

recorded by K.E. Eade and assistants and by M.E. Cherry.

A preliminary version of this map was originally published uncoloured (Gower et al., 1983) and a brief description of rock types in the area was given earlier by Gower et al. (1982). Most of the map is based on investigations carried out in 1980 and 1981, but additional field data were collected in subsequent visits, especially during mapping by C.F. Gower in 2004 along Highway 516. The present map incorporates field data collected by Eade (1962) and Cherry (1978a, b), making use of original field notes

The map is augmented by follow-up examination of stained slabs, petrographic thin sections, and whole-rock geochemical analyses. U-Pb geochronological results (Schärer et al., 1986; Schärer and Gower, 1988; Kamo et al., 1989; Gower et al., 1992), Nd-Sm isotopic data (Schärer, 1991), Rb-Sr isotopic data (Brooks, 1983; Schärer, 1991), K-Ar isotopic data (Murthy et al., 1989a) Ar-Ar isotopic data (van Nostrand, 1988; R.D. Dallmeyer, unpublished - see digital database), and paleomagnetic sites from Murthy et al. (1989a,b; 1992) and Park and Gower (1992) are shown. Localities designated as mineral occurrences are based partly on observations made during the 1981 field season, but include earlier and later reported discoveries (see Mineral Occurrence Table; current to 2009).

Since the preliminary map was published, interpretation for the region has evolved significantly, so there are major differences between the current and preliminary versions of this map, particularly regarding the depiction of thrusts and strike-slip faults, most of which are yet to be confirmed. Unit modification is partly related to a compilation approach applied to the whole of eastern Labrador, but border regions of the map have been revised as a result of data integration with adjacent map areas. Geological boundaries are poorly controlled, especially away from shorelines, and have been extrapolated inland using structural observations, regional aeromagnetic data and topographic trends. Pre-1994 data station sites have been digitized from where originally located on aerial photographs or (rarely) on topographic maps, so reliability of location is likely mostly dependent on initial plotting accuracy. Subsequent locations are based on GPS-supported readings.

As is characteristic of metamorphic and plutonic terranes, individual outcrops are typically very complex, and commonly embody several different rock types. Generally, the unit polygon depicted is based on what was judged to be the dominant rock type present, but this approach was not universally followed, due to the exigencies of specific situations, such as the need to emphasize minor rock types deemed to have high significance. All rock types recorded from any individual outcrop may be determined by consulting the 'Unit designator' string for that locality given in the digital database. The user is alerted to the fact that, in the digital database, no attempt has been made to reconcile rock names applied to field outcrops, versus those applied to stained slabs, or petrographic thin sections. Differences may be due to subsequent, more refined identifications, but other reasons may apply, such the sample (or thin section) not being representative of its source material. Unit designator and polygon labels applied are based on an awareness of such factors.

Recommended citation Gower, C.F., 2010: Geology of the Sandwich Bay area (NTS sheets 13H/11, 12, 13 and 14), southeastern Labrador. Geological Survey, Mines Branch, Department of Natural Resources, Government of Newfoundland and Labrador, Map 2010-11, Open File

Geological cartography by T. Paltanavage, Cartographic Unit, Geological Survey, Department of Natural Resources. Digital NTS base maps (NTS 13H/11, 12, 13 and 14) used for this map are available from Surveys and Mapping Branch, Natural Resources Canada. Magnetic declination at the centre of the map at the start of 2010 was 23° 03' W. Elevations are in metres above sea level for NTS sheets 13H/11 and 12, and in feet for NTS sheets 13H/13 and 14. Contour interval is 20 metres or 50 feet (13H13w) or 60 feet (13H/13e and 13H/14). UTM (Universal Transverse Mercator) Grid Zone 21, NAD (North American Datum) 27.

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NOTE: Map 2010-11 is one of twenty-five maps on the geology of the Grenville Province in eastern Labrador and adjacent eastern Makkovik Province produced by the Geological Survey, Mines Branch, Department of Natural Resources, Government of Newfoundland and Labrador.

