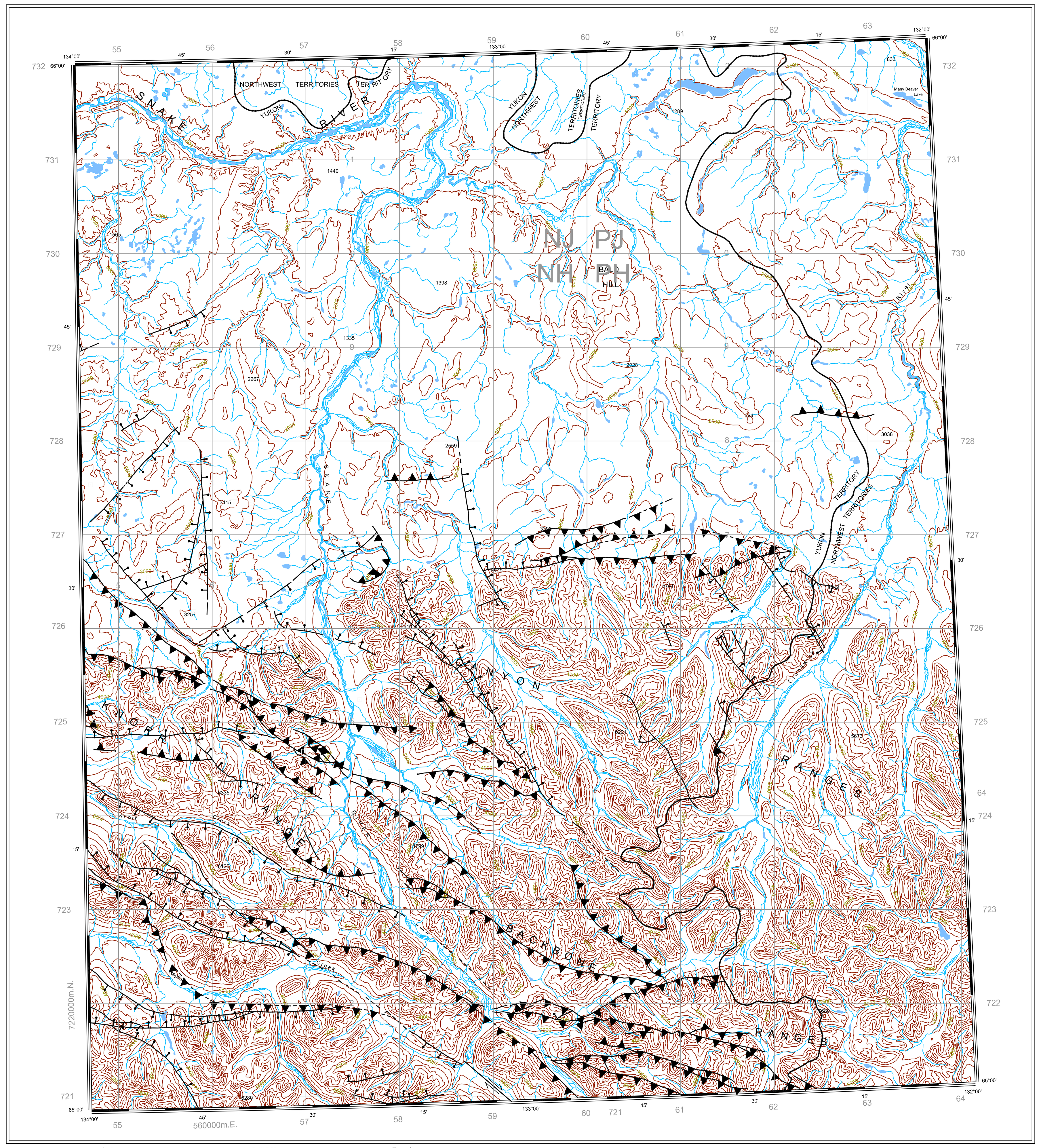
NATIONAL TOPOGRAPHIC SERIES NTDB (1995) D.I.A.N.D. N.A.P. LAND RESOURCES CANADA SHEET 106F



TEN THOUSAND METRE UNIVERSAL TRANSVERSE MERCATOR GRID NAD 83 Zone 8

NOTE: THIS MAP HAS BEEN PRODUCED BY THE COMPILATION OF DATA FROM VARIOUS SOURCES. IT IS NOT TO BE USED TO DEFINE LEGAL BOUNDARIES.

THIS MAP IS ISSUED AS A PRELIMINARY GUIDE FOR WHICH THE DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT WILL ACCEPT NO RESPONSIBILITY FOR ANY ERRORS, INACCURACIES OR OMISSIONS WHATSOEVER.

EDITION: 2 PRINT DATE: 99/09/24

SNAKE RIVER

YUKON TERRITORY

106 F

Scale

10 0 10 20 30 km

5 0 5 10 15 miles

CONTOUR INTERVAL 500 FEET Elevations in Feet above Mean Sea Level
North American Datum 1983 Transverse Mercator Projection
Universal Transvers Mercator Grid ZONE 8

N

106L TRAIL RIVER	106K MARTIN HOUSE	106J ONTARATUE RIVER
106E WIND RIVER	106F SNAKE RIVER	106G UPPER RAMPART RIVER
106D NASH CREEK	106C NADALEEN RIVER	106B BONNET PLUME LAKE

Index to Adjoining Sheets.

