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Exploration Potential for Base and Precious Metal Mineralization in Part of Strathy Township, Temagami Area

by

A.J. Fyon and J.H. Crocket

1986

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V.G. Milne, Director
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FOREWORD

This report summarizes the results of an applied study of part of the Temagami Greenstone Belt. The preliminary data indicate that two distinct volcano-sedimentary complexes exist, which have been structurally juxtaposed. The felsic volcanic rocks at the top of the younger volcano-sedimentary complex have geological and geochemical signatures indicating a good potential that these rocks may host volcanic-associated, Zn-Cu-Ag massive sulphide mineralization. Three deformation zones are considered by the author to have high gold potential.

This project was funded by the Ontario Geoscience Research Grant Program (Grant 132).

V.G. Milne
Director
Ontario Geological Survey

Abstract

The volcano-sedimentary stratigraphy in Strathy Township is subdivided into two terranes which are informally called the Older and Younger Volcanic Complexes. As a result of this study, the Younger Volcanic Complex has been subdivided into four formations: 1) a lower iron-rich, tholeiitic basalt cycle; 2) a calc-alkaline cycle consisting of basalt/andesite flows and felsic pyroclastic deposits; 3) a clastic sedimentary sequence; and 4) an upper, iron-rich, tholeiitic basalt cycle. Oxide facies iron formation occurs at the top of both the Older and Younger Volcanic Complexes.

The felsic volcanic rocks near the top of the Younger Volcanic Complex are interpreted to have a high potential to host volcanic-associated, Cu-Zn massive sulphide mineralizationn based on: 1) the presence of identified felsic vents; 2) sulphide-rich, accidental clasts in subaqueous pyroclastic, deposits; 3) low values of copper, zinc, and silver in stratabound zones near felsic vents; and 4) a distinctive rare earth element pattern characteristic of mineralized, felsic pyroclastic rocks.

Gold mineralization occurs in a variety of habits and rock types in and immediately adjacent to east- and northeast-trending, major zones of deformation. These zones provide excellent gold exploration targets. North-trending,

chloritized shear zones, which cut iron-rich tholeiitic basalt at the base of the Younger Volcanic Complex, are mineralized with gold, arsenopyrite, pyrrhotite and chalcopyrite. Recent exploration activity indicates that these zones also have potential to host gold mineralization.

Table of Contents

1	Introduction	1
1.1	Previous Work	2
2	Geological Overview	2
2.1	Stratigraphic subdivision of the Younger Volcanic Complex	4
2.1.1	Arsenic Lake formation	4
2.1.2	Link Lake formation	6
2.1.2.1	Mafic flows	6
2.1.2.2	Felsic rocks	7
2.1.3	Turtle Lake formation	8
2.1.3.1	Conglomerate facies	9
2.1.3.2	Thin bedded facies	9
2.1.3.3	Chert-magnetite iron formation	10
2.1.3.4	Interpretation of Turtle Lake formation	11
2.1.3.5	Equivalence of the iron formation units	12
2.1.4	Upper Volcanic formation	13
3	Felsic Volcanic Vents	13
3.1	Sherman vent	14
3.2	Milne vent	14
3.3	City dump vent	15
4	Intrusions	16
4.1	Mafic intrusions	16
4.1.1	Layered mafic intrusion	16
4.1.2	Diorite	17
4.2	Felsic dykes	17
4.3	Pyroxenite dykes	18
4.4	Diabase dykes	18
5	Structural Geology	18
5.1	Tetapaga Syncline	19
5.2	Link Lake Zone of Deformation	19
5.3	Net Lake - Vermillion Lake Zone of Deformation	20
5.4	Northeast Arm Zone of Deformation	21
5.5	North-trending shear zones	21
6	Metamorphism	23
7	Rock Alteration	23
7.1	Silicification	24
7.2	Ferroan carbonate	25
7.3	Calcite	26
8	Mineralization	26
8.1	Gold mineralization	27
8.1.1	Older Volcanic Complex	27
8.1.2	Younger Volcanic Complex	27
8.1.2.1	Sulphides in chloritized shear zones	28
8.1.2.2	Base metal sulphide-bearing quartz veins	29
8.1.2.3	Pyrrhotite-chalcopyrite-pentlandite-pyrite mineralization in deformed, layered intrusion	30
8.1.2.4	Disseminated pyrite in sericitized zones	31
8.1.2.5	Iron formation-associated gold	31
8.1.2.5.1	INCO Net Lake occurrence	31
8.1.2.5.2	Mayfair showing	34

9 Mineral Potential For This Part of the Temagami Greenstone Belt....................35
9.1 Volcanic-associated, Zn-Cu massive sulphide mineralization..............................35
9.2 Gold potential...............................37
9.3 Metal zonation...............................37
10 Summary 39
Acknowledgements..................................40
References...41

List of Figures

Figure 1: Location of study area in Strathy Township, showing the Older and Younger Volcanic Complex domains and zones of high strain..........................1a

Figure 2: Subdivision of Younger Volcanic Complex and the location of the Tetapaga Syncline, variolitic basalt, and banded, oxide facies iron formation....................................3a

Figure 3: Location of garnet, hornblende and quartz-potassium feldspar veins which define the outer limit of the amphibolite, contact metamorphic aureole which is developed about the Strathy-Chambers Batholith..................23a

Figure 4: Location and type of mineral occurrences in Strathy Township. A metal zonation from Mo to Cu to Au is developed from northeast to southwest along the Net Lake-Vermillion Lake Zone of Deformation. The Mo zone lies closest to the Strathy-Chambers Batholith..............27a

Figure 5: Rare earth element pattern of a sample from the felsic, subaqueous, pyroclastic flow exposed along the Milne-Sherman road, west of the Milne lumber town site. The flat, enriched total abundance (350 x chondrite) with a significant Eu depletion, is typical of extrusive, felsic volcanic rocks which are known to host volcanic-associated, massive sulphide mineralization.............36a

MAPS IN BACK POCKET

MAP 1: Geology of Northwest Strathy Township.

MAP 2: Geology of Southwest Strathy Township.

MAP 3: Geology of East-Central Strathy Township.

MAP 4: Geology of Northeast Strathy Township.

MAP 5: Geology of the East End of Arsenic Lake, Strathy Township.

MAP 6: Beanland or A. Perron Property, Strathy Township.

MAP 7: Mayfair Mines Limited, Strathy Township.

Exploration Potential for Base and Precious Metal Mineralization in Part of Strathy Township, Temagami Area

1986

by

A.J. Fyon[1] and J.H. Crocket[2]

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1. Introduction

Many geological features were recognized during a program of geological mapping in Strathy Township (Figure 1), that identify this areas as having a high potential to host epigenetic gold and volcanic-associated, Zn-Cu-Ag massive sulphide mineralization. The intent of this preliminary report is to describe these favourable indications and to point out those broad areas have the highest economic potential to host gold and/or base metal mineralization.

To appreciate the basis on which the high potential areas are identified, it is necessary to: 1) describe the stratigraphic and structural aspects of the northeast part of the Temagami Greenstone Belt in Strathy Township; 2) briefly describe the characteristics of base and precious metal mineralization, inculding the types of associated rock alteration; and 3) relate the types of mineralization and rock alteration to the volcanological and tectonic evolution of this part of the belt.

Regional mapping in part of Strathy Township (Figure 1) was conducted by the senior author during July 1983 and May-September 1984, at a scale of 1:4800, under the auspice of Ontario Geoscience Research Grant #132 to Dr. J.H. Crocket, McMaster University. Enlarged airphotos were used for ground control, and paced grids were established over

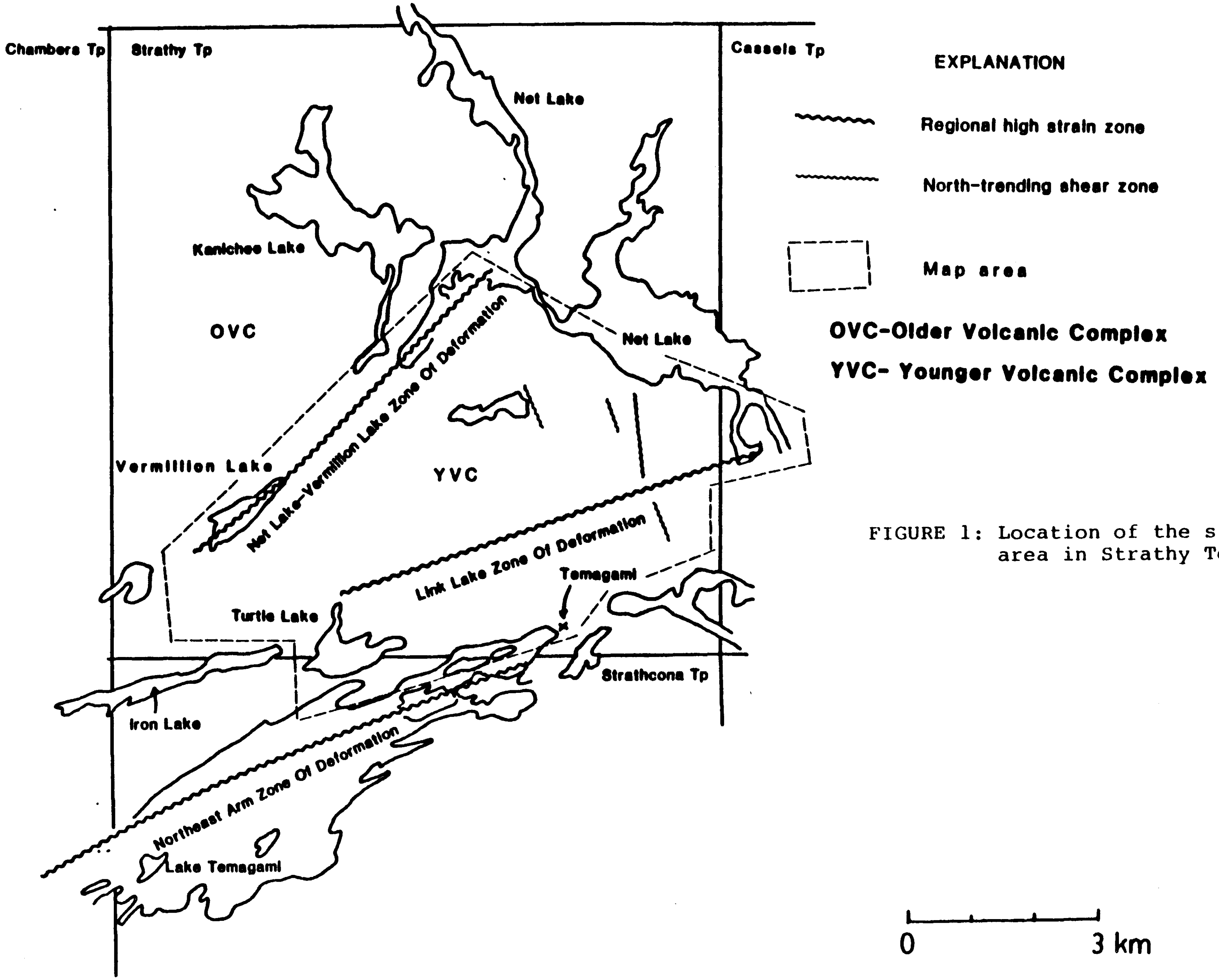


FIGURE 1: Location of the study area in Strathy Township.

properties which were mapped in more detail (scale 1:1200). Only the Archean rocks were examined during this study; none of the Proterozoic sedimentary rocks were examined. Assessment of mineral potential and the reconstruction of the geological history pertain only to the area examined in Strathy Township.

1.1. Previous work

An early regional study of the Temagami area was conducted by Moorehouse (1942). Systematic mapping of Strathy, Chambers, Strathcona, and Briggs Townships was completed by Bennett (1978). Many relevant references are contained in these two reports.

2. Geological Overview

The volcano-sedimentary stratigraphy of the Temagami Greenstone Belt in Strathy Township, is subdivided into two major cyclic sequences (Figure 1): 1) an older, dominantly felsic volcanic complex (Older Volcanic Complex), located primarily in Chambers Township, to the northwest of a line drawn from Vermillion Lake to Net Lake; and 2) an apparently younger, dominantly mafic volcanic complex (Younger Volcanic Complex or YVC), best developed east of this line, north of the Temagami town site. The YVC is the focus of this report.

The Older Volcanic Complex consists dominantly of felsic volcanic flows and pyroclastic deposits with lesser mafic volcanic rocks (Bennett 1978). Banded chert-magnetite-sulphide iron formation (West and North Pits of Sherman Mine) lies at the top of this complex. The YVC is subdivided into four formations (Figure 2), which have been informally named the Arsenic Lake formation (tholeiitic basalt flows), the Link Lake formation (calc-alkaline mafic and intermediate flows; and calc-alkaline intermediate to felsic flows and pyroclastic volcanic rocks), the Turtle Lake formation (clastic sediments and iron formation), and an unnamed upper formation (tholeiitic basalt flows).

