DESCRIPTIVE NOTES

This map shows the geology across part of the Komaktorvik shear zone along the eastern margin of the Torngat Orogen (Van Kranendonk et al., 1992). It adjoins Map 24P/10 to the west (Van Kranendonk and Wardle, 1994) and Map 24P/8 in the south (Van Kranendonk, 1994). The map area is well-exposed, except in the northwestern corner where the Eclipse River lies within a broad, sandy of raised beaches. The central north-south segment and the southeastern corner of the map area are dominated by the rugged Torngat Mountains, including The Horns and unnamed peaks between 3500-4200' in the central part, and the 4400' high Four Peaks region in the southeast. These mountains were created by the excavation of a broad peneplain by massive glaciers during the last ice age, the tiny of the disharmonic fold (intrafold adjustment zone of Schwerdtner and van Berkel, 1991). In this model, both the Komaktorvik and remnants of which survive in northerly-facing circues. Narrow arêtes, hanging valleys, moraines, and broad U-shaped valleys are other

Katherine River shear zones are interpreted to have formed roughly contemporaneously (Van Kranendonk et al., 1993), a conclusion common glacial features in this area. Rock glaciers, which are flow-banded trains of metre-sized, angular boulders, are common features

Supported by **U-Pb** 1798-1780 Ma ages from a number of syn-D_{n-3} granitic veins from the Komaktorvik and Katherine River shear zones in hanging valleys. Map coverage of the mountainous terrain was accomplished through helicopter-supported ground traverses from a (Scott et al., 1993; Scott and Machado, 1992, 1994). asecamp located in the west-central part of the map area (see map), into which we were flown by a Twin Otter airplane, from Kuujjuaq, Québec, equipped with tundra tires. Coastal outcrops in Eclipse Channel were visited by an inflatable boat with a 40 hpr outboard engine. The map area was previously included within a 1:250,000 scale reconnaissance mapping project of northeastern Quebec and northern Labrador (Taylor, 1979), but has not been previously studied in any detail.

The map area is underlain in part by rocks derived from Archean protoliths of the Nain Province, including predominantly migmatitic tonalitic orthogneisses [Agl, Agn, Argn] that contain inclusions and rafts of garnet- biotite+/-sillimanite paragneiss [Ams], variably retrogressed mafic granulite gneiss [Amf], white/grey to purple-weathering meta-anorthositic rocks [Aan], and metamorphosed ultramafic rocks [Aum]. Archean gneisses of the Nain Province are cut by Paleoproterozoic diabasic Avayalik dykes [Pdb] (Wardle et al., 1992). Together, these rocks are metamorphosed to the granulite facies in the southeastern part of the map area (Archean and superimposed Paleoproterozoic granulite facies; see below), and variably recrystallized to lower amphibolite-facies conditions throughout the rest of the map area during the Paleoproterozoic. A sample of amphibolite- facies, foliated hornblende tonalite from west of Ryans Bay was dated by U-Pb on zircon as 2802 ± 2 Ma, which is interpreted as a minimum age for this rock (Scott and Machado, 1994). The Hutton anorthositic suite [APan, APanl], of Late Archean or earliest Proterozoic age, has a range in composition from anorthosite to anorthositic gabbro, and includes rare ultramafic pods, patches of solid magnetite (s30cm x 1 m), and rusty sulphide-rich horizons. Textures vary from pristine, coarse-grained anorthosite with subophitic textures of blue igneous plagioclase feldspar (Labradorite) and recrystallized matic clots (now composed of hornblende-biotite-epidote) [APan], to medium-grained, granoblastic gneisses [APanl]. Contact relationships between anorthositic rocks and Archean gneisses are sharp and commonly tectonized, so that a relative age relationship between these units is unknown. Rocks of the Hutton anorthositic suite are cut by the Avayalik dykes [Pdb]. In tectonic contact with Archean gneisses are a heterogeneous package of matic gneisses [Psmg]. These rocks are characterized by units with a centimetre- to decimetre- scale layering defined by modal variations between hornblende, epidote, plagioclase, titanite, ilmenite, and quartz. In addition to the well-layered gneisses are layers of homogeneous amphibolite, plagioglase-phyric gabbro, rare horizons of thin quartz-feldspar porphyry, rusty paragneiss, one unit interpreted to be a fragmental andesite, and one outcrop with possible relict pillow structures (Van Kranendonk et al., 1994). These rocks are interpreted to be derived from predominantly mafic volcanic and/or volcaniclastic protoliths and to be Paleoproterozoic in age, because they do not contain Avayalik dykes and are in tectonic contact with

