## DESCRIPTIVE NOTES

The Hargrave Lake map area straddles the Paleozoic/Precambrian boundary in central Manitoba, which results in marked differences in physiography, drift thickness, and till composition on either side of the Shield margin. The northwestern part of the area is underlain by Precambrian metamorphosed volcanic and sedimentary rocks and associated intrusive rocks of the Flin Flon greenstone belt (Manitoba Energy and Mines, 1993). These rocks are structurally overlain by metamorphosed turbidites of the Kisseynew Domain, which outcrop in the northeast corner of the area. Rocks of the Churchill-Superior Boundary Zone also outcrop along the eastern edge of the area east of Ponton. South of the Shield margin, the Precambrian rocks are overlain by Paleozoic carbonate rocks, increasing in thickness up to 125 m at the southern edge of the area (Leclair et al., 1997).

The physiography of the map area is defined primarily by bedrock relief and by the presence of a glaciolacustrine basin in the eastern half of the area (Fig. 1, 2). On the Precambrian terrane, relief is flat to gently undulating, and the surficial cover is thin ( $< 3$ m) and discontinuous. Till rarely outcrops through the glaciolacustrine cover, and the thickest till accumulations occur on the down-ice side of small bedrock irregularities and bedrock highs. On the Paleozoic cover, relief is low, forming a northeast-sloping plain interrupted by isolated dolostone mesas, and the overburden is generally thicker and more continuous. In the north-south trending glaciolacustrine belt east of Hargrave Lake, vast regions of open water and peatlands form a monotonous landscape. Grass River, Mitishto River, Hargrave River, and Minago River all drain into Nelson River to the east. The map area is located within the discontinuous permafrost zone and forest cover is a mixed coniferous deciduous boreal community.

### Previous work

Bell (1978) proposed a sequence of glacial and deglacial events in the Wekusko Lake area, based on observations of surficial sediments and striae collected while mapping the bedrock. The surficial geology of the Wekusko Lake area was compiled at a regional scale by Klassen (1980). Klassen (1983, 1986) described the surficial sediments and outlined the history of deglaciation, as part of a regional study of north-central Manitoba. Current studies conducted as part of the NATMAP Shield Margin Project have concentrated on surficial mapping (McMartin, 1993, 1994a), drift prospecting and till provenance (McMartin 1994b; McMartin and Pringle, 1994; McMartin et al., 1996), surficial sediment geochemistry (Henderson and McMartin, 1995; Henderson et al., in press; McMartin et al., in press), and Lake Agassiz history (McMartin, 1996). Other studies were aimed at providing information for use in aggregate resources and land use planning activities (Ringrose, 1977; Mihychuk, 1988).

### Ice flow history

The map area lies in a zone influenced by ice flowing from two dispersal centres during the Late Wisconsinan (McMartin et al., 1996). Around Wekusko Lake, the predominant direction of ice flow indicators is towards the south-southwest, indicating glaciation from a Keewatin dispersal centre (Fig. 3). Approximately south of Mitishto River, predominant ice flow indicators have a west-southwestward orientation, indicating ice flow from a Labrador Sector dispersal centre (Fig. 3). Several minor ice flow events have also been recognized across the area. The oldest event was westward from an ice lobe centered east of the project area. The oldest Keewatin advance was southeastward and probably postdates the early westward flow. A southwestward readvance of Keewatin ice in Lake Agassiz was recognized in the Wekusko Lake area, overprinting completely the previous major events at several sites. This readvance caused a confluent and parallel ice flow between the two major lobes along the shield margin south of Wekusko Lake (Fig. 3). Late SSW striae in the Minago River area, WNW striae northwest of Hargrave Lake, and SSE striae west of Wekusko Lake are evidences for minor deglacial events.

### Surficial geology

The composition and texture of till vary across the map area depending on the depositing ice (Keewatin versus Labrador) and lithology of the underlying bedrock (McMartin et al., 1996). Three distinct surface till units have been recognized in the area. Over the Flin Flon greenstone belt, the most pervasive unit consists of a locally derived till overlying bedrock striated by the predominant Keewatin south-southwestward ice flow (unit 1a). Till matrix is sandy (up to 70% sand), and noncalcareous (Fig. 4). Clast composition reflects bedrock lithologies found immediately up-ice (Fig. 5). South of Wekusko Lake, the composition and texture of this unit grade into a sandy silty (up to 40% silt), weakly to moderately calcareous till (unit 1b, 2b) (Fig. 4), as the Shield component becomes diluted by Paleozoic debris (Fig. 5). The Paleozoic cover is overlain by a grey to light reddish brown, moderately to strongly calcareous (Fig. 4), and relatively clast-poor till of eastern provenance (unit 1c, 2c). This unit is silty sandy (up to 65% silt), and variably enriched in Paleozoic carbonate pebbles (Fig. 5). East of the Paleozoic cover, over the Churchill-Superior Boundary zone, the carbonate content and clast composition of this till unit suggest an important component from a more distal source in the Hudson Bay Lowlands ( McMartin et al., 1996; Matile and Thorleifson, 1997).

Stratified glaciofluvial deposits were formed in three areas. East of Hargrave River, ice-contact gravelly sands occur in several corridors which extend to the northeast outside of the map area as eskers and crevasse-filling kames (unit 3). These deposits occur as low, discontinuous ridges, and formed within Labrador retreating ice. Two other small glaciofluvial deposits display sedimentary structures and stratigraphy indicating deposition in Lake Agassiz (unit 4). Well sorted fine sand, deformed and faulted, interbedded with clay, gravel and diamictic units, occur as an outwash fan south of Monette Lake, and as a lee-side deposit southeast of Wekusko Lake.

Glacial lake deposits are widespread, diverse, and in places very thick. Fine grained sediments deposited in the deep water environment of Lake Agassiz occur at all elevations, draping topographic highs and filling topographic lows (unit 5a, 5b). They consist of noncalcareous to weakly calcareous silt, clay, and minor sand, commonly massive in the upper metre. The thickness of these deposits generally increases from west to east, masking both the Shield and Paleozoic terranes with up to 45 m of sediment in the eastern half of the map area (Fig. 2). Surfaces are locally inscribed by iceberg scours, particularly west of Ponton and between William Lake and Hargrave Lake. Discontinuous permafrost is present in thicker deposits, as evidenced by thermokarst depressions. Nearshore and littoral sediments are relatively abundant in the map area (unit 5c). These deposits formed as the level of Lake Agassiz dropped during the Morris Phase. Nearly continuous sandy ridges occur along Highway 6, forming the Ponton beaches (McMartin, 1996), and flights of shingle beaches occur along dolomitic bedrock escarpments. Nearshore sediments occur as a blanket of sand, grading basinward into finer sediments.

Alluvial deposits occur in the abandoned channel of Saskatchewan River, as calcareous silty floodplain and channel-fill sediments (unit 6). At the Ponton level, Saskatchewan River entered Lake Agassiz via the Minago River channel, which now consists of a series of lakes and a valley occupied by the Minago River. The Minago River channel was abandoned in mid-Holocene time due to isostatic uplift (McMartin, 1996).

Organic deposits include fen peat (unit 7b) and bog peat (unit 7a), widespread in poorly drained areas, primarily overlying offshore glaciolacustrine deposits. Isolated palsa and peat plateaus, thermokarst depressions and ponds, and collapse scar fens are indicators of permafrost.

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