REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA

PINE PASS (NTS 93O), BRITISH COLUMBIA

REPORT 2008-7

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INTRODUCTION

In 2007, the Northern Development Initiative Trust and Geoscience BC funded a reconnaissance-scale stream sediment and water survey covering NTS map sheet 93O - Pine Pass (Jackaman and Balfour, 2008[1]). Results from this work will contribute to the geochemical coverage of the province, complement existing private and publicly available geoscience data sets and provide the mining and exploration community with new, high-quality geochemical information.

Geoscience BC Report 2008-7 includes results of the 2007 survey. The information has been provided in a variety of digital formats. PDF files include survey descriptions and details regarding methods, field and analytical data listings, summary statistics, sample location map, geology map and maps for individual metals. Raw digital data files used in the production process are included in XLS and DBF formats.

SURVEY DESCRIPTION

The survey area surrounds the community of Mackenzie and is divided by the Rocky Mountain Trench (Map 2). To the east, the survey area lies within the Foreland belt, which is composed equally of upper Proterozoic and Paleozoic sedimentary rocks of the ancestral North America terrane. Lying in the Omineca belt, the southeast portion of the survey area is underlain by upper Proterozoic and Paleozoic rocks of the Cassiar and Slide Mountain terranes. The survey area contains 50 documented mineral occurrences with coal and limestone being the primary types found (MINFILE, 2007[2]).

Located in the western portion of the survey area, the Omineca Mountains are characterized by forested rounded summits and in the eastern portion are the moderately rugged mountains of the Hart Ranges and Rocky Mountain Foothills. Dissected by numerous actively flowing creeks and rivers, the area contains abundant sample sites to support a regional stream sediment and water survey. Fine-grained stream sediment is the preferred sample medium in these types of mountainous regions due to its widespread availability, ease of collection, and its ability to provide representative geochemical information for the drainage basin upstream from the sample site.

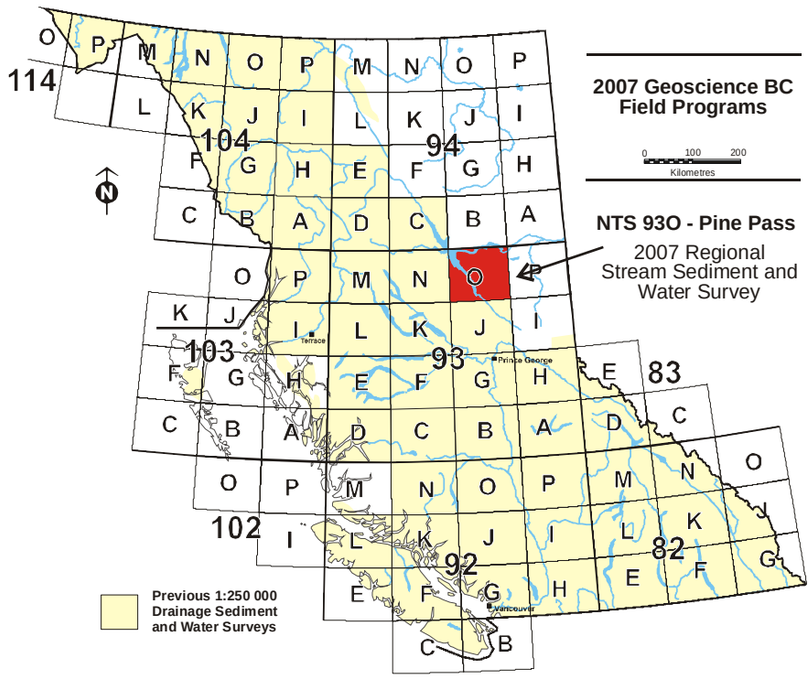

Figure 1. Location of survey area in central British Columbia.

[1]Jackaman, W. and Balfour, J.S. (2008): QUEST Project geochemistry: field surveys and data reanalysis, central British Columbia (parts of NTS 093A, B, G, H, J, K, N, O); *in* Geoscience BC Summary of Activities 2007, Geoscience BC, Report 2008-1, p. 7–10.

