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GEOLOGY OF THE MOUNT PEYTON MAP AREA (NTS 2D/14), CENTRAL NEWFOUNDLAND

W.L. Dickson, P.Geo.
Newfoundland Mapping Section

ABSTRACT

The Mount Peyton map area (NTS 2D/14) in central Newfoundland, lies within the Exploits Subzone of the Dunnage Zone. The area is dominated by the postkinematic, Silurian to Devonian Mount Peyton intrusive suite, which is composed of pyroxene ± hornblende ± biotite gabbro that has been intruded, at a high level, by biotite ± hornblende granite. The country rocks (southeast of the Mount Peyton intrusive suite), comprise folded and cleaved turbidites of the Middle Ordovician Davidsville Group and possibly Late Ordovician turbidites, similar to the Point Leamington Formation, which are intruded by the Mount Peyton intrusive suite. To the east, the country rocks are Silurian in age, thin-bedded, and locally, micaceous sandstones and siltstone. Bivalves, collected from just east of the map area, indicate that they may be as young as Late Silurian. These Silurian strata are possible correlatives of the Indian Islands Formation rather that the Botwood Group as previously shown.

West of the Mount Peyton intrusive suite, the sedimentary rocks form a ridge of migmatite and black psammite hornfels that are assigned to the Early Silurian Samson Formation. To the west, in probable fault contact with the Samson Formation, the sedimentary rocks of the Silurian Botwood Group show little effect of contact metamorphism. The Botwood Group comprises a sequence of tightly folded and cleaved, red and green, shallow-water siltstone, sandstone and conglomerate of the Wigwam Formation that overlie cleaved basalt of the Lawrenceton Formation.

Mineralization in the map area comprises gold–pyrite–arsenopyrite showings in gabbro near the eastern margin of the suite and dilational polymetallic quartz veins in the Wigwam Formation that locally contain visible gold. The gabbro in the suite is being assessed as a source of dimension stone.

INTRODUCTION

The Mount Peyton map area (NTS 2D/14) is located in central Newfoundland, approximately 20 km east of Grand Falls. Access to the area is gained from the Bay d'Espoir Highway (Route 230) and the various forest access roads off this and the Trans-Canada Highway, located a few kilometres north of the map area, at Jumpers Brook, Rattling Brook and Glenwood. These roads provide direct access to about half of the map area and provide starting points for foot and boat traverses. The current road network is shown in Dickson (1992a).

The ridges in the western half of the map area are fairly well exposed but access is hindered by cliffs, blown-down trees and burned-over forest. Outcrop is also good where road construction has removed the till cover and along river sections in the eastern part of the map area. Much of the low ground in the eastern part of the map area is covered by thick deposits of glaciofluvial and fluvial deposits. The vast plateau of gently undulating, till-covered, boggy ground, located south of Mount Peyton was surveyed by helicopter. Outcrop in this area was generally found only on the tops of low hills.

This report is the second of three on a project to map and sample for geochemical analysis, the NTS map areas 2D/11W, 2D/14 and part of 2E/3, and also parts of adjacent map areas that contain segments of the Mount Peyton intrusive suite. Another aspect of the project is the production of computer-generated geological maps using the computer programs FIELDLOG, developed by Boyan Brodaric of the Geological Survey of Canada, and AUTOCAD. This resulted in the generation of a comprehensive dataset and a trial coloured geological map displayed at the Newfoundland Department of Mines and Energy Open House (October, 1992).

REGIONAL SETTING

The Mount Peyton map area (Figure 1) is located entirely within the Exploits Subzone of the Dunnage Zone (Williams *et al.*, 1988). The map area is dominated by the central part

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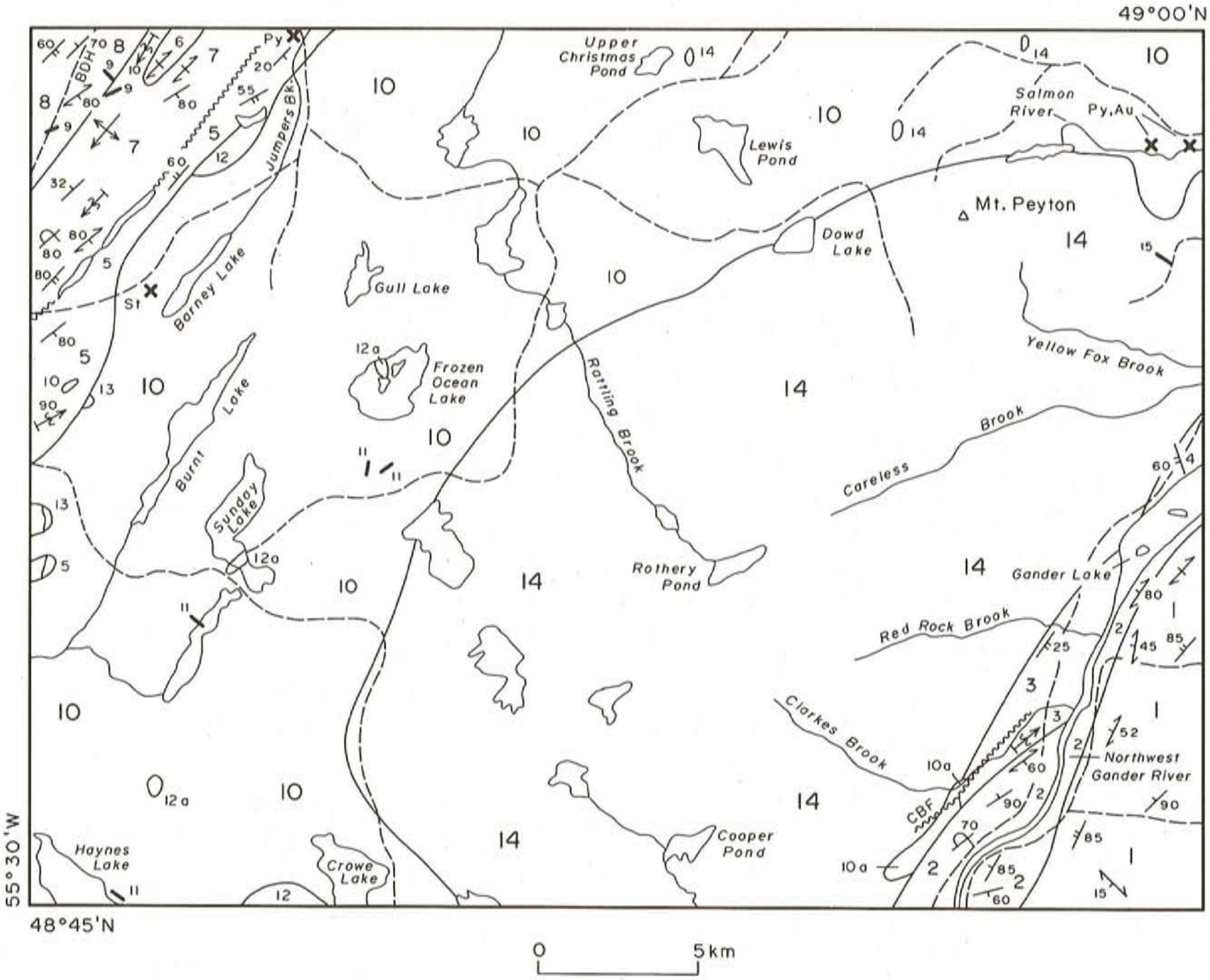

