

REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA, YUKON AND NORTHWEST TERR. GSC-OF 868, NGR 51-1981, NTS 105I

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REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA,  
NAHANNI MAP-AREA (NTS 105I), YUKON AND NORTHWEST TERRITORIES, 1981  
GSC OPEN FILE 868, NGR 51-1981

THE RECONNAISSANCE GEOCHEMICAL SURVEY OF THE NAHANNI MAP-AREA WAS CARRIED OUT AS PART OF THE NAHANNI INTEGRATED MULTIDISCIPLINARY PILOT PROJECT (NIMPP). THE NIMPP WAS ESTABLISHED BY THE GEOLOGICAL SURVEY OF CANADA TO STUDY, USING A MULTIDISCIPLINARY AND INTEGRATED APPROACH, THE MANY AND VARIED GEOLOGICAL, GEOCHEMICAL, MINERALIZING AND SURFICIAL PROCESSES CONSIDERED ACTIVE DURING THE FORMATION OF THE SELWYN BASIN AND THE MINERAL DEPOSITS HOSTED THEREIN.

W.D. GOODFELLOW DIRECTED GEOLOGICAL SURVEY OF CANADA ACTIVITIES RELATED TO GEOCHEMICAL METHODOLOGIES, SAMPLING AND ANALYTICAL SPECIFICATIONS, AND MAP AND DATA RELEASE FORMATS.

CONTRACTS FOR SAMPLE COLLECTION AND FOR ANALYSES OF SELECTED ELEMENTS WERE LET TO THE FOLLOWING COMPANIES:

COLLECTION

- STAFF PROVIDED BY MARSHALL, MACKLIN AND MONAGHAN LTD., TORONTO
- HELICOPTER SUPPORT PROVIDED BY CONWEST HELICOPTERS LTD., CALGARY

ANALYTICAL

- BONDAR-CLEGG AND COMPANY LTD. DETERMINED THE FOLLOWING ELEMENTS IN STREAM SEDIMENT ELEMENTS: ZN, CU, PB, NI, CO, AG, MN, FE, MO, V, W F, LOI, P205 AND BA.
- NOVA TRACK LTD., VANCOUVER DETERMINED U IN STREAM SEDIMENT BY DELAYED NEUTRON ACTIVATION.
- THE REMAINING ELEMENTS WERE ANALYSED IN THE GEOLOGICAL SURVEY OF CANADA LABORATORIES BY A.I. MACLAURIN, G. GAUTHIER AND W.M. ALEXANDER UNDER THE SUPERVISION OF G.E.M. HALL. SAMPLE PREPARATION WAS CARRIED OUT BY P.J. LAVERGNE AND W.H. NELSON. PRECISION AND ACCURACY OF ANALYTICAL RESULTS WERE MONITORED BY J.J. LYNCH.
- OPEN FILE PRODUCTION WAS COORDINATED BY N.G. LUND. VALUE AND SAMPLE LOCATION MAPS WERE CREATED BY A 1051 DRUM PLOTTER. THE SYMBOL PLOTS WERE DONE BY D.J. ELLWOOD DATA MANAGEMENT WAS DONE BY A. GALLETTA.

SAMPLE COLLECTION AND PREPARATION PROCEDURES

STREAM SEDIMENT AND WATER SAMPLES WERE COLLECTED AT AN AVERAGE DENSITY OF ONE SAMPLE PER 12 SQUARE KILOMETRES THROUGHOUT THE 11,558 SQUARE KILOMETRES THAT COMPRISE THE NAHANNI MAP-AREA (NTS 105I). FOR THE PURPOSES OF SAMPLING, PREPARATION AND ANALYTICAL CONTROL, SAMPLE NUMBERS WERE DIVIDED INTO BLOCKS OF 20 WITH EACH BLOCK CONSISTING OF 17 ROUTINE SAMPLES, ONE FIELD DUPLICATE, ONE BLIND DUPLICATE, AND ONE CONTROL REFERENCE STANDARD. FURTHER DETAILS CAN BE OBTAINED FROM GARRETT (1974).

AT GSC LABORATORIES IN OTTAWA, FIELD-DRIED STREAM SEDIMENT SAMPLES WERE AIR-DRIED, SIEVED TO MINUS-80 MESH (177 MICRONS) AND BALL MILLED TO MINUS-150 MESH. CONTROL REFERENCE AND BLIND DUPLICATE SAMPLE POSITIONS WERE FILLED DURING SAMPLE PREPARATION. IN THE CASE OF STREAM WATERS, THE CONTROL REFERENCE POSITION WAS FILLED IN THE FIELD WITH ONE OF THREE CONTROL STANDARDS COLLECTED NEAR BASE CAMP. THE BLIND DUPLICATES FOR STREAM WATERS WERE LEFT BLANK.

