# DPV 446

WEMINDJI AREA (MUNICIPALITE DE LA BAIE JAMES) - PRELIMINARY REPORT

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# WEMINDJI AREA

## Municipality of James Bay

J. H. REMICK

## PRELIMINARY REPORT

1977

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Gouvernement du Québec

MINISTERE DES RICHESSES NATURELLES

Service de l'Exploration Géologique

# WEMINDJI AREA

Municipality of James Bay

Preliminary Report

by

Jerome H. Remick

Québec

1976

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# TABLE OF CONTENTS

# ILLUSTRATIONS

## FIGURES



## MAPS AT THE SCALE OF : 1:150 000

INDEX MAP SHOWING THE LOCATION OF THE WEMINDJI MAP-AREA.

# WEMINDJI AREA

Municipality of James Bay

by

Jerome H. Remick

## INTRODUCTION

### Location

The Wemindji (Paint Hills) map-area, about 4,300 square miles in extent, is bounded by latitudes $52^{o}$ 30' and $53^{o}$ 00' and longitudes $76^{o}$ 00' and $79^{o}$ 00' (James Bay). An asphalt road connects the central part of the map-area with the town of Matagami, 200 miles to the south. Aircraft based at Matagami service the area. Jet service as well as daily bus service is available between Matagami and Montreal.

### Topographic and Aeromagnetic Maps

The map-area comprises 12 topographic map-sheets forming a rectangle two map-sheets north-south by six map-sheets east-west. The area is covered by N.T.S. topographic sheets 33 D and 33 C (1:250,000); by N.T.S. topographic sheets 33 D/9, 10, 15 and 16 and 33 C/9 to 16, inclusive (1:50,000); by aeromagnetic maps 7385, 7386, (1:253 440); and by aeromagnetic maps 5571, 5572, 5587, 5588, 5603, 5604, 5619, 5620, 5635, 5636, 5651 and 5652 (1:63,360), all of the Quebec-Ottawa "G" series (see figure 1).

### Previous Work

A.P. Low's geological reports (1889, 1897, 1903) provide good background data on the region. The map area is included in reconnaissance surveys by Shaw (1942) and by Eade (1966). The area to the south was mapped by Franconi (1975), that to the north by Remick (1977), Sharma (1974), and Eade (1966), and that to the east by Eade (1966). Some detailed exploration mid-way along the west shore of Ell lake in township 2616 (sheet 33 C/9) was carried out by Noranda Exploration Ltd. in 1964-1965 and by P.C.E. Exploration Ltd. in 1969.

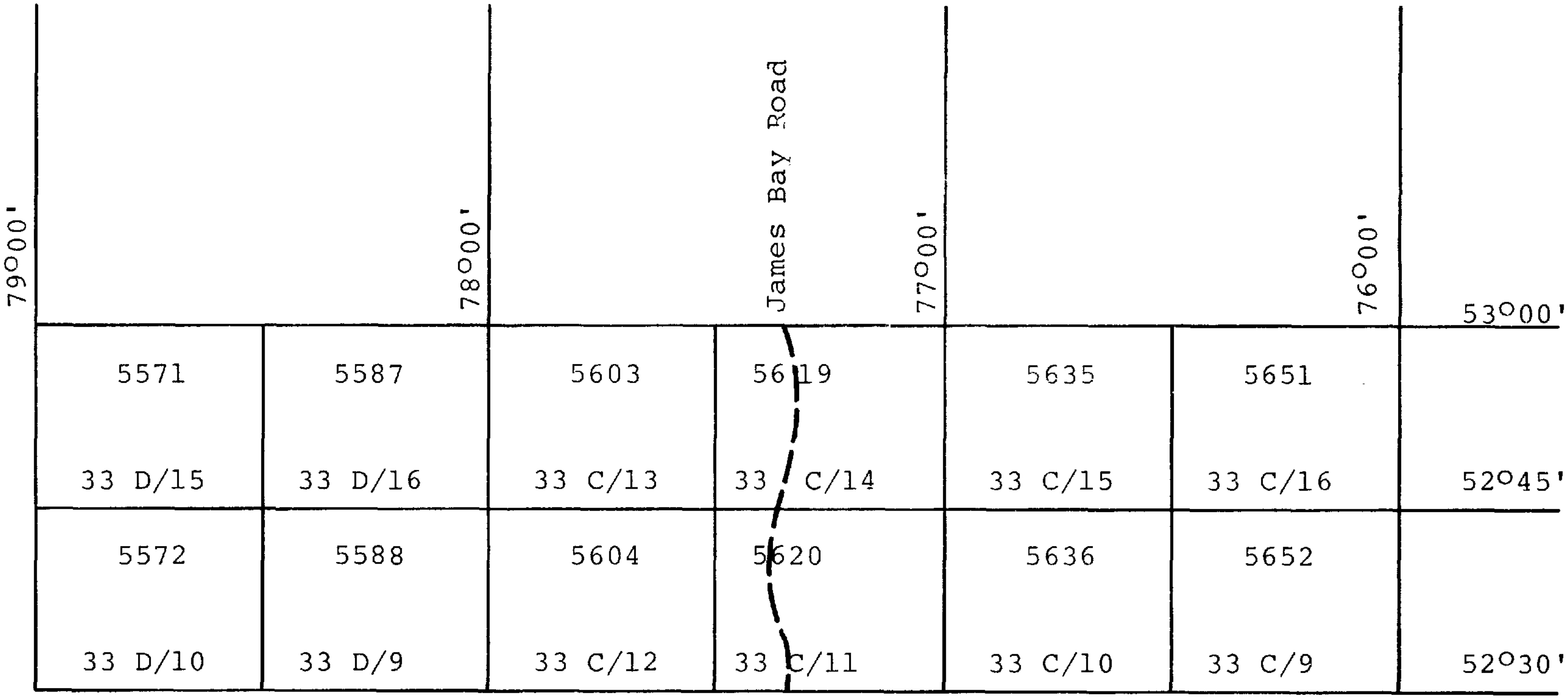


Figure 1. Sketch showing the location of topographic maps (1:50,000) and aeromagnetic maps (1:63,360) within the Wemindji map-area.

## Mapping Methods

The current work was undertaken as a one-year reconnaissance mapping project. Remick mapped the western eight sheets and most of sheet 33 C/10 using a Bell 47 G/4A helicopter to fly north-south traverses at intervals of 4 miles, with landings about every 2 miles, or more often where the geology warranted. Helicopter landing sites are lacking only in the northeast corner of the area. Four other geologists mapped sheets 33 C/15, 33 C/16 and 33 C/9 and parts of sheets 33 C/10 and 33 C/11 by canoe surveys of the shores of major lakes and inland by ground traverses at intervals of 4 miles or less. Sheets 33 C/9, C/15 and C/16 were mapped in more detail as much of the land surface around Boyd, Opinaca and Low Lakes is scheduled to be flooded by water to be diverted northward from Eastmain river to La Grande Rivière via the above-mentioned lakes for the James Bay Hydro Project(see figure 2).

In the field, geology was plotted directly on aerial photographs (1:31,680) and then transferred to 1:50,000 N.T.S. topographic sheets used as base maps. These maps are reproduced at the scale of 1:150 000 at the end of the report but they are available at the original scale from the Department, in the form of ozalid copies or microfiches.

The area was mapped during the 1975 field season.

## Access

The James Bay asphalt road, recently completed between Matagami and L.G. 2 with a side road to Fort George, traverses the central part of the map-area in a northerly direction. Several centers at intervals on the road provide gasoline,food and lodgings to those authorized to travel on the road.

In Matagami, several trucking firms, one with buses, are equipped to transport men and supplies along the James Bay road.

Float-equipped aircraft can land in most lakes throughout the area. However, a few lakes in the east part of the area, while large enough to accomodate a Beaver aircraft, are too shallow or contain boulders.

## Settlement

The Indian village of Wemindji (Paint Hills) lies in the extreme northwest corner of the map-area. A Hudson Bay Company post and a native-operated Co-Op store service the village's 525 Cree inhabitants with basic food supplies and clothing. A boat from Moosonee supplies the post twice each summer (in June and in September). Fresh food is brought in by plane regularly. A modern nursing station staffed by several nurses takes care of minor medical needs. More serious medical needs are taken care of in a new modern hospital at Fort George. Most of the resident Indian families live in recently-constructed bungalow homes. Communication to the outside is by radio telephone. Telephones are now being installed in each home. Television reception via satellite began early in 1976. An access road connecting the village to the James Bay road is under consideration.

The village of Vieux Comptoir (Old Factory) on the coast of James Bay was abondoned in 1958.

## Climate

The ice in the lakes and rivers breaks up during the last week in May. Ice floes remain in James bay until at least mid-June. Summers are generally quite hot with long days and not too much rain. The best weather is from June through mid-July. There is generally more rain and fog in August. Shorter days, cooler weather, fog and rain slow down field-work considerably after the end of August. It may take several days for the bush to dry at this time. Freeze-up starts in November.

## TOPOGRAPHY

The land surface rises gradually from the coast of James Bay to an elevation of about 700 feet at Low lake in the southeast corner of the map-area. In most places, relief is moderate with hills rising to 100 feet or less. Rolling topography of gently rounded to somewhat elongated joint-controlled hills of granitic rocks and also long, narrow hills of metavolcanics and amphibolite elongated parallel to the strike of the underlying rocks are characteristic throughout the area. Very rugged, steep-faced, joint-controlled hills of light pink leucocratic granite and a few high hills of granite in the east part of the map-area form the most prominent features.

## GENERAL GEOLOGY

The map-area lies within the Superior Tectonic Province of the Canadian Shield, and the bed rock is of Precambrian age. Rock outcrop is quite abundant throughout the area, but in its central part, there are a few large areas of muskeg devoid of rock outcrop.

Most of the map-area is underlain by various types of granitic rocks which in places contain inclusions of amphibolite and/or biotite paragneiss. Narrow zones of non-layered, fine-to medium-grained biotite paragneiss underlie many of the low areas between the granitic hills in the central part. Migmatite, consisting of biotite paragneiss and concordant layers and/or small bodies of leucocratic granite and pegmatite, occupies most of the northeast sector. A small mass of lithologically more complex migmatite underlies the north central part of the area at its northern boundary. Blocky, layered and nebulitic migmatite of pink leucocratic granite with inclusions of hornblendite, amphibolite, grey foliated biotite granite and/or biotite paragneiss underlies much of the coastal area of James Bay. A number of zones of metavolcanic rocks (mostly metabasalt) with associated metasedimentary rocks (mostly biotite paragneiss locally with layers of conglomerate; in three small areas quartzite and magnetite iron formation) and metamorphosed basic to ultrabasic intrusions as well as a number of zones of amphibolite, in places interlayered with biotite paragneiss, occur in the map-area. A small body of porphyritic alkaline syenite and another of brown-weathering peridotite were noted. Gabbro and diabase dykes, generally north-northwesterly trending but in a few places northeasterly trending, occur in the area.

The grade of metamorphism for most rocks ranges from greenschist facies to amphibolite facies. The presence of orthopyroxene in two outcrops of biotite paragneiss in the northeast part of the map-area indicates local transition to the granulite facies.

Much of the foliation strikes about east-west but a later north-south trending foliation is strongly developed in at least two areas(sheets 33 C/9, and 33 C/11).

Glacial striae trend N 75$^{\circ}$ E to N 65$^{\circ}$ E in much of the area and N 25$^{\circ}$ E to N 35$^{\circ}$ E near the coast of James Bay.

Small amounts of chalcopyrite, pyrrhotite and pyrite occur in metadiorite on the west shore of Ell lake near the eastern boundary of the area (Sheet 33 C/9) and in volcanic rocks and metasedimentary rocks in the Wemindji volcanic zone at the western boundary of the area (Sheet 33 D/15). A few plates (3cm in diameter) of molybdenite and some spodumene were noted (Shaw, GSC Map 42-10) in a white muscovite pegmatite cutting fairly fresh greenish grey basaltic lava on an island in James Bay in the western part of the Wemindji volcanic zone.

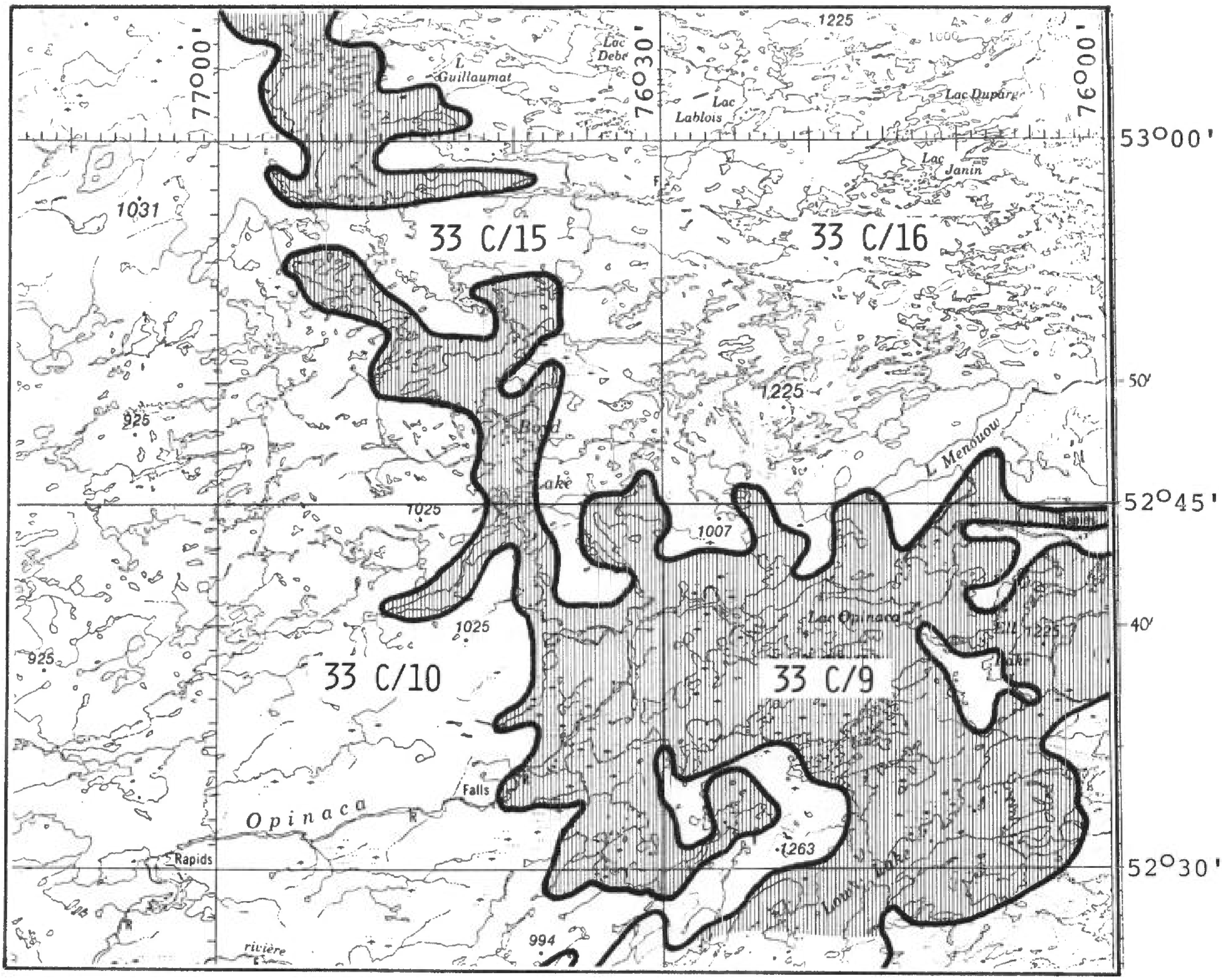


Figure 2 - Terrain to be flooded within the map-area by the James Bay Hydro Project.

