

GEOLOGICAL SURVEY OF CANADA OPEN FILE 2178
(parts of NTS 31M/13 and 32D/4)
CANADA – ONTARIO MINERAL DEVELOPMENT AGREEMENT (1985 – 1990)

**STREAM SEDIMENT AND WATER GEOCHEMICAL INFILL SURVEY DATA,
LARDER LAKE REGION, NORTHEASTERN ONTARIO**



INDEX MAP

Recommended citation:

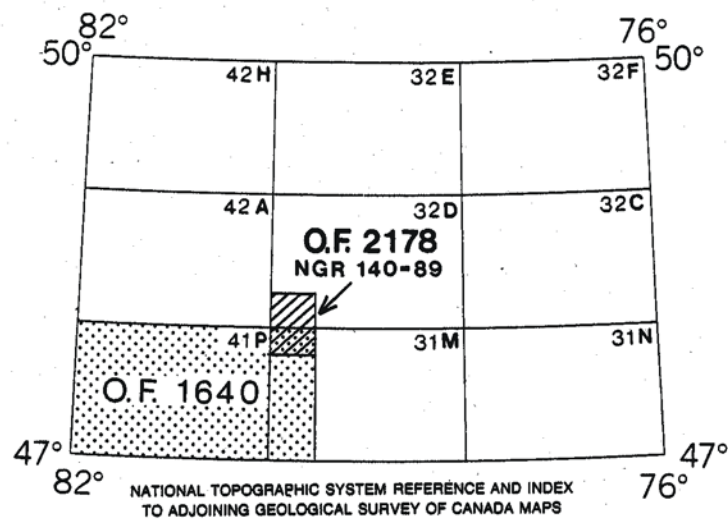
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1990: National Geochemical Reconnaissance Stream Sediment and Water Infill Data,
Larder Lake Region, Northeastern Ontario (parts of NTS 31M/13 and 32D/4) Geological
Survey of Canada

Open File 2178

August, 1990

**NATIONAL GEOCHEMICAL RECONNAISSANCE
STREAM SEDIMENT AND WATER GEOCHEMICAL INFILL DATA
ONTARIO 1990
GEOLOGICAL SURVEY OF CANADA OPEN FILE 2178, NGR 140-1989
Parts of NTS 31m/13 and 32D/4**



Open File 2178 represents a contribution to the Canada – Ontario Mineral Development Agreement (1985-1990), 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 LAKE SEDIMENT AND WATER GEOCHEMICAL DATA, ONTARIO 1990,
GSC OPEN FILE 2178, NGR 139-1989; PARTS OF NTS 42E, 42L AND 52H**

INTRODUCTION

Open File 2178, covering an area southeast of Kirkland Lake in northeastern Ontario, was sampled in 1989 as part of the Canada - Ontario Mineral Development Agreement. Open File 2178 contains the results of analyses of stream sediments and waters from this area for 43 elements plus loss-on-ignition. Corresponding waters were analysed for uranium, pH and fluoride.

The reconnaissance survey was undertaken by the Geological Survey of Canada in conjunction with the Ontario Ministry of Northern Development and Mines.

Analytical results and field observations are used to build a national geochemical data base for resource assessment, mineral exploration, geological mapping and environmental studies. Sample collection and preparation procedures and analytical methods are strictly specified and carefully monitored to ensure consistent and reliable results regardless of the area, the year or the analytical laboratory.

CREDITS

E.H.W. Hornbrook directed the survey.

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

Sample collection was carried out by Alexander C. Bath under the direction of Gerhard Meyer, Regional Geologist, Kirkland Lake, Ministry of Northern Development and Mines.

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

Analysis: Bondar-Clegg and Company
Ottawa, Ontario
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North Vancouver, British Columbia
J.J. Lynch

M. McCurdy edited open files and coordinated production.

A.C. Galletta managed the digital geochemical data and provided computer processing support.

The personal computer data base and software programs used for data entry, verification, processing and presentation in the publication of reports were designed and programmed by Harry Gross, Geochemical Data Manager for the Exploration Geochemistry Subdivision.

Sample location, gold value and symbol-trend maps were prepared by GSC staff.

Pat Doyle, C.C. Durham and Rob Phillips provided technical assistance.

DESCRIPTION OF SURVEY AND SAMPLE MANAGEMENT

Truck-supported sample collection was carried out during the summer of 1989. Stream sediment and water samples were collected at an average density of one sample per 10 square kilometres throughout the 2 000 square kilometres of the northeastern Ontario survey.

