MINERAL DEVELOPMENT DIVISION
DEPARTMENT OF MINES AND ENERGY
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

GRAND FALLS
NEWFOUNDLAND

Scale 1:50,000 Échelle

Miles 1 0 1 2 3 Miles
Metres 1000 0 1000 2000 3000 4000 Mètres
Yards 1000 0 1000 2000 3000 4000 Verges

MAP 81-99

LEGEND

SILURIAN AND DEVONIAN

16 **Mount Peyton Intrusive Suite:** *Quartz diorite, granodiorite and minor pink granite dikes and veins; minor gabbro and diorite.*

15 **Hodges Hill Granite:** *Medium to coarse grained pink and locally white, equigranular, hornblende-biotite granite.*

14 **Lemotte's Lake Granite:** *Pink, medium grained granite with minor mafic phases and xenoliths.*

13 *Fine to medium grained, equigranular, locally feldsparphyric, gabbro and diabase.*

SILURIAN OR DEVONIAN

STONY LAKE VOLCANIC ROCKS

12 *Gray and minor pink felsic crystal-lithic tuff, lapilli tuff, breccia, flow-banded rhyolite and sedimentary porphyry* **12a,** *mainly medium grained, gray, quartz-feldspar crystal-lithic tuff.*

SILURIAN AND OLDER

BOTWOOD GROUP (UNITS 9 and 10)

11 **Rogerson Lake Conglomerate (?):** *Red conglomerate with thin lenses of red sandstone and siltstone.*

10 *Red and gray-green, (in places crossbedded, ripple marked and mudcracked) micaceous sandstone, siltstone and conglomerate; minor calcareous rocks.*

9 *Intermediate to mafic and minor felsic volcanic rocks;* **9a,** *purple and green, locally amygdaloidal to mafic vesicular and calcite (pink) amygdaloidal, feldspar-phyric; locally scoriaceous, lava; minor mafic tuff and red sandstone;* **9b,** *purplish-red rhyolitic crystal-lithic, vitric and lapilli tuff and breccia;* **9c,** *altered, creamy green, felsic lithic-crystal tuff.*

8 *Green, locally purplish and feldspar-phyric, mafic volcanics with poorly developed pillow structures in places; minor breccia, agglomerate and chert.*

7 **Crippleback Lake Quartz Monzonite: 7a,** *fine to medium grained gabbro and diorite, locally feldspar-phyric;* **7b,** *medium grained quartz monzonite and granodiorite.*

6 *Interbedded green and red argillite, siltstone and shale; minor fine grained, green sandstone and unseparated mafic volcanic rocks.*

5 *Green pillow lava, pyroclastic breccia and minor agglomerate; interbedded mafic tuff. Minor felsic volcanics and blue-green chert.*

4 *Litharenite, conglomerate and interbedded siltstone, argillite and black shale; minor chert, calcareous sandstone and thin limestone beds;* **4a,** *pebble to boulder polymictic conglomerate with interbedded litharenite and minor black shale and argillite.*

MIDDLE ORDOVICIAN

3 *Black shale, locally graptolitic; minor litharenite and chert.*

MIDDLE ORDOVICIAN AND OLDER

VICTORIA LAKE GROUP (UNITS 1 and 2)

1 **Tally Pond Volcanic Rocks:** *Green, mafic to intermediate pillow lava, pillow breccia, and interbedded pyroclastic breccia, lapilli-tuff and tuff (locally sheared); minor unseparated diabase and gabbro dikes and sills; contains unseparated Unit 2 in places;* **1a,** *felsic tuff and breccia.*

2 *Siliceous siltstone, green and black argillite and shale and interbedded litharenite; minor green chert, red argillite and tuff; minor unseparated mafic volcanic rocks.*

