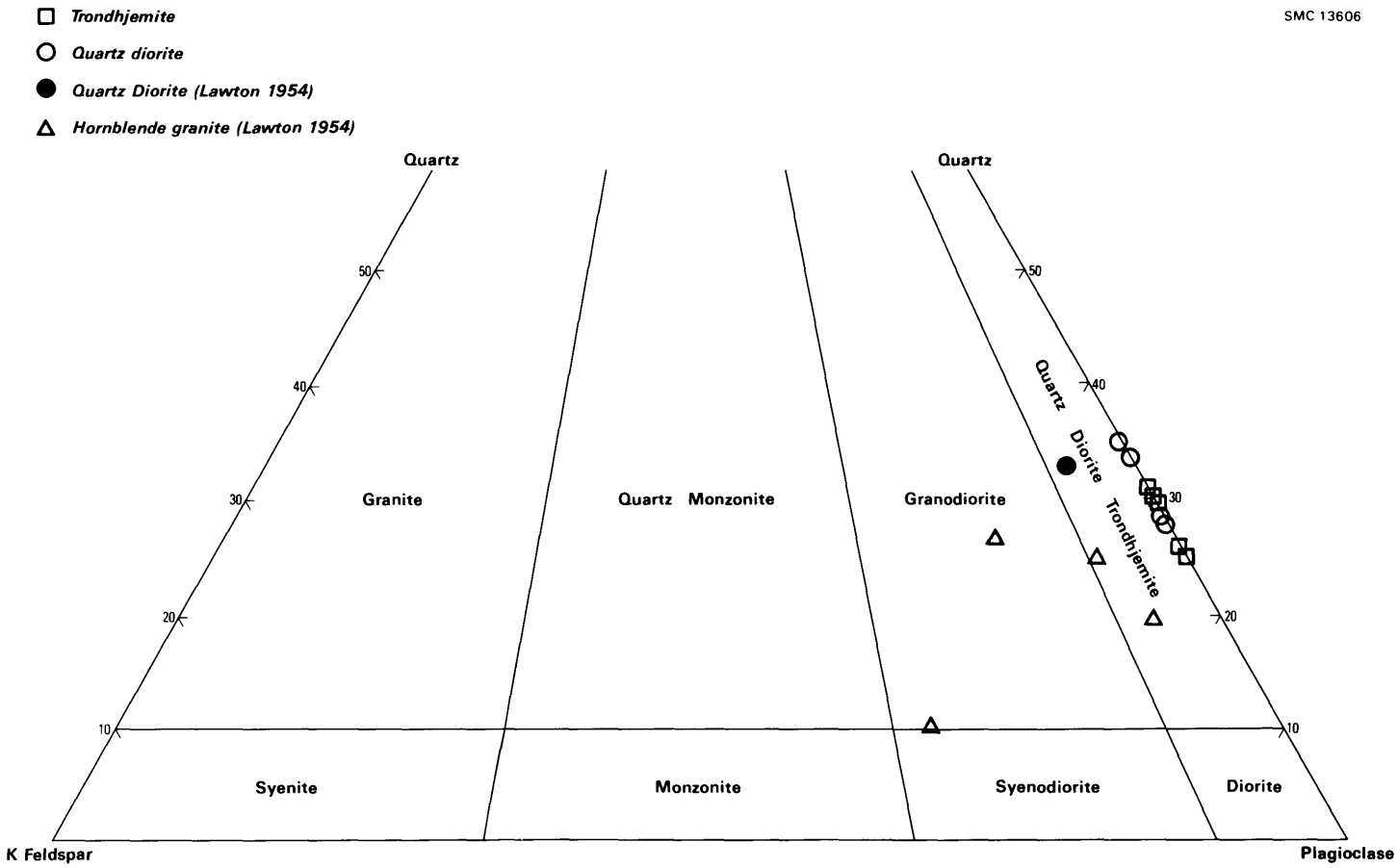


Figure 3–Volume percent of quartz, K-feldspar, and plagioclase in the Round Lake Batholith. Percentages were determined by modal analyses and recalculated to 100 percent.

amphibolite and east of the Obushkong Lake fault. The remainder of the area is underlain by an albite trondhjemite. The quartz diorite corresponds to the quartz diorite-oligoclase granite facies of Lawton (1954) and the albite trondhjemite is equivalent to Lawton's (1954) hornblende granite facies. Lawton (1954) indicates the trondhjemite is younger than the quartz diorite; he also suggests that the two rock types are separate magmatic injections rather than two phases of the same intrusion. Apophyses of the trondhjemite in the quartz diorite gives support to this conclusion.

TRONDHJEMITE

The granitic area south of the amphibolite belt in Haultain Township is underlain by trondhjemite as is all the granitic area in Van Hise Township. Locally it is found north of the amphibolite belt. It is massive, medium grained, pink to pale pink on the fresh surface, and pale pink to pinkish grey on the weathered surface, and appears very uniform throughout. The trondhjemite in Van Hise Township has a lower mafic mineral content which may reflect a different level of erosion because of faulting. The trondhjemite is locally porphyritic with phenocrysts of plagioclase and quartz.

Thin section examination indicates an average composition of 25 percent quartz, 61 percent plagioclase, 10 percent hornblende, and 3 percent chlorite with minor biotite, sphene, and finely disseminated hematite dust.

The plagioclase is commonly altered to white mica; it is mainly twinned and locally shows normal zoning with the core more altered than the rim; it is mainly albite in composition and may vary to sodic oligoclase. The plagioclase laths are up to 1.5 to 2 mm in diameter. The hornblende is pleochroic from bluish green to yellowish green and locally altered to chlorite. Quartz grains are clear and slightly strained. All thin sections were stained for potassic feldspar but none was indicated.

QUARTZ DIORITE

The quartz diorite is confined to north of the amphibolite belt in Haultain Township. It is weakly foliated to massive, equigranular, fine to coarse grained, grey to white, and locally pale pink. The finer grained rocks tend to be more foliated and occur mainly near the contacts or fault zone along the east-flowing reach of the Montreal River. Here the outcrops are locally brecciated and may be agmatitic especially north of the river. But with increasing distance from the contact and/or fault it has a more massive appearance.

Thin section examination indicated an average composition of 27 percent quartz, 60 percent plagioclase, 4 percent hornblende, 5 percent biotite, and 2 percent each of chlorite and epidote. The plagioclase is commonly sodic andesine (about An_{34}) and altered to saussurite and white mica and commonly twinned. Zoning where observed is normal with the cores more altered than the rims. The quartz is clear and mildly strained. Staining of the thin sections indicated no potassic feldspar.

The lack of potassic feldspar in this area, in contrast to its presence in the batholithic areas to the northeast, helps to further confirm Lawton's (1954) suggestion there is an increase of potassic feldspar over the whole batholith from southwest to northeast.

Previous workers (Collins 1913 and Burrows 1926) have suggested the trondhjemite is closer to a syenite in composition but the quartz content of greater than 10 percent and the lack of potassic feldspar precludes this conclusion.

Wilson Lake Area

North of Wilson Lake in Nicol Township an area of about 3.8 km ^{2} (1.5 square miles) of trondhjemite and syenodiorite is exposed.

The trondhjemite is similar to that to the north but is a darker pink and more mafic; the porphyritic variety is more common with plagioclase phenocrysts up to 3 mm. Thin section examination indicated a composition as shown in Table 3. In the porphyritic variety plagioclase phenocrysts of albite composition make up about 40 percent of the rock, with 20 percent quartz phenocrysts, and 40 percent groundmass. The groundmass is composed mainly of secondary micas, feldspar, and minor quartz with clots of chlorite here and there.

Syenodiorite occurs mainly at the northern end of the outcrop area and locally at the south. It is massive, fine to medium grained and light grey on the fresh surface. Thin section examination showed about 70 to 85 percent saussuritized plagioclase with 10 to 25 percent pale green to brown chlorite and 2 to 5 percent ferric oxide and a trace of quartz. The plagioclase ranges from 1 to 2 mm and is albite to oligoclase in composition. The ferric oxide occurs mainly disseminated in the chlorite. No potassic feldspar was found in thin section after staining.

Feldspar Porphyry Dikes

Feldspar porphyry dikes are tentatively correlated as equivalent in age with the granitic rocks, and occur intruding the metavolcanics. The dikes range from 0.3 m (1 foot) to 15 m (50 feet) in width. The dikes are massive pale pink to dark reddish brown and grey with euhedral to anhedral plagioclase phenocrysts ranging from 2 mm to 2 cm in length with an albite to oligoclase composition thus giving the dikes a trondhjemite composition. The plagioclase phenocrysts constitute 20 to 40 percent of the rock and one thin section had 5 percent quartz. The groundmass is a mosaic of quartz, feldspar, chlorite, and secondary micas. The pink is due to finely divided ferric oxide dust.

Age of the Round Lake Batholith

A K-Ar date gave an age of 2,605 m.y. (Lowdon *et al.* 1963). The dating was done on biotite from a sample taken from a road-cut on the Savard-Chamberlain

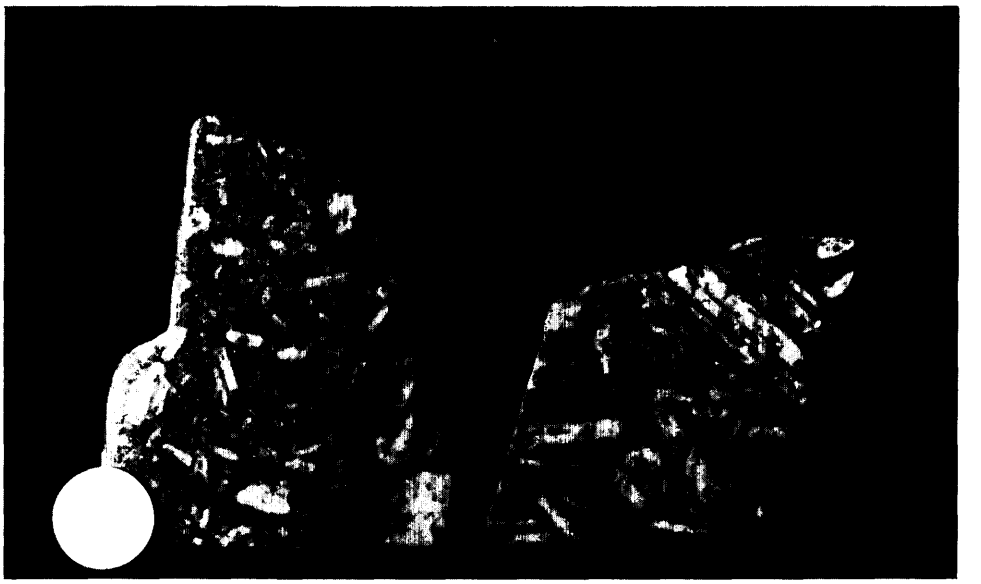


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Photo 2–Phenocrysts in Matachewan-type diabase dikes. The sample on the left shows the smaller, and short stubby phenocrysts and the one on the right shows the longer more slender phenocrysts.

township boundary and is in Lawton's (1954) quartz diorite–oligoclase granite facies. Recent work done by Gates (1970), however, would indicate the batholith is actually older than this. A Rb-Sr date of 2,690 ± 93 m.y. for Matachewan-type diabase was obtained in his study and the batholith is cut by numerous Matachewan-type dikes.

MAFIC INTRUSIVE ROCKS (MATACHEWAN DIABASE)

A profusion of north-striking dikes have intruded the metavolcanics and granitic rocks in the map-area. In the field they were not present in the Huronian rocks. The dikes range in width from about 3 m (10 feet) to 120 m (400 feet) and average about 25 m (80 feet). Similar dikes have been described elsewhere as Matachewan-type diabase; they are found to the west in Tyrrell and Knight Townships (Graham 1932). According to H.L. Lovell (1967,p.13) who describes numerous such dikes in the Matachewan area they were first recognized by Burrows (1918) and later described more completely by W.G. Miller (1923). On the basis of similar lithology and field relationships the dikes in the Gowganda area are correlated with the Matachewan dikes.

They are distinguished in the field by their rusty brown weathered surface and their mode of occurrence in north-trending ridges. They are locally porphy-

TABLE 4 MODAL ANALYSES OF MATACHEWAN-TYPE DIABASE. (Values in percent).

Specimen	W-5-9	H-18-14
Plagioclase	44.6	70
Pyroxene	32.5	18
Quartz	2.5	—
Micropegmatite	1.2	—
Biotite Chlorite	14.8	10
Sulphide minerals	4.8	2
Totals	100.4	100
Plagioclase composite (percent An)	48.0	—

ritic with plagioclase phenocrysts up to 5 cm (2 inches) but commonly 1 cm (½ inch). The phenocrysts are either subrounded or elongated (Photo 2). The rocks are massive, fine to medium grained and dark grey to greyish black; fine disseminated pyrite is common. Chilled margins are aphanitic and locally porphyritic with an aphanitic groundmass. A multiple dike was observed about 610 m (2,000 feet) east of the southern end of Jacobs Lake in Nicol Township; here a porphyritic dike has been intruded along the centre of an equigranular dike.

Thin section examination reveals a composition of dominantly plagioclase and pyroxene which are altered to white mica and chlorite respectively. Modal analyses are shown in Table 4. The plagioclase composition varies from andesine to sodic labradorite where it is not so altered as to preclude composition determination. Plagiociase laths average about 3 mm in length and have a subophitic relationship with the pyroxene.

W.F. Fahrig and R.K. Wanless (1963) have dated diabase dikes of this type at 2,485m.y. by the K-Ar method. More recently Gates (1970) has published a Rb-Sr isochron date of 2,690 ± 93 m.y. K-Ar age determinations also done in this study gave dates which are generally around 500 m.y. younger than the Rb-Sr. This date of 2,690 ± 93 m.y. therefore suggests that K-Ar age determinations of granitic rocks in the region are too young and that the granitic rocks may really be much older than originally indicated.

TABLE 5 | STRATIGRAPHIC NOMENCLATURE FOR THE COBALT GROUP OF THE HURONIAN SUPERGROUP.

Collins 1917, p.23	Thomson 1957	Federal Provincial Committee Robertson *et al.* 1969a,b	
Lorrain Quartzite	Lorrain Formation	Lorrain Formation	
	Firstbrook Formation		Firstbrook Member
Gowganda Formation		Gowganda Formation	
	Coleman Formation		Coleman Member

MIDDLE PRECAMBRIAN

Huronian Supergroup

COBALT GROUP

Following the igneous activity of the Early Precambrian a period of uplift, basin formation, and erosion occurred, resulting in the deposition of rocks of the Huronian Supergroup (Robertson *et al.* 1969a,b); of this Supergroup only rocks of the Cobalt Group are present in the map-area.

Over the years the nomenclature of the Cobalt Group has undergone several changes which are summarized in Table 5. The original classification of Collins (1917, p.23) who divided the Cobalt Group into the Lorrain and Gowganda Formations was changed by Thomson (1957). This reclassification divided the Gowganda Formation into the Coleman and Firstbrook Formations; unfortunately this reclassification involved the dropping of the historically well known name of the Gowganda Formation. The Federal Provincial Committee on Huronian Stratigraphic Nomenclature recognized this point and in their reports (Robertson, Card and Frarey 1969; Robertson, Frarey and Card 1969) recommended the name Gowganda Formation be retained and that the Coleman and Firstbrook Formations of Thomson be used as member names.

The Cobalt Group in the Gowganda area is subdivided as follows:

1. Gowganda Formation which is made up mainly of:
   a) Coleman Member - conglomerate, siltstone, feldspathic sandstones, and greywackes, and
   b) Firstbrook Member - laminated argillite.
2. The Lorrain Formation made up of pale green to white to pale pink feldspathic sandstones.

These three units underlie about 47 percent of the map-area.

Gowganda Formation

COLEMAN MEMBER

Distribution and Thickness

The Coleman Member of the Gowganda Formation is widely distributed throughout much of Milner Township, and extends to the north into Van Hise Township along fault zones on either side of Early Precambrian rocks. It is also present in the western half of Nicol Township where it is repeated, owing to faulting and, in part, rests nonconformably on Early Precambrian rocks. Exposures also occur within the Miller Lake basin and along the margins of the north-trending "tail" of the diabase basin.

The thickness of the Coleman Member is difficult to determine in the map-area because of faulting, disruption from diabase intrusions, and incomplete sections. Thomson (1968, p.17) has estimated, from assuming a mean easterly dip of 10 degrees for the bottom of the formation in contact with the metavolcanics in western Milner Township, a thickness of about 670 m (2,200 feet) in the central part of the township. About 240 m (800 feet) south of the Mann No.3 shaft drill hole data suggest a thickness below the diabase of about 1,200 m (4,000 feet). These thicknesses assume a uniform dip of the bottom contact and an absence of faulting (Thomson 1968, p.17). These figures are far in excess of the 150 m (500 feet) suggested by Collins (1913, p.45) who also felt a thickness of 300 m (1,000 feet) was seldom attained; Collins' figures, however, take into account the entire Cobalt Group.

E.S. Moore (1955, p.9) cites a thickness of 103 m (340 feet) southwest of Mire Lake in Haultain Township; this, however, is an incomplete section as it represents only that part of the Coleman Member lying below the diabase.

Lithology

The Coleman Member of the Gowganda Formation is lithologically heterogeneous and is composed of numerous clastic rock types, including feldspathic greywacke, arkose, feldspathic sandstone, ferruginous sandstones, argillite and

ODM9792

Photo 3–Lens of conglomerate in greywacke in the Gowganda Formation.

siltstone, conglomerate, and breccia. For the purposes of this report the term sandstone is synonymous with arenite.

FELDSPATHIC GREYWACKE

Rocks included in this category are variable in their texture and colour but have a relatively uniform composition. They are commonly very fine grained rocks, but locally are fine to medium grained. The finer rocks are dark to pale grey (with increasing grain size) and thinly bedded to massive (with increasing grain size). Locally there are fine- to medium-grained rocks which are grey to pink and have a higher feldspar content but are included in the feldspathic greywackes because of a higher matrix content than the arkose.

The greywackes are composed of 40 to 60 percent subrounded to subangular quartz, 20 to 40 percent feldspar, 10 to 15 percent rock fragments, 20 to 40 percent matrix, and minor amounts of opaque minerals including pyrite. The detrital grains are set in a pasty chloritic matrix. One sample examined contains irregular red laminae owing to hematite dust.

ARKOSE

Arkose in the Coleman Member tends to be more coarse-grained than the feldspathic greywacke, but is still a fine-grained rock and thickly bedded to mas-

TABLE 6 MODAL ANALYSES OF ROCKS OF COLEMAN MEMBER OF THE GOWGANDA FORMATION. (Values in percent).

Mineral	1	2	3
Quartz	46.0	60.1	51.2
Plagioclase	19.2	27.0	22.7
Potassic feldspar	5.0	3.1	10.3
Matrix	26.2	7.4	14.5
Chlorite	2.6	—	—
Mica	1.0	—	tr
Chert	—	2.4	—
Calcite	—	—	tr
Ferric oxide	—	—	0.7
Totals	100.0	100.0	99.4

1. Feldspathic greywacke, matrix of conglomerate
2. Arkose
3. Arkose

sive. Colours vary from light grey to buff to dark greyish red. Modal analyses (Table 6) and estimated modes indicate a compositional range of 50 to 65 percent quartz, 3 to 15 percent potassic feldspar, 15 to 27 percent plagioclase, 7 to 15 percent matrix material with micas, iron oxides, and chlorite observed in minor quantities.

Tightly packed rounded to subrounded quartz and feldspar grains range in size from 0.1 to 0.6 mm with 0.2 mm the approximate mode. The red is due to fine hematite dust which coats many of the grains.

CONGLOMERATE

The conglomerate, commonly referred to in other areas as "tillite", occurs in the map-area as lenses (Photo 3) and channels which cannot be traced for any great lateral or vertical distance except along the shores of Milner Bay and west of Haultain Lake.

The sandy matrix of the conglomerates commonly has a feldspathic greywacke composition; a modal analysis is included in Table 6. The rounded to subrounded quartz and feldspar grains appear to be floating in a siliceous and chloritic matrix. The feldspar grains tend to be more angular than the quartz which ranges from 0.3 to 0.5 mm in diameter. The matrix is apparently locally less resistant to erosion than the clasts (Photo 4).

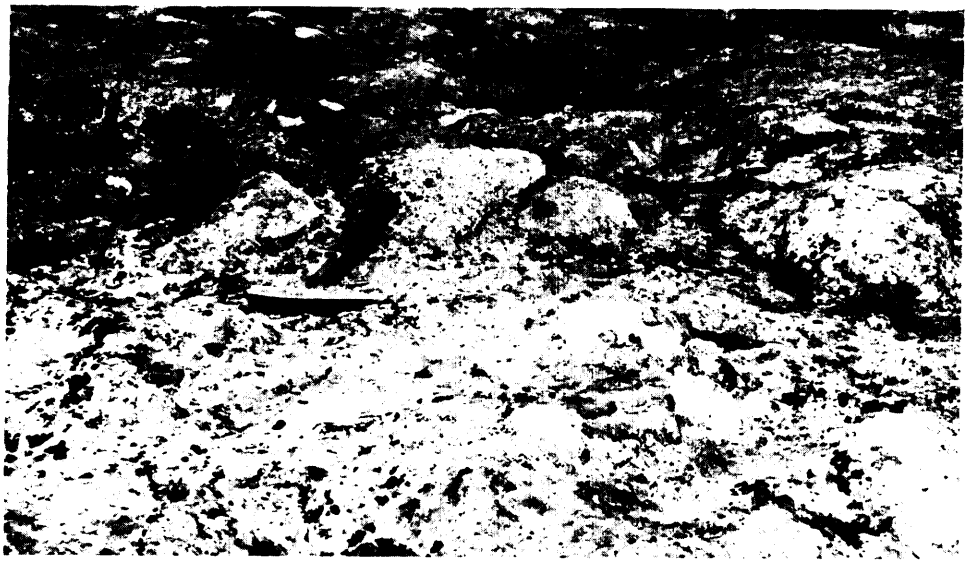

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Photo 4–Differential weathering and erosion in Gowganda Formation conglomerate. The clasts are seen to be more resistant than the matrix.

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Photo 5–Rapid change in size of clasts in Gowganda conglomerate.

ODM9795

Photo 6–Densely packed pebbles in Gowganda Formation conglomerate. This is adjacent to Photo 5.

Conglomerate clasts range from pebbles to boulders and are composed mainly of granitic rocks with lesser amounts of gabbro and metavolcanics. They are rounded to subangular and have a variable packing density. This density can vary over a short distance (Photos 5 and 6) from small densely packed pebbles to large more "floating" cobbles and boulders. This feature is exposed just over 1.6 km (1 mile) southwest of Lost Lake on Highway 560 and is near the top of the formation.

The conglomerate is common to the basal part of the formation in some localities; it is not everywhere in the form of a specified thickness at the base but in the form of lenses and channel fills in other sandstones. A basal conglomerate occurs north of Wilson Lake overlying granitic rock but no evidence for Precambrian glaciation in the form of striae was observed.

FELDSPATHIC SANDSTONE

This is a fine-grained pale brownish grey, thickly bedded to massive rock. A thin section indicated about 70 percent quartz, 10 percent chert, 15 percent feldspar, and 5 percent calcite. The quartz and feldspar grains are densely packed in a quartz and chert (with some chlorite) matrix (about 5 percent); the grains, generally subrounded to subangular, range from 0.2 to 0.4 mm in diameter.

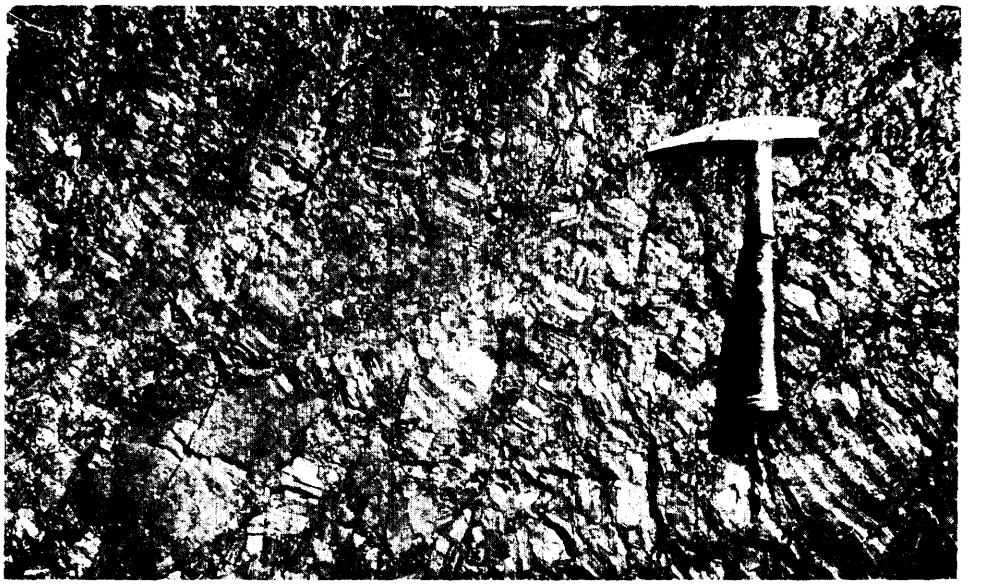

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Photo 7–Brecciated greywacke in the Gowganda Formation on the shore of Firth Lake.

SILTSTONE-ARGILLITE

Siltstone is the most abundant rock type in the Gowganda Formation especially in Milner Township. It is a fine-grained, dense, grey to greenish grey, well bedded to massive locally argillaceous rock. The rock contains about 40 to 60 percent quartz and 2 to 5 percent mainly plagioclase feldspar floating in a pasty matrix of chlorite and secondary white mica which makes up 15 to 30 percent of the rock. Graded bedding was observed in thin section with the quartz grains ranging from 0.01 to 0.03 mm. The siltstones could really be considered fine-grained greywackes. Pink, generally thick bedded to massive arkose with flame structures and slumping were noted in several localities.

BRECCIA

Breccia is present as a result of tectonic activity as well as depositional intraformational sedimentary breccia. Tectonic breccia (Photo 7) is considered to be the result of movement at a time when the rocks are partially consolidated. Along the shores of Firth Lake breccia of this type is common and may be the result of movement along north-striking faults during the time of Gowganda

ODM9797

Photo 8–Intraformational breccia in the Gowganda Formation on the shore of Firth Lake.

deposition. The intraformational conglomerate and breccia (Photo 8) are similar to pebbly mudstones (Crowell 1957) and are also found along the shores of Firth Lake. These rock types would suggest a depositional environment of slumping and mudflows along active fault escarpments.

FERRUGINOUS ARENITE

This sandstone varies from red to red and grey mottled, is fine grained, and is thickly bedded to massive. It is composed mainly of highly packed quartz grains and altered feldspars with about 3 percent hematite dust. The matrix comprises from 3 to 5 percent of the rock and is chloritic with lesser white mica.

FIRSTBROOK MEMBER

The Firstbrook Member is very limited in areal extent. The two small sections which have been assigned to this formation are in Nicol Township about 1,200 m (4,000 feet) east of Leroy Lake on Highway 560 and in Milner Township on some islands at the southern end of North Arm, Gowganda Lake. The sequence in Nicol Township is an estimated 25 m (80 feet) thick and there is a similar thickness exposed in Milner Township.

ODM9798

Photo 9–Photomicrograph of laminated argillite of the Firstbrook Member.

The Firstbrook is a unit of laminated argillite with alternating graded laminae which are various shades of dark red, green, and grey; this member conformably overlies the Coleman Member and is gradational into the overlying Lorrain Formation. The laminae are generally regular and undisturbed and range from about 0.5 to 4 mm and average about 1 mm.

Thin sections show the rock is made up of subangular to subrounded quartz (25 to 30 percent) and feldspar grains (5 to 10 percent) in a matrix (55 to 60 percent) of chlorite, mica, and hematite. Magnetite is about 5 to 10 percent. The grains range from 0.01 to 0.1 mm with large grains up to 0.5 mm common.

The laminae are graded (Photo 9) with the quartz being more coarse grained in the green and finer grained in the red; the grains are also more closely packed in the red laminae. A higher concentration of hematite in the red laminae gives them their colour; the magnetite in these laminae is finer grained because of alteration to hematite. The concentration of the hematite in the red laminae is variable and is locally gradational into the green laminae.

Ripple marks (Photo 10) are abundant on an open outcrop exposed on Highway 560.

The laminae of the Firstbrook Member bear a striking resemblance to glacial varves. T.A. Jackson (1965) in a study of these argillites concluded they were indeed the result of glacial deposition. D.A. Lindsey (1969) has suggested that the map-area is in an area of nonmarine deposition and that a transformation to

ODM9799

Photo 10–Ripple marks in the Firstbrook Member. Note leaching along joints. Photo taken on side of Highway 560 west of Lost Lake.

marine deposition is indicated to the south (Card *et al.* 1970; Lindsey 1966). Areas of quiet lacustrine deposition are also capable of producing varve-like sediments.

Origin of the Gowganda Formation

Over the years there has been much controversy concerning the origin of the Gowganda Formation. Numerous theories have been postulated; these include volcanic fragmental (Miller 1905, p.47), desert (Miller 1905, p.47), alluvial fan deposits (Bain 1925; McConnell 1927), and glacial. The glacial origin was first suggested by A.P. Coleman (1907) and since that time this has become the most popular.

The glacial theory is based mainly on the interpretation of the conglomerates as indurated tills, and the presence of isolated pebbles in bedded greywackes; these are looked upon as "dropstones" from floating ice.

Numerous other deposits in the world have been classified as having a glacial origin but some of these have been re-examined and the results have indicated a change in ideas. These include Paleozoic deposits of Mexico (Newell 1959) where there are deposits of conglomerate and associated varve-like sediments. Long considered glacial, N.D. Newell (1959) concluded they were the product of submarine slides. In a re-appraisal of the Ridgway and Gunnison "tillites" of south-

western Colorado, F.B. Van Houten (1957) concluded that the Gunnison is really a volcanic-rich mudflow and stream deposit. The fact that striated pebbles occur does not necessarily prove glacial origin inasmuch as the feature can also occur in mudflows. The Ridgway unit was considered either glacial or mudflow (Van Houten 1957).

R.H. Dott (1961) concluded the Late Paleozoic Squantum deposit in the Boston Bay area was also the result of submarine slides and mass flow. Dott, however, felt that the Gowganda may very well be glacial.

There is, however, widespread agreement on a glacial origin for deposits in the southern hemisphere (Hamilton and Krinsley 1967; Frakes and Crowell 1967).

Most of the recent work on the Gowganda Formation has concluded a glacial origin. This includes work by Lindsey (1966; 1969), P.E. Schenk (1965a), A.T. Ovenshine (1965), and G.M. Young (1968). S.B. Lumbers (1970, p.86) states that "no criteria diagnostic of a glacial origin of the Gowganda Formation were found" in the Tomiko area.

W. Hamilton and D. Krinsley (1967) state that the following three features in combination prove glaciation:

1. Polished and striated pavements and underlying *roches moutonées.*
2. Massive unsorted debris containing abundant rock flour and polymodal fine-grained sand.
3. Laminated fine-grained sediments enclosing numerous dropstones

Two striated pavements under the Gowganda have been reported by Schenk (1965a, b) at the south end of Lake Temagami and by H.C. Cooke *et al.* (1931) southwest of Noranda. The occurrence south of Lake Temagami has been credited to tectonic activity (Lumbers, personal communication). The other two criteria need not be the result of glaciation as they can be the result of mudflows and turbidity currents.

Two facies of deposition were suggested by Lindsey (1966; 1969); a continental glacial facies to the north and a marine glacial facies to the south.

The above brief discussion on features of glacial deposits and the Gowganda Formation is to indicate that if glacial action were responsible for deposition of the Gowganda it may not have been the only one. This has previously been suggested by S. M. Roscoe (1969, p.76) who stated that subaqueous turbidity currents, slides, torrential sheet flows are all capable of producing paraconglomerates

The Gowganda Formation in the Gowganda area has been deposited near the margins of a mountainous region which resulted from the orogenic period at the end of the Early Precambrian. As discussed in the section on Historical Geology numerous north-trending fault zones were generated at the end of the Early Precambrian; many of these were intruded by diabase dikes. This faulting continued during deposition of the Gowganda and it is suggested by the writer that much of the Gowganda Formation in the map-area is the result of sedimentation from active fault scarps; this would be in the form of mudflows and resulting in intraformational breccias (Photo 8) and soft deformation breccias (Photo 7). These features are common along the shores of Firth Lake in the Firth Lake fault zones. Flame structures and slump features are common along these western fault zones both in Milner Township and Leith Township (McIlwaine 1971) to the south; these features are commonly found in turbidite deposits.

Gravelly conglomerates in Nicol Township are suggestive of fluvial deposition.

A further, more detailed, examination of the Gowganda Formation in this area is essential before any conclusive statements can be made.

Lorrain Formation

Distribution and Thickness

Lorrain Formation rocks underlie most of southeastern Nicol Township and are preserved in downfaulted blocks along the Gowganda Lake-Obushkong Lake zones.

With an assumed mean dip of 10 degrees there is an estimated 900 m (3,000 feet) in the southeastern part of Nicol Township. Collins (1913, p.52) stated that it is known to have a thickness of 180 m (600 feet) but "...this amount is probably greatly exceeded".

Lithology

The Lorrain Formation is composed of a variety of fine-grained quartzose sandstones which are generally arkosic at the base, becoming less feldspathic towards the top, and grading to orthoquartzite. Feldspathic sandstone is the most common in this area.

MICACEOUS SANDSTONE

Micaceous sandstone varies from a very pale green to pale greenish grey; it is fine grained and thick bedded to massive. The quartz grains are 0.2 to 0.4 mm in diameter, rounded to subrounded in a matrix of about 5 percent secondary micas. These micas may, in part, be the remnants of completely altered feldspars. Minor feldspar and ferric oxides are present.

FELDSPATHIC SANDSTONE

The feldspathic sandstone is fine to coarse grained, and varies from greyish pink to pale green; the bedding is thick to massive. The rock is composed mainly of tightly to loosely packed, rounded to subrounded quartz and feldspar grains in a quartzose and micaceous matrix. Modal analysis for a sample is shown in Table 7.

TABLE 7 MODAL ANALYSES OF LORRAIN FORMATION ROCKS. (Values in percent).

Mineral	1	2	3	4	5
Quartz	59.1	57.6	65.3	79.3	52.1
Polycrystalline quartz	2.2	—	—	—	—
Plagioclase	—	3.9	2.4	0.5	8.4
Potassic feldspar	10.2	—	10.4	11.2	20.3
Muscovite	4.2	4.8	2.6	0.3	1.5
Ferric Oxide	2.2	—	3.4	—	1.3
Rock Fragments	—	0.6	—	—	—
Matrix	22.1	33.1	15.8	8.7	16.4
Totals	100.0	100.0	99.9	100.0	100.0

1. W-47-10 — Micaceous feldspathic greywacke
2. W-102-01 — Lithic greywacke
3. W-115-13 — Feldspathic greywacke
4. R-6-2 — Feldspathic sandstone
5. R-26-1 — Feldspathic greywacke

GREYWACKE

This is a rock type highly variable in colour, texture, and composition. Pale greenish grey, pink, and greyish pink are the most common with hematite spots occurring locally. Bedding is generally thick to massive.

The quartz grains are up to 1 mm in diameter but the mode is about 0.4 mm; they are rounded to subrounded and along with altered feldspar grains are in a matrix composed mainly of mica. There is a greater abundance of potassic feldspar than plagioclase. The spots of hematite show up as concentrations of coatings around detrital grains. Modal analyses are shown in Table 7. Most of the greywackes are considered feldspathic greywackes.

QUARTZITE

These are pale grey to white rocks which are mainly medium to coarse grained. They are composed of tightly packed quartz (up to 90 percent) grains in a mainly quartzose matrix (up to 15 percent) with lesser amounts of micas and chlorite. There is also minor local feldspar. These rocks range in composition from protoquartzite to orthoquartzite.

FERRUGINOUS SANDSTONE

These rocks are mainly feldspathic and quartzose sandstones but hematite is relatively evenly distributed throughout the rock making it a uniform red colour.

CONGLOMERATE

Thin lenses and beds of quartz pebble conglomerate occur locally. They do not have any great lateral extent and the quartz pebbles rarely exceed 2.5 cm (1 inch) in diameter.

Origin

A summary of various theories on the origin of the Lorrain Formation has been described by D.G. Hadley (1968, p.223) in which he states that environments of deposition previously ascribed include lacustrine, shallow water marine, fluvial in part, subaerial in part, and alluvial fan.

A more recent interpretation of the depositional environment of the Lorrain Formation was presented by Hadley (1968; 1970). In summary he stated that "chronologically, the depositional environments are shallow water marine, lacustrine, delta fringe, over-shelved beach and high energy beach" (Hadley 1970). Based on essentially unidirectional crossbed data, J. Wood (1971) has suggested that the Lorrain Formation was deposited in a fluvial environment. On the basis of mineralogy (the presence of diaspore and kaolinite) Wood (1971) also suggested that a tropical climate prevailed during deposition of the Middle and Upper Lorrain.

Paleocurrent data described by Hadley (1968, p.170) for the Cobalt area show a transport direction of S3E with a standard deviation of 49.4 degrees. Meagre data from the axes of trough crossbeds obtained by the author around the shores of Hangingstone Lake agree with these results.

The fact that in all the Lorrain Formation lithologies examined (Table 7), with the exception of greywacke, potassic feldspar exceeds plagioclase precludes local derivation of this clastic material because of the lack of potassic feldspar in the trondhjemite and quartz diorites in the map-area.

Mafic Intrusive Rocks

NIPISSING DIABASE

From an economic point of view the gabbroic rocks of the Nipissing Diabase (Miller 1910) sheets are the most important in the map-area. Very early in the history of the Timiskaming silver area it was recognized that these rocks held a

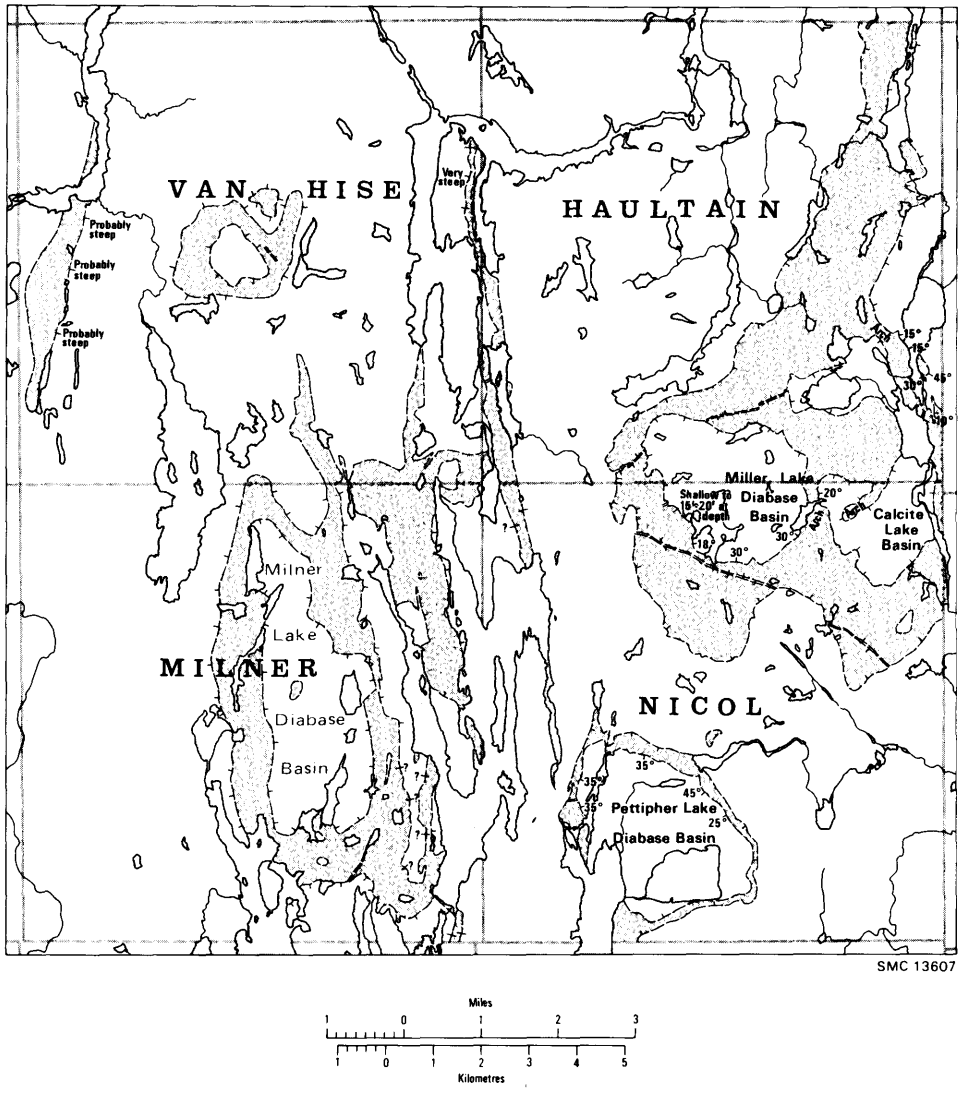


Figure 4–Shape and attitudes of Nipissing Diabase.

close spatial relationship with the rich silver deposits and the prospecting for diabase became intensive.

For many years, many geologists considered the areas of Nipissing Diabase to be remnants of a former continuous sheet which extended across the region (Burrows 1926; Campbell 1930). More recently, however, geologists have suggested that the Nipissing Diabase is actually made up of numerous gabbroic intrusions (Moore 1955; Hester 1967; McIlwaine 1971; Card *et al.* 1970). There are several such gabbro bodies in the map-area (Figure 4 and Map 2348 and Map 2349).

Shape and Attitude of the Diabase

Figure 4 illustrates the distribution of Nipissing Diabase intrusions in the area; on it are plotted the direction of dip and magnitude of dip, where known. These data have been obtained from the literature, field observations, and information supplied by Robert Thomson (Consulting Geologist).

Most of the diabase bodies in the map-area have a strong northerly orientation indicating that the dominant north-trending fault activity which controlled intrusion of Matachewan dikes and, in part, influenced Gowganda Formation deposition, was still active during intrusion of the Nipissing Diabase.

Little is known about the dike-like body along the west boundary of Van Hise Township. Limited evidence, however, suggests an easterly dip which is probably steep. The evidence includes the occurrence of aplite dikes along the eastern contact; aplite dikes, where they occur, are generally at or near the top of a diabase body. Also, Burrows (1926, p.56) stated that "...columnar jointing planes ...would suggest that the diabase is in the form of a sill rising from the east."

To the west of Foot Lake in Van Hise Township, is a subcircular body of diabase, which in part, intrudes Early Precambrian trondhjemite and Middle Precambrian Gowganda Formation. According to N.L. Bowen (1910, p.663) the outside contact of this body is the upper contact and it therefore dips away on all sides in which case it may be part of a diabase sheet which occurs to the west. A diagram by Bowen (1910, p.663) indicates that the diabase is truncated by the Milner Bay fault which can be traced along Foot Lake. Granophyre commonly occurs near the top of diabase bodies. Granophyre was not observed by the writer but it is described by Bowen (1910, p.663-665) at the outside contact which supports the interpretation that this is the upper contact. A body of complex form, known as the Milner Lake basin, occurs in Milner Township. The eastern rim of the body forms the Mann Ridge along which there are numerous silver occurrences. The central part of the body is underlain by the Gowganda Formation and the outer contacts of the rims apparently dip away from the basin forming arch structures. Evidence for the arch shape of the Mann Ridge has been obtained in underground exploration and diamond drilling (Resident Geologist's Files, Ministry of Natural Resources, Kirkland Lake). At its northern end the Mann Ridge divides into two branches. Thomson (1968, p.22) states "the sediments west of the west branch (i.e. inside the basin) and east of the east branch overlie the diabase. Where the branches join is the axis of the arch."

The position of the Lorrain Formation east of Reeve Lake is difficult to determine. Burrows (1926, p.17) states that the Lorrain Formation is below the diabase; this would suggest an apparent vertical movement on the "90 Fault" of north side down, to offset the axis of the Mann Ridge. A more recent suggestion (Hoiles 1957) is that this area of Lorrain Formation is preserved in a local downwarp in the diabase. Thomson (1968) and the present author tend to favour Burrows' interpretation.

The Pettipher Lake basin in Nicol Township dips inward at about 35 degrees as indicated from joint attitudes.

Striking north along the Haultain-Van Hise township boundary is a dike of Nipissing Diabase. Burrows (1926, p.19) found contacts indicating vertical and

45 degrees east dips. Recent diamond drilling has shown a near vertical to steep westerly dip. The location of these drill holes is shown on Map 2348 (back pocket).

