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GEOLOGY OF PART OF THE SNOWSHOE POND (12A/7) MAP AREA

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ABSTRACT

Two thirds of the Snowshoe Pond area have been mapped at a scale of 1:50,000. Three main geological divisions are recognized.

In the southern part of the area, stratified rocks consist of a single unit of polyphase-deformed clastic metasedimentary rocks of probable Middle Ordovician age, which are intruded by pretectonic mafic dikes. Most of these rocks have been metamorphosed in the upper amphibolite facies and some have been partially melted, an exception being in the northern part of the outcrop area where metamorphism is in the greenschist or lower amphibolite facies.

The northwest part of the area is underlain by sedimentary, volcanic and hypabyssal intrusive rocks typical of the Central Volcanic Belt of the Dunnage Zone. These are probably of Lower to Middle Ordovician and Silurian ages; they are moderately deformed and are metamorphosed in the greenschist facies.

Plutonic igneous intrusions consist mainly of prekinematic, synkinematic and postkinematic granitoid rocks that exclusively intrude the clastic sedimentary rocks in the southern part of the area, and each other. In contrast to these intrusions is a gabbro body containing an ultramafic phase, which is probably the youngest unit in the area; it intrudes rocks of the Central Volcanic Belt and one of the granitoid intrusions.

The mineral potential of the area has been hitherto very poorly known. Six main targets for mineral exploration are suggested:

1. *Tungsten mineralization associated with granitoid intrusions*
2. *Base- and precious-metal potential in mafic volcanic rocks*
3. *Base- and precious-metal potential in felsic volcanic rocks*
4. *Potential for lineament-related gold mineralization in pyritiferous psammite and associated rocks at Noel Paul's Brook*
5. *Similar potential in pyritiferous quartzite and semipelitic schist near the Ebbegunbaeg road*
6. *Potential for platinum-group-element concentrations in the mafic and ultramafic intrusion at Rodeross Lake*

INTRODUCTION

The Snowshoe Pond (12A/7) map area is located about 40 km south of Buchans in the centre of the Newfoundland Central Mobile Belt (Williams, 1964). It is accessible from Millertown by the hydro-development roads to Granite Lake and Ebbegunbaeg dam, and by the logging roads to Quinn and Rodeross lakes. Mapping at the 1:50,000 scale has been completed for two thirds of the map area (Figure 1).

The northwestern part of the area is underlain by Early Paleozoic volcanic and sedimentary rocks (Units 3 to 11) typical of the Dunnage Zone (Williams, 1978), and is included in the Central Volcanic Belt of Kean *et al.* (1981). In the southeastern part of the area, the oldest rocks are a monotonous sequence of clastic sedimentary rocks (Unit 1), resembling the Middle Ordovician Spruce Brook Formation of Colman-Sadd and Swinden (1984). For the most part, these metasedimentary rocks are metamorphosed at sillimanite grade or are partially melted, but southeast of Lake Douglas a belt of similar rocks, previously excluded from Unit 1 (Colman-Sadd, 1986) is metamorphosed in the greenschist facies, although it is intensely deformed. The southeastern area is intruded by two major granitoid bodies and several minor ones (Units 12 to 19). The boundary between the northwestern and southeastern parts of the area (Noel Paul's Line of Brown and Colman-Sadd, 1976) is placed about 2 km northwest of where it was shown by Colman-Sadd (1986). It is interpreted, at least in part, to be a fault zone, but even where exposed the evidence is problematic, and over most of its length it is either not exposed or, at Rodeross Lake, is obscured by a posttectonic gabbro intrusion (Unit 20).

The earliest geological investigations in the Snowshoe Pond area were those of Cormack (1824), made during his walk across the island of Newfoundland, and Howley (1917), when he led an expedition from Bay d'Espoir to the Exploits River in 1887.

Work done in the early 1950's by the Buchans Mining Company was compiled by Swanson (1952-60) and ASARCO supported a thesis by Coward (1966), which includes a detailed description of the Rodeross Lake intrusion. Williams (1970) produced a 1:250,000 scale geological map of Red

Indian Lake (east half) for the Geological Survey of Canada and it includes the geology of the Snowshoe Pond area. An aeromagnetic map at a scale of 1 inch to 1 mile of the whole Snowshoe Pond area, and total-field and vertical-gradient maps at scales of 1:50,000 and 1:25,000 for the west half have also been published by the Geological Survey of Canada (1968, 1985a,b,c,d,e,f). Work by the Newfoundland Department of Mines and Energy consists of a lake sediment geochemistry survey (Butler and Davenport, 1978; Davenport and Butler, 1981) and surficial-geology studies (Sparkes, 1984). Geological mapping by the department at the 1:50,000 scale has been done in neighbouring map areas (Colman-Sadd, 1985; Dickson, 1982; Dickson and Delaney, 1984; Kean, 1977, 1982; Kean and Jayasinghe, 1980).

Recent exploration by mining companies in the map area has concentrated on two targets:

1. Tungsten–molybdenum mineralization was discovered in the Wolf Mountain (12A/2) map area to the south during follow-up of lake sediment geochemical anomalies (Butler and Davenport, 1978; Dickson and McLellan, 1981), and a number of claims related to this discovery extended onto the southern edge of the Snowshoe Pond map area (Godfrey and Lane, 1981; Neelands, 1980; Saunders, 1980a,b). Information relating to this exploration work has been compiled by Tuach and Delaney (1986).

2. The base- and precious-metal potential of rocks in the Central Volcanic Belt within the area has been investigated by Hudson's Bay Oil and Gas Company and Noranda Exploration Company. The northwestern part of the area was included in an airborne-magnetic and electromagnetic survey flown for Hudson's Bay Oil and Gas Company (Aerodat, 1980). This survey was followed up in 1980 by 1:50,000 scale reconnaissance geological mapping (Nuri, 1980), and the testing, by ground geophysics, of one airborne anomaly within the Snowshoe Pond area, south of Rodeross Lake (Lassila, 1981).

Work by Noranda Exploration Company has been done under the Price–Norex Joint Venture. In the northwestern part of the area, data from a regional airborne magnetic and electromagnetic survey were reported by Reid (1981), along with the results of reconnaissance mapping, prospecting and stream-sediment sampling. Reid (1983) described the investigation of rhyolite units west and southeast of Lake Douglas, and a regional silt survey in the area around Wilding and Rogerson lakes. Fitzpatrick (1984a) reported work on, and to the southeast of, Lake Douglas, which consisted of airborne- and ground-electromagnetic surveys and wetland silt and stream geochemistry. Reports by Aerodat (1983), Fitzpatrick (1984b, 1985), MacKenzie (1985) and Andrews (1986) are currently confidential.

