

REGIONAL LAKE SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA, MANITOBA 1984, GSC-OF 1104, NGR 69-1984, NTS 64F

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REGIONAL LAKE SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA, MANITOBA 1984, GSC-OF 1104, NGR 69-1984, NTS 64F

GEOLOGICAL SURVEY OF CANADA OPEN FILE 1104,
REGIONAL LAKE SEDIMENT AND WATER GEOCHEMICAL RECONNAISSANCE DATA,
NORTH-WEST MANITOBA, NTS 64F.

OPEN FILE 1104 IS ONE OF THREE OPEN FILES (1103,1104 AND 1105) COVERING
NORTH-WEST MANITOBA, CONSISTING OF NTS 64B,64F AND 64G RESPECTIVELY.

THE RECONNAISSANCE SURVEY WAS UNDERTAKEN BY THE GEOLOGICAL SURVEY OF CANADA IN
CONJUNCTION WITH THE MANITOBA DEPARTMENT OF ENERGY AND MINES UNDER THE
CANADA-MANITOBA MINERAL DEVELOPMENT AGREEMENT (1984-1989).

E.H.W. HORNBROOK 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 AS FOLLOWS:

COLLECTION: - MARSHALL MACKLIN MONAGHAN LTD., TORONTO, ONTARIO
- E.H.W. HORNBROOK, P.W.B. FRISKE

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 SUPPORTED SAMPLE COLLECTION WAS CARRIED OUT DURING
THE SUMMER OF 1984.
LAKE SEDIMENT AND WATER SAMPLES WERE COLLECTED AT AN AVERAGE DENSITY OF ONE
SAMPLE PER 13 SQUARE KILOMETERS THROUGHTOUT THE 40,400 SQUARE KILOMETERS OF THE
NORTH-WEST MANITOBA SURVEY AREA.

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 SIEVED. THE MINUS 80 MESH (177 MICRONS) 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 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 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 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 CONTRACTORS'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 LAKE 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 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 IMMERSSED 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 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 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 S₂SO₄ 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.

FLUORIDE IN LAKE 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 DINITRILLO 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 5M NaOH SOLUTION. COOL AND DILUTE TO ONE LITER IN A VOLUMETRIC FLASK.

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 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.

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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)

ELEMENT	CARD	COLUMNS
FIELD		
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
LAKE AREA	1	32-35
SAMPLE DEPTH (METER)	1	36-38
REPLICATE STATUS	1	39-40
RELIEF	1	41-43
CONTAMINATION	1	48-51
SAMPLE COLOUR	1	52-57
SUSPENDED MATTER	1	58-59

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 0.5
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
V	PPM	3	31-35	5 2
CD	PPM	3	36-40	0.2 0.1
SB	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 LEGEND LIST

MAP-	NATIONAL TOPOGRAPHIC SYSTEM(NTS)- LETTERED QUADRANGLE (SCALE 1:250000). 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
LAKE AREA-	AREA OF LAKE SAMPLED
SP DT-	SAMPLE DEPTH MEASURED TO THE NEAREST METER
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)
SMPL 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)
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)
SB-	ANTIMONY MIBK SOLVENT EXTRACTION 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)

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ROCK TYPE:

- A - METADIORITE, HORNBLENDITE OF POSSIBLE ARCHEAN AGE
- 2A - BIOTITE-FELDSPAR-QUARTZ-PARAGNEISS + GARNET + GRANITE + OR - MUSCOVITE
- 2B - BIOTITE METATEXITE + GARNET + GRAPHITE (25-75% WHITE GRANITIC LIT)
- 2C - BIOTITE METATEXITE + GARNET + CORDIERITE
- 3A - LIGHT GREY BIOTITE (5-10%) QUARTZ-FELDSPAR-GNEISS + MAGNETITE + GARNET WITH DISCONTINUOUS DIORITE GNEISS LENSES
- 3B - LIGHT GREY TO DARK GREY BIOTITE (5-15%) QUARTZ-FELDSPAR-GNEISS INTERLAYERED WITH THIN LAYERS OF AMPHIBOLITE AND/OR HORNBLende-BIOTITE BEARING LAYERS
- 5 - AMPHIBOLITE, METAGABBRO, LOCALLY AGMATITIC
- 6A - METACONGLOMERATE
- 6B - THINLY LAYERED AMPHIBOLITE AND HORNBLende BIOTITE-BEARING LAYERS
- 6C - ARKOSIC GNEISS
- 7 - GNEISSIC DIORITE AND LEUCODIORITE
- 7A - BIOTITE + OR - HORNBLende GRANODIORITE GNEISS WITH WHITE GRANITIC LIT
- 7B - GABBRO
- 8 - GREY, MEDIUM TO COARSE GRAINED BIOTITE (5%) + MAGNETITE-TONALITE TO QUARTZ MONZONITE

ROCK TYPE:
(CONT.)

- 8A - HYBRID GNEISS OF GREY BIOTITE-QUARTZ MONZONITE AND GNEISSIC DIORITE
- 9 - FOLIATED QUARTZ DIORITE + MAGNETITE
- 10 - BIOTITE (15-20%) - TONALITE + OR - GARNET
- 11A - MEGACRYSTIC BIOTITE-GRANODIORITE
- 11B - MEGACRYSTIC BIOTITE-HORNBLende + OR - PYROXENE-GRANODIORITE
- 11C - COARSE GRAINED LEUCOCRATIC GRANODIORITE
- 12 - WHITE LEUCOCRATIC MEDIUM GRAINED TO PEGMATITIC MONZOGARNITE + OR - GARNET
- 13 - COARSE GRAINED TO MEGACRYSTIC-PYROXENE-HORNBLende-MONZONITE TO MONZOGARNITE WITH OLIVE-BROWN FELDSPAR
- 13B - HORNBLende-BIOTITE-MONZONITE TO QUARTZ MONZONITE WITH VARIGATED OLIVE-BROWN AND PINK FELDSPAR
- 14 - MEGACRYSTIC-BIOTITE-MAGNETITE QUARTZ MONZONITE
- 15 - BIOTITE + OR - HORNBLende COARSE GRAINED TO MEGACRYSTIC PINK GRANITE TO QUARTZ MONZONITE
- 15A - BIOTITE-HORNBLende GRANITE GNEISS
- 16 - MAGNETITE-BIOTITE-HORNBLende QUARTZ MONZONITE
- UKNN - UNKNOWN

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LAKE AREA: POND- POND
LT 1- 1/4 TO 1 SQ KM
1-5- 1/4 TO 5 SQ KM
GT 5- GREATER THAN 5 SQ KM

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

RELF: L- LOW
M- MEDIUM
H- HIGH

CONT: BLANK- NONE
1- PRESENT

SMPL COLOR: TN- TAN
YL- YELLOW
GN- GREEN
GY- GREY
BR- BROWN
BK- BLACK

SUSP: BLANK- NONE
L- LOW
H- HIGH