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OPEN FILE 902 IS ONE OF FOUR OPEN FILES 901,902,903, AND 904 COVERING THE WEST LABRADOR SURVEY, COMPRISING RESPECTIVELY OF NTS 13E;22P,23A,23B;23G,23H; AND 23I,23J,23O.

THE RECONNAISSANCE SURVEY WAS UNDERTAKEN BY THE GEOLOGICAL SURVEY OF CANADA IN CONJUNCTION WITH THE NEWFOUNDLAND DEPARTMENT OF MINES AND ENERGY UNDER THE CANADA-NEWFOUNDLAND COOPERATIVE MINERAL PROGRAM (1982-84).

E.H.W. HORNBROOK DIRECTED GEOLOGICAL SURVEY OF CANADA ACTIVITIES.

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

COLLECTION	- MARSHALL MACKLIN MONAGHAN LIMITED, TORONTO.
	- E.H.W. HORNBROOK, N.G. LUND
PREPARATION	- GOLDER ASSOCIATES, OTTAWA.
	- J.J. LYNCH
ANALYTICAL	- CHEMEX LABS. LIMITED, VANCOUVER.
	- ACME ANALYTICAL LABORATORIES LTD, TORONTO.
	- J.J. LYNCH

AT THE GEOLOGICAL SURVEY OF CANADA, N.G. LUND WAS RESPONSIBLE FOR OPEN FILE PRODUCTION; A.C.GALLETTA WAS RESPONSIBLE FOR DATA MANAGEMENT; AND F. WILLIAMS OF THE CARTOGRAPHIC SECTION SUPERVISED MAP PREPERATION.PLOTTING FACILITIES WERE MADE AVAILABLE THROUGH THE COMPUTER SCIENCE CENTRE OF E.M.R.

LAKE SEDIMENT AND WATER SAMPLES WERE COLLECTED AT AN AVERAGE DENSITY OF ONE SAMPLE PER 13 SQUARE KILOMETRES THROUGHOUT THE 53,000 SQUARE KILOMETRE WEST LABRADOR SURVEY AREA SAMPLED IN 1982. THE HELICOPTER SUPPORTED SAMPLE COLLECTION WAS CARRIED OUT BETWEEN JULY 8 AND AUGUST 20,1982. 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 SEIVED. THE MINUS 80 MESH (177 MICRONS) FRACTION WAS USED FOR SUBSEQUENT ANALYSES. AS REQUIRED, AT THIS TIME, CONTROL REFERENCE AND BLIND DUPLICATE SAMPLES WERE INSERTED INTO EACH ANALYTICAL BLOCK OF TWENTY SEDIMENT AND WATER SAMPLES. NO OTHER SAMPLE PROCESSING IN OTTAWA WAS CARRIED OUT ON THE WATER SAMPLES. THE DETERMINATION OF ZN, CU, PB, NI, CO, AG, MN, AS, MO, FE, HG, LOSS ON IGNITION, U, F, V, CD IN LAKE SEDIMENTS WAS CARRIED OUT BY CHEMEX LABS LIMITED.

THE DETERMINATION OF U, F AND PH IN LAKE WATERS WAS CARRIED OUT BY ACME LABORATORIES LIMITED.

FOR THE DETERMINATION OF ZN, CU, PB, NI, CO, AG, MN FE AND CD, A 1 GRAM SAMPLE WAS REACTED WITH 6 ML OF A MIXTURE OF 4M HCL AND M HNO3 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 90C AND HELD AT THIS TEMPERATURE FOR 2 HOURS WITH PERIODIC SHAKING. 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 ABSORTION 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 ARSENIC IS EVOLVED AS ASH3, 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 SPECTROSCPY USING A NITROUS OXIDE ACETYLENE FLAME. A 0.5 GRAM SAMPLE WAS REACTED WITH 1.5 ML CONCENTRATED HN03 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 SNS04 IN M H2S04. THE HG VAPOUR WAS THEN FLUSHED BY A STREAM OF AIR INTO AN ABSORTION CELL MOUNTED IN THE LIGHT PATH OF AN ATOMIC ABSORTION SPECTROPHOTOMETER. ABSORTION 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 X 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.

FLUORINE WAS DETERMINED IN LAKE 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.

URANIUM, FLUORIDE AND PH WERE DETERMINED IN LAKE WATER SAMPLES. UPON RECEIVING A BATCH OF SAMPLES, FLUORIDE AND PH WERE DETERMINED BY SPECIFIC ION ELECTRODE AND GLASS-CALOMEL COMBINATION ELECTRODE RESPECTIVELY.

FLUORIDE IN LAKE WATER SAMPLES WAS DETERMINED USING AN ORION FLUORIDE ELECTRODE AND A MODEL 404 ORION SPECIFIC ION METER. PRIOR TO MEASUREMENT AN ALIQUOT OF THE SAMPLE WAS MIXED WITH AN EQUAL VOLUME OF TISAB SOLUTION (TOTAL IONIC STRENGTH ADJUSTMENT BUFFER).

