

DESCRIPTIVE NOTES

The Caribou Creek map area is located in northwestern Alberta within the Fort Nelson and Peace River lowlands (Bostock, 1967). The Fort Nelson Lowlands is a region of flat relief with an elevation varying from 300 to 500 m above sea level (asl) and is incised by the Peace River, forming the Peace River Lowlands. The region drains to the east into the Peace River which is part of the Mackenzie River drainage. The main economic activities in the map area include gas exploitation and logging and to a lesser extent agriculture.

The surficial geology of the map area was interpreted from 1:60 000 scale black and white air photographs dating to 1983, 1993, and 1994 and produced by the Alberta Sustainable Resource Development. In addition and to a lesser extent, the surficial geology was interpreted from the shuttle radar topography mission (SRTM) imagery (SRTM 3-arc second; 90 m resolution). Field work was conducted during a 3 week period in the summer of 2005 and included the collection of field observations necessary for the mapping of the surficial geology, the logging of stratigraphy exposed in borrow pits and river bank exposures, and the collection of bulk glacial sediment samples (approx. 30 kg per sample). Access to the region was by truck, all terrain vehicle, and foot traverses. A hand auger was utilized to identify the sediment type within the upper one meter from surface due to the paucity of natural and man-made sediment exposures. The surficial geology was interpreted on air photographs and was subsequently digitized by a consultant using a digital visual plotter (DVP) system.

The bedrock of the map area consists of horizontally bedded, poorly indurated shale of the Shaftesbury Formation underlain by grey shale of the Loon River Formation (Green et al., 1970; Okulitch, 2006). The only bedrock exposures in the map area are located along the north shore of the Peace River and consist of horizontally bedded, poorly indurated shale of the Loon River Formation (Okulitch, 2006).

Till in the Caribou Creek map area consists of a clayey diamicton (10 to 40% clay) with a clast content varying from 5 to 20 %. Clast lithologies in till consist of locally derived shale and ironstone intermixed with Canadian Shield and Proterozoic to Paleozoic sedimentary bedrock transported from the northeast.

Glaciofluvial sediments are rare. One esker was mapped in the south east part of the map area, from air photo interpretation with no ground evaluation. The esker formed during glacial conditions and subsequently, was submerged in a glacial lake early during deglaciation. This esker was mapped as an ice-contact glaciofluvial deposit, but it may be overlain by a veneer of glacial lake sediments.

Glacial lake sediments are dominantly massive and rarely bedded. Because of the low clast content of till and poor sediment exposures the distinction between till and glacial lake sediments was difficult in several places. Glacial lake sediments generally thin to the west with respect to present surface elevation. The maximum elevation reached by glacial lake sediments is estimated at 410 m asl based on field observations made immediately to the north (Plouffe et al., in press) and in the southwest sector of the map area. Therefore, the glacial lake which formed in the region reached a minimum elevation of 410 m asl. Glacial lake sediment cover is discontinuous near the contact zone with till. Certain regions below the maximum extent of glacial lake sediment have been mapped as till, as opposed to glacial lake sediments, because of the high density and good definition of the glacial flutings. In certain areas underlain by a blanket of glaciolacustrine sediments, the surface topography is characterized by a field of circular mounds hundreds of meters in diameter with a relief > 2 m (unit **Lbh**). These landforms are interpreted to result from periglacial processes whereby local upheaval occurred because of freezing of thawed layers immediately following rapid glacial lake drainage. Similar features were observed in the surrounding regions and to the south, within the Sturgeon Lake map area (Henderson, 1959).

Eolian sediments composed of well sorted fine sand and minor silt are confined to the vicinity of the Peace River valley. Two dominant wind directions are recorded from the dune orientations. One dominant set of dunes is oriented NE-SW suggesting a wind direction from the SE (David, 1977; Pfeiffer and Wolfe, 2002). A less dominant second set of dunes is oriented WNW-ESE suggests a wind direction from the NNE (David, 1977; Pfeiffer and Wolfe, 2002). The contact between eolian and glacial lake sediments is gradational due to the thinning and discontinuous distribution of eolian sediments at the western edge of this large eolian deposit.

