

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, BRITISH COLUMBIA 1984, GSC-OF 1107, NGR 72-1984, NTS 93G(E/2) AND 93H(W/2)

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*          OPEN FILE    1107        *  
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GEOLOGICAL SURVEY OF CANADA OPEN FILE 1107: BRITISH COLUMBIA MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES OPEN FILE RGS-12
REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA,
EAST-CENTRAL BRITISH COLUMBIA 1984, NTS 93G(E/2) AND 93H(W/2).

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

W.J. MCMILLAN (BRITISH COLUMBIA GOVERNMENT) DIRECTED THE PROVINCIAL MINISTRY OF ENERGY, MINES AND PETROLEUM RESOURCES ACTIVITIES.

E.H.W. HORN BROOK DIRECTED THE SURVEY PROGRAM.

P.W.B. FRISKE COORDINATED THE OPERATIONAL ACTIVITIES OF THE CONTRACTING AND 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: - MCELHANNEY ENGINEERING SERVICES LTD., VANCOUVER,
BRITISH COLUMBIA
- H.R. SCHMITT (BRITISH COLUMBIA MINISTRY)

PREPARATION: - GOLDER ASSOCIATES, OTTAWA, ONTARIO
- J.J. LYNCH

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

N.G. LUND WAS RESPONSIBLE FOR DATA MANAGEMENT AND OPEN FILE PRODUCTION.

B. ELLIOTT CARRIED OUT THE DATA PROCESSING.

A.C. GALLETTA PREPARED THE REGIONAL TREND MARGINAL MAP UTILIZING A PROGRAM DEVELOPED BY D.J. ELLWOOD.

J. YELLE SUPERVISED MAP PREPARATION.

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 1984.
STREAM SEDIMENT AND WATER SAMPLES WERE COLLECTED AT AN AVERAGE DENSITY OF ONE SAMPLE PER 13 SQUARE KILOMETERS THROUGHOUT THE 14,760 SQUARE KILOMETERS OF THE EAST-CENTRAL B.C. SURVEY AREA.

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 ON APPROPRIATE 1/100,000 AND 1/125,000 SCALE NTS MAPS IN THE FIELD, AND LATER TRANSFERRED TO 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, AS, AND SB 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 90C 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 AND SB WERE DETERMINED BY ATOMIC ABSORPTION USING A HYDRIDE EVOLUTION METHOD WHEREIN THE HYDRIDE (ASH₃ OR SBH₃) 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.
WITH THE EXCEPTION OF THE IRRADIATION FACILITY, THE METHOD IS VERY SIMILAR TO THAT USED BY AECL IN PREVIOUS YEARS, A DETAILED DESCRIPTION OF WHICH IS PROVIDED BY BOULANGER ET AL (1975).
A TWO GRAM SAMPLE WAS IRRADIATED FOR 10 SECONDS IN THE TRIGA REACTOR LOCATED AT WASHINGTON STATE UNIVERSITY.
THE OPERATING FLUX WAS 8×10^{13} NEUTRONS/SQUARE CM/SECOND.
AFTER A 10 SECOND DELAY, THE SAMPLE WAS COUNTED FOR 10 SECONDS.
THE COUNTING EQUIPMENT WAS OF AECL DESIGN. CALIBRATION WAS DONE TWICE A DAY OR AS REQUIRED.
ONE STANDARD WAS ANALYSED AFTER EVERY 20 SAMPLES.

TUNGSTEN WAS DETERMINED AS FOLLOWS: A 0.2 GRAM SAMPLE OF STREAM SEDIMENT WAS FUSED WITH 1 GRAM K₂S₂O₇ 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% SNCL₂ 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. HClO₄ AND 2 ML CONC. HNO₃ TO FUMES OF HClO₄; 3 ML OF CONC. HClO₄ 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.