The main body of diabase in the map-area is the Miller Lake diabase basin which to the east incorporates local subbasins; these are found around Flatstone Lake and Calcite Lake. An arch projects south into the Calcite Lake subbasin. Striking north from the Miller Lake basin into adjacent Morel Township is a "tail' of diabase which dips to the east. Figure 5 shows a cross section through the Miller Lake basin and local subbasins.

Dips, shown on Figure 4, range from 15 to 30 degrees in the Miller Lake basin. These dips are from Moore (1955, p.13) who compiled them from Burrows (1926).

Thickness of the Diabase

Thomson (1968, p.24) states that from drilling in the Mann No.3 shaft workings a true thickness of 82 m (270 feet) can be determined for the diabase. In the Pettipher Lake area a thickness of about 150 m (500 feet) can be ascribed assuming a dip of 35 degrees although Moore (1955, p.13) gives a thickness of only 68 m (225 feet). The Miller Lake basin has a thickness of 284 m (935 feet) in the Siscoe Mine (Moore 1955, p.21).

Petrography

Because of the numerous petrographic studies made on the Nipissing Diabase no detailed work was attempted for this report. References for work on the Nipissing Diabase include M.E. Hriskevich (1952; 1968), Bowen (1909; 1910), Moore (1955), B.W. Hester (1967), J.L. Jambor (1971), Collins (1913), Card *et al.* (1970), E. Pattison and Card (1971), R.E. Hore (1910), and J. Satterly (1928).

In the field, outcrops of diabase commonly weather grey to brown and are reasonably well jointed. The texture varies from fine to coarse grained with a narrow 5 cm chill zone (2 inches) at the contacts. The fresh rocks are commonly grey to greenish grey, and with increasing content of hematitic micropegmatite become redder to form the locally known "red-rock". The main rock types in the area are pyroxene gabbro, amphibole gabbro, and granophyre.

The laths of plagioclase in the diabase are commonly saussuritized to varying degrees so that determination of the original composition is difficult. Where determination was possible the composition varies between calcic andesine and sodic labradorite except in the micropegmatite where the plagioclase is albitic. Modal analyses of the gabbros are shown in Table 8 and show that plagioclase ranges from 40 to 56 percent of the rock.

The pyroxene is predominantly augitic pyroxene, locally titaniferous. Large masses of pyroxene enclose or partially enclose the laths of plagioclase. The pyroxenes are locally altered to chlorite and amphibole. Table 8 indicates the range of pyroxene content to be from zero to 45 percent. The rocks with no pyroxene

TABLE 8 MODAL ANALYSES OF NIPISSING-TYPE DIABASE. (Values in percent).

Mineral	1	2	3	4	5	6	7
Plagioclase	46.4	49.2	47.6	40.7	49.7	51.2	56.0
Quartz	2.8	6.0	—	1.0	8.0	tr	tr
Micropegmatite	8.0	23.4	13.2	5.7	28.3	6.4	—
Pyroxene	33.4	—	17.6	45.3	—	23.4	43.0
Amphibole	6.8	16.2	14.2	1.0	1.3	12.0	tr
Biotite	0.6	2.6	1.7	3.0	—	1.6	—
Chlorite	0.6	—	1.0	1.0	9.0	tr	—
Fe Oxide	1.7	2.6	4.6	2.7	3.7	4.6	1.0
Totals	100.3	100.0	99.9	100.4	100.0	99.2	100.0
Plagioclase Comp.	An 58	altered	altered	altered	altered		

1. W-27-13 — Pyroxene gabbro
2. W-46-8 — Amphibole gabbro
3. W-53-30 — Pyroxene-amphibole gabbro
4. W-69-13 — Pyroxene gabbro
5. W-69-23 — Granophyre
6. W-71-02 — Pyroxene gabbro
7. W-80-15 — Pyroxene gabbro

are the amphibole gabbros and granophyre.

Amphibole is commonly altered to chlorite or biotite and occurs as both primary and secondary amphibole; the latter is commonly actinolite.

Quartz occurs as both free quartz and incorporated as intergrowths with albite to form micropegmatite; the albite commonly has a red turbid appearance due to the presence of hematite.

Granophyre or "red rock" is common along the west shore of Lost Lake and along the west shore of the North Arm of Gowganda Lake. Bowen (1910) described granophyre west of Foot Lake and attributed the formation of granophyre to the assimilation of aluminous country rocks above the gabbro. Card *et al.* (1970, p.104) state that "the chemical and mineralogical composition and differentiation trends show that granophyre or aplite is a normal product of differentiation of the gabbroic magma...".

Aplite occurs as small dikes west of Wigwam Lake and is composed of 90 to 95 percent intergrown quartz and albite and the rest is epidote. The red is due to finely divided hematite.

Late Precambrian (?)

MAFIC INTRUSIVE ROCKS

Quartz Diabase Dikes

Several northeast-trending quartz-bearing diabase dikes occur; these dikes are considered part of the Abitibi swarm (Fahrig *et al* 1965) which extends to the northeast into Quebec. The trend of these dikes in the map-area ranges from east to N30E and they are essentially vertical and up to 30 m (100 feet) wide.

The dikes are composed of massive equigranular, medium-grained diabase which is dark green to greenish grey. A.L. Sangster (1964) stated the dike rock can be differentiated from the Nipissing Diabase by the greyer fresh surface of the latter. The rock has a diabasic texture with sparse sulphide mineralization most of which is pyrite (Sangster 1964).

The following two paragraphs on the petrography of one of the dikes are paraphrased from Sangster (1964):

Plagioclase is the most abundant mineral. It occurs as laths ranging from 0.8 to 1.0 mm and has a composition of An_{62}. Quartz occurs as myrmekite and interstitially with abundant ferromagnesian alteration inclusions. The plagioclase has been altered to albite-epidote-sericite.

Pale brown augite locally altered to chlorite, hornblende, biotite, and epidote with ophitic relations with the feldspar is the most abundant ferromagnesian mineral. Other minerals present include hornblende, chlorite, biotite, epidote, ilmenite, magnetite, pyrite, chalcopyrite, and apatite.

The average of seven modal analyses by Sangster is as follows (in weight percent): plagioclase and its alteration products 43.59 percent, augite 26.64 percent, brown alteration 7.07 percent, hornblende 7.04 percent, Na-hornblende 0.69 percent, biotite 0.53 percent, chlorite 2.19 percent, mafic epidote 0.56 percent, magnetite 4.09 percent, quartz 3.89 percent, and myrmekite 3.42 percent.

In a study of the chill zone Sangster (1964) found it to be porphyritic in texture. The matrix which represents 90 percent of the rock is composed of a dark grey, fine-grained crystalline material in which traces of magnetite occur. Phenocrysts are plagioclase (6 percent) and pyroxene (4 percent).

AGE OF THE DIKES

Fahrig and Wanless (1963) reported the age of an Abitibi-type dike to be 1,230 m.y.; this is a K-Ar age on coarse phase biotite.

More recently, however, Gates (1970) published a Rb-Sr whole-rock date of 2,085 $\pm$110 m.y. This is in complete disagreement with the K-Ar date; it is in fact much closer to a Nipissing age and may indicate that some of the dikes represent a late stage of Nipissing intrusion.

ODM9800

Photo 11–Phenocrysts in olivine diabase.

Gates (1970) suggests the younger date may either indicate a reflection of the Grenville orogeny or else the Abitibi dikes . represent a composite of two separate intrusions which were introduced along the regional east-northeast planes of weakness.

One dike which extends into adjacent Leith Township (McIlwaine 1971) from Milner Township was once mapped as part of the Nipissing Diabase; it is now considered a later dike because crosscutting relations have been observed between this dike and a Nipissing Diabase sheet near Dobie Lake (R. Thomson, personal communication).

Olivine Diabase

A dike of olivine diabase strikes N70W across Nicol Township; this dike represents the youngest bedrock in the area. Petrographic similarity and geological setting suggest that the dike is related to the Sudbury-type dike swarm of A. Larochelle (1967; Fahrig and Jones 1969). The average width of the dike is about 30 m (100 feet).

The dike is a fine- to medium-grained locally porphyritic grey to black ophitic diabase. Phenocrysts are up to 5 cm (2 inches) (Photo 11) and are plagioclase (labradorite) in composition. The dike commonly weathers low compared to the country rock. Petrographic examination shows the rock to be composed of plagioclase laths up to 3 mm wholly or partially enclosed by titaniferous augite with equant grains of olivine up to 1 mm but more commonly 0.5 mm scattered

TABLE 9 MODAL ANALYSES OF OLIVINE DIABASE DIKE. (Values in percent).

Specimen	W-6-10	W-9-10
Plagioclase	59.1	58.1
(% An)	54	65
Pyroxene	17.1	18.4
Olivine	18.3	11.7
Magnetite	3.7	7.2
Biotite-Chlorite	1.8	4.6
Totals	100.0	100.0

TABLE 10 RADIOMETRIC AGE DETERMINATIONS OF SUDBURY-TYPE OLIVINE DIABASE DIKES.

Location	Method	Mineral	Age (m.y.)	Reference
E. of Blind River	Rb/Sr	Biotite	1245±25	Van Schmus 1965
Delhi Township	K/Ar	Biotite	1240±45	Wanless *et al.* 1966
Hybrid Lake Ont.	K/Ar	Biotite	950±75	Wanless *et al.* 1966
Baldwin Township	K/Ar	Biotite	1330±50	Wanless *et al.* 1965
Sudbury	K/Ar	Biotite	1020	Fairbairn *et al.* 1969
?				Fahrig & Wanless 1963
Sudbury	Rb/Sr	Whole Rock	1460±130	Gates and Hurlet C.J.E.S., Vol.10, p.900

throughout. Magnetite is rimmed by hematite. Modal analyses are presented in Table 9.

Similar dikes near Sudbury have been investigated by several workers and dates ranging from about 950 m.y. to 1460 m.y. have been reported (see Table 10).

CENOZOIC

QUATERNARY

Pleistocene and Recent

Pleistocene deposits are represented mainly by a thin discontinuous mantle of drift composed of sand and gravel.

Along the eastern border of Nicol Township is the only main area where the overburden becomes thick. Numerous eskers with a southeast trend are present in this area. This southeast trend parallels the trend of glacial striae in the area.

Sand and gravel pits, used mainly for highway maintenance, are present in Nicol Township.

STRUCTURAL GEOLOGY

Folds

Evidence of large-scale folding is present in the Early Precambrian metavolcanics. In these rocks the foliation trend swings from eastward in Van Hise, Haultain, and northern Nicol Townships to a southward strike in central Nicol Township; dips are steep mainly to the north and east. Top determinations from pillows in two localities suggest these inliers are disconnected segments of an anticline which existed prior to Middle Precambrian sedimentation.

Undulations in the Nipissing Diabase are considered primary and not the result of post-emplacement folding.

The Huronian rocks have been gently warped but not to the same degree as to the south in the Maple Mountain area (Card *et al.* 1970). This may be the result of a greater distance from the influence of the Penokean Orogeny.

Faults

Faults in the area trend in four main directions: north to north-northwest, northwest, northeast, and east. Criteria used for identifying faults in the area include shearing and brecciation, alteration, topographic lineaments, offsets in geological contacts, and repetitions of formations.

NORTH-STRIKING FAULTS

Firth Lake-Silverfive Lake Fault

The Silverfive Lake fault and the Firth Lake fault in western Van Hise and Milner Townships represent the extreme west and east branch extensions of a single fault known as the Firth Lake fault in Leith Township (McIlwaine 1971). The major fault appears to split into several branches in northern Leith Township which extend through Milner and most of Van Hise Townships. These branches may join again in northern Van Hise Township.

Evidence for these faults includes brecciated Gowganda Formation in southern Leith Township (McIlwaine 1971), shearing and brecciation along Firth Lake, brecciation and silicification along Silverfive Lake, and strong topographic linears formed by steep cliffs in Milner Township. The "step-like" nature of these cliffs suggests that relative vertical movement along these faults has been west side down. This appears to be the case with many of the north-striking faults in the map-area.

In Van Hise Township the Holland Lake fault, striking north-northeast, is a branch from the Firth Lake fault. Evidence for the fault is the 425 m (1,400 feet) left-hand displacement of the metavolcanic-trondhjemite contact at the east end of Holland Lake.

Elkhorn Lake Fault

This fault strikes northward along Elkhorn Lake through Margueratt and Logan Lakes to Gorman Lake in Milner Township. Evidence for the fault, apart from the strong topographic lineament along the lakes, includes shearing of the Gowganda Formation on the small islands west of Hawk Island in Elkhorn Lake and the 240 m (800 feet) left-hand displacement of a northeast-trending dike between Logan and Gorman Lakes.

Gowganda Lake-Obushkong Lake Faults

A system of at least four major faults occurs parallel and subparallel to the various arms of Gowganda Lake; the Milner Bay fault, the North Arm fault, the Gowganda Lake fault, and the Montreal River Fault are included in this set.

Evidence for the Milner Bay fault includes the strong topographic lineament and shearing in the diabase on the east shore at the north end of Milner Bay. Also, diamond drilling by Chimo Gold Mines Limited indicated a downthrown block of Lorrain Formation underlying Milner Bay. A sheared diabase-Lorrain Formation contact was described in the drill logs. The evidence suggests a relative movement of west side down and Thomson (1968) suggests a 230 m (750 foot) displacement. The preservation of the isolated area of Gowganda Formation in the area west of Foot Lake in Van Hise Township supports the interpre-

tation of downthrow to the west on this fault.

The main evidence for the North Arm fault is the strong lineament and brecciated Gowganda Formation near the north boundary of Van Hise Township.

Evidence for the Montreal River Fault includes the repetition of the Gowganda Formation, the steepening of the bedding dips near the fault, and shearing along Dinny Lake. Relative movement along the North Arm and Montreal River Faults is not certain. However, the limitation of Lorrain Formation rocks between these two faults suggests that they represent a small graben structure.

The Gowganda Lake fault is suggested only by the strong lineament and relative movement is not known.

Stumpy Lake Faults

Both the East and West Stumpy Lake faults can be traced south from Nicol Township into adjacent Charters Township (McIlwaine 1971) and the East fault continues farther south into Donovan Township (McIlwaine 1969d). Relative movement along both faults appears to be west side down, as determined from displaced contacts in Charters Township. Both faults continue north parallel to the shores of Stumpy Lake and displace the northern margin of the Pettipher Lake diabase basin. The West Stumpy Lake fault is a branch of the Montreal River Fault.

Wilson Lake Fault

Similar to the Stumpy Lake faults the Wilson Lake fault in Nicol Township can be traced south through Charters to Donovan Townships. Relative vertical movement, as suggested by contact displacement from apparent contact migration from subsequent erosion, is west side down. Shearing is present at the southwest end of Wilson Lake.

Wigwam Lake Fault

This fault extends from Bloom Lake in the north, south through Haultain Township into Nicol Township where it swings to the south-southeast along Calcite Creek into adjacent Lawson Township. Evidence for an apparent west side down movement of the fault is present along the east shore of Calcite Lake in Lawson Township (McLean 1968) where the Early Precambrian and Lorrain Formation rocks underlying the diabase have been exposed. Caving and bad ground experienced by Tormont Mines Limited (87) during drilling operations on Lost Lake is suggestive of faulting.

The McRae Lake fault is part of the Wigwam Lake fault system and is dominantly northeast-trending from Sigs Lake to where it joins the Wigwam Lake

fault at Bloom Lake; the fault appears to swing to the southeast through Sigs Lake. The fault is marked by a strong lineament and there is a 90 m (300 feet) right-hand displacement of the diabase dike south of Sigs Lake.

NORTHWEST-STRIKING FAULTS

Jacobs Lake Fault

This fault, in Nicol Township, is the most prominent fault with a northwest strike in the map-area. Evidence for the fault includes carbonatization and shearing in the cliffs along Jacobs Lake, shearing of ultramafic rocks in southwest Haultain Township, and about 30 m (100 feet) of right-hand displacement of Matachewan-type diabase dikes in southwest Haultain Township. The fault is included as part of the Lake Timiskaming Rift Valley by H.L. Lovell and T.W. Caine (1970) who suggest that the Jacobs Lake fault is an *en echelon* extension of the Net Lake fault, which passes through Temagami. According to Lovell and Caine (1970) the Net Lake fault has a relative vertical movement of northeast side down which would suggest similar activity on the Jacobs Lake fault.

Other Northwest Faults

The other faults with a northwest strike are relatively minor. One is located at the south end of Gowganda Lake cutting through the Lorrain Formation inlier at Reeve Lake. Another occurs west of Shanty Lake in Haultain Township offsetting the Gowganda Formation-Early Precambrian nonconformity.

NORTHEAST-STRIKING FAULTS

Mire Lake Fault

Moore (1955, p.22) describes this as a "fault of considerable magnitude' with a dip of 70 degrees southeast. The topographic expression of this fault can be traced from about 1½ km (1 mile) southwest of Mire Lake in Haultain Township northeast to Bulsch Lake, it is parallel to the contact between the Gowganda and the diabase and locally it crosses the contact.

Babs Lake Fault

Through and south of Babs Lake, Haultain Township, are two northeast lineaments which suggest faults; on the map left-hand displacements of 460 m

(1,500 feet) and 120 m (400 feet) respectively of Nipissing Diabase-Gowganda Formation contacts have been interpreted as indicative of these faults.

Wilson Creek Fault

In Nicol Township a northeast-trending lineament through Wilson Creek at the east end of Wilson Lake between the Wilson Lake and Jacobs Lake faults is suggestive of a fault.

Milner Lake Fault

This fault crosses the south end of Milner Lake and can be traced along a topographic lineament to the northeast across the peninsula between Milner Bay and the North Arm of Gowganda Lake. Right-hand displacement of Nipissing Diabase-Gowganda Formation contacts illustrate apparent movement along this fault.

EAST-STRIKING FAULTS

Penassi Lake-Bloom Lake Fault

The fault extends almost the entire width of the map-area and is the most prominent fault with this trend. There is about 600 m (2,000 feet) of apparent right-hand displacement of the Gowganda Formation-Early Precambrian nonconformity at the north end of Obushkong Lake in Van Hise Township, but this is obscured by the North Arm fault which cuts the Penassi Lake-Bloom Lake fault. The Penassi Lake-Bloom Lake fault also truncates the north-striking diabase body between Obushkong and Davidson Lakes.

90 Fault

This fault is so named because it follows the No.90 vein at the Mann Mine (26) in Milner Township. The fault truncates the inlier of Lorrain Formation in the diabase just west of Gowganda Lake, north of Reeve Lake.

OTHER FAULTS IN THE MAP-AREA

Numerous other faults are present in the map-area which are not of regional significance. Most of these faults have been disclosed in mining operations and

their relationships to economic geology, where significant, has been included in the section on "Descriptions of Properties and Occurrences". Examples of these faults are "C" fault on the Siscoe property, Nicol Township, and the Mann fault at the Mann Mine held by Manridge Mines Limited.

Minor Structures

METAMORPHIC FOLIATION

A weakly developed metamorphic foliation has been developed in the metavolcanics; the foliation is due to alignment of platy minerals, the most common of which is chlorite with mica less abundant. This foliation has helped to outline the suggested fold in the metavolcanics.

GNEISSOSITY

The gneissosity in the granitic rocks is only locally developed, is usually weak, and has a general eastward strike. There has been no segregation of minerals into discrete layers.

JOINTS

Only some of the joints are indicated on the maps due to space considerations. The more important joints are in the Nipissing Diabase and they are attributed to cooling phenomena. Gently dipping planar joints are commonly conformable with the sheets. Columnar and cylindroidal joints are common in the diabase; cylindroidal joints in the area are attributed to cooling (Eakins 1961) or to post-cooling tension (Hester 1967). They are useful in determining the attitude of the diabase in that the long axis of the cylindroid is normal to the contact of the diabase. Thomson (1968) suggested that columnar joints develop during cooling under unstressed conditions.

BEDDING

Beds in the Huronian sedimentary rocks generally have fairly gentle dips to the east (5 to 20 degrees) but in the vicinity of faults there is a pronounced steepening of dips (up to 60 degrees). The bedding is commonly thick except for the laminated beds in the argillite of the Firstbrook Member of the Gowganda Formation.

HISTORICAL GEOLOGY

The Early Precambrian volcanic rocks in the area are probably older than 2,-605 m.y. (K-Ar date for Round Lake Batholith, Lowdon *et al.* 1963). The volcanic rocks were subjected to folding and metamorphism and intruded by small mafic and ultramafic bodies; Early Precambrian time ended with the intrusion and cooling of the Round Lake Batholith, followed by the intrusion of the dominantly north-striking swarms of Matachewan-type diabase dikes.

Moore (1955, p.21) suggested the earth's crust at this time was subjected to east-west tension and thus numerous north-trending fractures and fault zones were developed along which the diabase dikes were intruded.

The Early Precambrian rocks of the area were then exposed to erosion and subsequently blanketed by deposition of the Gowganda Formation sediments comprised of detritus derived from a dominantly volcanic terrain. The deposition was in part controlled by the north-striking fault scarps, movement along which continued after the intrusion of diabase dikes. This fault scarp deposition is in part responsible for the chaotic breccias of the Gowganda Foomation in certain areas, examples of which are along Firth Lake and near Haultain Lake. Movement along fault zones during periods of deposition could be responsible for triggering turbidity currents. A Rb-Sr whole rock isochron age of 2,288 m.y. $\pm$ 87 (Fairbairn *et al.* 1969) has been determined for the Gowganda Formation in the map-area.

Erosion subsequently exposed the intrusive granitic rocks which apparently provided the source material for the shallow-water deposition of the more felsic Lorrain Formation. That the Lorrain Formation in the Gowganda area was not locally derived is suggested by the abundance of potassic feldspar in the sandstone. No potassic feldspar was found in the granitic rocks.

The intrusion of the Nipissing Diabase followed deposition of the Huronian sediments and the north-striking fault zones controlled to some extent the emplacement of these intrusions. Most of the diabase bodies have a north-trending orientation such as the Milner Lake basin, the "tail" of the Miller Lake basin, and the tabular bodies in Haultain and Van Hise Townships. Intrusion of the diabase in the map-area has been dated at 2,162 m.y. $\pm$ 27 B.P. (Fairbairn *et al.* 1969). Movement along the north-striking fault zones continued after diabase intrusion as the diabase has locally been affected by this fault system.

Subsequent events included the development of the other three fault sets; the relative ages of these faults is uncertain except to say that movement along the northwest-trending set continued for the longest period. Lovell and Caine (1970) included this set as part of the Timiskaming Rift Valley where it has displaced Early Paleozoic rocks. Locally the intrusion of diabase and olivine diabase dikes took place along these faults.

Pleistocene glaciation subsequently affected the whole area.

ECONOMIC GEOLOGY

Serpentine

Small serpentinized dunite bodies occur in the Firth Lake-Serpentine Lake area of Van Hise Township. Narrow stringers of asbestiform serpentine occur locally in outcrops; diamond drilling by Texmont Mines Limited in 1966 indicated similar stringers of serpentine at depth.

Silver-Cobalt and Associated Mineralization

Silver, with associated nickel-cobalt-iron arsenides, has been the only productive type of mineralization in the area; there has been almost continuous production from the Miller Lake O'Brien Mine since 1908 when silver was first discovered. Annual production figures for the camp are shown in Table 11. It would be next to impossible to put a true dollar value on this production due to fluctuating metal prices and inflation.

Much has been written over the years pertaining to the description and genesis of these deposits. Early descriptions include those by E.W. Todd (1926), E.S. Bastin (1939; 1949), Burrows (1926), and Moore (1955). More recent studies have been made by S.D. Scott (1964) and Hester (1967). The most comprehensive study of the silver mineralization is contained in a special volume of The Canadian Mineralogist entitled *The Silver-Arsenide Deposits of the Cobalt-Gowganda Region, Ontario*; the main contributors to this volume are W. Petruk (1971a,b) and J.L. Jambor (1971). Because of this work it was considered that no detailed study need be made for this report. A brief summary review follows.

Most of the known occurrences in the map-area are hosted by Nipissing Diabase and less commonly by Gowganda Formation and Early Precambrian metavolcanics. The mineralization is in vertical to steeply dipping calcite and quartz-calcite veins. The veins are narrow, ranging from fractures to 1 m (3 feet); they occur as single veins or more commonly as bifurcating or multiple branching vein systems.

Mineralized veins in the Miller Lake area are located in the top half of the Miller Lake diabase basin with the most productive veins occurring in the western margin. Petruk (1971a) states the ore veins occur at right angles to the contact between the diabase and metavolcanics, in joints, both planar and cylindroidal, and in faults crosscutting the cylindroidal joints. Orebodies are most common at vein intersections; both veins may or may not have ore but the ore zones may be at different horizons (Petruk 1971a, p.102). Petruk (1971a) suggests the average size of an ore vein is 2.5 to 5 cm (1 to 2 inches) wide with horizontal and vertical dimensions of 30 to 60 m (100 to 200 feet).

Although mineralization occurs outside the diabase only The Millerett (92) produced ore. The Leroy Lake property was explored by shaft sinking. The Millerett is in the Gowganda Formation whereas the Leroy Lake (116), on the east rim of the basin, is in a Matachewan-type diabase dike overlying the Nipissing

TABLE 11 ANNUAL PRODUCTION FIGURES FOR THE MAP-AREA (FROM ONTARIO DEPT. MINES ANNUAL REPORTS).

	Silver ounces	Cobalt pounds	Nickel pounds	Copper pounds
1910	475,548	5,000	—	—
1911	468,687	—	—	—
1912	549,976	—	—	—
1913	502,400	—	—	—
1914	399,300	—	—	—
1915	242,229	—	—	—
1916	383,393	—	—	—
1917	1,064,635	—	—	—
1918	638,198	26,994	—	—
1919	723,764	27,404	—	—
1920	431,731	15,236	—	—
1921	258,292	9,187	—	—
1922	170,651	8,478	—	—
1923	160,721	7,494	—	—
1924	598,057	18,148	—	—
1925	1,355,156	41,135	—	—
1926	1,236,640	36,731	—	—
1927	1,741,614	49,284	—	—
1928	1,677,429	59,860	—	—
1929	2,077,139	70,333	—	—
1930	2,066,415	104,527	—	—
1931	1,658,439	102,363	—	—
1932	1,374,780	72,081	—	—
1933	1,244,812	40,729	—	—
1934	1,039,565	32,273	—	—
1935	829,195	20,818	—	—
1936	640,099	24,241	—	—
1937	521,633	20,818	—	—
1938	501,821	15,457	—	—
1939	498,043	19,185	—	—
1940	5,343	207	—	—
1942	191,526	7,194	—	—
1943	172,698	5,205	—	—
1944	250,676	9,000	—	—
1945	44,585	1,185	—	—
1947	94,301	—	—	—
1948	183,163	—	—	—
1949	626,254	6,000	—	—
1950	836,047	18,470	—	—
1951	1,359,720	38,009	—	—
1952	1,869,493	36,054	—	—
1953	1,944,830	48,698	—	—
1954	2,234,570	50,495	—	19,610
1955	1,814,825	49,367	—	10,010
1956	1,608,081	48,398	4,657	7,507
1957	1,560,580	37,609	4,638	—
1958	1,900,056	45,795	6,664	2,746
1959	2,372,752	61,677	9,841	5,361
1960	2,765,792	—	—	25,527
1961	2,449,102	23,527	2,668	—
1962	2,261,492	9,088	3,054	1,778
1963	1,333,825	—	—	—
1964	1,548,990	—	—	347
1965	1,080,561	—	—	—
1966	1,206,149	—	552	—
1967	1,048,783	—	—	—
1968	1,093,238	—	—	—
1969	799,988	—	—	—
Totals	60,186,782	1,318,754	32,074	72,886

Diabase (Petruk 1971a, p.102).

In the Gowganda Lake area mineralized veins occur in both the upper and lower parts of the diabase; these veins are similar to those around Miller Lake in that they occur in veins which are in joints and faults.

Mineralization occurs as native metals, arsenides, sulphides, and oxides. The bulk of the silver is in the native state with minor native bismuth and gold. The arsenides are mainly the cobalt-nickel-iron varieties and the silver is intimately associated with them. Numerous sulphide and oxide minerals have been reported (Petruk 1971b).

For much more detail the reader is referred to the aforementioned edition of The Canadian Mineralogist.

Sand and Gravel

Several sand and gravel deposits, composed mainly of sand and gravelly sand, occur adjacent to Highway 560 and the O'Brien road. These are used mainly for road fill.

Descriptions of Properties and Occurrences

Descriptions of the mining properties in the area are listed alphabetically under the name of the owner who held the property as of December 31, 1969. The number in brackets following each name indicates the corresponding number on Map 2348 or 2349 (back pocket), as do the numbers in Table 13. Figure 5 illustrates property locations and boundaries more clearly.

VAN HISE TOWNSHIP

Foot Creek Occurrence (1)

A pit about 1.2 m by 1.2 m by 1.2 m (4 feet by 4 feet by 4 feet) has been put down on the contact between Gowganda Formation feldspathic greywacke and Nipissing Diabase. It is about 1000 m (3,000 feet) southwest of Foot Creek and 1370 m (4,500 feet) northwest of Foot Lake. The pit is on a vertical 5.1 cm (2 inch) thick calcite vein striking N20E; minor pyrite was observed. A grab sample taken by the author indicated traces of silver, nickel, and copper and no cobalt on analysis[1].

[1]All analyses and assays, unless otherwise stated, were made by the Mineral Research Branch, Ontario Division of Mines.

TABLE 12 DATA IN RESIDENT GEOLOGISTS FILES, ONTARIO MINISTRY OF NATURAL RESOURCES, KIRKLAND LAKE FROM LOVELL (1968).

Name of File	G	DH	M	EM	UG	CLP	Miscellaneous
			VAN HISE				
Alpine Silver Mines Ltd.						x	
Brett Lake	x						
Charbonneau	x						
Chibougamau Mining Co. Ltd.							Ref
Dencroft Mines Ltd.	x						
Gay River Lead Mines Ltd.						x	
Gowganda Silver Mines Ltd.	x		x				Gc
Hasaga Gold Mines Ltd.	x	x				x	
Hedlund	x						
Holwood Mines Ltd.	x					x	
Jaylac Mines Ltd.						x	
Maple Mountain							HS
Norseman Nickel Corporation Ltd.						x	
Silverplace Mines Ltd.	x	x				x	IP, R
Sutherland, Wm. Don		AM	AEM				
Texmont Mines Ltd.		x					
Thib, Frank							A, C
			MILNER				
Barber-Inch	x						
Barmill Syndicate	x	x					
Boyd-Gordon Mining Company Ltd.	x						
Central Milner Mines Ltd.	x	x					
Chimo Gold Mines Ltd.		x					
Ciglen-Ryan	x						
Cobalt Badger Silver Mines Ltd.		x					
Crews-McFarlan	x						HS
Decker, Albert							sTr, rTr
Derry							A, HS
Gowganda Silver Mines Ltd.	x		x				Gc
Gowganda United Cobalt Silver Mines Ltd.	x						
Hines, Floyd							sTr
Horan, Des		x					
Manor	x						
Manridge Mines Ltd.		x				x	
Maralgo Mines Ltd.	x						
Norseman Nickel Corporation Ltd.						x	
Pantan Mines Ltd.	x						
Pope, Alex R.							rTr
Silver Ore Zone Mines Ltd.	x	x	x			x	
Sobol, Jack	x	x					A, HS
Sutherland, Wm. Don		x					HS
Tego Silver Cobalt Mines Ltd.	x	x				x	XN, HS
Temiskaming & Hudson Bay Mining Company Ltd.	x						
Utopia Gold Mines Ltd.		x				x	
Yellowknife Bear Mines Ltd.	x	x				x	IP, XN, HS
Yellowknife Bear Mines Ltd. "Reeve-Dobie property"	x	x					IP, XN, HS
Zenmac Metal Mines Ltd.		x				x	HS

Table 12 continued

Name of File	G	DH	M	EM	UG	CLP	Miscellaneous
		HAULTAIN					
Bab's Lake	x	x					
Barnes	x	x					
Becker	x						
Canadian Astoria Minerals Ltd.		x					
Capitol Silver Mines Ltd.						x	
Castlebar Silver and Cobalt Mines Ltd.	x	x				x	
Castle-Trethewey Mines Ltd.	x	x				x	XN, HS
Cobalt Consolidated Mining Corporation Ltd.		x					
Everett Mines Ltd.							Tr
Fairmac Syndicate	x						
Gamble; Thompson	x						C
Gerrie, W.		x					
Gowganda Apex Company Ltd.					x	x	
Gowganda Silver Mines Ltd.	x		x	x			Gc
Haultain Mining Company Ltd.	x						
Hollinger, J.J.	x						
Hyland	x						
Lost Lake	x						
Melbura							C
Melisek	x						
Miller Lake O'Brien Mines Ltd.	x						
Mongeau, J.	x						
Montgomery, W.R.; Palmer, A.; Crawford, W.J.	x						
McRae	x						
New Redwood Gold Mines Ltd.	x			x		x	XN
Nichaul Mining Company Ltd.		x					
Ottawa Gowganda Mining Company Ltd.	x						C
Plaunt	x						
Roy Silver Mines Ltd.	x	x			x	x	A
Silverplace Mines Ltd.	x	x				x	IP, R
Siscoe Metals of Ontario Ltd.		x				x	XN
Siscoe Metals of Ontario Ltd. (Roy-Ten claims)	x					x	Gc
Solid Silver Mines Ltd.	x					x	
Tormont Mines Ltd.	x	x				x	XN
Trinity Chibougamau Mines Ltd.	x	x				x	
Wood, Thos.	x						A
Worldore Mining	x	x					
		NICOL					
Big Four		x					rTr, A
Caesar Minerals Ltd.		x	x				XN
Cartier Malartic	x						
Castlebar Silver and Cobalt Mines Ltd.		x					
Donaldson		x					
Gamble, W.A.		x					
Gibson; Duggan	x						
Giles, K.		x					XN
Gowganda Silver Mines Ltd.	x		x				Gc
Hyland; Johnson; Gardner	x						
Indore Gold Mines Ltd.		x					
International Mine Services Ltd.	x	x					

Table 12 continued

Name of File	G	DH	M	EM	UG	CLP	Miscellaneous
Millcrest-Brunhurst		x					XN
Morrison					x		
Nichaul		x					
Piata Mines Ltd.						x	
Quebec Yellowknife Gold Mines Ltd.	x	x				x	
Silver Dollar Mines Ltd. "Calcite Lake group"	x	x					
Siscoe Metals Ltd. - McIntyre		x					XN
Siscoe Metals of Ontario Ltd.		x				x	XN
Siscoe Metals of Ontario Ltd. (O'Connell claims)							Gc
Siscoe Metals of Ontario Ltd. (Roy-Ten claims)	x					x	Gc, HS, XN
Siscoe Metals of Ontario Ltd. (K Project)							Gc
Tego Silver Cobalt Mines	x	x				x	
Temiskaming Project Syndicate				x			
United Reef Petroleum Ltd.	x	x					Gc
Walsh Silver Mines Ltd.	x						
Willars, Jack	x		x	x			

NOTES:
A — assay reports
AEM — airborne electromagnetometer survey
AM — airborne magnetometer survey
C — correspondence
CLP — clippings
D — dip needle survey
DH — diamond drill holes
G — geological information (maps and/or reports) (also includes company prospectuses and financial statements)
Gc — geo-chemical survey
Gr — gravity survey
IP — induced polarization survey
M — ground magnetometer survey
R — resistivity survey
ra — radioactivity survey
S — seismic survey
SP — self potential survey
Tr — trenching
UG — underground geology (also includes level plans with no geology)

Explanation: The x's indicate the existence of work of the type indicated by the vertical columns headed "G", "DH", "M", "EM", "UG", "CLP", and "Miscellaneous".

TABLE 13 | PROPERTIES NOT DESCRIBED IN REPORT BECAUSE OF LACK OF INFORMATION.

Township	Property Number	Property Name	Number of claims	Surveyed
Van Hise	12	United Siscoe Mines Limited	11	No
Milner	42	United Siscoe Mines Limited	4	No
Haultain	59	R. Ferguson	1	Yes
Haultain	61	W.A. George	1	Yes
Haultain-Nicol	71	M. Mixer	1	Yes
Haultain	78	D. MacVeigh	5	No
Haultain	80	J.M. Patton	1	Yes
Haultain	81	M. Riel, ED 58	1	Yes
Haultain	82	M. Riel, TC 167	1	Yes
Nicol	112	MR 1251 and MR 1252	2	Yes

Gould Lake Occurrence (2)

About 520 m (1,700 feet) south of Gould Lake a 1.2 m wide (4 feet) quartz vein cuts medium-grained gabbroic metavolcanics, strikes N55W and dips 70 degrees southwest. A grab sample taken by the writer and assayed indicated no gold.

Silverfive Lake Occurrence (3)

Numerous white to grey brecciated quartz-carbonate veins (about 80 percent carbonate), and aplite dikes cutting a diabase cliff were mapped on the west shore of Silverfive Lake in southwestern Van Hise Township; some of these veins are shown on Map 2348 (back pocket). A pit 3.6 m by 3.6 m by 3.6 m (12 feet by 12 feet by 12 feet) has been put down on a 20 cm (8 inches) wide aplite dike striking N65W and dipping 75 degrees southwest, cut by a 10 cm (4 inches) thick calcite vein striking N35W and dipping 85 degrees northeast. Mineralization observed includes erythrite and chalcopyrite. Two grab samples taken from the pit by the writer and analyzed indicated traces of silver, cobalt, nickel, and copper. Similar results were obtained from a grab sample taken by the writer from one of the veins just to the north of the pit.

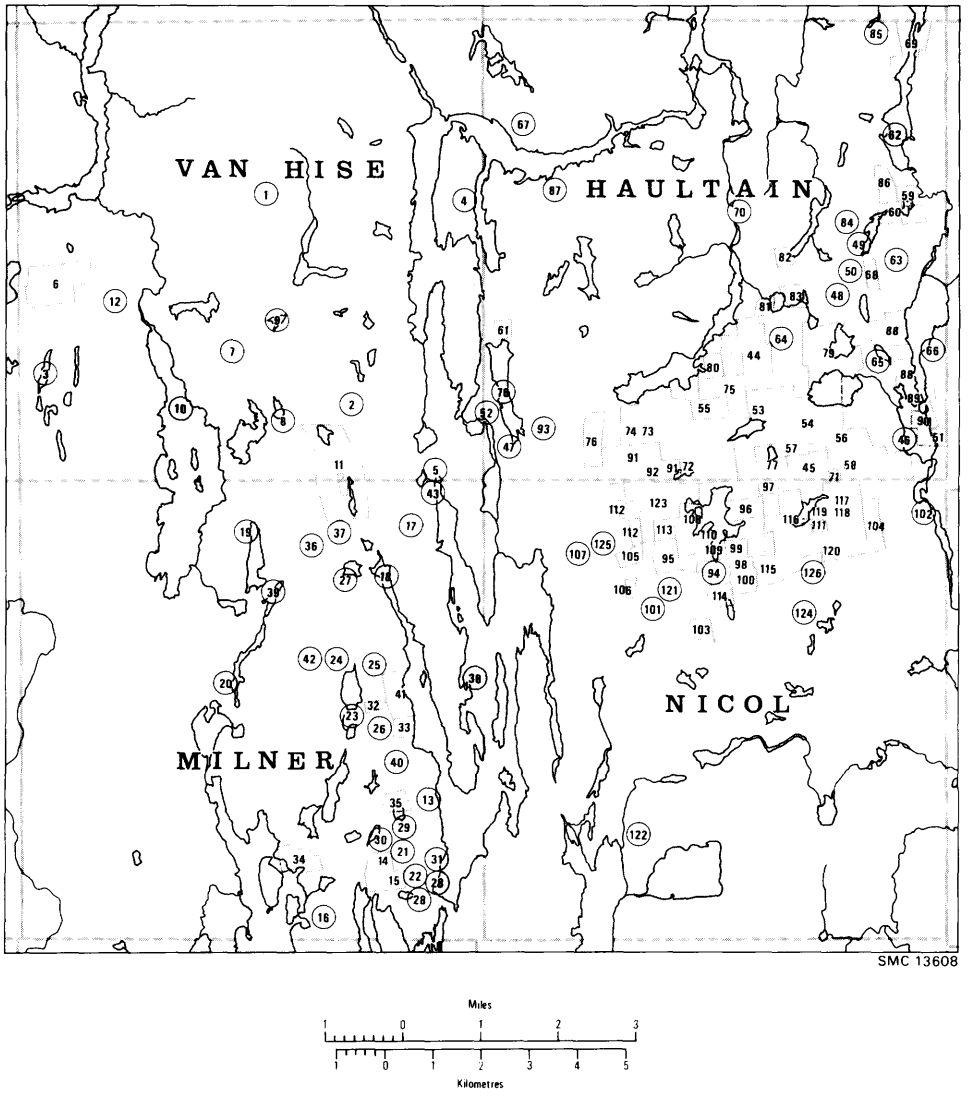


Figure 5–Property location diagram.

Silverplace Mines Limited [1965][1] (4)

By early 1965 Silverplace Mines Limited had completed a geological survey, a geophysical survey, and four diamond drill holes totalling 288 m (943 feet) on an eleven-claim group which straddled the north-striking Nipissing Diabase dike along the Van Hise-Haultain boundary. In 1962, three drill holes (Figure 6) totalling 518 m (1,797 feet) were put down by M. Sawchuk.

Lorrain Formation feldspathic sandstone, with local conglomerate, flanks the intruding Nipissing Diabase. In his report for the company, R. Liard (1964) suggests that the diabase dips gently to the east in the south part. The author's interpretation of the available diamond drill hole data (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) is that the contact has a vertical to steep westerly dip near the north.

The drilling was done presumably to test the downward extension of veins and their mineralization; surface trenching indicated minor copper and cobalt mineralization (Figure 6). One hole (SP 1) was put down to test one of the cross-faults which transect the diabase in a northeastward direction (Liard 1964).

The known mineralization is mainly near the centre of the diabase and the better zones are within 180 m (600 feet) of the cross-faults (Liard 1964). Liard (1964) reports that some silver has been found in these veins which are in fractures.

An induced polarization survey was done to locate any anomalies which might indicate silver veins (Sutherland 1964). Work was done first along known or assumed faults and linears; some of these were subsequently checked by perpendicular traverses. Seven high-value anomalous zones were delineated from the survey and of these four were recommended for further work, but apparently was not done.

Southeast Van Hise Township Occurrence (5)

A series of four small test pits were observed on or close to the contact between Nipissing Diabase and a later northeast-striking dike; these pits are between the north end of the North Arm of Gowganda Lake and Diabase Lake. The two northern pits, on the north side of Highway 560, are on the contact. In the southernmost pit chalcopyrite mineralization was observed in a quartz-carbonate vein. The pit 150 m (500 feet) northeast of this was put down on a 10 cm (4 inches) calcite vein striking N25E and dipping 70 degrees northwest; a grab sample taken by the writer from this pit and analyzed, indicated trace amounts of silver, cobalt, copper, and nickel.

There is a pit at the south end of Obushkong Lake on the northeast-trending diabase dike which exposes a 2.5 cm (1 inch) thick quartz vein lying in a north-striking epidotized fracture zone.

[1] A date in square brackets indicates last year of exploration activity.