## TABLE OF FORMATIONS

| | | | |
|---|---|---|---|
| Cenozoic | Quaternary | Unconsolidated Deposits | Swamp deposits, lake deposits of sand. |
| | | | Glacial and glacio-fluvial deposits of boulders, gravel, sand, silt, clay and till. |
| Precambrian | Proterozoic | Basic Dykes | Gabbro and diabase dykes. |
| | A R C H E A N | Alkaline Plutonic Rocks | Porphyritic alkaline syenite. |
| | | Ultrabasic Dykes | Peridotite. |
| | | Acidic to Intermediate Plutonic Rocks | Muscovite pegmatite, biotite pegmatite. |
| | | | Pink leucocratic granite. |
| | | | Porphyritic hornblende-biotite granodiorite. |
| | | | Hornblende and hornblende-biotite quartz diorite, diorite. |
| | | | Biotite and/or hornblende granodiorites and quartz monzonites. |
| | | Migmatites | Migmatitic biotite and biotite-hornblende paragneisses, leucocratic granite and associated rocks. |
| | | | James Bay migmatite of pink leucocratic granite with inclusions of hornblendite, amphibolite, biotite paragneiss and grey foliated biotite granite. |
| | | | Migmatite of paragneisses and amphibolite derived from volcanic and sedimentary rocks with granitic rocks. |
| | | Metamorphosed basic to Ultrabasic Intrusive Rocks In Volcano-sedimentary Zones. | Metagabbro, gabbroic metaanorthosite.<br>Small basic and ultrabasic dykes. |
| | | Metasedimentary Rocks | Biotite paragneiss and metaconglomerate; minor iron formation and quartzite. |
| | | Metavolcanic Rocks | Amphibolite.<br>Metabasalt, minor metatuff.<br>Metamorphosed acidic to intermediate volcanics with minor tuff. |

Rock units are not necessarily in their order of formation.

## Metabasalt and Amphibolite

Metabasalt, in places amphibolitized, is the dominant volcanic rock in each volcano-sedimentary zone. The rock shows its typical greenish grey color and is massive appearing in the wider parts of the larger zones. It grades to amphibolitized basalt toward the outer parts as well as the narrower parts of each zone. Pillow structures are well enough preserved for top determinations in some flows. Some of the best pillows are in outcrops of greenish grey lava along the James Bay road between milages 277 and 280 in the northern part of the large volcano-sedimentary zone that stretches across much of the southern part of sheet 33 C/11.

Amphibolite consisting of 55% to 60% well aligned hornblende needles, the remainder being grains of plagioclase, outcrops in narrow zones as well as inclusions in outcrops of granitic rock throughout the area. In places the amphibolite resembles a metasedimentary rock with compositional layering due to recrystallization forming narrow and more resistant layers, with coarse hornblende, and others, less resistant, rich in feldspar with some finer hornblende. Long, thin, resistant injected layers, several mm to several cm in width, of quartz and of granite reinforce the layered sedimentary aspect of some outcrops. Elongated and in a few places almost massive pillows occur in some outcrops and top determinations were made in a few places. Most if not all the amphibolite is of volcanic origin as compositionally and texturally the rock is similar to that occurring in narrow parts and near the edge of zones of basaltic lava.

Biotite paragneiss and narrow basic to ultrabasic sills are interlayered with metabasalt and amphibolite in each volcano-sedimentary zone. Most are not separable on the present scale of mapping.

## Acidic to Intermediate Volcanic Rocks

Schistose acidic to intermediate volcanic rocks, in places with what is believed to be minor layers of tuff, were noted in sheet 33 C/9. Most are probably close to intermediate in composition.

## Tuff

A small zone of graphitic tuff outcrops near the shore of the large peninsula southwest of the town of Wemindji in the Wemindji volcanic zone. The rock is very fine grained, black, slabby and in places very schistose. Thin films of graphite are evident on schistose planes. Very narrow fracture fillings of chalcopyrite and pyrrhotite were noted in places.

## Biotite Paragneiss

Biotite paragneiss is the predominant type of metasedimentary rock in the volcano-sedimentary zones. It also occurs in low areas between the high hills of pink leucocratic granite in the north central part of the map-area and in the migmatite in the northeast part of the area. Small inclusions of paragneiss were noted in some granitic outcrops throughout the area.

Biotite paragneiss in the large volcano-sedimentary zone in the south part of sheet 33 C/11 is characteristically tan to rusty brown on the weathered surface, slabby, fine grained and has a fine granular or sugary texture with grains being about 1 mm. Some specimens have a slight sandy feel. Much of the rock is non-layered but in places a gradational change in biotite content is reflected by white to brown layers from 1 mm to 3 cm, many being 1 to 2 mm. Thin (1-5 mm) lit-par-lit layers of granitic rock and in places quartz make up from several per cent and in a few places up to 15% of most outcrops. Cross joints normal to the bedding are well developed. Most of the rock appears the same from outcrop to outcrop. However local development of porphyroblasts of feldspar, andalusite and garnet in a few areas as well as the presence of local layers of conglomerate breaks the homogeneity of this rock unit.

In hand specimen the rock is homogeneous and equigranular consisting of from 5% to 10% fine brown biotite flakes, the remainder being quartz and feldspar. Accessory amounts of pyrite occur in places giving the rock a rusty brown color on the weathered surface. Narrow layers of sillimanite up to 7 mm thick occur in a few outcrops southwest of the south end of Saganash lake (sheet 33 C/11).

Porphyroblasts of andalusite have developed locally in a few small areas in response to greater than normal stress as is shown by crenulations along schistose planes. The amount of biotite is generally greater than in outcrops without andalusite. The andalusite occurs in rectangular grains with their long axis parallel to the direction of schistosity. Most are about 5 mm to 2 cm, but some are as much as 3 cm in length. The grains are grey, contain inclusions of the rock forming minerals, show irregular boundaries with the paragneiss and are resistant on the weathered surface. The amount of andalusite within any place in a single outcrop is variable and gradational. In one outcrop the range was generally 0 to 15% with about 50% in a 5 meter wide layer.

Small (1-2 mm) octahedral porphyroblasts of pink garnet occur disseminated in a few outcrops. They are generally not intermixed with andalusite although the best development of garnet was next to a zone containing andalusite.

From 20% to 35%, 1 mm to 4 mm porphyroblasts of white feldspar were noted in a few outcrops on the shore of Blacksmith lake.

Several small dykes of ultrabasic rock were noted to cut the paragneiss on the shore of Blacksmith lake in sheet 33 C/11.

Biotite paragneiss in the large area of migmatite in the northeast corner of the map area is coarser in grain size than that in the volcanic zones. It is described in the section on migmatitic biotite and biotite-hornblende paragneiss.

Much of the low area between the hills of pink leucocratic granite in the north central part of the map-area is underlain by biotite paragneiss. The distribution of these two rock types can only be shown by ground traverse. Much of the paragneiss is covered by a thin layer of overburden and so outcrops are not common. The rock has a black fresh surface, in some outcrops a rusty weathered surface and generally shows no compositional layering. The pink leucocratic granite has not penetrated the paragneiss in lit-par-lit fashion: the contacts appear sharp. Some outcrops show up to 5% very narrow white granitic layers.

## Conglomerate

Conglomerate layers occur within zones of biotite paragneiss in almost every volcano-sedimentary zone, and within a few isolated zones of biotite paragneiss not associated with amphibolite or volcanic rocks. Conglomerate was not observed in association with the biotite paragneiss in the area of migmatite in the northeast part of the map-area. Except for one outcrop on Pontax river, conglomerate was not noted in biotite paragneiss in the vast area of migmatite mapped by the writer in previous years (Remick,D.P. 274 and P.R. 514).

Many occurrences of conglomerate consist of small layers making up only part of an outcrop of biotite paragneiss. A few occurrences are outcrop size or larger. Some of the most interesting exposures are in various places in sheet 33 C/9 and on the shore of Saganash lake in sheet 33 C/11. The matrix is similar in composition to the biotite paragneiss. Granite pebbles and boulders and sedimentary rock fragments occur in most conglomerate outcrops; diorite and hornblendite pebbles were noted in one outcrop. The granite pebbles and boulders are white and generally spherical. In one outcrop they consist of about 25% quartz, 3% biotite and the remainder white feldspar. The sedimentary fragments are slabby being elongated parallel to their bedding and consist of varying amounts of quartz, feldspar, biotite and/or hornblende. They are thus similar in composition to the biotite paragneiss. In some outcrops there are several types of sedimentary rock fragments due to slight variations in their grain size and mineralogy which is reflected in color changes in the fragments.

## Iron Formation and Quartzite

A very small area of banded quartz-magnetite iron formation was observed in sheet 33 C/11 and is well shown on the airborne magnetic map by a small round magnetic anomaly of high intensity. Banded iron formation also outcrops nearby on the west side of the James Bay road just south of milage 277. Here the occurrence consists of interlayered iron silicates, quartz, and magnetite.
Layers are slightly twisted. Magnetite layers are from 2 to 5 mm and layers of granular quartz of from 1 cm to 3 cm. The weathered surface is rusty in places.

A small outcrop of quartzite occurs on a peninsula in Blacksmith lake (Sheet 33 C/11).

## Metagabbro and Gabbroic Meta-Anorthosite

Sills of metagabbro and in a few places ultrabasic rock occur in all volcano-sedimentary zones. Bodies large enough to be shown on the geological maps occur at the west edge of sheet 33 C/9, at the east edge of the adjoining sheet 33 C/10, and in sheet 33 C/11. Various compositional facies occur in the mappable bodies.

Gabbroic meta-anorthosite occurs as a minor phase in several closely spaced outcrops in the volcano-sedimentary zone in sheet 33 C/11. The rock contains subhedral to euhedral white plagioclase phenocrysts generally from 1 cm to 5 cm with a few up to 15 cm in length in a medium grained to coarse grained gabbroic matrix. The phenocrysts display sharp twinning striations and are labradorite in composition.

## Small Basic and Ultrabasic Dykes of Various Composition

Small basic to ultrabasic dykes of various compositions were noted cutting biotite paragneiss on Blacksmith lake (Sheet 33 C/11) and in the area of migmatite in the northeast part of the map area. Metamorphism has altered their original mineralogy.

## Migmatitic Biotite and Biotite-Hornblende Paragneiss and Associated Rocks

The northeast part of the map-area is underlain predominantly by migmatitic biotite and biotite-hornblende paragneisses. The paragneisses are interbanded with leucocratic granitic rocks which form concordant layers whose thicknesses range from a millimeter to hundreds of meters. In outcrop, the paragneiss/granitic rock ratio can have any value. From the air outcrops rich in biotite paragneiss are generally low in relief, moss covered and often rusty colored. Granitic masses show more relief.

Typical paragneisses consist of calcic oligoclase, quartz, biotite, and in some, hornblende. More than half the paragneisses contain hornblende, and about half contain potash feldspar. Garnetiferous paragneisses occur sporadically throughout the area. In two places, hypersthene is present, along with biotite or biotite and hornblende. Paragneisses are typically fine-to medium-grained, foliated and have a granoblastic texture indicative of extensive recrystallization.

The leucocratic granitic rocks that form mappable bands in the migmatized terrain are pink- to grey-weathering, and are generally quartz monzonitic in composition. The biotite content is normally less than 2%, and the plagioclase composition averages $An_{17}$ (oligoclase). Locally these medium grained rocks show a foliation due to a preferred dimensional orientation of quartz and feldspar grains.

Concordant bands of augite-bearing biotite-hornblende granodiorite-quartz monzonite occur in several places (particularly near Boyd Lake) in sheet 33 C/15. The rock is homogeneous, foliated, and locally contains small melanocratic inclusions.

Foliated biotite-hornblende granodiorite occurs locally as thick concordant layers that are folded with the surrounding paragneisses. This rock contains about 6% brown biotite and 1% hornblende, on average. It is typically medium-grained, but locally contains equant crystals of microcline up to 1 cm in length. Its homogeneity and locally porphyritic texture suggests that this rock-type is intrusive in origin; however in places, there appears to be a transition in texture and composition between this rock and highly recrystallized paragneiss.

Hornblende-rich (10%-20%) quartz monzonite-granodiorite occurs in two large concordant bodies in sheet 33 C/16. This rock is well foliated, and locally contains small lenticular, melanocratic inclusions. The plagioclase is notably sodic, averading $An_9$ in composition.

In the northeast corner of sheet 33 C/16, there are numerous thin layers of ultrabasic rock that are concordant with the adjacent gneisses and appear to be folded with them. The ultrabasic rocks consist of variable proportions of green hornblende, phlogopite, orthopyroxene, magnesian olivine (may be absent), and opaque minerals.

## James Bay Migmatite

Blocky, layered and nebulitic migmatite of pink leucocratic granite containing inclusions of amphibolite, hornblendite, biotite paragneiss and/or foliated biotite granite and cut by pink pegmatite underlies most of the coastal area of James Bay. The type of inclusions present, as well as their form (blocky, layered or nebulitic), their structure, and their amount varies within a single outcrop and from outcrop to outcrop. Small isolated plutons of pink granite and syenite occur in places. The lithologic and structural elements characteristic of the James Bay migmatite continue northward to at least latitude 54° 00', but do not continue very far inland.

