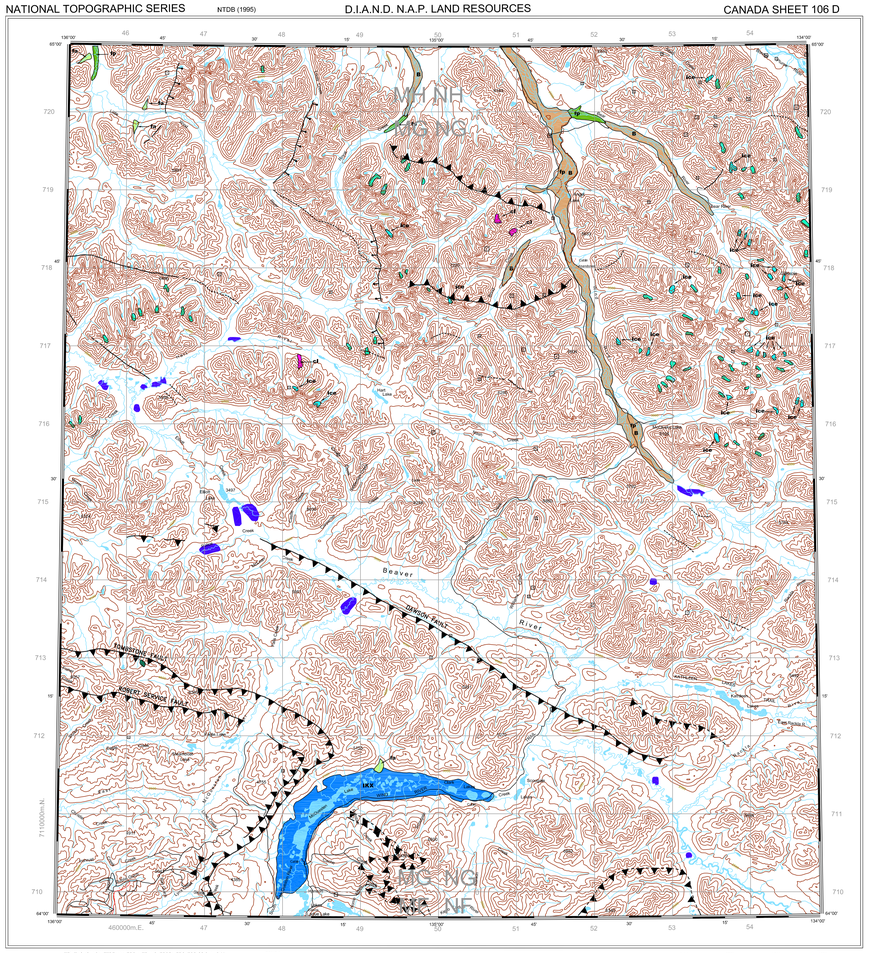
Yukon Government

YUKON GEOLOGY PROGRAM

Canada

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



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: JULY 22, 1999

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

NASH CREEK
YUKON TERRITORY
106 D
Scale

GEOPROCESS FILE - SUMMARY REPORT

NASH CREEK MAP AREA - NTS 106D

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 Nash Creek map area is mainly within the Foreland Belt except for the southwestern corner which is in the Omineca Belt. The map area is dominantly underlain by rocks of the Selwyn Basin and Mackenzie Platform.

The southern and southwestern parts of the map area are underlain by two large, northeasterly directed thrust panels separated by the Robert Service and Tombstone Faults. The thrust panels contain 800-530 million year old Hyland Group gritty quartzite, sandstone and quartz-pebble conglomerate, maroon and green shales, schist, phyllite and marble; 400-145 million year old Lower Schist argillite, slate and phyllite; and 360-320 million year old Keno Hill quartzite, slate and phyllite. The Keno Hill Quartzite and the Lower Schist units contain ubiquitous sills of diorite and gabbro. North of the thrust panels, the bedrock is dominated by strata of pre-530 million year old argillite, shale, phyllite, dolomite, slate, quartzite, conglomerate and limestone that is overlain by a thinner, 530-325 million year old sequence that includes the Earn and Road River Groups which are composed of black shale, limestone, chert, chert-pebble conglomerate, dolomite and sandstone with localized occurrences of diorite, gabbro and altered volcanic rocks.

