GEOPROCESS FILE - SUMMARY REPORT

NASH CREEK MAP AREA - N.T.S. 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 Introduction and User's 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's 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 and summaries followed by summaries of the bedrock geology, surficial geology and terrain hazards for this N.T.S. 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 attached to 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 N.T.S. 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 Introduction and User's 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.

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 prolific 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 holds 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 Platinum 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 and 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 arretes 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 observe 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 1,066 m (3,500 ft). Rock glaciers occupy northeast 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 Wind River are probably 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 - N.T.S. 106D

To be thorough, check the references for adjacent N.T.S. map sheets and the General Reference List (See Introduction and User's 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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