How to read the geological map

The objective of mapping south-central Baffin Island in 2015 was to improve the geological knowledge and document the economic potential of the greater Iqaluit area. Geological maps show the distribution of geological features, including different kinds of rocks and faults. Although the geology of every area is different, all geological maps have several features in common: coloured areas and letter symbols to represent the kind of rock unit at the surface, lines to show the type and location of contacts and faults, strike and dip symbols to show which way layers are tilted, and a map legend that explains the colours and symbols utilized.

The most striking features of geological maps are its colours. Each colour represents a different geological unit. A geological unit is a volume of a certain kind of rock of a given age. Geological units are named and defined by the geologists who make the geological map, based on observations of the rocks in the field and investigations on the age of the rocks. In addition to colour, each geological unit is assigned a set of letters to uniquely symbolize it on the map. Usually the symbol is the combination of an initial capital letter followed by one or more capital or lowercase letters. The first capital letter represents the age of the geological unit. Geologists have divided the history of the Earth into Eons. All letter symbols begin with a capital letter representing an Eon: for example P (Paleoproterozoic – 2500 to 1600 million years ago), N (Neoproterozoic – 1000 to 541 million years ago), or Q (Quaternary – 2.58 million years ago until today). The capital letters that follow indicate the name of the unit, if it has one. Lowercase letters indicate the type of rock. An example of named rock units on Baffin Island are metasedimentary rocks named "Lake Harbour Group". So PLHq on the map would be the symbol for Lake Harbour Group quartzite (deposited in the Paleoproterozoic). Similarly, Nd would be the symbol for an unnamed unit of diabase emplaced in the Neoproterozoic.

The place where two different geological units are found next to each other is called a contact, and this is represented by different kinds of lines on the geological map. When different geological units have been moved next to one another after they were formed, the contact is a fault contact. If one rock was intruded into another (for example granite intruded into sedimentary strata) then the contact is an intrusive contact. Another kind of line shown on most geologic maps is a fold axis. In addition to being moved by faults, geological units can also be bent and warped into folds. A line that follows the crest or trough of the fold is called the fold axis. Where the contact line is precisely located, it is shown as a solid line, but where it is uncertain, it is shown as dashed. The lines on the map may be modified by other symbols on the line (triangles, small tick marks, arrows, and more) which give more information about the line. For example, faults with triangles on them show that the side with the triangles has been moved up and over the side without the triangles. All the different symbols on the lines are explained in the map legend. Tilted layers are shown on a geological map with a strike and dip symbol. The symbol consists of three parts: a long line, a short line, and a number. The long line is called the strike line, and shows the direction in the layer that is still horizontal. Any tilted surface has a direction that is horizontal (think about walking on the side of a hill, there is always a way to go that is neither up nor down, but is level). The short line is called the dip line, and shows which way the layer is tilted. The number is called the dip, and shows how much the layer is tilted, in degrees, from flat. The higher the number, the steeper the tilting of the layer. Strike and dip symbols can be modified to give more information about the tilted layers just like lines can be, and these modifications are explained in the map legend.

All geological maps come with a table called a map legend. In the legend, all the colours and symbols are shown and explained. The map legend starts with a list showing the colour and letter symbol of every geological unit, starting at the top with the youngest or most recently formed unit, along with the name of the unit (if it has one) and a short description of the types of rock in that unit and their age. After the list of geological units, all the different types of lines on the map are explained, and then all the different strike and dip symbols. The map legend will also include explanations of any other kind of geological symbols used on a map (for example locations where fossils were found, locations of deposits of precious metals, and any other geological feature that might be important in the area documented by the geological map). Because the geology in every area is different, the map legend is vital to understanding the geological map.