GENERAL GEOLOGY

The geology of the Snowshoe Pond area, as mapped so far, can be considered in terms of three broad divisions:

1. Middle Ordovician clastic metasedimentary rocks of Unit 1 in the southern and eastern parts of the area; this division also includes minor outcrops of amphibolite (Unit 2)
2. Lower to Middle Ordovician and Silurian(?) metasedimentary, metavolcanic and hypabyssal igneous rocks of Units 3 to 11 (Central Volcanic Belt) in the northwest of the area
3. A variety of Silurian(?) to Devonian and possibly younger plutonic intrusions, including pretectonic, syntectonic and posttectonic granitoid bodies and associated migmatite (Units 12 to 19), and posttectonic gabbro and ultramafic rocks (Unit 20) (except for the gabbro and ultramafic intrusion, which cuts across the contact between divisions 1 and 2, the plutons are restricted to the outcrop area of the Unit 1 clastic metasedimentary rocks).

Clastic Metasedimentary Rocks and Amphibolite

Clastic metasedimentary rocks (Unit 1). The rocks of Unit 1 are directly continuous with a metasedimentary unit that extends eastward across the neighbouring Great Burnt Lake (12A/8) map area to the western edge of the Great Burnt Lake volcanic belt (Unit 3 of Colman-Sadd, 1985). This unit was correlated by Higgins (1951) with metasedimentary rocks to the east of the belt that are now known to be Middle Ordovician and were named the Spruce Brook Formation by Colman-Sadd and Swinden (1984). This correlation is followed here because of the similarity of rock types in the two areas.

Unit 1 consists of a monotonous sequence of interbedded quartzite, psammite, semipelite and pelite. Bed thickness varies from 3 cm to over 1 m and the proportions of the rock types are also quite variable. Overall, quartzite and psammite each form about 15 to 25 percent of the whole. The quartzite is light gray on fresh surfaces, but weathers white. Its grain size is 2 mm or less and generally fairly uniform. Beds commonly have sharp bases and laminated, more micaceous, upper sections. The psammite is dark gray and weathers brown, reflecting its greater mica content. The semipelite and pelite are dark gray or black and are locally rich in pyrite and/or tourmaline. In areas where the rock is not strongly deformed, the semipelitic beds are faintly parallel laminated and thin interbeds of quartzite and psammite are cross-laminated. One exposure of a possible pyritiferous quartz–feldspar-crystal tuff is not separated from Unit 1 on the map (Figure 1). It is located just east of the Ebbegunbaeg road, and near the north edge of the map area.

The intensity of deformation in Unit 1 is variable, although throughout the unit in the Snowshoe Pond area the number of structural events appears to be consistently two. In the more southerly outcrop area between Meelpaeg Lake and Snowshoe Pond, rocks that have not been partially melted have generally maintained their structural integrity despite sillimanite-grade metamorphism. The first period of deformation formed a ubiquitous cleavage in the micaceous beds, which is commonly, but not exclusively, parallel to bedding. In the quartzite beds, either there is no mesoscopic cleavage or there is a micaceous parting, spaced 0.5 to 2 cm apart. The second deformation has formed tight to isoclinal folds of bedding, the first cleavage, and migmatitic sweats. The folds are very common in some localities, for example in the northern inlet of Meelpaeg Lake, and rarely developed in others. A slight to moderate crenulation cleavage was formed during the second deformation in a few places within this outcrop area, but is nowhere very prominent.

In the northern outcrop area of Unit 1, southwestward from the north edge of the map area to Wilding Lake, the rocks are generally at a lower metamorphic grade, but are much more deformed. In exposures on the Ebbegunbaeg road the dominant rock type is greenish-gray sericitic schist, grading into black pyritic schist, and containing layers of quartzite and psammite. The latter were interpreted by Colman-Sadd (1986) as felsic volcanic rocks, but now that they have been traced southwestward to more extensive exposures in the hills southeast of Lake Douglas, they are thought to be of clastic sedimentary origin. Bedding within these rocks is discontinuous and finer sedimentary structures are absent as a result of the intense deformation. The schists have a first-deformation composite *C-S* fabric, and the *C* planes are spaced 0.5 to 1 cm apart and marked by metamorphic differentiation between the micas and quartz and feldspar. The quartzite and psammite beds have a single first-deformation foliation containing a very pronounced stretching lineation on cleavage surfaces. The second deformation has formed tight folds of bedding, the first fabrics, and numerous quartz segregations. It has also formed a crenulation cleavage in the schists. Good exposures of highly deformed Unit 1 extend southwestward to Noel Paul's Brook where they have a sharp, problematic contact with rocks tentatively placed in Unit 3. Exposures in the brooks north and south of Wilding Lake are provisionally placed in Unit 1, but their true affinity is at present uncertain.

The metamorphism of Unit 1 varies from greenschist and lower amphibolite facies in the northwest to upper amphibolite facies in the southeast, where rocks of the unit are partially melted to form migmatite (Unit 13). In the northwestern outcrop area, metamorphic assemblages in pelitic and semipelitic rocks contain chlorite, muscovite and biotite, defining first and second cleavages, but so far no andalusite, garnet or staurolite, characteristic of intermediate metamorphic grades elsewhere (Colman-Sadd and Swinden, 1984), have been identified. Between Meelpaeg Lake and Snowshoe Pond, metamorphism of the unit has generally produced fibrolitic sillimanite aggregates, 2 to 5 mm across, in semipelite and pelite, coexisting with quartz and muscovite. The exception is in the small area just southwest of the Ebbegunbaeg road between pegmatite of Unit 17 and foliated granite of Unit 12. Here sillimanite aggregates have not been identified, but there are probable porphyroblasts of andalusite and staurolite. Migmatization of Unit 1 is due in part to the injection of sheets of granite and granodiorite into country rock that is otherwise largely unmelted. However it has also formed in many places as a result of *in situ* melting, which has produced a gradation from metasedimentary rocks containing isolated granitic segregations to granitic gneiss and granitoid containing metasedimentary xenoliths.

The timing of metamorphism relative to structural development is uncertain from field observations. However, there are strong indications from the relationship of structures to migmatization that the peak of metamorphism postdated the first deformation and predated the second. Granitoid veins crosscut the main cleavage and have been folded by second-generation folds. Also the North Bay Granite (Units 14 to 16), which has a close spatial relationship to the highest grade metamorphic rocks (Colman-Sadd, 1985), contains many foliated xenoliths of Unit 1.