Granitic plutons show fairly good jointing. Small plutons rise above outcrops of migmatite which are generally flat, fairly low, and poorly jointed. Parts of some granitic outcrops are flat due to good horizontal jointing. The flat surface, low relief and poor jointing characteristic of the migmatite together with its intermixed pink and grey weathered surface is an aid to distinguishing migmatites from the air along the coast of James Bay.

Hornblendite occurs only in a few outcrops, usually as small angular to rounded fragments but in places as pieces of larger blocks brecciated and cemented with pink leucocratic granite. The rock is black, medium-grained and consists of biotite and hornblende. Small inclusions of hornblendite were noted inland.

Amphibolite, probably of volcanic origin, occurs as small to large blocks and blocky layers generally with sharp contacts although in places there is a narrow zone of grains of hornblende in the granite at its contact with the inclusion. In places it is apparent by the present configuration of many closely spaced small angular fragments of amphibolite that they were once part of a large block which has been brecciated and filled with pink leucogranite. The amphibolite is black, fine grained and consists of about 70% hornblende and 30% feldspar.

Grey foliated biotite granite and grey recrystallized biotite paragneiss occur as fairly thin and long layers or narrow lenses which are often swirly and partly absorbed by the granite showing a gradational contact. This is in contrast to the rather sharp contact shown by amphibolite and hornblendite inclusions. A number of outcrops consist of a swirly intermixture with gradational boundaries of grey foliated biotite granite and/or biotite paragneiss and pink leucocratic granitic rock.

Pink pegmatite dykes often with a few percent biotite in booklets up to 6 cm in length crosscut many outcrops. Along the coast of James Bay, white pegmatite is restricted to crosscutting volcano-sedimentary zones.

The strike and dip of foliation is variable even within a single outcrop of migmatite, the dip often being shallow to horizontal. In contrast, the foliation in all volcano-sedimentary zones in James Bay is as uniform and of the same nature as that inland.

## Migmatite of White Leucocratic Granite, Biotite Orthogneiss, Hybrid Diorite and Metamorphosed Rocks from Volcano-Sedimentary Zones.

An area of layered to blocky migmatite of biotite orthogneiss, intermediate hybrid rocks including hybrid diorite and various types of metamorphosed rocks from volcano-sedimentary zones; intruded by white leucocratic granite; and cut by pegmatite dykes and quartz veins is outlined in the north part of the sheet 33 C/13. Some outcrops consist of an intimate intermixture of various types of metamorphosed rocks from volcano-sedimentary zones including amphibolite and biotite paragneiss and white leucocratic granite in places as lit-par-lit layers. Many outcrops consist of white leucocratic granite with about 20% or slightly more inclusions. Outcrops are low and flat in contrast to higher hills of granitic rocks containing only a small amount of inclusions. This area of migmatite could be subdivided by ground mapping into several smaller formations including one of granite with less than 20% inclusions. This was difficult to do by helicopter. The migmatite area is shown on the preliminary map to separate it from the surrounding area of granite with only a small percentage of inclusions.

## Biotite and/or Hornblende Granodiorite and Quartz Monzonite

Granitic rocks, mostly granodiorite to quartz monzonite in composition, cut by pink pegmatite and generally containing inclusions of biotite paragneiss and/or amphibolite underlie much of the map-area. They are generally medium-grained and range from massive to foliated and white to grey to light pink. Most are equigranular but in a few localities such as the south part of sheet 33 C/12 they contain microcline phenocrysts up to 3 cm. They contain 2% to 10% biotite and/or hornblende, 20% to 25% quartz and in places accessory magnetite, the remainder being plagioclase and microcline. Accessory amounts of sphene and epidote can be seen in some hand specimens rich in hornblende. Biotite is usually the dominant mafic but hornblende, often in equal amounts, occurs in rocks of higher mafic content. Hornblende is the dominant mafic in a few areas.

Small areas of pink and grey leucocratic granite are included in this rock unit.

North to west-northwest trending jointing is quite striking from the air. Easterly trending jointing is less well developed. Horizontal jointing is present in some outcrops. Most of the granitic terrain consists of fairly low hills.

Inclusions of amphibolite and/or biotite paragneiss make up a small percentage of most outcrops; in some their amount varies markedly in various parts of the same outcrop. Locally, the percentage of inclusions is high enough to designate small areas as migmatite but most of these areas are too small to define at the present scale of mapping. The percentage of inclusions is usually higher in the granitic terrain defined in the legend by unit 8 than in the granitic bodies defined by units 9, 10 and 12.

Except for the pink leucocratic granite, the grey porphyritic hornblende-biotite granodiorite, and the hornblende-biotite quartz diorite defined in the legend by rock units 12, 10 and 9 respectively it is difficult to subdivide the granitic terrain meaningfully in a helicopter reconnaissance survey as physical characteristics and lithological changes of the various types of granitic rocks are not distinctive enough and lithologies often change over fairly short distances.

## Hornblende and Hornblende-Biotite Quartz Diorite and Diorite

Grey hornblende and hornblende-biotite quartz diorite and diorite in many places cut by pink leucocratic granite and pegmatite underlie large areas in sheets 33 C/9 and 33 C/10. In places pink leucocratic granite and pegmatite are more abundant than quartz diorite. The exact contact of the quartz diorite with other rock units in the west and south parts of sheet 33 C/10 is not certain due to the reconnaissance nature of the project so the contact has been drawn to include the maximum extent of the quartz diorite.

The rock is medium grained, homogeneous and equigranular. It consists of about 10% to 15% quartz, 5% to 8% hornblende, in places 2% biotite and white feldspar. Accessory sphene and epidote are characteristic. The weathered surface is rather smooth and white and the evenly distributed hornblende grains give it a salt and pepper effect.

## Porphyritic Hornblende-Biotite Granodiorite

A small mass of light grey porphyritic hornblende-biotite granodiorite outcrops in the north central part of the map-area. The rock contains 10% to 20% microcline phenocrysts, 20% quartz, 5% hornblende, 2% biotite, accessory sphene and the remainder plagioclase and potash feldspar. Concentrations of from 70% to nearly 90% phenocrysts occur in a few places in areas up to about one square meter. The phenocrysts are from 2 cm to 6 cm long averaging 3 cm and are generally white although in a road cut they have a light pink tinge and show a good cleavage and carlsbad twins. They contain about 5% of the rock forming minerals as inclusions in random distribution and so may be porphyroblastic in origin. In a few outcrops where the other rock forming minerals are fairly well aligned, the phenocrysts are random in orientation. Quartz occurs as large groups of glassy grains. The mafics are in small grains of about 2 to 3 mm. The feldspar is white, and the plagioclase shows sharp twinning striations.

The rock is massive and jointed both horizontally and vertically. A few narrow lenticular layers and/or lenses of biotite paragneiss and/or amphibolite occur as inclusions in some outcrops. Pink pegmatite dykes with a small amount of biotite and pink leucocratic granite cut the rock. Because of its homogeneity, general lack of inclusions and massive nature, the porphyritic granite is believed to be one of the youngest granitic rocks in the area, being older than the pink leucocratic granite and probably younger than most granitic rocks to the south. It appears closely related to the granitic rocks in the map-area to the north, most of which are massive and somewhat porphyritic. Porphyritic granites are not common in the map-area. About the only other locality in which they were observed to any extent is near the southern part of sheet 33 C/12 but here the phenocrysts are not as large.

## Pink Leucocratic Granite

Pink leucocratic granite underlies the central part of the map-area in the vacinity of Old Factory and McNab lakes and the north part of the northwest corner continuing for a short distance northward into the adjacent map-area. Characteristically it forms high hills (the highest in the area) up to 600 feet above lake level which usually show steep joint controlled cliffs.

The rock is massive, medium-to coarse-grained, homogeneous and broadly jointed. It consists of microcline, plagioclase, about 20% to 25% quartz and usually less than 1% biotite.

Inclusions are not common but in places there are a few small angular blocks of amphibolite and/or long narrow lenses of biotite paragneiss. Large mappable parts of a former volcano-sedimentary zone (mainly amphibolite) occur in several places along strike in the pink leucocratic granite a few miles north of the northwest corner of the map-area. The contact is sharp between the inclusions and the granite and there are no signs of assimilation.

Small pink pegmatitic phases in gradational contact with the granite are common and within them large cleavage fragments of microcline with included quartz show well developed graphitic texture. The pegmatite consists of quartz and feldspar and in a few places thin booklets of biotite. Cross cutting pegmatites are not common.

Biotite paragneiss in small masses, unfortunately not mappable in our reconnaissance work, occur in low areas between large hills of leucocratic granite and show almost no lit-par-lit penetration by the granite. Contacts are sharp and there is no assimilation.

Pink leucocratic granite cuts the other nearby granitic rocks but itself is not cut by other granitic rocks. It is believed to be the youngest granitic rock in the map-area.

## Pegmatite and Aplite

A fairly thick zone of white pegmatite outcrops north of Saganash and Blacksmith lakes and to the west of the former lake at the contact of the volcano-sedimentary zone with the granitic rocks to the north (sheet 33 C/11). Isolated outcrops of white pegmatite cut the Wemindji volcano-sedimentary zone. The rock consists mainly of quartz and feldspar and a small amount of muscovite. In the Wemindji volcano-sedimentary zone (sheet 33 D/15), a few plates of molybdenite about 3 cm in diameter were noted in two outcrops of white pegmatite and spodumene has been reported in an outcrop on an island in James Bay.

Pink leucocratic pegmatite outcrops throughout much of the area in small dykes. It consists mainly of quartz and feldspar with small amounts of biotite in the larger dykes.

Aplite dykes are not common. Black tourmaline crystals up to 8cm in diameter occur in a few of the muscovite pegmatites cutting volcano-sedimentary zones.

## Quartz, Calcite, Epidote and Pink Feldspar Joint and Fracture Fillings

Fracture fillings a mm or two thick of pink feldspar and of epidote occur throughout the map-area, especially in granitic rocks. In a few places pink feldspar and less commonly epidote filled fractures were noted in granitic rocks at their contact with a gabbro dyke.

Quartz veins of varying thickness are most commonly associated with zones of volcano-sedimentary rocks. Their most prominent occurrence is in the porphyritic alkaline syenite where milky white quartz veins up to 20 cm in thickness form a network in subparallel arrangement trending northeasterly.

## Peridotite

Two short northwesterly trending segments of a dyke-like plug about 45 meters in width of peridotite cut an outcrop of intermixed granodiorite and gneiss in the northeast corner of sheet 33 C/13. The weathered surface of the dyke is deep rusty brown in the center grading outward to tan and finally black at the edge. The edge of the dyke is somewhat schistose; the remainder being massive. Serpentine-filled fractures 1 to 3 mm thick are resistant on the weathered surface. The rock is well jointed and in places there are round pits on the weathered surface. From the air the rusty peridotite resembles a mineralized zone and so the location and identification of this rock type is important.

## Porphyritic Alkaline Syenite

Porphyritic alkaline syenite underlies two large islands in James Bay in the western part of the Wemindji volcanic zone (sheet 33 D/15). In hand specimen the rock consists of about 70% thin platy rectangles of salmon pink microcline up to 4 cm in a fine black matrix. Two thin sections showed 65% to 75% perthitic microcline about 20% aegerine-augite and 3% to 15% albite as well as accessory amounts of sphene and opaques. 3% arfvedsonite was noted in one section.

The rock is massive, fresh, hard to break and of dark color on its weathered surface. It is uniform in composition and in texture and jointed at wide intervals. A northeasterly trending network of quartz veins from 3 to 20 cm in width cuts across much of the outcrop. Its contact with the surrounding volcanic rocks is quite sharp. No inclusions were noted. Due to its greater resistance the syenite is noticeably higher in relief than the adjacent volcanic rocks and migmatite.

This is the first occurrence of this type of rock the writer has observed or heard of in the James Bay area of Quebec. It is believed to be one of the youngest Precambrian rocks in the area, probably being slightly older or possibly slightly younger than the late Precambrian diabase and gabbro dykes.

## Gabbro and Diabase Dykes

Gabbro and diabase dykes occur throughout the map-area and are believed to be the youngest rock. The dykes are restricted in occurrence to certain localities often occurring in small sub-parallel swarms, rather than being evenly distributed throughout the area. The largest dykes are about 90 meters in width. However, most major dykes are between 30 and 60 meters in width. The larger dykes outcrop discontinuously for many kilometers, in some cases crossing the map-area and continuing into adjacent areas. Local variation of their strike produces rather sinuous forms. From one up to a dozen or more sub-parallel striking dykes (mostly a few inches to several feet in width) may outcrop close to a major dyke.

The term gabbro is used for the larger and coarser grained dykes and diabase is used for the narrow fine-grained and aphanitic dykes. The latter are too small to be shown at the present scale of mapping.

Most dykes trend north-northwest; one large dyke trends northeast; their age relationship is not known.

In outcrop the rock is very resistant and rounded. Exfoliation occurs in places. Glacial ice has sculptured some dykes into *roches moutonnées*. The larger dykes form the cores of hills up to 25 meters high, the country rock on either side dropping off sharply to ground level; in a few places the borders of the dyke and the country rock are covered by overburden.

From the air, the larger dykes have the characteristic appearance of an asphalt highway, in places gently curved, due to their dark or rusty brown color, constant width, straight line contact with the country rock and well developed cross joints. In detail their contacts with the wall rock are in places zig-zag and their thickness may vary within short distances along strike. Usually they can be followed for short distances after which they lense out and reappear a bit farther on.

The edge of the dyke is usually steep to vertical and the contact is quite sharp with no assimilation of the wall rock. In a few places a red coloration is noticeable in granitic wall rock for from a few centimeters to a meter or so outward from the contact with the dyke. Angular fragments of granite occur in the margins of some dykes.

The rock is broadly jointed and very hard, breaking with an angular fracture. Its very massive nature suggests that major regional stressing,shown by foliation in other rocks, took place before their emplacement. Two broad sets of joints are generally present, probably developed due to contraction on cooling. The best developed set is normal to the trend of the dyke and the other set is almost parallel to its trend. The dykes are believed to have been intruded along tension fractures. Offsets along strike are in general due to the en échelon nature of the tension fractures rather than post-dyke faulting. However displacement due to post-dyke faulting was noted.

A chill zone of aphanitic rock 6 cm or more in thickness marks the edge of each dyke. The finer grained rock is dark grey to black on its fresh surface and the coarser rock is dark greenish grey to grey. The weathered surface is either dark or due to the weathering ofpyrite rusty brown.