SYMBOLS

- *Geological boundary (defined, approximate, assumed, gradational)*
- *Geological boundary (geophysically defined)*
- *Geophysical conductor*
- *Unconformity (assumed)*
- *Bedding, tops known (inclined, vertical, overturned)*
- *Bedding, tops unknown (inclined, vertical)*
- *Strike and dip of pillows, tops known (inclined, vertical)*
- *Strike and dip of pillows, tops unknown (inclined, vertical)*
- *Shearing and dip (inclined, vertical)*
- *Cleavage or schistosity (inclined, vertical)*
- *Flow banding (inclined)*
- *Axes of minor folds (showing trend and plunge)*
- *Anticline (defined, approximate) arrow indicates plunge*
- *Syncline (defined, approximate) arrow indicates plunge*
- *Syncline, overturned (defined, approximate)*
- *Fault (defined, approximate, assumed)*
- *Contact metamorphic aureole*
- *Outcrop*
- *Mineral indication (pyrite)* py
- *Graptolite locally*
- *Glacial striae (direction of movement known, unknown) numbers indicate relative age*
- *Diamond drill hole* DDH

Geology by B. F. Kean and N. L. Mercer, 1977. Published, 1981.

This preliminary map may be subject to revision and correction.

Geological cartography by Mineral Development Division, Department of Mines and Energy, Government of Newfoundland and Labrador.

Copies of this map may be obtained from the Publications and Information Section, Mineral Development Division, Department of Mines and Energy, P. O. Box 4750, St. John's, Newfoundland A1C 5T7.

Base map at same scale published by the Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa, 1973. Roads updated from Department of Forestry and Agriculture, Government of Newfoundland and Labrador, photography 1976.

Approximate magnetic declination, 1969, for centre of map, 28° 22' west decreasing 3.0' annually.

Elevations in feet above mean sea level.

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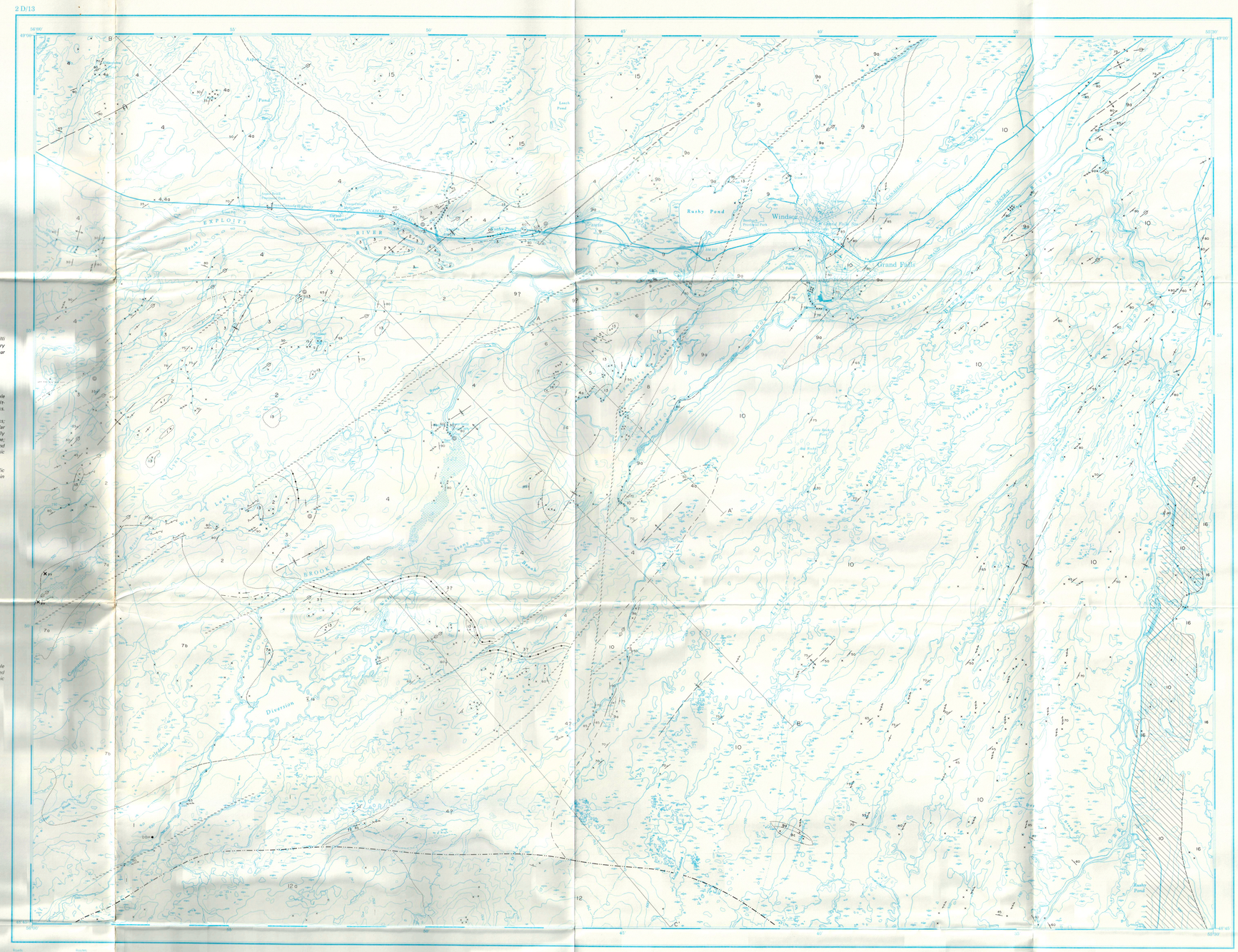

