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ONTARIO GEOLOGICAL SURVEY

Open File Report 5532

Geology of the
Mishewawa Lake Area
District of Algoma

by

N.W.D. Massey

1985

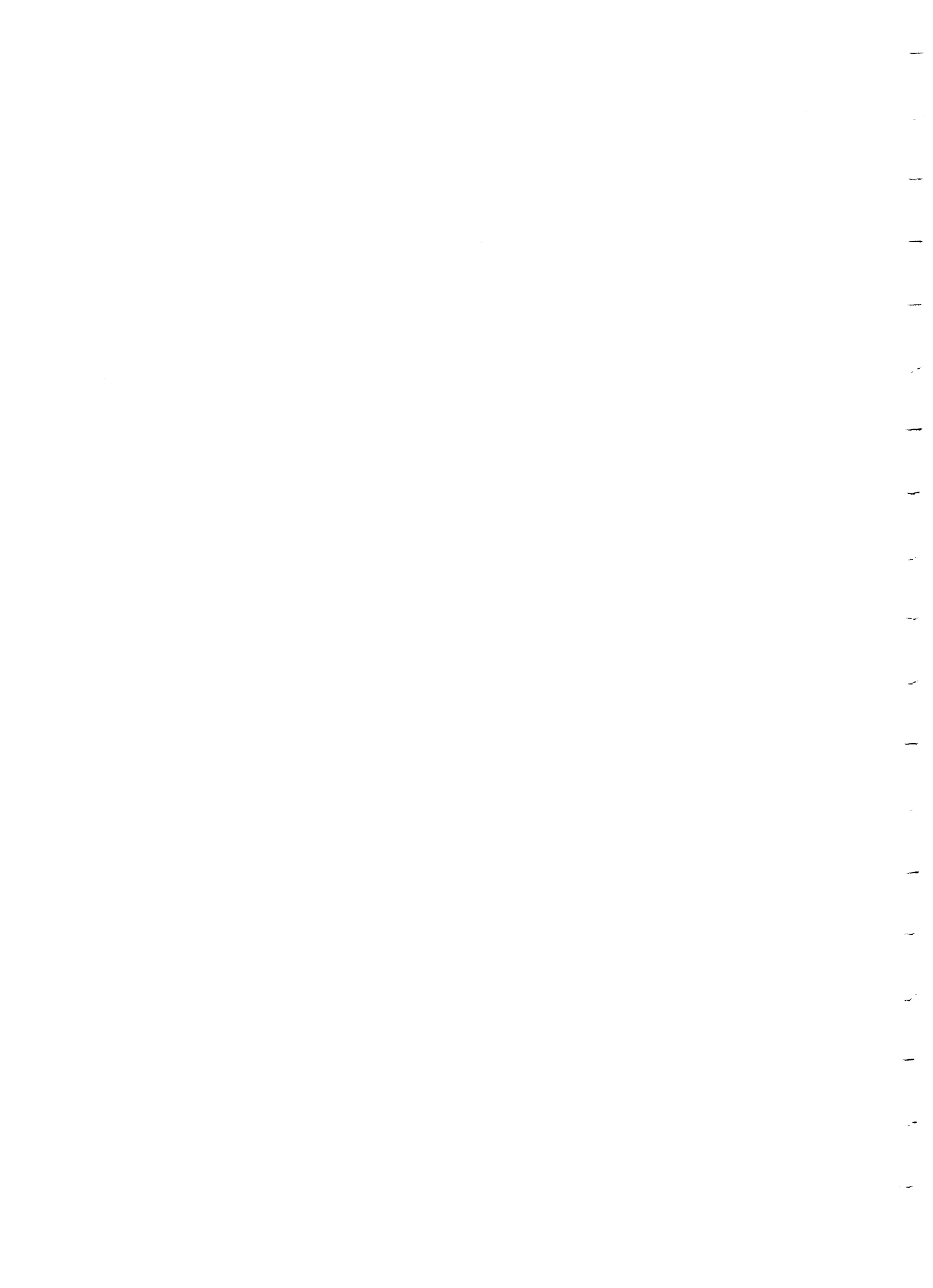
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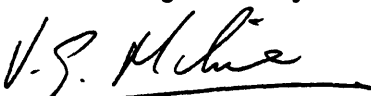
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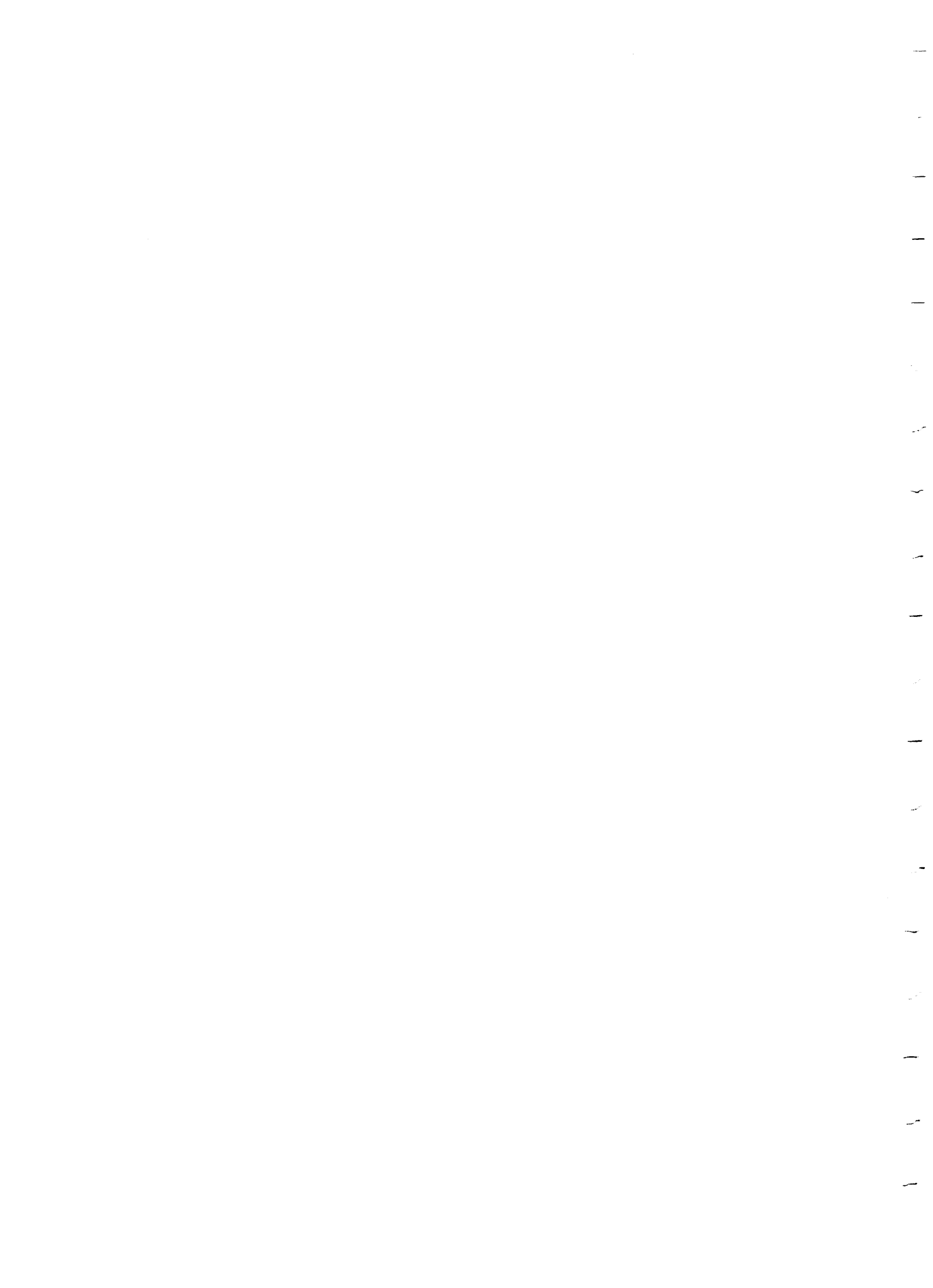
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V.G. Milne, Director
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FOREWORD

MISHEWAWA LAKE AREA

Detailed geological mapping of the Mishewawa Lake area was undertaken by the Ontario Geological Survey, Ontario Ministry of Natural Resources on behalf of the governments of Canada and Ontario under the Northern Ontario Rural Development Agreement (NORDA). This mapping is part of a larger program of geoscience surveys to encourage exploration and to provide a mineral potential evaluation of the Wawa-Michipicoten area.

The Mishewawa Lake area was selected for mapping on the basis of the presence of three past producers of gold, known occurrences of base metals and iron and the absence of previous detailed geological mapping.

V.G. Milne

Director

Ontario Geological Survey

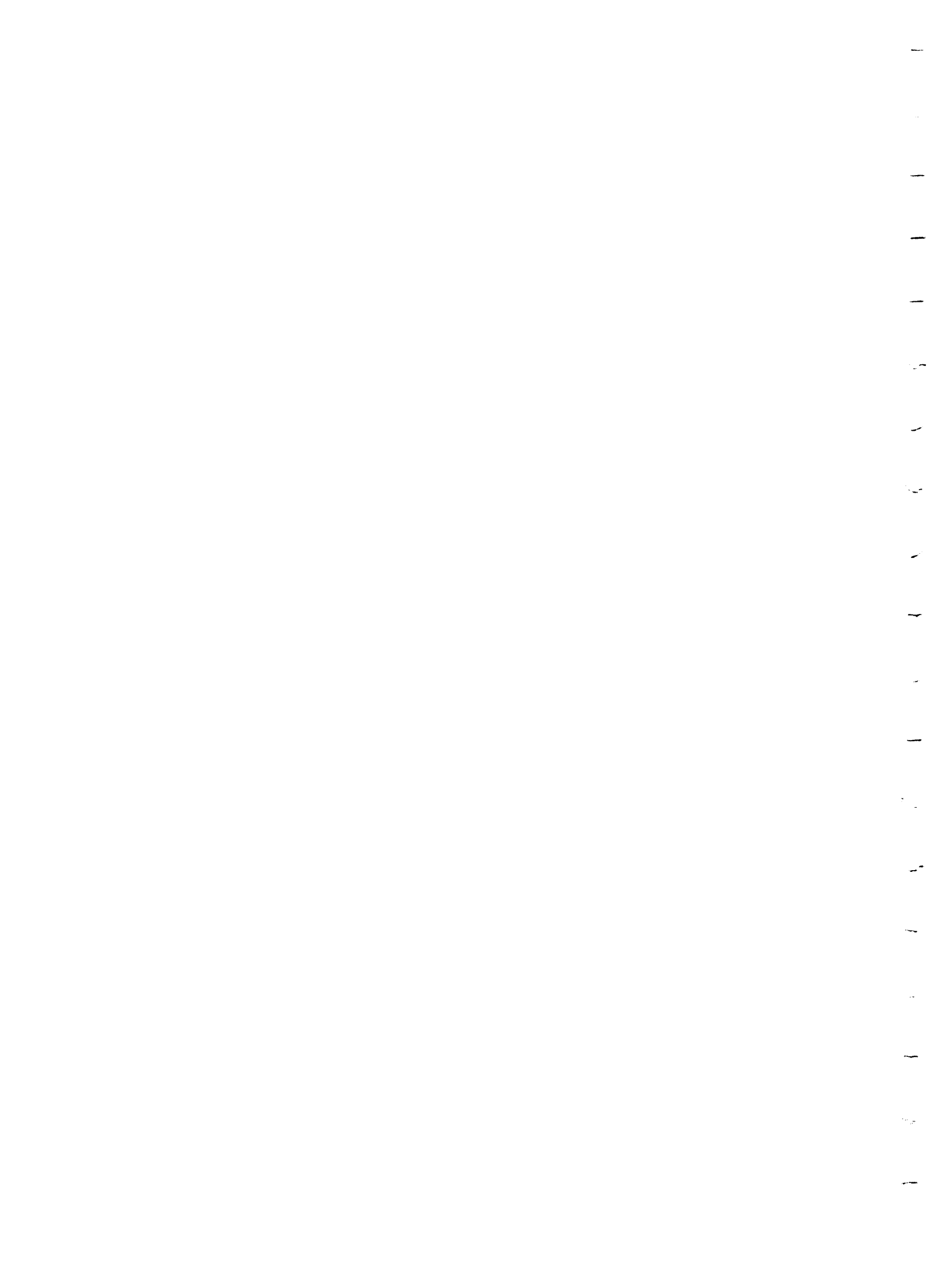
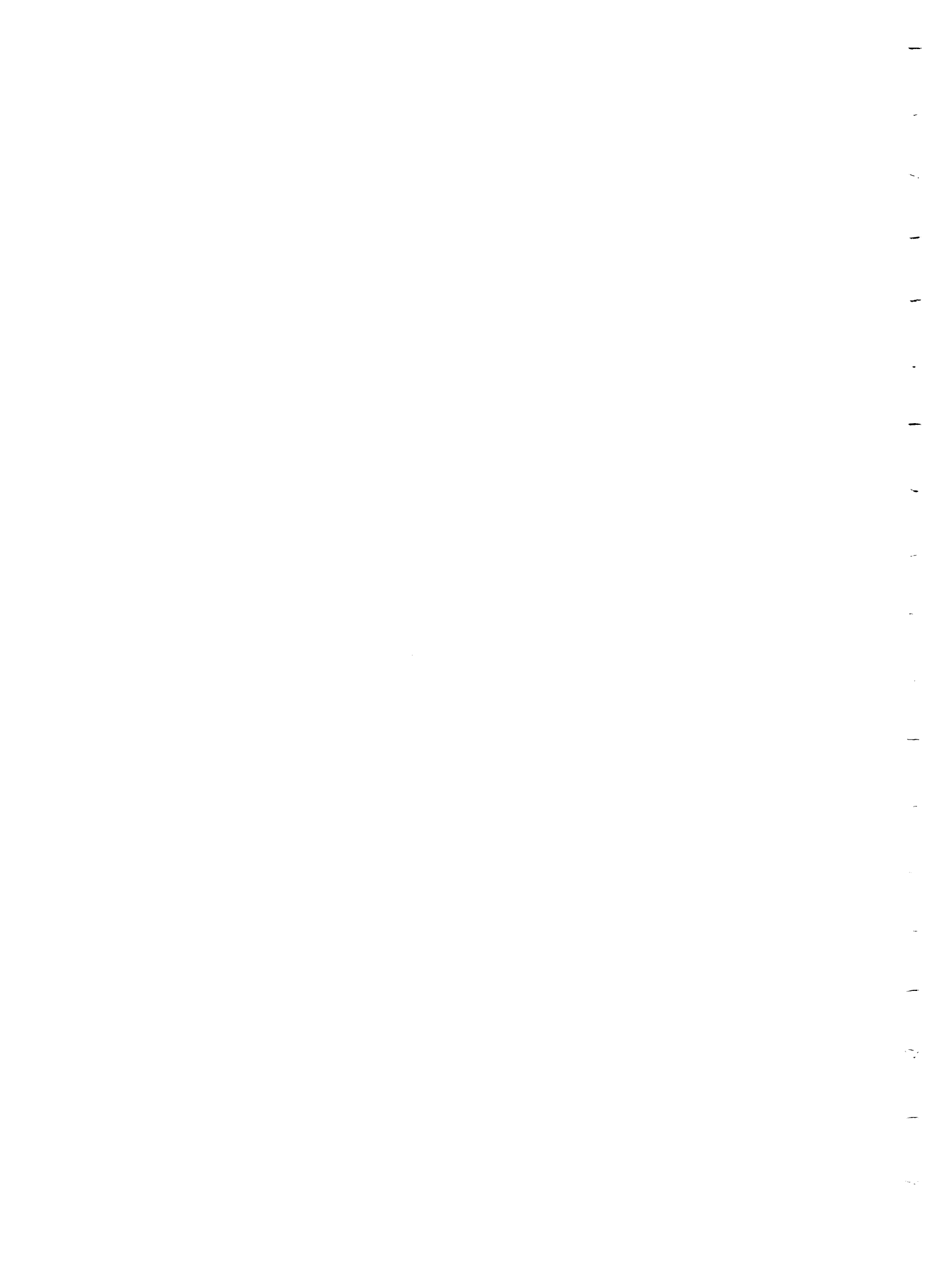


Table of Contents

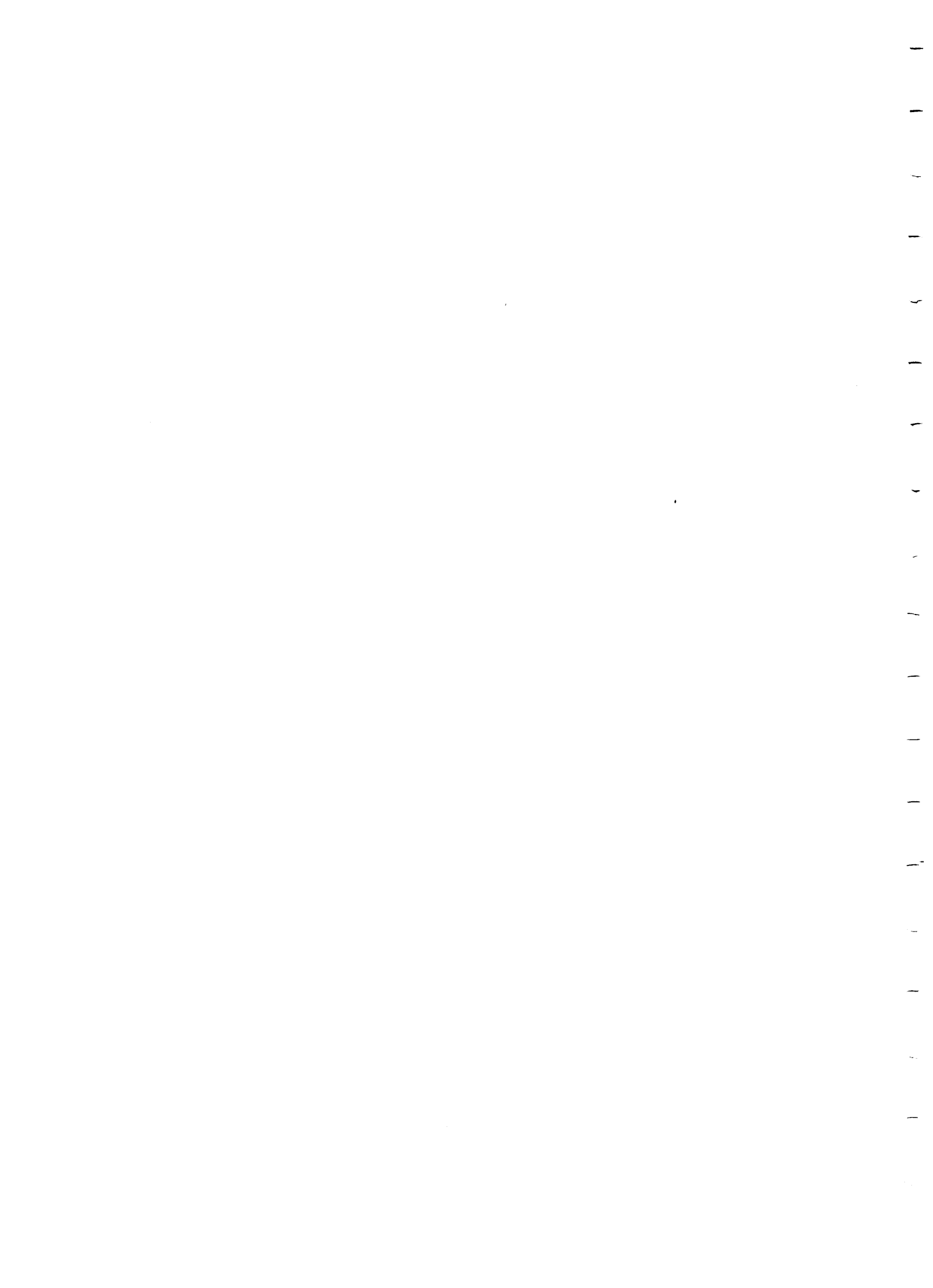
Introduction	1
Location	1
Access	1
Topography and Natural Resources	2
Previous Geological Work	5
Present Work	6
Mineral Exploration	7
Acknowledgements	8
General Geology	8
Table of Lithologic Units	144
Archean	10
Metavolcanics	10
Mafic-to-intermediate metavolcanics	10
Intermediate-to-felsic metavolcanics	13
Metasediments	17
Chemical metasediments	17
Clastic metasediments (Dore Series)	19
Conglomerate and wacke	20
Volcanic-clast conglomerate and wacke	22
Wackes feldspathic wackes and lithic rocks	23
Siltstones, mudstones, thinly bedded wackes and siltstones	23
Felsic metavolcanics	24
Facies distribution and interpretation	24



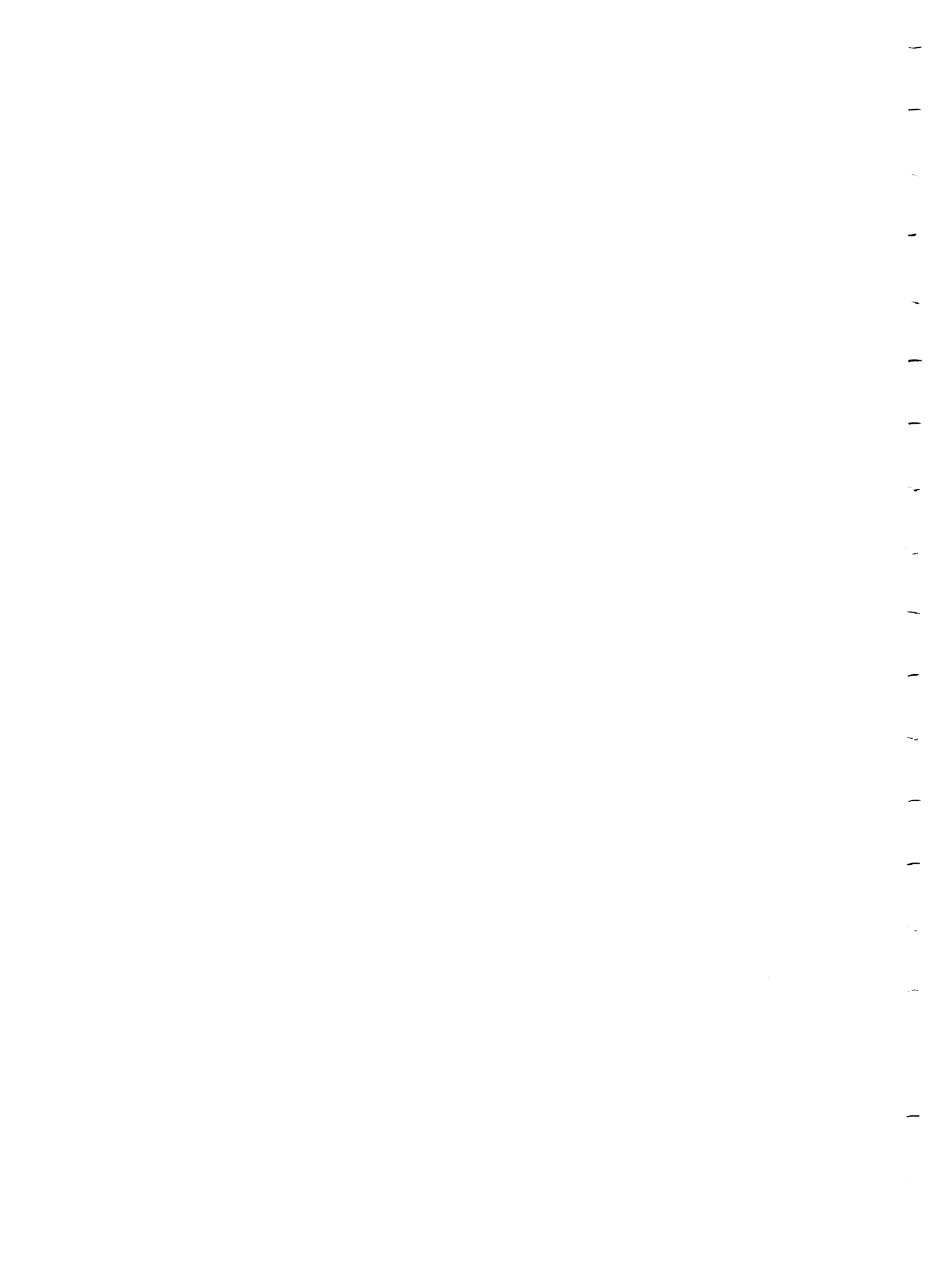
Mafic intrusive rocks	26
Gabbro-diorite bodies	27
Diabasic dikes	28
Intermediate-to-felsic intrusive rocks	29
Anjigami Gneiss Domaine	29
Whitefish Lake and Brule Bay Batholiths	30
Dore Lake Gneiss	32
Felsic Intrusions	33
Centennial Stock	33
Mission and Magpie High Falls Stocks	35
Bridget Lake and Sandy Beach Stocks	37
Minor felsic intrusive rocks	39
Middle-to-Late Proterozoic	40
Diabase Dikes	40
Alkalic Dikes	41
Keweenawan Supergroup	43
Jacobsville Sandstone	43
Cenozoic	44
Quaternary	44
Pleistocene and Holocene	44
Geochemistry	46
Metamorphism and rock alteration	48
Stratigraphic relationships	49
Structural Geology	52
Minor structures	52
Major folds	54



Major faults	55
Correlation of Geology with Aeromagnetic data	58
Economic Geology	59
Introduction	59
Gold deposits	61
Breton Group (Ra3)	62
Centennial Mine (Na 3)	62
The Dycie Area	67
Stenabaugh Vein (Ra 12)	68
Gananoque Vein	70
Willis Veins (Ra 15)	72
Weony Willie (Ra 13)	74
Other occurrences	74
Gibson Group (Ra 6)	75
Gold Monk Mine (Ra 7)	75
Laccolith Mining Company (Le 6)	77
Norwalk Mine (Ra 5, 9)	78
Nymon-Roller Lake Prospect (Ra 10)	81
Osisko Lake Mines Limited (Le 7)	82
Ranson Mine (Ra 11)	83
Ross Group (Le 8)	85
Valenti Group (Na 11)	87
Williamson-McWaters Group (Ra 14)	87
Base-metal deposits	88
Algoma Central Railway (Ne 3)	88
Algoma Ore Projects - anomalies 11 and 12	88



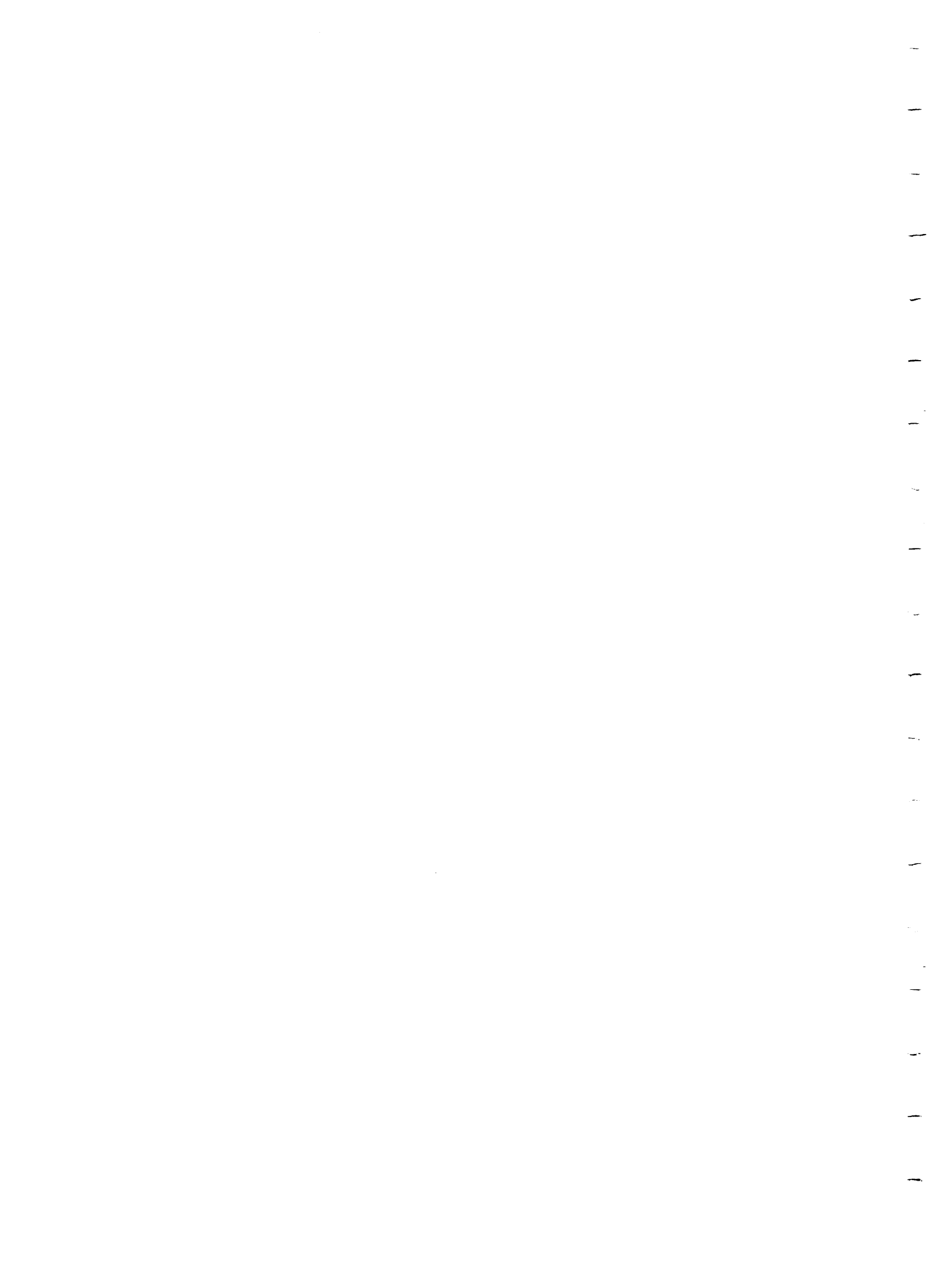
Algoma Steel Corporation Limited (Michipicoten Base-metal Project) (Le 2)	90
Algoma Steel Corporation Limited (Anjigami Project) (Ra 1 Na 1 Ne 1)	95
AMAX Minerals Exploration Limited (Niveau -1) (Na 2)	98
Asarco Exploration Company of Canada Limited	98
Clement Group (Ra 2 4 8)	100
Noranda Exploration Company Limited (Gimby - Hubert Group) (Na 6 8)	102
Noranda Exploration Company Limited (Niveau Project) (Na 9, Ne 4)	105
Iron deposits	106
Anjigami Lake Iron Formation (Ne 2)	106
Gros Cap Mining Location (Le 1, 5)	108
Jalore Mining Company (Lendrum Township) (Le 4) ...	110
Mishewawa Lake Deposit (Na 7)	110
Sand and Gravel	112
Suggestions to Prospectors	112
References	115



List of Figures

4 ✓	Key Maps showing the location of the Mishewawa Lake Area (To be supplied by Cartography)	131
2 ✓	Lithofacies variations in the "Dore Series" metasediments	132
3 ✓	Felsic intrusions in the Mishewawa Lake area	133
4 ✓	Modal Quartz - Potash feldspar - Plagioclase ternary diagrams for samples from (a) the Anjigami Gneiss Domaine; (b) Whitefish Lake and Brule Bay Batholith; (c) Felsic Intrusions	134
5 ✓	Orientations of various dike suites: (a) Archean (? Early Proterozoic) diabases and gabbros; (b) Keweenawan aphyric diabases; (c) Lamprophyres; (d) Keweenawan feldspar-phyric diabases	135
6 ✓	Interpreted Time - stratigraphic relationships, Mishewawa Lake area	136
7 ✓	<i>coloured white copy only</i> Structural Geology of the Mishewawa Lake Area	Back Pocket
8 ✓	(a) AFM and (b) Jensen Cation plots for metavolcanics and felsic intrusions from the Mishewawa Lake Area	137
9 ✓	(a) AFM and (b) Jensen Cation plots for mafic intrusions and related alkalic intrusions	138
10A ✓	<i>white copy</i> Exploration activity in the Mishewawa Lake Area	Back Pocket
10B ✓	<i>w.c.</i> Patented claims with mining rights in the Mishewawa Lake Area	Back Pocket

- 11 ✓ Exploration activity in the Dycie Lake - Scott Falls
area Back Pocket
- 12 ✓ Plan of No. 3 vein showing channel sampling by R.F.
Mitchell, M.E. 139
- 13 ✓ Location of anomalies investigated by Algoma Steel
Corporation Limited in Lendrum Township, 1979-82 140
- 14 ✓ Airborne magnetic and electromagnetic anomalies in
Rabazo, Naveau and Nebonaionquet Townships Back Pocket
- 15 ✓ The geology of the Gros Cap Iron Formation 141

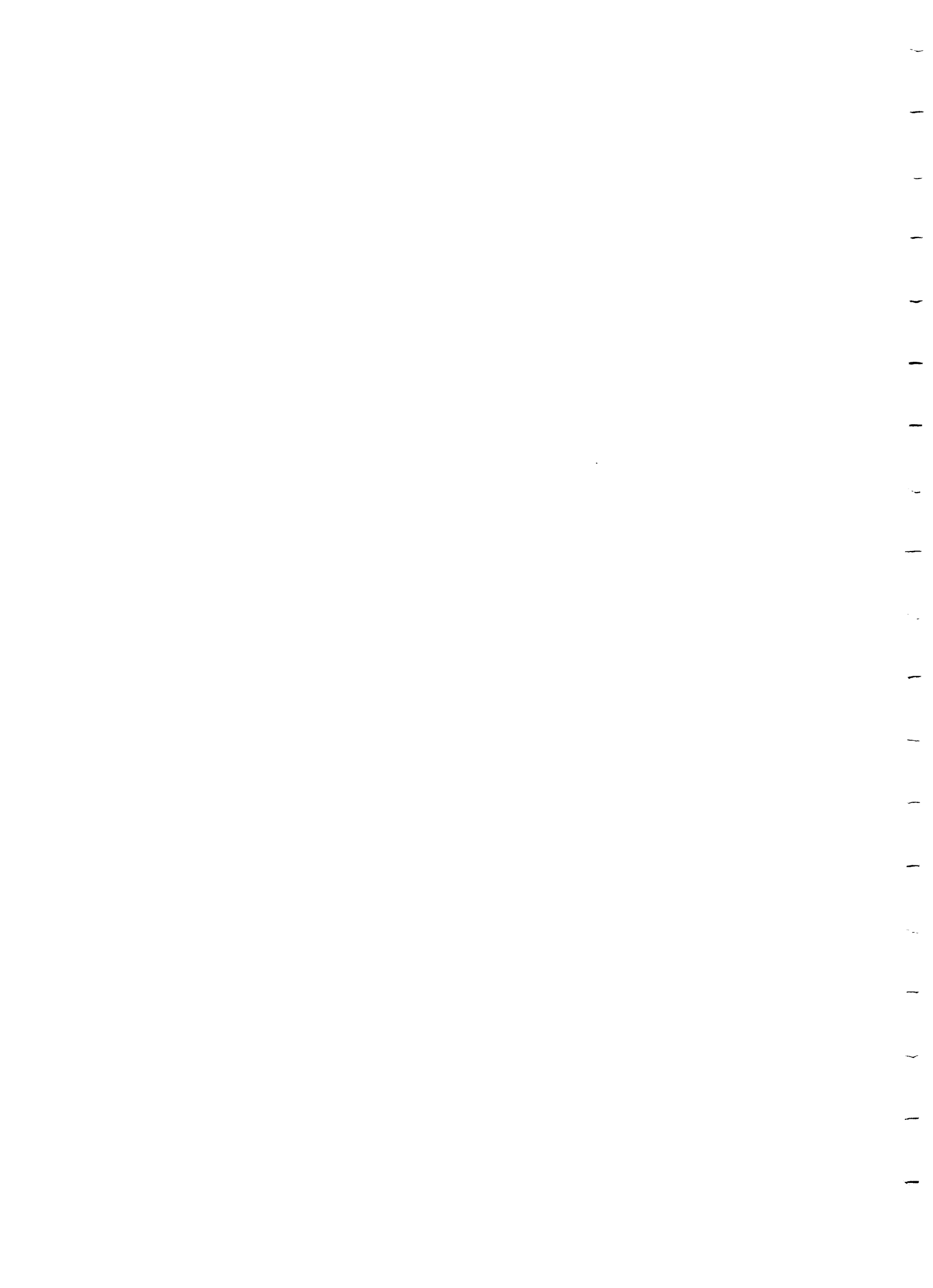


List of Tables

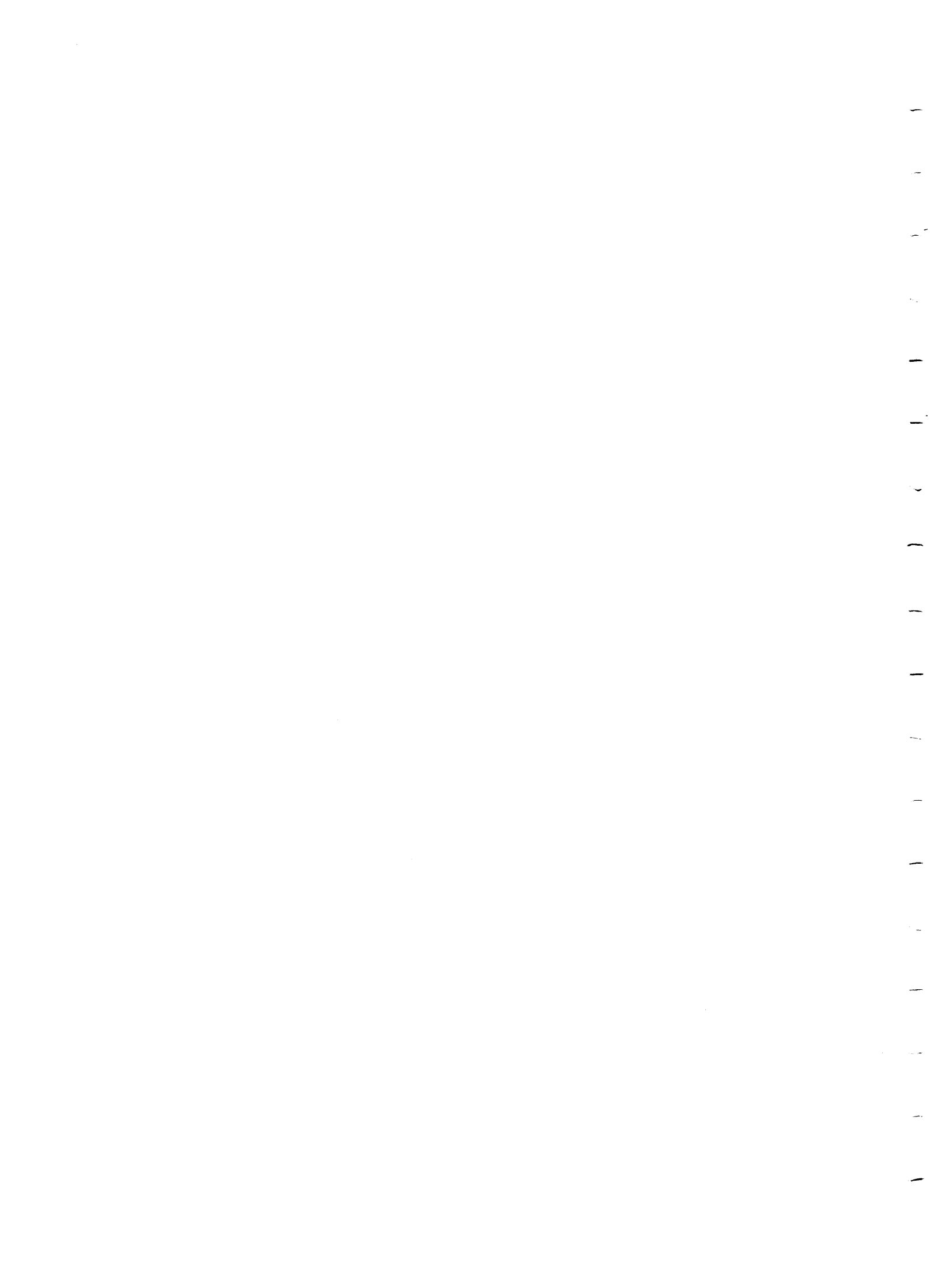
1) ✓	Former names of Lakes in the Mishewawa Lake Area	143
2) ✓	Table of Formations	144
3) ✓	Chemical analyses of supracrustal rocks in the Mishewawa Lake Area	146
4) ✓	Chemical analysis of mafic intrusive and related rocks in the Mishewawa Lake Area	148
5) ✓	Chemical analyses of felsic intrusive rocks in the Mishewawa Lake Area	150
6) ✓	Summary of assessment data on file with AFRO on December 31, 1983, relating to properties within the Mishewawa Lake Area	152

List of Plates

1	Pillow breccia with devitrified hyaloclastite matrix	158
2	Paragonite porphyroblasts in chlorite schist	158
3	Quartz-feldspar crystal tuff	159
4	Perlitic structure in plagioclase-phyric rhyolite flow	159
5	Slump scar in banded chert-magnetite ironstone	160
6	Flame structures in banded chert-magnetite ironstone	160
7	Polymictic conglomerate (Dore-type)	161
8	Cross-laminated arkosic wacke unit interbedded in polymictic conglomerate	161
9	Volcanic-clast conglomerate	162
10	Hornblende-plagioclase-quartz pegmatite patch in gabbro ...	162
11	Antiperthite crystal in pegmatite gabbro	163
12	Tonalite gneiss of the Anjigami Gneiss Domaine	163



13	Amphibolitic, massive mafic metavolcanic xenoliths in granodiorite of the Whitefish Batholith	164
14	Recrystallized and partially assimilated amphibolitic metavolcanic xenoliths in granite of the Brule Bay Batholith	164
15	Protoclastic texture in granodiorite of the Brule Bay Batholith	165
16	Recrystallized quartz eye in porphyritic granodiorite of the Mission Stock	165
17	Zoned plagioclase phenocryst, Sandy Beach Stock	166
18	Secondary crenulation cleavage in chlorite schist-felsic tuff interbeds	166
19	Old head gear, Centennial Mine, 1982	167
20	Norwalk Mine, 1908 (then known as the Monxmon Mine).	



