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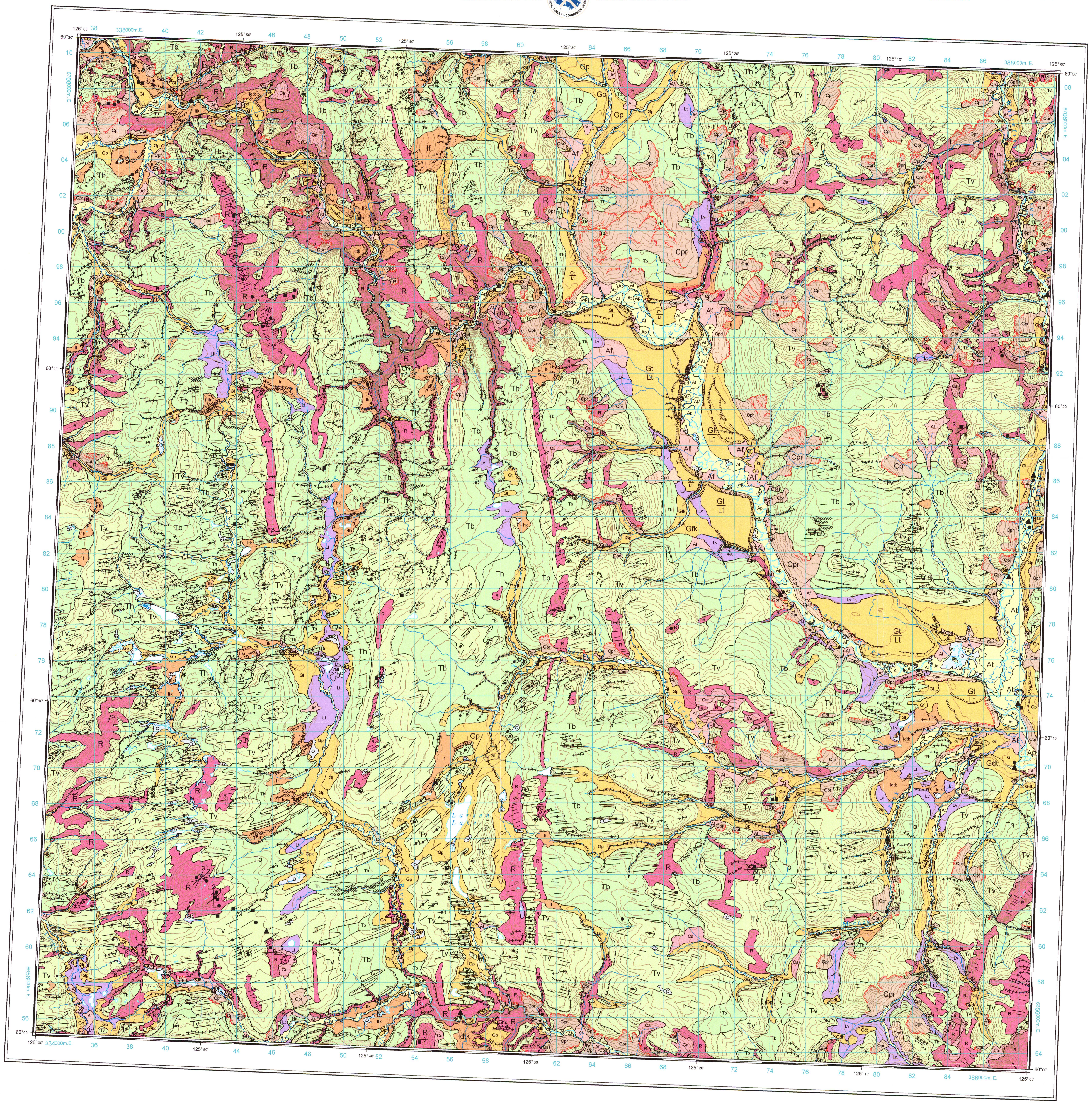
GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

Yukon Energy, Mines and Resources — Yukon Geological Survey — NATMAP CARTNAT Canada's National Geoscience Mapping Program / Le Programme national de cartographie géoscientifique du Canada



UNIVERSAL TRANSVERSE MERCATOR GRID, ZONE 10

LEGEND

Coloured legend blocks indicate units that appear on this map

QUATERNARY

SURFICIAL DEPOSITS

POST LAST GLACIATION

NONGLACIAL ENVIRONMENTS

O — ***ORGANIC DEPOSITS:*** *organic matter; >1 m thick; formed by the accumulation of vegetation in poorly drained depressions (swamps and bogs); usually forms flat terrain*

