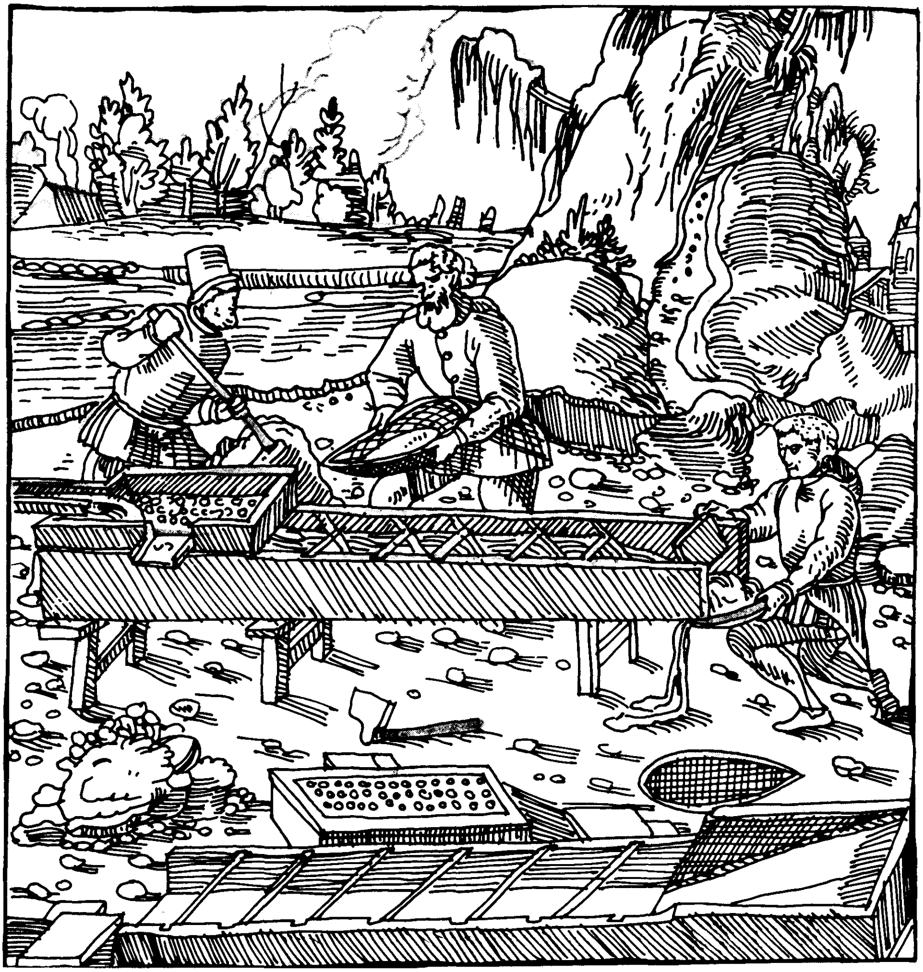

Frontispiece - Sluicing Operation Circa 1500 (after Agricola 1556, p. 323, reproduced from the cover of Canadian Mining Journal, February, 1975).

Ontario Geological Survey

Mineral Deposits Circular 17

ONTARIO OCCURRENCES OF FLOAT, PLACER GOLD, AND OTHER HEAVY MINERALS

by

S. A. Ferguson and E. B. Freeman

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ABSTRACT

Glaciation has influenced the distribution of float and heavy minerals. These loose pieces of rock or vein materials separated from bedrock by weathering and erosion have led to several mine discoveries. The known locations within Ontario of 110 float, 28 placer, and 4 heavy mineral occurrences are plotted on maps and described.

Case histories of deposits with associated float indicate that: (1) glacial transport is generally less than two-thirds of a mile, whereas esker transport is up to 12 times farther; (2) mineralogical properties and size of the source, in conjunction with topography, control the nature of the indicator train; (3) mercury anomalies may exist in the lower soil layers coincident with gold occurrences as in Ontario's Munro Esker and at Cortez, Nevada. Determination of mercury in soil gases appears promising as an exploration method for gold.

Placers may exist in preglacial as well as postglacial valleys. Magnetic and seismic methods have been used to locate buried placers. This report describes the occurrence of 27 gold placers and 1 silver placer in addition to 2 Canadian gold placer mining operations.

Diamonds exist in kimberlites and are associated with pyrope garnet, magnesian ilmenite, and chrome diopside. The presence of these indicator minerals has led to the identification of 2 kimberlite occurrences. Three finds of diamonds have been reported from Ontario, however, no positive identifications exist. No diamond-bearing kimberlite has been found to date in Ontario.

ONTARIO OCCURRENCES OF FLOAT, PLACER GOLD AND OTHER HEAVY MINERALS

by

Stewart A. Ferguson[1] and E.B. Freeman[2]

INTRODUCTION

Mineral exploration has long been an active pursuit of both individuals and mining companies in Ontario. In recent years there has been a resurgence of interest in prospecting by individuals as a full time occupation, but more especially as "weekend prospectors". Accordingly, it was thought appropriate to collect together the reported instances of mineralized fragments dislodged from their bedrock source so that the techniques of tracing such fragments to their source as well as the locations of known fragments would be available to those interested in mineral exploration.

Loose pieces of rock or vein materials that have been separated from the bedrock by weathering and erosion are called 'float' and if the material has been transported and deposited by glacial action the float boulders generally occur in 'till' of 'glacial drift'. Glacial erosion of ore deposits that in most cases have been deeply weathered by a long, previous erosion cycle produces a train of fragments ranging in size from boulders to clay-sized particles.

An age-old method of prospecting, that has been used since mining first began, has been tracing mineralized float, in order to locate the bedrock source of the mineralization. Recently the concept has been expanded to include all size fractions and to include geochemical determinations of the content of metal ions adsorbed to the surfaces of silt and clay particles. This broadening of the exploration technique has resulted in a renewed interest in float boulders as the possible starting point of an exploration program. Also, as the number of new finds decreases from prospecting outcrop areas, we must turn our attention to the drift covered areas.

Professor A. Dreimanis of the University of Western Ontario has published two papers on tracing float. The first paper was called "Steep Rock Iron Ore Boulder Train" (Dreimanis 1956) and the second paper was "Tracing Ore Boulders as a Prospecting Method in Canada" (Dreimanis 1958). A review of boulder tracing case histories in Sweden is given by Grip (Grip 1953). A more recent collection of papers is called "Prospecting in Areas of Glacial Terrain", edited by M.J. Jones (Jones 1973, p.138; 1975, p.154).

Some years ago, the writers began a compilation of float and placer gold occurrences as part of a lecture "Tracing Float and Mineral Fragments", delivered to Mineral Education classes (Ferguson and Freeman 1973, p.43-60). E.G. Bright (1973) formerly Regional Geologist at Timmins, compiled a map (Figure 1) showing mineralized float and heavy mineral occurrences in the Timmins area and stated that he knew the locations of eighty-two pieces of mineralized float. All the known occurrences of float, placer gold and indicator minerals for kimberlite were first compiled as open file report 5104 by S.A. Ferguson and released in May 1974. The present publication stems from OFR 5104 and is issued to provide easy access to as wide an audience as possible of the information contained herein.

Acknowledgments

As in all compilations many people have assisted with ideas, descriptions and literature references, and to all these people the writers wish to extend their thanks. Also the writers have used the work of previous observers who have left records of their findings and in individual descriptions the original source of the information is acknowledged. Particular thanks should be extended to Mr. Clifford D. MacKenzie

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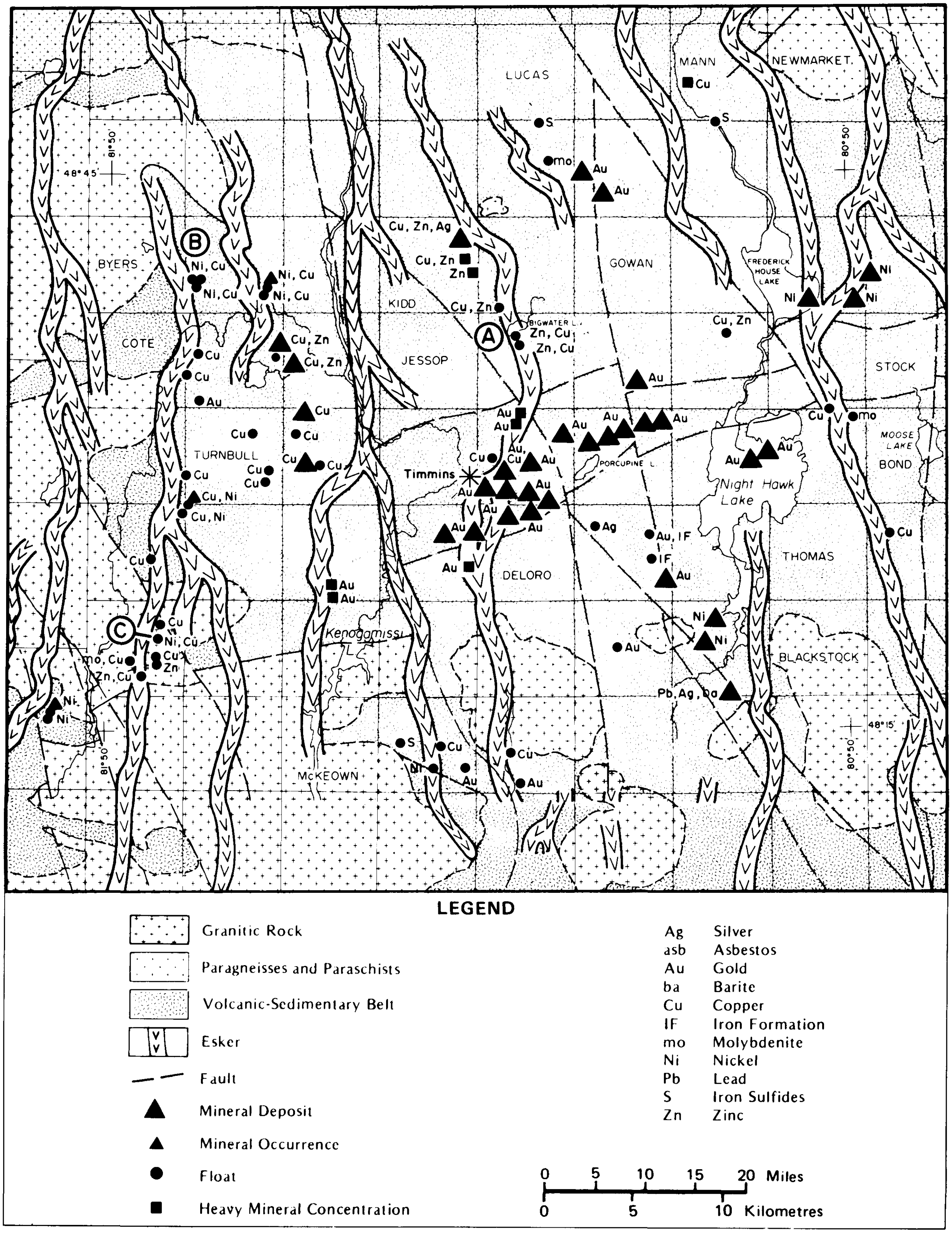


Figure 1 Mineralized float and heavy mineral concentrations in the Timmins area, northeastern Ontario.

of Hollinger Mines who gave the location and description of many float locations, and also took time to visit field occurrences and search the files at the Hollinger office with the help of Mr. W.H. Hanson. Mr. E.G. Bright, formerly Regional Geologist at Timmins, compiled a map of float and heavy mineral occurrences in the Timmins area in 1972 and provided details of his sources of information.

Dr. Robert Thomson, formerly Resident Geologist of Haileybury, provided data and references for silver float of the Cobalt area and Mr. Paul C. McLean described float in Balmer and Dome Townships at Red Lake. All the Regional and Resident Geologists or former Resident Geologists of the Ontario Ministry of Natural Resources supplied data from their files on occurrences of float and placer gold. Dr. E.G. Pye, Dr. Hugh Gwyn, Dr. D.R. Hewitt, Mr. R.P. Sage and Mr. L.S. Jensen, all of the Geological Branch, supplied data and literature references. Dr. W.J. Wolfe, of the Geological Branch, furnished copies of his unpublished analytical data as well as field work sheets relating to his study of the Lackner Lake boulder train. Dr. D.R. Haughton, Geology Division, National Research Council of Saskatchewan, supplied a copy of his report with accompanying maps of his study at Fable Lake, Saskatchewan. Mr. S.G. Hancock of Steep Rock Iron Mines Limited provided excellent photographs of dewatering operations at Steep Rock Lake. Mr. J.R. McGinn, Director, Lands Administration Branch, Ontario Ministry of Natural Resources, approved the section "Obtaining title to a placer operation".

Dr. U.J. Vagners, formerly Regional Geologist at Richmond Hill, has been most helpful in discussing geological concepts and methodologies. Dr. W.R. Cowan, of the Geological Branch, helped with Pleistocene stratigraphy and methods and literature references to these subjects. Dr. R.H. Morse, Consulting Geochemist, provided a list of references to the use of radon gas in geochemical surveys. Dr. G. Closs, geochemist in the Geological Branch, critically read the manuscript and suggested improvements.

Dr. W.G. Wahl, Consulting Geologist, read the manuscript and discussed field techniques and gave us permission to use unpublished data from a private report by Dr. U.J. Vagners.

Size Classification of Rock and Mineral Fragments

In terms such as 'boulder train' the word boulder has been used to include all size fractions larger than sand. Another usage would be to use boulders to describe sizes larger than 6 inches (15 cm) in diameter and pebbles for smaller rock fragments. A more precise geological classification is the Wentworth Classification; this classification has been used wherever possible throughout this report. The following table shows the Wentworth Classification in detail.

TABLE 1 SHOWING WENTWORTH CLASSIFICATION (FROM CROMPTON 1967, p.213).

Name of Loose Aggregate	Exact Size Limits	Approximate Inch Equivalents
Boulder gravel	greater than 256 mm	greater than 10 in.
Cobble gravel	64 to 256 mm	2.5 to 10 in.
Very coarse pebble gravel	32 to 64 mm	1.2 to 2.5 in.
Coarse pebble gravel	16 to 32 mm	0.6 to 1.2 in.
Medium pebble gravel	8 to 16 mm	0.3 to 0.6 in.
Fine pebble gravel	4 to 8 mm	0.15 to 0.3 in.
Granule (or very fine pebble) gravel	2 to 4 mm	0.08 to 0.15 in.
Very coarse sand	1 to 2 mm	0.04 to 0.08 in.
Coarse sand	1/2 to 1 mm	0.02 to 0.04 in.
Medium sand	1/4 to 1/2 mm	0.01 to 0.02 in.
Fine sand	1/8 to 1/4 mm	0.005 to 0.01 in.
Very fine sand	1/16 to 1/8 mm	0.002 to 0.005 in.
Silt	1/256 to 1/16 mm	0.00015 to 0.002 in.
Clay (clay-size materials)	less than 1/256 mm	less than 0.00015 in.

Glacial Deposits and the Occurrence of Float and Indicator Minerals

GLACIAL HISTORY

Ontario has been exposed to winter's ice and snows for thousands of years. Every so often, however, ice has accumulated sufficiently to move over the landscape as large continental glaciers. Fortunately, at present, the glaciers have melted northward, and we are able to enjoy summer as a time to vacation, rockhound, and prospect.

Glacial ice forms from the yearly accumulations of snow that have not melted during the summers. Eventually the snow granules are compressed to form ice granules and when sufficient ice has accumulated, glaciers begin to flow down hill into valleys and basins. At the Earth's polar regions, glaciers started expanding some 10,000,000 years ago, however, at the mid-latitudes large scale spreading of glaciers began somewhat more than 1,000,000 years ago. Evidence suggests at least four major ice advances have moved over the Ontario landscape; the most recent advance being termed the *Wisconsinan*, from the terminal deposits left in the State of Wisconsin about 18,000 years ago. Several advances and melt-backs (recessions) occurred during the Wisconsinan Glacial Stage overriding and altering the earlier glacially-created landforms.

Glaciers scoured and polished exposed rock surfaces creating scratched or striated rock surfaces (glacial striae). Glaciers also smoothed and elongated surface bedrock to create streamlined rock knobs (roche moutonnées) which indicate the directon of glacial movement. Drumlins are streamlined hills similar to roche moutonnées but composed of glacial debris with or without a bedrock core. Glaciers have left their scoured rock powder (rock flour) along with rock and soil debris (properly called *till*) in deposits called *moraines*. A *terminal moraine* is the ridge of debris, or till, along the front of a glacier marking the farthest advance of the ice. A *recessional moraine* is a similar ridge of till formed behind the terminal moraine during the melting back of the glacier. These moraines are roughly parallel and trend approximately at right angles to the glacial movement.

During the melting or recession of the glaciers much meltwater was produced which redistributed the till into a number of features. Meltwater drainage cut large river channels (called *meltwa er channels*) and also cut *spillways* into the land at the point where glacial lakes drained. Today, with the land higher than when it was depressed by the weight of the glacier and with less water available, these glacial watercourses are dried out or contain undersized "misfit" streams along their former courses. Some meltwater also flowed through constricted ice tunnels within or beneath glaciers depositing loads of sediment along their bottoms. When the ice receded long ridges of sand and gravel called *eskers* were left on the land. Glacial meltwater also flooded areas to form glacial lakes in which clay and silt settled out as glacial lacustrine deposits. Wave action within these lakes formed beaches and shorelines which may be seen in a few places along hillsides today.

The major glacial features described above may be seen on the published maps indicated in Figure 2.

DISTANCE OF GLACIAL TRANSPORT

A few glacial erratics have been transported long distances from their source areas. For example, a distinctive jasper pebble conglomerate from the North Shore of Lake Huron was transported about 620 miles (1,000 km) southwestwards to the vicinity of Columbia, Missouri, U.S.A. At one time this was assumed to be the general case and it certainly appears to be true for boulders of iron ore. However, more detailed studies have shown that the overlying glacial soils and rock fragments are generally representative of the underlying bedrock.

In 1957 D.F. Hewitt (Geological Branch, personal communication) made pebble counts from gravel pits in southern Ontario and found that the largest percentage of pebbles were local in origin. Grid sampling of the till and outwash to the southeast of the mines at Kirkland Lake showed that at a distance of 2,000 feet (610 m) from the source the gold content ranged from 1 to 10 particles, but at a distance of 10,000 feet (3050 m) gold was generally absent (Lee 1963, p.26). "Airborne radiometric measurements give an average analysis over a large area, including outcrop and overburden, but it is generally true that overburden radioactivity relates closely to that of the underlying rock". (Darnley *et al.* 1971, p.36). This observation is additional evidence that the overburden itself is essentially local in nature.

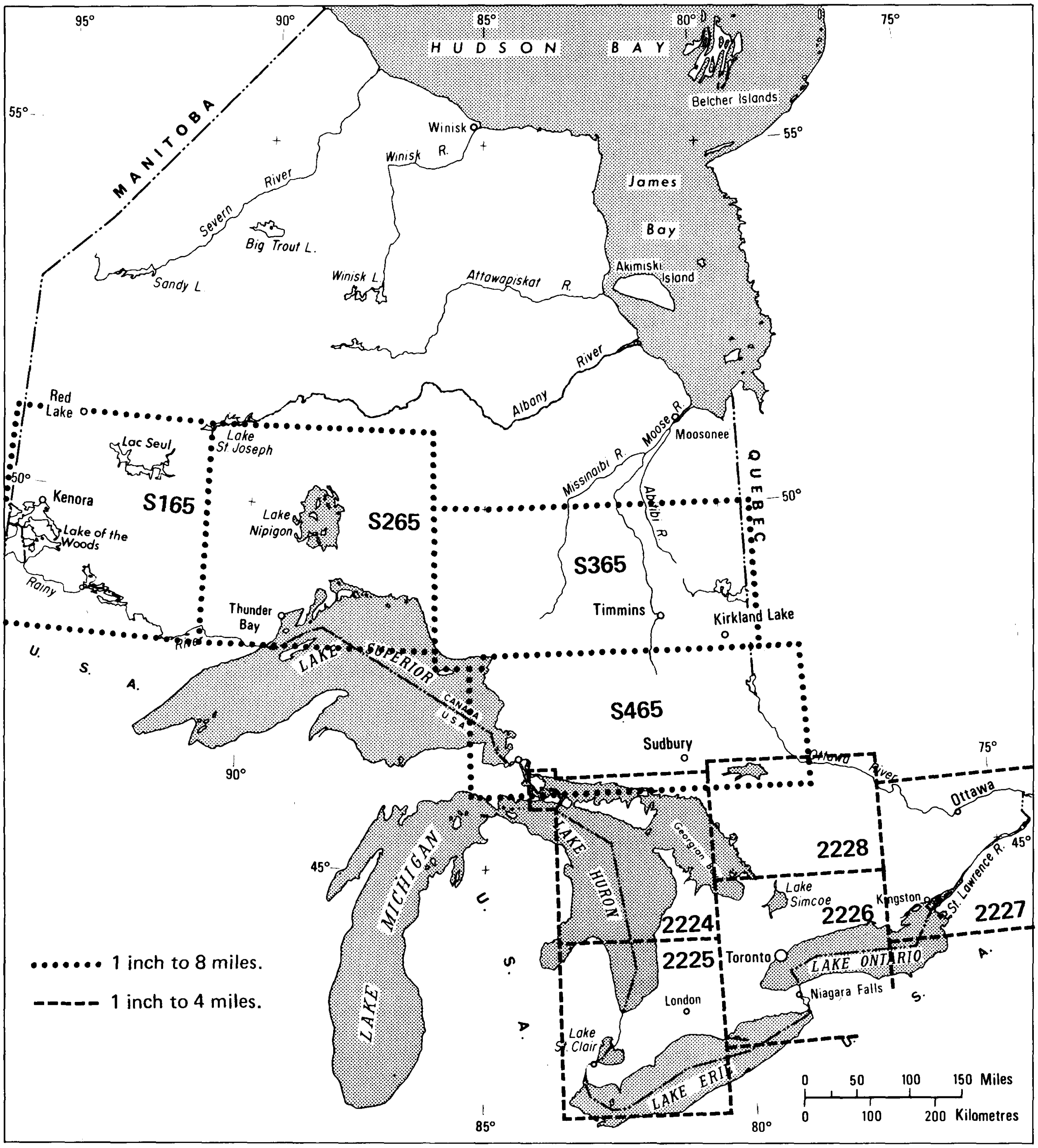


Figure 2 Index map shows surficial geology and physiography sheets, Ontario.

BOULDER TRACING

Boulder tracing has long been an established technique which begins as a visual scrutiny of clasts exposed on or near the surface. Roads and railway cuts, gravel pits, areas burnt over or cleared for farming are easiest to investigate. Boulders of interest are broken with the hammer and examined with the hand lens. Rusty, stained or weathered boulders, are of major interest to prospectors, especially if the rusty appearance is due to the weathering of sulphide minerals.

It should be remembered that rusty stains may also be owing to the weathering of iron carbonate minerals. Boulders of particular rock types which may be associated with economic mineralization should be recorded, as well as boulders of distinctive rock types which may assist in following the train, particularly if the mineralized clasts of interest are not abundant. Additional field observations can be made using a magnet, or a small electromagnetic unit such as a mine detector for sulphide minerals and magnetite, or a geiger counter or scintillometer for radioactive boulders. In a detailed survey, the ground is prospected very thoroughly until all clasts of interest have been located and are plotted on a map in order to assist in systematically following the train. Records should be kept of the dimensions of the clasts, the roundness, surface features, minerals present and reaction with geophysical instruments.

TILL FRAGMENTS NOT OF LOCAL ORIGIN

The following three paragraphs are from Lee (1963, p.30-31).

> "Rock fragments in the till not only show local transport but give valuable information on mineralization in the bedrock to the northwest. This far-travelled material represents less than one percent of all fragments in the coarser visible size ranges of the till. Hence, counts of about 1,000 rock fragments are needed in order to consistently observe its presence. Needless to say, this material must be distinct so that it can be recognized.
>
> A geographic plot of this indicator material is shown on Fig. 13 and includes the following: (1) iron formation, consisting of magnetite and quartz; (2) dunite; (3) dunite with veinlets of chrysotile asbestos; (4) chert nodules with a distinct weathered rind; and (5) Paleozoic fossils, including corals and brachiopods. The nearest known probable source for these fossils is about 200 miles [320 km] to the northwest.
>
> In conclusion, it can be stated generally that the till reflects a dominantly local source, but at the same time gives an important glimpse of the regional pattern." (Lee 1963, p.30 & 32).

INDICATOR TRAINS

The following description of indicator trains is taken from Shilts (1975, p.80):

> "Indicator trains are finger or ribbon shaped in plan view and vary in size and intensity according to the interactions of a number of factors, the most important of which are (1) type of fraction analysed, (2) degree of weathering of samples, (3) uniqueness of the component traced with respect to background bedrock, (4) size of the source, (5) resistance of the component to abrasion (mineralogy), (6) roughness of topography in the dispersal area and (7) topographic position of the source, whether protected or exposed to glacial scour".

Some of the factors affecting indicator trains are also described by Shilts (1975, p.76-78) as follows:

> "(1) If the lithological, mineralogical or chemical properties of the source of an indicator train are very different from those of the bedrock in the dispersal area, the indicator train will be distinct for a longer distance. For example, ultrabasic sources are usually easy to detect and have long, well-developed trains of nickel, chromium, cobalt and magnetite, components that are much less concentrated in the surrounding bedrock. . . " (76)
>
> "(2) The size of the source, its orientation with respect to glacial flow and its topographic position influence the size of its dispersal train. If the source is in a protected hollow or on the "lee" (down-ice) side of a ridge, it was not so available to glacial erosion as if it formed a ridge or occurred in an exposed position". (76)
>
> "(3) The roughness of the topography in the disper sal area controls the shape of indicator trains and the distance to which they can be traced. Debris that was

carried near the base of a glacier was often blocked or diverted by hills or ridges in the dispersal area". (76)

"(4) The mineralogy of the source affects both the strength and size of the dispersal train. Rocks composed of soft minerals such, as serpentinized peridotites, are easily ground up, producing particles from clay to boulder size. Thus, serpentine is a common component of all textural classes of till from the source to the limits of detection of a train. Sulphides, being harder and more difficult to crush, are found predominantly in the sand sizes throughout the train, as are hard minerals such as chromite and magnetite. In the case of these latter three minerals, the mineralogy has an important influence on how the minerals, dispersed in a train by glaciers, have behaved under weathering conditions. Stable minerals (magnetite) are unaffected by weathering, but unstable minerals (sulphides) are broken down in weathered deposits". (78)

"Once a method of sampling and analysis has been established as effective, maps are drawn showing the dispersal of mineral fragments or of the cations released by their weathering. It is useful, if time and geological information permit, to map a dispersal train of some distinctive rock or mineral to serve as a model for the interpretation of less well-defined trains of economically interesting components . . . . The finger-or ribbon-shaped plans and long distance of transport are typical of most glacial dispersal trains studied in Canada. The "fan" shapes depicted on many published dispersal maps usually apply to boulder-sized erratics and outline the total area of dispersal, not the zones of maximum concentration".

ESKER SEDIMENTATION

Shilts (1973, p.12-13) makes the following comments on esker sedimentation. Eskers are usually built in tunnels or in open channels in the glacier and probably are built in short segments by streams extending a few miles back from the ice margin. As the ice margin retreats the esker is extended headward. The implication of the segmented hypothesis is that the sediment in any sector of the esker can only be derived from a relatively small area that was being drained at the time of its formation which might be five miles (8 km) from the place of deposition.

An example of this type of sedimentation is given by Hewitt and Karrow (1963, p.24). The Frankford-Marlbank esker is 50 miles (80 km) in length and extends across the southern part of Hastings County and into the adjacent counties at a distance of 4 to 12 miles (6 - 19 km) north of Highway 401. The stream that formed this esker flowed southwestwards across the Precambrian-Paleozoic contact. North of the Paleozoic contact the gravel is composed entirely of Precambrian igneous and metamorphic rocks. At one-eighth of a mile (0.2 km) southwest of the Paleozoic contact, at Egansville Station, the gravel contains 18 percent Paleozoic rocks and at three-eighths of a mile (0.6 km), contains 50 percent Paleozoic rocks. Four miles (6 km) from the contact the gravel is composed of about 74 percent Paleozoic rocks.

Esker sampling by Lee (1965) indicated that the dunite source in the bedrock is generally up-ice 8 miles (13 km) from the position of peak abundance of 3.5 to 8 mm dunite particles in the esker. Similarly, trachyte was found 3 miles (5 km) up-ice from the position of peak abundance of the 8 to 15 mm trachyte particles in the esker.

MUNRO ESKER

H.A. Lee of the Geological Survey of Canada studied the Munro esker (Lee 1965). Thirty-four samples were taken along the esker over a length of sixty-two miles (100 km). Composite samples totalling 1.3 cubic feet (0.03 m^3) were obtained out of pit wall exposures from two parallel vertical areas three feet (1 m) wide and five feet (1.5 m) high, situated six feet (2 m) apart horizontally. A gravelly sand is preferable and was available along the crest of the ridges (Lee 1965, p.5).

Each sample was washed through fine screens and the concentrate of fine heavy minerals caught in a sluice box similar to the procedure used for analysis of the basal till at Kirkland Lake (Lee 1963, p.7). Further studies on part of the Munro esker were reported by Lee (1968) and the presence and abundance of pyrope garnet indicated a bedrock source in the vicinity of the Upper Canada Mine. A search of the mine workings resulted in the discovery of a kimberlite dike on the 2,750 foot (840 m) level (Lee and Lawrence 1968, p.1). The results of these surveys are summarized in Table 2.

DIRECTION OF GLACIAL MOVEMENT

Glacial striae can be observed in many outcrop areas and the direction from which the glacier has come may be deduced from the fact that scouring of the outcrop occurs on the side facing the glacier and deposition of till usually occurs in the lee of the outcrop. Materials deposited by glacial ice are generally fluted, that is, there is a series of low parallel ridges which are separated by shallow depressions. Such lineations may be observed on aerial photographs as such topographic features are usually marked by changes in vegetation. Where contoured topographic maps at a large scale are available, the direction of fluting is shown in the details of the contour lines and the shape of small lakes and ponds.

Due to the existence of a field of quartz boulders, some of which contain gold, on the Munro esker, a study of the Pleistocene geology was made of part of the esker in Warden and Milligan Townships by U.J. Vagners, of W.G. Wahl, Consulting Geologists. The Munro esker consists mainly of glaciofluvial gravels deposited by melt waters flowing from north to south. After the withdrawal of the glacier, a glacial lake existed in the vicinity and varved clays were deposited on the flanks of the esker and a shore cliff developed off the eastern side with associated shoreline sand and gravel. A glacial readvance deposited from 1½ to 3½ feet (0.5 - 1 m) of till on the higher part of the esker and the quartz boulders are associated with this till.

At 32 localities, pebble counts were made (Vagners 1965, p.2), which provided the data for Table 3.

In the vicinity of the boulder field, fluting indicated a direction of transport at 135°, which is approximately the direction of elongation, in plan of the boulder field. At five localities, till fabric studies consisted of measuring the direction of elongation of the fragments. Generally, there are two major directions of elongation as some fragments are pushed but others are rolled. At three of the sampling points, which presumably are up-ice from the boulder field, the direction of movement is 120° to 150°. One sampling station shows movement as due south and at the fifth location, two major directions are indicated at 125° and 170° (see Figure 3).

BURIED VALLEYS

Prospectors may be interested in the rocks which underlie buried valleys but there is also the possibility that placer materials may be present. The area where buried valleys were presumed to be present was selected using the highest altitude photographs then available which

TABLE 2 | RESULTS OF SCREEN SAMPLING MUNRO ESKER.

SCREEN FRACTION (mm)	SAMPLE		CLASTS	DISTANCE FROM ASSUMED BEDROCK SOURCE (miles)
	TOTAL SCREEN	SUBSAMPLE		
< 16 to > 8	n a.	300-500 pebbles	trachyte	3 ± 2 (Lee, 1965, p 12)
< 8 to > 3.35	4,000 to 8,000 gms.	1,000 grams (10,000 clasts or pieces)	dunite and magnetic clasts	8 ± 2 (Lee, 1965, p.8)
< 1.23 to > 0.5	0.3 to 0.4 cu. ft.	0.3 to 0.4 cu. ft.	pyrope	1.3 (Lee, 1968, p.2)
$< 10\,\mu$ to 0.5 mm	1.3 cu. ft.	1.3 cu. ft.	gold grains $10\,\mu$ and larger (+ 10 microns)	2 ± 2 (Lee, 1965, p.12) 1.3 (Lee, 1968, p.2)

TABLE 3 FRAGMENTS FROM THE MUNRO ESKER GREATER THAN 0.3 INCHES (8 mm) IN DIAMETER.

ROCK TYPE	TOTAL CLASTS PERCENT	AVERAGE ROUNDNESS
Granite	39	angular to subangular
Intermediate volcanics	29	subangular to subrounded
Basic volcanics	14	subangular to subrounded
Sheared volcanics	12	subangular to subrounded
Acid volcanics	less than 5	not recorded
Sediment	less than 3	not recorded
Porphyry	less than 3	not recorded
Quartz	less than 2	subangular to subrounded

were at a scale of one inch to one mile (1:63,360). The presence of the buried valleys was suspected from scattered parts of lineaments and unusual drainage. These features were obscure on the ground but became apparent after features due to vegetation, recent erosion, and glaciation were eliminated (Lee 1965, p.18). The Munro esker is a winding ridge one to four miles (1.6 to 6 km) in width with a series of depressions generally along the ridge axis. Location of the buried valleys established the fact that the zone of largest surface depressions overlies the deepest parts of a bedrock valley system (Lee 1965, p.2) and this observation may be of assistance in locating other buried valleys.

Work with a hammer seismograph (Hobson and Grant 1964) determined the depth to bedrock on traverses across a buried valley system for a length of thirteen miles (21 km) (GSC 1967; and Figure 4 this report). Three vertical bore holes of six inch (15.24 centimeter) diameter were put down to check the stratigraphy, gold content, and depth to bedrock, but two holes were stopped before bedrock was reached. Drilling confirmed the location and depth of the valley system as indicated by geophysics. Difficulties were encountered in obtaining bulk samples but generally the gold content was low as shown in Table 4.

GEOPHYSICAL METHODS FOR TRACING FLOAT, PLACERS, AND INDICATOR MINERALS

Magnetic

In 1924 a magnetic survey of part of the Kitchener Placer Mine property, Keithley Creek, Quensel Mining Division, British Columbia was made by K.C. Laylander (Laylander 1926, p.325-328; Galloway 1924, p.B127-B131). The instrument used was a Thomson-Thalen magnetometer manufactured in Sweden. Lines were established at 100 foot (30.5 m) spacing with stations at 50 foot (15.25 m) intervals and subsiduary stations every 10 feet (3.05 m) in the anomalous areas. The survey was successful in locating buried channels as these areas were more strongly magnetic and could be easily followed (see Figure 5). The statement is made that concentrate produced from the channel contained pyrite, galena, and argentite but no magnetite (Laylander 1926, p.326).

Heiland (1940, p.416) stated that over shallow placers, anomalies as large as 300 gammas may be present where the placer minerals are associated with magnetite. Also Heiland (1940, p.416) noted that some old placer channels have been filled with lava flows and for that reason can be detected magnetically.

Gravenor and Stupavsky (1974, p.658-663) tested the magnetic susceptibility of tills in southern Ontario and along the northern shores of Lake Huron and Lake Superior. Each sample was dried and screened and a representative part of the -2 mm material was placed in a small

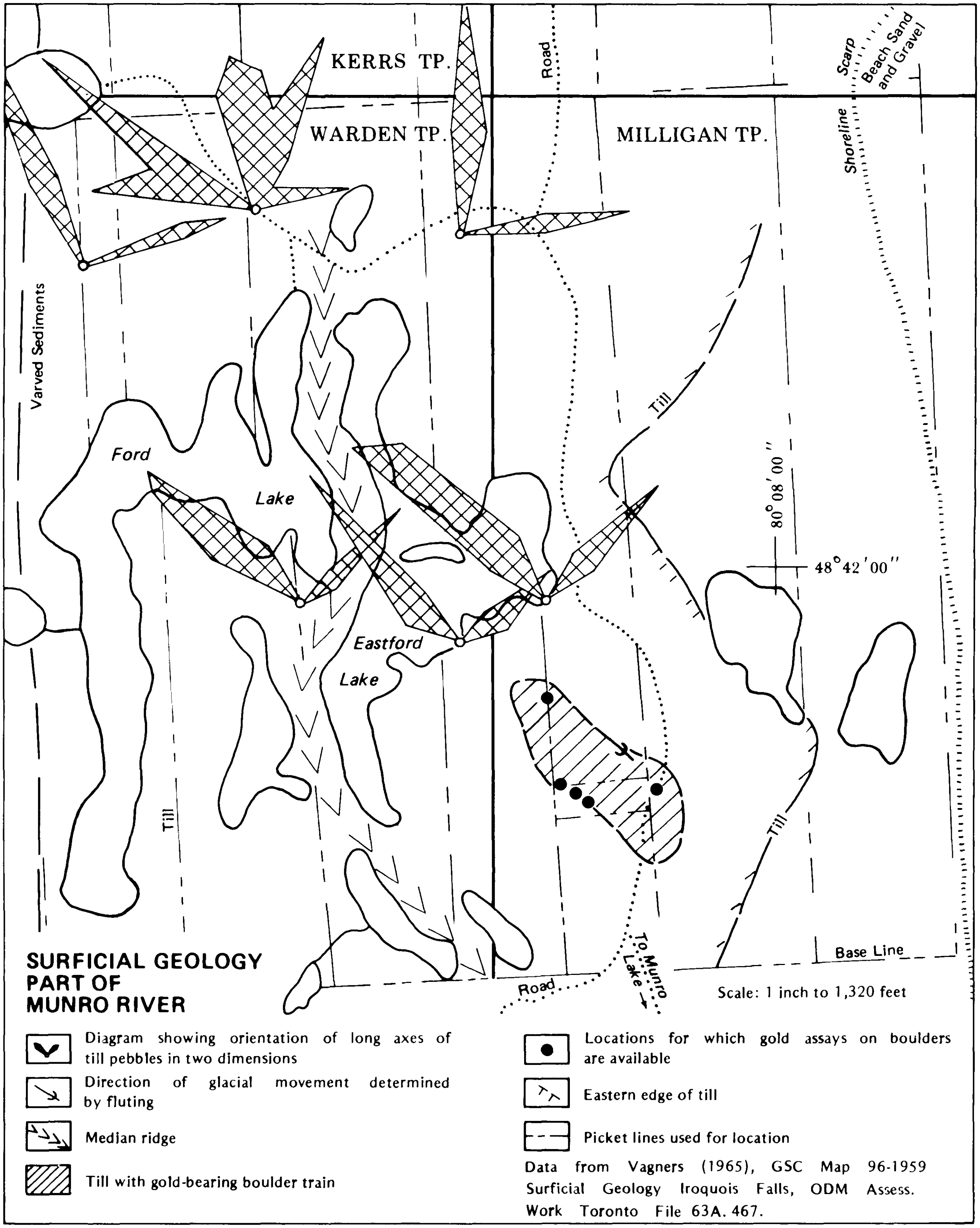


Figure 3 Diagram of sampling sites and surficial geology of part of the Munro Esker.

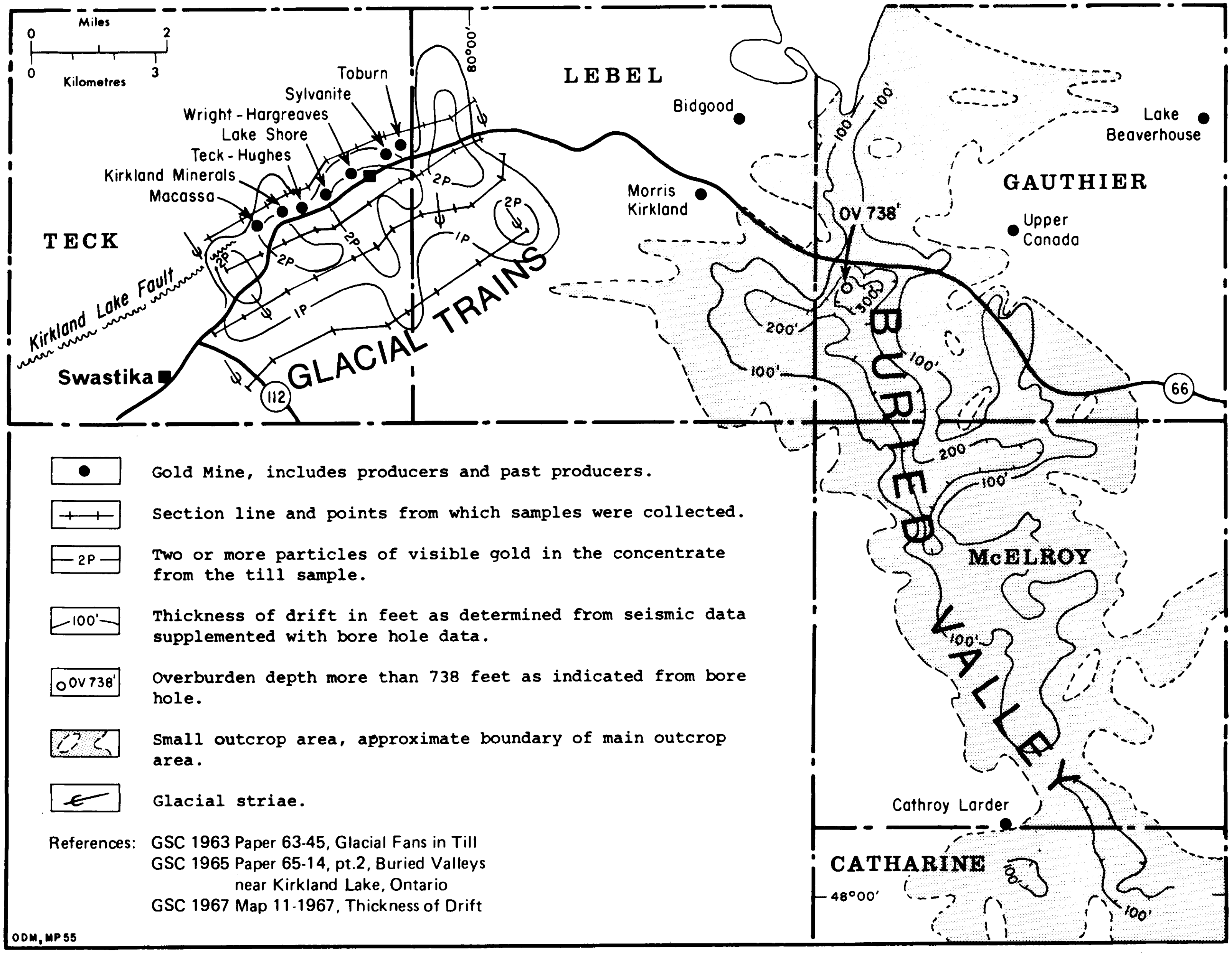


Figure 4 Concentration of gold particles in glacial trains in till and buried valley near Kirkland, Ontario (modified after GSC publications).

TABLE 4 | DRILLING REPORT ON BORE HOLES IN MUNRO ESKER.

DH No.	CORE LENGTH (feet)	PARTICLES OF GOLD IN SAMPLE OF 1.3 cubic feet	REMARKS
1	297	average of 12 samples contained less than 1 particle	aeolian, glaciolacustrine and glaciofluvial sediments
2	0 - 20	9 particles	aeolian (eolian) sand
	20 - 225	6.1 particles	glaciolacustrine sand, silt
	225 - 241	2.7 particles	glaciofluvial sand, sandy gravel
	241 - 277	n.d.	Chlorite schist bedrock
3	0 - 738		No samples attempted

bottle. The magnetic susceptibility of the sample was determined using a toroid transformer bridge as measured against a standard. There is a significant correlation between the quantity of heavy minerals and the magnetic susceptibility, and determining susceptibility is a much less tedious procedure. Some tills have a characteristic magnetic susceptibility which should be useful in tracing them in boreholes. However, as the distance from the source area increases, it becomes more difficult to identify individual tills by a method dependent on the content of Precambrian heavy minerals.

Electromagnetic

Conventional electrical surveys are little used in prospecting for placer or loose materials but may be useful in locating the ground water table. However, radio methods are used in instruments called mine detectors, treasure finders, or under such trade names as metallascope or terrometer and these may be useful. The low frequency types are modifications of an induction balance (Heiland 1940, p.627) and the presence of metallic bodies changes the mutual inductance between the primary coil and pick-up coil. The depth range of such instruments is not more than 5 feet (1.5 m). High frequency treasure finders usually have a transmitter and receiver and the intensity of the reception is recorded. Some of these instruments are able to detect mineral disseminations to a depth of 15 to 20 feet (5 to 6 m) (Heiland 1940, p.628). Such instruments are helpful in locating placer deposits, particularly if the heavy mineral assemblage includes magnetite, and also may assist in identifying boulders within a boulder train containing a few percent magnetite.

Seismic

The seismic method can be used to determine the depth of overburden. If bedrock channels are preglacial or interglacial drainage features, they may contain concentrations of placer minerals. A study which located a buried valley system was done at Kirkland Lake by Hobson and Grant (1964, p.80). Part of their description of instrument and field procedure is as follows:

> "The basic component of a hammer seismograph unit is an electronic instrument capable of accurately measuring (to .001 seconds) small intervals of time. In refraction seismic surveying these intervals are the time required for seismic energy imparted to the ground by a sledge hammer blow to travel a measured distance to a suitable detecting device. An inertia switch mounted on the hammer handle closes upon impact of the hammer with the steel plate and

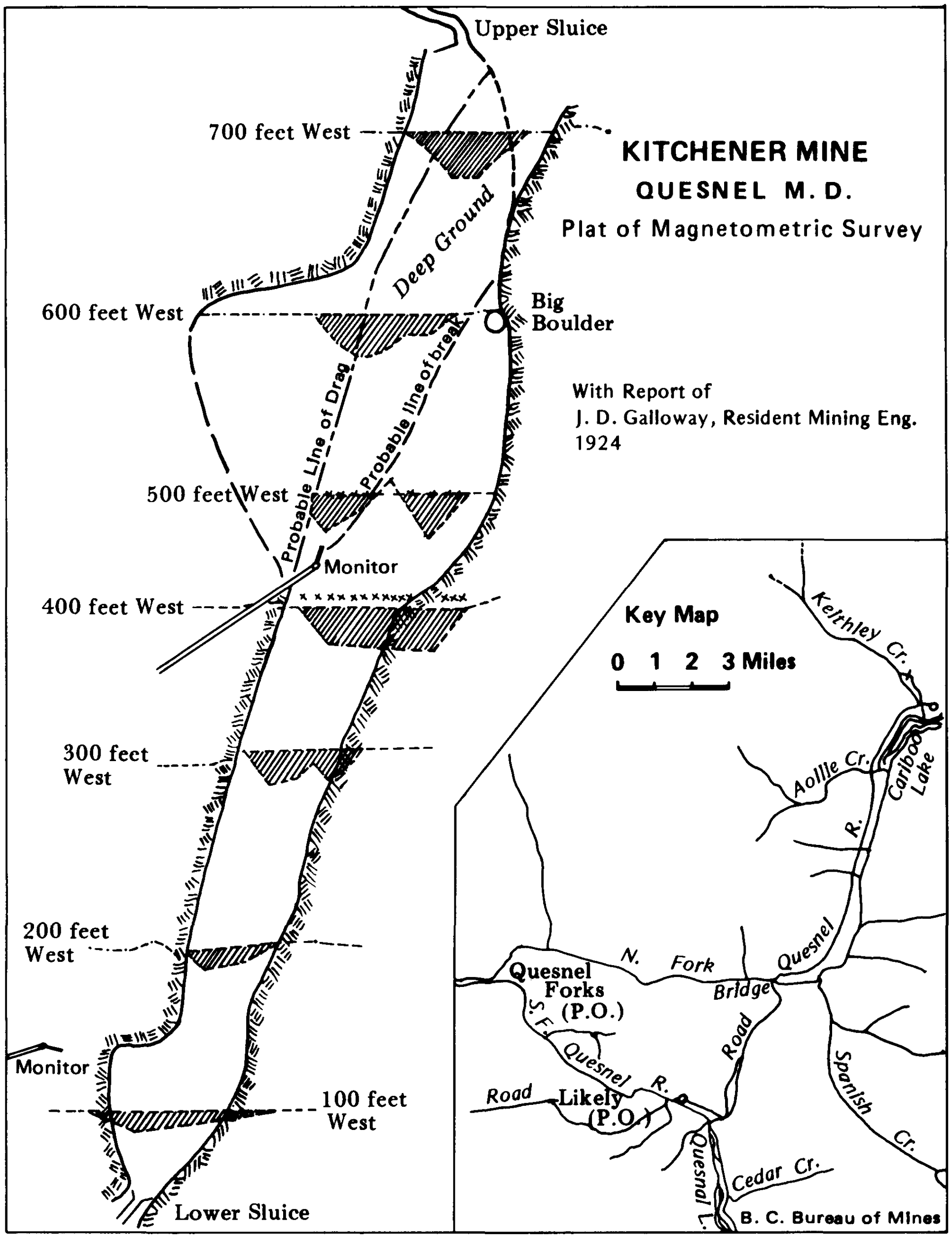


Figure 5 Plot of magnetometer survey of the Kitchener placer mine. Shaded areas show the channel as indicated by the magnetometer (May 1924). Cross-hatching outlines the channel as actually opened up later (after Galloway 1924, p. B130).

> triggers the timing instrument via a cable connection. The next recorded event is the arrival of the energy at the vibration sensitive detector or geophone. The times recorded for a sequence of such measurements for hammer points increasingly distant from the geophone station are plotted on a time-distance graph for subsequent interpretation . . . . Using the velocity data obtained from the time-distance graphs and the critical distances or intercept times, it is possible to calculate the thickness of the various overburden layers down to bedrock using conventional formulae".
>
> "A 16 pound [7 kg] 7.3 sledge hammer employed as an energy source appears to be considerably more effective than the lighter models. A metal striking plate 8 inch by 8 inch by 1 inch [20 cm by 20 cm by 2.5 cm] was used to insure transmission of the hammer energy to the ground."
>
> "Refraction seismic data recorded under favourable conditions is normally considered to be accurate within 5 or 10 percent."

Radiometric

In Saskatchewan the Rabbit Lake uranium orebody of Gulf Minerals was found in 1968. Robertson and Lattanzi (1974, p.16) made the following statement:

> "An airborne anomaly to the southwest of the orebody was caused by a pitchblende boulder train at the head of which the ore was found."

Also the Cluff Lake, Saskatchewan uranium orebodies of Mokta (Canada) Ltee were found due to an airborne radiometric survey related to boulder trains mineralized with pitchblende (Robertson and Lattanzi 1974, p.16). A.R. Meunier (1974) in a letter to the author gave additional information on this discovery which is abstracted in the following paragraph.

An airborne radiometric survey conducted in 1967 located an anomaly with peaks of about 300 counts per second. The following year helicopter and ground surveys located a number of highly radioactive boulders in till, glaciofluvial material, and lying on bedrock. The boulder train extends southwest from the "D" orebody a distance of about ½ kilometer (1,640 feet) and is of about the same width. Prospectors located other radioactive boulders which led to the discovery on the "N" and "Claude" orebodies but these boulder trains were much less extensive than the train associated with the "D" orebody.

GEOCHEMICAL METHODS OF TRACING FLOAT AND INDICATOR MINERALS

Geochemical techniques are applied to a wide variety of geological and plant materials. These materials include rocks, boulders, mineralized particles, the minus 100 mesh fraction of a soil or sediment, water, humus, branches of trees, etc. Work in Sweden has established the fact that "most ore mineralizations which have a boulder train also produce geochemical soil anomalies" (Kvalhein 1967, p.104). This general conclusion is believed also to apply in Canada. Some of these techniques are reviewed below.

Mineralized Clasts in Till

H.A. Lee of the Geological Survey of Canada (Lee 1963) published a study of till in the Kirkland Lake Area. The objective was to measure the dispersion of gold and other minerals in the various size fractions of basal till. The base line was laid out along the Kirkland Lake Fault in Teck and Lebel Townships (Figure 4). Traverse lines were at 2,000, 4,000 and 10,000 feet (610, 1220, and 3050 m) to the southeast. Sampling points were at 2,000 foot (610 m) intervals on the lines, except the line at 10,000 feet (3050 m) where the interval was 4,000 feet (1220 m). Pits were excavated using dynamite and a sample of 1.7 cubic feet (0.05 m^3) weighing from 80 to 100 pounds (36.3 to 45.4 kg) obtained.

The samples were washed through a series of stainless steel screens with openings at 16 mm, 8 mm, 3.35 mm (6 mesh), 1.23 mm (15 mesh), 0.5 mm (35 mesh) and the overflow passed over a sluice box set at a slope of 2 to 4 degrees. Water flow was adjusted so that there was just enough water to cover the riffles and produce some turbulence.

Some of the procedures were as follows (Lee 1963, p.10, 13):

VISUAL COUNTS

> "Visual measurements were made on the two coarser

size fractions and the total number of rock fragments was counted. These ranged from 50 to 399 for the coarser fraction and from 101 to 2,342 for the other. Rock fragments containing vein quartz were separated and their percentage was computed. The vein quartz was saved for later reference. Mineralized rock fragments were separated. Counts were made on fragments showing veined pyrite. Fragments with chlorite were counted, separated, and saved. Strongly magnetic fragments were counted and saved. Various other distinctive mineralized and fossilized rock fragments were also saved. All fragments that were saved were re-examined in a block inspection so as to minimize possibility of error during classification."

BINOCULAR MICROSCOPE COUNTS

"Material in the 1.23 to 3.35 mm and the 3.35 to 8 mm size ranges consisted chiefly of rock fragments. The material was examined both visually and with the aid of a binocular microscope . . . . A further check count was made at the end of the season.

Material from the riffle concentrate and from the 0.5 to 1.23 mm size range consisted chiefly of mineral grains. A heavy liquid separation was made of the material using tetrabromoform. Microscope slides were made using the heavy mineral fraction and the light mineral fraction. Epoxy cement was used to mount the grains. It has the advantage of not completely covering a grain and of permitting the use of different index oils consecutively."

SPECTROGRAPHIC ANALYSES

"Spectroscopic analyses were made in a Geological Survey field laboratory under the direction of R.H.C. Holman. A 1.5 metre Wadsworth mounted grating-type emission spectrograph was used. Analyses were made on finely pulverized material from two size fractions of the till (1.23 to 3.35 mm sizes and 0.5 to 1.23 mm sizes) and on a riffle concentrate after magnetite was removed. Separate spectrographic analyses were made on magnetite from the riffle concentrate.

Spectrographic analyses were done for the following purposes:
(1) To indicate anomalous abundance of a metal which could then be checked for in mineral combination by use of the binocular microscope. This was an attempt to bypass a tedious identification of all heavy minerals.
(2) To assist in evaluating post-depositional alteration of elements and minerals in the till.
(3) To make comparisons between the trace elements in various sizes of the till and different bedrock lithologies in the region."

The observations recorded by Lee (1963) were as follows:

VISIBLE GOLD IN RIFFLE CONCENTRATE

"The number of visible gold grains per sample in the fan decreases generally southwards from 1 grain to 10 grains in the first grid line 2,000 feet [610 m] south of the fault, to 1 grain to 3 grains on the 4,000 foot [1220 m] line south of the fault and is generally absent 10,000 feet [3050 m] south of the fault. This glacial fan shows a fairly good correlation with the mines along the Kirkland Lake fault." (Lee 1963, p.26, see also Figure 4, this report).

GOLD BOULDERS OF THE TILL

The following paragraph is condensed from Lee (1963, p.28-29).

As gold could not be seen in the boulders, boulders that might contain gold were selected on the basis of the presence of dark-coloured vein quartz, cherty-quartz, disseminated pyrite or pyrite in veinlets, the presence of alteration as bleaching or carbonatization. No pattern of boulders containing gold was obtained, which may have been due to the imperfect sampling technique in having to select 10 boulders out of a total of about 800.

BLUISH BLACK VEIN QUARTZ

"In the till, the only size range that carried sufficient fragments of bluish black vein quartz for counting was 3.35[.13"] to 8 mm [.31"]. A geographic plot showing distribution of this dark-coloured vein quartz in this size range of the till shows a glacial fan with a dominant source along the Kirkland Lake fault. The correlation is fair. This vein quartz fan resembles the visible gold fan . . . . (Lee 1963, p.30).

FAULT GOUGE

"The mines of the Kirkland Lake camp are in fault zones, ... the fault material shows in the till as schistose platy fragments. It is most abundant in the size range 8 [3.1"] to 16 mm [6.3"] or about the size of a Canadian five-cent piece. Chlorite fragments of that size were found to be an indicator in the till. The rock fragments in the till were classified as chlorite only if they were good plates of schistose chlorite. Excluded were fragments of rock with only chlorite veneers. Chlorite gouge collected underground from the "main break" of the Kirkland Lake fault at the

Teck Hughes mine was used as a reference for classification.

A plot of the geographic distribution of chlorite fragments in the till . . . . outlines a glacial fan with a source over the Kirkland Lake fault. The correlation is good." (Lee 1963, p.26).

GEOCHEMICAL PROSPECTING WITH DOGS

Prospecting dogs have come into use since 1965 as they have an excellent sense of smell and are able to detect the presence of sulphur dioxide. Dogs are tested for smell, defense and endurance; selected animals, usually Alsatians, are trained for a period of about four months and maximum efficiency is not achieved before the end of a full field season (Nilsonn 1973, p.97). The training is intended to develop a desire on the part of the dogs to locate sulphide-bearing rocks and to bark and whine while digging for an unexposed fragment. In Sweden, snow covering the ground and low temperatures are considered to be advantageous as the number of outside odours is reduced. In Canada, it is stated that good emission of sulphur dioxide occurs when the ground-air temperatures are relatively close to being the same and the temperature is above 50 degrees Farenheit (10°C) (Brock 1972, p.32).

RADON

Occurrence

Certain elements such as uranium are naturally radioactive and decay to produce other radioactive elements or isotopes. Three long-lived "parent" radioisotopes exist in nature as uranium 238, uranium 235, and thorium 232 that decay to produce "daughter" radioisotopes such as radium (a solid) and radon (a gas). The gaseous radon isotopes of mass 222, 220 and 219 respectively known as radon, thoron, and actinon decay with the emission of an alpha particle to solid radioactive products. The half-life of radon 222 is 3.82 days, thoron is 54.5 seconds, and actinon is 3.92 seconds. Radon 219 (actinon), because of its short half-life and the low isotopic abundance of its parent, uranium 235, does not need to be considered in a geochemical survey method.

Travel Distance

Because radon 222 persists significantly longer than the other radon isotopes, it is able to travel much farther from its immediate parent, which makes it useful in exploration for uranium. Stevens *et al.* (1971, p.259) stated:

". . . . for practical purposes, its 'detectable' migration distance will be the distance it travels in six half-lives, or 23 days, by which time only 1 percent of the original radon still exists".

Because of the tendency for radon to escape into the atmosphere, as well as its relatively short half-life of 3.8 days, its range in surface waters is limited to several hundred feet from the source (Dyck *et al.* 1971, p.132-133). However, ground waters may carry high radon concentrations for long distances in granitic rocks when water passageways become coated with radium leached from minerals by water. This situation is altered in a soil environment as Morse (1973, p.2) stated:

". . . radon would migrate up to 30 feet in dry soil before decaying to undetectable levels. In wet soil, however, this distance drops to a few inches".

Dyck *et al.* (1971, p.145-146) made the following observations on lake and stream sampling:

"The source of radon in the water is the radium in the sediment. From there, the radon moves by diffusion and turbulence to the surface where the sample is collected. Diffusion is slow, limiting the range of radon to about 20 feet, ... Remembering that radon is a gas with a half-life of 3.8 days, it is evident that the radon concentration will depend greatly on the distance from shore, depth and turbulence of water, as well as the concentration of radium in the sediment at the collection site".

Natural Concentration

Radon is measured in picocuries per litre (pc/1) or as a multiple of the background count, if the background count is measurable with the instrument being used. If the background count is too low to be measured with the survey instrument, the concentration may be expressed as the number of times it is above the minimum detection limit of the instrument.

Readings of twice background may be considered to be anomalously high. In the Beaverlodge area, the background values in streams and lakes were found to be approximately 12 and 1 picocuries per litre respectively (Dyck *et al.* 1971, p.132).

The radon content at the surface of lakes varies considerably from day to day and low radon values coincide roughly with windy days. In streams, the variation in radon content with time is *much* less than in the lakes (Dyck *et al.* 1971, p.132).

Sampling

Lake samples of surface waters may be collected in a glass bottle, taking care not to create bubbling or other turbulence in order to retain the radon gas. The sample is collected and tightly capped leaving but one air bubble within the bottle to prevent possible leakage due to temperature changes. Such samples may be taken from the pontoon of an aircraft and preferably about 20 feet (6.1 m) from shore in the delta area of an inflowing stream. In order to collect stream samples, it is necessary to go ashore and the collection point should be above places of water turbulence, such as falls or rapids. Loss of radon from filled bottles is exponential with time and can amount to 50 percent in 3 to 4 days (Dyck 1969a, p.8).

Soil gas may be collected by drilling a hole with a hand auger about 1½ inches (3.8 cm) in diameter and one foot (0.3 m) in depth. Gas from the hole is pumped directly into the counter (Morse 1973, p.3). A similar procedure may be used when the ground is snow-covered by drilling a hole to the bottom of the snow and sampling the gas at the snow-soil interface. Sutton and Soonawala (1975) described a method where the radium in a soil sample is collected by immersing the sample in water and analyzing for the radon collected. This method can achieve a depth penetration of several feet more than is possible using other techniques.

Analytical Methods and Techniques

A portable instrument consists of a metal tube with the inside coated with silver-activated zinc sulphide. Alpha particles do not penetrate the metal walls, so that only radiation within the instrument is recorded. When an alpha particle hits the zinc sulphide, a flash of light occurs which generally is registered by the photomultiplier tube and appears as a digital readout.

Air is evacuated from the cell and replaced by a radon-air mixture by bubbling air through a standard volume of the water sample. When soil gas is being tested, the radon-air mixture from the hole is pumped directly into the cell and dust is excluded by having a porous plug at the intake end of the gas line.

When the cell is filled, the count may be recorded for three 1-minute periods. Because of the short half-life of thoron, most counts appear in the first minute. Radon 222 is characterized by a steadier count rate which rises slightly as the alpha-emitting daughter elements become important. Empirical practice is that when the ratio of the third minute to the first minute exceeds 0.7, uranium mineralization is indicated (Morse 1973, p.4). Solid alpha-emitting daughter products of radon and thoron build up on the walls of the cell so that the background must be measured from time to time, particularly after high readings. Because the decay products are solid and cannot be removed by evacuation, it is important to count as soon as possible after filling, and remove the radon from the cell immediately after counting. When the radon is removed from the cell, the activity decreases rapidly, at first due to decay of polonium 218, then, more slowly with a composite half-life of about 35 minutes due to 27-minute lead 214 and 20-minute bismuth 214 (Dyck 1969a, p.8).

TABLE 5 PARENTS AND DAUGHTERS OF THE MAJOR LONG-LIVED RADIOACTIVE ELEMENTS.

Parent:		
Uranium 238	Uranium 235	Thorium 232
Daughters:		
Thorium - 234	Thorium - 231	Radium - 228
Protactinium - 234	Protactinium - 231	Actinium - 228
Uranium - 234	Actinium - 227	Thorium - 228
Thorium - 230	Thorium - 227	Radium - 224
Radium - 226	Radium - 223	Radon - 220
Radon - 222	Radon - 219	Polonium - 216
Polonium - 218	Polonium - 215	Lead - 212
Lead - 214	Lead - 211	Bismuth - 212
Bismuth - 214	Bismuth - 211	Polonium - 212
Polonium - 214	Thallium - 207	Thallium - 208
Lead - 210	Lead - 207	Lead - 208
Bismuth - 210		
Polonium - 210		
Lead - 206		

Fluorine

J.P. Lalonde (1974) carried out sampling of various geological materials in the vicinity of Madoc, where fluorite veins are known to occur. Determining the fluorine content of ground waters proved to be an effective geochemical method for outlining areas of possible economic interest.

Sampling and Analytical Method

Forty-seven ground water samples were collected at ½ mile (0.8 km) to 1 mile (1.6 km) intervals along two regional traverses each 20 miles (32 km) in length. Supplemental sampling brought the total number of ground water samples to 200 (Lalonde 1974, p.19). Samples were collected during April 1972 from springs and water wells on farms. The ground water was collected in 250 ml polyethylene bottles with caps of the same material. The bottles were thoroughly cleaned with acid and metal-free water before use. The temperature and pH were recorded at the site.

Ficklin (1970) described a method for determining fluorine in rocks and soils using an ion selective electrode. The ground water samples were allowed to come to room temperature and then buffered with a solution containing sodium acetate and acetic acid at a pH of 6.0. Then the fluorine content was determined using the selective ion method (Lalonde 1974, p.7).

Results

The ground water survey was successful in outlining two parallel zones of anomalously high fluorine content (Figure 6). One of the zones is the Moira Fault with associated fluorite veins. The results of testing the fluorine content of the rocks and waters of the area are described as follows (Lalonde 1974, Abstract):

> "Most rock types of the Madoc area are fluorine-rich and contain between 1,000 to 2,700 ppm F. Several surface water anomalies associated with areas of fluorite occurrences were located, and dispersion trains were traceable for several miles. The fluorine content of stream sediments is, however, of limited use in geochemical explorations because of the small contrast between background and anomalous concentrations. The fluorine content of ground waters clearly delineates areas containing known fluorite occurrences as well as other targets of interest; a positive correlation exists between ground water anomalies and fluorine-rich soils along the regional traverses. The lateral dispersion of fluorine in soils overlying subcropping fluorite veins is restricted and, therefore, can be used to pinpoint such occurrences. The most favourable soil horizon to sample for all elements studied is the organic A horizon which accentuates the contrast between background and anomalous concentrations. Barium and zinc in soils are also good tracers for fluorite veins; but strontium proved to be ineffective. The water soluble fluorine content of the A soil horizon can be used as an inexpensive field test".

Mercury

The following resume is taken from United States Geological Survey Professional Paper 713 (U.S.G.S. 1970), Jonasson (1970), Trost and Bisque (1971), Jonasson and Boyle (1972), Bristow and Jonasson (1972), and McNerney and Buseck (1973).

Mercury is present in soil gases and the atmosphere in both particulate and gaseous forms. The presence of mercury gas is partly due to the relatively high vapour pressure of the metallic state and to a lesser extent of some of its compounds. Mercury may be vapourized directly from the land surface, particularly from mineralized areas by radiant energy. Both particulate and gaseous forms of mercury in the atmosphere are returned to the earth's surface by rain. Mercury and mercury compounds are able to move between the atmosphere, hydrosphere, biosphere, pedosphere (soils and glacial materials), and the lithosphere.

Ground Water

Mercury compounds such as carbonates, sulphates, etc., as well as metallic mercury may be produced by ground water action on sulphide minerals. When the ground waters reach surface, the carbon dioxide content is reduced and both the dissolved and metallic mercury will be adsorbed by sediments. The clay, iron oxides, or organic matter which now holds the mercury will disperse downstream.

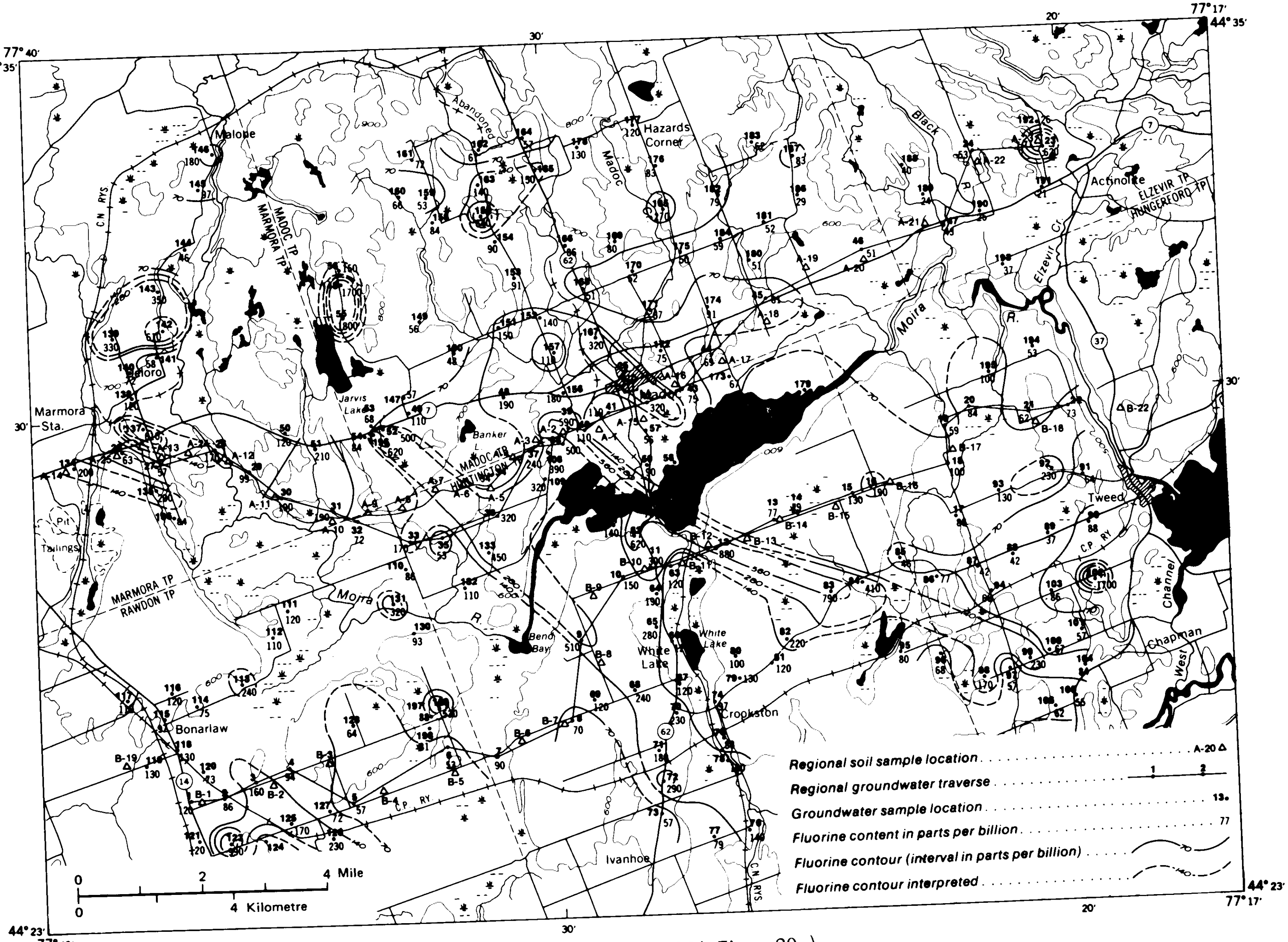


Figure 6 Fluorine in groundwater of the Madoc area, Ontario (after Lalonde 1974, Figure 20 c).

Soils

Mercury may enter soils as a vapour or as ions due to ground water action or to upward migration from faults or from sulphide deposits. The biodegradation of vegetation may also be a surface source of mercury. The particular soil zone which will have the highest mercury content depends on factors such as pH, the proximity of mineralization, and the percentage of organic and clay fractions. Warren *et al.* (1966, p.1025) concluded that:

> ". . . when the B and/or C horizons contain appreciably more mercury than do the A horizons, it is probable that mineralization is in the immediate vicinity. Contrariwise, where one or more of the A horizons is richest in mercury, it is probable that the mercury has, in one form or another, been transported and accumulated by vegetal matter."

Warren *et al.* (1966, p.1016) gave the following guide to the mercury content of soils from his studies in British Columbia:

Location of Soil Samples	*Mercury in parts per million*
Unrelated to mineralization	0.01 to 0.05
General area of base metal, gold, or molybdenite mineralization	0.05 to 0.25
Base metal deposit less than 1,000 feet from mineralization	0.25 to 2.5
Immediate vicinity of mercury mineralization	1 to 50

The correlation between the mercury content of soil gas and a bedrock gold deposit in the semi-arid climate of Nevada is shown in Figure 7. It is interesting to see how closely the mercury content parallels the gold deposit, forming a "mercury halo" over the deposit. A similar parallelism occurs along the Munro Esker complex of northeastern Ontario (Figure 8). An anomalously high area of placer gold was outlined by sampling part of the esker during the summer of 1965. The anomalously high gold area is shown in Figure 8, and again the mercury anomaly exists more or less coincident with the placer gold anomaly. It is of interest to compare these test results with those of Warren *et al.* (1966) in the preceding table. Seven drill holes failed to locate a bedrock source for the placer gold present and thus it was assumed the mercury emanated from material associated with the gold placer within the transported esker debris rather than from the bedrock itself.

Hood (1974, p.183) gave the following description:

> "Barringer Research has developed new field and lab geochemical techniques for the detection of vapour phase and hydromorphic anomalies in the organic fraction of the soil. The method is based on sampling of the appropriate soil horizon in which metals accumulate, followed by extraction from the organic fraction to reveal small traces of metals that have moved through the overburden. The measurement of trapped vapour-phase mercury provides great selectivity for mineralization whilst analysis of other base metals reveals trace anomalous concentrations which aid characterization of metal-rich sources. The system is substantially insensitive to the matrix material of the soil and is highly sensitive to metals that have travelled through the overburden. Extensive orientation surveys effectively demonstrated the application of the system in the detection of the mineralization concealed beneath transported overburden".

Gangue Minerals

Certain gangue minerals may have a mercury content comparable to ore minerals and the range for barite is 0.2 to 200 parts per million. Smaller amounts of mercury may also be present in fluorite, dolomite, calcite, siderite, and chalcedony (Jonasson and Boyle 1972, p.34). The presence of gangue minerals may be important in placer deposits as well as in bedrock deposits.

Atmosphere

The following conclusions are taken from U.S.G.S. (1970, p.38).

> "1) Mercury vapour is released to the atmosphere by evaporation from and by degassing of surface material.
> 2) Mercury content of air is highest over areas where the rocks are richest in mercury . . . .
> 3) The maximum content of mercury in air was found near midday; lesser amounts were found in the morning and evening; and minimum amounts were found near midnight.
> 4) The mercury content of ground surface air is considerably higher than that of air above the ground . . . .

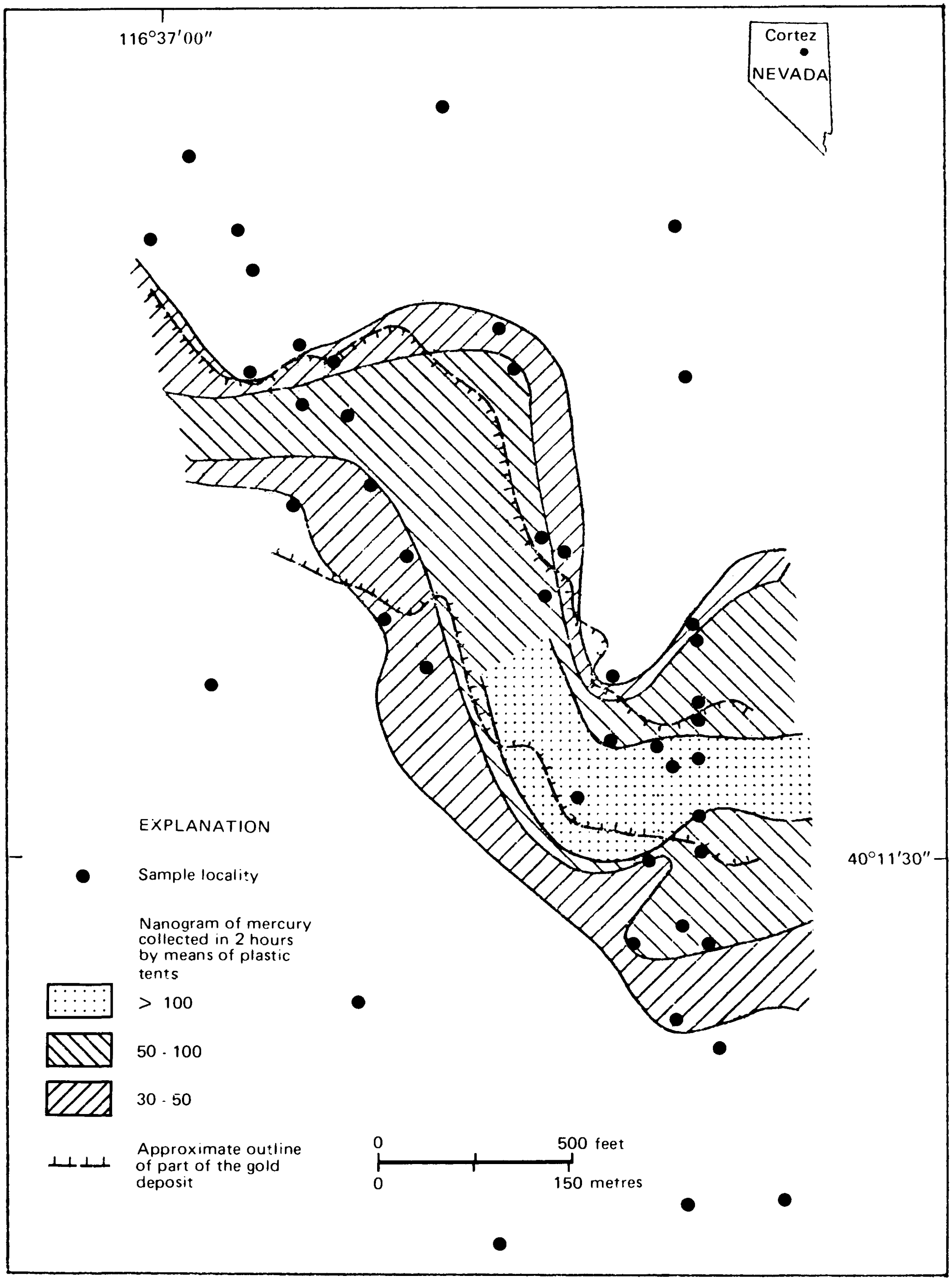


Figure 7 Mercury content in soil gas at Cortez, Nevada, U.S.A. (after J. H. McCarthy et al. 1969, U.S.G.S. Circular 609 p.8).

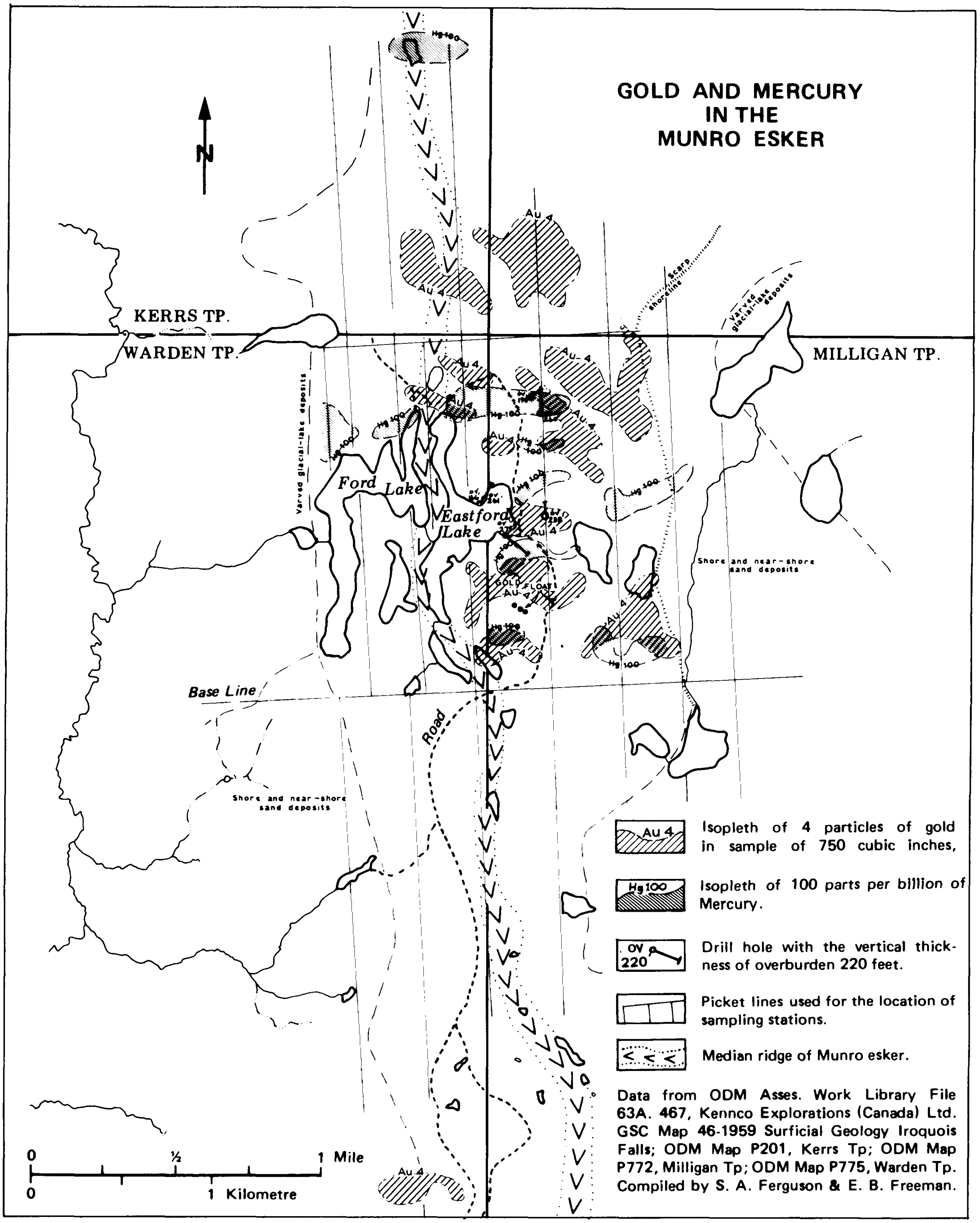


Figure 8 Concentration of gold and mercury in part of the Munro Esker, Munro, Warden and Kerrs townships, etc. Ontario.

TABLE 6 MAXIMUM MERCURY CONCENTRATION IN AIR MEASURED AT SCATTERED MINERALIZED AND NON-MINERALIZED AREAS OF THE WESTERN UNITED STATES.

	MAXIMUM MERCURY CONCENTRATION (Nanograms per cubic metre)	
Location	Ground Surface	400 feet above ground
Ord Mercury Mine, Arizona	20,000	108
Cerro Base Metal Mine, Arizona	1,500	24
Cortez Gold Mine, Nevada	180	55
Coeur d'Alene Silver Mining Area, Idaho	68	n.a.
Twin Buttes Porphyry Copper Mine, Arizona	20	22
Gila Bend, California Unmineralized Area	n.a.	4

n.a. - no data available

5) Background concentrations of mercury in air at 400 feet above ground in the Southwestern United States range from 3 to 9 nanograms per cubic metre".

Table 6 is modified from U.S.G.S. (1970, Table 28, p.67) and gives the maximum mercury concentration in air at certain localities in Western United States.

The above values for mercury are probably high but presumably are relatively correct. Hood (1972, p.195) made the following statement:

"It is now widely recognized that the values quoted in the earlier literature for atmospheric haloes over base metal mineralization were overly optimistic. More recent field work including that of Scintrex in Canada, U.S.A. and Australia now indicates that such haloes that do exist are unlikely to exceed 10 ng/m^3 (10 nanograms per cubic metre) even near ground level. The Scintrex equipment is designed to recognize these much lower values with adequate signal/noise ratios. Initial test survey results from Australia in particular, have been most encouraging. Using the prototype HGM system, with a very low-mounted intake, mobile surveys have been conducted over various types of sulphide mineralization in the Precambrian of NW Australia. Although the absolute levels were low, anomaly-background ratios of up to 10:1 were obtained. Amongst the advantages of this fast ground technique is the discrimination of sulphides from other geophysical features such as conductive graphitic zones, saline overburden, which could otherwise mask or distort conventional geophysical methods.

Soil gas measurements show promise as an economic ground follow-up tool. The HGG-3 equipment introduced by Scintrex in November 1971 was field tested near Perth, Ontario under conditions of intermittent rain and snow. In this area where conventional soil geochemical analysis had located a 600 ppb soil anomaly, a contrast ratio of at least 50:1 was obtained with the backpack instrument in measurement of the mercury content of the soil gas".

ANALYTICAL METHODS

It is suggested that the reader consult the summary of analytical methods that is given by Jonasson (1970, p.1-5) and Bristow and Jonasson (1972, p.39,47,85).

Laboratory methods are mainly atomic absorption techniques or modifications of this technique to achieve greater sensitivity or overcome certain difficulties. Other methods are calorimetric, catalytic, neutron activation, emission spectrographic, X-ray fluorescence, double-beam atomic fluorescence, etc. A portable instrument for soil gas measurements has been developed and marketed in Canada for the detection of mercury vapour (Hood 1973). This instrument has obtained strong responses over some copper-zinc, lead-zinc, and uranium deposits. Also, it has been used in geothermal exploration to help locate wet and dry steam fumaroles (Hood 1974, p.183).

AIRBORNE MINERAL PARTICLES

Extremely small particles from outcropping mineralization or the overlying weathered materials are contributed to the air. The technique utilizes the collection of airborne mineral particles and the analyses of these particles for the elements that they contain. Also the particles are analyzed for their number and size distribution as the largest particles occur in the air immediately above the ground source. The particles are collected by winding 900 feet (275 m) of nylon fishing line, 0.1 mm in diameter, on an aluminum frame 1 square foot (0.09 m^2) in cross section. An aircraft tows the frame on a cable at 100 to 200 feet (30 - 61 m) above ground level at times of still air. Half of the thread from an exposed frame is used for spectrographic analysis. If the analysis finds traces of metals of interest, the second half of the thread is pulled through an abrasive pad leaving two streaks. An analysis of the size distribution of the particles is made using an electron beam micro-analysis (Weiss 1971, p.502).

AIRBORNE METAL-ORGANIC COMPOUNDS

Small traces of mineralization are contributed to the atmosphere by growing plants and plant debris. The method holds promise in areas of overburden and in prospecting for porphyry coppers, lead, zinc, and precious metal mineralization. Hood (1974, p.168) gave the following description:

> "*The Barringer Airtrace system* is a new airborne biogeochemical technique developed as a complementary tool to airborne geophysics. It depends upon the little known biogeochemical phenomenon that metallo-organic compounds are dispersed into the overlying atmosphere by vegetation and soil humus. The system can detect minute traces of biologically complexed and adsorbed metals and provides sensitive indications of subsurface mineralization in surveys carried out at altitudes of 200 ft [61 m] and greater. It responds to geochemical migrations through overburden either in solution or in the vapour phase and shows considerable promise for use in prospecting areas of transported overburden. The system can function effectively in forested terrain even when the ground is covered with fresh snow; a fact that substantiates the importance of the role of biological transport in providing atmospheric dispersions.
>
> Metals detected directly by the Airtrace system include mercury, copper, lead, zinc, nickle and silver. Other indicators relating to vapour-phase dispersions of methane, carbon dioxide and sulphur gases are also monitored".

FLOAT

Deposition of Float

Most float boulders are found lying on the surface or partially covered or have been exposed in road cuts or gravel pits. In parts of northern Ontario the Cochrane Till represents the last glacial advance and possibly boulders were deposited during the retreat of this ice sheet.

An alternative hypothesis, is that float was present in the ice forming the walls of ice tunnels or ice canyons adjacent to the areas where eskers and outwash deposits were forming. As the ice melted, these boulders were dropped as ablation till over the area covered by the ice. The boulders that fell in the higher areas of sand and gravel are now exposed at surface, but those that fell in lower areas fell into lake clays or were covered by later clays or are present in lake bottoms or beneath areas of muskeg.

Experience in Sweden has shown that some certain boulder trains first appear on surface at a considerable distance down-ice from the outcrop area. The following description is condensed from Grip (1953, p.722-723) for the Harmservet occurrence. The boulders consisted of rich silver ore with native silver, argentite, sphalerite, and galena, but not enough sulphide minerals were present for the use of geophysical methods. The first boulder found weighed more than a ton, but for a distance of 1,300 metres (4,265 feet) no others were found. From 1,300 to 1,600 metres (4,265 to 5,249 feet), numerous boulders were present but the train appeared to terminate at the northern end. The train was followed for another 700 metres (2,296 feet) by digging trenches. At this point, the train ended and trenching to bedrock located silver mineralization beneath a depth of 6 metres (19.7 feet) of moraine.

The same phenomena occurs in the finer sized material and the following is from Hyvarinen *et al.* (1973, p.92-93):

"When a geochemical anomaly is traced vertically, it is seen that it begins at the outcrop on the surface of the bedrock, rises into the till bed and gradually reaches the surface of the till at a distance of 150 - 600 m (492 - 1,968 feet) from the outcrop. . . "

Figure 9, after Hyvarinen, illustrates the dispersal of asbestos boulders in till by glacial action.

FLOAT TRACING TECHNIQUES

A single piece of float is of interest but a group of boulders is of more importance. In addition, if the desired metal or mineral is present in small pebbles and also in the fines, the locality is of increasing interest and it becomes important to learn the dimensions of the float pieces, the associated minerals and rocks, and the direction in which they were transported. In order for the float to be discovered on surface away from a stream valley it would likely belong to a late glacial till. If it belongs to the latest till we would know that the deposit was exposed at the time of advance of the ice sheet or that boulders were present on surface and probably the deposit was not deeply buried.

Also we would hope to establish the grade, minimum width from the largest boulders, and minimum length from the width of the boulder train.

The procedure of investigation might be as follows:

1) Accurately plot the location of the float group on a map possibly at a scale of 1 inch to 200 feet or 1 inch to 500 feet (1:2,400 or 1:6,000).
2) Classify the float as to roundness, neglecting any recent fractures, as angular, subangular, subrounded.
3) Measure the diameters of the float and if there is a long axial direction, record it and plot the direction on the map.
4) Sample the float and have the sample assayed.
5) Record the associated minerals and rock types.
6) Establish the direction of glacial transport, possibly using fluting on the ridge of debris and use a contour map to outline the axial lines of ridges or depressions left by the latest ice movement which moulded the existing surface.
7) Lay out sampling stations at 50 foot (15.2 m) intervals along a line perpendicular to the direction of ice advance, to the edge of the exposure of till.
8) Dig a hole about 1 foot (0.31 m) in diameter and 18 inches (0.46 m) deep at each of the sampling stations and place all the material excavated on a piece of canvas or plywood.
9) Sieve the material excavated using a screen of ½ inch mesh. The sieve must be made of stainless steel, iron, or plastic and not of brass which would salt the sample for geochemical tests.
10) Place all float of similar rock types in heaps and weigh each type with a spring balance in order to determine the weight percent.
11) Count all fragments in each group and grade them as to roundness.
12) Test the pebbles for magnetism using a hand magnet and test them for apparent conductivity using an ohm-meter or metal detector.
13) Sieve the minus ½ inch material with a 35 mesh screen and separate the plus 35 mesh and minus 35 mesh into two piles and cone and quarter each pile in order to subdivide each fraction into two representative parts.
14) Pan one half of each fraction and count and describe the heavy mineral grains that can be identified with the naked eye or with a hand lens.
15) Package the other half of each fraction, or a representative part, to be used for geochemical tests.
16) Gradually enlarge the diameter of the hole and as each pebble is uncovered record the azimuth of the long axis. Generally two prominent directions should be present at right angles to each other as some pebbles are moved by pushing and others are rolled. On your detailed map plot the mean directions of the averages obtained.
17) If the results are sufficiently interesting for you to continue, move up-ice 200 feet, 500 feet, or 1,000 feet (61 m, 152.5 m, 305 m) etc., and establish another group of sample stations.

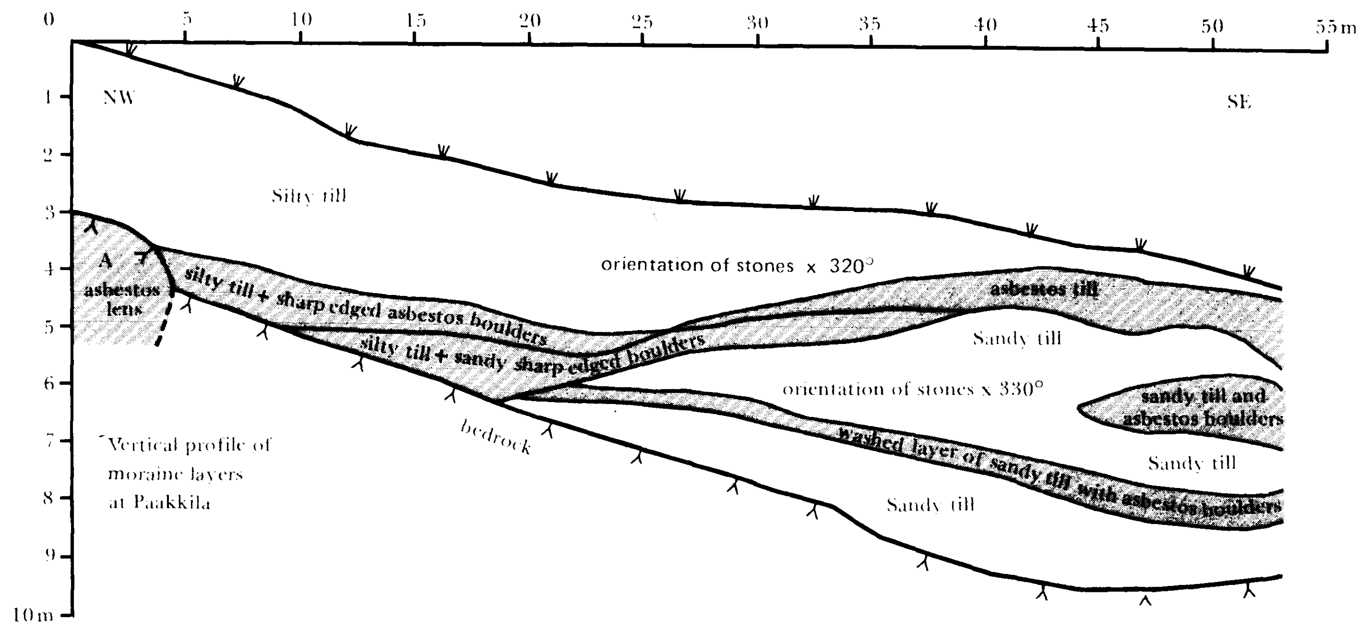


Figure 9 Asbestos-rich horizon in glacial till dipping from surface towards outcrop of asbestos lens in mica-gneiss bedrock (after Hyvarinen et al. 1973 p.93).

CASE HISTORIES OF TRACING FLOAT

Scadding Township Gold Float

A prospector, Peter McKellar, found gold float which lead to the discovery of a vein and is described as follows:

> "A gold property was located in the fall of 1891 about 20 miles [32 km] east of Sudbury . . . near Lake Kukagami. . . . The discovery was made in a swale, where in drift boulders free gold was found in the form of small nuggets . . . Mr. McKellar traced the boulders to their place of origin, a distance of only 200 feet [61 m], where several segregated veins were found . . . " (OBM 1892, Vol.2, p.237).

During 1902, work was in progress at the Scadding Township Gold Mine when a shaft was sunk to 186 feet (57 m) with 200 feet (61 m) of lateral workings and a second shaft to 40 feet (12 m). The dump was estimated to contain 7,000 tons (7112 tonnes) valued at $20 per ton (0.29 ounces gold per ton). The property is now held by Alwyn Porcupine Mines Limited.

Steep Rock Lake Iron Ore Float

The presence of boulders of iron oxides near Steep Rock Lake has long been known and it was generally supposed that the bedrock source of the boulders was beneath the lake. The boulders have been described by H.L. Smyth (1891, p.324), William McInnes (1897, p.57), W.G. Miller (1903, p.307), T.L. Tanton (1925, p.5) and T.W. Gibson (1937, p.133).

Steerola Exploration Company was formed by Julian Cross, Joseph Errington, and Donald M. Hogarth. Technical advice was rendered to the company by Watkin Samuel, a mining engineer of Toronto, and Hugh M. Roberts, a geologist from Duluth, Minnesota. A magnetic survey was made of part of the middle arm of the lake during 1937 and in 1938 iron ore was intersected by drilling beneath the lake in the area which became the Hogarth open-pit.

Steep Rock Iron Mines Limited was formed in 1942 and obtained title to the property. Diamond drilling from the ice and from the shores located the "A" and "B" orebodies in the middle arm of the lake and the "C" and "D" orebodies in the east arm. Work began in 1943 on diverting the Seine River and draining the middle and east arms of the lake. This part of the lake had an area of about 7 square miles (18 km^2) and was drained to a depth of over 140 feet (4 m) below the original water level. After two years' work, 70,000 million gallons (318,220 million litres) of water had been pumped and 26.5 million cubic yards (120.4 million cubic meters) of soil removed by dredging and pumping to expose the bedrock in the vicinity of the "B" orebody over an area of 520 acres (210 hectares)(see Photo 1). Production at this location began in 1945 and was called the Errington Mine. A cross-section of the Errington Mine showing the position of the former lake level is illustrated in Figure 11.

Indicator Train Steep Rock Lake Vicinity

A prospector, E. Corrigan showed G.G. Suffel boulders of iron oxides from near Quetico Lake. During 1951 a field party of Ventures Limited and led by G.G. Suffel and A. Dreimanis mapped the boulder locations in that area. A laboratory study of the clasts collected by the field party was made during the winter by D.G. Van Derlinger. A. Dreimanis continued the field studies in 1953-1954 under a research grant provided by the Geological Survey of Canada.

Field work included the examination of exposures of till and gravel along and adjacent to watercourses, road and railway cuts, and gravel pits. Quantitative studies of the iron ore pebbles showed that in the central train goethite formed 60 to 90 percent, hematite 10 to 30 percent and siliceous iron ore less than 10 percent. The pebble count is more constant in till than in gravel because till is an unsorted material, whereas gravels are sorted according to their weight. The ice-flow direction was determined by observing glacial striae, the stoss and lee ends of rock bosses and the orientation of pebbles in till. All data were plotted on a geological or topographic map in order to evaluate the results and facilitate planning of the work.

These studies established (Dreimanis 1956; 1958) the existence of a well-defined train of float 20 miles (32 km) long and 3 miles (4.8 km) wide which extends southward from the source area (see Figure 10). Normally, float does not extend for more than 2 to 3 miles (3.2 to 4.8 km) from the bedrock source and the detailed mapping was undertaken in the hope of locating another source of the boulders south of the known occurrence at Steep Rock Lake. One conclusion from the survey was that the smaller size pebbles and mineral grains are more accurate indicators

Photo 1 Floatore Island in foreground is the site B-1 shaft of the Errington Underground Mine. Centre of photo illustrates dredging in progress for what is to be the Roberts Open Pit. (Photo by George Hunter supplied by Steep Rock Iron Mines Limited).

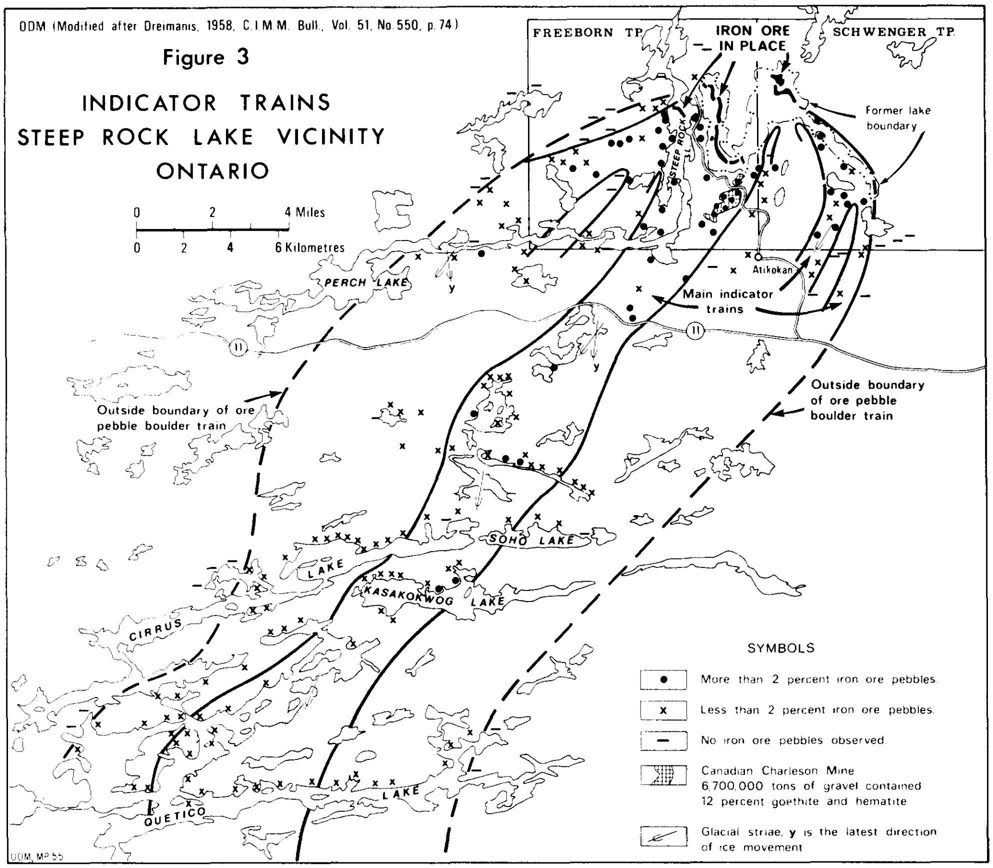


Figure 10 Shaded areas outline iron ore pebble concentrations of 2 percent or more, dashed line represents outside boundary of boulder train.

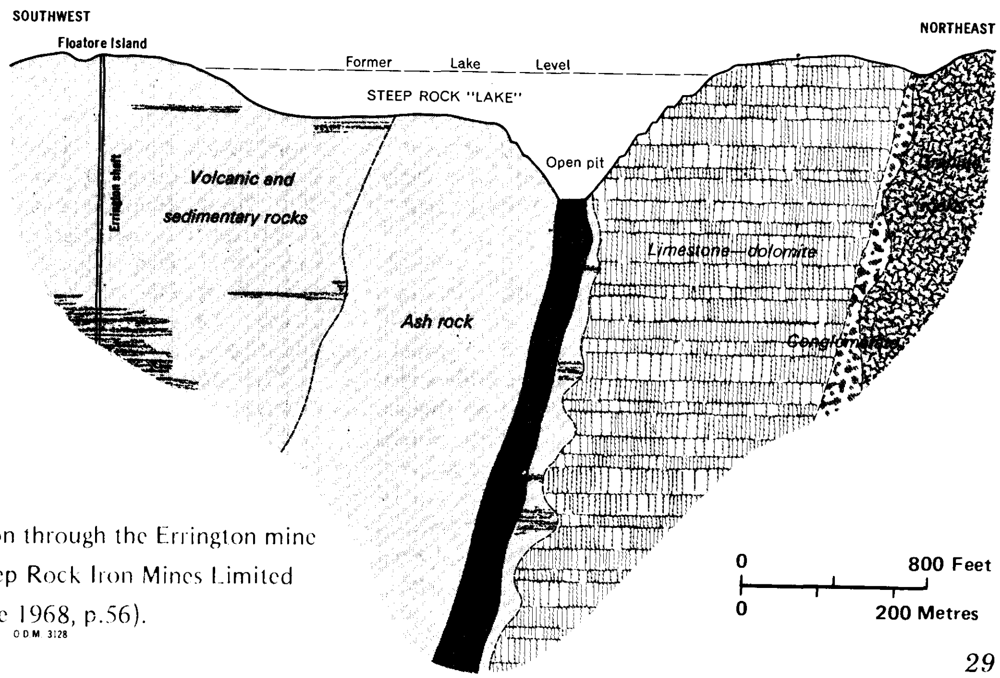


Figure 11 Vertical section through the Errington mine workings, Steep Rock Iron Mines Limited (after E.G. Pye 1968, p.56).
ODM 3128

of the source area location than cobbles or boulders. Throughout its indicator train the percentage of ore pebbles is generally less than 3 percent. Iron ore boulders were as abundant 21 to 24 miles (33 to 38 km) distant from the source as at 1 to 4 miles (1.6 to 6.4 km) from the source, whereas iron ore pebbles were 0.05 percent and 8 to 10 percent respectively at these localities.

Canadian Charleson Limited

Part of the indicator train at a distance from 3,000 to 7,000 feet (915 to 2135 meters) south of the shore of Steep Rock Lake was worked as a source of iron ore. When gravel pits were opened at this locality the presence of abundant clasts or iron oxides was observed. Exploration work from 1954 to 1956 showed that there was a higher percentage of iron ore in the gravel and sand sizes than in silt. Mining was selective with only the higher grade portions of the deposit being worked and the average weight recovery was 12 percent iron ore. The goethite-hematite concentrate produced was in the size range from minus 1 inch to plus 65 mesh and in addition a sized gravel and sand product was obtained. Production occurred from 1958 to 1965 and was 784,000 tons (796,544 tonnes) of concentrate valued at $6,401,000 tons of mill feed. Details of the operation are given by Shklanka (1972, p.59-64).

