REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA

NORTHERN VANCOUVER ISLAND, BRITISH COLUMBIA

GEOSCIENCE BC REPORT 2013-11

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NORTHERN VANCOUVER ISLAND, BRITISH COLUMBIA

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INTRODUCTION

The Northern Vancouver Island Exploration Geoscience Project is part of a series of large-scale regional geochemical studies that have been sponsored by Geoscience BC since 2007. Each of these projects has included a number of important geochemical initiatives such as new surveys and the reanalysis of archived sediment pulps. These types of projects generate a vast array of new information that significantly enhances the utility of the provincial geochemical database (Jackaman and Lett, 2013) and complements other components of the projects, such as high-resolution airborne geophysical surveys and community workshops (Simpson et al., 2013) as well as earlier geochemical survey work (Jackaman, 2011) and geological mapping (Nixon et al., 2008). This collection of high-quality geoscience information promotes exploration interest in the project areas and helps guide the development follow-up activities.

Jointly funded by Geoscience BC and Island Coastal Economic Trust, the 2012 project included new stream based geochemical survey plus the reanalysis of over 400 till samples (Figure 2) from government funded surveys that were originally completed in parts of NTS map sheets 092L in the mid-1990s (Figure 1). Geoscience BC Report 2013-11 includes results of the infill sampling program. Data generated by the till reanalysis work was released as a separate report in May 2013 (Jackaman, 2013).

Parts of this report also include data from regional stream surveys and reanalysis initiatives previously completed in the study area. This information has been provided in a variety of digital formats. PDF files include survey descriptions and details regarding methods, summary statistics, sample location maps and maps for individual metals. Raw digital data files containing field and analytical data listings are included in Microsoft® Excel (XLS) format.

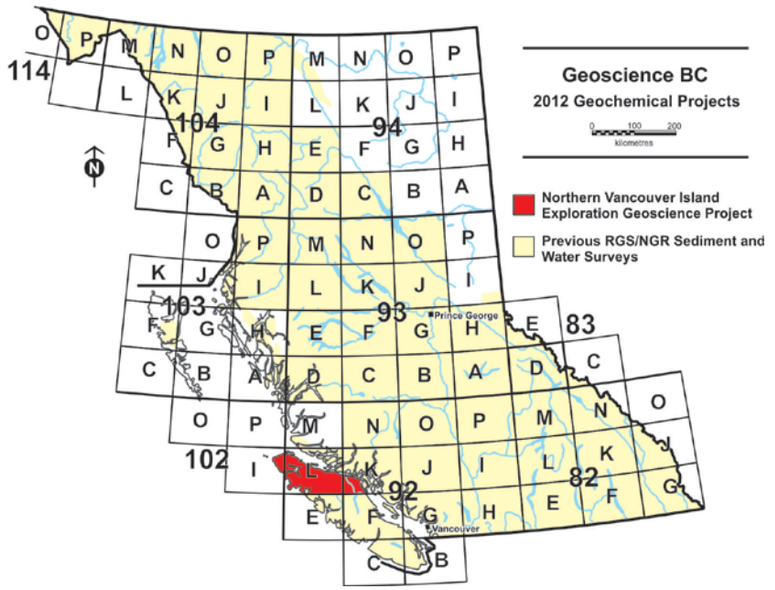

Figure 1. Location of the 2012 Northern Vancouver Island Exploration Geoscience Project in British Columbia.

SURVEY DESCRIPTION

The 2012 northern Vancouver Island survey covers an area of approximately 10,000 km^2 and is situated north of the communities of Campbell River and Zeballos (Figure 2). A total of 721 moss-trapped sediment samples plus water were acquired from 681stream sites located within NTS 1:250 000 map sheets 092L, 092K and 102I. The new sampling has been designed to increase geochemical coverage by targeting primary drainages not previously sampled and adding more sample sites upstream from existing locations in secondary or larger drainages. Combined with historical survey work, the resulting average sample site density has been improved to one site every 5 km^2.

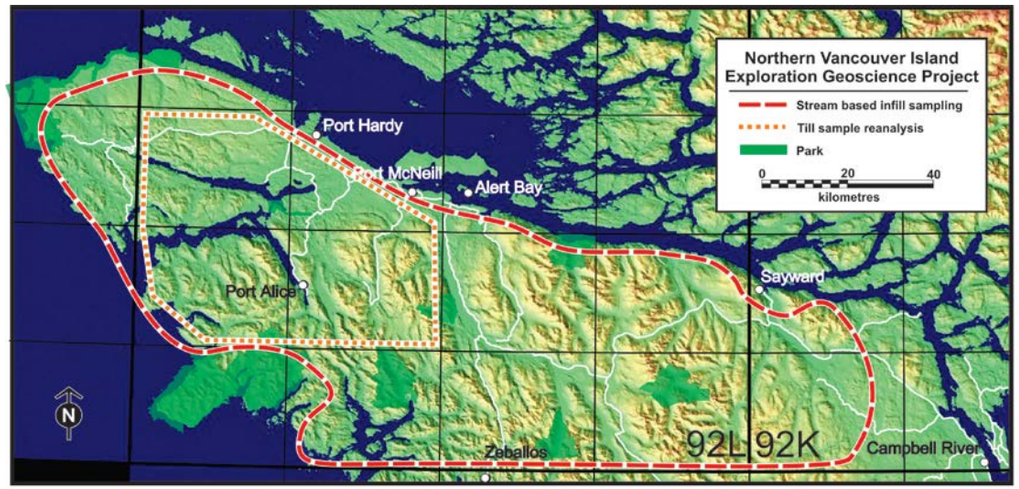

Figure 2. Location of the 2012 Northern Vancouver Island Exploration Geoscience Project study area.

SAMPLE COLLECTION

Truck supported, stream-based sample collection was carried out from July to October 2012. To maintain continuity with methods used during previous Vancouver Island surveys, moss-mat sediment samples were collected from appropriate locations at each site (Figure 3). In some cases, often due to stream channel disruptions associated with logging, conventional sediment (recently deposited, fine-grained material found within the active channel) was collected. Water samples were also collected, but due to the unusually dry weather, some of the sites were dry. Field duplicate samples were routinely collected in each analytical block of 20 samples.

Sediment material recovered from the moss-mats typically consisted of approximately 2 kilograms of fine silt to sand sized sediment with varying amounts of coarser gravels and organic constituents. Sediment samples were collected in Hubco® sample bags and water samples were collected in 250 mL high density polyethylene bottles. Field observations describing site location plus sample and site characteristics were recorded for each site. Samples were carefully transported back to field camps located in various northern Vancouver Island communities. At the field camps sediment samples were drip-dried in a contaminant free structure and water bottles were stored in a cool, dark location.

Stream sampling work was based on standard geochemical survey strategies and protocols initially developed for the National Geochemical Reconnaissance (NGR) program (Ballantyne 1991; Friske and Hornbrook, 1991) and adopted by the BC Regional Geochemical Survey (BCRGS) program (Gravel and Matysek, 1989).

SAMPLE PREPARATION

At the completion of the field program, the samples were shipped to ALS Global Ltd. (North Vancouver, B.C.) where the sediment samples were air-dried at temperatures below 40ºC and sieved to –80 mesh (<177 um). To monitor and assess accuracy and precision of analytical results, control reference material and analytical duplicate samples were inserted in each block of twenty sediment and water samples.

Figure 3. Photograph showing typical stream sediment material that has been trapped in moss-mats located in the active stream channel, northern Vancouver Island project area.

Splits of the processed sediment material were sent to ALS Global Ltd. and Becquerel Laboratories Inc. (Mississauga, Ontario) for analysis. ALS Global Ltd. tested the raw water samples for fluoride. Measurements for pH and conductivity were completed at each sample site using handheld meters.

