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DESCRIPTIVE NOTES

INTRODUCTION

This Open File map of the Half Way Hills-Whitehills Lake area represents the last and southernmost of a series of 4 preliminary 1:50 000 maps produced during ongoing field work (Zaleski et al., 1997; 1999a, 1999b) addressing the stratigraphic relationships, age, tectonic setting, and deformation history of the Woodburn Lake and Ketyet River groups north of Baker Lake (Fig. 1). The geological mapping and supporting geoscience studies of the Woodburn Project are part of the Western Churchill NATMAP, a collaborative mapping initiative by the Geological Survey of Canada, the Department of Indian and Northern Affairs, and the Government of the Northwest Territories in what is now Nunavut. This map is based primarily on field work carried out during 1999 and 2000, supplemented by the mapping of F.C. Taylor and I.R. Annesley in 1980 in the western half of the area (Taylor, 1985).

The 'Woodburn Lake group' and 'Ketyet River group' are not distinguished on this preliminary map. In past usage, the two groups run into each other with no clear distinction between their constituent lithological assemblages. Taylor (1985) considered all the supracrustal rocks in the area to be Archean and likely correlative with rocks to the north informally termed the 'Woodburn Lake group' (Ashton, 1981). Schau (1983) likewise interpreted the supracrustal rocks in the eastern half of the map area as Archean, and gave them the informal name 'Ketyet River group'. Metawackes and quartzites similar to those of the Woodburn Lake group can be traced through the Amarulik Lake area (Fig. 1) and to the east (Zaleski et al., 1999b) into the area mapped by Schau. However, it seems likely that with further petrological, geochronological, and geochemical data still pending from the Woodburn Project, it will be possible to revise and reclassify the lithostratigraphic succession.

The Woodburn Lake and Ketyet River groups include large volumes of quartzite, and Archean ages have been established for quartzites in the Third Portage-Pipedream lakes area (Ashton, 1988; Davis and Zaleski, 1998). If Archean ages are established for all the quartzites, then these will represent the most extensive accumulations of Archean quartzite and conglomerate in the Canadian Shield (Donaldson and de Kemp, 1998). However, pending further data, we have reintroduced the possibility that the Half Way Hills-Whitehills Lake quartzite and interlayered volcanic rocks are of Paleoproterozoic age and possibly correlative with the Amer group to the north (Fig. 1).

In addition to quartzites and bimodal komatiitic-felsic volcanic rocks, supracrustal rocks in the region include felsic, intermediate and mafic volcanic rocks, volcanogenic wackes, and abundant iron-formation, including auriferous iron-formation at the Meadowbank deposit (Cumberland Resources Ltd.) (Fig. 1). Mesoarchean detrital zircons were recognized in quartzite by Ashton (1988), but the Half Way Hills-Whitehills Lake area has provided the first evidence of *in situ* Mesoarchean basement to the Neoarchean supracrustal rocks.

REGIONAL GEOLOGY

The Woodburn Lake and Ketyet River groups lie in the Rae province (Churchill Province) (Fig. 1), north of the regional geophysical anomaly interpreted by Hoffman (1988) as the northeastern extension of the Snowbird tectonic zone. They comprise deformed supracrustal rocks, known in part to be of Neoarchean age (2.74-2.71 Ga, Davis and Zaleski, 1998 and W.J. Davis, unpublished data), extending northeasterly from Schultz Lake to beyond the Meadowbank and Quoich Rivers. The supracrustal rocks are intruded by Neoarchean granites ranging in age from ca. 2.62-2.60 Ga (Ashton, 1988; Roddick et al., 1992). Significant deformation followed emplacement of Neoarchean granites (Ashton, 1988; Davis and Zaleski, 1998). Deformed cratonic cover represented by the Amer group is considered to be of Paleoproterozoic age based on stratigraphic comparisons with the Hurwitz Group south of the Snowbird zone, and on locally preserved unconformable relationships to underlying Neoarchean granite (Tella et al., 1984; LeCheminant and Roddick, 1991). The tilted, but undeformed, ca. 1.83-1.72 Ga continental deposits of the Dubawnt Supergroup (Gall et al., 1992) limit the minimum age of pervasive ductile deformation in the region.