Figure 1. *Geological map of the Mount Peyton (NTS 2D/14) map area.*

of the extensive postkinematic Silurian–Devonian Mount Peyton intrusive suite (term 'Mount Peyton intrusive suite' informally introduced by Blackwood, 1982) that has intruded the folded and cleaved, unnamed Ordovician strata, the Silurian Botwood Group and other possible Silurian strata. The southeastern part of the map area is underlain by the Middle Ordovician Davidsville Group (Unit 1), which is the oldest dated unit in the map area (see Blackwood, 1982).

PREVIOUS WORK

The earliest geological survey in the Mount Peyton map area was carried out by J.P. Howley in 1875 (see Murray and Howley, 1881), who noted the presence of steeply dipping sandstone and slate along the Northwest Gander River. The next survey was carried out by the Photographic Survey Corporation (Baird *et al.*, 1951), who briefly described the extensive gabbroic and granitic rocks that had intruded sedimentary rocks. Anderson and Williams (1970) included the entire Mount Peyton map area in their 1:250 000-scale map of the Gander Lake (NTS 2D west half) map area. Most of the sedimentary rocks adjacent to the gabbro–granite complex were assigned to the Silurian Botwood Group, but an area of greywacke and associated conglomerate and siltstone along the lower part of the Northwest Gander River was considered to be possibly as old as Ordovician and an area of greywacke and slate to the southeast was shown to be Ordovician.

The gabbro–granite intrusion was informally named the Mount Peyton pluton by Strong *et al.* (1974) following a lithogeochemical survey of the northern part of the pluton in NTS map areas 2D/14 and 2E/3. The geochemical data indicated that the pluton was distinctly bimodal with only a few intermediate silica values reported. Subsequent work by Strong (1979) and Strong and Dupuy (1982) indicated that the Mount Peyton intrusive suite contains mantle material represented by the gabbro and that the granite was formed by crustal anatexis due to intrusion of the gabbro. The few intermediate compositions are considered to be the result of magma mixing and/or contamination of the mafic magma by sedimentary country rocks.

LEGEND (for Figure 1)

DEVONIAN or YOUNGER

15 *Diabase dyke*

SILURIAN and DEVONIAN

MOUNT PEYTON INTRUSIVE SUITE (Units 10 to 14)

14 *Pink, massive, equigranular, medium- to fine-grained, locally miarolitic, leucocratic, biotite granite*
13 *Buff, massive, equigranular, fine-grained, leucocratic, biotite granite*
12 *Grey, massive, equigranular, medium-grained, mesocratic, biotite granodiorite;* **12a,** *buff, massive, equigranular, fine-grained, biotite granite and granodiorite*
11 *Diabase and gabbro dykes*
10 *Grey, massive, equigranular, fine to medium grained, mesocratic, pyroxene ± hornblende ± biotite gabbro;* **10a,** *medium-grained metagabbro*
9 *Equigranular, massive and amygdaloidal, diabase dykes*

West of Mount Peyton Intrusive Suite

SILURIAN

BOTWOOD GROUP (Units 6 to 8)

Llandovery to Ludlow (?)

Wigwam Formation (Units 7 and 8)

8 *Red, green and grey, cleaved, medium- to thick-bedded sandstone and siltstone commonly containing rippled surfaces; minor volcanic pebble and cobble conglomerate*
7 *Thin-bedded, red and green, cleaved sandstone and siltstone*

Llandovery

6 Lawrenceton Formation *Grey, cleaved amygdaloidal basalt*

LATE ORDOVICIAN TO EARLY SILURIAN?

5 Samson Formation *Black and grey, biotite (± cordierite ± andalusite) sandstone hornfels and migmatite locally cut by abundant gabbroic and granitic dykes and veins*

East of Mount Peyton Intrusive Suite

LATE SILURIAN AND OLDER?

Pridolí

4 *Grey and red, medium-bedded sandstone and minor grey slate*

?Wenlock or younger

3 *Grey, red and cream, cleaved, thin-bedded, micaceous sandstone and siltstone and local grey, thick-bedded sandstone*

LATE ORDOVICIAN?

2 *Grey and green, poorly cleaved, medium- to thick-bedded, feldspathic sandstone and well-cleaved, grey siltstone*

MIDDLE ORDOVICIAN

1 DAVIDSVILLE GROUP *Grey to black, well cleaved, medium-bedded sandstone, siltstone and slate*

SYMBOLS

Geological contact
Bedding (tops known, unknown, overturned, vertical)
Cleavage (inclined, vertical)
Fold axis (with plunge)
Syncline, anticline
Fault
Showings (gold, pyrite) and dimension-stone quarry .... *Au Py St*
Forest access roads

GL.........Gander Lake	*CBF......Clarks Brook Fault*
NGR......Northwest Gander River	*BDH......Bay d'Espoir Highway (Route 360)*

Table 1. Published radiometric ages for the Mount Peyton intrusive suite. Ages have been recalculated to currently-used decay constants, where necessary (from Mandville, 1989)

Rock type[1]	Age (Ma)	Method	Location	Reference
Diorite	418 ± 21	K−Ar biotite	Burnt Lake	Wanless *et al.*, 1965
Granodiorite	270 ± 52	K−Ar hornblende	NW Gander R.	Wanless *et al.*, 1967
Granodiorite	369 ± 21	K−Ar biotite	Rattling Lake	Wanless *et al.*, 1967
Granite, gabbro	380 ± 30 390 ± 15	Rb−Sr whole rock Rb−Sr whole rock	N. end pluton	Bell *et al.*, 1977 revised by Bell and Blenkinsop, *in* Reynolds *et al.*, 1981
Granodiorite	428 ± 5[2]	Ar−Ar biotite	Frozen Ocean L.	Reynolds *et al.*, 1981
Gabbro	423 ± 5	Ar−Ar hornblende	Trans-Canada	Reynolds *et al.*, 1981
Gabbro	417 ± 5	Ar−Ar biotite	Trans-Canada	Reynolds *et al.*, 1981
Gabbro	410 ± 5	Ar−Ar hornblende	Trans-Canada	Reynolds *et al.*, 1981
Gabbro	414 ± 5	Ar−Ar biotite	Trans-Canada	Reynolds *et al.*, 1981
Gabbro incl.	412 ± 8	Ar−Ar biotite	Trans-Canada	Reynolds *et al.*, 1981
Gabbro incl.	400 ± 7	Ar−Ar hornblende	Trans-Canada	Reynolds *et al.*, 1981
Granitic matrix	422 ± 8	Ar−Ar biotite	Trans-Canada	Reynolds *et al.*, 1981

Notes: [1] rock types as reported in original paper
[2] considered to be anomalously high by Reynolds *et al.* (1981).