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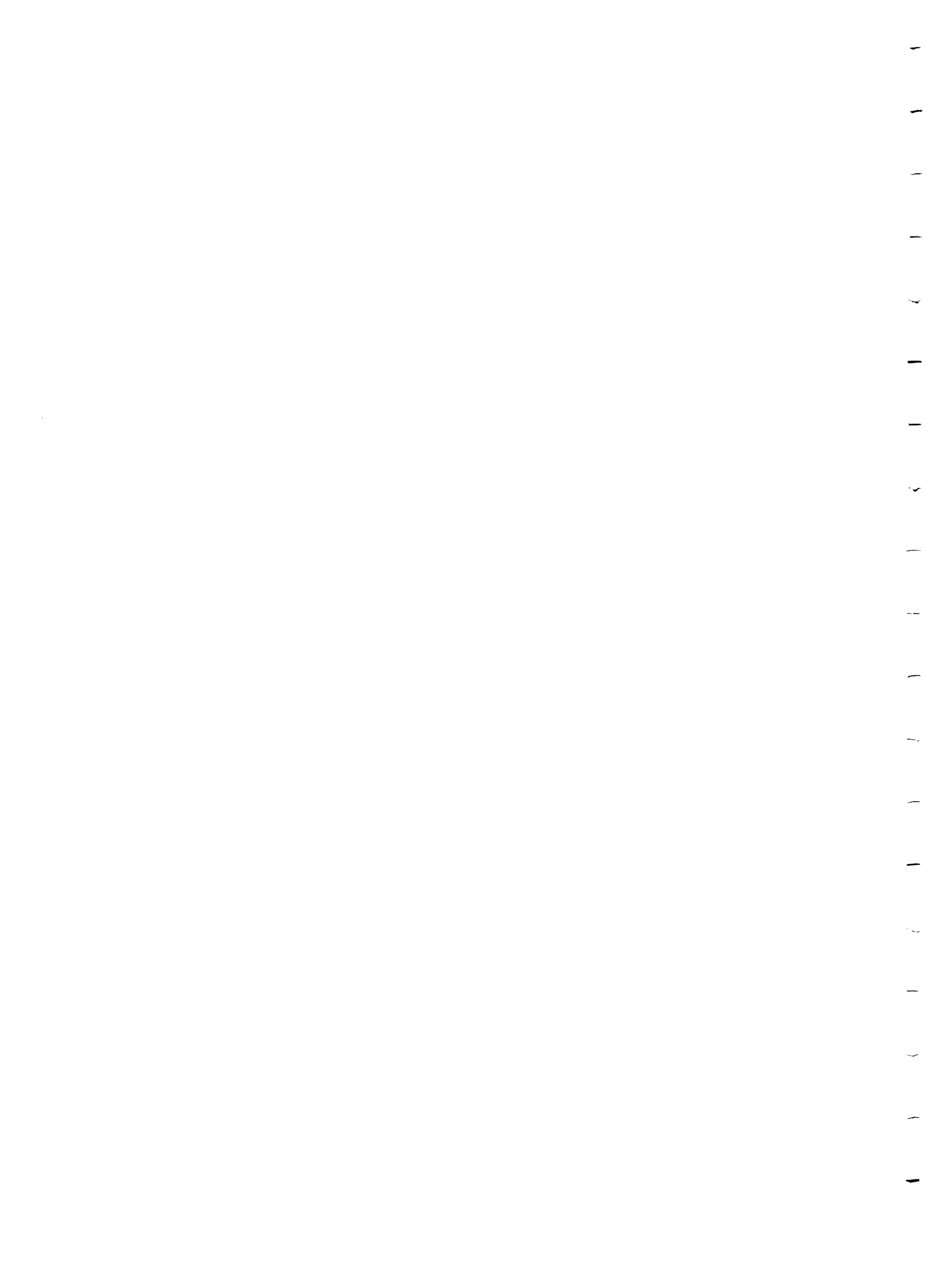
No attempt has been made to convert assays reported on ounces per ton or production figures in tons or ounces.

Abstract

The Mishewawa Lake Area covers an area of about 550 km² to the south and west of the Town of Wawa. It includes portions of Lendrum, Rabazo, Naveau and Nebonaionquet Townships, and Gros Cap Indian Reserve. The area covers the southern margin of the Wawa Supracrustal Belt.

Mafic-to-intermediate metavolcanics of Archean age are interbedded into lesser amounts of intermediate-to-felsic metavolcanics and minor iron formations, and are overlain by clastic metasediments with interbedded felsic metavolcanics. Several mafic bodies, including some conformable sills, intrude the supracrustals. Felsic stocks and plutons intrude the sequence both internally and external. A heterogeneous granodiorite-mafic metavolcanic zone comprises the margin of the supracrustal belt.

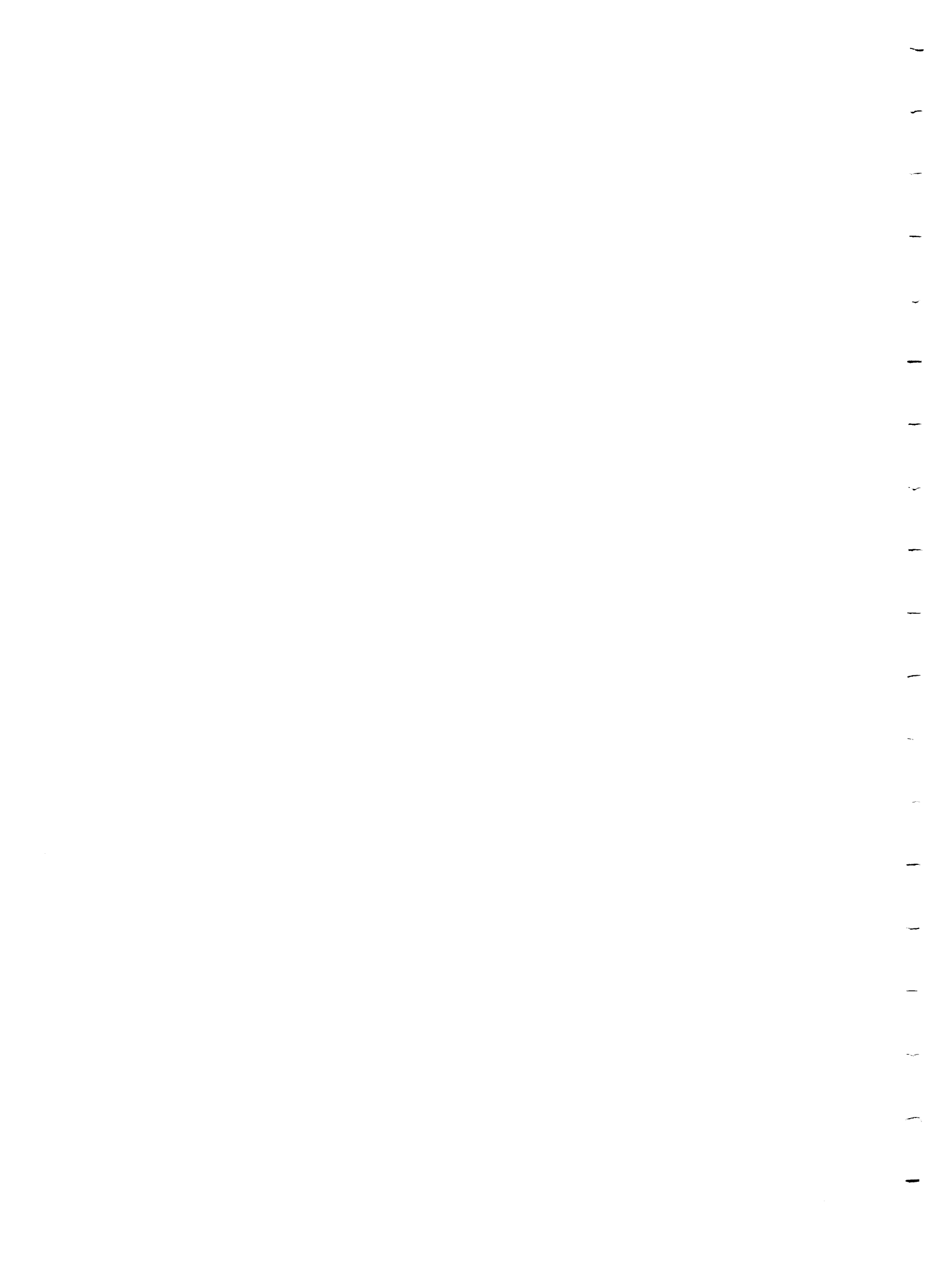
Deformation during the Kenoran Orogeny initially produced foliation and strike-faults. Continuing deformation resulted in three major folds. A late brittle deformation resulted in extensive faulting, usually with sinistral offsets. Faults



were also reactivated in the Proterozoic.

Diabase and feldspar-phyric diabase dikes cut all the lithologies and show diverse trends. The youngest intrusive units are a microsyenite and several lamprophyre dikes. A small outcrop of pebbly sandstone of Keweenawan age occurs on Smoky Point.

Mineral exploration has been intensive, though sporadic, since 1897. It has mainly concentrated on the search for gold and three mines have reached production in the area - the Centennial, Norwalk and Ranson Mines. Recent years have also seen the search for base-metals.



Geology of the Mishewawa Lake Area

District of Algoma

by

N.W D. Massey¹

Introduction

The Mishewawa Lake map-area an L-shaped tract of land to the south and west of the Town of Wawa, comprises about 550 km² delimited approximately by latitudes 47°50' to 48°01' N and Longitudes 84°29' to 84°57' W. It includes portions of Nebonaionquet, Naveau, Rabazo Townships (formerly Townships 28, 29 and 30 respectively, Range 22, Milne et al 1972) and Gros Cap Indian Reserve. Geological studies and mapping at a scale of 1:15,840 were conducted during the 1982 and 1983 field seasons under the Northern Ontario Rural Development Agreement between the governments of Canada and Ontario. The study is complementary to the regional mapping and lithostratigraphic synthesis of the Wawa-Michipicoten Belt in progress by Sage (1979, 1980, 1981a, 1982, 1983)

Access

The Trans-Canada Highway (Highway 17) passes through the map-area along the western side of Rabazo Township and the eastern side of Lendrum Township. Good all-weather roads run from Highway 17 northwest along the Lake Superior lakeshore to Michipicoten Harbour and Indian Beach; eastwards, along the northern side of the Michipicoten River to McPhail Falls; and

¹ Geologist, Precambrian Geology, Ontario Geological Survey, Ministry of Natural Resources.

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from Highway 101 southwards to Anjigami Station (Nebonaionquet Township). The main line of the Algoma Central Railway runs northwest through the centre of Nebonaionquet Township. A spur-line runs from Michipicoten Harbour through Trembley Flats to Siderite and Hawk Junction. Kashog, Mishewawa, Anjigami and Dore Lakes are also accessible by float-equipped plane from Wawa and Hawk Junction. Access into the rest of Naveau and Nebonaionquet Townships is possible by four-wheel drive vehicle or by foot along bush trails and logging roads. A logging road on the southern edge of Bailloquet Township provides access into the northern parts of Lendrum Township. The southern half of Rabazo Township lies within the Lake Superior Provincial Park and is accessible only by canoe and foot.

Access into Gros Cap Indian Reserve is by permission of the Band Council. Their willing concession of such access for the purposes of this study is gratefully acknowledged.

Topography and Natural Resources

The map-area is situated within the physiographic region of the Abitibi Uplands of the Canadian Shield (Bostock 1970), and is characterized by a very rugged, glaciated and rejuvenated terrain.

The surface of Lake Superior is 601' (183.2 m) above sea level and is bordered by steep rocky cliffs that rise several hundred feet above this level. Inland from Lake Superior the country is rugged with hills commonly rising to 1250' (381 m) a.s.l., and exceeding 1650' (503 m) a.s.l. and up to 1600'

(488 m) a.s.l. in northern Gros Cap Indian Reserve. Glaciation has incised a series of deep southwest-trending valleys which combined with a less well developed northwest-trending set of valleys produce a reticulate drainage pattern. A wide and deep valley has been eroded along the northwest-trending Trembley Fault in the Gros Cap Indian Reserve, with valley sides reaching two to threehundred feet above the valley floor. The topography of the map-area is characterized by abundant steep-sided hills and valleys, precipitous cliffs and occasional hummocky terrain interspersed with lakes, small ponds, streams, muskeg and alder or cedar swamps. Soil cover is variable, generally being thicker in the eastern part of the map-area.

Around Anjigami Lake (Nebonaionquet Township), the topography becomes less rugged and more rolling and hummocky with large sand plains between the hills, particularly north of Anjigami and Perry Stations. Bare rock slopes are fewer in number. Sand and gravel terraces are found along Sponge Creek, and a small sand plain occurs near the Fires and River. The Lower Michipicoten is bordered on both banks by a series of dissected sand and gravel terraces that rise up to 250' (76 m) above the river. Extensive sand and gravel plains are developed along the Magpie River, with large terraces rising up to 100' (30 m) above the river:

The whole map-area drains into Lake Superior. The Michipicoten River runs westward through the map-area and

drains much of Nebonaionquet Township via the Anjigami River and several other tributaries. Much of the southcentral part of the map-area (Naveau and southeastern Rabazo Townships) drains into Kashog Lake and hence southwest into the Old Woman River. The Noisy River drains most of the small lakes in Rabazo Township, although a few drain via small creeks directly into Lake Superior. The Magpie River flows southwards through Lendrum Township to join with the Michipicoten River just before the latter enters Lake Superior. Most of Lendrum Township and the Gross Cap Indian Reserve are drained by small streams that empty directly into Lake Superior, via Dore Lake and the Dore River.

The cold moist coastal climate around Lake Superior supports a diversified forest cover of spruce, white pine, red pine, tamarack, silver birch, mountain ash, balsam, cedar and maple. Thick underbrush is present in most areas, particularly those that were subjected to past logging in Naveau, Nebonaionquet and northern Lendrum Townships. Logging has recently proceeded in the Sponge Creek area (Nebonaionquet Township) and is presently active in the Perry area.

Hunting, trapping and fishing are carried out in the map-area. Sightings and other indications were found of black bear, moose, beaver, porcupine, otter, several species of waterfowl, partridge and goose. The lakes and streams yield pike, pickerel, lake and brook trout. Lake trout and salmon are caught in Lake Superior and in the Michipicoten River up

to Scott Falls Dam.

Rock falls and rapids on the Michipicoten River have provided sites for the development of hydro-electric power plants. The High Falls site was developed first, by the Algoma District Power Company (now part of the Great Lakes Power Company), with later developments at Scott Falls and McPhail Falls.

Previous Geological Work

Most of the geological work carried out in the past was concerned with the Wawa - Michipicoten Supracrustal Belt to the north of the Mishewawa Area. Some of the earlier descriptions of the Wawa Belt include Sir W.E. Logan (1847), L. Agassiz (1850), C.L. Herrick et al (1887), R. Bell (1878, 1899), W.H. Collins et al (1926), T.L. Gledhill (1927), M.H. Froberg (1937) and A.M. Goodwin (1962, 1963 and 1966). More recent work, by officers of the Ontario Geological Survey, includes that of R.J. Rupert (1979), R.P. Sage (1979, 1980, 1981a, 1981b, 1982, 1983) and Z.L. Mandziuk (1981). L. Ayres (1969) reported on the Gomitagama Supracrustal Belt to the south, and G. Bennett and P.C. Thurston (1977) on the Mishibishu Supracrustal Belt to the west.

No detailed mapping of the Mishewawa Lake Area has been undertaken before, although regional mapping was carried out by L.J. Weeks (1930) and A.F. Matheson (1932, 1933), but the geological map was never published. Description of iron formation occurrences within the area are given by A.P. Coleman (1906) and E.S. Moore (1906); and of some gold properties by

T.L. Gledhill (1927), M.H. Froberg (1937) and R.J. Rupert (1979). Aeromagnetic coverage is provided by ODM-GSC aeromagnetic map 2191 G and by OGS Geochemical/Geophysical Series Maps 80482-80484. Geological Data Inventory Folios have been compiled for Nebonaionquet (1983) and Naveau Townships (1984) by the staff of the Resident Geologist's Office, Sault Ste Marie.

It should be noted here that some confusion may rise in the consultation of the older literature due to the use of different names for lakes than those presently accepted and used on topographic maps. Table 1 summarizes some of these differences.

Present Work

Field work for Rabazo and most of Naveau Township was carried out in 1982, and for the remainder of the area in 1983. Geological mapping was conducted at a scale of 1:15,840 by a combination of routine pace-and compass traverses with outcrops being tied into topographic features recognizable on air photos. The base-maps based on Forest Resources Inventory sheets were supplied by the Lands and Waters Group, Ministry of Natural Resources. Aerial photos of 1:15,840 scale, released in 1980, were obtained from the Airphoto Library, Ministry of Natural Resources

To maintain some uniformity of mapping styles, the lithologic subdivisions developed by Sage in map-areas to the immediate north (e.g. Sage et al. 1982) were adopted, with minor additions for this survey.

Mineral Exploration

The Mishewawa Lake Area lies on the southern edge of the Wawa-Michipicoten "Camp" and, as such, has received much attention from prospectors, searching for gold and iron, since the initial gold rush of the late 1890's. Much of the early work concentrated on prospecting for gold and resulted in the development of three mines within the area - the Norwalk Mine (1903-1910), the Centennial Mine (1934-1939) and the Ranson Mine (1939). Further prospecting of these and other properties continues.

Investigations of iron deposits were carried out by officers of the Ontario Bureau of Mines and the Geological Survey of Canada (Coleman 1906, Moore 1906, Matheson 1933) but these deposits proved to have little commercial value. The larger deposits close to Anjigami and Mishewawa Lakes have received more recent attention, particularly to evaluate their potential for base-metals and gold.

Nebonaionquet and much of Naveau Township were included in a large land grant made in 1900 by the Government of Ontario to the Algoma Central and Hudson Bay Railway² as an incentive to build a railway from Sault Ste Marie to Hearst. This land is still administered by the railway and does not fall under the Ontario Mining Act. However, private claiming of mining rights by staking has been allowed by the company.

Lake Superior Provincial Park was created on 13 January 1944 and included the southern half of Rabazo Township. Some controlled staking was permitted from 19 June 1945, but, as of

² Name changed in 1965 to Algoma Central Library.

22 August 1956, all prospecting and staking has been prohibited.

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General Geology

The Mishewawa Lake area lies in the Wawa Structural Subprovince (Ayres et al 1971) which is part of the Abitibi Subprovince and includes the southern margin of the Wawa Supracrustal Belt with the Anjigami Gneiss Domain (Card 1979); a keel of supracrustal rocks extending east-southeast between Whitefish Lake Batholith and the Brule Bay Batholith. Table

II summarizes the geological units found in the area in approximate stratigraphic order, though a strict chronologic sequences is not implied for all formations.

Within the Mishewawa Lake area, mafic-to-intermediate metavolcanics of Archean age are interbedded with lesser amounts of intermediate-to-felsic metavolcanics and minor iron formations, and are overlain by clastic metasediments with interbedded felsic metavolcanics.

Several mafic bodies that appear to be conformable with the metavolcanics, represent either shallow-level sills or thick coarser-grained flows. Longer mafic stocks show cross-cutting relationships. The supracrustal sequence was intruded, both internally and externally by felsic stocks and plutons. A heterogeneous granodiorite - mafic-metavolcanic agmatite zone marks the margin of the supracrustal belt. Both supracrustals and intrusive rocks were folded, metamorphosed during the Kenoran Orogeny (Turek et al 1982) and faulted. Movement along some faults may have taken place in Proterozoic times also.

Diabase dikes, possibly of several Proterozoic ages, include the Archean rocks, often infilling earlier-formed faults and fractures. The youngest intrusive units are a microsyenite dike and several lamprophyre dikes that are probably related to the Middle Proterozoic Firesand Carbonatite in McMurray Township, north of the map-area.

A small outcrop of pebble conglomerate on Smoky Point is probably correlative with other Late Proterozoic - Cambrian

Jacobsville Sandstone outcrops in the eastern Lake Superior region (Kalliakoski 1982).

The entire area was glaciated during the Pleistocene Period. This resulted in a thin, discontinuous ground-moraine over the northern central and eastern parts of the area. Much of the western part was covered by post-glacial Lake Superior and the rock outcrop is more abundant here. Lacustrine and glacio-fluvial deposits are found around Anjigami Lake and along the Michipicoten and Magpie Rivers.

Archean

Metavolcanics

Mafic-to-intermediate metavolcanics

Mafic-to-intermediate metavolcanics form the bulk of the supracrustal sequence in the Mishewawa Lake Area. They include fine-to-medium grained massive flows, fine-to-medium grained pillowed flows, variolitic pillowed flows, pillow breccias, blocky breccias, laminated tuffs and chloritic schists. Xenoliths of mafic metavolcanics, showing various stages of recrystallization and assimilation, occur within the External Domain Brule Bay and Whitefish Lake Batholiths, as well as the Internal Centennial and Sandy Beach Stocks.

Massive flows are typically black to dark green or blue-green on fresh surfaces, though they may weather pale green. Tops of massive flows are poorly exposed, even where outcrop is extensive, and tend to be flat. Blocky or billowy tops may be observed where massive flows are succeeded by pillowed flows. The recognition of individual flows is difficult and

no accurate measurements of flow thickness were made.

Greenschist facies metamorphism has almost totally destroyed the original mineralogy of the rocks. Typically the massive flows consist of a fine-grained, hypidiomorphic to ultramafic matrix of albite + chlorite + epidote + actinolite + sericite + magnetite + sphene. Biotite and blue-green hornblende are present in appropriate metamorphic grades (see Structure and Metamorphism below). Sparse to moderate amounts of plagioclase microphenocrysts, now replaced by albite - epidote - sericite, occur in some flows. Minerals are usually unoriented, but a weak schistosity is locally defined by the parallel alignment of chlorite and actinolite.

Medium-grained, massive flows are diabasic or ophitic in texture and may only be distinguishable from intrusive diabase and gabbroic sills where contact relationships with other flows are clear. It is possible that some medium-grained flows were classified by the author as intrusive bodies on the accompanying maps.

Pillowed flows are similar to massive flows in mineralogy, being mainly fine-grained aphyric with some plagioclase - aphyric pillows. The pillows, where they are not too flattened due to deformation, vary in shape from irregular to bun and ovoid. Mattress pillows were occasionally found, as were lava tubes. The pillows range in size from approximately 30-35 cm long and 10-15 cm thick to 2-3 m long and 100-150 cm thick. Within one flow unit they are of similar size. Chloritic sel-

vedges are about 1-2 cm thick. Hyaloclastite and autoclastic breccia may occur between pillows. Amygdules, where developed, are usually concentrated in an outer zone of the pillows, though larger vugs may be scattered throughout. Amygdules and vugs are infilled by calcite, quartz, epidote, chlorite and occasional actinolite.

Variolitic pillows are fairly common, although they do not seem to form discrete mappable units. The varioles are rounded pale green to white spots within a darker green chloritic matrix. They may occur in concentric zones. Varioles increase in size and abundance towards the centre of the pillow, until they coalesce as one mass within the centre.

Pillow lavas are predominantly found in Rabazo and Lendrum Townships. They are uncommon within the rest of the area. This distribution may be in part due to a failure to recognize pillows in areas where more extreme deformation and shearing has occurred.

Beds of mafic breccia, averaging 1-2 m thick, up to 3-4 m thick in places, may be found interstratified with the pillowed flows. These breccia units commonly contain rounded to irregular pillow fragments as well as small pillows (see photo 1). The matrix consists of smaller mafic clasts and chlorite-rich hyalocastite material. Occasionally the breccia units consist of blocky angular mafic clasts in a chloritic matrix.

Chlorite-rich, mafic-to-intermediate tuffs occur as beds

interstratified with pillowed flows and as thicker independent units. They are usually dark green to grey in colour but may show lighter coloured laminations. The tuffs consist of chlorite, plagioclase, epidote, minor quartz and occasionally some biotite. Paragonite porphyroblasts were developed in one chlorite schist unit near the southeast end of Crozier Lake (photo 2). Some beds may contain large crystals (up to 3 mm) of labradorite altered to sericite-epidote-albite-calcite. Quartz veining is locally very common, both parallel to and crosscutting foliation. Magnetite is present in some horizons, as is pyrite.

Intermediate-to-felsic metavolcanics

Intermediate-to-felsic metavolcanics are dominantly pyroclastic in origin varying from tuff and crystal tuff, to lapillistone and heterolithic tuff breccia with a crystal tuff matrix. They occur principally in (a) the area north and northwest of Trembley Flats; (b) northeast of Smoky Point; (c) the Dycie Lake - Scott Falls area and (d) the Moon Lake - Anjigami Lake area. They also occur interdigitated with "Dore Series" clastic metasediments northeast of Brient and as thin units interbedded with more mafic tuffs and flows.

The sequence occurring in the western part of Rabazo Township is well exposed along the Lake Superior shoreline northeast of Smoky Point, and in roadcuts along the Highway 17 just north of the Lake Superior Provincial Park boundary. The sequence is dominated by pyroclastic units, ranging from crys-

tal tuffs to heterolithic tuff breccias, with interbeds of finer tuff, chert and occasionally mafic flows and tuffs. Blue to milky quartz and white feldspar crystals up to 3-4 mm in size are present in a white felsic or grey intermediate composition matrix. Individual units can contain up to 40 to 45 percent crystals. The relative proportions of quartz to feldspar crystals varies tremendously between units.

The euhedral to subhedral feldspar crystals are usually plagioclase, ranging in composition from albite to andesine, though they are commonly saussuritized and recrystallized. Microcline is uncommon. Quartz crystals are rounded or elongated parallel to the foliation, displaying strained extinctions and mozaic recrystallization. The matrix consists of a microgranular mosaic of quartz and feldspar with varying proportions of sericite, chlorite, biotite and calcite. Magnetite, epidote, zircon and pyrite are common accessories. The crystal tuffs are massive to well foliated, marked by the subparallel alignment of sericite and chlorite. Development of the foliation was accompanied by elongation of quartz crystals and fracturing of feldspar crystals (photo 3).

The heterolithic breccias contain rounded to angular clasts of quartz-feldspar porphyry, granodiorite, granite, crystal tuff, massive intermediates flows and mafic flows. Felsic lithologies predominate among the clasts. The matrix is a crystal tuff similar in all respects to that described above. Where foliation is well developed, clasts are augen-

shaped and stretched out along the foliation. The overall coarseness of the sequence, suggests it was deposited close to a vent area.

The intermediate-to-felsic sequence found in the Dycie Lake - Scott Falls area, and continuing down the centre of the supracrustal belt to Anjigami Lake, is much more variable, though still dominated by pyroclastics. Overall they are finer-grained than the pyroclastics in Rabazo and Lendrum Townships. Crystal tuffs are found in the Dycie Lake - Scott Falls area, and in a band running northwest from Kashog Lake. These, however, are usually finer, with crystals up to 2-3 mm, and contain fewer crystals than the Smoky Point sequence. Matrix composition varies, but is often grey chlorite and sericite. No coarser pyroclastics were observed.

Non-crystal-bearing tuffs are also common interbedded with the crystals tuffs. These vary from grey to red-brown in colour, are massive to laminated and often foliated. Chlorite and sericite are both common, though their proportions vary with composition. Quartz and feldspar occur as a microgranular mosaic. Epidote, magnetite and pyrite are common accessories. Carbonation is variable being common in the Dycie Lake - Scott Falls area, becoming uncommon towards Anjigami Lake.

To the west of Sinterville, in northern Lendrum Township, the felsic metavolcanic sequence consists of heterolithic breccia, intermediate to felsic flows and minor tuff and crystal tuff. The coarseness of the pyroclastics indi-

cates that they probably developed close to a vent area. The heterolithic breccias contain up to 60 percent clasts, which vary from 60-70 cm in size. The clasts are angular to rounded and may be elongated parallel to foliation. There are usually three or four distinct lithologies of clasts, all felsic, with a high proportion of flow material. Mafic clasts are uncommon. The matrix of the breccias is fine-grained, pale green to grey, with a weak to moderate foliation. Lapilli tuff units are similar to the breccia except that clast size averages 3-5 cm.

Felsic flows are fine-grained, pale grey to white in colour, massive, spherulitic, perlitic or flow-banded. They may contain sparse quartz or plagioclase microphenocrysts to 1 mm in size. The groundmass consists of quartz and feldspar as a microcrystalline mosaic or radiating feathery spherulite growths, with sericite, calcite and minor chlorite. Foliation or fracture cleavage is absent to weak. Flows of more intermediate composition are grey to dark grey in colour and may be amygdaloidal. Amygdules are chlorite-filled.

Further to the west the felsic metavolcanic sequence is dominated by quartz -, feldspar -, and quartz-feldspar-bearing crystal tuffs with lesser massive or laminated tuffs, breccia and minor felsic flows. The crystal tuffs contain subhedral feldspar crystals which average 2-3 mm in size. Quartz is blue to colourless, rounded to angular, averaging 1-2 mm in size. The matrix is light to dark grey, varying from massive to strongly foliated. Lithic clasts of lapilli and block size

are found in some crystal tuffs and may constitute up to 50-60% of the rock. They are usually of felsic volcanic lithologies - crystal tuffs, flows and minor porphyry - but mafic volcanic clasts may occur locally. Felsic flows are massive, white to grey in colour, and may contain quartz phenocrysts.

Metasediments

Chemical Metasediments

Chemical metasediments form minor though distinctive units within the supracrustal sequence. They range in composition from chert to magnetite-bearing chert, to magnetite and pyrite-pyrrhotite ironstones. They predominantly occur interbedded with mafic metavolcanics, but may be found within felsic metavolcanic sequences and as xenolithic blocks within the Line Lake Stock.

The ironstones are layered at various scales. Dark grey layers of almost pure magnetite alternate with layers of white to grey chert and magnetite-bearing chert. Occasional layers of chloritic, likely tuffaceous, material may also occur. Layers vary in thickness from laminae less than 1 mm thick to beds 5-10 m thick, to 30 cm or more for chert layers. Thicker bands are themselves often laminated. The relative proportions of magnetite-rich layers to siliceous cherty layers vary widely. In some outcrops magnetite forms as much as 60-70 percent of the rock, over widths of one to two metres. In other units magnetite may constitute only 20 percent of the rock.

The magnetite-rich layers are fine-to medium-grained, dense and finely laminated to massive. Siliceous layers vary from massive, cryptocrystalline to "sandy" textured. Magnetite may occur in these layers also. In some sandy textured chert horizons, particularly those with low magnetite content, spheroids of radiating fibres of grunerite occur, either scattered throughout the layers or concentrated along specific laminae or fractures. The grunerite weathers high resulting in knobby weathered surfaces. Cherty layers may show evidence of soft-sediment deformation with slump folds and scars (see photo 5), flame structures (see photo 6) and brecciation.

Most of the ironstone units are only 2-3 metres thick, and discontinuous, being traceable only for 100-200 metres along strike, although one, in Rabazo Township, can be traced for about 700 metres along the northern flank of the Bridget Lake Stock from Highway 17 northwest along the northern shore of Bridget Lake. Layering within the ironstones is usually contorted. Foliation may disrupt and transpose primary laminations. It is unclear whether the discontinuity of these units is due to structural disruption. Thicker, more laterally continuous magnetite ironstone units occur in the Mishewawa Lake to Anjigami Lake area, where they may be 25 metres thick and outcrop for 1700 metres along strike. They can be traced even further geophysically.

Pyritic ironstone is less common than magnetite ironstone.

Pyrite is often accompanied by pyrrhotite and minor chalcopyrite. The sulphides occur either disseminated in massive or laminated chert beds up to 2 m thick or in black graphite or chlorite beds to 10 cm thick that are interbedded with chert, magnetite ironstone or mafic metavolcanics. Although the majority of the pyrite ironstones are found in Lendrum Township, the largest beds are to be found east of the Firesand River (the AMAX Naveau - 1 property; up to 15 metres thick unit, strike length of about 600 metres) and on the Naveau and Nebonaionquet Township boundary (Noranda Exploration Co. Ltd Gimby-Hubert Property; thickness uncertain, strike length greater than 600 m). These deposits are described in more detail below (see Economic Geology section of this report).

A few chert units occur interbedded with intermediate to felsic volcanics. They are usually white to buff in colour; laminated massive or brecciated; and about 1-1.5 m thick.

Clastic Metasediments (Dore Series)

Apart from minor thin beds of laminated siltstone and mudstone interbedded with intermediate-to-felsic tuffs, clastic metasediments are confined to the northern margin of the supracrustal sequence in Lendrum Township. They occur in a synclinal belt running east-northeast from Dore Bay to the Trembley Fault, which offsets the belt to the north where it outcrops along the Lendrum and Bailloquet Township Boundary.

This belt of metasediments is part of a thick sequence found in the northern and central parts of the Wawa Supracrus-

tal Belt (Milne et al 1972). They are informally known as the "Dore Series", being first described at the north of the Dore River by Logan (1863). Further description and discussion has been given by Coleman and Willmott (1902), Collins, Quirke and Thomson (1926), Cooke (1937), Goodwin (1962) and Attoh (1980).

The sequence is dominated by thick beds of coarse polymictic boulder and cobble conglomerate and the classic "Dore Conglomerate" - but also includes volcanic-clast conglomerate and wacke, lithic wacke, feldspathic wacke, thin wacke-siltstone interbeds, siltstone, mudstone, argillite and interbeds of intermediate-to-felsic metavolcanics (see fig. 2).

Conglomerate and Wacke

Coarse boulder and cobble conglomerate is the most common lithologic type in the "Dore Series" metasediments. The conglomerate beds are polymictic containing clasts of massive granitoids (predominantly granodiorite to diorite), quartz and feldspar porphyries, felsic metavolcanics (flows and tuffs), mafic metavolcanics and of gabbro-diorite intrusions. Volcanic and porphyry clasts predominate. Chert and banded chert magnetite ironstone clasts are minor, less than 2 percent, but significant components of conglomerate beds on the south limb of the Dore Syncline. Vein quartz is only occasionally observed, including on quartz vein within a granodiorite boulder. Clast size varies between outcrops, commonly ranging from 30-40 cm but may be up to 80-100 cm, particularly for the granitoids. No evidence for grading was seen within any outcrop, and bedding could only be defined by wacke interlayers.

Original clast shapes are difficult to determine due to the effects of deformation. Granitoids are relatively unaffected by deformation and maintain well rounded spheroidal to ellipsoidal shapes. Chert and magnetite-ironstone clasts were also resistant to deformation and have angular, blocky shapes (see photo 7). Other lithologies show variable elongation along the foliation dependent upon the extent of deformation and lithic type. Volcanic clasts are the most elongate and mafic clasts may be particularly difficult to discriminate from the matrix. Foliation and elongate volcanic clasts wrap around less deformed porphyry and granitoid clasts. Foliation is often at a slight angle to bedding (15 to 20° difference), where this can be defined by interbedded wacke units, and the elongation of cherts along the foliation could be mistaken for original sedimentary imbrication.

The matrix of the conglomerate is a dark grey subarkosic wacke. It contains fine-to medium-grained biotite, chlorite, sericite, epidote, quartz and feldspar, with coarse-sand to granule sized clasts of plagioclase, perthite, single and polycrystalline quartz, and multi-grain quartz-feldspar rock fragments. Hornblende is developed where metamorphic grade is high.

Interbedded with the conglomerate are units of lithic wacke and subarkosic wacke similar in composition to the conglomerate matrix. These units are up to 60-70 cm thick and may be continuous beds or discontinuous lenses. They are generally massive or parallel laminated, but some cross-

lamination is observed (photo 8). They are medium-to coarse-sand size and may contain granule to pebble sized lithic clasts as well as quartz and feldspar crystals. They contain biotite, chlorite, sericite, epidote, quartz and feldspar.

Volcanic-Clast-Conglomerate and Wacke

Volcanic-clast conglomerate outcrops mainly along the northern margin of the "Dore Series", although some beds are found interlayered with the polymictic conglomerates on the south limb of the Dore Syncline. They are distinguished from the polymictic conglomerates on the basis of both size and composition of clasts. Clasts are of pebble size, often in the 3-5 cm range, but may be as large as 8 cm. Lithic composition of clasts is dominantly volcanic with mafic and felsic flow material as well as intermediate-to-felsic tuff and crystal tuff. Gabbro-diorite clasts are common, but porphyry is scarce and grantoids are totally absent. The conglomerate is well foliated and clasts are elongated parallel to the foliation. The matrix is medium-grained and rich in biotite and hornblende.

Interbeds of wacke and lithic wacke up to 30 cm thick occur in the volcanic-clast conglomerate. They are medium to coarse-sand in size. They may be parallel laminated or massive. Their clastic nature is not apparent in this section due to recrystallization and metamorphism to the epidote-amphibolite rank. They principally contain hornblende, quartz and feldspar with lesser amounts of biotite, epidote and sphene. Quartz crystals, upto 2 mm, were observed in some

outcrops.

Wacke, Feldspathic Wackes and Lithic Wackes

Beds of wacke, feldspathic wacke and lithic wacke are well developed in the eastern section of the "Dore Series" outcrop area, adjacent to a sequence of felsic metavolcanics (see fig. 2). They are dark grey, medium-to coarse-grained sediments. They are massive to medium-bedded, with some beds showing good parallel lamination. Other sedimentary structures, however, are not apparent. Lithic clasts, where present, are of granule to pebble size and commonly of felsic metavolcanic composition. They are elongated parallel to foliation. Large crystals of quartz, plagioclase and microcline are fairly common. The matrix contains chlorite and sericite, fine grained quartz and feldspar. Hornblende develops where metamorphic grade is high enough, with porphyroblasts up to 1 cm long.

Siltstones, Mudstones, Thinly Bedded Wackes and Siltstones

Finer-grained sediments predominantly outcrop in the central part of the Dore Syncline (see fig. 2), but may be encountered interbedded with the wackes and feldspathic wackes. Siltstone - mudstone beds are usually well bedded and laminated. Laminations vary from .5 to 2 mm, and bedding from 1-4 cm. Grain-size gradation is occasionally apparent where metamorphic recrystallization is not extensive. The siltstone-mudstone beds consist essentially of chlorite, quartz and minor opaque oxides with variably developed biotite porphyroblasts.

Thinly bedded wackes and siltstones are well bedded and laminated. Wacke beds range from 4 to 10 cm, siltstone beds from .5 to 1 cm. Parallel laminations are common. Locally, rip-up clasts and channel fills can be observed. Graded bedding is often obscured by recrystallization

Felsic Metavolcanics

Felsic metavolcanics are found interfingering with the "Dore Series" metasediments, particularly just west of the Trembley Fault (see fig. 2). These are predominantly quartz-bearing crystal tuff, feldspar-bearing crystal tuff, quartz-feldspar-bearing crystal tuff, heterolithic lapilli tuff and type breccia, massive to laminated tuffs and minor massive flows. Foliation is usually well developed. Hornblende is commonly developed in lapilli tuffs and type breccia both in the matrix and often replacing mafic clasts.