Amphibolite (Unit 2). The amphibolite of Unit 2 is a fine grained dark-green rock containing a single well developed foliation. The only outcrop area that is sufficiently large to be separated on the map occurs on the Ebbegunbaeg road, and this has been intruded by foliated granite of Unit 12 as well as unfoliated granite pegmatite of Unit 17. Elsewhere, for example in the northern inlet of Meelpaeg Lake, similar amphibolite has clearly intruded Unit 1 as pretectonic mafic dikes.

Central Volcanic Belt

Volcanic and sedimentary rocks east of Lake Douglas (Units 3 to 6). The triangular area between Lake Douglas and the outcrop area of Unit 1 is underlain by a sequence of sedimentary and mainly felsic volcanic rocks. Metamorphism is in the greenschist facies and deformation is generally moderate, including the development of a single penetrative LS fabric that was crenulated during a second event. More intensely deformed rocks that probably belong to this sequence are exposed on Noel Paul's Brook in contact with Unit 1; they have a strong LS or L fabric and are locally mylonitic.

The principal exposures of Unit 3 are along the southeastern shoreline of Lake Douglas. The unit consists of finely cross- and parallel-laminated gray siltstone that is thinly interbedded with arkosic sandstone and black shale. Rocks exposed on Noel Paul's Brook that are also included in the unit contain limestone and mafic volcanic or intrusive layers. Units 4, 5 and 6 form members of variable thickness within Unit 3. Unit 4 consists of gray, quartz and feldspar, crystal-lithic tuff containing minor disseminated sulfides. It is in contact on its northwest side with conglomerate of Unit 5, in which the main clast types are flow-banded rhyolite, crystal tuff and indeterminate felsic volcanic rocks. The conglomerate is clast supported, but contains lenses and interbeds of black shale. The clasts are subangular, and have been flattened to give a length to thickness ratio of 3:1. Unit 6 forms two large hills southeast of Lake Douglas and is also exposed on the shoreline. Inland, the unit forms a wide homogeneous outcrop area, consisting of gray, fine grained, massive rocks containing quartz crystals, and may be of either extrusive or intrusive origin. On the shoreline of Lake Douglas, the outcrop width is much narrower and the rock is a well cleaved crystal-lithic tuff (Plate 1) that has transitional contacts with surrounding sedimentary rocks. The tuff contains podiform zones of pyritic and sericitic alteration that are in the order of 30 cm wide by 1 or 2 m long.

The sequence of rocks comprising Units 3 to 6 is bounded on the southeast by Unit 1. The contact in the hills southeast of Lake Douglas is marked by exposures of greenish phyllitic quartz-eye schist, possibly derived from a felsic tuff. There is no significant change in metamorphic grade across the contact, but there is an abrupt increase in intensity of deformation and so it is assumed to be a fault. Another

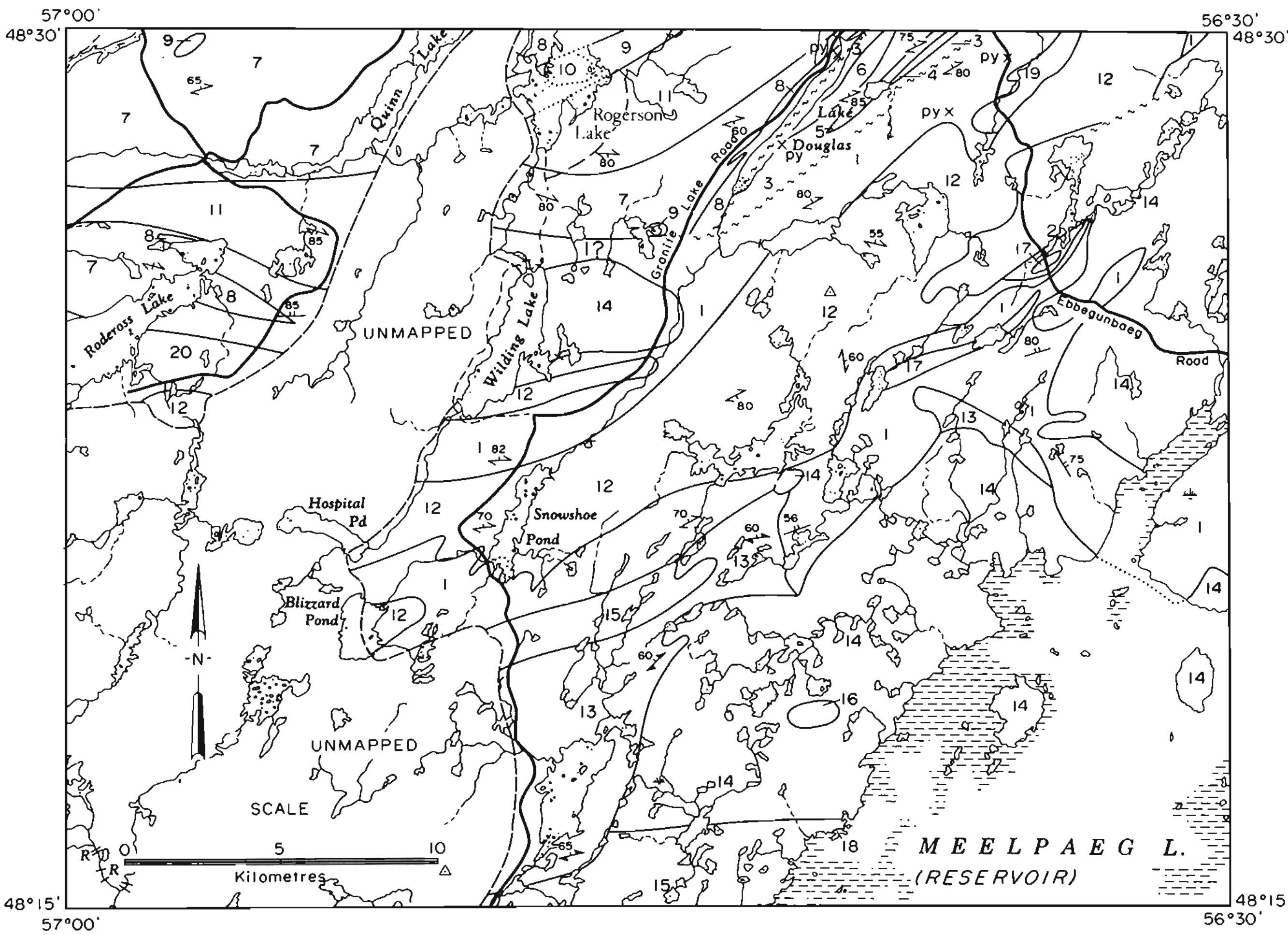

Figure 1: *Geological sketch map of the Snowshoe Pond (12A/7) map area.*

Plate 1: *Lithic tuff of Unit 6, exposed on the southeast shore of Lake Douglas.*

assumed fault is thought to run down the axis of Lake Douglas, because Units 3 to 6 strike obliquely across the southeast shore but do not reappear on the northwest shore. The northwest shore is underlain, along its entire length, by mafic volcanic rocks of Unit 8.