Wanless *et al.* (1965, 1967) provided the first radiometric ages for the gabbro and granite of the Mount Peyton intrusive suite (Table 1). Bell and Blenkinsop (1975) and Bell *et al.* (1977) dated some of the granite samples collected by Strong *et al.* (1974). This date was subsequently revised and is reported in Reynolds *et al.* (1981; see Table 1) along with new Ar−Ar dates for the suite. These dates clearly indicated that the gabbro is Late Silurian in age. However, layered gabbro to the south, in the Eastern Pond map area (Dickson, 1992b), has been dated as mid-Silurian (U−Pb zircon; G. Dunning, personal communication, 1992). No satisfactory dates have been obtained from the granite but dating of zircons from the granite at Red Rock Brook (in progress) should provide an age date.

Lapointe (1979) and Reynolds *et al.* (1981) carried out paleomagnetic studies of the Mount Peyton intrusive suite and the adjacent formations of the Botwood Group. Their results indicated that the poles for the granite and gabbro do not match the stable North American poles at 400 Ma. Furthermore, the Mount Peyton gabbro pole did not match the Mount Peyton granite pole. The difference in their positions was interpreted to be possibly the result of remagnetization at some unknown time.

Blackwood (1980, 1982) described the sedimentary rocks in the southeastern part of the Mount Peyton map area, but no detailed mapping of the presumed Silurian strata was carried out. The sedimentary rocks immediately east of the Mount Peyton intrusive suite were included in the Silurian Botwood Group and those farther east form part of the Middle Ordovician Davidsville Group. The eastern contact of the intrusive suite was precisely defined.

Tomlin (1982) carried out a detailed assessment of the dimension-stone potential of parts of the gabbroic portion of the Mount Peyton intrusive suite. The Borney Lake area was examined in detail along with areas immediately to the north in NTS map area 2E/3.

Regional lake-sediment geochemical surveys were carried out by Davenport and Butler (1981) and Davenport *et al.* (1988). The later report indicated that the eastern part of the Mount Peyton map area was particularly anomalous in Au, As and Sb. Also, the Mount Peyton map area was covered by a combined airborne gamma-ray spectrometric, VLF, and magnetic survey in 1987 (Geological Survey of Canada, 1989).

Surveys by exploration companies are described in the section on economic potential at the end of the manuscript.

The adjacent map areas have been mapped at a scale of 1:50 000. These are NTS 2D/11E by Blackwood (1981) and NTS 2D/11W by Dickson (1991), NTS 2D/13 by Kean and Mercer (1977), NTS 2D/15 by Blackwood (1982), NTS 2E/2 by Evans *et al.* (1992) and part of NTS 2E/3, north of the

Mount Peyton intrusive suite, by O'Brien (1992a). A compilation map of NTS 2E/3 was published by Dean (1977).

UNIT DESCRIPTIONS

UNIT 1: DAVIDSVILLE GROUP

The Davidsville Group is located in the southeastern part of the map area and has not been examined in detail in this study. Blackwood (1982) indicates that the unit consists mostly of well-bedded, fine- to coarse-grained, grey to greyish-black sandstone associated with interbedded siltstone and slate. These sediments contain partial Bouma sequences indicative of both proximal and distal turbidites. The common clasts include clear quartz grains and saussuritized plagioclase feldspar, fragments of sedimentary and mafic volcanic rocks. Rarer clasts are biotite, muscovite and tourmaline.

Blackwood (1982) notes that graptolites at Glenwood (identifications taken from Williams, 1972) indicate that the unit is of Middle Ordovician age. Graptolites collected from slate laminations in graphitic chert in a slate–siltstone–sandstone sequence on Careless Brook (just east of the map area) indicate a late Llandeilo or early Caradoc age (see Williams, *this volume*) for the top of Unit 1 where it is in fault contact with the Upper Silurian sandstone of Unit 4 (Boyce and Ash, 1992).

Blackwood (1982) describes this unit of the Davidsville Group as tightly folded with a well-developed, steeply dipping slaty cleavage. Metamorphism is in the lower greenschist facies and is represented by chlorite and sericite index minerals.

UNIT 2: UPPER ORDOVICIAN? SANDSTONE AND SLATE

A sequence of well-bedded, medium- to thick-bedded sandstone and minor slate (Unit 2) is exposed between the Northwest Gander River and just south of Clarks Brook. This unit is here separated from the Botwood Group of Blackwood (1982) on the basis of rock type and structural complexity. The contact of this unit with the Davidsville Group is not exposed, but Blackwood (1982) suggested a conformable relationship mainly on the basis of parallelism of bedding and cleavage. Anderson and Williams (1970) note that fossils collected from this unit, along the Northwest Gander River, were either indeterminate or of a wide stratigraphic range, e.g., *Favosites* sp.

On the Northwest Gander River, Unit 2 comprises an exposed sequence of parallel-bedded, laminated, medium-grained, green-grey sandstones. This sequence contains the fossiliferous strata noted above. To the north of the river, the sequence contains thick-bedded sandstone and minor thin- to medium-bedded, grey slate and siltstone. Plagioclase fragments are common. Sedimentary features include parallel and crosslaminations, ripped-up clasts, graded beds, scours and rare slump folds. These features are indicative of proximal turbidites.

Bedding is steeply dipping and is commonly overturned to the northwest. Tight folds of bedding plunge steeply to the northeast and the axial-planar cleavage dips steeply to the southeast. Throughout the sequence the cleavage is steeply dipping and trends northeastward (Plate 1).

Plate 1. *Steeply dipping sandstone of Unit 2 cut by granite dykes of the Mount Peyton intrusive suite, west of the Northwest Gander River. Lens cap is 5 cm in diameter.*

Based on observations in the map area and to the south (see Dickson, 1992b), this unit is very similar to the Point Leamington Formation (Williams, 1991) and Late Ordovician age is tentatively assigned to Unit 2.

UNITS 3 AND 4: SILURIAN SEDIMENTARY ROCKS EAST OF THE MOUNT PEYTON INTRUSIVE SUITE

Units 3 and 4 are located on the eastern side of the Mount Peyton intrusive suite and were assigned by previous workers (including Dickson, 1992c) to the Silurian Botwood Group, which locally contains similar rock types. Silurian fossils have been found in the map area in Unit 4 (see Blackwood, 1982). Along Careless Brook, 300 m to the east of NTS map area 2D/14, Unit 4 contains abundant fossils including corals, brachiopods, crinoids, bryozoa, bivalves, trilobites and trace fossils. Boyce and Ash (1992) and Boyce *et al.*, *(this volume)* reported four new bivalve localities from Careless Brook that contain *Orthonota ?simulans* Billings, 1874, *Modiolopsis* sp., as well as *Cuneamya arata* (Hall, 1860). The latter is noted by Boyce and Ash (*op. cit.*) to be a distinctive latest Silurian (Přídolí) bivalve species that also occurs in the Stonehouse Formation of the Arisaig district of Nova Scotia (McLearn, 1924). Boyce and Ash (*op. cit.*) also note that this horizon on Careless Brook may represent the youngest Silurian known in central Newfoundland.

