Newfoundland Labrador
Natural Resources

NOTES

A preliminary version of this map was published page-size together with a Current Research report, and as a 1:50,000 preliminary geological map based on data collected during the 2008 field season (*see* Hinchey and LaFlamme, 2009a, b).

The current map includes additional data collected during field visits in 2009 and 2010 by the author. The map also incorporates field data from Bailey (1981), making use of original field notes by Bailey and assistants M. Flannigan and A. Lalonde during 1977 and 1978. Previous geological maps of the area and region were used to provide a consistent structural and lithological interpretation of the region, especially in areas that had overgrown with vegetation since earlier maps were produced (see Clark, 1979a, b; Marten, 1977; Bailey, 1981; Gower *et al.*, 1982; MacDougall, 1988, Kerr, 1994; Hinchey, 2007; 2013).

The map interpretation is augmented by examination of new petrographic thin-sections, stained rock slabs, detailed geochemical analysis, Sm-Nd isotopic analysis and U–Pb geochronology. The associated data will accompany the digital release of this map. The geochemical data is available in Hinchey (2016). The digital database also includes thin section and hand sample information from MacFarlane's B.Sc. (Hon) project (MacFarlane, 2009) completed as part of this mapping project. Additionally, previous geochemical, isotopic and geochronological studies are incorporated into the map (Kerr *et al.*, 1992; Kerr, 1994, Hinchey and Rayner, 2008; Laflamme, 2011; Laflamme *et al.*, 2013; Hinchey, 2014, 2016). U–Pb geochronological results (Kerr *et al.*, 1992; Sparkes *et al.*, 2010; Laflamme, 2011; Sparkes and Dunning, 2015; Hinchey, 2013; Hinchey, unpublished data, 2016; Hinchey and Davis, 2013 and Nd isotopic data (Kerr *et al.*, 1992; Kerr, 1994; Laflamme, 2011) are shown. Locations of known mineral occurrences documented in the Mineral Occurrence Database (MODS) are plotted. Details of the mineral occurrences are outlined in the mineral occurrence database table.

The unit names used throughout the map area are those assigned by previous authors (see Gower *et al.*, 1982; Kerr, 1994; Ketchum *et al.*, 2002); these terms are formally defined in the published literature.

During field work, data stations were collected using a portable hand-held computer. The accompanying database contains all the digital data collected in the field, as well as the subsequent analysis of samples, including photographs, geochemical and geochronological data. Not all structural data are plotted on the map.

Individual outcrops are typically very complex and contain multiple rock types. The unit polygon typically represents the most abundant lithology in the area. The 'Unit designator' within the database will reflect this as well. The digital database contains the listing of all of the mapped rock types at any given outcrop. Discrepancies may exist between the rock name given in the field and the rock name assigned to a thin section description, rock slab and/or geochemistry due to subsequent more refined analysis. The original field interpretations remain unchanged in the database; however, the unit designators and labels will reflect the overall interpretation of all the data.

The main differences between this and that of Hinchey and Laflamme (2009b) are that detailed geochemical and geochronological analysis has further refined the geology of the Aillik Group[1], as well as the extent and nature of the plutonic suites in the area. In the current map area, the contact between the Mesoarchean gneiss and the structurally overlying Aillik Group is not exposed. The contact between the Post Hill Group[2] and the Aillik Group is obscured by a Mid-Paleoproterozoic intrusion; however, the increasing stain in the rocks towards the presumed contact is consistent with the interpretation that the contact is tectonic.