[2] MINFILE (2007): MINFILE BC mineral deposits database; BC Ministry of Energy, Mines and Petroleum Resources, URL <http://www.em.gov.bc.ca/Mining/Geolsurv/Minfile/> [October 2007].

STREAM SAMPLE COLLECTION

Methods and specifications utilized during the work were based on standard regional geochemical survey strategies used elsewhere in BC and Canada (Lett, 2005[3]; Ballantyne, 1991[4]).

Ground and helicopter-supported sampling was conducted during August and September 2007. A total of 906 stream sediment and water samples were collected from 854 sites at an average density of one site per 12 km^2 over the 10 500 km^2 survey area. In general, 1–2 kg fine-grained sediment samples were collected from actively flowing primary or secondary drainages with catchment areas of less than 10 km^2. Samples were composed of fine-grained sediment mixed with varying amounts of coarse sand, gravel and organic material. Surface water samples were collected in 250-ml HDPE bottles taking precautions to exclude suspended solids. Contaminated or poor-quality sample sites were avoided by choosing an alternate stream or by sampling a minimum of 50 metres upstream from the source of contamination. Field duplicate sediment and water samples were routinely collected in each analytical block of 20 samples and field observations and site locations were recorded for each sample site.

STREAM SAMPLE PREPARATION

The bags containing the sediment samples were catalogued and drip-dried at a field camp and collected water samples were stored in a cool location. At the end of the field program, samples were shipped to a commercial lab, where the sediment samples were further air-dried at temperatures below 40ºC. After drying, sediment samples were dried sieved to –80 mesh (180 µm) fraction. To monitor and assess accuracy and precision of analytical results, control reference material and analytical duplicate samples were routinely inserted into each block of twenty sediment samples.

[3] Lett, R.E.W. (2005): Regional geochemical survey database on CD; BC Ministry of Energy, Mines and Petroleum Resources, Geofile 2005-17.

[4] Ballantyne, S.B. (1991): Stream Geochemistry in the Canadian Cordillera: Conventional and Future Applications for Exploration; ***in*** Exploration Geochemistry Workshop, ***Geological Survey of Canada,*** Open File 2390.

STREAM SAMPLE ANALYSIS

Splits of each processed sediment sample were analyzed for base and precious metals, pathfinder elements and rare earth elements by inductively coupled plasma mass spectrometry (ICPMS) and instrumental neutron activation analysis (INAA). Loss-on-ignition and fluorine were also determined for sediment material. Fluoride, conductivity and pH were determined for raw water samples. A complete list of elements and analytical detection limits is provided in Tables 1 and 2.

Table 1. Detection Limits: ICPMS.

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

Table 2. Detection Limits: INAA, F, LOI and Waters.

Element		D.L.	Unit	Method	Element		D.L.	Unit	Method
Antimony	Sb	0.1	ppm	INAA	Samarium	Sm	0.1	ppm	INAA
Arsenic	As	0.5	ppm	INAA	Scandium	Sc	0.2	ppm	INAA
Barium	Ba	50	ppm	INAA	Sodium	Na	0.02	%	INAA
Bromine	Br	0.5	ppm	INAA	Tantalum	Ta	0.5	ppm	INAA
Cerium	Ce	5	ppm	INAA	Terbium	Tb	0.5	ppm	INAA
Cesium	Cs	0.5	ppm	INAA	Thorium	Th	0.2	ppm	INAA
Chromium	Cr	20	ppm	INAA	Tungsten	W	1	ppm	INAA
Cobalt	Co	5	ppm	INAA	Uranium	U	0.2	ppm	INAA
Europium	Eu	1	ppm	INAA	Ytterbium	Yb	2	ppm	INAA
Gold	Au	2	ppb	INAA	Sample Weight	Wt	0.01	gm	GRAV
Hafnium	Hf	1	ppm	INAA	Fluorine	F	10	ppm	ION
Iron	Fe	0.2	%	INAA	Loss on Ignition	LOI	0.1	%	GRAV
Lanthanum	La	2	ppm	INAA					
Lutetium	Lu	0.2	ppm	INAA	pH	pH			ISE
molybdenum	Mo	1	ppm	INAA	Fluoride	FW	20	ppb	ION
Rubidium	Rb	5	ppm	INAA	Conductivity	CND	0.01	uS	ISE

Inductively Coupled Plasma Mass Spectrometry (ICPMS)

For the determination of 35 elements listed in Table 1, a 0.5-gram sample was leached with 3 ml of a mixture of HCl, HNO_3, and distilled, deionized water (3:1:2 v/v) at 95°C for one hour. The sample solution was diluted to 10 ml and analysed by inductively coupled plasma mass spectroscopy on a Thermo-Electron X-series II instrument. Elements determined by ICPMS are listed in Table 1. Data for gold and boron was not published because of inadequate detection limits and/or precision.