Facies Distribution and Interpretation

Fig. 2 shows the distribution of the various sedimentary lithofacies found within the "Dore Series". On the northern limb of the Dore Syncline, beneath the polymictic conglomerate, a wedge-shaped sequence of metavolcanics is developed, which interdigitates and passes westward into wackes, feldspathic wackes and lithic wackes. More felsic metavolcanics and volcanic-clast conglomerate occur to the west. This sequence is interpreted as representing the development of felsic metavolcanics as a volcanic island with contemporaneous erosion and distal deposition of conglomerates and wackes around the volcanic edifice. The deposition of the sediments

was probably shallow subaqueous, though the effects of deformation and metamorphism preclude a definitive environmental interpretation. Only small patches of wacke and lithic wacke are found beneath the polymictic conglomerate on the south limb. This may reflect thinning of metasedimentary units to the south, away from the volcanic centre, comparable to that observed to the west (see fig. 2). However, it may also be due to faulting along the southern boundary of the meta-sediments cutting out the basal sequence (see below: Stratigraphy and Structure sections).

Provenance of the conglomerate clasts is somewhat problematical due to the lack of adequate paleodirection indicators. Much of the material within the conglomerates and wackes was probably derived from contemporaneous volcanism and erosion of the volcanic edifices. The large amounts of mafic metavolcanic and gabbro-diorite clasts suggest that uplift and erosion of older sequences also occurred. Magnetite-ironstone clasts are restricted to the southern band of conglomerate close to potential sources within to supracrustals to the south-east,

suggesting that at least some material input was from that direction. The absence of magnetite-ironstone clasts in the northern band probably reflects material input here from the north and east.

The source of the granitoid clasts is more problematical. The granitoid lithologies are all massive, equigranular and lack any pre-deposition foliation, ruling out their derivation from a pre-existing "basement" granitic terrain (Bass 1961). Goodwin (1962) and Bass (1961) concluded that these granitoid clasts were derived from small subvolcanic stocks and apophyses. These stocks are not well developed in the Wawa Belt, however, and do not appear to be an adequate source. A more likely provenance is the batholithic intrusions, external to the supracrustal belt, whose rise and emplacement are intimately linked with the structural deformation and uplift of the supracrustal belt (see below: Structure). A similar conclusion was reached by Ayres (1969) in the Gamitagama Belt for metasediments believed to be equivalent to the "Dore Series". More detailed studies of granitoid-clast lithologies, geochemistry and geochronology are needed to solve this problem.

The polymictic conglomerates pass up into a sequence of interbedded wacke-siltstones and laminated siltstone-mudstones. These are undoubtedly sub-aqueous in origin, and at least partially turbiditic.

Mafic Intrusive Rocks

Gabbro-diorite bodies

Several large bodies and many smaller sills and dikes of gabbro-diorite composition occur in the Mishewawa Lake Area. The larger bodies, such as that immediately west of Treeby Lake and that east of Rod and Gun Lake, are intrusive into metavolcanic rocks, although contacts may not always be exposed. Some bodies contain large roof-pendants and xenoliths of metavolcanics and banded magnetite-ironstone within them. The gabbro-diorites are typically bluish-grey on the fresh surface, weathering to greenish grey. They are medium- to coarse-grained and massive. In some exposures, variation in feldspar content results in a very irregular discontinuous banding. Very coarse-grained quartz-feldspar-hornblende pegmatite patches occur locally (photo 10). Localized shearing causes elongation of primary fabrics and may transform the gabbro into a strongly foliated chlorite schist with pods and veins of quartz and chlorite aligned along the foliation.

Texturally the gabbros are generally equigranular hypidiomorphic, though poikilitic pyroxene-feldspar intergrowths are common giving a mottled appearance to the rock. A feldspar-porphyrific gabbro is also present locally. Both augite and hypersthene may be present in varying relative proportions. Both pyroxenes show partial alteration to fibrous actinolite along crystal rims and internal fractures. More complete alteration resulted in replacement by actinolite, chlorite, calcite and fine-grained mosaic quartz. Blue-green pleochroic hornblende is, however, more common than

pyroxene. It has irregular to subhedral lath shapes often with ragged acicular terminations. Some of the hornblende is probably primary, but most appears to be metamorphic after pyroxene. Plagioclase laths are invariably saussuritized and replaced by epidote + albite + chlorite + calcite + quartz + sericite. This makes the distinction of gabbros from diorite almost impossible. Chlorite and actinolite occur in the groundmass with minor sphene, sulphides and magnetite. Interstitial graphic intergrowths of quartz and altered feldspar were observed in a quartz-magnetite gabbro body northwest of Sandy Beach.

Smaller bodies of gabbro-diorite intrude the metavolcanics subconcordantly. However, where contacts are not seen, it is difficult to adequately discriminate them from medium-to coarse-grained mafic flows and their occurrence may be over-represented on the accompanying maps. Lithologies and mineralogy are similar to the larger gabbro-diorite bodies.

Metadiorite dikes intrude the Centennial Stock and metagabbro dikes may be seen in some granodiorites marginal to the supracrustal belt. However, xenoliths of metagabbro in the batholithic granodiorites point to an overlapping history of mafic and felsic intrusive activity. A couple of small sill-like bodies also intrude the clastic metasediments.

Diabase dikes

Fine-to medium-grained rocks essentially similar in colour, weathering characteristics, mineralogy, etc., to the gabbro-diorites were observed in several localities, both as

marginal facies to the coarser rocks and as separate dikes. Although grouped here with the Archean mafic intrusions, the age relationships of these dikes is uncertain and they may be of Early to Middle Proterozoic age. They are equivalent to the suite of older diabase dikes described by Matheson (1932) in the Michipicoten River area and by Collins, Quirke and Thomson (1926) in the Michipicoten Region generally. Trends of the dikes show a dominant alignment in a north-northwest direction, with a secondary trend along an east-northeast direction (see figure 5).

Intermediate-to-felsic Intrusive Rocks

This suite of massive to moderately foliated felsic intrusive rocks bounds the supracrustal belt (see fig. 3). Granodiorite and tonalite are the dominant lithologies, but microgranodiorite, granite, diorite, quartz monzonite, quartz monzodiorite, and aplite and pegmatite are also found. They form the Whitefish Lake Batholith in the northeast of the map-area, the Brule Bay Batholith in the south, the Anjigami Gneiss Domaine in the east and the Dore Lake Gneiss in the northwest of Lendrum Township.

Anjigami Gneiss Domaine

The Anjigami Gneiss Domaine occurs east of the Agawa Canyon Fault and is characterized by its general gneissic fabric. The commonest lithologies present are tonalites and granodiorites, although diorites, quartz diorites and granites are also found (see fig. 4). Foliation is moderately to strongly developed, especially in gneissic banded outcrops.

Leucosomes vary from granodiorite to quartz diorite in composition; melanosomes from tonalite to diorite. Rocks are usually equigranular medium-to coarse-grained, but porphyroblasts up to 2 cm of white or pink feldspar are found in leucosomes and in some massive granodiorite-tonalites. Locally, hornblende porphyroblasts occur in dioritic melanosomes. Interbanded granodiorite and microgranodiorite are also found, with distinct though gradational contacts. Pegmatite and aplite veins and dikes intrude either parallel to foliation or cross-cutting.

The rocks are generally grey in colour, though granites may be pink. Hornblende is the dominant mafic mineral in tonalites and diorites, whereas biotite is found in granodiorites and granites. Epidote is characteristic of the Anjigami Gneiss Domaine rocks, being readily visible even in hand sample, and is common in all lithologies.

Whitefish Lake and Brule Bay Batholith

These batholiths are similar in lithologies and general characteristics, and are treated here collectively. Only the marginal zones of the batholiths were mapped in the field. Typically the marginal contact with the supracrustal belt is a gradational, heterogenous zone. Towards the contact the mafic metavolcanics show irregular veining of dike injection by fine-grained felsite and medium-grained granodiorite. The granodiorite becomes volumetrically more important in the contact zone, containing mafic metavolcanic enclaves of varying sizes. Further into the zone, the enclaves show signs

of recrystallization and assimilation by the enclosing felsic rocks, resulting in very patchy, heterogeneous diorites and granodiorites which vary in mafic content, quartz content and grain size. A weak to moderate foliation has developed in these diorites and granodiorites and a gneissic structure is apparent in some outcrops. The number of enclaves declines further into the batholiths where more massive granodiorites and granites occur. The marginal zone can be in excess of 1.5 km wide.

Granodiorite is typically white on fresh surface. Biotite content varies from 10 to 25 percent. Quartz is clear. Pink feldspar is present in the rare potassic rocks. Diorites generally lack quartz and have much higher mafic contents giving them an overall grey colour. Textures are generally equigranular; but minor porphyritic phases are found.

Plagioclase is the dominant feldspar in all rock types (see fig. 4). It is commonly oligoclase-andesine in composition in granodiorites, tonalites and diorites, but may be albite-oligoclase in the granites. Crystals form subhedral laths with albite and pericline polysynthetic twins. Compositional zoning of plagioclase is occasionally observed. Alteration to epidote and sericite is common and extensive. Microcline crystals are commonly anhedral and show less alteration than the plagioclase. Quartz is clear, unaltered and forms an anhedral mosaic with microcline, interstitial to the plagioclase. Myrmekitic and graphic overgrowths on plagioclase laths are occasionally seen. Proto-clastic texture is

indicated by trains of very fine-grained quartz and feldspar around larger crystals, as well as fracturing and breaking up of larger crystals. Brown, pleochroic biotite is the common mafic mineral, although blue-green pleochroic hornblende occurs in the diorites and quartz monzodiorites. Epidote, chlorite, muscovite and calcite occur as accessory minerals.

Recrystallized mafic enclaves predominantly consist of blue-green hornblende and pistacitic epidote. Biotite, muscovite, quartz and sphene are also present in varying amounts. Plagioclase may not always be present; when it is, it occurs within the groundmass with epidote, muscovite and quartz.

The Dore Lake Gneiss

Only the margin of the Dore Lake Gneiss was inspected during mapping. It consists predominantly of a medium- to coarse-grained, equigranular, leucocratic granodiorite. It is white to light grey on fresh surface. Biotite content rarely exceeds 5 percent. Muscovite is sometimes present. Foliation is strongly developed close to the contact with the "Dore Series" metasediments and metavolcanics, causing elongation of quartz and feldspar augens. Quartz veining may locally be abundant, parallel to the foliation. The development of foliation weakens to the north resulting in more massive granodiorite with only minor localized shearing. Xenoliths of metasediments and felsic metatuffs are found within the granodiorite.

A quartz-porphyrific granodiorite occurs in places along the contact with the "Dore Series". It is somewhat similar to

the Magpie High Falls and Mission Stocks (see below) and may thus be younger than the equigranular granodiorite, though contacts were not observed. It is massive to moderately foliated. Quartz phenocrysts are translucent, ranging from 5 to 8 mm in size. They are anhedral, rounded to elongated parallel to foliation. The equigranular, feldspathic matrix varies in grain size from 1-3 mm, but subhedral feldspar phenocrysts up to 5 mm may develop. Biotite content is less than 5 percent. Sericite and chlorite are developed on foliation planes.

Much of the foliation in the granodiorites is believed to have developed during emplacement and intrusion into the supracrustals. However, the straightness of the contact; the presence of abundant quartz veining; development of foliation in the later quartz-porphyritic granodiorite close to the supracrustal contact; and local shear zones in the more massive granodiorite phases; may suggest that later tectonic movement and faulting along the supracrustal-granodiorite contact, has enhanced foliation development.

Felsic Intrusions

The Centennial Stock

The Centennial Stock occurs in the northwest corner of Naveau Township (see fig. 3). Contacts with the surrounding metavolcanics are not exposed, although it apparently intrudes felsic metavolcanics both to the southwest and northeast. Its relationship to the Whitefish Lake Batholith is covered by fluvial sands west of the Firesand River.

The stock is composed of a coarse-grained, white to grey granodiorite to trondhjemite of variable colour index. It is characterized by the presence of blue to milky quartz eyes and slightly green feldspars. It is typically massive to weakly foliated, but localized shearing has produced a well foliated cataclastic rock, black in colour with pink felsic laminae. Quartz eyes are resistant to and form augens, whereas feldspars are stretched and fractured. Xenoliths of mafic metavolcanics are found within the stock. Though felsic metavolcanics border the stock, no xenoliths were recognized, possibly due to the fact that they may be more difficult to distinguish from the enclosing felsic rock, particularly if the xenolith has been partially digested.

Plagioclase forms subhedral lathes, weakly zoned and extensively altered to epidote + sericite + calcite. Unaltered patches suggest an original oligoclase composition. Anhedral, cross-hatched twinned microcline and patchy, zebra-striped microperthite are only slightly altered. They rarely constitute more than 10 percent of the rock. Quartz occurs in mosaics of anhedral crystals which may show variable grain size over short distances. Patchy and strained extinctions of the quartz are common. Brown pleochroic biotite occurs with minor chlorite and epidote in the groundmass, and may form braids around quartz and feldspar in weakly foliated samples.

A quartz-plagioclase porphyry, that grades into granodiorite, occurs marginal to the stock south of the Norwalk

Mine. It is a fine-grained, buff weathering rock with microphenocrysts of quartz and plagioclase. Plagioclase microphenocrysts are heavily altered to sericite + calcite. Small subhedral grains are also present in the groundmass. Quartz phenocrysts are rounded, anhedral and show signs of fracturing and infilling by fine-grained quartz and microperthite. The groundmass is composed mainly of microperthite, microcline, quartz, sericite, minor biotite and opaque oxides. The percentage of potash feldspar suggests a granite composition.

Aplite dikes, also of granitic composition, are common within the Centennial Stock. They are fine-grained white rocks that often have a rusty weathering surface. They have an allotriomorphic texture. They consist of quartz, plagioclase (albite-oligoclase) microperthite, microcline, muscovite and magnetite-ilmenite.

The Mission and Magpie High Falls Stocks

The Mission and Magpie High Falls Stocks in the western and eastern portion of a previously single body which has been cut by the Trembley Fault, off-setting the eastern half about 3 to 3.5 km to the north-northwest. Both stocks consist of the same distinctive quartz porphyritic granodiorite.

The Mission Stock intrudes mafic chlorite schists and laminated tuffs northeast of Mission and Roller Lakes. Dikes of similar lithology also intrude metagabbro on the Lake Superior shoreline just southwest of Fort Creek. The northern contact of the stock is covered by fluvial sands and gravels,

whereas to eastern contact is the Trembley Fault. Contacts with the mafic metavolcanics are not exposed but a marginal finer-grained felsic chill zone was observed northwest of Mission Lake. At the northern end of Roller Lake, the contact was sheared with the development of ribbons and veins of sugary quartz in the stock giving it a banded appearance.

The Mission Stock is comprised of a coarse-grained, pink coloured granodiorite with characteristic large, irregular to rounded clots of sugary, polycrystalline quartz. These clots result from recrystallization of original quartz phenocrysts. The granodiorite is massive to weakly foliated.

Plagioclase makes up 45 to 50 percent of the rock. It forms subhedral to euhedral laths that show good albite and pericline polysynthetic twins. Compositions are in the albite-oligoclase range. Cloudy alteration by epidote + sericite + iron oxide dust is very common. Microcline and microperthite comprise from 15 to 33 percent of the rock, being most abundant near the contact of the stock suggesting some compositional zonation in the stock. The potassium feldspar is usually anhedral and occurs in the groundmass interstitial to the plagioclase. It is less altered than the plagioclase. Quartz occurs as clear, unaltered, anhedral crystals in the groundmass mosaic. Green-brown pleochroic biotite, epidote and sphene occur in the matrix and may make up about 15 percent of the rock.

The Magpie High Falls Stock is lithologically similar to the Mission Stock, being also a coarse-grained pink quartz

porphyritic granodiorite. Quartz phenocrysts are often single crystals, but become sugary polycrystalline masses where the rock is foliated. Generally the granodiorite is massive, but is well foliated and sheared close to the Trembley Fault. Alteration effects close in the Trembley Fault can be pronounced with increased epidotization common.

A similar quartz-porphyritic granodiorite was found as a sill intruding polymictic conglomerate along an abandoned railway siding near Michipicoten Harbour. Also quartz porphyritic granodiorite was found within the Dore Gneiss (see above).

Bridget Lake and Sandy Beach Stocks

These two small stocks are both comprised of feldspar porphyry. The Bridget Lake Stock intrudes mafic flows and magnetite-ironstone at Bridget Lake. Its southwestern contact is apparently fault bounded though it is not well exposed. Outcrops along Highway 17 reveal an unusual contact relationship between the stock and the banded magnetite-ironstone. Along the northern margin, banded magnetite-ironstone is concordant with and interfolded with a massive mafic flow. The feldspar porphyry discordantly intrudes the mafic flow but terminates at the base of the ironstone bed, which continues to outcrop subhorizontally lying on top of the porphyry for several hundred metres in the road cuts. A distinct dark chlorite chill zone is present at the porphyry-ironstone contact and, in one location, small cherty xenoliths are present in the chill-zone. The ironstone appears to have

acted as a barrier to further rise of the porphyry magma.

The Bridget Lake Stock is comprised of a medium-grained feldspar porphyry with minor blue quartz eyes. Feldspars are white laths set in a green blue matrix. They range up to 1 cm in size, averaging 3-5 mm. Generally the porphyry is massive in texture, but a weak to strong foliation defined by aligned chlorite is developed in local shear zones.

Plagioclase phenocrysts are subhedral to euhedral. They show albite, pericline and Carlsbad twinning. Overgrowths of internal plagioclase are observed around the rims, though compositional zoning is not observed. The plagioclase is of andesine composition. Alteration to sericite and calcite gives a dusty appearance in transmitted light. Quartz phenocrysts are anhedral and clear. The groundmass consists of a fine grained, irregular interlocking mosaic of quartz and feldspar with chlorite, calcite, sphene and sericite.

The Sandy Beach Stock intrudes mafic metavolcanics and metagabbro north of Sandy Beach. Xenolithic blocks of massive and pillowed mafic metavolcanics and metagabbro are common within the stock, often being in excess of 15 m in length. Apophyses of porphyry occur in the surrounding country rock.

The porphyry is rich in phenocrysts, which make up to 80 percent of some outcrops. Feldspar is the dominant phenocrysts. It forms euhedral to rounded laths up to 5 mm size, averaging 2-3 mm. They are white to grey in colour, but may show pink coloured cores. Quartz phenocrysts may make up to 10 percent of the total phenocrysts. They are rounded, 1-2

mm in size, translucent to blue. Biotite is a significant, though minor (5 to 10 percent) component of the phenocrysts population. The matrix is grey and fine-grained.

Plagioclase phenocrysts show twinning according to the albite, pericline and Carlsbad laws. They may show compositional zoning and zoning of inclusions. Alteration to sericite + epidote + chlorite ± calcite is common, but unaltered relics suggest they are of andesine composition. Biotite is green to green-brown pleochroic and may show "schiller" structure with elongate rutile needles aligned at 120° angles (? plate XX). Biotite shows alteration to chlorite. Quartz phenocrysts are rounded, clear and may show strained extinction. The groundmass consists of a very fine-grained mosaic of quartz and plagioclase with minor chlorite, sphene, opaque oxides and calcite.

Minor Felsic Intrusive Rocks

Various felsic lithologies occur as dikes and sills in the metavolcanics. Feldspar porphyry, similar to that of the Sandy Beach and Bridget Stock, is common as dikes and subcordant sills in Lendrum Township for example, north of the mouth of the Michipicoten River.

Twin felsite dikes, from 1 to 1.5 m wide, occur throughout the map-area. They vary in colour from white to grey, but yellow and pink hues may also be seen. They are generally fine-grained aphanitic felsites, but may also carry phenocrysts of feldspar and/or quartz. Where contact relationships are uncertain they may easily be mistaken for

felsic flows. Their origin is uncertain, but they are most probably apophyses of various batholiths and stocks.

Quartz-feldspar porphyry forms a small body at Perrault's Beach, Gros Carp. I R49, and scattered dikes in Lendrum Township. It contains abundant white to translucent quartz phenocrysts up to 1 cm in size. They are rounded, euhedral and may be embayed. Feldspar phenocrysts occur as sparse longer crystals up to 2 cm in size, and more commonly as small crystals 3-4 mm. They are usually pink in colour, but some larger phenocrysts show pink-white zoning. Both plagioclase (oligoclase) and microcline are observed in thin sections. The green-pink weathering matrix consists of quartz, feldspar, biotite, sericite, calcite and opaque oxides.

Middle-to Late Proterozoic

Diabase Dikes

A suite of diabase dikes of probable Keweenawan age intrudes all the Archean lithologies. They are distinguished from the older Archean diabase by their fresher appearance in outcrop. They are usually black or grey, weathering to a green or brown colour. They are predominantly fine- to-medium grained and show a felted diabasic texture on weathered surface. Coarser grained equigranular to ophitic textures may be found in the central portion of thicker dikes. Two feldspar-phyric varieties are also found; one with large euhedral feldspar laths up to 3 cm long set in a black fine-grained matrix; the other with rounded or ragged feldspars in a blue-grey matrix. Feldspars are often concentrated

in the center of dikes, with aphyric margins.

Dikes of all varieties vary in thickness from a few centimetres to 30 metres. Contacts are sharp but may be irregular. The aphyric dikes show a variety of alignments and almost any trend can be found (figure 5). However, a set of northwest to north-northwest-trending dikes tend to predominate, with a possible conjugate set trending east-northeast. Feldspar-phyric dikes, however, tend to be aligned in a west-northwest direction and show less dispersion (figure 5). The relative age relations of the feldspar-phyric and aphyric diabases are unclear, and no conclusions can be reached about possible changes in the regional stress fields during intrusion of the dikes.

Despite their fresh look in hand sample, the diabases have suffered the effects of metamorphism, sometimes quite extensively. When unaltered, they are medium-grained, intergranular or diabasic in texture. Plagioclases are usually subhedral laths of labradorite composition, but phenocrysts may be zoned. Both augite and hypersthene can be present. Chlorite occurs intersertally. With metamorphism the plagioclase becomes partially to completely replaced by epidote + sericite + albite + quartz + biotite + chlorite. The pyroxenes are replaced by fibrous actinolite or green pleochroic hornblende. All of biotite, chlorite, actinolite, epidote, albite, sphene, pyrite and quartz may occur in the groundmass.

Alkalic dikes

Monchiquitic lamprophyre dykes are found crosscutting Archean lithologies and the diabase dikes. They are most commonly seen in roadcuts on Highway 17 and along the shoreline of Lake Superior. They are easily eroded due to blocky cooling fractures and are rarely seen elsewhere than noted. They are typically black when fresh, weathering to an orange-brown. Dikes are generally thin, varying up to a metre in width. Biotite-phyric and olivine-phyric varieties are most common, but pyroxene and feldspar phenocrysts are also seen. Often the dikes show evidence of multiple and composite intrusion, sometimes with thin screens of country rock trapped within the dikes. The few observations on the trends of lamprophyres dikes, suggest a dominant northeast trend. This may reflect the derivation of the lamprophyric magmas from the Firesand River Carbonatite Complex in McMurray Township to the northeast of the map-area.

Small rounded xenoliths of hartzburgite are found in one lamprophyre dike that intrudes the Mission Stock, as exposed in roadcuts opposite the Fort Road turnoff from Highway 17. These xenoliths and the enclosing lamprophyre have been described in detail by Mitchell and Janse (1982). The lamprophyre in an ocellar monchiquite containing phenocrysts and xenocrysts of olivine set in a panidiomorphic groundmass of titanomagnetite, aluminous pyroxene and titanian phlogopite, with a mesostasis of analcite, iron-rich pyroxene and calcite. Xenoliths are coarse granular chrome-spinel hartzburgites and one porphyroclastic garnet-spinel

wehrlite. The latter is considered by Mitchell and Janse (1982) to be a high-pressure cumulate from the monchiquite magma. The hartzburgite is interpreted to be derived from highly depleted mantle situated at depth of 50-90 km (Mitchell and Janse, 1982).

An east-west trending microsyenite dike cuts the Mission Stock at the northern end of the first set of roadcuts on Highway 17, immediately south of the Michipicoten River. It is four metres wide and is comprised of a very fine-grained orange coloured rock with rare subhedral microphenocrysts of pink potash feldspar. The groundmass consists predominantly of hematite-coated orthoclase with minor quartz, soda-amphibole and opaque oxides. The microsyenite intrudes a lamprophyre dike in the western roadcut. However, both microsyenite and lamprophyre are probably related to the emplacement of the Firesand River Carbonatite Complex in McMurray Township.

Keweenawan Supergroup

Jacobsville Sandstone

A small exposure of pale orange coloured, pebbly sandstone was found on the eastern side of Smoky Point, close to the neck of the point. A direct contact with the surrounding crystal tuff and tuff-breccia was not observed, though the sandstone is believed to unconformably overlies them. It probably correlates with other outcrops of Jacobsville Sandstone found along the eastern shore of Lake Superior (Kalliokoski 1982).

The sandstone is poorly sorted with rounded pebbles and rounded-to-angular granules set in a sandy matrix. Clasts are of a grey feldspar crystal tuff, pink-to-red feldspar, white-to-clear quartz and white chert. The matrix is grey when fresh, weathering to pale orange or buff. It is of very local provenance.

Cenozoic

Quaternary

Pleistocene and Holocene

Glacial striae generally trend southwest and probably represent the average movement of the final Valdez ice advance of the Wisconsin glaciation in the area (Hough 1963). A well developed set of valleys with glacially polished, rounded, sides parallels this trend south of the Michipicoten River. A similar trend is found in the Gamitagama area to the south (Ayres 1969).

Drift or ground moraine cover is lacking in much of the western part of the map-area, presumably due to removal by wave action of post-Valdez lakes. In the northern, central and eastern parts of the map-area, a thin discontinuous mantle of drift is found, usually less than a metre thick. Erratic boulders up to a few metres in size, and commonly of intermediate to felsic plutonic lithologies, are scattered over the land surface. A small esker about 2.5 to 3 metres high cuts across the northern area of Moon Lake (Naveau Township). A larger esker, about 12 m high occurs along the western shore of Byron Lake (Nebonaionquet Township).

Upon withdrawal of the ice sheet, the western part of the map-area, adjacent to Lake Superior, was inundated by waters of Lake Minong. The shore-line has gradually receded due to isostatic uplift of the surface and oscillating withdrawal of the lake-waters. As a result, a succession of shoreline stands is preserved as beaches and terraces (Hough 1963, Farrand 1969, Phillips 1980). The higher Lake Minong shore-line is now found at about 300 m above sea level, with the present Lake Superior water-level at 183.6 m a.s.l. Within the map-area, the shoreline was too rugged for beaches to form, but numerous cliffs occur like stairs above the present Lake Superior cliff-line. Flat sand and gravel plains in the Trout Creek (north of Dycie Lake) - Norwalk Lake area; the Firesand River area and the unnamed stream north of McPhail Falls, all occur at around 300 m a.s.l. and are probably part of a Lake Minong-related floodplain on delta.

Below this level, numerous terraces are found alongside the Michipicoten and Magpie Rivers. These are dominantly sand with occasional gravel layers and clay bands. Cross-bedding was reported in terraces along the lower part of the Michipicoten River by Coleman (1906). The terraces appear to have formed as the rivers incised and reworked the earlier fluvio-lacustrine deposits in response to the receding lake shoreline: The development of wide meanders, particularly in the Michipicoten River, has aided this process. The terracing on the Michipicoten and Magpie Rivers has been the subject of much early work and good descriptions are given by Coleman

(1906), Collins et al. (1927) and Matheson (1933). A modern evaluation of these terraces is presently in progress (E. Frey, M.N.R. Wawa, personal communication 1983).

A set of terraces and sandy lacustrine deposits, above the Lake Minong shoreline, is found around Anjigami Lake and extends north to Whitefish Lake. Interpretation of these terraces is uncertain at the moment, but they may represent a small lake that was perched above Lake Minong, perhaps held back by some blockage of morainic material in the Michipicoten River. Possibly related to these terraces and deposits is a series of terraces along Sponge Creek east of Anjigami Lake.

Recent sediments are comprised of organic mud in swamps, clay and silt in lakes, sand and gravel in streams and rivers, and sand and cobble beach deposits along Driftwood and Sandy Beaches. The material at Driftwood Beach appears to be reworked fluvial deposits, delineated by the Michipicoten and Magpie Rivers, which has been built into a bar by northward longshore drift. Coarser material has also been derived by erosion of the shoreline to the southwest.

Geochemistry

Geochemical analyses of selected samples of lithologies in the Mishewawa Lake Area were made by the Geoscience Laboratories, Ontario Geological Survey, Toronto. The results are compiled in Tables III, IV and V. A suite of mafic and felsic metavolcanic rocks was collected along Highway 17 through the Lower Cycle metavolcanic sequence. These have been subject to hydration and carbonation during metamorphism,

which is reflected in their high volatile contents (LOI and CO_2). However, the major-elements are sufficiently undisturbed to still allow the classification of the rocks. The mafic metavolcanics are tholeiite (fig. 8) according to the classification schemes of both Irvine and Baragar (1971) and Jensen (1976). Only basaltic compositions are present, and these show a moderate to strong iron-enrichment trend. The generally low Ni, Cr, and Co contents confirm this fractionation trend.

The two felsic metavolcanic samples, in contrast, are calc-alkaline in affinity and rhyolitic in composition. No samples of intermediate composition were found in the sequence. A similar bimodality of chemistry, tholeiitic mafics with calc-alkaline felsics is found in other lower Cycle sequences in the Wawa Supracrustal Belt (R.P. Sage, Geologist, Ontario Geological Survey, Toronto, personal communication, 1983), and helps to confirm the stratigraphic correlation of this sequence.

Felsic intrusions also show a calc-alkaline affinity (fig. 8), ranging in composition from andesitic for the feldspar porphyries to rhyolitic for the Mission and Magpie High Falls Stocks. They point to the continuity of calc-alkaline magma genesis during the development of the Wawa Supracrustal Belt.

Archean mafic intrusions (Table IV and fig. 9), as a group, show a strong iron-enrichment trend, typical of tholeiitic compositions.

Keweenawan diabases are also tholeiite (fig. 9), whereas the younger though related, lamprophyre and microsyenite are alkalic. The latter are included in figure 9 only for the sake of completeness.

Metamorphism and Rock Alteration

Supracrustal rocks in the Mishewawa Lake Area have been affected by regional metamorphism, contemporaneous contact metamorphism in the marginal zone of the supracrustal belt and later silicification and carbonate alteration.

Most of the supracrustal rocks show the effects of metamorphism and recrystallization under medium-pressure regional metamorphism. Mafic metavolcanics show the characteristic mineral assemblages of the low (albite + epidote + chlorite + actinolite to high (albite + epidote + biotite + actinolite + chlorite) greenschist facies rank (Miyashiro 1978, Turner 1968). Banded chert magnetite-ironstones show the development of grunerite indicating metamorphism at moderately high temperatures (>360° C at 200 MPa, Hoarse 1982). Metamorphic grade increases towards the margins of the supracrustal belt where epidote-amphibolite facies assemblages are found in mafic metavolcanics, mafic enclaves within the granodiorite batholiths, and in metasediments and felsic metavolcanics of the Dore Series. Blue-green hornblende is characteristic of these rocks. Garnet is only rarely observed. Minor retrograde alteration of hornblende and biotite to chlorite is observed in several samples.

Archean mafic intrusions show partial to complete

mineralogic readjustment to the greenschist and epidote-amphibolite facies rank.

The felsic stocks that internally intrude the supracrustal belt, produced little or no contact metamorphic effects on the surrounding rocks, although mafic enclaves in the Centennial Stock show epidote-amphibolite assemblages. The Mission, Magpie High Falls and Centennial Stocks show the effects of protoclasia, during emplacement, and cataclasis from later shearing and faulting events.

Carbonatization and occasional silicification of supracrustals and mafic intrusions is fairly limited in the Mishewawa Lake map-area compared to the rest of the Wawa Supracrustal Belt (Sage 1981G). Pervasive carbonatization is restricted to the Dycie Lake - Scott Falls area and the Roller Lake - Neywa Lake area, both in Rabazo Township; the northern Lendrum Township area; and the western coast of Gros Cap Peninsula, Lendrum Township, where replacement of mafic pillow lavas is almost complete in places. The causes and controls of the carbonatization are presently unknown.

Quartz and carbonate veining are more widespread and affects all lithologies.

Stratigraphic Relationships

The supracrustal rocks of the Mishewawa Lake Area have been deformed and faulted into various blocks (see fig. 7). Correlation between these blocks is difficult due to the lack of easily recognized, laterally continuous marker horizons. The problem is made worse when reliable facing evidence is not

found. The facing of pillows provides the best top indicators in the metavolcanics, but the pillows are often stretched and elongated or show irregular shapes.

Correlation is particularly difficult in the area of Rabazo Township west of the Trembley Fault. However, all the rocks in this area are believed to be part of the same cycle of volcanism, which shows a progression from massive mafic flows at the base up into pillowed flows (some variolitic), pillowed flows and tuffs, and finally laminated tuffs and chlorite schists at the top. Intermediate-to-felsic tuffs and crystal tuffs occur at several levels in the upper part of the mafic metavolcanic sequence. Thicker units of quartz-feldspar crystal tuffs and tuff-breccias overlie the mafic metavolcanics around Smoky Point. Chemical metasediments form discontinuous units within the mafic sequence and at the mafic-felsic boundary north of Treeby Lake. This cycle of volcanic rocks is probably correlative with the Lower Cycle volcanics outlined by Sage (1981G) in McMurray and Esquega Township, further north in the Wawa Supracrustal Belt.

The metavolcanics within the Mishewawa Lake Syncline consist of a sequence of massive flows passing up into tuffs and chlorite schists. Pillowed flows appear to be absent, although this may be a consequence of their non-recognition in an area of high strain and well developed penetrative foliation. Intermediate-to-felsic tuffs, laminated tuffs and crystal tuffs overlie the mafic metavolcanics. Chemical metasediments are found at various levels in the mafic

metavolcanics and felsic metavolcanics. The sequence correlates, through outcrops east of the Firesand River, with the Lower Cycle volcanics of McMurray and Lastheels Townships (Sage 1981G).

Intermediate-to-felsic crystal tuffs and tuffs in the Dycie Lake - Scott Falls area are continuous with tuffs in McMurray Township which have been interpreted as belonging to an Upper Cycle of volcanism related to the emplacement of the Jubilee Stock (Sage 1981a) and possibly the Centennial Stock. Their relationship with the metavolcanics south of the Michipicoten River is uncertain.

Intermediate-to-felsic metavolcanics with interbedded mafic metavolcanics form a band that runs north-northwest from Legarde Hill to Trembley and west of Rod and Gun Lake, where it bands to run east-northeast to the Black Trout - Porhill Fault. These metavolcanics are correlatable across the fault with intermediate-to-felsic metavolcanics that underlie the Mildred Iron Range in Bailloquet Township (Mandziuk 1980) and the Helen Iron Range in Chabanel Township (Sage et al. 1982). They thus represent the upper part of the Lower Cycle volcanics. They are overlain by pillowed mafic flows of the Middle Cycle to the southwest of Legarde Hill and in the Bailloquet-Lendrum Township Boundary area. The economically important, intervening chemical metasedimentary horizon, present elsewhere in the Wawa Belt (Goodwin 1962, Sage 1981G), is, however, absent in the Mishewawa Lake area.

The Middle Cycle metavolcanics also underlie the area to

the west of the Trembley Fault from the Michipicoten River to Gros Cap Peninsula. They consist of massive and pillowed mafic flows with interspersed pillow breccia units and interflow chemical metasediments. The "Dore Series" metasediments and metavolcanics overlie the mafic metavolcanics. Although the contact is probably faulted over much of its length (see Structure below), an unconformity is seen at the old tank farm at Michipicoten Harbour. No contact is seen between the metasediments and the mafic metavolcanics in the Lendrum-Bailloquet Township Boundary area, though facing evidence suggests the metasediments overlie the metavolcanics. The metasediments are included in the Middle Cycle by Sage (1981G).

Structural Geology

Minor Structure

The supracrustal rocks show evidence of at least three phases of deformation. The first produced a foliation that is commonly subparallel to beddings, where bedding is discernible, although it can be seen to be axial planar to small folds in banded chert-magnetite ironstones and to intrafolial folds in tuffs and schists. This foliation is pervasive throughout the area and is found in nearly all supracrustal lithologies, except the massive mafic flows. It is a closely spaced schistosity defined by the parallel alignment of chlorite and sericite within the rocks. This is accompanied by a strong flattening perpendicular to the schistosity, discernible at both microscopic (crystal augens with pressure

shadow zones tapering out along the schistosity in crystal tuffs) and microscopic (flattening and elongation of pillows in pillowed flows) scales. A crenulation lineation is associated with the first foliation, particularly in the finer grained mafic laminated tuffs and chlorite schists. A mineral lineation due to alignment of porphyroblastic hornblende, and an elongation lineation, due to stretching of varioles and pillows, are also seen occasionally.

A second foliation is found at several localities throughout the map-area. It is a crenulation cleavage that deforms the first foliation and beddings. It is wider spaced, 2 to 3 mm, and is seen to be axial planar to small slip folds on flexural-slip folds. Where subparallel to the first foliation, it is difficult to distinguish. A widely spaced, often exceeding 10 cm, fracture cleavage may develop in more massive lithologies.

A third brittle deformation has produced some kink bands within the more foliate lithologies, as well as faults and shears. These kink bands almost always show a sinistral offset, a feature exhibited by the majority of the faults in the map-area.

Numerous minor shears are found, particularly within the felsic intrusive stocks and the gabbros. Cataclasis within the zones is variable from moderate to extreme. Within the felsic rocks feldspars are fractured, pulled apart and sericitized, whereas the more resistant quartz is merely

recrystallized as polygonal mosaics with strained extinction. Gabbroic rocks show the elongation of oikocrysts along the shear and the development of a schistosity defined by the parallel alignment of chlorite. The shear zones are often subparallel to the first foliation, particularly within the gabbros, and may be of similar age, although since the felsic intrusive stocks may be younger, the shear zones may record a younger shearing deformation.

Major Folds

Several major folds can be recognized in the map-area (fig. 7). The belt of clastic metasediments in Lendrum Township and Gros Cap Indian Reserve, occurs within a syncline overturned to the northwest. Bedding and foliation are subparallel and dip southeasterly on both limbs, varying from about 50° to 80° . However, facing evidence from within the sediments shows that the southern limb of the fold faces northwesterly and is thus overturned (see fig. 7). This would agree with the earlier interpretation of Cooke (1937) and Matheson (1932), which refute Collins et al.'s (1926) assertion that the sequence dips homoclinally southwestward. There is little evidence to say if the syncline plunges or not. The Dore Syncline is bounded by the Dore Fault to the west and the Trembley Fault to the east. Its easterly continuation, which should be offset by the Trembley Fault into Bailloquet Township, has not been recognized to date (see Mandziuk and Studemeister 1981).

The Michipicoten Anticline has immediately south of the

Dore Syncline. It is somewhat asymmetric with the north overturned limb showing east-northeasterly trending bedding and foliation, which dip southeast and face to the northwest, while the south limb shows southeasterly trending bedding and foliation which dip and face to the southwest (see fig. 7). The anticline plunges fairly steeply to the west. The Michipicoten Anticline is recognized to the east of the Trembley Fault, as far as Rod and Gun Lake, but appears to be absent further east (see Sage et al 1982a, 1982b).

The Mishewawa Lake Syncline runs southeast across Naveau and Nebonaionquet Townships. Dips of the metavolcanics, though always steep, vary from southwest in the north limb to northeast in the south limb. The Mishewawa Lake Syncline has formed as a supracrustal keel between the Brule Bay and Whitefish Lake Batholith.

Within Rabazo Township, west of the Trembley Fault, the mafic metavolcanics show a variation in bedding and foliation trends from southeasterly around Crozier Lake to easterly on Treeby Lake and southeasterly around Fenton Lake. This trend parallels the contact with the Brule Bay Batholith. Facing evidence is scarce in this area, but suggests that the sequence generally faces away from the Batholith with some reversals due to medium scale folding and faulting.

