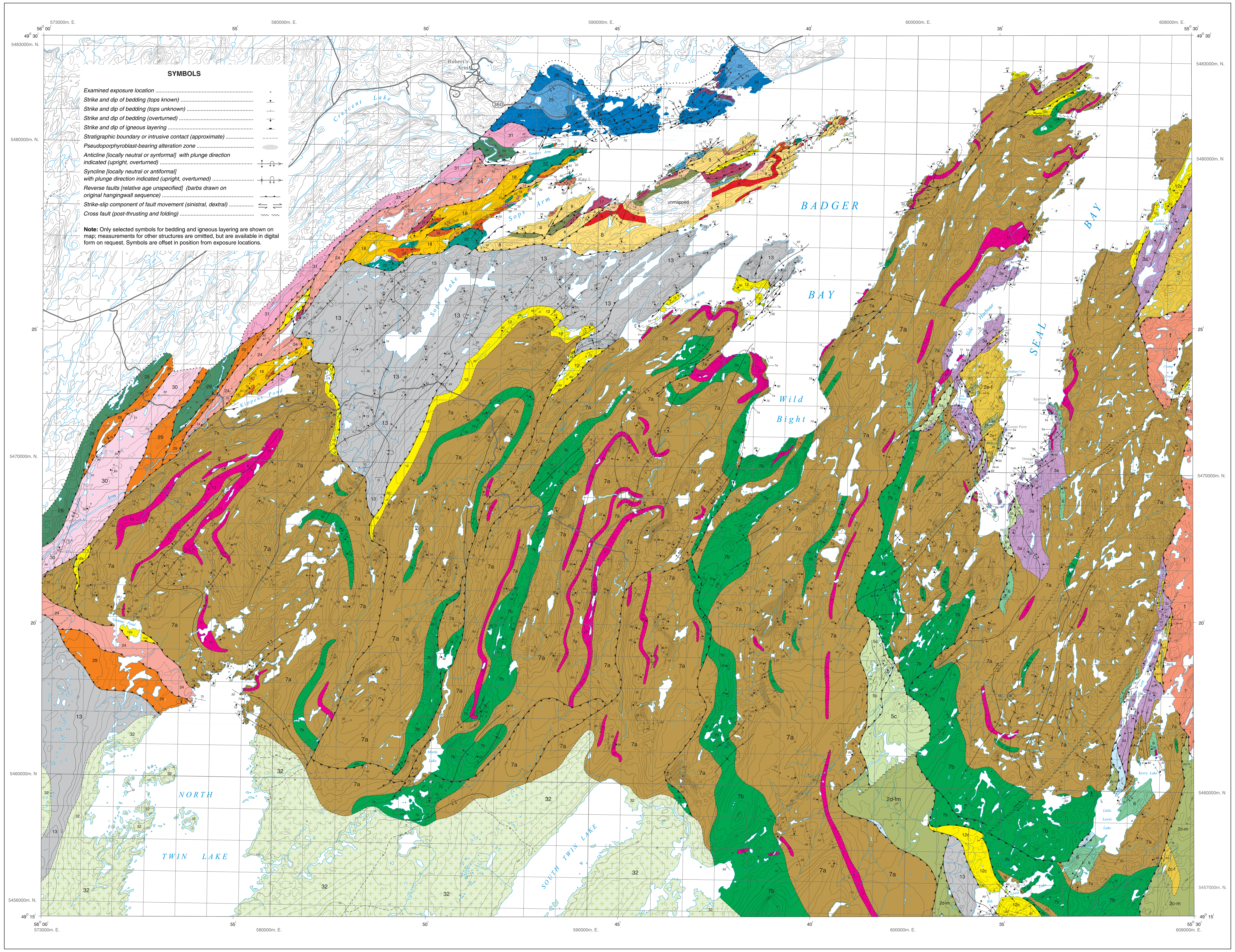


MAP 2001-38
OPEN FILE 002E/05/1160

GEOLOGY OF PART OF THE ROBERT'S ARM MAP AREA (NTS 2E/5), WESTERN NOTRE DAME BAY

Scale 1:50 000

0 1 2 3 4 5
kilometres

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR
Department of Mines and Energy
Geological Survey

