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Revised stratigraphy and sedimentology of the Paleoproterozoic Dubawnt Supergroup at the northern margin of Baker Lake Basin, Nunavut[1]

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Abstract: On the northwest side of the Paleoproterozoic Baker Lake basin the Christopher Island Formation, comprising volcanic flows intercalated with alluvial fan and pyroclastic rocks, unconformably overlies Archean gneiss. It is unconformably overlain by the Amarook Formation (new name), a well indurated sandstone characterized by large-scale crossbedding of probable eolian origin, and interbedded alluvial sandstone and conglomerate. The Amarook Formation correlates with similar strata recognized in drill core and outcrop from the eastern Thelon Basin. The disconformably overlying Pitz Formation includes lower volcanic and upper sedimentary members. The upper member correlates with strata mapped as basal Thelon Formation in the Thelon Basin.

Lower Dubawnt Supergroup rocks are offset by a series of northwest-striking dextral faults that may predate deposition of the overlying Barrensland Group. A possible strike-parallel fault may be responsible for repetition of lower Dubawnt strata in the southern part of the study area.

Résumé : Sur le côté nord-ouest du bassin paléo-protérozoïque de Baker Lake, la Formation de Christopher Island, qui comporte des coulées volcaniques intercalées à des roches pyroclastiques et à des roches de cônes alluviaux, recouvre en discordance du gneiss archéen. Elle est recouverte en discordance par la Formation d’Amarook (nouveau nom), un grès bien induré caractérisé par une stratification oblique à grande échelle, probablement d’origine éolienne, avec des interlits de grès alluvionnaire et de conglomérat. Une corrélation existe entre la Formation d’Amarook et des strates similaires reconnues dans des carottes de forages et des affleurements dans l’est du Bassin de Thelon. La Formation d’Amarook est recouverte en discordance par la Formation de Pitz, qui comprend un membre inférieur volcanique et un membre supérieur sédimentaire. Le membre supérieur peut être mis en corrélation avec des strates qui ont été assignées à la base de la Formation de Thelon dans le Bassin de Thelon.

Les roches inférieures du Supergroupe de Dubawnt sont décalées par une série de failles dextres à orientation nord-ouest qui pourraient être antérieurs à la mise en place du Groupe de Barrensland sus-jacent. Il est possible qu’une faille parallèle à la direction soit responsable de la répétition des strates inférieures du Supergroupe de Dubawnt dans la partie méridionale de la région d’étude.

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[1] Contribution to the Western Churchill NATMAP Project

INTRODUCTION

This paper utilizes field data collected with A.N. LeCheminant in 1988 (GSC) and new data collected in 1999 as part of an ongoing regional study of Baker Lake Basin (*see* Rainbird et al., 1999; Hadlari and Rainbird, 2000). The objectives of the present study were to examine field relationships along the northern margin of Baker Lake Basin in more detail. The main goal of our ongoing work is to establish the stratigraphy of the Dubawnt Supergroup in relation to paleogeography, depositional setting, and provenance as a basis for understanding the tectonic evolution of Baker Lake Basin and its associated subbasins.

REGIONAL GEOLOGY

The study region encompasses the southern part of the Schultz Lake map sheet (NTS 66 A), which straddles the northwestern margin of Baker Lake Basin (Fig. 1). The region originally was mapped by Wright (1967), along with the first sedimentological study of the Baker Lake Basin by Donaldson (1965, 1967), who established the initial stratigraphic nomenclature for the Dubawnt Group. The basin is filled by a volcano-sedimentary sequence called the Dubawnt Supergroup (Gall et al., 1992), which includes the Baker Lake Group, Wharton Group, and Barrensland Group (Fig. 2). Nowhere is the entire succession completely exposed; the distribution and depositional setting of these strata demands rapid lateral facies and thickness variations, and abrupt truncation of units by faults. The Christopher Island Formation is a sequence of potassic to ultrapotassic volcanic flows and intercalated epiclastic and pyroclastic deposits. It is unconformably overlain by the Wharton Group, which in the study area comprises a thick, previously unassigned, sequence of well indurated sandstone units and conglomerate, herein named Amarook Formation, and overlying porphyritic rhyolite, the Pitz Formation. Wharton Group and Baker Lake Group strata are unconformably overlain by conglomerate and sandstone units of the Thelon Formation, lowermost subunit of the Barrensland Group.