Regional metamorphic grade in general increases toward the east. An area of amphibolite-facies rocks extends south from Third Portage lake across the Amarulik domain (Zaleski et al., 1999b), forming a thermal culmination bounded by greenschist assemblages to north and south. Septa of supracrustal rocks extend into the high grade terrane of the Tehek Lake plutonic complex and the Quoich River gneisses, the latter interpreted as high grade equivalents of the Ketyet River group (Heywood and Schau, 1981; Schau et al., 1982). Similarly, Fraser (1988) considered paragneiss in the granulite terrane northeast of Woodburn Lake to be correlative with the Woodburn Lake group.

LITHOLOGICAL UNITS AND THEIR RELATIONSHIPS

The oldest rocks known in the Half Way Hills-Whitehills Lake area form a Mesoarchean basement complex extending from south of Sanningajukuluk to the Thelon River. The northeastern part of the basement complex is dominated by foliated to schistose granodiorite (unit Agd) for which a preliminary radiometric age of 2.87 Ga has been determined (W.J. Davis, unpublished data). The granodiorite is cut by variably foliated to schistose mafic dykes possibly representing feeders to overlying volcanic rocks. The southern and eastern contact with volcanic rocks (unit APmi) and quartzite (unit APqz) is marked by increased strain and by a quartz-filled breccia zone (unit APqv) developed in rocks on both sides of the contact. The zone is interpreted as a fault. The quartz breccia, quartzite, and foliated granodiorite are intruded by foliated granite (unit APgd). Along the northern and northwestern contact, granodiorite structurally overlies deformed pillowed and massive, mafic volcanic rocks (unit Am). The contact is marked by several metres of mafic schist with local low strain lozenges preserving possible relict pillows. An enclave of low strain in a re-entrant along the western contact (96°15.37'W, 64°39.40'N) shows massive (foliated) mafic volcanic rock in contact with strongly foliated granodiorite. The qualitative difference in strain between the mafic rock and granodiorite, and absence of a strain gradient toward the contact, suggest local preservation of a primary relationship between basement and stratigraphically overlying volcanic rocks.

Foliated granodiorite extends for several kilometres southwest toward the Thelon River, in association with heterogeneous, strongly deformed, banded mafic and felsic gneisses (unit Abg). In one location (96°17.17'W, 64°38.05'N), foliated granodiorite cuts across gniessic layering, suggesting that the gneisses comprise an older (> 2.87 Ga) component of the Mesoarchean basement complex.

Basement rocks are likely to be present as enclaves in the largely undifferentiated Neoarchean granite suite (unit Agt). Basement enclaves may be folded around the hinge of the Tasirjuaq synform (Fig. 2) extending south of Whitehills Lake, possibly encompassing lineated to mylonitic tonalite (unit Atnq) and gneissic to layered tonalite-amphibolite (unit Atng) of unknown (Archean) antiquity. In this area, Paleoproterozoic and/or Archean amphibolite (unit APam), Neoarchean(?) K-feldspar augen granites (unit Agt), and tonalite are uniformly strongly tectonized.

Mafic volcanic rocks (unit Am) and mafic schist (unit Ams) with subordinate felsic and intermediate volcanic and volcaniclastic rocks (units Afvc, Afs) extend from Kinngaaquk Tasia to the Thelon River, forming a belt (here called the 'Sanningajukuluk volcanic belt') between wackes (unit Awkq) to the north and quartzite (unit APqz) to the south. Preliminary results of radiometric dating on quartz-porphyritic felsic volcanic rocks (unit Afq) suggest that the belt is ca. 2.74 Ga, 15-25 m.y. older than the 2.72-2.71 Ga volcanic rocks in the Meadowbank River and Pipedream-Third Portage lakes areas (W.J. Davis,unpublished data). The mafic rocks are commonly pillowed, and pillow shapes indicate southward younging (Taylor, 1985) with local reversals (Kerswill et al., 1999). Spinifex-textured flows of komatiitic basalt (unit Akb) (classification based on geochemical analyses, Kerswill et al., 1999) in the northernmost part of the belt between Tasiraraujaq and Sanningajukuluk show southward younging (Kerswill et al., 1999). Thin oxide-facies and cherty-sulphidic iron-formations (units Aif, Ach) are locally present. The northern contact to wackes (unit Awkq) is marked by semicontinuous iron-formation and carbonate rocks (unit Acf) consisting of intensely carbonatized mafic-ultramafic rocks and layered to net-veined carbonate-quartz rocks, possibly derived from carbonate iron-formation. Pervasive carbonatization and discrete carbonate-altered shear zones extend into volcanic rocks south of the contact.

