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DESCRIPTIVE NOTES

INTRODUCTION

This 1:100 000 scale map and the accompanying Open File 1794 mapsheet 1 (NTS 56 P (South)) present results of bedrock mapping undertaken by the Canada-Nunavut Geoscience Office and Geological Survey of Canada under the Targeted Geoscience Initiative (TGI) during the summer of 2002. The objectives of the project were to upgrade geoscience knowledge of the prospective Committee Bay area (Fig. 1) and provide modern, 1:100 000 scale geological maps for the region. The Ellice Hills map area (NTS 56 P) is underlain by northeast-trending rocks of the Archean Prince Albert group (unit PAg: Heywood, 1967), a clastic-dominated supracrustal belt characterized by an association of quartzite and komatiite. Previous investigations of the Committee Bay belt (Figs. 1,2), include reconnaissance mapping (1:506 880) of Heywood (1962) and the subsequent 1:250 000 scale mapping in parts of the Laughland Lake (NTS 56 K) and northern Walker Lake (NTS 56 J) map sheets (Schau, 1982). The proposal to establish a new national park at Wager Bay (Fig. 1), including the headwaters of the Brown River, led to a mineral resource assessment by the Geological Survey of Canada (Jefferson and Schau, 1992; Chandler et al., 1993). As a result of the Committee Bay Targeted Geoscience Initiative Project, bedrock maps and related petrological and structural studies are available for: 1) Laughland Lake (56 K; Sandeman et al., 2001a-c; Johnstone, 2002; Johnstone et al., 2002; MacHattie, 2002); 2) Walker Lake and Arrowsmith River 56 J(N) and 56-O(S), respectively (Sanborn-Barrie et al., 2002; Skulski et al., 2002; Skulski et al., 2003a); and 3) Ellice Hills (56 P; this map; Sanborn-Barrie et al., 2003; Skulski et al., 2003b). Lithogeochemical prospecting results are available across the belt (Hyde et al., 2002; Sherlock and Deyell, 2002; Deyell and Sherlock, 2003), as are results of surficial mapping and drift prospecting (Little, 2001; Little et al., 2002; McMartin et al., 2002, 2003; Ozyer and Hickock, 2002; Utting et al., 2002; Giangioppi et al., 2003). An aeromagnetic survey that covered 85,300-line km, was flown along northwest-trending strike-perpendicular flight lines, and spaced at 400 m along a pre-calculated drape surface with a mean terrain clearance of 150 m (Kiss et al., 2002a-g; Miles et al., 2003). These datasets have been integral in the production of this map, particularly in regions of extensive Quaternary drift.

REGIONAL GEOLOGICAL SETTING

The north-central Rae domain of the western Churchill Province, lying west of Hudson Bay, contains a discontinuous, ca. 1000 km long, northeast-trending zone of polydeformed and metamorphosed Archean supracrustal belts with a diagnostic quartzite komatiite association, that includes the Woodburn and the Prince Albert groups (Fig. 1). The supracrustal rocks are inferred to have formed in a continental setting, reflected by local evidence for deposition on older sialic basement (e.g., 2.87 Ga, Zaleski et al., 2001) and the presence of older Meso- to Paleoarchean detrital zircon in widespread quartzites (e.g., Ashton, 1988; Davis and Zaleski, 1998; Skulski et al., 2003b). Volcanic rocks within this northeast-trending corridor include komatiite, basalt, andesite, dacite, and rhyolite; the latter two yielding U/Pb ages in the Woodburn Lake and Committee Bay area between 2.73 and 2.69 Ga (Zaleski et al., 2001; Skulski et al., 2003b and references therein; Skulski et al., unpublished). Archean plutonic rocks in the region appear to be dominated by calc-alkaline granitoid plutons emplaced between ca. 2.64 and 2.58 Ga (Ashton, 1988; LeCheminant and Roddick, 1991; Zaleski et al., 2001; Skulski et al., 2003a & b) with lesser synvolcanic tonalite.

Outliers, or possibly klippe of platformal to basinal facies, Paleoproterozoic meta-sedimentary rocks are found throughout the region (Figs. 1,2). These include: the > 1.85 Ga Amer Group (Tella, 1994); the ca. 1.88 Ga Penrhyn Group (Henderson, 1983); the Chantrey Group (Frisch, 2000) and; the Folster Lake Formation (Frisch, 1982). In the Committee Bay area, small outliers of Paleoproterozoic metasedimentary rocks include < 2.50 Ga quartzite in the Laughland Lake area (NTS 56 K), and < 2.32 Ga arkose and calc-arenite in the Ellice Hills (SHRIMP U/Pb detrital zircon; Skulski et al., unpublished; Table 1). These Paleoproterozoic sedimentary sequences have sustained Proterozoic deformation and are locally metamorphosed to amphibolite facies.

Archean and Paleoproterozoic strata in the region have a prominent northeasterly-striking tectonic fabric that is constrained in the Committee Bay and Woodburn Lake areas to have formed between ca. 1.85 and 1.82 Ga (Zaleski et al., 2001; Sanborn-Barrie et al., 2002; 2003). This predominant northeasterly fabric is interpreted to have resulted from regional D_2 deformation in the hinterland of the Trans-Hudson orogen. D_2 strain is generally superimposed on earlier D_1 fabrics and folds that formed after 2.6 Ga, but before 1.85 Ga (Fig. 1; Carson et al., 2003; Sanborn-Barrie et al., 2003). D_2 deformation was accompanied by regional greenschist to upper amphibolite metamorphism. Dextral, and locally oblique-slip, east-striking shear zones in the region overprint D_2 fabrics and include the Amer (Tella, 1994), Wager Bay (Henderson and Broome, 1990), and Walker Lake shear zones (Johnstone, 2002; Fig. 1).

In the Committee Bay area, Paleoproterozoic intrusive rocks include late- to post-tectonic ca. 1.825 Ga calc-alkaline granites and granodiorites of the Ford Lake batholith (LeCheminant et al., 1987) and similar age biotite magnetite ± fluorite monzogranites in the study-area (Skulski et al., 2003b). Plutonic units equivalent to the ca. 1750 Ma Nueltin Suite (Peterson et al., 2002) have not been documented in this part of the Rae domain, however, a small elliptical pluton of microcline megacrystic biotite-fluorite monzogranite was mapped in 56 K to the southwest and is inferred to be correlative with the Nueltin Suite. The northwest- trending, ca. 1.267 Ga gabbroic MacKenzie dykes cut all lithological units and structures.

GEOLOGY OF THE COMMITTEE BAY AREA

The Committee Bay area is generally underlain by three, lithologically distinct, northeast-trending crustal domains (Skulski et al., 2002 & 2003a; Fig. 2): the central, northern and southern domains. The central domain includes a main, northeast-trending belt of supracrustal rocks belonging to the Prince Albert group (PAg), herein called the Committee Bay supracrustal belt, that extends from the Laughland Lake area in the southwest to the Curtis River area in the northeast. Metasedimentary and volcanic rocks of the Committee Bay supracrustal belt (Fig. 2) in the NTS 56 P map sheet are mainly exposed in the southern part of the mapsheet, although thin, discontinuous rafts, lenses and xenoliths occur farther north, the largest of which is termed the Ellice Hills belt (Fig. 2). The PAg comprises abundant semipelite, psammite and quartz arenite, less common iron-formation and ultramafic rocks and uncommon phyllite, basalts and intermediate to felsic volcaniclastic rocks. These supracrustal rocks are flanked immediately to the northwest and southeast by medium-grained, variably foliated syn- to post-volcanic tonalite that intrudes the supracrustal rocks. Collectively, these rocks are intruded by areally extensive, equigranular, and microcline-porphyritic ca. 2.60 Ga granodiorite and monzogranite.

The southern domain is underlain by the regionally extensive, potassic, Walker Lake intrusive complex, which is dominated by potassium-feldspar porphyritic to augen granodiorite and monzogranite. The areal extent of the northern domain is difficult to determine in the map area. Much of the area lying immediately North of the Committee Bay supracrustal belt is underlain by voluminous, homogenous, moderately foliated, and lineated potassium-feldspar-phyric biotite granodiorite. North of the Atorquait fault, the granodiorite persists, but it, along with the tonalite and supracrustal units, is widely intruded by a range of younger, variably foliated granodiorite through syenogranite. Some of the latter are characterized by peraluminous mineral assemblages (muscovite ± garnet), and may represent plutonic derivatives from a package of higher-grade metasedimentary rocks at depth.

