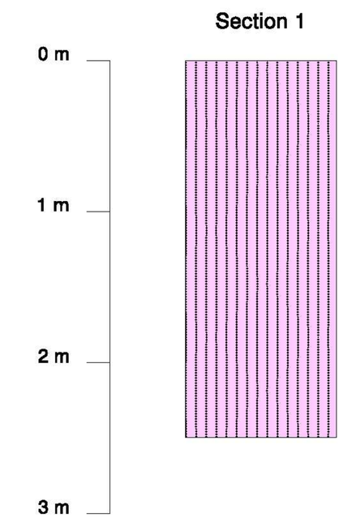
Natural Resources Canada / Ressources naturelles Canada

GEOLOGICAL SURVEY OF CANADA — COMMISSION GÉOLOGIQUE DU CANADA

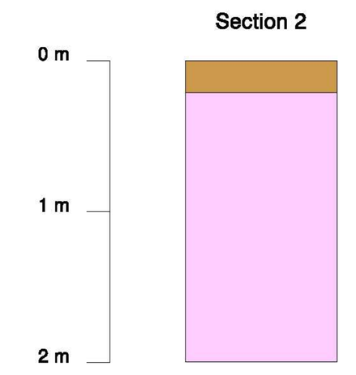
NATMAP CARTNAT
Canada's National Geoscience Mapping Program
Le Programme national de cartographie géoscientifique du Canada

Section 1 — Road cut along South Henderson Creek



Completely disaggregated schist bedrock

Section 2 — Road cut along South Henderson Creek



Colluvial diamicton

Partly to totally disaggregated schist

STRATIGRAPHIC LEGEND

Note: Not all stratigraphic units from the legend are present on stratigraphic logs

HOLOCENE (< 0.010 Ma)

- *Modern soil*
- *Stratified sand and gravel; alluvial sediments*

LATE PLEISTOCENE TO EARLY HOLOCENE (< 0.125 Ma)

- *Silt (organic rich), peat, and organic detritus, and extensive interstratified and segregated ice; collectively called muck*
- *Massive to stratified diamicton; colluvial sediments (may locally date to Middle Pleistocene)*
- *Massive to stratified silt and fine sand; eolian sediments*
- *Stratified silt and sand; resedimented eolian sediments locally interstratified with alluvial fan sediments*
- *Stratified sand and gravel; alluvial sediments*

MIDDLE PLEISTOCENE (0.780 - 0.125 Ma)

- *Paleosol developed in Reid and younger pre-Reid glaciofluvial sediments*
- *Stratified sand and gravel; glaciofluvial sediments deposited during Reid glaciation*
- *Stratified sand and gravel; glaciofluvial sediments deposited during younger pre-Reid glaciations*
- *Massive to stratified silt and fine sand; primary and resedimented eolian sediments*

LATE PLIOCENE AND EARLY PLEISTOCENE (2.7 - 0.780 Ma)

- *Paleosol developed in late Pliocene to early Pleistocene glaciofluvial and non-glacial sediments*
- *Stratified sand and gravel; glaciofluvial sediments deposited during older pre-Reid glaciations*
- *Stratified to massive diamicton; till deposited during one of several older pre-Reid glaciations*
- *Fine sand, silt and clay; lacustrine or slack water fluvial sediments*
- *Stratified to massive sand and gravel; non-glaciofluvial sediments, may be graded to pre-Reid outwash*

PLIOCENE (pre-glacial, 5 - 2.7 Ma)

- *Basalt and basalt breccia*
- *Stratified to massive gravel and sand; White Channel Gravel and equivalent clastic units predating regional glaciation, includes late Tertiary pediment sediments*

PRE-PLIOCENE (> 5 Ma)

- *Mesozoic and Paleozoic bedrock*

SYMBOL

- *Tephra - identification and age, if known, described on stratigraphic log*
- *Ice-wedge pseudomorph or sand wedge*