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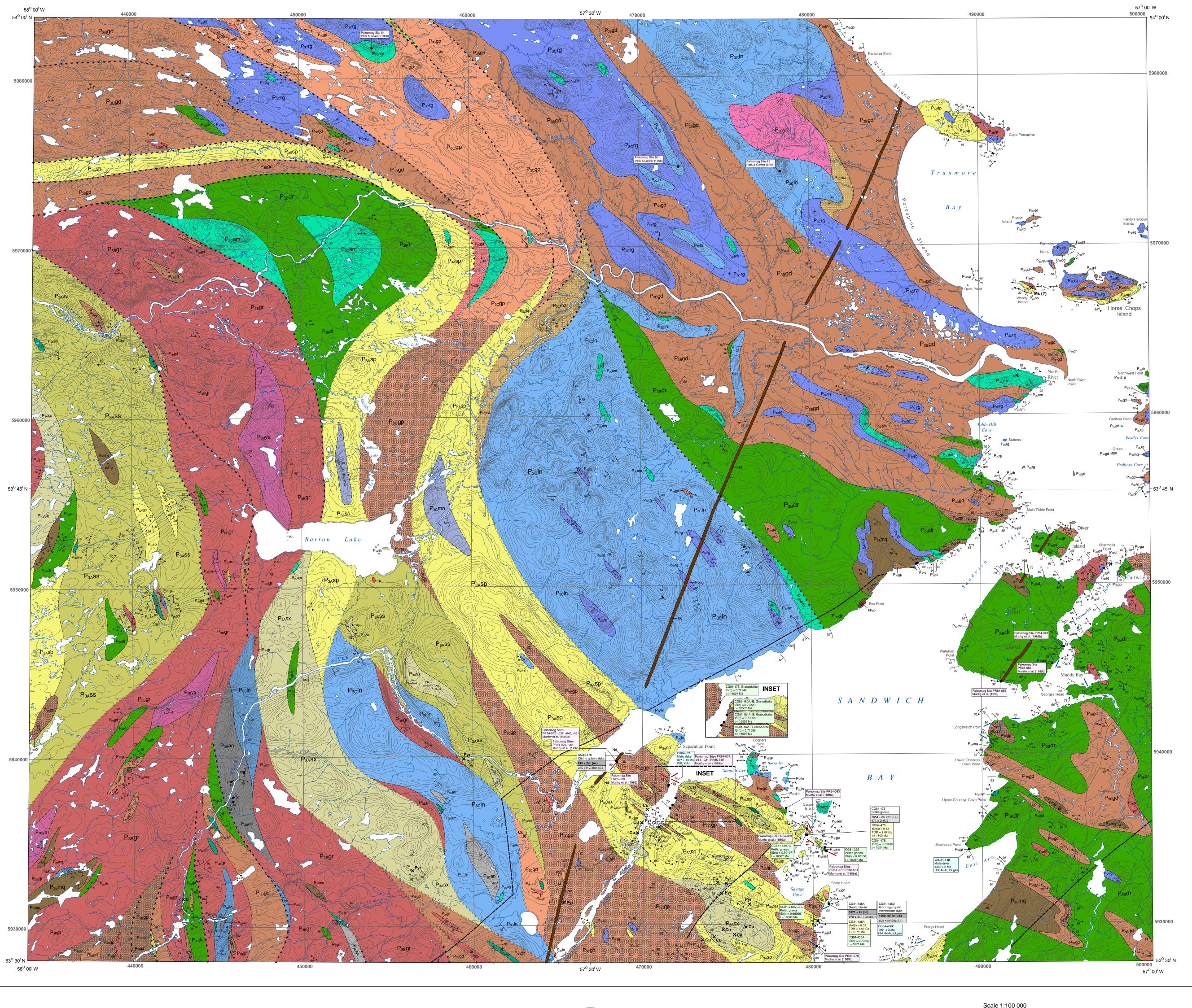
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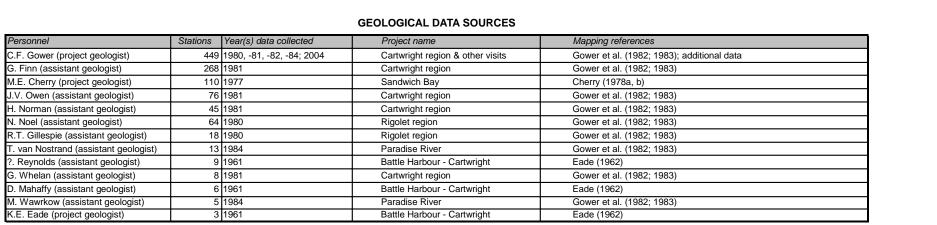
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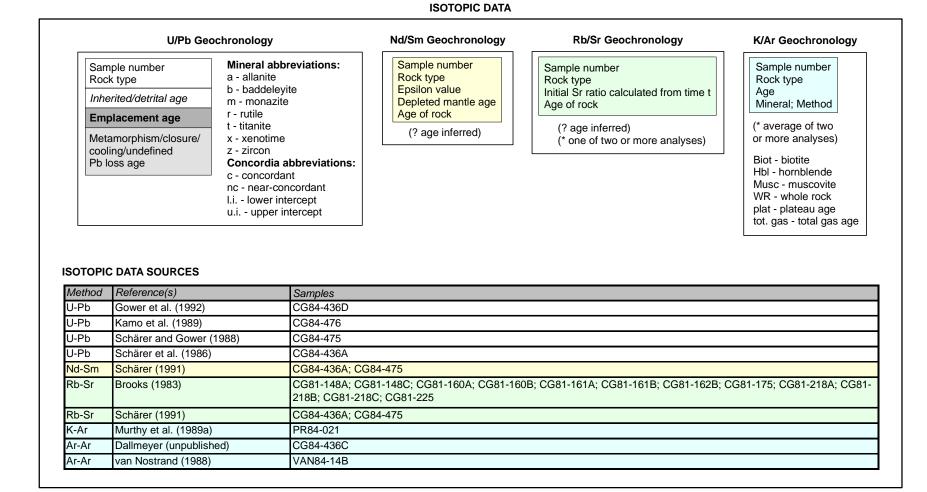
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GSNL (Geological Survey of Newfoundland and Labrador)

