GEOPROCESS FILE
SUMMARY REPORT

SNAG and BEAVER CREEK MAP AREAS
N.T.S. 115J and 115K (E1/2)

INTRDODUCTION

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 Users 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 Users 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)

Snag map area is mainly within the Omineca Belt except for a small portion southwest of the Denali Fault (Shakwak Valley) which is in the Insular Belt. The region is dominated by fairly subdued topography, wide river valleys (Yukon, Donjek, White) and the Wellesley Lake basin.

The Omineca Belt is dominated by crystalline rocks of the Yukon Tanana Terrane. They include pre-400 million year old Nisling Assemblage muscovite-biotite-quartz schist and micaceous quartzite; 400-320 million year old Nasina Assemblage graphitic quartzite, micaceous quartzite, quartz-mica schist, muscovite-biotite-quartz schist, phyllite, amphibolite and marble; 350 million year old Pelly Gneiss muscovite-chlorite biotite granodiorite gneiss; and 200-180 million year old hornblende granodiorite and quartz monzonite of the Klotassin Suite in the northern part of the map area. In the western area, this crystalline package is structurally overlain by a 400-150 million year old oceanic assemblage of sheared and massive greenstone, gabbro, dunite and peridotite (and serpentinized equivalents), argillaceous chert, hornfels, limestone and marble attributed to the Windy-McKinley Terrane.

The eastern half of map area is dominated by plutons of the 110 million year old Coffee Creek/Nisling Range/Dawson Batholith biotite-hornblende granodiorite, diorite, biotite granite and quartz monzonite. The southern half of the area contains aereally extensive flows of 70 million year old Carmacks Group (and Donjek volcanics) amygdaloidal augite olivine basalt, flow breccia and tuff, and local accumulations of 55 million year old Skukum Group (Casino and Mount Nansen volcanics, Tempelman-Kluit, 1984) acid tuff, ignimbrite and tuff-breccia. In the southeastern area, 55 million year old Nisling Range alaskite plutons are associated with vast swarms of north-trending quartz-feldspar porphyry dykes. The alaskite is commonly well jointed and forms castellated outcrops.

Southwest of the Denali Fault, rocks of the Wrangellia Terrane include 260-220 million year old basalt, tuff, argillite, siltstone, greywacke conglomerate and limestone and serpentinized peridotite.

Mineral deposits and occurrences

Yukon MINFILE lists more than 100 mineral prospects for the Snag map area, however many of them are geochemical anomalies, leaving only 30 with mineralization. Most of these properties are copper-molybdenum porphyry showings associated with 100-55 million year old plutons in the Dawson Range. The largest of these is the Casino deposit with more than 550 million tonnes of 0.25% copper, 0.025% molybdenum and 0.31 grams per tonne gold. This is one of the largest copper porphyry deposits in Canada. Other deposits in the area include silver-lead-gold veins of which the Bomber veins produced 372 tonnes of 3689 grams per tonne silver, 17.1 grams per tonne gold, 48% lead, with minor zinc, copper and bismuth.

SURFICIAL GEOLOGY

The main source of information in this area consists of two surficial geology and geomorphology maps at the 1:100,000 scale (Rampton, 1980a,b). The legend on these maps includes for each major geological unit: comments on nature of the material, distribution and stratigraphy, geomorphology, permafrost and comments on other related terrain characteristics.

Southwest Yukon was affected by two glaciations during the Pleistocene. In both cases, the ice flowed northwest along the Shakwak Trench and then spread out over the Wellesley Basin in a spatulate manner. High terrain remained exposed as islands, or nunataks, above the ice.

Mirror Creek, the most extensive glaciation, is most likely early Wisconsin in age. Moraine deposits and ice limits are believed to have reached 1280 m elevation. This glaciation extended southwest of the Shakwak Trench. Mirror Creek glaciers dammed the drainage of several creeks or streams and the ponded water formed lakes in minor valleys. Scottie

Creek was part of such a lake system and strand lines are visible at elevations between 580 and 610 m. The Macauley glaciation was not as extensive and is estimated to date from the late Wisconsin.

During deglaciation broad outwash plains were deposited, and at least in one case, drainage was diverted (the White River and Sanpete Creek were diverted along Dry Creek). Large amounts of silt were redeposited as loess blankets; at higher elevation this loess cover has been reworked by slope wash and solifluction processes. Following deglaciation, streams began to incise through the glacial, colluvial and glaciofluvial deposits which resulted in the formation of large alluvial fans at the mouth of most high gradient valleys.

Unglaciated uplands are covered by silty to loamy coarse gravel which is comprised of colluvial and residual bedrock material.

TERRAIN HAZARDS

Geological processes active in this map area which present the most immediate hazard to human activity are related to shifting channels and flooding risk of the White River.

Seismicity

There are 22 recorded seismic events within the Snag-Beaver Creek map area. Eight of the 22 events are of magnitude >3.0 to <4.0. Thes rest are less than magnitude 3.0. Most of the events are in the southern part of the map area.

Mass Movement Processes

The colluvial covered slopes of most of the map area are susceptible to gullying and solifluction. In areas underlain by permafrost, disturbance of the surface may result in the detachment of the active layer and failure. The risk of rock avalanches and large landslides on steep, bedrock slopes is restricted to small areas in the higher Nutzotin Mountains (southeast corner of NTS 115K).

Permafrost

The map area lies within the zone of widespread permafrost. Permafrost as thick as 30 m is common throughout the area, except under large lakes and stream channels, for instance, White River and Beaver Creek. Large ice bodies are usually found more often in fine-grained sediments such as fine sandy silt to clays, and under thick peat deposits. A high ice content can be inferred by the presence of ice wedges, ice lenses and ice veins. These ice bodies are not restricted to well sorted fine-grained deposits but are also found in poorly sorted deposits such as colluvial and morainal deposits with sufficient silty matrix. Thermokarst is associated with several shallow lakes, particularly in flat bottom valleys of the Klondike Plateau such as the Scottie Creek fine-grained alluvial deposits and associated organic material (Rampton, 1980). Pingos are most likely ice-cored. Permafrost related and periglacial processes are widespread in this map area. At high elevation, altiplenation terraces and tors can be found in the unglaciated ridges. Patterned ground, solifluction lobes, sorted stripes and polygons are common in the alpine and subalpine zones. Rock glaciers are found southwest of the Denali fault, in the Nutzotin Mountains.

Flooding and Other Risks

The rivers in the area are subject to seasonal flooding most years due to snowmelt runoff, rainstorm events, and ice jams. In addition to these expected seasonal flow variations, the White River floodplain is characterized by shifting channels and fluctuating flow. Periodic flooding is a common occurrence along this river.

References

Snag Map Area
N.T.S. 115J and 115K (E1/2)

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

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