Magnetic Declination 1989 varies from 33° 12' easterly at the centre of the west edge to 33° 31' easterly at the centre of the east edge. Mean annual change 21.6' westerly.

GEOPROCESS FILE - SUMMARY REPORT

SNAKE RIVER MAP AREA - NTS 106F

INTRODUCTION

The GEOPROCESS File is a compilation of information and knowledge on geological processes and terrain hazards, including mass movement processes, permafrost, flooding risks, faults, seismic activity and recent volcanism, etc. Please refer to the GEOPROCESS File User Guide for more in-depth information on how the maps were developed, which other GEOPROCESS File maps are available, how to utilize this inventory and how to interpret the legend. Special interest should be taken in the detailed description of the terrain hazard map units. Appendices in the User Guide include summary papers on the geological framework, permafrost distribution, and Quaternary geology in Yukon and a list of comprehensive GEOPROCESS File references.

This report includes a brief discussion of the scope and limitations of the GEOPROCESS File compilation maps followed by summaries of the bedrock geology, surficial geology and terrain hazards for this NTS map area, and a list of references.

Geological Processes and Terrain Hazard Compilation Maps

The GEOPROCESS File map units were drafted on the 1:250 000 topographic base maps through interpretation from bedrock geology maps, surficial geology maps and in some cases terrain hazard maps at various scales. The compilation maps have a confidence level reflecting the original source material. All materials used to produce the maps are listed in the references on each map. A file containing the documentation used to construct these maps is available at the Indian and Northern Affairs library in Whitehorse, Yukon. Areas for which no surficial geology or terrain hazard information is published were left blank. Summary reports on surficial geology and terrain hazards for these map sheets were written by extrapolating the data from adjacent map sheets or smaller scale maps. Information from small scale (e.g., 1:1 000 000) maps was used for the summary reports, but not redrafted onto the 1:250 000 GEOPROCESS File maps.

The GEOPROCESS File compilation maps are intended as a first cut planning tool; the legend on the maps describes the general aspects of terrain hazards (also see below) and associated geological processes. **These maps should never replace individual site investigations for planning of site specific features, such as buildings, roads, pits, etc.**

Bedrock Geology Summaries

Each 1:250 000 NTS map area is described according to morphogeological belts and terranes defined by Gabrielse et al. (1991) and Wheeler et al. (1991). Bedrock geology (including structure) and mineral occurrences are briefly described and taken largely from the referenced, most recent 1:250 000 geological map with additional contributions from Wheeler and McFeely (1991), and Yukon MINFILE (1993). A summary paper ("A Geological Framework for Yukon") in Appendix A of the User Guide provides a framework and context for each of the bedrock summaries.

The level of knowledge and understanding of Yukon geology is constantly evolving with more detailed mapping and development of geological models. Names, ages and terrane affinities of rock units on the most recent 1:250 000 geological maps may, in some cases, now be considered incorrect. Thus information contained within some of the bedrock geology summaries may be out of date. Although much of the information reflects the knowledge at the time that the source map was published, additional information has been inserted whenever possible to assist the user in merging the information with current geological maps, concepts and understanding. The age ranges for similar packages of rocks may also vary between map areas since the actual rocks, or at least the constraints on their age, may vary between map areas.

NOTE: A new digital compilation of Yukon Geology is now available by Steve Gordey and Andrew Makepeace (GSC Open File D3826 and/or DIAND Open File 1999-1(D)), and more recent MINFILE updates should also be verified (Yukon MINFILE, 2001).

BEDROCK GEOLOGY

The northern part of the Snake River map area is in the MacKenzie Platform. The central and southern parts are dominated by the Backbone and Knorr Mountain ranges contained within the Selwyn Basin. The Snake River flows from north to south through the map area. Cretaceous (70 to 140 million year old) sedimentary rocks of the northern interior platform consisting of sandstone and conglomerate underlie the northern part of the map area. The central part of the map area is dominated by 570-320 million year old shales, limestones, cherts and chert-pebble conglomerate of the Selwyn Basin. The southern part of the map area is underlain by Precambrian (older than 570 million years) sedimentary rocks of the Rapitan Formation, Gillespie Lake Group and Quartet Group. Northwest-trending faults, many of which are thrust faults, cut the Ordovician to Precambrian rock packages.

Mineral Deposits and Occurrences

There are nine known mineral occurrences in the Snake River map area. Five of these are Mississippi Valley type showings containing zinc and lead. There is one coal and one sedimentary gypsum occurrence. The largest deposit is the Crest iron deposit. Unconfirmed resource estimates suggest reserves on the order of 100 billion tonnes.

SURFICIAL GEOLOGY

The Snake River map area is within the limits of the McConnell glaciation. There is no published information on surface geology or Quaternary geology in this area. General information on glacial history and permafrost is available in the User Guide of the Geoprocess File. The following general comments are derived from maps published in adjoining map sheets and on general landform-hazard relationships expected in areas of similar latitude.

