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**Ontario Department of Mines
Geological Branch**

Open File Report 5006

**Geology of the
Elk Lake Area
District of Timiskaming**

1967

ONTARIO DEPARTMENT OF MINES
GEOLOGICAL BRANCH

OPEN FILE REPORT

No 5006

GEOLOGY OF THE
ELK LAKE AREA

DISTRICT OF TIMISKAMING

APRIL 3, 1967

ONTARIO
DEPARTMENT OF MINES

GEOLOGY OF THE ELK LAKE AREA
DISTRICT OF TIMISKAMING

By
B.E. MacKean

Geological Report No. 5006

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Preliminary Map * (Back pocket)

P. 159 Elk Lake - New Liskeard Sheet, Scale 1 inch to 2 miles

* Preliminary map may be purchased at Publications Office, Ontario
Department of Mines, Whitney Block, Parliament Buildings, Toronto.

Geology of the Elk Lake Area

District of Timiskaming

by

B.E. MacKean¹

Introduction

The Elk Lake area, to be described, comprises four complete townships, James, Mickle, Willet, and Roadhouse, and the eastern half of two townships, Lawson and Chown. The principal town, Elk Lake, is located in James township.

The first mineral discovery in the area was made in the autumn of 1906 when a showing of native silver was found in James township. From 1906 to 1964, considerable exploration and some development work has been done, but the period of greatest activity was between 1907 and 1913. There are presently no producing mines, but much interest is being directed to the area.

The eastern half of Chown township and the townships of James and Mickle were remapped in 1963, and the townships of Willet, Roadhouse, and Lawson were remapped in 1964. Uncoloured preliminary geological maps for James (P.239)

¹Geologist, Ontario Department of Mines, Toronto.
Manuscript received by the Chief Geologist Aug 18 1965

and Mickle (P.240) townships were issued in 1964, and for Chown (P.310), Lawson (P.311), Roadhouse (P.312), and Willet (P.313) townships in 1965 at the scale of 1 inch to $\frac{1}{2}$ mile by the Ontario Department of Mines.

The basemaps were compiled by the Cartographic Unit of the Ontario Department of Mines from maps of the Ontario Department of Lands and Forests (Forest Inventory Sheets). The geological information plotted on the basemaps was obtained by the writer using pace-and-compass traverses generally spaced at $\frac{1}{2}$ -mile intervals. Control of traversing was obtained from aerial photographs taken in 1959 by the Ontario Department of Lands and Forests at the scale of 1 inch to $\frac{1}{2}$ mile. James, the only subdivided township in the area mapped, was surveyed in 1903 and the boundaries have since become obscure because of subsequent fires and vegetation growth.

Acknowledgments

The author was ably assisted by W.H. McIlwaine, senior geological assistant, in 1963 and by Fred Harris, senior geological assistant, in 1964. J.G. Maniw, R.D. Martindale,

R.E. Johns were junior assistants in 1963, and N.W. Laverty, D.G. Stevens, and R.E. Maidenberg were junior assistants in 1964. Alvin Coombs assisted the writer in the drafting.

Means of Access

The town of Elk Lake, 37 miles northwest of Cobalt, is connected by Highway No. 65 with New Liskeard to the southeast and with Matachewan to the northwest, and by Highway No. 560 with Gowganda to the west and with Charlton to the east. Elk Lake is the terminal end of the Ontario Northland Railway branchline from Earleton. This branchline was completed in 1913.

The remaining road network in the area is: a private lumber road extending southward from Elk Lake passing beyond the southern boundary of Willet township; a private secondary road joining Highway No. 560 at mile $4\frac{1}{2}$ with Silverclaim Lake and Boland Lake in Mickle township; and a secondary road trending southward from Highway No. 560 at Longpoint Lake in Lawson township.

Previous Geological Work

A field party for the former Ontario Bureau of Mines, under the leadership of C.W. Knight, included part of James, Mickle, and Willet townships in a reconnaissance geological survey of the region in 1907. A.G. Burrow republished the geology of the Elk Lake area in his map on Gowganda in 1909.

W.H. Collins, of the Geological Survey of Canada mapped a region including the Elk Lake area in 1908-10, incorporating some of the geology done by C.W. Knight in 1907.

James township was partly mapped in 1954 by K.D. Lawton, but because of his untimely death, no geological report nor map was published.

Other references may be found in papers by A.E. Barlow (1908) on James township; R.E. Hore (1908) on vein occurrences in James township; N.L. Bowen (1910) to analyses of rocks taken from James township; and Bastin (1935) on the alteration effects of aplite-dike intrusion on the surrounding diabase rock.

The files of the Resident Geologist, Dr. Robert Thomson, Ontario Department of Mines, Cobalt, contain assessment work done in the area as well as some geological sketches made on properties visited by the Resident Geologist.

Topography

The local relief in the area seldom exceeds 100 feet. Several altitude measurements were made during the course of the field work on glacial outwash deposits, glacial beaches, terraces, and some mine shafts with an aneroid barometer using the bench mark (No. 196-E) at the Ontario Northland Railway station in Elk Lake as reference. This bench mark has an altitude of 968.166 feet. The relief associated with the Montreal River must be greater than 200 feet which is the depth of penetration of a drill through glacial lacustrine clays at Elk Lake without reaching bedrock.

The drainage in the area is essentially controlled by the bedrock structure. The southeasterly-trending streams in Willet and Roadhouse townships occupy prominent lineaments, roughly parallel to the Montreal River. Several streams aligned in a northeasterly direction do not appear to follow any particular lineament, however, there must be some control to explain their marked parallelism. Several streams are aligned in a north-south direction, possibly fault-controlled, as indicated by Makobe Creek in the central part of James township.

The rock exposures are poor in areas below the altitude of 980 feet above-sea-level because of the extensive glacial lacustrine deposits. In the vicinity of the Montreal River, excellent rock exposures are seen between the altitudes of approximately 980 feet and 1,010 feet, whereas, extensive glacial moraine deposits thinly cover the rock areas above the altitude of 1,010 feet. Numerous exposures are present in areas swept clean by glacial streams which deposited the sand and gravel in the low-lying areas. A large area of *ice-contact stratified drift* ~~glacial deposits~~ extends from Longpoint Lake in Chown township southward through Lawson township deeply covering all rock.

The topography is closely controlled by geology. The areas underlain by diabase intrusive rocks are characterized by prominent ridges, steep cliffs and an irregular topography. Diabase dikes are usually conspicuous by their tendency to be ridge-forming rocks.

Natural Resources

Agriculture is developed on the glacial-lacustrine clay deposits bordering the Montreal River. The area to the west of the Montreal River which is in the Temagami Forest Reserve provides some lumbering, but at present there are no ^{large} operations.

Hydroelectricity is generated at Indian Chutes north of Elk Lake on the Montreal River.

The lakes and streams in the area are constantly being fished and require periodical restocking. The animals most frequently seen were bear, moose, fox and bobcat; no deer were seen.

General Geology

All the bedrock in the area is of Precambrian age, composed of granitic rocks of the Round Lake batholith containing inclusions of metavolcanic rocks, Cobalt Group sedimentary rocks representing approximately 70 percent of the surface rock unconformably overlying the granitic and metavolcanic rocks, and Nipissing diabase which intrudes the above rocks in the form of dikes and sills and is itself intruded by olivine diabase dikes. No Haileyburian nor Matachewan intrusive rocks were recognized.

Pleistocene glaciation has affected the whole area and much of the surface rock is covered with unconsolidated material.

Table of Formations

CENOZOIC

Recent Fluvioglacial and lacustrine deposits.
 Pleistocene Glacial erosional and depositional deposits.

Unconformity

PRECAMBRIAN

PROTEROZOIC

LATE BASIC INTRUSIVE ROCKS

Olivine diabase (dikes).

Intrusive Contact

NIPISSING DIABASE (dikes and sills)

Granophyric diabase.
 Coarse-grained diabase.
 Olivine-hypersthene diabase.
 Diabase-undifferentiated.

Intrusive Contact

COBALT GROUP

Lorrain Formation

Quartzose sandstone member.
 Arkosic sandstone member.
 Hematitic siltstone member.

Gowganda Formation

Arkosic sandstone member.
 Conglomerate member.
 Banded siltstone member.
 Greywacke-siltstone member.

Unconformity

ARCHEAN

GRANITIC ROCKS

Granitic rocks (Round Lake batholith).

METAVOLCANICS

Basic metavolcanics.

Metavolcanics

A minor rock type in the area mapped is a basic metavolcanic rock present as inclusions within later granitic rocks. The metavolcanic rock group has been referred to as Keewatin-type by a number of workers in the area.

There are several small inclusions of the metavolcanic rock in lots 9, 10, and 11, concession VI, James township, where the rock is a slightly schistose to foliated, dark coloured, fine-grained amphibolite. Numerous lenses and veins of granitic material intrude the metavolcanics.

A larger metavolcanic inclusion in lots 2, 3, 4, and 5, concession VI, James township, is 500 feet wide and projects 1,800 feet southwestward into the township. The metavolcanic rock is essentially a dark coloured, fine-grained, slightly foliated amphibolite with a thin band less than 100 feet, of a metasedimentary-looking rock containing disseminated pyrite in the central region of the inclusion.

The inclusion ^{s are} ~~is a~~ steeply- to vertically-dipping foliated mass striking northeast parallel to the foliation in the surrounding granite.

Granitic Rocks

The granitic rocks in the area are part of the Round Lake batholith located to the north and northeast which, according to age dating on sample GSC 61-156 by the Geological Survey of Canada is 2,605 million years (Lowdon et al 1963, p.91). The dating of the Round Lake batholith at present appears to have been confined to one sample taken near Hough Lake, 20 miles northeast of Elk Lake. The Round Lake batholith is sometimes referred to as Algoman in age.

The most extensive granitic exposure in the area mapped is found in the northeast corner of Mickle township and the northwest corner of James township. Smaller areas of granite are exposed in lots 2, 3, 4, and 5, concession VI; in lots 4 and 5, concessions II and III; and in lot 1, concession I, James township. Two small granite exposures are in Willet township, 5,000 feet west, 1,800 feet south, and 8,000 feet west, 6,000 feet south of the northeast corner of Willet township. The small granite exposures in Willet township, 7,700 feet south, 11,600 feet and 16,500 feet west from the northeast corner, shown on Collins's

G.S.C. map 64A, were not seen. These two exposures are in an area having a high proportion of granophyric diabase.

The Elk Lake area occupies the exposed edge of the Round Lake batholith towards its southern and southwestern periphery. The granitic rocks are slightly foliated in the northeastern part of Mickle township and the northern part of James township, the gneissic structure being steeply to vertically inclined and striking in a northeasterly direction, probably parallel to its intrusive contact which is buried by the Cobalt Group sedimentary rocks. Zones of weaknesses marked by strong lineaments in a northeasterly direction are also evident in this area. The remaining granitic rocks, in the southern part of James township and in Willet township, do not show much foliation. This is because of characteristic porphyritic nature of the granitic rocks in Willet township and lot 1, concession I, James township. These granitic rocks as well as those of lots 4 and 5, concessions II and III have been affected also by granophyre associated with the diabase intrusion.

The granitic rocks are intruded in local areas by numerous, generally irregular, small acid dikes. Narrow diabase dikes cut the granitic rocks in several areas,

for example, in lots 3, 4, and 12, concession VI, and in lots 10 and 11, concession V, James township. Numerous narrow epidote stringers, for example; in lots 3, 4, and 5, concession VI, James township are roughly normal to the proposed diabase "sill" contact.

Inclusions in the granitic rock are seen to be abundant in lots 2, 3, 9, 10 and 11, concession VI, James township where metavolcanic rock inclusions are aligned in a north-easterly direction.

The granitic rocks in Mickle township and the northern part of James township are coarse- to medium-grained, white to pink in colour, and slightly foliated by alignment of amphibole and biotite. The quartz content is approximately 20 percent and the plagioclase consists of abundant albite and an altered variety. The rock is essentially a soda-rich granodiorite. The pink colour is caused by hematite dust associated with the plagioclase. No potash feldspar was recognized. Minor amounts of clinozoisite, sphene, and apatite are present. The granitic rocks in lot 1, concession I, James township and in Willet township are coarse-grained, porphyritic rocks containing phenocrysts of microcline feldspar, coarse quartz grains with a low percentage of

mafic minerals. Granophyre associated with the diabase has intruded porphyritic rocks as well and the granitic rocks in lots 4 and 5, concessions II and III, James township.

Cobalt Group

Flat-lying sedimentary rocks unconformably overlie the metavolcanic and the granitic rocks within the mapped area. The sedimentary rocks belong to the Cobalt Group which is composed of the stratigraphically lower Gowganda Formation and the overlying Lorrain Formation.

Gowganda Formation

The Gowganda Formation in this report is subdivided into three members: a greywacke-siltstone member; a banded siltstone member; and a conglomerate member. No lower- or basal-conglomerate member typical of the Cobalt area occurs in this area.

The Gowganda Formation was deposited on an irregular land surface such that, in James township for example, granitic rocks are known to underlie the banded siltstone member which is generally found at or near the top of the Gowganda Formation. Another example is the granitic

exposure, 5,500 feet south and 8,000 feet west of the northeast corner, Willet township where remnants of the Lorrain hematitic siltstone member are present. This would indicate that the Gowganda Formation in this area is very thin and that the thickness varies from one area to the next.

The Gowganda Formation members are difficult to map as units because of the heterogeneity of composition and because of the characteristic lensing nature of the various rock types. At best, the subdivision of the Gowganda Formation into mappable units or members is arbitrary.

Greywacke-Siltstone Member

The lowest member of the Gowganda Formation exposed in this area is a dark grey, massive siltstone generally called a greywacke. This member is quite heterogeneous in composition, containing bands of arkosic sandstone, of conglomerate, even scattered pebbles to boulders. The massive bedded siltstone appears to grade upward in places into a laminated, dark grey siltstone as in Chown township, 19,000 feet south, 11,000 feet west of the northeast corner.

The distribution of this member is most extensive in Chown township. In James township, the greywacke-siltstone is present in lots 5 and 6, concession VI; lots 5, 6, and 7, concessions II, III, and IV; and in lots 7, 8, 9, concession V, (Ph. 10). This latter area is quite heterogeneous in composition. A few rock exposures 20,000 feet west of the northeast corner of Mickle township indicate the presence of the massive, dark grey siltstone member, but the rock exposures are poor.

The massive greywacke siltstone contains less than 10 percent argillaceous material and this is in the form of chlorite which gives the rock its grey colour. The matrix is composed of fine-grained quartz and plagioclase feldspar with angular quartz and plagioclase feldspar fragments unevenly distributed. The plagioclase is albite and no microcline feldspar was seen. Hematite dust is associated with the albitic plagioclase.

Banded Siltstone Member

Near the top of the Gowganda Formation, there is a banded "greywacke" or banded siltstone which R. Thomson (1957, pp.40-42) would call the Firstbrook Formation;

however, this member is not extensive enough in the area mapped to distinguish it as a formation. This member is composed of fine-grained, red and grey, sometimes light and dark grey bands 1/16-1 inch thick. The term "slaty greywacke" used in some reports refers to a more uniformly banded siltstone, with bands 1/16 to 1/4 inch thick.

The banded siltstone member is poorly developed in Chown township. The area bordering the diabase intrusion in Mickle township 14,000 feet south and 12,800 feet west of the northeast corner and eastward paralleling the contact to 5,000 east of the Mickle/James township boundary contains banded siltstone. Banded siltstone is also encountered at the bottom of the Alsof shaft in Mickle township. This member is poorly developed in lots 7 and 8, concession V, James township, however, in lots 6 and 7, concession I, the banded siltstone appears to grade upward into a hematitic siltstone which is discussed later. Banded siltstone is well developed in the area around Red Lily Lake, 9,000 feet south, 13,000 feet west of the northeast corner, Willet township. At Rose Lake in the northeast corner of Willet township, the banded siltstone is associated with pebble conglomerate bands or lenses.

The petrographic study of a thin section of a specimen that looked unaltered actually showed alteration to be fairly marked with quartz grains in process of being recrystallized, white mica masking the plagioclase and the incipient spotting of white mica.

In some localities where the banded siltstone member is in contact with the Nipissing diabase, the banded siltstone shows black spotting which in places tends to obscure the bedding. The spotting is an alteration caused by the formation of chlorite. Brecciation is another local effect seen at some localities where the diabase is in contact with the banded siltstone, the banded siltstone appearing to have flowed away from the diabase (see photograph 5). Local intraformational flowage is also apparent in some ^{near the Nipissing diabase.} localities. The brecciation is not typical of the banded siltstone-diabase contact, but appears to be present at some localities only. Very little argillaceous material was seen in the groundmass, quartz and feldspar being the main components, chlorite, white mica, zircon and epidote the minor components. Hematite dust gives the red coloration.

Conglomerate Member

The conglomerate associated with the basal section of the Gowganda Formation is missing in this area, rather the conglomerate is present as lenses and bands scattered through the various members of the Gowganda Formation. The conglomerate member appears to be most common in areas toward the top of the Gowganda Formation, and in areas surrounding the granitic rock exposures. (Ph. 8).

The conglomerate is in the form of thin lenses generally less than 20 feet thick which can be traced along strike for short distances. In Chown township 16,300 feet west and 7,200 feet south from the northeast corner, the conglomerate is in the form of a channel deposit 20 feet wide steeply cutting finely banded arkosic sandstone. An imbricate structure is sometimes seen in the conglomerate indicating direction of current or deposition.

The conglomerate is well developed in Chown township as a band trending from 18,000 feet west of the northeast corner south-southeastward for a distance of 8,000 feet. A second but thin conglomerate lens, 20 feet at its maximum thickness, is seen near the base of a cliff approximately

15,000 feet west of South Twin Lake in Chown township. Here the conglomerate boulders at the base are up to 24 inches in diameter and grade rapidly upward into a pebble-cobble conglomerate. In Mickle township an irregular band of conglomerate with many large rounded boulders separate the granitic rock from the surrounding Lorrain arkosic sandstone. The conglomerate bordering the western side of the diabase "sill" intrusion from a spot 13,000 feet west of the northeast corner in Mickle township southward for 13,000 feet is fairly extensive reaching a maximum width of approximately 4,000 feet. The conglomerate in places contains up to 90 percent pebbles; however, no pattern of size distribution of the pebbles and cobbles could be seen. Towards the southern end of this conglomerate band, the matrix becomes the banded siltstone member. Local conglomerate facies separate the granitic exposures in James township from the surrounding Cobalt Group sedimentary rocks. Conglomerate lenses and layers are also present in the massive greywacke-siltstone area in lots 5, 6, 7, concessions II, III, IV, James township, where numerous small, conglomerate-filled channels are seen. In lot 7, concession V, James township there is an outcrop of

conglomerate where boulders and cobbles appear to have been dropped into a matrix of laminated greywacke-siltstone. Conglomerate is of minor and local importance in Willet township.

