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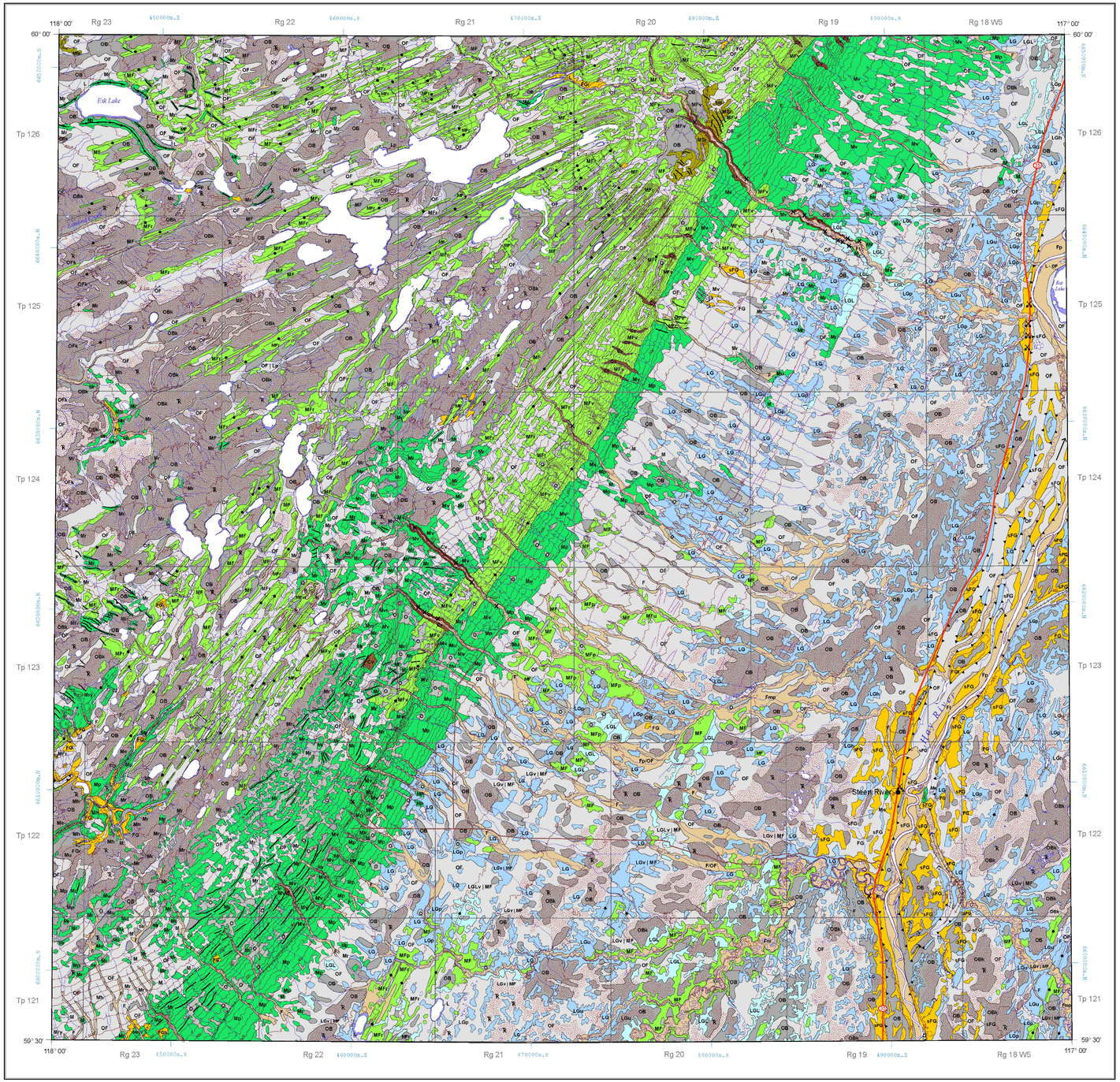

Published 2009

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Canada

AGS Map 420
GSC Open File 6104

Surficial Geology of the Cameron Hills Area (NTS 84N/NW)

Geology by: R.C. Paulen and A. Plouffe

Scale 1:100 000

0 2 4 6 8 10 kilometres
0 1 2 3 4 5 miles

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

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

This is a common map legend for the surficial geology of northern Alberta. Coloured legend blocks indicate map units that appear on this map. Not all map symbols shown in the legend necessarily appear on this map.

