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Ontario Division of Mines
Geological Branch
Open File Report 5113

Geology of the Gowganda Lake–Miller Lake Silver Area District of Timiskaming

1975

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DIVISION OF MINES
GEOLOGICAL BRANCH

Open File Report
5113

Geology of the Gowganda Lake-Miller Lake Silver Area. District of Timiskaming.

by
W.H. McIlwaine

1975

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CONTENTS

	Page
Contents	iii
Introduction	1
Geological Setting	2
History of Mineral Exploration	2
Means of Access	5
Acknowledgements	5
Present Geological Survey	7
Previous Geological and Geophysical Work	7
Topography	8
Drainage	9
Natural Resources	9
General Geology	11
Introduction	11
Early Precambrian	12
Metavolcanics	12
Mafic Intermediate to metavolcanics	12
Felsic meta volcanics	15
Metamorphosed Mafic and Ultramafic Intrusive rocks	17
Serpentinized Dunite	17
Metagabbro	19
Age and origin	20
Felsic Intrusive Rocks	20
Round Lake Batholith	21
Trondhjemite	24
Quartz-diorite	25
Wilson Lake Area	26
Feldspar Porphyry dikes	27
Age of the Round Lake Batholith	27
Mafic Intrusive Rocks (Matachewan diabase)	28
Age of the diabase	29
Middle Precambrian	31
Huronian Supergroup	31
Cobalt Group	31
The Gowganda Formation	34
Coleman member	
Distribution and thickness	34
Lithology	36
Feldspathic greywacke	36
Arkose	37
Conglomerate	37

	Page
Feldspathic sandstone	39
Siltstone-greywacke	40
Breccias	40
Ferruginous sandstone	41

	Page
Origin	41
Firstbrook Member	44
Lorrain Formation	46
Distribution and thickness	46
Lithology	46
Micaceous sandstone	46
Feldspathic sandstone	47
Greywacke	47
Quartzite	49
Ferruginous sandstone	49
Conglomerate	49
Origin	49
Mafic Intrusive Rocks	49
Nipissing Diabase	50
Shape and attitude of the diabase	51
Thickness of the diabase	54
Petrography	54
Late Precambrian (?)	57
Mafic Intrusive Rocks	
Quartz diabase dikes	57
Age of the dikes	59
Olivine Diabase	60
Cenozoic	60
Quaternary	60
Pleistocene, Recent	60
Structural Geology	63
Folding	63
Faulting	63
North Striking Faults	64
Firth Lake - Silverfive Lake Fault	64
Elkhorn Lake Fault	65
Gowganda Lake - Obushkong Lake Faults	65
Stumpy Lake Faults	66
Wilson Lake Fault	67
Wigwam Lake Fault	67
Northwest Striking Faults	67
Jacobs Lake Fault	67
Other northwest faults	68
Northeast striking faults	68
Mire Lake Fault	68
McRae Lake Fault	69
Babs Lake Fault	69
Wilson Creek Fault	69
Milner Lake Fault	69

Page

East Trending faults 70
Penassi Lake - Bloom Lake Fault 70
90 Fault 70
Other faults in the map area 70
Minor Structures 71
Metamorphic foliation 71
Gneissosity 71
Joints 71
Bedding 72

	Page
Historical Geology	72
Economic Geology	74
Serpentine	74
Silver-Cobalt and associated mineralization	74
Sand and Gravel	78
Descriptions of Properties	78
Van Hise Township	78
Foot Creek Occurrence (1)	78
Gould Lake Occurrence (2)	80
Silverfive Lake Occurrence (3)	80
Silverplace Mines Limited [1965] (4)	81
Southeast Van Hise Occurrence (5)	83
J. R. Stirrett (6)	83
History and development	84
General geology	85
Economic geology	85
W. D. Sutherland (7)	86
Brett Lake Occurrence (8)	87
Charbonneau Occurrences (9)	87
Texmont Mines Limited (10)	89
Tribag Mining Company Limited (11)	90
Milner Township	92
J. Beadman (13)	92
A. Decker (14, 15)	95
Geology of the property	95
Bartlett Open Cut (14)	95
Crews-McFarlan No. 2 (15)	96
Fryingpan Lake Shaft (16)	99
Gowganda Silver Mines Limited (17)	99
History and development	99
General geology	100
Assessment work data	100
F. Hines (18)	101
Lett Lake Occurrence (19)	102
Logan Lake Prospect (20)	102
Manridge Mines Limited (21-30)	102
History	103
General Geology	103
Work by the present company	104
Bartlett No. 1 (21)	104
Crews McFarlan No. 3 (22)	105
Boyd Gordon (23)	105
Crews McFarlan - Hewitt Lake (24)	106
Hewitt Lake Mining Syndicate (25)	107
The Mann Mine (26)	107
Myrtle Lake Area	110
South Bay (28)	111
The O'Brien (28)	111

	Page
Reeve Dobie (29)	112
Welch (30)	114
Maralgo Mines Limited [1957] (31)	114
South A showing	114
South B showing	115
South Showing	115
Montreal River Silver Mines Limited (32-34)	115
The Hedges (32)	117
The Milne (33)	117
TC 128 and TC 129 (34)	118
Miss Beatrice Reeve (35)	118
Silver Ore Zone Mines Limited (36-37)	118
General Geology	119
Bishop (36)	119
Transcontinental (37)	120
Other Shafts	120
D. Sutherland (38)	121
Tego Silver Cobalt Mines Limited [1961] (39-40)	122
F. Loring Prospect (39)	122
Armstrong Fraction (40)	123
United Reef Petroleums (41)	123
La Brick	123
Utopia Mining and Holding Corporation Limited (43)	124
Haultain Township	125
A. Allison (44)	125
General Geology	128
Structural Geology	128
Economic Geology	129
Blair Gowganda Silver Mines Limited (45)	130
F. Blake (46, 47)	131
Cobalt Nugget (47)	131
F. Bowen (48-50)	132
The MacAlpine (48)	133
General Geology	133
Structural Geology	133
Economic Geology	134
The McRae (49)	135
The Rawhide (50)	136
J. Bowen (51)	136
Calico Silver Mines Limited (52)	137
Castlebar Silver and Cobalt Mines Limited (53-58)	137
Babs Lake Area (53)	138
Flatstone Lake Area (54)	141
Millcrest (55)	142
MR 13014 (56)	143
MR 18026 and MR 18027 (57)	144
Ottawa-Gowganda (58)	144

	Page
K. A. Fletcher (60)	145
Gowganda Silver Mines Limited (62-66)	146
Bloom Lake Group (62)	147
Mire Lake Group (63)	148
McRae Lake Group (64)	149
Sigs Lake Group (65)	149
Wigwam Lake Group (66)	150
Haultain Lake Veins (67)	150
J. G. Jewell (68)	151
J. Melisek (69)	151
Miller Creek Prospect (70)	152
McIntyre Porcupine Mines Limited (72-76)	152
The Capitol (72)	153
The Castle Nos. 2 and 3 (73)	156
The Everrett (74)	161
HS 367 (75)	162
RSC 104 (76)	162
W. M. McIntyre (77)	162
W. R. and G. S. Olmsted (79)	163
M. Riel (81-83)	164
TC 94	164
Shanty Lake - McRae Lake Occurrence (84)	164
Solid Silver Mines Limited [1963] (85)	165
M. and A. Steinthal (86)	166
Stella Lake - Montreal River Occurrences (87)	167
Tormont Mines Limited (88-90)	168
The Haultain (88)	168
MR 13255 and MR 17124 (89)	171
The Wigwam (90)	173
United Siscoe Mines Limited (91-93)	174
Bonsall (91)	175
Millerett (92)	176
Roy-Ten Claim Group (93)	181
Nicol Township	181
R. Armstrong and G. Wilkinson (94)	181
Hylands-Johnson-Gardiner	181
Castlebar Silver and Cobalt Mines Limited (95-97)	183
Miller Lake West Group (95)	183
Miller Lake East Group (96)	184
MR 18865 (97)	184
Consolidated Morrison Explorations Limited (98-100)	185
Morrison (98)	185
History	185
General Geology	188
Economic Geology	188
Underground workings	189
WJ 9 (99)	189
Canadian Gowganda (100)	191

	Page
Gowganda Silver Mines Limited (101, 102)	191
Central Nicol Group (101)	191
East Nicol Group (102)	193
W. R. Hart (103)	194
International Nine Services Limited (104)	194
R. M. Mick (105-106)	195
HS 325 (105)	195
GG 3140 (106)	196
R. D. MacDougald (107)	197
Big Four	197
McIntyre Porcupine Mines Limited (108-112)	199
Castle No. 1 Shaft Mine (108)	200
The Hart (109)	201
The Walsh or Tonopah (110)	202
MR 297 (111)	203
W. Purich (113)	206
Palme-Paine	206
M. Shulman (114)	207
Silver Bar Mines Limited (115-120)	208
MR 12910 (115)	209
Coleroy (116)	209
Silver Bullion (117)	212
MR 12885 (118)	214
Chapelle (119)	214
MR 13008 (120)	215
T. V. Tamminen (121)	215
United Reef Petroleums Limited (122)	216
United Siscoe Mines Limited (123-125)	219
The Miller Lake O'Brien Mine (123)	219
O'Connell and "K" Project claims (124)	228
J. G. Willars (126)	229
References Cited	231

Tables

1.	Production figures for the Gowganda Area	6
2.	Table of Lithologic Units	10
3.	Modal analyses felsic plutonic rocks	22
4.	Modal analyses of Matachewan diabase	30
5.	Stratigraphic nomenclature of Huronian Supergroup rocks	32
6.	Modal analyses of Gowganda Formation rocks	38
7.	Modal analyses of Lorrain Formation rocks	48
8.	Modal analyses of Nipissing Diabase	56
9.	Modal analyses of olivine diabase	61
10.	Age dates of olivine diabase	62
11.	Annual production figures for the map-area	76
12.	Assessment work data	78a

		Page
13.	Properties for which no information is available	79
14.	Assay results of A Decker - Bartlett Open Cut (14)	97
15.	Production figures for Bartlett Open Cut (14)	98
16.	Production figures for the Mann Mine (26)	109
17.	Production figures for the Reeve Dobie Mine (29)	113
18.	Assay results on Maralgo Mines Limited [1957] (31)	116
19.	Production figures for Capitol Mine (72)	154
20.	Shafts at Castle and Capitol Mines	155
21.	Production figures for Castle Nos. 2 & 3 (73)	158
22.	Shafts at the Bonsall (91) and Millerett (92)	177
23.	Production figures at the Bonsall (91)	178
24.	Production figures at the Millerett (92)	180
25.	Production figures at the Morrison (98)	186
26.	Production figures at the Walsh (110)	205
27.	Production figures at the Miller Lake O'Brien (123)	223
28.	Winzes and Shafts at the Miller Lake O'Brien (123)	224

Figures

1.	Key map showing location of map-area	xiii
2.	Buried ultramafic body at Firth Lake	back pocket
3.	Volume percent of quartz and feldspar in granitic rocks	23
4.	Shape and attitudes of Nipissing Diabase (4 sheets)	back pocket
5.	(Deleted)	
6.	Property location diagram	back pocket
7.	Drilling and veins at Silver Place Mines Limited (4)	back pocket
8.	Niccolite showing on J. Beadman (13) property	93
9.	Shafts, vein zones, and diamond drilling at the Mann Mine (26)	back pocket
10.	Cross section through the Mann 'A' zone	back pocket
11.	Diamond drilling at Utopia Gold Mines (43)	126
12.	Vein and diamond drilling on A. Allison (44) property	back pocket
13.	Babs and Flatstone Lake areas of Castlebar Mines	back pocket
14.	Underground plans of Capitol Castle and Miller Lake O'Brien	back pocket

		Page
15.	Longitudinal Section through Castles No. 2 & 3	159
16.	Underground plans and work at Haultain shaft (88)	170
17.	Workings at Wigwam (80) Mine	back pocket
18.	Underground plans at the Morrison (98) and WJ 9 (99)	190
19.	Underground plans at the Walsh Mine (110)	204
20.	Underground plans at the Coleroy (116)	211
21.	Underground plans at the Silver Bullion (117)	213
22.	Diamond drilling and veins at United Reef Petroleums Limited (122)	back pocket
23.	Paragenetic sequence at Siscoe No. 13 Vein	226
24.	Ore body zoning at Siscoe No. 13 Vein	227

Photographs

1.	Relect olivine grams in serpentinized dunite	246
2.	Natachewan diabase phenocrysts	247
3.	Lens of Gowganda conglomerate in greywacke	248
4.	Differential weathering in conglomerate	249
5.	Range of pebble size in conglomerate	250
6.	Dense pebble packing next to photo 5	251
7.	Deformed bedded greywacke	252
8.	Intraformational breccia	253
9.	Laminated argillite	254
10.	Firstbrook Formation ripple marks	255
11.	Olivine diabase phenocrysts	256
12.	Siscoe No. 6 shaft	257

ABSTRACT

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

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 argillite of the Gowganda Formation, Firstbrook Member are present locally. Sedi-

mentation 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, intrude the earlier rocks. These are composed mainly of pyroxene gabbro with local granophyric phases in upper portions of the sheets. One sheet, in the Miller Lake area has a thickness of 935 feet (284 m).

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 has been won from the area with two-thirds of this coming from the Miller Lake O'Brien Mine.

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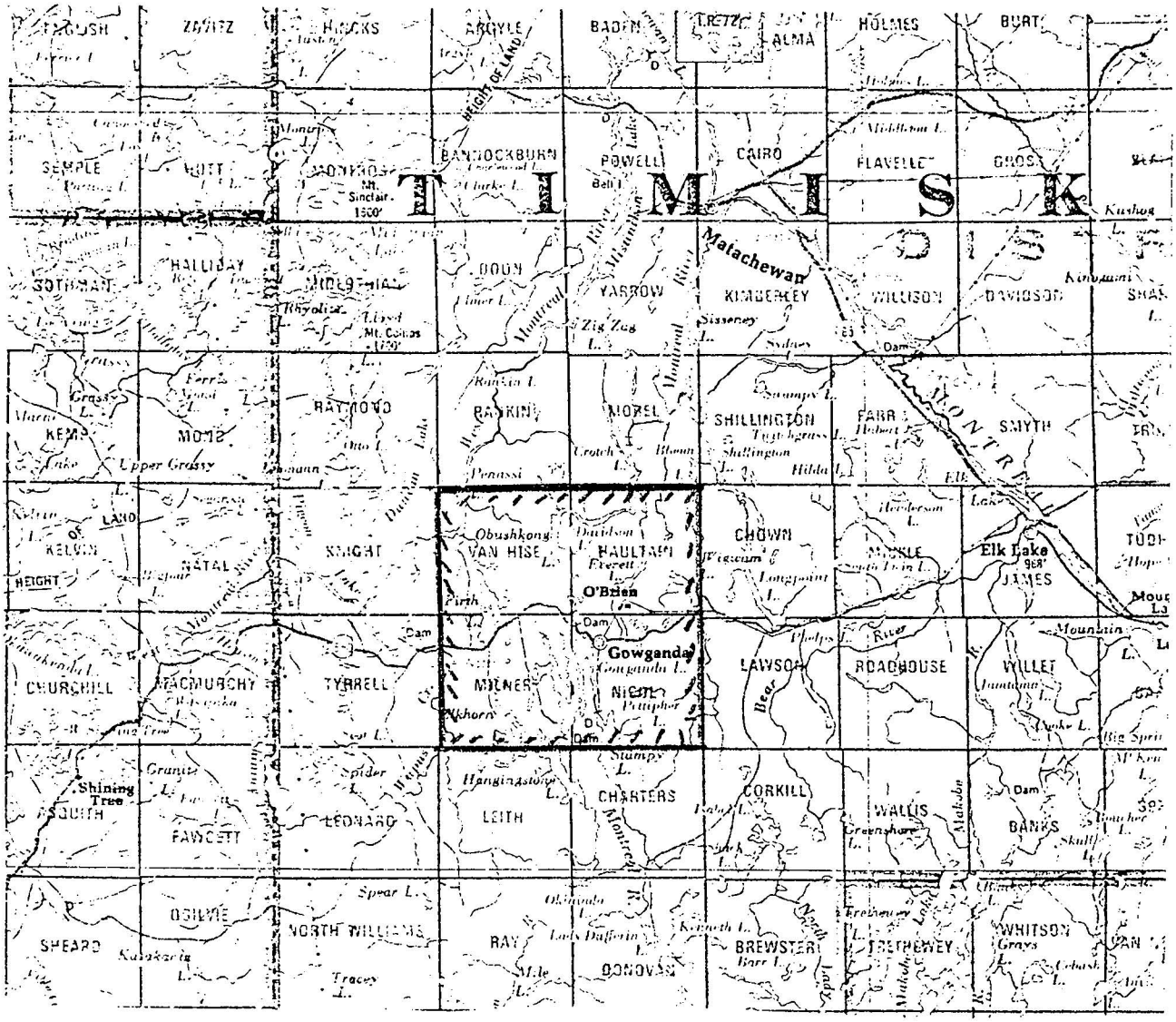


Figure 1: Key Map showing location of the Gowganda Lake-Miller Lake Silver Area. Scale 1 inch to 8 miles or 1:506,880

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 52 miles (83km)[2] west northwest of New Liskeard and 48 miles (77km) southwest of Kirkland Lake. The four 6 mile (9.6km) square townships form a square map-area of about 144 square miles (369 square km).

Gowganda, along with South Lorrain (McIlwaine 1970), is one of the more important satellite silver camps of the

---

1. Geologist, Ontario Division of Mines, Thunder Bay.

2. Metric equivalents given throughout the report are not precise, but are generally rounded off.

3. Manuscript accepted for publication by the Chief Geologist, October 1974

Timiskaming silver area. These camps arose due 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 sub-circular 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.

Several areas of Early Precambrian rocks are exposed through the Middle and Late (?) Precambrian cover; these are composed mainly of mafic metavolcanic rocks 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), 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 4 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

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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 Everrett, 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 Siscoe and exploration in the old workings has

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ODM DOES NOT GUARANTEE ACCURACY OF NUMERICAL VALUES

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 branch roads, most of which can be travelled by car, run 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 fieldwork.

Discussions with D. Tenny and A. Reed mine geologists

Table 1 Recorded Total Production by each mine in the map area to the end of 1969

Township	Mine	Total ounces of silver	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

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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 provided 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 on a scale of 1 inch to 1/4 mile (about 1cm to 158m or 1:15,840). Pace and compass traverses were run at approximately 1/4 mile (400m) intervals. The geology was plotted on acetate sheets over aerial photographs flown in 1958 and obtained from the Ontario Department of Lands and Forests. This information was then transferred to basemaps compiled by the Cartographic Unit of the Ontario Department of Mines from Forest Resources Inventory maps of the Silviculture Section of the Ontario Department of Lands and Forests. Preliminary uncoloured geological maps were published following each of the field seasons. 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, 1968, 1969 a and b).

Previous Geological and Geophysical Work

The first mapping in the area was done by Collins (1913)

at a scale of 1 inch to 4 miles (1cm to 2.6km or 1:260,000). Later more detailed mapping was done by Burrows (1921) at a scale of 1 inch to 1 mile (1cm to 0.64km or 1:64,000). A revision of this map, published in 1926, concentrated on the Miller Lake Basin (Burrows, 1926) and was at a scale of 1 inch to 1/2 mile (1cm to 0.32km or 1:32,000). The most recent map is Moore's (Moore 1955), also at a scale of 1 inch to 1/2 mile; 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 also 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 (G.S.C. 1956 a and b) at a scale of 1 inch to 1 mile (1cm to 0.64km or 1:64,000). These maps were issued again in 1970 at the same scale (ODM-GSC 1970 a and b) and at the scale of 1 inch to 1/2 mile (1cm to 0.32km or 1:32,000) (ODM-GSC 1970, c, d, e, f). One aeromagnetic map at a scale of 1 inch to 4 miles (1cm to 2.6km or 1:260,000) also includes the map-area (ODM-GSC 1970 g).

Topography

The area is one of moderate relief with a maximum of 400 feet (122m) being attained just to the west of Flatstone Lake where a ridge of Nipissing Diabase reaches an elevation

above sea level.
of 1,500 feet (460m). 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. For more information on the topography the reader is referred to Maps 3,392and 3,393,back pocket, on which topographic contours are illustrated.

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 jackpine. 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.

Table 2 | Table of Lithologic Units

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 SUPER GROUP
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

GENERAL GEOLOGY

INTRODUCTION

The map-area is near the northwest 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 to this being 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
Metavolcanic rocks with associated iron formation.

Table 2 illustrates 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, northwestern and northeastern 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 Township the mafic

metavolcanics have been intruded by serpentinized ultramafic rocks and apparently associated metagabbro.

Felsic plutonic rocks are exposed over much of north central Van Hise and Haultain Townships. These granitic rocks represent the extreme southwest 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 Formation 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

Metavolcanics

Mafic to Intermediate Metavolcanic

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 metavolcanic rocks, which occur as local inliers in the Middle Precambrian cover rocks, are found in 5 main areas as follows:-

1. Van Hise Township
2. Dinny Lake-Everrett Lake
3. Miller Lake
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 metavolcanic rocks.

On the basis of colour index, the metavolcanic rocks 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 indicated 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 mafic metavolcanic rock thin section

contained about 20 percent carbonate minerals (mainly calcite). Coarser-grained metavolcanics, presumably central portions 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 and 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 about 7 percent opaques 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 indicated a composition of 70 to 80 percent hornblende, 10 to 25 percent plagioclase and one section contained 10 percent magnetite, 5 percent garnet and 3 percent chlorite. The hornblende is strongly pleochroic with interstitial corroded plagioclase.

Pyroclastic units, lavas with poorly preserved pillows and amygdaloidal lavas occur locally in the metavolcanic rocks. Tops to the northeast were 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 "horse shoe" shaped area of about 1 square mile (2.6 square km) in northwest Nicol Township is underlain by felsic metavolcanic rocks 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 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 was 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 R.S.C. 92 is an outcrop of similar 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 was 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 southeast corner 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. (See Figure 2.)

Serpentinized Dunite

Serpentinized dunite occurs mainly between Firth and Serpentine Lake 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

Figure 2 : In back pocket.

fresh surfaces are fine-grained and dark green. The sub-rounded 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 sulphides and traces of biotite, carbonate and pyroxene. Most of the serpentine is psudomorph after olivine (Photo 1), and forms flaky or felted aggregates ranging from 0.3mm to 1mm in diameter.

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

Metagabbro

Metagabbro in part is spatially related to the serpentinized dunite, but ultramafic rocks were not found to be associated with the outcrop area of metagabbro 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

metagabbro is generally fine- to medium-grained.

In thin section the metagabbro consists of 40 to 50 percent saussuritized plagioclase and 40 to 50 percent uralitized pyroxene; less common are chlorite (5 to 15 percent) sulphides (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 intrude them. The intense 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 metagabbro 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 portion 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 portion 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 southwest 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. It may, however, 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 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)

Table 3 Modes of felsic intrusive rocks

	1	2	3	4	5	6	7	8	9	10	11
Quartz	30	20.6	19.9	2.30	29.7	24.9	23.6	26.4	27.6	28.8	28.2
Plagioclase	61	62.6	56.6	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	-	-	-	6.58	-	-	-	-	-	-	-
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

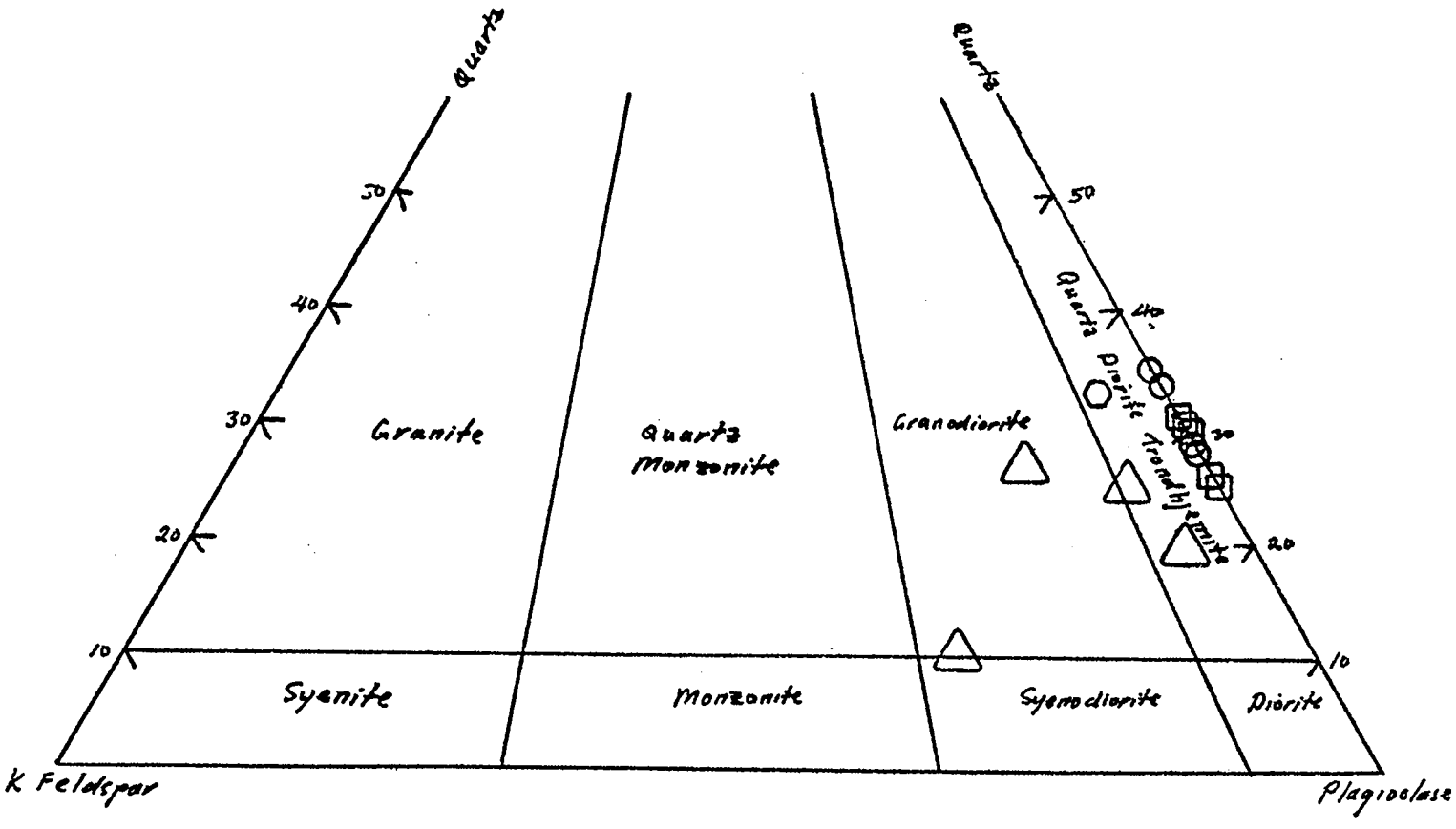


Figure 3 Volume percent of quartz, potassic feldspar and plagioclase in the Round Lake Batholith. Percentages were determined by Modal Analyses and recalculated to 100 percent.

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. Apophysese 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 due to 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 ferric-oxide 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 ranging to sodic oligoclase. The plagioclase

laths are up to 1.5-2 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 in some cases agmatitic especially north of the river. But with increasing distance from the contact and/or fault a more massive appearance is attained.

Thin section examination indicated an average composition of 27 percent quartz, 60 percent plagioclase, 4 percent hornblende, 5 percent biotite, 2 percent each of chlorite and epidote. The plagioclase is commonly sodic andesine (about An34) and altered to sausserite 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.

in this area, in contrast to its presence in the batholithic areas to the northeast

The lack of potassic feldspar helps further to 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 1924) 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 1.5 square miles (3.8 square km) 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 north 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 sausseritized 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 ablite 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 rocks. The dikes range from 1 foot to about 50 feet (30 cm to 15 m) 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 mosiac 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 2605 million years (Lowdon et al 1963). The dating was done on biotite from a sample

taken from a road cut on the Savard-Chamberlain Township boundary and is in Lawton's (1954) quartz-diorite-oligoclase granite facies. Recent work by Gates (1970), however, would indicate the batholith is actually older than this. A Rb-Sr date of 2690±93 million years 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 northerly striking dikes have intruded the metavolcanic and granitic rocks in the map-area. They were not, however, seen to be cutting Huronian Rocks. The dikes range in width from about 10 feet (3 m) to 400 feet (122 m) and average about 80 feet (24 m). Similar dikes have been described elsewhere as Matachewan type diabase; they are found immediately to the west in Tyrell and Knight Townships (Graham 1933). According to Lovell (1967) who describes numerous such dikes in the Matachewan area they were first recognized by Burrows (1910) and later described more completely by Miller (1923). On the basis of similar lithology and field relationships the dikes in the Gowganda area are corelated 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 porphyritic with plagioclase phenocrysts up to 2 inches (5 cm) but commonly 1/2 inch (1 cm). 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 2,000 feet (610 m) east of the south 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. Plagioclase laths average about 3 mm in length and have a sub-ophitic relationship with the pyroxene.