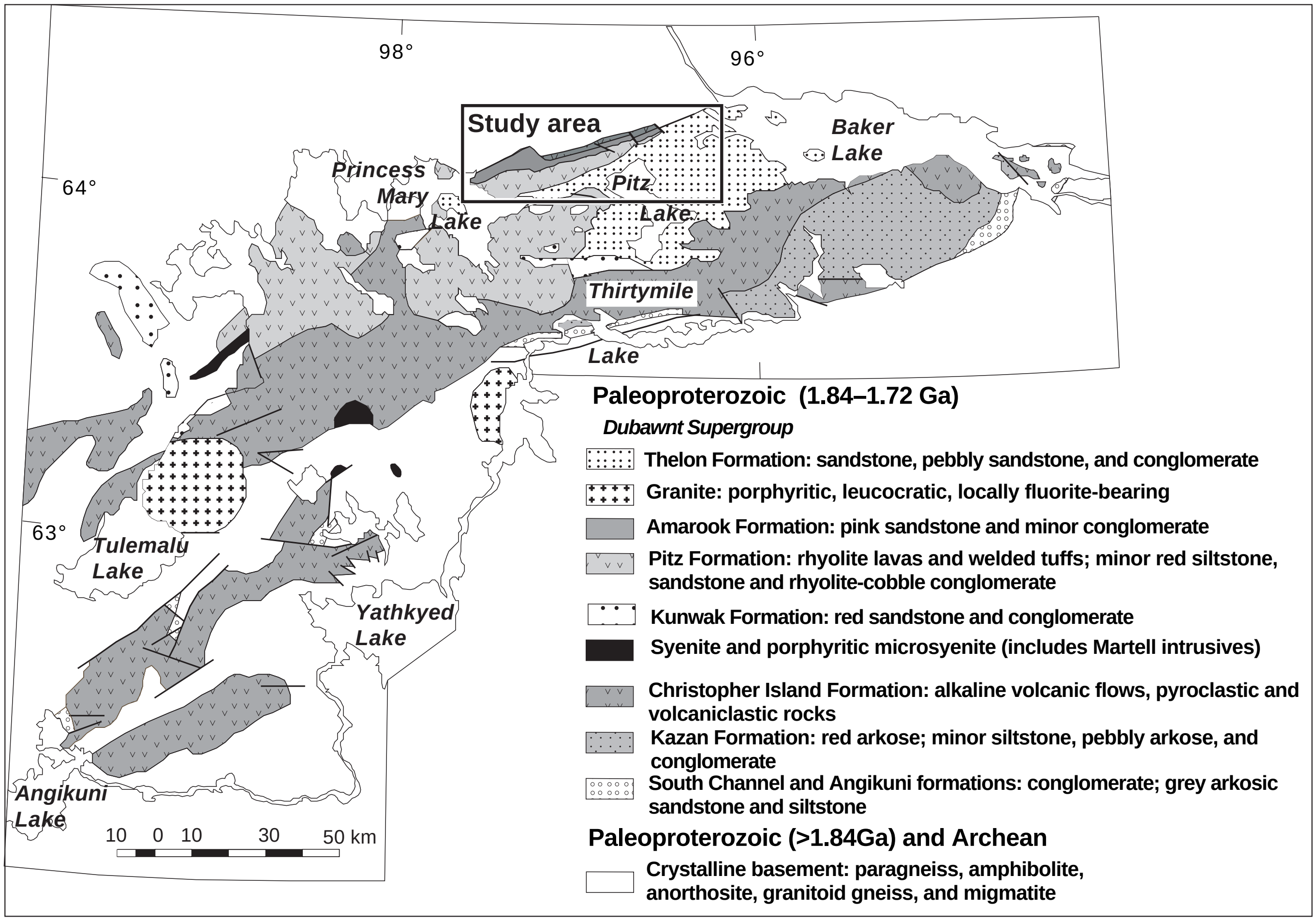

Figure 1. *Distribution of Dubawnt Supergroup rocks in the Baker Lake Basin and smaller subbasins between Angikuni Lake and Yathkyed Lake (*after *LeCheminant et al., 1979). Box indicates outline of map in Figure 3.*

Gall et al. (1992)	This report
Dubawnt Supergroup	
Barrensland Group Lookout Pt. Formation Kuungmi Formation Thelon Formation (>1.72 Ga)	Barrensland Group Lookout Pt. Formation Kuungmi Formation Thelon Formation (>1.72 Ga)
unconformity	
Wharton Group Pitz Formation (ca. 1.76 Ga)	Wharton Group Pitz Formation (ca. 1.76 Ga) sedimentary member volcanic member Amarook Formation
unconformity	
Baker Lake Group Kunwak Formation Christopher Island Formation (ca. 1.83 Ga) Kazan Formation South Channel Formation	Baker Lake Group Kunwak Formation Christopher Island Formation (ca.1.83 Ga) South Channel–Kazan Formation
unconformity	
Archean granite-greenstone terrane *(western Churchill Province)*	

Figure 2. *Revised lithostratigraphic subdivision of the Dubawnt Supergroup.*

LOCAL GEOLOGY

Archean gneiss

Dubawnt Supergroup rocks are underlain by granitoid gneiss of suspected late Archean age, which contains discontinuous pods and screens of amphibolite. In the vicinity of the unconformity with the overlying Dubawnt Supergroup, the basement rocks are strongly hematitized and contain abundant quartz veins.

Dubawnt Supergroup

Christopher Island Formation

The Christopher Island Formation forms the base of the Dubawnt Supergroup in the study area. It outcrops intermittently along a l–3 km wide band from an area about 15 km northwest of Pitz Lake to Qinguq Bay, about 50 km east-northeast (Fig. 3). Strata dip southeastward at 30°–50° with steeper dips being recorded near faults. Most detailed observations of the Christopher Island Formation come from a well exposed section along Aniguq River, where it is estimated to be 800–l000 m thick (Fig. 4).

Interflow sedimentary rocks

On the west side of the river, basement gneiss units are overlain by a 7.5 m thick horizon composed of pebble- to cobble-size (up to 40 cm) clasts of angular to subrounded, locally derived gneissic monzogranite. This generally clast-supported conglomerate is set in a matrix of sandy to granular granitic detritus. The conglomerate includes breccia composed of quartz-carbonate altered gneiss boulders. The entire zone was affected by strong argillic and hematitic alteration consistent with chemical weathering and regolith development on the Archean paleosurface prior to deposition of the Christopher Island Formation.

The basal regolith unit passes abruptly into a coarsening-upward sequence (~25 m thick) of parallel-stratified siltstone, sandstone, and paraconglomerate. Bedding thickness increases upward with grain size from thickly laminated to thickly bedded, many beds displaying distinct normal grading and, less commonly, reverse grading. The rocks are primarily red-brown to maroon lithic wacke composed mainly of cognate volcanic rock fragments with varying but lesser amounts of angular quartz and feldspar. Early diagenetic grain-coatings of hematite are responsible for the red coloration of these rocks. Within this volcaniclastic unit are some relatively coarse, massive, K-feldspar crystal-rich layers (Fig. 5). Some of the layers also contain large, well rounded, green phlogopite crystals. These distinctive crystal-rich facies outcrop at the same stratigraphic level farther to the northeast, on the west side of Qinguq Bay.