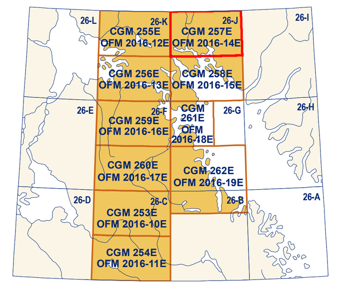
Fieldwork and geological mapping on south-central Baffin Island established the distribution of metasedimentary rocks (Lake Harbour Group; map units PLHq, PLHc, PLHs, PLHp; Piling Group; unit PPL) that can be correlated or not with rock formations on Meta Incognita Peninsula. A suite of magmatic sheets (sills) was documented and will be the focus of further study (map units PLHu, PLHm, PLHd). These are of potential economic importance as they contain metallic minerals (sulphides), and their occurrence could indicate the presence of economic metal concentrations. Three rock deformations and two thermal events were recognized. Such events can be correlated with similar ones that took place 1800 million years ago and have been previously documented both elsewhere on Baffin Island and in northern Quebec. These results will be used to compare and improve models showing the ancient geological evolution of Nunavut.

Abstract

This map summarizes the field observations for the Clearwater Fiord (north) map area following eight weeks of regional and targeted bedrock mapping on western Hall Peninsula. The 2015 field campaign completes a two-decade mission to update map coverage for the whole of Baffin Island south of latitude 70°N. The bedrock is dominated by a Paleoproterozoic metaplutonic suite, ranging in composition from gabbro to syenogranite, with crosscutting relations indicating a progression from mafic to silicic magmatism. Prevailing upper amphibolite to lower granulite facies metamorphic conditions overlap the stability limits of magnetite and orthopyroxene, which is consistent with equilibrium phase diagrams and regional aeromagnetic data. Metasedimentary rocks, including quartzite, pelite, marble, and metagreywacke, are present as screens and enclaves between and within plutonic bodies. An examination of the 'ghost' stratigraphy suggests that the metasedimentary rocks can be correlated with the middle Paleoproterozoic Lake Harbour Group in the south and Piling Group in the north. Two basaltic dyke swarms and shallowly dipping Ordovician limestone respectively crosscut and overly the Paleoproterozoic units.

Résumé

La présente carte synthétise les observations de terrain réalisées dans la région cartographique de Clearwater Fiord (nord) suite à huit semaines de cartographie régionale et ciblée du substratum rocheux. La campagne de terrain de 2015 met fin à deux décennies de travaux visant à mettre à jour la couverture cartographique de l'ensemble de l'île de Baffin au sud de la latitude 70°N. Le substratum rocheux est dominé par une suite métaplutonique du Paléoprotérozoïque, dont la composition varie du gabbro au syénogranite, qui affiche des relations de recoupement révélant une progression d'un magmatisme mafique à un magmatisme siliceux. Les conditions dominantes d'un métamorphisme du faciès des amphibolites supérieur au faciès des granulites inférieur chevauchent les limites de stabilité de la magnétite et de l'orthopyroxène, ce qui est compatible avec les diagrammes de phases à l'équilibre et les données aéromagnétiques régionales. Des roches métasédimentaires, dont de la quartzite, de la pélite, du marbre et du metagrauwacke, sont présents sous forme d'écrans entre les massifs plutoniques et d'enclaves au sein de ceux-ci. Une examination de la stratigraphie «fantôme» laisse croire que les roches métasédimentaires peuvent être corrélées avec les unités du Paléoprotérozoïque moyen du Groupe de Lake Harbour, au sud, et du Groupe de Piling, au nord. Deux essaims de dykes basaltiques et des strates de calcaire ordovicien de faible pendage recoupent et recouvrent respectivement les unités de carte d'âge Paléoprotérozoïque.