COLLUVIAL DEPOSITS: *block accumulations and mass wasting debris, 1-50 m thick*

Ca — *Talus (scree): accumulations of blocks; commonly exceeding 2 m in diameter; as much as 50 m thick; forming aprons and fans below cliffs*

Cpd — *Debris slump deposits: unconsolidated material; generally smaller blocks or more localized masses, but may include larger masses (>10 m thick) where associated with thick till, glaciolacustrine or glaciofluvial deposits; internal structure of material may be retained; commonly traceable upslope to active scarps; where sufficient moisture is present the slump can become a debris flow, producing characteristic levees along its lateral margins and a spatulate form at the base of slope*

Cpr — *Bedrock slump deposits: large rotational blocks in bedrock, shallow to 10's of metres thick; internal structure of material may be retained; commonly traceable upslope to active scarps; where sufficient moisture is present the slump may produce a flow at its base, forming a characteristic spatulate form; prominent in areas underlain by shale, siltstone and sandstone beds of Cretaceous Garbutt Fm. and Triassic Toad Fm.; associated with the largest mass movements in the region*

Csr — *Rock slide deposits: chaotic landscape of irregular and stacked bedrock blocks; associated with moderately dipping, poorly-indurated sandstone and shale-rich beds in the Mattson Formation*

ALLUVIAL DEPOSITS: *gravel, sand, and organic detritus; >1 m thick*

A — *Fluvial deposits: well sorted gravel and sand with detrital organic beds, including concentrations of logs;* **Ap**, *floodplains mantling valley floors, forming meander scars and point bars;* **At**, *terraces along valley wall sides*

Af — *Alluvial fan: poorly sorted gravel and sand with organic detritus and buried soils; fans are commonly crossed by debris flow channels and levees and subject to shifting stream courses*

POSTGLACIAL OR LATE WISCONSINAN

PROGLACIAL AND GLACIAL ENVIRONMENTS

L — ***GLACIOLACUSTRINE DEPOSITS:*** *coarse to fine sand, silt and clay, with gravel debris flow layers and dropstones; deposited in glacier-dammed lakes; level topography;* **Lv**, *thin discontinuous veneers, <1 m thick;* **Lt**, *forming terraces, commonly deeply dissected by postglacial erosion where thick*

GLACIOFLUVIAL DEPOSITS: *gravel, sand, minor sandy diamict, usually >1 m thick; deposited on, beneath, or in front of glacier margins*

G — *Proglacial outwash:* **Gdt**, *braided outwash delta terraces;* **Gf**, *fans;* **Gp**, *outwash plains mantling valley floors;* **Gt**, *level outwash terraces;* **Gk**, *kettle holes*

I — *Ice contact stratified drift: deposited behind or at the ice magin; topography is undulating, irregular, or ridged;* **It**, *lateral kame terraces;* **Id**, *braided outwash deltas;* **Idt**, *delta terraces;* **If**, *fans;* **Ik**, *kettle holes;* **Ih**, *hummocky moulin kame fields, or ice block disintegration terrain;* **Ir**, *eskers*

TILL: *nonsorted diamict deposited directly by glacial ice; matrix is sandy to clayey and contains striated clasts of various lithologies*

Tb — *Till blanket: > 2 m thick; forming undulating topography that obscures underlying bedrock structure;* **Th**, *hummocky topography*

Tv — *Till veneer: < 2 m thick and discontinuous; surface mimics underlying bedrock structure*

PRE-QUATERNARY

BEDROCK

R — *Bedrock, undifferentiated.*

NOTE: *Extensive and thick (>50 m) glacial Lake Beaver (unofficial name) sediment in the central part of the map area are capped by ~10 m of glaciofluvial lag deposits. In these areas, the surficial cover is coloured according to the overlying glaciofluvial deposits, and labelled as Gt/Lt to indicate the presence of the underlying thick glaciolacustrine sediment.*

MAP SYMBOLS

- *Geological boundary*
- *Slump scarp*
- *Terrace scarp*
- *Moraine*
- *Esker (direction of flow known or assumed)*
- *Striae (glacial flow direction known, unknown; cross-cutting striae are numbered sequentially)*
- *Fluting or drumlinoid ridge parallel to ice flow (direction of flow known, unknown)*
- *Proglacial meltwater channel; abandoned or occupied by small underfit stream (wide, narrow with direction of flow inferred)*
- *Kettle hole*
- *Ground observation*
- *Drift geochemistry sample site*
- *Canadian Shield erratic*

NOTE:

Mass Wasting: *is the collective term for a range of processes and resultant landforms that relate to the gravitational downslope movement of rock and/or unconsolidated material without direct conveyance by water, air or ice. Water and ice are, however, often key components in initiating and perpetuating mass wasting by reducing the strength of materials and in their plastic and fluid behaviour.*

Different types of mass wasting are distinguished by the type of materials involved (e.g., bedrock, talus, till), the mode of deformation (e.g., creep, slide, slump, flow), speed of movement, morphology of the moving mass, and water content.