Age of the Diabase

Fahrig and Wanless (1963) have dated diabase dikes of this type at 2,485 my by the K-Ar method. More recently Gates (1970) has published a Rb-Sr isochron date of 2690±93 my. K-Ar age determinations also done in this study gave dates which were generally around 500 my younger than the Rb-Sr. This date of 2690±93 my 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 4 | Modal analyses of Matachewan type diabase

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
Sulphides	4.8	2
Plagioclase composite (percent An)	48	

MIDDLE PRECAMBRIAN

Huronian Supergroup

Cobalt Group

Following the igneous activity of the Early Precambrian a period of erosion occurred, uplift, basin formation and resulting in the deposition of rocks of the Huronian Supergroup (Robertson et al 1969a, 1969b); 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 in 1957 (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 et al 1969a, 1969b) recommended the name Gowganda Formation be retained and that the Coleman and Firstbrook Formations of Thomson be used as member names.

Table 5 Cobalt Group Stratigraphic Units

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

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

1. Gowganda Formation which is made up mainly of: Coleman Member - conglomerate, siltstone, feldspathic sandstones and greywackes, and

Firstbrook Member made up of 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.

The 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, due 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 metavolcanic rocks in western Milner Township, a thickness of about 2,200 feet (670 m) in the central part of the township. About 800 feet (240 m) south of the Mann No. 3 shaft drill hole data suggest a thickness below the diabase of about 4,000 feet (1,220 m). 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 500 feet (152 m) suggested by Collins (1913, p. 45), who also felt a thickness of 1,000 feet (305 m) was seldom attained; Collins' figures, however, take into account the entire Cobalt Group.

Moore (1955, p. 9) cites a thickness of 340 feet (103 m) southwest of Mire Lake in Haultain Township; this, however, is an incomplete section as it represents only that portion 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 greywacke, arkose, quartz. feldspar sandstone, ferruginous sandstones, argillite and 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 very fine-grained rocks commonly, 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 their 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 due 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 massive. Colours observed range 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 mm 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

Table 6 | Modal analyses of Gowganda Formation, Coleman Member Rocks

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

1. Feldspathic greywacke
2. Arkose
3. Arkose

angular than the quartz which ranges from 0.3 mm to 0.5 mm in diameter. The matrix is apparently locally less resistant to erosion than the clasts (Photo 4).

Conglomerate clasts range from pebbles to boulders and are composed mainly of granitic rocks with lesser amounts of metagabbro and metavolcanic rocks. They are rounded to subangular and have a variable packing density. This density can change 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 mile (1.6 km) 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 was noted north of Wilson Lake lying on 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 siliceous (with some chlorite) matrix; the grains

generally sub-rounded to sub-angular
range from 0.2 mm to 0.4 mm in diameter.

Siltstone-greywacke

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 feldspar floating in pasty matrix of chlorite and secondary white mica. Graded bedding was observed in thin section with the quartz grains ranging from 0.01 mm to 0.03 mm. The siltstones could really be considered fine-grained greywackes. Pink arkosic beds with flame structures and slumping were noted in several localities.

Breccias

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

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

Origin

This discussion should be placed after the First brook Member descriptions on page 46

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 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 Palezoic deposits of Mexico (Newell 1957) where there are deposits of conglomerate and associated varve like

sediments. Long considered glacial Newell (1957) concluded they were the product of submarine slides. In a re-appraisal of the Ridgway and Gunnison "tillites" of southwest Colorado Van Houten (1957) concluded the Gunnison is really a volcanic rich mudflow and stream deposit. The fact that striated pebbles occur does not necessarily prove glacial origin as the feature can also occur in mudflows. The Ridgway unit was considered either glacial or mudflow (Van Houten 1957).

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) Schenk (1965a) Ovenshine (1965) and Young (1968). Lumbers (1970, p. 86) states that "no criteria diagnostic of a glacial origin of the Gowganda Formation were found" in the Tomiko area.

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

1. Polished and striated pavements and underlying roche moutonees.

2. Massive non-sorted 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 (1965 a & b) at the south end of Lake Temagami and by Cooke et al (1931) southwest of Noranda. The occurrence south of Lake Timagami has been credited to tectonic activity (Lumbers personal comm.). 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 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 scraps; this would be in the form of mud flows 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.

Firstbrook Member

The Firstbrook Member is very limited in aerial extent. The two small sections which have been assigned to this Formation are in Nicol Township about 4,000 feet (1,220 m) east of Leroy Lake on Highway 560 and in Milner Township on some islands in Milner Bay. The sequence in Nicol Township is an estimated 80 feet (24 m) thick and there is a similar thickness exposed in Milner Township.

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 mm to 4 mm and average about 1 mm.

Thin sections show the rock is made up of sub-angular to sub-rounded 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 mm 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 due to 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 on Highway 560.

The laminae of the Firstbrook Formation bear a striking resemblance to glacial varves. Jackson (1965) in a study of these argillites concluded they were indeed the result of glacial deposition. Lindsey (1969) has suggested that the

map-area is in an area of non-marine deposition and that a transformation to marine deposition is indicated to the south (Card et al 1970). Areas of quiet lacustrine deposition are also capable of producing varve like sediments.

Lorrain Formation

Distribution and Thickness

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

With an assumed mean dip of 10 degrees there is an estimated 3,000 feet (900 m) in the southeastern part of Nicol Township. Collins (1913, p. 52) stated that it is known to have a thickness of 600 feet (180 m) 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, rounded to subrounded in a matrix of about 5% secondary micas. These micas may, in part, be the remnants of completely altered feldspars. Minor feldspar and ferric oxides were observed.

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 siliceous and micaceous matrix. Modal analyses for two samples are shown in Table 7.

Greywacke

This is a highly variable rock type 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 range up to 1 mm 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 over 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

Table 7 | Modal Analyses of the Lorrain Formation

	1	2	3	4	5
	%	%	%	%	%
Mineral					
Quartz	59.1	57.6	65.3	79.3	52.1
Pollycrystalline 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
Fe Oxide	2.2	-	3.4	-	1.3
Rock Fragments	-	0.6	-	-	-
Matrix	22.1	33.1	15.8	8.7	16.4

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 Felsapathic greywacke

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 siliceous 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 one inch in diameter (2.5 cm).

Origin

A summary of various theories on the origin of the Lorrain Formation has been described by Hadley (1968, p. 223) in which he states that environments of deposition previously ascribed include lacustrine, shallow water marine, fluvial in part, sub-aerial 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 states that "chronologically, the depositional environments are shallow water marine, lacustrine, delta fringe, over-shelved beach and high energy beach" (Hadley 1970). Wood (1971) has suggested that the Lorrain Formation was deposited in a fluvial environment based on essentially unidirectional crossbed data. 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 S3^{o}E with a standard deviation of 49.4 degrees. Meagre data from the axes of trough cross beds 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) 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 close spatial relationship with the rich silver

deposits and the prospecting for diabase became intensive.

For many years the areas of Nipissing Diabase were considered to be remnants of a former continuous sheet which extended across the region (Burrows 1926; Campbell 1930 and others). More recently, however, it has been suggested that the Nipissing Diabase is actually made up of numerous gabbroic intrusions (Moore 1955; Hester 1967; McIlwaine 1971; Card et al 1970 and others). There are several such gabbro bodies in the map-area (Figure 4 and Map 2 and 2).

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 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 the 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 sub-circular body of diabase, which in part, intrudes Early Precambrian trondhjemite and Middle Precambrian Gowganda Formation. According to 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 portion 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

(Resident Geol. Files)

obtained in underground exploration and diamond drilling. At its north 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 , back pocket.

The main body of diabase in the map-area is the Miller Lake Diabase Basin which to the east incorporates local sub basins; these are found around Flatstone Lake and Calcite Lake. An arch projects south into the Calcite Lake sub-basin.

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 sub-basins.

Dips, as 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 270 feet (82 m) can be determined for the diabase. In the Pettipher Lake area a thickness of about 500 feet (150 m) can be ascribed assuming a dip of 35 degrees although Moore (1955, p. 13) gives a thickness of only 225 feet (68 m). The Miller Lake Basin has a thickness of 935 feet (284 m) in the Siscoe Mine (Moore 1955, p. 12).

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 Hriskevich (1957, 1968), Bowen (1909, 1910), Moore (1955), Hester (1967), Jambor (1971), Collins (1913), Card et al (1970), Pattison and Card (1971), Hore (1910), and 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 2 inch (5 cm) chill zone at the contacts. The fresh rocks are commonly grey to greenish grey and with increasing content of hematitic micro pegmatite become more red to give 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 varied 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 are the amphibole gabbros granophyre.

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

Table 8 Modal Analyses of Nipissing Type Diabase

Mineral	1 %	2 %	3 %	4 %	5 %	6 %	7 %
Plagioclase	46.4	49.2	47.6	40.7	49.7	51.2	56
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
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
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

Quartz occurs as both free quartz and incorporated as intergrowths with albite to from 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) 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 northeasterly 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 N 30° E and they are essentially vertical and up to 100 feet (30 m) wide.

The dikes are composed of massive equigranular, medium-grained diabase which is dark green to greenish-grey. 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 2 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 observed include hornblende, chlorite, biotite, epidote, ilmenite, magnetite, pyrite, chalcopyrite and apatite.

The average of seven modal analyses by Sangster is as follows:- 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 was composed of a dark grey, fine-grained crystalline material in which traces of magnetite were observed. Phenocrysts were 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 million years; this is a K/Ar date on coarse phase biotite.

More recently, however, Gates (1970) published a Rb/Sr whole-rock date of 2,085 ± 110 million years. 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.

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 ENE 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 cross-cutting 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 N70°W 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 Larochelle (1967; Fahrig and Jones 1969). The average width of the dike is about 100 feet (30 m).

The dike is a fine- to medium-grained locally porphyritic grey to black ophitic diabase. Phenocrysts are up to 2 inches (5 cm) (Photo 11) and are plagioclase 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 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

With the high percentage of bedrock exposure 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

Table 9 Modal analyses of olivine diabase dike

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

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
Dehli Township	K/Ar	Biotite	1240 ± 45	Wanless et al 1966
Hybrid Lake Ont.	K-Ar	Biotite	950 ± 75	" " 1966
Baldwin Township	K-Ar	Biotite	1330 ± 50	Wanless etal 1965
Sudbury	K-Ar	Biotite	1020	Fairbairn etal 1969
?				Fahrig & Wanless (1963)
Sudbury	Rb-Sr	Whole Rock	1460 ± 130	GATES AND HURLEY C.J.E.S., Vol. 10, p980

main area where the overburden becomes thick. Numerous eskers with a southeast trend were observed in this area. This southeasterly trend paralells the trend of glacial striae observed during the mapping project.

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

STRUCTURAL GEOLOGY

FOLDING

The main evidence for large scale folding is in the Early Precambrian metavolcanic rocks. There is a swing in foliation trends from easterly in Van Hise, Haultain and northern Nicol Townships to a southerly strike in central Nicol Township; dips are steep mainly to the north and east. Meagre 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 a function of a greater distance from the influence of the Penokean Orogeny.

FAULTING

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 and from there they 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 along with strong topographic linears formed by steep cliffs in Milner Township. The "step like" nature of these cliffs suggest 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 NNE, is a branch from

the Firth Lake fault. Evidence for the fault is the 1,400 feet (425 m) left hand displacement of the metavolcanic-trondhjemite contact at the east end of Holland Lake.

Elkhorn Lake Fault

This fault strikes northerly 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 800-foot (240 m) left hand displacement of a northeast trending dike between Logan and Forman Lakes.

Gowganda Lake-Obushkong Lake Faults

A system of at least four major faults occurs parallel and sub-parallel 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, shearing in the diabase on the east shore at the north end of Milner Bay and 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 (Thomson 1968 suggested 750 feet (230 m)).

The preservation of the isolated area of Gowganda Formation in the area west of Foot Lake in Van Hise Township supports the interpretation 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 further south into Donovan Township (McIlwaine 1969d). Relative movement along both faults, from displaced contacts in Charters Township, appears to be west side down. Both faults continue north parallel to the shores of Stumpy Lake and displace the northern margin of the Pettipher Lake Diabase Basin.

The Montreal River Fault

is a branch of the West Stumpy Lake 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 Township. 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 corner 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 (MacKean 1968) where the Early Precambrian and Lorrain Formation rocks underlying the diabase have been exposed. Caving and bad ground experienced by Tormont Mines Limited during drilling operations on Lost Lake is suggestive of faulting.

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 100 feet (30 m) of right hand displacement of Matachewan type diabase dikes in southwest Haultain Township. The fault is included as part of the Lake Temiskaming Rift Valley by Lovell and Caine (1970) who suggest that the Jacob 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°SE. The topographic expression of this fault can be traced from about 1 mile (1.6 km) 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.

McRae Lake Fault

This fault in Haultain Township 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 300 foot (90 m) right hand displacement of the diabase dike south of Sigs Lake.

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 1,500 feet (460 m) and 400 feet (120 m) respectively of Nipissing diabase-Gowganda Formation contacts have been interpreted as indicative of these faults.

Wilson Creek Fault

In Hird 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 diabase Gowganda contacts illustrate apparent movement along this fault.

East Trending 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 2,000 feet (610 m) of apparent right hand displacement of the Gowganda Formation - Early Precambrian nonconformity, but this is obscured by the North Arm fault which cuts the Penassi Lake - Bloom Lake fault. The 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. The fault truncates the inlier of Lorrain Formation in the diabase just west of Gowganda 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. Examples of these faults are "C" fault on the Siscoe property,

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 metavolcanic rocks; the foliation is due to alignement 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 metavolcanic rocks.

Gneissosity

The gneissosity in the granitic rocks is only locally developed, is usually weak, and has a general easterly 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). Thomson (1968) suggested that columnar joints develop during cooling under unstressed

conditions. 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.

Bedding

Beds in the Huronian sedimentary rocks generally have fairly gentle dips to the east (5° to 20°) but in the vicinity of faults there is a pronounced steepening of dips (up to 60°). The bedding is commonly thick except for the laminated beds in the argillite of the Firstbrook 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 ultra mafic 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 Formation 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 my $\pm$ 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 where as no potassic feldspar was found in the granitic rocks.

The intrusion of the Nipissing Diabases 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 my ± 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 set continued for the longest period. This set is included as part of the Timiskaming Rift Valley by Lovell and Caine (1970) which has displaced Early Paleozoic rocks. Locally the intrusion of diabase and olivine diabase dikes took place along these faults. trenching

Pleistocene glaciation subsequently effected 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 and 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 Todd (1926), Bastin (1939, 1949), Burrows (1926), Moore (1955) and others. More recently studies have been made by 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 and J. L. Jambor. 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 metavolcanic rocks. The mineralization is in vertical to steeply dipping calcite and quartz-calcite veins. The veins are narrow, ranging from fractures to 3 feet (1 m); they occur as single veins or more commonly as bifurcating or multiple branching veins forming vein systems.

Table 11 | Annual production figures for the map-area

	Silver ounces	Cobalt lbs	Nickel lbs	Copper lbs
1910	474,548	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

ODM DOES NOT GUARANTEE ACCURACY OF NUMERICAL VALUES

ODM DOES NOT GUARANTEE ACCURACY OF NUMERICAL VALUES

Table 11 (continued)

	Silver ounces	Cobalt lbs	Nickel lbs	Copper lbs
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

ODM DOES NOT GUARANTEE ACCURACY OF NUMERICAL VALUES

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 metavolcanic rocks, in joints, both planar and cylindroidal, and in faults cross-cutting the cylindroidal joints. Ore bodies 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 ~~body~~ vein is 1 to 2 inches (2.5 to 5 cm) wide with horizontal and vertical dimensions 100 to 200 feet (30 to 60 m).

Although mineralization occurs outside the diabase only the Millerett produced ore. The Leroy Lake property was explored by shaft sinking. The Millerett is in the Gowganda Formation whereas the Leroy Lake, on the east rim of the basin, is in a Matachewan-type diabase dike overlying the Nipissing 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 2 or 2 , back pocket, as do the numbers in Tables 12 and 13. Figure 6 illustrates property locations and boundaries more clearly.

VAN HISE TOWNSHIP

Foot Creek Occurrence (1)

A pit about 4 feet by 4 feet by 4 feet (1.2 m by 1.2 m by 1.2 m) has been put down on the contact between Gowganda Formation feldspathic greywacke and Nipissing diabase. It is about 3,300 feet (1,000 m) southwest of Foot Creek and 4,500 feet (1,370 m) northwest of Foot Lake. The pit is on a vertical 2 inch (5.1 cm) thick calcite vein striking N20°E;

Table 12 Data on file in Resident Geologists Office, Kirkland Lake from Lovell 1968

NAME OF FILE	G	DH	M	EM	UG	C&P	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

Table 12 continued

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
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					
Giglen-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						

Table 12 continued

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
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-Doble property"	x	x					IP, XN, HS
Zenmac Metal Mines Ltd.		x				x	HS
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					

Table 12 continued

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
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
Mellsek	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					

Table 12 continued

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
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					

78e

Table 12 cont.

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
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					
Millcrest-Brunhurst		x					XN
Morrison					x		
Nichaul		x					
Plata 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	

Table 12 continued

NAME OF FILE	G	DH	M	EM	UG	CLP	MISCELLANEOUS
Temiskaming Project Syndicate				x			
United Reef Petroleums Ltd.	x	x					Gc
Walsh Silver Mines Ltd.	x						
Willers, Jack	x		x	x			

End of table 12

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 Ltd.	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

ODM DOES NOT GUARANTEE ACCURACY OF NUMERICAL VALUES

minor pyrite was observed. A grab sample taken by the author indicated traces of silver, nickel and copper and no cobalt on assay.[1]

Gould Lake Occurrence (2)

About 1,700 feet (520 m) south of Gould Lake a 4-foot (1.2 m) wide quartz vein cuts medium-grained gabbroic meta-volcanics, strikes N55°W and dips 70° southwest. A grab sample taken by the writer and assayed by the Laboratory and Research Branch 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 2 , back pocket. A pit 12 feet by 12 feet (3.6 m by 3.6 m by 3.6 m) has been put down on an 8 inch (20.3 cm) wide aplite dike striking N65°W and dipping 75° southwest, cut by a 4 inch (10.1 cm) thick calcite vein striking N35°W and dipping 85° northeast. Mineralization observed includes erythrite and chalcopyrite. Two grab samples taken from the pit by the writer and assayed by the Laboratory and Research Branch, indicated traces of silver, cobalt, nickel and copper. Similar results were obtained from a grap sample taken by the writer from one of the veins just to the north of the pit.

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

Silverplace Mines Limited [1965] (4)

By early 1965 Silverplace Mines Limited had completed a geological survey, a geophysical survey and 4 diamond drill holes totalling 943 feet (288 m) on an 11 claim group which straddled the north striking Nipissing Diabase dike along the Van Hise-Haultain boundary. In 1962 3 drill holes (Figure 7) totalling 1,797 feet (518 m) were put down by M. Sawchuk.

Lorrain Formation feldspathic quartizite, with local conglomerate, flanks the intruding Nipissing Diabase. In his report for the company Liard (1964) suggests that the diabase dips gently to the east in the south part. The authors interpretation of the available diamond drill hole data (Resid Geols. Files) 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 7). One hole (SP 1) was put down to test one of the cross faults which transect the diabase in a northeasterly direction (Liard 1964).

The known mineralization is mainly near the centre of the diabase and the better zones are within 600 feet (183 m) of the cross faults (Liard). 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).

Figure 7: In back pocket.

Work was done first along known or assumed faults and linears; some of these were subsequently checked by perpendicular traverses. Seven anomalous zones were delineated from the survey and of these four were recommended for further work, but apparently was not done.

Southeast Van Hise Occurrence (5)

A series of 4 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 500 feet (152 m) northeast of this was put down on a 4 inch (10.2 cm) calcite vein striking N25°E and dipping 70° northwest; a grab sample taken by the writer from this pit and assayed by the Laboratory and Research Branch, 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 one inch (2.5 cm) thick quartz vein lying in a north striking epidotized fracture zone.

J.R. Stirrett (6)

(Thompson-Gowganda or Alpine Silver Mine)

In 1969, J.R. Stirrett held five leased claims about one mile (1.6 km) northwest of Firth Lake and numbered as

follows:- GG 4,724, HR 453, HR 454, HR 458, and HR 459.

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 1,000 feet (310 m) of trenching, sinking 2 shallow shafts and driving an adit. The adit was driven west into a diabase ridge for 575 feet (176 m) to intersect an aplite dike at a depth of 170 feet (51 m); the dike was drifted along for 80 feet (24 m) (Burrows 1921, p. 41). The location of the shafts is not known but they are reported to be 30 feet (9 m) and 50 feet (15 m) 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 1,200 feet (370 m) were put down. There was no recorded production and no further recorded work 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 easterly 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 veins in aplite and small amounts of fine cobalt (MacPhail 1952). The dike has been exposed for a length of 500 feet (150 m), strikes N20°E and dips west at 75° (McPhail 1952). Numerous other aplite dikes are present and range from 6 to 12 inches (15 to 30 cm) wide and have essentially the same attitude. Locally dikes striking N60°E and N80°E occur (Burrows 1921, p. 41).

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 reported one of the diamond drill holes at a depth of 33.5 feet (10 m) returned 263 ounces of silver per ton and 0.95% cobalt.

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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 and Charbonneau occurrences (8 and 9).

Early Precambrian metavolcanic rocks 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, outcrops along the north of the claim group. Matachewan type diabase dikes occur throughout. The western and eastern portions 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 indicated no anomalies of significant amplitude from the electromagnetic survey (Prior 1969). The magnetic survey showed highs associated with Nipissing Diabase (Prior 1969).

Numerous quartz veins were mapped in the metavolcanic rocks by the author; several of these veins were assayed for grab samples taken by the author of

by the Mineral Research Branch
samples
gold. These were all taken from easterly trending veins between Holland and Serpentine Lakes. The results from 5 assays indicated trace amounts of gold from 4 and nil from the other. The veins range in width up to 48 inches (1.2 m).

Brett Lake Occurrence (8)

The main pit of the Brett Lake occurrence is about 800 feet (243 m) east of Brett Lake. The pit is more exactly a short trench about 30 feet (9.1 m) long excavated a quartz-carbonate vein system in conglomerate about 6 feet (1.9 m) wide and striking N70°E. The pit is on the north edge of a Gowganda Formation conglomerate near the diabase contact. The vein system is composed of numerous quartz-carbonate veinlets. Mineralization observed in the veins by the author included native bismuth and erythrite with minor pyrite, chalcopyrite and cobalt arsenides. A grab sample taken by the writer for assay by the Mineral Research Branch returned 0.16 ounce of 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 in 19?? failed to find any significant mineralization at depth. (Assess Files)

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 northward into Foot Lake about 2,500 feet (760 m) away.

The occurrence is described (Asses. Files) as two quartz veins striking about N70°W containing chalcopyrite. As mapped by the author there are two sets of quartz veins. In a trench 50 feet (15.2 m) long as shown on Map 2 , back pocket, there is a series of quartz veins which range from ½ inch (1 cm) to 3 inches wide (7.6 cm). Four copper values have been reported (Assess. Files) 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 done by Swastika Laboratories Limited.

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

What is described as the south showing is approximately half way between Gould and Otter Lakes. Numerous sub-parallel quartz veins are described (Assess. Files) as varying from 18 inches to 48 inches (46 cm to 122 cm) thick and about 10 feet to 20 feet (3 m to 6 m) apart. One reported analysis (Assess. Files) from this showing gave 0.02 percent copper.

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Texmont Mines Limited (10)

In 1969 the property consisted of 18 unsurveyed claims numbered MR 42140 to MR 42157; the claims are over Firth Lake in Van Hise Township and cover a magnetic anomoly indicated on an aeromagnetic map (GSC 1970).

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 the locations of which are shown on Map 2, back pocket, totalling 1,602 feet (485 m); the logs of these holes which were submitted for assessment credit indicate the Gowganda Formation is 53 to 57 feet (16.1 to 17.4 m) 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 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. Desson (1968) suggests that the magnetic response over the remainder of the area indicates that mafic meta volcanics or gabbro under lie 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 metagabbro at the north end of Firth Lake were sampled by the author. At the north end of the island an 8 inch (20.6 cm) vein strikes east; pyrite was observed in the vein. Two grab samples of the vein were assayed by the Mineral Research Branch and contained 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 2 inches (5 cm) wide and strikes N40°W. Assay results (Mineral Research Branch) showed 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 9 surveyed claims straddling the Van Hise - Milner Townships boundary; the claims are numbered MR 13045 to MR 13053 inclusive. Parts of claims MR 13048 and MR 13050 represent an approximate restaking of

TC 141 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 the 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 the 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 roadside 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 N20°E and dipping 70° west with pyrite and minor chalcopyrite mineralization. A grab sample taken by the writer gave traces of silver, cobalt, nickel and copper (analyses by the Mineral Research Branch).

On the west side of the Milner Bay fault the Gowganda Formation/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

taken from the outcrop by the author assayed by the Mineral Research Branch gave 1.40 ounces of silver per ton, 0.15 percent cobalt and traces of nickel and copper, and 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 3 unsurveyed claims on the Gowganda Lake shoreline east of Reeve Lake; the claims were numbered MR 39547 to MR 39549.

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 1,000 feet (305 m) wide dips under feldspathic sandstone of the Lorrain Formation.

The main occurrence on the property is a branching fracture zone (Figure 8) which is near the south boundary and was trenched and sampled in 1957 by Maralgo Mines Limited. The zone which strikes N85°E and dips 70 to 80 degrees south consists of quartz-carbonate vein material with massive niccolite and lesser amounts of rammelsbergite and argentite (Hoiles 1957), chalcopyrite, erythrite and annabergite. The

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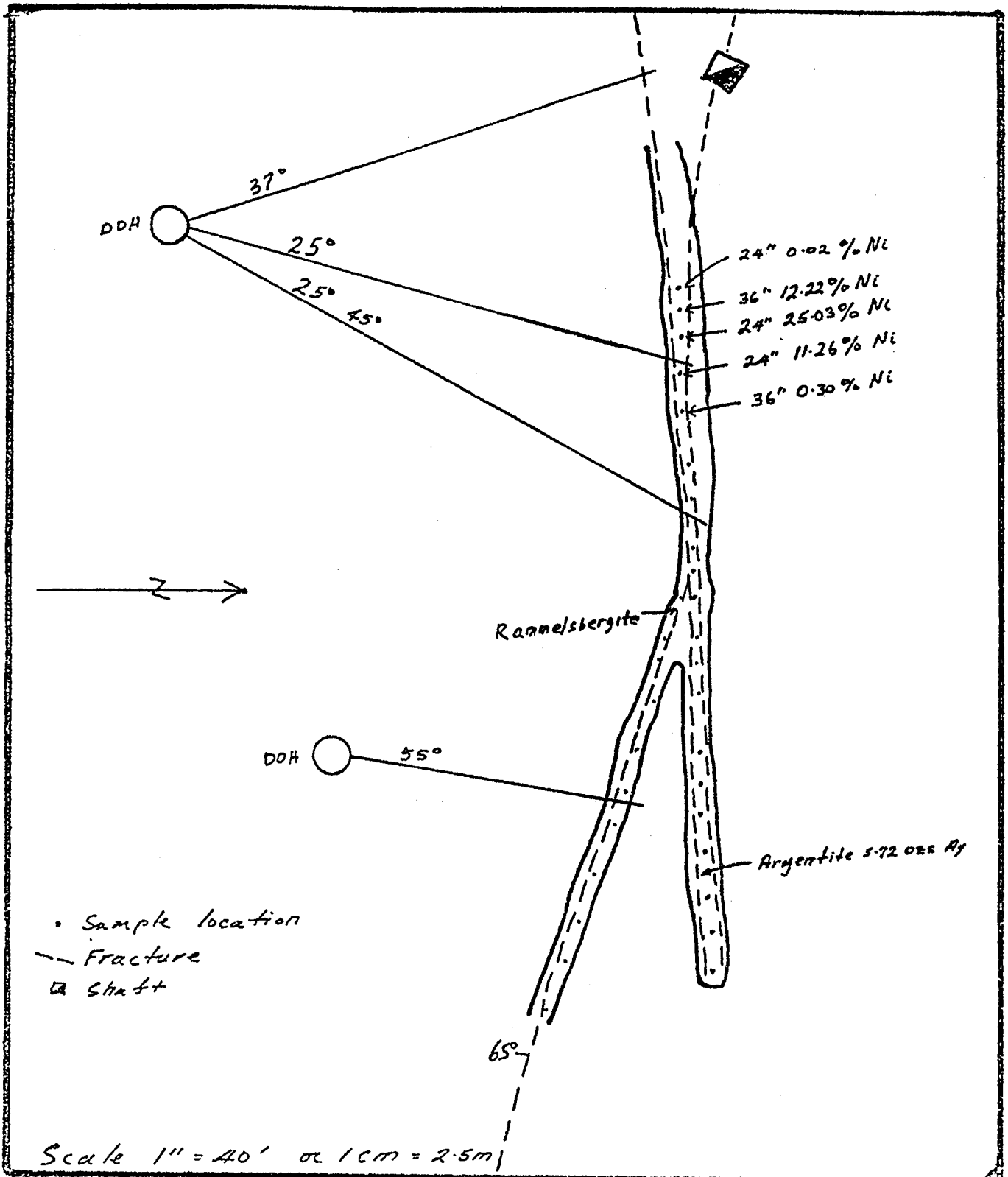


Figure 8 Plan of trenching on nickel occurrence on J. Beadman (13) property. Modified from assessment work data of Maralyo Mines Limited

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fracture zone has been trenched to a depth of about 6 feet (1.9 m) for about 115 feet (35 m) and a branch fracture for about 50 feet (15 m).