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

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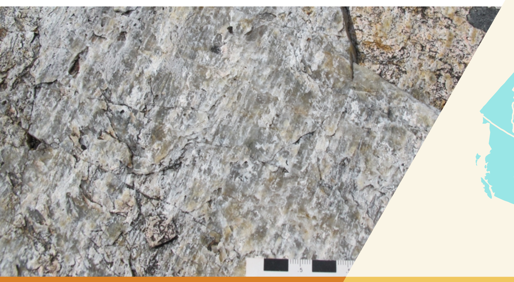
GEOLOGICAL SURVEY OF CANADA
CANADIAN GEOSCIENCE MAP 257E
CANADA-NUNAVUT GEOSCIENCE OFFICE
OPEN FILE MAP 2016-14E

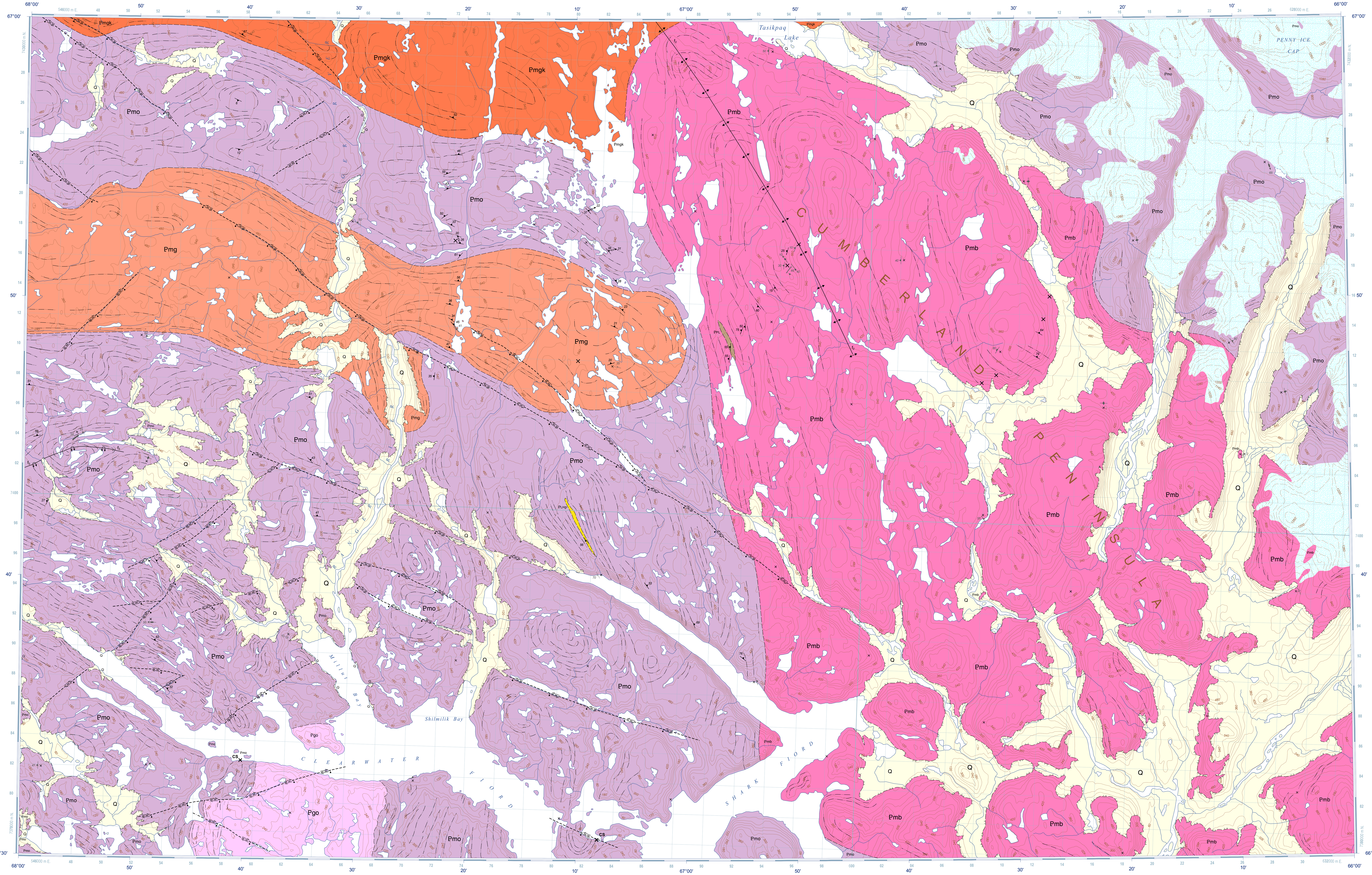
GEOLOGY

CLEARWATER FIORD (NORTH)