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ABBREVIATIONS

Amz	Amazonite	Geological contact
Au	Gold	
Bt	Biotite	Normal fault
Cly	Clay	
Cr	Chromium	Strike-slip fault
Cu	Copper	,
Fe	Iron	Thrust fault
Fel	Feldspar	
FI	Fluorite	Normal fault reactivating thrust
Gnt	Garnet	
Ilm	Ilmenite	Fold axial plane (1st, 2nd, 3rd generation)*
Lst	Limestone	Tota axiai piarie (13t, 21ta, 3ta generator)
		C fold ovic (1st generation)
Mgt	Magnetite	S-fold axis (1st generation)
Мо	Molybdenite	
Ms	Muscovite	Z-fold axis (1st generation)
Neph	Nepheline	
Ni	Nickel	Dyke (affinity unspecified)
Pb	Lead	
Pd	Paladium	Fault (sense of movement unknown, dextral, sinistral, normal)
Po	Pyrrhotite	
Pt	Platinum	Joint
Pyr	Pyrite	
Saph	Sapphire	Linear fabric (1st, 2nd, 3rd generation)*
Si	Silica	
Stn	Dimension stone	Fold axis (1st, 2nd, 3rd generation)*
Th	Thorium	Total and (Tot, 2114, 314 generation)
		Clinicanaida
Tourm	Tourmaline	Slickenside
Tpz	Topaz	On all reliand data retailers
U	Uranium	Geological data stationx
V	Vanadium	
Zn	Zinc	Geological data station (no fabric measured)*
Zr	Zirconium	
(?)	Occurrence reported	Bedding (tops known, unknown)
. ,	but validity suspect	
		Enclave
TE:		Foliation (1st, 2nd, 3rd generation)*
mineral occurrence and structural		rollation (1st, 2nd, 3rd generation)
mbols do r	not appear on each map.	Gnaissosity (1st 2nd generation)*
		Gneissosity (1st, 2nd generation)*
rtical struc	tures use 90° dip value.	Louis and the contract them a toronton and the
acai sa actardo dos do dip value.		Igneous layering (tops known, unknown)
Seneration	of structure only applicable	
observation site.		Vein
onsei vallo	III SILG.	
		Shear zone (sense of movement unknown, dextral,
B4	OMA ONETIO DATA	sinistral, reverse)
PALE	OMAGNETIC DATA	,
	a and a tile a cite and an	Mineral occurrence
Paleom	nagnetic site number	Mineral occurrence

MAP 2010-11 OPEN FILE 013H/0065 GEOLOGY OF THE SANDWICH BAY AREA (NTS SHEETS 13H/11, 12, 13 & 14) SOUTHEASTERN LABRADOR

LEGEND

LAT	LATE PALEOPROTEROZOIC (P ₃ 1800 – 1600 Ma) LATE LABRADORIAN GRANITOID INTRUSIONS (P _{3C} 1660 – 1600 Ma) e.g., Paradise Arm intrusion and Hawke Bay intrusive suite								
P ₃₀	dr P _{3C} ga	P _{3C} gd P	cgp P₃cgr	P _{3C} mn	P _{3C} mq	P _{3C} mz	P _{3C} yq	P _{3C} d	
P _{3C} d	n Diorite,	, quartz dio	rite and tonal	ite; locall	y gradin	g into le	ucogabbr	onorite	