The metamorphic grade in the main supracrustal belt varies from upper greenschist in the southwest to amphibolite facies in the northeast. It is difficult to evaluate the regional metamorphic grade to the 56 P (north) owing to a lack of rocks that offer diagnostic mineral assemblages. However, to the northwest (56-O (south)), the grade increases to upper amphibolite facies with consequent development of metasedimentary diatexites and paragneisses with peraluminous melt lenses. Intrusive units that may be interpreted as cogenetic with the volcanic rocks, range from rare gabbro through common quartz diorite and diorite, abundant tonalite to granodiorite and rare granite. A similar lack of appropriate lithologies and diagnostic mineral assemblages makes accurate determination of metamorphic grade in the southern domain difficult, however, widespread hornblende in plutonic rocks and local garnet in metasedimentary inclusions suggests amphibolite facies metamorphic conditions.

GEOLOGY OF THE ELLICE HILLS AREA (56 P)

SUPRACRUSTAL ROCKS OF THE PRINCE ALBERT GROUP (PAg)

Amphibolite and mafic volcanic rocks (unit Aas)

On the basis of preliminary U-Pb geochronology and stratigraphic relationships, basaltic rocks appear to form the lowermost sequence in the PAg. These are less abundant than ultramafic rocks, occur predominantly in the northern part of the map area (Ellice Hills belt) and typically comprise hornblende ± actinolite ± chlorite schists characterized by knobbly and irregular surfaces resulting from preferential weathering of ankerite and calcite. The mafic rocks typically form thin (40 m thick) horizons in biotite psammite throughout the region and are commonly interlayered with oxide and silicate facies iron-formation. Primary volcanic features such as pillows, lava shelves, or amygdales have been observed at very few localities in the western, lower-grade part of the belt but were rarely recognized in the 56 P map area (Fig. 3).

Intermediate volcanic rocks (unit Aiv)

Intermediate volcanic rocks are rare in 56 P and typically occur as laminated tuffaceous rocks that are interlayered with semipelite or psammite (unit Aps), basalt (unit Amv) and ultramafic rocks (unit Ak) southwest of Kinngalugjuaq Mountain (Fig. 2). Primary volcanic features were not identified.

Komatiite (unit Ak)

Ultramafic rocks are typically the most abundant (volcanic?) igneous rocks comprising the PAg. They commonly form thick (200 m), prominent high ridges relative to the surrounding metasedimentary units. These rocks comprise thin, metre-scale komatiitic flows locally exhibiting green-weathering spinifex zones and brown-weathering cumulate horizons. They are interlayered with semipelite, psammite, and iron-formation (Fig. 4) dominate the Ellice Hills belt but have a restricted presence southwest of Kinngalugjuaq Mountain (Fig. 2). These units locally exhibit schistose, talc-serpentine or talc-anthophyllite margins.

Iron-Formation (unit Aif)

Iron-formation occurs locally throughout the PAg as discontinuous, ~ 50 m wide units, and includes: finely laminated magnetite and chert (oxide facies: Fig. 5, sheet 1); centimeter to decimetre scale layered garnet-amphibole-rich layers (silicate facies), and minor sulphide facies characterized by the presence of either disseminated or fracture controlled sulphide minerals. iron-formation commonly occurs as interlayered combinations of the aforementioned types and locally as iron-rich chloritic schists. Sulphides, mostly pyrrhotite and pyrite with minor arsenopyrite and chalcopyrite are locally associated with secondary quartz veining. iron-formation is commonly interlayered with semipelitic or ultramafic rocks but locally occurs in association with quartz arenite and/or volcaniclastic rocks.

Quartz arenite (unit Aqz)

Quartz arenites are common in the southern, Committee Bay supracrustal belt, and form prominent hills in the southwest and central parts of the map sheet. These comprise muscovitic, white to grey, decimetre-scale bedded quartz arenite that structurally overlies predominent psammite and semipelite with less common garnet + grunerite silicate and magnetite iron-formation, and ultramafic horizons. Collectively the quartz arenite units form laterally continuous marker horizons that locally exhibit primary structures (grading, scours) indicating stratigraphic younging. In the southwestern Committee Bay belt, quartz arenite units locally contain abundant fuchsitic mica. These were interpreted by Schau (1982) as accumulations of detritus from paleo-weathering of adjacent ultramafic and felsic rocks. In the Kinngalugjuaq mountain and the Curtis River areas (Fig. 2), quartz arenite commonly contains cm-scale muscovite-quartz-magnetite knots that locally exhibit relic sillimanite. These faserkeisel (Fig. 6, sheet 1) locally define S_1, but are commonly re-oriented, defining S_2/L_2.

PAg (undivided: unit Aps)

The most abundant rock-types of the PAg comprise fine-grained, biotite ± garnet psammite and semipelite that are interbedded on mm- to dm-scale (Fig. 7). These rocks occur throughout the PAg, generally form recessive, low rubbly outcrop and dispersed rubble and comprise grey to brown metasandstone containing quartz, plagioclase, biotite, rare garnet, and local muscovite. They occur interlayered (~ 50 cm) with rare pelitic, arenitic, phyllitic, and metavolcanic units. Although bedding is commonly preserved, unequivocal younging indicators are rare but include pebble lags, graded beds and crossbeds. Conglomerates were not observed in the 56 P map area. A specimen of psammite, interlayered with komatiite and komatiitic basalt at the Mitten showing (Fig. 2), yielded a SHRIMP, U-Pb zircon maximum age of ca. 2.687 Ga (Table 1) indicating that the northern belts in 56 P may be part of the upper Prince Albert group (Skulski et al., 2003b).

PLUTONIC UNITS

Peridotite sills (unit Apr)

A second variety of ultramafic rock that occurs throughout the Committtee Bay belt in 56 P consists of layer parallel, < 50m thick bodies of orthopyroxene-porphyritic and oikocrystic peridotite (Fig. 8, sheet 1). These generally do not show internal textural variations and are interpreted to represent late-volcanic, bedding-parallel ultramafic sill complexes that may be comagmatic with the komatiite flows.

Diorite and gabbro (unit Adi)

Mafic to intermediate plutonic rocks occur throughout the map area and comprise weakly- to moderately-foliated, medium-grained, commonly plagioclase porphyritic diorite, quartz diorite, and rare gabbro, intruded by foliated and foliation parallel veins and dykes of biotite tonalite (Fig. 9). These rocks are collectively cut by foliated, irregular intrusions of fine- to medium-grained, reddened biotite + titanite ± magnetite monzogranite, and less commonly granodiorite. The gabbros and diorites typically form discontinuous rafts and xenoliths in younger tonalite and granodiorite.

Tonalite (unit At)

Tonalitic rocks are common throughout the map area and typically occur in close proximity to the supracrustal belts. These comprise moderately foliated and lineated, grey to pink, generally medium-grained biotite ± hornblende ± magnetite tonalite (Fig. 10, sheet 1). Tonalitic rocks typically contain outcrop-scale schlieren, inclusions, and rafts of diorite or gabbro (unit Agb), amphibolite (unit Aas), ultramafic rocks (unit Ak), quartzite (unit Aqz) and psammite to semipelite (unit Aps) and, where these are highly strained, a gneissic texture is locally developed. Tonalite is cut by all of the plutonic units, with the exception of gabbro-diorite and gneissic tonalite. U-Pb geochronology from the western part of the Committee Bay belt has indicated tonalitic rocks are generally post-volcanic at 2.61 Ga, but may also be syn-volcanic at 2.72 Ga (Skulski, unpublished data).

Central granodiorite (unit Agd)

The dominant rock-type in the map area is variably foliated and lineated, grey to pink, medium-grained, biotite ± hornblende ± magnetite, potassium feldspar-porphyritic granodiorite (Fig. 11, sheet 1). This unit dominates the central and northern parts of the map area north of the Committee Bay supracrustal belt. Map-scale rafts and outcrop-scale xenoliths of tonalite, gabbro-diorite, amphibolite, ultramafic rocks, and metasedimentary rocks are common throughout. The granodiorite is cut by younger biotite ± magnetite monzogranite (unit Ag), biotite ± muscovite granite (unit Amg) and potassium feldspar-megacrystic biotite ± magnetite monzogranite to granodiorite (unit Akg).