The niccolite and rammelsbergite occur as massive veins ranging from 1/2 inch (1.3 cm) to 2 inches (5 cm). Hoiles (1957 states that the highest nickel values occur in one short section (Figure 8) which is 10 feet (3 m) long and 28 inches (70 cm) 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 8) and niccolite was found in the dump by the author. High nickel values were also obtained on the eastern branch which assayed up to 15.44 percent nickel (Hoiles 1957). Maralgo Mines Limited had a total of 48 samples assayed for nickel and silver; the mean values obtained were 2.2 percent nickel and 0.11 ounce of silver per ton over 27 inches (69 cm) (Hoiles 1957). Four samples were also assayed for cobalt with values varying from 0.11 percent over 24 inches (61 cm) to 1.29 percent over 24 inches (61 cm) (Hoiles 1957).

A mineralized sample taken from the dump by the author and analysed by the Mineral Research Branch 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)

(Bartlett Open Cut (14))

(Crews McFarlan No. 2 (15))

In 1969 the property consisted of 3 claims, MR 50328 to MR 50330, which represent an approximate restaking of the surveyed claims MR 18062 to MR 18064. 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 contact with the intruded feldspathic sandstone and conglomerate of the Gowganda Formation is thought to dip to the west where it crosses the southwestern corner of the property.

Bartlett Open Cut (14)

Near the boundary of claim MR 50330 is an open cut or trench which is about 300 feet (91 m) long, 10 feet (3 m) wide and up to 18 feet (5.5 m) deep; the open cut extends about W20°S until it runs into low swampy ground. A 6 inch (15.3 cm) 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 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 772 feet (214 m) 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 3 samples for assay by the Mineral Research Branch, all of which 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).

Crews-McFarlan No. 2 (15)

About 1,500 feet (455 m) SSE 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:

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Table 14 — Assay results of samples take from Bartlett Open Cut now held by A. Decker

Sample No	Silver ozs/ton	Cobalt %	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

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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

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 half way 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 500 feet (152 m) 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 MR 47400 to MR 47413 and MR 47418 to MR 47435 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 fieldwork. 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 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. The rocks on the east side of the peninsula belong to the Firstbrook Member.

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 p.p.m. were obtained and some as high as 5 p.p.m. 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.

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F. Hines (18)

(Chimo Gold Mines Limited [1960])

(Northcliffe)

In 1969 F. Hines held two unsurveyed claims, MR 45236 and MR 45237, 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 3 holes totalling 990 feet (301.4 m) to explore at depth veins previously explored (possibly by Northcliffe) by surface workings and an adit 285 feet (86 m) long. The range of 44 assays was nil to 0.48 ounce of silver per ton with an average 0.02 ounce per ton (Assessment Files Research Office, Ontario Division of Mines, Toronto).

The claims are underlain by diabase. Assessment data suggested 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 160 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.

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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 in the section on Nipissing Diabase(p.101).

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 3 old pits but no mineralization was observed. To the west is an old shaft, possibly 50 feet (15 m) 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 1 inch (2.5 cm) vertical quartz vein which strikes N65°E. Parallel to the vein is a shear zone about 1 foot (30 cm) 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 1 to 2 inches (2.5 to 5.1 cm) wide and trending N20°E.

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 Robert Thomson (Thomson 1968) which was written while the author (Thomson) 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 cm to 24 m or 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 are 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 8,457 feet (2,579 m). 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 downward 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.

Sergiades (1968, p. 390) stated levels were established at 30 feet (9.1 m), 100 feet (30.5 m), 200 feet (61 m) and 300 feet (91.5 m).

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

Shaft
Crews McFarlan No. 3 (22)
located west of Great South Bay, Gowganda Lake,

This property 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 150 feet (46 m), there are three such veins within a width of 6 feet (2 m). On the 75 foot (23 m) level cross cuts were driven north and south, each for a distance of 140 feet (43 m) and 150 feet (46 m) of drilling was done on the veins. A sublevel at 40 feet (12.2 m) 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.

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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 150 feet (46 m). The shaft was sunk on a north trending diabase dike intruding Gowganda Formation rocks. About 2,000 feet (620 m) north of here is the No. 2 shaft which Thomson (1968, p. 7) indicates was at least 140 feet (43 m) deep at the end of 1917.

Hewitt Lake Mining Syndicate (25)

This 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 312 feet (95 m) deep with levels at 50, 150 and 200 feet (15, 46 and 61 m) with a total of 430 feet (131 m) of drifting and crosscutting. Thomson also reports vein material in the dump composed of white and pink calcite up to 6 inches (15.3 cm) with erythrite. Quartz vein material to 3/4 inch (1.9 cm) with some chalcopyrite was also observed.

The Mann Mine (26)

Native silver was discovered in Nipissing Diabase east of Boyd Lake in 1908 by Robert Mann (Sergiades 1968, p. 394). 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 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, 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 small shoot 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 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.

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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 9). Through this work 4 vein zones known as the "A", "B", "C"

Table 16 | Production figures 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.

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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 10.

The reserve estimates in 1968 were 19,000 tons (kg) 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) indicated numerous calcite veins near the south shore of Myrtle Lake; most of these small veins had a northerly strike and were investigated by diamond drilling. The logs of two holes were submitted for assessment credit; these holes totalled 409 feet (125 m). Several calcite veins with chalcopyrite and hematite were logged.

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South Bay (28)

The 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:[1]—
>
> 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.

Diamond drilling in the form of 4 holes totalling 864 feet (263 m) were put down in 1951 to examine the O'Brien area and a new shaft was put down about 600 feet (183 m) 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 Hellens (Hellens 1947) and re-examined again in 1951 by Hriskevich (Hriskevich 1951).

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 , 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 assayed 101.10 ounces of silver per ton, 0.29 percent cobalt, 0.10 percent nickel and a trace of copper.

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Table 17 Production figures 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

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Welch Mine (30)

The Welch Mine is south of the Reeve-Dobie and is probably represented by the shaft labelled 30 on Map , 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.

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Maralgo Mines Limited [1957] (31)

About 3,000 feet (910 m) southeast of Reeve Lake and 300 to 600 feet (91 m to 182 m) 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 Beadman (13) and 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 at N40°E and 70°NW has been trenched for about 37 feet (11.2 m); the fracture branches at the southeast and is terminated by a north striking slip which dips 20°E. 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 over 14 inches (35.6 cm) (Hoiles 1957). Complete results

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are in Table 18.

South B Showing: There is a northeast striking vertical zone about 2 feet (61 cm) wide with two fractures; bleached sections associated with the fractures are 8 to 10 inches (20.3 to 25.4 cm) 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 and assayed by the Mineral Research Branch, gave 0.18 percent cobalt with traces of silver, copper and nickel. About 100 feet (30.5 m) to the west is an old shaft; white quartz-carbonate vein material up to 4 inches (10.1 cm) with minor chalcopyrite was observed in the dump material.

South Showing: This occurrence consists of a trench 6 feet (1.9 m) deep and 45 feet (13.7 m) long on a shear zone at N70°E and 70°N. The diabase is pink near the surface but additional trenching indicated this alteration colour disappeared at depth. The zone was sampled at 5 foot (1.5 m) 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 (Analysis by Mineral Research Branch).

Montreal River Silver Mines Limited (32-34)

In 1969 the company held 3 claim groups as follows:-

1. The Hedges claim (TC 119) (32)
2. The Milne claim (TC 118) (33)
3. TC 128 and TC 129 (34)

Table 18 | Assay results at 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

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The Hedges Claim (32)

This surveyed claim is near the southeast corner 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 (1909, p. 18) describes a vein 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 westerly 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 2 , back pocket, in the southwest corner of the claim. Sergiades (1968, p. 411) reports a 1 inch (2.5 cm) calcite vein with argentite and high silver values.

TC 128 and TC 129 (34)

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

Miss Beatrice Reeve (35)

In 1969 the property consisted of two surveyed claims SW 1 and SW 2, on and 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 northeast corner of SW 1. The pit was put down on a vertical 2 inch to 3 inch (5.1 to 7.6 cm) quartz-carbonate vein striking at N55°W with minor chalcopyrite mineralization.

Silver Ore Zone Mines Limited (36-37)

(Bishop 36)

(Transcontinental 37)

A total of 7 claims to the northwest of Myrtle Lake were held by Silver Ore Zone Mines Limited in 1969; they were numbered MR 33794 to MR 33798, MR 36622 and MR 36623. There are 4 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 3 diamond drill holes totalling 1,041 feet (317.5 m) 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 southeast corner. Most of the west half of the property is underlain by diabase, which according to Lill (1964) dips to the east at 25 to 30 degrees under the sedimentary rocks. A diamond drill hole (shown on Map 2 , 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 (Northern Miner Dec. 24, 1964). The Northern Miner (Sept. 22, 1966) also stated a 550 feet (168 m) long conducter had been delineated by an electromagnetic survey near the shaft just south of the Bishop Shaft.

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 indicated 0.09 percent cobalt and traces of silver, nickel and copper (Analyses by Mineral Research Branch). Lill (1964) reports an assay of 24.78 ounces of silver per ton from these workings. Federal government files report 6 diamond drill holes in the shaft area totalling 300 feet (191 m) 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 75 feet (22.9 m) deep (OBM 1910, p. 119). About 30 feet (9.1 m) west of the shaft is a trench about 40 feet (12.1 m) long at N25°W; blocks of pink and white calcite up to 8 inches in maximum dimension (20.3 cm) with minor chalcopyrite mineralization were noted in the dump material.

Other Shafts

There are 2 other shafts on the property; one is 600 feet (183 m) northwest of the Bishop and the other is 1,100

feet (335.5 m) south. Grab samples taken by the author from the dumps of these shafts gave traces of silver, cobalt, nickel and copper. (Analyses by the Mineral Research Br.) Between the Bishop shaft and the shaft to the south several quartz veins from one-quarter to one-half inch (6 mm to 12 mm) are exposed.

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

D. Sutherland (38)

In 1969 the property consisted of 8 claims on the peninsula between Milner Bay and the North Arm of Gowganda Lake; the claims are numbered MR 47743 to MR 47748 and MR 47552 and MR 47553.

The southwest part of the property is underlain by Gowganda Formation conglomerate with lesser amounts of feldspathic quartzite 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 put down on a fracture system trending N10°W. Some quartz-carbonate vein material was noted in the dump.

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

(F. Loring Prospect, Armstrong Fraction)

F. Loring Prospect (39)

During the period from about 1950 to about 1961 Tego Silver Cobalt Mines Limited held ten 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 3 shafts to the east of Gorman Lake were put down in the early days; the position of these 3 shafts on Map 2 , back pocket, is approximate as they were not found during fieldwork but were taken from a sketch map of the property which accompanied a report by Gordon (1950).

In 1951 the company submitted diamond drill logs for assessment credit; the drilling consisted of four holes totalling 529 feet (161 m). Another four holes totalling 973 feet (296 m) 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 northwest corner of Logan Lake. The following paragraph 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 20 inches by 12 inches (51 cm by 30 cm). In some of these 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 TC 118 on the west shore of Milner Bay.

In 1909 a shaft was put down 100 feet (30.5 m) with a drift of 75 feet (22.9 m) 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.

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United Reef Petroleums Limited (41)

(La Brick)

The two surveyed claims held by this company in 1969

were MR 14850 and MR 14851; these are west of Milner Bay and east of Milner Lake. MR 14850 is an approximate restaking of HS 343 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 southwest corner of the property. The main shaft was collared in the diabase in the southwest corner 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 was given in OBM (1913, p. 124):-

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, MR 35142, 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 2 inches (5 cm) with some specularite was seen in the dump. Trace amounts of silver cobalt, nickel and copper were obtained from the assay by the Mineral Research Branch of a grab sample taken by the author.

In 1963 Utopia Gold Mines Limited put down seven diamond drill holes totalling 1,042 feet (317.8 m); 5 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 7 holes were submitted for assessment credit. One hole (No. 4) at 74 feet (22.5 m) indicated a vein 1/8 inch (3 mm) which gave an assay of 26.86 ounces of silver per ton. This vein is about 20 feet (6.1 m) north of the shaft (Figure 11). Small calcite veins were indicated in other holes (Figure 11) but no assay results were given in the logs except as shown in Figure 11.

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HAULTAIN TOWNSHIP

A. Allison (44)

(Former Trinity-Chibougamau 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 GG 4480, GG 5238, GG 5239, MR 18160 and MR 18161.

There are numerous pits and trenches (Figure 12 and Map 2), some of which were put down in the early days and others were blasted by Trinity-Chibougamau. In 1953, part

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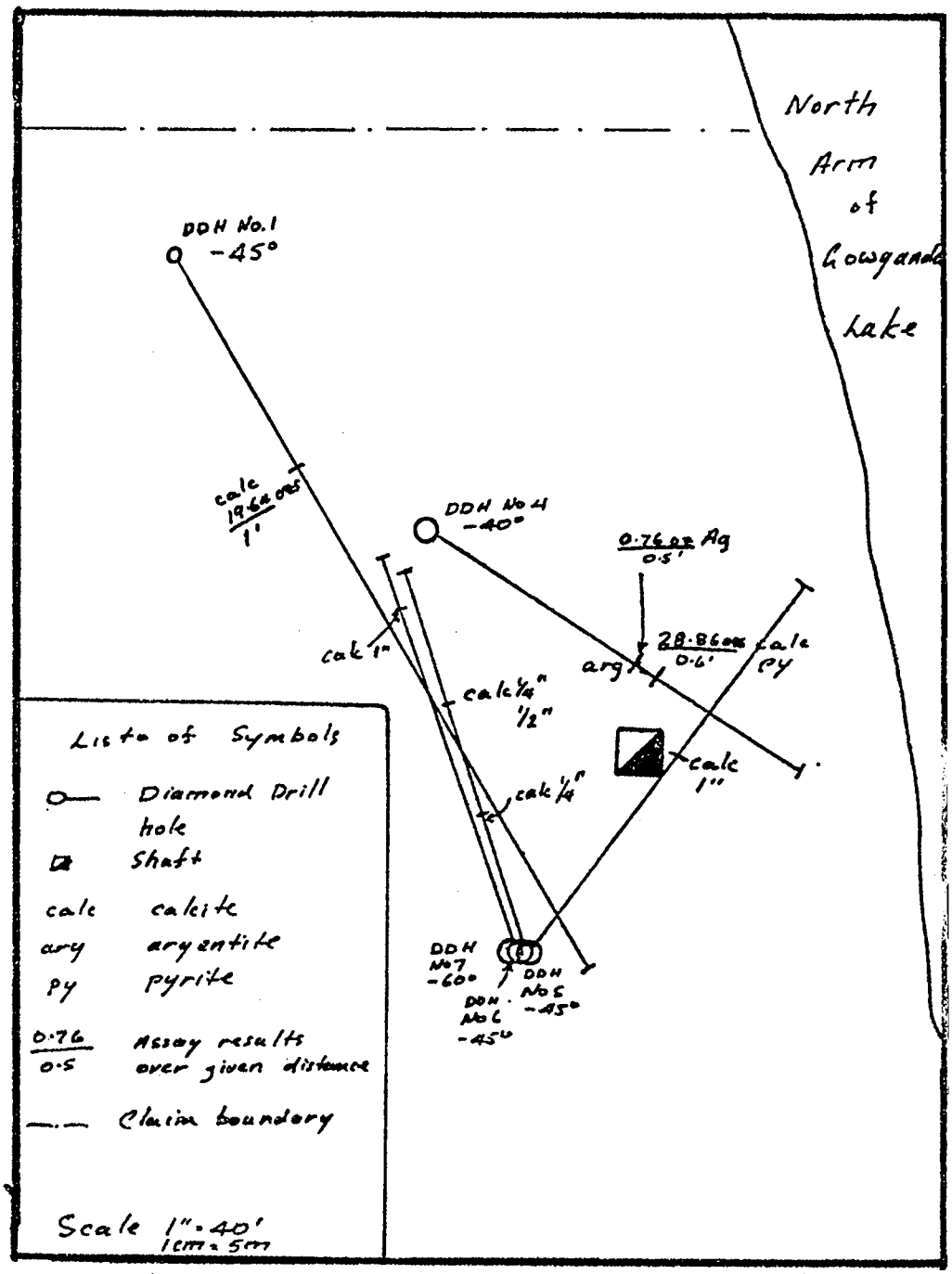


Figure II Diamond Drilling Programme at Utopia Gold Mines Limited - Modified from Assessment Work Data

Figure 12 : In back pocket

of this group, at least, was held by Cobalt Consolidated Mines 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.

General Geology

The oldest rocks on the property are Early Precambrian trondhjemite which underlies the western halves of GG 4480, and GG 5238. 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 100 feet to 500 feet (30.5 m to 152 m) striking northeast across eastern GG 4480, northwestern GG 5239 and central GG 5238. 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 Phelan (1962):-

The thickness of the diabase on the property is probably somewhat less than the 900 feet (274 m) 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 north-easterly 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-sediment 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. Sulphides associated with the veins include chalcopyrite, bornite, pyrrhotite and pyrite; cobalt arsenides are found locally. The main vein direction is N30°E with steep dips, but other directions are found. The greatest number of veins have been found in the central part of GG 5239 (Figure 12). Upon assay, low silver values have been obtained 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 were collared in the northwest part of MR 18160 (Figure 12). The two shallow holes both indicated several small veins with hematite, chalcopyrite, minor cobalt in one and galena in another.

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The Northern Miner of September 21, 1963, reported that Trinity-Chibougamau was 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 5 surveyed claims in one group in Nicol and Haultain Townships just north of Leroy Lake. The claims are numbered GG 4077, GG 4816, GG 4833, HS 718 and WJ 11 and have been held by the company since the late 1920's.

Early Precambrian basalt underlies the western portions of GG 4077 and GG 4816 and the extreme east of WJ 11. Local pyroclastics occur on GG 4077. 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 GG 4816.

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 GG 4077. During

the same year a two compartment shaft was sunk to 111 feet (30.7 m) (ODM 1927, p. 151-2). In 1927 the shaft was continued to 200 feet (61 m) with stations at 105 feet (31.5 m) and 182 feet (55 m) where minor drifting was done (ODM 1928, p. 166). In 1929 the shaft was sunk a further 49 feet (15 m) along with 250 feet (76 m) of drifting and 110 feet (33 m) of cross-cutting (ODM 1930, p. 148). This shaft was not found during field work.

During the field work a shaft was found near the east boundary of claim GG 4816. The apparent depth (about 10 feet (3 m)) of this shaft appears to preclude it from being that described above.

Besides this shaft old trenches were observed in central GG 4077.

F. Blake (46, 47)

(Cobalt Nugget (47))

In 1969 F. Blake held 5 unsurveyed claims in two blocks. The first block (46) consists of 3 claims numbered MR 47688 to MR 47690 and are in the southeast corner of Haultain Township and mostly over the water of Lost Lake; there is little known about these claims and they will not be discussed further.

Cobalt Nugget (47)

The other two claims are in the southwest and numbered

MR 45614 and MR 45615; 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 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 109 feet (33.1 m) and were all in diabase; the logs reported several carbonate stringers with mineralization including pyrite, chalcopyrite, galena, bornite and one instance of silver and cobalt.

F. Bowen (48-50)

(MacAlpine, McRae, Rawhide)

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 6 claims which were mapped and reported on by Gerrie (1952). This report was submitted for assessment credit.

Gerrie reports 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) states 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) reports 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 strike north. Crossing the central part of the property are two other faults which strike northeasterly. 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 100 feet (30.5 m) 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 400 feet (122 m) southwest of the shaft, Gerrie (1952) reports an aplitic vein with minor erythrite and low silver values.

In the eastern of the two fault valleys Gerrie (1952) reports two other veins which were not found by the author and therefore their position on Map 2 , back pocket, is approximate only.

About 1,000 feet (305 m) west of the north end of Crawford Lake is another shaft which is estimated by Gerrie (1952) to be about 30 feet (9.1 m) 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 73 feet (22.2 m) were put down to test the projection of the MacAlpine vein. No significant values were recorded in the logs.

About 300 feet (91 m) southwest of the MacAlpine another 4 holes totalling 87 feet (26.5 m) 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) of estimated 30 foot (9 m) depth at the southwest corner of McRae Lake. The dump material contains quartz, up to 2 inches (5 cm) and aplite. A small test pit 500 feet (150 m) north of the shaft has been put down on a fracture with quartz carbonate vein material up to 2 inches (5 cm). There are 2 small test pits about 300 feet (90 m) northwest of McRae Lake. One of these (shown on Map 2 , back pocket) was sunk on an aplite dike 2 feet (61 cm) wide striking N55°W.

These properties were worked in 1956 by Worldore Mining and 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 3 holes totalling 210.4 feet (64 m) and Castlebar drilled 6 holes totalling 1,622 feet (497 m)(Assessment Files Research Office, Ontario Division of Mines, Toronto).

Worldore put down 2 more holes northwest of the pit north of the shaft; these totalled 118.4 feet (36 m).

The Rawhide (50)

The Rawhide shaft is about 1,600 feet (460 m) northeast of Crawford Lake. It is a two compartment shaft of unknown depth. It appears to have been put down a system of 1 inch (2.5 cm) calcite veins striking N80°W. Mineralization observed included hematite and pyrite.

In 1956 the ground was optioned to Worldore Mining which sank a series of 9 short diamond drill holes totalling 537.5 feet (184 m) along a vein zone west northwest of the shaft. These veins are shown on the map accompanying Gerrie (1952). Carbonate veins up to 1.5 inches (3.8 cm) 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 6 holes totalling 1,466.7 feet (465.8 m) 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 HR 405; 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 4 to 6 inch (10 to 15 cm) calcite vein with hematite mineralization.

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Calico Silver Mines Limited (52)

In 1969 Calico Silver Mines Limited held 4 unsurveyed claims, MR 45368 to MR 45371, 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 3 claims adjacent to the northwest of the main block. The following claims in the main block were surveyed MR 13009 to MR 13016, MR 18026 to MR 18029, MR 18566, MR 18893 to MR 18895, MR 19109, MR 19145 to MR 19148, MR 19246, MR 19302 and MR 19303, MR 27888 to MR 27890 and MR 29299 and the following were unsurveyed MR 29329, MR 29425 and MR 29426, MR 32833 and MR 32834. The 3 adjacent claims MR 23998 to MR 24000 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 northeast 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. MR 13014 (56)
5. MR 18026 and MR 18027 (57)
6. Ottawa - Gowganda (58)

Babs Lake Area (53)

Geological mapping of this area was done by MacVeigh (1952) and the results were submitted for assessment credit. The geology shown in Figure 13 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 13 has been done. In 1952 5 holes near the shaft on MR 19145 totalled 827 feet (252 m). Further drilling on

Figure 13 : In back pocket.

the property took place as follows:-

1955 - 5 holes totalling 848 feet (259 m)
1959 - 5 holes totalling 1,885.1 feet (575 m)
1960 - 5 holes totalling 3,062 feet (924 m).

There are three additional holes shown on Figure 13; these are shown on a map submitted for assessment credit but there were no logs.

North of Babs Lake on MR 19145 is an old shaft which MacVeigh (1952) estimates to be 70 feet (21 m) deep with no lateral workings.

The following paragraph is paraphrased from MacVeigh (1952):-

The shaft vein, which strikes N10°W and dips 70 west, is about 1 inch (2.5 cm) 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 13. From the 37 assays reported in the logs of the 1959 drilling the best result was 1.74 ounces of silver over 1/2 inch (1 cm)(Assessment Files Research Office, Ontario Division of Mines, Toronto).

East of Babs Lake in the southwest corner of MR 18893 are several veins (Figure 13) 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

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faults cross Babs Lake (Figure 13 and Map 2 , 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 Newman (1961):-

A zone averaging 300 feet (91 m) 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 12 inches (30.4 cm) in Hole No. 29 and 9.3 ounces per ton in Hole No. 15 (Assessment Files Research Office, Ontario Division of Mines, Toronto).

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Flatstone Lake Area (54)

This occurrence, on claim MR 18895, is at the southwest corner of Flatstone Lake. There are several veins in the area (Figure 13) mostly with an east northeast strike; a shaft estimated by MacVeigh (1952) to be 40 feet (12.2 m) deep has been put down on one of the veins. There is chalcopyrite and bornite mineralization and two assays indicated 2.34 ounces over 2 inches (5 cm) and 0.42 ounce over 6 inches (15.2 cm) of silver per ton (MacVeigh 1952).

In 1952 four diamond drill holes which were put down to test the veins near the shaft (Figure 13) totalled 812 feet (247 m). 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).

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Millcrest (55)

This portion of the Castlebar property consists of the 3 claims MR 23998 to MR 24000.

Early Precambrian mafic metavolcanics underlie the southwest corner of MR 23999. The north half of MR 24000 is underlain by Early Precambrian trondhjemite which outcrops 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 MR 23998 near the south boundary.

Burrows (1926) indicated that work commenced on the property in the autumn of 1925. He stated the following on p. 39-40:-

> 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. W. H. Fairburn is manager for the Millcrest Mining Company, Limited.

Work continued in 1926 and shaft sinking continued to 112 feet (34.2 m) with about 200 feet (61 m) 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 308 feet (94 m) 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 1,000 feet (305 m) of development work in the years 1935 and 1936. They found 7 veins varying from 4 inches to 12 inches (10.2 cm to 20 cm) with cobalt and some silver mineralization.

In 1957 the logs of 2 diamond drill holes totalling 123 feet (37.5 m) were submitted for assessment credit by Nichaul Mining. These holes were put down southwest of the shaft. Logs of 3 more diamond drill holes totalling 175 feet (53 m) were submitted for assessment credit; one of these holes was near the shaft and the other in the southeast corner of MR 23999.

The property was acquired by Castlebar in 1958.

Newman (1961) describes several localities on MR 23999 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.

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MR 13014 (56)

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

There is a trench about 350 feet (107 m) 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 807 feet (246 m). The highest silver assay reported in the logs was 0.84 ounce per ton over 7 inches (17.8 cm), (Assessment Files Research Office, Ontario Division of Mines, Toronto). A grab sample taken by the author from the trench dump indicated 0.45 percent copper and traces of silver, cobalt and nickel (Analyses by the Mineral Research Branch).

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MR 18026 and MR 18027 (57)

Newman (1961) indicates that a number of veins with silver were observed on MR 18026. In 1959 Castlebar drilled 3 holes along a northeast strike and in a southeast direction in the northwest part of MR 18026. The holes were spaced about 25 feet (7.6 m) apart and totalled 620 feet (189 m). 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 fieldwork.

Ottawa - Gowganda (58)

The old Ottawa - Gowganda shaft is on MR 13016 near the south boundary of Haultain Township.

Except for Early Precambrian metavolcanic rocks in the southwest corner 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 6 holes in the vicinity of the shaft totalling 2,682 feet (815 m). A break down of 172 assays for silver which were reported in the logs shows that 10 returned nil, 55 gave a trace, 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 2 inches (5 cm), 81.50 ounces over 9 inches (22.9 cm), 88.50 ounces over 1.5 inches (3.8 cm) and 216.4 ounces over 3 inches (7.6 cm) (Assessment Files)

Two further drill holes totalling 806 feet (245 m) were put down on MR 13012 to the northeast of the shaft. The highest silver assay obtained was 10.32 ounces over 1 inch (2.5 cm) (Assessmen Files Research Office, Ontario Division of Mines, Toronto).

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K. A. Fletcher (60)

In 1969 the property consisted of three surveyed claims about halfway between Bloom and Wigwam Lakes, the claims are numbered HR 383, HR 385 and HR 386.

