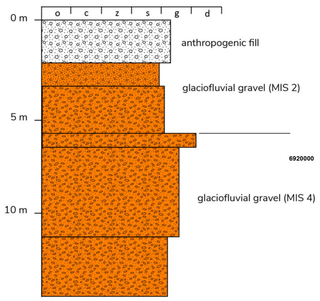
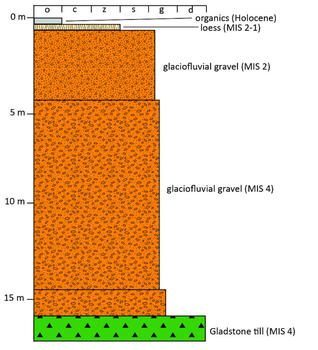
BOREHOLE LOGS

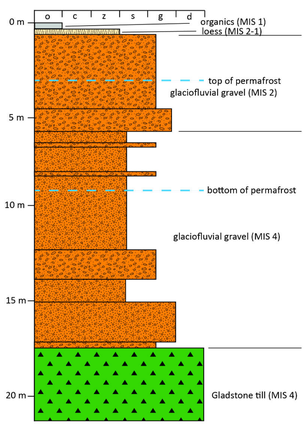
YGS_BC_Hwys
62.37973, -140.87811

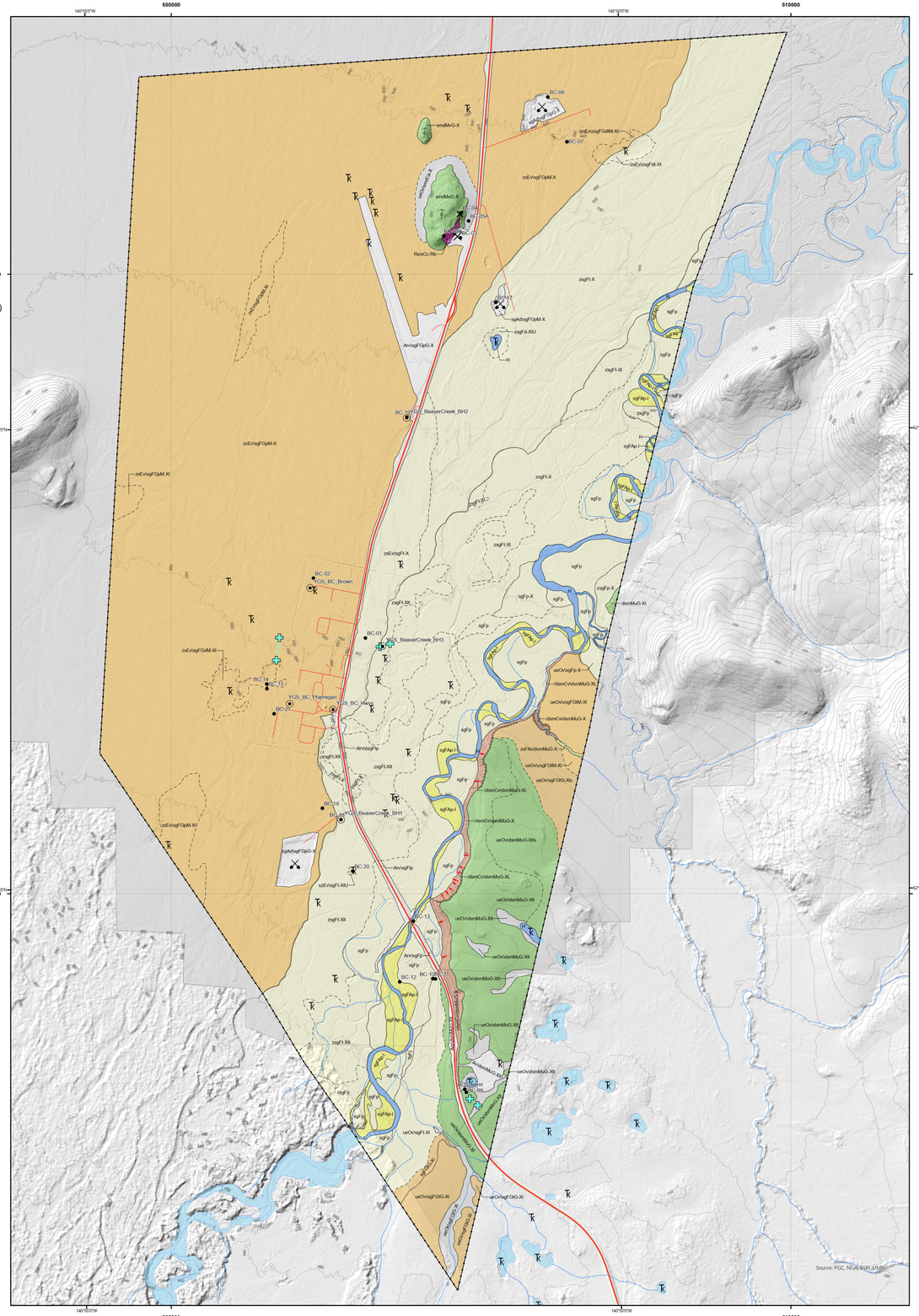


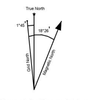
YGS_BC_Brown
62.38855, -132.88160



YGS_BC_Ptarmigan
62.38027, -140.88485







Use diagram only to obtain numerical values
APPROXIMATE MEAN DECLINATION APRIL 2020
FOR CENTRE OF MAP

SURFICIAL GEOLOGY

BEAVER CREEK, YUKON

PARTS OF NTS 115K/7

SCALE 1:15 000

0 0.5 1 2

kilometres

1:50 000 scale topographic base data produced by CENTRE FOR TOPOGRAPHIC INFORMATION, NATURAL RESOURCES CANADA

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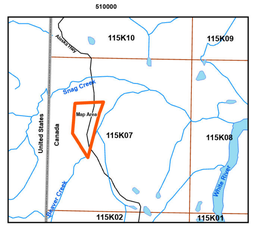
ONE THOUSAND METRE GRID
Universal Transverse Mercator Projection
North American Datum 1983
Zone 7

CONTOUR INTERVAL 10 METRES
Elevations in metres above Mean Sea Level



LEGEND

This surficial geology map was classified using the Terrain Classification System for British Columbia (Howes and Kenk, 1997), with minor modifications to meet standards set by the Yukon Geological Survey (2021). A sample map unit label is shown below to illustrate the terrain classification system. Surficial materials form the core of the polygon map unit labels and are symbolized with a single upper case letter. Lower case textures are written to the left of the surficial material, and lower case surface expressions are written to the right. An upper case activity qualifier (A = active; I = inactive) may be shown immediately following the surficial material designator. The glacial