GEOLOGY OF THE NOEL PAUL'S BROOK AREA (12A/9), NEWFOUNDLAND

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INTRODUCTION

1:50,000 scale geological mapping of the Noel Paul's Brook area (12A/9), central Newfoundland, was completed in the 1978 field season. The area, especially the northern half, can be reached by a network of logging roads. The southern part is best reached by helicopter and float plane.

The area was previously mapped on a scale of 1:250,000 by the Geological Survey of Canada (Williams, 1970) and has been explored for base metals by several mining companies. The southwestern part of the area has been the subject of an M.Sc. study (Mullins, 1961).

GENERAL GEOLOGY

The map area lies in the eastern marginal part of the Newfoundland Central Volcanic Belt (Kean, 1977a). For the most part it is underlain by sedimentary and volcanic rocks, some of which represent an eastward continuation of the Middle Ordovician (and earlier?) Victoria Lake Group (Kean, 1977b). The sediments have been metamorphosed to produce a terrain of paragneisses in the south. A northeast trending fault separates the paragneisses from a group of ultramafic rocks in the extreme southeastern part of the map area. A band of sandstone and conglomerate in the central part of the area contains clasts of the sedimentary and the volcanic rocks and is probably the youngest sedimentary unit present.

Gabbro, granodiorite, granite and a suite of diabase dikes constitute the intrusive rocks in the map area.

Twelve different lithological units have been recognized in the map area. In this report, the successive numbers do not define a stratigraphic sequence.

Unit 1.

Unit 1 underlies the extreme southeast corner of the map area. Excellent exposures of this unit occur north of Atlantic Lake and near the southern part of North Great Rattling Brook. It consists of medium grained gabbro, pyroxenite and minor diorite. Contacts between the different lithologies are not exposed but are probably gradational or intrusive. The unit has been metamorphosed, with most of the pyroxenes in the gabbro and pyroxenite converted to amphiboles. Veinlets of asbestos occur in the pyroxenite.

Unit 1 is deformed and has a strong northeast trending, steeply dipping cleavage which is most intense adjacent to the fault that separates the mafic rocks from the paragneisses of Unit 2.

The rocks of unit 1 are part of a large mafic - ultramafic complex that extends beyond the map area and that may represent a fragment of Ordovician ocean floor.

Unit 2.

Unit 2 underlies the southern part of the map area and is not well exposed. It consists of medium grained psammitic and semipelitiic paragneiss. The gneiss shows a well developed thin banding produced by alternating quartz-feldspar rich and biotite rich layers. Commonly, the banding has been folded to produce tight to isoclinal minor folds. Also present are quartz veins that have cut the banding and have been deformed with it to form minor folds and boudins. An east-northeast trending moderate to steeply dipping foliation occurs axial planar to the minor folds.

The gneisses have been metamorphosed to amphibolite grade; garnets are developed throughout and

andalusite occurs locally. The metamorphic grade decreases to the north and the gneisses pass into lower metamorphic grade rocks of Unit 3 over a distance of 0.5 to 1 km.

Unit 3.

This unit forms a 1 to 2 km wide northeast trending belt that, for the most part, lies to the south of and adjoining Noel Paul's Brook. Excellent exposures of the unit occur along the river and in the lower reaches of the major tributaries.

Unit 3 consists of greenish to gray phyllite, siltstone, sandstone and minor conglomerates, tuffaceous beds and black shales. These rock types are interbedded on a scale of a few centimetres to 2-3 m. The conglomerates occur as lenses and consist mainly of quartz pebbles set in a sandy matrix. The black shales occur as 1 to 4 m wide bands, mainly in the eastern part of the unit. The tuffaceous beds occur mostly in the area south of Carter Lake and Trail Pond.

The siltstones invariably exhibit distinct bedding marked by light and dark layers. The beds range from a few millimetres to 2 cm in thickness. Commonly, the bedding is tightly folded with the development of an east-northeast trending, moderately to steeply dipping cleavage axial planar to the folds. The same cleavage is well developed in the shales and the phyllites in the unit. The sandstone beds do not show the fabric but commonly show "pinch and swell" structures; in places thinner beds have been folded.

