

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA,BRITISH COLUMBIA 1985,GSC-OF 1216, NGR 81-1985, NTS 93J

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*      OPEN FILE    1216            *  
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GEOLOGICAL SURVEY OF CANADA OPEN FILE 1216: BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES OPEN FILE RGS-15
REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA OF CENTRAL BRITISH COLUMBIA IS ONE OF THREE OPEN FILES RELEASED IN 1986 (1214, 1215 AND 1216) COVERING NTS 93G, 93H AND 93J RESPECTIVELY.

THE RECONNAISSANCE SURVEY WAS UNDERTAKEN BY THE GEOLOGICAL SURVEY OF CANADA (GSC) IN CONJUNCTION WITH THE BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES (MEMPR) UNDER A "LETTER OF UNDERSTANDING" FOR A COOPERATIVE PROJECT.

E.H.W. HORN BROOK DIRECTED THE GEOLOGICAL SURVEY OF CANADA ACTIVITIES.

W.M. JOHNSON DIRECTED THE BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES ACTIVITIES.

P.W.B. FRISKE COORDINATED THE OPERATIONAL ACTIVITIES OF THE GEOLOGICAL SURVEY OF CANADA STAFF THROUGHOUT THE SURVEY.

CONTRACTS LET FOR COLLECTION, SAMPLE PREPARATION AND ANALYSIS WERE THE RESPONSIBILITY OF, AND WERE SUPERVISED AND/OR MONITORED BY THE STAFF OF THE RESOURCE GEOCHEMISTRY SUBDIVISION OR THE BRITISH COLUMBIA MINISTRY AS FOLLOWS:

COLLECTION: - HI-TEC RESOURCE MANAGEMENT LTD., VANCOUVER, BRITISH COLUMBIA
- A. BORONOWSKI (MEMPR)

PREPARATION: - GOLDER ASSOCIATES, OTTAWA, ONTARIO
- J.J. LYNCH (GSC)

ANALYSIS: - BARRINGER MAGENTA LTD., REXDALE, ONTARIO
- BARRINGER MAGENTA (ALBERTA) LTD., CALGARY, ALBERTA
- J.J. LYNCH (GSC)

H.R. SCHMITT AND N.G. LUND COORDINATED OPEN FILE PRODUCTION (GSC).

A.C. GALLETTA WAS RESPONSIBLE FOR DATA MANAGEMENT, AND FOR THE PREPARATION OF THE REGIONAL TREND MAP UTILIZING A PROGRAM DEVELOPED BY D.J. ELLWOOD (GSC).

J. YELLE SUPERVISED MAP PREPARATION (GSC).

COMPUTING AND PLOTTING FACILITIES WERE PROVIDED BY THE COMPUTER SCIENCE CENTER, E.M.R.

OPEN FILE TEXT WAS MANUFACTURED BY K.G. CAMPBELL CORPORATION LAZER PRINTING, OTTAWA

HELICOPTER AND TRUCK SUPPORTED SAMPLE COLLECTION WAS CARRIED OUT DURING THE SUMMER OF 1985.
STREAM SEDIMENT AND WATER SAMPLES WERE COLLECTED AT AN AVERAGE DENSITY OF ONE SAMPLE PER 13 SQUARE KILOMETERS THROUGHOUT THE 14,500 SQUARE KILOMETERS OF THE SURVEY AREA (NTS 93J).

SAMPLE SITE DUPLICATE SAMPLES WERE ROUTINELY COLLECTED IN EACH ANALYTICAL BLOCK OF TWENTY SAMPLES.

IN OTTAWA, FIELD DRIED SAMPLES WERE AIR-DRIED, SIEVED THROUGH AN 80 MESH SCREEN AND BALL MILLED. THE BALL MILLED 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 WATER AND SEDIMENT FIELD CARDS (REV. 74) USED BY THE GEOLOGICAL SURVEY OF CANADA (GARRETT, 1974).

THE SAMPLE SITE POSITIONS WERE MARKED IN THE FIELD ON APPROPRIATE 1/250,000 SCALE NTS MAPS.

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 RESOURCE GEOCHEMISTRY SUBDIVISION AT THE GEOLOGICAL SURVEY OF CANADA.

FOR THE DETERMINATION OF ZN, CU, PB, NI, CO, AG, MN, FE, CD, AND AS A 1 GRAM SAMPLE WAS REACTED WITH 3 ML CONC. HNO₃ IN A TEST TUBE OVERNIGHT AT ROOM TEMPERATURE.