TERRAIN HAZARDS

The Geological Survey of Canada's Pacific Geoscience Centre in Victoria provided the seismic information.

Mass Movement Processes

There is no mapped information or published information on mass movement hazards in this area. The following comments are based on landforms and hazards relationships identified on adjoining maps to the south and general considerations for areas at these latitudes.

Steep cirque walls and arretes (Vernon and Hughes, 1966) are likely to present avalanche and rock fall hazards. Most alpine slopes are likely covered by thin residual bedrock, colluvial veneer and may contain permafrost. Solifluction, detachment slides and poor drainage will likely result from surface disturbance on such slopes. In addition, the very long exposure of surfaces to weathering, frost shattering and creep has probably resulted in well-developed colluvial blankets on most surfaces at mid to high elevations and thick alluvial fans and aprons in valley bottoms. These deposits can also be subject to slope and permafrost-related processes. Surfaces are usually sensitive to disturbance and prone to slow to moderate, long term mass movements such as retrogressive thaw slides, as well as more rapid detachment slides common on solifluncted surfaces. Slow mass movement, such as soil creep and solifluction are probably common on most alpine slopes.

Permafrost

There is no mapped information or published information in this area. The following comments are based on adjoining maps to the south and general considerations for areas at these latitudes. This southern part of the map area is in the Extensive Discontinuous Permafrost Zone, and the northern part of the map area is in the Continuous Permafrost Zone (Heginbottom, 1995; Heginbottom and Radburn, 1992). Ice contents vary from low to moderate (10 to 20% ground ice) in morainal and colluvial deposits above valley floors, low to moderate in alluvial and fluvial deposits, and moderate to high (10->20%) in fine-grained glaciolacustrine deposits and in fine-grained alluvial fans and terraces above stream level. Permafrost is assumed to be absent or thinner under south-facing, well-drained slopes. Mean annual ground temperatures range from -2 to -5 degrees Celsius.

In the adjacent map area, 106D, (Vernon and Hughes, 1966) there is permafrost thickness in excess of 122 m (400 ft) in addition to solifluction lobes, patterned ground, and palsa bogs, as well as large surfaces covered by patterned ground. Similar features are likely found in 106F.

Active and inactive rock glaciers are most likely to occupy northeast- to northwest-facing cirques, and locally more southerly slope aspects.

Flooding and Other Risks

The lowermost terraces of the major rivers are most likely subject to flooding. Some sections of the braided channels are probably unstable. In addition to flooding risks, the steep portions of alluvial fans are also exposed to the additional possibility of mud flows and debris flows associated with rapid increases in discharge. Alluvial and colluvial fans are usually susceptible to channel migrations and erosion.

Seismicity

This is an area of high seismic activity. There are 133 recorded seismic events ranging from <2.0 to >6.0 in magnitude.

References: Snake River Map Area - NTS 106F

To be thorough, check the references for adjacent NTS map sheets and the General Reference List (See User Guide).

Most of the following references should be available for viewing in the DIAND library on the third floor of the Elijah Smith building in Whitehorse. The library and call number of some internal government reports are listed.

Boydell, A.N., Rutter, N.W., Hanley, P.T., Hughes, O.L., 1974. Surficial Geology, MacKenzie Valley, Transportation Corridor, District of MacKenzie, Maps and Legend. Geological Survey of Canada, Open File 189 (two 1:1 000 000 surficial geology maps). (NTS 106I, 106J, 106K, 106M, 106N, 106O Note - 106K is directly north of 106F)

Bell, R.T., 1986a. Geological map of northeastern Wernecke Mountains, Yukon Territory. Geological Survey of Canada, Open File 1207.

Brown, R.J.E., 1967. Permafrost in Canada. Geological Survey of Canada, Map 1246 (scale 1:7 603 200).

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Cato, N.R., 1989. Quaternary geology of the Peel Plateau - Richardson Mountains, Yukon and Northwest Territories, Canada. INQUA, Ottawa 1987

Delaney, G.D., 1978. Stratigraphic investigations of the lowermost succession of Proterozoic rocks, northern Wernecke Mountains, Yukon Territory. Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada. (report and maps) (NTS 106C, 106D, 106E, 106F)

Delaney, G.D., 1985. The middle Proterozoic Wernecke Supergroup, Wernecke Mountains, Yukon Territory. University of Western Ontario, Ph.D. thesis. (NTS 106C, 106D, 106E, 106F)

Eisbacher, G.H., 1978. Observations on the streaming mechanisms of large rock slides, northern Cordillera, Paper 78-01A, p. 49-52. (NTS 106A/NW, 106F/SW)

Gabrielse, H. and Yorath, C.J. (eds), 1991. Geology of the Cordilleran Orogen in Canada. Geological Survey of Canada, Geology of Canada, No. 4, 844 p.

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Heginbottom, J.A. and Radburn, L.K. (comps.), 1992. Permafrost and ground ice conditions of northwestern Canada. Geological Survey of Canada, Map 1691A, scale 1:1 000 000.

Heginbottom, J.A., 1995. Canada Permafrost, The National Atlas of Canada 5th Edition, Natural Resources Canada, Geological Survey of Canada, Map MCR 4177F, 1:7 500 000 scale.