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 (Garrett, 1974).

The sample site positions were marked on appropriate 1:50 000 scale NTS maps in the field. These maps were digitized at the Geological Survey in Ottawa to obtain the sample site UTM coordinates.

In Ottawa, field dried samples were air-dried and sieved through a minus 80 mesh (177 micron) screen, and ball-milled before 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.

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 original sample location map produced in the field was then overlain 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 NGR 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

Instrumental Neutron Activation Analysis (INAA)

The weighed sample (generally 10 to 40 g) is irradiated epithermally for 20 minutes in a neutron flux with an approximate density of 1 x 10¹¹ neutrons/cm²/second. Counting begins seven days after irradiation. The counting time is somewhat variable (6 to 11 minutes) and is matrix dependent. Counting is done on a germanium-lithium co-axial counter. The counting data is accumulated on a VAX computer and is subsequently converted to concentrations. Numerous international reference samples are irradiated with each batch of routine samples. Elements determined by INA analyses include: Na, Sc, Cr, Fe, Co, Ni, Zn, As, Se, Br, Rb, Zr, Mo, Ag, Cd, Sn, Sb, Te, Cs, Ba, La, Ce, Sm, Eu, Tb, Yb,

Lu, Hf, Ta, W, Ir, Au, Th, and U. The sample weight is also reported. Data for Zn, Se, Zr, Ag, Cd, Sn, Te, and Ir are not published because of inadequate detection limits and/or precision.

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 is reacted with 3 mL concentrated HNO_3 in a test tube overnight at room temperature. After digestion, the test-tube is 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. One mL of concentrated HCl is added and heating continues for another 90 minutes. The sample solution is then diluted to 20 mL with metal-free water and mixed. Zn, Cu, Pb, Ni, Co, Ag, Mn, Fe and Cd are determined by atomic absorption spectroscopy using an air-acetylene flame. Background corrections are made for Pb, Ni, Co, Ag, and Cd.

Arsenic is determined by atomic absorption using a hydride evolution method wherein the hydride (AsH_3) 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).

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

Mercury is determined by the Hatch and Ott procedure with some modifications. The method is described by Jonasson *et al.* (1973). A 0.5 gram sample is reacted with 20 mL concentrated HNO_3 and 1 mL concentrated HCl in a test tube for 10 minutes at room temperature prior to two hours of digestion with mixing at 90°C in a hot water bath. After digestion, the sample solutions are cooled and diluted to 100 mL with metal-free water. The Hg present is reduced to the elemental state by the addition of 10 mL of 10% w/v SnSO_4 in M H_2SO_4 . The Hg vapour is then flushed by a stream of air into an absorption cell mounted in the light path of an atomic absorption spectrophotometer. Absorption measurements are made at 253.7 nm.

Loss-on-ignition is determined using a 500 mg sample. The sample, weighed into 30 mL beaker, is placed in a cold muffle furnace and brought up to 500°C over a period of two to three hours. The sample is held at this temperature for four hours, then allowed to cool to room temperature for weighing.

Uranium is 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, 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/cm²/second. 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 BF_3 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.

Antimony is 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. A one mL aliquot of this solution is 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.

Fluorine is determined as described by Ficklin (1970). A 250 mg sample is sintered with 1 gram 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 solution should range from 5.5 to 6.5. The fluoride content of the test solution is measured using a fluoride ion electrode. Standard solutions contain sodium carbonate and citric acid in the same quantities as the sample solution.

Tin in stream sediments is determined by heating a 200 mg sample with NH_4I : the sublimed SnI_4 is dissolved in acid and the tin determined by atomic absorption spectrometry after solvent extraction of the tin into methyl isobutyl ketone containing trioctylphosphine oxide (TOPO). The method is described by E.P. Walsh and T.T. Chao.

Water Analyses

Fluoride in water samples is determined using a fluoride electrode. Prior to measurement an aliquot of the sample is 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 g NaCl and 4 g 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 5 M NaOH solution. Cool and dilute to one liter in a volumetric flask. Detection limit = 20 ppb.

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

Uranium in waters is 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 pyrophosphate species which fluoresces when exposed to the laser. Since organic matter in the sample can cause unpredictable behaviour, a standard addition method is used. Further, the reaction of uranium with Fluran can be delayed or sluggish; for this reason an

arbitrary 24 hour time delay between the addition of the Fluran and the actual reading is incorporated into this method. In practice, 500 µL of Fluran solution are added to a 5 mL sample and allowed to stand for 24 hours. At the end of this period fluorescence readings are made with the addition of 0.0, 0.2 and 0.4 ppb U. For high samples the additions are 0.0, 2.0 and 4.0 (20 µL aliquots of 55 or 550 ppb U are used). All readings are taken against a sample blank.