North of the Sanningajukuluk volcanic belt, arkosic wacke (unit Awkq) and interlayered slate (unit Awsl) are continuous with the extensive wackes of the Amarulik domain (Fig. 1). In general, the abundance of feldspar-crystal clasts increases toward the south, suggesting volcanogenic input resulting in tuffaceous or volcaniclastic wacke (unit Awtf). Preliminary results of detrital zircon analyses in the Amarulik domain show provenance from Mesoarchean and Neoarchean sources, including sources of similar age to the Sanningajukuluk volcanic belt (W.J. Davis, unpublished data). Several exposures of normally graded bedding north of the map area (northeast of Tasiraraujaq) indicate southward younging toward the volcanic belt. The relationships imply that Sanningajukuluk volcanic belt is in fault contact with underlying younger wackes of the Amarulik domain (Fig. 2). Extensive intermittent exposures of polymictic conglomerate and interbedded finer clastic rocks (unit APcg) along the fault are considered to be possible syntectonic deposits (see below), and hence, younger than the units to north and south.

East of Tasiraraujak and Whitehills Lake, metamorphic grade increases to amphibolite-facies and supracrustal rocks are coarsely recrystallized to locally porphyroblastic schists and gneisses. East of Kingaaquk Tasia, semiconformable granitic sheets and leucocratic segregations increase in abundance. Amphibolite gneiss (unit Amg) interlayered with thin iron-formation, quartzite (units Aqz, Aqzg), and biotitic metasedimentary rocks (units Apt, Apa) can be traced from the Tehek Lake area to the north, where they are considered to be of Archean age (Zaleski et al., 1999b). Amphibolite gneiss was interpreted as metamorphosed sedimentary rock with chemical and clastic components (amphibole-plagioclase gneiss of Zaleski et al., 1999b), possibly a calc-silicate altered volcaniclastic wacke. West of Kinngaaquk Tasia, amphibolite gneiss is interlayered with pelite (locally containing staurolite and garnet), biotite-hornblende schist (unit Apt), and thin quartzite layers. The amphibolite gneiss is typically resistant to weathering and forms high ridges and hills, for example as at the landmark hill of Kinngaaquk for which Kinngaaquk Tasia is named (traditional names). Throughout the high grade area, quartzite commonly contains coarse grained muscovite and is transitional to interlayered paragneiss (unit Apa) containing sillimanite knots overgrown by coarse grained muscovite and biotite.

Clastic sedimentary rocks and subordinate volcanic rocks, here referred to collectively as the 'Kingarjuit belt' underlie the area around Whitehills Lake and southwest to the Thelon River. Extensive exposures of white quartzite (unit APqz) form the prominent relief of the Half Way Hills (Kingarjuit). Preliminary results of radiometric dating show that the quartzite contains Mesoarchean and Neoarchean detrital zircons, including zircons of similar age to the Sanningajukuluk volcanic belt (W.J. Davis, unpublished data), establishing that the quartzite is younger than the Sanningajukuluk belt. Given the presence of hematitic quartzite, the paucity of pyritic conglomerate, and the preservation of wave ripple marks (as in the Paleoproterozoic Amer group), the age of the quartzite and associated rocks is regarded as uncertain, either Archean or Paleoproterozoic, pending further constraints (Zaleski et al., 2000).

Stratigraphic relationships within the Kingarjuit belt are speculative. Younging directions within the quartzite, based on cross-bedding and ripple marks, are dominantly inward away from the outer margin. Changes in younging direction and local overturned bedding 5 km east of the Thelon River (96°22.03'W, 64°34.19'N) are accounted for by mesoscopic chevron folds (Wouter Bleeker, pers. com., 2000), parasitic to the macroscopic Tasirjuaq synform that deforms the Kingarjuit belt. Oligomictic conglomerate (unit APqcg) and subarkose (unit APqm) are locally present within the quartzite and around its periphery. Polymictic conglomerate (unit APcg) along the contact to the Sanningajukuluk volcanic belt between Tasiraraujaq and Sanningajukuluk is interpreted as the basal unit of the Kingarjuit belt. Oligomictic conglomerate lies within the quartzite along the contact to volcanic rocks (unit APmi) in the hinge region of the Tasirjuaq synform (96°18.5'W, 64°33'N). The conglomerate fines from boulder-cobble conglomerate to pebbly sandstone toward the volcanic rocks.