In addition, the Numok Intrusive Suite occurs in the Aillik domain in two areas; a southwesterly exposure to the west of Big River (this map area) and a northeasterly exposure surrounding the Adlavik Islands (Kerr, 1994; Hinchey and Laflamme, 2009a). These two intrusions were interpreted as representing disrupted halves of an originally continuous pluton that was offset by the Adlavik Brook fault zone (Kerr, 1994). The northeastern zone of the Numok Intrusive suite was dated at 1801 ± 2 Ma using U-Pb zircon geochronology (Kerr et al., 1992). A new U-Pb zircon age obtained for a sample from quartz monzonite from the southern Numok Intrusive Suite yielded an age of 1808 ± 2.3 Ma (MacFarlane, 2009). This new U-Pb geochronology indicates the southern Numok Intrusive Suite is at least 3 m.y. older and temporally distinct than the northern Numok Intrusive Suite, and therefore the two exposures are not part of the same pluton. However, they may represent separate plutons within the same genetically related suite. The interpretation that the northern and southern Numok Intrusive Suite originally formed a continuous pluton that was offset by the Adlavik Brook fault zone is no longer valid and, as such, this intrusion cannot be used to assess the displacement along this fault zone.

(1) This group was previously termed the Upper Aillik Group (*see* Marten, 1977), and subsequently renamed Aillik Group by Ketchum *et al.*, 2002.

(2) Previously termed the Lower Aillik Group (*see* Marten, 1977), and renamed based on distinct lithology and geochronological age by Ketchum *et al.*, 2002

(3) U–Pb radiometric dates and geochronological information from A.M. Hinchey (unpublished data, 2016)

(4) Sm–Nd isotopic data from A.M. Hinchey (unpublished data, 2016)

Geology by A.M. Hinchey and C. Laflamme
GIS/digital cartography by N.A. Stapleton

Base map in digital format published at Geomatics Canada, Earth Sciences Sector, Natural Resources Canada, Ottawa

ASTER GDEM is a product of METI and NASA.

Elevations in feet above mean sea level. Contour Interval 50 feet

Universal Transverse Mercator projection (UTM) Zone 21

North American Datum (NAD) 1927

Copies of this map may be obtained from the Geoscience Publication and Information Section, Geological Survey, Department of Natural Resources, Government of Newfoundland and Labrador, P.O. Box 8700, St. John's, NL, Canada A1B 4J6 [pub@gov.nl.ca]

Departmental website: http://www.nr.gov.nl.ca/nr/
Geological Survey website: http://www.nr.gov.nl.ca/nr/mines/Geoscience/

This map is subject to revision and modifiaction. Symbols for bedding and selected minor structures are not plotted directly at the exposure location.

Published 2016.

Recommended Citation

Hinchey, A.M, and LaFlamme, C.
2016: Geology of the Monkey Hill Area, Labrador (NTS 13J/14). Scale 1:50,000. Newfoundland and Labrador Department of Natural Resources, Geological Survey, Map 2016-15, Open File 013J/14/0308