Fluvial sediments are restricted in extent except along the Peace River where well developed terraces occur at up to 60 m above present river level. The terraces are composed of moderately to poorly sorted, crudely bedded, sand and bouldery, cobbly and pebbly gravel.

Organic deposits in the form of fens and bogs are omnipresent in the Caribou Creek map area. Permafrost is still present in the hummocky bogs (unit **O¹h**).

Flutings and drumlinoid ridges are well developed in the region. Within the Caribou Creek map area, fluting morphologies are apparent through the cover of glacial lake sediments and organic deposits. In other words, the flutings are draped by a veneer of glacial lake sediments or organic deposits but are still visible on air photographs. Flutings are a key indicator of ice-flow directions in this region where bedrock striations are absent because of the poorly indurated nature of the bedrock. Only minor moraines have been mapped in the region suggesting an ice-front retreat to the east-northeast. Circular landforms of unknown origin were observed in the central and east central part of the map area. Some of these features are composed of multiple, tightly spaced and very-low relief circular ridges. Their origin glacial, or periglacial is still unclear. Similar features are present to the north (Plouffe et al., in press).

During the Late Wisconsinan glaciation, glaciers derived from the Keewatin Sector of the Laurentide Ice Sheet advanced westerly to southwesterly over the Caribou Creek map area. At glacial maximum, ice was generally flowing to the west and southwest as evidenced by the orientation of flutings and drumlinoid ridges. Retreat of ice from the area occurred between 11 500 and 11 000 radiocarbon years BP (13 450 to 13 000 calendar years BP) (Dyke, 2004). The southwestern sector of the map area was deglaciated first, at which time an ice-contact meltwater channel was eroded in the underlying sediments and served as the outlet of the Keg River stage of glacial lake Peace (Mathews, 1980). Glacial lake Peace expended into the map area as ice retreated easterly and impounded the eastward drainage. The extent and elevation of this glacial lake diminished as ice retreated easterly. At some point, the level of glacial lake Peace was controlled by an outlet through the Meander River spillway at an elevation of 330 m asl, immediately north of the map area (Plouffe et al., in press). The Peace River drainage within the Caribou Creek map area was established following the eastward migration of glacial lake Peace along the retreating ice front. The river went through a cycle of aggradation and degradation leaving thick accumulation of sand and gravel in the form of paired terraces. During early post-glacial time, and prior to the development of an extensive vegetation cover, katabatic winds reworked part of the sandy sediments into eolian dunes. Following deglaciation, vegetation invaded the region and organic material accumulated. Conditions became cool enough at about 3700 radiocarbon years BP to allow for the development of permafrost in northwest Alberta (Zoltai, 1993). Permafrost is still present in the hummocky bogs (unit **O¹h**). Because of the generally flat topography of the region and the continuous damming of small streams by beavers, the energy of secondary streams is low and little fluvial incision has occurred.

Granular resources are limited in this region. Granular aggregate resources extraction has already taken place in the fluvial terraces of the Peace River. Other fluvial deposits in the area are unlikely to represent potential aggregate resources as they are composed generally of sand and silt, are limited in extent, and are located near modern river level where the water table is high. The esker identified in the south east part of the map area represents a prospect for aggregate resources. For information on aggregate resources in the region, the reader should consult Edwards et al. (2004). Bedrock and sediment landslides have occurred in the escarpments of the Peace River terraces and represent natural hazards in this region.

This map represents a product of the project Shallow Gas and Diamond Opportunities in Northern Alberta and British Columbia of the Northern Resources Development Program of the Geological Survey of Canada. The project is conducted in collaboration with the Alberta Geological Survey and the British Columbia Ministry of Energy, Mines and Petroleum Resources. Surficial geology maps adjacent to the Caribou Creek map sheet include to the west (Plouffe et al., 2004), to the northwest (Paulen et al., 2005), to the north (Plouffe et al., 2007), to the northeast (Paulen and Plouffe, 2007a), and to the east (Paulen and Plouffe, 2007b). Capable field assistance was provided by Thomas Ahkimmachie, Erwin Fournier, Chris Kowalchuk, Thomas Talley, and Nicky-Lee Wasp Colin.

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