In hand specimen the rock is equigranular and homogeneous. A few dykes contain up to 5% pale yellowish green saussuritized plagioclase phenocrysts up to 2 cm. Medium grained rectangular plagioclase laths with interstitial anhedral green pyroxene impart the typical diabasic texture to most dykes although some show a granitic texture. The rock contains from 50% to 60% plagioclase, the remainder being pyroxene, minor amounts of magnetite and in places a few grains of pyrite. Thin sections show labradorite often highly saussuritized, augite, and less than 5% each of hornblende, biotite and opaques. 2% olivine occurs in one section and 5% quartz in another.

While many dykes contain magnetite, only a few are indicated by anomalies on regional aeromagnetic maps. The most pronounced aeromagnetic anomaly caused by a dyke is due to the northeasterly trending dyke in the southeast cornor of the map-area.

## Boulders, Gravel, Sand, Silt, Clay and Till Deposits

A large sand plain with layers of gravel covers the north central part of the area on both sides of the James Bay road. East-northeast trending glacial hills of sand with a sprinkling of boulders on top occur in places. Boulder beaches occur near the top of some of the higher hills. Marine clay underlies the sand in places.

Glacial striae trend about N 75° E to N 65° E in the east part of the map-area and from N 25° E to N 35° E near James Bay.

## METAMORPHIC FACIES

The grade of metamorphism for most rocks ranges from greenschist facies to amphibolite facies. The presence of orthopyroxene in two occurrences of biotite-bearing paragneiss in the northeast corner of the map-area indicates local transitions to the granulite facies.

Porphyroblasts of garnet were noted throughout the area in some outcrops of biotite paragneiss and in white leucocratic granite in contact with them,as well as in a few outcrops of amphibolitized basalt.

Rectangular porphyroblasts of andalusite containing small inclusions of minerals found in the host rock are limited to a few of the more highly stressed outcrops of biotite paragneiss in the volcano-sedimentary zone on the south shore of Blacksmith lake (sheet 33 C/11).

Small anhedral porphyroblasts of white feldspar were noted in a few outcrops of biotite paragneiss on the north shore of Blacksmith lake.

A few narrow layers of sillimanite occur in biotite paragneiss south of the west end of Saganash lake.

Narrow layers of iron silicate were noted in an outcrop of iron formation on the west side of the James Bay road just south of milage 277 (sheet 33 C/11).

## STRUCTURAL GEOLOGY

Metamorphic foliation is well developed throughout the map-area as schistosity and/or compositional layering in the metasedimentary and metavolcanic rocks while a coarser gneissosity is more common in the metaplutonic rocks. Pink and white pegmatite and leucocratic granite are generally unfoliated except in the migmatite complex in the northeast part of the map-area. Much of the foliation strikes generally east-west but a later north-south trending foliation is strongly developed in much of sheet 33 C/9,the west part of sheet 33 C/11, and the east part of sheet 33 C/12.

The structure is very complex in the well-exposed migmatitic terrain in the northeast corner of the map-area (sheets 33 C/15 and 33 C/16). The general strike of the rock units in this area is east-west; dips are moderate to steep, although in several areas, particularly near Boyd lake, dips of less than 40° are common. The rocks are intensely folded, with the foliation tracing out the folds. Isoclinal folds predominate in the north halves of both map sheets, whereas both open and isoclinal folds are common in the south halves. Near north-south strikes are commonplace in the south halves of the sheets. About 2/3 of all lineations (primarily the axes of small folds) trend approximately east-west, while the rest are scattered in the other directions. Plunges between 20° and 30° are most common, and almost all lineations plunge at 40° or less. East and west-plunging lineations are approximately equally common. Domical structures are present in both map sheets.

In many places along the coast of James Bay as far northward as latitude 54° 00' both the strike and dip of the foliation in the migmatite is variable from outcrop and even within a single outcrop; the dip often being shallow to horizontal. The foliation in zones of volcano-sedimentary rock and in zones of amphibolite in James Bay is similar to that inland: subvertical dips and a constant strike. A bit inland from the shore of James Bay, the foliation in the granitic and gneissic rocks is constant with steep dips and follows the regional trend.

Northerly striking joints are well developed in most areas of granitic rock; this is very evident from the air. An easterly trending set of joints is much less prominent.

A decrease in the size of feldspar and quartz grains from south to north in a few layers of biotite paragneiss and a decrease in the size of pebbles from south to north in an outcrop of conglomerate in the north shore of Blacksmith lake (sheet 33 C/11) as well as northeasterly facing pillow tops somewhat further west in outcrops on the James Bay road indicate that tops in at least the northern part of the volcano-sedimentary zone in this area are facing north. Positive pillow top determinations could not be made on the south part of this zone. While not apparent in many outcrops, grain gradation should be a useful tool when more detailed work is undertaken.

Pillow top determinations could be made in almost every volcanic zone in the map-area except for those in sheet 33 C/9.

## ECONOMIC GEOLOGY

Mineralization within the maps-area occurs in the following host rocks: belts of metamorphosed volcano-sedimentary rocks, metadiorite, biotite paragneiss, and pegmatite. From our observations the first two geological environments appear to be the most favorable for prospection. The sulphide showings on the west shore of Ell lake (sheet 33 C/9) are the only ones that have been examined in detail by mining compagnies prior to our geological mapping.

Sulphide mineralization occurs in long, rusty and in places silicified zones parallel to the foliation in all belts of metamorphosed volcano-sedimentary rocks and in a few zones of amphibolite. The rusty zones usually result from small lenses of massive or disseminated pyrite and/or pyrrhotite and in a few places contain magnetite and/or a few grains of chalcopyrite. Narrow chalcopyrite-filled fractures in graphitic tuff in the Wemindji volcano-sedimentary zone, about 7km southwest of the village of Wemindji (Nouveau Comptoir-Paint Hills), and mineralization in the east end of this zone are interesting enough to warrant detailed prospection of the entire zone (sheet 33 D/15).

Small amounts of chalcopyrite along with pyrite and pyrrhotite and in a few places magnetite occur along foliation planes, in fractures cross-cutting the foliation, and as disseminations within rusty zones in metadiorite in two main showings on the west shore of Ell lake (sheet 33 C/9). Almost the entire area in this topographic sheet is scheduled to be flooded in the next few years.

Rusty areas in biotite paragneiss apparantly caused by small amounts of disseminated pyrite were noted in a few places in the northeast part of the map-area. Pyrite has weathered out in some occurrences. This type of mineralization does not appear to be of economic interest.

A few flakes of molybdenite and a little spodumene have been reported by Shaw (G.S.C. Map 42-10, 1942) in a white muscovite pegmatite cutting greenish grey lava on an island in James Bay in the Wemindji volcano-sedimentary zone (sheet 33 D/15). A few flakes of molybdenite were noted in a similar pegmatite inland near the east end of this zone. These pegmatite masses are too small to be of economic interest. The only other area where large white pegmatites were observed is north and west of the large volcano-sedimentary zone that underlies the south part of sheet 33 C/11; time did not permit examinations of these pegmatites.

The various areas in which mineralization was observed are described in detail below. Their location is shown on the accompanying geological maps by an encircled number and on the index map in Figure 3 accompanying this report. While mineralized zones M-2 through M-7 (see figure 3) are not significant economically, they are indicative of the type of mineralized zones in volcanic rocks in sheet 33 C/9. Our work and the geological map made previously by Noranda Exploration Co. Ltd. indicate that there are a number of rusty zones in sheet 33 C/9 and the adjoining east part of sheet 33 C/10 consisting of pyrite, in places pyrrhotite, more rarely magnetite, and in a few places a few specks of chalcopyrite.

Mineralized Zone M-1 (Sheet 33 C/9)

The sulphide showings on the west shore of Ell lake in township 2616 are the only showings in the map-area that have been examined in any detail by mining companies.

Noranda Exploration Co. Ltd. made the discovery in 1964 and during that year and the following year carried out ground geophysics (EM and Mag.),prospection, trenching and geological mapping (GM-18256) and pack sack drilling (3 shallow holes) (GM-18326). The mineralization noted in hole EL-1 (a 50 foot hole) is logged as follows (GM-18326): a shear zone at 15.3 feet of .8 feet with 1% pyrite and chalcopyrite; a shear zone at 29.5 feet of 1.5 feet containing less than 2% pyrite and chalcopyrite; one inch of massive chalcopyrite at 43'; and several narrow layers, ¼" to .4' of pyrite. The logs of the other two holes are not available.

In 1969 PCE Explorations Ltd. carried out additional ground geophysics (EM and Mag.) and geochemistry (GM-24610) and drilled two holes totaling 561 feet (GM-24611). Their drilling intersected metagranodiorite with a narrow zone of meta-andesite. Calcite and jasper filled fractures occur in both rocks types. Sulphide mineralization is logged as occurring in both rock types in a few zones up to 4 feet thick carrying from 1% to 2% disseminated blebs and crystals of pyrite in places with blebs of chalcopyrite as well as zones containing a few scattered pyrite cubes. The claims were abondoned as the amount of chalcopyrite was very small.

Copies of the results of most of the surveys undertaken by Noranda and PCE are available from the Quebec Department of Natural Resources as per the "GM" numbers cited above.

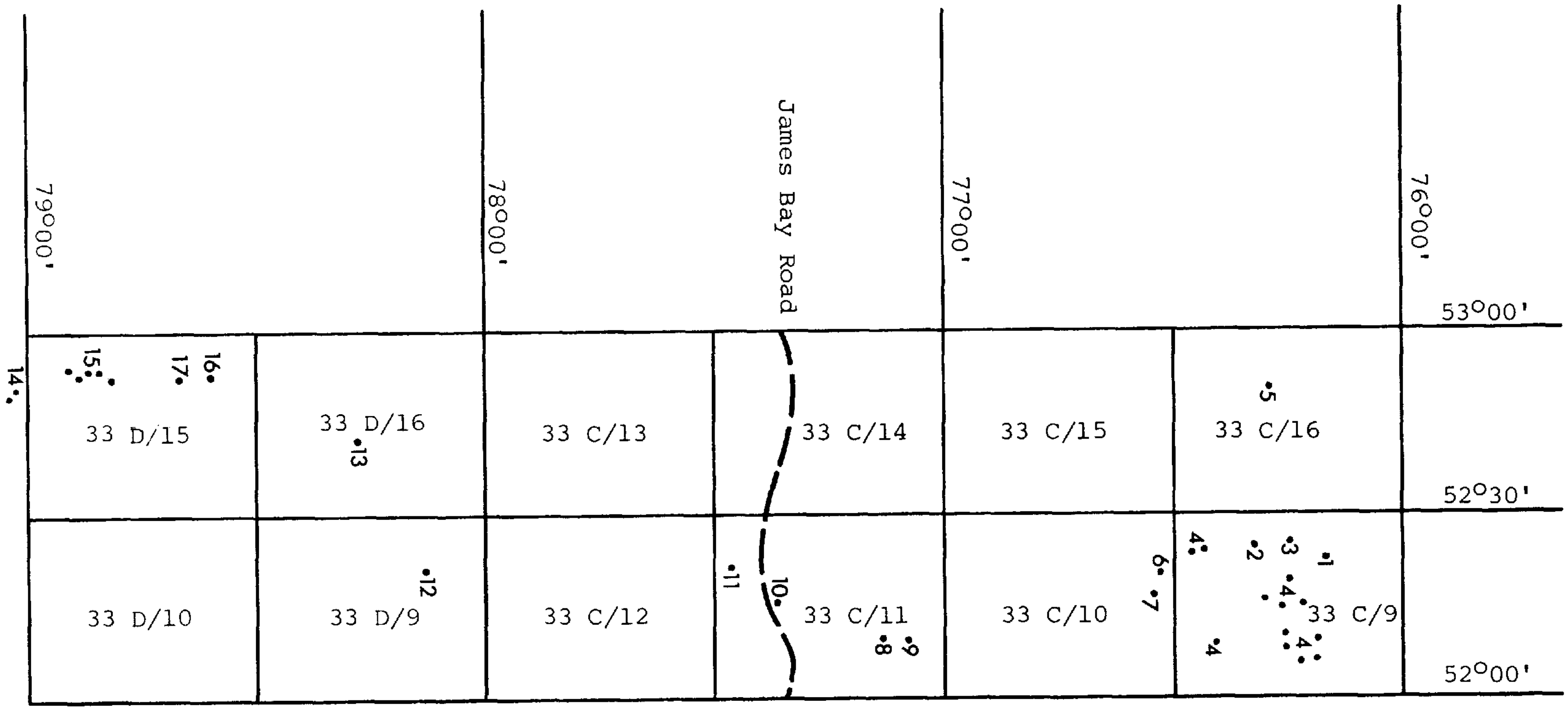


Figure 3 - Sketch showing the location of mineralized zones described in this report. For the exact location of each showing, refer to the geological maps at the end of the report.

The main mineralized areas are in two zones about 600 m apart on the west shore of Ell lake and on a small island on strike about 1.60km to the northeast. The two mainland showings contain pyrite, minor pyrrhotite, small amounts of chalcopyrite, and locally magnetite in a dark grey metadiorite along foliation planes, in fractures crosscutting the foliation and in small veins. Mineralization also occurs as disseminations of pyrite in several large rusty zones in lighter colored and less well foliated metadiorite. Azurite and malachite stains occur in places along fractures. Calcite rhombs and terminated small quartz crystals were noted by us in a small vuggy vein. Several per cent disseminated pyrite occurs along west striking joints in a shistose metadiorite close to a 2 m wide north-northwest trending diabase dyke on a small island about 1.6km to the northeast of the two main showings.

While these showings are local in extent and themselves of no economic value they do indicate the possibility of larger deposits in the same geological environment. The entire area is scheduled to be flooded in a few years.

Mineralized Zone M-2 (Sheet 33 C/9)

A silicified mineralized zone in metabasalt approximately 6 m across strike and 60 m along strike consisting of small areas of massive and disseminated pyrite with very small amounts of chalcopyrite and possibly pyrrhotite was noted on the north shore of Opinica lake.

Mineralized Zone M-3 (Sheet C/9)

A mineralized zone was noted near the east end of Opinica lake in biotite paragneiss (now altered to chlorite and quartz) about 1.5 m across strike and 9 m along strike, containing 30% or more pyrrhotite and a little pyrite. Outside this zone the sulphides are disseminated and parallel the foliation. A second zone, smaller in extent, of massive pyrrhotite occurs about 300 m west of the above-mentioned zone.

Mineralized Zone M-4 (Sheet C/9)

Various showings of pyrite, in a few occurrences with the odd speck of chalcopyrite, in volcanic rock noted by Noranda Exploration Co. Ltd.