Vendome Mine, Fiedmont Township, Quebec

This lead and zinc mine near Barraute, Quebec, was located by P.R. Geoffroy about 1938 by tracing sulphide boulders to their source. It provides an illustration of tracing float in an area largely covered by clay. The following description, and Figure 12, is taken from *Dreimanis* (1958, p.51-52):

> ". . . . This discovery is in the clay belt, in an area not very suitable for boulder tracing. Most of the ground is covered by glaciolacustrine deposits, clays, silts, or sand. As a consequence, boulders are to be found only in washed till remains on higher bedrock outcrops, end-moraines, or eskers which protrude through the mantle of the lake clays, or deep in the valleys eroded through these clays. It is difficult here to trace a boulder train. Nevertheless, by combining boulder tracing with geophysical surveys and test-drilling, Geoffroy succeeded in locating the source of the float, which had a very low ratio of lead to zinc. The search is still continuing for the other source of boulders with a relatively higher content of lead . . . . "

Geochemical methods were also tried in the area south of Vendome where boulders were found more than 3,500 feet (1070 m) from their source, but with negative results. The abundance of sulphide boulders was only 1 to 5 per 1,000 other boulders at this distance, with boulders containing massive or disseminated pyrite outnumbering 5 to 10 times the boulders containing sphalerite.

Pardee Township, McCuaig Float

The McCuaig float, as shown in Figure 13, is located in lot 13, concession VIII, Pardee Township, on the north side of Highway 593 (Devon Road). This location is about ½ mile (0.8 km) east from the Devon Township boundary line and approximately 8.1 miles (13 km) by road northwest from the junction of Highways 593 and 61. Float is reported most abundant near the western end of the boulder train about 300 feet (91 m) northeast of the road. This float is of special interest as it led to the discovery of the Great Lakes Nickel mineral deposit by prospector J.S. Brodie in 1950.

The McCuaig float (mineralized anorthositic gabbro) occurs near the centre of the eastern half of a swampy lowland valley some 18 miles (29 km) long and from 1 to 2 miles (1.6 to 3.2 km) wide formed on the lacustrine red clays of glacial Lake Kaministikwa. The float is found in a hill of glacial drift, about 1 mile in diameter, which rises up to 130 feet (40 m) above the valley bottom. The area is heavily forested with much forest litter obscuring the boulders, making tracing of the boulder train difficult. The float according to J.A. McCuaig (1950) is primarily confined to a zone striking 64° extending over a length of 1,000 feet (305 m) with a width of 250 feet (76 m). A much larger zone is indicated by Geul (1970 and accompanying Map ODM 2207).

The patented claims covering this float discovery were staked in July 1917 by John A. McCuaig and brought to patent in 1923. Magnetic surveys in 1936 and 1942 failed to outline any important anomalies. A small bulk sample was sent to Falconbridge Nickel Mines Limited in December 1942 for milling tests which indicated economic recovery rates could be obtained should the source of mineralization be found.

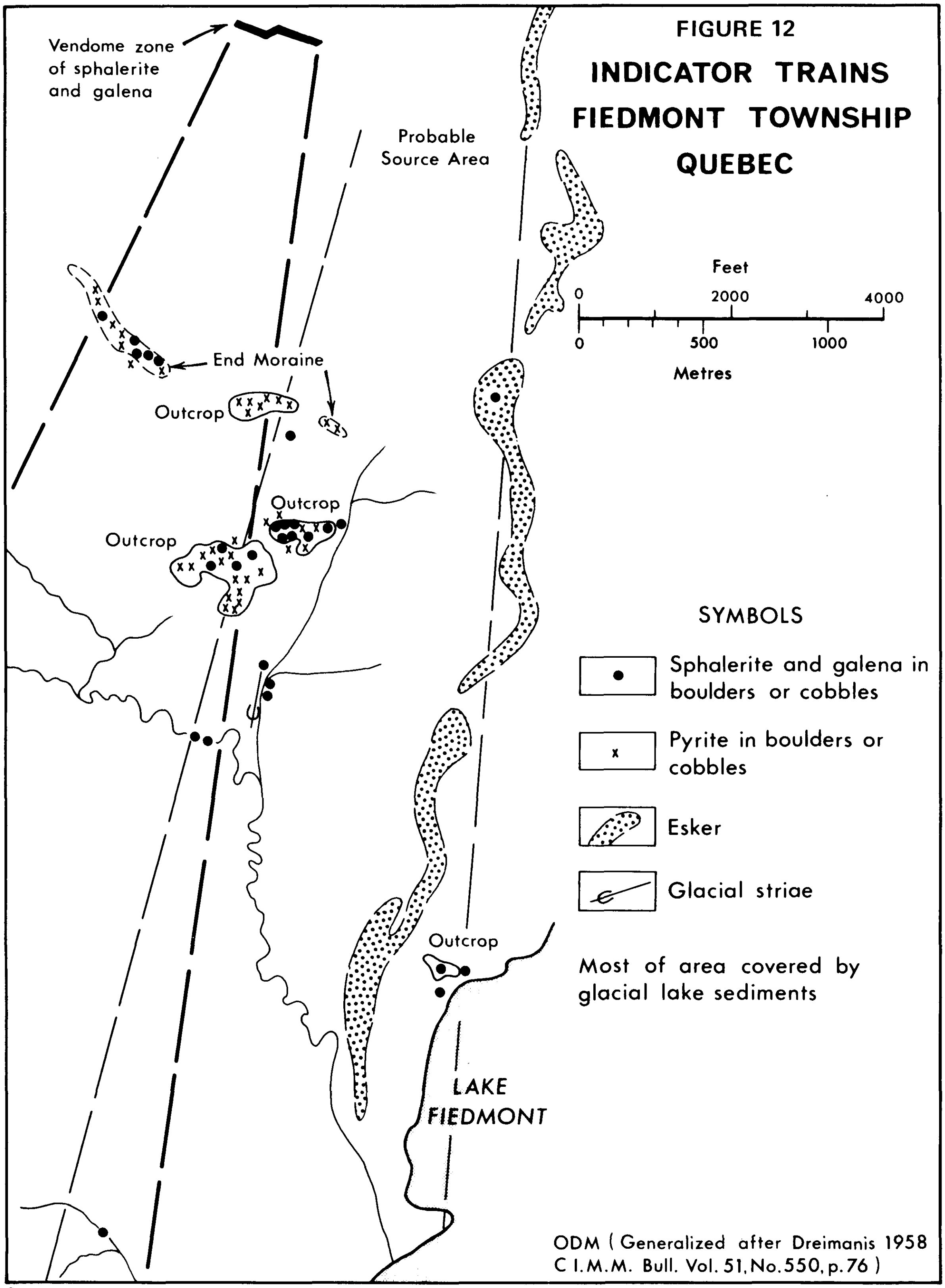


FIGURE 12
INDICATOR TRAINS
FIEDMONT TOWNSHIP
QUEBEC
Vendome zone
of sphalerite
and galena
Probable
Source Area
Feet
0
2000
4000
0
500
1000
Metres
End Moraine
Outcrop
Outcrop
Outcrop
Outcrop
LAKE
FIEDMONT
SYMBOLS
Sphalerite and galena in boulders or cobbles
Pyrite in boulders or cobbles
Esker
Glacial striae
Most of area covered by glacial lake sediments
ODM (Generalized after Dreimanis 1958
C I.M.M. Bull. Vol. 51, No.550, p.76)

ODM, MP 55

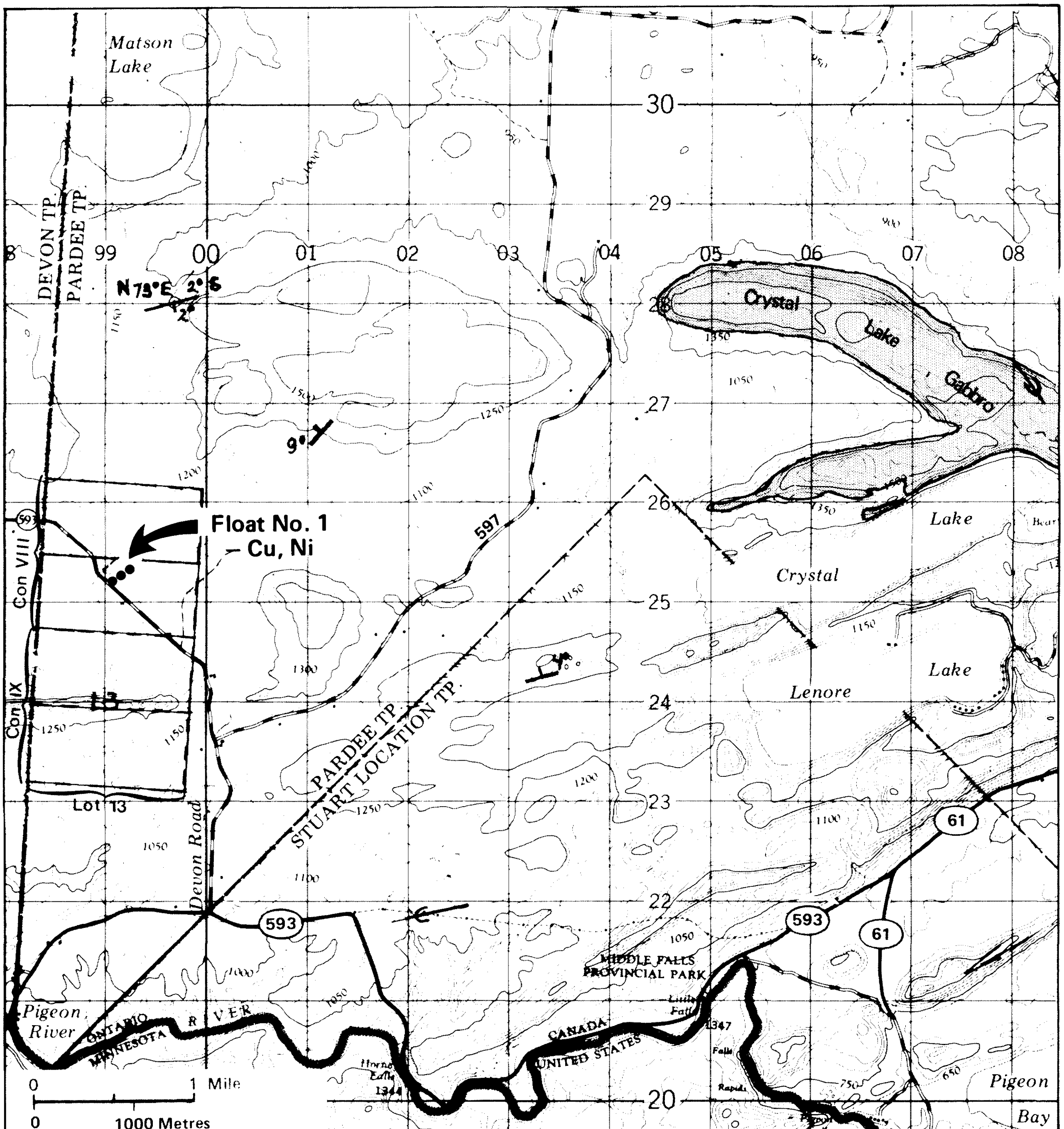


Figure 13 Pardee Township copper, nickel float, located in lot 13, concession VIII. National Topographic Series map 52A/4E, Pigeon River.

Trenching and some drilling was performed in 1949 and confirmed earlier test pitting that the mineralized gabbroic rock was float and not bedrock. Some of the float fragments are large, one block weighing over 350 tons (355 tonnes) and several fragments exceed 10 feet (3 m) in length. The averages of several assays as compiled by J.A. McCuaig (1950) were: copper 0.79 percent, nickel 0.29 percent, platinum 0.06 ounce per ton, gold 0.01 ounce per ton, and silver 0.20 ounce per ton. Drilling results have indicated overburden thickness of at least 187 feet (57 m).

McCuaig (1950) was of the opinion that a continental ice sheet deposited the float from a (relatively) nearby local source. However, prospector J.S. Brodie by assuming a valley glaciation, more or less confined to the lowland, deposited the float, located the apparent source 4 miles (6.4 km) to the northeast in 1950. In 1952, Brodie and T.W. Page returned to stake a group of 11 claims on property currently held by Great Lakes Nickel Corporation Limited. That the source of the float is from the Great Lakes Nickel deposit appears evident from the results of a semi-quantitative spectrographic analysis of the float and Great Lakes Nickel "ore" as reported in Geul (1970). Since relief of more than 500 feet (150 m) occurs in this area, it is reasonable to assume that some valley glaciation would have occurred during the beginning and wasting stages of continental glaciation here.

Great Lakes Nickel Corporation Limited has published reserves of 45.6 million tons (41.4 million tonnes) of 0.34 percent copper, 0.18 percent nickel, plus low values of platinum, palladium, and gold (Northern Miner 1974).

See also the section of this report on "Pardee Township Float No. 1 [Cu, Ni]".

Lackner Lake Boulder Train

This area is within NTS quadrangles 41 O/11 and 41 O/14 and Lackner Lake is within Lackner Township (Latitude 47°48′; Longitude 83°01′) near the western boundary. McNaught Township (Latitude 47°48′; Longitude 83°11′) adjoins Lackner Township on the western side, and the boulder train extends southwest from this area as shown on Figure 14. A gravel road leads northeast from Highway 129 to the property and the boulder train was studied adjacent to the road.

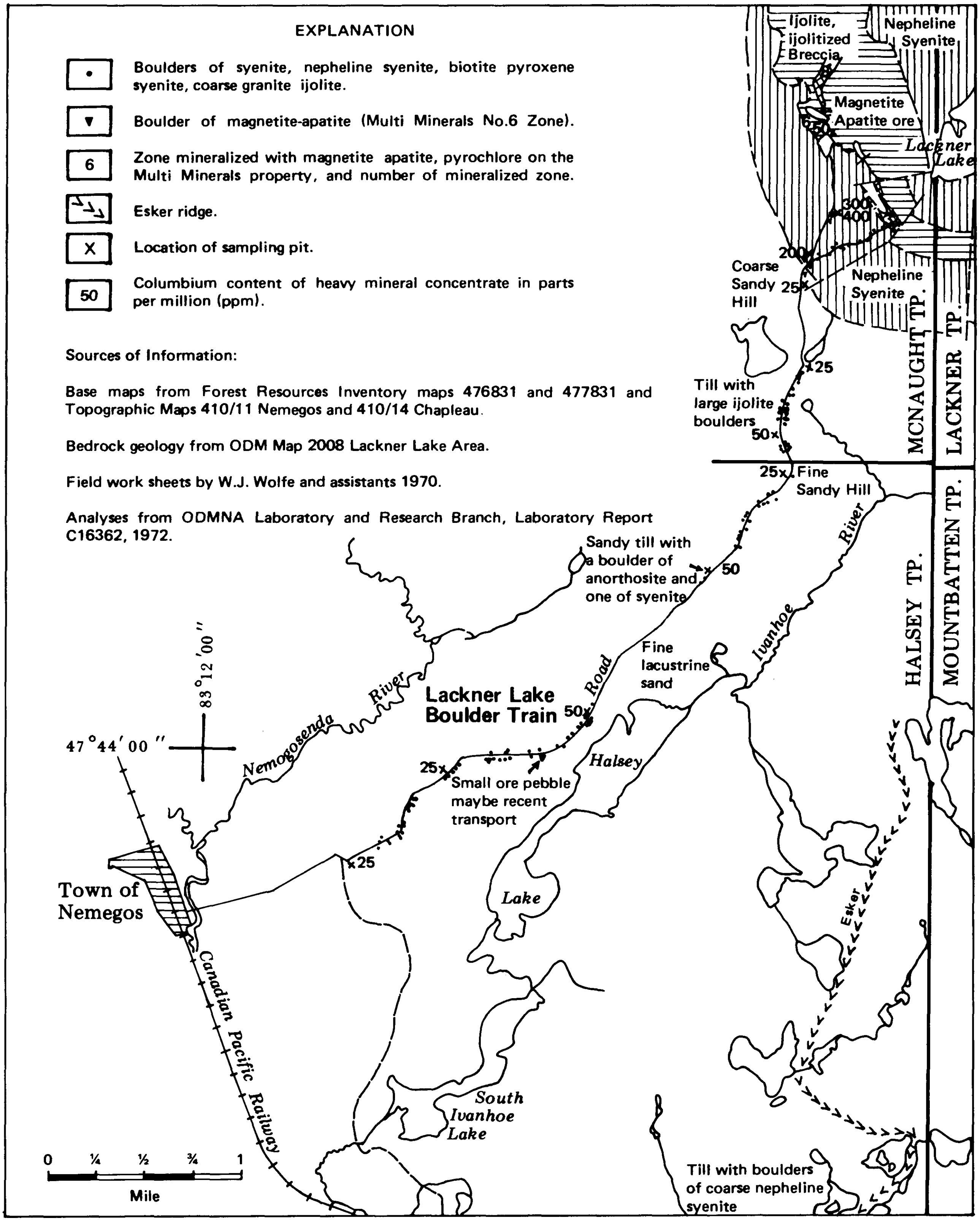
A carbonatite-alkalic complex, which is oval in plan and 19,000 feet (5795 m) from north to south and 17,000 feet (5185 m) from east to west, occurs in McNaught and Lackner Townships (Parsons 1961, GR 3 map is incl.; and accompanying Map ODM 2008). The complex consists largely of nephelene syenite, and within the syenite there is a partial ring of ijolite and ijolite breccia. The ijolite is a dark coloured rock composed mainly of aegirine-augite and nephelene with minor amounts of biotite, apatite, calcite, magnetite, apatite, and pyrochlore.

Multi Minerals Limited holds (1978) the southwestern part of the complex and some of the zones of economic interest are as follows (Ferguson 1971, p.40):

TABLE 7 MAGNETITE, APATITE, AND COLUMBITE RESERVES IN MULTI MINERALS LACKNER LAKE CARBONATITE-ALKALIC COMPLEX.

Zone	Length Feet	Width Feet	Reserve Tons	Magnetite Percent	Apatite Percent	Cb_2O_5 Percent
No.3	1,600	80	37,000,000	21.3	13.7	0.198
No.4	1,500	75				
No.6 (Main)	800	150	5,024,250	69.6	21.9	0.173
No.8	1,500	—	80,000,000	—	—	0.25

Footnote: To convert feet to meters multiply by 0.305; for tons to tonnes multiply by 0.907


EXPLANATION
Boulders of syenite, nepheline syenite, biotite pyroxene syenite, coarse granite ijolite.
Boulder of magnetite-apatite (Multi Minerals No.6 Zone).
6
Zone mineralized with magnetite apatite, pyrochlore on the Multi Minerals property, and number of mineralized zone.
Esker ridge.
X
Location of sampling pit.
50
Columbium content of heavy mineral concentrate in parts per million (ppm).
Sources of Information:
Base maps from Forest Resources Inventory maps 476831 and 477831 and Topographic Maps 410/11 Nemegos and 410/14 Chapleau.
Bedrock geology from ODM Map 2008 Lackner Lake Area.
Field work sheets by W.J. Wolfe and assistants 1970.
Analyses from ODMNA Laboratory and Research Branch, Laboratory Report C16362, 1972.
Ijolite, ijolitized Breccia
Nepheline Syenite
Magnetite Apatite ore
Lackner Lake
300
400
200
Coarse Sandy Hill
25
Nepheline Syenite
Till with large ijolite boulders
50
Fine Sandy Hill
Sandy till with a boulder of anorthosite and one of syenite
Fine lacustrine sand
Ivanhoe River
Road
Lackner Lake Boulder Train
Nemogosenda River
83°12′00″
47°44′00″
Small ore pebble maybe recent transport
Halsey Lake
Town of Nemegos
Canadian Pacific Railway
South Ivanhoe Lake
Esker
Till with boulders of coarse nepheline syenite
MCNAUGHT TP.
LACKNER TP.
HALSEY TP.
MOUNTBATTEN TP.
0 ¼ ½ ¾ 1
Mile

During the summer of 1970, W.J. Wolfe (1971, p.109) carried out a study of boulders along the road leading to the deposit and collected geochemical samples in order to test the clastic dispersion in the area southwest of the columbium-bearing complex. The Lackner Lake boulder train was mapped along the road for a distance of 5 miles (8 km) southwest of the Multi-Minerals No.6 (main) zone. Pits were dug to a depth of 2.5 to 3.5 feet (4 to 5.6 m) at intervals ranging from ¼ mile to 1 mile (0.4 to 1.6 km) and samples of the till and ice-contact drift were collected from the walls of the pit. Each sample weighed about 8 pounds (3.6 kg) and after being air dried the samples were screened and the minus 80 mesh plus 230 mesh fraction was analyzed for Cu, Ni, Co, Zn, Nb, La, and Ce.

Many boulders derived from the carbonatite-alkalic complex were found along the road and were quite abundant overlying the complex and for 2 miles (3.2 km) southwest of the contact, and a few scattered boulders are present for a distance of 5 miles (8 km). A few boulders of magnetite-apatite were found up to 1.5 miles (2.4 km) from the bedrock occurrence. Glacial till up to 1 mile (1.6 km) from known zones of mineralization contained from 200 to 400 parts per million (ppm) of columbium. Elsewhere the columbium content of the size fraction analyzed was 50 ppm or below the detection limit of the method used and arbitrarily assigned a value of 25 ppm. Also, a single sample collected from an esker did now show an enrichment in columbium. Analyses for the other elements did not show any trends.

The study indicated that a sufficient number of boulders from the complex were present for a distance of at least 5 miles (8 km) to have been useful in locating the outcrop area. Scattered boulders of magnetite-apatite are dispersed up to 1.5 miles (2.4 km) from the bedrock source but generally are much less abundant than nephelene syenite or ijolite. Geochemical sampling for columbium would be of some assistance for indicating the existence of mineralization in the immediate area but there is no long distance dispersion in the glacial till. No other associated minerals were found to be of help in assisting in location of columbium mineralization (pyrochlore).

Fable Lake Area, Saskatchewan

Fable Lake is within National Topographic System Map Area 74A and the area of interest lies within Latitude 56°10'N and 56°15'N and Longitude 105°45'W and 105°50'W. A geochemical survey of part of this area was carried out by D.R. Haughton, Geology Division, National Research Council of Saskatchewan. The area was chosen because mineralized boulders were known to exist in it and the purpose of the survey was to determine whether geochemical soil sampling could be as effective as boulder tracing in a glaciated region. The following description of the project is paraphrased from Haughton (1973, p.1,3):

Wollex Exploration Limited holds the property on which float was discovered by E. Partridge in 1971. The Precambrian bedrock consists of garnet-biotite gneiss, garnet-sillimanite gneiss, garnet quartzite, and quartzite. The mineralized boulders are quartzite with minor feldspar and small quantities of galena, sphalerite, pyrite, and rarely arsenopyrite. Assays of 98 boulders had a maximum content of 4.61 percent lead and 13.27 percent zinc, and averages of 0.41 percnet lead and 4.51 percent zinc. Geological, magnetic and electromagnetic surveys, and drilling have been carried out but were unsuccessful in locating the bedrock source of the float.

Within the grid system sand, gravel, and some muskeg are present north of line 48+00NE, and south of this line there are outcrop ridges separated by drift covered valleys. From observations in an adjacent area it is assumed that the direction of glacial movement has been at 215°.

Geochemical samples were collected at 100-foot (30.5 m) intervals on lines 200 feet (61 m) apart. B_1 soil zone samples were preferred where they were available but if they were not available stream sediments or A_0 samples of partly decomposed plant material were taken. The samples were dried and the finer fraction was obtained by sieving through a 60 mesh screen. Two grams of the minus 60 mesh fraction were digested in hot 1:9 HCL:HNO_3, and the filtrate from this digestion was analyzed. The plotted analyses for lead are shown in Figure 15 and the results as given in the abstract (Haughton 1973, p.vii) are as follows:

> "It is found that [geochemical] sampling of the B_1 soil horizon in an area known to contain galena and sphalerite-bearing quartzite boulders duplicates and expands the anomalous zones, as defined by experienced prospectors. Statistical manipulation of the analytical data for Cu, Ni, Co, Pb, Zn, U, Mo,

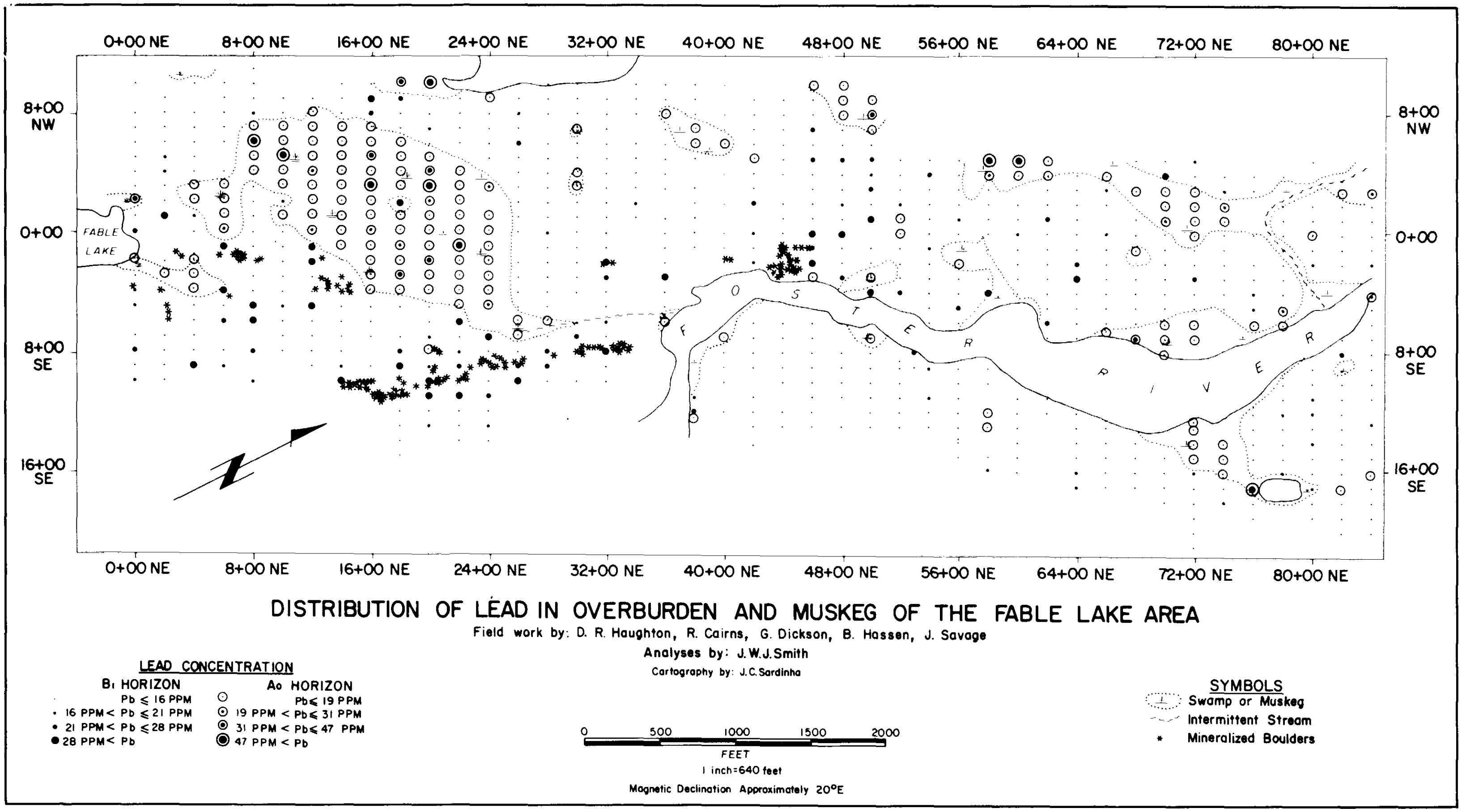
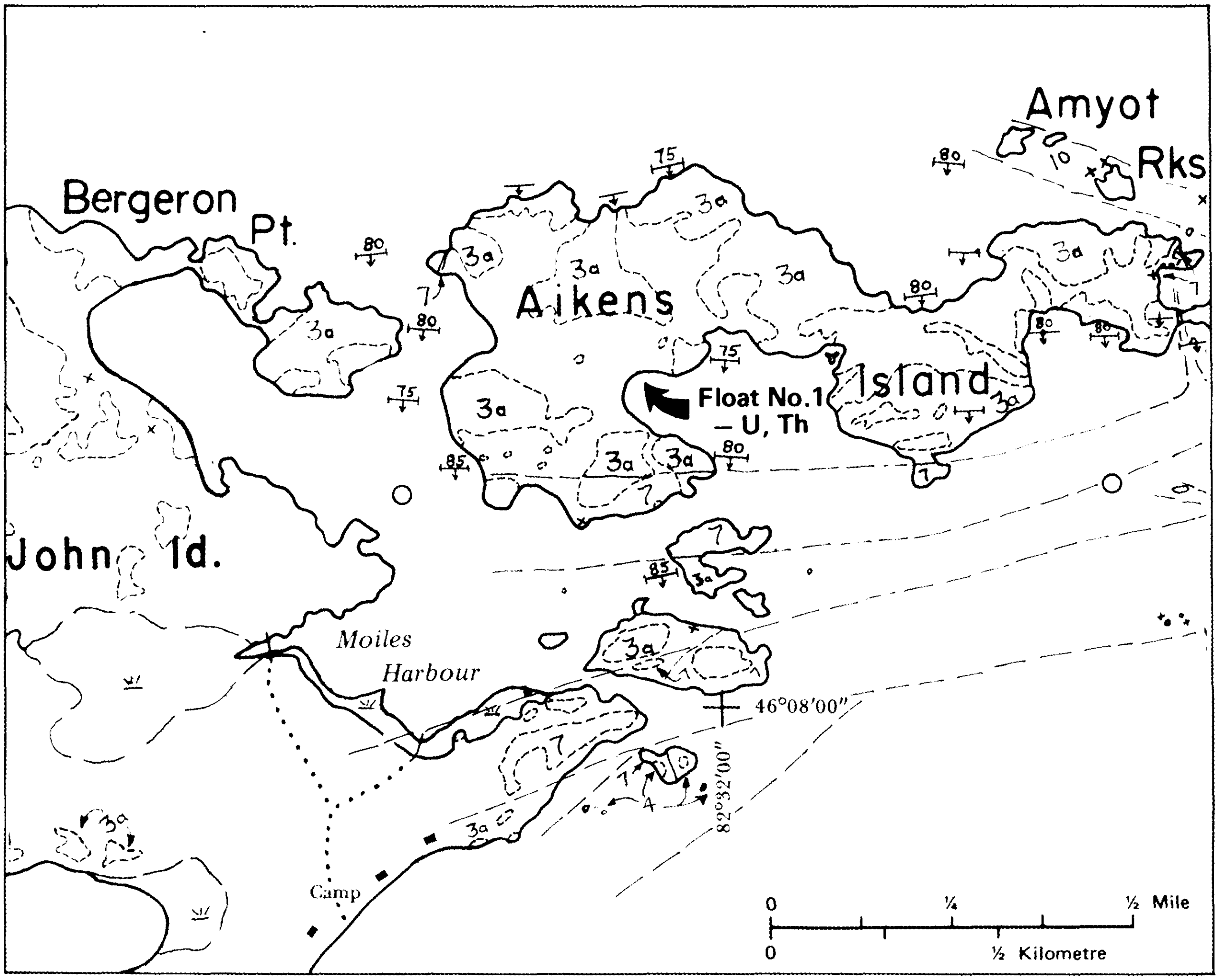


Figure 15 Distribution of lead concentration in the A_0 and B_1 horizons of the Wollex Exploration Limited holdings in the Fable Lake area (after D. R. Haughton 1973, map No. 4).

Fe and Hg indicates that Pb and Zn are the most useful elements as indicators of galena and sphalerite mineralization, rather than pathfinder elements. Pb appears to be less mobile and shows a smaller range of values than Zn. However, there is a strong correlation between the two elements and each define equally well the distribution of mineralized boulders."



Algoma District

Aikens Island Float No.1 - [U, Th]

Main Metals: Uranium, Thorium

Location: Aikens Island (Latitude 46°08', Longitude 82°32'), separated from the North Shore of Lake Huron by Whalesback Channel, on northwest corner of bay in the south shore of the island. NTS 40J/02E.

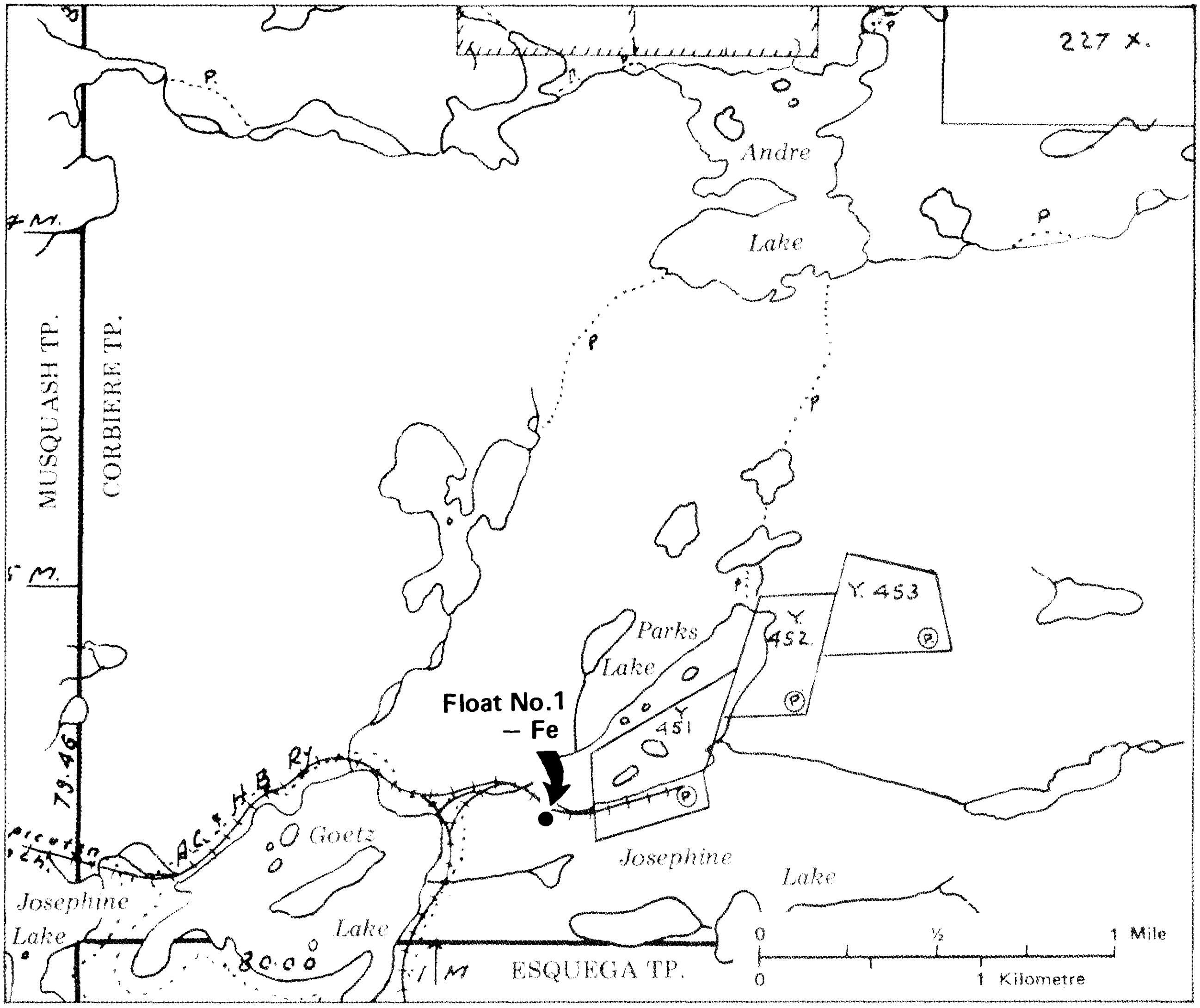
Map Reference: ODM Map P.319, I.R. 7 East and Offshore Islands.

Description: A rusty boulder contains radioactive quartz pebble conglomerate.

Bedrock Source: Presumably a conglomerate bed in the Lower Mississaugi which may be present beneath the waters of Whalesback Channel.

Remarks: Found in 1968 by Marvin Armstrong who was employed by Agressive Mining Limited.

References: Benner, R.I. (1968) Rept. on the Lake Huron Property of Agressive Mining Limited, office of the Regional Geologist, Ontario Ministry of Natural Resources, File SSM 1453.



Algoma District

Corbiere Township, Float No. 1 [Fe]
(formerly Township 28, Range 25)

Main Metals: Iron

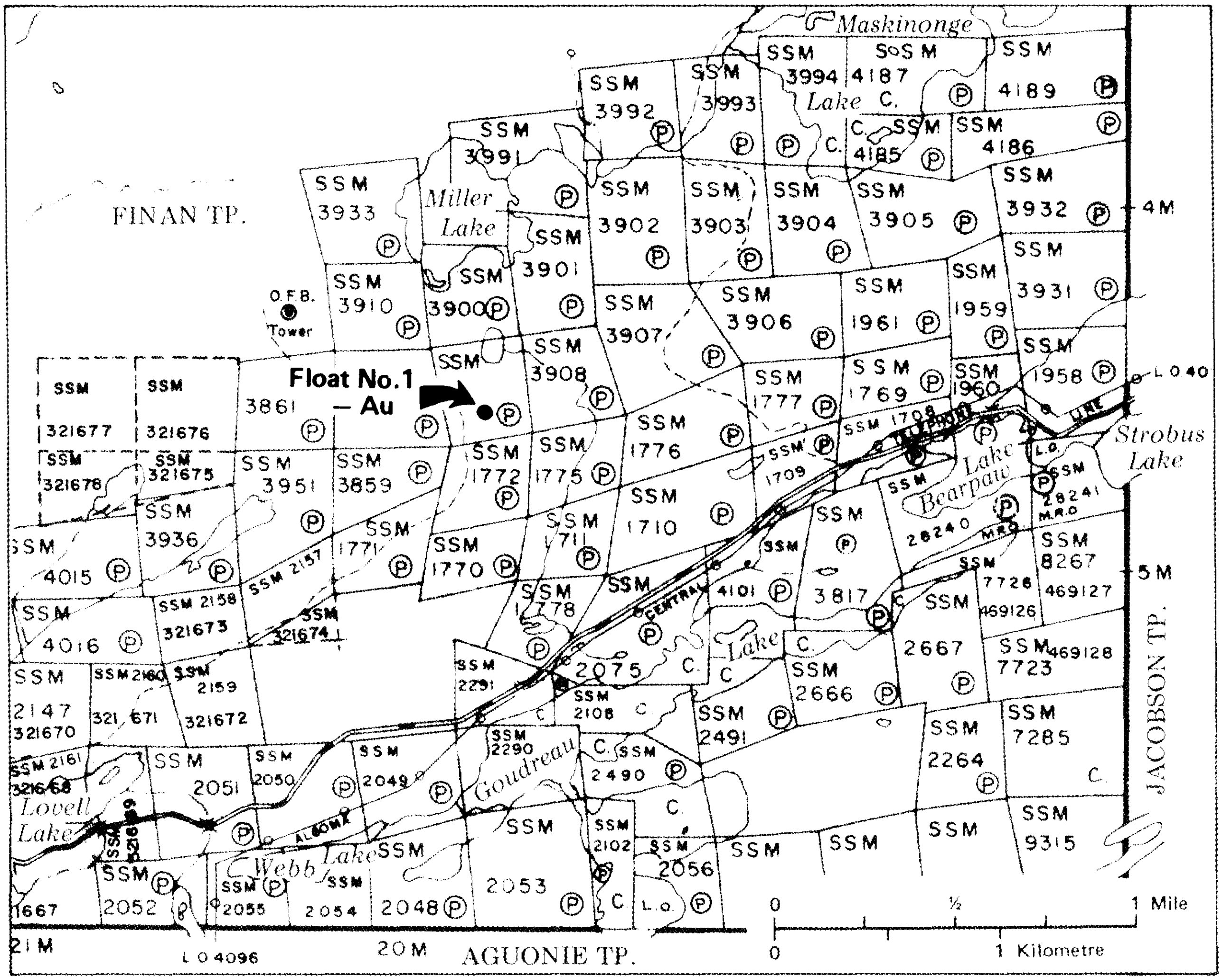
Location: Corbiere Township (Township 28, Range 25) (Latitude 47°57′, Longitude 84°36′), southwest of Parkes Lake (now drained), claims AC742, AC743. NTS 41N/15E.
Map Reference: ODM Map 1946-8, Josephine-Bartlett Iron Range.

Description: Large boulders of hematite and brown iron ore were present.

Bedrock Source: Hematite was present in the lake bottom about 1500 feet (460 m) to the northeast.

Remarks: Alois Goetz discovered iron oxide boulders near Parkes Lake in 1899 and staked a number of claims. The property eventually became the Josephine Mine.

Reference: ODM (1946), Vol.55, pt.4, p.37,49.



Algoma District

Finan Township, Float No. 1 - [Au]
(formerly Township 49)

Main Metals: Gold

Location: Finan Township (Township 49) (Latitude 48°20′, Longitude 84°29′) claim SSM3909 Kremzar group, about 4,000 feet (1219 m) north of Goudreau Lake, beside the Pic Road. NTS 42C/8W.

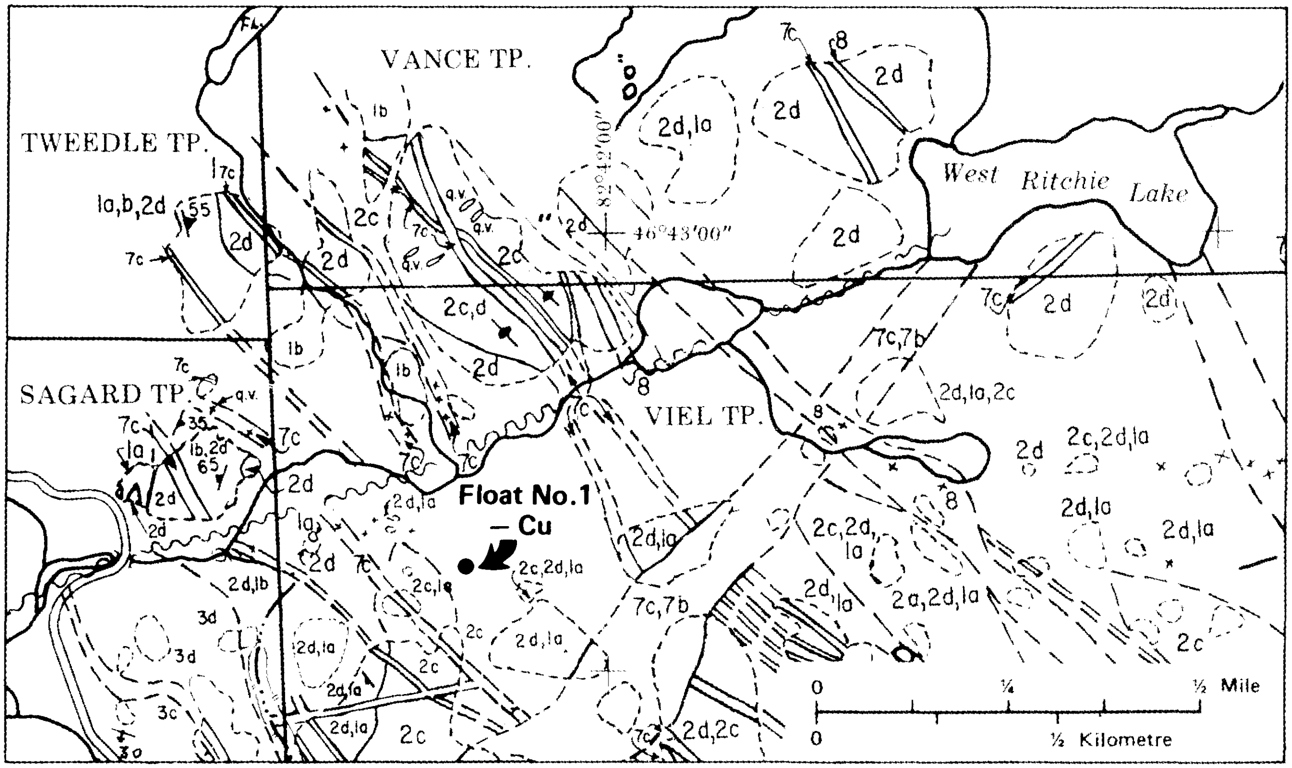
Map Reference: ODM Map 40e, Goudreau Gold Area.

Description: A group of pebbles and angular boulders ranged in size from a few inches to 2 feet (.61 m) in diameter. Some of the pieces were rusty and friable from the weathering of sulphides and the rusty patches contained native gold. The rock consisted of quartz containing pyrite, limonite, hematite, ilmenite, biotite, chlorite, and epidote.

Bedrock Source: The probable source is a vein on claim SSM3901 about a quarter mile (402 m) to the northeast.

Remarks: *Circa* 1925 the find was made by Patice Kremzar.

Reference: ODM (1931), Vol.40, pt.IV, p.26. ODM (1927), Vol.36, pt.2, p.77.



Algoma District

Viel Township, Float No.1 - [Cu]
(formerly Township U)

Main Metals: Copper

Location: Viel Township (Township U) (Latitude 46°41′, Longitude 82°38′), Claim SSM359098, Highway 546 leads northeast of Iron Bridge and ends in Viel Township. From this highway a road leads north near the common boundary of Viel Township and Sagard Township (formerly Township 1A). In 1973 a logging road was constructed from this road along the south side of the creek flowing from West Ritchie Lake. Mineralized boulders were found along this road. NTS 41J/10E.

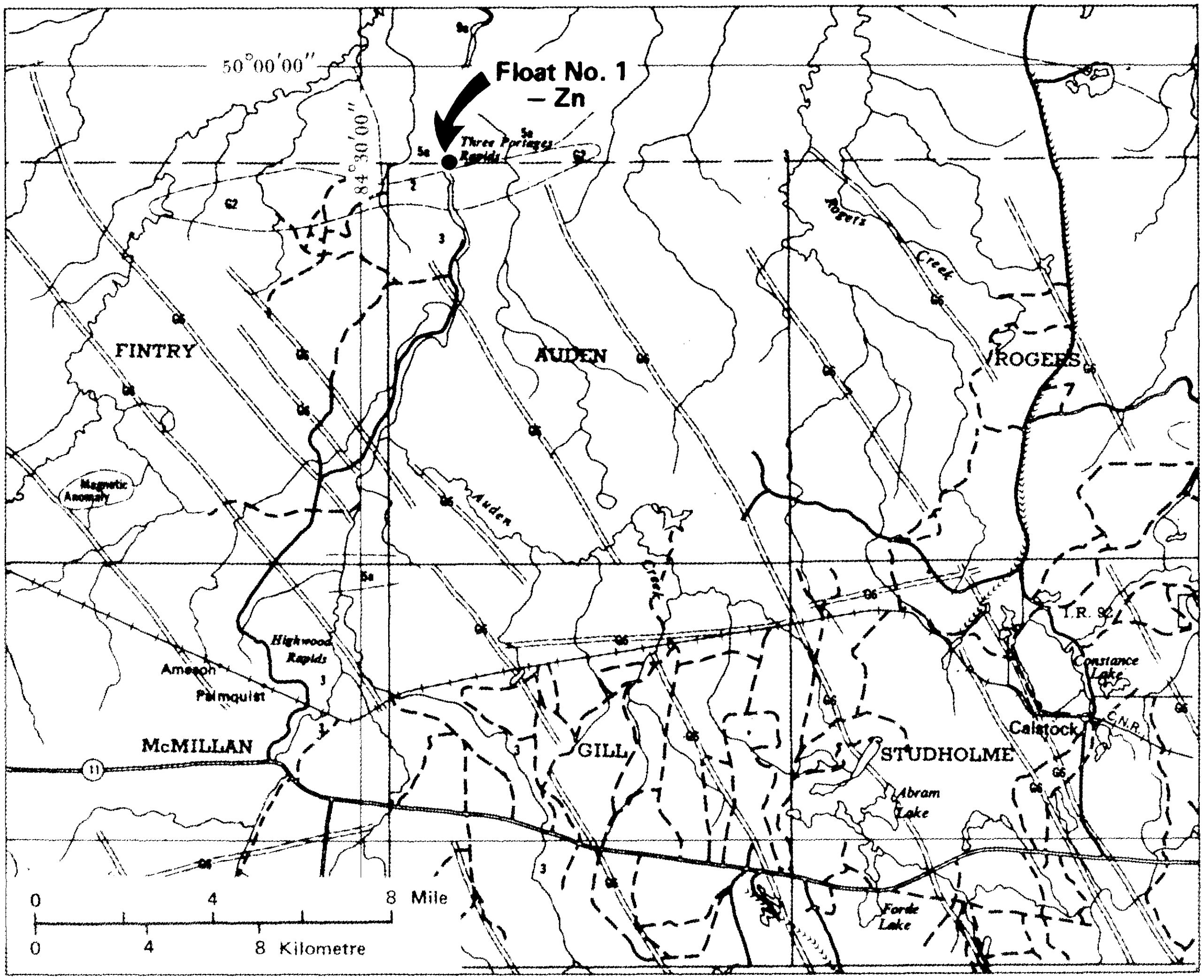
Map Reference: ODM Map P.468

Description: Mineralized boulders were found in the road cut, and by trenching, for 1,000 feet (305 m) along the valley and for several hundred feet southeast of the road. Many of the boulders contained quartz-carbonate veins heavily mineralized with chalcopyrite and in places the glacial till is cemented with a 1 to 3 inch (25 to 75 mm) layer of malachite.

Bedrock Source: Unknown but possibly on the north side of the valley. Diabase in the road cut contains chalcopyrite and minor copper mineralization occurred in one diamond drill hole (U73-3) on Claim SSM359098.

Remarks: The claim group was staked June 21, 1973 by William Girard. An induced polarization survey was carried out and 5 holes with a combined length of 1,002 feet (305 m) were diamond drilled by Geophysical Engineering Limited. Drill hole U73-4 is a vertical drill hole 120 feet (37 m) in depth drilled to test below the showing for a parallel showing and drill hole U73-5 was inclined at 45 degrees and was drilled "under the area of rich copper float".

References: ODM 1973 MP57, p.88; Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 'Township U, Drilling Report 14'.



Cochrane District

Auden Township Float No.1 - [Zn]

Main Metals: Zinc

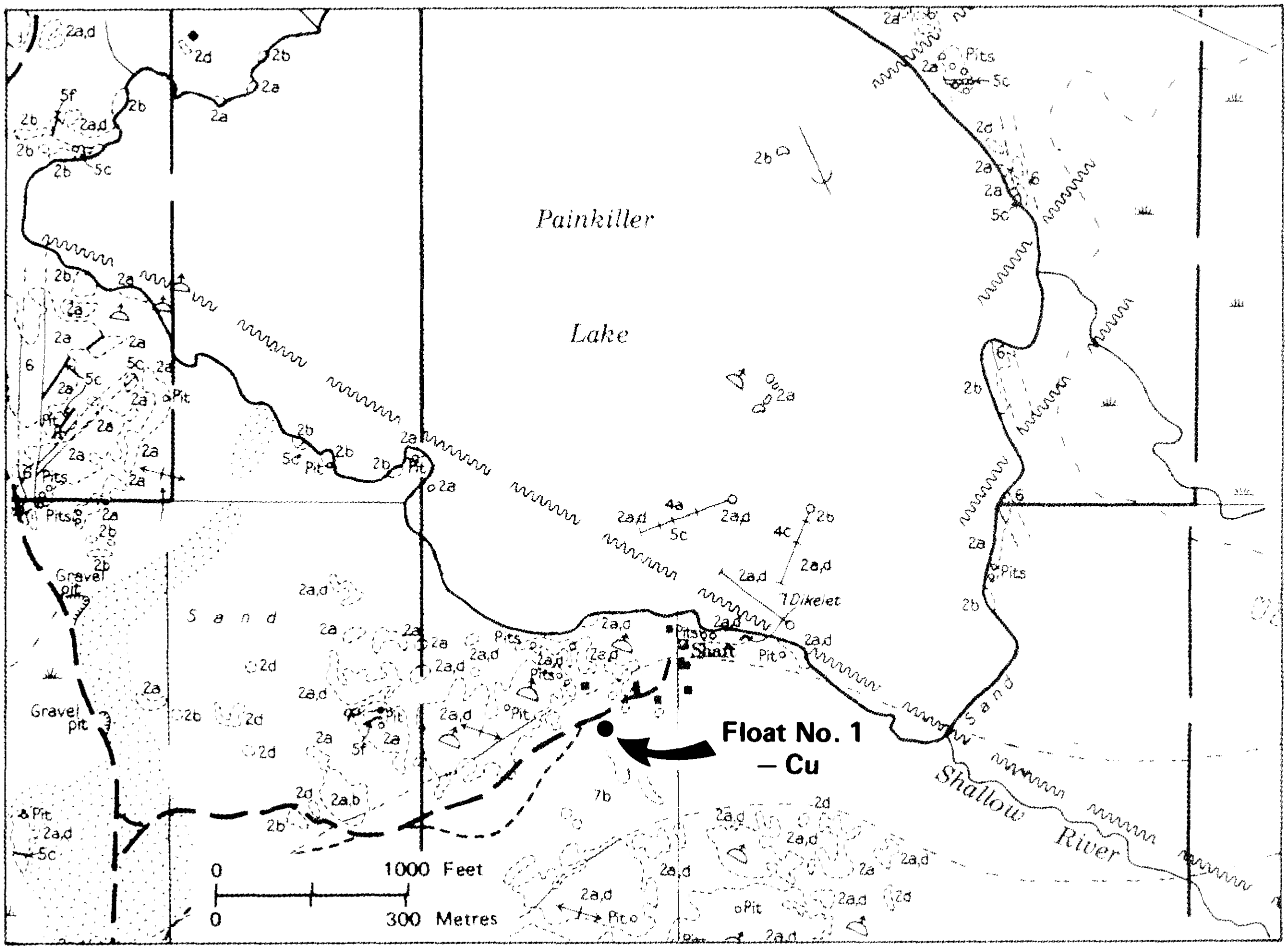
Location: Auden Township (Latitude 49°54', Longitude 84°22'), claim SSM31945, in a small bay on the east side of the Nagagami River. Syenite outcrops in the same general vicinity on the west side of the river. A prominent outcrop 350 feet (107 m) in length consists of conglomerate containing pebbles and boulders of granitic rocks. A sulphide showing is located immediately south of the conglomerate on the west bank of the river, and the float locality is about a quarter mile (400 m) downstream. NTS 42F/16W.

Map Reference: ODM Map 2202 Caramet-Pagwa Sheet, shows the sulphide showing.

Description: Two fist-sized pieces of Paleozoic limestone contained dark coloured sphalerite.

Remarks: Float was observed by S.A. Ferguson in 1954 in the company of James McGale, prospector.

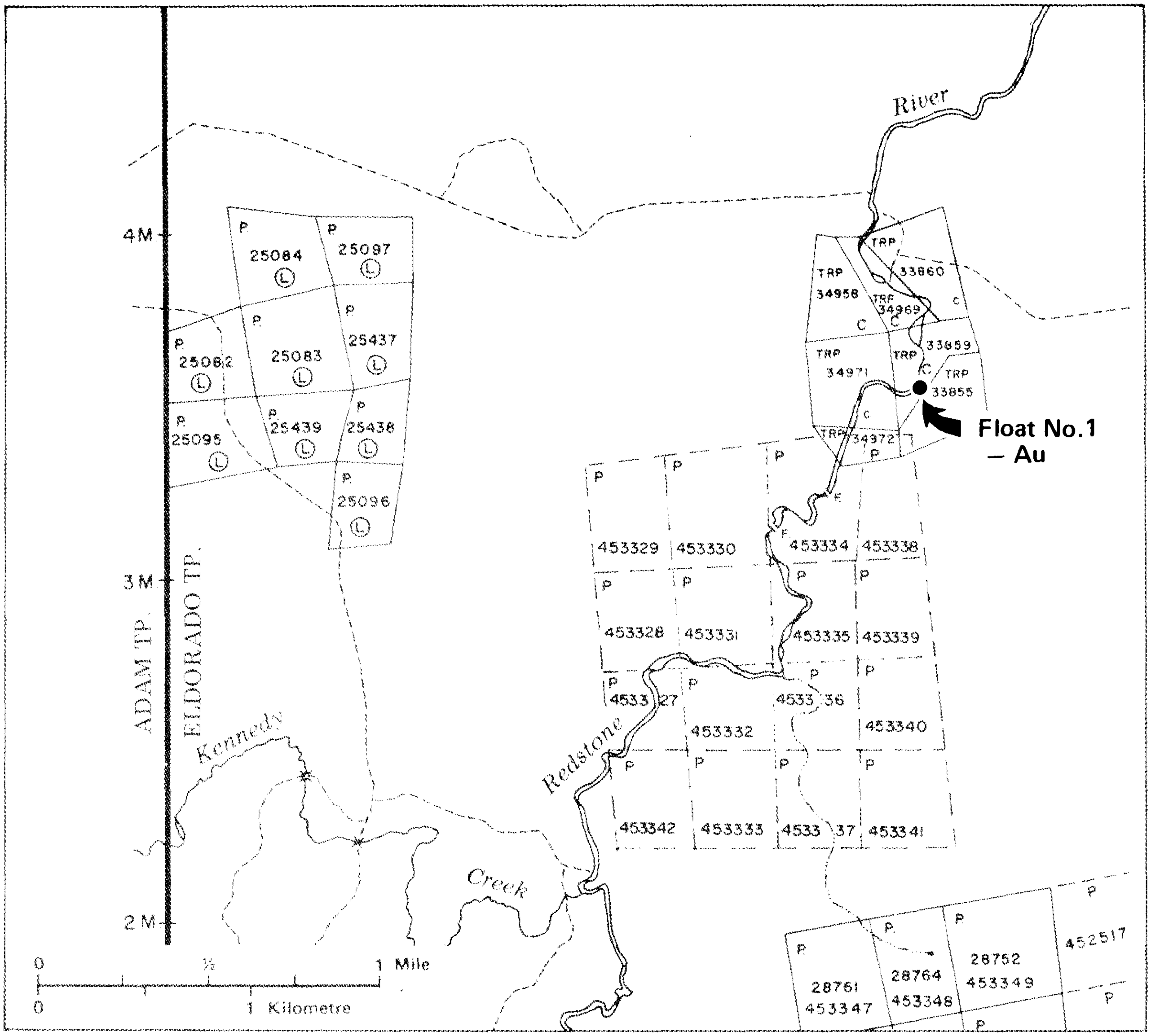
Reference: Regional Geologist Office, Ontario Ministry of Natural Resources, Timmins, File T-537.



Cochrane District

Beatty Township Float No.1 - [Cu]

Main Metals: Copper
Location: Beatty Township (Latitude 48°35′, Longitude 80°21′), South of Painkiller Lake, NE¼ of N½ lot 8, concession V. NTS 42A/9W.
Map Reference: ODM Map 1947-2, Township of Beatty.
Description: Pieces of massive sulphide mineralization up to 5 inches (13 cm) in length contain pyrrhotite and chalcopyrite and assay up to 12 percent copper. Larger pieces formerly were present but have been carried away. The pieces of sulphide mineralization are on an outcrop of diabase.
Bedrock Source: The float is believed to have come from the Potter-Doal Mine and to have been transported by man.
Remarks: Hand cobbed ore from the Potter-Doal Mine was hauled out by horse drawn sleighs along a winter road which crossed Painkiller Lake. Loads that became stuck were lightened by throwing off part of the load. Consequently a train of ore specimens can be found along the road generally in low places although these specimens are on an outcrop. In 1925, a 25-ton (25.4 tonnes) bulk sample taken out assayed 15.22 percent copper.
References: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1973. ODM MRC12, p.126.

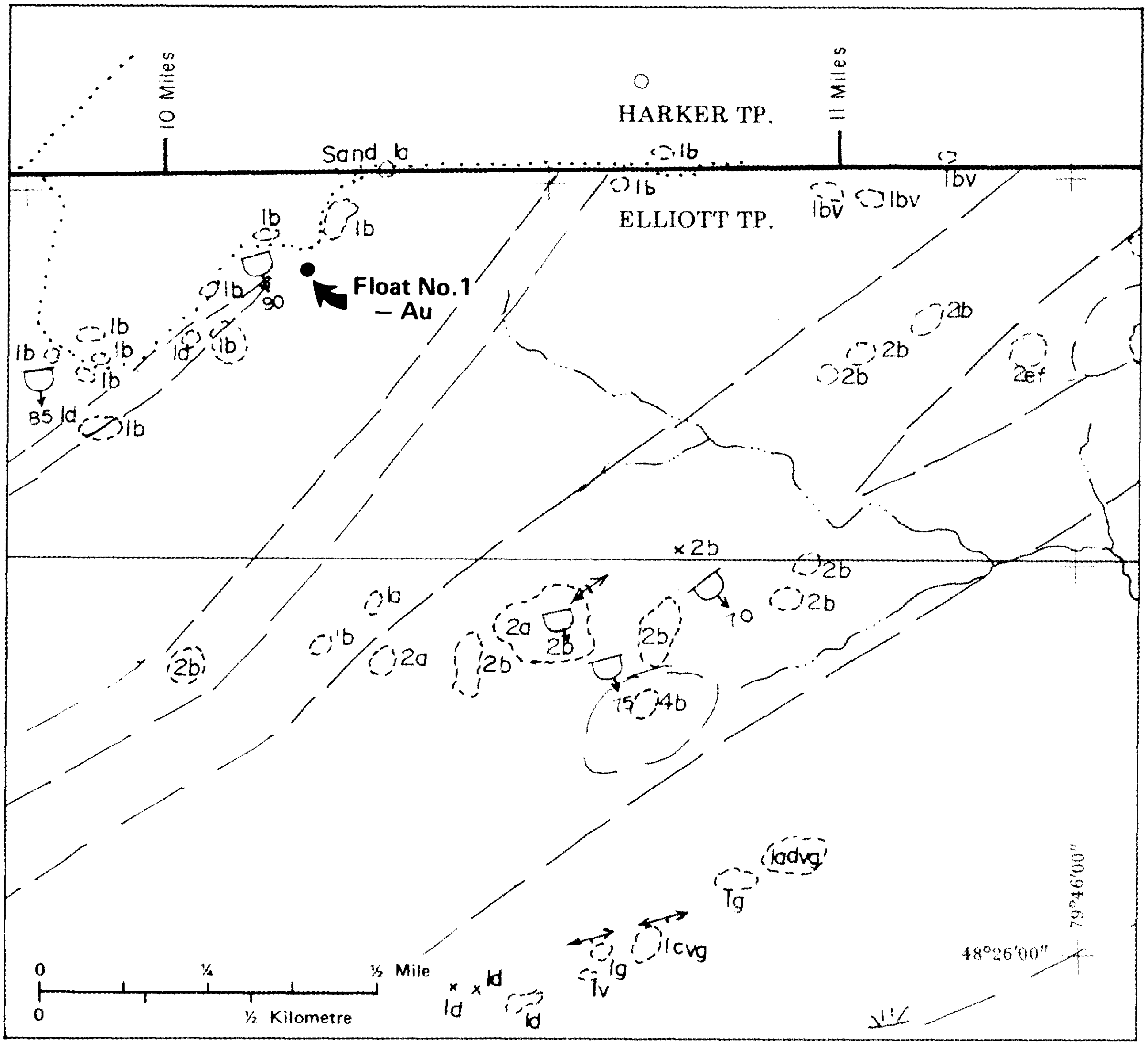


Cochrane District

Eldorado Township Float No.1 - [Au]

Main Metals: Gold
Location: Eldorado Township (Latitude 48°20′, Longitude 81°08′), Claim TRP1850 on the Redstone River. NTS 42A/06E.
Map Reference: ODM Map P.572, Eldorado Township; ODM Map 2046, Timmins-Kirkland Lake Sheet.

Description: A small boulder contained quartz and calcite mineralized with pyrite and gold.
Bedrock Source: A short distance to the north a gold showing has been investigated by sinking a shallow shaft, pitting, and trenching.
References: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Elliot Township Float No.1 - [Au]

Main Metals: Gold

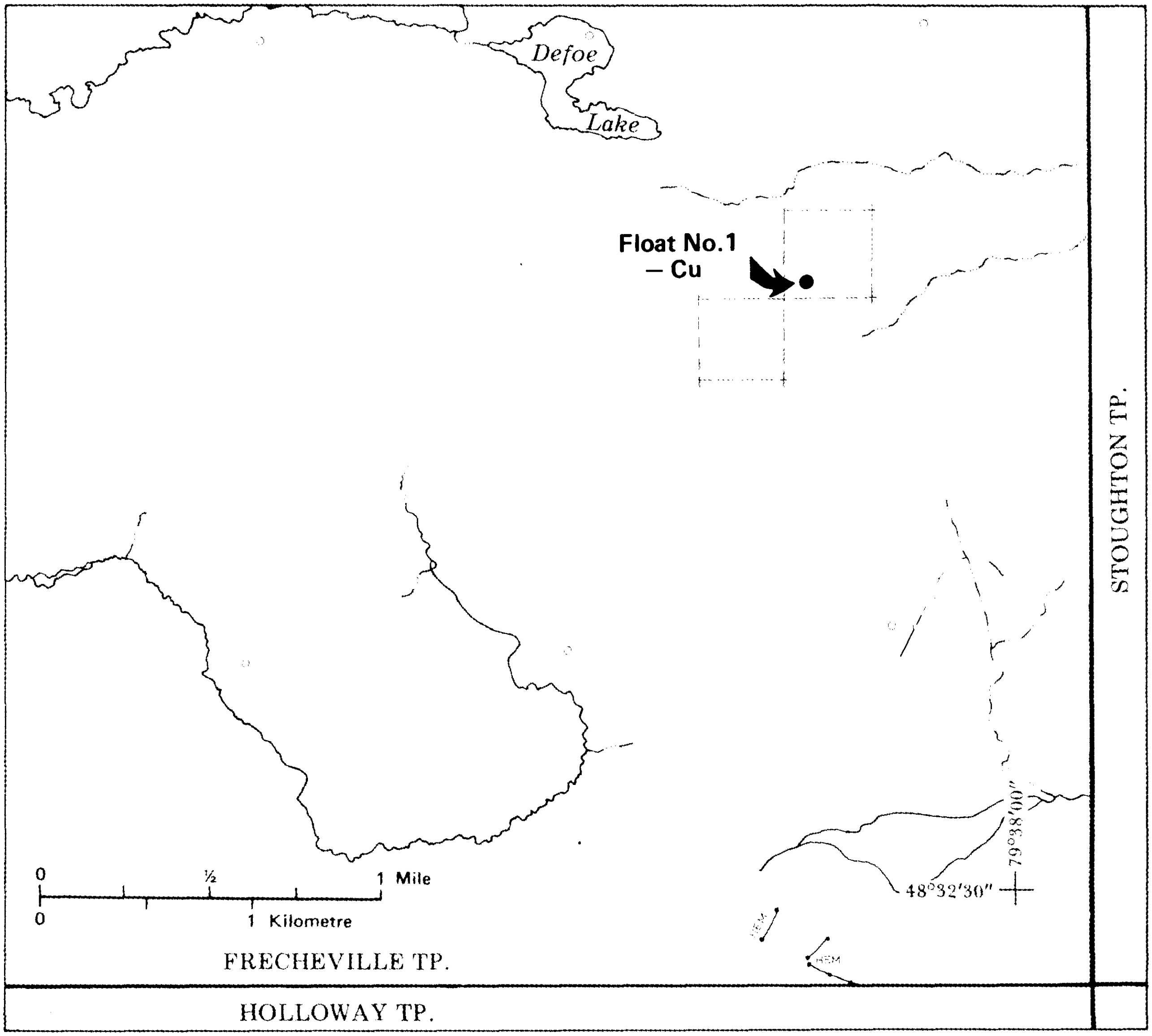
Location: Elliot Township (Latitude 48°25', Longitude 79°49'), claims 7399 and 7400, located adjacent to the north boundary between mile posts 10 and 11. NTS 32D/5W.

Map Reference: ODM Map P.705, Elliot Township.

Description: Well mineralized and gold-bearing, angular to rounded, blocks of reddish-brown rhyolite have been observed in a sandy area.

Remarks: Observed by T.L. Gledhill, in 1924, during a survey by the Ontario Department of Mines.

References: ODM 1925, Vol.34, pt.6, p.97.



Cochrane District

Frecheville Township Float No.1 - [Cu]

Main Metals: Copper

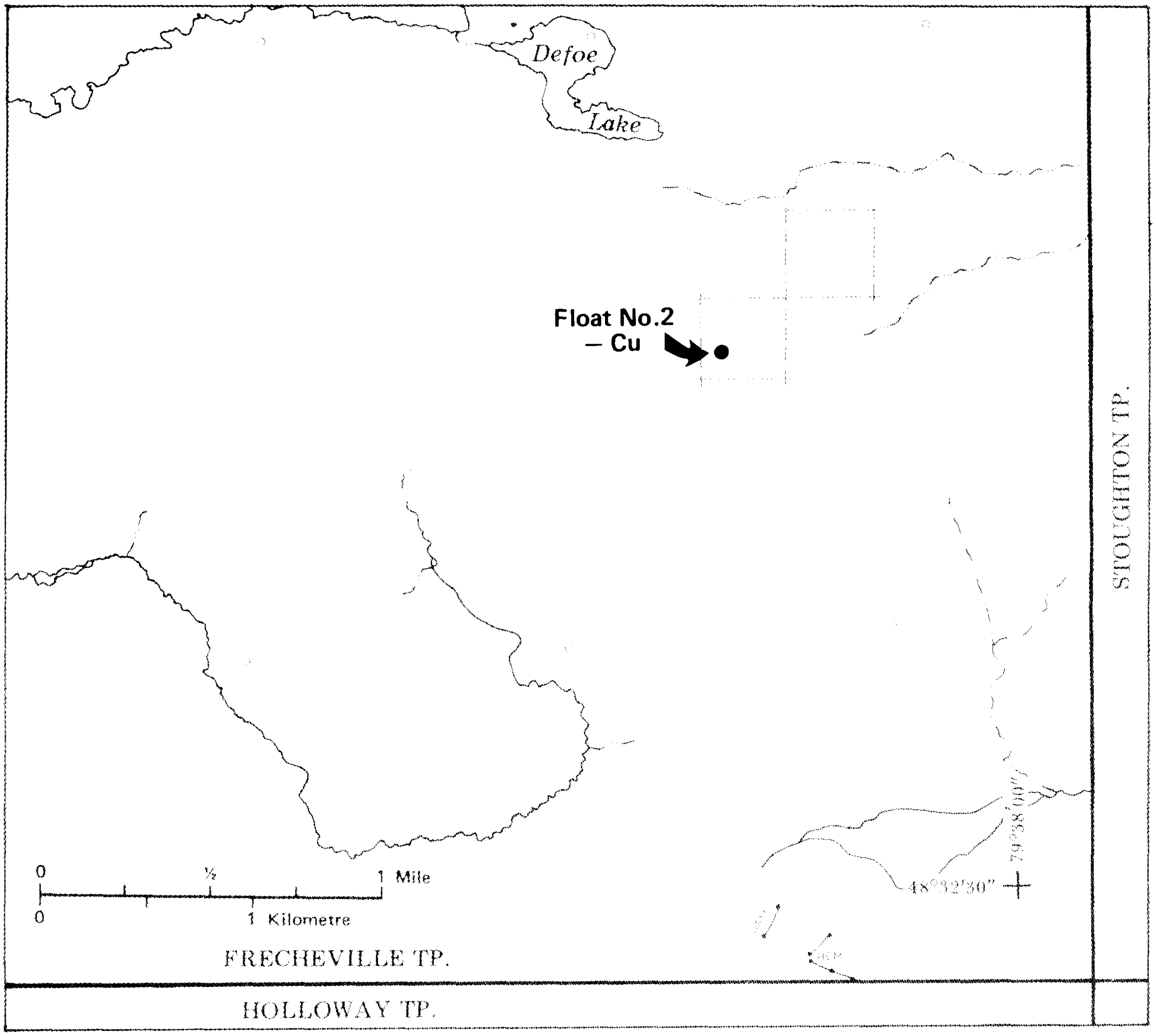
Location: Frecheville Township (Latitude 48°35', Longitude 79°41'), claim L327886. NTS 32D/12E.

Map Reference: ODM Map P.798, Frecheville Township.

Description: A group of about 30 angular, closely-spaced rhyolite boulders from ½ to 1 foot (.15 - 0.3 m) in diameter containing from 5 to 10 percent pyrite and traces of chalcopyrite. These boulders are believed to be essentially in place. The area is flat with thin soil and dense vegetation and exposures are mainly under the roots of fallen trees.

Remarks: Boulders found and described by Warren Gilman.

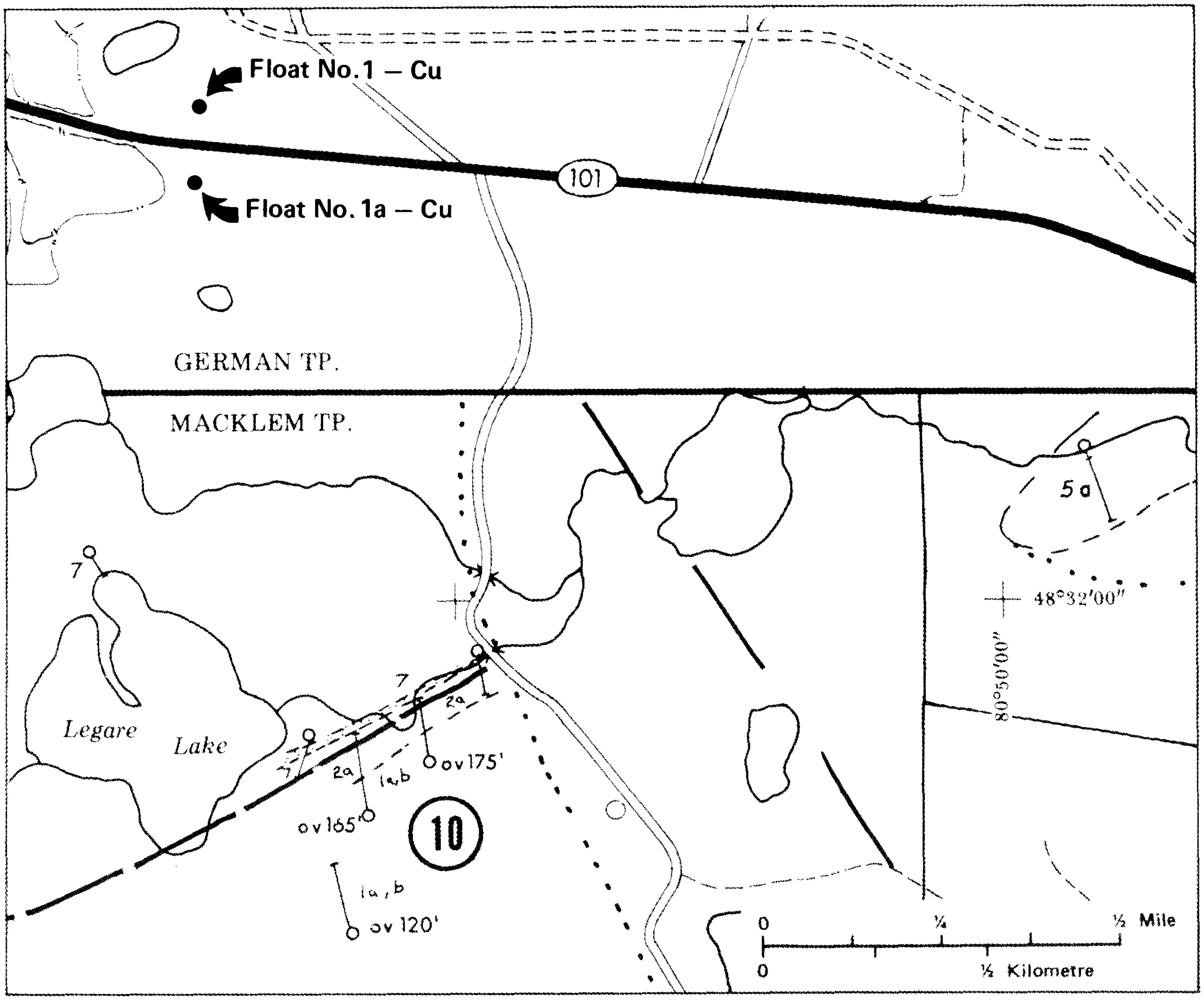
References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.2995; Warren Gilman, Consulting Geologist, Timmins, Ontario, personal communication, 1972.



Cochrane District

Frecheville Township Float No.2 - [Cu]

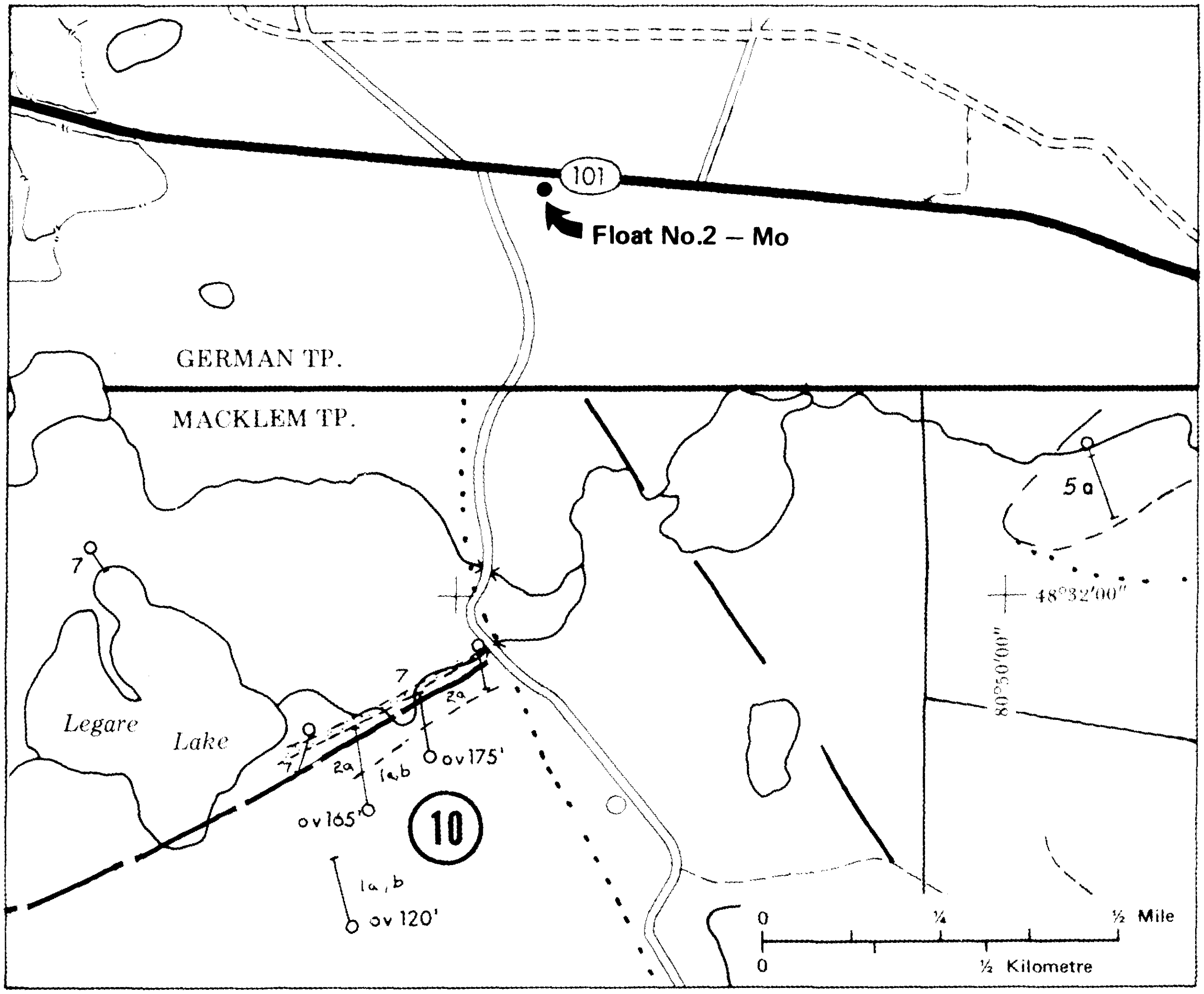
Main Metals: Copper
Location: Frecheville Township (Latitude 48° 35′, Longitude 79° 41′), claim L327881. NTS 32D/12E.
Map Reference: ODM Map P.798, Frecheville Township.
Description: A group of white-weathering rhyolite boulders containing up to 5 percent pyrite and traces of chalcopyrite. These boulders are on slightly higher ground adjacent to a swamp.
Remarks: Boulders found and described by Warren Gilman.
References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.2995; Warren Gilman, Consulting Geologist, Timmins, Ontario, personal communication, 1972.



Cochrane District

German Township Float No.1 - [Cu] ;
No.1a - [Cu]

Main Metals: Copper
Location: German Township (Latitude 48°35', Longitude 80°53'), concession 1, near the south boundary of the township and in gravel pits about 2,000 feet (600 m) west along Highway 101 from the Gibson Lake Road. NTS 42A/10W.
Map Reference: ODM Map P.546 Macklem Township and part of German Township.
Mineralized float and heavy mineral concentrations, Figure 1, this report.
Description: To the north of the highway, a round piece of quartz-sericite schist, about 6 inches (15 cm) in diameter, contained rusty sulphides and assayed 1 percent copper. A similar piece of float occurs south of the highway.
Remarks: Found by A. Skrecky, McIntyre Porcupine Mines Limited, and is no longer in place.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

German Township Float No.2 - [Mo]

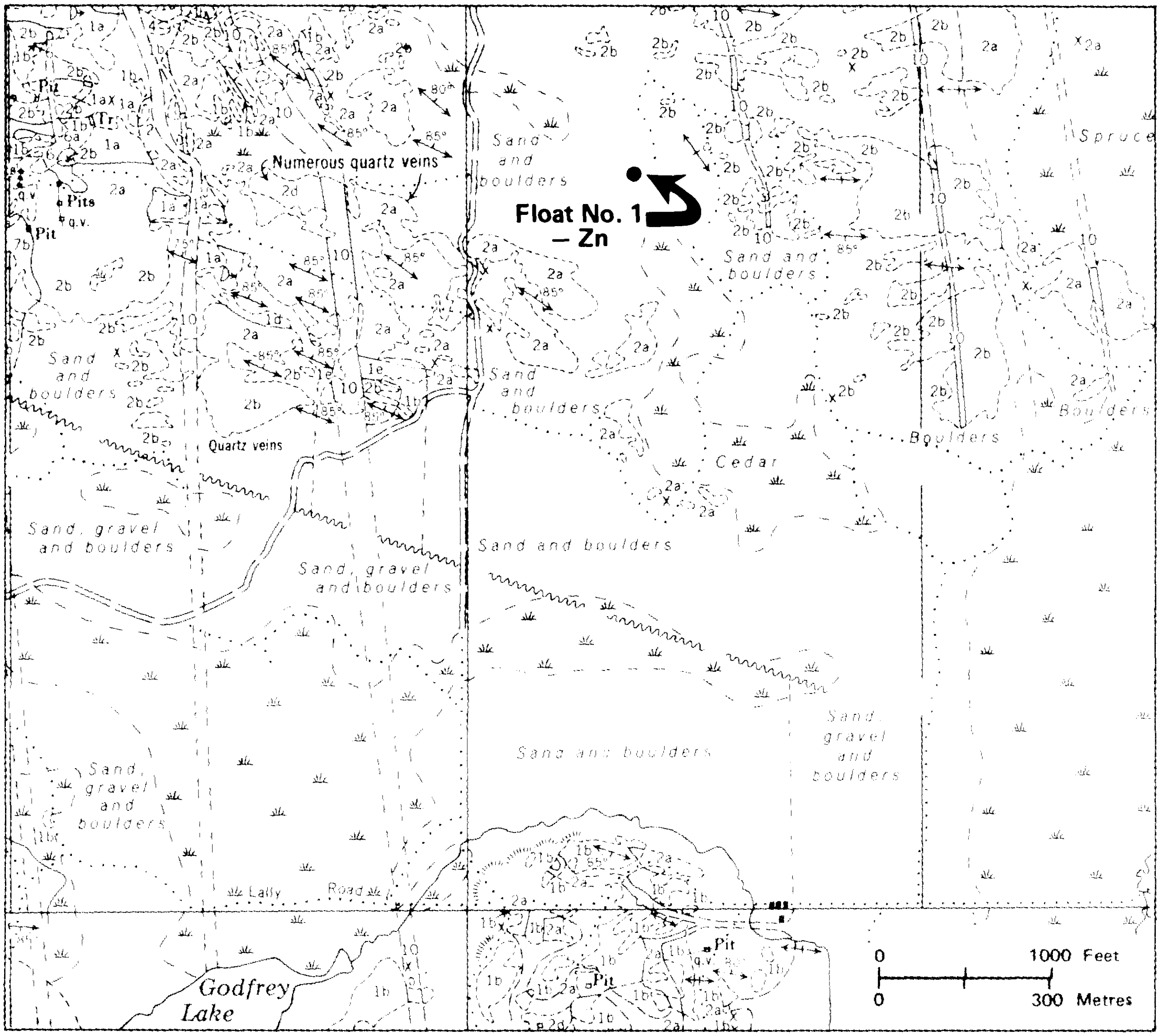
Main Metals: Molybdenum

Location: German Township (Latitude 48°35', Longitude 80°53'), in a field on the south side of the Highway 101 about 100 feet (30 m) south of the road and about 600 feet (183 m) east of the Gibson Lake turn off from the highway. NTS 42A/10W. Map Reference: ODM Map P.546 Macklem Township and part of German Township.

Description: An angular to subangular, granitic boulder about 4 feet (1.3 m) in maximum diameter, and containing molybdenite mineralization along a fracture plane.

Remarks: Location of the boulder is known to C.D. MacKenzie, Hollinger Mines Limited, and the boulder is still in place.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, and C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1973.



Cochrane District

Godfrey Township Float No.1 - [Zn]

Main Metals: Zinc

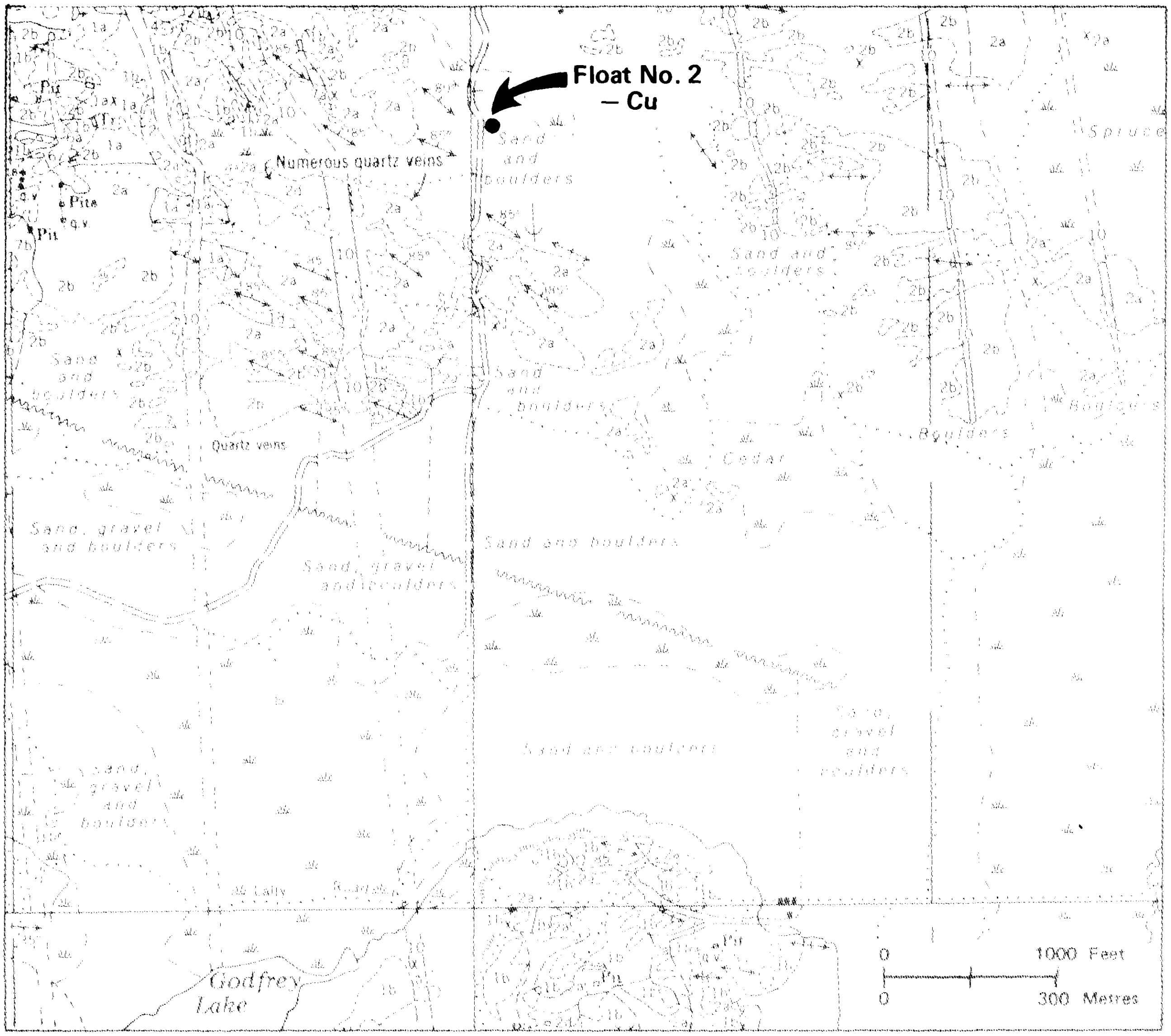
Location: Godfrey Township (Latitude 48°30′, Longitude 81°31′), NW¼ of N½, lot 8, concession IV. NTS 42A/5E.

Map Reference: ODM Map 1954-4, Godfrey Township.

Description: A rhyolite boulder about 5½ feet (1.7 m) in diameter was found partly buried and contains disseminations and stringers of sphalerite. The boulder was resting on bedrock.

Remarks: Drilling by Mespi Mines Limited showed mineralization to be in a boulder. Information supplied by Roger Denommee, Mining Recorder, Timmins, 1971.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.

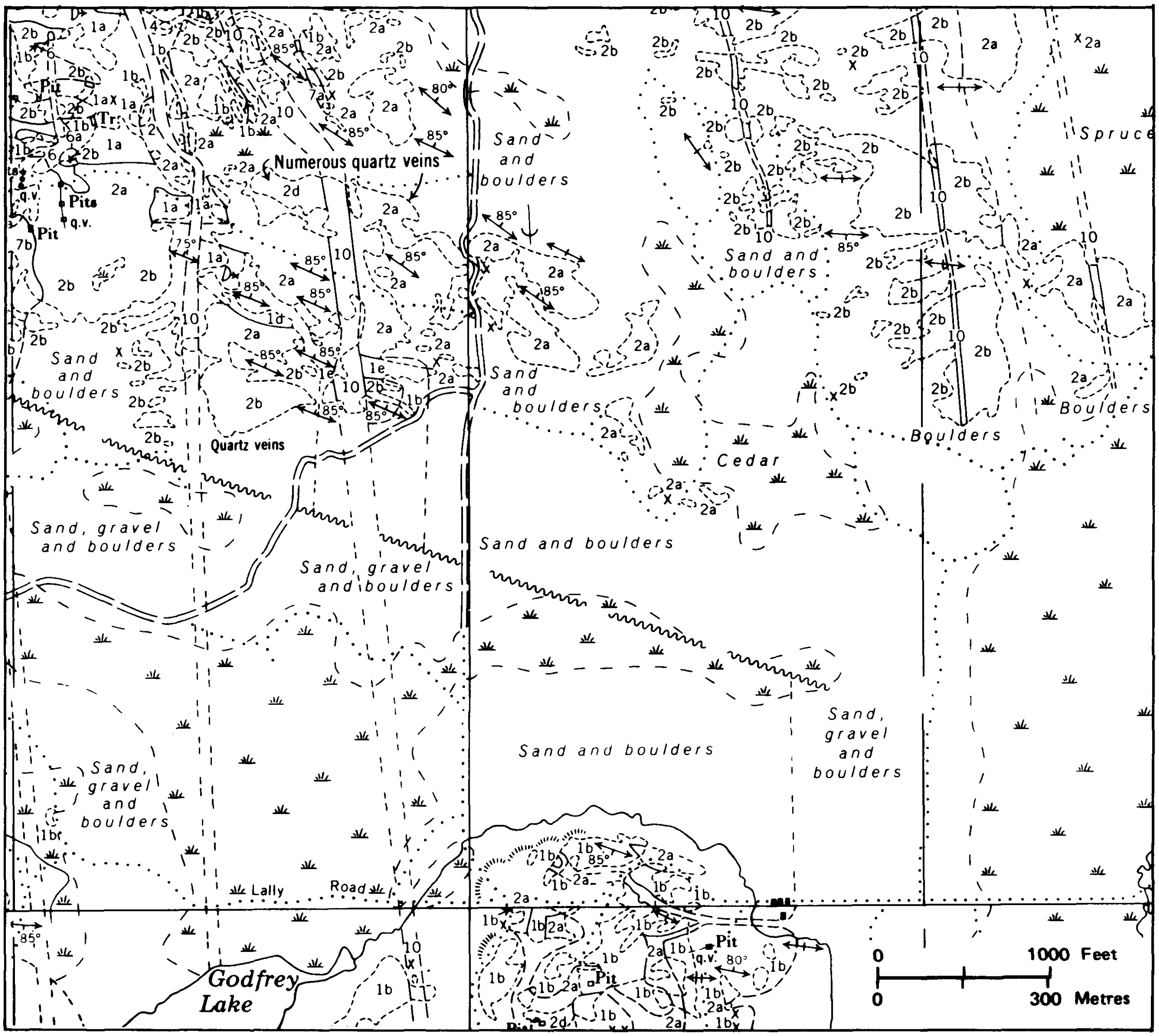


Cochrane District

Godfrey Township Float No.2 - [Cu]

Main Metals: Copper
Location: Godfrey Township (Latitude 48°30′, Longitude 81°31′), lot 6, concession IV, just inside lot boundary and 1,000 feet (306 m) south of north boundary and east of small pond, NW¼ N½. NTS 42A/5E.

Map Reference: ODM Map 1954-5, Godfrey Township.
Description: A small piece of rhyolite contains pyrite and chalcopyrite.
Remarks: Found by the staff of Hollinger Mines Limited.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Godfrey Township Float No.3 - [Cu]

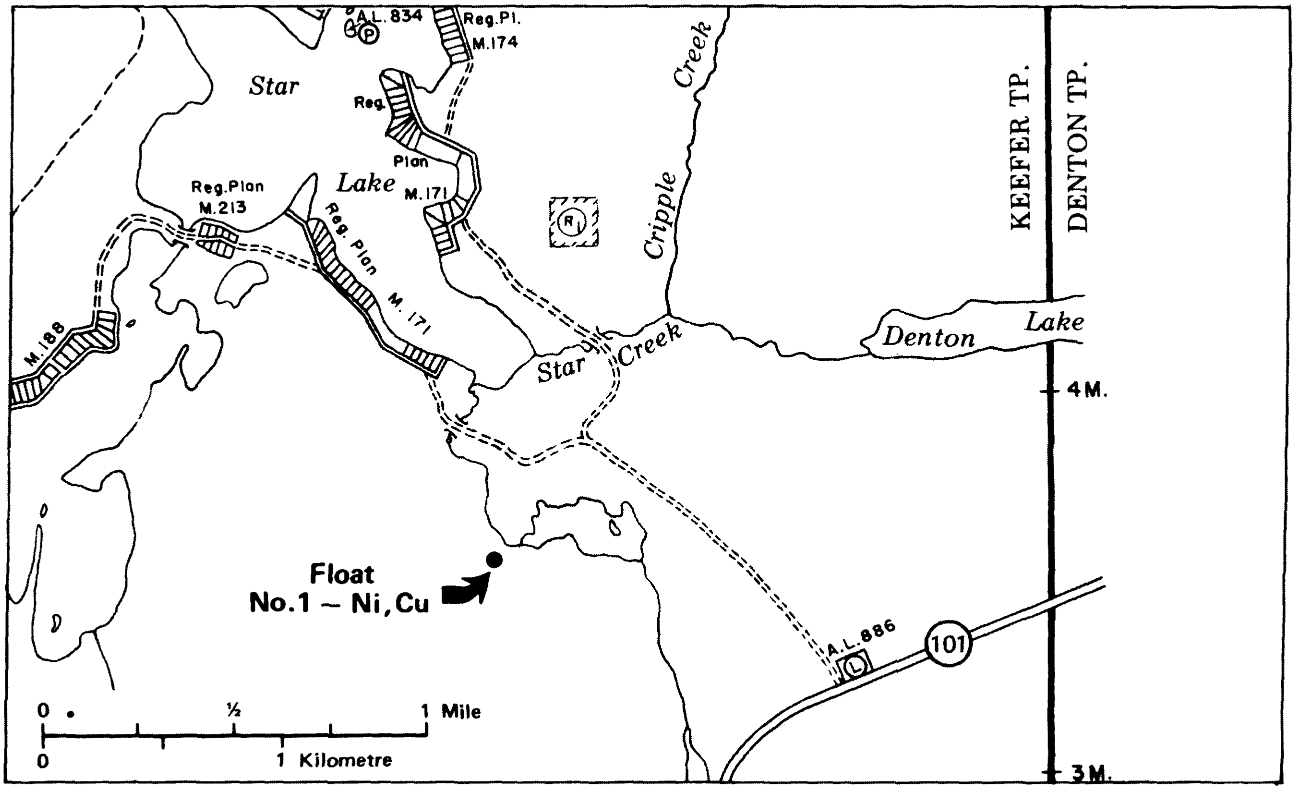
Main Metals: Copper

Location: Godfrey Township (Latitude 48°30', Longitude 81°31'), NW¼ of N½, lot 8, concession IV. NTS 42A/5E. Location not shown on map as exact area doubtful. Map Reference: ODM Map 1954-4, Godfrey Township.

Description: Dacite agglomerate boulder, 4 feet by 5 feet (1.2 - 1.5 m). Containing sulphide minerals with chalcopyrite and malachite in the matrix.

Remarks: Found by C.D. Mackenzie, Hollinger Mines Limited.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Keefer Township Float No.1 - [Ni,Cu]

Main Metals: Nickel, Copper

Location: Keefer Township (Latitude 48°20', Longitude 81°47'), about 2,200 feet (670 m) south of Star Lake. A blazed line extends 250 feet (75 m) north of the beaver dam to the boulder. NTS 42A/5W.

Map Reference: ODM Map P.27, Keefer Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: The float measures 8½ x 7 x 3 ft. (2.6 x 2.1 x 0.9 m) with the long axis at 170°. It is rusty-brown in colour and was partially buried in a clayey, ablation till which overlies sand or sandy gravel of a regional esker complex.

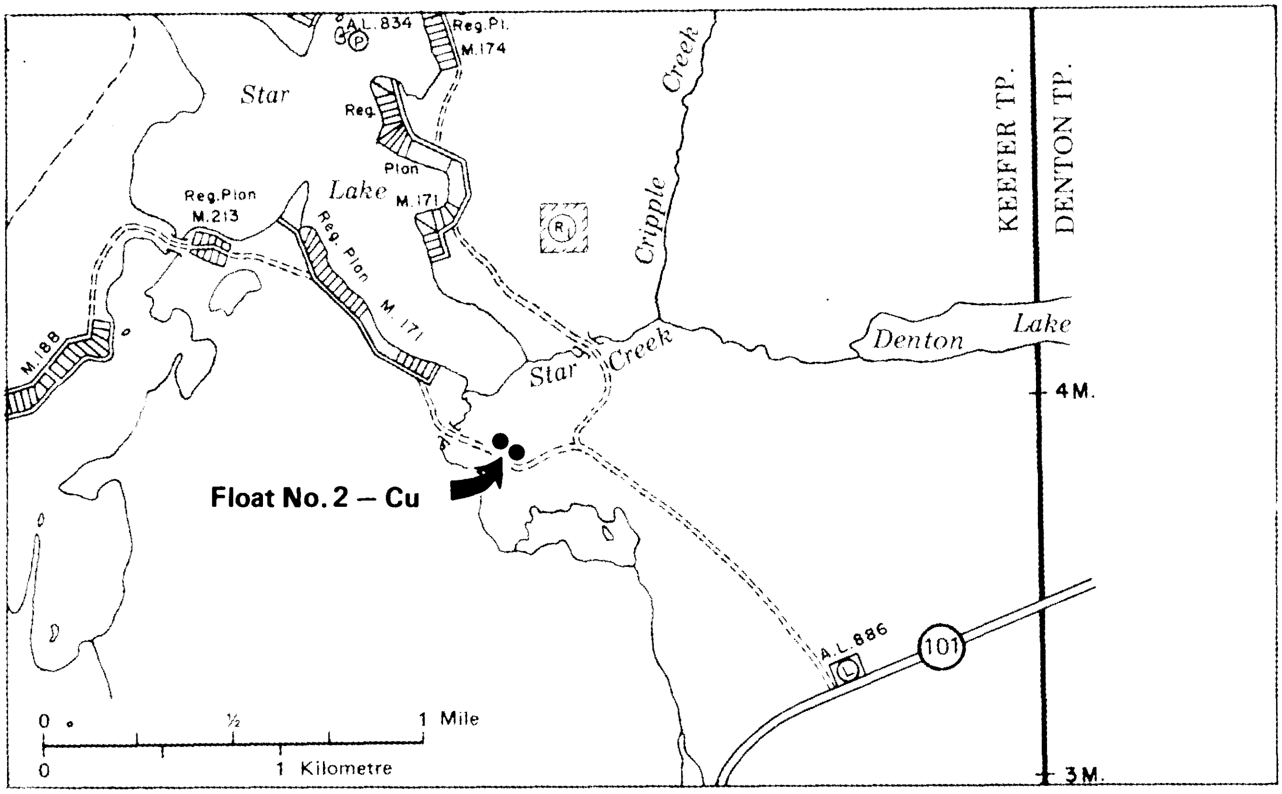
The float is a medium grained rock, possibly gabbro or diorite, and some polished sections contain clusters of femic minerals. A thin section description ODM Laboratory Report No.15355 is as follows: "The chief mineral components are a green, sodic amphibole, altered plagioclase feldspar of sodic composition, and the sulphides noted above [pyrrhotite, chalcopyrite, and probably pentlandite]. The amphibole is the predominating silicate, forming roughly bladed crystals of considerable variation in grain size.

The feldspar is coarse grained and anhedral. It displays albite and pericline twinning and is partly altered to saussurite."

A polished section of the rock about six inches in diameter contains more than 50 percent pyrrhotite and 2 to 3 percent chalcopyrite. The combined nickel and copper content is reported to be about 3 percent.

Remarks: Prospectors working for Hollinger Mines Limited brought this float to the attention of C.D. MacKenzie *circa* 1960.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1972; ODM Laboratory Report 1970, No.15355, to Hollinger Mines Limited.



Cochrane District

Keefer Township Float No.2 - [Cu]

Main Metals: Copper

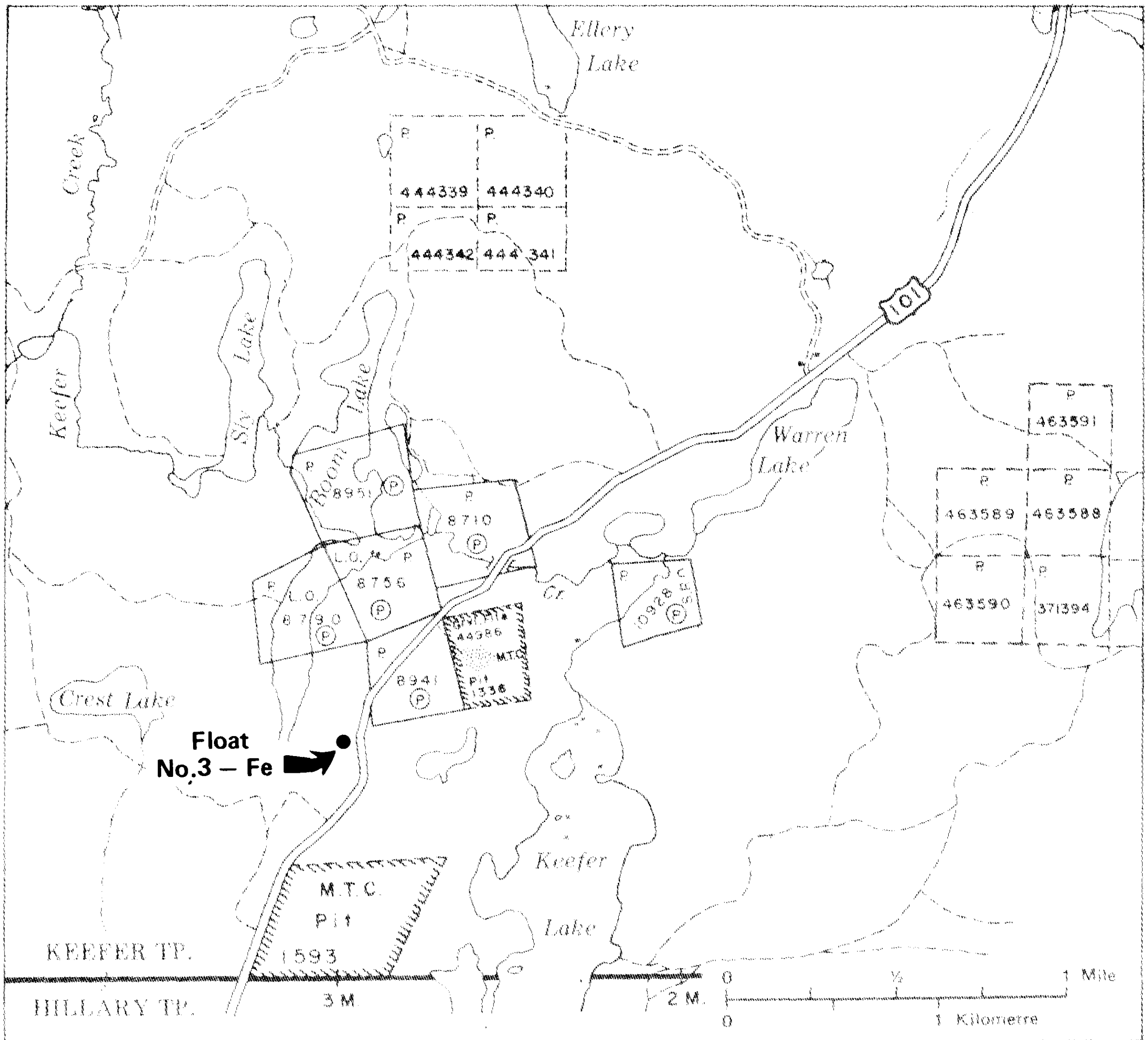
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), low road cuts across the esker on the road to Star Lake, north of Highway 101.