Potassium feldspar megacrystic monzogranite (unit Akg)

North of the Committee Bay supracrustal belt and, in particular, north of the Atorquait fault are several oblate plutonic masses of biotite ± magnetite potassium feldspar-megacrystic granodiorite to monzogranite (Fig. 12). Typically, potassium feldspar megacrysts (~ 4 cm) are weakly flattened and along with biotite form a weakly to moderately developed foliation. The age of this unit is not well defined, but it may represent a textural varient of unit Ag (see below).

Monzogranite (unit Ag)

Throughout the central and northern parts of the map area, particularly north of the Committee Bay Supracrustal belt, all supracrustal units and the majority of the plutonic rocks are cut by unit Ag. This unit comprises typically fine- to locally medium-grained, pink to white, variably foliated and lineated biotite ± magnetite monzogranite (Fig. 13). It forms irregularly shaped sheets, dykes and sills in most other rock types and is commonly accompanied by reddening of the adjacent host rocks.

Peraluminous granites (unit Amu)

Unlike the two map sheets to the southwest (Skulski et al., 2003a), the Ellice Hills map area contains no recognized exposures of migmatized amphibolite facies supracrustal rocks, in contrast to the western part of the belt where upper amphibolite facies migmatite is exposed in the southern 56-O (Carson et al., 2003) and in the Kuaguat Complex (Schau, 1982; Sandeman et al., 2001b and c). In northernmost 56 P, widespread tonalitic and granodioritic intrusions are cut by large plutonic masses of variably foliated, biotite ± muscovite ± garnet-bearing, commonly K-feldspar porphyritic monzogranite and syenogranite (unit Amg: Fig. 14) which may represent partial melt products from these migmatitic domains. These peraluminous plutons carry a generally weakly developed, undulating foliation, in contrast with well foliated adjacent tonalitic and granodioritic units. A U-Pb SHRIMP determination on zircon from a small muscovite-biotite monzogranite (unit Amg) sill that cuts psammite at the Mitten showing (Fig. 2: Table 1) yielded an age of ca. 2.577 Ga, suggesting the peraluminous granitoids may represent syn- to late-D_1 intrusions.

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PROTEROZOIC ROCKS

Proterozoic metasedimentary rocks (unit PFL)

At the northeastern end of the Committee Bay belt in the 56 P map area is a small outlier of polydeformed clastic metasedimentary rocks that structurally overlie the Archean units and was inferred in the field to be correlative with the Folster Lake formation on Melville Peninsula (Frisch, 1982). The sequence comprises an open syncline of shallowly dipping (5–20°), ca. 80 m thick, pink to buff subarkose and overlying grey, recessive, calcareous arenite (Fig. 17). Bedding in the subarkose is 10–30 cm thick with rare low-angle crossbedding indicating normal younging. These sedimentary rocks are strongly recrystallized with the calcareous arenite having abundant metamorphic epidote and diopside. The sedimentary rocks exhibit a shallowly dipping foliation that appears to be correlative with the regional S_2 foliation. A preliminary SHRIMP U-Pb investigation on zircon from a specimen of the subarkose yielded a maximum age of sedimentation of ca. 2.321 Ga (Skulski, unpublished data: Table 1).

Proterozoic Dykes (unit PMd)

North-northwest-trending, fine- to medium-grained, tholeiitic MacKenzie diabase gabbro dykes exhibit chill margins and cut all stratigraphic elements in the Committee Bay region.

STRUCTURE

The structural geology of the Ellice Hills map area can be considered in terms of three principal structural domains, delimited on the basis of the orientation of planar and linear structural elements, and on the phases of deformation recorded by rocks in each domain. The central domain includes rocks proximal to, and including, the Committee Bay supracrustal belt and contains the most complex structure attributed to three main deformation events (D_1, D_2, D_3). The northern structural domain is dominated by plutonic rocks that typically carry northeast-trending D_2 fabrics and are structurally less complex, largely owing to their initial isotropic character and to a lower degree of accumulated finite strain. The southern structural domain, which includes the Walker Lake intrusive complex, is characterized by south-trending, west-dipping fabrics attributed to D_1, with only mimimal effects of superposed D_2 strain.

D_1 structures

The earliest tectonic elements S_1 and L_1 are best represented in the southern part of the map area, where south-striking, shallow west-dipping L_1 = S_1 fabrics are penetratively developed. These S_1 fabrics consistently dip shallowly (10°) to moderately (55°) to the west, except in the far southwest corner of the map sheet, where S_1 foliation dips locally to the east. Mineral lineations in the southern structural domain are less well developed relative to other parts of the map area and plunge moderately west. Rare macroscopic folds are generally symmetrical and are defined by compositional layering and by folded inclusion trails in the granitoid rocks. S_1 fabrics are also prevalent at two localities in the central supracrustal domain, where composite S_0-S_1 fabrics define the hinge zones of regional F_2 folds.

D_2 structures

The dominant northeast structural fabric of the central and northern Ellice Hills map area is related to penetrative D_2 deformation that has been bracketed between ca. 1.86 Ga and 1.81 Ga (Carson et al., 2003; Skulski and Sanborn-Barrie, unpublished data, 2002). This northeast structural grain is defined by the orientation of the supracrustal belts and intervening plutonic domains, and also by the macroscopic structural elements (S_2, F_2, L_2) that characterize these rocks. Penetrative D_2 deformation involved northwest-directed shortening that resulted in upright to inclined northwest-vergent F_2 folds and northeast-striking, moderately southeast-dipping foliations. Two major northeast-trending, southwest-plunging F_2 folds within the Committee Bay supracrustal belt are defined by facing reversals and folded S_0-S_1 fabrics. In the Kinngalugjuaq Mountain area, southeast-striking, moderately southwest-dipping S_1 foliation surfaces collectively define the hinge zone of a major, southwest-plunging F_2 anticline which is supported by isolated evidence of northward and southward younging in quartzite along its north and south flanks, respectively. At a number of localities along its hinge zone, a variably oriented S_1 foliation is transected by a second-generation foliation (S_2) that trends 70–80°E, axial planar to the anticlinal trace. In the Curtis River area, variably oriented (steeply west-dipping to near-vertical) bedding-parallel foliation planes define an open fold closure which is complementary to S_1S_0 trends in the Kinngalugjuaq Mountain area. Opposing stratigraphic facing across the supracrustal belt in the Curtis River area suggest a major synclinal structure that folds S_0-S_1. The inclined, northwest-vergent Curtis River F_2 syncline exposes quartzite-semipelite in its limbs and mainly plutonic rocks with inclusions of metasedimentary rocks in its hinge.

L_2 lineations plunge mainly to the southwest throughout the central supracrustal structural domain and plunge mainly southeast in lower strain rocks of the northern structural domain. A notable exception to this occurs in the northeastern part of Committee Bay supracrustal belt where shallow northeast-plunging lineations may reflect modification by an F_3 fold. Variations in the intensity of D_2 strain between these domains suggests that during D_2, strain was preferentially partitioned into the low-competency, highly anisotropic supracrustal rocks of the Committee Bay belt.

An outlier of Paleoproterozoic metasedimentary rocks (= 2.321 Ga: Skulski Unpublished data) exposed near the Committee Bay coast provides important insight into the timing of tectonometamorphism in the area. These rocks contain a tectonic foliation and metamorphic mineral assemblage consistent with their deposition prior to D_2. They contain a bedding-parallel cleavage that is interpreted to represent a refracted S_2 foliation, consistent with deposition of these rocks after D_1, but prior to D_2.

D_3 structures

Subsequent D_3 deformation of supracrustal rocks has resulted in the widespread development of open, conjugate, kink-style F_3 folds, and tight chevron folds. These are attributed to layer-parallel shortening of anisotropic metasedimentary rocks. Attitudes of F_3 folds throughout the central domain are consistent with late-stage, northeast-directed shortening across the Committee Bay belt.

The Atorquait Fault

The Atorquait fault transects all of the rocks exposed in 56 P (north), excluding the MacKenzie dykes. In the west, the fault is accompanied by extensive hematitization of the country rocks and by local strong development of cataclasites. Farther east, the extent of hematitization decreases and the deformation along the fault zone is characterized by the development of protomylonitic strands within the host rocks over distances of 5–10 metres. The fault appears to terminate in the east but there is accompanied by local development of thin mylonitic strands. This structure is clearly visible on aeromagnetic maps and separates a southern domain having moderate to shallow dipping fabrics from a northern domain with more steeply dipping structural elements.

