GEOLOGY OF THE SOUND ISLAND MAP AREA (WEST HALF), NEWFOUNDLAND

by E.M. Hussey

INTRODUCTION

The east half of the Sound Island map area (1M/16) has been mapped by O'Driscoll (1977) and field investigations of the west half were completed during 1977. Previous work includes reconnaissance mapping by Rose (1948) and Anderson (1965), petrographic studies by Keyes (1948), geochemical studies of the granites by O'Driscoll (1973) and Strong *et al.* (1974), and isotopic age dating of the granites by Bell and Blenkinsop (1975, 1977).

GENERAL GEOLOGY

A major geological problem in the area concerns the nature of the relationship between the Love Cove (Jenness, 1963) and Musgravetown Groups (Hayes, 1948). The Love Cove Group was originally defined as a thick sequence of deformed volcanic and sedimentary rocks and equivalent schists. On the basis of evidence to the north in Bonavista Bay, the Musgravetown Group has been interpreted to unconformably overlie the Love Cove Group (Jenness, 1963). Both units are considered to be Hadrynian in age. Anderson (1965) depicted the contact between those groups and their correlatives to be faulted in the northeast and of an undetermined nature in the southern part of the Sound Island map area. Recent investigations by the author to the north in the Port Blandford area indicate that much of what had been considered Musgravetown Group strata is conformable with Love Cove Group rocks there. The present field studies in the Sound Island map area indicate a similar relationship.

Lack of outcrop, faulting, and limited structural data in crucial areas leave the relations of some formations in doubt. Accordingly, some of the units in this report have been numbered to delineate lithologic distinctions rather than relative stratigraphic position.

Love Cove Group (unit 1-3)

This group is tentatively redefined and divided into three informal units of formational rank. This redefinition does not fundamentally alter current ideas on the stratigraphic and tectonic meaning of the group. The Musgravetown Group, as shown outcropping in the west half of the Sound Island map area by Anderson (1965), is included within the expanded Love Cove Group since no significant geologic break could be found to separate them.

Unit 1 is the most extensive areally and probably stratigraphically. It is not clearly divisible in the east and southeast but can be separated into four broad lithologic members in the northwest.

Unit 1

This unit occupies the southeast and northeast portions of the map area and is intruded by the Swift Current pluton. It appears correlative with the Deer Park Pond Formation in the Terrenceville map area (Bradley, 1962). Gray, fine grained, massive to flow banded, largely plagioclase or quartz phyric rhyolites are the dominant lithology. Adjacent to the Swift Current granite, coarsely porphyritic quartz and/or feldspar porphyries with rhyolitic to aplitic matrices and pink felsite with minor granite are more abundant. Porphyritic intermediate flows, massive to amygdaloidal mafic flows and pyroclastics and silicic to mafic crystal-lithic tuffs and minor related sediments are subordinate. These rocks range from relatively massive lithologies to sericite-chlorite schists.

Unit 1a: This areally extensive unit is of indeterminate thickness. It consists of red, gray, and yellow coarse silicic agglomerate (blocks average 20 cm in diameter, up to 1.5 m), crystal-lithic tuffs and flow banded to autobrecciated and massive feldspar phyric rhyolite. Massive to thinly bedded tuffs are associated with minor laminated gray siltstone, red slates and red to green sandstone. Subordinate gray amygdaloidal basalts and basaltic agglomerate are interbedded with, and basaltic blocks occur in, the silicic agglomerates. Minor intermediate volcanics and scattered basic dykes also occur.

Unit 1b: The areal distribution of this member appears to define a broad fold which may be in the order of 400 m thick. It includes fine to medium grained dark gray amygdaloidal basalt and basaltic pyroclastics in which angular to rounded fragments of basalt may be up to 20-30 cm in diameter. Red to purplish, fine grained mafic tuffs are also included in this unit.