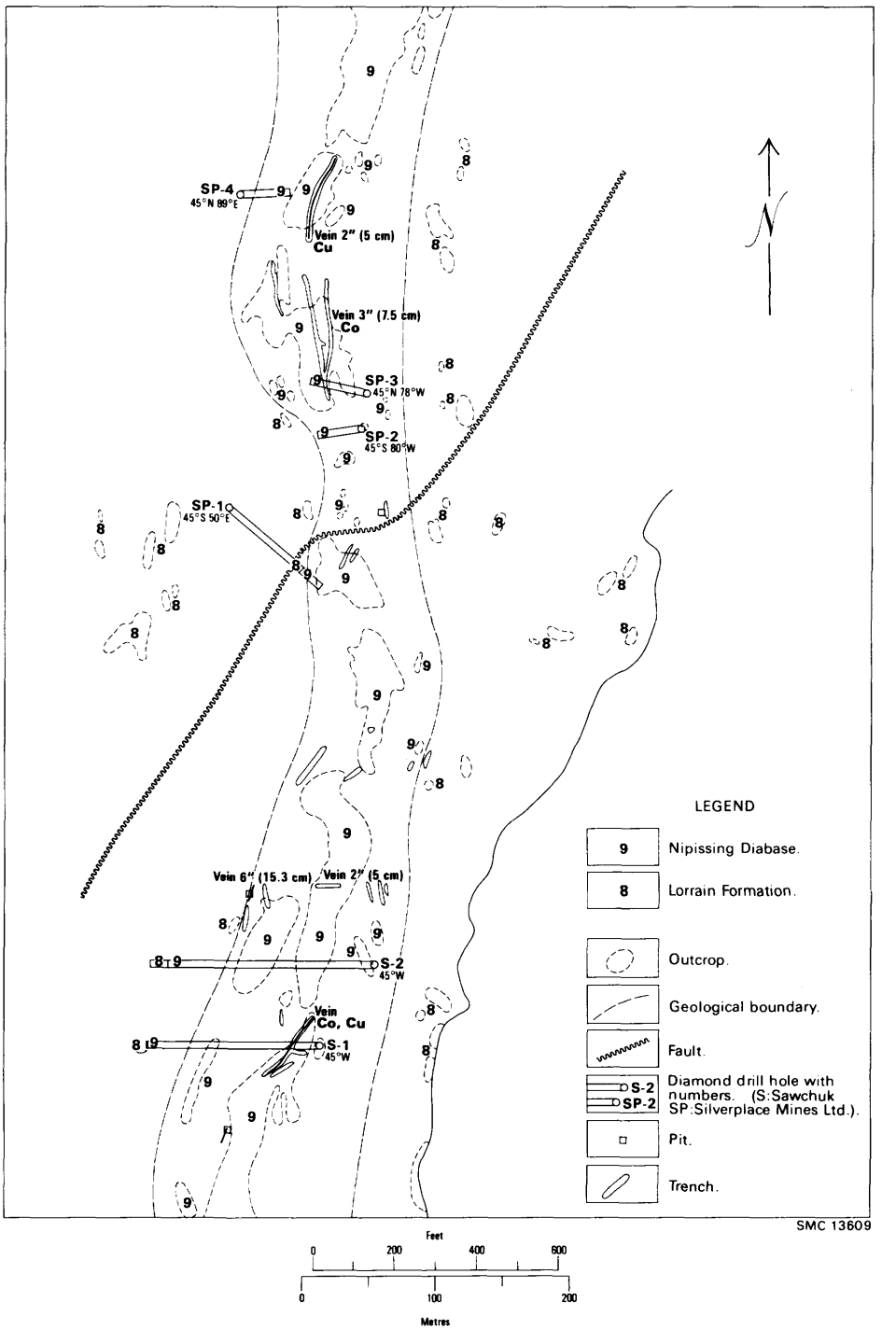


Figure 6–Plan of diamond drill holes, trenches, and veins on Silverplace Mines Limited [1965] (4). Modified from assessment work data.

J.R. Stirrett (6)

(Thompson-Gowganda or Alpine Silver Mine)

In 1969, J.R. Stirrett held five leased claims about 1½ km (1 mile) northwest of Firth Lake and numbered as follows: GG4724, HR453, HR454, HR458, and HR459.

HISTORY AND DEVELOPMENT

The property was first staked in the early days by E.J. Thompson and after a few years of intermittent prospecting it was acquired by Alpine Silver Mines Limited in 1920.

Development work for the next two years consisted of about 300 m (1,000 feet) of trenching, sinking two shallow shafts, and driving an adit. The adit was driven west into a diabase ridge for 176 m (575 feet) to intersect an aplite dike at a depth of 51 m (170 feet); the dike was drifted along for 24 m (80 feet) (Burrows 1921, p.41). The location of the shafts is not known but they are reported to be 9 m (30 feet) and 15 m (90 feet) deep (Burrows 1921, p.41).

The property then became dormant until 1951 when it was acquired by Holwood Mines Limited; some effort was made by this company to bring the property into production. A 50 tons per day mill was erected and seven diamond drill holes totalling 370 m (1,200 feet) were put down. There was no recorded production and no further work was recorded after 1953.

Jaylac Mines Limited took an option on the property in 1960. They cleaned out old trenches and did further surface work.

No further recorded work has been done on the property since then.

GENERAL GEOLOGY

The eastern third of the property is inferred to be underlain by sandstone and conglomerate of the Gowganda Formation.

Nipissing Diabase underlies the rest of the claim group. Burrows (1926, p.56) suggested this ridge of diabase is an eastward dipping sill.

ECONOMIC GEOLOGY

Mineralization is associated with a series of aplite dikes in the diabase. The main dike is buff and the silver is associated with white calcite in aplite and small amounts of fine cobalt (MacPhail 1952). The dike has been exposed for a length of 150 m (500 feet), strikes N20E, and dips west at 75 degrees (MacPhail 1952). Numerous other aplite dikes are present and range from 15 to 30 cm (6 to

12 inches) wide and have essentially the same attitude. Locally dikes striking N60E and N80E occur (Burrows 1921, p.41).

R. MacPhail (1952) states the silver occurs as nodules and plates, particularly along the contact between the aplite and the diabase.

Reports as to the grade of silver vary. Chip samples taken by MacPhail (1952) returned assays up to 34.31 ounces of silver per ton. The Northern Miner in 1953 (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) reported one of the diamond drill holes at a depth of 10 m (33.5 feet) returned 263 ounces of silver per ton and 0.95 percent cobalt.

W.D. Sutherland (7, 8, 9)

In 1969 the property consisted of 99 claims in one block; the southwestern part of the block surrounded the property of Texmont Mines Limited (10). Parts of this property will be described separately under the headings of Brett Lake Occurrence (8) and Charbonneau Occurrences (9).

Early Precambrian metavolcanics are the most common on the property. Fine-grained andesitic to basaltic rocks are the most common of these with local amphibolite and gabbroic flows. Intrusive gabbro occurs in the northwest along the Firth Lake shore. Trondhjemite, representing the extreme southern part of the Round Lake Batholith, is present along the north of the claim group. Matachewan-type diabase dikes occur throughout. The western and eastern parts of the property are underlain by Gowganda Formation rocks; feldspathic sandstone in the west and conglomerate in the east are the most common. Nipissing-type diabase occurs as part of a north-trending dike just east of Brett Lake.

Airborne geophysical surveys, including electromagnetic and magnetic, were conducted and the results submitted for assessment credit (Prior 1969). These indicate no anomalies of significant amplitude from the electromagnetic survey (Prior 1969). The magnetic survey shows highs associated with Nipissing Diabase (Prior 1969).

Numerous quartz veins were mapped in the metavolcanics by the author; grab samples taken by the author of several of these veins were assayed for gold. These samples were all taken from east-trending veins between Holland and Serpentine Lakes. The results from five assays indicate trace amounts of gold from four and nil from the other. The veins vary in width up to 1.2 m (48 inches).

BRETT LAKE OCCURRENCE (8)

The main part of the Brett Lake occurrence is about 240 m (800 feet) east of Brett Lake. The pit is more exactly a short trench about 9 m (30 feet) long excavated on a quartz-carbonate vein system in conglomerate about 2 m (6 feet) wide and striking N70E. The pit is on the north edge of a Gowganda Formation conglomerate near the diabase contact. The vein system is composed of numer-

ous quartz-carbonate veinlets. Mineralization observed in the veins by the author include native bismuth and erythrite with minor pyrite, chalcopyrite, and cobalt arsenides. A grab sample taken by the author for analysis returned 0.16 ounce silver per ton and 0.44 percent cobalt, 0.10 percent nickel, and a trace of copper.

Five short diamond drill holes put down by Hasaga Gold Mines Limited (*ca.* 1956) failed to find any significant mineralization at depth (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

CHARBONNEAU OCCURRENCES (9)

A report in the assessment files of the Ontario Division of Mines describes two occurrences which are on the ground held by W.D. Sutherland. They are described as the north and south showings.

The north showing is on the east shore of a small lake which drains about 760 m (2,500 feet) northward into Foot Lake.

The occurrence is described (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) as two quartz veins striking about N70W containing chalcopyrite. As mapped by the author there are two sets of quartz veins. In a trench 15.2 m (50 feet) long as shown on Map 2348 (back pocket), there is a series of quartz veins which range from 1 cm (½ inch) to 7.6 cm (3 inches) wide. Four copper values have been reported (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) for samples from this trench which were as follows: 0.03 percent Cu, 0.08 percent Cu, 4.20 percent Cu, and 6.11 percent Cu. These analyses were made by Swastika Laboratories Limited.

About 15.2 m (50 feet) to the south is a small pit put down on quartz veins with malachite mineralization. Three samples from this pit are reported (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) to have contained copper values as follows: none, 0.01 percent Cu, and 1.68 percent Cu. A grab sample taken by the author from the dump indicated 0.01 ounce of gold per ton (Assay, M.R. Browen).

What is described as the south showing is approximately halfway between Gould and Otter Lakes. Numerous subparallel quartz veins are described (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) as varying from 46 to 122 cm (18 to 48 inches) thick and about 3 to 6 m (10 to 20 feet) apart. One reported analysis (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake) from this showing gave 0.02 percent copper.

Texmont Mines Limited (10)

In 1969 the property consisted of 18 unsurveyed claims numbered MR42140 to MR42157; the claims are over Firth Lake in Van Hise Township and cover a magnetic anomaly indicated on an Aeromagnetic Map (ODM-GSC 1970c).

Intermediate to mafic Early Precambrian metavolcanics underlie a small area of the claim group on the west shore of Serpentine Lake. The area between Serpentine and Firth Lakes is underlain by a crudely zoned mafic and ultramafic intrusion. The rest of the property is underlain by feldspathic sandstone, conglomerate, breccia, and local argillite of the Gowganda Formation. Another ultramafic body is indicated by drilling and geophysics to be underlying the Gowganda Formation (Figure 2).

The Firth Lake fault crosses the east part of the property.

In 1966, Texmont Mines Limited put down two diamond drill holes totalling 485 m (1,602 feet); the locations of these diamond drill holes are shown on Map 2348, back pocket; the logs of these holes which were submitted for assessment credit indicate the Gowganda Formation is 16.1 to 17.4 m (53 to 57 feet) thick in this area. The drill logs indicate that peridotite, with local stringers of magnetite or asbestos, was encountered in the rest of the drilling.

Ground electromagnetic and magnetometer surveys were conducted by the company in 1968 and the results were submitted for assessment credit. The electromagnetic survey indicated four very weak anomalies of "questionable value" (Desson 1968). The magnetic anomalies were indicated in the other survey, these correspond to the ultramafic bodies located along the fault zone. C.F. Desson (1968) suggests that the magnetic response over the remainder of the area indicates that mafic metavolcanics or gabbro underlie the Cobalt Group sedimentary cover. A suggested outline of the covered peridotite body is indicated in Figure 2.

Two quartz veins on a small island of gabbro at the north end of Firth Lake were sampled by the author. At the north end of the island a 20 cm (8 inches) vein strikes east; pyrite is present in the vein. Two grab samples of the vein were analyzed and found to contain a trace of copper and no gold in one, and 2.40 ounces of silver with traces of cobalt, nickel, and copper in the other. The latter specimen contained carbonate in the quartz.

Another quartz vein at the south end of the island is 5 cm (2 inches) wide and strikes N40W. Analysis results show traces of silver, cobalt, nickel, and copper in a grab sample taken by the author.

Tribag Mining Company Limited (11)

(Hedlund)

In 1969 the company held nine surveyed claims straddling the Van Hise-Milner township boundary; the claims are numbered MR13045 to MR13053 inclusive. Parts of claims MR13048 and MR13050 represent an approximate restaking of TC141 which is known as the Hedlund claim.

The Hedlund was described by Burrows (1926, p.56) as follows:

> During 1920, L.O. Hedlund was prospecting T.C. 141 and an adjacent claim to the east, situated a mile and a half north of the northwest arm of Gowganda lake. These claims were staked around McLoughlin lake, which has since been drained by the blasting of a rock ledge at its lower end in aid of the waterpower supply of Gowganda lake and which is now represented by a marsh. Considerable

work was done on the west side of the marsh in the sill diabase, and also on the east side, in a dike of diabase which intrudes the conglomerate. The best results were obtained west of the marsh, where there are quartz veins showing some native silver. A shaft has been sunk to a depth of ten feet at the junction of a quartz vein two to three inches in width, with a northeast strike and narrow transverse stringers of aplite. The quartz vein with offsets has been traced southwestwards several hundred feet. It has a banded structure showing scales of native silver in the white quartz, together with copper pyrites, galena, and a little niccolite at ths shaft. A little cobalt bloom was also seen in the narrow veins near the shaft. The transverse veins at the shaft also show a little native silver in aplite.

The sill diabase outcrops at a few places in the marsh but was not observed in contact with the older rocks that occur to the east of the marsh. On the west side of claim T.C. 141 the diabase underlies the conglomerate at a high angle.

Two large pits were found during the field work but whether one of these is the Hedlund shaft is not known.

Mineralization, apparently associated with the contact between the Gowganda Formation and the Nipissing Diabase, was observed in two outcrops on Highway 560. In an outcrop of diabase between a fault and the Gowganda Formation contact on MR 13049 just north of Highway 560 is a narrow calcite vein striking N20E and dipping 70 degrees west with pyrite and minor chalcopyrite mineralization. A grab sample taken by the writer gave traces of silver, cobalt, nickel, and copper.

On the west side of the Milner Bay fault the Gowganda Formation and Nipissing Diabase contact is exposed and chalcopyrite, erythrite, and malachite occur in the diabase and in narrow carbonate veins in the diabase. Two grab samples were taken from the outcrop by the author and analyzed. One gave 1.40 ounces of silver per ton, 0.15 percent cobalt, and traces of nickel and copper; the other sample gave values of 0.16 ounce of silver per ton, traces of cobalt and nickel, and 0.52 percent copper. The latter sample was mineralized diabase.

MILNER TOWNSHIP

J. Beadman (13)

(Maralgo Mines Limited [1957])

The J. Beadman property comprises three unsurveyed claims on the Gowganda Lake shoreline east of Reeve Lake; the claims were numbered MR39547 to MR39549.

The eastern edge of the property is underlain by conglomerate with local feldspathic sandstone and siltstone of the Gowganda Formation. This overlies a local arch in the Nipissing Diabase. The western edge of this ridge of diabase which is about 300 m (1,000 feet) wide dips under feldspathic sandstone of the Lorrain Formation.

The main occurrence on the property is a branching fracture zone (Figure 7) which is near the south boundary and was trenched and sampled by Maralgo Mines Limited. The zone which strikes N85E and dips 70 to 80 degrees south consists of quartz-carbonate vein material with massive niccolite and lesser

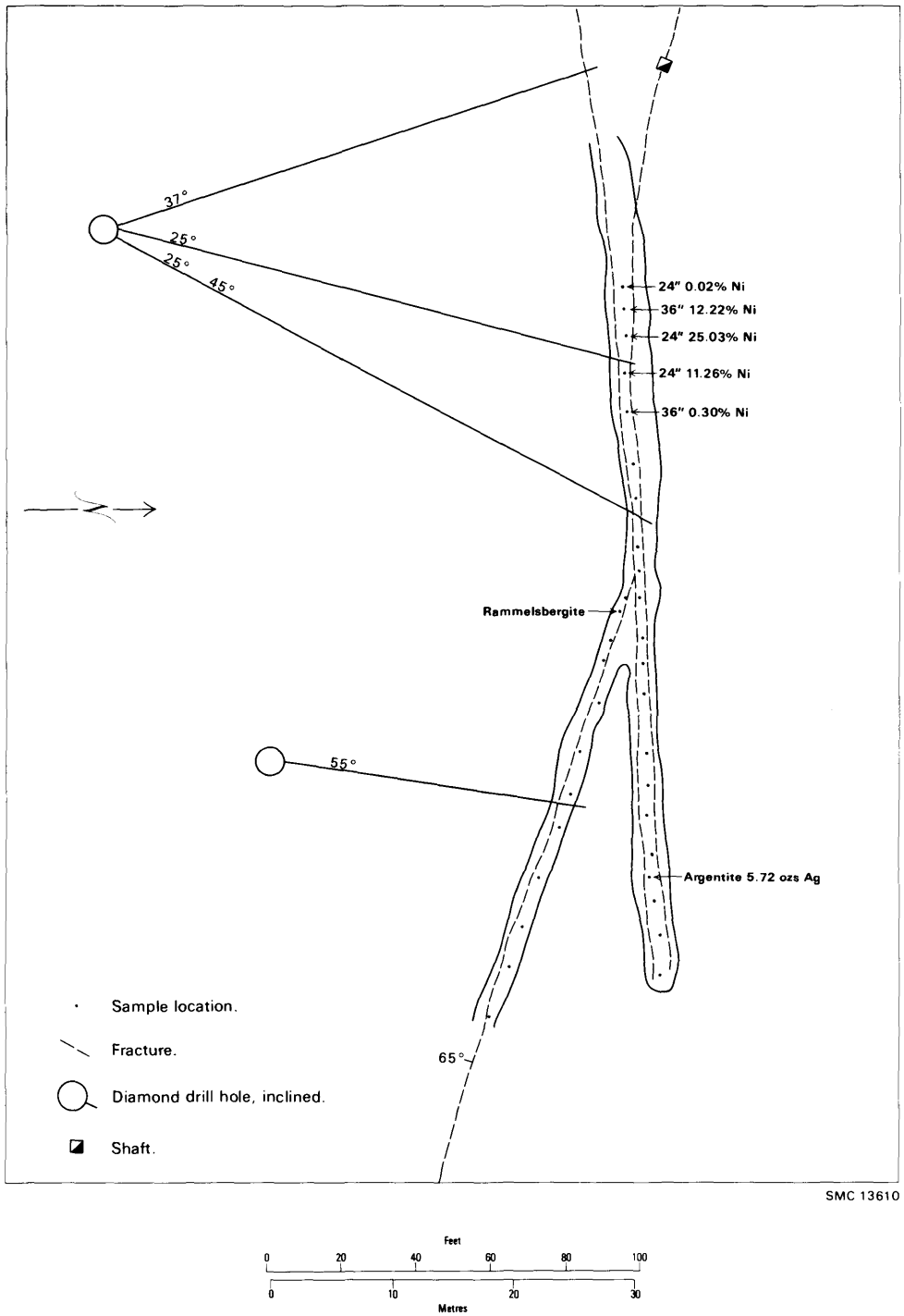


Figure 7–Plan of trenching on nickel occurrence, J. Beadman (13) property. Modified from assessment work data of Maralgo Mines Limited.

amounts of rammelsbergite and argentite (Hoiles 1957), chalcopyrite, erythrite, and annabergite. The fracture zone has been trenched to a depth of about 2 m (6 feet) for about 35 m (115 feet) and a branch fracture for about 15 m (50 feet).

The niccolite and rammelsbergite occur as massive veins ranging from 1.3 cm (½ inch) to 5 cm (2 inches). R.G. Hoiles (1957) states that the highest nickel values occur in one short section (Figure 7) which is 3 m (10 feet) long and 70 cm (28 inches) wide and averages 15.47 percent nickel. Along this section the two fractures branch; previous operators sank a shallow shaft on the northern fracture (Figure 7) and niccolite was found in the dump by the author. High nickel values were also obtained on the eastern branch which analyzed up to 15.44 percent nickel (Hoiles 1957). Maralgo Mines Limited had a total of 48 samples analyzed for nickel and silver; the mean values obtained were 2.2 percent nickel and 0.11 ounce of silver per ton over 69 cm (27 inches) (Hoiles 1957). Four samples were also analyzed for cobalt with values varying from 0.11 percent over 61 cm (24 inches) to 1.29 percent over 61 cm (24 inches) (Hoiles 1957).

A mineralized sample taken from the dump by the author and analyzed gave the following results: 0.16 ounce of silver per ton, 5.31 percent cobalt, 14.9 percent nickel, and a trace of copper.

A. Decker (14, 15)

In 1969 the property consisted of three claims, MR50328 to MR50330, which represent an approximate restaking of the surveyed claims MR18062 to MR18064. Included in this property is the Bartlett Open Cut (14) and the Crews McFarlan No.2 Shaft (15). The group previously formed part of a larger group operated by the Barmill Syndicate in 1951.

GEOLOGY OF THE PROPERTY

Most of the property is underlain by a tongue of Nipissing Diabase which extends southeast from the Milner Lake basin. The diabase contact with the feldspathic sandstone and conglomerate of the Gowganda Formation is thought to dip to the west where it crosses the southwestern part of the property.

BARTLETT OPEN CUT (14)

Near the boundary of claim MR50330 is an open-cut or trench which is about 90 m (300 feet) long, 3 m (10 feet) wide, and up to 5.5 m (18 feet) deep; the open-cut extends about S70W until it runs into low swampy ground. A 15 cm (6 inches) calcite vein with narrow stringers on either side can be seen near the east end.

The workings were put down in the early days, presumably by the Bartlett Mines Company who were the first to work the ground; it was later held by the

TABLE 14 ANALYSES OF SAMPLES FROM THE BARTLETT OPEN CUT(14) NOW HELD BY A. DECKER.

Sample No.	Silver ozs/ton	Cobalt percent	Nickel	Copper
W-84-20A	2.40	0.45	tr	tr
W-84-20C	130.90	0.13	tr	tr
W-84-20E	7.76	0.39	tr	tr

Scottish Nigeria Mining Company and then by the Crews McFarlan Mining Company (Burrows 1921, p.36). The ground was held in 1951 by the Barmill Syndicate.

On both sides of the open-cut are several shallow dumps, which in 1951, were sampled by the Barmill Syndicate. The results of this sampling are not known. The syndicate also put down 14 diamond drill holes at regular intervals under the open-cut; the logs reported calcite stringers and aplite and indicated a total of 214 m (772 feet) were drilled (Assessment Files Research Office, Ontario Division of Mines, Toronto). Diabase was the only rock type reported.

The present owner has performed stripping and bulldozing around the open-cut; this work was submitted for assessment credit in 1970.

Mineralization includes silver, cobalt arsenides, specularite, and niccolite. The author took three samples from the dump for analysis. All samples indicate higher than usual amounts of silver and cobalt. The results are shown in Table 14. Most of 20,912 ounces of silver at the Crews McFarlan production came from the open-cut (see Table 15).

TABLE 15 PRODUCTION FOR THE BARTLETT MINE (14) NOW HELD BY A. DECKER (SERGIADES 1968, p.391).

Year	Ore and conc. shipped (tons)	Cobalt pounds	Silver ounces
1918	30	—	6,527
1919	42	—	13,692
1940	1	18	—
Totals	73	18	20,219

CREWS MCFARLAN NO.2 (15)

About 450 m (1,500 feet) south-southeast of the Bartlett open-cut is a shaft known as the Crews McFarlan No.2. This part of the property is described by Burrows (1926, p.50) as follows:

> No.2 shaft, located in the southwestern part of the property, was sunk 100 feet and drifting and crosscutting amounting to 360 feet done. The work did not indicate commercial ore. A narrow vein, about a quarter of an inch in width, carrying massive smaltite and silver, was encountered in the workings. Directly west of the shaft, there is an aplite dike which showed a lens of calcite with smaltite and silver over a few feet. A shallow open-cut was made along the lens of ore by the early operators, and a few bags of high-grade material were obtained.

Fryingpan Lake Shaft (16)

About halfway between Fryingpan and Elkhorn Lakes a shaft of unknown depth has been put down on the contact between Gowganda Formation feldspathic sandstone and a northeast-trending diabase dike. Quartz-carbonate vein material with chalcopyrite was seen in the dump.

About 150 m (500 feet) south of the shaft an old pit, on the opposite side of the dike, has been sunk into the contact. No vein material was observed. The author could find no record of this work.

Gowganda Silver Mines Limited (17)

In 1969 this property consisted of 32 claims in northeast Milner Township and southeast Van Hise Township. The claims were numbered MR47400 to MR47413 and MR47418 to MR47435 and form one group of several other claim groups held by the company and described elsewhere in this report under Haultain and Nicol Townships.

HISTORY AND DEVELOPMENT

Evidence of minor prospecting in the form of small pits and shafts was observed during field work. Geochemical soil sampling and geophysical surveys have also been carried out by the present owners (Assessment Files Research Office, Ontario Division of Mines, Toronto).

GENERAL GEOLOGY

The property is underlain mainly by Nipissing Diabase which underlies much of the peninsula between Milner Bay and the North Arm of Gowganda Lake.

Gowganda Formation rocks are found underlying the diabase on both sides of the peninsula indicating that this diabase is an erosional remnant on top of the sediments. The Gowganda Formation rocks are mainly feldspathic sandstone with lesser amounts of siltstone, feldspathic greywacke, and protoquartzite. Laminated argillite of the Firstbrook Member is also present on the east side of the peninsula.

ASSESSMENT WORK DATA

Geophysical and geochemical surveys have been done by the company and the results submitted for assessment credit in 1969. Several narrow magnetic anomalies were indicated in the geophysical surveys; these anomalies were generally associated with magnetic depressions (Szetu 1969).

The geochemical survey took the form of soil sampling and analysis for silver. Several results of 1 ppm were obtained and some as high as 5 ppm but in general the results appeared to be below detection limits.

A few old pits and trenches were noted during the course of this survey.

F. Hines (18)

(Chimo Gold Mines Limited [1960])

(Northcliffe)

In 1969 F. Hines held two unsurveyed claims MR45236 and MR45237, which included the workings of the Northcliffe Prospect. This was part of the property held and diamond drilled by Chimo Gold Mines Limited in 1960. This company put down three holes totalling 301.4 m (990 feet) to explore at depth veins previously explored (possibly by Northcliffe) by surface workings and an adit 86 m (285 feet) long. The range of 44 assays was nil to 0.48 ounce of silver per ton with an average of 0.02 ounce per ton (Assessment Files Research Office, Ontario Division of Mines, Toronto).

The claims are underlain by diabase. Assessment data suggest a gentle dip to the east as interpreted from diamond drilling. Lorrain Formation underlies the lake and is in fault contact with the diabase.

Burrows (1921, p.39-40) described the property as follows:

> The Northcliff prospect is situated at the north end of the northwest arm of Gowganda lake. The property consists of about 100 acres, the principal claim of which is J.S. 282. The veins are in the Nipissing diabase, which occurs as a high ridge along the northeast shore of the lake. The ridge rises abruptly from the water's edge to an elevation of 125 feet. The relationship to the conglomerate is seen along the north line of J.S. 282 where the diabase underlies the conglomerate at 60°W.
>
> The property was operated from the fall of 1919 for about one year. Some surface work was done on a series of veins on the top of the ridge. An open-cut 25 feet long was made on a calcite vein with strike N.20°E., which averages from about one to three inches in width. Some specimens showing

crystallized smaltite and silver were taken from the open-cut. The vein is faulted ten feet west of the south end of the cut. Shallow cuts and trenches were also made on some other fractures near the open-cut. Most attention was, however, given to driving a tunnel eastward into the hill from near the water's edge. This work was stopped before it was certain that the underground extension of the surface vein carrying silver had been intersected. Several calcite veins, from one to three inches in width, and a stringer of quartz showing some silver were cut in the tunnel, but no drifting was done on them.

The tunnel is about 285 feet in length. The work was accomplished by using steam-drills, but this was not found satisfactory, and it is expected when conditions improve that a compressor plant will be installed.

Burrows' description of the contact relationship is in opposition to that suggested in the assessment work data of Chimo Gold Mines Limited as discussed above.

Lett Lake Occurrence (19)

Between the north end of Lett Lake and Highway 560 are several old workings all in pyroxene gabbro of the Nipissing Diabase.

Near the lake are three old pits but no mineralization was observed. To the west is an old shaft, possibly 15 m (50 feet) deep, with quartz and calcite in the dump material. No metallic mineralization was observed. To the west of the shaft is a small test pit put down on a 2.5 cm (1 inch) vertical quartz vein which strikes N65E. Parallel to the vein is a shear zone about 30 cm (1 foot) wide.

Logan Lake Prospect (20)

On the east shore of Logan Lake is an old shaft put down in pyroxene gabbro. The depth of the shaft is not known but it was sunk on a calcite vein which is 2.5 to 5 cm (1 to 2 inches) wide and trending N20E.

Manridge Mines Limited (21-30)

The Manridge Mines Limited property in 1969 consisted of a large north-south block of 75 claims covering the topographic feature known locally as the Mann Ridge. The company is a subsidiary of Yellowknife Bear Mines Limited and Zenmac Metal Mines Limited.

Most of the following property description is derived from a report by Thomson (1968) which was written while he was consulting for Siscoe Metals of Ontario Limited who held an option on the property. The present author here acknowledges Siscoe Metals of Ontario Limited and Thomson for the use of this report.

HISTORY

The Manridge ground is composed of several old mining properties which were among the early producers in the area although production was limited. Included in this group are the Boyd Gordon, part of the Bartlett, Crews McFarlan, Crews McFarlan-Hewitt Lake, Hewitt Lake Mining Syndicate, Mann Mine, Reeve Dobie, the South Bay Mine, the O'Brien, and the Welch.

GENERAL GEOLOGY

The ground was originally staked to cover all that area which is underlain by the Mann Ridge. This ridge represents the eastern rim of the Milner Township diabase basin and is in the form of an arch structure. The diabase dips to the east and west under sedimentary rocks of the Cobalt Group.

The following section is paraphrased from Thomson (1968, p.9-12):

Just prior to 1960 most of the Mann Ridge was held by M. Sawchuk. In 1960 Yellowknife Bear Mines acquired an interest in this ground and exploration work was done. Work included geological mapping at a scale of 1 inch to 200 feet (1:2,400) (Phelan 1960). During the years following 1960 much diamond drilling was carried out in various parts of the property; this will be discussed in greater detail when each of the old mining properties is described separately. An induced potential survey was carried out in the vicinity of the Reeve Dobie and Mann Mines.

In 1966 Zenmac Metal Mines Limited took an option on the property and in that year drilled 39 holes totalling 2579 m (8,457 feet). A further 46 holes were drilled in 1967. Geochemical and detailed geological mapping in the area of the Mann Mine was also done. Zenmac also undertook the construction of an all weather road from Highway 560 to the Mann Mine.

BARTLETT NO.1 SHAFT (21)

This shaft was put down in the early days and is just northeast of the Bartlett Open Cut (14) now held by A. Decker.

It was described by Burrows (1926, p.49-50) as follows:

> No.1 shaft, at which the most extensive work has been done, is on claim H.F. 222. It is in the lower part of the diabase sill about 500 feet west of the outcrop of the underlying quartzite which dips about 45° W. The shaft is 300 feet deep with workings on three levels, totalling over 1,000 feet. It was started on a high-grade ore shoot that extended down only 25 feet. The ore was massive smaltite and native silver in calcite from two to three inches in width. A series of open-cuts were made southwestward from the shaft on a number of lenses of ore over a distance of 350 feet. The chief gangue material with the ore is calcite, but lenses of the mineral occur with an aplite dike along which the open-cut was made. The aplite and diabase wall rock are much fractured in places and contain sheets and scales of native silver. Some of the vein material carries considerable copper pyrites. The high-grade ore consisted of smaltite with native silver and argentite. Some of the diabase and aplite carrying abundant leaf silver is of good milling grade. Most of the ore shipped from the property came from the open-cut.

A.O. Sergiades (1968, p.390) stated levels were established at 9.1 m, 30.5 m, 60 m, and 91.5 m (30, 100, 300, and 300 feet).

Most of the Bartlett production was from the open-cut (see Table 15) and some presumably came from this shaft.

CREWS MCFARLAN NO.3 SHAFT (22)

This property located west of Great South Bay, Gowganda Lake, was described by Burrows (1926, p.50) as follows:

> The most recent work was done on claim H.F. 224 in the southeastern part of the property where several veins were located by trenching. One of these, having a width of one inch, contained a shoot of high-grade ore along which an open-cut was made and a quantity of high-grade ore obtained. A shaft, No.3, situated 40 feet to the north of the open-cut and near a second vein, was sunk to a depth of 75 feet and at 50 feet a crosscut made southwestward to the silver-bearing vein on which some exploratory work was done and also on the vein located near the shaft. Some silver ore was encountered on this level, but the outlook was not sufficiently encouraging to continue operations under the high cost of operation.
>
> The ore obtained from the open-cut was of peculiar appearance as most of the calcite vein matter is very dark, almost black in colour. This dark colour is evidently due to very fine particles of magnetite disseminated in the calcite. Some of the high-grade vein shows massive native silver with argentite in calcite, the silver occurring in veinlets and masses generally near the contact with the diabase. Other samples show massive smaltite with the silver minerals. Four chains southeast of the shaft there is a two-inch aplite dike, showing calcite with niccolite and smaltite, on which a shallow pit was sunk.

BOYD GORDON (23)

The original Boyd Gordon discovery was made in 1908 (Sergiades 1968, p.392) when high-grade silver ore was discovered in outcrop to the northeast of Boyd Lake.

The following description of the workings and geology is paraphrased from Sergiades (1968, p.392):

Calcite veins strike just south of west and are locally enriched with short silver ore shoots. At the shaft, which was put down 45 m (150 feet), there are three such veins within a width of 2 m (6 feet). On the 25 m (75 feet) level crosscuts were driven north and south, each for a distance of 40 m (140 feet); 45 m (150 feet) of drilling was done on the veins. A sublevel at 12 m (40 feet) was established with stoping from this area. This work was done in 1909 and 1910, and 4,678 ounces of silver were produced during 1910 from 30 tons of ore.

CREWS MCFARLAN-HEWITT LAKE (24)

To the northwest of Milner Lake are two shafts put down by the Crews McFarlan Mining Company and later worked on by the Hewitt Lake Mining Company. Thomson (1968, p.7) indicates that the No.1 shaft, just west of the

north end of Milner Lake, was put down 45 m (150 feet). The shaft was sunk on a north-trending diabase dike which had intruded Gowganda Formation rocks. About 620 m (2,000 feet) north of here is the No.2 shaft which Thomson (1968, p.7) indicates was at least 40 m (140 feet) deep at the end of 1917.

HEWITT LAKE MINING SYNDICATE (25)

The former property located east of Milner Lake was described by Burrows (1926, p.50) as follows:

> For some years previous to 1920, the Hewitt Lake Mining Company operated a group of claims lying west of Gowganda lake and half a mile north of the Mann mines. When these were visited in 1920, no work was being done and the workings were filled with water. One shaft is reported to have been sunk to a depth of 300 feet with some lateral work, but no information is obtainable as to the silver-bearing character of the veins. The Nipissing diabase is exposed at the surface, erosion having removed the overlying sediments from a part of it. Some small patches of sediment still show on the diabase sill, consequently the workings are in the upper part of the diabase where fractures would be looked for.

According to Thomson (1968, p.53) the shaft is 95 m (312 feet) deep with levels at 15, 45, and 61 m (50, 150, and 200 feet) with a total of 130 m (430 feet) of drifting and crosscutting. Thomson also reports vein material up to 15 cm (6 inches) wide in the dump composed of white and pink calcite with erythrite. Quartz vein material up to 1.9 cm (¾ inch) in width with some chalcopyrite was also observed.

MANN MINE (26)

Native silver was discovered in Nipissing Diabase east of Boyd Lake in 1908 by Robert Mann (Burrows 1926, p.51). It was close to here that the first of five shafts was put down. Collins (1913, p.109) described the original discovery as follows:

> Mann. Mining claims H.R. 250, 251, and 252 are owned by Mann Mines, Limited. The original discovery was made on H.R. 252 in August, 1908, in a 5 inch quartz-calcite vein running nearly east and west. The gangue had been decomposed and leached out at the surface leaving a thick spine of silver visible in the face of a low diabase wall. This rich ore body proved to be limited in size. Since then a group of six parallel veins striking nearly at right angles to the first one have been exposed. The diabase near by is much shattered, probably by faulting along a north and south plane, east of which the discovery vein could not be traced.

Burrows (1926, p.51-52) described the workings of the early days as follows:

> The principal vein is No.3, which has produced almost all the ore shipped from the mine. The vein has been traced 1,300 feet by trenching, while open-cuts and underground operations indicated several ore shoots. No.3 shaft has been sunk to a depth of 200 feet with levels at 80 feet, 120 feet, and 200 feet, while No.4 shaft, located 350 feet to the east, was sunk to the 80-foot level and connected on this level with No.3 shaft. Most of the underground work was done on the 80-foot level, where three stopes were opened up to the west of the No.3 shaft and one stope 100 feet west of No.4 shaft. The east stope connects with an open-cut which was made just west of No.4 shaft. This cut is 30 feet long,

TABLE 16 | PRODUCTION FOR THE MANN MINE (26) HELD IN 1969 BY MANRIDGE MINES LIMITED (SERGIADES 1968, p.395).

Year	Ore and conc. shipped tons	Silver ounces
1912	34	36,589
1913	16	32,477
1914	18	29,756
1952	—	20,150[1]
Totals	68	118,972

[1]From the treatment of 3,094 tons of tailings.

and about 14 tons of high-grade ore were taken from it. The ore shoot pitches west at 45 degrees and does not extend below the level. An ore shoot near No.3 shaft also shows a pitch to the west and was 50 feet in length on the 80-foot level. The ore shoot was stoped from about 15 feet below the level to near the surface. A third stope was made on the vein 130 feet west of No.3 shaft and was also carried from 15 feet below the level to near the surface. The shoot was about 60 feet long on the level. A fourth smallshoot about 15 feet in length was found near the end of the west drift on the 80-foot level. High-grade ore was also encountered on the 120-foot level, 200 feet west of No.3 shaft; 450 feet of drifting along the vein was also done on the 200 foot level of the No.3 shaft.

The vein is about one to 5½ inches in width. The ore was hand-sorted at the surface and bagged for shipment. Twenty tons of low grade ore were treated at the Millerett mill in 1912, and from this 715 ounces of fine silver were produced. The high-grade ore is chiefly native silver with smaltite in calcite. Forty-eight tons of high-grade silver ore, from which were recovered 99,076 ounces of silver, were shipped from the property. One shipment averaging 2,000 ounces of silver per ton contained $2 per ton in gold.

On the Mann property, there are two pronounced north and south ridges. On the west ridge, all of the veins have a strike of a few degrees north of east, whereas on the east ridge there are a number of veins which strike nearly north, in addition to a number which strike east. This has suggested the possibility of faulting. The underground work proved a strong north-south fault dipping 45°W., with a crushed zone about four feet in width. The western part of No.3 vein was displaced 15 feet to the south by this fault. The Boyd-Gordon mine, H.S. 371, was taken over by the Mann mine in 1912.

Production figures are given in Table 16.

In 1952, Siscoe Metals of Ontario Limited rehabilitated the No.3 shaft which resulted in limited production (Table 16).

As stated earlier in this property description extensive diamond drilling was done on the property and much of this was done in the vicinity of the Mann shafts (Figure 8). Through this work four vein zones known as the "A", "B", "C", and "D" zones were delineated. These zones are, according to Thomson (1968),"the best silver deposits" known on the property; they occur near the central part of the diabase. The vein zones strike about east and are made up of numerous calcite and quartz calcite veins. "C" zone is near the No.3 shaft and a cross section through this is illustrated in Figure 9.

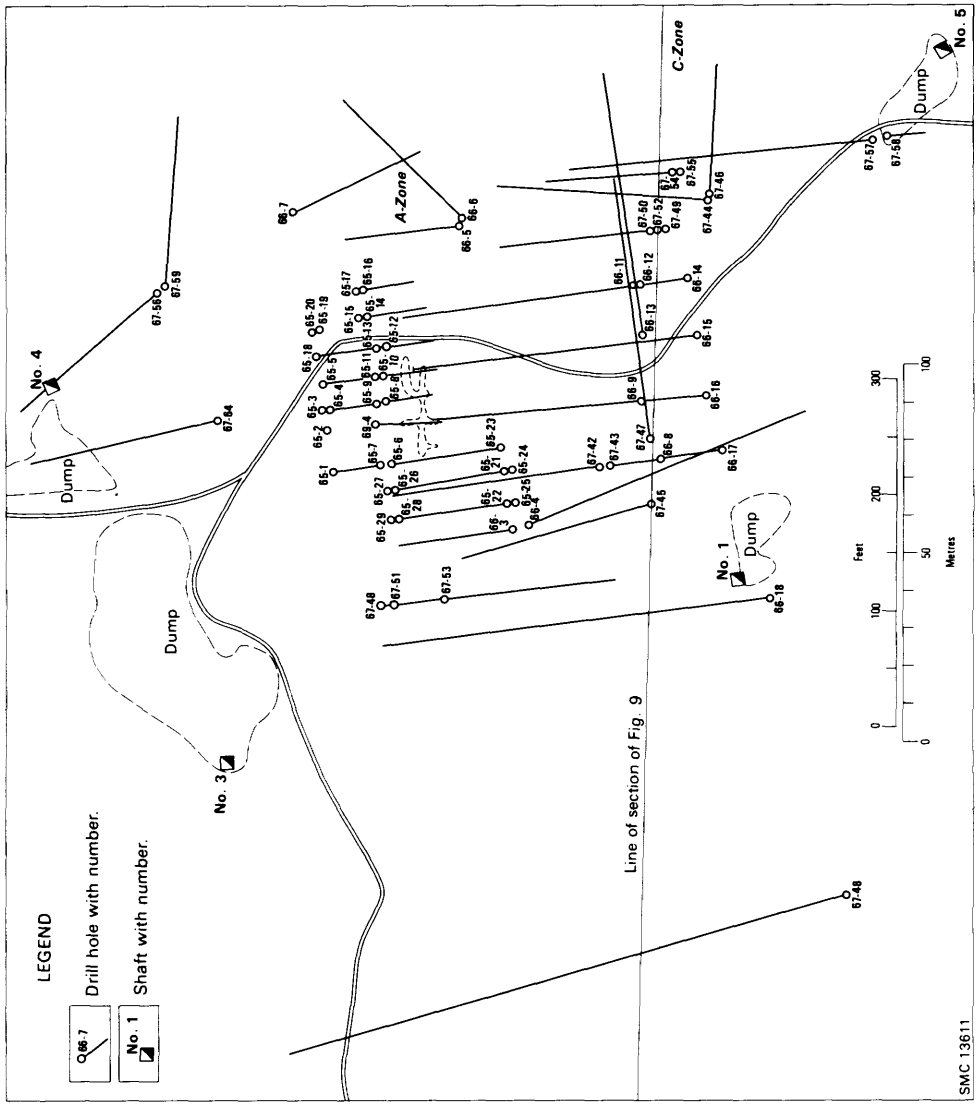


Figure 8–Plan of shafts of Mann Mine (26) and diamond drilling on the "A" and "C" zones. Modified from plans of Manridge Mines Limited.

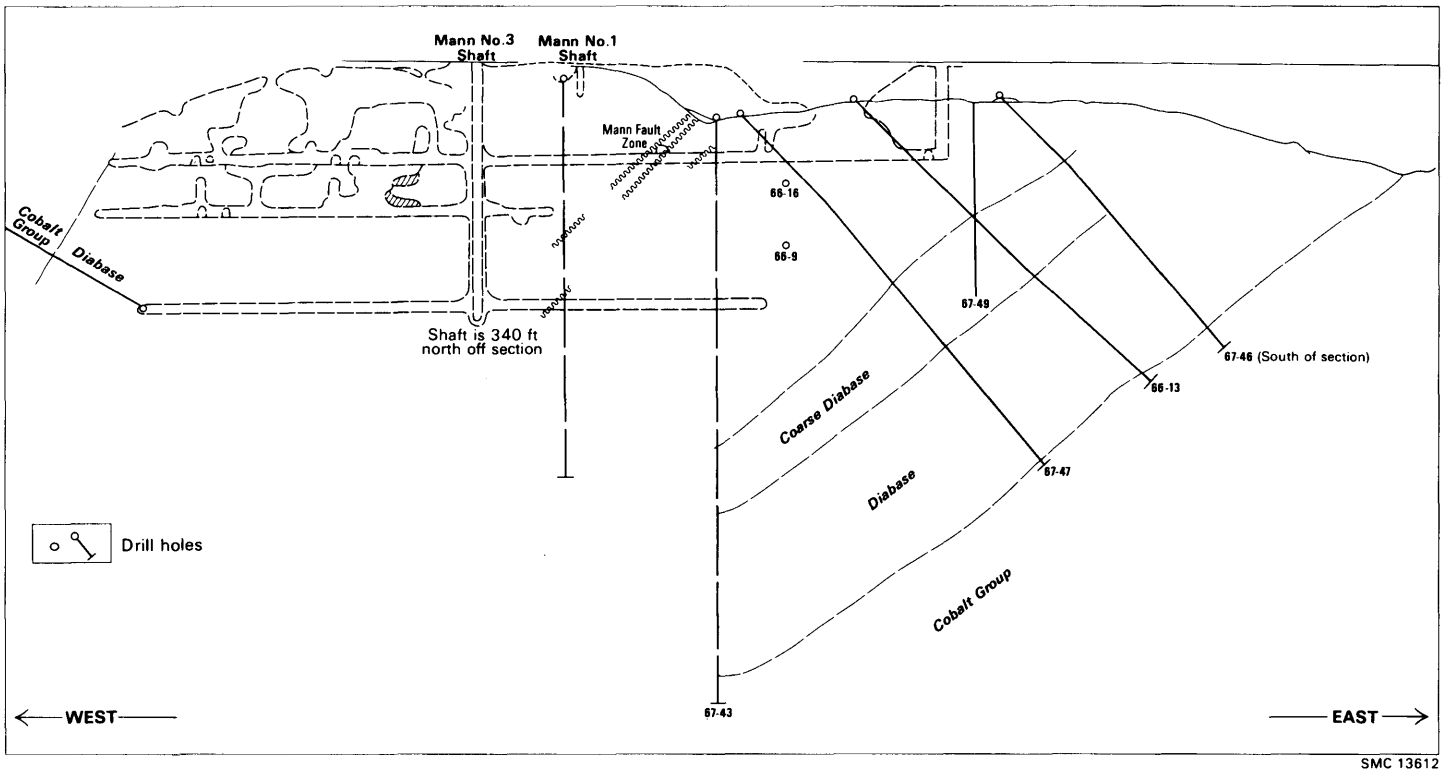


Figure 9–Cross section through Mann "C" zone. Modified from plans of Manridge Mines Limited. Line of section is shown on Figure 8.

