DESCRIPTIVE NOTES

INTRODUCTION

New 1:50,000-scale mapping in the Mackenzie-Victory lakes area (Figure 1) indicates that: 1) the belt of siliciclastic rocks extending for ca. 40 km from southwest of Mackenzie Lake to northwestern Victory Lake and previously mapped as "Mackenzie Lake metasediments" (Bell, 1968; 1971; Davidson, 1970; Hanmer et al., 1998), correlate with the lower part of the Hurwitz Group; 2) Archean volcanogenic strata (Kaminak Group) which host base metal massive sulphide prospects are unconformably beneath the Hurwitz Group; 3) both basement and cover experienced penetrative deformation (including tight to isoclinal folding) and upper greenschist facies metamorphism before ca. 1.83 Ga (presumed age of undeformed and unmetamorphosed lamprophyre dykes); and 4) structures reflect intense Paleoproterozic deformation, and the effects of Archean strain are not obvious.

Kaminak Group: (units Am; Af)

The oldest lithostratigraphic unit in the area comprises a succession of bimodal mafic-felsic volcanic rocks and volcanogenic sedimentary interbeds. The volcanic rocks form a continuum that ranges from mafic flows with local felsic intercalations (unit Am) to felsic flows and tuffs with minor mafic layers (unit Af). The mafic volcanic rocks are typically massive but locally contain pillows and brecciated beds. Similarly, quartz-phyric felsic beds are generally massive and contain only rare proximal-type volcanic breccias. Highly cleaved tuffs and tuffaceous sandstones and siltstones form metre-scale beds within mixed mafic-felsic units. Mafic volcanic and tuffaceous units commonly contain coarse hornblende-plagioclase ± garnet; some pelitic beds within tuffaceous units are cordierite-bearing.

Granite, granodiorite, diorite (unit Ag)

On the northwestern and northern margins of the map area, granitic to dioritic rocks (unit Ag) are in fault contact with the Kaminak Group. Intrusive relationships are inferred because, adjacent to the contacts, the granitic bodies contain numerous supracrustal enclaves and the supracrustal rocks are cut by granitic satellite dykes.

Gabbro dykes (Kaminak swarm; unit Kdy)

Rare north and northeast-trending gabbro dykes (unit Kdy), locally containing feldspar megacrysts, cross cut the Archean supracrustal and granitic rocks. Significantly (see Structure below), the dykes contain a penetrative foliation that is concordant with fabrics in the host rocks. They are likely part of the ca. 2.45 Ga (Heaman, 1994) Kaminak swarm.

Hurwitz Group (units PHN; PHPm; PHPp PHPm ± p; PHKm; PHKmqpc)

A sequence of siliciclastic rocks originally mapped as "Mackenzie Lake metasediments" outcrops in a belt from southwest of Mackenzie Lake to northeast of Victory Lake. Contacts of this sequence are faulted, but a basal unconformity is inferred because: 1) conglomerate-bearing beds in the sequence contain clasts derived from subjacent granitic and volcanogenic rocks; 2) granitic dykes, and megacrystic gabbro dykes which cut Archean volcanogenic strata are lacking; and 3) the change from exclusively volcanogenic rocks in the Kaminak Group to exclusively siliciclastic rocks is abrupt and signifies a dramatic change in depositional regime. Three main units are defined. As described below, individually and collectively these units bear strong resemblance to lower Hurwitz Group strata better preserved elsewhere (see Aspler and Chiarenzelli, 1997).

The lowest unit (unit PHN) consists of massive, parallel-stratified and locally cross trough-stratified subarkose to quartz arenite, local quartz-pebble conglomerate and rare semi-pelite. The maximum thickness of this unit is ca. 600 m, but locally only a few metres are preserved because of fault cut-out adjacent to basement. This unit, considered equivalent to the Noomut Formation (Aspler and Chiarenzelli, 1996 b), signifies fluvial sedimentation during initial stages of Hurwitz Basin subsidence.