LEGEND

Middle Ordovician - Early Devonian
HODGES HILL INTRUSIVE COMPLEX
TWIN LAKES DIORITE

32 — *Early to Late Silurian (?):* medium-grained leucocratic granodiorite; medium-grained equigranular grey gabbro; minor coarse-grained hornblende diorite; rare leucogranite veins; posttectonic relative to structures in the Exploits and Notre Dame subzones

STRATIFIED AND INTRUSIVE ROCKS OF THE NOTRE DAME SUBZONE
Early to Middle Ordovician
ROBERTS ARM GROUP
CRESCENT LAKE FORMATION

31 — *Early Middle Ordovician (?):* interbedded bright-red and dark-red chert; maroon, thin-bedded siltstone and siliceous laminated argillite; light-green, medium-bedded, siliceous sandstone; grey-green, medium- to thick-bedded wacke having distinctive jasper, granite and basalt pebbles; sedimentary rocks of units 29 and 30 unseparated

30 — Green sandstone turbidites containing abundant jasper clasts, poorly bedded wacke containing red chert and basalt clasts, and polymictic conglomerate containing conspicuous volcanic and plutonic boulders

29 — Red and grey chert rhythmites interbedded with thin-bedded siliceous argillite and graded grey sandstone

28 — *Late Early Ordovician (?):* light-green, massive, aphanitic, vesicular basalt; light-green basalt breccia and pillow breccias; dark-green, fine-grained, pyroxene-porphyritic basalt; minor, green and red, variably hematized, pillowed basalt with red chert veins near Tommys Arm river estuary (possible thrust slice of Unit 26); rare interstitial red chert and interflow red argillite; Crescent "terrane" of previous workers

UNSEPARATED TERRANES/FORMATIONS (of the ROBERTS ARM GROUP)

27 — *Early or Middle Ordovician (?):* gabbro sills; unseparated diorite sheets

26 — *Late Early Ordovician (?):* pillow lava and pillow breccia; dark-green, massive, vesicular, variably porphyritic, locally flow-foliated basalt; pillowed basalts containing epidote-rich and hematite-rich zones in concentric bands and as veinlets; variably hematized basalt associated with minor interstitial and interflow red chert

25 — *Late Early Ordovician (?):* light-grey, massive, quartz-phyric felsite; buff to pink, felsic crystal tuff having eutaxitic quartz grains; variably chloritized, felsic lithic tuff (locally containing silicified rock fragments); felsic breccia and subordinate basalt blocks; minor quartz-feldspar porphyry

RED INDIAN LINE STRUCTURAL ZONE
Middle Ordovician (?)
SOPS HEAD COMPLEX
TECTONIZED BLOCK-IN-MATRIX MELANGE UNIT

24 — *Middle Ordovician to Late Silurian (?):* dark-grey melange dominated by small polylithic blocks having internal foliations or internal folds; platey, pyrite-rich, black phyllite or pelitic schist (locally forming the matrix of the melange belt or representing an original mudstone-bearing map unit); minor porphyroclastic schist derived from semi-psammite and metabasite; minor red-matrix melange derived from hematitic basalt and protomylonite; minor green-matrix melange derived from chloritic basalt and cataclastite

BROKEN OLISTOSTROMAL UNITS

23 — Sparry Limestone–*Middle Ordovician:* conodont-bearing limestone in stratigraphic contact with various basalt types in discrete volcanic blocks; limestone beds forming solitary carbonate megablocks and smaller olistoliths in melange; limestone clasts resedimented along with monolithic basalt clasts in alternating muddy and calcareous debrites; banded marble interstratified or tectonically interlayered with pyritic black argillite. Similar lithodemes within large limestone clasts in Unit 10. Also, in the basal Moores Cove Formation of the Cottrells Cove Group, the Hummock Island Limestone of the Exploits Group, and the Cutwell Group on Long Island