HYDROGEN ION ACTIVITY (PH) WAS MEASURED WITH A BROADLEY-JAMES COMBINATION ELECTRODE AND A MODEL 404 ORION SPECIFIC ION 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, 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 DELEAY BETWEEN THE ADDITION OF THE FLURAN AND THE ACTUAL READING WAS INCORPORATED INTO THIS METHOD.

IN PRACTICE, 500UL FLURAN SOLUTION WAS ADDED TO A 5ML 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 (20UL ALIQUOTS OF 55 OR 550 PPB U WERE USED).

ALL READINGS WERE TAKEN AGAINST A SAMPLE BLANK.

ON RECEIPT, FIELD AND ANALYTICAL DATA WERE PUNCHED ONTO 80 COLUMN CARDS AND ALL SUBSEQUENT PROCESSING WAS CARRIED OUT WITH THE AID OF COMPUTERS.

THE FIELD DATA WERE RECORDED BY THE FIELD CONTRACT STAFF ONTO STANDARD LAKE 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 DOMINANT ROCK TYPES IN THE LAKE CATCHMENT BASINS WERE IDENTIFIED ON APPROPRIATE GEOLOGICAL MAPS USED AS THE BEDROCK GEOLOGICAL BASE ON NGR MAPS.

ANAL. CARD	COLUMNS DETECTION LIMIT		I LIMIT
1	21-25	2	1
1	26-30	2	1
1	31-35	2	1
1	36-40	2	1
1	41-45	2	1
1	46-50	0.2	0.1
1	51-55	5	2
1	56-60	1	0.5
1	61-65	2	1
1	66-70	0.02	0.01
1	71-75	10	5
1	76-79	1.0	0.5
2	21-25	0.2	0.1
2	26-30	40	20
2	31-35	0.5	0.2
2	36-40	0.2	0.1
3	26-30	20	10
3	31-35		
3	36-40	0.05	0.002
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THE ANALYTICAL DATA WERE RECORDED AS FOLLOWS (SEE GARRETT, 1974, FOR DETAILS) AND FOR CONVENIENCE THE DETECTION LIMITS OF THE ANALYTICAL METHODS USED ARE ALSO GIVEN-

UNLESS OTHERWISE NOTED THE UNITS OF MEASUREMENT FOR THE ANALYSES ARE PPM. THE SECOND FIGURE UNDER DETECTION LIMIT IS THE FIGURE TO WHICH VALUES WERE ARBITRARILY SET IF THEY FELL BELOW THE DETECTION LIMIT.

GENERAL INSPECTIONS OF THE FIELD AND ANALYTICAL DATA WERE MADE TO CHECK FOR ANY MISSING INFORMATION AND/OR GROSS ERRORS. THE SAMPLE SITE COORDINATES WERE CHECKED BY PLOTTING SAMPLING LOCATION MAPS ON A CALCOMP 1051 DRUM PLOTTER FROM THE DIGITIZED COORDINATES AND THEN OVERLAYING THESE OVER THE FIELD CONTRACTOR'S SAMPLE LOCATION BASE MAPS.

QUALITY CONTROL AND MONITORING OF THE GEOLOGICAL DATA WAS UNDERTAKEN BY A STANDARD METHOD USED BY THE RESOURCE GEOCHEMISTRY SUBDIVISION AT THE GEOLOGICAL SURVEY OF CANADA.

## REFERENCES

- BOULANGER, A., EVANS, D.J.R. AND RABY, B.F. (1975) URANIUM ANALYSIS BY NEUTRON ACTIVATION DELAYED NEUTRON COUNTING: PROC. OF THE 7TH ANNUAL SYMP. OF CANADIAN MINERAL ANALYSTS. THUNDER BAY, ONTARIO, SEPT. 22-23, 1975.
- FICKLIN, W.H. (1970) A RAPID METHOD FOR THE DETERMINATION OF FLUORIDE IN ROCKS AND SOILS, USING AN ION SELECTIVE ELECTRODE. U.S. GEOL. SURV. PAPER 700C PP. C186-188.
- GARRETT, R.G. (1974) FIELD DATA AQUISITION METHODS FOR APPLIED GEOCHEMICAL SURVEYS AT THE GEOLOGICAL SURVEY OF CANADA: GEOL SURV. CAN. PAPER 74-52.
- 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.
- HALL, G.E.M. (1979) A STUDY OF THE STABILITY OF URANIUM IN WATERS COLLECTED FROM VARIOUS GEOLOGICAL ENVIRONMENTS IN CANADA; IN CURRENT RESEARCH, PART A, GEOL. SURV. CAN. PAPER 79-1A, P. 361-365.
- 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.