qualifier "G" may alternatively be written immediately following the surficial material to indicate glacially modified materials. Age is indicated by a capital letter that follows the surface expression but precedes the process modifiers. Geomorphological processes (capital letters) and subclasses (lower case letters) always follow a dash symbol ("-").

TERRAIN CLASSIFICATION SYSTEM

COMPOSITE SYMBOL DELIMITERS:

Due to scale limitations, up to 4 terrain units may be included in a single map unit label (*e.g.*, sgFGptM.dsmMbM/xsCv\ptLGpM-XvV). Each component is separated by a delimiter that indicates relative proportions between the components (".", "/", "//") or a stratigraphic relationship ("\").

"." - terrain units on either side of the symbol are of approximately equal proportion
"/" - terrain unit(s) before the symbol is more extensive than the one(s) following; where present at the beginning of a terrain unit, indicates discontinuous cover
"//" - terrain unit(s) before the symbol is considerably more extensive than the one(s) following
"\" - terrain unit(s) before the "\" symbol stratigraphically overlies the one(s) following

SURFICIAL MATERIALS

Surficial materials are non-lithified, unconsolidated sediments. They are produced by weathering, sediment deposition, biological accumulation, and human and volcanic activity. In general, surficial materials are of relatively young geological age and constitute the parent material of most (pedological) soils. Note that a single polygon will be coloured only by the dominant surficial material, but other materials may exist in that unit.

