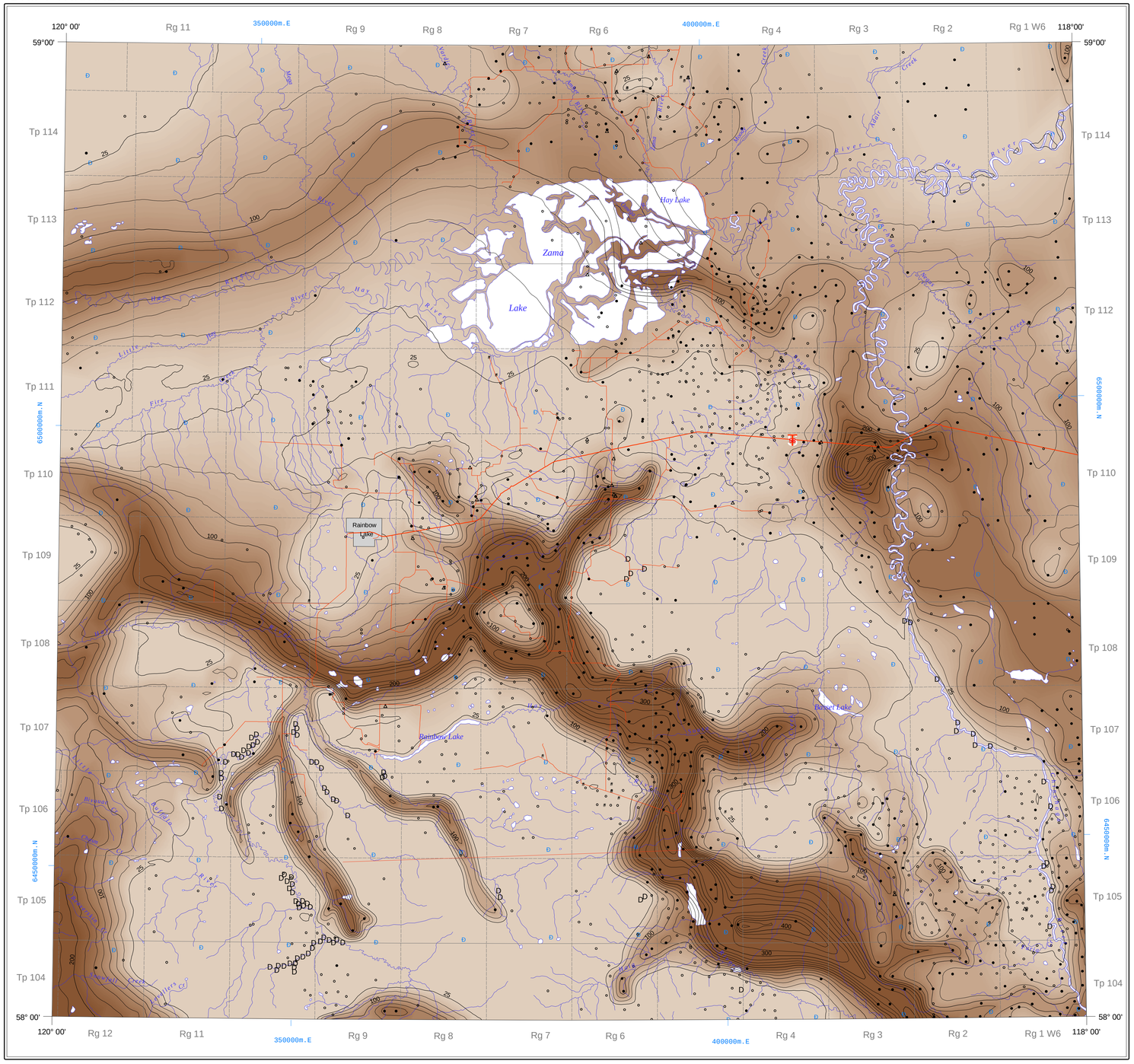
NTS 84L
DRIFT THICKNESS



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Map 329

Drift Thickness of Zama Lake Area, Alberta (NTS 84L)

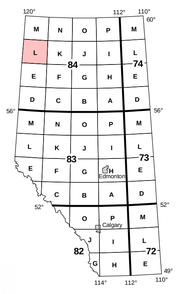
Geology by: J.G. Pawlowicz, A.S. Hickin, T.J. Nicoll, M.M. Fenton, R.C. Paulen, A. Plouffe and I.R. Smith

Scale 1:250 000

0 3.75 7.5 15 22.5 30 kilometres

0 2.5 5 10 15 20 25 miles

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



Shallow Gas & Diamond Opportunities in Northern Alberta and British Columbia 2003 - 2007

Data

The drift thickness map represents the difference between the land surface and the bedrock surface. Petrophysical logs from oil and gas wells 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 caliper) were useful in making the pick for top of bedrock; however, the gamma and resistivity logs proved to be the most useful. In this region, the drift typically displays lower gamma values and higher resistivity values than the underlying bedrock. Other sources of data were drill cuttings, water well lithologs and surficial geological mapping that provided information on bedrock outcrop locations and till veneers over shallow bedrock (Paulen et al., 2005a and 2005b; Plouffe et al., 2004; Smith et al., 2005).

Mapping the bedrock surface was difficult in some areas where data were sparse. In many of the wells, log traces are not available for the upper part of the hole. The depth of surface casing set in bedrock provides a limit on the maximum possible drift thickness. Conversely, water wells and gas wells that did not intersect bedrock provide minimum drift thickness values. The drift thickness interpretation was made after completion of the bedrock topography contouring. Bedrock topography contours were initially generated from bedrock surface picks using a computer-contouring program with subsequent modifications to better reflect the geological model. The bedrock topography surface, in a digital grid format, was subtracted from a digital elevation model of the land surface. The resulting grid was then contoured to form an isopach map of the drift.