DESCRIPTIVE NOTES

The physiography of the Stewart River map area is characterized by steep-sided V-shaped dendritic valley systems incised up to 500 m into a formerly rolling erosional surface of early to middle Tertiary age know as the Klondike Plateau (Mathews 1986). Bedrock is predominantly orthogneiss, metaquartzite and schist (Bostock 1942; J. Ryan, 2002 personal communication). In the southwest quadrant of the map area, the plateau is cut by the confluence of the Stewart River and the Yukon River valleys. The Stewart River valley is wider than the Yukon River valley up and down stream from the Stewart River confluence. This disparity exists despite the fact that Yukon River has a much larger discharge than Stewart River. This anomaly is part of a body of evidence that suggest that the ancestral Yukon River flowed in a different direction and may have followed the course of the Stewart River but opposite to contemporary flow (Tempelman-Kluit 1980). Long periods of weathering and a lack of glaciation within the map area have resulted in slopes that are covered by thick colluvium. This colluvial cover is prone to failure as thin landslides along the base of the weathered mantle. Natural bedrock exposures are largely confined to tors along ridges or cliff cut-banks along rivers.

Prior to climatic cooling and the onset of regional glaciation during the Pliocene, the major valleys in the map area had broad bottoms flanked by pediment slopes. These gentle slope elements progressively expanded at the expense of adjacent steeper valley sides. Incision of the former broad valley bottoms and pediments occurred during the late Pliocene in response to glacially induced reversal in the flow of the ancestral Yukon River or an increase in the rate of regional uplift. Former pediments are now partly preserved as terrace-like features 30 m or more above the present flood plains of the Stewart and Yukon Rivers. With the onset of periglacial climates during the latter half of the Pliocene (Froese et al. 2000), denudation of vegetation on slopes led to an increase in sediment load in streams that in turn resulted in thick gravel fills that were subsequently incised into terraces (benches) along lower Henderson Creek. The progressive incision of Henderson Creek and similar streams through the Tertiary and Quaternary served to erode gold from perhaps dispersed and low-grade lode sources into economically viable and concentrate placers.

One or more times during the late Pliocene and early Pleistocene, the digitate margin of a Cordilleran ice sheet(s) advanced down the Stewart River Valley (pre-Reid glaciations (Hughes et al. 1989)) to within 20 km of the Yukon River-Stewart River confluence. The reversal of flow direction of the Yukon and Stewart rivers has been attributed to blockage of drainage by the formation of these ice sheets (Tempelman-Kluit 1980; Duk-Rodkin et al. 2001). Deposits of glacial fluvial gravel and sand were laid down along the Stewart River valley. Subsequent incision of this gravelly fill has isolated remnants as glaciofluvial terraces up to 30 m above the present flood plain.

On level, well-drained sites, such as on terraces underlain by glacial outwash, reddish fossil soils have developed within the upper one to two metres of terrace gravels. These are marked by disaggregation and partial or total weathering of micaceous and feldspar-rich clasts to clay as well as the development of clay skins (also known as argillans) around clasts. These soils developed during one or more warm and moist interglacial climates during the early or middle Pleistocene. These have been called the Wounded Moose soil (Tarnocai and Schweger, 1991; Tarnocai and Smith, 1989).

Fluvial terraces and most valley margins are partly or completely overlain by complexes of colluvial and alluvial fans and resedimented eolian silt and organic sediments (commonly called muck). Eolian silt was deposited by winds originating from adjacent ice sheets which mantled Yukon many times during the last several million years.

Continuous permafrost occurs along the bases of north facing slopes and the bottoms of most steep sided valleys. Patterned ground, segregated ice bodies and open system pingos are common in these areas, particularly within resedimented loess and organic deposits.

Gold placers have been exploited from benches and valley bottoms along Henderson and North Henderson creeks. Smaller unnamed creeks to the north and south of Henderson Creek share a common erosional history and bedrock geology but are largely unexplored or unexploited and present future placer exploration targets.