Stratigraphic tops could not be determined.

The unit has a greenschist facies metamorphic grade except in the part that lies in the eastern half of the map area. There it has been contact metamorphosed, is darker in color and contains numerous small (<1 mm diameter) cordierite spots.

Unit 4.

Unit 4 underlies the northwestern part of the map area. It is poorly exposed. The unit undergoes a facies change from north to south. In the north it consists mostly of graywacke with minor conglomerate and siltstone, whereas in the south it consists mainly of siltstones with cherty horizons. A few black shale outcrops were found in the northern part of the unit. The graywacke consists of angular to subrounded quartz and feldspar grains and lithic fragments. In places it shows graded bedding and scour marks. The conglomerate contains rounded quartz pebbles and angular dark shale fragments in a sandy matrix.

The unit shows a variably developed east-northeast striking cleavage which is most pronounced in the shales. The attitudes of bedding and stratigraphic tops indicate that the unit has been folded around east-northeast trending fold axes.

The metamorphic grade of the unit is in the greenschist facies.

Unit 5.

All the basic and intermediate volcanic rocks in the area have been tentatively grouped under Unit 5, which is subdivided into 5a and 5b. The prominent mafic volcanic rock band, that stretches across the map area and bounds Unit 3 in the north constitutes subunit 5a. The other mafic and intermediate volcanic rocks that occur as irregular lenses and discontinuous bands, mainly in the northern half of the area, form subunit 5b.

Subunit 5a is fairly well exposed and gives rise to a number of prominent steep hills. It is composed mainly of fine to coarse grained mafic tuff, massive mafic flows and mafic pillow lava. Some of the pillows reach up to 1 m in diameter. Minor lenses of light gray impure limestone are locally interbedded with the mafic volcanic rocks. Subunit 5a shows a well developed east-northeast trending, steeply dipping cleavage. It has a conformable contact with Unit 3, but its relationship with the units to the north is not known.

Rocks of subunit 5b are not well exposed but at many places the occurrence of angular float of mafic volcanic rocks has been interpreted as sub outcrop. This assumption has been substantiated by drill hole data at some localities. Sub-unit 5a ranges from basaltic to andesitic in composition. Coarse breccias and agglomerates are common. Tuffs, massive flows and mafic pillow lava are present in places. Subunit 5b has a locally well developed fabric. No limestones were found in this subunit.

For the most part, subunit 5b occurs intercalated with the rocks of Unit 4 and the felsic volcanic rocks of Unit 6.

Unit 6.

The felsic volcanic rocks in the map area have been grouped under Unit 6. They form two northeast trending volcanic belts the Carter Lake belt (subunit 6a) in the south, which is intercalated with Unit 3, and the Tally Pond belt (subunit 6b) in the north, which is intercalated with Unit 4.

Subunit 6a extends from west of Trail Pond to northeast of Carter Lake. It consists mostly of quartz porphyry, quartz-feldspar porphyry and fine to coarse grained tuff. These rocks have a well developed east-northeast trending steeply dipping cleavage.

The Tally Pond belt extends from west of Tally

Pond to east of Cripple Back Lake. The felsic volcanic rocks in this belt occur as lenses and discontinuous bands. Except in the areas northeast of Tally Pond and south and southeast of Cripple Back Lake they are not well exposed. In the above localities they consist of coarse breccias and fine to coarse tuff. Subunit 6b does not show a penetrative fabric.

Unit 7.

Unit 7 is a poorly exposed belt of conglomerate, sandstone, graywacke and siltstone that extends from south of Tally Pond to east of Sandy Lake. The conglomerate contains subrounded to round clasts of the sedimentary and the volcanic rocks of units 3 to 6. The clasts, ranging from a few centimetres to 30 cm in diameter, are contained in a sandy matrix. The sandstone is light gray in color and at places contains thin silty or shaly layers. The graywacke contains abundant small lithic fragments and commonly occurs interbedded with 3 to 30 cm thick siltstone layers. At places the rocks show an east-northeast trending cleavage.

Contact relationships between Unit 7 and the adjacent sedimentary and volcanic rock units are not known. However, as it contains clasts of the latter types, Unit 7 is probably the youngest sedimentary unit in the map area.