A

HOLOCENE
Anthropogenic (A): Surficial materials modified by human activities such that their original physical properties have been significantly altered. Applied to areas within the map where anthropogenic deposition or erosion has altered the original landform. (*i.e.*, gravel pits, building pads, road prisms, airstrips, landfills).

O

Organic (O): Material derived from the decomposition of organic matter consisting of peat with fibric to mesic decomposition. Organic materials in the map area are commonly found in low-lying areas where wet ground conditions have facilitated a thick accumulation of vegetative matter. In the map area, organic deposits form blankets (greater than 1 m thick) and veneers (less than 1 m thick) over inorganic materials that commonly have poor drainage capacity due to a high percentage of silt and clay and a shallow permafrost table. In the map area, the topographic lows found in undulating moraine deposits and glaciofluvial and inactive fluvial terraces with overbank silts are prone to the accumulation of organic material due to the combination of poor drainage and impermeable surface materials. Ice-rich permafrost conditions are common in these deposits.

F

Fluvial – inactive (F): Sediments transported and deposited by modern streams and rivers, found in floodplains, fans and terraces. Fluvial sediments in the map area are predominantly those comprising high-energy meandering river floodplains. Fluvial deposits typically consist of well-sorted stratified sand and gravel comprising subangular to well-rounded clasts with minor silt. Inactive floodplain deposits may be subject to flooding accompanied by sudden stream migration and inundation. Permafrost is common in inactive fluvial sediments, fine-grained lenses and beds in fluvial deposits may contain ice, although it may be discontinuous over relatively small areas.

F^{A}

Fluvial - Active (F^{A}): Active fluvial sediments in the map area are predominantly associated with floodplains and channels of Beaver Creek. Beaver Creek is a meandering river that bisects the map area, running generally southwest to northeast. Permafrost is uncommon in active fluvial deposits.

C

HOLOCENE AND PLEISTOCENE
Colluvium (C): Material transported and deposited by down-slope, gravity-driven processes such as creep, solifluction, landslides and snow avalanches. It commonly has a weakly-stratified structure with a variable texture and composition controlled by the parent material, transport mechanism and travel distance. Colluvium is rare in the map area and associated with mass movement on steeper slopes.

E

Eolian - Inactive (E): Sediment transported and deposited by wind. Much of the map area is covered with a veneer of wind-deposited fine sand and silt that may not be indicated in material labels. Eolian veneers are ubiquitous on surfaces older than Holocene. Thicker eolian deposits are present within shallow channels on glaciofluvial surfaces and may be ice-rich.

F^{G}

PLEISTOCENE AND OLDER
Glaciofluvial (F^{G}): Glaciofluvial deposits include materials that have been deposited by glacial meltwater either directly in front of, or in contact with, glacier ice. Glaciofluvial materials are abundant in the Beaver Creek map area and form two distinct terraces associated with McConnell and Gladstone glaciations. The Gladstone surface (F^{G} G) forms a large braided outwash plain making up the areas west and north of the map area. Small remanent terrace in the south and southeast portions of the map area are present where not overlain by McConnell glaciofluvial outwash. The McConnell outwash surface is incised into the Gladstone surface and forms a discontinuous terrace dissected by Holocene fluvial erosion. McConnell outwash deposits form the majority of the map area Glaciofluvial deposits may be affected by permafrost but in most cases are ice-poor due to their coarse grain size. Several large depressions in the glaciofluvial surfaces up to 7 m deep suggest buried glacier ice has been and may still be present within or below these materials. Glaciofluvial materials provide an ideal source for aggregate.

M

Moraine (M): Moraine deposits (till) include materials that have been deposited directly by a glacier or ice sheet without modification by any other agent of transportation. Moraine deposits are typically highly variable and depend upon both the source of material incorporated by the glacier and the mode of deposition. Moraine deposits in the map area are characterized by poorly-sorted, strongly-compacted material lacking stratification and containing a heterogeneous mixture of lithologies and particle sizes, usually in a matrix of sand, silt and clay. The moraine deposits in the map area were deposited by the St Elias lobe of the northern Cordilleran Ice Sheet, likely during the Gladstone glaciation (Turner *et al.*, 2013). Moraine deposits are commonly affected by permafrost and some moraine deposits may be ice-rich due to segregated or buried ice.