Major Faults

Several major faults and lineaments cut the map-area (fig. 7). The oldest set of faults is a group of predominantly strike faults which generally trend

east-northeast. The Brient Fault lies on the south side of the Dore Syncline. Although not exposed anywhere along its length, it is marked by the erosion of a fairly major valley feature. A series of gabbroic intrusions, with local evidence of minor shearing within them, is found in the mafic metavolcanics to the south of the fault. The fault probably formed during folding of the Dore Syncline and Michipicoten Anticline. It represents thrusting in the overturned limb, localized along the metasediment-metavolcanic contact, where ductility contrasts were greatest. The amount of vertical and horizontal movement is unknown. The Brient Fault is probably a western continuation of the Magpie River Fault in Chabanel Township, although faulting in the intervening area between the Trembley and Black Trout Lake Faults is uncertain. In the Bailloquet-Lendrum Township boundary area, sheared gabbro is found just south of a minor photo lineament. This photo lineament runs between metasediments to the north and mafic metavolcanics to the south. No other evidence of faulting was observed.

The Driftwood Fault lies close to the southwest trending Lake Superior shoreline - a probable topographic expression of the faulting. It separates the southeast trending middle cycle metavolcanics of Lendrum Township from the similar trending Lower Cycle metavolcanics of Rabazo Township. The fault is a probable extension of the Wawa Lake Fault, though correlation is hampered by thick fluvial terrace deposits along the Magpie River.

Strike faulting in Rabazo Township, of west north-west trend, and the Firesand River Fault are probably of similar age to the Brient-Magpie River and Driftwood-Wawa Lake Faults.

A second set of faults crosscuts and offsets the major folds and the first set of faults. In the western and northern parts of the map-area, these faults trend to the southeast for example e.g. Trembley Fault, whereas in the eastern part of the area the faults trend northeasterly. In nearly all cases, apparent offsets are sinistral, though amount of offset varies from a few hundred metres on the Black Trout Lake Fault to about 3 to 3.5 km along the Trembley Fault. Deflection of foliation and bedding found close to the Trembley Fault in Lendrum Township confirms the sinistral slip. Vertical movements along the faults are unknown in amount or sense, although offsets of the supracrustal belt boundaries along the old Woman River Fault point to it having a downthrow to the northwest.

The Trembley Fault shows bifurcation and the development of a zone of en-echelon shears in the Trembley Flats area. This is in contrast to the more normally defined faults to the northwest and southeast. This wider dispersion of the fault zone corresponds to the fault crosscutting the Michipicoten Anticline and running subparallel to its southern limb. Here it would have been easier for stress to be relieved along a series of strike-slips parallel to foliation, than by a single fault plane at a low angle to the foliation.

The relative ages of the southeast- and

northeast-trending faults is unknown. There is no evidence for them having crosscut or displaced each other, and they may represent a synchronous conjugate set of fractures. The faults are believed to be Late Archean - Early Proterozoic in age, but some of them were probably reactivated during the Middle to Late Proterozoic Keweenawan rifting event, as Keweenawan diabase dikes are themselves veined and fractured.

Correlation of Geology with Aeromagnetic data

The Mishewawa Lake Area is covered by both regional aeromagnetic maps (Ontario Department of Mines - Geological Survey of Canada 1962; Maps 2191G, 2192G, and 2205G) and more detailed maps (1:20,000; Ontario Geological Survey 1980, Geophysical/Geochemical Series, Maps 80482-80484).

Mafic metavolcanic and intrusive rocks generally produce moderate magnetic anomalies of 200-400 gammas above the felsic plutonic rocks. However, felsic metavolcanics and clastic metasediments have low magnetic signatures comparable to the felsic plutonic rocks. Pronounced high linear magnetic anomalies of up to 2000 gammas occur over iron formations in Naveau and Nebonaionquet Townships. A broad magnetic anomaly of about 700 gammas beneath Michipicoten Bay suggests the continuation of the Gros Cap Iron Formation southeast to the Driftwood Fault.

A circular anomaly of about 400 gammas in the southeastern corner of Nebonaionquet Township, has been interpreted as being over a gabbroic stock intrusive into the Anjigami Gneiss Complex (Milne et al. 1972), although outcrop

is poor in the area and little gabbroic material is exposed.

Major faults are detectable on the aeromagnetic maps where they juxtapose mafic metavolcanics with felsic plutons or other supracrustals. Diabase dikes are not discernible due to the lack of contrast with the predominantly mafic supracrustal sequence.

Economic Geology

Introduction

The Mishewawa Lake area lies on the southern edge of the Wawa-Michipicoten 'camp' and as such has received much attention from prospectors and explorationists searching for gold and iron ore. A few localities have also been investigated for base metals.

Exploration activity in the Wawa-Michipicoten Camp has been mainly concentrated in three major periods:

- a) 1896-1914 The first ten years following the initial discovery of gold in the Wawa Camp in 1897 (Gledhill 1927) saw a gold rush in the area with claims being staked on almost every quartz vein. Some claims were staked in the river valleys, in the hopes of finding placer deposits. Interest in iron ore also commenced during this period.
- b) Middle '20s to the Second World War. This was probably the most productive period for gold in the camp, with eight or nine modestly-sized mines in production.
- c) Post 1960 The opening of the Trans-Canada Highway (Highway 17) made the Wawa area more accessible and led to renewed interest in the mineral resources of the area. This

was further boosted in the 1970's by the sharp rise in the price of gold.

Within the Mishewawa Lake Area, three mines have recorded production of gold - the Norwalk Mine (1903-1910), the Centennial Mine (1934-1939) and the Ranson Mine (1939). The Mays Shaft on the Stenabaugh Vein is also reported to have produced gold from a one-man operation.

Despite the very intensive exploration activity, only limited records of the work carried out and their results are available, and for several areas records are totally lacking. The few records remaining are complicated by restaking under a confusing variety of designation systems causing errors and ambiguities in the identification of mineral locations in earlier geological reports. Also in much of Naveau and the whole of Nebonaionquet Townships, the land is owned by the Algoma Central Railway and is not administered under the Ontario Mining Act. However, private claiming of mining rights by staking have been permitted by the company. Table VI summarizes the information available in the Assessment Files Research Office, Toronto; the office of the Regional Geologist, Sault Ste. Marie and the office of the Mines Recorder, Algoma Central Railway, Sault Ste. Marie.

Geological data inventory folios covering the Mishewawa Lake area are in preparation by the staff of the Resident Geologist's office, Sault Ste. Marie, although only the Nebonaionquet Township (GDIF 122) and Naveau Township (GDIF 134) folios have been published at the time of writing.

Information on the Centennial and Norwalk Mines is included in Ferguson et al. (1971). All this information along with past reports of the Ontario Geological Survey and Geological Survey of Canada has been consulted in preparing the following descriptions of mineral occurrences.

Gold Deposits

As in the rest of the Wawa Camp (Rupert 1979), gold deposits in the Mishewawa Lake area can be subdivided into two types. Type I deposits are auriferous, quartz veins or silicified shear zones. The host rock is variable and includes mafic and felsic metavolcanics as well as mafic and felsic intrusions. The majority of occurrences in the area are of this type. Two of the three past producing mines, the Norwalk and Centennial Mines, occur on quartz veins within, but close to the margins of, the Centennial Stock. The Ranson Mine has auriferous quartz veins in sheared feldspar porphyry and in mafic metavolcanics and sheared gabbro.

The type II deposits are sulphide-bearing, siliceous iron formation with disseminated gold. Though these may show persistent low-grade gold mineralization, none of these occurrences has as yet been developed into a producing mine.

The quartz vein or shear zone type of deposit is apparently restricted to Rabazo Township and adjacent parts of Lendrum and Naveau Townships. No occurrences have been recorded in the rest of Lendrum, Naveau and Nebonaionquet Townships. Small iron-formation type deposits occur in Rabazo Township, for example the Willis Shaft, but the main potential

for this type of deposit would appear to be in Naveau and Nebonaionquet Township where iron formations are thicker and laterally more continuous.

The Breton Group (Rabazo-Dulhut Townships) (Ra3)

This group of eight claims lies to the south of the Ranson Property and west of the Williamson-McWaters Group, straddling the boundary line between Dulhut and Rabazo Townships at the southern end of Bridget Lake. Several veins were located in the property, hosted in gabbro, iron formation and mafic metavolcanics. These were investigated by Erie Canadian Mines Limited (1938) and Hollinger Consolidated Gold Mines Limited (1938) but found to contain low gold values of little interest.

Part of the area of this property is included in claims owned by Bridget Lake Resources Inc.

Centennial Mine (formerly Kitchi-Gammi Mine) (Naveau Township)
(Na 3)

History and Development

The Centennial Mine is located about 1 km north of the High Falls Dam in Naveau Township. The property was originally staked at the turn of the century. Along the vein several claims, with different owners were developed separately. The major development was on the "Zagloba" and "Continuity" claims (Boyd 1901, 1902), but shafts were also sunk on the "Lincoln" and "Peru" claims (Boyd 1900, 1902).

Boyd (1901) provides the following description of the "Zagloba" and "Continuity" claims:

"Zagloba" claim, No. 602, situated six miles east of the mission, and about one mile north of the falls on the Michipicoton river, was visited on November 2. The property is owned by the Waterloo County Mining Syndicate. Mr. E.A. Douglas, A.R.S.M., is consulting engineer, and Mr. T. Huson Murray, resident manager. The vein, which occurs in the granite near the contact has been traced across the claim a distance of 20 chains, with a strike of west northwest and east southeast, dipping 45 degrees to the east, and has an average surface width of five feet. At the time of my visit the shafts were full of water, operations having ceased until machinery could be installed. The following particulars were given me by Mr. Douglas: the main shaft is 6 feet by 8 feet, with a depth of 125 feet, timbered down to a depth of 40 feet. The shaft follows the course of the vein, which becomes more perpendicular as depth is reached. At the 80-foot level a drift was made 25 feet in length each way. At a distance of 100 feet south of the main shaft, a shaft 6 by 8 feet was sunk 25 feet, and 500 feet north, another shaft 6 by 8 feet was sunk 35 feet deep. Besides the shafts the vein has been stripped and opened up in three places between the main shaft and the 35-foot shaft. On a parallel vein four feet wide, situated 200 feet east of the main vein, some stripping has been done, also on another parallel vein 150 feet west of the main vein.

The following buildings were erected: sleep camp, cook camp, office, storehouse, dynamite house, stable and blacksmith shop. The mine has been closed down until a pumping, hoisting and steam drilling plant can be installed, when operations will be resumed.

South of and adjoining the "Zagloba" claim is the "Continuity" Claim which is situated on the continuation of the "Zagloba" vein. It is owned by Mr. L.E. Lum, of Duluth, Minn., and is being developed by Mr. R.W. Seelye of the same place. The vein has been traced and stripped in places for a distance of 600 feet, and a shaft sunk 22 feet deep.

Sleep camp, cook camp, engine house, store house, and powder house have been built, and the following machinery installed: 1) a Jenckes 18-h.p. upright boiler; 2) one Jenckes special 6-inch hoisting engine; 3) one No. 5 Cameron pump; 4) a No. 2 Little Giant Rand steam drill. The machinery was ready for use on the November 5. Work will be carried on all winter with a gang of ten men.

The following year the main Zagloba shaft was sunk another 27 feet (8 m) to a depth of 155 feet (47 m) (Boyd 1902). At 145 (44 km) a level was made, and drifts were run one in a westerly direction a distance of 70 feet (21 m) and one easterly 23 feet (7 m).

In 1903, the Kitchi-Gammi Gold Mining Company Limited bought up all the claims on the property and commenced new work (Boyd 1904). An inclined shaft was sunk midway between

the main Zagloba shaft and the Continuity Shaft, to a depth of 110 feet (34 m) with a drift started south at this level. A mill was also constructed but work stopped shortly afterwards.

The Braddock Development Company took over the property in 1909, constructed a new mill and installed two Nissen stamps (Corkill 1909). The shaft, however, was not dewatered.

Investigations of the property were made by N.A. Timmins Corporation (1926) and Gledhill (1927). However, the mine remained idle until May 1934 when work commenced by the Centennial Gold Mines Limited. The old shafts were dewatered and sampled, and a new 7 by 11 foot (2.1 m X 3.3 m), 30 degree shaft started (Sinclair et al. 1935). A new plant was installed and several new buildings erected. Operations were suspended in December 1934, at which time the shaft had reached a depth of 130 feet (40 m).

L.B. United Mines Limited optioned the property and resumed underground work in 1935. The shaft was deepened to 262 feet (80 m) with levels established at 125 feet (38 m) and 250 feet (76 m) (Sinclair et al. 1936). Connections were made on the first level with two of the older shafts situated on either side. Some drifting and crosscutting was also accomplished on the second level. A 50 ton amalgamation-concentration mill was installed and concentrates shipped to Sault Ste. Marie for refining. Work during 1936 mainly concentrated on lamprophyre dikes which were believed to carry commercial values of the platinum-group metals. The Ontario Securities Commission, however, examined the mine and failed

to find values in these metals (Sinclair et al. 1937). Further drifting and stoping of the quartz veins ensued until operations ceased in June 1937.

Agawa Gold Mines Limited (later known as Agawa Porcupine Mines Limited) acquired the Centennial Mine in 1937 and re-opened it in August 1938. 1750 feet (533 m) of surface trenching and two diamond drill holes totalling 500 feet (152 m) preceded the opening. Operations finally ceased on October 9, 1939 (Tower et al. 1940). Total development work in the main shaft, by all parties, constituted 748 feet (228 m) of drifts and crosscuts and 138 feet (42 m) of raises on the first level, and 2969 feet (905 m) of drifts and crosscuts and 150 feet (55 m) of raises on the second level.

No further underground work has taken place at the Centennial Mine, though sporadic surface prospecting and drilling has occurred including that done by Mrs. B. Corleton (1966), 8 diamond drill holes totalling 2085.5 feet (636 m) and Mr. P.J. McLean (1973, a 120 foot trench). The property at the time of writing is covered by staked claims owned by Mr. J. Cuneatz of Wawa.

Geology and character of the ore

The gold-bearing quartz veins of the Centennial Mine occur as fissure fillings in the Centennial stock. The granodiorite locally encloses pendants of chloritic mafic metavolcanics, one of which occurs on the hanging wall of the main vein (Gledhill 1927). Froberg (1935) recognized four veins on the surface, all striking approximately northwest and

dipping 40 to 45 degrees northeast. Two veins were opened up on the first level of the main shaft and a third vein on the second level. The veins consist of glassy quartz with small amounts of carbonate and tourmaline (Frohberg 1935).

Mineralization is pyrite, pyrrhotite and chalcopyrite with rare visible gold. The veins vary in thickness with the main vein ranging from 2 feet (0.6 m) to 7 feet (2.1 m). It can be traced for about 350 m along strike. Red feldspar-carbonate veins and lamprophyre dikes cut the quartz veins.

Production

Production records for the Centennial Mine are scanty. In 1935, LB United Mines Limited treated a total of 2587 tons of ore yielding 34 tons of concentrate (Sinclair et al. 1936). However, the final yield of gold is unknown.

Between 1939-40, Agawa Porcupine Mines Limited milled 8,612 tons of ore yielding 610 ounces of gold and 36 ounces of silver for a total value of \$22,397 (Ferguson et al. 1971, Tower et al. 1940).

The Dycie Area (Rabazo)

This area in Rabazo Township is bounded by the Michipicoten river to the south and the High Falls road to the north and east. It is adjacent to and west of the Norwalk Mine. It has been subjected to extensive claim staking and prospecting since the earliest days of the Wawa Camp. This work resulted in the location of many quartz veins of varying size and tenor. Few records remain of much of this early work. More recent prospecting has been in multi-claim blocks

covering much or all of the area in a more systematic way.

Only the major showings are described below, after data summarized on figure 11.

i) Stenabaugh Vein (Ra 12)

This prospect occurs on the western side of the Dycie Area, about half a kilometre west of the turn off to the Municipal Dump. Prospecting in this area has occurred intermittently since 1898, several claims being shown in this area on Boyd's (1898) map. Gledhill. (1927) provides the following description:

"A vein on this claim (No. 3,723) was explored by the Stenabaugh brothers. The vein strikes N. 85°E. mag., and the bordering rock is a Keewatin greenstone. The vein is a single, well-defined fissure one, but in a few places along the same strike a network of smaller quartz veins takes its place. The smaller veins are more prominent towards the west end of the vein system, where there is more carbonate and fewer sulphides.

A set of small parallel veins outcrops on the slope north of the east end of the large vein. The schistosity planes dip 80°S.

Near the east end a 15-foot test pit has been sunk on the vein. In this place sulphides are a little more prominent but are not conspicuous. The writer obtained a high gold assay here on a sample of the best-looking vein matter. Native gold is reported from this pit. About 250 feet of the vein has been exposed by stripping."

Few records of prospecting and staking between this report and the 1960's remain. During the 1930's, Milmac Mines Limited owned group of claims covering the Dycie Area. Their prospectus contains quotations from a report by a Mr. R.F. Mitchell of an investigation of the Stenabaugh vein which stated that channel sampling revealed variable gold values up to \$118.20 per ton (gold at \$20 per ounce). Dr. T.L. Gledhill is reported to have re-examined the property in 1933 and confirmed the presence of a lens of ore about 125 feet (38 m) long, with one intersection about 80 feet (24 m) long averaging \$30.72 per ton (gold at \$20 per ounce) over a width of 39 inches (1 m). The plan of Mitchell's channel sampling contained in the prospectus (fig. 12), also shows the presence of a shaft on the highest tenor portion of the vein, called May's Shaft, apparently named after an old prospector who had mined and milled the vein in a one-man operation with some success (Duff, information in report submitted to New Campbell Island Mines Limited, 1961).

The property was restaked and acquired by New Campbell Island Mines Limited in 1961, and optioned to Consolidated Bellekeno Mines Limited in 1962. A report by Mr. T.L. Gledhill, Jr., for Consolidated Bellekeno Mines Limited describes the vein as follows:

"This quartz carbonate vein has been exposed 280 feet and varies in width from 3 feet to 10 feet in width (sic). The sulphide content increases to the west. The vein itself is near vertical and strikes east-west. The vein

is at the intersection on a strong north-west shear zone and an east-west vein. Grab samples were not impressive but channel samples were taken across the vein when it had first been opened 40 years ago, as reported, were promising.

Six holes totalling 834 feet (254 m) were drilled on the Stenabaugh Vein in December 1962. Several scattered 1 to 3 feet (30-90 cm) wide vein intersections were located, but drilling failed to indicate any continuity of the main vein. Assays of drill core were extremely low and failed to confirm the previously reported assays from surface material.

The Stenabaugh Vein was covered by claim blocks investigated by Pongo Gold Mines Limited (1970) and Canabec Explorations Limited (1978-82). Though no specific investigations of the vein per se were reported.

ii) Gananoque Vein

This vein occurs about half a kilometre northeast of the Stenabaugh Vein and is one of the oldest recorded occurrences in the Wawa-Michipicoten Camp. Boyd (1899) reports:

Claim No. 128, "Gananoque," situated three miles east of Michipicoten city, owned by J. Legge of Gananoque and S. Barton of Sault Ste. Marie, was visited on 13th October. The strike of the vein is N.E. and S.W. with a dip of 45° to the north. The vein is well mineralized with iron and copper pyrites, galena and free gold. It has been traced 600 feet over a hill, and varies in width where work has been done from five to nine feet. Work was commenced in

the fall of 1897, ceased during the winter, and commenced again in May, 1898. At the foot of a hill 22 feet of stripping nine feet wide preparatory to drifting a tunnel has been done. Half way up the hill a tunnel six by eight feet has been drifted in a distance of 17 feet, besides 19 feet of preparatory stripping. Summer and winter camps have been built and a waggon road cut out to Michipicoton City.

In the following year a tunnel was driven into the bottom of the hill, 5 feet (1.5 m) wide and 14 feet (4.3 m) high for a distance of 34 feet (10 m) following the vein (Boyd 1900). Much work was also done in cleaning off the overhanging rock above the tunnel. The tunnel was driven a further 19 feet (6 m) along the vein in the following year (Boyd 1901). A second tunnel was drifted a distance of 20 feet (6 m) to strike the vein. Work appears to have ceased not long afterwards.

Gledhill (1927) visited the property and the area just to the east of the workings and reported:

Several pits and adits have been made on a group of claims along the Mission road on claims B.Y. 31 and 81. The country rock is a basic Keewatin volcanic. A banded iron formation, consisting of jaspilite, silica, and some pyrite, attracted the attention of the prospectors in the early days. There is no definite fissure vein or gold mineralization with the banded iron formation at these pits. An assay of the pyrite-bearing iron formation gave no values in gold. A little farther west in the same

rocks a fissure vein of quartz outcrops on the face of a steep Keewatin cliff and has been explored by two adits; it is fairly well mineralized.

Consolidated Bellekeno Mines Limited (1962) obtained unspecified "gold values" from assays of material from the dump around the Ganonoque adit. A hole was drilled to intersect a white, glassy quartz vein with sparse fine pyrite. The vein assayed 0.02 ounces per ton in gold over its 2.4 foot (70 cm) width.

Rupert (1979) visited the occurrence and provides the following description:

A large lensy vein above the pits is up to 5 feet wide and is composed of glassy quartz with about 5 percent rusty carbonate and 1 percent pyrite. It strikes northwest and dips steeply. Numerous other small veins of similar composition from a few inches to one foot wide are present here, with a variety of attitudes. Flat or gentle northeast dips predominate. Wall rocks are felsic to intermediate pyroclastic volcanic rocks, with minor mafic sections.

iii) Willis Vein (Ra 15)

The Willis Vein is located about half a kilometre southeast of the turn-off to the Municipal Dump, just south of the old power line. It was of interest to the earliest prospectors and is described by Boyd (1900) as follows:

Claim No. 480, is owned by the Corona Mining Company, Limited, with Mr. W.H. Wylie as manager. On a large vein

with a strike of west-northwest and east-southeast, which has been traced from Wawa creek across to Michipicoton river, the vein matter is about 180 feet wide, consisting of a mixture of quartz and slate. A shaft 6' X 8' X 23' deep has been sunk all in quartz, which is heavily mineralized with iron and copper pyrites, with traces of mispickel and zinc blende. A camp 16' X 28', and blacksmith shops have been built.

The shaft was probably extended to a depth of 60 feet (18 m) (Gledhill 1927). Despite being restaked several times no records remain of any further work on the property until the 1960's Consolidated Bellekeno Mines Limited (1962) collected a grab sample from the dump, though assay values are unreported.

The next owner, Mrs. B. Carleton, carried out diamond drilling on the property in 1964, which indicated that the shaft was located on a transverse quartz vein, with a moderate northward dip, cutting a zone of sulphide-rich clastic sediments and banded chert (Rupert 1979). The quartz veins are up to 4 feet (1.2 m) wide and consist of blue quartz with blebs of pyrrhotite, pyrite, chalcopyrite, red sphalerite and arsenopyrite crystals in widely varying amounts. The enclosing sediments include banded cherts, sericitic schists, chlorite schists, wackes and graphitic schists or slates. All of the sulphide minerals in the veins also occur as disseminated grains or laminae in the various sediments, particularly the graphitic sections. No assay values were reported from the drilling project.

Canabec Explorations Limited (1979) also drilled a hole near the Willis Shaft revealing four zones of mineralization consisting of finely disseminated or laminar pyrite, pyrrhotite, chalcopyrite and arsenopyrite in banded cherts and carbonate. The zones varied from 5 feet (1.5 m) to 6 feet (1.8 m) wide but no assay results have yet been reported.

iv) Weary Willie (Ra 13)

The Weary Willie prospect lies about 1.5 km southeast of the Willis Shaft. Gledhill (1927) provides the earliest description:

On this claim (No. 3,396) situated in the face of a cliff near the north bank of the Michipicoten river, a quartz vein was staked in the early days; since then it has been stripped and a small test pit has been sunk on it.

The rocks that enclose the vein are highly sheared Keewatin basic rocks. The vein has a bluish colour and is between two and three feet wide. Ankerite, the iron-bearing vein carbonate, is prominent in and near the vein, and pyrite is the chief vein sulphide.

The break is very definite and the vein doubtless extends a great distance, probably as far as the Willis claim to the northwest where a shaft has been sunk on a vein, similar in appearance, on the continuation of the strike of the Weary Willie vein.

No further work on this occurrence has been reported.

v) Other Occurrences

Assessment of large multiclaim blocks in the Dycie Area

by Consolidated Bellekeno Mines Limited (1963) and Canabec Exploration Limited (1978-82) have revealed the presence of numerous quartz and quartz-carbonate veins, many of which were previously pitted or trenched. Most of them, however, are fairly small and have not warranted any further assessment work.

Canabec Explorations Limited identified the presence of three strong conductive zones in the eastern part of the property, two of them west of Norwalk Lake and one south of the 'Fred c' shaft. Drilling of these zones revealed the presence of mineralized quartz and carbonate veins and stringers, but assay values were uncommonly as high as 0.10 ounce per ton. Further drilling and assessment of these zones continues.

Gibson Group (Rabazo Township) (Ra 6)

This property is located near a small lake, just west of the southern end of Roller Lake, in Rabazo Township. The property was inspected by Hollinger Consolidated Gold Mines in 1936. They reported a fairly well defined sugary quartz vein extending for about 150 feet (46 m) in a "greenstone porphyry". It was cut by lamprophyre dikes. Mineralization consisted of galena, pyrite and some chalcopyrite. Two diamond drill-holes were reported to have been sunk by previous owners on the north end of the vein with unknown results. No gold was reported in the assays of any of the samples collected.

Gold Monk Mine (Rabazo Township) (Ra 7)

This property is located about half a kilometre from the Scott Falls in Rabazo Township. It was originally staked in the 1930's by Mungo Williamson and Associates. The main discovery was made in 1936 and 1937. A 35 degree inclined shaft was sunk to a depth of 45 feet (14 m) on a northwesterly dipping vein. Approximately 125 tons of rock was mined from the shaft, 70 tons of hand-sorted ore, varying from 1.0 to 2.0 ounce per ton in grade, was shipped to the nearby Centennial Mine for milling (Bayne, in report submitted to K. Shortt, 1975).

In late 1936, Erie Canadian Mines Limited inspected the property and sampled the vein and country rock. The gold-bearing shear zone was traced on the surface for 0.5 mile (800 m) northwest of the shaft and 600 feet (150 m) southeastwards. The vein was reported to be about 3' (0.9 m) wide with considerable coarse free gold. Pyrrhotite and chalcopyrite occurred as patches in the sericite schist host-rock. Assay values reported on samples taken in the shaft indicate gold values from \$0.40 to \$1.60 (0.01-0.05 oz/ton) in the schistose vein walls where sulphide laminae were present and from \$0.80 to \$19.20 (0.02-0.55 oz/ton) in the quartz vein.

In the late 1930's the claim group was optioned to Centennial Gold Mines Limited who carried out some trenching and drilled one hole across the shear zone. In 1944, Algoma Ore Properties Limited inspected the property and collected two samples from the main vein. Despite assays of 1.58 and

3.47 ounces of gold per ton, no follow-up work was done.

In 1974 the property was acquired by Ken Short and associates, who mined about 260 tons of rock by slashing the old shaft collar across a total width of 28 feet (8 m) to depths of 5-10 feet (1.5-3.0 m). Vein material across 5-10 foot (1.5-3.0 m) widths were also slashed from the cliff-face above the shaft. Hand-sorted batches of their material were assayed and subjected to Wilfley Table tests.

Further trenching and drilling has been undertaken by Monk Gold Mines Limited in 1983. This has revealed the presence of a second mineralized zone, parallel to the main shear zone, and located about 200 m west of the shaft. This zone generally lacks a main quartz vein, consisting usually of quartz stringers and disseminated sulphides in well foliated and carbonated, sericitic quartz crystal tuff and chlorite schist. Mineralization consists of pyrrhotite, pyrite, chalcopyrite and gold. Tourmaline and talc are also present. Assay results have not yet been reported.

Laccolith Mining Company (Lendrum Township) (Le 6)

This group of six claims was located on the south and east sides of Legarde Hill. The date of original discovery is unknown, though work was reported as being in progress by Gledhill (1927). Descriptions of the property are poor but several mineralized zones were reported, close to the contact between the Magpie High Falls Stock and mafic metavolcanics. These mineralized zones were probably quartz veins and silicified shear zones. They ranged from 25' to 125'

(7.6-38.1 m) in width and several hundred feet (70-100 m) in length. One diamond drill hole was sunk to a depth of 1112' (339 m). It intersected the major mineralized zone at 400' (122 m), showing \$2.87 gold values over 32' (9.8 m). Samples from other zones ran from trace to \$14.00. Unfortunately no records remain of the locations for the drill-hole nor for the other samples.

Norwalk Mine (formerly Manxman Mine) (Rabazo-Naveau Townships) (Ra 5,9)

History of Development

The Norwalk Mine is situated about 1.5 kilometres north of Scott Falls on the boundary between Rabazo and Naveau Townships. The original group of claims was staked by James H. Teare in 1899 to examine several gold-bearing quartz veins. Operations were started in 1901 by the Manxmon Gold Company. Boyd (1903) inspected the operations and records the following:

Work on the main shaft on claim 1,229 stopped on 20th July. At that time the shaft had been sunk to a depth of 126 feet, and timbered to 120 feet in depth. At 100 feet drifting was done 20 feet south and 18 feet north, with a cross cut of 10 feet.

On claim "Mabel," No. 641, the work consisted in quarrying on a dyke of quartz porphyry working on a face about 125 feet east and west, with an average height of 20 feet. About 300 tons had been quarried.

Sinking at an angle of 40°, a shaft 6 feet by 6 feet, 20

feet deep, had been put down on a small quartz vein in the dike with an average width of one foot.

At the time of inspection, 25th October, a ten-stamp mill (Fraser and Chalmers) was being installed. The foundations had been completed, the mortars were in place, and the mill building sided up. Power will be supplied by the engine and boiler formerly in use at the shaft on claim 1,229. The mill is situated on the shore of a small lake 1,000 feet southwest of the quarry. The ore will be conveyed to the mill by a horse tram. Thirty men were employed, five of whom were miners, the balance working on the buildings. Mr. Angus Gibson is manager, with Mr. J.W. Douglas as assistant.

The mill was completed and several runs made with unsatisfactory results (Boyd 1904)

The mine was idle until 1908, when it was acquired by the Norwalk Mining Company who worked the mine during 1909. The shaft was sunk on the vein with a slope of 45° to depth of 138 feet (42 m) with a level at 110 feet (33 m) where drifts run east 25 feet (8 m) and west 25 feet (8 m) (Corkill 1909). Power was obtained from the Algoma Power Company at High Falls. A new hoist and a motor to drive the air compressor were installed. In 1910, the mine was transferred to the LePage Gold Mining Company and further work was carried out that year.

The Grace Mining Company Limited secured ownership in 1919 and started overhauling the machinery. Underground work

began in January 1920, continuing till May 1920. Sutherland et al (1921) report:

The Manxman was inspected on May 5, when 26 men were employed and only shaft-sinking was being done. The shaft then measured 254 feet on the slope. It follows the vein which lies at about 45 degrees for 240 feet and at 75 degrees for the remaining 14 feet. Drifting has been done to the northwest on two levels; on the 110-foot for about 100 feet and on the 200-foot for 120 feet. The present owners did about 75 feet of the drifting on the 110-foot level and stoped to a height of 30 feet above the level. Some stoping was done on the 200-foot level by the former owners. A few days after the inspection was made, the company stopped all work.

Gledhill (1927) further reported a cross-cut driven 20 feet (6 m) west from a point 48 feet (15 m) down the shaft. An aerial tramway ran from the crusher in the shaft house to the mill. The mill ran for a short time but results are unrecorded.

Ownership reverted back to the Norwalk Mining Company but no further mining took place. Surface prospecting in the Norwalk Mine area and the adjacent Dycie Lake area has been conducted by the N.A. Timmins Corporation (1926), Candore Explorations Limited (1963) and Canabec Explorations Limited (1978-82). The latter two companies drilled diamond drill holes in the vicinity of the Norwalk Mine shaft and the 'Fred c' shaft that intersected several quartz-veins and silicified

shears but all gave low to negligible gold assays.

Geology and character of the ore

The Norwalk vein is within the Centennial stock though it lies close to its western margin where it is in contact with intermediate to felsic tuffs. The main vein situated within sheared granodiorite, strikes east and dips 35° to the south. (Gledhill 1927). Mineralization consists of pyrite, arsenopyrite and gold in quartz. The vein was reported by Mr. Angus Gibson (in Gledhill 1927) to be 10 inches (25 cm) wide on the surface and five feet (1.5 m) wide at the 200 foot (60 m) level. The native gold was reported to be coarser at depth with some very rich ore pockets being encountered. Quartz in the vein is glassy but has a sugary texture close to inclusions of wall rock. Some mineralized, sheared granodiorite was also worked as ore.

At the 'Fred C' shaft, a quartz vein with a northwest strike is surrounded by greenstone and diabase (Gledhill 1927). The ore is massive pyrrhotite with some chalcopyrite. The vein is 24 feet (7 m) wide where intersected at the 50 foot (15 m) level (Ferguson et al 1971).

Production

Total production figures for the Norwalk Mine are not accurately known. However, Ferguson et al (1971) estimate that 60 ounces of gold, valued at \$1412, were extracted from 820 tons of ore in the years 1904 and 1910 combined. No production is recorded from the 'Fred C' shaft.

Nymon-Roller Lake Prospect

This occurrence lies on the northwestern corner of Roller Lake, Rabazo Township. In 1961, W.D. Sutherland initiated a diamond drilling program on the property, sinking eight holes with a total length of 2361.9 feet (720 m). The holes passed mainly through chlorite schists with occasional massive flows, diabase and lamprophyre dikes. Some holes passed into the Mission Stock. Mineralization consisted mainly of disseminated pyrite, with pyrrhotite and chalcopyrite, within the chlorite schist. Some quartz and quartz-carbonate veins and stringers were also noted. Assay values for gold were very low, less than \$1 per ton (0.03 oz/ton) with a high of \$4.90 (0.14 oz/ton).

Osisko Lake Mines Limited (Lendrum Township) (Le 7)

A group of 23 claims was staked by Osisko Lake Mines Limited in late 1982, covering part of Lendrum and Bailloquet Townships adjacent to the northern boundary of the Gros Cap Indian Reserve. This is adjacent to Algoma Steel Corporation Limited's Anomaly 7G-7C area (see Algoma Steel Corporation Limited (Michipicoten Base-metals Project) below p. xxx) and to the area within the Gros Cap Indian Reserve that is undergoing investigation by the Department of Indian and Northern Affairs.

A VLF-EM survey and geological mapping at 1:2400 were conducted during the spring and summer of 1983. Two conductors were located in the southeast portion of the property which extend into the Algoma Steel Corporation Limited property to the east, and into the Gros Cap Indian

Reserve to the southwest. Ferruginous cherts and tuffs in the area are mostly obscured by glacial drift. The chert bands are quartz rich and low in sulphide mineral content. Assayed gold values from grab samples were very low and no further work has resulted.

Ranson Mine (Rabazo Township) (Ra 11)

History of Development

The Ranson Mine is located in Rabazo Township, about half a kilometre west of Bridget Lake, and a few hundred metres inland from Lake Superior.

Prospecting in the area probably occurred from the earliest days of the Wawa Camp, but no information is available until the 1930's, when a group of eleven claims was incorporated under the ownership of Ranson Gold Mines Limited.

In 1937, the property was investigated by Hollinger Consolidated Gold Mines Limited with a view to option. Several quartz veins were located and sampled. Some very high assays were reportedly obtained, but these were confined to very short shoots. In 1938, Erie Canadian Mines Limited also inspected the property and sampled three quartz veins. No assay values were reported.

Ranson Gold Mines Limited continued development of the property in 1938 and eventually commenced mining operations in February 1939 (Tower et al 1940). An adit 189 feet (58 m) long was driven into a hillside and, at 160 feet (49 m) from the portal, a raise was put through to the surface, a distance of 98 feet (30 m). About 400 feet (122 m) of surface

trenching was carried out. Mining operations closed down in November 1939. Further surface exploration appears to have continued, however, including trenching and diamond drilling (see AFRO microfiche Rabazo 0015). No further mining has ensued, however.

The property is presently undergoing investigation and development by Bridget Lake Resources Incorporated.

Geology and character of ore

Several quartz veins have been located on the Ranson Property, although only one has, as yet, been mined. The 'H' vein is exposed within the portal. It varies from 30-75 cm wide and pinches swells along a strike length of approximately 180 m. It is hosted in sheared feldspar porphyry of the Bridget Lake Stock, with blue quartz and white feldspar phenocrysts preserved in well-foliated greenish chloritic matrix. Carbonatization of the host is pervasive. Mineralization consists of pyrite, chalcopyrite, galena, sphalerite and gold. Visible gold is rare in the 'H' vein and appears to be localized along sericite- and chlorite-coated slip-planes that cut the vein. The host porphyry is in contact with carbonated chlorite schist to the west, which shows a foliation parallel to that of the sheared porphyry. Reported assay values in the 'H' vein from underground, surface and drill samples, vary from 0.02 oz/ton to 2.26 oz/ton over widths of 9"-30" (23-76 cm) (AFRO fiche Rabazo 0015).

Present development work is concentrated on the 'F' vein. This occurs along the sheared contact between a well foliated

chloritic gabbro to the east and weakly foliated feldspar porphyry to the west. The vein ranges from 20 cm to 75 cm thick and has been traced for about 275 m. Mineralization is similar to the 'H' vein with pyrite, chalcopyrite, bornite, sphalerite and gold. Some tourmaline occurs in the quartz gangue. To the north the adjacent feldspar porphyry becomes well foliated and shows abundant rusty staining with malachite stains. Assay samples from a pit in the 'E' vein near the old camp site, yielded gold values of 3.89 oz/ton over 24" (61 cm), though, at other locations on the vein, surface and drill samples yielded values from 0.01 to 0.61 oz/ton over 4"-42" (10-107 cm) (AFRO fiche Rabazo 0015).

Many other quartz veins are known outside the mine area within the Bridget Lake Stock, although it is not known if any are mineralized. The main mineralized veins around the mine are within or close to a major lineament that extends about 2 km from Lake Superior through Bridget Lake to the south of Blackington Lake, although no prospecting results are available outside the immediate mine area:

Production

During 1939, the Ranson Mine produced 774 tons of ore which yielded 156 ounces of gold and 24 ounces of silver for a total value of \$5938 (Tremblay 1940).

Ross Group (Lendrum Township) (Le 8)

Five claims formed a group located in the southeast corner of Lendrum Township, north of Simmon's Hill and east of the present Highway 17. The original date of staking is

unknown, but assessment work is reported from 1909.

Six quartz veins were recorded as being discovered, each of which had been stripped, pitted and trenched to varying degrees. The veins were predominantly quartz with chalcopryrite, galena and native gold mineralization. Host rocks are not recorded but are probably schistose mafic metavolcanics, though two veins are reported to be within or at the contact of a granitic body. The veins vary in width from 16" (41 cm) to 38" (97 cm), though some thickened with depth. Several of the veins were traced for a couple of hundred feet (60-70 m). Reported assay values on samples collected over the width of veins in pits and trenches yielded several good values; for example vein 1, 2 oz/ton gold over 18" (46 cm); vein 5, 4.86 oz/ton gold and 6.4 oz/ton silver over 26" (66 cm); and vein 8, 0.7 oz/ton gold over 38" (97 cm).

A sulphide-bearing, graphitic shale was located on two of the claims. Pyrrhotite mineralization is much oxidized in the upper part of the bed, but oxidization decreases at a depth of a few feet (1 m). The horizon is up to 7'8" (2.3 m) thick. Assay values were variable from zero up to 11.2 oz/ton (over 40" (1 m)) of gold. The latter locality reportedly yielded a nugget of 40.3 oz, not included in the assay result. Assay values for base-metals were negligible.

No further work on the property is reported since 1909. The ground is presently (1983) covered by claims owned by J. Filo, C. Clement and G. Clement.

The Valenti Group (Naveau Township) (Na 11)

The Valenti Group is situated about 2 km northeast of the High Falls Dam in Naveau Township. It comprised a group of claims situated on both sides of the Firesand River. It was inspected by N.A. Timmins Corporation in 1926, but no further work was carried out. Gledhill (1927) described the property as follows:

The Valenti group is situated a short distance northeast of High falls and comprises claims Nos. 1,498, 1,509, 4,105, 1,481, 1,482, 4,106, 1,488, and 1,483. One set of veins lies on the west side and another on the east side of the creek. The western set are about 300 feet north of the cabin. They are enclosed by Keewatin basic schist and have been cross-faulted into three sections. Their strike is northwest. The quartz is well mineralized and in the north and south sections contains commercial values in gold, in widths of from three to four feet. The vein on the east side of the creek has the same strike as those on the west side and almost in line with them. A 10-foot pit has been sunk at the north end of this vein. The chief sulphide is pyrite, and the vein is not far from a ridge of granodiorite to the southeast. The gold assays are not as high as in the west veins, but an assay of several dollars per ton over a width of 96 inches was obtained at the pit on its southeast side.