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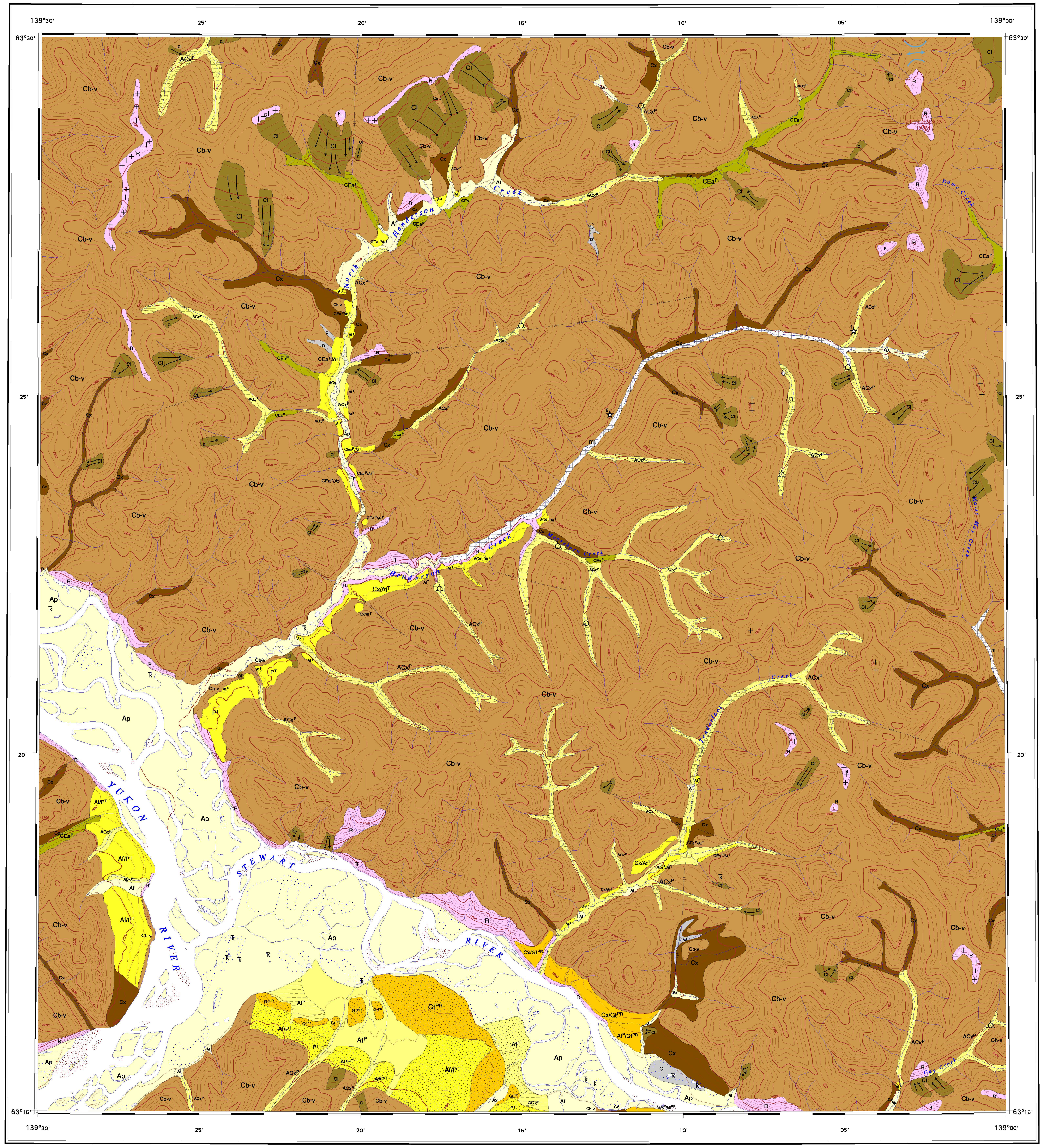
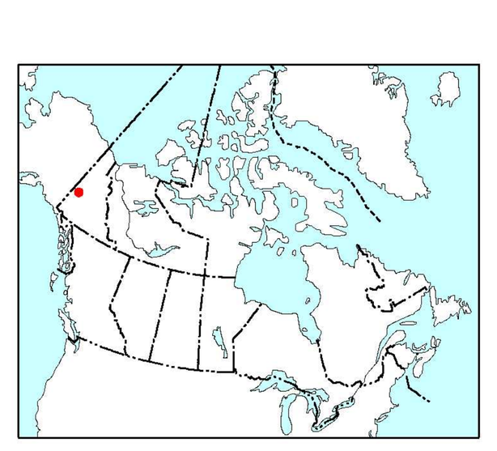




