CHAPTER 4 NEW MAPPING

4.1 Compilation Maps: Preliminary Release

The newly released maps (TNB Geology Working Group, 2001) were compiled from proprietary exploration data and core (Macek and McGregor, 1998, Macek et al., 1999) and published under the auspices of Manitoba Industry, Trade and Mines, Geological Survey. They cover the exposed parts of the TNB at 1:50,000 scale and the buried part at 1:100,000 scale (**Figs. 3.1, 4.1,** and **4.2**). These maps have provided a new look at the TNB, and manuscript copies were used extensively in this report for the regional stratigraphic synthesis and the regional structural analysis (**Sections 5** and **6**).

4.2 Setting and Mystery Lakes

The boundary zone between the TNB and the Kisseynew Domain in the Setting Lake area was remapped by H. Zwanzig during part of the 1997, 1998, and 1999 summer mapping seasons (Zwanzig, 1997, 1998, 1999a). The mapped area straddles the boundary between the TNB to the southeast and the Kisseynew Gneiss Belt to the northwest. The mapping was done at 1:25,000 scale and utilised previous 1:25,000-scale mapping by Albino and Macek (1981a, and b). The coverage consists of a 12 km-wide strip northwest of Highway 6, extending from Kiski Lake in the southwest to the Soab Lake South mine site and Brostrom Lake in the northeast, (**Fig. 4.1**). Areas in the Kisseynew Domain included August, Five-Mile, Fish and Pakwa lakes. The mapping focused on 1) recording the key features of major stratigraphic units; 2) analyzing the large-scale fold patterns; 3) measuring and describing the various fabric elements in the Proterozoic and Archean rocks; and 4) compiling a Proterozoic structural history of the southern part of the exposed TNB. Where exposure permitted, the work focused mainly on the structure, stratigraphy, and geochemistry of the Ospwagan Group, which hosts the mineralized intrusions in the TNB. Unusually low water levels in the lakes during this period exposed outcrops of most of the formations and members in the Ospwagan Group that are normally flooded. The maps have been incorporated into the regional compilation (TNB Geology Working Group, 2001).

Mesoscopic structural data were also collected in the Mystery Lake area (Zwanzig, 2000). The Mystery Lake shoreline has a varied relief and provides a combination of subhorizontal pavements, steeply dipping cleavage surfaces, and southward facing outcrop faces resulting from glacial abrasion and plucking. Consequently, the various planar and linear fabric elements and kinematic indicators could be measured on the three principal surfaces. A special effort was made to analyze the strain pattern around the large ultramafic bodies hidden under Mystery Lake (Coats et al., 1972).

The new mapping indicates the following:

1) The Grass River Group (also known as the Sickle Group), which is part of the 1.84 Ga continental clastic and volcaniclastic apron that formed in the collapsing Reindeer Zone, unconformably overlies the Ospwagan Group and represents a syncollisional overlap assemblage.

2) The early Superior Boundary Fault Zone in this area trends north (like the deeper seismic reflections) and has been overprinted by northeast-trending structures, interleaving

Ospwagan Group lithologies with Burntwood Group lithologies in the Kisseynew Domain northwest of Thompson and interleaving Kisseynew sedimentary rocks with Archean basement rocks in antiforms at Setting Lake.

3) West- or southwest-verging D_2 recumbent folds and thrusts placed Ospwagan Group structurally on the Kisseynew sedimentary rocks to the west, consistent with the seismic profile. This is consistent with new and existing U-Pb monazite ages suggesting that D_2 occurred at approximately 1.82 Ga (Machado, 1990).

4.3 Thompson South Pit

The west shoulder of INCO's Thompson Mine South Pit was remapped by Jürgen Kraus during the late summer of 1998, at a scale of 1" to 40' (1:480) and locally at a scale of 1" to 20' (1:240). Mapping was focussed on and adjacent to, a ~40m wide mafic intrusion, locally known as the South Pit gabbro. Based on field observations, the South Pit gabbro is believed to be similar to other mafic dykes in the TNB (see Peck et al., 1998). Recent geochronological data for the TNB (Hulbert and Hamilton, unpubl. data) have shown that some of the ultramafic magmatism was coeval with the 1883 Ma "Molson Dykes". With this in mind, the relative age of emplacement of the South Pit gabbro was evaluated with respect to deformation in order to place constraints on the early evolution of the TNB. Full details of the results of these studies were published by Kraus et al. (1998) and presented in the 1999 Annual Report for the project (CAMIRO Research Group, 1999).

4.4 Future Mapping

Current plans of the Manitoba Geological Survey are to extend the regional mapping northwest of the TNB to delineate the major tectonostratigraphic elements, which are inferred to comprise 1) Paleoarchean and Mesoarchean crust, 2) Ospwagan Group, and 3) sedimentary gneiss units of the Kisseynew Domain. This will include Nd-Sm isotope work to obtain model ages, the most efficient method to distinguish the various tectonic elements. It will require further co-operation from some of the sponsors and access to their drill core, but the data will further constrain the limits of the TNB and will be useful for exploration.

A preliminary structural analysis of the central part of the exposed TNB, using the new compilation map (TNB Geology Working Group, 2001), has suggested that the closure of the inverted basement limb of the Thompson nappe (Bleeker, 1990a and b) may lie north of Soab Creek. Future structural mapping may be possible there during a year of low water levels. A critical structural problem that could be mapped on Ospwagan Lake during low water is a comparison of stratigraphic sections on the western (upright) limb and the eastern (overturned) limb. Such comparisons have uncovered significant sedimentary facies changes across the axial surface of the fold nappes on the south flank of the Kisseynew Domain (Zwanzig, 1999b).