All the aforementioned units are tightly folded and trend northwesterly. A series of enigmatic breccia bodies (areas of shattered rock), some of which are enormous, outline a significant arcuate, west- to west-northwest-trending zone of structural weakness and are known as the Wernecke Breccias. The central part of this arc occurs in the northeastern part of the map area.

A few small intrusions of 100 million year old granodiorite, quartz monzonite and syenite of the Selwyn Plutonic Suite cut the thrust panels in the extreme southwestern part of the map area.

Mineral Deposits and Occurrences

The Nash Creek map area contains over 100 reported prospects and occurrences, most of which are silver-rich, lead-zinc veins in the southern half of the map area. Equally abundant are copper veins in the northeastern part of the map area associated with Wernecke Breccias, and these have seen increasing exploration attention in recent years. Hardrock occurrences of tin, tungsten, gold, silver, lead and zinc are associated with granitic intrusions in the Potato Hills/Dublin Gulch region. The Dublin Gulch bulk mineable gold porphyry deposit contained in granite hosts a mineable reserve of 50.4 mT grading 0.9 grams per tonne gold in the Eagle Zone, with further potential in the Olive, Steiner and Rainbow Gulch Zones. Skarn in the adjacent limestone contains approximately 5.4 million tonnes of 0.82% tungsten tri-oxide (the Mar or Ray Gulch Tungsten deposit). Placer gold has been mined in the area over the last century, and placer tungsten and tin are also present in the gravels. Other deposits with reported tonnage include the Marg volcanogenic massive sulphide deposit which contains 5.5 million tonnes of 1.8% copper, 7.5% combined lead and zinc, and 63 grams per tonne silver with 1 gram per tonne gold; the Blende, a replacement deposit containing 19.4 million tonnes of 3% zinc, 2.8% lead, and 56 grams per tonne silver; the Clark which hosts 325 000 tonnes of 255 grams per tonne silver and 11% combined lead and zinc; the Peso contains 140 000 tonnes of 716 grams per tonne silver and 3.7% lead; and of particular Interest is the Nick which is a unique, stratabound nickel-occurrence.

SURFICIAL GEOLOGY

There is very little information available on the Quaternary geology of this map sheet. A very generalized map at the 1:250 000 scale (Vernon and Hughes; 1966) derived from air photograph interpretation outlines major surface geology units and the report provides a basic framework for the glacial history of the area.

Glaciers covering this area were part of a large transection glacier network or system which flowed generally northwestward. At least three major ice advances are inferred, based on geomorphic evidence only. The extent of the oldest glaciation is not well-defined in this area. The intermediate glaciers occupied the Wind River valley and extended northward, into the Beaver River-Kathleen Lake and Hart River area, and into some of the valleys crossing these two major systems. Ice surface of this glaciation is estimated to be the highest at Kathleen Lake (1432 m) and sloped to the northwest, west and southwest. Ice thickness at Kathleen Lake was around 670 m. Most of the tributary valleys also supported small glaciers which merged with the larger Ice masses.

The more recent glaciation shows a more restricted distribution and in most cases, tributary glaciers did not join the main valley glaciers. Based on the scarce geomorphic evidence of Ice fluctuation, it is assumed that this recent Ice retreated rapidly and continuously towards the southeast. Glacial deposits are mapped at elevations ranging from 762 m to 1229 m, along valley floors and walls. They consist of a sandy till with gravelly inclusions derived from the sedimentary bedrock. Till is expected to be as thick as 30 m in valley bottom and forms a thin discontinuous veneer along valley side, below the glacial limits. Glaciolacustrine sediments are found in the McQuesten Lake area, at elevations below 762 m. The silt and clay deposits show severe thermokarst subsidence and ponding.

TERRAIN HAZARDS

Seismicity

There are 38 recorded seismic events within the Nash Creek map area. Twenty-nine of these events are located in the northeast corner of the map area. All of the recorded events are 4.0 to 4.99 magnitude or less.

Mass Movement Processes

There is no mapped information or published information on mass movement hazards in this area. Steep cirque walls and arêtes visible on the surficial geology map (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. It is likely that solifluction, detachment slides and poor drainage will result from surface disturbance on such slopes. A few large slides were mapped; the largest one is on the south side of the Hart River between Elliot Creek and Hart Lake.