Map Reference: ODM Map P.27, Keefer Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: Pieces of rusty rhyolite float about 6 inches (15 cm) in diameter is mineralized with pyrite and chalcopyrite.

Remarks: Some of these pieces of float were present in the bulldozer cut and lying on the surface adjacent to the road.

Reference: R. Wolverton, Noranda Exploration Company Limited, personal communication, 1973.



Cochrane District

Keefer Township Float No.3 - [Fe]

Main Metals: Iron

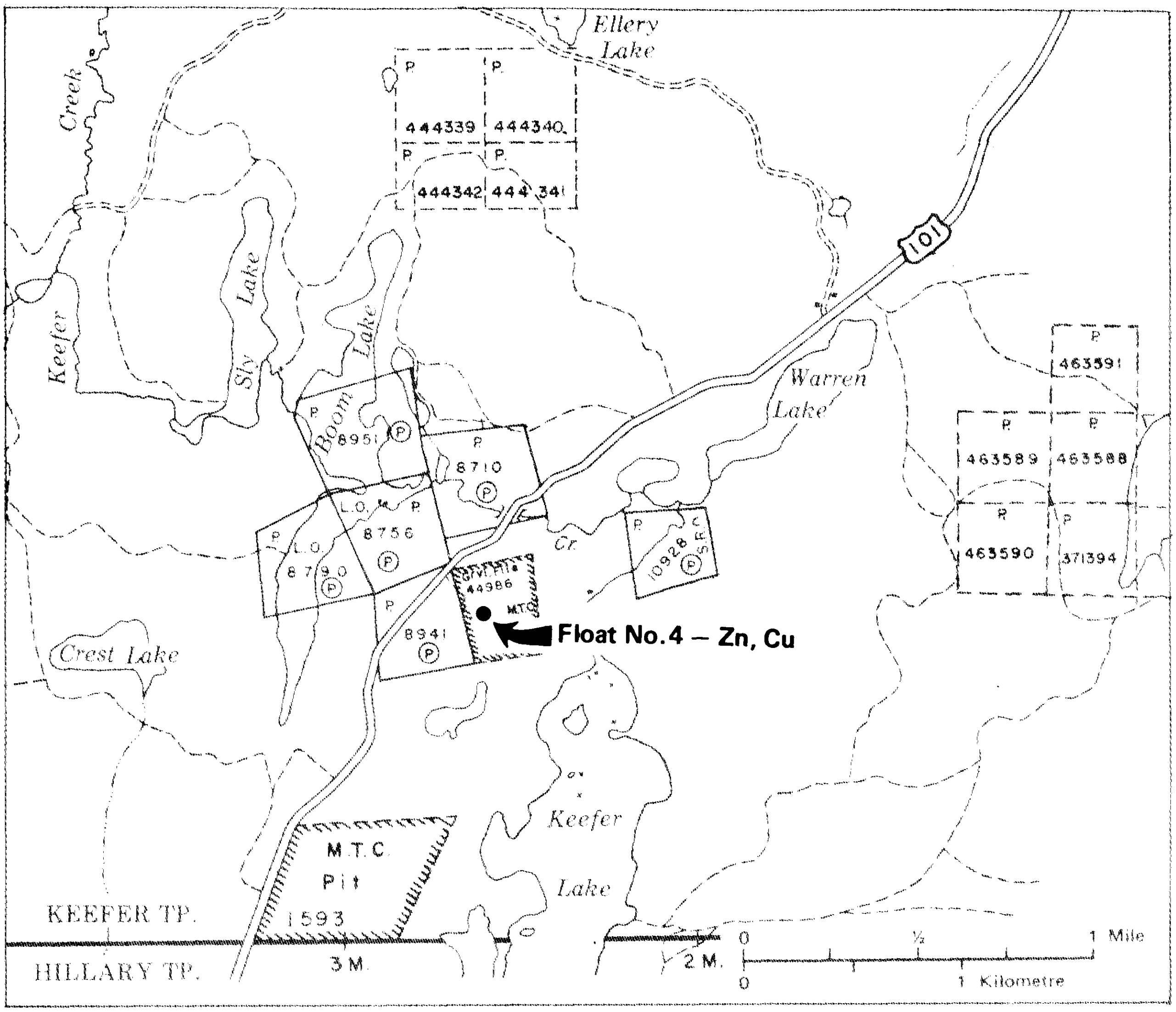
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), on the north side of Highway 101 about 650 feet (200 m) south along the road from the western boundary of claim P8941. NTS 42A/5W.

Map Reference: ODM Map P.27, Keefer Township.

Description: A boulder of massive pyrrhotite about 1½ feet (48 cm) by 1 foot (30 cm) in diameter was located in a sandy boulder plain. Possibly it is sulphide iron formation.

Remarks: Found by the exploration staff Hollinger Mines Limited.

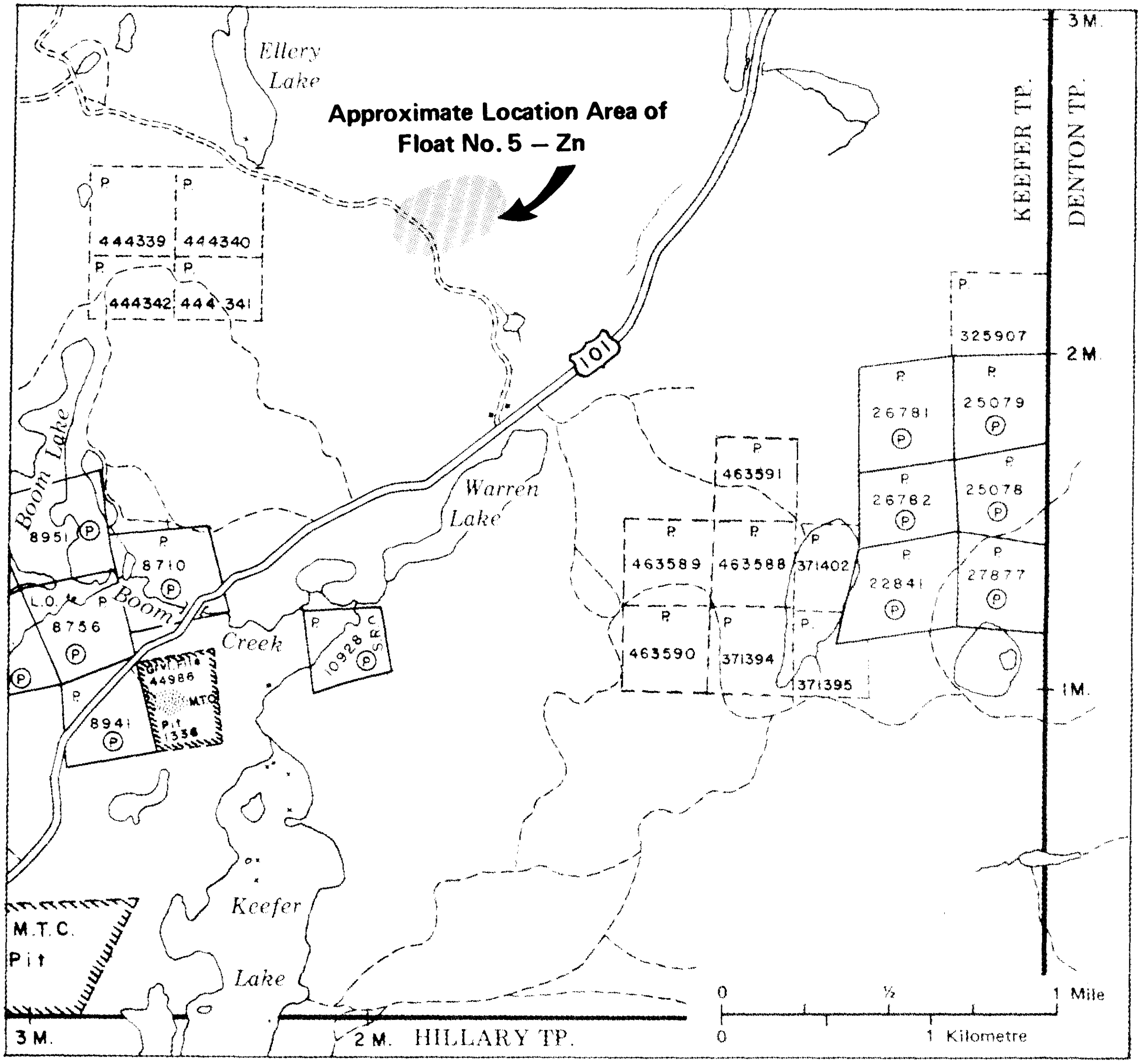
Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1973.



Cochrane District

Keefer Township Float No.4 - [Zn, Cu]

Main Metals: Zinc, Copper
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), in a road cut south of Highway No.101. NTS 42A/5W.
Map Reference: ODM Map P.27, Keefer Township.
Description: The following excerpt is from GSC Paper 72-1 A, p.189:
"A massive sulphide boulder (mainly pyrite, minor sphalerite, traces of chalcopyrite) approximately 40 cm [16 inches] in diameter was discovered in a new road cut along Highway 101 in Keefer Township (48°17′48″N, 81°46′33″W). The gossan covered boulder was found in colluvium, perhaps reworked till, about 1.0 m [40 inches] below the surface, 0.75 m [30 inches] above bedrock (altered greenstone).
Remarks: Found and described by R.G. Skinner, in 1971, Geological Survey of Canada.
Reference: GSC 1972, Paper 72-1 A, p.189.

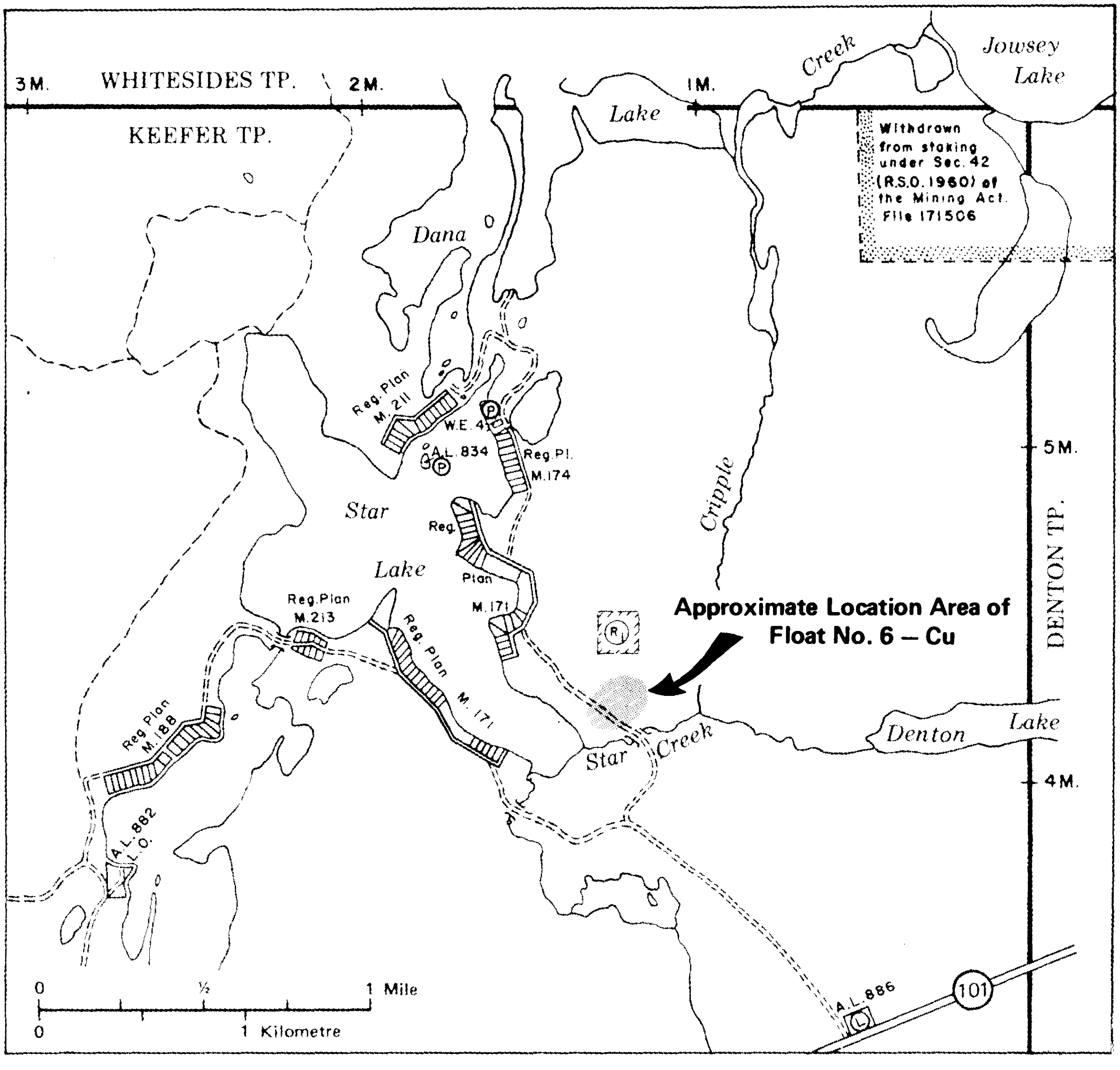


Cochrane District

Keefer Township Float No.5 - [Zn]

Main Metals: Zinc
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), north side of Highway 101 and 200 feet (61 m) north of Float No.7. NTS 42A/5W.

Map Reference: ODM Map P.27, Keefer Township.
Description: A quartz-carbonate boulder containing reddish sphalerite.
Remarks: Found by Cyril Giles, Hollinger Mines Limited, 1971.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.

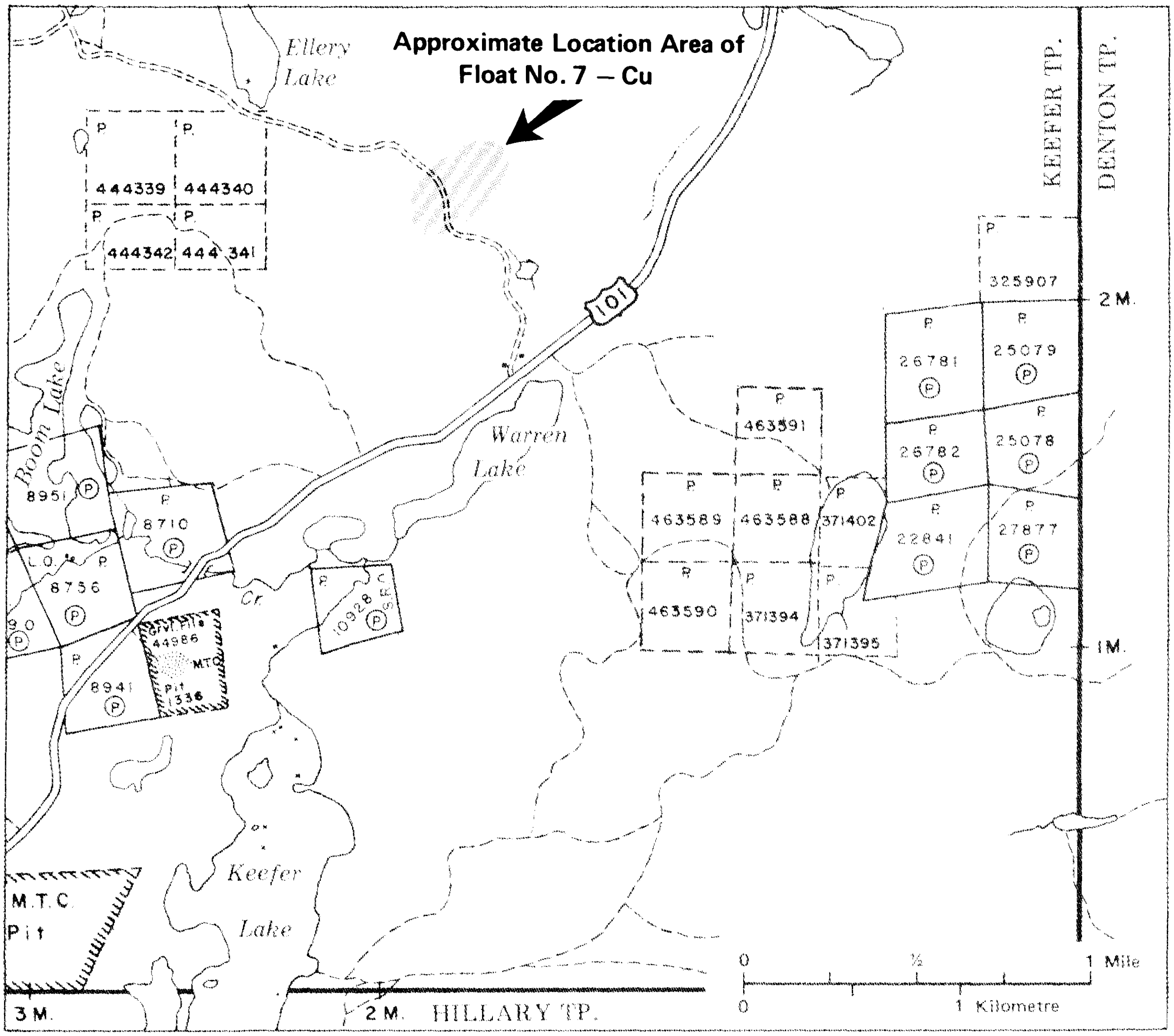


Cochrane District

Keefer Township Float No.6 - [Cu]

Main Metals: Copper
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), NTS 42A/5W.
Map Reference: ODM Map P.27, Keefer Township.

Description: A rounded boulder about 1 foot (0.3 m) in diameter containing massive pyrite with minor chalcopyrite in a cherty rhyolite.
Remarks: Found by C.D. MacKenzie, *circa* 1970, Hollinger Mines Limited.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.

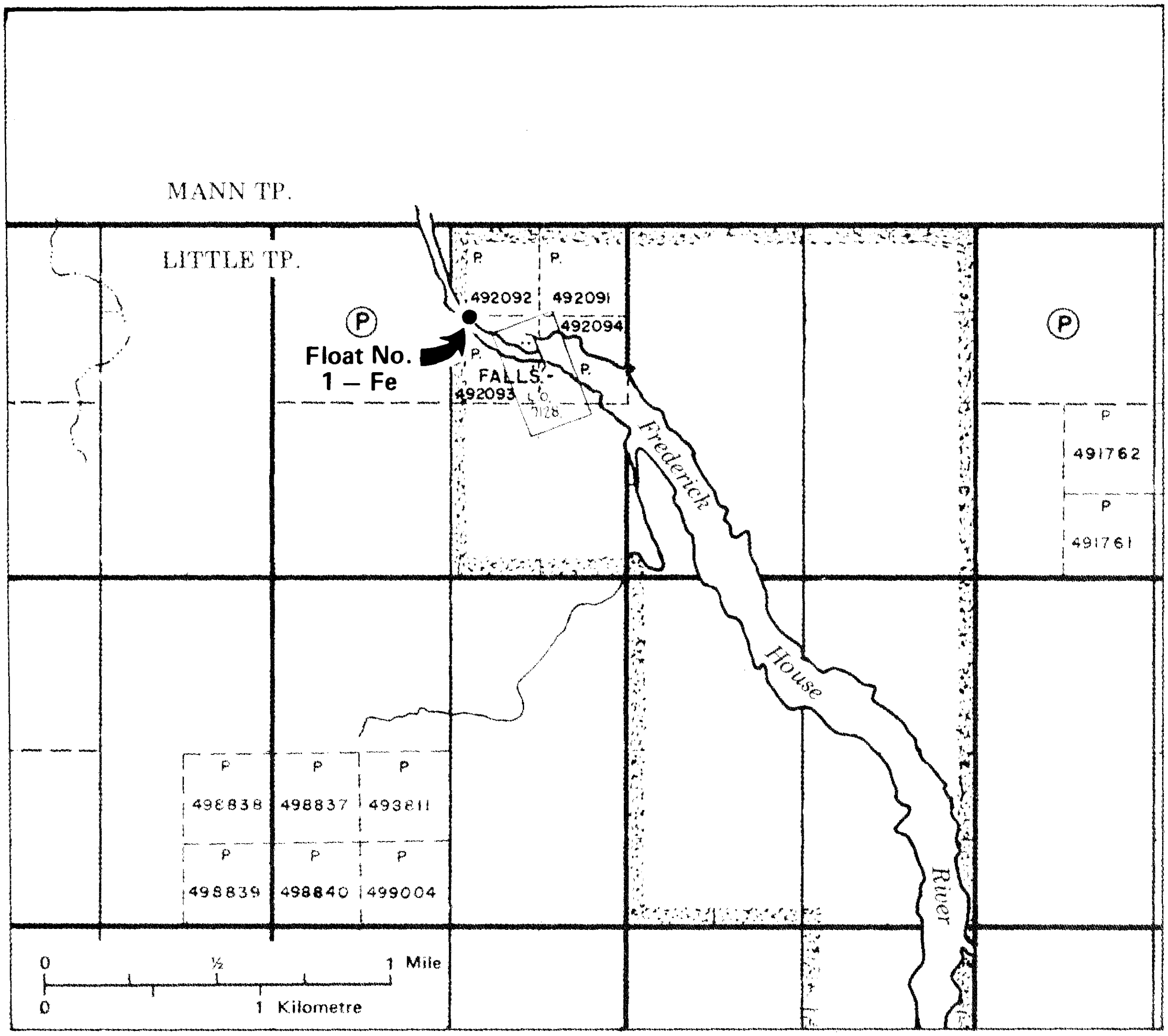


Cochrane District

Keefer Township Float No.7 - [Cu]

Main Metals: Copper
Location: Keefer Township (Latitude 48°20′, Longitude 81°47′), on old power line, 200 feet (61 m) south of Float No.5. NTS 42A/5W.
Map Reference: ODM Map P.27, Keefer Township.

Description: A large block (10 foot diameter) of aplitic granite containing disseminated chalcopyrite.
Remarks: Discovered *circa* 1971 during a staking rush in Keefer Township.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Little Township Float No.1 - [Fe]

Main Metals: Iron

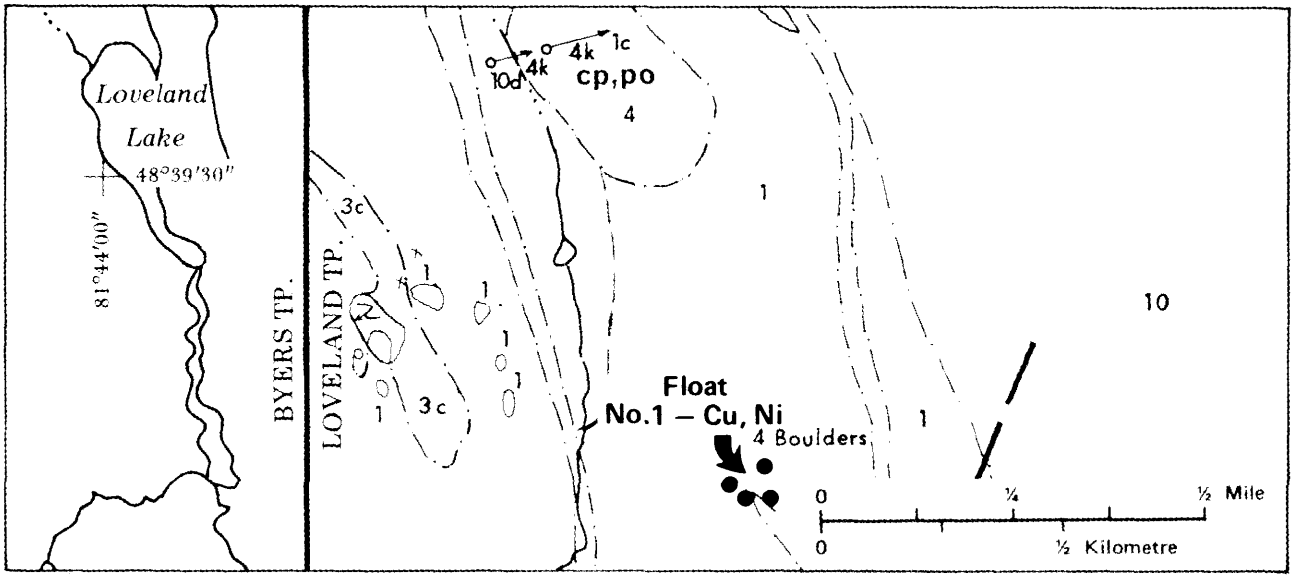
Location: Little Township (Latitude 48°45′, Longitude 81°00′), just south of the north boundary of the township, about 500 feet (152 m) north of the dam and beside the Frederickhouse River. NTS 42A/14E.

Map Reference: OMNR Claim Map M535, Little Township. Mineralized float and heavy mineral concentrations in the Timmins Area, Figure 1, this report.

Description: A rounded boulder about 1½ to 2 feet (0.5-0.6 m) in diameter consisting of massive pyrite and assaying a trace of copper and no gold. The boulder had been moved downstream by the river.

Remarks: Found by a letter carrier from Timmins.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Loveland Township Float No.1 - [Ni,Cu]

Main Metals: Nickel, Copper

Location: Loveland Township (Latitude 48°40', Longitude 81°40'), about 2,000 feet (610 m) east of the 2-mile post on the western boundary. NTS 42A/12E.

Map Reference: ODM Map P.696 Loveland Township. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: Four angular boulders were found in an area about 300 feet (91 m) long with the major diameters of the boulders 25, 10, 6, and 5 feet (7.6, 3, 1.8, 1.5 m) and, in addition there were many cobbles of fist size. These boulders lie on a local area of ablation till on top of the sand of a major esker which trends north-south.

The rock is a peridotite which in places contains irregular clots of amphibole and feldspar. The following thin section description is from ODM Laboratory Report No. 15355, 1970:

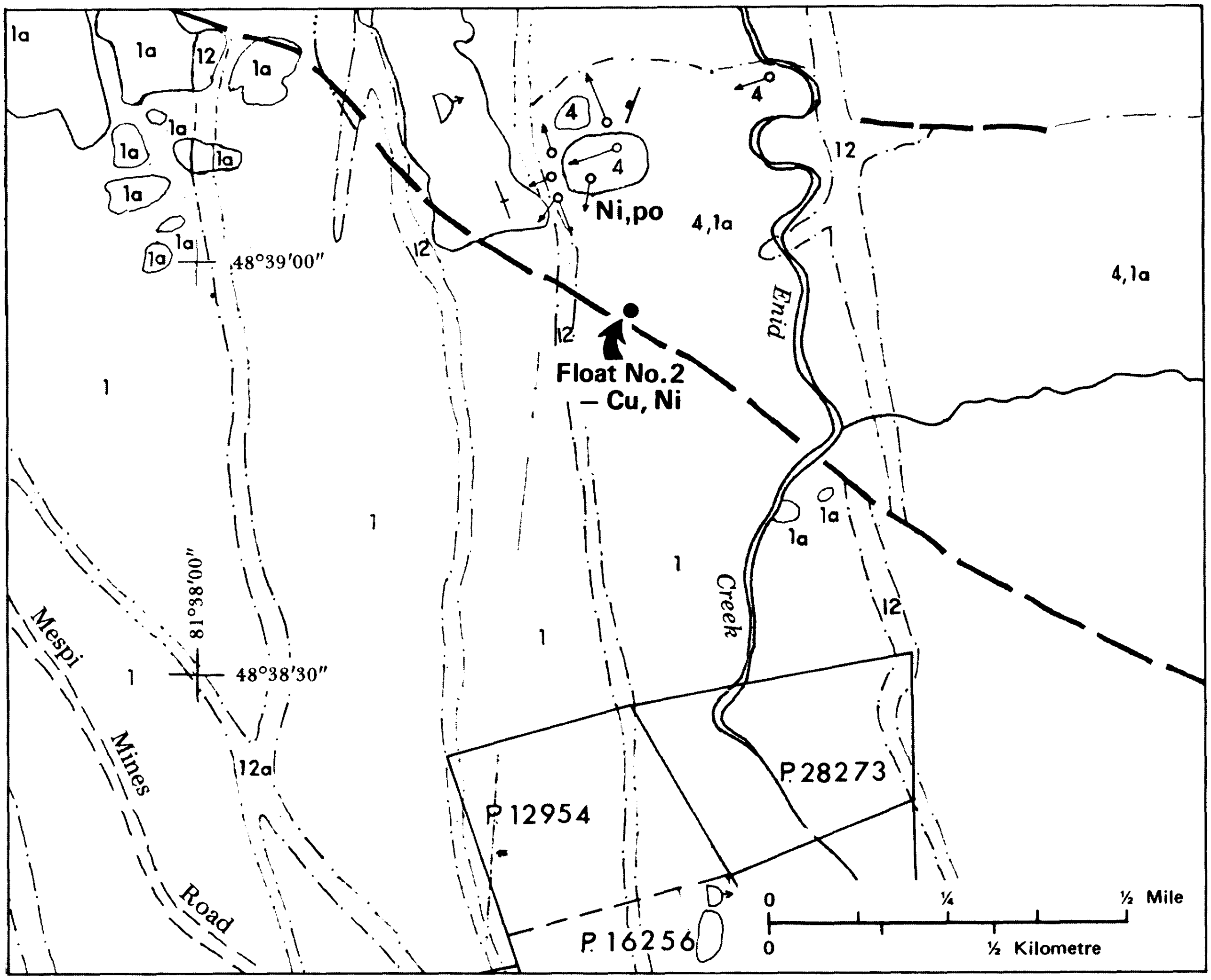
"Amphibole, pyroxene and olivine comprise the silicate matrix of the rock. Sulphides make up the remainder of this sample. The rock has undergone metamorphism whereby fine-grained non-pleochroic amphibole (tremolite) predominates. Original crystals of olivine are completely surrounded by sulphides which may have protected them from alteration. A few grains of hypersthene were observed along with clinopyroxene in the matrix.

The sulphides appear to be a primary constituent of the rock."

A specimen in the office of the Regional Geologist, Ontario Ministry of Natural Resources, Timmins, shows the pyrrhotite disseminated in fine grains throughout the rock resembling the texture of the disseminated ore from the Alexo Mine. Specimens submitted for assay indicate a nickel content of about 1.5 percent and a copper content from 0.3 to 0.5 percent.

Remarks: George Jamieson, prospector resident at Kamiskotia Lake in 1940 was aware of the existence of this float. C.D. MacKenzie, Hollinger Mines Limited provided the locations and dimensions of the pieces of float shown on ODM Map P.25 *circa* 1955 and recently supplied a copy of the Laboratory Report.

References: ODM Rpt. 1944, Vol.53, Pt.4, p.16; ODM Map P.25 Loveland Township; ODM Map P.682 Loveland Township; ODM Laboratory Report 1970, No.15355 to Hollinger Mines Limited.



Cochrane District

Loveland Township Float No.2 - [Ni,Cu]

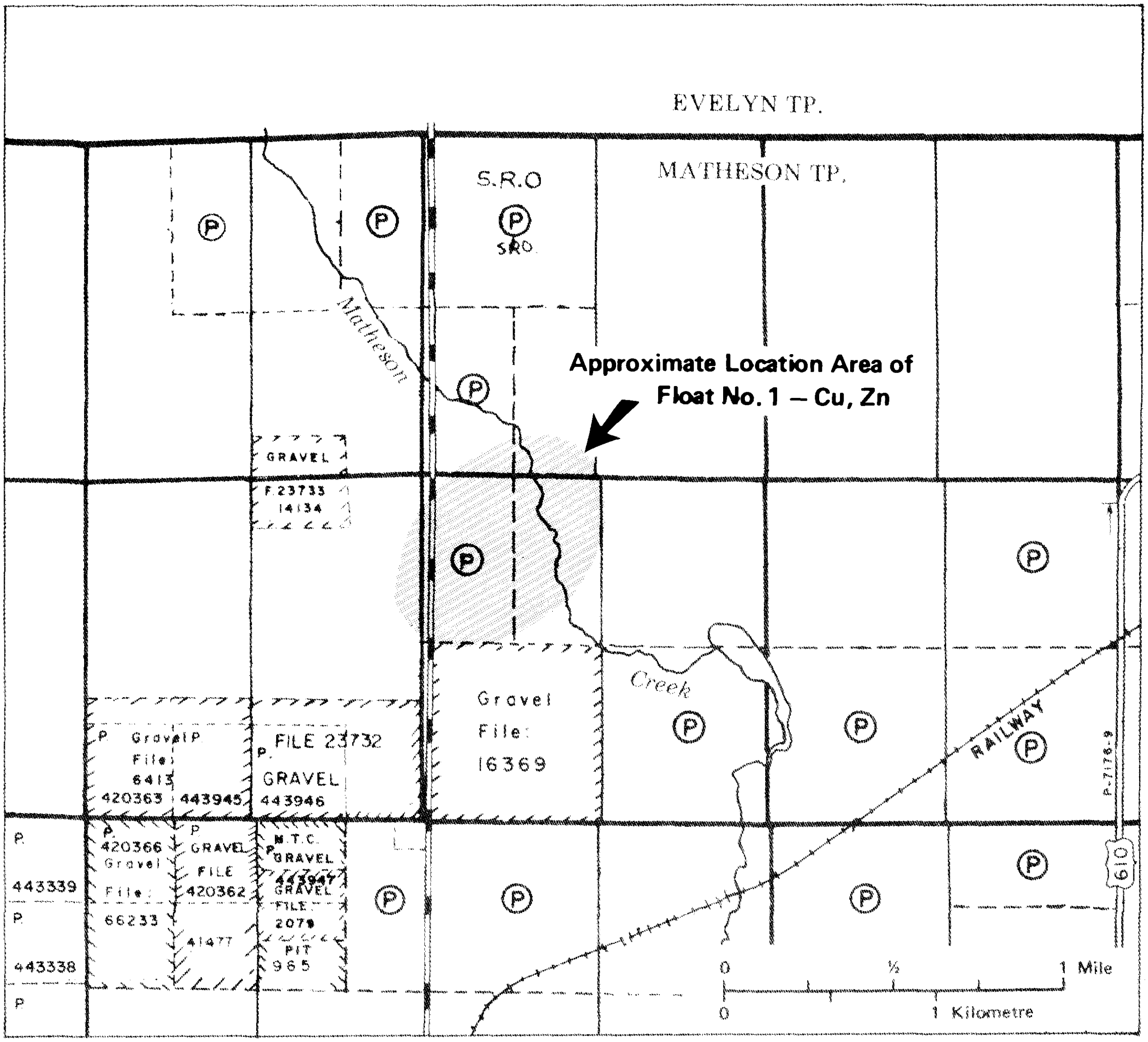
Main Metals: Nickel, Copper

Location: Loveland Township (Latitude 48°40', Longitude 81°40'), located about 6,000 feet (1830 m) west of the eastern township boundary and 9,800 feet (2987 m) north of the southern boundary. NTS 42A/12E. Map Reference: ODM P.696 Loveland Township indicates where the mineralization was intersected in drilling. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: A boulder 2 to 3 feet (0.6-0.9 m) in diameter was resting on bedrock about 50 feet (15 m) southeast of the showing and another large boulder, 8 feet (2.4 m) in diameter was found about 1,000 feet 305 m) southeast of the showing as well as other smaller boulders forming a train in this vicinity. Assay for nickel 3 to 4 percent.

Remarks: Found by C.D. MacKenzie and drilled by Hollinger Mines Limited, 1957-1966.

References: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973; ODM MRC12, p.123.



Cochrane District

Matheson Township Float No.1 - [Cu,Zn]

Main Metals: Copper, Zinc

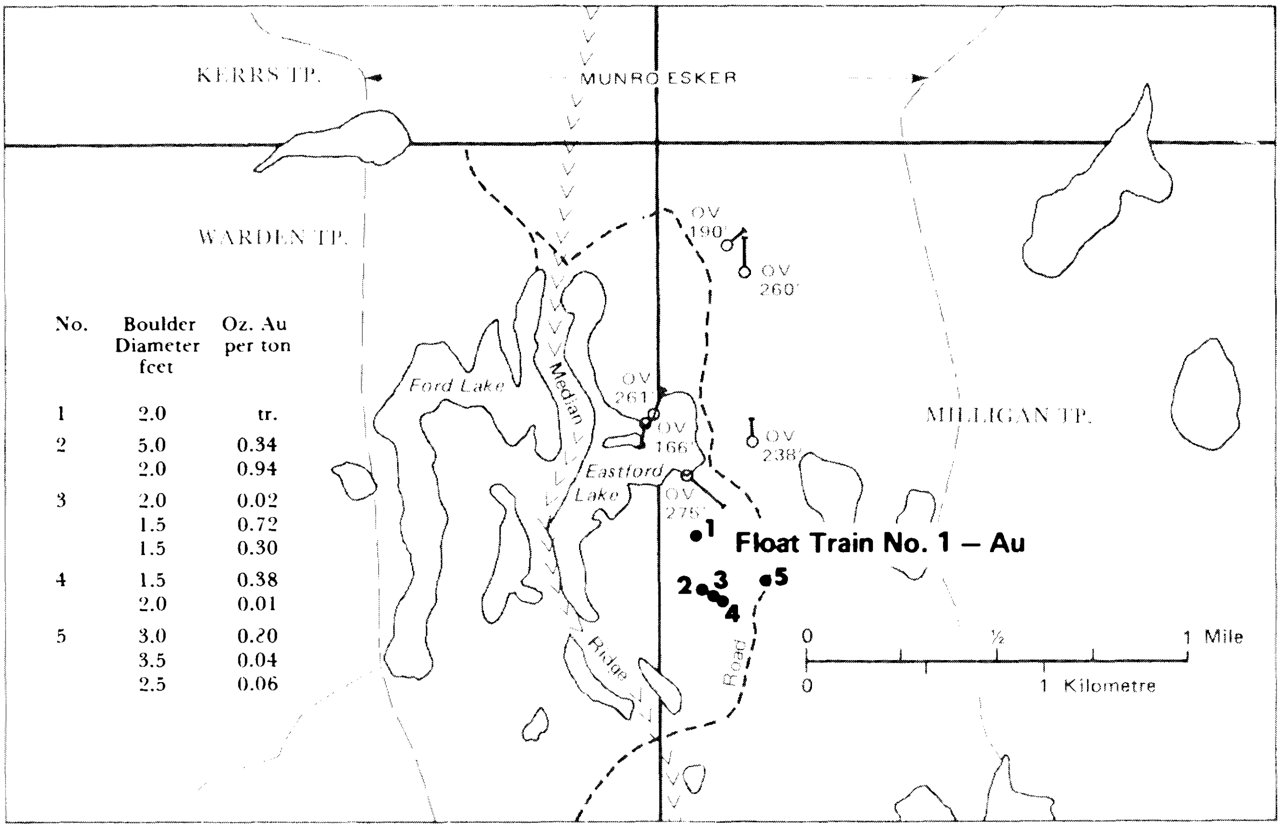
Location: Matheson Township (Latitude 48°35′, Longitude 81°00′), north central part, *exact location uncertain.* NTS 42A/10W and 42A/11E.

Map Reference: OMNR Claim Map M297, Matheson Township. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: A boulder of massive sphalerite and chalcopyrite was reported by a farmer.

Remarks: Doubtful validity.

Reference: E.G. Bright, Regional Geologist, Ontario Ministy of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Milligan Township Float Train No.1 - [Au]

Main Metals: Gold

Location: Milligan Township (Latitude 48°40′, Longitude 80°28′), northwest corner near the boundary with Warden Township and from 1,500 to 2,400 feet (460-730 m) east of the south end of Eastford Lake. NTS 42A/9E.

Map Reference: ODM Map P.772, Milligan Township.

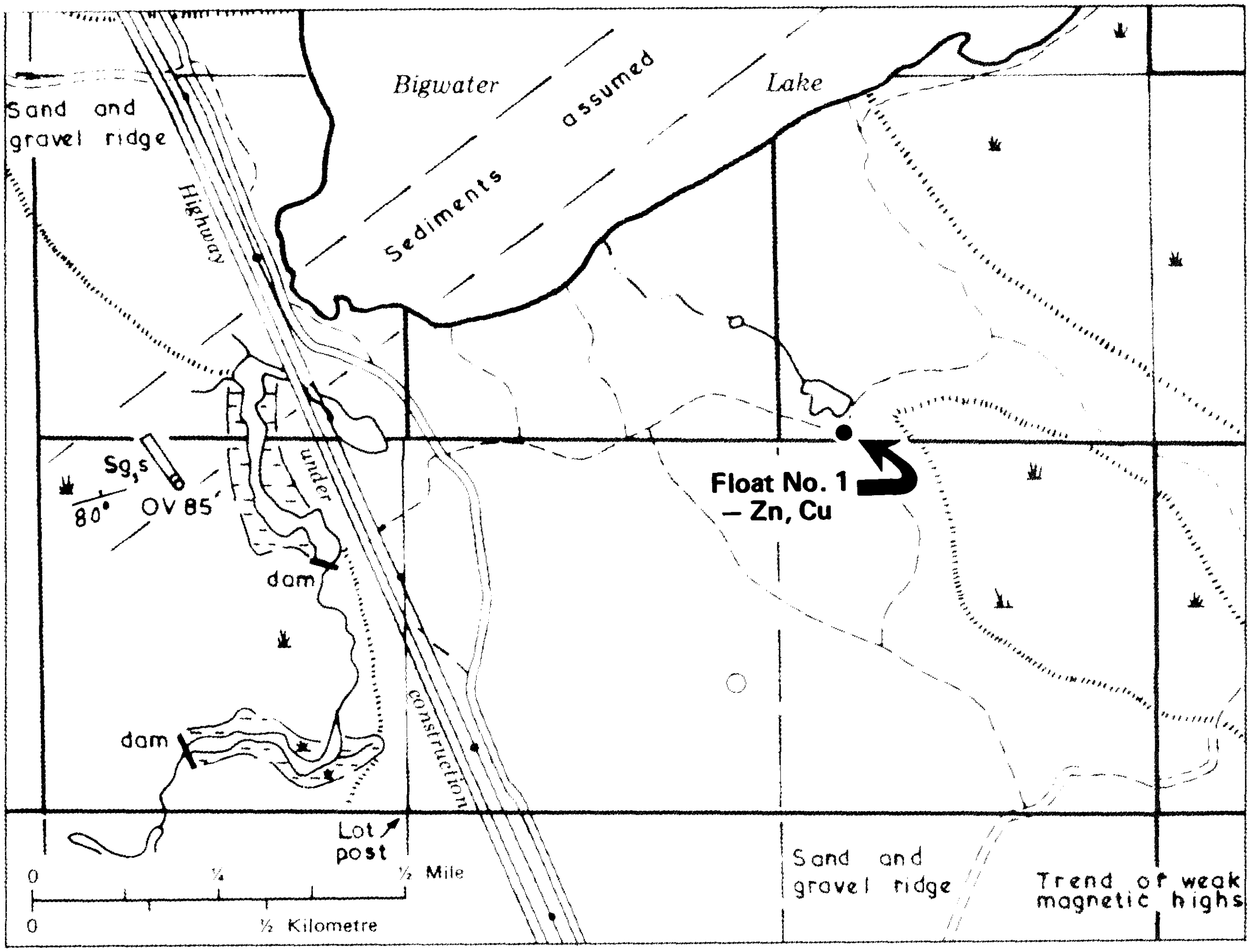
Description: A group of boulders of white quartz containing scanty sulphide mineralization and a little visible gold at localities 2,3, and 4 on the accompanying map. Seven of these boulders range in diameter from 1.5 to 5 feet (0.6-1.5 m) and have a gold content from 0.01 to 0.72 ounce per ton. Four other quartz boulders in the same locality were not assayed. At locality 5 on the accompanying sketch, three pieces of quartz float are from 2.5 to 3.5 feet (0.8-1.1 m) in diameter and contain up to 0.80 ounce Au per ton. Four other boulders at this locality were not assayed. At locality 1, a quartz float 2 feet (0.6 m) in diameter assayed trace of gold and one other boulder was not assayed.

These pieces of float rest on the top of a sandy till about 1.5 feet (0.5 m) in thickness which overlies the glaciofluvial gravels of the Munro esker.

Bedrock Source: Unknown. Presumably somewhere to the northwest. Overburden thickness ranges from 166 to 238 feet (50-72 m).

Remarks: Located and described in 1965 by U.J. Vagners, geologist, in a private report for W.G. Wahl Limited.

Reference: W.G. Wahl, Consulting Geologist, W.G. Wahl Limited, Toronto, Ontario, personal communication, 1972.



Cochrane District

Murphy Township Float No.1 - [Zn,Cu]

Main Metals: Zinc, Copper

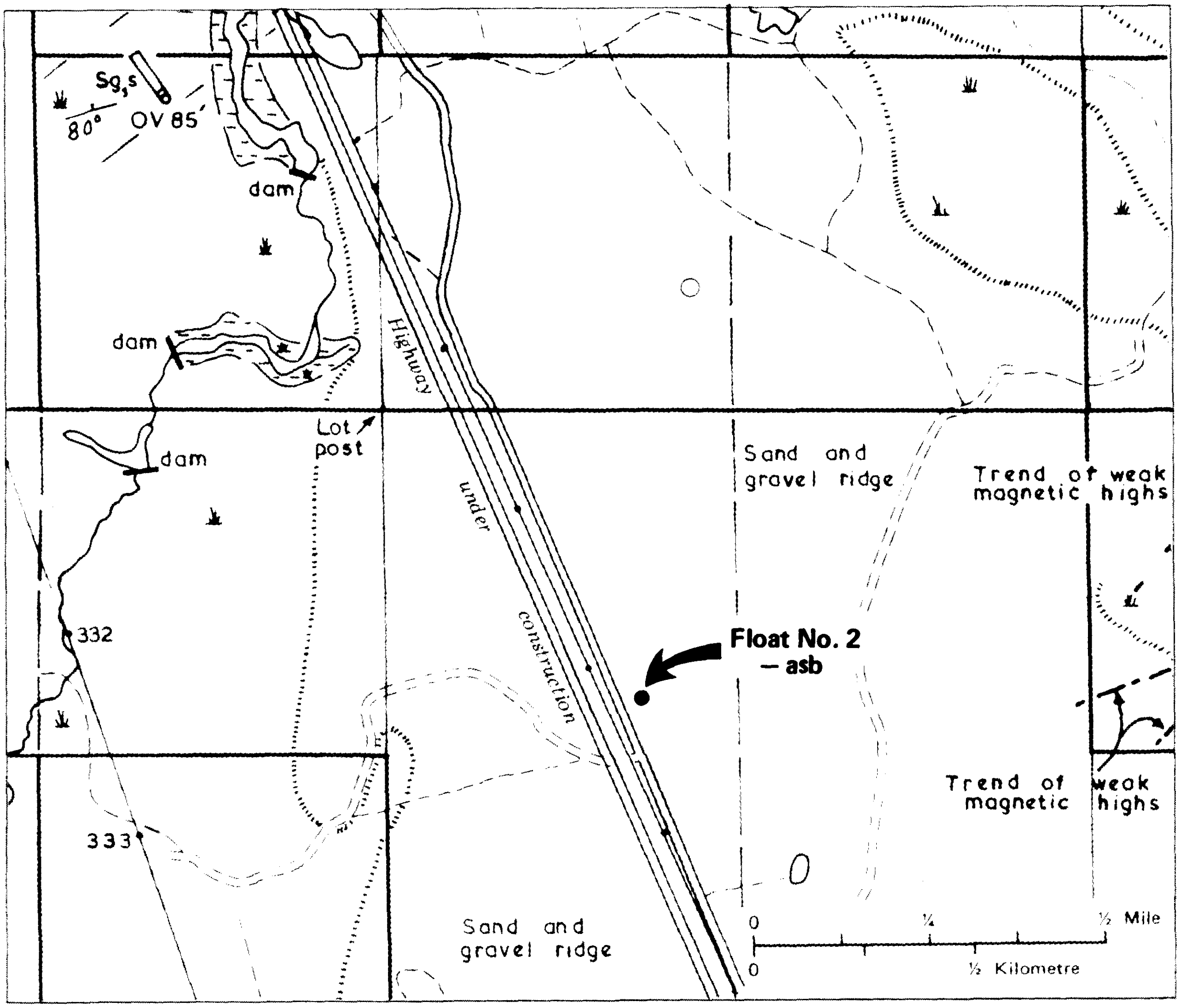
Location: Murphy Township (Latitude 48°35′, Longitude 81°16′), lot 7, concession V, on bush road south of small pond about 2,400 feet (730 m) south of Bigwater Lake. NTS 42A/11W.

Map Reference: ODM Map P.255, Murphy Township. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: A fairly well rounded, rusty piece of float was found on the bush road almost completely buried in the sand of an esker complex. The largest float measured 3 x 2½ x 2 feet (0.9 x 0.7 x 0.6 m) and another piece about 1 foot (0.3 m) in diameter was found about 75 feet (23 m) away and a train of smaller pieces of float is present over a length of 200 feet (61 m). These pieces of float consist of nearly massive sphalerite with small amounts of chalcopyrite and smaller, fist-size pieces with chalcopyrite; these fragments are round to subangular.

Remarks: Found by Peter La Fleche, prospector, Noranda Mines Limited. The float is no longer in place.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Murphy Township Float No.2 - [asb]

Main Commodity: Asbestos

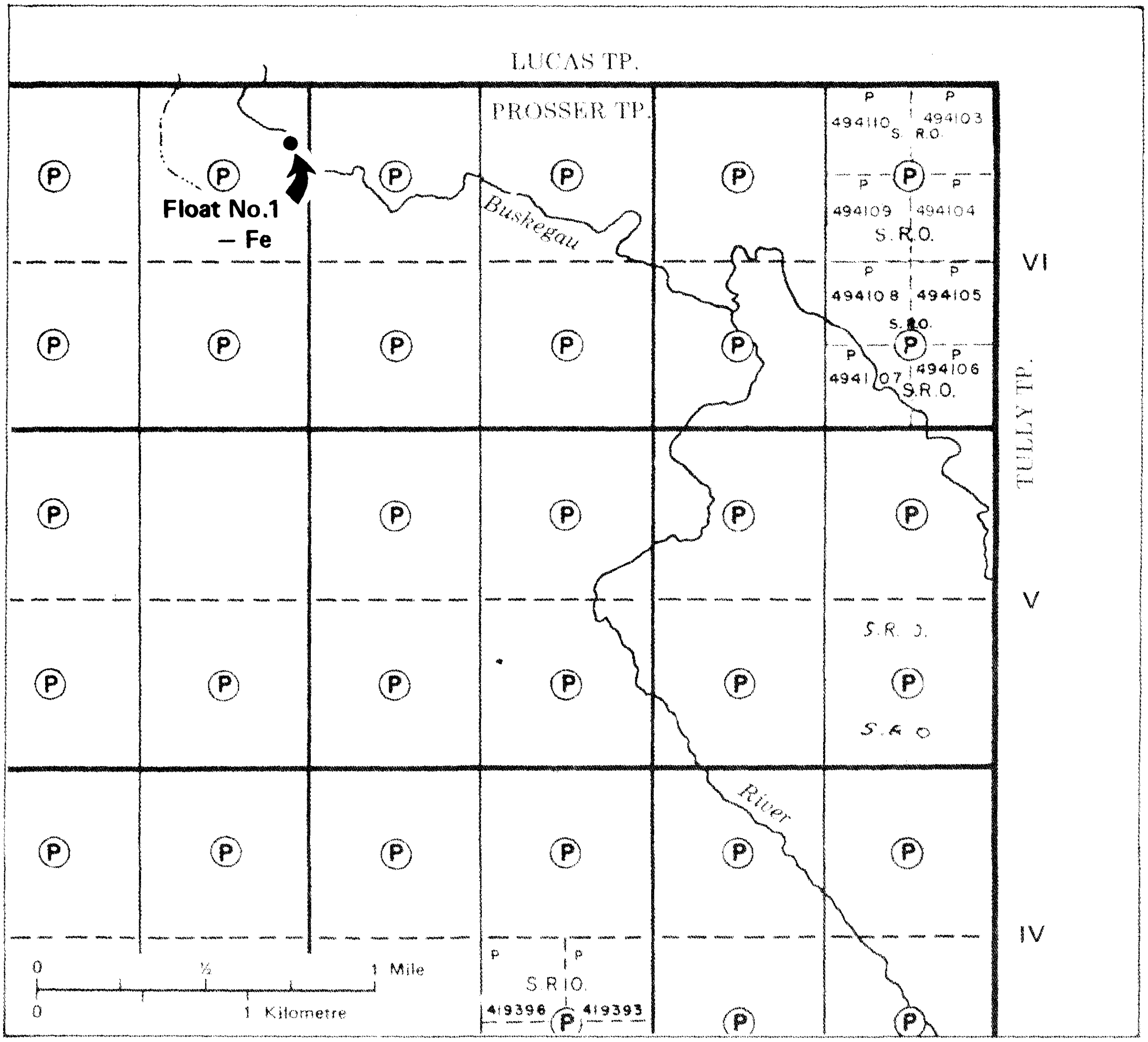
Location: Murphy Township (Latitude 48°35′, Longitude 81°16′), lot 8, concession V, about 400 feet (120 m) east of Highway No.655. NTS 42A/11W.

Map Reference: ODM Map P.255, Murphy Township.

Description: A subrounded boulder of serpentinite 9 x 6 x 4 inches (23 x 15 x 10 cm) containing two parallel veinlets of cross-fibre asbestos, was found in the sandy part of an esker complex. One veinlet of chrysotile asbestos varies in width from a thread up to 0.1 inch (0.2 cm) and the other veinlet is from 0.2 to 0.3 inch (0.5-0.7 cm) in width.

Remarks: Boulder found in 1972 by W. King, Hollinger Mines Limited. A possible source would be in Wark Township, 7½ miles (12 km) to the north.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1973.



Cochrane District

Prosser Township Float No.1 - [Fe]

Main Metals: Iron

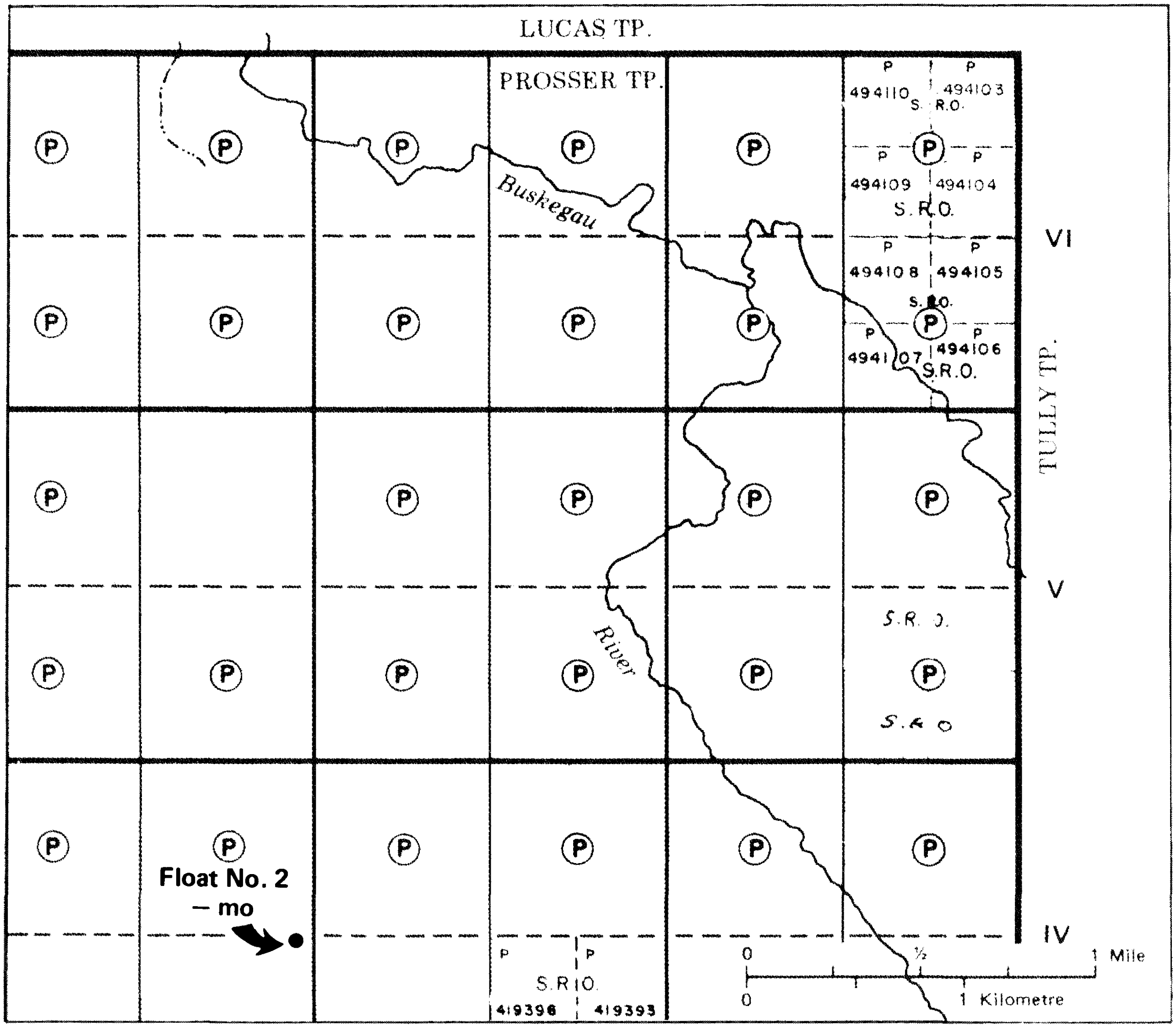
Location: Prosser Township (Latitude 48°45′, Longitude 81°16′), bed of Buskegau River. NTS 42A/11E, 42A/11W, 42A/14E, and 42A/14W.

Map Reference: OMNR Claim Map M571, Prosser Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: A pebble of greenstone contains considerable pyrrhotite.

Remarks: Described by J.G. McMillan (OBM 1905), and observed during an exploratory survey for Ontario Bureau of Mines.

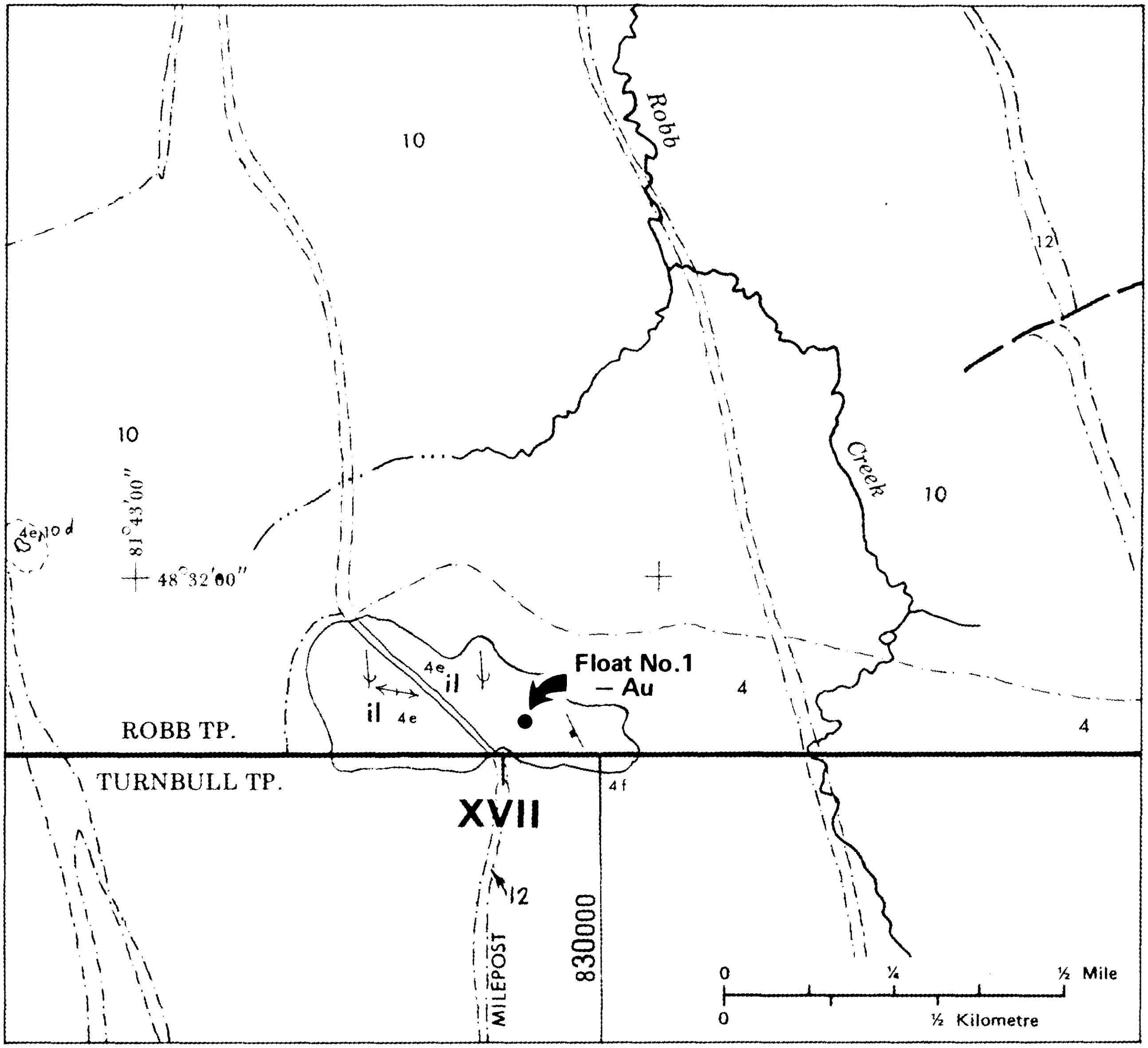
Reference: OBM 1905, Vol.XIV, pt.1, p.193.



Cochrane District

Prosser Township Float No.2 - [Mo]

Main Metals: Molybdenum
Location: Prosser Township (Latitude 48°45′, Longitude 81°16′), central part of the township about 1½ miles (2.4 km) east of Prosser Creek. NTS 42A/11E, 42A/11W, 42A/14E and 42A/14W.
Map Reference: ODM P.698, Pamour Sheet.
Description: An angular to subangular boulder of pegmatitic granite about 1½ feet (0.5 m) in diameter contains blebs of molybdenite. The boulder occurs in an area of flat outcrop and scattered ground moraine.
Remarks: Found by E.G. Bright doing geological mapping. The boulder is still in place and the nearest possible source is believed to be 12 to 15 miles (19-24 km) to the north.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Robb Township Float No.1 - [Au]

Main Metals: Gold

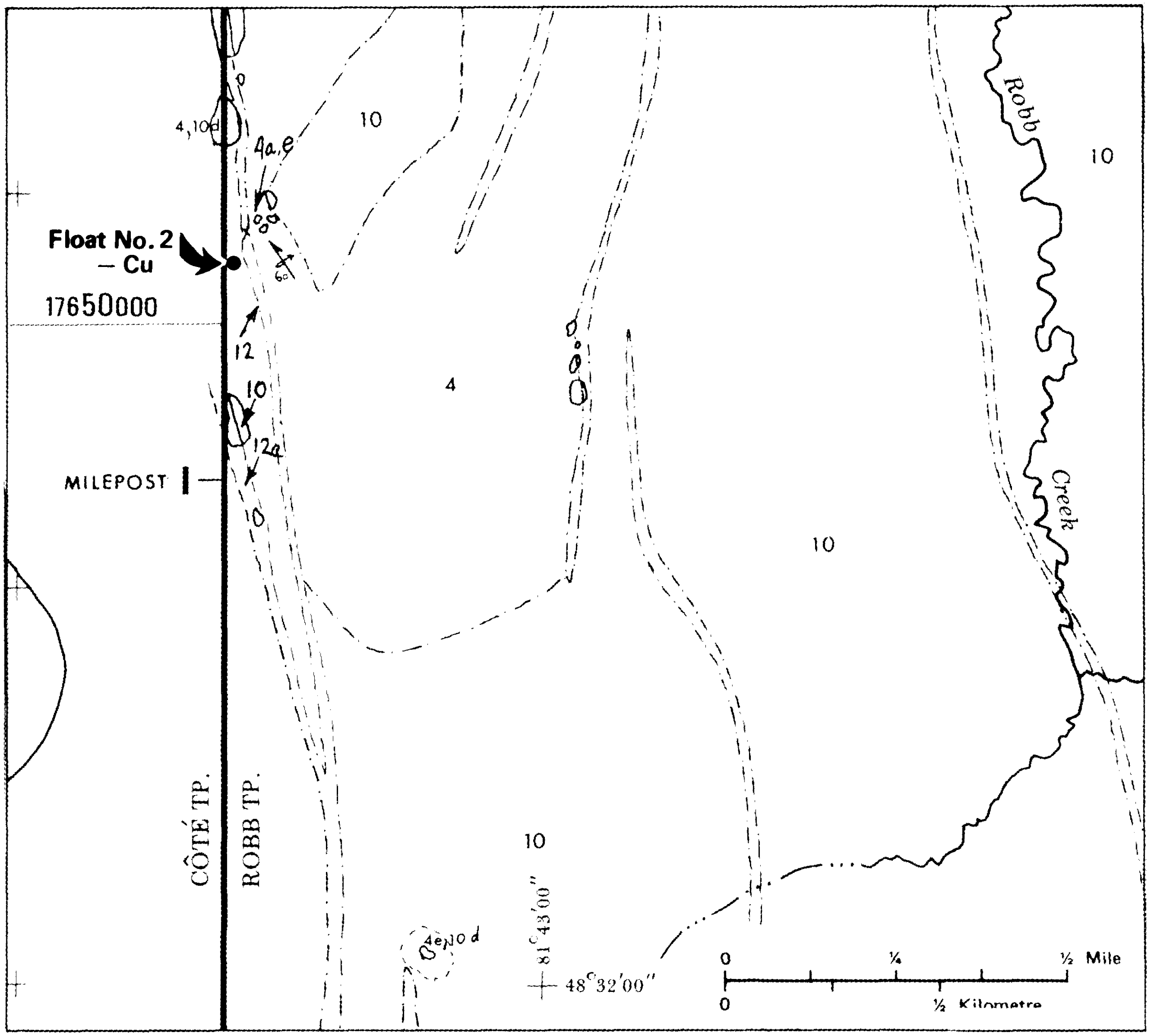
Location: Robb Township (Latitude 48°35', Longitude 81°40'), 330 feet (100 m) northeast of the 17-mile post (1 mile; 1.6 km east of southwest corner)on the south boundary of the township.

NTS 42A/12E.

Map Reference: ODM Map P.694, Robb Township.

Description: A piece of float weighing several tons was found and broken up by prospectors. Visible gold was present and one boulder assayed 0.28 ounce of gold per ton.

Reference: OBM 1915, Vol.24, pt.3, p.60.



Cochrane District

Robb Township Float No.2 - [Cu]

Main Metals: Copper

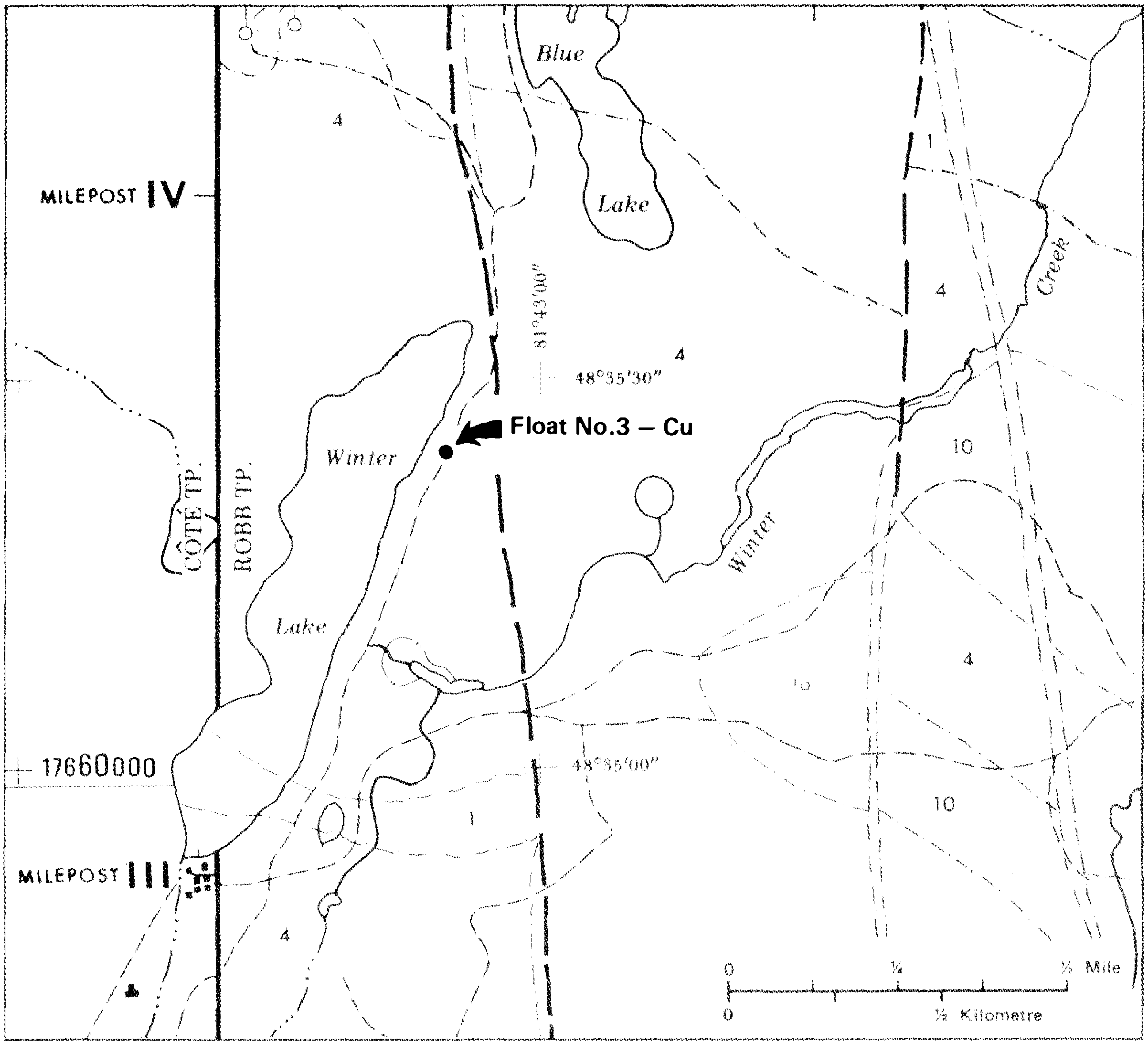
Location: Robb Township (Latitude 48°35', Longitude 81°40'), on the west boundary of the township, south of Winter Lake. NTS 42A/12E.

Map Reference: ODM Map P.694, Robb Township. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: A boulder of felsic metavolcanics containing pyrite and minor chalcopyrite.

Remarks: Found by Robert S. Middleton during the course of a geophysical survey conducted by the Geological Branch, Division of Mines.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Robb Township Float No.3 - [Cu]

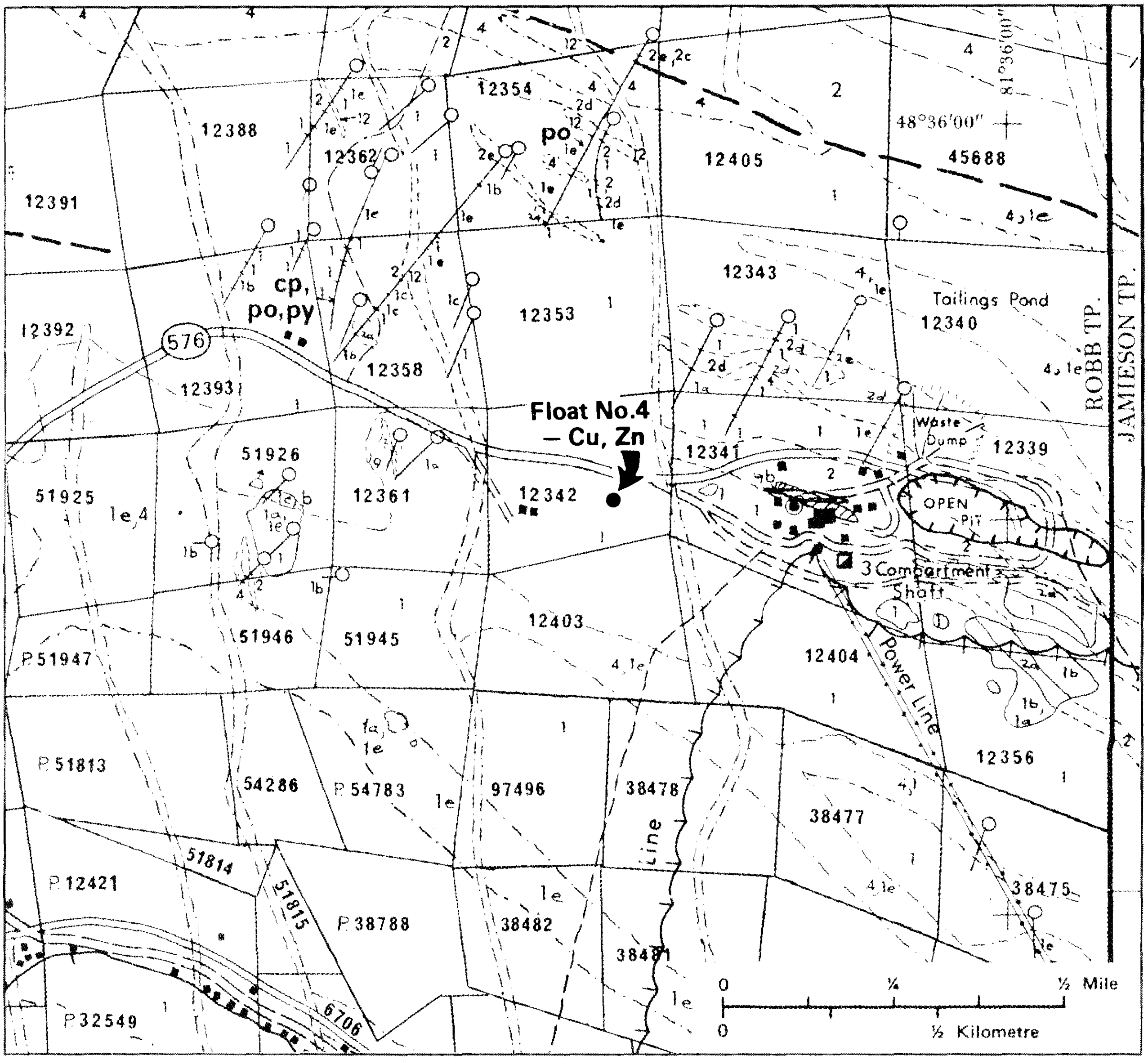
Main Metals: Copper

Location: Robb Township (Latitude 48°35′, Longitude 81°40′), east of the northeast corner of Winter Lake. NTS 42A/12E. Map Reference: ODM Map P.694, Robb Township.

Description: An angular boulder of altered andesite containing disseminated pyrrhotite, pyrite, and chalcopyrite.

Remarks: Found by J. Boissoneault, consulting geologist, Timmins, 1971.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Robb Township Float No.4 - [Cu, Zn]

Main Metals: Copper, Zinc

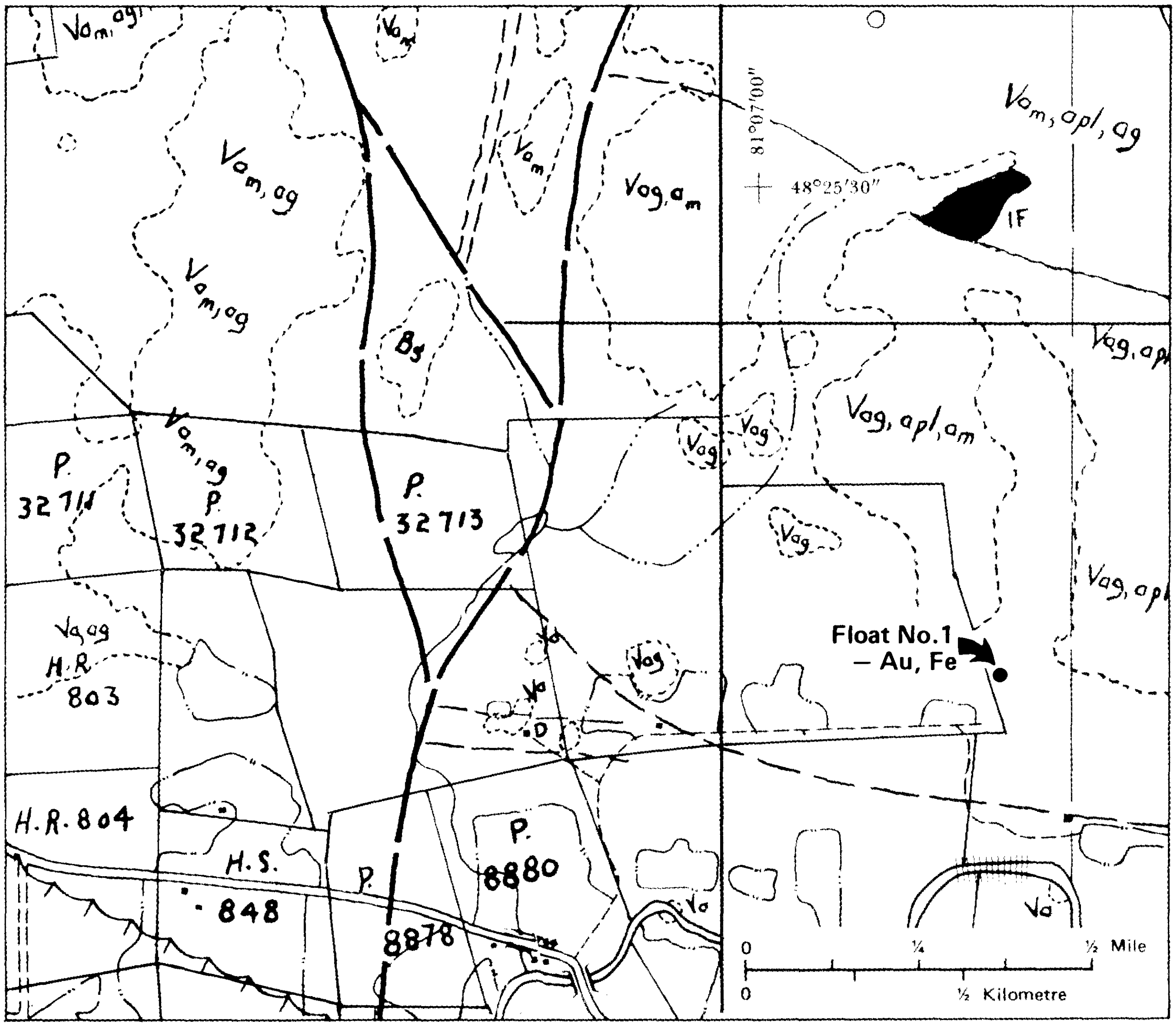
Location: Robb Township (Latitude 48°35', Longitude 81°40'), south side of road at the gate to the Kam Kotia Mine. NTS 42A/12E.

Map Reference: ODM P.694, Robb Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: A small fragment containing copper-zinc sulphide minerals was found in the till.

Remarks: Found by R.G. Skinner, Geological Survey of Canada, 1971.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Shaw Township Float No.1 - [Au,Fe]

Main Metals: Gold, Iron

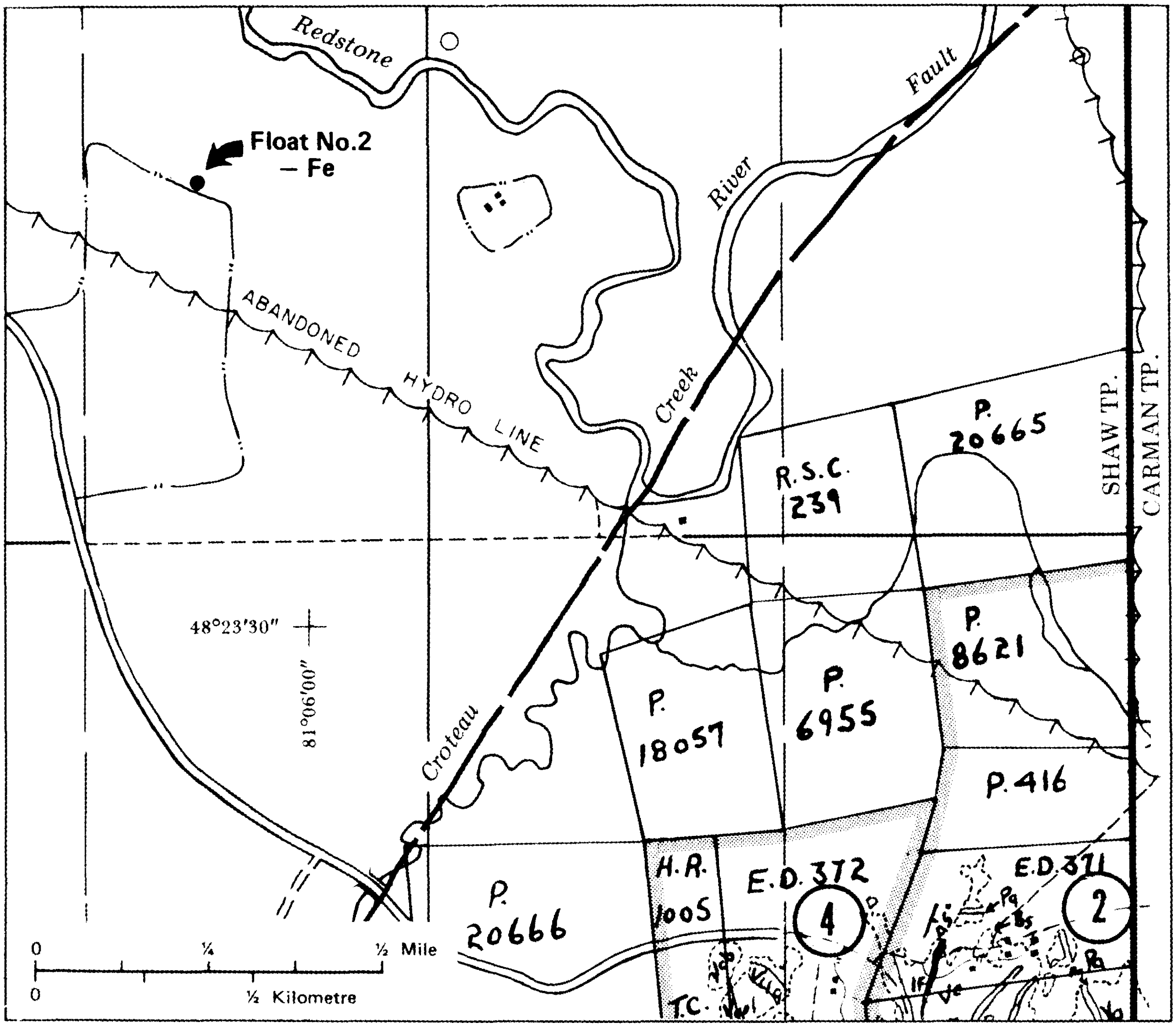
Location: Shaw Township (Latitude 48°25′, Longitude 81°08′), claim P29466. NTS 42A/6E.

Map Reference: ODM Map P.343, Shaw Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: A group of sulphide iron formation boulders are present at this locality and a chip sample of a very large boulder assayed 0.16 ounce of gold per ton.

Remarks: Located and described by E.L. McVeigh, Consulting Geologist, during a geological survey of the Amshaw Porcupine Mines property in 1947.

References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.97, p.8,9.



Cochrane District

Shaw Township Float No.2 - [Fe]

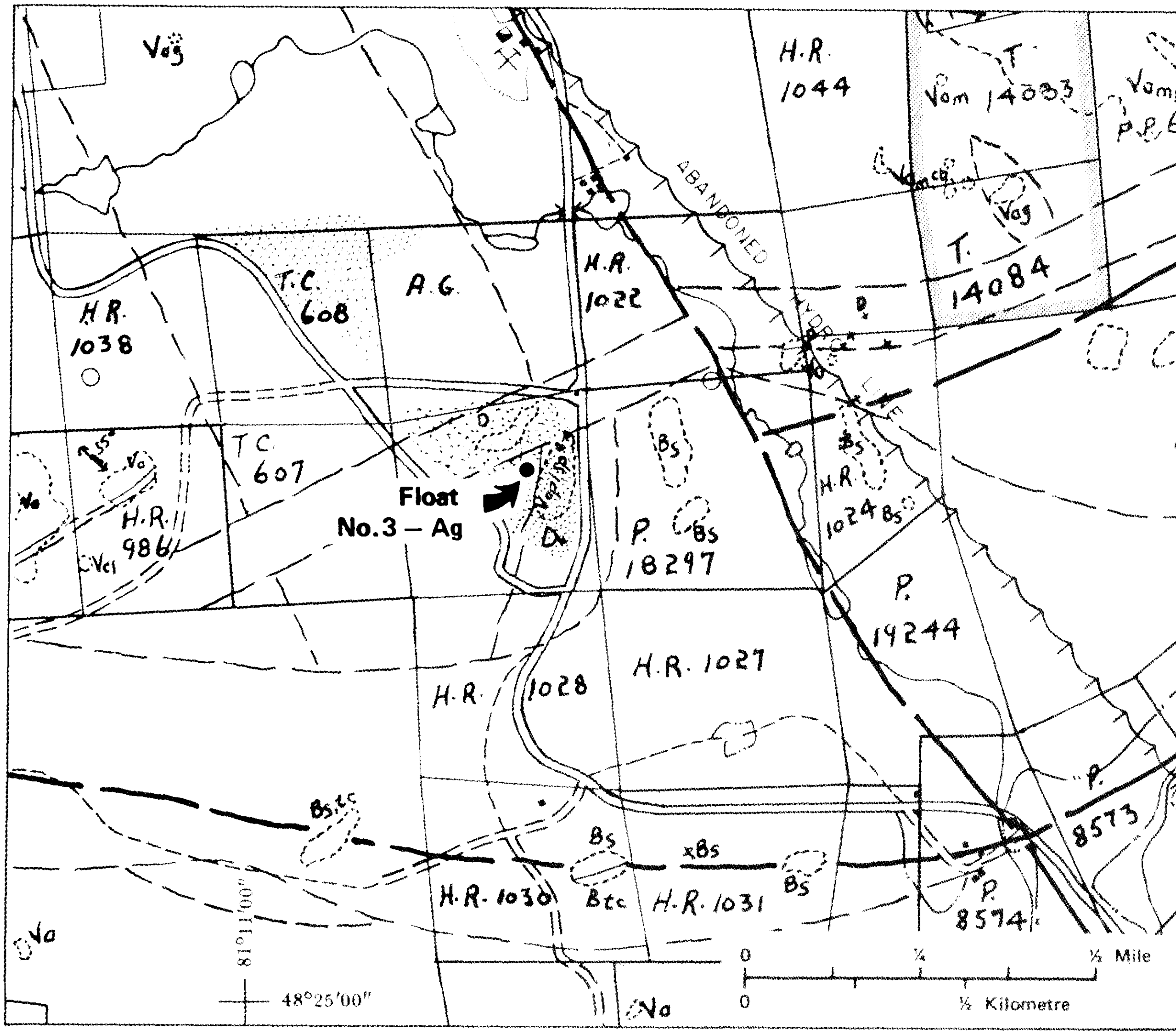
Main Metals: Iron

Location: Shaw Township (Latitude 48°25', Longitude 81°08'), claim P9692. NTS 42A/6E.
Map Reference: ODM Map P.343, Shaw Township. Mineralized float and heavy mineral concentrations in the Timmins area, Figure 1, this report.

Description: Numerous boulders with sulphide mineralization occur near a greenstone outcrop.

Remarks: Located and described by E.L. McVeigh, Consulting Geologist, during a geological survey of the Amshaw Porcupine Mines property in 1947.

Reference: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.97, p.11.



Cochrane District

Shaw Township Float No.3 - [Ag]

Main Metals: Silver

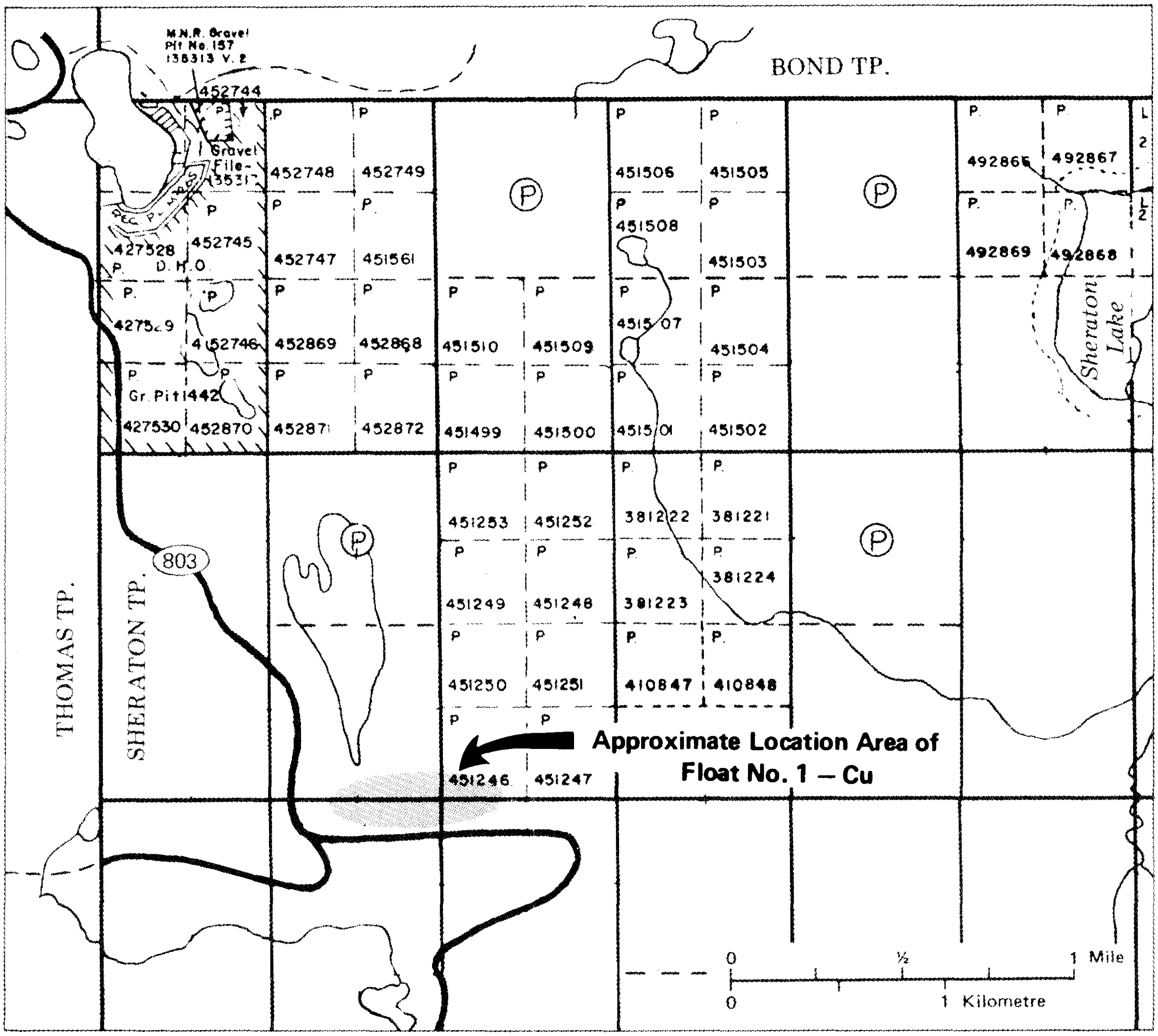
Location: Shaw Township (Latitude 48°25', Longitude 81°08'), claim P18296, Dome Gravel Pit. NTS 42A/6E.

Map Reference: ODM Map P.343, Shaw Township. Mineralized float and heavy mineral concentrations, Figure 1, this report.

Description: A boulder 16 x 8 feet (5 x 2.5 m) of felsic metavolcanics or dacite containing massive and disseminated pyrite and pyrrhotite. Selected samples of massive sulphide mineralization assayed from 7 to 14 ounces of silver to the ton.

Remarks: Boulder located by R.E. Allerston, prospector, mid 1960s.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Sheraton Township Float No.1 - [Cu]

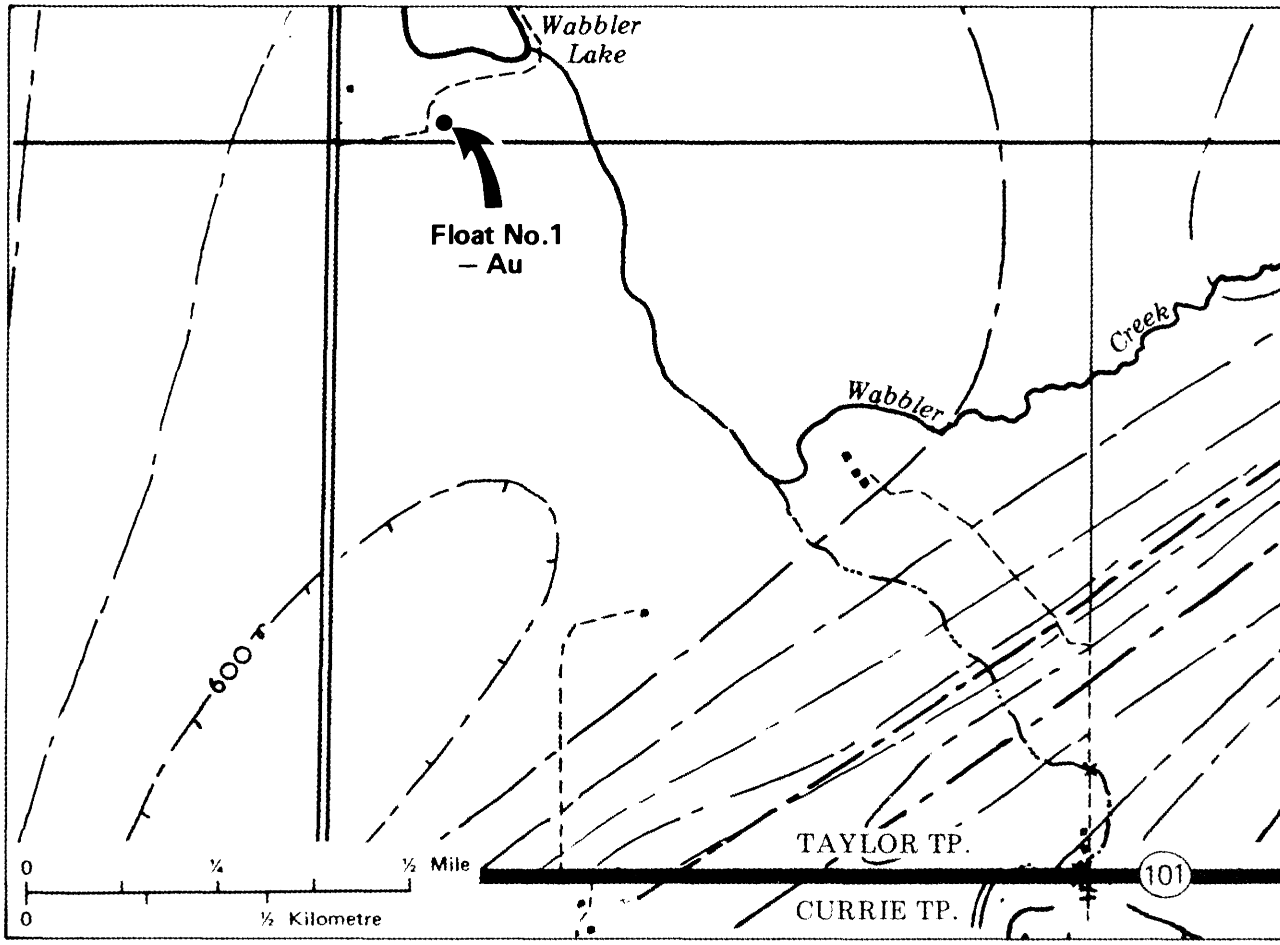
Main Metals: Copper

Location: Sheraton Township (Latitude 48°25′, Longitude 80°44′). NTS 42A/7.
Map Reference: OMNR Claim Map M386, Sheraton Township.

Description: An angular fragment of chloritized rhyolite 6 inches (15 cm) wide and 2 inches (5 cm) thick contained disseminated chalcopyrite and quartz stringers containing chalcopyrite. An assay for copper ran 0.5 percent.

Remarks: Located by a prospector who brought it to A. Skrecky, McIntyre Porcupine Mines Limited, who assayed and described it.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Taylor Township Float No.1 - [Au]

Main Metals: Gold

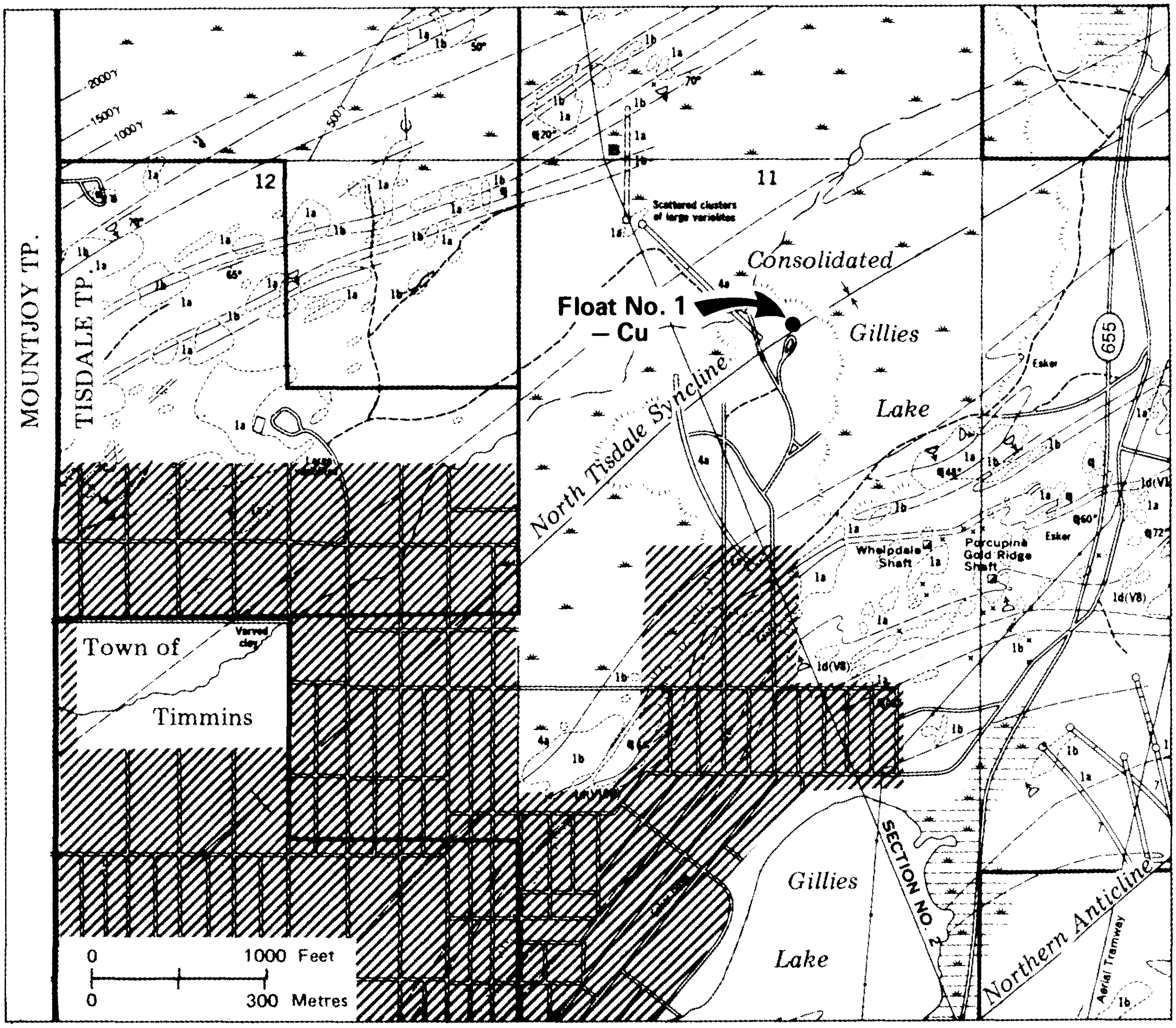
Location: Taylor Township (Latitude 48°35′, Longitude 80°36′), lot 8, concession II, a farm on the east side of the road leading from Highway 101 to Val Gagne and south of Wabbler Lake. The float is in the bush and is located 800 feet (240 m) east of the road and 40 feet (12 m) north of the bush road. NTS 42A/10E.

Map Reference: ODM Map P.39, Taylor Township.

Description: A subangular, rusty boulder 4½ x 3½ x 2½ feet (1.4 x 1.0 x 0.7 m) is partly buried in sand and consists of quartz-carbonate stringers in a chlorite-carbonate schist. Assays from channel grab samples show from 0.17 to 3.5 ounces of gold per ton and the schist contained 14 percent MgO. Another piece of float was reported to exist about 100 feet (30 m) farther to the east but has now been removed.

Remarks: Two packsack drill holes have been drilled through the boulder and the core contained visible gold. The float was known to exist *circa* 1940 and was brought to the attention of the staff of Hollinger Mines Limited *circa* 1960. The farm is owned by Louis Lachapelle and permission must be obtained to visit the locality.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1973.

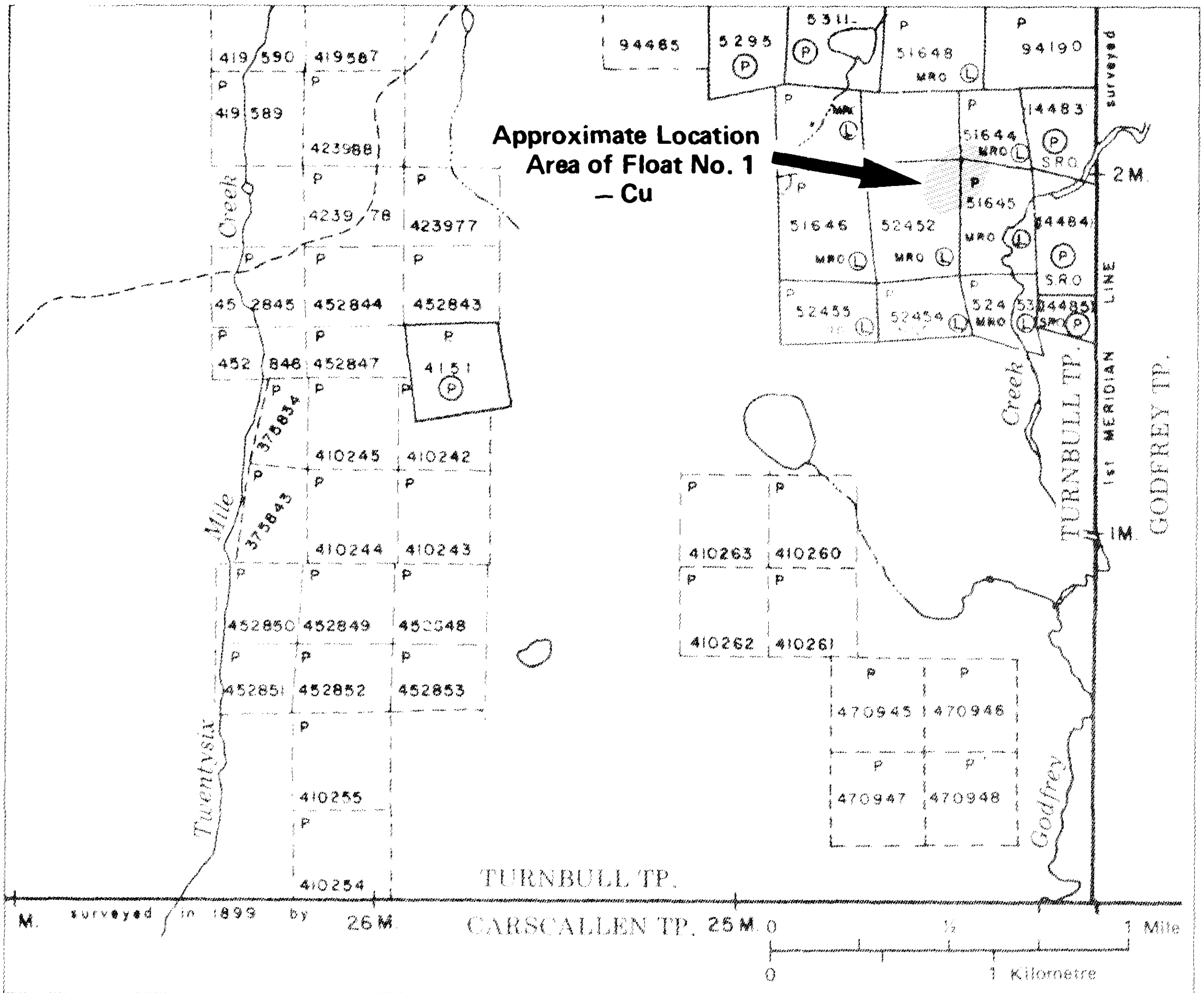


Cochrane District

Tisdale Township Float No.1 - [Cu]

Main Metals: Copper
Location: Tisdale Township (Latitude 48°30′, Longitude 81°16′), north half of lot 12, concession III, north slope of the hill north of the television station. NTS 42A/6W. Map Reference: ODM Map 2075, Tisdale Township, shows the general area but the float location is not shown.