Unit 1c: Sediments of a probable fluviatile origin are exposed within the volcanic sequence and are similar to sediments of Unit 3. The unit includes finely laminated reddish purple to gray and buff, slumped siltstones and massive bedded to laminated and cross laminated, commonly normally graded, fine to medium grained sandstones. In the south, quartzitic sandstones host laminae and cross-laminae rich in detrital magnetite. These sediments are hornfelsed adjacent to the Ackley City batholith.

Unit 1d: This lithologic subdivision is disposed in a narrow belt trending northeast from Piper's Hole River. It consists of cleaved sedimentary rocks which appear to be intimately associated with silicic agglomerates of 1a, but are faulted in the southeast against schistose, sericitized silicic crystal tuffs of that unit. These rocks consist of gently to moderately dipping green to light red, cross-bedded, in places laminated, medium grained sandstone to pebble conglomerate. The detrital assemblage consists of rounded to subangular volcanic pebbles (8 cm in diameter) in a matrix containing abundant white feldspar crystal fragments.

Unit 2

This sequence occupies a narrow northeast trending belt (average width approximately 2 km) which is on strike and probably correlative with the Southern Hills and Andersons Cove Formations of the Gisbourne Lake and Terrenceville map areas (Bradley, 1962). It appears to be conformable upon volcanic rocks of unit 1 to the southeast while relationships with volcanic rocks to the northeast are unclear, but are probably conformable.

This unit can be subdivided into two subunits. Unit 2a consists of fine to coarse grained, thinly bedded, laminated, green to gray, minor red, tuffaceous graywacke, graywacke conglomerate, siltstone and very minor slate. Unit 2b consists of lenses of pink to gray often massive rhyolite, lithic tuff, and basaltic agglomertae. Tuffaceous quartzitic and arkosic beds, which may contain laminae and cross laminae rich in detrital magnetite, occur immediately southwest of Pipers Hole River. Silicic volcanic and lesser basaltic detritus are the dominant clast lithologies while rounded, fine to medium grained, clasts of feldspar porphyry and granite occur in the northeast. Silicic crystal-lithic tuffs are abundant in the northeast. Despite the tectonic flattening and crystallization of sericite and chlorite on the steep fabric, numerous sedimentary structures are recognizable (e.g. grading and cross-lamination). Pretectonic dykes of feldspar porphyry, granite, diabase and rhyolite cut these sediments.

Unit 3

These sediments are exposed in the northwest corner of the area. They consist of purplish-gray to buff, festoon cross-bedded, graded, coarse grained to fine grained quartzitic to arkosic sandstone with minor intraformational breccias and interbedded siltstones. A cleavage is preferentially developed in the silty beds.

Swift Current Granite (4a, 4b)

This extensive, composite pluton, almost exclusively intrudes volcanic rocks of unit 1 and bears some textural similarities to the volcanic rocks adjacent to its margin. It is primarily a massive to well cleaved, medium grained pluton which ranges in composition from biotite-hornblende granite (4a) through granodiorite to syenite with minor aplite and hornblende pegmatite. Fine grained, pink granitic porphyries with rounded quartz blebs up to 1 cm long occur near the margins. Scattered granitic dykes apparently related to the pluton occur in the volcanic and sedimentary rocks.

Fine grained to medium grained diorite (4b) occur as isolated plugs within the volcanic and sedimentary rocks. Diabase dike swarms, their attitude commonly conforming to the north trending fabric, intrude sedimentary rocks, volcanic rocks and granite east and northeast of Long Pond.

Ackley Batholith (5)

This large posttectonic pluton is a homogenous, pink, coarse grained to very coarse grained, biotite granite. Volcanic and sedimentary rocks are hornfelsed adjacent to the contacts with development of actinolite and/or green biotite. A relatively fine grained silicic vuggy phase was seen in one small outcrop.