LOCATION MAP

OPEN FILE 4583

SURFICIAL GEOLOGY

STEWART RIVER

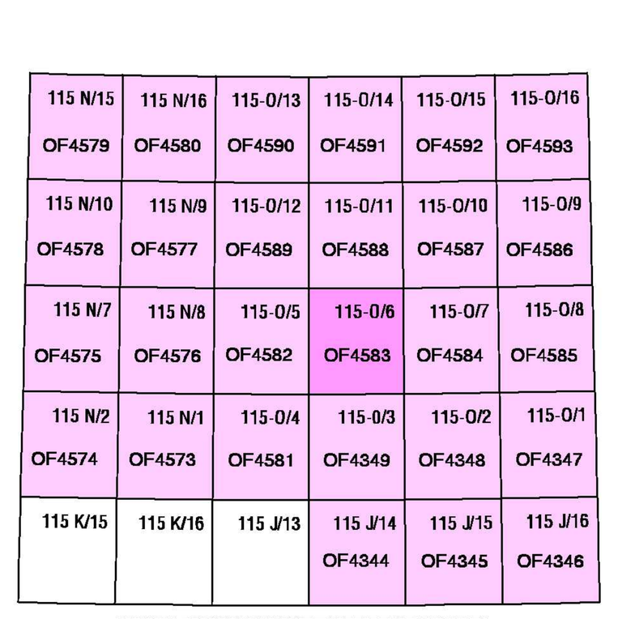
YUKON TERRITORY

Scale 1:50 000/Échelle 1/50 000

kilometres 1 0 1 2 3 4 kilomètres

Universal Transverse Mercator Projection
North American Datum 1983

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



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

LEGEND

Note: Map units listed below occur within one metre of the surface. Where organic or eolian sediments < 1 m thick overlie these, a pattern is overlaid upon the map unit. Along some valleys, colluvial or alluvial sediments > 1 m thick overlie older alluvial gravels that could contain placer gold. In order to accentuate these potentially exploitable deposits, a compound map unit is presented, e.g., **Cx/At^T**. *This means that colluvial complex sediments overlie alluvial terrace sediments thought to be late Tertiary in age. This legend is part of a larger regional study hence coloured boxes indicate units that appear on this map. In addition, not all symbols in the legend are represented on this map.*

CENOZOIC

QUATERNARY

HOLOCENE

- **m** — ***Made Land:*** *placer mines, roads, and airstrip*

ORGANIC DEPOSITS: *peat and organic silt formed predominantly by the accumulation of vegetative material in bogs, fens, and swamps situated on valley bottoms; permafrost is commonly encountered within 1 m of the surface. Thermokarst collapse is common.*

- **O** — ***Organic Blanket:*** *undivided; thickness > 1 m to 5 m*
- ***Organic Veneer:*** *blanket bog generally < 1 m thick*

ALLUVIAL DEPOSITS: *gravel to silt size sediments, well stratified, deposited by streams*