Description: A subangular to rounded large pebble of siliceous rock contained blebs of chalcopyrite found resting near the edge of an outcrop area of andesite flows covered by scattered ground moraine.
Remarks: Found *circa* 1969 by C.D. Egerton, formerly Mining Recorder, Timmins.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Turnbull Township Float No.1 - [Cu]

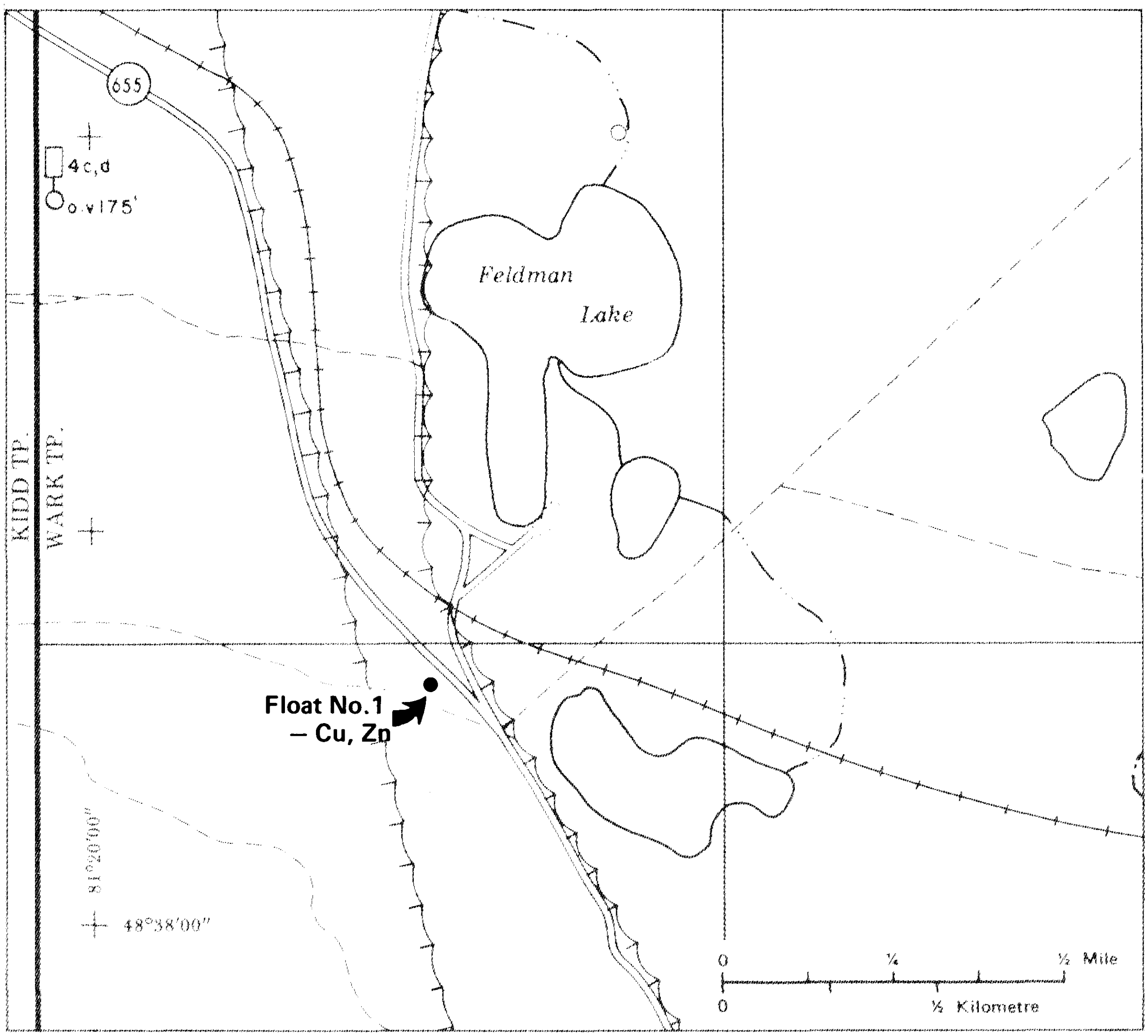
Main Metals: Copper

Location: Turnbull Township (Latitude 48° 30′, Longitude 81°40′). NTS 42A/5E and 42A/12E.
Map Reference: OMNR Claim Map M316, Turnbull Township.

Description: Several clusters of boulders are present with the largest 18 feet (5.5 m) by 2 feet (0.6 m) and others of fist size. Some of the boulders are gabbro with others being felsic metavolcanics, both types contain stringers of disseminated and massive sulphides containing chalcopyrite. Selected material assayed up to 4 percent Copper.

Remarks: A claim group was held in this vicinity by Kennco *circa* 1950, and a source of the boulders was found from 60 to 300 feet (18-91 m) to the north. This float was rediscovered by prospectors J. Larch and F. Rousseau in the early 1960s.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.

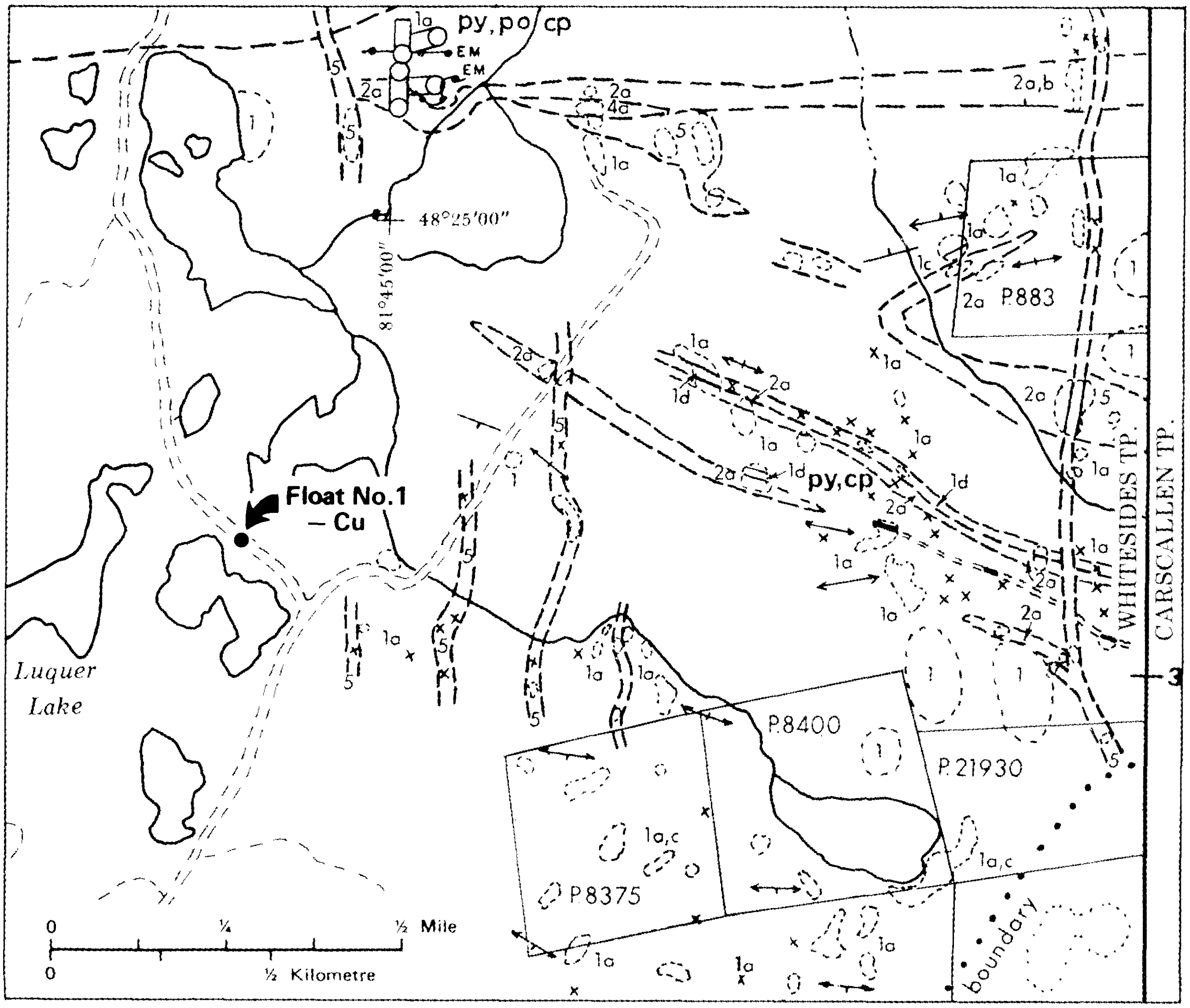


Cochrane District

Wark Township Float No.1 - [Cu,Zn]

Main Metals: Copper, Zinc
Location: Wark Township (Latitude 48°40', Longitude 81°16'), in an old gravel pit on the west side of Highway 655 at Feldman Lake. NTS 42A/11E, 42A/11W.
Map Reference: ODM Map P.478, Wark Township.

Description: A rhyolite boulder 1½ to 2 feet (0.45-0.6 m) in diameter containing disseminated to massive sphalerite and chalcopyrite was found in the wall of the gravel pit.
Remarks: Found by staff Texasgulf Inc. Boulder is no longer in place.
Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Whitesides Township Float No.1 - [Cu]

Main Metals: Copper

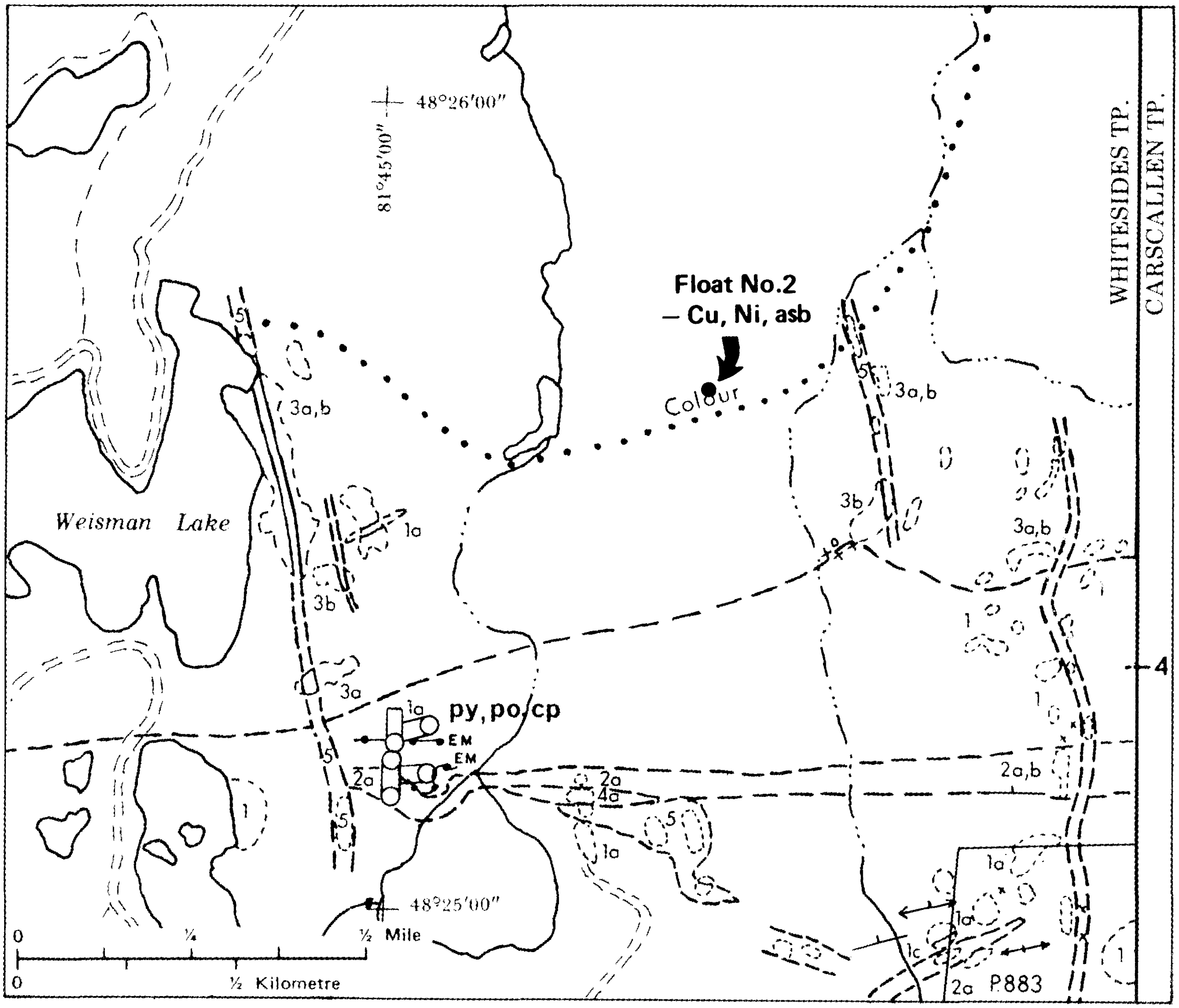
Location: Whitesides Township (Latitude 48°25′, Longitude 81°47′), on the road between two small lakes. NTS 42A/5W.

Map Reference: ODM Map P.488, Whitesides Township.

Description: A subrounded cobble (fist size) of granular rhyolite or aplite contained disseminated chalcopyrite.

Remarks: Found and collected by E.G. Bright, *circa* 1970.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Whitesides Township Float No.2 - [Cu,Ni,asb]

Main Commodities: Copper, Nickel, Asbestos

Location: Whitesides Township (Latitude 48°25', Longitude 81°47'), mainly but also partly in Turnbull and Carscallen Townships. NTS 42A/5W.

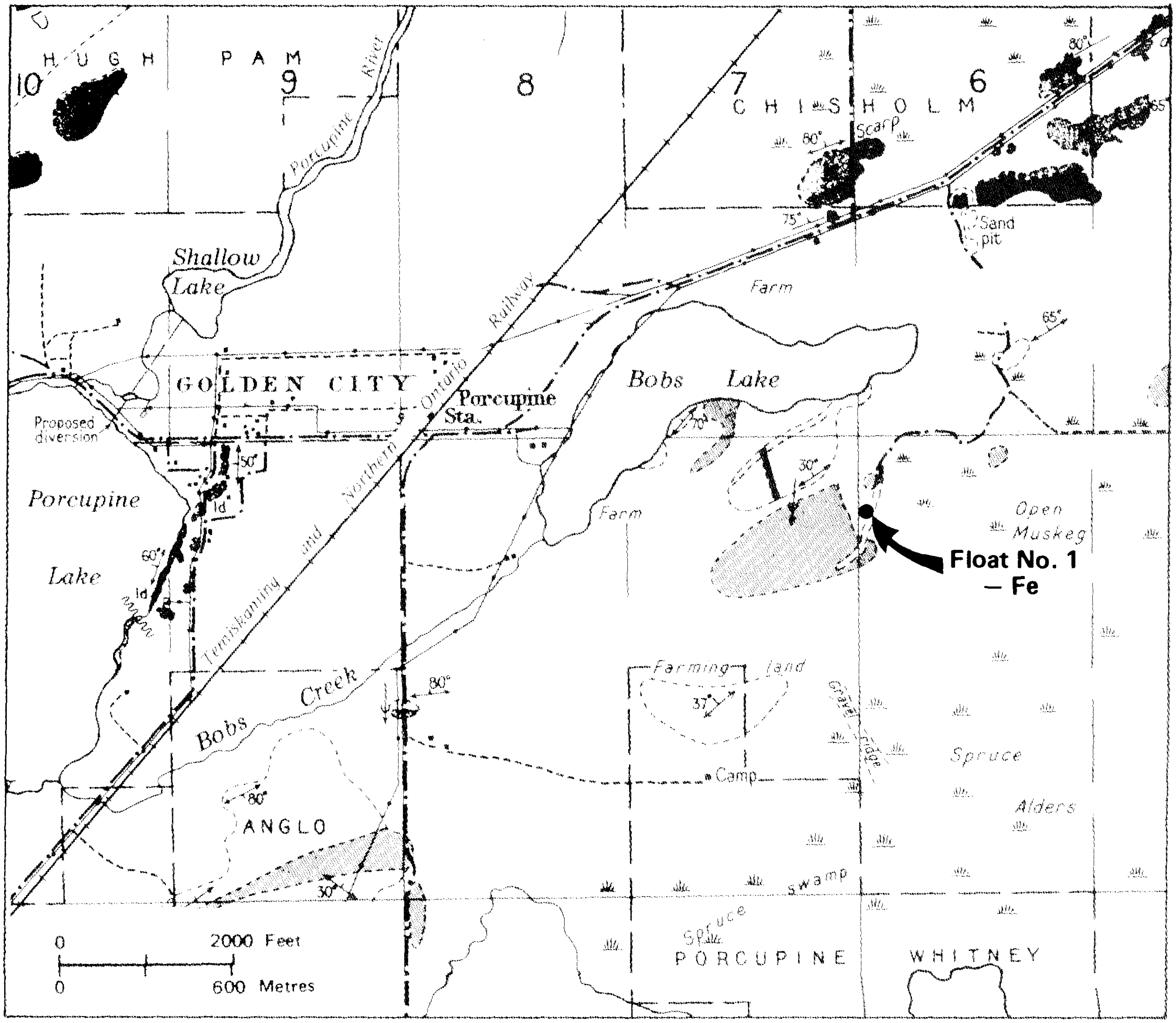
Map Reference: ODM Map P.488, Whitesides Township.

Description: A small train of altered gabbro boulders containing pyrrhotite and chalcopyrite, and cross-fibre asbestos veinlets up to ½ inch (1.0 cm) in width.

Bedrock Source: Outcrop of gabbro containing pyrrhotite, chalcopyrite, and asbestos veinlets in the northwest corner of Carscallen Township located 1.3 miles (2 km) to the northeast from the float.

Remarks: Found by C.D. MacKenzie, Hollinger Mines Limited, *circa* 1960.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Cochrane District

Whitney Township Float No.1 - [Fe]

Main Metals: Iron

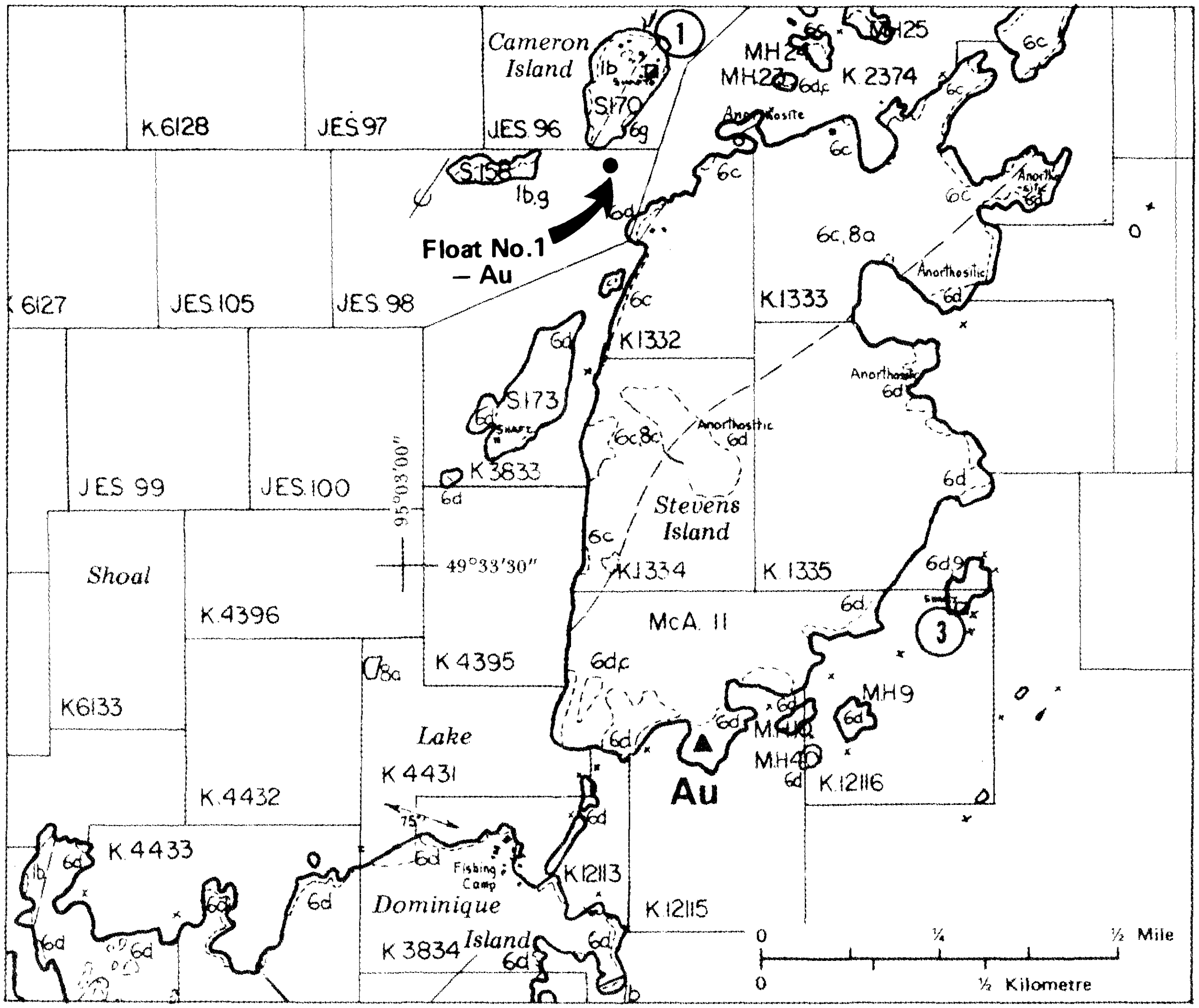
Location: Whitney Township (Latitude 48°30′, Longitude 81°08′), lot 6, concession III, about 1,500 feet (460 m) southeast of Bobs Lake. NTS 42A/11E and 42A/6E. Map Reference: ODM Map 47a, Porcupine Area.

Description: Six pieces of float, each at least 3 feet (0.9 m) in diameter, are present in a gravel pit and consist of siliceous iron formation with lenses of massive pyrrhotite, pyrite, and a little magnetite.

Bedrock Source: The probable area is a band of iron formation near the south shore of Bobs Lake about 1,200 feet (365 m) to the northwest.

Remarks: Found by C.D. MacKenzie, Hollinger Mines Limited.

Reference: C.D. MacKenzie, personal communication, 1972.



Kenora District

Snowshoe Bay Area Float No.1 - [Au]

Main Metals: Gold

Location: Shoal Lake, Cameron Island (Latitude 49° 34′, Longitude 95° 03′), at the extreme south end of the island at water's edge. NTS 52E/11E.

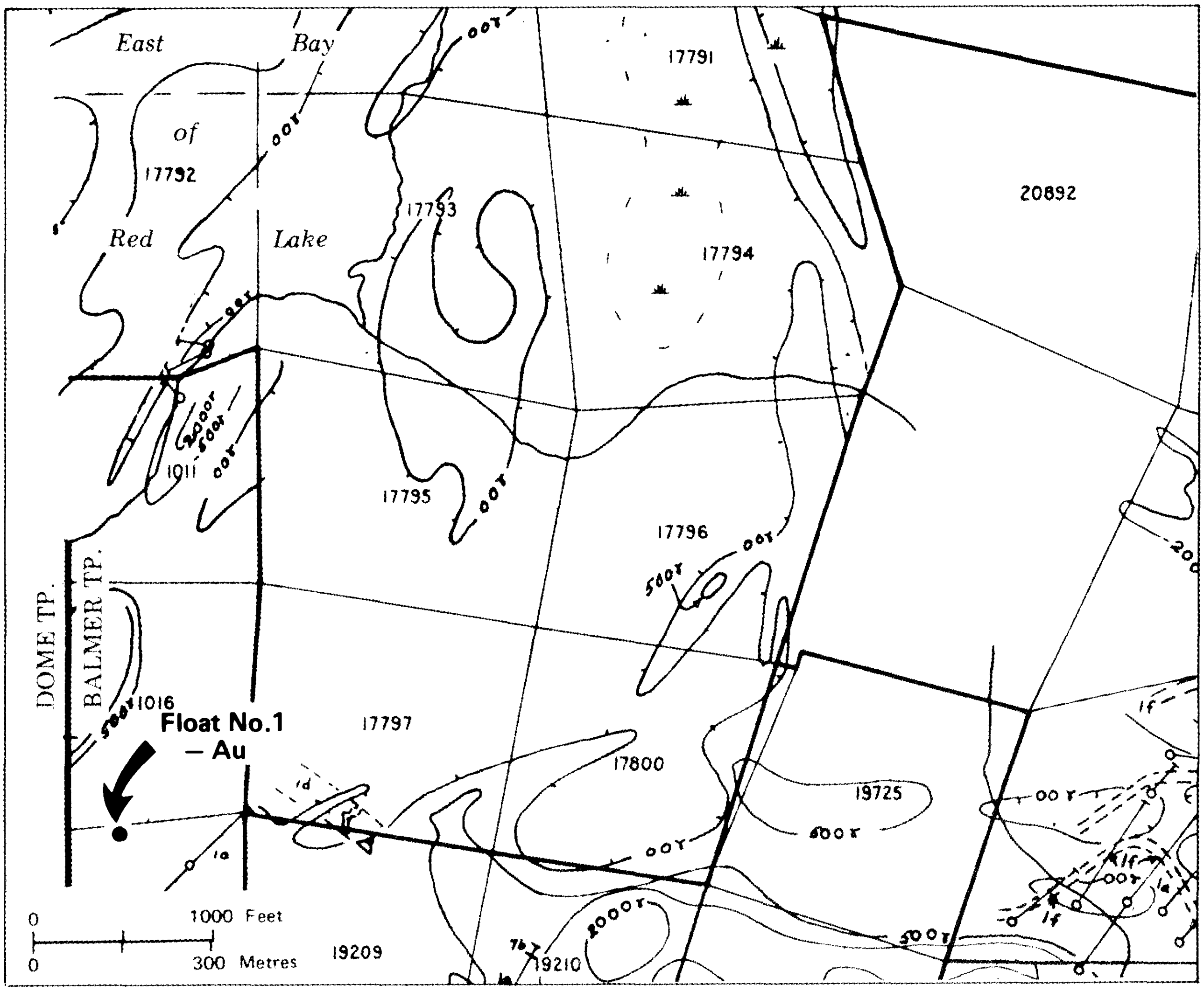
Map Reference: ODM Map P.527, North Shoal Lake Area, West Sheet. OMNR Claim Map M2704, Snowshoe Bay Area.

Description: High grade gold-bearing float consisting of bands of fine-grained arsenopyrite associated with sericite and apple-green chrome mica (fuchsite).

Bedrock Source: Drilling under the lake at south end of island outlined a body of gold mineralization up to 140 feet (42 m) in length and 52 feet (16 m) in width.

Remarks: J.G. Cross, of Duport Mining Company Limited, located gold mineralization by diamond drilling a series of 9 holes under the lake during winter of 1933-1934.

References: ODM (1935), Vol.44, pt.4, p.44,47, and Figure 9, p.46; ODM (1936), Vol.45, pt.3, p.47-49.



Kenora District (Patricia Portion)

Balmer Township Float No.1 - [Au]

Main Metals: Gold

Location: Balmer Township (Latitude 51°04′, Longitude 93°41′), about 600 feet (183 m) southeast of the 1 mile post on the west boundary of the township, claim KRL 1019. NTS 52N/4E.

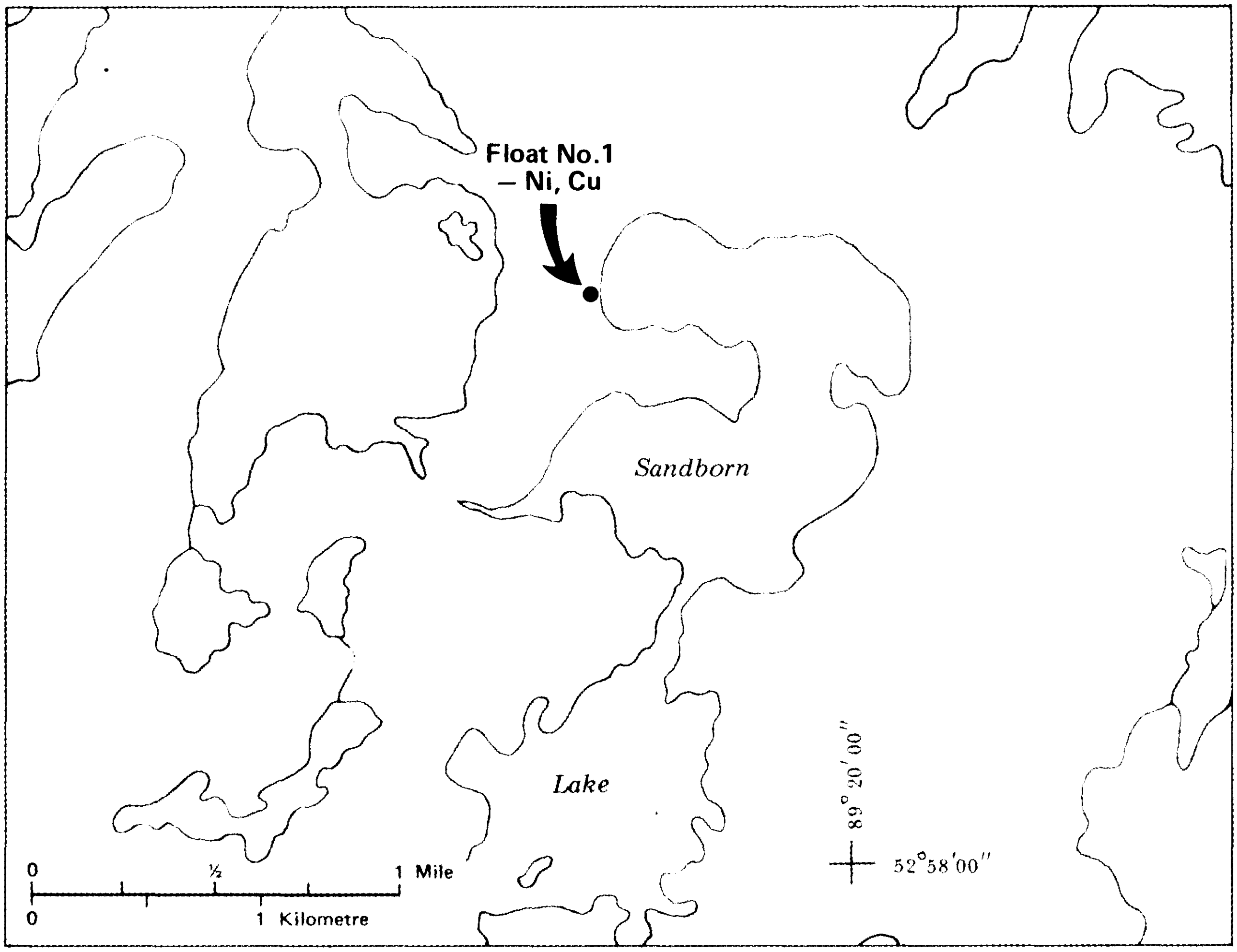
Map Reference: ODM Map P.47, Balmer Township.

Description: A subrounded boulder of basalt contains quartz-carbonate veining, is mineralized with pyrite and assays 0.32 ounces of gold per ton. The float was partly covered and is located in an area of sand and gravel overburden about 100 feet (30 m) in thickness.

Bedrock Source: Unknown

Remarks: Found by William Mills, prospector for Margaret Red Lake Mines Limited, *circa* 1935.

References: Kaymac Gold Mines Limited Property Plan, scale 1 inch to 300 feet by W.P. Corking, 1944 (information from P.C. McLean, geologist, Kaymac Gold Mines Limited, personal communication, 1973).



Kenora District (Patricia Portion)

Chiah Lake Area Float No.1 - [Ni,Cu]

Main Metals: Nickel, Copper

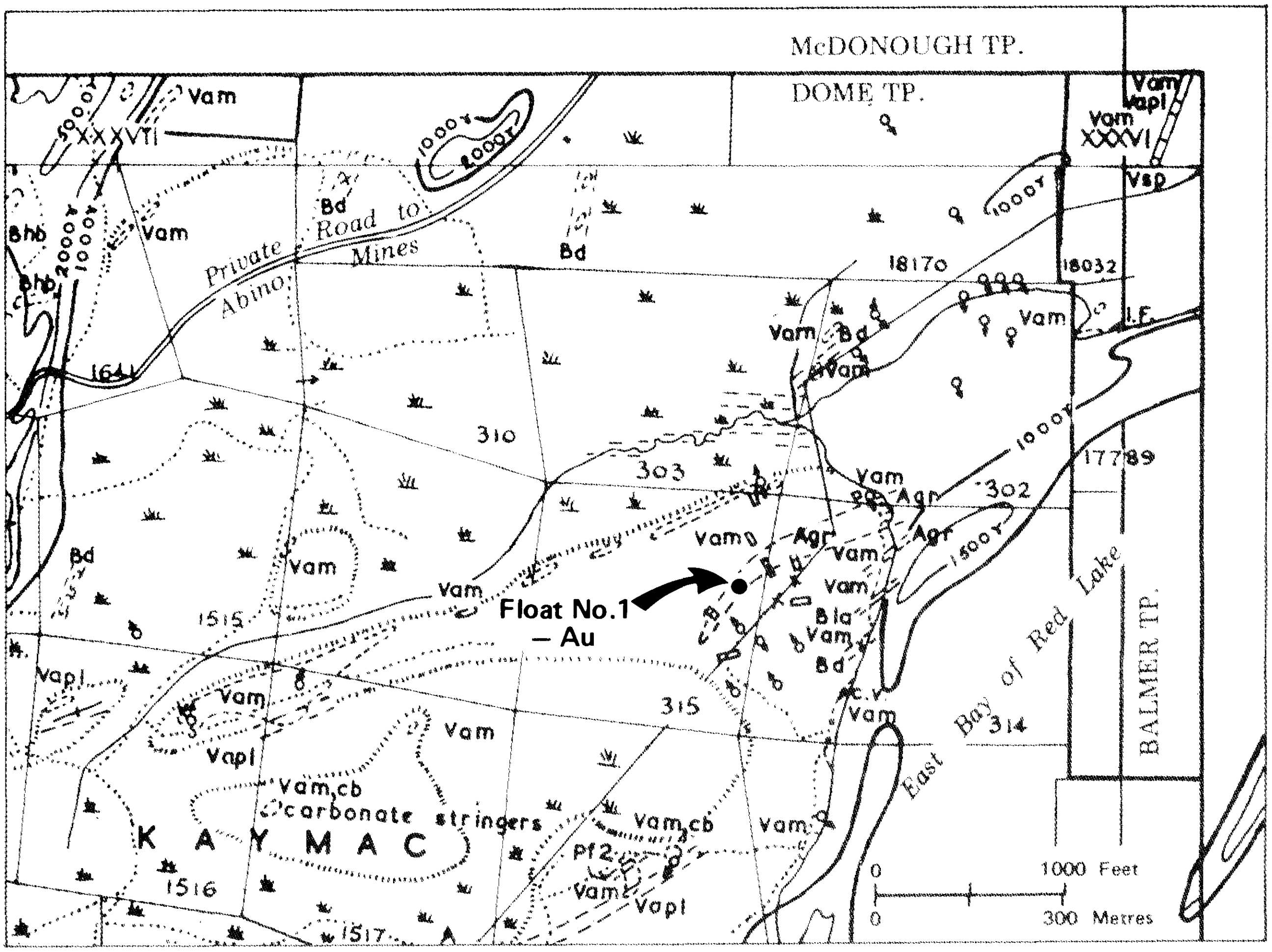
Location: Chiah Lake Area, SE corner of map is Latitude 52°57′, Longitude 89°26′, Sandborn Lake is a northwestern arm of Wunnummin Lake. NTS 53A/14W.
Map Reference: ODM Map 49p, Wunnummin Lake Area.

Description: A piece of float was found which contained nickel and copper.

Bedrock Source: A magnetic anomaly located about 1,000 feet (300 m) north of the presumed location of the boulder may be the bedrock location.

Remarks: The float discovery was made by T. Sandborn, prospector, in 1938, and he made a magnetic survey of the area adjacent to the northwest part of Sandborn Lake. This area was drilled by The Mining Corporation of Canada Limited during the winter of 1938-1939. The same area was drilled by the Canadian Nickel Company Limited in 1972.

References: ODM Rept. 1940, Vol.49, pt.8, p.10, Assessment Files Research Office, Geological Branch, Division of Mines, Toronto, Chiah Lake Area, Drilling Rept. 10.



Kenora District (Patricia Portion)

Dome Township Float No.1 - [Au]

Main Metals: Gold

Location: Dome Township (Latitude 51°04′, Longitude 93°51′), about 800 feet (240 m) west of the shore of East Bay, Kaymac Gold Mines Limited Property, claim KRL 315, about 500 feet (152 m) south of No. 1 post and 200 feet (61 m) west of the claim line. NTS 52N/4W.

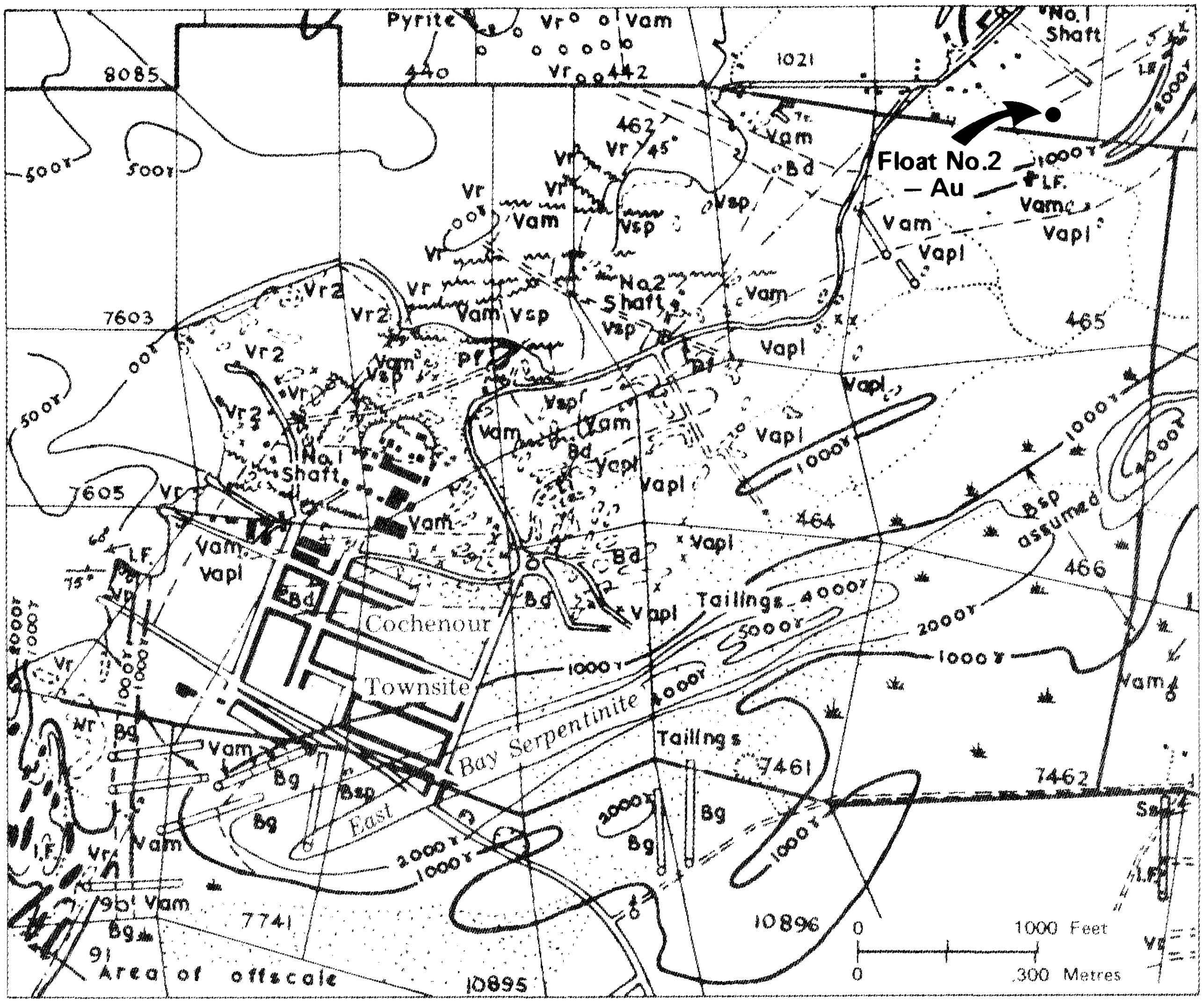
Map Reference: ODM Map P.125, Dome Township.

Description: A rusty, angular slab of sheared medium-grained granite is about 1 foot (0.3 m) by 8 inches (0.2 m) by 4 inches (0.1 m) in size. The rock contains bands of arsenopyrite up to ¼ inch (0.6 cm) in width and assays 0.5 ounces of gold per ton. This float has been broken and part of it removed.

Bedrock Source: The underlying bedrock is of a similar type and presumably the boulder is close to the source area.

Remarks: Found and described by Paul C. McLean, geologist, Kaymac Gold Mines Limited.

Reference: Float location from company map of Kaymac Gold Mines Limited Property, scale 1 inch to 300 feet, by W.P. Corking, 1944 (information from P.C. McLean, geologist, personal communication, 1973).



Kenora District (Patricia Portion)

Dome Township Float No.2 - [Au]

Main Metals: Gold

Location: Dome Township (Latitude 51°04′, Longitude 93°51′), about 800 feet (240 m) southeast of Marboy No.1 shaft, Marboy property, claim KRL 1022, about 300 feet (91 m) west of No.2 post and 200 feet (61 m) north of the claim line. NTS 52N/4W.

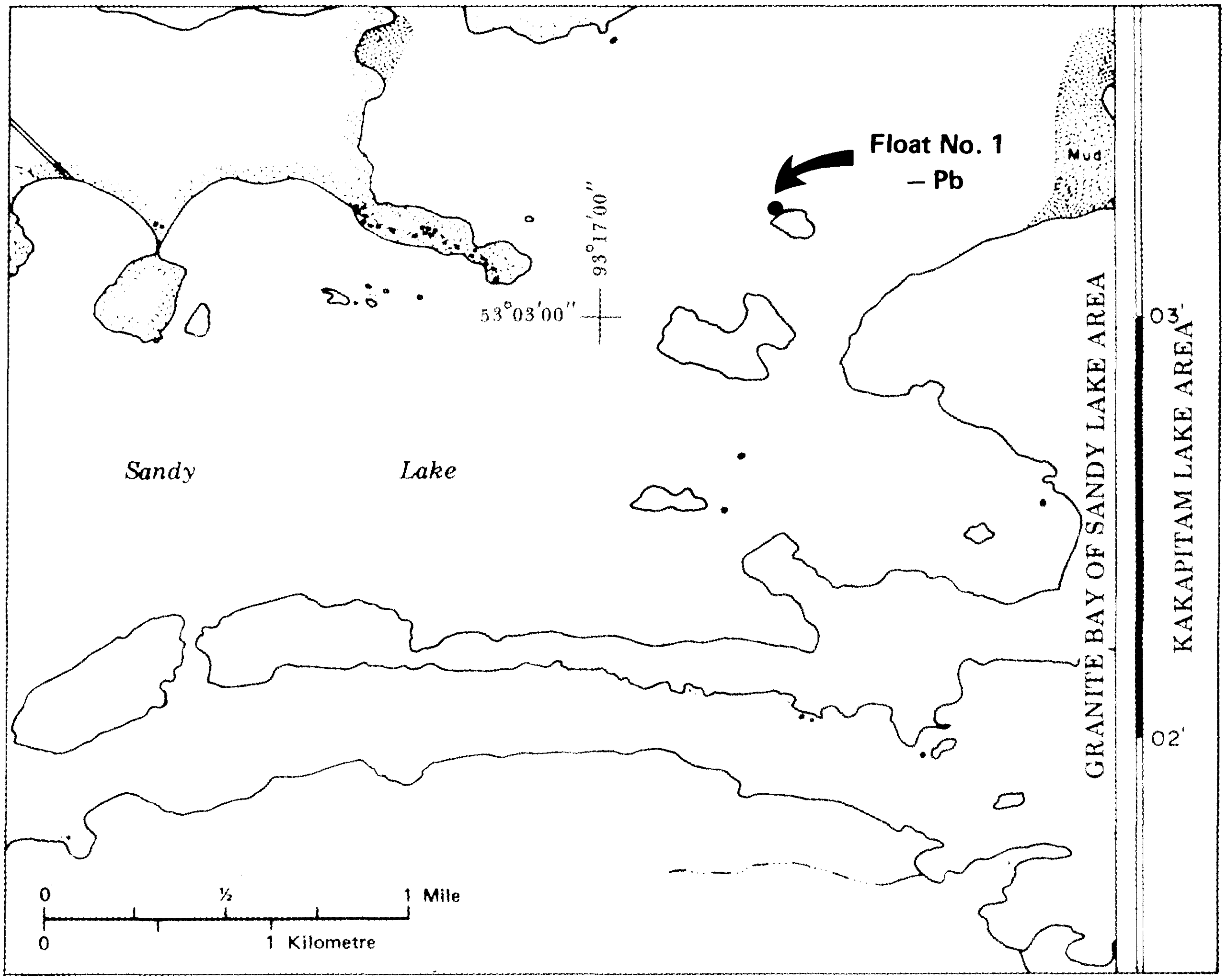
Map Reference: ODM Map P.125, Dome Township.

Description: The float is a subrounded boulder of quartz-carbonate of McMarmac (Marboy) ore type and is about 6 feet (1.8 m) in diameter. The boulder is still in place.

Bedrock Source: This rock type occurs about 800 feet (240 m) to the north of Marboy No.1 shaft.

Remarks: Found and described by Paul C. McLean in late 1930s or early 1940s.

Reference: P.C. McLean, geologist, Kaymac Gold Mines Limited, personal communication, 1973.



Kenora District (Patricia Portion)

Granite Bay of Sandy Lake Area Float No.1 - [Pb]

Main Metals: Lead

Location: Sandy Lake Area, SE corner of claim map is Latitude 53°05', Longitude 93°20'. An island in Sandy Lake, 2½ miles (4 km) east of Bernadette Mission and southwest of the mouth of the Stain River. NTS 53F/3W.

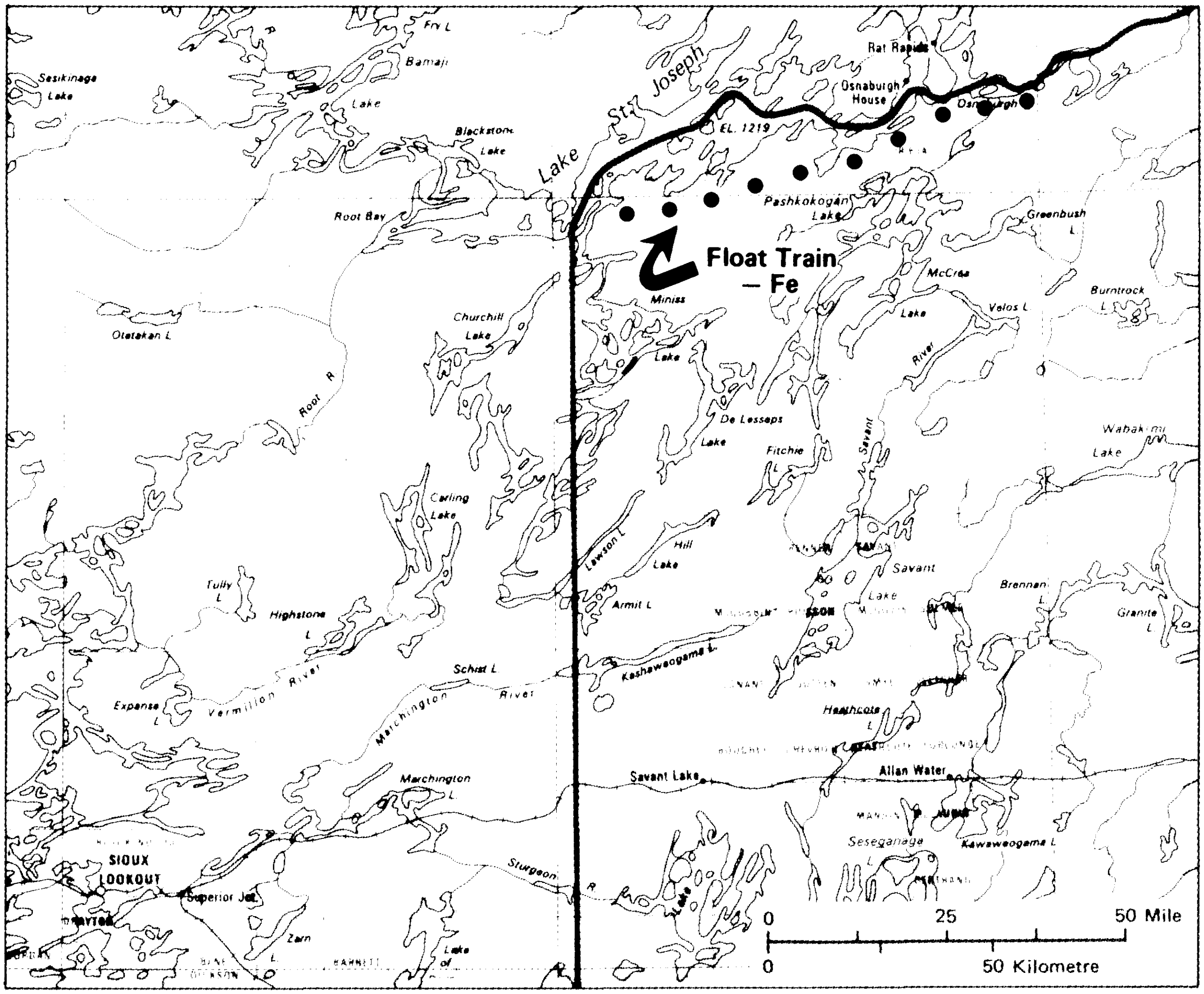
Map Reference: OMNR Claim Map M3018, Granite Bay of Sandy Lake.

Description: Galena-sphalerite float can be seen along the shores of a small island.

Bedrock Source: Dacite porphyry and 'greenstone' outcrop on the island and galena can be seen in several places. On the north side of the island there are lenses of rusty, sugary quartz containing pyrite and blebs of galena. A picked sample of quartz containing galena assayed 0.03 ounces of gold per ton.

Remarks: Dubeau galena Showing described by Jack Satterly, Senior Geologist, Ontario Department of Mines, 1937.

Reference: ODM Rept. 1938, Vol.47, pt.7, p.41.



Kenora District (Patricia Portion)
and Thunder Bay District

Lake St. Joseph Float Train - [Fe]

Main Metals: Iron

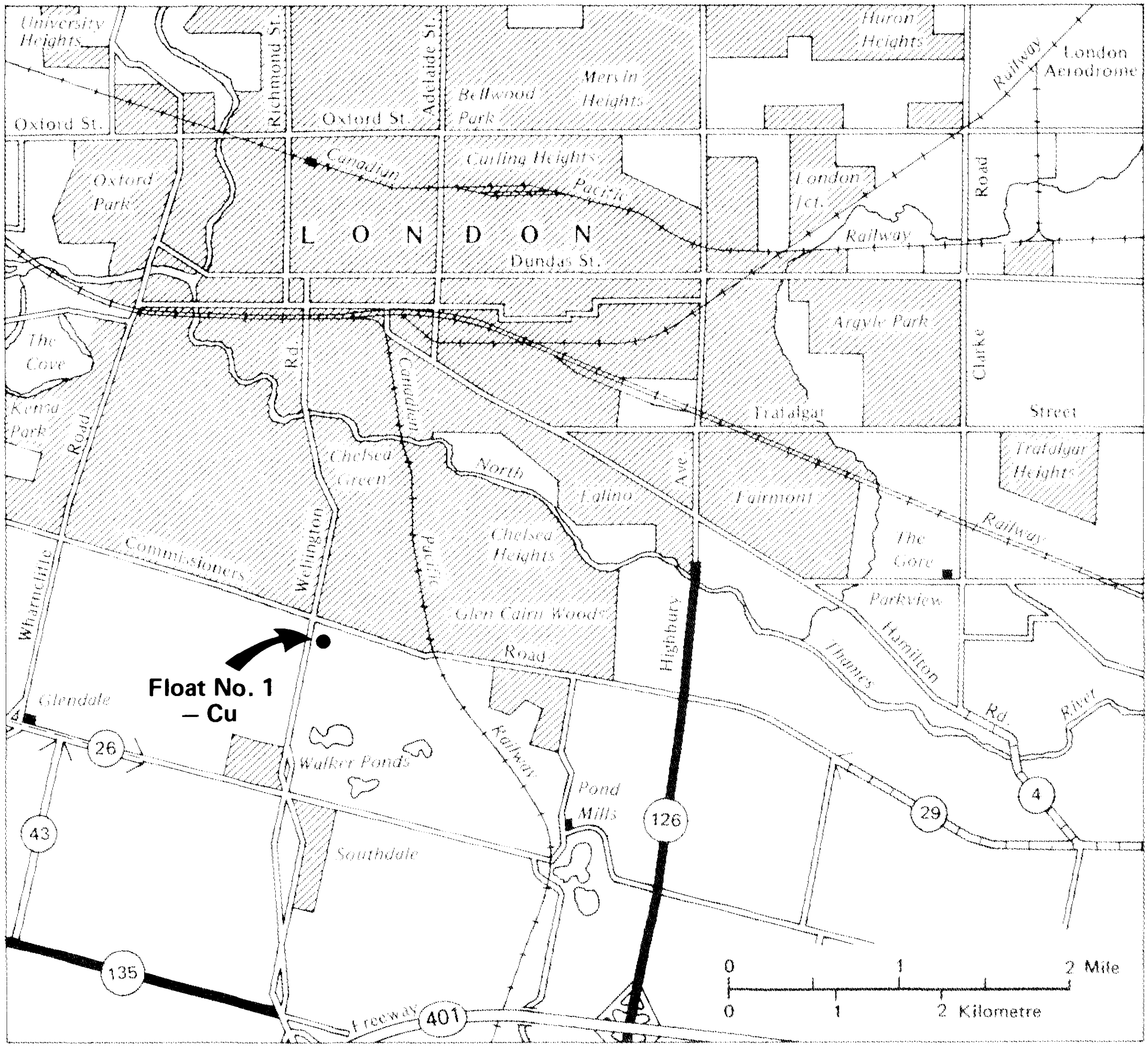
Location: Lake St. Joseph (Latitude 51°05′, Longitude 90°35′). Over a length of 30 miles (48 km) there are pieces of float widely scattered along the shores and islands of Lake St. Joseph. NTS 52J/15, 52J/16, 52O/1, and 52O/2.

Map Reference: ODMNA Map 2199, Ontario Geological Map, West Central Sheet.

Description: Boulders of massive bedded oolitic hematite are widely scattered throughout the area. The largest boulders are 3 feet (0.9 m) by 2 feet (0.6 m) by 1 foot (0.3 m) in thickness but there are many fragments of smaller sizes. Presumably these pieces of float are of Paleozoic age.

Bedrock Source: The nearest known Paleozoic outcrops are 160 miles (256 km) to the northeast.

Reference: R.P. Sage, Geologist, Precambrian Geology Section, Geological Branch, personal communication.



Middlesex County

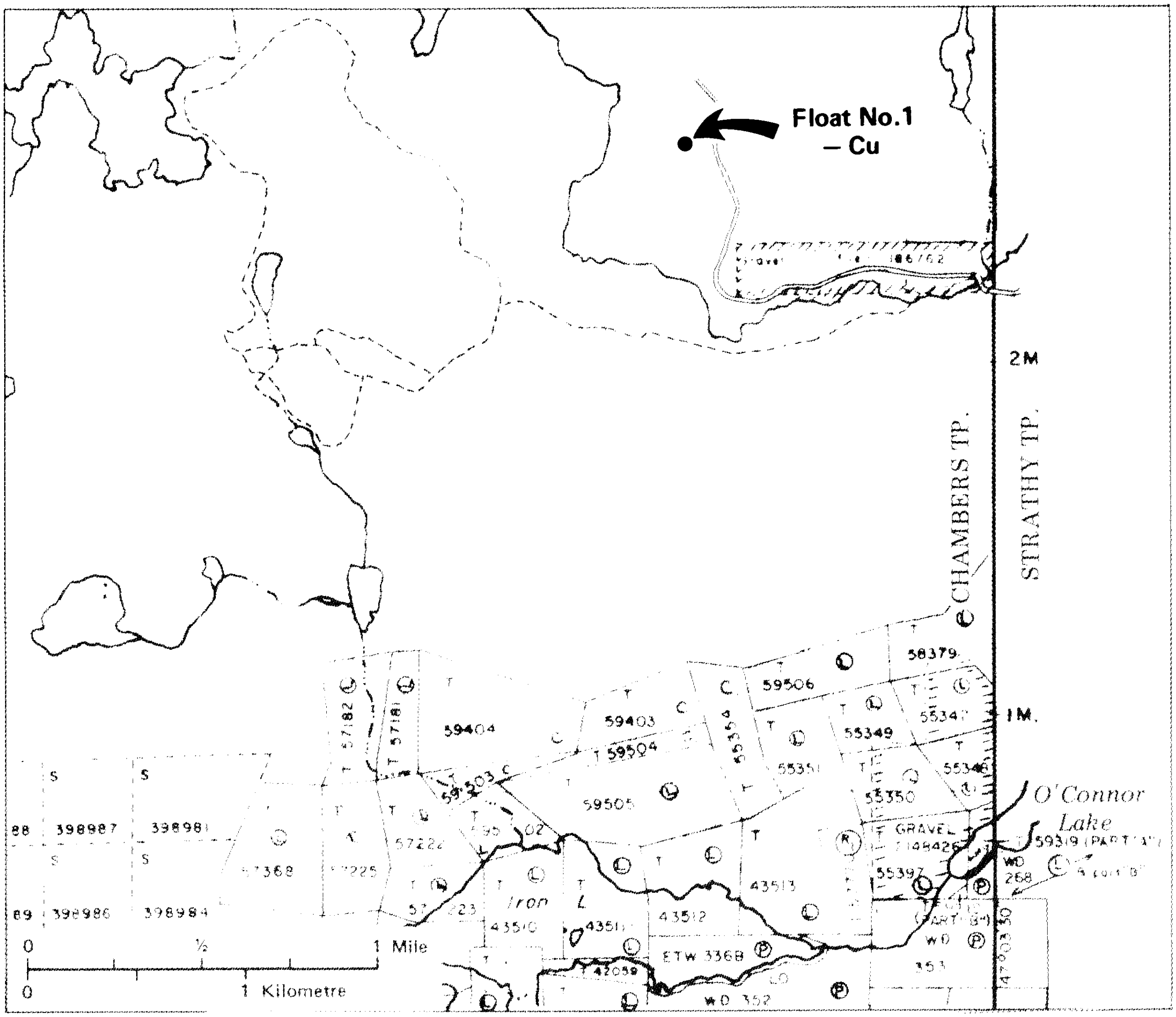
London Township Float No.1 - [Cu]

Main Metals: Copper

Location: City of London (Latitude 42°59′, Longitude 81°14′). Westminster Hospital Excavation at the corner of Commissioners Road and Wellington Street. NTS 40I/14E. Map Reference: Ontario Ministry of Transportation and Communications Middlesex County (East Portion), Rev. June 1973.

Description: A cobble of Precambrian igneous rock containing some native copper was found in the Catfish Creek Till of the Ingersoll Moraine.

References: CIM Bull. 1958, Vol.51, No.550, p.73, A. Dreimanis, Professor, Department of Geology, University of Western Ontario, personal communication, 1972.



Nipissing District

Chambers Township Float No.1 - [Cu]

Main Metals: Copper

Location: Chambers Township (Latitude 47° 07′, Longitude 79° 57′), is located about 3 miles (4.8 km) northwest of the northeast arm of Lake Temagami. The mineralized boulder was found on claim L317861 held by R.J. Wright. NTS 31M/4W.

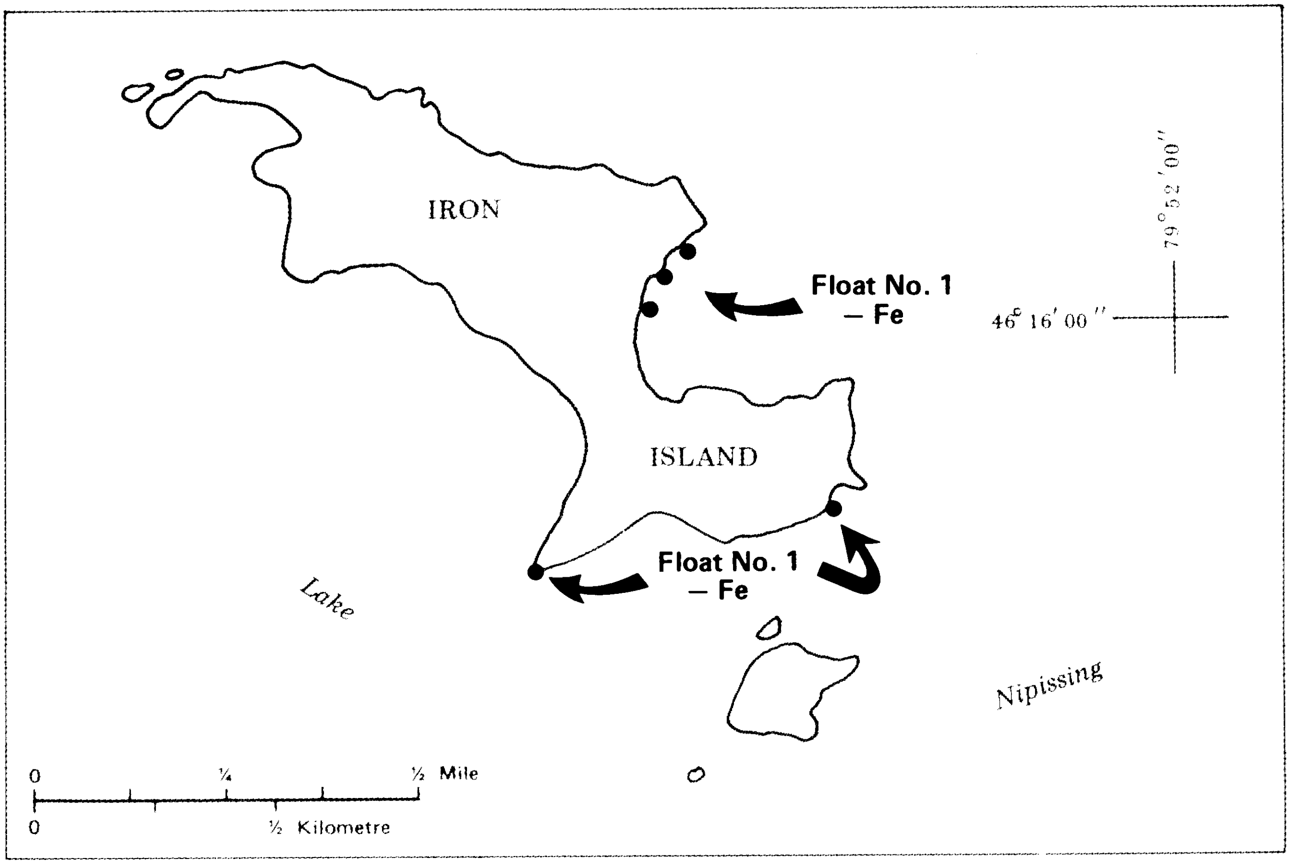
Map Reference: OMNR Claim Map M447, Chambers Township.

Description: A fist-sized piece of bornite that was found during prospecting activities and is no longer in place.

Bedrock Source: Unknown

Remarks: Found by Mr. Parsons, *circa* 1971, prospector, for Copperfields Mining Corporation Limited and the float is no longer in place.

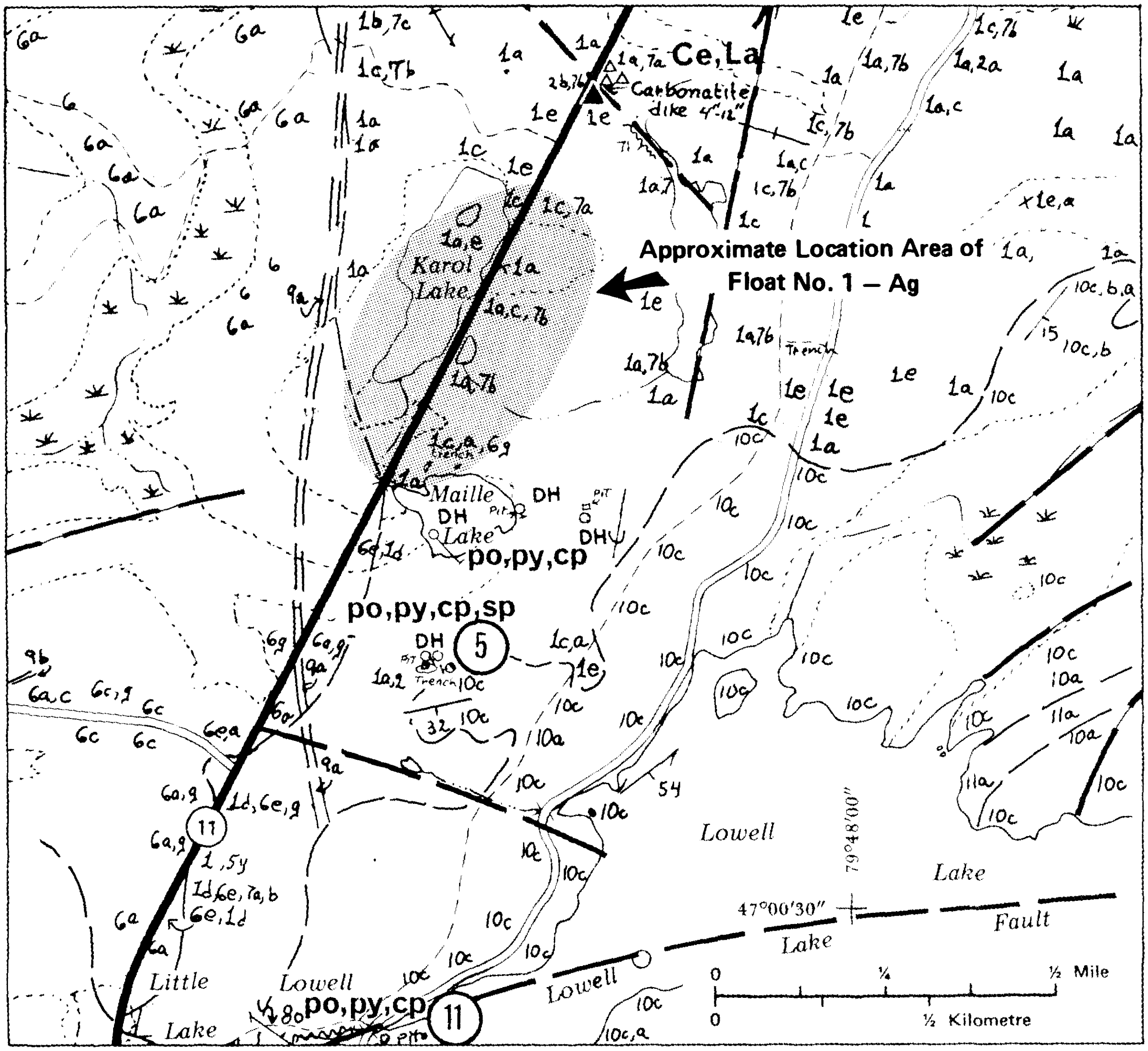
Reference: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 2.726, page 3.



Nipissing District

Iron Island Float No.1 - [Fe]

Main Metals: Iron
Location: Iron Island, Lake Nipissing (Latitude 46°16′, Longitude 79°53′), beach at the east end of the island and at the southwestern tip. NTS 31L/5W.
Map Reference: OMNR Claim Map, Plan of Iron Island and part of Lake Nipissing.
Description: The following excerpts are from A. Murray's report for GSC for the year 1854, p.123:
"The beach near the outcrop is strewn with masses (hematite) of all sizes from great boulders weighing several hundred pounds to small rounded pebbles not bigger than marbles."
"At the extreme southwest point of the island the rock is again a crystalline limestone and a long beach running out from it to the westward is perfectly covered with boulders of specular iron ore. Iron ore occurs also at the southeast point of the island although it is not in such great abundance and only in detached masses strewn upon the beach."
Bedrock Source: Iron-titanium oxide minerals are present in all phases of the carbonatite complex, but concentrations of up to 60 percent are in dolomitic carbonatite.
Remarks: Most of the loose iron-bearing material was collected and shipped away before 1899. Work by Nipiron Mines Limited 1952-1953.
References: GSC (1857) Report of progress 1853-1856, p.123; GSC (1897) Ann. Rept., Vol.10, pt.I, p.150; Geological Assoc. of Canada (1949) Proceedings, Vol.1, p.925; ODM GR 94, p.79-81.



Nipissing District

Strathcona Township Float No.1 - [Ag]

Main Metals: Silver

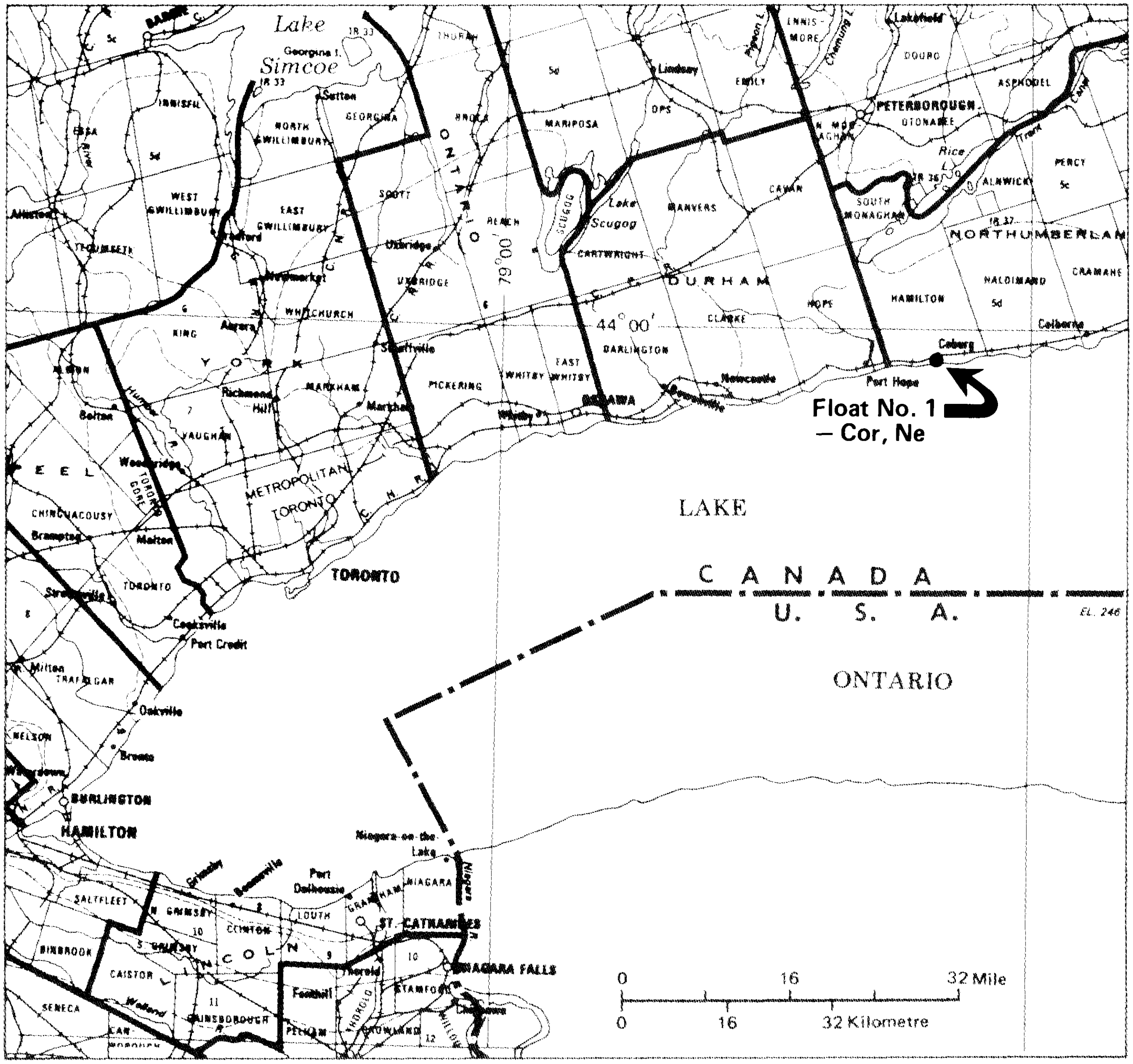
Location: Strathcona Township (Latitude 47°02', Longitude 79°49'), near Karol Lake on the west side of Highway 11. NTS 31M/4W. Map Reference: ODM Map P.596, Strathcona Township.

Description: Silver float.

Bedrock Source: Possibly Cobalt area about 20 miles (32 km) to the north.

Remarks: Found by employees of Zenmac Metal Mines Limited.

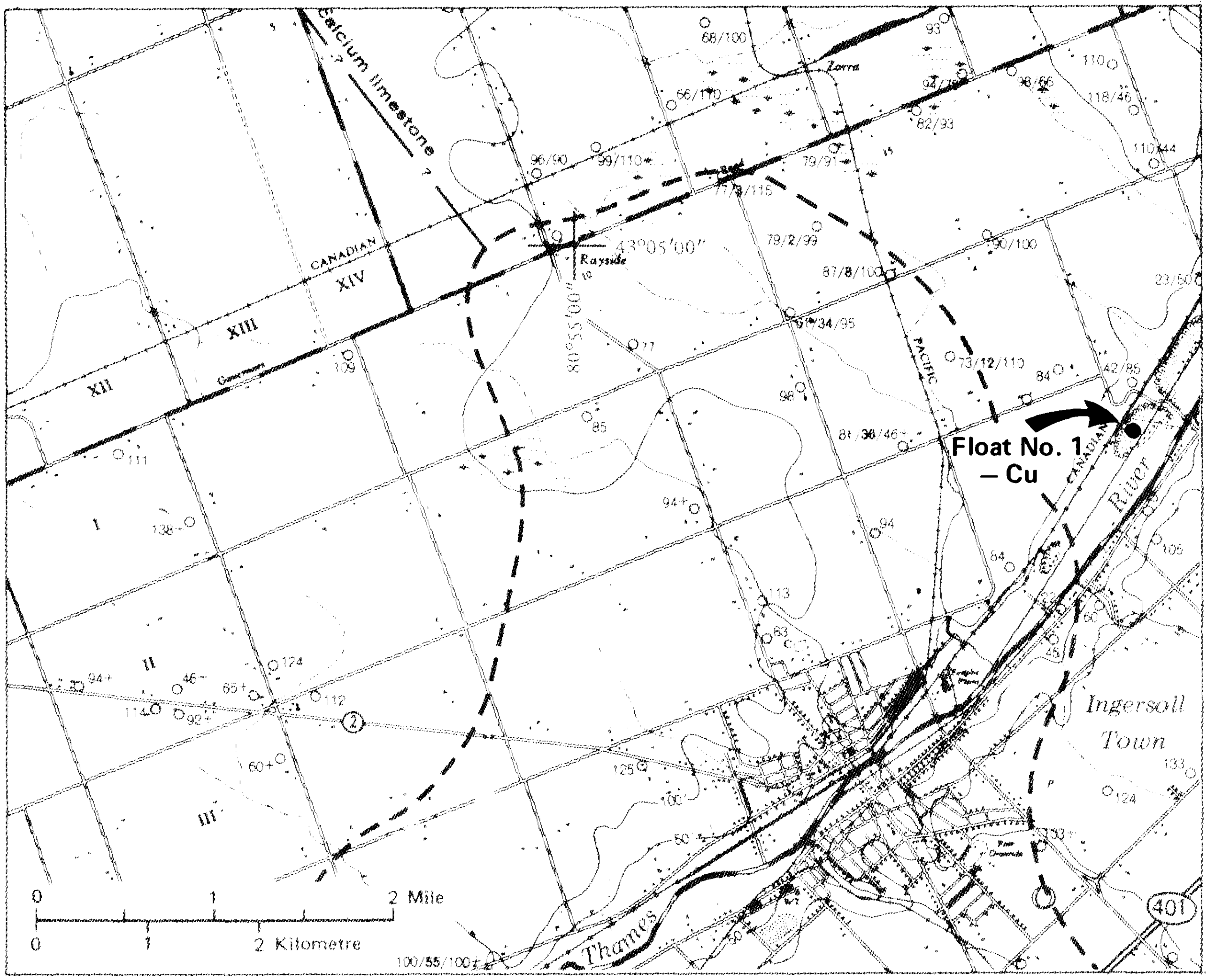
Reference: Robert Thomson, Geologist, Haileybury, personal communication, 1973.



Northumberland County

Hamilton Township Float No.1 - [Cor,Ne]

Main Commodity: Corundum, Nepheline
Location: Hamilton Township (Latitude 44°03′, Longitude 78°13′), north shore of Lake Ontario near Cobourg, NTS 30M/16E. Map Reference: ODM Map 2254, Paleozoic Geology of Southern Ontario.
Description: Some boulders of nepheline syenite contained crystals of corundum.
Bedrock Source: The nearest Precambrian outcrops are 40 miles (64 km) to the north.
Remarks: Found by Professor A.P. Coleman in 1888, and thought to be transported from Dungannon Township (see shaded area on accompanying figure).
Reference: OBM 1899, Vol.8, p.244.



Oxford County

North Oxford Township Float No.1 - [Cu]

Main Metals: Copper

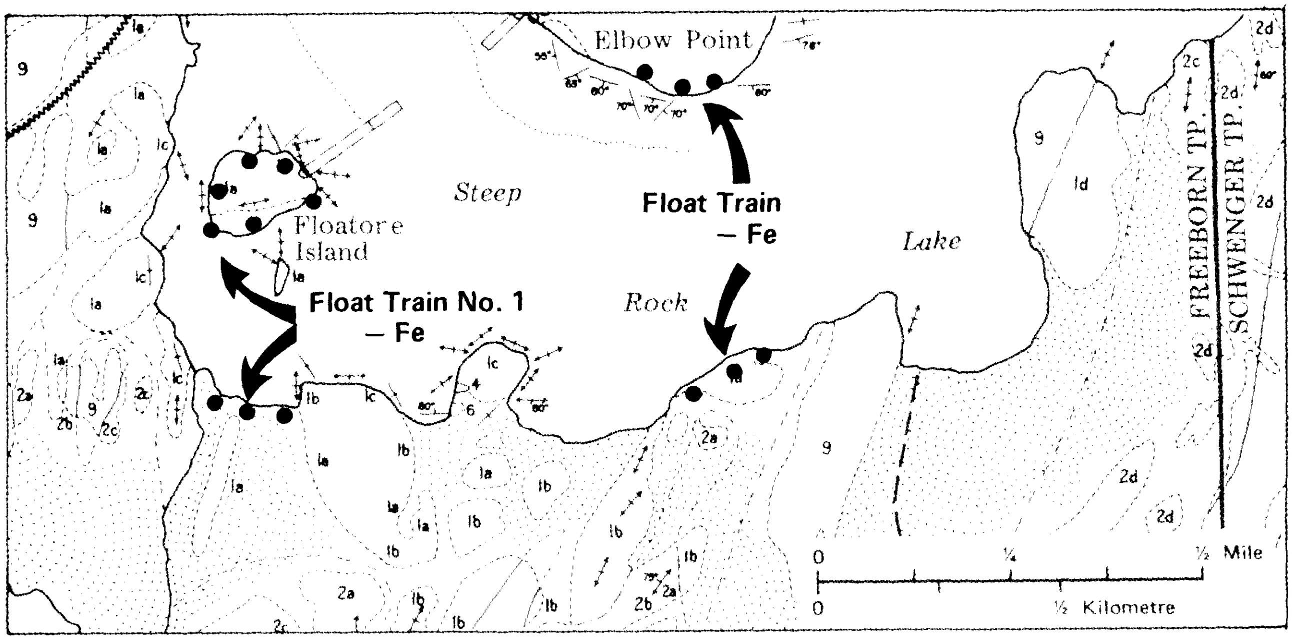
Location: North Oxford (Latitude 43°02', Longitude 80°57'), Con.III, lots 16-17, about 6 miles (9.6 km) southwest of Woodstock and 1.8 miles (2.9 km) southwest of Beachville, Cyanamid of Canada Quarry Limited, located between Highway 2 and the Canadian National Railway. NTS 40P/2W.

Map Reference: ODM Map 1960d, Detroit River Limestone of the Beachville Area.

Description: A slab of native copper, about 10 inches by 8 inches by 9 inches (25 cm x 20 cm x 23 cm) was present in the gravel and jammed the crusher. The specimen was given to the Royal Ontario Museum in 1959.

Bedrock Source: Presumably this copper nugget is from a Precambrian source. The nearest probable area is about 300 miles (480 km) to the north.

Reference: D.F. Hewitt, Chief, Phanerozoic Geology Section, Geological Branch, personal communication, 1973.



Rainy River District

Freeborn Township, etc., (Canadian Charleson) Float Train - [Fe]

Main Metals: Iron

Location: Freeborn Township (Latitude 48°49′ Longitude 91°42′), at the southern end of the Middle Arm, Steep Rock Lake, both on Elbow Point at the southern end of Mosher Peninsula, on Floatore Island and along the southern shore of this part of the Lake. Drilling indicated a concentration in gravels from 1 to 2 miles (1.6 to 3.2 km) south of this part of the Lake which was mined as the Canadian Charleson deposit. The main boulder train extends from 22 miles (35 km) southwest and has a width of 2 to 3 miles (3.2 to 4.8 km). NTS 52B/13E.

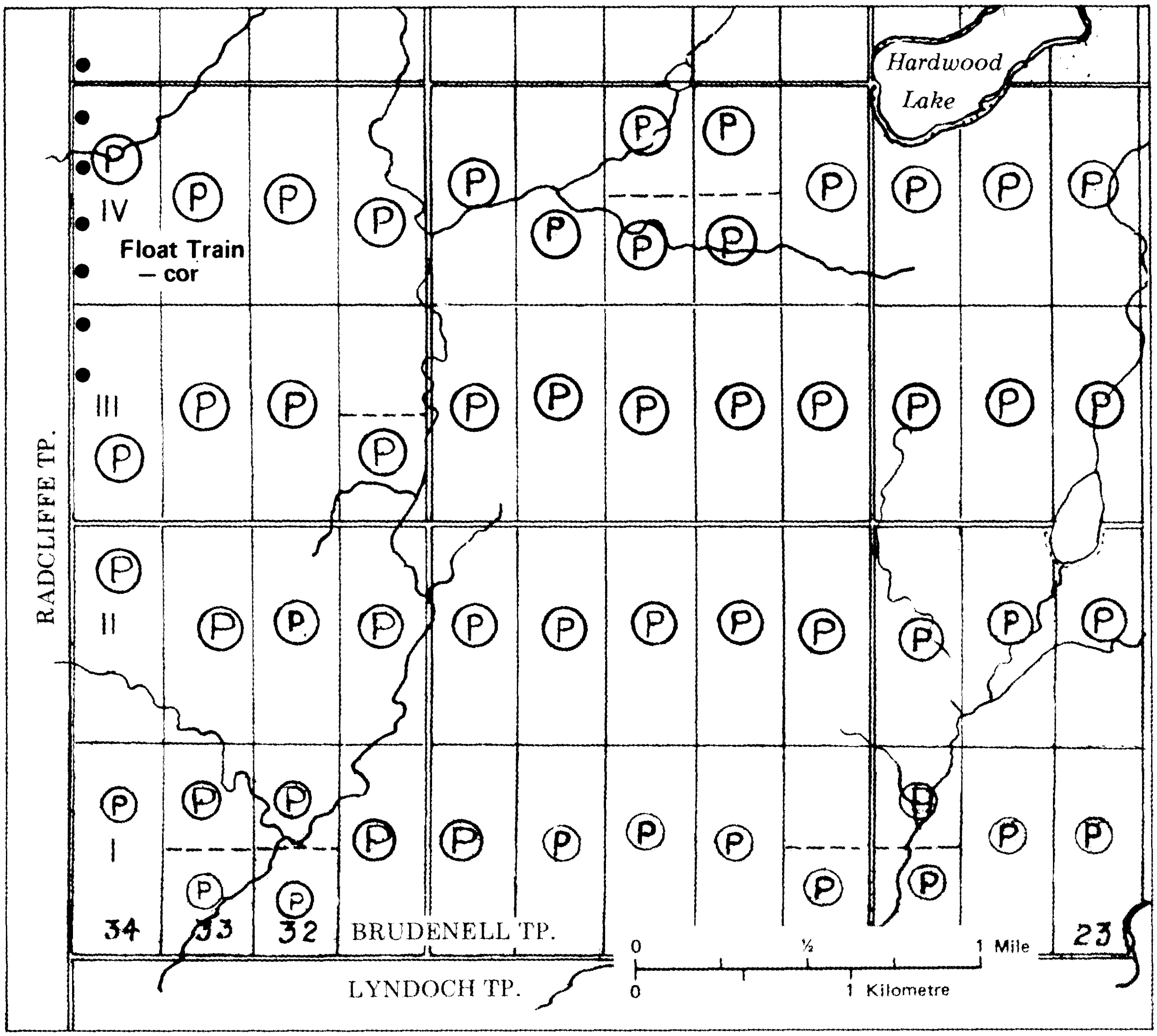
Map Reference: Figure 10 of this report. ODM Map 48b, Steep Rock Lake Area. ODMNA Map 2217, Steep Rock Lake Area.

Description: Some boulders on the shores of Steep Rock Lake were angular and up to 5 feet (1.6 m) in diameter and one boulder found in a gravel pit weighed 20 tons (20 tns). However, generally pebbles were much more abundant than boulders. Throughout the boulder train the percentage of ore pebbles is generally less than 3 percent but increases toward the source area to an average of 10 percent in till and 26 percent in gravel. The pebbles in the boulder train are 60 to 90 percent goethite and the remainder largely hematite pebbles. At the Canadian Charleson Mine 784,000 tons (796,544 tns) of iron ore was recovered from 6.7 million tons (6.8 mil tns) of gravel.

Bedrock Source: The source area was the iron ore in place located beneath the bed of Steep Rock Lake.

Remarks: The iron ore float at Steep Rock Lake was reported by H.L. Smyth in 1891, W. McInnes in 1897 and by W.G. Miller in 1903. Guided by the abundance of iron ore boulders at the middle part of Steep Rock Lake and a magnetic survey the large deposits of iron ore were first drilled during 1937 and 1938. Canadian Charleson Limited recovered iron ore from gravels of the boulder train from 1958 to 1965.

References: American Jour Sci (1891), 3rd Ser., Vol. 42, p.317-331.
GSC (1897), Vol.10, p.57H.
OBM (1902) Rept., Vol.12, p.304-317.
GSC (1925) Summ. Rept., part C, p.2-5.
GAC (1956), Vol.8, pt.1, p.27-70.
CIM (1958) Trans., Vol.61, p.49-56.
ODMNA (1972) GR93, p.59-64.



Renfrew County

Brudenell Township Float Train - [cor]

Main Commodity: Corundum

Location: Brudenell Township (Latitude 45°25′, Longitude 77°25′), lot 34 in concessions III, IV, V, along the road on the western boundary of the township for about 1 mile (1.6 km). NTS 31F/6W.

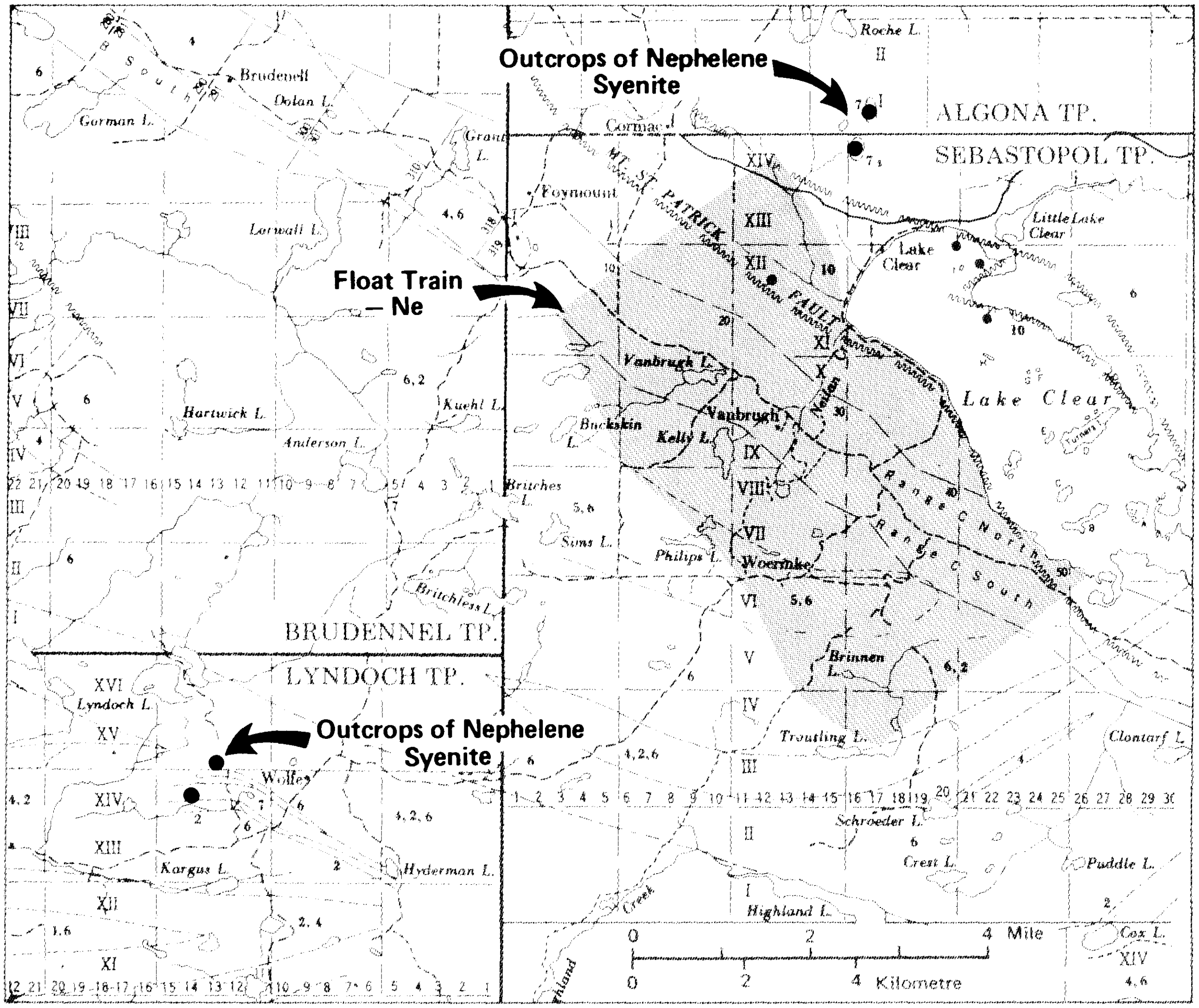
Map Reference: OMNR Claim Map M59, Brudenell Township.

Description: Numerous boulders, some of which are of large size, lie along the hillside and at the edge of the road. Boulders containing corundum are numerous in a depression south from the outcrop.

Bedrock Source: Corundum occurs in place on lot 34, concession V.

Remarks: The deposit was found in place by following the boulders.

Reference: OBM (1898), Vol.7, pt.3, p.222.



Renfrew County

Sebastopol Township Float Train - [ne]

Main Commodity: Nepheline

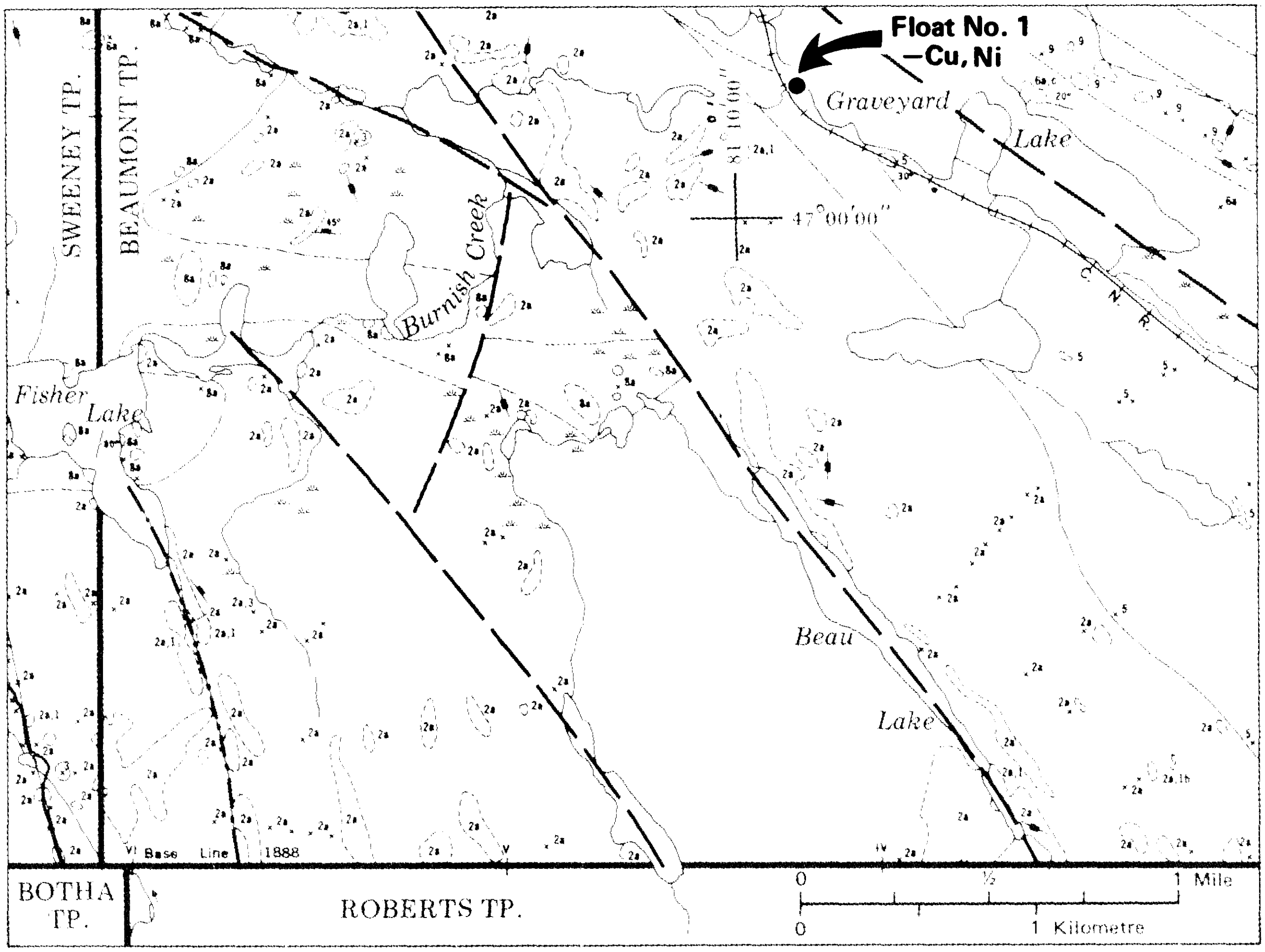
Location: Sebastopol Township (Latitude 45°25′, Longitude 77°14′), the western part of the township and extending southwest into Lyndoch Township to the west and south of Lake Clear. NTS 31F/6.

Map Reference: ODM Map 53b, Renfrew Area.

Description: Numerous boulders of nepheline syer te are present in a train more than 3 miles (4.8 km) in width to the south and southwest of Lake Clear. The train extends to the north and northwest of Lake Clear.

Bedrock Source: Nepheline outcrops both north and south of the township line from 1 to 1½ miles (1.6 to 2.4 km) north of Lake Clear. Nepheline syenite also outcrops in the northern part of Lyndoch Township and possibly the float trains from these two outcrop areas have been considered to be a single train.

References: OBM (1898), Vol.7, pt.3, p.224.
ODM (1944), Vol.53, pt.3, p.90-92.



Sudbury District

Beaumont Township Float No.1 - [Cu,Ni]

Main Metals: Copper, Nickel

Location: Beaumont Township (Latitude 47°02' Longitude 81°08') between the Canadian National Railway and the shore of Graveyard Lake and on the south side of Burnish Creek about 30 feet (9 m) from the shore and about 200 feet (61 m) from the railway. NTS 41P/03E.

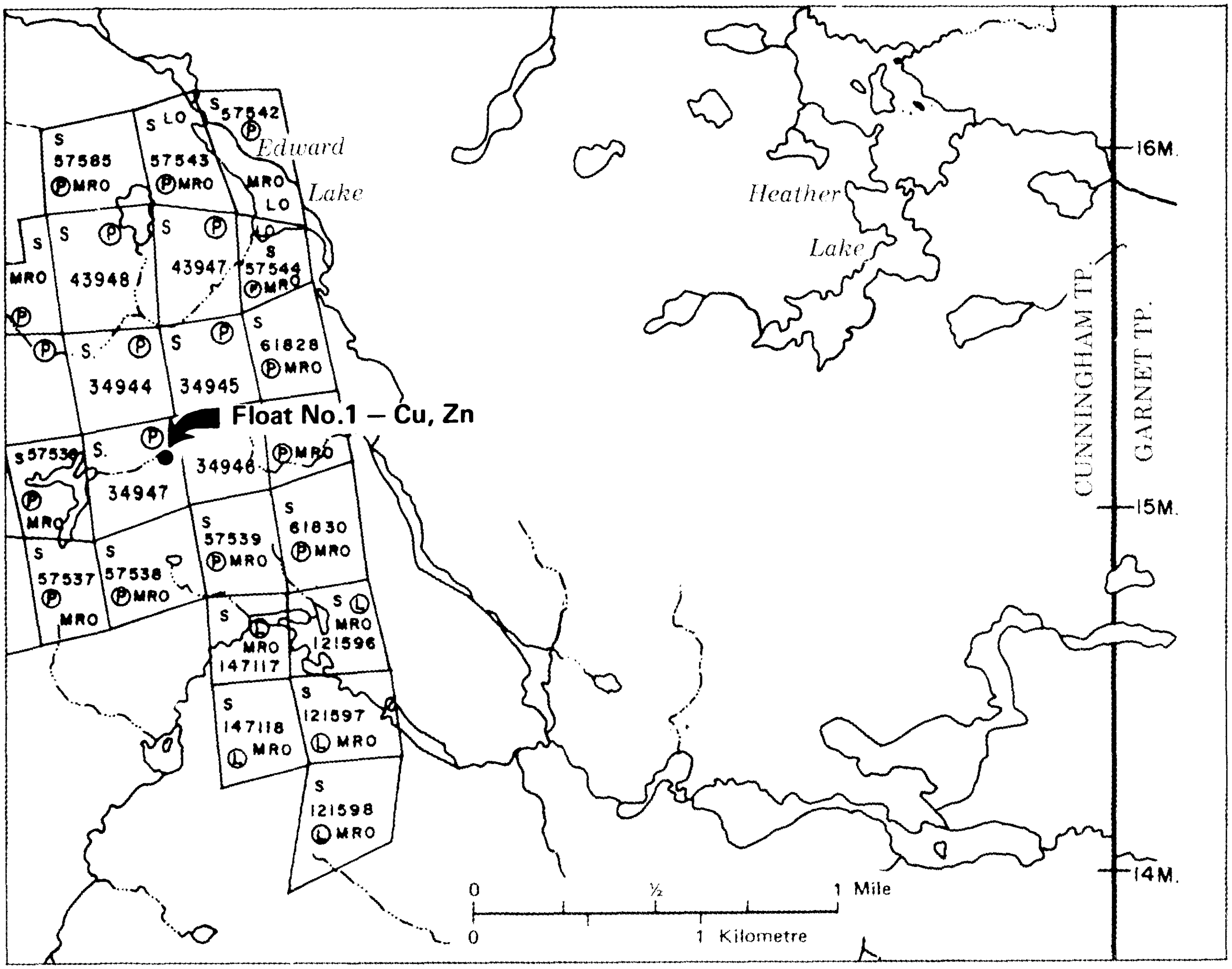
Map Reference: ODM Map 2261, Sweeney, Beaumont, and Beresford Townships.

Description: The boulders are mainly about 1 foot (0.3 m) in diameter and are a dark coloured, foliated, igneous rock heavily mineralized with pyrrhotite and chalcopyrite. Possibly 2 or 3 tons (2 or 3 tns) of boulders are present, associated with gravel. An average of two grab samples assayed 1.56 percent Cu and 0.34 percent Ni.

Bedrock Source: It seems probable that this is ore from Sudbury and was dumped by the railway although it is difficult to explain how it was transported 200 feet (61 m) along the creek. Another possibility is that the boulders are a natural occurrence and were derived from a diabase sill.

Remarks: Found by Fred Symonds, prospector in 1974.

References: Cluff, G.H. (1974) Senior Field Geologist, Falconbridge Nickel Mines Ltd. Letter to Fred Symonds gives assays by Falconbridge Nickel Mines Limited. Copy of assays are in author's (Ferguson) files.



Sudbury District

Cunningham Township Float No.1 - [Cu,Zn]

Main Metals: Copper, Zinc

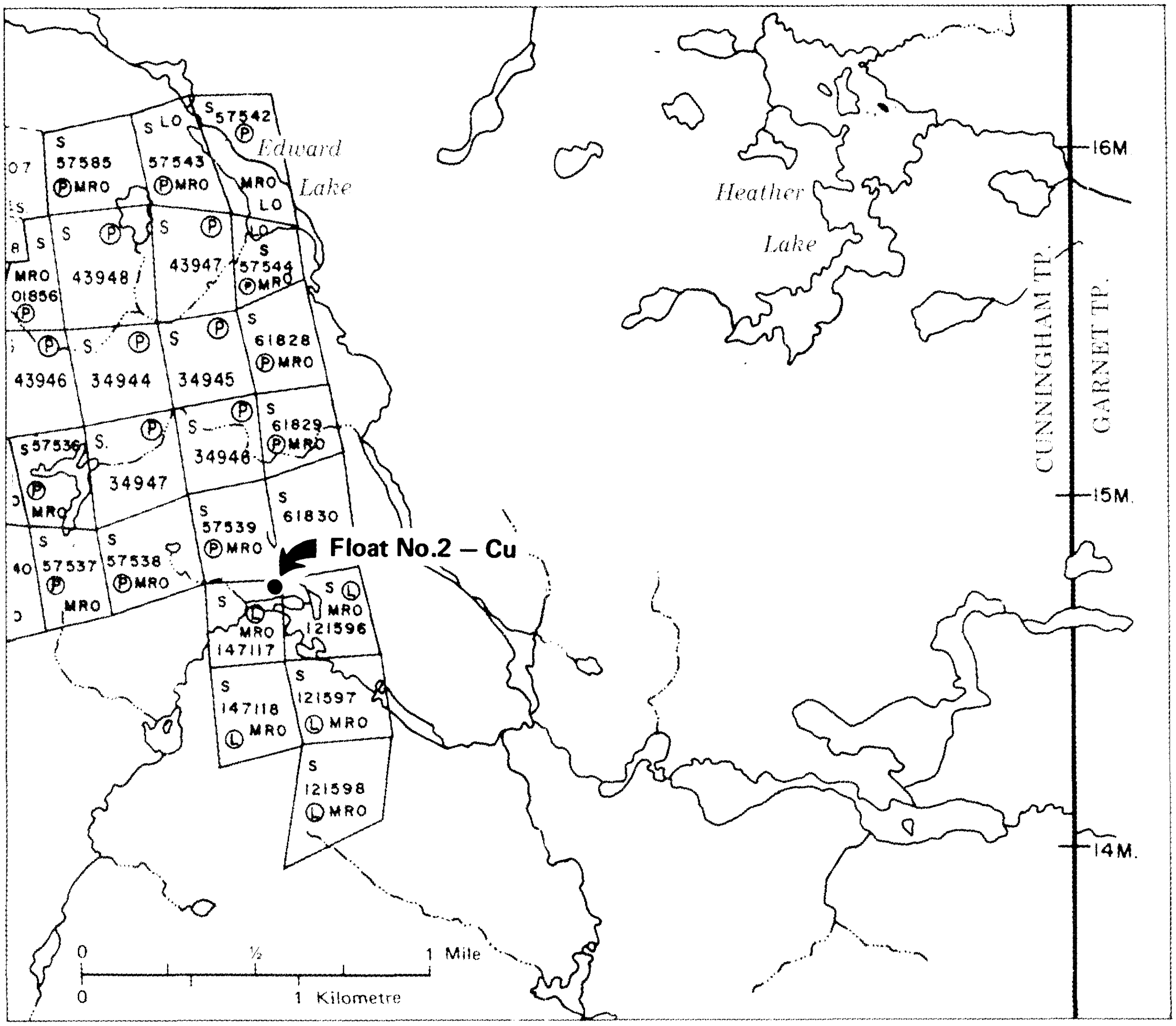
Location: Cunningham Township (Latitude 47°43', Longitude 82°40') Claim S34947, 650 feet (198 m) south of NE corner post and 150 feet (45 m) west of the claim line. NTS Reference 41O/10E.
Map References: ODM Map 51f, Cunningham-Garnet Area; ODM Map 2116, Chapleau-Foliet Sheet.