Lorrain Formation

The Lorrain Formation is here subdivided into three members: a lower hematitic siltstone member; an arkosic or feldspathic sandstone member; and an upper quartzose sandstone member.

Hematitic Siltstone Member

This member is placed in the lower part of the Lorrain Formation because it overlies the banded siltstone member of the Gowganda Formation (James township, concession I, lots 6 and 7), because the hematitic siltstone appears to grade upward into the overlying arkosic sandstone. In some places as in lot 6, concession I, James township, the hematitic siltstone seems to have a gradational contact with the underlying banded siltstone. The hematitic siltstone is well developed in one sector and poorly

developed in several scattered sectors. The most extensive hematitic siltstone development is in Mickle and Chown townships where there is a crescentric band starting in the vicinity of 15,000 feet south and 15,000 feet west of the northeast corner, Mickle township and trending northwest to the vicinity of Hermence Lake where it turns to the southwest into Chown township and pinches out in the vicinity of 25,000 feet south and 9,000 feet west of the northeast corner of Chown township. Small exposures of hematitic siltstone are seen along the secondary road to Silverclaim Lake, 17,000 feet south and 5,000 feet west of the northeast corner in Mickle township; and in Willet township near Sunday Lake, 17,000 feet west of the northeast corner. Collin's map No. 64a accompanying his 1913 report shows the hematitic siltstone in the vicinity of Hermence Lake, Mickle township, to be mapped as part of the Gowganda Formation.

The hematitic siltstone is composed essentially of quartz and feldspar grains with a high proportion of hematite dust obscuring the optical properties of the minerals. Some chlorite is present in the matrix but the quantity is less than 10 percent.

Arkosic Sandstone Member

The most extensive rock type in this area is the arkosic sandstone member which forms a broad arc in the area mapped. Arkosic sandstone is also present in the Gowganda Formation generally associated with the conglomerate member, but is not mapped as a separate member. The hematitic siltstone grades into a fine-grained sandstone which in some parts is very hematitic in colour, but in general, is light pink in colour. (Ph. 2) The sandstone texture becomes coarser-grained towards the top of the member resulting in medium- to coarse-grained arkosic sandstone.

Graded bedding is common in the arkosic sandstone as well as crossbedding. Strikes and dips of bedding are difficult to measure because of the crossbedding and because of the generally poor indications of bedding. In the medium- to coarse-grained sandstone areas, such as the southwestern part of Mickle township, the quartz grains appear to be frosted.

The sandstone is composed of 50-60 percent quartz, 35-45 percent of feldspar, some opaque minerals, and minor amounts of chlorite, epidote, and zircon. The quartz grains

in areas away from the diabase intrusions do not show any overgrowths and are subrounded to subangular. The feldspar is mainly plagioclase with little to no microcline or potash feldspar. Microcline feldspar is associated with the arkosic sandstone in the vicinity of the microcline-bearing granitic rocks in Willet township. Hematite dust surrounds the sandstone grains and is also associated with some of the plagioclase grains.

Quartzose Sandstone Member

The greater part of Roadhouse township and parts of Willet and Lawson townships are covered with a quartzose sandstone which overlies the arkosic sandstone gradationally. An intraformational conglomerate consisting of balls of arkosic sandstone in quartzose sandstone matrix is present north of Crane Lake in the vicinity of 12,000 feet south, 16,000 feet west from the northeast corner, Roadhouse township.

The quartzose sandstone is characteristically white in colour with various shades of pink near the arkosic sandstone boundary and bright green in colour in some areas that have been intruded by diabase dikes. Bedding is

generally difficult to measure because of the presence of crossbedding and because of the absence of distinct bedding planes. Thin pebble bands of local extent were seen in several localities to contain jasper and blue quartz pebbles associated with predominantly white quartz pebbles. (Ph. 1). No pattern for the pebble-band distribution could be interpreted with any degree of certainty, although one distribution pattern that would need further checking is that the pebble bands are found in the vicinity of strong lineaments.

"Nipissing" Diabase

Diabase

ls

The result of mapping this area at $\frac{1}{4}$ -mile intervals indicates to the writer that the "Nipissing" diabase here is not just a sill, rather that it is a complex intrusion intruded along feeder dikes into sill-like structures.

The diabase was mapped in the field in terms of texture, of olivine and hypersthene content, and of granophyre content. Banding was rarely seen in the diabase; however, when seen it coincided with the attitude of horizontal jointing which was measured. (Ph. 6).

The diabase here is generally referred to as "Nipissing" diabase of Keweenawan age; however, the only age determination to date is that by the Geological Survey of Canada on Sample GSC 61-157 from the Cobalt area which was approximately 2,095 million years (Lowdon et al 1963, p.92).

The diabase is essentially an olivine-hypersthene rock which shows olivine in greater proportions in areas near the proposed base of the "sill". The hypersthene is much more widespread and is generally seen in the hand specimens of the medium-grained diabase not affected by granophyre. Coarse- to very coarse-grained diabase is found sometimes in the vicinity of the top of the "sill"; however, in several areas near the base of the "sill", coarse-grained diabase was seen to intrude the medium-grained diabase. The late granophyric phase of the diabase is generally interstitially associated with the coarse-grained diabase, sometimes as irregular zones cutting the diabase and as well-defined aplite dikes. The aplite dikes were most commonly seen near the base of the "sill".

There are two diabase dikes at the eastern boundary of Willet township, one 7,500 feet south and the second, 18,000 feet south of the northeast corner. Both dikes are 300-400 feet wide, but each "spreads out" on the

surface into a form generally thought to be a "sill" northwestward from the township boundary. It is impossible to denote "tops" and "bottoms" of the sill along these diabase "sills" based on mineral-content or on textural-features. The "tops" generally indicated here by the prospectors is to the southwest on the southernmost diabase "sill" and to the northeast on the northernmost diabase "sill", in each case, dipping under the banded siltstone member. The "base" of the sill in each case is on Lorrain arkosic sandstone.

In the vicinity of Entwill Lake, 13,000 feet west and 3,000 feet south of the northeast corner, Willet township, a band of diabase trending to the north-northeast appears to have "tops" towards the northwest and the "bottom" towards the southeast. This is suggested by the olivine-hypersthene content of the diabase to the southeast and the coarse-grained diabase to the northwest of the diabase band. The indicated top continues northward to the Montreal River in lot 4, concession III, James township. The bottom of the sill may continue to the northeast part the arkosic sandstone exposures to the Montreal River where, projecting the "bottom" of the sill northeastward across the Montreal River, it is seen to

roughly agree with the base of the sill seen in lot 11, concession IV, Tudhope township. If this is the case, the diabase in the southeast corner of James township would turn abruptly to the east into a diabase dike which extends into lots 10, 11, 12, concession I, Tudhope township.

The northeast part of James township is extensively covered with diabase providing little to suggest feeder dikes. The bottom of the sill is indicated by hypersthene-olivine diabase and the actual contact with the arkosic sandstone is exposed in lots 1 and 2, concession VI, James township. A dike, picked up at depth by diamond drilling on the Ethel Copper Mine property, may be a feeder dike or may be an actual dike cutting the hypersthene-olivine diabase. The diabase area in lots 1 and 2, concessions IV and V, James township, has a coarse-grained texture which cannot be easily attributed to the "top-of-the-sill".

The diabase dike in lots 7, 8, 9, concessions IV and V, James township, probably goes under the sedimentary rocks to the northeast in lot 7, concession V, as suggested by the amount of alteration seen in the sedimentary rock. This diabase dike may continue across the Montreal River and join the diabase exposed in lot 6, concession VI.

The "base-of-the-sill" in Mickle township is indicated on the map 4,000 feet south and 8,000 feet west of the northeast corner where olivine-hypersthene diabase is present. The contact of the diabase and sedimentary rock is known at the 376-foot level, 10 feet north of the shaft where the contact dips 70 degrees to the south. The Rotondo drill hole at the southeast end of Boland Lake, Mickle township cuts the bottom of the diabase near the present surface. Very coarse- to coarse-grained diabase in Mickle township is mostly seen in a zone trending northwesterly from a point 14,000 feet south and 3,000 feet west of the northeast corner.

The diabase is sometimes referred to as "quartz diabase". The diabase near the "base-of-the-sill" has olivine which has been altered to serpentine and opaque minerals up to an estimated 30 percent of the rock giving the rock a black spotted appearance. Hypersthene was seen to have been inverted from pigeonite with attendant augite exsolution in several thin sections. Hypersthene could be seen in the hand specimens of the slides studied except in specimens having granophyric material where the hypersthene wasn't apparent. Augite pyroxene is also present in most of the thin sections of diabase examined. The plagioclase

in the hand specimens is usually green in colour caused by alteration, generally saussuritization and some sericitization. The altered plagioclase is about An₅₀ in composition. Albite plagioclase injected into the diabase with associated quartz has a typical micropegmatite texture and is loosely referred to as granophyre. The albite plagioclase has hematite dust as inclusions giving the rock a pink hue. Titaniferous magnetite could be seen in some coarse-grained diabase hand specimens.

The thickness of the diabase is known at several localities where intersected by drill holes, the old Beaver Auxiliary mine in lot 9, concession V, James township; the old Beacon mine, lot 4, concession I, James township; and the Welsh Silver Property or old Otisse-Currie mine, 9,500 feet west, and 10,100 feet south of the northeast corner of Mickle township. Each is reported separately under the section on "Description of Properties".

Granophyre

Intruding the diabase rocks is a pinkish acidic material called granophyre, sometimes referred to as micropegmatite. It is common in the Elk Lake area as aplite dikes and as

interstitial material in the diabase groundmass; the aplite dikes are most common in diabase areas near the proposed bottom of the "sill" and the interstitial granophyre most commonly in the coarse- to very coarse-grained diabase.

The granophyre development is sometimes associated with lineaments which here probably control their intrusion. For example, a granophyric-rich rock is associated with the various diabase dikes and some of the sedimentary rocks which are in contact with the strong north-south Makobe Creek lineament in lots 7, 8, concessions II, III, IV, James township. Another possible example of granophyre being controlled by lineaments is in Mickle township where a northwesterly-trending lineament from the vicinity of 5,000 feet west and 13,300 feet south of the northeast corner to Silverclaim Lake has abundant granophyre which in places looks like a medium-grained syenite except for the distinct micropegmatite texture. Most of the granophyre-bearing areas however, cannot be clearly related to lineaments. The granophyre is seen to intrude coarse-grained diabase in Mickle township, 8,900 feet south and west of the northeast corner, as a diffuse dike 12-15 inches wide without having distinct contacts.

Granophyre also intrudes and replaces older sedimentary and granitic rocks, the sedimentary rocks along Makobe Creek, mentioned above being a good example. Another example of granophyre intruding and replacing sedimentary rocks is seen on Jim McGale's property, lot 12, concession III, Tudhope township; at 18,800 feet south, 1,500 feet east of the northeast corner of James township, where well bedded arkosic sandstones have narrow zones of granophyre, 1 to 3 inches in width, controlled by jointing.

Some of the granitic rocks in lots 4 and 5, concessions II and III, James township, near the diabase contact, contain a high proportion of pink albitic plagioclase up to 60 percent by volume, which may have been intruded as granophyre. Similarly, the strong northeast-trending zone or lineament cutting across the granite in Mickle township and lot 12, concession VI, James township, has pink albitic plagioclase and associated chloritization of the mafic minerals which may be caused by granophyre intruded along the lineament, replacing the adjacent granitic rock.

The large exposure at the top of the ridge about 11,000 feet west and 11,500 feet south of the northeast corner of Mickle township, appears to have been formerly arkosic sandstone which has been intruded and replaced by granophyre.

The contact with the underlying diabase, seen above the North American adit in the same locality, has a large magnetic effect because of the presence of magnetite. In lot 4, concession V, James township, the vicinity of the old Moose Horn mine, the granophyre which intrudes the medium-grained diabase has apparently caused a considerable amount of alteration in the diabase. The altered diabase is reddish brown in colour, the feldspars having a brownish stain and the mafic minerals generally chloritized. The altered and surrounding diabase was seen to contain spherical clots of feldspar and quartz minerals which may weather out differentially leaving a pitted surface.

The composition of the granophyre is essentially albitic plagioclase and quartz in micropegmatitic intergrowth. The reddish color^uation is caused by the abundance of hematite dust. The medium-grained granophyre, 4,600 feet west and 13,500 feet south of the northeast corner of Mickle township shows euhedral acid plagioclase grains surrounded by radiating intergrowths of albitic plagioclase and quartz which terminate at an even boundary. Chlorite is the associated mafic mineral, no pyroxene nor amphibole were present. Titanomagnetite altered to leucoxene is a common

accessory mineral as is sphene and apatite; apatite crystals cut the micropegmatite intergrowths. Zircon, zoisite and garnets were present in some of the granophyric specimens. Bowen (1910, p.667) gives the analysis of an aplite dike from James township which shows the Na_2O content to be 6.89 percent and the K_2O content to be a trace; no potash feldspar was seen by the writer in the petrographic slides examined. Bastin (1935) discusses the occurrence of aplite veins or dikes in the diabase rock of the Elk Lake and Gowganda region and their effect on the diabase country rock.

Late Basic Intrusive Rocks

Olivine Diabase

The olivine diabase dikes have a characteristic fresh appearance with minute olivine grains forming part of the matrix for white plagioclase laths. The texture is generally equigranular except along the northeast contact at several exposures where the plagioclase has a porphyritic texture, the euhedral plagioclase phenocrysts being up to 2 inches in length and 1 inch in width. The plagioclase phenocrysts are not white but have a greenish hue.

The ophitic texture is very much evident in ²thin sections where plagioclase laths having the composition of labradorite are in a fine-grained matrix of 25 percent olivine and 10 to 15 percent of augitic pyroxene. Apatite is common and constitutes 3 to 4 percent of the slide. No quartz nor granophyric material was seen. The olivine is estimated to be chrysotile in composition.

The olivine diabase is not present as one continuous dike from Willet township through Roadhouse and into Chown townships, rather it is 18,000 feet long in Willet and the southeastern part of Roadhouse townships where after an offset of 3,500 feet the dike continues northwestward for 13,500 feet when it appears to stop and was not seen until Chown township, where intermittent exposures indicate a dike for 17,000 feet. The dikes are all consistently trending to the northwest and are parallel to various strong lineaments. The olivine diabase dike cuts the Nipissing diabase dike in Roadhouse township.

Pleistocene

The entire region has been glaciated resulting in at least one extensive sheet of glacial till being deposited and which was subsequently modified by later glaciofluvial and glaciolacustrine action.

Remnants of glacial deposition features such as eskers are seen near Henderson Lake, Mickle township. The eskers extend southward as low ridges over a distance of 7,000 feet. A larger esker, 40 to 50 feet high at its northern end, extends southward a distance of 12,000 feet from near the northeast corner, Chown township. A large esker, up to 100 feet in height, extends south-southwestward from the south end of Longpoint Lake, 14,000 feet west and 2,500 feet south of the northeast corner, Lawson township. This esker passes out of the area which this report covers. All the eskers in the area mapped are composed essentially of sand, gravel, pebbles and some cobbles. Boulders are scarce.

Glacial topography, essentially a depositional feature consisting of kames and kettles, is well developed in a small area on the north side of Longpoint Lake near the south boundary of Chown township. Extensive kame and kettle topography is associated with the esker, mentioned above, in Lawson township. The kames and kettles are essentially composed of sand and gravel.

Glacial moraines are not well developed in the Elk Lake area; however, there is one morainic area, 14,500 feet south and 10,000 feet west of the northeast corner, Mickle township. Here numerous ridges are composed of boulders, cobbles, sand and gravel.

Glacial-erosion features, such as striations, are seen to vary in direction from the western part towards the eastern part of the mapped area. The directions plotted on the basemap are those of the most consistent direction in the area represented. In the southwestern part of the map-area, the glacial striae strike S.10-15°W. whereas, in the southeastern part, the striae strike S.20-25°E. In the southeastern part of Chown township where the general direction of glacial striae is S.5°E., a second striae direction of S.30°W. was measured; however, two directions of striae at the same spot was seldom seen.

Glacial erosion has exposed extensive rock areas. In some localities, glacial streams have removed glacial till and overburden depositing it as outwash deposits in the low-lying drainage areas. Such an outwash deposit extends from a point one mile north of Burgess Lake, Mickle township, northeastward to Elk Lake. The outwash deposits here consist of well sorted, stratified sand and gravel deposits. The altitudes measured at the sand and gravel pits in Mickle township 22,000 feet south and 4,000 feet west; and 25,000 feet south, 8,000 feet west are approximately 980 feet and 990 feet respectively.

The well-washed sands, in lots 8 and 9, concession V, James township, at the road's edge are 975 feet and 985 feet in altitude.

A former glacial lake occupied the present Montreal River and bordering areas as is evident by the presence of flat-lying varved clay deposits. Excellent beaches are seen to have been associated with the glacial lake, one beach may be seen at a large gravel pit near the O.N.R. station in Elk Lake, and another at a gravel pit 4,500 feet south, 19,000 feet west of the northeast corner of James township (lot 8, concession VI). Such beach deposits consist of bedded fine and coarse gravels, which at the latter pit dip 35 degrees towards the former lake. The altitude of the above pits are 960 feet each, the measurements taken within the pits. The altitudes taken at the top of the above two pits are 1,009 feet and 1,006 feet respectively. Altitude measurements of the varved clay which represents the bottom of the glacial lake in the vicinity of Elk Lake are between 956 feet and 960 feet above sea level. The fact that the top of the beaches had altitudes approximately 1,010 feet above sea level would suggest that areas below this altitude would have been well washed. This is the

case of the rock exposures on the northeast side of Montreal River, opposite Elk Lake, in the south half of lot 5, concession VI where the altitudes range between 990 feet and 1,000 feet. This accounts for the excellent rock exposures typical of James township on the northeastern side of the Montreal River. The southwest side of the Montreal River south of Elk Lake has poor rock exposures, possibly because the altitudes of this area are above 1,010 feet. A small terrace seen in the varved clay deposits in the north half of lot 8, concession VI, James township with altitudes of 960 feet and 945 feet indicates a short pause in the lowering of the glacial lake.