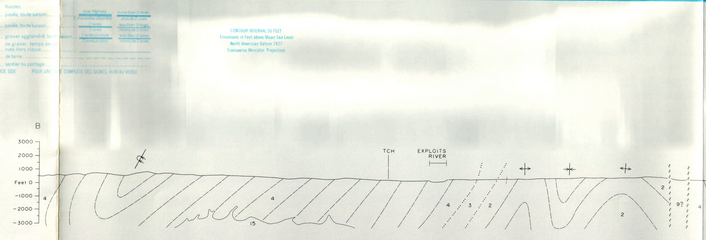

SYMBOLS

Bedding (diagrammatic representation from observations and interpretations).

Intrusive contact.

All other symbols and numbers are the same as those used in the map legend.

Horizontal and vertical scales 1:50,000.

DESCRIPTIVE NOTES

The map area is a gently undulating to hummocky, heavily wooded terrain with a mean elevation of about 100 m and with hills rarely exceeding 250 m. The topographic grain and main drainage pattern trend east to northeast and directly reflect bedrock structure. All of the area has been glaciated with the dominant ice movement to the northeast. Glacial till of variable thickness blankets all of the area.

The map area was previously mapped at a 1:250,000 scale by the Geological Survey of Canada (Anderson and Williams, 1970), and parts of the area were mapped on a scale of 1 inch to 1 mile by the Geological Survey of Newfoundland (Hriskevitch, 1949, 1950).

The map area lies in the central Paleozoic mobile belt of the Newfoundland Appalachians (Williams, 1964). The sedimentary and volcanic rocks are mainly of Ordovician and Silurian age and are openly folded, locally overturned, faulted and cut by a variety of intrusions of Siluro-Devonian age.

Volcanic and sedimentary rocks of map units 1 and 2 are extensions of the Victoria Lake Group defined to the southwest (Kean and Jayasinghe, 1980a, b). The units are lateral equivalents with a gradual contact between them. Unit 1 contains interlayers of the sedimentary rocks of unit 2 particularly in its upper parts; and unit 2 contains thin intercalations of mafic volcanics of unit 1. The sedimentary rocks (unit 2) have graded bedding, convolute laminations and in general display aspects of distal turbidites of the Bouma cycle (Bouma, 1962).