Permafrost

This area lies within the extensive discontinuous permafrost zone (Heginbottom and Radburn, 1992), with low to moderate ice content in morainal and colluvial deposits above valley floors, low to moderate ice content in alluvial and fluvial deposits, and moderate to high ice content in fine-grained glaciolacustrine deposits, such as the deposits around McQuesten Lake, 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.

Vernon and Hughes (1966) quote observations from McTaggart (1960) of permafrost thickness in excess of 122 m (400 ft). They noted the presence of solifluction lobes, patterned ground, palsa bogs and pingos throughout the map area as well as large surfaces covered by patterned ground at the intersection of the Bear and Wind rivers. They also observed that "the floors of the larger valleys, particularly in Tintina Trench and Yukon Plateau are covered with thick accumulations of organic silt and woody or sedgy peat containing large amounts of ground ice". Following disturbance, some of the degrading (melting) ice wedges leave depressions up to 3 m wide and 2 m deep.

Active rock glaciers show unvegetated steep fronts and are commonly located at elevations above 1820 m (6000 ft). Inactive rock glaciers are mostly vegetated and have rounder front profiles; they usually head at elevations as low as 1066 m (3500 ft). Rock glaciers occupy northeasts- to northwest-facing cirques, and locally more southerly aspects, particularly in the Wernecke Mountains. Debris-covered glaciers can be as thick as 60 m (200 ft) and head in cirques with steep north-facing headwalls.

Flooding and Other Risks

The lowermost terraces of the major rivers are subject to flooding. Some sections of the braided channels of the White River are presently unstable. In addition to flooding risk, the steep portions of alluvial fans are also exposed to the additional possibility of mud flows and debris flows associated with rapid discharge increases.

References: Nash Creek Map Area - NTS 106D

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.

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* Green, L.H., 1972. Geology of Nash Creek, Larsen Creek, and Dawson Creek map-areas, Yukon Territory. Geological Survey of Canada, Memoir 364 (includes map 1282A).

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.

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* 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
	Rapid mass movements (debris torrent) with known point source. Limits of runout not implied by symbol.	high
	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		>5.0

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 dilaintegrating 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.
Imt	Mountain Ice caps.	Avalanches, ice and rock falls, and crevasses.
Ic	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.
mrk	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

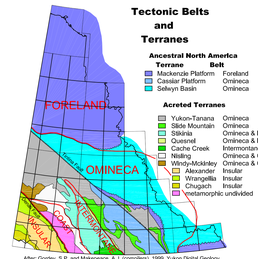
LEGEND QUATERNARY VOLCANISM

No known recent volcanism in map area 106D

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.



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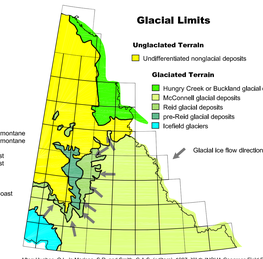
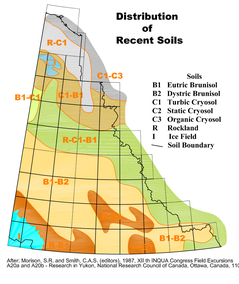


After: Hughes, O.L. in Morison, S.R. and Smith, C.A.S. (editors), 1987. XII th INQUA Congress Field Excursions A20, p12 to 19. - Research in Yukon, National Research Council of Canada, Ottawa, Canada, 110p



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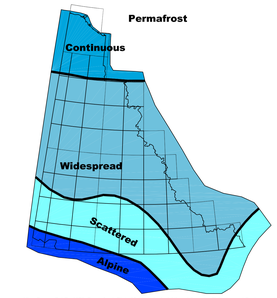

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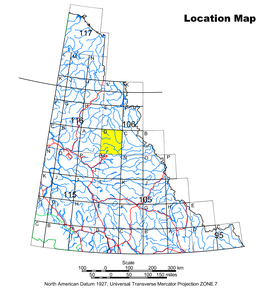

Exploration and Geological Services Division
Yukon Region
Indian and Northern Affairs Canada

Yukon GEOPROCESS File

Geological Processes and Terrain Hazards of Nash Creek 106D

by

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

Copies of this map and the accompanying Geological Summary 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

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