1992: Whole rock Pb isotopic compositions of Archean and Proterozoic rocks from northern Labrador used to separate major units in Archean Nain Province gneisses. A minimum age is suggested by the oldest intrusive metaplutonic rock, dated to the north of the map

area as 1910 ± 2 Ma (Scott et al., 1993). Nain Province rocks, the Hutton anorthositic suite, and the layered mafic gneisses are all cut by a suite of Paleoproterozoic metapluto rocks (the DTG suite), which has a range in composition from diorite and gabbro [Pid], through tonalite and granodiorite [PiDTG], to youngest monzodiorite [Pimd] and granite [Pigr] (Van Kranendonk and Scott, 1992; Van Kranendonk et al., 1993, 1994). Tonalitic compositions are by far the most voluminous and display a range in texture from homogeneous, medium-grained rocks, to those with a gneissic character that is commonly seen to be obtained through partial assimilation of their host Archean gneisses. These rocks do not contain Avayalik dykes, and have been dated outside of the map area by U-Pb on zircon, as between 1910-1885 Ma (Scott et al., 1993; Scott, D.J. and Machado, N., Scott and Machado, 1992, 1994). Coarse-grained K-feldspar megacrystic granite [Pigt], characterized by a porphyroclastic texture (≤40% K-feldspar megacrysts, up to 5 cm in long dimension) and a strongly- developed schistosity defined by aligned micas, cuts Archean gneisses in the map area, and rocks of the Hutton anorthositic suite immediately to the south (Van Kranendonk, 1994). This granite may represent a separate unit from the DTG suite, as indicated by cross-cutting relationships, the absence of complex structural fabric elements, and the age of a similar rock from Killinek Island that has been dated as 1864 ± 2 Ma (Scott and Machado, 1992). Cutting across all previous rock units within the Komaktorvik shear zone are a set of fine- to medium-grained, equigranular, olive green-weathering (hornblende-plagioclase+/-garnet) mafic dykes [Pdg] . These N-S striking dykes have highly irregular intrusion forms and are weakly deformed relative to strongly sheared country rocks; features which suggest a syn-tectonic emplacement during Komaktorvik shear deformation (Van Kranendonk et al., 1994). Metamorphic rocks of the map area are cut by fresh, brown-weathering diabase dykes which strike generally east- west. A K-Ar age of Scott, D.J., Machado, N., Van Kranendonk, M., Wardle, R.

Structural geology The map area is dominated by Archean structures in Archean granulite-facies gneisses in the southeast, and by structures related to

the formation of the north-south striking Komaktorvik shear zone located within the central part of the map area (Van Kranendonk et al.,

Taylor, F.C., Archean Nain gneisses contain evidence of a polycyclic tectonic history which may span from ≥3.6-2.56 Ga (cf. Bridgwater and Schiøtte, 1991; Bridgwater and Wardle, 1992). Migmatitic, heterogeneous orthogneisses contain an early set of intrafolial isoclinal folds that affect a first generation of leucosome veins. These rocks and their complex structures are cut by homogeneous, leucocratic tonalite sheets, which are themselves folded and foliated by a later generation of strucutres (D_n). The second foliation is axial planar to a set of upright, close to tight folds, whose moderately south-plunging axes (F_n) are parallel to granulite-facies mineral lineations (L_n) defined by orthopyroxene, hornblende and quartz. The second set of structures is believed to be Late Archean in age (ca. 2770 Ma: Scott and Machado, 1994). A set of narrow, retrograde shear zones in the granulite-facies gneisses (not shown on map), may have formed at ca. 2650 Ma, the age of monazite in amphibolite-facies granitic rocks from north of the map area (Scott and Machado, 1994). Archean structures are cut by Avayalik dykes and subsequently affected by multiple sets of Paleoproterozoic structures, only some of

1994:. Geology, Tower Mountain, Newfoundland (Labrador) - Québec: Geological Survey of Canada, Open File 2828, scale 1:50,000 the western shore of Ryans Bay and the southern shore of Eclipse Channel, where heterogeneous, layered and strongly foliated rocks of