ALL STREAM WATERS WERE FILTERED THROUGH 0.45 UM FILTER PAPER BEFORE ANALYSES.

STREAM WATER

URANIUM WAS DETERMINED BY LASER INDUCED FLUORESCENCE USING A SCINTREX UA-3. A 5 ML SAMPLE WAS PIPETTED INTO A QUARTZ CELL AND A METAPHOSPHATE-PHOSPHATE SOLUTION (500 UL) ADDED. THE FLUORESCENCE OF THE URANYL PHOSPHATE FORMED AND EXCITED BY THE LASER WAS MEASURED. THE METHOD OF STANDARD ADDITIONS WAS USED.

FLUORIDE WAS MEASURED USING A SPECIFIC ION ELECTRODE AND AN ORION METER. A 5 ML SAMPLE OF WATER AND A 5 ML ALIQUOT OF BUFFER (TISAB) WERE MEASURED USING UV READINGS. ALKALINITY AND PH WERE DETERMINED SIMULTANEOUSLY USING A RADIOMETER TTT 81 DIGITAL TITRATOR AND PH METER RESPECTIVELY.

ANIONS CL, NO<sub>3</sub>, PO<sub>4</sub>, SO<sub>4</sub>, WERE MEASURED USING ION CHROMATOGRAPHY. A 100 UL SAMPLE WAS SEPARATED ON AN EXCHANGE RESIN AND THE RESULTING SOLUTION PASSED THROUGH A HIGH CAPACITY CATION EXCHANGE RESIN TO A CONDUCTIVITY CELL. THE ELUENT USED WAS 0.003 M NA<sub>2</sub>CO<sub>3</sub>/0.0024 M NAHCO<sub>3</sub>. A DIONEX SYSTEM 12 WAS USED.

MAJOR CATIONS NA, K, CA, MG, MN, FE AND ZN WERE DETERMINED BY DIRECT ASPIRATION USING A PERKIN ELMER 5000 ATOMIC ABSORPTION SPECTROPHOTOMETER. AN AIR-ACETYLENE FLAME WAS USED IN ALL CASES. A 2000 PPM POTASSIUM SOLUTION WAS USED AS AN IONIZATION BUFFER FOR NA ANALYSES; 2000 PPM SODIUM FOR K ANALYSES, AND 2000 PPM LANTHANUM WAS USED AS A RELEASING AGENT FOR CA ANALYSES.

STREAM SEDIMENT

ZN, CU, PB, NI, CO, AG, CD, MN, FE, MO AND V WERE DETERMINED BY ATOMIC ABSORPTION SPECTROPHOTOMETRY AFTER DECOMPOSITION WITH A MULTI-ACID TOTAL DIGESTION. A 500 MG SAMPLE WAS LEACHED OVER A PERIOD OF 4 HOURS USING A 5 ML ALIQUOT OF HF - HCL - HNO<sub>3</sub> - HCLO<sub>4</sub> ACID MIXTURE (RATIO 1:1:1:1) . A FINAL SOLUTION OF 5% HCL WAS MADE UP TO A VOLUME OF 20 ML. ALL ELEMENTS WITH THE EXCEPTION OF MO WERE ATOMIZED USING AN AIR-ACETYLENE FLAME; A NITROUS OXIDE-ACETYLENE FLAME AND A 1000 PPM AL SOLUTION AS IONIZATION BUFFER WERE USED FOR MO ANALYSES. BACKGROUND CORRECTIONS WERE MADE ON NI, CO, AG, PB AND MO ANALYSES.

F WAS DETERMINED USING AN ION SELECTIVE ELECTRODE AND TOTAL IONIC STRENGTH ADJUSTMENT BUFFER (TISAB). A 500 MG SAMPLE WAS FUSED WITH NA<sub>2</sub>CO<sub>3</sub> - KNO<sub>3</sub> (9:1) AT 800 C FOR 10 MINUTES.

