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INDUSTRIAL MINERALS AND FOLLOW-UP OF LAKE- AND STREAM-SEDIMENT GEOCHEMICAL ANOMALIES IN LABRADOR

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Mineral Deposits Section

ABSTRACT

During the 1987 field season, a program of industrial-mineral exploration and geochemical follow-up work was carried out in western, southeastern, and northern Labrador.

In western Labrador, Proterozoic outliers of the Sims Formation near the Esker highway were examined as potential sources of silica. A 600-m section was sampled on the Sims outlier; grab samples were obtained from three other outliers. A kyanite–garnet–mica prospect was sampled 6 km southeast of Wabush, and pegmatites containing large biotite crystals are reported from new roadcuts on the Trans-Labrador Highway.

During geochemical follow-up work in southeastern Labrador, five styles of potential mineralization with adjacent lake sediment geochemical anomalies were recognized: 1) gold in hydrothermal veins and pegmatites; 2) clastic-hosted base and precious metals in pyritic zones; 3) platinum-group-element mineralization in mafic plutonic rocks; 4) precious metals and uranium associated with late Grenvillian plutons; and 5) base and precious metals, and uranium in late Precambrian–early Paleozoic cover sequences. Industrial-mineral potential in the area includes quartz–feldspar–mica pegmatites, and zirconium-rich, mylonitic metasediments.

The industrial-mineral survey in northern Labrador concentrated on silica and dolomite evaluation within the Aphebian Ramah Group, and an assessment of a graphite deposit at the west end of Saglek Fiord. Geochemical follow-up work in the Ramah Group consisted of rock and silt sampling in the vicinity of Au, Zn, Pb, and As stream sediment anomalies. In the Saglek area, Au, W, U, As, Zn, and Pb geochemical anomalies in both stream and lake sediments were briefly examined and four potential exploration targets were identified.

INTRODUCTION

The 1987 industrial-mineral program in Labrador was the fourth year in an assessment of its industrial-mineral potential, with an emphasis on dolomite and silica resources. Initial investigation of a dolomitic marble formation in the Labrador City–Wabush area in 1984, led to the development of quarries, which supply flux used in the production of iron ore pellets by the Iron Ore Company of Canada. Surface sampling and subsequent drilling of extremely pure silica deposits 3- to 5-km west of Labrador City, has brought the area to the attention of major silica producers and consumers in Canada. A feasibility study is currently looking into the economics of establishing secondary manufacturing of silica-based products in the Labrador City area, using relatively inexpensive hydroelectric power from Churchill Falls. During the 1987 field season, one new dolomite prospect and three new silica prospects were evaluated.

Lake- and stream-sediment geochemical surveys in southeastern and northern Labrador indicate many geochemical anomalies and areas having potential for mineral discoveries (Geological Survey of Canada, 1984, 1986, 1987). However, due to the remoteness of these areas, little follow-up work has been undertaken by the mining industry. Regional and detailed geological mapping, carried out by the Newfoundland Department of Mines and the Geological Survey of Canada, are providing the geological background necessary to evaluate these geochemical anomalies. Follow-up work carried out in the 1987 field season has begun this process by identifying many potential exploration targets in southeastern and northern Labrador.

WESTERN LABRADOR

Sims Formation

In June 1987, a one-week sampling program was carried out in the Proterozoic Sims Formation in western Labrador (Figure 1), which consists of 100 m of fluvial arkose and conglomerate overlain by 600 m of predominantly marine quartz arenite (Ware and Hiscott, 1985). The Sims Formation

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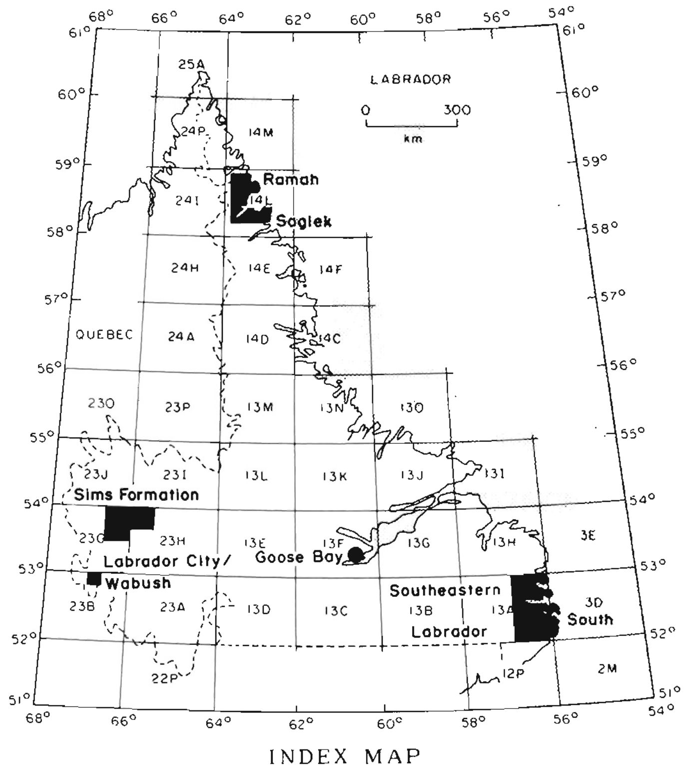


Figure 1. *Location of 1987 field areas.*

was described in an unpublished M.Sc. thesis by Ware (1983). Geochemical analyses of three samples of quartz arenite reported in his thesis indicate that this unit is very pure, containing approximately 2 percent impurities (Table 1).

Table 1. Analyses of Sims quartz arenite (Ware, 1983)

Sample Location	Fe_2O_3 %	Al_2O_3 %	MgO %	CaO %	Na_2O %	K_2O %	TiO_2 %
Sim's outlier	0.10	1.54	0.04	0.04	0.007	0.46	--
Evening outlier	0.05	1.21	--	0.02	0.016	0.42	0.04
Muriel outlier	0.11	1.85	0.09	0.19	0.012	0.52	--

The Sims Formation is well exposed in three separate outliers 3- to 10-km north of the Esker road, and in one outlier 15 km south of the road (Figure 2). The outliers, which form hills with elevations up to 400 m above the surrounding area, were once part of an extensive blanket of clastic sediment, which was deposited unconformably on the Aphebian Knob Lake Group (Ware and Hiscott, 1985). All of the outliers are capped by the resistant quartz arenite unit. The 600-m thick quartz arenite unit was subdivided into four facies by Ware (1983), predominantly on the basis of paleocurrent data (crossbedding and ripple marks). The lower 75 to 100 m are interpreted as fluvial deposits, possibly reworked coastal sands. These are overlain by 20 m to 40 m of quartz granule and quartz pebble conglomerate, interbedded with medium- to coarse-grained sandstone. This latter facies, a beach deposit, is as an excellent marker bed. Ware (1983) subdivided quartz arenite above the conglomerate into 250 m of coastal and nearshore-marine sediments, overlain by 250 m of sediments deposited in an open-marine setting.