Baffin Island, Nunavut

1:100 000





HOW TO READ THE LEGEND

This legend is common to CGM 253E, CGM 254E, CGM 255E, CGM 256E, CGM 257E, CGM 258E, CGM 259E, CGM 260E, CGM 261E, and CGM 262E. Coloured legend blocks denote map units that appear on this map. The age category (Eon) of the map unit is indicated by the first upper case letter, e.g. example P (Paleoproterozoic), the tectonostratigraphic name, if applicable, by the second and third upper case letters, e.g. LH (Lake Harbour Group), and the lithology by the lower case letter(s), e.g. mo (orthorpyroxene-bearing monzogranite).

QUATERNARY

- **Q** — Glacial till (bouldery diamicton); glaciofluvial sand and gravel; glaciolacustrine, glaciomarine and marine sand, silt, and gravel; alluvial sand and gravel; talus scree bouldery diamicton.

ORDOVICIAN

- **OA** — **AMADJUAQ FORMATION:** limestone; tan to dark brown; nodular bedded, weathers massive; argillaceous to shaly in lower part.

NEOPROTEROZOIC

- **Nd** — Diabase dyke (Franklin swarm).

MESOPROTEROZOIC–CENOZOIC

- **MCd** — Diabase dyke (Kekertaluk swarm).

PALEOPROTEROZOIC

- **Psb** — Biotite syenogranite; locally with K-feldspar megacrysts.
- **Pmg** — Biotite-garnet±orthopyroxene monzogranite; locally contains abundant inclusions of metasedimentary rock.
- **Pmgk** — Biotite-garnet±orthopyroxene monzogranite; with K-feldspar megacrysts; locally contains abundant inclusions of metasedimentary rock.
- **Pmb** — Biotite-magnetite±orthopyroxene monzogranite; locally with K-feldspar megacrysts.
- **Pmh** — Biotite-hornblende±magnetite±orthopyroxene monzogranite.
- **Pms** — Orthopyroxene-biotite monzogranite; commonly contains abundant inclusions of metasedimentary rock.
- **Pmo** — Orthopyroxene-biotite±magnetite monzogranite; locally with K-feldspar megacrysts.
- **Pgo** — Orthopyroxene-hornblende-biotite±magnetite granodiorite.
- **Pd** — Hornblende-orthopyroxene-clinopyroxene diorite, leucodiorite; locally layered with compositions ranging from diorite to anorthosite.
- **Pg** — Hornblende-clinopyroxene-magnetite±biotite gabbro; locally layered with compositions ranging from gabbro to anorthosite.

PILING GROUP

- **PPL** — **LONGSTAFF BLUFF FORMATION:** psammite, semipelite, arkosic and lithic metawacke; thin-to-thick layers, light to dark grey; minor hornblende-bearing calc-silicate layers and concretions.

LAKE HARBOUR GROUP

FROBISHER SUITE

- **PLHw** — White garnet-biotite leucogranite; commonly interlayered with metasedimentary rock.
- **PLHd** — Metaleucodiorite.
- **PLHm** — Metagabbro, amphibolite.
- **PLHu** — Metaperidotite, metapyroxenite, metadunite.