Williamson-McWaters Group (Rabazo Township) (Ra 14)

This group of twenty-three claims was centred on

Blackington Lake in Rabazo Township, east and southeast of the Ranson property. Few records remain of work on the property although Erie Canadian Mines Limited (1938) did inspect a vein on one of the claims just south of Bridget Lake. The vein was sugary quartz, 5 feet (1.5 m) wide, in gabbro. The vein dipped 75 degrees southwestwards with a strike of N 20°W. Fine, visible gold was reported near the hanging wall. No assay data are available.

The area of this claim group, is presently covered by claims owned by Bridget Lake Resources and by R.J. McGowan.

Base-metal Deposits

Only a limited amount of prospecting for base-metals has been undertaken in the area, with little success to date. Two types of deposits have been investigated:

- a) Sulphide-bearing quartz veins, containing galena and chalcopyrite along with the more common pyrite.
- b) Sulphide-facies iron formations - dominantly pyrite-pyrrhotite with minor chalcopyrite.

These types appear to be mutually exclusive in geographical distribution. The vein-type deposits are located within and marginal to the Mission Granite in Rabazo Township. Iron-formation type deposits, however, are found in Naveau and Nebonaionquet Townships. Both types of deposit have also been targets for gold prospecting.

Algoma Central Railway (Naveau - Nebonaionquet Township)

(Ne.3)

In 1962, Algoma Central Railway flew a helicopter-borne

electromagnetic and magnetic survey over the Anjigami-Mishewawa Lake area. Several anomalies were detected and seven of these were selected for follow-up ground studies (see figure 5). These included the AMAX Naveau -1 property and the Anjigami Lake Iron Formation property. Of the other anomalies investigated, only one appeared to be associated with possible base-metal sulphide mineralization. It lies close to Anjigami Lake, west of the Anjigami Lake Iron Formation Property. No further work was undertaken, however.

Algoma Ore Properties - Anomalies 11 and 12 (Rabazo Township)

In 1962, Algoma Ore Properties flew an airborne magnetic survey over the Wawa-Michipicoten region. Two of the anomalies identified in the survey are located in Rabazo Township. Follow-up ground magnetic and electromagnetic surveys and geological investigations were made of these in 1962.

Anomaly 11 lies just east of a small unnamed lake about half a kilometre north-northeast of Bridget Lake. Three narrow east-west trending zones of low magnetic relief were found, but no conductivity changes were revealed by the electromagnetic survey. Minor disseminated magnetite and occasional pyrite observed in the massive to pillowed metavolcanics probably account for the magnetic anomaly.

Anomaly 12 lies at the western end of Mission Lake, almost adjacent to the Nymon-Roller Lake Prospect. Several magnetic anomalies were detected all of "medium intensity" and striking in an east-west direction. However, only weak

indications of a conductive zone were found by the electromagnetic survey. The magnetic anomalies occurred over banded basic tuffs containing small amounts of finely disseminated pyrite and pyrrhotite. The northwestern part of this prospect is now included in the Michipicoten Provincial Park and is no longer open for prospecting.

Algoma Steel Corporation Limited (Michipicoten Base-metal Project) (Le 2)

In 1979, Algoma Steel Corporation Limited initiated a base-metal exploration project covering their extensive land holdings, and surrounding areas, within the Wawa area. Lendrum Township lies on the western end of this project area and several localities within it were investigated.

Initially a field program of basic geological mapping of the project area was launched, coupled with lithogeochemical sampling. A helicopter-borne magnetic and electromagnetic survey was flown February 18-March 8, 1980 by Aerodat Limited. This survey helped delineate several anomalies, including 6 in Lendrum Township, worthy of further ground geophysical and geological follow-up (see fig. 4). Diamond drilling was conducted where favourable mineralized zones were encountered.

a) Anomaly 1

This is located on the northwest part of Gros Cap Peninsula, just south of the Indian Reserve Boundary. The anomaly is caused by zones of graphite and graphitic chert intercalated with mafic volcanics. The graphitic units vary from 60-90 cm up to 7 m wide. Pyrite is the only visible

sulphide reported. No assay results are available.

b) Anomaly 2 (Michipicoten Harbour Showing)

This occurrence is exposed in a roadcut about 1.5 km east of Michipicoten Harbour. A unit of sulphide-bearing meta-sediments occurs intercalated with pillowed mafic meta-volcanics. The host metasediments are graphitic slates and laminated chert. Sulphides, principally pyrite and pyrrhotite, are disseminated throughout the metasediments, with some thin layers of semi-massive to massive sulphide. Chalcopyrite occurs in the laminated chert and sphalerite in the graphitic slate.

The mineralized unit was traced about 350 m to the southwest where it grades into a lean, banded iron formation with pyrite and trace sphalerite. Other thin impersistent sulphide-bearing chert horizons occur in roadcuts to the east, as well as small isolated sulphide occurrences in cherty tuffs to the north. Assay values are not reported, though values up to 0.25% Cu and 0.65% Zn are indicated in company reports.

c) Anomaly 3

This anomaly is located on the peninsula of land north of the mouth of the Michipicoten River, close to Michipicoten Lodge. It results from a narrow (2.5 m) horizon of sulphidic graphite, chert and siliceous tuff, interbedded with pillowed and massive mafic metavolcanics. Sulphides are predominantly pyrite and pyrrhotite with minor chalcopyrite.

The conductive zone is traceable over a strike length of at least 350 m, with airborne geophysics indicating a possible

strike length of 2 km. Assays as high as 0.25% Cu and 0.86% Zn are reported from grab samples in company reports.

d) Anomaly 5 (Tower Hill Showing)

This anomaly is located towards the top of Legarde Mountain, east of the OVOR communications tower. Ground geophysics confirmed the presence of two parallel conductors of moderate strength with good continuity, along strike, of approximately 800 m. A strong magnetic anomaly is associated with the southern conductor.

The southern conductor is exposed in a roadcut near the summit of the hill. It consists of a black to rusty, cherty, graphitic layer, with pyrrhotite and minor pyrite and chalcopyrite, interbedded with slaty sulphidic graphite and siliceous cherty tuff. The mineralized horizon occurs at or near the contact between thinly bedded, felsic tuff and lapilli tuff to the northeast and mafic pillowed flows to the southwest. The contact between these rocks has been invaded by gabbro-diorite intrusions which make it difficult to define the contact on the surface. Along strike to the southeast, six old exploration pits have been sunk on similar pyrrhotite mineralization in felsic tuffs. No records remain from this earlier exploration activity.

Samples of sulphide-bearing material from the roadcut and the pits assayed anomalously high in Zn (up to 0.49%) and/or Cu (up to 0.33%). Two diamond drill holes confirmed the presence of two mineralized zones - a southern pyrrhotite-pyrite rich, graphitic, chloritic chert horizon (about

3-4 m thick) and a northern laminated graphitic chert with pyrrhotite (about 2 m thick). Several thinner sulphide mineralized cherty horizons were also indicated between the two major zones. Assay values reported from drill-cores were generally sub-economic, but ranged up to 0.35% Zn and 0.19% Cu over a 60-70 cm section. Au and Ag values were all low.

e) Anomaly 6-6a

These anomalies occur about 1.5 km southwest of Trembley Station in the area between the Trembley Fault and the Gros Cap Indian Reserve. The area is underlain by pillowed and massive mafic flows with gabbro sills and dikes and feldspar porphyry dikes. Cherty sulphidic tuff horizons, which may be laterally persistent for up to a few hundred metres, are found in various places and may carry minor chalcopyrite and/or sphalerite. The major anomalies, however, occur in swampy areas where there is no outcrop. Diamond drilling revealed a 12 m thick section of laminar graphitic chert with relatively massive, talcose, fine-to medium-grained green tuffs interbedded with mafic flows. The cherty tuff horizon showed variable pyrite and pyrrhotite mineralization, with occasional trace chalcopyrite. Fourteen samples through the cherty tuff section were reported to have generally low to subeconomic assay values for Au (<0.075 oz/ton), Ag (<0.05 oz/ton), Cu (<1-780 ppm) and Zn (79-2180 ppm).

f) Anomalies 7b-7c

Several closely grouped anomalies were indicated in an area near the northeast corner of the Gros Cap Indian Reserve,

close to the north boundary of Lendrum Township. The area is underlain by pillowed and massive mafic flows, with quartz and feldspar crystal tuffs to the southeast and clastic meta-sediments to the northwest. Gabbro sills intrude the mafic flows. The sequence is strongly foliated, striking about 0600, dipping moderately to steeply southeastward, though younging northwestward. Carbonatization, particularly of felsic tuffs, is pervasive and intense.

Banded chert-magnetite-chlorite iron formations with sulphides occur at several locations within the mafic meta-volcanic sequence and explain some of the anomalies. Diamond drilling also revealed the presence of cherty tuffs with sulphide-rich horizons near the metavolcanic-metasediment contact. Reported assay results from drill core suggest anomalous values for Cu (up to 0.11%) and Zn (up to 0.37%), but there are usually across narrow zones (up to 1.2 m) with a maximum of 40% sulphides.

All of the anomalies investigated in Lendrum Township, occur in similar settings at approximately the same stratigraphic position in the metavolcanic sequence. They result from sulphide rich graphitic cherty tuffs and interflow sediments within mafic flows above or at the contact with felsic pyroclastics. The mineralized zones are often anomalously high in Zn and Cu, but low in Au and Ag.

All work on these properties ceased with the disbanding of Algoma Steel Corporation Limited's Exploration Division in 1982.

Algoma Steel Corporation Ltd. (Anjigami Project) (Rabazo, Nareau and Nebonaionquet Townships) (Ra 1, Na 1, Ne 1)

Following the release of airborne electromagnetic and total intensity magnetic surveys (OGS 1980) by the Ontario Government in January 1981, Algoma Steel Corporation Ltd. launched its Anjigami Project exploration program for gold and base metals. This program covered prospects within Rabazo, Naveau and Nebonaionquet Townships. In total 40 unpatented mining claims were acquired covering 22 selected anomalies (see fig. 14). Four other identified anomalies proved to be on already claimed land.

Ground examinations consisted of magnetic, electromagnetic and geological surveys with some local stripping and trenching where warranted to expose conductors. No drilling was undertaken. Lack of success and deteriorating steel markets lead to a re-evaluation of the project and its abandonment in 1982.

All of the anomalies are summarized on fig. xx, but a few are worthing of further description here:

a) Anomaly I, Dodds Lake-Nezwa Lake

This anomaly is located in the northeastern part of Dodds Lake. It is an old prospect though the original date of discovery is unknown. It was staked by Roy Ranson and Associates 1937-45; Messrs Arvid, John and Leander Hult 1965-46, Carl Nyman 1961, and Ed Nyman 1964. Although some trenching and diamond drilling were carried out by these previous prospectors, no technical results from this work

remain.

The main magnetic anomaly seems to be due to a diabase dike, and several electromagnetic anomalies are due to semi-conductive overburden overlying a narrow lean iron formation. However, ground investigations revealed the presence of several polymetallic quartz veins within the mafic metavolcanic country rocks. The veins consist of fine-grained sugary quartz with subordinate amounts of sulphides.

The main vein is located along a linear zone extending across Nezwa and Dodds Lakes, near the portage. It is subvertical with a strike of 120°, slightly crosscutting the regional foliation. Several other parallel quartz veins occur on the northeast arm of Dodds Lake. The veins are variable in thickness from 30 cm to 3 m and may have stringers running off into the wall rocks. They have sheared walls which are bleached and contain abundant pyrite cubes. Within the quartz vein, sulphides include pyrite, chalcopyrite, minor galena and molybdenite and traces of sphalerite. Concentrations are higher near wall rock enclaves and along central seams in the veins.

Although results of assays are unavailable, these are reportedly low for base and precious metals, with only molybdenum and silver approaching sub-economic grade. Four grab samples collected by the author from the main vein gave only trace to low values for Au (<0.01 oz/ton), Ag (<0.01 oz/ton), Cu (6-60 ppm), Pb (<10-450 ppm) and Zn (13-265 ppm).

b) Anomaly 10, north of Bridget Lake

This anomaly is located immediately north of Bridget Lake about 350 m from the former Ranson Gold Mine. Ground geophysics indicated a broad conductor on VLF electromagnetic response with a coincident magnetic anomaly. These lay over the northern margin of a steeply dipping, fine-grained rhyolite to dacite flow, with abundant disseminated pyrrhotite, interlayered with mafic flows. Pyrrhotite occurs in fine- to medium-grained aggregates. It varies in amount from none in the central and southern parts of the flow to as much as 25 near the north contact. It is not uniformly distributed at all locations along the contact, being most abundant where the rhyolite is thickest. Intense siliceous gossanning is common near the contact. However, no significant gold or base metal values were detected in assay samples.

A weaker magnetic and electromagnetic anomaly associated with the southern footwall of the felsic flow results from a graphite-chlorite-silica schist, with no associated sulphides.

c) Anomaly 26, east of Moon Lake

This anomaly occurs to the west of the intersection of Mishewawa Lake trail with another trail that leads south towards Fir Lake. The anomaly is reported to have been trenched in 3 or 4 places over 20 years ago, though no records remain. At the trails intersection and in two old trenches to the east, a 2 m wide mafic flow top is mineralized with pyrrhotite and pyrite. Gossanning and bleaching are extensive. No assay results are reported.

Asarco Exploration Company of Canada Limited
(Naveau-Nebonaionquet Townships)

In March 1975, Asarco Exploration company of Canada Limited entered into a joint mineral exploration venture with Algoma Central Railway concerning their mineral rights in Naveau and Nebonaionquet Townships. During April 1975, Kenting Earth Sciences Limited was engaged to undertake a combined airborne electromagnetic and magnetic survey of the two townships with a view to locating geophysical anomalies that might indicate massive sulphide prospects.

A large number of conductive zones and magnetic anomalies were detected by the airborne survey, the majority of which lay in the area between Mishewawa and Anjigami Lakes e.g. the Gimby-Hubert Property. A few anomalies were also located outside this area e.g. the AMAX Naveau 1 property (see figure 5).

Ground follow-up work on selected anomalies was carried out in May and June 1975, involving electromagnetic and magnetometer surveys as well as geological mapping. Most of the anomalies were explained as due to graphitic horizons together with iron formation. Some trenching was done to confirm this interpretation, but no drilling was undertaken. AMAX Minerals Exploration Limited (Naveau-1) Property,
(Naveau) (Na 2)

This property is located in Naveau Township, along the northernmost power line, about 1 km east of the Firesand River. The property was first investigated in 1963 after a

helicopter-borne electromagnetic survey, flown by Algoma Central Railways the year before, had located a strong conductor. Ground electromagnetic and magnetic surveys were made and geology mapped by H.O. Seigel and Associates Limited on behalf of Franc R. Joubin and Associates Limited. Two strong conductors were outlined on the ground, correlating with magnetic highs. A 50 foot (15 m) wide, well-mineralized zone, including pyrrhotite and pyrite with traces of chalcopyrite and bornite, lay along the easterly conductor. It ran roughly north-south with a vertical dip. No outcrop was observed on the western conductor.

In 1975 Asarco Exploration Company of Canada Limited contracted Kenting Earth Sciences to fly an electromagnetic survey in the Anjigami area. The Naveau-1 property was staked by AMAX Minerals Exploration Limited in 1979 as a follow up to this survey. The mineralized zone was interpreted to be a sulphide-type iron formation which separates granitic gneisses and diorites underlying the eastern half of the property from mafic tuffs and related sediments to the west. A second, banded magnetite-chert iron formation occurs about 250 m west of the sulphide iron formation. The sulphide iron formation consists of beds and lenses of massive pyrrhotite with lesser amounts of pyrite. Minor chalcopyrite and sphalerite were also observed. Chip samples and grab samples were taken across the width of the sulphide zone in a trench on the power-line and another trench about 200 m to the north. Assay values for Cu, Zn, Ni, Au and Ag were reported but all were

low. A soil sample survey failed to indicate any significant anomalous geochemical halo associated with the sulphide zone.

The Clement Group (formerly the Legarde Property and Candore Explorations Ltd. (B 1K Prospect) (Rabazo Township) (Ra 2, 4, 8)

This occurrence is south of the Michipicoten River, about half a kilometre east of Roller Lake in Rabazo Township.

Initial prospecting activity seems to have taken place in 1928 (Weeks 1930), although claims were staked south of the Michipicoten River in the earliest days of the Wawa Camp and may have included this area. Several people owned claims on the property, but these were amalgamated under option to J.P. Legarde in the 1930's.

Moore (1931) visited the property and describes it thus: The country rock is red, pink, and grey granite, and the veins contain galena, sphalerite, chalcopyrite, and pyrite. There are old pits on some of these claims, the dumps of which are now overgrown with small spruce. Some of the veins are practically barren white quartz, but those recently discovered are well mineralized with sulphides. One vein, apparently on claim No. 6,750 (the claims have been restaked more than once), is exposed for 200 feet in trenches and pits along the north face of a small granite hill. It is about 3 feet wide at the west end where it runs under drift and 5 feet wide near the centre; it pinches out at the east end. Parts of the

vein are heavily mineralized with galena, chalcopyrite, and pyrite. The sulphides run mostly in streaks and patches. One band of galena 2 to 6 inches wide runs through the vein parallel to the dip and tends to follow the hanging wall.

On top of the hill about 15 feet south of the main vein, a parallel vein runs through the hill. It runs out into stringers at the west end and is about 5 feet wide where it disappears under the drift cover to the east. It is not so well mineralized as the main vein, but it carries some sulphides. Between the two veins the granite is somewhat fractured, and the spaces between fragments are filled with quartz, which is mostly barren.

A sample of the better mineralized vein material was assayed by the Provincial Assayer and gave the following results: gold, \$9.60 per ton; silver, 3.34 ounces per ton; lead, 7.39 per cent; copper, 1.80 per cent.

There are a number of other small, mineralized veins on the properties, but the one described is the most interesting that was seen.

The property was investigated by Hollinger Consolidated Gold Mines Limited in 1937. They sampled the main vein, described by Moore, and eight others for gold. Assay values reported, however, were poor, mainly below 0.05 ounces Au per ton, with the highest at 0.20 ounces Au per ton. No further action was taken.

In 1963, Candore Explorations Limited acquired the

property and carried out a drilling program on the main vein. Nine holes were drilled totalling 604 feet. The vein proved to be variably mineralized with pyrite, galena and chalcopryrite. Assay data for gold was low, mostly 0.01 ounces Au per ton or less, with a high of 0.30 ounces Au per ton. No data were reported for other metals.

Trenching of the vein was undertaken by C. Clement in 1974 but no details of sampling or assay values are available. The property is presently under claim to J. Morton though no further details of prospecting work are available.

Noranda Exploration Company Limited (Gimby-Hubert Group)
(Naveau Township) (Na 6,8)

History of Development

This property originally consisted of a group of six claims located about one and a half kilometres north of Fir Lake, close to the Naveau-Nebonaionquet Township boundary.

Iron formation was first mentioned in the area by Coleman (1906) and later by Matheson (1935), though neither described the presence of sulphides. The property was staked in 1939 by Dr. J.E. Gimby and Messers W. Hubert and A.L. McCreight.

In 1960 an option was arranged with the Towagamac Exploration Company, but this lapsed before any work was carried out. The claim owners did some trenching on the exposures during the war years, and in 1946 optioned the property to Mr. A. White who surveyed the claims.

The claims were inspected by Jalore Mining Company Limited in 1948 who mapped and sampled the trenches and

outcrops of the sulphide-rich zone. Despite favourable reports, no follow-up work was carried out.

In 1969, the property was optioned through Mr. W. Ringsleben to Noranda Mines Limited. A preliminary survey was undertaken by Ringsleben in 1949, followed in 1950 by detailed geologic mapping, electromagnetic and dip needle surveys, and diamond drilling by Noranda Mines Limited itself. Fairly extensive sampling of the drill core and some new trenches were made. Assay results, however, were only reported for Fe, S and SiO₂ and not for base metals or gold.

In 1952, Condela Development Company made a brief inspection of the property but did not proceed any further. No more work was done until 1975 when Asarco Exploration Company of Canada Limited detected an airborne electromagnetic anomaly on the property. This was followed up with ground electromagnetic and magnetic surveys. A couple of samples were taken from unidentified trenches, but assay values for gold and base metals were very low.

Geology of the deposit

The property is underlain primarily by tuffaceous rocks of an intermediate to felsic composition with interbedded chemical metasediments. Occasional massive mafic flows are also reported in drill-logs. The metavolcanics are intruded by diorite and diabase.

The iron-formation occurs in three zones. The western zone extends for about 200 m striking approximately 110 degrees. It may be up to 25 m wide. The central zone is

offset about 150 m north from the east end of the western zone. It extends for about 240 m with sharp cut offs faults at both ends. Maximum thickness is about 35 m. The eastern zone is poorly exposed but may be up to 200 m in length. The thickness is uncertain. Differences in descriptions by previous investigators suggest that not only are there lithological differences between the three zones, but also some lateral variation within a particular zone.

The western zone shows a northward progression from light coloured tuffs into interbedded tuffs and siliceous iron formation; siliceous magnetite-bearing iron formation; massive sulphides (pyrite, pyrrhotite and a little chalcopyrite) with bands of pyritized schists and patches of magnetite, irregular lenses of sideritic iron formation; and finally tuffs with some carbonate near the contact. Dip is reported by Noranda Mines Limited geologists to be steep to the north.

The central zone was extensively drilled by Noranda Mines Limited in 1950 and shows a general northward progression from diorite into a magnetite-bearing greenstone; lean quartzitic iron formation with chlorite and magnetite; a mineralized zone with pyrrhotite-magnetite with minor quartz giving way to pyrrhotite-pyrite; banded magnetite-quartzite iron formation and then magnetite-bearing greenstone. This sequence is then repeated before passing into tuffs. This succession in the drillholes conflicts somewhat with descriptions of trenches in the zone, in which the sulphide zone has been described as varying from massive to a breccia-ore with large blocks of

country rock in a sulphide matrix. Drilling through a breccia-ore may give rise to some of the lithologic variability seen in the core-logs, although the presence of two mineralized zones with an intervening magnetite-bearing greenstone is consistent and common to all the holes in the central zone. Dips are reported by the Noranda Mines Limited geologists to be steep to the south although others report steep northerly dips.

The eastern zone is poorly exposed but seems to consist essentially of siliceous iron formation with magnetite but no sulphides.

The relationship between the three zones is unknown. It has been suggested by the Noranda Mines Limited geologists, that the central and western zones are stratigraphically equivalent and lie on the north and south limits respectively of a tightly folded synform. However, the lithologic differences between the three zones would militate against this and perhaps are better explained by their being separate horizons.

Noranda Exploration Company Limited (Naveau Project) (Naveau and Nebonaionquet Townships) (Na 9, Ne 4)

In 1981, following publication of airborne electromagnetic and total intensity magnetic surveys (OGS 1980) by the Ontario Government, Noranda Exploration Company Limited staked out three groups of claims in Naveau and Nebonaionquet Townships (see figure 1A). Ground electromagnetic and magnetic surveys were conducted in 1981. Follow up geological

surveys and grab sampling was conducted in 1982. Results of this sampling are not available.

Iron Deposits

Several iron formation deposits have been found in the Mishewawa Lake area and looked at for their potential as iron ore (Coleman 1906, Moore 1906, Matheson 1935). These are nearly all of the banded magnetite-chert type with some subsidiary sulphide type. Little sideritic iron formation has been found in the area.

The larger, more continuous deposits occur in the eastern half of the area, but even these appear to be too thin, too variable in lithology and too low-grade to be of much economic importance at the present.

Anjigami Lake Iron Formation (Nebonaionquet Township) (Ne 2)

History of Prospecting

This property is located about 2.5 km south of Anjigami Station in Nebonaionquet Township, near mileage 147 on the Algoma Central Railway line.

The original discovery was made in rock cuts along the rail-line at the turn of the century by an unknown prospector. Four forty-acre claims were staked over the property which ran in an arc from the railway northeastwards through Banana Lake almost to the power line. In 1904, these claims were owned by Mr. T.W. Trotter who undertook some geological mapping but no development work.

In 1908, the Anjigami Iron Mining Company acquired the property on a royalty basis from Mr. Trotter. They did

further geological work accompanied by stripping and trenching. Samples of various lithologies were taken but no analytical results were recorded. The property reverted back to Mr. Trotter, and in 1912 was inspected by a Mr. L.L. Belton.

No further work is recorded on the property until 1944, by which time it had been restaked by Messrs O. Palmagner and E. Benson. In 1944 the area was inspected by Algoma Ore Properties Limited but deemed to be of little interest.

The Algoma Central Railway's airborne geophysical survey of 1962 detected a conductor underneath the property. This was investigated further in 1963 with ground-based electromagnetic, magnetic and geological surveys. The iron formation was found to produce a strong though variable magnetic anomaly. A moderate-to-strong conductor also found associated with the magnetic anomaly, was interpreted as being due to sulphide mineralization associated with the iron formation. Despite recommendation for further trenching and drilling, no work has been carried out on the property since.

Geology of Deposit

Banded iron formation is interbedded with mafic to intermediate tuffs and chlorite schists forming a zone about 60 m wide and extending discontinuously for about one and a half kilometers across the property. Several layers of iron formation, varying in thickness up to 7 m, occur within this zone. The layers vary in lithology from granular silica to banded cherts to banded magnetite-chert. A pyrite-rich band

up to 3.5 m wide is also reported by past investigators on the south side of the zone.

The zone varies in strike from east-southeast near the rail-line to east-northeast in the east. Dips are vertical. Local variations in dip and strike are common due to minor folding of the sequence.

Gros Cap Mining Location (Lendrum Township) (Le 1, 5)

History of Prospecting

The ironstones outcropping on the southwest corner of Gros Cap Peninsula were the first mineral deposit to be explored and investigated in the Wawa-Michipicoten area in modern times. In 1860, Mr. J.W. Johnston of Detroit had already initiated work on the deposit (MacFarlane 1866) and a shaft was sunk at the southwest end of the deposit, under the supervision of Capt. William Grierson, to a depth of 64 feet (19.5 m). An open cut was also made on the bed from the shore line to the shaft. Some test pits were sunk further along the strike of the deposit. No records remain from this early activity though MacFarlane (1866) asserts that some ore was shipped.

By 1899, the property had been acquired by a Mr. Ely on behalf of Minnesota and Illinois interests. Coleman (1899) reports the workings to be overgrown and the shaft filled with water. The property passed into the hands of the Algoma Steel Corporation Limited and was included in the Gros Cap Mining Location. Mapping and sampling of the old shaft and test pits, and extension of the iron formation to the northwest,

were undertaken in 1916. Two diamond drill holes were sunk in 1917-18 to depths of 608' (185 m) and 436' (133 m). No concentration of hematite at depth was found and work was abandoned.

The Gros Cap Mining Location was visited by Matheson (1933) who located and described other iron formations in the area. Algoma Ore Properties carried out further mapping of the Gros Cap shoreline in 1962, examining the various iron formations in order to evaluate the significance of airborne magnetic anomalies. No work has been done in the area since.

Geology of the deposit

Two major northwest striking beds of banded iron-rich chert outcrop on the southwest corner of Gros Cap (figure 6). The northeastern one is more important of the two, and is the one subject to past exploration activity. It consists of a banded hematite-chert ironstone with only traces of magnetite. The hematite forms blue-grey compact laminae and bands varying from 1-10 cm thick. Occasional fibrous and botryoidal forms are found in cavities. Limonite occurs in laminae and on surfaces. Chert is white, microcrystalline.

The bed varies in thickness from about 20 m at its southern end to about 30 m at its northern end. Total length on land is about 400 m, but it continues under the lake at both ends. Only the bottom 6-7 m is exposed in the open cut around the shaft, the upper part of the horizon being leaner with hematite disseminated in the chert. The oxide content was reported to increase with depth such that at the bottom of

the shaft (64', 19.5 m) there was solid ore for the full width of the shaft (7', 2.1 m) (Coleman 1899). Diamond drilling results, however, showed no increase in hematite with depth. Although analytical data are lacking, even in the hematite-rich portion of the bed, oxide content is probably less than 35%, and the deposit is sub-economic at best.

Several other iron-formations on the Gros Cap Peninsula are described by Matheson (1933). These are all fairly thin (20 cm-15 m), either magnetite or hematite-cherts with minor pyrite and are usually quite lean.

Jalore Mining Company (Lendrum Township) (Le 4)

In 1948, Jalore Mining Company carried out geological mapping on two areas in northern Lendrum Township where high aeromagnetic anomalies had been detected and interpreted as possible iron formations. Five traverses were run across the northern anomaly, near the Lendrum-Bailloquet Township boundary, and four across the southern anomaly, near Rod and Gun Lake. No iron formation was found in either location and investigations ceased.

Mishewawa Lake Deposit (Naveau Township) (Na 7)

Iron Formation on the northeast side of Mishewawa Lake was first briefly described by Coleman (1906). Matheson (1935) gave the following more extensive description of what he termed the Deep Lake Iron Formation:

The average strike of this range is about south 60 degrees east and the dip is vertical or in a few places 80 degrees northeast. The range is offset along two

faults that strike northeastward. The range forms part of a high ridge. Deep gullies striking northeastward cut across it along the two faults, at the outlet of Cabin Lake and at the middle bay on the north side of Deep Lake. Banded silica with magnetite forms most of the outcrops. The amount of magnetite in the layers is variable; at the outlet of Cabin Lake is relatively abundant, whereas the outcrops on the east bay of Deep Lake have only a very little magnetite in layers within the silica. Near where the middle section of the iron range crosses Deep Lake Creek, on the south side of the creek, the iron formation and associated rocks are slightly contorted and consist of indefinitely banded, rusty-weathering silica and magnetite with some fine-grained, radiating light brown amphibole. About 15 chains southeast of where the range crosses the creek, banded white silica and medium-grained magnetite outcrop on the southwest side of the range, which is over 400 feet wide and dips 80 to 85 degrees northeastward at this point. Some pyrite is present and parts of the exposure are leached and have a cellular, porous structure. A dark brown limonite crust up to one-third inch thick forms a secondary coating over some of the iron formation. Farther east silica is banded with very narrow layers of carbonate largely changed to limonite. A large part of the range is drift covered, but it is traceable by means of the dip needle; the eastern

extension of the range is still unmapped. The exposures are not rich enough in iron minerals to be commercially valuable, but a range of this size may possibly have a carbonate member at some point, most likely along the middle section on the northeast side.

There are no records of prospecting in this range, however, until 1952 when geologists from Jalore Mining Company Limited visited the area. Although some sampling was done, the iron formation was felt to be too lean to be of much commercial value. No other prospecting activity has taken place in the range.

Sand and Gravel

Fluvio-glacial sands and gravels occurring in terraces along the Michipicoten and Magpie Rivers (Rabazo and Lendrum Townships) form potential resources for the aggregate industry. They are presently being exploited in gravel pits in the Trembley Flats area, and several abandoned pits are located along Highway 17 and the High Falls Road.

Fluvio-glacial and lacustrine sands are also extensive to the north of Anjigami Lake (Nebonaionquet Township) and have been used at Perry Station for grade material for Algoma Central Railway. Sand and gravel terraces are also to be found along sections of Sponge Creek (Nebonaionquet Township).

Suggestions to Prospectors

Much of the past prospecting work in the Mishewawa Lake Area has been concentrated on auriferous quartz veins on silicified shears. This will probably continue to be the case

in the future. Several lineaments may be useful targets for prospecting. The Ranson Mine property lies on and close to a northwest-trending lineament that runs from the shore of Lake Superior across Bridget Lake and the south of Blackington Lake. Prospecting along the lineament may well be warranted, particularly close to the Bridget Lake Stock.

A dike-filled lineament enters the map area from McMurray Township south Dycie Lake. The Dorwin Shear, which localizes gold mineralization in McMurray Township, also joins with this lineament just north of Dycie Lake. A conductor has been located on or close to this lineament by Canabec Explorations Limited although only low gold values have been reported to date (AFRO microfiche Rabazo 0021-41). The Gold Monk Mine property would also appear to lie on the extension of this lineament. Its continuation southwards across the Michipicoten River is not known.

The presence of two past producers - the Norwalk Mine and the Centennial Mine - within sheared zones of the Centennial Stock suggests that further attention to this body may be warranted. Many shear-zones have been noted during field mapping although little is known about their trends, or relationship to mineralization.

Sulphide ironstones in the Mishewawa Lake - Anjigami Lake area may show some potential for base-metal and gold production. They are, however, poorly exposed and will probably require significant drilling to test them. Visible gold has been reported in magnetite ironstones in Rabazo

Township. The narrowness and lack of continuity of the ironstone units in this area, may, however, preclude their being economically viable.

Sulphide ironstones in Lendrum Township show significant enrichment in copper and zinc and may be targets for base-metal exploration. Gold values in these ironstones, however, appear to be low.

Polymetallic quartz veins are found in the Mission Stock and surrounding metavolcanics in Rabazo Township. The Magpie High Falls Stock (Lendrum Township) is correlative with the Mission Stock, being offset along the Trembley Fault, suggesting the possibility of finding polymetallic quartz veins within it and the surrounding rocks, though none have been reported to date.

The presence of molybdenite-quartz veins in the gneissic terrain around Molybdenite Lake, Andre Township, (Mandziuk 1981) northwest of Lendrum Township, may suggest a potential for this type of mineralization in the northern part of the Gros Cap Indian Reserve No. 49.

No mineralization has been recorded to date within the clastic metasediments.

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Figure Captions

- Fig. 1. Key Map showing the location of the Mishewawa Lake area.
- Fig. 2. Lithofacies variation in the "Dore Series" metasediments
- Fig. 3. Felsic Intrusions in the Mishewawa Lake Area.
- Fig. 4. Modal Quartz-Potash Feldspar - Plagioclase ternary diagrams for samples from (a) the Anjigami Gneiss Domaine; (b) Whitefish Lake and Brule Batholiths; (c) Felsic Intrusions. Fields after Streckeisen (1976) - 3 granite; 4 granodiorite; 5 tonalite; 9 quartz monzodiorite 10 quartz diorite, 9 monzodiorite 10 diorite.
- Figure 5 Orientations of various dike suites.
a) Archean (? Early Proterozoic); b) Keweenawan aphyric diabases. c) Lamprophyres. d) Keweenawan feldspar phytic diabases. Numbers in parentheses indicate the number of observations in each data set.
- Figure 6 Interpreted time - stratigraphic relationships, Mishewawa Lake area. Volcanic cycles after Sage (1981b).
- Figure 7. Structural Geology of the Mishewawa Lake area.

- Figure 8 (a) AFM and (b) Jensen Cation Plots from
metavolcanics and felsic intrusions from the
Mishewawa Lake area Field after (a) Irvine and
Baragar (1971) and (b) Jensen.
- Figure 9 a) AFM and (b) Jensen Cation plots for mafic
intrusions and related alkalic intrusions.
- Figure 10A Exploration Activity in the Mishewawa Lake Area.
- Figure 10B Patented Mining Claims in the Mishewawa Lake Area.
- Figure 11 Exploration Activity in the Dycie Lake - Scott
Falls Area
- Figure 12 "Plan of No 3 Vein showing channel sampling by
R.F. Mitchell, M.E."
- Figure 13 Location of anomalies investigated by Algoma Steel
Corporation Ltd. in Lendrum Township 1979-1982.
- Figure 14 Airborne magnetic and electromagnetic anomalies in
Rabazo, Naveau and Nebonaionquet Townships.
(continued on next page)

Figure 14 (con't)

Anomaly	Investigating Company ¹	Type of Anomaly	Approximate Strength	Explanation ²
1	ASCL (10)	EM	a) Strong	a) Pyrrhotic rich zone within rhyotite flow
2	ASCL (9)		b) moderate	b) Graphite schist
3	ASCL (11)	EM	moderate-strong	? Banded oxide iron formation
4	ASCL (12)	EM	poor	Interbedded graphitic shale, pyritic and graphitic chert and chert breccia, and felsic tuffs
5	Asarco (1)	Mag	poor	Pyrite ± magnetite-chert IF
6	ASCL (24)	EM	moderate	Oxide I.F. plus graphite bands
7	ASCL (1)	Mag	strong	Conductive lake bottom sediments
8	ASCL (13)	EM	weak	Polymetallic quartz vein in pyritic shear zone
9	ASCL (14)	Mag	moderate	Rusty laminated chert and banded pyrite-chert with minor hematite
10	ASCL (2)	EM	weak-moderate	?Xenolithic lens of oxide IF in granitic gneiss
11	ASCL (15)	EM	moderate	Conductive lake bottom sediments
12	ASCL (16)			Felsic tuffs, carbonated with minor pyrite
13	ASCL (17)	EM	weak-moderate	Unexplained
14	ASCL (18)	EM	moderate	Laminated to banded carbonate I.F.
15	ASCL (19)	Mag	strong	?Oxide-IF with some sulphides
16	ASCL (25)	EM	moderate-strong	Banded magnetite-chert IF
17	ASCL (3)	Mag	weak	?Diabase Dike
18	ASCL (2)	EM	moderate	Overburden in bedrock depression
19	ASCL (3)	Mag	moderate	Disseminated pyrite-pyrrhotite in felsic meta-volcanics
20	Asarco (3)	EM	weak	Oxide I.F.
21	Asarco (4)	Mag	Moderate	
22	J/S (5E)	EM	strong	Sulphide (pyrrhotite-pyrite-chalcopyrite-sphalerite) iron formatio
23	AMAX (Naveau-1)	Mag	strong	
24	ASCL (4)	EM	weak-moderate	Pyritic lenses within metavolcanics
25	ASCL (5)	EM	weak-moderate	Pyritic lenses within metavolcanics

Figure 14 (con't)

Anomaly	Investigating Company ¹	Type of Anomaly	Approximate Strength	Explanation ²
23	ASCL (20)	EM	weak	Overburden effect
24	Asarco (7)			Unexplained (? oxide IF)
25	Asarco (5)	EM	moderate	?Graphitic horizon associated with rusty chert
26	Noranda 2 (Naveau-1)	EM	moderate	?Graphitic horizon associated with rusty chert
27	Asarco (6)	Mag	weak-moderate	Pyrite-pyrrhotite in mafic flow tops
27	Noranda 2 (Naveau-1)	EM	weak	Thin rusty sulphide-bearing chert
28	ASCL (26)	EM	moderate	Banded magnetite-pyrite-chert IF
29	ASCL (6)	EM	strong	Graphitic horizon associated with oxide IF
30	ASCL (7)	EM	moderate	Graphite interbedded with oxide IF
31	Asarco (12)	EM	moderate	Sulphide and oxide iron formation
32	Asarco (11)	EM	moderate	
32	Noranda 2 (Naveau-2)	Mag	moderate	
32	Asarco (10)			
32	Noranda 1 (Hubert pty)			
33	Asarco (9)	EM	?	Graphitic horizon associated with oxide IF
34	Asarco (8)	Mag	strong	Oxide iron formation with graphitic seams
34	Noranda 2 (Naveau-3)	Mag		Banded chloritic and siliceous oxide IF close to supracrustal-granite margin
35	ASCL (21)	EM	weak	Unexplained (?IF)
35		Mag	weak-moderate	Graphite + oxide iron formation
36	Asarco (13)			Unexplained (?IF)
37	Asarco (17)	EM		Unexplained (?IF)
38	Asarco (14)			Unexplained (?IF)
39	Asarco (15)			Unexplained (?IF)
40	Asarco (16)			Unexplained (?IF)
41	Asarco (18)			Unexplained (?IF)
42	Asarco (19)			Unexplained (?IF)
43	J/S (B)	EM	weak	Unexplained, sandy overburden
44	J/S (A)	EM	weak	Unexplained, sandy overburden
45	ASCL (22)	EM	weak	Banded magnetite-pyrite-chert IF plus overburden effects
46	ASCL (23)	EM	weak	Overburden conductors
47	Asarco (22)	EM	moderate	?Iron formation or or overburden effect
48	J/S (1)	Mag	moderate	Sulphide and oxide iron formations
48	Asarco (20, 21)	EM	strong	Banded magnetite-chert IF with some rusty pyritic chert
49	J/S (2)	Mag	strong	
49	ASCL (8)	EM	strong	
		Mag	strong	

Figure 14 (con't)

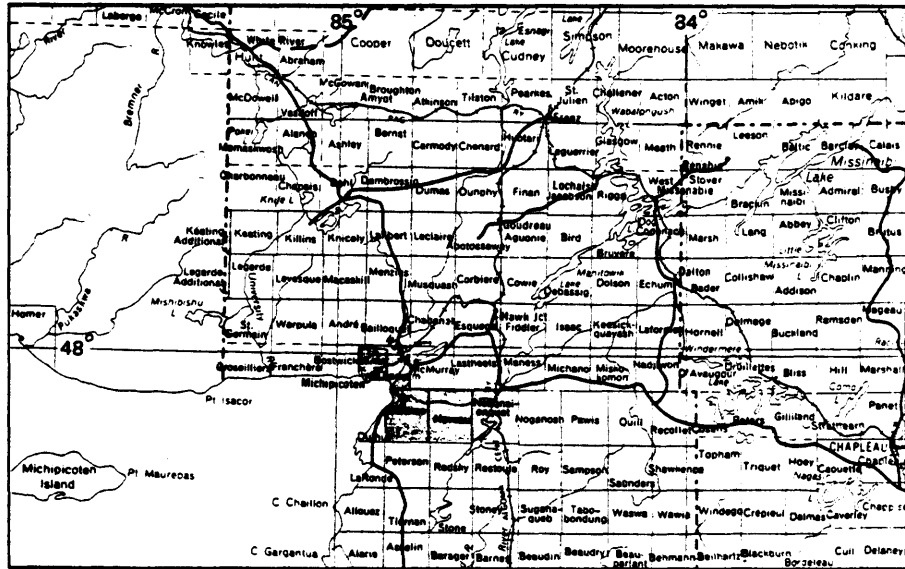
Anomaly	Investigating Company ¹	Type of Anomaly	Approximate Strength	Explanation ²
50	J/S (2A)	EM	weak	Unexplained, sandy overburden
51	J/S (6)	a)EM	moderate	a)? shear zone in granodiorite
52	J/S (6A)	b)Mag EM	strong weak	b) Diabase dike Unexplained, sandy overburden
53	J/S (6B)	EM	weak	Unexplained, sandy overburden
54	AOP (Wagner 12)	Mag EM	strong weak	Disseminated pyrite-pyrrhotite in mafic tuffs
55	AOP (Wagner 11)	Mag	strong	Disseminated magnetite in mafic metavolcanics

- 1 AMAX Amax Minerals Exploration (1979)
 Asarco Asarco Exploration Company of Canada (1975)
 ASCL Algoma Steel Corporation Limited (Project Anjigami) (1981-2)
 J/S (F.R. Joubin and Associates
 (H.O. Seigel and Associates (1962-63)
 Noranda 1 Noranda Exploration Company Limited (1949-50)
 Noranda 2 Noranda Exploration Company Limited (1981-83)
 AOP Algoma Ore Properties (1962)

NOTE: numbers in brackets are anomaly designation used by the investigating company.