Mineralized Zone M-5 (Sheet 33 C/16)

Up to 7% disseminated cubical pyrite was noted in a zone of rusty migmatitic biotite paragneiss. Chalcopyrite was not detected. The rusty zone is up to

9 m across strike and is exposed for about 90 m along strike disappearing under overburden and reappearing some 150 m further east.

Mineralized Zone M-6 (Sheet 33 C/10)

Up to 4% pyrite and minor pyrrhotite generally as disseminations but in places more concentrated as thin (3-5mm) discontinuous veins and stringers occurs in north striking metabasalt and amphibolite just north of a narrows on Opinaca River (see figure 4). The mineralized zone, parallel to the foliation, was traced for 450 m along strike north of the river and is estimated to be 600 m across strike. All outcrops are rusty and contain some disseminated pyrite. Concentrations of sulphides appear as broad rusty stripes parallel to the foliation. A large northeasterly striking late Precambrian gabbro dyke nearby is not mineralized.

Mineralized Zone 7 (Sheet 33 C/10)

An outcrop of metagabbro and metavolcanic rock with a rusty zone about 11 m thick across strike containing up to 5% pyrite and minor pyrrhotite occurs about 1.6 km south along strike of mineralised zone M-6 and appears to be a continuation of the same zone of metavolcanics (see figure 4). The sulphides are generally disseminated but in places they are in small masses up to 8 cm in diameter associated with massive quartz and generally elongated parallel to the foliation of the host rock. Pyrite is finely disseminated throughout. Metagabbro is host for much of the mineralization.

The same rock types continue northward to the north shore just opposite mineralized zone 7. Although the rocks on the north shore are rust stained, concentrated rusty zones were not noted. All rocks contain some disseminated pyrite, generally less than 0.5% of the rock. Large barren bull quartz veins are present.

Rust-stained outcrops of metavolcanics and amphibolites were observed for about 1.3 km northeast of mineralized zone 7 to outcrop R.J. 386 and southward for about 3.2 km to outcrop R.J. 372 (see figure 4).

Mineralized Zone M-8 (Sheet 33 C/11).

The writer noted a rusty zone about 3 m long by 0.8 m wide in quartzite interlayered with biotite paragneiss near the east end of the peninsula on the west shore of Blacksmith lake. Local small lenses consisting almost entirely of pyrite

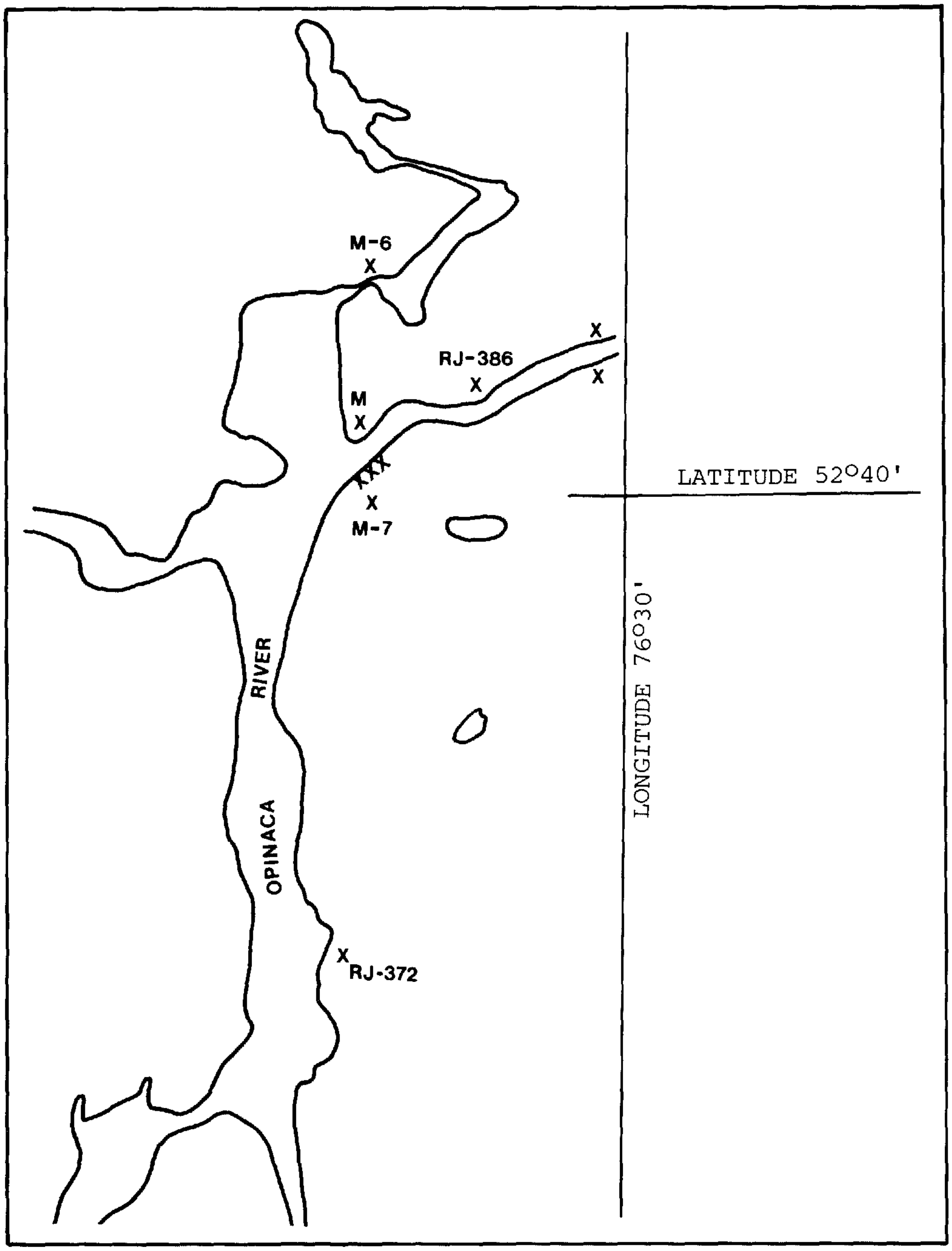


Figure 4 - Sketch map at 1:50 000 showing locations of Mineralized Zones 6 and 7.

crystals, mostly pyritohedrons, occur within the central part of the rusty zone. A lense 8cm by 20cm of pure pyritohedrons was noted. Up to 2% disseminated magnetite occurs in the quartzite. The mineralization is confined to the quartzite and does not appear to be of economic importance.

Mineralized Zone M-9 (Sheet 33 C/11)

A few grains of disseminated chalcopyrite were noted under hand lens along fractures and foliation planes in a few but not the majority of specimens of very schistose to sheared metadiorite to quartz diorite intruding biotite paragneiss on the shore of the bay just west of the main part of Blacksmith lake. Several more massive appearing basic to ultrabasic intrusives occur to the south. This general area including the basic intrusives just south may be a worthwhile area for ground prospection. The area is easily accessible from the James Bay road by a short canoe traverse.

Mineralized Zone M-10 (Sheet 33 C/11)

A rusty zone over 300m along strike and 30 to 60m across strike was noted parallel to the regional strike in fine grained tuff or quartzo-feldspathic metasedimentary rock along the James Bay Road at milage 280. Up to 5% very fine grained pyrite was noted along bedding planes within this zone in a very fine grained cherty metasedimentary rock or tuff. Disseminated pyrrhotite was noted in nearby pillow lavas. Most of the mineralization appears to be syngenetic.

Mineralized Zone M-11 (Sheet 33 C/11)

Red stain in the soil at the edge of muskeg was noted from the air.

Mineralized Zone M-12 (Sheet 33 D/9)

Red stain in the soil at the edge of muskeg was noted fron the air

Mineralized Zone M-13 (Sheet 33 D/16)

Just east of rivière du Peuplier several rusty zones were noted in metaconglomerate. The zones are 30 to 60 meters long by 1 to 2 meters wide and locally contain small rusty lenses often in silicified zones with about 5% pyrite. Some rusty quartz veins were observed. Helicopter time permitted only a very brief examination.

Mineralized Zone 14 (Sheet 33 D/15)

A few plates of molybdenite (3 cm in diameter), a little spodumene and green microcline (amazonite) are reported to occur in a fairly large mass of muscovite pegmatite cutting greenish grey basaltic lava in the Wemindji volcano-sedimentary zone on an offshore island in James Bay (Shaw, G.S.C. Map 42-10). The pegmatite is not large enough to be of economic interest. A smaller muscovite pegmatite with a single plate of molybdenite about 3 cm in diameter was noted by the writer inland near the east end of the same volcano-sedimentary zone.

Mineralized Zone 15 (Sheet 33 D/15)

A well exposed and impressive rusty zone extends intermittently along the regional strike for about 6.5 km and for over 30 m across strike along the north side of the peninsula of volcanic rock which is centered about 5km southwest of the Indian village of Wemindji (Paint Hills). The rusty zone is very friable and silicified. In places it is reddish in color and in a few places weathers to yellow ochre. Small lenses of more concentrated sulphides generally in silicified zones and/or fractures occur throughout the rusty zones. These lenses generally consist of from 5% to 20% pyrite, up to 2% or slightly more pyrrhotite, and magnetite. Chalcopyrite occurs in a few places and is generally 0.5% or less in amount. Assays indicate the presence of small amounts of sphalerite. Much of the host rock appears to be altered, silicified, amphibolitized basaltic lava.

Assays were taken at various places along the mineralized zone. Their location is shown in Figure 5. Assay results are as follows:

| Sample | Au oz/t | Ag oz/t | Cu ppm | Zn ppm | Pb ppm | Ni ppm |
|---|---|---|---|---|---|---|
| 15-1 | 0.002 | 0.000 | 780 | 134 | 5 | 169 |
| 15-2 | 0.004 | 0.080 | 55 | 111 | 12 | 80 |
| 15-3 | 0.003 | 0.000 | 880 | 50 | 7 | 255 |
| 15-4 | 0.002 | 0.000 | 220 | 101 | 6 | 136 |
| 15-5 | 0.002 | 0.000 | 25 | 124 | 15 | 58 |
| 15-6 | 0.002 | 0.000 | 12 | 40 | 9 | 157 |
| 15-7 | 0.000 | 0.000 | 85 | 140 | 5 | 137 |
| 15-8 | 0.002 | 0.000 | 30 | 35 | 5 | 20 |

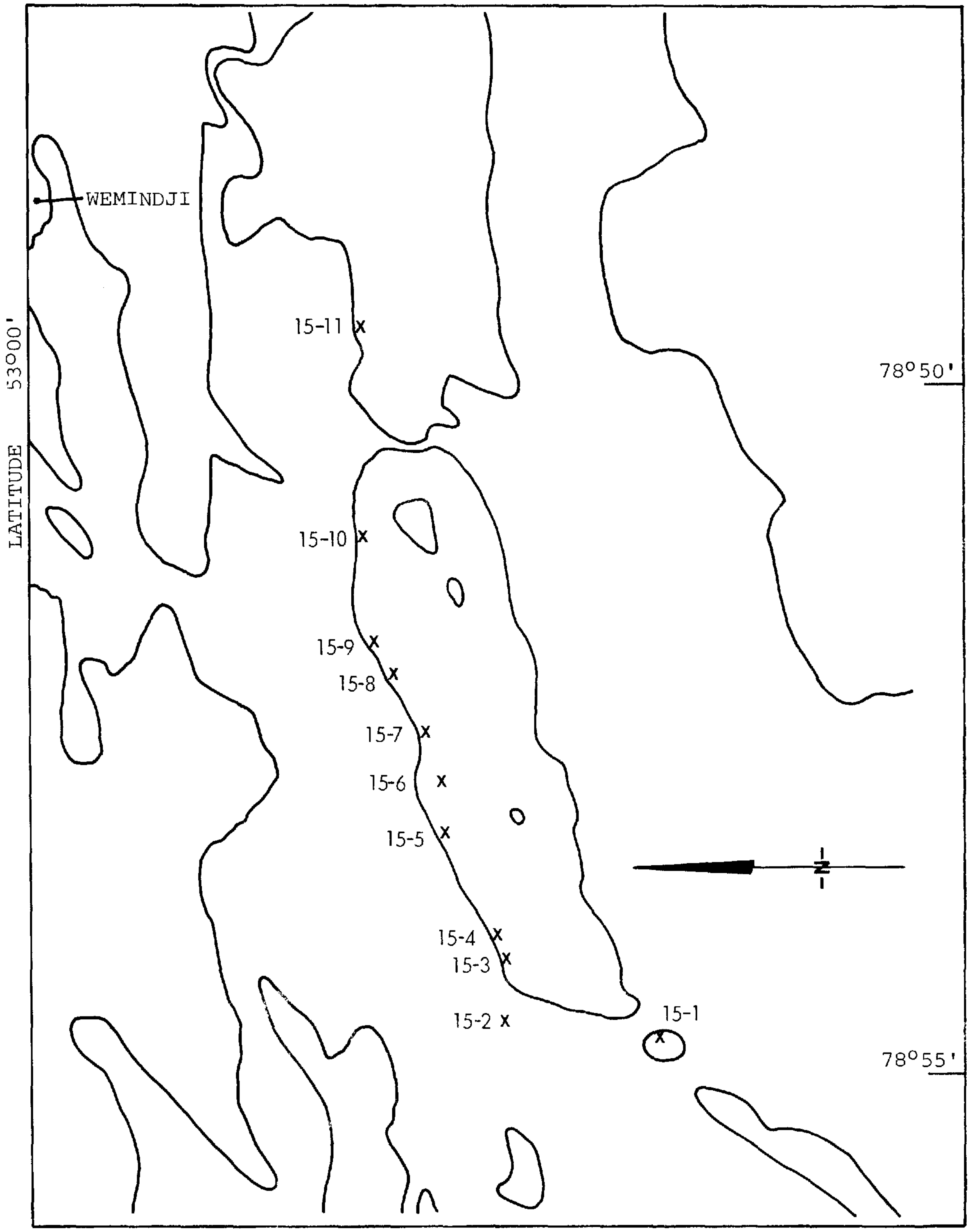


Figure 5 - Sketch map at 1:50 000 showing the location of assay samples from Mineralized Zone 15.

| | | | | | | |
|---|---|---|---|---|---|---|
| 15-9 | 0.000 | 0.000 | 130 | 145 | 10 | 95 |
| 15-10 | 0.000 | 0.003 | 190 | 712 | 18 | 189 |
| 15-11 | 0.001 | 0.000 | 15 | 102 | 4 | 69 |

The best exposure of chalcopyrite noted is in a schistose graphitic tuff intermixed with basaltic lava (location 15-4 on Figure 5) where about 1% chalcopyrite and several percent pyrrhotite were noted in fracture fillings and as films along shear planes in one hand specimen. Other hand specimens showed less chalcopyrite.