From the logs filed on the three water wells drilled in James township, it is evident that the varved clay overlies a porous gravel by a thickness greater than 200 feet within 200 feet of the Montreal River (Ontario Department of Lands and Forest's water well), by over 100 feet in thickness within 500 feet of the Montreal River (Ontario Department of Highway's water well), and by 58 feet in thickness at a distance of 1,000 feet from the Montreal River at Mr. Charles Bain's water well, Elk Lake. ~~The Ontario Department of Mines gets its water~~

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~~from Bear Creek.~~ The thickness of the varved clay becomes thinner as the glacial lake beaches are approached.

Structural Geology

The structure of the Archean rocks is mainly a foliation aligned in a northeasterly direction parallel to the proposed contact of the granitic rocks with the metavolcanic rocks which are overlain in this area by flat-lying sedimentary rocks. The metavolcanic rocks present in the area are aligned parallel to the granitic rock foliations.

The Cobalt Group sedimentary rocks are flat-lying and unconformably overlie the granitic rocks and metavolcanic rocks. The Cobalt Group sedimentary rocks were deposited on a very irregular surface. Further local complications are introduced by the intrusions of the Nipissing diabase which the writer suggests were intruded along feeder dikes generally aligned in a northwest-southeast direction and a northeast-southwest direction, parallel to the regional structure. ~~seen on a small scale map of the Cobalt-Gowganda region.~~ This regional pattern is present in the area as strong lineaments which are seen to cut across all the rock types.

The strong lineament along Makobe Creek in lots 7, 8, concessions III, IV, James township, marks a change in lithology, the Lorrain Formation being exposed to the

west and the Gowganda Formation to the east. The lineament acts as a channelway for diabase and later granophyric solutions and may have contributed to the vertical movement.

Other lineaments, for example, the Crane Lake lineament in Roadhouse township is a fault or fractured zone in places. Some fracture zones associated with this lineament have considerable amounts of hematite staining along the fracture planes. Other lineaments in the area have acted as channelways for olivine diabase dikes.

The strong northeasterly lineament cutting across the granitic rock in Mickle township and through lots 11 and 12, concession VI, James township, has extensive alteration in the form of chloritization of the amphiboles in the granitic rock and the coloration of the feldspars from white to pink by the introduction of hematitic dust and possibly some albitic plagioclase. Further this lineament is seen to cut across the diabase area in Mickle township and is marked by the presence of diabase dikes further to the southwest (southwest of Mickle Creek).

The finely banded siltstone member is seen to be brecciated in a number of areas where it is in contact with the intruding diabase rock. In Mickle township, 1,300 feet west and 12,700 feet south of the northeast corner, the banded siltstone has been brecciated and flowed away from the diabase so as to form a brecciated mass overlying a finely banded undeformed sedimentary rock. Flowage in the fine-grained sedimentary rocks is quite common along areas in close proximity to the diabase intrusions.

The structure of the diabase is dependent upon the feeder dike distribution. Banding is poorly developed in the diabase through gravitational settling. The diabase bodies tend to have dike-form in the quartz-rich sandstone rock types of the Lorrain Formation and to form "sills" when associated with the Gowganda Formation.

Economic Geology

The Elk Lake area has been carefully explored by trenching, pitting, and in a number of cases, by shaft sinking, the greatest proportion of the work being done between the first discovery of silver in the area in 1906 and the outbreak of World War I in 1914. To date (1965), these mining properties have been investigated, drilled, shafts repeatedly dewatered, but little information has been recorded. Very little surface geology nor underground geological mapping has been done.

The writer in most cases could sample a mine dump but was not able to examine the mine workings. No attempt was made to sample each exposed vein carefully because of the number found and the amount of vegetation covering them.

A general relationship is that the majority of the shafts are located near the contact with the very coarse-grained diabase and the medium-grained diabase; this does not appear to apply to the Cotley mine or the Otisse shaft in Mickle township.

The plotting of various lineaments seen on the air photographs shows that some are aligned with several pits,

trenches and shafts. The lineaments in some cases are caused by diabase or aplite dikes, by strong jointing or faulting. These may be quite important and should be investigated. It was noted in the field that aplite dikes, diabase dikes, and diabase rock in general contain no carbonate, whereas, in those areas that do contain prospect shafts or interesting prospects, the presence of carbonate in the above rocks is generally evident. However, in some parts of the area away from the known mineral occurrences, diabase dikes, diabase country rock, and aplite dikes, etc. were found to be carbonate-rich.

In the Elk Lake area most of the mineral occurrences are in the Nipissing diabase suggesting some genetic relationship between them. Porous rocks such as the lower conglomerate member of the Cobalt Group sedimentary rocks at Cobalt are missing in the Elk Lake area. Rocks of the Lorrain Formation appear to be poor host rocks as indicated by the general absence of diabase "sills" in their midst, while dikes are common. The reason why the diabase rock is generally the host rock may be that fracturing and alteration has made it more amenable to ore deposition.

The occurrences of silver mineralization seen by the writer are always associated with carbonate veins which, cut aplite veins and specularite veins. The writer has not seen specularite veins cut silver-bearing carbonate veins. However, a specularite vein on the 65-foot level of the Alsof mine merges into a carbonate containing niccolite blebs.

Description of Properties

James Township

Bermead Mining Corporation Ltd. (1)

A group of 13 leased mining claims in James township are presently held by the Bermead Mining Corp., incorporated in 1951. This company succeeds the Jock Sutherland Prospecting Syndicate which held the claims in the 1940's and early 1950's.

The above group of leased claims includes a number of former properties:-

- a) The Tee Arr Mining Company property was originally claim T.R.189, later claim M.R.6352, and presently leased claim M.R.14728, the southwest quarter of the south half of lot 10, concession V. The company was incorporated in 1909, but has been inactive since 1911.
- b) The Elk Lake Cobalt Silver Mining Co. Ltd. property in James township consisted of two claims, T.R.193 presently M.R.12579, the northwest quarter of the north half of lot 10, concession IV, and T.R.194, presently M.R.12580, the northeast quarter of the north half of lot 10, concession IV. A third claim, T.R.192, is in Mickle township and will be

treated separately. The Elk Lake Cobalt Silver Co. was incorporated in 1907 and the claims acquired from Donald McRae, Stewart Smith, James Smith and James Eckford.

c) The Kerry Mining Company, a company with head office in Rochester, N.Y. and Woodstock, Ontario., was patented by supplementary license dated Sept. 26, 1906; however, no annual returns have been filed with the Provincial Secretary since 1910. The property consisted of one claim, T.R.580, presently M.R.12354, being the southeast quarter of the south half of lot 11, concession V.

d) The James Township Silver Mines Ltd., incorporated 1907, apparently controlled two claims in James township and two claims in Mickle township. In James township, only one claim, T.R.443, later M.R.12595, is identified as the northwest quarter of the south half of lot 9, concession V.

e) The Silver Horn Mining Co. Ltd., incorporated 1906, controlled a number of mining claims in James township of which one is in the above group, present claim M.R.12593, the northeast quarter of the north half of lot 11, concession IV.

The first silver discovery in the Elk Lake area was made on the Downey property, claim T.R.189, which in 1909 became the Tee Arr Mining Co. property. A photograph of the Downey vein is reproduced opposite page 256 in A.E. Barlow's paper of 1908.

The No. 1 shaft, just southeast of the centre of the claim, is on the east side of a diabase ridge. The shaft is reported in an extract of a letter by E.C. Smith, consulting geologist to Tee Arr Mining Co. (shown to the writer by J. Sutherland), to be 170 feet deep, and sunk on a north-south calcite vein. A small adit, 10 feet in length, follows a 2-inch specularite vein on the west side of the shaft. Strong jointing, possibly shearing, is seen near the No. 1 shaft striking $N.60^{\circ}E.$ and dipping $80^{\circ}NW.$

A trench follows a carbonate vein from the No. 1 shaft southerly for a distance of 400 feet to the No. 2 shaft. The carbonate vein varies from 1 to 6 inches in width along the trench. It strikes $N.35^{\circ}W.$, and dips $80^{\circ}SW.$ In places, the vein appears to be controlled by shearing in the diabase. The No. 2 shaft is timbered and is estimated to be 30 feet deep. Mineralization

observed by the writer on the dump is niccolite, "smaltite", chalcopyrite, bornite, and carbonate. Aplite-dike rock is also present.

The carbonate vein strikes about S.42°E. from the No. 2 shaft towards the No. 3 shaft over a distance of 200 feet. The No. 3 shaft is estimated to be 10 feet in depth. The carbonate vein is 4 inches wide at the No. 3 shaft, strikes east and dips 60°N. Cobalt bloom is present on the rock dump. A pit is approximately 130 feet to the west of the No. 3 shaft. The No. 4 shaft on the east side of a gully, approximately 200 feet at N.48°E. from the No. 1 shaft, is on a carbonate vein striking in a northeasterly direction and dipping to the northwest. The shaft is timbered (4 by 8 feet) and is approximately 70 feet deep. The carbonate vein is at least 12 inches wide judging from the rock samples seen on the mine dump. Specularite with chalcopyrite is common. Small pits and trenches are scattered south of the No. 4 shaft.

A very vague description of several veins was included in the prospectus of the Elk Lake Cobalt Silver Mining Company filed with the Provincial Secretary. The veins are

referred to the No. 1 claim Post of T.R.193 which may be in the vicinity of the No. 3 shaft.

A shaft is at the base of a diabase cliff 1,300 feet, at N.12°E. from the No. 1 shaft. The depth of the shaft is estimated to be 35 feet. The rock on the dump is sedimentary in appearance, so that possibly the shaft is at or near the sedimentary-diabase contact. An adit partly closed by fallen rock is at the side of the diabase cliff, but no mineralization was seen. A 2-inch carbonate vein with specularite is exposed at the top of the diabase cliff. Much trenching is evident in the area; however, most trenches are filled in with vegetation.

R. Braune Property (2)

Four patented mining claims numbered 2213, 10266, 2214, and 4408, namely the southwest quarter of the south half of lot 5, concession VI, and the northeast, southeast, and southwest quarters of the south half of lot 6, concession VI, James township respectively, are ^{were} ^{in 1885} ~~presently~~ held by R. Braune.

Claims 2213 and 2214 were patented in 1910 by Dr. Stephen H. Murphy of Renfrew. According to J.A. Tremblay, Elk Lake,

the Braune claims were controlled by Ross & Ballard of Renfrew and that the shafts were sunk about 1910.

A shaft, in the southwest corner of claim 2213, has an altitude of about 996 feet above sea level. A trench appears to strike westward from the shaft for 200 feet and a number of irregular dikelets 1 inch to 5 inches wide cut coarse-grained diabase 500 feet west of the above shaft. At 600 feet S.60°W. from the shaft, there is a 2-inch, vertical aplite dike which strikes N.10°E. A hundred feet to the west is an irregular, fine-grained diabase dike cutting the coarse-grained diabase.

A second shaft is near the centre of claim 2214. The writer has no information on this shaft.

The southern three claims expose diabase near the top of the "sill" in an east-west direction. The diabase is coarse- to very coarse-grained with minor amounts of associated granophyre. Lineaments on air photograph 4729-137 conform to the few structures plotted such as veins and minor shearing. Columnar or cylindroidal jointing is common near the edge of the exposure in the south half of lot 6, concession VI.

Diabase Silver Mines, Limited (The) (formerly) (3)

The property of The Diabase Silver Mines, Limited (incorp. 1909) in James township consisted of a number of scattered

claims - two of which were the northeast and southeast quarters of the north half of lot 3, concession II, which were unstaked in 1964.

A pit, estimated to be 20 feet deep, is near the south boundary of the northern claim. The pit is on a calcite-aplite vein which contains chalcopyrite and bornite. The aplite vein, as shown by material on the dump is greater than 6 inches wide and the calcite vein material ranges from $\frac{1}{4}$ to 4 inches in width.

Rock exposures on the claims are few; however, the diabase seen is fine- to medium-grained. A ridge of coarse-grained diabase is exposed southeast of the pit, but its relationship to the surrounding medium-grained diabase is not clear.

Elco Property

(formerly The Devlin Mining Co. Ltd.) (4)

The Elco property consists of three leased claims, M.R.12529, M.R.12530, and M.R.18962, being respectively the northeast and southeast quarters of the south half, and southeast quarter of the north half of lot 1, concession I, James township.

The property was originally owned by Richard Devlin who formed The Devlin Mining Co. Ltd., (incorp. 1908; charter cancelled 1936), doing much of the development work in 1909 and 1910 (O.D.M. 1909, p.125; 1910, p.115). The last recorded work was done by the Enright Mining Ltd. in 1926. In 1926 "a total of 430 feet of drifting and crosscutting and 15 feet of winzing was done on the 100-foot level, and 280 feet of drifting on the 200-foot level, besides a certain amount of diamond-drilling (O.D.M. 1927, p.158). The Elco group acquired the property in the early 1940's.

The Devlin or No. 1 shaft is 215 feet deep with levels at 100 and 200 feet. The shaft intersected a small aplite vein carrying low values of native silver at the 200-foot depth (Can. Min. Jour., 1910, p.606).

A diamond drill hole was drilled in 1926 from the 200-foot level, 25 feet southeast from the shaft, at S.37°E., dip 60° for a length of 675 feet. The purpose of the drill hole was to determine the thickness of the diabase sill and the thickness of the underlying conglomerate formation.

The property is underlain mainly by coarse-grained diabase which is thought to be the top of a diabase "sill" dipping steeply towards the southeast. The sill is interpreted by the writer to merge into a broad dike which strikes eastward into Tudhope township. The upper contact of the diabase sill is in the southeast corner of the property, and of James township, where it is in contact with the overlying upper conglomerate member and banded siltstone member of the Gowganda Formation.

A granitic rock is exposed on the west and east shores of Devlin Lake. A vertical 10-foot diabase dike striking N.45°W. and in line with the No. 1 shaft, 1,250 feet away, cuts the granitic rock on the east side of Devlin Lake. Carbonate is associated with strong shear and joint planes in the diabase dike.

The No. 2 shaft, reported to be 500 feet from the No. 1 shaft, is 50 feet deep (O.D.M. 1909, p.175; 1910, p.115). This shaft was not found by the writer, but is thought to be roughly north of No. 1 shaft. The No. 3 shaft, reported (O.D.M. 1910, p.115) to be 20 feet deep, may be the pit seen at 1,470 feet N.18°W. from No. 1 shaft. This No. 3 shaft is sunk on a calcite vein up to 8 inches in width and strikes N.55°W. Minor

cobalt bloom and minor chalcopyrite is seen associated with the calcite.

R.M. Quigley of the Lawton Field Party, Ontario Department of Mines, in 1954 reports a calcite vein 10 inches wide and striking N.45°E. at 1,450 feet N.10°W. from No. 1 shaft. This may be the Imerson vein reported in this vicinity by Wm. L. Powell. A pit containing a 3-inch wide calcite vein striking N.60°W. is 205 feet at N.74°E. from No. 1 shaft. A second pit containing a 2½-inch smaltite-niccolite vein is 230 feet S.81°E. from No. 1 shaft. A third known pit sunk on a calcite vein striking N.85°W. is 310 feet at N.56°W. from No. 1 shaft.

A trench was seen to follow a 1½-2½-inch calcite vein, striking N.⁸⁰70°W. over a distance of 140 feet with cobalt bloom at the western end of the trench. The trench is 550 feet at N.57°W. from No. 1 shaft.

An aplitic or granophyric zone containing about 20 percent granophyre cuts the coarse-grained diabase at 500 feet N.53°W. from No. 1 shaft. This zone is seen to be about in line with a fault zone, 10 feet in width, which cuts the granitic rock at the edge of

Devlin Lake, 1,300 feet N.50°W. from No. 1 shaft. The fault zone has much granophyric material and associated carbonate material.

There is a considerable amount of pitting and trenching on this property. It is interesting to note that the reported occurrence of native silver on the 100-foot level of the Devlin shaft is in a vein striking N.30°E., roughly normal to the above mentioned fault, dike, and most veins seen.

Ethel Copper Mines Limited (5)

The James township part of the property consists of 6 patented mining claims, all in lot 1, concession VI, numbered 10316 and 10036 being the southeast and southwest quarters of the north half respectively; numbered 9431 and 6165 being the northeast and northwest quarters of the south half respectively; and numbered 3748 and 9331 being the southeast and southwest quarters of the south half respectively.

Little information on the early history of the above claims is available. Claims numbered 9331 and 3748 were

part of the former Elklake-Cobalt Mines of Ontario Limited (incorp. 1908); the claim numbered 9⁴31 was patented in 1911 by Fenwick Ellis, and Henry Dickson patented claim numbered 10036 in 1909. In 1962, the Ethel Copper property was leased by St. Lucie Exploration Company Limited, and in 1965, Ethel Copper again got control of the property.

The writer wishes to acknowledge the kindness of Bill Elliot for access to the logs of 27 diamond drill holes put down in 1961-1962, and of Graham Duff, Sheridan Geophysics Limited, for access to mine plans. The mine was flooded at the time of the writer's visit in 1963 and again in 1964.

Two baselines have been cut, the more extensive line bearing west for a distance of 7,500 feet from the 0 + 00 station, 2,700 feet south and 200 feet west of the northeast corner, James township. Picket lines normal to the baseline are spaced at 200-foot intervals; however, only the 0 + 00 station and the baseline are shown on the map. The second baseline, bearing S.67°W. from the north side of the adit, is approximately 1,000 feet in length. Normal to this baseline are picket

lines at 100-foot intervals, providing a grid system which controls most of the 27 diamond drill holes drilled in 1961-1962.

An induced polarization and electromagnetic survey was made on the property in May and June, 1961, by McPhar Geophysics Limited. The diamond drilling program in 1961-62 investigated the anomalies and outlined the mineralized zone upon which an adit had been started at an earlier date.

The adit, 2,300 feet south, 200 feet west of the northeast corner of James township, is inclined at 20 degrees, bearing S.67°W. for a length of 350 feet. The altitude at the portal of the adit is approximately 990 feet above sea level. At the bottom of the adit (125-foot level), a 25-foot crosscut to the south intersects the vein zone which was drifted on to the east and to the west for a total distance of 500 feet.

The mineralization of the vein zone consisted of chalcopyrite, bornite, and specularite in a carbonate matrix; however, the veins are richest in the diabase and submarginal in the underlying sedimentary rocks. The grade of the ore according to the Prospectus filed with the Ontario Securities Commission is 3.15 percent

copper over 6.3 feet. Assays reported in the diamond drill logs show a wide range of values, one of the better values being 10.4 percent copper over 2.8 feet.

On the property a thin covering of fine- to medium-grained, olivine-hypersthene diabase overlies arkosic sedimentary rock 1,000 feet southwest of the adit. According to the attitude of the horizontal jointing north of the adit, the diabase appears to dip towards the east. Conglomeratic sedimentary rock was encountered at the surface by diamond drilling 400 feet east of the adit.

