DESCRIPTIVE NOTES

INTRODUCTION

This map extends 1:50 000 scale coverage of Archean and Paleoproterozoic rocks southward from Hawk Hill Lake (Aspler and Bursey, 1990) to the Sealhole and Fitzpatrick lakes area (Fig.1), updating reconnaissance mapping by Eade (1973; 1974). Three major unconformity bounded sequences are exposed: the Henik Group (Neoarchean), the Montgomery Group (age uncertain), and the Hurwitz Group (Paleoproterozoic).

Henik Group: (unit Āmf)

The Henik Group is the local name for Archean supracrustal rocks in the central part of the Ennadai-Rankin greenstone belt (Eade, 1974). North and east of Fitzpatrick Lake, the Henik group is represented by a lower greenschist facies bimodal mafic-felsic succession (unit Āmf). Mafic volcanic flows are predominant (ca. 90 %), and consist of thickly bedded, fine-grained flows (± gabbro sills). Many of these flows display exceptionally well preserved pillow structures which locally contain variolites. Felsic flows form massive interlayers 1-10 m thick separating mafic flows several 10's of metres thick. Inter-flow siliciclastic rocks (turbiditic sandstones and mudstones) and thin (< 1 m) dolostone lenses are locally preserved. This volcanic succession is near the base of, and likely forms a tongue within, a predominantly sedimentary sub-unit of the Henik Group exposed north of the map area near Hawk Hill Lake (Aspler and Bursey, 1990) and near Otter Lake (Aspler et al., 1994b) and informally referred to as "unit A1" (Aspler and Chiarenzelli, 1996 a).

Granite, granodiorite, gneiss (units Āg; Āgn)

South of Sealhole and Fitzpatrick lakes, highly strained mafic volcanic rocks define dismembered lozenges within well-foliated biotite-hornblende granitic rocks (unit Āg). Contacts are faulted, but the volcanic rocks are inferred to be older because they are cut by granitic dykes and occur as enclaves in the granites at all scales. Granitic gneisses (unit Āgn) are exposed beneath the Hurwitz Group on the western side of Sealhole Lake. The relationship of these gneisses to the granitic rocks that cut the Henik Group is unknown.

Montgomery Group (unit Ā-ⱣM)

A unit of polymictic conglomerate and arkose (unit Ā-ⱣM), up to 2000 m thick, overlies Henik Group strata east of, and extending across, Fitzpatrick Lake. Although not exposed, the lower contact of this unit is inferred to be an angular unconformity because its map trace appears to truncate folds and fabrics in the Henik Group, and because the conglomerates contain foliated clasts that are indistinguishable from subjacent basement. Near the base of the unit, massive, thickly bedded, framework-intact cobble-boulder conglomerates containing a coarse arkose matrix are predominant, and arkoses define local decimetre- to metre-scale lenses. The conglomerates contain clasts that are representative of subjacent basement sources and consist mainly of granitic fragments (up to 90 %) with variable amounts of mafic volcanic, gabbro, and felsic volcanic debris (see Figure 3 in Aspler et al., 2000a). The clasts are subangular to well rounded; maximum sizes are up to 1 metre. Significantly, many contain an internal penetrative foliation (see below). The relative abundance of conglomerate decreases gradually up-section such that near the top of the unit, arkoses are predominant. The arkoses form decimetre- to metre-scale parallel-stratified and trough cross-stratified sheets containing local single pebble-cobble layers and metre-scale lenses of conglomerate. Sparse (n = 15) data from trough cross beds indicate mainly northward paleoflow. Syndepositional faulting likely generated the relief necessary for the accumulation of these thick, coarse conglomerate-bearing strata, and we interpret this sequence to have been deposited on alluvial fans that drained northward from east-trending fault scarps cut into Archean basement. The lower part of the section is considered to reflect a proximal fan setting in which repeated low-viscosity flash floods produced amalgamated stacks of framework-intact, coarse sand matrix-bearing cobble-boulder conglomerate as entrenched channel, bar and diffuse sheet deposits. Local arkose lenses likely represent incompletely preserved channel- and bar-top (waning flood) wedges. An overall fining-upward trend probably reflects scarp retreat; arkoses (± conglomerates) in the upper part of the section are considered to be medial to distal fan deposits formed by flash floods.