The reserve estimates in 1968 were 19,000 tons grading 35 ounces of silver per ton (Sergiades 1968, p.394).

The property was optioned to Siscoe for production and a limited amount of ore was produced for treatment at the Siscoe mill. Owing to the nature of the ore, production ceased in 1970.

MYRTLE LAKE AREA (27)

Mapping by Liard (1963) indicates numerous calcite veins near the south shore of Myrtle Lake; most of these small veins have a northward strike and were investigated by diamond drilling. The logs of two holes were submitted for assessment credit; these holes totalled 125 m (409 feet). Several calcite veins with chalcopyrite and hematite were logged.

SOUTH BAY AND O'BRIEN (28)

These old mines are located just east of a small lake west of the Great South Bay of Gowganda Lake. The property was described by Burrows (1926, p.55) as follows:

> The South Bay Mining Company did exploratory work several years ago on claims H.S. 723 and 724. They also sank a shaft to a depth of 100 feet on the O'Brien claim, H.S. 602, lying to the west. There is a series of five calcite-quartz veins near the shaft, with a general northwest strike, running from H.S. 602 to H.S. 723. In addition to the shaft, several large open-cuts were made on veins. A description of the property is given in a report on the Gowganda Silver Area:
>
> "Active development was in progress on that part of the property which adjoins the southeast claim of the Bartlett mine when visited in October 1912. A great amount of surface trenching had been accomplished, and open-cuts had been made on some of the veins. Smaltite, niccolite, and silver were found at different points. At one place, 90 feet south of the shaft, some high-grade ore had been taken from a cut about 20 feet in length. The shaft was down 100 feet, and a crosscut was being run to the south to intersect three northwest-southeast veins which showed on the surface. A north crosscut was also being run towards a vein with strike N.60°W. which crosses from the Bartlett property. A 50-foot shaft had also been sunk just south of the north boundary line, on a vein parallel to the one just mentioned. The material on the dump consists of diabase, with aplite and calcite. Native silver and argentite occur in some of the vein material. Part of the vein about one inch in width consists of crystallized epidote and quartz carrying silver and argentite."
>
> "Columnar structure is quite pronounced in the diabase, and along the joints veins have been formed, suggesting the filling of cooling cracks. Some of the country rock is quite reddish and coarse grained, and traceable into the dark grey diabase. Much of the reddish rock adjoining the veins is greatly stained with cobalt and nickel bloom."

Four diamond drill holes totalling 263 m (864 feet) were put down in 1951 to examine the O'Brien area and a new shaft was put down about 180 m (600 feet) northwest of the original shaft. This work was done by Cobalt Badger Silver Mines Limited and the results are on file with the Ontario Division of Mines.

These old mines were also part of the Ciglen Ryan Group when it was mapped in 1947 by A.D. Hellens (1947) and re-examined in 1951 by Hriskevich (1951).

TABLE 17 | PRODUCTION FOR THE REEVE DOBIE MINE (29) HELD IN 1969 BY MANRIDGE MINES LIMITED (SERGIADES 1968, p.397).

Year	Ore and conc. Shipped	Silver ounces
1910	54	45,800
1916	11	22,723
1917	6	14,486
1919	—	1,200
1920	10	4,375
Totals	81	88,584

REEVE DOBIE MINE (29)

The Reeve Dobie Mine is located between Reeve and Dobie Lakes. The main work on the property was from two shafts and an adit which are shown on Map 2348 (back pocket). From these workings a total 88,584 ounces of silver has been produced; production figures are shown in Table 17. The property was described by Burrows (1926, p.53) as follows:

> The Reeve-Dobie mine, which had been operated intermittently since 1908, was closed down in the fall of 1920. It has been worked by various interests. The original discoveries were among the most spectacular in the camp, and from open-cuts along short ore shoots some very rich silver ore was shipped. The early work consisted in prospecting for high-grade ore which was found to occur in a number of short shoots along a mineralized zone about 700 feet in length. Most of the high-grade ore was taken from a number of open-cuts. Later a mill was erected which ran for a short time treating diabase carrying minute veinlets containing native silver. The mill was reopened in 1919, a flotation plant was added, and ore from an open-cut or glory hole to the south of the shaft was treated. The ore was dropped to the 50-foot level and trammed to the shaft. The mill rock was said to carry from 30 to 35 ounces of silver per ton. Underground operations were carried to the 200-foot level, and considerable drifting and crosscutting was done. A number of strong faults were encountered in the workings. Very little work has been done on the west side of the property where there is much fracturing.

During the same period as the exploratory diamond drilling was being done at the Mann Mine, Zenmac Metal Mines Limited were also putting down numerous diamond drill holes in the vicinity of the Reeve Dobie.

A well mineralized grab sample taken by the author from the dump of the adit and analyzed gave 101.10 ounces of silver per ton, 0.29 percent cobalt, 0.10 percent nickel, and a trace of copper.

WELCH MINE (30)

The Welch Mine is south of the Reeve Dobie and is probably represented by the shaft labelled "30" on Map 2348 (back pocket). According to Sergiades (1968, p.399) active mining produced 1,000 ounces of silver in 1910 from the shipment of one ton of ore.

Maralgo Mines Limited [1957] (31)

About 900 m (3,000 feet) southeast of Reeve Lake and 90 to 180 m (300 to 600 feet) south of a small lake are three occurrences described by Hoiles (1957). Sampling of old pits and trenches in diabase was done by Maralgo Mines Limited in 1957; other work by the same company is described under the properties J. Beadman (13) and Beatrice Reeve (35).

Hoiles (1957) describes three occurrences which he named from north to south; the South "A" showing, the South "B" showing, and the South showing.

The following descriptions are paraphrased from Hoiles (1957).

South A showing: A fracture with a N40E strike and a dip of 70 degrees northwest has been trenched for about 11 m (37 feet); the fracture branches at the southeast and is terminated by a north-striking slip which dips 20 degrees east. There is pyrite mineralization associated with the fracture. Four samples were taken for assay across the zones, the highest result was 0.20 ounce of silver per ton across 35.6 cm (14 inches) (Hoiles 1957). Complete results are in Table 18.

South B showing: There is a northeast-striking vertical zone about 60 cm (2 feet) wide with two fractures; bleached sections associated with the fractures are 20 to 25 cm (8 to 10 inches) wide with calcite, pyrite, and galena. Assay results are shown in Table 18.

There is a pit on this occurrence which was found during the present survey; erythrite was observed and a grab sample taken by the writer gave 0.18 percent cobalt with traces of silver, copper, and nickel. About 30 m (100 feet) to the west is an old shaft; white quartz-carbonate vein material up to 10 cm (4 inches) with minor chalcopyrite was observed in the dump material.

South showing: This occurrence consists of a trench 2 m (6 feet) deep and 15 m (45 feet) long on a shear zone with a strike of N70E and a dip of 70 degrees north. The diabase is pink near the surface but additional trenching indicated this alteration colour disappeared at depth. The zone was sampled at 1.5 m (5 feet) intervals by Maralgo Mines Limited and assayed for silver; the results are shown in Table 18. A selected mineralized sample taken by the author gave 3.84 ounces of silver per ton and 6.3 percent cobalt.

Montreal River Silver Mines Limited (32-34)

In 1969 the company held three claim groups as follows:

1. The Hedges Claim (TC 119) (32)

TABLE 18 ASSAY RESULTS FOR MARALGO MINES LIMITED [1957] (31) FROM HOILES (1957).

Showing	Width in inches	Silver ounces
South A	14	0.20
	10	0.16
	32	tr
	20	0.16
South B	12	0.24
	10	tr
	8	1.64
South	36	tr
	36	0.10
	24	0.12
	28	0.08
	30	0.22
	24	0.14
	30	tr
	24	0.18
	30	0.16

2. The Milne Claim (TC 118) (33)
3. TC 128 and TC 129 (34)

THE HEDGES CLAIM (32)

This surveyed claim is near the southeast end of Milner Lake. The north-trending footwall contact of the Milner Lake diabase basin crosses the extreme west of the claim. The diabase is overlain by the Gowganda Formation.

Burrows (1908, p.18) describes a vein (not located by the present author) on the property as follows:

> On T.C. 119 (Hedges claim) a vein or fissure with strike N.58° E., and about one inch in width has been traced several hundred feet. At one point for about ten feet, where it could be seen, the vein showed massive smaltite, in parts of which there was disseminated silver.

THE MILNE CLAIM (33)

This surveyed claim is between Milner Bay and Boyd Lake. The eastern half of the claim is underlain by conglomerate and siltstone of the Gowganda Formation which is overlain to the west by part of the west-dipping east rim of the Milner Lake Nipissing Diabase basin.

The following is from Burrows (1909, p.18):

> On T.C. 118 (Milne claim) the main vein or fissure strikes northwest, and had been traced about 150 feet. It appeared to be richest at the southeast end, where a pit about 8 feet deep had been sunk. In this pit for a few feet the vein is very rich in silver, which showed as a rib in the calcite. Here the vein is from one to two inches in width. In part of the vein the silver is replaced by argentite. At the northwest extension of the vein a shaft had been sunk about 15 feet, and a little silver was found.

This may be the shaft shown on Map 2348 (back pocket) in the southwestern part of the claim. Sergiades (1968, p.411) reports a 2.5 cm (1 inch) calcite vein with argentite and high silver values.

TC128 and TC129 (34)

The author has no information on these claims near Elkhorn Lake except they are underlain by diabase.

Beatrice Reeves (35)

In 1969 the property consisted of two surveyed claims SW1 and SW2, which cover part of and are also north of Reeve Lake in Milner Township. Fine-grained diabase underlies the two claims. A small test pit was found by the writer in the northeastern part of SW1. The pit was put down on a vertical 5 to 7 cm (2 to 3 inch) quartz-carbonate vein striking at N55W with minor chalcopyrite mineralization.

Silver Ore Zone Mines Limited (36,37)

A total of seven claims to the northwest of Myrtle Lake were held by Silver Ore Zone Mines Limited in 1969; they were numbered MR33794 to MR33798, MR36622, and MR36623. There are four old shafts on the property; one is the old Bishop shaft (36) and another is thought to be the Transcontinental shaft (37).

Results of geological mapping (Lill 1964) and a magnetometer survey (Wagner 1964) plus the logs of three diamond drill holes totalling 317.5 m (1,041 feet) have been submitted for assessment credit. Other work carried out by Silver Ore Zone Mines Limited includes bulldozing and cleaning out several old trenches and pits, pumping out shafts and diamond drilling.

GENERAL GEOLOGY

The eastern half of the property is underlain by feldspathic greywacke and feldspathic sandstone of the Gowganda Formation, conglomerate occurs in the

extreme southeastern part. Most of the west half of the property is underlain by diabase, which according to J.R. Lill (1964) dips under the sedimentary rocks at 25 to 30 degrees east . A diamond drill hole shown on Map 2348 (back pocket) indicates the diabase underlies the sedimentary rocks and is dipping to the east.

Lill (1964) describes numerous faults represented by linear depressions, one of these is the Milner Bay fault.

A magnetometer survey indicates generally anomalous highs in the areas underlain by diabase. The company also carried out a geochemical survey (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake). The Northern Miner (1966) also stated a 168 m (550 feet) long conductor had been delineated by an electromagnetic survey near the shaft just south of the Bishop shaft.

THE BISHOP (36)

One of the shafts held by the company was formerly operated by the Bishop Mining Company. This was described by Burrows (1926, p. 49) as follows:

> The Bishop Mining Company operated a group of claims lying northwest of the northwest arm of Gowganda lake. A shaft on Claim T.C. 136 was sunk 130 feet with drifting of 20 feet. The surface of the diabase exposed here is near the top of the sill. A small remnant of the overlying sediment, partly altered to adinole, occurs along the road north of the shaft. The diabase is well fractured and some silver occurs in veins at the surface, but underground operations were discontinued before sufficient lateral work was done to determine the possibilities of the veins underground. The veins have an approximate northeast strike and are nearly vertical. Some of the vein material on the dump shows bloom and flakes of native silver.

A grab sample taken by the author and analyzed indicated 0.09 percent cobalt and traces of silver, nickel, and copper. Lill (1964) reports an assay of 24.78 ounces of silver per ton from these workings. Federal government files report six diamond drill holes in the shaft area totalling 190 m (300 feet) which encountered veins.

TRANSCONTINENTAL (37)

To the northeast of the Bishop shaft is another shaft which is believed to be that put down by Transcontinental Silver Mines Limited in 1909; the shaft is reported to be 25 m (75 feet) deep (OBM 1910, p.119). About 10 m (30 feet) west of the shaft is a trench about 12 m (40 feet) long at N25W; blocks of pink and white calcite up to 20 cm (8 inches) in maximum dimension with minor chalcopyrite mineralization were noted in the dump material.

OTHER SHAFTS

There are two other shafts on the property; one is 180 m (600 feet) northwest of the Bishop and the other is 335 m (1,100 feet) south. Grab samples taken

by the author from the dumps of these shafts gave traces of silver, cobalt, nickel, and copper. Between the Bishop shaft and the shaft to the south several quartz veins from 6 to 12 mm (¼ to ½ inch) are exposed.

Geological mapping by Lill (1964) indicates numerous small trenches and pits, presumably old, occurring on the property.

D. Sutherland (38)

In 1969 the property consisted of eight claims on the peninsula between Milner Bay and the North Arm of Gowganda Lake; the claims are numbered MR47743 to MR47748, MR47552, and MR47553.

The southwest part of the property is underlain by Gowganda Formation conglomerate with lesser amounts of feldspathic mudstone and protoquartzite. Overlying the sediments is fine- to medium-grained pyroxene gabbro with local amphibole gabbro; granophyre is present on the east side of Gordon Bay and Beaton Bay. This lower contact of the diabase dips to the northeast.

Seven diamond drill holes were put down on the property between 1968 and 1970; the total length of these holes is not known as the logs submitted for assessment credit did not give the depth of each hole. Minor mineralization was noted in some holes, but nothing of economic value reported (Assessment Files Research Office, Ontario Division of Mines, Toronto).

A small test pit on the shoreline near Beaton Bay was excavated on a fracture system trending N10W. Some quartz-carbonate vein material was noted in the dump.

Tego Silver Cobalt Mines Limited [1961] (39,40)

F. LORING PROSPECT (39)

During the period from about 1950 to about 1961 Tego Silver Cobalt Mines Limited held 10 claims surrounding Gorman Lake; this has been referred to as the F. Loring Prospect by Sergiades (1968, p.411). Numerous veins in the area have been subjected to pitting and trenching over the years and three shafts to the east of Gorman Lake were put down in the early days; the position of these three shafts on Map 2348, back pocket, is approximate as they were not found during field work but were taken from a sketch map of the property which accompanied a report by M.B.R. Gordon (1950).

In 1951 the company submitted diamond drill logs for assessment credit; the drilling consisted of four holes totalling 161 m (529 feet). Another four holes totalling 296 m (973 feet) were drilled in 1961. The latter drilling was done on or just northeast of Logan Lake.

Thomson (1965) visited the property in 1951 and his report gives descriptions of some of the more important veins.

No.1 vein is at the northwestern edge of Logan Lake. The following para-

graph is paraphrased from Thomson (1965).

The vein consists of a series of disconnected circular to irregular shaped carbonate bodies along the centre of a northeast-striking diabase dike; the largest of these bodies was about 50 by 30 cm (20 by 12 inches). In some bodies epidote is associated with the carbonate. Cobalt mineralization was present in some, with no regularity to its distribution. The vein has been pitted and trenched.

Other veins are composed of carbonate with local sphalerite, chalcopyrite, and erythrite mineralization. More detailed descriptions are given in Thomson (1965).

ARMSTRONG FRACTION (40)

This claim was also once held by Tego Silver Cobalt Mines Limited; it is a former claim just south of TC118 on the west shore of Milner Bay.

In 1909 a shaft was put down 30 m (100 feet) with a drift of 23 m (75 feet) running north; the work was done by Silvers, Limited (OBM 1910, p.119).

Vein material described from the dump by Gordon (1950) contains silver and one assay gave 121.4 ounces of silver per ton.

United Reef Petroleums Limited (41)

(La Brick)

The two surveyed claims held by this company in 1969 were MR14850 and MR14851; these are west of Milner Bay and east of Milner Lake. MR14850 is an approximate restaking of HS343 known as the La Brick claim.

Most of the property is underlain by a variety of Gowganda Formation rocks. The contact with the Nipissing Diabase passes through the southwestern part of the property. The main shaft was collared in the diabase in the southwestern part of the La Brick claim.

The following is from (OBM 1910, p.118):

> The La Brick claims adjoin the Mann property on the east. Two shafts were sunk to a depth of 40 and 45 feet respectively during the summer of 1909. Work was resumed on the claims in March, 1910, under the direction of Mr. O. Henry.

A later description of work is as follows; (OBM 1913, p.124):

> On the west shore of Gowganda lake, just east of the Mann mines, the La Brick Mining Syndicate have been carrying on development work under Superintendent G.R. Rogers. The main shaft is 200 feet in depth. On the 100-foot level a drift has been run northeast 100 feet, and on the 200-foot level drifts run northeast 200 feet and southeast 104 feet.
>
> The plant consists of two 50 h.p. boilers, a hoist and compressor developing 500 cubic feet of air per minute.

The location of the other shaft is not known.

Utopia Mining and Holding Corporation Limited (43)

(Utopia Gold Mines Limited)

(Gowganda Lake Property)

In 1969, the property consisted of one claim, MR35142, on the west shore of the North Arm of Gowganda Lake. The claim is part of the former Gowganda Lake property and is underlain entirely by fine- to medium-grained diabase.

A shaft of unknown depth was put down in the early days. Grey and pink calcite up to 5 cm (2 inches) with some specularite was seen in the dump. Trace amounts of silver, cobalt, nickel, and copper were obtained from the analysis of a grab sample taken by the author.

In 1963 Utopia Gold Mines Limited put down seven diamond drill holes totalling 317.8 m (1,042 feet); five of these holes were put down near the shaft and the other two on the claim to the north which was held by the company at that time. The logs of these seven holes were submitted for assessment credit. One hole (No.4) at 22 m (74 feet) indicated a vein 3 mm (⅜ inch) which gave an assay of 26.86 ounces of silver per ton. This vein is about 6 m (20 feet) north of the shaft (Figure 10). Small calcite veins were indicated in other holes (Figure 10) but no assay results were given in the logs except as shown in Figure 10.

HAULTAIN TOWNSHIP

A. Allison (44)

(Former Trinity-Chibougamau Mines Limited Option)

The property consists of five surveyed claims in Haultain Township; they are just north of Babs Lake and east of Everett Lake and include claims GG4480, GG5238, GG5239, MR18160, and MR18161.

There are numerous pits and trenches (Figure 11 and Map 2349), some of which were put down in the early days and others were blasted by Trinity-Chibougamau Mines Limited. In 1953, part of this group, at least, was held by Cobalt Consolidated Mining Corporation Limited as indicated by the logs of two diamond drill holes submitted for assessment credit. A geological report and map (Phelan 1962) at the scale of 1:2,400 and logs for two diamond drill holes were submitted by Trinity Chibougamau Mines Limited.

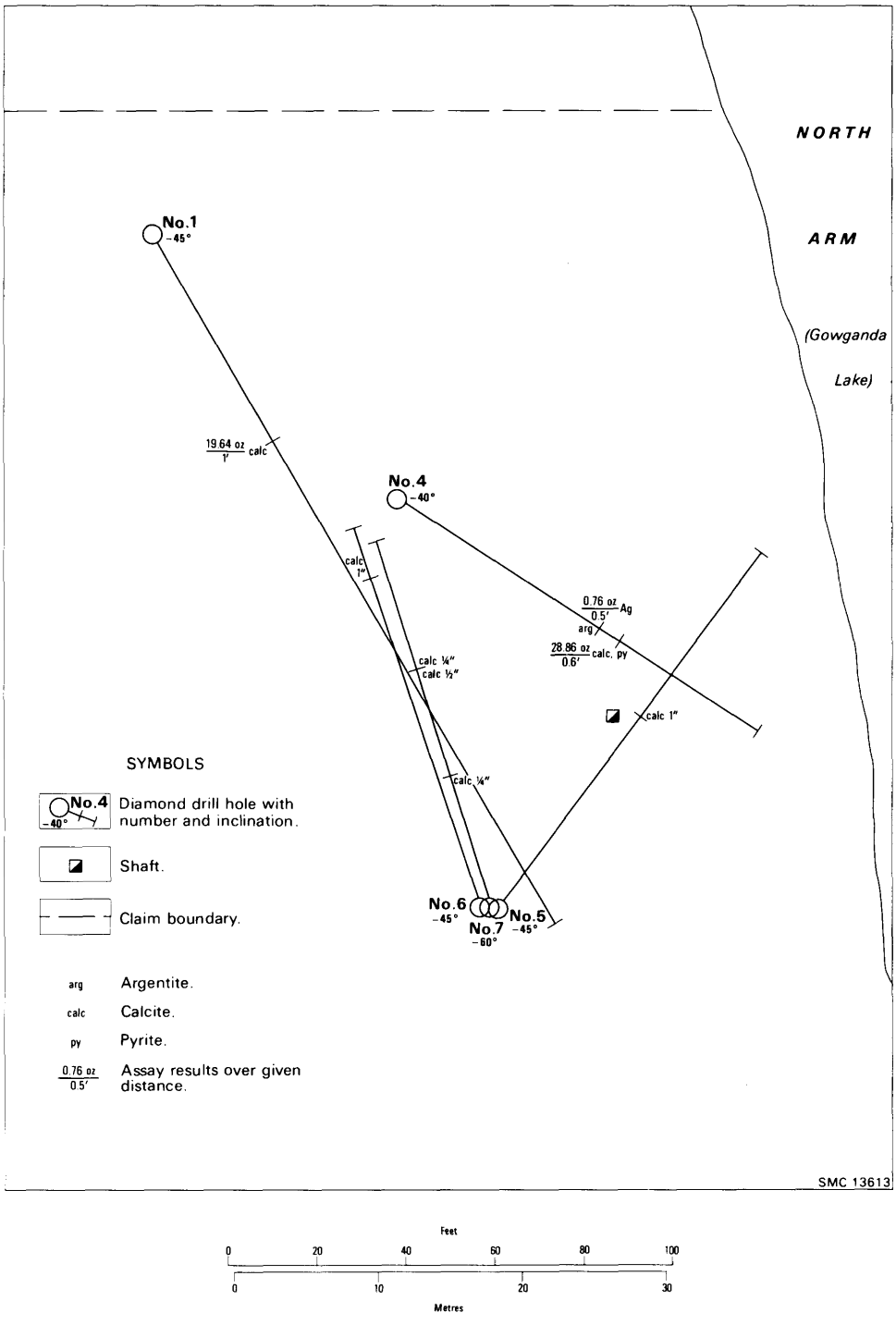


Figure 10–Diamond drilling program at Utopia Gold Mines Limited (43). Modified from assessment work data.

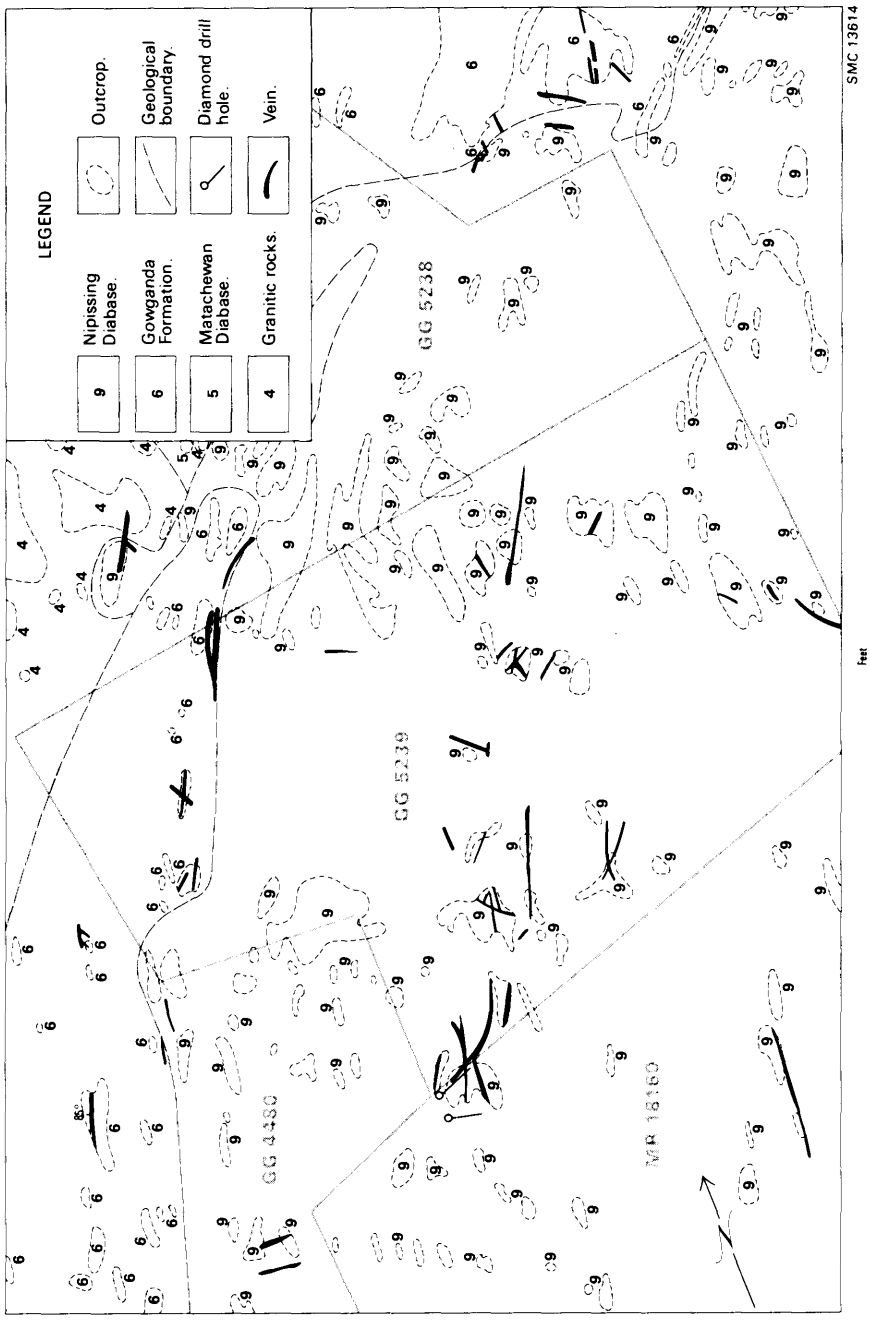


Figure 11–Plans of geology and veins on A. Allison (44) property. Modified from map of Trinity Chibougamau Mines Limited, 1962.

GENERAL GEOLOGY

The oldest rocks on the property are Early Precambrian trondhjemite which underlies the western halves of GG4480 and GG5238. Matachewan-type diabase dikes are also found. Overlying the trondhjemite to the east is the Gowganda Formation which in this area consists mainly of conglomerate with local areas of greywacke and arkose. The sediments form a wide belt 30 to 150 m (100 to 500 feet) striking northeast across eastern GG4480, northwestern GG5239, and central GG5238. The rest of the claim group is underlain by Nipissing Diabase, generally medium to coarse grained. Cylindroidal joints are common.

STRUCTURAL GEOLOGY

The following is paraphrased from L.G. Phelan (1962).

The thickness of the diabase on the property is probably somewhat less than the 270 m (900 feet) in the Miller Lake basin. Limited evidence suggests that the sill dips gently to the east.

There are two prominent topographic features which are postulated faults. The Mire Lake fault, striking northeast, is definitely identified as a fault in workings south of the property. On this claim group the fault is a deep depression which in part marks the diabase-sedimentary rock contact. The other, known as "K" fault on the Castle property strikes north through the property.

ECONOMIC GEOLOGY

The following paragraph is paraphrased from Phelan (1962).

There are numerous veins which are mainly calcite and less commonly quartz. Sulphide minerals associated with the veins include chalcopyrite, bornite, pyrrhotite, and pyrite; cobalt arsenides are found locally. The main vein direction is N30E with steep dips, but other directions are found. The greatest number of veins have been found in the central part of GG5239 (Figure 11). Low silver values have been obtained in assays from some of these veins, but no pattern as to direction, type, or area has been recognized as more favourable than another. Some silver values have also been obtained from the sediments which are below the diabase.

The diamond drill holes put down by Cobalt Consolidated Mining Corporation Limited were collared in the northwestern part of MR18160 (Figure 11). The two shallow holes both indicated several small veins with hematite and chalcopyrite along with minor cobalt in one and galena in another.

The Northern Miner (1963) reported that Trinity-Chibougamau Mines Limited were disappointed with their drilling as nothing of ore grade was found in the numerous veins encountered.

Blair Gowganda Silver Mines Limited (45)

In 1969 the company held five surveyed claims in one group in Nicol and Haultain Townships just north of Leroy Lake. The claims are numbered GG4077, GG4816, GG4833, HS718, and WJ11 and have been held by the company since the late 1920s.

Early Precambrian basalt underlies the western parts of GG4077 and GG4816 and the extreme eastern part of WJ11. Local pryoclastics occur on GG4077. Dikes of Matachewan-type diabase are also found. The Early Precambrian rocks are overlain by the Gowganda Formation. Conglomerate is the most common rock type found with local feldspathic greywacke and feldspathic sandstone in the northern part of the property.

These rocks are intruded by Nipissing-type pyroxene gabbro. The diabase on the property appears to be in the form of a local arch dipping east and west under the overlying sediments and volcanics.

A late diabase dike strikes east across GG4816.

During the summer of 1927 surface trenching was done by the company (ODM 1927, p.151); signs of these trenches were found during the present survey in central GG4077. During the same year a two-compartment shaft was sunk to 30.7 m (111 feet) (ODM 1927, p.151-152). In 1927 the shaft was continued to 61 m (200 feet) with stations at 31.5m and 55 m (105 and 182 feet) where minor drifting was done (ODM 1928, p.166). In 1929 the shaft was sunk another 15 m (49 feet) along with 76 m (250 feet) of drifting and 33 m (110 feet) of crosscutting (ODM 1930, p.148). This shaft was not found during the field work.

During the field work a shaft was found near the east boundary of claim GG4816. The apparent depth of about 3 m (10 feet) of this shaft appears to preclude it from being that described above.

Besides this shaft, old trenches were observed in central GG4077.

F. Blake (46, 47)

In 1969 F. Blake held five unsurveyed claims in two blocks. The first block (Lost Lake Group) (46) consists of three claims numbered MR47688 to MR47690 and are in the southeastern part of Haultain Township and mostly over the water of Lost Lake; there is little known about these claim and they will not be discussed further. The other two claims are discussed under Cobalt Nugget (47).

COBALT NUGGET (47)

The other two claims are in the southwestern part of Haultain Township and are numbered MR45614 and MR45615; they include the old shaft of Cobalt Nugget Silver Limited and are also known as the Donaldson claims.

The property is underlain by the north-trending dike-like body of Nipissing Diabase which outcrops along the west shore of Dinny Lake. Burrows (1926, p.40) described the property as follows:

Some exploratory work was done during 1925 on the property, which lies northeast of Burke lake . Heavy fracturing occurs near the east side of the diabase ridge near Dinny lake. The most prominent vein strikes N. 25° E., and on this a shaft was sunk 40 feet. Faulting has followed along the calcite vein, and secondary chalcedonic quartz has cemented the earlier calcite. Open spaces or vugs occur in the vein structure, which dips from the shaft on the east side near the bottom. No silver or cobalt minerals were recognized in the vein at the bottom of the shaft, but some cobalt bloom occurs in pieces on the dump. Some rich specimens of silver ore are reported from near the surface.

The veins occur in a downfaulted mass of diabase, but the horizon of the exposed veins, with relation to the top and bottom of the sill, is not known.

In 1963 Siscoe Metals of Ontario Limited submitted the logs of two diamond drill holes for assessment credit; the holes which were just north and south of the Cobalt Nugget Shaft totalled 33.1 m (109 feet) and were all in diabase; the logs reported several carbonate stringers with mineralization including pyrite, chalcopyrite, galena, bornite, and one occurrence of silver and cobalt.

F. Bowen (48-50)

In 1969 F. Bowen held 13 unsurveyed claims over and west of McRae and Crawford Lakes. The property is underlain by the Nipissing Diabase which is dipping east. Included in the property are the old workings known as the MacAlpine (48), the McRae (49), and the Rawhide (50) which are all described separately.

THE MacALPINE (48)

The old MacAlpine shaft is located west of Crawford Lake in what is part of the former Hollinger Group of six claims which were mapped and reported by W. Gerrie (1952). This report was submitted for assessment credit.

Gerrie reported that considerable work was done in the early days on these claims but no ore was found.

General Geology

All of the claims are underlain by Nipissing Diabase which dips to the east. Gerrie (1952) stated there is a possible slight downwarp in the sill striking slightly east of north across the centre of the claim group. The diabase is medium to coarse grained and Gerrie (1952) reported granophyric rock near the west shore of Crawford Lake.

Structural Geology

There are four faults traversing the claim group: the fault through Crawford Lake on the east, and another fault on the west, both strike north. Crossing the

central part of the property are two other faults which strike northeastward. All of these are represented topographically by strong linear depressions.

Economic Geology

Veins have been found mainly in the valleys resulting from the two central faults, and strike at right angles to the faults. The main showing found by Gerrie (1952), and by the author, is that on which the MacAlpine shaft was sunk in the early days. Gerrie (1952) reports the shaft to be 30 m (100 feet) deep but no other information is known. There are also trenches in the vicinity of the shaft but the vein is obscured by debris. Gerrie (1952) reports that the vein appears as a crack on higher ground and has minor erythrite.

Approximately 120 m (400 feet) southwest of the shaft, Gerrie (1952) reports an aplitic vein with minor erythrite and low silver values.

In the eastern of the two central fault valleys Gerrie (1952) reports two other veins which were not found by the author and therefore their position on Map 2349 (back pocket) is approximate only.

About 300 m (1,000 feet) west of the north end of Crawford Lake is another shaft which was estimated by Gerrie (1952) to be about 10 m (30 feet) deep. It was sunk from a short adit running into the cliff. A crack containing calcite and a little mineralization represents the vein in the adit.

Diamond drill logs signed by Gerrie and dated 1954 were submitted for assessment credit for work around the MacAlpine shaft. Three short holes just northwest of the shaft totalling 22.2 m (73 feet) were put down to test the projection of the MacAlpine vein. No significant values were recorded in the logs.

About 90 m (300 feet) southwest of the MacAlpine another four holes totalling 26.5 m (87 feet) were drilled; it is thought these holes were drilled to test the fault zone near which the MacAlpine shaft was sunk.

THE McRAE (49)

There is a shaft (the McRae shaft) which is estimated to be 9 m (30 feet) deep at the southwestern end of McRae Lake. The dump material contains quartz, up to 5 cm (2 inches) and aplite. A small test pit 150 m (500 feet) north of the shaft has been put down on a fracture with quartz-carbonate vein material up to 5 cm (2 inches). There are two small test pits about 90 m (300 feet) northwest of McRae Lake. One of these (shown on Map 2349, back pocket) was sunk on an aplite dike 60 cm (2 feet) wide striking N55W.

These properties were worked in 1956 by Worldore Mining Claims Limited and in 1962 by Castlebar Silver and Cobalt Mines Limited. Drilling to the west of the shaft on a projected strike of the vein failed to find any significant values. Worldore put down three holes totalling 64 m (210.4 feet) and Castlebar drilled six holes totalling 497 m (1,622 feet) (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Worldore put down two more holes northwest of the pit north of the shaft; these totalled 36 m (118.4 feet).

The Rawhide shaft is about 460 m (1,600 feet) northwest of Crawford Lake. It is a two-compartment shaft of unknown depth. It appears to have been put down on a system of 2.5 cm (1 inch) calcite veins striking N80W. Mineralization observed includes hematite and pyrite.

In 1956 the ground was optioned to Worldore Mining Claims Limited which sank a series of nine short diamond drill holes totalling 184 m (537.5 feet) along a vein zone west-northwest of the shaft. These veins are shown on the map accompanying the report of Gerrie (1952). Carbonate veins up to 3.8 cm (1½ inches) were reported in the logs submitted for assessment credit.

Castlebar Silver and Cobalt Mines Limited held an option on this part of the property in 1962 in which year they drilled six holes totalling 465.8 m (1,466.7 feet) along what appears to be the same system of veins that Worldore drilled on. No significant silver values were obtained from assays (Assessment Files Research Office, Ontario Division of Mines, Toronto).

J. Bowen (51)

In 1969 Mrs. J. Bowen held claim HR405; the eastern boundary of Haultain Township cuts through the centre of the claim which is underlain by diabase. In Chown Township is a small test pit which is just off Highway 560 (see Mackean 1968). The pit was put down to test a 10 to 15 cm (4 to 6 inch) calcite vein with hematite mineralization.

Calico Silver Mines Limited (52)

In 1969 Calico Silver Mines Limited held four unsurveyed claims, MR45368 to MR45371, between the west boundary of Haultain Township and Dinny Lake.

The property is underlain by a north-trending dike-like body of Nipissing Diabase which has intruded feldspathic sandstone and arkose of the Lorrain Formation on the west side. A late northeast-trending dike cuts across the property.

This property is part of the ground formerly held by New Redwood Gold Mines Limited in 1951. An electromagnetic survey indicated several linear anomalies on which diamond drilling was recommended but the author has no information on whether this was carried out. The geophysical survey was submitted for assessment credit.

Castlebar Silver and Cobalt Mines Limited (53-58)

At the end of 1969 the company held 33 contiguous claims with an additional three claims adjacent to the northwest of the main block. The following

claims in the main block were surveyed MR13009 to MR13016, MR18026 to MR18029, MR18566, MR18893 to MR18895, MR19109, MR19145 to MR19148, MR19246, MR19302 and MR19303, MR27888 to MR27890, and MR29299. The following claims were not surveyed : MR29329, MR29425 and MR29426, MR32833, and MR32834. The three adjacent claims, MR23998 to MR24000, are surveyed and known as the Millcrest.

The southwest and the north-central parts of the main block property are underlain by Gowganda Formation rocks consisting mainly of feldspathic sandstone and greywacke with local conglomerate and ferruginous sandstone in the southwest.

These sedimentary rocks flank a local arch along the northeastern part of the Miller Lake diabase basin. Isolated remnants of Gowganda rocks occur locally on the diabase.

The general geology of the Millcrest claims is described under that heading.

For the purposes of description of individual occurrences or prospects on the property it is divided (by the author) under the following headings:

1. Babs Lake Area (53)
2. Flatstone Lake Area (54)
3. Millcrest (55)
4. MR13014 (56)
5. MR18026 and MR18027 (57)
6. Ottawa Gowganda (58)

BABS LAKE AREA (53)

Geological mapping of this area was done by E.L. MacVeigh (1952) and the results were submitted for assessment credit. The geology shown in Figure 12 represents part of the area mapped by MacVeigh and is modified from his map.

In addition to this mapping, diamond drilling as shown on Figure 12 has been done. In 1952 five holes were drilled near the shaft on MR19145 totalling 252 m (827 feet). Further drilling on the property took place as follows:

1955 - 5 holes totalling 259 m (848 feet)
1959 - 5 holes totalling 574.58 m (1,885.1 feet)
1960 - 5 holes totalling 933.3 m (3,062 feet)

There are three additional holes not shown on Figure 12; these are shown on a map submitted for assessment credit but there were no logs.

North of Babs Lake on MR19145 is an old shaft which MacVeigh (1952) estimated to be about 20 m (70 feet) deep with no lateral workings.

The following paragraph is paraphrased from MacVeigh (1952).

The shaft vein, which strikes N10W and dips 70 degrees west, is about 2.5 cm (1 inch) wide and is exposed south of the shaft. Two assay results from the vein indicated 18 and 52 ounces of silver per ton and one returned 3 percent cobalt. The prospect is near the middle of the diabase sheet.

Drilling around this shaft apparently was not encouraging. The locations of the drill holes in this area are shown on Figure 12. From the 37 assays reported in the logs of the 1959 drilling the best result was 1.74 ounces of silver over 1 cm (½ inch) (Assessment Files Research Office, Ontario Division of Mines, Toronto).

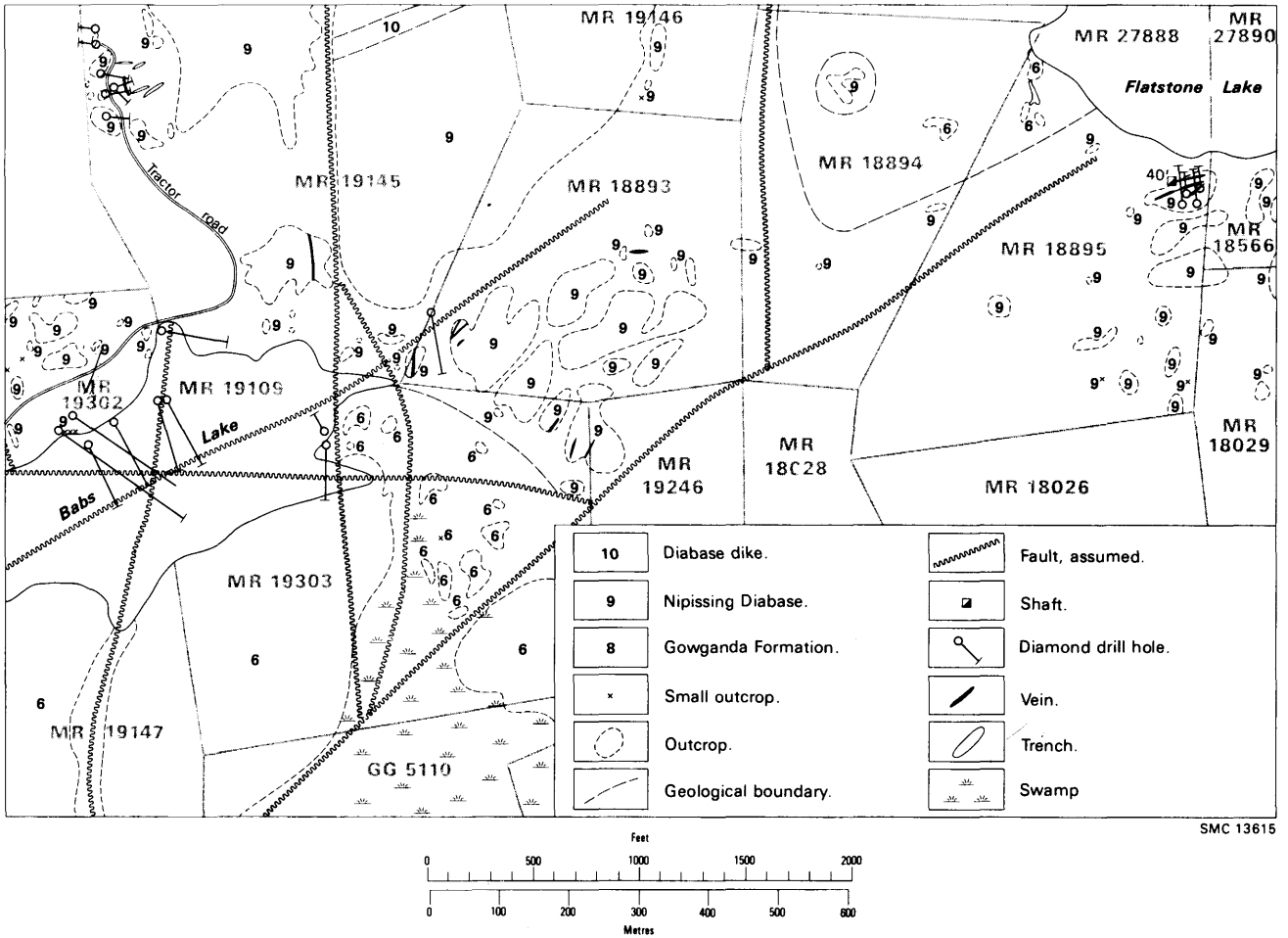


Figure 12–Geology and diamond drilling in the Babs Lake Area (53) and Flatstone Lake Area (54) of Castlebar Silver and Cobalt Mines Limited. Modified from plans of Castlebar.