The diabase is 100 feet thick at drill hole 61-17, located 950 feet at S.35°W. from the adit, and is 100 feet thick at drill hole 62-1, located 1,600 feet at S.35°W. from the adit. One of the S. Rosenblat holes, 2,300 feet at N.54°E. from the adit, cuts the diabase where it is 140 feet thick.

A lineament, seen on aerial photograph 4729-139, projects into James township from Tudhope township on the south side of the adit. This lineament, 3,500 feet from the adit, towards the east where it crosses the Big Jackpot mine road, is ^{indicated by} a coarse-grained diabase
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dike with interstitial granophyre; however, the logs of the drill holes that would have intersected this lineament in the vicinity of the adit seldom mention a coarse-grained diabase being encountered. The lineament which appears to follow the underground workings may be a dike; although the dike was not seen at the surface. The company prospectus refers to faulting as the control of the vein system, the north side of the fault dropping a vertical distance between 90 and 130 feet. A second lineament is seen to cross into James township from Tudhope township 400 feet south of the adit.

A shaft on the western boundary of the property, on claim 6165, is reported to be 70 feet deep. It is sunk on a vein up to 8 inches wide, striking $N.63^{\circ}E$. and dipping $80^{\circ}NW$. A 10-inch shear zone parallels the vein. Samples taken from the dump contain calcite, chalcopyrite, bornite, and specularite. Some of the material showed brecciated arkosic sandstone associated with the mineralization.

German Development Company Limited (The) (formerly) (6)

The former property of The German Development Company is claim M.R.202, presently unstaked, the southeast

quarter of the north half of lot 9, concession V, James township. The company was incorporated in 1906, but went out of business after 1913.

Photographs of the outcrop of "the Big Vein" on claim M.R.202 are given in a paper by A.E. Barlow (1908, facing pp.256, 264), and native silver and smaltite are noted as occurring in this 18-inch calcite vein.

A shaft, estimated to be deeper than 30 feet, is shown on Lenwood Mining & Explorations Ltd. geological assessment map (O.D.M. file No. 63A.316).

Giles Property (former) (7)

A former claim M.R.18605 held by D. Giles in 1950, which was claim M.R.23 in 1908, was in 1964 claim M.R.35072, being the northwest quarter of the south half of lot 7, concession V, James township.

D. Giles did assessment work on this claim in 1950 and reported low silver values associated with galena mineralization.

A pit near the centre of the claim is sunk on an irregular quartz vein with associated galena. The vein

is up to 16 inches in width and is trenched over a length of 50 feet exposing a shear zone parallel to the vein, striking N.65°E. and dipping 80°SE. The shear zone is up to four feet in width.

A small trench 25 feet north of the pit exposes a gossan zone in a conglomerate caused by the oxidation of sulphides, mainly chalcopyrite, disseminated in the sandstone matrix.

Granophyre with disseminated specularite is seen associated with a thin band of arkosic sandstone in greywacke-siltstone 400 feet south of the pit. The granophyre also cuts the sedimentary rock as irregular veins.

J.J. Gray

(formerly Big Six Silver Cobalt Mines Limited) (8)

The leased claim, M.R.15116 is the southwest quarter of the south half of lot 8, concession VI, James township, and in 1964 was held by J.J. Gray of Toronto. It was originally claim T.R.521, later M.R.177, operated by the Big Six Silver Cobalt Mines Limited (incorp. 1906) in 1909. In 1912, the plant of the Big Six property

was purchased by The Regal Mining Co. (Can. Min. Jour., 1912, p.318). This claim was one of the two leased claims held by Lenwood Mining & Explorations Ltd. in the early 1950's.

The annual report of the Department (O.D.M. 1910, p.115) states that a shaft has been sunk to a depth of 194 feet with 60 feet of drifting on the 100-foot level.

The Big Six shaft may be located in the northwest part of the claim. It was not found by the writer while traversing the area.

J.J. Gray and C.L. Murray (9)

(formerly Beaver Auxiliary Mines Co. Ltd.)

Leased claim M.R.12352 is the northeast quarter of the north half of lot 9, concession V, James township, and in 1964 was held by J.J. Gray of Toronto. The claim, formerly T.R.529 (not T.R.531) and M.R.87, was originally one of the John Gordon Donaldson claims and was patented in 1910. Donaldson operated the property up to 1912 when it was purchased and operated by Beaver Auxiliary Mines Co. Ltd. (incorp. 1912) of

which the Beaver Consolidated Mines Ltd. held 75 percent of the stock (O.D.M., 1913, p.123).

The early operations are described in annual reports of the Department (O.D.M., 1912, p.149; 1913, p.123; 1914, p.154; 1915, p.127; 1926, p.141; and 1927, p.151).

The Beaver Auxiliary was operated at intervals up to 1926-27. In 1928 the property and machinery was offered for sale. Little information is available between 1928 and the late 1940's when Port Coldwell Mines and Metals Ltd. had control in 1947. Lenwood Mining & Explorations Limited (see p.76) held this and another leased claim (M.R.15116) along with a group of 14 unpatented claims, all in James township and mostly in lots 7, 8, 9, and 10, concession V. From Lenwood Mining the property passed to C.L. Murray and J.J. Gray who, in 1963, dropped the 14 unpatented claims.

A shaft, later called the No. 2 shaft, was sunk on a north-south vein by Donaldson following the vein down to the 100-foot level with not much silver showing in the vein. The vein widened from 4 to 8 inches on the 100-foot level about 40 feet south of the shaft and is

reported to have assayed 2,000 ounces silver per ton ore (Can. Min. Jour., 1912, p.470).

After the Beaver Consolidated group took over in 1912, it was decided to sink a new shaft because the No. 2 shaft would not be adequate for extensive operations. In 1913, the new shaft (No. 1 shaft) was 220 feet deep and the north-south (No. 1 vein) was cut on the 200-foot level, 60 feet east of the shaft where the silver values were not encouraging. A drift on the 200-foot level to the south encountered a rich ore shoot assaying 5,000-6,000 ounces silver per ton over a width of $2\frac{1}{2}$ -3 inches (Can. Min. Jour., 1913, p.623). Before the mine was closed in August, 1914, the No. 1 shaft was 275 feet deep with two drifts on the 200-foot level, one to the north and one to the south.

In 1925 the mine was dewatered with 65 feet of drifting and 65 feet of crosscutting on the 200-foot level, and 164 feet of drifting and 40 feet of crosscutting on the 300-foot level (O.D.M. 1926, p.141). In 1926 the shaft was sunk 485 feet below the 300-foot level where a heavy flow of water was encountered, which prevented lateral work being carried on at the

800-foot level. In addition to the shaft-sinking, a total of 285 feet of cross-cutting, 291 feet of drifting, 50 feet of station cutting, and 12 feet of raising was done mainly on the 600-foot level (O.D.M., 1927, p.151). The mine was closed at the end of 1926.

A diamond drill hole from the 300-foot level, inclined 85 degrees, was put down to determine the thickness of the diabase sill and the thickness of the conglomerate underlying the sill. The upper contact of the conglomerate was reached at a distance of 760 feet from the surface and the drill hole was being driven towards the lower contact of the conglomerate (Can. Min. Jour., 1925, p.1055). No further information could be found by the writer as to the outcome of the drilling.

The No. 1 shaft, is near the centre of the claim. No. 2 shaft is 300 feet at N.20°E. from the No. 1 shaft. The altitude of the No. 1 shaft is about 1,111 feet above sea level and the No. 2 shaft is about 1,129 feet. The depth of the No. 1 shaft is not known with certainty, possibly greater than 670 feet and the depth of the No. 2 shaft is approximately 150 feet. The mine

plans filed with the Mines Inspection Branch indicate a No. 3 shaft at 400 feet S.33°E. from the No. 1 shaft. A trench on the No. 3 vein extends N.60°E. from the No. 3 shaft. The No. 4 vein 60 feet east of the No. 3 shaft has a strike of N.80°E. The No. 2 vein, which joins the north-south No. 1 vein from the east, is 130 feet at N.55°E. from the No. 1 shaft. The No. 2 vein strikes N.60°E. The No. 1 vein appears to dip 80°W. The vein is narrow, but, as described in the literature, widens at places to as much as 8 inches.

Mineralization at the Beaver Auxiliary is galena, niccolite, "smaltite" or a cobalt-bearing mineral, and silver. Silver mineralization is mentioned to have occurred on the 200-foot level, possibly between 40 and 100 feet south on the south drift.

Several pits and trenches were reported to have been put down on this property. A 6-foot deep pit is on a 3-inch calcite vein with associated chalcopyrite and bornite at about 500 feet S.63°W. from the No. 1 shaft. This vertical vein strikes N.40°W. A trench is indicated on the Lenwood assessment work map at a

distance of 1,400 feet, N.63°W. from No. 1 shaft.

K.D. Lawton's field party in 1954 found several trenches in conglomerate at about 1,700 feet S.40°E. from the No. 1 shaft. No mention is made of vein occurrences.

Langham Cobalt Mines Ltd. (The) (formerly) (10)

The south half of lot 1, concession III, James township was originally given to Joseph C. Rogers, a Fenian Raid veteran, as a grant from the crown under special act of Parliament. The land was sold to Messrs. Hamilton and Gavin.

The west half, about 72 acres, was sold by Mr. Hamilton to H.H. Lang, who in turn sold it to a syndicate which formed a company, The Langham Cobalt Mines, Ltd., incorporated 1909. No annual returns have been filed with the Provincial Secretary since 1913.

The eastern half, of 90.9 acres, was sold to Robert T. Mullen of Montreal, who organized The Gavin Hamilton Mining Company Limited, incorporated 1908. The company went into liquidation in the latter part of 1909.

Annual reports of the Department (O.D.M., 1909, p.126; 1910, p.115) state that the Gavin Hamilton shaft had been sunk to a depth of 160 feet with crosscutting, and drifting for 95 feet to the east and 100 feet to the north. The Langham Cobalt Mines shaft is reported to have been sunk to a depth of 60 feet.

The Gavin Hamilton shaft is in the southwest corner of the northeast quarter of the south half of lot 1, concession III and the Langham shaft is 450 feet, due west of the Gavin Hamilton.

A lineament striking N.75°W. is seen on aerial photograph 4727-27 passing to the north of the Gavin Hamilton shaft. Other lesser lineaments are probably trenches bearing N.35°E. The Langham shaft is on a 10-inch wide calcite vein with brecciated diabase fragments in it. The vein is vertical and strikes N.50°E. The minerals seen are bornite, chalcopyrite, pyrite, and cobalt bloom.

The prospectus filed with the Provincial Secretary by The Langham Cobalt Mines, Limited mentions that the Gavin Hamilton group had stripped 11 veins, 8 of which contained silver. The veins were reported to be striking east-west, numbered from the north to the

south. The Gavin Hamilton shaft is reported to have been sunk on the No. 3 vein which is from 4 to 24 inches wide carrying niccolite, smaltite and silver in a calcite matrix.

The workings that were not covered with vegetation when examined by the writer include a trench on a calcite vein 400 feet at S.70°W. from the Gavin Hamilton shaft. There is an old shaft or pit with calcite, quartz, specularite, chalcopryrite on the rock dump 250 feet at S.25°W. from the Gavin Hamilton shaft. The calcite, specularite, chalcopryrite vein is in the centre of an aplite dike or vein. A small trench 500 feet at S.45°W. shows a vuggy quartz-calcite vein which strikes east parallel to fracturing in the diabase.

The country rock is fine- to medium-grained diabase becoming rich in granophyre at the western edge of the outcrop, 1,000 feet northwest from the Gavin Hamilton shaft.

Laurin-Welsh Property (11)

(formerly Moose Horn Mines Ltd.)

The former Moose Horn Mines Ltd., a New York City

based company, incorporated 1907, bought four mining claims, being the north half of lot 4, concession V, James township. The vendors of the claims were Charles Gifford and James S. Garvin. The company charter was cancelled in 1953 and the last annual report was filed with the Provincial Secretary in 1920.

Today, the property is composed of two patented claims, numbered 6666 and 6667, southeast and southwest quarters respectively; and two unpatented claims, M.R.38997 and M.R.38998, the northwest and northeast quarters respectively. The patented claims are held by Leonard Laurin of Elk Lake, and the unpatented claims are held by G.S. Welsh, Matachewan.

The annual reports of the Department (O.D.M. 1909, p.126; 1910, p.116; 1912, p.149; 1913, p.124; and 1914, p.155) indicate that two shafts have been sunk, one to a depth of 35 feet and the main shaft to a depth of 125 feet from which level 1,000 feet of drifting had been done. Two winzes were sunk to depths of 50 feet and 75 feet below the 125-foot level.

The Can. Min. Jour. (1908, p.133) reports that a number of rich narrow veins with high silver values were being developed; a high grade ore find on the 125-foot level (1910, p.185); a small trial shipment

of ore (3.00 tons) (1910, p.735); niccolite and cobalt at the 150-foot level (probably 125-foot level) (1913, p.125).

No mine plans nor geological records on the mine property have been kept. There is a shaft in the northwest quarter claim altitude 991 feet above sea level, near Highway 560 to Charlton from Elk Lake. This probably is the main shaft, 125 feet deep. The large rock dump contains aplite vein material cutting diabase, calcite veins cutting aplite veins, cobalt-bearing arsenide minerals, calcite vein material greater than 4 inches wide, and a little native silver.

There is a vertical aplite dike, 8 to 10 inches wide, striking N.70°E. at S.80°E. for 200 feet from the main shaft. A gossan is associated with this aplite vein which can be traced over a distance of 250 feet. Carbonate in fractures is abundant in this vein; however, carbonate is not always associated with aplite veins nor granophyric diabase.

A small shaft, altitude 1,009 feet above sea level, on the east side of Moosehorn Creek, and also

on the east boundary of the property, is 1,850 feet at S.58°E. from the main shaft. A vertical 2 to 3-inch calcite vein in the shaft strikes N.5°W. A trench follows this vein south from the shaft for a distance of 100 feet.

A larger shaft, altitude 990 feet above sea level, south of the small shaft mentioned above, is 2,100 feet, at S.65°E. from the main shaft. This shaft, according to the size of the rock dump, may be about 100 feet deep. Aplite vein material cut by calcite with associated cobalt bloom was seen on the rock dump, but the mineralization was not extensive. Trenching extends eastward, at N.55°E. for a distance of 210 feet where it is met by a second trench from the north, bearing N.10°W. Some work would be required to clean the trenches for examination.

The above-mentioned shafts are all sunk in diabase that has a medium-grained texture and varying proportions of interstitial granophyre which ranges from 10 to 30 percent of the rock. Very coarse-grained diabase is exposed at 400 feet to the northwest of the main shaft; however, this facies of the diabase after extending eastward near the "top-of-the-sill" to the above spot,

turns abruptly to the south. The medium-grained diabase in the shaft area generally has an altered appearance, possibly caused by the introduction of the granophyre. The altered diabase has brownish stained feldspar and chloritized pyroxene in the hand specimen. At an outcrop, 700 feet at N.68°E. from the main shaft, the diabase, though not strongly altered, still shows the effect of the alteration by the development of spherules of granophyre which are clearly evident on the weathered surface (see photograph 9).

Lenwood Mining and Explorations Limited (formerly) (12)

In 1956 Lenwood Mining and Explorations Limited¹ held a group of 14 unsurveyed claims, M.R.22325 - 36 incl. and M.R.22548, 49 in lots 7, 8, 9 and 10, concession V, and in lot 10, concession VI, James township. The claim group included the former German Development Co. Ltd. claim on which there is a shaft 30 feet deep (see p. 62). The claims were cancelled in 1957.

1

Charter cancelled July 8, 1965.

A geological survey covering the 14 claims was made for the company by C.F. Cockshutt in 1956 and filed for assessment work credit with the Ontario Department of Mines (File No. 63A.316). In addition to the old pits and trenches shown on Map 2000 the assessment work map shows an adit with calcite stringers just west of the transmission line in the centre of claim M.R.22325 (the southeast quarter of the north half of lot 8, concession V), and two pits and a trench on the contact of a north-south diabase dike in the west part of claim M.R.22335 (the southwest quarter of the north half of lot 10, concession V). No vein material is recorded in them.

As shown on Map 2000 the claims are underlain from east to west by the greywacke-siltstone (dip 10° S) and conglomerate members of the Gowganda Formation; Nipissing diabase as a sill striking NE., the top being to the southeast. The diabase sill is underlain by the arkosic sandstone member of the Lorrain Formation, the conglomerate member of the Gowganda Formation, and they in turn by granite cut by a diabase dike. The lineaments (joints?) in the diabase sill strikes $N.60^{\circ}$ to 70° E. and $N.25^{\circ}$ to 40° W.

McKenzie Property (13)

The leased mining claim, M.R.14770, the southeast quarter of the south half of lot 4, concession III, James township, formerly T.R.846, was developed by the McKenzie Mining and Exploration Company, Limited, incorporated 1908. No annual returns have been filed with the Provincial Secretary since 1909.

Miller (1910, p.163) states:

"At the ^aMcKenzie a shaft has been sunk 60 feet, with a cross-cut to the southwest. There were two veins which dipped to the northeast in the shaft. The cross-cut was made to intersect a vein which showed on the surface 35 feet from the shaft. This vein strikes N.29°W., dips to the east, and has been developed by a shaft 30 feet deep and a long open cut and trench. The vein material is banded, consisting of aplite, with white and grey bands of calcite carrying copper pyrites. Native silver in small scales has been obtained in the vein of grey calcite. A number of veins occur on the property but most of them are undeveloped. An eight-inch basalt dike cuts the sill diabase and veins at the workings".

The Can. Min. Jour. (1910, p.735) mentions that the mine operations were shut down, but were in operation in 1913 (1913, p.125).

The main shaft is in a gully in the north-central part of the claim. The shaft is on a vein which is trenched westward; the 1-inch vein of calcite strikes

N.40°W. and dips 65°NE. About 40 feet to the south, a second trench follows a 1½-inch calcite vein, striking N.33°W., and dipping 75°NE. The trench follows the vein for 100 feet. A small shaft is also on this vein. Granophyre or an aplite vein parallels the calcite vein.

The diabase in the vicinity of the trenches is medium- to coarse-grained with a minor amount of interstitial granophyre. Fracturing cuts the diabase near the trenches, striking N.87°E. and dipping 80°S. Strong fracturing, possibly faulting, striking N.40°E. and dipping vertically is seen to roughly follow a gully. The mine workings are near the zone between the medium-grained diabase to the north and to the east and the coarse-grained diabase to the south and to the west.