The relationship of this unit to the Hurwitz Group is uncertain because of faulted contacts and covered intervals. However, an unconformity is inferred because the unit is lithologically distinct from basal Hurwitz units in the area, and because it forms an isolated wedge that appears to be discordant with respect to lower Hurwitz Group strata. Hence the unit is interpreted to constitute an outlier of the Montgomery Group which, in its type area at Montgomery Lake (Fig. 1), is separated from the overlying Hurwitz Group by an angular unconformity (Aspler and Chiarenzelli, 1996 b). Whether the Montgomery Group represents a late Neoarchean molassoid sequence or a Paleoproterozoic precursor to the Hurwitz Group remains unclear.

Hurwitz Group (units ⱣHP; ⱣHKml; ⱣHKmm; ⱣHKmcc; ⱣHKw; ⱣHKh; ⱣHA; ⱣHgb; ⱣHW)

Unconformably overlying the Henik and Montgomery groups, the Hurwitz Group is an assemblage of siliciclastic and carbonate rocks that were deposited in a continental to shallow-marine intracratonic basin that once blanketed a large part of the Hearne domain (Fig. 1). The maximum age of Hurwitz Basin is defined by ca. 2.45 Ga baddeleyite (Heaman, 1994) from the Kaminak dykes that cut basement rocks but not the Hurwitz Group (Davidson, 1970). Although previous suggestions regarding basin initiation (Noomut, Padlei, Kinga and Ameto formations) by lithospheric stretching related to breakup of a possible Neoarchean supercontinent (Kenorland, Aspler and Chiarenzelli, 1997; 1998) remain tenable, new data (Aspler et al., 2000b; Davis et al., 2000) indicate that uppermost units (Watterson and Tavani formations) were deposited after emplacement of a regionally extensive set of gabbro sills into the Hurwitz Group (2111 ± 1 Ma baddeleyite; Heaman and LeCheminant, 1993).

A thick lower Hurwitz Group section in the eastern and northern parts of the map area is partly a consequence of extensive Padlei Formation conglomerate, arkose and sandstone-siltstone rhythmite deposits (unit ⱣHP). In addition, restricted subunits appear at both the base and top of the Maguse Member. The lower subunit (unit ⱣHKml) is ca. 1200 m thick and contains arkose and polymictic pebble conglomerate sheets as well as the subarkose to quartz arenite and quartz pebble conglomerate beds that are more typical of the Maguse Member (unit ⱣHKmm). Mixing of relatively immature and mature arenites in this subunit likely reflects variation in degree of reworking and residence time at sites of temporary storage on the Maguse fluvial plain. Near the base of this subunit is a 50 m thick interval in which decimetre- to metre-scale sheets of subarkose separate beds of dololutite (± microbial laminite) containing centimetre-scale sandstone lenses. With the exception of similar beds near Rankin Inlet (Ryan et al., 1999), and calc-silicates west of Edehon Lake (Eade, 1973), carbonate rocks have not been reported from elsewhere in the Kinga Formation. The carbonate-bearing beds are inferred to represent the remnants of a mixed siliciclastic-carbonate sequence that was deposited during a short-lived marine incursion of the Maguse fluvial plain. At the top of the Maguse Member near White Cliff Lake is a ca. 175 metre-thick sub-unit (unit ⱣHKmu), previously recognized only in the Padlei map area (Aspler and Chiarenzelli, 1997), that consists of polymictic pebbly arkose and conglomerate containing primarily granitic and mafic volcanic clasts.The Padlei Formation and Maguse Member thin abruptly to the south and west, such that in southern Fitzpatrick Lake and southern and western Sealhole Lake, the wave ripple-marked supermature quartz arenites of the Whiterock Member (unit ⱣHKw) directly onlap basement (see Figure 4 in Aspler et al., 2000a). Small isolated outcrops of the Hawk Hill Member (unit ⱣHKh), consisting of layered hematitic chert and chert breccia occur above the Whiterock Member west of White Cliff Lake, southwest of Sealhole Lake and northeast of Sealhole Lake. Exposures of Ameto Formation (unit ⱣHA) mudrocks are limited to local frost heaves. Gabbro sills extend as discontinuous pods within the Hurwitz Group for a strike length of ca. 450 km, from the Rankin Inlet area southwest to Watterson Lake (Fig.1). Typically within the Ameto Formation, the sills also occur in the lower part of the Maguse Member east of Fitzpatrick Lake, and directly above the Whiterock Member at Sealhole Lake (unit ⱣHgb). In many of these outcrops, the gabbros display centimetre-scale feldspar megacrysts, a feature not previously recognized elsewhere in the Hurwitz gabbros (see Figure 7 in Aspler et al., 2000a). On the eastern shore of Sealhole Lake, such megacrysts are distributed in layers concordant to bedding in subjacent strata; some of these layers define graded beds. Feeder dykes to the gabbro sills have not hitherto been reported, but megacryst-bearing, north and northeast-trending dykes that are indistinguishable from the gabbro sills outcrop east of Fitzpatrick Lake, and we suggest that these are rare examples of feeder dykes. A mixed siliciclastic-carbonate facies of the Watterson Formation (unit ⱣHW) outcrops on a north-projecting peninsula in southern Sealhole Lake, but contacts with underlying units arasxze not exposed.