UNIT	UNIT NAME	DESCRIPTION AND GENESIS
QUATERNARY		
HOLOCENE		
A		**ANTHROPOGENIC MATERIALS:** Culturally made or modified geological materials such that their physical properties (e.g., structure, cohesion, compaction) have been drastically altered.
O		**ORGANIC DEPOSITS:** Undifferentiated peat (woody to fibrous muck) occurring in undifferentiated wetlands; commonly underlain by fine-grained, poorly drained glaciolacustrine deposits; includes marshes, swamps, bogs and fens.
	OB	**Bog peat:** Occurs in a peatland with a fluctuating water table and commonly a raised surface; peatland surface is dominated by sphagnum mosses, heath shrubs and short, stunted trees.
	OF	**Fen peat:** Occurs in a peatland with water table at surface and slow internal drainage; peatland surface is dominated by sedges, with grasses and reeds near local pools, and is sparsely treed.
C		**COLLUVIAL DEPOSITS:** Materials that have reached their present position as a result of direct, gravity-induced movement; commonly occurs as slope and slump deposits confined to valley slopes and floors; includes pre-existing bedrock, till, glaciolacustrine, glaciofluvial and eolian sediments, generally poorly sorted.
F		**FLUVIAL DEPOSITS:** Sediments transported and deposited by streams and rivers; synonymous with alluvial. Includes well-sorted stratified sand, gravel, silt, clay and organic sediments occurring in channel and overbank deposits (e.g., postglacial floodplains, terraces, fans and deltas).
L		**LACUSTRINE DEPOSITS:** Sediments deposited in and adjacent to recent and modern lakes; offshore sand, silt and clay, minor organic deposits; littoral (nearshore) beaches and bars; sand, silt and minor gravel.
E		**EOLIAN DEPOSITS:** Wind-deposited sediments; well-sorted, medium to fine-grained sand and minor silt (loess); generally massive to locally cross bedded or ripple laminated; includes both active and vegetated deposits.
PLEISTOCENE		
LG		**GLACIOLACUSTRINE DEPOSITS:** Primarily fine-grained, distal sediments deposited in or along the margins of glacial lakes, including sediments released by the melting of floating ice. Includes laminated (rhythmically bedded) to massive fine sand, silt and clay, and may contain ice-rafted stones.
	LGL	**Littoral and nearshore sediments:** Massive to stratified, well-sorted silty sand, pebbly sand and minor gravel; occurs as beaches, bars, spits and deltaic foresets deposited during regression and lowering of glacial lakes.
FG		**GLACIOFLUVIAL DEPOSITS:** Sediments deposited by glacial meltwater streams as subaerial or subaqueous outwash. Includes sand and gravel, often stratified, minor silt, and may show evidence of ice melting (slumped structures). Features include meltwater channels, kettle holes, terraces and minor ice-contact sediments.
	FGI	**Ice-contact sediments:** Sediments deposited by glacial meltwater streams in direct contact with glacial ice, either in front of (kame terraces) or within (eskers, crevasse ridges) glacial ice. Includes massive to stratified, poor to moderately sorted, coarse sediments (predominantly pebble gravel and coarse sand, locally till) and may show evidence of ice melting (slumped structures).
M		**MORAINE:** Nonsorted diamicton (till) deposited directly by glacial ice consisting of a mixture of clay, silt, sand and minor pebbles, cobbles and boulders. Locally, this unit may contain blocks of bedrock, pre-existing stratified sediment and till, and lenses of glaciolacustrine and/or glaciofluvial sediment.
	MS	**Stagnant ice moraine:** Material resulting from the collapse and lateral movement of englacial and supraglacial sediment in response to melting (ablation) of buried stagnant ice at the ice margin; sediment is mainly diamicton, but locally includes stratified sediments of glaciolacustrine or glaciofluvial origin. Characterized by low to high-relief hummocky topography.
	MT	**Ice-thrust moraine:** Terrain resulting from glacio-tectonic transport of originally subglacial material deposited by the glacier more or less intact; deposits may include syngenetic till, as well as masses of pre-existing till, stratified drift and/or bedrock. Characterized by high to moderate relief and features include hill-hole pairs and glacio-tectonic moraine ridges.
	MF	**Fluted moraine:** Glacially streamlined terrain; varies from alternating furrows and ridges to nearly equidimensional smoothed hills; all landforms parallel the local ice flow direction; includes flutes, drumlins and drumlinoids.
FP		**PREGLACIAL FLUVIAL DEPOSITS:** Sediments transported and deposited by streams and rivers prior to glaciation. Includes sand and gravel deposits occurring in paleovalleys (i.e., preglacial floodplains, terraces, fans and deltas); ranging from late Tertiary to middle Wisconsin.
PRE-QUATERNARY		
RT		**UNCONSOLIDATED FLUVIAL GRAVELS:** Predominately well-sorted, quartzite and chert gravel and cobbles; Cordilleran source, Paleogene (Tertiary) to early Quaternary.
R		**BEDROCK:** Undifferentiated; may include clastic sedimentary rock, shale, carbonate and crystalline (Shield), kimberlite and/or coal.