AFTER DIGESTION, THE TEST TUBE WAS IMMERSSED 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 CONC. 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.

AS WAS DETERMINED BY ATOMIC ABSORPTION USING A HYDRIDE EVOLUTION METHOD WHEREIN THE HYDRIDE (ASH₃) IS EVOLVED, 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 WERE DETERMINED BY ATOMIC ABSORPTION SPECTROSCOPY USING A NITROUS OXIDE ACETYLENE FLAME.
A 0.5 GRAM SAMPLE WAS REACTED WITH 1.5 ML CONCENTRATED HNO₃ AT 90C FOR 30 MINUTES.
AT THIS POINT 0.5 ML CONCENTRATED HCL WAS ADDED AND THE DIGESTION WAS CONTINUED AT 90C 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.

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 HNO₃ AND 1 ML CONCENTRATED HCL IN A TEST-TUBE FOR 10 MINUTES AT ROOM TEMPERATURE PRIOR TO 2 HOURS OF DIGESTION WITH MIXING AT 90C 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 W/V SnSO₄ IN M H₂SO₄.
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.

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 500C 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.

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 10¹² 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.

TUNGSTEN WAS DETERMINED AS FOLLOWS: A 0.2 GRAM SAMPLE OF STREAM SEDIMENT WAS FUSED WITH 1 GRAM $K_2S_2O_7$ IN A RIMLESS TEST TUBE AT 575C FOR 15 MINUTES IN A FURNACE. THE COOLED MELT WAS THEN LEACHED WITH 10 ML CONCENTRATED HCL IN A WATER BATH HEATED TO 85C. 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 85C 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 4-6 HOURS AT 80-85C 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.
A DETAILED DESCRIPTION OF THE METHOD IS GIVEN BY QUIN AND BROOKS (1972)

BARIUM WAS DETERMINED AS FOLLOWS: A 0.25 GRAM SAMPLE WAS HEATED WITH 5 ML CONC. HF, 5 ML CONC. $HClO_4$ AND 2 ML CONC. HNO_3 TO FUMES OF $HClO_4$; 3 ML OF CONC. $HClO_4$ 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 ATOMIC ABSORPTION SPECTROSCOPY USING A NITROUS OXIDE ACETYLENE FLAME.

FLUORINE WAS DETERMINED IN STREAM SEDIMENTS 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 1 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.
A DETECTION LIMIT OF 40 PPM IS ACHIEVED.

ANTIMONY WAS DETERMINED IN STREAM SEDIMENTS 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 90C AND MAINTAINED AT THIS TEMPERATURE FOR AT LEAST 90 MINUTES. THE SOLUTION IS COOLED AND DILUTED TO 10 ML. A 400 UL ALIQUOT OF THIS TEST SOLUTION IS REMOVED 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.

TIN WAS DETERMINED IN STREAM SEDIMENTS AS FOLLOWS ;
A 200 MG SAMPLE IS HEATED WITH NH_4I ; THE SUBLIMED SnI_4 IS DISSOLVED IN
1% TARTARIC ACID AND THE TIN IS DETERMINED BY HYDRIDE GENERATION-ATOMIC
ABSORPTION SPECTROMETRY. MEASUREMENTS ARE MADE AT THE 286.3 NM LINE
USING AN AIR-HYDROGEN FLAME.

FLUORIDE IN STREAM 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 SOLUTION (TOTAL IONIC STRENGTH ADJUSTMENT BUFFER).
THE TISAB II BUFFER SOLUTION WAS PREPARED AS FOLLOWS: TO 50 ML METAL
FREE WATER ADD 57 ML GLACIAL ACETIC ACID, 58 GM NaCl AND 4 GM CDTA
(CYCLOHEXYLENE DINITRILE 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.

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 COMMERCIALY AS FLURAN AND COMPOSED OF SODIUM
PYROPHOSPHATE AND SODIUM MONOPHOSPHATE, (HALL, G.E.M., 1979) IS ADDED TO
PRODUCE THE URANYL PYROPHOSATE SPECIES WHICH FLUORESCES WHEN EXPOSED
TO THE LASER.
SINCE ORGANIC MATTER IN THE SAMPLE CAN CAUSE UNPREDICABLE BEHAVIOUR, A STANDARD
ADDITION METHOD WAS USED.
FURTHER, THERE HAVE BEEN INSTANCES AT THE G.S.C. 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 UL 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 UL ALIQUOTS OF EITHER
55 OR 550 PPB U WERE USED).
ALL READINGS WERE TAKEN AGAINST A SAMPLE BLANK.