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 NA₂CO₃ 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
W	PPM	3	26-30	2	1
SB	PPM	3	36-40	0.2	0.1
BA	PPM	3	41-45	40	20
V	PPM	3	46-50	5	2
CD	PPM	3	51-55	0.2	0.1
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 PHSYIOGRAPHY

PATT- DRAINAGE PATTERN

TYPE- STREAM TYPE

CLSE- STREAM CLASS

SRCE- SOURCE OF WATER

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, BRITISH COLUMBIA 1984, GSC-OF 1107, NGR 72-1984, NTS 93G(E/2) AND 93H(W/2)

ROCK TYPE/AGE FOR NTS 93G(E/2)

(TILL 44) - TILL GRAVEL, SAND, SILT, ALLUVIUM
 (BSLT 42) - OLIVINE BASALT FLOWS, BRECCIA AND TUFF
 (SNDS 42) - SANDSTONE, SHALE, CONGLOMERATE, DIATOMITE, LIGNITE
 (ANDS 42) - ENDAKO GROUP: ANDESITE, BASALT, DACITE
 (CGLM 42) - CONGLOMERATE, SANDSTONE, SHALE, TUFF, BRECCIA
 (RYLT 41) - OOTSA LAKE GROUP: RHYOLITEDACITE, TRACHYTE, SANDSTONE, SHALE, CONGLOMERATE
 (SHLE 34) - SHALE, GREYWACKE, CONGLOMERATE
 (ANDS 33) - TAKLA GROUP: ANDESITE, BASALT, TUFF, BRECCIA, CONGLOMERATE, GREYWACKE, SHALE, LIMESTONE
 (PLLT 32) - BLACK PHYLLITE, SILTSTONE, LIMESTONE, QUARTZITE
 (CHRT 23) - CACHE CREEK GROUP: RIBBON CHERT, BLACK ARGILLITE, LIMESTONE, GREENSTONE
 (BSLT 21) - SLIDE MOUNTAIN GROUP: BASALT, BRECCIA, TUFF, CHERT, ARGILLITE, SANDSTONE, LIMESTONE, CONGLOMERATE
 (SNDS 04) - KAZA GROUP: SANDSTONE, CONGLOMERATE, GRIT, PHYLLITE, SCHIST, AMPHIBOLITE, MARBLE, GNEISS
 (QTMZ 36) - NAVER INTRUSIONS: QUARTZ MONZONITE, SYENITE, MONZONITE, GRANODIORITE, DIORITE
 (GRDR 32) - TAKOMKANE BATHOLITH AND BODIES OF SIMILAR AGE AND LITHOLOGY: GRANODIORITE, QUARTZ DIORITE, QUARTZ MONZONITE

ROCK TYPE/AGE FOR NTS 93H(W/2)

(TILL 44) - TILL, GRAVEL, SAND SILT, ALLUVIUM
 (PLLT 32) - PHYLLITE, ARGILLITE, MINOR LIMESTONE, QUARTZITE
 (BSLT 21) - SLIDE MOUNTAIN GROUP, ANTLER FORMATION: PILLOW BASALT, BRECCIA, TUFF, MINOR DIORITE AND GABBRO, CHERT, ARGILLITE, LITHIC SANDSTONE
 (CGLM 21) - GUYET FORMATION, GREENBERRY FORMATION: CONGLOMERATE, ARGILLITE, LITHIC SANDSTONE, CRINOIDAL LIMESTONE
 (BSLT 18) - BLACK STUART FORMATION: BASALT, CHERT, CHERT BRECCIA, DOLOMITE BRECCIA, UPPER UNIT CHERTY ARGILLITE, PHYLLITE, SANDY LIMESTONE
 (DLMT 16) - NONDA FORMATION ALL OR IN PART: DOLOMITE, LIMESTONE, QUARTZITE, SHALE, GREENSTONE FLOWS AND SILLS
 (SHLE 12) - LYNX, DOME CREEK, ARCTOMYS, WATERFOWL, HOTA-ADOLPHUS, TATEI-CHETANG, TITKANA FORMATIONS: SHALE, SILTY LIMESTONE, DOLOMITE, SANDSTONE, SILTSTONE, ARGILLITE, PHYLLITE
 (QRTZ 11) - MAHTO, MURAL, MIDAS, MCNAUGHTON, YANKS PEAK FORMATIONS: QUARTZITE, LIMESTONE, SHALE, SILTSTONE, PHYLLITE, DOLOMITE, CONGLOMERATE
 (SHLE 04) - YANKEE BELLE, CUNNINGHAM FORMATIONS: SHALE, LIMESTONE, SILTSTONE, DOLOMITE, PHYLLITE
 (PLLT 04) - MIETTE GROUP; ISAAC FORMATION: PHYLLITE, ARGILLITE, SCHIST, SANDSTONE, LIMESTONE, CONGLOMERATE
 (FPCA 04) - KAZA GROUP, SNOWSHOE FORMATION, MIDDLE MIETTE GROUP: FELDSPATHIC SANDSTONE, GRANULE CONGLOMERATE, SILTSTONE, ARGILLITE, PHYLLITE, SCHIST, LIMESTONE MARBLE
 (ARGL 04) - LOWER MIETTE GROUP: ARGILLITE, PHYLLITE, SANDSTONE, LIMESTONE