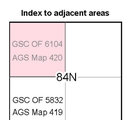
SYMBOL LEGEND

- Permafrost; relict and/or active
- Thermokarst depression
- Landslide and active layer failure scar (small)
- Landslide and active layer failure scar (large)
- Eolian forms; dune ridges
- Beach or strandline
- Wave-cut bench
- Escarpment
- Meltwater channel (minor)
- Meltwater channel (minor, flow indicated)
- Meltwater channel (major)
- Meltwater channel (major, flow indicated)
- Crevasse filling
- Ice-contact slope
- Kettle
- Esker, direction of paleoflow unknown
- Esker, direction of paleoflow indicated
- Drumlinoid or streamlined landform
- Drumlinoid, down-ice flow indicated
- Buried drumlinoid or streamlined landform
- Minor moraine ridge
- Major moraine ridge
- Iceberg scour
- Ice thrust ridge
- Striation (direction unknown)
- Striation (direction known)
- Bedrock outcrop
- Gravel and/or sand pit
- Section of stratigraphic interest

BASEMAP LEGEND

- Paved highway
- Gravel road - all season
- Unimproved road
- Truck-trail
- River
- Lake
- UTM, Zone 11 Grid (e.g. 430000m.E)
- Contour, intervals 10 metres
- Hamlet

Index to adjacent areas



UNIT NOTATION

Example: sandy GLACIOLACUSTRINE plain

s GL p
Textural modifier | Genetic unit | Geomorphic modifier

Textural Modifier

Textural characteristics may be applied to the terrain classification as a prefix based on field observations or by inference from distinctive genesis and/or morphology. When two modifiers are given, the second letter is the dominant texture, with the first letter indicating the secondary texture; i.e., sc for sandy clay.

