

Descriptive Notes

Physiography and Drainage
The north trending Watson River valley lies in the central part of the map area and is bound by the Mount Lorne upland and the Lewes Creek headwaters to the east and Gray Ridge to the west. The highest summit in the map area is Mount Lorne at 2000 m.

The Watson River meanders eastward into the map area and bends south near Bear Creek. Further south, Lewes Creek flows into Lewes Lake which then drains into the Watson River. Annie Lake drains into the Watson River near the western edge of the map area. A portion of the Wheaton River is visible in the southwestern corner of the map area.

The McConnell Glaciation in the Whitehorse area
During the Late Wisconsin McConnell Glaciation (~20 000 years ago), the Whitehorse map area (NTS 105D) was glaciated by ice lobes originating in the Coast Mountains and the Cassiar Mountains of southern Yukon. Initial ice accumulations in the map area probably began in the higher regions of the Coast Mountains. It was likely not until localized ice caps had formed that the more distal Cassiar Lobe advanced into the map area from the southeast through Marsh Lake valley. The convergence of the two lobes at glacial maximum occurred over the Coast Mountains west of the city of Whitehorse. At the height of the last glaciation, movement of ice over this area was to the northwest and was unobstructed by topography.

The pattern of deglaciation is highlighted by periods of differential retreat and fluctuating ice fronts. A re-advance of the Cassiar Lobe occurred into this area and in doing so deposited a significant amount of sediment on the landscape. The re-advance covered most of this map area as it flowed westward into the Coast Mountains. As it retreated and thinned the lobe broke into a series of valley glaciers separated by uplands. During this period there were a number of prolonged recessional standstills where the ice margin stayed in one place. The most significant phase in the glacial recession has been termed the Chadium stage (see map 2 and 3) after the Chadium Lake area in the Whitehorse city limits. Ice flowing westward from the Marsh Lake/Fish Lake area wrapped around the Mount Lorne/Cassiar Mountain upland splitting the ice front into two valley glaciers. The valley glacier to the north filled the Yukon River valley with its ice front positioned over the Chadium Lake area. The valley glacier to the south flowed west and north up the Watson River valley and terminated in the Lewes Lake area. A third valley glacier filled the lower portion of the Watson River valley and terminated at Annie Lake. Melwater draining off these various ice lobes is provided in the Watson River valley and drained westward into the Rose Lake area.

Landforms
Lewes Lake
A large area of ablation moraine was deposited in the Lewes Lake area during the Chadium recessional stage (Figure 1). The depression in which Lewes Lake lies owes its existence to the poorly drained swath of rolling gravel deposits left behind by the former glacier. The access road into Lewes Lake off the South Klondike Highway exposes the gravel deposits in road cuts. At Lewes Lake the rolling moraine topography is clearly visible. Also exposed around the margin of the lake are small moraine deposits that formed on the bottom of Lewes Lake in the post-glacial period. The water level in Lewes Lake was dropped for railroad engineering purposes in the early 1900's, exposing portions of the lake bed.

Mount Lorne
Three well developed cirques are visible from the South Klondike Highway on the west side of Mount Lorne (see circle symbol on map, Figure 2). Small alpine glaciers (1-2 km in length) formed in these cirques during the late stages of the last glaciation. Their moraines are well defined (see moraine symbols).

Bear Creek
A thick package of kame delta sediments is exposed in Bear Creek about 3 km east of the South Klondike Highway. This large delta formed marginal to the glacier that once filled the lower Watson River valley and blocked the Bear Creek drainage. Melwater was also entering the drainage at the headwaters from Marsh Lake by pushing westward up against the Mount Lorne upland (Figure 3). Deep meltwater channels are still visible as the drainage divide.

Watson River flats
Broad glacial lake bed surfaces characterize the Watson River valley north and west of Lewes Lake. These all-ice deposits were laid down in a glacial lake that once covered this portion of the valley. It places the glacial lake sediments have been reworked by the strong southerly winds into small dunes (see "E" in the map legend). All the alluvial features in this map area are currently inactive.