The two bounding faults of Units 3 to 6 project southwestward to intersect near a well exposed section in Noel Paul's Brook. At the southern end of the exposure, there are beds of quartzite (up to 1 m thick), semipelite and pelite of Unit 1. The quartzite beds pinch and swell as a result of incipient boudinage, and some are completely dismembered; in places, fractures within them are filled with pyrite. The semipelite and pelite have a good planar fabric parallel to bedding and a slight stretching lineation that plunges moderately to the southeast. The rocks of Unit 1 are in sharp contact with the rocks of Unit 3 that form the remainder of the exposure (Plate 2). Immediately adjacent to the contact on the north side, Unit 3 consists of a very well banded flaggy psammite containing a moderate to good LS fabric. Quartz grains up to 1 mm across form augen within a micaceous matrix, and much of the rock contains disseminated pyrite. At the contact, Unit 1 is represented by a partially boudinaged quartzite bed exhibiting irregular boundaries that cut into the banding of the flaggy psammite (Unit 3) without disturbing its planar nature. Ultramylonite, up to 2 cm thick, is present along parts of the contact.

LEGEND

DEVONIAN(?)

20 *Equigranular, medium to fine grained, gray, biotite–pyroxene–hornblende gabbro; includes unseparated pyroxenite, and gabbroic and granitic pegmatite*

SILURO-DEVONIAN

19 *Equigranular, medium grained, white, muscovite–biotite granite*

18 *Equigranular, medium grained, pink syenite(?)*

17 *Garnet–tourmaline–muscovite pegmatite*

NORTH BAY GRANITE (Units 14-16)

16 *Equigranular, medium grained, white, muscovite–garnet granite (not exposed in situ)*

15 *Equigranular, medium grained, gray to buff, biotite–muscovite granodiorite*

14 *Feldspar-porphyritic to equigranular, medium grained, gray to pink, biotite granodiorite*

13 *Migmatite, rich in biotite schlieren and metasedimentary fragments derived from Unit 1 (gradational into Unit 14 of the North Bay Granite)*

12 *Equigranular to feldspar-megacrystic, foliated, medium grained, gray to pink, biotite granite; locally mylonitic*

SILURIAN(?)

11 ROGERSON LAKE CONGLOMERATE: *purple, clast-supported, polymictic conglomerate*

ORDOVICIAN

VICTORIA LAKE GROUP (Units 7-10)

10 *Equigranular, medium grained, gray to pink, chlorite–biotite granite*

9 *Diabase dikes and small gabbro intrusions (probably related to mafic volcanic rocks of Unit 8)*

8 *Mafic pillow lava, pillow breccia and massive flows*

7 *Sedimentary rocks composed mainly of shale, siltstone and sandstone, but also including conglomerate; minor, unseparated felsic crystal tuff and mafic volcanic rocks*

6 *Crystal-lithic felsic tuff, and rhyolitic flows and/or subvolcanic intrusive rocks*

5 *Clast-supported conglomerate composed mainly of felsic volcanic clasts*

4 *Gray, quartz–feldspar, crystal-lithic felsic tuff*

3 *Gray, parallel- and cross-laminated shale, siltstone and sandstone; includes strongly deformed rocks on Noel Paul's Brook that contain bands of limestone and mafic volcanic and/or intrusive rocks*

2 *Foliated, fine grained amphibolite (probably derived from mafic dikes intrusive into Unit 1)*

1 *Interbedded quartzite, psammite, semipelite and pelite, intruded by unseparated mafic dikes (probably equivalent to Spruce Brook Formation)*

Plate 2: *Contact between Units 1 and 3 on Noel Paul's Brook. Unit 1, on the south side of the contact, forms the elevated, right-hand half of the exposure; it consists of boudinaged and dismembered quartzite and semipelite beds. Unit 3, on the north side of the exposure, is composed of psammite exhibiting a well developed planar banding.*

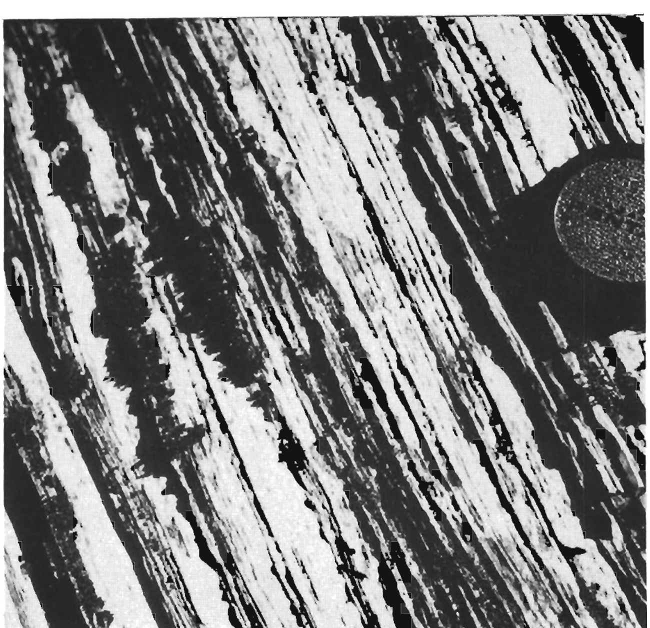

Plate 3: *Banded limestone and chert, forming part of Unit 3 at Noel Paul's Brook.*

Plate 4: *Cleavage surfaces in silicic rocks of Unit 3 at Noel Paul's Brook, showing a well developed lineation.*

Plate 5: *Vesicular basalt bombs forming a block of agglomerate, which is included in conglomerate of Unit 7 at Codeross Lake.*

Northwestward from the contact with Unit 1, the flaggy psammite is interlayered with well banded limestone and chert (Plate 3), with fine grained, pyritiferous mafic volcanic or intrusive rocks that have a composite *C-S* fabric, and with a fine grained, well lineated silicic rock that may be a mylonite (Plate 4). All the rocks found in this exposure northwest of Unit 1 are tentatively placed in Unit 3, although this unit is not known to contain limestone or mafic igneous rocks in any of its other exposures. It is also uncertain that the flaggy psammite and silicic rock are actually correlatives of the sandstone, siltstone and shale observed on the southeast shore of Lake Douglas. It is possible that these rocks in fact correlate with felsic volcanic rocks of Units 4 or 6, and that the mafic rocks are structurally interlayered representatives of Unit 8.