SAMPLE ANALYSIS

The stream sediment pulps were analyzed for base and precious metals, pathfinder elements and rare earth elements by aqua-regia digestion followed by combination of inductively coupled plasma - atomic emission spectrometry (ICP-AES) and inductively coupled plasma - mass spectrometry (ICP-MS), plus by instrumental neutron activation analysis (INAA). Loss-on-ignition and fluorine were also determined for sediment material. Fluoride, conductivity and pH were determined for the stream water samples. A complete list of elements and analytical detection limits is provided in Tables 1, 2 and 3.

Ultra-trace Aqua Region Digestion and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) analysis

For the determination of 53 elements listed in Table 1, a 0.5-gram sample was digested in 5 mL of 75% aqua regia solution comprised of 1 part HNO_3 to 3 parts HCl, in a graphite heating block at 115°C. After cooling, the solution was diluted to 12.5 mL with deionized water and mixed. The sample was first analyzed by ICP-AES on an Agilent 725 instrument and subsequently by quadrupole ICP-MS on an Agilent 7700x instrument.

Table 1. List of elements and associated detection levels from ICP-MS analysis using aqua-regia digestion, northern Vancouver Island project area. (Abbreviations: ppm, parts per million; ppb, parts per billion; pct, percent)

Element		Detection Levels	Units
Aluminum	Al	0.01 to 10	pct
Antimony	Sb	0.02 to 2000	ppm
Arsenic	As	0.01 to 10000	ppm
Barium	Ba	0.5 to 10000	ppm
Bismuth	Bi	0.001 to 2000	ppm
Boron	B	0.04 to 2000	ppm
Cadmium	Cd	0.001 to 2000	ppm
Calcium	Ca	0.01 to 40	pct
Chromium	Cr	0.01 to 10000	ppm
Cobalt	Co	0.001 to 2000	ppm
Copper	Cu	0.01 to 10000	ppm
Gallium	Ga	0.004 to 100	ppm
Gold	Au	0.2 to 100000	ppb
Iron	Fe	0.001 to 40	pct
Lanthanum	La	0.002 to 10000	ppm
Lead	Pb	0.01 to 10000	ppm
Magnesium	Mg	0.01 to 30	pct
Manganese	Mn	0.1 to 10000	ppm
Mercury	Hg	4 to 50000	ppb
Molybdenum	Mo	0.01 to 2000	ppm
Nickel	Ni	0.04 to 10000	ppm
Phosphorus	P	0.001 to 5	pct
Potassium	K	0.01 to 10	pct
Scandium	Sc	0.005 to 100	ppm
Selenium	Se	0.1 to 100	ppm
Silver	Ag	1 to 100000	ppb
Sodium	Na	0.001 to 5	pct
Strontium	Sr	0.01 to 10000	ppm
Sulphur	S	0.01 to 5	pct
Tellurium	Te	0.01 to 1000	ppm
Thallium	Tl	0.002 to 1000	ppm
Thorium	Th	0.002 to 2000	ppm
Titanium	Ti	0.001 to 5	pct
Tungsten	W	0.001 to 100	ppm
Uranium	U	0.005 to 2000	ppm
Vanadium	V	0.1 to 10000	ppm
Zinc	Zn	0.1 to 10000	ppm
Beryllium	Be	0.01 to 1000	ppm
Cerium	Ce	0.003 to 2000	ppm
Cesium	Cs	0.005 to 2000	ppm
Germanium	Ge	0.005 to 100	ppm
Hafnium	Hf	0.002 to 1000	ppm
Indium	In	0.005 to 1000	ppm
Lithium	Li	0.1 to 2000	ppm
Niobium	Nb	0.002 to 2000	ppm
Rhenium	Re	1 to 1000	ppb
Rubidium	Rb	0.005 to 2000	ppm
Tin	Sn	0.01 to 100	ppm
Tantalum	Ta	0.005 to 2000	ppm
Yttrium	Y	0.003 to 2000	ppm
Zirconium	Zr	0.001 to 2000	ppm
Platinum	Pt	2 to 100000	ppb
Palladium	Pd	1 to 200000	ppb

Table 2. List of INAA elements and associated detection levels, northern Vancouver Island project area. (Abbreviations: ppm, parts per million; ppb, parts per billion; pct, percent; g, gram)

Element		Detection Levels	Units	Element		Detection Levels	Units
Antimony	Sb	0.1	ppm	Tantalum	Ta	0.5	ppm
Arsenic	As	0.5	ppm	Terbium	Tb	0.5	ppm
Barium	Ba	50	ppm	Thorium	Th	0.2	ppm
Bromine	Br	0.5	ppm	Tungsten	W	1	ppm
Cerium	Ce	5	ppm	Uranium	U	0.2	ppm
Cesium	Cs	0.5	ppm	Ytterbium	Yb	2	ppm
Chromium	Cr	20	ppm	Europium	Eu	1	ppm
Cobalt	Co	5	ppm	Cadmium	Cd	5	ppm
Gold	Au	2	ppb	Iridium	Ir	50	ppb
Hafnium	Hf	1	ppm	Nickel	Ni	10	ppm
Iron	Fe	0.2	pct	Selenium	Se	5	ppm
Lanthanum	La	2	ppm	Silver	Ag	2	ppm
Lutetium	Lu	0.2	ppm	Tellurium	Te	10	ppm
Molybdenum	Mo	1	ppm	Tin	Sn	100	ppm
Rubidium	Rb	5	ppm	Titanium	Ti	100	ppm
Samarium	Sm	0.1	ppm	Zinc	Zn	100	ppm
Scandium	Sc	0.2	ppm	Zirconium	Zr	200	ppm
Sodium	Na	1	pct	Weight	Wt	0.01	g

Table 3. Detection levels for F and LOI in sediments plus F, CND and pH in waters, northern Vancouver Island project area. (Abbreviations: ppm, parts per million; ppb, parts per billion; pct, percent; uS, microsiemen)

Element		Detection Levels	Units	Element		Detection Levels	Units
Fluorine	F	10	ppm	Fluoride	F	20	ppb
Loss on Ignition	LOI	0.1	pct	Conductivity	CND	0.01	uS
				pH	pH	0.01	

Instrumental Neutron Activation Analysis (INAA)

For the determination of 35 elements listed in Table 2, weighed and encapsulated samples were packaged for irradiation along with internal standards and international reference materials. Samples with an average weight of 26 grams plus 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. Data for europium, cadmium, iridium, nickel, selenium, silver, tellurium, tin, titanium, zinc, and zirconium are not included in this report because of inadequate detection limits and/or precision.

Other Sediment Analysis

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.

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.

Water Analysis

The pH and conductivity of waters was determined using handheld Oakton Multi-parameter TESTR 35 Series instruments. Meters were calibrated using commercial buffer solutions.

Fluoride in waters was determined by ion chromatography analysis.

DATA PRESENTATION

Information compiled in this report includes field and analytical results from stream samples collected during the 2012 northern Vancouver Island regional geochemical survey. Field observations and analytical results from this work have been determined to be complete and accurate.

To provide complete geochemical data coverage, results from previously published government funded BCRGS stream surveys (Lett, 2005) and results from Geoscience BC supported reanalysis initiatives (Jackaman, 2011) have been incorporated into this report. The data are presented in the following appendices and digital data files:

Appendix A and B:

These sections present summary statistics for individual elements for both the 2012 northern Vancouver Island data set (Appendix A), and a combined data set that includes the 2012 results plus information compiled from previous geochemical surveys (Appendix B) completed in the study area.

Appendix C:

This section includes a sample location map plus combined proportional symbol and gridded image maps for a selection of metals determined by ICP-MS. The image maps were created using an inverse distance weighting method. Colour depicted on the gridded images and proportional symbol size reflects data ranges that are based on percentiles calculated from the combined data sets (Appendix B). Maximum symbol size is assigned to highest values. Portraying high values with larger symbols and bright colours helps highlight regional geochemical trends and areas that may host anomalous results.