Mineralized samples from two locations a bit farther east are described below under zone 16 and 17.

The Wemindji volcano-sedimentary zone is from 1.5 km to over 5 km in width and is exposed intermittently for about 45 km along strike, the westernmost outcrops being on Solomon's Temple Islands in James Bay. The exact width of the zone in James Bay is not known as rock is exposed only on a narrow chain of islands. In James Bay, it is probably wider than rock exposures indicate as outcrops of basaltic lava on the westernmost islands shown on sheet 33 D/15 are greenish grey and fresh and the pillows are massive. A bit farther east of the above mentioned island, the basalt is amphibolitized with a good foliation and pillows are elongated.

Geologist R.A. Cornish, employed by Mousseau Tremblay Inc., paid a brief visit to Solomon's Temple Islands in August 1976. He noted intermediate to basic porphyritic pillowed lava and basic greenish grey lava on the islands cut by northerly and easterly trending gabbro and diabase dykes. The pillows are massive and their tops face south. Foliation strikes east northeasterly and dips moderately south. East northeast to easterly trending rusty zones up to 5 m in width with sharp contacts were noted on several of the islands. The zones contain 2 to 3% pyrite and pyrrhotite in basaltic lava as thin films on schistose planes and fine disseminations. While none of the mineralized specimens from Solomon's Temple Islands are of economic interest, they do show that mineralization is present in this area. The Wemindji volcano-sedimentary zone has not yet been prospected. Because of the large rusty zone south of the town of Wemindji, the presence of sulphides in various places from one end of the zone to the other, and the variety of different metallic minerals observed, it seems to warrants some ground prospection (Figure 6).

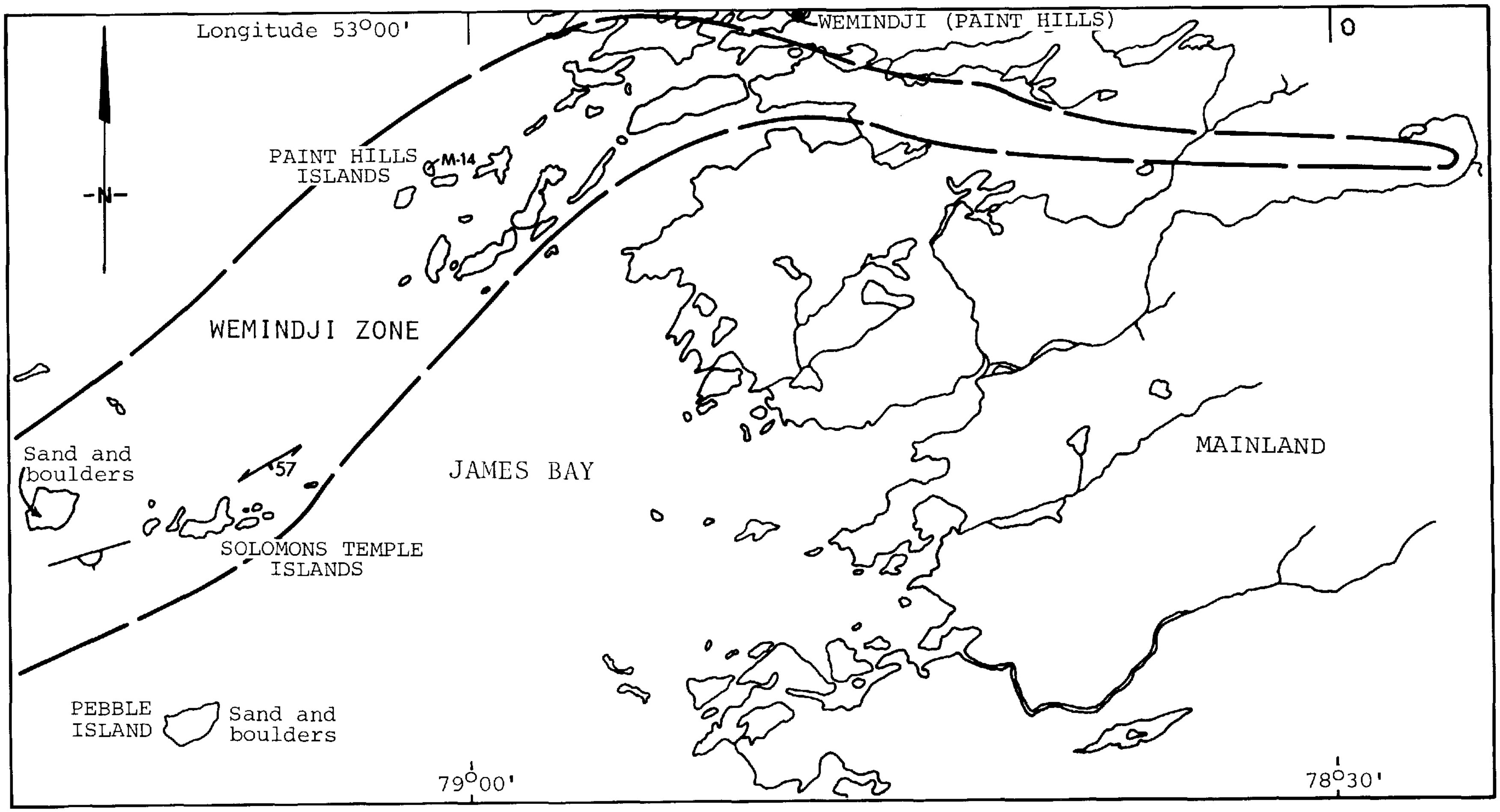


Figure 6 - Sketch map at 1:250 000 showing the possible extent of the Wemindji volcano-sedimentary zone.

Mineralized Zone M-16 (Sheet 33 D/15)

A small gossan 5 m wide by 15 m long parallel to the foliation occurs in biotite paragneiss with a few narrow layers of amphibolite. The assay sample was a medium grained silicified hornblende rich rock in contact with biotite paragneiss and contained 1% to 5% disseminated cubical pyrite. Slight concentration of cubical pyrite along fractures in quartz veins was noted. Assay results show 2600 ppm copper, 1092 ppm nickel, 117 ppm zinc, 7 ppm lead, traces of silver and no gold.

Mineralized Zone 17 (Sheet 33 D/15)

The outcrop is recorded as schistose amphibolitized basaltic lava and interlayered biotite paragneiss with a small rusty zone.

A very silicified dark hand specimen shows about 1% pyrite with a few grains each of chalcopyrite, specularite, galena and possibly sphalerite as well as calcite and quartz along fractures. Azurite, malachite and limonite stain the specimen. A terminated quartz crystal is in a small vug.

Conclusions

In view of the various mineralized showings noted above, certain places within the map-area appear to be favorable for copper-zinc mineralization. The most favorable areas for prospection in order of potential economic value appear to be:

1) The entire Wemindji volcano-sedimentary zone (Sheet 33 D/15 and Figure 6).
2) The metadiorite and volcanics in sheet 33 C/9.
3) The volcano-sedimentary zone that underlies the southern part of sheet 33 C/11 especially the basic and ultrabasic intrusives south of Blacksmith and Saganash lakes.
4) Other volcano-sedimentary zones in the map-area.

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## WEMINDJI AREA

## LEGEND

### CENOZOIC

16 Unconsolidated deposits

### PRECAMBRIAN

15 Diabase dykes, gabbro dykes.

14 Porphyritic alkaline syenite.

13 Peridotite.

12 Pink and in some places white leucocratic granite and pegmatite; in places with inclusions, layers or zones of biotite paragneiss and/or amphibolite.

11 Blocky and layered migmatite of pink leucocratic granite with inclusions of hornblendite, amphibolite, grey foliated biotite granite and in places biotite paragneiss.

10 Grey porphyritic hornblende-biotite granodiorite.

9 Grey hornblende-biotite quartz-diorite in places cut by pink leucocratic granite and pegmatite; some diorite.

9a Diorite.

8 Biotite, biotite-hornblende and hornblende granodiorite (massive or foliated) in places with inclusions, layers or zones of biotite paragneiss, amphibolite and/or granitic gneiss.

8a Granodiorites of unit 8 with more than 20% inclusions of amphibolite, biotite paragneiss and/or granitic gneiss.

7 Migmatite of biotite paragneiss and generally concordant layers or small masses of leucocratic granite and pegmatite; in a few places with amphibolite and/or hornblende-plagioclase gneiss.

6 Migmatite of white leucocratic granite, biotite orthogneiss, hybrid diorite and metamorphosed rocks from volcano-sedimentary zones.

5 Amphibolite, in places with biotite paragneiss and/or hornblende-plagioclase gneiss; zones with lit-par-lit granite near edge.

4 Metagabbro (4a); anorthositic metagabbro (4b).

3 Biotite paragneiss in places with a little lit-par-lit granite (3a); metaconglomerate generally interlayered with biotite paragneiss (3b); quartzite (3c); iron formation (3d).

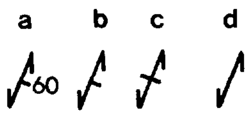
2 Acidic to intermediate volcanics; minor tuff.

1 Metabasalt and amphibolitized metabasalt in places with rocks of units 2, 3, 4, 5, 12.

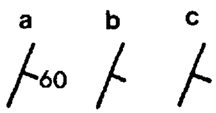
SYMBOLS

Outcrop: large (a), small (b)

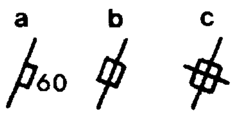

Geological contact.



Strike and dip of foliation: inclined with known dip (a), inclined with amount of dip unknown (b), vertical (c) dip unknown (d).

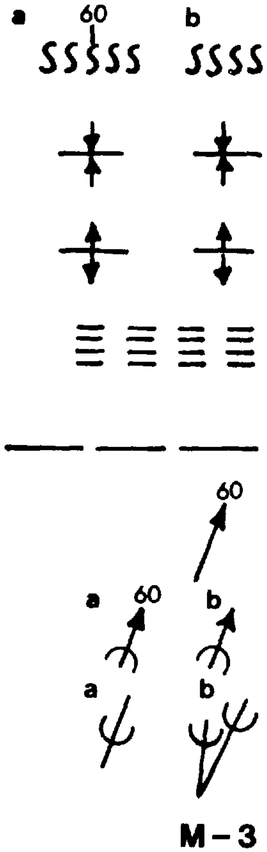


Strike and dip of bedding: inclined with known dip (a), inclined amount of dip unknown (b), inclined with direction of top known (c).



Strike and dip of jointing: inclined (a), vertical (b), horizontal (c).

Strike and attitude of pillow structures: direction of top known (a), direction of top indeterminate (b): direction of top questionable(c)




Shear zone: inclined (a), vertical (b).

Synform.

Antiform.

Structural trends from air photos.

Lineaments.

Trend and plunge of mineral linaetion.

Trend and plunge of minor folds: amount of plunge known (a), unknown (b).

Trend of glacial striae: single set (a), intersecting set (b).

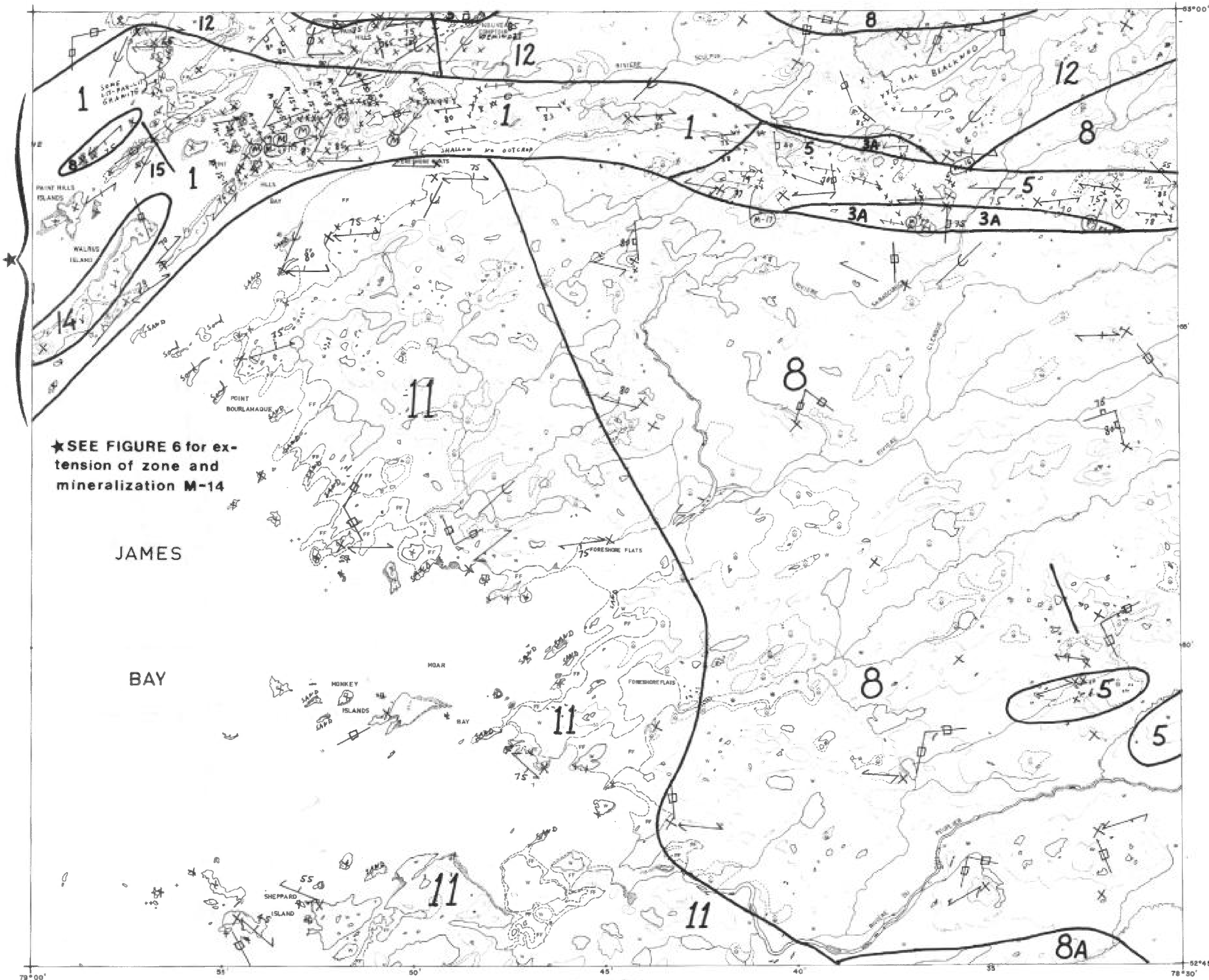
Mineralization (see report for description).

