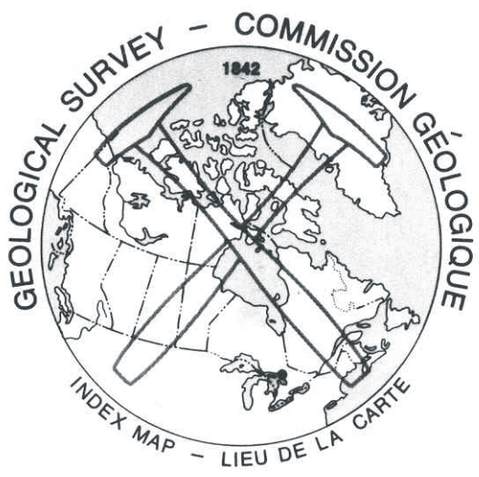
GEOLOGICAL SURVEY OF CANADA OPEN FILE 1650
(115P, part of 105M)
CANADA –YUKON MINERAL DEVELOPMENT AGREEMENT (1985-1989)

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, CENTRAL YUKON



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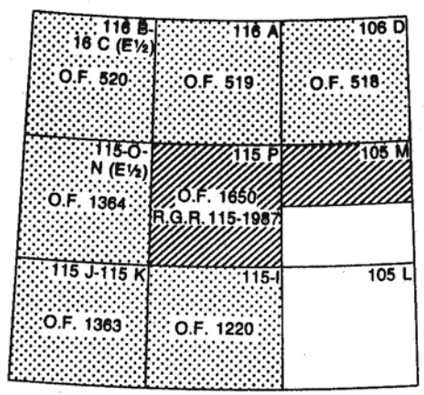
August, 1988

NATIONAL GEOCHEMICAL RECONNAISSANCE STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, YUKON 1988, GSC OPEN FILE 1650, NGR 115 – 1988, NTS 115P, 105M (N½)



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE AND INDEX TO ADJOINING GEOLOGICAL SURVEY OF CANADA MAPS

SYSTÈME NATIONAL DE RÉFÉRENCE CARTOGRAPHIQUE ET INDEX DES CARTES ATTENANTES PUBLIÉES PAR LA COMMISSION GÉOLOGIQUE DU CANADA

Open File 1650 represents a contribution to the Canada – Yukon Mineral Development Agreement (1985-1989), a subsidiary agreement under the Economic and Regional Development Agreement. This project was funded and managed by the Geological Survey of Canada.

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REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, YUKON 1988, GSC OF 1650, NGR 115 – 1988, NTS 105M (N½)

Geological Survey of Canada Open File 1650

Regional Stream Sediment and Water Geochemical Reconnaissance Data
Central Yukon, consisting of NTS 115P, and 105M north-half

INTRODUCTION

Open File 1650 is one of three regional geochemical open files covering parts of Yukon which were sampled in 1987 as part of the Canada – Yukon Mineral Development Agreement. Open File 1650 represents analyses of stream sediment material and waters for 24 elements.

The reconnaissance survey was undertaken in 1987 by the Geological Survey of Canada in conjunction with the Department of Indian Affairs and Northern Development, and the Government of Yukon under the Canada – Yukon Mineral Development Agreement (1985 - 1989).

The data base of the survey contributes to a national geochemical reconnaissance and are used for resource assessment, mineral exploration and geological mapping. Regional survey sample collection and preparation procedures, analytical methods and repeatability of results are therefore strictly specified and controlled. In this way, consistent data can be systematically obtained in different areas in different years from different analytical laboratories

CREDITS

E.H.W. Hornbrook directed the survey.

P.W.B. Friske coordinated the operational activities of contract and Geological Survey of Canada staff.

Contracts were let to the following companies for sample collection, preparation and analysis and were managed by the following staff of the Exploration Geochemistry Subdivision:

Collection: Monaghan Delph Miller, Don Mills, Ontario
E.H.W. Hornbrook
P.W.B. Friske

Preparation: Golder Associates, Ottawa, Ontario
J.J. Lynch

Analysis: Bondar Clegg and Company Ltd., Ottawa
Chemex Labs Limited, Vancouver, B.C. (waters and Au)
J.J. Lynch

H.R. Schmitt coordinated and edited open file production.

