

DESCRIPTIVE NOTES

The Moody Creek (84 M02) surficial geology map was produced as a part of a collaborative research project by the Geological Survey of Canada (Natural Resources Canada) and the Alberta Geological Survey (Alberta Energy and Utilities Board). This collaborative project also extends into northeast British Columbia (84 M1 and 84 M2) with the participation of the British Columbia Ministry of Energy, Mines and Petroleum Resources. Other surficial geology maps within the 84 M map area include Alberta (1985), Fox et al. (1987), Edwards et al. (2004), Plouffe et al. (2004a, 2004b), Plouffe et al. (2006), and Smith et al. (in press).

The Moody Creek map area encompasses the hamlet of Zama City and the main infrastructure for the Zama oil and gas fields. This area is experiencing rapid growth and activity in both the mature oil pools and the newly emerging shale gas fields.

The map area straddles the transition from the Fort Nelson Lowland to the south with an elevation varying from 350 to 450 m above sea level (ASL) and the Alberta Plateau to the north (Bostock, 1987) which reaches an elevation of 800 m (ASL) at the map border. Permafrost is discontinuous in the map area, and typically underlies peat accumulations and other organic peat deposits. The permafrost is seasonally thawed and vulnerable to melting due to anthropogenic activities, such as road, seismic line, and drill pad construction.

This surficial geology map was produced from the interpretation of 1:200 000 scale black and white air photographs (Alberta Sustainable Development, 1984) and from field investigations conducted during the summers of 2004 and 2005. Stratigraphy within this region was determined from borings pits, and peat profiles, gravel pits, hand dug pits, and with an outcrop probe. To provide an indication of ice-flow direction in a region where glacial striations on bedrock are absent, till fabrics were measured at a number of sites. The till fabric depicted on the map represents the mean orientation of 25 to 50 profiles (to ± 1 to ± 2 degrees) observed within till.

During the last glacial (Late Wisconsinan), the Laurentide Ice Sheet advanced over the area in a general westward direction. During both advance and retreat-phases, proglacial lakes formed as ice blocked the eastward drainage from the Corralles (Blair, 1980; Lemmen et al., 1984; Smith et al., 2005). In the low-lying areas along the southern portion of the map, till is overlain by a discontinuous glacial lake sediment veneer. A thin glacial outwash covered glaciolacustrine sediments observed in a number of borings pits is interpreted as a surge into the north margin of glacial Lake Hay. Alternatively, it could represent the grounding of floating ice, as numerous iceberg scours are observed in the map area. The flat topography of the area and lack of natural sediment exposures will require the use of surface data (e.g. drill logs and drilling) for future stratigraphic studies.

Bedrock in the map area is only exposed in outcrops located into the slopes of the Alberta Plateau. The map area is extensively mantled by fine grained (silt to clay) glacial sediment deposited by glacier lobes that retreated from the regional widely indurated Cretaceous shale bedrock of the upper Fort St. John Group (Shaltheis Formation). Erratics found in till include Canadian Shield granitic and metamorphic (Rhizophora, Devonian limestone and dolostones, and Proterozoic Athabasca sandstone). Till is the most common surficial material and is generally clay rich with clay concentrations of 5 to 15%. The high clay content of the till is a consequence of the reworking of advance-phase glacial lake sediments and shale bedrock. Till occurs as a veneer or a blanket, with the latter being further subdivided based on surface expression: blanket, ridged, and hummocky. Upwards to the northern portion of the map area, till reflect bedrock topography and are draped by a blanket of till between 1 and 10 m thick. In flat lowland areas, till is at least 1 m thick.

Glaciolacustrine sediments are also clay-rich, and form a veneer 1 to 4 m thick above till in low-lying areas in the south. These sediments form a continuous cover at elevations below 450 m, and occur discontinuously above this elevation. Glaciolacustrine sediments occur as massive silt and clay, contorted beds of sand, silt and clay, and as interstratified sand and clayey silt. Where they are present, they represent deposition in glacial Lake Hay, and where they are discontinuous, they are likely the result of local ponding.

Glacial outwash is rare. Gravel surfaces were found at only one location in association with a meander channel (50°19'N 118°09'W). Their location is marked by a gravel pit symbol. Glacial outwash is in short supply in the region and most roads are surfaced with the same fine-grained till that is used for their foundations. Fine-grained till provides a good impervious base in areas of permafrost and water saturated bog and fen deposits. However, only roads that are surfaced with gravel can be used during wet weather conditions. Gravel associated with the aforementioned meander channel may be a new source of local aggregate in the area. Alluvial sediments generally consist of sand and silt rich in organic detritus. Organic sediments include forfic bog material and water saturated mesic fen material that is commonly mixed with fine grained sediments. Large fens occupy the southern portion of the map area and overlie glaciolacustrine sediments.

