DESCRIPTIVE NOTES

The Kingnait Fiord map sheet, southwest Cumberland Peninsula, Baffin Island, is relatively poorly exposed compared to other parts of Cumberland Peninsula (Figure 1). Accordingly, recently available aeromagnetic data (Figure 2, Coyle 2009) and Landsat 7 data (Figure 3) were relied upon more heavily than in other areas to delineate the geology. Bedrock exposure is generally restricted to coastal and island exposures in vertical cliff faces, where variably foliated to gneissic tonalitic rocks (PAtn), typically containing layers, enclaves and/or inclusions of diorite (PAdr) and/or gabbro (PAgb) and cut by mm- to cm-scale veins of monzogranite–(±)orthopyroxene (PAgt). Biotite tonalite gneiss exposed 16 km east of Iqalujjuaq Fiord has a preliminary age of 2.99 Ga, establishing parts of this tonalitic complex as a Mesoarchean basement inlier. Tonalitic rocks are unconformably overlain by a succession of quartzite and marble, presumed to be part of a Paleoproterozoic cover sequence, thereby establishing the presence of much younger, but similar looking plutonic rocks (e.g., Ptn). Narrow screens and enclaves of supracrustal rocks, including amphibolite, iron formation, quartzite, marble and pelitic gneiss, are present in the assemblage of biotite-garnet±orthopyroxene monzogranite and tonalite gneiss. Where these appear to have intrusive contact relationships with tonalitic host rocks known, or inferred, to be Archean they are designated Archean (AAp). Metasedimentary rocks suspected to represent a Paleoproterozoic cover sequence, the Hoare Bay group (Jackson 1971), are exposed along the shore of Kingnait Fiord and in the northeastern part of the map sheet. They are subdivided into units PAgd, PAsp, PAps and PAqt. Quartzite (PAqt) is locally rich in several diagnostic units such as tiny arenite (Pa$_{qt}$), marble (Pc$_{qt}$), both generally as 1–3 m thick units, or orthoquartzite (Pqt$_{qt}$), which attains a thickness of several hundred metres on Kingnait Fiord (see cover photo). Metasedimentary rocks of undetermined age or affinity are designated PAsp to reflect current uncertainty. Ultramafic pyroxenite sills (Pum), whose positive magnetic expression allows extrapolation of their subsurface continuity across, can both tonalite and some Paleoproterozoic cover rocks but locally appear to be transitional with them.

At two localities in the northeastern part of this map sheet, fine-grained mafic rocks interpreted to represent Paleoproterozoic diabase dykes (PAmv) have been sampled for geochronology. Amphibolite of unknown origin (PAmv) is commonly associated with metasedimentary rocks.

Foliated, medium-grained, commonly K-feldspar and/or quartz porphyritic monzogranite, granodiorite (Pgd), charnockite (Pmz) and quartz diorite (Pdr) are exposed throughout the northwestern part of this map sheet, a region characterized by a elevated yet variable magnetic intensity (Figure 2). Pgd and Pmz are interpreted to represent a single, regionally extensive unit, which can be traced for over 250 km from Pangnirtung to Qikiqtarjuaq (Figure 1). A preliminary age of ca. 1.9 Ga (N. Rayner, pers comm. 2011) distinguishes it from the 1.864–1.845 Ga Cumberland batholith (Whalen et al., 2010).

Structures and fabrics throughout the map area are consistent with two penetrative deformation events whereby D_1 structures are folded about a broadly arcuate southwest to northeast trending F_2 axes and are axial planar to a gneissic layering (S_1) that dips 30–50° to the northwest. S_1 is parallel to, and variably developed moderately west-dipping foliation. Field observations and the regional magnetic data reveal a set of west-northwest striking diabase dykes, spaced 2.5 km apart, transects the poorly exposed southern part of this map sheet.

