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DESCRIPTIVE NOTES

The Schultz Lake south map area (NTS 66A south) was located beneath a zone of outflow within the Laurentide Ice Sheet that existed in the Kivalliq Region, possibly through much of its Wisconsinan history. The map area contains a complex assemblage of glacial landforms including streamlined striations, crosscutting and superimposed streamlined landforms, and stacked till units of distinct provenance, indicate that flow directions significantly changed through time. This is interpreted to be the result of the migration of the main ice divide in the region, by as much as 500 km between ice-flow phases, concordant with adjustments in the overall shape of the ice sheet (McMartin and Henderson, 2004). The complexity of these ice-flow changes, indicative of glacial transport in the map area are multidirectional, at times opposite.

The summary of the Quaternary geology presented here is based on recent data acquired by the Geological Survey of Canada (Operations) in the Kivalliq Region between 1996 and 2000 (Western Churchill Metallogeny Project). It builds on previous surficial mapping in the area by the GSC at 1:125 000 scale by Aylesworth et al. (1990), and ice-flow and drift-composition studies at local and regional scales (i.e. Cunningham and Shilts, 1977a, b; Shilts, 1980a, b; Aylesworth and Shilts, 1989; Klassen, 1995, 2001).

ICE-FLOW HISTORY

Bedrock outcrops often display two or more sets of striations having distinct trends, indicating major changes in ice-flow directions related to the migration of the Keewatin Ice Divide during the last glaciation (McMartin and Henderson, 2004; McMartin and Dredge, 2005; McMartin et al., 2006).

Early flows

Evidence of an early west-southwestward flow is subtle in the map area with poorly preserved striations trending 227°–207° (Fig. 1a). In addition, early south-southwesterly striations (198°–201°) were observed at two sites in the southwest part of the map area (Fig. 1a). Striations of this trend and southwestward flow are well preserved throughout the central part of the map area (197°–179°). They are found on both high and low ground, and may occur on bedrock surfaces striated by later northwesterly flows. The south-southeast flow appears to have shifted southeasterly as indicated by crosscutting striations trending 122°–152° (Fig. 1a). These southeast striations are restricted to an area south of Schultz Lake, suggesting that the ice divide started to migrate southerly across the map area during this phase.

Northwesterly flows

A major flow reversal occurred in the entire Schultz Lake map area as indicated by north-northwest striations (336°–349°) occurring on both high and low terrain (Fig. 1b). Associated landforms are predominant in the central part of the area. North-northwest ice-flow indicators were reported as far as 50 km beyond the present coastline (Aylesworth et al., 1990; McMartin and Henderson, unpublished; Henderson, 2004). This flow is significant in that it implies that the ice divide continued to migrate much farther to the southeast than previously recognized. The north-northwest flow progressively shifted to the northwest (318°–334°), then to the west-northwest (284°–313°), as indicated by crosscutting striations and landforms (Fig. 1b).

Late flows

The last flow in the Schultz Lake south map area was westerly as indicated by late striations trending 268°–283° (Fig. 1c), and westerly trending short drumlinoid features. The northern limit of the westerly indicators forms the abrupt northern margin of a drumlin field marking a major late-glacial ice stream. This ice stream extended westerly into the higher portions of the Thelon River basin as far as longitude 108°W (Stokes and Clark, 2003), and southerly across Nightingale Lake (McMartin and Henderson, 2004). Late-glacial ice-flow indicators in the east part of the map area include a set of east-west, north-northeast and northwest-trending drumlins and crag-and-tail landforms. East and northeast of Pitz Lake, the latest ice-flow indicators are southeastwest (Fig. 1d), which suggests that, during deglaciation, the ice divide migrated back within the map area, lying across the Pitz Lake basin and the western part of Baker Lake. This is the position that has been shown in maps and reports by W.W. Shilts and others as the location of the Keewatin Ice Divide (extra-lobate).