P_{3C}ga Alkali-feldspar granite, granite and quartz syenite forming discrete plutons P_{3C}gd Granite to granodiorite forming discrete unmigmatized plutons

e.g., White Bear Arm complex and Sand Hill Big Pond intrusion

P_{3C}an Massive to strongly foliated anorthosite and leucogabbronorite

P_{3C}ag P_{3C}am P_{3C}an P_{3C}rg P_{3C}ln P_{3C}lt P_{3C}um

P_{3C}lt Primary textured to recrystallized leucotroctolite

P_{3B}ag P_{3B}an P_{3B}In P_{3B}mn P_{3B}rg P_{3B}um

melanocratic variants

LATE LABRADORIAN ANORTHOSITIC AND MAFIC INTRUSIONS (P_{3C} 1660 – 1600 Ma)

P_{3C}ag Weakly to markedly foliated mafic granulite, plus leucocratic and melanocratic variants

P_{3C}rg Massive to strongly foliated gabbro and norite, commonly layered; subophitic and locally

 $P_{3C}um \qquad \text{Massive, weakly or strongly foliated ultramafic rocks, commonly layered and locally showing} \\$

P_{3C}In Primary textured to recrystallized leucogabbronorite and leucogabbro; coronitic locally

EARLY LABRADORIAN MAFIC AND ASSOCIATED ROCKS (P_{3B} 1710 – 1660 Ma)

P_{3B}ag Weakly foliated to gneissic amphibolite and mafic granulite, plus leucocratic and

P_{3B}ln Weakly foliated to gneissic leucogabbronorite and leucogabbro; coronitic locally

P_{3B}um Massive, weakly or strongly foliated ultramafic rocks, commonly layered and locally

EARLY LABRADORIAN GRANITOID AND ASSOCIATED ROCKS (ca. 1678 and 1671 Ma)

P_{3B}gd Foliated to gneissic granodiorite and compositionally equivalent well-banded gneiss

P_{3B}gp Foliated to gneissic megacrystic/porphyritic granitoid rocks, augen gneiss

P_{3B}dr Foliated to gneissic diorite to quartz diorite, and compositionally equivalent well-banded gneiss;

P_{3B}gr Foliated to gneissic granite and alkali-feldspar granite, and compositionally equivalent well-

P_{3B}mq Foliated to gneissic quartz monzonite, grading into diorite or syenite, and compositionally

P_{3B}ya Foliated to gneissic syenite, alkali-feldspar syenite and alkali-feldspar granite, and

P_{3B}am Amphibolite skialiths, lenses and layers (mainly remnants of former dykes)

P_{3B}mz Foliated to gneissic monzonite and monzodiorite, and compositionally equivalent well-banded

P_{3A}dr Foliated to gneissic diorite to quartz diorite, and compositionally equivalent well-banded gneiss

P_{3A}gr Foliated to gneissic granite and alkali-feldspar granite, and compositionally equivalent well-

P_{3A}In Foliated to gneissic leucogabbronorite, and compositionally equivalent well-banded gneiss

P_{3A}ss Quartz-feldspar psammitic schist and gneiss; medium grained and commonly rusty-weathering

P_{3A}sx Metasedimentary diatexite; coarse grained to pegmatitic and characteristically white-weathering

P_{3A}vf Fine- to medium-grained, banded quartzofeldspathic rocks; locally have lensoid shapes, possibly

P_{3A}vm Fine- to medium-grained, banded amphibolite containing quartz-feldspar layers and calc-silicate

P_{2C}dr Foliated to gneissic diorite to quartz diorite, and compositionally equivalent well-banded gneiss

P_{2C}gr Foliated to gneissic granite and alkali-feldspar granite, and compositionally equivalent well-banded

P_{2C}mz Foliated to gneissic monzonite to monzodiorite, and compositionally equivalent well-banded gneiss

P_{2C}ya Foliated to gneissic syenite to alkali-feldspar syenite, and compositionally equivalent well-banded

P_{2C}gd Foliated to gneissic granodiorite and compositionally equivalent well-banded gneiss