BA WAS ANALYSED BY X-RAY FLUORESCENCE USING PRESSED POWDER DISCS. COLORIMETRIC METHODS EMPLOYING THE STANDARD DITHIOL METHOD WERE USED TO MEASURE W. THE SAMPLE WAS FUSED AT 800 C IN NICKEL CRUCIBLES ALONG WITH A MIXTURE OF NA<sub>2</sub>CO<sub>3</sub>, NA<sub>2</sub>SO<sub>4</sub> AND KNO<sub>3</sub> (5/4/1). P<sub>2</sub>O<sub>5</sub> WAS DETERMINED COLORIMETRICALLY USING THE H<sub>2</sub>SO<sub>4</sub> AND AMMONIUM MOLYBDATE METHOD AFTER SAMPLE DECOMPOSITION USING HNO<sub>3</sub> - HCL - HCLO<sub>4</sub>.

LOSS ON IGNITION (LOI) WAS A MEASURE OF THE WEIGHT PERCENT LOSS OF VOLATILES AFTER IGNITING A KNOWN WEIGHT OF SAMPLE AT 450 C FOR 4 HOURS.

U WAS DETERMINED BY NEUTRON ACTIVATION ANALYSES USING DELAYED NEUTRON COUNTING ON A 3 GRAM SAMPLE. THE FLUX DENSITY USED WAS 2 X 10<sup>11</sup> N/CM<sup>2</sup> S TO 1 X 10<sup>12</sup> N/CM<sup>2</sup> S.

FOR THE DETERMINATION OF AS, SB AND HG, A 750 ML SAMPLE WAS DIGESTED OVERNIGHT IN AQUA REGIA (3 HCL:1HNO<sub>3</sub>). IT WAS THEN TREATED IN A WATER BATH FOR APPROXIMATELY 4 HOURS DURING WHICH THE TEMPERATURE WAS RAISED TO 90 C. THE FINAL VOLUME WAS 15 ML. SUBSEQUENTLY, AS, SB WERE MEASURED BY ATOMIC ABSORPTION SPECTROPHOTOMETRY USING A SILICA TUBE HEATED TO 900 C. THE HYDRIDE OF THE ELEMENT WAS FORMED WITH A SODIUM BOROHYDRIDE REDUCING AGENT. MERCURY WAS DETERMINED SIMILARLY BY MEASURING HG VAPOUR ATOMIZED IN A SILICA TUBE HEATED TO 100 C.

ANALYTICAL DATA WERE RECORDED ON 80 COLUMN COMPUTER CARDS AS FOLLOWS.

ELEMENT	SAMPLE RECORD CARD	COLUMNS	DETECTION LIMIT	LESS THAN DETECTION LIMIT
WATER				
U (PPB)	2	21 - 25	0.10	0.05
F (PPB)	2	26 - 30	25	12
ZN (PPB)	2	36 - 40	5	2
MN (PPB)	2	41 - 45	10	5
FE (PPB)	2	46 - 50	40	20
CA (PPM)	2	56 - 60	0.5	0.2
MG (PPM)	2	61 - 65	0.2	0.1
NA (PPM)	2	66 - 70	0.2	0.1
K (PPM)	2	71 - 75	0.2	0.1
NO3 (PPM)	3	21 - 25	0.2	0.1
PO4 (PPM)	3	31 - 35	0.15	0.10
SO4 (PPM)	3	36 - 40	0.5	0.2
CL (PPM)	3	41 - 45	0.1	0.05
PH	3	46 - 50		
ALKALINITY (PPM)	3	51 - 56	2.0	1.0
SEDIMENT				
ZN (PPM)	4	21 - 25	2	1
CU (PPM)	4	26 - 30	2	1
PB (PPM)	4	31 - 35	2	1
NI (PPM)	4	36 - 40	2	1
CO (PPM)	4	41 - 45	2	1
AG (PPM)	4	46 - 50	0.2	0.1
MN (PPM)	4	51 - 55	2	1
FE (PCT)	4	56 - 60	0.2	0.1
MO (PPM)	4	61 - 65	2	1
V (PPM)	4	71 - 75	20	10
W (PPM)	4	76 - 79	2	1
U (PPM)	5	21 - 25	1.0	0.5
F (PPM)	5	26 - 30	20	10
AS (PPM)	5	31 - 35	0.4	0.2
HG (PPB)	5	36 - 40	30	15
SB (PPM)	5	41 - 45	0.4	0.2
CD (PPM)	5	46 - 50	0.2	0.1
L.O.I. (PCT)	5	51 - 55		
P2O5 (PCT)	5	56 - 60	0.04	0.02
BA (PCT)	5	61 - 65	0.02	0.01