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 HR 386 have been blasted into the diabase. One is on a one foot (30 cm) epidote rich aplite dike which strikes N60°E. The other is on a 4 inch (10 cm) quartz-carbonate vein striking N55°W. Mineralization observed included pyrite and erythrite; upon assay a grab sample taken by the writer gave traces of silver, cobalt, nickel and copper (Analyses by the Mineral Research Branch).

To the east on claim HR 385 is a shaft, of unknown depth, which was put down on a 2 inch (5 cm) quartz vein. No mineralization was observed in the dump rock.

Gowganda Silver Mines Limited (62-66)

In 1969 the company held 55 unsurveyed claims in Haultain Township; for the purposes of this report these claims have been divided into 5 groups:-

1. Bloom Lake Group - 18 claims - MR 47463 to MR 47480 (62)

2. McRae Lake Group - 10 claims - MR 47456 to MR 47466, MR 47167 to MR 47169 (63)

3. Mire Lake Group - 9 claims - MR 47145 to MR 47153 (64)

4. Sigs Lake Group - 11 claims - MR 47154 to MR 47166, MR 47170 and MR 47171 (65)

5. Wigwam Lake Group - 5 claims - MR 47180 and MR 47223 to MR 47226 (66).

The other two claims are in the southeast corner 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, which, on the property, is a "tail" from the Miller Lake Basin, 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 2 to 6 inch (5 to 15 cm) calcite veins at N40°E and 80° northwest. A pit on the west shore of the lake was put down to test a 2 inch (5 cm) vertical calcite at N65°E with minor erythrite mineralization. These two workings were observed during mapping for this report.

A further 3 pits were found to the west of Bloom Lake during a geophysical survey of the claim group (Szetu 1969a). A sample with chalcopyrite and erythrite from one of these pits assayed 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, 1969a).

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

Mire Lake Group (63)

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

The northwest corner 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, 10 feet (3 m) deep, just south of Mire Lake has been put down on a calcite vein zone in conglomerate. The zone strikes N10°W and dips 65° west and contains pyrite and specularite mineralization.

The results of a geochemical survey (Shaw 1969) and a geophysical survey (Szetu 1969b) were submitted by the company for assessment credit. The geochemical survey, which consisted of soil sampling had only 4 analyses above zero. One of these, about 1,400 feet (425 m) south of Mire Lake

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indicates 3 ppm of silver (Shaw 1969).

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

McRae Lake Group (64)

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 1969b). One of these is along the east shore of Crawford Lake and the other south east of McRae Lake (Szetu 1969b).

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

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diabase dike strikes northeast across the property.

Soil sampling indicated a very local anomaly of 3 ppm silver about 1,600 feet (490 m) east of the north end of Sigs Lake (Shaw 1969).

Wigwam Lake Group (66)

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 N25°E contains erytherite, chalcopyrite and malachite mineralization. An assayed grab sample taken by the author from the dump indicated 0.45 percent copper and traces of silver, cobalt and nickel (Analyses by the Mineral Research Branch).

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

Haultain Lake Veins (67)

Between Haultain Lake and the Montreal River are numerous aplite dikes and quartz veins. The aplite has a dominant east trend and locally ranges to northeast and they are up to 2 feet (61 cm) in width. The quartz veins have variable strikes and are up to 10 inches (25 cm) in width. These aplite dikes also occur to the northeast of Haultain Lake where they reach a width of 12 inches (30 cm) and have a more varied strike.

J. G. Jewell (68)

In 1969 the property consisted of surveyed claim ED 40 about 1/2 mile (0.8 km) northwest of Wigwam Lake.

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

A north striking 4 inch (10 cm) aplite dike was found by the author during the fieldwork.

J. Melisek (69)

In 1969 this property consisted of 4 surveyed claims straddling Bloom Lake in the northeast corner of Haultain Township. The claim numbers are AK 22, LO 224, LO 225 and GG 5763.

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 southeast corner of AK 22 on the west shore of Bloom Lake. Argillite and siltstone of the Gowganda Formation nonconformably overlies 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 5 foot (1.5 m) deep test pit was found on the west shore of Bloom Lake on LO 224. The pit was put down to test

a 1 inch (2.5 cm) calcite vein in diabase at N65°E and 80° north. The diabase has been sheared; brecciated pieces of diabase were observed in the vein which has been displaced about 6 inches (15 cm). Erythrite and cobalt-nickel arsenides were observed.

Miller Creek Prospect (70)

On the west side of Miller Creek, about 700 feet (210 m) 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 2,700 feet (820 m) west northwest of the shaft is a small test pit on a quartz vein in foliated amphibolite. The vein is 4 inches wide (10 cm) and strikes N60°W 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:- HS 350 to HS 357, HS 364 to HS 369, LM 101, LM 105 to LM 110, RSC 99, RSC 100, RSC 102 and RSC 104. 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 HS 351. 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 per cent. cobalt and 13.31 per cent. 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 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.

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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 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 due to 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-examing 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

Table 19 | Production figures 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

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Table 20 | SHAFTS, CASTLE AND CAPITOL MINES

	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

From O.O.M. Annual Report for 1969
Volume 79, p. 116

No. 6 shaft area. Figure 14 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.

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The Castle Nos. 2 & 3 (73)

According to Sergiades (1968, p. 378) this property was held in 1917 by the Castle Mining Company and then in 1918 by the Trethewey Silver Cobalt 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 15.

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

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Figure 14: In back pocket

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

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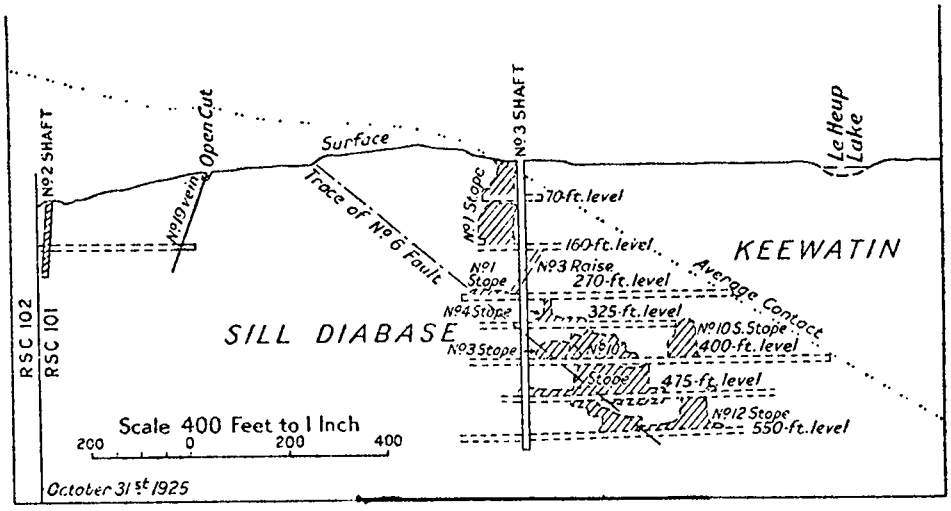


Figure 15 -

Longitudinal Section through Castles No. 2 and 3.

From ODM Vol. 35, pt. 3

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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 550-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 lumnar jointing planes in several directions are at right angles to the contact, l since the fracturing follows in part the columnar jointing planes, the dip eins is dependent on the contact. The principal directions of veins are, ughly, 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, were 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.

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 850 feet (259 m) with a total of 11 levels (Sergiades 1968, p. 378).

Diamond drilling was started by Siscoe 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 4 claims as follows: LM 105, LM 106, RSC 102 and RSC 103. The workings in the old mine are confined to the western rim of the Miller Lake basin on RSC 101 and RSC 102. The property has been described by Burrows (1926, p. 38) as follows:-

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 15) the workings northwest on to the Everett ground on the 160 foot (49 m) level. Here further work included 30 feet (9.1 m) of cross-cutting in 1922 and in 1924 a winze was sunk for 105 feet (35 m) below the level with 401 feet (122 m) of development work here in 1924.

HS 367 (75)

On HS 367 an adit has been driven at S75°W into a cliff of sheared diabase to intersect a 1 1/2 inch (3.6 cm) sulphide vein containing pyrite, chalcopyrite and some hematite. The vein strikes N15°W.

RSC 104 (76)

On RSC 104 a small test pit has been blasted into a 1 1/2 inch (3.6 cm) calcite vein with abundant erythrite; the vein strikes N80°E.

W. M. McIntyre (77)

(Gamble Thompson Claims)

The surveyed claims numbered GG 5111, in Nicol Township and GG 4910, GG 5061 and GG 5110, 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. Feldspathic sandstone nonconformably overlies the Early Precambrian rocks in the north half of the property. 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

GG 4910. The vein is 4 inches to 8 inches (10.1 to 20.2 cm) and is described as being along a diabase-metavolcanic contact (Carnegie 1920). It is assumed this contact is between metavolcanics and Matachewan Diabase.

MR and GS Olmsted (79)

(Barbara)

In 1969 the property consisted of eight surveyed claims just north of Flatstone Lake in southeast Haultain Township. The claims are GC 4108, SW 6 to SW 9, SW 11, SW 19 and SW 27. 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 claim S.W. 18, south of Lake Irene.

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

M. Riel (81-83)

(TC 94)

Three separate surveyed claims were held by M. Riel; ED 55 (81) is on and west of Mire Lake and TC 167 (82) is at the south end of McRae Lake; nothing is known about these claims. The third claim, TC 94 (83), is on the east side of Mire Lake.

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, 6 feet (1.9 m) deep, was found in the northeast corner of the claim. The pit was sunk on a narrow quartz-carbonate vein with chalcopyrite, pyrite and arsenopyrite mineralization; the vein strikes N85°E.

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 6 feet (1.9 m) deep and was sunk on a calcite vein striking N80°W; the vein is 36 to 42 inches (90 to 100.6 cm) wide.

The dump by the other pit contained 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 6 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 by Early Precambrian granitic rocks in the southeast corner. The diabase is locally medium- to coarse-grained and has an easterly dip of 25° (Howe 1963). Howe (1963) also estimates the thickness of the sill to be in the order of 1,500 to 2,000 feet (450 m to 610 m).

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 12 inches (30 cm) (Howe 1963).

One small test pit was observed during the present survey about 400 feet (120 m) southwest of a small pond on the north boundary of Haultain Township. Calcite with erythrite and chalcopyrite mineralization was observed.

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M. and A. Steinthal (86)

(Becker Claims)

The property, in 1969, consisted of 2 surveyed claims, southwest of Bloom Lake, which are historically known as the Becker Claims; they are numbered GG 3450 and TC 219.

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 on the property; 3 of these veins have had exploratory shafts sunk on them. None of these veins or shafts was found during fieldwork and therefore are not shown on Map 2 , back pocket. The vein material is mainly calcite but there are a few quartz or calcite and quartz. The calcite veins are generally in the range of one to five inches (2.5 to 12.7 cm) and the quartz veins are generally much wider, up to 15 inches (38 cm). Mineralization, mainly in the carbonate material, consisted of silver, bismuth, chalcopyrite, galena, erythrite, hematite and cobalt arsenides; quartz veins generally were barren (Montague 1912).

Three exploratory shafts were sunk; No. 1 shaft on vein No. 2 is 32 feet (9.7 m) deep, No. 2 shaft is on vein No. 3 and is 75 feet (22.8 m) deep and No. 3 shaft is on vein No. 4 and is 12 feet (3.6 m) deep. Stripping and trenching has been performed on several other veins (Montague 1912).

Montague (1912) also gives the results of assays for silver as follows:- No. 1 vein trace, No. 2 vein 17.3 ounces

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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 and 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 4 feet (1.2 m) deep and 12 feet by 15 feet (3.6 m by 4.6 m) across. A grab sample taken by the writer from the quartz-carbonate vein material indicated only trace amounts of silver, cobalt, nickel and copper (Analyses by the Mineral Research Branch). The pit is in Matachewan type diabase.

A shaft 3,000 feet (910 m) northwest of Stella Lake has been sunk on a Matachewan diabase dike. The shaft is about 30 feet (9 m) deep and was sunk on two quartz carbonate veins; the one is 18 inches (46 cm) wide and strikes N85°E and the other is 12 inches (31 cm) and strikes N80°E. Vuggy crystalline quartz is common. A grab sample taken by the author from the dump gave traces of silver, cobalt, nickel and copper on assay by the Mineral Research Branch.

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 2 inch (5 cm) quartz vein at N70°W; the vein has been intruded along the centre of an aplite dike up to 4 inches (10 cm) wide. Traces of silver, gold, cobalt, nickel and copper were indicated upon assay. Pyrrhotite, sphalerite and pyrite mineralization was observed.

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Tormont Mines Limited (88-90)

(Haultain and Wigwam)

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 3 descriptions:-

1. The Haultain (88)
2. MR 13255 and MR 17124 (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 16) was subsequently put down to 350 feet (107 m) with a level established at this point and at 250 feet (76 m) (MacVeigh 1961), but the extent of the lower levels is not known.

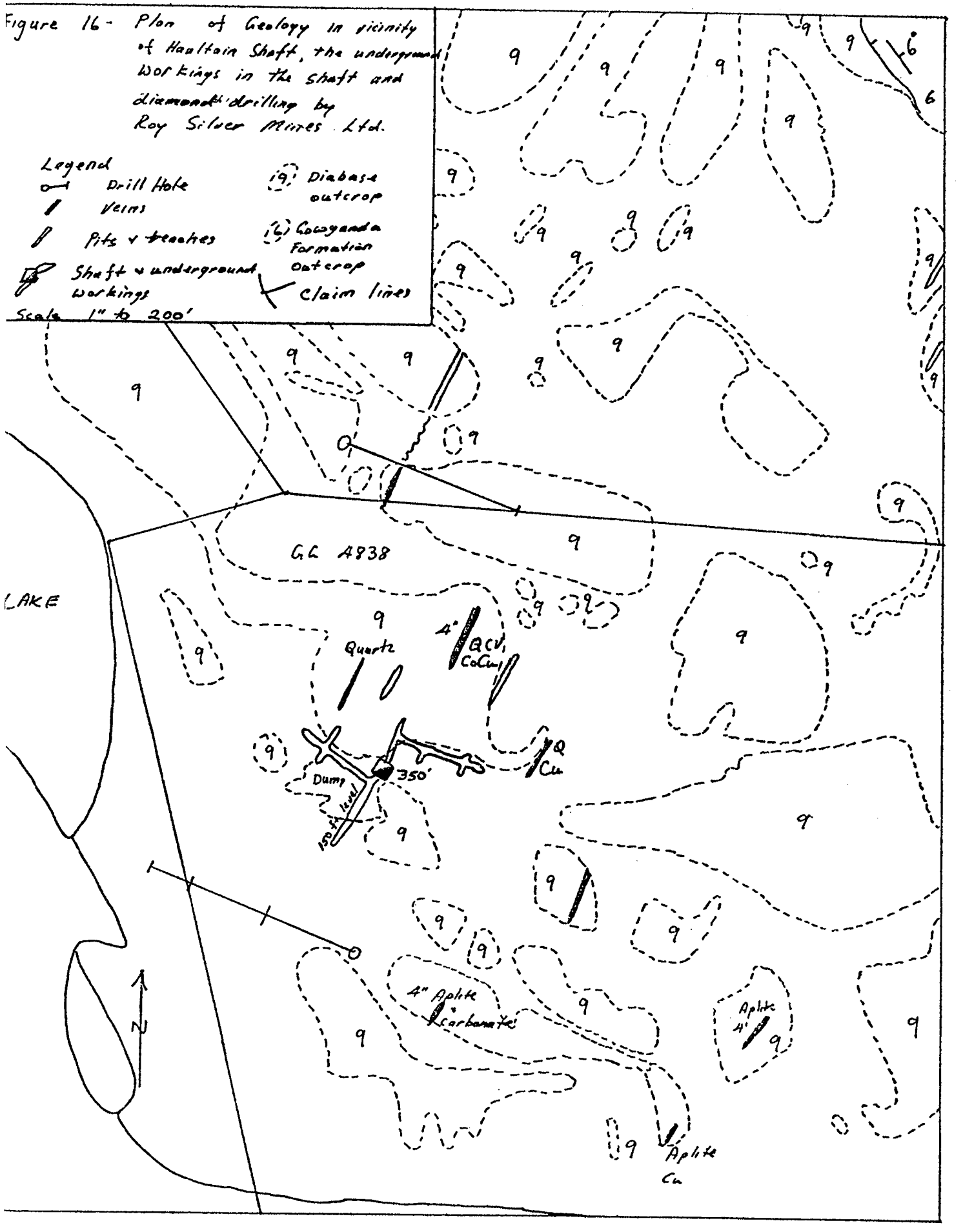
In 1951 Roy Silver Mines[1] dewatered the workings and completed a flat diamond drill hole from the 250 foot (76 m) level for 350 feet (107 m) to the east (MacVeigh 1961). MacVeigh (1961) also indicated that the hole intersected two cobalt bearing veins which may be correlated with known veins on the 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 16) totalling 935.2 feet (285 m) were filed with the Ontario Department of Mines. These holes were put down north and south of the workings to intersect projected extensions of the main vein. The log indicated that a wide zone of quartz-carbonate vein material was intersected, just west of the projected Haultain vein system, with 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).

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

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Figure 16 - Plan of Geology in vicinity of Haultain Shaft, the underground workings in the shaft and diamond drilling by Roy Silver Mines Ltd.
Legend
Drill Hole
Veins
Pits & trenches
Shaft & underground workings
Scale 1" to 200'
Diabase outcrop
Cobalt Formation outcrop
Claim lines
LAKE
GL 4838
Quartz
4" Qtz Cu Co Cu
Dump
350'
Qtz Cu
4" Aplite Carbonate
Aplite 4"
Aplite Cu
N

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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) The log suggested that this vein, encountered near the bottom of the hole is possibly the main shaft vein.

The log of another hole (Figure 16) to the southwest of the shaft was abandoned after drilling through 120 feet (36 m) 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 traces of silver, nickel and copper and no cobalt (Mineral Research Branch).

MR 19076 and MR 17124 (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 17) cuts across a high bluff of diabase between Wigwam and Lost Lakes. The vein system which strikes N60°E is 5 inches (12.7 cm) wide and has been traced for 400 feet (122 m). A 5 inch (12.7 cm) wide sample of calcite near the centre gave a silver assay of 8.96 ounces per ton. (McVeigh 1961) The vein's association with an aplite dike is generally considered unfavourable for ore, but the occurrence is on strike with a lineal depression along which silver is found to the west.

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Figure 17 : In back pocket

Roy Silver Mines Limited put down two diamond drill holes on MR 17124 with no ore found. Total length of the holes was 531.8 feet (162 m) (Figure 17).

The Wigwam (90)

The Wigwam (Figure 17) is on the east side of Lost Lake about halfway along the shore and was described by Burrows (1926, p. 39) as follows:-

> 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 149 feet (44 m) of drifting in 1951 (Sergiades 1968, p. 384). To the north

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of the workings 878.4 feet (268 m) of diamond drilling was also done by Roy Silver Mines.

During the period of 1962 to 1963 Tormont Mines Limited drilled a total of 3,563 feet (1,079 m). A 20 foot (6.1 m) trench gave high grade assays up to 3,000 ounces of silver per ton over 2 to 3 inches (5.1 to 7.6 cm); this lead 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.

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United Siscoe Mines Limited (91-93)

(Bonsall (91) and Millerett (92))

This property is operated by Siscoe Metals of Ontario Limited a wholly owned subsiduary of United Siscoe Mines Limited. In 1969 the property in Haultain Township was composed of 7 surveyed claims numbered RSC 82 to RSC 87 and RSC 95. 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 6.

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 straight-line compressor, 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 RSC 82 and RSC 83; the shaft was down 139 feet (42 m) by the end of the year. An ultimate depth of 511 feet (156 m) was reached with levels established at 230 feet (70 m), 350 feet (106 m) and 500 feet (152 m) (Company annual report for 1966). During this same year 4 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 1,500 feet (456 m) north of the shaft. All of the ore mined from this area is from the lower contact of the Nipissing Diabase from along an axis which plunges gently to the southeast (Annual report for 1969). New ore along this axis failed to materialize and underground operations were suspended in 1969.

Millerett (92)

Claim RSC 95 was originally referred to in 1908 as the Blackburn claim; it is now known as the Millerett as in 1909 the property was taken over by the Millerett Silver Mining Company (Sergiades 1968, p. 382). The ground was then held in 1913 by the Miller Lake O'Brien Company and finally by

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 ODM Annual Report Volume 79 p. 115.

Table 23 | Production figures 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

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Siscoe in 1945. Production from the mine was all in the early years (Table 24) and totalled 611,822 ounces of silver and 5,000 pounds of cobalt (Sergiades 1968, p. 375).

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 2 inches (5 cm) wide with "five leaflets" of silver which impregnate the host rock for a distance of up to 2 feet (61 cm) 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 253 feet (77 m) for development of the main vein; from this adit a crosscut was driven west for 150 feet (46 m). No. 1 shaft was put down 83 feet (25.3 m) with a level at 70 feet (21.3 m) which was driven 290 feet (88 m) to the southwest and 150 feet (46 m) to the northeast.

In 1914 and 1915 No. 10 shaft was sunk for 127 feet (39 m) in the south central part of the claim with levels established at 60 feet (18.3 m) and 127 feet (39 m).

More recently Siscoe has done diamond drilling and put a raise up from the 450 foot (137 m) level of their main

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

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workings to the 300 foot (91 m) sub-level of the main Millerett workings. From here 80 feet (24.4 m) 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. Campbell (1967a) reports that several areas containing anomalous silver were delineated, especially in areas of Nipissing Diabase and Early Precambrian metavolcanic rocks.

The logs of 13 diamond drill holes totalling 2,924 feet (887 m) were put down on MR 42507 which lies immediately north of RSC 82. 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 MR 50438 which represented a restaking of former claims RSC 131 and RSC 142 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 in 1925 with the sinking of a shaft to 100 feet (30.5 m) (ODM 1926, p. 149).

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

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 (analysis by Mineral Research Branch).

A calcite vein 2 to 4 inches (5 to 10 cm) in diabase has been exposed in the gravel pit by the highway in the southwest corner of the claim, the vein is vertical and strikes N40°E.

Castlebar Silver and Cobalt Mines Limited (95-97)

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 1/2 mile (0.8 km) west southwest of Miller Lake and consists of MR 23995 to MR 23997.

Except for the olivine diabase dike which is inferred to strike northwest across MR 23995 the entire group is underlain by pyroxene gabbro of the Nipissing Diabase.

During the mapping calcite stringers were observed in a trench 30 feet (9 m) long on claim MR23996; the stringers strike N65°E and dip 85 degrees south and are mineralized with pyrite and chalcopyrite.

In 1957 the logs of diamond drilling totalling 195 feet (60 m) for 3 holes were submitted for assessment credit by Nichaul Mining; they were all drilled on MR 23996. Diabase was the only rock type described in the logs with several calcite stringers and associated sulphide mineralization.

The log of one hole 55 feet (16.8 m) signed by K. Sanford was submitted in 1958. This hole was drilled in the northeast corner of MR 23997 and encountered only diabase; a calcite vein with pyrite is reported in the log.

The log of one further hole 211 feet (64 m) long was

submitted in 1961 by Castlebar; this hole was drilled near the west boundary of MR 23996 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 MR 18610 and MR 18611 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 1,554 feet (470 m); one hole (shown on Map 2) was drilled vertically to determine the depth of the upper diabase contact which was found at 451.8 feet (138 m). Vein material between 677.5 and 678.5 feet (207 m) contained niccolite and native silver. Numerous quartz stringers were described.

MR 18865 (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 160 feet (49 m) are on file in Kirkland Lake.

Consolidated Morrison Explorations Limited (98-100)

The property consists of 4 surveyed claims MR 15951, TC 204, TC 315 and WJ 9; TC 315 is the site of the main shaft of the past producing Morrison Mine. The production figures are shown in Table 25.

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. Mr. 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 TC 204 and TC 315 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 90 foot (27 m) 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. Mr.

Table 25 | Production Figures for Morrison Mine from Sergrades (1968 p. 405) owned in 1969 by Consolidated Morrison Explorations Limited

Year	Ore Raised Tons	Ore and Concentrates Shipped (tons)	Cobalt lbs.	Silver ounces
1930	4,024	50	5,397	154,799
1931				120
1932				
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

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Strong then in 1922 and 1923 acquired ground along the upper diabase contact; this included the Morrison. The property was optioned by the Tonapah Mining Company who sank a shaft to 300 feet (91 m) with lateral workings on this level and a raise to workings on the 275 foot (84 m) level and a winze to the 375 foot (114 m) 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 Mr. 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 600 feet (183 m) with levels established at 425 feet (130 m), 500 feet (152 m) and 575 feet (175 m) with a resultant production of silver. The drop in price of silver resulted in the mine becoming closed for 15 years.

During this period HR 204 and HR 205 (now MR 15951) were acquired by Mr. Strong; these are the former Canadian Gowganda property.

The property was enlarged in 1951 by an amalgamation with Anglo Huronian who held WJ 9 and who through their subsidiary Prospectors Airways formed New Morrison Mines Limited. Further exploration led to new oreshoots and

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 WJ 9 from the above operations consisted of a few diamond drill holes.

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

General Geology

Most of WJ 9 is underlain by Early Precambrian mafic metavolcanics consisting of flows and pyroclastic rocks. To the south of this assemblage is pyroxene gabbro of the intruding Nipissing Diabase which dips to the north under the metavolcanic assemblage. The diabase is cut by the northwest trending olivine diabase dike.

Moore (1955, p. 35) describes a northwest striking fault which dips 24 degrees northeast, the fault cuts through the mine and may be seen on the 175 foot (53 m) and 300 foot (91 m) levels. There is a crushed zone along the fault several inches (cm) wide on the 300 foot (91 m) 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°NE. 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

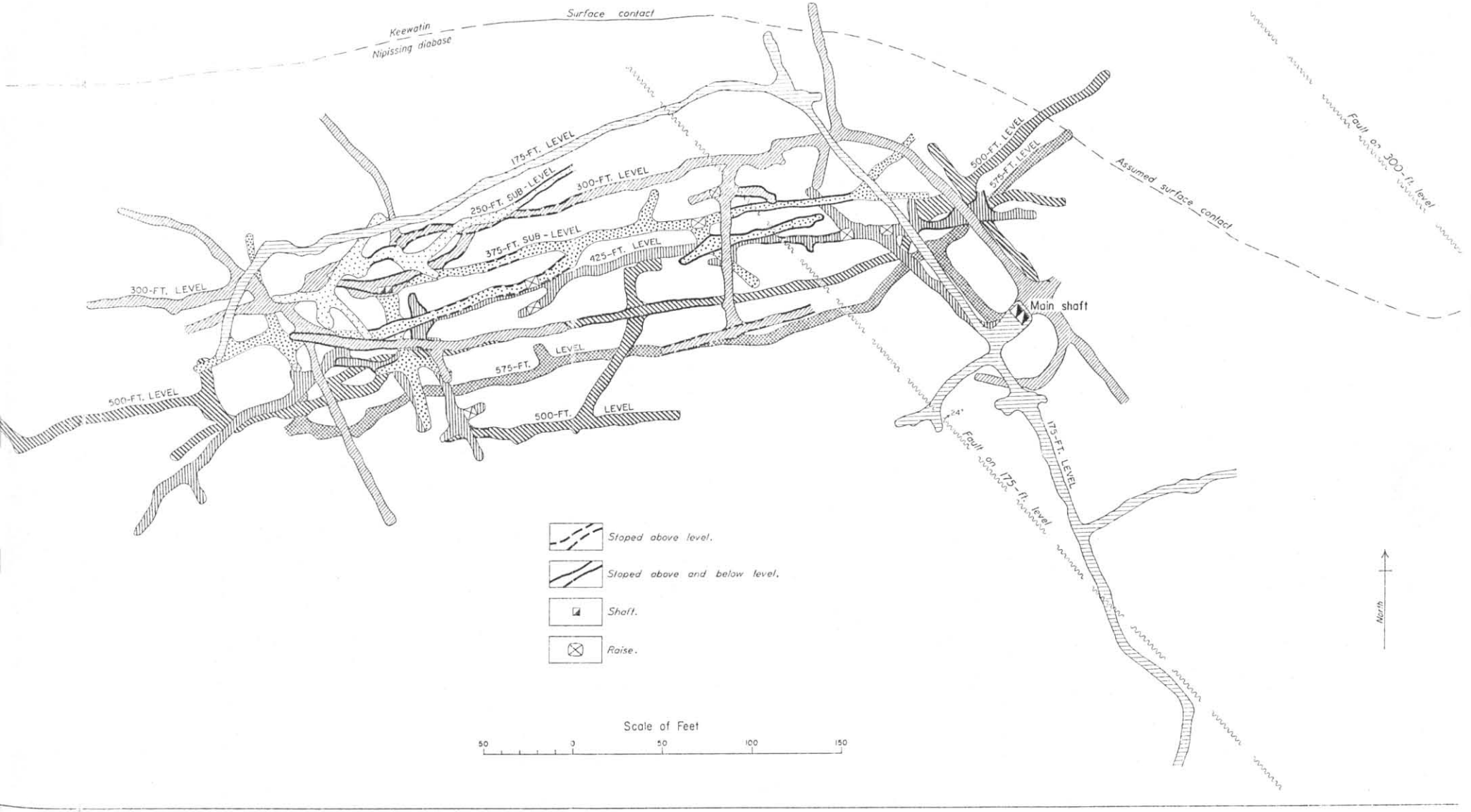
Plans of the underground workings are shown in Figure 18. There are seven levels and sublevels in the mine.