A pit approximately 20 feet deep is 800 feet N.78°E. from the McKenzie shaft. The pit is on a vertical, pink calcite vein in places greater than 2 inches wide which strikes S.55°E. from the pit. A narrow aplite vein is associated with the calcite vein. A second vein on the west side of the pit has

dark calcite over a width of 4 inches, strikes N.82°E. and dips 70°S. This vein follows prominent cylindroidal jointing turning southeastward towards the pit.

Master Stein Cobalt Mining Company Limited (The) (formerly) (14)

The northeast quarter of the south half of lot 4, concession III, James township was prospected by a Winnipeg company called The Master Stein Cobalt Mining Co. Ltd., incorporated in 1907. The company ceased operations about 1912.

The property has a prominent lineament in the form of an east-west valley and a south-facing escarpment of diabase. At the base of the diabase cliff there is a 20-foot pit on a vertical quartz-calcite vein, 10 inches wide, striking N.55°E. A flat-lying 2-inch aplite vein is also present at the pit.

A sheared zone, striking N.65°E., and dipping 80°S. was found at the base of the escarpment, parallel to a minor lineament.

Montreal River International Silver Mines, Limited (15)

Montreal River International Silver Mines, Ltd. held the following parcels namely: in James township, north part of broken lot 6, concession VI, constituting 159½ acres; lot 7, concession VI, north of the Montreal River, constituting 196 acres; and patented claim 3485, the southwest quarter of the north half of lot 3, concession VI.

The property on lot 7, concession VI, formerly held by David Donovan, a veteran of the Fenian raid, was acquired by Montreal River International Silver Mines, Limited. Diabase is exposed but no pits nor shafts were seen while mapping this lot. The property on lot 6, concession VI, formerly held by James Beattie, a Fenian raid veteran, was acquired by the company in 1907. The country rock is sedimentary and its contact with the diabase is close to the line separating lots 6 and 7. The diabase is thought by the writer to dip easterly under the sedimentary rocks for a short distance. Claim 3485 in lot 3, concession VI straddles the contact between the

diabase rock to the southeast and the sedimentary rock to the northwest, the contact being vertical. According to the Can. Min. Jour. (1908, pp.133 and 479) the vein following the contact was exposed over 400 feet in length and is up to 20 inches wide. A shaft was sunk on this vein, and the mineralization is reported to be niccolite, "smaltite", and a little silver in a carbonate matrix. The shaft, in the southwest corner of claim 3485, has an altitude of 999 feet above sea level. It is on two carbonate veins, each striking N.25°E. and dipping 80°NW. The writer did not see any niccolite or silver on the mine dump.

A 24-inch quartz vein in granite with pockets of pyrite and minor specularite is exposed in a 30-foot long trench at 1,250 feet N.17°E. from the above shaft. This vein is about on the north boundary of claim 3485.

Mother-Lode Mining Co. Ltd. (The) (formerly) (16)

The presently unstaked claim, T.R.522, later M.R.17, the northwest quarter of the south half of lot 8, concession VI, James township, was originally owned by Herbert Gates. He sold it to a Detroit

syndicate which formed The Mother-Lode Mining Co. Ltd., incorporated 1908. No annual returns have been filed with the Provincial Secretary since 1914 and the company's charter was cancelled in 1958.

Annual reports of the Department (O.D.M., 1909, p.126, 1910, p.116) give the following information: An adit, total length of workings, 365 feet; a winze sunk 50 feet on a vein; a raise for 25 feet; and a shaft sunk 100 feet. The Can. Min. Jour. (1908, p.479; 1909, pp.250, 340) gives descriptions of the development work.

The writer wishes to thank R.W. Christoph, Toronto for access to his sketch map and comments made on the "Mother Lode" property in 1959.

An adit, 30 feet southeast of the Mother Lode shaft goes south for 36 feet before encountering a small calcite crossvein $\frac{1}{2}$ to $\frac{3}{4}$ inch wide, striking to the southeast. The vein is drifted upon for a further distance of 32 feet where it pinches out. A second vein with east-west strike was encountered near the end of the drift. A drift followed this vein west and at eight feet a third vein, $\frac{1}{2}$ to 2 inches wide, striking

N.20°W. was found. It consisted of calcite, specularite, and chalcopyrite. This third vein was drifted upon for a length of 45 feet. The third vein is roughly in line with the shaft. The second vein was drifted upon further to the west, a winze being sunk on the vein approximately 10 feet west of the third vein. The winze is 50 feet deep and dips parallel to the vein at 68 degrees to the north. Native silver is said to have been mined from the winze. The Can. Min. Jour. (1909, p.314) reports there is a 60-foot raise on the second vein 6 feet west of the winze. Native silver, argentite, and minor cobalt-bearing minerals were exposed at the top of the raise. The vein near the bottom of the raise, west wall, is 1½ inches wide containing abundant chalcopyrite in calcite. The drift along the second vein continues to the west, possibly for another two hundred feet.

Mr. Christoph's sketch shows the drift on the second vein to turn southwestward, however, the sketch was not to scale and the workings were not visited by the writer.

The shaft is 100 feet deep, and the altitude is about 1,047 feet above sea level.

A trench filled with vegetation extends westward from the adit for a distance of 400 feet. A second trench to the south at the top of the hill parallels the first trench. A pit at its eastern end is probably the pit which Gates first worked and in which the silver values are reported to have pinched out at a depth of 15 feet (Can. Min. Jour., 1908, p.133).

Norton-McMahon Property (17)

The unsurveyed mining claim M.R.30677, formerly M.R.21308, is the northeast quarter of the south half of lot 2, concession I, James township. The claim is part of a group held by H.E. Norton and L. McMahon of Elk Lake.

A 20-foot pit, is sunk at the southern end of a $1\frac{1}{2}$ to $2\frac{1}{2}$ -inch wide, vertical, calcite vein striking N.35°E. and trenched over a distance of 100 feet. The pit was full of water when visited by the writer, but K.D. Lawton, Ontario Department of Mines, reported in 1954 that native silver, a cobalt-bearing mineral, and cobalt bloom were present in the pit. Chalcopyrite and specularite mineralization is also present in the vein along the trench.

A second vein, parallel to the above vein, is 100 feet to the southeast, and is exposed over a length of 50 feet. The vein is controlled by strong cylindroidal or columnar jointing, striking N.20°E. at the north end, and N.25°W. at the south end. The maximum width is 4 inches, generally 1½ inches in width. K.D. Lawton in 1954 reported seeing native silver, niccolite, and a cobalt-bearing mineral "smaltite" in this vein.

The veins are in an area underlain by coarse-grained diabase, however, the medium-grained diabase is nearby to the south and west. A lineament seen on air photograph 4726-39 passes from Devlin Lake northwestward across the southern end of the trenches.

Patricia Mines, Limited (formerly) (18)

The old Patricia Mines, Ltd. property, open to staking in 1964, is the northwest quarter of the south half of lot 2, concession II, James township.

A shaft in the southeast corner of the claim is probably the old Patricia shaft. It is a two-compartment, 5 by 7-foot shaft, estimated to be 90 feet deep, sunk on the north side of a hill where

there is a 12-inch aplite dike and an 8-inch calcite vein. The dike and associated vein, which strike west, extend westward for a distance of 200 feet. Specimens taken from the mine dump contain calcite, chalcopyrite, specularite and cobalt bloom.

The diabase in the vicinity of the shaft is a fine- to medium-grained hypersthene diabase. The writer suggests that the shaft is located in the lower part of the Nipissing diabase "sill".

Prudential Mines Limited (formerly) (19)

The Provincial Secretary's files show that the former Prudential Mines Limited was incorporated in 1908, and acquired five claims from John J. McNeil in 1908. The five patented claims are 10394, 9732, and 9733 being the northeast, southeast, and northwest quarters respectively of the south half of lot 5, concession VI, James township, and 9666 and 4345 being the southeast and northwest quarters respectively of the south half of lot 4, concession VI. No annual returns have been filed since 1910. In 1964 claim 9666 (M.R.30805) was held by G.S. Welsh.

The early work is described in an annual report of the Department (O.D.M. 1913, p.124) and by Miller (1910, p.161). A shaft had been sunk to a depth of 125 feet on an aplite dike which at a depth of 30 feet had reopened, with the formation of a "smaltite" vein. At the bottom of the shaft this vein was about 1 inch wide with an inch of aplite on either side.

The shaft, on the east boundary of claim 10394 has a barren 10-inch carbonate vein on the north side of the shaft. A series of fractures filled with carbonate and vuggy quartz are exposed 200-300 feet north of the shaft.

A diabase dike conforming to a lineament on aerial photograph 4729-137 strikes N.70°E. 200 feet south of the Prudential shaft.

Regal Mining Company, Limited (The) (formerly) (20)

The former claim T.R.832, later M.R.276, unstaked in 1964, is the southeast quarter of the south half of lot 9, concession VI, James township. It was developed by a Detroit company, The Regal Mining Company, Limited, incorporated 1908. The company has been inactive since

Feb. 1911 although the treasurer, Edward Telfer, had a lease on the claim for 10 years subsequent to 1911.

The Regal shaft is 250 feet deep with 75 feet of crosscutting on the 200-foot level (Miller 1910, p.161; O.D.M. 1913, p.124). The Can. Min. Jour. (1913, p.125) states that the purpose of the crosscutting is to intersect the "Donaldson" or No. 1 vein striking north from the Beaver Auxiliary shaft to the south.

The exact position of the Regal shaft is not known; however, it may be the shaft in the southeast corner of the claim which has an altitude of 1,138 feet above sea level and a large dump on the south side of the shaft. No mineralization was evident on the dump.

A second shaft which at the time of the field work was thought to be the Big Six shaft, and reported as such on Preliminary Map P.239, is near the northeast corner of the claim. The altitude of the second shaft is 1,064 feet above sea level. A small shaft or pit is near the southeast corner of the property.

Solomino Gold Mines Limited (21)

The Solomino Gold Mine property in James township in May, 1963 consisted of a block of nine unpatented claims with claim M.R.28868 in the centre. Most of the development work is on claims M.R.28868, the northwest quarter of the north half of lot 3, concession and M.R.28869 I; the northeast quarter of the north half of lot 4, concession I.

Claim M.R.28869, originally the Cleaves claim, was bought by an American company, the Beacon Consolidated Mines, Limited about 1909. Development work is reported in the Ontario Bureau of Mines reports (1910, p.161; 1913, p.123; and 1915, p.126). Assessment work has been filed with the Ontario Department of Mines for claims M.R.22004 (in 1964 M.R.28868) and M.R.22005 (in 1964 M.R.28869). The No. 1 Post of claim M.R.22005 is 1,100 feet N.35°E. from the Beacon shaft.

The writer wishes to thank Roy Zarysky, of Solomino Gold Mines Limited for access to geological reports on the property by G.L. Holbrook, consulting geologist.

An old road, now a trail, connects the property with the Montreal River $1\frac{1}{2}$ miles to the northeast. A new road was built in 1963 from a point approximately $3\frac{1}{2}$ miles south of Elk Lake on a private lumber road eastward for 8,500 feet to the Beacon shaft.

The 7 by 12-foot vertical shaft sunk by the Beacon Consolidated Mines, Limited is between two ponds within claim M.R. 28869. The shaft was sunk to a depth of 200 feet where there was approximately 500 feet of cross-cutting and some drifting done by 1912. Further deepening of the shaft from a depth of 200 feet to 500 feet was stopped at 376 feet with the outbreak of war in 1914. Stations were completed at the 100-foot and the 300-foot depths, and a level at the 200-foot depth before 1914.

The Beacon shaft was sunk on an easterly-trending calcite vein now covered with broken rock. This vein is said to have contained native silver near and at the surface. The recent assays by Solomino on samples from 19 calcite veins intersected by the crosscut on the 200-foot level showed values below 1.0 ounces silver per ton.

An old shaft is 1,600 feet, S.70°W. from the Beacon shaft. The country rock is coarse- to very coarse-grained diabase with interstitial granophyre; however, the fine-grained diabase seen on the rock dump represents a diabase dike which may be the continuation of the diabase dike exposed 1,000 feet to the east. The shaft is estimated to be 60 feet deep.

A small trench 570 feet, at N.33°E. from the Beacon shaft follows a narrow quartz-calcite vein containing specularite and chalcopyrite. The vein is vertical and strikes N.60°E. A second trench, 450 feet, at N.50°E. from the Beacon shaft consists of several calcite veins up to 2 inches in width along a zone striking N.70°E. When first visited by the writer in 1963, the vein consisted essentially of calcite with cobalt bloom along the vein contacts; however, later in 1963, Solomino Gold Mines did further work and opened a 2-inch calcite vein along the north side of the trench which contained native silver. The company reports samples assayed up to 3,285 ounces silver per ton. A pit, 10 by 25 feet, was sunk on the vein or zone to a depth of 12 feet. Native silver was also associated with cross

fractures in the diabase bordering the calcite vein. A sample taken across a width of 2 feet at the bottom of the pit is reported by the company to contain 224.1 ounces silver per ton and 3.42 percent cobalt. Six diamond drill holes under the trench did not intersect any visible silver. There are several old trenches, mostly filled with vegetation, at a distance of 1,500 feet, N.26°E. from the Beacon shaft; however, a shallow pit exposes a small calcite vein $\frac{1}{2}$ to 1 inch in width striking N.65°W. and dipping 85°N. Irregular aplitic vein material $\frac{1}{2}$ to 1 inch in width was seen on the dump. Mineralization appeared to be essentially chalcopyrite. A drill hole put down in 1964 for a length of 121 feet to intersect the above vein shows the country rock to be medium-grained diabase with about 1 to 2 percent interstitial granophyre. Carbonate is present in minor amounts with some of the granophyre.

A diamond drill hole dipping 78° was put down in 1963 from the 300-foot level of the Beacon shaft, towards the south (exact bearing is not known). The purpose of this drill hole was to locate the diabase-sedimentary rock contact which was intersected at 325 feet. The

sedimentary rock intersected is finely bedded to banded siltstone which would be mapped as a member of the upper Gowganda Formation. The sedimentary rock is in contact with a granitic-looking rock at footage 329. The hole was stopped at footage 360. The thickness of the diabase body at the Beacon mine would be about 618 feet.

The diabase intersected by the drill hole is mainly a fine-grained rock containing altered olivine and hypersthene. Near the bottom of the diabase, in the vicinity of footage 290, epidote, minor granophyre, and minor carbonate are associated with the diabase.

The surface rock in the vicinity of the Beacon shaft is a medium-grained diabase. A strong magnetic deflection is noticed in this area, in particular where the medium- and the coarse-grained diabase are in contact. The coarse- to very coarse-grained diabase is 200 feet southwest of the shaft where it appears to be intruding the medium-grained diabase. Variable amounts of granophyre are associated interstitially with the coarse-grained diabase. It is to be noted that most of the development work has been done in medium-grained hypersthene-bearing diabase, but is in close proximity

to the coarse- to very coarse-grained diabase to the south and west.

Thorlit Exploration Limited (22)

In 1964 Thorlit Exploration Limited held the south half of lot 2, concession V, James township.

R.H. Waddell (23)

In 1964 R.H. Waddell held 20 unsurveyed claims M.R.38946-38951, 39236-39239, 39565-39568, 41580-41585 in lots 1 and 2, concession IV, and lots 1, 2, and 3, concession V, James township. This ground included the former property (now M.R.39568) of The Elk Lake Discovery Mines Ltd. (incorp. 1908), namely the southeast quarter of the north half of lot 1, concession V. Development work was carried out on this property in 1908 and 1909, but all work ceased in the latter part of 1909. A shaft was sunk to a depth of 150 feet with drifting for 75 feet to the northeast and 287 feet to the northwest. Some test pits were also sunk (O.D.M. 1909, p.125; 1910, p.115).

On these claims there are a number of old pits, trenches, and in addition to the Elk Lake Discovery shaft another shaft ^{3,115 feet deep,} on the north boundary of the northeast quarter of the north half of lot 2, concession V (currently M.R.41581), ^{the former location - Ontario property (O.D.H. 1915, p. 127).} These workings expose a number of aplite veins. The Nipissing diabase on the claims is mainly coarse-grained or olivine-hypersthene diabase with minor amounts of granophyric diabase. Several well-marked lineaments are shown on map 2000.

The shafts, shown on the west boundary of lot 3, concession V, should probably all be in lot 4 (former Moose Horn property).

G.S. Welsh-James Township Properties

G.S. Welsh-James township properties ^{are} described under [^] the name of the company that did most of the development work.

The properties are:-

- (a) Ethel Copper Mines Ltd., concession VI, lot 1, S $\frac{1}{2}$, SW $\frac{1}{4}$ and SE $\frac{1}{4}$
 (see under same) concession VI, lot 1, S $\frac{1}{2}$, NW $\frac{1}{4}$ and NE $\frac{1}{4}$
 concession VI, lot 1, N $\frac{1}{2}$, SW $\frac{1}{4}$ and SE $\frac{1}{4}$
- (b) northern part of Elklake Cobalt Mines of Ontario, Ltd.
 (in 1964-65, included in the property of Ethel Copper Mines Ltd.)
 concession VI, lot 1, S $\frac{1}{2}$, SW $\frac{1}{4}$ and SE $\frac{1}{4}$

- (c) formerly McManus property, concession IV, lot 1, N $\frac{1}{2}$,
NW $\frac{1}{4}$ and NE $\frac{1}{4}$
(also formerly Elk Lake Silver Mines, Ltd.)
(also part of Mother-Lode property - see under same)
- (d) formerly Regent Mines, Limited, concession IV, lot 1,
S $\frac{1}{2}$, SE $\frac{1}{4}$
concession III, lot 1,
N $\frac{1}{2}$, NE $\frac{1}{4}$
- (e) formerly Marvel Silver Mines Ltd., concession VI, lot 4,
S $\frac{1}{2}$, SW $\frac{1}{4}$
- (f) G.S. Welsh, concession VI, lot 2, S $\frac{1}{2}$
concession VI, lot 2, N $\frac{1}{2}$, NW $\frac{1}{4}$, NE $\frac{1}{4}$, and SW $\frac{1}{4}$
concession VI, lot 3, S $\frac{1}{2}$
concession VI, lot 3, N $\frac{1}{2}$, SE $\frac{1}{4}$
concession VI, lot 4, S $\frac{1}{2}$, SE $\frac{1}{4}$
(part of former Prudential Mines Limited - see under same)
concession V, lot 4, N $\frac{1}{2}$, NW $\frac{1}{4}$ and NE $\frac{1}{4}$
(northern part of Moose Horn Mines Ltd. - see under same).