Description: The following description is taken from the Financial Post, October 19, 1974, p.C-6: ". . . copper float, found as large boulders, assaying in excess of 5% copper and mineralogically identical to the copper-zinc of the centre zone has been found. . ."

Bedrock Source: The centre of Consolidated Shunsby (Main) Zone is located about 400 feet (120 m) to the northwest of the float location.

Remarks: The float location is shown on a geological map by Teck Exploration Company Limited.

References: Teck Exploration Company Limited geological map on file, Office of the Regional Geologist, Ontario Ministry of Natural Resources, Timmins.
Finanical Post, October 19, 1974, p.C-6, news item "Seeks More Ore".



Sudbury District

Cunningham Township Float No.2 - [Cu]

Main Metals: Copper

Location: Cunningham Township (Latitude 47°43', Longitude 82°40') Claims S147117 and S121596 just south of the NE corner of claim S147117. NTS Reference 41O/10E.

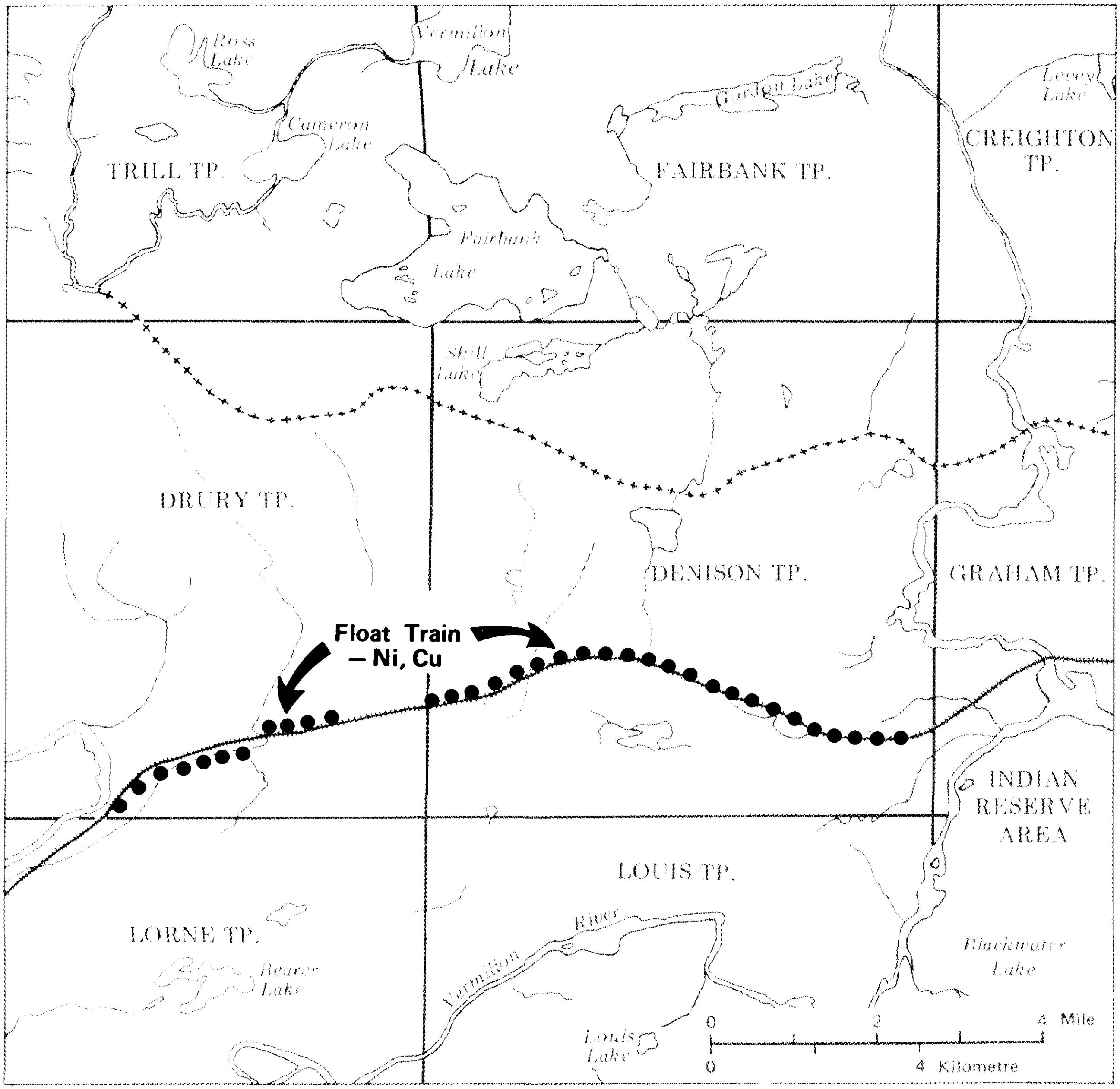
Map Reference: ODM Map 51f, Cunningham-Garnet Area; ODM Map 2116, Chapleau-Foliet Sheet.

Description: No description is available except for a map note "Cu float".

Bedrock Source: The south zone of Consolidated Shunsby Mines Limited is located about 1,400 feet (426 m) northwest.

Remarks: The float location is shown on a sketch map of claim S57539 dated 1956 by R.K. Mudford.

References: R.K. Mudford map on file, office of the Regional Geologist, Ontario Ministry of Natural Resources, Timmins.

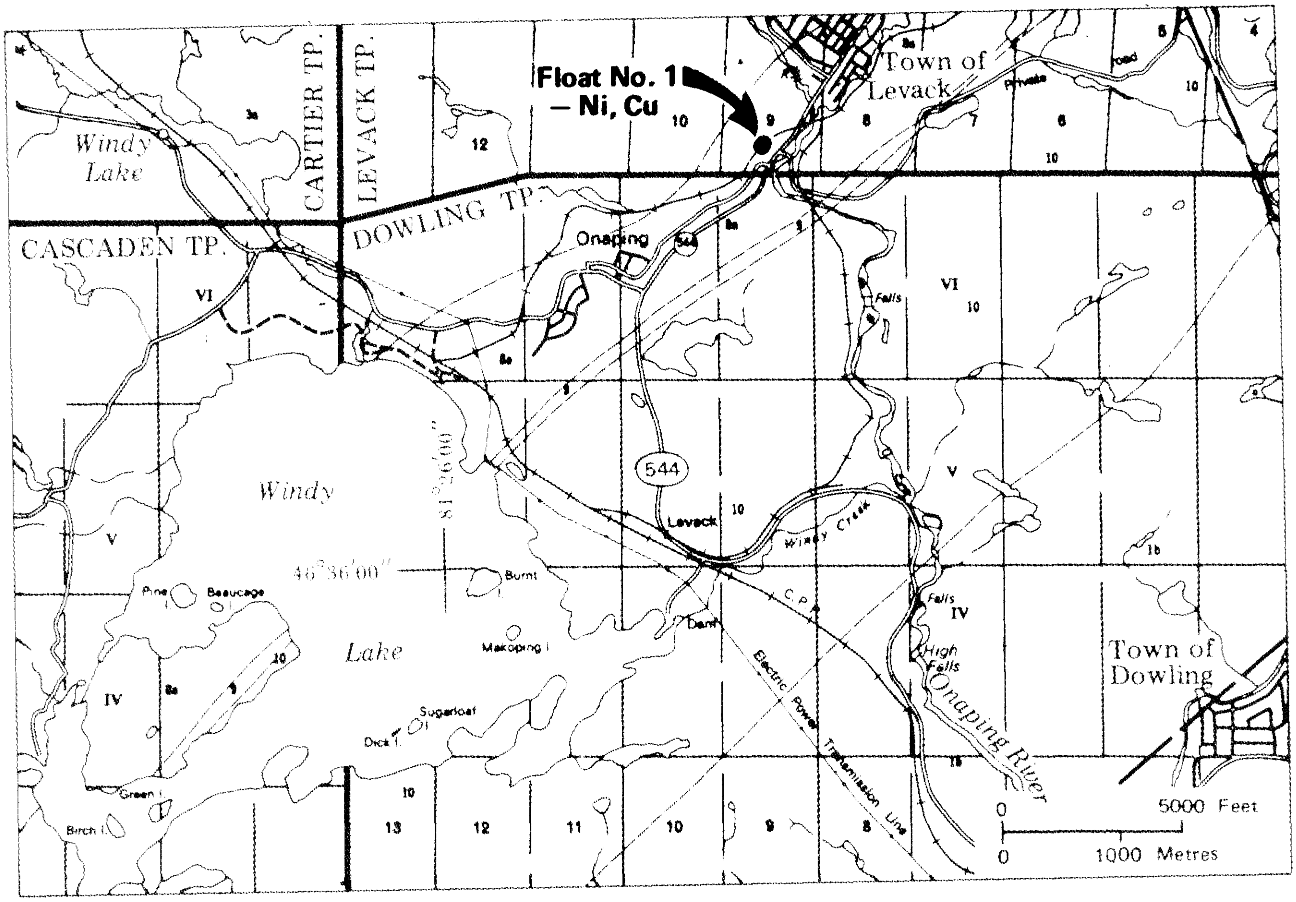


Sudbury District

Denison and Drury Townships Float Train - [Ni,Cu]

Main Metals: Nickel, Copper
Location: Abandoned Algoma Branch railway Denison Township (Latitude 46°25′, Longitude 81°22′). NTS 41I/6W.

Map Reference: OBM Map 9b, Sudbury Mining District.
Description: Fill for the railway grade was rock considered to be waste from the mines operating at Sudbury before 1900. Parts of the fill assay up to 2 percent combined nickel and copper.
Remarks: Parts of the railway right of way are now used as local access roads.



Sudbury District

Levack Township Float No.1 - [Ni,Cu]

Main Metals: Nickel, Copper

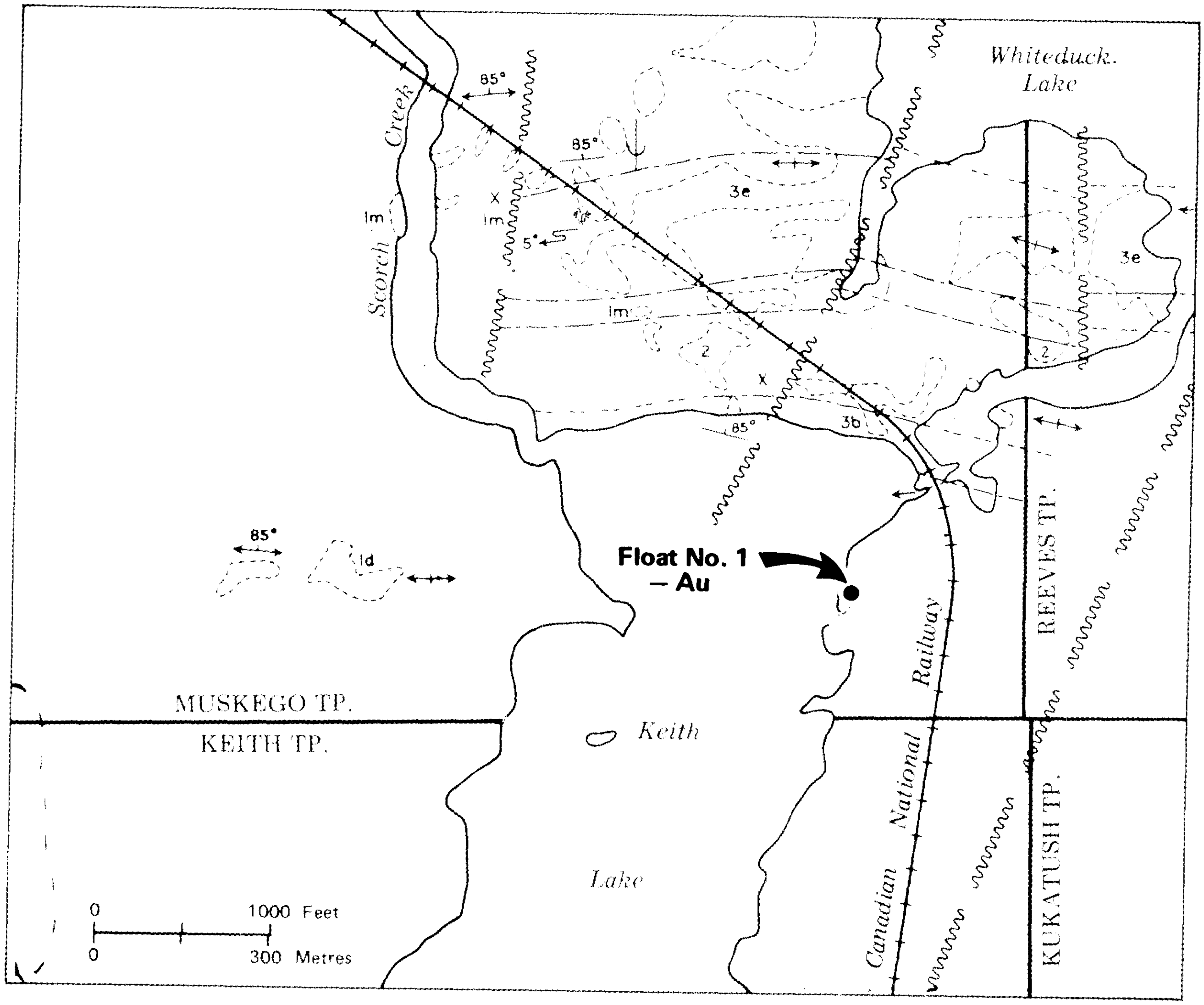
Location: Levack Township (Latitude 46°41′, Longitude 81°22′), southern part of township. NTS 41I/11W.
Map References: ODM Map 2170 Sudbury Mining Area; OBM Map 29b Windy Lake; ODM Map P.91 Levack Township and north part of Dowling Township.

Description: Boulders containing ore of the Sudbury type were found along the Canadian Pacific Railway near Windy Lake in Dowling Township and also about a mile farther to the northeast in Levack Township. ODM Map P.91 shows a discontinuous esker extending northeast of Windy Lake and presumably the boulders were associated with this sand and gravel ridge.

Remarks: James Stobie found the boulders in the fall of 1887 and in 1889, resumed prospecting and found mineralization which became part of the Levack Mine.

Bedrock Source: The Levack Mine of The International Nickel Company of Canada Limited is 2 miles (3.2 km) northeast of the southern boundary of the township and 4 miles (6.4 km) from the shore of Windy Lake. Since that time, ore has been located at the Hardy and Onaping Mines of Falconbridge Nickel Mines Limited, 1/8 and 1/4 miles (0.2 and 0.4 km), respectively, northeast of the southern boundary of the township. Probably some of the boulders were close to the Hardy mineralization.

References: The Levack Mine, p.51-52 *in* Report of the Royal Ontario Nickel Commission, printed by order of the Legislative Assembly of Ontario 1917.



Sudbury District

Muskego Township Float No.1 - [Au]

Main Metals: Gold

Location: Muskego Township (Latitude 48°16′ Longitude 82°19′), lot 13, concession I, on the east side of Keith Lake about 700 feet (213 m) north of the township boundary. NTS 42B/1.

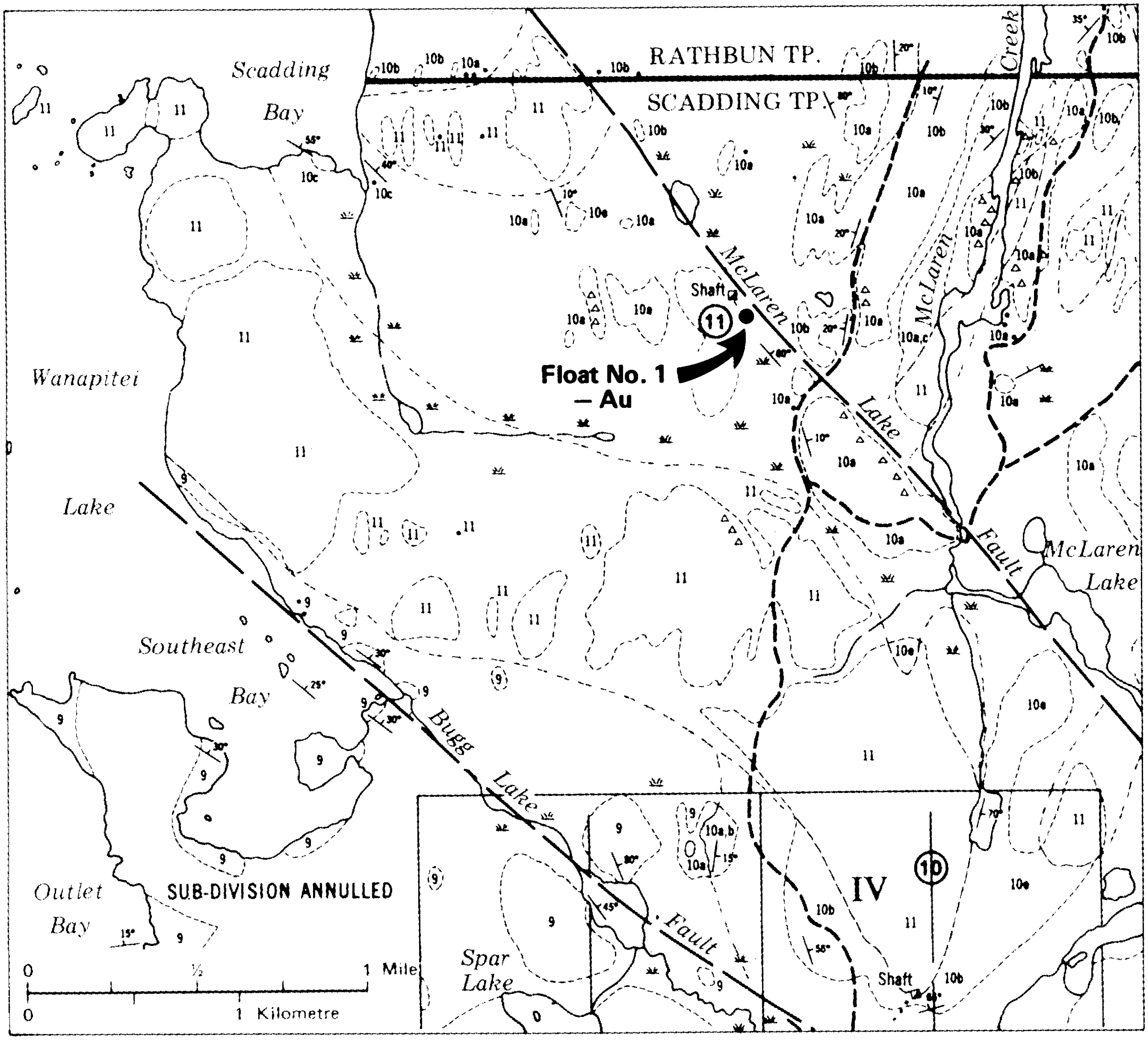
Map Reference: ODM Map 1950-4, Parts of Keith and Muskego Township.

Description: A mineralized fragment consisted of mainly arsenopyrite and a grab sample assayed 0.03 oz Au/ton and a picked sample of arsenopyrite assayed 0.07 oz Au/ton. The float was found on the north side of a low outcrop of intermediate to basic metavolcanics.

Bedrock Source: Arsenopyrite occurs in small veins in the metasediments about 2,500 feet (762 m) to the north.

Remarks: Found by V.K. Prest in 1947 during the course of a geological survey for the Ontario Department of Mines.

Reference: ODM (1950), Vol.59, pt.7, p.33.



Sudbury District

Scadding Township Float No.1 - [Au]

Main Metals: Gold

Location: Scadding Township (Latitude 46°41′ Longitude 80°37′), about 2 1/8 miles (3.4 km) southeast of Scadding Bay on Wanapitei Lake. NTS 41I/10E.

Map Reference: ODM Map 2009, Maclennan and Scadding Townships.

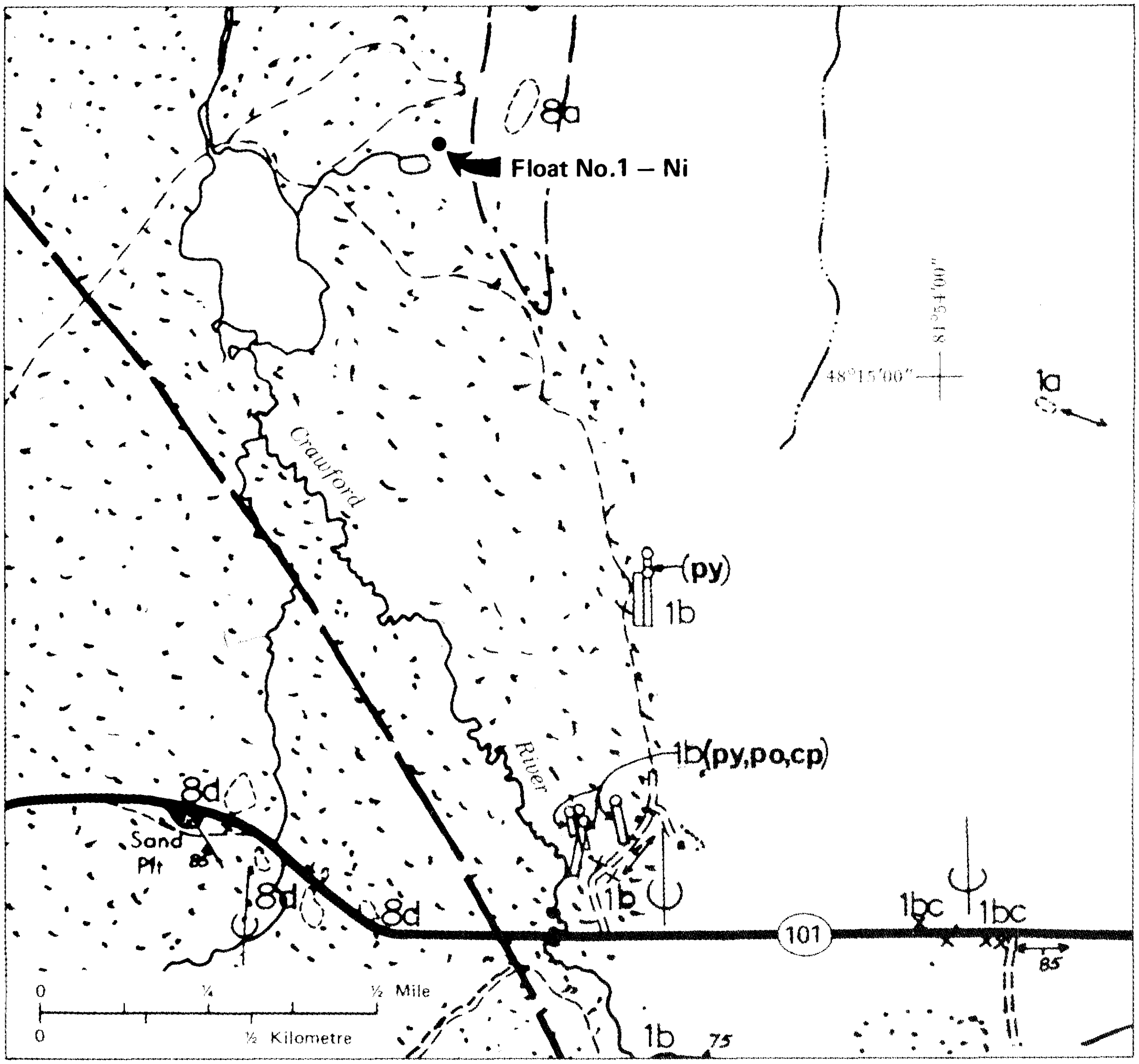
Description: Boulders located in a low wet area contained small particles of visible gold.

Bedrock Source: Veins outcrop about 200 feet (61 m) to the north and are considered to be the source. The property is now held by Alwyn Porcupine Mines Limited.

Remarks: The find was made by a prospector, Peter McKellar in 1891.

Reference: OBM 1892, p.237.

ODM GR2, Maclennan and Scadding Townships.



Sudbury District

Sewell Township Float No.1 - [Ni]

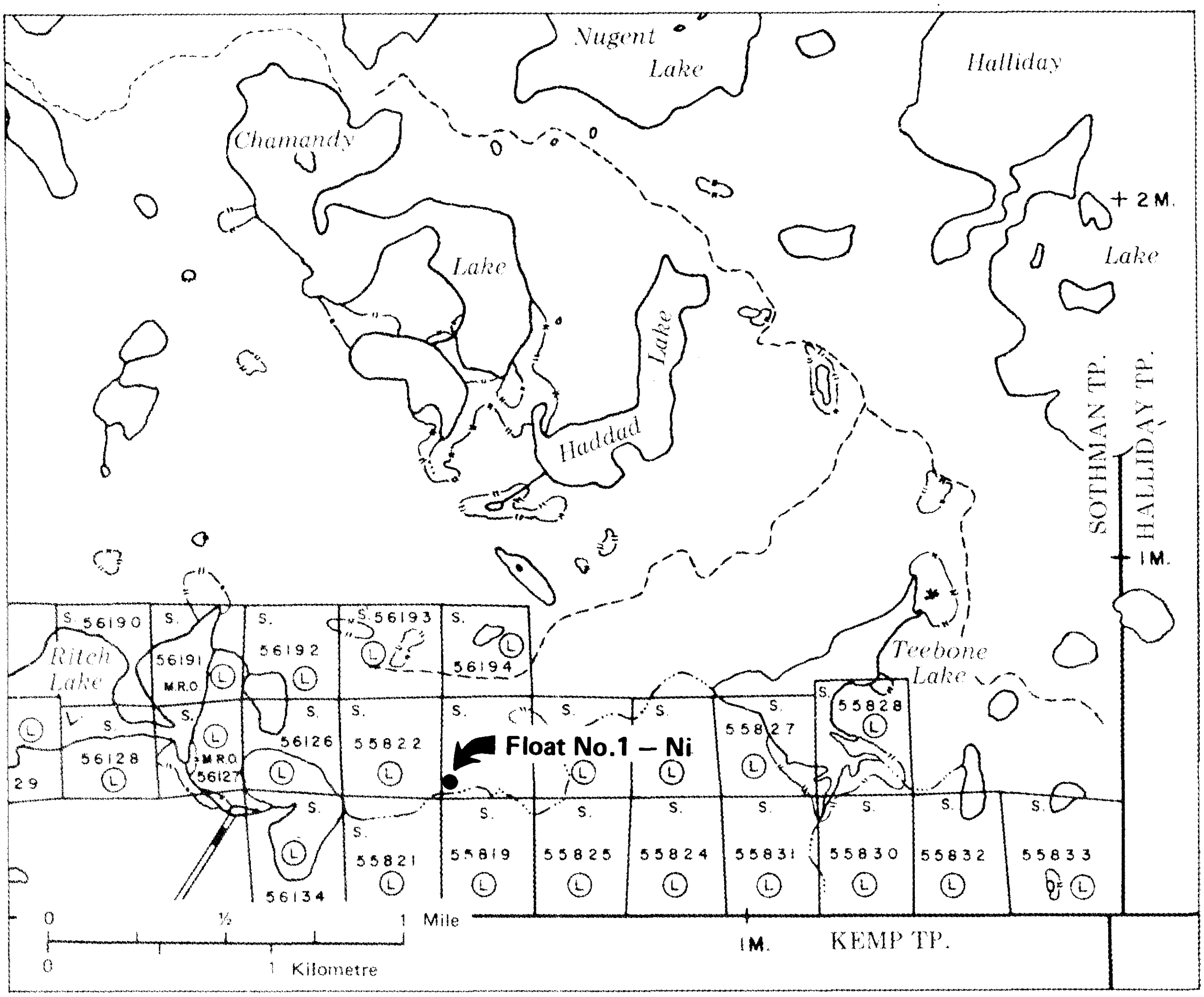
Main Metals: Nickel

Location: Sewell Township (Latitude 48°16′, Longitude 81°57′), NTS 42A/4W and 42A/5W.
Map Reference: ODM Map P.464, Sewell Township.

Description: Boulder train spread within 1,000 feet (300 m) south of the outcrop area contains fist-sized pebbles of gabbro that has been amphibolitized and partly granitized and serpentinized.

Remarks: Found by the staff of McIntyre Porcupine Mines Limited, 1971.

References: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Sudbury District

Sothman Township Float No.1 - [Ni]

Main Metals: Nickel

Location: Sothman Township (Latitude 47°54', Longitude 81°19'), in claim S55820, 150 feet (45 m) N and 50 feet (15.2 m) E of No.3 claim post. NTS 41P/14.

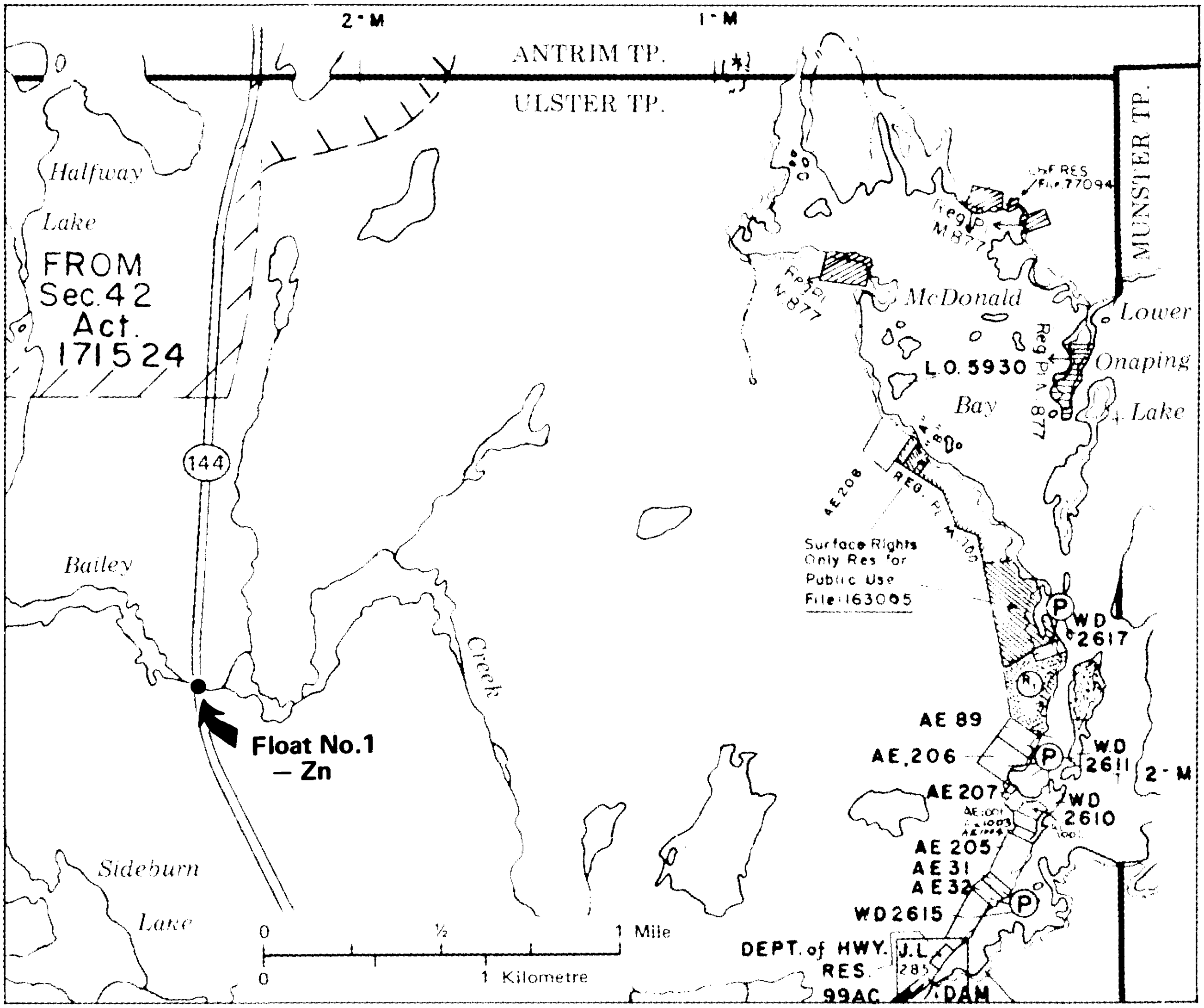
Map Reference: ODM Map 1953-3, Sothman Township.

Description: Nickel-bearing float consisting of disseminated pyrrhotite, pentlandite, and chalcopyrite was found by prospectors checking an aeromagnetic anomaly.

Bedrock Source: Trenches exposed an underlying ultrabasic intrusion containing disseminated pyrrhotite, pentlandite, and chalcopyrite.

Remarks: The boulders were found in 1950 by prospectors working for Dominion Gulf Company. Drilling indicated a zone 9.3 feet (2.8 m) wide, 160 feet (40 m) long, and 280 feet (85 m) deep, which contains 1.46 percent nickel and minor amounts of copper.

References: ODM (1953) Rept., Vol.62, pt.6, p.27. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63-301, Surface Plan.



Sudbury District

Ulster Township Float No.1 - [Zn]

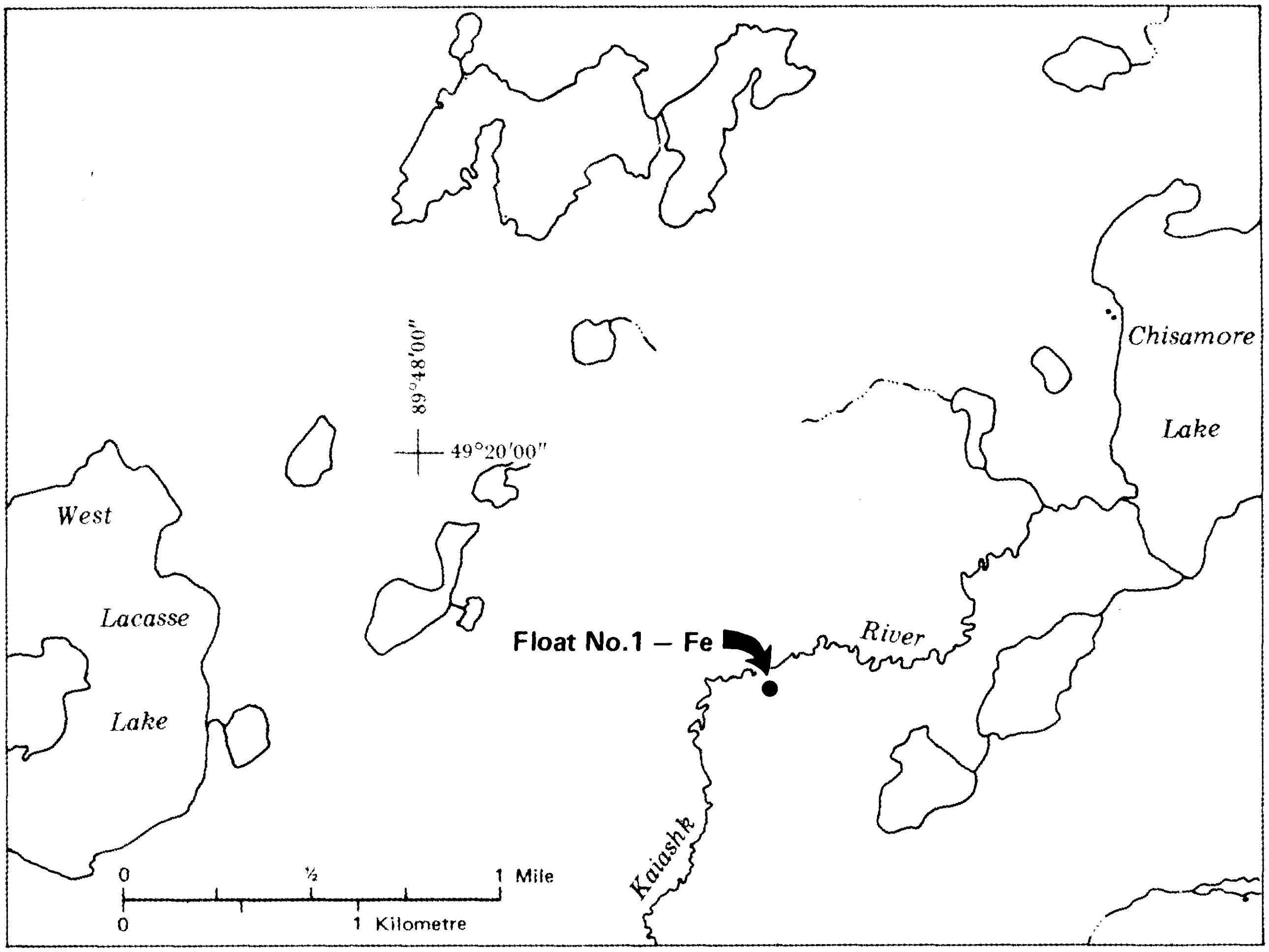
Main Metals: Zinc

Location: Along Highway 144 north of Sudbury at the Bailey Creek crossing Ulster Township (Latitude 46°51′, Longitude 81°39′) mineralized boulders are present in the road fill. NTS 41I/13E.
Map Reference: OMNR Claim Map M1168, Ulster Township.

Description: Angular blocks 3 to 4 feet (0.9 to 1.2 m) in diameter are a high-rank granitoid gneiss containing garnet. Mineralization consists of pyrite masses and crystals and sphalerite.

Bedrock Source: Presumably blasted from a road cut further north during road building operations, alternatively it is possible these boulders came from the Geneva Mine dump a few miles south near Benny.

Remarks: Found by a local prospector in 1974 and brought to the attention of D.G. Innes, Resident Geologist, Ontario Ministry of Natural Resources, Sudbury.



Thunder Bay District

Armistice Lake Area Float No.1 - [Fe]

Main Metals: Iron

Location: Armistice Lake area as shown on Ontario Ministry of Natural Resources Claim Map M2910 has the SE corner at Latitude 49°15′ and Longitude 89°45′. A Great Lakes Paper Company road leads to Camp 235 on West Lacasse Lake. A gravel pit is located to the east of the Kaiashk River on the north side of the road. NTS 52H/5W.

Map Reference: OMNR Claim Map M2910, Armistice Lake Area.

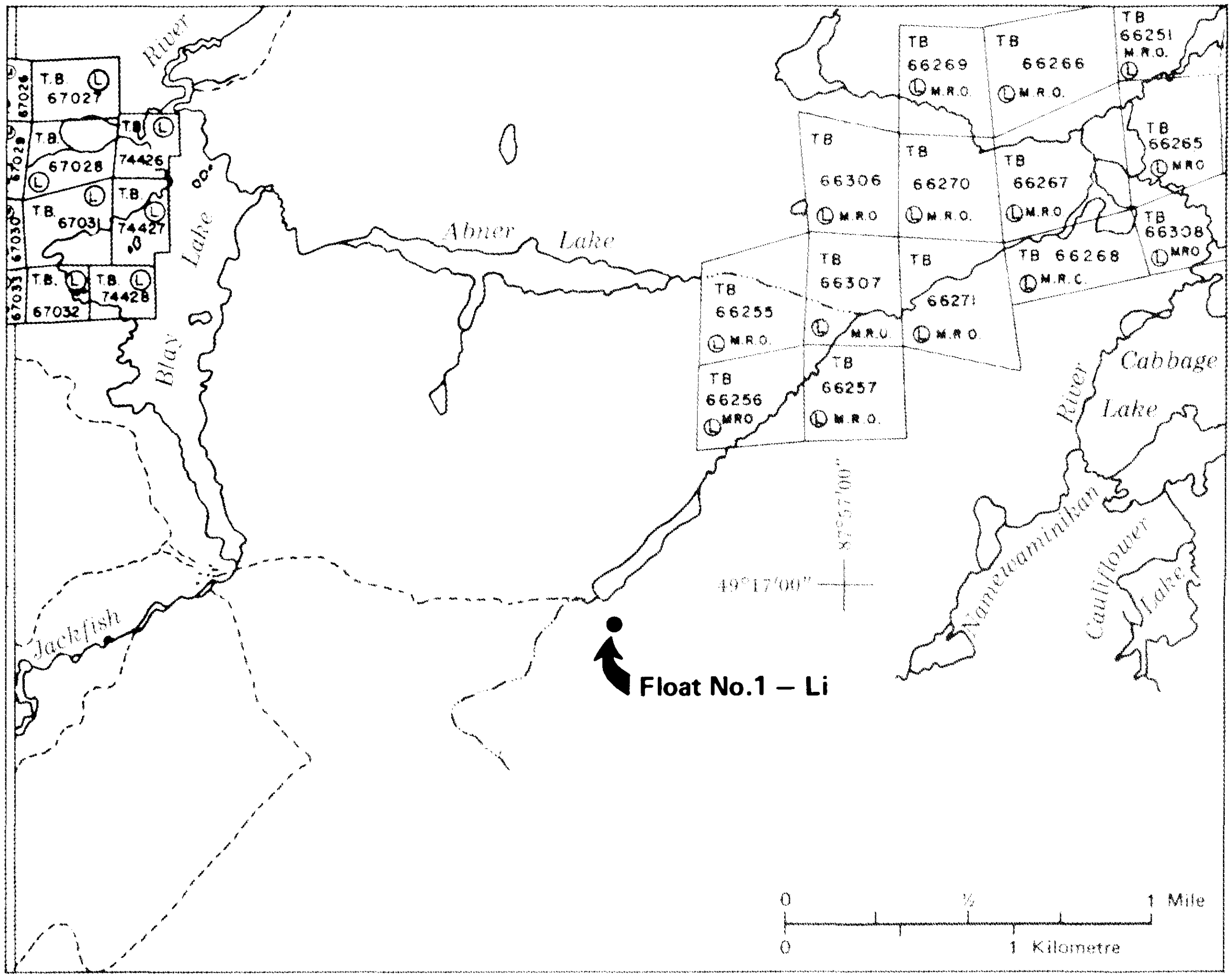
Description: About 10 boulders of sulphide iron formation containing pyrite and pyrrhotite are present in a gravel pit. The boulders are generally about 1 foot (0.3 m) in diameter with the largest angular boulder 3 feet by 2 feet (0.9-0.6 m). A sample assayed 0.04 percent copper.

Remarks: Observed by R.P. Sage, Geologist, Precambrian Geology Section, Geological Branch, during the course of geological mapping for the Geological Branch, Division of Mines, during the summer of 1973.

References: R.P. Sage, personal communication, 1973.

Mineral Research Branch, Division of Mines, Assay certificate C16935.

Mineral Research Branch 32 element spectroscopic analysis No.10007.



Thunder Bay District

Barbara Lake Area Float No.1 - [Li]

Main Metals: Lithium

Location: Barbara Lake Area, SE corner of claim map sheet (Latitude 49°15', Longitude 87°45'), about 400 feet (120 m) southeast of the south end of a beaver pond and about 2,800 feet (853 m) southwest of No.3 post of surveyed claim TB66256. Location is shown as mining property 8 on ODM Map 2056. NTS 42E/5W.

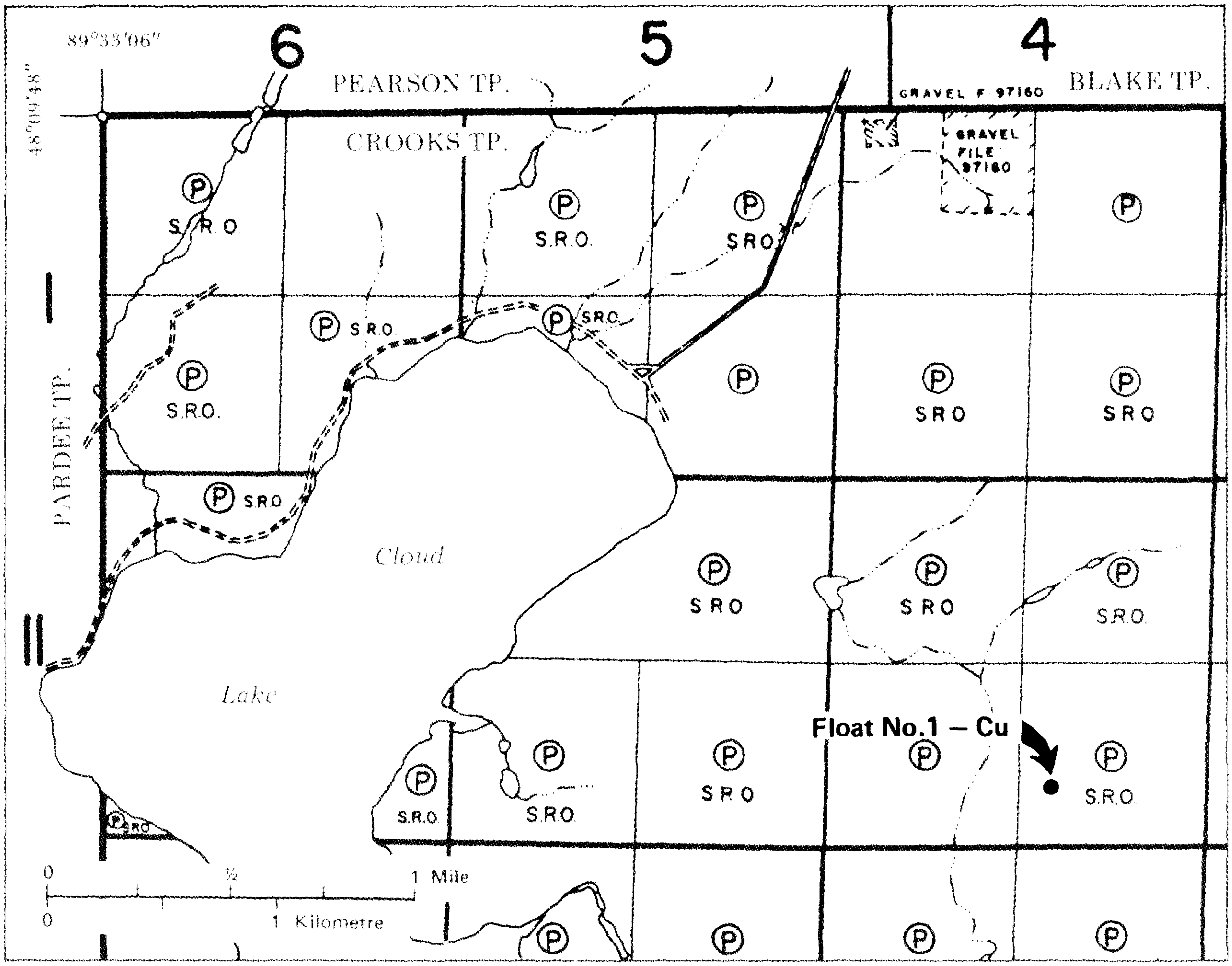
Map References: ODM Map 2056, Georgia Lake Area.

OMNR Claim Map M2505, Barbara Lake Area.

Description: Spodumene is present in 11 glacial erratics which range in size from 3 by 3 by 3 feet (0.9 x 0.9 x 0.9 m) to 15 by 15 by 10 feet (4.6 x 4.6 x 3.1 m).

Remarks: Geological survey and trenching by Georgia Lake Lithium Mines Limited in 1955, and an aggregate total of 9,589 feet (2923 m) of diamond drilling in 1956.

References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63A.294. ODM GR31, p.71.



Thunder Bay District

Crooks Township Float No.1 - [Cu]

Main Metals: Copper

Location: Crooks Township (Latitude 48°07', Longitude 89°28'), SE ¼ of lot 4, concession II, claims TB109605 and TB109606. NTS 52A/3E.

Map Reference: ODM Map 2250, Crooks Township, Jarvis and Prince Locations, and Offshore Islands.

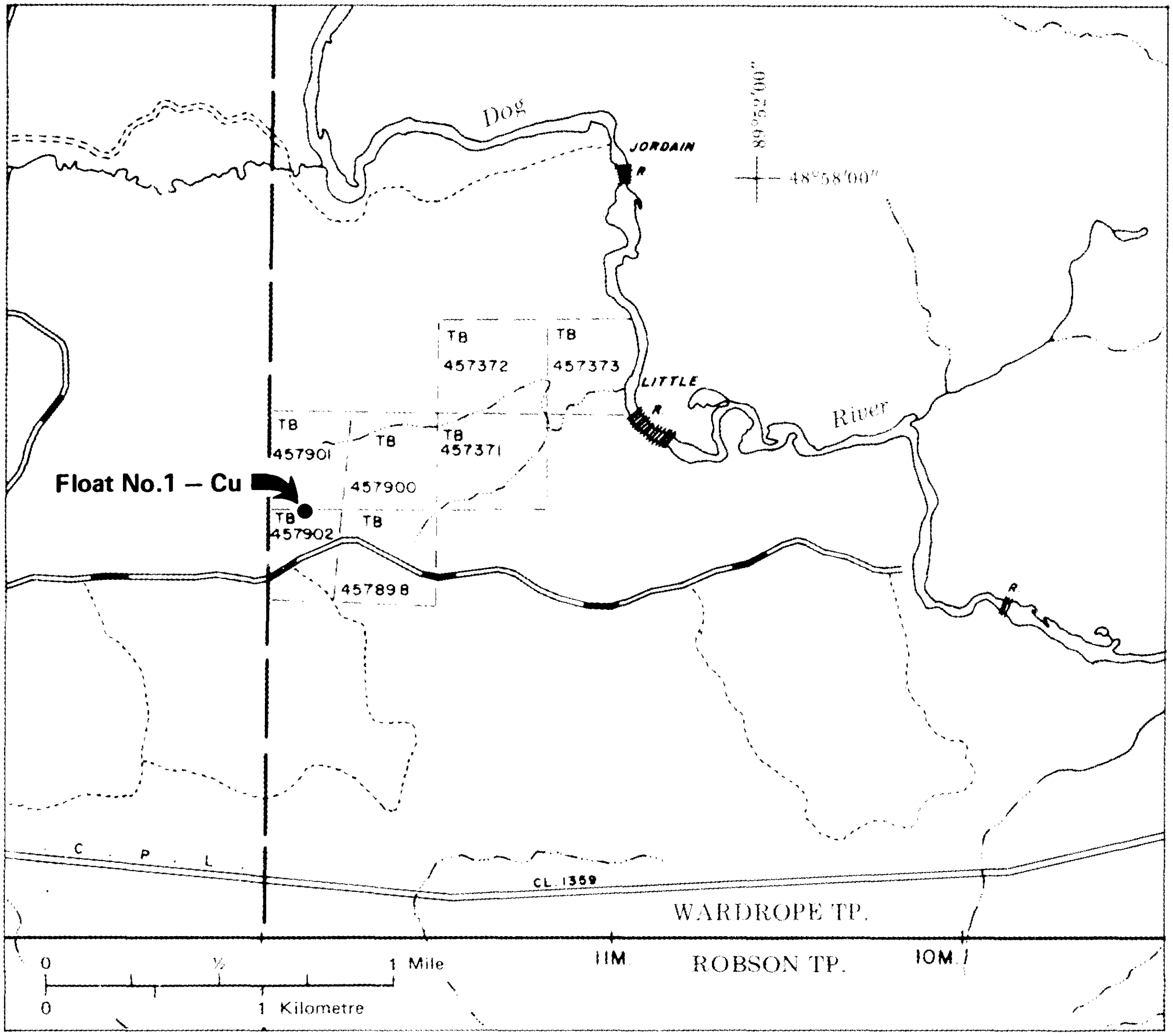
Description: A slab of mineralized rock: 113 feet (34.4 m) long, 53 feet (16 m) wide and 15 feet (4.5 m) thick. Native copper and cuprite occur as amygdules in an amygdaloidal hematite-stained lava.

Bedrock Source: Unknown. Similar rocks are known to occur on Isle Royale 20 miles (32 km) to the southeast. Alternatively, the rock might have developed as the upper vesicular phase of a diabase sill which has now been eroded.

Remarks: Diamond drilling by Salem Exploration Limited in 1963 indicated that the float is underlain by overburden.

Reference: ODM GR102, p.39,40.

Assessment Files Research Office, Geological Branch, Division of Mines, Toronto, Crooks Township Drilling Rept. 12, Salem Exploration Ltd.



Thunder Bay District

Dog River Area Float No.1 - [Cu]

Main Metals: Copper

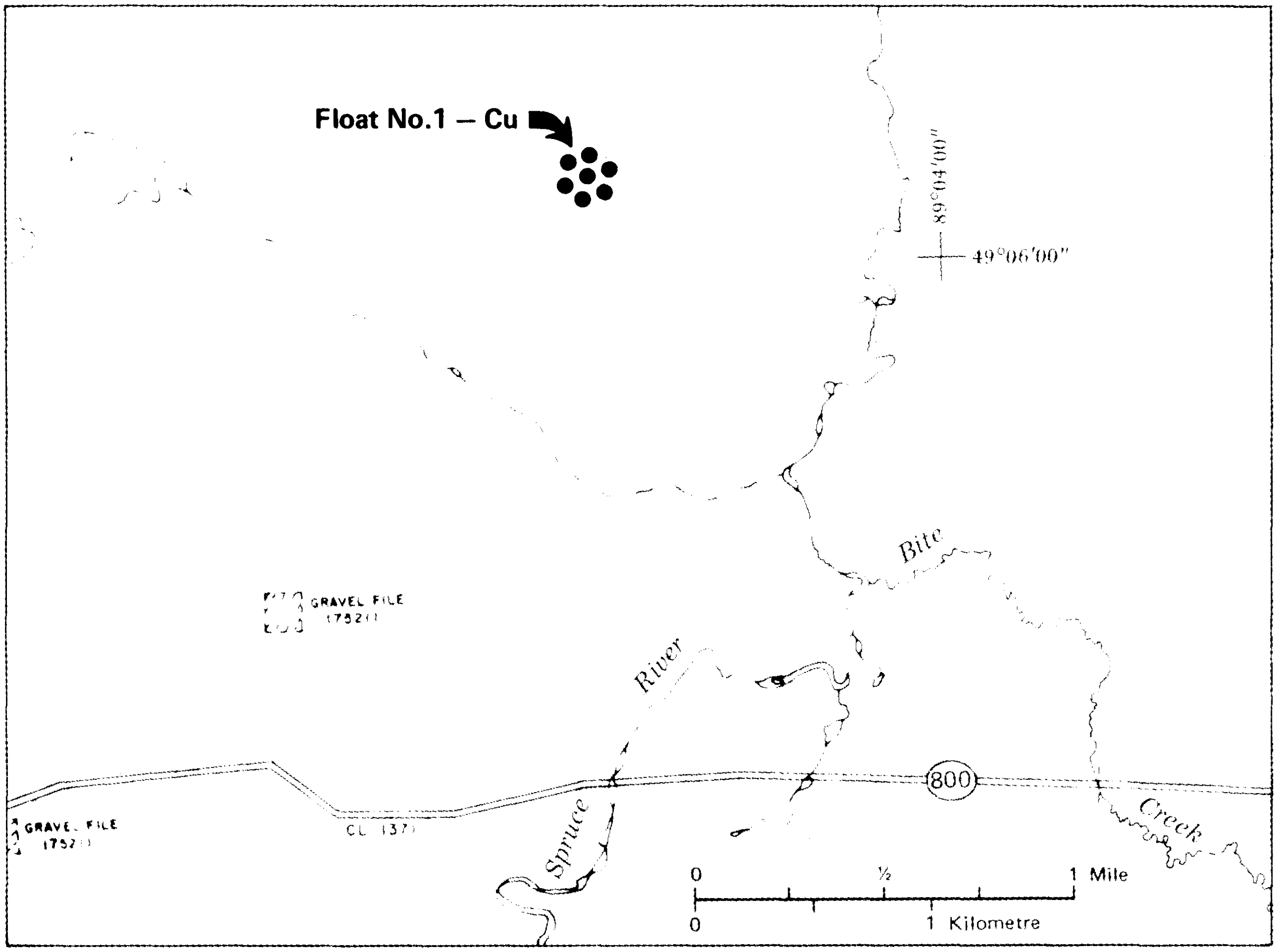
Location: Dog River Area, SE corner of map (Latitude 48°52'30", Longitude 89°45'), claim TB276049 adjacent to the western boundary. Meridian grid 15 NE and 6 NW. NTS 52A/13E.

Map Reference: OMNR Claim Map M1699, Dog River Area.

Description: Large angular blocks of float contained some massive pyrite, pyrrhotite, and minor chalcopyrite.

Remarks: Found by Meridian Mining and Exploration Company Limited during the course of a geophysical survey in 1970.

Reference: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 2.451, p.8.



Thunder Bay District

Eaglehead Lake Area Float No. 1 - [Cu]

Main Metals: Copper

Location: Eaglehead Lake Area is shown on Ontario Ministry of Natural Resources Claim Map M2639 and the SE corner of the map is Latitude 49°00′ and Longitude 89°00′. The float was located about 5 miles (8 km) southwest of Disraeli Lake in an area about 1,000 feet (300 m) in diameter at the common corner of claims TB129533, TB129534, TB129541, and TB129542. NTS 52H/3E.

Map Reference: OMNR Claim Map M2639, Eaglehead Lake Area.

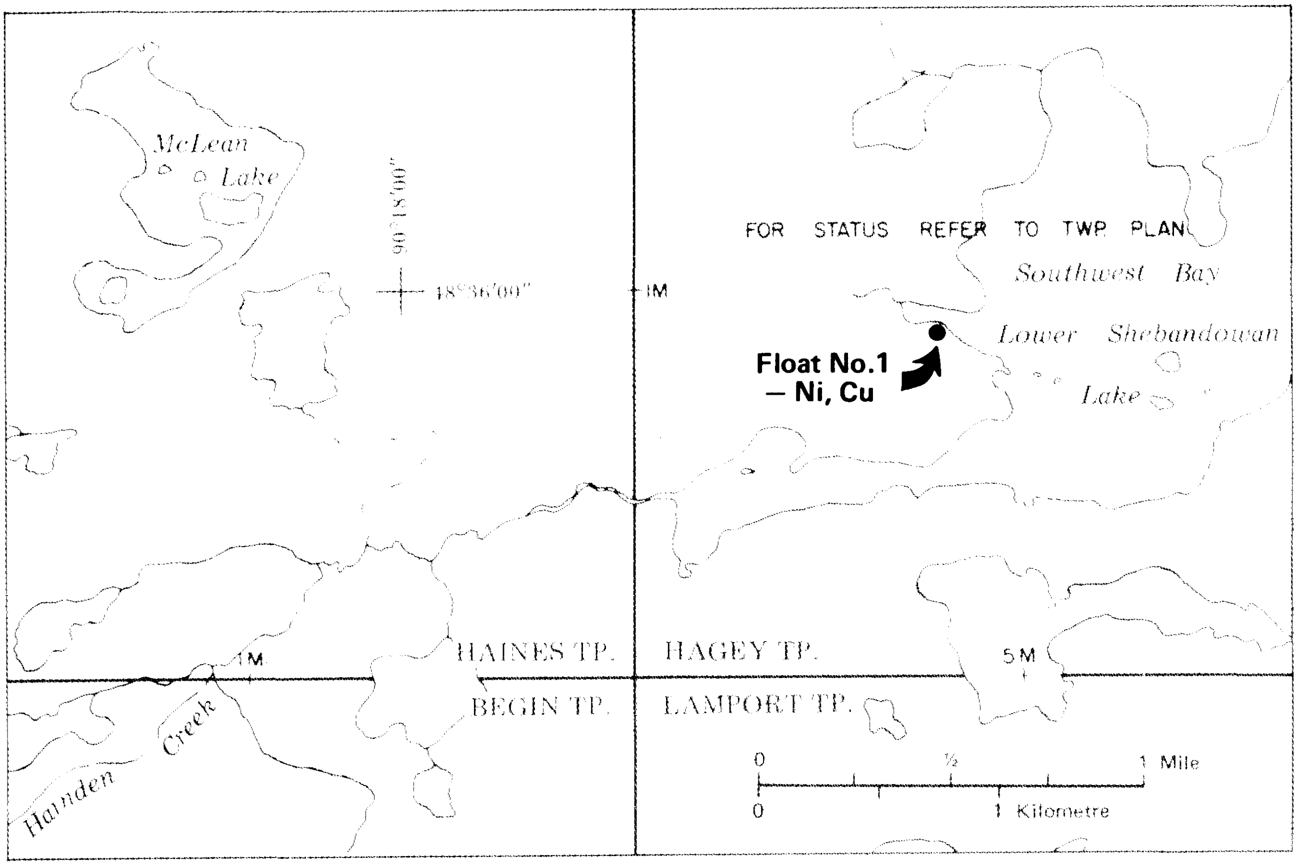
ODMNA Map 2235, Disraeli Lake Sheet.

Description: Dolomite float containing finely disseminated chalcocite is present in this area.

Bedrock Source: An induced polarization survey followed by diamond drilling in 1967 failed to locate bedrock mineralization.

Remarks: The records do not say who discovered the float but work on the property was by Falconbridge Nickel Mines Limited.

References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.2191. Rept. Induced Polarization Survey Disraeli Lake Claims and accompanying geological map. ODM GR98, p.28.



Thunder Bay District

Hagey Township Float No.1 - [Ni-Cu]

Main Metals: Nickel, Copper

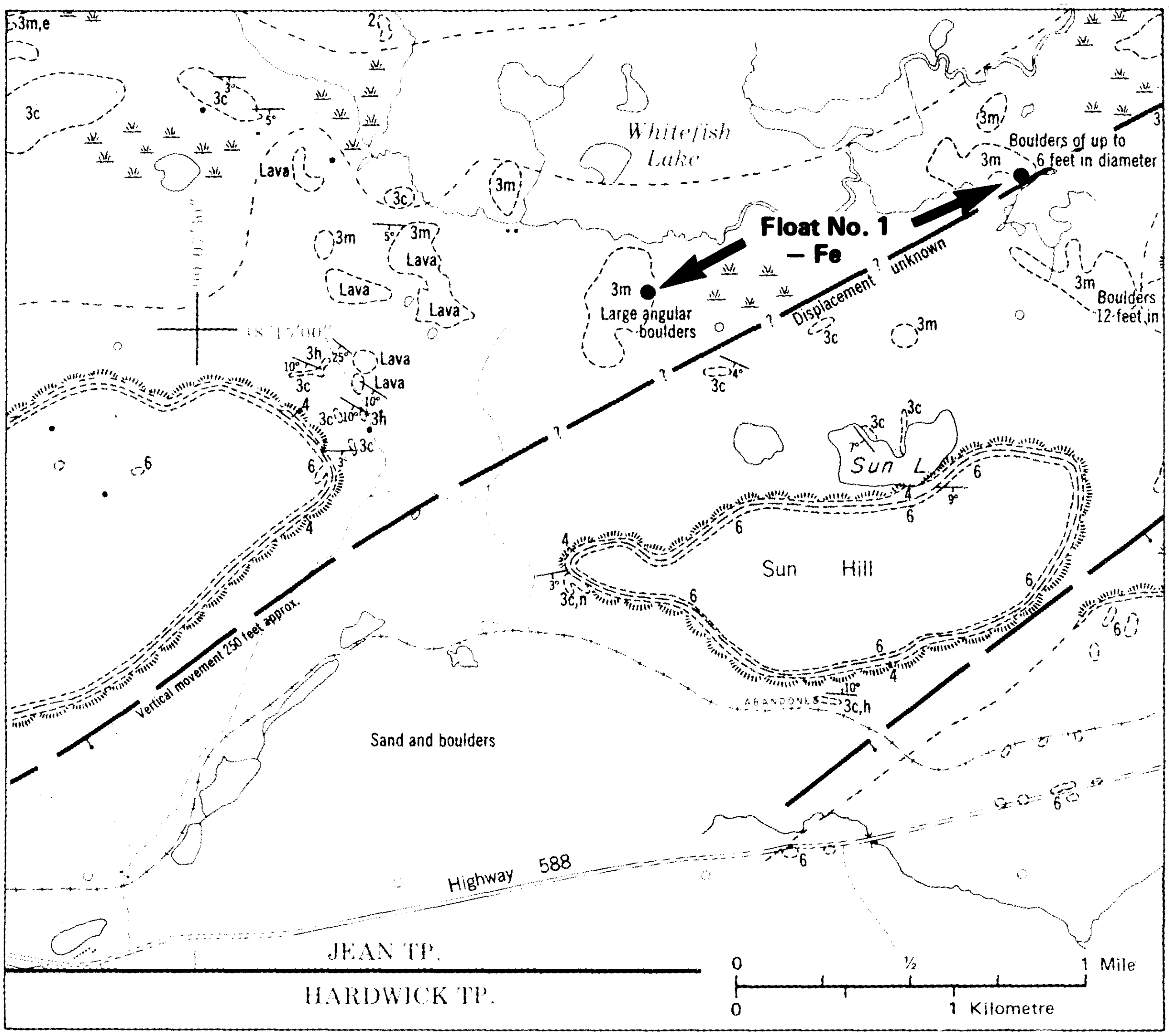
Location: Hagey Township (Latitude 48°37′, Longitude 90°14′), in the southwestern part of the township, Southwest Bay, Lower Shebandowan Lake. NTS 52B/9E. Map Reference: ODM Map 2127, Greenwater Lake Sheet.

Description: Boulders of serpentinite containing pyrite, pyrrhotite, magnetite, chalcopyrite, and polydymite occur on the south shore of Discovery Bay. A shipment of ore to the Mines Branch, Ottawa for metallurgical testing assayed 2.97 percent nickel, 1.65 percent copper, 0.15 percent cobalt, 0.03 ounces of platinum per ton, and 0.048 ounces of palladium per ton.

Bedrock Source: The mineralized boulders come from the serpentinite body on the north side of Discovery Bay about 250 feet (76 m) from the boulders. The ore lenses average 16 feet (4.8 m) in width and are up to 1,600 feet (490 m) in length.

Remarks: J.G. Cross (1920, ODM Rept., Vol.29, pt.1, p.226) stated that the presence of nickel in the sulphides was discovered by a chemist, W.W. Benner in 1913 and the following year J.G. Cross made further discoveries by digging test pits. R.J. Watson (1928, ODM Rept., Vol.37, pt.4, p.128) mentioned the existence of the boulders. The Shebandowan Mine is operated by The International Nickel Company of Canada Limited and began operations in 1973.

References: ODM 1928 Rept., Vol.37, pt.4, p.128-148. ODM 1920 Rept. Vol.29, pt.1, p.226-234. GSC 1922 Sum. Rept., pt.D, p.1-8. Mines Branch, Ottawa, Investigations in ore dressing and metallurgy; No.617, p.137, ODM MRC 12, p.289-290.



Thunder Bay District

Jean Township Float No.1 - [Fe]

Main Metals: Iron

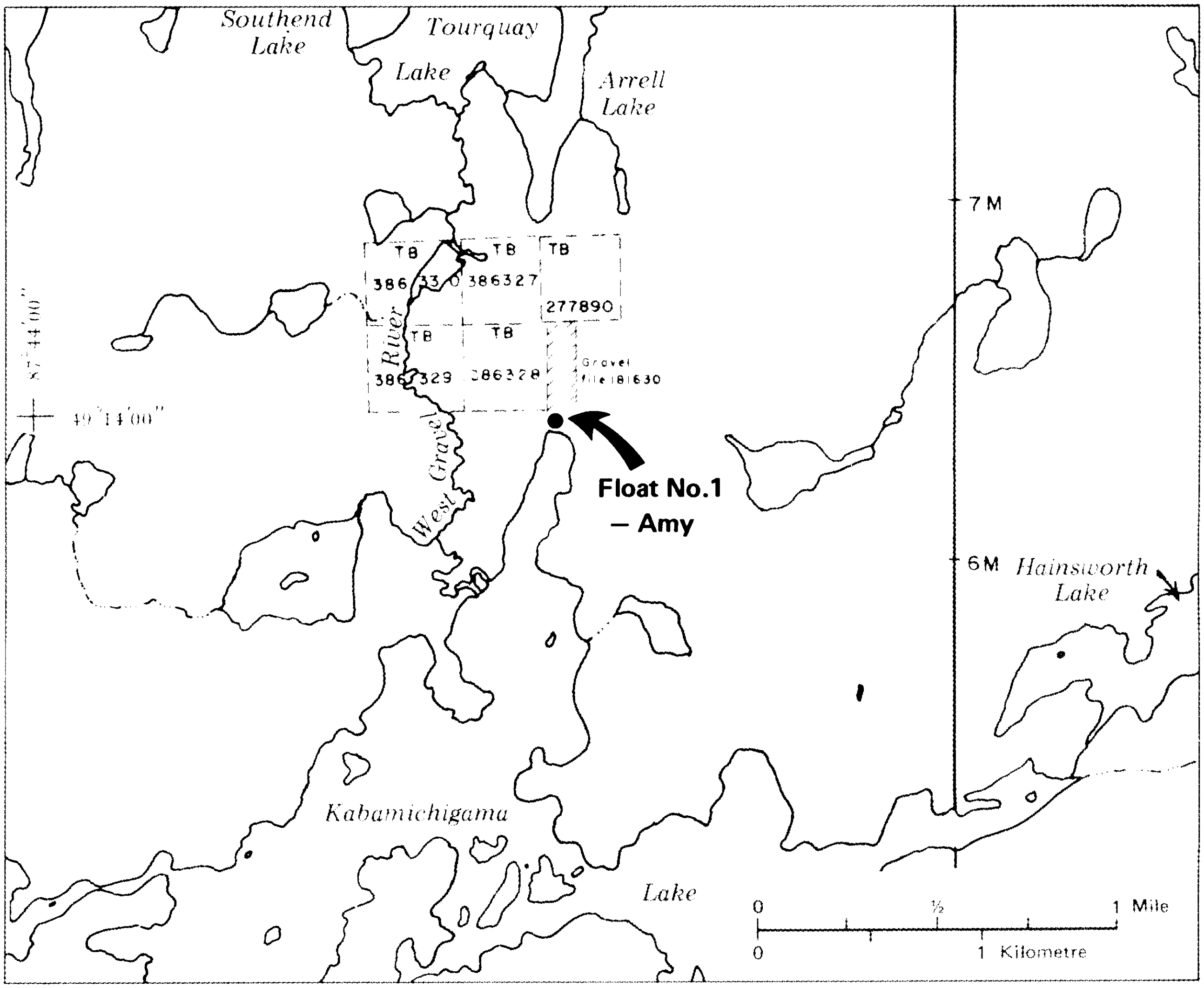
Location: Jean Township (Latitude 48°17′, Longitude 90°05′), north of Highway 588, about 35 miles (56 km) west of Thunder Bay. NTS 52B/8E.

Map References: ODM Map 1960i, Whitefish Lake Area. OMNR Claim Map M1765, Jean Township.

Description: Groups of boulders up to 6 feet (1.8 m) in diameter contain lenticles and zones of hematite-magnetite up to a foot in diameter.

Bedrock Source: The boulders are considered to be remnants of an overlying bed that has been eroded and the boulders rest upon a flow rock.

Reference: ODM (1960) Rept., Vol.69, pt.7, p.52-53.



Thunder Bay District

Kabamichigama Lake Area Float No.1 - [Amy]

Main Commodity: Amethyst

Location: Kabamichigama Lake Area, SE corner of map, (Latitude 49°07′30″, Longitude 87°30′), on the north side of Kabamichigama Lake (Latitude 49°13′, Longitude 87°39′). Gravel claim 181630, on a Domtar Woodlands road. NTS 42E/4E.

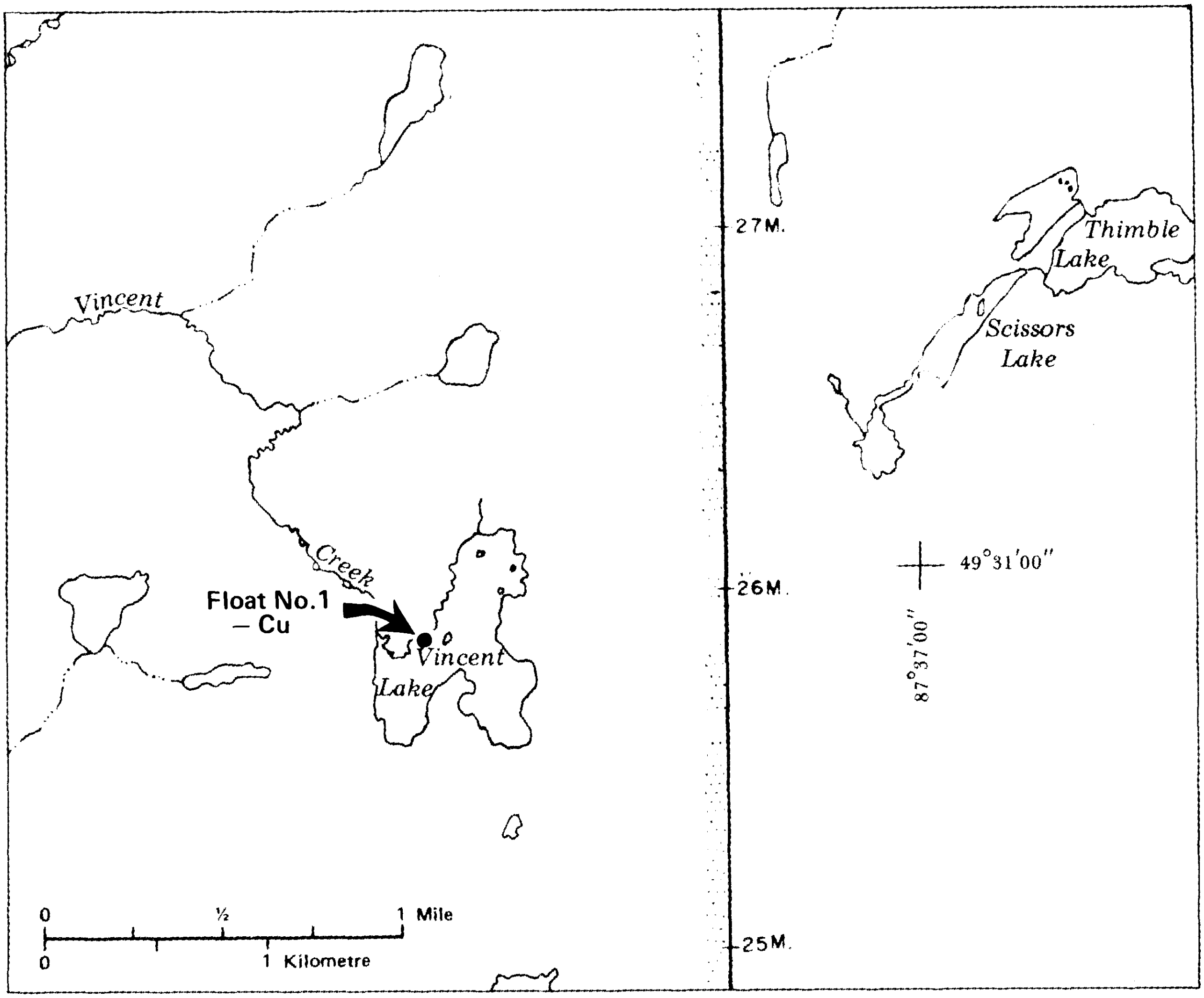
Map Reference: ODM Map 2293, Dickison Lake.

Description: Amethyst float was found in the bed of a bush road.

Bedrock Source: The country rock is a pink biotite granite and a fault zone containing amethyst strikes north across the road. About 1/8 mile (0.2 km) north of the road the zone has been stripped for a width of 70 feet (21 m) and individual veins are from 1 to 3 feet (0.3 to 0.9 m) wide. Vugs in the veins are lined with pink to purple amethyst and some crystals up to 3 inches (7.6 cm) in length have been recovered.

Remarks: Found in 1969 by T. Galarneau, prospector of Nipigon, Ontario.

References: ODM (1975) GR123, p.20-21. ODM Brochure 1975, Amethyst, Purple Gemstone of the North.



Thunder Bay District

Leopard Lake Area Float No.1 - [Cu]

Main Metals: Copper

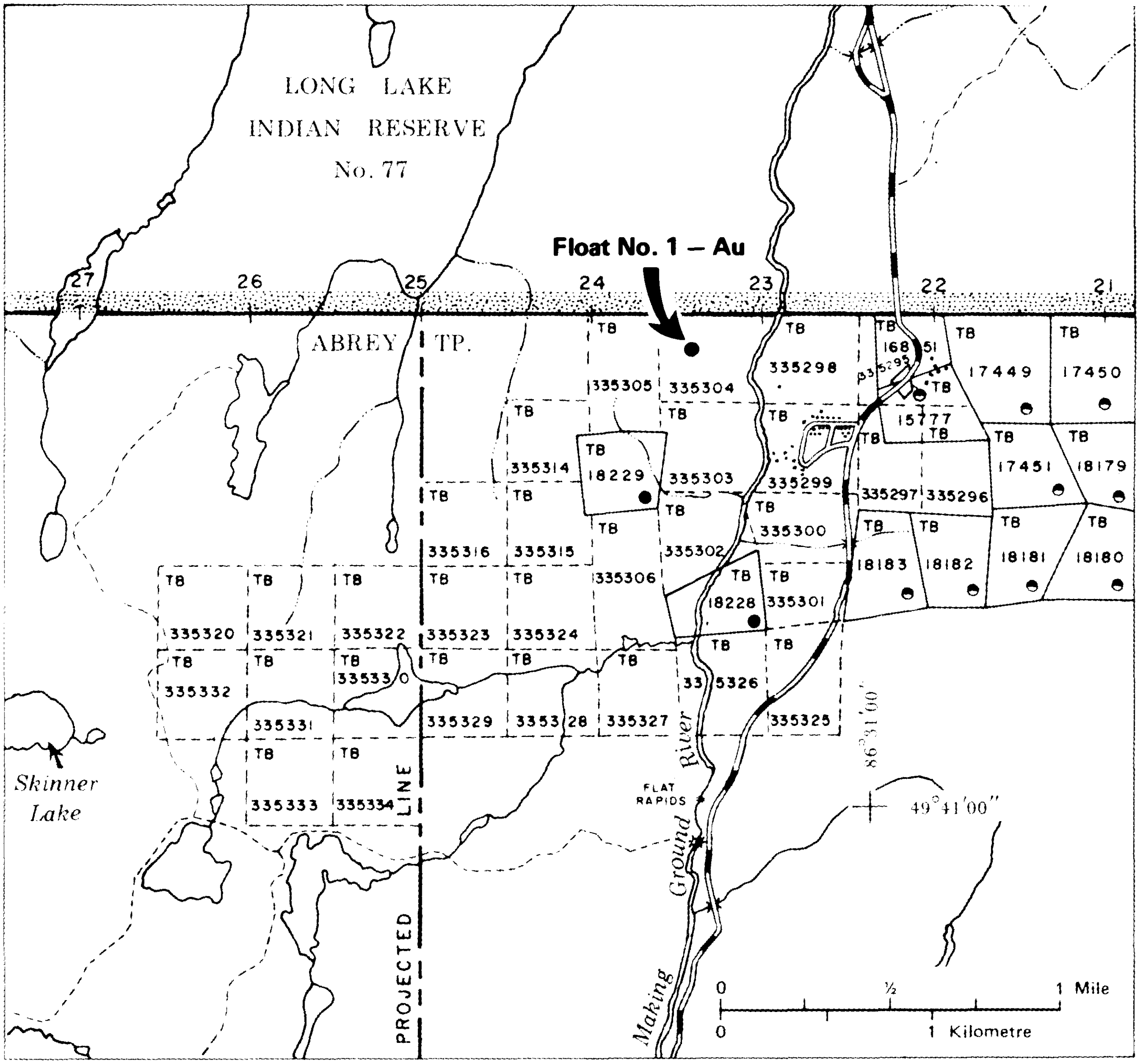
Location: Leopard Lake Area, SE corner of map (Latitude 49°30′, Longitude 80°30′) on the west shore of Vincent Lake, Claim TB287069, NTS 42E/5E.
Map Reference: OMNR Claim Map 2495, Leopard Lake Area.

Description: Numerous large pieces of angular greywacke up to 8 feet (2.4 m) in length contain disseminated chalcopyrite and assayed 1.5 percent copper.

Bedrock Source: A breccia zone with an exposed width of 15 feet (4.5 m) occurs on the eastern shore of Vincent Lake and on a shoal in the lake on Claim TB287064. This zone contains veinlets and disseminations of pyrite, pyrrhotite, and chalcopyrite.

Remarks: Found by Joe Thorsteinson, Prospector, Beardmore, during the fall of 1970.

Reference: Attachment to letter, dated May 3, 1972 by M.I. Watson, Lynx-Canada Explorations Limited, to the Ontario Division of Mines under Mineral Exploration Assistance Program, Contract GB-18.



Thunder Bay District

McBean Lake Area Float No.1 - [Au]

Main Metals: Gold

Location: McBean Lake Area, SE corner of map (Latitude 49°30', Longitude 86°30'), on the south side of Long Lake Indian Reserve No.77 and about a ¼ mile (0.4 km) west of the Making Ground River. NTS 42E/10E.

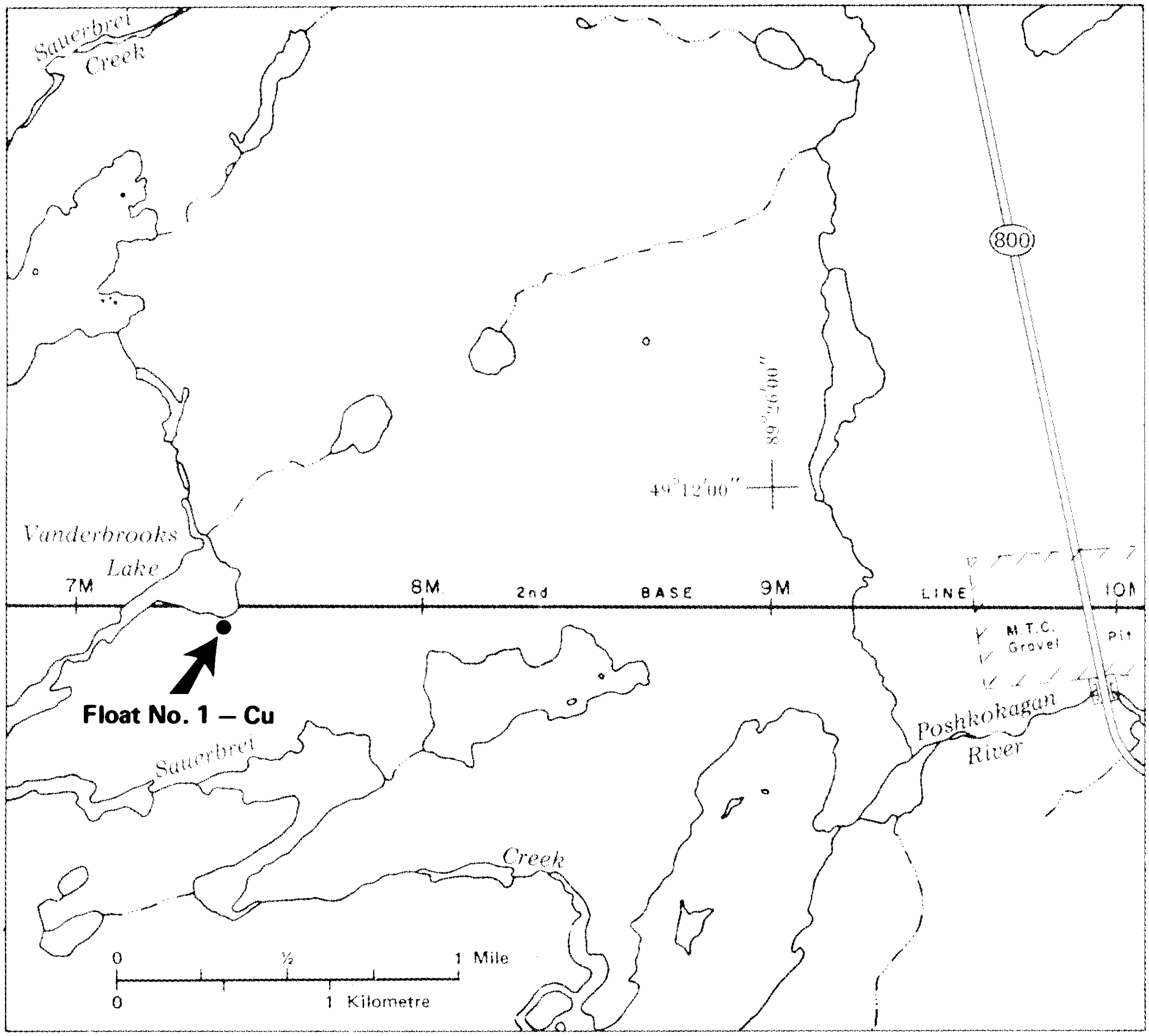
Map Reference: OMNR Claim Map M1622, McBean Lake Area.

Description: Boulders of quartz diorite contain coarse visible gold with little quartz present.

Bedrock Source: Quartz diorite was found in place containing quartz stringers but no gold.

Remarks: Work on the property by Goldfinders Limited *circa* 1936.

Reference: ODM (1937), Vol.46, pt.3, p.18-19.



Thunder Bay District

Max Lake Area Float No.1 - [Cu]

Main Metals: Copper

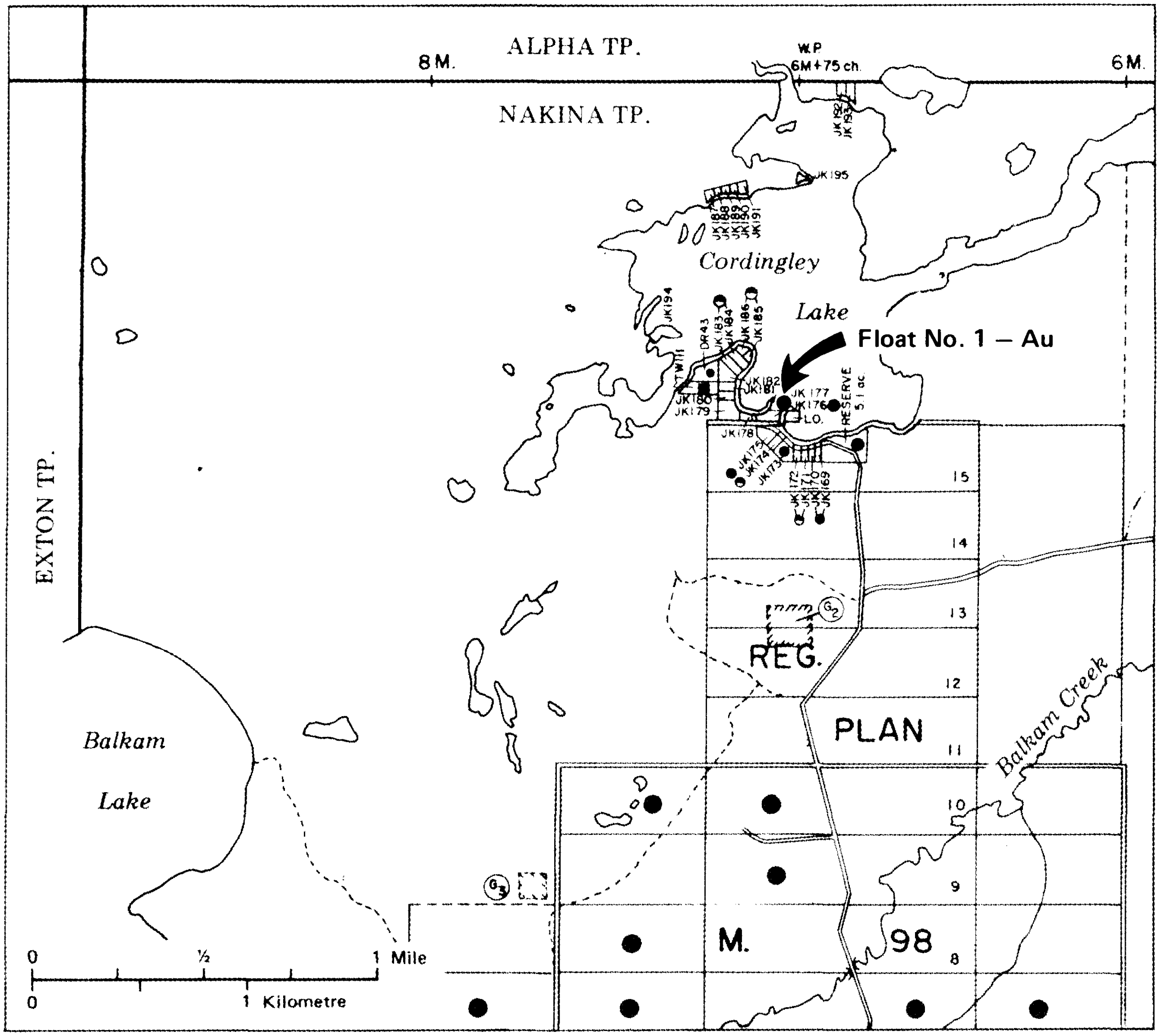
Location: Max Lake Area, SE corner of map (Latitude 49°07'30", Longitude 89°30'), south shore of Vandenbrooks Lake at extreme east end. NTS 52H/3W.
Map References: ODM Map 2136, Max Lake Sheet. OMNR Claim Map M2899, Max Lake Area.

Description: A copper-bearing float boulder was found.

Bedrock Source: Possibly mineralization along the Vandenbrooks Lake Fault.

Remarks: Found in 1964 by E.G. Pye (now Director, Geological Branch, Division of Mines) during the course of a geological survey for the Ontario Department of Mines.

Reference: ODM GR64, p.31.
ODM Map 2136.

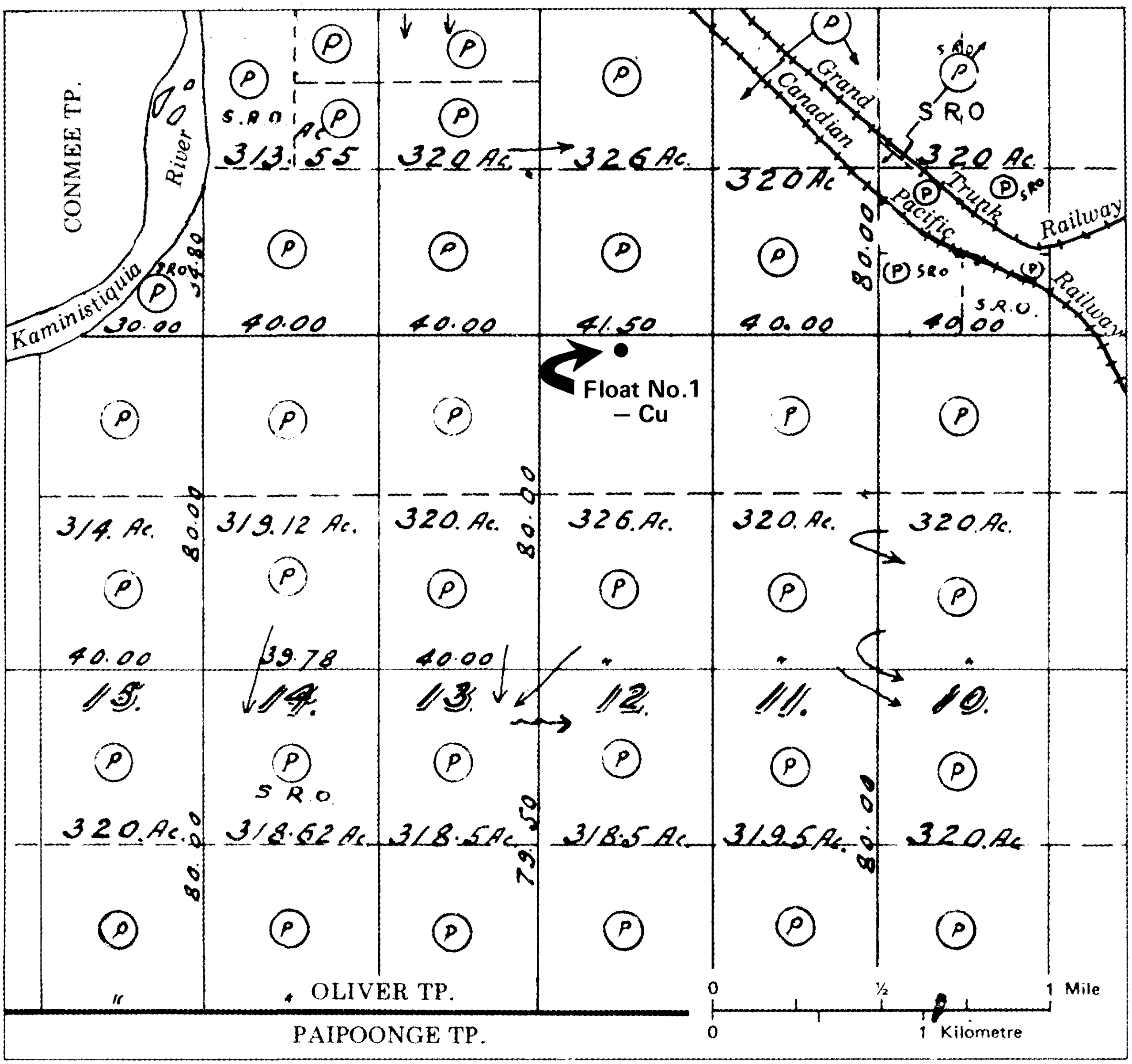


Thunder Bay District

Nakina Township Float No.1 - [Au]

Main Metals: Gold
Location: Nakina Village, Nakina Township (Latitude 50°10′, Longitude 86°39′) on the road between the Superior Airways Office and the shore of the western bay of Lake Cordingley. NTS 42L/2E.
Map Reference: OMNR Claim Map M1831, Nakina Township.

Description: A rounded piece of dark grey chert or obsidian about 3 inches (7.6 cm) in diameter contained a fleck of native gold in a small fracture.
Source: The float was part of the gravel dumped on the road and no doubt came from a local gravel pit.
Remarks: Found by Fred Symonds, prospector of Toronto.
Reference: Fred Symonds, personal communication, *circa* 1972.



Thunder Bay District

Oliver Township Float No.1 - [Cu]

Main Metals: Copper

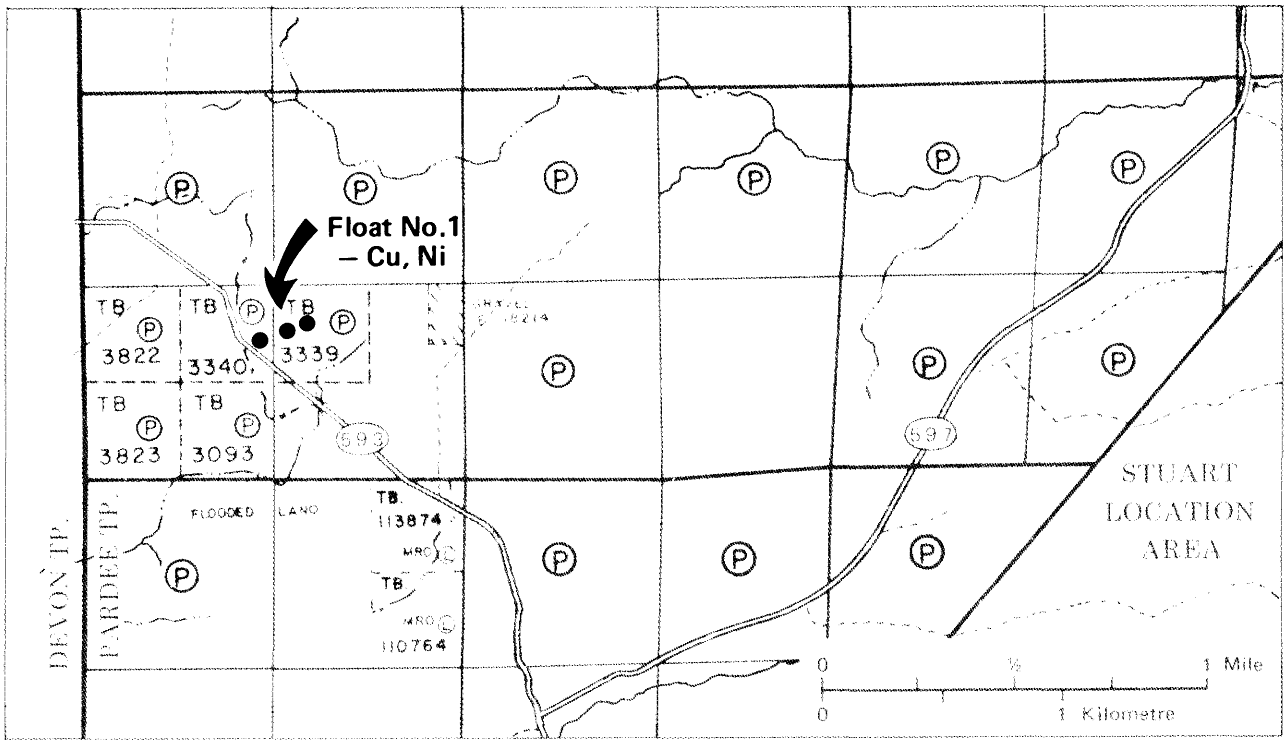
Location: Oliver Township (Latitude 48°27′, Longitude 89°30′), N½ lot 12, concession II, on south side of road, about 2 miles (3.2 km) northwest of the settlement of Murillo. NTS 52A/5E.

Map Reference: ODM Map 2065, Atikokan-Lakehead Sheet.
OMNR Claim Map M1845, Oliver Township.

Description: Specks of native copper are present in basalt float.

Remarks: Trenching done in the vicinity.

Reference: Files of Regional Geologist, Ontario Ministry of Natural Resources, Thunder Bay.



Thunder Bay District

Pardee Township Float No.1 - [Cu,Ni]

Main Metals: Copper, Nickel

Location: Pardee Township (Latitude 48°05′, Longitude 89°38′), near the intersection of Highway 593 and the western boundary of Pardee Township, S½ lot 13, concession VIII. NTS 52A/4E.

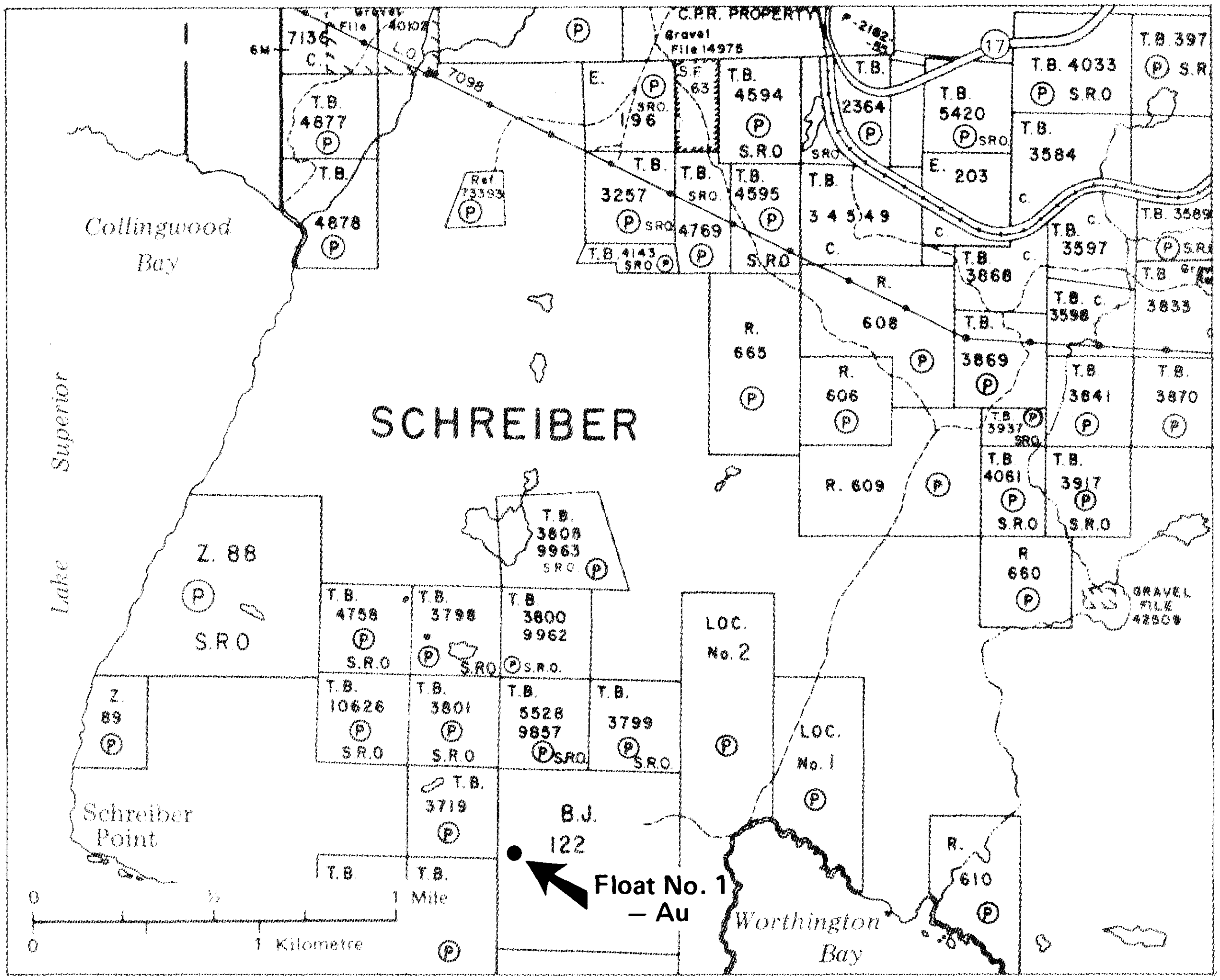
Map Reference: ODM Map 2207, Devon and Pardee Townships.

Description: Float boulders are present on a drift-covered hillside in an area 1,000 feet (300 m) long by 250 feet (76 m) wide with the larger piece of float near the western end. The largest pieces of float are 20 feet by 15 feet by 12 feet (6 m by 4.5 m by 3.6 m) and weigh about 350 tons (355 tns). The rock is a medium- to coarse-grained diabase and contains pyrrhotite, pentlandite, chalcopyrite, and magnetite. A grab sample assayed 0.79 percent copper and 0.29 percent nickel.

Bedrock Source: Unknown but probably the Crystal Lake Gabbro of the Great Lakes Nickel Corporation located about 4 miles (6.4 km) to the northeast.

Remarks: Found by J.A. McCuaig, prospector, *circa* 1913, and pits have been dug to establish the extent of mineralized boulders. A vertical drill hole encountered drift and boulders to a depth of 200 feet (61 m) and at 112 feet (34 m) a 6 inch (15 cm) core length of sulphide-bearing diabase. J.S. Brodie, prospector, (1952) considered the float due to valley glaciation and by following the valley, located bedrock mineralization in the Crystal Lake Gabbro on what is now the property of the Great Lakes Nickel Corporation. See also the Section on 'Case Histories of Tracing Float' earlier in this report, 'Pardee Township, McCuaig Float, Ontario'.

