NGR Surveys in Northern Yukon Territory to Evaluate Mineral Resource Potential

(Parts of NTS 106B, 106C, 106E, 106F, 106K and 106L)

Regional Overview

A stream sediment and water survey was carried out in 2001 over an area of approximately 19 300 km^2 between latitudes 64ºN and 67ºN in northeastern Yukon Territory (Fig. 1). Two physiographic regions, mountain and plateau, are represented within the area surveyed. Samples collected east of the Richardson Mountains on the Trail River (106L) map sheet, on the northeast quarter of the Wind River (106E) map sheet, and on the northern half of the Snake River (106F) map sheet (Fig. 2) fall within the Peel Plateau (Mathews, 1986). The Peel Plateau is a relatively subdued terrain of undulating plateaus and incised valleys lying mostly below 600 m elevation, with a few hills over 800 m. The region is underlain by Lower Cretaceous rocks consisting of thin beds of brown or black shale interbedded with siltstone or clay, with silty, sandy or conglomeratic basal units (Gordey & Makepeace, 2001). Late Pleistocene Continental (Laurentide) ice advanced from the east (Duk-Rodkin, 1999), leaving blankets of morainal material in valleys and uplands. Vegetation below the tree line of 600 to 750 m consists of black spruce, larch, white spruce and paper birch (Oswald and Senyk, 1977).

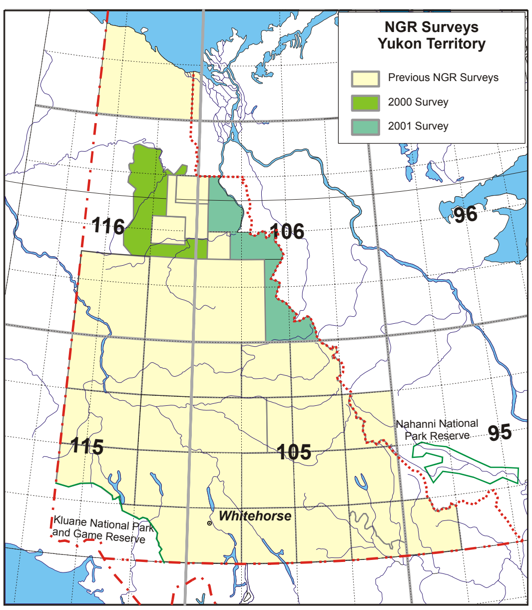

Fig. 1. National Geochemical Reconnaissance surveys carried out in Yukon Territory

Along the western margins of the Peel Plateau, on the Snake River map sheet, the survey extends into foothills of the Richardson Mountains (Fig. 2), which are formed mainly of Upper Devonian to Lower or Middle Cambrian sedimentary shale, siltstone and limestone. The Richardson Mountains formed an effective barrier to the westerly moving Laurentide ice, and only the eastern slopes are glaciated, to an elevation of about 1100 m (Oswald and Senyk, 1977).

Mountains of the Canyon and Backbone Ranges, and the Wernecke Mountains define the physiography of the south half of the Snake River, and the Bonnet Plume Lake (106B) and Nadaleen River (106C) map sheets (Fig. 2). Peaks rising above 2300 m are present in the Backbone Ranges on the Nadaleen River map sheet. Ice fields and glaciers are present at higher elevations. On the eastern half of the Nadaleen River map sheet and the southwest half of the Bonnet Plume Lake map sheet the Bonnet Plume and Nadaleen Ranges of the Wernecke Mountains (Selwyn Mountains) rise to lower elevations than the Backbone Ranges, but some peaks exceed 2000 m. The southern half of the survey area is underlain by metamorphic and sedimentary units dominated by upper Devonian to lower Proterozoic phyllite, dolomite, argillite, slate, limestone, chert, sandstone and conglomerate (Gordey & Makepeace, 2001). The retreat of northwesterly-flowing Late Pleistocene Cordilleran glaciers left behind morainal deposits in valleys and on lower slopes (Duk-Rodkin, 1999). Higher slopes are mantled with colluvium and scree. Although black and white spruce occur at elevations below 1200 m, most of the area lies above the tree line (Oswald and Senyk, 1977).