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL DATA, BRITISH COLUMBIA 1984, GSC-OF 1107, NGR 72-1984, NTS 93G(E/2) AND 93H(W/2)

AGE:	RATE:	TYPE:
04 - HADRYNIAN	0 - ZERO	0 - UNDEFINED
11 - CAMBRIAN AND HADRYNIAN	1 - SLOW	1 - PERMANENT, CONTINUOUS
12 - CAMBRIAN	2 - MODERATE	2 - INTERMITTENT
16 - LOWER SILURIAN	3 - FAST	3 - RE-EMERGENT, DISCONTINUOUS
18 - DEVONIAN	4 - TORRENTIAL	
21 - MISSISSIPPIAN		CLSE:
23 - PENNSYLVANIAN AND PERMIAN (NTS 93G)	SCOL:	2 - SECONDARY
MISSISSIPPIAN AND PERMIAN (NTS 93H)	0 - UNKNOWN	3 - TERTIARY
32 - TRIASSIC	1 - RED, BROWN	4 - QUARTERNARY
33 - UPPER TRIASSIC AND LOWER JURASSIC	2 - WHITE, BUFF	
34 - JURASSIC	3 - BLACK	SRCE:
36 - CRETACEOUS	4 - YELLOW	1 - GROUNDWATER
41 - UPPER-CRETACEOUS-LOWER TERTIARY (NTS 93G)	5 - GREEN	3 - RECENT PRECIPITATION
UPPER-CRETACEOUS-PALEOCENE (NTS 93H)	6 - GREY	4 - ICE-CAP OR GLACIER MELT WATER
42 - TERTIARY		
44 - PLEISTOCENE AND RECENT	SMP CMP:	
	0 - ABSENT	
SAMP:	1 - MINOR <33%	
1 - STREAM BED SEDIMENT	2 - MEDIUM 33-67%	
6 - SIMULTANEOUS STREAM WATER	3 - MAJOR >67%	
AND SEDIMENT		
	PPPS:	
RP ST:	0 - NONE	
00 - ROUTINE REGIONAL SAMPLE	1 - RED, BROWN	
10 - FIRST OF FIELD DUPLICATE	2 - WHITE, BUFF	
20 - SECOND OF FIELD DUPLICATE	3 - BLACK	
	4 - YELLOW	
CONT:	PRPB:	
0 - NONE	0 - FEATURELESS	
1 - POSSIBLE	2 - WHITE, BUFF	
2 - PROBABLE		
3 - DEFINITE	PHYS:	
6 - AGRICULTURAL	1 - MUSKEG, SWAMPLAND	
8 - FORESTRY ACTIVITY	2 - PENEPLAIN, PLATEAU	
	3 - HILLY, UNDULATING	
BANK:	4 - MOUNTAINOUS, MATURE	
0 - UNDEFINED UNCONSOLIDATED MATERIAL	5 - MOUNTAINOUS, YOUTHFUL	
1 - ALLUVIAL		
2 - COLLUVIAL	PATT:	
3 - GLACIAL TILL, TILLITE	0 - POORLY DEFINED, HAPHAZARD	
4 - GLACIAL OUTWASH, MORaine	1 - DENDRITIC	
5 - BARE ROCK	2 - HERRINGBONE	
6 - TALUS, SCREE	5 - DISCONTINUOUS SHIELD TYPE	
7 - ORGANIC PREDOMINANT	(CHAINS OF LAKES AND SWAMP	
	6 - BASINAL	
WCOL:	7 - OTHER	
0 - CLEAR		
1 - BROWN TRANSPARENT		
2 - WHITE CLOUDY		
3 - BROWN CLOUDY		

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 (PPM)
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)
W- TUNGSTEN BY COLORIMETRY USING DITHIOL (PPM)
SB- ANTIMONY MIBK SOLVANT EXTRACTION ATOMIC
ABSORPTION SPECTROSCOPY (PPM)
BA-
V- VANADIUM BY ATOMIC ABSORPTION SPECTROSCOPY (PPM)
CD- CADMIUM BY ATOMIC ABSORPTION SPECTROSCOPY (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)