The Strathy-Chambers Batholith is a pink to grey quartz monzonite to granodiorite which intrudes the greenstone belt. An amphibolite-hornfels envelope is developed about the intrusion, in the adjacent metavolcanic rocks. Diabase dykes belonging to the Sudbury Dyke Swarm (age 1280-880 Ma; Van Schmus 1975) trend 335° and cut all Archean rocks in the map area.

The studied part of the YVC (Figure 2), is interpreted as a south facing, homoclinal sequence from the contact with the Strathy-Chambers Batholith, to just north of the Temagami town site. This section lies on the north limb of the Tetapaga Syncline. The metavolcanic rocks of the Link Lake formation are repeated on the south limb of the Tatapaga

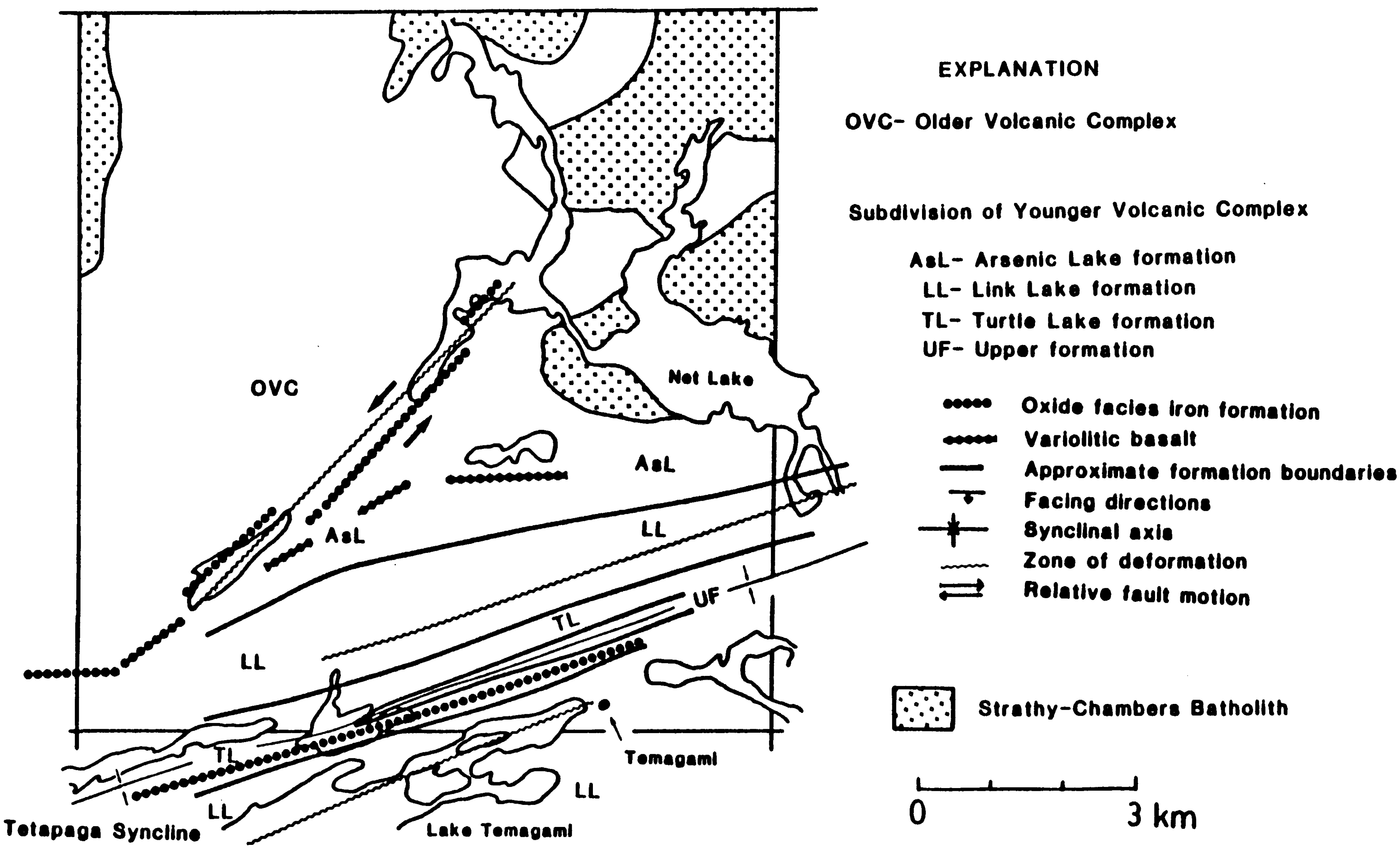


FIGURE 2: Subdivision of younger volcanic complex and the location of the Tetapaga Syncline, variolitic basalt, and banded, oxide facies iron formation.

Syncline and are exposed along and to the south of the Northeast Arm of Lake Temagami. Chert-magnetite iron formation (OBIF) lies at the base and top of the YVC (Figure 2).

2.1. Stratigraphic Subdivision of the Younger Volcanic Complex

2.1.1. Arsenic Lake formation

This is the lowermost formation in the YVC. Dark green, iron-rich, massive and pillowed tholeiitic basalt predominate. Two variolitic flow units have been traced from Highway 11, west to Vermillion Lake area (Map 2; Figure 2). No variolitic basalt was observed east of Highway 11; however, exposure is poor in this area.

Throughout the Arsenic Lake formation, distinctive, feldspar-phyric basalt flows occur. This basalt type carries tabular feldspar phenocrysts which range up to 2 cm in cross section. Both pillowed and massive flows were observed to carry the coarse feldspar. Coarse feldspar-bearing, iron tholeiitic basalt is more abundant to the east of Highway 11 (Map 3).

A layered sill, compositionally zoned from pyroxenite to anorthosite, crops out in the northwest part of the map area, south of Net Lake (Map 1).

Banded, chert-magnetite and rarer chert-pyrite -pyrrhotite iron formation occur at the base of the Arsenic Lake Formation (Map 1; Figure 2). Old drilling in the Vermillion Lake area (Assessment Files, Resident Geologist, Ministry of Northern Development and Mines, Cobalt) and spatial relationships observed on surface, indicate that the sulphide-rich iron formation lies up to 10 m stratigraphically below the oxide facies iron formation. Iron production from the West and North Pits of the Sherman Iron Mine comes from this OBIF unit.

An ultramafic "fragmental" rock lies immediately above this OBIF. This ultramafic rock is exposed in the hanging wall of the West Pit in the Sherman Mine and crops out at this approximate stratigraphic position on the Perron (Beanland) and Mayfair properties to the northeast (Maps 2, 6, 7). This rock consists of centimetre-sized, ultramafic rock fragments which rest in a calcite matrix. Locally, distinct layering, accompanied with size grading, was observed in this unit (e.g. on Mayfair property; Map 7). Primary volcanic textures are not present, and this layering could represent bedding. It is not certain if the fragmental texture represents a tectonic fabric developed in an ultramafic sill, or if this rock is a metasediment.

2.1.2. Link Lake formation

Feldspar-phyric, calc-alkaline basalt and andesite flows and less abundant quartz- and quartz-feldspar-phyric felsic flows and pyroclastic deposits typify the Link Lake formation. Both quartz-phyric and feldspar ($\pm$ quartz)-phyric felsic rocks are present. Although the data base is small, feldspar- (with lesser quartz) phyric, felsic deposits appear to be more abundant on the Sherman Iron Mine property, west of Turtle lake. A dioritic intrusive sill, which crops out along the Milne-Sherman road, was intruded into the Link Lake formation.

2.1.2.1 Mafic flows

The feldspar-phyric mafic flows are commonly pillowed. Feldspar abundance averages 5%, and feldspar grain size generally does not exceed 1 mm, in contrast to the coarse grained feldspar phenocrysts which appear in some of the iron-rich, tholeiitic basalt of the Arsenic Lake formation. Where strongly feldspar-phyric, towards the top of the Link Lake formation, and in the absence of pillows, there can be some question whether the rock is a diorite intrusion, or a feldspar tuff.

2.1.2.2 Felsic rocks

Felsic flows are less common in the Link lake formation. The most aerially extensive felsic flow, or felsic dome, crops out between Link and Turtle Lakes (Map 2). It extends for about 2.5 km along strike to the east and has a maximum thickness of 200 m. Although generally aphyric, feldspar is rarely present and a variety of volcanic breccia is locally developed. The thickest part of this unit occurs at the west end of Link Lake, possibly coincident with a feeder zone.

The bulk of felsic rock in the Link Lake formation occurs as subaqueous, pyroclastic flows (Fiske 1963, Fiske and Matsuda 1964). These deposits display the characteristic normal grading, and occasionally the pre-ence of a finely bedded (now silicified), tuffaceous cap that was deposited from turbidity currents late in each eruptive pulse. Not all individual deposits have this thin bedded cap. Juvenile pyroclasts are predominantly quartz (± feldspar) - phyric and range up to 30 cm in crosssection. Less common are dark green juvenile pyroclasts which appear to consist of chlorite and sericite. The dark green fragments have undergone preferential flattening in response to shear within the Link Lake Zone of Deformation. These dark, flattened fragments have been interpreted as pumice (Bennett 1978). Some of the subaqueous, pyroclastic deposits contain composite, accidental fragments which consist of pyrite and sugary quartz (recrystallized chert?). Their presence indicates that sulphide-precipitating, hydrothermal activity occurred somewhere in the volcanic source area.

The felsic volcanic tuff-breccias exposed on the Sherman Iron Mine property differ slightly from those exposed to the east, in that feldspar, instead of quartz, is the dominant phenocryst phase. This contrasts with the felsic, subaqueous, pyroclastic deposits to the east, where quartz is the dominant phenocryst. These units are either products of different magma chambers or one chamber which became chemically stratified, perhaps with respect to water pressure. The tendency for the feldspar-phyric, extrusive, felsic volcanic products to be restricted geographically to the western part of the map area, concentrated on the Sherman Mine property, suggests that perhaps the first hypothesis is more probable.

2.1.3. Turtle Lake formation

Resedimented (turbiditic), felsic, epiclastic, turbiditic sediments comprise the Turtle Lake Formation, which is host to the Sherman Mine South and East Pit iron formations. The sediments in this formation have been subdivided into three facies: 1) a coarse, epiclastic, matrix supported conglomerate; 2) thin bedded, normally graded, distal turbidite deposits; and 3) banded, chert-magnetite iron formation.

2.1.3.1. Conglomerate facies

The base of the Turtle Lake formation is defined by a heterolithic, volcaniclastic, matrix-supported conglomerate unit which lies conformably above the felsic flows (dome) and pillowed, calc-alkaline basalts of the Link Lake formation. Identified in this unit are several varieties of rounded to subangular, felsic and mafic volcanic fragments, rare vein quartz fragments and one fragment of white chert. No banded iron formation fragments were seen. The clast size averages 20 cm at the base of the section and fines both upward and laterally. Generally, layering (bedding) is not obvious, although crude layering is developed locally. At any point, the deposits tend to be very poorly sorted, and imbrication is not well developed. The clast imbrication that was observed suggests paleoflow was from a westerly direction. This coarse, clastic unit has been traced to the east for approximately 2 km, where it thins and eventually pinches out. The wedge-shaped aspect in cross section, thickest edge to the west of Link Lake, and the poorly constrained paleoflow data, suggest that the source area and, hence, a region of higher topography, lay to the west of Link Lake.

2.1.3.2. Thin bedded facies

The conglomerate unit passes laterally and vertically into thin bedded deposits. These thin bedded deposits show normal grading, flame structures, rip-up clasts, ball and pillow, and scour features. These characteristics are typical of turbidity deposits, although no complete Bouma sequences were recognized. This facies has been traced to the eastern limits of the map area.

Towards the top of the Turtle Lake formation, interbedded with thin-bedded wackes on the south limb of the Tetapaga Syncline, are several dark green, strongly vesiscular, iron-rich tholeiitic basalts. These are best exposed along the south shore of Turtle Lake (Map 2). Vesicle size exceeds 1 cm in some cases and all are now filled by sugary white quartz. OBIF lies between two such pillowed flows. This is the first evidence of iron formation in this stratigraphic succession.

2.1.3.3 Chert-magnetite iron formation

A thick (30 m) unit of chert-magnetite iron formation occurs at the top of the thin-bedded turbidite package, on the south limb of the Tatapaga Syncline (Figure 2; Map 2). The macroscopic transition from clastic sediments into iron formation, almost devoid of clastic sediments, is rapid. Stratigraphically beneath the iron formation, across a 100 metre section, the proportion of chert and magnetite layers, interbedded with the volcaniclastic, thin-bedded turbidite deposits, increases; however, the chert and magnetite layers constitute no more than a few volume percent of the clastic, sedimentary sequence. The chert and magnetite layers, where present in the clastic sedimentary-rich section, occupy the "E" Bouma division in these turbidity deposits. Abruptly, across 1 metre, no coarse (>0.5 mm) clastic detritus remains and only chert-magnetite and minor, dark green chlorite-rich bands exist. This iron formation material defines the South and East Pits of the Sherman Iron Mine.