Digital Data:

The data summary presented in this package is not considered exhaustive. In order to accommodate more detailed assessments, raw digital data files for each data set used in this package have been included in Microsoft® Excel (XLS) format. Refer to the README.PDF file for details on the data files.

ACKNOWLEDGMENTS

This project was jointly funded by Geoscience BC[1] and the Island Coastal Economic Trust[2]. Companies that provided program support are listed as follows:

Collection:	Noble Exploration Services Ltd., Sooke, BC
Preparation:	ALS Global Ltd., North Vancouver, BC
Analysis:	ICPMS, F, LOI: ALS Global Ltd., North Vancouver, BC INAA: Becquerel Laboratories Ltd., Mississauga, Ont F in Water: ALS Global Ltd., North Vancouver, BC

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[1] Geoscience BC, 440 - 890 West Pender Street, Vancouver, B.C., Canada, V6C 1J9
URL: http://www.geosciencebc.com/s/Home.asp

[2] Island Coastal Economic Trust, 201A - 2435 Mansfield Drive, Courtenay, B.C., Canada, V9N 2M2
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*** APPENDIX A – SUMMARY STATISTICS ***

2012 NVI Survey Data Set

Notes:

- Calculations provided in Appendix B include analytical results from a regional stream survey conducted in the northern Vancouver Island study area in 2012.
- Calculations ignore analytical results from the second (REP=2) of paired field duplicate samples.
- Data reported by the labs at less than the detection limit have been set to the reported detection limit.
- Data for europium, cadmium, iridium, nickel, selenium, silver, tellurium, tin, titanium, zinc, and zirconium by INAA are not included in this report because of inadequate detection limits and/or precision.
- For a complete listing of the raw data, refer to Microsoft® Excel (XLS) format digital data files.

Summary Statistics – 2012 Survey Data Set

	STREAM SEDIMENT																		
Variable	**Al**	**Sb**	**As**	**Ba**	**Bi**	**B**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Ga**	**Au**	**Fe**	**La**	**Pb**	**Mg**	**Mn**	**Hg**
Units	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**%**	**ppm**	**ppm**	**%**	**ppm**	**ppb**
D.L.	**0.01**	**0.02**	**0.01**	**0.5**	**0.001**	**0.04**	**0.001**	**0.01**	**0.01**	**0.001**	**0.01**	**0.004**	**0.2**	**0.001**	**0.002**	**0.01**	**0.01**	**0.1**	**4**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**
N	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681
N > DL	681	679	681	681	681	26	681	681	681	681	681	681	645	681	681	681	681	681	680
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	2.50	0.33	11.28	46.99	0.12	2.98	0.29	1.24	44.71	25.28	81.28	7.84	16.51	4.81	5.56	4.64	1.16	1271.15	256.6
Median	2.40	0.15	3.53	38.30	0.04	0.04	0.15	1.09	36.00	21.50	57.90	7.66	1.40	4.75	4.82	3.17	1.01	928.00	59.0
Mode	1.62	0.07	0.69	15.00	0.04	0.04	0.20	0.61	15.80	20.90	29.00	10.55	0.50	4.32	2.80	2.57	0.80	1055.00	37.0
Range	4.99	12.38	1404.72	231.0	8.854	159.96	8.799	18.23	323.60	581.540	829.40	14.850	4919.8	15.200	25.470	85.79	12.78	37477.0	48396
St Dev	0.85	0.69	58.67	35.17	0.55	8.37	0.57	0.90	36.19	27.19	69.19	2.51	200.55	1.50	2.94	6.57	0.83	1991.15	2036.36
Coef Var	0.341	2.068	5.203	0.748	4.599	2.806	1.964	0.726	0.809	1.076	0.851	0.320	12.151	0.313	0.528	1.417	0.712	1.566	7.937
Log Mean	0.370	-0.750	0.581	1.566	-1.316	-0.851	-0.798	0.029	1.543	1.320	1.770	0.871	0.220	0.656	0.699	0.519	-0.021	2.969	1.821
Geo Mean	2.34	0.18	3.81	36.82	0.05	0.14	0.16	1.07	34.92	20.88	58.94	7.43	1.66	4.53	4.99	3.30	0.95	931.10	66.2
Log StDv	0.163	0.429	0.532	0.305	0.415	1.028	0.413	0.235	0.307	0.254	0.361	0.145	0.586	0.175	0.197	0.316	0.280	0.299	0.459
Log CVar	0.443	-0.571	0.917	0.195	-0.315	-1.209	-0.518	8.109	0.199	0.192	0.204	0.167	2.677	0.267	0.282	0.610	-14.003	0.101	0.252
Percntls																			
Minimum	0.50	0.02	0.28	6.0	0.006	0.04	0.011	0.17	3.40	2.460	4.60	2.000	0.2	0.050	1.330	0.41	0.12	123.0	4
10th	1.46	0.06	0.85	14.5	0.018	0.04	0.054	0.53	13.90	10.050	19.60	4.820	0.4	3.110	2.900	1.38	0.40	414.0	22
20th	1.81	0.07	1.25	19.2	0.024	0.04	0.077	0.68	20.20	13.350	28.70	5.470	0.6	3.570	3.390	1.84	0.56	537.0	31
30th	2.01	0.09	1.82	23.6	0.030	0.04	0.096	0.83	25.80	16.200	35.70	6.240	0.8	4.030	3.920	2.26	0.73	665.0	40
40th	2.20	0.12	2.53	30.1	0.036	0.04	0.119	0.96	30.70	18.750	44.20	6.920	1.1	4.350	4.360	2.80	0.84	802.0	48
50th	2.40	0.15	3.53	38.3	0.042	0.04	0.146	1.09	36.00	21.500	57.90	7.660	1.4	4.750	4.820	3.17	1.01	928.0	59
60th	2.64	0.20	4.85	46.1	0.051	0.04	0.172	1.25	42.00	25.100	82.10	8.410	1.9	5.120	5.500	3.70	1.20	1055.0	72
70th	2.91	0.26	6.95	55.9	0.061	0.04	0.210	1.48	49.20	28.300	107.50	9.060	2.6	5.520	6.290	4.33	1.37	1205.0	90
80th	3.22	0.39	10.15	67.9	0.078	10.00	0.293	1.74	59.10	32.200	133.00	10.000	3.5	5.920	7.110	5.27	1.62	1505.0	117
85th	3.42	0.51	13.30	76.7	0.094	10.00	0.417	1.88	64.70	34.600	146.00	10.550	4.6	6.080	7.950	6.38	1.79	1650.0	142
90th	3.66	0.67	17.40	92.2	0.149	10.00	0.558	2.06	83.70	38.500	162.00	11.300	6.5	6.550	8.950	7.46	2.05	2030.0	189
95th	3.97	1.20	29.00	117.0	0.357	10.00	0.990	2.44	111.50	48.100	190.00	12.300	18.9	7.290	10.850	11.95	2.44	2650.0	409
98th	4.34	2.02	66.00	154.0	0.686	20.00	2.000	2.79	162.50	73.100	240.00	13.250	83.3	7.980	12.700	23.30	2.94	5120.0	1420
99th	4.59	2.29	107.50	171.5	0.990	30.00	2.800	2.93	182.50	85.600	276.00	14.100	213.0	8.670	14.900	28.10	3.46	7860.0	3500
Maximum	5.49	12.40	1405.00	237.0	8.860	160.00	8.810	18.40	327.00	584.000	834.00	16.850	4920.0	15.250	26.800	86.20	12.90	37600.0	48400