SELECTED DEPOSITS AND MINERAL OCCURENCES

NUMBER	NAME	TYPE	AGE	ELEMENTS
1	NAR	VEIN	UNKNOWN	CU, PB, ZN, AG
2	ZIN	SKARN	CRETACEOUS?	PB, ZN
3	PAD	STRATABOUND	L. SILURIAN	PB, ZN
4	HUG	STRATABOUND	L. SILURIAN	PB, ZN
5	VULCAN	STRATABOUND	L. SILURIAN	PB, ZN
6	SUMMIT LAKE	STRATABOUND	DEVONIAN	BA
7	VULCAN	VEIN	UNKNOWN	PB, ZN
8	REXALL	STRATABOUND	L. SILURIAN	U, P
9	LENED	SKARN	CRETACEOUS?	W
10	LENED	SKARN	CRETACEOUS?	W
11	LENED	SKARN	CRETACEOUS?	W
12	GOLDEN RAM	SKARN	CRETACEOUS?	PB, ZN
13	GMHS	STRATABOUND	DEVONIAN	BA
14	NOR	STRATABOUND	DEVONIAN	ZN, PB, BA
15	RED	REPLACEMENT	UNKNOWN	ZN
16	SALAT	REPLACEMENT	UNKNOWN	ZN, PB
17	COMINCO	STRATABOUND	DEVONIAN	ZN, PB, BA
18	GOTRONIC	REPLACEMENT	UNKNOWN	ZN, PB
19	XY	STRATABOUND	L. SILURIAN	ZN, PB
20	UNNAMED	STRATABOUND	DEVONIANIAN	BA
21	UNNAMED	STRATABOUND	DEVONIANIAN	BA
22	SHIELD	STRATABOUND	L. SILURIAN	ZN, PB
23	BONNIE	REPLACEMENT	UNKNOWN	ZN
24	ANNIV	STRATABOUND	L. SILURIAN	ZN, PB
25	OP	STRATABOUND	L. SILURIAN	ZN, PB
26	ORO	STRATABOUND	DEVONIAN	BA

SELECTED DEPOSITS AND MINERAL OCCURENCES (CONT'D)

NUMBER	NAME	TYPE	AGE	ELEMENTS
27	DIRCKS	STRATABOUND	L. SILURIAN	ZN, CU
28	PR	SKARN	CRETACEOUS?	CU
29	CLEA	SKARN	CRETACEOUS?	W
30	HILLMAN	SKARN	CRETACEOUS?	ZN
31	BIRK	SKARN	CRETACEOUS?	AU, BA
32	NOM	VEIN	UNKNOWN	AU, AG
33	SAND	REPLACEMENT	UNKNOWN	ZN
34	O'GRADY	VEIN	UNKNOWN	PB, ZN
35	CAM	VEIN	UNKNOWN	PB, ZN
36	JOLI GREEN	STRATABOUND	L. SILURIAN	ZN
37	SKULL	VEIN	UNKNOWN	PB, ZN
38	CHRISTIE	VEIN	UNKNOWN	PB, ZN

DATA LIST LEGEND

MAP- NATIONAL TOPOGRAPHIC SYSTEM(NTS)- LETTERED QUADRANGLE  
 (SCALE 1:250000). PART OF SAMPLE NUMBER  
 SAMPLE- REMAINDER OF SAMPLE NUMBER- YEAR(2), FIELD CREW(1),  
 SAMPLE SEQUENCE NUMBER(3)

UTM COORDINATES- UNIVERSAL TRANSVERSE MERCATOR(UTM) COORDINATE  
 SYSTEM- SAMPLE COORDINATES  
 ZN- ZONE  
 EAST- EASTING (METERS)  
 NORTH- NORTHING (METERS)

ROCK TYPE- MAJOR ROCK TYPE OF CATCHMENT AREA  
 AGE- STRATIGRAPHIC AGE OF ROCK TYPE

WD- WIDTH OF STREAM (FEET) AT THE SAMPLE SITE  
 DT- DEPTH OF STREAM SAMPLED TO NEAREST TENTH OF FOOT

SAMP- TYPE OF MATERIAL SAMPLED

RP ST- REPLICATE STATUS- RELATIONSHIP OF SAMPLE WITH RESPECT  
 TO OTHERS WITHIN THE SURVEY

CONT- CONTAMINATION

BANK- BANK TYPE

WCOL- WATER COLOUR AND SUSPENDED LOAD

RATE- WATER FLOW RATE

SCOL- PREDOMINANT SEDIMENT COLOUR

SMP CMP- SAMPLE COMPOSITION- BULK MECHANICAL COMPOSITION OF  
 SAND, FINES, ORGANICS RESPECTIVELY

PPPS- PRECIPITATE OR STAIN ON SEDIMENTS AT SAMPLE SITE

PRPB- DISTINCTIVE PRECIPITATES, STAINS, WEATHERING, BLOOMS ON  
 ROCKS IN THE IMMEDIATE CATCHMENT AREA

ALTD- SAMPLE ALTITUDE (FEET A.S.L.)