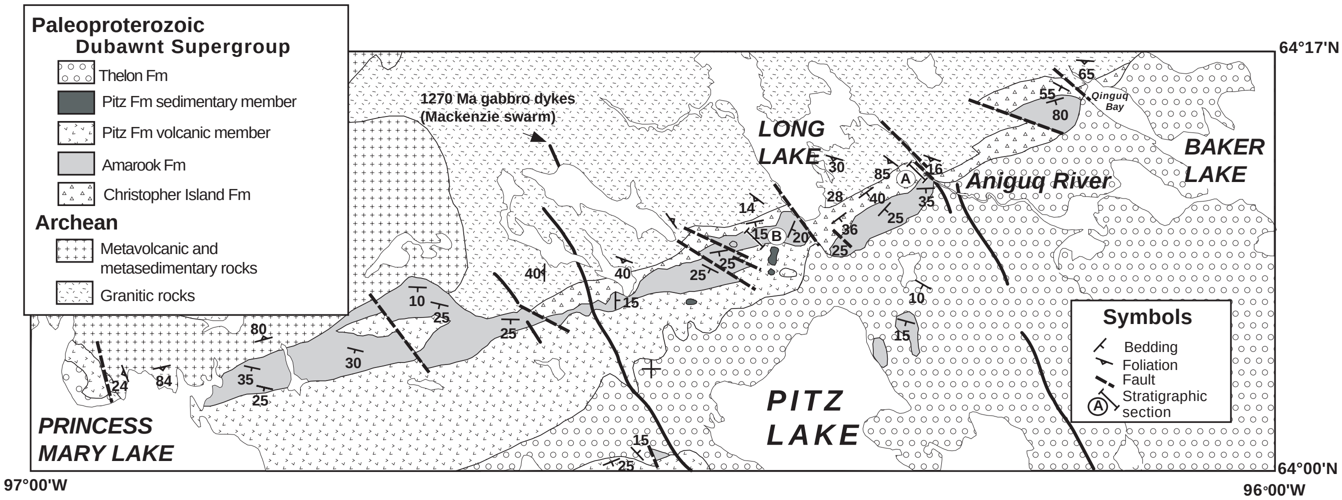

Figure 3. *Geological sketch map of the Precambrian geology of the study area (NTS 66 A/1, 66 A/2, 66 A/3, and part of 66 A/4).*

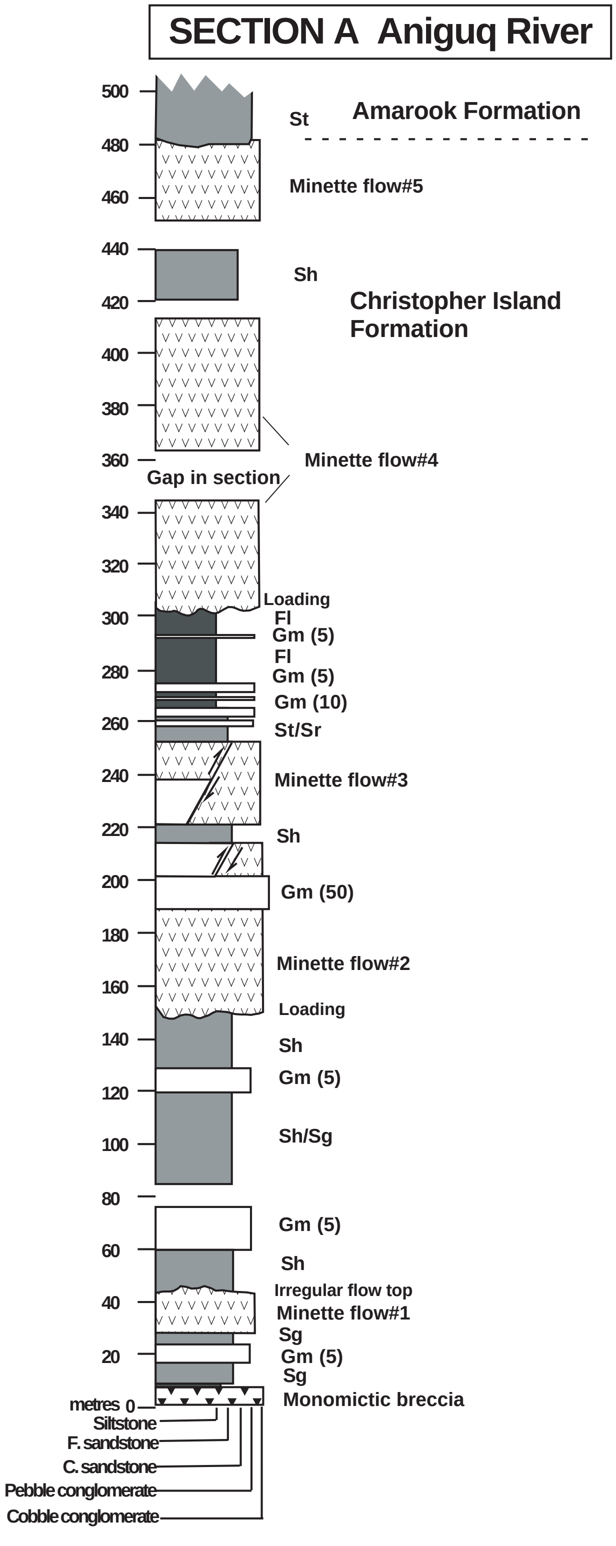

Figure 4. *Composite stratigraphic section of the Christopher Island Formation along the Aniguq River (section A, Fig. 3). Lithofacies identifiers after Miall (1978): Gm, massive or crudely bedded gravel with maximum clast size in brackets; St, trough crossbedded sandstone; Sr, sandstone with ripples; Sh, sandstone with horizontal lamination; Sg, sandstone with horizontal stratification and grading; Fl, mudstone and siltstone with fine lamination.*