Other faults

A series of north north-west-trending brittle faults transect all of the rocks in the area with the exception of the MacKenzie dykes. These faults are commonly not observed on the ground and occur in topographically low lineaments. Moderate reddening of the host rocks is locally observed as are variations in structural trends or significant stratigraphic offset across the faults.

METAMORPHISM

The Committee Bay belt is characterized by a general increase in metamorphic grade from greenschist-facies in the southwest (56 K) through upper-amphibolite-facies to the northwest and northeast (56 P:Schau, 1982; Berman et al., in press). The lowest grade part of the belt is represented by upper-greenschist facies rocks in 56 K. To the northeast of this tonalite, talc-serpentine ultramafic volcanic rocks preserve cumulate and quench (spinifex) textures (MacHattie, 2002), and to the west, metapelitic rocks contain chlorite-chloritoid-muscovite and chlorite-kyanite-muscovite assemblages (Schau, 1982). A relatively steep metamorphic gradient to the west and north, and gentle gradient to the east passes through lower-amphibolite-facies St-Grt-Bt ± Ms and And-Bt ± Ms metapsammites and metapelites, reaching mid-amphibolite facies (Grt-Sil-Bt ± Ms metapelites) within large portions of the central domain (including that in 56 P), and upper- amphibolite facies (Kfs-Sil-Gt ± Crd metapelites) in the northern domain. Low-pressure facies-series metamorphism is indicated by the widespread occurrence of andalusite in lower-amphibolite-facies rocks and Grt-Crd-Kfs at the highest metamorphic grades, reached locally in the northern subdomain exposed in 56-O south (Carson et al., 2003).

This general metamorphic pattern is interpreted to be the product of at least two major metamorphic events (Sanborn-Barrie et al., 2003; Carson et al., 2003; Berman et al., in press). For instance, in the 56 P map sheet, S_1 fabrics are defined by aligned biotite and muscovite in pelite and quartzite, with local biotite alignment and quartz elongation in plutonic rocks. In addition, numerous localities display bedding-parallel S_1 defined by aligned, elongate white-weathering aluminous nodules (Fig. 6, sheet 1) that represent sillimanite porphyroblasts, subsequently retrogressed to muscovite and locally reoriented by D_2 strain. These relationships indicate that early mid-amphibolite-facies metamorphism (M_1) of < ca. 2.71 Ga supracrustal rocks in the Ellice Hills area was pre- to syn-D_1. A subsequent metamorphic event, M_2, is attributed to widespread growth of garnet porphyroblasts that overgrow S_1 and are wrapped by sillimanite-biotite S_2 fabrics, indicating mid-amphibolite-facies M_2 event synchronous with D_2. Ongoing *in situ* U-Pb geochronology studies of monazite reveal three main periods of monazite growth at ca. 2.35 Ga, ca. 1840–1820 Ma and ca. 1.78 Ga that may correspond to regional M_1 (D_1?), M_2 (D_2), and local M_3 metamorphic events in the Committee Bay region (Berman et al., in press).

ECONOMIC GEOLOGY

In contrast with the lithologically comparable, auriferous Woodburn Lake group to the southwest (Fig. 1: Henderson et al., 1991; Zaleski et al., 2001), the Committee Bay belt has, over the past decade, received only modest mineral exploration (Dusfresne and Williamson, 1997; Sherlock and Deyell, 2002; Deyell and Sherlock, 2003). A recent major increase in the acquisition of prospecting permits and mineral claims in the region has, however, significantly raised the metallogenetic prospectivity of the belt. Numerous prospects for base metals and gold have been identified in the Committee Bay area, however, the most favorable setting for mineralization is auriferous sulphide mineralization associated with iron-formation. Significant occurences in 56 P include the Peanut, Mist-Koffy, and Inuk showings. The geology of these showings is discussed in detail by Deyell and Sherlock (2003).

Auriferous, sulphidized oxide and silicate facies iron-formation in the Committee Bay area (Hyde et al., 2002; Sherlock and Deyell, 2002; Deyell and Sherlock, 2003) is inferred to be part of an upper, ca. 2.71 Ga supracrustal sequence. Detailed mapping and sampling from numerous gold occurrences along the belt has highlighted an association between auriferous iron-formation and polydeformed rocks. In these areas, gold is localized within D_2 structures, such as hinge zones of shallow northeast- plunging F_2 folds and/or shear zones parallel to northeast-striking F_2 axial planes.The Inuk gold occurrence (Fig. 2: 56 P south) is associated with ultramafic rocks, iron-formation and clastic metasedimentary rocks intruded by granodiorite. The supracrustal rocks and biotite granodiorite are interlayered and have been folded together into a moderately to steeply NNE-plunging fold. Gold is associated with silicic and sulphidic iron-formation at the contact between ultramafic rocks and iron-formation. Localization of gold at this contact within the hinge of a F_2 fold suggests that alteration and mineralization are syn-D_2. During folding, this contact may have been a dilational site allowing access for hydrothermal fluids, alteration, and mineralization. In support of this proposal, is the recognition of small D_2 shear zones axial planar to F_2 that commonly have narrow auriferous sulphidation haloes. Supracrustal rocks at the Mist-Koffy showing (Fig. 2: 56 P south) consist of clastic sedimentary rocks interbedded with ultramafic rocks, quartz arenite and a thin interval of iron-formation. Ultramafic rocks are restricted to the northern margin of the supracrustal sequence and are weakly to strongly foliated and locally exhibit large orthopyroxene megacrysts. High strain zones that developed during D_2 are mainly localized in iron-formation intervals at the contact with the ultramafic rocks. Iron-formation within the high strain zones are sulphidized and silicified, and locally contain auriferous sulphiditic quartz stringers. Locally, stretched and distorted ultramafic wallrocks and boudinaged dykes of monzogranite pegmatite were observed. The Mist showing exhibits some similarities to Inuk, with gold localized at lithologic contacts within dilational sites caused by flexural slip along lithological contacts during D_2 folding. Near the Peanut showing (Fig. 2: 56 P south), supracrustal rocks are dominated by quartzite that cores a major F_2 fold, the Kinngalugjuaq Mountain anticline. South of the quartzite, thin bands of ultramafic rock and iron-formation are interlayered with a thick sequence of psammite. Gold at Peanut is hosted in sulphidic iron-formation where mineralization is concentrated in high strain zones developed at lithologic contacts, likely along the limbs of minor F_2 folds. Gold is associated with sulphides (pyrite-pyrrhotite) that locally are disseminated throughout magnetite- and amphibole-rich layers within iron-formation. These findings along with similar temporal relationships from the Woodburn Lake area (Meadowbank gold deposit) to the SW, suggest that Paleoproterozoic (ca. 1.85–1.81 Ga) deformation of Neoarchean (ca. 2.71 Ga) supracrustal rocks has played a significant role in the localization of gold mineralization in the Committee Bay area, and elsewhere throughout the western Churchill Province.