By extrapolating recent work by Currie (1992) and H. Williams (personal communication, 1992) to the north in NTS map area 2E/7, into map areas NTS 2E/2 and 2D/15, the Botwood Group may not extend as far east in NTS map areas 2E/2 and 2D/15 as indicated by previous workers (e.g., Blackwood, 1982; Evans *et al.*, 1992). These eastern former units of the Botwood Group would be part of the Silurian Indian Islands Group following Currie (1992). The descriptions of the formations within this group are similar to those exposed west of the Northwest Gander River and Units 3 and 4 are tentatively correlated with the Indian Islands Group.

Unit 3 is composed mainly of thick sequences of parallel, thin beds (2 to 10 cm) of cream, grey, green and minor red, variably micaceous sandstone and siltstone. Locally, the strata include medium- to thick-bedded, grey sandstone. Sedimentary features include parallel laminations, rare crosslaminations, and fine-grained graded beds. These strata are highly folded and contain at least two generations of folds and associated cleavages. Bedding is steeply dipping and is commonly overturned to the northwest. Fold axes and intersection lineations indicate that the folds plunge gently to the northeast. On Red Rocks Brook, medium-bedded, brown sandstone is highly folded and reverse faulted. These rocks outcrop 60 m from the granite of the Mount Peyton intrusive suite but there is no indication of contact metamorphism. Throughout the unit there is no evidence of metamorphism above the lowest greenschist facies.

A major fault zone along Clarks Brook (here introduced as 'the Clarks Brook fault') has resulted in the formation of a mélange of highly contorted and sheared thin- and thick-bedded sandstone, siltstone, shale (Plate 2) and locally graphitic chert. This fault zone is at least 300 m wide and extends into the probable Devonian granite (Unit 14) of the Mount Peyton intrusive suite, where the granite is converted to a chloritic cataclasite. The fault appears to lie mainly within Unit 3 but older rocks may occur as slivers within the fault zone. One possible example is a lenticle of graphitic chert that is possibly equivalent to the Caradocian graptolitic chert and slate exposed to the northeast, at Careless Brook (Williams, *this volume*) and to the southwest (see Dickson, 1991, 1992b; Williams, *this volume*).

The contact between Units 2 and 3 is not exposed. There may be a fault and this is supported by the abrupt change in structural style from Unit 2 to Unit 3 and changes in bed thickness and rock type.

Unit 4 is spatially separated from Unit 3 by extensive glacial outwash derived from the central part of the map area. Northwest of Gander Lake, in the Mount Peyton (NTS 2D/14) map area, the few outcrops of this unit comprise medium-grained, grey, red-brown and red sandstone and grey slate. Blackwood (1982) reported an outcrop of fossiliferous sandstone that contained crinoids and corals that are apparently similar to the Silurian fossiliferous strata exposed along Careless Brook, 2.5 km to the northeast. This outcrop was not located during the present study. Sedimentary features are rare but at the easternmost outcrop of Unit 4 load-casts indicate that the sequence is younging to the west. The beds and cleavage trend generally northward and cleavage is parallel to bedding. The unit is metamorphosed in the lowest greenschist facies.

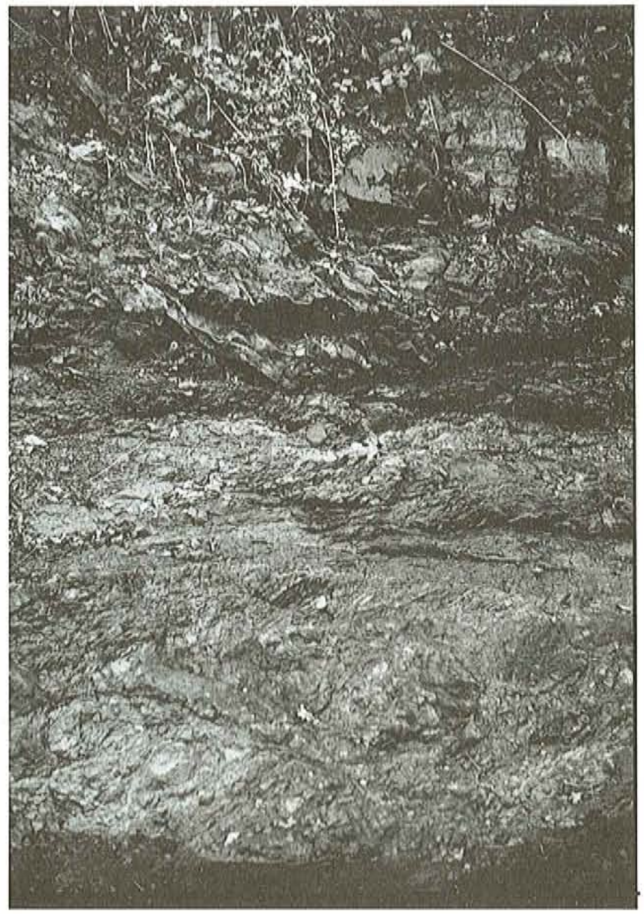

Plate 2. *Cliff face composed of a mélange of Unit 3 sedimentary rocks along the Clarks Brook Fault, Clarks Brook. Cliff face is 2 m high.*

UNIT 5: SAMSON FORMATION?

The contact metamorphic aureole around the northwestern part of the Mount Peyton intrusive suite appears to be restricted to a distinctive sequence of grey to black sandstone that may form a continuation of the Late Ordovician–Early Silurian Samson Formation mapped in the Botwood (NTS 2E/3) map area immediately to the north by O'Brien (1992a,b). The presumed Samson Formation in the map area includes medium- to thick-bedded sandstone hornfels and migmatite that form a prominent, northeast-trending ridge adjacent to the Mount Peyton intrusive suite (Units 10 and 12).

The contact with the Mount Peyton intrusive suite is not exposed but the presence of abundant mafic dykes and an isolated plug of gabbro within the unit clearly indicate that the contact is intrusive although faulting along this contact cannot be discounted. The western contact of Unit 5 is not exposed but apparently coincides with a northeast-trending valley along the west side of the ridge that may also reflect a northeast-trending fault. Exposures to the west of this of valley are assigned to Unit 6 of the Botwood Group, and comprise a sequence of thin-bedded, mainly green and red sandstone and siltstone.