A complete section of the quartz arenite unit is exposed on the northwest side of the Sims outlier, where the authors chip sampled and briefly described a 500-m stratigraphic section in 3- to 10-m intervals. Despite the different facies within the quartz arenite unit, the rock itself is quite similar in appearance throughout. The quartz arenite is generally white in colour, with various shades of pink to purple and pale orange to brown. It is fine- to medium-grained and very well cemented with silica, typically breaking with a conchoidal fracture. It occurs in 30- to 150-cm-thick beds, which may show crossbedding or have bedding planes displaying ripple marks or sandwave-like forms. Impurities consist of minor hematite-stained laminations and dark-grey grains and crystals of hematite, which are often oxidized to a red or orange colour. The euhedral shape of these crystals (visible under a binocular microscope) suggest that they are secondary or diagenetic in origin. Minor pink feldspar grains are visible in the lower facies. Ware (1983) reports that in thin section sericite can be seen surrounding many grains.

A small section through the quartz arenite was also sampled from the southeast end of the Sims outlier, and grab samples were collected from the MacLean, Muriel, and Evening outliers. The pebble conglomerate was located in all but the Evening outlier and will facilitate stratigraphic correlation of the samples. Geochemical results from chip samples will give a better indication of the amount of impurities and the potential of these deposits as a source of high-purity silica. The potential availability of cheap hydroelectric power from the Churchill Falls power station, and the close proximity of these outliers to the Esker highway, which connects Churchill Falls to the Quebec North Shore and Labrador Railway, would make these deposits attractive to major silica producers if one or more of the quartz arenite facies have sufficiently low impurity levels.

Labrador City Area

Several kyanite and graphite occurrences were investigated in the Labrador City–Wabush area. The occurrence that appears to have the best potential is the Flora Lake kyanite prospect, located 400 m west of the south end of Flora Lake (Figure 3). This prospect has been described by Boyko (1953) and Rivers (1978). Crystals of blue kyanite, up to 5-cm long, occur in a garnet–mica–quartz gneiss. The prospect consists of a 30- to 50-m wide zone, within a north-trending ridge that extends along strike for at least 1 km. This zone contains up to 20 percent kyanite, 10 to 20 percent garnet (crystals up to 1.5 cm), and 10 to 15 percent mica (dominantly muscovite). All three minerals would have economic potential if they could be efficiently separated from the host rock.

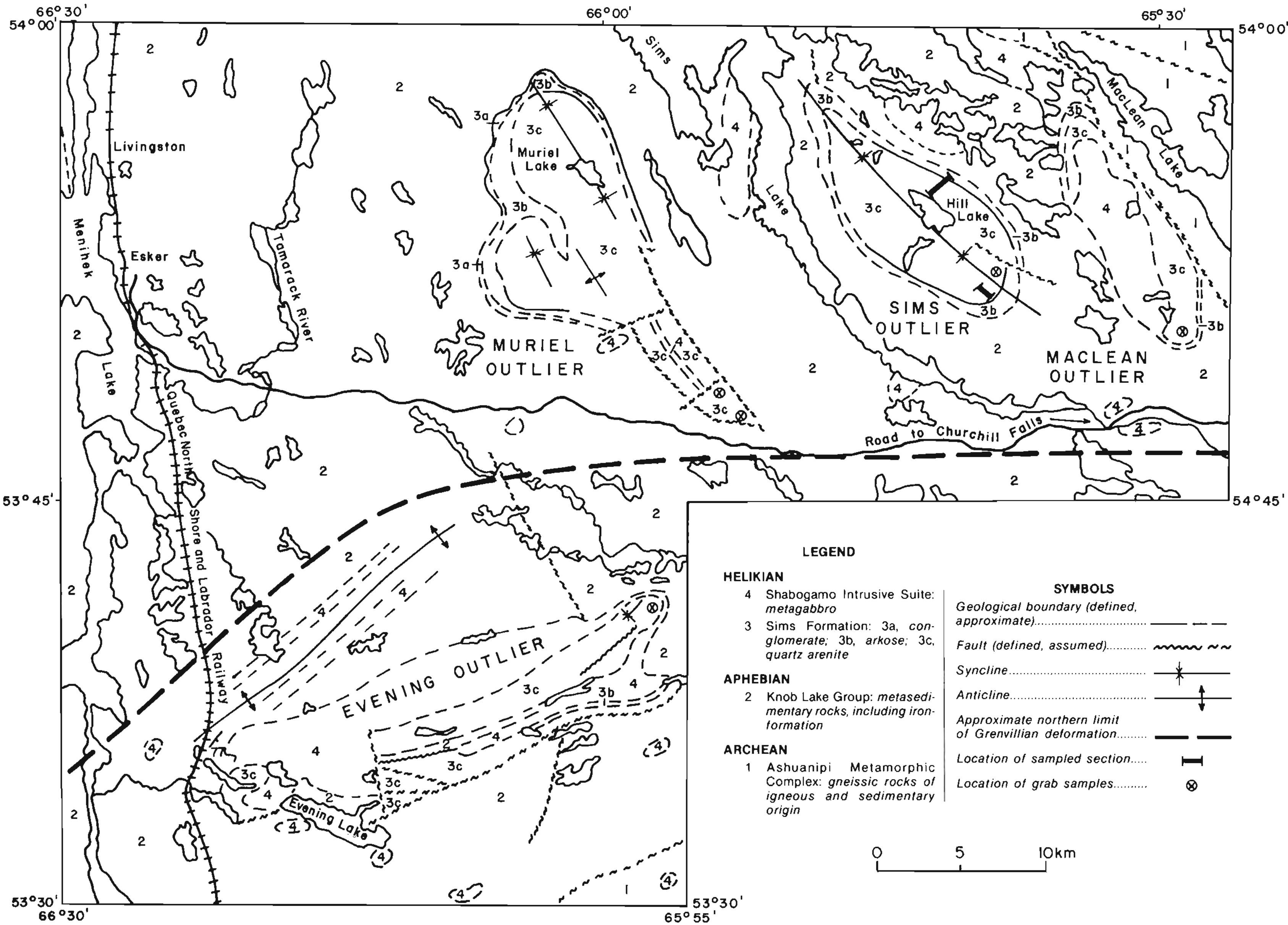
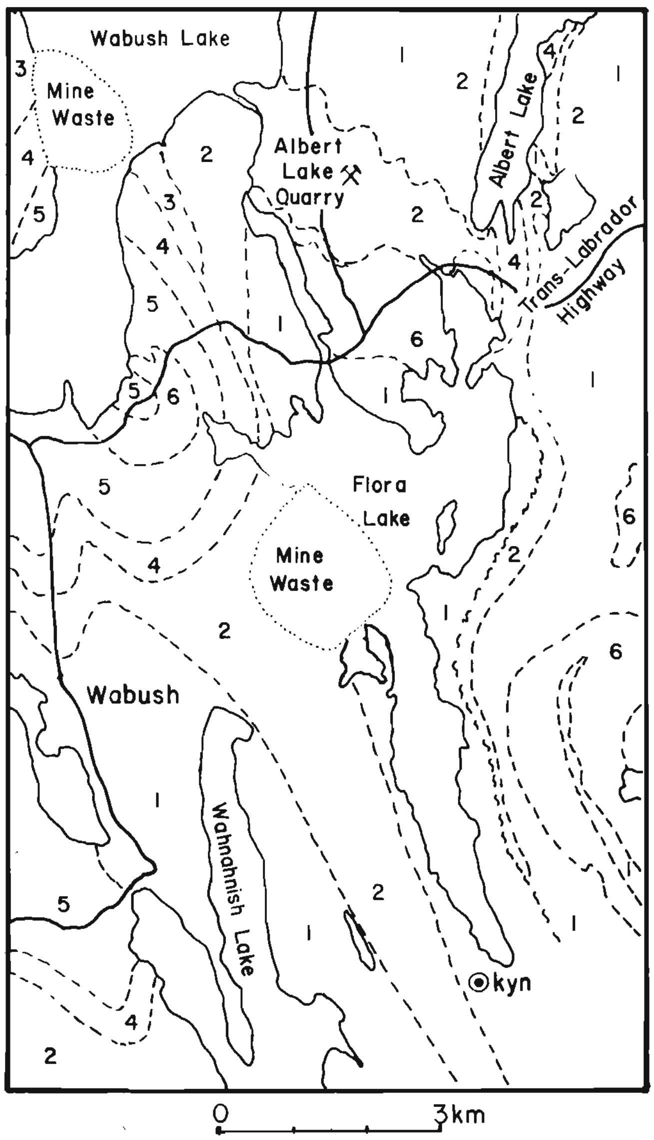