Cowley Lake
See map 3

Annie Lake
Large terraces and undulating gravelly deposits can be found in the vicinity of Annie Lake. During the Chadium stage phase in ice recession, northward flowing ice filled the lower Watson River valley and terminated at Annie Lake. Water draining off the ice front flowed northward into Glacial Lake Watson. The north end of Annie Lake still has a river channel morphology that is remnant of this glacial meltwater drainage (Figure 4).

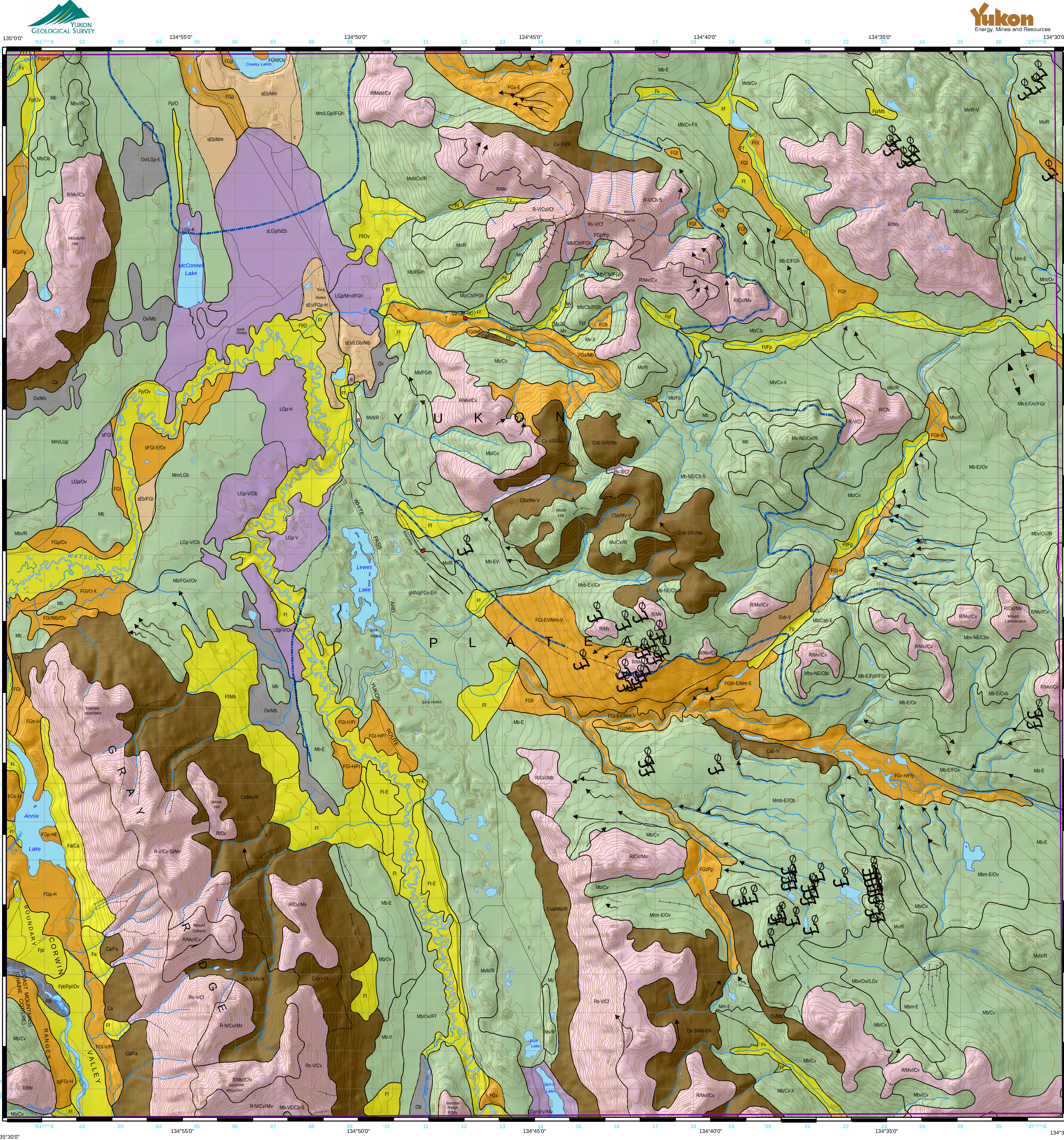