Summary Statistics – 2012 Survey Data Set

	STREAM SEDIMENT																	
Variable	**Mo**	**Ni**	**P**	**K**	**Sc**	**Se**	**Ag**	**Na**	**Sr**	**S**	**Te**	**Tl**	**Th**	**Ti**	**W**	**U**	**V**	**Zn**
Units	**ppm**	**ppm**	**%**	**%**	**ppm**	**ppm**	**ppb**	**%**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**
D.L.	**0.01**	**0.04**	**0.001**	**0.01**	**0.005**	**0.1**	**1**	**0.001**	**0.01**	**0.01**	**0.01**	**0.002**	**0.002**	**0.001**	**0.001**	**0.005**	**0.1**	**0.1**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**
N	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681
N > DL	681	681	681	661	681	640	681	681	681	507	499	681	681	681	681	681	681	681
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	1.17	38.35	0.07	0.04	7.88	1.30	81.7	0.03	53.37	0.13	0.09	0.05	0.67	0.27	0.26	0.65	144.56	79.62
Median	0.62	29.00	0.06	0.04	7.39	0.90	50.0	0.02	40.30	0.03	0.04	0.03	0.41	0.23	0.08	0.30	135.50	69.90
Mode	0.24	25.70	0.05	0.04	11.20	0.90	26.0	0.02	25.40	0.01	0.01	0.02	0.37	0.11	0.06	0.16	127.00	80.90
Range	18.15	1173.08	0.964	0.18	24.820	21.8	2596	0.141	2100.30	9.99	4.98	0.977	8.235	0.981	43.687	20.835	488.2	1074.4
St Dev	1.68	55.69	0.05	0.02	4.19	1.76	135.62	0.02	88.55	0.60	0.32	0.07	0.84	0.17	1.95	1.12	59.02	75.57
Coef Var	1.444	1.452	0.807	0.482	0.532	1.347	1.659	0.619	1.659	4.689	3.773	1.511	1.245	0.641	7.504	1.723	0.408	0.949
Log Mean	-0.139	1.414	-1.230	-1.426	0.824	-0.053	1.743	-1.624	1.623	-1.436	-1.462	-1.527	-0.322	-0.671	-1.034	-0.418	2.125	1.820
Geo Mean	0.73	25.93	0.06	0.04	6.66	0.89	55.3	0.02	41.93	0.04	0.03	0.03	0.48	0.21	0.09	0.38	133.26	66.05
Log StDv	0.384	0.389	0.191	0.205	0.273	0.377	0.341	0.237	0.258	0.507	0.456	0.389	0.322	0.326	0.377	0.401	0.180	0.251
Log CVar	-2.765	0.275	-0.155	-0.143	0.331	-7.258	0.196	-0.146	0.159	-0.353	-0.312	-0.255	-1.004	-0.487	-0.365	-0.961	0.085	0.138
Percntls																		
Minimum	0.10	1.92	0.016	0.01	0.880	0.1	4	0.006	9.70	0.01	0.01	0.003	0.045	0.009	0.013	0.065	17.8	10.6
10th	0.27	7.22	0.038	0.02	2.710	0.3	24	0.012	21.10	0.01	0.01	0.010	0.222	0.082	0.040	0.148	79.9	31.4
20th	0.34	12.70	0.043	0.03	4.030	0.5	30	0.015	25.80	0.01	0.01	0.014	0.278	0.115	0.050	0.171	97.1	42.9
30th	0.40	18.00	0.047	0.03	5.290	0.7	36	0.018	29.90	0.02	0.02	0.017	0.319	0.147	0.060	0.203	109.5	52.2
40th	0.51	23.00	0.051	0.03	6.270	0.9	41	0.020	34.30	0.03	0.03	0.021	0.366	0.178	0.069	0.245	123.5	62.5
50th	0.62	29.00	0.055	0.04	7.390	0.9	50	0.024	40.30	0.03	0.04	0.027	0.411	0.231	0.082	0.302	135.5	69.9
60th	0.78	34.80	0.061	0.04	8.700	1.1	62	0.027	46.00	0.04	0.04	0.034	0.469	0.285	0.096	0.393	150.0	77.9
70th	1.04	42.50	0.068	0.05	9.830	1.2	78	0.031	55.10	0.06	0.06	0.046	0.585	0.357	0.115	0.544	166.5	86.4
80th	1.47	51.30	0.077	0.06	11.350	1.5	97	0.037	65.20	0.08	0.07	0.060	0.823	0.442	0.145	0.834	187.0	96.4
85th	1.93	59.70	0.084	0.06	12.100	1.7	117	0.041	72.50	0.10	0.08	0.072	1.010	0.487	0.162	1.125	200.0	104.5
90th	2.71	70.40	0.096	0.06	13.450	2.1	154	0.049	85.90	0.15	0.10	0.101	1.320	0.519	0.218	1.590	215.0	119.5
95th	3.85	98.50	0.126	0.08	15.550	3.4	227	0.059	108.50	0.29	0.17	0.135	2.300	0.580	0.399	2.390	240.0	148.5
98th	5.41	128.50	0.199	0.09	17.050	6.1	350	0.078	179.00	0.93	0.68	0.240	3.010	0.632	0.990	3.080	290.0	208.0
99th	7.96	163.00	0.246	0.11	18.750	9.5	525	0.085	266.00	2.35	0.94	0.377	3.480	0.664	2.220	3.660	338.0	317.0
Maximum	18.25	1175.00	0.980	0.19	25.700	21.9	2600	0.147	2110.00	10.00	4.99	0.980	8.280	0.990	43.700	20.900	506.0	1085.0

Summary Statistics – 2012 Survey Data Set

	STREAM SEDIMENT															
Variable	**Be**	**Ce**	**Cs**	**Ge**	**Hf**	**In**	**Li**	**Nb**	**Re**	**Rb**	**Sn**	**Ta**	**Y**	**Zr**	**Pt**	**Pd**
Units	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**ppb**
D.L.	**0.01**	**0.003**	**0.005**	**0.005**	**0.002**	**0.005**	**0.1**	**0.002**	**1**	**0.005**	**0.01**	**0.005**	**0.003**	**0.001**	**2**	**1**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**
N	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681
N > DL	681	681	681	681	681	671	681	681	105	681	681	404	681	681	167	679
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0.33	13.62	0.56	0.15	0.16	0.03	8.62	1.13	1.6	2.44	0.56	0.01	10.26	5.95	2.4	13.6
Median	0.30	12.10	0.42	0.13	0.08	0.03	7.40	1.04	1.0	2.19	0.53	0.01	9.72	2.97	2.0	12.0
Mode	0.19	10.60	0.22	0.09	0.03	0.02	4.20	1.38	1.0	2.32	0.64	0.01	13.10	0.31	2.0	7.0
Range	1.70	61.650	3.521	1.009	0.985	1.150	29.5	3.428	35	9.935	10.26	0.043	35.270	37.20	7	84
St Dev	0.16	6.59	0.46	0.13	0.17	0.05	4.89	0.60	2.60	1.29	0.46	0.01	4.74	6.86	0.83	8.11
Coef Var	0.503	0.484	0.810	0.813	1.109	1.520	0.568	0.532	1.607	0.530	0.808	0.661	0.462	1.151	0.346	0.596
Log Mean	-0.539	1.094	-0.349	-0.878	-1.065	-1.572	0.869	-0.020	0.088	0.330	-0.298	-2.099	0.962	0.460	0.362	1.058
Geo Mean	0.29	12.42	0.45	0.13	0.09	0.03	7.39	0.95	1.2	2.14	0.50	0.01	9.16	2.89	2.3	11.4
Log StDv	0.215	0.182	0.279	0.214	0.502	0.280	0.245	0.271	0.236	0.228	0.196	0.223	0.216	0.569	0.116	0.268
Log CVar	-0.398	0.167	-0.803	-0.244	-0.472	-0.178	0.282	-13.573	2.714	0.694	-0.658	-0.106	0.224	1.236	0.322	0.253
Percntls																
Minimum	0.05	3.750	0.079	0.036	0.005	0.005	1.5	0.072	1	0.415	0.09	0.005	1.930	0.10	2	1
10th	0.15	7.500	0.213	0.074	0.020	0.011	3.5	0.407	1	1.070	0.28	0.005	4.920	0.51	2	5
20th	0.19	8.860	0.257	0.090	0.028	0.016	4.4	0.601	1	1.330	0.35	0.005	6.230	0.84	2	7
30th	0.23	10.000	0.305	0.104	0.041	0.020	5.4	0.719	1	1.620	0.41	0.005	7.350	1.31	2	8
40th	0.27	11.050	0.358	0.117	0.059	0.024	6.4	0.879	1	1.905	0.47	0.005	8.520	1.96	2	10
50th	0.30	12.100	0.419	0.132	0.084	0.029	7.4	1.040	1	2.190	0.53	0.007	9.720	2.97	2	12
60th	0.33	13.450	0.494	0.147	0.122	0.033	8.7	1.200	1	2.510	0.58	0.009	10.950	4.45	2	14
70th	0.37	15.250	0.591	0.169	0.180	0.038	10.2	1.390	1	2.870	0.64	0.010	12.500	6.70	2	17
80th	0.44	17.200	0.724	0.190	0.292	0.045	12.4	1.660	1	3.320	0.70	0.013	13.750	11.00	3	20
85th	0.49	18.750	0.885	0.205	0.331	0.047	13.7	1.810	2	3.750	0.75	0.014	14.700	13.75	3	21
90th	0.55	21.300	1.115	0.220	0.393	0.053	15.1	1.995	2	4.190	0.81	0.017	15.700	16.20	4	24
95th	0.63	24.600	1.515	0.250	0.505	0.062	18.2	2.170	5	4.810	0.91	0.022	18.450	21.30	4	27
98th	0.72	31.200	1.975	0.313	0.643	0.083	20.9	2.400	8	5.800	1.09	0.027	21.900	25.00	5	32
99th	0.79	36.600	2.340	0.990	0.786	0.111	23.5	2.600	12	6.100	1.37	0.034	24.400	27.40	5	35
Maximum	1.75	65.400	3.600	1.045	0.990	1.155	31.0	3.500	36	10.350	10.35	0.048	37.200	37.30	9	85