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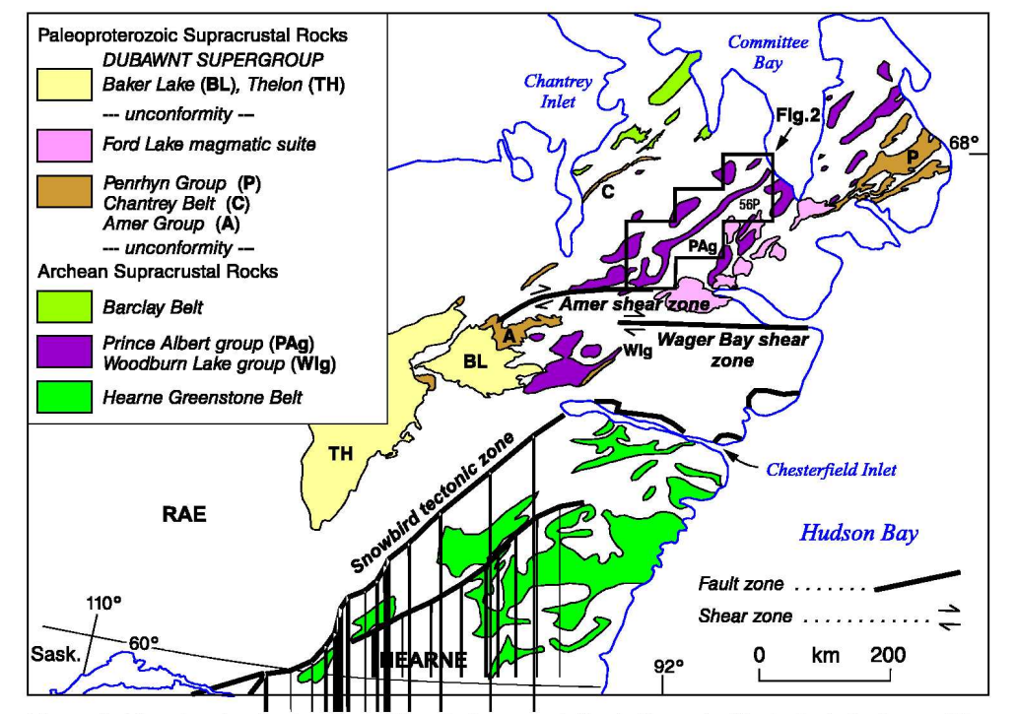
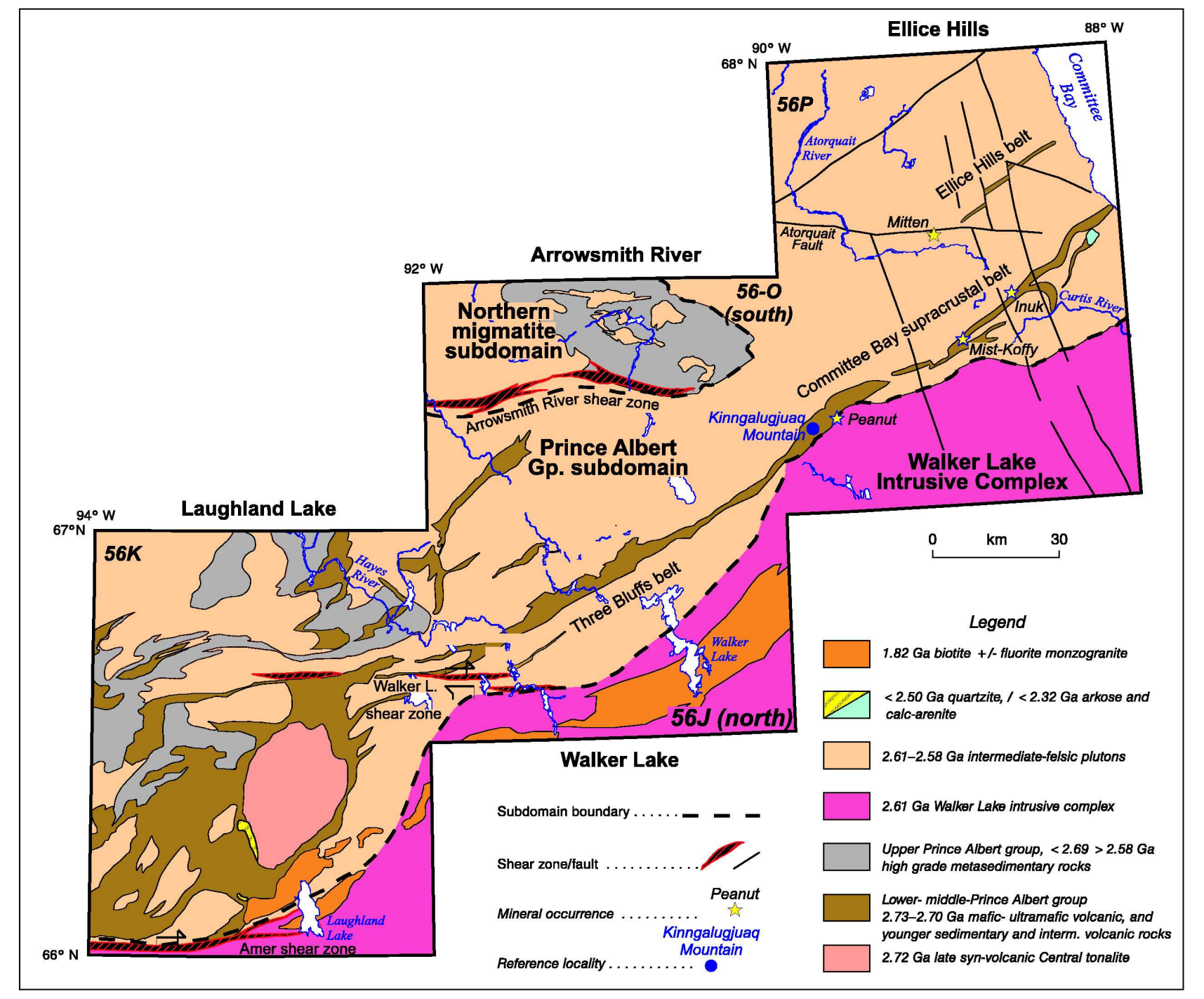


Figure 1: Map showing the location of the study area relative to the main lithotectonic features of the western Churchill Province.

Map Number	Sample Number	Rock Type	Easting	Northing	UTM Zone (NAD83)	Maximum age (detrital)	Crystallization age	Source
1	SNB-02-2490B	Psammite (unit Aqz) interbedded with komatiite at the Mitten showing	412340	7500795	16	2687 +/- 10 Ma		T. Skulski et al., (unpublished)
2	SNB-02-2490D	Foliated (S2) muscovite granite sill (unit Amg) that cuts psammite at the Mitten showing	412340	7500795	16		2577 +/- 18 Ma	T. Skulski et al., (unpublished)
3	SNB-02-431	Foliated (S2) metamorphosed Paleoproterozoic subarkose (unit PFL) that overlies crossbedded calc-arenite	450749	7494071	16	2321 +/- 16 Ma		T. Skulski et al., (unpublished)

Table 1: U-Pb geochronology for samples from the Ellice Hills area, Nunavut. Locations are shown on the map with labelled black diamonds.



Ellice Hills
Arrowsmith River
Northern migmatite subdomain
Prince Albert Gp. subdomain
Walker Lake Intrusive Complex
Laughland Lake
56K
56J (north)
56-O (south)
56P
94° W
67°N
66° N
Amer shear zone
Legend
Subdomain boundary
Shear zone/fault
Mineral occurrence
Peanut
Reference locality
Kinngalugjuaq Mountain
2.61 Ga Walker Lake intrusive complex
Upper Prince Albert group, < 2.69 > 2.58 Ga high grade metasedimentary rocks
Lower- middle-Prince Albert group 2.73–2.70 Ga mafic- ultramafic volcanic, and younger sedimentary and interm. volcanic rocks
2.72 Ga late syn-volcanic Central tonalite

Figure 2. Schematic geological map of the Committee Bay belt showing the distribution of rocks comprising the southern Walker Lake intrusive complex, the central Prince Albert group subdomain and the northern migmatite subdomain.