Ordovician volcanic and sedimentary rocks west of Lake Douglas (Units 7 to 10). The Ordovician volcanic and sedimentary rocks of the Central Volcanic Belt west of Lake Douglas are divided into two by the long sinuous outcrop area of the Silurian(?) Rogerson Lake Conglomerate. Although the conglomerate probably obscures a prominent structural lineament, there is no great contrast between the Ordovician rocks on either side of it. They are therefore described together.

Unit 7 consists of a variety of sedimentary rocks, as well as a few minor unseparated exposures of felsic and mafic volcanic rocks. Felsic crystal and lithic tuff containing minor disseminated pyrite occurs at two localities adjacent to the south boundary of the Rogerson Lake Conglomerate immediately west of Lake Douglas. Silicified pyritiferous mafic volcanic rocks occur in a few exposures at Louis Lake, along the Granite Lake road, and near the brook joining Wilding and Rogerson lakes. Sedimentary rocks of Unit 7 southeast of Rogerson Lake consist principally of laminated brown-weathering siltstone and gray to green shale containing a few beds of arkosic sandstone.

Sedimentary rocks at Rodeross Lake are also assigned to Unit 7, although they are generally coarser grained and more varied than those to the east. They include a conglomerate bed at least 10 m thick composed principally of subrounded mafic clasts 2 to 10 cm across. The rock however is poorly sorted and maximum clast size is about 2 m. Some of the larger blocks are composed of agglomerate, which is itself formed of vesicular mafic volcanic fragments (Plate 5). The majority of sedimentary rock exposures around Rodeross Lake consists of green-gray, mafic volcanogenic grit, sandstone and siltstone, in which bed thickness varies from 3 cm to 3 m. Parallel laminations are characteristic of the sandstone beds, which generally have uniform grain size and are not graded. Dark-gray shale forms a few exposures, but in all of these, the volcanogenic sandstone is still represented as thin, widely separated beds.

North of Rodeross Lake and west of Quinn Lake, most of the few exposures that have been located consist of either bedded volcanogenic sandstone and siltstone or black shale.

Except for the occurrences of felsic tuff included with Unit 7, all volcanic rocks west of Lake Douglas are mafic. On the basis of lithological similarities, they are included in a single unit (Unit 8), but differences may become apparent at a later date when chemical data are available. The mafic volcanic rocks along the northwest shore of Lake Douglas are massive or pillowed, dark green and locally vesicular. They are variably altered and contain disseminated pyrite, especially in well cleaved shear zones. At the northeast end of the lake, a 30-cm-thick zone contains massive and stockwork pyrite that encloses fragments of volcanic rocks. Locally the volcanic rocks are interlayered with black shale and volcaniclastic sandstone. Mafic volcanic rocks at Rogerson Lake form a single exposure that is epidotized and pyritic, and contains fragments that may be bombs or pillows. At Rodeross Lake, two separate outcrop areas contain vesicular pillow lava (Plate 6), pillow breccia and massive flows, and are potential sources for much of the detritus in the neighbouring sedimentary rocks of Unit 7.

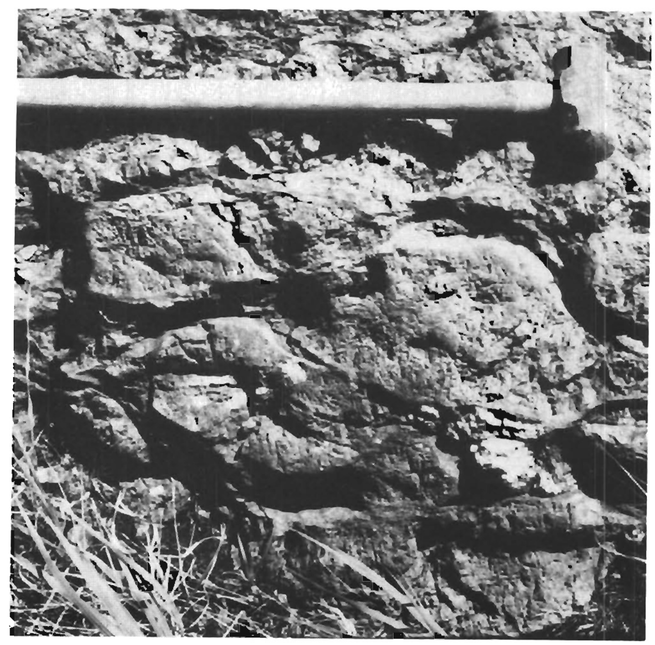

Plate 6: *Pillow lava of Unit 8 at Rodeross Lake.*

Mafic intrusive rocks that appear to be related to the volcanic rocks of Unit 8 are included in Unit 9. At Rogerson Lake, they consist principally of diabase dikes, 3 m or more wide, and massive gabbro. The dikes contain phenocrysts (2 to 3 mm across) of feldspar (except in their chilled margins), and intrude the gabbro, which is fine to medium grained and equigranular. At one exposure, the dikes and gabbro, which are essentially undeformed, intrude a coarse grained plutonic rock of dioritic composition that has a good, spaced cleavage. Fine to medium grained gabbroic rocks, similar to those at Rogerson Lake, also occur in and near the northeast end of Rodeross Lake, where they are associated with mafic volcanic rocks of Unit 8. On an island in the northeast end of the lake, the gabbro is cut by a pyrite-rich, mylonitic shear zone. These rocks are distinct from the large gabbroic intrusion (Unit 20) at the southwest end of the lake.

Unit 10 consists of medium grained, gray to pink, equigranular, chlorite granite, and appears to form a single circular intrusion into Unit 9 at Rogerson Lake. Mafic dikes resembling those of Unit 9 are also intrusive into the granite. Because of these relationships, and also because of its distinct appearance, this granite body is thought to be unrelated to other granitoid bodies in the map area. It is most likely to be a subvolcanic intrusion of Ordovician age.