Hughes, O.L., 1971. Northern Yukon Territory and northwestern District of Mackenzie. Geological Survey of Canada, Map 1319A, 1:506 880 scale. (NTS 106E, 106F, 106/NW, 116F, 116G, 116H, 117)

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Hughes, O.L., Pilon, J. and Veillette, J.J., 1973. Surficial geology and land classification, MacKenzie valley transportation corridor. Paper 73-01A, p. 229-230. (NTS 106E, 106F, 106L, 116H, 116I, 116N, 116O, 116P)

Klein, C. and Beukes, N.J., 1993. Sedimentology and geochemistry of the glaciogenic late Proterozoic Iron- Formation in Canada. Economic Geology, Vol. 88, No. 3, p. 542-565.

Norris, A.W., 1968. Reconnaissance Devonian stratigraphy of northern Yukon Territory and northwestern District of Mackenzie. Geological Survey of Canada, Paper 67-53, 287 p.

Norris, D.K., 1984. Composite legend to accompany maps 1514A to 1529A, and structure section diagram 1530A (Operation Porcupine project area). (NTS 117, 116/NE, 116/NW, 116F, 116G, 116H, 106/NW, 106E, 106F)

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Vernon, P. and Hughes, O.L.,1966. Surficial geology, Dawson, Larsen Creek, and Nash Creek map-areas, Yukon Territory (116B and 116C E1/2), 116A and 106D). Geological Survey of Canada, Bulletin 136, 25 p.

* Wheeler, J.O., Brookfield, A.J., Gabrielse, H., Monger, J.W.H., Tipper, H.W. and Woodsworth, G.J., 1991. Terrane map of the Canadian Cordillera. Geological Survey of Canada, Map 1713.

* Wheeler, J.O. and McFeely, P., 1991. Tectonic Assemblage map of the Canadian Cordillera. Geological Survey of Canada, Map 1712A.

Yukon MINFILE, 1994. 106F - Snake River. Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada.

* References used in compiling this map

LEGEND

LEGEND TERRAIN HAZARDS

MAP SYMBOL	TERRAIN HAZARDS	ASSOCIATED RISK LEVELS, COMMENTS
	Mass Movement Processes	
A	Snow Avalanched.	high
F	Extremely slow to moderate rates of failure in soil and bedrock, including soil creep, rock creep, earthflow, soil or rock slump, debris or rock slide.	low to intermediate
R	Moderate to extremely rapid rates of failure in soil and bedrock (1.5 m/d to >3 m/s), including rock slump, debris slide, rock slide, debris flow, debris torrent, debris avalanche, rockfall, rock avalanche.	high
	Arctic, Alpine and Periglacial Processes	
X	Permafrost present.	low
K	Thermokarst present.	low
S	Soliflucted.	low to intermediate
Z	Grouped, cryoturbated, soliflucted, nivated.	low to intermediate
	Fluvial Processes	
B	Braided, unstable channels, risk of flooding.	intermediate to high
E	Fluvial erosion, deposition and low risk of flooding.	low to intermediate
J	Anastomosing.	intermediate to high
U	Flooded regularly.	intermediate to high
	Miscellaneous Erosion Processes	
T	Karst.	intermediate
P	Piping.	intermediate to high
V	Gullied.	low to intermediate

	On Site Symbols	Risk Level
	Unit boundary (defined, approximate).	
	Erosional escarpment.	high
	Landslide escarpment.	high
	Landslide (includes source and runout areas).	high
	Pingo.	high
	Rock glacier.	high
*	Spring or saline seep.	low
	Observation of frozen soil or ground ice.	low
T	Rapid mass movements (debris torrent) with known point source. Limits of runout not implied by symbol.	high
E	Slow mass movement (earth flow) with landslide, escarpment source. Limits of landslide runout not implied by symbol.	intermediate to high

LEGEND SEISMIC EVENTS

SYMBOL	MAGNITUDE REPRESENTED	SYMBOL	MAGNITUDE REPRESENTED
	<2.0		4.0 to 4.999
	2.0 to 2.999		5.0 to 5.999
	3.0 to 3.999		>6.0

LEGEND GEOLOGICAL PROCESSES

MAP SYMBOL	DESCRIPTION	INFERRED HAZARDS
cf	Talus fan or apron, moderate to steep slope, coarse angular bedrock fragments, sources are often areas of rapidly disintegrating bedrock.	Rock fall and debris flows common on active fans, steep slopes generally unstable to traffic.
cl	Landslide, moderate slope, varies from large blocks of bedrock to finer material.	Landslides generally are recurrent in susceptible areas and may be become active if disturbed.
cs	Colluvium covered slope, gentle to moderate slope, underlain by unsorted rubble, solifluction and other periglacial features common.	Areas of fine textured materials and gentle slopes at high elevations, where there is ground ice will be susceptible to high solifluction rates and thermokarst if disturbed.
fa	Alluvial fan, active.	Subject to shifts in channel and bar positions, occasionally subject to flooding.
fp	Floodplain.	Subject to shift in channel and bar positions, occasionally subject to flooding.
ice	Glacier ice.	Crevasses.
im	Mountain ice caps.	Avalanches, ice and rock falls, and crevasses.
is	Cliff glacier.	Avalanches, ice and rock falls.
l	Lacustrine or glaciolacustrine sediments.	Silt and clay, usually susceptible to frost heaving and, if permafrost present, to thermokarsting when disturbed.
m/i	Rock glacier, debris covered glacier.	Ice at depth make surface susceptible to thermokarst, unstable slopes.
o	Organic.	Thick organic matter is often underlain by permafrost. Disturbance of permafrost may cause poor drainage and thermokarsting.