WJ 9 (99)

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

In 1926 the property was operated by W. J. Nine Silver Mines, a subsiduary of Huronian Belt Company. The shaft was continued to 400 feet (122 m) with the upper diabase contact encountered at 188 feet (57 m). Lateral work, most of which was done on the 400 foot (122 m) level totalled 1,838 feet (592 m). Underground plans are included in Figure 18.

Figure 18 also shows a vertical diamond drill hole which was put down about 400 feet (122 m) north of the shaft and indicating the upper diabase contact was encountered at 263 feet (80 m).



Morrison Mine, Consolidated Morrison Explorations Ltd.

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Canadian Gowganda (100)

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

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 TC 151.

Early Precambrian metavolcanic and felsic plutonic rocks occur in the east and southeast portions of the property. Metavolcanic rocks in the northeast consists of mafic flows, locally with poor pillows, and minor felsic volcanic rocks. North of Bonsall Lake, basalt, andesite, coarse mafic volcanics 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 southwest and west 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 fieldwork. about 1 mile northwest of Bonsol Lake
Near the west boundary of the property, is a 10 feet (3 m) deep pit in feldspathic greywacke. A vertical brecciated zone to 3 feet (90 cm) strikes N60°E and is filled with numerous calcite veins with pyrite and chalcopyrite mineralization. An assayed grab sample taken by the writer showed only traces of silver, nickel and copper and no cobalt (analyses by Mineral Research Branch).

About 2,000 feet (610 m) east of this pit is an old pit 4 feet (1.2 m) deep in diabase and about 2,000 feet (610 m) 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 MR 15024 3 calcite veins were mapped. The north vein is a vertical 4 inch (10.1 cm) calcite vein striking N20°E with pyrite and chalcopyrite. The central vein is an almost vertical 1 inch (2.5 cm) calcite vein with pyrite and chalcopyrite striking N70°E. The south vein is a near vertical calcite vein 4 inches (10.1 cm) wide striking N65°E 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

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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 TC 151. A positive anomaly occurs in the northeast 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, of these claims 2 are in Haultain Township and 31 in Nicol Township and the remainder divided between Chown and Lawson Townships.

The north and south 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 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 Benner (1947) with follow up diamond drilling in 1948. The diamond drilling was all along the west shore of Calcite Lake. The logs of

9 holes totalling 1,213 feet (370 m) were submitted for assessment credit; several calcite stringers with minor chalcopyrite and pyrite were logged.

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

In the southeast corner of Haultain Township an old adit has been driven along a calcite vein at S70°E. The vein is 4 inches (10 cm) wide with pyrite and chalcopyrite mineralization.

W. R. Hart (103)

In 1969 the property consisted of surveyed claim TC 151 which is about half way between Bonsall Lake and Highway 567. The claim is underlain by Nipissing Diabase. A written communication from Mr. 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 4 surveyed claims MR 13002 to MR 13005 in a north south block in the northeast corner of Nicol Township.

Both the Gowganda and Firstbrook Formations are present; these are overlain to the east by the Lorrain Formation. The Gowganda Formation consists of conglomerate in the south

and feldspathic sandstone in the north. The Firstbrook Formation 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. The results of geological mapping for the company (Mather 1965) included all that considered by the present author as Firstbrook in the Lorrain Formation. Diamond drilling by the company in the southwest corner of MR 13002 indicated the laminae in the argillite gradually became thinner and more regular with depth before the diabase was encountered.

The upper contact of the diabase strikes northeast across MR 13002.

Besides the above hole (302 feet (93.4 m)) which was submitted in 1968 for assessment credit logs were submitted in 1967 for 2 other holes totalling 326 feet (199 m) on MR 13004. Gowganda Formation was reported for the length of both holes.

R. M. Mick (105-106)

The property in 1969 consisted of 2 separate surveyed claims, HS 325 and GG 3140, in the northwest quarter of Nicol Township.

HS 325 (105)

The western two-thirds of this claim is underlain by

Gowganda Formation feldspathic sandstone. 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 Pickard (1936) from whom the following paragraph has been paraphrased:-

The vein is 2 to 4 inches (5.1 to 10.2 cm) strikes north and is vertical. About halfway along the east boundary a fault, which strikes west, offsets the vein 60 feet (18.3 m) with left hand displacement. A pit 5 feet by 7 feet by 12 feet deep (1.5 by 2.1 by 3.6 m) 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.

GG 3140 (106)

This claim, south of Highway 567, is underlain by feldspathic sandstone and feldspathic greywacke of the Gowganda Formation.

During the fieldwork a small test pit was found. The pit was on a quartz-carbonate vein striking northeast with chalcopyrite mineralization.

R. D. MacDougald (107)

(Big Four)

In 1969, this property consisted of 5 unsurveyed claims just east of Gowganda; these claims in part represent a restaking of the former surveyed claims WD 961 to WD 964, locally known as the Big Four, but in addition to this the property extends to the south side of Highway 560.

The north 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 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 south boundary of the property, 1,000 feet east of Gowganda, a test pit has been sunk on two quartz veins 2 to 4 inches (5 to 10 cm) wide, striking N30°E and dipping 65° 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 assay (Mineral Research Branch) of a grab sample taken by the author.

Northwest of this pit, about 300 feet (91 m) south of just east of Banker Bay a small lake 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 1/2 inch (1 cm) wide.

About 600 feet (180 m) north is another pit which is 15 feet (4.6 m) deep; the pit is on a vertical vein composed of white calcite and quartz bearing N70°E and varying in width from 1 to 12 inches (2.5 to 30.5 cm). Observed mineralization included pyrite and chalcopyrite. The vein was traced for about 100 feet (30.5 m).

About 1,300 feet (400 m) northeast of this pit is another pit which was put down 4 feet (1.2 m) on a series of quartz veinlets up to 1 inch (2.5 cm) in width and striking N15°E in Matachewan diabase.

About 800 feet (240 m) 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 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. An assayed grab sample taken by the writer indicated 0.80 percent cobalt and traces of silver, nickel and copper (Mineral Research Branch)

Over the years the logs of 7 diamond drill holes totalling 705.5 feet (214 m) have been submitted to the Kirkland Lake office. Some of this drilling was done on the pit to the southwest.

South of this prospect about 1,000 feet is an adit in conglomerate; the adit strikes N80°E into a west facing cliff. To the east are numerous quartz veins up to 5 inches (12.5 cm) at N70°E and 65° 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 18 surveyed claims as follows:- AK 18, GG 3879, HR 297,

HS 358 to HS 363, LM 111, MR 1251, MR 1252, RSC 98, RSC 105, RSC 106, RSC 135 and RSC 136. Fifteen of these claims form a block on and around Miller Lake and HR 297 (111) is on the southeast side of Leroy Lake and MR 1251 and MR 1252 (112) are just west of the O'Brien road. Nothing is known about the latter two and they are not described.

Except for HR 297 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 RSC 106 on the northwest 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 14. The eventual depth of the shaft was 460 feet (140 m) with a total of 5,000 feet (1,525 m) of lateral work on levels established at 200 feet (61 m), 300 feet (91.5 m), 360 feet (110 m) and 450 feet (137 m).

According to the 1967 Siscoe 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 525 foot (160 m) level (Figure 14) and encountered ore on RSC 106. In 1968 it was estimated that 25 percent of Siscoe's production came from the 650 (184 m) and 525 foot (160 m) 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 indicated numerous veins but none appeared to be ore grade.

The Hart (109)

The Hart is on claims RSC 135 and RSC 136 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 immediate area and it is not sure which is the Hart. A grab sample taken by the writer taken from the dump of the southern shaft (Map 2 , back pocket) assayed as follows:- 1.14 ounces of silver per ton, 0.49 percent copper and traces of cobalt and nickel (Mineral Research Branch)

The Walsh or Tonapah (110)

The Walsh or Tonapah shaft is on GG 3879 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 19.

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 650 foot (184 m) level of the main mine workings to connect with the Walsh 480 foot (166 m) level; this was completed in 1969. Examination of the workings indicated "sporadic sections with silver mineralization" (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 (Annual Report 1969). Silver and cobalt mineralization were encountered in several holes.

HR 297 (111)

This surveyed claim, on the southeast 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.

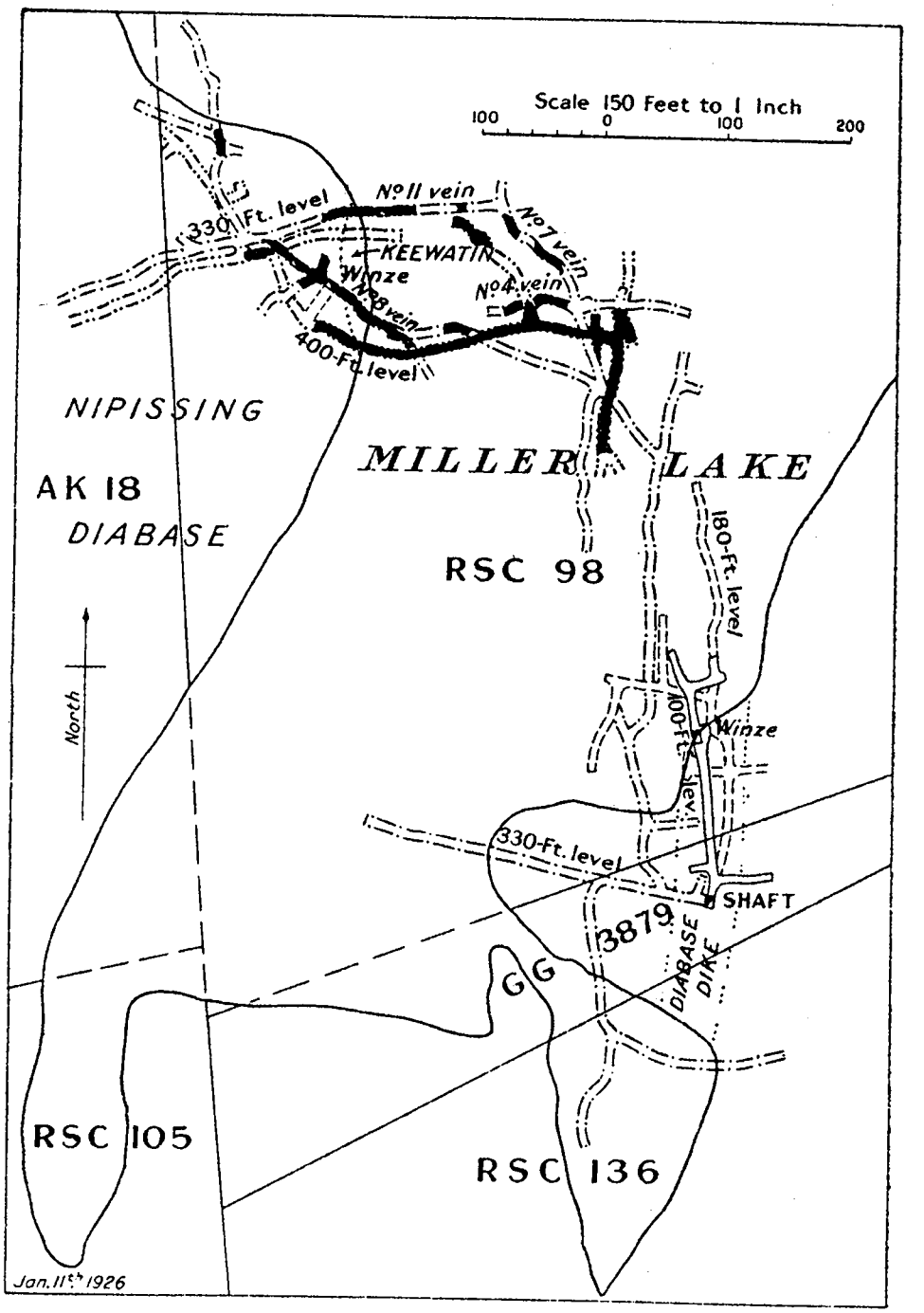


Figure 19- Underground plans of Walsh Mine (110) held in 1969 by McIntyre Porcupine Mines Limited and leased to United Siscoe Mines Ltd. (from Burrows 1926, p.42)

Table 26 | Production figures 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).

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W. Purich (113)

(Palmer-Paine)

The property in 1969 consisted of the surveyed claim TC 177 with the road from Highway 567 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 southwest corner 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 TC 177 Mining Company Limited which, by May 1918, had completed shaft sinking to 200 feet (61 m) and commenced crosscutting (OBM 1918, p. 130). The company was acquired by Palmer-Paine Mines Limited in 1919. This company deepened the shaft to 208 feet (63.4 m) with lateral work on the 200 foot (61 m) level extending 370 feet (113.2 m) to the northeast (OBM 1919, p. 152). Further work by this company consisted of drifting on the 170 foot (52 m) level in 1920 (ODM 1920, p. 108). All of the above workings are in the Nipissing Diabase.

Calcite up to 3 inches (7.6 cm) was observed in the dump material. A small test pit in the northwest corner 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 mainly of sandy gravel.

M. Shulman (114)

(Quebec Yellowknife Gold Mines Limited [1947, 1950])

In 1969 the property consisted of 3 surveyed fractions of claims which together formed a square the approximate size of a normal claim; the claims are numbered MR 15041, MR 15042 and MR 18087 and are about 1/4 mile (0.4 km) 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 1947, 1950) trenching and diamond drilling. The diamond drilling program consisted of three holes, the logs of which were submitted for assessment credit, totalling 323.6 feet (98.1 m); 12 samples were assayed for silver but poor results were obtained with 9 samples returning a trace and the remaining three indicating 0.06, 0.22 and 0.26 ounce per ton.

Mapping and trenching delineated several vein systems. One of the more persistent is near the west boundary of claim MR 15024 where it has been exposed by several trenches over a distance of about 500 feet (150 m). Calcite vein material up to 3 inches (7.6 cm) has local pyrite and chalcopyrite mineralization (Gardiner 1947). One sample indicated 8.41

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ounces of silver per ton and 14.29 percent copper (Gardiner 1947).

On MR 18087 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 20 feet (6.1 m); 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 northeast corner of Nicol Township; the claims were numbered MR 12884 to MR 12889, MR 12901 to MR 12911, MR 12924 and MR 13006 to MR 13008.

The northeast and northwest 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 outcrops in the southeast corner of the property with conglomerate dominant and local feldspathic greywacke and feldspathic sandstone. Bedded argillite? quartzite of the Firstbrook Formation outcrops on the highway on the east side of MR 12903. Pyroxene gabbro of the Nipissing Diabase occupies much of the

central portion 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 southwest corner of the property.

MR 12910 (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 fieldwork; the location on Map 2 back pocket, is taken from Moore (1955). To the southwest of the shaft, near the road, is a 1/4 inch (6 mm) calcite vein which strikes north and dips 85 degrees east.

Coleroy (116)

The Coleroy is on MR 12907 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 were 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 on 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 488 foot (149 m) level and establishing a new level at 563 feet (172 m) by means of a winze (ODM 1927, p. 156). The shaft was also deepened to 650 feet (198 m) and a level established here. Lateral work included 1,749 feet (1,228 m) of drifting and 233 feet (71 m) of crosscuts (ODM 1927, p. 156).

In 1927 work continued on the 3 lower levels totalling 1,330 feet (405 m) of drifting, 680 feet (207 m) of cross-cutting and a 17 foot (5.2 m) winze. Patches of silver were found over a length of 80 feet (24 m) on the 488 foot (149 m) level (ODM 1928, p. 168).

Figure 20 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

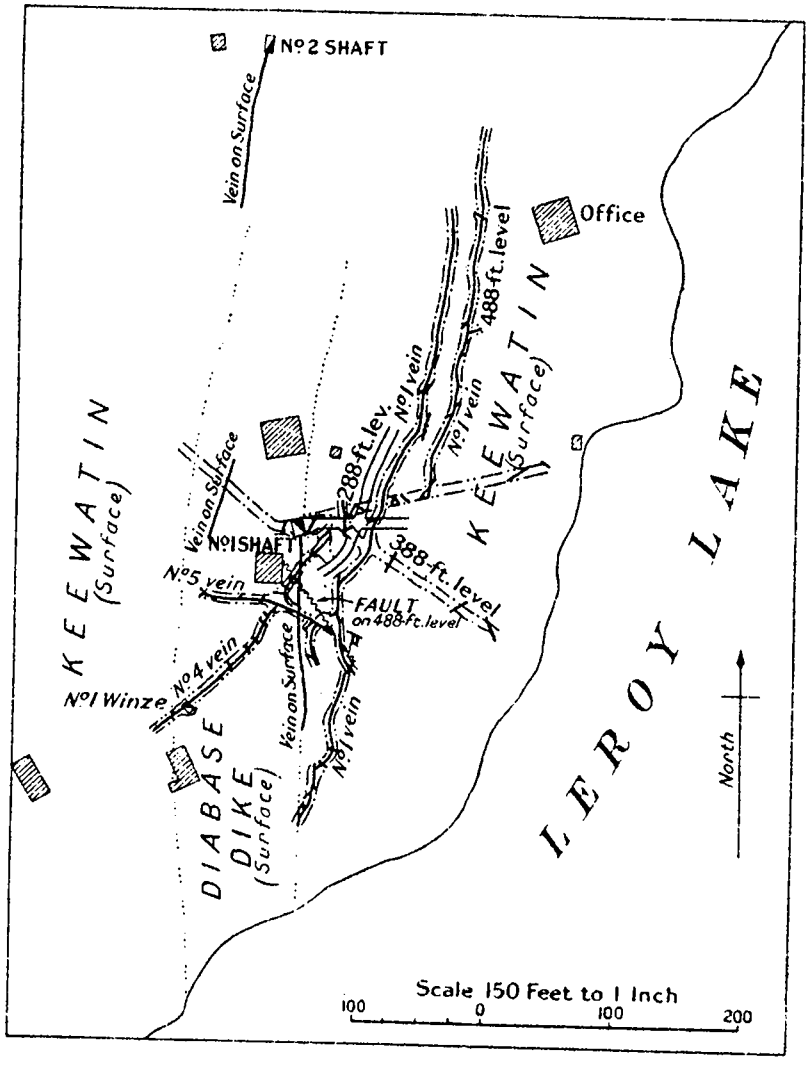


Figure 20 – Underground plans of the Coleray-Cowgamoda Mine (116) held in 1969 by Silver Bar Mines Limited (from Burrows, 1926, p. 45)

recorded production.

Silver Bullion (117)

This old mine is on MR 12884 at the northeast corner 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.

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 21 shows the workings in the Silver Bullion and is also from Burrows (1926).

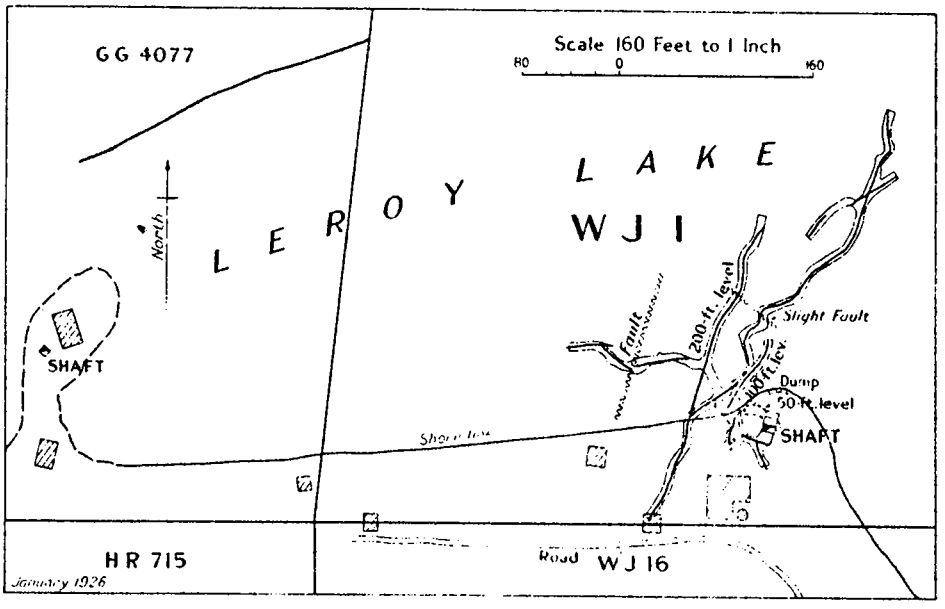


Figure 21- Underground plans of Silver Bullion Mine (117) held in 1969 by Silver Bar Mines Limited. (from Burrows 1926, p.46)

MR 12885 (118)

About 600 feet (180 m) 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 12 inch (30 cm) quartz vein at N20°W.

Chapelle (119)

The Chapelle is on MR 12924 just east of Leroy Lake. The following description is from Burrows (1926, p. 41):-

> This 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 assayed 1.04 percent cobalt, 0.98 percent nickel with traces of silver and copper and the other sample showed traces of all four elements (analyses by the Mineral Research Branch). Mineralization noted included annabergite, erthryite, bornite, chalcopyrite and pyrite.

MR 13008 (120)

An old shaft in the southwest corner of this claim has been reported by Willars (1969b). The shaft is on calcite veins in a shear zone associated with a northerly trending fault.

T. V. Tamminen (121)

The property consisted as of 1969 of 2 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 2 diamond drill holes for assessment credit; another 3 were submitted in 1953.

The first two, in the central part of the property, near the calcite vein shown on Map 2 , back pocket, totalled 272.3 feet (83 m). One section 0.6 foot (18 cm) long contained 30 percent chalcopyrite and assayed 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 57 feet (17.4 m) long; several calcite stringers were reported in the logs.

The other two holes were put down in the northeast corner and totalled 145 feet (44 m). They were put down to

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examine veins exposed on the surface (not on Map 2) but nothing of economic value was reported(Assessment Files).

Mr. Tamminen (personal communication 1969) reports sulphide and hematite mineralization in veins in old pits on the property.

In the central part of the property a 2 inch (5 cm) calcite vein was found by the field party. The vein strikes N70°E and dips 85 degrees south. In the southwest corner trenching striking N85°E and a pit 5 feet (15 m) 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 northeast corner of the property. Underlying most of the property are the Gowganda and Lorrain Formations. The sediments have been intruded by the sub-circular Pettipher Lake Diabase which is about 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; the veins here are the most concentrated of any place in the diabase basin. They are composed of grey calcite ranging in width from 1/4 inch (6 mm) to 5 inches (12.7 cm) and they occur in joints (Mather 1969). Three of the larger veins on MR 45197 (Figure 22) were 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 due to 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 11,220 samples along with several hundred check samples (Mather 1968). Anomalous 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 8,581 feet (2,617 m) were submitted for assessment credit; all of these holes were put down in the vicinity of Stumpy Lake (Figure 22). 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

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Figure 22: In back pocket

these veins assayed only traces of silver, cobalt, nickel and copper (analyses by the Mineral Research Branch).

The other area of interest on the property is the northeast trending diabase dike immediately north of Pettipher Lake. Numerous small test pits and a shaft 25 feet (7.6 m) deep have been sunk along the dike; the dump contained calcite with chalcopyrite. Traces of silver, nickel and copper and no cobalt were obtained on assay of a grab sample taken by the author from the dump (analyses by the Mineral Research Branch).

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 subsiduary 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 RSC 88 to RSC 94 on which the famous Miller Lake O'Brien (123) mine is located. The second is the O'Connell Group (124) 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 RSC 90 and

RSC 91 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 Young and 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 silver 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. 7 N., No. 7 N.W., etc. On stoping No. 6 above the 350-foot level it was found to join No. 7 N., 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 20° (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 100-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.

Continuing 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 United Siscoe Mines 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 14 and these workings are summarized in Table 28.

Since taking over the property United Siscoe Mines 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 previously in the section on Economic Geology there have been numerous detailed studies made on

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Table 27 | Production figures from Miller Lake O'Brien Mine

YEAR	ORE & CONC. SHIPPED TONS	COBALT Lbs.	SILVER Oz.	Nkl Lbs.	Cppr Lbs.
1910	31		91,730		
11	135		338,000		
12	112		354,252		
13	167		469,923		
14	114		369,544		
15	110		242,229		
16	171		360,670		
17	350		1,050,149		
18	160	26,994	631,671		
19	184	27,404	708,872		
1920	115	14,982	376,417		
21	103	9,187	224,340		
22	76	6,948	130,553		
23	24	2,199	12,844		
24	26	2,154	50,021		
25	150	7,226	347,909		
26	33	3,007	70,764		
27	260	15,768	588,216		
28	285	26,303	876,461		
29	359	35,880	1,197,634		
30	358	52,005	1,188,390		
31	350	38,411	1,289,742		
32	530	72,081	1,374,660		
33	366	40,729	1,244,812		
34	270	32,273	1,039,565		
35	214	20,818	800,669		
36	234	24,241	637,411		
37	201	20,818	521,633		
38	196	15,457	501,821		
39	200	19,185	498,043		
1942	69	7,194			
43	60	5,205	191,526		
44	71	9,000	172,693		
45	11	1,185	250,676		
47			44,585		
48	507		94,301		
49	723	6,000	183,163		
1950	1,182	18,470	626,254		
51	1,247	23,115	836,047		
52	1,454	20,369	879,506		
53	871	13,400	1047,037		
54	1,542	17,500	640,100		
55	1,073	24,917	1,097,563		
56	787	17,036	1,039,162		
57	963	17,040	722,236		
58	1,239	23,740	903,177	2,997	19,610
59	1,352	34,374	1,215,651	4,529	10,010
60	1,317		1,379,650		7,507
61	1,419	23,527	1,346,534	2,668	
62	1,185	9,088	1,440,433	3,054	2,746
63	1,287		1,382,440		5,361
64	1,272		1,333,825		25,527
65	1,159		1,331,580		
66			1,080,561		1,778
67			1,206,149		347
68			917,333		
69 (1)			978,711		
			799,998		
Totals		785,700	49,736,585	13,248	72,946

(1) Includes partial production from McIntyre Porcupine Leased ground

From A.O. Sergiades, ODM MRC 10

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Table 28

SHAFTS, SISCOE MINE

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

From 1969 ODM Annual Report Volume 74 p. 115.

the silver-cobalt vein systems of the Temiskaming area and one such study was made on the number 13 vein system in the Siscoe workings by 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.

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 23 is from Scott (1964). The sequence is as follows:- arsenopyrite, triarsenides, diarsenides, monarsenides, sulpharsenides, sulphides, sulphantimonides and native elements.