2.1.3.4 Interpretation of Turtle Lake Formation

The conglomerate facies of the Turtle Lake formation is interpreted to be an alluvial fan, constructed from proximal, turbiditic deposits which accumulated adjacent to a topographical high located to the west, possibly on the Sherman Mine property. The thin-bedded deposits are interpreted to be classical turbidite deposits derived from a felsic volcanic centre. This epiclastic material accumulated on the more distal part of the fan (to the east) or on an abandoned lobe (deposits near the top of the formation).

The following interpretation regarding the accumulation of the OBIF follows from evidence provided by the basalt and sedimentary rock on which chert and an iron-rich precursor were precipitated: 1) OBIF accumulated in a shallow (but below storm wave base), subaqueous regime as a result of precipitation of silica and an iron-rich phase; 2) significant accumulation of OBIF resulted during hiati in clastic, turbiditic sedimentation and effusive mafic volcanism; 3) the host rocks which enclose the East and South Pit iron formations are turbiditic, epiclastic wackes, whose source was largely a felsic volcanic terrane, possibly located to the west - primary, felsic pyroclastic tuffs or breccias are rare to absent in the immediate footwall and hangingwall of the OBIF; 4) the equivalent sedimentary stratigraphy on the north limb of the Tetapaga Syncline, exposed just north of Turtle Lake, also consists ofturbiditic deposits, but a thick, coarse epiclastic, resedimented conglomerate occupies the time horizon represented by the OBIF on the south limb. That is, OBIF accumulation on the north limb was probably prevented by the active accretion of the proximal coarse clastic rock.

2.1.3.5. Equivalence of the iron formation units

Assuming that the stratigraphic subdivision presented is valid, then it is apparent that the oxide facies iron formation, which constitutes the North and West Pits of the Sherman Iron Mine, lies at the base of the Younger Volcanic Complex, interbedded with iron-rich, tholeiitic basalt. The East and South Pits are developed in iron formation which lies at the top of the Younger Volcanic Complex, associated with epiclastic, turbiditic sediments. Thus, the two regionally extensive bands of oxide facies iron formation are not stratigraphically equivalent, at least within the constraints imposed by the reconstructed volcano-sedimentary stratigraphy in this part of Strathy Township.

2.1.4. Upper Volcanic formation

This formation consists of dark green, massive and pillowed, iron-rich tholeiitic basalt flows which are preserved in the core of the Tetapaga Syncline. Very little of this formation is exposed in the western part of Strathy Township, because of the gentle eastward plunge of the Tetapaga Syncline.

3. Felsic volcanic vents

Felsic volcanic vents are inferred to have existed at the Sherman Mine (Sherman vent), near the Milne Lumber Mill (Milne vent) and just east of the city dump (City Dump vent). Recognition of fossil volcanic vents is important because of their close spatial association with certain types of mineral deposits. This seems to be the case in the Temagami area because favourable indications of volcanic-associated, Cu-Zn massive sulphide mineralization have been observed in rocks of the Link Lake formation (Section 8.1), and a case will be made that some of the late, epigenetic gold mineralization also occurs in proximity to, although genetically unrelated to, the felsic dykes which may have fed the vent volcanism. The criteria which were used to identify these areas as fossil vents are discussed on an individual vent basis.

3.1. Sherman vent

The area to the west of Link Lake, on the Sherman Iron Mine property, was not mapped in detail; however, several features imply that a major volcanic vent existed on, or in the hemisphere to the west of, the Sherman Mine property. This evidence includes the pre-ence of two extrusive, felsic flows which crop out between Link and Turtle Lakes (Map 2). The aspect of the largest felsic flow, described in Section 2.1.2., suggests that its feeder zone was located at the western end of Link Lake. Additionally, facies changes and paleoflow directions observed in the wedge of coarse grained, resedimented conglomerate (Turtle Lake formation), indicate that a topographical high, perhaps the manifestation of a volcanic vent, existed west of Link Lake. Finally, in a very general way, coarsest felsic volcanic fragments occur in feldspar-phyric, pyroclastic deposits exposed on the Sherman Mine property, also suggesting proximity to a vent area.

3.2 Milne vent

A small felsic volcanic vent is exposed along the Milne-Sherman road, just north of the Milne town site (Map 3). A quartz-porphyry intrusion intrudes mafic and rhyolitic flows and a diorite dyke. The grain size of quartz phenocrysts averages about 3 mm in the core of the intrusion, but decreases towards the edge of the body. A breccia, interpreted to be a breccia carapace, is developed along the western margin of the body. A fine grained, quartz-phyric felsic rock, possibly a rhyolite flow, crops out adjacent to the small felsic dome, a feature consistent with vent geology. A possible subvolcanic intrusive equivalent to the felsic dome is exposed about 1 km to the northwest (Map 3). Exposed along the railroad to the west of the lumber yard is a body of quartz-feldspar porphyry. It is not known if this body is an intrusion or an extrusive rhyolite flow; however, a subjective interpretation is that it represents a sheared, rhyolite flow.

3.3. City Dump vent

Little outcrop in this area precludes a confident reconstruction of the geology in the suspected vent area; however, a number of north-trending, quartz-feldspar and feldspar-rich, felsic dykes occur to the north of the city dump (Map 3). None of these dykes can be traced across the Link Lake Zone of Deformation. This suggests that these dykes may have fed a small vent, manifest now by some felsic flows, in the city dump area. Note that along strike, certain lithologies can be correlated through the Link Lake of deformation (Maps 2 and 3). This suggests that the absence of the felsic dykes on the south side of this zone, in the city dump area, is not necessarily an expression of displacement along the zone of deformation.

4. Intrusions

Several types of intrusions are found in the area. They are discussed in sequence from oldest to youngest.

4.1. Mafic Intrusions

4.1.1. Layered mafic intrusion

A layered mafic intrusion is exposed in northwest Strathy Township (Map 1). It consists of a marginal phase of diorite, which is followed inward successively by pyroxenite, gabbro, and anorthositic gabbro. One small outcrop of anorthosite was found. Pyrrhotite (with exsolved pentlandite and chalcopyrite) is ubiquitous in the pyroxenitic rock. Many narrow (<5 m), northeast-trending shear zones cut the body (Map 1). These high strain zones are parallel to the Vermillion Lake-Net Lake Zone of Deformation. Most of these shear zones carry quartz veins with pyrite, chalcopyrite, and pentlandite. This body may be equivalent in age to the Ajax Intrusion (Bennett 1978, p.22) from which the Kanichee Mine produced 99,284 lbs. Cu, 65,434 lbs. Ni, 37 oz. Au, 910 oz Ag., 83 oz. Pt., and 196 oz. Pd from 3318 tons milled (Thomson et al. 1957).

It is possible that this layered intrusion represents a high level magma chamber which fed tholeiitic volcanism.

4.1.2. Diorite

This body crops out along the north limb of the Tetapaga Syncline, along the Milne-Sherman road (Maps 2 and 3). In outcrop it has a characteristic "frothy"-textured, very light coloured weathered surface, due to the positive weathering of plagioclase, which constitutes >50% of the rock. A number of narrow (<1 m), east-trending high strain zones, apparently related to the Link Lake Zone of Deformation, are localized in the diorite; hence, the diorite was intruded at least prior to the last increment of strain along the Link Lake Zone of Deformation. A dyke similar to this one (Broom Island Diorite) was described in more detail by Bennett (1978, p.21).

The diorite may represent a high level magma chamber which fed the calc-alkalic, feldspar-phyric felsic volcanism, the extrusive products of which are most abundant on the Sherman Mine property.

4.2 Felsic dykes

Quartz- and feldspar-quartz porphyry intrusive dykes are common. The distinction between these two types is based on the presence of mesoscopically visible quartz or feldspar phenocrysts. Both types of dykes appear to have been intruded relatively early in the volcano-tectonic history. Some evidence, discussed in section 3.3 suggests that they may represent subvolcanic feeders to the recognized calc-alkalic, felsic volcanic events. For example, a higher density of these dykes occurs to the north of (stratigraphically below) the city dump area and in the Arsenic Lake area. Felsic dykes are rare to the south of (stratigraphically above) the Link Lake Formation. Quartz porphyry dykes cut the layered, mafic intrusion.

4.3. Pyroxenite dykes

Several narrow (<2 m) pyroxenite dykes cut rocks in all formations. One, east of Highway 11, is roughly north-northwest-trending, while two others, north of Arsenic Lake, are east-trending. One such dyke, exposed along the Kanichee Mine Road, cuts the Strathy-Chambers Batholith.

4.4. Diabase dykes

Northwest-trending diabase dykes cut all rock types in the area and are interpreted to belong to the Sudbury dyke swarm (aged 1250 Ma; Van Schmus 1975).

5. Structural Geology

One major fold and three major zones of deformation were identified on the area.

5.1. Tetapaga Syncline

The major fold in the area is the Tetapaga Syncline (Bennett 1978). This is an isoclinal fold which plunges approximately 25° to the east. The surface trace of the fold axial plane trends east-northeast through Turtle Lake (Figure 2; Maps 2 and 3). Iron-rich, tholeiitic basalt flows (Upper Volcanic formation) occupy the core of the syncline.

5.2. Link Lake Zone of Deformation

This broad zone of deformation trends easterly through Link Lake, and is characterized by well developed foliation and replacement of the volcanic rock by ferroan carbonate. It has been traced for at least 3 km east of Highway 11 and attains a width of at least 0.5 km. Its extent to the west of Link Lake is uncertain, because no expression of this zone was observed on the Sherman Mine property. Hence, the Link Lake Zone of Deformation may deflect south, and merge with the Northeast Arm Zone of Deformation.

The strain intensity across the zone is heterogeneous, in that megascopic low strain lozenges occur throughout. In general, the highest strain intensity is developed in the felsic pyroclastic rocks. Ferroan carbonate alteration, manifest either as carbonate veins or wallrock replacement, is common and widespread within the zone of deformation.

mafic flows contain the greatest abundance of secondary ferroan carbonate.

Because the zone trends subparallel to the stratigraphy, no obvious displacement of marker horizons is evident. Kinematic indicators are lacking, making a kinematic analysis of the zone difficult. Extension lineations plunge steeply.

5.3. Net Lake-Vermillion Lake Zone of Deformation

Mapping was not carried completely across this zone; therefore, its true width is not known. The expression of this zone of deformation is clearly identifiable on Bennett's (1978) map of Chambers and Strathy Township (Map 2323) by the dramatic change in the strike of the volcanic stratigraphy of both the Older and Younger Volcanic Complexes. The volcanic units and the oxide facies iron formation which lie at the top of the Older Volcanic Complex, to the west of this zone of deformation, strike nearly due east. These units have been dragged to the northeast where they strike into the zone of deformation (Figure 2). Conversely, the variolitic basalt units in the Arsenic Lake formation, have been dragged to the southwest where they enter the zone of deformation from the east (Figure 2; Map 2). This sense of the stratigraphic deflection is consistent with a component of sinistral shear along the zone of deformation.

On an outcrop scale, this zone of deformation is characterized by the development of an intense foliation and numerous small (<10 cm in width) ferroan carbonate veins. Ferroan carbonate replacement does not seem to be as widespread in this zone of deformation as that observed in the Link Lake Zone of Deformation.

5.4. Northeast Arm Zone of Deformation

The surface trace of this zone is coincidental with the northeast arm of Lake Temagami (Figure 1). Although this zone was not examined in detail, casual examination of several islands along the northeast arm shows the development of intense foliation and the introduction of secondary ferroan carbonate across a zone of about 1 km in width. No kinematic analysis of this zone was undertaken.

5.5 North-trending Shear Zones

Several north-trending shear zones cut the iron rich, tholeiitic basalts of the Arsenic Lake Formation (Figure 1; Map 3). These zones vary in width from <1 m to as much as 5 m. In general the basaltic rock has developed an intense foliation and has been chloritized.

Some field evidence suggests that these shear zones may occupy a broader zone of weakness that was periodically activated over at least 1000 Ma. Evidence for early tectonic instability along these zones, possibly coincident with volcanism, comes from the higher density of felsic dykes concentrated immediately about these zones. One of these areas with a high density of felsic dykes is the Big Dan Shear Zone, located north of the City Dump felsic volcanic vent (Map 3). The felsic dykes in this area are interpreted to represent a subvolcanic feeder system to the overlying felsic volcanism. It is conceivable that the dykes utilized a pre-existing zone of crustal weakness, now manifest by the shear zones. Repeated activation of the Big Dan Shear Zone is demonstrated by dextral offset of the clastic sediments of the Turtle Lake formation, east of the Ontario Northland railroad tracks (Map 3). This period of activation along the Big Dan Shear Zone also affected the felsic dykes that are exposed to the north of the actual Big Dan showing; however, significant displacement of the dykes at this position is not recorded. The latest period of activation along the Big Dan structure resulted in sinistral displacement of a Proterozoic, diabase dyke which cuts the shear zone. A similar abundance of felsic dykes occurs in the immediate area of the Arsenic Lake (Penrose; Map 5) gold property, suggesting that similar, periodic activation took place along that structural zone. Thus, the north-trending shear zones could have been active for at least a 1,000 million years.