Figure 2. *Geological map of the Sims Formation (after Ware and Wardle, 1979).*



LEGEND

HELIKIAN

6 Shabogamo Intrusive Suite: *metagabbro*

APHEBIAN

5 Menihek Formation: *black schist, phyllite, slate*

4 Sokoman Formation: *iron formation*

3 Wishart Formation: *quartzite*

2 Denault Formation: *dolomitic marble*

1 Attikamagen Formation: *quartzofeldspathic schist*

SYMBOLS

——— *Geological boundary*

~~~ *Fault*

⚒ *Active quarry (dolomite)*

◉ *Kyanite prospect*

Figure 3. *Geological map of the Labrador City–Wabush area.*

Road construction on the Trans-Labrador Highway, between Emeril and Twin Falls, has intersected several pegmatites. Biotite crystals in the pegmatites range in size up to 25 cm by 15 cm, and were sampled by Rod Klassen and Frank Thompson of the Geological Survey of Canada. The samples were kindly passed on to the Newfoundland Department of Mines.

SOUTHEASTERN LABRADOR

A lake sediment geochemical survey released by the Geological Survey of Canada in 1984 for southeastern Labrador (Geological Survey of Canada, 1984) indicates the presence of many multi-element anomalies near the coast where overburden is relatively thin. Using preliminary geological maps by Gower *et al.* scheduled for publication in 1988 for the Port Hope Simpson and St Lewis River map regions, geochemical follow-up (consisting of rock and silt sampling) was carried out. Several industrial-mineral prospects were also investigated during the course of this work.

The Port Hope Simpson and St Lewis River map regions are located within the Grenville Province and are divided into six northwest-trending, lithostructural entities by Gower *et al.* (1987, *this volume*) (Figure 4). Lithologies include metasedimentary gneisses, a major mafic plutonic body (White Bear Arm complex), and a variety of granitoid rocks including several late Grenvillian plutons. There are, in addition, two sets of mafic dykes that intrude the region; they are considered to be late Precambrian–early Paleozoic and late Paleozoic in age (Gower *et al.*, 1987). These late- and post-Grenvillian intrusions are often coincident with lake sediment geochemical anomalies.
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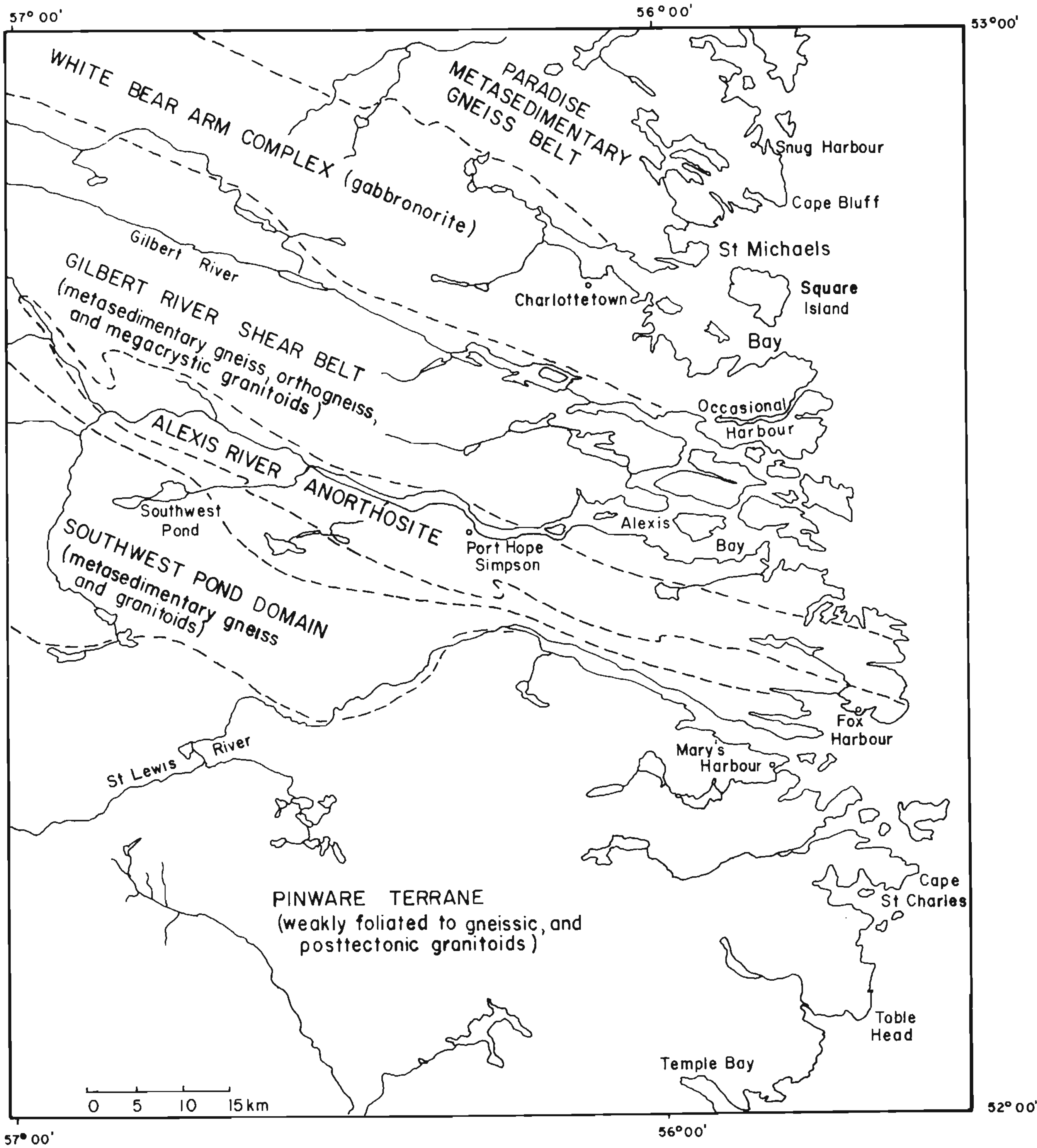

Figure 4. *Lithostructural subdivisions of southeastern Labrador (after Gower* et al., *1987,* this volume).

LEGEND (Figure 5)

UPPER PROTEROZOIC–LOWER CAMBRIAN

9 *gabbro, olivine gabbro*

MIDDLE PROTEROZOIC

8 *gabbro, norite, troctolite*

7 *monzonite, monzodiorite, and syenite*

6 *leucogabbro and leuconorite*

5 *amphibolite and retrograded metagabbro*

MIDDLE OR LOWER PROTEROZOIC

4 *amphibolite*

3 *sillimanite-bearing, quartz–feldspar schist and gneiss*

2 *biotite–hornblende diorite gneiss*

1 *biotite granite gneiss*

SYMBOLS

— — — *Geological boundary*