22 — Basalt Flows–*Early to Middle Ordovician (?):* internally-fractured, marginally-shattered epidotized basalt (injected by green epiclastic wacke - itself impregnated with black mudstone); massive, light-green, fine-grained, silicified basalt (in depositional contact with siliciclastic and calcareous sedimentary strata within map-scale blocks); pillow breccia and hematized basalt (resedimented with jasper and chert in red siliceous debrite); minor olistoliths of basalt breccia (chilled against mudstone) in a matrix of fractured volcaniclastic wacke; the above rocks are seen in the dominantly sand-matrix debrite belts. The dominantly mud-matrix debrite belts display light-green and dark-grey aphanitic basalt (injected by black mudstone) and porphyritic vesicular basalt (augened by featureless black mudstone, or wrapped by partially broken interbeds of pyritic black argillite and dark-grey laminated siltstone, or partly enclosed by black pebbly mudstone). Similar lithodemes in Unit 16. Also, in the Pennys Brook Formation of the Wild Bight Group and the Crescent Lake Formation of the Roberts Arm Group

21 — Mottled Turbidite and Variegated Chert–*Early to Middle Ordovician (?):* green and grey, parallel- and cross-laminated, rhythmically interbedded, siliceous turbidites having mottled and nodular texture (forming mottled olistoliths within unmottled pebbly mudstone). Minor red, green and grey chert interbedded with laminated siliceous argillite. Similar lithodemes in units 14 and 17

20 — Polymictic Conglomerate–*Early to Middle Ordovician (?):* thickly stratified, poorly sorted, graded conglomerate beds with distinctive basalt, limestone and granite boulders (partly or completely enclosed by chaotically deformed sandy debrite); small, massive, buff-weathered conglomerate blocks (within muddy debrites); conglomeratic turbidite lenticles (preserving erosive bases above black pyritic argillite and channels within interstratified sandstone turbidites). Similar unbroken lithodemes in Unit 10

19 — Black Argillite - Pebbly Mudstone–*Early to Middle Ordovician (?):* sulphidic pebbly mudstone (showing in-situ fragmentation of slumped grey siltstone and black argillite beds); basalt block-in-argillite within conglomerate block-in-argillite within pebbly mudstone or sandy debrite; stratiform intervals of coherently-bedded black argillite (forming a substrate, devoid of chert, to basalt or conglomerate sequences). Similar unbroken lithodemes in Unit 9.

18 — Massive Wacke–*Early to Middle Ordovician (?):* buff-weathered, massive, granular wacke completely or partially surrounding polylithic blocks in debrites; minor, partially disaggregated interbeds of light-grey wacke and dark-grey argillite. Unbroken successions of similar wacke (interstratified with thin-bedded sandstone and siltstone) may occur in Unit 8

UNBROKEN LITHOSTRATIGRAPHIC UNITS
[Wild Bight Group / Exploits Group / Roberts Arm Group / Cottrells Cove Group]

17 — *Middle Ordovician (?):* interbedded, red and green chert; deep-red and bright-red, thin-bedded, laminated argillite; green and grey, medium-bedded, fine-grained, siliceous, sandstone turbidite. In places, Unit 17 is interlayered with Unit 16 or stratigraphically overlies Unit 16. Similar lithodemes occur in the lower Crescent Lake Formation of the Roberts Arm Group, the lower Moores Cove Formation of the Cottrells Cove Group, the lower Strong Island Chert of the Exploits Group, and the lower Shoal Arm Formation (as well as in Late Cambrian(?) to Middle Ordovician units such as the Omega Point Formation of the Wild Bight Group and the Saunders Cove Formation of the Exploits Group)

16 — *Middle Ordovician (?):* light-green, variably porphyritic, basalt flows; massive, poorly stratified and well-graded basalt breccias; minor flow-foliated vesicular basalt; rare pillow breccia with epiclastic or calcareous cement; rare, grey aphanitic, mafic to intermediate, volcanic flows