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 gold that distinguish its geochemical behaviour from most other elements include (Harris, 1982):

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

These factors result in a particle sparsity effect wherein very low concentrations of gold are heterogeneously enriched in the surficial environment. Hence, a major problem facing the geochemist is to obtain a representative sample. In general, areas where concentrations of gold in sediments are low, and/or grain sizes of the gold present relatively high require proportionally larger samples to reduce the uncertainty between subsample analytical values and actual values. Conversely, as actual gold concentrations increase or grain size decreases, the number of gold particles to be shared in random subsamples increases and 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 gold analyses. Therefore, to obtain representative samples, grain size is reduced by sieving and ball milling of the dried sediments.

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

- (1) For each block of 20 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 measure sampling variance;
 - (c) analysis of a second subsample (blind duplicate) from one sample to measure and control short-term precision.
- (2) For both stream 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 the total data set.
- (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. Ongoing studies suggest that the gold distribution in these samples is more likely to be variable than in samples with a higher LOI content.

The presentation of gold data, statistical treatment and the value map format are different than for other elements. Gold 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 only the first analytical value. Gold values less than the detection limit are set to half that limit. On the value map, initial values are followed by a comma and a value obtained by a second analysis, where determined. Sample weights used can be found in the text. Following are possible variations in data presentation on a value map.

+ *	No data
+27	Single analysis
+27,14	Repeat analysis
+<1	Single analysis, less than detection limit

TABLE 1. Summary of Analytical Data and Methods

ELEMENT		DETECTION LEVEL		METHOD
<u>SEDIMENTS:</u>				
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	HY-AAS
Mo	Molybdenum	2	ppm	AAS
Fe	Iron	0.02	pct	AAS
U	Uranium	0.5	ppm	NADNC
Hg	Mercury	10	ppb	CV-AAS
F	Fluorine	20	ppm	AAS
V	Vanadium	5	ppm	AAS
Cd	Cadmium	0.2	ppm	AAS
Sb	Antimony	0.2	ppm	HY-AAS
LOI	Loss-on-ignition	1	pct	GRAV
Sn	Tin	1	ppm	AAS
Na	Sodium	0.02	pct	INAA
Sc	Scandium	0.2	ppm	INAA
Cr	Chromium	20	ppm	INAA
Fe	Iron	0.2	pct	INAA
Co	Cobalt	5	ppm	INAA
Ni	Nickel	10	ppm	INAA
As	Arsenic	0.5	ppm	INAA
Br	Bromine	0.5	ppm	INAA
Rb	Rubidium	5	ppm	INAA
Mo	Molybdenum	1	ppm	INAA
Sb	Antimony	0.1	ppm	INAA
Cs	Cesium	0.5	ppm	INAA
Ba	Barium	50	ppm	INAA
La	Lanthanum	2	ppm	INAA
Ce	Cerium	5	ppm	INAA
Sm	Samarium	0.10	ppm	INAA
Eu	Europium	1	ppm	INAA
Tb	Terbium	0.5	ppm	INAA
Yb	Ytterbium	2	ppm	INAA
Lu	Lutetium	0.2	ppm	INAA
Hf	Hafnium	1	ppm	INAA
Ta	Tantalum	0.5	ppm	INAA
W	Tungsten	1	ppm	INAA
Th	Thorium	0.2	ppm	INAA
U	Uranium	0.2	ppm	INAA
Wt	Weight	0.01	g	-
Au	Gold	2	ppb	INAA
<u>WATERS:</u>				
F	Fluoride	20	ppb	ISE
pH	Hydrogen ion activity	-	-	GCM
U	Uranium	0.05	ppb	LIF

- AAS
- atomic absorption spectrometry
- GCM
- glass Calomel electrode and pH meter
- GRAV
- gravimetry
- ISE
- ion selective electrode
- LIF
- laser-induced fluorescence
- NADNC
- neutron activation, delayed neutron counting
- HY-AAS
- atomic absorption using hydride evolution
- CV-AAS
- cold vapour (flameless) atomic absorption

In summary, geochemical follow-up investigations for gold 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 gold 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 methods and interpretation.

FIELD DATA LEGEND

Table 2 describes the field and map information appearing on the following pages preceeding the analytical data for each sample site.