G.S. Welsh

(formerly Marvel Silver Mines Ltd.) (24)

The property of the former Marvel Silver Mines Ltd., incorporated 1908, consisted of one claim, the southwest quarter of the south half of lot 4, concession VI, James township. In 1964 it was an unsurveyed mining claim, M.R.30804, held by G.S. Welsh, Matachewan. Marvel Silver Mines Ltd. had purchased the claim from W.F.M. Plotke in 1908. No annual returns have been filed with the Provincial Secretary since Dec. 31, 1910.

A shaft at the southeast corner of the claim may not be on the Marvel property. The depth of the shaft is estimated to be about 100 feet. A trench trends N.45°W. from the shaft for 150 feet following strong jointing or possible shearing. The writer did not find any mineralized material on the rock dump.

According to the files of the Provincial Secretary, the Plotke claim has three veins. The No. 1 vein is 8 inches wide and was stripped over a length of 350 feet. The mineralization consists of calcite, niccolite, a cobalt-bearing mineral and silver. A 10-foot deep pit was sunk on the vein. The No. 2 vein is 4 to 10 inches wide and had been stripped over 250 feet. A pit sunk to a depth of 7 feet contained native silver as well as niccolite and smaltite. A 15-foot deep pit was sunk on a No. 3 vein at the east end of the property. No sketch map was included with this description.

There is a bulldozed strip of ground 1,400 feet, at N.45°W. from the shaft identified above which exposes a diabase dike and a 1-inch calcite vein. The calcite vein has some cobalt bloom associated with it and strikes N.70°W. Several irregular aplite dikes up to 4 inches in width are also present.

G.S. Welsh Group - former McManus Property (25)

In 1964, two unpatented mining claims M.R.34543 and M.R.34544, the northeast and northwest quarters of the north half of lot 1, concession IV, James township, were held by G.S. Welsh. They had previously been held from 1957 to 1963 by R.H. McManus & Co. of Detroit and by Mother-Lode Mining Company Ltd. between 1953 and 1957. The history of this property before 1953 is not well documented.

The two claims were part of a group patented in 1907 by John A. Mitchell; however, the property in question was referred to as the Munro property around 1910. The Elk Lake Silver Mines, Ltd., incorporated in 1907, controlled the two claims, but the Provincial Secretary's files do not indicate any development work done.

A small shaft in the west part of claim 34543 is sunk 30 feet on a carbonate and parallel aplite vein which strikes N.10°E. At 450 feet, N.60°W. from the shaft is a trench approximately 600 feet in length. A pit, 18-feet deep, was sunk on the trench, but was filled with water at the time of visit. The carbonate

vein which is trenched is 5 to 6 inches wide with abundant niccolite and cobalt-bearing arsenides. The vein strikes N.20°E.

Dr. Robert Thomson, resident geologist, Cobalt, visited the property on June 30, 1958 and reported seeing specimens from the dump of the 18-foot pit to contain niccolite, chalcopyrite, pyrite, native bismuth, grey metallic Co-Ni-Fe arsenides and sulpharsenides, and native silver in leaves.

A second pit is at 500 feet N.30°W. from the small shaft formerly mentioned. The pit is about 10 feet deep and vein material on the dump is mineralized with chalcopyrite, bornite, cobalt bloom, and nickel bloom. This pit may be an extension of the vein from the south. A small vein containing chalcopyrite and striking N.60°W. is exposed south of the pit. Another vein is said to be at 800 feet, N.65°W. from the small shaft.

Assessment work on claim M.R.25990 (M.R.34544 above) has been filed with the Ontario Department of Mines for work dated June and July, 1958 by the McManus group. A diamond drill hole intersected the carbonate vein approximately 75 feet below the collar of the 18-foot

pit. The pit is indicated to be 450 feet south and 350 feet west of the No. 1 Post, claim M.R.25990.

The diabase in the vicinity of the small shaft is medium-grained, however, the diabase becomes coarse- to very coarse-grained 1,200 feet to the west. Granophyric interstitial material varies from 0 to 30 percent in the coarse-grained diabase.

Lawson Township

Barite

Eby or Scott Claim (1)

A barite showing on unsurveyed mining claim M.R.34976 (cancelled 1965) is $\frac{1}{2}$ mile south of highway No. 560 and about one mile southeast of Longpoint Lake.

The property has been described by Guillet (1963, pp.19-21, and fig. 8) as follows:

Prior to 1920, a single claim was staked by H. D. Eby of Toronto. In 1939 and 1940, 142 tons and 83 tons respectively were shipped from an open-cut by H. D. Eby and Company. At the time of the writer's visit in 1962, the area around the cut had been recently brushed-out and a single diamond-drillhole had been put down. The ground was open for staking throughout the latter part of 1962.

The barite is an irregular lens, 60 feet long by 8 feet wide, cutting medium- to coarse-grained Nipissing diabase. It lies in low ground, less than 10 feet above swamp-level, between two parallel ridges of diabase 100 feet apart. The lens strikes N.75°E. and dips vertically. W. S. Dyer (1940, p. 4) reports that the results of diamond-drilling proved the occurrence to be shallow. The lens has been opened along its entire length to a depth of 8 feet, but the cut is now water-filled. The east end of the occurrence is terminated abruptly against the steep flank of a diabase ridge. The suggestion of a tailing-out of the vein material to the north along the edge of the ridge apparently prompted the recent drilling of a single hole in this area (see Figure 8). The west end of the occurrence is concealed by drift, but mineable widths apparently do not continue as far as the western ridge of diabase. Walls of the deposit are irregular, corroded, and vuggy. Brecciation of the wallrock is not conspicuous. There are two sets of joints in the diabase; one is parallel to the long direction of the barite lens (N.75°E.), and one is approximately at right angles to it (N.20°W.). There is no increase in the frequency of joints on-strike with the barite lens, and continuation of the barite structure in this direction is, therefore, doubtful. However, a shallow but continuous depression, 8 or 10 feet wide, crosses a low ridge of granite in a direction parallel to the barite lens but offset 100 feet north.

The granite is a medium-grained pink rock of Algonian age, typically well-jointed at N.70°W.; it forms a series of low rounded ridges west of the barite lens. No barite was seen in association with the depression in the granite.

The regional geology is described by E. S. Moore (1956). The barite deposit is just off the eastern edge of his map-sheet. Moore notes several ages of diabase, represented by both dikes and sills. The barite occupies a fracture in the earliest, a sill of Nipissing diabase. The limited extent and abrupt termination of the lens suggests that the ridges of diabase at both ends may be dikes. If the barite formed before the intrusion of these dikes, other segments of the lens may have been offset by them. The depression noted in the granite ridge may be such a segment. If the dikes intruded before the formation of the barite, the lack of continuation of the barite structure may be due to a

difference in competency between the sill and dike rocks, as is the case in many of the Lake Superior occurrences. Barite is not reported (Todd 1926, p. 77) as a constituent of silver veins in the Gowganda area, a fact which would seem to preclude a common origin for the two.

H. S. Spence (1922, p.40) describes the barite as follows:

The barytes is of very good quality, and is practically free from objectionable impurities in the shape of sulphides, fluorite, etc. The ore consists of a close aggregate of large, platy crystals, ranging from white to colourless, the latter often exhibiting a high degree of iridescence. Some stained material was noticed, but much even of the surface ore is only slightly off-color.

Some of the barite is of the fine-grained compact variety. Calcite is present but rare, and fine needles of green actinolite exist in some places with hematite near the walls.

The tenor of barite is high. H. S. Spence (1922, p. 40) reports that a grab sample analyzed by the Mines Branch, Ottawa, gave the following result:

BaSO ₄	98.03
SrSO ₄	0.70
CaSO ₄	1.20
	<hr/>
	99.93

A ground sample tested for colour against a sample of prime white barite is "equal if not superior to the standard," according to Spence (1922, p. 13), who also suggests that the barite in

this deposit is softer (with respect to ease of milling) than the barite in other northern Ontario occurrences.

Mickle Township

Alsof Mines Limited (1),(2),(3),(4),(5),(6)

In 1964, the Alsof Mines property in Mickle township consisted of 17 mining claims of which 5 were leased mining claims, R.S.C.79 or M.R.423, M.R.17662, M.R.17663, M.R.18417, and M.R.18650. Claims which were surveyed in 1964 but are not leased are M.R.21087, M.R.21088, and M.R.21129. The remaining unsurveyed claims are M.R.22207, M.R.28915, M.R.28916, M.R.34307, M.R.37273, M.R.38048, M.R.38049, M.R.41272, and M.R.41273. This group of claims stretch from Silverclaim Lake north northwestward to Boland Lake.

The writer wishes to thank Mrs. W. Oliver and John Cameron for their assistance with this property. R.R. Coggan, president of Alsof Mines Limited permitted the writer access to a mineralogical report (L.R.933) made in 1963 by Lakefield Research of Canada Limited and to a geological report dated March 20, 1964 by A.C.A. Howe, consultant engineer. Ralph Ferguson, Matachewan permitted the writer to make a visit in 1963 when the workings were pumped out to the 200-foot level.

Dr. Robert Thomson, resident geologist, visited all mine workings on June 5, 1950. John Maniw the writer's assistant, studied several polished sections of mineralized specimens taken at the mine.

Claim R.S.C.79 or M.R.423 (1)

Claim R.S.C.79 (M.R.⁴23) of the Mapes Johnston Mining Company Limited (incorp. 1909) was bought from Donald J. Sellers by F.L. Mapes and E.E. Johnston, Jan 2, 1909. This property was called the York claim by Collins (1913, p.109). Mining operations were started by Mapes Johnston Mining in 1912 and stopped in 1914 between which time most of the development work had been done. The Brant Mines, Limited reopened the mine in Oct. 1917 and closed in Jan. 1918. The property was bought in 1936 by D.G. Oliver and John Cameron and was leased from them in 1940 by the Symass Mining Syndicate. In October, 1962, the property was acquired by Alsof Mines Ltd. from John Cameron and the D.G. Oliver Estate.

The early work on the property is described in the annual reports of the department (O.D.M. 1914, p.155; 1915, pp.61 and 127; 1916, p.123; 1917, p.130, and 1919, pp.151-152; 1937, pp.233-34; and 1941, p.164).

The Mapes Johnston shaft in the southwest corner of claim R.S.C.79 was sunk to a depth of 200 feet with three levels at 65, 100, and 200 feet. A winze follows the vein from the 200-foot level to a depth of 376 feet with levels at 265, 310, and 375 feet. All the above work with approximately 1,000 feet of lateral work and 150 feet of raising had been completed by the Mapes Johnston company prior to 1918.

The mine shaft is connected by a secondary road which extends from Boland Lake, at the north boundary of Mickle township, southward to Highway 560, mile 4.5 west from Elk Lake.

Assessment work has been filed in 1963 by Alsof Mines Limited with the Ontario Department of Mines on 4 diamond drill holes totalling 1,041 feet, drilled from the 200-foot level.

The main shaft was sunk on a vein which is followed by trenching to the southwest where at 110 feet is a 90-foot prospect shaft. Trenching continues towards the southwest and silver is reported to have been taken from the vein about 210-feet from the main shaft. A raise from the 65-foot level comes to the surface near

this spot. Silver is also reported to have occurred in the vein trenched about 300 feet southwest of the shaft. The outline of the trench suggests that the vein was controlled locally by cylindroidal or columnar jointing which is common here (see photograph 6).

The diabase at the surface is a medium-grained, olivine-hypersthene rock with little or no granophyre as interstitial material. The hypersthene content is estimated to be up to 25 percent by volume. Aplite dike rock is seen on the mine dump.

The geology of the mine is very poorly recorded. The writer's visit and that of Dr. Robert Thomson was made more difficult by the lack of means to wash the walls. The writer's visit was mainly confined to the 65-foot level.

On the 65-foot level there is exposed at the portal to the shaft a calcite vein with well crystallized native silver and "smaltite" mineralization. The carbonate vein is 1-6 inches wide, strikes $N.40^{\circ}E$. and dips $75^{\circ}NW$. Near this location there is a 12-inch aplite dike and, 5 feet northeast, a 1-inch aplite dike striking $N.70^{\circ}W$. The carbonate vein cuts the aplite

vein. The drift follows the vein to the northeast, and at 38-feet from the shaft portal a thin specularite vein striking N.30°W. is cut by the main vein. At a 15-foot raise, 40 feet northeast from the shaft, the vein contains carbonate, specularite and chalcopyrite. At 50 feet from the shaft the specularite-chalcopyrite-carbonate vein changes into a solid zone of niccolite in carbonate, and at 53 feet again merges further on into a two-inch specularite-chalcopyrite-carbonate vein. The vein in the vicinity of the niccolite is very irregular. The 65-foot level drift follows the carbonate to the southwest for 40 feet where the carbonate vein is cut by a series of calcite, chalcopyrite, specularite-bearing veins striking N.45°W. The drift follows the veins to the northwest a short distance to a raise which reaches the surface. Native silver is reported in this raise. The drift continues to the southwest from 20 feet up the raise, the drift being called the 101-Drift South. The 90-foot prospect shaft is 80 feet southwest of the raise. The 101-drift continues to the southwest along the vein system which generally contains specularite, and chalcopyrite in a carbonate matrix.

The 100-foot level was visited by the writer, but the workings were ^{too} dirty to examine. Northeast along the drift from the shaft is a raise which connects to the 65-foot level. The raise contained high grade silver. Similarly for the raise southwest of the shaft which also connects the 100-foot level to the 65-foot level. A fault zone near the southwest end of the drift dips 35°SW.

On the 200-foot level there is a 60-foot raise to the northeast of the shaft. A subdrift, 40 ^{feet} long, is at the top of the 60-foot raise which encountered good silver values. Several occurrences of nickel-cobalt-sulpharsenide-arsenide mineralization were seen in this level. J. Maniw identified the mineral alloclasite from a niccolite- "smaltite" bearing sample taken on this level. Native bismuth is also reported. A flat-lying fault dipping 17°SSE. cuts the vertical veins in a thrust-like movement of small displacement.

Very little information is available for the 265-foot, the 300-foot and the 375-foot levels. Silver is reported to have occurred in the raises. The diabase-sedimentary contact is 10 feet north of the shaft on the 376-foot

level where the contact dips 85° S. Native bismuth has been identified in fractures within the banded siltstone rock on the mine dump which came from the 376-foot level.

The Can. Min. Jour. (1915, p.288) mentions a $2\frac{1}{2}$ -ton ore shipment from the old Mapes Johnston mine with the ore estimated to be 1,500 ounces silver per ton. From another source, the writer has found assays for a total shipment of $2\frac{1}{2}$ -tons of ore dated 1915. The assays are:

1-ton assayed	42.5 ounces silver per ton
	11 percent cobalt
	8 percent nickel
	35 percent arsenic

$1\frac{1}{2}$ -ton assayed	407 ounces silver per ton
	9 percent cobalt
	9 percent nickel
	27 percent arsenic.

Claim M.R.17663 (2)

At the north end of Silverclaim Lake in Mickle township, within leased claim M.R.17663, there is a 250-foot trench in the northeast corner of the claim. The trench follows a vein system which is up to 30 inches wide and composed of carbonate, specularite, chalcopryrite, and minor bornite, grading 10 percent copper. The vein strikes $N.10^{\circ}$ E.

The diabase in the vicinity shows good cylindroidal or columnar jointing. The diabase contains minor amounts of granophyre as interstitial material and is medium-grained.

Claim M.R.18650 (3)

The leased claim M.R.18650 is a large claim at the southwest end of Silverclaim Lake in Mickle township. This includes part of the old claim M.R.597 which was one of the Bernard Micmac claims.

A trench near the shore at the south end of Silverclaim Lake, follows the No. 2 vein for a distance of 60 feet. At the lake edge, the vein is 2 inches wide and strikes north, but has a curved attitude because of columnar jointing. It is a carbonate vein with chalcopyrite and minor cobalt bloom along the vein contacts.

A trench in the southwest corner of the claim follows a curving $\frac{1}{2}$ - to 1-inch carbonate vein for 100 feet. The vein contains native silver. The vein strikes north at its northern exposures. A pit 10-feet deep is at the south end of the trench. Other trenches are in the vicinity of this trench, but are mostly filled in with vegetation. Hasaga Gold Mines Limited drilled

8 diamond drill holes under the vein and trench in 1955 over a strike length of 150 feet. Two drill holes, no. 5 and no. 7, drilled in the same section but intersecting the vein at different depths assayed 213.4 ounces of silver per ton over 7 inches at 80-foot depth and 170.9 ounces silver per ton over 3 inches near 130-foot depth but 40 feet west of the exposed vein respectively. The no. 7 drill hole assayed 0.18 ounces of silver per ton over 4 inches near the 130-foot depth on the exposed vein. The writer wishes to thank E. Thompson, Keevil Mining Group, for the above drilling information. The no. 5 and no. 7 drill holes were spotted to intersect the vein 40 feet from the north end of the 100-foot trench; no. 5 drill hole was located 70 feet east of the vein and no. 7 drill hole was located 120 feet east of the vein. The diabase country rock is very coarse-grained with interstitial granophyre except in the vicinity of the vein and trench where the granophyre content increases to 25 percent by volume.

An old, filled trench bearing N.20°E. for 70 feet, is 60 feet at S.20°W. from the 10-foot pit. It is nearly parallel to a picket line extending 300 feet,

at S.21°W. from the 10-foot pit to the no. 3 post, claim M.R.18650.

A shaft near the east boundary of the claim at the south end of Silverclaim Lake is estimated to be 50 feet deep. The vein on which the shaft is sunk strikes N.13°W. Pickle Crow Gold Mines Ltd. sited 4 diamond drill holes to intersect this vein up to a distance of 170 feet south of the shaft in the 1950's, but no silver values were intersected. The dump rock at the shaft contains chalcopyrite, pyrite, carbonate, and cobalt bloom. Aplite dike rock up to 8 inches wide was seen. The diabase on the dump is coarse-grained and again, granophyre is seen to be associated with the coarse-grained dump rock but not with the coarse-grained diabase in the vicinity of vein material.

Claims M.R.28915 and M.R.28916 (4)

The two unsurveyed claims, M.R.28915 and M.R.28916, are at the northeast end of Silverclaim Lake and conform roughly to old claims T.R.453 and T.R.598 respectively. Claim T.R.453 is part of the former Elk Lake Silver property and T.R.598 part of the Bernard Micmac claim group.

Assessment work in the form of diamond drilling has been filed with the Ontario Department of Mines for claim M.R.28915.

A vein is reported by John Cameron, Elk Lake, to be on claim M.R.28916, on the south side of the northeast arm of Silverclaim Lake. The vein is apparently in a valley, strikes N.40-45°W., is up to 4 inches wide, and contains cobalt, nickel and silver. The writer did not see this vein.