Summary Statistics – 2012 Survey Data Set

	STREAM SEDIMENT																
Variable	**Sb**	**As**	**Ba**	**Br**	**Ce**	**Cs**	**Cr**	**Co**	**Au**	**Hf**	**Fe**	**La**	**Lu**	**Mo**	**Rb**	**Sm**	**Sc**
Units	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**
D.L.	**0.1**	**0.5**	**50**	**0.5**	**5**	**0.5**	**20**	**5**	**2**	**1**	**0.2**	**2**	**0.2**	**1**	**5**	**0.1**	**0.2**
Anal Mth	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**
N	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681	681
N > DL	617	674	666	681	679	407	649	681	433	668	681	681	647	120	548	681	681
Missing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0.77	13.13	273.2	29.43	26.9	1.01	167.7	35.1	25.8	5.9	7.71	12.8	0.45	1.5	16.8	3.80	28.56
Median	0.40	4.30	250.0	21.00	25.0	0.70	120.0	32.0	4.0	4.0	7.70	12.0	0.40	1.0	15.0	3.70	27.30
Mode	0.20	1.70	140.0	12.00	22.0	0.50	20.0	20.0	2.0	3.0	10.00	10.0	0.40	1.0	5.0	3.90	19.00
Range	18.9	1709.5	1150	191.6	115	14.5	3280	578	2158	56	23.0	53	1.3	23	125	13.2	73.1
St Dev	1.23	70.22	179.11	27.67	11.26	0.97	203.29	28.16	107.35	5.49	2.43	5.55	0.19	2.03	12.18	1.26	9.90
Coef Var	1.603	5.346	0.655	0.940	0.418	0.964	1.213	0.802	4.164	0.933	0.315	0.433	0.410	1.323	0.727	0.331	0.347
Log Mean	-0.340	0.690	2.335	1.314	1.398	-0.091	2.057	1.485	0.808	0.657	0.866	1.074	-0.372	0.089	1.123	0.559	1.428
Geo Mean	0.46	4.90	216.1	20.61	25.0	0.81	114.1	30.5	6.4	4.5	7.35	11.9	0.42	1.2	13.3	3.62	26.79
Log StDv	0.408	0.490	0.313	0.371	0.167	0.252	0.380	0.220	0.593	0.293	0.137	0.166	0.157	0.220	0.301	0.134	0.160
Log CVar	-1.201	0.710	0.134	0.282	0.120	-2.798	0.185	0.148	0.734	0.447	0.159	0.155	-0.422	2.498	0.268	0.239	0.112
Percntls																	
Minimum	0.1	0.5	50	1.4	5	0.5	20	6	2	1	2.2	3	0.2	1	5	0.9	7.3
10th	0.2	1.4	78	7.1	16	0.5	33	16	2	2	4.8	8	0.3	1	5	2.5	16.0
20th	0.2	1.7	100	10.0	19	0.5	54	20	2	3	5.7	9	0.3	1	6	2.9	20.0
30th	0.3	2.3	140	13.0	21	0.5	75	23	2	3	6.3	10	0.4	1	8	3.2	22.6
40th	0.3	3.3	190	16.0	23	0.5	97	27	3	4	7.0	11	0.4	1	11	3.4	25.2
50th	0.4	4.3	250	21.0	25	0.7	120	32	4	4	7.7	12	0.4	1	15	3.7	27.3
60th	0.5	6.1	310	26.0	27	0.8	150	37	6	5	8.3	13	0.4	1	18	3.9	30.4
70th	0.7	8.3	360	33.0	30	1.0	190	41	10	6	8.9	14	0.5	1	21	4.1	33.6
80th	0.9	12.0	420	42.0	34	1.3	240	46	20	8	9.4	16	0.6	1	25	4.5	37.3
85th	1.2	15.0	460	50.5	36	1.6	260	48	32	9	10.0	17	0.6	2	27	4.7	39.5
90th	1.7	21.0	510	63.3	40	1.9	330	52	52	11	10.0	19	0.7	2	30	5.1	42.2
95th	2.8	34.0	600	81.6	47	2.6	440	58	110	16	11.0	22	0.8	4	37	5.9	45.7
98th	3.4	67.5	720	113.0	56	3.4	630	82	190	26	13.0	28	1.0	6	47	7.0	48.6
99th	5.0	113.0	790	129.0	67	4.6	880	97	253	29	15.0	33	1.2	10	54	7.7	50.1
Maximum	19.0	1710.0	1200	193.0	120	15.0	3300	584	2160	57	25.2	56	1.5	24	130	14.1	80.4