6. Metamorphism

Except for a contact metamorphic, amphibolite grade aureole that is developed about the Strathy-Chambers Batholith, the volcano-sedimentary terrane has attained greenschist facies of metamorphism. The precise location of the greenschist-amphibolite isograde is not yet constrained by petrographic analysis; however, its approximate position is indicated on Figure 3, based on the distribution of hornblende and garnet, found infrequently in basalt flows, and quartz-potassium feldspar veins. In the northern and eastern part of the West pit (Sherman Iron Mine, minnesotaite is present in the silicate mesobands (Campbell, 1978; Crocket et al. 1984).

7. Rock Alteration

Several types of rock alteration were recognized in this area. These, listed from oldest to youngest, are: 1) filling of vesiscles by quartz, calcite and chlorite; 2) quartz veinlets; 3) epidote veinlets; 4) pervasive replacement of volcanic rock by silica (referred to as silicification); 5) pervasive replacement of volcanic rock by ferroan carbonate or calcite; and 6) calcite precipitation in extension fractures. Types 1-3 are found throughout the area and do not correlate spatially with either the precious or base metal occurrences; they are not discussed further.

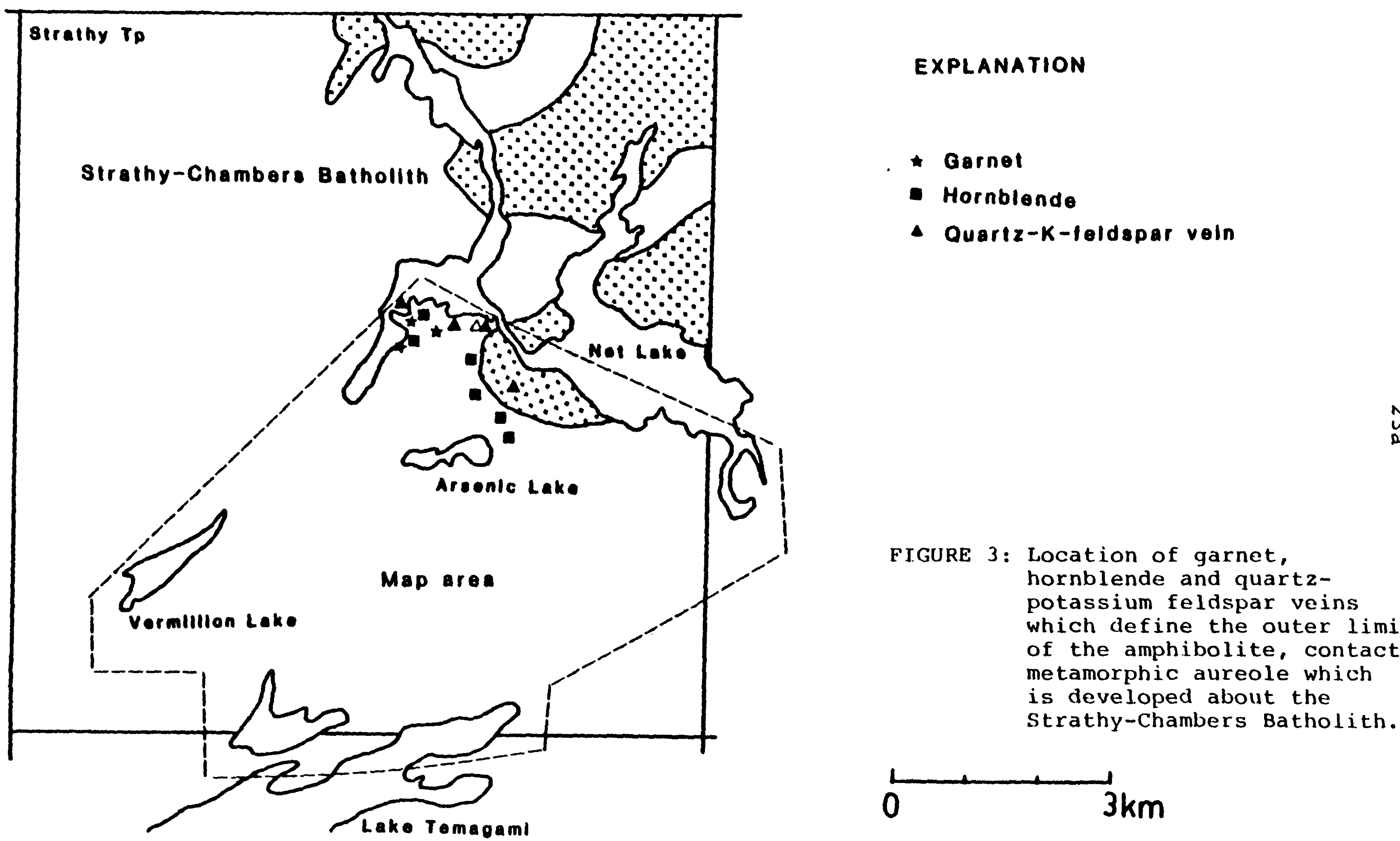


FIGURE 3: Location of garnet, hornblende and quartz-potassium feldspar veins which define the outer limit of the amphibolite, contact metamorphic aureole which is developed about the Strathy-Chambers Batholith.

7.1. Silicification

Silicified mafic, pillowed volcanic rock crops out along and to the west of the north-trending Ontario Northland railroad track, east of the Big Dan property (Map 3) and in the Outlet/Boot Bay area of Net Lake (Map 4). This type of alteration has been documented in zones of deformation (Andrews and Hugon 1985) and as the product of low temperature, sea water alteration (Gibson et al. 1983). In this map area, the rocks within and immediately outside the zones of silicification bear no intense foliation, and the areas of silicification do not lie within the Link Lake Zone of Deformation. Thus, it is possible that these patches of silicification developed during a low temperature, sea water alteration event.

The aerial extent of silicification exposed in the Outlet/Boot Bay area of Net Lake (Map 4) is poorly constrained, because only one day was spent examining outcrop in this area. The presence of silicified rock in this area is not in doubt, for good outcrop of incipiently silicified, pillow basalt can be observed along the lake shore of Net Lake; however, the volume of silicified rock is uncertain because some felsic volcanic rock does occur at this stratigraphic position. This question is critical and requires additional evaluation because chlorite alteration, manifest as veinlets and pervasive replacement of a previously silica-rich rock, was also identified in the Boot

Bay area (Map 4). The presence of this chlorite alteration, accompanied by traces of veinlet pyrite, pyrrhotite and chalcopyrite, may indicate that a higher temperature, base metal-bearing hydrothermal system affected the rocks in this area of Net Lake. Although these observations are preliminary, they suggest that this area may have potential for volcanic-associated, massive sulphide mineralization (see section 8.1).

7.2. Ferroan carbonate

Ferroan carbonate replacement of volcanic rock is a common feature observed in the Northeast Arm, Link Lake and Net Lake-Vermillion Lake Zones of Deformation. Some of these ferroan carbonate alteration zones are flanked by calcite-rich alteration assemblages, analogous to the distribution of alteration assemblages recognized in the Timmins area (Fyon and Crocket 1982). Within the high strain zones, ferroan carbonate is also manifest as metre-wide veins which have been traced along strike for 100's of metres, at least in the case of ferroan carbonate vein which is exposed along the northeast arm of Lake Temagami (See Map 2323; Bennett 1978).

7.3. Calcite

A restricted area, where basalt has been replaced by calcite, occurs just north of the city dump (Map 3). Although developed adjacent to the Link Lake Zone of Deformation, rocks within and immediately outside the zone of calcite alteration do not generally bear an intense foliation. Thus, if the zone of calcite alteration was localized by the Link Lake Zone of Deformation, it developed outside the zone of the highest strain.

8. Mineralization

Commodities which have been mined in the Temagami area include iron, copper and gold. The iron deposits have been described by Bennett (1978) and are not addressed in this report. One significant copper producer, Temagami Copper Mine, is also briefly described by Bennett (1978). Many gold showings and properties occur in Strathy Township and along the eastern margin of Chambers Township (Figure 4). These are described by Savage (1935) and Moorhouse (1942).

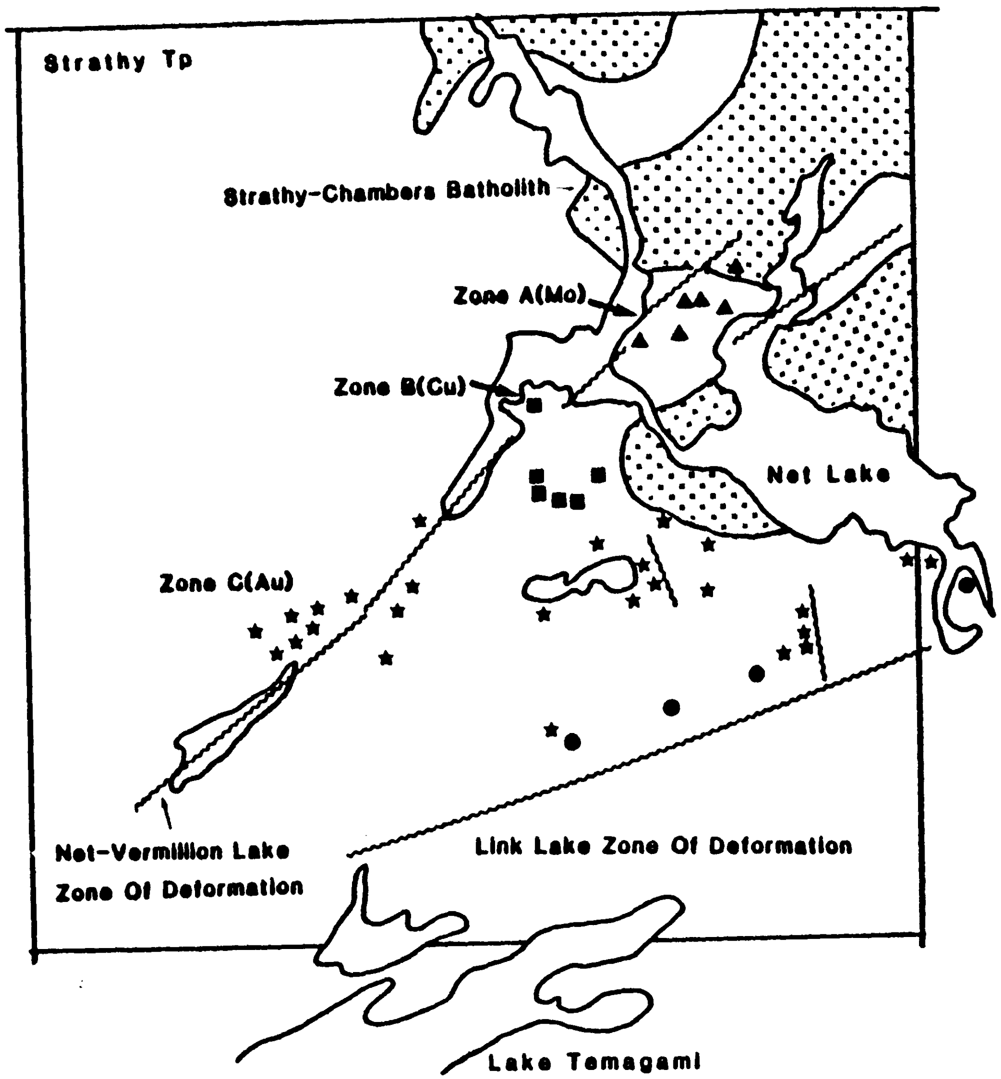
8.1. Gold Mineralization

8.1.1. Older Volcanic Complex

Many gold-pyrite showings occur in the felsic volcanic rocks near the top of the Older Volcanic Complex, adjacent to and on the northwest side of the Vermillion Lake-Net Lake Zone of deformation (Figure 4). These showings were not examined during this study. However, the location of these showings within and adjacent to the Net Lake-Vermillion Lake Zone of Deformation strongly suggests that they are related to the development of that high strain zone.

8.1.2. Younger Volcanic Complex

Gold mineralization in this complex occurs in several different habits: 1) north-trending, chloritized shear zones containing arsenopyrite, pyrrhotite, pyrite, and chalcopyrite (Big Dan, Arsenic Lake showings); 2) quartz veins which carry base metal sulphides associated with ferroan carbonate wallrock alteration (Perron or Beanland property and COMINCO's Hermiston-McCauley claims); 3) pyrite in deformed magnetite-rich iron formation (Mayfair and INCO properties); 4) pyrite in sericitized and carbonatized felsic, volcanic rock (Pingue Lake showing; Bennett 1978, p.113); and 5) quartz-pyrrhotite-chalcopyrite-pentlandite-pyrite zones within deformation zones in the layered mafic intrusion.



EXPLANATION

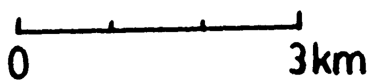
▲ Molybdenite-chalcopyrite

★ Au-arsenopyrite-pyrrhotite-(chalcopyrite,sphalerite,pyrite,galena)

■ Pyrrhotite-pentlandite-chalcopyrite-(pyrite,Au)

● Pyrite-sphalerite-(chalcopyrite)

FIGURE 4: Location and type of mineral occurrences in Strathy Township.