Black shales and slates (unit 3) form a major northeast-trending marker unit defined by scattered outcrop and by a strong airborne electromagnetic anomaly (Lazenby, 1966). It is a continuation of the Caradocian graptolitic shales present in the Badger area to the west (Kean and Jayasinghe, 1980b). Graptolites collected from this unit at Red Cliff and Leech Brook along the Exploits River are identified by Bergström et al. (1974) as indicative of a Middle Ordovician (Caradocian) age. New graptolite localities south of the Exploits River also yield Middle Ordovician forms; however, additional collecting is needed for definite dating. The following forms (identified by J. Riva, written communications, 1980) are present: *Orthograptus ex calcaratus* group, *Glyptograptus* sp., *Dicranograptus* cf. *ramosus* (Hall), *Leptograptus* sp. A ground electromagnetic conductor of graphitic black shale in the Diversion Lake area (Dimmell, 1974a, b) has a strike length of approximately ten kilometres and its position between units 1 and 4 suggest its interpretation as part of unit 3.

Sedimentary rocks of map unit 4 form a coarsening upwards flysheid sequence that conformably overlies unit 3. It is a continuation of similar rocks in the Badger map area (Kean and Jayasinghe, 1980b). The lower stratigraphic levels contain extensive black shale, slate and argillite interbedded with litharenite. The finer grained rock types decrease in volume upwards with an accompanying increase in the amount of conglomerate. The coarse clastic rocks contain sedimentary, volcanic, quartz and feldspar clasts. In several localities north of the Trans Canada Highway and at the southwest end of Lemotte's Lake, granite pebbles and cobbles are common. Black shales from the lower part of this unit in the Badger area contain late Caradoc - early Ashgill graptolites (J. Riva, written communications, 1980). In the Stony Brook area, rocks of unit 4 become reddish and appear to grade into red sandstones of the Botwood Group (Unit 10). Through analogy with the Ordovician-Silurian stratigraphy of eastern Notre Dame Bay and comparative lithologies, rocks of unit 4 are considered of Late Ordovician or Early Silurian age (Anderson and Williams, 1970).

Submarine mafic and intermediate volcanic rocks of map unit 5 appear to overlie post-Caradocian graywacke and conglomerate (unit 4) and is thus considered to be of post-Caradocian age. The unit has lithological similarities to both the pre-Caradocian Tally Pond volcanic rocks (unit 1) and the post-Caradocian Buchans and Frozen Ocean Groups to the west and north.

Fine grained sedimentary rocks (unit 6) are, in part, interlayered with the volcanic rocks of unit 5 and are similar to sedimentary rocks associated with the lower stratigraphic levels of post-Caradocian volcanic rocks elsewhere, e.g. Roberts Arm Group (Dean, 1978). However, unit 6 in part also resembles rocks of both units 2 and 4.

Map unit 8 consists of subaqueous mafic volcanic rocks that grade upwards into terrestrial volcanics (unit 9) of the Botwood Group. The unit differs from unit 9 in the lack of the strong development of the purplish color, in having a low degree of vesicularity and in the local development of pillow structures with interpillow and intercalated chert and siltstone.

Volcanic rocks (unit 9) and sedimentary rocks (unit 10) of the Silurian Botwood Group (Dean, 1978) form a conformable succession with both lithologies interlayered in the contact zone and also higher up in the sedimentary sequence along Exploits River. A Silurian age for the Botwood Group is based on paleontological evidence from outside the area to the northeast (Williams, 1962).

Sedimentary rocks of map unit 11 are lithologically similar to both the Botwood Group and the Rogerson Lake Conglomerate (Kean and Jayasinghe, 1980a). Unit 11, like the Rogerson Lake Conglomerate in the Lake Ambrose - Noel Paul's map areas, directly overlies the Tally Pond volcanic rocks along their southern margin. Unit 11 is thus correlated with the Rogerson Lake Conglomerate which is considered to be the time equivalent of the Silurian Botwood Group (Kean and Jayasinghe, 1980a).