Creep is the slow (mm's to cm's per year), often imperceptible, downslope movement of soil, talus or other unconsolidated material. Creep occurs episodically in response to solution weathering, seasonal wetting and drying, or freeze-thaw cycles and may include the plastic deformation of clay-rich soils. While more prevalent on steep slopes, creep can occur on slopes <5°. Creep is responsible for the formation of gelifluction lobes, prominent, small-scale (metres in length, centimetres thick), periglacial landforms found along upper reaches of local ridges (but not included in the regional surficial geology mapping).

Slides are rapid, downslope movements of bedrock or unconsolidated material. Failure occurs along bedding and/or fracture planes in bedrock, and along bedrock contacts, or structural and sedimentological boundaries within unconsolidated material. Slides can be initiated at shallow or considerable depths.

Slumps involve the rotational movement of bedrock and/or unconsolidated material along failure planes. Slumps may occur as individual blocks or amorphous masses (reflecting water content and structural integrity of the failing material). Slumps commonly extend progressively up-slope through time, and can be associated with active scarp or headwall retreat. Slumps can be initiated by failure along bedding, fracture, or sedimentological planes, by infiltration of surface water, through lateral incision and undercutting of slopes by streams or excavation activities (e.g., road building, pipeline trenching). Slumps are prominent in areas adjoining the Beaver River that are comprised of moderate to shallow dipping, Lower Cretaceous Garbutt Formation shale and siltstone, and Triassic Toad Formation shale and interbedded sandstone. Slumps are also prominent in valleys (independent of geology) where rivers and creeks are actively undercutting their banks. Slumps are associated with the largest mass movements in the map area.

While different earth surface materials and geological settings are often strongly associated with various types of mass wasting, predicting their occurrence, magnitude and rate of deformation is often not possible. Some areas that are prone to mass wasting include regions of steeply dipping bedrock, poorly indurated and shale-rich bedrock, and along stream courses and meandering river channels. Human activities such as road building, pipeline trenching, logging and seismic exploration can also initiate mass wasting, particularly where they undercut slopes, or act to destabilize surficial materials.

Glacial History: *The southwest La Biche River map area was glaciated during the last (Late Wisconsinan) glaciation (ca. 25-10 000 years ago) by the continental Laurentide Ice Sheet (LIS) flowing from the northeast (Keewatin Sector) and by the Cordilleran Ice Sheet (CIS) flowing from the west. The Laurentide Ice Sheet dispersed distinctive granite erratics, originating from the Canadian Shield, that were found atop the mountain ranges to the east (at elevations up to 1620 m above sea level (asl)), and are commonly found in river gravels along the Whitefish River and eastern reaches of the Beaver River within this map area. Rare granite erratics were found in the southern part of the map area in proximity to Larsen Creek and Crow River, and a single granite erratic was found atop a point bar in the Beaver River near the western limit of the map sheet. The spatial distribution of granite erratics suggests deposition by Laurentide ice extending into the map area as a series of valley-confined, lobate flows. This indicates that Laurentide ice occupied portions of this map are prior to arrival of the CIS. Coalescence of the LIS and CIS eventually occurred, subsuming the entire landscape. This coalescence is recorded by the eastward to northeastward rotational progression of striae, and bedrock flutes and drumlins within the map area (recording flow of Cordilleran ice), and a mirroring westward to northwestward flow of the same features in areas east of this map sheet (recording flow of Laurentide ice). The densely fluted and drumlinized terrain around Larsen Lake demonstrates this pattern particularly well. A 10-Be cosmogenic exposure age of 25.6 ± 3.2 ka cal. B.P. measured on a sandstone erratic from the crest (1850 m asl) of the Kotaneelee Range to the east also confirms that this coalescence occurred during the Late Wisconsinan and further provides a minimum regional upper elevational limit of glaciation.*

With the exception of crystalline syenites and Cambrian argillite which outcrop in the northwest part of the map area, striae were rarely preserved on bedrock. Dense forests and thick moss-lichen carpets over bedrock outcrops further diminished the potential striae record. Where found, striae largely parallelled the regional flutings and drumlin trends.