STRUCTURE

In the northwest, the outcrop pattern of mafic volcanic rocks with relatively sparse bedding attitudes appears to indicate a large, gently north plunging structure. Cleavage development becomes more prominent eastward with a progressive increase in the degree of crystallization of chlorite, epidote and sericite in the volcanic rocks and green biotite and sericite in the sedimentary rocks. In the Sandy Harbour River Formation fabric development is axial planar to tight to isoclinal, moderately north plunging folds. No such closures could be defined in volcanic rocks of unit 1, which are massive to schistose. A second cleavage, possibly associated with kinking and minor box folding of S_1 is only locally developed. However, in the area adjacent to the southeasternmost margin of the Swift Current Granite tight folding of the dominant lower greenschist fabric has locally produced a crude composite banding on S_2 in quartz-pyrophyllite-sericite schists. North-northeast, northeast and east-southeast fault sets are important in controlling geological contacts, especially those of the Swift Current Granite. Their dip generally appears steep and many may have a significant strike-slip component.

ECONOMIC GEOLOGY

No exploration activity has been reported from this area in recent years. Some exploration, prospecting, promotional and academic work were done at various times during the first half of the century (Dahl, 1918; Bainbridge, 1934; Howlands, 1938, 1940) on specular hematite showings adjacent to the southeast margin of the Swift Current granite in the Hickey's Pond- Hickey's Brook area.

Minor malachite staining occurs in the Long Pond area in graywackes of unit **2a**. Disseminated pyrite is common and minor pyrrhotite and very minor chalcopyrite occur in mafic volcanics of unit **1** to the northwest of the Swift Current Granite.

Substantial gravel deposits near the mouth of Pipers Hole River are presently being used in road construction.

Volcanic rocks in a narrow belt adjacent to the southeasternmost margin of the Swift Current granite and at several localities farther to the southeast have been reduced to pyrophyllite-quartz and quartz-sericite schists (identification of pyrophyllite by X-ray Diffraction; J. Vahtra, personal communication), with common concordant to semiconcordant quartz veins.

The immediate area of the main Hickey's Pond iron showing is underlain by fine grained, sucrosic, siliceous material disposed in steeply dipping gray to lighter bands up to 2 cm thick. These gray siliceous bands are often separated by a thin selvage composed wholly of white to yellow pyrophyllite and sericite. These minerals define a penetrative fabric parallel to the banding and both are tightly folded on a south plunging axis to produce a steep fracture cleavage. The southwestern portion of the outcrop hosts a white, rusted, pyritic, fine grained nonbanded siliceous rock.

Minor disseminated specular hematite occurs throughout the outcrop while in limited areas, perhaps several metres in diameter, alternate bands are composed of black fine grained specular hematite and a lesser amount of quartz and pink alunite-quartz assemblages. Hematite bands vary from 1 mm to 5 cm in thickness and are of restricted lateral extent.

At Chimney Falls, on Hickey's Brook, 4 km to the south-southeast, quartz-pyrophyllite schists have a gradational contact with relatively massive, but deformed, crystal-lithic tuffs to the immediate northwest. Here, recrystallized quartz, specular hematite and alunite assemblages alternate with the pyrophyllite rich bands.

The other mode of occurrence of specular hematite is within concordant to semiconcordant quartz veins which often contain disseminated specular hematite. They reach their maximum size at the 'main showing". There, the zone of significant hematite mineralization is at the most 2 m wide and of very limited length and unknown depth. The hematite occurs as stringers up to 10 cm thick parallel to the sides of the vein. Irregular masses including quartz and hematite up to 1.3 x 3 m in vertical section occur in the vein with lesser alunite. Hematite occurs as individual bladed crystals up to 4 cm long and as larger rosettes. This vein was trenched and a 9 m shaft sunk on adjacent lower ground (pre-1918). Preliminary X-ray diffraction semi-quantitative analysis shows the northernmost occurrence of quartz-pyrophyllite schist to contain at least 20% pyrophyllite and illite if any sericite (J. Vahtra, personal communications).