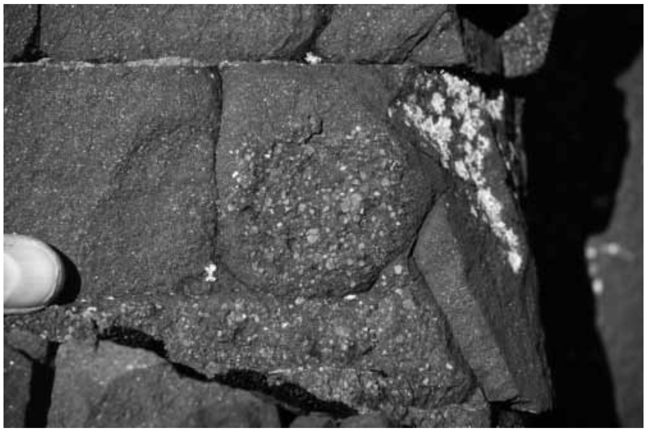

Figure 5. *K-feldspar crystal tuff from basal Christopher Island Formation near Qinguq Bay.*

About 140 m above the unconformity (Fig. 4), a second volcanic flow is overlain by a relatively coarse epiclastic sedimentary sequence, which differs from underlying sedimentary strata in that it is red and contains more basement-derived siliciclastic detritus. At the base it is a coarse (maximum clast size 50 cm, mode 10 cm), poorly indurated and poorly sorted but faintly stratified conglomerate with sub-to well-rounded clasts representing roughly equal proportions of granitoid and cognate volcanic rocks. The section fines upward; above 250 m, coarse layers form the bases of cycles that are capped by parallel-laminated to rarely ripple crosslaminated granule-bearing red siltstone and fine-grained sandstone. The siltstone facies is interbedded with 5–15 cm thick parallel-bedded and crossbedded pebbly sandstone interbeds.

The section continues on the east side of the river where it has been separated by 800–1000 m of dextral movement along a fault which coincides with the course of Aniguq River (Fig. 3). Here, a third volcanic flow is overlain by a short (26.5 m) section of epiclastic redbeds, similar to strata below the flow on the west side of the river. These comprise a series of metre-scale fining upward cycles beginning with trough crossbedded pebbly conglomerate and capped by alternating horizontally stratified to current-ripple crosslaminated fine-grained sandstone and siltstone with desiccation cracks. This segment of the section is overlain by a fourth volcanic flow which is about 50 m thick (Fig. 4). Above this is a short gap followed by an approximately 60 m thick sequence of mainly very coarse-grained, crudely stratified, disorganized framework conglomerate. Clasts generally are well rounded, up to 1 m in diameter and vary from about 80% basement clasts at the base to less than 50% at the top. Coarse conglomerate units form 5–10 m thick fining-upward cycles that typically are capped by horizontally stratified sandstone (Fig. 4).

In the absence of definitive petrographic evidence, horizontally stratified and graded pebbly wacke and siltstone units near the base of the Aniguq River section are interpreted as primary volcanic ejecta. These rocks are very similar to fine-grained volcaniclastic strata in the Dubawnt Lake subbasin that were interpreted as tuffs (Rainbird and

Peterson, 1990), and are distinguished from overlying interflow sedimentary strata by their maroon colour, finer grain size, lower component of siliciclastic detritus, and lack of bedforms. Overlying epiclastic redbeds represent deposition on an unstable alluvial plain, the character of which was controlled by a complex interplay of faulting and volcanism. Poorly sorted parallel-stratified conglomerate units with rounded clasts suggest relatively high-energy deposition, perhaps by sheet floods with finer grained parallel-stratified and graded interbeds representing waning current deposits. These deposits reflect periods of rapid erosion and accumulation on relatively unstable slopes with subsequent slope failure triggered by periodic basin-margin faulting.

Lava flows

The sedimentary succession is abruptly overlain and interbedded with a series of potassic lava flows that vary in thickness from 15 m to 100 m (Fig. 4). The lavas are similar to those described from adjoining map areas (LeCheminant et al., 1979; Blake, 1980; Peterson et al., 1989) and can be classified mainly as phlogopite-phyric mafic minette. Randomly oriented (2–5 mm wide) phlogopite macrocrysts compose 5–10% of the rock. Some samples contain similar amounts of 1–2 mm blocky clinopyroxene that is variably altered to calcite. Apatite microcrysts are also very common. Macrocrysts are set in a fine-grained, reddish-brown groundmass composed of alkali feldspar laths with minor amounts of interstitial quartz, hematite, and opaque minerals. The upper portion of flow #2 and all of flow #4 (Fig. 4), contain irregular to rounded amygdules up to 2 cm long which typically are flattened parallel to flow boundaries. Most are filled with pink calcite which weathers out on exposed surfaces. A peculiar feature of flow #3 is the rare occurrence of elliptical, concentrically layered concentrations of phlogopite with long axis dimensions of 1–5 cm. The petrology of these mantle-derived inclusions, known as glimmerite nodules, has been described in some detail by Peterson and LeCheminant (1993).