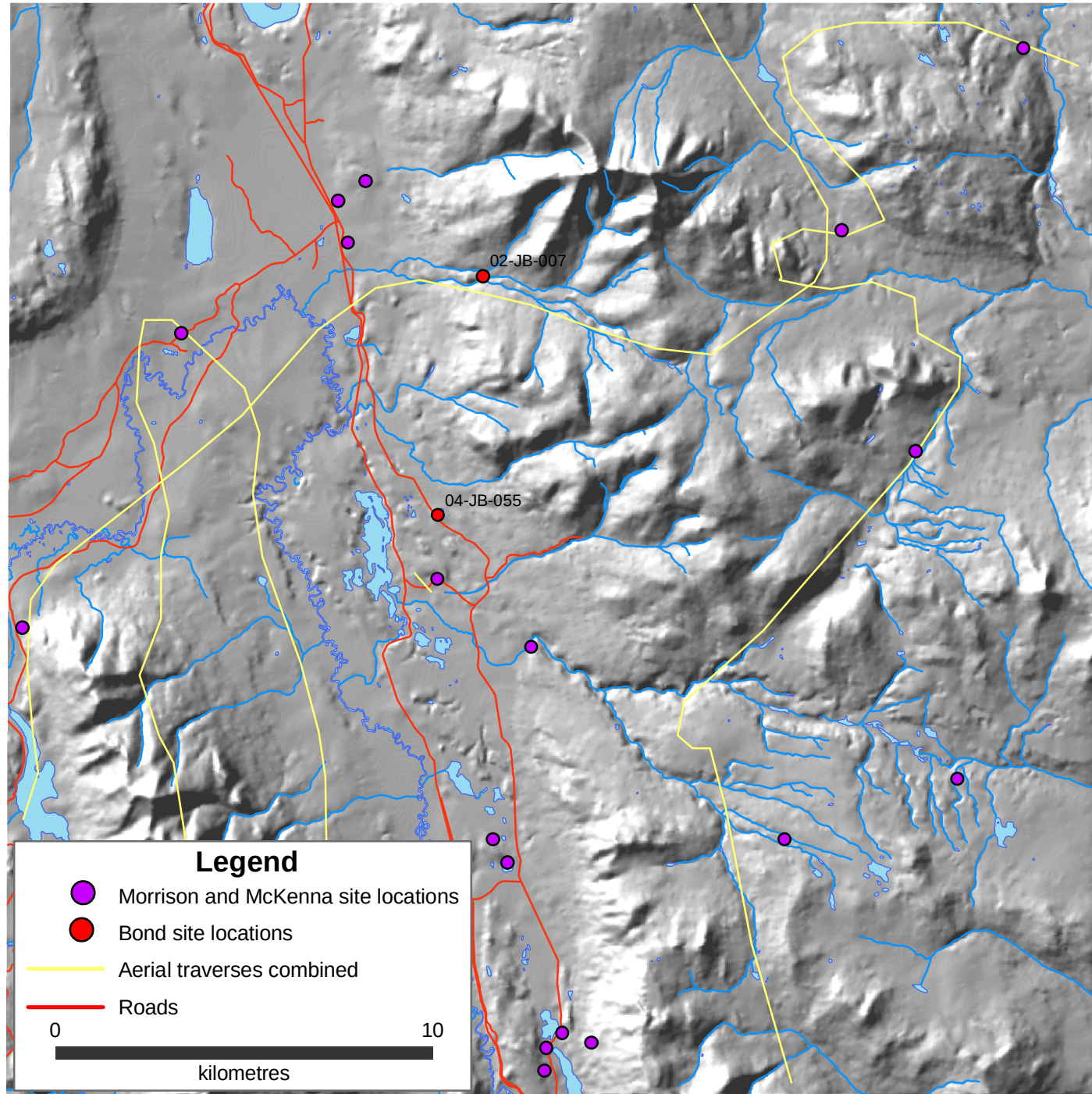
Figure 1. An aerial view to the south over Lewes Lake. Lewes Lake is contained within a large area of ablation moraine that was deposited at the terminus of a glacier that once filled the Watson River valley. An esker is visible in the middle of the lake. This ablation moraine was deposited at the same time as the Chadium lake moraine near Whitehorse (Chadium Stage). Till associated with ablation processes often consists of coarse textured gravelly sediment.