A.C. Galletta and D. Wright managed the digital geochemical data, provided computer processing support, and developed software to plot the open file, symbol and regional trend maps. Computing services were provided by the Computer Science Centre, EMR. The plotting was done by Canada Lands Data Systems staff at Environment Canada, Hull, Quebec.

H. Gross developed microcomputer software to produce data listings and summary statistics

J. Yelle and F. Williams of the Geological Information Division supervised the preparation of open file base maps by Cartography Unit A-2 and Terra Surveys Ltd., Ottawa.

M. McCurdy, S. Cook and C.C. Durham provided technical support and editing assistance.

J.C. Bélec provided word processing support.

DESCRIPTION OF SURVEY AND SAMPLE MANAGEMENT

Helicopter and truck supported sample collection was carried out during the summer of 1987.

Stream sediment and water samples were collected at an average density of one sample per 13 square kilometres throughout the 16,600 square kilometres of the central Yukon survey.

Sample site duplicate samples were routinely collected in each analytical block of twenty samples.

In Ottawa, field dried samples were air-dried, crushed, ball milled and sieved. The minus 80 mesh (177 microns) fraction was used for subsequent analyses. At this 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.

On receipt, field and analytical data were processed with the aid of computers.

The field data were recorded by the field contract staff on standard stream sediment field cards (Rev. 74) used by the Geological Survey of Canada (Garrett, 1974).

The sample site positions were marked on appropriate 1/250,000 scale NTS maps in the field. These maps were digitized at the Geological Survey in Ottawa to obtain the sample site UTM coordinates.

The sample site coordinates were checked as follows: a sample location map was produced on a Calcomp 1051 drum plotter using the digitized coordinates; the field contractor's sample location map was then overlayed with the Calcomp map; the two sets of points were checked for coincidence. The dominant rock types in the stream catchment basins were identified on appropriate geological maps used as the bedrock geological base on RGR maps.

Thorough inspections of the field and analytical data were made to check for any missing information and/or gross errors.

Quality control and monitoring of the geochemical data was undertaken by a standard method used by the Exploration Geochemistry Subdivision at the Geological Survey of Canada.

ANALYTICAL PROCEDURES

Atomic Absorption Spectroscopy (AAS) and Other Analyses

For the determination of Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe, Cd, and As a 1 gram sample was reacted with 3 mL concentrated HNO_3 in a test-tube overnight at room temperature. After digestion, the test-tube was immersed in a hot water bath at room temperature and brought up to 90° C and held at this temperature for 30 minutes with periodic shaking. 1 mL concentrated HCl was added and heating was continued for another 90 minutes. The sample solution was then diluted to 20 mL with metal free water and mixed. Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe and Cd were determined by atomic absorption spectroscopy using an air-acetylene flame. Background corrections were made for Pb, Ni, Co, Ag and Cd.

Arsenic was determined by atomic absorption using a hydride evolution method wherein the hydride (AsH3) is evolved and passed through a heated quartz tube in the light path of an atomic absorption spectrophotometer. The method is described by Aslin (1976). Detection limit = 1 ppm.

Molybdenum and vanadium were determined by atomic absorption spectroscopy using a nitrous oxide acetylene flame. A 0.5 gram sample was reacted with 1.5 mL concentrated HNO_3 at 90° C for 30 minutes. At this point 0.5 mL concentrated HCl was added and the digestion was continued at 90° C for an additional 90 minutes. After cooling, 8 mL of 1250 ppm Al solution were added and the sample solution was diluted to 10 mL before aspiration. Detection limit: Mo - 2 ppm; V - 5 ppm.

Mercury was determined by the Hatch and Ott Procedure with some modifications. The method is described by Jonasson *et al*. (1973). A 0.5 gram sample was reacted with 20 mL concentrated HNO_3 and 1 mL concentrated HCl in a test-tube for 10 minutes at room temperature prior to 2 hours of digestion with

mixing at 90° C in a hot water bath. After digestion, the sample solutions were cooled and diluted to 100 mL with metal free water. The Hg present was reduced to the elemental state by the addition of 10 mL 10% w/v $SnSO_4$ in M H_2SO_4. The Hg vapour was then flushed by a stream of air into an absorption cell mounted in the light path of an atomic absorption spectrophotometer. Absorption measurements were made at 253.7 nm. Detection limit = 10 ppb.