~~~ *Fault*

Pyritic zones

o *Lake sediment geochemical anomalies*

Ag ....Silver

As ....Arsenic

Cd ....Cadmium

Cu ....Copper

Hg ....Mercury

Mo ....Molybdenum

Ni ....Nickel

U ....Uranium

Zn ....Zinc

Geochemical Follow-up

Geochemical follow-up work will be discussed in 6 parts, categorized on the basis of lithological and geographical associations.

Hydrothermal veins and pegmatites. The St. Michaels Bay area, in the Port Hope Simpson map region, is cut by a major north-northeast-trending mafic dyke and many quartz–potassium feldspar–biotite pegmatites (Figure 5). In the northwest corner of this area, on the west side of New York Bay, there is an As–Cd–Mo–Ag–Hg–Cu lake sediment anomaly. A zone of intense potassic alteration containing associated quartz carbonate veining and hydrothermal brecciation, was sampled from shoreline exposures adjacent to this anomaly. The quartz veins are up to 50 cm in width and commonly contain angular fragments of pervasively altered wall rock with up to 2 percent pyrite and chalcopyrite. The veins also include elongate fragments of cryptocrystalline quartz, commonly laminated, that are light to dark grey-green. Networks of thin, crosscutting quartz veins are common in the red, potassic-altered country rock. The most intense alteration and veining was seen along the shoreline, over a strike length of approximately 500 m. Two other zones of potassic alteration, with associated quartz–potassium feldspar pegmatites occur along strike 2 km to the north and 1 km to the south. Grab samples analyzed from the veins and altered country rock do not contain any anomalous gold values. Samples of coarse potassium feldspar from the pegmatite at the southern extension of the system will be dated by the K–Ar method.

Pyritic Zones. Yellow and brown, extensively weathered, limonitic and sulphur-stained outcrops are common in the Dead Islands area, in the northern part of St. Michaels Bay. The outcrops are the surface expression of pyritic zones associated with pelitic gneiss, mafic supracrustal rocks, calc-silicate layers and quartzite or metamorphic banded chert (Gower *et al.*, 1987). Pyritic zones have also been mapped inland to the west of the Dead Islands, south of Occasional Harbour, and north of Port Hope Simpson by Gower *et al.* (1987). Lake sediment geochemical results from the areas adjacent to these pyritic zones are characterized by Ag–Hg–Cu–Zn anomalies. Gold values reported from these zones by Gower *et al.* (1987) range up to 36 ppb. In several of the less weathered shoreline exposures (for example, opposite Woody Island on the south side of Lackaname Ridge), the lithologies consist of coarse grained quartzite, in beds 1 to 5-cm thick, separated by 1- to 10-mm-thick laminations of medium grained quartz–biotite–muscovite ± garnet and hornblende schist. These rocks contain 2 to 5 percent pyrrhotite–pyrite ± chalcopyrite. Preliminary geochemical results indicate that the samples contain up to 42 ppb Au, 210 to 440 ppm Zn, and up to 18 ppm As and 64 ppm Ni. If the thin quartzite beds were originally deposited as chert horizons, a possibility put forth by Gower *et al.* (1987), a compelling analogy could be drawn with Middle Ordovician cherts and shales in central Newfoundland, which are known to contain thin beds of massive banded sulphides. The association with supracrustal amphibolites, which may indicate contemporaneous volcanic activity, would suggest potential for sediment-hosted, submarine, exhalative, base-metal deposits in these metasedimentary rocks.

Mafic plutonic rocks. In the southeastern part of St Michaels Bay, two Ni–As–Mo ± U ± Cd lake sediment geochemical anomalies occur on Birchy Narrows Island, within the White Bear Arm complex, a major southwest-trending mafic plutonic body with an average width of 15 km (Gower *et al.*, 1987). The island is predominantly underlain by gabbro, norite, and troctolite. Primary igneous mineralogies and textures are visible in much of this complex
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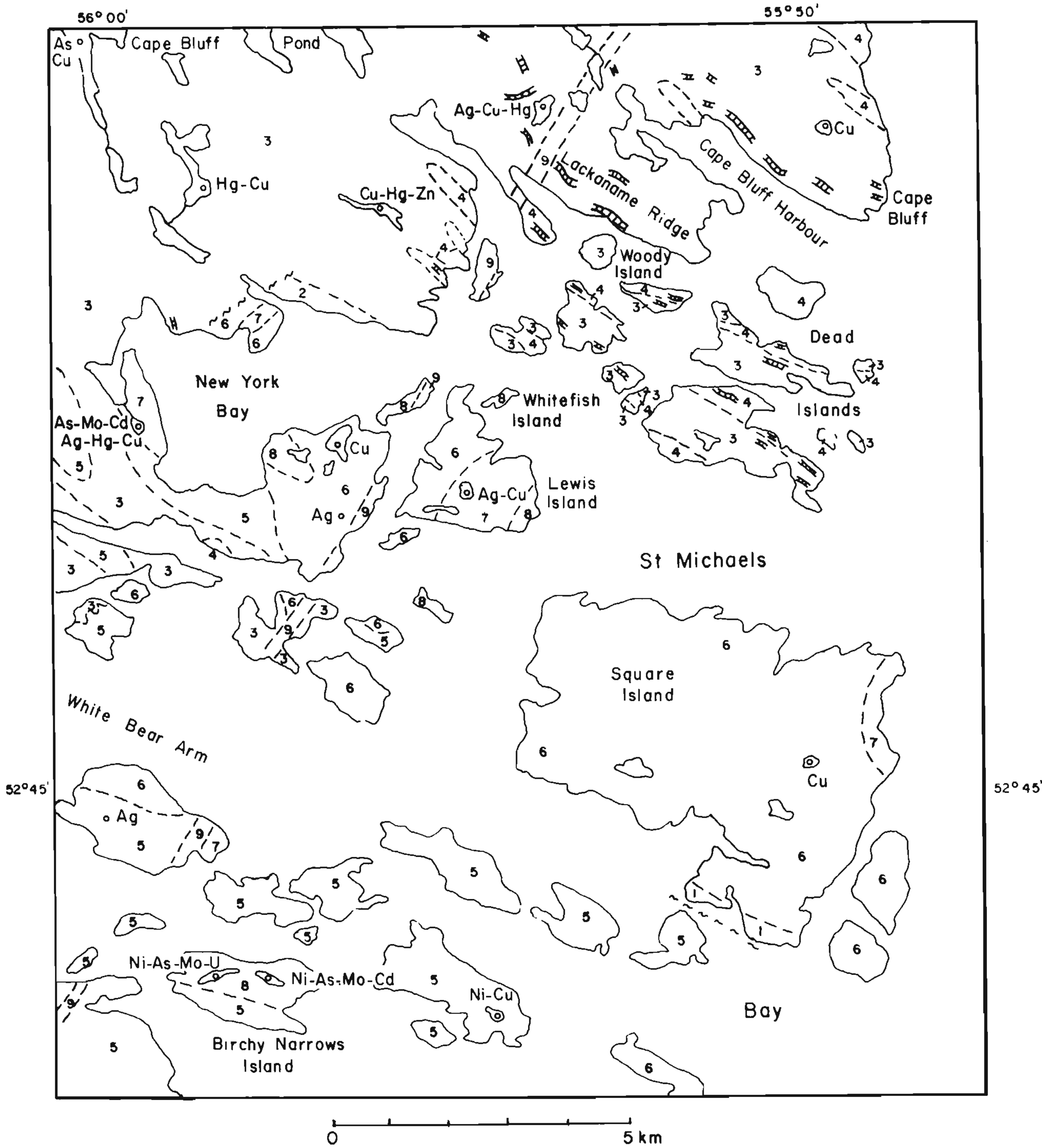