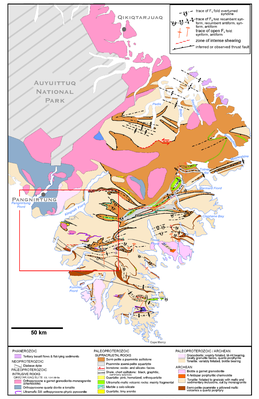


Figure 1. Generalized bedrock geology of Cumberland Peninsula, eastern Baffin Island, showing location of the Kingnait Fiord map sheet (CGM 2) outlined in red.

Abstract

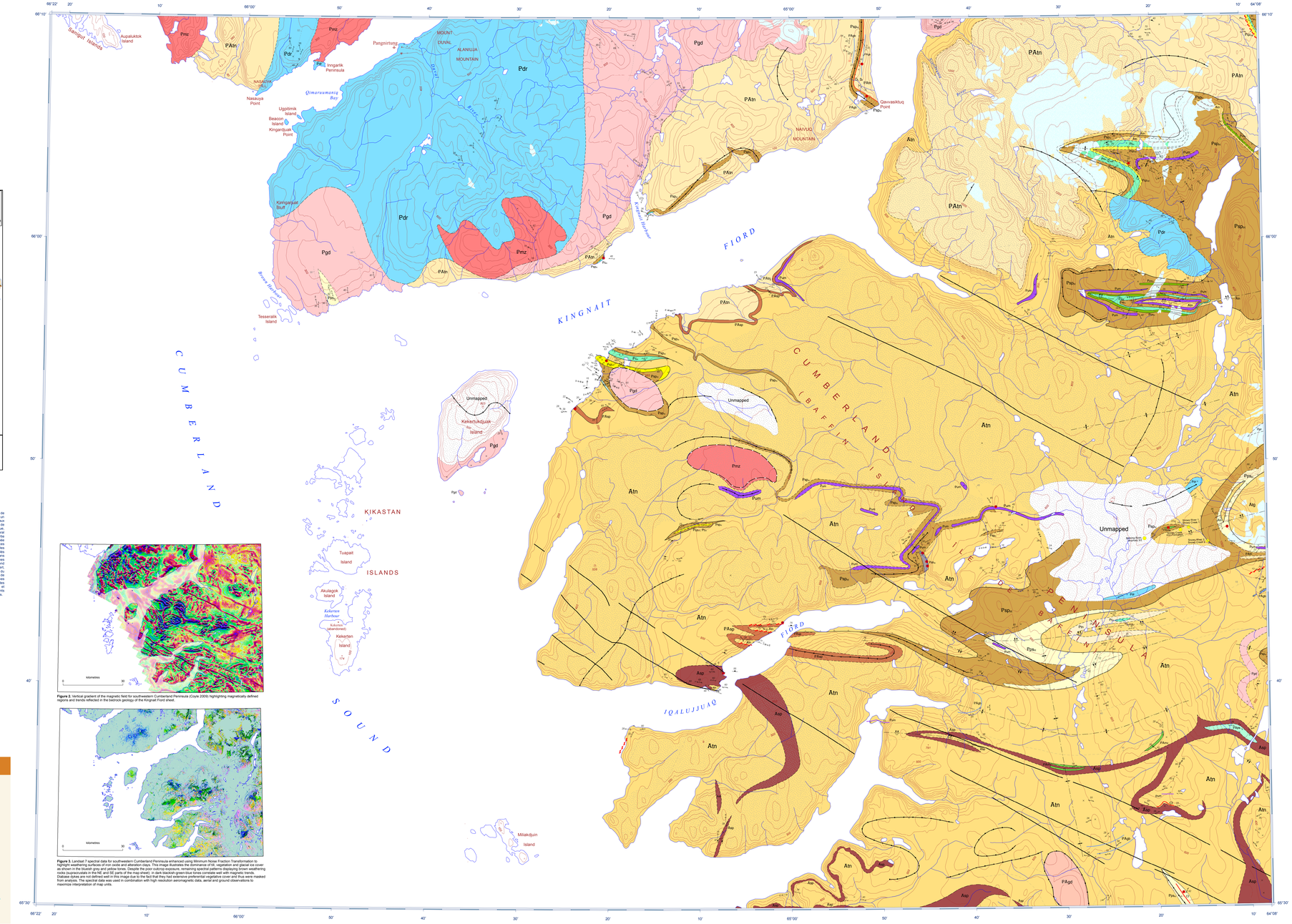
Cumberland Peninsula, eastern Baffin Island, is an under-explored, frontier with significant diamond, base- and precious-metal potential. Plutonic rocks of Cumberland Peninsula form the structural basement to Paleoproterozoic cover rocks exposed in the north. Tonalitic rocks are variably foliated to gneissic with preliminary Archean ages of ca. 2.9–2.77 Ga. Supracrustal rocks occurring as isolated strands in the south are inferred to be of Archean age. Extensive Paleoproterozoic cover rocks, the Hoare Bay group in the north include silicate- and oxide-facies iron formation, chert, graphitic-pyritiferous shale, minor quartzite, and marbles, with widespread psammitic-semipelite turbidite. At several localities, mafic to ultramafic sills intrude the cover sequence and/or supporting both flow and pyroclastic origin. Additional mafic panels of uncertain origin are widespread.