The mafic to intermediate volcanic rocks (unit APmi) of the Kingarjuit belt are remarkably homogeneous and massive, and they are characterized by plagioclase megacrysts, 1-3 cm in length. The megacrysts distinguish the volcanic rocks from those of the Sanningajukuluk belt, especially southeast of Sanningajukuluk where both volcanic suites occur together. The distinction is supported by geochemical analyses which indicate an 'arc-like' signature for Kingarjuit rocks, in contrast to komatiitic and tholeiitic signatures for Sanningajukuluk rocks (Kerswill et al., 1999, note that their 'northern' volcanic belt includes both suites). Near the northern margin of the Kingarjuit belt, plagioclase megacrystic volcanic rocks are interlayered with quartzite. In one location (96°8.63'W, 64°39.95'N), dark quartzite in contact with volcanic rocks apparently contains detritus derived from the local volcanic substrate.

On Whitehills Lake, greywacke (unit APwk), polymictic conglomerate (unit APcg) and slate (unit APsl) lie inside quartzite folded by the Tasirjuaq synform (Fig. 2). The contact with quartzite lies in a wide valley with no exposure. In one location (96°9.16'W, 64°36.96'N), intermittent outcrops show a transition from coarse polymictic conglomerate with pebbly-granular interbeds, to greywacke with pebbly-granular beds, to flaggy greywacke with minor pebbles in a few beds, to quartzite. Clasts in the conglomerate include granite, syenite, quartzite and quartz-feldspar porphyry, intraformational wacke and conglomerate, and local amphibolite, laminated dolostone, mafic and felsic volcanic rocks, and chert. On the north side of Whitehills Lake (96°1.29'W, 64°38.95'N), several beds, 2-4 m thick, are dominated by syenite clasts, several centimetres to 1.5 m in size, in a matrix largely composed of finer syenitic detritus. The clasts show brecciation and dense fractures not evident in the matrix. Taylor (1985) reported massive to brecciated syenite overlain by syenite-clast conglomerate, which he interpreted as an unconformity developed on top of syenite. In contrast, we did not see evidence of *in situ* regolith or syenite. The large size of internally brecciated syenite clasts implies a proximal source. However, their distribution in several beds suggests sedimentary deposition.

In the higher grade domain east of Whitehills Lake, fine grained homogeneous amphibolite (unit APmi) and associated quartzite (unit APqz) are included with the Kingarjuit belt, and hence, considered to be Neoarchean or Paleoproterozoic. Black sulphidic pelite (unit APpts) and minor polymictic conglomerate (unit APcg) are tentatively correlated with similar sedimentary rocks along strike in the Kingarjuit belt. However, the pelite is host to extensive gossans and quartzite on its south side contains numerous silicate-sulphide iron-formations (unit APif) and gossans, atypical of quartzite in the main Kingarjuit belt.

Supracrustal rocks in the eastern map area are sheeted and intruded by sheets of weakly foliated to massive monzodiorite to syenite (units Pmdsy, Pmd, Psy), commonly showing patchy and nebulous textures indicating hybridization and magma mingling. Tectonic fabrics in monzodiorite are mostly developed adjacent to contacts. In the adjacent supracrustal rocks, sillimanite knots are overgrown by coarse grained retrograde muscovite and biotite. Fabrics in the monzodiorite-syenite suite and in supracrustal rocks are cut by massive unfoliated granite (unit PHgt). The granite is considered to be part of the Paleoproterozoic Hudson granite suite (Peterson and van Breemen, 1999), which includes massive granite dykes in the Amarulik domain that have been dated at 1835 ±-1 Ma (Roddick et al., 1992). Lamprophyre and syenite dykes (unit PMlm), and more plug-like intrusions exposed on islands in Whitehills Lake, belong to the Martell intrusions, the subvolcanic equivalent of the 1825 ±-12 Ma, Christopher Island Formation (Dubawnt Supergroup) (LeCheminant et al., 1987; Roddick and Miller, 1994). Several east-northeasterly trending diabase dykes (unit Pdb) in the northern map area are likely equivalent to post-Hudsonian dykes that cut the Pitz Formation (Dubawnt Supergroup) in the Aberdeen Lake area 100 km to the west (A..N. LeCheminant, pers. comm., 1999).