Silicic volcanic rocks (unit 12) were originally interpreted to be Ordovician (Hriskevitch, 1950) but were considered by Anderson and Williams (1970) to be the youngest layered rocks in the map area and assigned to the Devonian for the following reasons: (a) they are lithologically distinctive and have no correlatives among Ordovician or Silurian rocks of north-central Newfoundland; (b) agglomerates southeast of Stony Lake contain fragments of siltstone that resemble siltstones of the Botwood Group; (c) structural evidence and oval outcrop pattern suggest the unit truncates the northeast trending Acadian structures of the Botwood Group (d) primary features, such as, shards, flow banding and pumice are well preserved with little evidence of structural deformation. The volcanic rocks of unit 12 are thus interpreted to unconformably overlie the folded rocks of the Botwood and Victoria Lake Groups.

Intrusive rocks of map unit 7 are a northeastward extension of the Crippleback Lake quartz monzonite and are interpreted to be co-magmatic with the Tally Pond volcanic rocks.

Basic intrusive rocks (unit 13) in the map area probably vary from Ordovician to Devonian in age as is demonstrable elsewhere in central Newfoundland. They consist of altered augite and variably saussuritized andesine with an intergranular to intersertal and in places, glomeroporphyritic texture. The augite is altered to chlorite, epidote, clinozoisite and brown hornblende. In some of the small intrusions brown hornblende is extensive as a rim around altered cores of pyroxene.

The Lemotte's Lake granite (unit 14) is considered Siluro-Devonian as it is intrusive into probable Silurian rocks and is lithologically similar to dated Siluro-Devonian granites.

The Hodges Hill Granite (unit 15) has a whole rock Rb-Sr isochron age of 411 ± 6 Ma (B.J. Fryer, personal communications, 1980), *i.e.* late Silurian. The granite typically consists of quartz, alkali-feldspar graphic textures common, perthite and plagioclase. Mafic minerals are generally biotite and hornblende; however, near the contact with the country rocks they are replaced by alkali (sodic) amphibole (riebeckitic - arfvedsonitic?) and pyroxene. The country rocks are contact metamorphosed to a hornblende-biotite hornfels around the granite.

Unit 16 is the marginal contact facies of the Mount Peyton intrusive Suite exposed to the east of the map area. Granite rocks of the Mount Peyton give a whole rock Rb-Sr isochron age of 393 ± 30 Ma ($\lambda = 1.42 \times 10^{-11}$ yr^{-1}) (Bell *et al.*, 1977). Anderson and Williams (1970) reported K-Ar ages of 410 ± 21 Ma and 264 ± 52 Ma respectively for the mafic and granitic phases of the intrusion. Unit 16 contains numerous xenoliths of the country rocks and contact metamorphism has produced an aureole up to 1.5 km wide consisting of a granoblastic aggregate of quartz, plagioclase and biotite.

Rocks of map units 1 to 11 have a weak to well developed, northeast trending, steeply dipping cleavage (locally schistose). It is axial planar to open, to locally tight and overturned, northeast and locally south plunging folds. Shearing and slickensiding mark the major fault zones. Map units 12 to 16 have no cleavage or evidence of penetrative regional deformation; however, they are cut and sheared by the faulting. The rocks of the map area are regionally metamorphosed in the sub to low greenschist facies.

Disseminated pyrite occurrences are associated with the volcanic rocks of map units 1 and 5, intrusive rocks of unit 7 and the black shales and slates in the sedimentary sequences. Past exploration activity has concentrated on the volcanic rocks of units 1 and 5. Molybdenite bearing float occurs associated with rocks of unit 7 in the Badger map area (Kean and Jayasinghe, 1980b; Jayasinghe and Kean, in preparation).

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