Figure 2. An aerial view of Mount Lorne's southeast facing cirque. The view is to the northeast. The moraine symbol line shows the limit of a local alpine glacier that advanced out of the cirque during the latter phases of the last glaciation.

Figure 3. An aerial view to the south over the upland surface that extends south of Mount Lorne. The dip to the surface of a kame terrace (see arrow) indicates that meltwater draining across this upland flowed from east to west.

Figure 4. An aerial view to the southeast looking over Annie Lake. The channel-like morphology of the north end of the lake is a remnant portion of a northward flowing river that emptied into Glacial Lake Watson. The river was fed by drainage out of the Watson River valley which was diverted north due to a glacier positioned in the valley to the south. Today, the Annie Lake Road traverses across this former river channel.

Aerial Traverses and Site Locations

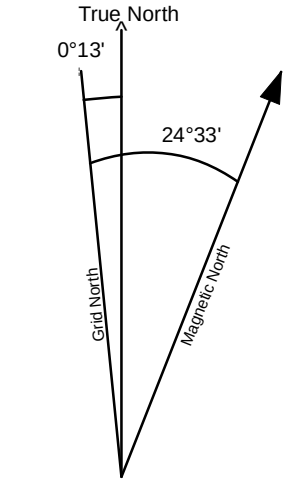


SURFICIAL GEOLOGY
ROBINSON
NTS 105D/07
YUKON
SCALE 1:50 000

ONE THOUSAND METRE
Universal Transverse Mercator Grid
Zone 8

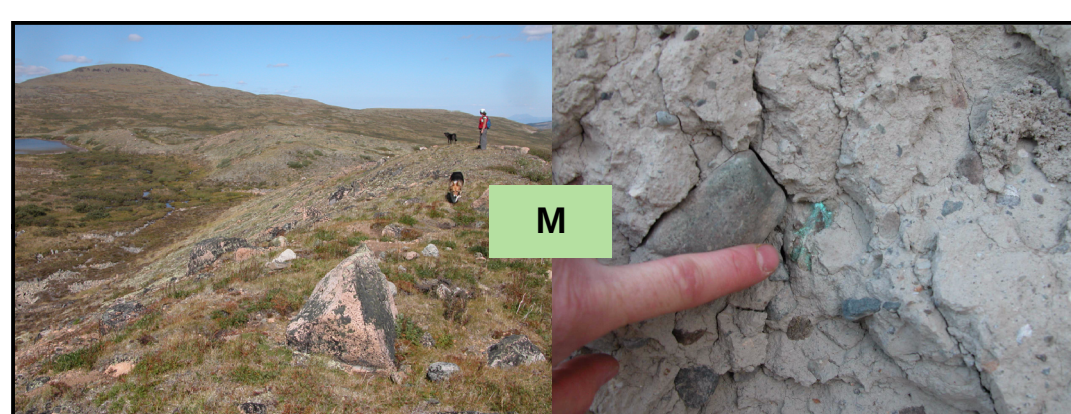
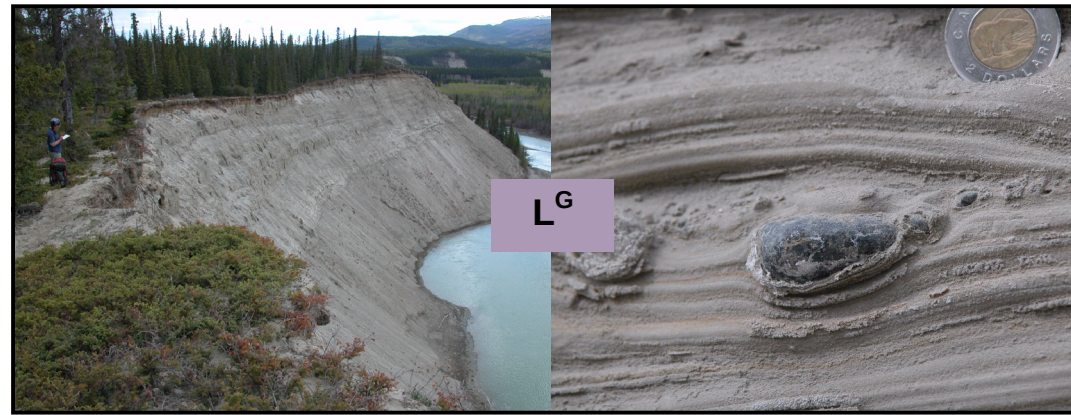
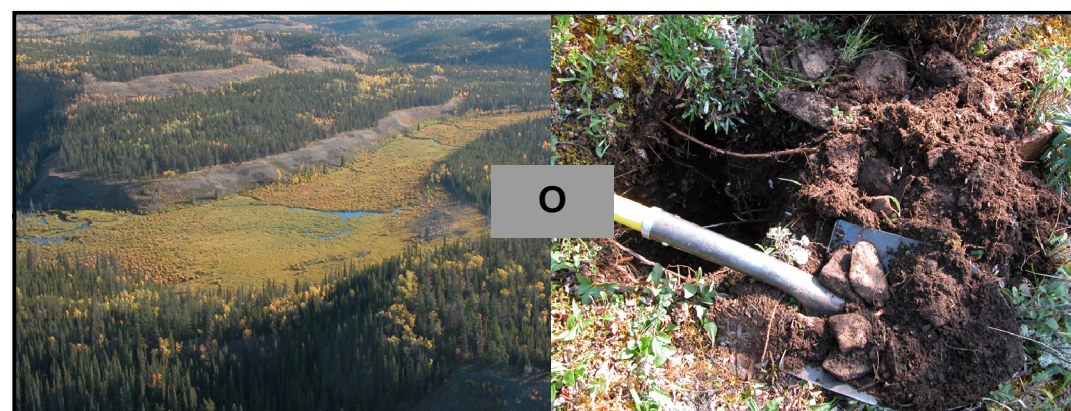
CONTOUR INTERVAL 100 FEET
Elevation in feet above Mean Sea Level
North American Datum 1987
Universal Transverse Mercator