This map supercedes Map 2009-29, Open File 013J/14/0272

Note

Disclaimer

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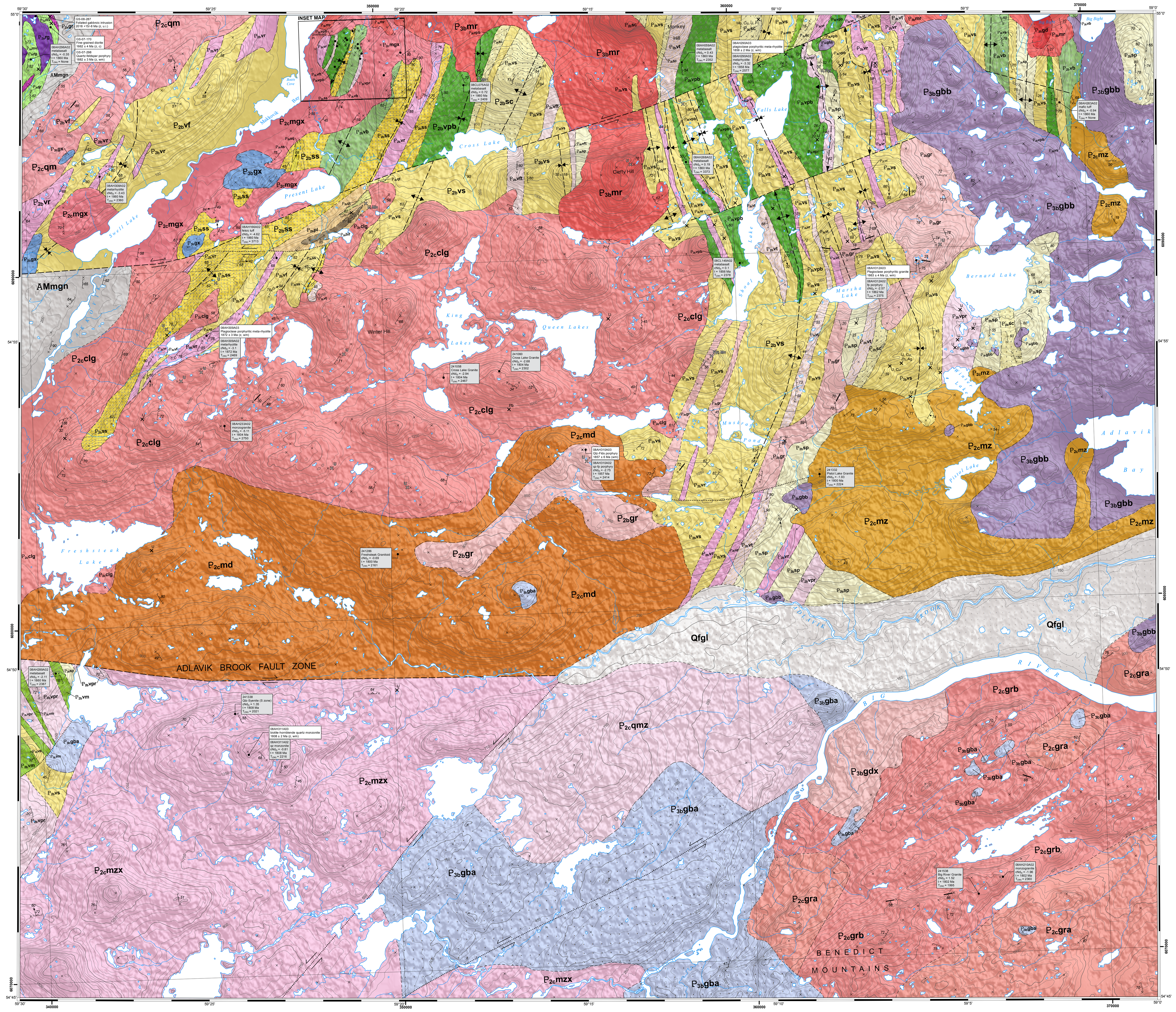


U-Pb Geochronology

Sample Number
Rock Type
Crystalization Age
Detrital Age
Metamorphic/cooling/ Pb loss age

Mineral Analyzed
z - zircon
t - titanite
a - allanite
p - perovskite

Interpretation
wm - weighted mean
c - concordant
nc - near-concordant
u.i. - upper intercept
l.i. - lower intercept
e - estimate

Data Sources

Sample No	UTM (Zone 21, NAD 27) Easting	Northing	Age	Mineral	Method	Reference
08AH290A3	362128	6095752	1858 ± 2 Ma	Zircon	SHRIMP	A.M. Hinchey, unpublished(3)
08AH309A3	344928	6088120	1872 ± 3 Ma	Zircon	SHRIMP	A.M. Hinchey, unpublished(3)
08AH310A3	355522	6084607	1857 ± 6 Ma	Zircon	ID-TIMS	A.M. Hinchey, unpublished(3)
08AH312A03	365218	6089626	1863 ± 4 Ma	Zircon	SHRIMP	A.M. Hinchey, unpublished(3)
08CL198A3	349589	6095958	1852 ± 7 Ma	Zircon	SHRIMP	LaFlamme, 2011
08CL199A3	350305	6095440	1805 ± 6 Ma	Zircon	SHRIMP	LaFlamme, 2011
08AH311A03	345775	6076370	1808 ± 2 Ma	Zircon	SHRIMP	McFarlane, A. 2009
GS-08-287	340475	6097407	2018 +15/-8 Ma	Zircon	ID-TIMS	Sparkes and Dunning, 2015
GS-07-170	340900	6097160	1662 ± 4 Ma	Titanite	ID-TIMS	Sparkes et al., 2010
GS-07-298	340900	6097160	1882 ± 3 Ma	Zircon	ID-TIMS	Sparkes et al., 2010