Résumé

La péninsule Cumberland, située dans l'est de l'île de Baffin, est une région pionnière peu explorée offrant un important potentiel en diamants ainsi qu'en métaux communs et précieux. Des roches plutoniques, de composition allant de la tonalite à la diorite quartzique, constituent le socle structural des roches de couverture des roches supracrustales qui dominent dans sa partie nord. La texture des roches tonalitiques varie de foliée à gneissique, selon des datations préliminaires, les roches dateraient de l'Archéen, vers 2,77 Ga. Des roches supracrustales affleurant sous forme de bandes dans le sud, dateraient également de l'Archéen. Dans le nord, une couverture étendue de roches métasédimentaires du groupe de Hoare Bay comprend une formation de fer à faciès silicaté et oxydé, du chert, de la shale graphitique-pyritifère, de la quartzite et de la marbre, avec une présence répandue de turbidites de psammite-semipélite. A plusieurs endroits, des roches ultramafiques à mafiques recoupent la séquence de couverture primaires indiquant des origines de coulée et des origines pyroclastiques. D'autres fragments mafiques d'origine incertaine sont largement répandus.

Figure 2. Vertical gradient of the magnetic field for southwestern Cumberland Peninsula (Coyle 2009) highlighting magnetically defined regions and trends reflected in the bedrock geology of the Kingnait Fiord sheet.

Figure 3. Landsat 7 spectral data for southwestern Cumberland Peninsula enhanced using Minimum Noise Fraction Transformation to highlight weathering surfaces of iron oxide and alteration clays. This image illustrates the dominance of till, vegetation and glacial ice cover as shown in the blueish grey and yellow tones. Despite the poor outcrop exposure, remaining spectral patterns displaying brown weathering surfaces are dominated by PAtn, Pgd and Pmz. Pyroxenite sills and Paleoproterozoic cover rocks are rarely exposed. Diabase dykes are not defined well in this image due to the fact that they had extensive preferential vegetative cover and thus were masked from analysis. The spectral data was used in combination with high resolution aeromagnetic data, aerial and ground observations to maximize interpretation of map units.



National Topographic System reference and index to adjoining published Geological Survey of Canada maps

CGM 1 CGM 2 CGM 3 CGM 4 CGM 5 CGM 6 CGM 7 CGM 8 CGM 9

Cover illustration:
View to east of southeast shore of Kingnait Fiord where orthoquartzite of the Paleoproterozoic Hoare Bay Group (foreground and background right) shelf facies forms a resistant peak in (till-covered) contact with Archean tonalite gneiss (background left), Nunavut. Photograph by M. Sanborn-Barrie, 2011-034

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LEGEND

This legend is common to CGM 1–CGM 3.
Coloured legend blocks indicate map units that appear on this map.
Not all symbols shown in this legend appear on this map.

QUATERNARY
PLEISTOCENE–RECENT

Unconsolidated deposits: mainly glacial till, see Dyke (in press a, b) for detailed surficial geology.