Intrusive rocks (Units 8, 9, 10, 11 and 12)

The intrusive rocks in the area range from granitic stocks to a suite of diabase dikes.

Unit 8 consists of two small medium grained gabbros that intrude Unit 4 in the northwest corner of the map area.

An east-northeast - west-southwest elongated body of medium to coarse grained quartz monzonite-granodiorite underlying the Cripple Back Lake-Middle Pond area in the northeast corner of the map area constitutes Unit 9. Unit 9 intrudes the mafic and felsic volcanic rocks of subunits 5b and 6b, with which it may have a comagmatic relationship.

Unit 10 is a large coarse grained biotite granite underlying the southeastern part of the map area. It contains muscovite and/or garnet in places. Unit 10 intrudes the gneisses of Unit 2 and the mafic volcanic rocks of subunit 5a.

Unit 11 is a coarse grained biotite granite at the southern margin of the map area. It is part of a larger granite body that occurs to the south of the present map area. Unit 11 resembles Unit 10 in lithology and has been emplaced into Unit 2.

An elongated, medium to coarse grained, biotite granite intruding Units 2 and 3 in the southwestern part of the map area constitutes Unit 12. It appears to contain a lesser amount of biotite than Units 10 and 11.

A suite of east-southeast trending diabase dikes intrudes Units 2 and 12 in the southwestern corner of the map area. These dikes are fine grained and in places contain plagioclase phenocrysts. Chilled margins are common.

The intrusive rocks in the area do not show any penetrative fabric.

ECONOMIC GEOLOGY

Mineralization in the map area occurs within the mafic and felsic volcanic rocks of Units 5 and 6, especially in the Tally Pond volcanic belt. A mineralized zone was found in felsic volcanic rocks of this belt southeast of Burnt Pond (Dimmell, 1974). This zone contains disseminated grains and fracture fillings of pyrite, chalcopyrite, galena and sphalerite. Elsewhere in the belt the rocks commonly carry disseminated pyrite, chalcopyrite and sphalerite. Float containing pyrite, chalcopyrite and sphalerite occurs at Tally Pond and at a few other places within the Tally Pond volcanic belt.

The quartz monzonite-granodiorite intrusion (Unit 9) underlying the Cripple Back Lake area is probably comagmatic with Tally Pond volcanic rocks and may have a high potential for mineralization. In a few places near Cripple Back Lake , fractures in the intrusions were found to contain pyrite and chalcopyrite. This intrusion may also be favorable for uranium and molybdenum.

Mafic volcanic rocks of subunit 5a contain disseminated pyrite and pyrrhotite. Veinlets of asbestos were found in subunit 5a and in Unit 1 rocks.