15 — *Middle Ordovician (?):* thinly bedded, grey, banded, microcrystalline chert interstratified with sulphidic and siliceous, black argillite; minor, buff-weathered, light-grey, net-veined and recrystallized chert; these rocks are interlayered with Unit 14 or stratigraphically overlie Unit 14

14 — *Middle Ordovician (?):* mottled, green and grey, parallel- and cross-laminated, siliceous turbidites; nodular, fine-grained, thin-bedded, graded sandstone containing mud microflakes and sandstone dykelets; rhythmic interbeds of dark-green cherty siltstone and dark-grey banded argillite. Unit 14 underlies and also overlies Unit 16 and is in depositional contact with units 9 and 10; similar lithodemes are present in the upper Pennys Brook Formation of the Wild Bight Group, the lower Shoal Arm Formation, and the upper New Bay Formation of the Exploits Group

STRATIFIED AND INTRUSIVE ROCKS OF THE EXPLOITS SUBZONE
Late Ordovician
BADGER GROUP (Unit 13)
GULL ISLAND FORMATION

13 — *Early Late Ordovician:* predominantly massive, quartz-rich granular to pebbly wacke; minor thin- and thick-bedded, light-grey sandstone turbidites; rare olistostrome along southwest margin of unit; rare cobble conglomerate (with fossiliferous limestone clasts) along northwest margin of unit

Middle and Late Ordovician (?)
SHOAL ARM FORMATION

12 — *Late Middle Ordovician to Early Late Ordovician (?):* **12a:** black graptolitic slate interstratified with very thin beds of pyritic carbonaceous siltstone and dark-grey siliceous argillite; **12b:** light-grey bioturbated chert containing rare black shale partings; light-grey, thin-bedded to laminated, silicified wacke interbedded with green siliceous argillite and irregularly-mottled sandstone; **12c:** red radiolarian chert, red laminated argillite and red siliceous siltstone containing slump-folded nodules; maroon and green siltstone rhythmites (containing pyrolusite-bearing horizons) interbedded with turquoise chert

Middle Ordovician (?)
GUMMY BROOK GABBRO

11 — Medium-grained equigranular gabbro sills; minor dark-grey diorite sheets; coarse-grained glomeracrystic gabbro and diabase (in places cutting epidotized and saussuritized gabbro); pretectonic relative to structures in the Exploits Subzone

Late Cambrian (?) to Middle Ordovician
EXPLOITS GROUP
NEW BAY FORMATION

10 — *Late Early Ordovician:* polymictic, cobble-to-boulder, clast-supported conglomerate with well-rounded siliciclastic, calcareous and magmatic clasts; massive, light-grey pebbly wacke; depositional contacts with Unit 8 and Unit 9. Similar lithodemes are also presently assigned to the upper Moores Cove Formation of the Cottrells Cove Group and the upper Crescent Lake Formation of the Roberts Arm Group

9 — *Late Early Ordovician (?):* dark-grey and black, laminated and siliceous, siltstone turbidites; black, pyritic argillite or pyritic slate; minor, light-green, slump-folded sandstone with interbedded or chaotically mixed mudstone

8 — *Late Early Ordovician (?):* thin interbeds of light green sandstone and dark grey siltstone; minor, light grey, medium-bedded granular wacke; rare, dark-grey and black sulphidic argillite; all rocks are siliceous and highly indurated

WILD BIGHT GROUP
PENNYS BROOK FORMATION

7a, 7b — *Early Middle to Late Middle Ordovician:* **7a:** thin-bedded, green and grey, variably mottled, concretionary turbidites; thin- and thick-bedded, grey-green sandstone containing imbricated rip-up clasts of slump-folded banded argillite grading to parallel-laminated sandstone; thickly stratified, dark-green, tuffaceous wacke with predominant vesicular basalt and subordinate intermediate to felsic volcanic clasts; massive to thickly bedded epiclastic wacke (and associated debrites) with mixed sedimentary and volcanic clasts; minor pebbly wacke containing distinctive jasper and red argillite clasts. **7b:** laterally discontinuous lenticles of pillow lava, pillow breccia and massive vesicular basalt breccia; associated sand-matrix olistostromes and chaotically-slumped mixtites with various volcanic and sedimentary intraclasts