P_{2C}mq Foliated to gneissic quartz monzonite, grading into diorite or syenite, and compositionally

P_{2C}gp Foliated to gneissic megacrystic/porphyritic granitoid rocks, augen gneiss

P_{2C}am Amphibolite skialiths, lenses and layers (mainly remnants of former dykes)

P_{2C}sc Calc-silicate rocks, compositionally layered, medium grained

P_{2C}so Conglomerate and agglomerate, partially of volcanic origin

P_{2C}vb Volcanic breccia, angular clasts, grading into agglomerate

indicating felsic volcanoclastic protolith

pods; interpreted as mafic volcanic rocks

P_{2C}vp Felsic volcanic porphyry interpreted to be hypabyssal

P_{2C}sp Fine- to medium-grained pelitic schist and gneiss

P_{2C}sq Quartzite, meta-arkose, thin to thick bedded

P_{2C}rg Massive to strongly foliated gabbro and norite, commonly layered; subophitic and locally

P_{2C}ss Quartz-feldspar psammitic schist and gneiss; medium grained and commonly rusty-weathering

P_{2C}vf Fine- to medium-grained, banded quartzofeldspathic rocks; locally have lensoid shapes, possibly

P_{2C}vm Fine- to medium-grained, banded amphibolite containing quartz-feldspar layers and calc-silicate

P_{3A}gd Foliated to gneissic granodiorite and compositionally equivalent well-banded gneiss

P_{3A}gp Foliated to gneissic megacrystic/porphyritic granitoid rocks, augen gneiss

P_{3A}am Amphibolite skialiths, lenses and layers (mainly remnants of former dykes)

PRE-LABRADORIAN SUPRACRUSTAL ROCKS (P_{3A} 1800 – 1710 Ma) (Age uncertain; certainly pre-1670 Ma, probably 1800 – 1770 Ma)

P_{3A}sc Calc-silicate rocks, compositionally layered, medium grained

P_{3A}SC P_{3A}SP P_{3A}SQ P_{3A}SS P_{3A}SX P_{3A}Vf P_{3A}Vm

P_{3A}sp Fine- to medium-grained pelitic schist and gneiss

indicating felsic volcanoclastic protolith

pods; interpreted as mafic volcanic rocks

MID PALEOPROTEROZOIC (P₂ 2100 – 1800 Ma)

LATE MID PALEOPROTEROZOIC (P_{2C} 1900 – 1800 Ma)

P_{2C}ga Alkali-feldspar granite, granite and quartz syenite

equivalent well-banded gneiss

P_{2C}yq Syenite to quartz syenite

P_{2C}am P_{2C}rg P_{2C}d

P_{2C}d Unnamed mafic dykes

P_{2C}sc P_{2C}so P_{2C}sp P_{2C}sq P_{2C}ss

P_{2C}vb P_{2C}vf P_{2C}vi P_{2C}vm P_{2C}vp

P_{2C}vi Intermediate volcanic rocks

Sedimentary protolith

Volcanic protolith

Mafic and associated intrusive rocks

P_{2C}dr P_{2C}ga P_{2C}gd P_{2C}gg P_{2C}gr P_{2C}mq P_{2C}mz P_{2C}ya P_{2C}yq

Granitoid and related intrusive rocks

P_{3A}sq Quartzite, meta-arkose, thin to thick bedded

e.g., Alexis River anorthosite (assigned here although age is uncertain)

P_{3B}an Weakly foliated to gneissic anorthosite and leucogabbronorite

P_{3B}dr P_{3B}gd P_{3B}gp P_{3B}gr P_{3B}mq P_{3B}mz P_{3B}ya P_{3B}am

P_{3B}mn Weakly foliated to gneissic monzonorite and monzogabbro

P_{3B}rg Weakly foliated to gneissic gabbro and norite

in part derived from leucogabbronorite

equivalent well-banded gneiss

compositionally equivalent well-banded gneiss

PRE-LABRADORIAN GRANITOID ROCKS (P_{3A} 1800 – 1710 Ma)

P_{3A}ag: P_{3A}dr P_{3A}gd P_{3A}go P_{3A}gr P_{3A}ln P_{3A}am

P_{3A}ag Mafic granulite skialiths, lenses and layers

banded gneiss

Sedimentary protolith

Volcanic protolith

showing cumulate textures

e.g., Neveisik Island and Red Island events

P_{3C}am Weakly to markedly foliated amphibolite, plus leucocratic and melanocratic variants