2:50 000-scale base data
PROCESSED FOR TOPOGRAPHIC
INFORMATION
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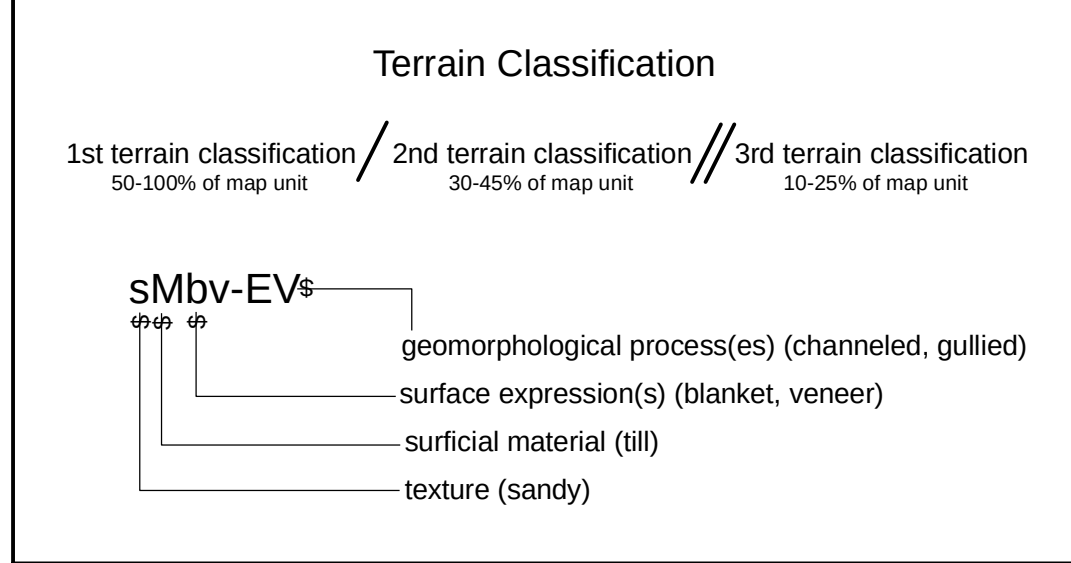


Use diagram only to obtain numerical values
APPROXIMATE MEAN DECLINATION 2000
FOR CENTRE OF MAP
Annual change decreasing 11.5

QUATERNARY



PRE-QUATERNARY (UNDIVIDED)



Legend

SURFACE EXPRESSION

Surface expression refers to the form (percentage of slopes) and pattern of forms expressed by a surficial material at the land surface. This three dimensional shape of the material is determined by landform, texture, and grain. Surface expression symbols also describe the manner in which unconsolidated surficial materials relate to the underlying substrate (e.g., veneer). Surface expression is indicated by up to three lower case letters, placed immediately following the surficial material designation, listed in order of decreasing extent.

Label	Name	Description
a	apron	Material that has been transported down a slope and deposited in accumulations at the base of the slope.
b	blanket	A layer of unconsolidated material thick enough to mask minor irregularities of the surface of the underlying material, but still conforms to the general underlying topography. A blanket is greater than 1 m thick and possesses no constructional forms typical of the material's genesis; outcrops of the underlying unit are rare.
d	delta	Flat to gently sloping surface deposited at the mouth of a river in a body of water. Channel scars on the delta surface are commonly visible.
f	fertile	A fan is a relatively smooth sector of a cone with a slope gradient from apex to toe not including 15° (20%), and a longitudinal profile that is either straight, or slightly concave or convex. Commonly applies to fluvial fans.
h	hummocky	Steep-sided hummocks and hollows with undulating surfaces dominantly between 15 and 30° (20° to 70%) if composed of unconsolidated materials; bedrock slopes may be steeper. Local relief is greater than 1 m. In plan, an assemblage of non-linear, generally chaotic forms that are rounded or irregular in cross-profile. Commonly applied to kame and kettle glacialic terrain.
m	moraine	Elongate hummocks with slopes dominantly between 3 and 35° (5 to 20%) with local relief more than 1 m. In plan, an assemblage of parallel or sub-parallel linear forms with subdued relief. Commonly applied to bedrock ridges and fans or streamlined hills.
p	plain	A level or very gently sloping, unconsolidated glacial surface with gradients 0.5 to 2° (1 to 3%) local surface irregularities generally have a relief of less than 1 m. Applied to glacial-till floodplains, organic deposits, lacustrine deposits and alluvial plains.
r	ridge(s)	Elongate hummocks with slopes dominantly between 15 and 35° (20 to 70%) if composed of unconsolidated materials, bedrock slopes may be steeper. Local relief is greater than 1 m. In plan, an assemblage of parallel or sub-parallel linear forms. Commonly applied to streamlined hills, moraine ridges, convulse fillings and ridge bedrock.
s	steep slope	Unconsolidated glacial surface with gradients greater than 20° (30%), and a smooth longitudinal profile that is either straight, or slightly concave or convex. Local surface irregularities generally have a relief of less than 1 m. bedrock slopes may be more irregular. Commonly applied to terrace scapes, gently sloping and bedrock cliffs.
t	terraced	A single or assemblage of step-like forms where each step-like form consists of a steep face and a horizontal or gently inclined surface (broad) above it. Applied to fluvial and lacustrine terraces and stepped bedrock topography.
v	veneer	A layer of unconsolidated materials too thin to mask the minor irregularities of the surface of the underlying material. It is between about 10 cm and 1 m in thickness, and possesses no constructional forms typical of the material's genesis. Commonly applied to debris caps and colluvial veneers.
x	complex	A combination of several surface expressions.