SURFICIAL GEOLOGY

Relatively thick (~5 m) and continuous drift, largely derived from red Proterozoic rocks of the Dubawnt Supergroup (unit R2), cover extensive areas, forming rolling till plains, commonly streamlined in response to late-glacial ice flow. Bedrock is locally exposed in areas of thin drift (unit TM). The glacial landscape is more emphatic and thin till (unit Tv) is predominant, Hummocky gills, natural sections along the Thelon River, and drill-hole data indicate that till is the predominant surficial deposit and forms the bulk of streamlined forms, ribbed moraine (unit Tr), and hummocky moraine (unit Th). The map area is essentially devoid of glaciofluvial sediments although there are restricted areas north of Judge Sissons Lake and in the southeast part of the map area where glaciofluvial sediments occur in eskers, kettles, meltwater channels, sculpted slopes, kame terraces (unit Gk), and subaerial outwash (unit Go). Late-during deglaciation, a retreating ice mass centred across the Pitz Lake basin and western part of Baker Lake was blocking the natural drainage of the Thelon River, producing an extensive glacial lake in the upper Thelon River valley, west of the map area (e.g. Bird, 1951). The level of this lake fell by successive drainages to the east, as ice receded from the eastern part of the map area, leaving a series of high-level marine shorelines at an elevation of 181 m in the extreme northwest of the map area, dropping to about 125 m north of Pitz Lake, records the southeastward-declining marine limit in the area. Two radiocarbon dates on marine shells collected in the Thelon River valley north of the map area in 2004 (McMartin et al., 2006), together with previous dates given on the map of Aylesworth et al. (1990), suggest that deglaciation took place at about 5900 and 5200 BP (Table 1). The 1.7 m of glacio-isostatic rebound caused a rapid rise in the land surface, and as the land emerged, till deposits were reworked by nearshore marine processes, forming flights of raised strandlines (unit Mr) on the sides of till and bored Proterozoic bedrock hills. Deltaic sediments (unit Md) deposited into the postglacial Tyrrell Sea by glacial and nonglacial streams are present along several modern drainage ways in the southeast. Evidence for marine reworking of glacial sediments, to varying degrees, is present at all elevations below marine limit, but particularly below 60 m a.s.l., and veneers of fine-grained sand and silt are present locally in topographic depressions (unit TM). Throughout the map area, younger alluvial sediments (unit A) and organic deposits occur in low-lying areas, and are commonly overlain by thin, fibrous peat (unit AO).

TILL PROVENANCE

Till derived from the Paleozoic carbonate southwest of Thelon River has a reddish matrix and a significant Dubawnt Supergroup clast content, primarily reflecting northwestward dispersal of local Dubawnt Supergroup rock types (Fig. 2). A clear northwestward dispersal of Thelon Formation clasts from the margin of the Baker Lake basin is observed in the area around Long Lake immediately north of outcrops of Thelon Formation around Pitz Lake (Fig. 3). Thelon Formation sandstone clasts are also concentrated on the surface of till in the area south of Pitz Lake, but decreasing quantities of clasts of this rock are located to the southeast. Outside the dispersal train, Dubawnt Supergroup clasts are scarce or absent in surface till of the Schultz Lake map area. In the northeast, surface till has an olive-brown to grey-brown colour and intrusive and supracrustal clasts are predominant, indicating a local provenance. At several sites along the margin of the 'Dubawnt dispersal train', the surface till consists of two distinct tills, the upper till being a thin veneer of olive-brown till with a local clast content, overlying a reddish till signature from two distinct provenance areas (McMartin et al., 2006). In summary, northwestward dispersal may be the prevailing glacial transport direction over most of the Schultz Lake south map area, consistent with the ice-divide migration model presented above. However, the presence of clasts in stony and rich-in-local arenites to subangular Thelon Formation sandstone clasts, indicative of low-velocity, basal ice conditions in proximity to an ice divide. A complex till stratigraphy was observed in boreholes along the Thelon River (Shilts, 1980b) and one section of till examined and sampled in the Schultz Lake south map area west-northwest of Baker Lake revealed a multiple-till stratigraphy based on eight changes in till composition (McMartin et al., 2006).