P_{3C}gp Megacrystic/porphyritic granite to granodiorite

P_{3C}gr Granite and minor alkali-feldspar granite P_{3C}mn Monzonorite and monzogabbro

P_{3C}mq Quartz monzonite, including rare quartz syenite

P_{3C}mz Monzonite, including minor syenite

P_{3C}yq Syenite to quartz syenite forming discrete plutons NSb Sandwich Bay conglomerate P_{3C}d Unnamed mafic dykes

Nc Clastic dykes

Nd Long Range dykes Nq Quartz veins LATE MESOPROTEROZOIC (M₃ 1200 – 900 Ma)

Dd Sandwich Bay and Battle Harbour dykes

Crow Head and Blanc-Sablon members)

NEOPROTEROZOIC – EARLY CAMBRIAN

NCLc Lighthouse Cove Formation

NCBa Bateau Formation

NDm: NGi NSb:

NDm Double Mer Formation

NEOPROTEROZOIC

NGi Gilbert arkose

Bradore Formation (subdivided into L'Anse-au-Clair,

EARLY CAMBRIAN CFo Forteau Formation

LATE POST-GRENVILLIAN INTRUSIONS (M_{3D} ca. 975 – 955 Ma) e.g., Chateau Pond granite

 M_{3D} gp M_{3D} gr M_{3D} ln M_{3D} mn M_{3D} mq M_{3D} mz M_{3D} yq M_{3D} d M_{3D}gp Massive to weakly foliated megacrystic/porphyritic granite to quartz monzonite

M_{3D}gr Massive to weakly foliated granite to alkali-feldspar granite M_{3D}In Massive to weakly foliated leucogabbro to leuconorite

M_{3D}mn Massive to weakly foliated monzogabbro and monzonorite M_{3D}mq Massive to weakly foliated quartz monzonite; mantled feldspar textures

M_{3D}mz Massive to weakly foliated monzonite to monzodiorite

M_{3D}yq Massive to weakly foliated syenite, quartz syenite and alkali-feldspar quartz syenite

M_{3D}d Unnamed mafic dykes

EARLY POST-GRENVILLIAN INTRUSIONS (M_{3C} ca. 985 – 975 Ma) e.g., Beaver Brook and Picton Pond plutons M_{3C}gr M_{3C}ln M_{3C}mn M_{3C}mq M_{3C}rg M_{3C}yq M_{3C}d >

M_{3C}gr Weakly to moderately foliated granite to alkali-feldspar granite

M_{3C}In Weakly to moderately foliated leucogabbro to leuconorite M_{3C}mn Weakly to moderately foliated monzogabbro to monzonorite

M_{3C}mq Weakly to moderately foliated monzonite to quartz monzonite

M_{3C}rg Weakly to moderately foliated gabbro, norite and troctolite

M_{3C}yq Weakly to moderately foliated syenite, quartz syenite and alkali-feldspar syenite

SYN-GRENVILLIAN INTRUSIONS (M_{3B} ca. 1085 – 985 Ma) M_{3B}gd M_{3B}go M_{3B}gr M_{3B}yn M_{3B}d >

M_{3B}gd Moderately to strongly foliated granodiorite to quartz diorite

M_{3C}d L'Anse-au-Diable, York Point, Gilbert Bay mafic dykes

M_{3B}gp Moderately to strongly foliated megacrystic/porphyritic granodiorite to quartz diorite

M_{3B}gr Moderately to strongly foliated granite to alkali-feldspar granite M_{3B}yn Moderately to strongly foliated aegerine- or nepheline-bearing syenite

M_{3B}d Unnamed mafic dykes (Makkovik Province and adjacent Grenville Province)

PRE-GRENVILLIAN INTRUSIONS (M_{3A} ca. 1200 – 1085 Ma) e.g., Gilbert Bay pluton M_{3A}gr M_{3A}mn

M_{3A}gr Weakly to strongly foliated granite M_{3A}mn Weakly to strongly foliated monzonite to monzonorite

MIDDLE MESOPROTEROZOIC (M₂ 1350 – 1200 Ma) e.g., Upper North River intrusion M_2 gr M_2 rg M_2 yq M_2 d \nearrow

M₂gr Weakly to strongly foliated granite and alkali-feldspar granite M₂rg Weakly to strongly foliated gabbronorite (in database only - Lourdes-de-Blanc-Sablon intrusion,