At the top of flow #2, crosscutting veins up to 5 cm wide, contain very fine-grained, tan-weathering dolomite. These originate within a rubbly flow-top regolith and pinch out several metres down into the underlying flow. Similar features are more extensively developed at the top of flow #4, where they can be traced downward for about 15 m (Fig. 6). Close scrutiny reveals that the vein infill is finely laminated with slight upturning at the vein walls (Fig. 6). At the contact with overlying epiclastic rocks, the laminated carbonate forms a laterally extensive horizon nearly 1.5 m thick. Angular to subrounded clasts of minette with weathering rinds are contained within the zone, which is strongly overprinted by hematite. The carbonate veins are considered to have been precipitated from groundwater as a geopetal infill of fractures in the lava flows; however, the mechanism for development of laminar dolomite above the flow may be related to weathering, prior to deposition of the overlying epiclastic rocks.

Figure 6. *Laminar dolomite geopetal infill approximately 15 m below the top of minette flow #4 from Aniguq River, section A (Fig. 4).*

Amarook Formation

About l.5 km southeast of the base of section A, altered minette flows of the Christopher Island Formation pass upward through a 3–4 m thick sandstone-hosted volcanic fragment breccia into hard, pink, fine-grained, well sorted subarkose. The minette fragments range in size from a few millimetres up to 1 m and have broken away from the underlying flows. The fragments display varying degrees of colour alteration suggesting that the alteration was predepositional. These features are consistent with an erosional unconformity and chemical and physical weathering of the Christopher Island Formation prior to deposition of the sandstone. The fine-grained sandstone unit continues upward for about 10 m before it disappears under glacial drift. It outcrops again as a prominent ridge above the river canyon. The sandstone forms a distinct map unit, up to 3 km wide, that can be traced for more than 50 km along northwest side of Baker Lake Basin (Fig. 3). Like the underlying formations it strikes east-northeast with moderate to steep dips to the southeast and is similarly affected by northwest-striking normal faults.

This unit, herein named Amarook Formation, was formerly mapped as Kazan Formation by Donaldson (1965, 1967). (This unit has been referred to informally as the Howling Wolf formation; Amarook is the Inuit word for “wolf”.) However, this sandstone unconformably overlies volcanic flows of the Christopher Island Formation and at several localities along the southern edge of its exposure it is disconformably overlain by conglomerate of the basal Thelon Formation. These conglomerate units contain clasts of hard, pink sandstone, identical to the underlying Amarook Formation. Reconnaissance indicates that it is well exposed southwest of Aberdeen Lake on the north side of the Dubawnt River, and also on the east side of Marjorie Lake (LeCheminant et al., 1983), where it was mapped as a lower member of the Pitz Formation. Several drill cores taken from the eastern Thelon Basin contain a distinctive, well sorted and well indurated arkosic sandstone between basement and the

Thelon Formation (unpub. data, Cameco Corporation, 1998). These observations suggest that the Amarook Formation is regionally extensive within Thelon and Baker Lake basins.

A relatively well exposed section occurs a few kilometres west of the south end of Long Lake (section “B”; Fig. 7). There it is divisible into four subfacies on the basis of regional mapping and stratigraphic section measurement.

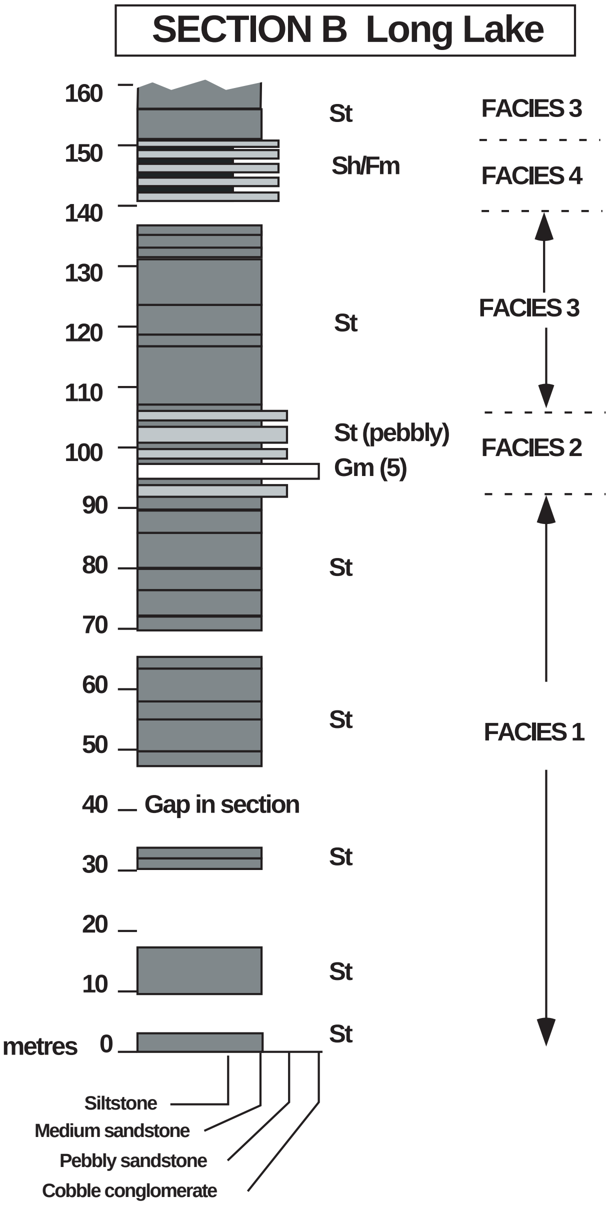

Figure 7. *Stratigraphic type section of the Amarook Formation west of Long Lake (section B, Fig. 3). Lithofacies identifiers after Miall (1978): Gm, massive or crudely bedded gravel with maximum clast size in brackets; St, large-scale, tabular-trough crossbedded sandstone; Sh, sandstone with horizontal lamination; Fm, massive mudstone with desiccation cracks.*

Facies 1 is a thick, very well indurated, pink to red, fine- to medium-grained subarkose. Grains are extremely well rounded and well sorted and thoroughly cemented by quartz. Facies 1 also is characterized by 2–8 m thick, simple tabular-trough to wedge-planar crossbedding. Individual troughs have exposed widths up to 100 m. Nowhere is a complete section exposed but near Qinguq Bay, facies 1 attains a thickness of at least 450 m. Paleocurrents derived from crossbedding indicate strong unimodal transport toward the south and southwest.