During deglaciation, a large proglacial lake formed between the two retreating ice sheets within the Beaver River valley. This glacial Lake Beaver (unofficial name) occupied >140 km², and contains silty-sand deposits >50 m thick. Three, eastward-descending levels of this former lake are recognized, reflecting different positions of impounding ice margins. As outlets to the east opened up, glacial Lake Beaver sediments were incised and terraced by deglacial rivers, leaving up to 10 m of glaciofluvial sand and gravel lag on the surface. Smaller scale, ice-contact, glaciofluvial and glaciolacustrine deposits are common within southward draining river valleys, marking the local impoundment of drainages by the retreating CIS.

Permafrost: *The map area lies within the region of discontinuous permafrost. In areas along the Whitefish River to the north, massive ground ice was identified within sections of glaciolacustrine sediment. Conspicuous seepage fronts and patterns of slumping in glaciolacustrine deposits along the Whitefish and Beaver rivers within the map area suggest buried ice masses may also exist, however this remains to be proven. In the southwest quadrant of the map area, permafrost appears to be widespread. White and black spruce forests exhibit chaotic tilting patterns on slopes (drunken forests) and stunted growth. There is also excessive accumulations of organic debris on the forest floor, and pits dug for drift prospecting frequently encountered frozen soil at depths <50 cm.*

Bedrock Geology: *The eastern reaches of the Beaver River are situated within a synclinal basin underlain by poorly exposed, generally shallow-dipping (<30°), fine-grained clastic strata of the Triassic Grayling and Toad formations and the Cretaceous Garbutt Formation. Sandstones of the Carboniferous Mattson Formation underlie high ground to the north and south of the Beaver River. To the west, the geology mainly comprises Cambrian to Devonian carbonate and coarse clastic strata repeated in shallow to moderate dipping, north-south trending fault panels. In the northwest corner of the map, the geology is further complicated by the presence of a Proterozoic syenite intrusion closely associated with exposures of Proterozoic clastic strata. Tertiary volcanism is indicated by the presence of Paleocene basalt capping 150+ m of unconsolidated Tertiary fluvial deposits, an Eocene syenite intrusion in the northwest corner of the map, and six intrusive Eocene trachytes with associated porphyritic volcanic deposits outcropping in the east half of the map. [see Fallas et al., 2004]*

REFERENCES

Fallas, K.M., Pigage, L.C., and MacNaughton, R.B. (compilers)
2004: Geology, southwest La Biche River (95C/SW), Yukon Territory and British Columbia; Geological Survey of Canada, Open File 4664, 2 sheets, scale 1:100 000.

INDEX MAP

CONTOUR INTERVAL 100 FEET
Elevations in Feet above Mean Sea Level

OPEN FILE 4680

SURFICIAL GEOLOGY

LA BICHE RIVER (southwest)

YUKON TERRITORY - BRITISH COLUMBIA

Scale 1:100 000/Échelle 1/100 000

Kilometres 2 0 2 4 6 Kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

Projection transverse universelle de Mercator
Système de référence géodésique nord-américain, 1983

Compilation by I.R. Smith based on fieldwork and studies of vertical air photographs 1999-2002.
THIS MAP IS A PRODUCT OF THE CENTRAL FORELAND NATMAP PROJECT

Surficial geology from field work by I.R. Smith 1999-2002.
Additional data from L. Pigage, 2001-2002.

Digital cartography by Géotech and I.R. Smith.

Ary revisions or additional geological information known to the user would be welcomed by the Geological Survey of Canada.

Base maps at 1:50 000 scale published by Surveys and Mapping Branch in 1971.

95D/E Coal River	95C/NW La Biche River	95C/15 Dendale Lake	95C/16 Etanda Lakes GSC OF 1671
		95C/10 Tika Creek GSC OF 4702	95C/9 Chinkeh Creek GSC OF 1615
	95C/SW La Biche River GSC OF 4680	95C/7 Brown Lake GSC OF 1771	95C/8 Babiche Mountain GSC OF 1558
		95C/2 Mount Merrill GSC OF 4324	95C/1 Mount Martin GSC OF 4260
94M/NE Rabbit River	94N/N Toad River		

NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

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4680
GEOLOGICAL SURVEY OF CANADA
COMMISSION GÉOLOGIQUE DU CANADA
2004

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