THE FOLLOWING TABLES DISPLAY THE DATA RECORD FORMAT SPECIFICATIONS.
 THE DETECTION LIMITS OF THE ANALYTICAL METHODS ARE GIVEN.
 THE SECOND FIGURE UNDER THE DETECTION LIMIT HEADING IS USED
 ARBITRARILY TO DENOTE VALUES BELOW THE DETECTION LIMIT (USUALLY
 1/2 DETECTION LIMIT)

FIELD	ELEMENT	CARD	COLUMNS
	MAP	1	01-06
	ID	1	07-12
	UTM ZONE	1	13-14
	UTM EAST (METER)	1	15-20
	UTM NORTH (METER)	1	21-27
	ROCK TYPE	1	28-31
	SAMPLE MATERIAL	1	32
	STREAM WIDTH (DECIMETER)	1	33-35
	STREAM DEPTH (DECIMETER)	1	36-38
	REPLICATE STATUS	1	39-40
	CONTAMINATION	1	41
	BANK TYPE	1	42
	WATER COLOUR	1	43
	FLOW RATE	1	44
	SEDIMENT COLOUR	1	45
	SAMPLE COMPOSITION	1	46-48
	PRECIPITATE IN STREAM	1	49
	DISTINCTIVE PRECIPITATE	1	50
	GENERAL PHYSIOGRAPHY	1	55
	DRAINAGE PATTERN	1	56
	STREAM TYPE	1	57
	STREAM CLASS	1	58
	SOURCE OF WATER	1	59
	AGE	1	70-71

THE ANALYTICAL DATA WERE RECORDED AS FOLLOWS:

ELEMENT	UNITS	CARD	COLUMNS	DETECTION LIMIT	
SEDIMENT					
ZN	PPM	2	21-25	2	1
CU	PPM	2	26-30	2	1
PB	PPM	2	31-35	2	1
NI	PPM	2	36-40	2	1
CO	PPM	2	41-45	2	1
AG	PPM	2	46-50	0.2	0.1
MN	PPM	2	51-55	5	2
AS	PPM	2	56-60	1.0	0.5
MO	PPM	2	61-65	2	1
FE	PCT	2	66-70	0.02	0.01
HG	PPB	2	71-75	10	5
LOI	PCT	2	76-80	1.0	0.5
U	PPM	3	21-25	0.5	0.2
F	PPM	3	26-30	40	20
V	PPM	3	31-35	5	2
CD	PPM	3	36-40	0.2	0.1
W	PPM	3	46-50	2	1
SN	PPM	3	51-55	1.0	0.5
SB	PPM	3	56-60	0.2	0.1
BA	PPM	3	61-65	40	20
WATER					
F	PPB	4	26-30	20	10
PH		4	31-35		
U	PPB	4	36-40	0.05	0.02

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DATA LIST LEGEND

MAP-	NATIONAL TOPOGRAPHIC SYSTEM(NTS)- LETTERED QUADRANGLE (SCALE 1:50000). PART OF SAMPLE NUMBER
ID-	REMAINDER OF SAMPLE NUMBER- YEAR(2), FIELD CREW(1), SAMPLE SEQUENCE NUMBER(3)
UTM COORDINATS-	UNIVERSAL TRANVERSE MERCATOR(UTM) COORDINATE SYSTEM- SAMPLE COORDINATES
ZN-	ZONE
EAST-	EASTING (METERS)
NORTH-	NORTHING (METERS)
ROCK TYPE-	MAJOR ROCK TYPE OF LAKE CATCHMENT AREA
AGE-	STRATIGRAPHIC AGE OF ROCK TYPE
WD-	WIDTH OF STREAM(DECIMETER) AT NEAREST SAMPLE SITE
DT-	DEPTH OF STREAM SAMPLED TO NEAREST DECIMETER
SAMP-	TYPE OF MATERIAL SAMPLED
RP ST-	REPLICATE STATUS- RELATIONSHIP OF SAMPLE WITH RESPECT TO OTHERS WITHIN THE SURVEY
CONT-	CONTAMINATION
WCOL-	WATER COLOUR AND SUSPENDED LOAD
RATE-	WATER FLOW RATE
SCOL-	PREDOMINANT SEDIMENT COLOUR
SMP CMP-	SAMPLE COMPOSITION- BULK MECHANICAL COMPOSITION OF SAND, FINES AND ORGANICS RESPECTIVELY
PPPS-	PRECIPITATE OR STAIN ON SEDIMENTS AT SAMPLE SITE
PRPB-	DISTINCTIVE PRECIPITATE,STAIN,WEATHERING,BLOOMS ON ROCKS IN IMMEDIATE CATCHMENT AREA
PHYS-	GENERAL PHYSIOGRAPHY
PATT-	DRAINAGE PATTERN
TYPE-	STREAM TYPE
CLSE-	STREAM CLASS
SRCE-	SOURCE OF WATER