REFERENCES

- Aslin, G.E.M.** (1976) The determination of arsenic and antimony in geological materials by flameless atomic absorption spectrophotometer; *Journal of Geochemical Exploration*, Vol. 6, pp. 321-330.
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- Harris, J.F.** (1982) Sampling and analytical requirements for effective use of geochemistry in exploration for gold; *in* *Levinson, A.A., Editor, Precious Metals in the Northern Cordillera*, proceedings of a symposium sponsored by the Association of Exploration Geochemists and the Cordilleran Section of the Geological Association of Canada, pp. 53-67.
- Jonasson, I.R., Lynch, J.J. and Trip, L.J.** (1973) Field and laboratory methods used by the Geological Survey of Canada in geochemical surveys; No. 12, *Mercury in Ores, Rocks, Soils, Sediments and Water*, *Geol. Surv. Can. Paper* 73-21.
- Welsch, E.P. and Chao, T.T.** (1976) Determination of trace amounts of tin in geological materials by atomic absorption spectrometry; *Anal. Chim. Acta.*, Vol. 82, pp. 337-342.

TABLE 2. Field Observations Legend

FIELD RECORD	DEFINITION	TEXT CODE
MAP SHEET	National Topographic System (NTS); lettered quadrangle (1;50 000 scale)	31M or 32D
SAMPLE ID	Remainder of sample number: Year Field crew Sample sequence number	89 1 or 3 001-999
REP STAT	Replicate status; the relationship of the sample to others within the survey: Routine sample site First of duplicate pair Second of duplicate pair	00 10 20
UTM	Universal Transverse Mercator (UTM) co-ordinate system; digitized sample location coordinates	
ZN	Zone 7 to 22	
EASTING	UTM Easting in metres	
NORTHING	UTM Northing in metres	
ROCK UNIT	Major rock type of stream catchment area: PALEOZOIC LOWER AND MIDDLE SILURIAN Thornloe Formation: limestone, dolomite, sandstone Wabi Formation: limesone, shale..... MIDDLE AND UPPER ORDOVICIAN Dawson Point Formation: shale Farr Formation: limestone Buckle Formation: limestone Guigues Formation: sandstone PRECAMBRIAN MIDDLE PRECAMBRIAN (PROTEROZOIC) Mafic Intrusive Rocks diabase, granophyre..... Huronian Supergroup Cobalt Group Lorrain Formation: quartzite, arkose Gowganda Formation: Coleman member - conglomerate, arkose, greywacke, quartzite, argillite.. EARLY PRECAMBRIAN (ARCHEAN) Felsic Intrusive Rocks quartz porphyry, quartz-feldspar porphyry, feldspar porphyry, granophyre, felsite; trondhjemite, granodiorite, quartz monzonite syenite, monzonite, feldspar porphyry..... Metamorphosed Mafic and Ultramafic Rocks gabbro, diorite, lamprophyre peridotite, dunite, pyroxenite, serpentinite..... Metasediments conglomerate, greywacke, siltstone, slate, argillite... greywacke, siltstone, slate, argillite, and minor pebble conglomerate Metavolcanics alkalic metavolcanics: trachyte, leucitic trachyte; flows tuff, breccia felsic metavolcanics: pyroclastic rocks, flows..... intermediate and mafic volcanics: intermediate flows; intermediate pyroclastic rocks; mafic flows and pyroclastic rocks iron formation: and ferruginous chert (occurs as members of stratigraphic units 1, 2, 4 and 5)	STW PSG ODFB PMI PHCL PHCG AFIQ AFIS AMM AMU AMC MMG AAM AFM AIMM AIF

FIELD RECORD	DEFINITION	TEXT CODE
ROCK AGE	Stratigraphic age of dominant rock type in catchment basin: Silurian Ordovician Proterozoic..... Archean.....	20 15 04 02
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	SedOnly SpgSedOnly HvMnCn Strm GrWat Sed/Water SpgSep/Sed
STREAM WIDTH	Stream width in decimetres	
STREAM DEPTH	Stream depth in decimetres	
SAMPLE CONT.	Contamination; human or natural: None Possible Probable Definite Mining activity..... Industrial sources Agricultural Domestic or household Forestry activities Burned areas	- Possible Probable Definite Mining Industry Agricult Domestic Forestry Burn
BANK TYPE	Bank type; the general nature of the bank material adjacent to the sample site: Alluvial Colluvial (bare rock, residual or mountain soils).. Glacial till Glacial outwash sediments..... Bare rock..... Talus scree Organic predominant (debris, peat, muskeg, swamp)	Alluv Colluv Till Outwash Bare Rk Tal/Scr Organic
WATER COLOUR	Water colour; the general colour and suspended load of the sampled water: Clear Brown transparent White cloudy Brown cloudy	Clear BnTrans WhCl'dy BnCl'dy
STREAM FLOW	Water flow rate: Stagnant Slow Moderate Fast Torrential.....	Stagnt Slow Modert Fast Torrnt
SAMPLE COLOUR	Predominant sediment colour: Red-brown White-buff Black..... Yellow Green..... Grey, blue grey Pink Buff to brown Brown	Rd-Bn Wh-Bf Black Yellow Green Gy-Blu Pink Bf-Bn Brown