8.1.2.1. Sulphides in chloritized shear zones

The Big Dan (Map 3), Penrose (Map 5), Little Dan (Map 5) and several other minor showings in northern Strathy Township are typical of this type of gold mineralization. Arsenopyrite, pyrrhotite, pyrite, and trace chalcopyrite with sphalerite occur as disseminations, veinlets and in quartz veins within north-trending, chloritized shear zones which cut the iron-rich, tholeiitic basalts of the Arsenic Lake formation. Quartz-feldspar porphyry dykes tend parallel to or lie within the shear zones, an are cut by the mineralization. Although this type of occurrence could be examined only in surface showings, a mineralogical and textural zonation appears to be present. Arsenopyrite, pyrrhotite, and traces of chalcopyrite occur as massive pods and impregnations in the chloritized rock. About this arsenic-rich zone, pyrite occurs as veinlets and farther out still, as disseminations. Chalcopyrite occurs in later fractures which crosscut the massive arsenopyrite. Traces of sphalerite are present on the Big Dan property, within quartz porphyry dykes where deformed by the north-trending shear zones. Quartz veins are present in the mineralized zones, generally in or near the arsenopyrite-rich zones, but the veins are not abundant. These chloritic shear zones are narrow, generally not exceeding 1 m in width, although recent drilling on the Penrose or Arsenic Lake property has defined one such zone that is about 10 m in width (Northern Miner Press Release, February 5, 1986). The strike length

continuity of these zones is variable; the shear zone which hosts the Big Dan mineralization has been traced for about 1.5 km (Map 3).

The only available grade/tonnage figures for this type of mineralization are for the Penrose property, where 60,000 tons grading about 6.5 g/t are reported (Assessment Files, Resident Geologist, Ministry of Northern Development and Mines, Cobalt).

8.1.2.2. Base metal sulphide-bearing quartz veins

This type of mineralization is exemplified by the Perron (Map 6) and the COMINCO (Moorhouse 1942, p.33) showings, where pyrite, chalcopyrite, galena, sphalerite and free gold are present in a quartz vein system. This type of mineralization seems to be localized within and immediately adjacent to the Net Lake -Vermillion Lake Zone of Deformation.

On the Perron (Beanland) property (Map 6), a single quartz vein up to 1 m in width carries the bulk of the sulphide. This vein trends northeast, parallel to the Net Lake - Vermillion Lake Zone of Deformation, and dips steeply. Ferroan carbonate alteration of the tholeiitic basalt is common adjacent to the vein, which contrasts with the arsenic-rich showings where chlorite is the dominant alteration mineral. This showing lies on the southeast margin of the Net Lake - Vermillion Lake Zone of Deformation.

A quartz vein array is more characteristic of the COMINCO showing, where a number of thin (<5 cm) quartz-sulphide veins have precipitated within a fractured dioritic intrusive (Moorehouse 1942). Approximately 31,000 tons, grading 8.4 g/ton, was outlined in 1935-1938, on this property (Northern Miner, April 5, 1984, p.21). This mineralized zone lies on the northwest side of the Net Lake - Vermillion Lake Zone of Deformation.

8.1.2.3. Pyrrhotite-chalcopyrite-pentlandite-pyrite mineralization in deformed, layered intrusion

A number of northeast-trending deformation zones are localized in the pyroxenite phase of the layered, mafic sill located in northwest Strathy Township, east of the Net Lake-Vermillion Lake Zone of Deformation (Map 1). Within these high strain zones, quartz veins commonly carry chalcopyrite, pyrite, pyrrhotite with exsolved pentlandite, and traces of sphalerite and galena (e.g. INCO Canada vein, Bennett 1978, p.89). Chalcopyrite, pyrrhotite, and pentlandite occur in shear zones which lack quartz veining. None of these zones appear to carry significant gold values, although assay characterization of such material is incomplete. The presence of platinum group elements in these zones has not yet been assessed.

8.1.2.4. Disseminated pyrite in sericitized zones

Several deformation zones trending parallel to the Northeast Arm Deformation Zone carry disseminated pyrite. They are more abundant along the south shore of the northeast arm of Lake Temagami and one such pyritic zone is exposed in a railway cut near Pingue Lake (Bennett 1978, p.113). Although chip samples taken systematically across this zone assayed only trace gold, the abundance of disseminated pyrite (5-10%), and the replacement of the felsic rock (in part a quartz porphyry) by ferroan carbonate, quartz and white mica are encouraging indications, suggesting that this, or subparallel, intensely foliated zones may be auriferous.

8.1.2.5. Iron formation-associated gold

Anomalous gold and copper values occur in the iron formation which trends northeast within the Net Lake-Vermillion Lake Zone of Deformation. Only two surface exposures of this type of mineralization exist: 1) the INCO ground just south of Net Lake; and 2) the Mayfair Property, southeast of Cooke Lake.

8.1.2.5.1. INCO Net Lake occurrence

A chert-magnetite-pyrrhotite unit crops out along the southwest shore of Net Lake (INCO property; Map 1). Pyrrhotite, as the most abundant sulphide mineral, occurs as veinlets and disseminations. Traces of pyrite, sphalerite and exsolved pentlandite and chalcopyrite accompany the pyrrhotite. Magnetite proportion varies from 100% to less than 10%. The main showing is located just south of the Kanichee Mine road. Low gold and base metal (Cu) values characterize this zone (Assessment Files, Resident Geologist, Ministry of Northern Development and Mines, Cobalt).

This sulphide-bearing unit lies at the top of the Older Volcanic Complex, within felsic rocks. It is overlain by massive, dark green, iron-rich tholeiitic basalt flows of the Arsenic Lake formation. None of the felsic volcanic material appears to be proximal because fragment size rarely exceeds 1 cm, and generally is less than 1 mm.

Based on the stratigraphic position of the sulphide zone and the associated rock types, it has been suggested that the sulphide zone represents a volcanogenic, massive sulphide deposit (Bennett 1975). However, a number of observations argue against a volcanogenic origin for this sulphide mineralization. An unusual feature of this showing is the abundance of magnetite at the actual showing. Surface mapping (Maps 1 and 2) and a compilation of magnetometer and drill hole data show that the chert-magnetite iron formation, which crops out in the West and North Pits of the Sherman Iron Mine, can be traced northeast, beneath and along a string of lakes from Vermillion Lake to Net Lake. These iron formation units lie at approximately the same stratigraphic position as the magnetite-bearing, INCO sulphide showing on Net Lake. This stratigraphic correlation suggests that the INCO showing occurs within a sulphidized oxide facies, banded iron formation.

Furthermore, intermineral textures between pyrrhotite and magnetite, observed in polished section, indicate that the sulphide minerals (pyrrhotite, chalcopyrite and pyrite) are secondary after magnetite. That is, the protolith appears to have been a chert-magnetite iron formation which was sulphidized. In fact, the chert-magnetite iron formation is exposed to the southeast, for about 1 km (Map 1), along the east shore of a narrow bay off of Net Lake. This iron formation unit is stratigraphically equivalent to the INCO Net Lake showing, although it is not sulphide-bearing at this locality.

Franklin et al. (1981) report the frequency with which oxide facies, banded iron formation occurs in proximity to volcanic-associated, massive sulphide mineralization. With the exception of the highly deformed and metamorphosed Manitouwadge deposits, no significant oxide facies iron formation is present within at least several 100 metres of the other 130 Shield deposits (Franklin et al. 1981). This antipathetic spatial relationship between oxide facies iron formations and volcanic-associated massive sulphide deposits argues against the INCO showing being a volcanic-associated massive sulphide deposit.

This zone lies within the Net Lake-Vermillion Lake Zone of Deformation, close to the margin of the Strathy-Chambers batholith. The presence of garnet and hornblende in the main zone indicates that this sulphidized section of the chert-magnetite iron formation lies within the amphibolite facies, contact metamorphic aureole which is developed about the Chambers-Strathy Batholith.

8.1.2.5.2. Mayfair showing

On the Mayfair property (Maps 2 and 7), a northwest-trending cross fault is accompanied by drag folding of a chert-magnetite iron formation unit. Secondary, epigenetic pyrite occurs in this folded iron formation as discordant veinlets and replacements after magnetite. Also exposed on this property is an auriferous quartz-pyrite vein (40 cm wide), which cross cuts the iron formation at the northeastern end. This vein can be traced for approximately 60 m in a west-northwesterly direction. Characterization of the gold content of this deformed iron formation is in progress; however, the similarity of this unit to other deformed, gold-bearing, sulphidized Archean iron formations (MacDonald 1983; Fyon et al. 1983) suggests that its gold potential may be greater than previously considered.

9. Mineral Potential for this Part of the Temagami Greenstone Belt

There is good potential that significant gold and copper deposits exist in this area of the Temagami Greenstone Belt. The evidence for this assertion will be outlined in the following sections.

9.1. Volcanic-associated, Zn-Cu massive sulphide mineralization

The following features collectively indicate that the felsic volcanic rocks of the Link Lake formation have a high potential to host volcanic-associated, Zn-Cu-Ag massive sulphide mineralization: 1) several volcanic vents have been identified in this area (Sherman, Milne, City Dump Vents) - massive sulphide deposits are known to occur near or on volcanic vents (Franklin et al. 1981); 2) felsic, subaqueous, pyroclastic flows are abundant - explosive, submarine, felsic volcanism indicates that the felsic magma chamber was volatile-charged and erupted in a subaqueous environment; 3) accidental (not juvenile), composite, chert-pyrite fragments occur in the subaqueous, felsic, pyroclastic deposits exposed along the Milne-Sherman road, in the Milne vent area, indicating that sulphide was being precipitated in the source area; 4) stratiform pyrite accumulations occur in the Milne felsic vent area on the Morrison, Percy, and MacVeigh properties (Assessment Files, Resident Geologist, Ministry of Northern Development and Mines, Cobalt), where low grade copper (0.56-0.22%), zinc (0.07-3.57%), and silver (43-110 g/t) values were obtained (see Bennett 1978, p.93)- this provides evidence of an hydrothermal system which concentrated low levels of copper, zinc and silver in this area; 5) three pyrite-sphalerite veins, which attain widths up to 0.5 m, cut quartz porphyritic rocks and are exposed along the east-trending spur of the Ontario Northland railroad near the Milne vent area - an hydrothermal system concentrated low levels of base metals in this vent area; 6) silicification and chloritization in the Outlet/Boot Bay area of Net Lake (Map 4), particularly where accompanied by pyrite and rare chalcopyrite veinlets, could be favourable alteration expressions of a potentially base metal-rich, hydrothermal system; 4) the REE pattern (Figure 5) of one sample of felsic, subaqueous pyroclastic flow, collected along the Milne-Sherman road near the Milne felsic volcanic vent, has a flat pattern, 300 - 400x chondrite, with a negative europium anomaly - such patterns are typical of extrusive, felsic volcanic rocks which are known to host volcanic-associated, massive sulphide mineralization (Thurston 1982; Campbell et al. 1982).

Those geographical areas within the Link Lake formation which have the most encouraging signs pointing to volcanic-associated massive sulphide mineralization include: 1) the road area from the Milne vent to the city dump area; and 2) the Outlet/Boot Bay area (Maps 3 and 4).

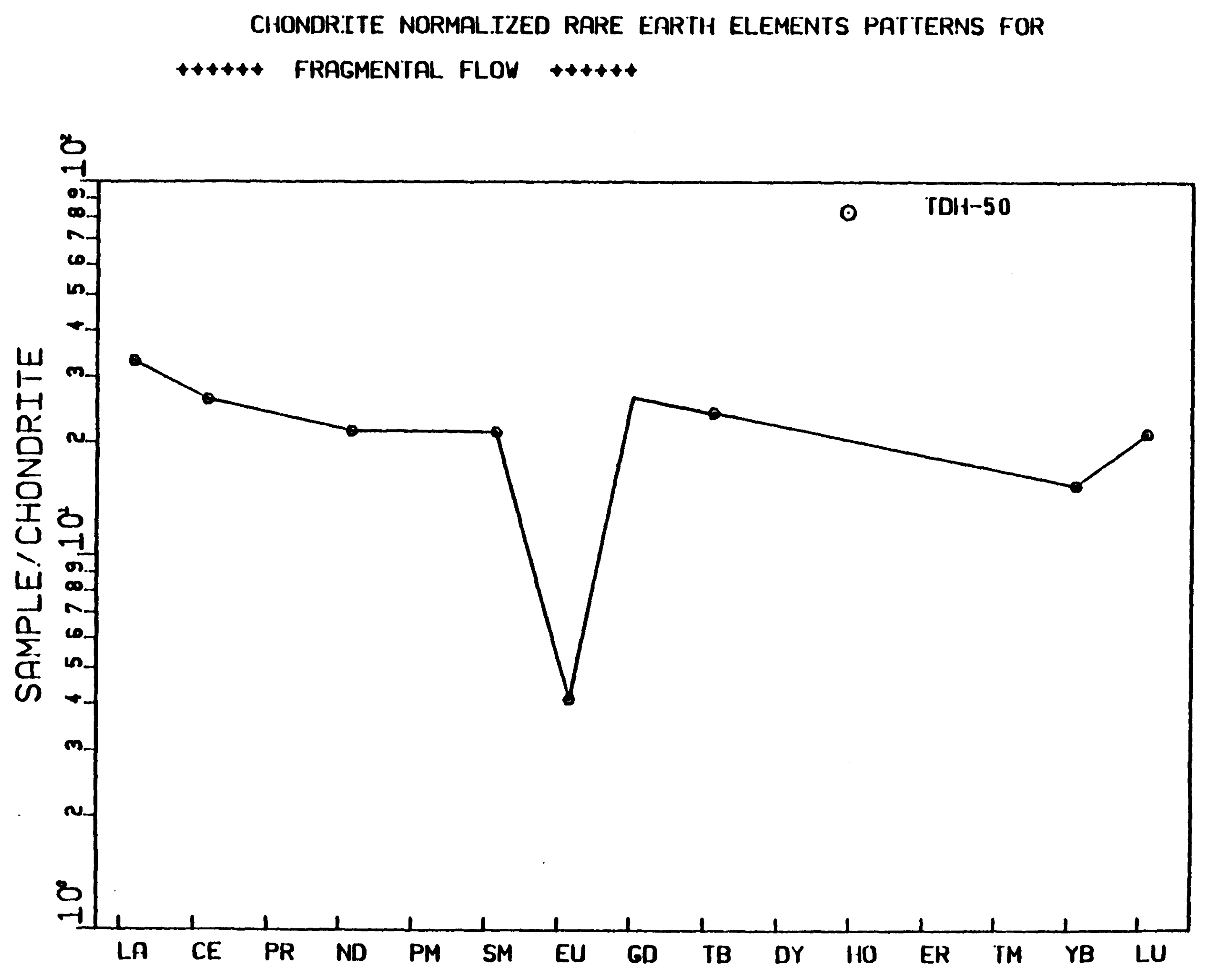


FIGURE 5: Rare earth element pattern of a sample from the felsic, subaqueous, pyroclastic flow exposed along the Milne-Sherman road.