Figure 5. *Geology of the St. Michaels Bay area, Port Hope Simpson map region (after Gower,* et al., *1987).*

and primary layering is evident in some of the more extreme compositions (Gower *et al.*, 1987). The platinum potential of the White Bear Arm complex is noted by Gower *et al.* (1987), and discussed by Wardle (1987).

On the north side of Birchy Narrows Island, intensely metamorphosed pyroxenites were sampled from a 2-m wide, vertical layer that outcrops at the shoreline. The rock is predominantly composed of clinopyroxene, hornblende, and lesser interstitial plagioclase containing well-developed garnet coronas, and opaques. Samples from this exposure are presently being analyzed for platinum-group-element mineralization.

Late Grenvillian plutons. Two late Grenvillian plutons have been mapped in the Port Hope Simpson map region by Gower *et al.* (1987). One of these plutons, the Southwest Pond granite, has adjacent Ag–Cu–Hg–U lake sediment anomalies. The granite is pink to buff-weathering and medium to coarse grained. Associated intrusions of microgranite and pegmatitic dykes are present in the surrounding country rock. The mineralogy consists of sericitized plagioclase, microcline, quartz, chloritized biotite, and accessory titanite, apatite, magnetite, and zircon (Gower *et al.*, 1987). Rock samples were collected from across the granite, from rusty zones within the country rock and red hematite-stained pegmatites. Scintillometer readings over the granite range from 280 to 540 total counts per second (tcps).

Uranium in granitic gneiss of unknown age. A large uranium lake sediment anomaly occurs adjacent to outcrops of granitic gneiss with background scintillometer readings between 950 and 1000 tcps, approximately 55 km northwest of Port Hope Simpson. The high readings are restricted to narrow zones, 5- to 40-cm wide, of plagioclase–potassium feldspar–quartz–hornblende pegmatitic and foliated granite. Adjacent zones of amphibolite have considerably lower readings. This uranium anomaly occurs 25 km northwest of the Southwest Pond granite and does not appear to be related to late Grenvillian plutons.

Late Precambrian–early Paleozoic cover sequence. Several outliers of the upper Precambrian Bateau Formation outcrop inland from Table Head, in the southeastern portion of the St Lewis River map region (Figure 4). There are several Ag–Hg–U–Pb lake sediment geochemical anomalies in the vicinity of, and possibly relating to, these outliers. A stratigraphic section through the Bateau Formation and the overlying Lighthouse Cove Formation was mapped and chip sampled to determine if local enrichment of these and other elements occur within these formations.

A 15-m section was sampled at 3-m intervals, on the southeastern side of a large outlier between Table Head and Pleasure Harbour Pond. The section consists of red to maroon, medium- to thick-bedded arkosic sandstone and conglomerate. The sandstone is colour laminated and banded, commonly crossbedded, and contains heavy-mineral laminae that consist predominantly of specular hematite. A coarse conglomerate, with 1- to 3-cm angular clasts, is exposed at the top of the section, and contains up to 5 percent magnetite. A 4-m section was also sampled through the overlying Lighthouse Cove Formation. The fine grained, amygdaloidal basalts are columnar jointed, and form the top of the outlier. Disseminated chalcopyrite was observed in several of the chip samples. A more complete description of these two formations is given by Gower *et al. (this volume)*.

A 4-m wide, southeast-trending quartz–feldspar pegmatite, which intrudes the Grenvillian basement, but not the overlying formations, was sampled about 25 m immediately northwest of this outlier. No mineralization was observed, but scintillometer readings were 200 tcps as compared to 100 tcps over the other sampled intervals.

Industrial Minerals

Several of the large pegmatites in the St. Michaels Bay area were examined as potential sources of high-purity silica, feldspar, and mica. On Whitefish Island, immediately north of Lewis Island (Figure 5), two large pegmatites were chip sampled and described. A 3- to 5-m wide, steeply inclined pegmatite, is exposed on the southeastern side of Whitefish Island and consists of potassium feldspar, quartz and mica. Pink feldspar constitutes approximately 85 percent of the pegmatite and is coarsely crystalline; some crystals are up to 25 cm in diameter. Quartz occurs as small irregular lenses up to 60 cm in length, but typically forms graphic intergrowths with the feldspar. Biotite constitutes less than 5 percent of the pegmatite, and occurs in thin books of crystals up to 40 cm in diameter.

On the northwest side of the island, a 6- to 8-m wide, quartz–feldspar pegmatite is exposed over a strike length of 30 m. The pegmatite is well zoned, containing pods of white quartz up to 4-m wide and 15 m in length, enveloped by thinner zones of pure feldspar and graphically intergrown quartz and feldspar. There are no visible iron-bearing minerals within the quartz pods and only traces of feldspar. Chip samples were taken to assess its potential as a source of high-purity silica. If samples have less than 0.5 percent total impurities, further testing will be carried out to examine its potential for optical-grade silica.