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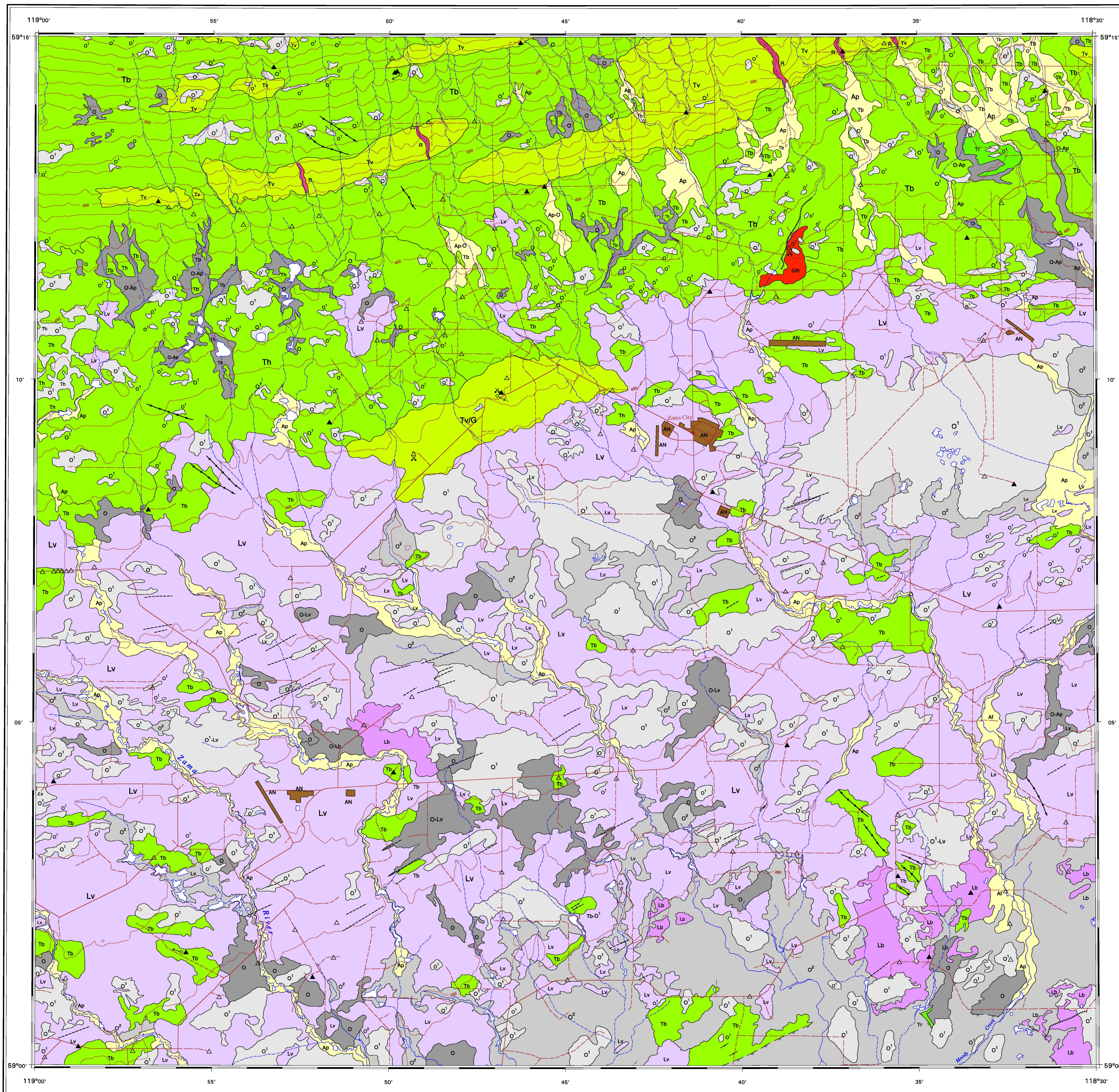
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LEGEND

Note: In areas where the surficial cover forms a complex pattern, the area is coloured according to the dominant unit and labelled in descending order of cover (e.g. O-Tv). Where buried aggregate deposits (sand and gravel) commonly associated with G1 or G2 surficial units are known, or suspected, areas are coloured according to the overlying unit and labelled in the following manner: LV/G.