GEOLOGICAL SURVEY NEWFOUNDLAND AND LABRADOR 1864

MAP 2016-15

OPEN FILE 013J/14/0308

GEOLOGY OF THE MONKEY HILL AREA, LABRADOR (NTS 13J/14)

Scale 1:50 000

0 2 4 6
Kilometres

Sm-Nd Isotopic Data

Sample Number
Rock Type
$\varepsilon Nd_{(t)}$ - epsilon value at time (t)
time (t) - assumed or known age of rock (Ma)
Depleted Mantle model Ages $T_{(DM)}$

Sm-Nd Isotopic Data References

Reference	Samples							
A.M. Hinchey, unpublished(4)	08AH059A02	08AH166A02	08AH210A02	08AH233A02	08AH263A02	08AH268A02	08AH289A02	08AH290A02
	08AH296A02	08AH308A02	08AH309A02	08AH310A02	08AH311A02	08AH312A02	08CL075A02	08CL149A02
Kerr, 1989	241286	241058	241060	241332	241338	241538		
LaFlamme, 2011	08CL099B02	08CL107A02	08CL152B02	08CL159A02	08CL167A02	08CL195A02	08CL197A02	08CL198A02
	08CL199A02	08CL266A02	08CL268A02					

LEGEND

PLEISTOCENE – RECENT

Qfgl Fluvioglacial and glacial gravels and sand

LATE PALEOPROTEROZOIC (P_3 *ca.* 1800–1640 Ma)

AGES POORLY CONSTRAINED
(Probably related to ca. 1650–1635 Ma magmatism)

P_{3b}gx Medium- to coarse-grained, biotite-bearing gabbro, non-foliated, massive

P_{3b}gdx Medium- to coarse-grained, biotite–hornblende granodiorite, massive, undeformed, locally plagioclase porphyritic (possible equivalent of Numok Intrusive Suite or fine-grained Big River Granite)

LATE LABRADORIAN (P_{3b} ca. 1650–1640 Ma)

INTRUSIVE ROCKS
Unclassified units - no stratigraphic order implied

Monkey Hill Intrusive Suite (*ca.* 1640 Ma)

P_{3b}gd Little Monkey Hill granite: Medium-grained, leucocratic granodiorite to monzodiorite

P_{3b}mr Fine- to medium-grained, locally plagioclase porphyritic biotite monzogranite and includes the Monkey Hill Granite 'main body' and Round Pond granite

Adlavik Intrusive Suite (*ca.* 1650 Ma)

P_{3b}gbb Coarse- to medium-grained leucogabbro, gabbro and melanogabbro, part of the 'main body' of the Adlavik Intrusive Suite. A U–Pb zircon date of 1649 ± 1 Ma was obtained from a potassic monzodiorite phase of this suite in Adlavik Bay, east of the map area

P_{3b}gba Fine- to medium-grained, biotite-bearing gabbro to locally leucogabbro, massive, occurs as xenoliths in Big River Granite and Numok Intrusive Suite, part of the Big River Valley area of the Adlavik Intrusive Suite

MID PALEOPROTEROZOIC (P_2 *ca.* 2100–1800 Ma)

EARLY LATE PALEOPROTEROZOIC (P_{2c} ca. 1800 Ma)