Magnetic declination: $17^{\circ}$ to $19^{\circ}$ West.

FIELD WORK BY:
Russ Jacoby, Harvey Hunter - Maps 33 C/9, 33 C/10.
Tom Clark, Bob Jean - Maps 33 C/16, 33 C/15.
J.H. Rémick - Maps 33 C/11, 33 C/12, 33 C/13, 33 C/14,
33 D/9, 33 D/10, 33 D/15, 33 D/16.

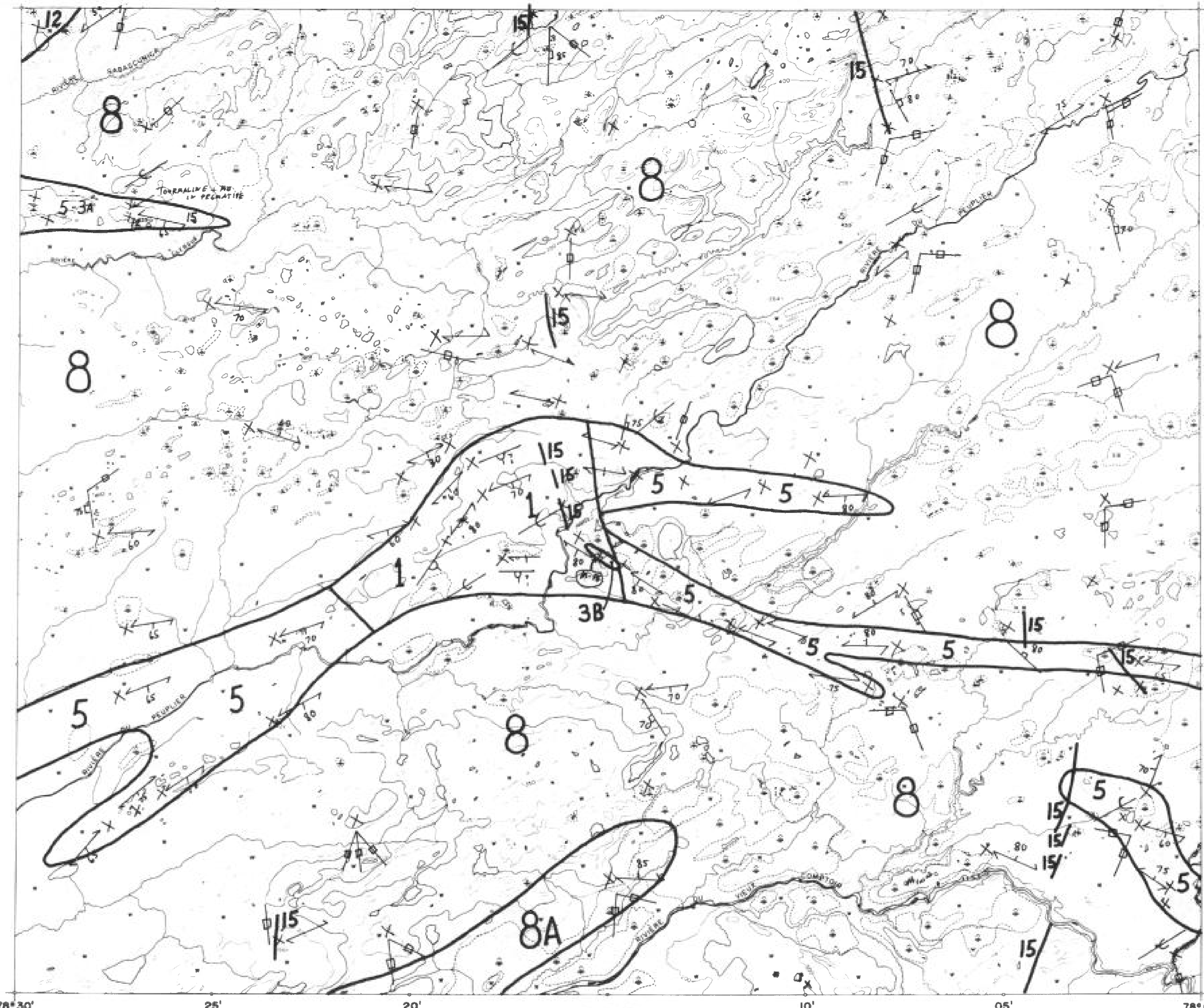
SUPERVISION OF PROJECT: J.H. Rémick (1975)

Service de l'Exploration géologique,
Ministère des Richesses Naturelles de Québec.

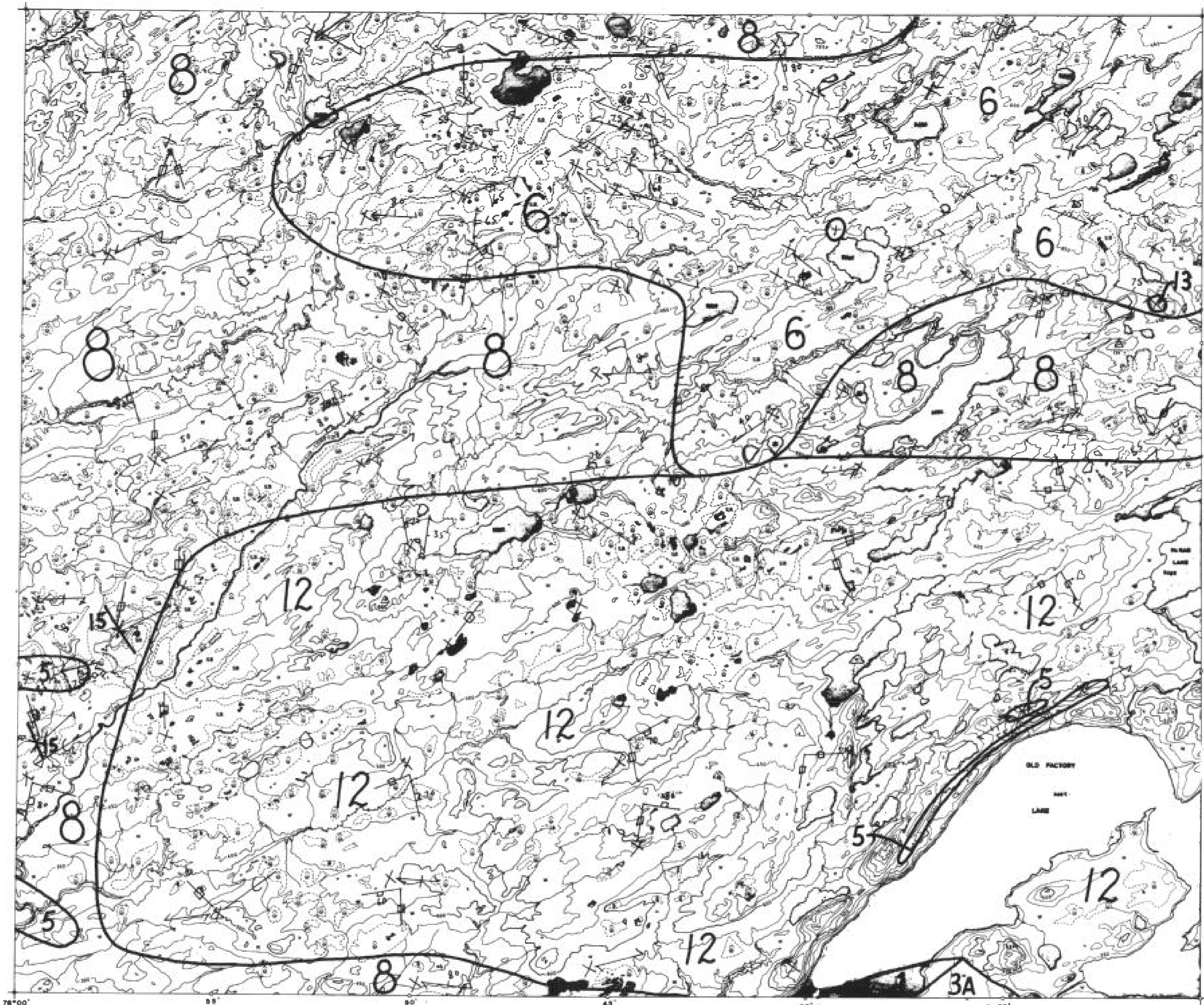


★SEE FIGURE 6 for extension of zone and mineralization M-14
JAMES
BAY
POINT BOURLAMAQUE
MONKEY ISLANDS
SHEPPARD ISLAND
WALRUS ISLAND
PAINT HILLS ISLANDS
FORESHORE FLATS
MOAR
BAY
SAND
SHALLOW NO OUTCROP
79°00'
78°30'
53°00'
52°45'


33 D/15


53°00'
55'
50'
52°45'
78°30'
25'
20'
10'
05'
78°00'
RIVIÈRE
SABASCUNICA
TOURMALINE
RIVIÈRE
PEUPLIER
RIVIÈRE DU PEUPLIER
RIVIÈRE DU VIEUX COMPTOIR
12
15
8
5-3A
5
1
3B
8A