The metamorphic grade of Units 7 to 10 is entirely within the greenschist facies. Deformation was also consistent in intensity, and most variations in strain can be attributed to the differing competencies of the rock units. The most highly strained rocks are the shales at Rodeross Lake, which have a penetrative S_1 cleavage axial planar to isoclinal F_1 folds; the F_1 folds are in turn tightly refolded by F_2 folds that have a strain-slip axial planar cleavage. Sandstone generally has a single, moderate, penetrative cleavage. The mafic volcanic rocks are either moderately cleaved or massive, and most pillow lavas show some degree of flattening. Both the mafic volcanic rocks and the intrusive rocks, which generally have no penetrative cleavage, are cut by high-strain zones in which there is good cleavage development, brecciation and, in some cases, mylonitization.

Rogerson Lake Conglomerate (Unit 11). The Rogerson Lake Conglomerate forms a narrow sinuous belt that extends southwestward from the Noel Paul's Brook (12A/9) and Lake Ambrose (12A/10) map areas (Kean and Jayasinghe, 1980), through the northwest corner of the Snowshoe Pond map area, and into the Victoria Lake (12A/6) (Kean, 1977) and King George IV Lake (12A/4) map areas (Kean, 1983). In the Snowshoe Pond area, the best exposures occur on the shores of Rogerson Lake and in the cut-over woodlands to the east. No exposure was found west of Quinn Lake, but some are present in the neighbouring Victoria Lake area, which suggests that the unit is continuous.

The conglomerate has a characteristic purplish color and forms massive exposures in which bedding is only identifiable where sandy lenses occur. The pebbles are subrounded and generally 10 cm or less in their long axes (Plate 7), although a few range up to 30 cm. The near-round ones have flattening ratios of about 1.5:1. Pebbles larger than 3 cm across are in part supported by a sandy matrix.

A great variety of rock types is represented in the conglomerate. Felsic volcanic clasts include crystal tuff and slabs (up to 4 cm by 20 cm) of aphanitic rhyolitic. Sedimentary clasts vary from argillite through arkosic sandstone to conglomerate, the latter containing a similar range of clasts to that found in the host conglomerate. Other clasts consist of granitoid, chert and jasper. Vein quartz, mafic volcanic rocks and gabbros are surprisingly rare, considering their widespread occurrence in neighbouring units.

A sandy facies of the conglomerate occurs in one exposure on the Rodeross Lake road. Beds of grit and conglomerate (maximum long axis of clasts is 3 cm) are interbedded with lenses of sandstone, up to 15 cm thick, that are massive or cross-laminated and contain thin discontinuous shale laminae.

Plate 7: *Rogerson Lake Conglomerate (Unit 11), just east of Rogerson Lake.*

The conglomerate contains a single, variably developed cleavage, and is locally cut by quartz and calcite veins. In a few places, the veins and the cleavage are crenulated by a second deformation.

The age and relationships of the Rogerson Lake Conglomerate are uncertain. Kean *et al.* (1981) considered it to be Late Ordovician or Silurian, and this age is supported by the present work since the molasse aspect of the deposit clearly contrasts with the marine Middle Ordovician deposits adjacent to it. The nature of the contacts with other units is also unknown since none are exposed in the Snowshoe Pond map area, but it is reasonable to interpret them as either faulted or unconformable, as shown on the maps of Kean (1977, 1983) and Kean and Jayasinghe (1980).

Plutonic Intrusions

Foliated biotite granite (Unit 12). Unit 12 consists mostly of pink or gray, equigranular, medium grained, biotite granite. At one location, on the east shore of Blizzard Pond, foliated, feldspar-megacrystic, biotite granite is included in the unit, although it is at present uncertain whether this is a phase of the main body or a separate intrusion.

In most exposures of Unit 12, biotite defines an anastomosing planar fabric, spaced 2 mm to 10 cm apart. A stretching lineation is also defined by mica, feldspar and quartz on cleavage surfaces. In some zones, most notably at Snowshoe Pond and westward to Hospital Pond, the granite is mylonitic and parts of it are reduced to a biotite–chlorite schist. Exposures at Snowshoe Pond show tight to isoclinal folds of the mylonitic fabric; the fold axes are parallel to the plunge of an intense stretching lineation (Plate 8).

Plate 8: *Stretching lineation in mylonitized granite of Unit 12, Snowshoe Pond.*

The granite erodes as a series of ridges controlled by the first-deformation fabric, and these ridges clearly define large-scale second-deformation folds. The folds have wavelengths in the order of 2 km and plunge gently to the northeast. The curved contact of the granite with Unit 1, west of the Ebbegunbaeg road, defines the hinge of an antiform, and the folds in the granite correspond to smaller second-deformation folds in Unit 1.

The foliated granite has an assumed intrusive contact with metasedimentary rocks of Unit 1. The only exposed contact with older rocks is with amphibolite of Unit 2 on the Ebbegunbaeg Road. In this locality, the first-deformation fabrics of the two units are continuous across the contact. Elsewhere, fabrics in amphibolite and metasedimentary rocks of Unit 1 have a similar relationship. There does not appear to be any increase in metamorphism toward the foliated granite, but if there was originally an aureole, it is likely to have been obscured either by the subsequent posttectonic metamorphism associated with the North Bay Granite, or by intense deformation in the lower grade part of Unit 1, southeast of Lake Douglas.

Migmatitic gneiss (Unit 13). Migmatitic gneiss is distinguished from partially melted metasedimentary rocks of Unit 1 by the absence of sedimentary layering. There is, in fact, a gradation from Unit 1 metasedimentary rocks into migmatitic gneiss, which, in turn, grades into granodiorite of the North Bay Granite.

The migmatitic gneiss consists of an equigranular, medium grained, biotite–muscovite granite leucosome, and varying proportions of biotite-rich schlieren. There are also xenoliths of psammite and quartzite. The foliation in the gneiss is defined by a preferred orientation of the schlieren, but there is no tectonic fabric within the granite leucosome. The gneiss is commonly cut by muscovite–garnet aplite and pegmatite veins.