- **Ap** — ***Floodplain Sediments:*** *gravel, cobble to pebble; massive to well stratified, capped by sand and silt; flat lying; includes lacustrine and organic deposits in abandoned channels and backswamp areas; subject to periodic inundation and reworking by floods; thickness 1 to 5 m*
- **Af** — ***Alluvial Fan Sediments:*** *gravel, sand, silt, and diamicton, massive to well stratified; sediments form fan-shaped landforms or complexes of coalesced fan-shape landform at the confluence of tributary streams; may be subject to flooding accompanied by sudden stream migration and inundation; thickness up to 10 m*
- **Ax** — ***Alluvial Sediments Complex:*** *sediments forming floodplains, fans, and terraces that cannot be subdivided at this map scale*

HOLOCENE AND PLEISTOCENE (UNDIVIDED)

COLLUVIAL DEPOSITS: *stony diamicton resulting from the physical and chemical breakdown of bedrock and subsequent reworking and transportation by creep, solifluction, and landsliding; colluvial deposits may contain reworked glaciofluvial and morainal sediments within the limits of pre-Reid ice-cover and reworked eolian sediments; colluvial deposits are products of formation and reworking over a significant part of the Pleistocene and Holocene epochs; surface is commonly hummocky or undulating*

- **Cb-v** — ***Colluvial Blanket and Veneer Sediments:*** *diamicton, stony with a sandy matrix; massive to poorly stratified; colluviated blankets generally conform to underlying bedrock and exceed 1 m in thickness; veneers are < 1 m in thickness and are commonly discontinuous over bedrock*
- **Ca** — ***Colluvial Apron Sediments:*** *bouldery diamicton and bouldery sandy gravel, poorly sorted; massive; sediments form a wedge-like slope-toe complex of small steep debris flow and solifluction deposits; thickness is < 1 m at the upper and lower slope limit to up to 5 m or more in the thickest part of the apron*
- **Cl** — ***Landslide Sediments:*** *silt loam to boulders, poorly sorted to unsorted; massive; clasts are subangular to angular and are locally derived; thickness varies greatly*
- **Cx** — ***Colluvial Complex Sediments:*** *areas of intergrading colluvial and alluvial sediments which are too complex to subdivide at the scale of mapping; unit may include colluvial and alluvial fan, colluvial blanket, landslide sediments and colluviated drift within the limits of glaciation; the unit commonly occurs along the lower slopes of valley margins*
- **CEa^P** — ***Colluvial/Eolian Apron (muck):*** *primary deposits of eolian fine sand and silt resedimented and interstratified with organic silt, and detritus, alluvial fan gravel and sand and variable amounts of stony colluvial diamicton; forms aprons along valley bottoms through resedimentation of eolian sediments from valley sides to valley floor, commonly preserved on north-facing slopes; thickness 1 to 20 m; commonly contains segregated bodies of ice and buried ice wedges*

MIDDLE TO LATE PLEISTOCENE (UNDIVIDED)

ALLUVIAL DEPOSITS: *gravel and sand deposited by streams that were not fed by glacial meltwater; sediments may have experienced several cycles of alluviation and erosion, but are now inactive due to burial or fluvial incision; basal gravels within these sediments commonly contain placer gold*

- **At^P** — ***Alluvial Terrace Sediments:*** *gravel, cobble to pebble with a sandy matrix; massive to well stratified; capped by sand and silt; sediments are of flood plain origin now isolated from flooding by stream incision; thickness 1 m to 10 m*
- **Af^P** — ***Alluvial Fan Sediments:*** *single fans or aprons of coalesced fans formed of gravel and sand, poorly to moderately sorted, now isolated from water and debris floods due to fluvial incision; sediments disturbed by cryoturbation; thickness up to 10 m*
- **ACx^P** — ***Alluvial/Colluvial Complex Sediments:*** *silt, sand and gravel, poorly to moderately sorted; thin to thick bedded, interstratified with colluvial diamicton; sediments underlie the floors and margins of narrow upland valleys and grade laterally up slope into colluvial blankets; sediments may represent several depositional cycles; thickness may exceed 10 m in mid-valley locations*