INTRUSIVE ROCKS

Freshsteak granitoid

P_{2c}md Fine- to medium-grained, biotite–hornblende quartz monzonite to monzodiorite, minor granodiorite, massive, leucocratic, locally plagioclase porphyritic

Big River Granite (*ca.* 1802 Ma)

P_{2c}grb Coarse-grained, magnetite- and fluorite-bearing, biotite–hornblende monzogranite, K-feldspar phenocrysts preserve occasional pseudo-rapakivi texture, locally slightly foliated

P_{2c}gra Coarse- to very coarse-grained, magnetite-bearing, hornblende–biotite monzogranite to syenogranite, locally varying to quartz syenite, K-feldspar phenocrysts preserve occasional pseudo-rapakivi texture, locally slightly foliated

Lanceground Intrusive Suite

P_{2c}mz Pistol Lake granite: pink to buff, medium- to coarse-grained, hornblende monzogranite to quartz syenite, minor syenogranite and granodiorite

Kennedy Mountain Intrusive Suite (Units P_{2c}clg–P_{2c}mgx *ca.* 1800 Ma)

P_{2c}mgx Medium- to coarse-grained, biotite monzogranite and minor granodiorite, locally foliated, often fluorite-bearing, locally plagioclase porphyritic: likely southern extension of the Narrows granite.

P_{2c}clg Cross Lake granite: medium- to coarse-grained, leucocratic, often fluorite-bearing, biotite monzogranite, minor syenogranite, and hornblende monzogranite to granodiorite, locally foliated

Long Island Quartz Monzonite (*ca.* 1802 Ma)

P_{2c}qm Strongly to moderately foliated, locally porphyritic, granodiorite, monzodiorite and quartz monzonite

Numok Intrusive Suite (*ca.* 1808 Ma)

P_{2c}mzx Medium- to coarse-grained, massive, biotite–hornblende quartz monzonite to monzonite, locally porphyritic (K-feldspar), weakly foliated in areas, locally crumbly in appearance (due to presence of clinopyroxene and possible relict fayalite). The unit has a U-Pb zircon date of 1808 ± 2.3 Ma

P_{2c}qmz Coarse-grained, magnetite–biotite-hornblende quartz monzogranite, non-foliated to weakly foliated, locally preserved relict clinopyroxene and fayalite

LATE MID PALEOPROTEROZOIC (P_{2b} ca. 1873–1850 Ma)

INTRUSIVE ROCKS

P_{2b}gr Foliated, recrystallized, fine- to medium-grained, quartz +/- feldspar-porphyritic granite; interpreted as synvolcanic, hypabyssal intrusions, age dates range between *ca.* 1873 – 1858 Ma

SUPRACRUSTAL ROCKS
(Comprises the deformed and metamorphosed Aillik Group(1) *ca.* 1885–1850 Ma)

P_{2b}vpr Fine-grained quartz-felsic tuff, porphyritic to equigranular metarhyolite, associated with minor felsic metatuff; this is a composite unit comprising several temporally distinct flows that are structurally repeated throughout the map area. Several U–Pb zircon dates for this unit range from *ca.* 1864 – 1855 Ma

P_{2b}vft Banded felsic metatuff, includes minor lapilli metatuff, tuffaceous metasandstone, metarhyolite and tuff metabreccia; this unit comprises several temporally distinct ash flows ranging in age from *ca.* 1863 – 1850 Ma

P_{2b}vpb Moderately deformed pillow metabasalt; this unit is characterized by geochemical patterns that have flat rare-earth-element (REE) signatures relative to chondrite

P_{2b}vm Fine- to medium-grained, strongly deformed, metabasalt (amphibolite) and minor mafic metatuff; locally contains calcite–epidote nodules; this unit is characterized by geochemical patterns that have flat rare-earth-element (REE) signatures relative to chondrite

P_{2b}vs Non- to weakly bedded, tuffaceous to volcaniclastic metasandstone; includes minor felsic metatuff and metarhyolite flows