Clapp (1914) reported an association between alunite and pyrophyllite and minor base and precious metals in deposits on Vancouver Island which are thought to have genetic affinities with the Manuels, Conception Bay pyrophyllite deposit (Buddington, 1916). Both appear to be metasomatic alterations of silicic volcanic rocks intruded by granitoid plutons with resulting redistribution of SiO_2, NaO, CaO, MgO, Al_2O_3, and iron oxides. It appears then, that the Hickey's Pond specular hematite-alunite- pyrophyllite-quartz-minor sericite mineral assemblage may be the product of metasomatic reactions induced by the intrusion of the Swift Current granite (pretectonically) into Love Cove Group silicic volcanic rocks.

CONCLUSIONS

1. All rocks in the map area are pretectonic with respect to a lower greenschist grade orogenic event except the Ackley batholith, which is dated at 345 ± 5 Ma (Bell *et al.*, 1977). The fabric is variably developed throughout the area. Faulting may have played an active role in the deformation.

2. The Swift Current granite is intrusive into the Love Cove volcanic pile and its suprajacent volcanogenic sediments. There may be a genetic link between the granite and volcanics.

3. Unit 2 is a portion of a relatively continuous sequence of graywackes and tuffaceous sediments which overlie variably deformed volcanic rocks and extend from Clode Sound, Bonavista Bay to the Baine Harbour map area, Burin Peninsula (O'Brien, personal communication).

4. The potential for economic pyrophyllite and possibly precious metal mineralization at the margins of the Swift Current granite may be significant.

5. Mr. Elias Pardy is a fine cook (pies and bread are excellent; gravy not at all lumpy; accomplished speaker; hewer of wood, drawer of water).

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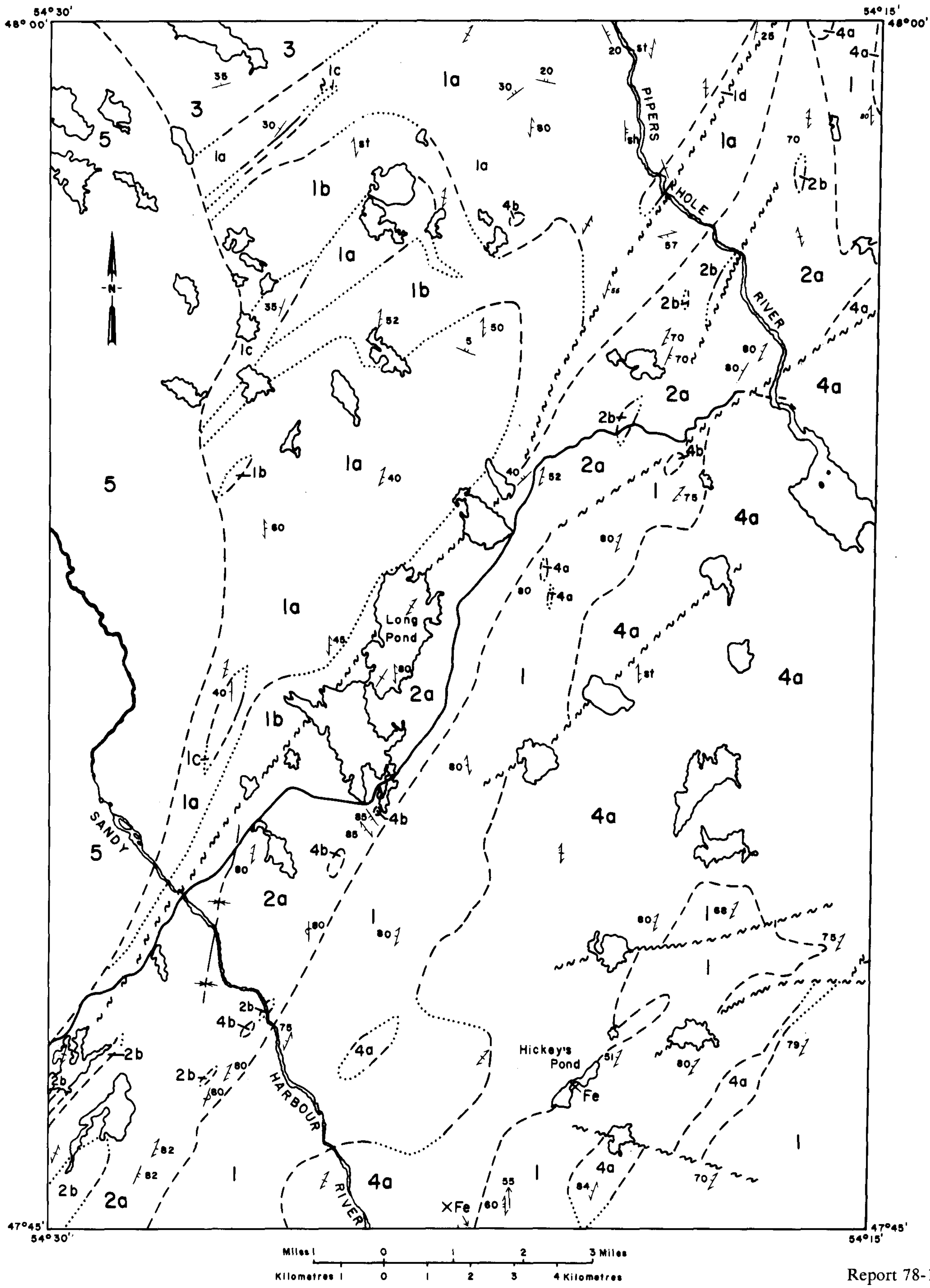
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LEGEND