9.2. Gold potential

Studies of greenstone terranes in the Superior Province illustrate that major gold deposits occur in regional zones of deformation (Hugon and Schwerdtner 1985 and discussions in Colvine et al. 1984). In this regard, the Northeast Arm, Link Lake, and Net Lake-Vermillion Lake Zones of Deformation are obvious high potential areas. Several disseminated pyrite showings occur in the Northeast Arm Zone of Deformation (see Bennett 1978 for a listing); however, the high frequency of gold occurrences in and adjacent to the Net Lake-Vermillion Lake Zone of Deformation (Figure 4) targets this area as having especially high potential. Few gold occurrences have been found to date in the Link Lake Zone of Deformation. The north-trending, chloritized shear zones which cut the iron-rich, tholeiitic basalts of the Arsenic Lake formation and carry arsenopyrite-rich gold mineralization, also represent favourable gold exploration targets. The drilling by Stroud Resources on the Arsenic Lake (Penrose property) demonstrates that these north-trending structures can attain widths in excess of 10 metres (Northern Miner Press Release, February 5, 1986).

9.3. Metal zonation

A crude Mo-Cu-Au metal zonation is developed along the Net Lake - Vermillion Lake Zone of Deformation, as defined by the mineralogy of the occurrences (Figure 4). Starting at the northeastern end of this structural zone, adjacent to the Strathy-Chambers Batholith, and moving progressively to the southwest, the metal zonation is as follows: Mo-Cu (Zone A, Figure 4); Cu-Au (Zone B, Figure 4): Au (Zone C, Figure 4). Molybdenite, accompanied by minor chalcopyrite, occurs at the northeast end of the Net Lake-Vermillion Lake structural zone (Barton property; Bennett 1978, p.96) in steeply dipping quartz veins which trend 075°, approximately parallel to the structural trend of this zone of deformation in this area. Quartz-molybdenite-chalcopyrite veins up to 60 cm in width are present and veined zones up to 10 m in width are reported (Bennett 1978, p.96). Generally low, but significant values of silver and gold (up to 10 ppm silver and 3 ppm gold) and traces of bismuth accompany the Mo-Cu mineralization.

Southwesterly from this Mo-Cu zone, the next mineral showing is the INCO Net Lake occurrence, where low values of Cu and Au are reported (Bennett 1975). This could be considered as a transitional zone between Mo-Cu-rich and Au-rich domains. Mineral occurrences which lie farther to the southwest tend to be gold-rich, although sphalerite, galena and chalcopyrite occur as minor associated within the vein systems (e.g. at the COMINCO and Beanland or Perron properties).

This gross metal zonation is similar to that developed in the Hollinger McIntyre mineralized system (Ferguson et al. 1968) and in the Geraldton Gold Camp (Macdonald 1984). Within the Timmins and Geraldton mining camps, the richest gold deposits occurred just outside the Mo-Cu metal zones. Using the Timmins and Geraldton camps as a model, a favourable area for gold exploration includes the section of the Net Lake - Vermillion Lake Zone of Deformation to the southwest of Net Lake.

10. Summary

These studies, in a small area of the Temagami Greenstone Belt, indicate that high potential exists for both base and precious metal deposits. The Link Lake formation represents the most favourable exploration target for volcanic-associated, Zn-Cu-Ag massive sulphide mineralization. The Temagami Copper Mine was hosted partly in felsic volcanic rocks interpreted, on the basis of the stratigraphic reconstruction described previously in this report, to be stratigraphically equivalent to the Link Lake formation.

The high frequency of gold occurrences along the Net Lake-Vermillion Lake Zone of Deformation and the metal zonation from Mo to Cu to Au along this structural zone, identifies that structure as an extremely interesting and favourable target of gold exploration. The fewer number of gold occurrences in the Northeast Arm and Link Lake zones of deformation should not be viewed negatively; a number of disseminated sulphide occurrences are present in sheared and carbonatized and sericitized rock which require serious consideration.

ACKNOWLEDGEMENTS

Mr. Herb Niemetz, President of International Mineral Recovery and Explorations, provided access to drill core and the Niemetz claim, east of Arsenic Lake. Mr. S. Kay, President of United Reef Petroleums Limited, granted permission to map on the former Big Dan property. Mr. Bill Morrison, consultant, provided much geological and geophysical data for a large area south of Arsenic Lake. Mr. George Coburn, President of Stroud Resources Limited, granted access to the former Arsenic Lake (Penrose) property. Mr. Bob Garrett of Sherman Mines Limited arranged access to the Sherman Mine properties during the mine shut down. Without the cooperation of all these gentlemen, this project would not have been possible.

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MAP 1
GEOLOGY OF NORTHWEST STRATHY TWP.

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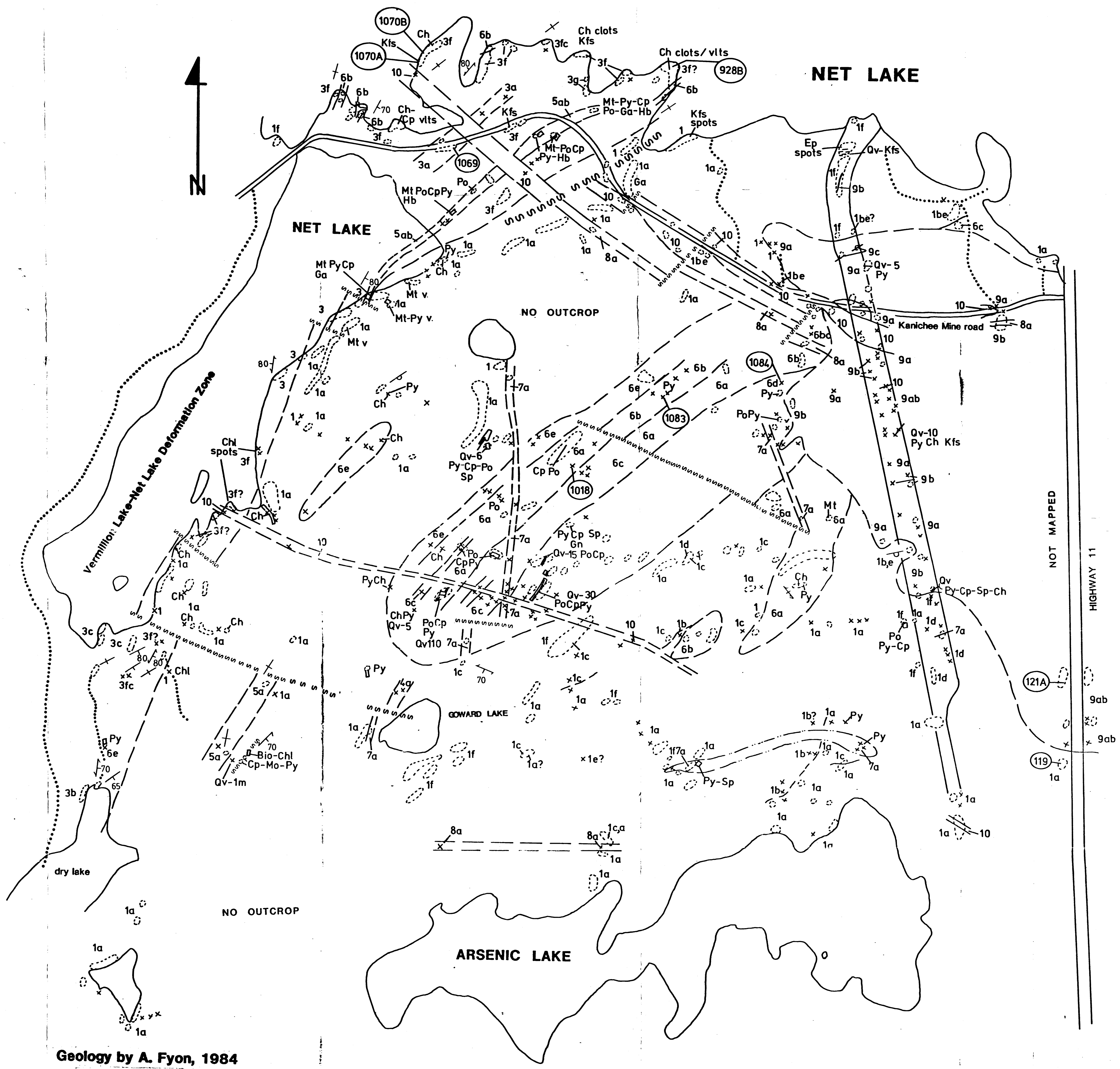

LEGEND

1 Mafic Tholeiitic Metavolcanic Flows
- 1 Unsubdivided
- a Massive
- b Pillowed
- c Breccia
- d Coarse feldspar–phyric flow
- e Variolitic
- f Fine grained

3 Intermediate To Felsic Cala Alkaline Metavolcanic Rocks
- a Quartz–phyric flow
- c Tuff–breccia
- f Feldspar–rich tuff

5 Chemical Metasediment
- a Chert–magnetite iron formation
- b Chert–sulphide

6 Ultramafic To Mafic Intrusive Rocks
- a Pyroxenite
- b Gabbro
- c Anorthositic gabbro
- d Anorthosite
- e Diorite

7 Felsic Intrusive Rocks
- a Quartz porphyry

8 Mafic Intrusive Rock
- a Pyroxenite

9 Chambers–Strathy Batholith
- a Quartz monzonite
- b Trondhjemite
- c K–feldspar quartz pegmatite

10 Diabase

SYMBOLS

┴	Bedding	— —	Geological contact
	Foliation	ᔕᔕᔕ	Fault
▭	Trench	═	Road
·····	Trail		Gas pipe line
Qv–10	Quartz vein–width(cms)		
Mtv	Magnetite vein		
Bio	Biotite	Ch	Chlorite
Cp	Chalcopyrite	Ep	Epidote
Ga	Garnet	Gn	Galena
Hb	Hornblende	Kfs	Potassium feldspar
Mo	Molybdenite	Mt	Magnetite
Po	Pyrrhotite	Py	Pyrite
Sp	Sphalerite		
(1010)	Sample #		