LEGEND FAULTS

Fault
defined, approximate, assumed, extrapolated beneath overburden

Fault
Solid circle indicates downthrown side
Arrows indicate relative movement

Thrust Fault (teeth indicate upthrust side)

Airphoto Lineament

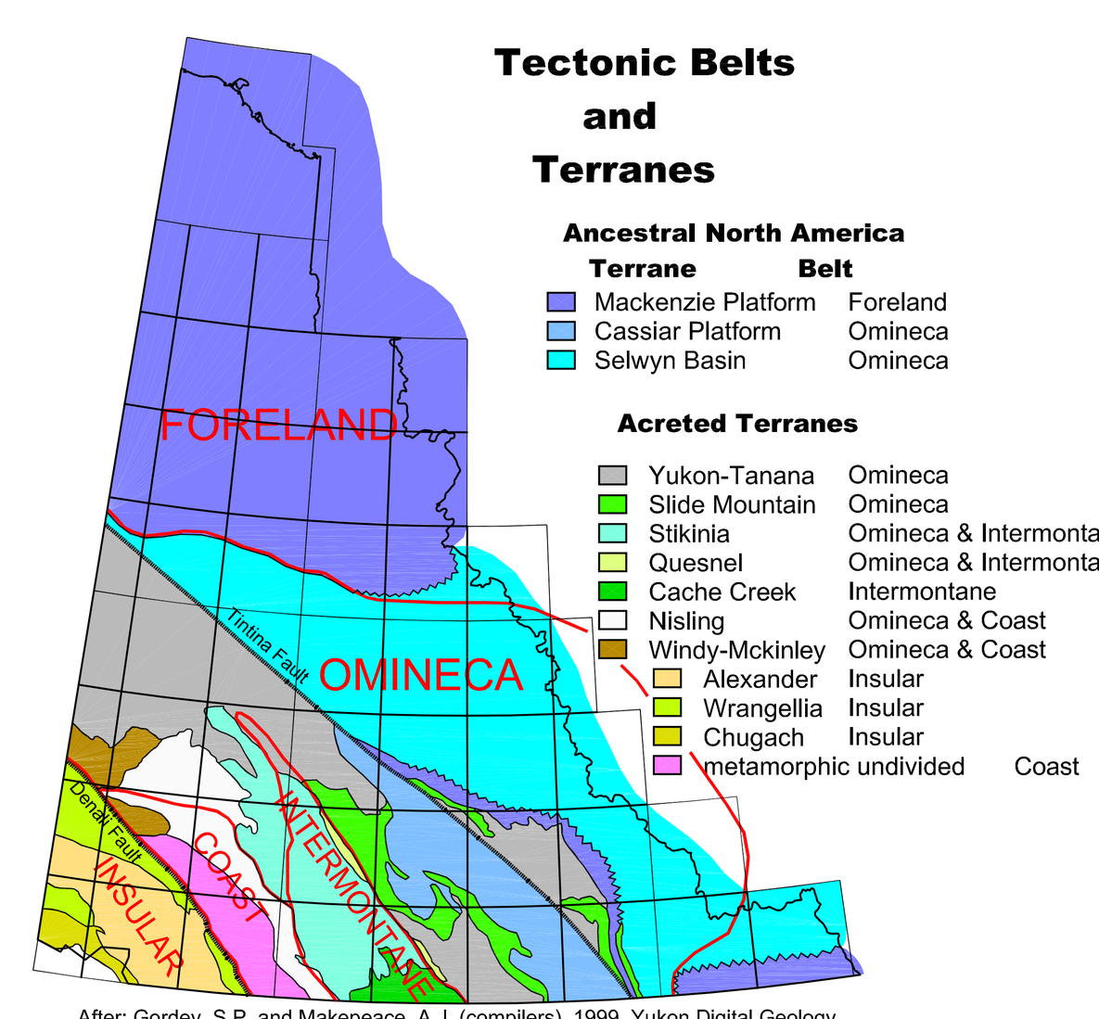
LEGEND QUATERNARY VOLCANISM

No known recent volcanism in map area 106F

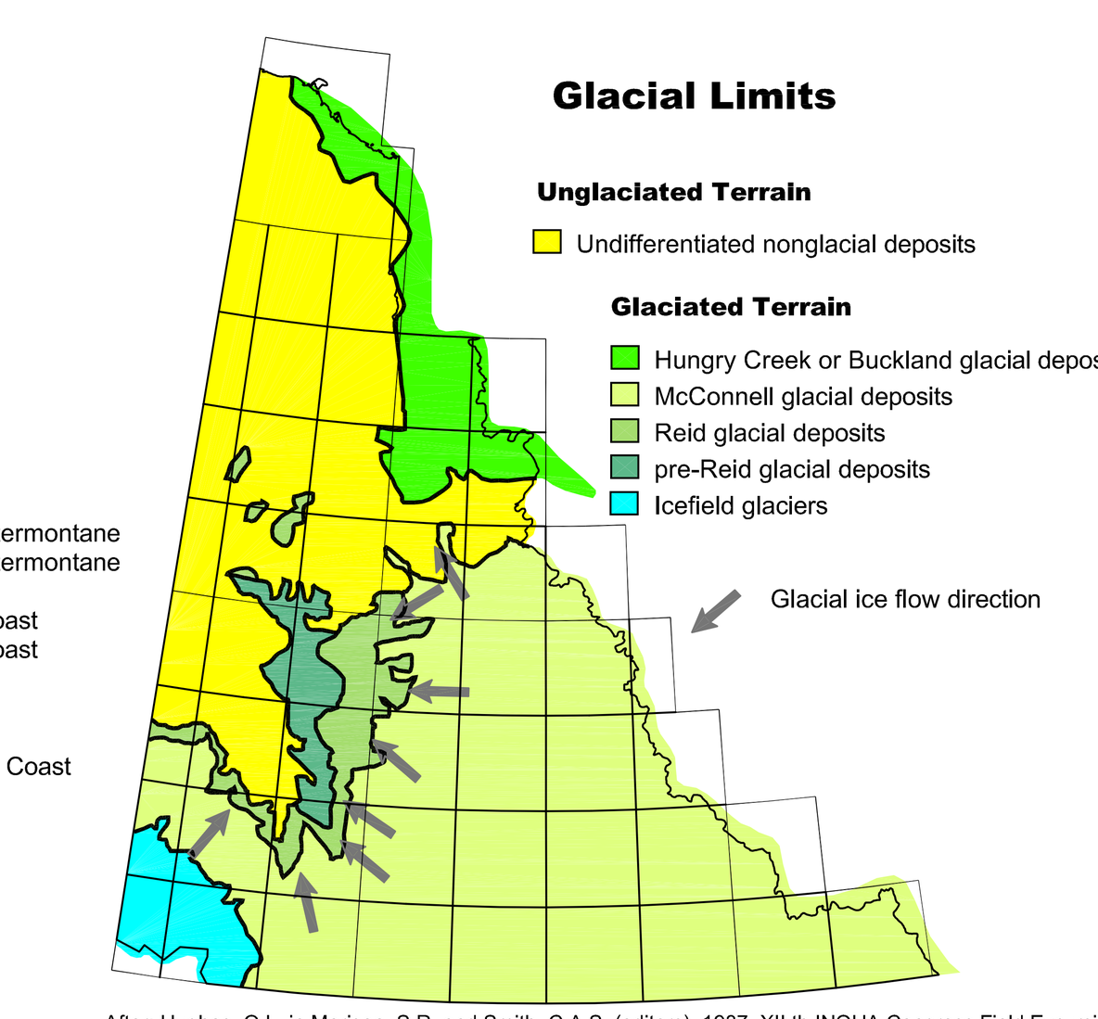
OTHER FEATURES

Roads
Streams
Lakes