PHYS- GENERAL PHYSIOGRAPHY  
 PAT- DRAINAGE PATTERN  
 TYPE- STREAM TYPE  
 CLSE- STREAM CLASS  
 SRCE- SOURCE OF WATER

FORM NAME- REFER TO GEOLOGICAL LEGEND;  
 EG. OSPT=ORDOVICIAN TO SILURIAN PELITES AND CHERTS



REGIONAL STREAM SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA, YUKON AND NORTHWEST TERR. GSC-OF 868, NGR 51-1981, NTS 105I

ROCK TYPE:	GLAV- GLACIAL AND ALLUVIAL SEDIMENTS	CONT:	0- NONE 1- POSSIBLE	PPPS:	0- NONE 1- RED,BROWN
	CGLM- CONGLOMERATE		4- MINING ACTIVITY INCLUDING PITTING,TRENCHING		2- WHITE
	SLSN- SILTSTONE		6- AGRICULTURAL		3- BLACK
	LMSN- LIMESTONE				4- YELLOW
	SHLE- SHALE	BANK:	0- UNDEFINED		
	MDSN- MUDSTONE		1- ALLUVIAL	PRPB:	0- FEATURELESS
	SLTE- SLATE		2- COLLUVIAL		1- RED,BROWN
	QZMZ- QUARTZ MONZONITE		3- GLACIAL TILL		2- WHITE,BUFF
	SNDS- SANDSTONE		4- GLACIAL OUTWASH,MORaine		3- BLACK
	ARNT- ARENITE		5- BARE ROCK		
	DLMT- DOLOMITE		6- TALUS,SCREE		
			7- ORGANIC PREDOMENANT		
AGE:	07- HADRYNIAN			PHYS:	1- MUSKEG, SWAMPLAND
	08- PROTEROZOIC - CAMBRIAN				2- PENEPLAIN, PLATEAU
	10- CAMBRIAN	WCOL:	0- CLEAR		3- HILLY,UNDULATING
	11- CAMBRIAN LOWER		1- BROWN TRANSPARENT		4- MOUNTAINOUS,MATURE
	12- CAMBRIAN MIDDLE		2- WHITE CLOUDY		5- MOUNTAINOUS YOUTHFUL
	13- CAMBRIAN UPPER		3- BROWN CLOUDY		
	14- CAMBRIAN - ORDOVICIAN			PATT:	0- POORLY DEFINED HAPHAZARD
	19- ORDOVICIAN - SILURIAN				1- DENDRITIC
	24- SILURIAN - DEVONIAN	RATE:	0- ZERO		3- HERRING BONE
	25- DEVONIAN		1- SLOW		
	26- DEVONIAN LOWER		2- MODERATE		
	27- DEVONIAN MIDDLE		3- FAST		
	29- DEVONIAN - CARBONEFEROUS		4- TORRENTIAL		
	30- CARBONIFEROUS			TYPE:	0- UNDEFINED
	42- TRIASSIC				1- PERMANENT,CONTINUOUS
	52- CRETACEOUS	SCOL:	1- RED,BROWN		2- INTERMITTENT,SEASONAL
	64- QUATERNARY		2- WHITE,BUFF		3- RE-EMERGENT,DISCONTINUOUS
			3- BLACK		
SAMP:	1- STREAM BED SEDIMENT		4- YELLOW	CLSE:	0- UNDEFINED
			6- GREY,BLUE-GREY		1- PRIMARY
	4- STREAM WATER		7- PINK		2- SECONDARY
	6- SIMULTANEOUS STREAM WATER AND SEDIMENT		8- BROWN		3- TERTIARY
		SMP CMP:	0- ABSENT		
			1- MINOR <33%	SRCE:	0- UNKNOWN
RRP ST:	00- ROUTINE REGIONAL SAMPLE		2- MEDIUM 33-67%		1- GROUNDWATER
	10- FIRST OF FIELD DUPLICATE		3- MAJOR >67%		2- SNOW MELT OR SPRING RUN-OFF
	20- SECOND OF FIELD DUPLICATE				4- ICE-CAP OR GLACIER MELT WATER