SPARROW COVE FORMATION

6 — *Early to Middle Ordovician (?):* dark-green, porphyritic pillow lava with some interstitial variegated chert; subordinate, thin-bedded, light-green, graded sandstone and light-grey, parallel-laminated argillite interstratified with vesicular basalt flows; minor gabbro sills, rare tuff beds and rip-up clasts of tuffaceous wacke

SIDE HARBOUR (?) BASALT UNIT

5 — *Early to Middle Ordovician (?):* pillow lava, pillow breccia, minor chert and turbidite
5a: in the Side Harbour Pond area, pillow lava associated with jasper-bearing chert and siliceous red argillite; siliceous, hematite-rich vesicular basalt; minor, maroon siltstone lenses intercalated with amygdaloidal basalt flows [possibly Omega Point Formation?]. **5b:** in the Seal Bay Bottom area, green vesicular pillow lava transitional to red pillow lava containing jasper disseminations; hematite-rich pillow breccia with interstitial red chert; collapsed, slumped and variably disaggregated pillowed basalt in sand-matrix debrite; minor gabbro sills; rare green laminated sandstone and red siliceous argillite [possibly lower Omega Point Formation? or upper Glovers Harbour Formation?]. **5c:** in the upper Seal Bay Brook area, hematite-, epidote- and chlorite-bearing pillowed basalt, vesicular pillow lava having jasper disseminations; red and green basalt breccia, in places, grading to fine-grained mafic tuff; local zones of highly discoidal pillow breccia with interstitial red chert; minor jasper-bearing chert and maroon argillite interbeds; rare diorite sills [possibly Omega Point Formation? or, alternatively, upper Pennys Brook Formation?]

BANDED GREY ARGILLITE UNIT

4 — *Early to Middle Ordovician (?):* in the Little Lewis Lake area, thin interbeds of dark-grey shale and light-grey siltstone, laminated and banded siliceous grey argillite, carbonaceous dark-grey slate; minor debrite dominated by various sedimentary blocks. In the Seal Bay Brook - Big Lewis Lake area, mostly debrite having banded argillite blocks and altered volcanic blocks [possibly uncommonly thick part of Omega Point Formation?]

OMEGA POINT FORMATION

3a, 3b — *Early to Middle Ordovician (?):* **3a:** red, massive to thickly stratified, poorly sorted gravel beds with subrounded cobbles and boulders of hematized volcanic and intrusive rocks; chaotically-slumped debrite and red conglomeratic wacke; red chert, red siliceous argillite and hematitic banded iron formation; interbedded, red and green, parallel- and cross-laminated siltstone turbidites (having spotted pseudoporphyroblasts in places); dark grey carbonaceous shale, light grey, thickly stratified, polymictic, conglomeratic turbidite. **3b:** in the Long Pond area, pillowed basalt flows interstratified with red chert, red siliceous argillite, maroon siltstone and grey-green wacke [possibly Side Harbour Basalt?]

GLOVERS HARBOUR FORMATION

2 — *Late Cambrian (?) to Early Ordovician:* interstratified rhyolite and basalt; minor felsic porphyry and diabase

2a-f, 2a-m — **2a-f:** dominantly felsic intrusive and volcanic rocks of the Long Pond area: hematite-rich quartz-feldspar porphyry (locally injected by red chert veinlets); light-grey rhyolite breccia and pyritic felsic tuff; rare, purplish-red rhyolite dykes. **2a-m:** dominantly mafic volcanic rocks of the Long Pond area: dark green pillow breccia and light-green basalt flows; minor mixed mafic–felsic volcanic breccia