Instrumental Neutron Activation Analysis (INAA)

Weighed and encapsulated samples were packaged for irradiation along with internal standards and international reference materials. Samples and standards were irradiated together with neutron flux monitors in a two-megawatt pool type reactor. After a seven-day decay period, samples were measured with a high-resolution germanium detector. Typical counting times were 500 seconds. Elements determined by INAA are listed in Table 2. Data for silver, cadmium, iridium, nickel, selenium, tin, tellurium, titanium, zinc, and zirconium are not published because of inadequate detection limits and/or precision.

Other Sediment Analysis

Loss-on-ignition was determined using a 1-gram sample. The sample, weighed into a crucible, was placed into a 1000ºC muffle furnace for one hour. The crucibles were removed from the oven and cooled to 100ºC and then transferred to a desiccator for cooling to room temperature. The crucibles were re-weighed, and the difference was reported as loss-on-ignition (GRAV).

To measure fluorine, a 0.25-gram sample was fused with 1-gram of sodium carbonate-sodium nitrate. After being leached with metal free water for 1 hour, 10 ml of 10% citric acid solution is added. Fluoride was measured using specific ion electrode analysis (ION).

Water Analysis

The pH of stream waters was determined using an electronic pH meter with glass electrode and automatic temperature compensator, with a resolution of 0.01 pH units. Meters were calibrated using NIST approved buffer solutions of 4, 7 and 10 pH (ISE).

Conductivity of stream waters was determined using a YSI Model 31 Conductivity Bridge from Yellow Springs Instruments Inc with an error not exceeding 1% or 1 µmhos/cm, whichever was greater. Meters were calibrated using standard reference solutions of 447 and 2270 µmhos/cm (ISE).

For fluoride, a 50 ml sample was placed into a beaker and a digital pH meter equipped with a fluoride specific ion electrode inserted. A 50 ml Ioncal Buffer was added and the solution retested (ION).

DATA PRESENTATION

Geochemical information compiled in this report includes field and analytical results from samples collected during a regional stream survey conducted in 2007 (N = 906). Results from the survey have been determined to be accurate and complete. The data package has been prepared as a PDF document and presents survey results in three appendices that are described as follows:

Appendix 'A': Is a complete listing of site location information, field observations and analytical results for the 2007 survey. Tables preceding the data listings define codes used for field observations and underlying geology.

Appendix 'B': Presents summary statistics for individual elements and a more detailed summary based on the underlying bedrock geology determined at each sample site. The calculations have been determined from raw data and values reported by the labs at less then detection limit have been set to half the detection limit.

Appendix 'C': Includes a sample location map, simplified geology and mineral occurrence map and proportional symbol maps for each element. For most maps the symbol size and colour reflects data ranges that are based on the 30^{th}, 50^{th}, 70^{th}, 90^{th} and 95^{th} percentiles as determined from the raw data. Maximum symbol size is assigned to values greater than the 95^{th} percentile. Portraying high values with large, bold symbols, with background values represented by relatively smaller dots, helps highlight regional trends and anomalous sample sites.

The data summary presented in this package is not considered exhaustive. In order to accommodate more detailed assessments, raw digital data files have been included in XLS and DBF formats.

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Helicopter:	Prism Helicopters, Pit Meadows, BC
Collection:	CME Managing Consultants Inc., Vancouver, BC Noble Exploration Services Ltd., Sooke, BC
Preparation:	Eco Tech Laboratory Ltd., Kamloops, BC
Analysis:	Eco Tech Laboratory Ltd., Kamloops, BC Becquerel Laboratories Ltd., Mississauga, Ont

* * *

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