Claim M.R.34307 (5)

A small vein containing carbonate and galena is exposed at 2,050 feet, S.15°W. from the Alsof shaft. The vein is near the south end of the claim in Mickle township. The vein is vertical, strikes west and is on the east side of a diabase ridge.

Claim M.R.37273 (6)

A vein 950 feet at S.55°W. from the Alsof shaft was stripped by John Cameron in 1964. At its western end, and at the base of a diabase hill, the vein strikes N.80°E. but changes to N.63°E. 100 feet eastward along the vein and trench. The vein is $\frac{1}{2}$ - to $\frac{3}{4}$ -inch wide

and is composed of calcite, barite, and euhedral quartz crystals at its western end. At the eastern end of the vein, it is 2 $\frac{1}{2}$ inches wide and consists of carbonate and specularite.

Cotley Mines Limited (7)

In 1964, the Cotley Mines property in Mickle township consisted of 12 surveyed or leased claims, southeast of Silverclaim Lake. The claims are: M.R.12890, 16294, 16319, 17600, 18460, 18461, 18466, 18504, 18505, 18506, 19649, and 19650.

The most important claims in this group are M.R.12890 and M.R.16294 which were originally W.D.904 and was known as the Shane-Darragh claim. The Can. Min. Jour. (1908, p.133) reports the richest vein in the area to occur on the Shane-Darragh claim which was then in dispute. The vein was described as being 6-8 inches wide, and carrying 25 percent silver (Can. Min. Jour. 1908, p.134). Claim M.R.12890 became the Downey claim as the result of the litigation. The Can. Min. Jour., (1913, p.799) mentions 11 tons of ore ready to be shipped which were

taken from an open cut 30 feet long by 15 feet deep. A shaft was in the process of being sunk to intersect the vein at the 50-foot level.

Colcourt Mines Limited carried out some surface work in 1952 (O.D.M. 1954, p.132).

In 1953 Cotley Mines Ltd. began operations in July. A 28-foot test pit sunk during former operations, was deepened to 79 feet, and became No. 1 shaft. A level was established at a depth of 75 feet, and 71 feet of drifting was done. Diamond-drilling consisting of 26 holes, totalling 3,452 feet, was carried out from underground. About 437 tons of silver ore were hoisted, and 290 tons taken to the mill at Siscoe Metals, Ltd. for treatment (O.D.M. 1954, p.132).

Silverclaim Lake Mines Ltd. (incorp. 1954), as a wholly-owned subsidiary of Siscoe Gold Mines Ltd., took a lease on the Cotley mine, and carried on operations from May 15 to Nov. 1, 1955. "The lease agreement was then terminated and the property reverted to Cotley Mines Limited."

"The vertical, two-compartment shaft, known as

No. 1, is 84 feet deep, with a level at 75 feet, on which 71 feet of drifting had been done in 1953. In 1955 about 30 feet of raising was done from the level."

"Diamond-drilling in 1955 consisted of 5 holes totalling 881 feet, from surface, and 8 holes totalling 554^{feet}, from underground.

"A total of 2,106 tons of silver ore was mined and treated in the Siscoe No. 2 mill." (O.D.M. 1956, pt. 2, p.134).

The Cotley shaft, a name derived from John Cameron, D.G. Oliver, Les Treganza and Jack Bailey, is near the west boundary of claim M.R.16294. It is 75 feet deep with total drifting of 100 feet of which 80 feet is said to have been in ore. The silver is said to have occurred in ^{sl}dips within the country rock. The mining operation was entirely in reddish or granophyric diabase.

At the Cotley shaft, the No. 1 vein strikes N.10°E., turning to N.20°E. at the northern end of the vein. The No. 2 vein branches off the No. 1 vein, 30 feet north of the shaft, and strikes approx. north for 60 feet.

The Downey vein is 200 feet at S.70°W. from the Cotley shaft. The Downey vein strikes N.80°E., is 70 feet long and has records of silver occurring.

Another vein, called the No. 4 is 400 feet at S.28°W. from the Cotley shaft, where an aplite dike strikes S.10°E. and dips 85°W. A second aplite dike, striking N.80°W., is seen in this area but because of the broken rock it is not known if it cuts the other. A pit is sunk near the intersection of these aplite dikes.

A pit, 300 feet at S.60°W. from the Cotley shaft, in the south corner of M.R.12890 exposes a very fine-grained diabase in contact with very coarse-grained diabase. This marks the contact of a diabase dike that strikes towards the east passing to the south of the Cotley shaft.

The geology of the area is essentially coarse-grained diabase with varying proportions of granophyre. Generally most mine shafts are located in areas in medium-grained diabase near the coarse-grained diabase. The relationship of the diabase dike to the silver occurrence is not known, except that silver has not been mined from the dike.

McAuley and Rotondo Group (8),(9)

In 1963 the McAuley and Rotondo Group comprised the following unsurveyed mining claims: M.R.34064 to 34067 incl., M.R.34057, M.R.34623 to 34625 incl., and M.R.34698, all in the northeastern part of Mickle township.

Claim M.R.34057 (8)

At the southeast end of Boland Lake in Mickle township, a diamond drill hole was sited 9,100 feet west and 2,500 feet south of the northeast corner of Mickle township. The drill hole was inclined 45 degrees, bearing S.70°W. for a length of 300 feet. The drill logs have been filed for assessment work with the Ontario Department of Mines, dated June 20, 1963.

The diabase intersected is a hypersthene-bearing, possibly olivine-bearing rock with a fine-grained diabase dike between core lengths of 89-95 feet. The fine-grained diabase dike has disseminated carbonate as well as carbonate along fracture planes but contains no observable mineralization. The

diabase-sedimentary contact is at 184-footage with the underlying finely-banded, red and grey, siltstone containing disseminated carbonate near the diabase contact. The carbonate is present only in the relatively porous rocks such as sandstone and conglomerate lenses away from the diabase contact. The finely banded siltstone constituted a core length of 30 feet which overlies an 80-foot section of arkosic sandstone and conglomerate. The purpose of the drill hole was to intersect the easterly-trending lineament to the south of the drill hole.

Claims M.R.34065 to M.R.34067 inclusive (9)

A small shaft, 6,400 feet west and 5,700 feet south of the northeast corner of Mickle township, may be in the unsurveyed mining claim M.R.34066. The writer has very little information on this property and had mistakenly identified the shaft as that of the former Mickle Silver Mines on O.D.M. map P.240.

A trench trends S.85°E. from the shaft for 100 feet, possibly following a vein which is covered. Vein material on the dump indicates a 2-inch carbonate vein with specularite and chalcopyrite.

There is a shallow pit on the west side of a diabase hill at 600 feet. N.40°W. from the above shaft. The pit exposes a small vertical vein, striking N.15°W., composed of carbonate, specularite and chalcopryrite. Five vertical one-inch wide veins of specularite, vuggy quartz and minor chalcopryrite are present at the top of a diabase ridge at 600 feet S.38°W. from the shaft. The veins strike N.50°E. At 400 feet S.38°W. from the shaft, there is a five-inch wide, vertical, calcite, quartz, specularite vein striking N.25°E. Another five-inch wide, vertical vein of calcite, specularite, and chalcopryrite is at 800 feet N.17°E. from the shaft. This vein strikes N.30°W.

The western end of a large vein is 1,100 feet at S.80°E. from the shaft. The vein is up to 14 inches in width but averages 2 inches, and strike about east for a distance of 200 feet. The mineralization is essentially calcite, specularite, and chalcopryrite. A further distance of 200 feet towards the east a pit and trench expose a one-inch wide calcite, specularite, and chalcopryrite vein striking N.65°E. and dipping 80°NW.

The area has numerous occurrences of small veins generally composed of calcite, specularite and chalcopyrite. No cobalt bloom was associated with the vein occurrences seen.

Silverore Zone Mines Ltd. (10)

In 1964 a group of 8 unsurveyed mining claims, M.R.34400 to 34407 inclusive, southwest of Silverclaim Lake, in Mickle township were held by the Silverore Zone Mines Ltd.

There are no shafts on the property; however, the property straddles the upper contact of the diabase "sill" with the overlying sedimentary rocks.

A baseline was cut in 1963 for a total length of 4,600 feet, station 800 west being at the road east of the pond 9,400 feet west and 13,100 feet south of the northeast corner of Mickle township. The baseline at the road has a bearing of N.86°W. Picket lines about normal to the baseline are spaced at 200-foot intervals.

A magnetometer and geological survey (File No.63.1249) has been filed with the Ontario Department of Mines for

assessment work in 1963. The survey shows an anomaly near the upper contact of the diabase with the overlying banded/siltstone sedimentary rocks near station 3500 west. A smaller anomaly in the vicinity of station 1500 west may be caused by diabase present near the rock surface.

Vermont Mines Limited (11)

In 1964 Vermont Mines Limited held a group of four claims within Mickle township of which two, M.R.20364 and M.R.20365 at the west end of Boland Lake are leased, and the two surveyed claims to the north are M.R.20912 and M.R.20911.

One of the first holders of the property was Boland and Thompson who had in 1908 a group of seven claims (Can. Min. Jour. 1908, p.379). They formed The Boland-Thompson Silver Mining Co. Ltd., incorp. 1909 (O.D.M. 1910, p.48). There is no record in annual reports of the Department of the work carried out by this company. In 1946 Fahrenheit Mining Co. Ltd. (incorp. 1946) staked the claims M.R.13508 (M.R.20364) and M.R.13509 (M.R.20365).

The property was acquired by Vermont Mines Ltd. in 1961.

A geological assessment report and map (scale 1 inch to 200 feet) have been filed with the Ontario Department of Mines (File No. 63A.397) by Vermont Mines Limited, covering the area from the diabase-sedimentary contact to the west to Thompson Lake to the east based on field work carried out in 1960-61. The map indicates 12 diamond drill holes were put down in an area to the northeast of the shaft.

A shaft has been sunk at the line between the claims, M.R.20364 and M.R.20365. It was dewatered in 1946 by Fahrenheit Mining Co. Ltd. and found to be 70 feet deep. The level at the bottom was sampled (O.D.M. 1947, p.106). Some surface trenching had been done and the writer sampled native silver from a calcite vein striking north from the shaft for 100 feet. The vein is 2 inches wide and contained native silver and some "cobalt-bearing" mineral. An assay of 1,100 ounces of silver per ton is reported from this vein near the northern end of the vein.

The diabase rock at the trench is medium-grained with 8 to 10 percent estimated interstitial granophyre

which is carbonate-rich. The diabase rocks to the west are coarse-grained, similarly those to the northwest and to the south. The diabase to the west on the south side of the creek is also carbonate-rich, possibly controlled by the strong structural feature or lineament which extends to the east.

There is a small vein trenched into the side of the hill 1,800 feet east of the shaft where cobalt bloom is associated with a shear zone striking N.35°W. and dipping 85°SW.

G.S. Welsh-Mickle Township Properties (12),(13),(14),(15)

In 1964 G.S. Welsh held a group of 22 claims, west of Silverclaim Lake, in Mickle township composed of 20 unsurveyed mining claims, M.R.29938 to M.R.29447 inclusive, M.R.31788, M.R.31868 to M.R.31874 inclusive, M.R.31877, and M.R.32764; and 2 surveyed claims R.S.C. 125 or M.R.752 and E.B.21 or T.R.224.

This group of claims includes several forming mining properties:-

North American Silver Mining Co. Ltd. (12)

Mickle Silver Mines, Limited. (13)

Otisse-Currie Consolidated Silver Mines, Limited. (14)

Otisse Mining Company. (15)

North American Silver Mining Co. Ltd. (12)

North American Silver Mining Co. Ltd., incorporated 1909, had a property consisting of five claims, J.S.174 to J.S.178 inclusive (Collins, 1913, p.108) presently (1964-65) the unsurveyed claims M.R.32764, M.R.29941, M.R.29938, M.R.29939 and M.R.29940 respectively which roughly conform to the former claims. The Can. Min. Jour. (1908, p.25) refers to the above J.S. claims as the Clinton claims, later (1908, pp.133 and 379) as the Clinton and Steindler Syndicate claims of which four out of five are reported to have native silver veins, the fifth claim has a galena vein.

The North American adit 10,750 feet west and 11,200 feet south of the northeast corner of Mickle township is on the east side of a diabase cliff within mining claim M.R.29941, formerly J.S.175. The adit apparently shows the contact between the diabase and

the overlying granophyric rock which had been sedimentary rock replaced by granophyre solutions. The North American shaft is 100 feet to the east of the adit and the mine plans indicate the shaft to have a 70-foot level, with a drift to the west for 350 feet and one long crosscut to the north for 240 feet. The shaft timbers were replaced in 1963-64 by Candore Explorations Ltd. when they held an option on the property. The sampling of the vein system in the drift showed low silver values.

A 4-inch wide calcite and barite vein is exposed about 300 feet west of the adit, the vein striking east. A second shaft is at 220 feet N.67°E. from the North American shaft and is on the east side of the valley. The depth of the shaft is not known.

A third shaft is at the top of the diabase hill to the east, at 400 feet N.71°E. from the North American shaft. The mine dump contains fine-grained diabase with a high proportion of granophyric material. A few specimens contained carbonate and chalcopyrite. Eighty feet north of the third shaft there is a trench, striking N.85°W. for 175 feet to the western

edge of the hill. A small adit is on the side of the hill at the western end of the trench, however, no vein was seen.

On former claim J.S.174, or currently claim M.R.32764, just south of surveyed claim T.R.224, there is a small shaft, estimated to be 50 feet deep, on a vein striking $N.60^{\circ}W$. The trench follows the vein to the westward for 100 feet to a pit which shows two parallel aplite dikes, one 12 inches and the second 6 inches wide. No galena is associated with the aplite at the pit, however, the dump rock at the shaft contains galena, and minor chalcopyrite in an aplitic matrix. The total trenching is 220 feet along this vein system. The Can. Min. Jour. (1908, p.379) refers to a galena vein associated with aplite assaying $37\frac{1}{2}$ percent lead and small values of silver from this claim.

A trench and a pit on the east side of the diabase ridge, at 600 feet $N.74^{\circ}W$. from the galena shaft (above) show several irregular, thin aplite veins striking west and dipping $75^{\circ}N$. About ^{1/2} further west (100 feet) there are several old trenches on calcite veins with associated

cobalt bloom. 200 feet further west on the western side of the diabase ridge, a trench follows a calcite-quartz vein striking $N.65^{\circ}E.$ and dipping $80^{\circ}N.$ The vein has euhedral quartz crystals projecting into the calcite from the vein contact which looks like ^anarrow band of aplite. Cobalt bloom is also associated with the vein contact. The vein is 80 to 100 feet long.

Very little in the way of veins, pits or trenches were seen in the areas formerly occupied by J.S.176, 177, and 178 now claims M.R.29938, M.R.29939, and M.R.29940 respectively. A pit is near the western side of claim M.R.29939 (J.S.177), 10,900 feet west and 7,300 feet south of the northeast corner of Mickle township. The pit is estimated to be 20 feet deep on an aplite vein 3 to 4 inches wide which strikes $N.55^{\circ}E.$ A second pit, at 150 feet $S.55^{\circ}W.$ from the first pit, shows two veins, one bearing $N.55^{\circ}E.$ and a second vein which is 6 to 7 inches wide containing carbonate, chalcopyrite and cobalt bloom, strikes $N.80^{\circ}W.$

An adit is at the side of a steep east-facing cliff, west of a lake, that is west of surveyed claim R.S.C.79. The adit ($S.72^{\circ}W.$) follows a vertical

specularite vein, striking N.72°E. for possibly a distance of 100 feet.

M.R.29939 (formerly Mickle Silver Mines Limited) (13)

Mickle Silver Mines, Limited, incorporated 1925, (charter cancelled 1956) controlled two claims, M.R.7268 (J.S.177) and M.R.7269 (J.S.178) bought from Harry Coles. The location of claims J.S.177 and 178 is shown on Knight's map in a report by Miller (1907, Map 16f). In 1926 40 feet of sinking is reported (O.D.M. 1927, p.163). The shaft was not found, but is thought to be in line with the veins from the Alsof (Mapes Johnson) shaft.

Claim R.S.C.125 or M.R.752 (14)

The property of the former Otisse-Currie Consolidated Silver Mines, Limited is claim R.S.C.125 or M.R.752, in Mickle township. The early work is described in the annual reports of the Department (O.D.M. 1909, p.127, and 1910, p.116) and in a report by Collins (1913, p.108). The Otisse-Currie Company went into receivership in 1909.

A shaft 9,700 feet west and 9,400 feet south of the northeast corner of Mickle township is on the west side

of the secondary road to Boland Lake from Highway 560. The shaft is 100 feet deep with 250 feet of drifting (O.D.M. 1910, p.116).

Claim E.B.21 or T.R.224 (formerly Otisse Mining Company Limited) (15)

The leased claim E.B.21 or T.R.224 Mickle township may have originally been owned by Sam Otisse in 1908 and later, 1910, is known to have been controlled by the Otisse Mining Company. Little information on the history of this property between 1910 and 1960 is available. In the 1960's, Majortrans Oil and Mines Ltd. held an option on the property, and carried out work on the property in 1963 which is described as follows (O.D.M. 1963, p.134): "Former operators had sunk a vertical, two-compartment shaft on claim No.224, 160 feet below the collar, with levels established at 75- and 150-foot depths. On the 75-foot level, 755 feet of drifting and 240 feet of crosscutting had been completed; on the 150-foot level, 230 feet of drifting and 130 feet of crosscutting had been completed.

"The present company operated from 1 January to 30 March 1963.

"Some 23 diamond-drillholes, totalling 2,950 feet, were completed from underground. A silver vein on the 75-foot level was mined, with some high-grade material bagged and shipped to the Timiskaming Testing Laboratories at Cobalt. The mill rock was trucked to Noranda."

Candore Explorations Ltd. held an option in 1963 and in that year dewatered the Otisse shaft, and 33 diamond drill holes, totalling 1,665 feet, were completed from the 75-foot level (O.D.M.1963 p.125). The property is presently, 1964-65, controlled by G.S. Welsh of Matachewan.

The Can. Min. Jour. (1908, p.379) reports that there are six important veins of calcite or aplite all carrying silver. The veins are said to average three to four inches in width and strike east-west. Mention is also made of a gabbro dike 30 inches wide having contacts occupied by narrow carbonate veins with white silver, and further that silver was seen in the gabbro which may be another name for coarse-grained diabase.

A second shaft is reported in the Can. Min. Jour. (1909, p.186). This may be the small shaft at 300 feet S.63°E. from the Otisse shaft or perhaps may be the Otisse-Currie shaft 1,000 feet to the north. The

Can. Min. Jour. (1910, p.186) reports that ore is somewhat variable at depth but that rich ore does extend to depth. A total of 1,396 feet of workings had been done up to that time.