Loss on ignition was determined using a 500 mg sample. The sample, weighed into 30 ml beaker, was placed in a cold muffle furnace and brought up to 500° C over a period of 2 - 3 hours. The sample was left at this temperature for 4 hours, then allowed to cool to room temperature for weighing. Detection limit = 1.0 pct.

Uranium was determined using a neutron activation method with delayed neutron counting. A detailed description of the method is provided by Boulanger *et al*. (1975). In brief, a 1 gram sample is weighed into a 7 dram polyethylene vial, capped and sealed. The irradiation is provided by the Slowpoke reactor with an operating flux of 10** 12 neutrons/sq cm/sec. The samples are pneumatically transferred from an automatic loader to the reactor, where each sample is irradiated for 60 seconds. After irradiation, the sample is again transferred pneumatically to the counting facility where after a 10 second delay the sample is counted for 60 seconds with six BF3 detector tubes embedded in paraffin. Following counting, the samples are automatically ejected into a shielded storage container. Calibration is carried out twice a day as a minimum, using natural materials of known uranium concentration. Detection limit = 0.5 ppm.

Antimony was determined as described by Aslin (1976). A 500 mg sample is placed in a test tube; 3 mL concentrated HNO_3 and 9 mL concentrated HCl are added and the mixture is allowed to stand overnight at room temperature. The mixture is heated slowly to 90° C and maintained at this temperature for at least 90 minutes. The solution is cooled and diluted to 10 mL with 1.8 M HCl. The antimony in an aliquot of this dilute solution is then determined by hydride evolution - atomic absorption spectrometry. Detection limit = 0.2 ppm.

Fluorine was determined as described by Ficklin (1970). A 250 mg sample is sintered with 1 g of a flux consisting of two parts by weight sodium carbonate and one part by weight potassium nitrate. The residue is then leached with water. The sodium carbonate is neutralized with 10 mL 10% (w/v) citric acid and the resulting solution is diluted to 100 mL with water. The pH of the resulting solution should be from 5.5 to 6.5. The fluoride content of the test solution is then measured using a fluoride ion electrode. Standard solutions contain sodium carbonate and citric acid in the same quantities as the sample solution. Detection limit = 20 ppm.

Gold was usually determined on a 10 g sediment sample; depending on the amount of sample available, lesser weights were sometimes used. This resulted in a variable detection limit: 2 ppb for a 5 g sample, 1 ppb for a 10 g sample... The sample was fused to produce a lead button, collecting any gold in the sample, which was cupelled in a muffle furnace to produce a silver (dore) bead. The silver beads were irradiated in a neutron flux for one hour, cooled for four hours, and counted by gamma ray spectrometry. Calibration was carried out using standard and blank beads.

Tungsten was determined as follows: A 0.2 g sample of stream sediment was fused with 1 g $K_2S_2O_7$ in a rimless test tube at 575° C for 15 minutes in a furnace. The cooled melt was then leached with 10 mL concentrated HCl in a water bath heated to 85° C. After the soluble material had completely dissolved, the insoluble material was allowed to settle and an aliquot of 5 mL was transferred to another test tube. 5 mL of 20% $SnCl_2$ solution were then added to the sample aliquot, mixed and heated for 10 minutes at 85° C in a hot water bath. A 1 mL aliquot of dithiol solution (1% dithiol in iso-amyl acetate) was added to the test solution and the test solution was then heated for 4 to 6 hours at 80 - 85° C in a hot water bath. The test solution was then removed from the hot water bath, cooled and 2.5 mL of kerosene added to dissolve the globule. The colour intensity of the kerosene solution was measured at 630 nm using a spectrophotometer. The method is described by Quin and Brooks (1972). Detection limit = 2 ppm.

Tin in stream sediments was determined as follows: A 200 mg sample was heated with NH_4I; the sublimed SnI4 was dissolved in acid and the tin determined by atomic absorption spectrometry. Detection limit = 1 ppm

Barium was determined as follows: A 0.25 g sample was heated with 5 mL concentrated $HClO_4$ were added and heated to light fumes; 5 mL of water were added and the solution was transferred to a calibrated test tube and diluted to 25 mL with water. Barium was determined by spectroscopy. Detection limit = 40 ppm.