STRUCTURAL INTERPRETATION

Four main phases of deformation (D_1-D_4) are recognized on the basis of fabric orientations and overprinting relationships, relationships between fabrics and metamorphic mineral assemblages, correlations to macroscopic structures, and interpretation of the map pattern. Each of the main deformation events produced macroscopic folds and related fabrics. The dominant fabrics in the area are easterly to northerly trending, S_1 and S_2 mineral schistosities. S_1 is typically parallel to bedding (S_0), and locally S_1 and S_0 define mesoscopic F_2 folds. S_2 is commonly a composite fabric comprising transposed S_1 or, locally, a differentiated crenulation cleavage. S_3 and S_4 are typically westerly and southerly trending crenulation cleavages associated with mesoscopic and macroscopic folds. Their relative timing is uncertain. West of the greenschist-amphibolite transition (Fig. 2), low grade phyllosilicate minerals and amphiboles define S_1 and S_2 schistosities, which are crenulated by S_3 and S_4 fabrics. East of the transition, composite S_1/S_2 defined by medium and high grade minerals are increasingly transposed to form composite S_3 or S_4 fabrics. S_3 and S_4 fabrics are partly defined by coarse grained recrystallized muscovite and biotite.

The oldest tectonic fabrics recognized comprise gneissic and mylonitic layering in basement rocks that are cut by 2.87 Ga granodiorite. These fabrics predate deposition of Neoarchean supracrustal rocks and they are omitted from the D_1-D_4 structural scheme discussed here. The granodiorite contains a schistosity which is generally conformable with the dominantly northeasterly trending, southerly dipping foliation in adjacent younger supracrustal rocks. Strain in the granodiorite increases toward the southern contact with quartz breccia (fault zone) and the Kingarjuit belt. A strong, down-dip to moderately oblique, stretching lineation plunging toward the southeast could be related to early movement on the fault.

The major northeasterly trending fold that deforms quartzite and associated lithological units (Fig. 2) was recognized by Taylor (1985) who considered it to be an overturned, northwesterly verging syncline. Henderson and Henderson (1994) reinterpreted the fold as an F_2 synform which deforms a schistosity subparallel to layering. Both authors placed the axial surface trace within the volcanic unit (unit APmi) north of Whitehills Lake. Our work shows that the Kingarjuit volcanic unit defines parasitic S-shaped folds along the northern limb of the F_2 fold, here called the 'Tasirjuaq synform' (Fig. 2). The axial surface trace passes through Whitehills Lake. Our preferred explanation of the symmetry of lithological units along the trace of the Tasirjuaq synform is that it refolds an F_1 fold, the axial surface trace of which lies within the volcanic unit. Northeasterly structural facing on S_2 in the outer quartzite west of Whitehills Lake is consistent with an F_1 syncline. In this scenario, the polymictic conglomerate on Whitehills Lake is correlative with that along the outer margin of the quartzite (southwest of Tasiraraujak), interpreted as the basal unit of the Kingarjuit belt overlying an unconformity with basement and the Sanningajukuluk belt. Greywacke on Whitehills Lake may be equivalent to schistose subarkose along the outer quartzite contact. The exposures of volcanic rock and interlayered quartzite southeast of Sanningajukuluk suggest the presence of additional F_1 or F_2 fold traces, or possible drag folds related to faulting along the contact to basement (see below). An F_2 antiformal fold exposes basement rocks from south of Sanningajukuluk to the Thelon River. If a Paleoproterozoic age is established for the Kingarjuit belt, then D_1-D_4 deformation will also be established as Paleoproterozoic (post-Kingarjuit belt and pre-Dubawnt Supergroup).

Two major northeasterly trending, syn-D_1 or syn-D_2 faults dissect the map area (Fig. 2, low angle reverse faults). The contact between the Kingarjuit belt and basement is a silicified fault zone and cuts up-section across Kingarjuit lithostratigraphy through quartzite into volcanic rocks south of Sanningajukuluk, implying that the unconformity is not intact, or only locally intact. The contact is also partly coincident (within the crude constraints thus far available) with the biotite-in metamorphic transition (Fig. 2). The presence of the higher grade assemblages in the stratigraphically higher units of the faulted hangingwall is consistent with a reverse component to displacement. Local foliation fish and mica microfabrics in the basal subarkose also suggest south-side-up movement toward the northwest. The fault coincides with one of several northwest-directed thrust faults and splays inferred by Taylor (1985) on both margins of, and within, the quartzite, an interpretation which implies that reverse faults postdated the Tasirjuaq synform. Our interpretation differs in that we consider that the fault could be either folded around the Tasirjuaq synform, and hence pre-D_2, or it could be related, possibly localized on the northern overturned limb of the fold.