NEOPROTEROZOIC

Diabase dyke: WNW-trending, medium-grained, non-foliated, massive; equigranular; magnetite-bearing mafic dykes; typically 1–3 m wide, up to 6 m wide.

PALEOPROTEROZOIC

POST-TECTONIC PLUTONIC ROCKS

Granitesyenogranite: unstrained to weakly foliated, coarse-grained to pegmatitic, typically white-weathering peraluminous muscovite-biotite-garnet±tourmaline pegmatite; less commonly pink weathering syenogranite with 1–5% biotite as coarse books, locally up to 10% muscovite±garnet±tourmaline; both rock types are rarely represented as a map-scale unit but are denoted by map code, where prevalent in outcrop.

SYN- to LATE-TECTONIC PLUTONIC ROCKS

Peraluminous granodiorite: Beige-weathering, leucratic, weakly foliated biotite-garnet±orthopyroxene granodiorite with 5–10% biotite, 1–3% garnet, foliation concordant to the dominant shallow-dipping gneissic fabric in basement plutonic rocks and cover rocks of the Hoare Bay group. Dated at 1836 ± 2 Ma at Canyon Wash locality N107

Homblende quartz dioritetdiorite: post-D_1 pre-D_2 medium-grained, foliated hornblende-bearing diorite – quartz diorite, characterized by abundant more mafic, hornblende-bearing inclusions of more mafic composition, possibly of related (cogenetic) origin.

PRE- to SYN-TECTONIC PLUTONIC ROCKS

Tonalite: light grey to white weathering, variably foliated homogeneous biotite tonalite±orthopyroxene±granodiorite, locally containing xenoliths of marble (Pc_{qt}) and semipelite (Pa_{qt}).

QIKIQTARJUAQ PLUTONIC SUITE

Granodiorite: weakly foliated, light grey to beige-weathering, medium-grained, equigranular biotite-magnetite-garnet±orthopyroxene granodiorite; 3% burgundy garnet typically as aggregates; may be quartz porphyritic, up to 1 cm; patchy granulite-facies assemblages and colouring.

Charnockite: weakly to strongly foliated, coarse-grained, biotite-orthopyroxene monzogranite±granodiorite (charnockite±enderbite) with distinctive greasy brown fresh surface indicative of attainment of granulite facies, commonly containing elliptical, 1 cm long quartz eyes; orthopyroxene partially retrogressed to biotite and serpentine (basitic), locally containing 10–15% K-feldspar phenocrysts; up to 10 cm (e.g. NW of Pangnirtung Fiord); cuts syn-porphyritic ultramafic sills at M79 & M98 and is commonly cut by monzogranite pegmatite veins.

Quartz-diorite – tonalite: Variably foliated, olive-brown weathering, equigranular, medium-grained, orthopyroxene±clinopyroxene-bearing quartz diorite – tonalite; well-exposed, prevalent unit on the peninsula between Pangnirtung and Kingnait fiords.

Ultramafic sills: concordant sills of ultramafic composition are represented by three main types: 1) most prevalent is dark green- to brown-weathering clinopyroxene-orthopyroxene-magnetite±actinolite pyroxenite occurring as 50–100 m thick sills intrusive into supracrustal rocks and tonalitic gneiss, and cut by K-feldspar porphyritic charnockite of the Cumberland Batholith; pyroxenite displays diagnostic weathered surface due to 15–20% brown-weathering pits, 5–8 mm, thought to represent sites of orthopyroxene megacrysts; 2) medium- to coarse-grained, massive, fine-grained, equigranular, non-magnetic, ilmenite-bearing ultramafic sills, average 3–5 m thick, forming resistant layers exposed as discontinuous black rubble in till-covered region SE of Kingnait Fiord; 3) minor <2 m wide, bright green-weathering clinopyroxenite with pale green to white pegmatitic plagioclase-rich interiors are denoted by a purple line labeled Pum. Potential carving stone locally designated with cs.