DATA LEGEND

- MAP- NATIONAL TOPOGRAPHIC SYSTEM(NTS)- LETTERED QUADRANGLE (SCALE 1:250000). PART OF SAMPLE NUMBER ID- REMAINDER OF SAMPLE NUMBER- YEAR(2), FILED CREW(1), SAMPLE SEQUENCE NUMBER(3)
- SAMPLE SEQUENCE NUMBER(3)
- UTM COORDINATES- 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
  - LAKE AREA- AREA OF LAKE SAMPLED SMP DTH- SAMPLE DEPTH MEASURED TO THE NEAREST FOOT
    - RP ST- REPLICATE STATUS- RELATIONSHIP OF SAMPLE WITH RESPECT TO OTHERS WITHIN THE SURVEY
    - RELF- RELIEF OF THE SURROUNDING LAKE CATCHMENT BASIN
    - CONT- CONTAMINATION- HUMAN OR NATURAL (WORK-DRILL/TRENCH, CAMP, FUEL, OR GOSSAN)
  - SAMPL COLOR- SEDIMENT COLOUR
    - SUSP- SUSPENDED MATTER

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) CONT: 1- PRESENT AS- ARSENIC BY ATOMIC ABSORPTION SPECTROSCOPY (PPM) MO- MOLYBDENUM BY ATOMIC ABSORPTION SPECTROSCOPY (PPM) FE- IRON BY ATOMIC ABSORPTION SPECTROSCOPY(%) SAMPL COLOR: TN- TAN HG- MERCURY BY ATOMIC ABSORPTION SPECTROSCOPY(PPB) LOI- LOSS ON IGNITION BY WEIGHT DIFFERENCE (%) U- URANIUM BY DELAYED NEUTRON ACTIVATION (PPM) F- FLOURINE BY SPECIFIC ION ELECTRODE (PPM) V- VANADIUM BY ATOMIC ABSORPTION SPECTROSCOPY(PPM) CD- CADMIUM BY ATOMIC ABSORPTION SPECTROSCOPY(PPM) F-W- FLOURINE IN WATERS BY FISSION TRACK(PPB)
PH- PH BY COMBINATION GLASS - CALOMEL ELECTRODE
(1982) U-W- URANIUM IN WATERS BY SCINTREX(PPB)

ROCK TYPE: HUGP- PARAGNEISSES, GRANITOID GNEISSES OF PROBABLE SEDIMENTARY ORGIN,

MINOR QUARTZITE AND MARBLE

- MINOR QUARTZITE AND MARDLE APHG- DOLOMITE, MARBLE, QUARTZITE, IRON FORMATION, PARASCHIST AND PARAGNEISS HUGN- SILLIMANITE GNEISS, COMMONLY MIGMATITIC.
  - MINOR AMPHIBOLITE
  - AGWF- IRON FORMATION: WABUSH FORMATION
  - AUGP- METASEDIMENTARY GRANITOID GNEISSES, MINOR AMPHIBOLITE, SILLIMANITE GNEISS, METAOUARTZITE, MARBLE
  - AUGN- SILLIMANITE GNEISS, WITH ABUNDANT INTRUSIVE PEGMATITIC MATERIAL, MINOR AMPHIBOLITE
  - AUGR- GRANULITIC, DIORITIC TO GRANODIORITIC GNEISS
  - AUGB- AMPHIBOLITE, PYROXENE AMPHIBOLITE, CHLORITE SCHIST, GARNET- AND BIOTITE-RICH GNEISSES
  - ARCS- PYROXENE GRANULITE, UNSEPARATED ACIDIC INTRUSIVES: ASHUANIPI COMPLEX
  - NH15- GRANITE TO GRANODIORITE, MASSIVE TO POORLY FOLIATED PORPHYRITIC IN PART
  - PH11- ANORTHOSITE SUITE: ANORTHOSITE, ANORTHOSITIC GABBRO, LEUCOTROCTOLITE
  - PH10- GABBRO, NORITE, ANORTHOSITE GABBRO, TROCTOLITE, DIORITE, DERIVED BASIC GNEISSES AND AMPHIBOLITE

## LAKE AREA: POND- POND

- LT 1- 1/4 TO 1 SO KM
- 1-5- 1 TO 5 SO KM
- GT 1- GREATER THAN 5 SO KM
- RP ST: 00- ROUTINE SAMPLE
  - 10- FIRST OF FIELD DUPLICATE
  - 20- SECOND OF FIELD DUPLICATE
- RELF: L- LOW M- MEDIUM
  - H- HIGH
- BLANK- NONE

YL- YELLOW GR- GREEN GY- GREY BN- BROWN BK- BLACK SUSP: L- LIGHT H- HEAVY BLANK- NONE