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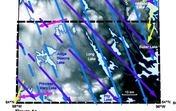

Figure 1a

Figure 1b

Figure 1c

Figure 1. Sequences of ice-flow movements in the Schultz Lake map sheet, based on striations and landforms (modified from McMartin et al., 2006). The Schultz Lake south map area is located in the southern half (dashed black outline).

Figure 2. Concentration of total Dubawnt Supergroup clasts in surface till. An inverse-distance weighted map shows the regional trends. Potential source areas of Dubawnt Supergroup rocks are stippled in black.

Figure 3. Concentration of Thelon Formation clasts in surface till. An inverse-distance weighted map shows the regional trends. Potential source areas of Thelon Formation rocks are stippled in black.

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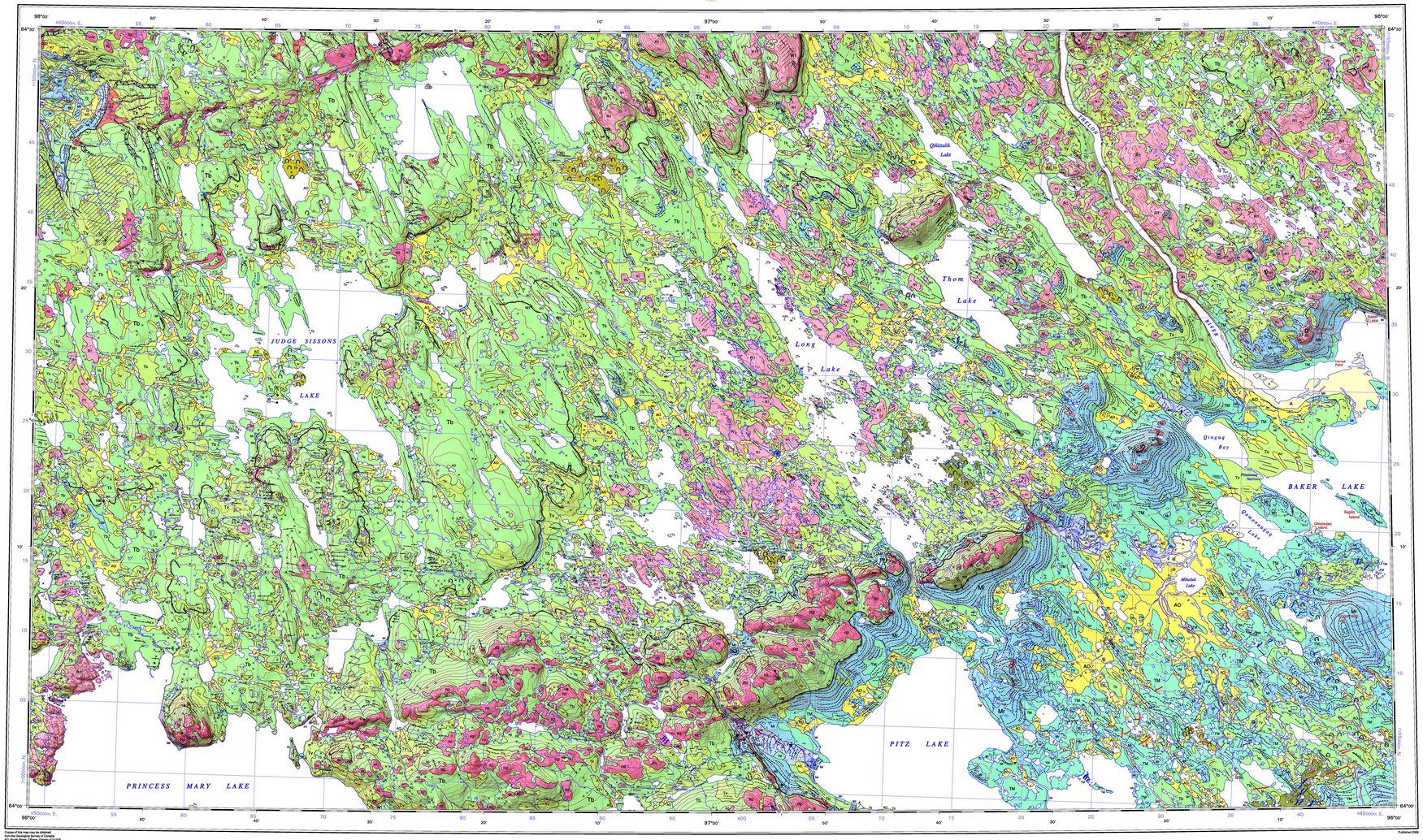

