GEOPROCESS FILE
SUMMARY REPORT

STEWART RIVER MAP AREA
N.T.S. 115O (E1/2) and 115N

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 Exploration and Geological Services Division, Indian and Northern Affairs Canada 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, geological structures 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 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 (Tempelman-Kluit 1974)

The Stewart River map area is entirely within the Omineca Belt. The map area is mostly unglaciated except for the large river valleys and bedrock exposure is generally poor. The topography of the region is subdued and characterized by low rolling hills.

The bedrock geology is dominated by amphibolite-grade metamorphic rocks of the Yukon-Tanana Terrane. The Yukon-Tanana Terrane rocks consist mostly of pre-400 million year old Nisling Assemblage muscovite-biotite quartzite, quartz-feldspar-mica schist, amphibolite, augen gneiss, marble and phyllite. These rocks are structurally overlain by 400-320 million year old Nasina Assemblage graphitic quartzite, micaceous quartzite, quartz-mica schist, amphibolite, marble; 350 million year old muscovite-chlorite-biotite granodiorite gneiss known as the Pelly Gneiss; and 350-250 million year old meta-volcanic quartz-mica schist of the Nisutlin Assemblage, known as the Klondike Schist. The structural contact between the Nisling and Nasina metamorphic assemblages is marked by numerous exposures of variably serpentinized ultramafic rocks and is thus interpreted as a thrust fault.

Rocks in the extreme northeast corner of the map area are separated from the metamorphic rocks along the Tintina Fault. These rocks are composed of 530-390 million year old Road River Group black shale, chert, argillite and siltstone. Rocks in the Tintina Fault include mainly 50 million year old conglomerate and sandstone.

The metamorphic assemblages are intruded by a few plutons of 100 million year old granodiorite and a few small plugs of 50 million year old quartz-feldspar porphyry and leucogranite. Numerous, extensive successions of 75 million year old Carmacks Group volcanic rocks, especially in the area between the Yukon and Sixtymile Rivers, are composed of basalt and andesite flows and tuffs. Tantalus Formation quartz pebble conglomerate and sandstone locally underlie the Carmacks Group, but form a thick section at Haystack Mountain.

Mineral Deposits and Occurrences

There are 145 mineral occurrences and prospects listed for the Stewart River map area. Sixty-eight of these have known mineralization and thirty-six of these are gold veins. Other types of mineralization include: silver-lead, copper veins, skarn and porphyry occurrences, and minor deposits of coal and asbestos. There is only one hardrock deposit with defined reserves in the Stewart River map area, although there has been production from a few small high-grade mines in the Sixty Mile (Learner and Connaught occurrences) and Klondike (Lone Star 15,000 tonnes of ore) River areas in the past 80 years. The Lone Star has present reserves of 907,200 tonnes of 2.4 grams of gold per tonne.

The Stewart River area is better known for its placer gold than hardrock mineralization. Historically, greater than 11 million ounces (310 million grams) of placer gold has been mined from the creeks of the Stewart River area. There are presently 50-100 operating mines in the region.

SURFICIAL GEOLOGY

The Stewart River map area is located in the unglaciated portion of the Western Yukon Plateau. During late Tertiary time (20 to 2 million years ago), smooth rounded summits and valleys formed as a mature landscape with a well developed system of streams which drained in a southerly direction. After a period of tectonic stability (e.g. inactive faults), uplift occurred (e.g. upward movement in the crust) which continued into the Quaternary time period, 2 million years to present, (Templeman-Kluit, 1980). Drainage systems became entrenched and with the onset of Quaternary glaciations drainage reversals in a northerly direction occurred throughout central Yukon (Templeman-Kluit, 1980). Alluvial settings include: 1. glaciofluvial sand and gravel termed the "Klondike Gravel" which is pre-Reid in age; 2. White Channel sediments which stratigraphically underlie the Klondike Gravel. White Channel sediments are thought to be late Pliocene to early Pleistocene in age; 3. mid to lower slope terrace features which contain fluvial gravel and sand and black muck and 4. valley bottom fluvial deposits. All of these alluvial settings contain placer gold with the exception of the Klondike Gravel.

TERRAIN HAZARDS

The main source of information for the terrain hazards map is derived from surficial geology and soil survey maps. The Geological Survey of Canada Pacific Geoscience Center in Victoria provided the seismic information.

Seismicity

Six earthquake events have been recorded in the Stewart River map area. Five of these were between magnitude 2 and 3 and one was between magnitude 3 and 4. Most epicentres are in the eastern part of the map area.

Mass Movement Processes

No information is available for this area to help estimate the probability or distribution of active processes or landforms; however, the following assumptions can be made. Permafrost is present on north facing slopes, and processes such as solifluction, soil creep, nivation and cryoturbation can occur. Fine-grained sediments in the valley bottoms are likely to be underlain by permafrost with high ice content, which may thermokarst if disturbed. Avalanches and rockfalls are always a possible risk on steep slopes, and bedrock such as the Klondike schist and ultramafic rock may fail if slope conditions such as degrading permafrost or excessive moisture are present. An example of a mass movement failure is the large landslide above the townsite of Dawson (just north of the map area) which is chiefly composed of friable ultramafic bedrock.

Permafrost

Although there is no information available for this particular map area, conditions are likely very similar to the Dawson map area (Heginbottom and Radburn, 1992) located directly north of the Stewart map area. Permafrost conditions in the Stewart River area can be described as extensive, discontinuous permafrost, with a low to moderate ice content (Heginbottom and Radburn, 1992). Massive ice bodies may be found at depth particularly in fine-grained sediments. In the Dawson area, coarse gravel has been excavated and found to be frozen at depth as great as 30 meters (Mougeot, 1992). Fine grained alluvial sediments contain large tabular ice bodies, as well as numerous ice wedges, ice veins and lenses. Cryoplanation terraces and nivation hollows are active at high elevations, in addition to soil creep and solifluction on north facing slopes.

Flooding Hazards

No data on flooding hazards are available for this map area, however, hazard levels are probably very similar to those in the Mayo or Dawson map areas.

References

Stewart River Map Area
N.T.S. 115N (E1/2) and 115O

Note: To be thorough, check the references for adjacent N.T.S. map sheets and the General Reference List.

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