R

Bedrock (R): Bedrock exposure is rare in the region area due to thick glacial sediments covering all but most prominent bedrock cored hills and ridges and steep slopes and ridges beyond the Gladstone glacial limit. The only exposure in the map area is of Ruby Range Suite granodiorite (Yukon Geological Survey, 2022)

SURFICIAL MATERIAL AGE

GLACIATION	TIME PERIOD	APPROXIMATE GLACIAL AGE	MARINE ISOTOPE STAGE
M - McConnell	late Wisconsin	15 000 years ago	2
G - Gladstone	early Wisconsin	55 000 years ago	4

TEXTURE

Texture refers to the size, shape and sorting of particles in clastic sediments, and the proportion and degree of decomposition of plant fibre in organic sediments. Texture is indicated by up to three lower case letters, placed immediately before the surficial material designator, listed in order of increasing abundance.

Specific clastic textures
s - sand: particles >0.0625–2 mm in size
z - silt: particles 2 µm–0.0625 mm in size

Common clastic textural groupings
d - mixed fragments: a mixture of rounded and angular particles >2 mm in size
g - gravel: a mixture of two or more size ranges of rounded particles >2 mm in size (*e.g.*, boulders, cobbles and pebbles); may include interstitial sand
m - mud: a mixture of silt and clay; may also contain a minor fraction of fine sand

Organic terms
e - fibric: contains well-preserved fibre (40% or more) that can be identified as to botanical origin upon rubbing
u - mesic: contains organic materials in an intermediate state of decomposition

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. All processes are assumed to be active unless the qualifier "I" (inactive) is used. Up to three upper case letters may be used to indicate processes. These are listed in order of decreasing importance and placed after the surface expression symbol, following a dash (-) symbol.
Subclasses are used to provide more specific information about a general geomorphological process, and are represented by lower case letters placed after the related process designator. Up to two subclasses can be associated with each process. Process subclasses used on this map are defined with the related process below.

HYDROLOGIC PROCESSES
I – irregularly sinuous channel: a defined main channel that does not show consistent repetition of meander forms. Back channels, side channels, bars and islands may be present.
U – inundation: terrain seasonally under standing water which results from high watertable.

MASS MOVEMENT PROCESSES
L – undifferentiated landslide: rapid or slow downslope movement of masses of cohesive or non-cohesive surficial materials and/or bedrock.

PERIGLACIAL PROCESSES
X - permafrost: processes controlled by the presence of permafrost, and permafrost aggradation or degradation.
Subclasses: (l) segregated ice – ice forming discrete layers of lenses within the subsurface. ; (s) sheetwash – small parallel channels draining permafrost slopes, (t) thermokarst subsidence – ground-surface depressions created by the thawing of ice-rich permafrost and associated soil subsidence

DEGLACIAL PROCESSES
H - kettled: depressions in surficial materials resulting from the melting of buried glacier ice.

SURFACE EXPRESSION

Surface expression refers to the form (assemblage of slopes) and pattern of forms expressed by a surficial material on the land surface. This three-dimensional shape of the material is equivalent to 'landform' used in a non-genetic sense (*e.g.*, ridges or plain). 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 designator, and is listed in order of decreasing extent.

a - apron: a wedge-like slope-toe complex of laterally coalescent colluvial fans and blankets; longitudinal slopes are generally less than 15° (26%) from apex to toe with flat or gently convex/concave profiles.
b - blanket: a layer of unconsolidated material thick enough (greater than 1 m) to mask minor irregularities of the surface of the underlying material, but still conforms to the general underlying topography; outcrops of the underlying unit are rare.
d - depression: an area of lower elevation than surrounding surface; abrupt breaks in slope mark the bound of the depressions which have side slopes steeper than the surrounding terrain.
h - hummock: steep-sided hillock(s) and hollow(s) with multidirectional slopes dominantly between 15–35° (26–70%) if composed of unconsolidated materials, whereas bedrock slopes may be steeper; local relief 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 knob-and-kettle glaciofluvial terrain and landslide debris.
p - plain: a level or very gently sloping, unidirectional (planar) surface with slopes 0–3° (0–5%); relief of local surface irregularities generally less than 1 m; applied to (glacio)fluvial floodplains, organic deposits, lacustrine deposits and till plains.
t - terrace: a single or assemblage of step-like forms where each step-like form consists of a scarp face and a horizontal or gently inclined surface above it; applied to fluvial and lacustrine terraces and stepped bedrock topography.
u - undulating gently sloping hills and hollows with multidirectional slopes up to 15°; local relief is greater than 1 m.
v - veneer: a layer of unconsolidated materials too thin to mask the minor irregularities of the surface of the underlying material; 10 cm to 1 m in thickness; commonly applied to eolian/loess veneers and colluvial veneers.