7. Zoning in the orebody was also indicated (Figure 24). 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.

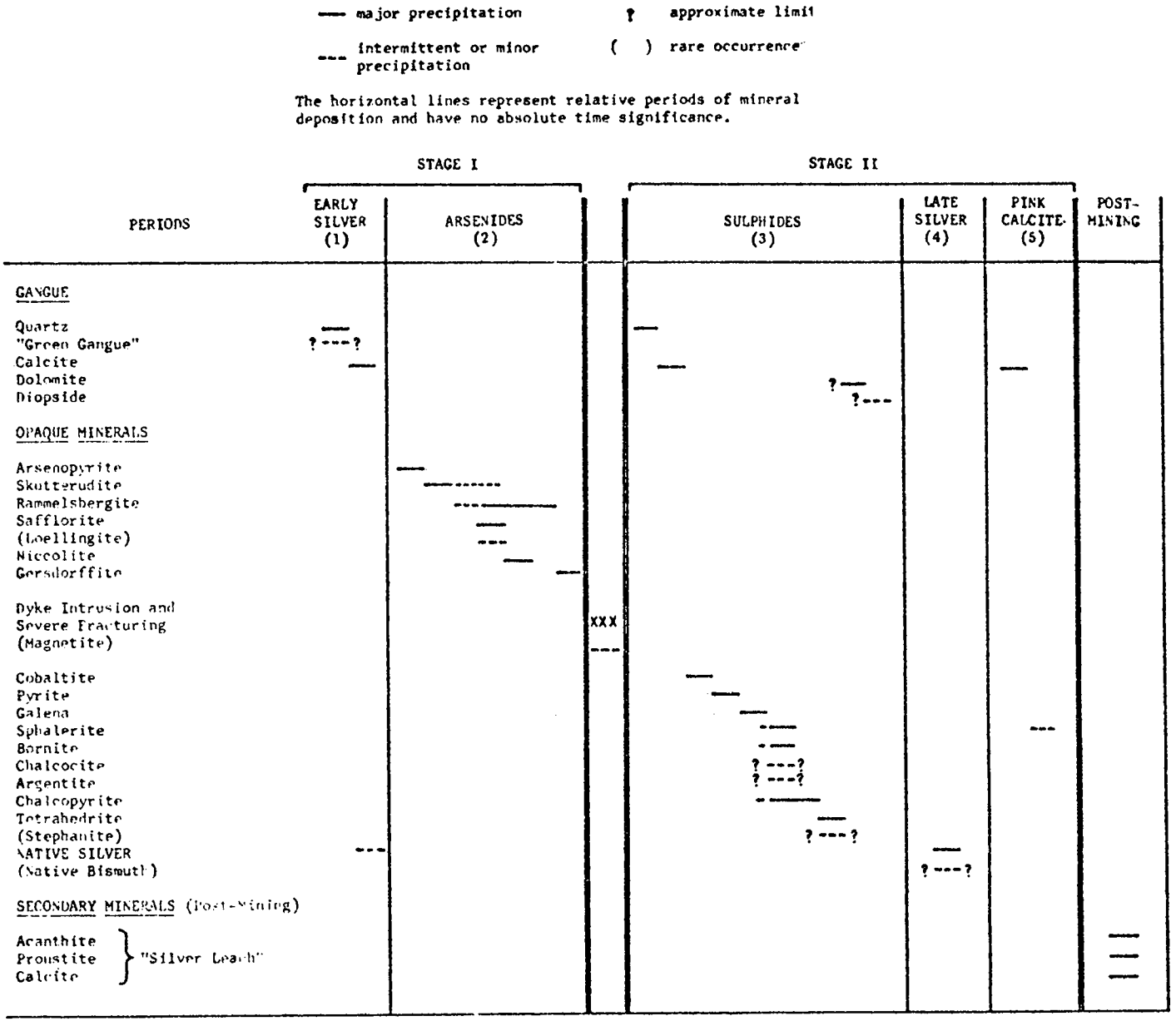


Figure 23 - Paragenetic sequence in the No. B vein System in the Miller Lake O'Brien Mine (123) held in 1969 by United Siscoe Mines Limited. (from Scott 1964, p. 56)

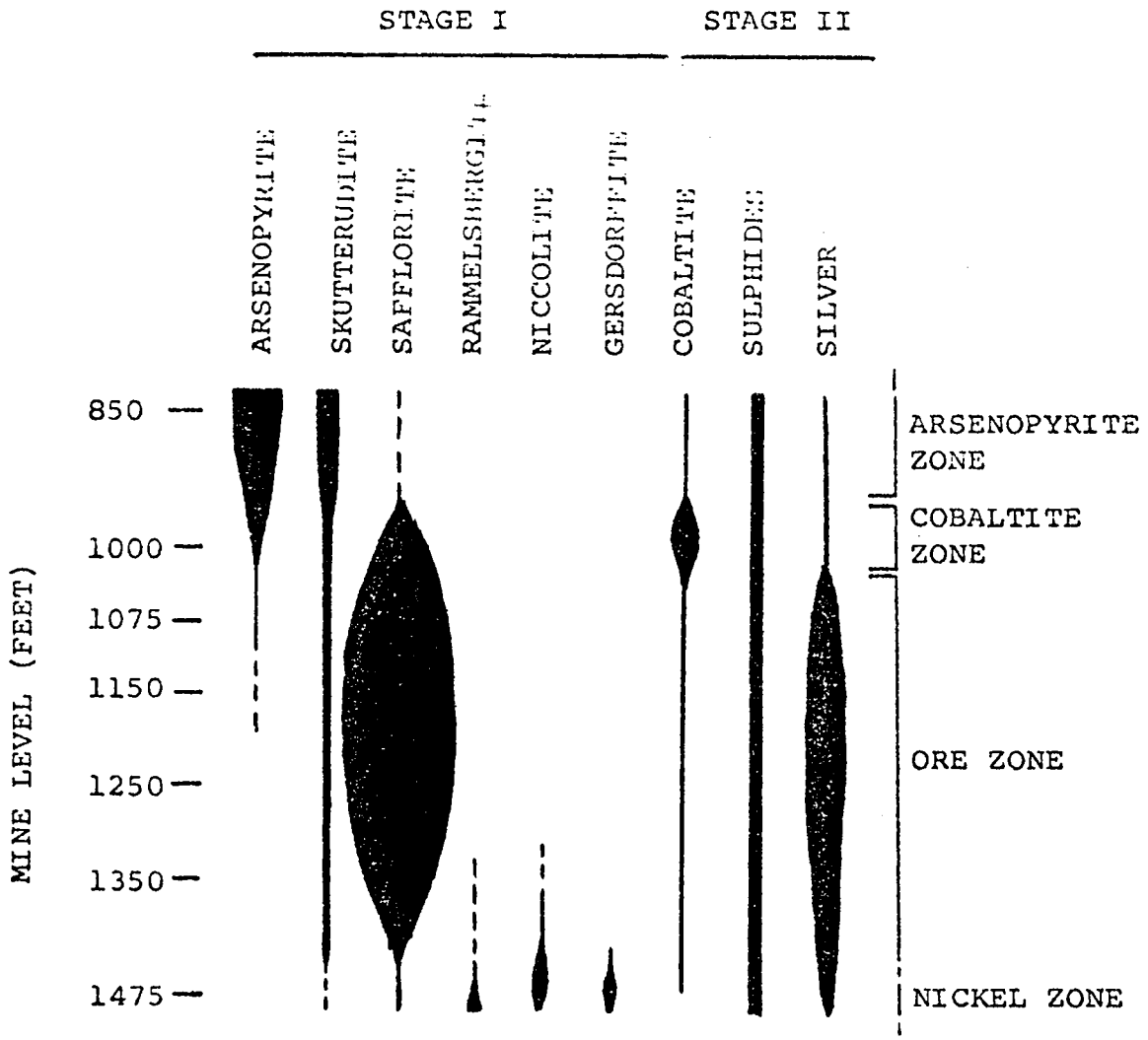


Figure 24 - Estimated relative abundance of the metallic minerals in the No. 13 vein system of the Miller Lake O'Brien Mine (123) held in 1964 by United Siscoe Mines Limited. The abundance is plotted against depth in a pre-fault reconstruction (from Scott 1964, p. 70)

8. Typical wall rock alteration is present with a dark chlorite band adjacent to the veins which grades outward to a light sausseritized 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 my. post-diabase solidification.

All of the above conclusions are from Scott (1964).

O'Connell Claims and "K" Project (124)
located about 1 mile south of Leroy Lake

This block of 27 contiguous claims, 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 intrudes the assemblage, outcrops in the southwest corner of the claim group. All these rocks have been intruded by north trending Matachewan diabase dikes.

Pyroxene gabbro of the Nipissing Diabase outcrops 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 1967, 1969)

were conducted and the results submitted for assessment credit.

The results of the first survey (Campbell 1967) were inconclusive but several anomalous 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 4 foot (1.3 m) quartz porphyry dikelet in a diabase dike in mafic volcanics. The dike strikes northwest.

There is also a pit, in the northwest corner of the group, which has been sunk on a 2 inch (5 cm) calcite vein with pyrite mineralization.

Cartier Malarctic held part of the ground in the north along the olivine diabase dike just south of MR 12911 of Silverbar Mines Limited. Geological mapping (Gardiner 1947) indicated several veins in the metavolcanic rocks.

J. G. Willars (126)

J. G. Willars held two unsurveyed claims in 1968 in the northeast quarter of Nicol Township. They are part of group held by Orrana 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 northeasterly 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 N65°E with gouge 2 inches (5 cm) 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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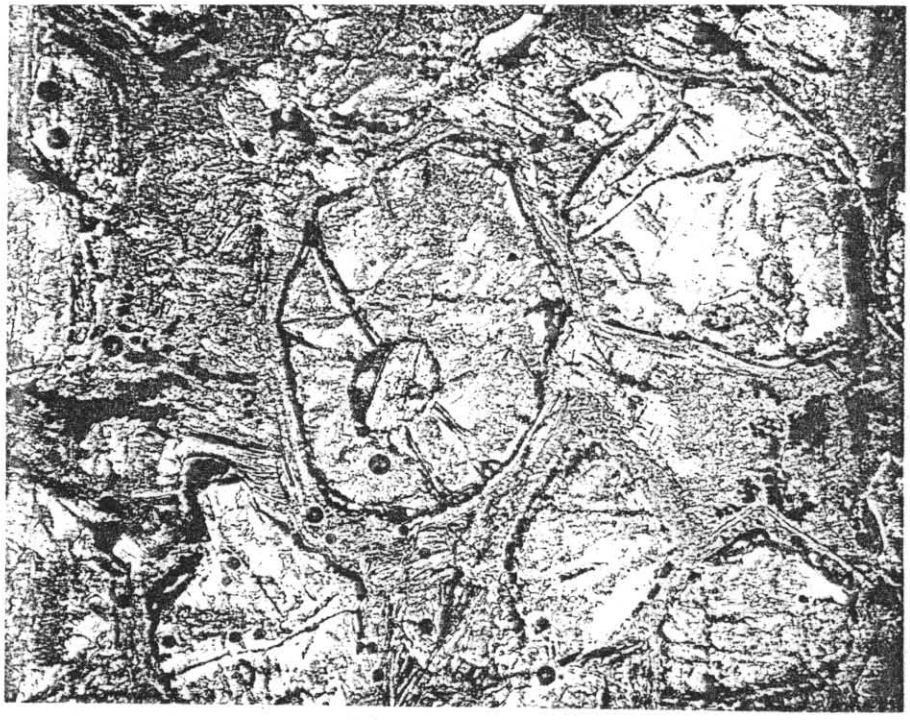


Photo 1. Photomicrograph of serpentinized olivine grains in a serpentinized dunite (plane light). Approximately 65X magnification.

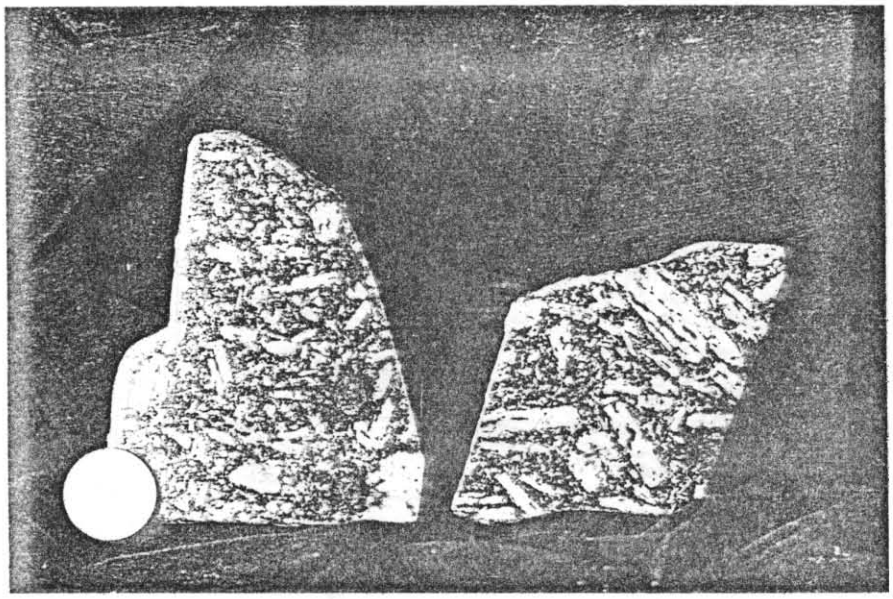


Photo 2. Phenocrysts in Matachewan type diabase dikes. The sample on the left shows the smaller, and short stubby phenocrysts and the one on the right shows the longer more slender phenocrysts.

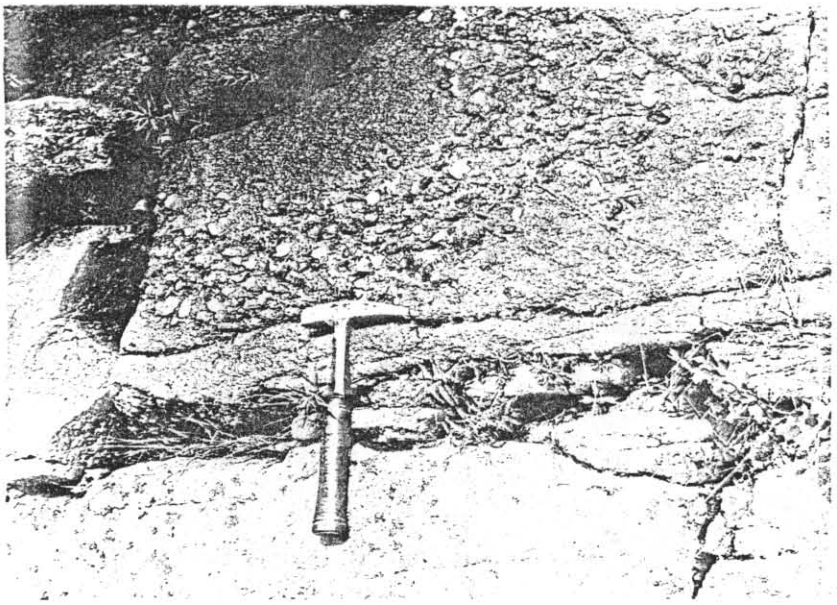


Photo 3. Lens of conglomerate in grewacke in the Gowganda Formation.

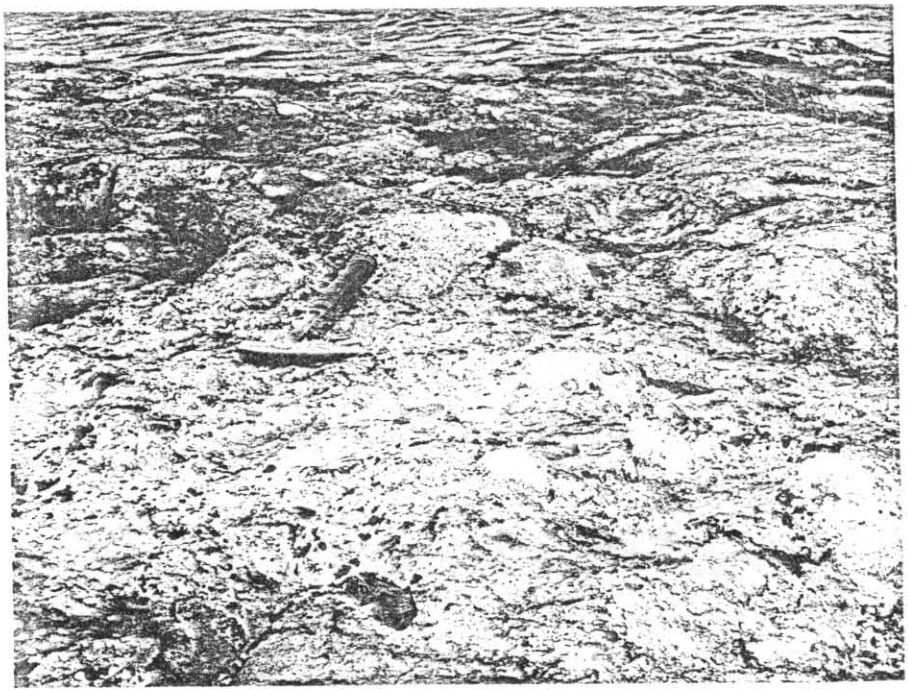


Photo 4. Differential weathering and erosion in Gowganda Formation conglomerate. The clasts are seen to be more resistant than the matrix.

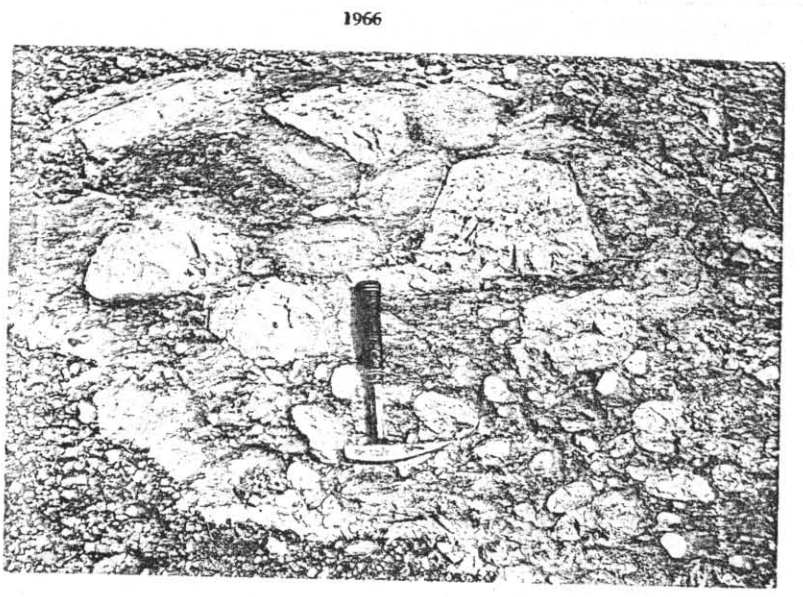


Photo 5. Rapid change in size of clasts in Gowganda conglomerate.

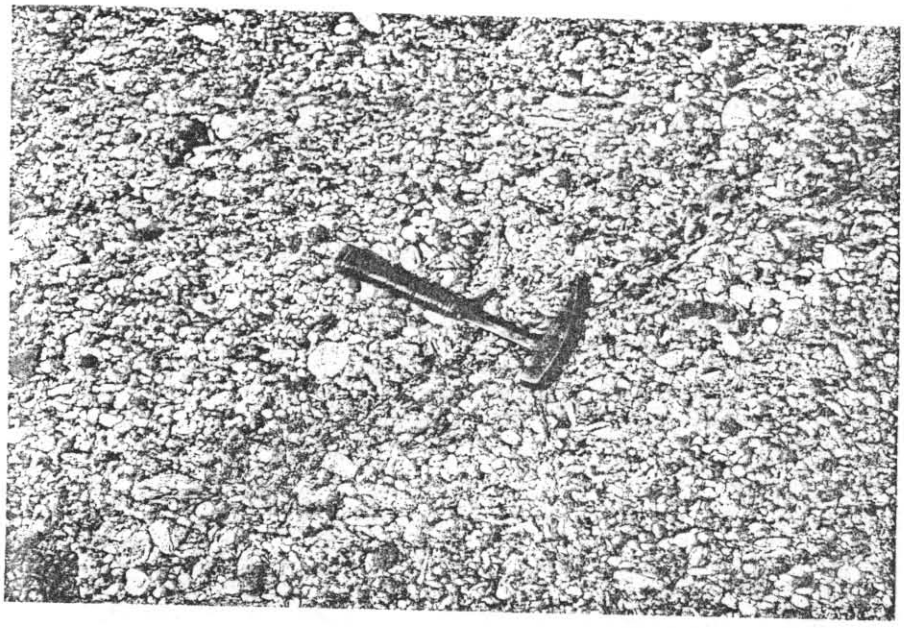


Photo 6. Densley packed pebbles in Gowganda Formation conglomerate. This is adjacent to photo 5.



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

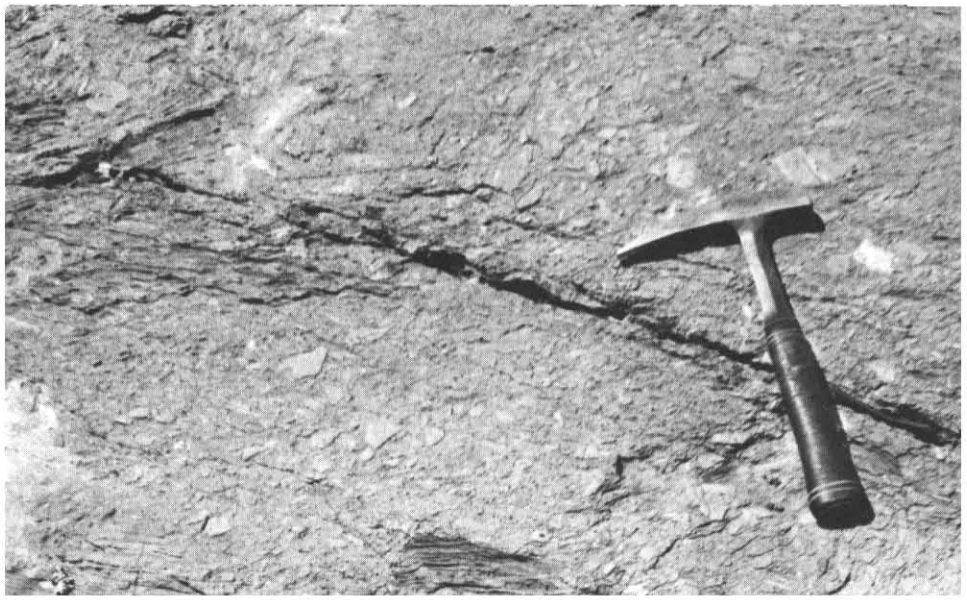


Photo 8. Intraformational breccia in the Gowganda Formation on the shore of Firth Lake.

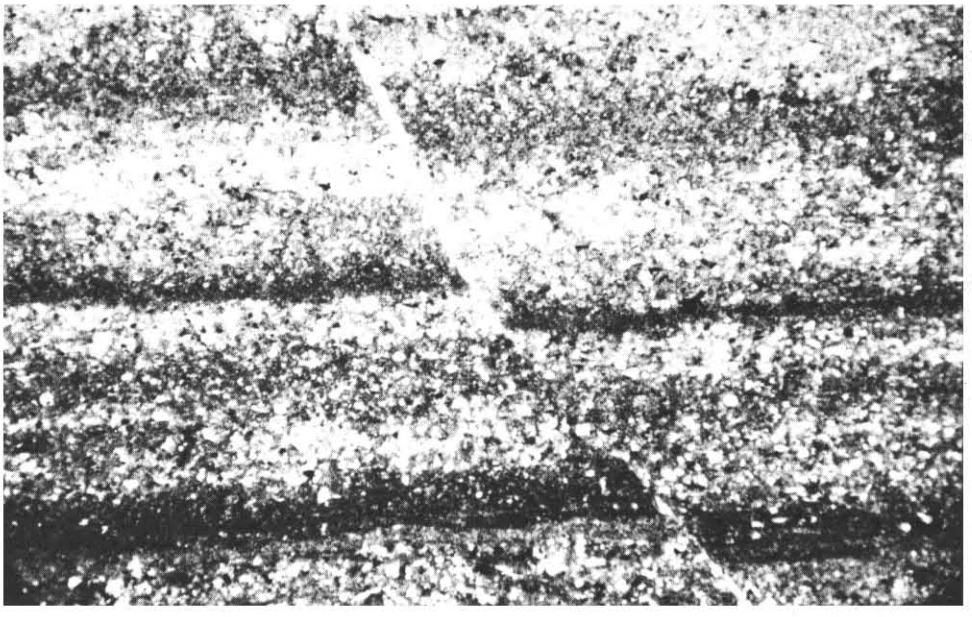


Photo 9. Photomicrograph of laminated argillite of the Firstbrook Formation.

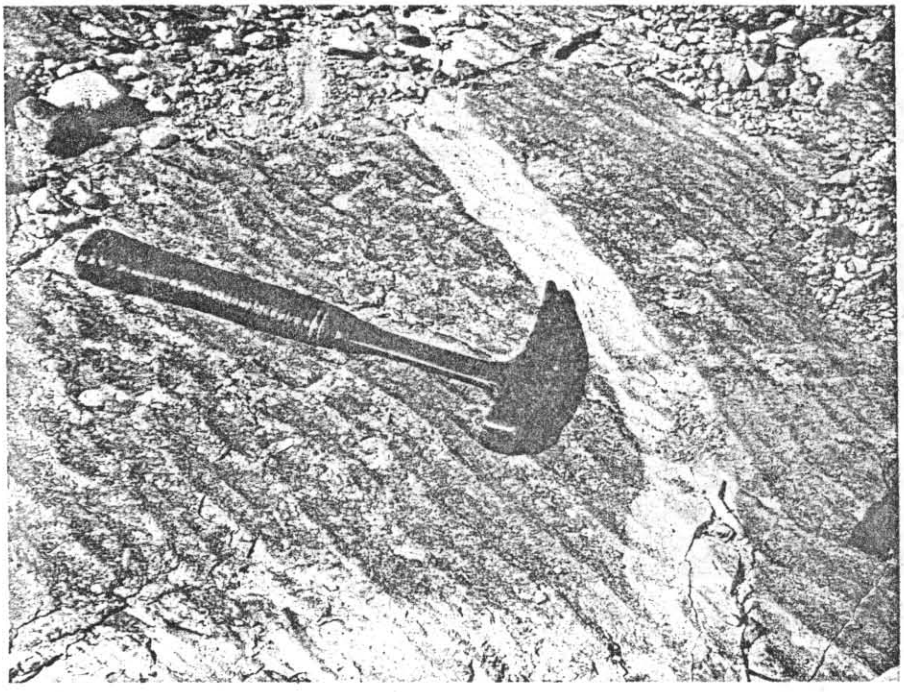


Photo 10. Ripple marks in Firstbrook Member. Note leaching along joints. Photo taken on side of Highway 560 west of Lost Lake.

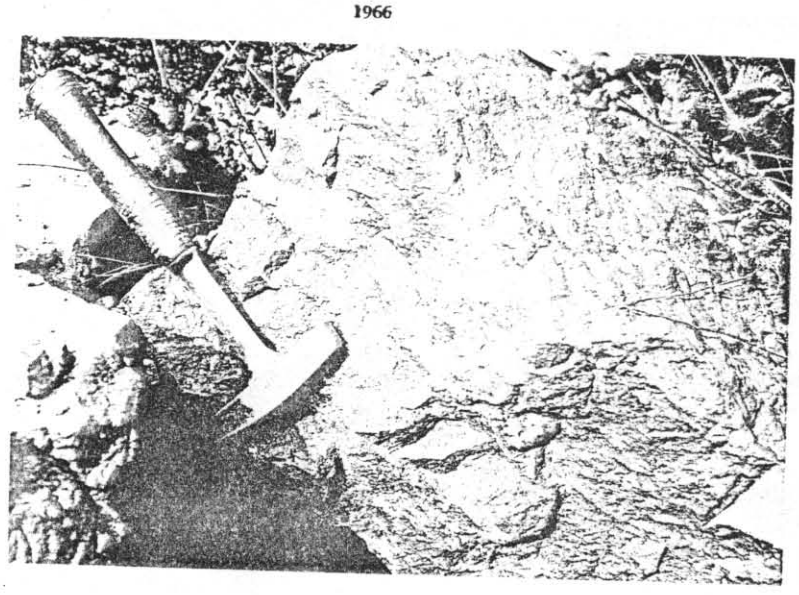


Photo 11. Phenocrysts in olivine diabase.

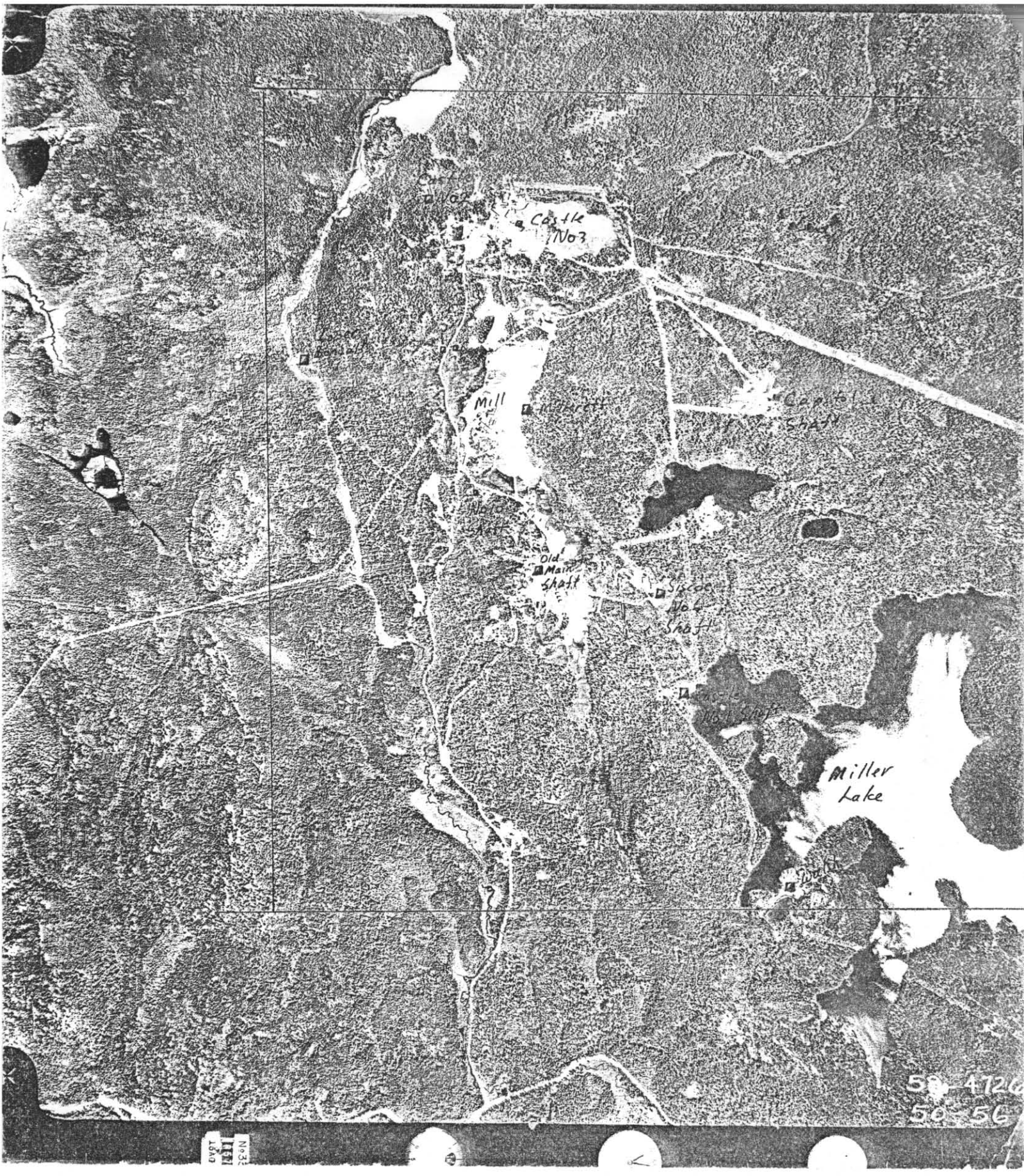


Photo 12. No. 6 shaft at United Sisco Mines Limited.