GEOMORPHOLOGICAL PROCESSES

Geomorphological processes are natural mechanisms of weathering, erosion and deposition that result in the modification of the surficial materials and landforms at the earth's surface. Processes are indicated by up to three upper case letters, listed in order of decreasing importance, placed after the surface expression symbol, and separated from the surface expression by a dash (-).

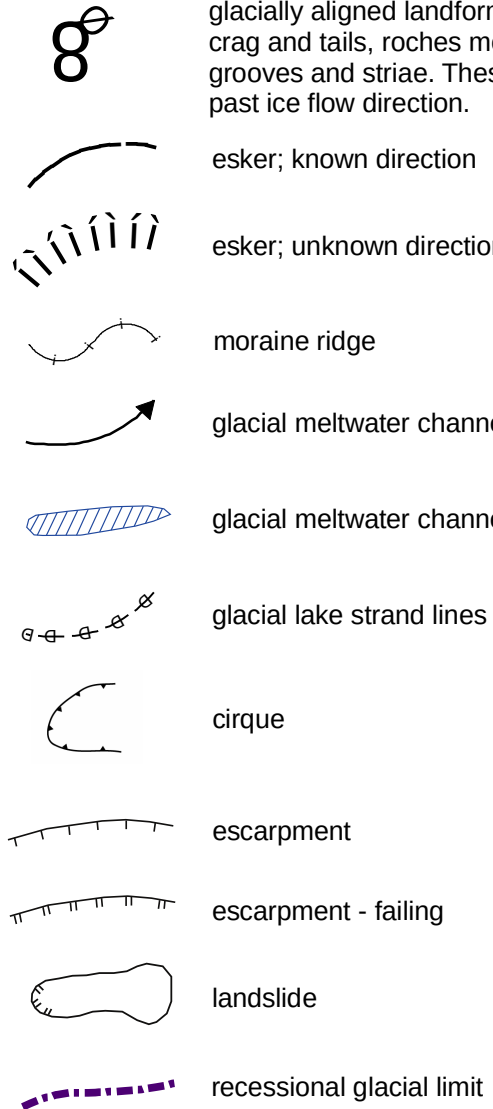
Group	Process	Label	Description
Erosional Processes	deflation	D	The removal of sand and silt particles from unconsolidated materials by wind.
	thrusting	T	Characterized by subsidence and causing due to melting or ground ice in permafrost areas.
	glacial erosion	V	Shallow, linear, melt movement and/or snow avalanching, resulting in the formation of parallel and subparallel long, narrow ridges.
Mass Movement Processes	active	A	Flowing, sliding, melt, locally spring water (ice, meltwater), resulting in lag deposits formed by the removal of fines from a matrix of coarse and fine particles.
	landslide	L	Call of slanted or moving water later not underlying by fluvial deposits.
	snow avalanches	A	Rapid downslope movement of snow and ice, as well as incorporated rock, surficial material and vegetation debris, by flowing or sliding.
Periglacial Processes	creep	C	Downslope movement of masses of cohesive or non-cohesive surficial material and/or bedrock by creeping, flowing or slumping.
	crystallization	C	Movement of surficial materials by heating and/or churning due to frost action (expansion freezing and thawing).
	recession	R	Erosion of bedrock or surficial materials beneath and along the margin of snow patches by freeze-thaw processes (frost chattering and thermal contraction) and/or by the action of meltwater.
Depositional Processes	solifluction	S	Slow gravitational downslope movement of saturated non-frozen overburden across a frozen or otherwise impermeable substrate.
	permafrost processes	X	Processes controlled by the presence of permafrost and permafrost degradation or degradation. Applied to areas with continuous, discontinuous, and/or seasonal permafrost.
	channelized by meltwater	E	Erosion and channel formation by meltwater ablation, beneath, or in front of a glacier.
	settled	T	Depositions in surficial materials resulting from the melting of buried glacial ice.