North Bay Granite (Units 14, 15 and 16). Two lobes of the North Bay Granite extend westward from the Great Burnt Lake (12A/8) map area (Colman-Sadd, 1985), and the southern one continues southward into the Wolf Mountain (12A/2) map area (Dickson, 1982; Dickson and Delaney, 1984). The principal rock type in the Snowshoe Pond area is medium to coarse grained, gray to pink, feldspar-porphyritic, biotite granodiorite (Unit 14). The K-feldspar phenocrysts are locally absent in the interior parts of the granodiorite, and are not developed where the granodiorite grades into migmatite (Unit 13). In some localities on the north and east shores of Meelpaeg Lake, the phenocrysts are concentrated in crude layers, which are associated with concentrations of xenoliths. The xenoliths consist mainly of quartzite, psammite and biotite–sillimanite schist similar to rock types in Unit 1. They are generally planar and aligned, and are accompanied by round to elliptical inclusions of either biotite–hornblende microgranitoid or diorite.

Unit 15 is exposed south of Snowshoe Pond and is interpreted, from boulder distribution, to underlie the southern part of the map area between the road and the west shore of Meelpaeg Lake. It consists of gray to buff, medium grained, equigranular, biotite–muscovite granite. It contains the same types of xenoliths as the granodiorite, but its relationship to the granodiorite is uncertain.

Unit 16 is not exposed in the Snowshoe Pond area, but its presence is indicated by a concentration of boulders just west of Meelpaeg Lake. It consists of medium grained, equigranular, unfoliated garnet–muscovite granite, and is similar to a phase of the North Bay Granite exposed on the Ebbegunbaeg road in the Great Burnt Lake (12A/8) map area (Colman-Sadd, 1985).

All three units of the North Bay Granite are cut by garnet–tourmaline–muscovite granite pegmatites and aplites. All three are also essentially posttectonic. Although a weak fabric defined by stretched quartz and aligned biotite occurs at the northwestern edge of the granodiorite outcrop area, the intrusion appears to transect one limb of the fold in the foliated granite of Unit 12, and so was probably emplaced in the terminal stages of the second deformation. Foliated xenoliths of Unit 12 occur in the granodiorite at the contact on the Ebbegunbaeg road, and foliated xenoliths of Unit 1 metasedimentary rocks are ubiquitous.

Pegmatite (Unit 17). Very coarse grained, garnet–muscovite granite pegmatite, containing feldspar crystals up to 30 cm long, occurs in a northeast-trending string of exposures, southwest of the Ebbegunbaeg road. They are interpreted to form a single intrusion. A similar pegmatite intrusion, but also containing tourmaline, occurs on the road 1 km to the north, and is probably a separate intrusion. Both intrusions are posttectonic and may be related to the North Bay Granite.

Syenite(?) (Unit 18). Syenite of Unit 18 occurs in a single exposure on the west shore of Meelpaeg Lake in an area that is generally poorly exposed, but is thought to be underlain mostly by granite and granodiorite of Units 14 and 15. The syenite is pink, medium grained, and equigranular, except for a few feldspar phenocrysts. It is composed of pink and white feldspar, green chlorite and/or hornblende, and accessory pyrite. It contains scattered, pink, aphanitic rock fragments. Its relationship to other units is unknown.

Leucogranite (Unit 19). Unit 19 consists of white, medium grained, equigranular leucogranite. It contains quartz, white feldspar and minor amounts of biotite, chlorite and muscovite, and is cut by quartz and quartz–tourmaline veins.

The granite appears from its outcrop pattern to be intrusive into Unit 1, but no contacts are exposed. Its contact with the foliated granite of Unit 12 consists of a zone about 1 km wide in which sills of leucogranite have intruded parallel to the cleavage surfaces in the foliated granite. The leucogranite is brecciated and has a fracture cleavage, but is no more deformed where it intrudes mylonite than where it intrudes moderately foliated granite. Intrusion is therefore considered to postdate the first mylonitic deformation, but it either predates or is synchronous with the second deformation. The relationship of the leucogranite to the North Bay Granite is uncertain.

Gabbro and associated rocks (Unit 20). Unit 20 forms part of an intrusive body that extends westward into the neighbouring Victoria Lake (12A/6) map area. Coward (1966) and Kean (1977) described the intrusion as being layered, showing a variation from peridotite, through troctolite and olivine gabbro, to diorite. Kean (1977) considered biotite granite that intrudes the body to be genetically related.

Within the Snowshoe Pond area, most of Unit 20 consists of two phases of unfoliated, dark-gray gabbro. Of these, a medium grained phase having crystals 2 to 3 mm across is the most important. Its constituent minerals, identifiable in hand specimen, are plagioclase, biotite, pyroxene, amphibole and pyrite. The medium grained phase has slight internal variations in grain size, and subphases so defined have both sharp and diffuse contacts. It contains segregations of quartz surrounded by biotite selvages, and patches of ultramafic rock composed principally of pyroxene and amphibole. It is clearly intrusive into the second main phase, which is gabbro of similar mineralogy, but whose grain size is finer (1 mm or less). Inclusions up to 4 m across of the finer grained phase occur in the medium grained phase. Xenoliths of foliated granite (Unit 12), migmatitic quartzite and semipelite, and coarsely garnetiferous, thinly bedded schist occur in both of the main phases. The xenoliths are generally enclosed in pegmatitic gabbro (Plate 9) that is rich in plagioclase and biotite crystals up to 1 cm across. The pegmatitic gabbro occurs as web-like intrusive veins in both the medium and fine grained phases, and also forms segregations exhibiting sharp and gradational contacts in the medium grained phase. In one locality near the south edge of the intrusion, it contains crystals of red garnet 1 cm across.

A minor phase of particular interest occurs in the brook that flows north into Rodeross Lake. It is composed of coarse grained (1 cm), black pyroxenite containing fine disseminations of pyrite. The phase appears to form a sheet or lens 200 m thick that strikes east–west and is about 300 m inside the southern edge of the intrusion. Its southern contact with the medium grained gabbro is obscured by inclusions of granite and metasedimentary rocks, and by possible veins of granite. Its northern contact appears to be gradational with gabbro, although in one locality a block of pyroxenite was observed to form an inclusion in the gabbro.

Plate 9: *Gabbro of Unit 20 at Rodeross Lake. In the bottom part of the photograph a metasedimentary xenolith is enveloped by pegmatitic gabbro. In the top half, the gabbro is cut by a vein of granite pegmatite that is thought to be genetically related to it.*

Both of the main phases of the gabbro are intruded by quartz–biotite veins and by biotite–chlorite–tourmaline granite pegmatite (Plate 9) containing graphically intergrown quartz and feldspar. These veins and dikes vary from a few centimetres to over a metre in width. They are thought to be genetically related to the gabbro intrusion because of their absence in the country rocks and the occurrence of a few diffuse contacts between pegmatite and gabbro.