Fluoride in lake water samples was determined using a fluoride electrode. Prior to measurement an aliquot of the sample was mixed with an equal volume of TISAB II buffer solution (total ionic strength adjustment buffer). The TISAB II buffer solution is prepared as follows: to 50 mL metal-free water add 57 mL glacial acetic acid, 58 gm NaCl and 4 gm CDTA (cyclohexylene dinitrilo tetraacetic acid). Stir to dissolve and cool to room temperature. Using a pH meter, adjust the pH between 5.0 and 5.5 by slowly adding 5M NaOH solution. Cool and dilute to one litre in a volumetric flask. Detection limit = 20 ppb.

Hydrogen ion activity (pH) was measured with a combination glass-calomel electrode and a pH meter.

Uranium in waters was determined by a laser-induced fluorometric method using a Scintrex UA-3 uranium analyser. A complexing agent, known commercially as fluran and composed of sodium pyrophosphate and sodium monophosphate (Hall, 1979) is added to produce the uranyl pyrophosate species which fluoresces when exposed to the laser. Since organic matter in the sample can cause unpredictable behaviour, a standard addition method was used. Further, there have been instances at the GSC where the reaction of uranium with fluran is either delayed or sluggish; for this reason an arbitrary 24 hour time delay between the addition of the fluran and the actual reading was incorporated into this method. In practice 500 µL of fluran solution were added to a 5 mL sample and allowed to stand for 24 hours. At the end of this period fluorescence readings were made with the addition of 0.0, 0.2 and 0.4 ppb U. For high samples the additions were 0.0, 2.0 and 4.0 (20 µL aliquots of either 55 or 550 ppb U were used). All readings were taken against a sample blank. Detection limit = .05 ppb.

Table 1 provides a summary of analytical data and methods.

PRESENTATION AND INTERPRETATION OF GOLD DATA

The following discussion reviews the format used to present the Au geochemical data and outlines some important points to consider when interpreting this data. This discussion is included in recognition of the special geochemical behaviour and mode of occurrence of Au in nature and the resultant difficulties in obtaining and analyzing samples which reflect the actual concentration level at a given site.

To correctly interpret Au geochemical data from regional stream sediment or lake sediment surveys requires an appreciation of the unique chemical and physical characteristics of Au and its mobility in the surficial environment. Key properties of Au that distinguish its geochemical behaviour from most other elements include (Harris, 1982):

(1) Au occurs most commonly in the native form which is chemically and physically resistant. A high proportion of the metal is dispersed in micron-sized particulate form. Gold's high specific gravity results in heterogeneous distribution, especially in stream sediment and clastic-rich (low LOI) lake sediment environments. Au distribution appears to be more homogeneous in organic-rich fluviatile and lake sediment environments.

(2) Gold typically occurs at low concentrations in the ppb range. Whereas gold concentrations of only a few ppm may represent economic deposits, background levels encountered from stream and centre-lake sediments seldom exceed 10 ppb, and commonly are near the detection limit of 1 ppb.

These factors result in a particle sparsity effect wherein very low concentrations of Au are heterogeneously enriched in the surficial environment. Hence, a major problem facing the geochemist is to obtain a representative sample. In general, the lower the actual concentration of Au the larger the sample size, or the smaller the grain size required to reduce uncertainty over whether subsample analytical values truly represent actual values. Conversely, as actual Au concentrations increase or grain size decreases, the number of Au particles to be shared in random subsamples increases and the variability of results decreases (Clifton *et al.*, 1969; Harris, 1982). The limited amount of material collected during the rapid, reconnaissance-style regional surveys and the need to analyze for a broad spectrum of elements, precludes the use of a significantly large sample weight for the Au analyses. Therefore, to the extent that sample representivity can be increased, sample grain size is reduced by sieving and ball milling of all samples.

The following control methods are currently employed to evaluate and monitor the sampling and analytical variability which are inherent in the analysis of Au in geochemical mediums:

(1) For each block of twenty samples:

(a) random insertion of a standard reference sample to control analytical accuracy and long-term precision;

(b) collection of a field duplicate (two samples from one site) to control sampling variance;

(c) analysis of a second subsample (blind duplicate) from one sample to control short-term precision.