STRUCTURAL GEOLOGY

Evidence for Archean deformation, and at least one episode of Paleoproterozoic (post-Hurwitz Group) deformation, is preserved in the Sealhole-Fitzpatrick Lake area.

Archean deformation: Henik Group and allied granitic rocks

Three lines of evidence suggest pre-Paleoproterozic deformation of Archean rocks. First, Montgomery Group and lower Hurwitz Group conglomerate units contain abundant well foliated basement-derived granitic and volcanic clasts. Second, east of Fitzpatrick Lake, east-northeast- trending folds and fabrics in the Henik Group are deflected and truncated by northwest-trending structures in the Hurwitz Group. Third, adjacent to the large granitic body south of Sealhole and Fitzpatrick lakes, granitic dykes cut mafic volcanic rocks. Some granitic dykes are folded with, and contain the same northeast-trending penetrative fabric as, the volcanic rocks, whereas other such dykes cross-cut the penetrative fabric. Hence, deformation and granite emplacement appear to have overlapped in time. Although the granitic rocks are undated, they are unconformably beneath the Hurwitz Group and are interpreted to be Archean, and thus deformation was probably Archean. Northeast-trending fabrics in Archean rocks south of Sealhole and Fitzpatrick lakes are subparallel to some structures in the Hurwitz Group, indicating that Archean and Paleoproterozoic deformation were, in part, coaxial.

Paleoproterozoic (?) deformation: Montgomery Group

Rocks of the Montgomery Group are deformed by northeast-trending folds and related fabrics that are subparallel to structures in the Hurwitz Group. We cannot specify with certainty that these structures are post-Hurwitz Group because they may represent a pre-Hurwitz Group event such as recorded in the Montgomery Group type area. However, the Hurwitz gabbro dykes that cut the Montgomery Group contain cleavage parallel to cleavage in host strata, and hence we infer that the deformation recorded in the Montgomery Group is Paleoproterozic.

Paleoproterozoic deformation: Hurwitz Group

At a simplified level, post-Hurwitz Group structures in the Sealhole-Fitzpatrick lake area define a northerly trending basement-cover synclinorium. At a detailed level however, the structure is more complex, and variably oriented folds and faults reflect heterogeneous strain from shortening of a lithologically anisotropic assemblage of non-uniform thickness.

The structural grain of the area is controlled by northeast- and north-trending folds, high-angle faults and cleavage. Folds are open, concentric and locally display a box-like morphology. Axial surfaces are steep, and hinge lines plunge gently to the north and south. Plunge reversals about northwest trends produce dome and basin (Type-1) interference structures, but a northwest-trending cleavage has not been observed, and the near-vertical, northeast-trending cleavage surfaces are undeflected about northwest trends. This interference style, best exemplified by a northwest-elongate canoe-shaped syncline northwest of White Cliff Lake, probably represents culmination and depression growth during progressive folding rather than discrete "D^1" and "D^2" events. Near the core of the synclinorium, high-angle north- and northeast-trending faults cutting both basement and Hurwitz Group display both reverse and normal offsets. Approximately 10 km north of Fitzpatrick Lake, one fault branches into three splays that rejoin along strike farther south in Sealhole Lake. Together the faults define a duplex-like structure in which individual splays separate repeated lower Hurwitz Group panels. This duplex-like structure probably formed to accommodate constrictions in the core of the main basement-cover synclinorium. Similarly, variably oriented high-angle oblique-slip cross faults, particularly common where the sub-Whiterock Member section is thin or non-existent (e.g. southwestern Sealhole Lake), typically fan around fold hinge zones and likely were formed to accommodate fold tightening during concentric folding.

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