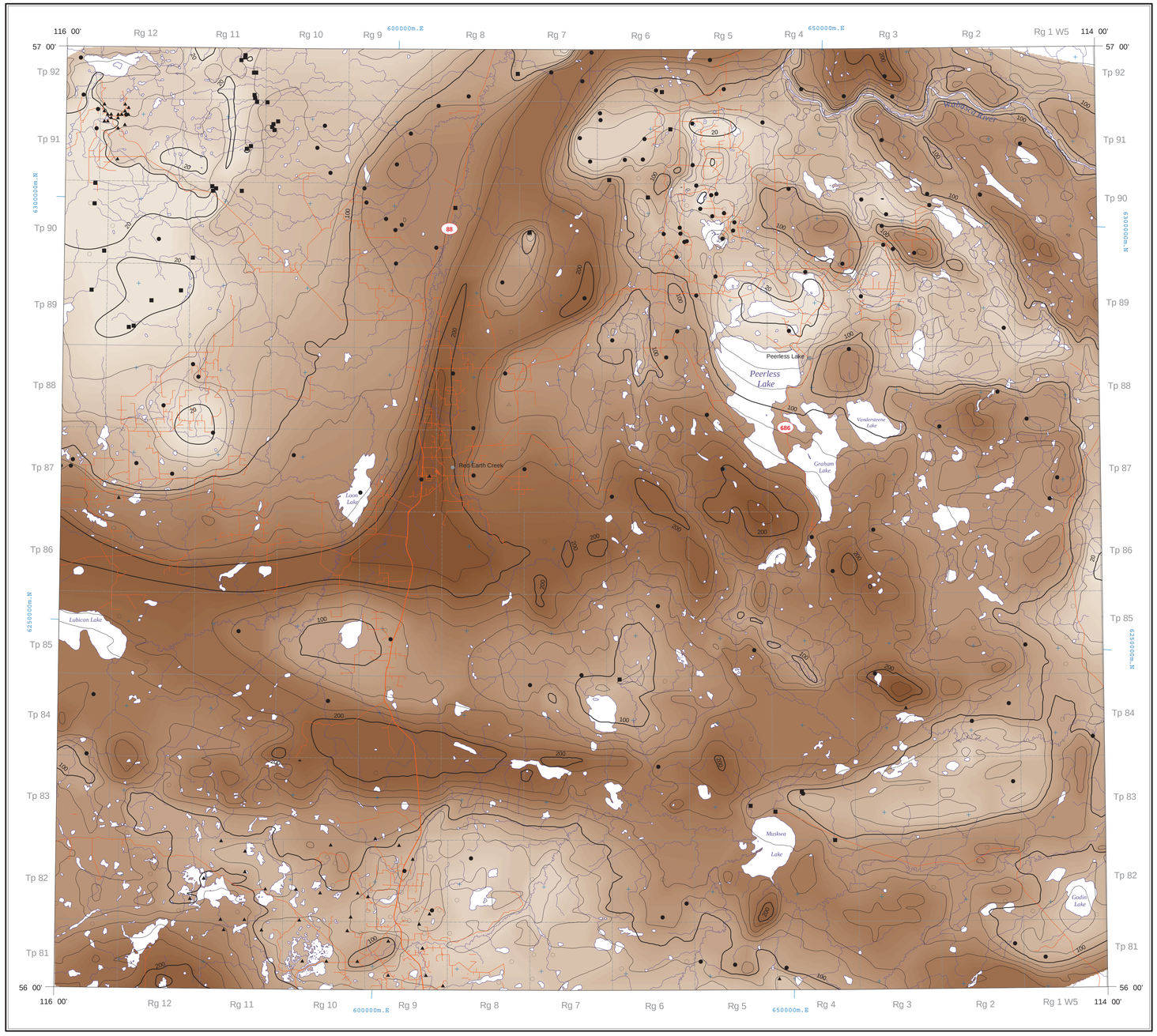
NTS 84B
Drift Thickness



Published 2005
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Map 253

Drift Thickness of Peerless Lake Area, Alberta (NTS 84B)

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Scale 1:250 000

5 0 5 10 15 20 25 30 kilometres
5 0 5 10 15 20 miles

Projection: Universal Transverse Mercator, Zone 11
Datum: North American Datum, 1983