2b-m — **2b-m:** dominantly mafic volcanic rocks of the Little Lewis Lake area: red basalt breccia containing disseminated jasper, green vesicular basalt with pyritic quartz stringers; minor slump-folded grey argillite (partially enclosing mafic volcanic blocks)

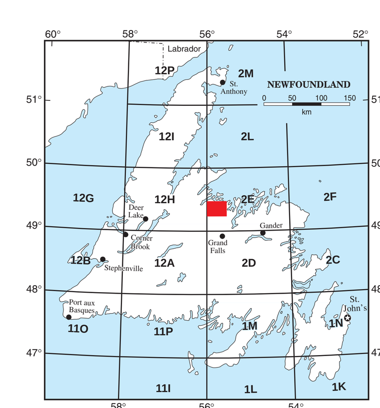
2c-f, 2c-m — **2c-f:** dominantly felsic volcanic rocks of the Kerry Lake–Nanny Bag Lake area: light-grey, well-banded, flow-folded rhyolite intruded by diabase dykes; minor basalt flows. **2c-m:** dominantly mafic volcanic rocks of the Kerry Lake–Nanny Bag Lake area: dark-green chloritic pillowed basalt, light-green, epidote-rich, pyritic, net-veined basalt; minor, variegated, red and green, vesicular pillow lava

2d-m, 2d-fm — **2d-m:** dominantly mafic volcanic rocks of the Big Lewis Lake–New Bay Pond area: massive, dark-grey and dark-green basalt flows; minor pillow breccia grading to tuffaceous wacke; rare mafic tectonite. **2d-fm:** unseparated mafic and felsic volcanic rocks of the Big Lewis Lake–New Bay Pond area: light-green siliceous basalt breccia, dark-green pyritic basalt flows, felsic–mafic crystal lithic tuff; minor debrite with banded argillite and siliceous basalt blocks

2e-f, 2e-m — **2e-f:** dominantly felsic volcanic rocks of the Indian Cove - Corner Point area: purplish-red rhyolite breccia and hematitic flow-banded rhyolite; light-grey, pyritic, rhyolite-dominant volcanic breccia; mixed mafic–felsic volcanic breccia (having outsized basalt bombs and silicified flow-banded rhyolite blocks); minor, light-green, quartz-phyric crystal tuff; minor quartz-feldspar porphyry; rare, purplish-red rhyolite dykes. **2e-m:** dominantly mafic volcanic rocks of the Indian Cove - Corner Point area: dark-green pillowed basalt, light-green basalt breccia; minor diorite and diabase

Cambro-Ordovician
SOUTH LAKE IGNEOUS COMPLEX

1 — *Late Cambrian (?) to Early Ordovician:* unseparated mafic and felsic plutonic rocks, including layered gabbro (having swarms of sheeted mafic dykes); flaser-banded metagabbro (in places, hosting small gossan zones); medium-grained, locally pyritic, blue-quartz tonalite (containing metagabbro enclaves); minor hornblende diorite and gabbro pegmatite



INDEX MAP

Geology by B. H. O'Brien, 1990; B. H. O'Brien and D. L. MacDonald, 1996; B. H. O'Brien, and M. E. Rees,1997; B. H. O'Brien and B. McConnell, 1999; B. H. O'Brien, A.Pickett and L. Normore, 2000.

Base map in digital format published by Surveys and Mapping Branch, Natural Resources Canada, Ottawa.

Approximate magnetic declination, 1980, at centre of map 26° 30' W, decreasing 11.6' annually.

Elevations in metres above sea level.

Universal Transverse Mercator Projection (UTM) Zone 21.

North American Datum (NAD) 1927.

Copies of this map may be obtained from the Geoscience Publications and Information Section, Geological Survey, Department of Mines and Energy, Government of Newfoundland and Labrador, P.O. Box 8700, St. John's, Newfoundland, Canada A1B 4J6 [http://www.geosurv.gov.nf.ca].

This map is subject to revision and modification.

Geological cartography by A. H. Paltanavage.

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