A second fault juxtaposes the Sanningajukuluk volcanic belt with younger Amarulik wacke along a southerly dipping structural contact (Fig. 2). The fault is nearly conformable to the Sanningajukuluk belt in that it closely follows units of iron-formation and carbonate rocks. The low angle geometry and reverse sense of movement are consistent with a thrust fault. Polymictic conglomerate is present intermittently along the contact suggesting synkinematic deposition contemporaneous with faulting, and hence possible Paleoproterozoic age. The conglomerate contains fabrics consistent with at least D_2 deformation, and the easternmost occurrence (east of Tasiraraujaq) is strongly recrystallized and biotitic in keeping with the increase in regional metamorphic grade.

Macroscopic F_3 folds and related fabrics trend westerly across the area (Fig. 2). South of Sanningajukuluk, F_3 folds deform reverse faults and F_2 folds, producing fold interference patterns. S_3 crenulation cleavage and mesoscopic folds overprint the Tasirjuaq synform and related fabrics between the Thelon River and Whitehills Lake. Northerly trending upright F_4 folds deform the Tasirjuaq synform and extend north into the Amarulik domain (F_3 of Henderson and Henderson, 1994 and Zaleski et al., 1999b). East of Tasiraraujak and Whitehills Lake, a combination of fold interference (dominantly F_3 and F_4), shallow dips and topographic relief imparts a complex map pattern. South of Kinngaaquk Tasia, the westerly trending lenticular map pattern is a consequence of shallowly plunging F_3 folds. The folds deform supracrustal rocks and intrusive sheets belonging to the Paleoproterozoic monzodiorite suite. South and southeast of Whitehills Lake, high strain associated with retrogression produced an east-west trending, straight, structural domain discordant to polyphase fold traces to the north. Lithological contacts are tectonized and primary relationships between Archean and/or Paleoproterozoic units are obscured.

METAMORPHISM

Metamorphic grade varies across the area from low in the west to high in the east (Fig. 2). In the west, mafic rocks contain greenschist-facies assemblages of amphibole-chlorite-epidote-plagioclase, and iron-formation near the Meadowbank River contains stilpnomelane (96°2.8.38'W, 64°35.86'N). A biotite-in transition recognized in felsic and sedimentary rocks subdivides the low grade area (Fig. 2), with K-feldspar-chlorite-white mica in the northwest, and biotite-muscovite in the southeast. The transition is subparallel to the faulted contact between the Sanningajukuluk and Tasirjuaq belts for much of its length. However, in the north, the biotite-in transition crosses the contact as well as the inferred thrust fault between the Sanningajukuluk belt and Amarulik domain.

A greenschist- to amphibolite-facies transition near the eastern contact of the Tasirjuaq belt is defined by a change from kyanite and chloritoid in quartzite to the west, to sillimanite- and staurolite-bearing assemblages in metasedimentary rocks to the east. Assemblages in metabasites change from greenschist-facies to hornblende-clinopyroxene-plagioclase consistent with amphibolite-facies. Polyphase metamorphism and structural telescoping may have played a role in the distribution of assemblages. For example, two instances of isolated high grade assemblages (garnet-clinopyroxene in metabasite, and K-feldspar-sillimanite in paragneiss) have been noted near the greenschist-amphibolite transition. The position of the southern extension of the transition is poorly constrained, but biotite-aluminosilicate assemblages continue east of Whitehills Lake. At the southeastern end of Kinngaaquk Tasia, relict andalusite porphyroblasts are overgrown by sillimanite and a transition from andalusite-biotite to sillimanite-biotite-bearing assemblages can be traced to the southeast in pelitic rocks. If the aluminosilicate-bearing pelitic assemblages represent a prograde sequence, then they suggest relatively low pressure metamorphic conditions (< 3-4 kb).