East of Babs Lake in the southwestern part of MR18893 are several veins (Figure 12) which were examined by the 1955 diamond drilling by Castlebar. Out of 23 reported assays in the logs the highest silver value was 0.64 ounce per ton (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Numerous linear elements which have been interpreted as faults cross Babs Lake (Figure 12 and Map 2349, back pocket). Seven diamond drill holes were put down in 1959 and 1960 to examine these zones for mineralization.

The following paragraph is paraphrased from W.R. Newman (1961).

A zone, averaging 90 m (300 feet) in width, with numerous quartz-carbonate veins was indicated. Assays from these veins gave values up to 18.12 ounces of silver per ton over 30 cm (12 inches) in Hole No.29 and 9.3 ounces per ton in Hole No.15 (Assessment Files Research Office, Ontario Division of Mines, Toronto).

FLATSTONE LAKE AREA (54)

This occurrence, on claim MR18895, is at the southwestern end of Flatstone Lake. There are several veins in the area (Figure 12) mostly with an east-northeast strike; a shaft estimated by MacVeigh (1952) to be 12 m (40 feet) deep has been put down on one of the veins. There is chalcopyrite and bornite mineralization and two assays indicated 2.34 ounces over 5 cm (2 inches) and 0.42 ounce over 15 cm (6 inches) of silver per ton (MacVeigh 1952).

In 1952 four diamond drill holes which were put down to test the veins near the shaft (Figure 12) totalled 247 m (812 feet). The logs indicated the drilling was in diabase and that out of 39 assays for silver 33 indicated a trace with other results as follows: 0.06, 0.08, 0.08, 0.14, 0.22, and 0.25 ounce per ton (Assessment Files Research Office, Ontario Division of Mines, Toronto).

MILLCREST (55)

This part of the Castlebar property consists of the three claims MR23998 to MR24000.

Early Precambrian mafic metavolcanics underlie the southwestern part of MR23999. The north half of MR24000 is underlain by Early Precambrian trondhjemite which occurs along the shore of Everett Lake. The lower contact of the Nipissing Diabase strikes east through the centre of the claim; this rock type underlies the remainder of the three claims except for a Late Precambrian diabase dike which is inferred to strike east across MR23998 near the southern boundary.

Burrows (1926, p.39-40) described the property as follows:

> The property consists of groups of claims located south of Everett lake and on the east side of Miller lake. Work was started on the north group late in the autumn of 1925, calcite veins with cobalt bloom being found in the diabase near the hanging-wall side. By March, 1926, a shaft had been sunk 65 feet, the vein being about 12 inches wide. Some native silver is reported from the vein.

Work continued in 1926 and shaft sinking continued to 34.2 m (112 feet) with about 60 m (200 feet) of drifting at this level (ODM 1927, p.164).

Apparently the workings flooded as they had to be pumped out the following year and shaft sinking was continued. By the end of February 1928 a depth of 94 m (308 feet) had been attained (ODM 1928, p.171).

The property was held from 1935 to 1942 by Fairmac Silver Mines Limited. According to federal government files this company dewatered the shaft and did 300 m (1,000 feet) of development work in the years 1935 to 1936. They found seven veins varying from 10 to 20 cm (4 to 12 inches) with cobalt and some silver mineralization.

In 1957 the logs of two diamond drill holes totalling 37.5 m (123 feet) were submitted for assessment credit by Nichaul Mining. These holes were put down southwest of the shaft. Logs of three more diamond drill holes totalling 53 m (175 feet) were submitted for assessment credit; one of these holes was near the shaft and the others in the southeastern part of MR23999.

The property was acquired by Castlebar in 1958.

Newman (1961) describes several localities on MR23999 which have been explored for silver. North of the shaft are parallel veins giving assays from 0.5 to 1.0 ounce per ton of silver (Assessment Files Research Office, Ontario Division of Mines, Toronto).

During the present survey calcite with chalcopyrite, pyrite, and specularite was observed in the dump material of the shaft.

MR13014 (56)

This claim is underlain by diabase except for an isolated remnant of Gowganda feldspathic sandstone in the western part of the claim.

There is a trench about 110 m (350 feet) long with calcite veins. Two diamond drill holes on the claim, presumably to test the extension of these veins were put down in 1962; the holes totalled 246 m (807 feet). The highest silver assay reported in the logs is 0.84 ounce per ton over 17.8 cm (7 inches) (Assessment Files Research Office, Ontario Division of Mines, Toronto). A grab sample taken by the author from the trench dump indicated on analysis 0.45 percent copper and traces of silver, cobalt, and nickel.

MR18026 and MR18027 (57)

Newman (1961) indicates that a number of veins with silver were observed on MR18026. In 1959 Castlebar drilled three holes along a northeast strike and in a southeast direction in the northwestern part of MR18026. The holes were spaced about 8 m (25 feet) apart and totalled 189m (620 feet). Although numerous veins were reported in the logs submitted for assessment credit no assay results were given.

Two old test pits, one on each claim, were observed during the field work.

OTTAWA GOWGANDA (58)

The old Ottawa Gowganda shaft is on MR13016 near the south boundary of Haultain Township.

Except for Early Precambrian metavolcanic rocks in the southwestern part of the claim it is underlain by Nipissing Diabase. The diabase dips south under the metavolcanics.

Burrows (1926, p.38) gave the following description:

> The property, consisting of claims L.O. 74, 75, and 76, is situated half a mile west of Lost lake. The rock exposures are dominantly Nipissing diabase and a little conglomerate of the Cobalt series overlying the diabase. In addition, there is a narrow diabase dike intruding the sill diabase on claim L.O. 76.
>
> In the early days of Gowganda, a shaft was sunk to a depth of 207 feet and a little lateral work done on the 100- and 200-foot levels. During 1925, much trenching, with some blasting, was done on the surface. This work exposed a number of veins, showing calcite, quartz, copper pyrites, bornite, specular iron, and cobalt bloom, and a little silver was occasionally seen in the veins and wall rock. The company is known as the Ottawa Gowganda Mining Company, Limited.
>
> Erosion appears to have cut only into the upper part of the diabase sill, which in the Miller Lake section is a favourable horizon for silver deposits.

In 1962 the present owners drilled six holes in the vicinity of the shaft totalling 815 m (2,682 feet). A breakdown of 172 assays for silver which were reported in the logs shows that 10 returned nil, 55 gave traces, 40 were from 0.01 to 0.1 ounce per ton, 55 from 0.1 to 0.5 ounce per ton, 7 from 0.5 to 1.0 ounce per ton, and 4 between 1 and 5 ounces per ton. Four anomalous assays were 7.83 ounces over 5 cm (2 inches), 81.50 ounces over 22.9 cm (9 inches), 88.50 ounces over 3.8 cm (1.5 inches), and 216.4 ounces over 7.6 cm (3 inches) (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Two further drill holes totalling 245 m (806 feet) were put down on MR13012 to the northeast of the shaft. The highest silver assay obtained was 10.32 ounces over 2.5 cm (1 inch) (Assessment Files Research Office, Ontario Division of Mines, Toronto).

K.A. Fletcher (60)

In 1969 the property consisted of three surveyed claims about halfway between Bloom and Wigwam Lakes, the claims are numbered HR383, HR385, and HR386.

Most of the claim group is underlain by Nipissing Diabase which is locally granophyric. The diabase dips to the east under the intruded Gowganda Formation. Two major faults, the McRae Lake and the Wigwam Lake traverse the property.

Two small test pits near the north shore of McRae Lake on HR386 have been blasted into the diabase. One is on a 30 cm (1-foot) epidote-rich aplite dike which strikes N60E. The other is on a 10 cm (4-inch) quartz-carbonate vein striking N55W. Mineralization observed included pyrite and erythrite; upon analysis a grab sample taken by the writer gave traces of silver, cobalt, nickel, and copper.

To the east on claim HR385 is a shaft of unknown depth which was put down on a 5 cm (2-inch) quartz vein. No mineralization was observed in the dump rock.

Gowganda Silver Mines Limited (62-66)

In 1969 the company held 63 unsurveyed claims in Haultain Township; for the purposes of this report these claims have been divided into five groups:

1. Bloom Lake Group (62) - 18 claims: MR47463 to MR47480
2. McRae Lake Group (63) - 14 claims: MR47456 to MR47466, MR47167 to MR47169
3. Mire Lake Group (64) - 9 claims: MR47145 to MR47153
4. Sigs Lake Group (65) - 15 claims: MR47154 to MR47166, MR47170 and 47171.
5. Wigwam Lake Group (66) - 5 claims: MR47180 and MR47223 to MR47226.

The other two claims are in the southeastern part of the township and their description is included with the Calcite Lake Group in Nicol Township.

BLOOM LAKE GROUP (62)

In the assessment work data submitted by the company on all their claims this is referred to as the "F" Group.

Outcrops of Early Precambrian quartz diorite occur along the shores of Bloom Lake. The Nipissing Diabase on the property is a "tail" from the Miller Lake basin and dips to the east under the quartz diorite.

Workings on the claim group consists of an adit on the east shore of Bloom Lake and several old test pits. The adit was driven along a series of 5 to 15 cm (2 to 6 inches) calcite veins which strike N40E and dip 80 degrees northwest. A pit on the west shore of the lake was put down to test a 5 cm (2-inch) vertical calcite vein with minor erythrite mineralization which strikes N65E. These two workings were observed during mapping for this report.

A further three pits were found to the west of Bloom Lake during a geophysical survey of the claim group (Szetu 1969). A sample with chalcopyrite and erythrite from one of these pits analyzed 0.61 ounce of silver per ton and 7.72 percent copper; a sample from one of the other pits gave 0.5 ounce of silver per ton, 1 to 2 percent copper, and 0.1 percent cobalt (Szetu 1969).

Magnetic and electromagnetic surveys were carried out over the claim group (Szetu 1969). A series of magnetic anomalies were indicated within the diabase and considered to be associated with fault zones (Szetu 1969). Several conductor zones were indicated by the electromagnetic survey; these also were considered to be associated with fault zones (Szetu 1969).

McRAE LAKE GROUP (63)

This is referred to as Group "G-4" by the company.

The southeast half of the property is underlain by Gowganda Formation rocks, consisting mainly of feldspathic sandstone and conglomerate with feldspathic greywacke and siltstone occurring locally. The upper contact of the Nipissing Diabase, which underlies the rest of the group strikes north-northeast.

Soil sampling indicated no anomalous zones (Shaw 1969).

Two north-trending magnetic zones were indicated in the geophysical surveys (Szetu 1969). One of these is along the east shore of Crawford Lake and the other southeast of McRae Lake (Szetu 1969).

MIRE LAKE GROUP (64)

The company refers to this as the "E" Group.

The northwestern part of the property is underlain by feldspathic sandstone and conglomerate of the Gowganda Formation. Feldspathic sandstone also underlies the south end of the group just west of Flatstone Lake. The ground between these two areas is underlain by Nipissing Diabase; both contacts dip south-southeast. A late diabase dike cuts across the south of the claim group.

A pit, 3 m (10 feet) deep, just south of Mire Lake has been put down on a calcite vein zone in conglomerate. The zone strikes N10W and dips 65 degrees west and contains pyrite and specularite mineralization.

The results of a geochemical survey (Shaw 1969) and a geophysical survey (Szetu 1969) were submitted by the company for assessment credit. The geochemical survey, which consisted of soil sampling had only four analyses above zero. One of these, about 425 m (1,400 feet) south of Mire Lake, indicated 3 ppm of silver (Shaw 1969).

The magnetic survey indicated a northeast-trending magnetic low with a "narrow but moderately strong high magnetic zone along the southeast side" (Szetu 1969).

SIGS LAKE GROUP (65)

This is known as Group "G-1".

Most of this group is underlain by Gowganda Formation rocks of all types except breccia and lithic greywacke; these sedimentary rocks form much of the central area of the Flatstone Lake basin of Nipissing Diabase. The diabase dips under the sediments from the north and the south. A late diabase dike strikes northeast across the property.

Soil sampling indicated a very local anomaly of 3 ppm silver about 500 m (1,600 feet) east of the north end of Sigs Lake (Shaw 1969).

This is referred to as Group "G-3".

Feldspathic greywacke and conglomerate of the Gowganda Formation overlie a tongue of Nipissing Diabase.

Along the east shore of Wigwam Lake are two small test pits and some trenching. A near vertical quartz-carbonate vein at N25E contains erytherite, chalcopyrite, and malachite mineralization. An analyzed grab sample taken by the author from the dump indicated 0.45 percent copper and traces of silver, cobalt, and nickel.

No significant anomalies were indicated by geochemistry (Shaw 1969) and geophysics (Szetu 1969).

Haultain Lake Veins (67)

Between Haultain Lake and the Montreal River are numerous aplite dikes and quartz veins. The aplite dikes have a dominant east trend but locally vary to a northeast trend. They are up to 60 cm (2 feet) in width. The aplite dikes also occur to the northeast of Haultain Lake where they reach a width of 30 cm (12 inches) and have a more varied strike. The quartz veins have variable strikes and are up to 25 cm (10 inches) in width.

J.G. Jewell (68)

In 1969 the property consisted of surveyed claim ED40 about 0.8 km (½ mile) northwest of Wigwam Lake.

The hanging-wall contact of the diabase strikes northeast across the southeastern part of the claim. The Gowganda Formation here is feldspathic greywacke. The diabase ranges from fine to coarse grained and is locally granophyric and red.

A north-striking 10 cm (4 inches) aplite dike was found by the author during the field work.

J. Melisek (69)

In 1969 this property consisted of four surveyed claims straddling Bloom Lake in the northeastern part of Haultain Township. The claim numbers are AK22, LO224, LO225, and GG5763.

A narrow strip of Early Precambrian quartz diorite runs along the east shore of Bloom Lake and widens to the south where it is exposed in the southeastern part of AK22 on the west shore of Bloom Lake. Argillite and siltstone of the Gowganda Formation nonconformably overlie the quartz diorite to the east. Intruding these older rocks is medium- to coarse-grained Nipissing Diabase which

dips to the east. This diabase is a "tail" of the Miller Lake basin.

A 1.5 m (5 feet) deep test pit was found on the west shore of Bloom Lake on LO224. The pit was put down to test a 2.5 cm (1 inch) calcite vein in diabase which strikes N65E and dips 80 degrees north. The diabase has been sheared; brecciated pieces of diabase were observed in the vein which has been displaced about 15 cm (6 inches). Erythrite and cobalt-nickel arsenides were observed.

Miller Creek Prospect (70)

On the west side of Miller Creek, about 200 m (700 feet) north of Everett Lake, a shaft of unknown depth has been sunk on the contact between foliated amphibolite and Matachewan Diabase. Quartz is present in the dump material.

About 820 m (2,700 feet) west-northwest of the shaft is a small test pit on a quartz vein in foliated amphibolite. The vein is 10 cm (4 inches) wide and strikes N60W and dips 55 degrees southwest.

McIntyre Porcupine Mines Limited (72-76)

In 1969 this property was composed of 25 leased claims in Haultain Township and were numbered as follows: HS350 to HS357, HS364 to HS369, LM101, LM105 to LM110, RSC99, RSC100, RSC102, and RSC104. These claims, all of which were leased in 1967 to United Siscoe Mines Limited, include the Capitol, The Castle Nos.2 and 3, and the Everett Mines.

THE CAPITOL (72)

The Capitol is on claim HS351. A description of early work was given by Burrows (1926, p.32-33):

> Work was done on claim H.S. 351, formerly called the Symmes-Young. A strong, attractive north-south vein, carrying iron-cobalt-nickel arsenides, was discovered in 1908 and exposed by trenching for 700 feet on this and the adjoining claim to the north. In places there are several parallel veins, from an inch to three inches in width, exposed in trenches. A shaft was sunk 44 feet on the vein at a point where the width was 12 inches. At a depth of 30 feet, there were several veins exposed in a width of 15 inches. A sample of the grey cobalt-nickel-bearing minerals examined by J.A. Reid contained 12.44 percent cobalt and 13.31 percent nickel. The ore carried less than an ounce of silver per ton.
>
> To explore the property, the Capitol management proposed to sink a shaft into the underlying diabase sill. The shaft, located 60 feet west of the vein, passed through 110 feet of sediments of the Cobalt series which overlay Keewatin greenstone; at a depth of 819 feet, where sinking was discontinued, the formation was Keewatin greenstone. At the 800-foot level, crosscuts 273 feet east and 182

TABLE 19 PRODUCTION FOR THE CAPITOL MINE (72) HELD IN 1969 BY McINTYRE PORCUPINE MINES LIMITED AND LEASED TO UNITED SISCOE MINES LIMITED. (SERGIADES 1968, p.377).

Year	Ore and conc. shipped (tons)	Cobalt pounds	Silver ounces	Nickel pounds
1951	180	14,894	480,214	
1952	258	12,181	731,172	
1953	455	25,638	1,011,730	
1954	794	29,637	992,017	
1955	638	24,450	775,663	
1956	513	31,362	885,845	4,657
1957	491	20,569	657,403	4,638
1958	547	22,055	684,005	3,667
1959	563	27,303	1,026,218	5,312
1960	643		1,419,258	
1961	500		1,008,669	
1962	640		879,052	
1964	1,701		217,410	
1966				552
Totals	7,923	209,474	10,837,181	18,826

TABLE 20 SHAFTS, CASTLE AND CAPITOL MINES (ODMNA 1969, p.116).

	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth below Surface
				feet	feet
CAPITOL MINE					
Capitol Shaft	HS351	Vertical	2	Surface	819
Capitol winze	HS351	Vertical	2	778	1,131
Inclined haulageway	HS351	27	2	1,125	1,425
Capitol Cobalt shaft	HS351	Vertical	1 (inactive)	Surface	38
CASTLE MINE					
No. 1 shaft	RSC106	Vertical	1 (inactive)	Surface	460
No. 2 shaft	RSC101	Vertical	(inactive)	Surface	160
No. 3 shaft	RSC101	Vertical	2	Surface	850

feet west were made. Further work, by diamond-drilling from this horizon, located the contact with the sill diabase at 1,039 feet from the surface.

In an amalgamation of Capitol Silver Mines Limited and Trethewey Silver Cobalt Mines Limited, the new company of Castle-Trethewey Mines Limited was formed in 1929. Operations closed in 1931 but attempts to operate the mine

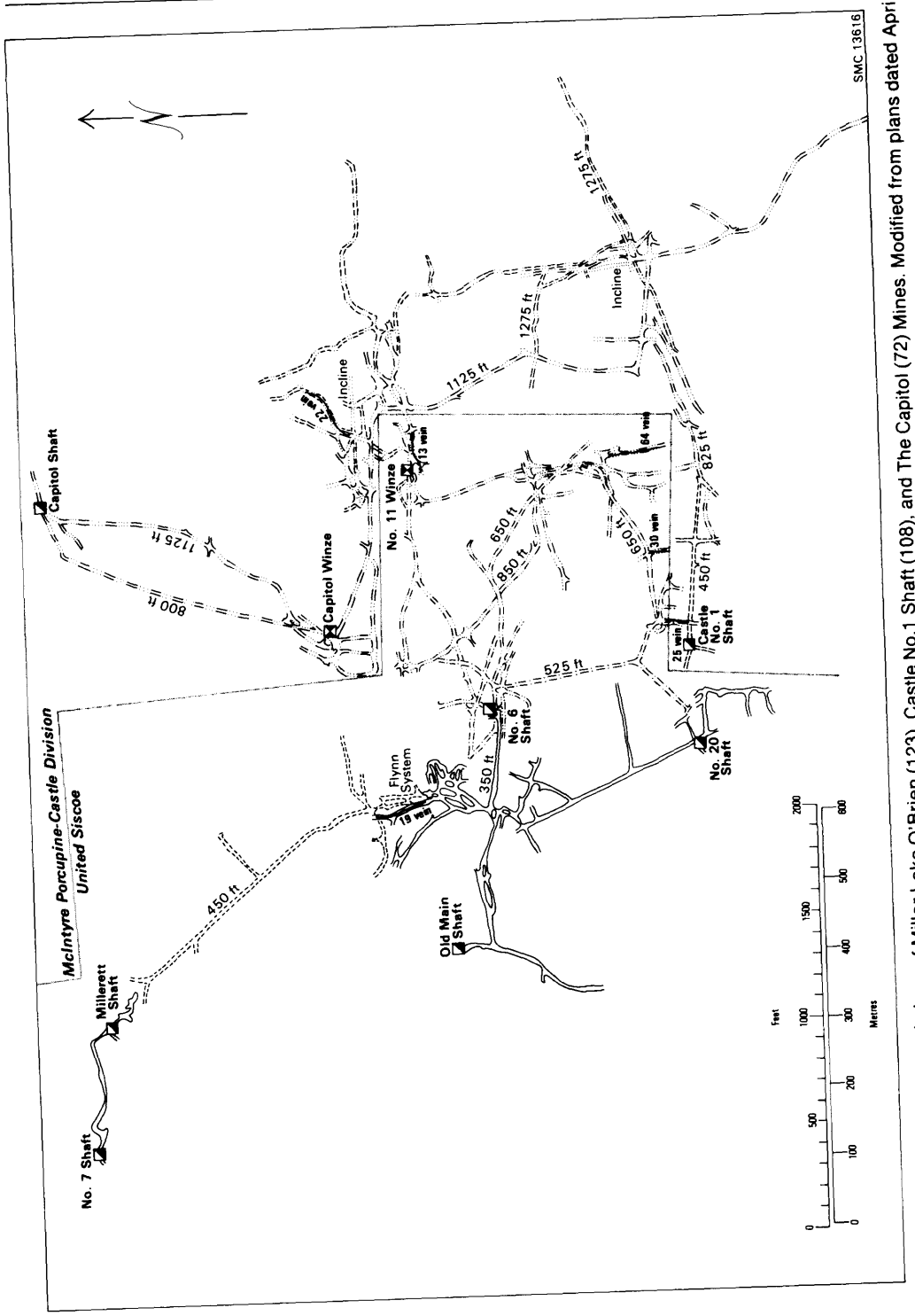


Figure 13–Partial underground plans of Miller Lake O'Brien (123), Castle No.1 Shaft (108), and The Capitol (72) Mines. Modified from plans dated April 1968, in the Annual Report of Siscoe Mines Limited for 1967.

were renewed in 1948 when work was commenced in the Capitol workings. The property was taken over in 1959 by McIntyre Porcupine Mines Limited. Production figures are shown in Table 19 and a summary of the shafts in Table 20. The mine was closed because of a lack of ore in 1966. In 1967 United Siscoe Mines Limited took a long-term lease on all of McIntyre's Gowganda area property with the idea of re-examining the old workings for additional ore. This has met with success as the Siscoe Annual Report indicates that 55 percent of the 1969 production came from the Capitol workings which have been connected through underground development to the Siscoe No.6 shaft area. Figure 13 shows parts of the underground workings of the Capitol and adjacent mine workings.

Moore (1955, p.33) described part of the geology in the mine as follows:

> From the shaft a drift 1,500 feet long was driven S.25°W. to the diabase, on the 800-foot level. A winze was sunk from the 800-foot level to the 1,125-foot level, and from this level an inclined haulage way was sunk to the 1,425-foot level, the deepest in Gowganda. The dip of the sill, which averages 16°E. for the workings, is becoming nearly flat, indicating that the bottom of the Miller Lake basin is being approached. Many faults have been encountered, some several hundred feet in length. They dip 35°-45 °E. and are much steeper than the upper contact of the sill. The veins are mainly in the hanging wall sides of these faults. Vein No.133 on the 1,200-foot level had a very productive shoot about 250 feet long and of similar height, which produced over 800,000 ounces of silver. High-grade ore was found during the summer of 1954 in a continuation of the rich vein described as occurring on the 1,200-foot level of the Siscoe mine.

CASTLE TRETHEWEY NO.2 AND NO.3 (73)

According to Sergiades (1968, p.378) this property was held in 1917 by the Castle Mining Company Limited and then in 1918 by the Trethewey Silver Co-

TABLE 21 PRODUCTION FIGURES FOR CASTLE TRETHEWEY MINE (73) HELD IN 1969 BY McINTYRE PORCUPINE MINES LIMITED UNDER LEASE TO UNITED SISCOE MINES LIMITED.

Year	Ore and conc shipped tons	Cobalt pounds	Silver ounces
1920	45	254	48,373
1921	30	—	33,952
1922	9	1,530	40,098
1923	44	5,295	146,981
1924	163	15,994	544,575
1925	346	32,708	961,950
1926	313	32,443	979,890
1927	312	32,536	932,806
1928	310	33,557	800,968
1929	272	34,453	879,505
1930	238	47,125	723,226
1931	144	63,952	368,697
Totals	2,226	299,847	6,461,021

balt Mining Company Limited. It would appear that these two companies amalgamated in 1922 to form Castle Trethewey Mines Limited. The property was in production from 1920 to 1931 and produced a total of 6,461,021 ounces of silver (Table 21). Shafts are summarized in Table 20 and illustrated in Figure 14.

The geology and development history are summarized by Burrows (1926, p.33-37):

Operations were begun on this portion of the company's holdings in the fall of 1919. A series of veins were located by trenching near the west line of the claim. The veins are continuations of fractures that were worked several years previously on claim R.S.C. 102 by the Miller Lake and Everett mines. They strike approximately N.30°W. and dip S. 85°S.W. At the surface, the silver deposit consisted of a series of closely spaced calcite and quartz veins over a width of 18 inches. In sinking No.2 shaft, the veins were found at times to unite into fewer and wider veins, a width of five inches of high-grade ore being occasionally encountered. Native silver, iron-cobalt-nickel arsenides, copper pyrites, and specularite occurred in portions of the veins. Where several narrow veins occurred closely spaced, one would carry ore and an adjacent one be practically barren, with the values shifting from one vein to another at different horizons. The shoot as developed had a length of 80 feet, extending to about the 150-foot level. The broken ore was passed over picking tables and the high-grade ore together with silver-bearing wall rock gave a grade of shipping ore of approximately 1,000 ounces per ton. Exploratory work in the vicinity of this ore shoot did not reveal ore, although a number of strong calcite veins were located.

In the spring of 1920, a prospector discovered a high-grade vein in the Keewatin near the contact with the underlying diabase on which an open-cut was first made showing a shoot 30 feet in length. Oxidation extended down several feet, and a number of bags of loose fragments of silver, up to 15 inches in length, were sacked. Solid ore when first encountered showed a width of three inches of silver, arsenides, and calcite.

To develop the ore, a vertical shaft (No.3) was started in the fall of 1920. The contact was reached at a depth of 30 feet and was confused, since the Keewatin rock here is a fine-grained hornblende diabase. The high-grade vein was found to continue from the Keewatin into the Nipissing diabase, to be followed by an overlapping vein on the north side in which the ore continued downward.

During the early development of this area, the ore shoots were encountered to the northwest of the shaft, the principal veins, Nos. 1, 2, and 3, dipping to the north.

Following the early operations previously described, No.3 shaft (vertical) was gradually deepened, and by 1925 a number of veins were developed to the 350-foot level. New veins were encountered lying to the east and northeast of the shaft, the workings being in the Nipissing diabase. The connecting veins are filling- and replacement-deposits along intersecting fractures. The veins have a dip which is dependent on the attitude of the overlying contact. Above the workings at No.3 shaft, the diabase-greenstone contact rises to the west and north, the contact at the surface being represented by a broad curve. The columnar jointing planes in several directions are at right angles to the contact, and since the fracturing follows in part the columnar jointing planes, the dip of veins is dependent on the contact. The principal directions of veins are, roughly, northeast and northwest, the strike and dip varying over the length. The dips vary from northeast to northwest. Important veins like No.4 and No.10 intersect at several levels. In one place three veins, Nos. 5, 10, and 13, intersect at a point where the curving joint planes are prominent. The general relationship of the veins is shown on the accompanying plan of the underground workings.

Several strong faults are encountered in the workings. One fault, No.6, roughly parallels the contact, and most of the ore already found lies above the fault. The veins themselves show only minor faulting, up to a few feet. The ore occurs as shoots along the veins, and these vary in length up to 300 feet. They consist of high-grade vein and wall rock impregnated with leaf silver. The veins are commonly from two to five inches in width. The shoots at No.3 shaft occur within 400 feet of the contact, which dips on an average of 30° E. In addition to calcite and quartz as gangue minerals a light greenish-coloured secondary hornblende occurs prominently in certain veins, e.g. No.5 vein.

In the accompanying section from No.2 to No.3 shafts, Castle mine,...[where] the contact shown continued to the west at the same dip, the ore at No.2 shaft would lie about 660 feet from the contact, but it is probable that the contact, which has been eroded to the present surface, may have flattened to the west, in which case the ore would be in the upper part of the diabase sill, as at No.3 shaft.

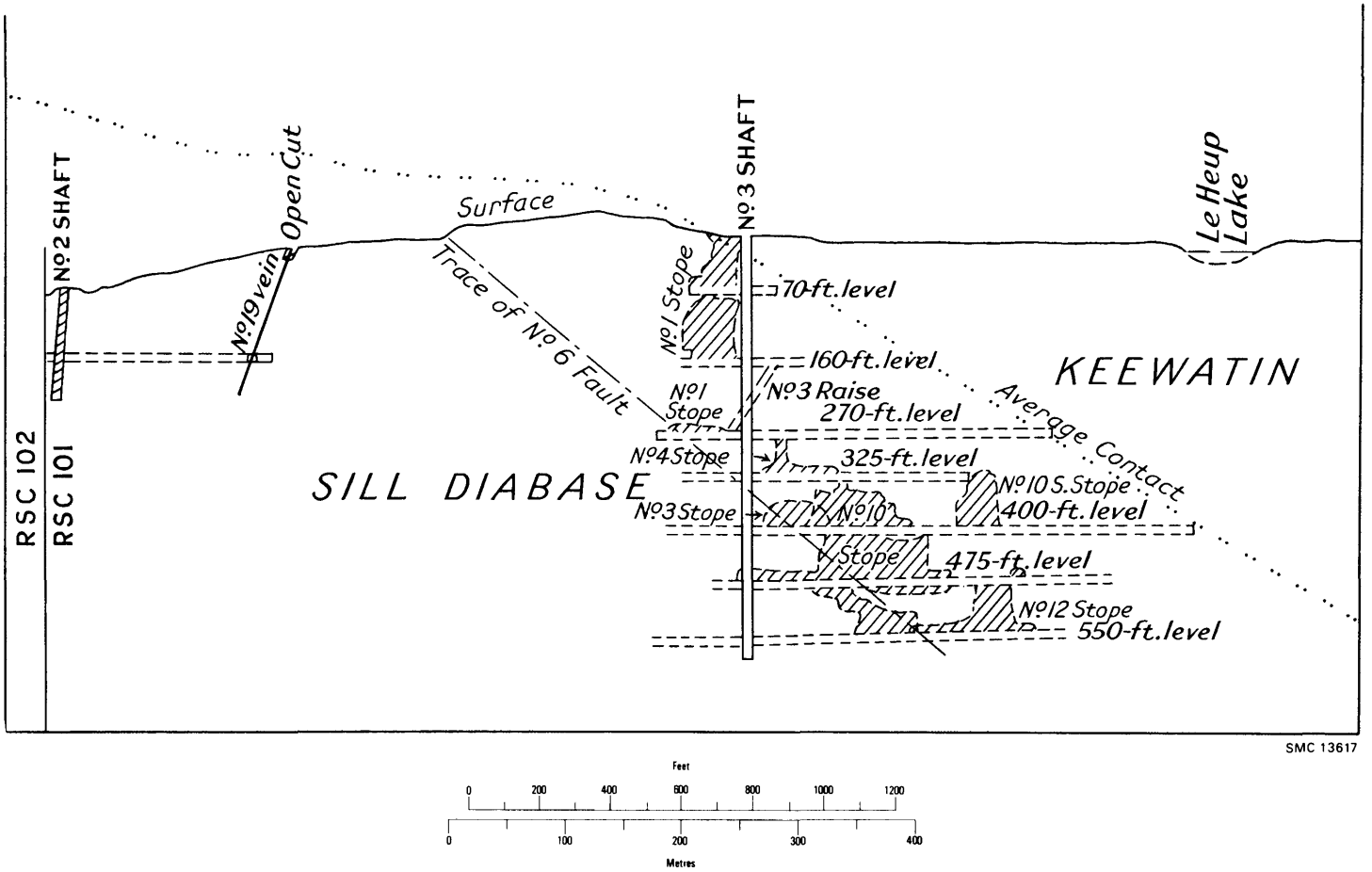


Figure 14–Longitudinal section through shafts No.2 and No.3, Castle Trethewey Mine (73). (Burrows 1926, p.35).

Since the property was visited in October, 1925, No.3 shaft has been deepened to the 700-foot level and lateral work started on the 625-foot level.

During 1925, much trenching was done on the surface and a number of veins carrying native silver and arsenides were located. One of these occurs in the Keewatin on the southern part of claim R.S.C. 101. The most important is the vein series lying north of No.3 shaft, to which a crosscut is being run on the 475-foot level.

Mining continued until 1931 by which time the shaft had reached a depth of 259 m (850 feet) with a total of 11 levels (sergiades 1968, p.378).

Diamond drilling was started by Siscoe Mines Limited in 1970 to explore the workings of the No.3 shaft.

THE EVERETT (74)

The property, formerly held by Everett Mines Limited, at one time consisted of four claims as follows: LM105, LM106, RSC102, and RSC103. The workings in the old mine are confined to the western rim of the Miller Lake basin on RSC101 and RSC102. The property has been described by Burrows (1926, p.38) as follows:

This property, lying to the west of R.S.C. 101, was operated some years ago by the Miller Lake and Everett Mines, Limited, and 8.35 tons of silver ore were shipped in 1910. The ore was taken from a long open-cut on a series of silver-bearing veins striking N.35° W. The ore was hand-sorted, and there are a few tons of mill rock on the dump at present, where fragments of diabase frequently show scales of native silver. Fissuring is pronounced on claims R.S.C. 101 and 102 in the vicinity of the north and south centre line.

The property was operated again in 1924, and further shipment of 1.5 tons of silver ore was made.

The latter shipment yielded 3,461 ounces of silver.

According to Sergiades (1968, p.380) the underground workings were developed from the adjacent Castle No.2 Shaft under lease. They extended (Figure 14) the workings northwest on to the Everett ground on the 49 m (160 feet) level. Here further work included 9 m (30 feet) of crosscutting in 1922 and in 1924 a winze was sunk for 35 m (105 feet) below the level with 122 m (401 feet) of development work here in 1924.

HS367 (75)

On HS367 an adit has been driven at S75W into a cliff of sheared diabase to intersect a 3.6 cm (1 ½ inch) sulphide vein containing pyrite, chalcopyrite, and some hematite. The vein strikes N15W.

RSC104 (76)

On RSC104 a small test pit has been blasted into a 3.6 cm (1½ inch) calcite vein with abundant erythrite; the vein strikes N80E.

W.M. McIntyre (77)
(Gamble Thompson Claims)

The surveyed claims numbered GG5111 in Nicol Township, and GG4910, GG5061, and GG5110, all in Haultain Township were held by W.M. McIntyre in 1969. They are historically known as the Gamble Thompson Claims.

The southern half of the property is underlain by intermediate to mafic metavolcanic flows with local intercalated pyroclastics. Matachewan Diabase dikes intrude this assemblage. In the north half of the property feldspathic sandstone nonconformably overlies the Early Precambrian rocks. An east-trending late diabase dike cuts the metavolcanics.

An old private report (Carnegie 1920) describes a northeast-striking calcite vein on each side of the creek on GG4910. The vein is 10 to 20 cm (4 to 8 inches) and is described as being along a diabase-metavolcanic contact (Carnegie 1920). It is assumed this contact is between metavolcanics and Matachewan Diabase.

W.R. and G.S. Olmsted (79)

(Barbara)

In 1969 the property consisted of eight surveyed claims just north of Flatstone Lake in the southeastern quarter of Haultain Township. The claims are GL4108, SW6 to SW9, SW11, SW19, and SW27. The first five mentioned claims are part of the old Barbara property (OBM 1916, p.124).

The southern part of the property is underlain by the Gowganda Formation and consists mainly of feldspathic greywacke and sandstone with local argillite. Most of the rest of the property is underlain by Nipissing Diabase which according to Burrows (1926, p.38) is a footwall contact. This contact is the north rim of the Flatstone Lake basin. A late diabase dike strikes east-northeast through the Gowganda Formation.

Burrows (1926, p.38) describes the economic geology and development on the property as follows:

> During parts of 1915 and 1916, some exploratory work was done on the Barbara property, situated to the north of Lake Irene. Several veins of quartz and calcite show on the surface. A strong vein on claim S.W. 8, striking N.15°E., has been trenched for several hundred feet and consists of calcite and quartz, from an inch to two inches in width, carrying copper pyrites and bornite. A little native silver shows in seams in the very coarse, gabbro-like diabase. A shaft was sunk to the 100-foot level, and some crosscutting was done on the level to intersect veins. The veins are located well within the diabase sill. The sedimentary rocks, a quarter of a mile south around Lake Irene, lie on the sill.
>
> Some smaltite and silver occur in veins on ciaim S.W. 18, south of Lake Irene.

The crosscutting goes 15.8 m (52 feet) west and 2.4 m (8 feet) east of the shaft (OBM 1916, p.124).

M. Riel (81-83)

Three separate surveyed claims were held by M. Riel; ED55 (81) is on and west of Mire Lake and TC167 (82) is at the south end of Shanty Lake; nothing is known about these claims. The third claim, TC94 (83), is on the east side of Mire Lake.

TC94 (83)

This claim is underlain mainly by pyroxene gabbro of the Nipissing Diabase with the inferred lower contact passing near the west boundary of the claim. Gowganda Formation rocks are inferred to underlie the diabase.

A pit, 2 m (6 feet) deep, was found in the northeast part of the claim. The pit was sunk on a narrow quartz-carbonate vein with chalcopyrite, pyrite, and arsenopyrite mineralization; the vein strikes N85E.

Shanty Lake-McRae Lake Occurrence (84)

Between Shanty and McRae Lakes two small test pits were found in pyroxene gabbro of the Nipissing Diabase.

The southern pit is 2 m (6 feet) deep and was sunk on a calcite vein striking N80W; the vein is 90 to 100 cm (36 to 42 inches) wide.

The dump by the other pit contains quartz-carbonate vein material with erythrite.

Solid Silver Mines Limited [1963] (85)

In 1963 this company, which changed its name to Solid Silver Metals and Holdings Limited in 1970, held a group of six unsurveyed claims in northeastern Haultain Township.

Geological mapping by the company (Howe 1963) indicates that the property is underlain by Nipissing Diabase except where it is overlain in the southeastern part by Early Precambrian granitic rocks. The diabase is locally medium to coarse grained and dips 25 degrees east (Howe 1963). A.C.A. Howe (1963) also estimated the thickness of the sill to be about 450 to 600 m (1,500 to 2,000 feet).

Numerous calcite veins with bornite, cobalt, and some silver mineralization were found (Howe 1963); they were generally in east-northeast-trending fractures. Pits and trenches were put down on some of these veins in the old days and some were cleaned out by Solid Silver Mines Limited. Assays of samples taken from some of these old pits varied from 1 to 12 ounces of silver per ton over 30 cm (12 inches) (Howe 1963).

One small test pit was observed during the present survey about 120 m (400

feet) southwest of a small pond on the north boundary of Haultain Township. Calcite with erythrite and chalcopyrite mlneralization was observed.

M. and A. Steinthal (86)

(Becker Claims)

The property, in 1969, consisted of two surveyed claims, southwest of Bloom Lake, which are historically known as the Becker Claims; they are numbered GG3450 and TC219.

Both claims are underlain by the "tail" of diabase which extends from the Miller Lake basin.

An old report on the property (Montague 1912) describes some 29 veins; three of these have had exploratory shafts sunk on them. None of these veins or shafts were found during field work and therefore are not shown on Map 2349 (back pocket). The vein material is mainly calcite but there are a few quartz or calcite and quartz veins. The calcite veins are generally in the range of 2.5 to 12.7 cm (1 to 5 inches) and the quartz veins are generally much wider, up to 38 cm (15 inches). Mineralization, mainly in the carbonate material, consists of silver, bismuth, chalcopyrite, galena, erythrite, hematite, and cobalt arsenides; the quartz veins generally were found to be barren (Montague 1912).

Three exploratory shafts were sunk:

No. 1 shaft on vein No.2 - 9.7 m (32 feet) deep
No.2 shaft on vein No.3 - 22.8 m (75 feet) deep
No.3 shaft on vein No.4 - 3.6 m (12 feet) deep.
Stripping and trenching has been performed on several other veins (Montague 1912).

J.A. Montague (1912) also gives the results of assays for silver as follows:

No.1 vein - trace
No.2 vein - 17.3 ounces per ton
No.3 shaft (bottom) - 9.2 ounces per ton
No.5 vein - 2.7 ounces per ton
No.10 vein - trace
No.22 vein - 132.5 ounces per ton

A trace of gold was indicated in No.10 vein.

Stella Lake-Montreal River Occurrences (87)

Northwest of Stella Lake, on the shore of the Montreal River is a pit 1.2 m (4 feet) deep and 3.6 by 4.6 m (12 by 15 feet) across. A grab sample taken by the writer from the quartz-carbonate vein material indicated only trace amounts of silver, cobalt, nickel, and copper. The pit is in Matachewan-type diabase.

A shaft 900 m (3,000 feet) northwest of Stella Lake has been sunk on a Matachewan Diabase dike. The shaft is about 9 m (30 feet) deep and was sunk on

two quartz-carbonate veins; the one is 46 cm (18 inches) wide and strikes N85E and the other is 31 cm (12 inches) and strikes N80E. Vuggy crystalline quartz is common. A grab sample taken by the author from the dump gave traces of silver, cobalt, nickel, and copper on analysis.

Due north of Stella Lake is a test pit on the contact between contaminated trondhjemite and foliated amphibolite and a Matachewan Diabase dike. The pit is on a 5 cm (2 inches) quartz vein which has a strike of N70W; the vein has been intruded along the centre of an aplite dike up to 10 cm (4 inches) wide. Traces of silver, gold, cobalt, nickel, and copper were indicated upon analysis. Pyrrhotite, sphalerite, and pyrite mineralization was observed.

Tormont Mines Limited (88-90)

The company held 13 surveyed claims in a narrow north-trending block along parts of Lost and Wigwam Lakes in Haultain Township.

The property covers, in part, an arch in the extreme eastern rim of the Miller Lake diabase basin. Locally small patches of feldspathic greywacke of the Gowganda Formation lie on top of the diabase. The Wigwam Lake fault cuts through part of the property. According to MacVeigh (1961) the upper contact of the diabase dips about 20 degrees to the east-northeast.

For this report the property will be divided into three descriptions:

1. The Haultain (88)
2. MR13255 and MR17124 (89)
3. The Wigwam (90)

THE HAULTAIN (88)

The Haultain property was described by Burrows (1926, p.38-39) as follows:

> The property, consisting of five claims, is located to the southwest of Wigwam lake, and is operated by the Haultain Mining Company, Limited.
>
> Erosion has cut into the upper portion of the diabase sill with hanging-wall contacts of the Cobalt series on the east and west. On claims G.G. 4,628 and 4,838, a number of roughly parallel veins, approximately N.20°E., are exposed at the surface, indicating considerable fracturing in the crest of the diabase sill. Calcite, quartz, cobalt-nickel-iron-bearing arsenides, bornite, copper pyrites, with some native silver occur in the veins. The silver, arsenides, and sulphides are sparsely distributed in the veins.
>
> A shaft has been sunk to the 150-foot level on No.5 vein, and drifting at this level had just begun at the time of the visit. Some native silver was observed in the grey calcite vein material. The property is equipped with a small plant consisting of hoist, compressor, and boiler. A 15-foot arrastre was being constructed at the time of the writer's visit.

The shaft (Figure 15) was subsequently put down to 107 m (350 feet) with a level established at this point and at 76 m (250 feet) (MacVeigh 1961), but the extent of the lower levels is not known.