During the investigation of a Pb–Cd–W–Cu lake sediment geochemical anomaly in Fox Harbour Pond, several lithogeochemical samples were collected from the top of a cliff 2.5 km east of Fox Harbour (Figure 4). A pale, orange-brown to purplish-brown, fine- to medium-grained mylonite was noted to have anomalous radioactivity of 800 to 1000 tcps. The mineralogy consists of quartz, plagioclase, potassium, feldspar, amphibole, and 2 to 4 percent magnetite. An initial geochemical assay returned a value of 3.4 percent Zr with anomolously high values for Ce, Hf, La, Rb, Th, Sn, Yb, and U. Comparison with peralkaline granites from Strange Lake (Miller, 1986) show Na, Ce and especially La contents to be too low for this mylonitic sample to have such a protolith. With only regional, 1:100,000-scale geological mapping having been carried out to date, the extent of these rocks is poorly known.

NORTHERN LABRADOR

Ramah Group

Introduction. During the 1987 field season, a dolomite unit and a chert unit within the Aphebian Ramah Group (Figure 6) were mapped and chip sampled. A pyrite unit and pyritic black shales directly underlying the chert unit were also sampled to determine if there are zones of base- and/or precious-metal enrichment.

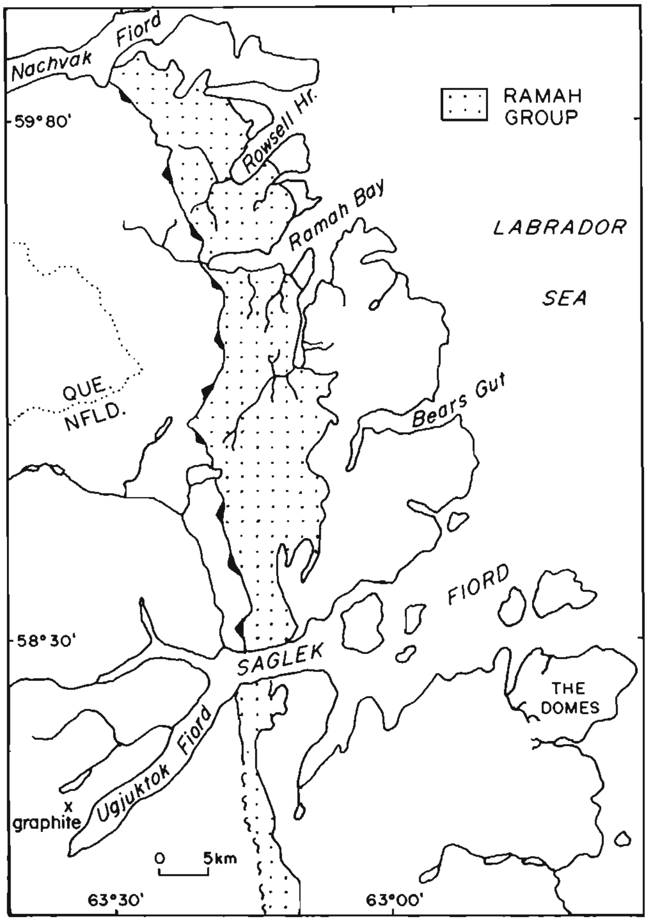


Figure 6. *Location map of Ramah Group (after Knight and Morgan, 1976).*

A regional geochemical sampling survey carried out in northern Labrador by the Geological Survey of Canada (1987), indicates Zn, Au, Pb, and Sb anomalies in streams draining the uplands underlain by the Ramah Group, and Au, W, and Pb anomalies in streams draining areas underlain by the Archean basement. Geochemical follow-up work was carried out to investigate these anomalies.

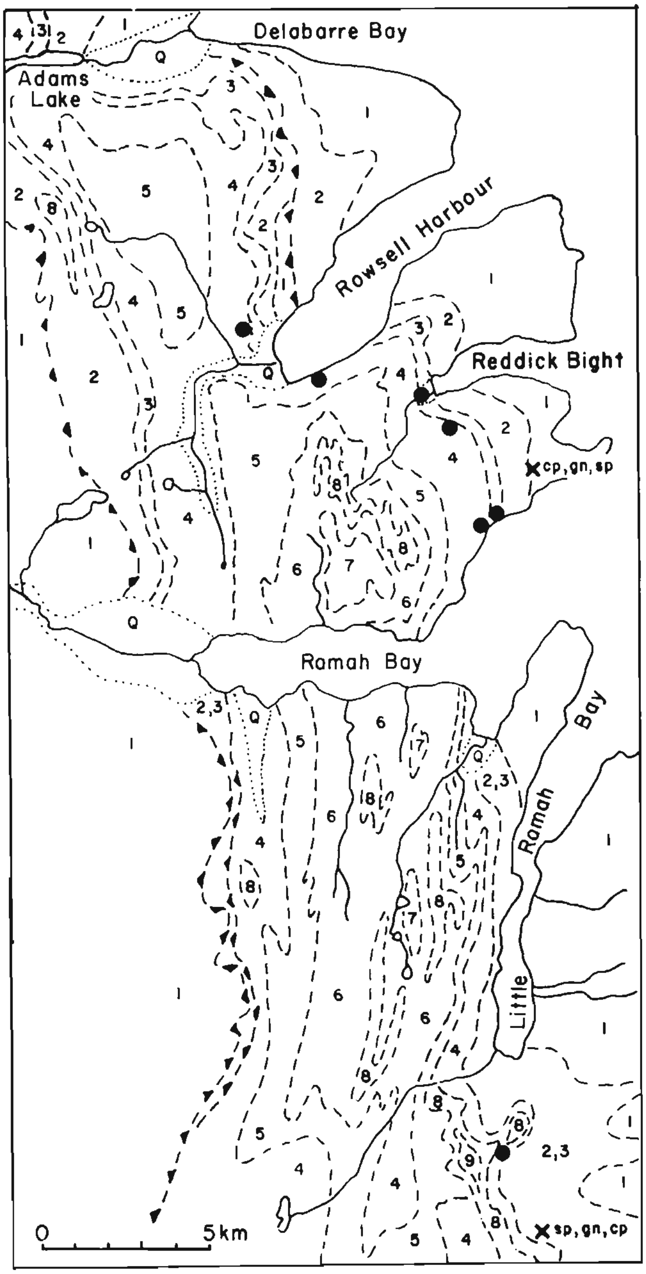
Geology. The Ramah Group comprises a 1700-m sequence of clastic and carbonate rocks deposited unconformably on Archean basement (Knight and Morgan, 1976). A lower shallow-marine, shelf sequence of sandstone, siltstone, shale and one thin volcanic flow, is capped by a thin dolomite unit. It is overlain by a thick succession of black and multicoloured shales (including pyrite and chert units), greywacke, dolomitic breccias, and thin-bedded and sandy carbonates (Knight and Morgan, 1981).

Dolomite. At the top of the shallow-marine, shelf sequence, within the Reddick Bight Formation, there is a conspicuous 3- to 10-m thick, yellow to yellow-brown weathering replacement dolomite unit, (Morgan, 1975; Knight and Morgan, 1981). Two sections of the dolomite were mapped and chip sampled at 1-m intervals.