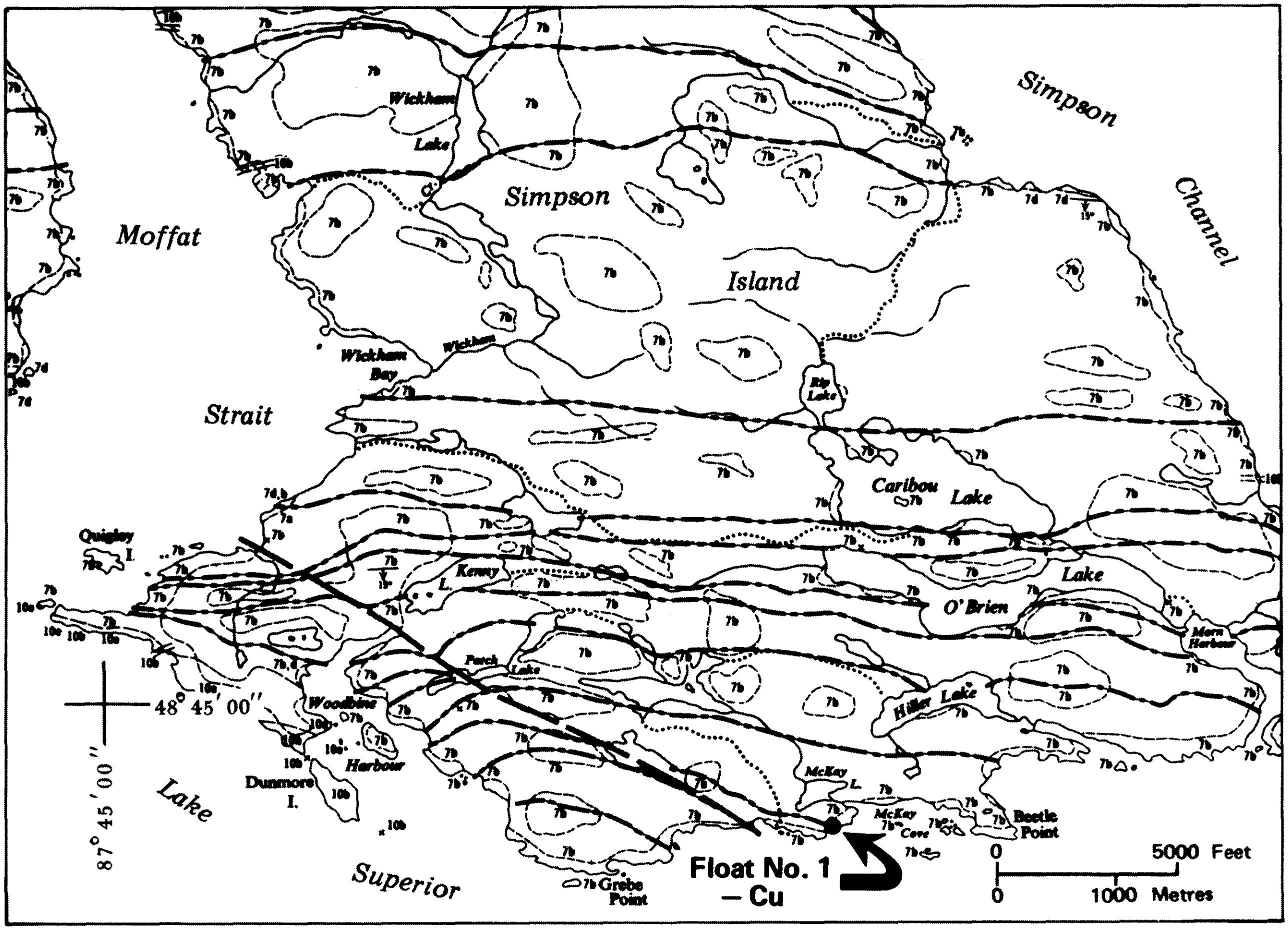
References: GSC Paper 35-1. Copper-Nickel occurrences in the Pigeon River Area. Unpublished MSc Thesis, McGill University, 1950. A Copper-Nickel Occurrence in Pardee Township, by J.A. McCuaig. ODM GR87, McCuaig Property, p.39.



Thunder Bay District

Priske Township Float No.1 - [Au]
(formerly Township 84)

Main Metals: Gold
Location: Priske Township (Latitude 48°50′, Longitude 87°14′), claim BJ122, about 3 miles (4.8 km) south of Schreiber. NTS 42D/14E.
Map References: ODM Map 47j, Schreiber Area. OMNR Claim Map M1932, Township 84.
Description: Quartz float was found which contained visible gold.
Bedrock Source: A narrow rich vein in hornblende syenite contains specks of native gold in pyrite, and also a gold telluride.
Remarks: L.H. Estell, employee of W.L. Longworth and optionee of claim BJ122, found quartz float and located the rich vein in 1920. Work on the property has been by P. McKellar and W.L. Longworth, Schreiber Gold Mines Limited, R.N. Palmer and associates, North Shore Gold Mines and P.A.L. Exploration Limited. Some 2,441 ounces of gold and 226 ounces of silver were produced from 3,808 tons (3,869 tns) of ore.
References: ODM (1921) Rept., Vol.30, pt.4, p.13. ODMNA (1971) MRC13, p.287-288.



Thunder Bay District

Simpson Island Float No.1 - [Cu]

Main Metals: Copper

Location: Simpson Island (Latitude 48°46', Longitude 87°41') in Lake Superior about 32 miles (51 km) southeast of Nipigon, McKay Cove is on the south shore of the island. NTS 42D/13E.

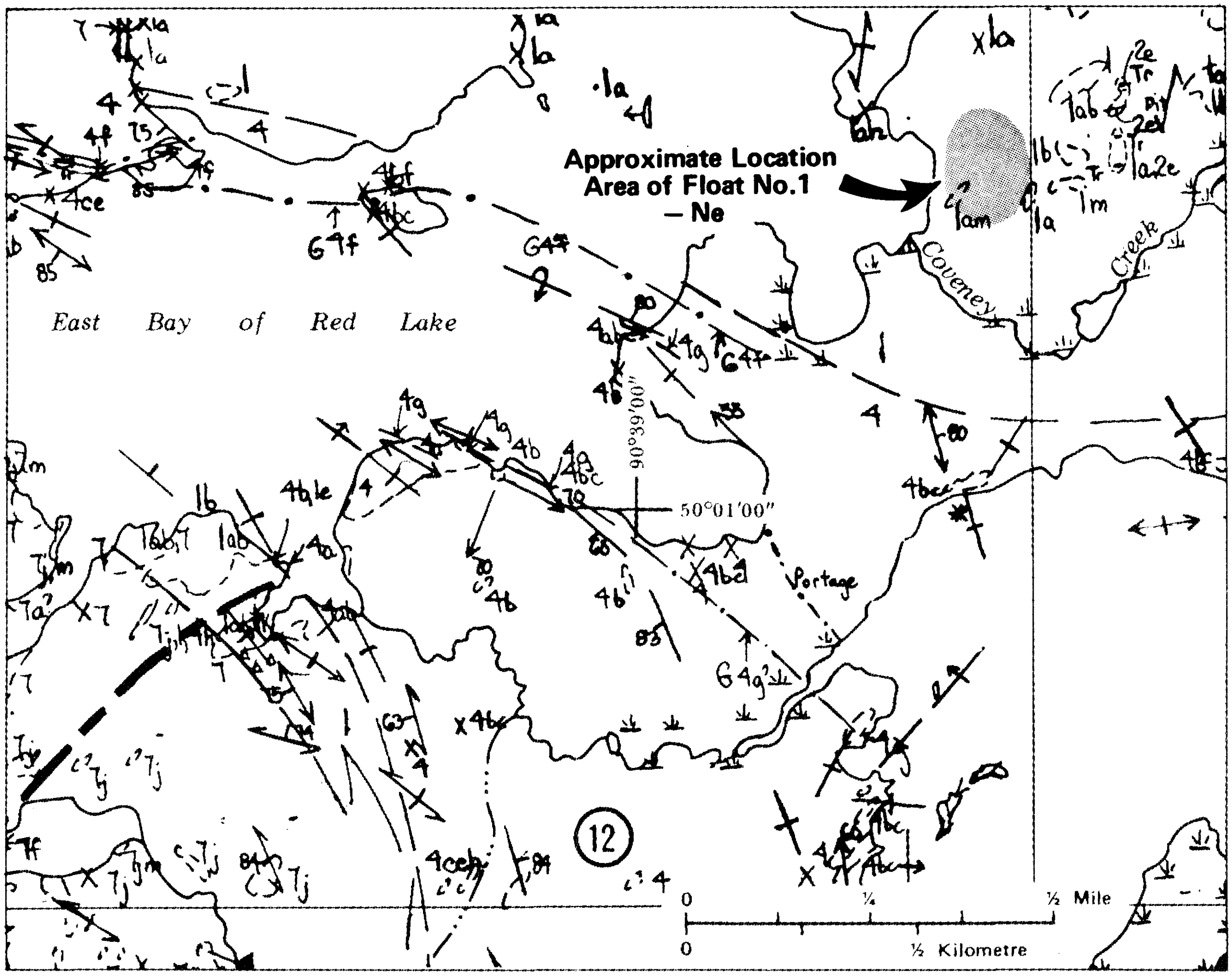
Map Reference: ODM Map 2285, St. Ignace Island and Adjacent Islands.

Description: Native copper occurs in pebbles of light coloured apple-green prehnite, on a small beach adjacent to McKay Cove, as part of the beach sand and gravel. On the freshly broken surface the prehnite can be seen to consist of fan-shaped, radiating crystal aggregates with native copper between the prehnite and country rock.

Bedrock Source: Late Precambrian mafic flows form the headlands flanking the beach. Former gas cavities in the flows are now filled with botryoidal to mammillary prehnite with the largest masses of prehnite up to 20 cm (8 in.) in diameter at a distance of about 1 m (3.3 ft.) apart. Native copper is commonly present in the prehnite as small crystals about 1.0 mm in diameter or as arborescent crystalline forms from 1.0 to 3.0 mm in diameter. The central part of some cavity fillings is largely calcite.

Remarks: This occurrence was found in 1974 by Ray Kenney of Rossport, Ontario.

Reference: R.P. Sage, Geologist, Precambrian Geology Section, Geological Branch, Personal communication, May 26, 1975.



Thunder Bay District

Squaw Lake Area Float No.1 - [Ne]

Main Commodity: Nepheline

Location: Squaw Lake Area, East Bay of Sturgeon Lake (Latitude 50°05', Longitude 90°33'). NTS 52J/2E.

Map References: ODM Map P.968 and P.842, Squaw Lake - Sturgeon Lake Area, Northeast Area - Squaw Lake Sheet.

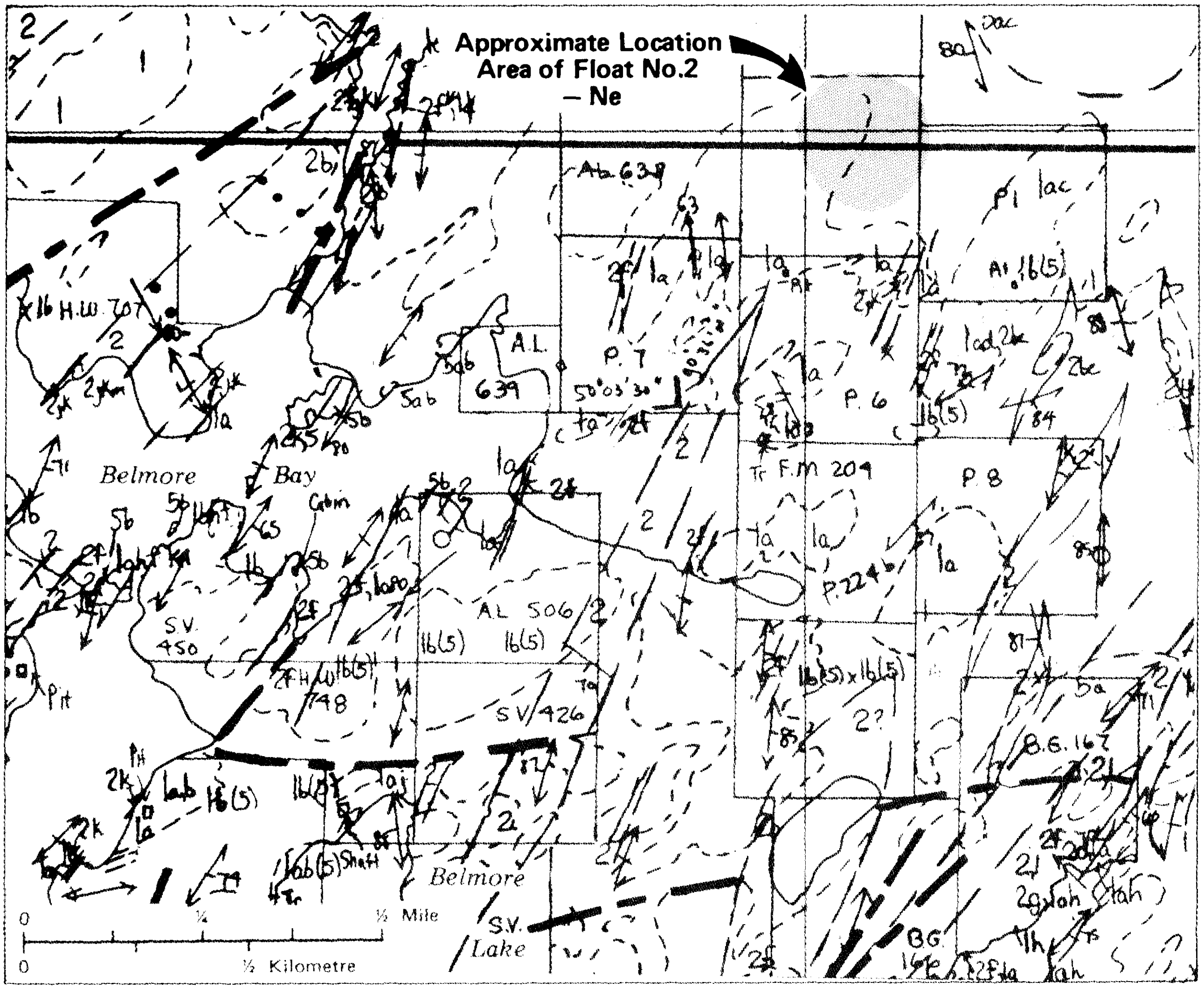
ODM Map 2169, Sioux Lookout - Armstrong Sheet.

Description: Two or three boulders, a couple of feet in diameter, of medium to coarse grained light grey nepheline syenite were observed. Mineralogy as seen in hand specimens consisted of feldspar, nepheline, black mica, magnetite, apatite, and pyrite.

Bedrock Source: The precise location of the boulders in relation to East Bay is not known. The Sturgeon Narrows Alkalic Complex is present immediately south of East Bay so that these boulders are close to a bedrock source.

Remarks: Samples of the boulders were collected by W.G. Miller, provincial geologist, in July 1902; analyzed by A.G. Burrows, provincial geologist; and examined microscopically by Professor R.W. Brock.

References: OBM Rept. 1903, Vol.12, p.87, 104-105. ODM Rept. 1924, Vol.33, pt.6, p.33-36.



Thunder Bay District

Squaw Lake Area Float No.2 - [Ne]

Main Commodity: Nepheline

Location: Squaw Lake Area, East Bay of Sturgeon Lake (Latitude 50°05′, Longitude 90°33′). NTS 52J/2E.

Map References: ODM Map P.968 and P. 842, Squaw Lake - Sturgeon Lake Area, Northeast Area - Squaw Lake Sheet.

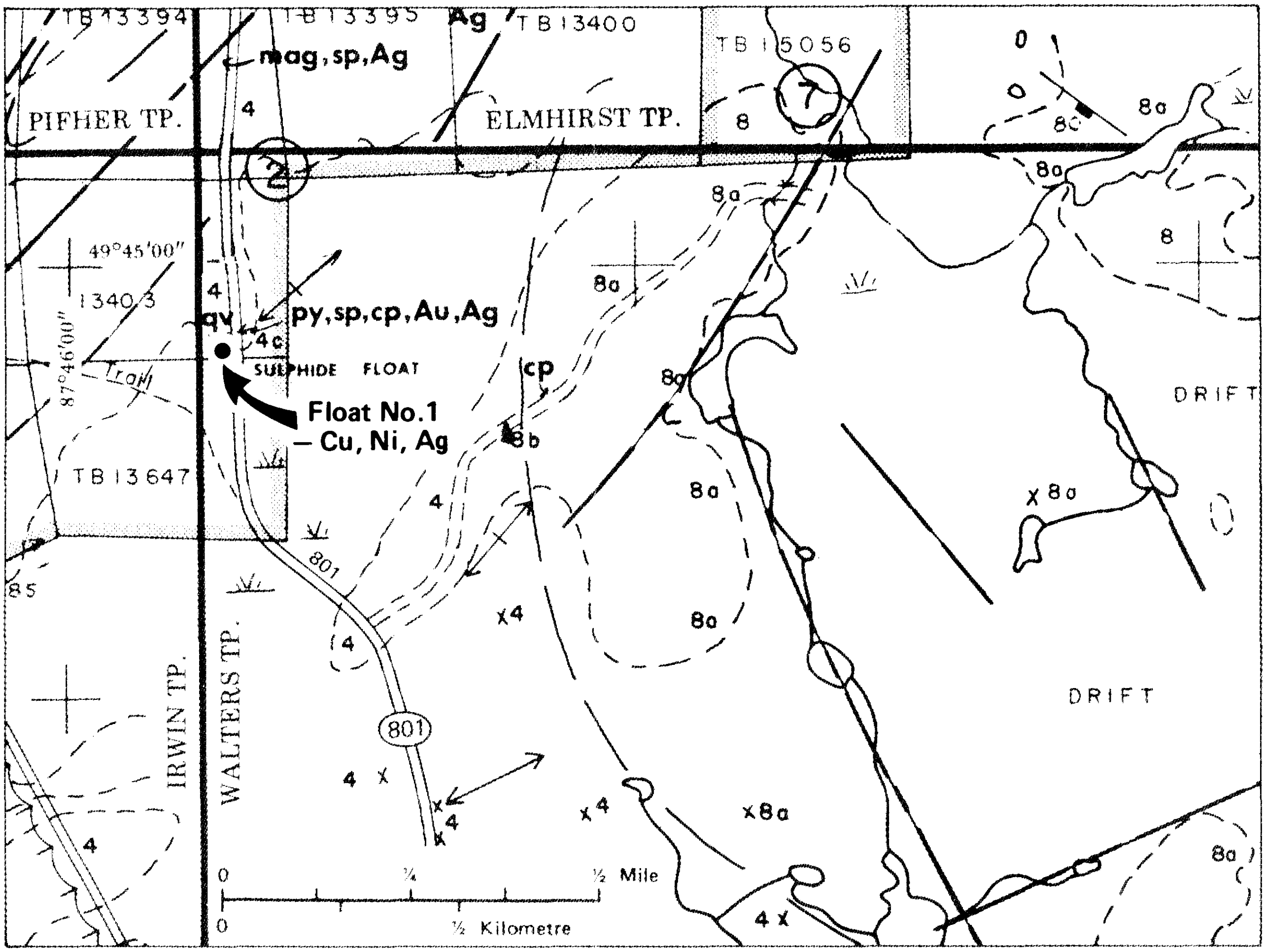
ODM Map 2169, Sioux Lookout - Armstrong Sheet.

Description: Boulders appearing bleached and puddled of nepheline syenite, containing euhedral feldspar, were found in drift.

Bedrock Source: The precise location of these boulders along the surveyed line is not known. The Sturgeon Narrows Alkalic Complex is present south of East Bay so that these boulders are fairly close to a bedrock source.

Remarks: These boulders were discovered, sampled, and analyzed by T.L. Gledhill, provincial geologist, from a survey eastward along a Base Line surveyed by K.G. Ross, O.L.S.

Reference: ODM Rept. 1924, Vol.33, pt.6, p.33-36.



Thunder Bay District

Walters Township Float No.1 - [Cu,Ni,Ag]

Main Metals: Copper, Nickel, Silver

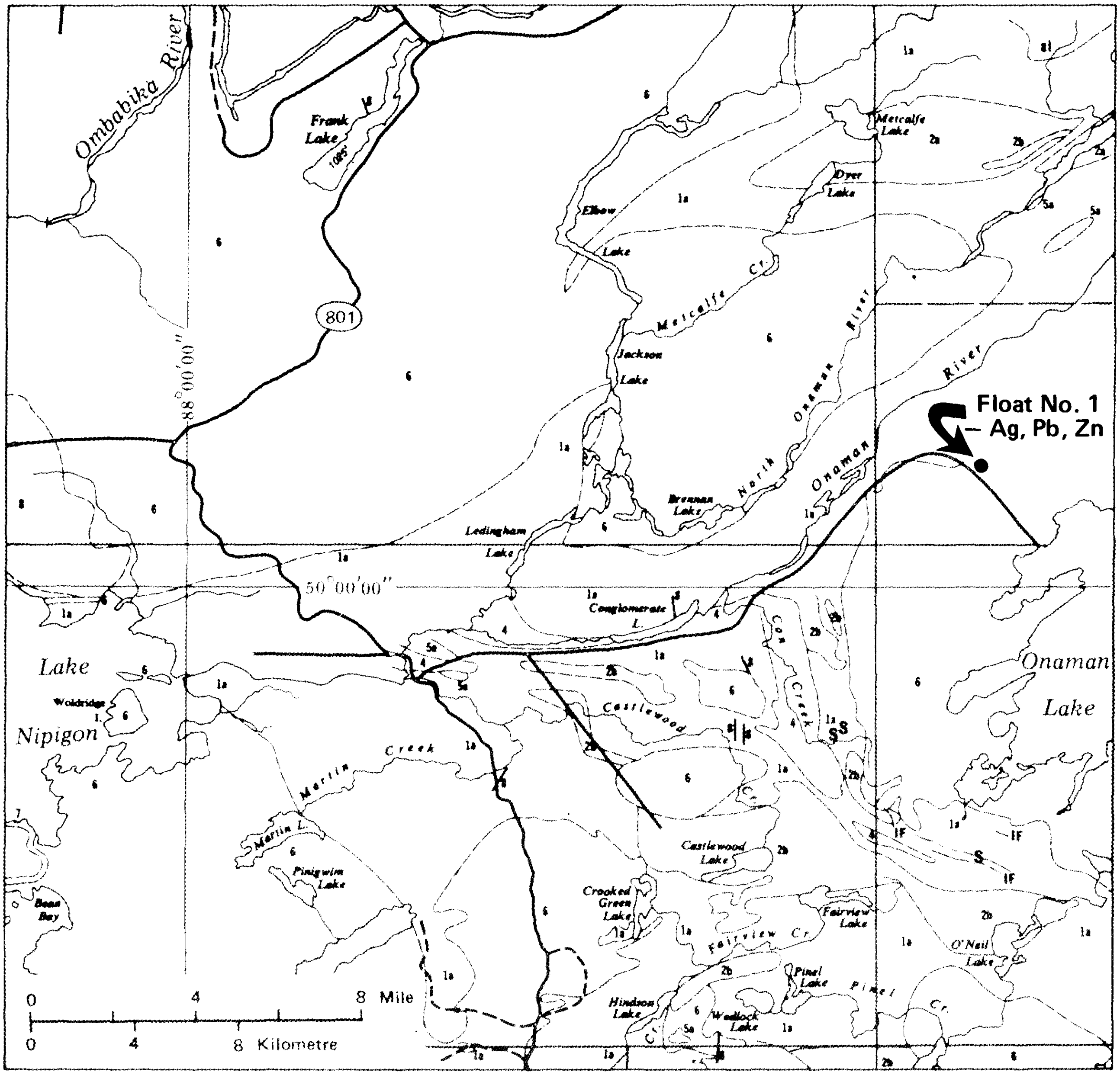
Location: Walters Township (Latitude 49°42', Longitude 87°42'), about ¼ mile (0.4 km) south of the north boundary of the township and on the west side of a secondary road. NTS 42E/12E.
Map Reference: ODM Map P.539, Walters Township.

Description: A piece of sulphide float about 1 foot (0.3 m) in diameter was found at this locality and assayed 4.80 percent Cu, 3.48 percent Ni, 0.02 oz. Au per ton, 1.40 oz. Ag per ton, and minor amounts of Pb, Zn, Co.

Bedrock Source: Mineralized veins are present in the vicinity but the sulphide mineralization appears to be dissimilar. Probably transported by man and may be ore from Sudbury.

Remarks: Found by W.O. Mackasey, Geologist, Precambrian Geology Section, Geological Branch, during the course of an ODM geological survey in 1968.

Reference: J. Scott, Assistant to the Regional Geologist, Ontario Ministry of Natural Resources, Thunder Bay, personal communication (1972). W.O. Mackasey, personal communication (1973). ODM Map P.539, Marginal Notes. ODM GR149, Geology of Walters and Leduc Townships, p.39.



Thunder Bay District

National Topographic System Quadrangle
42L/4E Float No.1 - [Ag,Pb,Zn]

Main Metals: Silver, Lead, Zinc

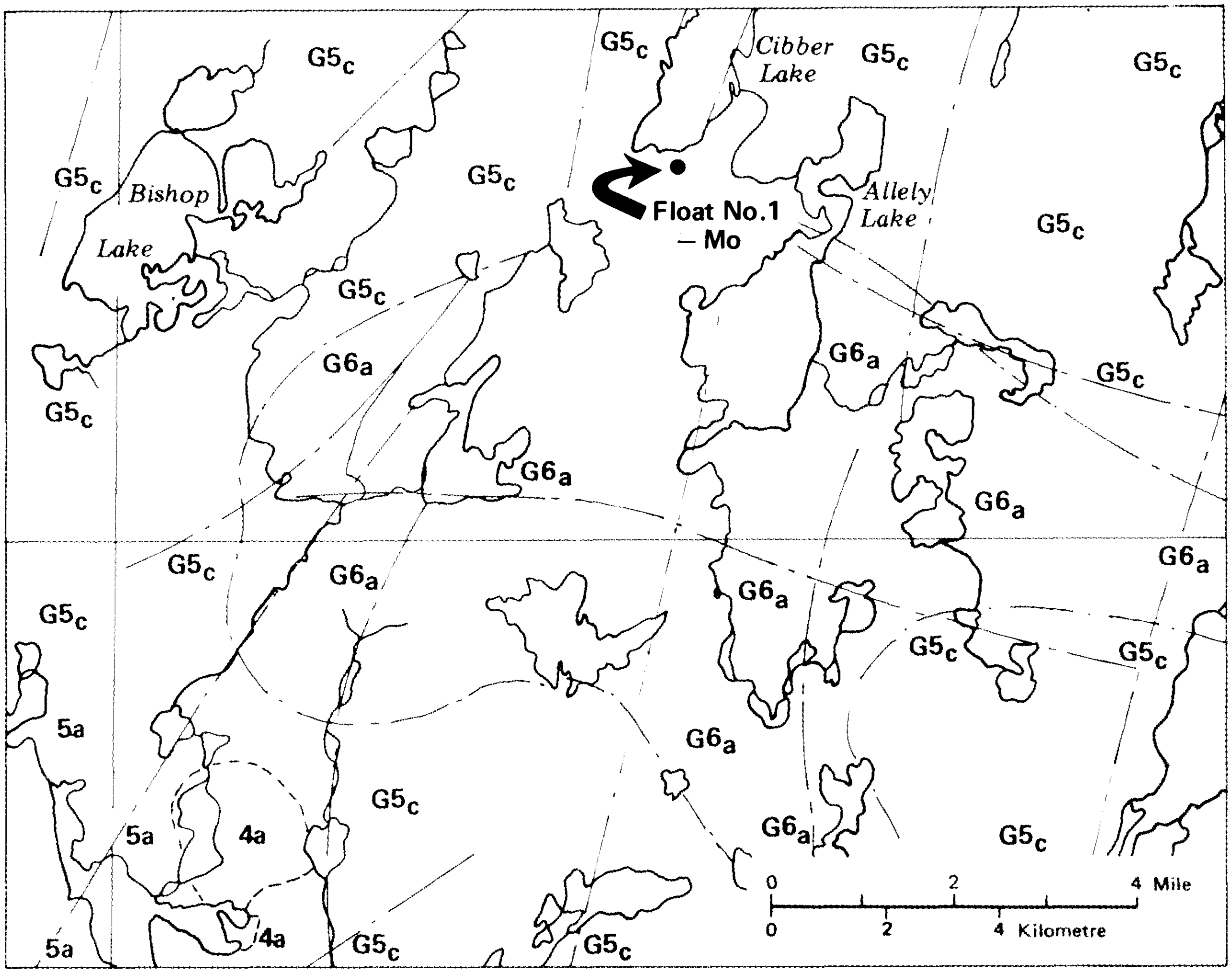
Location: NTS Quadrangle (Latitude 50°00' to 50°15', Longitude 87°30' to 87°45'), about 2 miles (3.2 km) northwest of Onaman Lake. NTS 42L/4E.

Map Reference: ODM Map 2102, Tashota-Geraldton Sheet.

Description: Ag, Pb, Zn float.

Remarks: Float shown on Map 2102, Tashota-Geraldton Sheet.

Reference: Files in the Regional Geologist office, Ontario Ministry of Natural Resources, Thunder Bay.



Thunder Bay District

National Topographic System Quadrangle 52G/9W Float No. 1 [Mo]

Main Metals: Molybdenum

Location: NTS Quadrangle 52G/9W (Latitude 49°30′ - 49°45′, Longitude 90°15′ - 90°30′). The float is located in a gravel pit about 1,000 feet (300 m) south of Cibber Lake on the north side of a bush road which leads west from the Great Lakes Pulp and Paper Company Limited road.

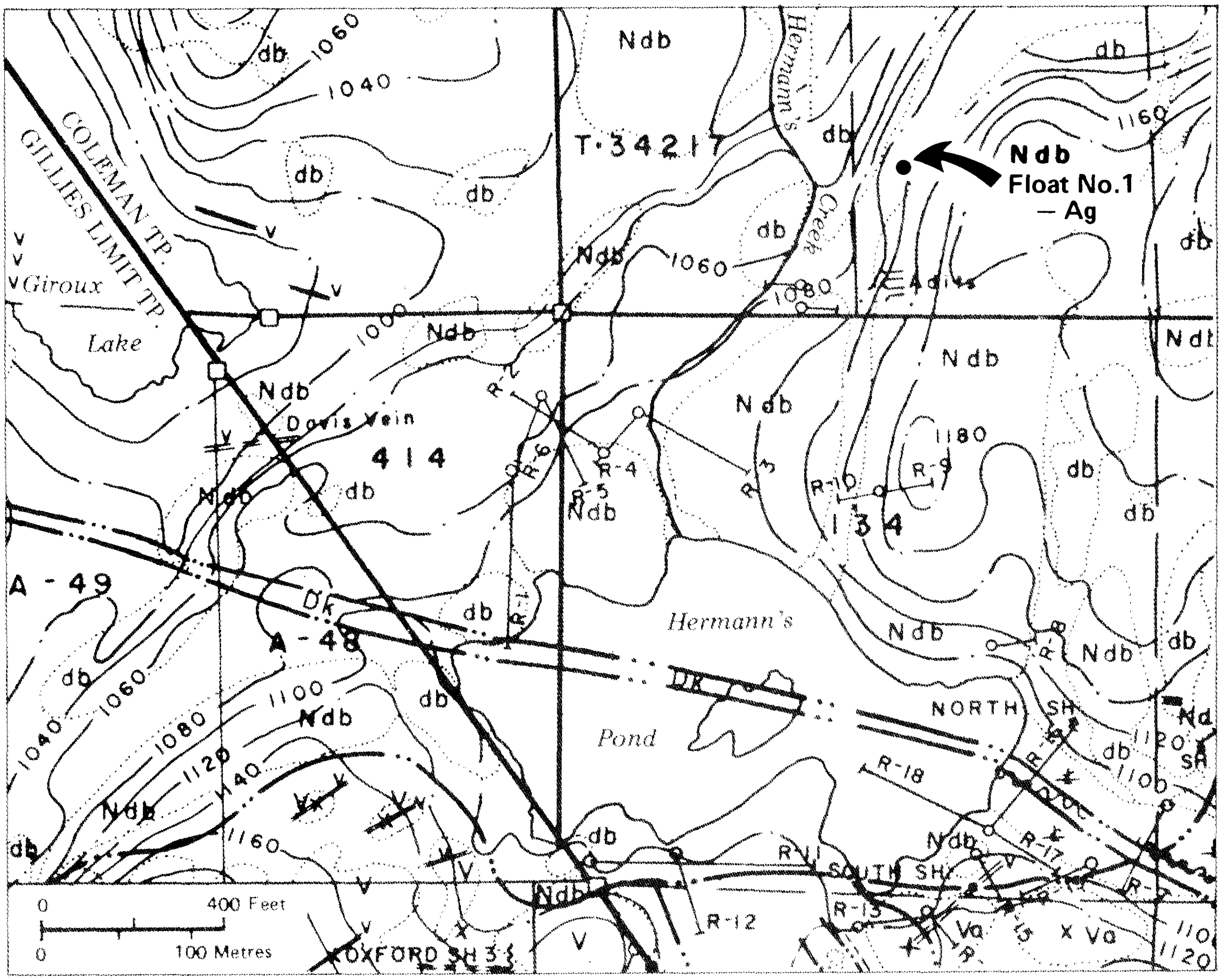
Map Reference: ODM Map 326, Garden-Obonga Lakes Sheet.

Description: A subrounded boulder of ultramafic rock, about 3 feet by 2 feet (0.9 x 0.6 m) is split parallel to a feldspathic veinlet. Flakes of coarse molybdenite are present in the veinlet. The boulder occurs in a gravel pit in an area of pitted outwash with local eskers up to a mile in length.

Bedrock Source: Unknown.

Remarks: Observed by R.P. Sage, Geologist, Precambrian Geology Section, Geological Branch, during the course of geological mapping for the Geological Branch during the summer of 1973. The boulder is no longer in place.

References: ODM MP56, Summary of Field Work 1973, p.50. R.P. Sage, personal communication.



Timiskaming District

Coleman Township (Gem) Float No.1 - [Ag]

Main Metals: Silver

Location: Coleman Township (Latitude 47°22′, Longitude 79°48′), E part, SW¼, S½, lot 3, concession IV, 750 feet (229 m) east and 320 feet (97.5 feet) north of southwest corner lot post. NTS 31M/5W.

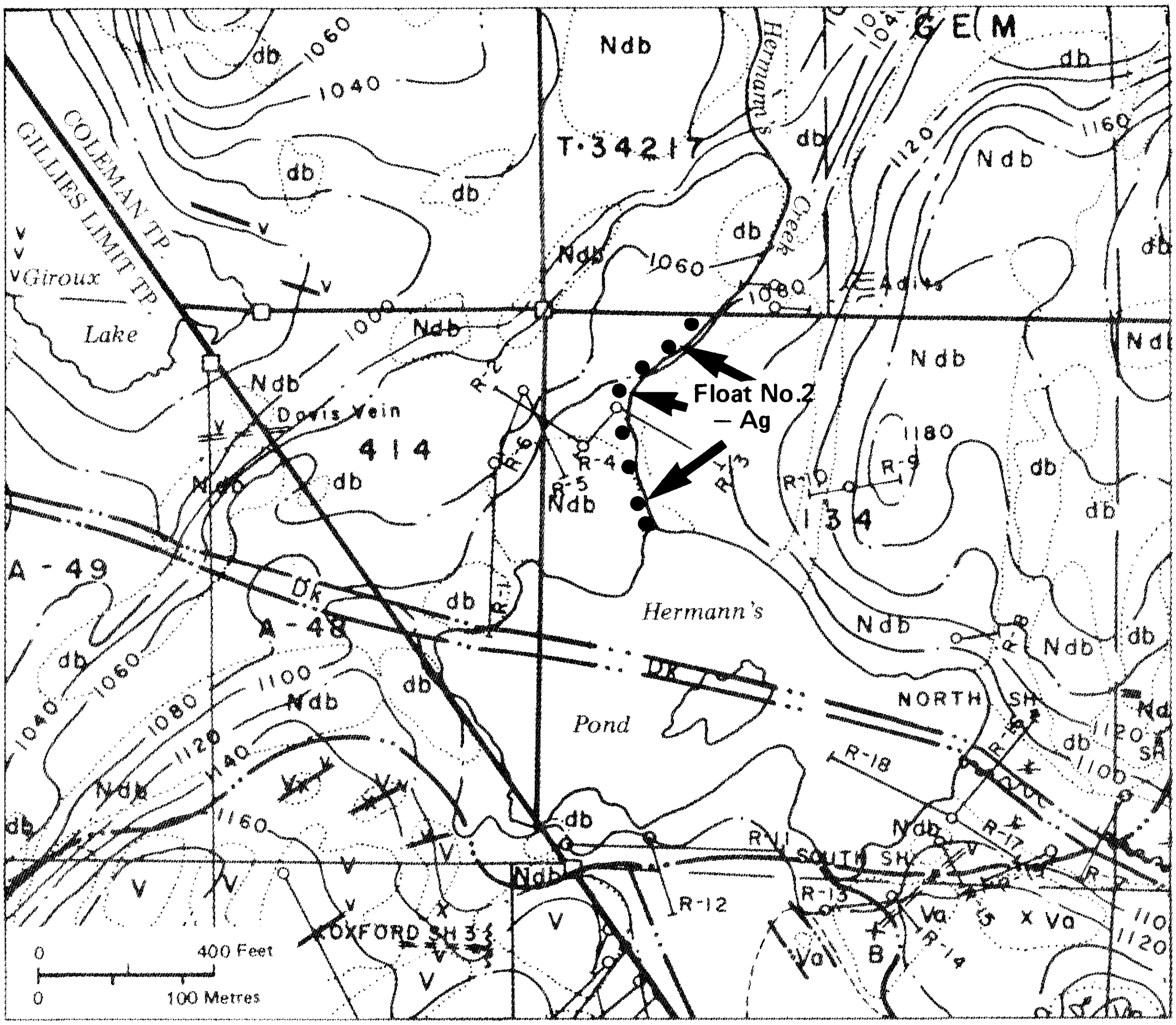
Map Reference: ODM Map P.96, Coleman Township (part only).

Description: A rich silver-bearing piece of greywacke was found on the top of a hill of diabase on the Gem claim. It is the largest nugget found to date in the Cobalt camp. The dimensions are 5.4 feet by 2.4 feet by 1.5 feet (1.6 m by 0.7 m by 0.5 m) and it weighs 1,640 pounds (744.5 kg) and contains 9,715 ounces of silver. Several small nuggets formed part of a float train.

Bedrock Source: The probable source is believed to be the silver veins exposed in the vicinity of Kerr Lake about ¾ miles (1.2 km) to the north.

Remarks: Found about 1910 and presently on display in the Whitney Block, Queen's Park, Toronto.

Reference: OBM 1910, Vol.19, pt.1, p.21-22. ODM 1961 PR 1961-6, p.63-64. OBM 1910, Vol.19, pt.2, p.32.



Timiskaming District

Coleman Township (Dreadnought)
Float No.2 - [Ag]

Main Metals: Silver

Location: Coleman Township (Latitude 47°22′, Longitude 79°48′), claim 134 in the northwestern part of lot 3, concession III. About 3 nuggets were found in the bed of Hermann's Creek from Hermann Pond to the north boundary of claim 314, a distance of 600 feet (180 m). NTS 31M/5W.

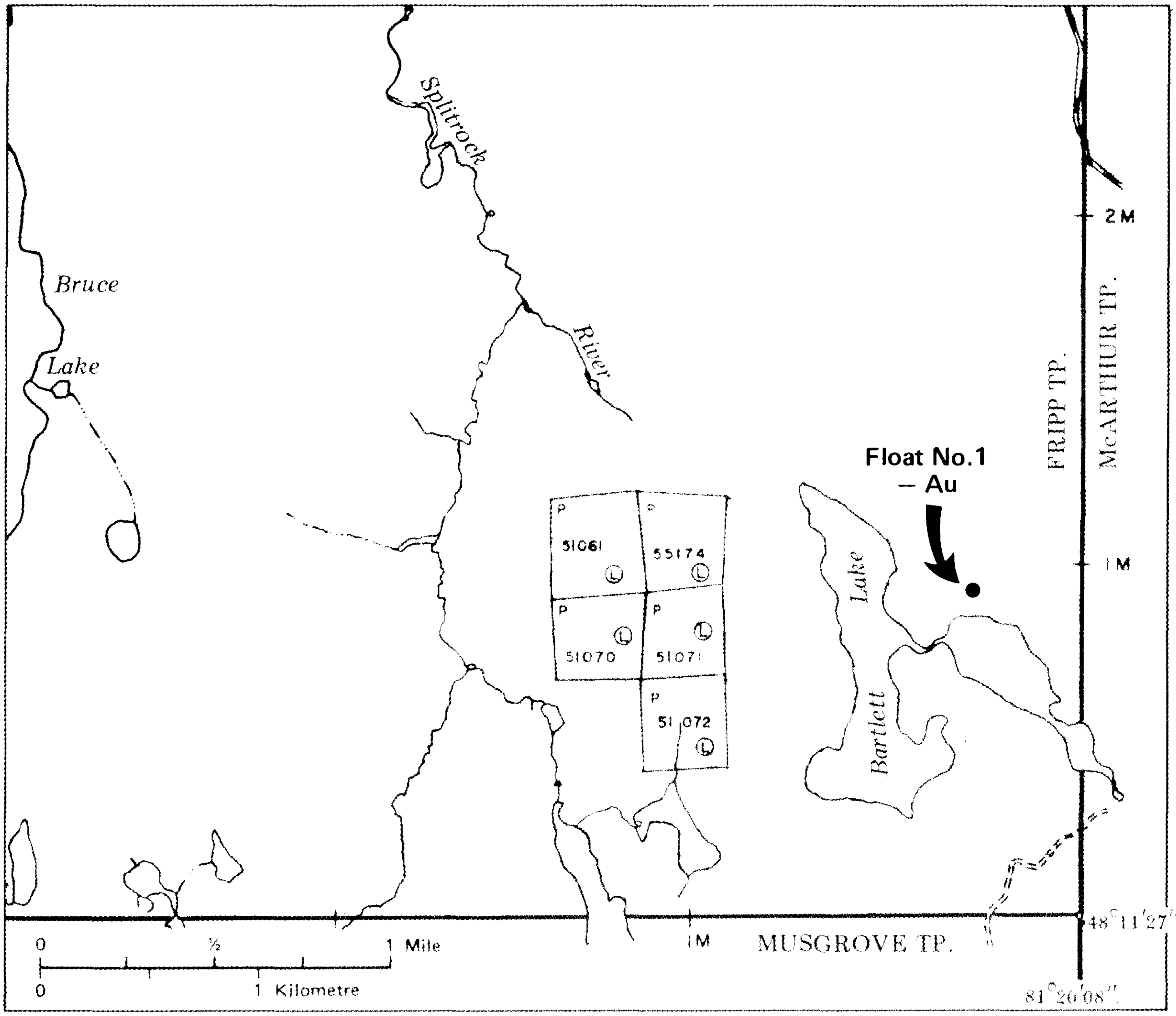
Map Reference: ODM Map P.96, Coleman Township (part only).

Description: About 40 silver nuggets of sizes averaging about that of a man's head were found on this claim.

Bedrock Source: These nuggets were found on the claim south of the Gem float and presumably have the same source, the veins at Kerr Lake about a mile to the north.

Remarks: Found about 1909 by persons unknown.

References: ODM 1961, PR 1961-7, p.84.

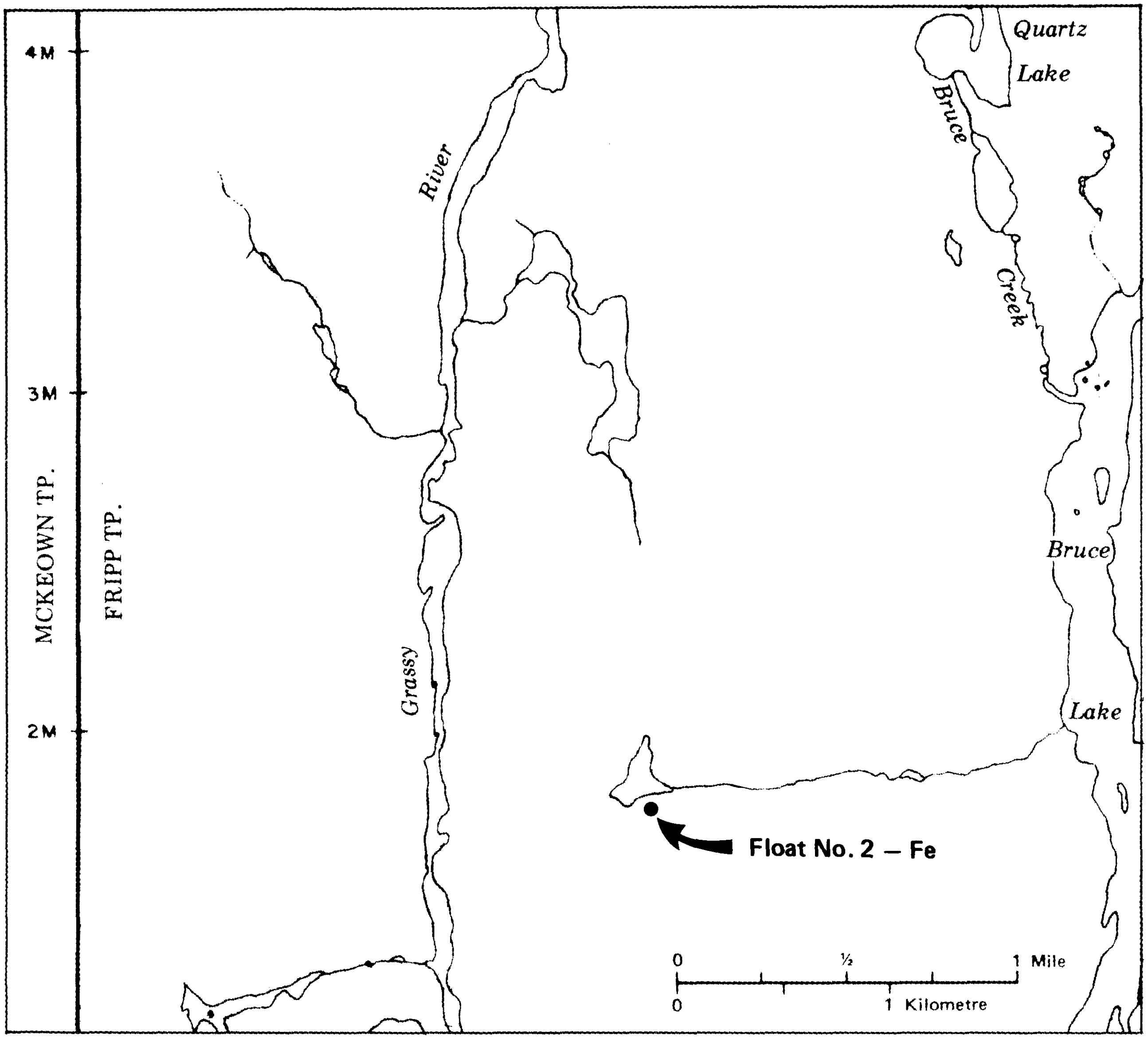


Timiskaming District

Fripp Township Float No.1 - [Au]

Main Metals: Gold
Location: Fripp Township (Latitude 48°14′, Longitude 81°25′), about 1,800 feet (550 m) west of the 1-mile post on the east boundary of the township and 500 feet (152 m) north of Bartlett Lake. NTS 42A/3W.
Map Reference: OMNR Claim Map 281, Fripp Township.

Description: A boulder 20 feet (6 m) in diameter was found *circa* 1918, by Dan Barris, prospector. The boulder was broken up and hauled out to South Porcupine. It was rumoured that $500 of gold was recovered at $20.68/oz.
Remarks: Information on gold boulder supplied by Bruce MacDonald, geologist, Hollinger Mines Limited, to E.G. Bright in 1971.
References: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, personal communication, 1973.



Timiskaming District

Fripp Township Float No.2 - [Fe]

Main Metals: Iron

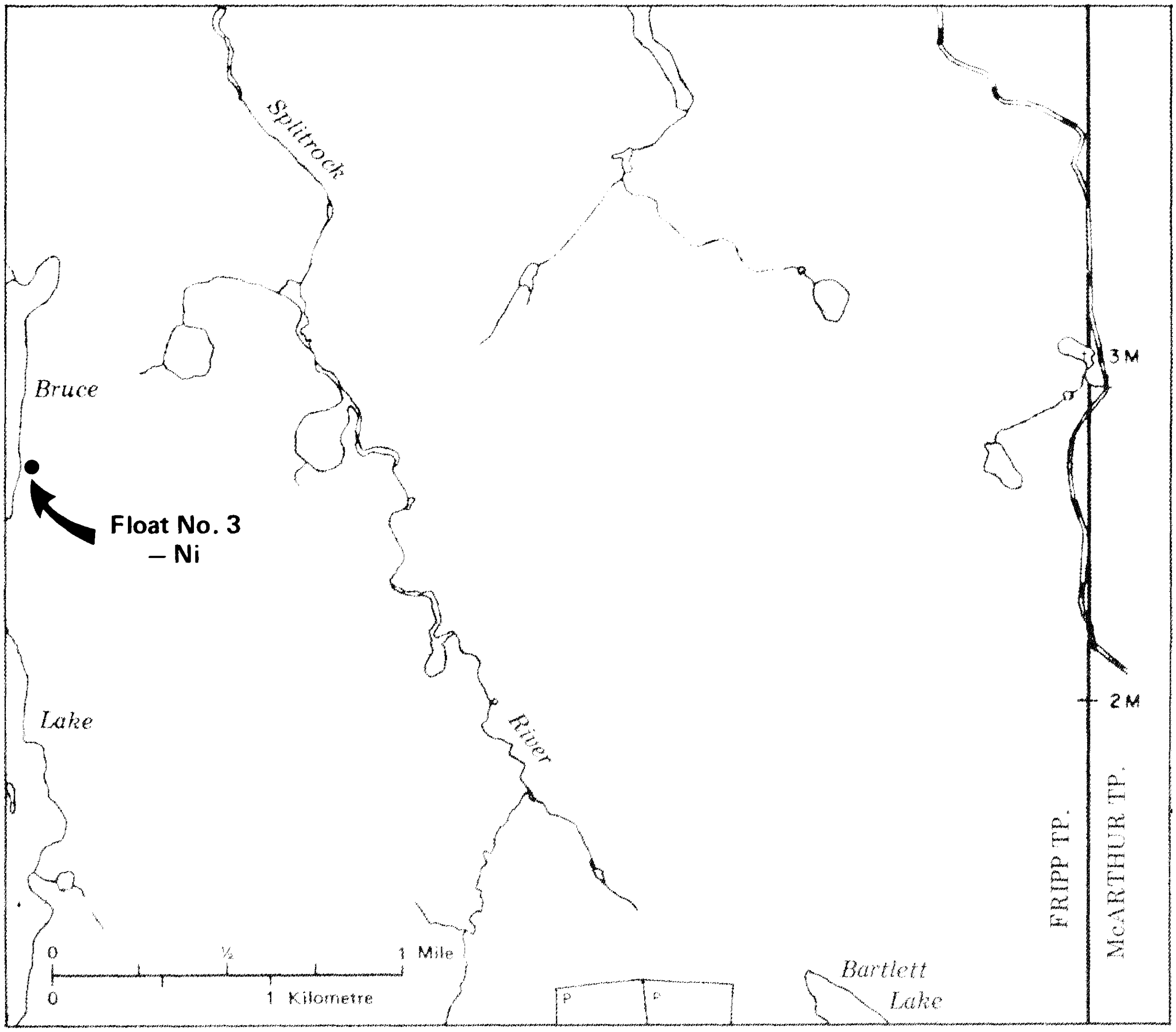
Location: Fripp Township (Latitude 48°14', Longitude 81°25'), on the south side of a small unnamed lake about 8,300 feet (2530 m) east of the west boundary of the township and 9,200 feet (2800 m) north of the south boundary of the township. NTS 42A/3W.

Map Reference: OMNR Claim Map 281, Fripp Township.

Description: A piece of massive pyrite 3 feet by 2 feet (0.9 by 0.6 m) was located and is still in place.

Remarks: Boulder found by the staff of Hollinger Mines Limited *circa* 1960.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1972.



Timiskaming District

Fripp Township Float No.3 - [Ni]

Main Metals: Nickel

Location: Fripp Township (Latitude 48°14′, Longitude 81°25′), on the east side of Bruce Lake, about 15,800 feet (4815 m) west of the east boundary of the township and 14,200 feet (4330 m) north of the south boundary of the township. NTS 42A/3W.

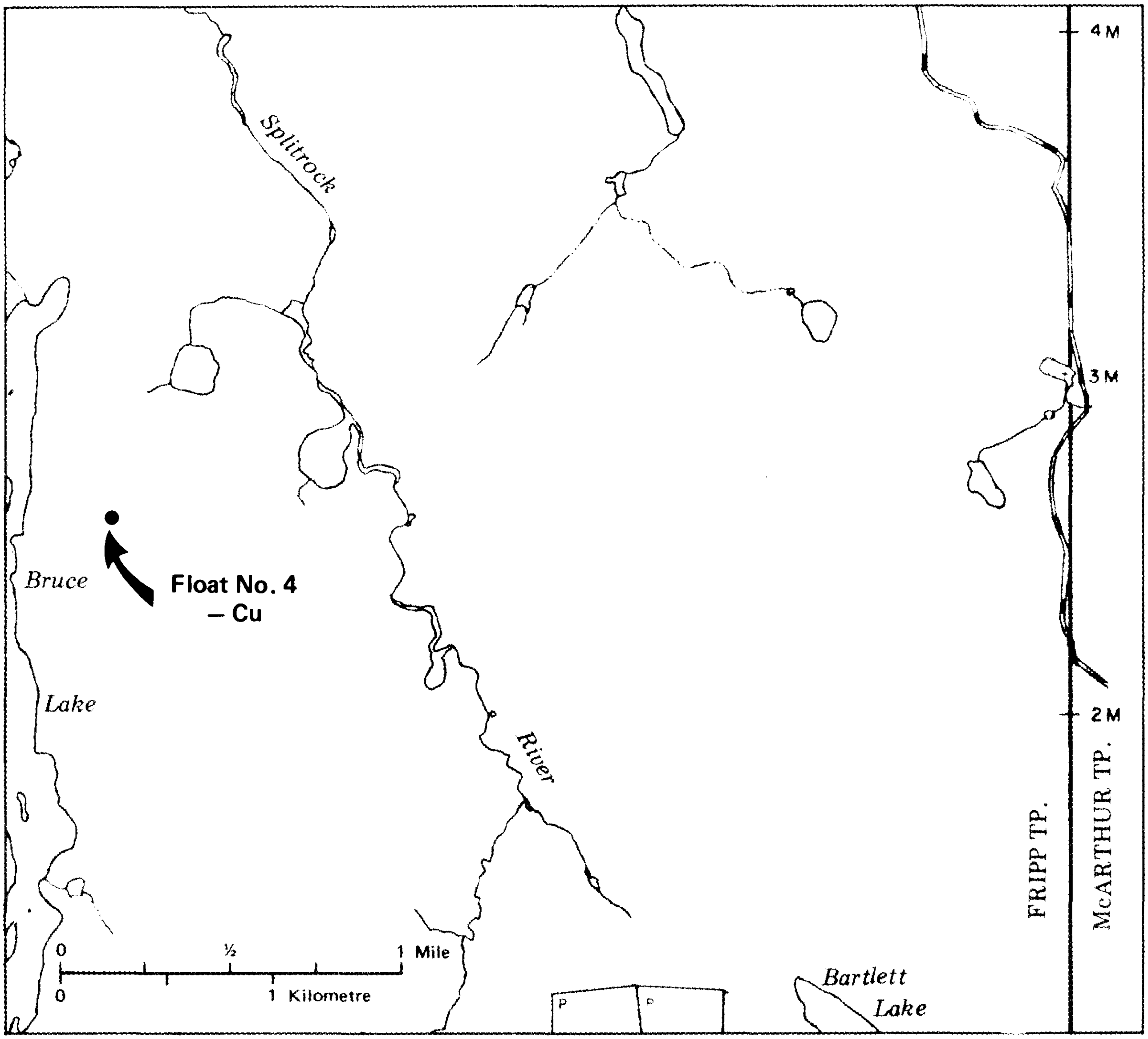
Map Reference: OMNR Claim Map 281, Fripp Township.

Description: A boulder of ultrabasic rock about 2 feet by 3 feet (0.6 by 0.9 m) rests on sandy clay and contains lenses of pyrrhotite that assay up to 1.5 percent nickel.

Bedrock Source: A nearby outcrop of ultrabasic rock is probably the source.

Remarks: Found by Cyril Giles, prospector for Hollinger Mines Limited, 1961.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1972.



Timiskaming District

Fripp Township Float No.4 - [Cu]

Main Metals: Copper

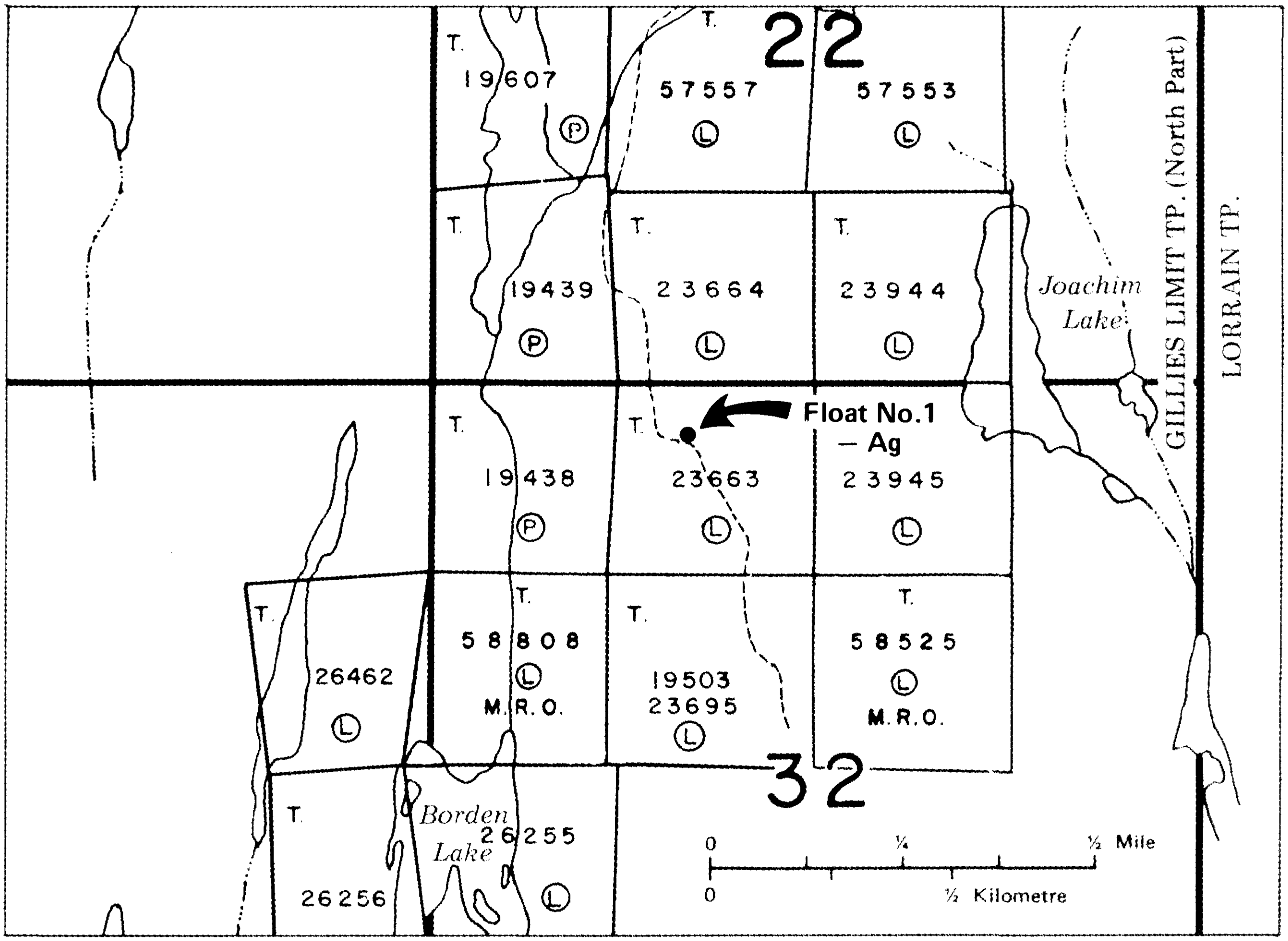
Location: Fripp Township (Latitude 48°14′, Longitude 81°25′), about 2,000 feet (610 m) east of Bruce Lake, about 14,200 feet (4330 m) west of the east boundary of the township and about 13,500 feet (4115 m) north of the south boundary of the township. NTS 42A/3W.

Map Reference: OMNR Claim Map 281, Fripp Township.

Description: A piece of float contains bands of sulphide iron formation with some chalcopyrite. A picked sample of pieces containing chalcopyrite assayed 1.5 percent copper.

Remarks: Found by the Hollinger Mines Limited staff, 1961.

Reference: C.D. MacKenzie, Hollinger Mines Limited, personal communication, 1972.



Timiskaming District

Gillies Limit Township Float No.1 - [Ag]

Main Metals: Silver

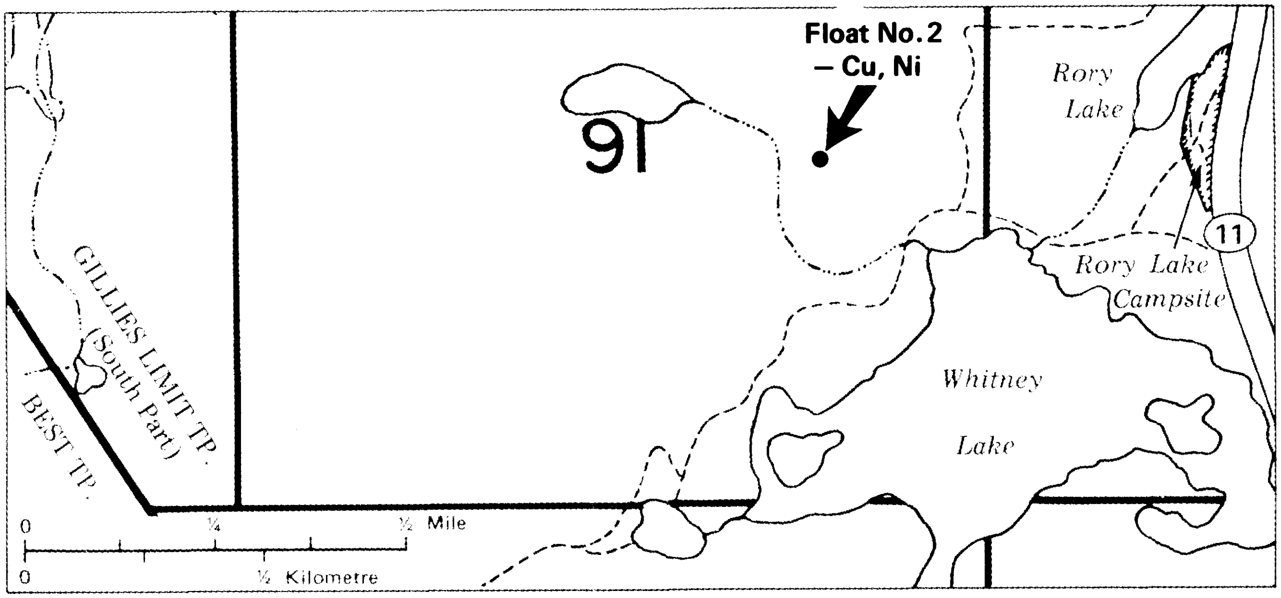
Location: About 6 miles (10 km) south of Cobalt, Gillies Limit, (Latitude 47°77′, Longitude 79°44′) Block 32, claim T23663. From the northwest corner of Block 32 the float was 380 feet (116 m) south and 1,780 feet (542.5 m) east.
NTS 31M/5E.
Map Reference: OMNR Claim Map M484, Gillies Limit (North Part).

Description: The nugget weighs in excess of 1400 pounds (635 kg.) with very abundant native silver in a Keewatin volcanic rock.

Bedrock Source: Unknown but presumably from the Cobalt camp.

Remarks: The silver nugget is stated to weigh 1424 pounds (646.5 kg.) and is calculated to contain "11,001 fine ounces of silver, or 754 pounds avoirdupois." (Gibson, 1937, p.67). A figure of 750 pounds is quoted in The Ontario Department of Mines Review for 1969, p.116. The figure of 12,000 ounces given in an accompanying photograph is avoirdupois, not troy ounces. If 754 pounds avoirdupois is correct then the silver content in ounces should read 9,048 ounces. It appears the figure of 11,001 ounces was first published in Ontario Mines and Mineral Resources, 6th edition, 1936, p.44.

Reference: Gibson, T.W., (1937) Mining in Ontario, a publication of the Ontario Department of Mines, p.67.



Timiskaming District

Gillies Limit Township Float No.2 - [Cu,Ni]

Main Metals: Copper, Nickel

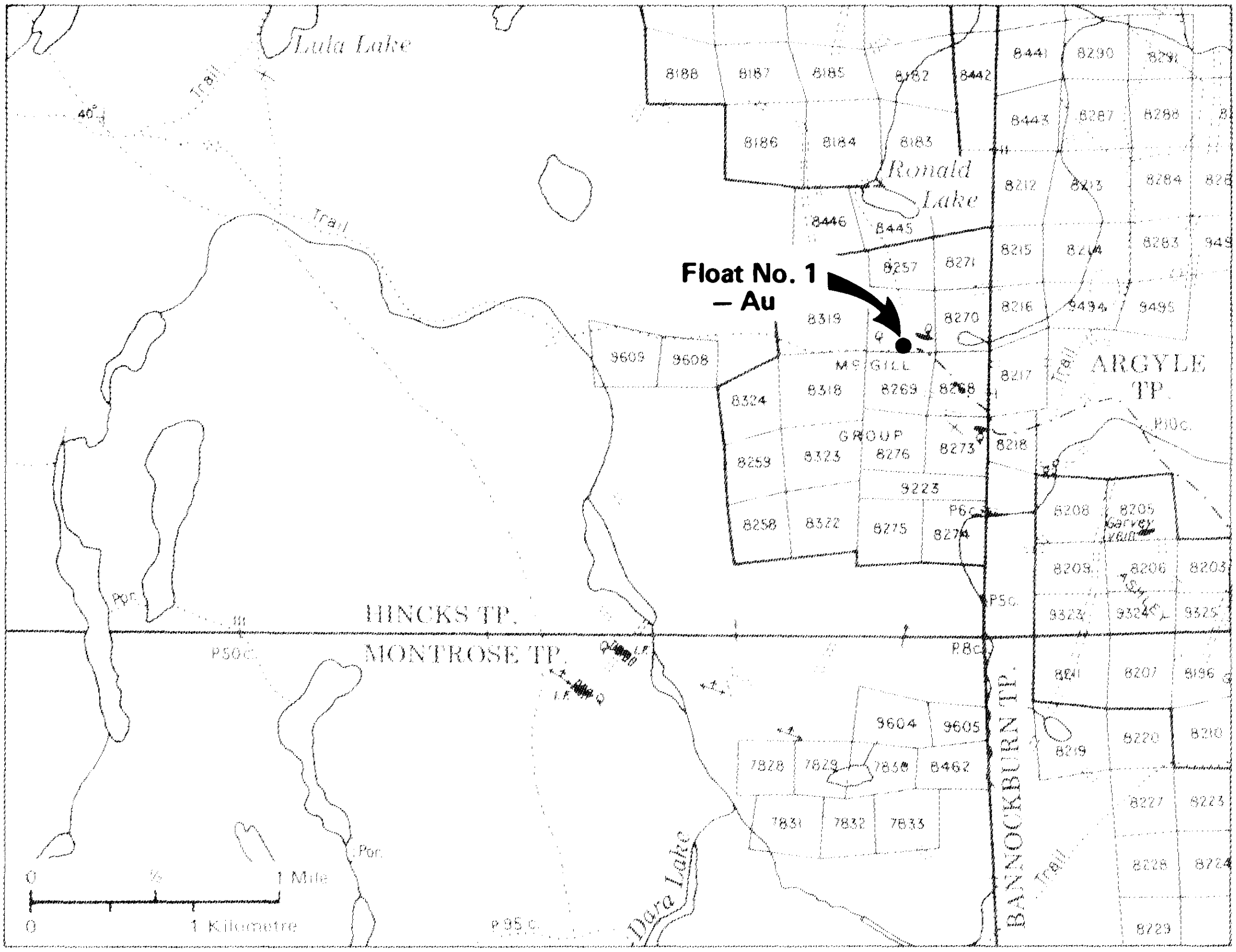
Location: Gillies Limit Township (Latitude 47°17′, Longitude 79°44′) Block 91 in the southern part of the township, west of Highway 11 and northwest of Whitney Lake. NTS 31M/6W.
Map Reference: Figure 2, accompanying OFR 5016.

Description: Five pieces of rusty float partly embedded in overburden were found in an area 200 feet (61 m) in an east-west direction and 150 feet (45 m) on a north-south direction. The rock type was a quartz diorite or pyroxenite mineralized with pyrite, pyrrhotite, and chalcopyrite. Individual pieces of float ranged in size from 60 pounds to 30 pounds (27 kg to 13.6 kg) and some of the smaller pieces were strongly oxidized massive pyrite and pyrrhotite. A 50-pound (22.7 kg) piece of massive sulphides was found near the shore of a beaver pond about 250 feet (76 m) northwest of the central float group and another mineralized boulder occurred about 250 feet (76 m) north of the general area of float. The eighth piece of float is large and contains disseminated sulphides and occurs 530 feet (161 m) north of Whitney Lake and 1,100 feet (335 m) east of the central float group.

Bedrock Source: No zones of massive sulphides have been located. Trenching in an area about 500 feet (152 m) northwest of the central group of float located bedrock mineralization. A trench about 250 feet (76 m) north of Whitney Lake exposed a rusty zone in peridotite that assayed 0.61 percent Cu and 0.16 percent Ni over a width of 10 feet (3.1 m).

Remarks: The float was located by Norman Montgomery, prospector about 1955. Surface work on the property to date includes geological, magnetic, and electromagnetic surveys and trenching. Diamond drilling in the immediate vicinity of the float includes 4 holes with a combined length of 1,193 feet (363 m) in 1956 by Coniagas Mines Limited, 9 holes with a total length of 2,737 feet (834 m) drilled in 1963-1964 and 3 holes with a total footage of 552 feet (168 m) in 1971 by Nickel Rim Mines Limited.

References: ODM 1968 OFR 5016, p.58-60. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.772, File 63.932, Gillies Limit Township, South Part, Drilling Reports 11, 16.



Timiskaming District

Hincks Township Float No.1 - [Au]

Main Metals: Gold

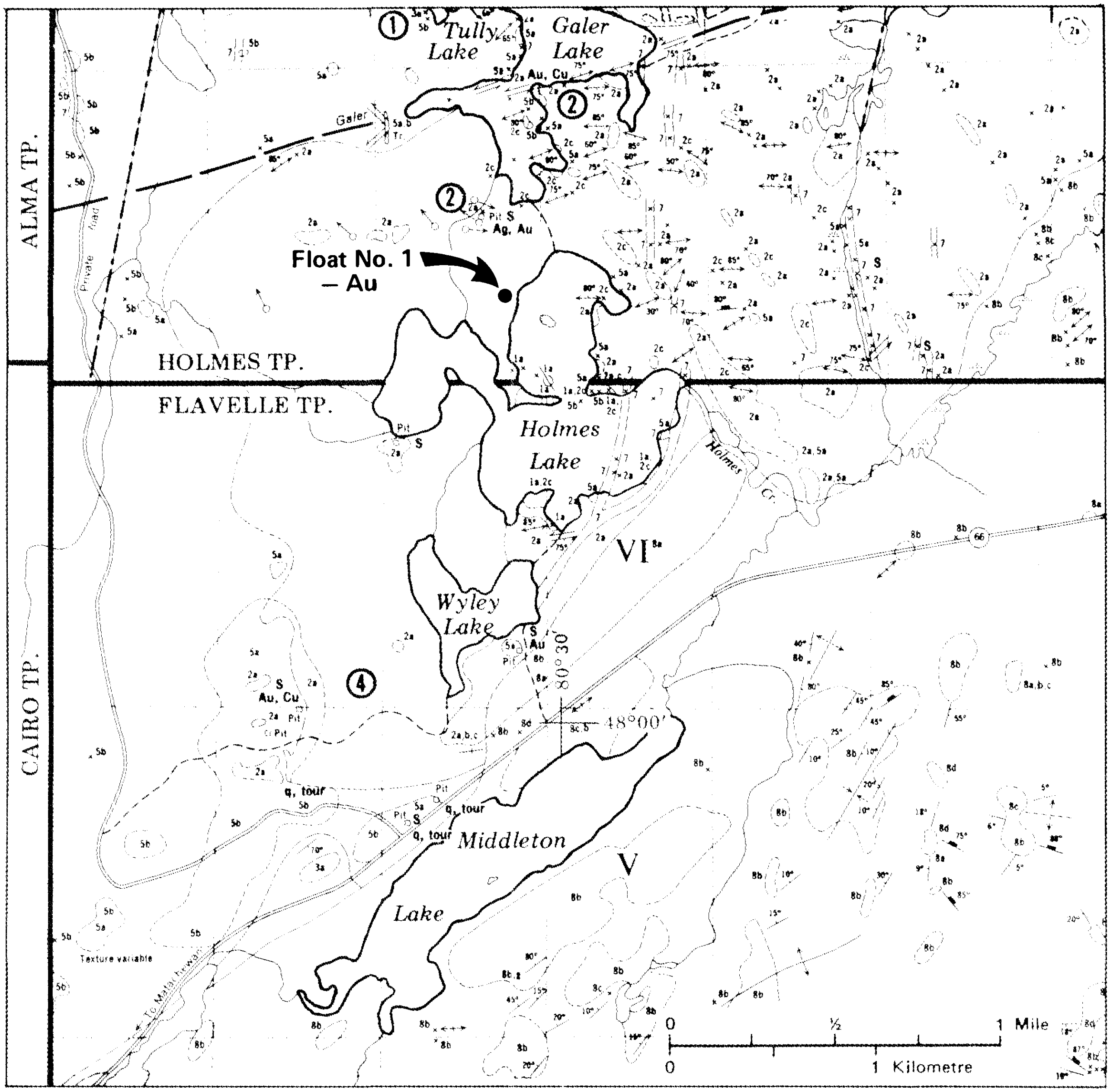
Location: Hincks Township (Latitude 48°04′, Longitude 81°00′), southeastern part of Hincks Township, near the south boundary, claim 8272. NTS 42A/2W and 42A/3E. Map Reference: ODM Map 41a, Bannockburn Gold area.

Description: A large block of float quartz showing heavy mineralization with pyrite and carrying gold. Trenching showed a number of these blocks weighing several tons occurring on the surface and to depths of 8 feet (2.4 m). These blocks consist chiefly of vein matter, with stringers of quartz cutting basalt, which is heavily mineralized with pyrite and ankerite, with some native gold, galena, and a little altaite.

Bedrock Source: The blocks are not far removed from their original position but trenching and drilling was difficult due to the depth of overburden and the deeply weathered nature of the bedrock surface.

Remarks: The float was found in the spring of 1931 by persons unknown. Deep trenching and diamond drilling was done by The Mining Corporation of Canada Limited in return for an interest in McGill Gold Mines Limited. As a result of this two veins have been located.

Reference: ODM (1932), Vol.41, pt.2, p.19.



Timiskaming District

Holmes Township Float No.1 - [Au]

Main Metals: Gold

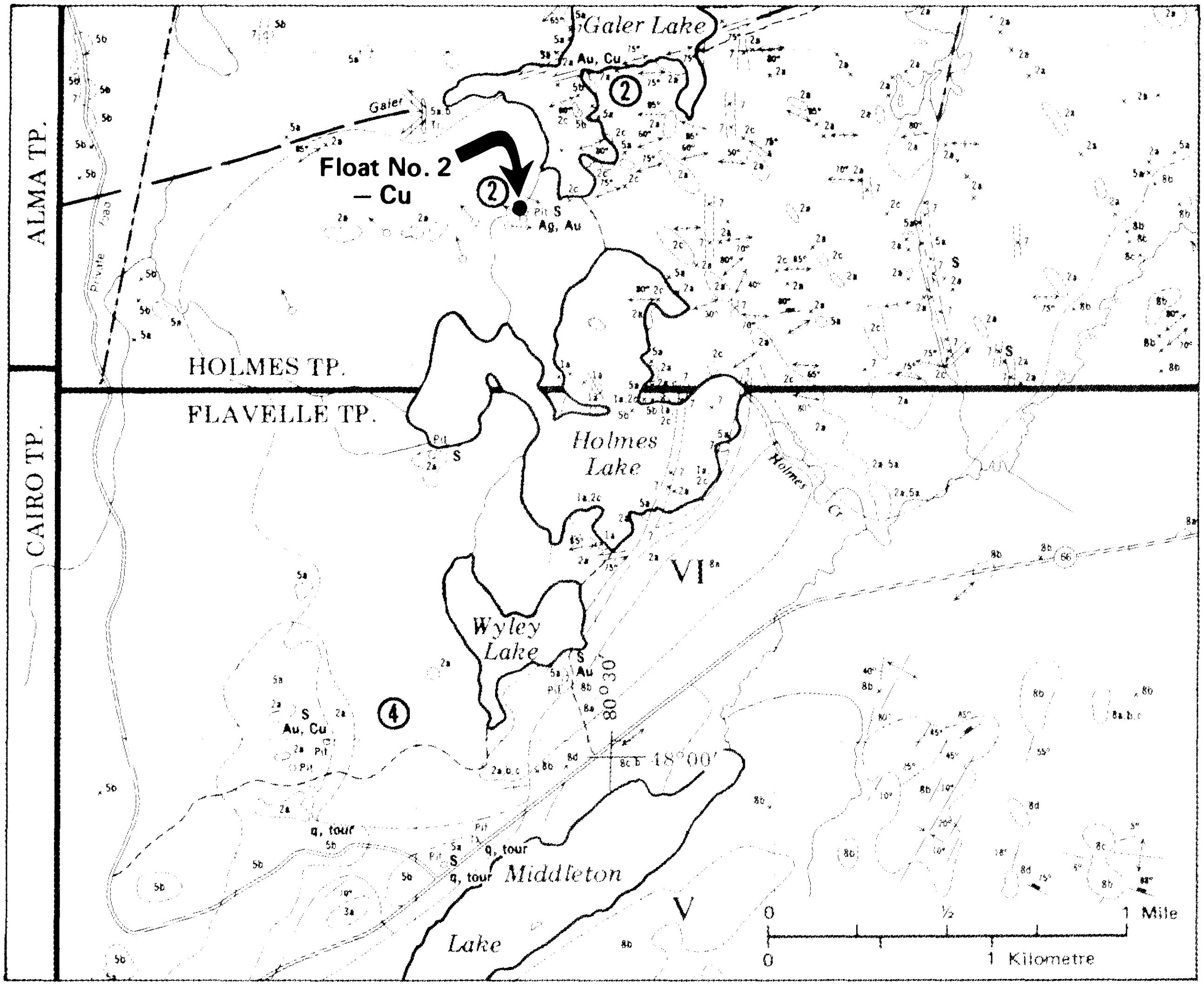
Location: Holmes Township (Latitude 48°04′, Longitude 80°28′). NTS 42A/1W and 42A/2E.

Map Reference: ODM Map 2078, Holmes-Burt Area.

Description: Float containing gold is reported.

Remarks: Float found in the late 1950s by George Boyles, prospector, Haileyburg, Ontario.

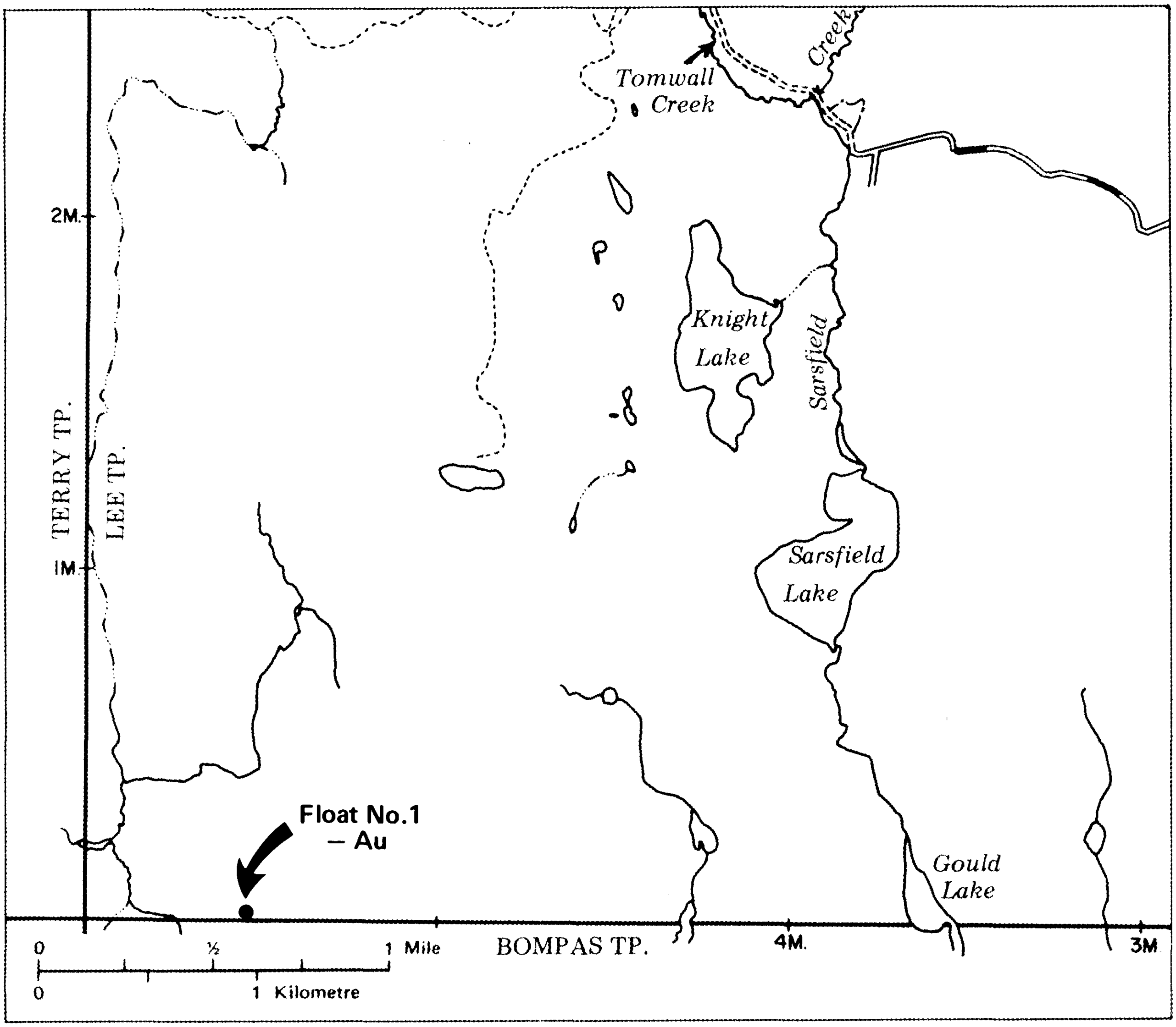
Reference: W.G. Wahl, Consulting Geologist, Toronto, personal communication, 1972.



Timiskaming District

Holmes Township Float No.2 - [Cu]

Main Metals: Copper
Location: Holmes Township (Latitude 48°04′, Longitude 80°28′) S½, lot 10, Concession I, NTS 42A/1W and 42A/2E.
Map Reference: ODM Map 2078, Holmes-Burt Area.
Description: A boulder of mafic tuff 10 feet (3.1 m) in diameter contained chalcopyrite.
Remarks: Original discoverers (perhaps the Brookbank brothers) thought this sulphide occurrence was bedrock and blasted it apart. Later drilling by Daniel Hellens, working for Voyager Explorations Limited, failed to locate the source of this float.
Bedrock Source: On ODM Map 2078 a pit containing sulphide mineralization is shown near the north boundary of the S½ of lot 10, concession I. Presumably the boulder was located south of this showing.
Reference: Resident Geologist's Office, Ontario Ministry of Natural Resources, Kirkland Lake, File, Voyager Explorations Limited. H.L. Lovell, Resident Geologist, Kirkland Lake, personal communication, 1973.



Timiskaming District

Lee Township Float No.1 - [Au]

Main Metals: Gold

Location: Lee Township (Latitude 48°14′, Longitude 80°20′), immediately west of the 5½ mile post on the south boundary. NTS 42A/1W.

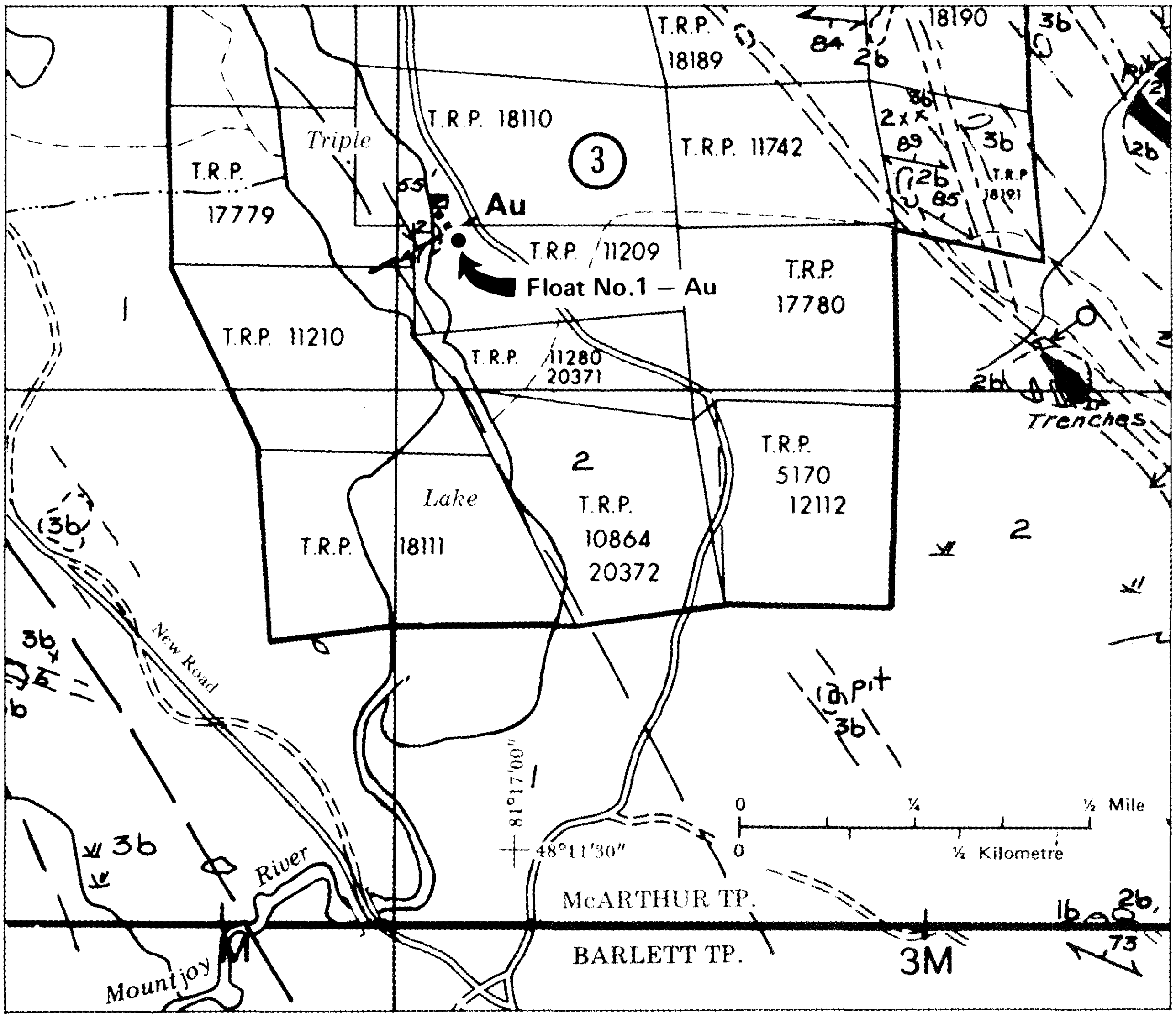
Map Reference: ODM Map 31d, Watabeag Area shows vicinity but not boulder location.

Description: A speck of gold was observed on a narrow dike cutting a granite boulder, which was thought to have been moved only a short distance.

Bedrock Source: A short distance of travel is indicated by the angular nature of the granite boulder and the occurrence of identical granite outcropping "a few chains east".

Remarks: Recorded by D.G.H. Wright during the course of geological mapping for the Geological Branch during the summer of 1921.

Reference: ODM Rept. 1922, Vol.31, pt.7, p.23.



Timiskaming District

McArthur Township Float No.1 - [Au]

Main Metals: Gold

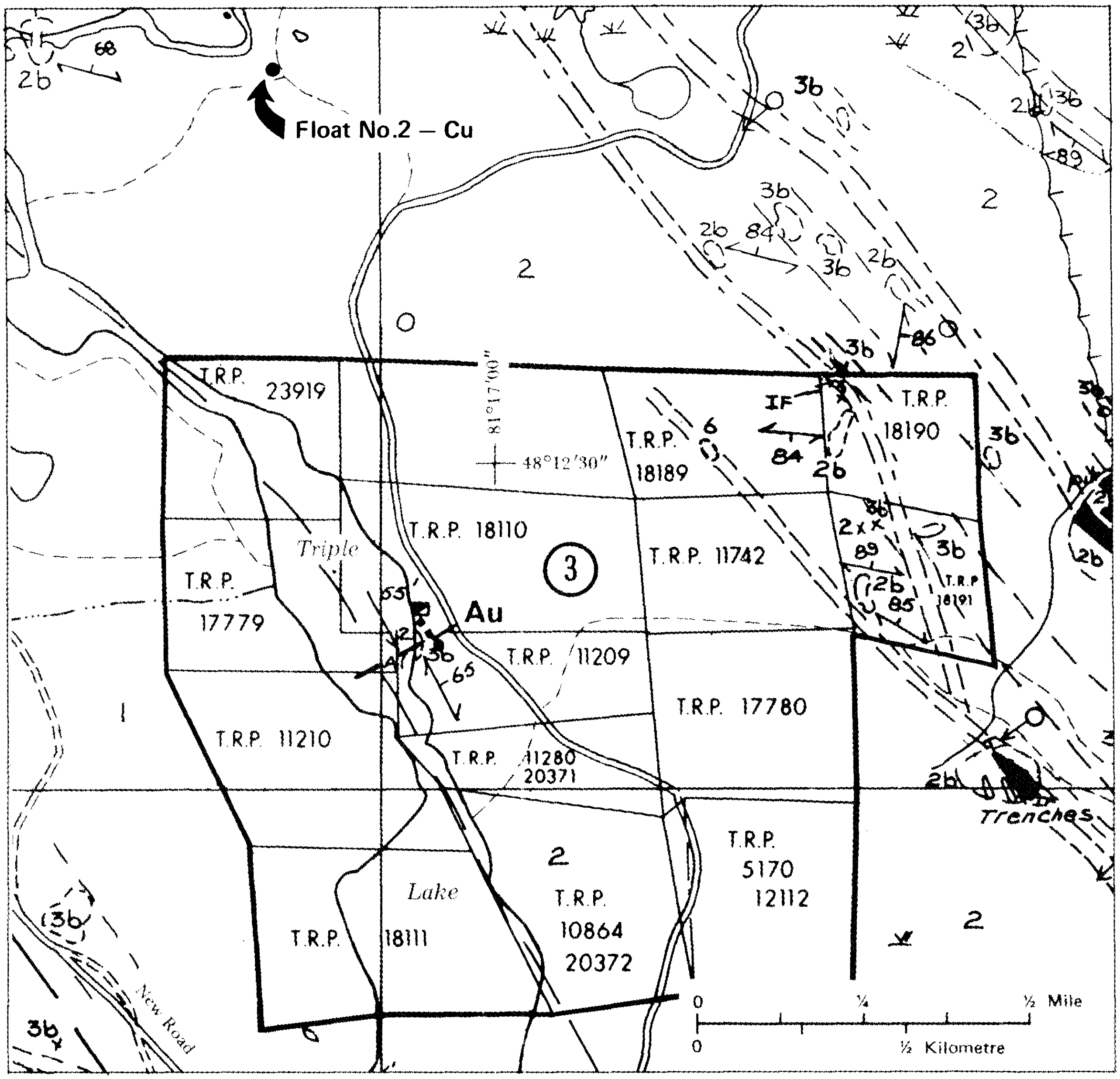
Location: McArthur Township (Latitude 48°14' Longitude 81°19'), claim TRP11209 on the east side of Triple Lake. NTS 42A/3E. Map Reference: ODM Map P.631 McArthur Township.

Description: A piece of quartz float was found on surface, and stripping of the sandy overburden exposed a quartz vein 2 to 5 feet (10.6 to 1.5 m) in width containing abundant pyrite, chalcopyrite, pyrrhotite, a little sphalerite, and visible gold. Samples of quartz from the vein dump chosen because they contained no visible metal gave favourable assay results.

Bedrock Source: The quartz vein uncovered by stripping of the overburden corresponds to the piece of float and is considered to be the source of the float.

Remarks: Float discovered by John Spence, prospector, before 1925.

Reference: ODM Rept., Vol.35, pt.6, p.53-54.



Timiskaming District

McArthur Township Float No.2 - [Cu]

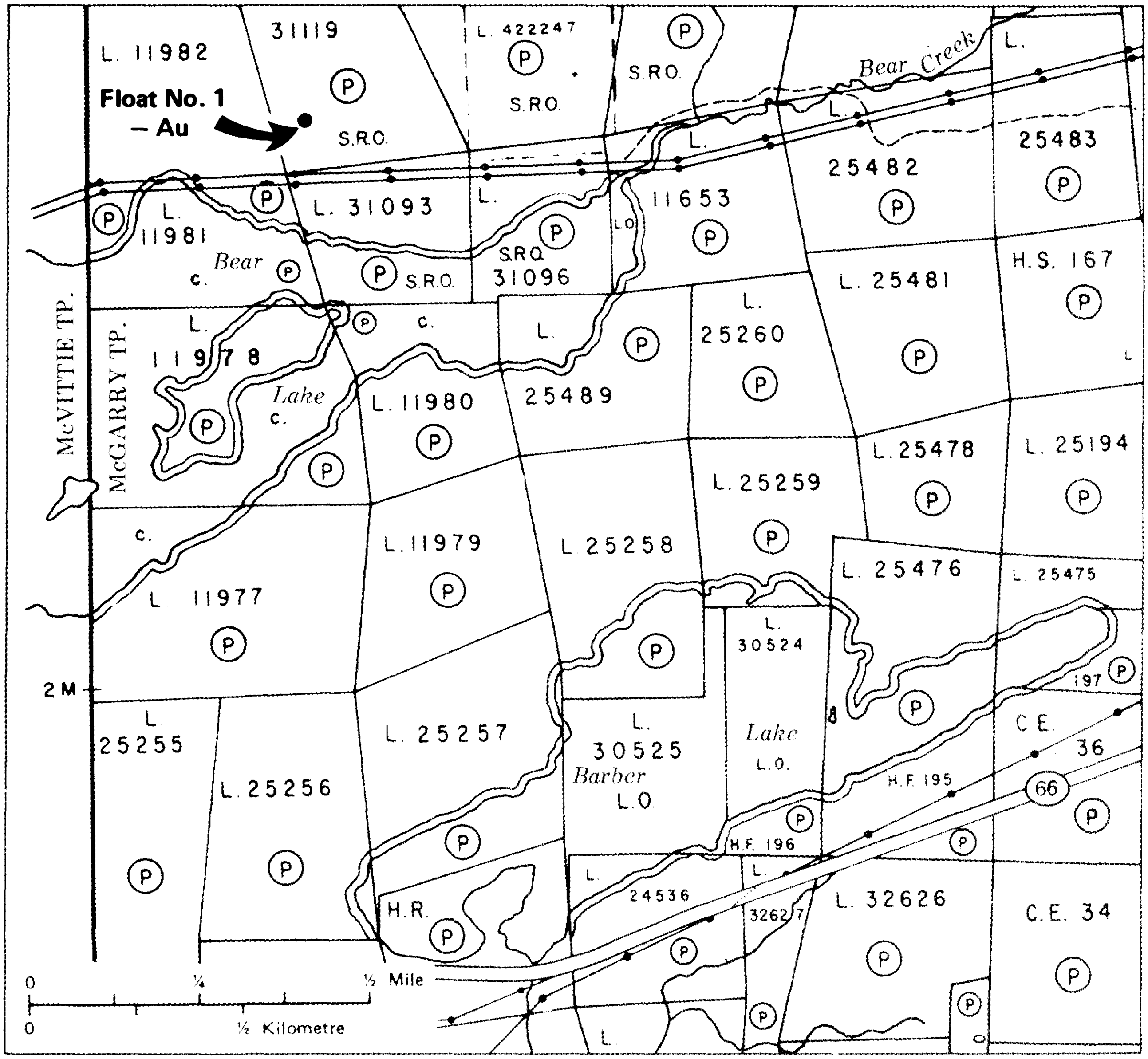
Main Metals: Copper

Location: McArthur Township (Latitude 48°14' Longitude 81°19') NTS 42A/3E.
Map Reference: ODM Map P.631 McArthur Township.

Description: A piece of float containing chalcopyrite was reported.

Remarks: Boulder found by staff of Mespi Mines Limited on property held by Acme Oil and Gas Co. Ltd., *circa* 1967.

Reference: E.G. Bright, Regional Geologist, Ontario Ministry of Natural Resources, Timmins, Ontario, personal communication, 1973.

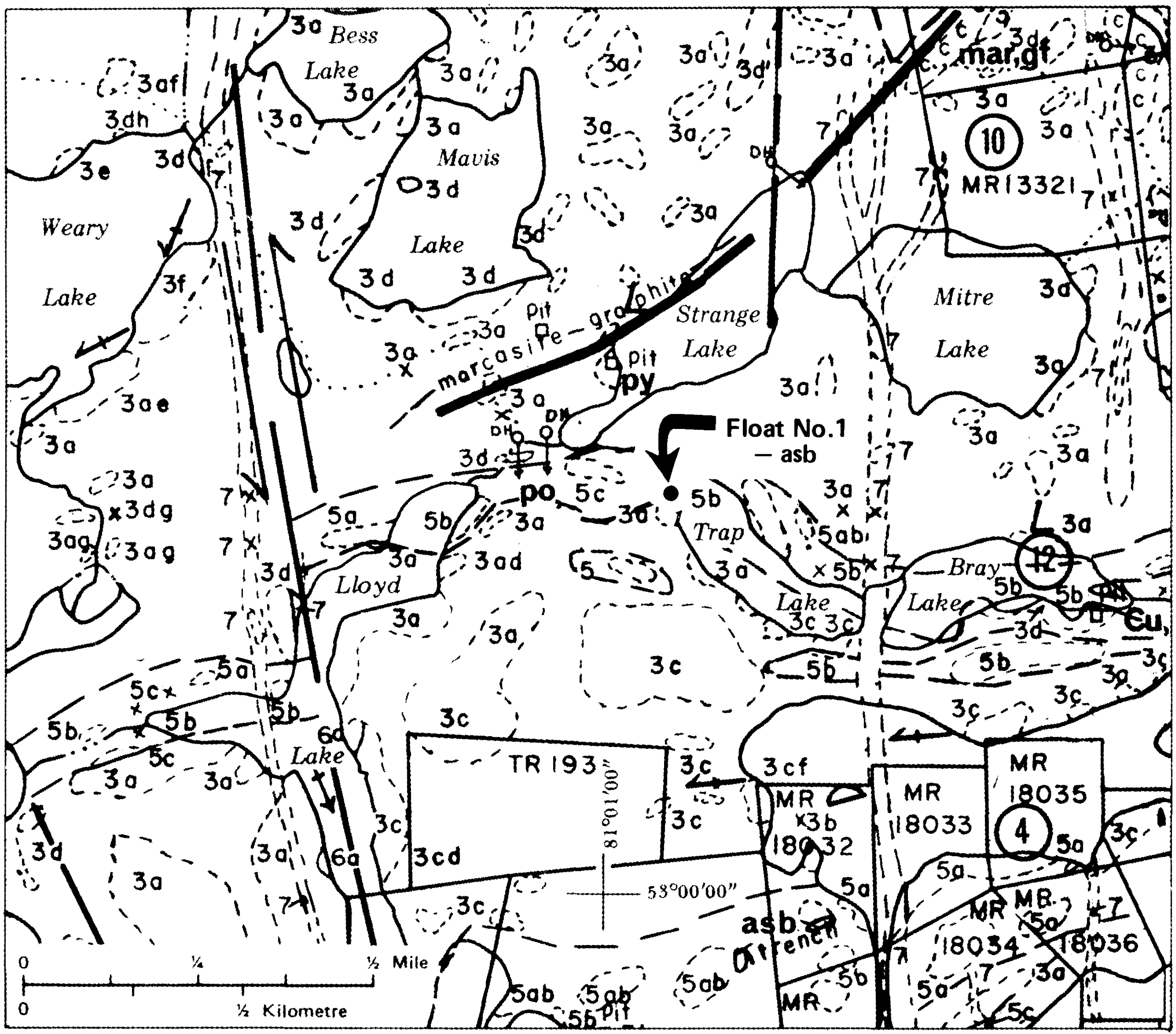


Timiskaming District

McGarry Township Float No.1 - [Au]

Main Metals: Gold
Location: McGarry Township (Latitude 48°09′, Longitude 79°38′), claim L31119. NTS 32D/4E.
Map Reference: OMNR Claim Map M369, McGarry Township.

Description: Four boulders found in a pit in the Munro Esker showed a gold content by fire assay.
Remarks: Found by a Geological Survey of Canada field party investigating the heavy mineral content in Kirkland Lake Region, 1963.
Reference: GSC Paper 63-45, p.32.



Timiskaming District

Midlothian Township Float No.1 - [asb]

Main Commodity: Asbestos

Location: Midlothian Township (Latitude 47°54′ Longitude 81°00′), claim L284380 at the northeast end of Trap Lake, on base line at intersection with line 6 plus 00 NW. NTS 41P/14E.

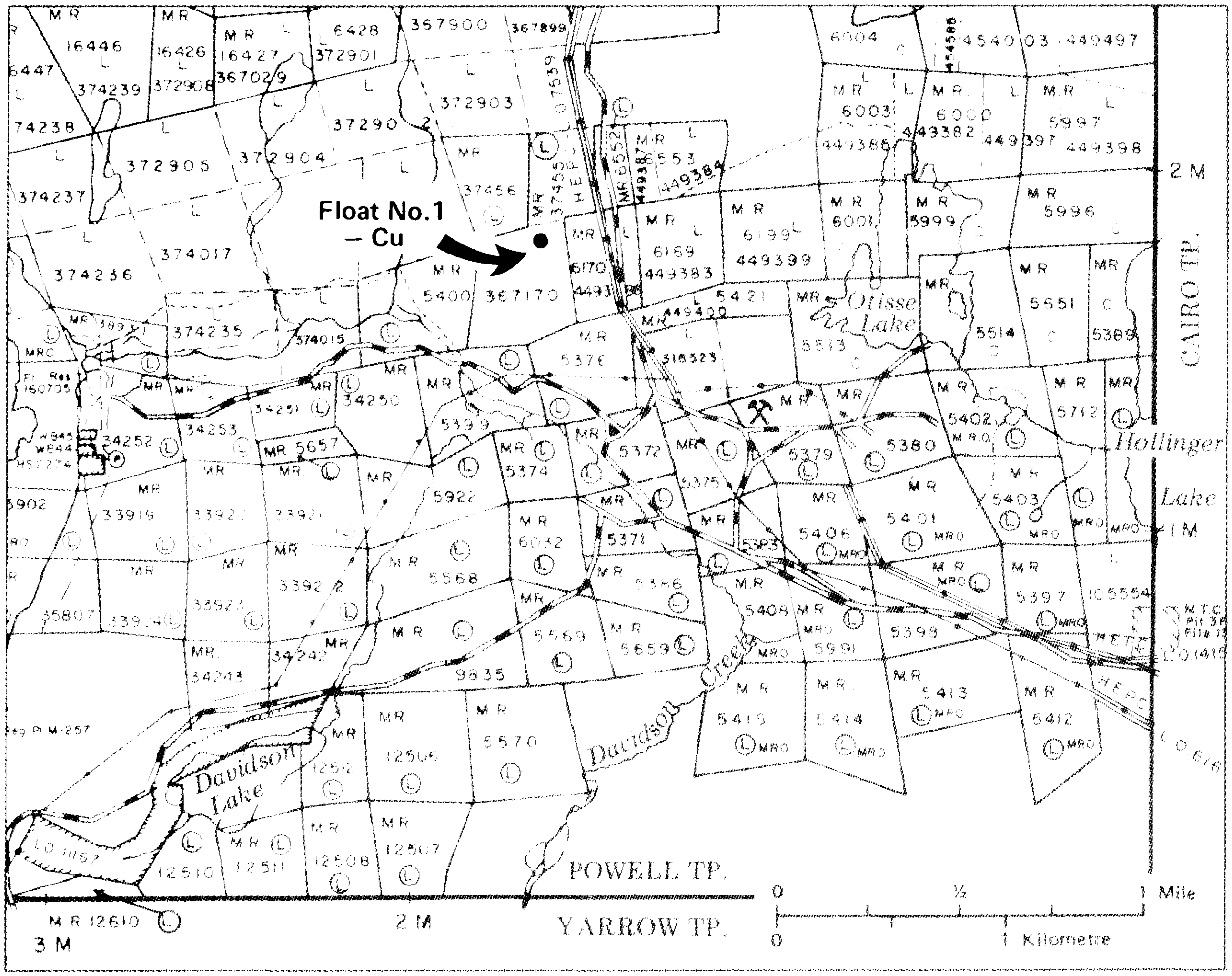
Map Reference: ODM Map P.386 Midlothian Township.

Description: An angular boulder of peridotite contains veinlets of chrysotile asbestos.

Bedrock Source: A peridotite outcrop is located nearby.

Remarks: Float described and recorded by D.F. DesRosiers, Geologist for Watts, Griffis, and McQuat Limited, Toronto, 1973.