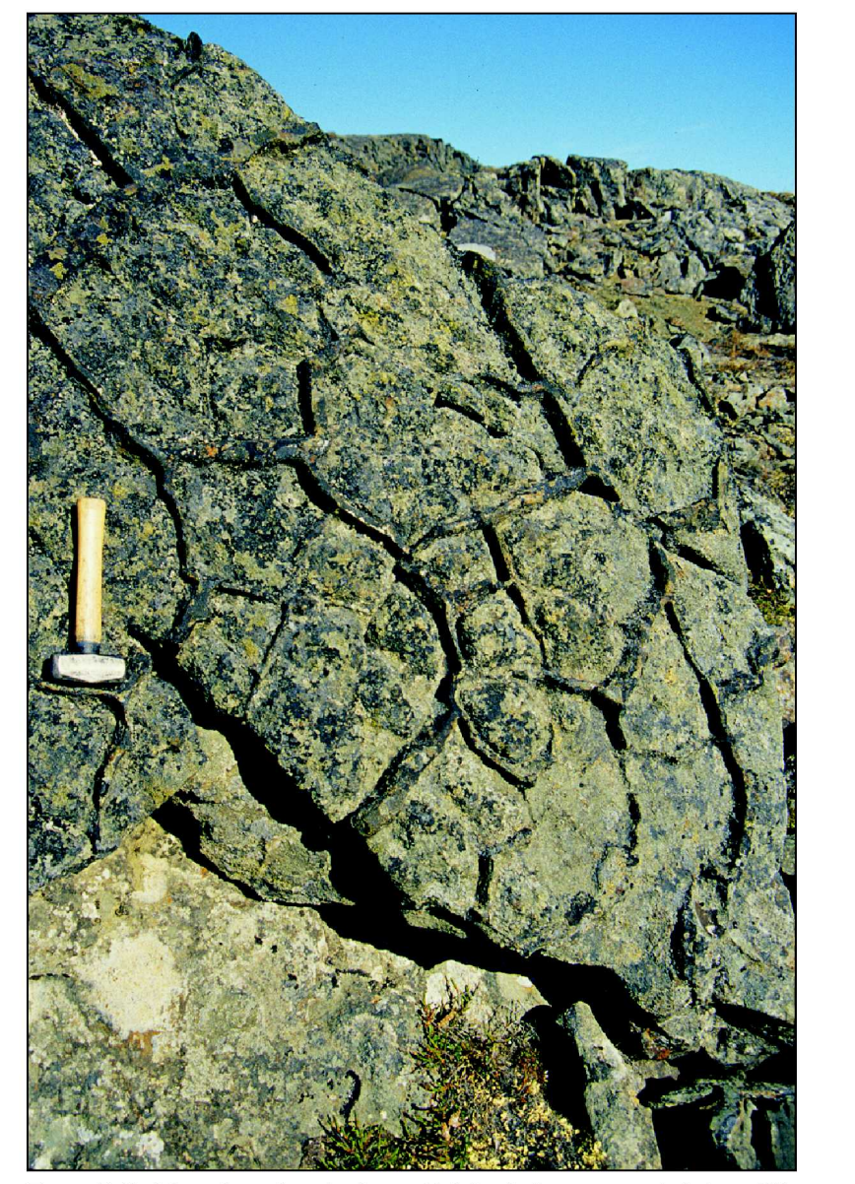


Figure 3. Bedding-plane view of polygonal jointing in the upper part of akomatiitic basalt flow (unit Ak). Hammer for scale is 22 cm long.UTM 411759, 7500657.

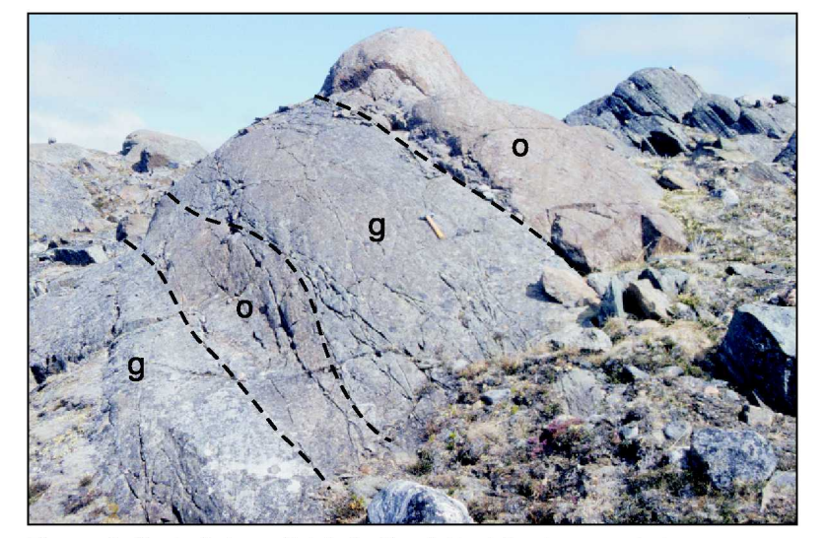


Figure 4. Contact, immediately to the right of the hammer, between orange weathering (o), cumulate and green weathering (g) spinifex zones in a ca. 5 m thick komatiite flow (unit Ak). Hammer for scale is 1 m. UTM 391348, 7490077.

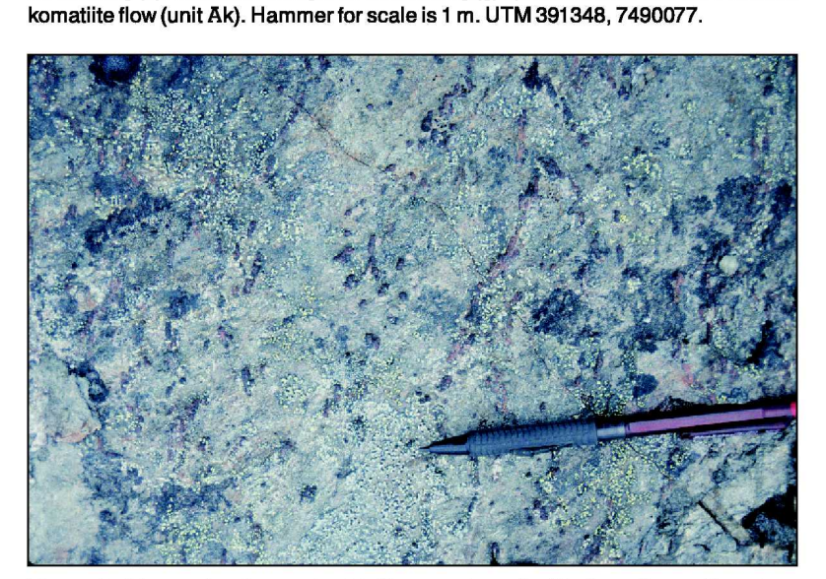


Figure 7. Fine-grained, massive biotite-garnet semipelite from the northeastern end of the Committee Bay supracrustal belt (unit Aps). Mechanical pencil for scale is 15 cm. UTM 448279, 7492621.

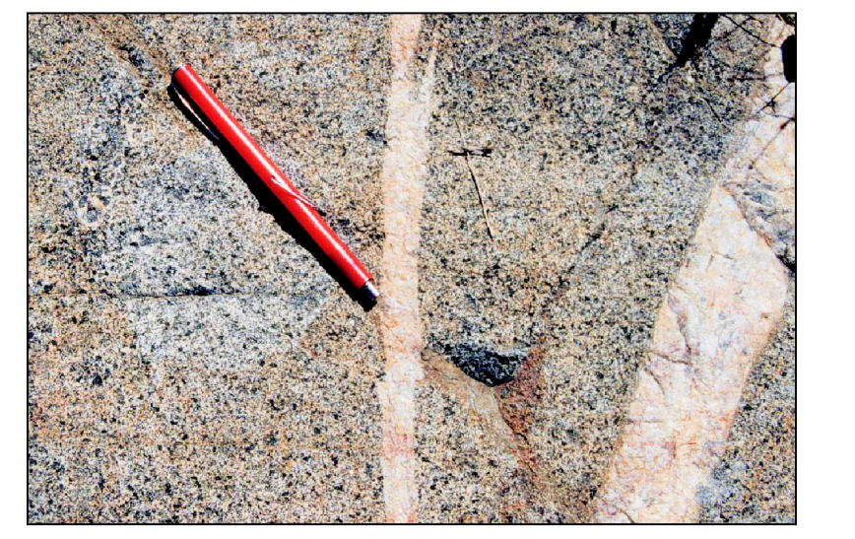


Figure 9. Massive, medium-grained hornblende quartz diorite (unit Adi) cut by veins of medium-coarse grained biotite monzogranite (unit Ag). Pencil magnet for scale is13 cm. UTM 444540, 7508789.

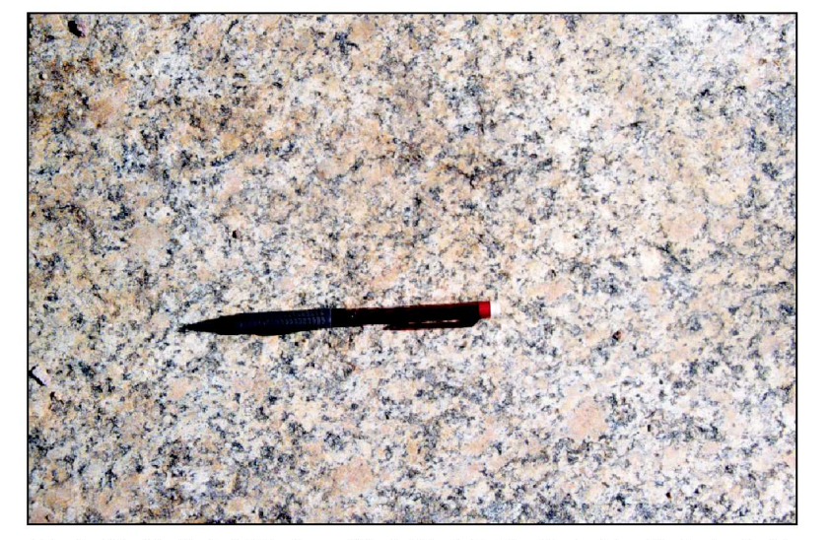


Figure 12. Medium-grained, weakly foliated biotite-microcline phyric to mega-crystic granodiorite to monzogranite (unit Akg). Mechanical pencil for scale is 15 cm. UTM 398032, 7504386.