A 5-m thick unit of massive recrystallized dolomite was sampled at the shoreline on the north side of Ramah Bay (Figure 7). The dolomite is thin- to medium-bedded and light- to dark-grey on a fresh surface. Quartz- and carbonate-veining are common. Several thin dolomite beds contain 1 to 2 percent disseminated pyrite. A 25-m section of dolomite, which may be structurally repeated, was also sampled along Warspite Brook, approximately 500 m inland from the head of Reddick Bight. At Reddick Bight, the dolomite is underlain by iron-stained dolomitic shale and sandstone, and is overlain by laminated, green to black siltstone and sandstone of the Nullataktok Formation. The yellow-weathering dolomite is light- to dark-grey banded, and finely crystalline. It is thin bedded to massive, and chert interbeds and lenses up to 65 cm thick are common and locally associated with thin shale laminations. Quartz- and carbonate-veining is ubiquitous. At the top of the section there is a thin breccia unit containing fragments of dolomitic sandstone and chert.

Pyrite and chert. Above the basal, sandy-shelf sequence, rocks of the Nullataktok Formation record an abrupt change to deep water, anoxic basinal shales (Knight and Morgan, 1981). The Nullataktok Formation consists of approximately 600 m of black and multicoloured shale and mudstone, thin-bedded silty dolomite, dolomitic breccias, pyrite, iron-formation and sedimentary chert (Knight and Morgan, 1981).

The pyrite and chert units occur near the base of the Nullataktok Formation, and vary in combined thickness from 8 to 20 m, with the chert always overlying the pyrite. The pyrite bed has attracted prospectors since the begining of the century, and several test pits were excavated. Geochemical analyses reported by Douglas (1953) from Rowsell Harbour, indicate no Cu and Au, a trace of Ag, and sulphur and iron contents that average 43 percent and 39 percent, respectively. The pyrite bed is approximately 2-m thick in Rowsell Harbour, where it consists of finely laminated pyrite, and cherty to graphitic pyrite. Two kilometers south of Little Ramah Bay the pyrite bed, which is up to 3-m thick, is laminated to pebbly. The clasts include pyrite, chert, and shale up to 10 cm in length, but averaging 1 cm. Minor chalcopyrite was observed within the brecciated beds. The pyrite unit on the north shore of Ramah Bay is 2- to 4-m thick and laminated, with secondary brecciation that produced large fragments of laminated pyrite crudely aligned parallel to bedding. Underlying the pyritic beds at Ramah Bay, there is a minimun of 40 m of yellow sulphur-stained, black, graphitic and very pyritic shale. This section was chip sampled at 3-m intervals to ascertain if there is base-metal enrichment within these beds.



LEGEND

QUATERNARY

Q *Glacial drift; marine and lake deposits*

APHEBIAN

9 *Ultramafic rocks*

8 *Diabase and amphibolite sills*

7 Cameron Brook Formation: *greywacke*

6 Typhoon Peak Formation: *slate and shale*

5 Warspite Brook Formation: *dolomitic breccia, sandstone and mudstone*

4 Nullataktok Formation: *pyrite-rich, black graphitic slate and shale; multicoloured mudstone; pyrite bed and chert horizon*

3 Reddick Bight Formation: *black quartzite; sandstone–siltstone laminites; dolomite horizon*

2 Rowsell Harbour Formation: *multicoloured quartzite; phyllite, mudstone and conglomerate; basalt flow*

ARCHEAN

1 *Granitic gneiss; migmatite; mafic gneiss*

SYMBOLS

— — — *Geological boundary*

▲ — ▲ *Thrust fault*

● *Sampled section*

Mineral Occurrences

sp..*Sphalerite*

gn..*Galena*

cp..*Chalcopyrite*

Figure 7. *Location of sections sampled.*

Directly overlying the pyritic unit is a thick chert unit. The chert, which has been well studied by archaeologists (Fitzhugh, 1972, and Lazenby, 1980), is a source of prehistoric tools (lithics) which were extensively traded on the Labrador coast, and as far south as Maine. Exploration was also carried out by British Newfoundland Exploration Limited (BRINEX, now BRINCO) in 1959, when they evaluated the chert as a source of honing material (Grimley, 1959). In this present study, the chert is being evaluated as a source of high-purity silica. Stratigraphic mapping and chip sampling were carried out at four sections. Grab samples were collected from the whitest beds and also from three other sections that were not measured.

The chert unit ranges in thickness from 3 to a maximum of 17 m (Knight and Morgan, 1981). The thickest sections contain the highest percentage of dolomitic and shale interbeds. The chert beds have a blocky fracture and are usually heavily iron stained. This resistent unit juts out conspicuously from hillside exposures of the recessive black shales of the Nullataktok Formation.

The chert is thin to thick bedded (maximum thickness approximately 1 m), and the beds pinch and swell along strike. At the base of each section, directly above the pyrite bed, the chert is typically dark grey to black and often pyritic. The black colour is due to the presence of intercrystalline graphite

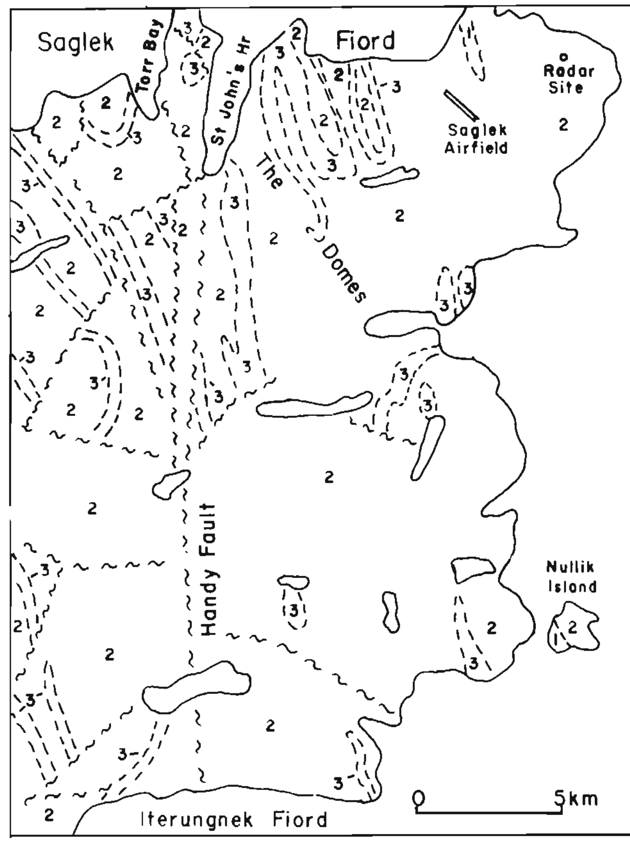
(Lazenby, 1980), and is usually associated with 1 to 5 percent pyrite. In most sections the chert is grey, but varies from white to black. The white chert rarely attains a thickness greater than 25 cm. Dolomitic beds, lenses, and nodules, and pyritic shale laminations are present in all sections, and are regularly interbedded with thin- to medium-bedded chert in the thicker sections, (i.e., on the northwest side of Rowsell Harbour). Total impurities for each section range from less than 1 percent to 20 percent, and average approximately 7.5 percent.