Van Kranendonk, M.J. and Scott, D.J., the DTG suite are interpreted as containing a strong S_{n+1} fabric. These rocks are cut by N-S striking tonalite dykes which contain a biotite foliation, which is interpreted to be S_{n+3} . A possible age constraint for the D_{n+1} deformation is provided by the oldest metamorphic U-Pb date of 1870 ± 3 Ma (Scott and Machado, 1994), obtained from monazite from a sample of Tasiuyak gneiss located in map sheet 24P/7 (Van Kranendonk, 1993). No linear fabric elements associated with D_{n+1} have been recognized. D_{n-2} structures of the Abloviak shear zone are generally not recognized in the map area. However, a set of NNE and SSW-plunging, tight folds of gneissosity in retrogressed Archean gneisses in the southwestern corner of the map area, that have different orientations from

the regionally-developed set of SW-plunging D_{n+3} folds (see below), may represent F_{n+2} folds. Third generation structures (D_{n+3}) are the most prominent across the central and western parts of the map area, and vary in orientation gneisses and rocks of the DTG suite are steeply east-dipping and contain a weak NE-plunging lineation defined by hornblende and quartz. djacent to the eastern margin of the KSZ, megacrystic granites contain a protomylonitic to mylonitic schistosity in which are found downdip elongation lineations defined by biotite, quartz and stretched quartzo-feldspathic aggregates, and kinematic indicators of east-side-up and sinistral horizontal displacement. These give way to the fabric elements of the KSZ, which include N-S striking, steeply west-dipping protomylonitic to mylonitic schistosities with abundant kinematic indicators of oblique, sinistral, east-side-up shear, and SW-plunging linear fabric elements including tight folds (F_{n+3}) and mineral elongation lineations (L_{n+3}) defined by hornblende and quartz. margins of the high strain zone are saw-toothed in the plane of the map, with narrow zones of high strain splaying off from the main N-S shear zone, particularly along its western margin and in the northeastern part of the map area. Folds have an S-asymmetry across the eastern half of the KSZ, but give way to symmetrical and z-asymmetrical folds across the western part of the zone, where the trend of axes varies from SW to N. West of the KSZ, D_{n+3} fabric elements swing to the SW, where tightly folded rocks contain moderate to shallow NE-dipping foliations and moderately SW-plunging linear fabric elements. Rare kinematic indicators in these lower amphibolite-facies, annealed rocks, suggest a west-side-up, dextral sense of displacement. The east-west changes in orientations of planar and linear D_{n+3} fabric elements across the **KSZ** (change from steeply east-dipping to moderately west-dipping foliations, the change in strike of the foliations, and the opposing senses of displacement) are interpreted to reflect their formation within the hinge zone of a crustal-scale disharmonic fold profile which developed off of the bend in the Abloviak shear zone during late, cross-orogen shortening and flexure (Van Kranendonk et al., 1993). The western limb of this s-asymmetric fold is located to the west of the present map area and does not contain penetrative D_{n+3} fabric elements. The eastern limb of the fold, however, is

KOMAKTORVIK

Structural (UPPER CASE) and lithological (lower case) subdivisions of the northern part of the Paleoproterozoic Torngat Orogen, Labrador, Québec and Northwest Territories (after Van Kranendonk et al., 1992).

Location of map area outlined by square box.

- Hutton anorthositic suite

Area of strong

represented by the KSZ, which was the locus for significant sinistral, east-side-up oblique displacement. The north-south striking zone of high-strain in the central part of the KSZ represents the strongly-deformed hinge zone of the fold in this model, as is reflected in the change The inference deduced from the geometry and kinematics of the structures, and the observation that granulite-facies rocks occur on valley, and in the lowlands north of Eclipse Channel and between it and Ryans Bay, where broad, flat gravel plateaux form the remnants either side of the KSZ, is that folding was accompanied by symmetrical uplift of the high-grade terrains across a northward-tapering wedge of lower-grade crust in the hinge zone of the fold. The tightly-folded material in the hinge zone became detached from the rigid,

Metamorphism

Paleoproterozoic metamorphic grade varies from granulite facies in the east to lower amphibolite facies across the rest of the map area. In the east, Archean granulite-facies gneisses [Agl] contain garnet-clinopyroxene assemblages overgrowing orthopyroxene (cf. Van Kranendonk et al., 1994), whereas Avayalik dykes contain only garnet-clinopyroxene porphyroblasts in a matrix of hornblende and plagioclase. These observations are used to suggest that the orthopyroxene-bearing assemblages in the gneisses are Archean, whereas the clinopyroxene-garnet assemblages are Paleoproterozoic. A complexity arises from observations of Avayalik dykes with a high-pressure assemblage cutting retrogressed, sheared gneisses. The age of the Paleoproterozoic granulite-facies metamorphism is uncertain, but may have occurred at ca. 1835 Ma, the age of zircon from a granulite-facies Avayalik dyke located north of the present map area (Scott and Machado, 1994; Van Kranendonk et al., 1994). Granulite-facies assemblages in Archean gneisses are retrogressed to lower amphibolite-facies assemblages approaching the Komaktorvik shear zone. Paleoproterozoic rocks north and west of Ryans Bay contain only prograde amphibolite-facies assemblages in this area, and show no evidence of having been metamorphosed in the granulite facies. Lower amphibolite-facies assemblages include hornblende-biotite-epidote-titanite \pm actinolite \pm calcite \pm muscovite; garnet is absent. Epidote is extensively preserved in weakly-strained matic gneisses [Psmg] immediately west of the basecamp. A U-Pb titanite age of 1745 ± 3 Ma from the southern part of the map area indicates the end of this low-grade metamorphism.