Facies 2 (Fig. 7) is a fine- to medium-grained, moderate- to well sorted and well indurated red quartz arenite with pebbly laminations and interbedded conglomeratic horizons up to 1 m thick. The conglomeratic beds are both clast- and matrix-supported; the matrix is the red arkose described above. Clasts include well rounded pebbles and cobbles of, in decreasing order of abundance, vein quartz, Christopher Island Formation volcanic rocks, pink quartz arenite and basement granitoid rocks. Parallel stratification is the dominant bedding fabric.

Facies 3 overlies facies 2 and is a sequence of red, fine- to medium-grained quartz arenite composed of large to very large simple tabular-trough crossbeds. It is very similar to facies 1 but is distinguishable by its dark red colour and by the fact that it contains pebbly interlayers along crossbed-bounding surfaces.

Facies 4 is bounded by facies 3 rocks (Fig. 7) and is characterized by red, moderately sorted and indurated pebbly quartz arenite with interstratified silty mudstone and minor conglomerate. The mudstone interbeds display wave ripples and pervasive desiccation cracks. Parallel stratification is ubiquitous.

Several lines of evidence suggest that the Amarook Formation was deposited, in part by ephemeral streams, probably under semiarid to arid conditions. Parallel stratification in facies 2 and 4 suggests deposition under upper flow regime conditions in shallow water. Given the absence of substrate stabilizing vegetation in the Proterozoic, such conditions may have prevailed during periods of heavy rainfall and subsequent flash flooding. Silty mudstone interlayers were deposited by suspension from ponded waters after flooding. Ripples were formed by wind-generated waves on the ponds and mudcracks resulted when the ponds were dried up. The large-scale crossbedded sandstone beds of facies 1 are interpreted as eolian on the basis of the large scale of the crossbeds, high textural and compositional maturity, total absence of any coarse- or fine-grained detritus, and because of the possible ephemeral nature and arid climate suggested by the bounding facies. Facies 3 sandstone units are more difficult to interpret because of the pebbly interlayers, but these could represent wind deflation lags. Additional petrographic and detailed field studies to look for wind-generated fine structures such as climbing wind-ripple lamination (Hunter, 1977) are needed to make a definitive interpretation.

Pitz Formation

The Pitz Formation is separable into lower volcanic and upper sedimentary members. In the study area, both are confined mainly to a ridge-forming outcrop belt that trends northeast between Princess Mary Lake and the prominent fault and/or lineament that forms the eastern shoreline of Long Lake (Fig. 3). Strata dip toward the south at 20°–30°. The Pitz Formation also outcrops along a subparallel ridge to the south, which trends through northern Pitz Lake. The contact between the Pitz Formation and the Amarook Formation is erosional and is exposed about 3 km southwest of the southern end of Long Lake.

The volcanic member of the Pitz Formation comprises siliceous lava flows, considered to be the extrusive equivalents of the 1755–1760 Ma Nueltin granite (references *in* Peterson and van Breemen, 1999). The lavas are rhyolite to rhyodacite; most common in this area is mauve to bright red porphyritic rhyodacite containing varying amounts of white kaolinized potassium feldspar phenocrysts up to 3 cm, smaller quartz eyes, and minor fine-grained mafic grains. Fresh feldspar phenocrysts are very rare. In general, the Pitz Formation volcanic member has remarkable primary homogeneity making it difficult to distinguish flow boundaries and attitudes. Interflow pyroclastic rocks including rhyolite breccia, lithic arenite, and red tuffaceous siltstone were noted in a few scattered outcrops but are thin and discontinuous.

The most common feature of the volcanic rocks is kaolinite, hematite, and silica alteration. Kaolinite occurs mainly as a replacement of potassium feldspar phenocrysts but also as veinlets and other irregular void space fillings. Hematite is ubiquitous as fine disseminations in the groundmass but occurs most notably in red sandy siltstone which infills rectilinear to irregular fractures in the rhyolite. Quartz veinlets occur in drab, hematite-poor (bleached?) rhyolite where they appear to crosscut the kaolinite. The strongest alteration is confined to a zone 2–3 m beneath the overlying unconformity with the Thelon Formation. These alteration zones are truncated at the unconformity indicating that they were formed in an interval after eruption of the rhyolite but prior to deposition of the overlying sedimentary rocks.

The alteration features are interpreted to be the product of sublateritic weathering and regolith development. Kaolinite is a typical weathering product of feldspars, and hematite is produced through the breakdown of ferromagnesian minerals, in this case by oxidizing meteoric waters. The hematitic siltstone fracture infills may be remanent soil material which penetrated the regolith zone and escaped subsequent erosion. Quartz veinlets and disseminations are likely silcretes derived from the release of silica during chemical weathering of the Pitz rhyolite. Silcretes have been documented from a number of different localities and stratigraphic horizons within the Dubawnt Supergroup, including the Pitz Formation (cf. Chiarenzelli *in* LeCheminant et al., 1983; Ross and Chiarenzelli, 1985).