EOLIAN DEPOSITS: *well sorted medium sand to silt initially transported and deposited by wind action during glaciations and commonly resedimented through fluvial and colluvial processes; deposits of very fine sand and coarse silt < 1 m thick are distributed discontinuously throughout low lying areas*

- **Eb^P** — ***Eolian Blanket:*** *fine sand and silt, well sorted; massive; may form crescent-shape and linear dunes and featureless or gently undulating inter-dune eolian plains; thickness 1 to 5 m*
- ***Eolian Veneer:*** *thin deposits of very fine sand and coarse silt distributed discontinuously throughout low lying areas, thickness < 1 m*

LATE PLEISTOCENE - McCONNELL GLACIATION

GLACIOFLUVIAL DEPOSITS: *gravel and sand deposited by streams flowing away from glacial ice; deposits display poor soil development with rare cryoturbation*

- **Gt^M** — ***Glaciofluvial Terrace Sediments:*** *gravel and sand, unweathered, forming one or more terraces*

MIDDLE PLEISTOCENE - REID GLACIATION

GLACIOFLUVIAL DEPOSITS: *gravel and sand deposited by streams flowing away from glacial ice; deposits display moderate soil development with signs of cryoturbation; soil thickness < 0.5 m*

- **Gt^R** — ***Glaciofluvial Terrace Sediments:*** *gravel and sand, moderately weathered, forming one or more terraces*

LATE PLIOCENE TO MIDDLE PLEISTOCENE - pre-Reid GLACIATIONS (UNDIVIDED)

GLACIOLACUSTRINE DEPOSITS: *well stratified sand, silt, clay, deposited in lakes ponded by glacial ice*

- **Lu^PR** — ***Glaciolacustrine Undivided:*** *sand, silt, and clay; undifferentiated at this scale of mapping*

GLACIOFLUVIAL DEPOSITS: *gravel and sand deposited by streams flowing away from glacial ice in meltwater channels and outwash plains; massive to well stratified. Surface soils may extend to 2 m depth with well developed clay skins on clasts, frequent signs of cryoturbation (ice wedge pseudomorph and sand wedges), and strong chemical weathering*

- **Gt^PR** — ***Glaciofluvial Terrace Sediments:*** *gravel and sand, deeply weathered; incised into flights of terraces; thickness 1 to > 5 m*

MORAINAL DEPOSITS (TILL): *glacial diamicton, mainly till, generally consisting of a matrix ranging from sand to clay that supports clasts ranging from boulders to pebbles in size; deposited either directly from glacial ice or by gravity flow from glacial ice; surface soils may extend to 2 m depth with well developed clay skins on clasts, frequent signs of cryoturbation (ice wedge pseudomorph and sand wedges), and strong chemical weathering*

- **Tb^PR** — ***Till Blanket:*** *diamicton, stony, silty-sand matrix; massive; conforms to underlying topography, thickness > 1 m; extensively colluviated on slopes*
- **Tv^PR** — ***Till Veneer:*** *diamicton, stony, silty-sand matrix; massive; discontinuous and may contain extensive areas of thin (< 1 m) colluvium*

ALLUVIAL DEPOSITS: *Gravel and sand deposited by streams that were not fed by glacial meltwater; sediments may have experienced several cycles of alluviation and erosion, but are now inactive due to burial or fluvial incision; basal gravels within these sediments commonly contain placer gold*

- **At^PR** — ***Alluvial Terrace Sediments:*** *sandy pebble and cobble gravel deposited by streams having a fluvial source but graded to the margins of pre-Reid glaciers or glacial drainage; thickness 1 to 5 m*