The writer visited the Otisse shaft in the fall of 1964 when the shaft was pumped out to the 75-foot level. A coarse-grained diabase zone was seen between veins No. 3 and No. 4, striking same ^tatit^ude as the vein and containing interstitial granophyre as well as thin aplite dikes. The horizontal jointing seen in the workings consist^eantly dip 10° to 17° E. and strike generally N. to N. 10° W. Good grade silver ore has been intersected at various intervals along the drifts, however, work to date does not give any clue as to control.

A diamond drill hole, No. 62-9, bearing south, inclined at 60 degrees, and with a length of 945 feet intersected the base of the diabase at core length of 929 feet, entering banded red and black finely banded siltstone of the Gowganda Formation. This drill hole is located at 210 feet N. 47° W. from the shaft.

Willet Township

Accra Explorations Limited (1)

The Accra Explorations Limited in 1964-65 held an option on the Singer group of 9 unsurveyed claims M.R.34941 to 34946 incl., 34951, 34953, and 34954 adjacent to the east boundary of Willet township and extending south from surveyed claims J.S.209 and D.G.57.

A geophysical survey of these 9 claims in 1964 has been filed for assessment work credit with the Ontario Department of Mines (File No. 63.1340). According to this survey most of the claims are in Barber township and only the west parts of M.R.34946, 34945, 34951, and 34953 are in Willet township.

A baseline was cut in the 1960's from 4,800 feet south and 600 feet west of the northeast corner of Willet township. The baseline is approximately 8,000 feet long, bearing S.5°E., with picket lines at 400-foot intervals. The baseline with the 000 and 3200 picket lines are alone shown on the basemap.

A diamond drilling program was done in 1964, one drill hole, No. 64-2, is at 7,100 feet south and 200 feet east of the northeast corner of Willet township or 2000 feet S. and 450 feet E. on the picket-line grid. This hole was drilled at S.85°W., dips 30 degrees, for a length of 199 feet. The rock intersected was generally coarse-grained diabase. The purpose of the hole was to drill below a small shaft to the west of the drill hole. The collar of a second drill hole, No. 64-1, is at 8,200 feet south and 1,500 feet east of the northeast corner of Willet township. This hole was drilled at S.40°E., dips 45 degrees, and has a length of 148 feet. It was put down to investigate the brecciated diabase at the contact of the diabase dike and arkosic sandstone. A third hole was reported to have been drilled but the drill hole located ^{ion} is not known to the writer.

Barnet Property (2)

The leased mining claims D.G.56 or M.R.5037, D.G.57 or M.R.5065, and J.S.209 or M.R.858 are in

the northeast corner of Willet township. The three claims originally were patented by J.E.H. Barnet and were held in 1964-5 by T.F. Barnet of Renfrew.

A shaft, on the leased claim J.S.209 or M.R.858, is 80 feet deep and has about 350 feet of drifting and crosscutting on the 70-foot level.

Accra Explorations Ltd. leased the claims in 1963 and drilled 6 diamond-drill holes from the 70-foot level, totalling 929 feet (O.D.M. 1963, p.117).

Vein No. 1 on which the shaft is sunk is a 3- to 10-inch calcite vein containing "smaltite" striking in a northeasterly direction. A trench, 100 feet north of the shaft, follows a calcite vein to the northeast and southwest 200 feet and 100 feet respectively. The northeastern end of the vein is near the 000 station of the baseline from where the vein strikes S.54°W. for 170 feet, at which point it splits into two, a 5-inch and a 7-inch vein, each composed of carbonate, chalcopryite, "smaltite", cobalt bloom. Granophyre vein material follows the calcite vein at its northeastern end. Vugs are common in the carbonate vein, and the quartz, in places, looks like chalcedony. Granophyre intrudes

diabase irregularly in this vicinity resulting in a coarsening of texture. Columnar jointing is common. A patch of sedimentary rock in contact with diabase is present on the north side of the trench near the northeastern edge of the outcrop.

Floyd Property (3)

The Floyd property consists of two leased claims in the northeastern part of Willet township. The claims are R.S.C.81 or M.R.257 and D.C.58 or M.R.1353, the former of which has an adit into the side of a north-facing diabase hill. The length of the adit is not known.

The adit follows a south-striking vein into the hill. The writer has very little information on this property, but several individuals have referred to native silver occurring in this vein associated with "smalcite".

The vein on which the adit was driven does not continue on the north side of the stream which flows on the north side of the adit. A. Mosher drilled a

hole 600 feet to the west of the adit with the drill site on the north side of the creek. The creek follows a very strong lineament, and the log of the drill hole, filed for assessment work on claim M.R.18632, dated Dec. 7, 1950, with the Ontario Department of Mines, intersected a broken zone (private communication) and a reddish diabase which probably is granophyre.

Ganda Silver Mines Limited (4)

Ganda Silver Mines in 1964 controlled a group of 18 unsurveyed mining claims, M.R.33299 to 33301 inclusive; M.R.33303 to 33305 inclusive; M.R.33307 to 33310 inclusive; M.R.33328; M.R.33330; M.R.33641 to 33645 inclusive; and M.R.33650; all in Willet township.

The Ganda property includes part of the former Paragon Silver Mining Company, Limited property which consisted of 2 claims D.G.75, later M.R.5111, now probably M.R.33307 and D.G.76 later M.R.5112, now probably M.R.33308, north of Scugog Lake. The Paragon Silver Mining Company, Limited, incorporated 1912, is reported to have sunk a shaft 168 feet deep which is

on claim D.G.75 (O.D.M. 1916, p.123). On Dec. 23, 1923, the Paragon Silver Mining Co. Ltd. charter was exchanged for the Paragon-Hitchcock Mines, Limited; however, the shaft usually referred to as the Paragon-Hitchcock is not in Willet township, but rather in Tudhope township, concession I, lot 10; a mistake being frequently exercised.

The writer has very little information on the history of the remaining claims in the Ganda group. The Tichbourne claim (s) were in the vicinity of the claim D.G.63, later M.R.1249, 16,000 feet west and 4,000 feet south of the northeast corner of Willet township.

The No. 1 shaft of the Paragon Silver Mining Company, on former claim D.G.75, or M.R.5111 is 4,100 feet west and 10,500 feet south of the northeast corner of Willet township. The shaft is 168 feet deep, sunk on a diabase dike about 50 feet wide which strikes N.70°W. The shaft has levels at 90 and 160 feet. The 90-foot level has a crosscut to the north and south each for a distance of 20 feet, cutting the diabase-sedimentary rock contact which is highly fractured. The 160-foot level has a 15-foot drift to the west and a crosscut at the end of the drift, for 25 feet to the north. Calcite veins

were reported in the fractured contact zone; however, no silver values were reported.

The No. 2 shaft of the former Paragon Silver is 1,300 feet, at N.70°W. from the No. 1 shaft. It is 40 feet deep. A carbonate vein, exposed in a trench 30 feet southeast from the shaft, is 2-4 inches wide, strikes N.40°W. and dips 70°S.

The writer wishes to thank A.C.A. Howe, consulting engineer for Ganda Silver Mines Ltd. for some of the information on the former Paragon Silver shafts.

The Ganda property includes the property of the former Willet Cobalt Mining Company Limited, incorporated 1909, but in arrears with their annual returns to the Provincial Secretary since 1913. The Willet Cobalt company had 12 claims purchased from A.D. McBride in 1909. The claims were M.R.3701 to 3703 inclusive; M.R.3899 to 3905 inclusive; and two claims not recorded in the company prospectus. A second company named Willet Silver Mines, Limited, incorporated 1909, had the same officers associated with it as the later Willet Cobalt Mining Company, Sam McBride being the president of Willet Silver.

A pit, 3,200 feet south and 16,000 feet west of the northeast corner of Willet township, and a trench are in a highly altered zone in the coarse-grained diabase. The altered zone is $2\frac{1}{2}$ feet wide and strikes $N.85^{\circ}W$. No mineralization was found. A second pit 500 feet at $S.45^{\circ}E$. from the last pit has no apparent mineralization. A 100-foot trench at $S.20^{\circ}E$. from the pit also does not show any apparent mineralization. The Tichbourne showings in the vicinity of Sunday Lake were not seen by the writer. Apparently there are several calcite veins, striking $N.25^{\circ}E$. over 150 feet with widths from $\frac{1}{4}$ to 4 inches. A trench at the south end is 10 feet long and a pit exposes the vein at the north end to a depth of 25 feet. Some leaf silver and argentite were reported by A.C.A. Howe, consulting engineer.

A trench, 7,000 feet south and 11,000 feet west of the northeast corner of Willet township, strikes $S.50^{\circ}E$. following fracturing in the diabase for about 70 feet. The core from a drill hole nearby contained calcite and cobalt bloom.

A carbonate-rich vein one-inch wide is seen in a

small pit at 6,000 feet south and 15,500 feet west of the northeast corner of Willet township. A shear zone parallels the vein, striking N.10°E.

Gomar Mines Limited (5)

In 1964 Gomar Mines Ltd. held 9 unsurveyed claims, M.R.34947-34950 incl., M.R.34952, and M.R.34955-34958 incl., northeast of Scugog Lake, Willet township. A geological and geophysical survey of the claim group in 1964 has been filed for assessment work credit with the Ontario Department of Mines (File No. 63.1334).

The claims are underlain by Lorrain Formation arkosic sandstone cut by two known narrow diabase dikes.

Pritchard-Bastien Property (6) (formerly Lucky Godfrey Cobalt Mines Co. Ltd.)

In 1964 a group of four unpatented claims M.R.26214 to 262217 incl. in the northeast corner of Willet township were held by E.C. Pritchard and Albert Bastien, Elk Lake. This group is ^{part of} the former mining property of the Lucky Godfrey Cobalt mines Company Ltd. (incorp. 1908), for

which no annual returns have been made since Dec. 1911. The Lucky Godfrey company bought 6 patented claims J.S.202-207 incl. in James and Willet townships from Richard Godfrey.

The early work on the property is described in the annual reports of the Department (O.D.M. 1909, p.126; 1910, p.116; and 1912, p.149). One carload of ore was shipped in March 1910 (O.D.M. 1910, p.116). The mine was shut down in late 1910 (Can. Min. Jour., 1910, p.735).

The Lucky Godfrey shaft is 300 feet west of Rose Lake. It is 102 feet deep, a level at 100 feet and there is about 300 feet of drifting and crosscutting.

Thomson¹ examined the Lucky Godfrey mine on July 14, 1961 and describes two vein systems. The Lucky Godfrey No. 1 vein strikes N.75°E. and dips 85°N. The No. 1 vein system is a number of semi-parallel fractures over a width of 2 to 3 feet, the south wall being a chlorite-covered slip surface. Apparently the vein system was not visible in 1961

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Robert Thomson, Resident Geologist, Ontario Department of Mines, Cobalt.

in the surface trench southwest of the shaft. The carload of ore shipped came from the surface trench southwest of the shaft which is 50 feet long and about 15 feet deep. The ore is said to have contained native silver and a black earthy material.

The Lucky Godfrey No. 2 vein is a thick (up to $2\frac{1}{2}$ feet including inclusions and schists) low-lying zone (dipping from 0 to 43 degrees) containing mainly coarse-grained carbonate and some quartz. Chloritic schist forms the wallrock of the vein. Thomson reports chalcopyrite and pyrite as the only mineralization associated with the carbonate. The No. 2 vein, according to Zenmac Metal Mines Ltd. who had optioned the property in 1962, has an average dip of 7° SE. Thomson states that the vein in places is very irregular and measured a dip of 20 degrees to the southeast of chlorite slips 40 feet below the collar of the shaft. The flat-lying structures cut off the nearly vertical structures.

The Lucky Godfrey shaft is entirely within diabase rock; however, Thomson reports the 100-foot level north of the shaft is in granophyric diabase whereas, to the

south of the shaft, granophyric material is missing from the diabase. On the surface, the diabase 300 feet southeast from the shaft is coarse-grained with an estimated 3 percent of interstitial granophyre. The surface diabase at the shaft is medium-grained with 2 to 3 percent granophyre; however, the same diabase on the rock dump is very coarse-grained containing up to 40 percent granophyre.

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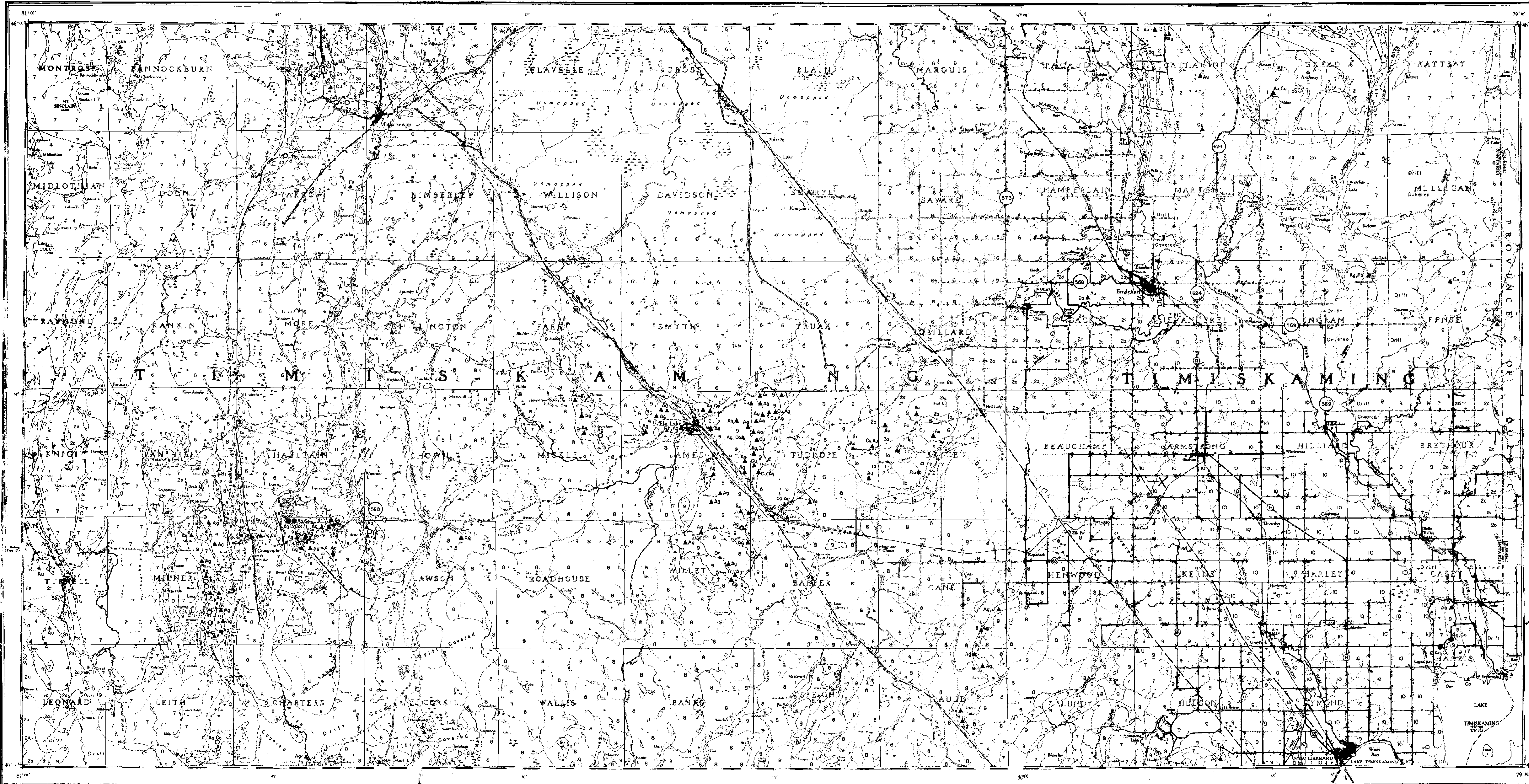
P.310, Chown township; P.311, Lawson township;
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- LEGEND**
- CENOZOIC**
Pleistocene and Recent
Sand, gravel, clay (larger areas only).
- PALEOZOIC**
Silurian and Ordovician
10 Dolomite, limestone, shale, sandstone.
UNCONFORMITY
- PRECAMBRIAN**
PROTEROZOIC
Keewenaw, and Matachewan (pre-Huronian)
9 Diabase.
INTRUSIVE CONTACT
- Huronian System
Cobalt Group
Lorrain Formation
8 Quartzite, arkose.
Cowganda Formation
7 Conglomerate, arkose, greywacke, slate.
UNCONFORMITY
- ARCHEAN**
Acid Intrusive Rocks^d
6 Granite, syenite, and associated porphyritic types.
Basic and Ultrabasic Intrusive Rocks^c
5 Gabbro, diorite (5a).
Peridotite, dunite, pyroxenite, and altered equivalents (5b).
INTRUSIVE CONTACT
- Sedimentary Rocks^b
4 Conglomerate, greywacke, argillite, slate, including trachytic volcanic rocks in Kirkland-Larder belt (4a).
UNCONFORMITY
- Sedimentary Rocks^a
3 Conglomerate and greywacke (3a), iron formation (3b), and tuff (3b). Amphibolite, schist, and gneiss derived from sediments and, possibly, basic intrusive and extrusive rocks (3c).
- Basic Volcanic Rocks^a
2 Andesite, basalt, basic pyroclastic rocks. Undifferentiated volcanic rocks with interflow sediments (2a).
Acid and Intermediate Volcanic Rocks^a
1 Rhyolite, trachyte, and acid pyroclastic rocks (1a); dacite (1b).
- a, b, c, d. Formerly classified as Keewatin, Timiskaming, Hailoeburrian, and Algonian respectively.

- SYMBOLS**
- Fault
 - Producing mine
 - Past Producer
 - ▲ Mineral Occurrence

MINERAL OCCURRENCE REFERENCE

Ag	Silver
asb	Asbestos
Au	Gold
ba	Barite
Co	Cobalt
Cu	Copper
Fe	Iron
Mo	Molybdenum
Pb	Lead
U	Uranium
Zn	Zinc

SOURCES OF INFORMATION
Geology from maps of the Ontario Department of Mines and unpublished maps of mining companies. Geological compilation by W.S. Savage, Robert Thomson, and K.G. Fenwick, 1962.

Base map from National Topographic Series Sheets 41P/NE and 31M/NW

PRELIMINARY GEOLOGICAL MAP No. P159
ELK LAKE - NEW LISKEARD SHEET
DISTRICT OF TIMISKAMING

Scale 1 Inch to 2 Miles