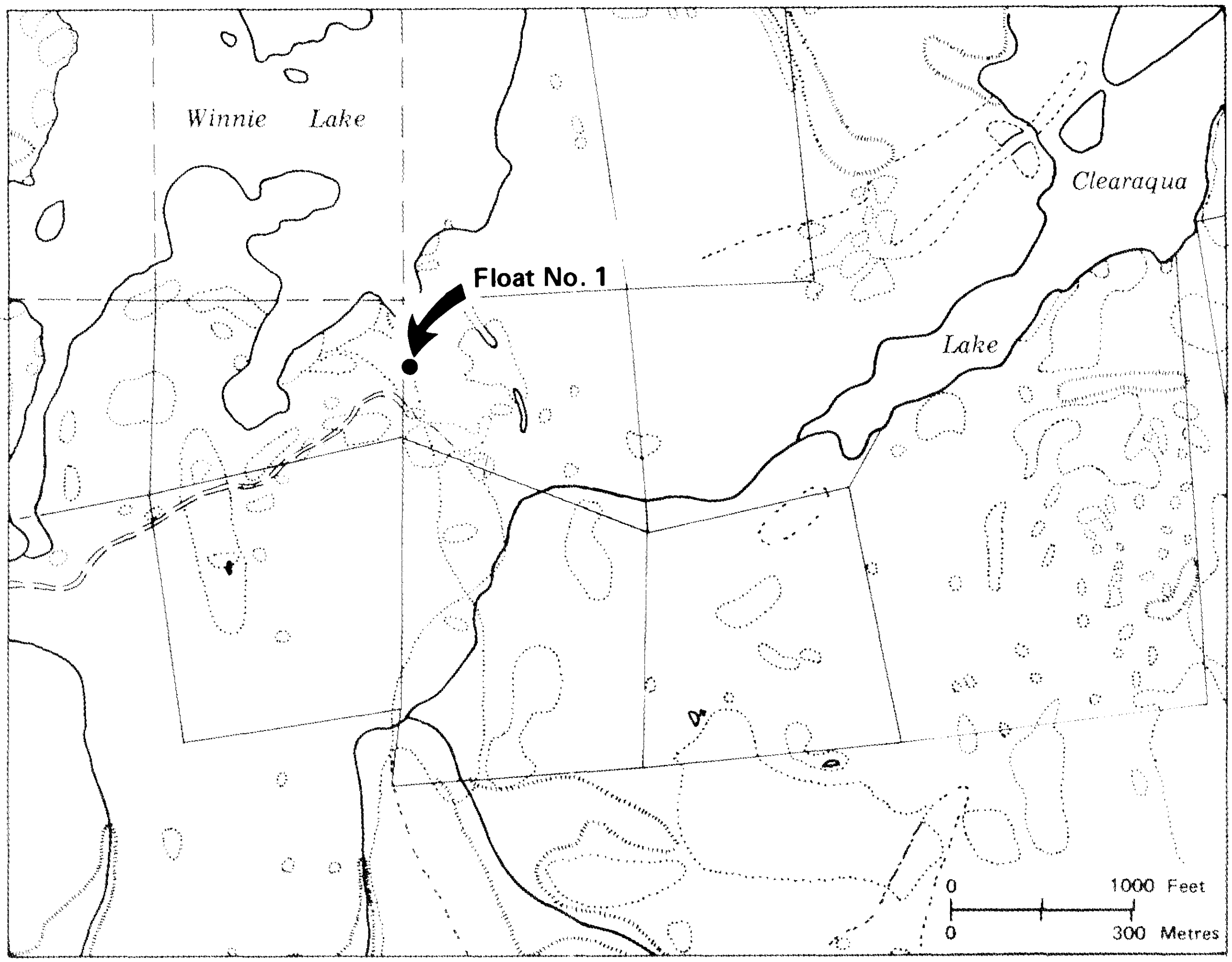
Reference: Report submitted by Tojaro Holding Limited, to the Ontario Division of Mines under Mineral Exploration Assistance. Contract CG-60. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.3147.



Timiskaming District

Powell Township Float No.1 - [Cu]

Main Metals: Copper
Location: Powell Township (Latitude 47°59′, Longitude 80°43′), northeast corner of claim L367170. NTS 41P/15E.
Map Reference: ODM Map 2110 Powell and Cairo Townships.
Description: Boulders well mineralized with chalcopyrite are present in the overburden. Drilling indicated that the bedrock was an altered syenite porphyry with little mineralization as described in Majestic Construction Limited drill holes 8 and 9.
Bedrock Source: Unknown but presumably at some distance from the float location.
Remarks: Described by Jack G. Willars, Mining Geologist, in letter to Peter Bourke, Majestic Construction Ltd. dated December 1973.
Reference: Report by Jack G. Willars for Majestic Construction Limited, submitted to the Ontario Division of Mines under Mineral Exploration Assistance. Contract CG-64. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File Powell Township Drilling Rept.13.



Timiskaming District

Teck Township Float No.1

Main Metals: Unknown

Location: Teck Township (Latitude 48°09', Longitude 80°04'), claim L1898 (103843), northwestern corner of township and south of Winnie Lake. NTS 41P/1E.
Map Reference: ODM Map 1945-1, Teck Township.

Description: A map accompanying a drilling report has the notation "float" and an arrow indicating the location.

Bedrock Source: Unknown, as float was not described, however a sulphide zone a few feet in width and 70 feet (21 m) long occurs about 250 feet (76 m) southward of the float location. Exposed heavy mineralization consists of pyrrhotite, pyrite, chalcopyrite, sphalerite, and magnetite.

References: ODM Rept. 1948, Vol.57, pt.5, p.53, Winnie Lake Mining Company Limited. Archibald, F.G. (1974) Rept. of diamond drilling for Lynx-Canada Explorations Ltd. and New Insco Mines Ltd. joint venture, Winnie Lake Hurd Option; Teck and Bernhardt Townships, Ontario, filed under contract KL-60, ODM Mineral Exploration Assistance Program. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.3274.

ADDITIONAL INFO. RE PAGE 151

Re: PLACER OPERATIONS AND DREDGING LEASES

An Attempt to remove alluvial gold, platinum or precious stones from streams or lakes or even lands not covered by water may be done in two ways depending on the extent of the operation.

1. Placer Mining - If the licencee is of moderate means and has discovered an area from which he feels it would be profitable to remove gold etc. by placer operations employing skin diving techniques or using a shore line sluice etc. he must stake out a normal mining claim and acquire title. Inasmuch as either of the operation methods mentioned do not form assessment work as defined by the Mining Act, they must use one of the recognized methods. One of these would be the use of churn drill (based at the rate of a day for every three hours worked). No ore may be removed from the water or land, that is, the gold may not be recovered until such time as the assessment work is done and actual title is issued.

2. Leases - The Mining Act provides that dredging leases may be issued for the purpose of recovering gold etc. This involves operations of a major scale involving costly equipment using dredges and a guaranteed expenditure of thousands of dollars. Under this alternative, applicants must make application for lease to the Ministry and such lease granted is only if the proposed operations satisfy the discretion of the Ministry.

- At present under Section 646, subsection 2 of the Mining Act, a dredging lease may be applied for through the Regional Director, Ministry of Natural Resources, in whose area the dredging is proposed.

OBTAINING LAND TITLE FOR A PLACER OPERATION

Some of the possible ways of obtaining title for a placer mining operation are as follows:

1. Placer Mining Claim
Ontario regulation for staking a mining claim and the subsequent Assessment Work Requirements are the same for a placer mining claim as to explore for minerals in the bedrock. Under this method the person staking the claim would have to do 200 days of assessment work and obtain title to the property before beginning commercial production. A relevant excerpt from The Mining Act[1] R.S.O. 1970, Part III is as follows:

> "120. A licensee who makes a discovery of a natural stratum, bed or deposit of sand, earth, clay, gravel or cement carrying gold, platinum or precious stones that is probably of such size and character as to be likely to be workable at a profit may stake out and record a mining claim to be called a Placer Mining Claim thereon, and the provisions of this Act as to the staking out and recording of a mining claim upon the discovery of valuable mineral in place thereon, as far as practicable, apply to the staking out of a placer mining claim as if the words "a natural stratum, bed or deposit of sand, earth, clay, gravel or cement carrying gold, platinum or precious stones that is probably of such size and character as to be likely to be workable at a profit" were used instead of "valuable mineral in place", and the other provisions of this Act as to mining claims, as far as practicable, apply to a placer mining claim, and "mining claim" wherever used in this Act shall, unless repugnant to the context, be read as including placer mining claim. R.S.O. 1970, c.274, s.120."
> (see also note 1, p. 150)

2. Exploratory Licenses and Dredging Leases
Upon application to the Minister of Natural Resources, a lease may be granted to dredge or work in any river, stream, etc. Part V, Section 125 of the Mining Act is as follows:

> "125. The Lieutenant Governor in Council may make regulations respecting the issue of licences to explore and leases to dredge or work in any river, stream or lake or lands not covered by water for the purpose of recovering therefrom alluvial gold, platinum, precious stones or any other valuable mineral not in place. R.S.O. 1970, c.274, s.125."
> (see also note 2, p. 150)

3. Lands Held Under The Public Lands Act, The Free Grants and Homesteads Act, etc.
Where the surface and mining rights are held by an individual or company, the owner would be able to conduct placer operations on the property that he holds.
Ownership of the surface rights only would not of itself authorize removal of material by placer operations. If the mining rights are staked as mining claims or are the property of the Crown, then the minerals therein would not form part of the surface estate.

4. Permits for Gemstone Collection and Panning for Gold
It has been recommended that:

> "Permits for gemstone collection and panning for gold be issued by the mining recorders and refusals to issue such permits be appealable to the Mining Commissioner."
>
> This recommendation in the "Report of the Advisory Committee to the Minister of Natural Resources on the Revision of the Mining Act", February 18, 1974, Recommendation 39, page 20.

Reservations Relating to Titles

These reservations are mainly given under Sections 108 and 109 of The Mining Act and include reservations for roads, water power development, railways, use of navigable waters, fishing rights, etc. Of particular interest to placer mining is the reservation of surface rights and mining rights for one chain from the high water mark along navigable waters. Also where a claim includes land covered with or bordering on water, there may be reserved for the Crown the surface rights not exceeding 400 feet (122 m) in width from the high water mark (The Mining Act, Sect.51 [4]).

Operational Considerations

Leases are subject to the Navigable Waters Protection Act (Canada), The Beds of Navigable Waters Protection Act, The Lakes and Rivers Protection Act, The Beach Protection Act, etc.[2] Matters such as preservation of water quality, lowering of the water level in wells, erection of dams, control of ports, disposal of tailings,

[1] The reader should consult the latest edition of the Mining Act before staking claims, etc.

[2] See page 152

disposal of garbage and sewage, and dust and noise control are dealt with by the Ministry of Health and Ministry of the Environment. Rehabilitation of the land would be under The Mining Act with guidelines similar to those used in The Pits and Quarries Control Act, 1971 (Amended by Ontario Regulation 107/72).

Heavy Minerals

Residual minerals are those minerals that tend to remain unaltered in the zone of weathering. Some of these minerals are chemically inert, as gold and platinum, and others are already oxides that do not change in the presence of oxygen, carbon dioxide, and water, such as magnetite, hematite, cassiterite, and quartz. Heavy minerals are those minerals that have a specific gravity of more than 2.9 and will sink in a liquid of that density such as tetrabromethane. These heavy minerals may be recovered from sands and gravels by panning or sluicing. The specific gravity of pure gold is 19.3 and pure platinum 21.45 but as native metals they are usually alloyed with other metals which reduces their density to the range of 15.0 to 19.3.

[2]Provincial Acts may be ordered from: Ontario Government Bookstore, 880 Bay Street, Toronto, Ontario, M7A 1N8. A general compilation of environmental legislation affecting mining operations throughout Ontario is available as: *Guide to Legislation Affecting Mining in Ontario*, MPBP 9, 1979, and available at $15.00 from the Public Service Centre, Ministry of Natural Resources, W1640, Whitney Block, Queen's Park, Toronto, Ontario, M7A 1W3.

DEFINITIONS AND EXPLANATIONS OF PLACER TERMS

PLACER MINERALS

Native gold is the most important placer mineral. A large part of the world's supply of diamonds, platinum, and cassiterite (stream tin) is derived from fluvial gravels. Monazite, columbite, ilmenite, zircon, sapphire, ruby, as well as silver, bismuth, copper, amalgam (an alloy of mercury with gold or silver), palladium, and cinnabar have been recovered from placer deposits.

TABLE 8 HEAVY MINERALS AND THE EFFICIENCY OF THE RECOVERY METHODS (MODIFIED AFTER THEOBALD (1957) p.21, SIGOV (1939) p.3, AND GLEESON (1970) p.25).

Minerals	Specific Gravity	Panning Recovery (Sigov) percent	Panning Recovery (Theobald) percent	Sluicing Recovery (Gleeson) percent
Amphibole Spodumene	2.8-3.3	15	—	—
Limonite Staurolite Kyanite Epidote	3.4-3.8	60	—	75
Garnet Corundum Rutile	3.9-4.2	76	68	75
Hematite Ilmenite Zircon	4.4-5.1	83	62-72	—
Monazite	4.6-5.4	—	84	—
Magnetite	5.2	90	59	97

For comparison purposes the specific gravity of diamond is 3.5 and cassiterite is 7.1.

GEOLOGICAL HISTORY OF PLACER GOLD

Gold commonly occurs as flakes or seams of native gold in quartz veins which also contain a few percent of other heavy minerals such as pyrite, pyrrhotite, galena, sphalerite, and arsenopyrite. Many types of host rock contain gold mineralization such as basalt, rhyolite, tuff, carbonate silicate and sulphide iron formation, conglomerate, slate, and granitic rocks.

Placer gold is present as fine dust, scales, and small nuggets; most nuggets are worn and pitted. At only one occurrence in Ontario was placer gold recorded in association with quartz. Generally the associated minerals in a placer deposit that are not the heavy minerals occurring in most primary deposits, suggests that there has been a long history of weathering and mechanical sorting.

SIZES OF GOLD PARTICLES

Gold particles vary greatly in size which affects the value and methods of recovery. The following size classification is modified after Young (1946 p.451).

The following definitions and descriptions are slightly modified after the definitions given by Parker (1974 p.3-4), parts of which are direct quotations.

Placer or Placer Deposit is an "accumulation of rock waste formed by natural processes of sedimentation, mass wasting or weathering in which the natural processes have mechanically brought about a relative concentration" of heavy minerals. The concept of a natural mechanical concentration distinguishes placer deposits from most weathered outcrops of ore deposits and from sediments in general.

Placer Gravel is the "rock waste which makes up a placer deposit, without regard to genesis, size or shape. Thus, placer gravels may include fluvial deposits (mixtures of sand, gravel, and boulders in any proportion), till, dune sand, colluvium," etc.

Eluvial Placer Deposit is a placer deposit which lies on or nearby the source, but in which the natural mechanical processes such as elutriation has brought about concentration of the heavy minerals. Elutriation is a process in which the heavier particles sink and the lighter, finer particles rise in a slowly rising current of water and the lighter particles may be washed away. These deposits grade into gossans or into the partially weathered bedrock mineral deposits which have formed by chemical weathering processes.

Colluvial Placer Deposit is a placer deposit located at some distance from the "source and in which concentration has been affected primarily by mass wasting processes." Mass wasting is the downslope transport of soil and rock under the influence of gravity. It includes slow displacement such as creep and rapid movements such as earthflows and landslides.

Alluvial Placer Deposit is a placer deposit formed by the action of running water.

Gold Concentration "is used to refer to the amount of gold in a unit volume of placer gravel",

TABLE 9 | SIZE CLASSIFICATION OF PARTICLES OF GOLD.

Size Description	U.S. Screens mesh	U.S. Screens millimeters	Average Number of Particles per Ounce; colours*
coarse	plus 10	plus 2.0	—
medium	minus 10, plus 20	minus 2.0, plus 0.841	2,200
fine	minus 20, plus 40	minus 0.841, plus 0.420	12,000
very fine	minus 40	minus 0.420	40,000
flour	—	—	314,500 to 885,000

*Several thousand "colours" may constitute 1 cent's worth of gold (gold at $35.00 per ounce).

and usually is expressed in cents per cubic yard.

Gold Distribution "is used to refer to the amount of gold above a unit area of bedrock surface beneath the placer deposit" and usually is expressed in cents per square yard.

Gold Moment "is used to refer to the vertical distribution of gold in placer gravels; it is the relative position of the 'center of gravity' of the gold in a column of gravel, expressed as the percentage the distance of the 'center of gravity' of" the gold is above the bedrock to the total thickness of the gravel.

By-Product Placer Gold is placer gold obtained from a sand and gravel washing plant. In the United States such plants have been in operation since 1922 on Clear Creek, Adams and Jefferson Counties, Colorado (Parker 1974, p.22). In Ontario a similar type of operation at the Canadian Charleson property, Steep Rock Lake, separated iron oxides from the associated gravels.

AGES AND TOPOGRAPHIC LOCATIONS OF PLACER DEPOSITS

Placer deposits, being the result of erosional processes, have occurred from place to place ever since erosion began on the earth. Placer deposits exist today as preserved pre-Glacial placers, Pleistocene placers, or as modern placers. Placers may form directly from the erosion of rock containing "heavy minerals" or by the reworking of an earlier formed placer. Pre-Glacial placers may be expected in topographically low areas such as old river valleys, however, many Pleistocene gravel deposits are above the level of present day streams.

ECONOMIC FEATURES OF PLACER DEPOSITS

Some economic considerations controlling the value of placer deposits are as follows (modified after Young 1946, p.450):

1 - The extent or area covered.
2 - Thickness of the 'pay' gravel and thickness of the overburden.
3 - Surface topography and other significant surface features.
4 - The slope and shape of the bedrock and whether hard or soft and smooth or irregular.
5 - The nature of the gravel, whether fine, medium, or coarse; whether loose, compacted, cemented, or frozen; and whether large boulders are present or absent.
6 - The distribution of the mineral to be recovered. Whether uniformly distributed, concentrated, or in crevices in the bedrock.
7 - The fineness or subdivision of the mineral.
8 - The value of the alluvial material.
9 - The disposal of waste.
10 - The separation method employed.
11 - The methods available for excavation and transportation.
12 - The water supply available and the head of water obtainable, as well as the level of ground water.
13 - Transportation, climate, laws, and taxes.
14 - Buried logs and other debris.
15 - Pollution regulations.
16 - Reclaimation requirements.

RECOVERY METHODS

Panning

Panning is a technique that has been associated with mining since very early times and particularly with placer mining. The basis of panning is that the mineral to be recovered is much heavier than the sand or other material that is discarded. The recovery of the mineral is related to the type of material sampled, the grain size of the mineral, and the specific gravity of the mineral. Samples with a large proportion of clay must be washed to remove the clay before the panning is started and a part of the heavy mineral may be lost in suspension with the clay if the mineral is in thin flakes. Lang (1970, p.254) gave the following description:

> "Gold pans are of different sizes, the most common being 16 inches in diameter at the top, the sides sloping at about 40 degrees, and the depth being about 2½ inches. They are generally made of sheet iron. If they are too highly polished, or if they become greasy, they will not retain fine-grained gold; new ones may have been greased to prevent rusting.
>
> The pan is filled with sand or gravel and immersed in a slack part of a stream, or in a lake or pond, or even in a tub of water, and the gravel is stirred with the hands. Any soil is thus washed away, after which any larger pebbles are tossed out by hand. The pan is

then alternately shaken, and rotated under water, then raised to the surface at an angle so that the upper material is spilled and washed away.

This process is repeated until only the heavier grains, if any, remain. These generally comprise magnetite, pyrite, hematite, and other heavy minerals, and any gold that may be present. If a little water is added and the pan is rotated with a deft movement, the gold, being heavier, is separated to form a 'tail' behind the other heavy minerals. The gold may include nuggets, or pieces about the size of grains of wheat, but it is usually in the form of small flakes or grains called 'colours'. Beginners often become excited if they see a few colours as a result of their panning, but these colours are so small that their value is slight. To save the gold in the pan, the heavy fraction is dried, magnetite is removed with a magnet, and other foreign grains are blown out, picked out, or allowed to remain. Very fine gold may have to be saved by panning with a copper pan and placing a little mercury in it to form an amalgam, which is heated in a retort to drive off the mercury and condense it for further use. Care must be taken not to breathe the poisonous mercury fumes."

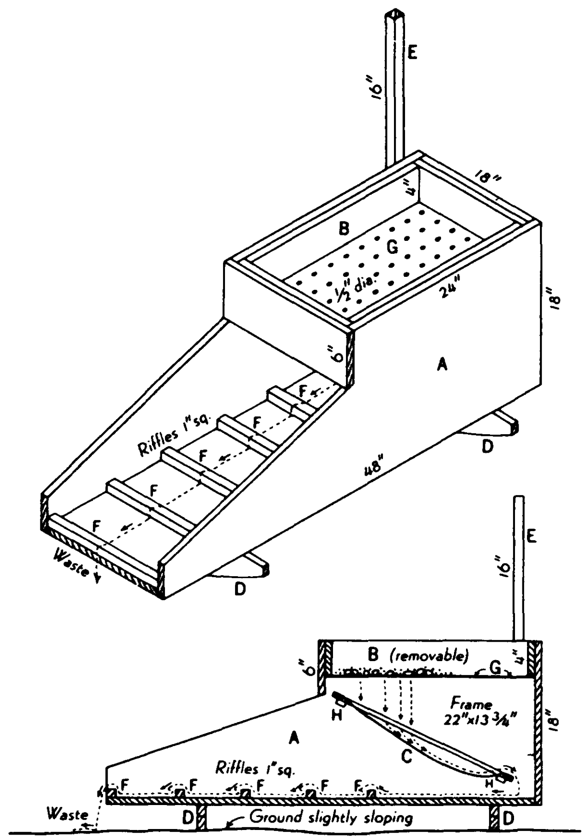
As the amount of material handled is usually small the pan is employed as a sampling device and it can be used to determine the presence and amounts of the heavy minerals associated with kimberlite. Satterly (1971, p.21) reported that of 26 kimberlite pipes found from 1945 to 1967 in the Siberian Plateau, USSR, 2 were exposed, 7 were found by panning for indicator minerals, 15 by ground magnetics, 1 by aeromagnetics and 1 by aerial photography.

Rocking

The following description and figure of a rocker is taken from Lang (1970, p.257):

"A common device for separating the gold obtained in small operations, called a rocker, is somewhat the size and shape of a cradle. One can be made from a few pieces of board, a piece of coarse screen or sheet iron with holes drilled or punched in it, and a piece of canvas, burlap, blanket, or some other cloth having a nap, which is necessary to catch fine gold. Rockers are of slightly different designs and sizes, the larger ones bein used when most of the gold is fine grained, because the longer box is then more efficient. A medium-sized one is illustrated on Figure [16].

To operate a rocker, gravel is shovelled onto the screen. Water is then poured over it from a dipper and at the same time the rocker is given a quick jerk with a sudden stop. This is repeated, with the addition of just enough water to wash the sand through without flushing out any fine gold. The coarse material that does not pass through the screen is thrown out, after removing any nuggets that might be present. A rocker is most efficient when used by two men, one of whom shovels in the gravel while the other operates the rocker and the dipper. Water can be saved and used over again if necessary, but clear fresh water is best. Two men can wash 3 to 5 cubic yards [2.29 to 3.80 m^3] of gravel a day in this way, which is ten to twenty times as much as they could do by panning"



A. Box, 48"x18"x18". B. Tray with iron bottom containing ½" holes. C. Apron of burlap mounted in frame. D. Rockers. E. Handle for rocking. F. Riffles, for catching gold. G. ½" holes in iron bottom of tray. H. Cleats holding frame in place. Course of material through rocker.

Dirt and water are put into B and apparatus is rocked by handle. Water and sand and gold pass through holes onto apron C where most black sand and gold is caught, then over riffles by which more gold is caught, thence to waste. Material remaining in B is thrown out and apron is removed and washed.

Figure 16. Diagram illustrating construction and mode of operation of a rocker (after J.D. Galloway).

Sluicing

A description of sluicing is given in Mining Textbook No.3, Practical Mining (published by Canadian Legion Educational Services, Ottawa 1945, p.121).

> "In certain circumstances it is possible to save labour still more by sluicing. This requires enough flowing water to make a fast-flowing stream, say three or four inches deep in a sluice-box a foot wide, and a grade of three or four feet [1.2 m] in a length of, say, thirty or forty [9 or 12 m] feet. Above the upper end of the sluice is a screen, as with the rocker, onto which the gravel is shovelled or dumped from a wheelbarrow. The water runs in over the gravel on the screen, washing the fine gravel through it, and the coarse gravel is discharged over one side. The fine gravel is carried down the sluice-boxes, which may extend as much as thirty or forty feet [9 or 12 m] and runs to waste at the end. The gold is caught in riffles fastened across the bottom of the sluice-boxes at intervals."

The United States Bureau of Mines Information Circular "Placer Mining in the Western United States" (Gardner and Johnson 1934) gave a great deal of information on placer mining including the construction and operation of sluice boxes. A similar publication "Hydraulic Mining Methods" (Holland 1942) described operations and practices in British Columbia.

Sluice boxes may also be used as a sampling device and the box used by Lee (1963, p.7) consisted of a set of five stainless steel screens with the smallest screen having an opening of 0.05 mm (35 mesh). Sieving was by a wet method and the fines from the screens were passed over an aluminum sluice box set to a slope of from 2 to 4 degrees. Matting was placed in the bottom of the sluice box with cross-ribs over the matting, and a flow of water was maintained that just covered the ribs. Gold was concentrated on the riffle together with the other heavy minerals and usually came to rest within a few feet of the beginning of the riffle mat.

Hydraulicking consists of using water under pressure of 60 to 100 pounds per square inch (413.7 to 689.5 kPa) to cut away a bank of gravel or soil. The nozzle at the end of the pipeline is called the monitor or giant and in a small operation the diameter of the nozzle might be from 1 to 4 inches (2.5 to 10 cm). If overburden is removed it is allowed to flow away with the discharge water but gold-bearing gravels are passed through a sluice box.

Bucket-Ladder Dredging

Dredges with various modifications have been used in placer operations since they were developed in New Zealand about 1882. Dredging is applicable to large flat deposits lying on bedrock and also to the weathered bedrock surface and to certain bedrock such as schists with fairly smooth contours and in such locations that the lack of grade prevents hydraulicking. Most large dredges use electrical power and many hulls or pontoons are launched in their ponds and the machinery installed on the floating hull. The front of the dredge contains a narrow well or open space in which the continuous line buckets operate and at the stern a stacker with a conveyor belt discharges the oversize and gravel after processing. Gold recovery is effected by screening, washing, sluicing, and tabling. The dredge floats on its own pond and the pond moves as the gravel is extracted and processed. The depth of digging for gold dredges is up to 124 feet (37.8 m) below the waterline at a ladder angle of 45 degrees and a ladder length of 216 feet (65.8 m) (Young 1946, p.473).

The continuous bucket dredge is operated by stepping ahead about 6 feet (1.8 m) or more with the ladder elevated and then the front of the dredge is swung in an arc to make a cut the width of the pond. The ladder is lowered sufficiently in order to assure full buckets. The dredge is swung back and forth over the same arc making cuts at succeeding lower elevation. This procedure is continued until the lower operating limit is reached or bedrock is encountered with the top 2-5 feet (0.6-1.5 m) dredge if possible. Banks up to 50 feet (15 m) above pond level can be handled by having the dredge undermine the bank and cause it to cave into the pond. The water in the pond is used for processing the gravel and is recirculated. If the gravels enclosing the pond are highly porous a water supply of 1,000 gallons per minute (4546 l./min) may be required to maintain the water level in the pond (Young 1946, p.479-480). Gravel and boulders are stacked while sand fills in behind the dredge.

Dragline Dredging

The washing plants are mounted on scows or pontoons to which gravel is delivered by dragline excavator located on dry land. The excavator retreats as it cuts away the bank on which it stands and the washer moves forward on the newly dredged part of the pond. The special field of the dragline dredge is in working deposits too small to warrant installation of bucket-ladder dredges. This method of operation requires gravel with few boulders, a depth of gravel below the waterline of not more than 30 feet (9.1 m) and preferably not more than 16 feet (4.9 m), and fairly soft, unfissured bedrock. Portability of equipment and low capital cost are advantages of dragline dredging.

Drift Mining

Drift mining is the exploitation of placers by underground methods. As this method is much more expensive than surface operations the deposits must be of much higher grade and values of $4 per cubic yard (0.75 m^3) and upward were necessary for the deposit to be economic in 1946 (Young 1946, p.493). At present (1975) values in excess of $25 per cubic yard are probably necessary for production by this method. In the Klondike, drift mining was carried out by smaller operators with little capital and this district had the added advantage of frozen gravels. A shaft is sunk to reach the deepest part of the paystreak and a drive is put out along the long axis of the paystreak either in the gravel or in the underlying bedrock. Frozen ground is usually thawed with the use of steam points 5 to 8 feet (1.5 to 2.4 m) in length driven into the faces, and explosives are rarely used. Mining is generally in the form of longwall-retreating and the thickness of the paystreak mined varies from 3 to 8 feet (0.9 to 2.4 m). The paystreak usually occurred as the bottom 3 feet (0.9 m) of the gravel and as the upper 2 feet (0.6 m) of the bedrock. Gravel from the workings is washed in a sluice in the summer when water is available.

Cleaning Up

As cleanup time should be kept to a minimum, large hydraulic mines usually clean up once a season except for the upper one or two boxes. Dredges clean up every 10 days or 2 weeks because large amounts of gold are recovered in fairly short sluices. For a shovelling operation the upper part of the sluice may be cleaned up daily. A small stream of clear water is run through the sluice until the riffles are bare. The riffles of the first box are lifted and washed into the box and any burlap or fabric used is placed in a tub and scrubbed. The contents of the box are shovelled to the head and washed with a light flow of water so that the sand is washed away and any pebbles are thrown out and washing is continued until a satisfactory concentrate is produced. Gold and amalgam may be scooped out or all the concentrate including the black sand may be taken from the box for further treatment. The box is cleaned with brushes and scrapers to recover any gold or amalgam caught in nail holes or cracks.

Blowing

The following description is taken from Gardner and Johnson (1934, p.78-79):

> "The grains of sand remaining in an almost final product may be removed from the gold by blowing. A flat tin about 2 feet (0.6 m) square with the edges bent up about one half inch, is best for the purpose. However, with care and skill the operation can be performed in a common gold pan, as is done by many prospectors, particularly when cleaning dry-washer concentrates. The material should be perfectly dry. Much effort is saved by using a magnet to take out any magnetite sand in the concentrates; often this mineral comprises as much as 90 percent of the material. A piece of paper folded around or held against the end of the magnet will keep the magnetite sand from sticking to the metal. When all the magnetite is removed, blowing gently on the remaining sand and gold will drive the former to the farther edge of the sheet, leaving the gold behind. In most instances the loss of a few fine colors is not serious."

Amalgamation

Amalgamation is a process in which mercury alloys with another metal particularly gold. Mercury does not alloy with platinum. Clean placer gold alloys readily with mercury but gold coated with iron oxide does not readily amalgamate and the mercury tends to become fouled and sluggish. Straining mercury through chamois or tightly woven cloth removes some of the surface scum and foreign material, alternatively potassium cyanide may be used to dissolve impurities or the mercury can be retorted. Mercury near the head of the box takes up gold and becomes pasty and finally quite hard so that is is necessary to add more mercury to bring it to a fluid condition. The concentrate is cleaned using pans, rockers, or small sluices and as care is required small amounts are treated at a time.

Amalgamation in a gold pan is described by Gardner and Johnson (1934, p.79) as follows:

> "A small quantity of quicksilver, ranging from an ounce to a quarter of a teaspoonful, will catch all the gold from a pan of sluice concentrates. The mercury is simply placed in the pan with about 5 pounds (2.27 kg) of concentrates and agitated under water until no more free gold can be observed. Then the sands are panned off, care being taken not to lose any of the amalgam or fine drops of mercury, which gradually will run together into a single mass. If the concentrates are nearly all black sand only a small quantity should be washed at a time, but if much light sand is present larger quantities can be washed."

> "Copper-plated pans or pans with steel rims and copper bottoms are available and are useful for saving fine gold in concentrates. The copper is coated with mercury by first cleaning it with emery paper, then rubbing clean, bright mercury or amalgam on it until it presents a smooth, shiny surface. The gold in the material being treated is picked up quickly by the amalgam surface. Only fine sand can be treated to advantage as coarse sand or gravel will scour the amalgam off the copper. As fast as amalgam accumulates on the copper it is scraped off with a smooth, dull-edged, iron scraper such as a putty knife. More mercury may then be added to keep the surface bright and in a "receptive" condition."

Some Canadian Placer Gold Operations

The Yukon Consolidated Gold Corporation Limited

TYPE OF OPERATION

The Yukon Consolidated Gold Corporation Limited operated up to 10 electrically driven dredges and 1 hydraulic and mechanical operation in the Klondike alluvial mining district. The placer deposits were in the valleys of the Klondike River and its southern tributaries Bonanza, Bear, and Humber Creeks, and in the valleys of the Indian River and its tributaries Dominion, Gold Run, Sulphur, Eureka, and Quartz Creeks. Recovery of gold by this company began in 1932 and continued until November 1966 when all known profitable gravels had been exhausted.

DESCRIPTION OF DEPOSITS

In most places the upper alluvial layer in the creeks and gulches consisted of 2 to 40 feet (0.6-12 m) of permanently frozen, silty organic material, locally called muck, with the greatest depths near the sides of the valleys. Creek gravels were the most productive and covered the valley bottoms to depths of from 4 to 10 feet (1.2-3 m) (Gleason 1970, p.10), except for the Klondike Valley where the average depth is 30 feet (9 m) and the maximum depth 45 feet (14 m) (Blanchard and Romanowitz 1941, p.10-594). The gravels consisted of about 60 percent quartz and schist pebbles and the balance of sand with small amounts of clay. The greatest concentration of gold was in the lower few feet of the gravels and the weathered upper few feet of the bedrock. About two-thirds of the area tested for dredging had previously been worked by drift and/or hydraulic mining. Of a gravel reserve of 92,000,000 cubic yards (70,322,340 m^3) in 1938 about 9 percent was in hill and bench gravels with the balance in valley gravels.

PAYSTREAKS

The longer dimension of paystreaks was roughly parallel to the trend of the valley but did not necessarily coincide with the present stream system. The width of the paystreaks usually expanded from a few feet at the head of a creek to several hundred feet near the mouth. The gold content of the gravels generally decreased downstream, except for a few cases where the richer ground was near the creek mouth. The gold values varied much more rapidly across a valley than along it and consequently exploration drill holes are more closely spaced in transverse sections.

LAYOUT OF DRILL HOLES

The first step in exploration was to make a map, usually at a scale of 1 inch to 200 feet, which is small enough to cover a considerable area and large enough for the accurate measurement of distances and for the planemetric calculation of areas. The standard pattern for exploration drilling was a triangle system with holes on the line spaced 200 feet apart, lines 500 feet apart, and the holes staggered so that the triangles formed had their long axes parallel to the trend of the valley. In reconnaissance drilling the line spacing was at 1,000 feet (300 m) or a greater distance, and in broad deposits the drill holes were located at the corners of equilateral triangles.

CHURN DRILLING

Vertical holes were drilled with a churn drill and in unfrozen ground a casing 6 inches (15 cm) in diameter was used, however, in frozen ground drilling was done without a casing. Where no casing was used the volume of the hole was calculated by adding a half cubic foot of water in successive increments and reading the height of the water surface. Each half cubic foot of water generally raised the level of the water in the hole from 2½ to 3 feet.

Gravel from the drill hole was sampled in 2-foot (0.6 m) sections by bailing the material loosened by drilling. The pulp was washed in a metal trough with a 10 percent grade to remove any clay and the residue panned to about a quarter of a teaspoonful of concentrate or until the gold was clearly visible. The number of colours were counted, the weight of the gold estimated, and the concentrate is collected in a bottle for each drill hole or up to about a 15-foot (4.6 m) section. Rejects from the panning were run through a rocker as a check against loss. A complete field record of the hole as well as the jars of concentrate was kept by the panner. In the assay office the concentrate was panned and the gold amalgamated with mercury. Gold was parted from the amalgam using a 50 percent nitric acid solution, washed, dried, annealed, and weighed. The gold content per cubic yard was calculated from the amount of gold recovered and the volume of material in which it was contained.

PRODUCTION

The following general statement of production is taken from Skinner (1961, p.6):

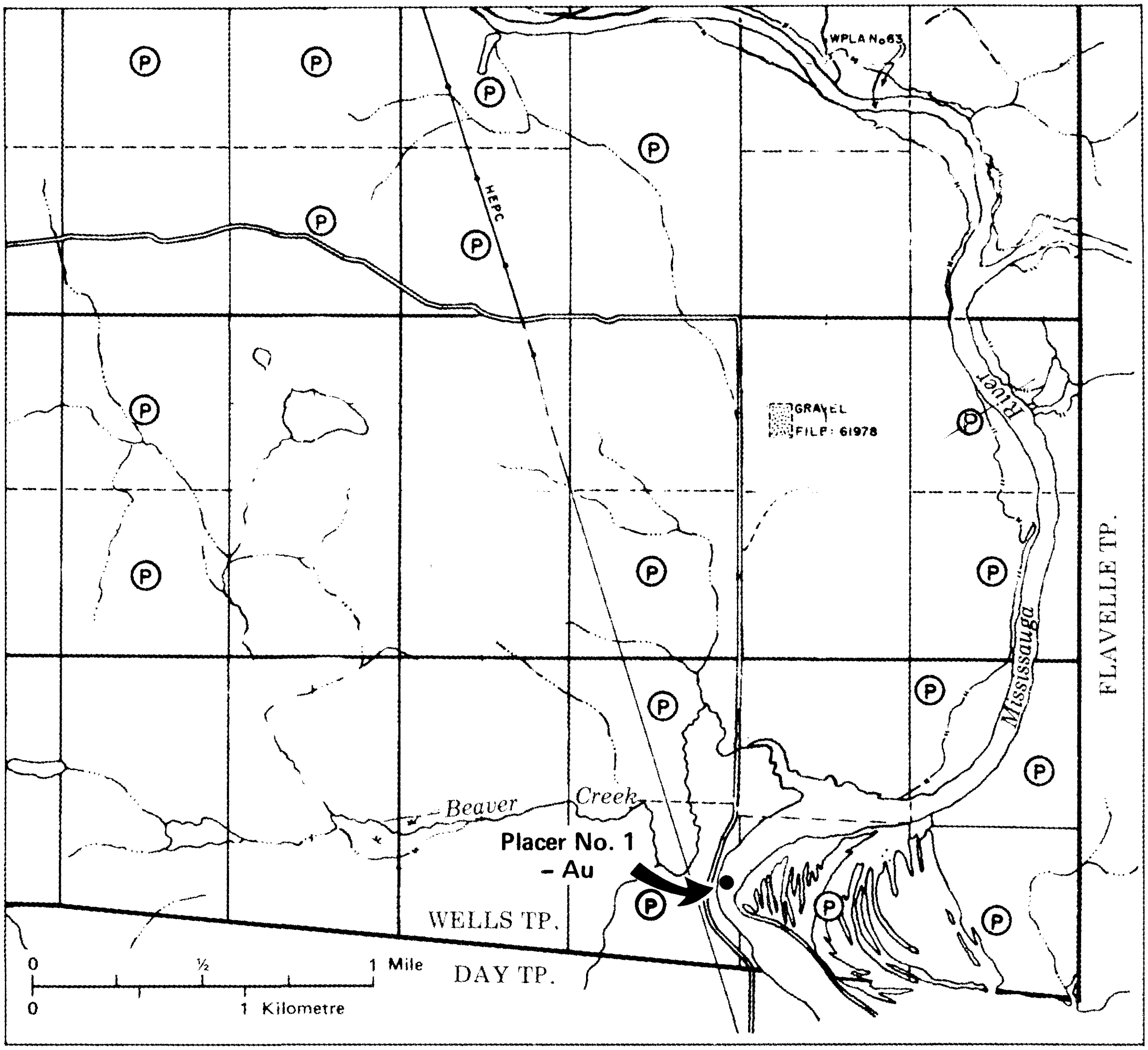
> "The discovery of gold on Bonanza Creek in August 1896 resulted in the Klondike gold rush of 1898. Production reached a peak value of $22,275,000 in 1900, but by 1907 most of the rich, easily mined ground had been worked out and production declined to $3,150,000. However, when dredging was introduced to the Klondike in 1905 and various interests were amalgamated, gold production increased to $5,856,780 in 1913, an amount unexceeded since. The rich hydraulic and dredging areas were gradually exhausted and the value of production diminished to $1,243,287 in 1923; from then until 1934 it was less than $1,000,000."

BEAUCEVILLE PLACERS

The Beauceville placers are in the Chaudiere River basin in Beauce County, Quebec, in an area underlain by Ordovician sedimentary and volcanic rocks. A gold nugget, weighing about 51.5 ounces (1451 gm), thought to be the largest ever found in Canada, was discovered in Beauce County in 1865. From 1875 to 1885 gold production amounted to about $2,000,000 of which more than $1,500,000 came from the Gilbert River (MacKay 1921, p.70,73). These deep channel deposits are pre-Pleistocene, auriferous gravels that were cemented in many places and overlain by boulder clay and water saturated sand. Gold was concentrated in the lower few feet of the gravels, in the underlying clay, and on the surface or within cracks in the bedrock. Difficulties in mining included the depth of the gravels which were up to 97 feet (29.5 m) below surface, the presence of ground water and quicksand, the number of large boulders, the difficulties in disposing of the tailings, and the lack of sufficient water for continuous hydraulic mining purposes (MacKay 1921, p.82).

TABLE 10 SOME PRODUCTION STATISTICS OF YUKON CONSOLIDATED GOLD CORPORATION LIMITED (FINANCIAL POST SURVEY OF MINES 1967, p.108; BOSTOCK 1941, p.5; AND SKINNER 1961, p.8).

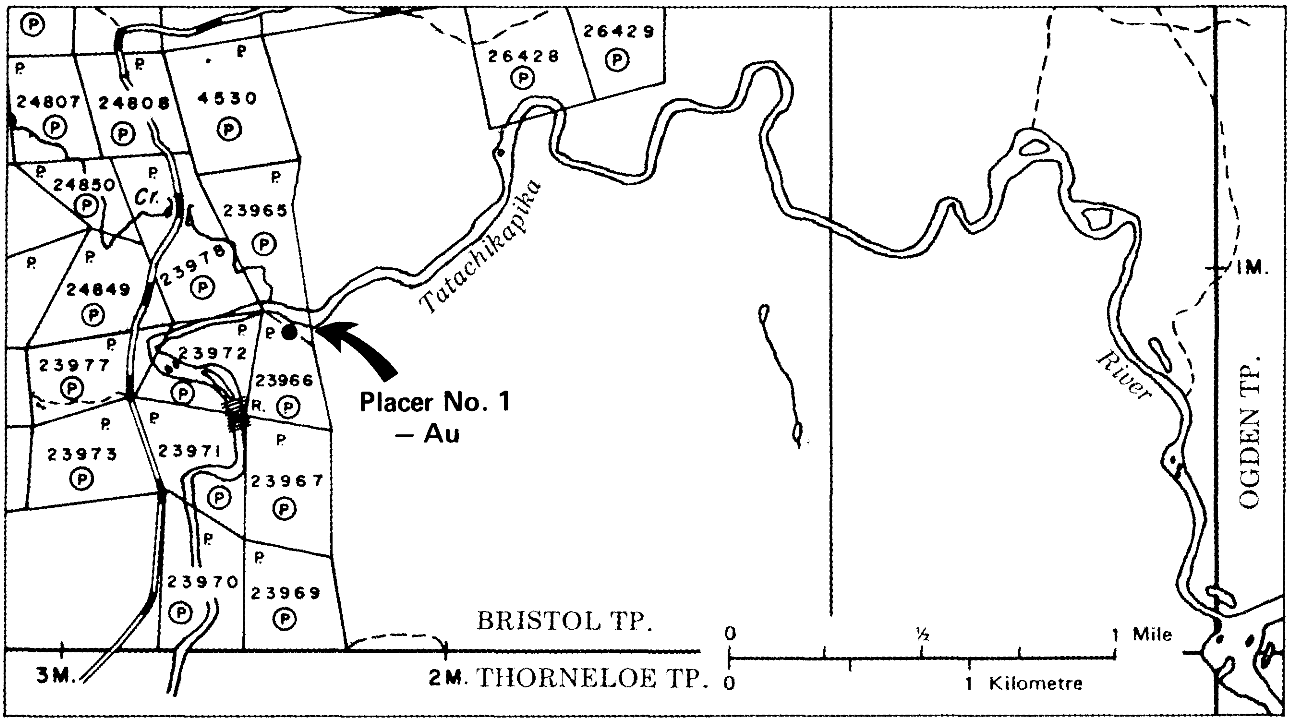
Years	Gold ounces	Silver ounces	Value dollars	Gravel Processed yards	Recovery Per Yard cents
1937	36,850	8,814	1,287,723	7,443,785	17.29
1960	63,300	—	2,169,300	4,826,000	44.04
1932-1965	—	—	57,431,416	202,656,044	28.34



Algoma District

Wells Township Placer No.1

Main Metals: Gold
Location: Wells Township (Latitude 46°25', Longitude 83°24'), concession I, S½, lot 3, on Mississauga River. NTS 41J/6W. Map Reference: ODM Map 2108, Sault Ste. Marie-Elliot Lake Sheet.
Description: The upper part of the section consists of yellow sand and the lower part of coarse sand cemented by iron oxides. Samples obtained in the summer of 1898 from both the upper and lower parts of the section contained a few colours in the pan and a few cents per ton by fire assay.
Remarks: In 1898, the farm was owned by James Ralph. Testing of the sand was done by A.P. Coleman at the School of Practical Science, University of Toronto, 1899.
Reference: OBM Rept. 1899, Vol.8, p.149.



Cochrane District

Bristol Township Placer No.1

Main Metals: Gold

Location: Bristol Township (Latitude 48°25′, Longitude 81°31′), Claims P23966 and P23972, where Thunder Creek joins the Tatachikapiks (Redsucker) River. NTS 42A/5E.

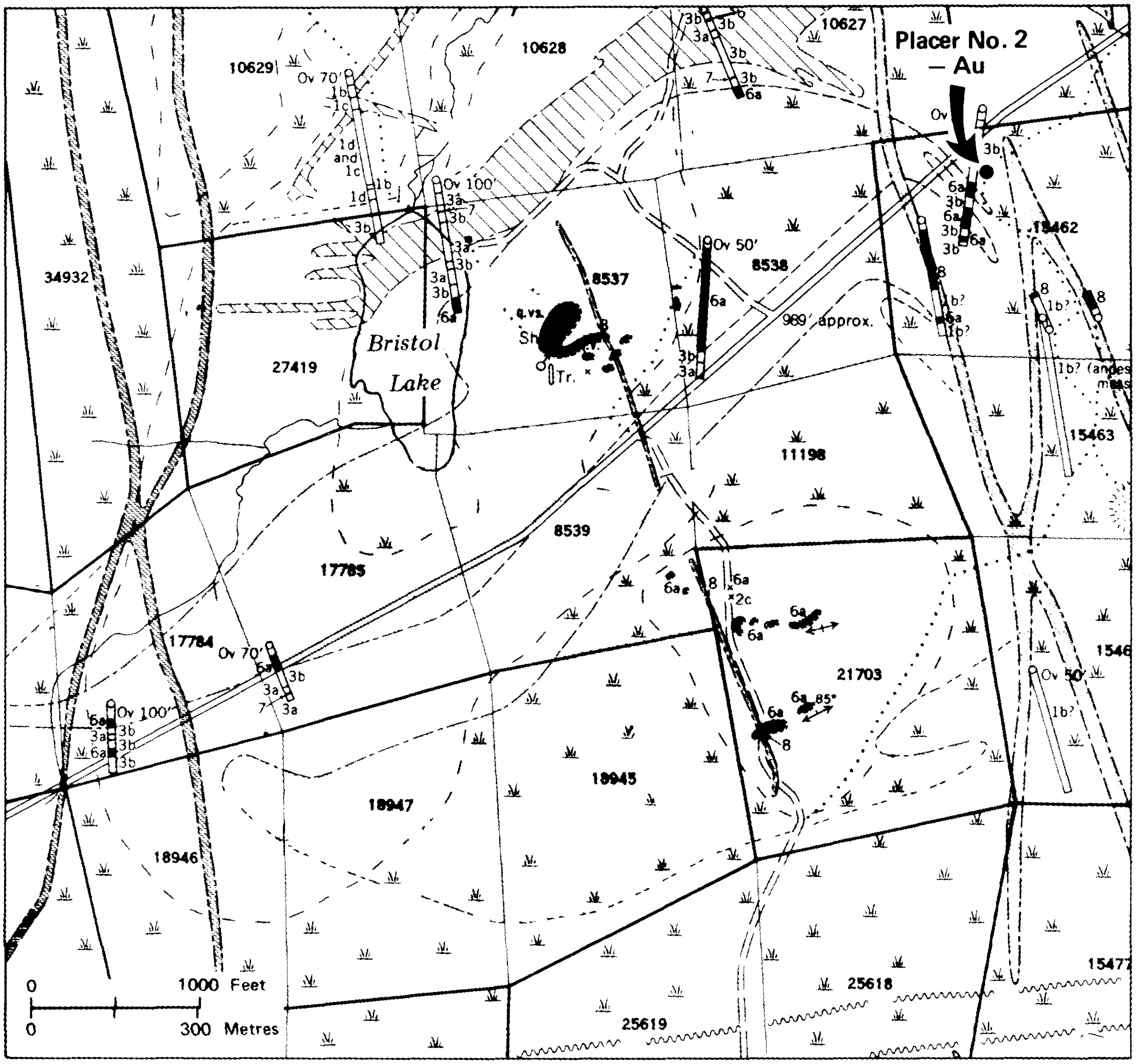
Map Reference: ODM Map 1957-7, Bristol Township.

Description: Early prospectors discovered that gold could be panned in gravels from the bed of the Tatachikapaks (Redsucker) River at the mouth of Thunder Creek. In 1931 Edward Gauthier found that he was able to get from 2 to 17 colours by panning sand from the river banks. About 1931, a test made with a sluice box and a mercury coated plate for a 3 day period indicated that the gold content was 0.03 ounces per ton. Sampling in 1934, by Hollinger Consolidated Gold Mines Limited gave assays ranging from trace to 0.018 ounces of gold per ton. The east bank of the River was sampled, by Hollinger Consolidated Gold Mines Limited in 1934. One-thirtieth of a cubic yard sample was selected and carefully panned and the concentrate assayed with the following results:

Location	Weight of Concentrate Grams	Gold Ounces
No.1 post Claim P23966	198	0.018
South side of bend P23967	132	0.0035
South side of bend P23971	157	0.0055
South boundary P23970	18	trace
Thornloe Township, 350 feet south of Bristol boundary	190	0.003

Remarks: In 1931 the property was held by a syndicate consisting of Edward Gauthier, P. Gauthier, F. Feldman, J.A. McInnes, and Herbert Bourne. In 1957 the property was held by Britaura Porcupine Mines Limited.

References: ODM Rept. 1957, Vol.66, pt.7, p.23-24. ODM Rept. 1926, Vol.35, pt.6, p.23. Regional Geologist's Office, Ontario Ministry of Natural Resources, Timmins, File T-625.



Cochrane District

Bristol Township Placer No.2

Main Metals: Gold
Location: Bristol Township (Latitude 48°25′, Longitude 81°31′), Claim P15462, east of Bristol Lake. NTS 42A/5E.
Map Reference: ODM Map 1957-7, Bristol Township.

Description: In 1929 Foley-O'Brien Limited drill hole No.4 intersected a seam in the bedrock at a depth of 295 feet (90 m). Sand flowed from this seam into the hole and assayed 0.14 ounces of gold per ton.
References: ODM Rept. 1957, Vol.66, pt.7, p.28. Regional Geologist, Ontario Ministry of Natural Resources, Timmins, File T-552.

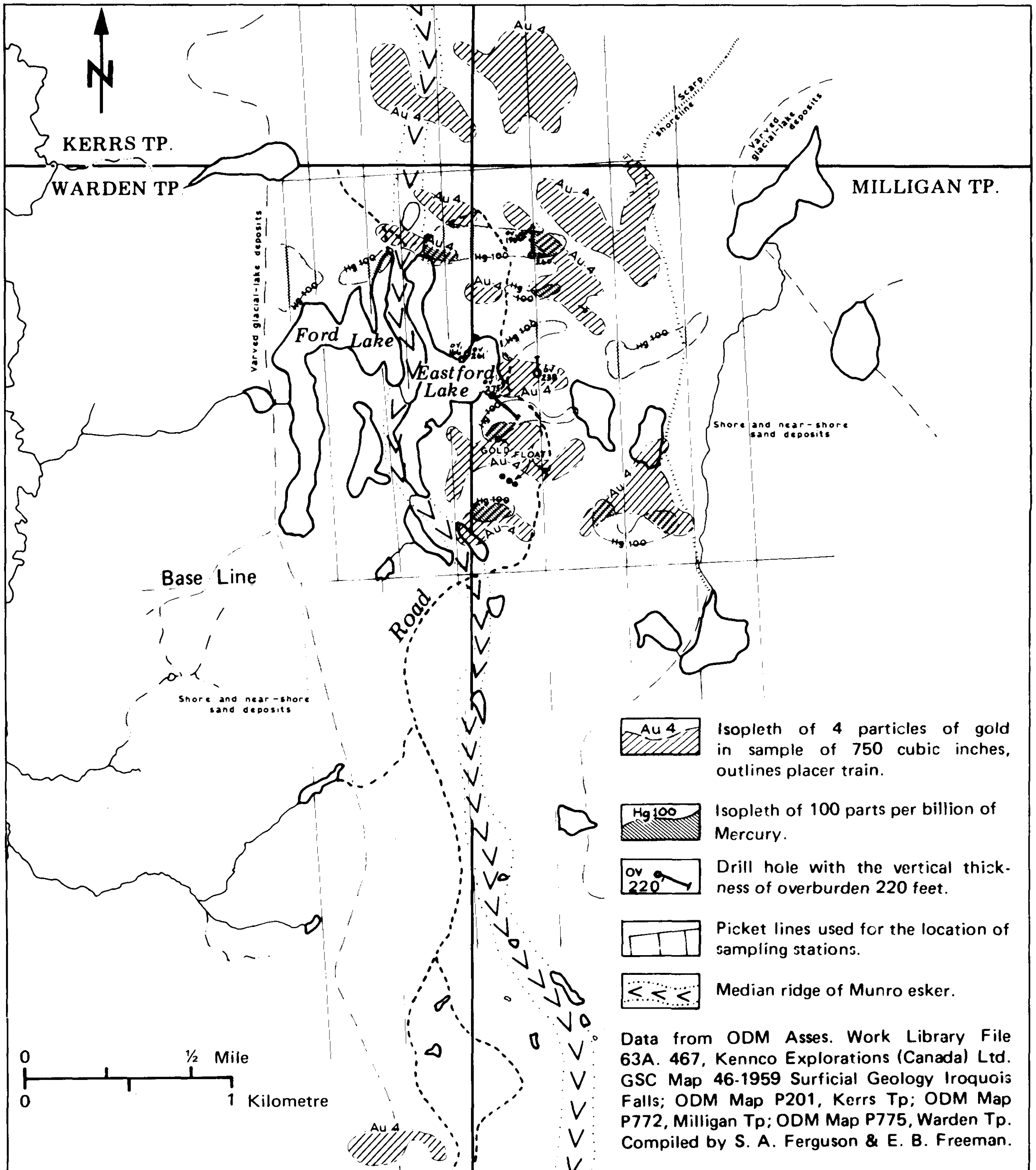


Figure 16a Gold and Mercury in the Munro Esker.

Cochrane District

Milligan, Warden, and Kerrs Townships and Rayner Lake Area, Placer Train

Main Metals: Gold

Location: Milligan Township (Latitude 48°40', Longitude 80°05'), Warden Township (Latitude 48°40', Longitude 80°13'), Kerrs Township (Latitude 48°45', Longitude 80°13'), and Rayner Lake Area, SE Corner (Latitude 48°37', Longitude 80°00'), mainly in the northwest corner of Milligan Township and east of Eastford Lake. NTS 42A/9E.

Map References: ODM Map P.772 Milligan Township; ODM Map P.775 Warden Township; ODM Map P.201 Kerrs Township; OMNR Claim Map M375, Rayner Lake.

Description: Milligan Township Placer Train - Au is described earlier in this report under the Float descriptions.

Kennco Explorations (Canada) Limited examined a part of the Munro Esker near the common corner of these three townships during 1965 to determine the content of gold and mercury. In this vicinity the Munro Esker is an outwash plain up to 1.5 miles (2.4 km) in width with varved sediments on the western side. The eastern side of the ridge of sand and gravel is a shoreline scarp and below the scarp are shore and near shore deposits of sand and gravel that have been removed from the esker during the existence of a post-glacial lake. These deposits are about 3/8 of a mile (0.6 km) in width and are bordered on the east by varved sediments. Resistivity surveys indicated that the overburden depth was from 200 to 300 feet (60 to 90 m) and drilling has established the depths as 166, 215, 220, 238, and 270 feet (50.6, 65.3, 67, 72.5 and 82 m) at the points where the drill holes are located. Samples were located in a grid pattern at 400-foot (122 m) intervals and each sample had a volume of 750 cubic inches (0.43 cubic feet) and was collected from the upper 2 feet immediately underlying the 'B' soil zone. Each sample was screened and washed in an aluminum sluice box containing a rubber riffle mat. The concentrate from the sluice box, consisting mainly of garnet and magnetite was panned and the number of gold particles counted and graded as to size. Approximately 8 miles (13 km) of the esker was sampled and 956 samples collected over the width of the esker and for a length of 1½ miles (2.4 km) most of the samples contained at least from 1 to 3 particles of gold. Areas containing more than 4 particles of gold were considered to be anomalously high and individual values ranged up to 24 particles of gold. The largest anomalously high areas were up to ½ mile (0.8 km) in length and from 1/8 to ¼ mile (0.2 to 0.4 km) in width (see Figure 8, p.22 and Figure 3, p.10).

Samples for the mercury test were collected at 499 locations and consisted of 100 mg of organic-free sand taken at a depth of about 9 inches (23 cm) with determinations for mercury done in the Toronto laboratories of McPhar Geophysics Limited. The mercury content ranged upward from 25 parts per billion (ppb) to 333 ppb. The largest area containing more than 100 ppb was over 2,000 feet (610 m) long and about 400 feet (122 m) wide. There is a tendency for the higher concentrations of mercury to occur near areas with a higher gold content, however, some areas with anomalously high gold do not have associated anomalously high mercury.

Remarks: The objective of the exploration project was to use the mercury content of the esker to assist in locating the bedrock source of gold responsible for the gold placer near Eastford Lake. Drilling indicated that the underlying country rocks are mafic metavolcanics but no assays higher than 0.01 ounces of gold per ton were obtained. As the gold placer occurred in transported material (an esker), and drilling failed to locate a bedrock source, it was assumed (in File No.63A.467) that the coincident, anomalously high, mercury content emanated from minerals within the esker sands rather than from the bedrock beneath.

References: Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File No.63A.467; GSC Map 46-1959, Surficial Geology, Iroquois Falls; ODM Map P.201, Kerrs Township.

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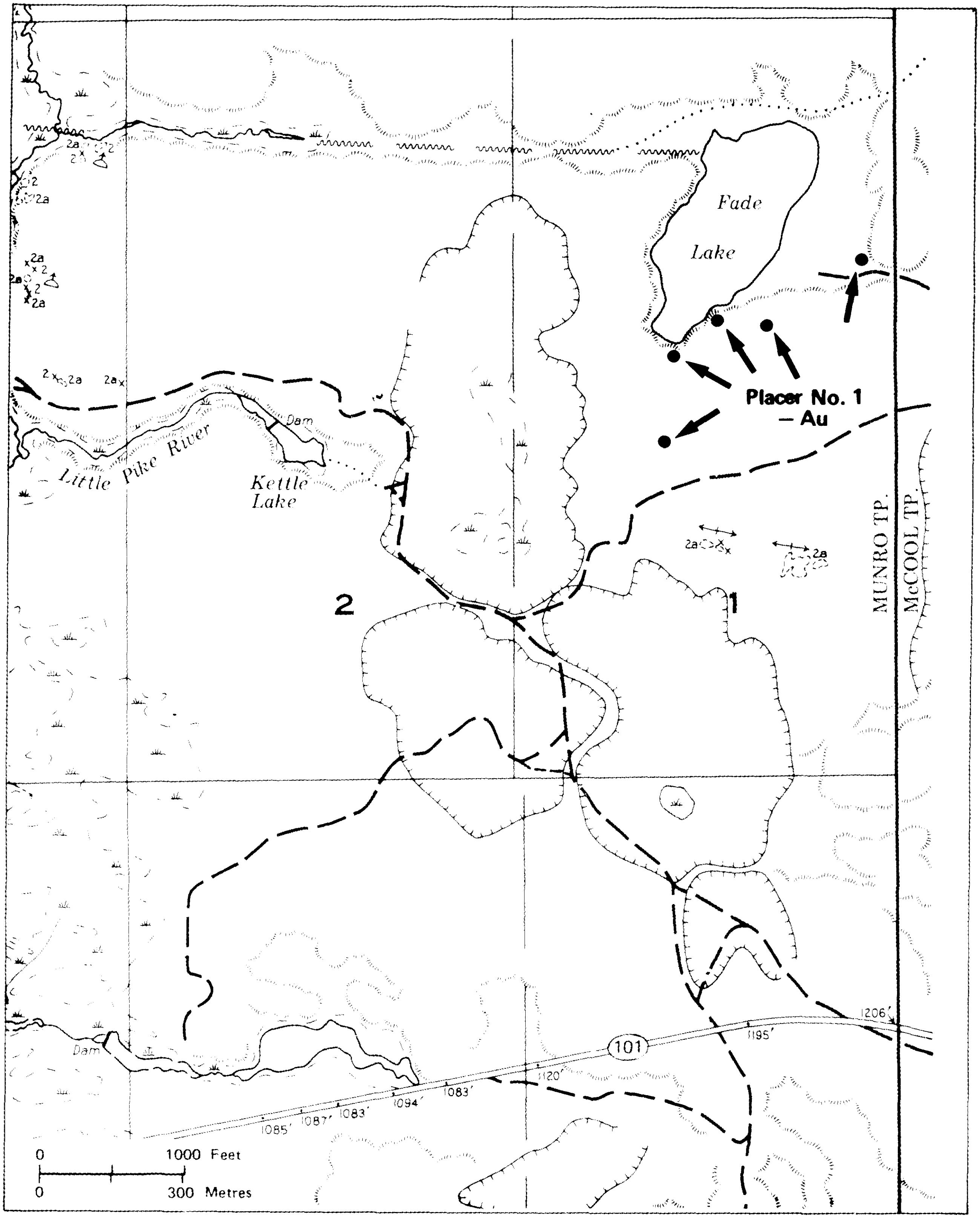
[1]see page 20, 22 of this report



Fade
Lake
Placer No. 1
– Au
Little Pike River
Dam
Kettle
Lake
2
1
MUNRO TP.
McCOOL TP.
101
1206'
1195'
1120'
1083'
1094'
1083'
1087'
1085'
Dam
0
1000 Feet
0
300 Metres

Cochrane District

Munro Township Placer No.1

Main Metals: Gold

Location: Munro Township (Latitude 48°35′, Longitude 80°12′), lot 1, concession II, south and east of Fade Lake, NTS 42A/9E. Map Reference: ODM 1951-5, Munro Township.

Description: In 1951 a sluice box, 200 feet (60 m) long by 3 feet (0.9 m) wide, was built by Reoplata Mines Limited and approximately 1,000 cubic yards (765 m^3) of gravel was washed at the southern end of Fade Lake. No gold of commercial value was recovered.

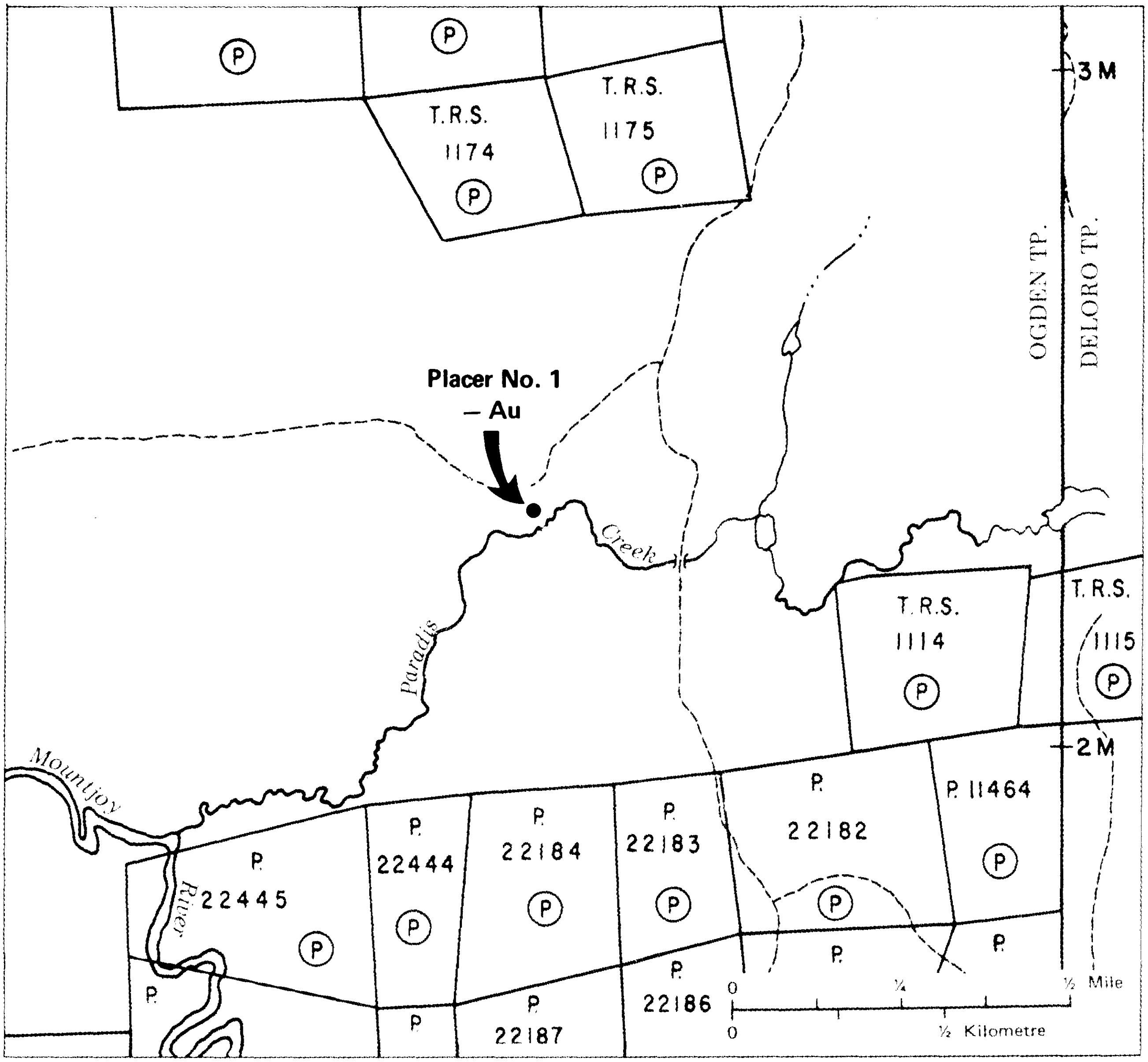
Operations were resumed by Reoplata Mines Limited at this same locality in 1953 and a drag line with a capacity of 3 yards (2.7 m) per hour was used to excavate a trench and the sand. The trommel consisted of a rotating, horizontal, cylindrical screen which discarded from the feed all material larger than ¼ inch (0.6 mm) in diameter. The finer material passed to two jigs which were open at the lower end. A grating was present at the bottom of the jig and a bed of shot lay in the grating and was overlain by a bed of sulphides crushed to pass ¼ inch (0.6 mm) mesh. When the jig was in operation it was filled with water and connected to a piston. The compression stroke of the piston caused an upsurge of water through the jig and at the end of the stroke some water was injected into the jig in order to counteract the expansion stroke and allow some time for the suspended material to settle. The heavy minerals from the sand were collected in a reservoir at the bottom of the jig and removed after 4 hours of operation. On the one occasion when the author (Ferguson) was observing the operation the concentrate removed at the end of this period was estimated to be about 100 pounds (45 kg). Gold could be panned from the concentrate and about 5 colours were present in each pan. The overflow from the jig was passed through a sluice box in order to check that gold was not being lost. The concentrate consisted mainly of magnetite, ilmenite, and garnet with possibly some zirconium and uranium-bearing minerals.

The following assays are taken from a report on the property by H. Borgford, for Reoplata Mines Limited, May 13, 1952, Resident Geologist's Office, Ontario Ministry of Natural Resources, Kirkland Lake, File Reoplata Mines Limited.

Location		Sample Number	Gold per ton ounces
Munro Township			
SE¼ of S½ lot 1, con. I	gravel pit near centre	B 204	—
SE¼ of N½ lot 1, con.II	pit 700 feet from SW corner	B 202	0.01
SE¼ of N½ lot 1, con.II	pit 600 feet SW of NE corner	Black Sand	4.20
SE¼ of N½ lot 1, con.II	pit on east side of Fade Lake	B 203	0.02
SE¼ of N½ lot 1, con.II	pit on east side of Fade Lake	MG 101	0.01
SW¼ of N½ lot 1, con.II	SE end of Fade Lake	SMx 2	0.11
NW¼ of S½ lot 1, con.II	shaft 350 feet SW of NE corner	SH 100	0.04

Remarks: Work in 1951 and 1953 by Reoplata Mines Limited.

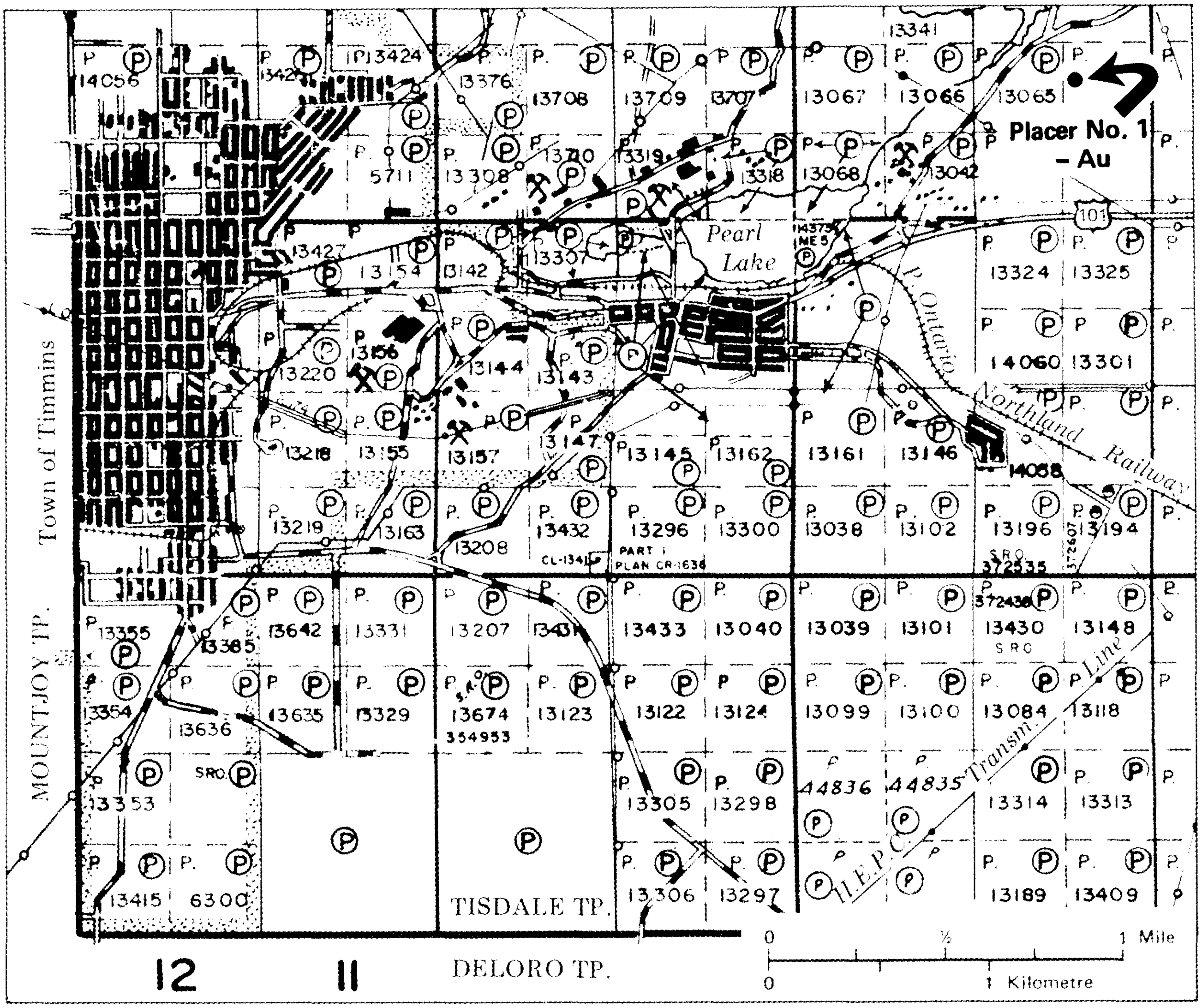
References: Resident Geologist's Office, Ontario Ministry of Natural Resources, Kirkland Lake, File Reoplata Mines; Financial Post Survey of Mines, 1954, p.250; ODM Rept. 1951, Vol.61, pt.2, p.69.



Cochrane District

Ogden Township Placer No.1

Main Metals: Gold
Location: Ogden Township (Latitude 48°25′, Longitude 81°25′), Claim P8769, Paradis Creek about 4000 feet (1220 m) west of the east boundary of the Township. NTS 42A/6W.
Map Reference: ODM Map 35g, Carscallen, Bristol and Ogden Townships. ODM Map 47a, Porcupine Area.
Description: Placer gold has been reported in Paradis Creek where the creek valley has cut a channel 50 feet (15 m) in depth through glacial sands with some boulders.
Reference: ODM 1926, Vol.35, pt.6, p.23.



Cochrane District

Tisdale Township Placer No.1

Main Metals: Gold

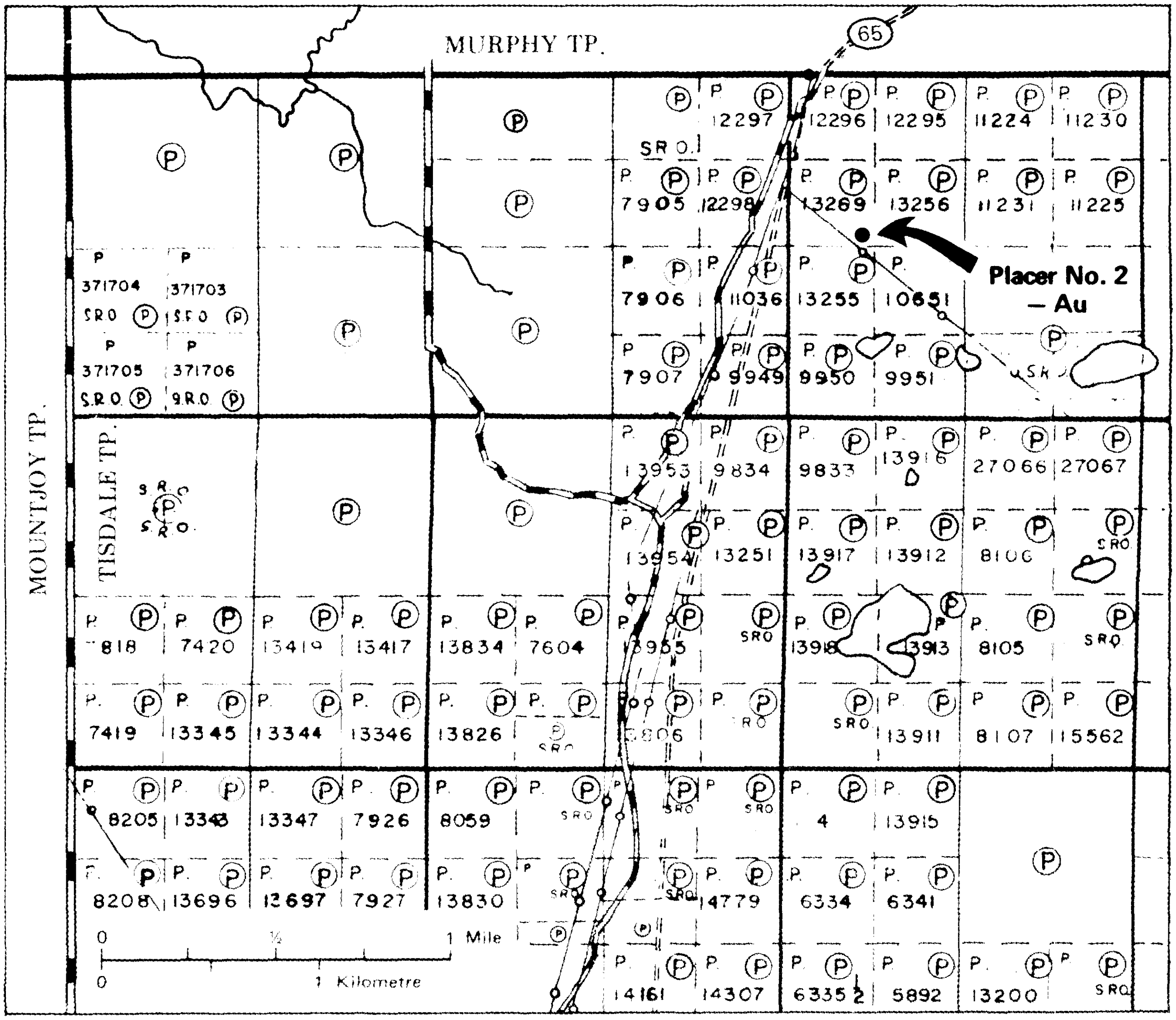
Location: Tisdale Township (Latitude 48°30′, Longitude 81°16′) N½ of the S½ of lot 7, concession III. NTS 42A/6W.
Map Reference: ODM Map 2075, Tisdale Township.

Description: A.P. Sabina (1974, p.131) made the following statement: "A rocker was at one time used to recover gold from decomposed surface veins."

Bedrock Source: During the weathering process concentration of gold may be produced by the decomposition and removal of the lighter or more soluble materials leaving behind gold and iron rust.

Remarks: In 1911, the property was known as the Armstrong-Booth group and later became part of the Coniaurum Mine property.

References: GSC 1974 Paper 73-13, Rocks and Minerals for the Collector by A.P. Sabina. OBM 1911, Vol.20, pt.2, p.21.



Cochrane District

Tisdale Township Placer No.2

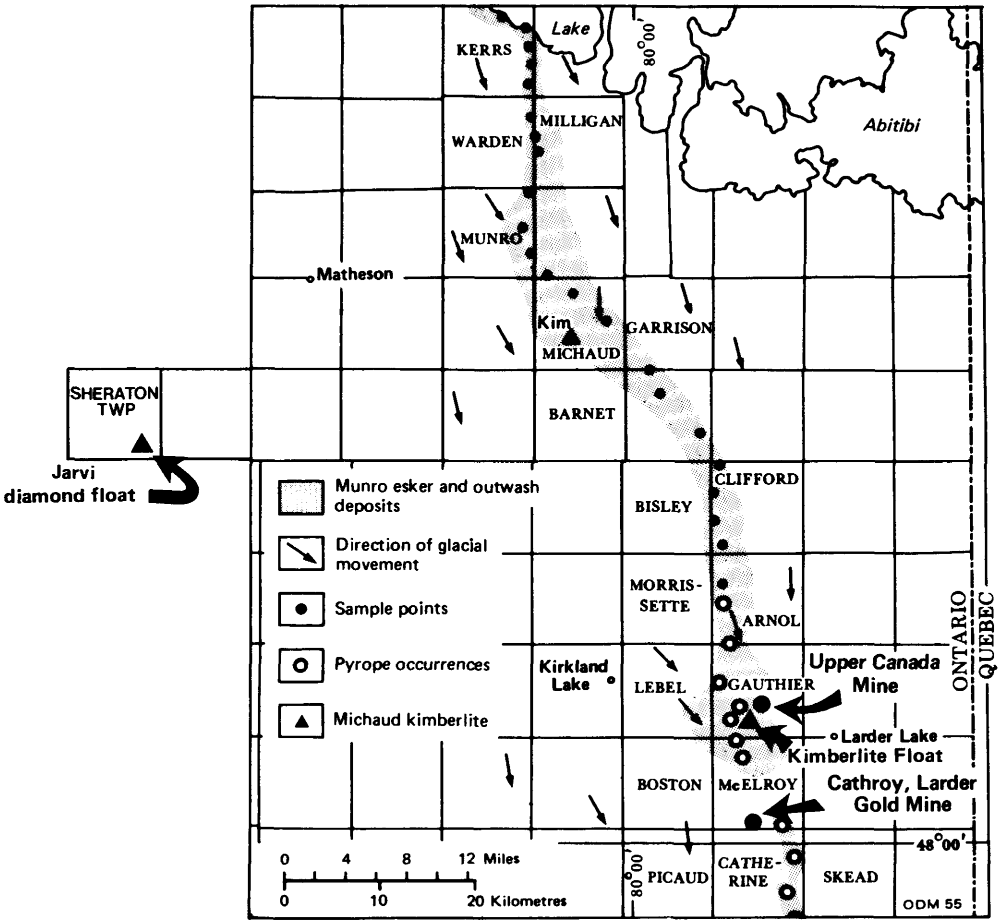
Main Metals: Gold

Location: Tisdale Township (Latitude 48°39′, Longitude 81°16′), lot 8, concession VI, Hollinger Gold Mines gravel claims. NTS 42A/6W.

Map Reference: ODM Map 2075, Tisdale Township.

Description: Gravel used for backfill in the mines was periodically checked for the gold content. A sample would be passed over a table to concentrate the heavy minerals and the table concentrate was further concentrated using a superpanner. The concentrate from the superpanner was assayed for gold. In 25 tests made from 1953 to 1955, 5 samples assayed from 1 to 8 cents; 15 samples, 1/10 to 8/10 cents; 5 samples less than 100/cent per ton with gold valued at $35 per ounce. In the period April to September 1953, five samples of unusually high grade averaged 4 cents per ton.

Reference: ODM 1968, GR58, p.165.



Cochrane and Timiskaming Districts

Munro Esker Placer Train

Main Metals: Gold

Location: This esker extends over a length of 70 miles (112 km) from Kerrs Township (Latitude 48° 45′, Longitude 80° 13′) on the western side of Lake Abitibi to Catharine Township (Latitude 47° 59′, Longitude 79° 49′) southeast of Kirkland Lake. NTS 32D/4W, 32D/5W, 32M/13W, 42A/16, 42A/9, 42A/8.

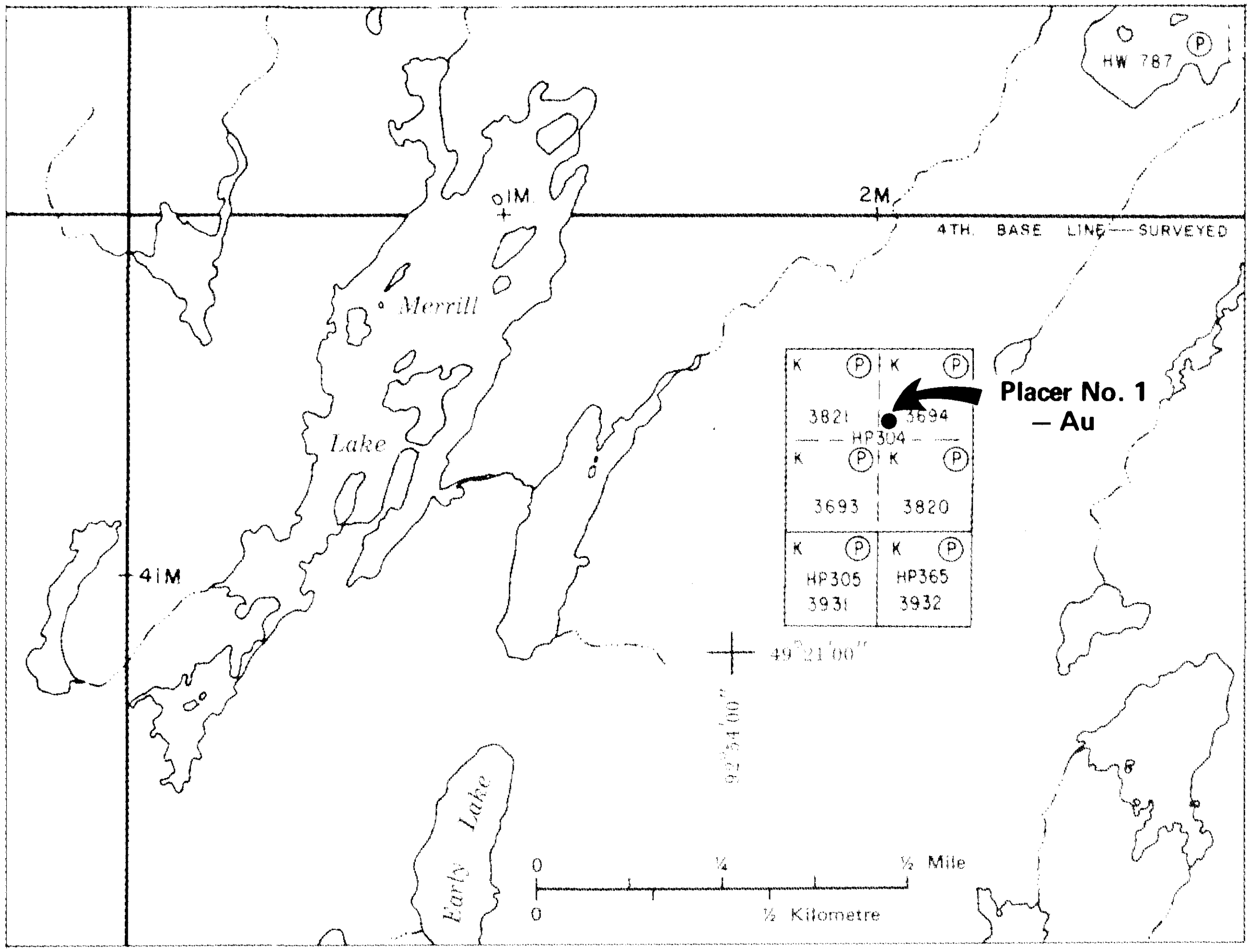
Map Reference: Lee GSC paper 65-14, Ontario Dept. of Lands and Forests Map S465, and ODMNA, MP7, Figure 7, p.28.

Description: Staff of the Geological Survey of Canada collected 34 samples over the length of the esker, from pits 5 feet (1.5 m) in depth. Each sample had a volume of 1.3 cubic feet (0.04 m^3). The esker is formed predominantly of sand consisting of rock and mineral fragments. A particular rock or mineral fragment was found to have the greatest concentration in the esker about 2 miles (3.2 km) downstream (south) from the source. Work near the Upper Canada Mine indicated that only in the upper few feet of the esker is gold in the free state as at greater depths it is contained in pyrite.

Bedrock Source: Two of the concentrations of gold in the esker are correlated with the Upper Canada Mine and the Cathroy Larder Gold Mine. However, concentrations in the townships of Kerrs, Warden, Milligan, Munro, Michaud, Clifford, and Arnold are not related to any known bedrock source.

Remarks: The conclusion was reached that sampling of the upper 4 feet (1.2 m) of the esker is adequate.

References: GSC 1965 Paper 65-14, pt.1, p.12 and 14; GSC 1968 Paper 68-1, pt.A, p.173; See also the following sections in this report: "Direction of Glacial Movement"; "Geochemical Methods"; "Milligan Township Float Train No.1 - Au"; "Milligan, Warden, and Kerrs Townships and Raynor Lake Area Placer Train".



Kenora District

Lower Manitou Lake Area Placer No.1

Main Metals: Gold

Location: Lower Manitou Lake Area. SE Corner of map sheet is Latitude 49°15′, Longitude 92°45′. Claim HP304 now held as 4 claims, K3820 and K3821 and K3693 and K3694, about 2 miles (3.2 km) east of mile 41 on the 6th meridian. NTS 52F/7W.

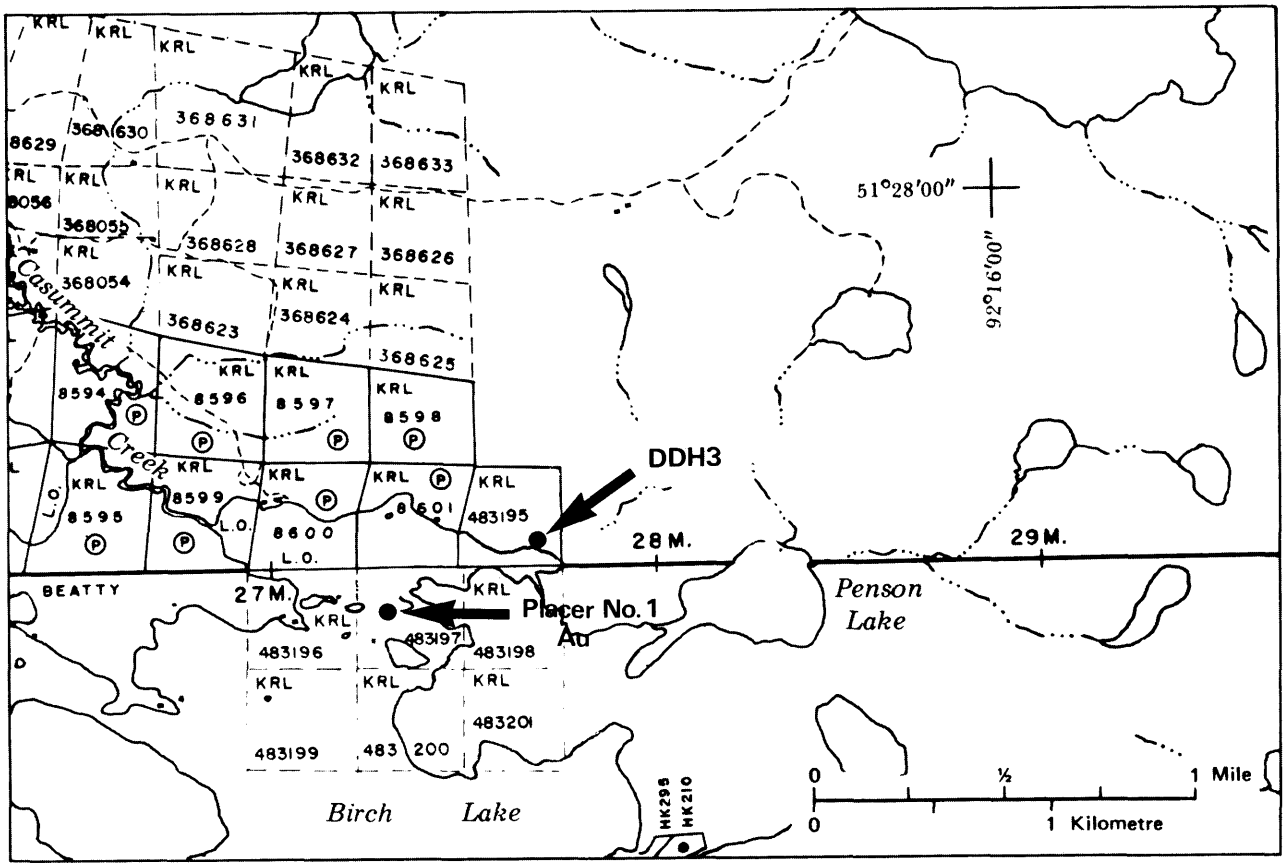
Map Reference: ODM Map 42c, Manitou-Stormy Lakes Area. ODM Map 2320, Lower Manitou Lake-Uphill Lake.

Description: The placer consists of the mud of a swamp with small angular fragments of quartz and schist from which a few dollars worth of gold was reported in 1896 to have been obtained.

Bedrock Source: The placer materials are considered to be debris from a nearby vein from 6 to 18 inches (15 to 45 cm) wide from which one assay was 38.5 ounces of gold per ton.

Remarks: The discovery was made by three brothers, John, August, and Eric Fransen and George Aspelund in 1895 and was known as the Swede Boys' Claim. A sluice box was set up to recover the gold and operated sporadically in 1895 and 1896.

References: OBM 1895, Vol.5, p.163; OBM 1896, Vol.6, p.83-84; ODM 1933, Vol.42, pt.4, p.35; ODM GR 142, p.66-67.



Kenora District (Patricia Portion)

Casummit Lake Area Placer No.1

Main Metals: Gold

Location: Casummit Lake Area. SE Corner of map is Latitude 51°22′, Longitude 92°15′. Unsurveyed claim KRL47586 was located on the south side of the 10th Base Line between mileage 27¼ and 27½, on the accompanying map restaked as KRL 483197. Claim KRL46952 (8791) was located on the north side of the 10th Base Line between mileages 27½ and 24¾ and now is restaked as KRL483195. NTS 52N/1W.

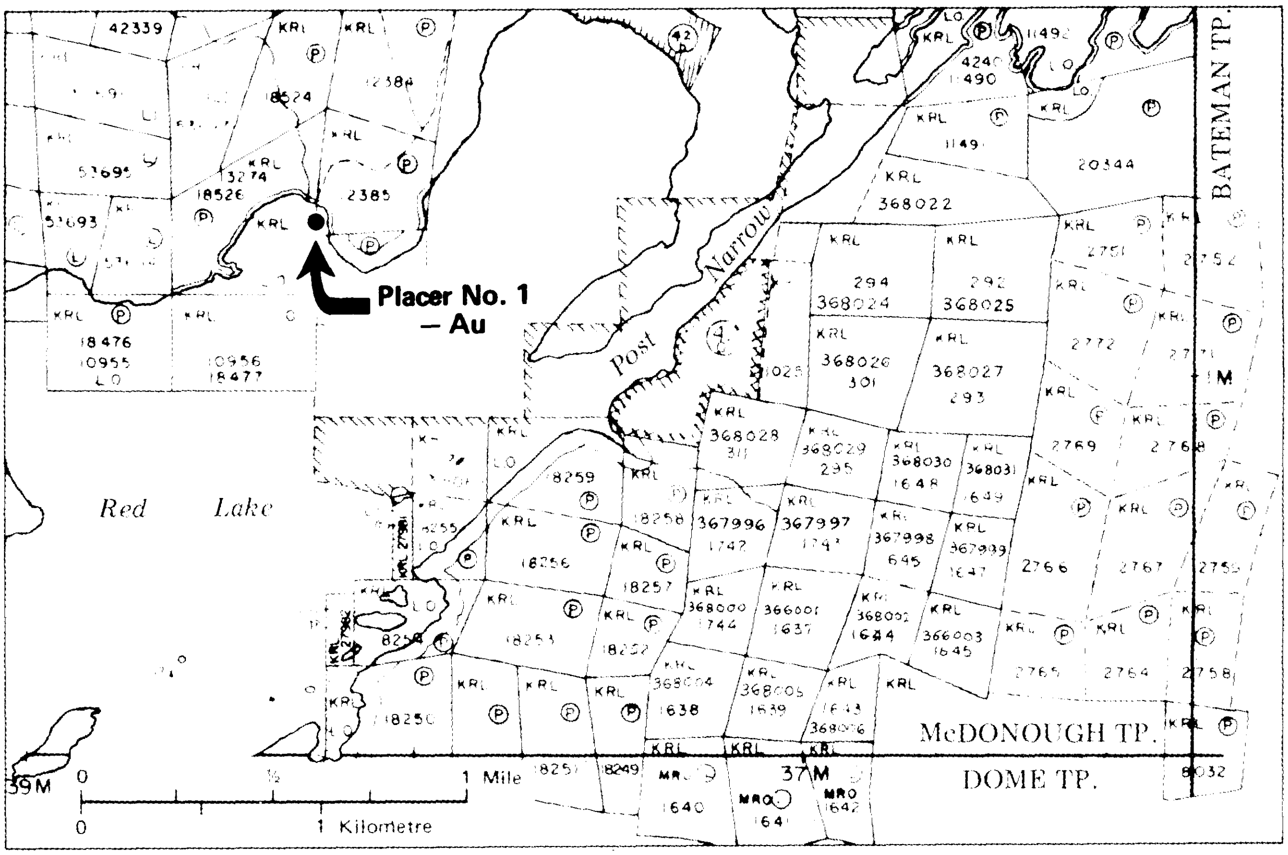
Map Reference: ODM 42d, Shabumeni-Birch Lakes Area.

Description: Along the south side of the larger island in Claim KRL47586 (389990) an excellent tailing of gold could be obtained from panning the schist. Hole 3 drilled southward on claim KRL46952 (390003) intersected schist mineralized with pyrite from 43 to 47 feet (13 to 14.3 m) and gold could be panned from the sludge.

Bedrock Source: Near the south shore of the island a vein is exposed for 300 feet (90 m) and varies in width from 8 inches to 5 feet (0.2 to 1.5 m). Grab samples from the wider part of the vein contained arsenopyrite and assayed up to 56 ounces per ton. Gold weathered from the vein was present in the adjacent schist.

Remarks: Gold on surface located by Leslie Kaye, geologist for Alcon Exploration and Mining Syndicate. In 1960 Dickenson Mines Limited took an option on the property and drilling was carried out.

References: Leslie Kaye, personal communication, December 1972. Assessment Files Research Office, Geological Branch, Division of Mines, Toronto, Casummit Lake Area, Drilling Reports 11 and 12.



Kenora District (Patricia Portion)

McDonough Township Placer No.1

Main Metals: Gold

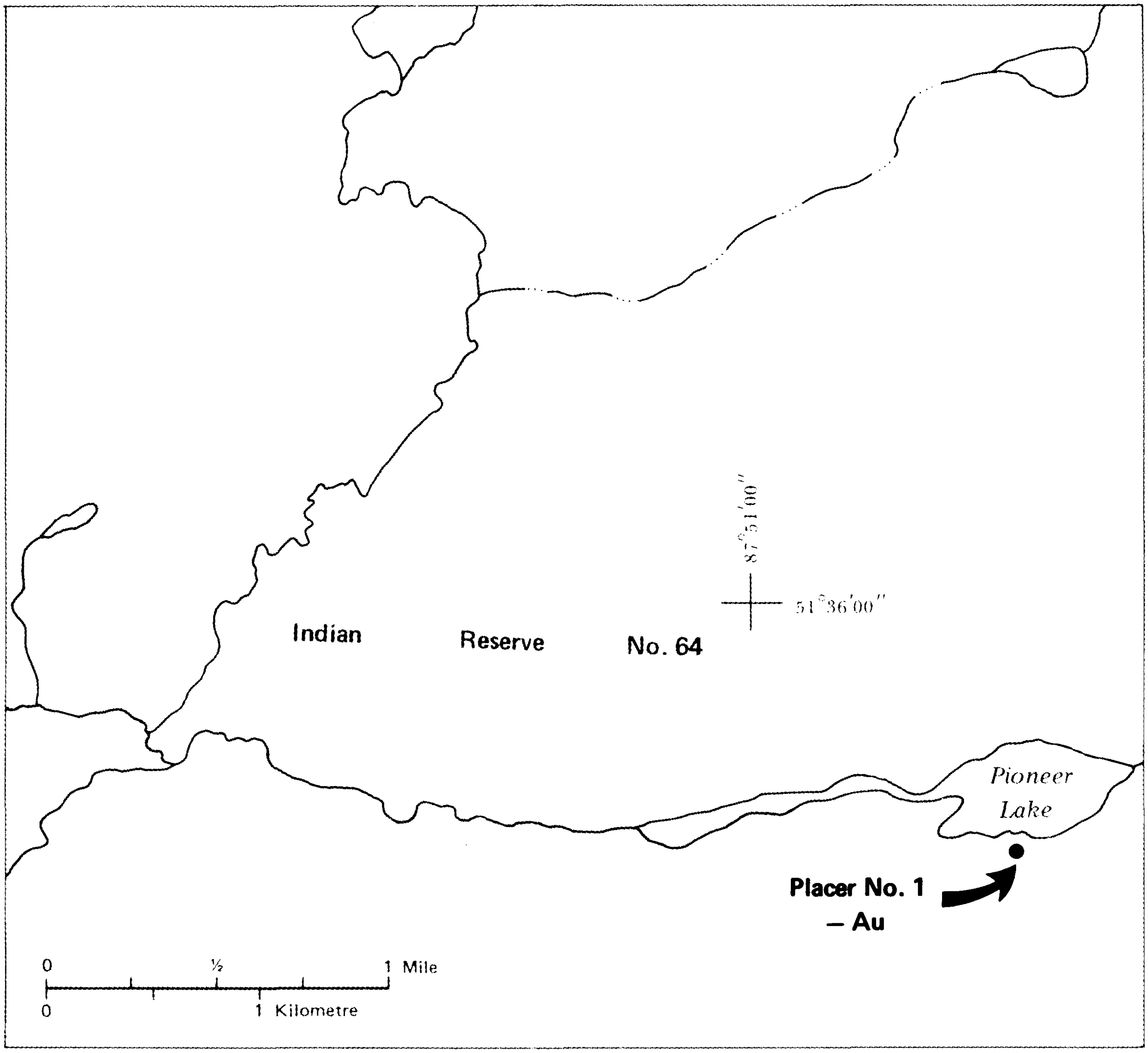
Location: McDonough Township (Latitude 51°10', Longitude 93°51') Claims KRL 12385 (18525) and KRL10957 (18478) on the shore of Red Lake, west of the southern entrance to Post Narrows. NTS 52N/4W. Map Reference: ODM Map 49b, Red Lake Area (East Sheet).

Description: Angular pieces of rock containing gold, with the largest pieces about 3 inches (7.6 cm) in diameter, occurred in sand below the level of Red Lake. On claim KRL 12385 (18525) placer gold is reported to be present in sand in an area about 80 feet by 80 feet (24 m x 24 m) below the lake level. In 1969, gold-bearing rock was recovered which contained about $1,500 (43 ounces) of gold.

Bedrock Source: The source is unknown but the possibility exists that the gold may have been placed there by someone trying to salt the claim or was lost by someone engaged in stealing gold from the mines.

Remarks: In 1969, Boy Scouts camped in the area located the gold-bearing rock in the sand. Cochenour Willans Gold Mines Limited optioned the property but were unable to locate the source of the gold. R.A. Riley, Resident Geologist, Ontario Ministry of Natural Resources, and D.A. Hutton, Cochenour Willans Gold Mines Limited, visited the area and were able to recover a cup full of gold-bearing chips.

References: ODM 1940, Vol.49, pt.2, p.120-121 describes Gold Seekers Property. Personal communication, March 27, 1972, R.A. Riley, Resident Geologist, Ontario Ministry of Natural Resources, Red Lake.



Kenora District (Patricia Portion)

Reserve Lake Area Placer No.1

Main Metals: Gold

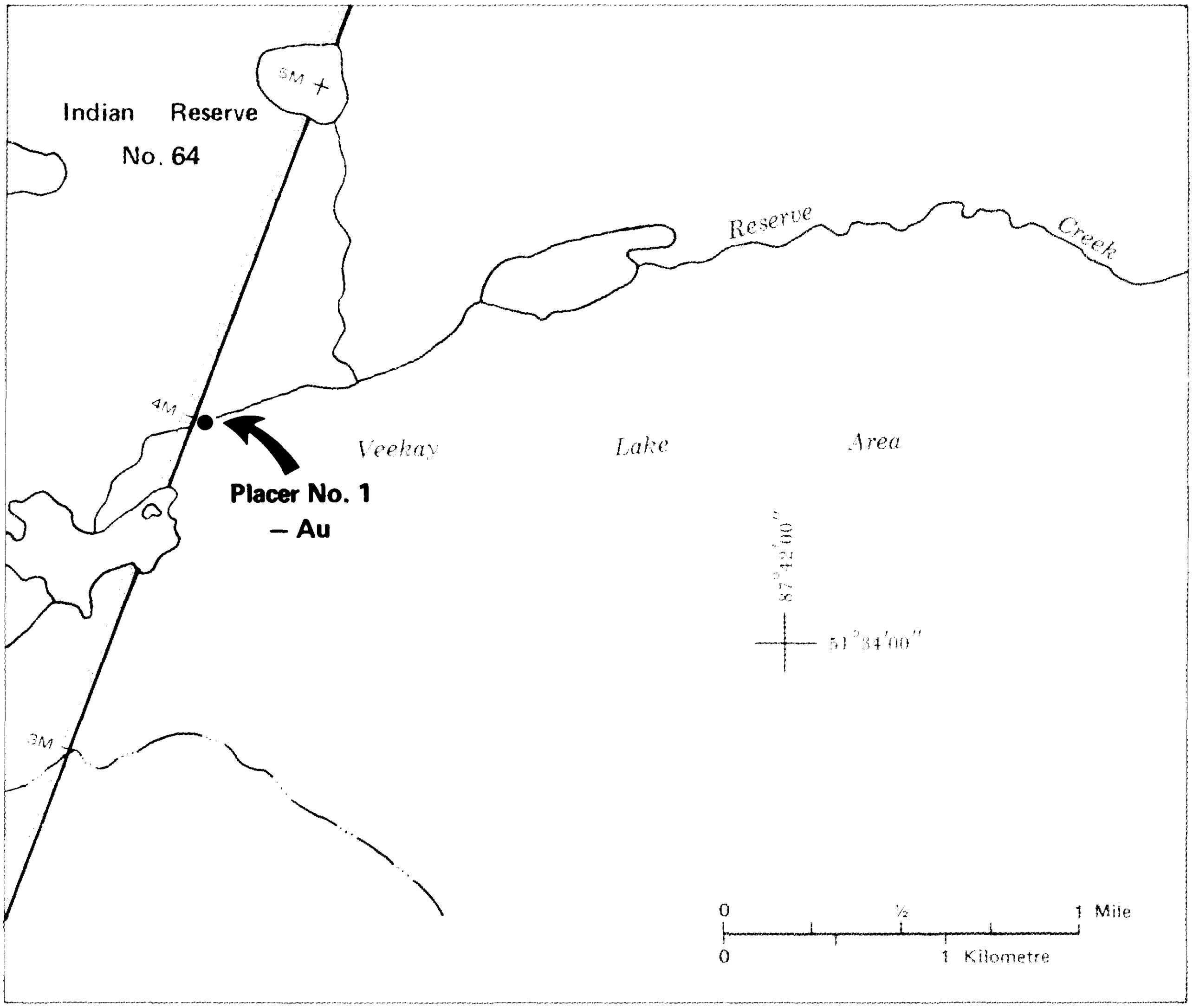
Location: The southeast corner of Ontario Ministry of Natural Resources Claim Map 2320 is Latitude 51°30', Longitude 87°45' and Pioneer Lake is Latitude 51°36', Longitude 87°50' within Indian Reserve No.64. NTS 42M/12W.