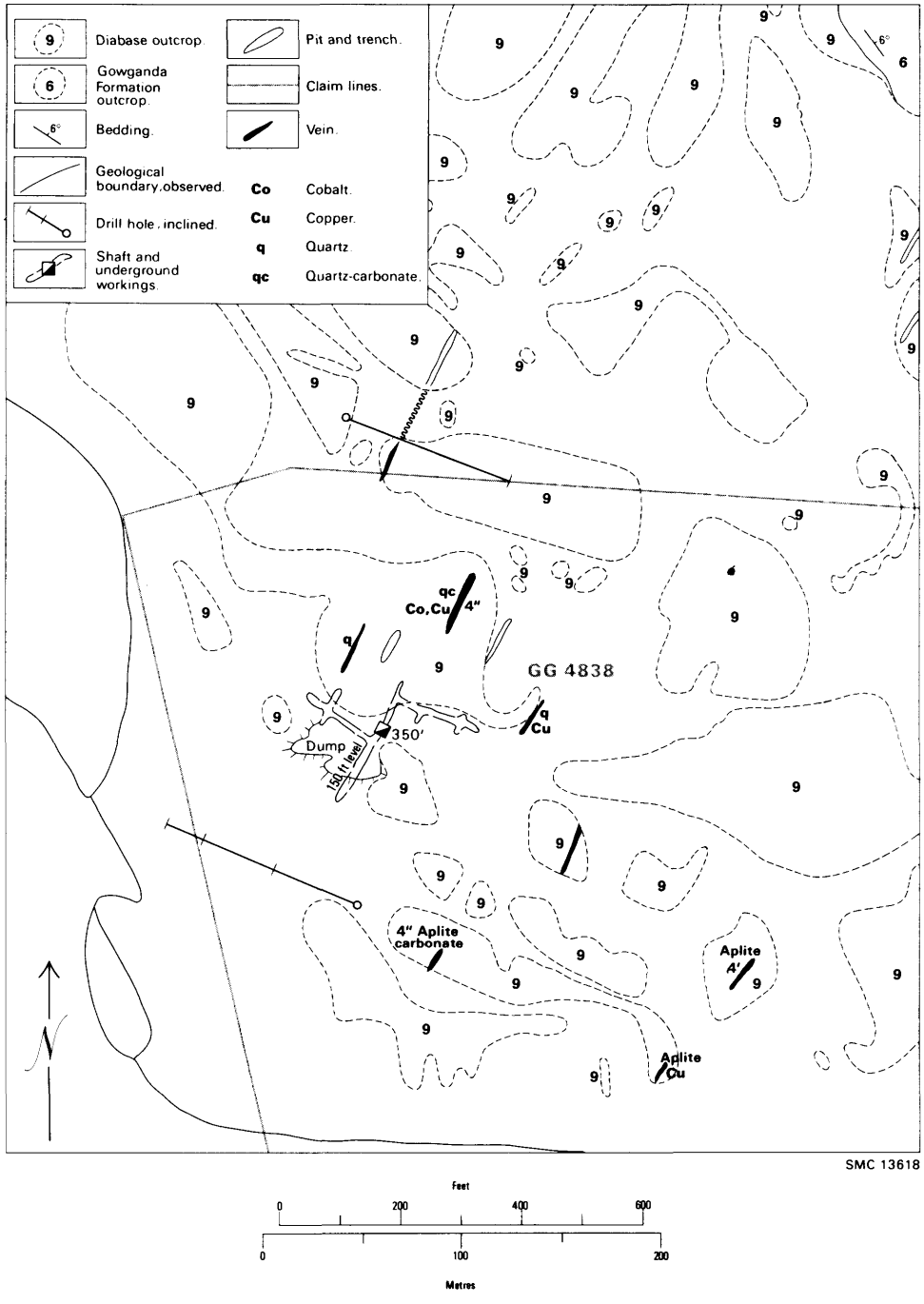


Figure 15–Plans of geology in vicinity of The Haultain (88) shaft, the underground workings in the shaft, and diamond drilling by Roy Silver Mines Limited.

In 1951 Roy Silver Mines Limited [1] dewatered the workings and completed a flat diamond drill hole from the 76 m (250 feet) level for 107 m (350 feet) to the east (MacVeigh 1961). MacVeigh (1961) also indicated that the hole intersected two cobalt-bearing veins which may be correlated with known veins on surface.

Subsequent to this the property was mapped for Tormont Mines Limited by MacVeigh (1961) who in his report recommended a diamond drilling program.

The logs of two holes (Figure 15) totalling 285.1 m (935.2 feet) are on file with the Ontario Division of Mines. These holes were put down north and south of the workings to intersect projected extensions of the main vein. The log indicates that a wide zone of quartz-carbonate vein material was intersected, just west of the projected Haultain vein system. This vein material had assays of 1.62 ounces of silver per ton over 0.1 foot and 1.30 ounces of silver per ton over 0.1 foot (Assessment Files Research Office, Ontario Division of Mines, Toronto). In the hole to the north of the shaft the best silver assay was 0.73 ounce per ton over 0.2 foot (Assessment Files Research Office, Ontario Division of Mines, Toronto). The log suggests that this vein which was encountered near the bottom of the hole, is possibly the main shaft vein.

The log of another hole (Figure 15) to the southwest of the shaft was abandoned after drilling through 35 m (120 feet) of overburden; this may be indicative of a pre-Pleistocene valley which in turn may be a fault zone.

A sample from the dump taken by the author indicated on analysis traces of silver, nickel, and copper. There was no cobalt indicated.

MR13255 AND MR17124 (89)

These two surveyed claims between Wigwam and Lost Lakes are underlain entirely by pyroxene gabbro of the Nipissing Diabase.

The following description is paraphrased from MacVeigh (1961).

A quartz-carbonate vein system (Figure 16) cuts across a high bluff of diabase between Wigwam and Lost Lakes. The vein system which strikes N60E is 12 cm (5 inches) wide and has been traced for 120 m (400 feet). A 12 cm (5 inches) wide sample of calcite near the centre gave a silver assay of 8.96 ounces per ton (MacVeigh 1961). The vein's association with an aplite dike is generally considered unfavourable for ore, but the occurrence is on strike with a linear depression along which silver is found to the west.

Roy Silver Mines Limited put down two diamond drill holes on MR17124 with no ore found. Total length of the holes was 162 m (531.8 feet) (Figure 16).

THE WIGWAM (90)

The Wigwam (Figure 16) is on the east side of Lost Lake about halfway along the shore and was described by Burrows (1926, p.39) as follows:

[1] Roy Silver Mines Limited was reorganized in 1961 and the name changed to Tormont Mines Limited.

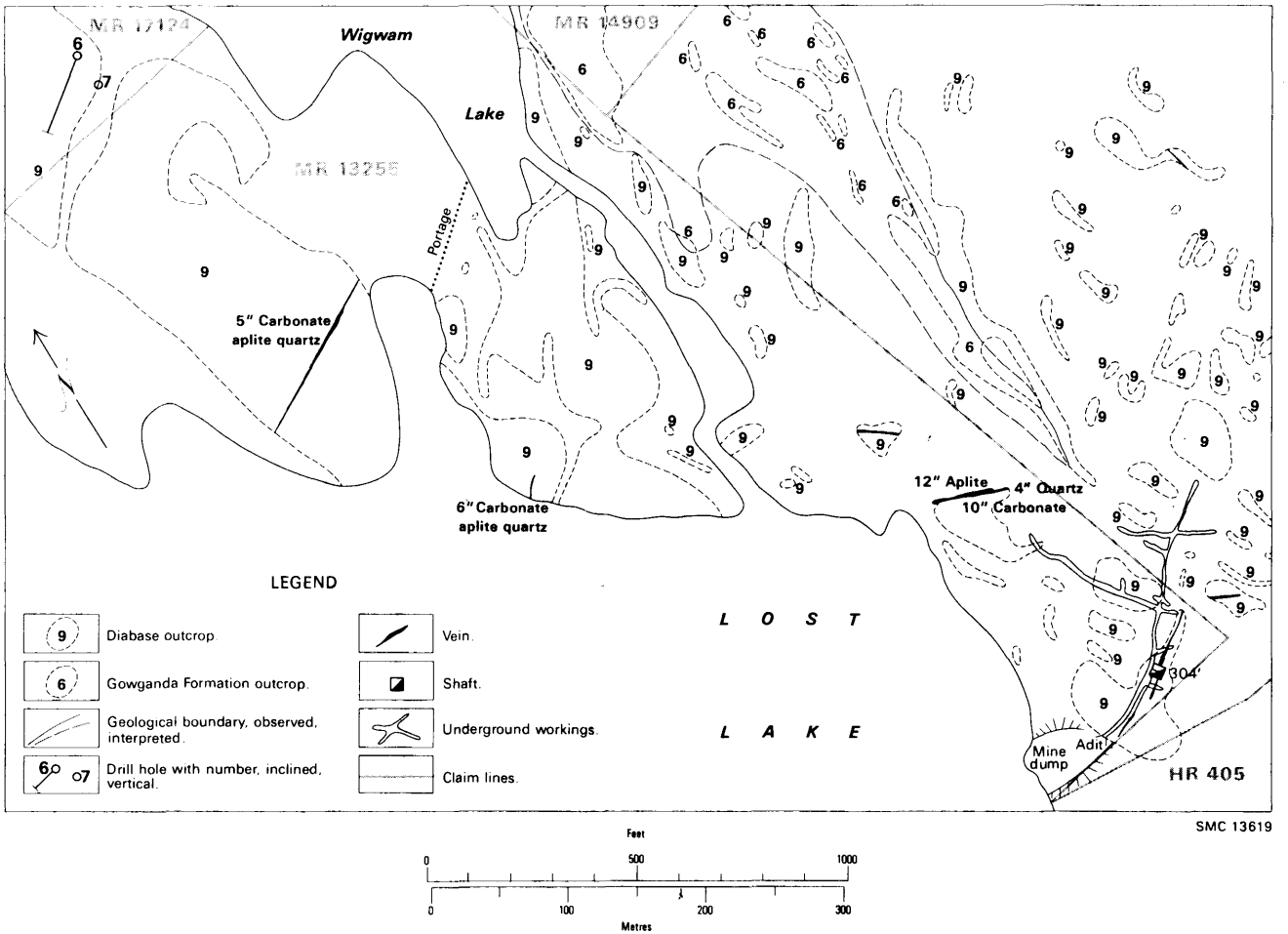


Figure 16–Plan showing geology and drill hole locations on MR13255 and MR17124 (89) and workings and veins at The Wigwam (90)

Wigwam Silver Mines, Limited, has seven claims, but the work has been confined to H.R. 499 and L.O. 316 on the east shore of Lost Lake. The diabase rises as a high ridge from the lake; and to prospect the ridge, on which occur a number of veins in some of which native silver has been found, a tunnel was driven from 20 feet above the lake in a northeast direction for 800 feet. The property was idle at the time of the writer's visit, but J.W. Sanderson, manager, furnished the following information:

"At 610 feet in the tunnel, a vein two feet wide was drifted on for 230 feet. At 350 feet, silver and arsenides were discovered in a strong vein, which was drifted on for 400 feet. At 384 feet in the tunnel, a calcite vein carrying silver was also intersected. A winze was sunk at a distance of 200 feet from the tunnel entrance, where two intersecting veins carrying some silver were located; and some work was done on the 100- and 190-foot levels below the tunnel. A raise of 114 feet was also put to the surface at the winze. Some faults, showing heavy gouge, were encountered in the workings."

"The mass of diabase has an arched structure, dipping under cobalt sediments on the east and west sides. Most of the veins have a northeast strike. Aplite occurs in some of the veins."

Mr. Horace Strong, engineer in charge of the operations, suggests that there is a north-south major fault at the shore of Lost Lake; and it is the intention, when the property is reopened, to drift westward to the contact at the lowest level.

In 1923, 602 tons of ore and concentrates were shipped out which produced 896 ounces of silver (Sergiades 1968, p.385).

The property was apparently inactive until 1949 when it was acquired by Roy Silver Mines Limited. The company sampled and mapped the workings and completed 44 m (149 feet) of drifting in 1951 (Sergiades 1968, p.384). To the north of the workings 267.7 m (878.4 feet) of diamond drilling was also done by Roy Silver Mines Limited.

During the period from 1962 to 1963 Tormont Mines Limited drilled a total of 1,079 m (3,563 feet). A 6 m (20 feet) trench gave high-grade assays up to 3,000 ounces of silver per ton over 5.1 to 7.6 cm (2 to 3 inches); this led to two inclined raises being driven from the adit to surface but no ore was found (Sergiades 1968, p.384).

Caving and bad ground in a hole drilled from the shore out under Lost Lake indicated a fault zone which probably represents the Wigwam Lake fault.

United Siscoe Mines Limited (91, 92, 93)

This property is operated by Siscoe Metals of Ontario Limited, a wholly owned subsidiary of United Siscoe Mines Limited. In 1969, the property in Haultain Township was composed of seven surveyed claims numbered RSC82 to RSC87 and RSC95. These surveyed claims included the old Bonsall (91) and Millerett (92) mines which will be described separately. To the north, west, and southwest is a block of 33 unsurveyed claims, 18 of which are in Nicol Township and for this report will be described together. These claims are referred to as the Roy-Ten (93) group and the area covered by them can be seen in Figure 5.

BONSALL (91)

The geology, early history and development were described by Burrows (1926, p.25-27) as follows:

The Bonsall property was among the earliest operated at Gowganda. It includes eight claims: R.S.C. 82 to 89 inclusive, situated northwest of Miller lake. The first work was done on claims 82 and 83, on veins carrying native silver discovered by Percy Bonsall in 1908. Most of the silver and smaltite showed in a narrow vein, averaging about one inch, with strike N. 34°E., which was traced for 100 feet by trenching. The surface of the vein was much oxidized, showing crystallized silver in black, cobalt and nickel, decomposition products. A shaft was sunk on the vein to a depth of 25 feet and a drift run northward.

A main shaft was later sunk on a cross-vein that strikes nearly east and varies from one to four inches in width. This vein intersects the previously described vein 30 feet east of the shaft. A drift at the 25-foot level was made along the vein for 60 feet and on the narrower vein for 40 feet. High-grade ore of the character shown near the surface was not encountered. The rich ore was found to occur near the junction of the two veins. About 30 sacks of ore were taken out in 1909. The main shaft was continued to a depth of 125 feet with a north-south drift of 60 feet in a faulted zone on the 75-foot level and 186 feet of drifting and crosscutting on the 120-foot level.

The property was reopened several years later by the Miller Lake O'Brien interests, who did considerable work at the lower level. A strong north-south fault, dipping 45° E. and showing about 12 feet in width of fractured diabase, was encountered 45 feet east of the shaft. This fault was also crossed at 60 feet in the shaft and would reach the surface in the bed of Miller creek. To the east of the fault, the east and west vein was drifted on for 130 feet. The vein carries calcite with some quartz containing copper pyrites, galena, and a little native silver. A second vein, 175 feet southeast of this vein, was drifted on for 26 feet. It showed low assay values in silver.

From March to July, 1920, the property was worked under the management of George Glendinning. The workings at the various shafts were dewatered, and the veins sampled at the several levels. At the main shaft, No.1, the work at the 120-foot level consisted in extending the drift on the main vein for 71 feet and on the south vein for 108 feet, with 23 feet of crosscutting. At the 75-foot level a crosscut was made eastward 33 feet to the vein, and 83 feet of drifting was done in a northeast direction. A raise was made at the intersection of the vein to the 25-foot level. This level was also connected with the open-cut. From these operations a quantity of silver ore was hand-sorted, bagged, and shipped to Cobalt.

In addition to the operations at the main shaft, some work has been done on the east side of the property, on claim R.S.C. 84. Two shafts were sunk by the early operators on silver-bearing calcite veins. The east shaft, 60 feet deep with some lateral workings, was too wet for operating, and a second shaft was sunk to the 100-foot level on a narrow calcite vein, an inch or two in width, which showed a few segregations of silver and smaltite. The drift at the 100-foot level, 74 feet in length, showed the vein to carry a little silver and smaltite, similar to that on the surface. Several veins occur on the surface, but little work has been done. Owing to the favourable location of the veins in the diabase near the upper contact with the Keewatin, it would seem that this locality would warrant more extensive exploration.

The property is equipped with a plant at the western workings, consisting of two 50 h.p. boilers, a stright-line compreser and a hoist. A plant at the eastern workings was destroyed by a forest fire. The property has been purchased by the owners of the Miller Lake O'Brien mine and now forms part of that group. Very little additional work, beyond trenching on the northeast claim, has been done. A north-south vein in the Keewatin on the Castle property was traced southward on to the Bonsall claim.

A summary of Bonsall shafts is shown in Table 22 and production figures are in Table 23.

In 1965 the present owners initiated a program of exploration in the Bonsall Mine area. A new shaft was sunk near the boundary of RSC82 and RSC83; the shaft was down 42 m (139 feet) by the end of the year. An ultimate depth of 156 m (511 feet) was reached with levels established at 70, 106, and 152 m (230, 350, and 500 feet) (Siscoe Metals of Ontario, Annual Report 1966). During this same year four separate ore shoots of "medium- to high-grade' ore were worked on. The only recorded production came in 1967 and 1968 as shown in Table 23. No new ore was found in 1967 from underground exploration, but surface diamond drilling encountered ore some 450 m (1,500 feet) north of the shaft. All of the ore mined from this area was at the lower contact of the Nipissing Diabase from

TABLE 22 SHAFTS AT BONSALL (91) AND MILLERETT MINES (92).

Shaft	Claim	Inclination	No. of compartments	Collar Depth	Vertical depth below surface
Upper Bonsal					
No.1 shaft	RSC95	Vertical	2 (inactive)	Surface	85
No.2 shaft	RSC84	80°	2 (inactive)	Surface	115
No.3 shaft	RSC84	Vertical	2 (inactive)	Surface	68
Lower Bonsal					
No.1 shaft	RSC83	76°	2 (inactive)	Surface	132
No.2 shaft	RSC83	Vertical	3	Surface	511
Millerett					
No.1 shaft	RSC95	Vertical	2 (inactive)	Surface	85
No.7 shaft	RSC95	Vertical	2 (inactive)	Surface	210
No.9 shaft	RSC95	Vertical	1 (inactive)	Surface	35
No.10 shaft	RSC95	77°	2 (inactive)	Surface	127
No.1 winze	—	65°	2 (inactive)	70	136
No.2 winze	—	79°	2 (inactive)	200	303

(From 1969 ODMNA Annual Report, Volume 79, p.115).

TABLE 23 PRODUCTION FOR BONSALL MINE (91) HELD IN 1969 BY UNITED SISCOE MINES LIMITED (SERGIADES 1968, p.375).

Year	Ore and conc. shipped (tons)	Silver ounces
1910	4	7,840
1920	13	2,566
1967	4,193	131,450
1968	5,904	114,527
Totals	10,114	256,383

TABLE 24 | PRODUCTION FIGURES FOR MILLERETT MINE (92) HELD IN 1969 BY UNITED SISCOE MINES LIMITED (SERGIADES 1968, p.383).

Year	Ore and conc shipped (tons)	Cobalt pounds	Silver ounces
1910	347	5,000	322,000
1911	53	—	130,687
1912	192	—	159,135
Totals	592	5,000	611,822

along an axis which plunges gently to the southeast (Siscoe Metals of Ontario Limited, Annual Report 1969). New ore was not encountered along this axis and underground operations were suspended in 1969.

THE MILLERETT (92)

Claim RSC95 was originally referred to in 1908 as the Blackburn claim; it is now known as the Millerett since in 1909 the property was taken over by the Millerett Silver Mining Company (Sergiades 1968, p.382). In 1913 the ground was held by the Miller Lake O'Brien Company and finally by Siscoe Metals of Ontario Limited in 1945. Production from the mine was all in the early years (Table 24).

The claim is underlain by Early Precambrian mafic volcanic rocks and conglomerate and feldspathic greywacke of the Gowganda Formation. Intruding these older rocks is Nipissing Diabase with the upper contact of the Miller Lake basin crossing the claim.

According to Sergiades (1968, p.382) there are two known principal veins. The main vein strikes northwest and is in the conglomerate and No.7 strikes east in the diabase. The veins are calcite and are about 5 cm (2 inches) wide with "five leaflets' of silver which impregnate the host rock for a distance of up to 60 cm (2 feet) from the veins.

After silver was discovered in 1908 development started the following year. The development is summarized in Table 22. An adit was driven 77 m (253 feet) for development of the main vein; from this adit a crosscut was driven west for 46 m (150 feet). No.1 shaft was put down 25 m (83 feet) with a level at 21 m (70 feet) which was driven 88 m (290 feet) to the southwest and 46 m (150 feet) to the northeast.

In 1914 and 1915 No.10 shaft was sunk for 39 m (127 feet) in the south-central part of the claim with levels established at 18 m (60 feet) and 39 m (127 feet).

More recently Siscoe has done diamond drilling and put a raise up from the 137 m (450-foot) level of their main workings to the 91 m (300-foot) sublevel of the main Millerett workings. From here 24.4 m (80 feet) of raising and crosscutting was done to some high-grade ore.

ROY-TEN CLAIM GROUP (93)

In 1966 a geochemical survey was undertaken by the company on this block of claims. E.E. Campbell (1967a) reports that several areas containing anomalous silver were delineated, especially in areas of Nipissing Diabase and Early Precambrian metavolcanic rocks.

Thirteen diamond drill holes totalling 891.2 m (2,924 feet) were put down on MR42507 which lies just north of RSC82. Some silver values were indicated in the logs (Assessment Files Research Office, Ontario Division of Mines, Toronto).

NICOL TOWNSHIP

R. Armstrong and G. Wilkinson (94)

(Hylands-Johnson-Gardiner)

In 1969 the property consisted of unsurveyed claim MR50438 which represented a restaking of former claims RSC131 and RSC142 and is part of the former Hylands-Johnson-Gardiner property.

With the exception of a late northwest-trending olivine diabase dike the property is underlain entirely by pyroxene gabbro of the Nipissing Diabase; the upper contact of the inside of the Miller Lake basin lies just north of the property.

Work first started on the ground with stripping in 1925 after which a shaft was sunk to 30.5 m (100 feet) (ODM 1926, p.149).

The following year the operation was taken over by Plata Mines Limited, a subsidiary of Noranda Mines Limited. The shaft was continued to a depth of 87 m (285 feet) with stations cut at 61 and 81 m (200 and 265 feet). Work on the 61 m (200-foot) level consisted of crosscutting 46 m (150 feet) north and 40 m (130 feet) south; on the 81 m (265-foot) level crosscuts were driven 76 m (250 feet) north and 40 m south (130 feet). When the mine was closed in April 1927 a total of 850 m (2,800 feet) of crosscutting and drifting had been done with most of it on the 81 m (265-foot) level, where 253 m (830 feet) of work was done (ODM 1927, p.174,175).

In 1952 the property was optioned by the Gardiner-Johnson Property Syndicate. The work performed by this group included dewatering the shaft with sampling and diamond drilling on both levels. Work was then suspended (ODM 1953, p.109).

A grab sample taken by the writer from the dump indicated only traces of silver, cobalt, nickel, and copper.

A calcite vein 5 to 10 cm (2 to 4 inches) in diabase has been exposed in the gravel pit by the highway in the southwestern part of the claim. The vein is vertical and strikes N40E.

Castlebar Silver and Cobalt Mines Limited (95, 96, 97)

The ground in Nicol Township held by the company consisted of six surveyed claims in three areas each of which will be described separately.

MILLER LAKE WEST GROUP (95)

This group of claims lies about 0.8 km (½ mile) west-southwest of Miller Lake and consists of MR23995 to MR23997.

Except for the olivine diabase dike which is inferred to strike northwest across MR23995 the entire group is underlain by pyroxene gabbro of the Nipissing Diabase.

During the mapping calcite stringers were observed in a trench 9 m (30 feet) long on claim MR23996; the stringers strike N65E and dip 85 degrees south and are mineralized with pyrite and chalcopyrite.

In 1957 the logs of diamond drilling totalling 60 m (195 feet) for three holes were submitted for assessment credit by Nichaul Mining; they were all drilled on MR23996. Diabase was the only rock type described in the logs with several calcite stringers and associated sulphide mineralization.

The log of one hole 16.8 m (55 feet) signed by K. Sanford was submitted in 1958. This hole was drilled in the northeastern part of MR23997 and encountered only diabase; a calcite vein with pyrite is reported in the log.

The log of one further hole 64 m (211 feet) long was submitted in 1961 by Castlebar; this hole was drilled near the west boundary of MR23996 and was drilled just south of the previously mentioned calcite stringers. Diabase was encountered the full length of the hole; numerous carbonate and quartz-carbonate stringers with chalcopyrite, hematite, and epidote were also described.

MILLER LAKE EAST GROUP (96)

This group of two claims consists of MR18610 and MR18611 on the east shore of Miller Lake.

The claims are underlain by Early Precambrian metavolcanic rocks composed of mafic flows and amphibolite. A small lens of sedimentary rocks also occurs. This assemblage has been intruded by Matachewan Diabase dikes.

Two undated diamond drill hole logs are on file in Kirkland Lake. These two holes totalled 470 m (1,554 feet); one hole, shown on Map 2349 (back pocket) was drilled vertically to determine the depth of the upper diabase contact which was

TABLE 25 PRODUCTION FOR MORRISON MINE FROM SERGIADES (1968, p.405) OWNED IN 1969 BY CONSOLIDATED MORRISON EXPLORATIONS LIMITED.

Year	Ore Raised Tons	Ore and conc. shipped (tons)	Cobalt pounds	Silver ounces
1930	4,024	50	5,397	154,799
1931	—	—	—	—
1932	—	—	—	120
1935	712	593	—	28,526
1936	100	45	—	2,688
1940	—	2	96	3,794
1952	2,998	121	3,504	91,284
1953	11,090	235	9,660	293,000
1954	6,021	243	3,358	144,990
Totals	24,945	—	22,018	719,201

found at 138 m (451.8 feet). Vein material between 207-207.1 m (677.5-678.5 feet) contained niccolite and native silver. Numerous quartz stringers were described.

MR18865 (97)

This claim is one claim northeast of the previous group on the south side of the boundary between Nicol and Haultain Townships. It is underlain by Early Precambrian metavolcanic rocks.

Two undated drill hole logs for drilling totalling 49 m (160 feet) are on file in Kirkland Lake (Resident Geologist's Files, Ontario Ministry of Natural Resources, Kirkland Lake).

Consolidated Morrison Explorations Limited (98, 99, 100)

The property consists of four surveyed claims: MR15951, TC204, TC315, and WJ9; TC315 is the site of the main shaft of the past producing Morrison Mine. The production figures are shown in Table 25.

THE MORRISON (98)

History

This section on the history of the Morrison Mine is paraphrased from a letter written to H.C. Rickaby, Deputy Minister of Mines by H.F. Strong of Haileybury in 1956. H.F. Strong was at one time mine manager. A copy of this letter

was kindly given to the author by Consolidated Morrison Explorations Limited.

The original ground consisted of the two mining claims TC204 and TC315 which were staked in 1909 for General Morrison of Ottawa. A company known as Northern Mining Company was formed with subsequent exploration of the claims and sinking a 27 m (90-foot) shaft. Some high-grade silver was discovered and one particularly rich piece was sent to London and placed in the Empire exhibit. No ore was found, however, and thus the property lay idle for many years.In 1922 and 1923, Strong acquired ground along the upper diabase contact; this included the Morrison. The property was optioned by the Tonapah Canadian Mines Limited who sank a shaft to 91 m (300 feet) with lateral workings on this level and a raise to workings on the 84 m (275-foot) level and a winze to the 114 m (375-foot) level with several ore shoots discovered. The price of silver was erratic and Tonapah dropped the option. However, a compromise arrangement was reached between Morrison and Tonapah which resulted in the formation of Morrison Mines Limited with Tonapah having a 40 percent interest. By 1928 Tonapah had withdrawn its directors and Strong was appointed president, a position he held until 1951. On two occasions during this period, in 1929 and 1930, the price of silver became such that further exploration was warranted. The shaft was continued to a depth of 183 m (600 feet) with levels at 130, 152, and 175 m (425, 500, and 575 feet) with a resultant production of silver. The drop in price of silver resulted in the mine being closed for 15 years.

During this period HR204 and HR205 (now MR15951) were acquired by Strong; these are the former Canadian Gowganda property.

The property was enlarged in 1951 by an amalgamation with Anglo-Huronian Limited who held WJ9 and who through their subsidiary Prospectors Airways Company, Limited formed New Morrison Mines Limited. Further exploration found new ore shoots and led to additional production. In the summer of 1953 operating control of the property was turned over to Siscoe Metals of Ontario Limited who through a new company called Lost Lake Mines Limited mined and explored the property.

The only work on WJ9 from the above operations consisted of a few diamond drill holes.

Early in 1955 the property was turned back by Lost Lake Mines Limited to New Morrison Mines who then reorganized to form Consolidated Morrison Explorations Limited.

General Geology

Most of WJ9 is underlain by Early Precambrian mafic metavolcanics consisting of flows and pyroclastic rocks. To the south of this assemblage is pyroxene gabbro of the intruded Nipissing Diabase which dips to the north under the metavolcanic assemblage. The diabase is cut by a northwest-trending olivine diabase dike.

Moore (1955, p.35) described a northwest-striking fault which dips 24 degrees northeast. The fault cuts through the mine and could be seen on the 53 and 91 m levels (175 and 300 feet). There is a crushed zone along the fault several inches wide on the 91 m (300-foot) level.

Economic Geology

The following description is from Moore (1955, p.35):

The veins in the Morrison form a narrow ore zone about 400 feet long, dipping steeply south and striking parallel to the sill contact. It was bottomed close to the 500-foot level. Just why this ore zone formed there can not be explained unless its occurrence resulted from the development of pronounced columnar jointage in the sill in this area. Some of the columns are unusual in that they curve around into a nearly horizontal position. Further, the veins, as previously described, are peculiar in that most of them show bands of granophyre next to the diabase walls, followed by a band of quartz on either side with calcite and ore minerals in the centre of the vein. It is possible that they owe their existence to differentiation in the sill, and that they are therefore of local derivation. A large fault striking nearly northwest and dipping 24 ° N.E. cuts through the mine and may be seen on the 175-foot level near the shaft and on a long drift on the 300-foot level east of the shaft. At the latter point there is a crushed zone along the fault several inches wide. Since this fault passes above the ore zone it seems to bear no important relation to it. The ore coming from this mine during the summer of 1954 amounted to about 60 tons a day, averaging about 25 ounces per ton. The mine was closed in the autumn.

Underground Workings

Plans of the underground workings are shown in Figure 17. There are seven levels and sublevels in the mine.

WJ9 (99)

This claim was acquired in 1925 by the Huronian Belt Company with surface operations and shaft sinking to 16.8 m (55 feet) taking place (ODM 1926, p.148).

In 1926 the property was operated by W.J. Nine Silver Mines, a subsidiary of Huronian Belt Company. The shaft was continued to 122 m (400 feet) with the upper diabase contact encountered at 57 m (188 feet). Lateral work, most of which was done on the 122 m (400-foot) level, totalled 592 m (1,838 feet) (ODM 1927, p.177). Underground plans are included in Figure 17.

Figure 17 also shows a vertical diamond drill hole which was put down about 120 m (400 feet) north of the shaft. The upper diabase contact was encountered at 80.2 m (263 feet).

CANADIAN GOWGANDA (100)

The shaft on this old property is reported (Burrows 1926) to be 30.5 m (100 feet) deep with limited drifting on a vein at this level. According to Burrows (1926, p.5) 8 tons of ore were shipped from the mine in 1911.

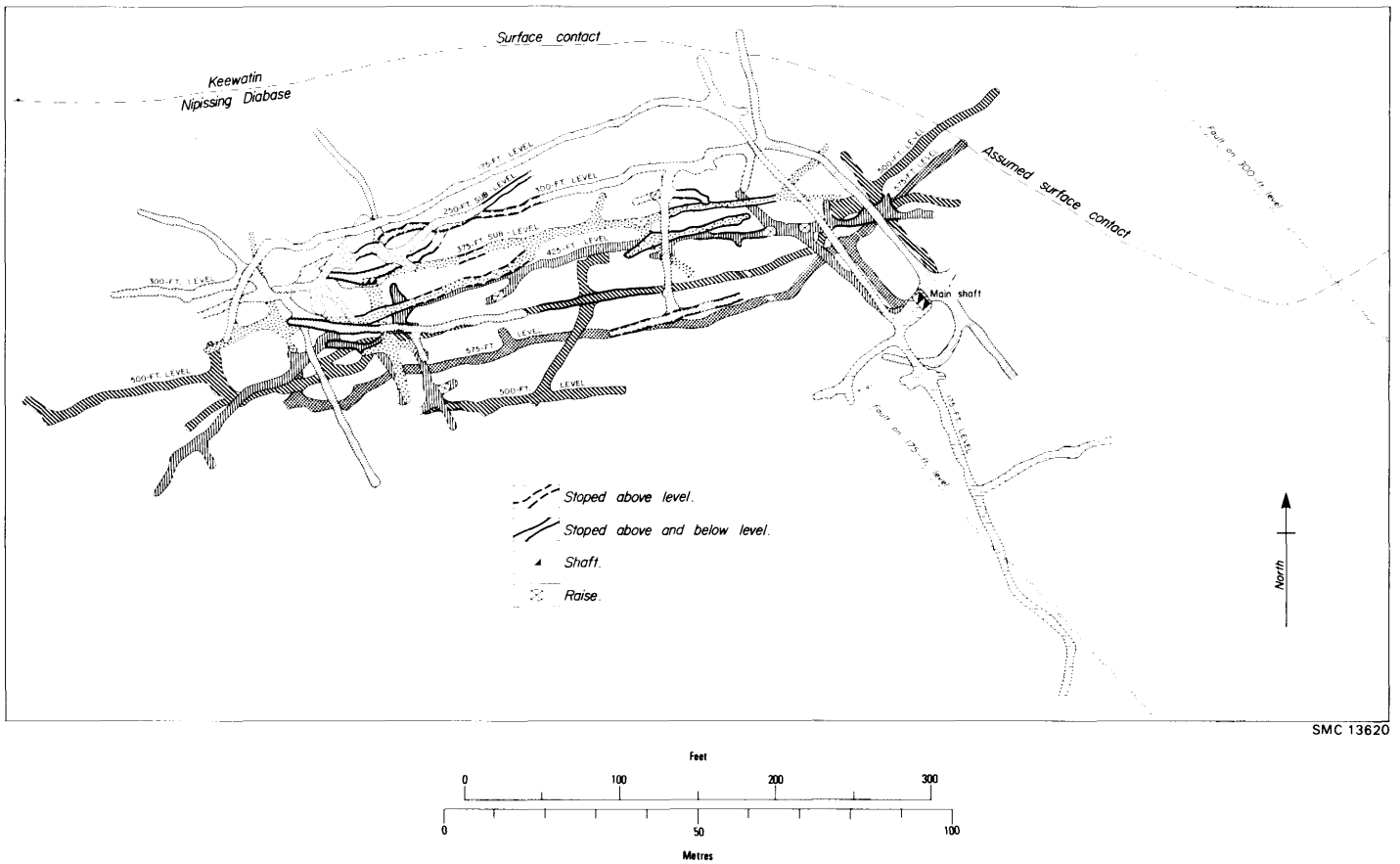


Figure 17–Underground plans at The Morrison (98) and WJ9 (99). Consolidated Morrison Explorations Limited.

Gowganda Silver Mines Limited (101, 102)

The company held two claim groups of unsurveyed claims in the township in 1969; the central group consisted of 22 claims and the eastern group contained 33 claims. Each of these groups will be described separately.

CENTRAL NICOL GROUP (101)

This group of claims lies north of Bonsall Lake and surrounds surveyed claim TC151.

Early Precambrian metavolcanic and felsic plutonic rocks occur in the eastern and southeastern parts of the property. Metavolcanics in the northeastern part consist of mafic flows, locally with poor pillows, and minor felsic volcanic rocks. North of Bonsall Lake, basalt, andesite, coarse mafic metavolcanics, and amphibolite occur. The felsic plutonic rocks are composed mainly of trondhjemite and syenodiorite. Matachewan Diabase dikes are common in the granitic rocks.

Gowganda Formation sedimentary rocks are found in the southwestern and western parts of the property. The most common rock types are feldspathic greywacke and sandstone with less common conglomerate, breccia, and siltstone.

The north-central part of the claim group is underlain by pyroxene gabbro of the Nipissing Diabase. The contact with the older rocks is the lower contact.

Several old workings were found during the field work.

Near the west boundary of the property about 1.6 km (1 mile) northwest of Bonsall Lake is a 3 m (10-foot) deep pit in feldspathic greywacke. A vertical brecciated zone to 90 cm (3 feet) strikes N60E and is filled with numerous calcite veins with pyrite and chalcopyrite mineralization. A grab sample taken by the writer showed only traces of silver, nickel, and copper and no cobalt.

About 600 m (2,000 feet) east of this pit is an old pit 1 m (4 feet) deep in diabase and about 600 m (2,000 feet) north of here are old trenches.

A geophysical survey (Morrison 1960) was conducted over two claims in this area but showed no significant anomalies.

Near the north boundary of the property south of claim MR15024 three calcite veins were mapped. The north vein is a vertical 10 cm (4 inches) calcite vein striking N20E with pyrite and chalcopyrite. The central vein is an almost vertical 2.5 cm (1-inch) calcite vein with pyrite and chalcopyrite striking N70E. The south vein is a near vertical calcite vein 10 cm (4 inches) wide striking N65E and also with pyrite and chalcopyrite. East of these veins is an old north-trending trench which appears to have been put down across the trace of the Jacobs Lake fault.

A geochemical survey (Shaw 1969) for Gowganda Silver Mines Limited indicated 12 analyses of 0.7 ppm silver or greater but none was greater than 1.0 ppm.

Two anomalous areas were indicated by a ground magnetic survey (Szetu 1969). A strong but small negative anomaly occurs immediately west of TC151. A positive anomaly occurs in the northeastern part of the claim group; apparently this is over Early Precambrian metavolcanic rocks (Assessment Files Research Office, Ontario Division of Mines, Toronto).

EAST NICOL GROUP (102)

This group of claims is referred to by the company as Group A and is composed of 53 claims. Two of these claims are in Haultain Township and 31 in Nicol Township and the remainder divided between Chown and Lawson Townships.

The northern and southern parts of the property are underlain by the Lorrain Formation, mainly feldspathic sandstone with local micaceous sandstone and ferruginous sandstone common near the Nicol-Haultain township boundary. There is also an outlier of feldspathic sandstone on the Nipissing Diabase which underlies the rest of the property. The intrusion is composed of pyroxene gabbro and dips to the west-northwest.

Part of this ground was held by Silver Dollar Mines Limited and was mapped for the company by R.J. Benner (*ca.*1948) with follow-up diamond drilling in 1948. The diamond drilling was all along the west shore of Calcite Lake. The logs of nine holes totalling 369.7 m (1,213 feet) were submitted for assessment credit; several calcite stringers with minor chalcopyrite and pyrite were logged (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Geophysical (Szetu 1969) and geochemical surveys (Shaw 1969) were conducted by the present company with some minor anomalous areas encountered.

In the southeastern part of Haultain Township an old adit was driven along a calcite vein at S70E. The vein is 10 cm (4 inches) wide with pyrite and chalcopyrite mineralization.

W.R. Hart (103)

In 1969 the property consisted of surveyed claim TC151 which is about halfway between Bonsall Lake and Highway 560. The claim is underlain by Nipissing Diabase. A written communication from W.R. Hart (1969) stated there are three old prospect pits on the claim. Diabase with quartz veins are found on the dump.

International Mine Services Limited (104)

The property in 1969 was composed of the four surveyed claims MR13002 to MR13005 in a north-south block in the northeastern part of Nicol Township.

Both the Coleman and Firstbrook Members of the Gowganda Formation are present; these are overlain to the east by the Lorrain Formation. The Coleman Member consists of conglomerate in the south and feldspathic sandstone in the north. The Firstbrook Member is a bedded argillite with abundant ripple-marks. The Lorrain Formation consists of ferruginous sandstone grading up to feldspathic sandstone. The contact here between the Firstbrook and the Lorrain is gradational. Geological mapping for the company (Mather 1965) shows as Lorrain Formation what the present author considers the Firstbrook Member of the Gowganda. Diamond drilling by the company in the southwestern part of

MR13002 indicated a gradation to thinner and more regular laminae from thicker and somewhat irregular laminae before the diabase was encountered.

The upper contact of the diabase strikes northeast across MR13002.

Besides the above hole with a depth of 93.4 m (302 feet) which was submitted in 1968 for assessment credit, logs were submitted in 1967 for two other holes totalling 199 m (326 feet) on MR13004. Gowganda Formation was reported for the length of both holes.

R.M. Mick (105, 106)

The property in 1969 consisted of two separate surveyed claims, HS325 and GG3140, in the northwestern quarter of Nicol Township.

HS325 (105)

The western two thirds of this claim is underlain by feldspathic sandstone of the Coleman Member of the Gowganda Formation. The lower contact of the Nipissing Diabase, which underlies the eastern third of the claim, strikes north across the claim; the diabase is pyroxene gabbro in composition.

A calcite vein in the gabbro has been described by H.G. Pickard (1936) from whom the following paragraph has been paraphrased:

The vein is 5.1 to 10.2 cm (2 to 4 inches) strikes north and is vertical. About halfway along the east boundary a fault, which strikes west, offsets the vein 20 m (60 feet) with left-hand displacement. A pit 1.5 by 2 by 3 m (5 by 7 by 12 feet) deep has been sunk at the intersection of the fault and the south part of the vein.

Mineralization associated with the vein includes sphalerite and galena.

GG3140 (106)

This claim, south of Highway 560, is underlain by feldspathic sandstone and feldspathic greywacke of the Coleman Member of the Gowganda Formation.

During the field work a small test pit was found. The pit was on a quartz-carbonate vein with chalcopyrite mineralization and striking northeast.

R.D. MacDougald (107)

(Big Four)

In 1969 this property consisted of five unsurveyed claims just east of Gowganda; these claims in part represent a restaking of the former surveyed claims

WD961 to WD964, locally known as the Big Four. In addition to this, the property extends to the south side of Highway 560.

The northern part of the property is underlain by Early Precambrian porphyritic dacite with local felsic tuff and associated sulphide facies iron formation. Numerous Matachewan-type dikes intrude this assemblage. To the south the Coleman Member of the Gowganda Formation nonconformably overlies these rocks; the sediments are composed mainly of conglomerate, feldspathic sandstone, and feldspathic greywacke. Northeast-trending diabase dikes are the youngest rocks found.

Numerous pits, trenches, and shafts attest to early and recent prospecting on the property and the author thanks Mr. MacDougald for a brief tour of the property.

Near the southern boundary of the property 300 m (1,000 feet) east of Gowganda, a test pit has been sunk on two quartz veins 5 to 10 cm (2 to 4 inches) wide, striking N30E and dipping 65 degrees northwest. The veins can be traced across the outcrop from the pit; they are brecciated and contain fragments of the host sedimentary rock. Chalcopyrite, pyrite, and erythrite were observed but only traces of silver, cobalt, nickel, and copper were indicated on analysis of a grab sample taken by the author.

Northwest of this pit, about 90 m (300 feet) south of a small lake just east of Banker Bay is a pit on the north contact of a diabase dike. No mineralization was observed in the dump material which contained minor quartz up to 1 cm (½ inch) wide.

About 180 m (600 feet) north is another pit which is 5 m (15 feet) deep; the pit is on a vertical white calcite and quartz vein which strikes N70E and varies in width from 2.5 to 30.5 cm (1 to 12 inches). Observed mineralization included pyrite and chalcopyrite. The vein was traced for about 30 m (100 feet).

About 400 m (1,300 feet) northeast of this pit is another pit which was put down 1 m (4 feet) on a series of quartz veinlets up to 2.5 cm (1 inch) in width and striking N15E in Matachewan Diabase.

About 250 m (800 feet) southeast of here is the main mineral occurrence on the property. This prospect has been referred to in the literature as the Big Four (Burrows 1926; Sergiades 1968) and the Banker Bay Occurrence (Shklanka 1968). This prospect is also part of the ground formerly held by Tego Silver-Cobalt Mines Limited.