ROCK TYPE/AGE :

CENOZOIC:

(TILL 44) - TILL GRAVEL, SAND, SILT, ALLUVIUM

(SNDS 42) - SANDSTONE, SHALE, CONGLOMERATE, DIATOMITE, LIGNITE

MESOZOIC - CENOZOIC:

(ANDS 33) - TAKLA GROUP: ANDESITE, BASALT, TUFF, BRECCIA, CONGLOMERATE, GREYWACKE, SHALE, LIMESTONE

PALEOZOIC:

(LMSN 23) - CACHE CREEK GROUP: LIMESTONE, MINOR CHERT, ARGILLITE, GREENSTONE

(CHRT 23) - CACHE CREEK GROUP: RIBBON CHERT, BLACK ARGILLITE, LIMESTONE, GREENSTONE

(BSLT 21) - SLIDE MOUNTAIN GROUP: BASALT, BRECCIA, TUFF, CHERT, ARGILLITE, SANDSTONE, LIMESTONE, CONGLOMERATE

(LMSN 17) - LIMESTONE, DOLOMITE, SANDY DOLOMITE, QUARTZITE, SHALE

(LMSN 16) - LIMESTONE, DOLOMITE, QUARTZITE, SHALE, GREENSTONE SILLS AND FLOWS

(LMSN 14) - CHUSHINA, MANKMAN, BEAVERFOOT FORMATIONS: LIMESTONE, SANDSTONE, DOLOMITE, SHALE, QUARTZITE

(SHLE 13) - SHALE, CALCAREOUS SHALE, LIMESTONE, DOLOMITE

(LMSN 13) - LIMESTONE, SHALE, QUARTZITE

(LMSN 12) - LYNX, HOTA, TATEI, CHETANG, TITKANA, ARCTOMYS, WATERFOWL, MURAL, MAHTO, FORMATIONS: LIMESTONE, DOLOMITE, SHALE, SANDSTONE, QUARTZITE, SILTSTONE

PROTEROZOIC:

(MSDM 11) - UNDIVIDED SEDIMENTARY AND METASEDIMENTARY ROCKS OF HADRYNIAN TO LOWER DEVONIAN AGE

(PLLT 04) - MIETTE GROUP (UPPER): PHYLLITE, ARGILLITE, SANDSTONE, LIMESTONE, CONGLOMERATE

(SMRK 04) - MIETTE GROUP (UNDIVIDED)

INTRUSIVE AND METAMORPHIC COMPLEX ROCKS :

(QZMZ 42) - QUARTZ MONZONITE, GRANODIORITE, QUARTZ DIORITE

(GRDR 36) - GRANODIORITE, QUARTZ DIORITE, MINOR GRANITE, SYENITE, GABBRO, PYROXENITE

(GRNG 50) - WOLVERINE METAMORPHIC COMPLEX: GRANITOID GNEISS, PEGMATITE, SCHIST, AMPHIBOLITE, QUARTZITE

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA,BRITISH COLUMBIA 1985,GSC-OF 1216, NGR 81-1985, NTS 93J