(2) For both stream sediments and lake sediments, routine repeat analyses on a second subsample are performed for all samples having values that are statistically above approximately the 90th percentile of total data set. This applies only to gold analyses by fire assay preconcentration followed by neutron activation. **Such routine repeat analyses are not performed for INA analyses of archived samples.**

(3) For lake sediments only, a routine repeat analysis on a second subsample is performed on those samples with LOI values below 10%, indicating a large clastic component. On-going studies suggest that the Au distribution in these samples is more likely to be variable than in samples with a higher LOI content. **Again, routine repeat analyses are performed only when the fire assay preconcentration/neutron activation method is used.**

Au data presentation, statistical treatment and the value map format are different than for other elements. Au data listed in the open file may include initial analytical results, values determined from repeat analyses, together with sample weights and corresponding detection limits for all analyzed samples. The gold, statistical parameters and regional symbol trend plots are determined using the following data population selection criteria:

(1) Only the first analytical value is utilized.

(2) Au values determined from sample weights less than 10 g are excluded, except where determined by instrumental neutron activation analyses.

(3) Au values less than the detection limit (<1 ppb) for 10 g samples are set to 0.5 ppb.

On the value map, repeat analysis values, where determined (not field duplicates), are placed in brackets following the initial value determination. All values determined on a sample less than 10 g are denoted by an asterisk. Actual sample weight used can be determined from the text. Following are possible variations in data presentation on a value map:

*	No data
+ 27	Single analysis, 10 g sample weight
+ 27*	single analysis, < 10 g sample weight
+ 27 (14)	Repeat analysis, both samples 10 g
+ 27 (14*)	Repeat analysis, first sample 10 g, repeat < 10 g
+ <1	Single analysis, 10 g sample, less than detection limit of 1 ppb

In summary, geochemical follow-up investigations for Au should be based on a careful consideration of all geological and geochemical information, and especially a careful appraisal of gold geochemical data and its variability. In some instances, prospective follow-up areas may be indirectly identified by pathfinder element associations in favourable geology, although a complementary Au response due to natural variability may be lacking. Once an anomalous area has been identified, field investigations should be designed to include detailed geochemical follow-up surveys and collection of large representative samples. Subsequent repeat subsample analyses will increase the reliability of results and permit a better understanding of natural variability which can then be used to improve sampling methodology and interpretation.

STREAM SEDIMENT DATA LIST LEGEND AND DIGITAL FIELD RECORD FORMAT

Table 2 lists both the field and map information which is recorded at each sample site and is listed in the accompanying data listings, and the digital record format for the tape or diskette version of the open file. For the digital record A = alpha; X = numeric, unless indicated otherwise.

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TABLE 1. Summary of Analytical Data and Methods

Element		Detection level		Method(s)
SEDIMENTS:				
Zn	Zinc	2	ppm	AAS
Cu	Copper	2	ppm	AAS
Pb	Lead	2	ppm	AAS
Ni	Nickel	2	ppm	AAS
Co	Cobalt	2	ppm	AAS
Ag	Silver	0.2	ppm	AAS
Mn	Manganese	5	ppm	AAS
As	Arsenic	1	ppm	AAS
Mo	Molybdenum	2	ppm	AAS
Fe	Iron	0.02	pct	AAS
Hg	Mercury	10	ppb	AAS
LOI	Loss-on-ignition	1.0	pct	GRAV
U	Uranium	0.5	ppm	NADNC
F	Fluorine	20	ppm	ISE
V	Vanadium	5	ppm	AAS
Cd	Cadmium	0.2	ppm	AAS
Sb	Antimony	0.2	ppm	AAS
W	Tungsten	2	ppm	COL
Ba	Barium	40	ppm	DCP
Sn	Tin	1	ppm	AAS
Au	Gold	1	ppb	FA - NA

TABLE 1 – Continued

Element		Detection level		Method(s)
WATERS:				
F	Fluoride	20	ppb	ISE
pH	Hydrogen ion activity			GCM
U	Uranium	0.05	ppb	LIF