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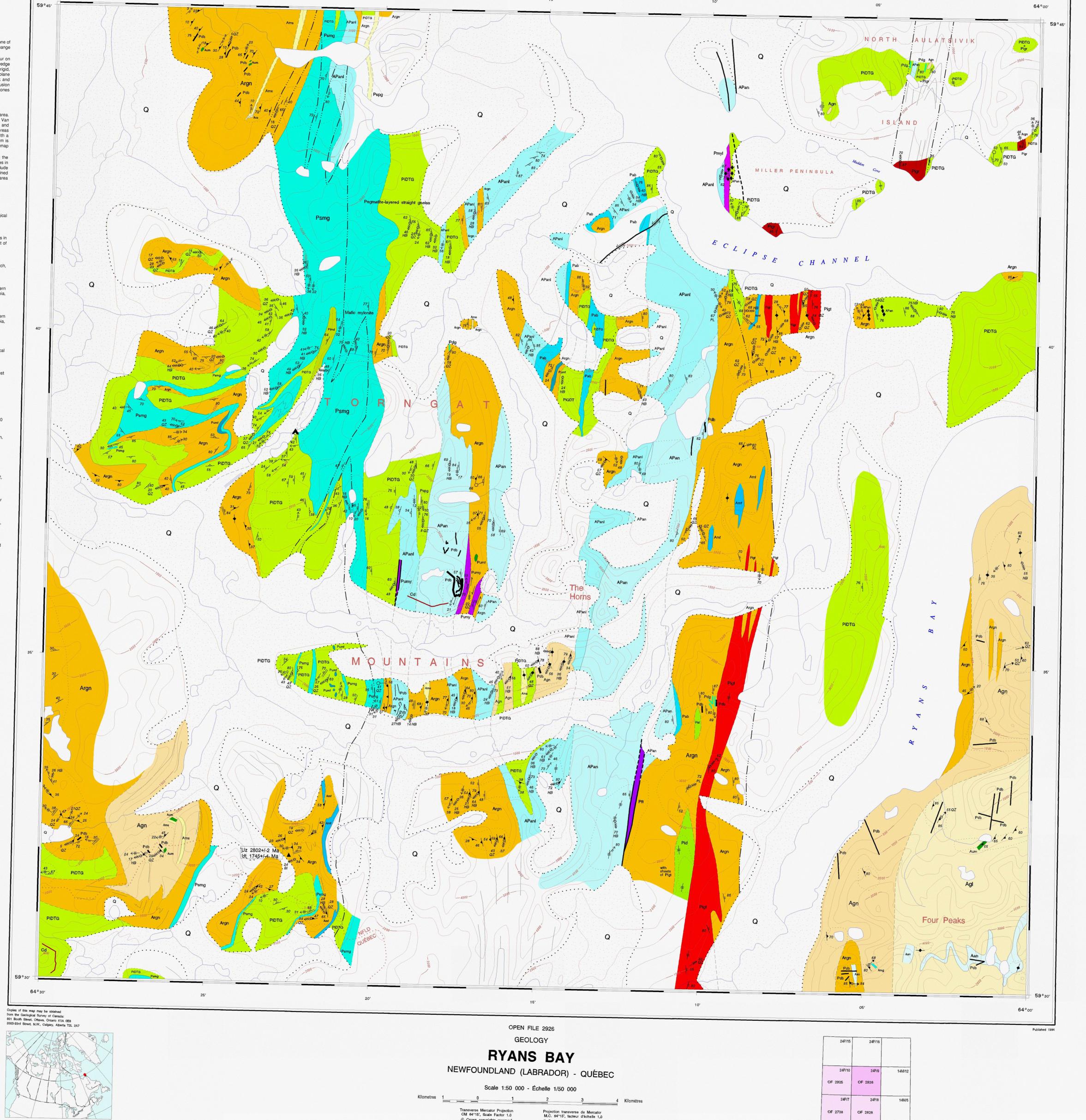
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LOCATION MAP - LOCALISATION DE LA CARTE





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Geology by M.J. Van Kranendonk, R.J. Wardle, F.C. Mengel, L.M. Campbell, R. Churchill, S. Schwartz, L. Godin, and L. Reid, 1991-1993, Geological Survey of Canada

Digital map compilation by M.J. Van Kranendonk, Geological Survey of Canada

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