SUPRACRUSTAL ROCKS

HOARE BAY GROUP

Semipelite/psammite/psilitstone: light brown-, grey- and/or rusty-weathering, layered semi-pelitepsilite commonly containing 15–40% biotite, 1–2 mm, 1–5% garnet as 2–4 mm porphyroblasts, rarely up to 2 cm and up to 10% sillimanite as fibrous, felty crystals or as white-weathering nodules (fleeker/keet); brick red weathering units contain up to 15% graphite; rarely muscovite-bearing; typically occurring as 2–4 m thick panels, but may be up to 12 m thick; interlayered with psammite; rare calcsilicate: lenticular to elongate calc-silicate concretions denoted by pale green oval symbol.

Psammite/semipelite: grey, white, creamy-beige weathering psammite as cm- to m-scale layers, up to 5 m thick, generally with semipelite, rarely with calc-silicate; contains 5–15% biotite 0.5–1 mm, <5% garnet, rarely andalusite±eustochite; lenticular to elongate calc-silicate concretions denoted by pale green oval symbol.

Iron-formation: oxide- (O_x) and/or silicate-facies (S_{ix}) typically thin (<1 m) and lenticular interbeds of silicate-facies iron-formation in the western map area and thicker (up to 5–10 m), predominantly oxide-facies, in the eastern and northeastern map areas.

Shale/siltstone: grey to black weathering shale±siltstone±pelite; black shale is generally 1–3 m wide with abundant graphite and sulphides, commonly gossanous or marked by white chalky sulphur coating on weathered surface; locally bedding and cleavage coated by pyrite; grey shale is 1–100 m wide, fissile to flaggy, is locally associated with dolomitic marble and calc silicate and locally appears to transition up section into black shale. Shale horizons < 1 m wide are denoted by a grey line labeled Psh_{sx}.

Chert: massive to laminated chert, typically 1–3 m wide, locally up to 5 m wide; generally deep purple- to rusty-weathering (gossanous) but locally pale grey- and white-weathering and thinly to thickly laminated (i.e. near Exeter Sound); observed to occur structurally above and below metasedimentic rocks (Psh_{sx}).

Pink orthoquartzite: vitreous, hematized, pink-weathering, fine- to medium-sand size orthoquartzite, 1–2 m thick, spatially associated with Psh_{sx}; may have associated minor intercalated, chalky grey-weathering psammite and/or chert.

Ultramafic-Mafic volcanic rocks: komatiitic, basaltic-komatiitic to basaltic volcanic rocks, variably textured including fragmental, pillowed and massive flows; typically bright green weathering, characteristic of high-Mg composition; locally dark green- to black- weathering, fine-grained, mafic flows; well-exposed on Bowdoin Peninsula and on Qaqulik (Cockburn) Island; may be correlative with Mount Joy volcanics.

Pink orthoquartzite: vitreous, hematized, pink-weathering, fine- to medium-sand size orthoquartzite; 1–2 m thick, spatially associated with Psh_{sx}; may have associated minor intercalated, chalky grey-weathering psammite and/or chert.

Marble – Calc silicate: pale brown- to light-grey weathering marble, typically composed of calcite, chlino-clinohumite assemblages, average 1–3 m thick; lesser associated pale-green to white calc-silicate generally as thin (<20 cm) interbeds and nodules/concretions/boudins, contains up to 20% diopside, up to 20% amphibole±tremolite±grossular; locally with psammite and semipelite interbeds; multilenticular silicate >2 m wide denoted by turquoise line labelled Pc_{qt}.

Limy arenite: immature quartz-rich clastic rocks characterized by 5–15% pale green diopside±tremolite, an indication of metamorphosed limy component, also commonly containing <2% muscovite and graphite; occurs as cm- to m-thick layers, associated with quartzite.

Orthoquartzite: pale grey, blue-grey to white-weathering, equigranular, fine- to medium-sand size orthoquartzite; typically massive and thickly bedded, with no recognizable primary structures; across the map area, this unit averages 5–20 m and thickens to 400 m at the "type" Kingnait exposure on the southeast shore of Kingnait Fiord; may contain up to 2% pale pink garnet and <5% biotite; locally interbedded with psammite and semipelite.