AAS - Atomic absorption spectrometry
COL - Colorimetry using dithiol
DCP - Direct current plasma emission spectroscopy
FA - NA - Fire assay preconcentration – neutron activation
GCM - Glass Calomel electrode and pH meter
GRAV - Gravimetry
ISE - Ion selective electrode
LIF - Laser-induced fluorescence
NADNC - Neutron Activation delayed neutron counting

TABLE 2. DATA LIST AND DIGITAL FORMAT LEGEND
Record 1 – Field Data

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
MAP	National topographic system (NTS): lettered quadrangle (1:250,000 scale) or (1:50,000 scale). Part of sample number		1-6 "XXXAXX"
SAMPLE ID	Remainder of sample number: Year Field Crew Sample sequence number	 19XX 1, 3, 5, 7 001 - 999	7 – 12 "XX " " X " " XXX"
UTM COORDINATES	Universal Transverse Mercator (UTM) Coordinate system; digitized sample location coordinates.		
ZN	Zone 7 to 22		13 – 14 "XX"
EASTING	UTM Easting in metres		15 – 20 "XXXXXX"
NORTHING	UTM Northing in metres		21 – 27 "XXXXXXX"
ROCK TYPE	Major rock type of stream catchment area: Cenozoic Glacial, surficial sediments Selkirk Gp.; volcanic flows, breccia, tuff Rhyolite, trachyte Rhyolite porphyry, granite Carmacks Gp.; andesite, basalt Granite, syenite prophyry Conglomerate, sandstone Mesozoic Syenite, monzonite Granite South Fork Fm; andesite, dacite Quartz monzonite, cassiar intrusives Keno Hill Fm.; quartzite Diorite Gabbro, diorite, ultramafics Phyllite, quartzite, greenstone Conglomerate, chert, tuff Andesite, trachyte	 Qs Rs Mvr LTg OMCV ETf ITs Ky Kg KSF Kqm JKKH JKdi JKb Jp Mcg Mvd	28 – 31 "Qs" "Rs" "Mvr" "LTg" "OMCV" "ETf" "ITs" "Ky" "Kg" "KSF" "Kqm" "JKKH" "JKdi" "JKb" "jp" "Mcg" "Mvd"

TABLE 2 - Continued

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
ROCK TYPE Continued	Paleozoic Greywacke, argillite, limestone Anvil Range Gp.; volcanics, sediments Big Salmon Met. Cplx.; schist, gneiss Crystal Peaks Fm.; chert pebble conglomerate Earn Gp.; slate, quartzite, limestone Road River Fm.; shale, chert Pelly Gneiss; gneissic granodiorite Limestone Proterozoic Limestone Quartzite, argillite, shale Graphitic phyllite, quartzite Greenstone	 Ps CPAV CPsn DMCP DEI OSDR Pgdn Pc Hc Hqp Hpq Hv	 "Ps" "CPAV" "CPsn" "DMCP" "DEI" "OSDR" "Pgdn" "Pc" "Hc" "Hqp" "Hpq" "Hv"
SAMPLE TYPE	Sample material collected: Stream bed sediment only Spring or sediment seep Heavy mineral concentrate Stream water only Natural groundwater, spring seep Simultaneous stream sediment and water Simultaneous spring or seep water and sediment	 1 2 3 4 5 6 7	32 "1" "2" "3" "4" "5" "6" "7"
WID	Stream width in decimetres	 001 – 999	33 – 35 "XXX"
DEP	Water depth in decimetres	 001 - 999	36 – 38 "XXX"
RS	Replicate status; the relationship of the sample to others in the project: A routine sample site First of a duplicate pair Second of a duplicate pair	 00 10 20	39 – 40 "00" "10" "20"