Summary Statistics – 2012 Survey Data Set

				STREAM SEDIMENT						WATER	
Variable	**Na**	**Ta**	**Tb**	**Th**	**W**	**U**	**Yb**	**F**	**LOI**	**FW**	**CND**	**PH**
Units	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppb**	**uS**	
D.L.	**0.02**	**0.5**	**0.5**	**0.2**	**1**	**0.2**	**2**	**20**	**0.1**	**20**	**1**	**0.1**
Anal Mth	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**INAA**	**ION**	**GRAV**	**IC**	**ISE**	**ISE**
N	681	681	681	681	681	681	681	681	681	621	621	621
N > DL	681	226	507	679	35	634	382	681	681	83	621	621
Missing	0	0	0	0	0	0	0	0	0	60	60	60
Mean	1.73	0.60	0.72	1.72	1.3	1.45	2.9	260.6	12.66	23.6	62.3	7.38
Median	1.70	0.50	0.70	1.40	1.0	1.10	3.0	200.0	11.10	20.0	43.0	7.40
Mode	1.60	0.50	0.50	0.60	1.0	0.30	2.0	200.0	7.20	20.0	20.0	7.60
Range	3.57	2.8	1.6	22.4	91	18.8	7	1900	66.1	340	466	5.8
St Dev	0.54	0.26	0.24	1.72	4.33	1.50	1.11	180.11	7.80	23.67	58.03	0.65
Coef Var	0.312	0.436	0.329	1.000	3.211	1.041	0.384	0.691	0.616	1.005	0.932	0.088
Log Mean	0.214	-0.241	-0.161	0.125	0.028	-0.009	0.435	2.351	1.032	1.333	1.645	0.866
Geo Mean	1.64	0.57	0.69	1.33	1.1	0.98	2.7	224.2	10.76	21.5	44.2	7.35
Log StDv	0.150	0.118	0.122	0.293	0.150	0.387	0.141	0.222	0.248	0.128	0.358	0.040
Log CVar	0.703	-0.490	-0.759	2.346	5.567	-43.014	0.325	0.095	0.241	0.096	0.218	0.046
Percntls												
Minimum	0.25	0.5	0.5	0.2	1	0.2	2	50	1.7	20	7	3.6
10th	1.00	0.5	0.5	0.6	1	0.3	2	130	4.9	20	15	6.7
20th	1.30	0.5	0.5	0.7	1	0.4	2	150	6.8	20	21	6.9
30th	1.50	0.5	0.6	0.9	1	0.6	2	170	7.8	20	27	7.1
40th	1.60	0.5	0.6	1.1	1	0.8	2	190	9.2	20	33	7.2
50th	1.70	0.5	0.7	1.4	1	1.1	3	200	11.1	20	43	7.4
60th	1.80	0.5	0.7	1.6	1	1.3	3	240	12.6	20	53	7.6
70th	2.00	0.6	0.8	1.9	1	1.6	3	280	14.4	20	70	7.7
80th	2.17	0.6	0.8	2.3	1	2.1	3	330	17.4	20	93	7.9
85th	2.30	0.7	0.9	2.5	1	2.5	4	380	19.5	20	114	8.0
90th	2.42	0.8	1.0	3.0	1	3.2	4	440	22.1	22	140	8.2
95th	2.60	1.0	1.2	3.7	2	4.1	5	560	27.6	32	184	8.3
98th	2.87	1.4	1.4	6.1	3	4.9	6	820	33.0	64	226	8.6
99th	2.98	1.7	1.5	9.0	4	6.6	7	1020	38.8	86	263	8.7
Maximum	3.82	3.3	2.1	22.6	92	19.0	9	1950	67.8	360	473	9.4

Regional Stream Sediment and Water Geochemical Data

NORTHERN VANCOUVER ISLAND, BRITISH COLUMBIA

GEOSCIENCE BC REPORT 2013-11

*** APPENDIX B – SUMMARY STATISTICS ***

Combined Northern Vancouver Island Data Set

Notes:

- The following summary statistics were used to produce the element maps provided in Appendix C.
- Calculations include results from government funded surveys completed in the study area in 1988, 1989 and 2012; and a ICP-MS reanalysis project published in 2011.
- Calculations ignore missing values and analytical results from the second (REP=2) of paired field duplicate samples.
- Data reported by the labs at less than the detection limit have been set to the reported detection limit.
- Data for gold by INAA has been combined with original gold by fire assay (FA) data.
- Results for boron, platinum, paladium and tantalum by ICP-MS are not included because of inadequate detection limits and/or precision.
- For a complete listing of the raw data, refer to Microsoft® Excel (XLS) format digital data files.

Summary Statistics – Combined Data Sets

	STREAM SEDIMENT																			
Variable	**Al**	**Sb**	**As**	**Ba**	**Bi**	**Cd**	**Ca**	**Cr**	**Co**	**Cu**	**Ga**	**Au**	**Fe**	**La**	**Pb**	**Mg**	**Mn**	**Hg**	**Mo**	**Ni**
Units	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**%**	**ppm**	**ppm**	**%**	**ppm**	**ppb**	**ppm**	**ppm**
2012 D.L.	**0.01**	**0.02**	**0.01**	**0.5**	**0.001**	**0.001**	**0.01**	**0.01**	**0.001**	**0.01**	**0.004**	**0.2**	**0.001**	**0.002**	**0.01**	**0.01**	**0.1**	**4**	**0.01**	**0.04**
2011 D.L.	**0.01**	**0.02**	**0.1**	**0.5**	**0.02**	**0.01**	**0.01**	**0.5**	**0.1**	**0.01**	**0.1**	**0.2**	**0.01**	**0.5**	**0.01**	**0.01**	**1**	**5**	**0.01**	**0.1**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**
N	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729
N > DL	1729	1722	1729	1729	1729	1729	1729	1729	1729	1729	1729	1640	1729	1729	1729	1729	1729	1728	1729	1729
Missing	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Mean	2.49	0.34	11.26	43.87	0.11	0.27	1.21	44.09	22.96	76.92	8.05	43.46	4.83	5.60	5.07	1.14	1121.23	297.0	1.17	35.53
Median	2.39	0.16	3.92	35.10	0.04	0.14	1.04	35.30	20.70	54.10	7.79	1.90	4.79	4.99	3.50	1.01	886.00	65.0	0.66	27.40
Mode	2.25	0.08	1.00	15.00	0.02	0.10	0.61	22.10	20.90	18.20	10.55	0.20	6.02	3.60	2.57	0.95	1120.00	51.0	0.36	21.50
Range	5.10	12.68	1404.90	384.4	17.544	13.389	18.27	496.70	581.540	3175.50	15.840	20099.8	20.550	26.000	186.59	12.79	37477.0	48396	33.60	1173.20
St Dev	0.87	0.68	42.88	35.06	0.57	0.62	0.82	36.97	18.84	99.76	2.47	722.46	1.48	2.71	7.56	0.74	1373.71	2062.08	1.79	42.32
Coef Var	0.348	1.999	3.809	0.799	5.089	2.275	0.680	0.839	0.820	1.297	0.307	16.625	0.307	0.484	1.491	0.652	1.225	6.943	1.532	1.191
Log Mean	0.367	-0.740	0.614	1.540	-1.300	-0.805	0.013	1.544	1.298	1.747	0.884	0.309	0.662	0.706	0.563	-0.026	2.949	1.878	-0.122	1.399
Geo Mean	2.33	0.18	4.11	34.66	0.05	0.16	1.03	35.03	19.84	55.78	7.66	2.04	4.59	5.08	3.66	0.94	889.26	75.5	0.75	25.04
Log StDv	0.166	0.435	0.546	0.294	0.409	0.386	0.247	0.290	0.230	0.346	0.140	0.590	0.151	0.189	0.311	0.277	0.270	0.456	0.364	0.370
Log CVar	0.453	-0.589	0.891	0.191	-0.314	-0.480	20.624	0.188	0.177	0.198	0.158	1.908	0.229	0.268	0.552	-10.637	0.091	0.243	-2.983	0.265
Percntls																				
Minimum	0.39	0.02	0.10	5.6	0.006	0.011	0.13	2.30	2.460	4.50	1.360	0.2	0.050	0.800	0.41	0.11	123.0	4	0.10	1.80
10th	1.41	0.06	0.89	14.3	0.020	0.060	0.48	15.70	9.900	20.20	5.000	0.5	3.110	2.990	1.52	0.39	416.0	27	0.29	7.61
20th	1.76	0.08	1.30	18.9	0.022	0.080	0.62	20.80	13.000	28.40	5.840	0.7	3.630	3.600	2.03	0.55	544.0	37	0.36	12.50
30th	1.99	0.09	1.95	23.4	0.030	0.100	0.75	25.70	15.800	35.40	6.530	1.1	4.060	4.100	2.56	0.70	655.0	45	0.44	17.30
40th	2.19	0.12	2.74	29.2	0.038	0.120	0.90	30.40	18.200	43.20	7.130	1.5	4.430	4.490	2.99	0.85	782.0	53	0.53	21.80
50th	2.39	0.16	3.92	35.1	0.042	0.140	1.04	35.30	20.700	54.10	7.790	1.9	4.790	4.990	3.50	1.01	886.0	65	0.66	27.40
60th	2.64	0.22	5.40	41.9	0.053	0.170	1.22	41.10	23.100	70.40	8.500	2.4	5.130	5.600	4.07	1.18	1005.0	78	0.83	32.90
70th	2.91	0.28	7.60	49.5	0.069	0.210	1.42	47.90	26.500	95.50	9.250	3.1	5.500	6.300	4.78	1.35	1150.0	96	1.10	40.00
80th	3.24	0.41	10.80	60.1	0.090	0.290	1.71	58.00	30.200	119.00	10.200	4.2	5.910	7.200	6.10	1.61	1380.0	129	1.53	49.40
85th	3.45	0.53	13.70	69.5	0.113	0.380	1.87	64.30	32.900	134.00	10.850	5.5	6.080	7.870	7.12	1.77	1540.0	157	1.87	56.40
90th	3.69	0.72	19.85	81.6	0.160	0.507	2.16	79.20	36.000	152.50	11.550	8.2	6.460	8.900	8.90	2.03	1800.0	220	2.37	66.40
95th	3.99	1.16	38.80	108.5	0.300	0.790	2.52	103.00	41.700	180.00	12.600	19.5	7.130	10.400	12.65	2.43	2430.0	469	3.53	90.20
98th	4.31	2.01	80.70	142.0	0.590	1.480	2.79	156.50	53.000	225.00	13.450	83.3	8.090	12.700	21.50	2.88	3640.0	2070	4.90	131.50
99th	4.59	2.45	136.00	175.5	0.910	2.580	3.00	188.50	66.800	275.00	13.950	196.0	9.260	14.900	30.20	3.33	5640.0	4240	7.96	163.50
Maximum	5.49	12.70	1405.00	390.0	17.550	13.400	18.40	499.00	584.000	3180.00	17.200	20100.0	20.600	26.800	187.00	12.90	37600.0	48400	33.70	1175.00