LEGEND

CENOZOIC
QUATERNARY
PLEISTOCENE AND RECENT
Glacial deposits, swamp, lake and stream deposits

UNCONFORMITY

PRECAMBRIAN
LATE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS (a)
Diabase dikes

11	11a	Olivine diabase
	11b	Porphyritic olivine diabase
10	10	Diabase

INTRUSIVE CONTACT

MIDDLE PRECAMBRIAN
MAFIC INTRUSIVE ROCKS (a)
Nipissing Diabase

9	9	Unsubdivided
	9a	Pyroxene gabbro
	9b	Amphibole gabbro
	9c	Granophyre

INTRUSIVE CONTACT

HURONIAN
COBALT GROUP
Lorrain Formation (a)

8	8	Unsubdivided
	8a	Micaceous sandstone
	8b	Feldspathic sandstone
	8c	Greywacke
	8d	Quartzose sandstone, protoquartzite
	8e	Ferruginous sandstone
	8f	Or th oconglomerate

Gowganda Formation
Firstbrook Member (a)

7	7a	Laminated argillite
	7b	Quartzite

Coleman Member (a)

	6	Unsubdivided
	6a	Feldspathic greywacke
	6b	Feldspathic sandstone, arkose
	6c	Conglomerate
	6d	Ferruginous sandstone

	6e	Breccia
	6f	Argillite, siltstone
	6g	Protoquartzite
	6h	Lithic greywacke

UNCONFORMITY

EARLY PRECAMBRIAN (ARCHEAN

MAFIC INTRUSIVE ROCKS (a)

Diabase dikes (Matchewan type)

5	5a	Diabase
	5b	Porphyritic diabase

INTRUSIVE CONTACT

FELSIC INTRUSIVE ROCKS (a)

4	4	Unsubdivided
	4a	Trondhjemite
	4b	Porphyritic trondhejemite
	4c	Quartz-diorite
	4d	Syenodiorite
	4e	Contaminated zone
	4f	Pegmatite
	4g	Feldspar porphyry

INTRUSIVE CONTACT

METAMORPHOSED MAFIC AND ULTRAMAFIC INTRUSIVE RICKS (a)

3	3	Unsubdivided
	3a	Metagabbro
	3b	Serpentinized dunite

INTRUSIVE CONTACT

METAVOLCANICS

FELSIC METAVOLCANICS ROCKS (a)

	2	Unsubdivided
	2a	Dacite, porphyritic dacite
	2b	Felsic tuff
IF	IF	Iron Formation

MAFIC TO INTERMEDIATE METAVOLCANICS (a)

1	1	Unsubdivided
	1a	Basalt, andesite
	1b	Amphibolite
	1c	Foliated amphibolite
	1d	Gabbroic flows
	1e	Amygdaloidal basalt
	1f	Pillowed lava
	1g	Pyroclastic rocks
	1h	Porphyritic andesite
	1j	Schistose rocks
	1k	Metasedimentary rocks

(a) Rock types in these groups are subdivided lithologically and the order does not imply age relationship within the groups.

List of Properties

VAN HISE TOWNSHIP

1. Foot Creek Occurrence
2. Gould Lake Occurrence
3. Silverfive Lake Occurrence
4. Silverplace Mines Limited [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 Limited
11. Tribag Mining Corporation Limited
12* United Siscoe Mines Limited

MILNER TOWNSHIP

13. Beadman, J.

    Decker, A. (14-15)
14. Bartlett Open Cut
15. Crews McFarlan No. 2
16. Fryingpan Lake Shaft
17. Gowganda Silver Mines Limited
18. Hines, F.
19. Lett Lake Occurrence
20. Logan Lake Prospect

    Manridge Mines Limited (21-30)

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 Limited [1957]

Montreal River Silver Mines Limited (32-34)

32. The Hedges

33. The Milne

34. TC 128 and TC 129

35. Reeve, Beatrice

Silver Ore Zone Mines Limited (36-37)

36. The Bishop

37. Transcontinental

38. Sutherland, D.

Tego Silver Cobalt Mines Limited 1961 (39-40)

39. F. Loring Prospect

40. Armstrong

41. United Reef Petroleums Limited

42* United Siscoe Mines Limited

43. Utopia Gold Mines Limited

HAULTAIN TOWNSHIP

44. Allison, A.

45. Blair Gowganda Silver Mines Limited

Blake, F. (46-47)

46. Lost Lake Group

47. Cobalt Nugget

Bowen, F. (48-50)

48. The MacAlpine

49. The McRae

50. The Rawhide

51. Bowen, J.

52. Calico Silver Mines Limited

Castlebar Silver and Cobalt Mines Limited (53-58)

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 Limited (62-66)

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 Porcuping Mines Limited (72-76)

72. The Capitol

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. (81-83)

81* ED 58

82* TC 167

83. TC 94

84. Shanty Lake-McRae Lake Occurrence

85. Solid Silver Mines Limited [1963]

86. Steinthal, M. and A.

87. Stella Lake-Montreal River Occurrences

Tormont Mines Limited (88-90)

88. The Haultain

89. MR 13255 and MR 17124

90. The Wigwam

United Siscoe Mines Limited (91-93)

91. Bonsall

92. The Millerett

93. Roy-Ten Group

NICOL TOWNSHIP

94. Armstrong, R. and Wilkinson, G.

Castlebar Silver and Cobalt Mines Limited (95-97)

95. Miller Lake West Group

96. Miller Lake East Group

97. MR 18865

Consolidated Morrison Explorations Limited (98-100)

98. The Morrison

99. WJ. 9

100. Canadian Gowganda

Gowganda Silver Mines Limited (101-102)

101. Central Nicol Group

102. East Nicol Group

103. Hart, W.R.

104. International Mine Services Limited

Mick, R.M. (105-106)

105. HS 325

106. GG 3140

107. MacDougald, R.D.

McIntyre Porcuping Mines Limited (108-111)

108. Castle No. 1 Shaft Mines

109. The Hart

110. The Walsh

111. HR 297

112* MR 1251 and MR 1252

113. Purich, W.

114. Shulman, M.

Silver Bar Mines Limited (115-121)

115. MR 12910

116. Coleroy

117. Silver Bullion

118. MR 12885

119. Chapelle

120. MR 13008

121. Tamminen, T.V.

122. United Reef Petroleums Limited

United Siscoe Mines Limited (123-125)

123. Miller Lake O'Brien Mine

124. O'Connell Group "K" Project

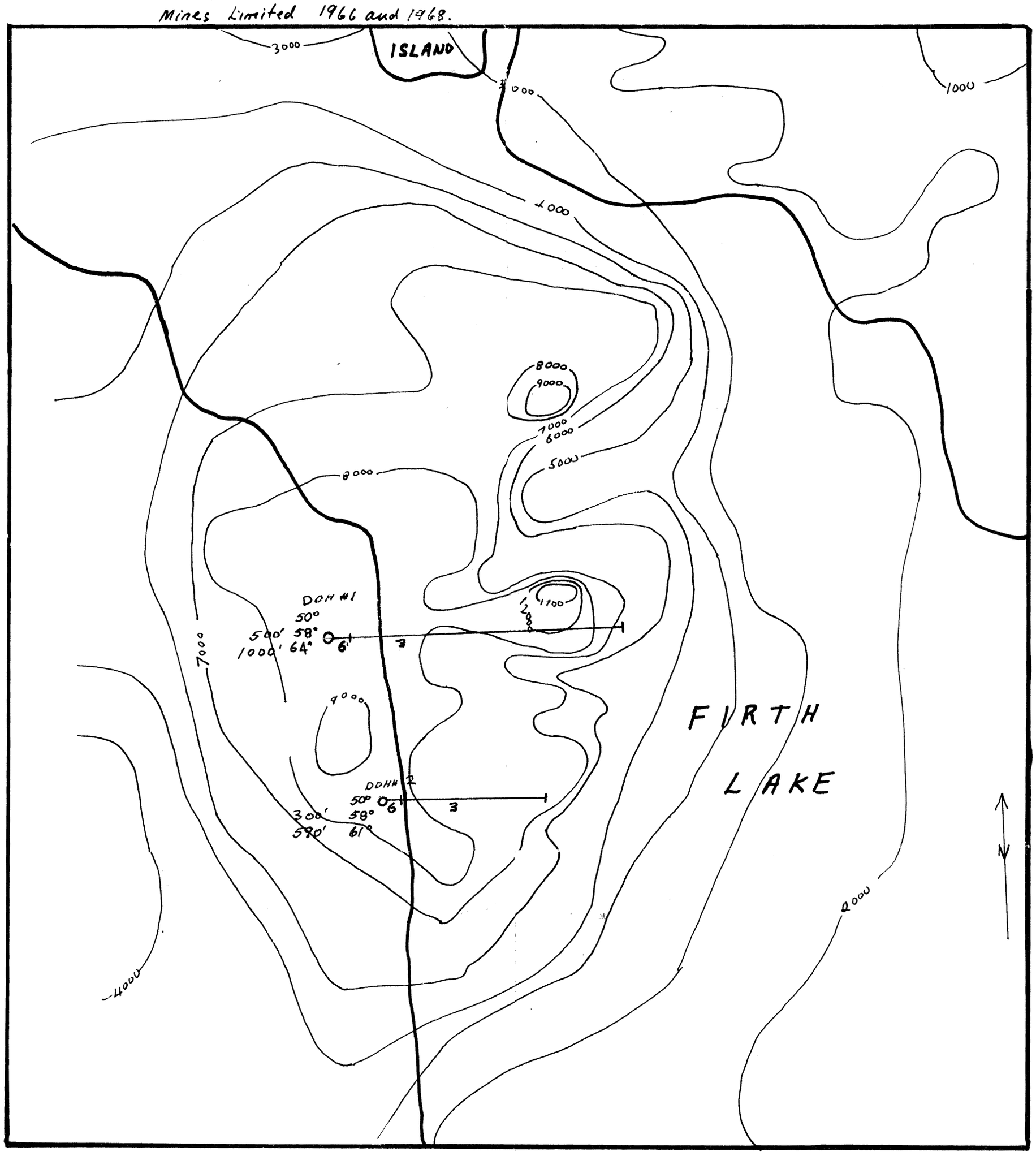
125. Roy-Ten Group

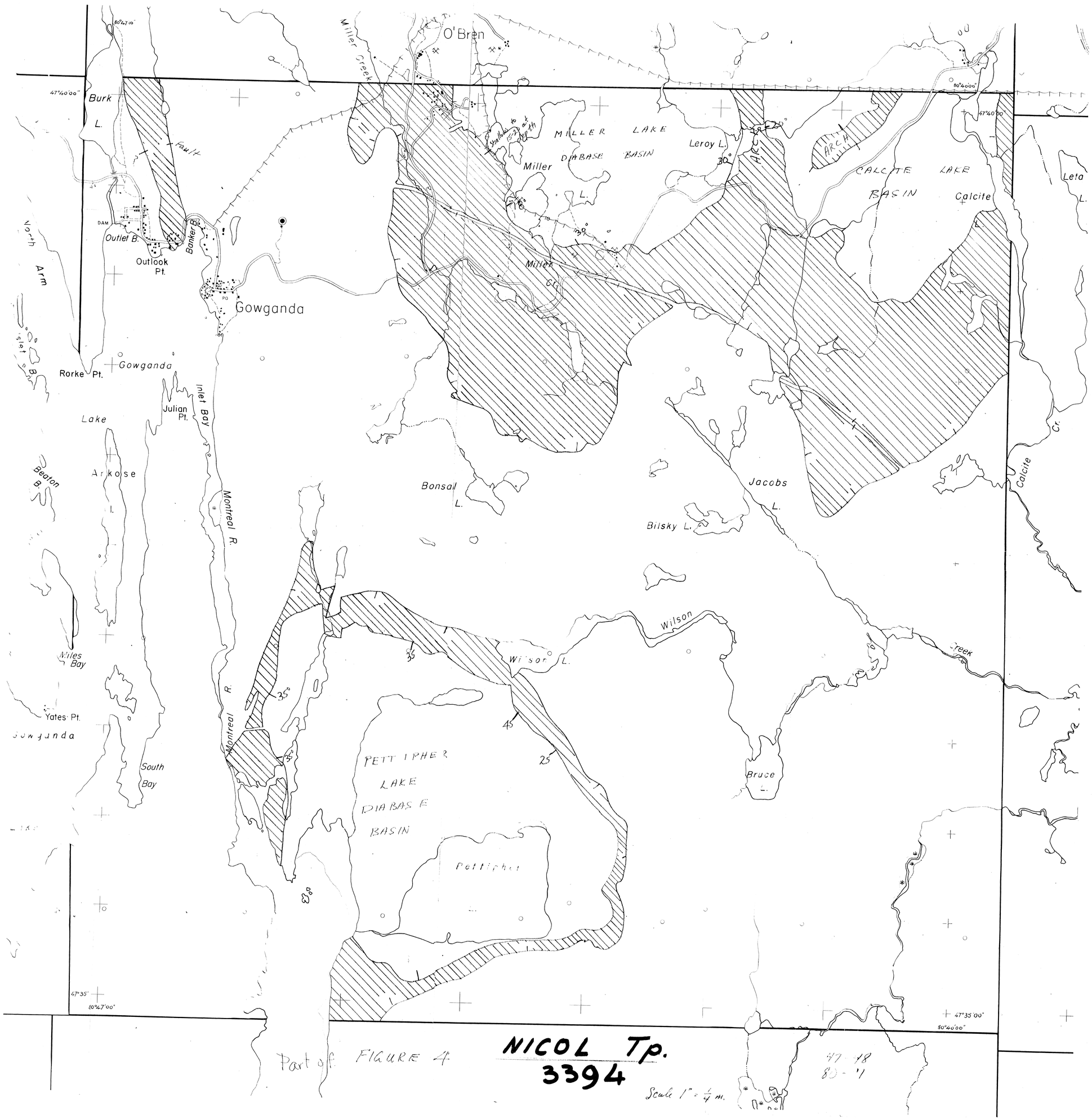
126. Willars, J.G.

* Not described in report - see Table 13.

This list of properties is to be used for both figure 6 and the maps.

Figure 2 Magnetic anomoly and diamond drill holes indicating buried peridotite(3) body under the Cowganda Formation (6). Modified from Assessment Work data of Texmont Mines Limited 1966 and 1968.





Part of FIGURE 4.

NICOL Tp.
3394

47-18
80-11

Scale 1" = ¼ m.

PART OF FIGURE 4.

Nipissing Diabase

Diabase boundary with direction and magnetude of dip

80°55'00"
47°45'30"
80°47'00"
47°40'00"

Penassi

Kawakanika Lake

Haultain L.

Montreal R.

Foot Cr.

Probably Steep

West Montreal R.

Firth

Very Steep

Davidson L.

Silverfive

Probably Steep

Thompson L.

Obushkong

Foot L.

Glosser Bay

Lake

Cr.

Holland L.

Pantaloon L.

Otter L.

Probably Steep

Polliwog L.

Silverfive Lake

Gould Lake

Diabase

Dinny Lake

Dumond Lake

Brett L.

Serpentine Lake

McIntosh L.

McIntosh

Diabase

Edith L.

Burk L.

Firth Lake

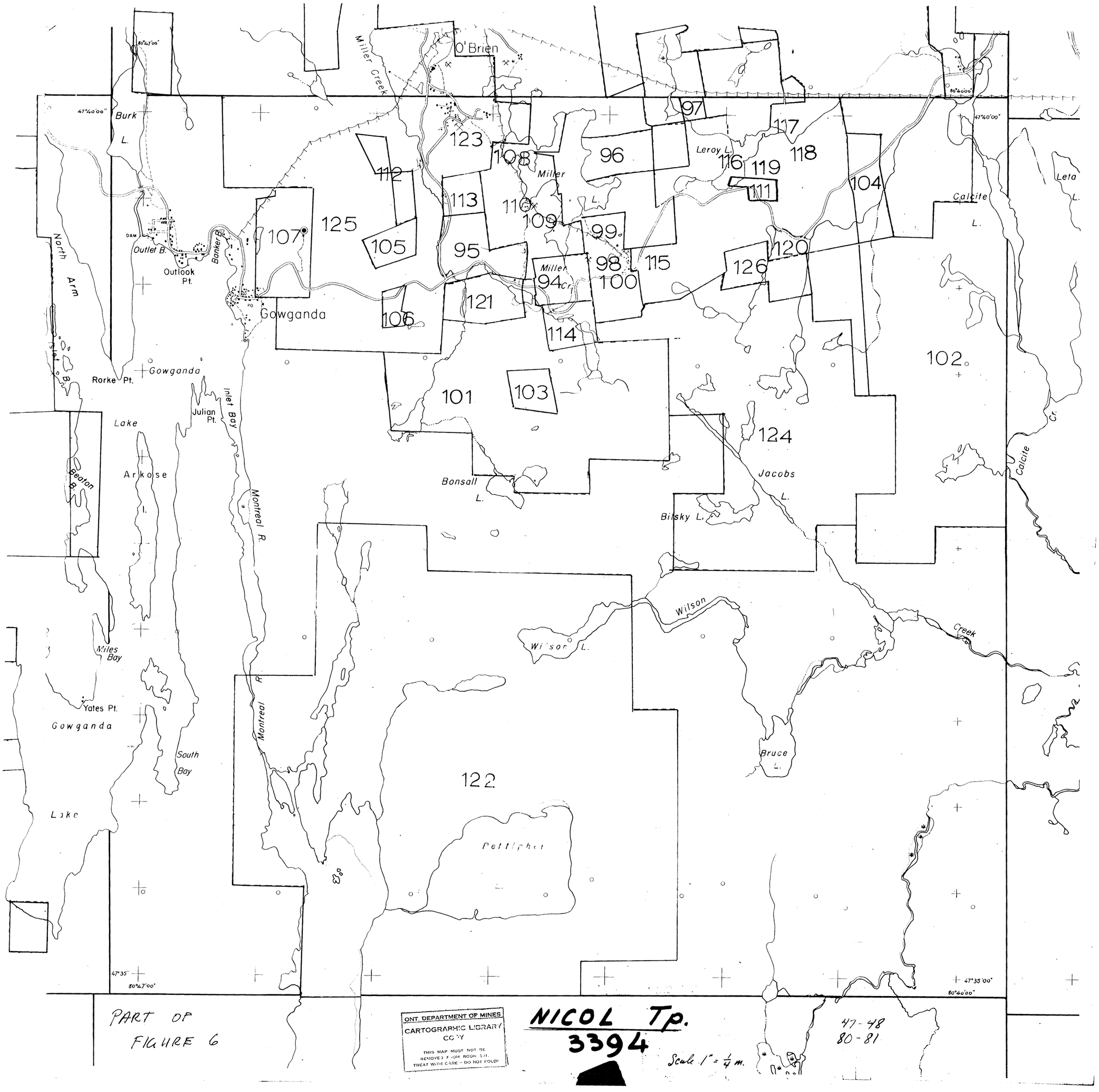
VAN HISE Tp.
3305

47-48
80-81

Scale 1" = ¼ m

80°47'00"
47°45'30"
Haultain L.
Montreal R.
East Beaver L.
Montreal R.
Miller
Davidson L.
Cr.
Stella L.
Molly L.
Obushkong Lake
Dinny Lake
Everett L.
Edith L.
Miller Creek
P.O.
O'Brien
47°40'00"
80°47'00"
Burk L.
HAULTAIN Tp.
3392
Bloom Lake
80°46'00"
47°45'30"
Jerome L.
Bloom L.
Bulsch L.
Calcite
Shanty L.
McRae L.
Cr.
Mire L.
Crawford L.
Wigwam L.
ARCH
15°
15°
Sigs L.
30°
45°
Flatstone L.
10°
Babs L.
Lost L.
Leroy L.
Miller L.
47°40'00"
80°46'00"
Leta L.
Part of Figure 4
47-48
80-81
Scale 1" = ¼ m.

OFR 5113
50% REDUCTION
MICROFILM COPY



PART OF FIGURE 6

ONT. DEPARTMENT OF MINES
CARTOGRAPHIC LIBRARY
COPY
THIS MAP MUST NOT BE REMOVED FROM ROOM 321.
TREAT WITH CARE – DO NOT FOLD

NICOL Tp.

3394

Scale 1" = ¼ m.

47-48
80-81

Part of Figure 6

MILNER Tp.
3393

Moss L.

Wapus Creek

UPPER NOTCH RAPIDS

Firth Lake

19

Lett Lake

N. Gamble L.

39

Gorman Lake

Logan Lake

20

Marguerat L.

McIntosh

37

17

43

36

Myrtle L.

27

18

Milner Bay

North Arm

Burk L.

80°47'00"

47°40'00"

DAM

Outlet B.

Rorke Pt.

Gowganda Lake

Islet B.

24

25

38

Beaton B.

Arkose I.

Milner Lake

41

32

23

Boyd L.

26

33

40

Milner Bay

Gordon Bay

Miles Bay

Yates Pt.

Gowganda

Long L.

Crawford L.

35

13

Reeve L.

29

Cobie L.

30

Brennan L.

31

Lake

34

21

14

15

22

28

28

Great South Bay

Hawk I.

Fryingpan

16

Elkhorn L.

47°33'00"

80°55'00"

47°35'00"

80°47'00"

ONT. DEPARTMENT OF MINES
CARTOGRAPHIC LIBRARY
COPY
THIS MAP MUST NOT BE REMOVED FROM THIS ROOM
THIS LABEL TO BE LEFT ON - DO NOT DEFACE

47-48
80-81
Scale 1" = ¼ M.

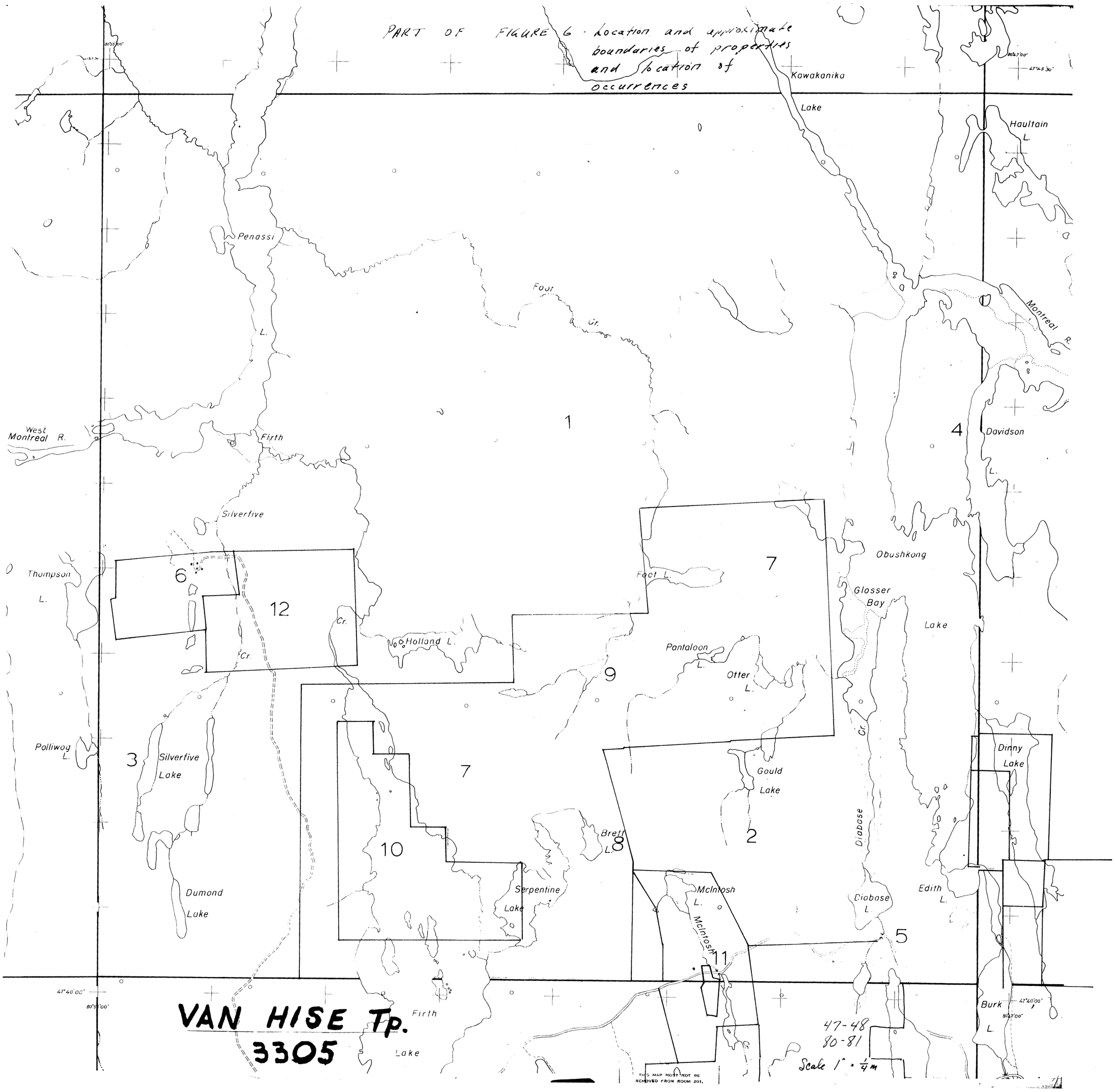
Part of FIGURE 6

HAULTAIN Tp.
3392

Scale 1" = ¼ m.