Marsh

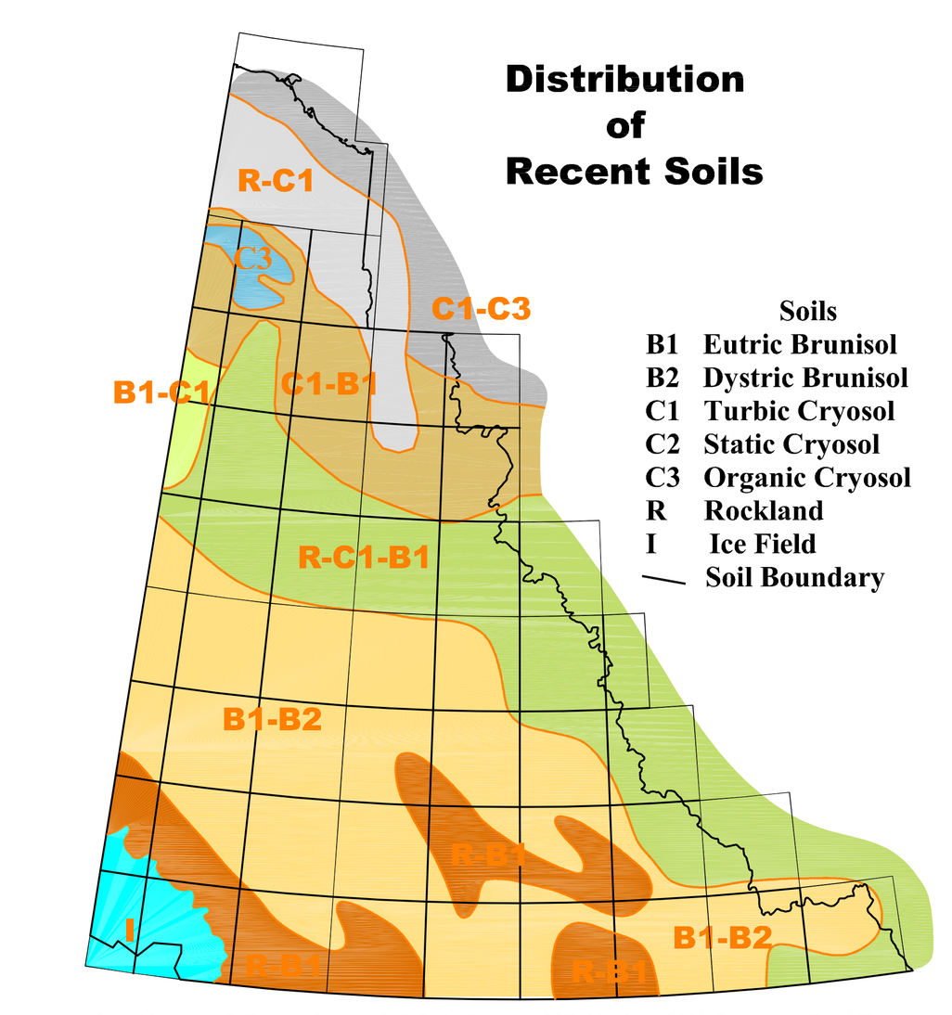
NOTE: Where areas have more than one identified process or hazard, the colour of the encompassing polygon is assigned based on a hierarchical scheme relating to the severity of the hazard. The relative order of severity is: Terrain Hazards (Mass Movement Processes then Fluvial Processes then Arctic, Alpine and Periglacial Processess) followed by Geological Processes.