The volcanic member is overlain in a few small areas north of Pitz Lake by a sedimentary member composed of massive to faintly stratified matrix-supported sandy conglomerate, parallel-stratified mixed conglomerate and sandstone followed by an upper crossbedded sandstone lithofacies that contains minor conglomerate and siltstone. Framework clasts vary from l–5 cm diameter, are subangular to subrounded, and comprise about 30% volcanic rocks, 60% sedimentary rocks (mainly sandstone), and 10% basement granitoid and volcanic rocks. Abundances vary considerably according to regional and stratigraphic locality. The basal conglomerate has an open framework of about 90% Pitz Formation volcanic member clasts in a matrix of red, well indurated, and moderately well sorted lithic arenite and quartz arenite. Higher in the stratigraphy, there is an increasing component of clasts bearing striking similarity to the Amarook sandstone. A distinctive aspect of the conglomerate matrix and overlying sandstone units is that they contain a high abundance of red cherty lithic fragments presumably derived from the underlying volcanic rocks or from silcrete that may have formed on the rhyolite. Both sandstone and conglomerate contain thin interlaminations of red silty mudstone, some of which are mudcracked and wave rippled. Strikingly similar rocks were described from south of Aberdeen Lake by Chiarenzelli (*in* LeCheminant et al., 1983, p. 443) and Ross and Chiarenzelli (1985), who assigned them to the basal Thelon Formation but who also remarked on their similarity to interflow sedimentary units of the nearby Pitz Formation.

Due to the broad regional extent of the volcanic rocks and the inferred high viscosity of these siliceous lavas it is probable that there were numerous volcanic centres along the northwest margin of Baker Lake Basin. Regional reconnaissance shows that the stratigraphic relationship between the lavas and overlying and underlying sedimentary units can differ and that there may be more than one horizon of felsic volcanic rocks outside the present study area. The discontinuous nature of the lavas is exemplified by their abrupt termination to the northeast. Likewise there are several sedimentary sequences separating these lavas, which might best be assigned as members of the Pitz Formation. Generally, these sedimentary units are similar to the fluvial facies of the underlying Amarook Formation, and may represent a continuation of sedimentation that was essentially interrupted by the felsic volcanism.

Thelon Formation

The Thelon Formation outcrops sporadically along rivers and gullies in low-lying areas in the southeastern part of the study area (Fig. 3). It is the youngest rock unit and unconformably overlies Wharton and Baker Lake Group rocks. The few exposures of the unconformity line up along a northeast trend from Princess Mary Lake to Baker Lake.

The Thelon Formation comprises two members in the study area. The basal member is a very coarse-grained, pebbly to conglomeratic quartz arenite with distinctive white clay-mineral cement. Rocks are pink to mauve, crumbly weathering and composed of moderate to large-scale trough crossbeds with no intervening fines. At the base it is dominated by locally derived clasts: Pitz Formation rhyodacite in the west and Amarook sandstone in the east. Crossbeds yield unimodal northwest-directed paleocurrents. Deposition by large-scale braided rivers is inferred. Estimated thickness of the basal member along a section on the Aniguq River is about 100 m.

The basal member is overlain by a fine- to medium-grained, very well sorted quartz arenite composed of very thick tabular-trough crossbeds with individual sets up to 10 m thick and more than 100 m wide. Foresets are a few centimetres thick with weak normal grading suggesting that they are grainflow deposits, common on large eolian dunes. The sheer size of the crossbeds coupled with the high textural and compositional maturity of these sandstone beds supports an eolian interpretation. These rocks are identical in character and stratigraphic position to what was interpreted as an eolian crossbedded facies in the southeastern Thelon Basin by Jackson et al. (1983).

DISCUSSION: MAP PATTERNS AND FAULTING DURING DEVELOPMENT OF BAKER LAKE BASIN

At least two generations of faulting offset rocks of the Dubawnt Supergroup (Fig. 3). The first and most obvious is the northwest-striking set that exhibits apparent dextral offset of up to 1 km (e.g. Long Lake and Aniguq River faults; Fig. 3). Associated with these faults are a west-northwest-trending conjugate set of faults with smaller apparent offsets. An important feature of both sets of faults is that they do not appear to affect the Thelon, suggesting that faulting occurred prior to its deposition. The timing of faulting, therefore, can be constrained to the period ca. 1.76 Ga–1.72 Ga, based on the inferred depositional ages of the Pitz Formation volcanic member (Peterson and van Breemen, 1999) and the age of diagenesis of the Thelon Formation (Miller et al., 1989). Northwest-trending dextral faults that offset lower Dubawnt Supergroup strata have also been recognized in eastern Baker Lake Basin (Blake, 1980; Rainbird et al., 1999) and at the western end of Thirty Mile Lake (LeCheminant et al., 1979; Hadlari and Rainbird, 2000).

The second generation of faulting is inferred directly from field mapping. On the east side of Pitz Lake is a succession originally mapped as Kazan Formation (Donaldson, 1965), which we now recognize as well indurated, pink, crossbedded sandstone of the Amarook Formation (Fig. 3). These strata appear to correlate with outcrops of Amarook Formation located on the west side of Pitz Lake (also previously mapped as Kazan Formation, Donaldson, 1965). Hills on the west side of Pitz Lake and south of the present study area expose what may be a repetition of the Amarook–Pitz stratigraphy established to the north (cf. Blake, 1980, Fig. 9). The attitude of these strata is similar to those in the north, suggesting that there is an east-northeast-trending fault in the valley between the two areas of outcrop (i.e. the lowland between Princess Mary Lake and Pitz Lake). The lowland also is occupied by flat-lying, apparently undisturbed exposures of Thelon Formation fluvial and eolian sandstone, suggesting that this faulting also predates its deposition. The strata to the south therefore are uplifted relative to those in the north. The relationship between the proposed two generations of faulting is unknown.

CONCLUSIONS

The stratigraphy of the Dubawnt Supergroup on the northwest side of Baker Lake Basin differs significantly from that in the south. Here, volcanic rocks of the Christopher Island Formation were deposited directly onto basement gneiss along with less voluminous basin-margin alluvial fan and pyroclastic interflows. Previously unrecognized weathering horizons on the tops of volcanic flows are interpreted as hiatal sequence boundaries of unknown duration.