DEVONIAN

5 — **ACKLEY CITY BATHOLITH:** *Massive, pink, coarse grained to megacrystic biotite granite.*

CAMBRIAN OR EARLIER

4 — **SWIFT CURRENT GRANITE: 4a,** *Medium grained biotite-hornblende foliated to massive, granite, granodiorite, syenite; minor aplite;* **4b,** *fine to medium grained diorite and minor diabase.*

HADRYNIAN OR EARLIER

LOVE COVE GROUP

3 — *Light purple fluviatile sandstone and finely laminated shale.*

2 — **2a,** *Thinly bedded to laminated, graded to cross-laminated, green to gray graywacke, graywacke conglomerate, siltstone; minor quartzitic and arkosic beds in places with thin magnetite rich laminae and cross laminae;* **2b,** *lenses of pink to gray felsite and lithic tuff; minor basaltic agglomerate.*

1 — *Quartz and/or feldspar porphyries; fine grained, gray quartz and/or feldspar phyric rhyolites; basalts and basaltic pyroclastics; prophyritic intermediate (?) flows; pink felsite and minor granite adjacent to Swift Current Granite; abundant crystal-lithic tuffs in southeast;* **1a,** *silicic red-gray agglomerates, lithic to crystal tuffs, and red, massive, feldspar phyric, flow banded rhyolite; minor intercalated green sandstones and red siltstones, and basaltic flows and pyroclastics;* **1b,** *amygdaloidal, medium gray basaltic flows and red-gray basaltic agglomerates and tuffs; minor rhyolite;* **1c,** *thin intercalations of light to purplish fluviatile sandstone and siltstone;* **1d,** *green, thin to medium bedded graywacke and graywacke conglomerate.*

SYMBOLS

Geological Contact (defined, approximate, assumed)
Fault (defined, approximate, assumed)
Bedding, tops known (inclined, overturned)
Bedding, tops unknown (inclined, vertical)
Schistosity, cleavage, S_1 (inclined, vertical)
Schistosity, cleavage, S_2 (inclined)
Syncline
Mineral occurrence