The middle unit (units PHPm; PHPp PHPm ± p) defines a thick (up to 1000 m) section consisting predominantly of cobble-boulder conglomerates (see Figure 5 *in* Aspler et al., 2000). These conglomerates are typically massive and thickly-bedded, but locally define channels and graded sheets, and contain parallel and trough cross-stratified wedges and sheets of subarkose and arkose. Clasts (up to 1 m in diameter) are generally subrounded to well rounded and are self-supporting in a coarse arkosic matrix. Monomictic granite-clast conglomerate (unit PHPm) and polymictic conglomerate (unit PHPp) locally define discrete mappable sub-units. The monomictic conglomerates consist almost exclusively of different types of granitic clasts (fine- to coarse-grained, locally pegmatitic) with rare amphibolite and gabbroic fragments, whereas the polymictic conglomerates contain a diverse suite including granitic, quartzite, chert, felsic volcanic and mafic volcanic clasts. Locally, sections of monomictic conglomerate contain polymictic conglomerate sheets (unit PHpm ± p). Significantly, the clasts lack a pre-existing tectonic fabric (see Structure below). Discontinuous zones of epidote alteration occur within the granite-clast conglomerate. The appearance of stratified conglomerates and immature arenites above a section of relatively mature arenites containing quartz pebble conglomerates (Noomut Formation) in the Mackenzie-Victory lakes area is one of the features that characterize the Padlei Formation (Bell, 1970 a) in other parts of Hurwitz Basin, although local rhythmites containing cold-climate and/or glacial indicators are lacking. Similar to Padlei deposits elsewhere, the stratified conglomerates and arkoses are interpreted to be periglacial fluvial deposits filling paleovalleys incised into Archean basement (see Aspler and Chiarenzelli, 1997), although the thickness and lateral continuity of these strata, and an abundance of soft-sediment deformation structures, could also imply fault-generated relief during sedimentation.

The upper unit (unit PHKm) is ca. 1000 m thick and consists of grey (locally white) subarkose to quartz arenite that contains beds of quartz pebble conglomerate. Primary sedimentary structures are generally obscured by a penetrative cleavage, but local parallel and trough cross-stratified heavy mineral layers are preserved. Some of the subarkose to quartz arenite beds contain kyanite. Beds with quartz-chert pebbles, either as isolated clasts or concentrated in m-scale framework-intact beds, occur sporadically throughout the unit. One ca. 100 m-thick horizon, containing thickly bedded (20 cm to 10 m) sheets of framework-intact quartz pebble conglomerate (unit PHKmqpc) proved to be a useful marker. The upper unit is virtually identical to parts of the Maguse Member (Kinga Formation; Bell, 1970 a) exposed elsewhere in Hurwitz Basin. It is interpreted to represent sedimentation on an extensive alluvial plain in a wet paleoclimate. The paucity of coarse-grained detritus and restriction of clast types to durable lithologies are indicators of low topographic relief and a long residence time for chemical weathering and abrasion before final sedimentation. Kyanite likely resulted from metamorphism of aluminous phyllosilicates found elsewhere in the Maguse Member and considered the products of tropical weathering (Bell, 1970 b; Young, 1973).

Lamprophyre dykes (unit PDcif)

At one locality between Mackenzie Lake and Victory Lake, an east-trending undeformed and unmetamorphosed lamprophyre dyke cuts penetratively foliated Hurwitz Group polymictic conglomerate and sandstone. Presumably part of the Christopher Island swarm, the dyke is significant because it demonstrates deformation and metamorphism in the area was pre-Christopher Island Formation magmatism, currently estimated at: 1850 +30/-10 Ma (U-Pb zircon, Tella et al. 1985); 1825 ± 12 Ma ($^{40}Ar/^{39}Ar$ hornblende, Roddick and Miller 1994) and 1832 ± 28 Ma (Pb/Pb isochron, apatite, MacRae et al. 1996).

Post-tectonic granites (unit Pg)

In the southwestern part of the map area, a non-foliated fluorite/tourmaline-bearing granite pluton (and associated satellite dykes) cuts penetratively deformed Hurwitz Group, likely one of the post-tectonic granitic blooms within the western Churchill Province defined by Peterson and van Breemen (1999; ca. 1.83 Ga Hudson suite; ca. 1.76 Ga Nueltin suite).