FIELD RECORD	DEFINITION	TEXT CODE																								
SAMPLE COMP.	<p>Sediment composition; description of the bulk mechanical composition of the collected sample on a scale of 1 to 3, the total of the column must add up to 3 or 4 or 5: Size fractions are divided as follows:</p> <p>Column 1 >0.125 mm (sand) Column 2 <0.125 mm (fines – organic silt, clay) Column 3 organic material</p> <p>Amount of size fraction: sum of amounts = 3 4 5</p> <table><tr><td>Absent</td><td>0</td><td>0</td><td>0</td><td></td><td>0</td></tr><tr><td>Minor</td><td><33%</td><td>25%</td><td>20%</td><td>.....</td><td>1</td></tr><tr><td>Medium</td><td>33-67%</td><td>50%</td><td>40%</td><td>.....</td><td>2</td></tr><tr><td>Major</td><td>>67%</td><td>75%</td><td>60%</td><td>.....</td><td>3</td></tr></table>	Absent	0	0	0		0	Minor	<33%	25%	20%	1	Medium	33-67%	50%	40%	2	Major	>67%	75%	60%	3	
Absent	0	0	0		0																					
Minor	<33%	25%	20%	1																					
Medium	33-67%	50%	40%	2																					
Major	>67%	75%	60%	3																					
BOTTOM PCPT	<p>Precipitate or stain; the presence of any coatings on pebbles, boulders or stream bottoms:</p> <p>None..... Red-brown..... White or buff..... Black..... Yellow..... Green..... Grey..... Pink..... Buff to brown.....</p>	<p>Rd-Bn Wh-Bf Black Yellow Green Grey Pink Bf-Bn</p>																								
BANK PCPT	<p>Distinctive precipitate, stains or weathering on rocks in immediate area of catchment basin or stream bank:</p> <p>None..... Red, brown (eg. Fe)..... White, buff (eg. Co₃, Zn)..... Black (e.g. Fe, Mn, sulphides)..... Yellow (e.g. Pb, U, Fe, Mo, REE)..... Green (Cu, Ni, U, Mo, As, Fe)..... Bluish (Zn, P)..... Pink (Co, As).....</p>	<p>- Rd-Bn Wh-Bf Black Yellow Green Blue Pink</p>																								
STREAM PHYSIOG	<p>General physiography of the drainage basin:</p> <p>Plain..... Muskeg, swampland..... Peneplain, plateau..... Hilly, undulating..... Mountainous, mature..... Mountainous, youthful (precipitous).....</p>	<p>Plain Swamp Penpln Hill Moun/M Moun/Y</p>																								
STREAM DRAINAGE	<p>Drainage pattern:</p> <p>Poorly defined, haphazard..... Dendritic..... Herringbone..... Rectangular..... Trellis..... Discontinuous shield type (chains of lakes)..... Basinal..... Others.....</p>	<p>Poor Dendrc Herrbn Rectln Trellis Discnt Closed Other</p>																								
STREAM TYPE	<p>Stream type:</p> <p>Undefined..... Permanent, continuous..... Intermittent, seasonal..... Re-emergent, discontinuous.....</p>	<p>Undfnd Permnt Intermit Re-emerg</p>																								

FIELD RECORD	DEFINITION	TEXT CODE
STREAM CLASS	Classification based on proximity to source: Undefined Primary Secondary Tertiary Quaternary	Undfnd Pri'ary Sec'ary Ter'ary Qua'ary
STREAM SOURCE	Source of water: Unknown Groundwater Snow melt or spring run-off Recent precipitation Ice-cap or glacial meltwater	Unknown Ground Sp'gMelt RecRain Glacier
Miscellaneous	Missing data in any field	*