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1 Challenger Drive, Dartmouth, Nova Scotia B2Y 4A2

Authors: I. McMartin, L.A. Dredge, and J.M. Aylesworth

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MAP 2120A

SURFICIAL GEOLOGY

SCHULTZ LAKE SOUTH

NUNAVUT

Scale 1:100 000/Échelle 1/100 000

kilometres 2 0 2 4 6 8 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983
© Her Majesty the Queen in Right of Canada 2008

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983
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Any revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada

Digital base map from data compiled by Geomatics Canada, modified by DDD

Shaded relief image prepared by DDD, derived from the digital elevation model supplied by Canadian Digital Elevation Data
Illumination: azimuth 315°, altitude 45°, vertical factor 5x

Some geographical names subject to revision

Mean magnetic declination 2008, 01°55' W, increasing 13.3' annually; Readings vary from 0°07' W in the SW corner to 2°41' W in the NE corner of the map

Elevations in metres above mean sea level

Published 2008

LEGEND

QUATERNARY

POST-LAST GLACIATION

ALLUVIAL DEPOSITS: *stream-deposited material within active drainage systems formed since retreat of the postglacial sea, proglacial lakes, or glacial ice; 1 m to several metres thick.*

- **A** — ***Alluvium:*** *sand, gravel, and cobbles; 1–10 m thick; deposited in channels and on floodplains, or as deltaic sediments where modern streams enter lakes.*
- **AO** — ***Alluvium and marine or outwash sediments, undifferentiated:*** *sand or silt, minor gravel; 1–5 m thick; modern alluvium mixed with fine-grained marine sediments washed from till slopes by wave action, or with glaciofluvial outwash sediments in stream valleys or abandoned channels above marine limit; occurs in topographic lows in the marine limit zone; commonly covered by a thin organic mat; high water table and rare ice-wedge polygons.*

MARINE DEPOSITS: *materials deposited in the postglacial Tyrrell Sea from 6500 ± 500 BP to about 500 years ago; mainly derived from reworking of glacial deposits by wave and current action during marine regression; 1 m to several metres thick.*

- **Md** — ***Deltaic sediments:*** *sand, pebbly sand, and gravel; 2–20 m thick; deposited by glacial or nonglacial streams draining into the sea.*
- **Mr** — ***Littoral sediments:*** *generally well sorted sand, gravel, cobbles, or boulders; 1–5 m thick; deposited as beaches, bars, spits, and shore ice-push ridges; derived from the reworking of upland surficial deposits.*

LAST GLACIATION

GLACIOFLUVIAL DEPOSITS: *generally well sorted material deposited by meltwater streams behind, at, and in front of the ice margin; 2 m to several metres thick.*

- **Gk** — ***Ice-contact sediments:*** *poorly stratified sand and gravel; 5–15 m thick; deposited in, over, or around ice or in subglacial ice tunnels; forming isolated kame terraces near marine limit.*
- **Go** — ***Outwash sediments:*** *stratified sand and gravel; 2–15 m thick; deposited in a proglacial environment by subaerial meltwater streams in areas above local sea level as valley trains, terraces, and fans; surfaces locally terraced, hummocky, and kettled; grading to deltaic sediments near marine limit.*