- 2 Explanations derived from ground investigations (geophysics plus geology). Where no ground investigation undertaken, anomaly is shown as unexplained with possible interpretation in brackets.

Figure 15. The geology of the Gros Cap Iron Formation. Data from Assessment Files (Algoma Steel Corp Ltd.) and Author's mapping.



LOCATION MAP

Scale: 1:1 584 000 or 1 inch to 25 miles

Figure 1

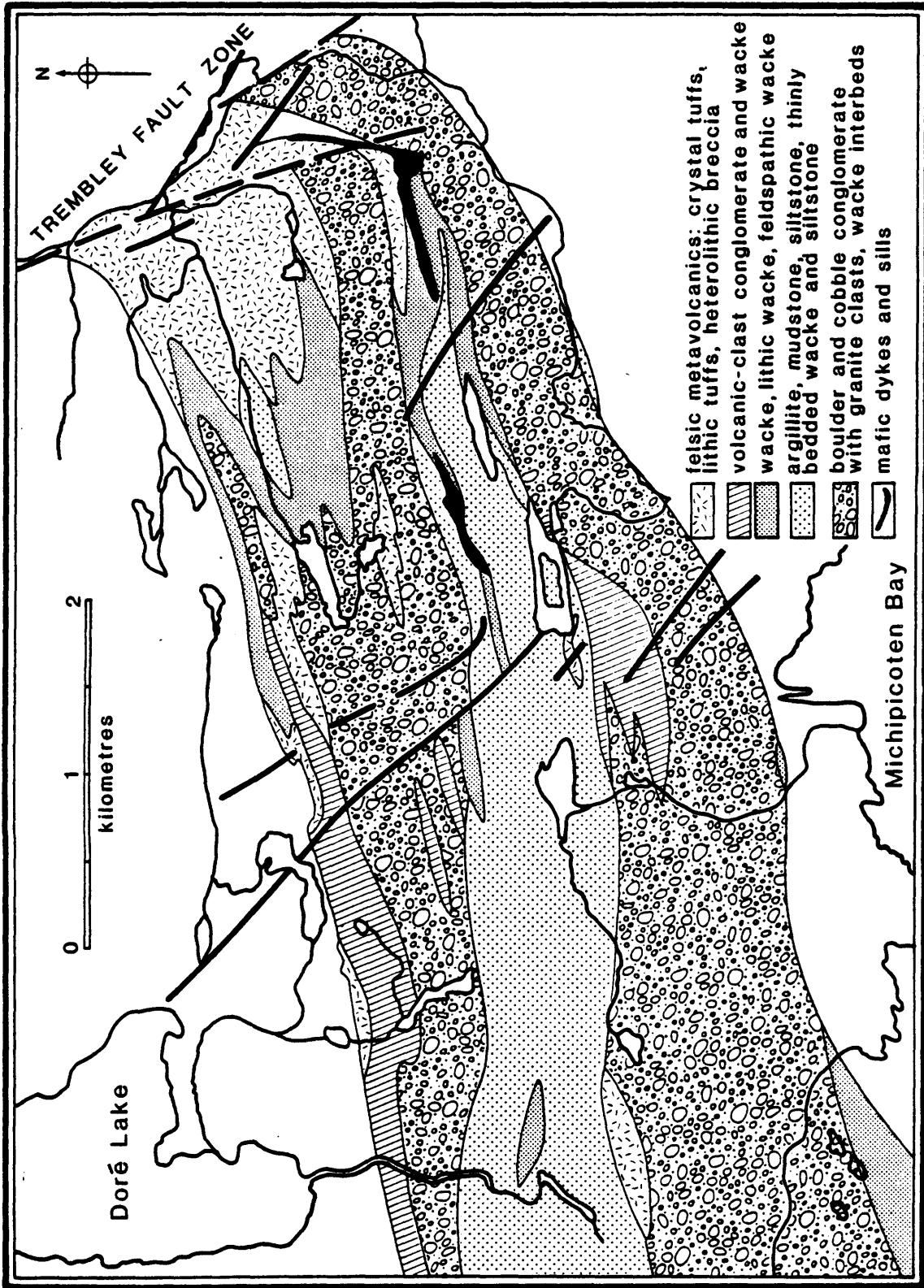


Figure 2

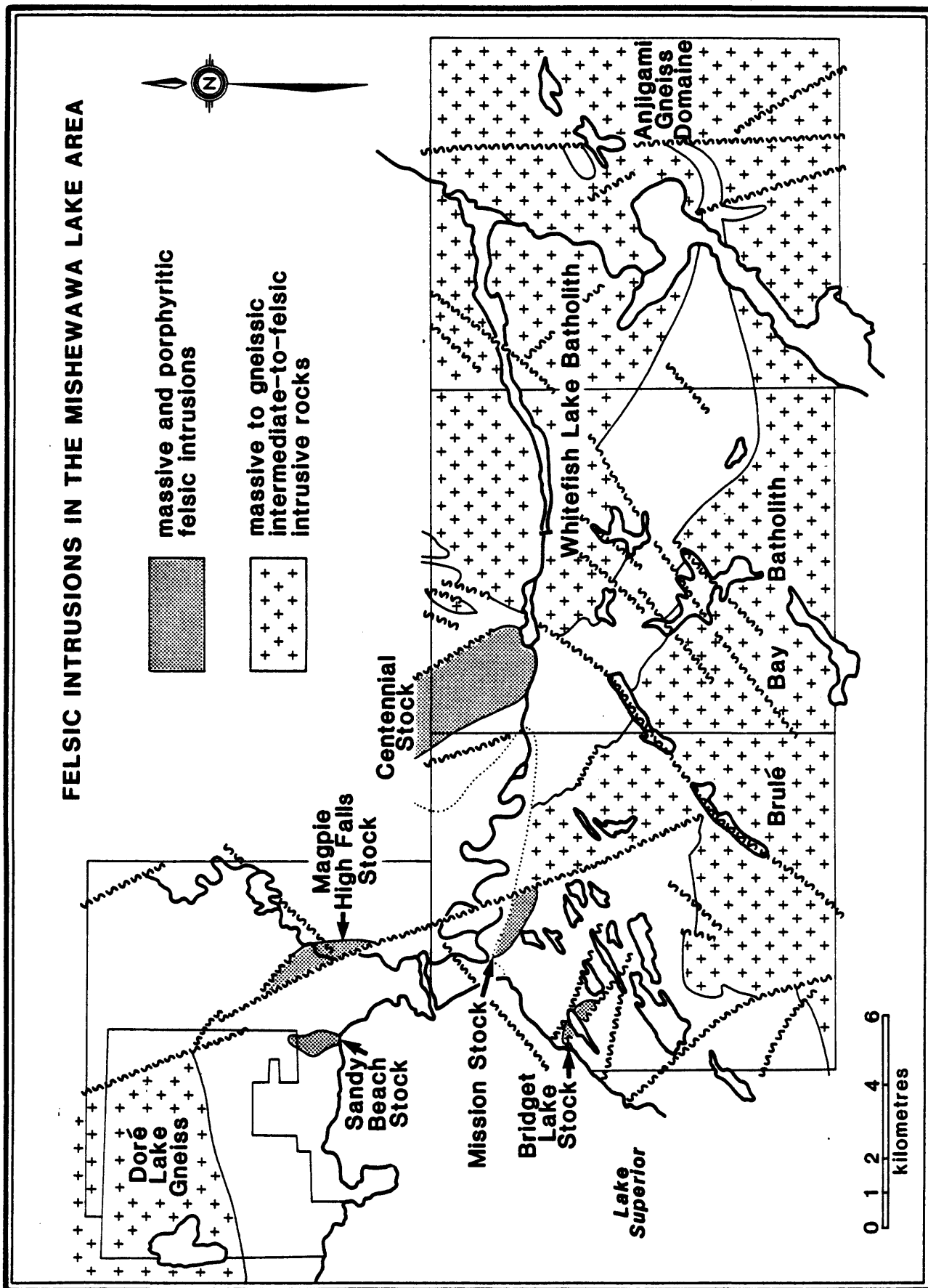


Figure 3

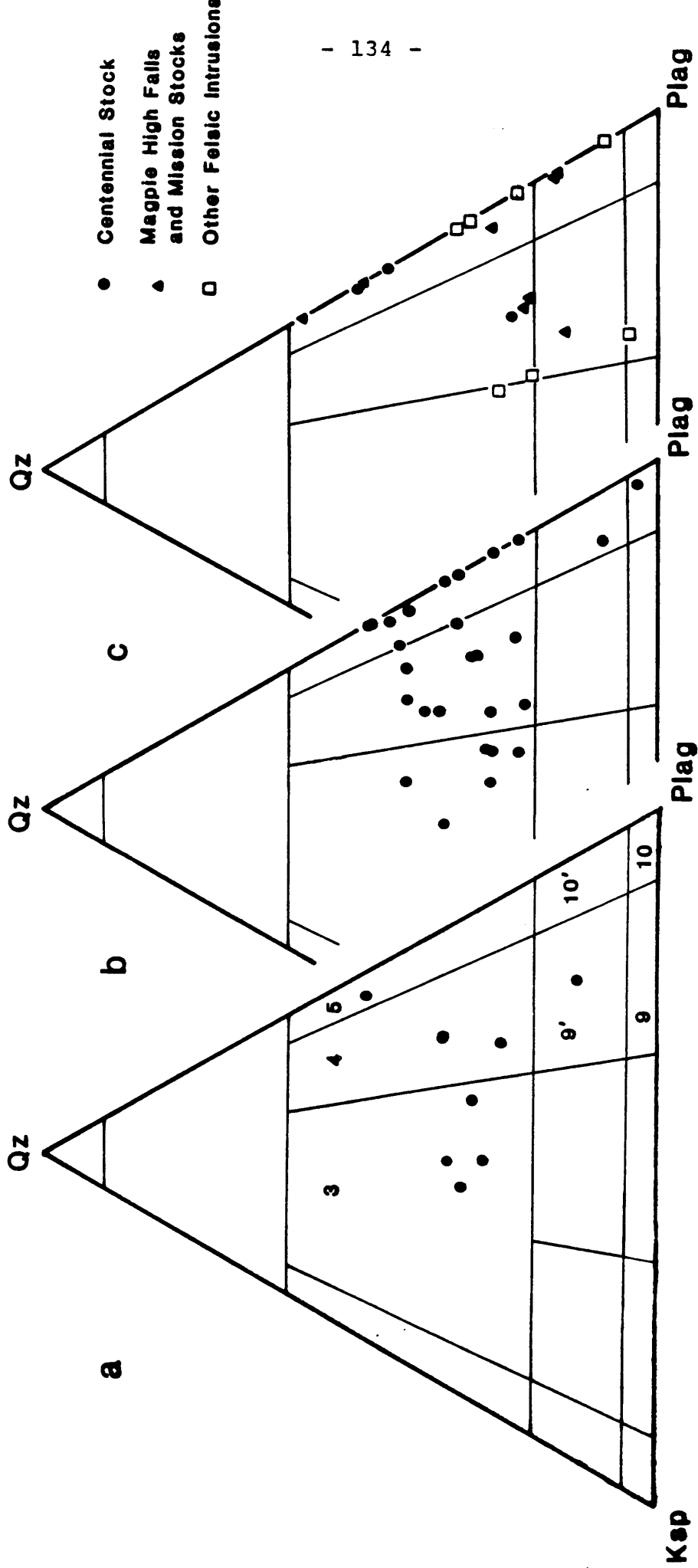


Figure 4

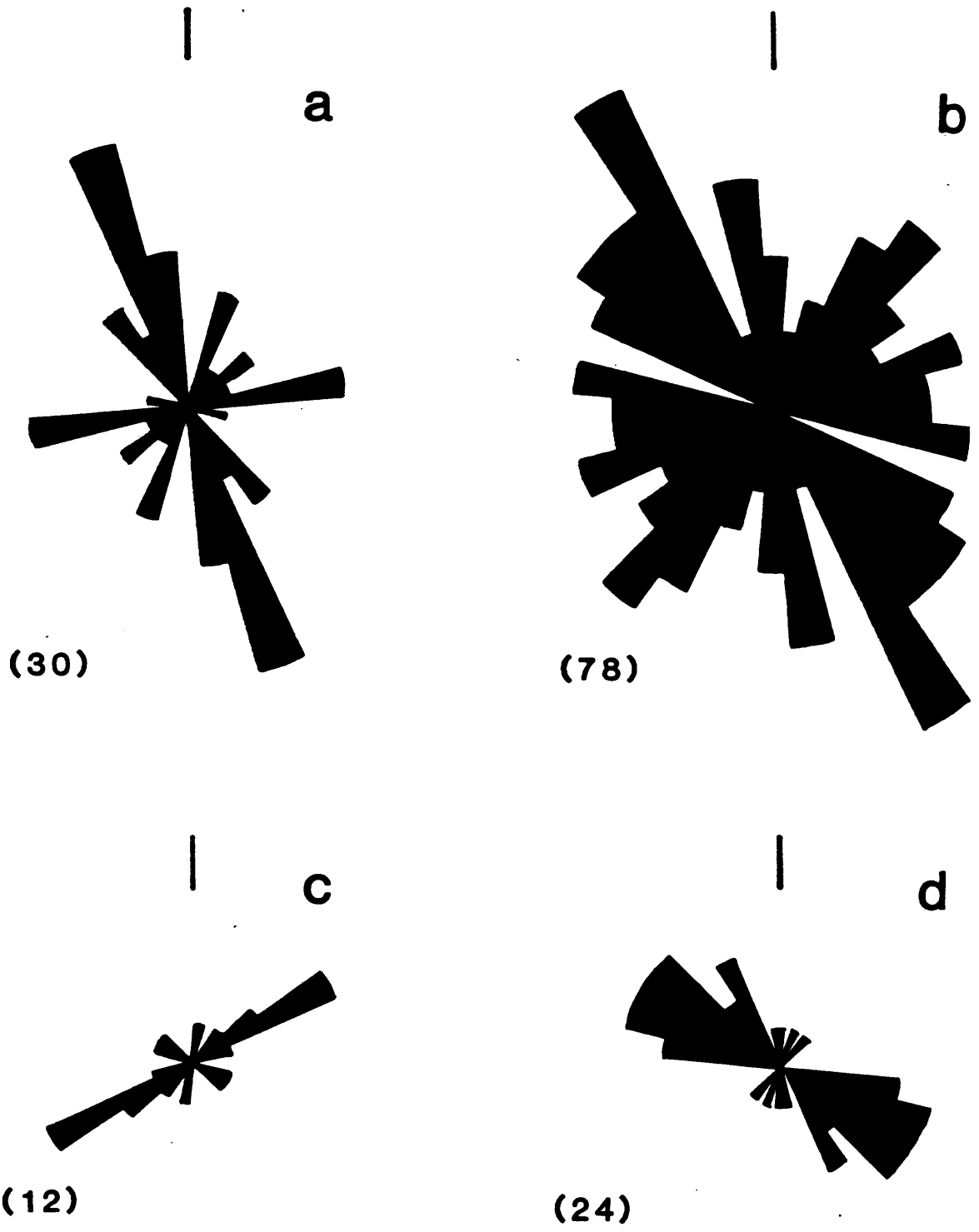


Figure 5

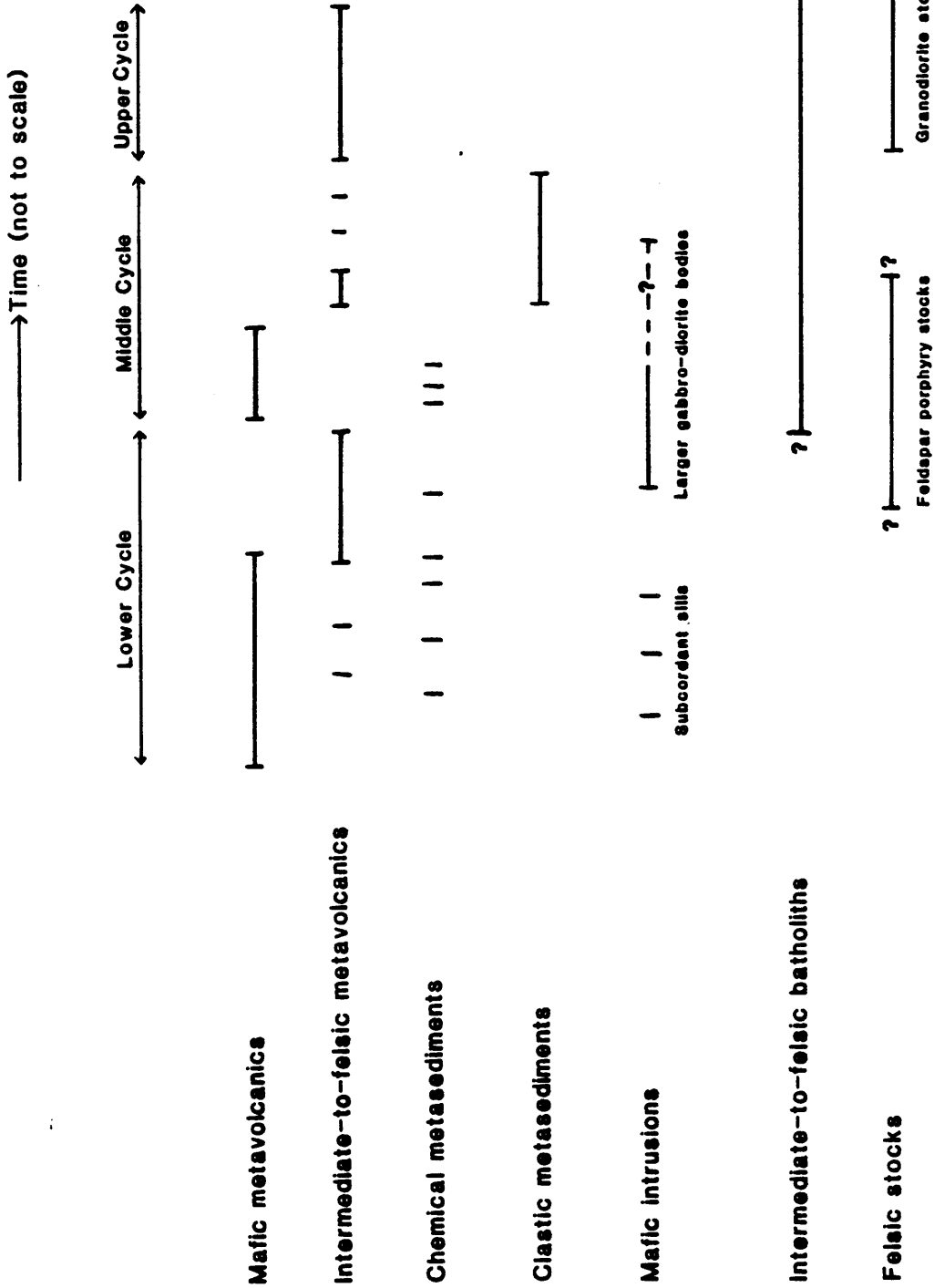


Figure 6 Interpreted time-stratigraphic relationships, Mishewawa Lake area. Volcanic cycles after Sage (1981b).

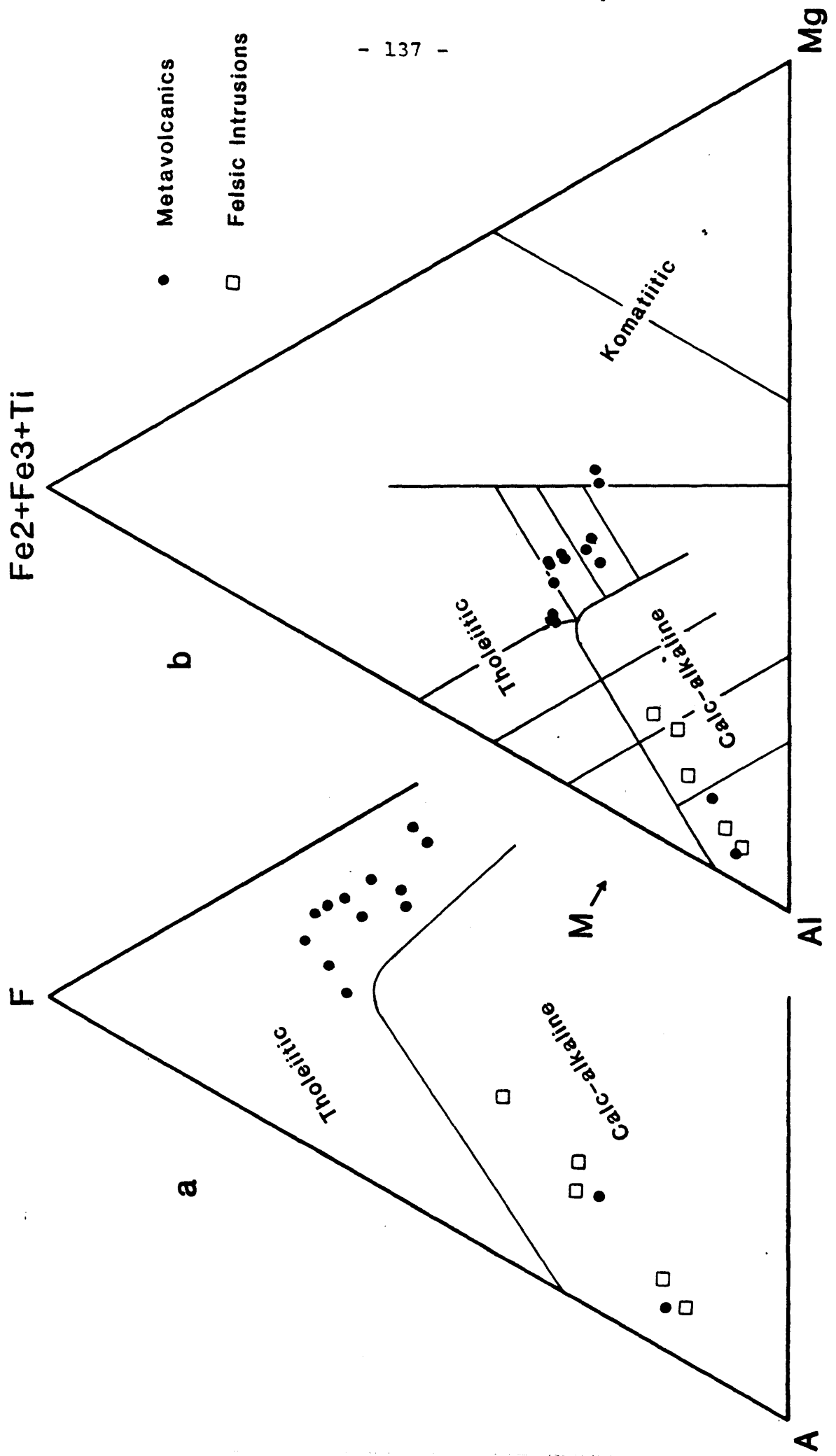


Figure 8

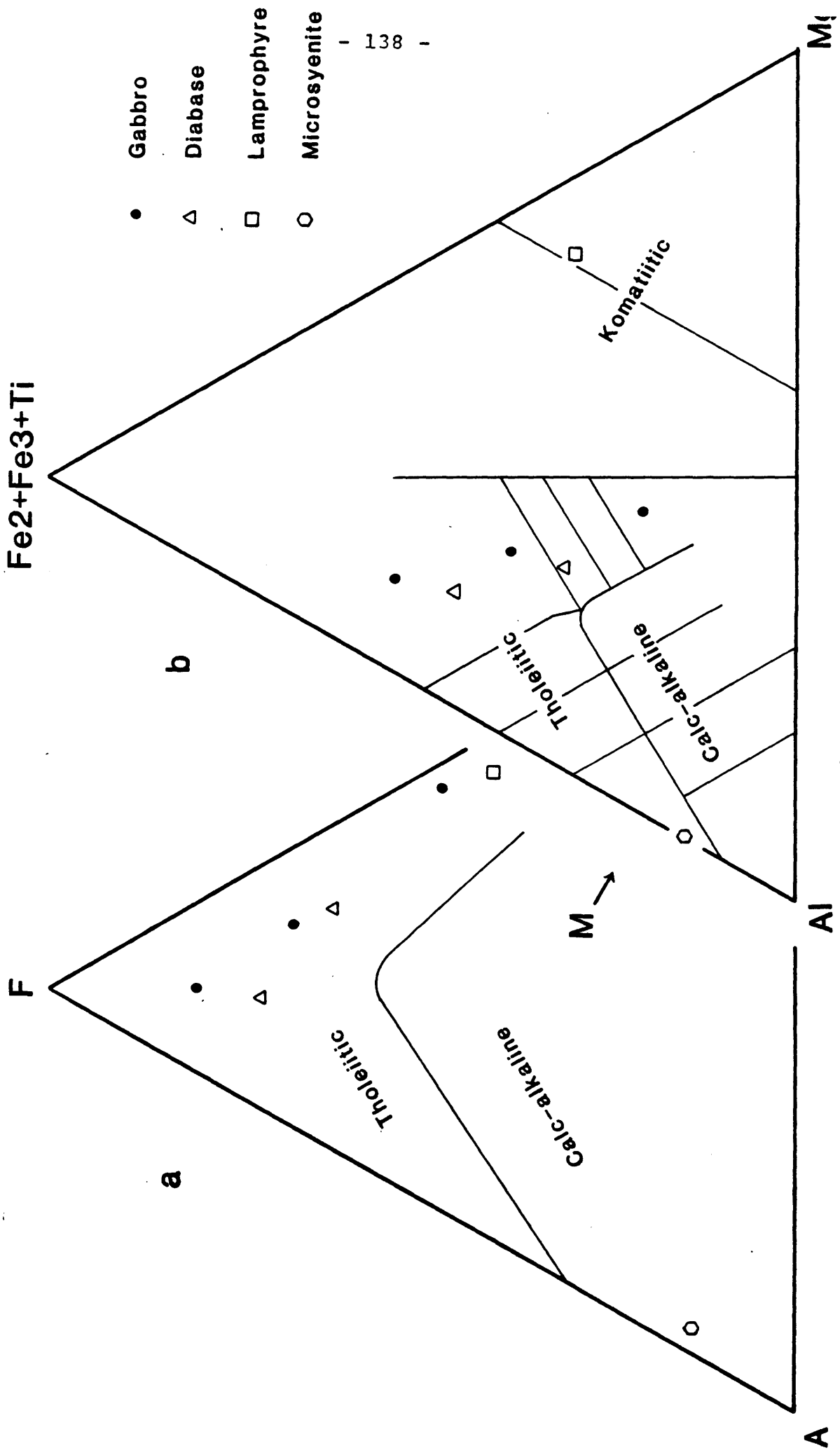


Figure 9

"Plan of No. 3 Vein showing channel sampling by R. F. Mitchell, M.E."

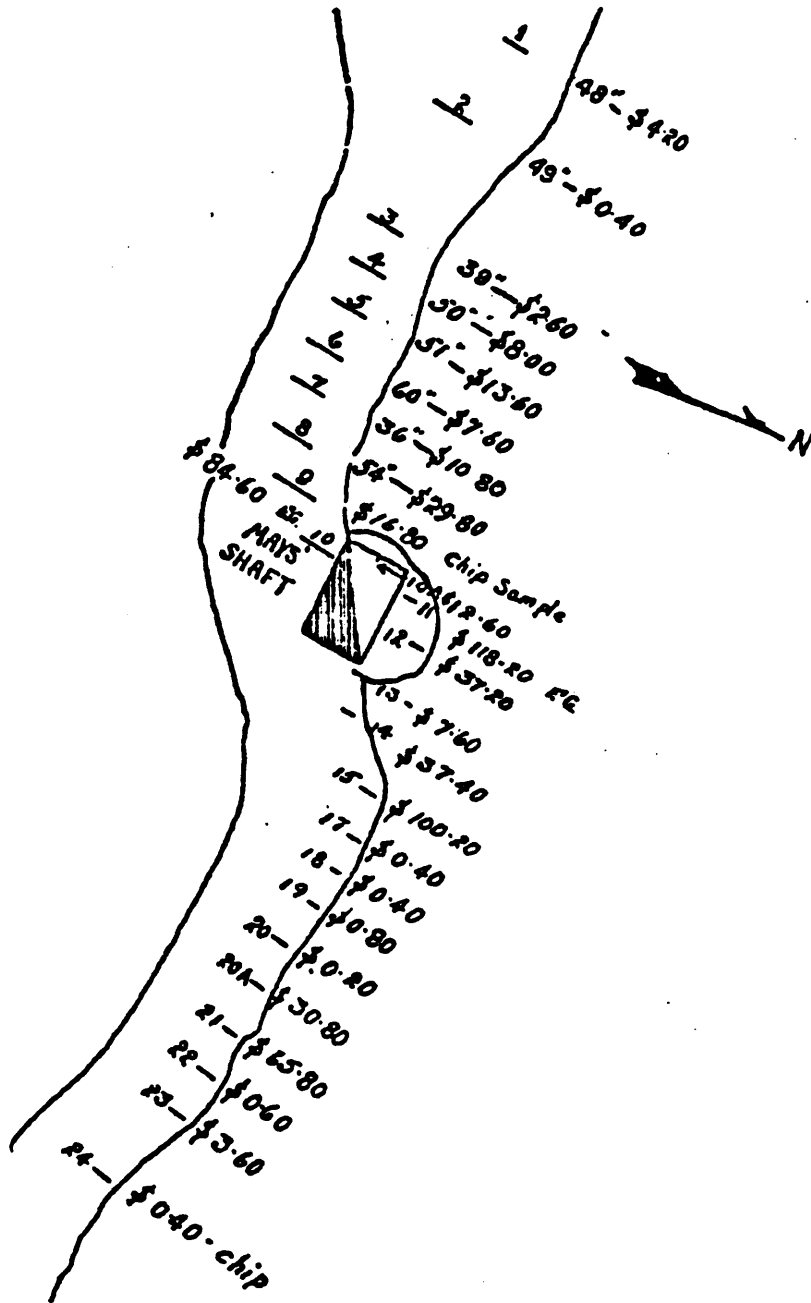


Figure 12

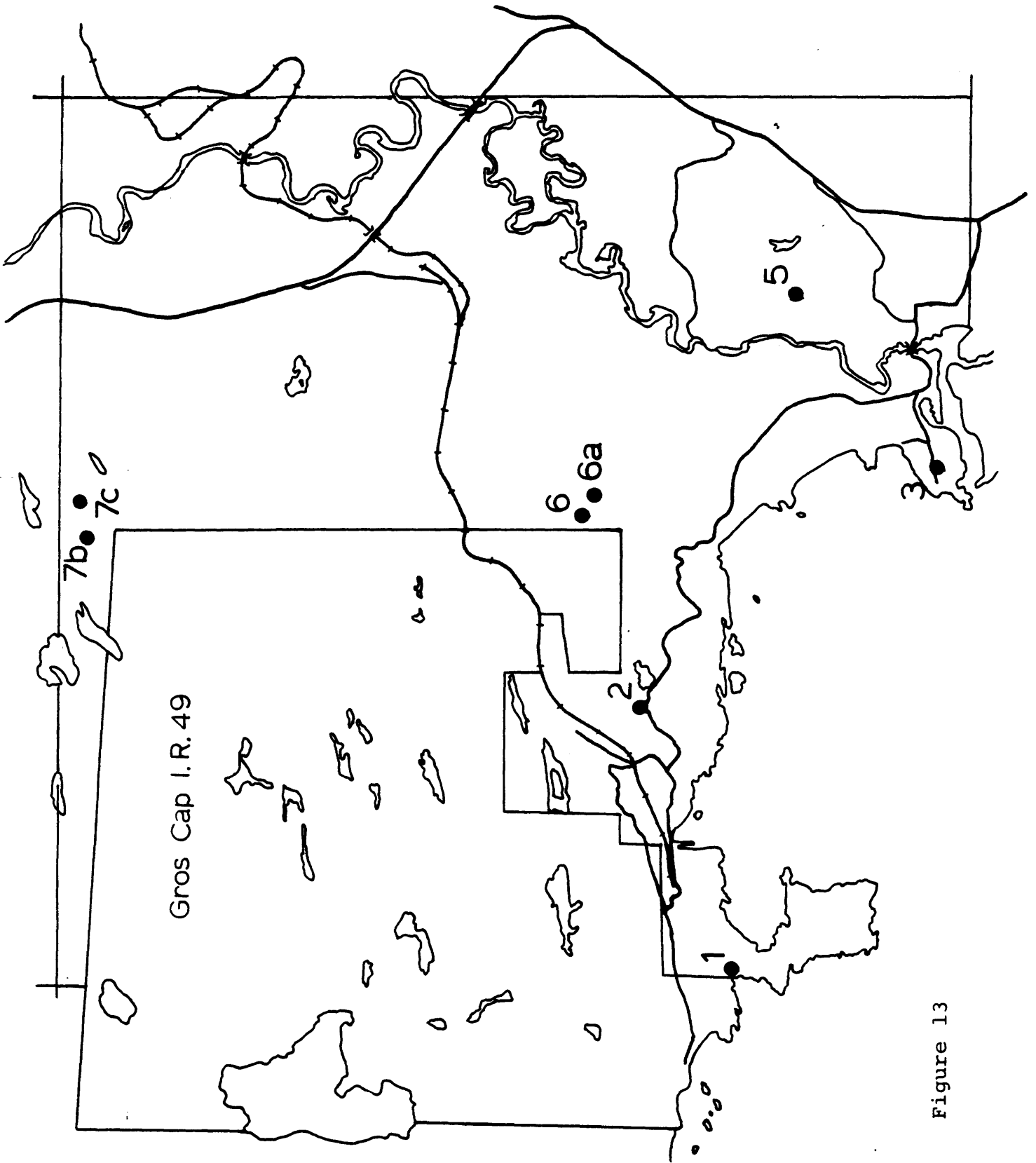


Figure 13

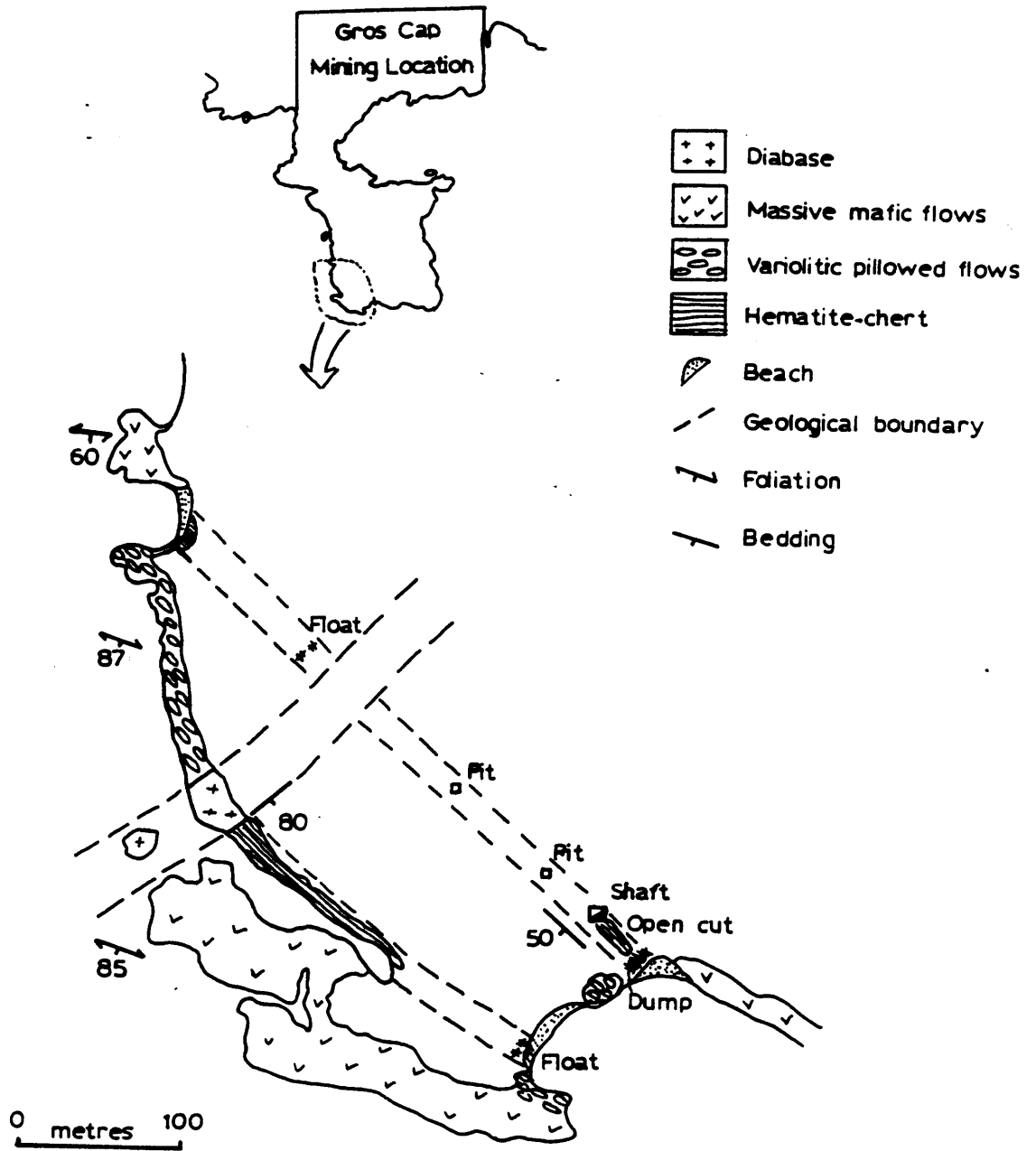


Figure 15

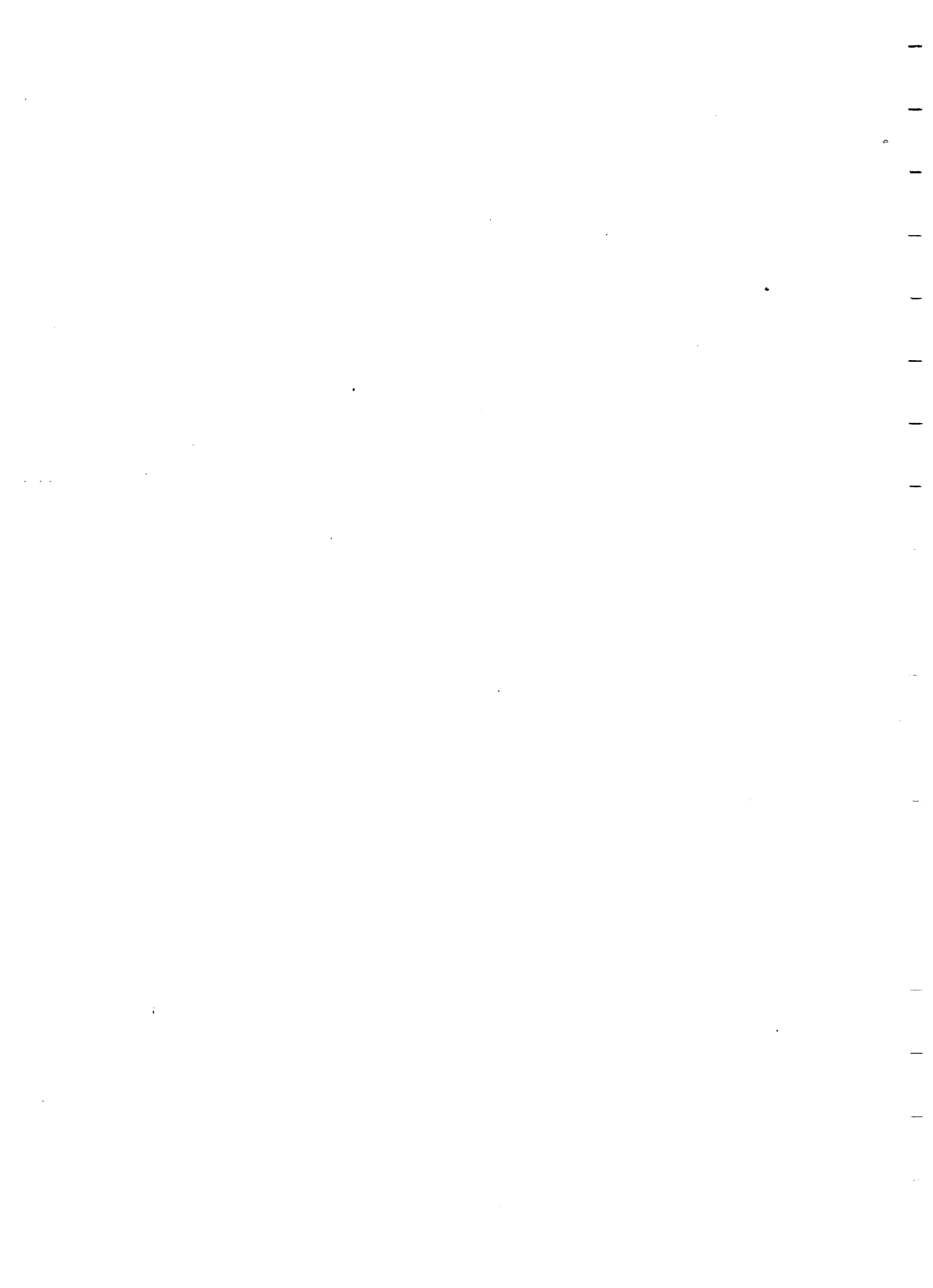


TABLE I FORMER NAMES FOR LAKES IN THE MISHEWAWA LAKE AREA

<u>Former Name</u>	<u>Present Name</u>
Antoine Lake ^a	(immediately NW of Blackington Lake)
Banana Lake ^a	(between Anjigami and Frost Lakes)
Blagdon Lake	Blackington Lake
Cedar Lake	Thrya Lake
Centre Lake	Nezwa Lake
Chub Lake ^a	(immediately NW of Treeby Lake)
Cranberry Lake	Prentice Lake
Cross Lake	Crozier Lake
Deep Lake	Mishewawa Lake
Great Lake	Kasbog Lake
Island Lake	Treeby Lake
Peter's Lake	Shakwa Lake
Pike Lake	Mission Lake
Round Lake	Roller Lake
Summit Lake	Kearn's Lake
Twin Lake	Hilltop and Nezwa Lakes

a Unnamed on most recent topographic map (Michipicoten Harbour, 41N/15, edition 2, 1976) Location indicated in paranthesis.