ECONOMIC GEOLOGY

The map area encompasses 22 known gold, base metal and polymetallic mineral occurrences, 21 of which lie in the Sanningajukuluk volcanic belt or in adjacent Amarulik wackes. A base metal occurrence (#1, Mineral Occurrences) and numerous gossans are present in sulphidic pelite, quartzite and iron-formation southeast of Whitehills Lake. Several features of vein-hosted mineral occurrences in the Sanningajukuluk belt led Kerswill et al. (1999) to conclude that gold and base metal mineralization were linked to synvolcanic rather than late tectonic processes. These features included the metal endowment, Au with strongly anomalous Ag, Pb and/or Zn, in addition to locally anomalous concentrations of one or more of Mo, W, Bi, Sb and As. Also, the metal-rich veins show evidence of deformation and metamorphism. The suggestion of Kerswill et al. (1999) of a genetic link between metal deposition and granitoid plutons inferred to be subvolcanic is not supported by our subsequent work. At least one of the 'plutons' in question is the basement granodiorite southeast of Sanningajukuluk.

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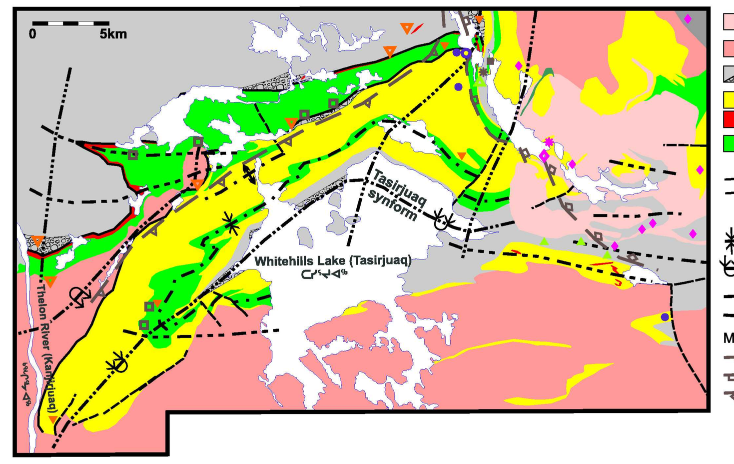

Figure 2. Generalized geology with preliminary interpretation of macroscopic folds, low angle reverse faults, and metamorphic transitions. Metamorphic assemblages are shown by symbols that match those in the map legend.

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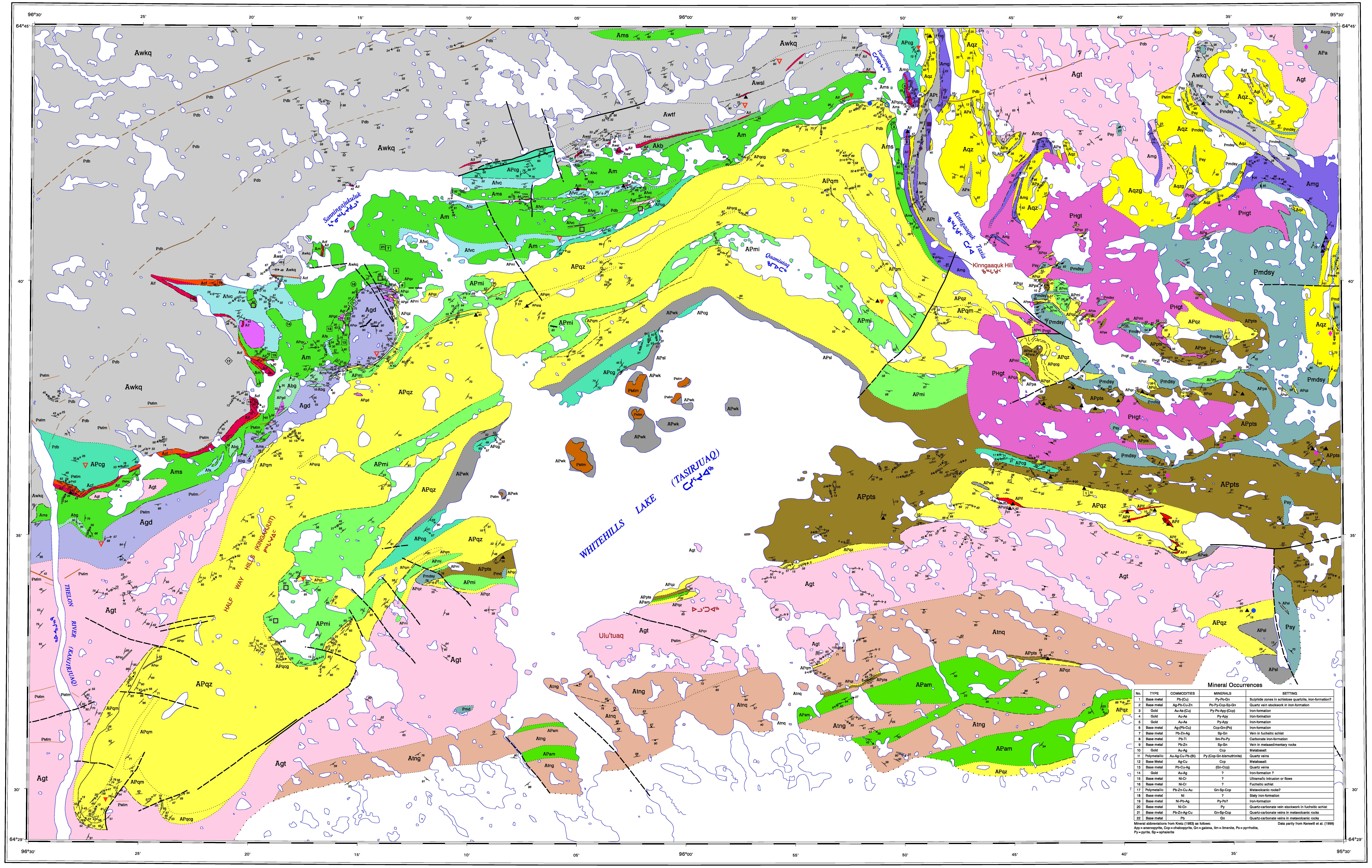