TEXTURE

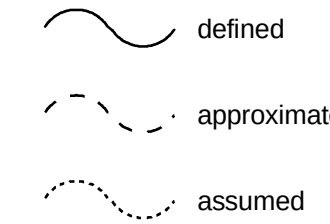
Describes the dominant size of particles in mineral sediments and the fiber content of organic materials. Texture is indicated by up to three lower case letters.

Label	Name	Description
a	angular	Angular particles greater than 256 mm in size.
b	blocky	Angular particles greater than 256 mm in size.
c	coarse	Two or more size ranges of rounded particles greater than 2 mm. May include interstitial sand.
d	fine	Most of the sand and clay may also include silt and clay.
i	intermediate	Intermediate particles greater than 256 mm in size.
l	loose	Unconsolidated particles having a diameter of 0.25 mm.
p	poorly sorted	Unconsolidated particles having a diameter of 0.25 mm.
s	sorted	Particles of which the fine earth fraction contains more than 70% by weight of fine sand or coarse particles. Particles greater than 2 mm occur less than 30% by volume.
t	textured	Particles of which the fine earth fraction contains less than 15% of sand or coarse particles and less than 30% clay. Particles greater than 2 mm occur less than 30% by volume.
z	clay	Particles where the fine earth fraction contains 35% or more clay (less than 0.002 mm) by weight and particles greater than 2 mm occur less than 30% by volume.
o	organic	The near decomposition of all organic materials; there is a large amount of well preserved fiber that is readily identifiable as to botanical origin. Fibers retain their characteristic shape upon rubbing.
f	fertile	Organic material in an intermediate stage of decomposition; there is an intermediate amount of fiber that can be identifiable as to botanical origin.
m	moor	Highly decomposed organic material; there is a small amount of fiber that can be identified as to botanical origin. Fibers that are present can be easily destroyed by rubbing.
h	humic	Organic material containing more than 50% of woody fibers.

SYMBOLS



GEOLOGICAL BOUNDARIES



REFERENCES

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- Morison, S.R., McKenna, K., and Davies, S., 1982. Soils and surficial geology, Southern Lakes Project (Maps 105D SE, SW, NE, NW). Resource Planning and Management Branch, Department of Renewable Resources, Government of Yukon.
- Wheeler, J.O., 1961. Whitehorse Map-Area, Yukon Territory 105D. Geological Survey of Canada, Memoir 312, 156 p.

RECOMMENDED CITATION

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Any revisions or additional geological information known to the user would be welcomed by the Yukon Geological Survey.

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Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Geoscience Map 2005-5
Surficial Geology of Robinson (NTS 105D/07),
Yukon (1:50 000 scale)

by
J.D. Bond, S.R. Morison and K. McKenna