A previously unassigned sedimentary unit, termed here the Amarook Formation, unconformably overlies the Christopher Island Formation and is included in the Wharton Group. Up to 1 km thick, this well indurated sandstone, characterized by large-scale crossbedding of probable eolian origin, is interbedded with alluvial sandstone and conglomerate. It is exposed along the northwest margin of Baker Lake Basin and correlates with similar strata recognized in drill core from the eastern Thelon Basin. The disconformably overlying Pitz Formation is subdivided into a lower volcanic member and an upper sedimentary member, although more complex stratigraphic relationships exist outside the study area. The upper member correlates with strata mapped as basal Thelon Formation in the Thelon Basin, south of Aberdeen Lake.

Lower Dubawnt Supergroup rocks are laterally offset up to 1 km by a series of northwest-striking dextral faults that appear to predate deposition of the overlying Barrensland Group (Thelon Formation). A possible basin-parallel fault may be responsible for repetition of lower Dubawnt strata in the southern part of the map area.

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REFERENCES

Blake, D.H.
1980: Volcanic rocks of the Paleohelikian Dubawnt Group in the Baker Lake-Angikuni Lake Area, District of Keewatin, N.W.T.; Geological Survey of Canada, Bulletin 309, 39 p.

Donaldson, J.A.
1965: The Dubawnt Group, District of Keewatin and Mackenzie; Geological Survey of Canada, Paper 64-20, 11 p.
1967: Study of the Dubawnt Group; *in* Report of Activities, Part A; Geological Survey of Canada, Paper 67-1A, p. 23–25.

Gall, Q., Peterson, T.D., and Donaldson, J.A.
1992: A proposed revision of early Proterozoic stratigraphy of the Thelon and Baker Lake basins, Northwest Territories; *in* Current Research, Part C; Geological Survey of Canada, Paper 92-1C, p. 129–137.

Hadlari, T. and Rainbird, R.H.
2000: Sequence stratigraphy and sedimentology of the Paleoproterozoic Baker Lake Group in the Baker Lake Basin, Thirty Mile Lake, Nunavut; Geological Survey of Canada, Current Research 2000-C9, 10 p. (online; http://www.nrcan.gc.ca/gsc/bookstore)

Hunter, R.E.
1977: Terminology of cross-stratified sedimentary layers and climbing-ripple structures; Journal of Sedimentary Petrology, v. 47, p. 697–706.

Jackson, M.J., Pianosi, J.G., and Donaldson, J.A.
1983: Aeolian dunes in early Proterozoic Thelon Formation near Schultz Lake, central Keewatin; *in* Current Research, Part B; Geological Survey of Canada, Paper 83-1B, p. 53–63.

LeCheminant, A.N., Ashton, K.E., Chiarenzelli, J., Donaldson, J.A., Best, M.A., Tella, S., and Thompson, D.L.
1983: Geology of the Aberdeen Lake map area, District of Keewatin: Preliminary report; *in* Current Research, Part A; Geological Survey of Canada, Paper 83-1A, p. 437–448.

LeCheminant, A.N., Leatherbarrow, R.W., and Miller, A.R.
1979: Thirty Mile Lake Map Area, District of Keewatin; *in* Current Research, Part B; Geological Survey of Canada, Paper 79-1B, p. 319–327.

Miall, A.D.
1978: Lithofacies types and vertical profile models in braided river deposits: a summary; *in* Fluvial Sedimentology, (ed.) A.D. Miall; Canadian Society of Petroleum Geology, Memoir 5, p. 597–604.

Miller, A.R., Cumming, G.L., and Krstic, D.
1989: U-Pb, Pb-Pb and K-Ar isotope study of the uraniferous phosphate-bearing rocks in the Thelon Formation, Dubawnt Group, Northwest Territories, Canada; Canadian Journal of Earth Sciences, v. 26, p. 867–880.

Peterson, T.D. and LeCheminant, A.N.
1993: Glimmerite xenoliths in Early Proterozoic ultrapotassic rocks from the Churchill Province; Canadian Mineralogist, v. 31, p. 801–819.

Peterson, T.D. and van Breemen, O.
1999: Review and progress report of Proterozoic granitoid rocks of western Churchill Province, Northwest Territories (Nunavut); in Current Research, Part C; Geological Survey of Canada, p. 119–127.

Peterson, T.D., LeCheminant, A.N., and Rainbird, R.H.
1989: Preliminary report on the geology of northwestern Dubawnt Lake area, District of Keewatin, N.W.T.; *in* Current Research, Part C; Geological Survey of Canada, Paper 89-1C, p. 173–183.

Rainbird, R.H. and Peterson, T.D.
1990: Physical volcanology and sedimentology of lower Dubawnt Group strata, Dubawnt Lake, District of Keewatin, N.W.T.; *in* Current Research, Part C; Geological Survey of Canada, Paper 90-1C, p. 207–217.

Rainbird, R.H., Hadlari, T., and Donaldson, J.A.
1999: Stratigraphy and Paleogeography of the Paleoproterozoic Baker Lake Group in the eastern Baker Lake basin, Northwest Territories (Nunavut), Current Research 1999-C, Geological Survey of Canada, p. 43–54.

Ross, G.M., and Chiarenzelli, J.R.
1985: Paleoclimatic significance of widespread Proterozoic silcretes in the Bear and Churchill provinces of the northwestern Canadian Shield; Journal of Sedimentary Petrology, v. 55, p. 196–204.

Wright, G.M..
1967: Geology of the southeastern barren ground, parts of the districts of Mackenzie and Keewatin (Operations Keewatin, Baker, Thelon); Geological Survey of Canada, Memoir 350, 91 p.

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