STRUCTURE

South of Mackenzie Lake, basement and Hurwitz Group define a northeast-trending synclinorium that tapers to the southwest between two basement-cover faults. On the western side of the synclinorium, a high-angle intrabasement fault juxtaposes granitic rocks against the Kaminak Group. Near the "Marce prospect", the granitic rocks are structurally above a relatively thick Kaminak Group section (cross-section B-B'), whereas to the northeast they are structurally beneath, and the Kaminak Group is cut out against a high angle basement-cover fault (axial projection A-A'). The dip of this basement-cover fault also changes through the vertical along strike, resulting in basement-over-cover juxtaposition in the south, and cover-over-basement relationships in the north. This fault is near the Noomut Formation-basement contact in the south (cross-section B-B'), but cuts up-section northward and eliminates the Noomut Formation near axial projection A-A'. In the interior of the synclinorium, tight to isoclinal folds in Hurwitz Group strata display steeply-dipping axial surfaces and penetrative planar fabrics and shallowly-plunging hinge lines and stretching lineations. In the south, near the "Marce prospect", the synclinorium comprises a narrow southeast-vergent syncline caught between two faults (cross-section B-B'). To the northeast, the synclinorium broadens markedly and exposes higher stratigraphic levels as a basement-cover fault splay cuts upsection and is folded together with the Hurwitz Group. Rocks on the isthmus between Mackenzie and Victory lakes are separated from the southern synclinorium by a northwest-trending cross fault adjacent to which relatively low-strain Hurwitz Group rocks are folded. Farther east, at the "Victory prospect", highly strained Archean granitic and Kaminak Group rocks are faulted above the Hurwitz Group, and all three map units define a south-vergent overturned package.

We interpret the post-Hurwitz Group structures in the Mackenzie-Victory lakes area to represent an extreme example of a style of deformation found elsewhere in the Hearne domain, in which complex structures arise from space restrictions in the cores of major basement-cover infolds. Deformation is inferred to have occurred pre- ca.1.83 Ga because an undeformed and unmetamorphosed lamprophyre dyke cuts structures in the Hurwitz Group, and post-ca. 2.45 Ga, because Kaminak dykes contain a penetrative fabric (see above). Archean basement rocks adjacent to the Hurwitz Group generally bear a penetrative fabric. Despite this, basement clasts within voluminous Hurwitz Group conglomerates lack a pre-depositional tectonic fabric. Hence we conclude that, in contrast to the Kaminak Lake area to the southeast (Hanmer et al., 1998) structures in the Mackenzie-Victory lakes area reflect intense Paleoproterozic deformation, and that the effects of Archean strain are not obvious.

BASE METAL MASSIVE SULPHIDE PROSPECTS

Base metal massive sulphides hosted by Kaminak Group volcanogenic rocks have recently been discovered by Comaplex Minerals Corp. on their Victory Lake property. Values reported below are from Armitage (unpublished data, Comaplex Minerals Corp. 1998, 1999). At the "west zone" of the "Victoria prospect " massive and stringer pyrite, sphalerite, chalcopyrite and galena extend for a strike length of ca. 450 metres. They are hosted by silicified and quartz-veined amphibole-garnet schists (up to 25 m thick) thought to be metamorphic equivalents of hydrothermally altered (chloritic and silicic) mafic to intermediate volcanic rocks. Averaged chip samples from trenching across a 4 metre thick lens of massive mineralization assayed: 6.77% Zn; 0.2% Cu; 0.2% Pb; 24 g/t Ag and 0.054 g/t Au. Diamond drilling tested the down-dip extension of this mineralization; samples from one drill hole yielded: 8.28% Zn; 0.38% Cu; and 17.48 g/t Ag over an interval of 5.12 metres. Stringer to disseminated chalocopyrite has assayed as high as 0.37 % Cu over 7.6 metres. The "main zone" of the Victoria prospect is a 1000 metre long alteration horizon containing massive and stringer pyrite, sphalerite and galena in felsic to intermediate volcaniclastic strata. Metre-scale zones of strongly pyritic muscovite-quatrz ± andalusite ± staurolite ± gahnite are interpreted to have been derived from metamorphism of tuffaceous beds that previously underwent intense sericite hydrothermal alteration. Samples from a massive sulphide lens yielded up to 19.1% Zn, 3.5% Pb, and 240 g/t Ag; those from stringer mineralization yielded up to 0.92% Zn, 0.35% Pb, and 64 g/t Ag. At the "Marce prospect" southwest of Mackenzie Lake, surface samples from sulphide zones hosted by mafic to intermediate volcanic rocks averaged 9.6% Zn, 1.5% Cu, and 259g/t Ag. Gold assayed as high as 7.2 g/t. The geological and mineralogical characteristics of base metal mineralization in the Mackenzie-Victory lakes area are typical of volcanic massive sulphide deposits. The Marce and Victoria prospects may represent a single horizon that was disrupted by Archean plutonism and Paleoproterozoic deformation.

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