Most of Unit 5 is extensively migmatized and contains a biotite–psammite paleosome and a composite neosome comprising grey, biotite granodiorite, buff biotite granite and granitic pegmatite. Isolated granite patches are common. The paleosome is highly disrupted by the granodiorite neosome, gabbro veins and dykes, and forms angular blocks of all sizes in the neosome (Plate 3). Features preserved in the paleosome include parallel-bedded and locally, laminated psammite, crosslaminated psammite, rare crossbedding and graded fine-grained psammite.

Plate 3. *Isolated block of psammite in granite matrix; part of the migmatized Samson Formation sandstone, west of Borney Lake. Lens cap is 5 cm in diameter.*

The structure of the unit is difficult to determine due to the extensive disruption of beds by the granodiorite neosome. On Jumpers Brook, biotite psammite hornfels displays crossbedding and crosslamination that indicate younging to the southeast. West of Borney Lake, graded beds contain cordierite and andalusite porphyroblasts in their finer grained portions and this feature also indicates younging to the southeast. However, tight folding is common throughout the unit and these younging directions may not be representative. All components of the unit lack a penetrative fabric.

UNITS 6 TO 8: BOTWOOD GROUP

The two formations of the Botwood Group are the Lawrenceton Formation, which is represented in the map area by a single hill of cleaved basalt (Unit 6), and the Wigwam Formation, which is represented by thin- and medium-bedded sandstone and siltstone (Unit 7) and a more extensive sequence of thin-bedded siltstone, medium- to thick-bedded sandstone and thick-bedded conglomerate (Unit 8).

Unit 6: Lawrenceton Formation

The basalt of the Lawrenceton Formation is a grey, fine-grained, amygdaloidal rock. The amygdules are partially filled with calcite. The basalt contains a poorly developed, northeast-trending and vertical, fracture cleavage. A dyke of highly feldspar-porphyritic diabase (Unit 9) cuts across the northeastern corner of the hill.

The basalt is flanked to the northwest and southeast by red and grey sandstone and siltstone of the Wigwam Formation, which young away from the basalt. The Lawrenceton Formation appears, therefore, to outcrop in the core of an anticlinorium that opens to the northeast (see next section; Units 7 and 8).

Units 7 and 8: Wigwam Formation

The Wigwam Formation includes the thin- to medium-bedded sandstone and siltstone (Unit 7) that underlie the area between the Samson Formation (Unit 5) to the southeast and Unit 8 to the northwest. The dominant rock types are interbedded red, purple, grey, orange and green sandstone and siltstone. Sedimentary features are rare but include parallel- and crosslaminations, sandstone dykes and scours.

The few younging directions obtained from these features indicate that the succession forms an anticlinorium with steeply dipping limbs centred on the Lawrenceton Formation. To the southwest, at the western edge of the map area, the Wigwam Formation consistently youngs to the northwest indicating that the southeastern limb of the anticline is folded into a syncline. Bedding is steeply dipping and locally overturned on the southeastern limb of this syncline. A few fold closures indicate that the folds plunge to the southwest at around 10°. Kink-bands are locally present and these contain small quartz veins.

Unit 8 of the Wigwam Formation is dominated by red and green, medium- and thick-bedded sandstone associated with minor medium- and thin-bedded siltstone and slate, and very thick-bedded pebble and cobble conglomerate. Sedimentary structures are common and these include small- (wavelength of 2 cm) and medium-scale (10 cm) rippled surfaces (Plate 4), parallel- and crosslaminations, crossbedding, scours and shale rip-ups. Fine-grained white mica is common in the sandstone.

Plate 4. *Large-scale rippled surfaces in the Wigwam Formation of the Botwood Group sandstone (Unit 8), Bay d'Espoir highway. Note book is 11 cm wide.*

The conglomerate is polymict, clast-supported and the dominant clasts are fine-grained, plagioclase-porphyritic basalt, quartz-feldspar-crystal tuff, flow-layered felsic tuff, and laminated sandstone. The clasts are rounded to subrounded and the matrix is a poorly sorted, coarse-grained sandstone. The volcanic clasts are typical of the underlying Lawrenceton Formation from northeast of the map area and the laminated sandstone is possibly derived from Unit 6. The presence of these clasts indicate that an unconformity exists between the Lawrenceton Formation and the Wigwam Formation. The occurrence of conglomerate defines the base of the westward-younging sequence of thick-bedded sandstone and associated rocks (Unit 8) and the contact of Units 7 and 8 is assumed to be conformable. The sedimentary features displayed by Units 7 and 8 possibly indicate a shallowing-upward, shallow-marine to fluvial sequence.

The strata generally dip to the northwest at a high angle and cleavage is subparallel to bedding. Locally, bedding dips to the southeast indicating the presence of small-scale folds. Intersection lineations generally indicate that the folds plunge gently to the northeast or southwest at 5 to 10°, however, steeper plunges (up to 70°) to the southwest are also indicated by bedding–cleavage intersections. A prominent fracture cleavage is locally present in the sandstone. This cleavage forms quartz-filled fractures that trend toward 340° and dip at 80° to the east.

UNIT 9: DIABASE DYKES

A few diabase dykes intrude Unit 3 and the Botwood Group but no dykes were found in Units 1, 2 and 4. The dykes within the contact metamorphosed Samson Formation sandstone (Unit 5) are interpreted to be derived from the gabbro of the Mount Peyton intrusive suite and these are assigned to Unit 11.

Two, 25-cm-thick diabase dykes were found that cut the sandstone of Unit 3 along Clarks Brook. The diabase dykes are fine grained and possess chilled margins. One dyke cuts the mélange along the Clarks Brook fault and another identical dyke cuts cleaved sandstone.

The dykes in the Botwood Group comprise two types. Fine-grained, light-grey to buff-coloured, highly porphyritic diabase dykes (Plate 5), about 1 m thick that cut the Lawrenceton Formation; also two similar dykes cut the Wigwam Formation, 1.5 km to the southeast. The dykes contain about 20 percent plagioclase phenocrysts, up to 1 cm in length, chloritized pyroxene phenocrysts, 2 to 5 mm in length, and calcite-filled spherical amygdules up 1 cm in diameter. Fractures in the dykes are also filled with calcite. The adjacent buff-coloured sediments are metamorphosed to a black hornfels.

The other type of dyke in the Botwood Group is a fine-grained, equigranular, uniform-textured diabase. It is commonly sheared and fractured, chloritized, and veined by calcite. These two varieties of dyke are in close proximity at one locality and it appears that the porphyritic variety cuts the equigranular dyke. The dykes are undeformed and are assumed to be Silurian or Devonian in age.