After: Gordey, S.P. and Makepeace, A.J. (compilers), 1999. Yukon Digital Geology Geological Survey of Canada Open File D3826, Exploration and Geological Services Division Yukon, Indian and Northern Affairs, Open File 1999-1 (D)



After: Hughes, O.L. in Morison, S.R. and Smith, C.A.S. (editors), 1987, XII th INQUA Congress Field Excursions A20, p12 to 16 - Research in Yukon, National Research Council of Canada, Ottawa, Canada, 110p



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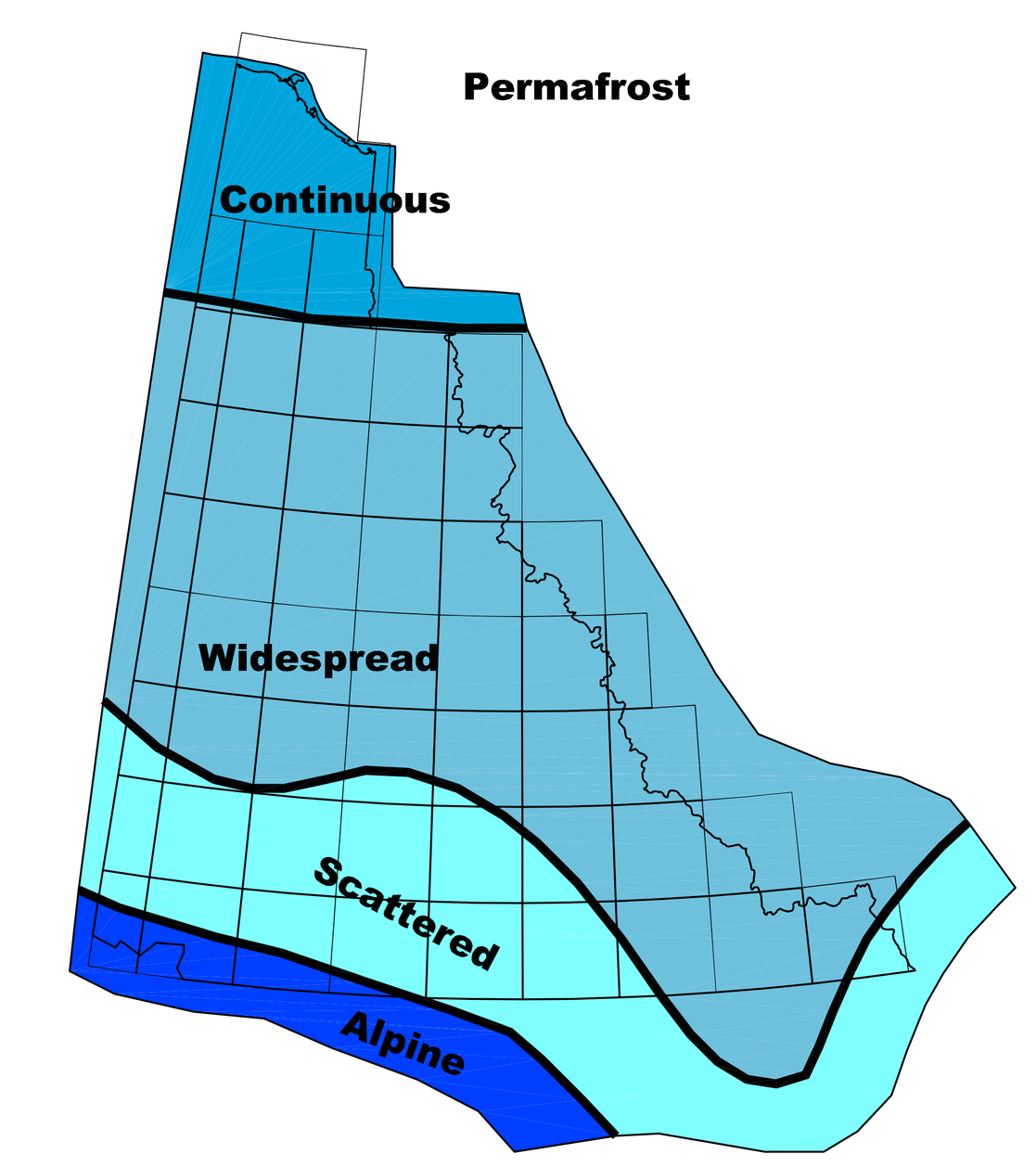