P_{2b}sc Polymictic matrix-supported conglomerate containing poorly sorted subrounded clasts of rhyolite, foliated and unfoliated granite, mafic tuff, sandstone, marble, basalt, mafic tuff and quartzite

P_{2b}sp Thin-bedded to laminated metasandstone interbedded with lesser grey–green–pink metasiltstone and minor marble; primary structures are locally preserved

P_{2b}vb Fine- to medium-grained, strongly deformed, metabasalt (amphibolite) and minor mafic metatuff, locally containing calcite–epidote nodules; this unit characteristically has geochemical patterns that show enriched light-rare-earth-elements (LREE) to heavy-rare-earth-elements (HREE) when normalized to chondrite

P_{2b}vf Non- to weakly bedded, tuffaceous to volcaniclastic metasandstone; includes minor metarhyolite flows, banded felsic tuff and volcaniclastic breccia, pervasively altered

P_{2b}vt Banded felsic tuff, includes minor lapilli metatuff, metatuffaceous sandstone and metarhyolite

P_{2b}vr Fine-grained feldspar, porphyritic to equigranular, locally flow-banded metarhyolite and associated with minor felsic metatuff; this unit comprises several temporally distinct flows that are structurally repeated; the unit has U–Pb zircon dates ranging from *ca.* 1883 – 1872 Ma

P_{2b}ss Thin-bedded to laminated metasandstone interbedded with lesser grey-green-pink metasiltstone; minor marble

P_{2b}sq Polymictic metaconglomerate and metatuffaceous conglomerate, interbedded with 2- to 10- m thick beds of metatuffaceous sandstone, clasts are poorly sorted, subrounded and are dominatly granite, tuffaceous sandstone, amphibolite, rhyolite, quartzite, marble and mafic tuff

P_{2b}qt Orthoquartzite, massive to weakly bedded, contains disseminated sulphides (pyrite, molybdenite)

P_{2b}bif Banded iron formation, comprising thin-banded (2 to 15 mm thick) magnetite–hematite layers interbedded with quartzite layers and minor semipelite layers

P_{2b}pl Semipelite–quartzite (metamorphosed thin-bedded mudstone/sandstone), thin-bedded (3 to 10 cm thick), isoclinally folded, contains rusty sulphide-rich horizons; unit appears similar to the Post Hill Group

MID PALEOPROTEROZOIC (P_{2a} ca. 2100 –1882 Ma)

INTRUSIVE ROCKS

P_{2a}gr Quartz-feldspar-porphyritic leucocratic, locally sheared, biotite granite; to the south of the map area, in the vicinity of the Kitts deposit, the unit has a U–Pb zircon date of 1882 ± 3 Ma

P_{2a}rg Fine- to medium-grained, locally coarse-grained metagabbro; amphiboles are tremolite or actinolite; includes part of the Kitts Metagabbro that has a U–Pb zircon date of *ca.* 2018 Ma

SUPRACRUSTAL ROCKS
(includes part of the Post Hill Group(2))

P_{2a}mv Fine-grained amphibolite (metabasalt), preserves relict pillows interlayered with minor psammite, pelite, argilite and orthoquartzite; interpreted as part of the Mafic Pillow Lava unit, which is part of the Kitts Pillow Lava Formation; comprises part of the Post Hill Group

MESOARCHEAN (AM *ca.* 2800 Ma)

AMmgn Locally migmatitic, highly strained, quartzofeldspathic orthogneiss; 2 km to the southeast of Swell Lake; this unit has a U–Pb zircon date of 2813 +16/-13 Ma