Geochemical Follow-Up

Area between Saglek and Nachvak fiords. A release of stream sediment geochemical data (Geological Survey of Canada, 1987) identified many multi-element anomalies, including several Au–As–Sb ± Zn ± Pb anomalies in streams draining areas underlain by the Ramah Group between Saglek and Nachvak fiords. In addition to these multi-element anomalies, there are several Zn, Pb, and As anomalies (Geological Survey of Canada, 1987). In the region to the east, which is underlain by Archean basement, there are Au, W, Pb, U, and Ni stream sediment anomalies. Rusty-weathering shales are very common in the Nullataktok and Typhoon Peak formations, especially where they are intruded by diabase sills. Both the shales and the diabase sills contain sulphides; these units were extensively sampled in places that are coincident with Au and Zn anomalies. Several other anomalies appear to coincide with previously reported mineralization (Morgan, 1975), including sphalerite within the dolomite unit of the Reddick Bight Formation south of Little Ramah Bay, and galena veins within Archean rocks north of Ramah Bay. Ultramafic rocks south of Little Ramah Bay were also sampled for Au and platinum-group-element mineralization.

Saglek area. Lake sediment and stream sediment sampling in northern Labrador has identified numerous geochemical anomalies in the Saglek area (Geological Survey of Canada, 1986, 1987). These include two adjacent As–Ni–U–Pb–Mo–Sb–W lake sediment anomalies at the north end of The Domes, several Hg–U–Ni–As–Cu–Zn–Pb–Cd–Au ± Ag anomalies in streams draining the eastern portion of the area, and the highest stream sediment Au anomaly in northern Labrador, which occurs on the west side of Torr Bay, along the northern border of the area (Figure 8).

The Saglek area is underlain by an Archean block containing some of the oldest known rocks in the Canadian Shield. The Uivak gneisses, highly deformed quartzofeldspathic gneisses, underlie approximately 50 percent of the area. Within these gneisses are rafts and belts of older rocks of the Nulliak assemblage, which include mafic and ultramafic rocks, magnetite iron-formation, calc-silicate rock and pelitic gneiss (Ryan *et al.*, 1983). The Upernavik supracrustals, which are assumed to have been deposited on, and subsequently structurally interwoven with the Uivak gneisses, consist of metasedimentary rocks interlayered with amphibolites, ultramafic pods and layered basic bodies (Bridgwater *et al.*, 1975). A major metamorphic event around 2.8 Ga produced northerly trending folds and was accompanied by the intrusion of granite sheets. A later period



LEGEND

ARCHEAN

3 Upernavik Supracrustals: *metasedimentary rocks, metavolcanic and mafic/ultramafic intrusive rocks*

2 Quartzofeldspathic gneiss: *Uivak gneiss and its reworked and migmatized derivatives*

1 Nulliak Assemblage: *metasedimentary and mafic–ultramafic rocks*

SYMBOLS

---- *Geological boundary*

~~~ *Fault*

Figure 8. *Geology of Saglek area.*

of igneous activity is signified by the intrusion of pale-grey, granitic sheets along shear belts (Bridgwater *et al.*, 1975). A major north-south trending fault (the Handy Fault, Bridgwater *et al.*, 1975) which cuts through St. John's Harbour, separates the area into two metamorphic domains, amphibolite-facies rocks to the east, and granulite-facies rocks to the west.

Four potential targets for exploration have been identified in the Saglek area. First, tungsten stream sediment
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geochemical anomalies are present throughout the area, particularly the eastern portion. By analogy with similar rocks in Greenland (Appel, 1986, 1987), it is possible that the Upernavik supracrustals in this area are host to scheelite mineralization. In western Greenland, stratabound scheelite mineralization is present in the Malene supracrustals, which are equivalent to the Upernavik supracrustals in this area. The scheelite occurs as disseminated grains in amphibolite, which are often aligned in bands paralleling the unit. The scheelite is also present in veinlets, joint coatings and within calc-silicate bands within the amphibolites (Appel, 1987). A large concession area in Greenland which contains many of these occurences, is presently being explored by Kidd Creek Mines Limited (Appel, 1986).

Second, a pale-grey, granitic sheet, which outcrops to the east of St. John's Harbour (Figure 8), was found by the authors to have anomolously high radioactivity, in the range of 8,500 to 9,000 tcps. This 3-m wide unit is adjacent to a major lake sediment uranium anomaly, one of many such anomalies that exist in the eastern portion of the area. Rock samples also return anomalously high values in Pb and Mo.

Third, the highest recorded gold anomaly in stream sediments in northern Labrador occurs on the western side of Torr Bay. The stream that contains the anomaly drains an area underlain by Uivak gneisses containing abundant enclaves of the Nulliak assemblage. The latter outcrops in the stream (Ryan, personal communication, 1988). Mappable units of iron-formation and grey metachert of the Nulliak assemblage are common along the western side of the Handy Fault, 3 to 5 km south of St. John's Harbour, and are near a Au anomaly. These chemical sediments may represent a source for the gold and merit detailed exploration.

Finally, an orange-brown-weathering fault gouge is present on the steep banks of a river 3.5 km south of Torr Bay. This anomolously fresh-looking fault gouge has limonitic and hematitic (potassic ?) staining. The Handy Fault, which runs parallel to and less than 1 km west of this fault, has been possibly reactivated in Paleozoic times (Bridgwater, personal communication, 1987). This major fault could have been a locus for mineralizing fluids, in the manner postulated for major lineaments that are being explored for gold on the island of Newfoundland.

Graphite

Graphite was briefly mined at the western end of Saglek Fiord in 1942 (Carr, 1958). The deposit was first reported by H. J. MacLean who visited the site in 1940 (*in* Douglas, 1953). The site was also visited and described by Carr (1958), who examined the deposit in 1942. The deposit is located approximately 5 km north-northeast of the southwest end of Ugjuktok Fiord, at an elevation of approximately 760 m. The site is accessible by a northeast-trending valley that slopes gently down to the fiord, where a boat landing can be made at the mouth of the 'Noch-tish-swock' River (Carr, 1958). Tractor marks are still visible along the route that was used during the 1942 mining venture.

The deposit consists of a 30- to 90-cm-thick lens of coarse flake- to finely crystalline-graphite. The lense occurs within a mylonitic quartz–feldspar–garnet gneiss and is parallel to the gneissic foliation. The graphite is remarkably free of impurities over the present 8-m-long exposure and a small stockpile of graphite boulders at the base of the slope are equally pure. The deposit is exposed partway up a moderately steep dipslope, and it is 30 to 90 cm below the suface. Carr (1958) estimated that there are 20 tonnes of graphite in place and stated (page 74) that there is a good chance of 'finding larger more important deposits in this area'. MacLean (*in* Douglas, 1953) reported that four different graphite horizons are visible about 'halfway up the eastern slope', which may refer to the northwest side of Ugjuktok Fiord. Several large graphite boulders were collected from this deposit. These will be analyzed to determine the percentage of the more valuable coarse flake graphite.

Numerous occurrences of graphite are reported between Saglek and Nachvak fiords, within the mylonite unit (Coleman, 1921). Two occurences, which were briefly visited along the north shore of Nachvak Fiord and Nachvak Lake, consisted of minor disseminated graphite within the quartz–feldspar–garnet mylonite.

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