AGE:	RATE:	TYPE:
04 - HADRYNIAN	0 - ZERO	0 - UNDEFINED
11 - HADRYNIAN AND LOWER DEVONIAN	1 - SLOW	1 - PERMANENT,CONTINUOUS
13 - CAMBRIAN AND ORDOVICIAN	2 - MODERATE	2 - INTERMITTENT
14 - ORDOVICIAN	3 - FAST	3 - RE-EMERGENT,DISCONTINUOUS
12 - CAMBRIAN		CLSE:
16 - LOWER SILURIAN	SCOL:	1 - PRIMARY
17 - SILURIAN (?) AND DEVONIAN	1 - RED,BROWN	3 - TERTIARY
18 - DEVONIAN	2 - WHITE,BUFF	4 - QUARTERNARY
21 - MISSISSIPPIAN	3 - BLACK	SRCE:
23 - PENNSYLVANIAN AND PERMIAN	4 - YELLOW	0 - UNKNOWN
33 - UPPER TRIASSIC AND LOWER JURASSIC	5 - GREEN	1 - GROUNDWATER
36 - CRETACEOUS	6 - GREY	3 - RECENT PRECIPITATION
42 - TERTIARY	8 - BUFF TO BROWN	4 - ICE-CAP OR GLACIER MELT WATER
44 - PLEISTOCENE AND RECENT		

SAMP:

- 1 - STREAM BED SEDIMENT
- 6 - SIMULTANEOUS STREAM WATER AND SEDIMENT

RP ST:

- 00 - ROUTINE REGIONAL SAMPLE
- 10 - FIRST OF FIELD DUPLICATE
- 20 - SECOND OF FIELD DUPLICATE

CONT:

- 0 - NONE
- 1 - POSSIBLE
- 2 - PROBABLE
- 3 - DEFINITE
- 5 - INDUSTRIAL SOURCES
- 6 - AGRICULTURAL
- 8 - FORESTRY ACTIVITY
- 9 -BURNED AREAS

BANK:

- 0 - UNDEFINED UNCONSOLIDATED MATERIAL
- 1 - ALLUVIAL
- 2 - COLLUVIAL
- 3 - GLACIAL TILL,TILLITE
- 4 - GLACIAL OUTWASH,MORaine
- 5 - BARE ROCK
- 7 - ORGANIC PREDOMINANT

WCOL:

- 0 - CLEAR
- 1 - BROWN TRANSPARENT
- 2 - WHITE CLOUDY
- 3 - BROWN CLOUDY

SAM CMP: - PORTION OF EACH COMPONENT IS INDICATED
AS A FRACTION OF THE TOTAL OF ALL THREE COLUMNS

EXAMPLE:

- 013 NO SAND, 25% FINES, 75% ORGANICS
- 122 20% SAND, 40% FINES, 40% ORGANICS
- 030 NO SAND, 100% FINES, NO ORGANICS
- 111 33% SAND, 33% FINES, 33% ORGANICS

PPPS:

- 0 - NONE
- 1 - RED,BROWN OR BLACK
- 2 - WHITE,BUFF
- 3 - BLACK

PRPB:

- 0 - FEATURELESS
- 1 - RED,BROWN

PHYS:

- 1 - MUSKEG,SWAMPLAND
- 2 - PENEPLAIN,PLATEAU
- 3 - HILLY,UNDULATING
- 4 - MOUNTAINOUS,MATURE

PATT:

- 0 - POORLY DEFINED,HAPHAZARD
- 1 - DENDRITIC
- 3 - RECTANGULAR
- 5 - DISCONTINUOUS SHIELD TYPE
(CHAINS OF LAKES AND SWAMP
- 6 - BASINAL

ZN-	ZINC BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
CU-	COPPER BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
PB-	LEAD BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
NI-	NICKEL BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
CO-	COBALT BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
AG-	SILVER BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
MN-	MANGANESE BY ATOMIC ABSORPTION SPECTROSCOPY
AS-	ARSENIC BY COLOURIMETRY (PPM)
MO-	MOLYBDENUM BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
FE-	IRON BY ATOMIC ABSORPTION SPECTROSCOPY (%)
HG-	MERCURY BY FLAMELESS SPECTROSCOPY (PPB)
LOI-	LOSS ON IGNITION BY WEIGHT DIFFERENCE (%)
U-	URANIUM BY DELAYED NEUTRON ACTIVATION (PPM)
V-	VANADIUM BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
CD-	CADMIUM BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
W-	TUNGSTEN BY COLORIMETRY USING DITHIOL (PPM)
SB-	HYDRIDE EVOLUTION-ATOMIC ABSORPTION SPECTROMETRY (PPM)
BA-	BARIUM BY ATOMIC ABSORPTION (PPM)
F-W-	FLUORINE IN WATER BY FISSION TRACK (PPB)
PH-	PH BY COMBINATION GLASS-CALOMEL ELECTRODE
U-W-	URANIUM IN WATERS BY SCINTREX (PPB)