(1),(2) See NOTES column

SYMBOLS

Contact (defined, approximate, assumed)
Fault (approximate, assumed)
Dextral fault (approximate)
Sinistral fault (approximate)
Sinistral fault (assumed)
Antiform (approximate)
Antiform, showing plunge (approximate)
Synform (approximate)
Synform, showing plunge (approximate)
Fold axial plane (generation unknown)
Fold axis (generation unknown)
Dyke / Sill with dip
Flow contact (top unknown)
Bedding (top known, unknown)
Foliation or cleavage (generation unknown, 1st)
Igneous layering (top unknown)
Intersection lineation (1st generation)
Linear fabric (generation unknown, 1st)
Slicken Striae
Mineral occurrence
New mineral indication
Geochronology / Isotopic data sample location
Stations

MINERAL OCCURRENCES

Data from the Mineral Occurrence Data System (MODS) of the GSNL

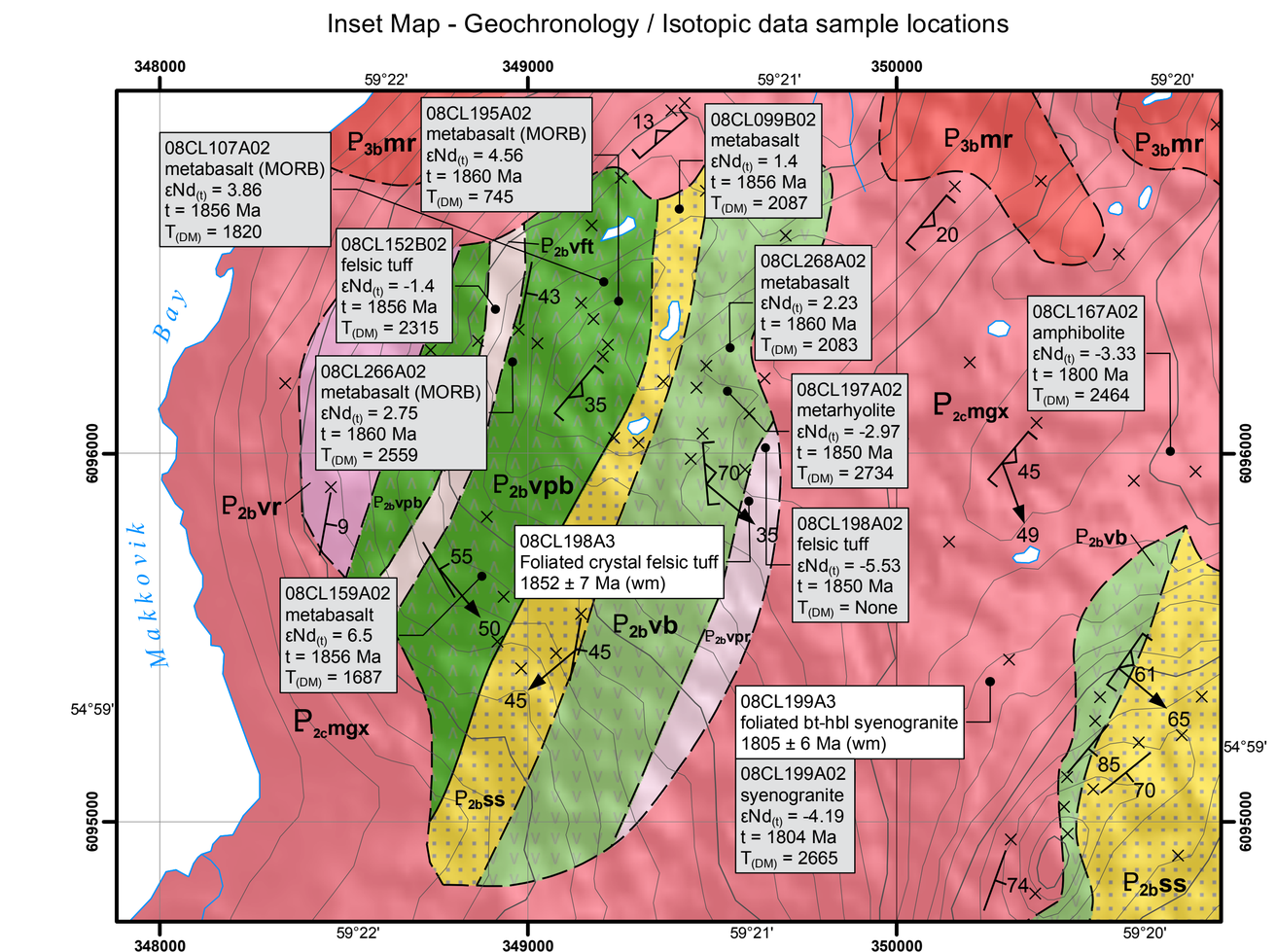
NEW MINERAL INDICATIONS

Data from A.M. Hinchey (unpublished, 2016)

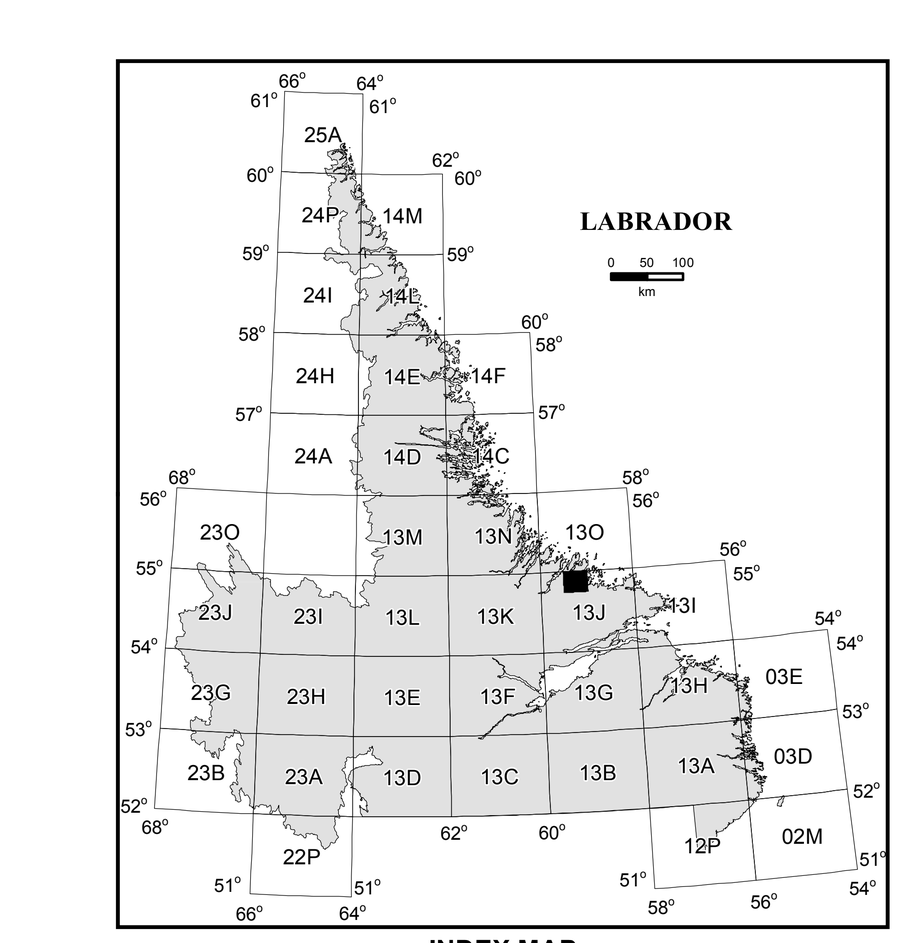
MINERAL ABBREVIATIONS

Cu Copper
Fl Fluorite
Pb Lead
Mo Molybdenite
Pyr Pyrite
Ag Silver
U Uranium
Zn Zinc

Inset Map - Geochronology / Isotopic data sample locations



Scale 1: 20 000
Metres



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