A late diabase dike intrudes the felsic metavolcanic rocks and sulphide facies iron formation. The occurrence was described by Burrows (1926, p.40) as follows:

> The Big Four consists of four mining claims, W.D. 961-64, situated half a mile northeast of Gowganda lake. There is a great assemblage of rocks, consisting of Keewatin iron formation and green schist, quartz porphyry, older diabase dikes, Cobalt series conglomerate, and later diabase dikes. The diabase sill is not exposed on the property.
>
> A vein, carrying calcite, arsenopyrite, cobaltite, iron pyrites, and galena, was found on claim W.D. 962. It strikes N.14°E. and dips 30°E. An open-cut about 20 feet in length was made along the vein, disclosing a width of 5 to 6 inches of material carrying much bloom and arsenides. This showing is cut off by a diabase dike to the south. To the south of the dike, which is 50 feet wide, there are also some small showings of bloom. The vein or lens carrying the cobaltite occurs in iron formation, here represented by a siliceous rock resembling chert, which for four feet above the vein is much stained with iron rust. A sample from the vein carries no gold and 8 ounces of silver per ton. A shaft sunk at a point 50 feet east of the outcrop of the vein intersected the low-dipping vein, which showed the same mineralization.

Some prospecting was also done on rusty siliceous iron formation three chains northeast of the shaft. This work indicated a mass of solid iron pyrites in the iron formation lying between two north-south diabase dikes 9 feet apart and having a footwall of quartz porphyry dipping 60°N. Toward the north, the iron pyrites, about 6 feet wide, becomes leaner, grading into siliceous iron formation. The area immediately beyond the two dikes of diabase is drift covered and may conceal the extension of the sulphide band. A sample of the iron pyrites carries 41.35 per cent. of sulphur. The siliceous iron formation, carrying disseminated iron pyrites, contains no gold.

The vein material is not similar to normal vein material; areas of carbonate occur in a chloritic mass which has high local concentrations of erythrite. A grab sample taken by the author indicated 0.80 percent cobalt and traces of silver, nickel, and copper.

Over the years the logs of seven diamond drill holes totalling 214 m (705.5 feet) have been submitted to the assessment work files, Resident Geologist's Files, Ontario Mininstry of Natural Resources, Kirkland Lake. Some of this drilling was done on the pit to the southwest.

South of this prospect about 300 m (1,000 feet) is an adit in conglomerate; the adit strikes N80E into a west-facing cliff. To the east are numerous quartz veins up to 12.5 cm (5 inches) thick which strike N70E and dip 65 degrees north. These veins are apparently barren.

McIntyre Porcupine Mines Limited (108-112)

In 1967 all the ground held by McIntyre Porcupine Mines Limited was leased to United Siscoe Mines Limited. The property described in this part of the report is composed of 17 surveyed claims as follows: AK18, GG3879, HR297, HS358 to HS363, LM111, MR1251, MR1252, RSC98, RSC105, RSC106, RSC135, and RSC136. Fifteen of these claims form a block on and around Miller Lake and HR297 (111) is on the southeastern side of Leroy Lake and MR1251 and MR1252 (112) are just west of the O'Brien road. Nothing is known about the latter two and they are not described.

Except for HR297 the claim group is inside the Miller Lake diabase basin and for the most part the main block is underlain by Early Precambrian mafic volcanic rocks which have been intruded by north-striking Matachewan Diabase dikes. The upper diabase contact cuts across the western margins of the property.

CASTLE NO. 1 SHAFT MINE (108)

This shaft is on claim RSC106 on the northwestern shore of Miller Lake. The general geological setting is similar to that found at the Castle Nos. 2 and 3 (73). A description was given by Burrows (1926, p.41) as follows:

A shaft was started in Keewatin on claim R.S.C. 106 and sunk to the 300-foot level. The diabase was first encountered at 90 feet, and from this depth to 130 feet the shaft was in both formations, showing a nearly vertical contact for this distance. Below this, the shaft was entirely in the diabase, and a crosscut 400 feet in length to the north of east was run to the contact, indicating a general dip of contact of 20 degrees from 130 feet in the shaft. The contact was further ascertained, in a long drift extending 500 feet to the north of the crosscut, to be 15°N.E. Consequently, at this horizon, the

diabase dips gently under the Keewatin. A calcite vein, striking north and south and dipping steeply to the west, was discovered 130 feet from the shaft; and drifting on the vein for about 230 feet has been done on the 300-foot level and also on the 360-foot level, which is connected with the upper level by a steeply inclined winze on the vein. This vein carries in places some native silver, together with smaltite, niccolite, native bismuth, copper pyrites and pyrite, and some quartz. Several strong faults dipping 30°N.E. were encountered in the workings. One of these displaced the vein 20 feet on the 300-foot level. Several other calcite veins were also discovered. One of these showed a width of six inches in a crosscut west from the main vein, while another was encountered 400 feet from the shaft in the long crosscut, near the Keewatin contact. This vein of calcite up to four inches wide carries some smaltite.

Claim R.S.C. 92 reverted to its original owners and was purchased by the Miller Lake O'Brien mine.

Part of the underground workings of this shaft is shown in Figure 13. The final depth of the shaft was 140 m (460 feet) with a total of 1525 m (5,000 feet) of lateral work on levels established at 61 m, 91.5 m, 110 m, and 137 m (200 feet, 300 feet, 360 feet, and 450 feet).

According to the 1967 Siscoe Mines Limited annual report, this exploration would appear to have been above the good ore zones, as that year Siscoe drifted south along their 25-vein system on the 160 m (525 feet) level (Figure 13) and encountered ore on RSC106. In 1968 it was estimated that 25 percent of Siscoe's production came from the 184 m (650 feet) and 160 m (525 feet) levels in this general Castle area. This same area produced about 35 percent in 1969 but it appeared that ore reserves in this area had pretty well been mined out. Exploratory diamond drilling by Siscoe indicated numerous veins but none appeared to be ore grade.

THE HART (109)

The Hart is on claims RSC135 and RSC136 and was described by Burrows (1921, p.34) as follows:

The Hart claims, R.S.C. 135 and 136, were under option for a part of the year 1920. This property is favourably located along the hanging-wall contact of the sill diabase with the Keewatin, the sill outcropping on the southerly claim and the southwest part of the northerly claim. A shaft was sunk to the 100-foot level on a strong calcite vein. The vein strikes N.23 degs.E., is nearly vertical and averages about four to six inches in width. Masses of vein material from the drift show abundant copper pyrite, bornite and pyrite. A little silver is reported from the vein. When visited in September, 1920, the drifts had reached 80 feet and 25 feet, north and south of the shaft respectively. A number of calcite veins are exposed on the surface.

Two shafts were found by the author in this area and it is not sure which is the Hart. A grab sample taken by the writer from the dump of the southern shaft (Map 2349, back pocket) analyzed as follows: 1.14 ounces of silver per ton, 0.49 percent copper, and traces of cobalt, and nickel.

THE WALSH OR TONAPAH (110)

The Walsh or Tonapah shaft is on GG3879 on the west shore of Miller Lake. The early history, development, and geology are described by Burrows (1926,

p.41-44) as follows:

In 1924 the Tonopah Canadian Mines Company secured options on a number of properties in the vicinity of Miller lake, including Walsh, Hart, Morrison. Most of the exploratory work has been confined to the Walsh and Morrison.

The Walsh property was under option to the Crown Reserve Mining Company during parts of 1917 and 1918. A shaft, previously sunk 60 feet, was continued to 200 feet, and exploratory work was done on the 100- and 180-foot levels, this work for the most part being on veins in a diabase dike, which intrudes the Keewatin greenstone and which lay above the diabase sill. Silver was discovered over a short length in a calcite vein on the 100-foot level, but the results on the 180-foot level were less promising.

During the early part of 1920, the Walsh Mines, Limited, reopened the property and continued prospecting on the 180-foot level. The diabase sill was encountered in the northern part of the workings and some exploratory work was done on it, after which the property was closed down.

The Victoria Syndicate pumped out and sampled the property early in 1924, and later on the Tonopah Canadian Mines Company took the property over. The shaft was sunk to the 330-foot level, passing from the diabase dike into the diabase sill at about 210 feet. The two diabases being somewhat alike, the contact was difficult to locate in the shaft within a few feet. However, the dike which contains prominent phenocrysts of plagioclase gave place to the non-porphyritic diabase sill, and this rock is encountered in all the workings on the 330- and 400-foot levels.

Following exploratory work on several veins at the 330-foot level, at about 500 feet north-northwest of the shaft an ore zone was encountered, in which there are a number of intersecting veins, Nos. 7, 8, 9, 10, and 11.

It was observed that the diabase in the area of veins showed a stronger development of jointing than elsewhere, the surfaces of the joints assuming the cylindrical character, with numerous parallel parting planes, which is a feature of the favourable location of ore in the Miller Lake area.

The principal vein, No. 8, contains one high-grade ore shoot, 130 feet in length, while several ore shoots of shorter length were located in the different veins.

An inclined winze was sunk on No. 8 vein to the 400-foot level, and development work was done on the veins at this level. About 1,000 feet of work, of which 460 feet was in ore, was accomplished from the winze. One vein from 4 to 9 inches in width showed a shoot of high-grade 120 feet long. Some of the ore is mill rock averaging 30 ounces of silver over a stoping width.

The shaft has been deepened to 480 feet, and the vein system is to be developed at this depth.

The new hoist and compressor, which were first driven by steam, have been electrified, and the electric power was in use on March 20. Plans have been prepared and excavations are under way for a 75-ton concentrating plant. Ernest Craig is manager.

The underground workings are illustrated in Figure 18.

In 1943 the property was taken over by Tonapah Mining Company of Nevada and this resulted in limited production. Total production figures are in Table 26.

More recent work has been done by Siscoe. This work was started in 1968 by drifting from the 184 m level (650 feet) of the main mine workings to connect with the Walsh 166 m (480 feet) level; this was completed in 1969. Examination of the workings indicated "sporadic sections with silver mineralization' (Siscoe Annual Report 1969) but insufficient to mine. Diamond drilling, both underground and surface, was also initiated in 1969. The surface program was to examine a roll in the upper Nipissing Diabase contact (Siscoe Annual Report 1969). Silver and cobalt mineralization were encountered in several holes.

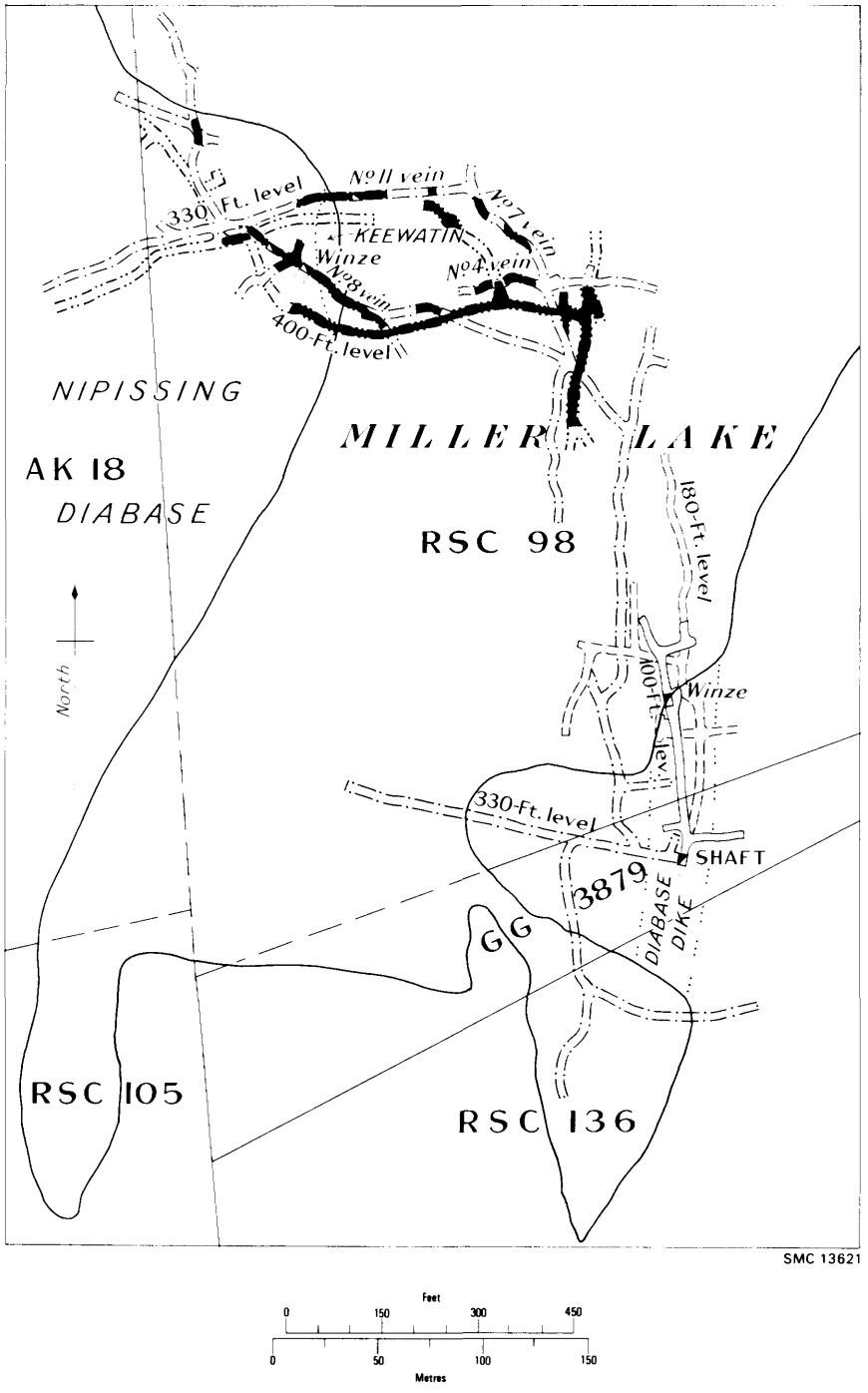


Figure 18–Underground plans of The Walsh (110) held in 1969 by McIntyre Porcupine Mines Limited and leased to United Siscoe Mines Limited (Burrows 1926, p.42).

TABLE 26 PRODUCTION FOR WALSH MINE (110) HELD IN 1969 BY McINTYRE PORCUPINE MINES LIMITED UNDER LEASE TO UNITED SISCOE MINES LIMITED (SERGIADES 1968, p.409).

Year	Ore and conc shipped (tons)	Cobalt pounds	Silver ounces
1925[1]	13	1,201	45,297
1926	95	1,281	185,986
1927	126	980	220,592
1940	2	93	1,549
Totals	236	3,555	453,424

[1] Includes small production from Morrison mine (98).

HR297 (111)

This surveyed claim, on the southeastern shore of Leroy Lake, is underlain by Nipissing Diabase. A small test pit was found in the western part of the claim. Calcite with pyrite and chalcopyrite was observed.

W. Purich (113)

(Palmer-Paine)

The property in 1969 consisted of the surveyed claim TC177 with the road from Highway 560 to O'Brien passing through the west part of the claim.

The claim is almost entirely underlain by pyroxene gabbro of the Nipissing Diabase. A Late Precambrian olivine diabase dike strikes northwest across the southwestern part of the claim. The property is in the approximate centre of the western rim of the Miller Lake basin.

The property was operated in 1917 by TC177 Mining Company Limited which by May 1918 had completed shaft sinking to 61 m (200 feet) and commenced crosscutting (OBM 1918, p.130). The company was acquired by Palmer-Paine Mines Limited in 1919. This company deepened the shaft to 63.4 m (208 feet) with lateral work on the 61 m (200 feet) level extending 113 m (370 feet) to the northeast (OBM 1919, p.152). Further work by this company consisted of drifting on the 52 m (170 feet) level in 1920 (ODM 1920, p.108). All of the above workings are in the Nipissing Diabase.

Calcite up to 7.6 cm (3 inches) was observed in the dump material. A small test pit in the northwestern part of the claim was observed. Quartz-carbonate vein material was found in the dump.

A gravel pit near the west boundary of the claim consists of mainly sandy gravel.

M. Shulman (114)

(Quebec Yellowknife Gold Mines Limited)

In 1969 the property consisted of three surveyed fractions of claims which together formed a square the approximate size of a normal claim; the claims are numbered MR15041, MR15024 and MR18087 and are about 0.4 km (¼ mile) south of Miller Lake.

The property is underlain by pyroxene gabbro of the Nipissing Diabase in the upper third of the Miller Lake diabase basin on the south rim. The Jacobs Lake fault cuts northwest across the property.

The property was formerly held by Quebec Yellowknife Gold Mines Limited. Work by this company consisted of geological mapping (Gardiner 1947a; 1950), trenching, and diamond drilling. The diamond drilling program consisted of three holes, the logs of which were submitted for assessment credit, totalling 98.1 m (323.6 feet); twelve samples were assayed for silver but poor results were obtained with nine samples returning a trace and the remaining three indicating 0.06, 0.22 and 0.26 ounce per ton (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Mapping and trenching delineated several vein systems. One of the more persistent is near the west boundary of claim MR15024 where it has been exposed by several trenches over a distance of about 150 m (500 feet). Calcite vein material up to 7.6 cm (3 inches) has local pyrite and chalcopyrite mineralization (Gardiner 1947a). One sample indicated 8.41 ounces of silver per ton and 14.29 percent copper (Gardiner 1947a).

On MR18087 a vertical calcite vein striking just north of east was found just east of Highway 560 (Gardiner 1950). The vein which fills a curving fracture, is grey calcite with erythrite. Other mineralization noted includes cobaltite, bismuthinite, and chalcopyrite (Gardiner 1950). Four samples were taken over a length of 6 m (20 feet); the assay results indicated 3.75 ounces and 0.4 ounce of silver per ton and the other two gave a trace of silver (Gardiner 1950).

Silver Bar Mines Limited (115-120)

The property in 1969 consisted of 21 surveyed claims in the northeastern part of Nicol Township; the claims were numbered MR12884 to MR12889, MR12901 to MR12911, MR12924, and MR13006 to MR13008.

The northeastern and northwestern parts of the property are underlain by

Early Precambrian intermediate to mafic metavolcanic rocks which are composed mainly of fine-grained basalt and gabbroic basalt; these rocks have been intruded by Matachewan Diabase dikes. The Gowganda Formation occurs in the southeastern part of the property with outcrops of conglomerate dominant and local feldspathic greywacke and feldspathic sandstone. Bedded argillite of the Firstbrook Member of the Gowganda Formation is present on the highway on the east side of MR12903. Pyroxene gabbro of the Nipissing Diabase occupies much of the central part of the property; this eastern margin of the intrusion forms a local arch with contacts dipping away from each other.

Several old occurrences, prospects, and mines occur within the property and these will be described in a clockwise sequence starting from the southwestern part of the property.

MR12910 (115)

There is an old shaft just east of Highway 560 sunk in the diabase. Nothing is known about this shaft and it was not observed during the field work; the location on Map 2349 (back pocket) is taken from Moore (1955). To the southwest of the shaft near the road, is a 6 mm (¼ inch) calcite vein which strikes north and dips 85 degrees east.

COLEROY (116)

The Coleroy is on MR12907 on the west shore of Leroy Lake. The following description of the mine is from Burrows (1926, p.44-46):

> The property is located on the southwest shore of Leroy Lake and was operated as the Collins claim for a number of years by F.H. Collins. The rocks exposed at the surface are Keewatin greenstones and tuffs, striking N.60°E. These are intruded by a dike of Matachewan diabase with a northerly trend. Surface work exposed a vein, along the east contact of the dike, consisting of calcite, quartz, copper pyrites, iron pyrites, with sparse cobalt and nickel minerals and native silver. A second vein of similar character was found on the west side of the dike 375 feet north of the main shaft, on which a shaft was sunk 20 feet. A vertical shaft was started on the east vein, which dipped from the shaft at 50 feet, the shaft below this being in the dike to the 288-foot level. A second vein crossed the shaft from 165 feet to 180 feet. The contact with the underlying diabase was encountered at 288 feet. The contact has an average dip of 30°N.W.
>
> The shaft was first deepened by the new company, Coleroy Gowganda, to the 388-foot level, where lateral work was done on a series of calcite veins in the diabase. No. 1 vein, with a width up to 12 inches and strike N.18°E., was drifted on for 360 feet. Some indications of silver obtained, but no high-grade was found. The shaft was deepened another 100 feet, where lateral work is in progress on veins located approximately 200 feet below the contact. Several faults, displacing the veins a few inches to a few feet, were found.
>
> Some native silver, argentite, and cobalt-nickel arsenides in small amounts were encountered in the drift on the 488-foot level along No. 1 vein. The most promising showings were found in No. 4 vein, which lies southwest of the shaft. For 40 feet, the calcite contains native silver and argentite, with grey and copper-coloured arsenides. A winze has been started in the showing.
>
> The property has the same geological structure as the Castle, the diabase coming up under the Keewatin in a reversed direction. John Shaw is manager.

Following this the assets of Coleroy Gowganda Mines Limited were acquired by Coleroy Mining Company in 1927 and the property was then taken over in 1943 by Silver Bar Mines Limited.

Further work subsequent to Burrows (1926) included, in 1926, further development work on the 149 m (488 feet) level and establishing a new level at 172 m (563 feet) by means of a winze (ODM 1927, p.156). The shaft was also deepened to 198 m (650 feet) and a level established here. Lateral work included 1,228 m (1,749 feet) of drifting and 71 m (233 feet) of crosscuts (ODM 1927, p.156).

In 1927 work continued on the three lower levels totalling 405 m (1,330 feet) of drifting, 207 m (680 feet) of crosscutting, and a 5.2 m (17 feet) winze. Patches of silver were found over a length of 24 m (80 feet) on the 149 m (488 feet) level (ODM 1928, p.168).

Figure 19 is from Burrows (1926, p.45) and is therefore incomplete as this latter development is not shown.

According to Sergiades (1968, p.401) there was no recorded production.

SILVER BULLION (117)

This old mine is on MR12884 in the southwestern part, and near the northeastern shore of Leroy Lake. The following description was written by Burrows (1926, p.46-47):

The following information is reprinted from the 1921 report:

"The Silver Bullion property is situated at the northeast end of Leroy lake. It includes two claims, on each of which a shaft has been sunk. The eastern claim, W.J. 1, formerly called the Dodds, contains outcropping of schistose Keewatin greenstone. Near the south line of the claim a vein, carrying native silver, smaltite, and native bismuth, with strike nearly east and west, was discovered. An open-cut was made on the vein by former operators, the cut being carried to a flat slip beyond which no work was done. A few bags of silver ore were taken from the open-cut. Further work by the Silver Bullion company showed the lower extension of the vein to be faulted four feet to the north. A shaft was put down on the vein to a depth of approximately 50 feet by means of hand steel. The work showed a succession of faults and slips, the vein being displaced a few feet north or south, with the greater movement to the north. The greatest throw is at the bottom of the shaft where the lower part of the vein is displaced six feet to the north. At 30 feet in the shaft, the vein is six inches in width. Segregations of silver, smaltite, niccolite, and bismuth were encountered in the calcite vein. A plant, consisting of a 100 h.p. boiler, a 6-drill compressor, and a 6- by 8-inch hoist, was installed in the fall of 1920. The property was closed down shortly after, but it is expected operations will be resumed early in 1921."

"The shaft on the western claim is located on a small island where there is an outcropping of Keewatin. It was sunk 100 feet, and the area under the lake was prospected by a crosscut to the south. A two-inch vein of calcite was encountered 90 feet to the south of the shaft. This vein showed a little smaltite. The shaft was abandoned for the new shaft on the Dodds vein."

Later the shaft was deepened and exploratory work was done on the 100- and 200-foot levels under the direction of Horace F. Strong. The contact between the Keewatin greenstone and Nipissing diabase was encountered 15 feet below the 100-foot level, indicating a dip of contact of about 20° N.E.

Most of the work was done on the 200-foot level, where several strong intersecting veins were drifted on. The principal gangue is calcite, but there is also much quartz. One vein striking N. 30° E. up to 18 inches in width, carries considerable bornite and copper pyrites. These minerals are associated with quartz, which occurs near the walls of the vein, the calcite generally occupying the centre of the vein as a later filling. A few showings of native silver were found in the vein to the northeast of the shaft, and also in a vein to the west.

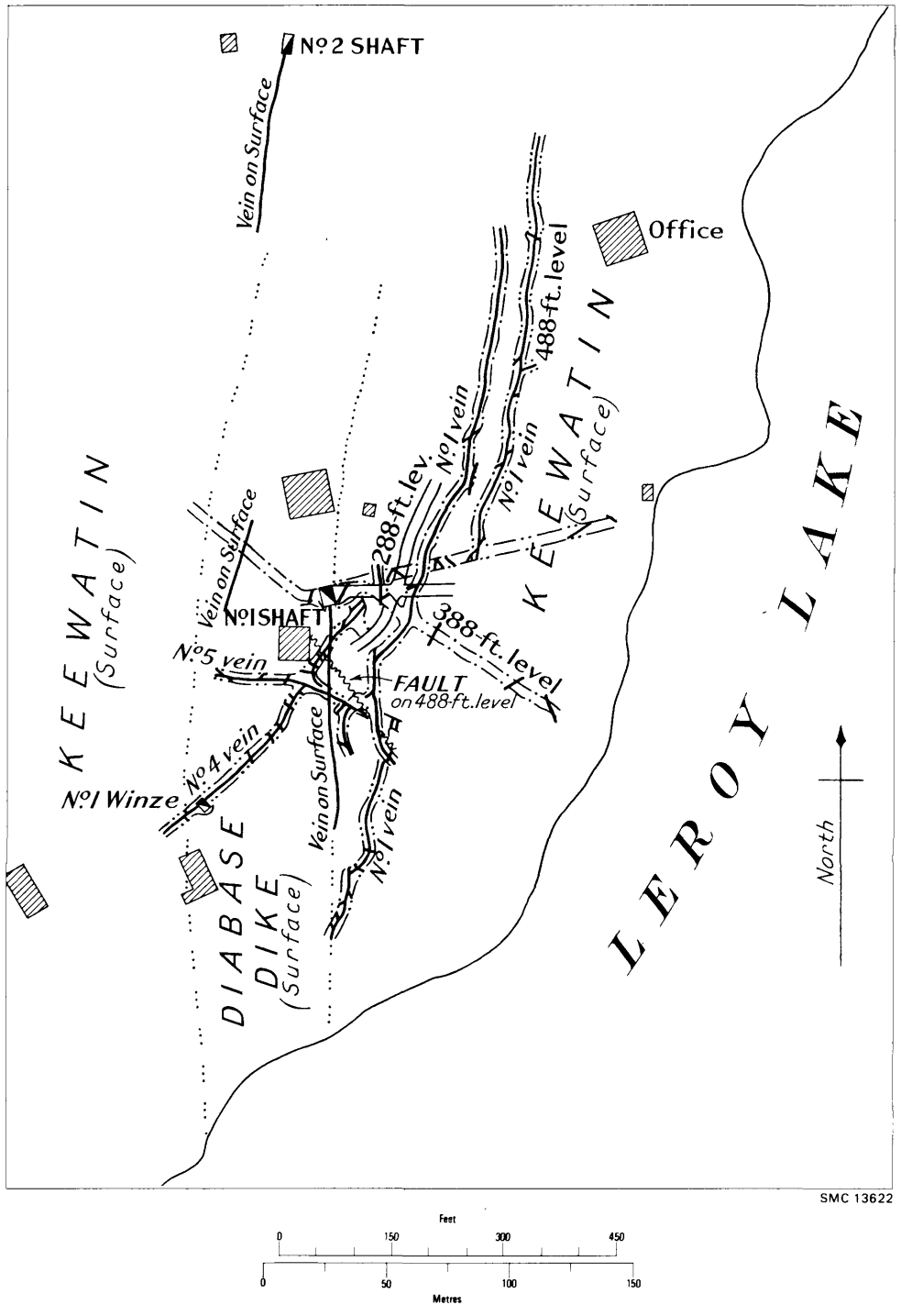


Figure 19–Underground plans at the Coleroy Gowganda Mine (116) held in 1969 by Silver Bar Mines Limited (Burrows 1926, p.45).

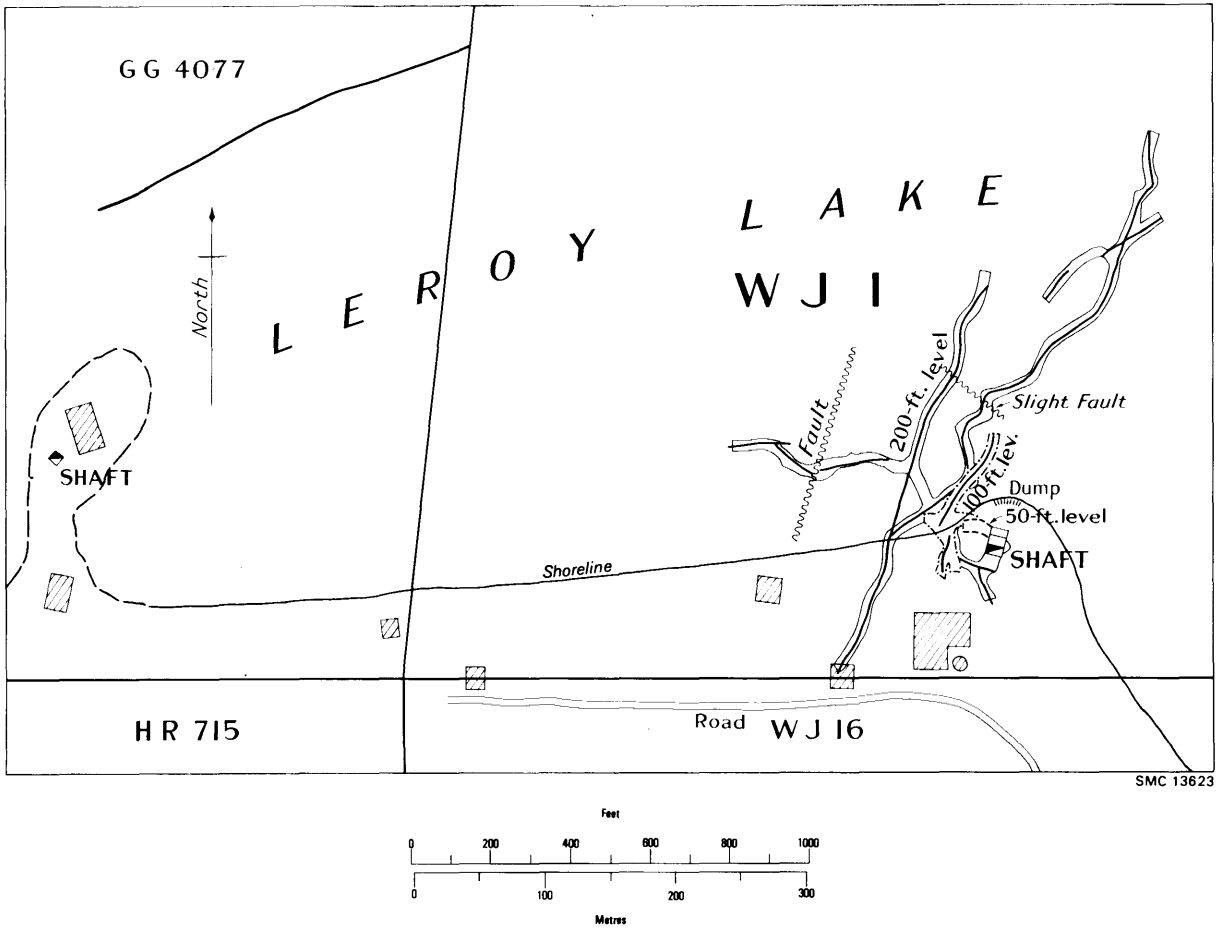


Figure 20–Plan showing shaft, buildings and underground workings, Silver Bullion Mine (117) held in 1969 by Silver Bar Mines Limited (Burrows 1926, p.46).

It was proposed to deepen the shaft to the 350-foot level and to explore the diabase at this horizon, the workings still being in the upper part of the diabase, a favourable prospecting horizon for this section of Gowganda.

The accompanying plan and section of the property were prepared by Mr. Strong.

Figure 20 shows the workings in the Silver Bullion and is also from Burrows (1926, p.46).

MR12885 (118)

About 180 m (600 feet) south-southeast of the main Silver Bullion shaft is a short adit driven into a cliff of Early Precambrian mafic metavolcanic rocks. The adit was apparently driven to intersect a 30 cm (12 inches) quartz vein with a N20W strike.

CHAPELLE (119)

The Chapelle is on MR12924 just east of Leroy Lake. The following description is from Burrows (1926, p.41):

The property lies to the east of Leroy lake, including part of the lake. The rock exposed on the surface is nearly all sill diabase, with a small amount of Keewatin near the northeast corner-post. In October, 1919, C. L. Campbell and W. H. Fairburn, who had optioned the property, began work by continuing the sinking of a shaft that had been begun some years before. This shaft is on a strong aplite dike and calcite vein. Some high-grade silver ore was encountered by the former operators at 48 feet and again in the drift at the 85-foot level. Small amounts of silver had been found frequently while sinking the shaft and running the drift. Exploration showed that the vein, which strikes S. 20° W. when drifted on to the south, was faulted 55 feet to the southeast. This fault, which dips 60° N.E., contains drag vein material and also that of an aplite dike. In the face of the drift beyond the fault, there is a 4-inch vein of calcite and two mineralized aplite dikes of 1½ and 4 inches respectively. Specimens on the dump show calcite and aplite, with copper pyrites, bornite, iron pyrites, and some smaltite and niccolite.

A number of veins were located on the surface by means of trenching in previous years, but most of these are now concealed by sand filling in the trenches. These veins occur in the diabase, which rises as a sill from the northwest, having the same relation to the Keewatin area northwest of Leroy lake as the diabase to the northwest of Miller lake, that is, it dips under the Keewatin. Work was discontinued on this claim in November, 1919.

Two grab samples were taken from the dump by the author; one sample analyzed 1.04 percent cobalt, 0.98 percent nickel with traces of silver and copper and the other sample showed traces of all four elements. Mineralization noted included annabergite, erythrite, bornite, chalcopyrite, and pyrite.

MR13008 (120)

An old shaft in the southwestern part of this claim has been reported by J.G. Willars (1969b). The shaft is on calcite veins in a shear zone associated with a north-trending fault.

T.V. Tamminen (121)

The property consisted in 1969 of two unsurveyed claims in an east-west block, which are part of the group held by Indore Gold Mines Limited in 1951.

The property is underlain entirely by pyroxene gabbro of the Nipissing Diabase.

In 1951 Indore Gold Mines Limited submitted the logs of two diamond drill holes for assessment credit; another three were submitted in 1953.

The first two in the central part of the property near the calcite vein shown on Map 2349 (back pocket) totalled 83 m (272.3 feet). One section 18 cm (0.6 foot) long contained 30 percent chalcopyrite and analyzed 10.25 percent copper; the best silver assay of 0.68 ounce per ton came from this same section (Assessment Files Research Office, Ontario Division of Mines, Toronto).

One of the 1953 holes drilled in the same general area was 17.4 m (57 feet) long; several calcite stringers were reported in the logs.

The other two holes were put down in the northeastern part and totalled 44 m (145 feet). They were put down to examine veins exposed on the surface but nothing of economic value was reported (Assessment Files Research Office, Ontario Division of Mines, Toronto).

Tamminen (personal communication, 1969) reported sulphide and hematite mineralization in veins in old pits on the property.

In the central part of the property a 5 cm (2-inch) calcite vein was found by the field party. The vein strikes N70E and dips 85 degrees south. In the southeastern part, trenching striking N85E and a pit 1.5 m (5 feet) deep were found. Calcite with bornite, chalcopyrite, and pyrite were found in the dump material.

United Reef Petroleums Limited (122)

In 1968 United Reef Petroleums Limited held a block of 117 unsurveyed claims, 6 of which were optioned from R. Ford of Gowganda, in the southwest quarter of Nicol Township.

During the summer of 1968 the company carried out a geological survey (Mather 1969) and a soil sampling program (Mather 1968) for geochemical analysis for cobalt and silver.

Early Precambrian syenodiorite and trondhjemite intruded by numerous Matachewan-type dikes occur in the northeastern part of the property. Underlying most of the property are the Gowganda and Lorrain Formations. The sediments have been intruded by the subcircular Pettipher Lake diabase which is about 240 m (800 feet) thick. The circular shape of the diabase has been disrupted by several north-trending faults. There are also several northeast-trending diabase dikes intruding the sediments.

Mather (1969) reports a series of east-striking veins north of Stumpy Lake, 0.8 km (½ mile) east of South Bay, Gowganda Lake; the veins here are the most concentrated of any place in the diabase basin. They are composed of grey calcite ranging in width from 6 mm to 12.7 cm (¼ to 5 inches) and they occur in joints (Mather 1969). Three of the larger veins on MR45197 (Figure 21) were

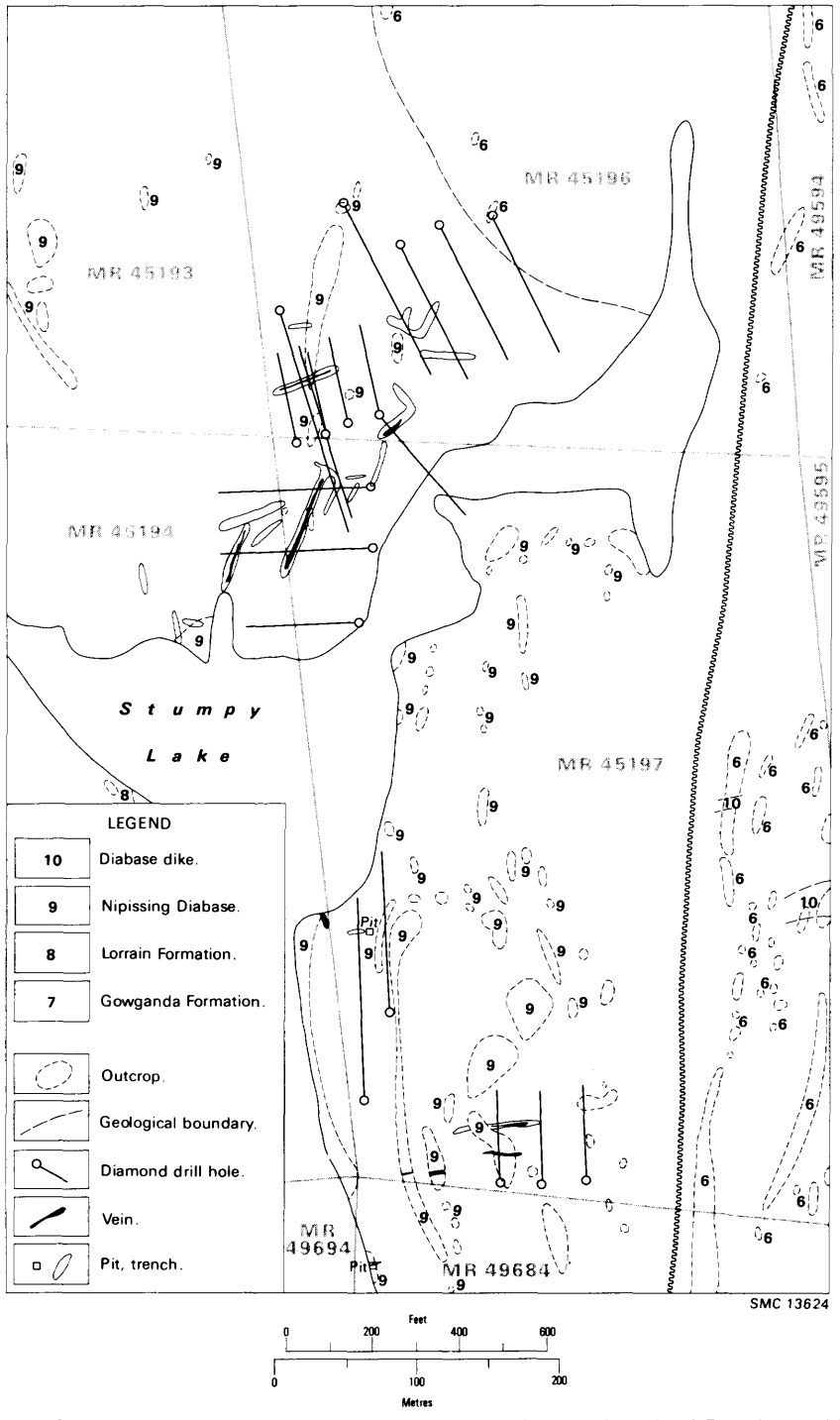


Figure 21–Geology, diamond drilling, and veins at part of the United Reef Petroleums Limited (122) property.

sampled following blasting and two returned assays of 20 ounces of silver per ton (Mather 1969). There is little or no visible silver but pyrite, chalcopyrite, and galena were observed (Mather 1969).

Mather (1969) suggests this vein system has been exposed by the erosion of the upthrown west side of a fault which strikes north-northeast along Stumpy Lake and the long narrow lake to the north of Stumpy; the fault dips 30 degrees east.

The geochemical survey involved over a thousand samples along with several hundred check samples (Mather 1968). Anomalous high values were encountered in areas of known veins.

Exploration on the property was continued with follow-up diamond drilling. The logs of 20 holes totalling 2,617 m (8,581 feet) were submitted for assessment credit; all of these holes were put down in the vicinity of Stumpy Lake (Figure 21). The highest assay reported in the logs was 0.50 ounce of silver per ton. A sample taken by the field party from a pit on the shore of Stumpy Lake in the vicinity of these veins analyzed only traces of silver, cobalt, nickel, and copper.

The other area of interest on the property is the northeast-trending diabase dike north of Pettipher Lake. Numerous small test pits and a shaft 7.6 m (25 feet) deep have been sunk along the dike; the dump contains calcite with chalcopyrite. Traces of silver, nickel, and copper and no cobalt were obtained on analysis of a grab sample taken by the author from the dump.

United Siscoe Mines Limited (123-125)

In 1969 the property of United Siscoe Mines Limited was operated by Siscoe Metals of Ontario Limited which in 1972 was a wholly owned subsidiary of United Siscoe. The company's property was composed of three blocks of claims each of which will be described separately. The first group is a block of seven surveyed claims numbered RSC88 to RSC94 on which the famous Miller Lake O'Brien (123) mine is located. The second is the O'Connell (124) Group of unsurveyed claims. Finally the Roy-Ten Group (125) is part of a block which overlaps into Haultain Township and has already been described in that section of the report under Roy-Ten Group (93) and will not be written up here.

THE MILLER LAKE O'BRIEN MINE (123)

The most important claims in this group are RSC90 and RSC91 which in 1908 were known as the Gates claims. In 1909 the property was held by the Miller Lake Mining Company and finally in 1910 was taken over by the M.J. O'Brien interests. According to S. Young and A. Young (1967, p.106) M.J. O'Brien bought the property on a hunch and never saw it. Later in that year Clifford Sifton bought a one-third interest in the mine for $12,000 which was what O'Brien paid for it (Young and Young 1967, p.107). A few months prior to the first ore shipment in 1910 Sifton relinquished his interest in the mine for $10,000 and in so doing lost a great deal of money (Young and Young 1967, p.108).