Summary Statistics – Combined Data Sets

	STREAM SEDIMENT																			
Variable	**P**	**K**	**Sc**	**Se**	**Ag**	**Na**	**Sr**	**S**	**Te**	**Tl**	**Th**	**Ti**	**W**	**U**	**V**	**Zn**	**Be**	**Ce**	**Cs**	**Ge**
Units	**%**	**%**	**ppm**	**ppm**	**ppb**	**%**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**%**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**	**ppm**
2012 D.L.	**0.001**	**0.01**	**0.005**	**0.1**	**1**	**0.001**	**0.01**	**0.01**	**0.01**	**0.002**	**0.002**	**0.001**	**0.001**	**0.005**	**0.1**	**0.1**	**0.01**	**0.003**	**0.005**	**0.005**
2011 D.L.	**0.001**	**0.01**	**0.1**	**0.1**	**2**	**0.001**	**0.5**	**0.02**	**0.02**	**0.02**	**0.1**	**0.001**	**0.05**	**0.05**	**2**	**0.1**	**0.1**	**0.1**	**0.02**	**0.1**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**
N	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729
N > DL	1729	1678	1729	1688	1729	1728	1729	1475	1412	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729	1729
Missing	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Mean	0.07	0.04	7.79	1.21	88.6	0.03	47.97	0.11	0.07	0.04	0.73	0.27	0.24	0.62	149.65	75.12	0.31	13.44	0.60	0.15
Median	0.06	0.04	7.45	0.90	51.0	0.03	37.20	0.04	0.03	0.03	0.42	0.23	0.09	0.32	141.00	67.70	0.28	12.05	0.45	0.14
Mode	0.06	0.03	7.50	0.90	37.0	0.03	27.10	0.01	0.01	0.02	0.40	0.14	0.05	0.17	109.00	105.00	0.25	11.60	0.34	0.12
Range	0.978	0.39	24.820	21.8	6256	0.989	2103.10	9.99	8.92	1.107	14.755	0.981	43.687	20.840	528.2	1074.4	1.70	63.390	4.581	1.009
St Dev	0.07	0.03	3.81	1.33	222.26	0.04	62.93	0.41	0.30	0.07	0.96	0.17	1.36	0.90	60.99	58.42	0.15	6.16	0.47	0.09
Coef Var	1.067	0.679	0.489	1.100	2.509	1.196	1.312	3.871	4.222	1.567	1.320	0.620	5.638	1.453	0.408	0.778	0.493	0.458	0.786	0.597
Log Mean	-1.221	-1.437	0.831	-0.036	1.747	-1.576	1.589	-1.346	-1.459	-1.506	-0.292	-0.655	-0.983	-0.399	2.140	1.807	-0.556	1.090	-0.319	-0.870
Geo Mean	0.06	0.04	6.78	0.92	55.8	0.03	38.85	0.05	0.03	0.03	0.51	0.22	0.10	0.40	138.19	64.06	0.28	12.31	0.48	0.13
Log StDv	0.196	0.218	0.246	0.309	0.342	0.241	0.254	0.449	0.403	0.322	0.326	0.305	0.371	0.366	0.177	0.237	0.206	0.180	0.275	0.186
Log CVar	-0.161	-0.152	0.297	-8.582	0.196	-0.153	0.160	-0.334	-0.276	-0.214	-1.117	-0.467	-0.377	-0.918	0.083	0.131	-0.370	0.165	-0.862	-0.214
Percntls																				
Minimum	0.012	0.01	0.880	0.1	4	0.001	6.90	0.01	0.01	0.003	0.045	0.009	0.013	0.060	17.8	10.6	0.05	2.010	0.079	0.036
10th	0.038	0.02	3.000	0.4	24	0.013	19.40	0.01	0.01	0.016	0.225	0.089	0.050	0.161	84.3	31.2	0.15	7.520	0.220	0.080
20th	0.044	0.03	4.350	0.6	31	0.017	24.50	0.02	0.02	0.020	0.300	0.124	0.055	0.190	101.0	41.9	0.19	8.900	0.280	0.094
30th	0.048	0.03	5.400	0.7	37	0.020	28.30	0.03	0.02	0.020	0.341	0.156	0.064	0.230	113.0	50.9	0.22	10.050	0.330	0.110
40th	0.053	0.03	6.400	0.8	44	0.023	32.70	0.03	0.03	0.020	0.400	0.187	0.077	0.275	126.5	59.9	0.25	11.000	0.384	0.120
50th	0.058	0.04	7.450	0.9	51	0.026	37.20	0.04	0.03	0.029	0.421	0.233	0.090	0.320	141.0	67.7	0.28	12.050	0.452	0.138
60th	0.063	0.04	8.500	1.0	61	0.029	42.50	0.05	0.04	0.030	0.500	0.282	0.103	0.415	156.0	74.9	0.31	13.400	0.540	0.150
70th	0.070	0.05	9.640	1.2	73	0.034	50.20	0.07	0.05	0.040	0.623	0.352	0.124	0.548	172.0	83.0	0.35	14.950	0.648	0.170
80th	0.080	0.05	11.000	1.4	94	0.040	61.50	0.09	0.07	0.055	0.900	0.431	0.159	0.800	196.0	93.5	0.40	17.000	0.810	0.190
85th	0.086	0.06	11.800	1.6	112	0.045	69.20	0.11	0.08	0.065	1.100	0.488	0.180	1.050	208.0	101.5	0.45	18.600	0.930	0.207
90th	0.097	0.06	12.800	2.0	148	0.052	78.40	0.16	0.10	0.080	1.400	0.533	0.250	1.385	225.0	116.0	0.50	20.800	1.120	0.220
95th	0.121	0.08	14.500	2.9	232	0.064	100.50	0.27	0.15	0.120	2.220	0.593	0.520	2.090	257.0	144.5	0.59	24.700	1.505	0.249
98th	0.172	0.12	16.100	4.8	401	0.089	147.00	0.57	0.46	0.190	3.200	0.642	1.440	2.940	295.0	203.0	0.71	31.200	1.990	0.280
99th	0.246	0.15	17.400	6.5	664	0.111	215.00	1.31	0.75	0.284	5.500	0.674	3.610	3.880	340.0	285.0	0.80	35.800	2.340	0.320
Maximum	0.990	0.40	25.700	21.9	6260	0.990	2110.00	10.00	8.93	1.110	14.800	0.990	43.700	20.900	546.0	1085.0	1.75	65.400	4.660	1.045