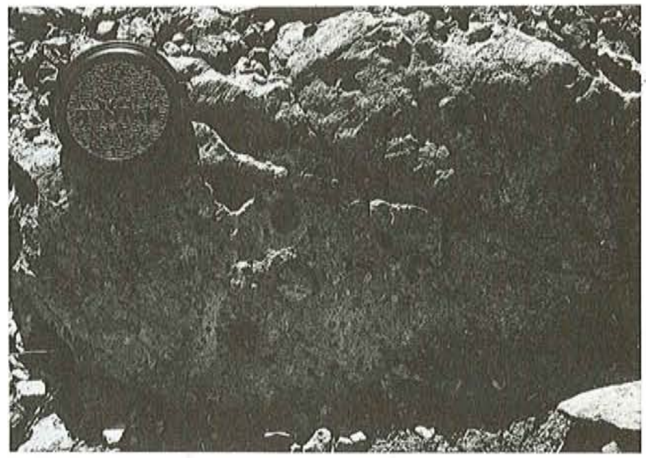

Plate 5. *Amygdaloidal, plagioclase feldspar-porphyritic, diabase dyke (Unit 9) that cuts sandstone of the Wigwam Formation of the Botwood Group (Unit 7), 1 km east of the Bay d'Espoir highway. Lens cap is 5 cm in diameter.*

UNITS 10 TO 14: MOUNT PEYTON INTRUSIVE SUITE

The postkinematic Mount Peyton intrusive suite, is an ovoid, 1400 km² batholith that extends north and south of the Mount Peyton (NTS 2D/14) map area and barely extends into the map areas to the east, northeast and west. In the Mount Peyton map area, the suite has two main components. These are dark-grey, fine-grained, equigranular, pyroxene ± hornblende ± biotite gabbro (Unit 10) and pink, medium-grained, equigranular, biotite granite (Unit 14). Minor components are medium-grained metagabbro (subunit 10a) that occurs along the southeastern margin of the suite, diabase dykes (Unit 11), grey biotite granodiorite (Unit 12) that forms a small unit along the northwestern contact, and buff biotite granite (Unit 13) that forms two tiny plugs along the western contact.

The contacts with the country rock are rarely exposed but the intrusive relationship is clearly indicated by the extensive metamorphic aureole and associated mafic dykes and plugs along the western margin. Intrusive contacts are not exposed along the eastern margin but local contact metamorphism and a few rare granite dykes in sandstone (Unit 2) indicate an intrusive relationship. However, the eastern margin of the granite (Unit 14) is extensively fractured, possibly indicating late faulting, and the Clarks Brook fault crosscuts the contact on Clarks Brook.

Contacts between the main phases (Units 10 and 14) are exposed along, and 1.5 km to the south of, Salmon River and plugs of granite identical to Unit 14 intrude the gabbro northwest of the river. Along Salmon River, pink, fine-grained, biotite granite appears to have partially assimilated the gabbro resulting in the formation of a buff-coloured, fine-grained, granodiorite hybrid. This hybrid rock is exposed for about 200 m along the river. The hybrid rock and the gabbro are also cut by fresh pink medium-grained granite dykes.

South of Salmon River, the contact between the granite and gabbro is marked by a 250 hectare zone of granite dykes that contains very large angular blocks of gabbro. These dykes vary in thickness and commonly contain small xenoliths of gabbro. The gabbro blocks are commonly invaded by granite veinlets. There are no apparent reaction zones between the granite and the gabbro.

The contact between the metagabbro (subunit 10a) and the main granite (Unit 14) is exposed along woods roads 2.5 km south of Clarks Brook. Large blocks of medium-grained gabbro containing amphibole porphyroblasts are engulfed by the granite. In some blocks, a hybrid rock has developed that contains 5- to 10 mm-long acicular amphibole crystals.

Unit 10

The gabbro is a remarkably uniform rock that shows only minor variations (Plate 6). Locally, it is medium- to medium-coarse-grained and contains a high proportion of pyroxene. At two localities, minor layering was observed. The layering reflects variation in the plagioclase to pyroxene ratio and each layer is about 15 cm thick. Granitic veins are common and are particularly abundant north of Salmon River.

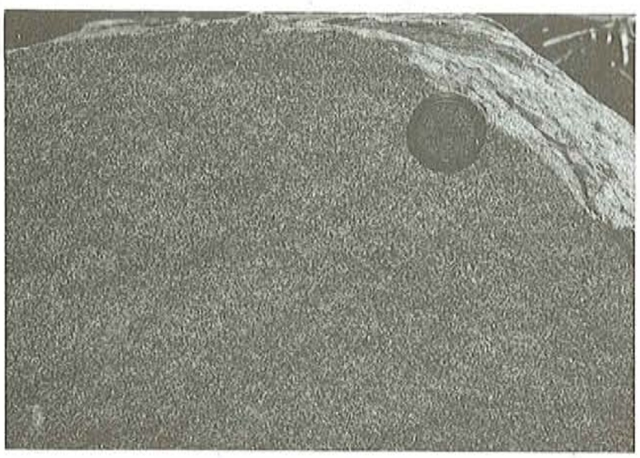

Plate 6. *Close-up view of quarried block of gabbro (Unit 10) from test quarry, 1 km southwest of Borney Lake. Lens cap is 5 cm in diameter.*

The aeromagnetic map for NTS 2D/14 indicates that the northeast-trending gabbro ridges west of Burnt Lake are distinctly magnetic compared to the gabbro to the east of the pond. There is no obvious mineralogical or textural difference between the rocks, but differences may become apparent through petrography or geochemistry.

Unit 11

Diabase and gabbro dykes are associated with the gabbro of the Mount Peyton intrusive suite and are most abundant in parts of the contact metamorphic aureole. These dykes are irregularly shaped, show no regular trend and vary in thickness from a few centimetres to about 1 m. Within the gabbro, the few dykes are generally about 20 to 75 cm thick and generally composed of fine-grained diabase. One dyke is composed of medium-grained gabbro. The spatial association of the dykes and the gabbro is interpreted to indicate that they are genetically related. The general lack of dykes in the granodiorite (Unit 12) and granite (Units 13 and 14) indicates that the dykes are the older unit.

Unit 12

The granodiorite is in possible gradational contact with the gabbro (Unit 10). There is no obvious abrupt change in rock type and the granodiorite may form a local fractionation product of the gabbro. The granodiorite is a medium-grained, light-grey rock that contains conspicuous quartz, biotite and hornblende. It is also distinctly more brittle that the gabbro.

Subunit 12a occurs as small intrusions of biotite granodiorite and granite that are scattered throughout the gabbro (Unit 10) in the western part of the suite. These intrusions generally form large dykes or small plugs that are well-separated from the main mass of granite.

Unit 13

The granite is a leucocratic, grey-pink to buff rock that forms two small plugs along the western margin of the suite. Three kilometres southwest of Borney Lake, the granite is in intrusive contact with migmatized sandstone. Granite dykes cut the quartz-rich sandstone. The contact with nearby gabbro is not exposed. Farther to the southwest, white, very fine-grained granite outcrops close to the margin of the suite. Its relationship to the other units is not known. The closest unit is migmatized sandstone, to the west in NTS map area 2D/13 (Kean and Mercer, 1977), with which the granite may be in contact.