METASEDIMENTARY ROCKS

- **PLHc** — Diopside-phlogopite-spinel-apatite marble, calc-silicate; minor siliciclastic layers; white garnet-biotite leucogranite pods and seams.
- **PLHa** — Hornblende-garnet-biotite±clinopyroxene amphibolite; locally with carbonate seams.
- **PLHp** — Garnet-sillimanite-biotite psammite; semipelite, pelite, quartzite; minor marble and calc-silicate; white garnet-biotite leucogranite pods and seams; metadiorite to metaleucodiorite and layered mafic-ultramafic sills.
- **PLHs** — Garnet-biotite semipelite; pelite, quartzite; white garnet-biotite leucogranite pods and seams.
- **PLHq** — Garnet-sillimanite quartzite, feldspathic quartzite; semipelite, orthoquartzite, pelite; minor marble and calc-silicate; white garnet-biotite leucogranite pods and seams.

ARCHEAN

- **Amm** — Biotite-magnetite monzogranite, locally crosscut by coarse-grained to pegmatitc syenogranite veins.
- **Amk** — K-feldspar megacrystic biotite monzogranite to quartz monzonite.
- **Ag** — Biotite±hornblende granodiorite to monzogranite.
- **At** — Biotite±hornblende tonalite to granodiorite; commonly contains layers of diorite to quartz diorite, and locally contains pods and enclaves of metagabbro.

Geological contact
- Approximate

Geological contact, depositional-unconformable
- Approximate

Oblique-slip fault, normal, inferred
- Sinistral slip
- Dextral slip

Foliation form line

Black structural symbols on map indicate an actual station location. Grey structural symbols refer to measurements that had to be offset for display purposes only; these include all legacy stations and some 2015 stations.

- 10 Banding, inclined
- Banding, inclined, dip unknown
- 30 Bedding, inclined
- 10 Contact, inclined
- 40 Fault plane, normal, inclined
- 10 Foliation, inclined
- Foliation, inclined, dip unknown
- Foliation, vertical
- 40 Fracture, inclined
- Shear zone, vertical
- 30 Fault grooves
- Glacial striae, flow direction unknown
- 10 Mineral lineation
- 20 Rodding
- 30 Stretching lineation

Antiform, defined
f_2

Antiform, overturned, defined
f_3

Station
- Fieldwork 2015
- Legacy

Carving stone
- CS Occurrence in hydrated ultramafic rock

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Authors: M.R. St-Onge, O.M. Weller, B.J. Dyck, N.M. Rayner, T. Chadwick, and D. Liikane

Geology by M.R. St-Onge, O.M Weller, B.J. Dyck, N.M. Rayner, T. Chadwick, and D. Liikane, Geological Survey of Canada; S. Noble-Nowdluk, T. Milton, and T. Rowe, Government of Nunavut, 2015

Geological interpretation by M.R. St-Onge and notes by M.R. St-Onge and O.M. Weller, 2015

Geology conforms to Bedrock Data Model, beta v. 2.6

Geomatics by A. Morin, A. Ford, C. Gilbert, L. Robertson, G. Buller, and R. Buenviaje

Cartography by N. Côté

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Map projection Universal Transverse Mercator, zone 19.
North American Datum 1983

GEOLOGY

CLEARWATER FIORD (NORTH)

Baffin Island, Nunavut

1:100 000

2 0 2 4 6 8 km

Base map at the scale of 1:250 000 from Natural Resources Canada, with modifications.
Elevations in metres above mean sea level

Mean magnetic declination 2016, 31°52'W, decreasing 29.2' annually. Readings vary from 31°26'W in the SW corner to 32°15'W in the NE corner of the map.

This map is not to be used for navigational purposes.

Title photograph: Well developed, down-dip, transverse mineral stretching lineation north of the trace of the proposed Baffin suture. Scale card graduation in centimetres. Clearwater Fiord, Baffin Island, Nunavut. Photograph by T. Chadwick. 2015-128

The Geological Survey of Canada welcomes corrections or additional information from users.

Data may include additional observations not portrayed on this map. *See* documentation accompanying the data. Additional descriptive notes, references, and figures are included in the map information document.

This publication is available for free download through GEOSCAN (http://geoscan.nrcan.gc.ca/) and the Canada-Nunavut Geoscience Office (http://cngo.ca/).

Preliminary publications in this series have not been scientifically edited.

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