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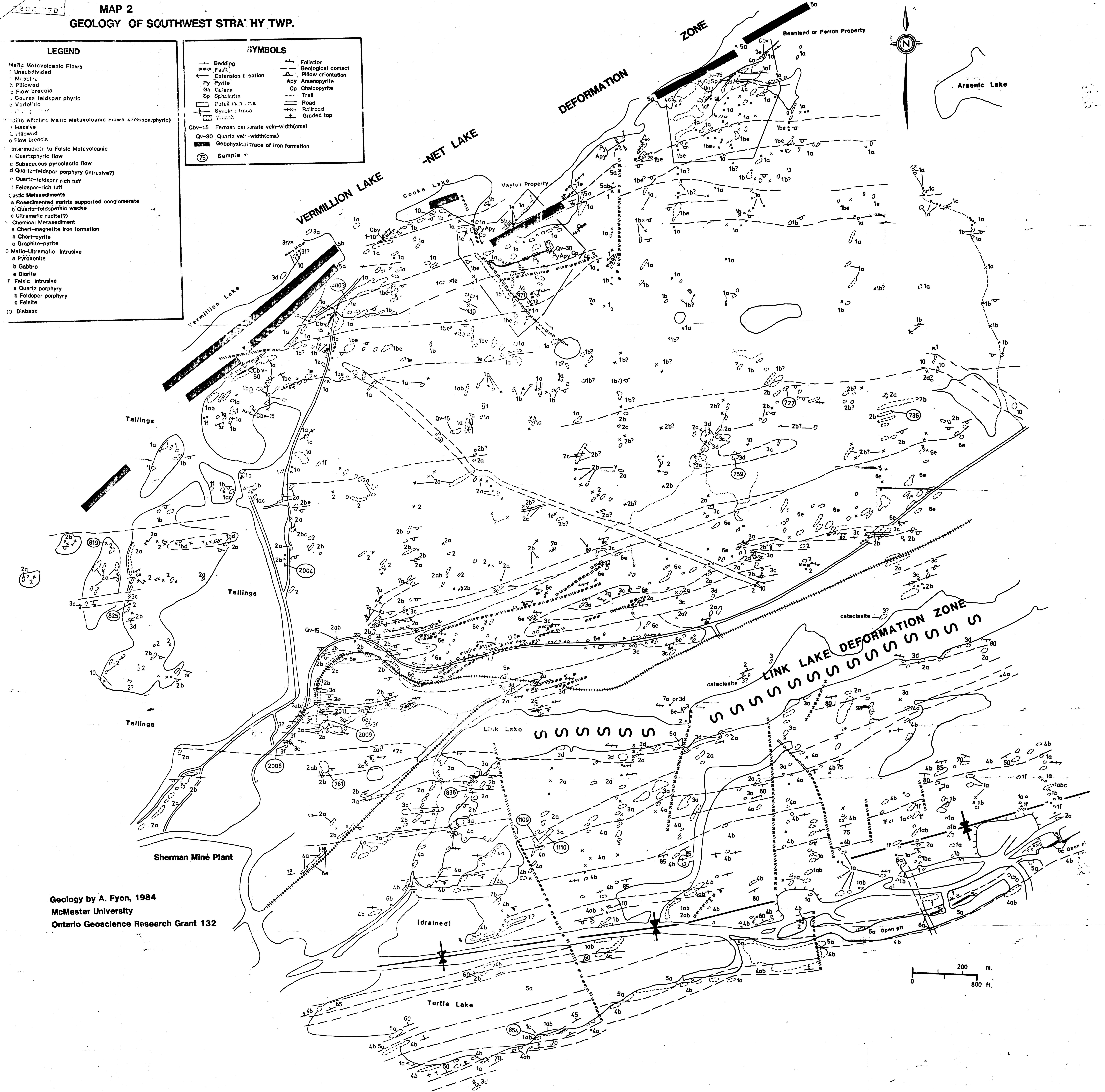
MAP 2
GEOLOGY OF SOUTHWEST STRATHY TWP.



MAP 3
GEOLOGY OF EAST-CENTRAL STRATHY TWP.

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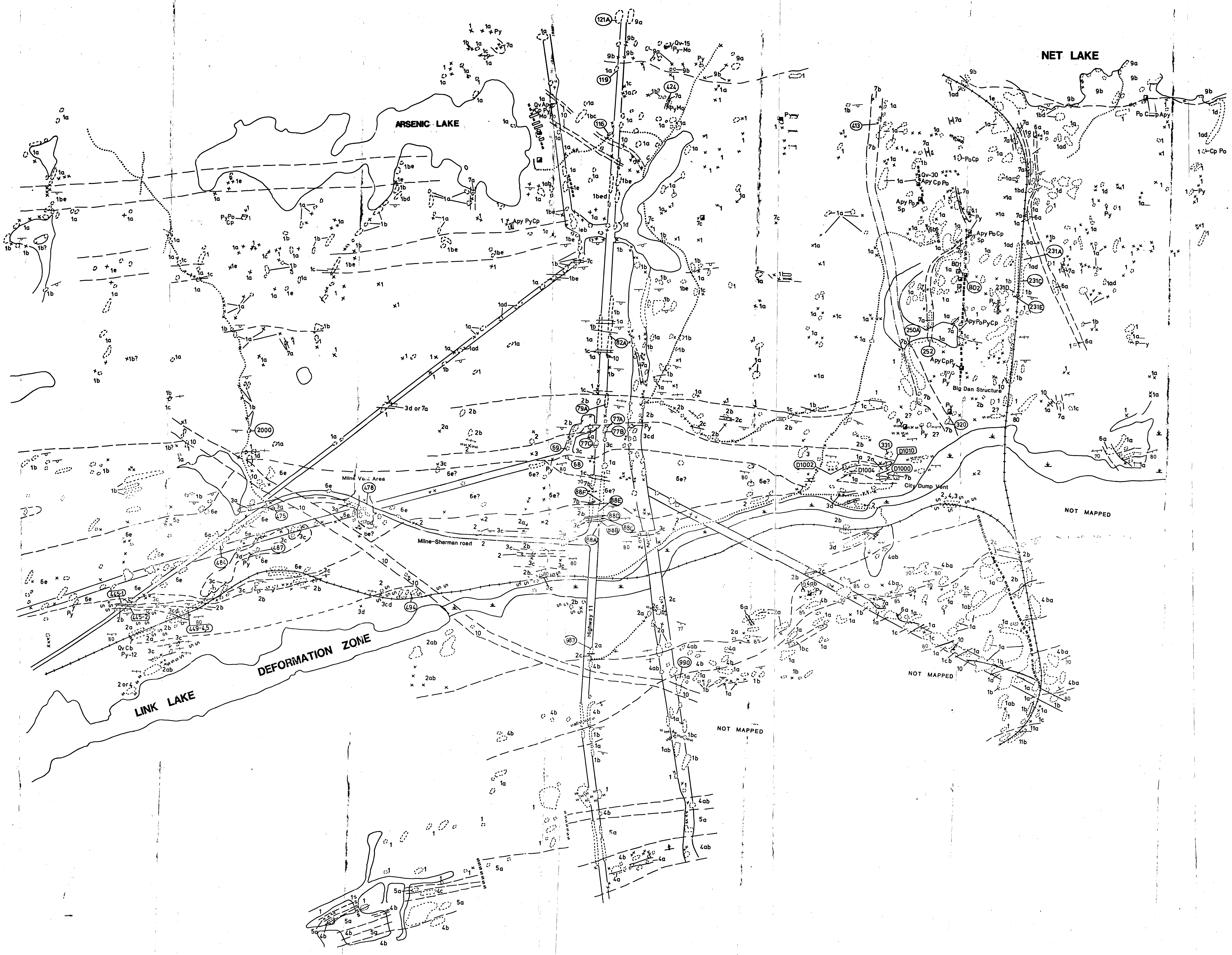

LEGEND

1 Mafic Tholeiitic Metavolcanic Flows
- 1 Unsubdivided
- a Massive
- b Pillowed
- c Breccia
- d Coarse feldspar-phyric
- e Variolitic
- f Fine grained

2 Mafic To Intermediate Calc Alkaline Metavolcanic Flows
- a Massive
- b Pillowed
- c Breccia

3 Intermediate To Felsic Calc Alkaline Metavolcanic Flows
- 3 Unsubdivided
- c Subaqueous pyroclastic breccia
- d Quartz porphyry flow

4 Clastic Turbiditic Metasediments
- a Matrix supported polymictic conglomerate
- b Volcaniclastic wacke

5 Chemical Metasediment
- a Chert-magnetite iron formation

6 Mafic To Ultramafic Intrusive Rocks
- a Pyroxenite
- e Diorite

7 Felsic Intrusive Rocks
- a Quartz porphyry
- b Feldspar-quartz porphyry
- c Felsite
- d Breccia carapace

9 Chambers-Strathy Batholith
- a Quartz monzonite
- b Trondhjemite

10 Diabase

11 Huronian Sediments (Cobalt Group)
- a Diamictite
- b Shale

SYMBOLS

	Bedding		Pillow orientation
	Graded top		Geological contact
	Fault		Foliation
Sp	Sphalerite	Mo	Molybdenite
Py	Pyrite	Apy	Arsenopyrite
Po	Pyrrhotite	Cp	Chalcopyrite
	Railroad		Powerline/pipeline
	Shaft		Swamp/creek
	Trail		Road
	Trench		
69	Sample number		
Qv-10	Quartz vein-width(cms)		
	Detail map area		

0 200 m.
0 800 ft

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33 x 19

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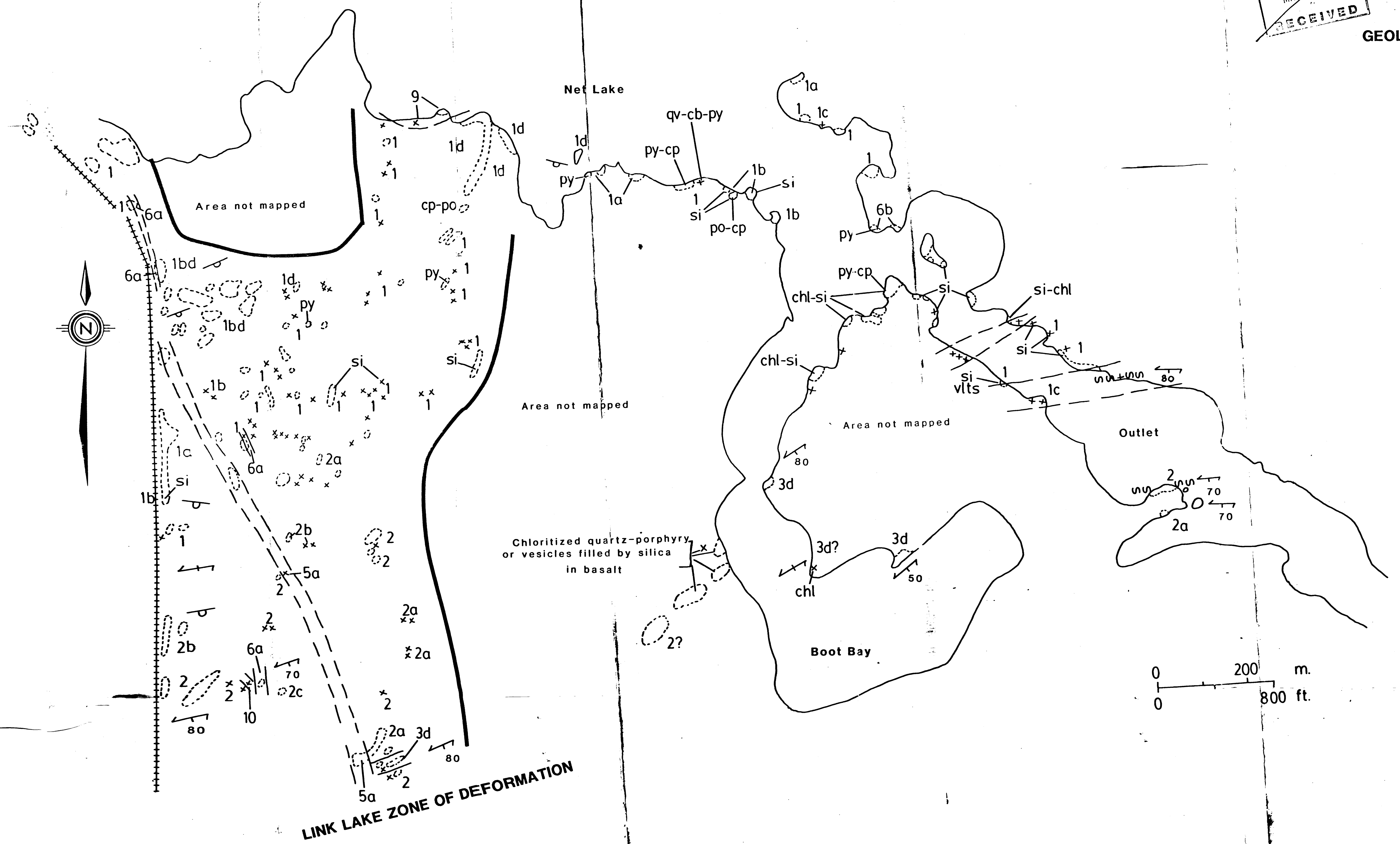
MAP 4

GEOLOGY OF NORTHEAST STRATHY TWP.