PALEOPROTEROZOIC / ARCHEAN (undetermined age)

PRE- to SYN-TECTONIC PLUTONIC ROCKS

Granodiorite: light grey weathered, medium-grained biotite±orthopyroxene±garnet granodiorite to monzogranite; variably foliated to mylonitic, locally K-feldspar porphyritic or porphyroclastic; commonly cut by monzogranite±charnockitic veins.

Tonalite: light grey to white weathering, weakly to moderately foliated homogeneous biotite tonalite.

Gabbro: black, dark grey to brown weathering, fine- to medium-grained, variably foliated non-magnetic gabbro typically with colour index between 60 and 85 occurring as 1–5 m wide layers, up to 20 m wide; mafics consist dominantly of hornblende ± biotite (up to 20%), locally clinopyroxene (5–10%), and 1–2% calcic plagioclase; locally medium grey-green weathering clinopyroxenite with hornblende (±biotite) and minor plagioclase (<5%) occurs as 1–5 m wide layers to lenticulate to gabbroic anorthosite (i.e. mafic complex east of Ijaulluk Fiord); continuous mafic layers <2 m wide are denoted by a blue line labeled PGb.

Diorite – Quartz diorite: medium grey-grey (dioritic) to light grey (quartz diorite), weak to moderately foliated, dominant igneous colour index of 40–60; may have hornblende or biotite as dominant mafic mineral and minor clinopyroxene; quartz diorite has colour index of 30–40 and typically hornblende > biotite with 5–20% quartz, non-magnetic.

SUPRACRUSTAL ROCKS

Psammite: light grey to rusty weathering psammite±quartzite±chert of undetermined age, may have 10% pale green diopside.

Semipelite: occurs as panels, layers and inclusions, average 20–50 m wide, within foliated plutonic rocks; typically brown-weathering, biotite-garnet±sillimanite±graphite semipelite.

Mafic volcanic - Amphibolite: black to dark green weathering, fine- to very fine-grained amphibolite with 50–70% hornblende and locally up to 5% garnet; occurs as layers up to 10 m thick; suspected to be extrusive in origin, but lacking diagnostic primary features.

ARCHEAN

PRE- to SYN-TECTONIC PLUTONIC ROCKS

Granodiorite: light grey weathered, medium-grained orthopyroxenes garnet granodiorite to monzogranite; typically weakly foliated and equigranular, locally K-feldspar porphyritic; commonly cut by monzogranite±charnockitic veins (Amz); yields a preliminary age of ca. 2.7 Ga west of Exeter Fiord.

Orthopyroxene monzogranite: K-feldspar porphyritic, orthopyroxene-monzogranite; moderately foliated, occuring as xenoliths in Apt; yields a preliminary age of ca. 2.75 Ga on Exeter Fiord.

Tonalite: variably foliated, fine- to medium-grained biotite tonalite±granodiorite; Atn is the oldest unit in the region and is commonly intruded by younger gneisses; homogeneous and inhomogeneous and typically containing xenoliths of diorite and quartz diorite; locally of homogeneous tonalite composition; yields preliminary ages of ca. 2.77 Ga at the head of Kumilien Fiord (CGM 1) and ca. 2.97 Ga northeast of Farthing Fiord (CGM 2).

Tonalite gneiss: compositionally layered orthogneiss dominated by tonalitic phase interspersed with dioritic, gabbroic and biotitic layers.

Gabbro: black, dark grey to brown weathering, fine- to medium-grained, variably foliated gabbro, typically with colour index of 60 to 85 and mafics dominantly as hornblende (40–60%), biotite (up to 20%), with locally clinopyroxene (5–8%) and minor mafics; occurring as layers, enclaves and xenoliths in plutonic rocks either known, or presumed, to be of Archean age.