47-48
80-81

PART OF FIGURE 6 - Location and approximate boundaries of properties and location of occurrences



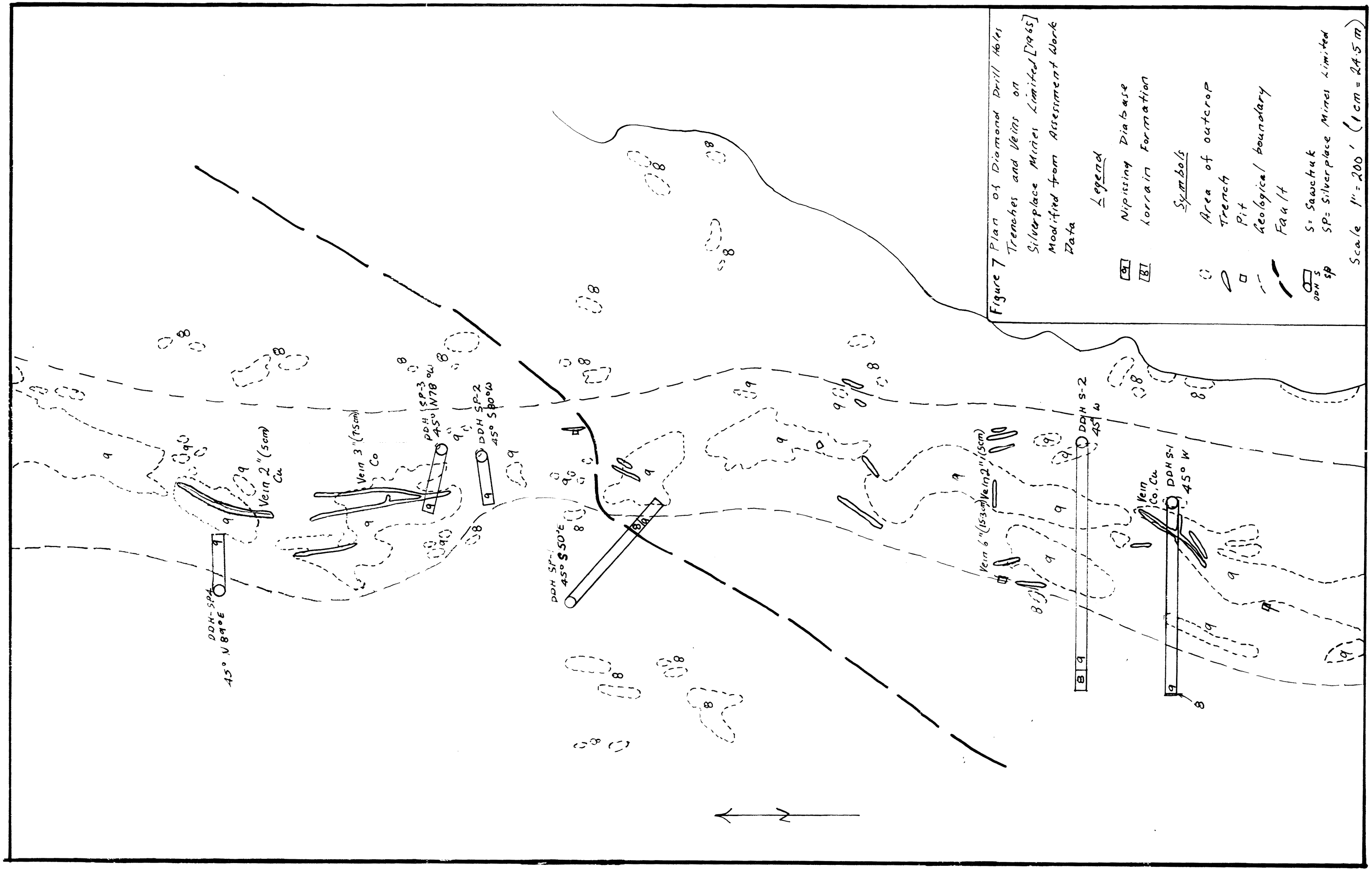
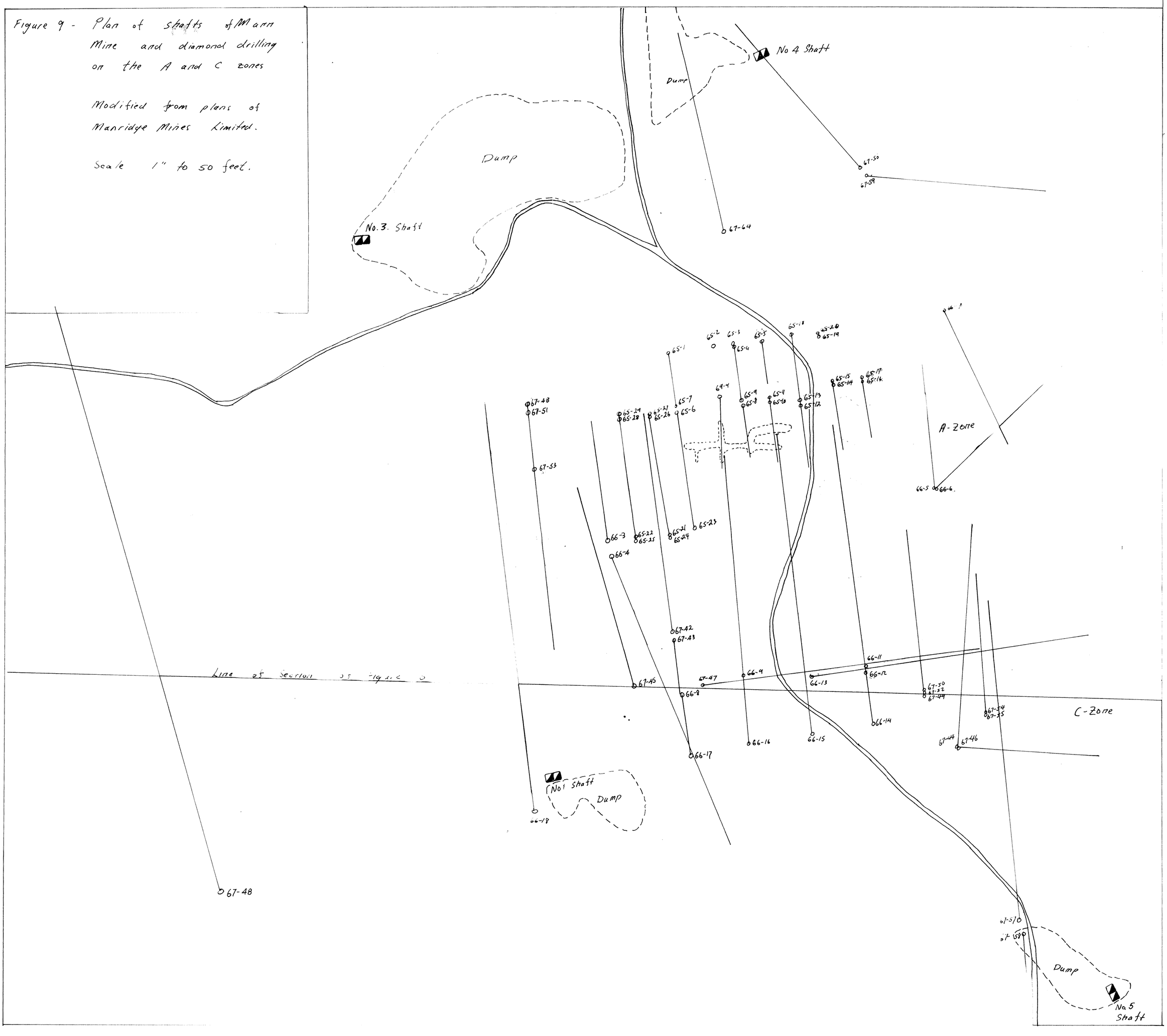

Vein 2" (5cm) Cu
DDH SP-4 45° N 89° E
Vein 3" (7.5cm) Co
DDH SP-3 45° N 78° W
DDH SP-2 45° S 80° W
DDH SP-1 45° S 50° E
Vein 6" (15.3cm) Vein 2" (5cm)
DDH S-2 45° W
Vein Co, Cu
DDH S-1 45° W
N
Figure 7 Plan of Diamond Drill Holes Trenches and Veins on Silverplace Mines Limited [1965] Modified from Assessment Work Data
Legend
Nipissing Diabase
Lorrain Formation
Symbols
Area of outcrop
Trench
Pit
Geological boundary
Fault
S = Sauchuk
SP = Silverplace Mines Limited
Scale 1" = 200' (1 cm = 24.5 m)

Figure 9 - Plan of shafts of Mann Mine and diamond drilling on the A and C zones

Modified from plans of Manridge Mines Limited.

Scale 1" to 50 feet.



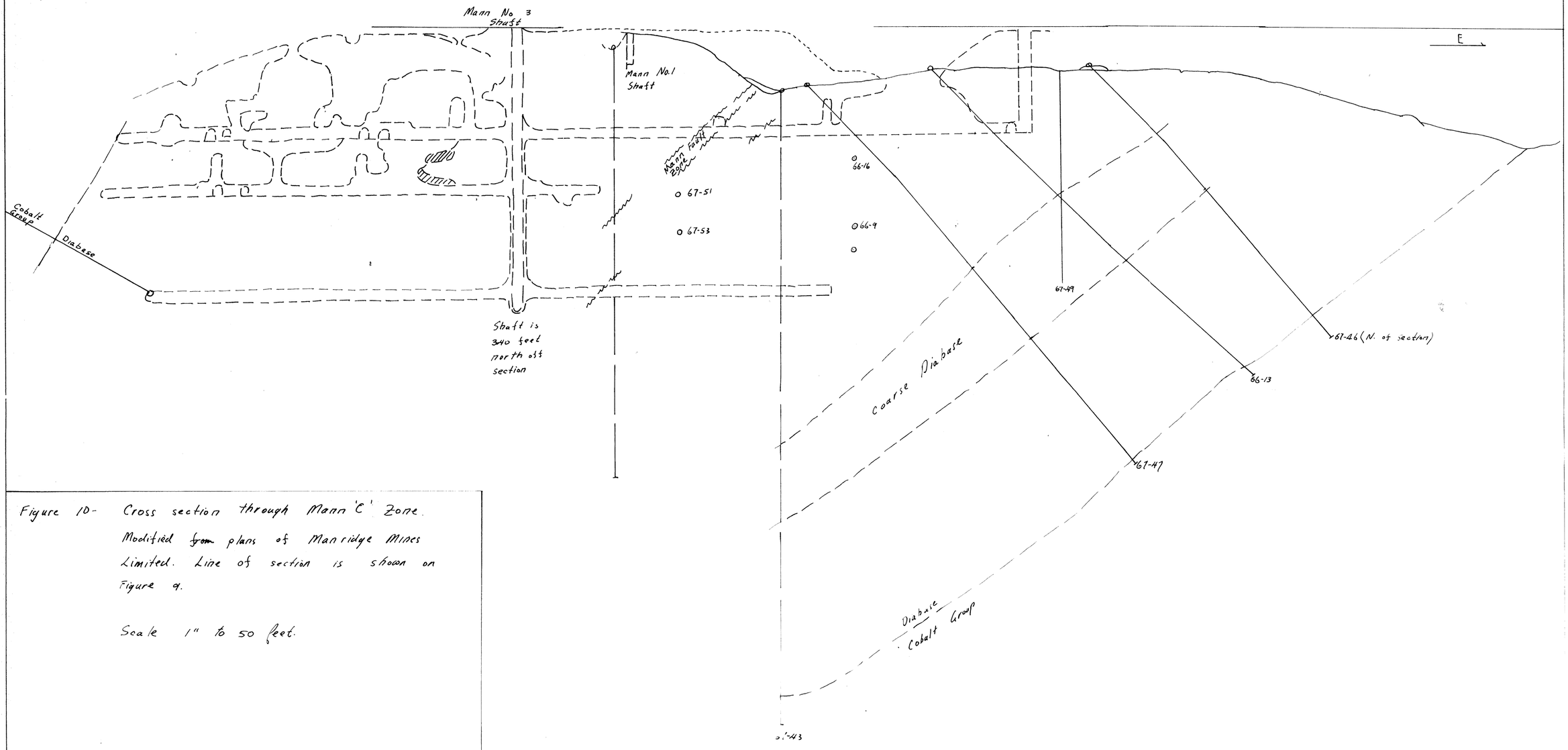


Figure 10- Cross section through Mann 'C' Zone. Modified from plans of Manridge Mines Limited. Line of section is shown on Figure 9.

Scale 1" to 50 feet.

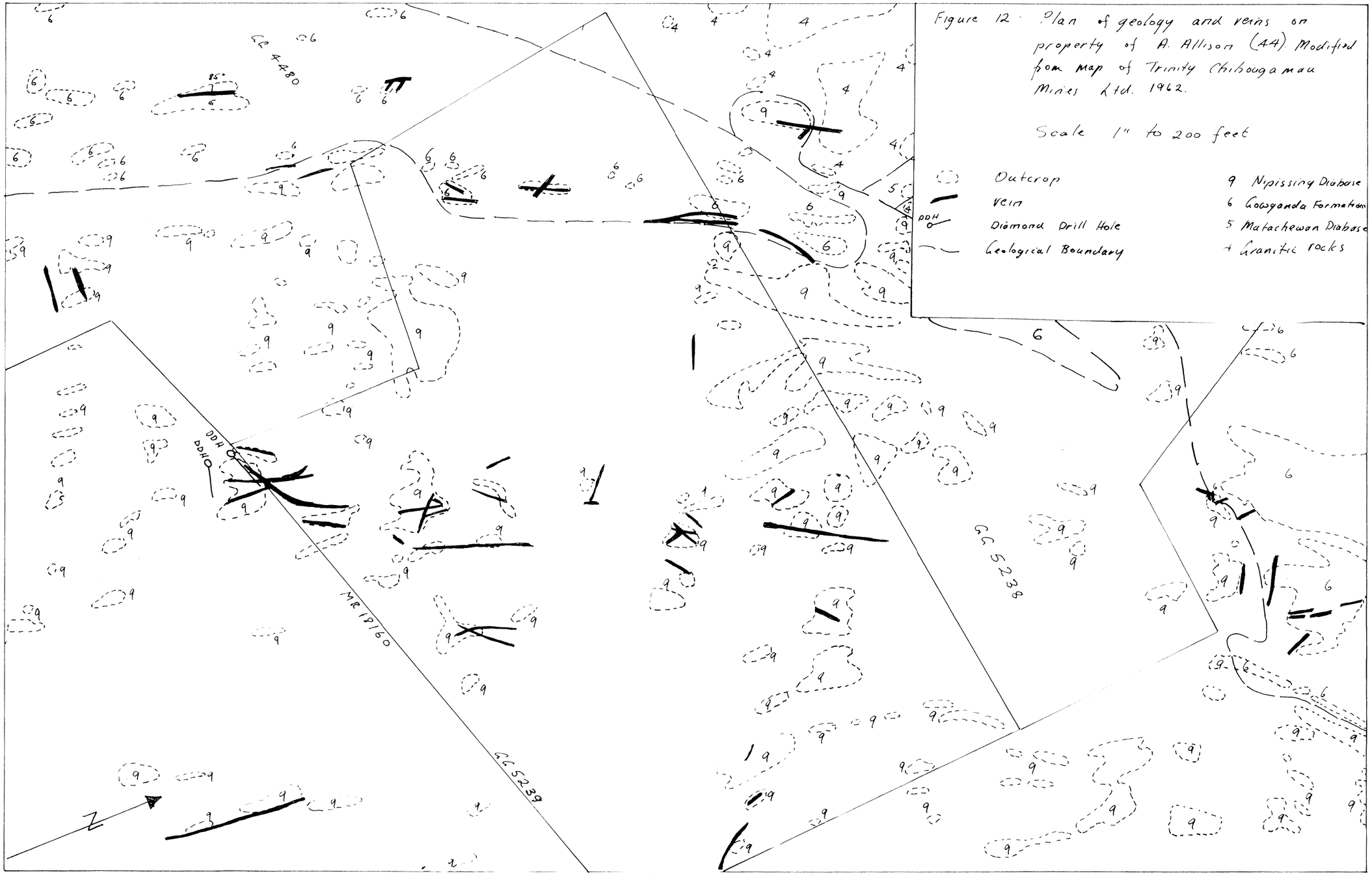


Figure 12. Plan of geology and veins on property of A. Allison (44). Modified from map of Trinity Chibougamau Mines Ltd. 1962.

Scale 1" to 200 feet

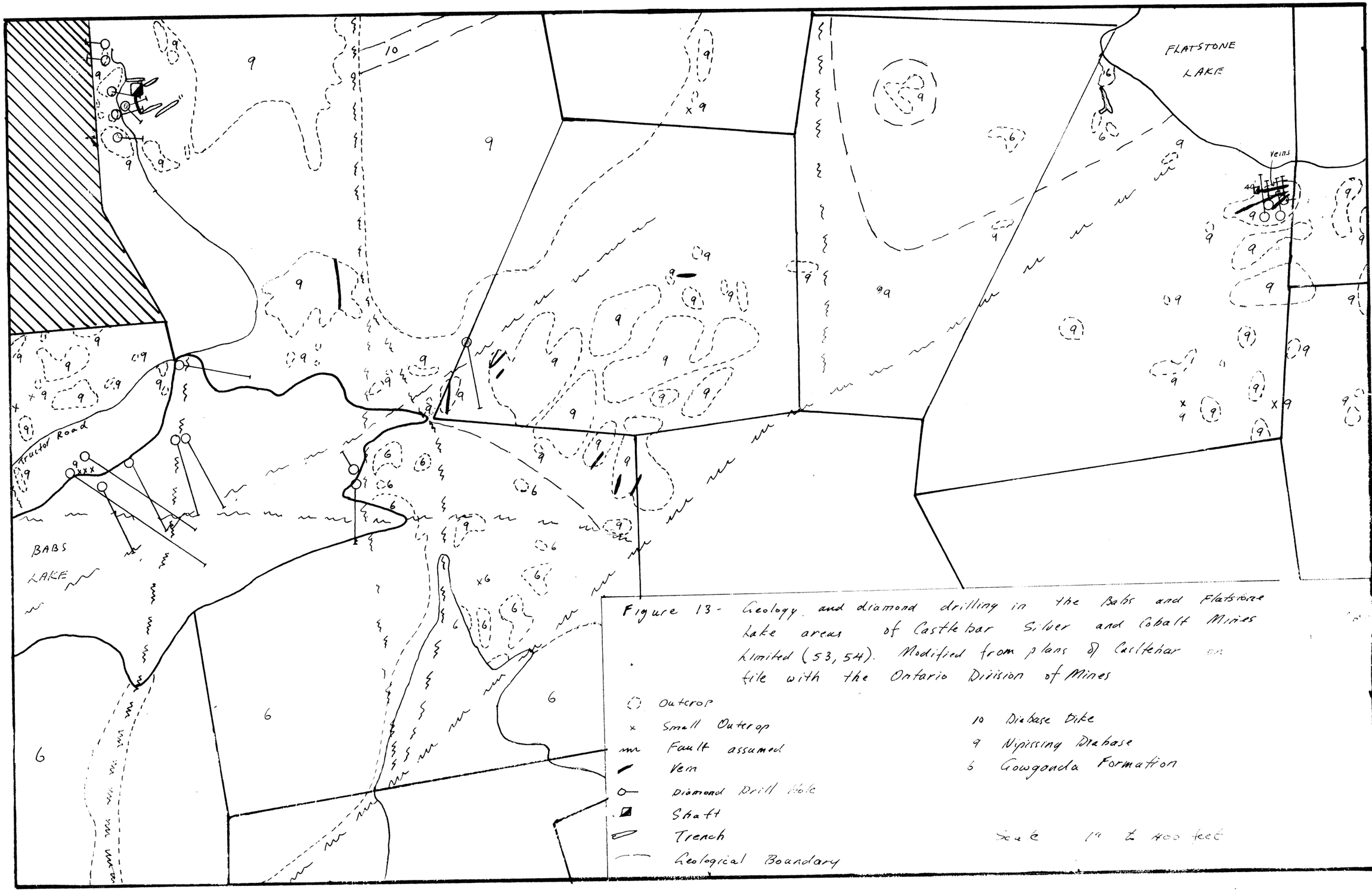


Figure 13- Geology and diamond drilling in the Babs and Flatstone Lake areas of Castle bar Silver and Cobalt Mines Limited (53, 54). Modified from plans of Castlebar on file with the Ontario Division of Mines

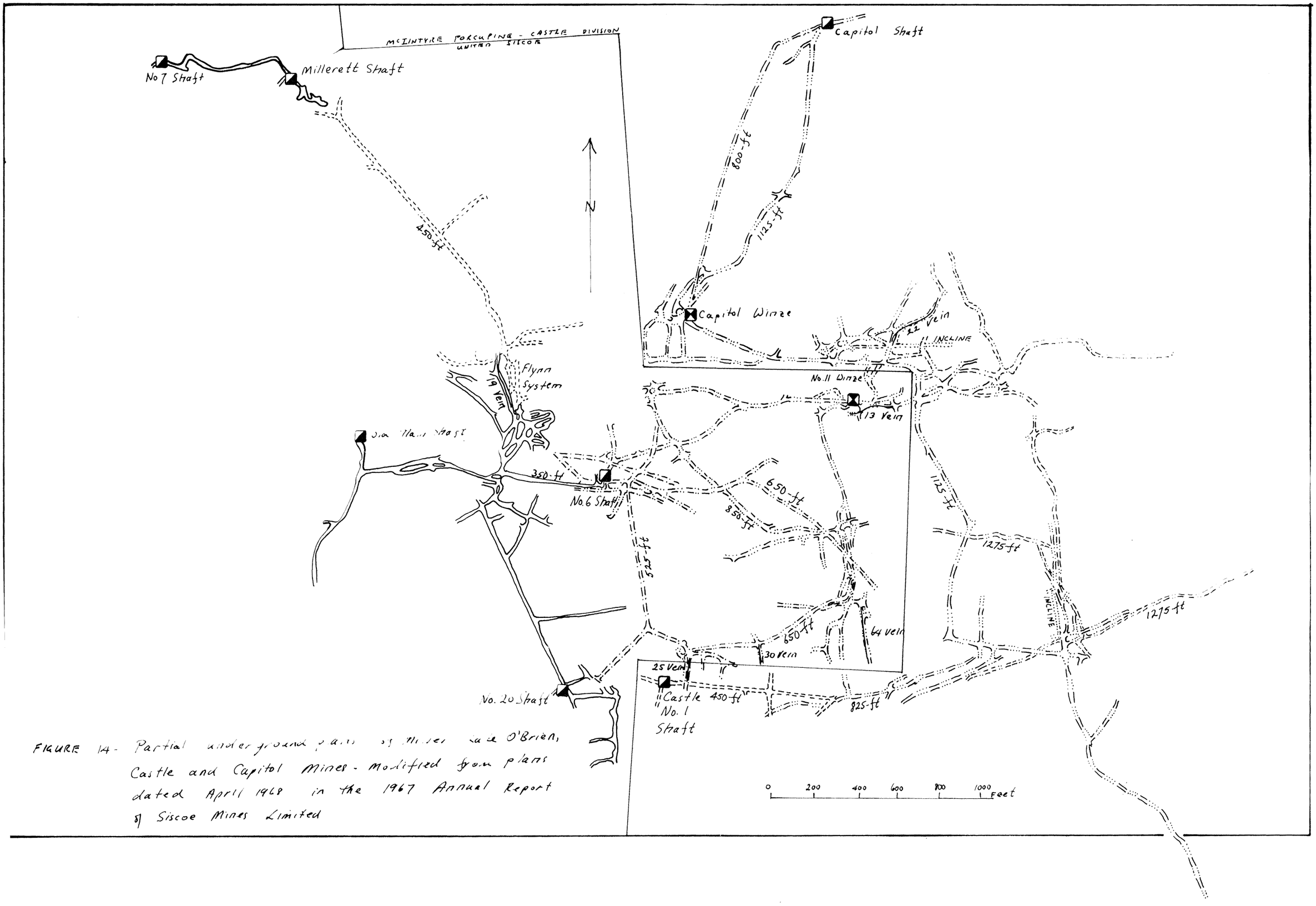


FIGURE 14 - Partial underground plans of McIver and O'Brien, Castle and Capitol Mines - Modified from plans dated April 1968 in the 1967 Annual Report of Siscoe Mines Limited

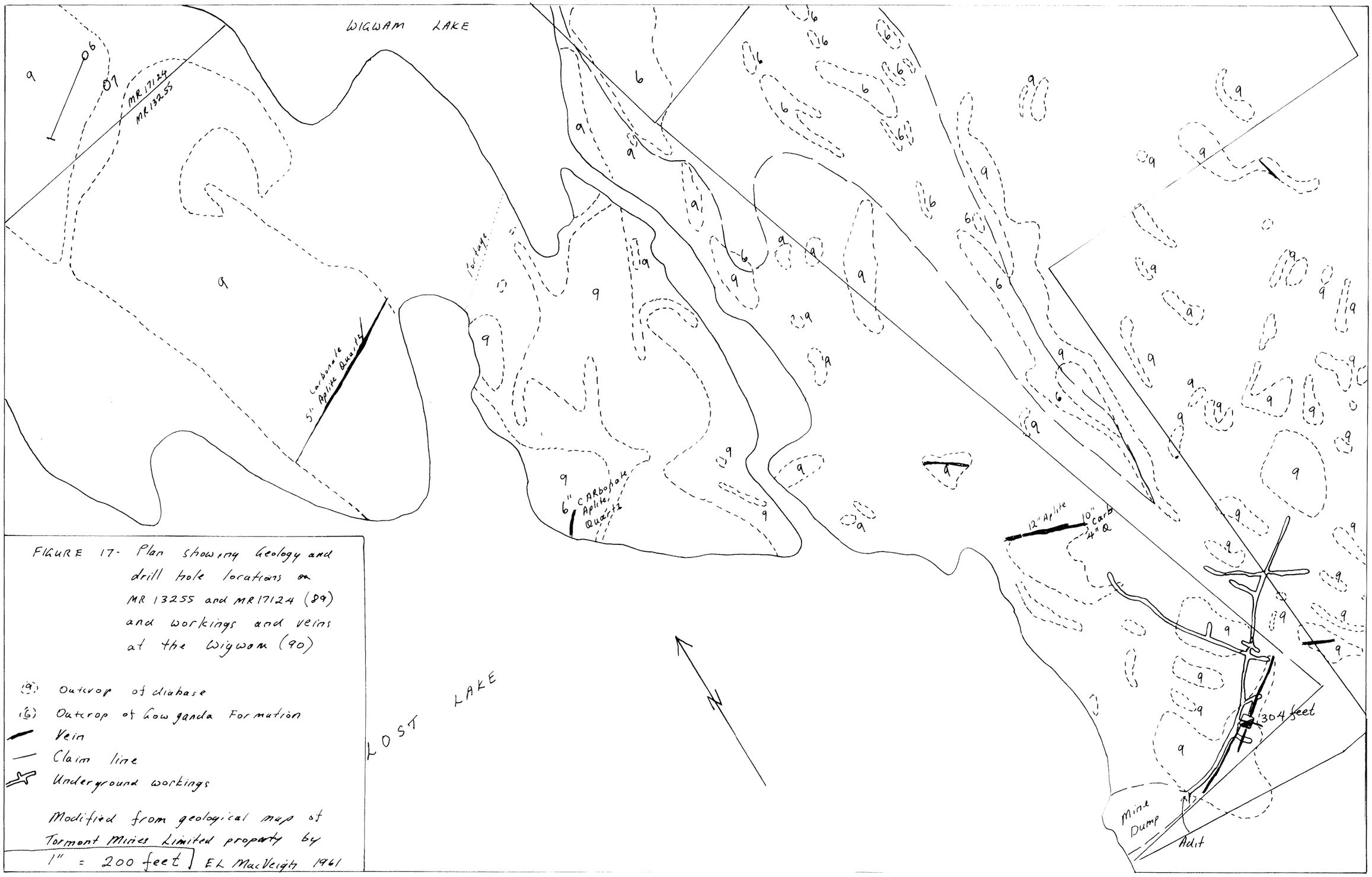


FIGURE 17- Plan showing Geology and drill hole locations on MR 13255 and MR17124 (89) and workings and veins at the Wigwam (90)

(9) Outcrop of diabase
(6) Outcrop of Cowganda Formation
Vein
Claim line
Underground workings

Modified from geological map of Tormont Mines Limited property by E.L. MacVeigh 1961

1" = 200 feet

MR 45193

MR 45194

MR 45196

MR 45197

MR 45194

MR 45195

MR 49694

MR 49684

STUMPY LAKE

16
45°

218

Figure 22 - Geology, diamond drilling and veins at part of the United Reef Petroleum Property (122).

- Outcrop
- Trench
- Vein
- Pit
- Diamond Drill Hole

10 Diabase dike
9 Nipissing Diabase
8 Lorrain Formation
7 Gowganda Formation

Scale 1" to 200 feet

NICOL Tp.
3394

ONTARIO DEPT. OF MINES
I. SATTERLY
1966
RECEIVED

80°55'00"
47°45'30"
80°47'00"
47°40'00"
RANKIN TOWNSHIP
KNIGHT TOWNSHIP
HAULTAIN TOWNSHIP (P.1)
MILNR TOWNSHIP (P.475)
VAN HISE TWP.
3305
Kawakanika Lake
Haulto L.
Penassi L.
Firth Lake
Silverfive Lake
Dumond Lake
Foot L.
Foot Cr.
Holland L.
Pantaloon Lake
Otter Lake
Gould Lake
Glosser Bay
Obushkong Lake
Davidson L.
Dinny Lake
Edith L.
Burk L.
Brett L.
Serpentine Lake
McIntosh Lake
Diabase L.
Penassi Lake - Thom Lake Fault
Firth Lake Fault
Marks Bay Fault
Holland Fault
Foot Fault
Silverfive Cr.
Foot Cr.
Diabase Cr.
HR 454
HR 458
HR 453
HR 459
GG4724
MR 13052
MR 13053
MR 13050
MR 13051
MR 13048
MR 13049
Adit
Pit
Pits
trench
spec
Aplite dike
4h dikes
numerous qv 2-40"
qv 21-24"
qv 48"
qv 8"
qv 2"
qv 1"
1g 4 dikes
Bi, Ag, Co, Ni
Ag, Co
cp, py
ONTARIO DEPT. OF MINES
J. SATTERLY
1957
FEB 11 1969
RECEIVED
ORIGINAL
65-15