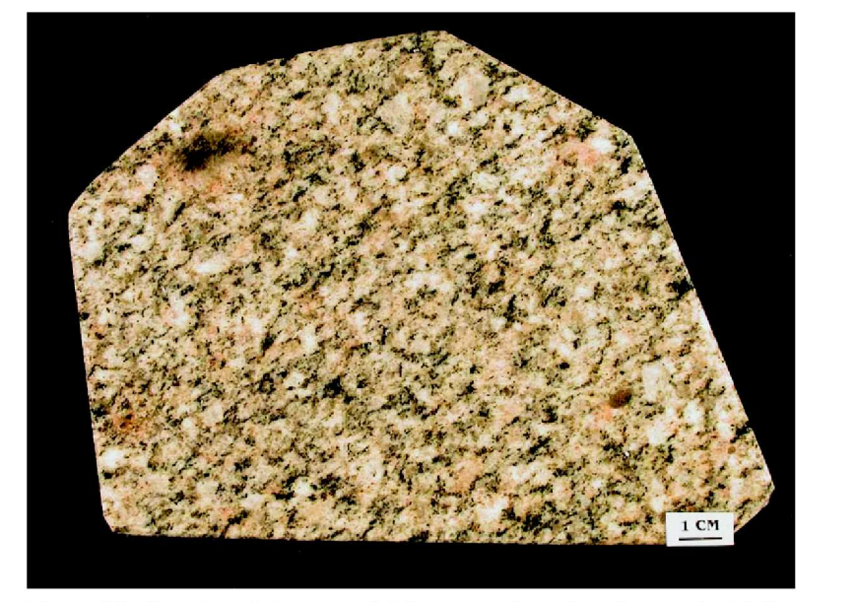


Figure 13. Cut slab photograph of foliated, weakly microcline-phyric, biotite-magnetite monzogranite (unit Ag). UTM 411595, 7528856.

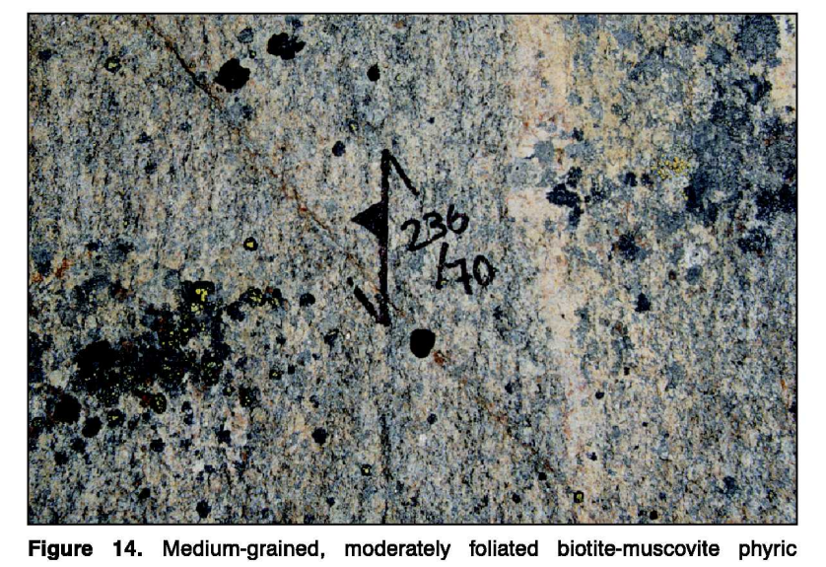


Figure 14. Medium-grained, moderately foliated biotite-muscovite phyric monzogranite (unit Amg) from the northern part of the map sheet. Strike symbol is 5 cm in length. UTM 415044, 7538453.

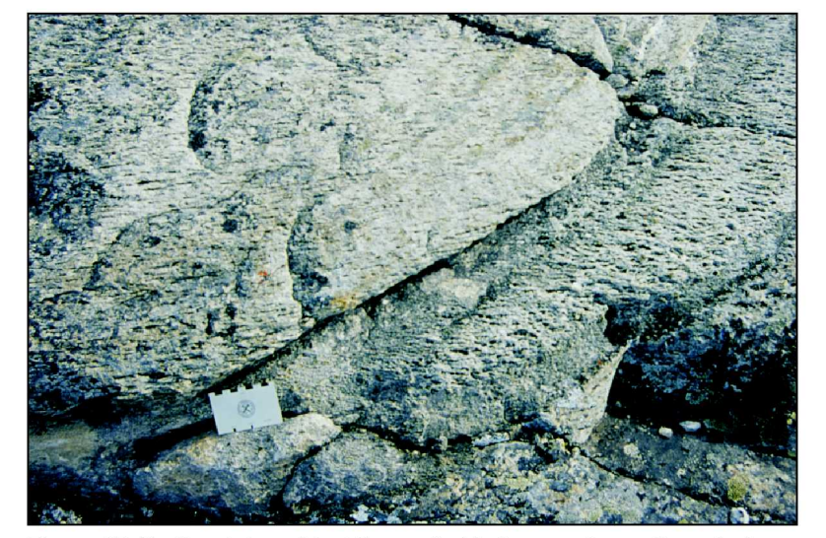


Figure 17. Sectional view of bedding contact between calc-arenite and arkose, with overprinting foliation in the Paleoproterozoic sedimentary rocks (unit PFL) near the southwest coast of Committee Bay. UTM 448974, 7494664.

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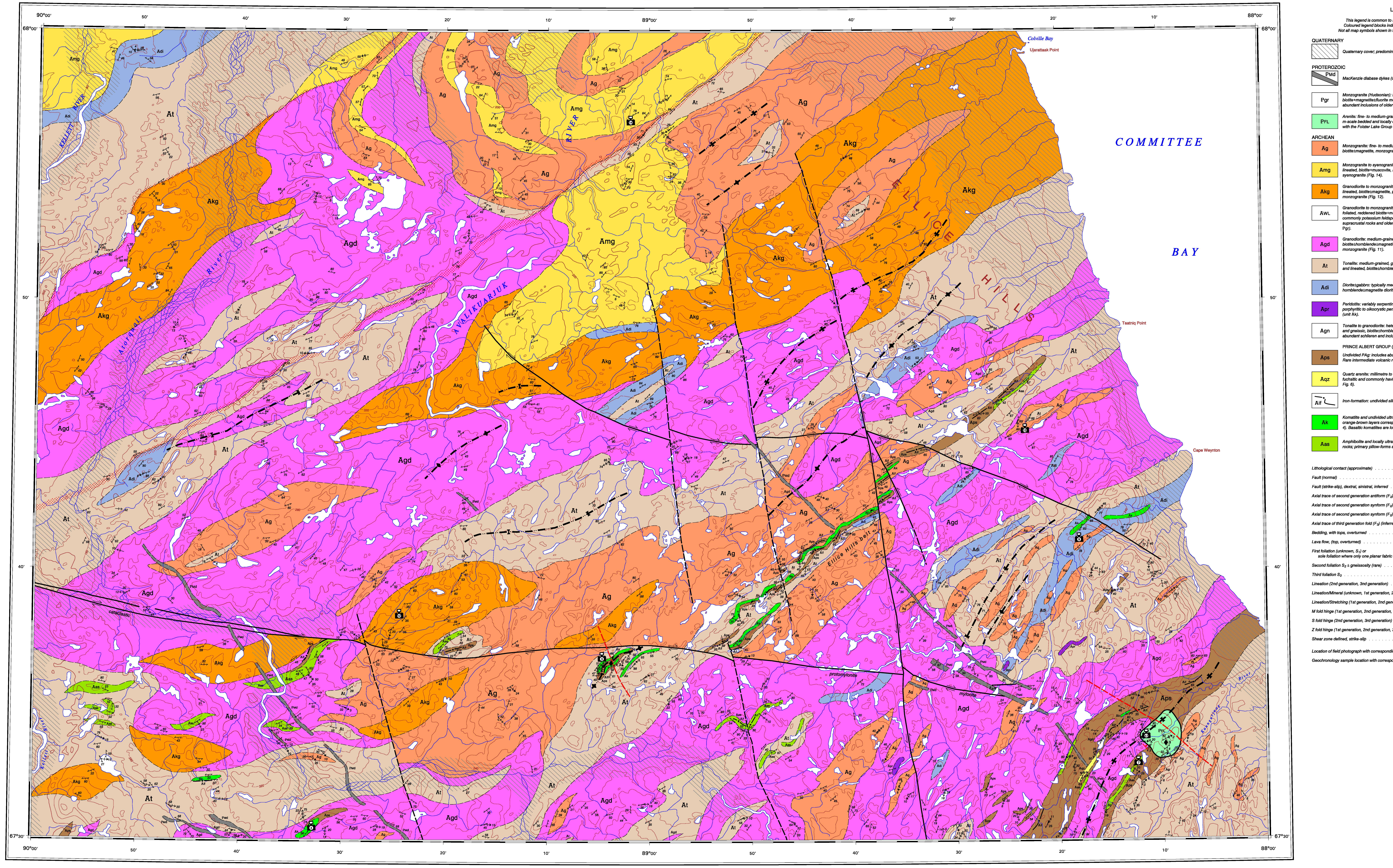