TABLE 2 - Continued

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
CONT	Contamination; human or natural:		41
	None	0	“0”
	Possible	1	“1”
	Probable	2	“2”
	Definite	3	“3”
	Mining activity	4	“4”
	Industrial Sources	5	“5”
	Agricultural	6	“6”
	Domestic or household	7	“7”
	Forestry activity	8	“8”
	Burned areas	9	“9”
BANK TYPE	Bank type; the general nature of the bank material dajacent to the sample site:		42
	Alluvial	1	“1”
	Colluvial (bare rock, residual or mountain soils)	2	“2”
	Glacial till	3	“3”
	Glacial outwash sediments	4	“4”
	Bare rock	5	“5”
	Talus scree	6	“6”
	Organic predominant (debris, peat, muskeg, swamp)	7	“7”
WATER COL	Water colour; the general colour and suspended load of the sampled water:		43
	Clear (Clear)	0	“0”
	Brown transparent (Bn trans)	1	“1”
	White cloudy (Wh Cloudy)	2	“2”
	Brown cloudy (Bn Cloudy)	3	“3”
FLOW RATE	Water flow rate:		44
	Stagnant	0	“0”
	Slow (Slow)	1	“1”
	Moderate (Mod)	2	“2”
	Fast (Fast)	3	“3”
	Torrential (Torr)	4	“4”

TABLE 2 - Continued

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
SED COL	Predominant sediment colour:		45
	Red, brown (Rd – Bn)	1	“1”
	White, buff (Wh – Bf)	2	“2”
	Black (Bk)	3	“3”
	Yellow (Yw)	4	“4”
	Green (Gn)	5	“5”
	Grey, blue grey (Gy - Bl)	6	“6”
	Pink (Pink)	7	“7”
	Buff to brown (Bf – Bn)	8	“8”
	Brown (Bn)	9	“9”
SED COMP	Sediment composition; description of the bulk mechanical composition of the collected sample on a scale of 0 to 3, the total of the columns must add to 3 or 4 or 5:		46 – 48
	Size fractions are divided as follows:		
	Column 46 - >0.125 mm – sand		″X ″
	Column 47 - <0.125 mm – fines, silt and clay, organics		″ X ″
	Column 48 – organics	0	″ X″
		1	
	Amount of size fraction:	2	
		3	

sum of amounts=	3	4	5
Absent	0	0	0
Minor	<33%	25%	20%
Medium	33-67%	50%	40%
Major	>67%	75%	60%

PCPT COL	Precipitate or stain; the presence of any coatings on pebbles, boulders or stream bottoms:		49
	None (None)	0	“0”
	Red – brown (Rd – Bn)	1	“1”
	White or buff (Wh – Bf)	2	“2”
	Black (Bk)	3	“3”
	Yellow (Yw)	4	“4”
	Green (Gn)	5	“5”
	Grey (Gy)	6	“6”
	Pink (Pink)	7	“7”
	Buff to brown (Bf – Bn)	8	“8”

TABLE 2 - Continued

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
BANK STAIN	Distinctive precipitate, stains, weathering on rocks in immediate catchment basin or stream banks:		50
	Featureless (None)	0	“0”
	Red, brown *(e.g.*, Fe) (Rd - Bn)	1	“1”
	White buff (*e.g.* CO_3, Zn) (Wh – Bf)	2	“2”
	Black (*e.g.* Fe, Mn, sulphides) (Bk)	3	“3”
	Yellow (*e.g.* Pb, U, Fe, Mo, REE) (Yw)		
	Green (Cu, Ni, U, Mo, As, Fe) (Gn)	4	“4”
	Bluish (Zn, P) (Bl)	5	“5”
	Pink (Co, As) (Pink)	6	“6”
		7	“7”
STRM PHYS	General physiography of drainage basin:		55
	Plain	0	“0”
	Muskeg, swampland	1	“1”
	Peneplain, plateau	2	“2”
	Hilly, undulating	3	“3”
	Mountainous, mature	4	“4”
	Mountainous, youthful (precipitous)	5	“5”
DRAIN PTRN	Drainage pattern:		56
	Poorly defined, haphazard	0	“0”
	Dendritic	1	“1”
	Herringbone	2	“2”
	Rectangular	3	“3”
	Trellis	4	“4”
	Discontinuous shield type (chains of lakes)	5	“5”
	Basinal (closed)	6	“6”
	Others	7	“7”
STREAM TYPE	Stream type::		57
	Undefined	0	“0”
	Permanent, continuous	1	“1”
	Intermittent, seasonal	2	“2”
	Re-emergent, discontinuous	3	“3”
STREAM CLASS	Stream class (order):		58
	Undefined	0	“0”
	Primary	1	“1”
	Secondary	2	“2”
	Tertiary	3	“3”
	Quaternary	4	“4”