Map Reference: ODM Map 51b, Fort Hope Area.

Description: Gold could be panned from a rusty mineralized zone on the south side of Pioneer Lake.

Remarks: Located in 1940 by prospectors Lorne Dempster and Jack Dempster working for Pioneer Gold Mines of B.C. Limited.

Reference: ODM Rept. 1942, Vol.51, pt.3, p.1,25.



Kenora District (Patricia Portion)

Veekay Lake Area Placer No.1

Main Metals: Gold

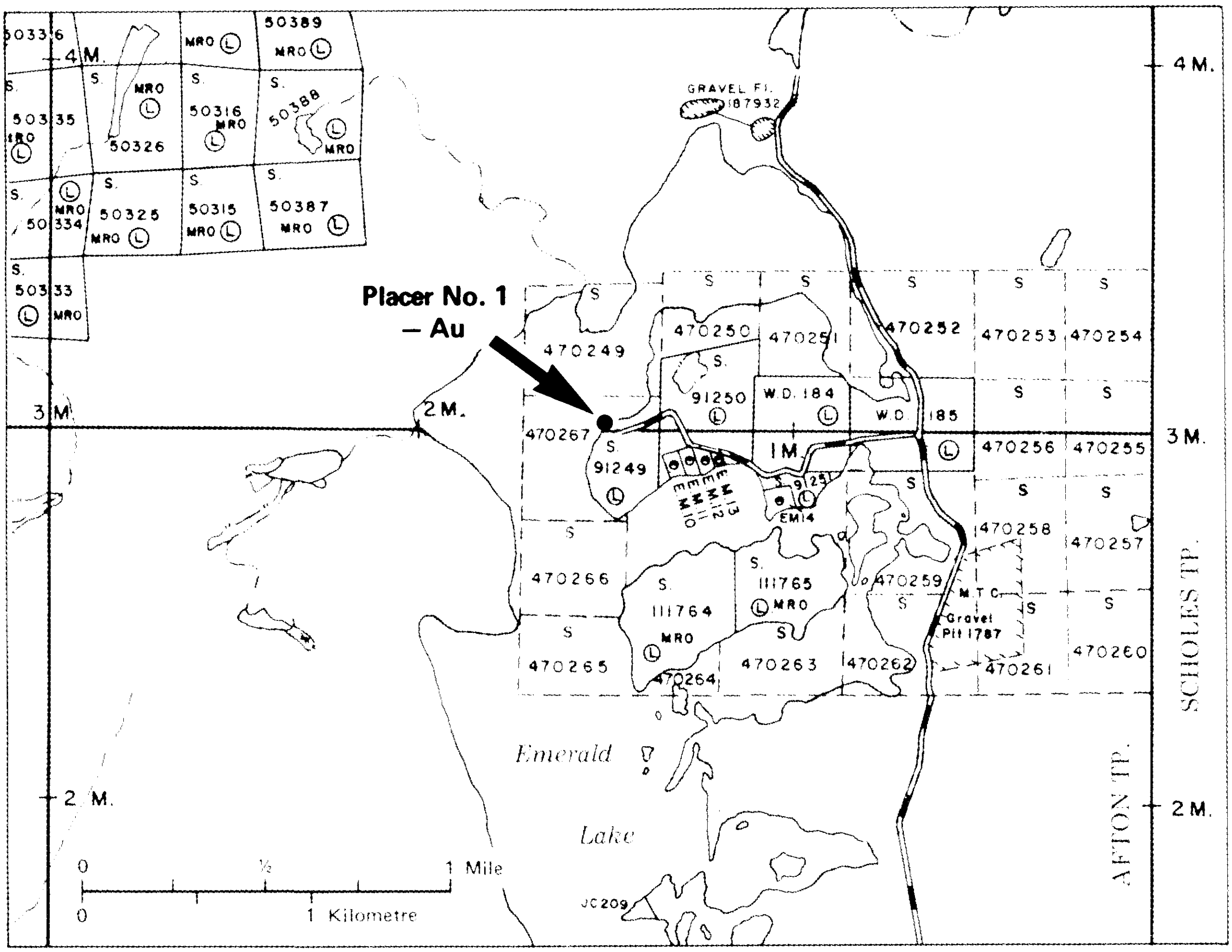
Location: Veekay Lake Area is on Ontario Ministry of Natural Resources Claim Map 2321 and the SE corner is Latitude 51°30′, Longitude 87°30′ and Reserve Creek is Latitude 51°34′, Longitude 87°45′ with the first discovery on the north side of the creek and close to the east boundary of the Indian Reserve. NTS 42M/12E.

Map Reference: ODM Map 51b, Fort Hope Area.

Description: Gold could be panned in several places in a mineralized shear zone adjacent to Reserve Creek.

Remarks: In 1940, the gold-bearing rusty zone was discovered by J.D. Williamson, prospector. Dome Mines Limited carried out stripping and drilling in 1941 and 1942.

References: ODM Rept. 1942, Vol.51, pt.3, p.1,25-27. Lun-Echo Gold Mines Ltd., Assessment Files Research Office, Geological Branch, Division of Mines, Toronto, Veekay Lake Area, Drilling Rept.11.



Sudbury District

Afton Township Placer No.1

Main Metals: Gold

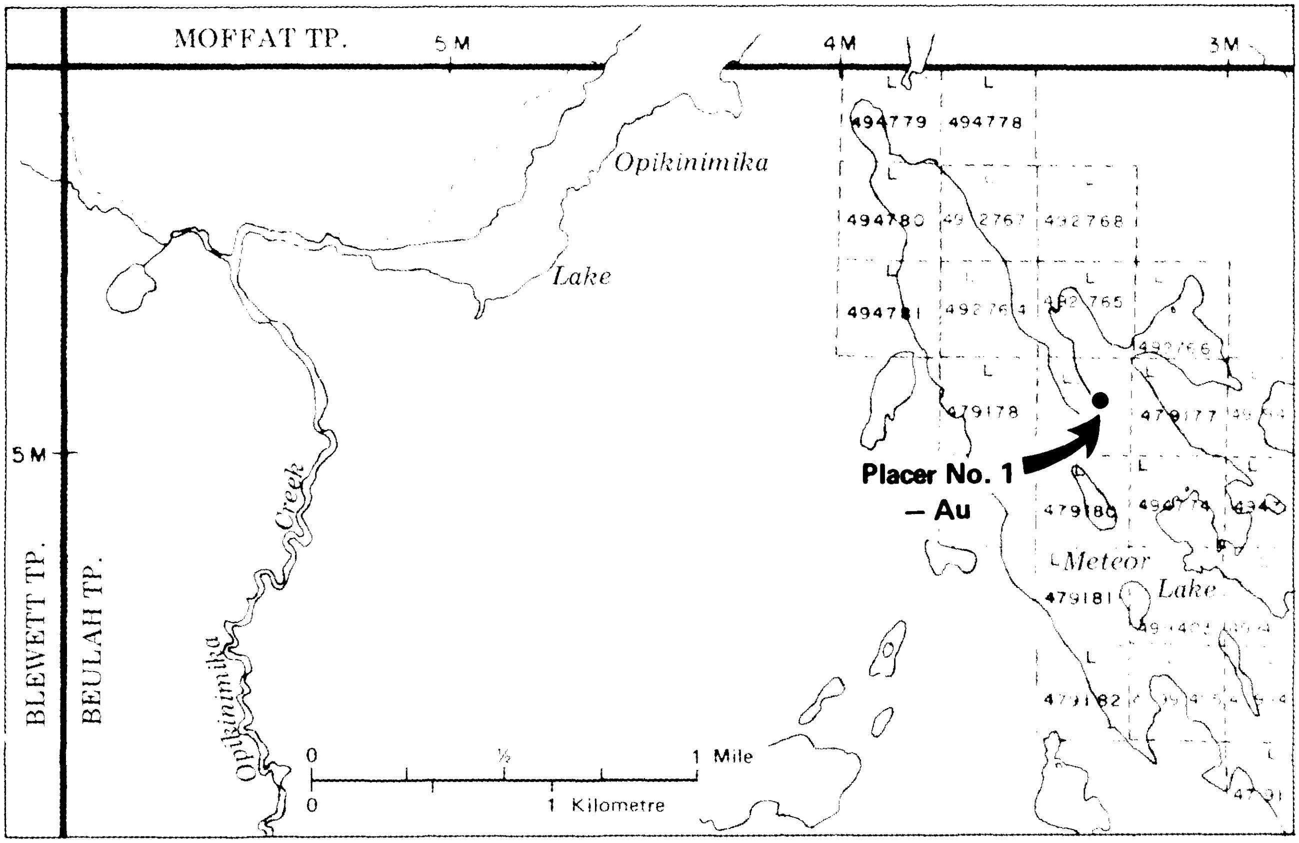
Location: Afton Township (Latitude 46°56′, Longitude 80°22′) Claim S91249 (426283) in the east central part of the township on a point on the east shore of Emerald Lake. NTS 41I/16W.

Map Reference: Part of Afton and Scholes Township, ODM Rept. 1936, Vol.45, pt.6, p.40. OGS Map 2385, Afton and Scholes Township.

Description: Gold in grains of considerable size was reported near the shore of Emerald Lake. The gold, mixed with sand, occurred in a small cave or "vug" in porous and friable silica within iron formation.

Remarks: The discovery was made before 1900 and first described by Willet G. Miller, provincial geologist in 1901. During 1915-1916 Golden Rose Mining Company did surface work and operated an amalgamation mill. In 1927 Afton Mines Limited sank a shaft from the end of a 240 foot (70 m) adit. From 1935 to its closure in 1941 New Golden Rose Mines Limited operated the mine. Recovery, including cleanup of the mill circuit in 1943-1944, totalled 45,414 ounces of gold and 8,299 ounces of silver valued at $1,666,563.

References: OBM 1901, Vol.10, p.175; ODM 1936, Vol.45, pt.6, p.46; Geoscience Data Centre Files, Geological Branch, Division of Mines, Toronto, New Golden Rose File, District of Sudbury, Township Afton.



Sudbury District

Beulah Township Placer No.1

Main Metals: Gold

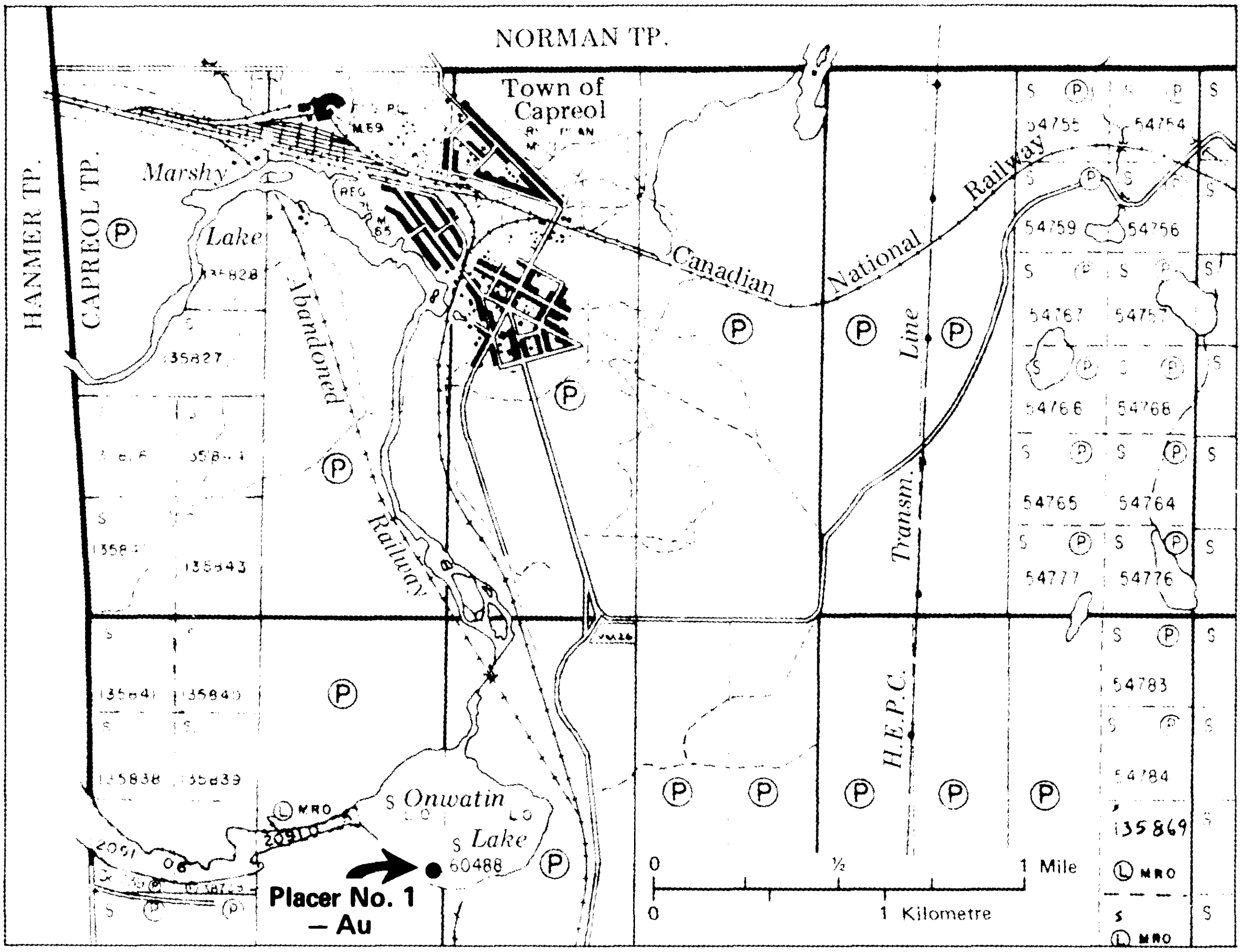
Location: Beulah Township (Latitude 47°17′, Longitude 81°25′) and Meteor Lake is in the north-central part of the township with a point on the eastern shore located 1½ miles south of the northern boundary of the township. NTS 41P/6W.

Map Reference: ODM Map P.300, Westree Sheet.

Description: Placer gravel for the sluicing plant was obtained from a pit 40 feet by 24 feet by 10 feet (12 m by 7.3 m by 3 m) deep on the west shore of a bay with the point in the lake consisting of esker gravels. The shorecliff near the pit was 15 feet (4.5 m) high and consisted of a lower unit of gravel and boulders, and a unit of boulders which was overlain by 1 to 4 feet (0.3 to 1.2 m) of fine sand. A test of about 600 pounds (270 kg) was made of the upper 2 feet (0.6 m) of gravel in the pit by passing it over a rocker. The gold recovered weighed 47.1 mg (1.66 oz) with a value of about 10 cents a ton (gold at $20.67 per ounce). The gold occurs as fine dust, scales, and coarse particles with the largest piece weighing 57.2 mg (2 oz). Most of the gold was reddish in colour but one piece weighing 20 mg (0.7 oz) was of lighter colour and presumably contained a larger proportion of silver. One angular piece of quartz contained small particles of gold.

Remarks: In 1900, the Onaping Gold Mining Company of Ontario Limited had a sluice in operation. A series of 11 sluice boxes, each 12 feet (3.6 m) in length, handled the placer gravel. It was found that most of the gold was recovered in the first five sluice boxes with the other boxes retaining only the very fine gold and black sand.

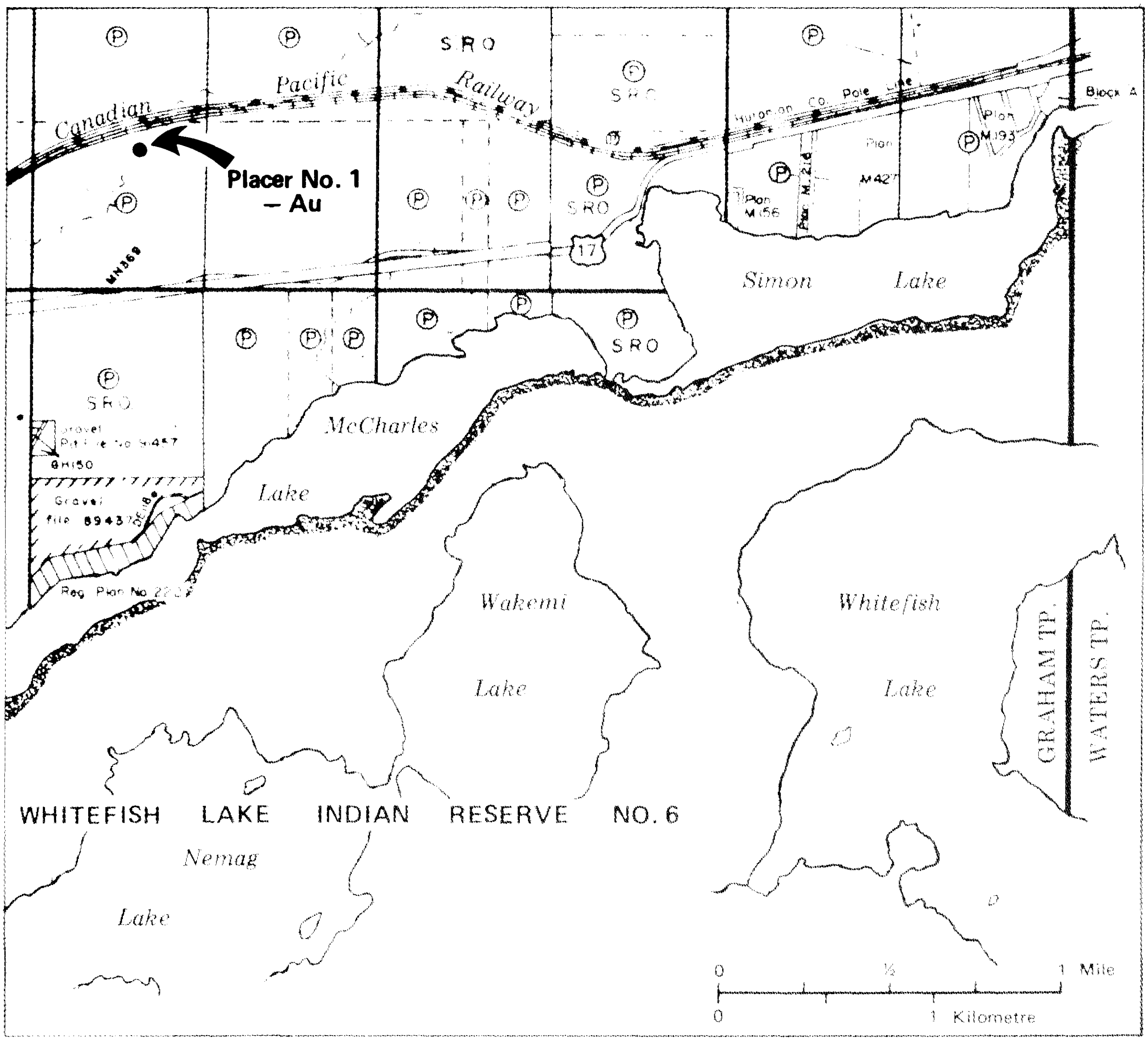
Reference: OBM Rept. 1901, Vol.10, p.156-158, 161.



Sudbury District

Capreol Township Placer No.1

Main Metals: Gold
Location: Capreol Township (Latitude 46°41′, Longitude 80°52′). Onwatin Lake is located in lots 10 and 11, concession V. NTS 41I/10W.
Map Reference: ODM 2170, Sudbury Area.
Description: V.K. Prest (ODM PR 1949-2, p.8) has reported as follows:
"The Onwatin Syndicate took samples from under Onwatin lake during the winters of 1938-39 and 1939-40 down to depths of 65 feet (19.8 m) and reported results of from $0.15 to more than $1.00 per yard [gold at $38.50 per ounce]. Hugh Craig put down six holes during the break-up period of 1946 and obtained assays that substantiated the above, though the pannings were disappointing. Apparently the gold is very fine. The holes were all near the south side of the lake. Coarser colours may well be expected toward the north shore."
Remarks: In 1901, a small plant was erected and operated by R.H. Ahn on the Vermilion River in Hanmer Township to the west of Capreol Township to recover placer gold by a combined amalgamation and cyanidation process. The placer operation was at its height between 1905 to 1908.
References: ODM Rept. 1902, Vol.11, p.18.
ODM 1949, PR 1949-2.
ODM 1970, GR80, p.38.

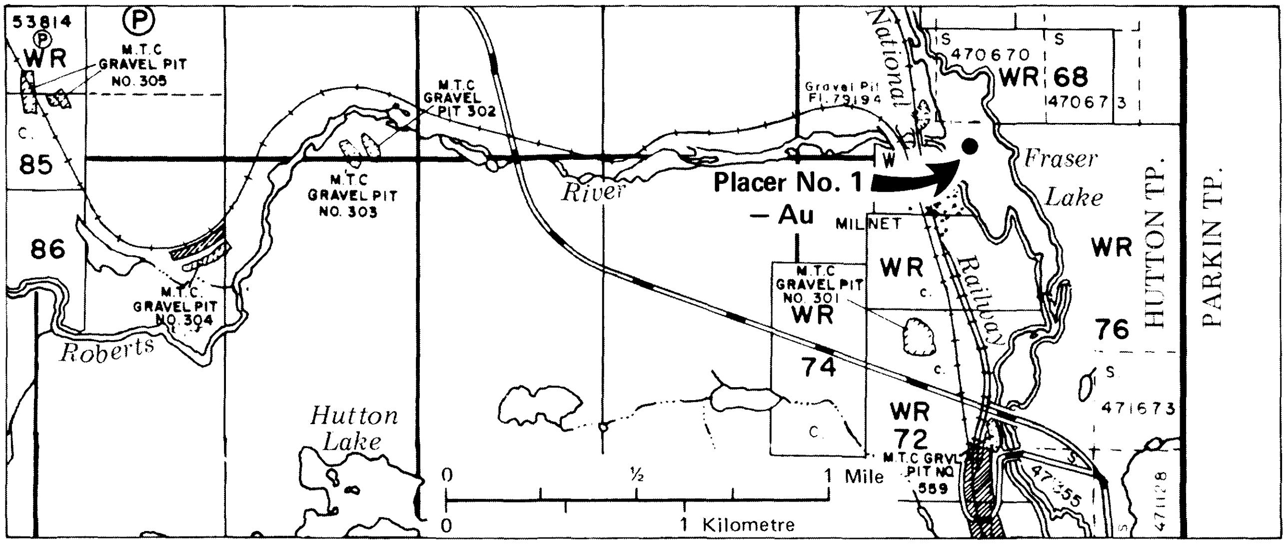


Sudbury District

Graham Township Placer No.1

Main Metals: Gold
Location: Graham Township (Latitude 46°25′, Longitude 81°16′) lot 5, concession III. NTS 41I/6W.
Map Reference: ODM Map 2119, Denison-Waters Area. ODM Map P.203, Graham Township.

Description: The presence of "alluvial gold" was reported to the Royal Commission on the Mineral Resources of Ontario.
Remarks: There has been no confirmation of this reported occurrence by George Shaw in 1890.
Reference: Rept. of the Royal Commission 1890, The Mineral Resources of Ontario and Measures for their Development, p. 105.



Sudbury District

Hutton Township Placer No.1

Main Metals: Gold

Location: Hutton Township (Latitude 46°51′, Longitude 80°00′), Fraser Lake and Ross Lake are expansions of the Vermilion River and occur in the southeastern part of the township. NTS 41I/15W.

Map Reference: Map 2180, Hutton and Parkin Townships.

Description: Gold may be panned along the Vermilion River for many miles although generally the gold content is low. Most of the gold is of the fine "shot" variety and only occasionally is large enough to be heard when dropped on a sheet of paper. The best pannings are obtained for a quarter mile (0.4 km) immediately east of Highway 545 at the north end of Ross Lake. Test pits in the gravel ridge north of Fraser Lake had a gold content of a few cents per cubic yard. The following excerpt is taken from V.K. Prest (ODM PR 1949-2, p.8):

"Four drill holes were put down in the lake (Fraser) during the winter of 1947-48; attractive values were obtained from one hole off the mouth of the Roberts river and encouraging results from another farther south. In the best hole the gravels were encountered under 76 feet (23 m) of water and muds. The upper 15 feet (4.6 m) of gravels constituted high-grade placer ground. Bedrock was encountered at 116 feet (35 m). Upstream from this point poor results were obtained, though the gravels and bedrock were encountered at similar depths. Farther south and near the west bank of the lake, the gravels were encountered at less than 60 feet (18 m)."

Remarks: 1897: Gold was reported to have been discovered on the Vermilion River in the northeast corner of Hanmer Township in 1891, 1896.

1959: Concor-Chibougamau Mines Limited carried out a seismic survey, did test pitting and drilled 17 vertical holes in Fraser Lake and farther southward on the east side of the river.

1959: Queensland Explorations Limited put down 36 test pits in the gravel ridge north of Fraser Lake.

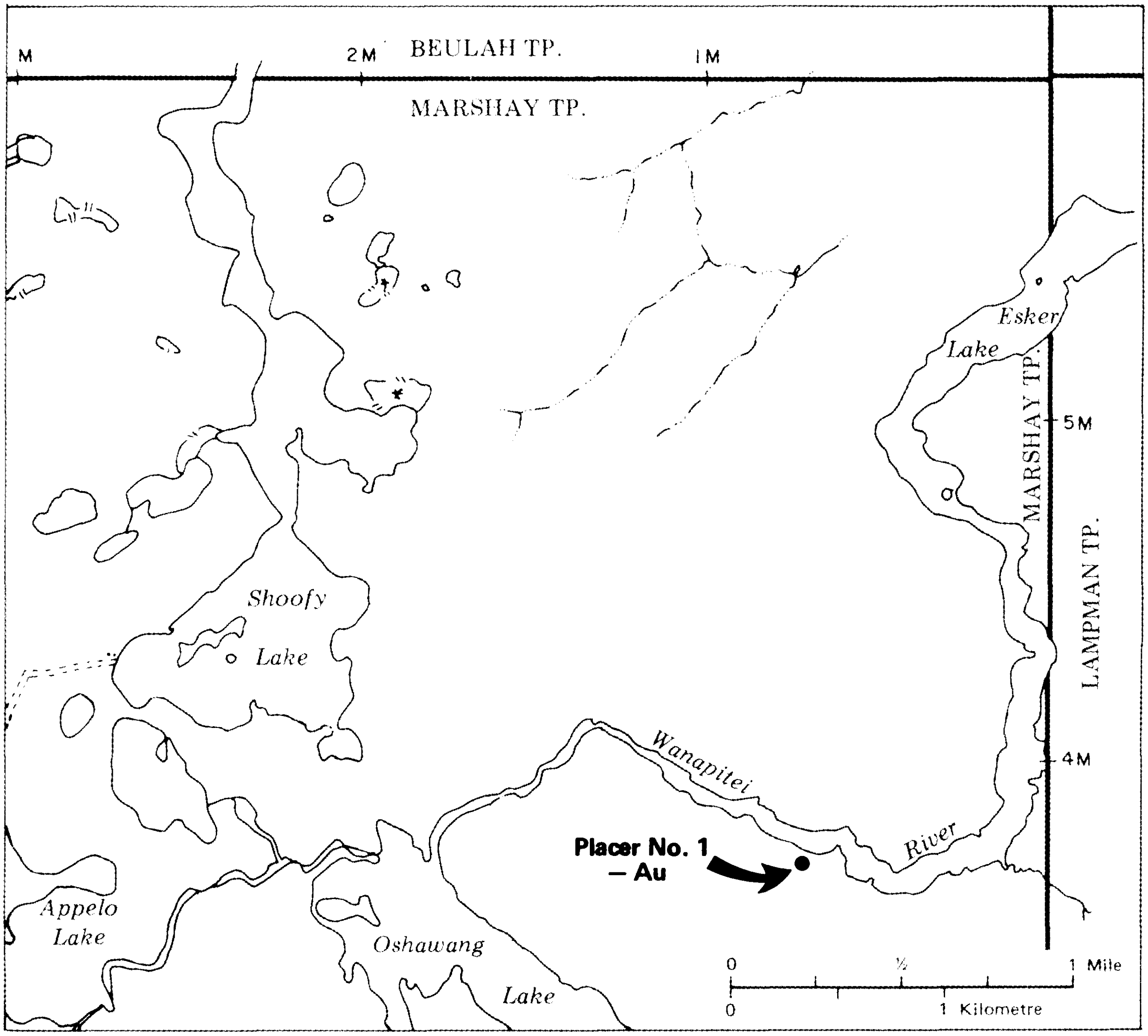
References: OBM Rept.1901,Vol.10, p.151- 154.

ODM 1949, PR 1949-2.

ODM 1970, GR80, p.35-39.

Assessment Files Research Office, Geological Branch, Division of Mines, Toronto; File 63.985, Concor-Chibougamau Mines Ltd., File 63.1001, Queensland Explorations Limited.

Hutton Tp. Drilling Rept. 14, Concor-Chibougamau Mines Limited.



Sudbury District

Marshay Township Placer No.1

Main Metals: Gold

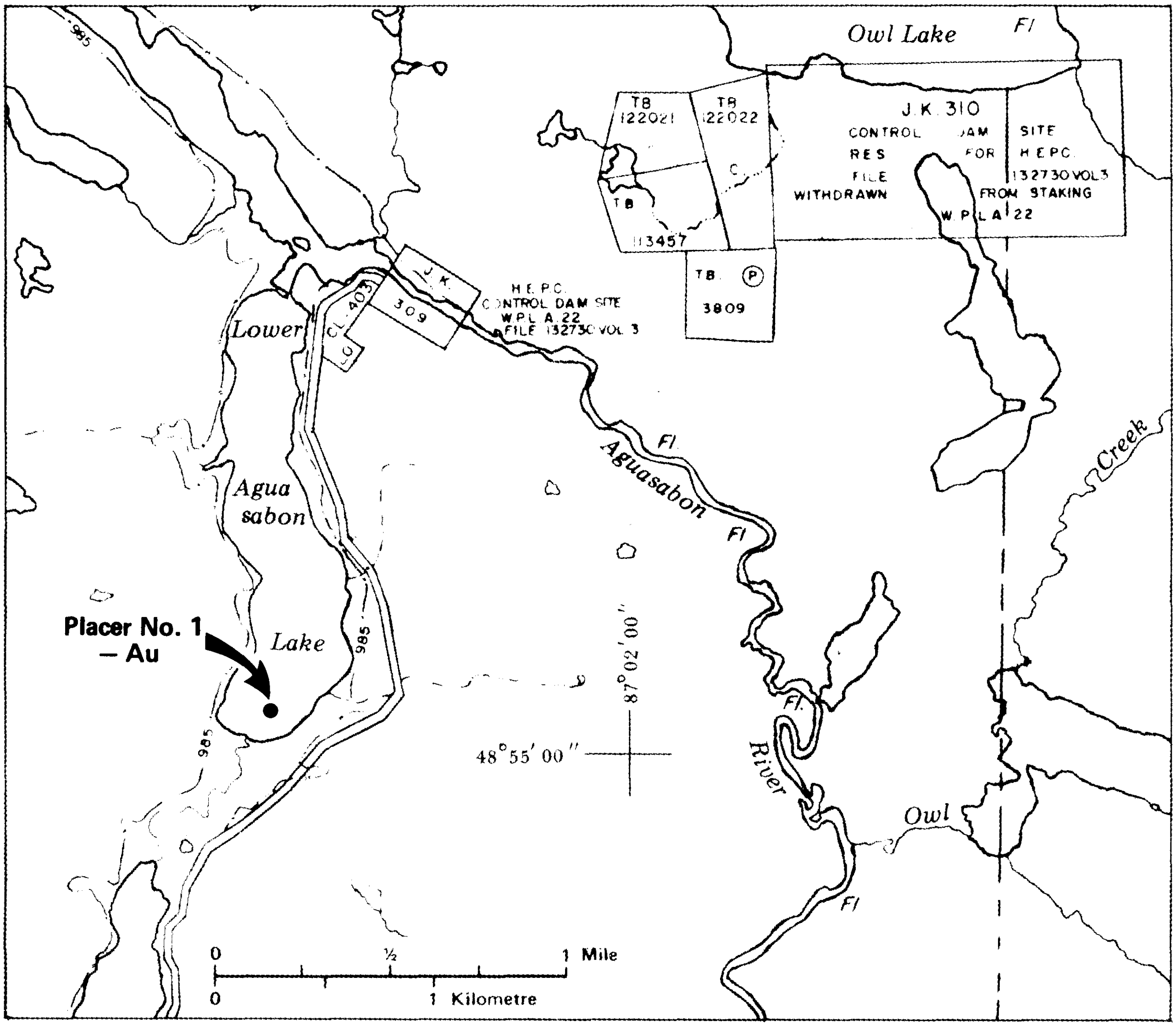
Location: Marshay Township (Latitude 47°11′, Longitude 81°25′) contains Oshawong (Islet) Lake which is part of the Wanapitei River System. NTS 41P/3W.

Map Reference: ODM Map 2188 Sudbury-Cobalt Sheet.

Description: A. H. Gracey, OBM 1897, reported obtaining 10 to 15 colours and a few fine colours respectively in panning gravel on the Wanapitei River at 1½ and 2 miles (2.4-3.2 km) downstream from Oshawong (Islet) Lake.

References: OBM 1898, Vol.7, pt.3, p.258.

OBM Map 7d, Showing Gold-Bearing Sands on Vermilion River.



Thunder Bay District

Lower Aguasabon Lake Area Placer No.1

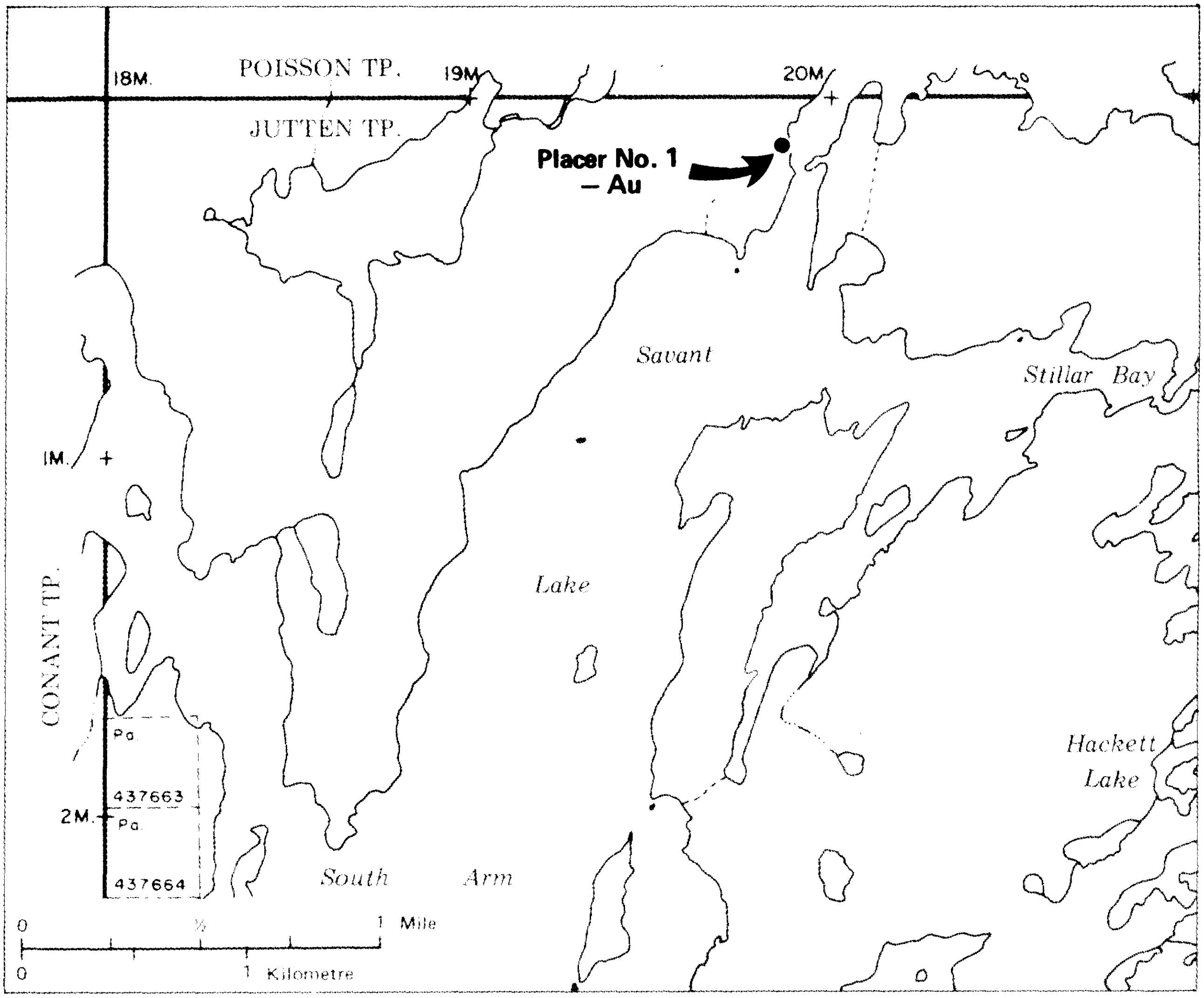
Main Metals: Gold

Location: The SE corner of Ontario Ministry of Natural Resources claim map No. 2518 is Latitude 48°52½′, Longitude 87°00′ with the southern boundary of the map sheet about 6 miles (9.6 km) north of Terrace Bay. NTS 42D/14E.

Map Reference: ODM Map 2232, Nipigon-Schreiber Sheet

Description: A note in the files of the Geological Branch, Division of Mines, states that placer gold was present along a river valley 6 to 7 miles (9.6 to 11.2 km) north of Terrace Bay in an area now flooded by a hydro-electric power dam. Presumably this would be the north flowing tributary of the Aguasabon River which is immediately above the power dam.

Remarks: This is a personal communication from a prospector who attended a Geological Branch Mineral Exploration course and is considered to be reliable (circa 1970).



Thunder Bay District

Jutten Township Placer No.1

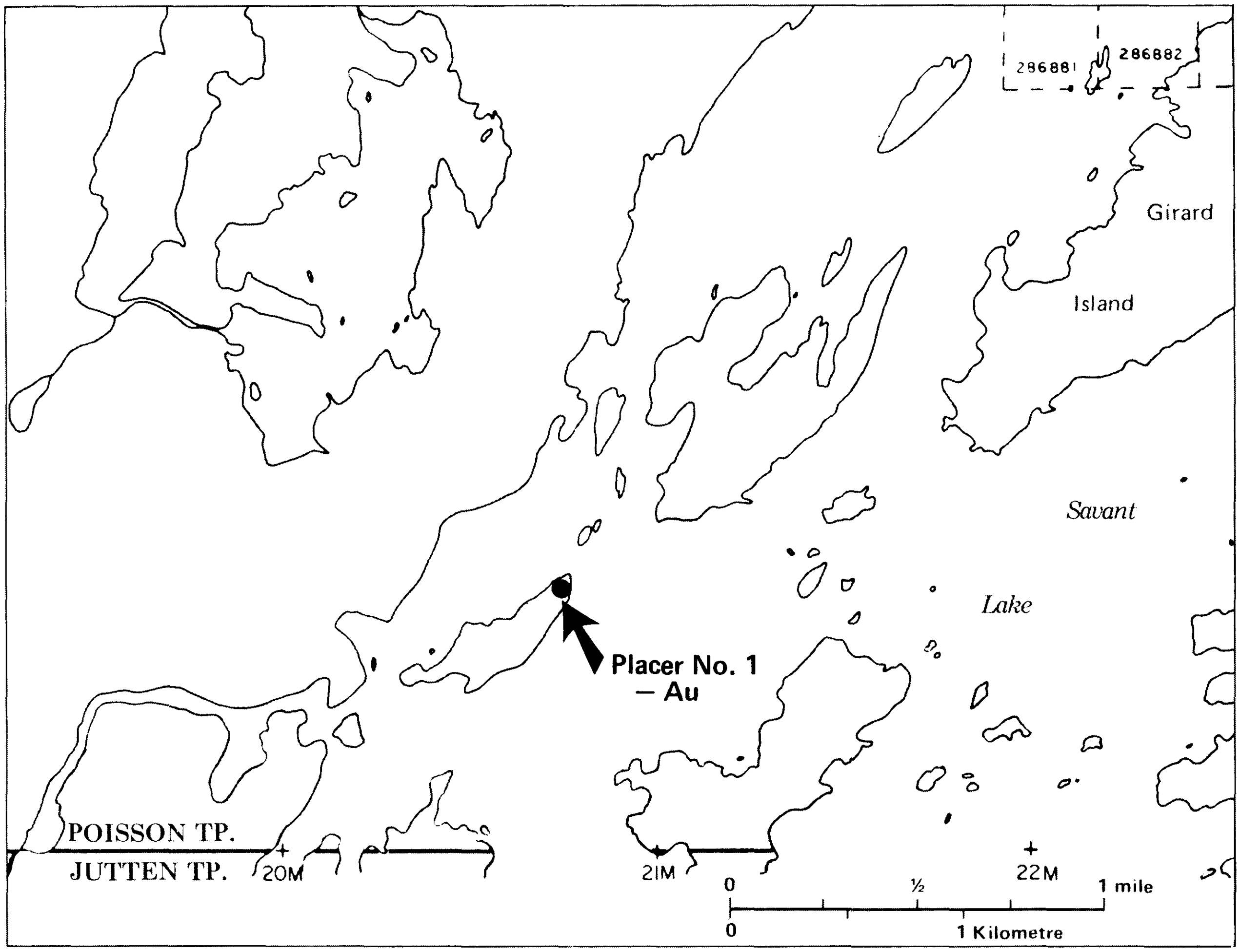
Main Metals: Gold

Location: Jutten Township (Latitude 50°22′, Longitude 90°29′) contains the South Arm of Savant Lake with the narrows separating the parts of the lake near the northern boundary of the township. NTS 52J/8W.

Map References: ODM Map 37j, Savant Lake Gold Area. ODM Map P.804, Jutten Township.

Description: W.G. Miller (OBM 1903, Vol.12, p.89) panned samples from the sandy area on the west side of the narrows near a deserted Hudson Bay Post. Most samples did not contain any gold but one sample of bedded sand taken about 300 feet (90 m) west of the shore and 8 feet (2.4 m) above lake level contained one good colour of shot-like form. An assay of the sand at this locality indicated a value of $2.00 per ton (gold at $20.67 per ounce).

References: OBM Rept. 1902, Vol.11, p.18, p.149. OBM Rept. 1903, Vol.12, p.88-90. ODM Rept. 1928, Vol.37, pt.4, p.67-68.



Thunder Bay District

Poisson Township Placer No.1

Main Metals: Gold

Location: Poisson Township (Latitude 50°27′, Longitude 90°29′) contains part of Savant Lake and the placer location is described as being on the very large island just above the narrows. NTS 52J/8W.

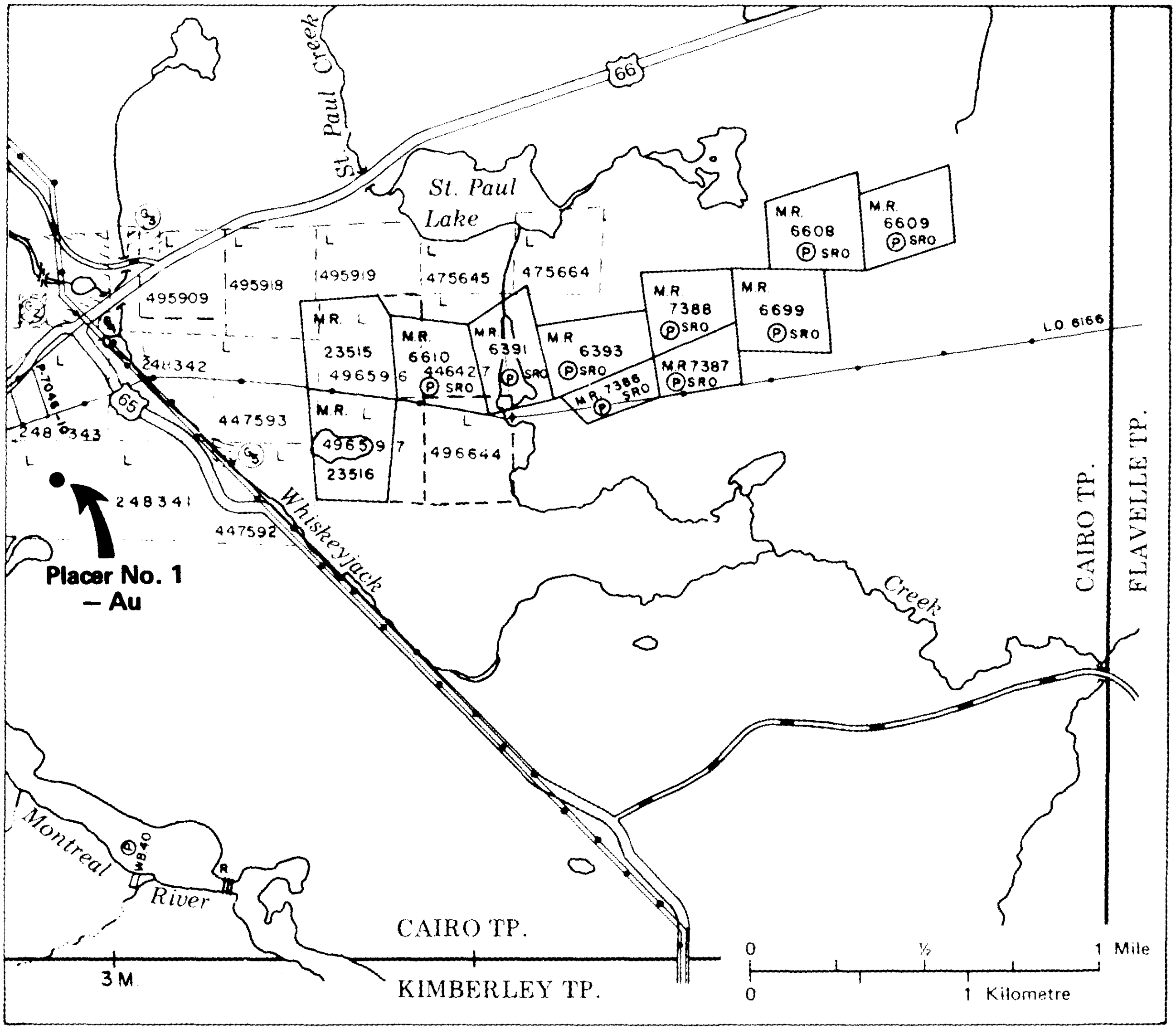
Map References: ODM Map 37j, Savant Lake Gold Area. ODM Map P.723, Poisson Township.

Description: The following description is from E.S. Moore (ODM Rept. 1928, Vol.37, pt.4, p.67):

"The . . . [north] end of the island is largely covered with sand and gravel, and attempts have been made to work the sands on a small scale. It has been found difficult to obtain colours by panning, as the gold is in fragments of rock and it can be detected by fire assay when it does not show in the pan. Fire assays made from samples collected by Miller [on the island] gave a trace to $1.80 a short ton of sand [gold at $20.67 per ounce]."

Remarks: 1901 gold in drift mentioned by William McInnes of the Geological Survey of Canada. 1902 Placer deposits examined by W.G. Miller of Ontario Bureau of Mines.

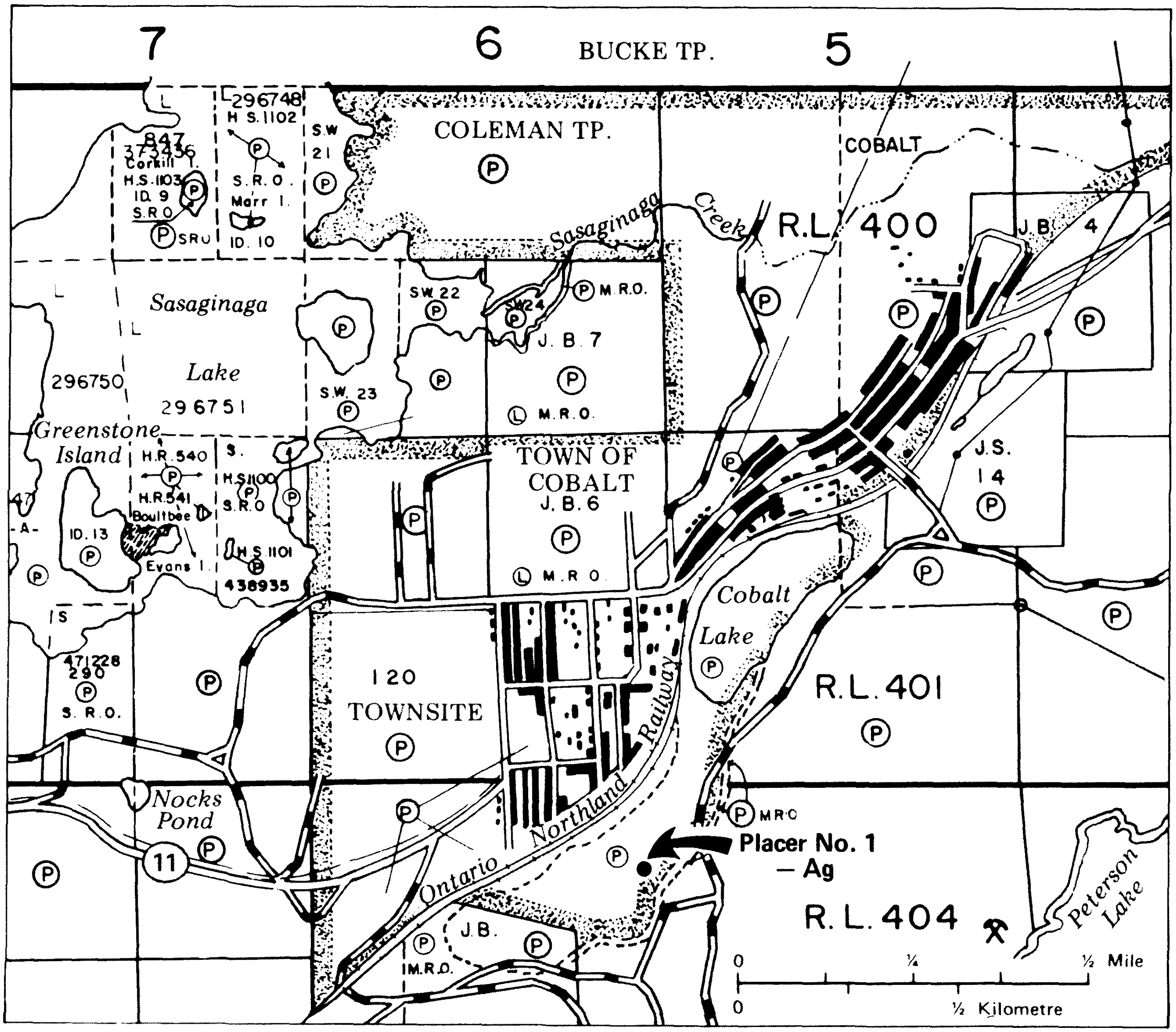
References: GSC Summ. Rept. 1901, Vol.14, p.95A. OBM 1902, Vol.11, p.18, 149. OBM 1903, Vol.12, p.88-90. ODM Rept. 1928, Vol.37, pt.4, p.67-68.



Timiskaming District

Cairo Township Placer No.1

Main Metals: Gold
Location: Cairo Township (Latitude 47°59′, Longitude 80°35′) contains the settlement of Matachewan which is reached by Highways 65 and 66. Fox Rapids occurs on the Montreal River a mile (1.6 km) north of the 2-mile post on the southern boundary of the township and the gold bearing sands are about 3,000 feet (900 m) northeast of Fox Rapids.
Map Reference: ODM Map 2110, Powell and Cairo Townships.
Description: The marginal notes of OBM Map 27a stated that alluvial gold in small amounts has been found in the sands and gravels.
Reference: OBM Map 27a, Matachewan Gold Area, Marginal Notes, map accompanying OBM Rept. 1918, Vol.27, pt.1.



Timiskaming District

Coleman Township Placer No.1

Main Metals: Silver

Location: Coleman Township (Latitude 47°22′, Longitude 79°48′) SE¼ of N½, lot 6, concession V, claim JB1 (part of RL404), along the former shoreline on the east side of Cobalt Lake. NTS 31M/5W.

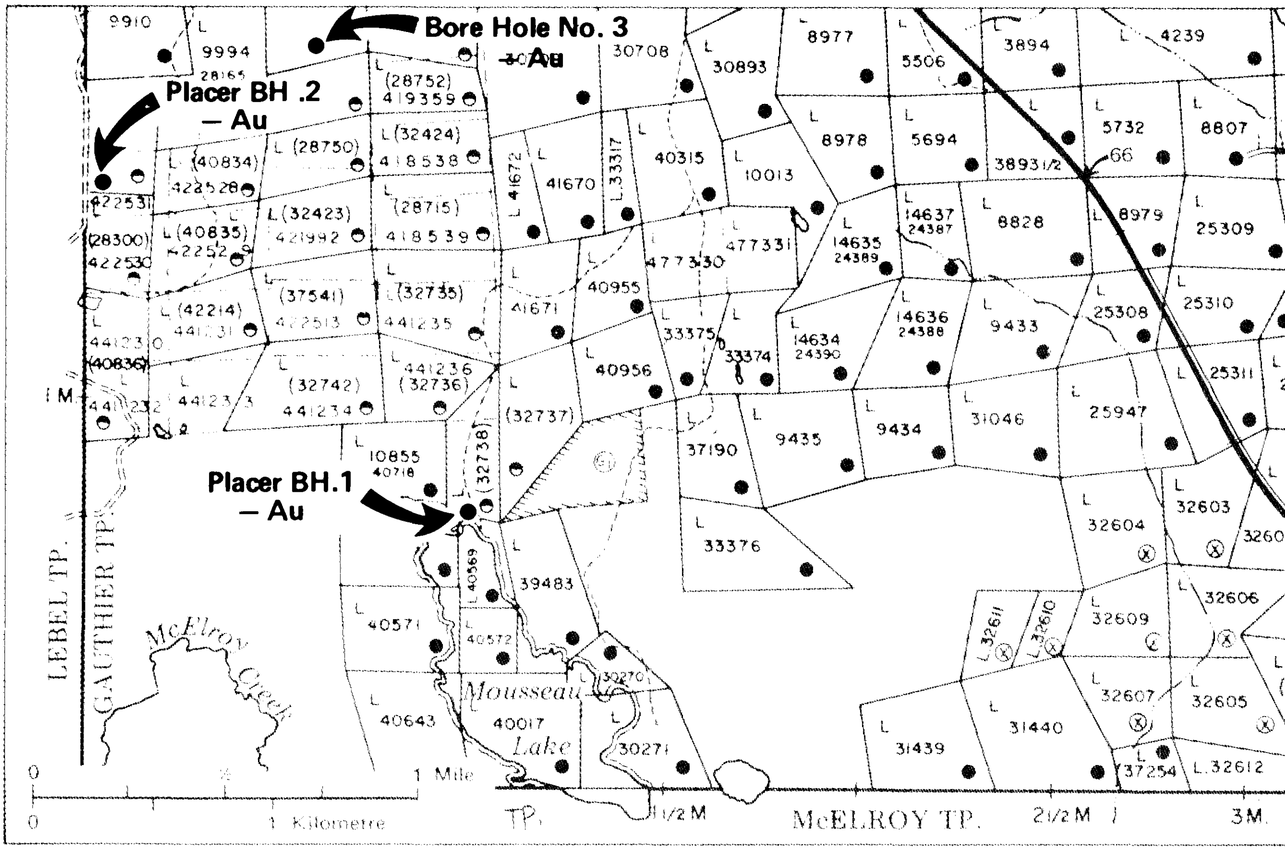
Map Reference: ODM Map 2050, Cobalt Silver Area, Northern Sheet.

Description: At the McKinley and Darragh Mine free silver was found in the gravel on the shore of the lake. Some 352 tons (319 tonnes) of argentiferous gravel containing 537 ounces of silver to the ton was shipped in 1905.

Bedrock Source: The argentiferous gravel is considered to be debris from adjacent veins on the shore.

Remarks: Recovered at the McKinley and Darragh Mine in 1905.

References: OBM 1906 Vol.15, pt.1, p.9, 79.



Timiskaming District

Gauthier Township Placer No.1

Main Metals: Gold

Location: Gauthier Township (Latitude 48°09′, Longitude 79°49′) is about 6 miles (9.6 km) east of Kirkland Lake. Drilling for placer gold was carried out in the southwest part of the township, claims L40569, L39520, and L30347. NTS 32D/4W.

Map Reference: GSC Map 11-1967, Thickness of Drift Lebel, Gauthier, Boston and McElroy Townships, Ontario.

Description: A buried valley was traced for a distance of 10 miles (16 km) by a GSC field party using a hammer seismograph. Geophysical work indicated that the depth to bedrock ranged from 100 feet (30 m) to more than 300 feet (90 m). Three vertical drill holes six inches (15.2 cm) in diameter were drilled by the Geological Survey of Canada to check the depth of the valley and to estimate the gold content. The gravel parts of the section could not be recovered.

Bore Hole 1, Claim L40569 drilled to 297 feet (90 m) in sand. An average of 12 bulk samples contained less than 1 grain of gold in 1.3 cubic feet (0.04 m^3).

Bore Hole 2, Claim L39520 reached bedrock at 241 feet (73.5 m) 0-20 sand 9 grains gold in 1.3 cubic ft. (0.04 m^3), 20-225 sand 6.1 grains gold in 1.3 cubic ft. (0.04 m^3), 225-241 gravelly sand 2.7 grains gold in 1.3 cubic ft. (0.04 m^3).

Bore Hole 3, Claim L30347, drilled to 390 feet (119 m) in 1965, and deepened to 738 feet (225 m) in 1967. Gold content not determined.

References: Canadian Min. Jour. April 1964, p.78-83. GSC 1965, Paper 65-14, pt.2, p.18-20.

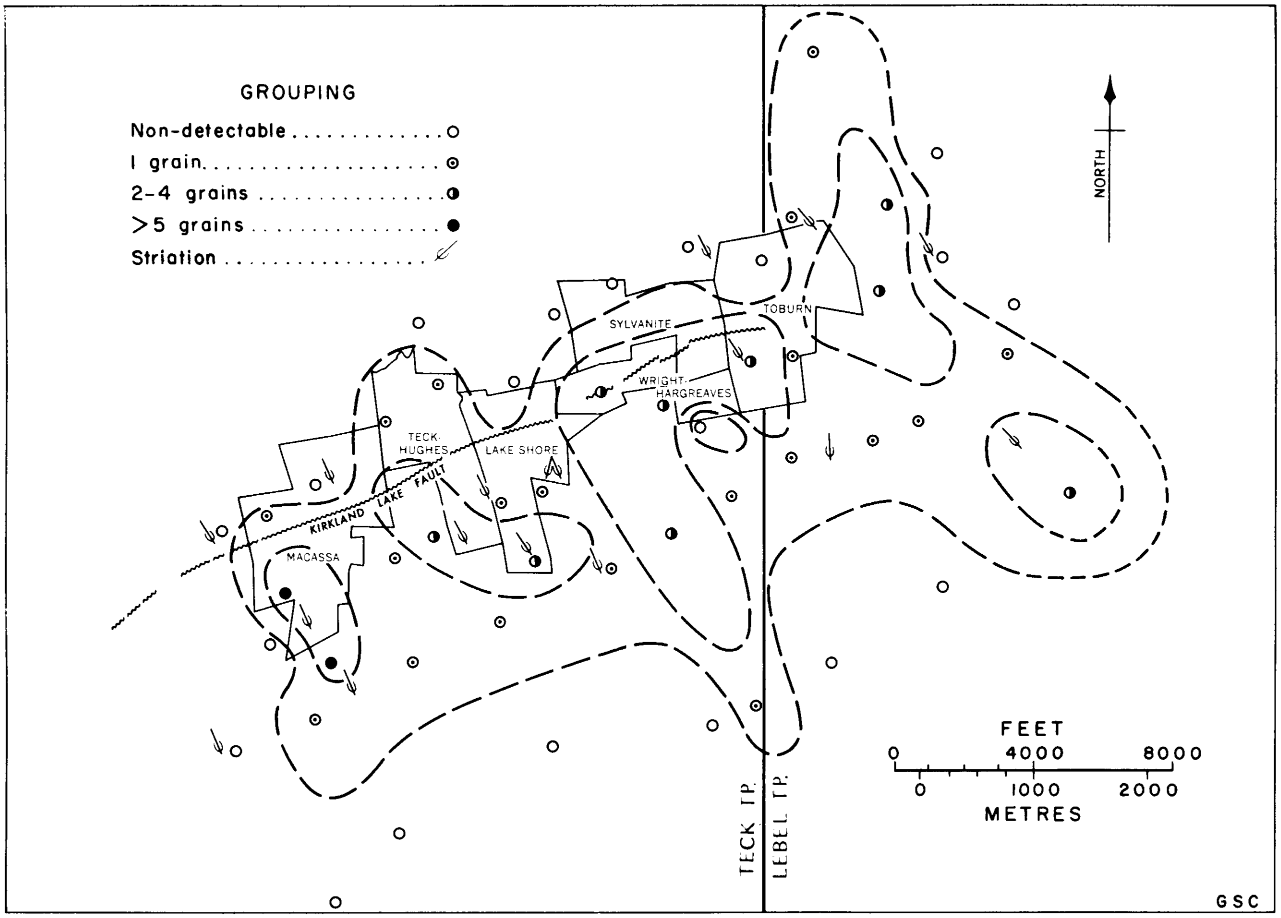


Figure 16b Gold Grains Visible to the Naked Eye in Riffle Concentrates

Timiskaming District

Lebel and Teck Townships Placer Train

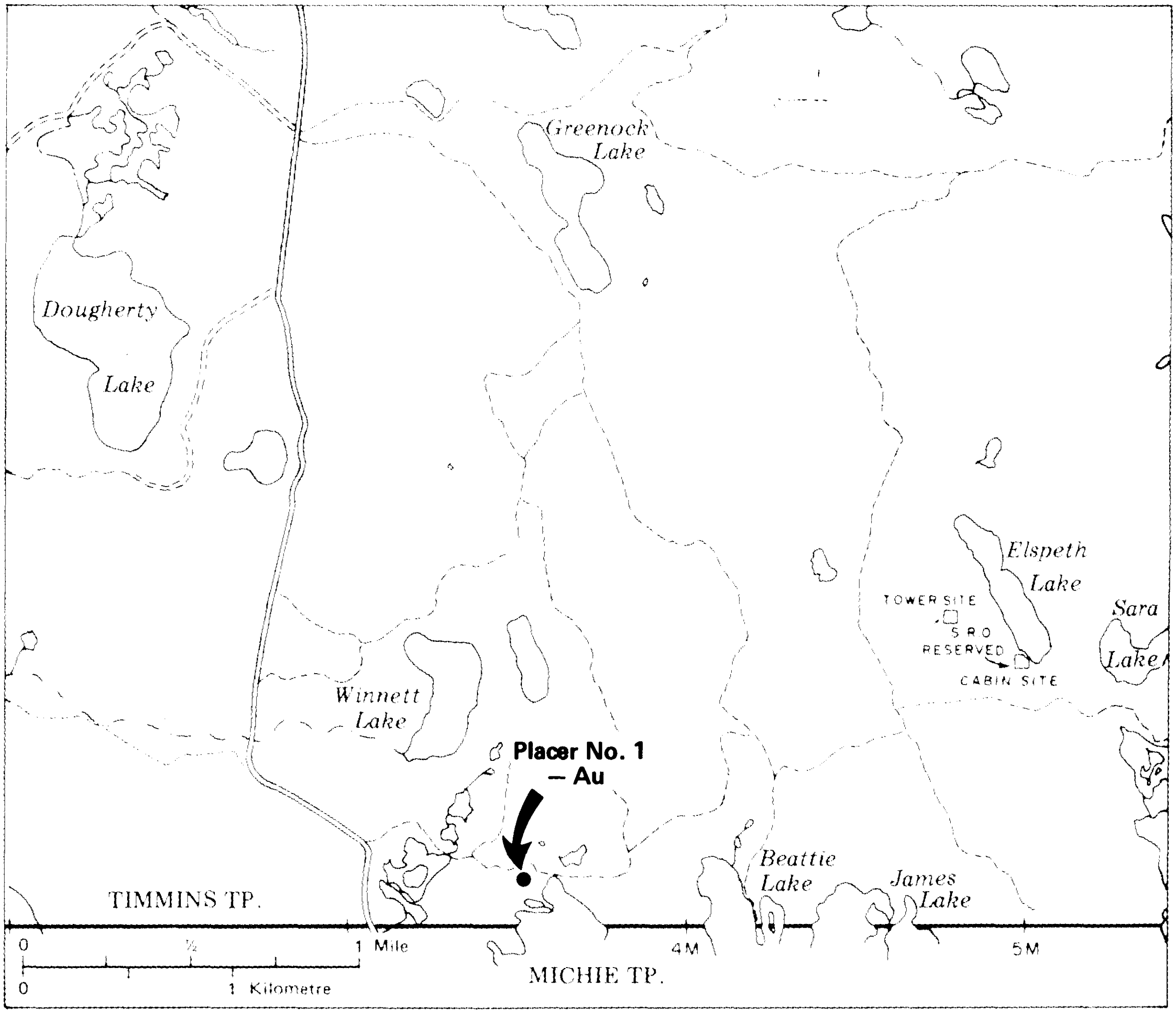
Main Metals: Gold

Location: These formerly producing gold mines of Kirkland Lake are located in Teck Township (Latitude 48°09′, Longitude 80°04′) and Lebel Township (Latitude 48°09′, Longitude 79°57′) on the east side of Teck Township. NTS 42A/1E.

Map References: GSC 1963, Paper 63-45, p.19, Gold Grain Visible to the Unaided Eye in Riffle Concentrate From Till.

Description: H.A. Lee (GSC 1963, Paper 63-45) investigated the gold content of the basal till to the southeast of the formerly producing mines. Samples of 1.7 cubic feet (0.05 m^3) were obtained by digging pits and the sample sieved and washed in a sluice box and the number of particles of gold visible to the naked eye were counted. On a traverse 2,000 feet (610 m) from the source the gold content ranged from 1 to 10 particles per sample and at 4,000 feet (1220 m) the gold content decreased to 1 to 3 particles per sample. Gold was generally absent on a traverse line 10,000 feet (3000 m) from the source.

Reference: GSC 1963, Paper 63-45, p.26.



Timiskaming District

Timmins Township Placer No.1

Main Metals: Gold

Location: Wolverton Lake (Latitude 48°17′, Longitude 80°44′) is mainly in Michie Township with the northern shoreline of the lake extending into Timmins Township (Latitude 48°20′, Longitude 80°44′) between the 3- and 4-mile posts on the southern boundary. NTS 42A/7W.

Map Reference: ODM Map 31d, Watabeag Lake Area.

Description: Douglas G.H. Wright author of ODM Rept. 1922 Vol.31, pt.7, mentions that panning of the gravel in the vicinity of Wolverton Lake is reported to have yielded a few colours in gold.

References: ODM Rept. 1922, Vol.31, pt.7, p.23.

INDICATOR MINERALS

An indicator mineral or pathfinder mineral is any mineral that aids in the discovery of an associated economic mineral. The indicator mineral may be more abundant, or may be easier to identify, or may enlarge the target area as part of a suite of associated minerals. Boyle (1974, p.1,3) has pointed out that associations of particular minerals are not fortuitous but are related to intrinsic chemical properties, and the conditions that prevailed at the time of deposition and in the subsequent weathering process. Indicator minerals may be identified directly, or by geochemical means which will determine the metallic or cation component of the mineral.

Indicator Minerals for Gold

A heavy mineral study was carried out in the Klondike Area, Yukon Territory by the Geological Survey of Canada. From this study Gleason (1970, p.55-56) made the following observations:

> "Pseudomorphs of goethite, limonite, and less commonly hematite, after pyrite are found in quantity in the creek gravels and eluvium over and near deposits of lode gold. Also associated with these deposits are small amounts of galena, and in some places chalcopyrite and sphalerite. In addition, barite, muscovite (sericite), magnetite, chlorite, and apatite are common heavy minerals associated with one or more of the four types of lode gold deposits. The best pathfinder heavy mineral for gold in the area is gold itself. . . .
>
> Indicators are that geochemical prospecting using soil analyses would be a more useful, cheaper, and a faster method for outlining gold-bearing structures than heavy mineral work. Zinc, lead, and possibly copper are the pathfinder elements for gold."

The geochemical association of arsenic, mercury, antimony, and tungsten was known to exist at several gold mines in north-central Nevada. A geochemical survey carried out by Erickson *et al.* (1966) of the United States Geological Survey located an area that was anomalously high in arsenic, antimony, and tungsten, and it was assumed that the area should also be anomalously high in mercury and gold. This assumption proved to be correct and resulted in the discovery of the Cortez gold deposit containing 3.4 million tons (3.45 million tonnes) with an average gold content of 0.29 ounces per ton (Wells *et al.* 1969, p.526-527; and Figure 7, this report).

INDICATOR MINERALS FOR KIMBERLITE

Indicator minerals for kimberlite are pyrope garnet, magnesian ilmentite, olivine, and chrome diopside. The presence of any of these minerals is of interest but higher concentrations, larger and more angular fragments, or two or more of the minerals occurring together increases the probability that the source is not far distant.

Pyrope

Garnets within eclogite inclusions in kimberlite, basalts, and layers in ultramafic rocks consist of more than 55 percent pyrope. Similar inclusions in migmatite, gneissic terrain contain from 30 to 55 percent pyrope in the garnets (Coleman *et al.* 1965, p.483). Wright (1938, p.441) gave the average proportion of pyrope molecule in garnets in particular rock types as: kimberlite 72.3 percent; ecologites 37.4 percent; other basic rocks such as gabbros, anorthosites, and basalts 20.7 percent; amphibolite schist 20.3 percent; and biotite schist 13.8 percent. The presence of pyrope in association with magnesian ilmenite and chrome diopside suggest a kimberlite source.

Most of the garnets in the heavy mineral concentrates from the James Bay Lowland collected by Wolfe *et al.* (1975, p.52-54) were angular and of no particular shape. The pyrope garnets were few in number and generally smaller than the other garnets with an average diameter of 1 mm (0.4 in.). Of the 20 pyrope grains identified 19 were approximately spherical and 1 grain was angular. The colour of the pyrope garnets varies from pale pink or pale red with a touch of purple, to pinkish-red-purple, to an intense reddish purple. The index of refraction is 1.76 or less and electron probe analyses of 10 grains showed the pyrope molecule to range from 66.8 to 73.7 percent.

Well rounded pyrope grains having the appearance of highly abraided material is generally interpreted as evidence of transport and abrasion over a long distance. However, pyrope garnets in kimberlite occur as spherical nodules and the sphericity cannot be confidently related to rounding due to weathering and sedimentary processes.

The following excerpt is from Satterly (1971, p.21):

> "Turskiy describes the use of Timofeyev's capillary tube (2-4 mm (0.8-1.6 in.) diameter rod with a 3-5 mm (1.2-2 in.) deep cup at one end) and heavy liquids for the identification of pyrope and magnesian ilmenite in prospecting for diamond deposits. Pyrope with a specific gravity of 3.70-3.75 is most common in kimberlites, and can be separated from almandine of a similar colour by using a liquid of gravity 3.8 in which a grain of pyrope floats and almandine sinks."

Magnesian Ilmenite

Magnesian ilmenite or picroilmenite contains from 8 to 16 percent MgO. Wolfe *et al.* (1974, p.57) performed analyses on 14 grains suspected of being magnesian ilmenite all of which were black in colour, somewhat rounded, and with a subvitreous lustre. Analyses were performed for MgO, TiO_2, and FeO and only one grain was found to have a high enough magnesia content to be classed as magnesian ilmenite and five other grains were ilmenite with a low percentage of magnesia. Two grains were rutile and six were not ilmenite. Tremblay (1963) reported 2 grains of ilmenite as of probably kimberlitic origin in samples T55-62 and T69-62.

Chrome Diopside

Chrome diopside should contain more than 1 percent chromium (Dana and Ford, 1932, p.558). In the James Bay Lowland Wolfe *et al.* (1974, p.29 and Table 5) were unable to identify any chrome diopside. Fifteen grains were selected as possible diopside of which three were diopside without chrome and light grains were chrome-bearing diopside with the chrome content ranging from 0.09 to 0.57 percent. Four of the eight grains displayed some cleavage and all the grains varied from light to dark green and olive, and one grain displayed some internal reflection. Sample T392-62 was reported by Tremblay (1963) as containing one grain of chrome diopside.

Abundance and Grain Size of Indicator Minerals

The following description is abstracted from Satterly (1971, p.21,23). In the USSR studies were made on the grain sizes of indicator minerals downstream from the kimberlite pipes, which were supplemented by laboratory studies. The quantities of pyrope and magnesian ilmenite decrease little for 1 mile (1.6 km) from the pipe but the grain size decreases to a fraction of a millimeter, and laboratory tests on these minerals indicated that over a distance of 96 miles (154 km) they would be decreased to 10 percent of the original content. Olivine persists downstream for 3 to 3½ miles (4.8-5.6 km) and chrome diopside persists for little more than few hundred yards. USSR experience shows that streams draining kimberlitic bodies contain anomalously high quantities of metals particularly zinc.

INVESTIGATIONS OF INDICATOR MINERALS FOR KIMBERLITE

Selco Exploration Company 1960

In 1960, T. Skimming of Selco Exploration Company Limited discovered that the stream gravels of the Moose River drainage basin contained pyrope garnets. Ninety-four heavy mineral samples were panned, screened, and concentrated from locations on the Mattagami, Abitibi, Little Abitibi, North French and Moose Rivers. Thirteen garnet grains from 12 localities were considered to be pyrope (Brown *et al.* 1967, p.20-21).

Canadian Rock Company Limited 1962, 1963

Dr. W.G. Wahl interested the Canadian Rock Company Ltd. in doing exploratory work during 1962 and 1963. Gravel samples of 1 cubic foot (0.03 m^3) each were collected at 25 locations of which 16 were on the Little Abitibi River, 6 from the Bad River, and 3 from the Abitibi River. These samples were screened and concentrated and sent for mineral analysis to the Central Metallurgical Laboratory, Johannesburg, South Africa. Eight of the samples contained a grain of magnesian ilmenite. Two samples contained magnesian ilmenite without pyrope, and one angular piece of chrome diopside was found in a sample taken at the junction of the Abitibi and Little Abitibi Rivers which did not contain any other indicator minerals (Tremblay 1963; Brown *et al.* 1967, p.21-22). Ten larger samples were collected and the heavy mineral concentrate examined for diamonds but no diamonds were found.

H.B. Naylor 1963

The following quotation is taken from Brown *et al.* 1967, p.22:

> "In 1963, six heavy mineral concentrate samples were taken by H.B. Naylor from the Cretaceous Mattagami Formation clay and silica-sand deposit on the Northern Ontario-China Clay property east of the Mattagami River in Kipling township near the Precambrian boundary. X-ray, optical and chemical analyses carried out by R.J. Holmes, Columbia University established the presence of pyrope-almandine garnet, diopside, and ilmenite. The mineral concentrates were too small to establish the pyrope content of the garnet, the chromium content of the diopside, and the magnesium content of the ilmenite. There is qualitative evidence for the presence of chromium in the diopside, but it is not conclusive [R.J. Holmes, written communication, 1964]."

Geological Survey of Canada 1965

The Munro Esker was sampled by Lee (1965) (see Placer Occurrences in Ontario, page 161), from Lake Abitibi for about 66 miles (105 km) to Catharine Township southeast of Kirkland Lake. Investigation of the gravelly sand layer of the esker resulted in the discovery of kimberlite at the Upper Canada Mine. From data accumulated on the distance of transport in this esker Lee assumed that the source of the pyrope would be in Gauthier Township. The presence of pyrope was believed to indicate the presence of kimberlite in the area and a search resulted in the discovery of a kimberlite dike in C5 drift east on the 2,750 foot (840 m) level of the Upper Canada Mine (Lee and Lawrence 1968, p.1).

The dike is about 3 feet (0.9 m) in width, strikes at 160°, and dips vertically. The enclosing rock is a porphyritic syenite and the dike is zoned with the central part more coarsely crystalline than the margins. A potassium-argon age determination on mica from the dike gave an age of 151 ± 8 million years which corresponds to Upper Jurassic (Lee and Lawrence 1968, p.1).

The kimberlite in the Upper Canada Mine is a porphyritic greenish grey to greenish black rock. Large rounded olivine grains, flakes of phlogopite, and an occasional purple-red garnet may be seen in hand specimens. Xenoliths of the enclosing syenite are present but not abundant. The rock is slightly magnetic and dilute hydrochloric acid produces some effervescence. A thin section examination indicated the following mineral content (Lee and Lawrence 1968, p.4).

Olivine phenocrysts	31 percent
Phlogopite	25 percent
Groundmass (mainly calcite and serpentine)	35 percent
Titaniferous magnetite and chromite	5 percent
Perovskite ($CaTiO_3$)	4 percent
Pyrope	trace

Geological Branch, Division of Mines

During 1973, a Geological Branch, Division of Mines, geological field party led by H.A. Lee of Lee Geo-Indicators Limited investigated an area mainly between Latitude 49°30′ to 51°00′ North and Longitude 80°30′ to 81°30″ West. Supervision of the project was by W.J. Wolfe of the Geological Branch and mineral determinations were by W.D. Hicks, S.J. McCance, and A. Tuemer of the Mineral Research Branch. Samples were taken at intervals from 2 to 8 miles (3.2 to 12.8 km) along the major north flowing rivers. Coarse sand and gravel was collected from areas of maximum heavy mineral concentration in riffled parts of the river beds, around and under boulder and cobble sized material. From 1 to 5 cubic feet (28 to 140 litres) of sand and gravel was wet screened at the site to produce a (4.5 litre) subsample of the 0.5 to 1.23 mm size fraction. To test the possible inflow of indicator minerals from Pleistocene stratigraphic units the Lower Till was sampled at 6 sites and the Adam till at 6 locations. Samples of esker gravels were taken from pits at intervals of ½ to 4 miles (0.8 to 6.4 km) along five eskers.

Eighteen grains of pyrope-rich garnet and one grain of magnesium ilmenite were identified in 11 sampling sites of alluvium collected from major river channels. In addition one sample of esker gravel contained 2 grains of pyrope. For sample locations see Wolfe *et al.* (1975) and

FIGURE 17 – Indicator Minerals for Kimberlite, Moose River Basin.

Legend

Sample Locations

✚ 82	Alluvium
★ E175	Massive to stratified esker gravels
KT	Kipling-Cochrane till and outwash
AT	Adam till
LT	Lower till unit

▲(1)	Pyrope reported and number of grains in sample (Wolfe *et al.* 1975)
● (1)	Pyrope reported and number of grains in sample (Skimming 1960)
♦(1)	Pyrope reported and number of grains in sample (Tremblay 1963)
●	Magnesian ilmenite reported (Wolfe *et al.* 1975)
+	Magnesian ilmenite reported (Tremblay 1963)

·›·›·›·›·›	Esker ridge taken from ODM Map No. 2334
	Outline of area covered by Aquitaine of Canada high sensitivity aeromagnetic survey, ODM Assessment Files Research Office, Geological Branch, Division of Mines, Toronto File No. 83.1 - 118.

(Modified after ODM Maps 2334, 2166 and 2167.)

ǀǀǀǀǀǀǀǀǀ	Intered outline of drift covered metavolcanic belts.

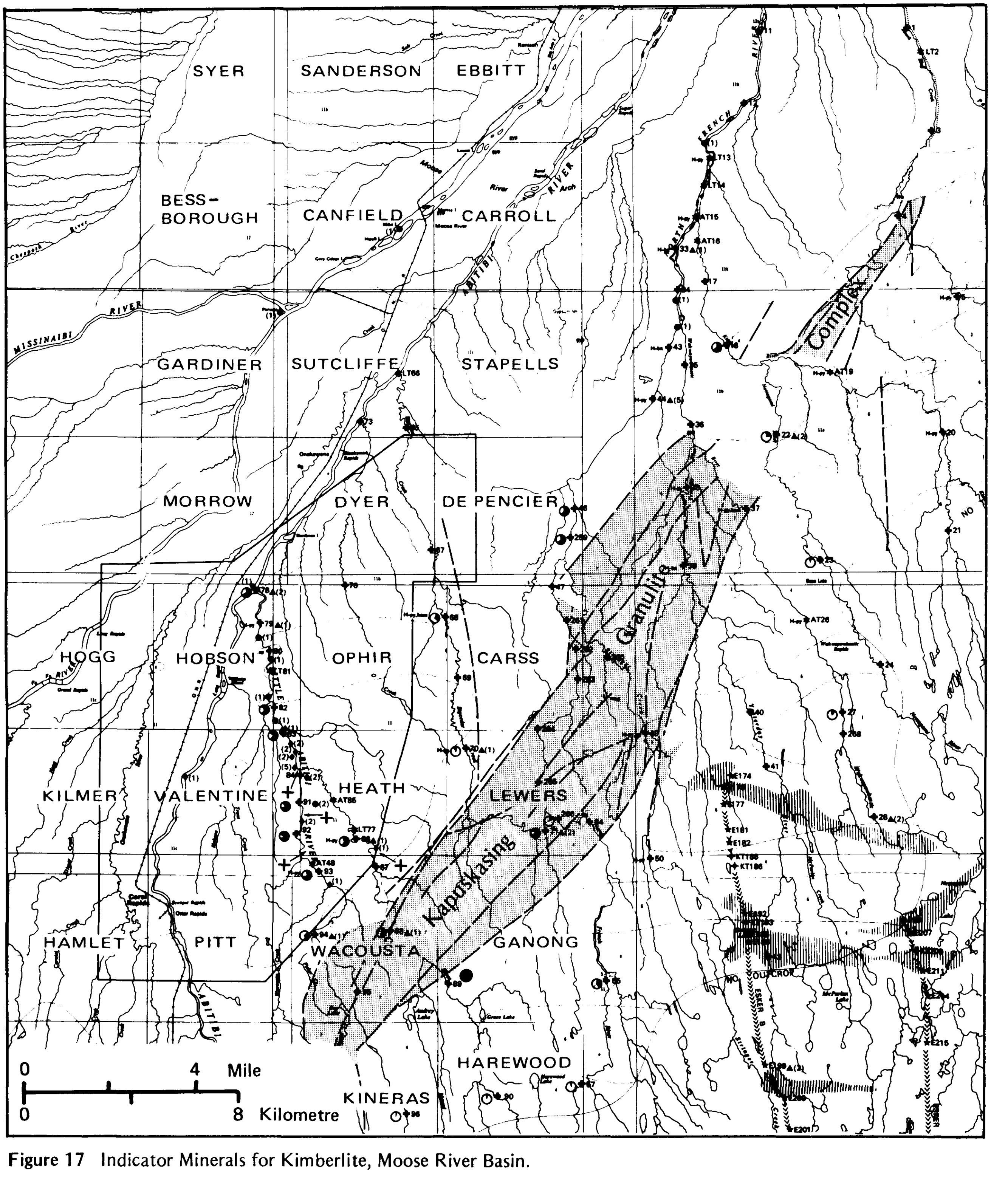


Figure 17 Indicator Minerals for Kimberlite, Moose River Basin.

Figure 17 of this report. The three surveys referred to on Figure 17 have located a total of 52 pyrope grains at 34 sites within the Moose River basin as shown on ODM Map 2334 in Wolfe *et al.* (1975).

GEOCHEMICAL PROSPECTING FOR KIMBERLITES

A study was carried out in Arkansas by Gregory and Tooms (1969) to determine whether geochemistry could be used to compliment mineralogical techniques in the search for kimberlites. It was found that anomalously high concentrations of elements could be detected in soils overlying kimberlites. Magnesium tends to be fixed particularly in the clay fraction. Nickel, iron, manganese, cobalt, vanadium, and phosphorous tend to be concentrated in the iron-manganese nodules and mineral aggregates, and niobium, chromium, titanium, zinc, and barium are most abundant in the silt fraction. In stream sediments the greatest contrast and the longest trains were obtained with niobium.

Reported Bedrock Occurrences of Diamonds

REAUME TOWNSHIP

In the Ontario Bureau of Mines Report Volume 23, Gibson (1914, p.47) noted that "thousands of microscopic diamonds" had been reported from an ultrabasic rock collected from the D. O'Connor claims in Reaume Township. The mineralogical identification was made by R.A.A. Johnston of the Geological Survey of Canada. The rock was a serpentinite containing veinlets of chrysotile asbestos which assayed 8.46 percent chromium, 14.5 percent iron, and 0.066 ounces of platinum.

Szetu (1954, p.9-11) discussed this reported occurrence of diamonds. The method used was to dissolve the chromite and examine the residue. The evidence used as proof of the existence of diamonds was the fluorescene of small octrahedral crystals. The existence of Johnston's microscopic diamonds has not been confirmed by x-ray investigation.

It seems probable that the identification of these microscopic minerals as diamonds was in error. Crystalline compounds into which electron energy charges may go with accompanying light transmission are called phosphor bases (Smith 1945, p.46). Phosphor bases include such common minerals as sphalerite, scheelite, gahnite, and willemite. Octrahedral crystals might be found in sphalerite or gahnite.[1]

VALENTINE TOWNSHIP (CORAL RAPIDS)

Two diamonds were reported to have been found in Valentine Township near the west bank of the Abitibi River, just upstream from Coral Rapids. In 1969, Selco Exploration Company Limited collected seven large samples with a total volume of 39.4 cubic yards (30 m^3) of various types of unconsolidated materials. These samples were washed but no diamonds were found (Edwards and Gratton-Bellow 1969).

Reported Alluvial Occurrences of Diamonds

DIAMONDS IN THE GREAT LAKES REGION

Diamonds have been found in glacial deposits and in reworked glacial deposits during the panning and sluicing of river gravels for gold. Since 1863 at least 82 discoveries of diamonds in the drift adjacent to the Great Lakes have been reported (Gunn 1967b, p.100). Of these 34 were in Indiana, 25 in Illinois, 16 in Wisconsin, 2 in Michigan, 2 in Ohio, 2 in New York, and 1 in Ontario. The source of the gold and the diamonds is unknown, and it has been supposed that they may have come from the Canadian Shield, which is exposed 200 to 400 miles (320 to 640 km) to the north. An alternative hypothesis which seems much more probable is that both the gold and diamonds came from a local source such as kimberlite plugs. In southern Indiana and southwest Wisconsin no indicator minerals such as pyrope have been found with the diamonds, however, gold, native copper, and jasper conglomerate do occur. Many kimberlites contain inclusions of the country rocks which they have intruded and Precambrian rock types could be present as inclusions which have been floated upward.

Studies of heavy minerals by Gwyn (1971) indicate the source areas of the Huron, Ontario, Erie, and Georgian Bay glacial lobes can be established. However, the studies were not extensive enough to distinguish the lobes of the Superior and Michigan basins.

[1] For identification of these "diamonds" see: Duke, J.M. and Bernardi, M. (1982) Chromian Andradite from Reaume Township, Ontario; Canadian Mineralogist, Vol. 20, pp. 49-53.

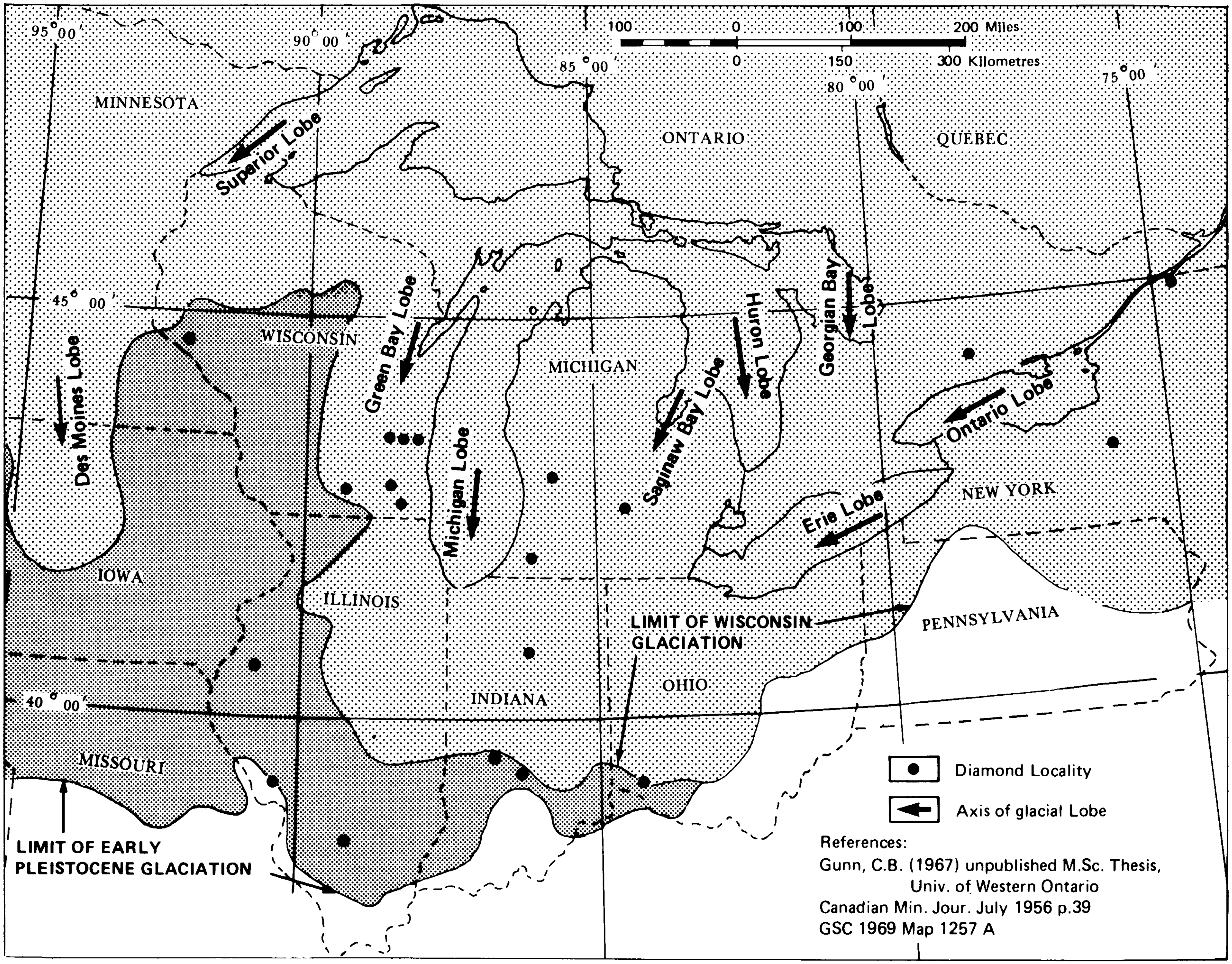
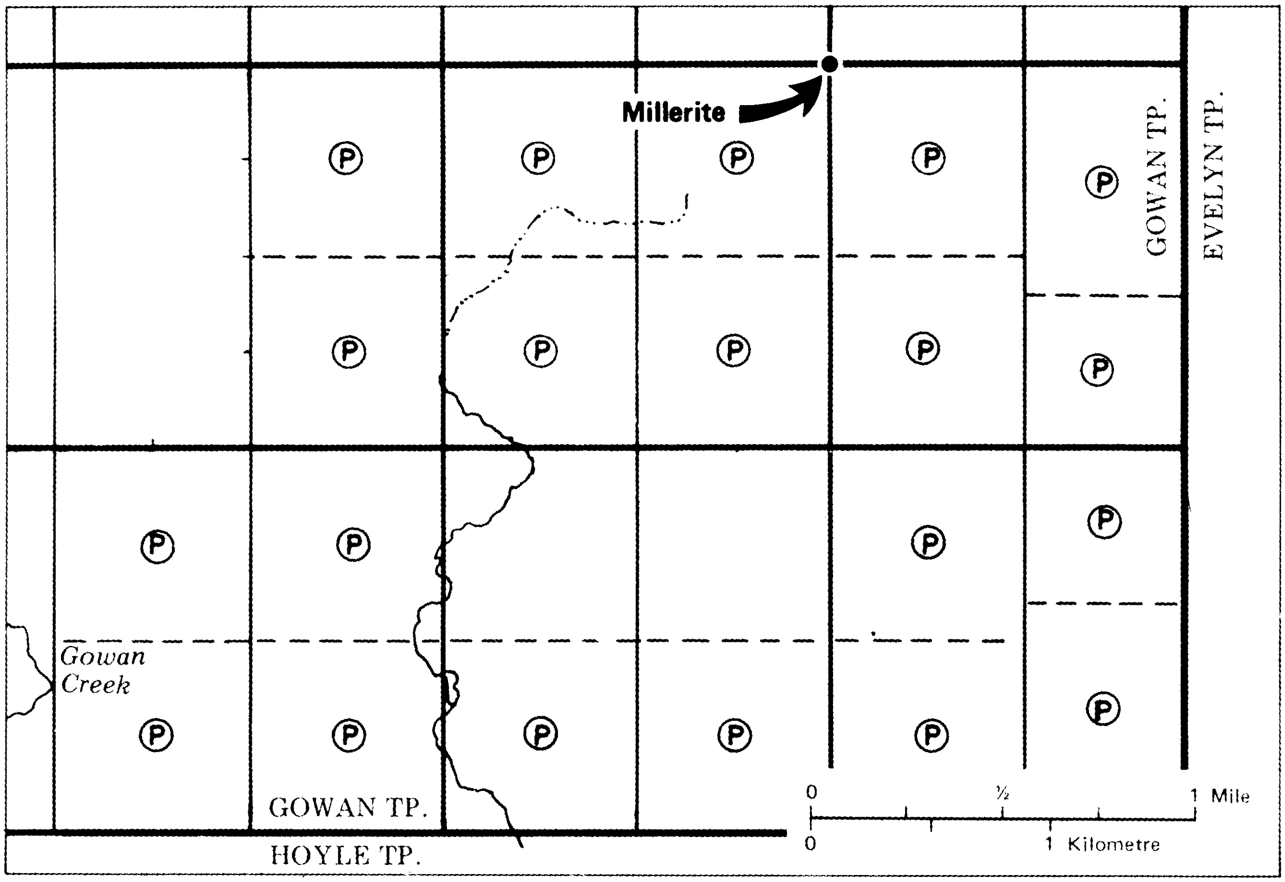


Figure 18 Great Lake Region drift diamond localities and associated glacial features.

ONTARIO, NEAR PETERBOROUGH

The following description of this reported occurrence is taken from Gunn (1967b, p.121):

> "Undated (some time before 1920). One stone, 33 carats (6.5 gm.). Rough, broken, of little value as gem. Found while digging a railway cut between Ottawa and Toronto, apparently near Peterborough. It was sold to a jeweller who showed it to G.F. Kunz about 1920. Mentioned by Kunz (1931); Blank (1935)."



Cochrane District

Gowan Township - Millerite

Location: Gowan Township (Latitude 48°40′, Longitude 81°08′), boundary between lots 2 and 3 and boundary between concessions II and III. NTS 42A/11E.
Map References: ODM Map P.729, Gowan Township. OMNR Claim Map M285, Gowan Township.

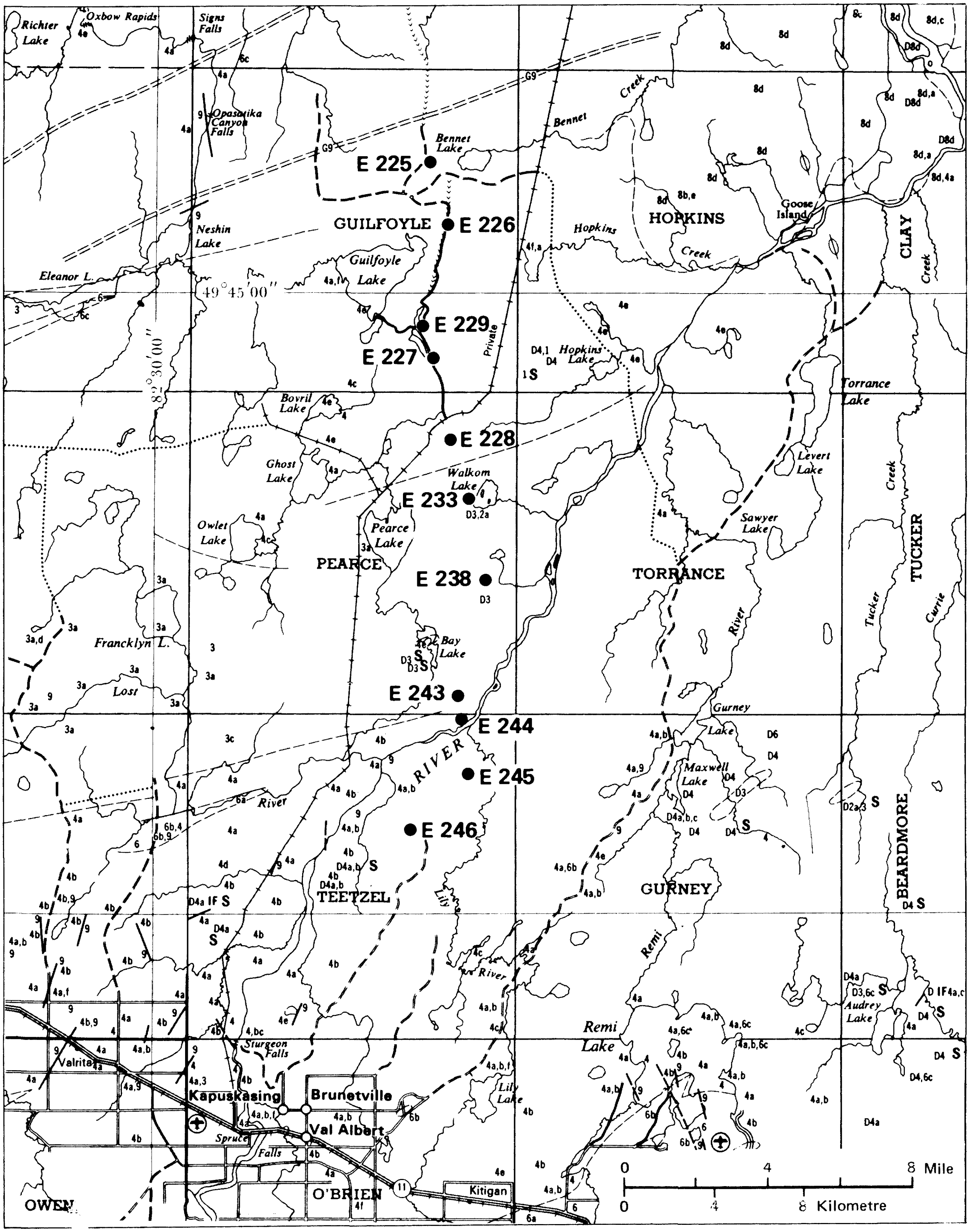
Description: Overburden drill hole FH-68 by the Geological Survey of Canada contained heavy minerals at a depth of 152 to 179 feet (46.3 to 54.6 m) in sandy till, sand, and gravel as follows:

Sample Depth	percent sulphides
152 (46.3 m)	2
156 (47.5 m)	10
164 (50.0 m)	5
179 (54.6 m)	10

Minerals present in decreasing order of abundance are magnetite (50 percent), pyrite, ilmenite-rutile-leucoxene, millerite, pentlandite-chalcopyrite. Some rock chips consist of serpentine-talc with abundant magnetite. The heavy mineral fraction minus the magnetic grains gave an assay of 3.5 percent nickel and 1.2 percent copper.

Bedrock Source: About 1 mile (1.6 km) up-ice from drill hole FH-68, serpentinized dunite has been indicated by diamond drilling and contains asbestos and pyrite. This serpentinite body is the probable source of the millerite in the till.

Reference: GSC (1973) Paper 73-1, Pt.B, p. 213-214.



E 225
E 226
E 227
E 228
E 229
E 233
E 238
E 243
E 244
E 245
E 246
GUILFOYLE
HOPKINS
CLAY
PEARCE
TORRANCE
TUCKER
TEETZEL
GURNEY
BEARDMORE
OWEN
O'BRIEN
Richter Lake
Oxbow Rapids
Signs Falls
Opasatika Canyon Falls
Bennet Lake
Bennet Creek
Neshin Lake
Guilfoyle Lake
Eleanor L.
Hopkins Creek
Goose Island
Hopkins Lake
Bovril Lake
Ghost Lake
Walkom Lake
Owlet Lake
Pearce Lake
Torrance Lake
Levert Lake
Sawyer Lake
Francklyn L.
Lost
Bay Lake
Gurney Lake
Maxwell Lake
River
Lily
Remi River
Remi Lake
Audrey Lake
Tucker Creek
Currie
Lily Lake
Sturgeon Falls
Kapuskasing
Brunetville
Val Albert
Valrita
Spruce Falls
Kitigan
Private
49°45'00"
82°30'00"
0 4 8 Mile
0 4 8 Kilometre

Cochrane District

Guilfoyle Township - Chalcopyrite, molybdenite

Location: Guilfoyle Township (Latitude 49°46′, Longitude 82°22′) on road south of Guilfoyle Lake. NTS 42G/9 and 42G/16. Map Reference: ODM Map 2166, Hearst-Kapuskasing Sheet. ODM Map 2334, accompanying GR 126.

Description: During a search for kimberlite indicator minerals in the Moose River basin, five eskers were sampled geochemically. Wolfe *et al.* (1975) provide the details and procedures. Granitic clasts containing disseminated pyrite, pyrrhotite, and minor chalcopyrite, or molybdenite were observed most commonly in one esker, that is shown in the accompanying figure.

Bulk samples from the esker ridges were obtained across 4 feet (1.2 m) of the C soil horizon in pits dug to obtain the kimberlite indicator minerals. Samples were screened at the site and rough concentrates obtained by a gravitation procedure. In the laboratory a -30+250 mesh fraction was obtained and the heavy mineral component separated for each sample using a liquid of specific gravity 2.96. These heavy mineral components were pulverized, leached with aqua regia and analyzed as shown below.

Sample	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Ag ppm	Mo ppm
E 227	62	28	82	40	—	2
E 229	20	30	48	26	—	—

Bedrock Source: The heavy mineral concentrations are slightly higher than in the other eskers sampled. A large number of mineralized clasts of quartz-feldspar-mica rocks with disseminated pyrite, pyrrhotite, and minor chalcopyrite and molybdenite are present in this esker south of Guilfoyle Township.

References: ODM GR126, p.35, Table 7.

Cochrane District

Pearce Township - Chalcopyrite, molybdenite

Location: Pearce Township (Latitude 49°38′, Longitude 82°22′) along esker ridge near the eastern boundary of the township. NTS 42G/9.

Map References: ODM Map 2166, Hearst-Kapuskasing Sheet. ODM Map 2334, accompanying GR 126.

Description: See description under Guilfoyle Township, previous page.

Sample	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Ag ppm	Mo ppm
E 228	60	26	74	45	6	—
E 233	7	46	28	10	—	—
E 238	54	26	56	54	—	—
E 243	42	47	53	46	—	—

Bedrock Source: Many granitic clasts mineralized with iron sulphides and minor amounts of chalcopyrite and molybdenite are present. The esker may have crossed a large subsurface source of disseminated pyrite, chalcopyrite, and molybdenite south of sample locality E 228.

References: ODM GR126, p.45 and Table 7.

Cochrane District

Teetzel Township - Chalcopyrite, molybdenite

Location: Teetzel Township (Latitude 49°30′, Longitude 82°22′), esker in the northeastern part of the township. NTS 42G/9.
Map Reference: ODM Map 2166 Hearst-Kapuskasing Sheet. ODM Map 2334, accompanying GR 126.
Description: See description under Guilfoyle Township, earlier in report.

Sample	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Ag ppm	Mo ppm
E 244	32	25	48	27	—	—
E 245	52	25	62	44	—	—
E 246	42	—	75	34	—	2

Bedrock Source: Mineralized granitic clasts containing iron sulphide minerals and minor amounts of chalcopyrite or molybdenite are present along the esker. A large subsurface source of disseminated pyrite, chalcopyrite, and molybdenite may be present south of sample E 228 in Pearce Township.
References: ODM GR126, p.45 and Table 7.

Conversion Factors for Measurements in Ontario Geological Survey Publications

If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE—Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in cooperation with the Coal Association of Canada.

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* The index lists only the occurrences that show significant assays for these elements.