LEGEND

This legend is common to sheet 1 and sheet 2 of Open File 1794.
Coloured legend blocks indicate map units that appear on this map.
Not all map symbols shown in the legend necessarily appear on this map.

QUATERNARY

Unit	Description
▨	*Quaternary cover; predominantly tills and fluvioglacial sediments.*

PROTEROZOIC

Unit	Description
PMd	*MacKenzie diabase dykes (ca. 1267 Ma).*
Pgr	*Monzogranite (Hudsonian): fine- to medium-grained, salmon to orange, biotite+magnetite±fluorite monzogranite, massive to locally variably foliated, contains abundant inclusions of older lithologies (Fig. 18).*
PFL	*Arenite: fine- to medium-grained, mm-scale laminated, reddish, interbedded with m-scale bedded and locally crossbedded calc-arenite (Fig. 17). Possibly correlative with the Folster Lake Group exposed on Melville Peninsula.*

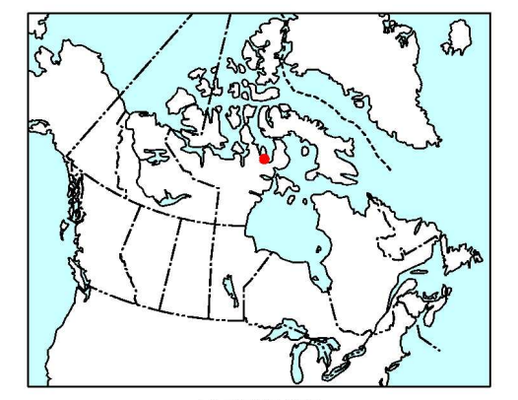
ARCHEAN

Unit	Description
Ag	*Monzogranite: fine- to medium-grained, white to pink, variably foliated and lineated, biotite±magnetite, monzogranite (Fig. 13).*
Amg	*Monzogranite to syenogranite: medium-grained, white to buff, variably foliated and lineated, biotite+muscovite, locally potassium feldspar porphyritic, monzogranite to syenogranite (Fig. 14).*
Akg	*Granodiorite to monzogranite: medium- to coarse-grained, variably foliated and lineated, biotite±magnetite, potassium feldspar megacrystic granodiorite to monzogranite (Fig. 12).*
AWL	*Granodiorite to monzogranite of the Walker Lake intrusive complex (ca. 2610 Ma): foliated, reddened biotite+magnetite±hornblende granodiorite to monzogranite, commonly potassium feldspar megacrystic to augen (Fig. 15), contains inclusions of supracrustal rocks and older granitoids, crosscut by Hudsonian monzogranite (unit Pgr).*
Agd	*Granodiorite: medium-grained, grey to pink, variably foliated and lineated, biotite±hornblende±magnetite, weakly potassium feldspar porphyritic granodiorite to monzogranite (Fig. 11).*
At	*Tonalite: medium-grained, grey to pink, locally gneissic but typically variably foliated and lineated, biotite±hornblende±magnetite tonalite (Fig. 10).*
Adi	*Diorite±gabbro: typically medium- to coarse-grained, variably foliated and lineated, hornblende±magnetite diorite and rare gabbro (Fig. 9).*
Apr	*Peridotite: variably serpentinized, medium- to coarse-grained, orthopyroxene porphyritic to oikocrystic peridotite sills (Fig. 8) that may be comagmatic with komatiite (unit Ak).*
Agn	*Tonalite to granodiorite: heterogeneous, fine- to medium-grained, strongly foliated and gneissic, biotite±hornblende±magnetite tonalite to granodiorite (Fig. 16) with abundant schlieren and inclusions of amphibolite, diorite and psammite.*

PRINCE ALBERT GROUP (PAg)

Unit	Description
Aps	*Undivided PAg: includes abundant semipelite (Fig. 7) and psammite and minor pelite. Rare intermediate volcanic rocks occur southwest of Kinngalugjuaq Mountain.*
Aqz	*Quartz arenite: millimetre to decimetre scale bedded units, locally crossbedded and fuchsitic and commonly having cm-scale faserkiesel (relict sillimanite porphyroblasts: Fig. 6).*
Aif	*Iron-formation: undivided silicate, oxide and less common sulphide facies (Fig. 5).*
Ak	*Komatiite and undivided ultramafic schists: komatiite typically exhibits dark green and orange-brown layers corresponding to spinifex and cumulate layers, respectively (Fig. 4). Basaltic komatiites are locally present (Fig. 3).*
Aas	*Amphibolite and locally ultramafic schist interpreted to be derived from mafic volcanic rocks; primary pillow-forms are only rarely recognized.*

Lithological contact (approximate)
Fault (normal)
Fault (strike-slip), dextral, sinistral, inferred
Axial trace of second generation antiform (F_2)
Axial trace of second generation synform (F_2)
Axial trace of second generation synform (F_2) (overturned)
Axial trace of third generation fold (F_3) (inferred)
Bedding, with tops, overturned 34 75
Lava flow, (top, overturned) 45
First foliation (unknown, S_1) or sole foliation where only one planar fabric observed 68
Second foliation S_2 ± gneissosity (rare) 59
Third foliation S_3 71
Lineation (2nd generation, 3nd generation) 97 65
Lineation/Mineral (unknown, 1st generation, 2nd generation) 5 81 27
Lineation/Stretching (1st generation, 2nd generation) 59 75
M fold hinge (1st generation, 2nd generation, 3rd generation) 73 40 67
S fold hinge (2nd generation, 3rd generation) 72 93
Z fold hinge (1st generation, 2nd generation, 3rd generation) 72 45 45
Shear zone defined, strike-slip
Location of field photograph with corresponding Figure number 4
Geochronology sample location with corresponding number ◆3



LOCATION MAP

Geology by H.A.I. Sandeman, T. Skulski, M. Sanborn-Barrie, J. Brown, D. Byrne, C. Carson, C. Deyell, T. MacHattie, D. Panagapko, and M. Young, 2002

Compilation by H.A.I. Sandeman, 2002-2003

Co-ordinated through the auspices of the Committee Bay Targeted Geoscience Initiative Project

Digital data preparation by C. Gilbert, Canada-Nunavut Geoscience Office (C-NGO)

Digital cartography by R.L. Allard, and M.J. Coulthart, Earth Sciences Sector Information Division (ESS Info)

OPEN FILE 1794

GEOLOGY

ELLICE HILLS

NUNAVUT

Scale 1:100 000/Échelle 1/100 000

kilometres 2 0 2 4 6 8 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983
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Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
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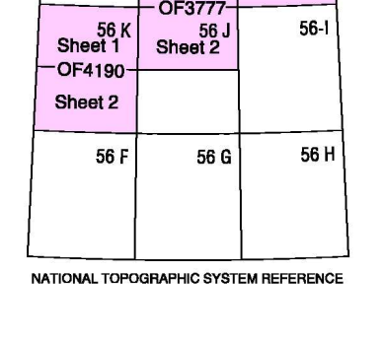
Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Geomatics Canada, modified by ESS Info

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area
Mean magnetic declination 2004, 20°57'W, decreasing 20.8' annually. Readings vary from 18°23'W in the SW corner to 23°29'W in the NE corner of the map

Elevations in metres above mean sea level. Contour interval of 40 metres



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2004
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Sheet 2 of 2, Geology

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