OPEN FILE 3697

GEOLOGY

HALF WAY HILLS TO WHITEHILLS LAKE AREA

NUNAVUT

Scale 1:50 000/Échelle 1/50 000

kilometres 1 0 1 2 3 4 kilomètres

Universal Transverse Mercator Projection
North American Datum 1927
© Her Majesty the Queen in Right of Canada, 2001

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1927
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Geology by E. Zaleski, S. Pehrsson, L. Wilkinson, Continental Geoscience Division, Geological Survey of Canada, E. Greiner, R. L'Heureux and N. Duke, University of Western Ontario, Department of Earth Sciences

Digital geological compilation by E. Zaleski, 1999-2000

Co-ordinated through the auspices of the Western Churchill NATMAP Project

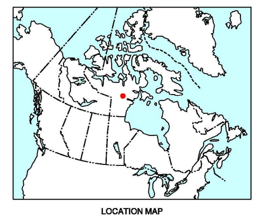
Digital cartography by J.D. Narraway, Earth Sciences Sector Information Division (ESS Info)

Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data extracted from Landsat TM imagery, modified by ESS Info and the Geological Survey of Canada

Some geographical names subject to revision
Traditional place names provided by elders of Baker Lake during a terminology workshop (Aug. 1999) facilitated by Lucy Evo, Inuit Heritage Centre, Baker Lake and Janet McGrath, Tamalik & Associates

Proximity to the North Magnetic Pole causes the magnetic compass to be erratic in this area
Magnetic declination 2001, 1°15'W, increasing 7.5' annually



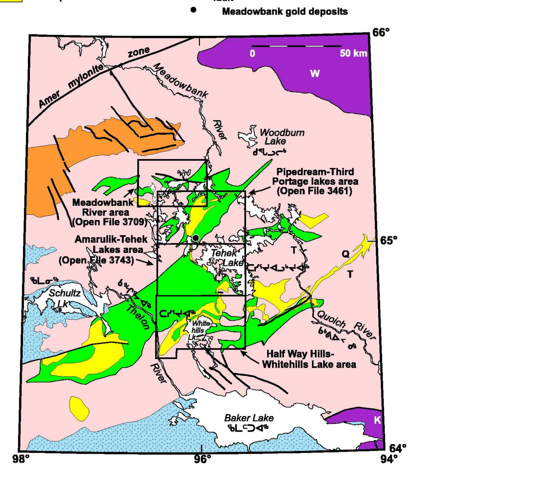


Figure 1. Regional setting of the Woodburn Lake and Ketyet River groups in the Amer Lake (NTS 66 H), Woodburn Lake (NTS 56 E), Baker Lake (NTS 56 D) and Schultz Lake (NTS 66 A) areas. The regional map is adapted from an unpublished compilation (L.Wilkinson, 1997) based on Donaldson (1966), Schau (1983), Taylor (1985), Fraser (1988), Tella (1994), and a compilation map in progress for the Schultz Lake area based on unpublished mapping by GSC geologists.

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OTTAWA
02/2001

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