The rocks of Unit 20 are undeformed and alteration is only slight and mainly restricted to joints. They contain rafts of previously foliated granite of Unit 12 and metasedimentary rocks of uncertain origin. Their contact with rocks to the south is exposed and clearly intrusive; their contact with the Central Volcanic Belt to the north, however, is not exposed and can only be assumed to be intrusive from the crosscutting map pattern in the Victoria Lake map area (Kean, 1977). Kean (1977) considered the intrusion to be of possible Jurassic age, but conceded that it might also be Devonian or Carboniferous. No new information on its age is available, but it is to be noted that the intrusion is similar to gabbro and associated rocks south of Cold Spring Pond (NTS 12A/1) (Colman-Sadd, 1983, 1984), at Round Pond (NTS 12A/1 and

2D/4) (Colman-Sadd, 1980, 1983), and at Long Pond (NTS 2D/4) (Colman-Sadd, 1980). The similarity is not only in the principal rock types, but also in the association of an ultramafic phase (cf. Round Pond Gabbronorite) and in the nature of crosscutting granite-pegmatite veins. These intrusions have previously been considered to be 'Middle Ordovician or later' (Colman-Sadd, 1980) and 'Devonian or older' (Colman-Sadd, 1984); no reliable evidence is available to control their age more precisely.

Quartz monzonite and associated rocks (not shown on map). Kean (1977) showed an intrusion extending from Valentine Lake in the Victoria Lake (12A/6) map area to the west edge of the Snowshoe Pond map area. It consists principally of quartz monzonite and minor phases of granodiorite, diorite, gabbro and pyroxenite. The outcrop of the intrusion can be projected into the Snowshoe Pond area in the region where the outflow from Quinn Lake crosses the map boundary. However, because there is no exposure and the intrusion was not observed, it is not shown on the map. Exposures of quartz monzonite occur on the Victoria River about 400 m west of the map boundary.

MINERAL POTENTIAL

No mineral occurrences are currently listed on the Newfoundland Department of Mines and Energy Mineral Occurrence Data System for the Snowshoe Pond area. Their absence probably reflects lack of exploration rather than lack of potential, since units containing established showings and prospects extend into the area from the north, south and west. Six potential environments for mineralization are presently apparent.

Tungsten–Molybdenum Mineralization

Wolframite, scheelite, molybdenite and pyrite occur in quartz veins and pegmatites and as disseminations on joint surfaces in the granitoid rocks of the Wolf Mountain (12A/2) map area to the south (Dickson, 1982; Tuach and Delaney, 1986; Tuach, *this volume).* The host rocks of the veins are equivalent to foliated granite of Unit 12 and granitoid rocks of the North Bay Granite (Units 14 to 16), and it is possible that the veins are products of the same late magmatism as pegmatites of Unit 17. There are also reported occurrences of wolframite and molybdenite in gneiss, equivalent to Unit 13, in the unmapped part of the Snowshoe Pond area, between Granite Lake and the Granite Lake road (Tuach and Delaney, 1986). This mineralization is reflected in the Cu, Pb, Zn, Mo, Ag, U and F lake sediment anomalies that extend into the southern part of the area (Butler and Davenport, 1978; Davenport and Butler, 1981).

Mafic Volcanic Rocks and Intrusions

Mafic volcanic rocks (Unit 8) occur at Lake Douglas and at Rogerson and Rodeross lakes. They are associated with mafic dikes and small gabbroic intrusions (Unit 9), and have potential for massive sulfide and precious-metal deposits. The volcanic rocks are locally silicified (e.g., at Louis Lake) and commonly contain pyrite, generally as disseminations, but also as massive and stockwork mineralization (e.g., at Lake Douglas). Pyrite also occurs in silicified shear zones in gabbro at Rodeross Lake. No assays from these occurrences are presently available.

Felsic Volcanic Rocks

The felsic volcanic rocks have potential for massive sulfide and precious-metal mineralization, examples of which occur along strike from the Snowshoe Pond area in the Boundary and Burnt Pond deposits of the Tally Pond volcanics (Kean, 1985). Felsic volcanic rocks that appear to be a direct correlative of the Tally Pond volcanics are included in Unit 7, and consist of crystal and lithic tuff containing minor disseminated pyrite. More extensive outcrops of felsic volcanic rocks occur east of Lake Douglas (Units 4 and 6) and may be more appropriately correlated with the Carter Lake Formation (Kean and Jayasinghe, 1980). Where they are exposed on the southeast shore of Lake Douglas, they contain zones of sericitic alteration containing lenses rich in pyrite; a grab sample from one of these assayed 243 ppb gold.

Psammite and Associated Rocks at Noel Paul's Brook

Rocks included in Unit 3 and exposed northwest of Unit 1 on Noel Paul's Brook consist of psammite, which may have a felsic volcanic origin, amphibolite and limestone. They have been strongly deformed and pyrite is disseminated through all rock types. Although the correlation of these rocks is at present uncertain, the amounts of sulfide and intensity of deformation may indicate potential for lineament-related gold mineralization (Tuach and French, 1986). No assays from these rocks are yet available.

Unit 1 at Ebbegunbaeg Road

Unit 1 generally consists of interbedded quartzite and semipelite, in most places at high metamorphic grade, and would not normally be considered to have much potential for mineralization. An exception is where the unit outcrops at the northern edge of the map area. In this region, it is strongly deformed and contains pyrite and pyrrhotite as disseminations and thin layers. It also includes an exposure of pyritic and hematitic rock just east of the road that may be strongly altered crystal tuff. As in the case of the exposures along Noel Paul's Brook, the unusual amounts of sulfide coupled with the intense deformation suggest the possibility of lineament-related gold mineralization, even though all assays to date have given negative results.

Gabbro and Associated Rocks (Unit 20)

Recent interest in platinum-group elements has encouraged the exploration of some mafic intrusions, particularly those containing ultramafic phases. In this regard, the intrusion at Rodeross Lake should be of particular interest and warrants at least a preliminary investigation because of its layered nature (Coward, 1966; Kean, 1977) and the presence of sulfide-bearing pyroxenite. Coward (1966) reported geochemical and geophysical surveys, as well as drilling, by ASARCO, but no assay results are available. If results in the future are encouraging, attention should also be paid to the similar intrusions in the Cold Spring Pond (12A/1) and Twillick Brook (2D/4) map areas.

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