Unit 14

The main granite phase forms an ovoid mass that underlies approximately 450 km^2 of the eastern part of the Mount Peyton intrusive suite, including that part within NTS map area 2D/11. The dominant rock type is medium-grained, equigranular biotite granite (Plate 7). Baird *et al.* (1951) note that the granite is locally granophyric and also contains hornblende in places. Along the eastern contact, the granite is distinctly finer grained for up to 2 km inside of the contact. Locally, miarolitic, fine-grained granite is the dominant phase. This is best displayed along Red Rocks Brook and Careless Brook where the miarolitic granite extends for 2 km west of the contact. Isolated occurrences of miarolitic granite are found on hilltops 2 km southwest and 5 km west-southwest of Dowd Lake. The contacts between these phases are probably gradational as no sharp contact were observed even in areas of near continuous exposure.

The granite is locally highly altered to a green- and cream-coloured, sericite-rich rock in a shear zone associated with a local fault that is exposed 1 km west of the contact

Plate 7. *Close-up view of medium-grained biotite granite (Unit 14), 2 km south of Mount Peyton. Lens cap is 5 cm in diameter.*

on Red Rocks Brook. The Clarks Brook fault has severely sheared the granite 1.5 km south of Clarks Brook and in a zone 100 m wide, the granite is reduced to a black, feldspar-porphyroclastic protomylonite.

Small, satellite plutons of pink granite have intruded the gabbro up to 5 km from the gabbro–granite contact. These have the form of large dykes over 50 m wide and at least 200 m long. To the north of Salmon River, the presence of two such intrusions, along with the abundance of granite veins, indicate that the gabbro may be underplated by granite at no great depth.

UNIT 15

Unit 15 is a single metre-thick, vertical diabase dyke, trending 123° that has intruded the main granite phase between Salmon River and Yellow Fox Brook. The dyke is black, massive, fresh and contains olivine and pyroxene phenocrysts set in a very fine-grained matrix. The core of the dyke is slightly amygdaloidal. The larger olivine phenocrysts are up to 7 mm in diameter but more commonly form abundant 1 to 2 mm crystals in the matrix. The pyroxene phenocrysts form black, elongate laths up to 2 mm in length. This dyke is unique and is probably the youngest unit in the map area.

ECONOMIC POTENTIAL

Significant mineral-exploration company work has occurred only recently in the Mount Peyton map area. Lundrigan Consulting Services Limited examined ground in the Jumpers Brook area (Pickett, 1990), and Noranda Exploration Company Limited have examined ground in the Salmon River (Tallman 1990a, 1991), 'Jumpers Brook' (10 km southeast of Sunday Lake; Graves, 1991), Northwest Gander River (Tallman, 1990b) and the Great Rattling Brook area (5 km east of Jumpers Brook; Sparkes, 1990; Tallman and Sparkes, 1991). The emphasis of the work was on the gold potential of the various areas.

The gabbro in the Salmon River area has been examined by Noranda Exploration Limited and several showings have been trenched, drilled, and geochemically and geophysically surveyed. Mineralization was found both in place and as float in the Salmon River area (Figure 1). Evans (1992) reports that the mineralization includes gold, pyrite, arsenopyrite, silver, sphalerite, galena, chalcopyrite and pyrrhotite in 'diorite' of the Mount Peyton intrusive suite.

The Great Rattling Brook area has been extensively explored by Noranda Exploration Limited (see Tallman, 1991). Mineralized dilational veins in sandstone occur as float in the Great Rattling Brook area, in the northwestern part of the map area (Evans, 1992). Evans (*op. cit.*) also reports that the veins contain visible gold, pyrite and arsenopyrite. Pickett (1990) reported that pyrite- and arsenopyrite-bearing sandstone hornfels along Jumpers Brook contained slightly elevated gold values (Figure 1).

Several areas of gabbro along the western margin of the suite have been staked as potential sources of dimension stone. A gabbro ridge 1 km west of Borney Lake has recently been quarried to assess its potential as dimension stone. Several test blocks of about 5m^3 have been produced (Plate 6). Several other areas in the northwestern and northeastern parts of the Mount Peyton intrusive suite (mainly to the north in NTS map area 2E/3) are currently held by companies under the Mineral Act and/or Quarry Materials Act.

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REFERENCES

Anderson, F.D. and Williams, H.
1970: Gander Lake (west half), Newfoundland. Geological Survey of Canada, Map 1195A.

Baird, D.M., Moore, J.C.G., Scott, H.S. and Walker, W.
1951: Reconnaissance geology of east-central Newfoundland between Sir Charles Hamilton Sound and Bay d'Espoir. Unpublished report, Photographic Survey Corporation, Toronto, 155 pages. [NFLD(446)]

Bell, K. and Blenkinsop, J.
1975: Geochronology of eastern Newfoundland. Nature, Volume 254, pages 410-411.

Bell, K., Blenkinsop, J. and Strong, D.F.
1977: The geochronology of some granitic bodies from eastern Newfoundland and its bearing on Appalachian evolution. Canadian Journal of Earth Sciences, Volume 14, pages 454-476.

Blackwood, R.F.
1980: Geology of the Gander (west) area (2D/15), Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 80-1, pages 53-61.

1981: West Gander Rivers (2D/11 east half) and Dead Wolf Pond (2D/10 west half). Newfoundland Department of Mines and Energy, Mineral Development Division, Map 81-100.

1982: Geology of the Gander Lake (2D/15) and Gander River (2E/2) area. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 82-4, 56 pages.

Boyce, W.D. and Ash, J.S.
1992: Paleontological investigations in Newfoundland: 1992. *In* Report of Activities for 1992. Newfoundland Department of Mines and Energy, Geological Survey Branch, pages 5-7.

Boyce, W.D., Ash, J.S. and Dickson, W.L.
This volume: The significance of a new bivalve fauna from the Gander map area (NTS 2D/15) and a review of Silurian bivalve-bearing faunas in central Newfoundland.

Currie, K.L.
1992: Ordovician–Silurian stratigraphy between Gander Bay and Birchy Bay, Newfoundland (NTS 2E/7 and 8). *In* Report of Activities for 1992. Newfoundland Department of Mines and Energy, Geological Survey Branch, pages 8-9.

Davenport, P.H. and Butler, A.J.
1981: Lake sediment geochemical survey of northeastern Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File (NFLD) 1256.

Davenport, P.H., Nolan, L.W. and Hayes, J.P.
1988: Gold and associated elements in lake sediment from regional surveys in the Gander Lake area (NTS 2D). Newfoundland Department of Mines and Energy, Mineral Development Division, Open File (2D) 175.

Dean, P.L.
1977: Geology and metallogeny of the Notre Dame Bay area, Newfoundland, to accompany metallogenic maps 12H/1,8,9, and 2E/3,4,5,6,7,9,10,11 and 12. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 77-10, 17 pages.