TABLE II TABLE OF FORMATIONS

PHANEROZOIC

CENOZOIC

QUATERNARY

HOLOCENE

Organic muds, lake and stream deposits, beach sands.

PLEISTOCENE

Drift, glacio-fluvial and lacustrine gravel and sand.

Unconformity

PRECAMBRIAN

MIDDLE TO LATE PROTEROZOIC

KEWEENAWAN SUPERGROUP

JACOBSTOWN SANDSTONE

Pebbly sandstone

Uncertain Age Relationship

ALKALIC INTRUSIVE ROCKS

Lamprophyre dikes

Microsyenite dike

Intrusive Contact

MAFIC INTRUSIVE ROCKS

Diabase, porphyritic diabase, minor gabbro

Intrusive Contact

ARCHEAN

FELSIC INTRUSIVE ROCKS

Massive granite-granodiorite, quartz-feldspar porphyry, feldspar porphyry, felsite.

Uncertain Age Relationship

INTERMEDIATE-TO-FELSIC INTRUSIVE ROCKS

Massive to foliated granite, granodiorite, tonalite, quartz monzodiorite and diorite with partially digested mafic xenoliths.

MAFIC INTRUSIVE ROCKS^a

Gabbro, hypersthene gabbro, anorthosite gabbro, augite norite, diorite, hornblende diorite, hornblende-plagioclase pegmatite, diabase^b.

Intrusive Contact

METASEDIMENTS

CHEMICAL METASEDIMENTS

Banded magnetite ironstone, pyrite-pyrrhotite, ironstone, chert, chert breccia.

CLASTIC METASEDIMENTS

Polymictic conglomerate, volcanic-clast conglomerate, feldspathic wacke, subarkosic wacke, lithic wacke, laminated siltstone-mudstone, tuffaceous argillite, para-amphibolite.

METAVOLCANICS

INTERMEDIATE-TO-FELSIC METAVOLCANICS

Tuff, laminated tuff, quartz-bearing crystal tuff, feldspar-bearing crystal tuff, quartz-feldspar-bearing crystal tuff, heterolithic tuff-breccia, massive flows, spherulitic flows, flow-banded flows, sericite schist.

MAFIC-TO-INTERMEDIATE METAVOLCANICS

Porphyritic, variolitic, massive and pillowed flows, pillow breccia, laminated tuffs, chlorite schist, amphibolite.

a - May be extrusive

b - May be Early to Middle Proterozoic in age.

TABLE III CHEMICAL ANALYSES OF SUPRACRUSTAL ROCKS IN
THE MISHEWAWA LAKE AREA

Major components (including CO₂ and S) in weight percent. Trace-elements in parts per million.

Note that in these analyses the total is calculated using LOI and hence CO₂ and S are listed following the total.

Chemical analyses performed by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Number	1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16				
	Chlorite Schlist	Chlorite Schlist	Magnetite-bearing Chlorite Schlist	Paragonite-bearing Chlorite Schlist	Pillowed Flows	Massive Flows	Pillowed Flow, Varfoliitic	Pillowed Flows	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Pillowed Flow, Varfoliitic	Feldspar Crystal Tuff	Quartz Crystal Tuff	Chert-Magnetitic Ironstone					
SiO ₂	44.10	46.40	44.20	44.90	45.00	41.00	43.60	48.40	47.70	47.30	50.90	49.50	45.90	49.50	67.20	73.90	57.90																		
TiO ₂	1.40	0.90	0.77	1.17	1.27	1.05	0.92	0.98	1.01	0.81	0.87	0.92	0.69	0.92	0.49	0.31	0.04																		
Al ₂ O ₃	12.10	13.10	11.20	13.00	13.20	13.60	12.00	12.00	14.30	13.40	13.80	13.50	11.00	13.50	15.40	13.70	0.88																		
Fe ₂ O ₃ *	13.10	12.50	10.60	11.50	14.40	14.30	12.10	13.10	14.60	12.30	11.00	12.20	11.30	12.20	2.54	1.38	38.40																		
MnO	0.21	0.20	.24	0.21	0.19	0.19	0.17	0.17	0.20	0.17	0.16	0.17	0.18	0.17	0.05	0.03	0.09																		
MgO	5.75	4.11	3.33	3.84	6.21	6.83	5.83	10.70	5.74	7.05	6.74	7.69	8.97	7.69	1.23	0.39	1.68																		
CaO	10.10	9.61	13.30	10.70	8.24	9.00	10.60	10.20	12.30	10.30	10.60	13.50	0.70	2.10	3.46	1.72	1.46																		
Na ₂ O	1.10	2.54	2.99	1.50	1.60	0.00	1.80	1.67	1.49	1.32	2.36	0.70	0.21	2.10	3.32	3.73	0.00																		
K ₂ O	0.04	0.27	0.18	0.19	0.06	1.78	0.38	0.10	0.23	0.23	0.20	0.26	0.21	0.20	2.10	2.15	0.05																		
P ₂ O ₅	0.04	0.01	0.00	0.00	0.01	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04																		
LOI	10.50	11.00	13.20	11.60	9.50	11.30	11.80	2.80	1.90	6.30	2.00	4.10	6.70	4.10	4.10	2.60	0.80																		
TOTAL	98.44	100.46	100.01	98.61	99.68	99.05	99.22	100.13	99.47	99.18	98.63	99.87	99.15	99.89	99.93	101.34																			
CO ₂	7.45	8.41	11.10	8.60	5.91	7.58	9.02	0.48	0.59	3.58	0.95	1.74	4.38	1.74	2.82	1.32	0.12																		
S	0.01	0.08	0.20	0.08	0.09	0.02	0.05	0.02	0.25	0.07	0.10	0.15	0.03	0.15	0.03	0.02	0.07																		
As	27.0	2.0	3.0	2.0	9.0	1.0	2.0	BLD	3.0	2.0	2.0	5.0	BDL	5.0	6.0	2.0	4.0																		
Ba	50	50	50	40	20	170	60	40	40	40	60	60	60	60	250	350	40																		
Be	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1																		
Co	32	45	38	36	40	51	41	56	47	42	45	44	44	48	6	BDL	BDL																		
Cr	157	146	144	118	170	70	62	780	210	145	425	630	630	500	7	BDL	BDL																		
Cu	60	139	122	108	51	30	64	90	111	82	100	78	78	76	11	5	77																		
Li	30	25	15	24	14	26	18	10	8	22	8	16	16	16	8	6	BDL																		
Nb	15	10	7	11	17	15	12	13	15	14	14	12	12	18	BDL	3	BDL																		
Ni	84	83	73	76	74	79	65	200	83	66	96	97	169	97	8	BDL	BDL																		
Sb	0.4	0.2	0.1	0.1	0.1	BDL	BDL	0.5	0.6	0.5	0.4	0.4	0.6	0.4	0.2	0.2	0.9																		
Sc	45	45	45	50	55	50	50	45	50	55	45	35	35	55	5	3	5																		
Sr	40	75	65	150	30	60	90	80	95	280	105	90	90	70	95	95	12																		
Y	270	225	200	260	290	245	250	240	290	240	235	205	205	270	35	13	35																		
Zn	40	9	12	10	19	11	11	10	16	75	18	18	14	18	4	5	13																		
Zn	96	94	78	98	106	136	99	90	102	82	76	81	72	81	48	22	94																		

TABLE IV CHEMICAL ANALYSES OF MAFIC INTRUSIVE AND RELATED
ROCKS IN THE MISHEWAWA LAKE AREA

Major components (including CO₂ and S) in weight percent. Trace-elements in parts per million.

Note that in these analyses the total is calculated using LOI and hence CO₂ and S are listed following the total.

Chemical analyses performed by Geoscience Laboratories, Ontario Geological Survey, Toronto.

Number	17	18	19	20	21	22	23
	Gabbro	Gabbro	Quartz- Magnetite Gabbro	Feldspar- porphyritic diabase	Diabase	Lamprophyre	Microsyenite
SiO ₂	49.00	48.50	48.90	48.70	50.90	32.20	66.40
TiO ₂	1.66	0.77	2.54	1.18	2.08	3.59	0.25
Al ₂ O ₃	12.50	14.40	11.20	14.40	12.00	3.85	15.00
Fe ₂ O ₃ *	17.20	9.76	23.60	14.50	19.10	16.90	3.91
MnO	0.21	0.15	0.34	0.20	0.23	0.23	0.10
MgO	5.53	9.26	2.67	6.00	3.15	21.10	0.04
CaO	8.51	13.00	7.22	10.90	7.57	11.00	1.26
Na ₂ O	1.90	0.39	2.32	1.58	2.57	0.02	4.81
K ₂ O	0.13	0.13	0.30	0.54	1.15	1.54	5.26
P ₂ O ₅	0.03	0.02	0.09	0.01	0.14	0.50	0.03
LO ₁	<u>2.60</u>	<u>2.30</u>	<u>0.30</u>	<u>0.70</u>	<u>0.60</u>	<u>8.70</u>	<u>2.30</u>
TOTAL	<u>99.27</u>	<u>98.68</u>	<u>99.48</u>	<u>98.71</u>	<u>99.49</u>	<u>99.63</u>	<u>99.36</u>
CO ₂	0.32	0.40	0.36	0.27	0.28	4.95	2.28
S	0.33	0.05	0.24	0.04	0.15	0.14	0.02
As	2.0	2.0	41.0	7.0	BDL	2.0	1.0
Ba	30	50	70	160	250	920	230
Be	2	1	2	2	2	4	4
Co	45	43	33	42	45	85	BDL
Cr	24	440	BDL	117	BDL	1070	BDL
Cu	120	64	48	156	130	80	BDL
Li	8	6	4	8	11	10	BDL
Nb	21	12	35	19	25	125	230
Ni	30	137	BDL	49	16	660	BDL
Sb	0.4	0.2	1.2	0.4	0.2	0.3	1.0
Sc	60	45	50	50	55	25	BDL
Sr	90	70	85	120	105	620	45
V	375	190	235	320	370	230	3
Y	25	9	45	40	50	19	70
Zn	102	70	160	106	150	124	62

TABLE V CHEMICAL ANALYSES OF FELSIC INTRUSIVE ROCKS IN THE
MISHEWAWA LAKE AREA

Major components (including CO₂ and S) in weight
percent. Trace-elements in parts per million.

Note that in these analyses the total is calculated
using LOI and hence CO₂ and S are listed following the total.

Chemical analyses performed by Geoscience Laboratories,
Ontario Geological Survey, Toronto.

Number	24 Mission Stock	25 Magpie High Falls Stock	26 Centennial Stock	27 Bridget Lake Stock	28 Sandy Beach Stock
SiO ₂	69.10	70.50	66.90	63.70	62.90
TiO ₂	0.41	0.19	0.65	0.65	0.50
Al ₂ O ₃	15.50	15.80	14.50	14.80	15.00
Fe ₂ O ₃ *	1.95	1.45	3.35	5.49	4.41
MnO	0.03	0.02	0.04	0.06	0.06
MgO	0.87	0.59	1.30	2.43	2.27
CaO	2.30	2.13	3.12	3.13	3.67
Na ₂ O	5.50	5.75	4.01	4.35	5.55
K ₂ O	2.01	2.26	2.05	1.07	2.30
P ₂ O ₅	0.00	0.01	0.00	0.01	0.12
LO ₁	1.10	1.20	3.60	3.60	2.80
TOTAL	98.77	99.90	99.52	99.28	99.60
CO ₂	0.73	0.48	2.26	2.21	2.37
S	0.03	0.01	0.01	0.01	0.12
As	ND	1.0	1.0	1.0	3.5
Ba	900	890	540	340	780
Be	1	2	1	1	2
Co	BDL	BDL	10	14	12
Cr	17	14	15	34	68
Cu	7	ND	11	8	44
Li	8	ND	8	15	26
Nb	2	25	7	5	30
Ni	5	5	13	29	21
Sb	0.3	0.2	0.1	0.3	5.3
Sc	2	4	9	10	9
Sr	730	765	165	160	530
V	30	20	50	70	70
Y	3	BDL	10	8	7
Zn	53	47	26	49	76

TABLE VI SUMMARY OF ASSESSMENT DATA ON FILE WITH AFRO ON
DEC. 31, 1983 RELATING TO PROPERTIES WITHIN
MISHEWAWA LAKE AREA

<u>Microfiche Number</u>	<u>Author</u>	<u>Type of Information</u>	<u>Date of Work</u>
Aguonie	0010 Candela Development Co.	a, Correspondence	1952
Bailloquet	0012 Jalore Mining Co. Ltd.	a	1948
Bostwick	0011 Jalore Mining Co. Ltd.	Geological maps	?1947
	0012 Algoma Steel Corp. Ltd. Algoma Ore Properties Ltd.	Multi-report-a,2	1899-1977
Chabanel	0039 Sylvonite Gold Mines Ltd. Erie Canadian Mining Ltd.	f,j(Au),Corresp.	1938
Deroche	0024 Algoma Central Railway, Algoma Central and Hudson Bay Railway	Multi-report-a,b,c,d,e	1903-63
Dalhut	0010 B1 Hollinger Consolidated Gold Mines Ltd.	f(Breton's Property)	1938
Lendrum	0010 A1 Algoma Steel Corp. Ltd. Algoma Ore Properties Ltd.	h(2,657')	1981
	0010 B1 Algoma Steel Corp. Ltd. Algoma Ore Properties Ltd.	h(1,375')	1981
	0010 C1 Algoma Steel Corp. Ltd. Algoma Ore Properties Ltd.	h(2,1010')	1981
	0010 D1 Erie Canadian Mines Ltd.	f(Biggins Property), j(Au)	1938
	0010 E1 Erie Canadian Mines Ltd.	f(Ross Property), j(Au)	1938
	0011 A1 Algoma Steel Corp. Ltd.	d	1982
	0011 B1 Algoma Steel Corp. Ltd.	a	1980
	0011 C1 Algoma Steel Corp. Ltd.	a	1980
	0012 A1 Algoma Steel Corp. Ltd.	a	1980
	0012 B1 Laccolith Gold Mines, Algoma Ore Properties Ltd.	Multi-report,-a	?1927
	0012 C1 Algoma Central Railway, Macanley T.N., Vishnupada B., Wilson I.D.H.	Multi-report-a	1961-62
	0013 A1 Algoma Ore Properties Ltd. Algoma Steel Corp. Ltd.	Multi-report-a	1913
	0013 B1 Guest T.E.	f,a	1909
	0013 C1 Dept. Indian & Northern Affairs, Bantley, NW	Appraisal of Indian Reserve land (Gros Cap IR49)	1973
	0013 D1 Dept. Indian & Northern Affairs, Jenkins WS	Iron ore from Gros Cap IR49	1962
0014 A1 Algoma Steel Corp. Ltd.	d	1982	
0014 B1 Frank H.	d,j(Au,Ag)	1982	
0015 A1 Algoma Steel Corp. Ltd.	h(1,99')	1981	
0015 B1 Algoma Steel Corp. Ltd.	d	1982	
McMurray	0019 A1 Consolidated Bellekeno Mines Ltd.	Multi-report-l,j (Au)	1962-63

	0025 C1	Milmac Mines Ltd.	f,a	1935
	0028 A1	Consolidated Bellekeno Mines Ltd.	a,e,g	1962
Naveau	0033	Pango Gold Mines Ltd.	a,e	1970
	0010 A1	Candore Explorations Ltd.	h(3,594'),j(Au)	1963
	0010 B1	Amax Minerals Exploration Ltd.	e,g,j(Cu,Zn,Ni,Au,Ag)	1979
	0011 A1	Canabec Explorations Ltd.	h(1,503')	1979
	0011 B1	Canabec Explorations Ltd.	f,a	1979
	0012 A1	Gemmell J.W.	d	1978
	0012 C1	McLean P.J.	g	1973
	0013 A1	Canabec Explorations Ltd.	d	1979
	0013 B1	Algoma Central Railway Vishnupada, B; Lien H.O.; Algoma Ore Properties Ltd.; McCartney C.G; Kidder S.J.	Multi-report -a	1944-74
	0013 C1	Carleton, B.	i	1966
	0013 E1	Jalore Mining Corp. Ltd.	a,j(Fe)	1948
	0014	Canabec Explorations Ltd.	d	1979
	0015 A1	Centennial Gold Mines Ltd.	a,j(Au)	1935
	0015 B1	Candore Explorations	a,j(Au)	1926
	0015 C1	Loughrin T.D.	a,j(Au)	1926
	0016	Noranda Mines Ltd.	a,i,j(S,Fe)	1950
	0017	Algoma Central Railway; Lien H.O.; Selgel HO; Asarco Exploration Co. of Canada	Multi-report-b,c	1963-75
	0018	Candore Explorations Ltd.	f(Norwalk Property),a	1963
	0019	Noranda Exploration Co. Ltd.	b,c	1982
Nebonalonquet	0010 A1	Algoma Central Railway; Palmgren O.; Lien H.O.; Carnetters C.A.	Multi-report-a,e	1954-61
	0010 B1	Algoma Central Railway; Palmgren O.	f,a	1967
	0010 C1	Algoma Central Railway; Palmgren O.; Algoma Ore Properties Ltd.	Multi-report-a,j (Au,Ag,Cu)	1944-63
	0011	Algoma Central Railway; Selgel H.O.; Lien H.O.; Trotter T.W.	Multi-report-a,d,e	1904-63
Rabaso	0010 A1	Christianson O. and Sutherland W.D.	h(3,273')	1962
	0010 B1	Canabec Explorations Ltd.	h(2,650'),j(Cu,Ni, Zn,Au)	1979
	0010 C1	Canabec Explorations Ltd.	h(7,1545'),j(Au)	1980
	0011 A1	Carleton B.	h(12,2609')	1970
	0011 C1	Candore Explorations Ltd.	h(9,604'),j(Au)	1963
	0012	Candore Explorations Ltd.	h(15,2417'),j(Au)	1963
	0013 A1	Sutherland W.D.	i	1962
	0013 B1	Sutherland W.D.	i,j(Au)	1961
	0014 A1	Candore Explorations Ltd.; Hollinger Consolidated Gold Mines Ltd.	f(Legarde Property)	1937
	0014 B1	Acme Gas & Oil Co. Ltd.	c	1966
	0015	Algoma Central Railway; New Campbell Island Mines Ltd.; Ranson Mines Ltd.; Macauley T.N.; Wilson I.S.H., Vishnupada B.	Multi-report-a,d,e	1946-63

0016 A1	Hollinger Consolidated Gold Mines Ltd.	f(Ranson Property)	1937
0016 B1	Hollinger Consolidated Gold Mines Ltd.	f(Gibson Property)	1974
0016 C1	Clement C	g	1974
0017 A1	Kustec S	g	1969
0017 B1	Ranson Gold Mines Ltd.; Erie Canadian Mines Ltd.	Multi-report-a, j(Au)	1938
0017 C1	Englund R.E.	h(8,473')	1974
0018 A1	Williamson M; Eric Canadian Mines Ltd.	a, j(Au)	1938
0018 B1	Williamson M; Rouleau D; Erie Canadian Mines Ltd.	j(Au), correspondence	1937
0019 A1	Phillips, J.J.	f, a	1965
0019 B1	Algoma Central Railway; Ranson Gold Mines Ltd.; Bruce EL.	f, a	1938
0019 C1	Erie Canadian Mines Ltd.	g	1938
0019 D1	Anderson J; Erie Canadian Mines Ltd.	correspondence	1936
0020	Canabec Explorations Ltd.	Prospectus	1978
0021	Canabec Explorations Ltd.	h(3,520')	1982
0022	Douglass F.A.; Algoma Ore Properties Ltd.	f(Gananoque), a, j(Au)	1901
0023	Algoma Steel Corp Ltd.	e	1982
0024	Algoma Steel Corp Ltd.	d	1982
0026	Algoma Steel Corp Ltd.	a, j(Au, Ag, Cu, Pb, Zn, Mo)	1982
0026	Canabec Explorations Ltd.	h(3,603'), j(Au, Cu, Co, Au)	1983

Key to Type of Information

- a Geology
- b Airborne electromagnetic survey
- c Airborne magnetic survey
- d Ground electromagnetic survey
- e Ground magnetic survey
- f Industrial property report
- g Trench
- h Drill holes (number of holes, total length drilled)
- l Diamond drilling (number, length unknown)
- j Assays (elements analysed)

Multi-reports contain several different reports on related properties in the same file.

TITLES FOR PLATES

1. Pillow breccia with devitrified hyaloclastite matrix
Perrault's Beach, Lendrum Township.
2. Paragonite porphyroblasts in chlorite schist (plane
polarized light), near Crozier Lake, Rabazo Township
(Sample 82 NWM 564)
3. Quartz-feldspar crystal tuff (crossed-nicols). Note the
recrystallization of quartz eyes, fragmentation of
plagioclase crystals and alignment of sericite in
groundmass. Highway 17, Rabazo Township (sample 82 NWM
0579).
4. Perlitic structure in plagioclase-phyric rhyolite flow
(plane polarized light). West of Sinterville, Lendrum
Township (sample 83 NWM 0375).
5. Slump-scar in banded chert-magnetite ironstone. West of
Sandy Beach, Lendrum Township.
6. Flame-structures in banded chert-magnetite ironstone.
West of Sandy Beach, Lendrum Township.
7. Polymictic conglomerate (Dore-type). Note the presence

- of magnetite-ironstone clasts. Island in Dore Bay, Gros Cap Indian Reserve.
8. Cross-laminated arkosic wacke unit interbedded in polymictic conglomerate. Island in Dore Bay, Gros Cap Indian Reserve.
 9. Volcanic-clast conglomerate from the north limb of the Dore Syncline. Gros Cap Indian Reserve.
 10. Hornblende-plagioclase-quartz pegmatite patch in gabbro. Michipicoten Harbour road, Lendrum Township.
 11. Antiperthite crystal in pegmatitic gabbro (cross-nicols). South east corner of Nebonaionquet Township. (sample 83 NWM 0188).
 12. Tonalite gneiss of the Anjigami Gneiss Domaine. Great Lakes Power Company Limited power line, southeast Nebonaionquet Township.
 13. Amphibolitic, massive mafic metavolcanic xenoliths in granodiorite of the Whitefish Lake Batholith. Great Lakes Power Company Limited power line, north of McPhail Falls, Naveau Township.
 14. Recrystallization of partially assimilated amphibolitic

- metavolcanic xenoliths in granite of the Brule Bay Batholith. Small lake about 2 km south of Shakwa Lake, Rabazo Township.
15. Proclastic texture in granodiorite of the Brule Bay Batholith (crossed nicols). South of Michipicoten River, Rabazo Township (sample 82 NWM 0440).
 16. Recrystallized quartz-eye in porphyritic granodiorite of the Mission Stock (crossed nicols). Highway 17, Rabazo Township.
 17. Plagioclase phenocryst showing zoning of composition and inclusions, Sandy Beach Stock (crossed nicols). Michipicoten Harbour road, Lendrum Township (Sample 83 NWM 0488).
 18. Chlorite schist bed, interbedded with felsic tuffs. Secondary Crenulation cleavage well developed in the chlorite schist, at a high angle to first foliation (which parallels bedding). Highway 17, Rabazo Township.
 19. Old head gear, Centennial Mine, 1982.
 20. Norwalk Mine 1908 (then known as the Manxman Mine) Note original photo is in Mines Library Archives in Michipicoten Folder.)

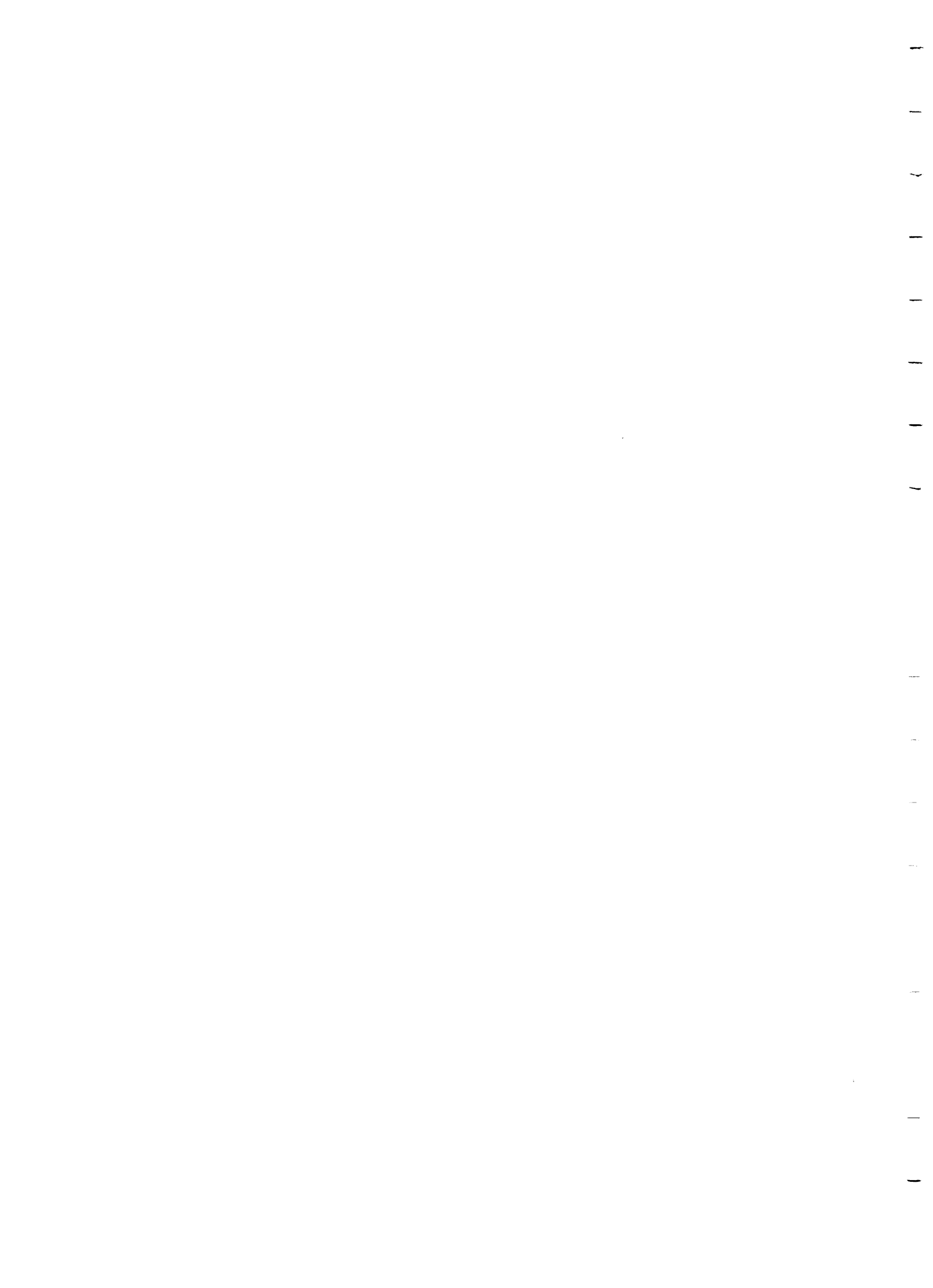




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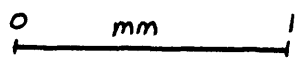
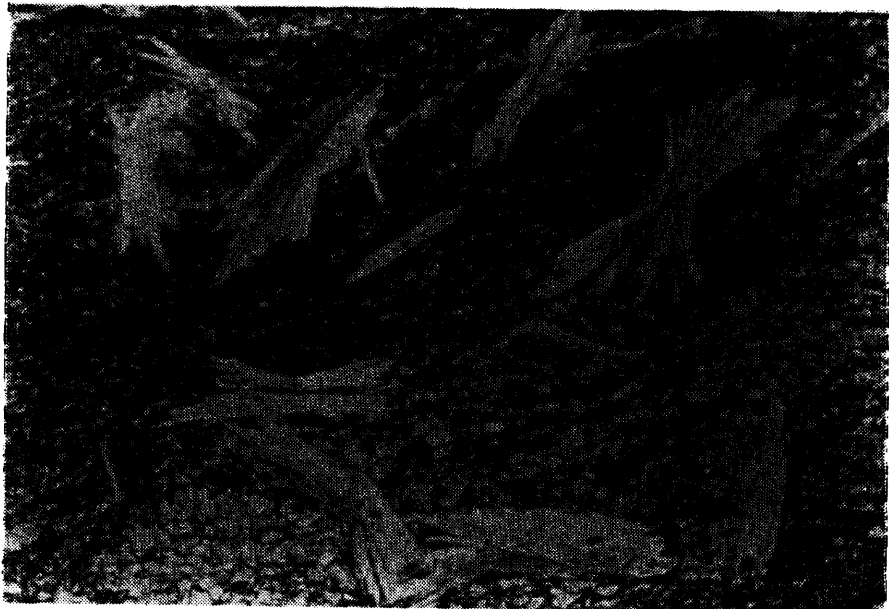


Plate 2



Plate 3

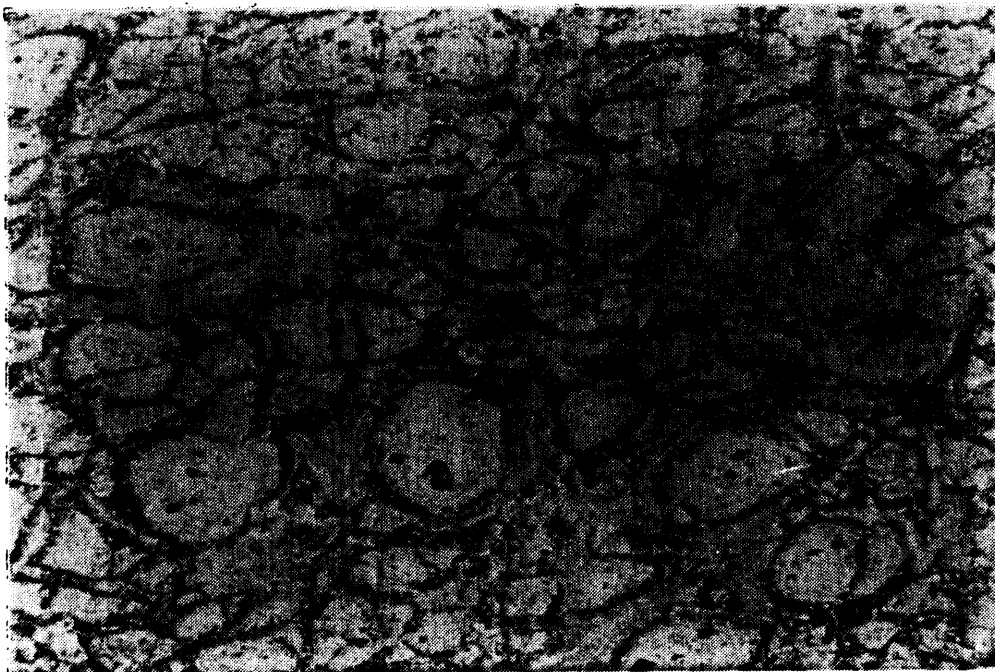


Plate 4



Plate 5

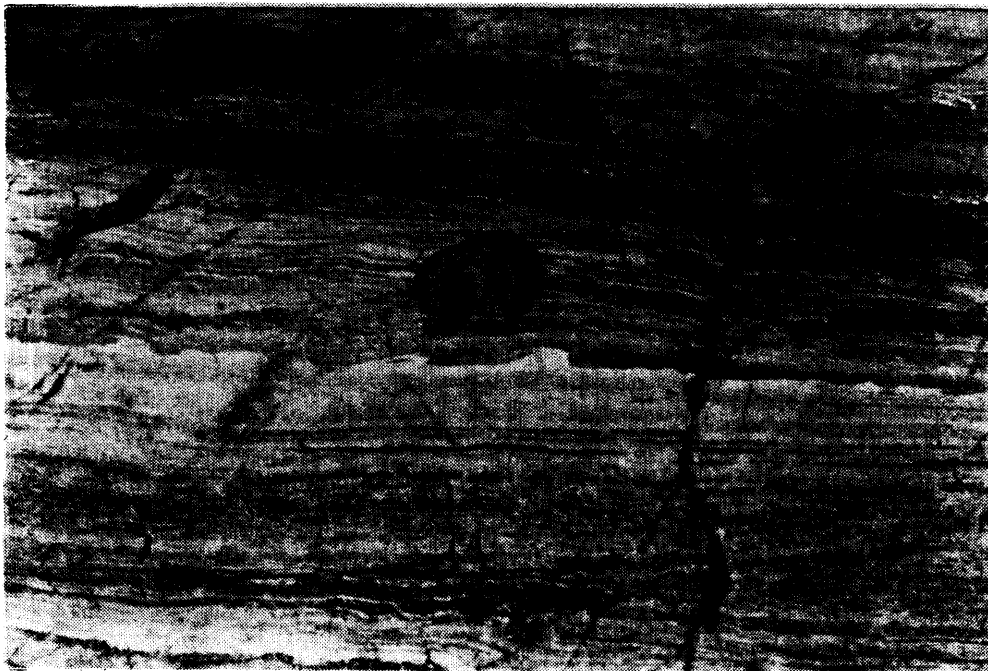


Plate 6



Plate 7



Plate 8

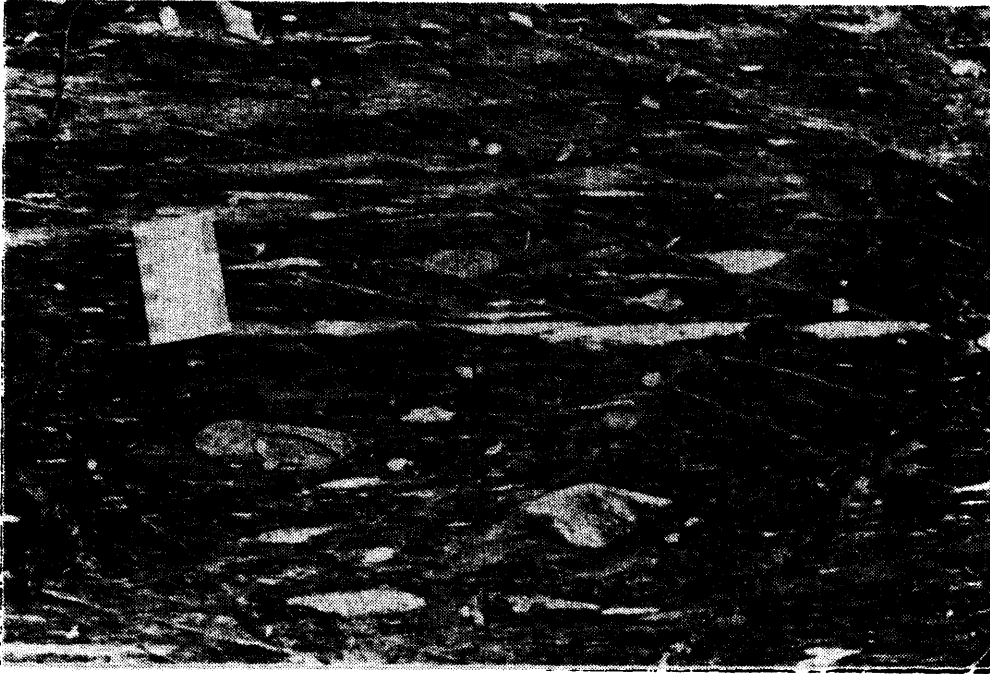


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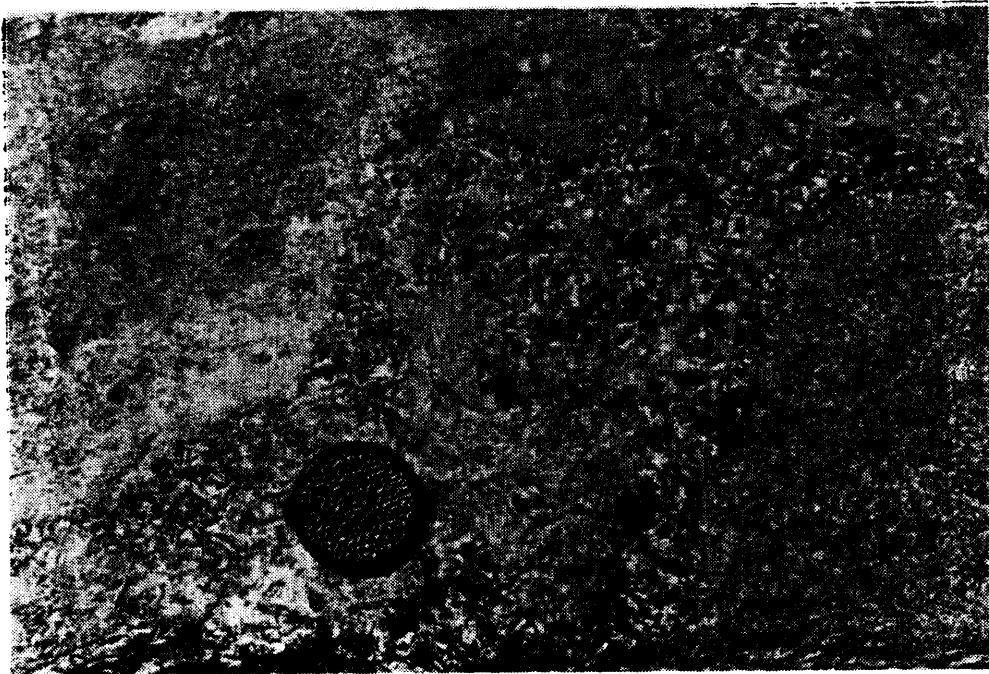