Some of the geology, early development and history of the property was described by Burrows (1920, p.81-82):

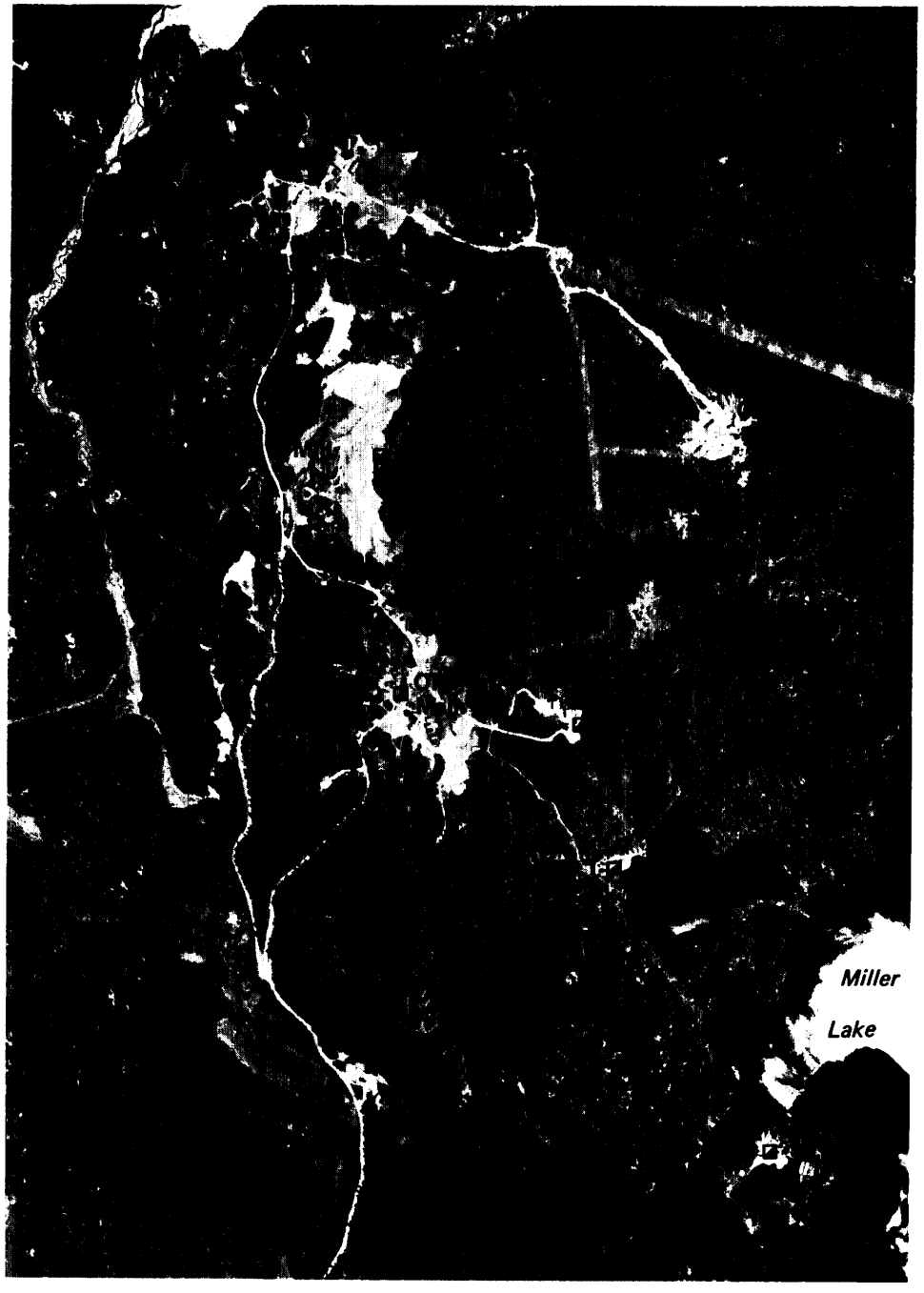
The Miller Lake O'Brien mine comprises a group of claims to the northwest of Miller lake. They were formerly the Gates claims, on which discoveries of native and smaltite were made in 1908. Later the Millerett mine was purchased by the Miller Lake O'Brien Company. The first development was done on veins with a general north and south strike, lying near the line between claims R.S.C. 90 (654) and R.S.C. 91 (653). Of these the most important were known as No. 2 vein system, which produced most of the ore in the early years of the mine. Development showed the veins of this system to dip steeply to the west, with the pitch of the ore shoots to the south. Of this system, the foot-wall veins have been the most productive. The ore shoot in the hanging-wall veins did not extend to the 140-foot level, whereas the foot-wall ore body continued nearly to the 350-foot level. Each of these series carried two or more veins, which were sufficiently close together, where the ore shoots occurred, to allow mining in one stope. The veins were generally from two to five inches wide, and in the ore shoots individual veins were not always productive, but where one was barren, a parallel vein would carry the high grade ore. Very little ore was taken from this system above the 60-foot level. The greater proportion of the silver values was confined to the veins themselves, there being only a small impregnation of the wall rock. Strong east and west faults dipping 30° north were encountered in the workings on No. 2 system. In developing this vein system a series of cross-veins was encountered south of the shaft, on the 250-foot level, having an east and west strike. This series of veins is known as the cross-system and dips to the south at a high angle. An ore-shoot was found on the 250-foot level, and was stoped a short distance above the 140-foot level. It was followed down below the 400-foot level with decreasing length along the drifts.

The latest discovered ore system is known as the "Flynn". The first ore was encountered on the 350-foot level. A long east and west drift had crossed a very pronounced north and south fault, dipping 50° east, and a northerly cross-cut had intersected No. 6 vein, which was followed to a second fault, striking east and west and dipping 30° to 40° north. Ore was found in No.6 vein above this fault. From this discovery the development was extended to a number of veins, the principal of which are No. 6, No. 7N., No. 7 N.W., etc. On stoping No. 6 above the 350-foot level it was found to join No. 7 N.W., producing the greatest width of high-grade found in the mine, where one portion of the vein was three feet wide of high-grade silver, smaltite and calcite. Later, in drifting on No. 7 vein on the 350-foot level, portions of it were of high-grade ore two feet wide. In this rich section of the "Flynn" system the stope was 14 feet in width, in places of high-grade veins and mill rock. Development in this part of the mine threw light on the ore relationships. The workings show that the high-grade values did not extend into the Keewatin, while the veins themselves became more indefinite, branching into stringers carrying galena, copper pyrites, and other common minerals. The contact as determined at a few points in different parts of the mine dips from 30° to 80° (with the sill diabase below the Keewatin greenstone), gradually flattening.

Development has shown the aforementioned east and west fault to be generally the lower boundary of the ore. The veins carrying the ore are said to have been only slightly displaced by the fault. One vein, No. 7 N.W., was observed to have been faulted about three feet. In this vein the east and west fault is not the lower boundary of the ore since ore was being stoped from it on the 400-foot level below the fault. The ore occurs in the diabase below the Keewatin greenstone, while the main ore-shoots pitch to the north, being controlled by the Keewatin-diabase contact and the east and west fault, the ore not necessarily coming close to the contact. In developing vein No. 7 N. which carries the principal ore body, an inclined winze (87° W) has been carried from the 350-foot level to the 525-foot level, and the ore from this and other veins is developed from the several levels.

Development at this mine on R.S.C. 90 and 91 has shown all the ore so far to be in the diabase. The early workings at No. 2 vein system were in the diabase, but outcropped at the surface, where only a small portion of the sill had been eroded. Later work being in the diabase below the Keewatin, it has been determined that silver ore occurs at greater depth from the present surface, depending roughly on the Keewatin-diabase contact. The silver ore occurs in the upper portion of the diabase sill in proximity to the contact.

The ore is partially dependent on faulting conditions, as shown in the workings of the Flynn system.



ODM9801

Photo 12–No.6 Shaft at United Siscoe Mines Limited.

Burrows (1926, p.29-32) describes further development:

During 1920, operations were continued on the series of veins in the Flynn system. A new vein, No. 16, carrying native silver, which lies 25 feet west of the north part of the main vein, No. 7 N., was discovered and drifted on for 140 feet on the 460-foot level. This vein lies above the strong north-south fault, which dips 50° E.; and the ore shoot in this vein, as well as N. 7 N.W., was not located below the fault. Further work was done on vein No.7 N.E., in which ore was found on the 525-foot level below the prominent east-west fault, called the ore fault, which in several veins terminated the downward extensions of ore shoots.

Further exploratory work was done in 1924 on a series of veins lying to the south of the Flynn system, resulting in the finding of further ore shoots on which more recent development work has been done. The veins occur in a connecting system of fractures which, in part, follow the curved columnar jointing of the diabase. The most important ore shoot on the 525-foot level is No. 73, where for a length of 210 feet the ore is high grade. It consists of from one to three veins up to six inches in width. In one part of the stope, three veins occur, showing considerable leaf silver in the wall rock, in a width of 18 feet. The high-grade veins consist of calcite and a little quartz, with native silver and iron-cobalt-nickel arsenides. Some of the calcite has a roughly banded structure and is very fine grained, suggesting colloidal origin. Most of the calcite is, however, coarsely crystallized, from grey to pink in colour. The veins in places show a band of calcite, parallel to which are the silver and cobalt minerals together with calcite. Strips of diabase at times occur in the veins, and these have been much altered by vein solutions, as has also the wall rock along the veins. The ore, as described elsewhere by Mr. Todd, has been greatly brecciated.

Exploratory work along veins has been continued at the 525-foot level from the diabase into the Keewatin, but so far no ore shoots have been indicated in the greenstone.

Development was continued by means of a winze on vein No. 71 to the 585-foot level, and ore of similar character to that on the 525-foot level was drifted on for 300 feet on the downward extension of No. 73. The winze has been continued to the 650-foot level with rich ore showing for 206 feet on vein No. 71, while vein No. 72 has not yet been cut on this level. In the latest work on the 650-foot level, a cross-vein, No. 79, containing high-grade ore, and a third high-grade vein, No. 80, branching from it, were encountered; the latter parallels No. 71. In addition to veins carrying silver, several containing cobalt-bearing minerals have been encountered on different levels.

Such minerals as copper pyrites, iron pyrites, galena, sphalerite, native bismuth, niccolite, and argentite occur in the veins.

The property was kept in production until 1939. Leasing operations were carried on from 1940 to 1944 (Sergiades 1968, p.402). In 1945 the property was taken over by Siscoe Metals of Ontario Limited, and continuous production has been maintained. Total production figures are in Table 27.

Underground workings and some of the main vein systems are illustrated in Figure 13 and these workings are summarized in Table 28.

Since taking over the property Siscoe Metals of Ontario Limited has kept up a continuing and intensive program of exploration and to a very large degree this has met with success as they have kept production up close to 1,000,000 ounces every year since 1954.

As mentioned proviously in the section on "Economic Geology" there have been numerous detailed studies made on the silver-cobalt vein systems of the Timaskaming area and one such study was made on the Number 13 vein system in the Siscoe workings by S.D. Scott (1964).

Scott's (1964) conclusions are summarized as follows:

1. The ore is within the Nipissing Diabase and the vein was emplaced tangentially to the cylindroidal joints as fracture-fillings and replacement.

2. The major thrust faults ("C' and Glory Hole faults) are post-ore and therefore did not influence vein formation.

3. The most abundant vein material is calcite.

TABLE 27 | PRODUCTION FOR MILLER LAKE O'BRIEN MINE (123)(SERGIADES 1968, p.403 AND ODM STATISTICS).

Year	Ore and conc. shipped (tons)	Cobalt pounds	Silver ounces	Nickel pounds	Copper pounds
1910	31	—	91,730	—	—
1911	135	—	338,000	—	—
1912	112	—	354,252	—	—
1913	167	—	469,923	—	—
1914	114	—	369,544	—	—
1915	110	—	242,229	—	—
1916	171	—	360,670	—	—
1917	350	—	1,050,149	—	—
1918	160	26,994	631,671	—	—
1919	184	27,404	708,872	—	—
1920	115	14,982	376,417	—	—
1921	103	9,187	224,340	—	—
1922	76	6,948	130,553	—	—
1923	24	2,199	12,844	—	—
1924	26	2,154	50,021	—	—
1925	150	7,226	347,909	—	—
1926	33	3,007	70,764	—	—
1927	260	15,768	588,216	—	—
1928	285	26,303	876,461	—	—
1929	359	35,880	1,197,634	—	—
1930	358	52,005	1,188,390	—	—
1931	350	38,411	1,289,742	—	—
1932	530	72,081	1,374,660	—	—
1933	366	40,729	1,244,812	—	—
1934	270	32,273	1,039,565	—	—
1935	214	20,818	800,669	—	—
1936	234	24,241	637,411	—	—
1937	201	20,818	521,633	—	—
1938	196	15,457	501,821	—	—
1939	200	19,185	498,043	—	—
1942	69	7,194	191,526	—	—
1943	60	5,205	172,693	—	—
1944	71	9,000	250,676	—	—
1945	11	1,185	44,585	—	—
1947	—	—	94,301	—	—
1948	507	—	183,163	—	—
1949	723	6,000	626,254	—	—
1950	1,182	18,470	836,047	—	—
1951	1,247	23,115	879,506	—	—
1952	1,454	20,369	1,047,037	—	—
1953	871	13,400	640,100	—	—
1954	1,542	17,500	1,097,563	—	—
1955	1,073	24,917	1,039,162	—	—
1956	787	17,036	722,236	—	—
1957	963	17,040	903,177	2,997	19,610
1958	1,239	23,740	1,215,651	4,529	10,010
1959	1,352	34,374	1,379,650	—	7,507
1960	1,317	—	1,346,534	2,668	—
1961	1,419	23,527	1,440,433	3,054	2,746
1962	1,185	9,088	1,382,440	—	5,361
1963	1,287	—	1,333,825	—	25,527
1964	1,272	—	1,331,580	—	—
1965	1,159	—	1,080,561	—	1,778
1966	—	—	1,206,149	—	—
1967	—	—	917,333	—	347
1968	—	—	978,711	—	—
1969(1)	—	—	799,998	—	—
Totals		785,700	40,736,585	13,248	72,946

(1) Includes partial production from McIntyre Porcupine Leased ground.

TABLE 28 | SHAFTS, SISCOE MINE (ODMNA 1969, p.115).

Shaft	Claim No.	Inclination	Number of Compartments	Collar Depth	Vertical Depth Below Surface
				Feet	Feet
No. 6 shaft	RSC91	Vertical	3 and 2	Surface	1,542
No. 2 shaft	RSC91	75½°	2 (inactive)	Surface	438
No.20 shaft	RSC94	76°	2 (inactive)	Surface	158
No. 1 winze	—	75°	2 (inactive)	350	458
No. 2 winze	—	82°	2 (inactive)	350	460
No. 3 winze	—	76°	2 (inactive)	350	402
No. 4 winze	—	82°	2 (inactive)	350	530
No. 5 winze	—	Vertical	2 (inactive)	525	640
No. 7 winze	—	75°	2 (inactive)	730	902
No. 8 winze	—	68°	2 (inactive)	730	788
No. 9 winze	—	Vertical	3 (inactive)	730	898
No.10 winze	—	69°	2 (inactive)	900	970
No.11 winze	—	Vertical	2	850	1,369

Shafts and winzes not connected to present workings.

4. Native silver and safflorite are the most abundant of 23 metallic minerals found.

5. There were two stages of mineralization separated by the intrusion of the quartz diabase dike and shearing of minerals of the first stage.

6. A paragenetic sequence for deposition as shown in Figure 22 is from Scott (1964). The sequence is as follows: arsenopyrite, triarsenides, diarsenides, monarsenides, sulpharsenides, sulphides, sulphantimonides, and native elements.

7. Zoning in the orebody is also indicated (Figure 23). From bottom to top is a nickel zone characterized by rammelsbergite, niccolite, and gersdorfite; overlying this is the ore zone with native silver, skutterudite, and safflorite the dominant minerals. Overlying the ore zone is a Cobaltite zone and an arsenopyrite zone.

8. Typical wall-rock alteration is present with a dark chlorite band adjacent to the veins which grades outward to a light saussuritized band and then to spotted diabase.

9. Scott (1964) concluded the veins are the result of ascending hydrothermal fluids at more than 500°C and cooled to less than 268°C during the late stages of mineralization.

10. The ores were from a magmatic source below the Nipissing Diabase and emplaced 865 m.y. post-diabase solidification.

O'CONNELL CLAIMS AND "K" PROJECT (124)

This block of 27 contiguous claims located about 1.6 km (1 mile) south of Leroy Lake is composed, in part, of the block referred to by the company as the O'Connell Group. Some of the northern claims formed part of their "K" project.

The western area of the claim group is underlain by Early Precambrian mafic metavolcanic flows with pillow lava and pyroclastics occurring locally. Porphyritic trondhjemite which intruded the assemblage, is exposed in the southwestern part of the claim group. All these rocks have been intruded by north-

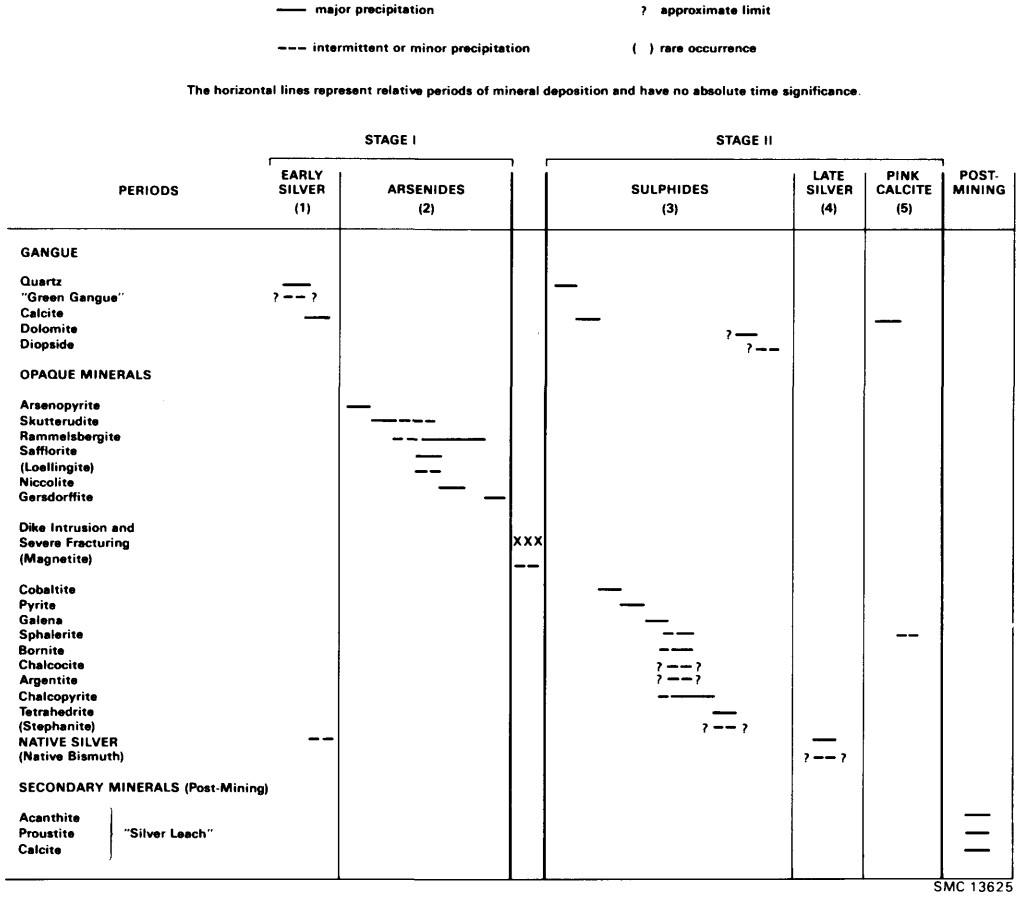


Figure 22–Paragenetic sequence in the No.13 vein system in the Miller Lake O'Brien Mine (123) held in 1969 by United Siscoe Mines Limited (Scott 1964, p.56).

trending Matachewan Diabase dikes.

Pyroxene gabbro of the Nipissing Diabase occurs in the eastern and northern sections of the claim group; the contact with the Early Precambrian rocks is the lower one.

Geochemical soil sampling programs (Campbell 1967b; 1969) were conducted and the results submitted for assessment credit.

The results of the first survey (Campbell 1967b) were inconclusive but several anomalous high value zones were indicated in the second survey (Campbell 1969) which was concentrated on the northern part of the property.

Just west of Jacobs Lake is a pit on a 1.3 m (4 feet) quartz porphyry dikelet in a diabase dike in mafic volcanics. The dike strikes northwest.

There is also a pit, in the northwestern part of the group, which has been sunk on a 5 cm (2 inches) calcite vein with pyrite mineralization.

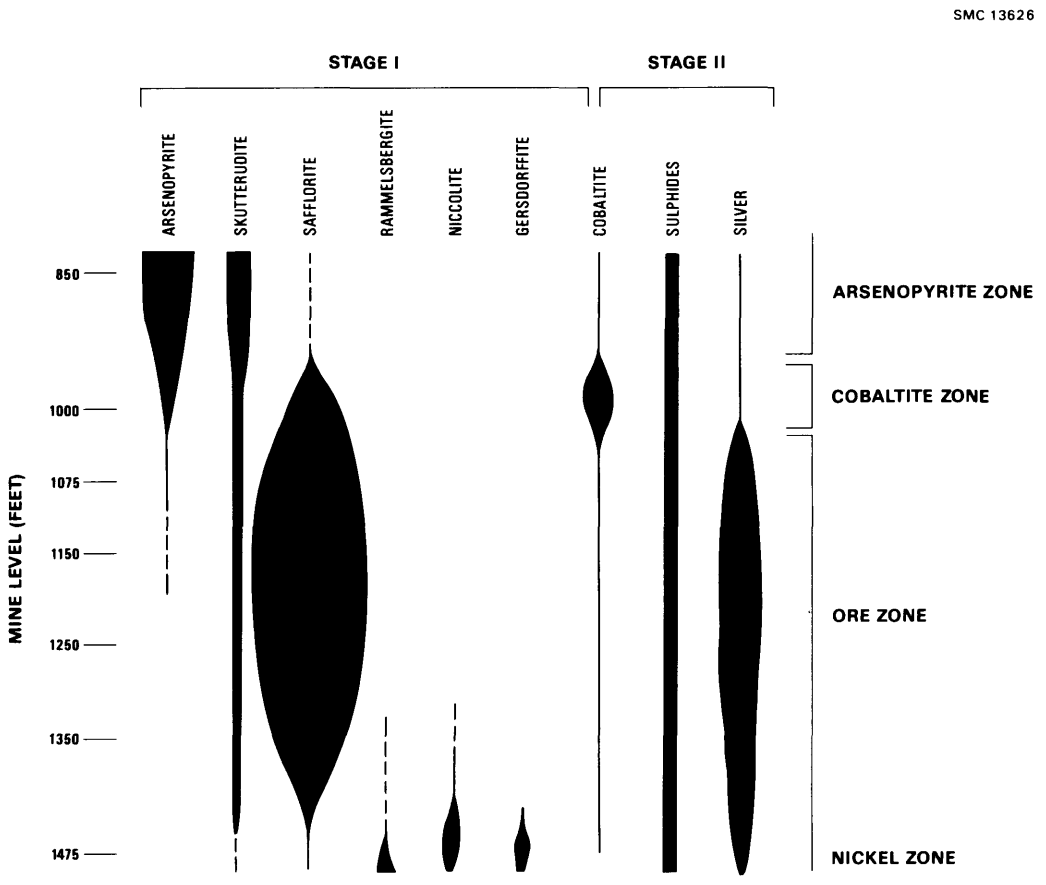


Figure 23–Estimated relative abundance of the metallic minerals in the No.13 vein system of the Miller Lake O'Brien Mine (123) held in 1969 by United Siscoe Mines Limited. The abundance is plotted against depth in a pre-fault reconstruction (Scott 1964, p.70).

Cartier-Malartic Mines Limited held part of the ground in the north along the olivine diabase dike just south of MR12911 of Silverbar Mines Limited. Geological mapping (Gardiner 1947b) indicated several veins in the metavolcanics.

J.G. Willars (126)

J.G. Willars held two unsurveyed claims in 1968 in the northeastern quarter of Nicol Township. They are part of the group held by Orvana Mines Limited in 1963 (Willars 1963).

The two claims are underlain by pyroxene gabbro of the Nipissing Diabase.

Several old pits and shafts on the property were presumably put down in the early days. Recent work on the property includes geophysical (Willars 1969a) and geological surveys (Willars 1969b).

The geophysics consisted of magnetometer and electromagnetic surveys. The magnetometer survey indicated "a mild background northeasterly trend across the claims' (Willars 1969a). Minor northeast-trending conductors were indicated in the electromagnetic survey (Willars 1969a).

The trends in both surveys appear to be coincident with fault zones on the property.

One of these faults is subparallel to the east boundary of the property; on the east side of the fault is a fracture zone striking N65E with gouge 5 cm (2 inches) wide with silver and erythrite (Willars 1969b). Grab samples taken by Willars assayed 229.1, 23.18, and 1.38 ounces of silver per ton (Willars 1963; 1969b). He also reported the core of an old diamond drill hole which intersected cobalt arsenides and grey calcite.

Little is known about the other workings on the property.

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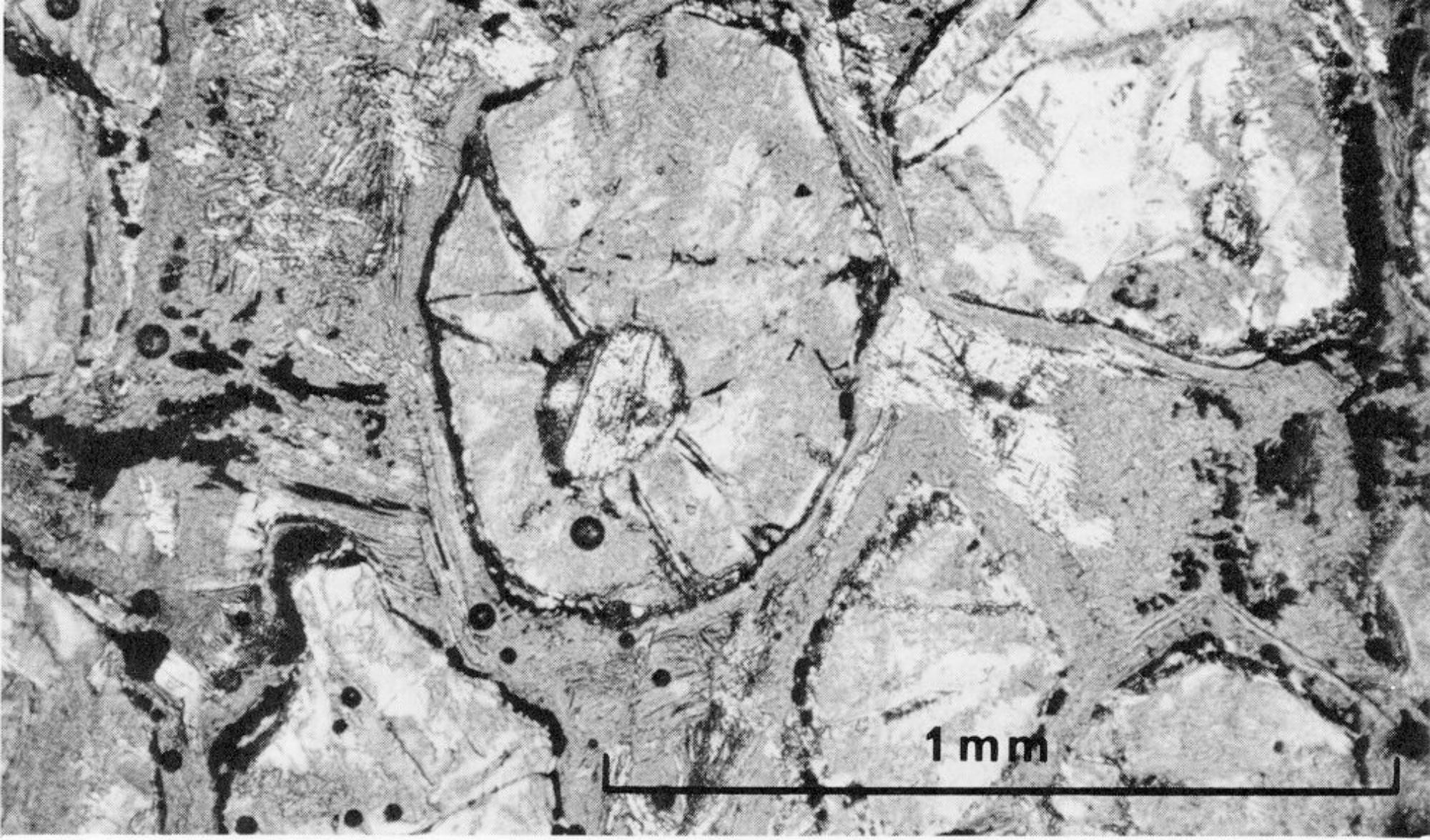
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Castle No.2
Castle No.3
Lower Bonsall
Capitol
Mill
Millerett
No.10
Old
Main
Siscoe No.6
Castle No.1
Miller
Lake
Walsh
Shaft

ODM9794

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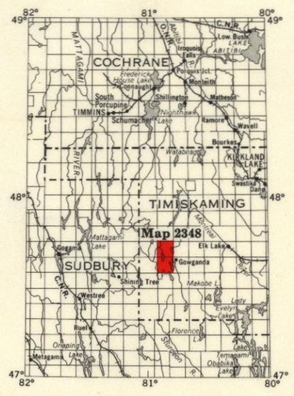
DR. J. K. REYNOLDS, *Deputy Minister of Natural Resources*
G. A. Jewett, *Executive Director, Division of Mines* E. G. Pye, *Director, Geological Branch*

Map 2348
Van Hise and Milner Townships



Scale, 1 inch to 50 miles
N.T.S. Reference 41P/10, 41P/15

LEGEND

PHANEROZOIC
CENOZOIC[a]
QUATERNARY
PLEISTOCENE AND RECENT
Glacial deposits, swamp, lake and stream deposits.
UNCONFORMITY
PRECAMBRIAN[b]
LATE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS[c]
DIABASE DIKES
11a Olivine diabase.
11b Porphyritic olivine diabase.†
10 Diabase.
INTRUSIVE CONTACT
MIDDLE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS[c]
NIPISSING DIABASE
9 Unsubdivided.
9a Pyroxene gabbro.
9b Amphibole gabbro.
9c Granophyre.
9d Aplite.
INTRUSIVE CONTACT
HURONIAN SUPERGROUP
COBALT GROUP[c]
LORRAIN FORMATION
8 Unsubdivided.
8a Micaceous sandstone.
8b Feldspathic sandstone.
8c Greywacke.
8d Quartzose sandstone, proto-quartzite.
8e Ferruginous sandstone.
8f Orthoconglomerate.
GOWGANDA FORMATION
Firstbrook Member
7 Laminated argillite.
Coleman Member
6 Unsubdivided.
6a Feldspathic greywacke.
6b Feldspathic sandstone, arkose.
6c Conglomerate.
6d Ferruginous sandstone.
6e Breccia.
6f Argillite, siltstone.
6g Protoquartzite.
UNCONFORMITY
EARLY PRECAMBRIAN (ARCHEAN)
MAFIC INTRUSIVE ROCKS[c]
DIABASE DIKES (MATACHEWAN TYPE)
5a Diabase.
5b Porphyritic diabase.
INTRUSIVE CONTACT
FELSIC INTRUSIVE ROCKS[c]
4 Unsubdivided.
4a Trondhjemite.
4b Porphyritic trondhjemite.
4c Quartz diorite.†
4d Syenodiorite.†
4e Contaminated zone.
4f Pegmatite.
4g Feldspar porphyry.
INTRUSIVE CONTACT
METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS[c]
3a Gabbro.
3b Serpentinized dunite.
INTRUSIVE CONTACT
METAVOLCANICS
FELSIC METAVOLCANIC ROCKS[c†]
2 Unsubdivided.
2a Dacite, porphyritic dacite.
2b Felsic tuff.
IF Iron Formation.†
MAFIC TO INTERMEDIATE METAVOLCANICS[c]
1 Unsubdivided.
1a Basalt, andesite.
1b Amphibolite.
1c Foliated amphibolite.
1d Gabbroic flows.
1e Amygdaloidal basalt.
1g Pillowed lava.
1h Pyroclastic rocks.
1j Porphyritic andesite.
1k Schistose rocks.
1m Metasedimentary rocks.

Breccia

Ag Silver.
anna Annabergite.†
Bi Bismuth.
bn Bornite.
calc Calcite.
Co Cobalt.
cp Chalcopyrite.
Cu Copper.
ery Erythrite.
hem Hematite.
nc Niccolite.
Ni Nickel.
po Pyrrhotite.†
py Pyrite.
q Quartz.
qc Quartz carbonate.
S Sulphide mineralization.
sp Sphalerite.†

SYMBOLS

Glacial striae.
Esker.
Small bedrock outcrop.
Area of bedrock outcrop.
Bedding, horizontal.
Bedding, top unknown; (inclined, vertical).
Lava flow; top (arrow) from pillows shape and packing.
Direction of palaeocurrent.
Schistosity; (horizontal, inclined, vertical).
Gneissosity, (horizontal, inclined, vertical).
Foliation; (horizontal, inclined, vertical).
Lineation with plunge.
Geological boundary, observed.
Geological boundary, position interpreted.
Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
Lineament.
Jointing; (horizontal, inclined, vertical).
Drill hole; (vertical, inclined).
Drill hole; (projected vertically, projected up dip).
Vein, vein network. Width in inches.
Shaft; depth in feet.
Magnetic attraction.
Motor road. Provincial highway number encircled where applicable.
Other road.
Trail, portage, winter road.
Building.
Township boundary with mileposts, approximate position only.
Mining property, surveyed.
Mineral deposit; mining property, unsurveyed.
Surveyed line approximate position only.

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts of the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map-unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

[c] *Rock types in these groups are subdivided lithologically and the order does not imply age relationship within the groups.*

† *Appears on companion sheet.*

PROPERTIES, MINERAL DEPOSITS

VAN HISE TOWNSHIP

1. Foot Creek occurrence.
2. Gould Lake occurrence.
3. Silverfive Lake occurrence.
4. Silverplace Mines Ltd. [1965].
5. Southeast Van Hise Township occurrence.
6. Stirrett, J. R.
7. Sutherland, W. D.
8. Brett Lake occurrence.
9. Charbonneau occurrences.
10. Texmont Mines Ltd.
11. Tribag Mining Co. Ltd.
12. United Siscoe Mines Ltd.

MILNER TOWNSHIP

13. Beadman, J.
    Decker, A.
14. Bartlett Open Cut.
15. Crews McFarlan No. 2.
16. Fryingpan Lake Shaft.
17. Gowganda Silver Mines Ltd.
18. Hines, F.
19. Lett Lake occurrence.
20. Logan Lake Prospect.
    Manridge Mines Ltd.
21. Bartlett No. 1.
22. Crews McFarlan No. 3.
23. Boyd Gordon.
24. Crews McFarlan-Hewitt Lake.
25. Hewitt Lake Mining Syndicate.
26. Mann Mine.
27. Myrtle Lake Area.
28. South Bay and O'Brien.
29. Reeve Dobie.
30. Welch.
31. Maralgo Mines Ltd. [1957].
    Montreal River Silver Mines Ltd.
32. The Hedges.
33. The Milne.
34. TC 128 and TC 129.
35. Reeve, Beatrice.
    Silver Ore Zone Mines Ltd.
36. The Bishop.
37. Transcontinental.
38. Sutherland, D.
    Tego Silver Cobalt Mines Ltd. [1961].
39. F. Loring Prospect.
40. Armstrong.
41. United Reef Petroleums Ltd.
42. United Siscoe Mines Ltd.
43. Utopia Gold Mines Ltd.

Information current to December 31st, 1969. Former properties on ground now open for staking are only shown if exploration data is available—a date in square brackets indicates last year of exploration activity. For further information see report.

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Cartography by M. J. Colman and assistants, Surveys and Mapping Branch, 1975.

Basemaps derived from maps of the Forest Resources Inventory, Surveys and Mapping Branch.

Magnetic declination in the area was approximately 9°15'W, 1966.

Published 1976

Map 2348
VAN HISE AND MILNER TOWNSHIPS
TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet

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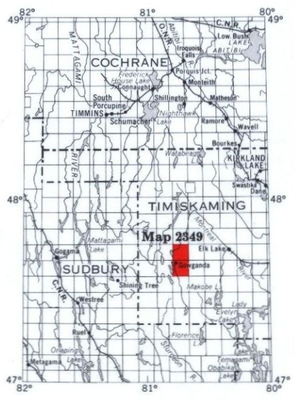

Scale, 1 inch to 50 miles
N.T.S. Reference 41P/10, 41P/15

SYMBOLS

- Glacial striae.
- Esker.
- Small bedrock outcrop.
- Area of bedrock outcrop.
- Bedding, horizontal.
- Bedding, top unknown; (inclined, vertical).
- Lava flow; top (arrow) from pillows shape and packing.
- Direction of palaeocurrent.
- Schistosity; (horizontal, inclined, vertical).
- Gneissosity, (horizontal, inclined, vertical).
- Foliation; (horizontal, inclined, vertical).
- Lineation with plunge.
- Geological boundary, observed.
- Geological boundary, position interpreted.
- Fault; (observed, assumed). Spot indicates down throw side, arrows indicate horizontal movement.
- Lineament.
- Jointing; (horizontal, inclined, vertical).
- Drill hole; (vertical, inclined).
- Drill hole; (projected vertically, projected up dip).
- Vein, vein network. Width in inches.
- Shaft; depth in feet.
- MA Magnetic attraction.
- 560 Motor road. Provincial highway number encircled where applicable.
- Other road.
- Trail, portage, winter road.
- Building.
- 2 Township boundary with mileposts, approximate position only.
- 103 Mining property, surveyed.
- 99 Mineral deposit; mining property, unsurveyed.
- Surveyed line approximate position only.

LEGEND

PHANEROZOIC

CENOZOIC[a]

QUATERNARY

PLEISTOCENE AND RECENT

Glacial deposits, swamp, lake and stream deposits.

UNCONFORMITY

PRECAMBRIAN[b]

LATE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS[c]

DIABASE DIKES

- 11a *Olivine diabase.*
- 11b *Porphyritic olivine diabase.*
- 10 *Diabase.*

INTRUSIVE CONTACT

MIDDLE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS[c]

NIPISSING DIABASE

- 9 *Unsubdivided.*
- 9a *Pyroxene gabbro.*
- 9b *Amphibole gabbro.*
- 9c *Granophyre.*
- 9d *Aplite.*

INTRUSIVE CONTACT

HURONIAN SUPERGROUP

COBALT GROUP[c]

LORRAIN FORMATION

- 8 *Unsubdivided.*
- 8a *Micaceous sandstone.*
- 8b *Feldspathic sandstone.*
- 8c *Greywacke.*
- 8d *Quartzose sandstone, proto-quartzite.*
- 8e *Ferruginous sandstone.*
- 8f *Orthoconglomerate.*

GOWGANDA FORMATION
Firstbrook Member

- 7 *Laminated argillite.*

Coleman Member

- 6 *Unsubdivided.*
- 6a *Feldspathic greywacke.*
- 6b *Feldspathic sandstone, arkose.*
- 6c *Conglomerate.*
- 6d *Ferruginous sandstone.*
- 6e *Breccia.*
- 6f *Argillite, siltstone.*
- 6g *Protoquartzite.*

UNCONFORMITY

EARLY PRECAMBRIAN (ARCHEAN)

MAFIC INTRUSIVE ROCKS[c]

DIABASE DIKES (MATACHEWAN TYPE)

- 5a *Diabase.*
- 5b *Porphyritic diabase.*

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS[c]

- 4 *Unsubdivided.*
- 4a *Trondhjemite.*
- 4b *Porphyritic trondhjemite.*
- 4c *Quartz diorite.*
- 4d *Syenodiorite.*
- 4e *Contaminated zone.*
- 4f *Pegmatite.*
- 4g *Feldspar porphyry.*

INTRUSIVE CONTACT

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE ROCKS[c]

- 3a *Gabbro.*
- 3b *Serpentinized dunite.*

INTRUSIVE CONTACT

METAVOLCANICS

FELSIC METAVOLCANIC ROCKS[c]

- 2 *Unsubdivided.*
- 2a *Dacite, porphyritic dacite.*
- 2b *Felsic tuff.*

IF *Iron Formation.*

MAFIC TO INTERMEDIATE METAVOLCANICS[c]

- 1 *Unsubdivided.*
- 1a *Basalt, andesite.*
- 1b *Amphibolite.*
- 1c *Foliated amphibolite.*
- 1d *Gabbroic flows.*
- 1e *Amygdaloidal basalt.*
- 1g *Pillowed lava.*
- 1h *Pyroclastic rocks.*
- 1j *Porphyritic andesite.*
- 1k *Schistose rocks.*
- 1m *Metasedimentary rocks.*

Breccia

Ag	*Silver.*
anna	*Annabergite.*
Bi	*Bismuth.*
bn	*Bornite.*
calc	*Calcite.*
Co	*Cobalt.*
cp	*Chalcopyrite.*
Cu	*Copper.*
ery	*Erythrite.*
hem	*Hematite.*
nc	*Niccolite.†*
Ni	*Nickel.*
po	*Pyrrhotite.*
py	*Pyrite.*
q	*Quartz.*
qc	*Quartz carbonate.*
S	*Sulphide mineralization.*
sp	*Sphalerite.*

[a] *Unconsolidated deposits. Cenozoic deposits are represented by the lighter coloured parts of the map.*

[b] *Bedrock geology. Outcrops and inferred extensions of each rock map-unit are shown respectively in deep and light tones of the same colour. Where in places a formation is too narrow to show colour and must be represented in black, a short black bar appears in the appropriate block.*

[c] *Rock types in these groups are subdivided lithologically and the order does not imply age relationship within the groups.*

† *Appears on companion sheet.*

PROPERTIES, MINERAL DEPOSITS

HAULTAIN TOWNSHIP

44. Allison, A.
45. Blair Gowganda Silver Mines Ltd.
    Blake, F.
46. Lost Lake Group.
47. Cobalt Nugget.
    Bowen, F.
48. The MacAlpine.
49. The McRae.
50. The Rawhide.
51. Bowen, J.
52. Calico Silver Mines Ltd.
    Castlebar Silver and Cobalt Mines Ltd.
53. Babs Lake Area.
54. Flatstone Lake Area.
55. Millcrest.
56. MR 13014.
57. MR 18026 and MR 18027.
58. Ottawa Gowganda.
59. Ferguson, R.
60. Fletcher, K. A.
61. George, W. A.
    Gowganda Silver Mines Ltd.
62. Bloom Lake Group.
63. McRae Lake Group.
64. Mire Lake Group.
65. Sigs Lake Group.
66. Wigwam Lake Group.
67. Haultain Lake Veins.
68. Jewell, J. G.
69. Melisek, J.
70. Miller Creek Prospect.
71. Mixer, M.
    McIntyre Porcupine Mines Ltd.
72. The Capital.
73. Castle Tretheway No. 2 and No. 3.
74. The Everett.
75. HS 367.
76. RSC 104.
77. McIntyre, W. M.
78. MacVeigh, D.
79. Olmsted, W. R. and G. S.
80. Patton, J. M.
    Riel, M.
81. ED 58.
82. TC 167.
83. TC 94.
84. Shanty Lake-McRae Lake occurrence.
85. Solid Silver Mines Ltd. [1963].
86. Steinthal, M. and A.
87. Stella Lake-Montreal River occurrences.
    Tormont Mines Ltd.
88. The Haultain.
89. MR 13255 and MR 17124.
90. The Wigwam.
    United Siscoe Mines Ltd.
91. Bonsall.
92. The Millerett.
93. Roy-Ten Group.

NICOL TOWNSHIP

94. Armstrong, R. and Wilkinson, G.
    Castlebar Silver and Cobalt Mines Ltd.
95. Miller Lake West Group.
96. Miller Lake East Group.
97. MR 18865.
    Consolidated Morrison Explorations Ltd.
98. The Morrison.
99. WJ. 9.
100. Canadian Gowganda.
    Gowganda Silver Mines Ltd.
101. Central Nicol Group.
102. East Nicol Group.
103. Hart, W. R.
104. International Mine Services Ltd.
    Mick, R. M.
105. HS 325.
106. GG 3140.
107. MacDougald, R. D.
    McIntyre Porcupine Mines Ltd.
108. Castle No. 1 Shaft Mine.
109. The Hart.
110. The Walsh.
111. HR 297.
112. MR 1251 and MR 1252.
113. Purich, W.
114. Shulman, M.
    Silver Bar Mines Ltd.
115. MR 12910.
116. Coleroy.
117. Silver Bullion.
118. MR 12885.
119. Chapelle.
120. MR 13008.
121. Tamminen, T. V.
122. United Reef Petroleums Ltd.
    United Siscoe Mines Ltd.
123. Miller Lake O'Brien Mine.
124. O'Connell Group "K" Project.
125. Roy-Ten Group.
126. Willars, J. G.

Information current to December 31st, 1969. Former properties on ground now open for staking are only shown if exploration data is available—a date in square brackets indicates last year of exploration activity. For further information see report.

SOURCES OF INFORMATION

Geology by W. H. McIlwaine and assistants, 1966, 1967 and 1968. O.D.M., Ministry of Natural Resources. Geology is not tied to surveyed lines.

Assessment work data.

Geological maps of mining companies.

Aeromagnetic maps: G.S.C. 284G, 287G.

Ministry of Natural Resources, O.D.M.: maps of Burrows (1926) and Moore (1955).

Preliminary maps P. 374, Nicol Township, 1966; P. 475, Milner Township, 1968; P. 517, Haultain Township and P. 518, Van Hise Township, 1969; scale 1 inch to ¼ mile.

Cartography by M. J. Colman and assistants, Surveys and Mapping Branch, 1975.

Basemaps derived from maps of the Forest Resources Inventory, Surveys and Mapping Branch.

Magnetic declination in the area was approximately 9°15'W, 1966.

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Map 2349

HAULTAIN AND NICOL TOWNSHIPS

TIMISKAMING DISTRICT

Scale 1:31,680 or 1 Inch to ½ Mile

Chains 80 60 40 20 0 1 2 Miles
Metres 1000 0 1 2 3 Kilometres
Feet 1000 0 5,000 10,000 Feet