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REFERENCES

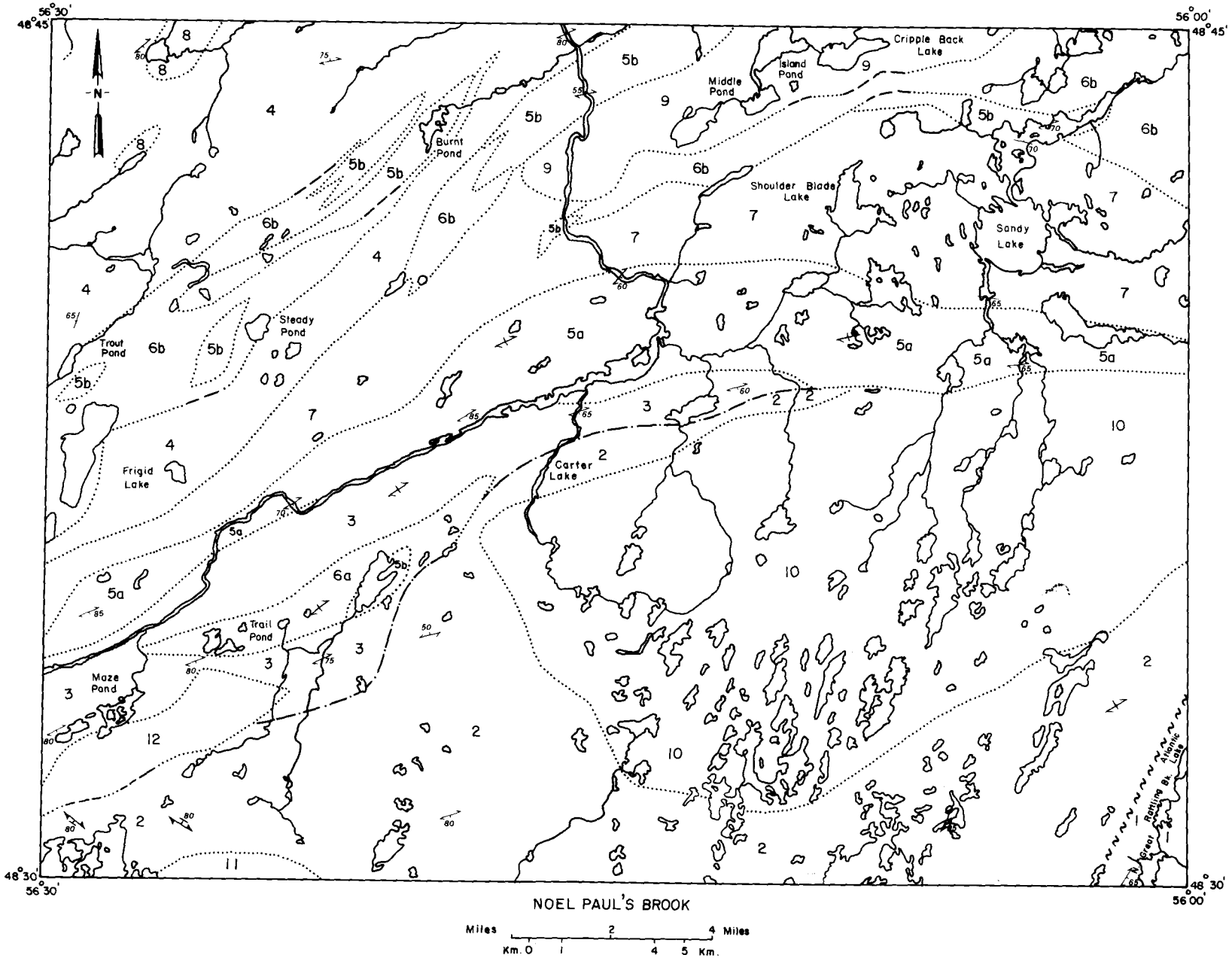
Dimmell, P.M.

1974: Report on claims 5785-5804, 5816-5941; Noel Paul's Brook area (12A/9W). Unpublished private report, Noranda Exploration Company Limited.

Kean, B.F.

1977a: Geological compilation of the Newfoundland Central Volcanic Belt. Newfoundland Department of Mines and Energy, Mineral Development Division, Map 7730.

1977b: Geology of the Victoria Lake map area



(12A/6), Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 77-4.

Mullins, J.

1961: Geology of the Noel Paul's Brook area, central Newfoundland. M.Sc. thesis, Memorial University of Newfoundland.

Williams, H.

1970: Red Indian Lake sheet, east half, Newfoundland. Geological Survey of Canada, Map 1196A.

LEGEND

DEVONIAN OR EARLIER(?)

12 *Medium to coarse grained biotite granite.*

11 *Coarse grained biotite granite.*

10 *Coarse grained biotite granite, containing garnet and muscovite in places.*

9 *Medium to coarse grained quartz monzonite and granodiorite.*

8 *Medium grained gabbro.*

SILURIAN AND EARLIER (?)

7 *Siltstone, sandstone, graywacke and conglomerate.*

6 *Acidic volcanic rocks:* **6a,** *Quartz porphyry, quartz-feldspar porphyry and tuff;* **6b,** *rhyolite, tuff and coarse breccia.*

5 *Basic volcanic rocks: Mafic tuff, pillow lava and flows.*

4 *Siltstone, graywacke, minor conglomerate and black shale.*

3 *Phyllite, siltstone and sandstone.*

2 *Garnet-biotite gneiss.*

1 *Metagabbro and pyroxenite.*