SYMBOLS

GEOLOGICAL BOUNDARIES:
- defined
- approximate
- assumed
- map boundary

GEOLOGICAL FEATURES:
- escarpment, undefined
- gully, unclassified

TOPOGRAPHIC FEATURES:
- contours
- streams
- roads and trails

BASEMAP BOUNDARIES:
- 2015 Lidar
- 2020 Lidar

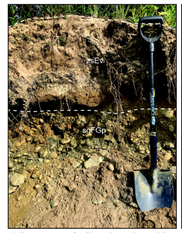
GROUND OBSERVATION SITES:
- field station
- permafrost borehole
- stratigraphic section
- ERT Survey

GLACIAL FEATURES:
- kame, unclassified
- drumlin or drumlinoid

PERMAFROST AND PERIGLACIAL FEATURES:
- thermokarst depression

OTHER SURFACE FEATURES:
- landslide, direction of movement
- gravel pit
- quarry

FIELD PHOTOS



Eolian veneer of silt and sand overlying glaciofluvial gravel exposed in a gravel pit at BC-17.

Eolian veneers of silt and sand overlying Gladstone (age assumed) till which overlies fractured bedrock. The exposure is located in a road cut at BC-04.

Sparse and stunted black spruce forest at BC-08 is indicative of a shallow permafrost table.

Gravel bar on Beaver Creek at site BC-13. Large woody debris is present on many bars from bank erosion during recent flood events.

Cores of organics and ice rich silts (>90% ice) from 50-100 cm in borehole BC_BH-01. The fine-grained sediments at the top of the stratigraphy contain more ice than the sands and gravels below.

Soil pit at site BC-08. Organics of varying stages of decomposition overlie undulating till. The permafrost table is located at approximately 60 cm depth. The active layer is thinner in areas where thick organics are present.

UAV photo of the Beaver Creek floodplain looking south from above the Beaver Creek bridge and the surrounding undulating till plain and outwash channels. Forest productivity is an indicator of depth to permafrost. A shallow permafrost table limits tree growth. The permafrost table is deeper along the active flood plain where regular flooding and groundwater flow warms the ground.

METHODS

Remote predictive surficial geological mapping was completed using 0.5 m-resolution Maxar satellite imagery collected in 2019 and one-metre resolution LiDAR data collected in 2015 and 2020 to generate a hillshade model for detailed desktop mapping. Field mapping was completed for the study area at a scale of 1:15 000 in August 2021. Field checking of units was completed by documenting anthropogenic and natural exposures of surficial materials and by digging soil pits and drilling shallow boreholes in a broad range of surface sediments and landforms. Borehole logs were recorded during a drilling program in October 2024.

ACKNOWLEDGEMENTS

This map covers a portion of the traditional territory of the White River First Nation. Jennifer Humphries and Moya Painter provided assistance with field mapping and permafrost monitoring. ERT surveys were completed by Kryotek Inc. Panya Lipovsky provided field assistance and review of this map.

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RECOMMENDED CITATION

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

Paper copies of this map may be obtained from Yukon Geological Survey, Room 102 - 300 Main St., Whitehorse, Yukon, Y1A 2B5. E-mail: geology@yukon.ca.

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Open File 2024-1

Surficial Geology of the Beaver Creek Area, Yukon
Parts of NTS 115K/7
1:15 000 scale

by
D.C. Cronmiller

Yukon Geological Survey
Energy, Mines and Resources
Government of Yukon

Yukon