GLACIAL DEPOSITS: *poorly sorted sediments with distinctive forms deposited directly by glacial ice; 1 m to several metres thick; till composition generally reflects a local provenance and a net glacial transport direction to the northwest, except in the southeast where it reflects a local provenance and a net glacial transport to the southeast. Till located mainly southwest of Thelon River has a reddish matrix and a significant Dubawnt Supergroup clast content; till composition northeast of the river generally reflects underlying bedrock types.*

- **TM** — ***Till and marine sediments, undifferentiated:*** *till and glacial marine diamictons mixed with patches of marine offshore and sublittoral sediments; 1–5 m thick; forming till-cored landforms veneered by marine silt and silty sand, or marine deposits in depressions among till landforms; includes areas of till reworked from marine and glaciofluvial deposits; a map occur anywhere below marine limit, but distribution is patchy above 60 m a.s.l.*
- **Tb** — ***Till blanket:*** *glacial diamicton; 2–25 m thick; deposited mainly in a subglacial environment; forming gently undulating till plain or streamlined landforms; includes areas of boulder lags as a result of wave-washing or meltwater erosion.*
- **Tv** — ***Till veneer:*** *glacial diamicton; 1–2 m thick; discontinuous cover mimicking underlying bedrock topography; includes numerous small bedrock outcrops and boulder fields.*
- **Tr** — ***Ribbed moraine:*** *generally bouldery till, in places sand and gravel; forming straight to sinuous ridges, less than 1 km long and 2–10 m high; ridges generally oriented at right angles to direction of ice flow.*
- **Th** — ***Hummocky till:*** *glacial diamicton, occurring as 5–30 m high rounded hummocks; surfaces lack a significant boulder cover.*

PRE-QUATERNARY

BEDROCK: *Archean to Paleoproterozoic supracrustal and intrusive igneous and metamorphic rocks; red volcanic rocks, and unmetamorphosed sediments; surface comprises more than 80% outcrop.*

- **R1** — ***Polydeformed and metamorphosed supracrustal and intrusive rocks:*** *Neoarchean metasedimentary and metavolcanic supracrustal rocks of the Woodburn Group, and late Archean granitoid complexes; Paleoproterozoic, clastic-dominated supracrustal rocks of the Kahyet River Group; minor Mesoarchean gneissic remnants of the basement to the Woodburn Group.*
- **R2** — ***Paleoproterozoic Dubawnt Supergroup rocks:*** *undeformed and unmetamorphosed red volcanic and sedimentary rocks; include distinctive quartz sandstone and conglomerate units of the Thelon Formation, and red volcanic rocks of the Pitz and Christopher Island formations.*

Geological boundary (defined)
Boulder fields
Marine limit (with elevation in metres) — 181
Beach ridge crests
Proglacial meltwater channel corridor
Proglacial meltwater channel (small)
Sculpted slope with partially eroded till blanket
Surface lineations
Crag-and-tail landform
Drumlinoid ridge
Glacially formed lineation, undifferentiated
Iceberg scour
Hummocky moraine
Ribbed moraine
Isolated bedrock outcrop
Prominent frost polygon
Kettle hole or lake
Striation (ice-flow direction known, unknown, poorly defined) — 320°, 320°, 320°
Crossed striae (numbers indicate relative age, 1 being the oldest) — 1, 2
Roche moutonnée
Radiocarbon date (see Table 1)
Field observation site

Map number	Radiocarbon age (BP)	Laboratory number	Material	Elevation (m)
1	4900 ± 140	GSC–1121	Shells	72
2	4900 ± 140	GSC–1120	Twigs	72
3	5970 ± 140	GSC–1093	Shells	96
4	5910 ± 140	GSC–1164	Shells	101

Table 1. Radiocarbon data.

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