M₂yq Weakly to strongly foliated syenite, quartz syenite and alkali-feldspar syenite

EARLY MESOPROTEROZOIC (M₁ 1600 - 1350 Ma) e.g., Upper Paradise River, Kyfanan Lake and 13B/12 intrusions, and Michael Gabbro

M₁an Massive or weakly foliated anorthosite to leucogabbronorite, indistinctly layered in places

M₁am Weakly to markedly foliated amphibolite, plus leucocratic and melanocratic variants; granulite facies equivalents

M₁dr Massive, weakly or strongly foliated diorite to amphibolite, may be metamorphic derivative of monzodiorite or leucogabbronorite

M₁gp Moderately to strongly foliated megacrystic/porphyritic granitoid rocks

M₁gr Massive, weakly or strongly foliated granite to quartz monzonite M₁In Massive, weakly or strongly foliated leucogabbronorite and anorthositic gabbro, locally

grading into gabbronorite, locally coronitic M₁mn Moderately to strongly foliated monzonorite

M₁mq Moderately to strongly foliated monzonite to quartz monzonite

M₁mz Moderately to strongly foliated monzonite to monzodiorite

M₁rg Massive to strongly foliated gabbro, norite and troctolite, commonly layered; subophitic and locally coronitic; includes recrystallized derivatives retaining igneous textures

M₁um Massive, weakly or strongly foliated ultramafic rocks, commonly layered and locally showing cumulate textures

M₁yq Moderately to strongly foliated syenite and quartz syenite

M₁d Mafic dykes; includes Michael Gabbro

LATE PALEOPROTEROZOIC AND EARLY MESOPROTEROZOIC (PM 1800 – 1350 Ma) (Ages generally unknown, but ca. 1650 Ma and 1500 – 1470 Ma rocks identified) RECRYSTALLIZED IGNEOUS ROCKS

PMdr Medium-grained, equigranular, recrystallized weakly to strongly foliated diorite, quartz diorite PMgd Weakly to strongly foliated granite to granodiorite

PMgp Megacrystic/porphyritic recrystallized granite to quartz monzonite PMgr Medium- to coarse-grained, recrystallized weakly to strongly foliated granite and alkali-feldspar

PMIn Medium- to coarse-grained, recrystallized leuconorite, leucogabbro

PMmd Medium- to coarse-grained, recrystallized, weakly to strongly foliated, monzodiorite to monzonite

PMmq Medium- to coarse-grained, recrystallized, weakly to strongly foliated quartz monzonite

PMam Amphibolite; generally thought to be derived from mafic dykes

PMrg Medium- to coarse-grained, gabbro, norite and troctolite

PMtn Medium- to coarse-grained, recrystallized, weakly to strongly foliated tonalite to granodiorite

PMyq Medium- to coarse-grained, recrystallized, weakly to strongly foliated syenite, alkali-feldspar

SUPRACRUSTAL ROCKS PROVISIONALLY ASSIGNED AS PITTS HARBOUR GROUP PMsc PMsp PMsq PMss PMsx PMvf PMvm

Sedimentary protolith

PMsc Calc-silicate rocks, compositionally layered, medium grained

PMsp Pelitic schist and gneiss

PMsq Quartzite, meta-arkose, thin to thick bedded PMss Quartz-feldspar psammitic schist and gneiss; medium grained

PMsx Coarse-grained to pegmatitic-granitic material (diatexite), characteristically associated with psammitic gneiss and quartzite

Volcanic protolith

PMvf Fine- to medium-grained, banded quartzofeldspathic rocks; locally having lensoid shapes, possibly indicating felsic volcaniclastic protolith

PMvm Fine- to medium-grained, banded amphibolite containing quartz-feldspar layers and calc-silicate pods; interpreted as mafic volcanic rocks

AGE GENERALLY POORLY CONSTRAINED β δ

β Brittle deformation; cataclastic rocks, pseudotacholite δ Ductile deformation; mylonite, straight gneiss AGE GENERALLY POORLY CONSTRAINED

f Aplite, microgranite (felsite)

k Carbonate vein

p Pegmatite

q Quartz vein

1. Legend is common to all maps (Map 2010-01 to Map 2010-25), but all units do not appear on every map. 2. Uncoloured units do not appear as polygons on maps, but are in unit-designator strings in database. 3. Some mafic dykes also shown as polygons (especially where orientation is unknown).

NOTES