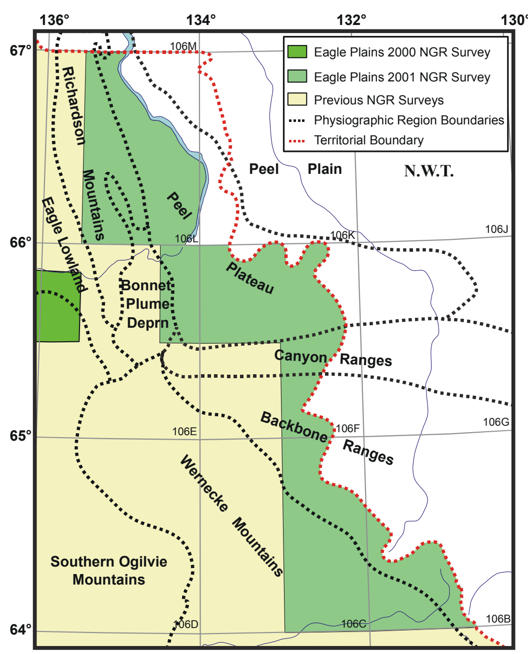

Fig 2. Physiographic regions of northeast Yukon Territory (from Mathews, 1986)

The Peel Plateau in the northern half of the survey area has been explored for oil and gas, but occurrences of metallic minerals have not been noted. In the Richardson Mountains at the western margin of the survey area (Fig. 2) U-Cu mineralization in Middle Proterozoic siltstone and argillite is associated with a diatreme breccia (Yukon MINFILE 106L 061). Stratabound Pb-Zn in lower Cambrian limestone occurs as galena, sphalerite and pyrite in vugs and local breccia zones (Yukon MINFILE 106L 033). The Canyon and Backbone Ranges host significant jasper-hematite iron formation (Yukon MINFILE 106F 008) in addition to stratabound Zn-Pb mineralization.

Mineralization recorded in the Wernecke Mountains (Fig. 2) includes stratabound Pb-Zn-Ba ±Ag, ±Sb, ±Hg in veins and brecciated rocks (Yukon MINFILE 106B 013, 015 and 024). West of the Snake River (106C), Ag-U-Cu mineralisation is associated with dioritic and gabbroic intrusions in Middle Proterozoic sedimentary rocks (106C 086); stratabound Pb-Zn ±Ag occurs in veins and brecciated carbonate rocks (Yukon MINFILE 106C 027, 031, 075 and 077), and U ±Cu, ±Co occurs in veins and disseminated in argillite (Yukon MINFILE 106C 069).

Survey Summary

Camps were established on Bonnet Plume Lake (Fig. 3) and Eagle Plains. Using helicopters, stream sediments and waters were collected from 1306 sites during the summer of 2001. Additional water samples were collected from 305 of these sites for subsequent filtration and acidification. Sample sites were distributed over a 19 300 km^2 survey area at an average of one sample per 15 km^2. Sample site duplicate samples were routinely collected in each analytical block of twenty samples. Field observations were recorded on standard forms used by the Geological Survey of Canada.

Fig 3. Widrig camp on Bonnet Plume Lake.

Field-dried samples were air-dried and sieved through an 80-mesh (177 µm) screen. At that time, control reference and blind duplicate samples were inserted into each block of twenty sediment samples. For the water samples, only control reference samples were inserted into the block. There were no blind duplicate water samples.

Sediment samples are being analysed for 36 variables using an aqua-regia digestion followed by inductively coupled plasma – mass spectrometry (ICP-MS) analysis (Table 1).