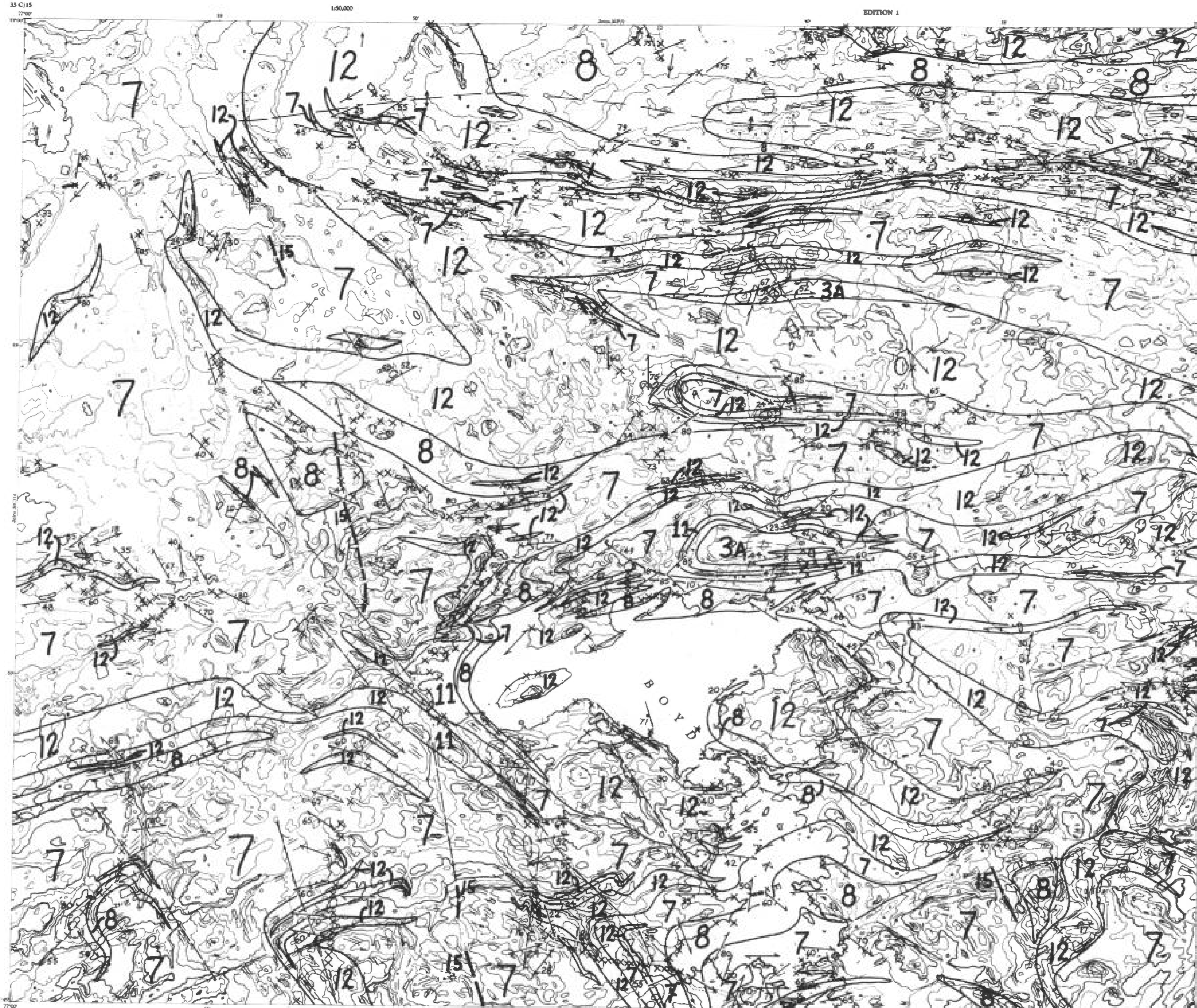
33 D/16


53°00'
55'
50'
52°45'
78°00'
55'
50'
45'
40'
35'
77°50'
OLD FACTORY
LAKE
8
6
12
5
15
13
3A

33 C/13

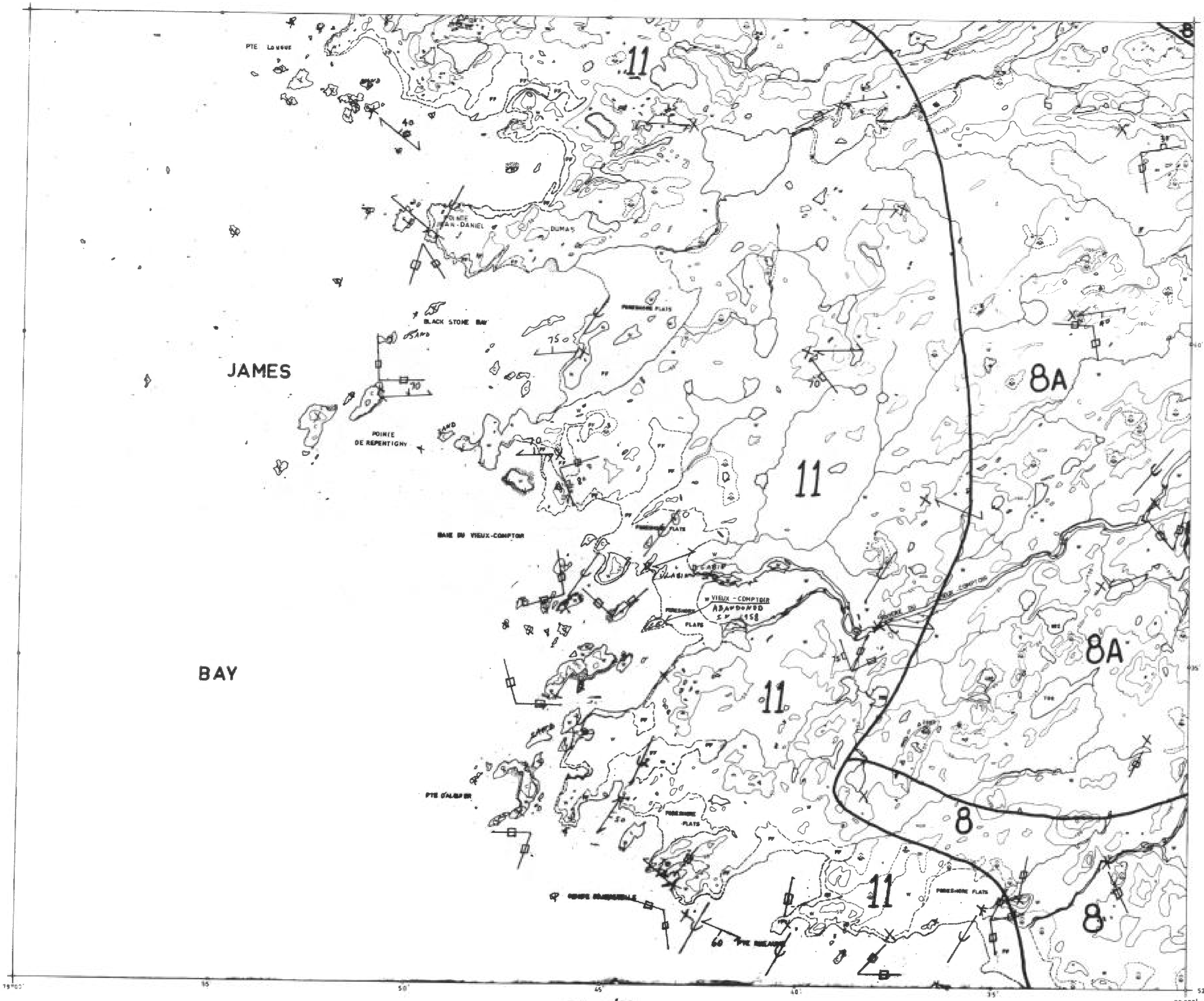

33 C/14
JAMES BAY ROAD
McNAB LAKE
OLD FACTORY LAKE
CAMP SITE
6
12
10
15
8
7
3A
1


33 C/14

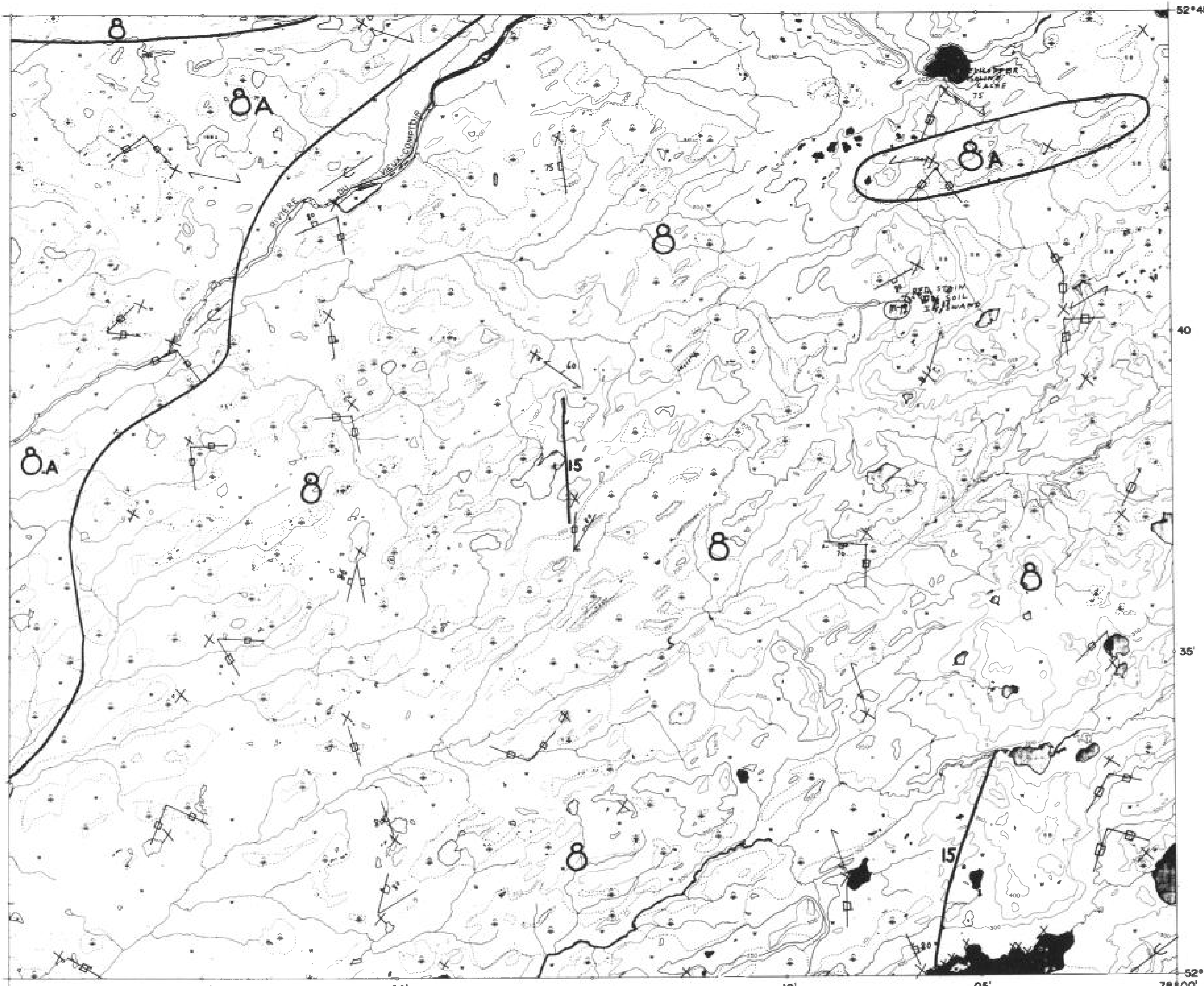



33 C/15

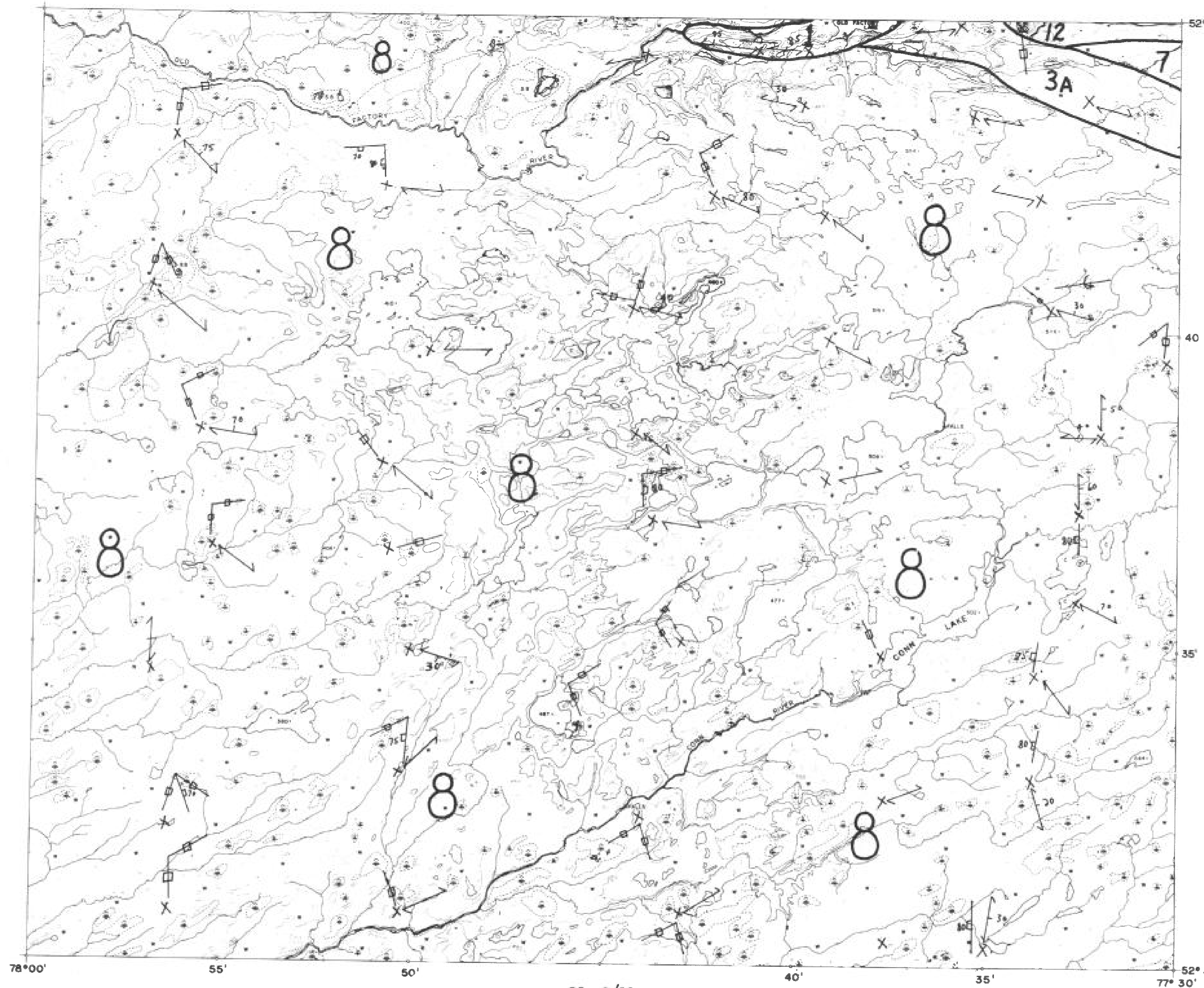

33 C/16


JAMES
BAY
BLACK STONE BAY
POINTE
DE REPENTIGNY
DUMAS
FORESHORE FLATS
VIEUX-COMPTOIR
ABANDONED
11
11
11
11
8A
8A
8
8
52°45'
52°30'
79°30'

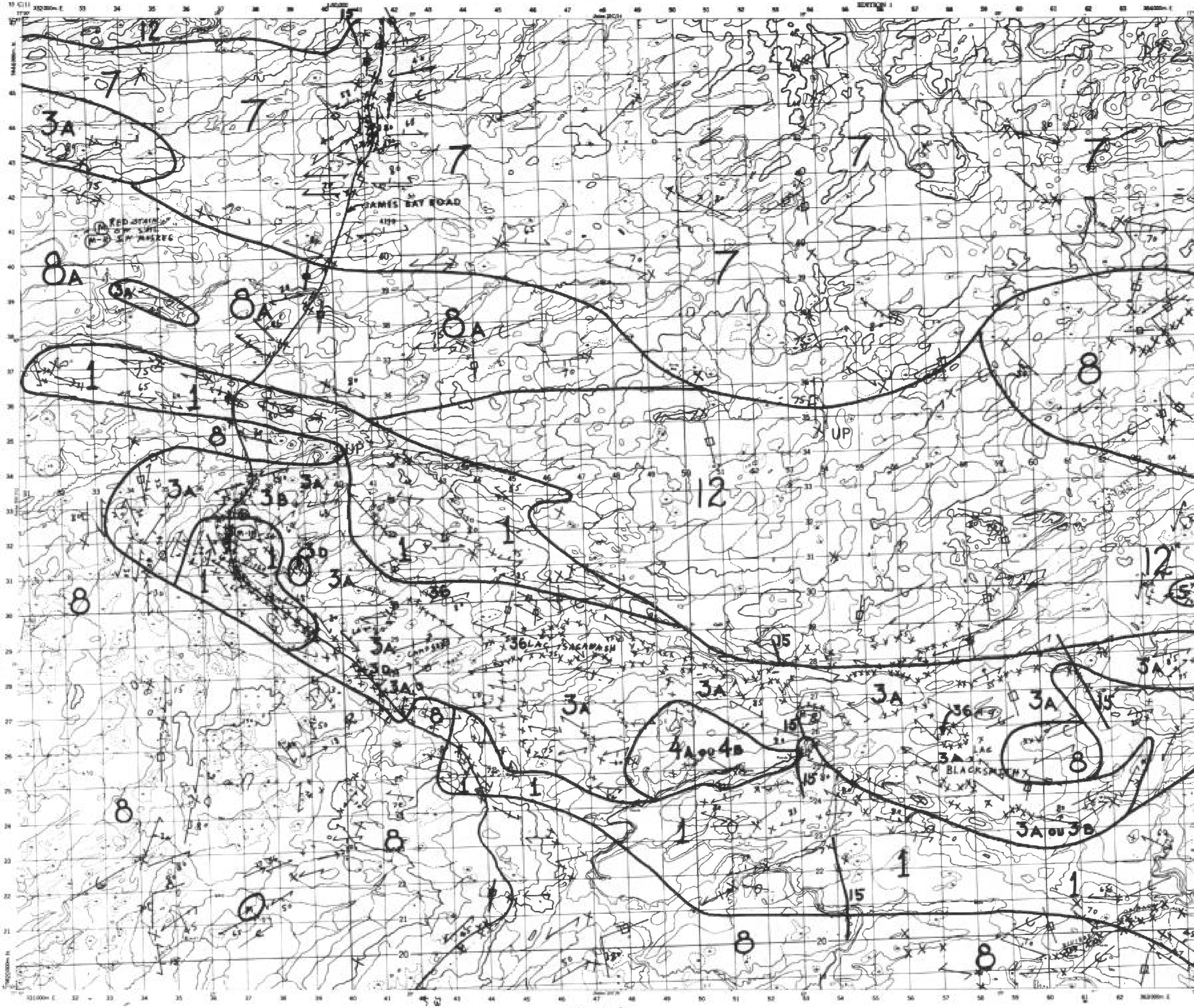
33 D/10




33 D/9


52°45'
40
35'
52° 30'
77° 30'
78°00'
55'
50'
40'
35'
OLD
FACTORY
RIVER
CONN
LAKE
CONN
RIVER
8
3A
12
7

33 C/12




33 C/11


33 C/10


33 C/9