Dickson, W.L.
1991: Eastern Pond (west half) map area (2D/11W), Newfoundland. Newfoundland Department Mines and Energy, Geological Survey Branch, Map 91-166.

1992a: Mount peyton (NTS 2D/14) map area, central Newfoundland. Newfoundland Department Mines and Energy, Geological Survey Branch, Map 92-22.

1992b: Ophiolites, sedimentary rocks, posttectonic intrusions and mineralization in the Eastern Pond (NTS 2D/11W), central Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey Branch, Report 92-1, pages 97-118.

1992c: Geology of the Mount Peyton (NTS 2D/14) map area, central Newfoundland. *In* Report of Activities for 1992. Newfoundland Department Mines and Energy, Geological Survey Branch, pages 14-16.

Evans, D.T.W.
1992: Gold metallogeny of the eastern Dunnage Zone, central Newfoundland. *In* Current Research. Newfoundland Department of Mines and Energy, Geological Survey Branch Report 92-1, pages 231-243.

Evans, D.T.W., Blackwood, R.F. and Hayes, J.P.
1992: Geology of the Gander River map area (NTS 2E/2). Scale 1:50 000. Newfoundland Department of Mines and Energy, Geological Survey Branch, Map 92-19.

Geological Survey of Canada
1989: Airborne gamma ray spectrometric, VLF and magnetic survey, Gander–Botwood area, Newfoundland. Geological Survey of Canada Map 35042(14)G (set of seven maps) and Map 63901(04)G. Also Newfoundland Department of Mines and Energy, Open File (NFLD) 1734.

Graves, G.
1991: First year assessment report on Licence 3968 Jumpers Brook (6796): Geochemistry, geophysics, geology, diamond drilling, NTS 2D/14. Noranda Exploration Company, Limited, unpublished report, 9 pages. [2D(0257)]

Kean, B.F. and Mercer, N.L.
1977: Grand Falls (2D/13) map area, Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Map 80-198.

Lapointe, P.L.
1979: Paleomagnetism and orogenic history of the Botwood Group and Mount Peyton Batholith, Central Mobile Belt, Newfoundland. Canadian Journal of Earth Sciences, Volume 16, pages 866-876.

Mandville, L.W.J., compiler.
1989: Newfoundland geochronology database, version 1.0. Newfoundland Department of Mines and Energy, Geological Survey Branch, Open File NFLD 1881.

McLearn, F.H.
1924: Palaeontology of the Silurian rocks of Arisaig, Nova Scotia. Geological Survey of Canada, Memoir 137, 180 pages.

Murray, A. and Howley, J.P.
1881: Geological Survey of Newfoundland. Edward Stanford, London, 536 pages.

O'Brien, B.H.
1992a: Geology of parts of NTS 2E/2,3,6 and 7. Newfoundland Department of Mines and Energy, Geological Survey Branch, Map 92-25.

1992b: Relationship of Ordovician and Silurian rocks in central Notre Dame Bay, Newfoundland. *In* Report of Activities for 1992. Newfoundland Department of Mines and Energy, Geological Survey Branch, pages 31-33.

Pickett, J.W.
1990: 1989 assessment report on the Jumpers Brook property, Licence 3463, Newfoundland, NTS 2E/3, 2D/14. Lundrigan Consulting Services Limited, unpublished report, 7 pages. [NFLD(1946)]

Reynolds, P.H., Taylor, K.A. and Morgan, W.R.
1981: $^{40}Ar/^{39}Ar$ ages from the Botwood–Mount Peyton region, Newfoundland: possible paleomagnetic implications. Canadian Journal of Earth Sciences, Volume 18, pages 1850-1855.

Sparkes, K.
1990: First year assessment report Great Rattling Brook. Licences 3599, 3652, 3749, 3750, NTS 2D/13,14. Noranda Exploration Company Limited, unpublished report, 15 pages. [2D(225)]

Strong, D.F.
1979: The Mount Peyton batholith, central Newfoundland, a bimodal calc-alkaline suite. Journal of Petrology, Volume 20, pages 119-138.

Strong, D.F., Dickson, W.L., O'Driscoll, C.F. and Kean, B.F.
1974: Geochemistry of eastern Newfoundland granitoid rocks. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 74-3, 140 pages.

Strong, D.F. and Dupuy, C.
1982: Rare earth elements in the bimodal Mount Peyton batholith: Evidence of crustal anatexis by mantle-derived magma. Canadian Journal of Earth Sciences, Volume 19, pages 308-315.

Tallman, P.
1990a: First year assessment report on Licences 3544 and 3856, Noront–Mount Peyton (4719) NTS 2D/14, 2D/15, 2E/2, 2E/3. Noranda Exploration Company Limited, unpublished report, 11 pages. [NFLD(1968)]

1990b: First year assessment report on geological mapping at N.W. Gander River property, Licence 3847, NTS 2D/14. Noranda Exploration Company Limited, unpublished report, 5 pages. [2D/14(241)]

1991: Second year assessment report on Licence 3544; Geophysics, soil and diamond drilling; Noront–Mount Peyton (6719) NTS 2D/14. Noranda Exploration Company Limited, unpublished report, 13 pages. [2D(247)]

Tallman, P. and Sparkes, K.
1991: Second year assessment report Great Rattling Brook (6750); Geophysics and diamond drilling; Licence 3652 NTS 2D/13,14. Noranda Exploration Company Limited, unpublished report, 10 pages. [2D(255)]

Tomlin, S.L.
1982: Potential of the Mount Peyton Batholith as a source of granite as dimension stone and memorial stone. Newfoundland Department of Mines and Energy, Mineral Development Division, Open File (NFLD) 1281, 12 pages.

Wanless, R.K., Stevens, R.D., Lachance, G.R. and Rimsaite, R.Y.H.
1965: Age determinations and geological studies: Part 1–Isotopic ages, Report 5. Geological Survey of Canada, Report 64-17, 126 pages.

Wanless, R.K., Stevens, R.D., Lachance, G.R. and Edmonds, C.M.
1967: Age determinations and geological studies: K-Ar isotopic ages, Report 7. Geological Survey of Canada, Report 66-17, 120 pages.

Williams, H.
1972: Stratigraphy of Botwood map area, northeastern Newfoundland. Geological Survey of Canada, Open File 113, 103 pages.

Williams, H., Colman-Sadd, S.P. and Swinden, H.S.
1988: Tectonic-stratigraphic subdivisions of central Newfoundland. *In* Current Research, Part B. Geological Survey of Canada, Paper 88-1B, pages 91-98.

Williams, S.H.
1991: Stratigraphy and graptolites of the Upper Ordovician Point Leamington Formation, central Newfoundland. Canadian Journal of Earth Sciences, Volume 28, pages 581-600.

This volume: More Ordovician and Silurian graptolites from the Exploits Subzone.

Note: Geological Survey Branch file numbers are included in square brackets.