Data

The drift thickness map represents the thickness of overburden between the land surface and the bedrock surface. Petrophysical logs were the primary source of information used for constructing the bedrock topography. A suite of the common well logs (gamma, resistivity, spontaneous potential, density, neutron, sonic and calliper) were useful in making the pick for top of bedrock; however, the gamma and resistivity logs proved to be the most useful. The drift typically displays a lower gamma response and higher resistivity response than the underlying bedrock. Other sources of data were water well lithologs, mineral exploration drillholes and outcrop information (Paulen et al., 2003).

Mapping the bedrock surface was difficult in some areas where data were sparse. Many of the log traces were absent from the upper part of the hole because of surface casing. The depth of surface casing set in bedrock was used for an estimate of maximum drift thickness in places with few data. Conversely, many water wells did not penetrate deep enough to intersect the bedrock, so only a minimum drift thickness value could be determined.

Interpretation

The physiography of the Peerless Lake map area has been defined by Pettapiece (1986) and a modified version of these subdivisions is shown on the accompanying digital elevation model (Figure 1). The Buffalo Head Hills Upland in the northwest, Peerless Lake Upland in the east, and Utikuma Uplands in the south are separated by the north-trending Loon River Lowland and the east-trending Wabasca Lowland. Throughout the map area drift covers the bedrock, with the exception of a few small isolated outcrops, and varies in thickness from less than 2 metres in parts of the Buffalo Head Hills to over 200 metres in the Loon River Lowland. Figure 2 shows the bedrock topography of the Peerless Lake map area, from Alberta Geological Survey Map 252 (Pawlowicz and Fenton, 2005). The sub-cropping bedrock consists mainly of Shaftesbury Formation and Smoky Group marine shales, with smaller areas of Dunvegan Formation sandstone (Hamilton et al., 1999).

The drift thickness interpretation was made after completion of the bedrock topography contouring. The bedrock topography contours were initially generated from bedrock surface picks using a computer-contouring program with some subsequent modifications by hand. The bedrock topography surface, in a digital grid format, was subtracted from a digital elevation model of the present-day surface. The resulting grid was then contoured to form an isopach map of the drift. Preliminary versions of this map were released as Alberta Geological Survey (AGS) publications by Pawlowicz and Fenton (2002) and Andriashek et al. (2001).

The drift thickness map shows the variation in thickness of unconsolidated sediment lying between the bedrock surface and the present-day land surface, and complements the Drift Thickness of Alberta map (Pawlowicz and Fenton, 1995). The thickness of the drift varies from locally less than 2 metres in Buffalo Head Hills to over 200 metres in the Loon River Lowland in the central part of the map area. Thick drift fills the major paleovalleys, which are the Muskwa Valley, the Red Earth Valley and Gods Valley. The drift is thinnest on the Peerless Lake Upland, the Utikuma Uplands and the Buffalo Head Hills Upland. In general, the areas of thin drift correspond to areas where the bedrock topography is high. Exceptions are the hills composed of thick drift, such as the ones located south of Muskwa Lake and southwest of Peerless Lake. These features are likely hill-hole pairs produced by glaciotectonism with lakes occupying the source depressions (holes). The drift also thickens in the southwestern part of the Utikuma Uplands. Experience from more detailed investigations in eastern Alberta (Andriashek and Fenton, 1989; Andriashek et al., 2001) have shown that unmapped, narrow, deep drift-filled channels are to be expected.

The composition and stratigraphy within the drift is poorly known; however, some information is available from holes drilled by AGS (Pawlowicz et al., 1996; Pawlowicz and Fenton, 1998; Pawlowicz et al., 1999; Pawlowicz and Fenton, 2002). Results from the drillholes indicate that in some places a multi-layer sequence of till and non-till sediments have been preserved. In one corehole, PL01-01, located approximately 35 km north of Red Earth Creek in the Loon River Lowland, the lithostratigraphy reveals a 50-metre till unit overlying 50 metres of glaciolacustrine sand, silt and clay overlying another 40-metre thick till unit that lies on the bedrock surface (Pawlowicz and Fenton, 2002). Preglacial sand and gravel were recognized in a small area on the Buffalo Head Hills (Paulen et al., 2003) but were not intersected in the buried valleys. Detailed investigations in the Sand River area to the east (Andriashek and Fenton, 1989; Andriashek, 2003) have identified several glacial and preglacial units in the deeply buried valleys.