p = pebble
g = gravel
s = sand
S = silt
c = clay
a = sand-silt-clay

GENETIC & GEOMORPHIC MODIFIERS

c	**crevasse fill**	ice-contact ridges, ice-squeeze deposits and linear forms deposited by meltwater in stagnant ice
d	**doughnut rings and ridges**	circular hummocks with a central depression, plateau mounds and brain-like pattern ridges, low to moderate relief
e	**eroded**	planar surface eroded by glacial meltwater, often capped by a boulder lag deposit and/or thin deposit of sand and gravel
f	**fan**	gently sloping fan-shaped mass of detrital debris
g	**gullied**	slopes dissected by modern ravines created by intermittent runoff
h	**hummock**	assemblage of approximately equidimensional hills and hollows; moderate to high relief (commonly greater than 2 m)
k	**collapse**	depression, including kettles, pitted morphology, thermokarst depressions, karst sinkholes
m	**meander**	sinuous curves, loops and oxbows produced as meltwater and modern streams shift their channels over time
p	**plain**	deposit greater than 2 m thick; commonly masks geomorphic pattern of underlying deposits; flat to gently rolling topography (commonly less than 2 m relief)
r	**ridged**	one or more parallel or subparallel, convex, linear morphological elements with a length-to-width ratio greater than 2; low to high relief
s	**slumped**	landslide blocks, slope failure debris
t	**terrace**	terrace bench cut by either meltwater or wave action; antiplanation terrace, kame terrace
u	**undulating**	low-relief rolling terrain; swell and swale topography
v	**veneer**	thin mantle of unconsolidated material too thin to mask the minor irregularities of the surface of the underlying material; it ranges in thickness from 10 cm to 1 metre and may be discontinuous
w	**washboard**	low-relief transverse moraine ridges, usually formed from basal ice shearing
y	**dissected**	channelled or dissected by glacial meltwater flow; dissected terrain by Holocene fluvial activity
z	**delta**	lake delta; ice-contact delta

Complex

Where two or more classes of terrain are interspersed in a mosaic or repeating pattern on a scale too small to warrant meaningful differentiation, the proportion of each component in the combination is given in a two or three position designation set off by slashes denoting arbitrary percentage limits. For example,

'Mp/LGv' means the area is underlain by approximately 60% morainal plain and up to 40% glaciolacustrine veneer.

'Mv/LGv/FGp' means at least 60% of the area is underlain by morainal veneer, with up to 40% glaciolacustrine veneer and less than 15% glaciofluvial plain.

'LGp/IM' means more than 60% of the area is underlain by a glaciolacustrine plain, with less than 15% moraine.

Stratigraphic Sequence

Where materials of different origins or textures are known to be superimposed or can be confidently inferred, the sequence is indicated in conventional order using vertical separators, such as:

'sLGv | Mp' Thin sandy glaciolacustrine sediment deposited on morainal plain

Transitional Association

Locally, two or more terrain units are juxtaposed by reason of related origin, temporal sequence or ambiguous geomorphic distinction. In the last case, both components may be present. Such situations are identified by a compound designation marked by a hyphen. Examples: 'FGz-LGz' indicating ice-contact delta indistinguishable from glaciolacustrine delta, or 'FGlk-MSh' indicating ice-contact kame and kettle topography that blends with hummocky stagnant ice moraine.

Morphologic Overprint

Where a sequence of geomorphic processes has produced a multi-aspect or compound terrain fabric, the geomorphic modifier suffixes are appended in the inferred order of superposition. 'Mpry' means a plain of till has been moulded into ridge forms and finally dissected by modern streams. 'FGphr' means a glaciofluvial plain has been discontinuously covered by ice-contact hummocks and ridges.

Acknowledgements

Surficial mapping was completed from 2005 to 2006 as an Alberta Geological Survey (AGS) and Geological Survey of Canada (GSC) collaborative contribution to NRD Project 4450 and the Quaternary mapping initiative under the Alberta Mineral Strategy. N. Atkinson, S. Botterill, H. Campbell, and K. Dlussky assisted with fieldwork. Digital cartography and GIS were completed by K. Mckay and GISmo Solutions Ltd. Base data provided by Spatial Data Warehouse Ltd. L. Dredge (GSC Ottawa) and N. Atkinson (AGS) provided constructive comments that improved this map.

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Recommended reference format

Paulen, R.C. and Plouffe, A. (2009): Surficial geology of the Cameron Hills area (NTS 84N/NW); Energy Resources Conservation Board, ERCB/AGS Map 420; Geological Survey of Canada, Open File 6104, scale 1:100 000.