TABLE 2 - Continued

FIELD RECORD	DEFINITION	TEXT CODE	DIGITAL RECORD COLUMN AND CODE
WATER SOURCE	Source of water:		59
	Unknown	0	“0”
	Groundwater	1	“1”
	Snow melt or spring run-off	2	“2”
	Recent precipitation	3	“3”
	Ice-cap or glacier meltwater	4	“4”
DAY*	Day of month site sampled:		60 - 61
MONTH*	Month number in year:		62 – 63
	January – 1 to December - 12		“XX”
AGE	Stratigraphic age of dominant rock type in catchment basin:		70 – 71
	Pleistocene and Recent	64	“64”
	Miocene, Late Tertiary	61	“61”
	Oligocene and Miocene	60	“60”
	Early Tertiary	59	“59”
	Lower Tertiary	58	“58”
	Cretaceous	52	“52”
	Jurassic and Cretaceous	51	“51”
	Jurassic	47	“47”
	Mesozoic	41	“41”
	Paleozoic	36	“36”
	Carboniferous and Permian	35	“35”
	Devonian and Mississippian	29	“29”
	Devonian	25	“25”
	Ordovician, Silurian and lower Devonian	19	“19”
	Paleozoic	09	“09”
	Hadrynian	07	“07”

* Digital record only, not listed in text

Record 2 – Atomic Absorption Spectrometry and Other Data

FIELD RECORD	DEFINITION	UNITS	DETECTION LEVEL	DIGITAL RECORD COLUMN AND CODE
Zn - SEDS	Zinc in stream sediments	ppm	2	16 - 20
Cu – SEDS	Copper in stream sediments	ppm	2	21 - 25
Pb - SEDS	Lead in stream sediments	ppm	2	26 – 30
Ni - SEDS	Nickel in stream sediments	ppm	2	31 – 35
Co – SEDS	Cobalt in stream sediments	ppm	2	36 – 40
Ag – SEDS	Silver in stream sediments	ppm	0.2	41 – 47
Mn – SEDS	Manganese in stream sediments	ppm	5	48 – 53
As – SEDS	Arsenic in stream sediments	ppm	1	54 – 60
Mo – SEDS	Molybdenum in stream sediments	ppm	2	61 – 65
Fe – SEDS	Iron in stream sediments	pct	0.02	66 – 70
Hg – SEDS	Mercury in stream sediments	ppb	10	71 – 75
LOI – SEDS	Loss-on-ignition	pct	1	76 - 80

Record 3 – Atomic Absorption Spectrometry and Other Data

FIELD RECORD	DEFINITION	UNITS	DETECTION LEVEL	DIGITAL RECORD COLUMN AND CODE
U - SEDS	Uranium in stream sediments	ppm	0.5	16 - 22
F – SEDS	Fluorine in stream sediments	ppm	20	23 - 27
V - SEDS	Vanadium in stream sediments	ppm	5	28 – 32
Cd - SEDS	Cadmium in stream sediments	ppm	0.2	33 – 39
Sb – SEDS	Antimony in stream sediments	ppm	0.2	40 – 46
W – SEDS	Tungsten in stream sediments	ppm	2	47 - 51
Ba – SEDS	Barium in stream sediments	ppm	40	52 - 56
Sn - SEDS	Tin in stream sediments	ppm	1	57 - 63

Record 4 – Atomic Absorption Spectrometry and Other Data

FIELD RECORD	DEFINITION	UNITS	DETECTION LEVEL	DIGITAL RECORD COLUMN AND CODE
F - WATERS	Fluoride in stream waters	ppb	20	16 - 20
pH – WATERS	pH of stream waters			21 - 25
U - WATERS	Uranium in stream waters	ppb	0.05	26 – 30
Au – SEDS	Gold in stream sediments	ppb	variable	31 – 35
REPEAT Au	Gold in stream sediments - repeat analysis	ppb	variable	36 – 40
Au WEIGHT	Sample weight for first gold analysis	grams		41 – 44
REPEAT Au WEIGHT	Sample weight for repeat gold analysis	grams		45 – 48