FEATURES LEGEND

Data sources

- Petroleum well, bedrock surface picked
- Petroleum well, bedrock surface above logged interval
- Water well, bedock surface picked
- Water well, bedrock surface below bottom of well
- Mineral exploration borehole, bedrock surface picked
- Mineral exploration borehole, bedrock surface below bottom of hole
- Drift thickness contour
  contour interval = 20 metres

Drift thickness

260 metres
200
140
80
20 metres

BASEMAP LEGEND

- City/Town
- Road - gravel
- Road - paved
- Township/range - surveyed
- Township/range - unsurveyed
- UTM, Zone 11 Grid (450000m.E)
- Rivers
- Lakes

Figure 1. Present day surface topography and physiography

Figure 2. Bedrock topography

References

Andriashek, L.D. (2003): Quaternary geological setting of the Athabasca oil sands (in situ) area, northeastern Alberta; Alberta Energy and Utilities Board, EUB/AGS Earth Sciences Report 2002-03, 286 p.

Andriashek, L.D. and Fenton, M.M. (1989): Quaternary stratigraphy and surficial geology of the Sand River area, 73L; Alberta Research Council, Alberta Geological Survey, Bulletin 57, 154 p.

Andriashek, L.D., Pawlowicz, J.G., Fenton, M.M. and Ranger, I. (2001): Bedrock topography and drift thickness, Athabasca Oil Sands (in situ) area and adjoining regions; Alberta Energy and Utilities Board, EUB/AGS Information Series 124.

Hamilton, W.H., Langenberg, W., Price, M.C. and Chao, D.K. (1999): Geological map of Alberta; Alberta Energy and Utilities Board, EUB/AGS Map 236, scale 1:1 000 000.

Paulen, R.C., Fenton, M.M., Pawlowicz, J.G. and Campbell, J.E. (2003): Surficial geology of the southeast Buffalo Head Hills area, Alberta (NTS 84B/NW); Alberta Energy and Utilities Board, EUB/AGS Map 265, scale 1:100 000.

Pawlowicz, J.G. and Fenton M.M. (1995): Drift thickness of Alberta; Alberta Department of Energy, Alberta Geological Survey, Map 227, scale 1:2 000 000.

Pawlowicz, J.G. and Fenton, M.M. (1998): Auger core lithologs from the Wabasca/Red Earth area, north-central Alberta; Alberta Energy and Utilities Board, EUB/AGS Open File Report 1998-03, 26 p.

Pawlowicz, J.G. and Fenton, M.M. (2002): Bedrock topography, drift thickness and subcrop geology of the Peerless Lake area, NTS 84B: an update; Alberta Energy and Utilities Board, EUB/AGS Information Series 125.

Pawlowicz, J.G. and Fenton, M.M. (2005): Bedrock topography of Peerless Lake area, Alberta, NTS 84B; Alberta Energy and Utilities Board, EUB/AGS Map 252, scale 1:250 000.

Pawlowicz, J.G., Jean, G.M. and Fenton, M.M. (1996): Preliminary stratigraphic tests to support mineral exploration: northern Alberta; Alberta Department of Energy, Alberta Geological Survey, Open File Report 1995-11, 34 p.

Pawlowicz, J.G., Meeks, J.O. and Fenton, M.M. (1999): Auger core descriptions, 1998 drilling, Peerless Lake map sheet (NTS 84B), north-central Alberta; Alberta Energy and Utilities Board, EUB/AGS Open File Report 1998-09, 27 p.

Pettapiece, W.W. (1986): Physiographic subdivisions of Alberta; Land Resource Research Centre, Research Branch, Agriculture Canada, physiographic map, scale 1:1 500 000.

Acknowledgements:

GIS/Cartography by:
N.L. Clarke

Digital base map provided by:
Spatial Data Warehouse
Digital elevation model provided by:
Geomatics Canada, NRCan