Plate 10



Plate 11



Plate 12

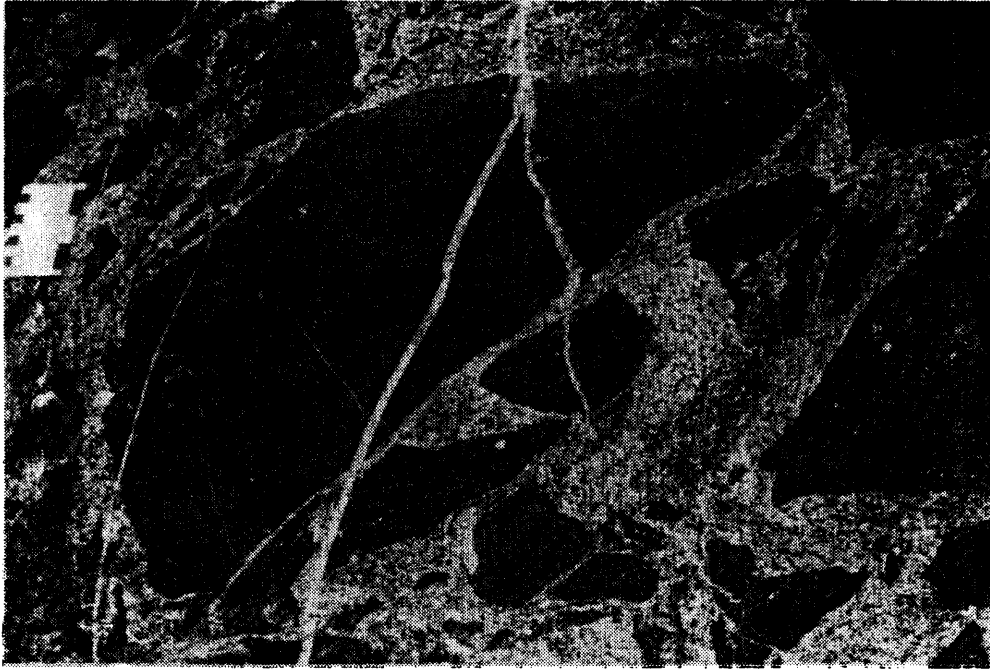


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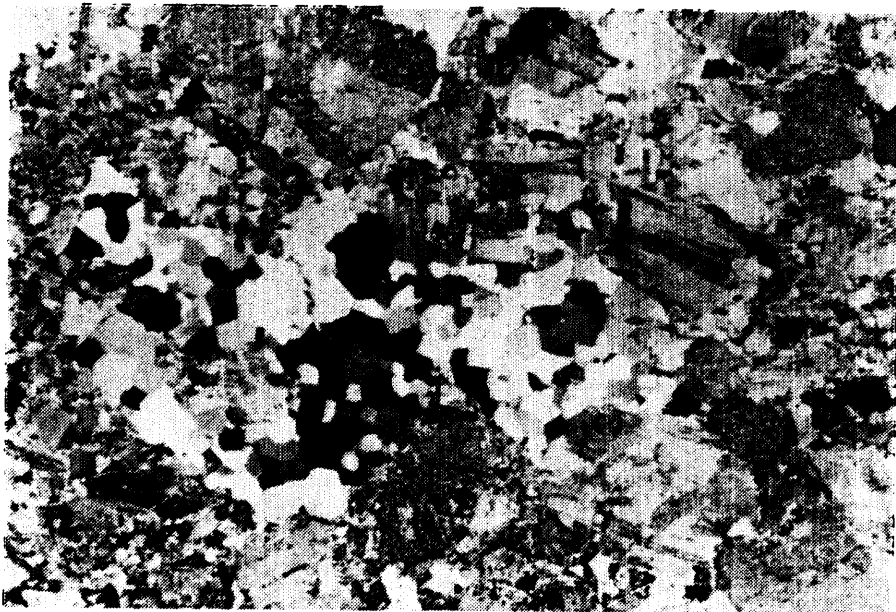


Plate 14



0 mm 1

Plate 15



0 mm 2

Plate 16

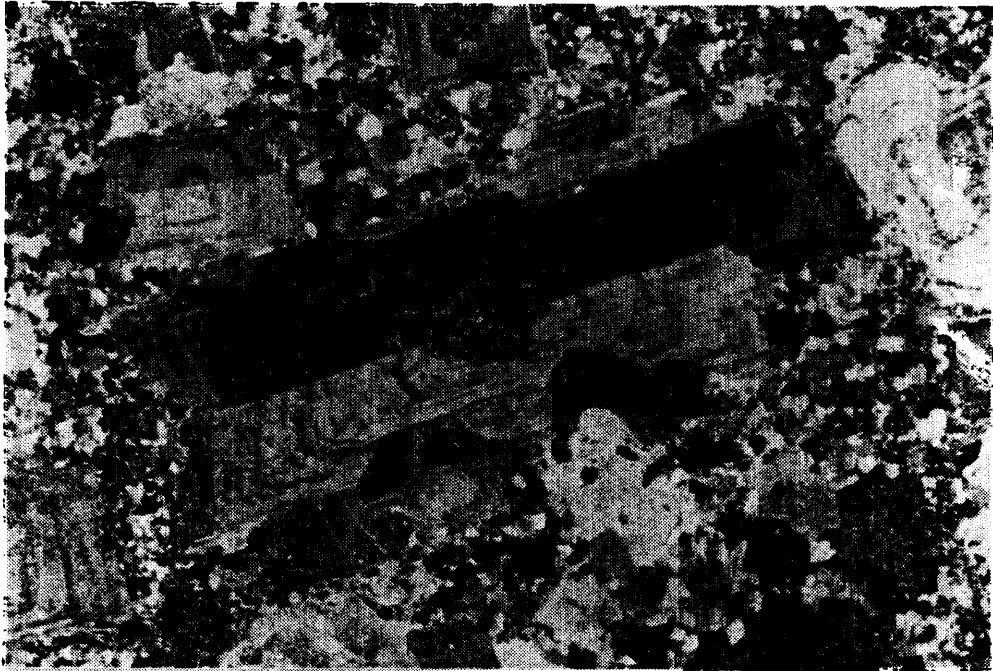


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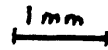
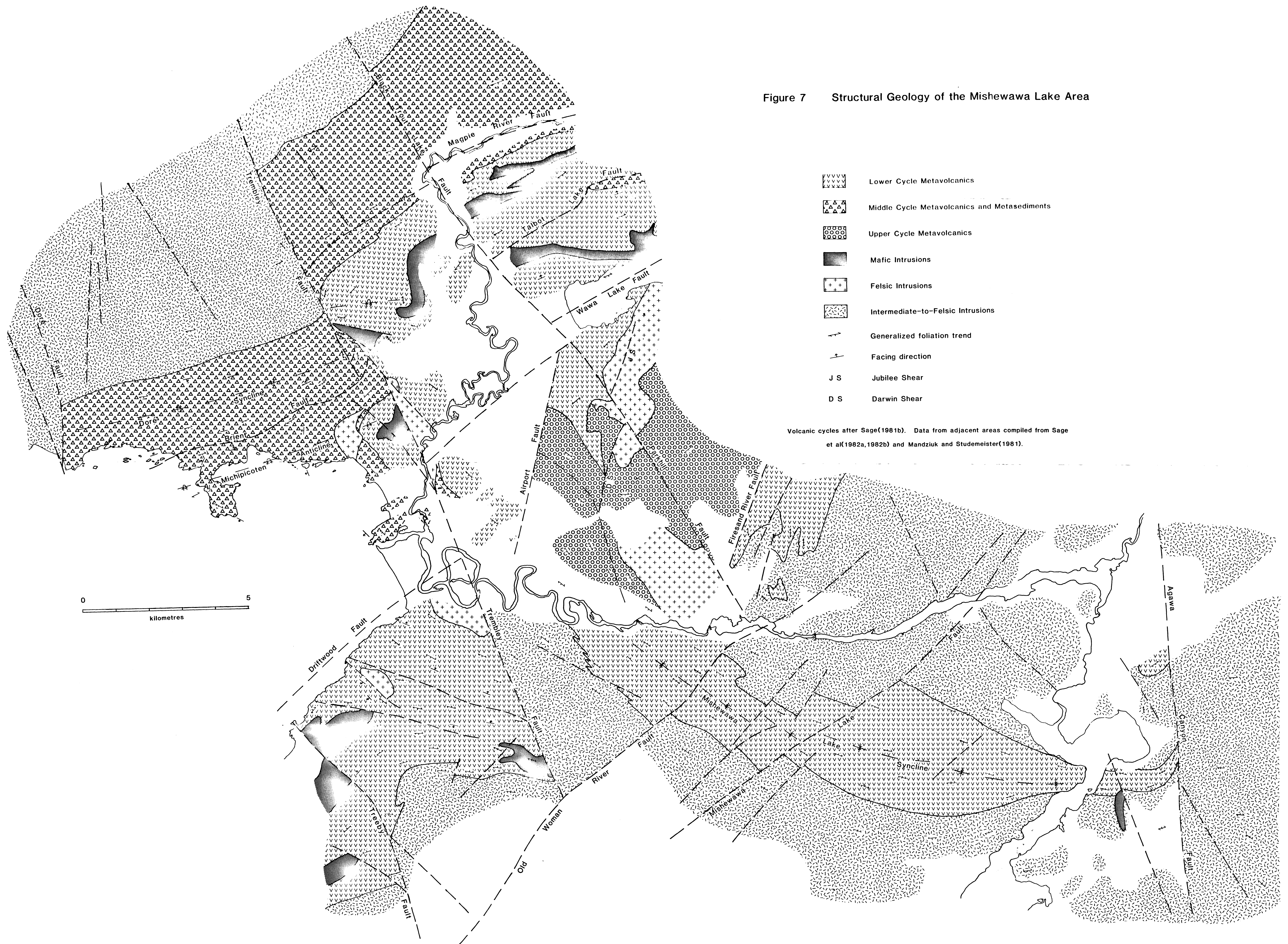






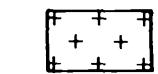

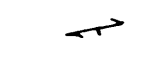
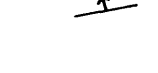
Plate 18



Plate 19

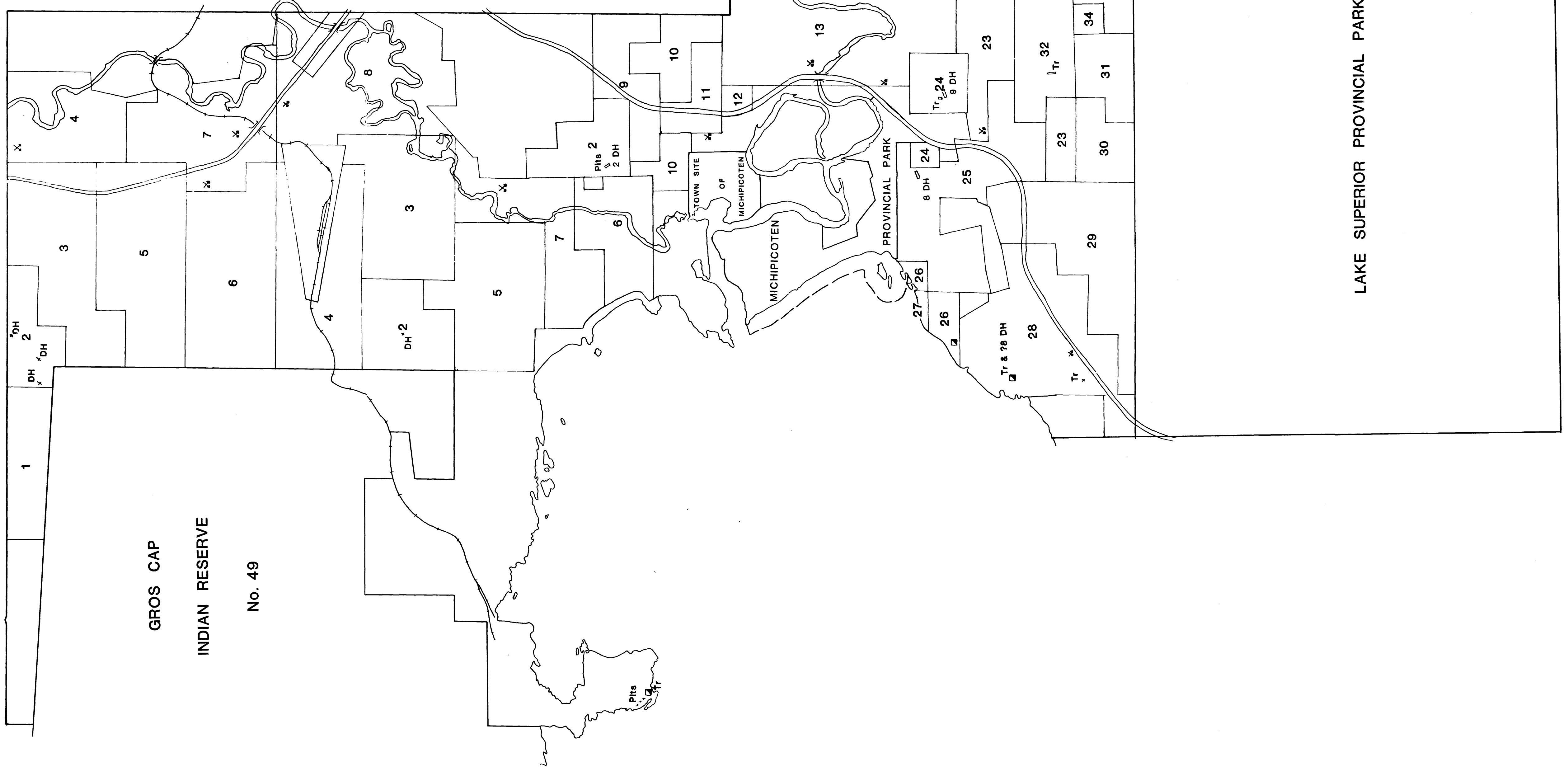
Figure 7 Structural Geology of the Mishewawa Lake Area



-  Lower Cycle Metavolcanics
-  Middle Cycle Metavolcanics and Metasediments
-  Upper Cycle Metavolcanics
-  Mafic Intrusions
-  Felsic Intrusions
-  Intermediate-to-Felsic Intrusions
-  Generalized foliation trend
-  Facing direction
- J S Jubilee Shear
- D S Darwin Shear

Volcanic cycles after Sage(1981b). Data from adjacent areas compiled from Sage et al(1982a,1982b) and Mandziuk and Studemeister(1981).

Figure 10A Exploration activity in the Mishewawa Lake Area



Registered Claim Owners (Dec 31 1983)

1	Osisko Lake Mines Ltd.	21	R Kolvek/B.K.K. Mining and Explorations
2	Algoma Steel Corp.	22	D MacDougall
3	S Petawabano	23	W Sutherland & Consil Mines Ltd.
4	R Mark	24	J Morton
5	M Neeposh	25	J Prendergast & Consil Mines Ltd.
6	S Longchap	26	Roller Resources Inc.
7	P Swallow	27	M Prendergast
8	B Mianscum	28	Bridget Lake Resources Inc.
9	G Clement	29	R McGowan
10	C Clement	30	Golden Pond Resources Inc.
11	J Filo	31	N Cornell
12	E Frey	32	C Bolvin
13	A Belzil	33	Noranda Exploration Co. Ltd.
14	D Duchenes	34	R Rupert
15	Canabec Exploration Ltd.	35	Gold Copper Exploration Ltd.
16	J Cureatz		
17	G Gratton		
18	P Bergeron		
19	G Longhurst		
20	W Monk & Monk Gold Mines Ltd.		

Boundaries of claim groups

Boundary between land administered under the Ontario Mines Act (Lendrum, Rabazo and northwest Naveau Townships) and land owned and administered by Algoma Central Railway (Naveau and Nebonaquoquet Townships)

Shafts and adits

□

Shafts and adits

Pit

Pit

Tr

Exploration trenching

Exploration trenching

X

Gravel pit

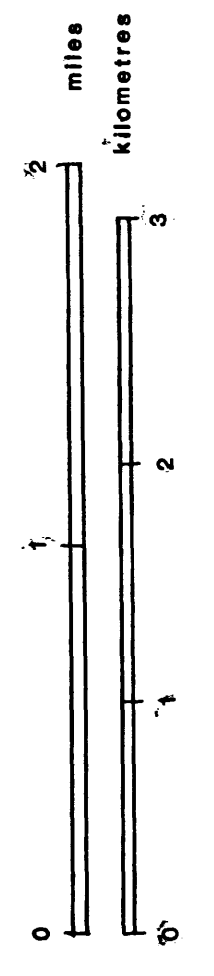
Gravel pit

DH

Drill holes

Drill holes

Based on field observations, assessment files and claim maps supplied by the Mining Recorder, M.N.R. Sault Ste Marie and the Mining Recorder, A.C.R. Sault Ste Marie



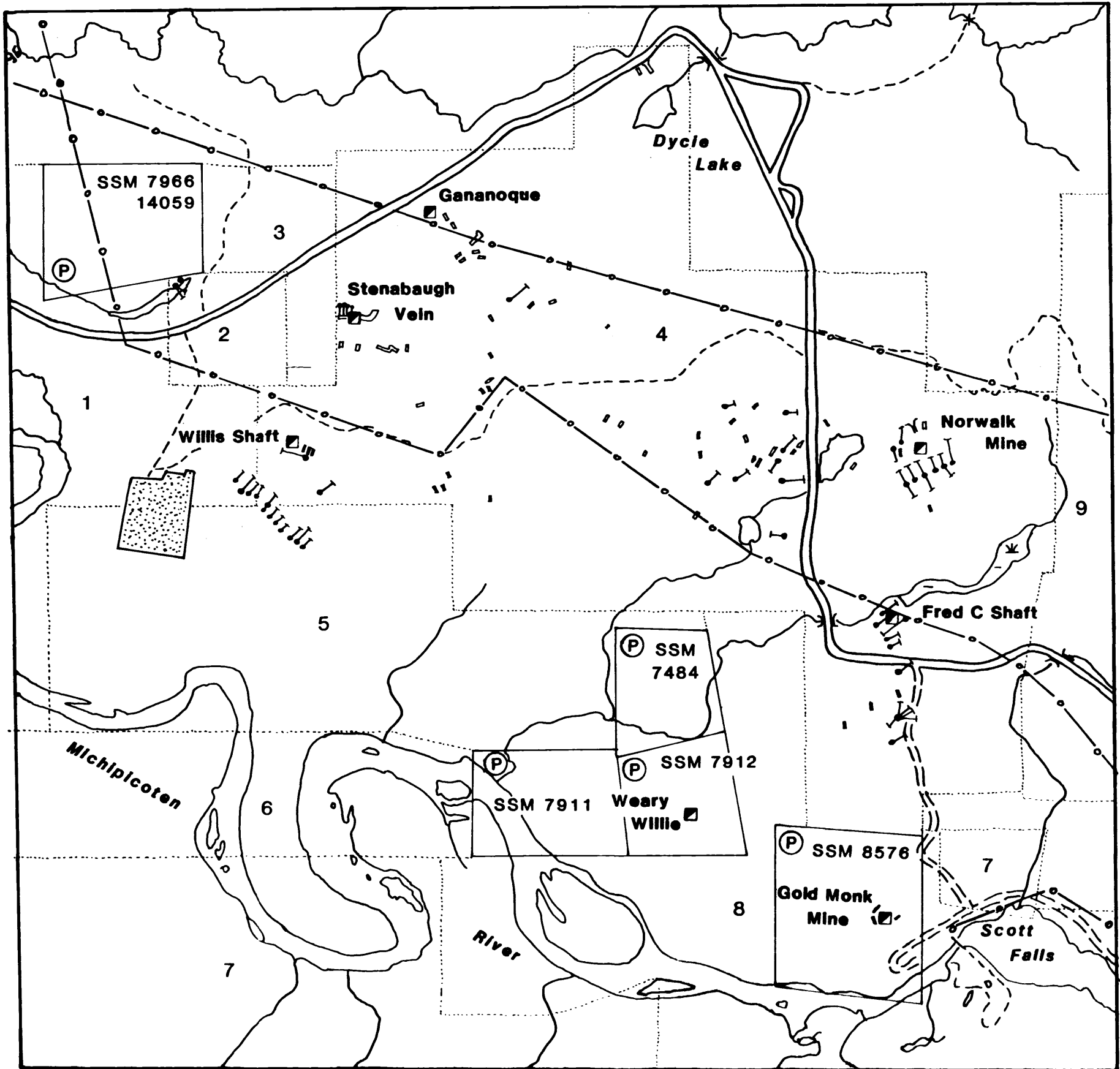
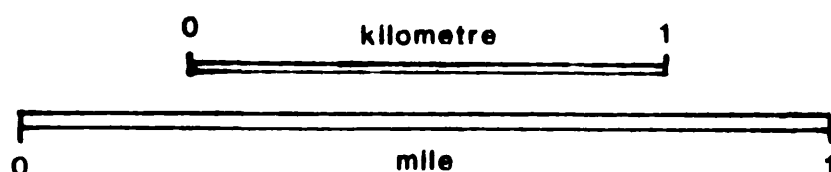


Figure 11 Exploration Activity in the Dycie Lake - Scott Falls Area

<p>Ⓟ Patented claims</p> <p>--- Claim group boundary</p> <p>■ Shaft</p> <p>↘ Adit</p> <p>✓ Drill hole</p> <p>· Trench</p> <p>--- Power line</p>	<p>Registered Claim Owners</p> <p>1 A Balzli</p> <p>2 J Healy</p> <p>3 D Deachenea</p> <p>4 Canaben Exploration Ltd.</p> <p>5 P Bergeron</p> <p>6 J Longhurst</p> <p>7 R Kolvek /B.K.K. Mining and Explorations</p> <p>8 W Monk and Monk Gold Mines Ltd.</p> <p>9 J Cureatz</p>
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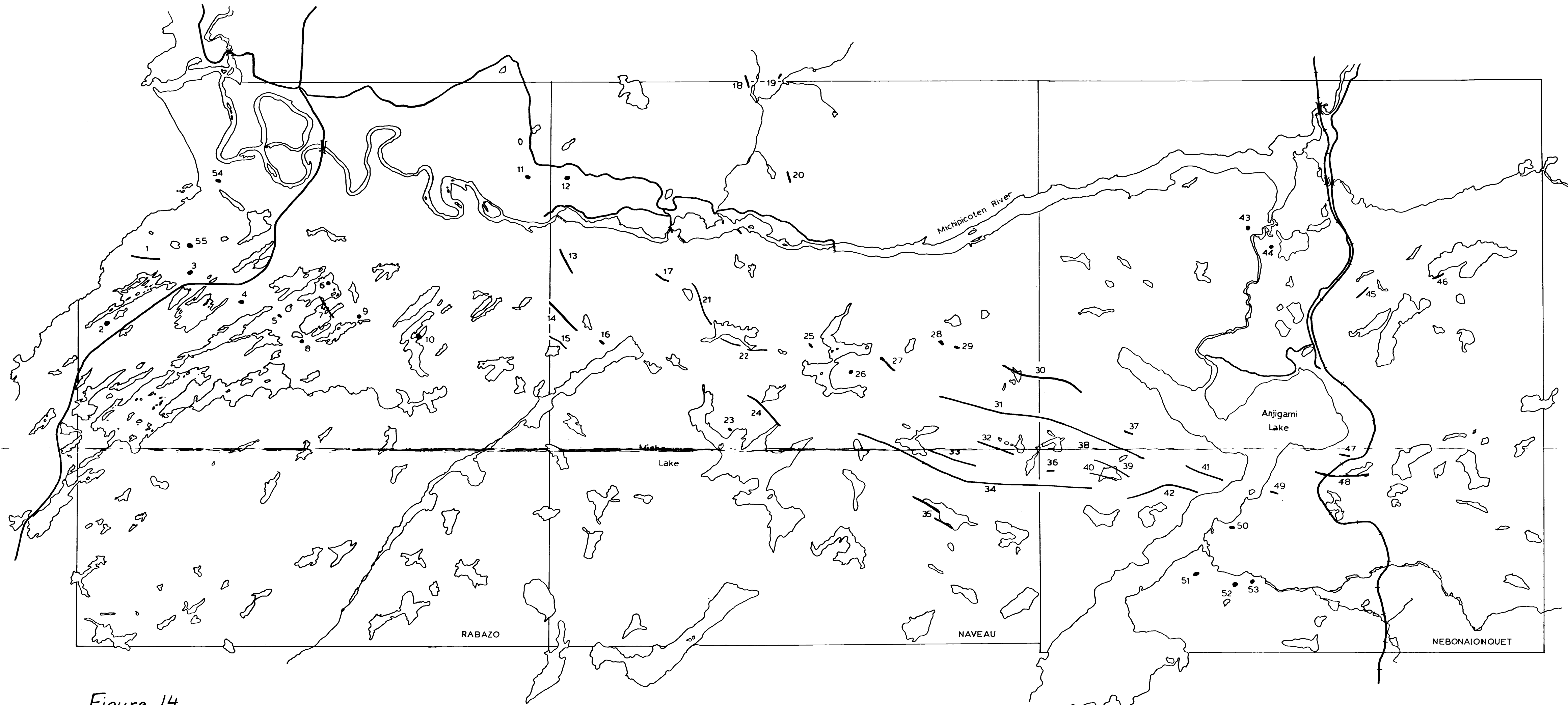
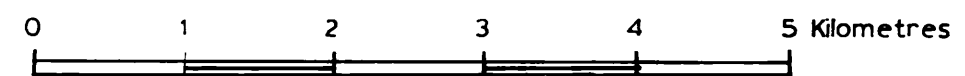
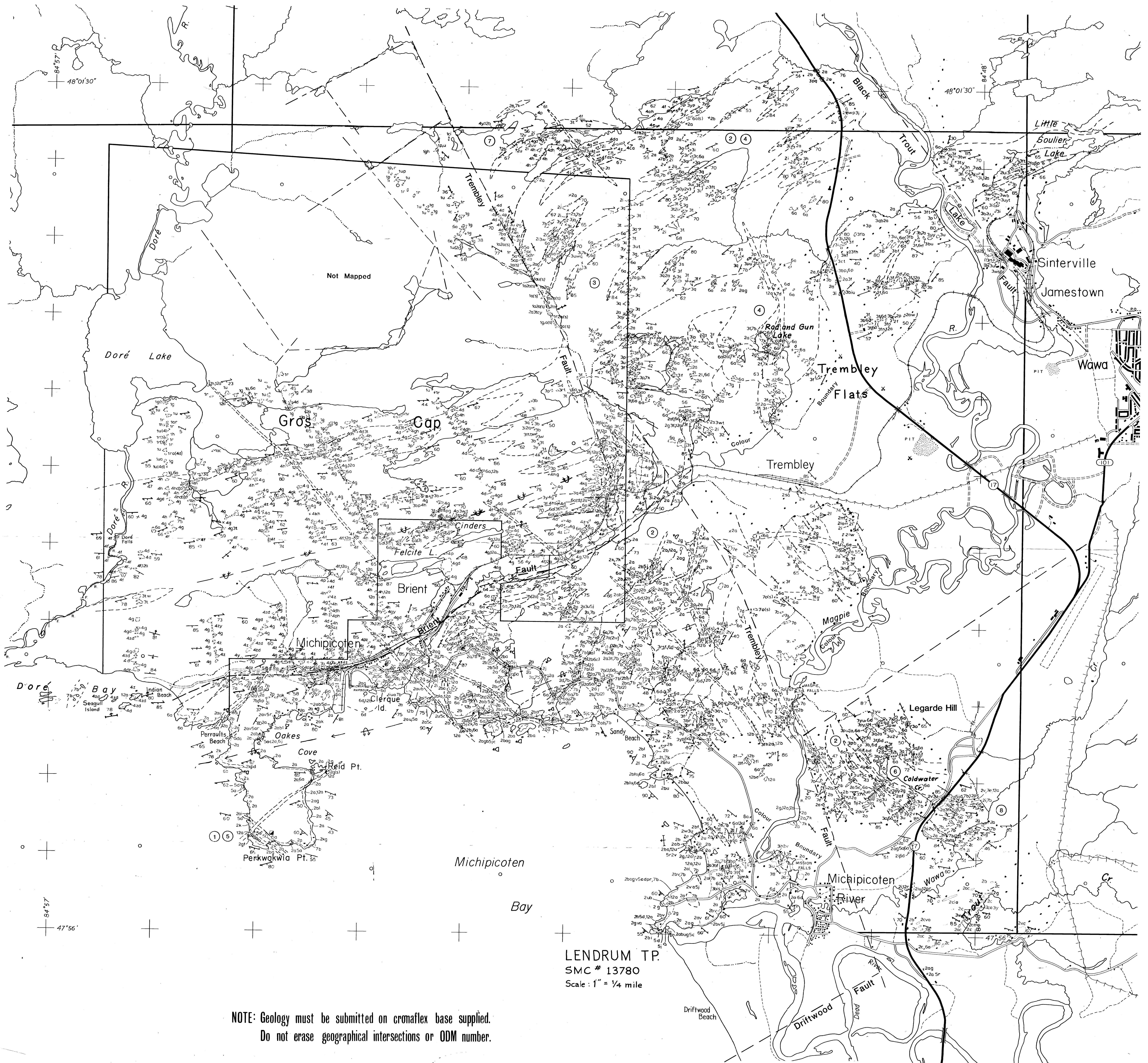


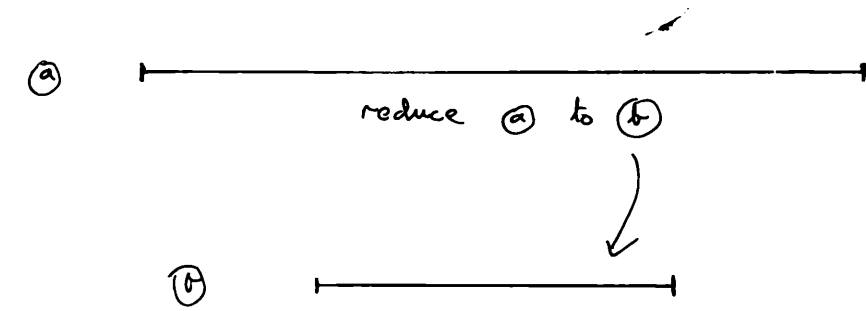
Figure 14

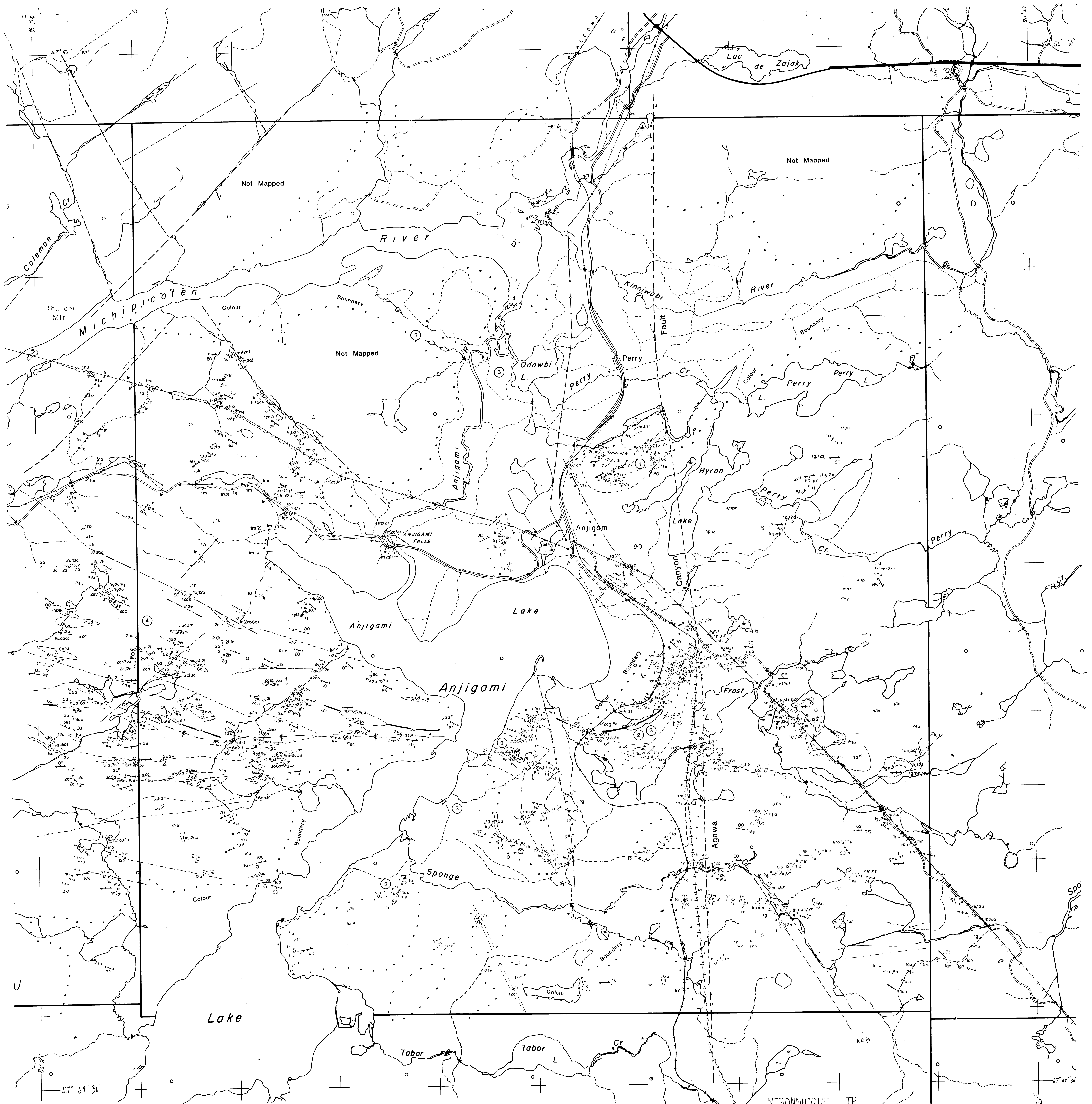




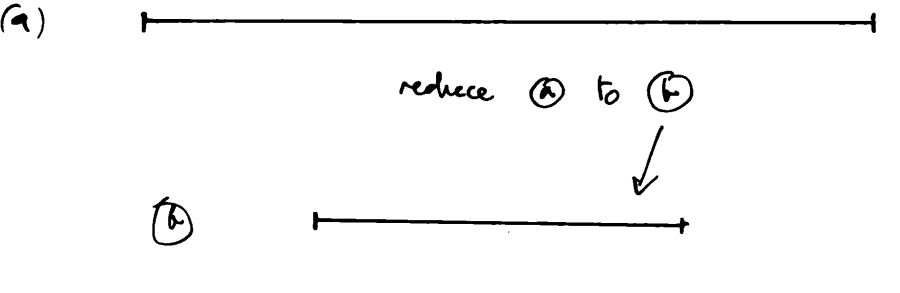
LENDRUM TP.
 SMC # 13780
 Scale: 1" = 1/4 mile

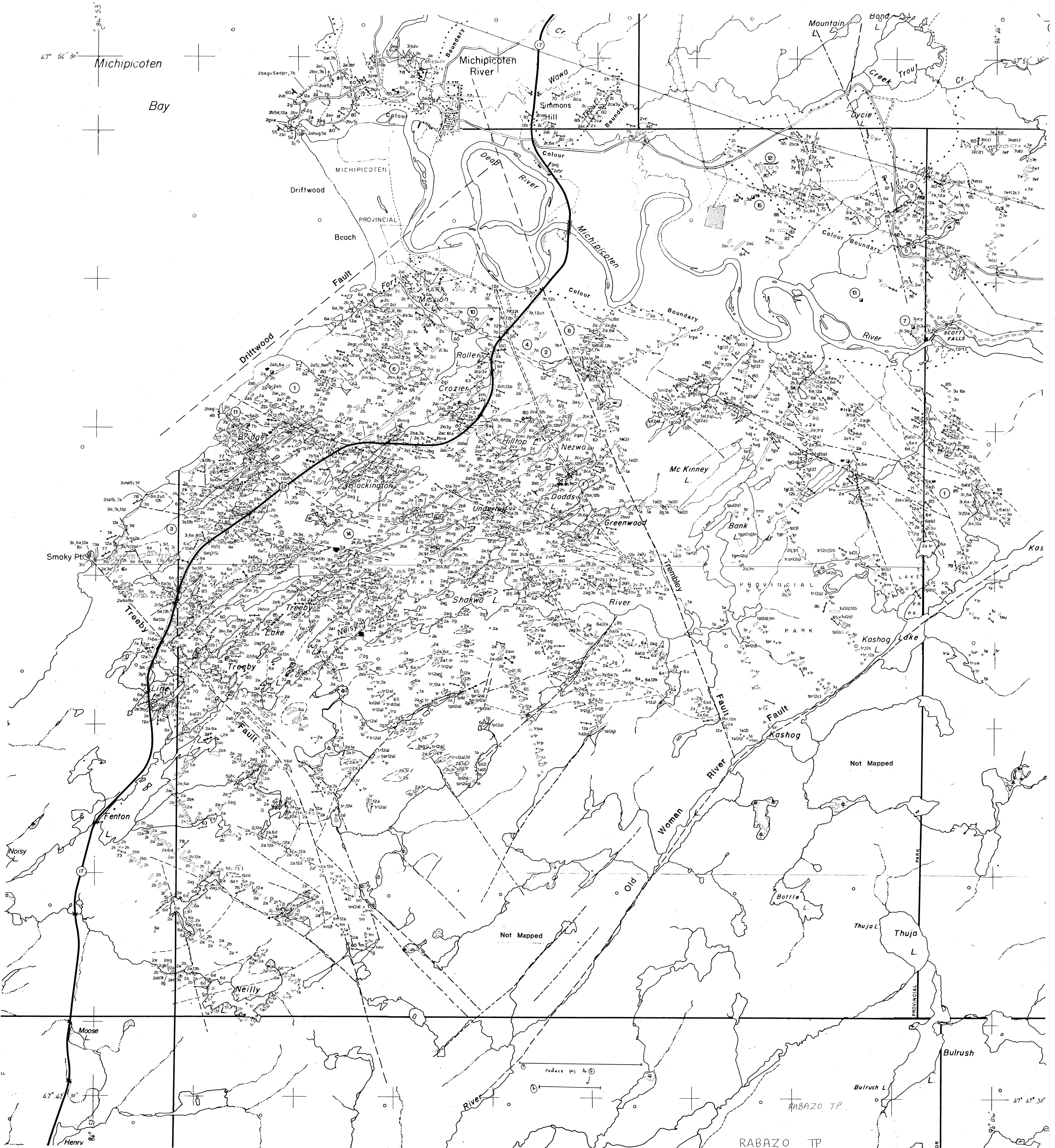
NOTE: Geology must be submitted on cromaflex base supplied.
 Do not erase geographical intersections or ODM number.





NEBONNAIQUET TP
 Scale 1" to 1/4 mile.
 SMC 15094





RABAZO TP
 Scale 1" to 1/4 mile
 SMC 15092