UNDIFFERENTIATED DRIFT: *diamicton, gravel, sand, silt and clay deposited from glacial ice, glacial streams, and glacially damned lakes; extensive weathering, poor exposure and permafrost make differentiation into component glacial sediments difficult; thicknesses commonly exceed 10 m and mask underlying bedrock topography; commonly colluviated and intergraded with colluvium; surface soils may extend to 2 m depth with well developed clay skins on clasts, frequent signs of cryoturbation (ice wedge pseudomorph and sand wedges), and strong chemical weathering*

- **D^PR** — ***Drift:*** *flat to gently sloping*
- **Dl^PR** — ***Drift Modified by Landsliding:*** *drift translated along failure plains into irregular steps and sub parallel scarps*
- **De^PR** — ***Fluvially Incised Drift:*** *formerly extensive areas of drift incised by closely spaced stream valleys*

LATE PLIOCENE

- **V^T** — ***Basalt:*** *columnar alkaline olivine basalt and flow breccia; erosional remnants of formerly valley filling flows underlying terraces along lower Rosebud Creek; thickness 10 m*

PLIOCENE AND LATE MIOCENE

ALLUVIAL DEPOSITS: *preglacial gravel and sand; highly dissected and deeply weathered*

- **P^T** — ***Pediment and Bajada Sediments:*** *inclined fluvial surfaces which are found at a midslope position in unglaciated drainage systems; usually thinner than 5 m; formed as a result of limited agradation of stream gravel and significant colluviation; composed of thin, poorly sorted gravel that contains both locally derived subangular stream gravel deposits and angular bedrock fragments*
- **At^T** — ***High Level Terrace Sediments (includes White Channel Gravel and equivalent sediments):*** *weathered pebble to cobble gravel > 1 m thick; surface soils may extend to 2 m depth with well developed clay skins on clasts, frequent signs of cryoturbation (ice wedge pseudomorph and sand wedges), and strong chemical weathering; within the Yukon River valley, terraces above the 500 m contour may be remnant features from the southward-flowing paleo-Yukon River drainage system*

PALEOZOIC AND MESOZOIC

- **R** — ***Bedrock:*** *schist, gneiss, ultramafics, granodiorite, monzonite, marble, and basalt; includes areas of thin colluvial cover, blockfields, and sorted stone polygons in alpine areas*

SYMBOLS

- *Geologic contact; defined, approximate, inferred*
- *Open system pingo, collapsed open system pingo*
- *Thermokarst collapse activity*
- *Landslide movement direction in bedrock and colluvium*
- *Scarps created by widespread landslide movement in drift*
- *Terrace scarp (ticks on sloped side)*
- *Degraded Cirque: active during pre-Reid Glaciations*
- *Degraded Arête: active during pre-Reid Glaciations*
- *Meltwater channel: flow direction, unknown flow direction*
- *Large meltwater channel*
- *All time (pre-Reid) glacial limit; defined, inferred*
- *Cryoplanation terrace*
- *Tor*
- *Landform Streamlined by glacial ice*
- *Vertebrate fossil locality*
- *Stratigraphic section*
- *Fault trace*
- *Lineaments (fault, fracture, joint system) defined by linear drainage courses, aligned gaps in ridges, or aligned breaks in bedrock slopes*
- *Abandoned valley: paleoflow defined*
- *Abandoned valley: paleoflow undefined*
- *Paleoflow, suspected buried valley*
- *Rock glacier*

Geology by L.E. Jackson, Jr. (1999 - 2002)

Co-ordinated through the auspices of the Ancient Pacific Margin NATMAP

Digital cartography K. Shimamura, Terrain Sciences Division

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 Geomatics Canada, modified by Parm Dhesi, Earth Sciences Sector Information Division (ESS Info)

Magnetic declination 2005, 25°29' E, decreasing 18.8' annually

Elevations in feet above mean sea level

Contour interval 100 feet

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COMMISSION GÉOLOGIQUE DU CANADA
2005

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