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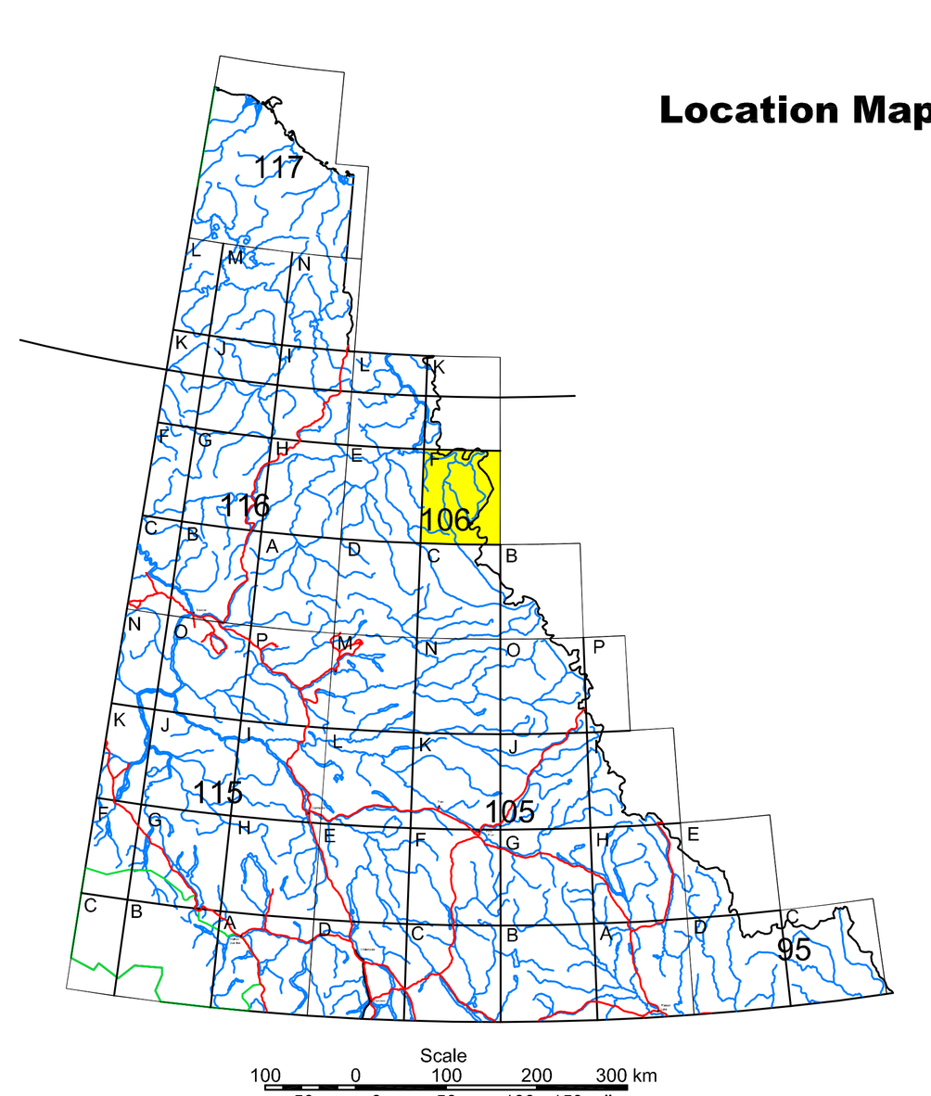

North American Datum 1927, Universal Transverse Mercator Projection ZONE 7

Exploration and Geological Services Division
Yukon Region
Indian and Northern Affairs Canada

Yukon GEOPROCESS File

Geological Processes and Terrain Hazards of Snake River 106F

by

Mougeot, C.M. and Walton, L.A.

Copies of this map may be obtained from Geoscience and Information Sales c/o Whitehorse Mining Recorder, Indian and Northern Affairs Canada, Room 102, 300 Main Street, Whitehorse, Yukon Y1A 2B5 (867) 667-3266; FAX; (867) 667-3267

Recommended citation: Mougeot, C.M. and Walton, L.A., 1996. Yukon GEOPROCESS File (2002), Geological Processes and Terrain Hazards of Snake River, 106F Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, 1:250 000 scale.