ELEMENT		DETECTION LEVEL	
Ag	Silver	2	ppb
Al	Aluminum	0.01	pct
As	Arsenic	0.1	ppm
B	Boron	1.0	ppm
Ba	Barium	0.5	ppm
Bi	Bismuth	0.02	ppm
Cd	Cadmium	0.01	ppm
Ca	Calcium	0.01	pct
Co	Cobalt	0.1	ppm
Cr	Chromium	0.5	ppm
Cu	Copper	0.01	ppm
Fe	Iron	0.01	pct
Ga	Gallium	0.2	ppm
Hg	Mercury	5	ppb
K	Potassium	0.01	pct
La	Lanthanum	0.5	ppm
Mg	Magnesium	0.01	pct
Mn	Manganese	1	ppm
Mo	Molybdenum	0.01	ppm
Na	Sodium	0.001	pct
Ni	Nickel	0.1	ppm
P	Phosphorus	0.001	pct
Pb	Lead	0.01	ppm
S	Sulphur	0.02	pct
Sb	Antimony	0.02	ppm
Sc	Scandium	0.1	ppm
Se	Selenium	0.1	ppm
Sr	Strontium	0.5	ppm
Te	Tellurium	0.02	ppm
Th	Thorium	0.1	ppm
Ti	Titanium	0.001	pct
Tl	Thallium	0.02	ppm
U	Uranium	0.1	ppm
V	Vanadium	2	ppm
W	Tungsten	0.2	ppm
Zn	Zinc	0.1	ppm

Table 1. Elements determined by ICP-MS.

Instrumental neutron activation analysis is used to determine 24 variables in a separate aliquot of sample (Table 2). Untreated water samples are being analysed for pH, U, and conductivity. Filtered and acidified waters are undergoing analysis for trace metals by ICP-MS.

Additional analytical methods are used to determine Sn and the approximate content of organic materials in sediments (loss-on-ignition).

ELEMENT		DETECTION LEVEL	
As	Arsenic	0.5	ppm
Au	Gold	2	ppb
AuWt	Sample Weight	0.01	g
Ba	Barium	50	ppm
Br	Bromine	0.5	ppm
Ce	Cerium	5	ppm
Co	Cobalt	5	ppm
Cr	Chromium	20	ppm
Cs	Cesium	0.5	ppm
Eu	Europium	1	ppm
Fe	Iron	0.2	pct
Hf	Hafnium	1	ppm
La	Lanthanum	2	ppm
Lu	Lutetium	0.2	ppm
Na	Sodium	0.02	pct
Rb	Rubidium	5	ppm
Sb	Antimony	0.1	ppm
Sc	Scandium	0.2	ppm
Sm	Samarium	0.1	ppm
Ta	Tantalum	0.5	ppm
Tb	Terbium	0.5	ppm
Th	Thorium	0.2	ppm
U	Uranium	0.2	ppm
W	Tungsten	1	ppm
Yb	Ytterbium	1	ppm

Table 2. Elements determined by INAA.

The Yukon Territorial Government and the Department of Indian and Northern Affairs, under the Yukon Geology Program, provided financial support. The Geological Survey of Canada, Mineral Resources Division, provided financial and logistical support.

References

Duk-Rodkin, A. (compiler)
1999 Glacial limits map of Yukon Territory; Geological Survey of Canada, Open File 3694 and Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, Geoscience Map 1999-2

Gordey, S.P. and Makepeace, A.J. (compilers)
2001 Bedrock Geology, Yukon Territory; Geological Survey of Canada, Open File 3754 and Exploration and Geological Services Division, Yukon Region, Indian and Northern Affairs Canada, Open File 2001-1, scale 1:1 000 000

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

Mathews, W.H. (compiler)
1986 Physiography of the Canadian Cordillera; Geological Survey of Canada, Map 1701A, scale 1:5 000 000

Oswald, E.T. and Senyk, J.P.
1977 Ecoregions of Yukon Territory, Fisheries and Environment Canada, 115 p.