QUATERNARY SURFICIAL DEPOSITS

POST LAST GLACIATION

ANTHROPOGENIC DEPOSITS: culturally-made or modified geological materials such that their original physical properties (e.g. structure, cohesion, compaction) have been drastically altered; >1 m thick.

ORGANIC DEPOSITS: peat and muck; 1 to 3 m thick on average; formed by the accumulation of plant material in various stages of decomposition; generally occurs as flat, wet terrain (swamps and bogs) over poorly drained substrates.

G1: Bog peat: sphagnum or forest peat formed in an ombrotrophic environment; wet terrain; may be tread or forest.

G2: Fen peat: peat derived from sedges and partially decayed shrubs in a eutrophic environment; forms relatively open peatlands with a mineral-rich water table that persists seasonally near the surface; generally covered with low shrubs and an occasional sparse layer of trees.

O: Undifferentiated bog and fen deposits: bog and fen deposits undifferentiated at this map scale.

ALLUVIAL DEPOSITS: sorted gravel, sand, minor silt, and organic detritus deposited by streams; commonly stratified.

Ap: Floodplain deposits: sorted gravel, sand, silt, and organic detritus >1 m thick; forming active floodplains close to river level with meander channels and scoll marks.

Al: Alluvial fan deposits: poorly sorted gravel, sand, and organic detritus >1 m thick.

POSTGLACIAL OR LATE WISCONSINAN PROGLACIAL AND GLACIAL ENVIRONMENTS

GLACIOLACUSTRINE DEPOSITS: fine sand, silt, and clay, with minor debris-flow diamicton, deposited in glacier-dammed lakes in valleys and along the margin of the retreating Laurentide ice Sheet; usually overlain by organic deposits in lowlands.

Lb: Glaciolacustrine blanket: >1 m thick.

Lv: Glaciolacustrine veneer: thin and discontinuous; <1 m thick.

GLACIOLACUSTRINE DEPOSITS: well to poorly stratified sand and gravel; minor diamicton; deposited behind, at, or in front of the ice margin by glacial meltwater; represents a potential aggregate source.

G: Proglacial outwash: cross-stratified gravel and sand deposited in front of the ice margin; 1 to 10 m thick; underlies Tv on this map.

Gh: Ice-contact stratified drift: poorly-sorted sand and gravel with minor diamicton; deposited in contact with the retreating glacier; 1 to >20 m thick; forming hummocky topography relating to melting of underlying ice.

Till: diamicton deposited directly by the Laurentide ice Sheet; sandy to clayey matrix with stratified clasts of various lithologies, including many Canadian Shield, carbonate, and sandstone erratics; clay content is typically low (<10 %).

Tb: Till blanket: >1 m thick, continuous till cover forming undulating topography that locally obscures underlying units.

Th: Hummocky till: >1 m thick; hummocky till surface.

Tr: Ridged till deposits: >1 m thick, moraine or crevasse fillings forming a ridged topography.

Tv: Till veneer: <1 m thick, discontinuous till cover, underlying bedrock topography is discernible.

PRE-QUATERNARY BEDROCK

R: Sedimentary bedrock: Cretaceous Fort St. John Group shales (including the Shaltheis Formation) and Devonian Formation sandstone exposed in highlands and along meltwater channel and canyon walls.

Geological boundary (defined)
Meltwater channel small (direction unknown)
Major moraine
Paleoshorelines
Iceberg scours
Fluting or drumfold ridge parallel to ice flow (direction unknown)
Till clast fabric
Gravel pit
Field observation site (with, without sample)▲△

GSC OPEN FILE 5283
EUB/AGS MAP 367
SURFICIAL GEOLOGY
MOODY CREEK
ALBERTA
Scale 1:50 000/Échelle 1/50 000

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Geology by C.J. Kowalchuk, B.C. Ward, R.C. Paulen, and A. Plouffe, 2004-2005
Airphoto interpretation by C.J. Kowalchuk, 2004-2005
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Digital map compilation by L. Robertson, Northern Canada Division, 2006
Digital cartography by J.D. Narraway, Data Dissemination Division (DDD)

Universal Transverse Mercator Projection
North American Datum 1983
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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 Alberta Sustainable Resource Development, modified by DDD.

Mean magnetic declination 2006, 21°27' E, decreasing 23.2' annually

Elevations in metres above sea level

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|--------|------------------|--------|
| 84 M05 | 84 M07 | 84 M08 |
| 84 M03 | 84 M02 OF5283 | 84 M01 |
| 84 L14 | 84 L15 | 84 L16 |

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE

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