EXPLANATION

1 Mafic Tholeiitic Metavolcanic Flows
- 1 Unsubdivided
- a Massive
- b Pillowed
- c Breccia
- d Coarse feldspar-phyric flow

2 Mafic To Intermediate Calc Alkalic Metavolcanic Rocks
- 2 Unsubdivided
- a Massive
- b Pillowed
- c Breccia

3 Intermediate To Felsic Calc Alkaline Metavolcanic Rocks
- 3 Unsubdivided
- a Siliceous flow
- c Subaqueous pyroclastic flow
- d Quartz porphyry flow or intrusive

5 Mafic To Ultramafic Intrusion
- a Pyroxenite

6 Early Felsic Intrusion
- a Quartz porphyry
- b Feldspar porphyry

9 Strathy-Chambers Batholith

10 Diabase

SYMBOLS

- Foliation
- Geological contact
- Shearing
- Pillow orientation

cb– Ferroan carbonate
po– Pyrrhotite
qv– Quartz vein
cp– Chalcopyrite
py– Pyrite
– ONR railroad
chl– Chlorite alteration
si– Silicification

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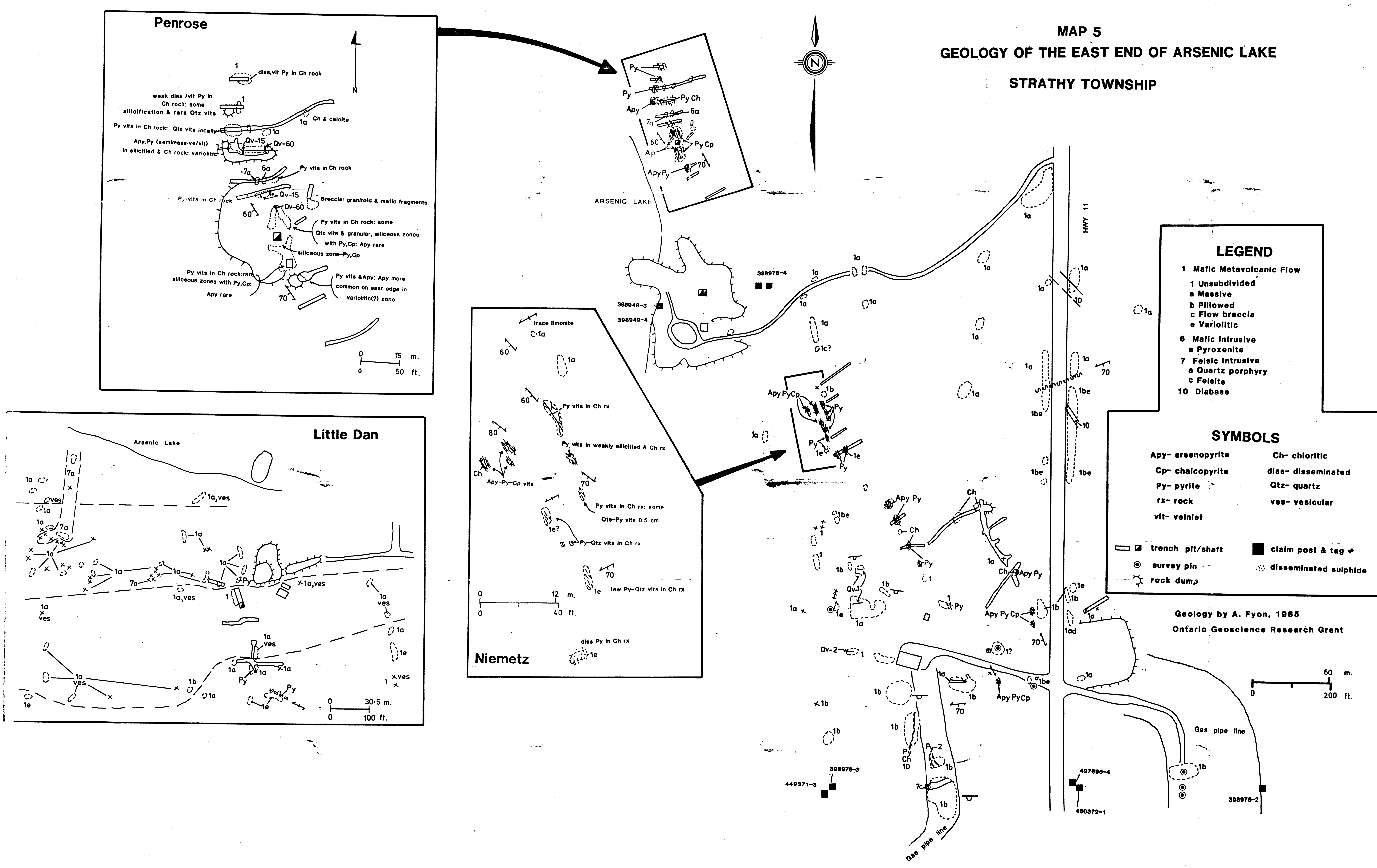

MAP 6

Beanland or A. Perron Property

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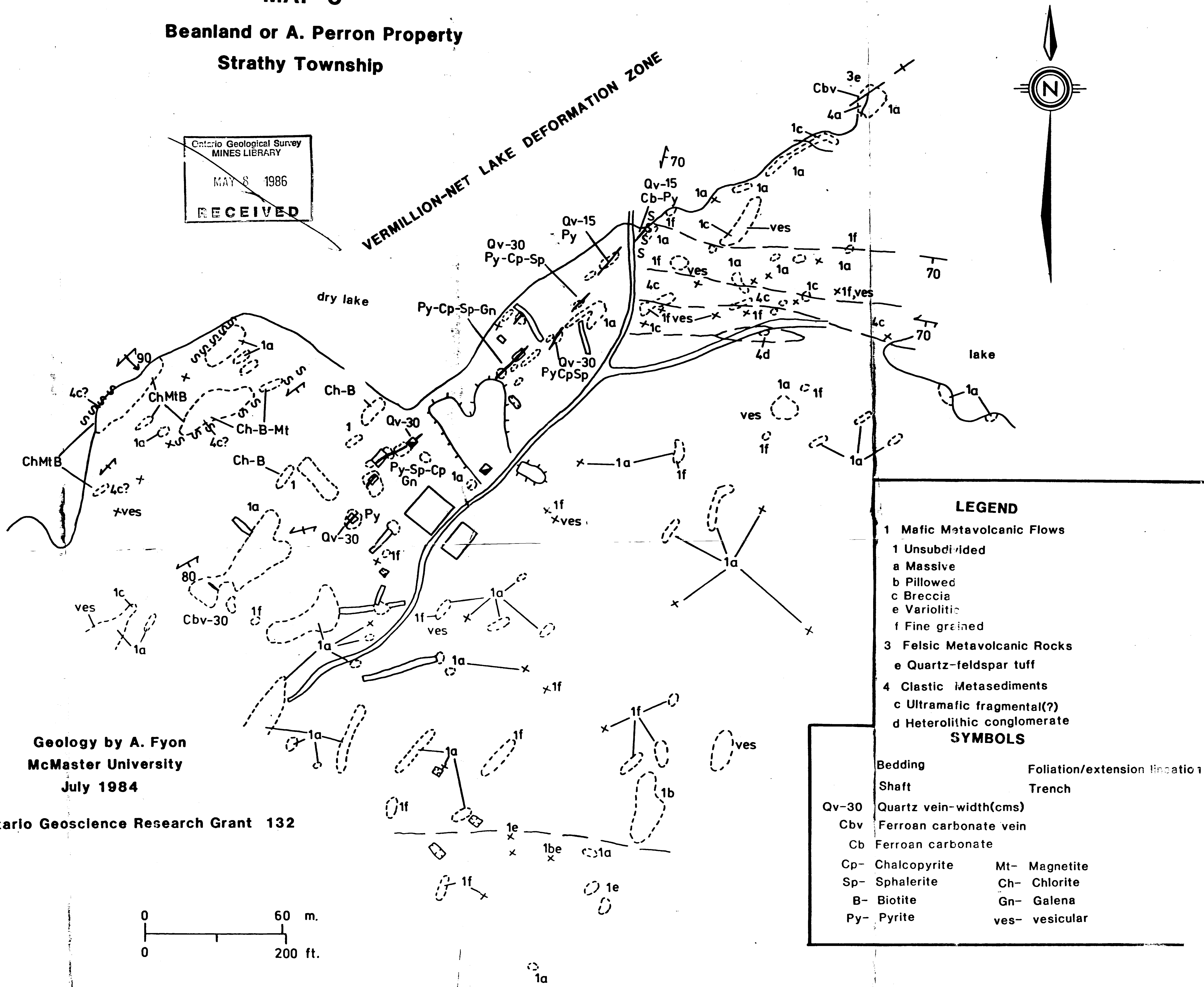

LEGEND

1 Mafic Metavolcanic Flows
- 1 Unsubdivided
- a Massive
- b Pillowed
- c Breccia
- e Variolitic
- f Fine grained

3 Felsic Metavolcanic Rocks
- e Quartz-feldspar tuff

4 Clastic Metasediments
- c Ultramafic fragmental(?)
- d Heterolithic conglomerate

SYMBOLS

	Bedding
	Foliation/extension lineation
	Shaft
	Trench
Qv-30	Quartz vein-width(cms)
Cbv	Ferroan carbonate vein
Cb	Ferroan carbonate
Cp-	Chalcopyrite
Sp-	Sphalerite
B-	Biotite
Py-	Pyrite
Mt-	Magnetite
Ch-	Chlorite
Gn-	Galena
ves-	vesicular

0 60 m.
0 200 ft.

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MAP 7
Mayfair Mines Ltd.
Strathy Township

LEGEND

1 Mafic Metavolcanic Flows

- 1 Unsubdivided
- a Massive
- b Pillowed
- c Breccia
- e Variolitic
- f Fine grained (possibly pillowed)

4 Clastic Metasediments

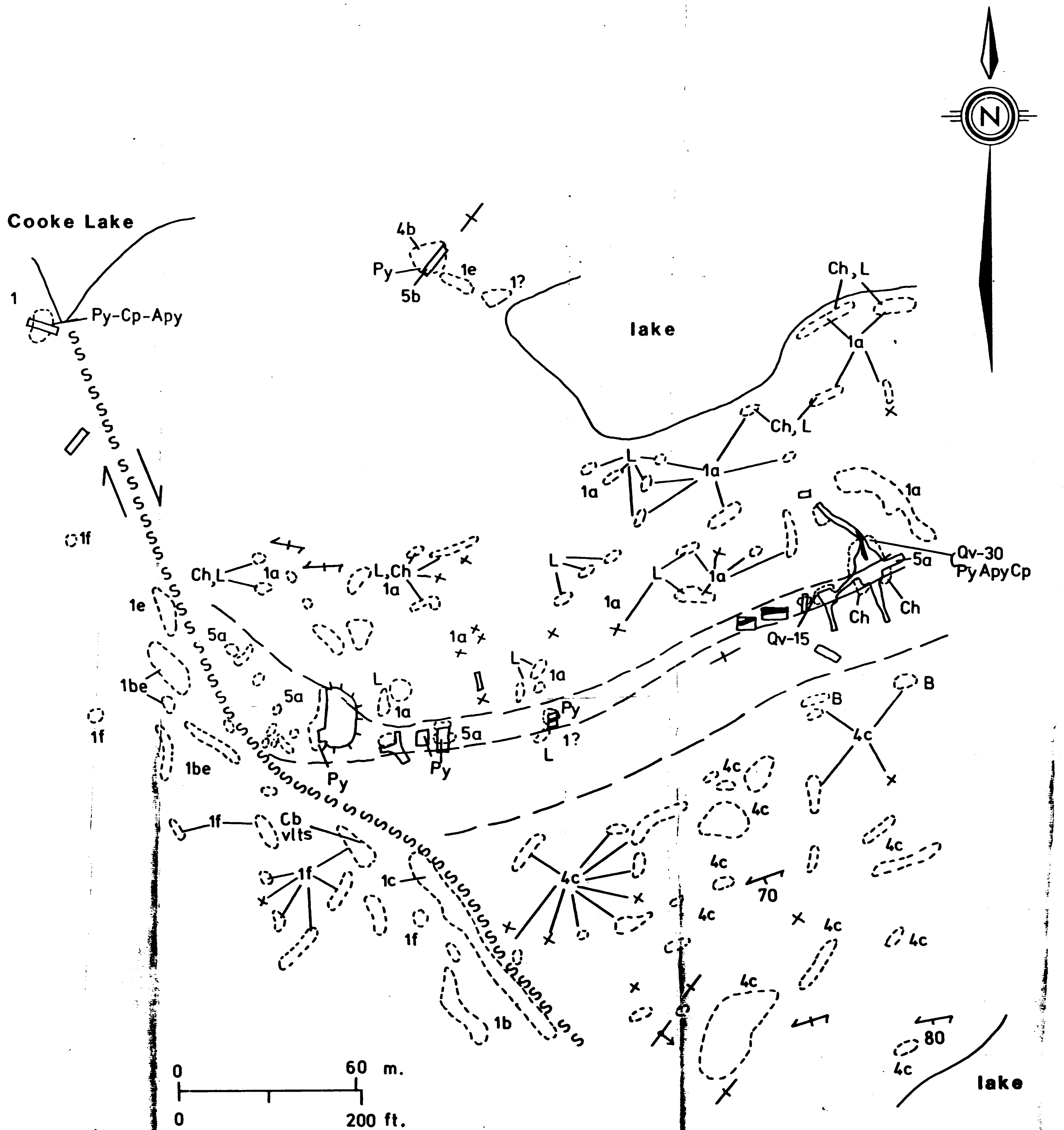
- b Wacke
- c Ultramafic fragmental(?)

5 Chemical Metasediments

- a Chert-magnetite-chlorite iron formation
- b Chert-pyrite iron formation

SYMBOLS

Bedding		Graded top	
Foliation		Fault	
Apy	Arsenopyrite	Chalcopyrite	Cp
Py	Pyrite	Leucoxene	L
Ch	Chloritized		
Qv-20	Quartz vein-width(cms)		
Cb vlts-	Carbonate veinlets		



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