SUPRACRUSTAL ROCKS

Semipelite: occurs as panels, layers and inclusions, average 20–50 m wide, within foliated to gneissic tonalite; typically brown-weathering, biotite-garnet±sillimanite±graphite semipelite, may be interlayered with garnet-rich (>60%) "garnetite" layers, 20–40 cm wide, amphibolite 1-4 m wide, and/or grey chert; 'gp' denotes graphite-rich unit.

Mafic volcanic rocks: dark green weathering, pillowed flow with brown-weathering vesicles and scarce 1 cm plagioclase phenocrysts; overlain by limy arenite and cut by quartz porphyry dated at ca. 2.91 Ga; restricted exposure in CGM 1 northeast of the head of Akilliarbuk Fiord, may also include amphibolite associated with Asp.

Lithological contact
- observed
- approximate
- inferred

Limit of mapping

Structural form line

S_n may have representative dip
S_n may have representative dip and plunge
S_n may have representative dip

Faults
- thrust, teeth on upthrown side
- inferred thrust, teeth on inferred upthrown side

Ductile shear zone, sense of shear unknown

Linear aeromagnetic anomaly
- positive
- negative

Axial trace of first generation (F_1) synform
- upright
- overturned, north-dipping limbs

Axial trace of second generation (F_2) antiform, synform
- upright
- overturned, north-dipping limbs

Axial trace of third generation (F_3) antiform, synform

Bedrock outcrop examined for this study

Gossans

Mineral showings*

Bedding
- inclined; facing known, facing unknown
- overturned, facing known (WN)
- igneous layering, inclined, tops unknown
- S_0=S_n, transposed

Cleavage
- inclined, first generation
- inclined, second generation

Schistosity
- schistosity, first generation; inclined, vertical
- schistosity, second generation: inclined, vertical
- schistosity, third generation: inclined, vertical

Crenulation
- greissosity, first generation: inclined, vertical
- greissosity, second generation: inclined

Ductile shear zone
- shear zone with dip

Mineral lineation
- intersection lineation, S_0-S_1
- intersection lineation, S_1-S_2
- mineral, stretching, first generation
- mineral, stretching, second generation
- mineral, stretching, third generation

Extension (direction and plunge indicated)

Folds*
- S fold, first generation; showing dip of axial plane and plunge of fold axis
- S fold, second generation; showing dip of axial plane and plunge of fold axis
- S fold, third generation; showing dip of axial plane and plunge of fold axis
- U fold, first generation; showing dip of axial plane and plunge of fold axis
- U fold, second generation; showing dip of axial plane and plunge of fold axis
- U fold, third generation; showing dip of axial plane and plunge of fold axis
- Z fold, first generation; showing dip of axial plane and plunge of fold axis
- Z fold, second generation; showing dip of axial plane and plunge of fold axis
- Z fold, unknown generation; showing dip of axial plane and plunge of fold axis

**Fold axis may occur without axial plane.*

Fault
- inclined, normal
- vertical, normal

Dyke, vein
- dyke
- dyke, sill
- vein: inclined, vertical

Ice movement
- direction known
- direction unknown

Sources of Information for Mineral Showings

NWT assessment reports http://www.nwtgeoscience.ca/romimt/ (originally published by Indian and Northern Affairs Canada)

Nunavut assessment reports http://nunavutgeoscience.ca/romimt_e.html (originally published by Indian and Northern Affairs Canada)

Geological Survey of Canada's Canadian and world mineral deposit databases, http://gdr.nrcan.gc.ca/mrdep or http://apps1.gdr.nrcan.gc.ca/gsc_minerals/index_e.html?language=en-CA

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Authors: M. Sanborn-Barrie, M. Young, J. Whalen, D. James, and M.R. St-Onge

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Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications.

Elevations in feet above mean sea level.

Mean magnetic declination 2011, 33°24.5'W, decreasing 28.8' annually. Readings vary from 32°56'W in the SW corner to 33°53'W in the NE corner of the map.

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Four trim marks around perimeter of map sheet. Trim map sheet first, then fold at folding marks.
Cover is 17cm wide when folded.
Second panel when folded is also 17cm wide.
Subsequent panels when folded are 17cm wide or less.