Discussion

The Zama Lake map area lies within the Fort Nelson Lowland, Vermilion Lowland and Clear Hills Uplands physiographic regions defined by Pettapiece (1986). These regions are shown on the accompanying digital elevation model (Figure 1). The Hay River Plain and the Zama Lake Plain lie within the Fort Nelson Lowland in the northern and eastern parts of the map area. This lowland is characterized by broad low-relief areas between 335 and 450 metres above sea level (m asl) blanketed by boreal forest and extensive bogs and fens. The southwestern quadrant of the map area forms part of the Clear Hills Uplands that rise to >700 m asl and contains the Rainbow Lake Plain, the Chinchaga Plain and Bassett Hill. Zama Lake and Hay Lake are the dominant features in the north-central part of the lowlands. A prominent ridge, informally named Rainbow Ridge, also referred to as Zama Mountain (Green et al., 1970), lies immediately south of Zama Lake. Present-day rivers include Hay River, which dissects the Rainbow Lake Plain and then flows through Zama Lake before exiting the northeast corner of the map area, and Meander River, which flows northward from the southeast corner.

Bedrock subcrop consists of Upper Cretaceous Dunvegan Formation in the uplands (Green et al., 1970; Hamilton et al., 1999). Cretaceous Shaftesbury Formation shale underlies much of the area with Lower Cretaceous Fort St. John Group shale present where the buried valleys have incised deeply into the bedrock. In the northeastern quadrant, Devonian Wabamun Group limestone lies immediately beneath the drift in some areas. Outcrops of Dunvegan Formation sandstone are found above 600 m asl on Bassett Hill and the Chinchaga Plain. Shaftesbury Formation shale outcrops along the Meander River, along former glacial meltwater channels and along the north flank of Rainbow Ridge (Paulen et al., 2005a and 2005b; Pawlowicz et al., 2005; Plouffe et al., 2004; Smith et al., 2005).

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). Throughout the map area drift covers the bedrock, with the exception of a few outcrops. The drift tends to be thin in the uplands, which generally correspond to elevated bedrock topography, and thick in areas where buried valleys are present. The bedrock topography map of the Zama Lake area shows the location of the major buried valleys (Figure 2; Pawlowicz et al., 2005). Drift is thinnest on the uplands of Rainbow Ridge, Bassett Hill, the Chinchaga Plain and the Rainbow Lake Plain. In the buried valleys the drift thickens markedly. In Township 110, Range 3, west of the 6th Meridian, drift thickness exceeds 300 m, filling a township-sized depression in the Zama Valley. The thickest drift in the map area, however, is found in the buried Rainbow Valley south of Bassett Hill in Township 105, Range 4, west of the 6th Meridian. The thick drift clearly shows the course of the Rainbow Valley from southeast to northwest. The land surface shows little evidence of these large drift-filled paleovalleys.

Information on the composition and stratigraphy of the drift is available from holes drilled by the Alberta Geological Survey (Pawlowicz and Fenton, 1998), drill cuttings and surficial geology maps (Paulen et al., 2005a and 2005b; Plouffe et al., 2004; Smith et al., 2005). The drift appears to be composed dominantly of glacial sediments. Preglacial fluvial sediments may be present in the lower parts of some of the buried valleys, as is well documented elsewhere in the province (Andriashek and Fenton, 1989; Andriashek, 2003). In some places a multi-layer sequence of till interbedded with glaciolacustrine and glaciofluvial sediments has been preserved. The deeply buried valleys may be expected to contain several glacial units as shown through detailed investigations in the Sand River area to the southeast (Andriashek and Fenton, 1989; Andriashek, 2003). Accumulations of shallow gas within drift, which are known to occur in the Zama Valley within Township 110, Range 3, west of the 6th Meridian and elsewhere in the Zama Lake region, may be due in part to adequate seals formed from thick clay-rich tills and glaciolacustrine sediments that trap the upward migrating gas.

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
- Bedrock outcrop
- Drift thickness surface to bedrock isopach contour interval 25 m

Drift Thickness

450 metres
350
250
150
50 metres

BASEMAP LEGEND

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

Figure 1. Present-day surface topography and physiography

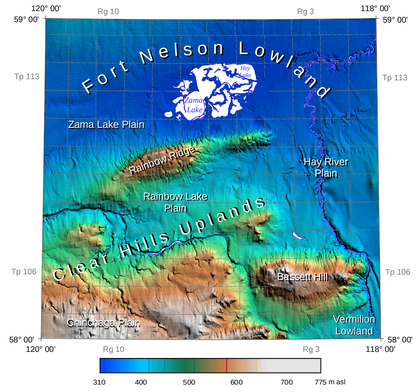
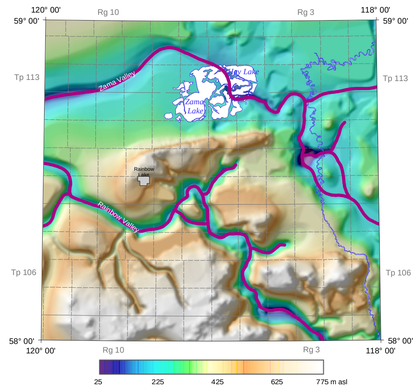


Figure 2. Bedrock topography



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EUB Alberta Energy and Utilities Board | AGS Alberta Geological Survey

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