Summary Statistics – Combined Data Sets

	STREAM SEDIMENT													WATER	
Variable	**Hf**	**In**	**Li**	**Nb**	**Re**	**Rb**	**Sn**	**Y**	**Zr**		**Au**	**F**	**LOI**	**FW**	**PH**
Units	**ppm**	**ppm**	**ppm**	**ppm**	**ppb**	**ppm**	**ppm**	**ppm**	**ppm**		**ppb**	**ppm**	**%**	**ppb**	
2012 D.L.	**0.002**	**0.005**	**0.1**	**0.002**	**1**	**0.005**	**0.01**	**0.003**	**0.001**	**2012 D.L.**	**2**	**20**	**0.1**	**20**	**0.1**
2011 D.L.	**0.02**	**0.02**	**0.1**	**0.02**	**1**	**0.1**	**0.1**	**0.01**	**0.001**	**1988/89 D.L.**	**2**	**20**	**0.1**	**20**	**0.1**
Anal Mth	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**	**ICPMS**		**FA+INAA**	**IC**	**GRAV**	**IC**	**ISE**
N	1729	1729	1729	1729	1729	1729	1729	1729	1729		1736	1736	1733	1641	1641
N > DL	1729	1715	1729	1729	337	1729	1729	1729	1729		1013	1733	1733	272	1641
Missing	7	7	7	7	7	7	7	7	7		0	0	3	95	95
Mean	0.19	0.03	8.56	1.28	1.6	2.77	0.57	10.48	7.02		28.2	201.6	11.94	18.4	6.97
Median	0.11	0.03	7.30	1.19	1.0	2.37	0.50	9.94	3.60		3.0	170.0	9.60	20.0	6.90
Mode	0.02	0.02	3.50	0.83	1.0	1.70	0.40	10.05	0.50		2.0	160.0	7.00	20.0	6.70
Range	1.325	1.150	32.8	4.328	35	24.085	10.26	36.030	45.40		5798	1930	81.8	350	5.8
St Dev	0.21	0.04	4.96	0.68	2.13	1.92	0.39	4.69	8.01		188.73	135.80	8.65	16.92	0.67
Coef Var	1.063	1.252	0.580	0.530	1.331	0.695	0.680	0.447	1.142		6.685	0.674	0.725	0.921	0.097
Log Mean	-0.958	-1.548	0.865	0.038	0.100	0.370	-0.288	0.974	0.548		0.741	2.242	0.994	1.207	0.841
Geo Mean	0.11	0.03	7.34	1.09	1.3	2.34	0.51	9.41	3.53		5.5	174.5	9.85	16.1	6.94
Log StDv	0.486	0.261	0.243	0.264	0.233	0.243	0.188	0.210	0.548		0.578	0.224	0.263	0.197	0.043
Log CVar	-0.507	-0.169	0.281	7.135	2.349	0.656	-0.653	0.216	1.002		0.781	0.100	0.265	0.163	0.051
Percntls															
Minimum	0.005	0.005	0.7	0.072	1	0.415	0.09	1.170	0.10		2	20	1.0	10	3.6
10th	0.022	0.012	3.6	0.486	1	1.140	0.30	4.990	0.60		2	100	4.6	10	6.2
20th	0.040	0.018	4.4	0.670	1	1.495	0.40	6.260	1.04		2	120	6.0	10	6.4
30th	0.060	0.022	5.4	0.827	1	1.730	0.40	7.520	1.65		2	140	7.0	10	6.6
40th	0.080	0.026	6.3	0.997	1	2.030	0.50	8.820	2.40		2	150	8.2	10	6.8
50th	0.110	0.030	7.3	1.190	1	2.370	0.50	9.940	3.60		3	170	9.6	20	6.9
60th	0.159	0.035	8.6	1.370	1	2.700	0.60	11.250	5.41		4	190	11.2	20	7.1
70th	0.222	0.040	10.0	1.590	1	3.100	0.66	12.650	7.90		7	210	13.4	20	7.3
80th	0.330	0.045	12.0	1.870	1	3.700	0.70	14.250	12.35		14	250	16.0	20	7.6
85th	0.393	0.049	13.3	2.020	2	4.100	0.80	15.250	15.30		24	280	18.4	22	7.7
90th	0.497	0.053	15.0	2.220	3	4.510	0.80	16.350	19.30		47	330	21.4	24	7.8
95th	0.630	0.062	18.4	2.540	4	5.800	0.90	18.950	25.10		100	410	27.5	30	8.1
98th	0.780	0.077	22.5	2.850	8	7.720	1.10	21.400	30.20		218	580	34.2	44	8.3
99th	0.900	0.090	25.3	3.140	11	10.600	1.40	23.600	33.70		368	800	48.8	68	8.5
Maximum	1.330	1.155	33.5	4.400	36	24.500	10.35	37.200	45.50		5800	1950	82.8	360	9.4

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA

NORTHERN VANCOUVER ISLAND, BRITISH COLUMBIA

GEOSCIENCE BC REPORT 2013-11

*** APPENDIX C - MAPS ***

Table of Contents

Sample Location			Map	1	Mercury	Hg	ICPMS	Map	19	Beryllium	Be	ICPMS	Map	38
Sediments ...					Molybdenum	Mo	ICPMS	Map	20	Cerium	Ce	ICPMS	Map	39
Aluminum	Al	ICPMS	Map	2	Nickel	Ni	ICPMS	Map	21	Cesium	Cs	ICPMS	Map	40
Antimony	Sb	ICPMS	Map	3	Phosphorus	P	ICPMS	Map	22	Germanium	Ge	ICPMS	Map	41
Arsenic	As	ICPMS	Map	4	Potassium	K	ICPMS	Map	23	Hafnium	Hf	ICPMS	Map	42
Barium	Ba	ICPMS	Map	5	Scandium	Sc	ICPMS	Map	24	Indium	In	ICPMS	Map	43
Bismuth	Bi	ICPMS	Map	6	Selenium	Se	ICPMS	Map	25	Lithium	Li	ICPMS	Map	44
Cadmium	Cd	ICPMS	Map	7	Silver	Ag	ICPMS	Map	26	Niobium	Nb	ICPMS	Map	45
Calcium	Ca	ICPMS	Map	8	Sodium	Na	ICPMS	Map	27	Rhenium	Re	ICPMS	Map	46
Chromium	Cr	ICPMS	Map	9	Strontium	Sr	ICPMS	Map	28	Rubidium	Rb	ICPMS	Map	47
Cobalt	Co	ICPMS	Map	10	Sulphur	S	ICPMS	Map	29	Tin	Sn	ICPMS	Map	48
Copper	Cu	ICPMS	Map	11	Tellurium	Te	ICPMS	Map	30	Yttrium	Y	ICPMS	Map	49
Gallium	Ga	ICPMS	Map	12	Thallium	Tl	ICPMS	Map	31	Zirconium	Zr	ICPMS	Map	50
Gold	Au	ICPMS	Map	13	Thorium	Th	ICPMS	Map	32	Gold	Au	FA\INAA	Map	51
Iron	Fe	ICPMS	Map	14	Titanium	Ti	ICPMS	Map	33	Fluorine	F	ION	Map	52
Lanthanum	La	ICPMS	Map	15	Tungsten	W	ICPMS	Map	34	Loss on Ignition	LOI	GRAV	Map	53
Lead	Pb	ICPMS	Map	16	Uranium	U	ICPMS	Map	35	***Waters ...***				
Magnesium	Mg	ICPMS	Map	17	Vanadium	V	ICPMS	Map	36	Fluoride	F	ION	Map	54
Manganese	Mn	ICPMS	Map	18	Zinc	Zn	ICPMS	Map	37	PH	pH	GCE	Map	55